2005 CELICA REPAIR MANUAL

INTRODUCTION IN
MAINTENANCE MA
PREPARATION PP
SERVICE SPECIFICATION SS
DIAGNOSTICS DI
ENGINE MECHANICAL EM
EMISSION CONTROL EC
SFI SF
COOLING CO
LUBRICATION LU
IGNITION IG
STARTING ST
CHARGING CH
CLUTCH CL
MANUAL TRANSAXLE (C56) MX
MANUAL TRANSAXLE (C60) MX
AUTOMATIC TRANSAXLE (U240E) AX
AUTOMATIC TRANSAXLE (U341E) AX
SUSPENSION AND AXLE SA
BRAKE BR
STEERING SR
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) RS
BODY ELECTRICAL BE
BODY BO
AIR CONDITIONING AC

HOW TO USE THIS MANUAL

IN00U–97

GENERAL INFORMATION

1. INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the section title and major heading are given at the top of every page.

2. PRECAUTION

At the beginning of each section, a PRECAUTION is given that pertains to all repair operations contained in that section.

Read these precautions before starting any repair task.

3. TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The fundamentals of how to proceed with troubleshooting are described on page IN–20.

Be sure to read this before performing troubleshooting.

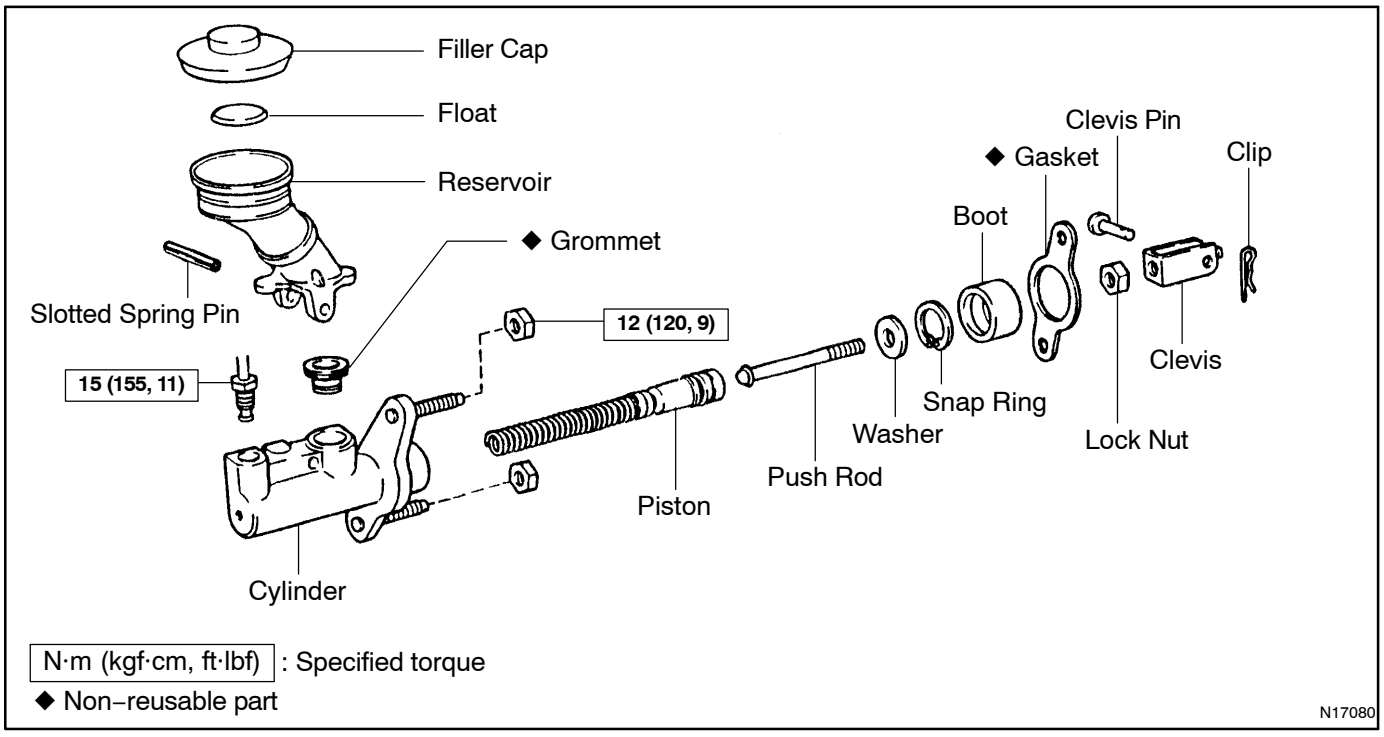
4. PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

5. REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

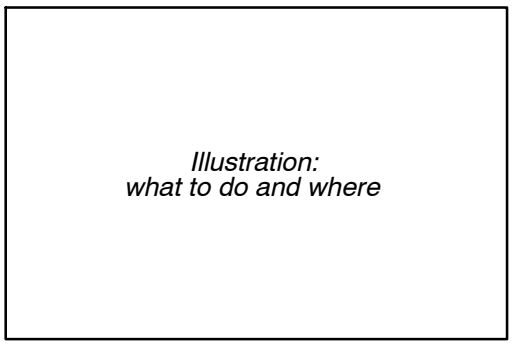
Example:



The procedures are presented in a step–by–step format:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:



Task heading : what to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.

SST 09350–30020 (09350–06120)

Set part No. *Component part No.*

Detailed text : how to do task

(b) Measure the stroke applying and releasing the compressed air (392 — 785 kPa, 4 — 8 kgf/cm^2 or 57 — 114 psi) as shown in the illustration.

Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)

Specification

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

6. REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

7. SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found in Service Specifications section for quick reference.

8. CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

9. SI UNIT

The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.

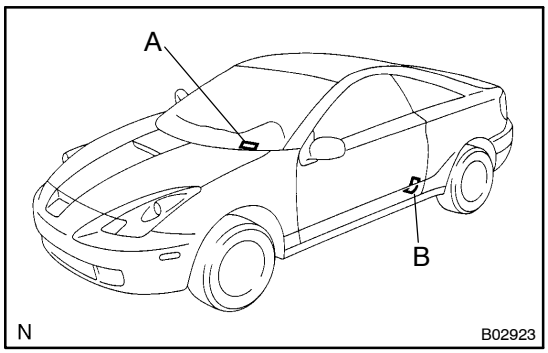
Example:

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

IDENTIFICATION INFORMATION

IN0CN–25

VEHICLE IDENTIFICATION AND ENGINE SERIAL NUMBER

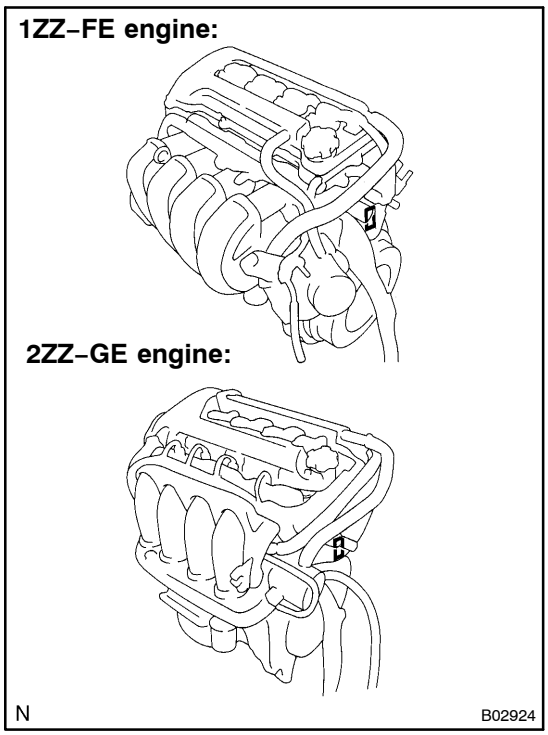


1. VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the vehicle identification number plate and the certification label, as shown in the illustration.

A: Vehicle Identification Number Plate

B: Certification Label



2. ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block, as shown in the illustration.

REPAIR INSTRUCTIONS

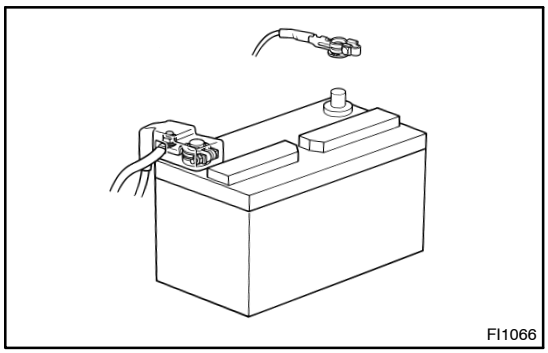
GENERAL INFORMATION

IN0CO–31

BASIC REPAIR HINT

(a) Use fender, seat and floor covers to keep the vehicle clean and prevent damage.

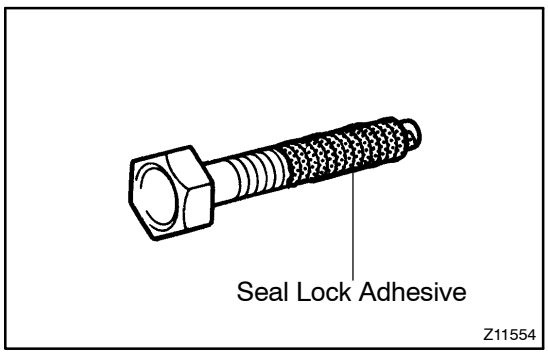
(b) During disassembly, keep parts in the appropriate order to facilitate reassembly.


FI1066

(c) Installation and removal of battery terminal:
  (1) Before performing electrical work, disconnect the negative (–) terminal cable from the battery.
  (2) If it is necessary to disconnect the battery for inspection or repair, first disconnect the negative (–) terminal cable.
  (3) When disconnecting the terminal cable, to prevent damage to battery terminal, loosen the cable nut and raise the cable straight up without twisting or prying it.
  (4) Clean the battery terminals and cable ends with a clean shop rag. Do not scrape them with a file or other abrasive objects.
  (5) Install the cable ends to the battery terminals after loosening the nut, and tighten the nut after installation. Do not use a hammer to tap the cable ends onto the terminals.
  (6) Be sure the cover for the positive (+) terminal is properly in place.

(d) Check hose and wiring connectors to make sure that they are connected securely and correctly.

(e) Non–reusable parts
  (1) Always replace cotter pins, gaskets, O–rings, oil seals, etc. with new ones.
  (2) Non–reusable parts are indicated in the component illustrations by the "◆" symbol.



Z11554

(f) Precoated parts

Precoated parts are bolts, nuts, etc. that are coated with a seal lock adhesive at the factory.
  (1) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
  (2) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

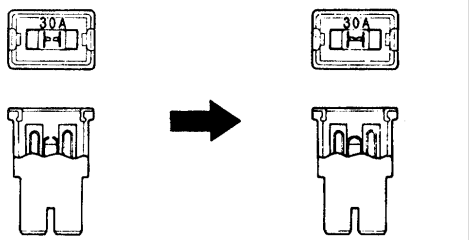
(3) Precoated parts are indicated in the component illustrations by the "★" symbol.

(g) When necessary, use a sealer on gaskets to prevent leaks.

(h) Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

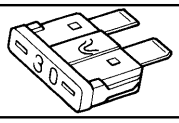
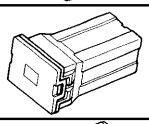
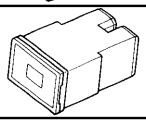
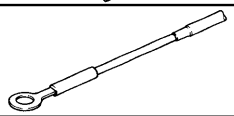
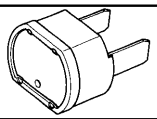
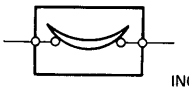
(i) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in Preparation section in this manual.

Medium Current Fuse and High Current Fuse Equal Amperage Rating



BE1367

(j) When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

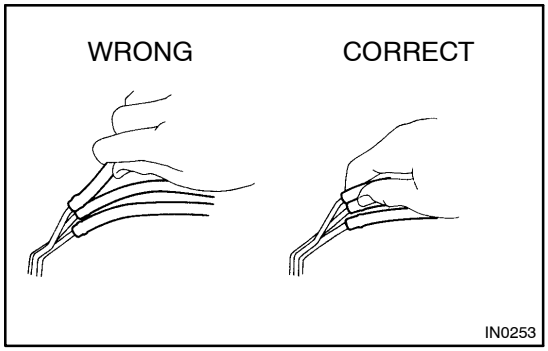
Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M–FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H–FUSE
 BE5597	 IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

V00076

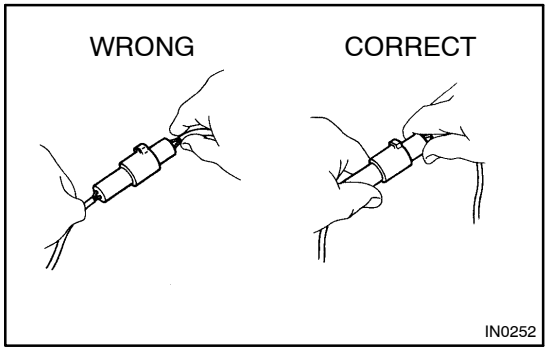
(k) Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–8).
- Cancel the parking brake on the level place and shift the transmission in Neutral (or N position).
- When jacking up the front wheels of the vehicle at first place stoppers behind the rear wheels.
- When jacking up the rear wheels of the vehicle at first place stoppers before the front wheels.
- When either the front or rear wheels only should be jacked up, set rigid racks and place stoppers in front and behind the other wheels on the ground.
- After the vehicle is jacked up, be sure to support it on rigid racks . It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.

(l) Observe the following precautions to avoid damage to the following parts:

(1) Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



(2) To disconnect vacuum hoses, pull off the end, not the middle of the hose.



(3) To pull apart electrical connectors, pull on the connector itself, not the wires.

(4) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.

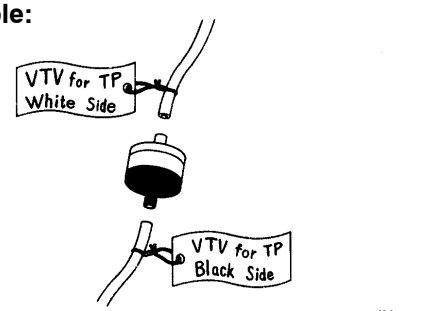
(5) When steam cleaning an engine, protect the electronic components, air filter and emission–related components from water.

(6) Never use an impact wrench to remove or install temperature switches or temperature sensors.

(7) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.

(8) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter for adjustment. Once the hose has been stretched, it may leak air.

Example:



(m) Installation and removal of vacuum hose:

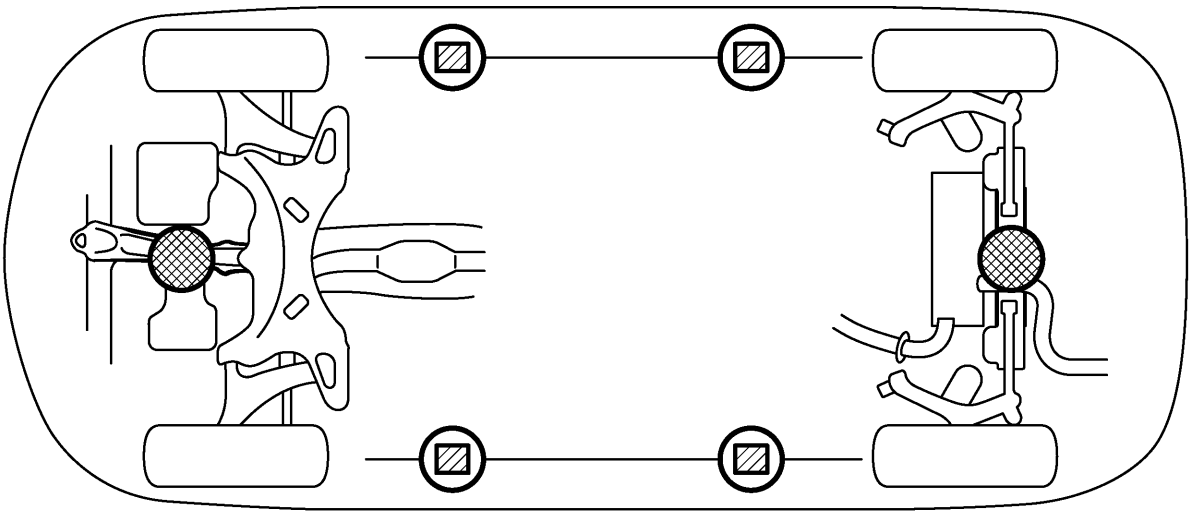
(1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected to.

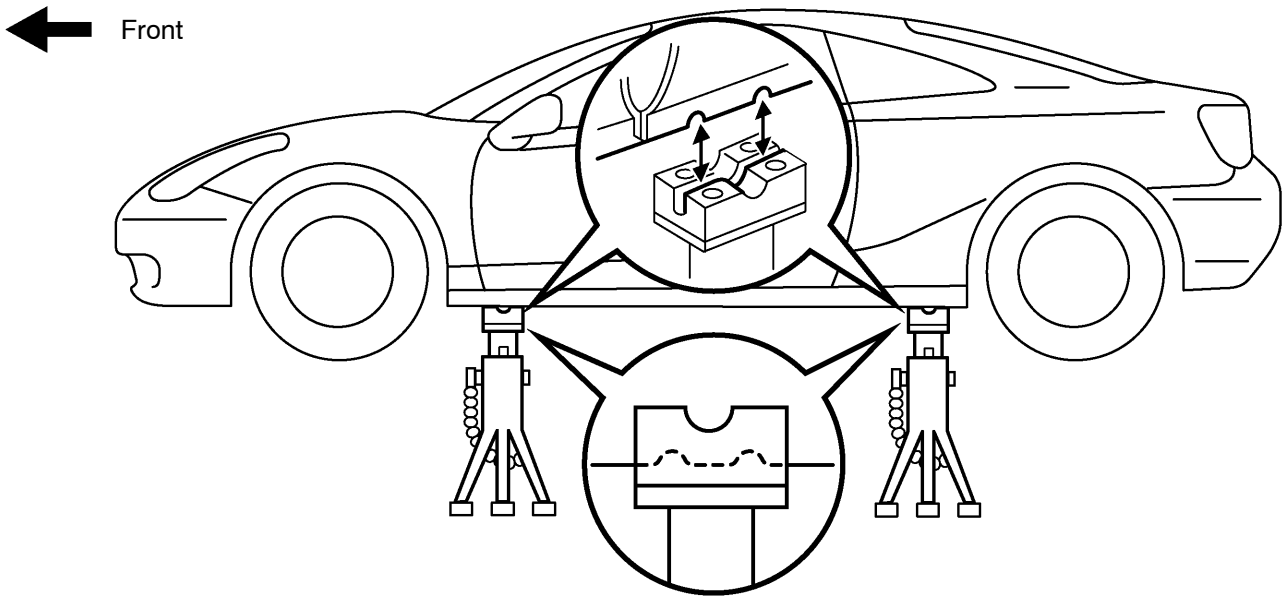
(2) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

(n) Unless otherwise stated, all resistance is measured at an ambient temperature of 20°C (68°F). Because the resistance may be outside specifications if measured at high temperatures immediately after the vehicle has been running, measurement should be made when the engine has cooled down.

IN0CP–25

VEHICLE LIFT AND SUPPORT LOCATIONS





JACK POSITION

Front ..... Front crossmember
Rear..... Rear axle beam
CAUTION : When jacking–up the rear and front, make sure the car is not carrying any extra weight.

PANTOGRAPH JACK POSITION

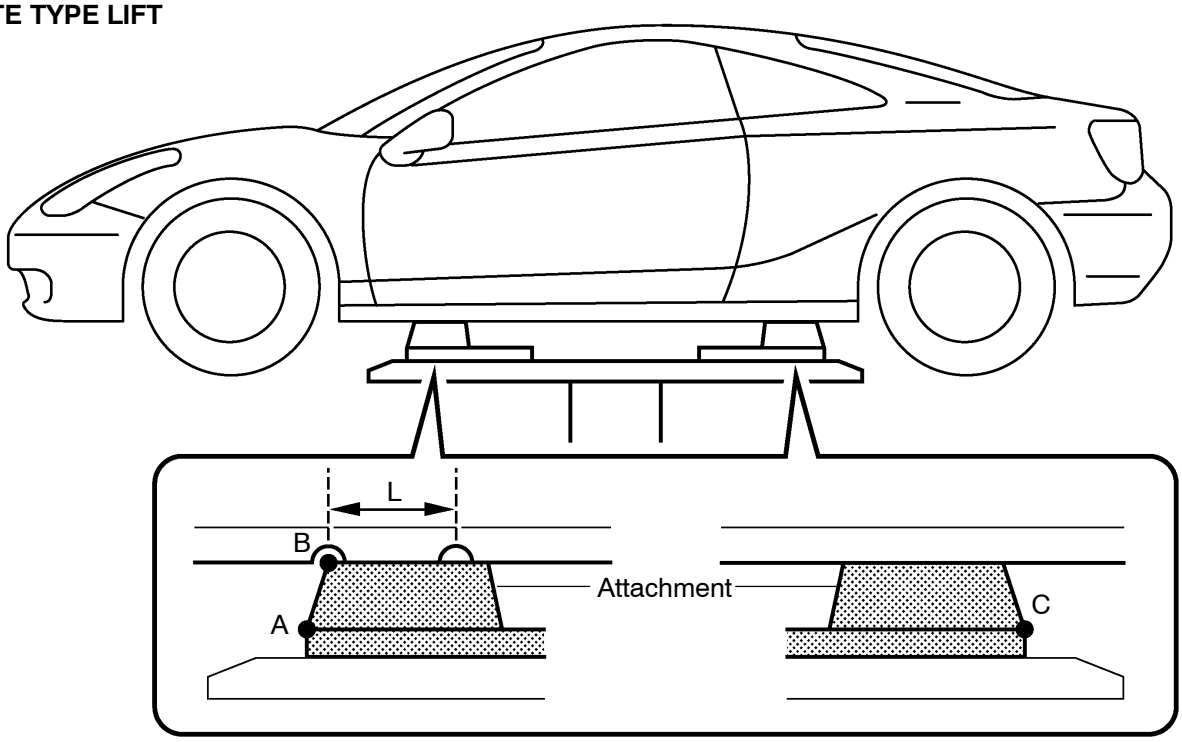
SUPPORT POSITION

Safety stand and swing arm type lift .....

N

B02925

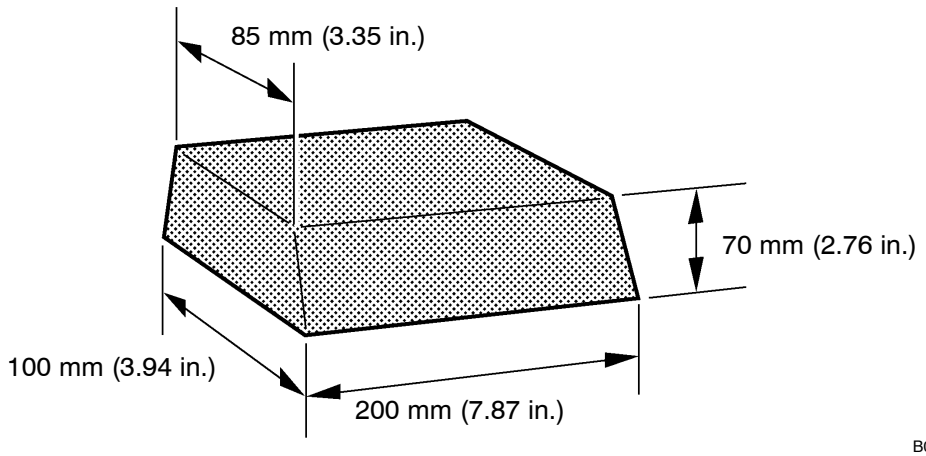
PLATE TYPE LIFT



HINT :

Left and right set position	Place the vehicle over the center of the lift.
Front and rear set position	• Align the cushion gum ends of the plate with the attachment lower ends (A, C). • Align the attachment upper end (B) with the front jack supporting point (L).

Attachment dimensions



N

B02926

FOR ALL OF VEHICLES

PRECAUTION

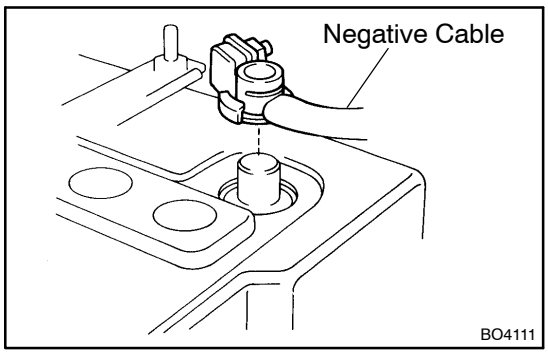
IN0FA–02

1. FOR VEHICLES EQUIPPED WITH SRS AIRBAG AND SEAT BELT PRETENSIONER

(a) The CELICA is equipped with an SRS (Supplemental Restraint System), such as the driver airbag, front passenger airbag assembly, side airbag assembly and seat belt pretensioner.

Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident.

Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.



(b) GENERAL NOTICE

(1) Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page DI–884).

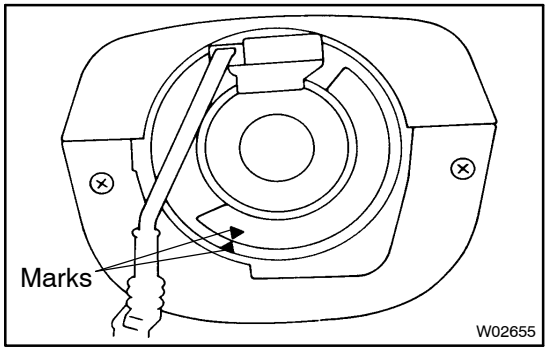
(2) Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery.

(The supplemental restraint system is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable from the battery, the SRS may deploy.)

When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by the each memory system. Then when work is finished, reset the clock and audio systems as before.

To avoid erasing the memory of each memory system, never use a back–up power supply from another battery.

(3) Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad, front passenger airbag assembly, side airbag assembly and seat belt pretensioner should be inspected (See page RS–14, RS–28, and BO–111).
(4) Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
(5) Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.
(6) Never disassemble and repair the airbag sensor assembly, steering wheel pad, front passenger airbag assembly, side airbag assembly or seat belt pretensioner.
(7) If the airbag sensor assembly, steering wheel pad, front passenger airbag assembly, side airbag assembly or seat belt pretensioner has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
(8) Do not directly expose the airbag sensor assembly, steering wheel pad, front passenger airbag assembly, side airbag assembly or seat belt pretensioner to hot air or flames.
(9) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit.
(10) Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
(11) After work on the supplemental restraint system is completed, check the SRS warning light (See page DI–884).



(c) SPIRAL CABLE (in Combination Switch)
The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other troubles may result. Refer to SR–21 of this manual concerning correct steering wheel installation.

(d) STEERING WHEEL PAD (with Airbag)

(1) When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.
Storing the pad with its metallic surface facing upward may lead to a serious accident if the airbag deploys for some reason. In addition do not store a steering wheel pad on top of another one.

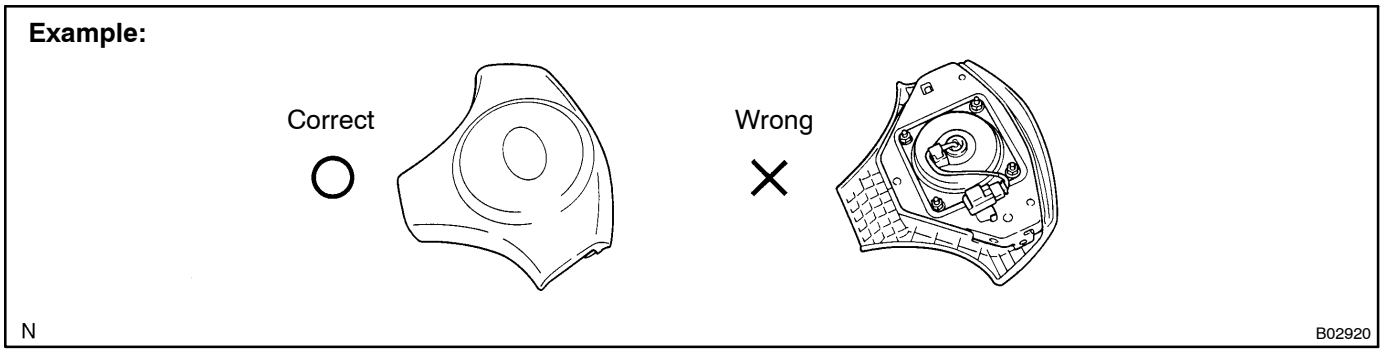
(2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

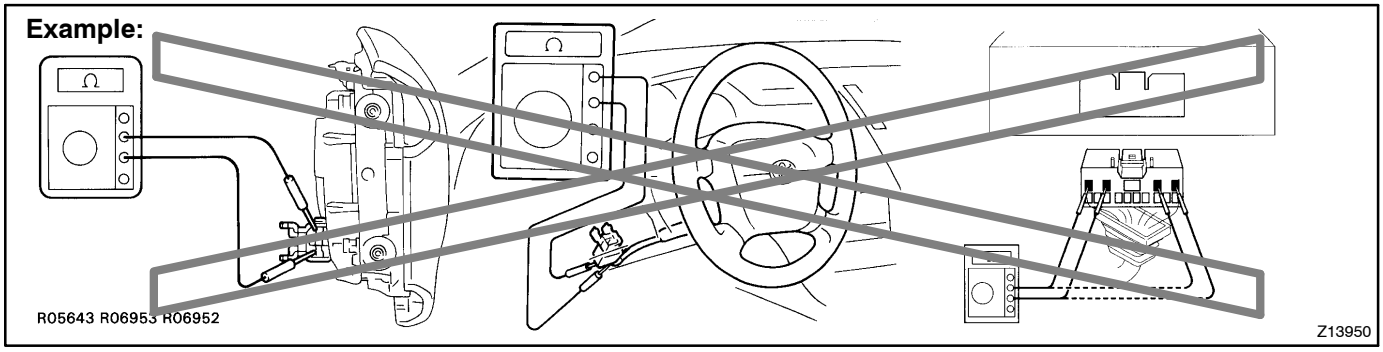
(3) Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind.

(4) Store the steering wheel pad where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.

(5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connector before starting work.

(6) When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page RS–16).
Carry out the operation in a safe place away from electrical noise.





(e) FRONT PASSENGER AIRBAG ASSEMBLY

(1) Always store a removed or new front passenger airbag assembly with the airbag deployment direction facing up.
Storing the airbag assembly with the airbag deployment direction facing down could cause a serious accident if the airbag inflates.

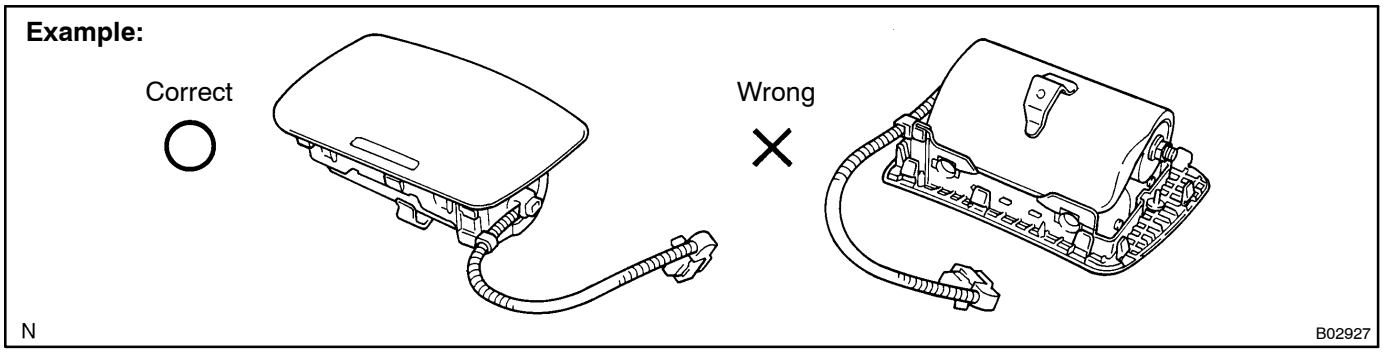
(2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

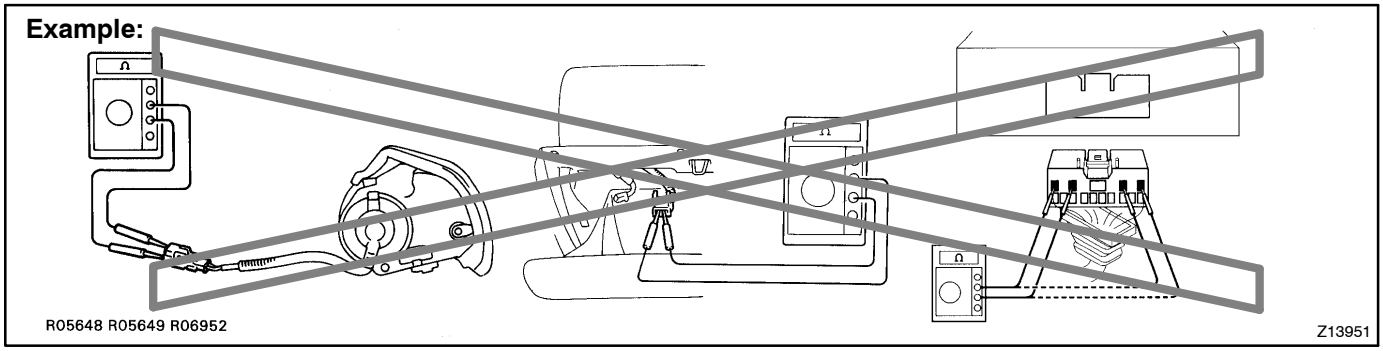
(3) Grease should not be applied to the front passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind.

(4) Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.

(5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the assembly before starting work.

(6) When disposing of a vehicle or the airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS–30).
Perform the operation in a safe place away from electrical noise.





(f) SIDE AIRBAG ASSEMBLY

(1) Always store a removed or new side airbag assembly with the airbag deployment direction facing up. Storing the airbag assembly with the airbag deployment direction facing down could cause a serious accident if the airbag deploys.

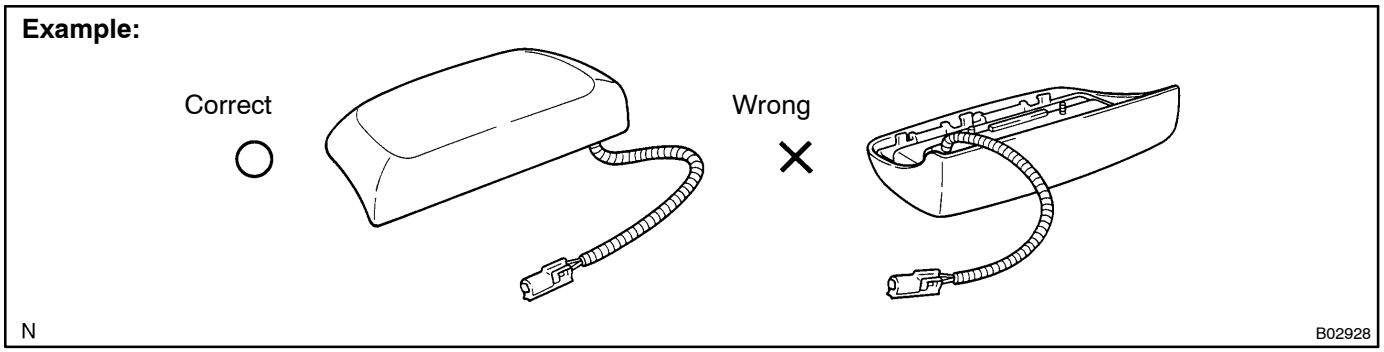
(2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

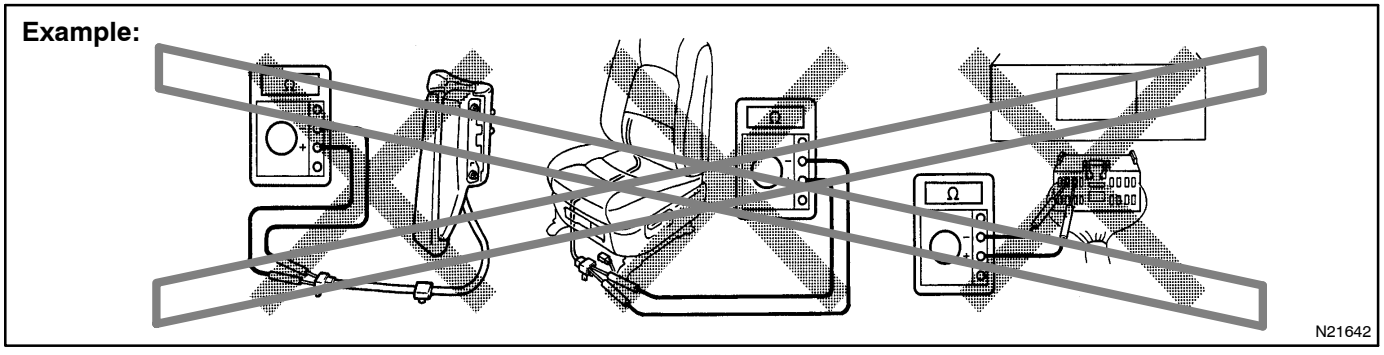
(3) Grease should not be applied to the side airbag assembly and the surface should not be cleaned with detergents of any kind.

(4) Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.

(5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the seat before starting work.

(6) When disposing of a vehicle or the side airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS–43).
Perform the operation in a safe place away from electrical noise.





(g) SEAT BELT PRETENSIONER

(1) Never measure the resistance of the seat belt pretensioner. (This may cause the seat belt pretensioner to activate, which is very dangerous.)

(2) Never disassemble the seat belt pretensioner.

(3) Never install the seat belt pretensioner in another vehicle.

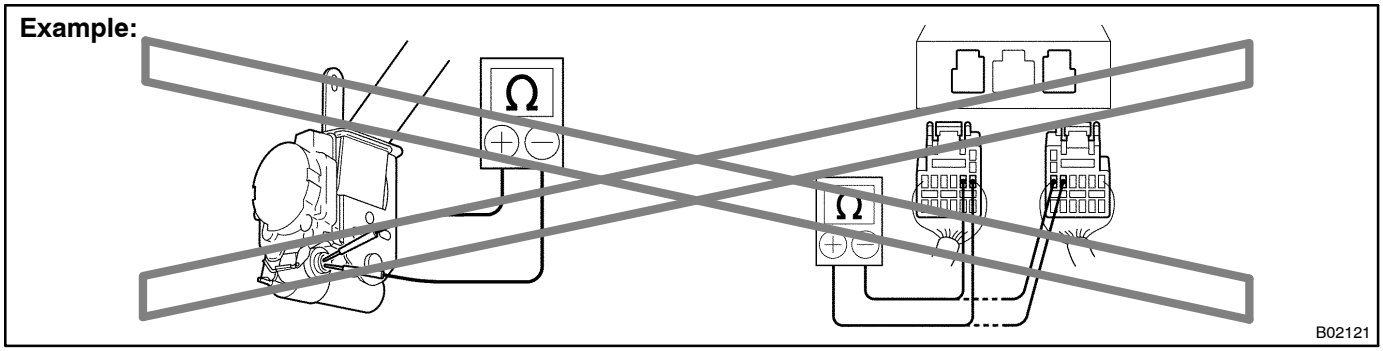
(4) Store the seat belt pretensioner where the ambient temperature remains below 80°C (176°F) and away from electrical noise without high humidity.

(5) When using electric welding, first disconnect the connector (yellow color and 2 pins) before starting work.

(6) When disposing of a vehicle or the seat belt pretensioner alone, the seat belt pretensioner should be activated before disposal (See page BO–112). Perform the operation in a safe place away from electrical noise.

(7) The seat belt pretensioner is hot after activation, so let it cool down sufficiently before the disposal. However never apply water to the seat belt pretensioner.

Example:



(h) AIRBAG SENSOR ASSEMBLY

(1) Never reuse the airbag sensor assembly involved in a collision when the SRS has deployed.

(2) The connectors to the airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connectors are connected or disconnected while the airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the supplemental restraint system.

(3) Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery, even if only loosing the set bolts of the airbag sensor assembly.

(i) WIRE HARNESS AND CONNECTOR

The SRS wire harness is integrated with the instrument panel wire harness assembly. All the connectors in the system are a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it as shown on page RS–72.

2. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION:

If large amount of unburned gasoline flows into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

(a) Use only unleaded gasoline.

(b) Avoid prolonged idling.
Avoid running the engine at idle speed for more than 20 minutes.

(c) Avoid spark jump test.
   (1) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
   (2) While testing, never race the engine.

(d) Avoid prolonged engine compression measurement.
Engine compression tests must be done as rapidly as possible.

(e) Do not run engine when fuel tank is nearly empty.
This may cause the engine to misfire and create an extra load on the converter.

(f) Avoid coasting with ignition turned off.

(g) Do not dispose of used catalyst along with parts contaminated with gasoline or oil.

3. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

For vehicles with mobile communication systems such as two–way radios and cellular telephones, observe the following precautions.

(1) Install the antenna as far as possible away from the ECU and sensors of the vehicle's electronic system.

(2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronic systems. For details about ECU and sensors locations, refer to the section on the applicable component.

(3) Avoid winding the antenna feeder together with other wiring as much as possible, and also avoid running the antenna feeder parallel with other wire harnesses.

(4) Check that the antenna and feeder are correctly adjusted.

(5) Do not install powerful mobile communications system.

4. FOR USING OBD II SCAN TOOL OR TOYOTA HAND–HELD TESTER

CAUTION:

Observe the following items for safety reasons:

- **Before using the OBD II scan tool or TOYOTA hand–held tester, the OBD II scan tool's instruction book or TOYOTA hand–held tester's operator manual should be read thoroughly.**
- **Be sure to route all cables securely when driving with the OBD II scan tool or TOYOTA hand–held tester connected to the vehicle. (i.e. Keep cables away from feet, pedals, steering wheel and shift lever.)**
- **Two persons are required when test driving with the OBD II scan tool or TOYOTA hand–held tester, one person to drive the vehicle and the other person to operate the OBD II scan tool or TOYOTA hand–held tester.**

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

IN05Y–45

GENERAL INFORMATION

A large number of ECU controlled systems are used in the CELICA. In general, the ECU controlled system is considered to be a very intricate system requiring a high level of technical knowledge and expert skill to troubleshoot. However, the fact is that if you proceed to inspect the circuits one by one, troubleshooting of these systems is not complex. If you have adequate understanding of the system and a basic knowledge of electricity, accurate diagnosis and necessary repair can be performed to locate and fix the problem. This manual is designed through emphasis of the above standpoint to help service technicians perform accurate and effective troubleshooting, and is compiled for the following major ECU controlled systems:
The troubleshooting procedure and how to make use of it are described on the following pages.

System	Page
1. 1ZZ–FE Engine	DI–1
2. 2ZZ–GE Engine	DI–293
3. U240E Automatic Transaxle	DI–666
4. U341E Automatic Transaxle	DI–755
5. Anti–Lock Brake System with Electronic Brake Force Distribution (EBD)	DI–834
6. Supplemental Restraint System	DI–882
7. Cruise Control System (1ZZ–FE)	DI–1037
8. Cruise Control System (2ZZ–GE)	DI–1088
9. Body Control system	DI–1117

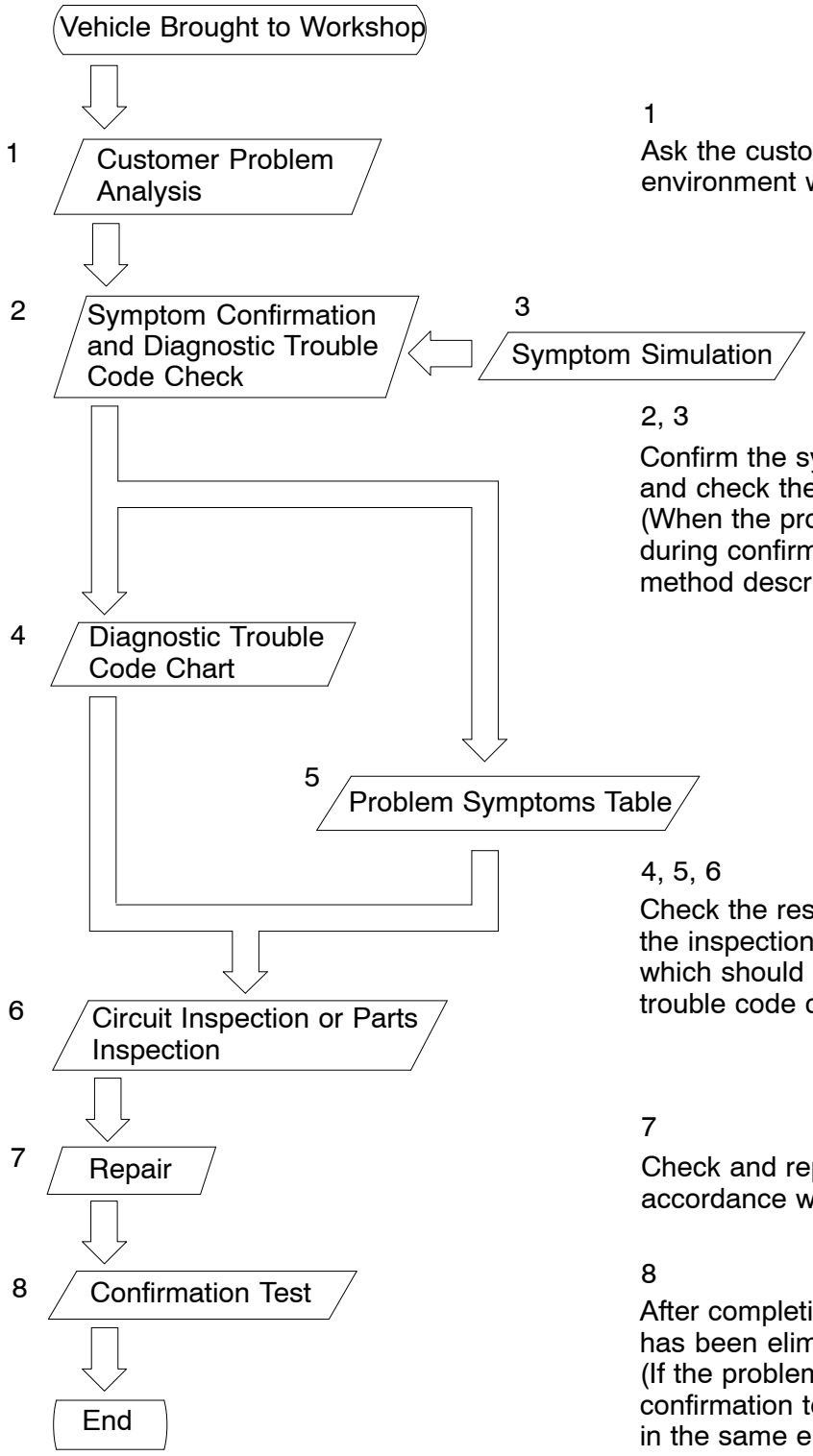
FOR USING OBD II SCAN TOOL OR TOYOTA HAND–HELD TESTER

- Before using the scan tool or tester, the scan tool's instruction book or tester's operator manual should be read thoroughly.
- If the scan tool or tester cannot communicate with ECU controlled systems when you have connected the cable of the scan tool or tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.
  (1) If communication is normal when the tool is connected to another vehicle, inspect the diagnosis data link line (Bus⊕line) or ECU power circuit of the vehicle.
  (2) If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so perform the Self Test procedures outline in the Tester Operator's Manual.

IN05W–46

HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure on the following page. Here, only the basic procedure is shown. Details are provided in Diagnostics section, showing the most effective methods for each circuit. Confirm the troubleshooting procedures first for the relevant circuit before beginning troubleshooting of that circuit.



1

Ask the customer about the conditions and the environment when the problem occurred.

2, 3

Confirm the symptoms and the problem conditions, and check the diagnostic trouble codes.
(When the problem symptoms do not appear during confirmation, use the symptom simulation method described later on.)

4, 5, 6

Check the results obtained in Step 2, then confirm the inspection procedure for the system or the part which should be checked using the diagnostic trouble code chart or the problem symptoms table.

7

Check and repair the affected system or part in accordance with the instructions in Step 6.

8

After completing repairs, confirm that the problem has been eliminated.
(If the problem is not reproduced, perform the confirmation test under the same conditions and in the same environment as when it occurred for the first time.)

1. CUSTOMER PROBLEM ANALYSIS

In troubleshooting, the problem symptoms must be confirmed accurately and all preconceptions must be cleared away in order to give an accurate judgment. To ascertain just what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.
Important Point in the Problem Analysis:
The following 5 items are important points in the problem analysis. Past problems which are thought to be unrelated and the repair history, etc. may also help in some cases, so as much information as possible should be gathered and its relationship with the problem symptoms should be correctly ascertained for reference in troubleshooting. A customer problem analysis table is provided in Diagnostics section for each system for your use.

Important Points in the Customer Problem Analysis

- What ––––– Vehicle model, system name
- When ––––– Date, time, occurrence frequency
- Where ––––– Road conditions
- Under what conditions? ––––– Running conditions, driving conditions, weather conditions
- How did it happen? ––––– Problem symptoms

(Sample) Engine control system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		**Model and Model Year**	
Driver's Name		**Frame No.**	
Data Vehicle Brought in		**Engine Model**	
License No.		**Odometer Reading**	km miles

Problem Symptoms	☐ **Engine does not Start**	☐ **Engine does not crank** ☐ **No initial combustion** ☐ **No complete combustion**
	☐ **Difficult to Start**	☐ **Engine cranks slowly** ☐ **Other** _____
	☐ **Poor Idling**	☐ **Incorrect first idle** ☐ **Idling rpm is abnormal** ☐ **High (rpm)** ☐ **Low (rpm)** ☐ **Rough idling** ☐ **Other** _____
	☐ **Poor Drive ability**	☐ **Hesitation** ☐ **Back fire** ☐ **Muffler explosion (after–fire)** ☐ **Surging** ☐ **Knocking** ☐ **Other** _____
	☐ **Engine Stall**	☐ **Soon after starting** ☐ **After accelerator pedal depressed** ☐ **After accelerator pedal released** ☐ **During A/C operation** ☐ **Shifting from N to D** ☐ **Other** _____
	☐ **Others**	

☐ **Constant** ☐ **Sometimes (times per day/month)**

2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the CELICA fulfills various functions. The first function is the Diagnostic Trouble Code Check in which a malfunction in the signal circuits to the ECU is stored in code in the ECU memory at the time of occurrence, to be output by the technician during troubleshooting. Another function is the Input Signal Check which checks if the signals from various switches are sent to the ECU correctly.
By using these check functions, the problem areas can be narrowed down quickly and troubleshooting can be performed effectively. Diagnostic functions are incorporated in the following systems in the CELICA.

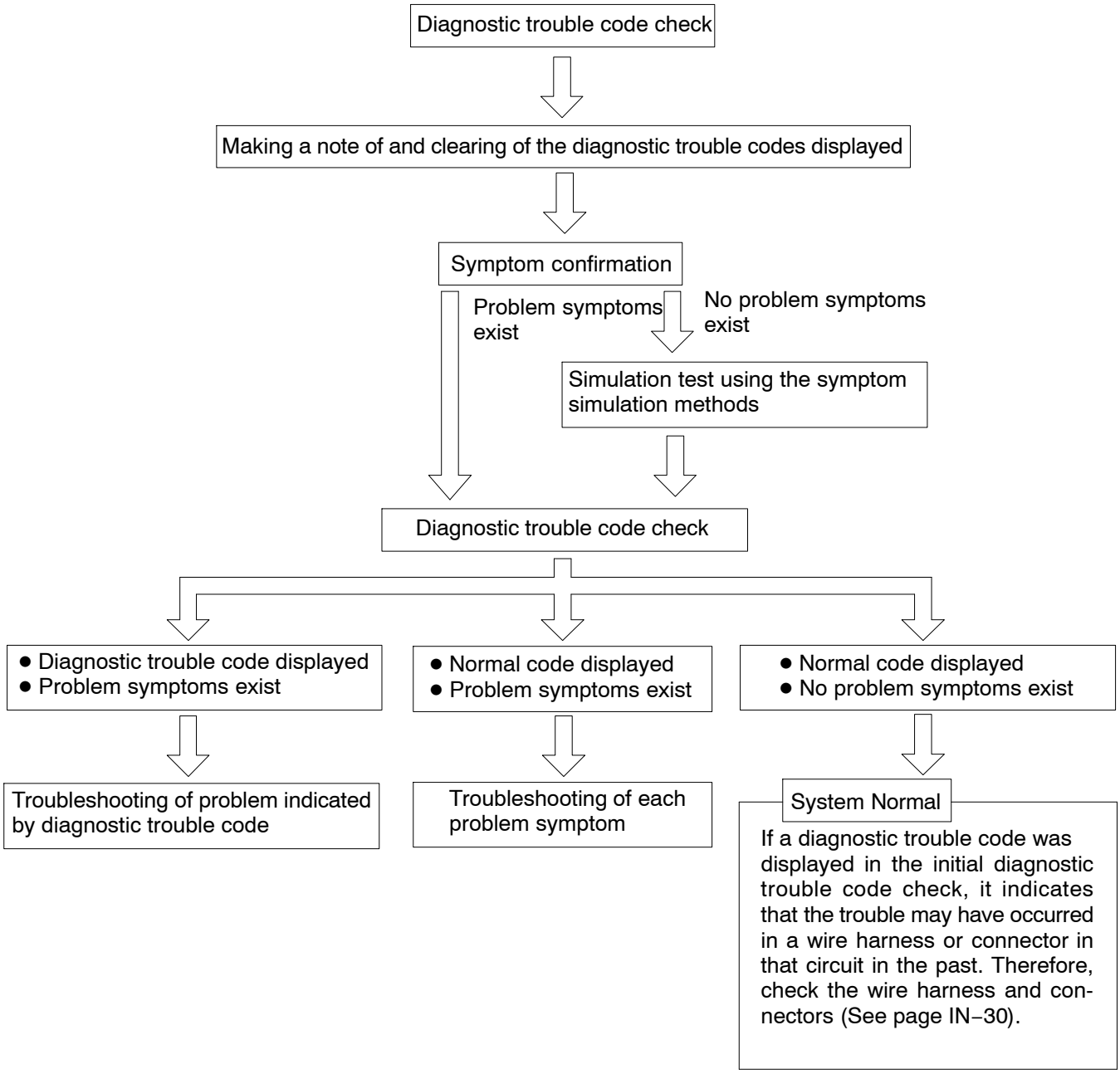
System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
Engine	○ (with Check Mode)	○	○
Automatic Transaxle (U240E)	○ (with Check Mode)	○	
Automatic Transaxle (U341E)	○ (with Check Mode)	○	
Anti–Lock Brake System with Electronic Brake Force Distribution (EBD)	○	○	○
Supplemental Restraint System	○		
Cruise Control System	○		
Body Control System	○		

In diagnostic trouble code check, it is very important to determine whether the problem indicated by the diagnostic trouble code is still occurring or occurred in the past but returned to normal at present. In addition, it must be checked in the problem symptom check whether the malfunction indicated by the diagnostic trouble code is directly related to the problem symptom or not. For this reason, the diagnostic trouble codes should be checked before and after the symptom confirmation to determine the current conditions, as shown in the table below. If this is not done, it may, depending on the case, result in unnecessary troubleshooting for normally operating systems, thus making it more difficult to locate the problem, or in repairs not pertinent to the problem. Therefore, always follow the procedure in correct order and perform the diagnostic trouble code check.

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

Diagnostic Trouble Code Check (Make a note of and then clear)	**Confirmation of Symptoms**	**Diagnostic Trouble Code Check**	**Problem Condition**
Diagnostic Trouble Code Display	Problem symptoms exist	Same diagnostic trouble code is displayed	Problem is still occurring in the diagnostic circuit
⇨		Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit (The diagnostic trouble code displayed first is either for a past problem or it is a secondary problem)
⇨	No problem symptoms exist		The problem occurred in the diagnostic circuit in the past
Normal Code Display ⇨	Problem symptoms exist	Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit
⇨	No problem symptoms exist	Normal code is displayed	The problem occurred in a place other than in the diagnostic circuit in the past

Taking into account the points on the previous page, a flow chart showing how to proceed with troubleshooting using the diagnostic trouble code check is shown below. This flow chart shows how to utilize the diagnostic trouble code check effectively, then by carefully checking the results, indicates how to proceed either to diagnostic trouble code troubleshooting or to troubleshooting of problem symptoms table.

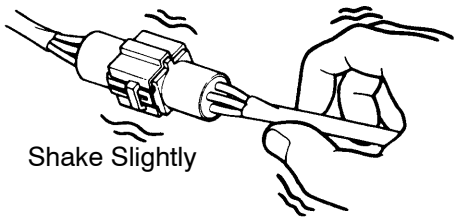
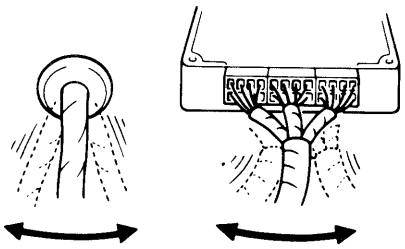
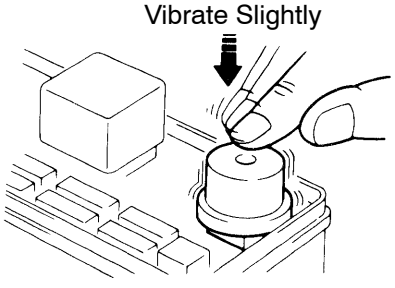


3. SYMPTOM SIMULATION

The most difficult case in troubleshooting is when there are no problem symptoms occurring. In such cases, a thorough customer problem analysis must be carried out, then simulate the same or similar conditions and environment in which the problem occurred in the customer's vehicle. No matter how much experience a technician has, or how skilled he may be, if he proceeds to troubleshoot without confirming the problem symptoms he will tend to overlook something important in the repair operation and make a wrong guess somewhere, which will only lead to a standstill. For example, for a problem which only occurs when the engine is cold, or for a problem which occurs due to vibration caused by the road during driving, etc., the problem can never be determined so long as the symptoms are confirmed with the engine hot condition or the vehicle at a standstill. Since vibration, heat or water penetration (moisture) is likely cause for problem which is difficult to reproduce, the symptom simulation tests introduced here are effective measures in that the external causes are applied to the vehicle in a stopped condition.

Important Points in the Symptom Simulation Test:

In the symptom simulation test, the problem symptoms should of course be confirmed, but the problem area or parts must also be found out. To do this, narrow down the possible problem circuits according to the symptoms before starting this test and connect a tester beforehand. After that, carry out the symptom simulation test, judging whether the circuit being tested is defective or normal and also confirming the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes of the symptom.

1	**VIBRATION METHOD: When vibration seems to be the major cause.**
CONNECTORS Slightly shake the connector vertically and horizontally. **WIRE HARNESS** Slightly shake the wire harness vertically and horizontally. The connector joint, fulcrum of the vibration, and body through portion are the major areas to be checked thoroughly.	  FI2331 FI2332
PARTS AND SENSOR Apply slight vibration with a finger to the part of the sensor considered to be the problem cause and check that the malfunction occurs. HINT: Applying strong vibration to relays may result in open relays.	 FI2330

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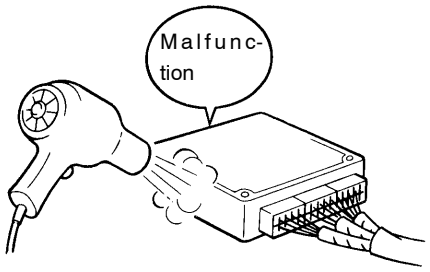
2	HEAT METHOD: When the problem seems to occur when the suspect area is heated.

Heat the component that is the likely cause of the malfunction with a hair dryer or similar object. Check to see if the malfunction occurs.

NOTICE:

(1) Do not heat to more than 60 °C (140 °F). (Temperature is limited not to damage the components.)

(2) Do not apply heat directly to parts in the ECU.



FI2334

3	WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high–humidity condition.

Sprinkle water onto the vehicle and check to see if the malfunction occurs.

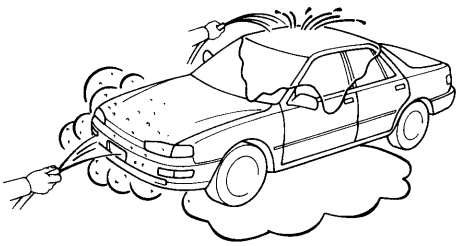
NOTICE:

(1) Never sprinkle water directly into the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.

(2) Never apply water directly onto the electronic components.

HINT:

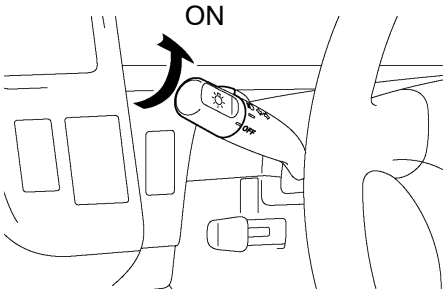
If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be taken.



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4	OTHER: When a malfunction seems to occur when electrical load is excessive.

Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.



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4. DIAGNOSTIC TROUBLE CODE CHART

The inspection procedure is shown in the table below. This table permits efficient and accurate troubleshooting using the diagnostic trouble codes displayed in the diagnostic trouble code check. Proceed with troubleshooting in accordance with the inspection procedure given in the diagnostic chart corresponding to the diagnostic trouble codes displayed. The engine diagnostic trouble code chart is shown below as an example.

- DTC No.
  Indicates the diagnostic trouble code.
- Page or Instructions
  Indicates the page where the inspection procedure for each circuit is to be found, or gives instructions for checking and repairs.

- Trouble Area
  Indicates the suspect area of the problem.

- Detection Item
  Indicates the system of the problem or contents of the problem.

DTC CHART (SAE Controlled)

HINT:
Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page referred to under the "See page" for the respective "DTC No." in the DTC chart.

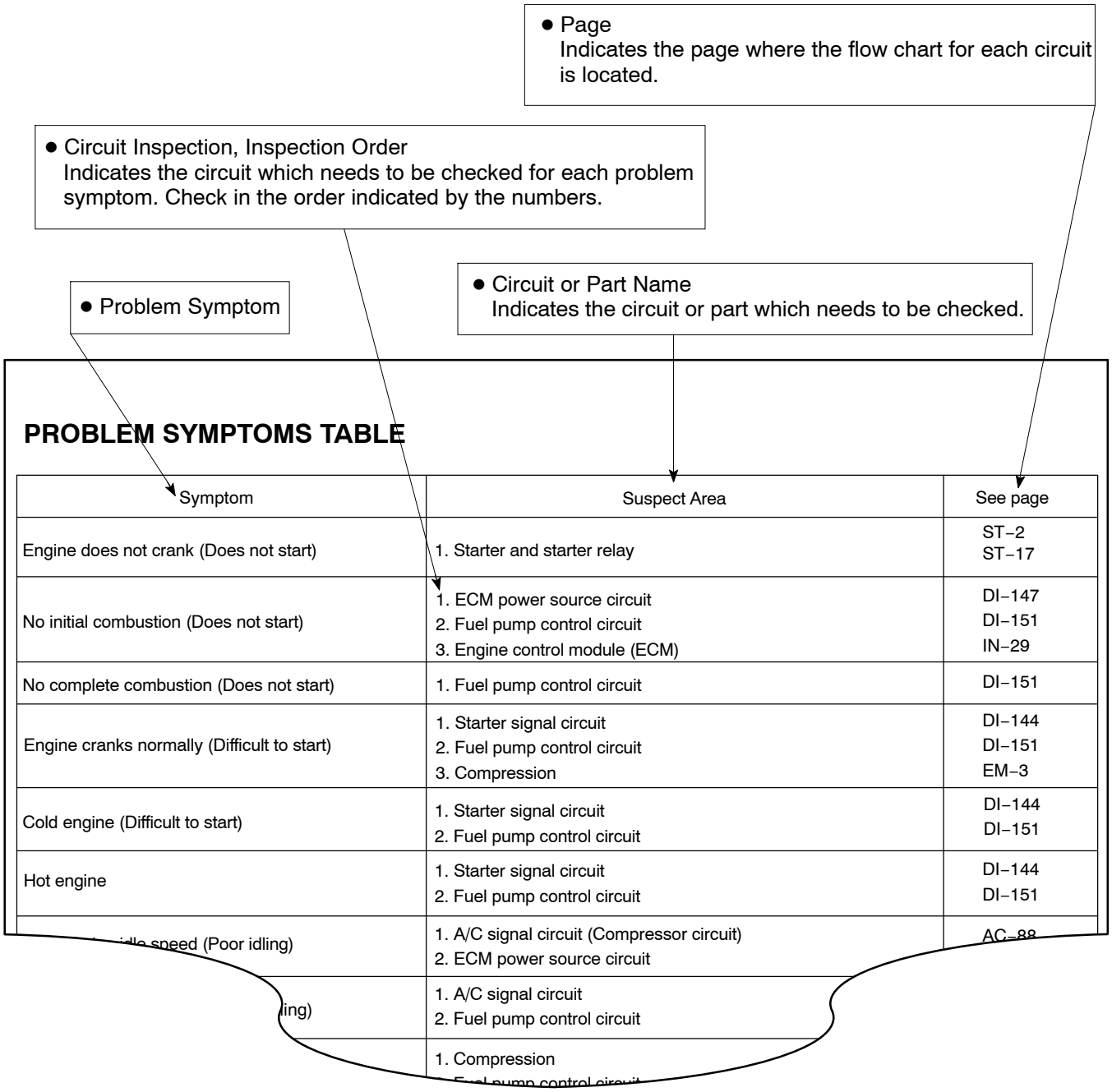
DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–24)	Mass Air Flow Circuit Malfunction	● Open or short in mass air flow meter circuit ● Mass air flow meter ● ECM	○	○
P0101 (DI–28)	Mass Air Flow Circuit Range/ Performance Problem	● Mass air flow meter	○	○
P0110 (DI–29)	Intake Air Temp. Circuit Malfunction	● Open or short in intake air temp. sensor circuit ● Intake air temp. sensor ● ECM	○	○
P0115 (DI–33)	Engine Coolant Temp. Circuit Malfunction	● Open or short in engine coolant temp. sensor circuit ● Engine coolant temp. sensor ● ECM	○	○
P0116 (DI–37)	Engine Coolant Temp. Circuit Range/ Performance Problem	● Engine coolant temp. sensor ● Cooling system	○	○
	/Pedal Position Sensor/Switch nction	● Open or short in throttle position sensor circuit ● Throttle position sensor ● ECM		
	osition Sensor/ Switch rformance Prob-	● Throttle position sensor		

5. PROBLEM SYMPTOMS TABLE

The suspected circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot the problem when a ”Normal” code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table indicate the inspection order in which the circuits or parts should be checked.

HINT:

When the problem is not detected by the diagnostic system even though the problem symptom is present, it is considered that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a system other than the diagnostic system.

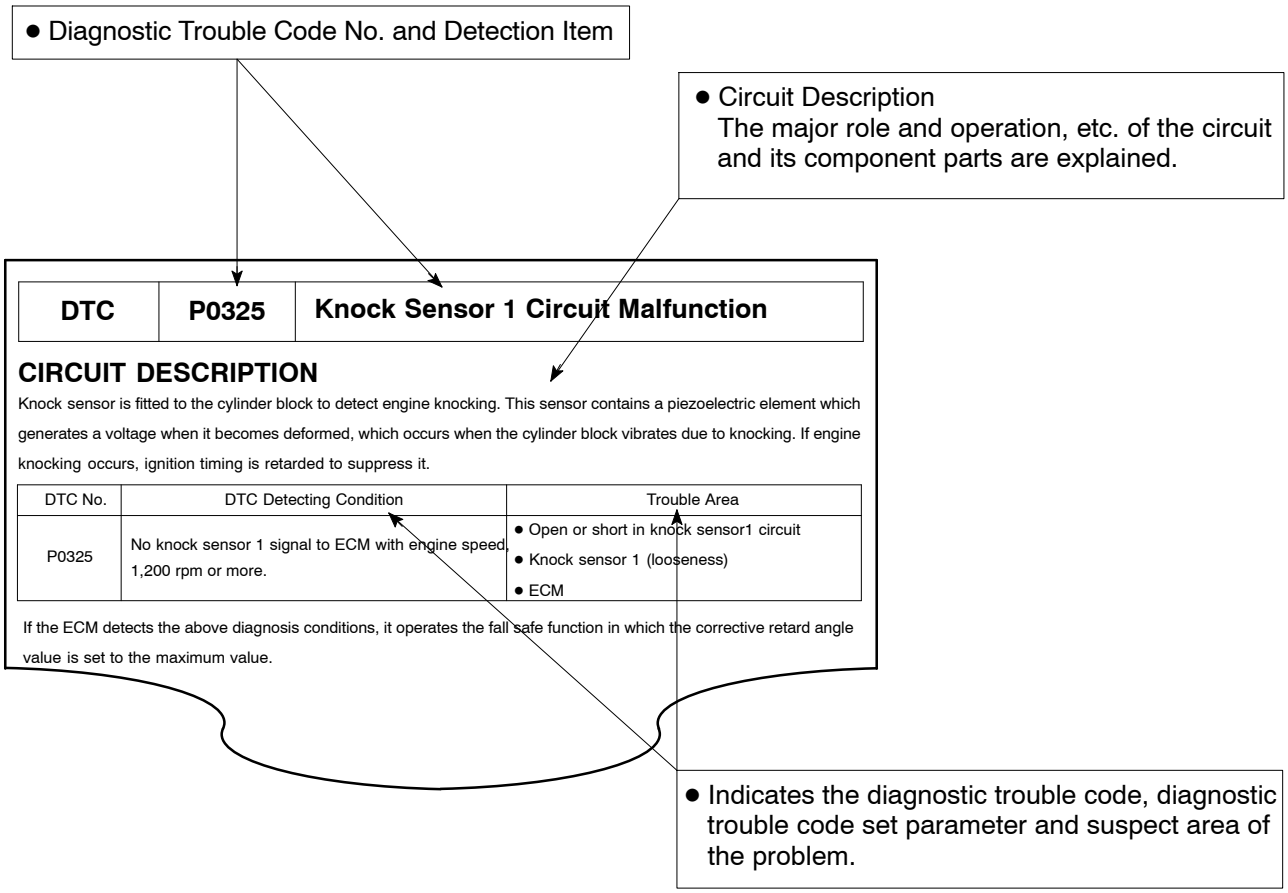


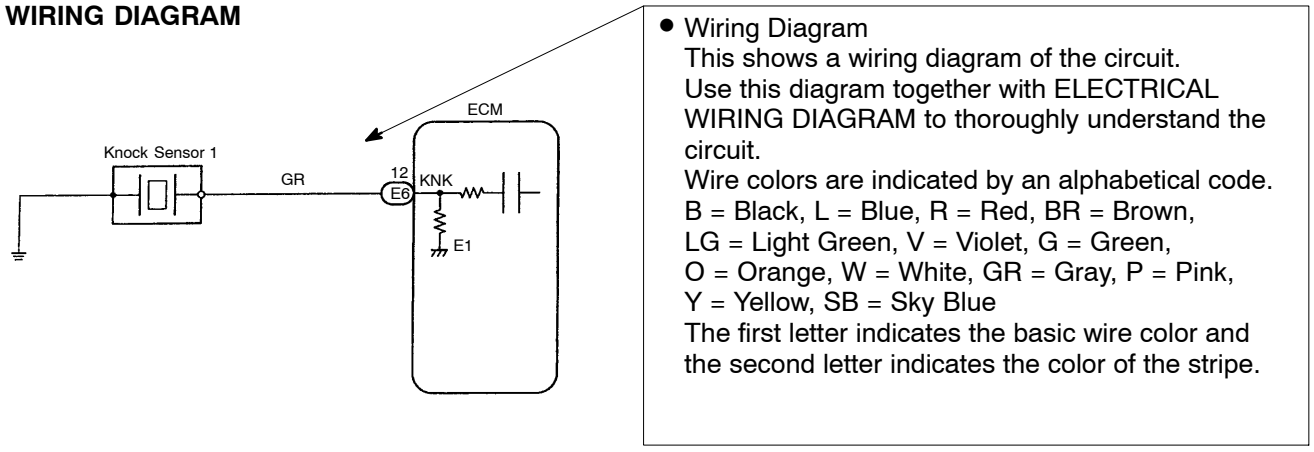
PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST–2 ST–17
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–147 DI–151 IN–29
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–151
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–144 DI–151 EM–3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–144 DI–151
Hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–144 DI–151
idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC–88
ling)	1. A/C signal circuit 2. Fuel pump control circuit	
	1. Compression Fuel pump control circuit	

6. CIRCUIT INSPECTION

How to read and use each page is shown below.





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● Indicates the position of the ignition switch during the check.

LOCK
Ignition Switch LOCK (OFF)

ON
Ignition Switch ON

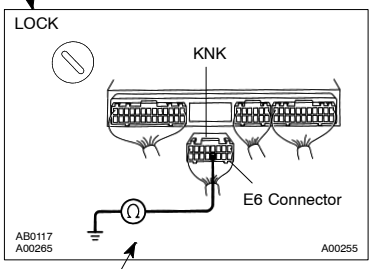
START
Ignition Switch START

ACC
Ignition Switch ACC

● Inspection Procedure
Use the inspection procedure to determine if the circuit is normal or abnormal, and, if it is abnormal, use it to determine whether the problem is located in the sensors, actuators, wire harness or ECU.

INSPECTION PROCEDURE

1 **Check continuity between terminal KNK of ECM connector and body ground.**



PREPARATION:
(a) Remove the glove compartment (See page SF–68).
(b) Disconnect the E6 connector of ECM.

CHECK:
Measure resistance between terminal KNK of ECM connector and body ground.

OK:
Resistance: 1 MΩ or higher

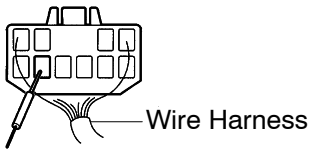
OK → **Go to step 3.**

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2 **Check knock sensor (See page SF–61).**

OK → **Replace knock sensor.**

● Indicates the place to check the voltage or resistance.
● Indicates the connector position to checked, from the front or back side.

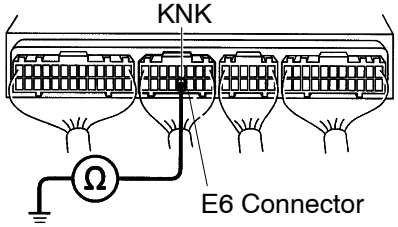


Check from the connector back side. (with harness)

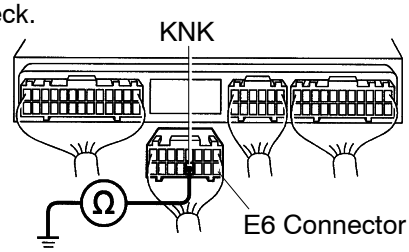


Check from the connector front side. (without harness)
In this case, care must be taken not to bend the terminals.

● Indicates the condition of the connector of ECU during the check.



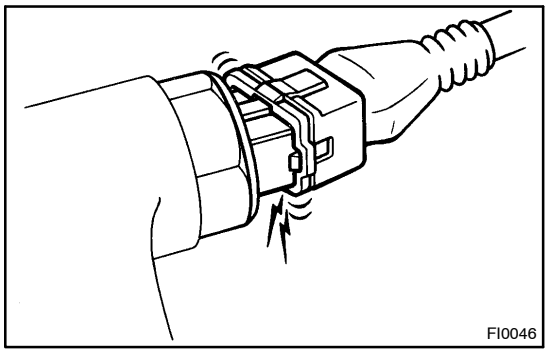
Connector being checked is connected.

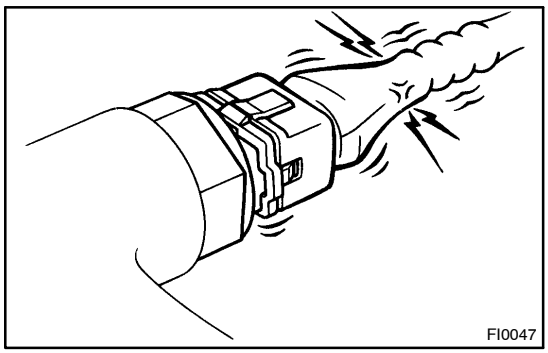


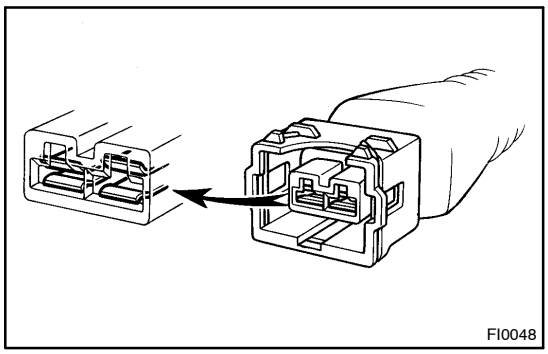
Connector being checked is disconnected.

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HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

- For troubleshooting, diagnostic trouble code charts or problem symptom table are provided for each circuit with detailed inspection procedures on the following pages.
- When all the component parts, wire harnesses and connectors of each circuit except the ECU are found to be normal in troubleshooting, then it is determined that the problem is in the ECU. Accordingly, if diagnosis is performed without the problem symptoms occurring, refer to Step 8 to replace the ECU. So always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method.
- The instructions ”Check wire harness and connector” and ”Check and replace ECU” which appear in the inspection procedure, are common and applicable to all diagnostic trouble codes. Follow the procedure outlined below whenever these instructions appear.

OPEN CIRCUIT:

This could be due to a disconnected wire harness, faulty contact in the connector, a connector terminal pulled out, etc.

HINT:

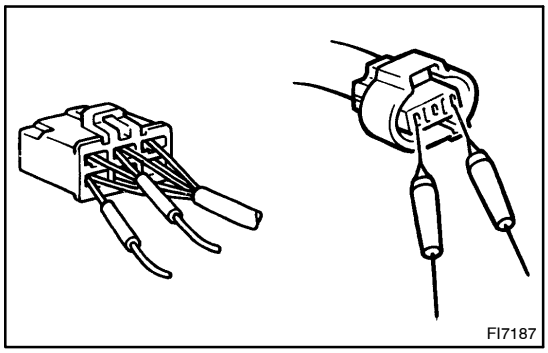
- It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a deformation of connector terminals. Simply disconnecting and reconnecting the connectors once changes the condition of the connection and may result in a return to normal operation. Therefore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, then the cause is considered to be in the wire harness or connectors.

SHORT CIRCUIT:

This could be due to a contact between wire harness and the body ground or to a short circuit occurred inside the switch, etc.

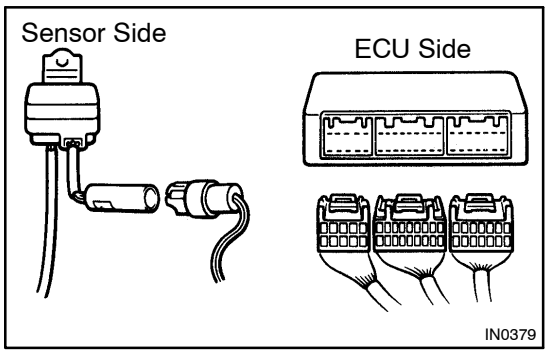
HINT:

When there is a short circuit between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly.



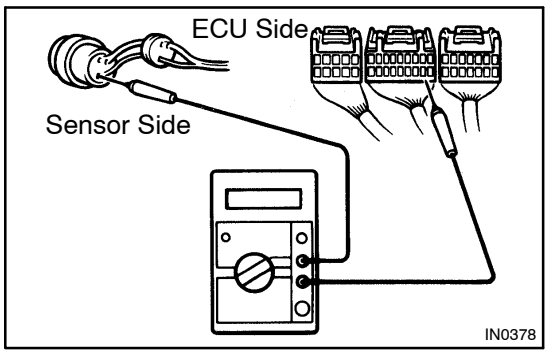
2. CONNECTOR HANDLING

When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.



3. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

(a) Disconnect the connectors at both ECU and sensor sides.

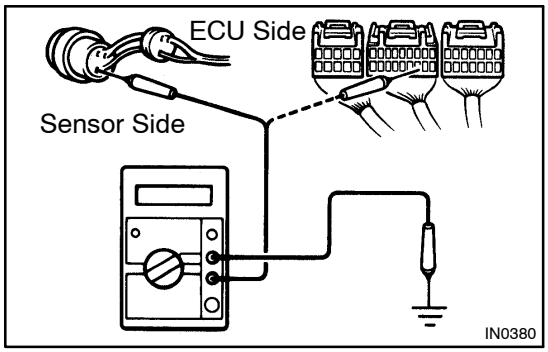


(b) Measure the resistance between the applicable terminals of the connectors.

Resistance: 1 Ω or less

HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.



4. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

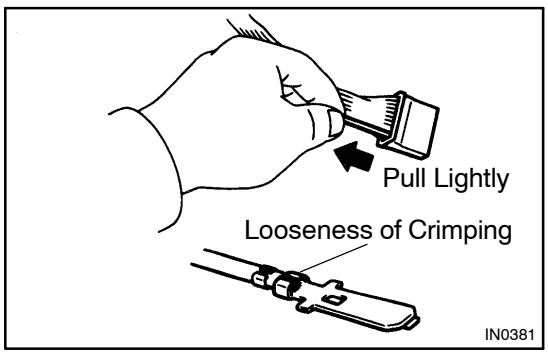
(a) Disconnect the connectors on both ends.

(b) Measure the resistance between the applicable terminals of the connectors and body ground. Be sure to carry out this check on the connectors on both ends.

Resistance: 1 MΩ or higher

HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.



5. VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.

(b) Check for rust or foreign material, etc. in the terminals of the connectors.

(c) Check crimped portions for looseness or damage and check that the terminals are secured in lock portion.

HINT:

The terminals should not come out when pulled lightly from the back.

(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

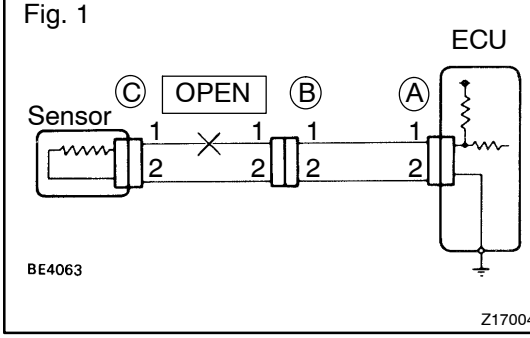
NOTICE:

When testing a gold–plated female terminal, always use a gold–plated male terminal.

HINT:

When the test terminal is pulled out more easily than others, there may be poor contact in that section.

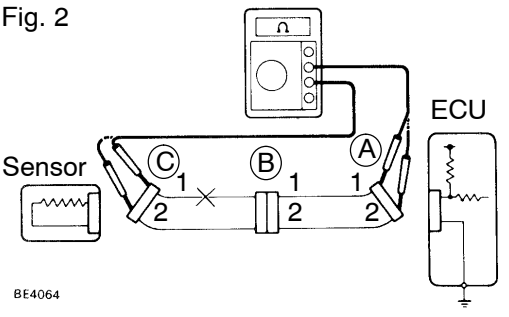
Fig. 1



6. CHECK OPEN CIRCUIT

For the open circuit in the wire harness in Fig. 1, perform ”(a) Continuity Check” or ”(b) Voltage Check” to locate the section.

Fig. 2



(a) Check the continuity.

(1) Disconnect connectors ”A” and ”C” and measure the resistance between them.

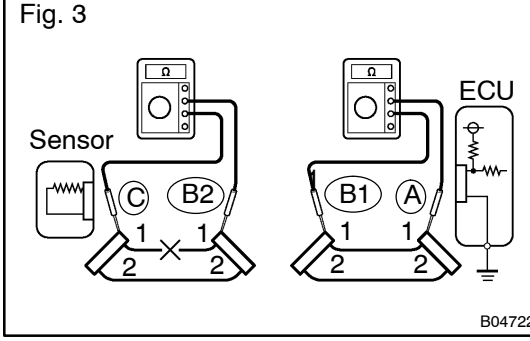
In the case of Fig. 2:

Between terminal 1 of connector ”A” and terminal 1 of connector ”C” → No continuity (open)

Between terminal 2 of connector ”A” and terminal 2 of connector ”C” → Continuity

Therefore, it is found out that there is an open circuit between terminal 1 of connector ”A” and terminal 1 of connector ”C”.

Fig. 3



(2) Disconnect connector ”B” and measure the resistance between the connectors.

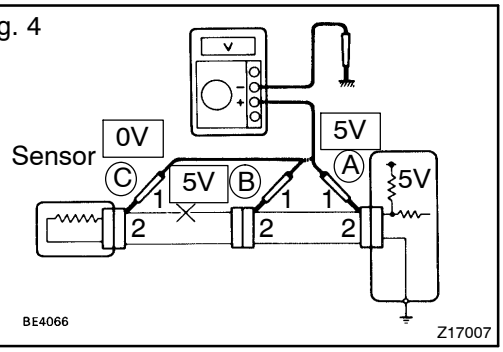
In the case of Fig. 3:

Between terminal 1 of connector ”A” and terminal 1 of connector ”B1” → Continuity

Between terminal 1 of connector ”B2” and terminal 1 of connector ”C” → No continuity (open)

Therefore, it is found out that there is an open circuit between terminal 1 of connector ”B2” and terminal 1 of connector ”C”.

Fig. 4



(b) Check the voltage.

In a circuit in which voltage is applied (to the ECU connector terminal), an open circuit can be checked for by conducting a voltage check.

As shown in Fig. 4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector "A" at the ECU 5V output terminal, terminal 1 of connector "B", and terminal 1 of connector "C", in that order.

If the results are:

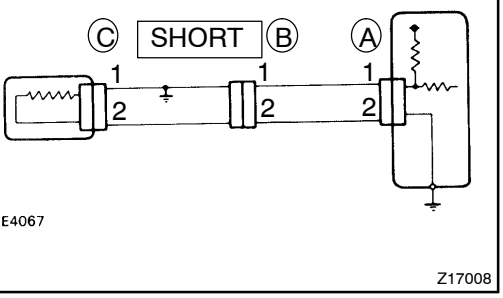
5V: Between Terminal 1 of connector "A" and Body Ground

5V: Between Terminal 1 of connector "B" and Body Ground

0V: Between Terminal 1 of connector "C" and Body Ground

Then it is found out that there is an open circuit in the wire harness between terminal 1 of "B" and terminal 1 of "C".

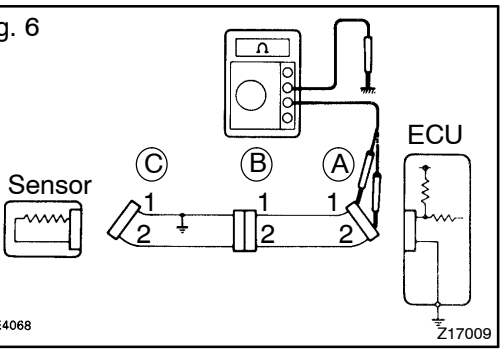
Fig. 5



7. CHECK SHORT CIRCUIT

If the wire harness is ground shorted as in Fig. 5, locate the section by conducting a "continuity check with ground".

Fig. 6



Check the continuity with ground.

(1) Disconnect connectors "A" and "C" and measure the resistance between terminal 1 and 2 of connector "A" and body ground.

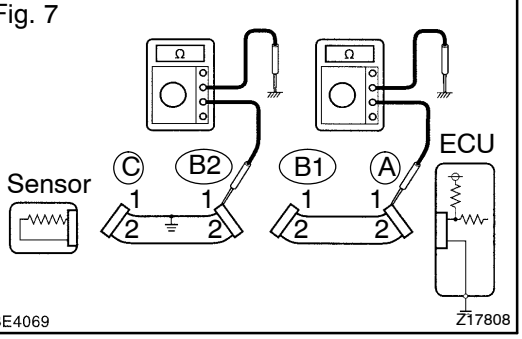
In the case of Fig. 6:

Between terminal 1 of connector "A" and body ground → Continuity (short)

Between terminal 2 of connector "A" and body ground → No continuity

Therefore, it is found out that there is a short circuit between terminal 1 of connector "A" and terminal 1 of connector "C".

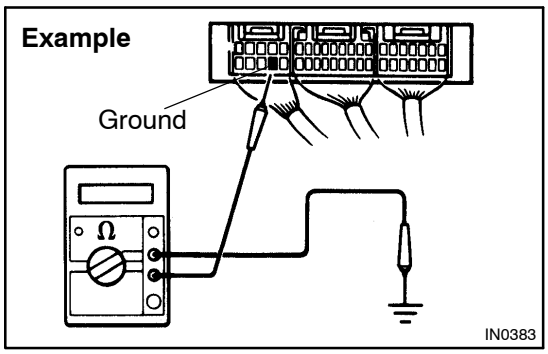
Fig. 7



(2) Disconnect connector ”B” and measure the resistance between terminal 1 of connector ”A” and body ground, and terminal 1 of connector ”B2” and body ground.
In the case of Fig. 7:
Between terminal 1 of connector ”A” and body ground → No continuity
Between terminal 1 of connector ”B2” and body ground → Continuity (short)
Therefore, it is found out that there is a short circuit between terminal 1 of connector ”B2” and terminal 1 of connector ”C”.

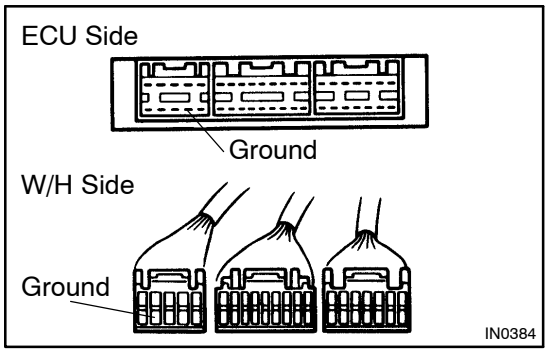
8. CHECK AND REPLACE ECU

First check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty, so replace the ECU with a normal functioning one and check that the symptoms appear.



(1) Measure the resistance between the ECU ground terminal and the body ground.

Resistance: 1 Ω or less



(2) Disconnect the ECU connector, check the ground terminals on the ECU side and the wire harness side for bend and check the contact pressure.

TERMS

ABBREVIATIONS USED IN THIS MANUAL

IN04Q–29

Abbreviations	Meaning
ABS	Anti–Lock Brake System
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACSD	Automatic Cold Start Device
A.D.D.	Automatic Disconnecting Differential
A/F	Air–Fuel Ratio
AHC	Active Height Control Suspension
ALR	Automatic Locking Retractor
ALT	Alternator
AMP	Amplifier
ANT	Antenna
APPROX.	Approximately
A/T	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVS	Adaptive Variable Suspension
BA	Brake Assist
BACS	Boost Altitude Compensation System
BAT	Battery
BDC	Bottom Dead Center
B/L	Bi–Level
B/S	Bore–Stroke Ratio
BTDC	Before Top Dead Center
BVSV	Bimetallic Vacuum Switching Valve
Calif.	California
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
COMB.	Combination
CPE	Coupe
CPS	Combustion Pressure Sensor
CPU	Central Processing Unit
CRS	Child Restraint System
CTR	Center
C/V	Check Valve
CV	Control Valve

CW	Curb Weight
DC	Direct Current
DEF	Defogger
DFL	Deflector
DIFF.	Differential
DIFF. LOCK	Differential Lock
D/INJ	Direct Injection
DLI	Distributorless Ignition
DOHC	Double Over Head Cam
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
EBD	Electronic Brake Force Distribution
ECAM	Engine Control And Measurement System
ECD	Electronic Controlled Diesel
ECDY	Eddy Current Dynamometer
ECU	Electronic Control Unit
ED	Electro–Deposited Coating
EDIC	Electric Diesel Injection Control
EDU	Electronic Driving Unit
EFI	Electronic Fuel Injection
E/G	Engine
EGR–VM	Exhaust Gas Recirculation–Vacuum Modulator
ELR	Emergency Locking Retractor
ENG	Engine
ESA	Electronic Spark Advance
ETCS	Electronic Throttle Control System
EVP	Evaporator
E–VRV	Electric Vacuum Regulating Valve
EXH	Exhaust
FE	Fuel Economy
FF	Front–Engine Front–Wheel–Drive
F/G	Fuel Gage
FIPG	Formed In Place Gasket
FL	Fusible Link
F/P	Fuel Pump
FPU	Fuel Pressure Up
Fr	Front
FR	Front–Engine Rear–Wheel–Drive
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front–Wheel–Drive
GAS	Gasoline
GSA	Gear Shift Actuator
GND	Ground
HAC	High Altitude Compensator

H/B	Hatchback
H–FUSE	High Current Fuse
HI	High
HID	High Intensity Discharge (Head Lamp)
HPU	Hydraulic Power Unit
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
IAC	Idle Air Control
IC	Integrated circuit
IDI	Indirect Diesel Injection
IFS	Independent Front Suspension
IG	Ignition
IIA	Integrated Ignition Assembly
IN	Intake (Manifold, Valve)
INT	Intermittent
I/P	Instrument Panel
IRS	Independent Rear Suspension
J/B	Junction Block
J/C	Junction Connector
KD	Kick–Down
LAN	Local Area Network
LB	Liftback
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left–Hand
LHD	Left–Hand Drive
L/H/W	Length, Height, Width
LLC	Long–Life Coolant
LNG	Liquified Natural Gas
LO	Low
LPG	Liquified Petroleum Gas
LSD	Limited Slip Differential
LSP & PV	Load Sensing Proportioning And Bypass Valve
LSPV	Load Sensing Proportioning Valve
MAX.	Maximum
M–FUSE	Medium Current Fuse
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MP	Multipurpose
MPX	Multiplex Communication System
M/T	Manual Transmission (Transaxle)
MT	Mount
MTG	Mounting
N	Neutral

NA	Natural Aspiration
No.	Number
O/D	Overdrive
OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
O/S	Oversize
P & BV	Proportioning And Bypass Valve
PCS	Power Control System
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PPS	Progressive Power Steering
PS	Power Steering
PTO	Power Take–Off
R & P	Rack And Pinion
R/B	Relay Block
RBS	Recirculating Ball Type Steering
R/F	Reinforcement
RFS	Rigid Front Suspension
RH	Right–Hand
RHD	Right–Hand Drive
RLY	Relay
ROM	Read Only Memory
Rr	Rear
RR	Rear–Engine Rear–Wheel Drive
RRS	Rigid Rear Suspension
RWD	Rear–Wheel Drive
SDN	Sedan
SEN	Sensor
SICS	Starting Injection Control System
SMT	Sequential Manual Transmission
SOC	State Of Charge
SOHC	Single Overhead Camshaft
SPEC	Specification
SPI	Single Point Injection
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
STJ	Cold–Start Fuel Injection
SW	Switch
SYS	System
T/A	Transaxle
TACH	Tachometer
TBI	Throttle Body Electronic Fuel Injection

TC	Turbocharger
TCCS	TOYOTA Computer–Controlled System
TCV	Timing Control Valve
TDC	Top Dead Center
TEMP.	Temperature
TEMS	TOYOTA Electronic Modulated Suspension
TIS	Total Information System For Vehicle Development
T/M	Transmission
TMC	TOYOTA Motor Corporation
TMMK	TOYOTA Motor Manufacturing Kentucky, Inc.
TRAC	Traction Control System
TURBO	Turbocharger
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VENT	Ventilator
VIN	Vehicle Identification Number
VPS	Variable Power Steering
VSC	Vehicle Skid Control
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
WGN	Wagon
W/H	Wire Harness
w/o	Without
1st	First
2nd	Second
2WD	Two Wheel Drive Vehicle (4x2)
4WD	Four Wheel Drive Vehicle (4x4)

IN0CI–09

GLOSSARY OF SAE AND TOYOTA TERMS

This glossary lists all SAE–J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their TOYOTA equivalents.

SAE ABBREVIATIONS	SAE TERMS	TOYOTA TERMS ( )––ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner, A/CL
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	HAC
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CTP	Closed Throttle Position	LL ON, Idle ON
DFI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	–
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Total Diagnosis Comunication Link (TDCL) 3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
ECL	Engine Control Level	–
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	TOYOTA Distributor–less Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	–
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	–
FEPROM	Flash Erasable Programmable Read Only Memory	–
FF	Flexible Fuel	–
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)

HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO_2S)
IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection (IDL)
IFS	Inertia Fuel–Shutoff	–
ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	–
MFI	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Lamp
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
O2S	Oxygen Sensor	Oxygen Sensor, O_2 Sensor (O_2S)
OBD	On–Board Diagnostic	On–Board Diagnostic System (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Convert (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	E–ABV
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
SRT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter

TCM	Transmission Control Module	Transmission ECU, ECT ECU
TP	Throttle Position	Throttle Position
TR	Transmission Range	–
TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three–Way Catalytic Converter	Three–Way Catalytic (TWC) Manifold Converter CC_{RO}
TWC+OC	Three–Way + Oxidation Catalytic Converter	CC_R + CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor
WOT	Wide Open Throttle	Full Throttle
WU–OC	Warm Up Oxidation Catalytic Converter	–
WU–TWC	Warm Up Three–Way Catalytic Converter	–
3GR	Third Gear	–
4GR	Fourth Gear	–

OUTSIDE VEHICLE

MA001–41

GENERAL MAINTENANCE

These are maintenance and inspection items which are considered to be the owner's responsibility. They can be done by the owner or they can have them done at a service shop.
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do.
Items and procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item cause the engine to run poorly and increase exhaust emissions.

2. TIRES

(a) Check the pressure with a gauge. If necessary, adjust.
(b) Check for cuts, damage or excessive wear.

3. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts. If necessary, tighten them.

4. TIRE ROTATION

Check the owner's manual supplement in which the maintenance schedule is shown.

5. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. If necessary, replace.

6. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.
(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

7. DOORS AND ENGINE HOOD

(a) Check that all doors and the tailgate operate smoothly, and that all latches lock securely.
(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

MA002–50

GENERAL MAINTENANCE

These are maintenance and inspection items which are considered to be the owner's responsibility. They can be done by the owner or they can have them done at a service shop.
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do.
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- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item cause the engine to run poorly and increase exhaust emissions.

2. LIGHTS

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.
(b) Check the headlight aim.

3. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

4. HORN

Check that it is working.

5. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

6. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.
(b) Check that the wipers do not streak.

7. WINDSHIELD DEFROSTER

Check that air comes out from the defroster outlet when operating the heater or air conditioner.

8. REAR VIEW MIRROR

Check that it is mounted securely.

9. SUN VISORS

Check that they move freely and are mounted securely.

10. STEERING WHEEL

Check that it has the specified free play. Be alert for changes in steering condition, such as hard steering, excessive free play or strange noises.

11. SEATS

(a) Check that the seat adjusters operate smoothly.
(b) Check that all latches lock securely in any position.
(c) For fold–down seat backs, check that the latches lock securely.

12. SEAT BELTS

(a) Check that the seat belt system such as the buckles, retractors and anchors operate properly and smoothly.
(b) Check that the belt webbing is not cut, frayed, worn or damaged.

13. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

14. CLUTCH PEDAL (See page CL–2)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper free play.

15. BRAKE PEDAL (See page BR–6)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper reserve distance and free play.

(c) Check the brake booster function.

16. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

17. PARKING BRAKE (See page BR–9)

(a) Check that the lever has the proper travel.

(b) On a safe incline, check that the vehicle is held securely with only the parking brake applied.

18. AUTOMATIC TRANSMISSION ”PARK” MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.

(b) On a safe incline, check that the vehicle is held securely with the selector lever in ”P” position and all brakes released.

UNDER HOOD

MA003–49

GENERAL MAINTENANCE

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every series item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item cause the engine to run poorly and increase exhaust emissions.

2. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

3. ENGINE COOLANT LEVEL

Check that the coolant level is between the "FULL" and "LOW" lines on the see–through reservoir.

4. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
(See page CO–12)

(b) Check the hoses for cracks, kinks, rot or loose connections.

5. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case.

6. BRAKE AND CLUTCH FLUID LEVELS

Check that the brake and clutch fluid levels are near the upper level line on the see–through reservoirs.

7. ENGINE DRIVE BELTS

Check drive belt for fraying, cracks, wear or oiliness.

8. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

9. POWER STEERING FLUID LEVEL

- Check the level.
- The level should be in the "HOT" or "COLD" range depending on the fluid temperature.

10. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.

(b) With the engine idling and the parking brake applied, shift the selector into all positions from "P" to "L", and then shift into "P" position.

(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re–insert the dipstick and check that the fluid level is in the HOT range.

(d) Do this check with the fluid at normal driving temperature (70 – 80°C, 158 – 176°F).

HINT:

Wait until the engine cools down (approx. 30 min.) before checking the fluid level after extended driving at high speeds, in hot weather, in heavy traffic or pulling a trailer.

11. EXHAUST SYSTEM

If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

ENGINE

MA055–02

INSPECTION

HINT:

Inspect these items when the engine is cold.

1. **INSPECT DRIVE BELT (See page CH–2)**
2. **REPLACE SPARK PLUGS (See page IG–1)**
3. **INSPECT AIR FILTER**

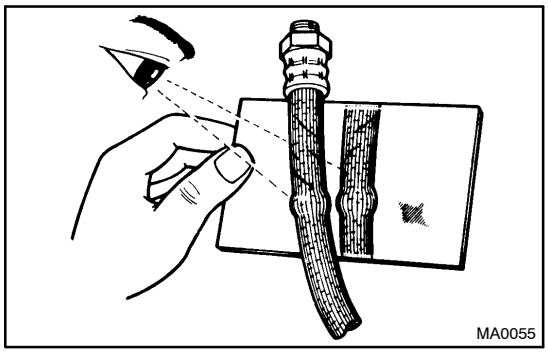
Visually check that the air filter is not excessively dirty or oily.

HINT:

Oiliness may indicate a stuck PCV valve.

If necessary, replace the air cleaner element.

4. **REPLACE ENGINE OIL AND OIL FILTER (See page LU–3)**
5. **REPLACE ENGINE COOLANT (See page CO–2)**
6. **REPLACE GASKET IN FUEL TANK CAP (See page SF–28)**
7. **INSPECT FUEL LINES AND CONNECTIONS (See page SF–28)**
8. **INSPECT EXHAUST PIPES AND MOUNTINGS (See page EC–11)**
9. **ADJUST VALVE CLEARANCE (See page EM–4)**



BRAKE

INSPECTION

MA00M–13

1. INSPECT BRAKE LINE PIPES AND HOSES

HINT:

Check in a well lighted area. Check the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before checking the front brake.

(a) Check all brake lines and hoses for:
- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass through the center of the grommets.

2. INSPECT FRONT BRAKE PADS AND DISCS
(See page BR–20)

3. INSPECT REAR BRAKE PADS AND DISCS
(See page BR–34)

4. INSPECT BRAKE LININGS AND DRUMS
(See page BR–39)

CHASSIS

MA03N–02

INSPECTION

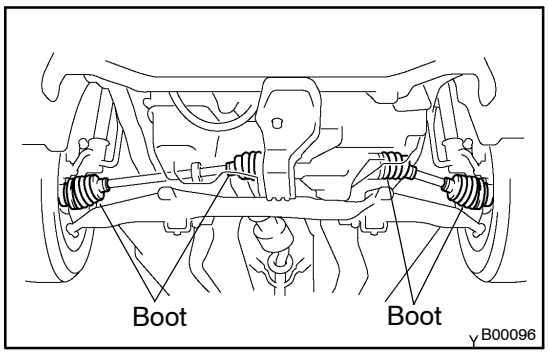
1. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay (See page SR–8).

(b) Check the steering linkage for looseness or damage.
Check that:
- Tie rod ends do not have excessive play.
- Dust seals and boots are not damaged.
- Boot clamps are not loose.

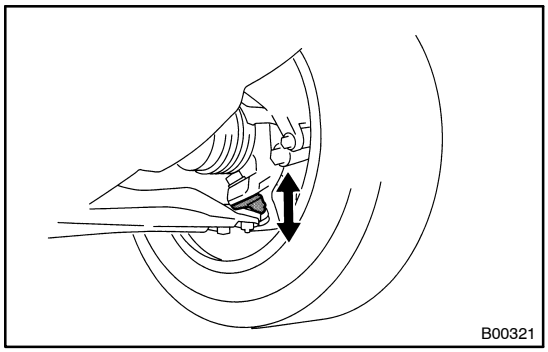
2. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear housing for oil leakage.



3. INSPECT DRIVE SHAFT BOOTS

Check the drive shaft boots for clamp looseness, leakage or damage.



4. INSPECT BALL JOINT AND DUST COVERS

(a) Inspect the ball joints for excessive looseness.
- Jack up the front of the vehicle and place wooden blocks with a height of 180 – 200 mm (7.09 – 7.87 in.) under the front tires.
- Lower the jack until there is about half a load on the front coil spring. Place stands under the vehicle for safety.
- Check that the front wheels are pointing straight ahead, and block them with chocks.
- Using a lever, pry up the end of the lower arm, and check the amount of play.

Maximum ball joint vertical play:
0 mm (0 in.)

If there is play, replace the ball joint.

(b) Check the dust cover for damage.

5. CHECK TRANSAXLE OIL (FLUID)

Visually check the transaxle for oil (fluid) leakage.

If leakage is found, check for the cause and repair.

6. REPLACE TRANSAXLE FLUID

(a) M/T:

Replace transaxle oil.

(C56: See page MX–4)

(C60: See page MX–4)

(b) A/T:

Replace transaxle (transmission) fluid.

(U240E: See page DI–669)

(U341E: See page DI–758)

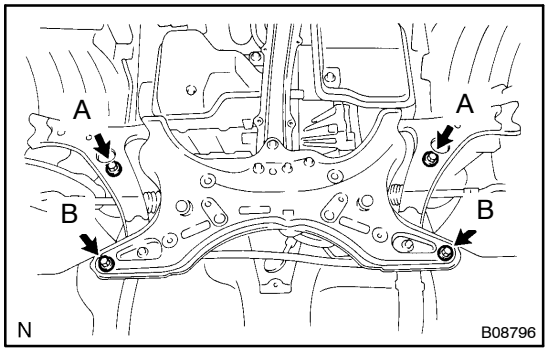
7. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

If the vehicle is mainly operated under the rough, muddy road conditions.

Tighten the seat mounting bolts and front and rear suspension member retaining bolts to specified torque.

- Seat mounting bolts

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

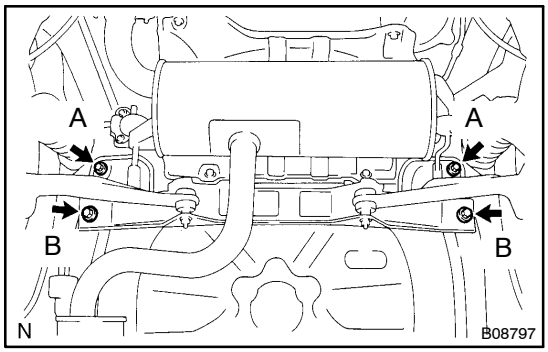


- Front suspension member – to body mounting bolts

Torque:

Bolt A 113 N·m (1,152 kgf·cm, 83 ft·lbf)

Bolt B 157 N·m (1,600 kgf·cm, 116 ft·lbf)



- Rear suspension member – to body mounting bolts

Torque:

Bolt A 80 N·m (816 kgf·cm, 59 ft·lbf)

Bolt B 130 N·m (1,326 kgf·cm, 96 ft·lbf

MAINTENANCE

EQUIPMENT

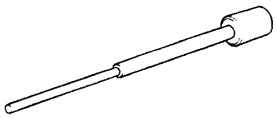
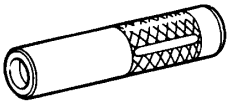
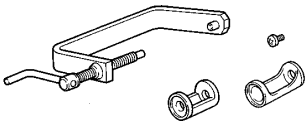
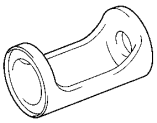
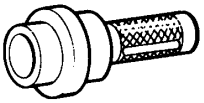
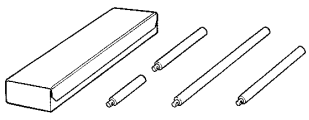
PP0E6–08

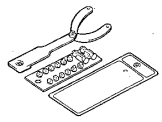
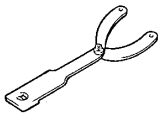
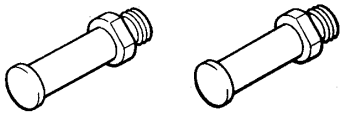
Mirror	Brake hose
Torque wrench	

ENGINE MECHANICAL

PP41A–02

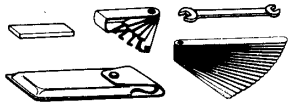
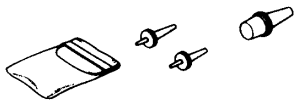
SST (Special Service Tools)

	09032–00100	Oil Pan Seal Cutter	
	09201–01055	Valve Guide Bushing Remover & Replacer 5.5	
	09201–41020	Valve Stem Oil Seal Replacer	
	09202–70020	Valve Spring Compressor	
	(09202–00020)	Attachment	
	09222–30010	Connecting Rod Bushing Remover & Replacer	
	09223–15030	Oil Seal & Bearing Replacer	
	09223–22010	Crankshaft Front Oil Seal Replacer	
	09309–37010	Transmission Bearing Replacer	
	09816–30010	Oil Pressure Switch Socket	
	09950–70010	Handle Set	
	(09951–07100)	Handle 100	

	09960–10010 Variable Pin Wrench Set	
	(09962–01000) Variable Pin Wrench Arm Assy	
	(09963–01000) Pin 10	

PP2EJ–05

RECOMMENDED TOOLS

	09090–04020	Engine Sling Device	For suspending engine
	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

PP0JS–16

EQUIPMENT

Abrasive compound	Valve
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Groove cleaning tool	Piston ring groove
Heater	
Magnetic finger	
Micrometer	
OBDII scan tool	
Pin hole grinder	Piston pin hole of piston
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Press	
Ridge reamer	Cylinder
Soft brush	
Solvent	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Torx® wrench socket set	Stud bolt
Valve seat cutter	
V–block	
Vernier calipers	
Wire brush	Valve

Torx is a registered trademark of Textron Inc.

PP187–05

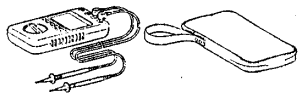
SSM (Special Service Materials)

08826–00080	Seal Packing Black or equivalent (FIPG)	
08826–00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	

EMISSION CONTROL

PP419–02

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

PP0JV–16

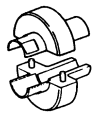
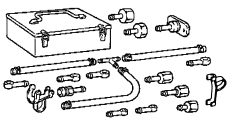
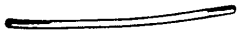
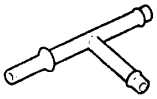
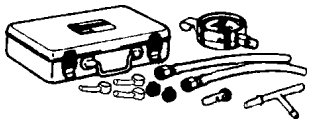
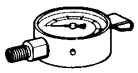
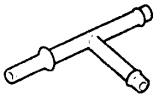
EQUIPMENT

Torque wrench	
Vacuum gauge	
Pressure gauge	
Hose clipper	

SFI

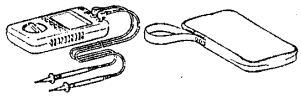
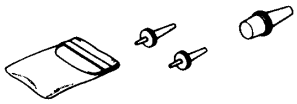
SST (Special Service Tools)

PP2ED–04

	09268–21010	Fuel Hose Puller	
	09268–41047	Injection Measuring Tool Set	
	(95336–08070)	Hose	
	(09268–41250)	T Joint	
	09268–45014	EFI Fuel Pressure Gauge	
	(09268–41200)	Gauge	
	(09268–41220)	Hose	
	(09268–41250)	T Joint	
	09816–30010	Oil Pressure Switch Socket	Knock sensor for 1ZZ–GE engine
	09842–30080	EFI Inspection Wire ”H”	
	09843–18020	Diagnosis Check Wire	

PP0JX–08

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	
	09258–00030	Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

PP0JY–19

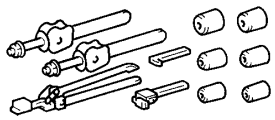
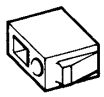
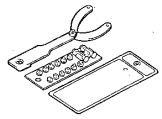
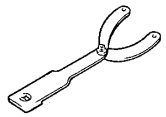
EQUIPMENT

Carburetor cleaner	Throttle body
Graduated cylinder	Injector
OBDII scan tool	
Soft brush	Throttle body
Sound scope	Injector
Torque wrench	
Vacuum gauge	

COOLING

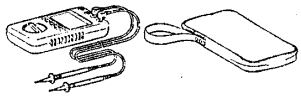
PP2DS–05

SST (Special Service Tools)

	09230–01010	Radiator Service Tool Set	
	09231–14010	Punch	
	09960–10010	Variable Pin Wrench Set	
	(09962–01000)	Variable Pin Wrench Arm Assy	
	(09963–00600)	Pin 6	

PP189–10

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

PP18A–12

EQUIPMENT

Heater	ECT switch, Thermostat
Radiator cap tester	
Thermometer	ECT switch, Thermostat
Torque wrench	
Vernier calipers	

PP18B–12

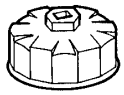
COOLANT

Item		Capacity	Classification
Engine coolant	1ZZ–FE:		Ethylene–glycol base
	M/T	5.7 liters (6.0 US qts, 5.0 Imp. qts)	
	A/T	5.6 liters (5.9 US qts, 4.9 Imp. qts)	
	2ZZ–GE:		
	M/T	5.9 liters (6.2 US qts, 5.2 Imp. qts)	
	A/T	5.8 liters (6.1 US qts, 5.1 Imp. qts)	

LUBRICATION

PP2DU–05

SST (Special Service Tools)

	09228–06501 Oil Filter Wrench	
	09816–30010 Oil Pressure Switch Socket	

PP0K5–15

EQUIPMENT

Oil pressure gauge	
Torque wrench	
Feeler gauge	
Straight edge	

PP0K6–19

LUBRICANT

Item		Capacity	Classification
Engine oil			
Drain and refill	1ZZ–FE:		
	w/ Oil Filter change	3.7 liters (3.9 US qts, 3.3 lmp.qts)	
	w/o Oil Filter change	3.5 liters (3.7 US qts, 3.1 lmp.qts)	API grade SL Energy–Conserving or ILSAC multigrade engine oil.
	2ZZ–GE:		
	w/ Oil Filter change	4.4 liters (4.8 US qts, 4.0 lmp.qts)	
	w/o Oil Filter change	4.2 liters (4.6 US qts, 3.8 lmp.qts)	
Dry fill	1ZZ–FE:	4.2 liters (4.4 US qts, 3.7 lmp.qts)	
	2ZZ–GE:	4.8 liters (5.1 US qts, 4.2 lmp.qts)	

PP2DT–06

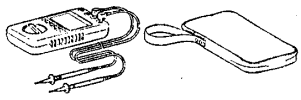
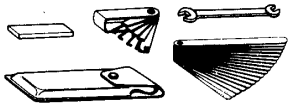
SSM (Special Service Materials)

08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Oil pressure switch

IGNITION

RECOMMENDED TOOLS

PP0K8–18

	09082–00040 TOYOTA Electrical Tester.	
	09200–00010 Engine Adjust Kit .	

PP0K9–10

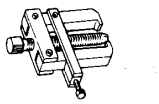
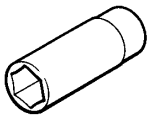
EQUIPMENT

Spark plug cleaner	

STARTING

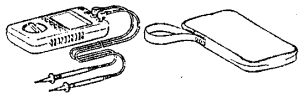
PP0KA–12

SST (Special Service Tools)

	09286–46011	Injection Pump Spline Shaft Puller	
	09810–38140	Starter Magnet Switch Nut Wrench 14	
	09820–00031	Alternator Rear Bearing Replacer	

PP0KB–11

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

PP0KC–09

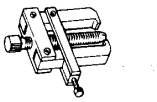
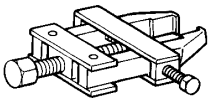
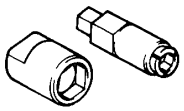
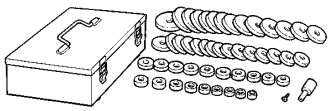
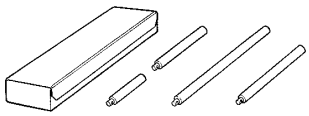
EQUIPMENT

Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Magnetic switch terminal kit part
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V–block	Commutator
Vernier calipers	Commutator, Brush

CHARGING

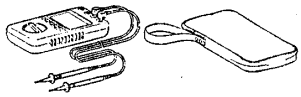
PP2DH–09

SST (Special Service Tools)

	09285–76010	Injection Pump Camshaft Bearing Cone Replacer	
	09286–46011	Injection Pump Spline Shaft Puller	
	09820–00021	Alternator Rear Bearing Puller	
	09820–00031	Alternator Rear Bearing Replacer	
	09820–63011	Alternator Pulley Set Nut Wrench Set	
	09950–60010	Replacer Set	
	(09951–00350)	Replacer 35	
	(09951–00530)	Replacer 53	
	09950–70010	Handle Set	
	(09951–07100)	Handle 100	

PP0KE–11

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

PP0KF–11

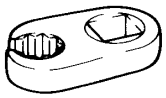
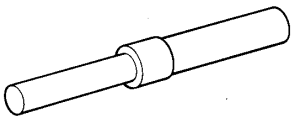
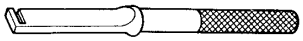
EQUIPMENT

Battery specific gravity gauge	Except maintenance free battery
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

CLUTCH

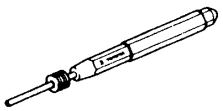
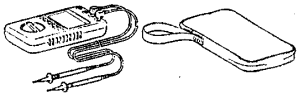
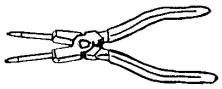
PP0GZ–06

SST (Special Service Tools)

	09023–00101	Union Nut Wrench 10mm	Clutch line
	09301–00210	Clutch Guide Tool	
	09333–00013	Clutch Diaphragm Spring Aligner	

PP2E1–03

RECOMMENDED TOOLS

	09031–00030 Pin Punch .	
	09082–00040 TOYOTA Electrical Tester.	
	09905–00013 Snap Ring Pliers .	

PP0H1–05

EQUIPMENT

Vernier calipers	
Dial indicator	
Torque wrench	

PP0CK–14

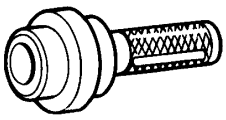
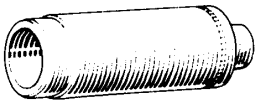
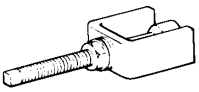
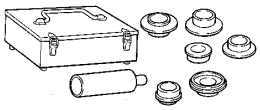
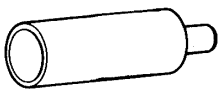
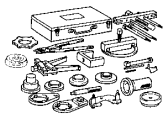
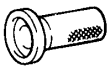
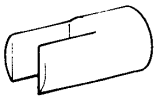
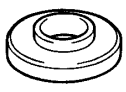
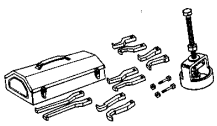
LUBRICANT

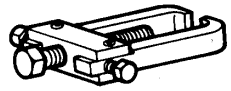
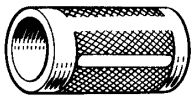
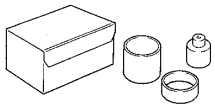
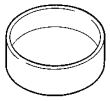
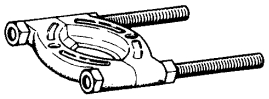
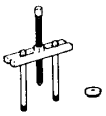
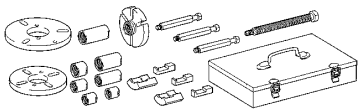
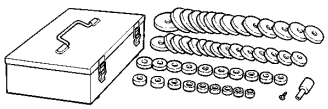
Item	Capacity	Classification
Brake fluid	–	SAE J1703 or FMVSS No. 116 DOT3

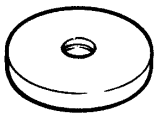
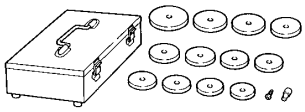
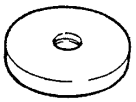
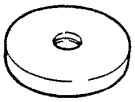
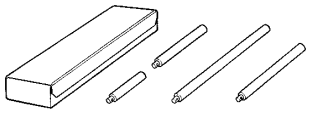
MANUAL TRANSAXLE (C56)

SST (Special Service Tools)

PP2EA–03

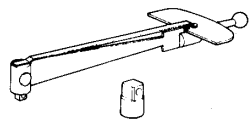
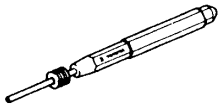
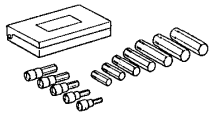
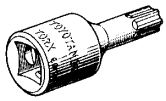
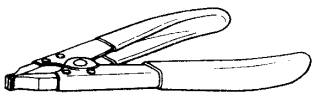
	09223–50010	Crankshaft Front oil Seal Replacer	Output shaft front bearing inner race
	09226–10010	Crankshaft Front & Rear Bearing Replacer	Transmission case oil seal
	09308–00010	Oil Seal Puller	Output shaft front bearing
	09309–12020	5th Driven Gear Replacer	
	09316–60011	Transmission & Transfer Bearing Replacer	Differential tapered roller bearing
	(09316–00011)	Replacer Pipe	
	09350–32014	TOYOTA Automatic Transmission Tool Set	Differential tapered roller bearing
	(09351–32120)	Overdrive Bearing Replacer	
	(09351–32140)	Oil Seal Replacer	
	09564–32011	Differential Preload Adaptor	
	09608–00071	Drive Pinion Rear Bearing Cone Replacer	Input shaft rear radial ball bearing Output shaft rear radial ball bearing
	09612–65014	Steering Worm Bearing Puller	Input shaft front bearing Differential tapered roller bearing outer race

	09628–62011	Ball Joint Puller	5th driven gear
	09636–20010	Upper Ball Joint Dust Cover Replacer	No. 3 hub sleeve assembly
	09710–28021	Front Suspension Bushing Tool Set	Transaxle case oil seal
	(09710–08041)	Bushing Replacer	
	09950–00020	Bearing Remover	
	09950–00030	Bearing Remover Attachment	Differential tapered roller bearing
	09950–30012	Puller A Set	No. 3 clutch hub
	09950–40011	Puller B Set	5th driven gear
	09950–60010	Replacer Set	
	(09951–00230)	Replacer 23	5th driven gear
	(09951–00350)	Replacer 35	Differential tapered roller bearing
	(09951–00360)	Replacer 36	Input shaft front oil seal Differential tapered roller bearing
	(09951–00400)	Replacer 40	Input shaft front bearing

	(09951–00560) Replacer 56	Output shaft front bearing
	09950–60020 Replacer Set No.2	
	(09951–00680) Replacer 68	Differential tapered roller bearing outer race (Transaxle case side)
	(09951–00710) Replacer 71	Differential tapered roller bearing outer race (Transmission case side)
	09950–70010 Handle Set	
	(09951–07150) Handle 150	

PP2EB–06

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	Differential preload
	09031–00030	Pin Punch .	
	09040–00011	Hexagon Wrench Set .	
	09042–00010	Torx Socket T30 .	
	09090–04020	Engine Sling Device	
	09905–00012	Snap Ring No.1 Expander .	

Torx is a registered trademark of Textron Inc.

PP04Q–08

EQUIPMENT

Dial indicator with magnetic base	
Feeler gauge	
Micrometer	
Torque wrench	
Magnetic finger	
Wooden block or similar object	

PP04S–10

LUBRICANT

Item	Capacity	Classification
Manual transaxle oil (w/ Differential oil)	1.9 liters (2.0 US qts, 1.7 Imp. qts)	API GL–4 or GL–5 SAE 75W–90

PP2EC–04

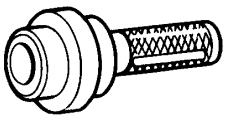
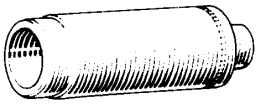
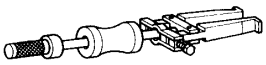
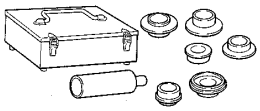
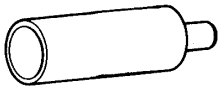
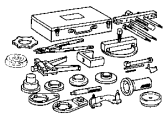
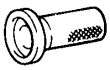
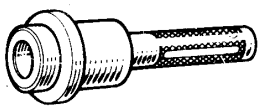
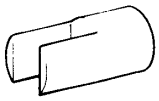
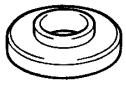
SSM (Special Service Materials)

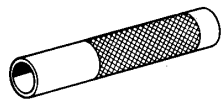
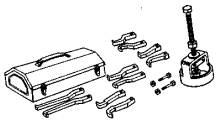
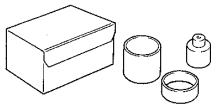
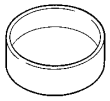
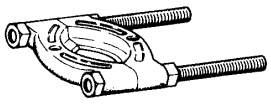
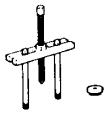
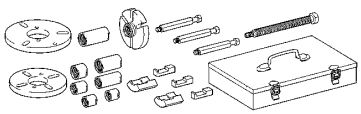
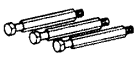
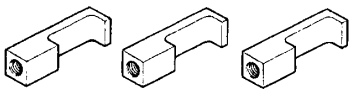
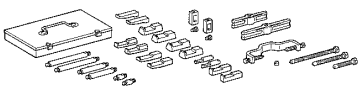
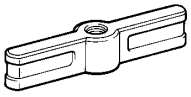
08826–00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Transmission case x Transaxle case Transmission case x Transmission case cover
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

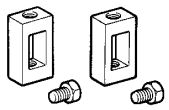
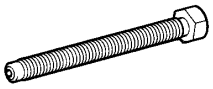
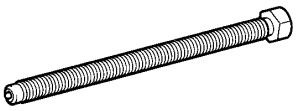
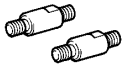
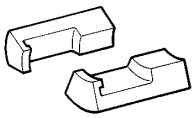
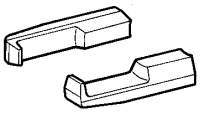
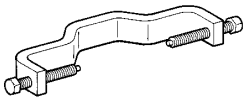
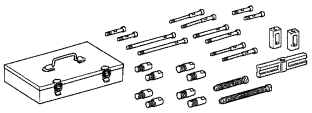
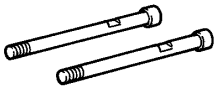
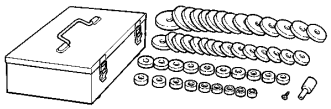
MANUAL TRANSAXLE (C60)

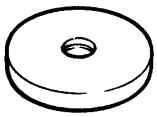
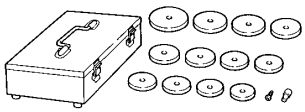
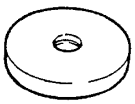
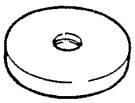
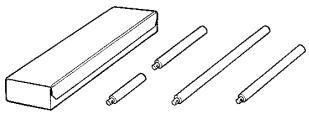
PP2E2–03

SST (Special Service Tools)

	09223–50010	Crankshaft Front oil Seal Replacer	Output shaft front bearing inner race
	09226–10010	Crankshaft Front & Rear Bearing Replacer	Transmission case oil seal
	09308–00010	Oil Seal Puller	Output shaft front bearing
	09316–60011	Transmission & Transfer Bearing Replacer	Differential tapered roller bearing
	(09316–00011)	Replacer Pipe	
	09325–12010	Transmission Oil Plug	Input shaft rear radial ball bearing 6th driven gear
	09350–32014	TOYOTA Automatic Transmission Tool Set	Differential case tapered roller bearing
	(09351–32120)	Overdrive Bearing Replacer	
	(09351–32140)	Oil Seal Replacer	
	09517–12010	Rear Axle Shaft Oil Seal Replacer	Output shaft rear radial ball bearing Input shaft rear radial ball bearing
	09564–32011	Differential Preload Adaptor	
	09608–00071	Drive Pinion Rear Bearing Cone Replacer	Input shaft center radial ball bearing 4th driven gear and center radial ball bearing

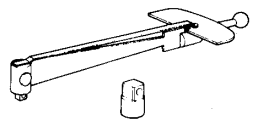
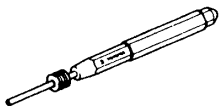
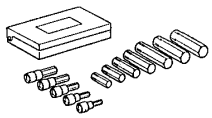
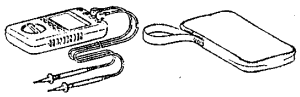
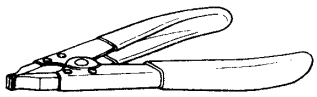
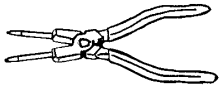
	09612–22011	Tilt Handle Bearing Replacer	No. 3 clutch hub assembly 5th driven gear
	09612–65014	Steering Worm Bearing Puller	Input shaft front bearing Differential tapered roller bearing outer race
	09710–28021	Front Suspension Bushing Tool Set	Transaxle case oil seal
	(09710–08041)	Bushing Replacer	
	09950–00020	Bearing Remover	
	09950–00030	Bearing Remover Attachment	
	09950–30012	Puller A Set	
	(09951–03010)	Upper Plate	
	(09953–03010)	Center Bolt	
	(09954–03010)	Arm	
	(09955–03021)	Claw No.2	
	09950–40011	Puller B Set	
	(09951–04010)	Hanger 150	

	(09952–04010) Slide Arm	
	(09953–04020) Center Bolt 150	
	(09953–04030) Center Bolt 200	
	(09954–04010) Arm 25	
	(09955–04021) Claw No.2	
	(09955–04061) Claw No.6	
	(09957–04010) Attachment	
	(09958–04011) Holder	
	09950–50013 Puller C Set	No. 3 clutch hub assembly
	(09954–05031) Claw No.3	
	09950–60010 Replacer Set	
	(09951–00180) Replacer 18	Transmission case bushing
	(09951–00350) Replacer 35	Differential tapered roller bearing

	(09951–00360) Replacer 36	Input shaft front oil seal
	(09951–00400) Replacer 40	Input shaft front bearing
	(09951–00560) Replacer 56	Output shaft front bearing
	09950–60020 Replacer Set No.2	
	(09951–00680) Replacer 68	Differential tapered roller bearing outer race (Transaxle case side)
	(09951–00710) Replacer 71	Differential tapered roller bearing outer race (transmission case side)
	09950–70010 Handle Set	
	(09951–07100) Handle 100	
	(09951–07150) Handle 150	

PP2E3–02

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	Differential preload
	09031–00030	Pin Punch .	
	09040–00011	Hexagon Wrench Set .	
	09082–00040	TOYOTA Electrical Tester.	
	09090–04020	Engine Sling Device	
	09905–00012	Snap Ring No.1 Expander .	
	09905–00013	Snap Ring Pliers .	

PP05J–03

EQUIPMENT

Dial indicator with magnetic base	
Feeler gauge	
Micrometer	
Torque wrench	
Magnetic finger	
Wooden block or similar object	

PP05K–03

LUBRICANT

Item	Capacity	Classification
Manual transaxle oil (w/ Differential oil)	2.3 liters (2.4 US qts, 2.0 Imp. qts)	API GL–4 or GL–5 SAE 75W–90

PP2E4–06

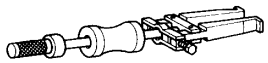
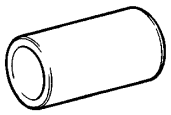
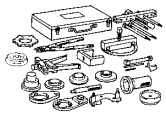
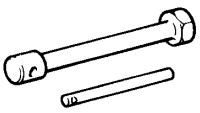
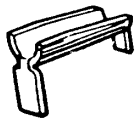
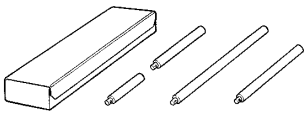
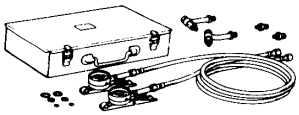
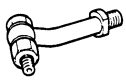
SSM (Special Service Materials)

08826–00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Transmission case x Transaxle case Transmission case x Transmission case cover
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

AUTOMATIC TRANSAXLE (U240E)

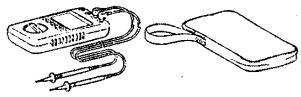
PP2DO–04

SST (Special Service Tools)

	09308–00010	Oil Seal Puller	Side gear shaft oil seal
	09223–00010	Cover & Seal Replacer	
	09350–32014	TOYOTA Automatic Transmission Tool Set	
	(09351–32010)	One–way Clutch Test Tool	
	(09351–32020)	Stator Stopper	
	(09351–32150)	Oil Seal Replacer	
	09950–70010	Handle Set	
	(09951–07150)	Handle 150	
	09992–00095	Automatic Transmission Oil Pressure Gauge Set	Line pressure
	(09992–00231)	Adaptor C	Line pressure
	(09992–00271)	Gauge Assy	Line pressure

PP26J–07

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	
	09090–04020 Engine Sling Device	

PP1DQ–06

EQUIPMENT

Straight edge	Torque converter clutch
Vernier calipers	Torque converter clutch
Dial indicator or dial indicator with magnetic base	Drive plate
Hexagon wrench (10 mm)	
Torque wrench	
OBDII scan tool	

PP26L–07

LUBRICANT

Item	Capacity	Classification
Automatic transaxle fluid		
Dry fill	7.6 liters (8.0 US qts, 6.7 lmp.qts)	ATF Type T–IV or equivalent
Drain and refill	4.1 liters (4.3 US qts, 3.6 lmp.qts)	

PP26M–04

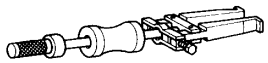
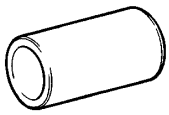
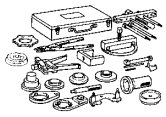
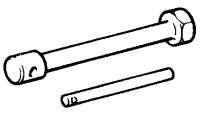
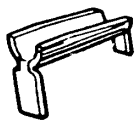
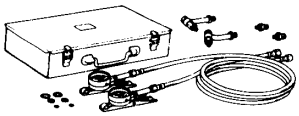
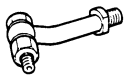
SSM (Special Service Materials)

08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

AUTOMATIC TRANSAXLE (U341E)

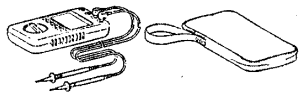
PP2E5–02

SST (Special Service Tools)

	09308–00010	Oil Seal Puller	Side gear shaft oil seal
	09223–00010	Cover & Seal Replacer	
	09350–32014	TOYOTA Automatic Transmission Tool Set	
	(09351–32010)	One–way Clutch Test Tool	
	(09351–32020)	Stator Stopper	
	09992–00095	Automatic Transmission Oil Pressure Gauge Set	Line pressure
	(09992–00231)	Adaptor C	Line pressure
	(09992–00271)	Gauge Assy	Line pressure

PP2E6–02

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	
	09090–04020 Engine Sling Device	

PP2E7–02

EQUIPMENT

Straight edge	Torque converter clutch
Vernier calipers	Torque converter clutch
Dial indicator or dial indicator with magnetic base	Drive plate
Hexagon wrench (10 mm)	
Torque wrench	
OBDII scan tool	
Punch	

PP2E8–02

LUBRICANT

Item	Capacity	Classification
Automatic transaxle fluid		
Dry fill	6.9 liters (7.3 US qts, 6.0 lmp.qts)	ATF Type T–IV
Drain and refill	2.9 liters (3.1 US qts, 2.6 lmp.qts)	

PP2E9–02

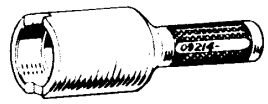
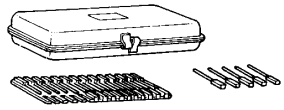
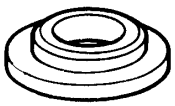
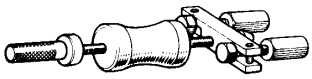
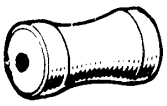
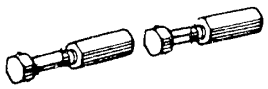
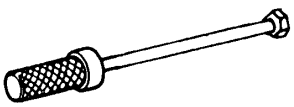
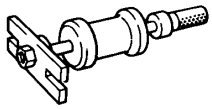
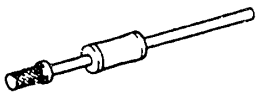
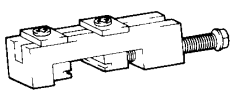
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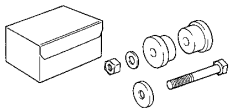
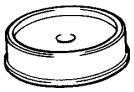
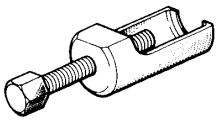
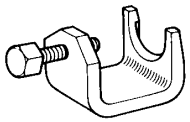
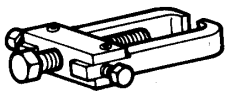
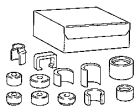
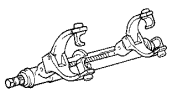
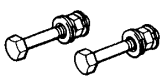
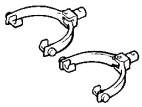
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

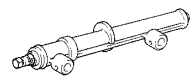
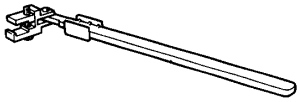
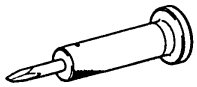
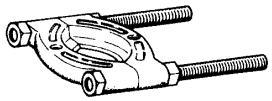
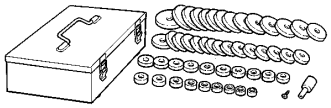
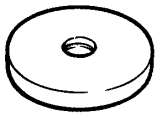
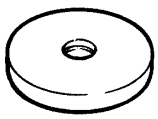
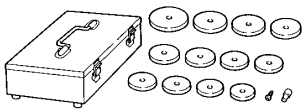
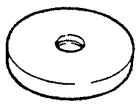
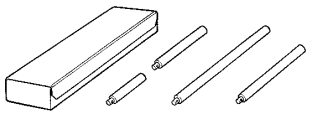
SUSPENSION AND AXLE

PP2DZ–03

SST (Special Service Tools)

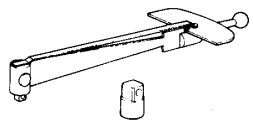
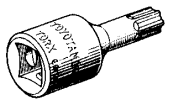
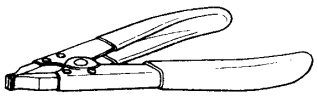
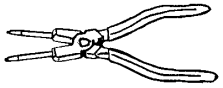
	09214–76011	Crankshaft Pulley Replacer	Rear axle
	09240–00020	Wire Gauge Set	Front drive shaft
	09506–35010	Differential Drive Pinion Rear Bearing Replacer	Front drive shaft
	09520–00031	Rear Axle Shaft Puller	
	(09520–00040)	Shocker	Front axle Rear axle
	(09521–00010)	Attachment	Front axle
	(09521–00020)	Rod with Grip	Front axle Rear axle
	09520–01010	Drive Shaft Remover Attachment	Front drive shaft
	09520–24010	Differential Side Gear Shaft Puller	Front drive shaft
	(09520–32040)	Shocker Set	
	09521–24010	Drive Shaft Boot Clamping Tool	Front drive shaft
	09527–17011	Rear Axle Shaft Bearing Remover	Front axle

	09555–55010	Differential Drive Pinion Bearing Replacer	Front axle
	09608–16042	Front Hub Bearing Adjusting Tool	Front drive shaft
	(09608–02021)	Bolt & Nut	
	(09608–02041)	Retainer	
	09608–32010	Steering Knuckle Oil Seal Replacer	Front axle
	09610–20012	Pitman Arm Puller	Front axle Front drive shaft Front suspension
	09628–10011	Ball Joint Puller	Front axle Rear axle
	09628–62011	Ball Joint Puller	Front axle Front suspension
	09710–30021	Suspension Bushing Tool Set	Front drive shaft
	(09710–03141)	Bushing Remover Base	
	09727–30021	Coil Spring Compressor	Front suspension Rear suspension
	(09727–00010)	Bolt Set	
	(09727–00021)	Arm Set	

	(09727–00031) Compressor	
	09729–22031 Front Spring Upper Seat Holder	Front suspension
	09930–00010 Drive Shaft Nut Chisel	Front axle Front drive shaft
	09950–00020 Bearing Remover	Front drive shaft Rear axle
	09950–60010 Replacer Set	
	(09951–00380) Replacer 38	Front axle
	(09951–00550) Replacer 55	Front axle
	(09951–00650) Replacer 65	Front axle Front drive shaft
	09950–60020 Replacer Set No.2	Front axle
	(09951–00730) Replacer 73	
	09950–70010 Handle Set	Front axle Front drive shaft
	(09951–07150) Handle 150	

PP2E0–02

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	
	09042–00010	Torx Socket T30 .	
	09090–04020	Engine Sling Device	
	09905–00012	Snap Ring No.1 Expander .	
	09905–00013	Snap Ring Pliers .	

PP08X–08

EQUIPMENT

Dial indicator with magnetic base	
Drill	
Torque wrench	

PP08Y–09

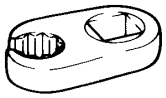
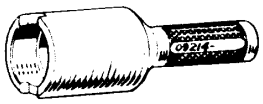
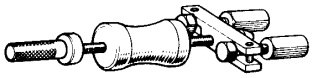
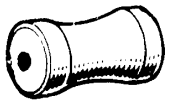
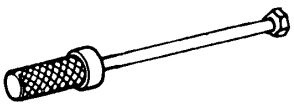
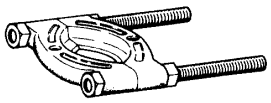
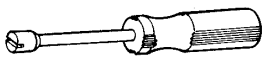
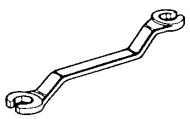
LUBRICANT

Drive shaft joint grease		Capacity	Application
1ZZ–FE (A/T):			
Outboard side	Color=Yellow ocher	110 – 120 g (3.9 – 4.2 oz.)	
Inboard side	Color=Yellow ocher	180 – 190 g (6.3 – 6.7 oz.)	
1ZZ–FE (M/T) and 2ZZ–GE:			
Outboard side	Color=Black	115 – 135 g (4.1 – 4.8 oz.)	
Inboard side	Color=Gray	100 – 120 g (3.5 – 4.2 oz.)	

BRAKE

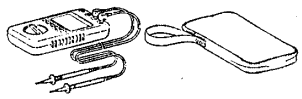
PP3Y2–03

SST (Special Service Tools)

	09023–00101	Union Nut Wrench 10mm	
	09214–76011	Crankshaft Pulley Replacer	
	09520–00031	Rear Axle Shaft Puller	
	(09520–00040)	Shocker	
	(09521–00020)	Rod with Grip	
	09950–00020	Bearing Remover	
	09703–30010	Brake Shoe Return Spring Tool	
	09709–29018	LSPV Gauge Set	
	09718–00010	Shoe Hold Down Spring Driver	
	09751–36011	Brake Line Union Nut 10 x 12 mm Wrench	
	09843–18040	Diagnosis Check Wire No.2	

PP3Y3–02

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

PP16E–08

EQUIPMENT

Torque wrench	
Micrometer	Brake disc
Dial indicator	Brake disc
Ruler	
Brake drum gauge	

PP16F–03

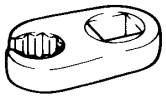
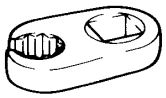
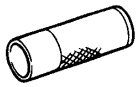
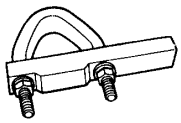
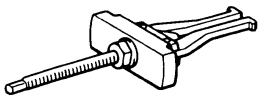
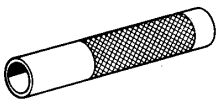
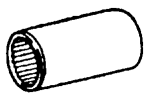
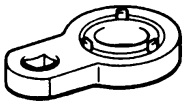
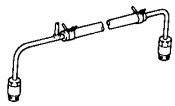
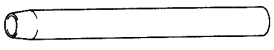
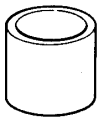
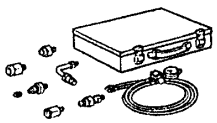
LUBRICANT

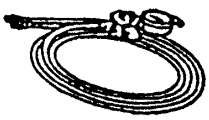
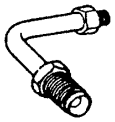
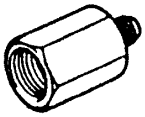
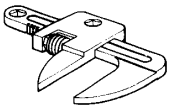
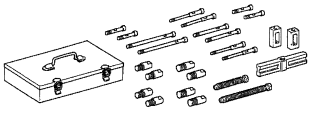
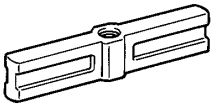
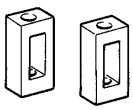
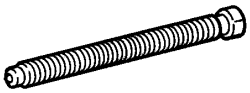
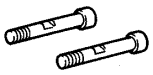
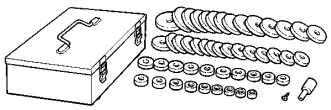
Item	Capacity	Classification
Brake fluid	–	SAE J1703 or FMVSS No. 116 DOT 3

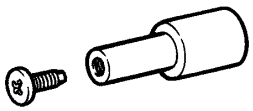
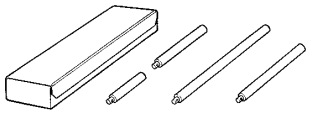
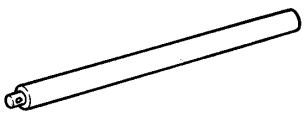
STEERING

PP2EK–05

SST (Special Service Tools)

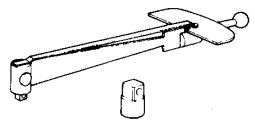
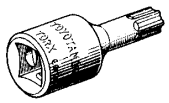
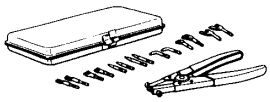
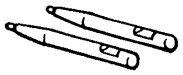
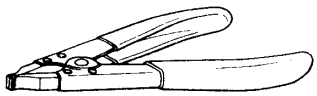
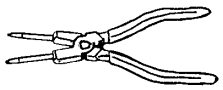
	09023–38201	Union Nut Wrench 12mm	PS gear
	09023–38401	Union Nut Wrench 14mm	PS vane pump PS gear
	09608–04031	Front Hub Inner Bearing Cone Replacer	Tilt steering column
	09612–00012	Rack & Pinion Steering Rack Housing Stand	PS gear
	09612–20010	Power Steering Oil Seal Puller	PS gear
	09612–22011	Tilt Handle Bearing Replacer	PS gear
	09616–00011	Steering Worm Bearing Adjusting Socket	PS gear
	09617–35020	Power Steering Ring Nut Wrench	PS gear
	09631–12071	Steering Rack Oil Seal Test Tool	PS gear
	09631–20051	Steering Rack Cover ”C”	PS gear
	09631–20081	Seal Ring Tool	PS gear
	09640–10010	Power Steering Pressure Gauge Set	Power steering fluid

	(09641–01010) Gauge Assy	
	(09641–01030) Attachment B	
	(09641–01060) Attachment E	
	09922–10010 Variable Open Wrench	PS gear
	09950–50013 Puller C Set	Tilt steering column
	(09951–05010) Hanger 150	
	(09952–05010) Slide Arm	
	(09953–05020) Center Bolt 150	
	(09954–05021) Claw No.2	
	09950–60010 Replacer Set	
	(09951–00210) Replacer 21	PS gear
	(09951–00240) Replacer 24	PS gear
	(09951–00280) Replacer 28	PS vane pump PS gear

	(09951–00340) Replacer 34	PS gear
	(09951–00350) Replacer 35	PS gear
	(09951–00400) Replacer 40	PS gear
	(09952–06010) Adapter	PS gear
	09950–70010 Handle Set	
	(09951–07100) Handle 100	PS vane pump PS gear
	(09951–07150) Handle 150	PS gear
	(09951–07200) Handle 200	PS gear
	(09951–07360) Handle 360	PS gear

PP2EL–06

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 kgf–cm)	PS vane pump PS gear
	09042–00010	Torx Socket T30 .	Tilt steering column
	09904–00010	Expander Set .	
	(09904–00050)	No. 4 Claw	
	09905–00012	Snap Ring No.1 Expander .	
	09905–00013	Snap Ring Pliers .	

Torx is a registered trademark of Textron Inc.

PP0J9–15

EQUIPMENT

Caliper gauge	PS vane pump
Dial indicator	PS gear
Feeler gauge	PS vane pump
Micrometer	PS vane pump
Torque wrench	
Vernier Calipers	PS vane pump

PP0JB–08

LUBRICANT

Item	Capacity	Classification
Power steering fluid Total	1.0 liters (1.1 US qts, 0.9 lmp.qts)	ATF DEXRON® II or III

PP1W4–05

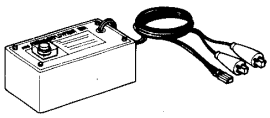
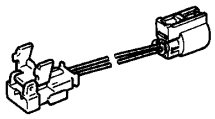
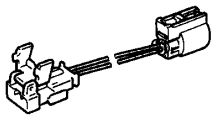
SSM (Special Service Materials)

08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	PS gear

SUPPLEMENTAL RESTRAINT SYSTEM

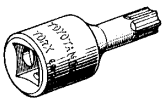
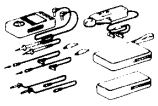
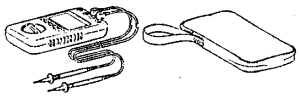
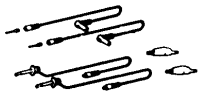
PP0MQ–11

SST (Special Service Tools)

	09082–00700	SRS Airbag Deployment Tool	
	09082–00750	Airbag Deployment Wire Sub–harness No.3	
	09082–00760	Airbag Deployment Wire Sub–harness No.4	
	09843–18020	Diagnosis Check Wire	

PP1XL–09

RECOMMENDED TOOLS

	09042–00020	Torx Socket T40 .	Airbag sensor assembly
	09082–00050	TOYOTA Electrical Tester Set.	
	09082–00040	TOYOTA Electrical Tester.	
	(09083–00150)	Test Lead Set	

Torx is a registered trademark of Textron Inc.

PP0MS–22

EQUIPMENT

Bolt Length: 35 mm (1.38 in.) Pitch: 1.0 mm (0.039 in.) Diam.: 6.0 mm (0.236 in.)	Airbag disposal
Tire Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Airbag disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Airbag disposal
Torque wrench	
Vinyl bag	Airbag disposal

BODY ELECTRICAL

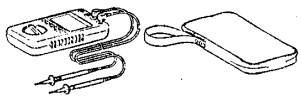
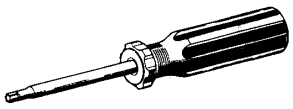
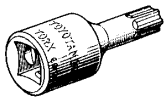
PP0KY–07

SST (Special Service Tools)

 09843–18040 Diagnosis Check Wire No.2	

PP0KZ–04

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	
	09041–00030	Torx Driver T30 .	For removing and installing steering wheel pad
	09042–00010	Torx Socket T30 .	For removing and installing steering wheel pad

Torx is a registered trademark of Textron Inc.

PP0L0–12

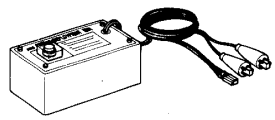
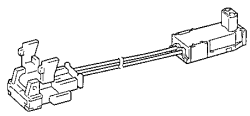
EQUIPMENT

Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Syphon	Brake fluid level warning switch
Bulb (3.4 W)	Fuel sender gauge
Bulb (21 W)	Turn signal flasher relay
Dry cell battery	Fuel sender gauge
Torque wrench	
Masking tape	Rear window defogger wire
Tin foil	Rear window defogger wire

BODY

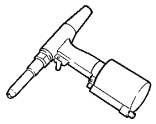
SST (Special Service Tools)

PP2DJ–05

	09082–00700	SRS Airbag Deployment Tool	
	09082–00740	Airbag Deployment Wire Sub–harness No.2	
	09812–00010	Door Hinge Set Bolt Wrench	

PP2DK–04

RECOMMENDED TOOLS

	09050–20010	Air Riveter.	
	(09050–02010)	Dust Cap.	
	(09050–02030)	Nose Piece No.2.	
	09060–60350	Revet Cutter.	

PP0MV–21

EQUIPMENT

Clip remover	
Torque wrench	
Hog ring pliers	
Tape	To avoid surface damage
Adhesive tape	To avoid surface damage
Double – stick tape	
Adhesive	
Cleaner	
Shop rag	Regulator handle
Knife	Moulding
Heat light	Moulding
Piano wire	Windshield
Sealer gun	
Brush	
Putty spatula	
Wooden block or similar object	For tying both piano wire ends
Plastic sheet	To avoid surface damage
Rope (no projections, difficult to break)	Seat belt pretensioner disposal
Tire Width: 185 mm (7.28 in.) Inner diam: 360 mm (14.17 in.)	Seat belt pretensioner disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam 360 mm (14.17 in.)	Seat belt pretinsioner disposal
Vinyl bag	Seat belt pretensioner disposal

PP0MW–04

LUBRICANT

Item	Capacity	Classification
MP grease	–	–

PP0TC–12

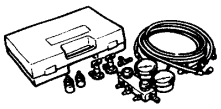
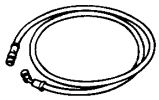
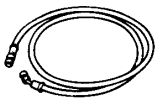
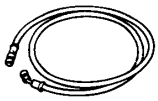
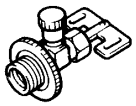
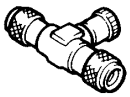
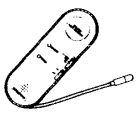
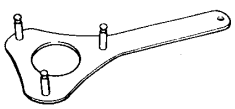
SSM (Special Service Materials)

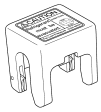
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	
08833–00030	Three cement black or equivalent	
08850–00801	Windshield Glass Adhesive Set or equivalent	

AIR CONDITIONING

PP3FK–02

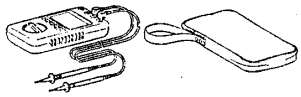
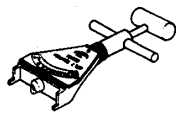
SST (Special Service Tools)

	07110–58060	Air Conditioner Service Tool Set	
	(07117–78050)	Refrigerant Charging Gauge	
	(07117–88060)	Refrigerant Charging Hose	Discharge (Red)
	(07117–88070)	Refrigerant Charging Hose	Suction (Blue)
	(07117–88080)	Refrigerant Charging Hose	Utility (Green)
	(07117–58060)	Refrigerant Drain Service Valve	
	(07117–58080)	Quick Disconnect Adapter	Discharge (diam. 16 mm)
	(07117–58090)	Quick Disconnect Adapter	Suction (diam. 13 mm)
	(07117–58070)	T–Joint	
	07116–38360	Gas Leak Detector Assembly	
	07112–76060	Magnetic Clutch Stopper	
	07112–66040	Magnetic Clutch Remover	

	95994–10020	Snap Ring Pliers (DENSO Part No.)	
	09870–00015	A/C Quick Joint Puller No.1	Suction tube
	09870–00025	A/C Quick Joint Puller No.2	Liquid tube

PP17X–03

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	
	09216–00021 Belt Tension Gauge .	
	09216–00030 Belt Tension Gauge Cable .	

PP0B8–17

EQUIPMENT

Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Thermometer	Thermistor, ECT switch
Torque wrench	
Dial indicator	Magnetic clutch
Plastic hammer	Magnetic clutch

PP17Y–06

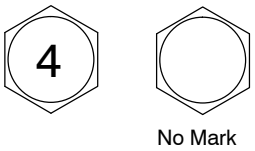
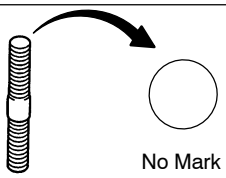
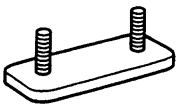
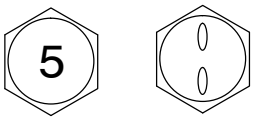
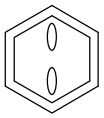
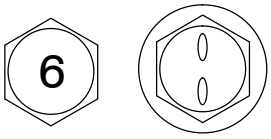
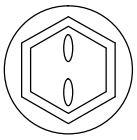
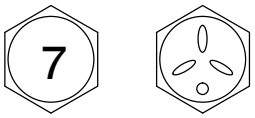
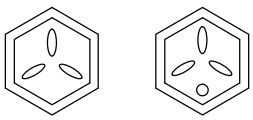
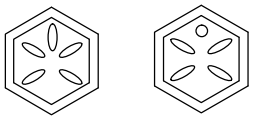
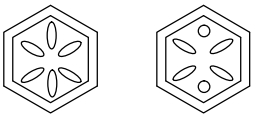
LUBRICANT

Item	Capacity	Classification
Compressor oil	–	ND–OIL 8 or equivalent
When replacing condenser	40 cc (1.4 fl.oz.)	
When replacing evaporator	40 cc (1.4 fl.oz.)	
When replacing compressor	120 cc (4.1 fl.oz.)	

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

SS0ZS–01

Bolt Type				Class
Hexagon Head Bolt		Stud Bolt	Weld Bolt	
Normal Recess Bolt	Deep Recess Bolt			
 No Mark	 No Mark	 No Mark		4T
				5T
 w/ Washer	 w/ Washer			6T
				7T
				8T
				9T
				10T
				11T

B06431

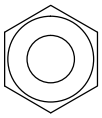
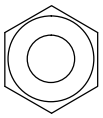
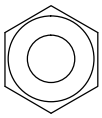
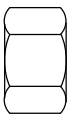
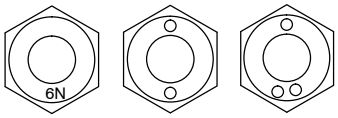
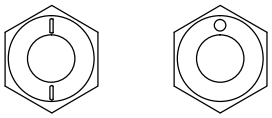
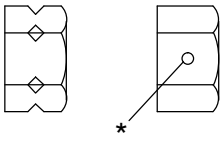
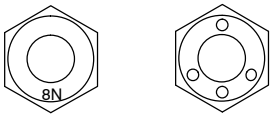
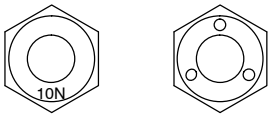
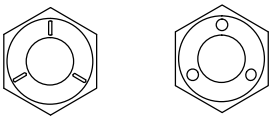
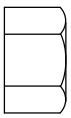
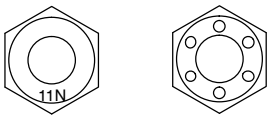
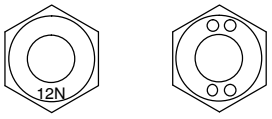
SS0ZT–01

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

SS0ZU–01

HOW TO DETERMINE NUT STRENGTH

Nut Type			Class
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forging Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/ Washer)	 No Mark (w/ Washer)	 No Mark	5N (4T)
 6N			6N
		 *	7N (5T)
 8N			8N
 10N		 No Mark	10N (7T)
 11N			11N
 12N			12N

*: Nut with 1 or more marks on one side surface of the nut.

B06432

HINT:

Use the nut with the same number of the nut strength classification or the greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

MAINTENANCE

SS0MG–06

SERVICE DATA

Front axle and suspension		
Ball joint vertical play	Maximum	0 mm (0 in.)

SS0MH–08

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Front seat x Body		37	375	27
Front suspension member x Body	Bolt A	113	1,152	83
(See page MA–7)	Bolt B	157	1,600	116
Rear suspension member x Body	Bolt A	80	816	59
(See page MA–7)	Bolt B	130	1,326	96

ENGINE MECHANICAL

SERVICE DATA

SS0MI–14

Compression pressure	1ZZ–FE:	at 250 rpm STD	1,500 kPa (15.3 kgf/cm^2, 218 psi)
		Minimum	1,000 kPa (10.2 kgf/cm^2, 145 psi)
		Difference of pressure between each cylinder	100 kPa (1.0 kgf/cm^2, 15 psi) or less
	2ZZ–GE:	at 250 rpm STD	1,400 kPa (14.3 kgf/cm^2, 203 psi)
		Minimum	1,000 kPa (10.2 kgf/cm^2, 145 psi)
		Difference of pressure between each cylinder	110 kPa (1.1 kgf/cm^2, 16 psi) or less
Valve clearance	1ZZ–FE:	at cold Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
		Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.)
	Valve clearance adjusting shim		
		No. 06	5.060 mm (0.1992 in.)
		No. 08	5.080 mm (0.2000 in.)
		No. 10	5.100 mm (0.2008 in.)
		No. 12	5.120 mm (0.2016 in.)
		No. 14	5.140 mm (0.2024 in.)
		No. 16	5.160 mm (0.2031 in.)
		No. 18	5.180 mm (0.2039 in.)
		No. 20	5.200 mm (0.2047 in.)
		No. 22	5.220 mm (0.2055 in.)
		No. 24	5.240 mm (0.2063 in.)
		No. 26	5.260 mm (0.2071 in.)
		No. 28	5.280 mm (0.2079 in.)
		No. 30	5.300 mm (0.2087 in.)
		No. 32	5.320 mm (0.2094 in.)
		No. 34	5.340 mm (0.2102 in.)
		No. 36	5.360 mm (0.2110 in.)
		No. 38	5.380 mm (0.2118 in.)
		No. 40	5.400 mm (0.2126 in.)
		No. 42	5.420 mm (0.2134 in.)
		No. 44	5.440 mm (0.2142 in.)
		No. 46	5.460 mm (0.2150 in.)
		No. 48	5.480 mm (0.2157 in.)
		No. 50	5.500 mm (0.2165 in.)
		No. 52	5.520 mm (0.2173 in.)
		No. 54	5.540 mm (0.2181 in.)
		No. 56	5.560 mm (0.2189 in.)
		No. 58	5.580 mm (0.2197 in.)
		No. 60	5.600 mm (0.2205 in.)
		No. 62	5.620 mm (0.2213 in.)
		No. 64	5.640 mm (0.2220 in.)
		No. 66	5.660 mm (0.2228 in.)
		No. 68	5.680 mm (0.2236 in.)
		No. 70	5.700 mm (0.2244 in.)
		No. 72	5.720 mm (0.2252 in.)
		No. 74	5.740 mm (0.2260 in.)

Valve clearance	2ZZ–GE:	at cold Intake	0.08 – 0.18 mm (0.0031 – 0.0071 in.)
		Exhaust	0.22 – 0.32 mm (0.0087 – 0.0126 in.)
	Valve clearance adjusting shim		
		No. 00	2.000 mm (0.0787 in.)
		No. 02	2.020 mm (0.0795 in.)
		No. 04	2.040 mm (0.0803 in.)
		No. 06	2.060 mm (0.0811 in.)
		No. 08	2.080 mm (0.0819 in.)
		No. 10	2.100 mm (0.0827 in.)
		No. 12	2.120 mm (0.0835 in.)
		No. 14	2.140 mm (0.0843 in.)
		No. 16	2.160 mm (0.0850 in.)
		No. 18	2.180 mm (0.0858 in.)
		No. 20	2.200 mm (0.0866 in.)
		No. 22	2.220 mm (0.0874 in.)
		No. 24	2.240 mm (0.0882 in.)
		No. 26	2.260 mm (0.0890 in.)
		No. 28	2.280 mm (0.0898 in.)
		No. 30	2.300 mm (0.0906 in.)
		No. 32	2.320 mm (0.0913 in.)
		No. 34	2.340 mm (0.0921 in.)
		No. 36	2.360 mm (0.0929 in.)
		No. 38	2.380 mm (0.0937 in.)
		No. 40	2.400 mm (0.0945 in.)
		No. 42	2.420 mm (0.0953 in.)
		No. 44	2.440 mm (0.0961 in.)
		No. 46	2.460 mm (0.0969 in.)
		No. 48	2.480 mm (0.0976 in.)
		No. 50	2.500 mm (0.0984 in.)
		No. 52	2.520 mm (0.0992 in.)
		No. 54	2.540 mm (0.1000 in.)
		No. 56	2.560 mm (0.1008 in.)
		No. 58	2.580 mm (0.1016 in.)
		No. 60	2.600 mm (0.1024 in.)
		No. 62	2.620 mm (0.1031 in.)
		No. 64	2.640 mm (0.1039 in.)
		No. 66	2.660 mm (0.1047 in.)
		No. 68	2.680 mm (0.1055 in.)
		No. 70	2.700 mm (0.1063 in.)
		No. 72	2.720 mm (0.1071 in.)
		No. 74	2.740 mm (0.1079 in.)
		No. 76	2.760 mm (0.1087 in.)
		No. 78	2.780 mm (0.1094 in.)
		No. 80	2.800 mm (0.1102 in.)
Ignition timing	1ZZ–FE:		10 – 18° BTDC @ idle
	2ZZ–GE:		8 – 12° BTDC @ idle
Idle speed	1ZZ–FE:	M/T	700 ± 50 rpm
		A/T	750 ± 50 rpm
	2ZZ–GE:	M/T	800 ± 50 rpm
		A/T	750 ± 50 rpm
Chain and timing sprocket	Chain length at 16 links	Maximum	122.6 mm (4.827 in.)
	Camshaft timing sprocket wear (w/ chain)	Minimum	97.3 mm (3.831 in.)
	Crankshaft timing sprocket wear (w/ chain)	Minimum	51.6 mm (2.031 in.)
Chain tensioner slipper and vibration damper	Wear	Maximum	1.0 mm (0.039 in.)

Cylinder head	Warpage	Maximum	0.05 mm (0.0020 in.)
	Valve seat		
	Refacing angle		30°, 45°, 75°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Residuary width	Minimum Intake	3.3 mm (0.130 in.)
		Exhaust	3.2 mm (0.126 in.)
	Valve guide busing bore diameter	1ZZ–FE	
		STD	10.285 – 10.306 mm (0.4049 – 0.4057 in.)
		O/S 0.05	10.335 – 10.356 mm (0.4068 – 0.4077 in.)
		2ZZ–GE	
		STD	10.488 – 10.506 mm (0.41291 – 0.41362 in.)
		O/S 0.05	10.538 – 10.556 mm (0.41488 – 00.41559 in.)
	Cylinder head bolt diameter		
		at tension portion STD	9.0 – 9.2 mm (0.354 – 0.362 in.)
		Minimum	9.0 mm (0.354 in.)
Valve guide bushing	1ZZ–FE:		
	Inside diameter		5.510 – 5.530 mm (0.2169 – 0.2177 in.)
	Protrusion height		8.7 – 9.1 mm (0.342 – 0.358 in.)
	2ZZ–GE:		
	Inside diameter		5.500 – 5.518 mm (0.2165 – 0.2172 in.)
	Protrusion height		15.3 – 15.7 mm (0.602 – 0.618 in.)
Valve	1ZZ–FE:		
	Valve overall length	STD Intake	88.65 mm (3.4902 in.)
		Exhaust	88.69 mm (3.4917 in.)
		Minimum Intake	88.35 mm (3.4783 in.)
		Exhaust	88.39 mm (3.4799 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.470 — 5.485 mm (0.2154 — 0.2159 in.)
		Exhaust	5.465 — 5.480 mm (0.2152 — 0.2157 in.)
	Stem oil clearance	STD Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Minimum	0.7 mm (0.028 in.)
	2ZZ–GE:		
	Valve overall length	STD Intake	111.3 mm (4.382 in.)
		Exhaust	111.7 mm (4.398 in.)
		Minimum Intake	110.9 mm (4.366 in.)
		Exhaust	111.3 mm (4.382 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.460 — 5.475 mm (0.21496 — 0.21555 in.)
		Exhaust	5.445 — 5.470 mm (0.21437 — 0.21535 in.)
	Stem oil clearance	STD Intake	0.025 — 0.058 mm (0.00098 — 0.00228 in.)
		Exhaust	0.030 — 0.063 mm (0.00118 — 0.00248 in.)
		Maximum	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Minimum	0.7 mm (0.028 in.)

Valve spring	1ZZ–FE:		
	Deviation	Maximum	1.6 mm (0.063 in.)
	Angle (Reference)	Maximum	2°
	Free length		45.90 mm (1.807 in.)
	Installed tension at 33.6 mm (1.323 in.)		139.6 – 154.4 N (14.2 – 15.8 kgf, 31.3 – 34.8 lbf)
	Maximum working tension at 24.6 mm (0.969 in.)		244.9 – 276.1 N (25.5 – 28.1 kgf, 56.2 – 61.9 lbf)
	2ZZ–GE:		
	Deviation	Maximum	1.6 mm (0.063 in.)
	Angle (Reference)	Maximum	2°
	Free length	Intake	46.4 mm (1.830 in.)
		Exhaust	46.5 mm (1.831 in.)
	Installed tension at 38.5 mm (1.516 in.)	Intake	220.2 – 243.8 N (22.5 – 24.7 kgf, 49.6 – 55.5 lbf)
		Exhaust	208.2 – 229.8 N (21.2 – 23.4 kgf, 47.6 – 52.6 lbf)
	Maximum working tension	Intake at 27.3 mm (1.075 in.)	533 – 589 N (54.4 – 60.1 kgf, 119.9 – 132.5 lbf)
		Exhaust at 28.5 mm (1.122 in.)	495.5 – 548.5 N (50.5 – 55.9 kgf, 111.3 – 123.3 lbf)
Valve lifter	1ZZ–FE:		
	Lifter diameter		30.966 – 30.976 mm (1.2191 – 1.2195 in.)
	Lifter bore diameter		31.000 – 31.025 mm (1.2205 – 1.2215 in.)
	Oil clearance	STD	0.024 – 0.059 mm (0.0009 – 0.0023 in.)
		Maximum	0.079 mm (0.0031 in.)
Camshaft	1ZZ–FE:		
	Thrust clearance	STD	0.040 – 0.095 mm (0.0016 – 0.0037 in.)
		Maximum	0.11 mm (0.0043 in.)
	Journal oil clearance	STD	0.035 – 0.072 mm (0.0014 – 0.0028 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter	No. 1	34.449 – 34.465 mm (1.3563 – 1.3569 in.)
		Others	22.949 – 22.965 mm (0.9035 – 0.9041 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Cam lobe height	STD Intake	44.333 – 44.433 mm (1.7454 – 1.7493 in.)
		Exhaust	43.761 – 43.861 mm (1.7229 – 1.7268 in.)
		Minimum Intake	44.18 mm (1.7394 in.)
		Exhaust	43.61 mm (1.7169 in.)
	2ZZ–GE:		
	Thrust clearance	STD	0.04 – 0.14 mm (0.0016 – 0.0055 in.)
		Maximum	0.15 mm (0.0059 in.)
	Journal oil clearance	STD	
		No. 1	0.035 – 0.076 mm (0.00138 – 0.00299 in.)
		Others	0.035 – 0.072 mm (0.00138 – 0.00283 in.)
		Maximum	0.1 mm (0.039 in.)
	Journal diameter	No. 1	34.449 – 34.465 mm (1.35626 – 1.35689 in.)
		Others	27.949 – 27.965 mm (1.10035 – 1.10098 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Cam lobe height	STD Intake	
		No. 1	40.607 – 40.707 mm (1.59586 – 1.59979 in.)
		No. 2	38.769 – 38.869 mm (1.52362 – 1.52755 in.)
		Exhaust	
		No. 1	40.019 – 40.119 mm (1.57275 – 1.57668 in.)
		No. 2	38.863 – 38.963 mm (1.52732 – 1.53125 in.)
		Minimum Intake	
		No. 1	40.45 mm (1.5925 in.)
		No. 2	38.61 mm (1.5201 in.)
		Exhaust	
		No. 1	39.86 mm (1.5693 in.)
		No. 2	38.71 mm (1.5240 in.)
Intake manifold	Warpage	Maximum	0.10 mm (0.0039 in.)
Exhaust manifold	Warpage	Maximum	0.70 mm (0.0276 in.)

Cylinder block	1ZZ–FE:	
	Cylinder head surface warpage – Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter – STD	79.000 – 79.013 mm (3.1102 – 3.1107 in.)
	Difference limit (See page EM–100)	0.10 mm (0.0039 in.)
	12 pointed head bearing cap sub–assembly bolt diameter at tension portion STD	7.3 – 7.5 mm (0.287 – 0.295 in.)
	Minimum	7.3 mm (0.287 in.)
	2ZZ–GE:	
	Cylinder head surface warpage – Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter – STD	82.000 – 82.013 mm (3.2283 – 3.2289 in.)
	Difference limit (See page EM–100)	0.10 mm (0.0039 in.)
	12 pointed head bearing cap sub–assembly bolt diameter at tension portion STD	7.3 – 7.5 mm (0.287 – 0.295 in.)
	Minimum	7.3 mm (0.287 in.)
Piston and piston ring	1ZZ–FE:	
	Piston diameter at 25.6 mm (1.008 in.) from the piston head	78.925 – 78.935 mm (3.1073 – 3.1077 in.)
	Piston oil clearance – STD	0.065 – 0.088 mm (0.0026 – 0.0035 in.)
	Maximum	0.10 mm (0.0039 in.)
	Piston ring groove clearance	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap – STD No. 1	0.25 – 0.35 mm (0.0098 – 0.0138 in.)
	No. 2	0.35 – 0.50 mm (0.0138 – 0.0197 in.)
	Oil	0.15 – 0.40 mm (0.0059 – 0.0157 in.)
	Maximum No. 1	1.05 mm (0.0413 in.)
	No. 2	1.20 mm (0.0472 in.)
	Oil	1.05 mm (0.0413 in.)
	2ZZ–GE:	
	Piston diameter at 12.0 mm (0.048 in.) from the piston head	81.975 – 81.993 mm (3.2274 – 3.2281 in.)
	Piston oil clearance – STD	0.007 – 0.038 mm (0.0003 – 0.0015 in.)
	Maximum	0.10 mm (0.0039 in.)
	Piston ring groove clearance	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap – STD No. 1	0.25 – 0.35 mm (0.0098 – 0.0138 in.)
	No. 2	0.35 – 0.50 mm (0.0138 –0.0197 in.)
	Oil	0.15 – 0.40 mm (0.0059 – 0.0157 in.)
	Maximum No. 1	1.05 mm (0.0413 in.)
	No. 2	1.20 mm (0.0472 in.)
	Oil	1.05 mm (0.0413 in.)

Connecting rod	1ZZ–FE:		
	Thrust clearance	STD	0.160 – 0.342 mm (0.0063 – 0.0135 in.)
		Maximum	0.342 mm (0.0135 in.)
	Connecting rod thickness		19.788 – 19.840 mm (0.7791 – 0.7811 in.)
	Connecting rod bearing center wall thickness		
	Reference	Mark 1	1.486 – 1.490 mm (0.0585 – 0.0587 in.)
		Mark 2	1.490 – 1.494 mm (0.0587 – 0.0588 in.)
		Mark 3	1.494 – 1.498 mm (0.0588 – 0.0590 in.)
	Connecting rod oil clearance	STD	0.028 – 0.060 mm (0.0011 – 0.0024 in.)
		Maximum	0.08 mm (0.0031 in.)
	Rod out–of–alignment	Maximum per/100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per/100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Bushing inside diameter		20.012 – 20.021 mm (0.7879 – 0.7882 in.)
	Piston pin diameter		20.004 – 20.013 mm (0.7876 – 0.7879 in.)
	Bushing oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
		Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt diameter		
		at tension portion STD	6.6 – 6.7 mm (0.260 – 0.264 in.)
		Minimum	6.4 mm (0.252 in.)
	2ZZ–GE:		
	Thrust clearance	STD	0.160 – 0.342 mm (0.0063 – 0.0135 in.)
		Maximum	0.342 mm (0.0135 in.)
	Connecting rod thickness		19.788 – 19.840 mm (0.7791 – 0.7811 in.)
	Connecting rod bearing center wall thickness		
	Reference	Mark 1	1.482 – 1.486 mm (0.0583 – 0.0585 in.)
		Mark 2	1.486 – 1.490 mm (0.0585 – 0.0587 in.)
		Mark 3	1.490 – 1.494 mm (0.0587 – 0.0588 in.)
	Connecting rod oil clearance	STD	0.028 – 0.052 mm (0.0011 – 0.0020 in.)
		Maximum	0.08 mm (0.0031 in.)
	Rod out–of–alignment	Maximum per/100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per/100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Bushing inside diameter	Connecting rod	20.011 – 20.023 mm (0.7878 – 0.7883 in.)
		Piston	20.013 – 20.025 mm (0.7879 – 0.7884 in.)
	Piston pin diameter		20.004 – 20.016 mm (0.7876 – 0.7880 in.)
	Bushing oil clearance	STD Piston x Piston pin	0.005 – 0.013 mm (0.0002 – 0.0005 in.)
		Piston pin x Connecting rod	0.005 – 0.009 mm (0.0002 – 0.0004 in.)
		Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt diameter		
		at tension portion STD	6.6 – 6.7 mm (0.260 – 0.264 in.)
		Minimum	6.4 mm (0.252 in.)

	1ZZ–FE:		
	Thrust clearance	STD	0.04 – 0.24 mm (0.0016 – 0.0094 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.430 – 2.480 mm (0.0957 – 0.0976 in.)
	Main journal oil clearance	STD	0.015 – 0.032 mm (0.0006 – 0.0013 in.)
		Maximum	0.050 mm (0.0020 in.)
	Main journal diameter	Mark 0	47.998 – 48.000 mm (1.8897 – 1.8898 in.)
		Mark 1	47.996 – 47.998 mm (1.8896 – 1.8897 in.)
		Mark 2	47.994 – 47.996 mm (1.8895 – 1.8896 in.)
		Mark 3	47.992 – 47.994 mm (1.8894 – 1.8895 in.)
		Mark 4	47.990 – 47.992 mm (1.8893 – 1.8894 in.)
		Mark 5	47.988 – 47.990 mm (1.8892 – 1.8893 in.)
	Main bearing center wall thickness		
	Reference	Mark 1	1.993 – 1.996 mm (0.0785 – 0.0786 in.)
		Mark 2	1.996 – 1.999 mm (0.0786 – 0.0787 in.)
		Mark 3	1.999 – 2.002 mm (0.0787 – 0.0788 in.)
		Mark 4	2.002 – 2.005 mm (0.0788 – 0.0789 in.)
	Crank pin diameter		43.992 – 44.000 mm (1.7320 – 1.7323 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out–of round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of round	Maximum	0.02 mm (0.0008 in.)
Crankshaft	2ZZ–GE:		
	Thrust clearance	STD	0.04 – 0.24 mm (0.0016 – 0.0094 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.430 – 2.480 mm (0.0957 – 0.0976 in.)
	Main journal oil clearance	STD	0.016 – 0.032 mm (0.0006 – 0.0013 in.)
		Maximum	0.050 mm (0.0020 in.)
	Main journal diameter	Mark 0	47.998 – 48.000 mm (1.8897 – 1.8898 in.)
		Mark 1	47.996 – 47.998 mm (1.8896 – 1.8897 in.)
		Mark 2	47.994 – 47.996 mm (1.8895 – 1.8896 in.)
		Mark 3	47.992 – 47.994 mm (1.8894 – 1.8895 in.)
		Mark 4	47.990 – 47.992 mm (1.8893 – 1.8894 in.)
		Mark 5	47.988 – 47.990 mm (1.8892 – 1.8893 in.)
	Main bearing center wall thickness		
	Reference	Mark 1	1.989 – 1.992 mm (0.0783 – 0.0784 in.)
		Mark 2	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
		Mark 3	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
		Mark 4	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
		Mark 5	2.001 – 2.004 mm (0.0788 – 0.0789 in.)
	Crank pin diameter		44.992 – 45.000 mm (1.7713 – 1.7717 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out–of round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of round	Maximum	0.02 mm (0.0008 in.)

SS0MJ–14

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Camshaft timing sprocket x Camshaft		54	551	40
Valve timing controller assembly x Camshaft		54	551	40
Chain vibration damper x Cylinder block	1ZZ–FE	11	113	8
	2ZZ–GE	20.5	209	15
Chain tensioner slipper x Cylinder block	1ZZ–FE	18.5	189	14
	2ZZ–GE	20.5	209	15
Timing chain cover				
1ZZ–FE: (See page EM–26)	10 mm head bolt D and E	13	133	10
	10 mm head bolt C	9	92	80 in.·lbf
	10 mm head bolt B	11	113	8
	12 mm head bolt A	18.5	189	14
	Stud (E8)	9.3	95	82 in.·lbf
2ZZ–GE: (See page EM–26)	Bolt A	21	214	15
	Bolt B	11	113	8
	Bolt C	9.0	92	80 in.·lbf
	Bolt D	9.0	92	80 in.·lbf
	Stud (E8)	9.3	95	82 in.·lbf
RH engine mounting bracket x Timing chain cover	1ZZ–FE	47	479	35
	2ZZ–GE	49	500	36
Driver belt tensioner x Timing chain cover	Bolt			
	1ZZ–FE	69	704	51
	2ZZ–GE	100	1,020	74
	Nut	29	296	21
Crankshaft position sensor x Timing chain cover		9.0	92	80 in.·lbf
Crankshaft pulley x Crankshaft	1ZZ–FE	138	1,409	102
	2ZZ–GE	120	1,200	87
Chain tensioner x Timing chain cover		9.0	92	80 in.·lbf
Cylinder head cover x Cylinder head	1ZZ–FE w/ Washer	9.0	92	80 in.·lbf
	w/o Washer	11	113	8
	2ZZ–GE	10	100	7
No. 1 ventilation pipe x Cylinder head cover		10	100	7
No. 1 ventilation pipe x Intake manifold	2ZZ–GE	25	255	18
RH engine mounting insulator		52	530	38
PS pump x Engine		36	370	27
Camshaft bearing cap x Cylinder head	1ZZ–FE No. 1	23	235	17
	No. 3	13	133	10
	2ZZ–GE	18.5	189	14
Rocker No. 1 and No. 2 shaft x Cylinder head	2ZZ–GE	7.5	76	66 in.·lbf
Oil control valve housing x Cylinder head	2ZZ–GE	9.0	92	80
Oil pressure switch x Cylinder head	2ZZ–GE	13	130	9
Oil control valve filter x Cylinder head	2ZZ–GE	29	300	22
Cylinder head x Cylinder block	1ZZ–FE 1st	49	500	36
	2nd	Turn 90°	Turn 90°	Turn 90°
	2ZZ–GE 1st	35	375	26
	2nd	Turn 180°	Turn 180°	Turn 180°
Water bypass pipe x Cylinder head		9.0	92	80 in.·lbf

Intake manifold x Cylinder head				
1ZZ–FE:		30	306	22
2ZZ–GE: (See page EM–67)	Bolt A	27	275	20
	Bolt B	46	469	34
	Bolt others	34	347	25
Intake manifold stay	2ZZ–GE	24	245	18
Exhaust manifold x Cylinder head	1ZZ–FE	37	377	27
	2ZZ–GE Bolt A	20	204	15
	Bolt B	50	510	37
Lower heat insulator x Exhaust manifold	1ZZ–FE	12	123	9
	2ZZ–GE	20	204	15
Upper heat insulator x Exhaust manifold	1ZZ–FE	18	184	13
	2ZZ–GE	20	204	15
Exhaust manifold stay	1ZZ–FE	49	500	37
	2ZZ–GE	50	510	37
Engine hanger x Cylinder head		38	388	28
LH engine mounting		80	816	59
Rear engine mounting bracket x Transaxle		64	653	47
Rear engine mounting	Through bolt	87	887	64
Suspension member	Bolt A	52	530	32
(See page EM–82)	Bolt B	52	530	32
	Bolt C	157	1,600	116
	Bolt D	157	1,600	116
	Bolt E	39	400	29
	Nut	52	530	32
PS gear x Suspension member		45	460	33
Exhaust pipe		43	440	32
Clutch release cylinder x Transaxle		12	120	9
Clutch release cylinder bracket	Bolt A	12	120	9
	Bolt B	4.9	50	43 in.·lbf
A/C Compressor x Engine		25	255	18
ECM box stay	Nut	12	120	9
	Bolt	18	185	13
ECM box		6.9	70	61 in.·lbf
ECM cover		6.9	70	61 in.·lbf
Air cleaner case		5.0	51	44 in.·lbf
Bearing cap sub–assembly x Cylinder block	12 pointed head 1st	22	225	16
	2nd	44	449	32
	3rd	Turn 45°	Turn 45°	Turn 45°
	4th	Turn 45°	Turn 45°	Turn 45°
	Hexagon head 1ZZ–FE	18.5	189	14
	2ZZ–GE	18	185	13
Screw plug x Bearing cap sub–assembly	2ZZ–GE	43	438	32
Connecting rod cap	1ZZ–FE 1st	20	204	15
	2nd	Turn 90°	Turn 90°	Turn 90°
	2ZZ–GE 1st	30	306	22
	2nd	Turn 90°	Turn 90°	Turn 90°
Oil strainer		9.0	92	80 in.·lbf
Oil pan baffle	2ZZ–GE	9.0	92	80 in.·lbf
Oil pan		9.0	92	80 in.·lbf
Oil filter union		30	306	21

Engine coolant drain union	1ZZ–FE	20	200	14
	2ZZ–GE	25	255	18
Knock sensor	1ZZ–FE	44	450	33
	2ZZ–GE	20	204	15
Ventilation case	2ZZ–GE	8.5	87	75 in.·lbf
Water bypass pipe x Cylinder block	1ZZ–FE	9.0	92	80 in.·lbf
	2ZZ–GE			
	Bolt	8.5	87	75 in.·lbf
	Nut	10	100	7
Dipstick guide	1ZZ–FE	11	113	8
	2ZZ–GE	24	245	18
Fly wheel	1st	49	500	36
	2nd	Turn 90°	Turn 90°	Turn 90°
Drive plate		88	897	65

EMISSION CONTROL

SERVICE DATA

SS1LW–02

Pressure sensor (for 2ZZ–GE)	Voltage	AIP – E2	1.0 – 2.2V
VSV for air switching valve (for 2ZZ–GE)	Resistance	at 20°C (68°F)	37 – 44 Ω
Air pump relay (for 2ZZ–GE)		Terminal 1 – 2 Terminal 3 – 4	Continuity No continuity

SS0MK–07

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Charcoal canister x Body		18	184	13
Air switching valve x Bracket	2ZZ–GE	8	82	71 in.·lbf
Air switching valve x Body	2ZZ–GE	20.5	209	15
Air pump assembly	2ZZ–GE	8	82	71 in.·lbf

SFI

SERVICE DATA

SS0MM–23

Fuel pressure regulator	Fuel pressure		301 – 347 kPa (3.1 – 3.5 kgf/cm^2, 44 – 50 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage	at 20°C (68°F)	13.4 – 14.2 Ω 47 – 58 cm^3 (2.7 – 3.3 cu in.) per 15 seconds 10 cm^3 (0.6 cu in.) or less One drop or less per 12 minutes
Mass air flow meter	Resistance	at –20°C (–4°F) at 20°C (68°F) at 60°C (140°F)	13.6 – 18.4 kΩ 2.21 – 2.69 kΩ 0.49 – 0.67 kΩ
Throttle position sensor (1ZZ–FE engine)	Clearance between stop screw and lever 0 mm (0 in.) Throttle valve fully open –	 VTA – E2 VTA – E2 VC – E2	 0.2 – 5.7 kΩ 2.0 – 10.2 kΩ 2.5 – 5.9 kΩ
Throttle control motor (2ZZ–GE engine)	Resistance	at 20°C (68°F)	0.3 – 100 kΩ
Camshaft timing oil control valve	Resistance	at 20°C (68°F)	6.9 – 7.9 Ω
VSV (CCV)	Resistance	at 20°C (68°F)	24 – 30 Ω
VSV (Pressure switching valve)	Resistance	at 20°C (68°F) at 120°C (248°F)	37 – 44 Ω 51 –62 Ω
VSV (EVAP)	Resistance	at 20°C (68°F)	27 – 33 Ω
VSV (Intake air control valve)	Resistance	at 20°C (68°F)	37 – 44 Ω
ECT sensor	Resistance	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
Vapor pressure sensor	Power source voltage Remove fuel tank cap	 Terminal 2 – 3	4.5 – 5.5 V 3.0 – 3.6 V
Knock sensor (2ZZ–GE engine)	Resistance	at 20°C (68°F)	120 – 280 Ω
Heated oxygen sensor (1ZZ–FE engine)	Heater coil resistance		5 – 10 Ω
Heated oxygen sensor (2ZZ–GE engine)	Heater coil resistance		11 – 16 Ω
Fuel cut rpm	Fuel return rpm		1,500 rpm

SS0MN–20

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Delivery pipe x Cylinder head	1ZZ–FE	19	190	14
	2ZZ–GE	29	290	21
Fuel pump x Fuel tank		4.0	40	35 in.·lbf
Fuel tank band x Body		39	400	29
Throttle body x Intake manifold	1ZZ–FE	21	210	15
Throttle body x Throttle gasket	2ZZ–GE	22	220	16
Throttle gasket x Intake manifold	2ZZ–GE	22	220	16
Camshaft timing oil control valve x Cylinder head	1ZZ–FE	7.5	80	66 in.·lbf
	2ZZ–GE	8.5	87	75 in.·lbf
Knock sensor 1 x Cylinder block	1ZZ–FE	44	450	33
	2ZZ–GE	20	204	15
Oxygen sensor x Front exhaust pipe		44	450	33
Accelerator pedal assembly x Body		5.0	51	44 in.·lbf

COOLING

SERVICE DATA

SS0MO–11

Thermostat	Valve opening temperature Valve lift	 at 90°C (194°F)	80.0 – 84.0°C (176 – 183°F) 10 mm (0.39 in.)
Radiator cap	Relief valve opening pressure	STD Minimum	93 – 123 kPa (0.95 – 1.25 kgf/cm^2, 13.5 – 17.8 psi) 79 kPa (0.8 kgf/cm^2, 11.5 psi)
Electric cooling fan	Rotating amperage		5.2 – 8.2 A

SS0MP–11

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Drain plug x Radiator		12.7	130	9
Water pump x Timing chain cover	1ZZ–FE			
(See page CO–7)	Bolt A	9.0	92	80 in.·lbf
	Bolt B	11	113	8
	2ZZ–GE	9.0	92	80 in.·lbf
Water pump pulley x Water pump		15	153	11
Water inlet x Cylinder block		10	100	7
Electric cooling fan x Radiator		6.0	60	53 in.·lbf
Engine coolant reservoir x Radiator upper support		5.0	51	44 in.·lbf
Fan motor x Fan shroud		2.55	26	23 in.·lbf
Fan x Fan motor		6.18	63	55 in.·lbf

LUBRICATION

SERVICE DATA

SS0MQ–13

Oil pressure		1ZZ–FE	
		at idle speed	29 kPa (0.3 kgf/cm^2, 43 psi) or more
		at 3,000 rpm	294 – 539 kPa (3.0 – 5.5 kgf/cm^2, 43 – 78 psi)
		2ZZ–GE	
		at idle speed	39.2 kPa (0.4 kgf/cm^2, 5.7 psi) or more
	Oil control valve housing	2ZZ–GE	
		at idle speed	39.2 kPa (0.4 kgf/cm^2, 5.7 psi) or more
Oil pump	Side clearance		
	STD	1ZZ–FE	0.025 – 0.071 mm (0.00098 – 0.00280 in.)
		2ZZ–GE	0.030 – 0.080 mm (0.00118 – 0.00314 in.)
	Maximum	1ZZ–FE	0.071 mm (0.00280 in.)
		2ZZ–GE	0.160 mm (0.00630 in.)
	Tip clearance		
	STD	1ZZ–FE	0.040 – 0.160 mm (0.00157 – 0.00630 in.)
		2ZZ–GE	0.060 – 0.180 mm (0.00236 – 0.00709 in.)
	Maximum	1ZZ–FE	0.160 mm (0.00630 in.)
		2ZZ–GE	0.350 mm (0.01378 in.)
	Body clearance		
	STD	1ZZ–FE	0.260 – 0.325 mm (0.01024 – 0.01280 in.)
		2ZZGE	0.125 – 0.180 mm (0.00492 – 0.00709 in.)
	Maximum		0.325 mm (0.01280 in.)

SS0MR–12

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Oil pressure switch x Cylinder block		13	130	9
Oil pressure switch x Oil control valve housing		13	130	9
Drain plug x Oil pan		37	378	27
Oil pump body cover x Oil pump body		10.5	107	8
Plug x Oil pump	1ZZ–FE	37	375	27
	2ZZ–GE	49	500	36
Oil pump x Cylinder block		9.0	92	80 in.·lbf
Oil nozzle x Cylinder block		9.0	92	80 in.·lbf

IGNITION

SERVICE DATA

SS0MS–15

Spark plug	Recommended spark plug	1ZZ–FE	
		DENSO	SK16R11
		NGK	IFR5A11
		2ZZ–GE	
		DENSO	SK20R11
		NGK	IFR6A11
Camshaft position-sensor	Resistance	at cold	835 – 1,400 Ω
		at hot	1,060 – 1,645 Ω
Crankshaft position sensor	Resistance	at cold	1,630 – 2,740 Ω
		at hot	2,065 – 3,225 Ω

SS0MT–12

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	184	13
Ignition coil (w/ Igniter) x Cylinder head cover	9.0	92	79 in.·lbf
Camshaft position sensor x Cylinder head	8.8	90	78 in.·lbf
Crankshaft position sensor x Timing chain cover	8.8	90	78 in.·lbf

STARTING

SERVICE DATA

SS0MU–09

Starter	Rated voltage and output power		12 V 1.4 kW
			12 V 1.2kW
	No–load characteristics	Current	90 A or less at 11.5 V
		rpm	3,000 rpm or more
	Brush length	STD	15.5 mm (0.610 in.)
		Minimum	10.0 mm (0.394 in.)
	Spring installed load	STD	
		1.4 kW	17.6 – 23.5 N (1.8 – 2.4 kgf, 4.0 – 5.3 lbf)
		1.2 kW	13.7 – 19.6 N (1.4 – 2.0 kgf, 3.1 – 4.6 lbf)
		Minimum	
		1.4 kW	11.8 N (1.2 kgf, 2.6 lbf)
		1.2 kW	8.8 N (0.9 kgf, 2.0 lbf)
	Commutator		
	Diameter	STD	30.0 mm (1.181 in.)
		Minimum	29.0 mm (1.412 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)

SS0MV–08

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Starter x Transaxle	37	380	28
End cover x Brush holder	3.8	39	34 in.·lbf
Starter housing x Magnetic switch	9.3	95	82 in.·lbf
End cover x Starter housing	9.3	95	82 in.·lbf
Lead wire x Terminal C of starter	5.9	60	52 in.·lbf
Terminal nut x Terminal C of starter, Terminal 30 of starter	17	173	12
Magnetic switch end cover x Magnetic switch	2.5	26	23 in.·lbf

CHARGING

SS0MW–13

SERVICE DATA

Battery	Voltage	at 20°C (68°F)	12.7 – 12.9 V
	Specific gravity	at 20°C (68°F)	1.25 – 1.29
Generator	Rated output		12 V 80 A
	Rotor coil resistance	M/T	2.7 – 3.1 Ω
		A/T	2.1 – 2.5 Ω
	Slip ring diameter	STD	14.2 – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Minimum	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage		13.2 – 14.8 V

SS0MX–11

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Bearing retainer x Drive end frame		3.0	31	27 in.·lbf
Rectifier end frame x Drive end frame	Nut A	4.5	46	40 in.·lbf
	Nut B	5.4	55	48 in.·lbf
Generator pulley x Rotor		111	1,125	81
Rectifier end frame x Brush holder, Voltage regulator		2.0	20	17 in.·lbf
Rectifier holder x Coil lead on rectifier end frame		2.9	30	25 in.·lbf
Rear end cover x Rectifier holder		4.4	45	39 in.·lbf
Plate terminal x Rectifier holder	Nut	4.4	45	39 in.·lbf
	Bolt	3.9	39	35 in.·lbf
Terminal insulator x Rectifier holder		4.1	42	36 in.·lbf
Generator x RH engine mount bracket		25	20	18
Generator x Cylinder block	1ZZ–FE	54	550	40
	2ZZ–GE	58	590	43
Generator x Generator bracket		29	295	21

CLUTCH

SERVICE DATA

SS09I–15

Pedal height from asphalt sheet	Standard pedal	135.6 – 145.6 mm (5.339 – 5.732 in.)
	Sport pedal	136.9 – 146.9 mm (5.390 – 5.783 in.)
Pedal freeplay		1.0 – 5.0 mm (0.039 – 0.197 in.)
Push rod play at pedal top		5.0 – 15.0 mm (0.197 – 0.591 in.)
Clutch release point from pedal full stroke end position		25 mm (0.98 in.) or more
Slotted spring pin protrusion		1.5 – 2.5 mm (0.059 – 0.098 in.)
Disc rivet head depth	Min.	0.3 mm (0.012 in.)
Disc runout	Max.	0.8 mm (0.031 in.)
Flywheel runout	Max.	0.1 mm (0.004 in.)
Diaphragm spring finger wear	Max. depth	0.5 mm (0.020 in.)
Diaphragm spring finger wear	Max. width	6.0 mm (0.236 in.)
Diaphragm spring tip non–alignment	Max.	0.5 mm (0.020 in.)

SS09J–15

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Clutch line union	15	155	11
Master cylinder installation nut	12	120	9
Bleeder plug	8.4	85	74 in.·lbf
Release cylinder installation bolt	12	120	9
Clutch line clamp x Clutch line bracket	4.9	50	43 in.·lbf
Flywheel set bolt	49	500	36
Clutch cover x Flywheel	19	195	14
Release fork support	37	375	27

MANUAL TRANSAXLE (C56)

SERVICE DATA

SS02P–19

Input shaft roller bearing journal diameter	Min.	24.985 mm (0.9837 in.)
Input shaft 3rd gear journal diameter	Min.	30.985 mm (1.2199 in.)
Input shaft 4th gear journal diameter	Min.	28.985 mm (1.1411 in.)
Input shaft 5th gear journal diameter	Min.	24.885 mm (0.9797 in.)
Input shaft runout	Max.	0.03 mm (0.0012 in.)
Output shaft roller bearing journal diameter	Min.	32.985 mm (1.2986 in.)
Output shaft 1st gear journal diameter	Min.	37.985 mm (1.4955 in.)
Output shaft 2nd gear journal diameter	Min.	31.985 mm (1.2592 in.)
Output shaft runout	Max.	0.03 mm (0.0012 in.)
Gear thrust clearance 1st	STD Max.	0.10 – 0.40 mm (0.0039 – 0.0157 in.) 0.40 mm (0.0157 in.)
Gear thrust clearance 2nd	STD Max.	0.10 – 0.55 mm (0.0039 – 0.0217 in.) 0.55 mm (0.0217 in.)
Gear thrust clearance 3rd	STD Max.	0.10 – 0.35 mm (0.0039 – 0.0138 in.) 0.35 mm (0.0138 in.)
Gear thrust clearance 4th	STD Max.	0.10 – 0.55 mm (0.0039 – 0.0217 in.) 0.55 mm (0.0217 in.)
Gear thrust clearance 5th	STD Max.	0.10 – 0.57 mm (0.0039 – 0.0224 in.) 0.57 mm (0.0224 in.)
Gear radial clearance 1st, 2nd, 3rd, 4th and 5th (KOYO made)	STD Max.	0.015 – 0.058 mm (0.0006 – 0.0023 in.) 0.058 mm (0.0023 in.)
Gear radial clearance 1st, 2nd, 3rd, 4th and 5th (NSK made)	STD Max.	0.015 – 0.056 mm (0.0006 – 0.0022 in.) 0.056 mm (0.0022 in.)
No. 3 gear shift fork to No. 3 hub sleeve clearance	Max.	0.5 mm (0.020 in.)
No. 2 gear shift fork to No. 2 hub sleeve clearance	Max.	0.35 mm (0.014 in.)
No. 1 gear shift fork to reverse gear clearance	Max.	0.35 mm (0.014 in.)
Synchronizer ring to gear clearance 1st, 4th and 5th	Min.	0.75 mm (0.0295 in.)
Synchronizer ring to gear clearance 3rd	Min.	0.65 mm (0.0256 in.)
Synchronizer ring to gear clearance 2nd	Min.	0.70 mm (0.0276 in.)
Drive in depth		
Input shaft front oil seal		15.8 ± 0.2 mm (0.622 ± 0.008 in.)
Input shaft front bearing		0 – 0.3 mm (0 – 0.012 in.)
Transmission case bushing		0.80 – 1.30 mm (0.0315 – 0.0512 in.)
Transmission case oil seal (Shift and select lever shaft side)		10.0 ± 0.3 mm (0.394 ± 0.012 in.)
Transmission case oil seal (Differential case side)		9.9 ± 0.3 mm (0.390 ± 0.012 in.)
Transaxle case oil seal		1.9 ± 0.3 mm (0.075 ± 0.012 in.)
Select inner lever slotted spring pin		0 ± 0.5 mm (0 ± 0.020 in.)
No. 1 shift inner lever slotted spring pin		0 ± 0.5 mm (0 ± 0.020 in.)
No. 2 shift inner lever slotted spring pin		3.5 ± 0.5 mm (0.138 ± 0.020 in.)

Input shaft snap ring thickness		
No. 2 clutch hub	Mark 0	2.30 mm (0.0906 in.)
	Mark 1	2.36 mm (0.0929 in.)
	Mark 2	2.42 mm (0.0953 in.)
	Mark 3	2.48 mm (0.0976 in.)
	Mark 4	2.54 mm (0.1000 in.)
	Mark 5	2.60 mm (0.1024 in.)
Rear radial ball bearing	Mark A	2.29 mm (0.0902 in.)
	Mark B	2.35 mm (0.0925 in.)
	Mark C	2.41 mm (0.0949 in.)
	Mark D	2.47 mm (0.0972 in.)
	Mark E	2.53 mm (0.0996 in.)
	Mark F	2.59 mm (0.1020 in.)
Output shaft snap ring thickness		
No. 1 clutch hub	Mark A	2.50 mm (0.0984 in.)
	Mark B	2.56 mm (0.1008 in.)
	Mark C	2.62 mm (0.1031 in.)
	Mark D	2.68 mm (0.1055 in.)
	Mark E	2.74 mm (0.1079 in.)
	Mark F	2.80 mm (0.1102 in.)
Front bearing inner race	Mark 7	1.85 mm (0.0728 in.)
	Mark 8	1.90 mm (0.0748 in.)
	Mark 1	1.95 mm (0.0768 in.)
	Mark 2	2.00 mm (0.0787 in.)
	Mark 3	2.05 mm (0.0807 in.)
	Mark 4	2.10 mm (0.0827 in.)
	Mark 5	2.15 mm (0.0846 in.)
	Mark 6	2.20 mm (0.0866 in.)
No. 3 clutch hub	Mark A	2.25 mm (0.0886 in.)
	Mark B	2.31 mm (0.0909 in.)
	Mark C	2.37 mm (0.0933 in.)
	Mark D	2.43 mm (0.0957 in.)
	Mark E	2.49 mm (0.0980 in.)
	Mark F	2.55 mm (0.1004 in.)
	Mark G	2.61 mm (0.1028 in.)
Differential tapered roller bearing preload (at starting)(For use with SST)		
	New bearing	0.8 –1.6 N·m (8 – 16 kgf·cm, 6.9 – 13.9 in.·lbf)
	Reused bearing	0.5 –1.0 N·m (5 – 10 kgf·cm, 4.3 – 8.7 in.·lbf)
Differential pinion to side gear backlash		0.05 mm – 0.20 mm (0.0020 – 0.0079 in.)
Differential side gear thrust washer thickness		0.95 mm (0.0374 in.)
		1.00 mm (0.0394 in.)
		1.05 mm (0.0413 in.)
		1.10 mm (0.0433 in.)
		1.15 mm (0.0453 in.)
		1.20 mm (0.0472 in.)

Differential tapered roller bearing adjusting shim thickness	
Mark AA	2.10 mm (0.0827 in.)
Mark BB	2.15 mm (0.0846 in.)
Mark CC	2.20 mm (0.0866 in.)
Mark DD	2.25 mm (0.0886 in.)
Mark EE	2.30 mm (0.0906 in.)
Mark FF	2.35 mm (0.0925 in.)
Mark GG	2.40 mm (0.0945 in.)
Mark HH	2.45 mm (0.0965 in.)
Mark JJ	2.50 mm (0.0984 in.)
Mark KK	2.55 mm (0.1004 in.)
Mark LL	2.60 mm (0.1024 in.)
Mark MM	2.65 mm (0.1043 in.)
Mark NN	2.70 mm (0.1063 in.)
Mark PP	2.75 mm (0.1083 in.)
Mark QQ	2.80 mm (0.1102 in.)
Mark RR	2.85 mm (0.1122 in.)
Mark SS	2.90 mm (0.1142 in.)
Mark TT	2.95 mm (0.1161 in.)
Mark UU	3.00 mm (0.1181 in.)

SS02Q–21

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
No. 2 cylinder head cover		7.0	71	62 in.·lbf
Radiator reservoir set bolt		4.9	50	43 in.·lbf
ECM cover x ECM box		6.9	70	61 in.·lbf
ECM box set bolt		6.9	70	61 in.·lbf
Battery carrier x Body	Bolt	18	185	13
	Nut	12	120	9
Clutch line set bolt	Bolt A	12	120	9
(See page MX–4)	Bolt B	4.9	50	43 in.·lbf
Clutch release cylinder x Transaxle		12	120	9
Starter x Transaxle		37	378	28
Transaxle x Engine (From transaxle side)		64	650	47
Transaxle x Engine (From engine side)	Bolt A	47	480	35
(See page MX–4)	Bolt B	23	230	17
No. 1 and No. 2 engine hangers set bolt		38	387	28
Engine left mounting bracket x Transaxle		60	610	44
Engine left mounting bracket x Engine left mounting insulator		80	820	59
Oxygen sensor x Front exhaust pipe		44	450	33
Front exhaust pipe		43	440	32
Pressure feed tube x PS vane pump assembly		40 (44)	410 (450)	30 (33)
Intermediate extension x Control valve shaft		35	360	26
Tube clamp		7.8	80	69 in.·lbf
Pressure feed and return tubes x PS gear assembly		40 (44)	410 (450)	30 (33)
Engine rear mounting insulator x Engine rear mounting bracket		87	890	64
Engine rear mounting bracket x Transaxle		64	650	47
Passenger airbag assembly		20	204	15
Airbag sensor assembly x Body		20	205	15
Steering wheel lock nut		34	350	25
Shift lever assembly x Body		12	120	9
Shift cable retainer x Body		4.9	50	43 in.·lbf
Shift and select control cable bracket		4.9	50	43 in.·lbf
Filler and drain plugs		39	400	29
Vehicle speed sensor		11	115	8
Back–up light switch		40	410	30
Control cable bracket x Transaxle case		25	250	18
Control shaft assembly		12	120	9
Selecting bellcrank assembly x Transmission case		25	250	18
Lever lock pin set nut		12	120	9
Transmission case x Transmission case cover		18	185	13
Lock ball assembly (Shift and select lever shaft side)		29	300	22
Control shaft cover x Transmission case		20	200	14
5th driven gear lock nut		118	1,200	87
No. 1, No. 2 and No. 3 gear shift forks set bolt		16	160	12
Rear bearing retainer x Transmission case		27	280	20
Reverse idler gear shaft lock bolt		29	300	22

Straight screw plug	25	250	18
Lock ball assembly (Reverse shift fork side)	39	400	29
Transmission case x Transaxle case	29	300	22
Oil receiver pipe set bolt	17	175	13
Reverse shift arm bracket x Transaxle case	17	175	13
No. 1 gear shift head set bolt	16	160	12
Output shaft front bearing lock plate set bolt	11	115	8
Transaxle case receiver x Transaxle case	11	115	8
Straight screw plug (Reverse restrict pin)	13	130	9
Differential case x Ring gear	77	790	57

( ): For use without SST

MANUAL TRANSAXLE (C60)

SERVICE DATA

SS032–04

Input shaft roller bearing journal diameter	Min.	24.985 mm (0.9837 in.)
Input shaft 3rd gear journal diameter	Min.	30.985 mm (1.2199 in.)
Input shaft 4th gear journal diameter	Min.	28.985 mm (1.1411 in.)
Input shaft 5th gear journal diameter	Min.	24.885 mm (0.9797 in.)
Input shaft 6th gear journal diameter	Min.	21.991 mm (0.8658 in.)
Input shaft runout	Max.	0.03 mm (0.0012 in.)
Output shaft roller bearing journal diameter	Min.	32.985 mm (1.2986 in.)
Output shaft 1st gear journal diameter	Min.	37.985 mm (1.4955 in.)
Output shaft 2nd gear journal diameter	Min.	31.985 mm (1.2592 in.)
Output shaft runout	Max.	0.03 mm (0.0012 in.)
Gear thrust clearance 1st	STD Max.	0.10 – 0.40 mm (0.0039 – 0.0157 in.) 0.40 mm (0.0157 in.)
Gear thrust clearance 2nd	STD Max.	0.10 – 0.55 mm (0.0039 – 0.0217 in.) 0.55 mm (0.0217 in.)
Gear thrust clearance 3rd	STD Max.	0.10 – 0.35 mm (0.0039 – 0.0138 in.) 0.35 mm (0.0138 in.)
Gear thrust clearance 4th	STD Max.	0.10 – 0.55 mm (0.0039 – 0.0217 in.) 0.55 mm (0.0217 in.)
Gear thrust clearance 5th	STD Max.	0.10 – 0.62 mm (0.0039 – 0.0244 in.) 0.62 mm (0.0244 in.)
Gear thrust clearance 6th	STD Max.	0.10 – 0.60 mm (0.0039 – 0.0236 in.) 0.60 mm (0.0236 in.)
Gear radial clearance 1st, 2nd, 3rd and 4th (KOYO made)	STD Max.	0.15 – 0.58 mm (0.0006 – 0.0023 in.) 0.058 mm (0.0023 in.)
Gear radial clearance 1st, 2nd, 3rd and 4th (NSK made)	STD Max.	0.015 – 0.056 mm (0.0006 – 0.0022 in.) 0.056 mm (0.0022 in.)
Gear radial clearance 5th	STD Max.	0.015 – 0.056 mm (0.0006 – 0.0022 in.) 0.056 mm (0.0022 in.)
Gear radial clearance 6th	STD Max.	0.009 – 0.050 mm (0.0003 – 0.0020 in.) 0.050 mm (0.0020 in.)
No. 3 gear shift fork to No. 3 hub sleeve clearance	Max.	0.89 mm (0.035 in.)
No. 2 gear shift fork to No. 2 hub sleeve clearance	Max.	0.35 mm (0.014 in.)
No. 1 gear shift fork to reverse gear clearance	Max.	0.35 mm (0.014 in.)
Synchronizer ring to gear clearance 1st, 4th, 5th and 6th	Min.	0.75 mm (0.0295 in.)
Synchronizer ring to gear clearance 3rd	Min.	0.65 mm (0.0256 in.)
Synchronizer ring to gear clearance 2nd	Min.	0.70 mm (0.0276 in.)
Drive in depth Input shaft front oil seal Input shaft front bearing Transmission case bushing Transmission case oil seal (Shift and select lever shaft side) No. 1 and No. 2 shift inner lever slotted spring pin Transmission case oil seal (Differential case side) Transaxle case oil seal		 15.8 ± 0.2 mm (0.622 ± 0.008 in.) 0 – 0.3 mm (0 – 0.012 in.) 0.80 – 1.30 mm (0.0315 – 0.0512 in.) 10.0 ± 0.3 mm (0.394 ± 0.012 in.) 0 ± 0.5 mm (0 ± 0.020 in.) 9.9 ± 0.3 mm (0.390 ± 0.012 in.) 1.9 ± 0.3 mm (0.075 ± 0.012 in.)
Differential side gear backlash		0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Differential side gear thrust washer thickness		
		0.95 mm (0.0374 in.)
		1.00 mm (0.0394 in.)
		1.05 mm (0.0413 in.)
		1.10 mm (0.0433 in.)
		1.15 mm (0.0453 in.)
		1.20 mm (0.0472 in.)
Differential tapered roller bearing preload (at starting) (For use with SST)		
	New bearing	0.8 – 1.6 N·m (8 – 16 kgf·cm, 6.9 – 13.9 in.·lbf)
	Reused bearing	0.5 – 1.0 N·m (5 – 10 kgf·cm, 4.3 – 8.7 in.·lbf)
Input shaft snap ring thickness		
No. 2 clutch hub	Mark 0	2.30 mm (0.0906 in.)
	Mark 1	2.36 mm (0.0929 in.)
	MarK 2	2.42 mm (0.0953 in.)
	Mark 3	2.48 mm (0.0976 in.)
	Mark 4	2.54 mm (0.1000 in.)
	Mark 5	2.60 mm (0.1024 in.)
No. 3 clutch hub	Mark A	1.75 mm (0.0689 in.)
	Mark B	1.80 mm (0.0709 in.)
	Mark C	1.85 mm (0.0728 in.)
	Mark D	1.90 mm (0.0748 in.)
	Mark E	1.95 mm (0.0768 in.)
	Mark F	2.00 mm (0.0787 in.)
	Mark G	2.05 mm (0.0807 in.)
	Mark H	2.10 mm (0.0827 in.)
	Mark J	2.15 mm (0.0846 in.)
Input shaft center radial ball bearing	Mark A	2.29 mm (0.0902 in.)
	Mark B	2.35 mm (0.0925 in.)
	Mark C	2.41 mm (0.0949 in.)
	Mark D	2.47 mm (0.0972 in.)
	Mark E	2.53 mm (0.0996 in.)
	Mark F	2.59 mm (0.1020 in)
Input shaft rear radial ball bearing	Mark A	1.70 mm (0.0669 in.)
	Mark B	1.75 mm (0.0689 in.)
	Mark C	1.80 mm (0.0709 in.)
	Mark D	1.85 mm (0.0728 in.)
	Mark E	1.90 mm (0.0748 in.)
	Mark F	1.95 mm (0.0768 in.)
	Mark G	2.00 mm (0.0787 in.)
	Mark H	2.05 mm (0.0807 in.)
	Mark J	2.10 mm (0.0827 in.)
	Mark K	2.15 mm (0.0846 in.)
	Mark L	2.20 mm (0.0866 in.)
	Mark M	2.25 mm (0.0886 in.)

Output shaft snap ring thickness		
No. 1 clutch hub	Mark A	2.50 mm (0.0984 in.)
	Mark B	2.56 mm (0.1008 in.)
	Mark C	2.62 mm (0.1031 in.)
	Mark D	2.68 mm (0.1055 in.)
	Mark E	2.74 mm (0.1079 in.)
	Mark F	2.80 mm (0.1102 in.)
Front bearing inner race	Mark 7	1.85 mm (0.0728 in.)
	Mark 8	1.90 mm (0.0748 in.)
	Mark 1	1.95 mm (0.0768 in.)
	Mark 2	2.00 mm (0.0787 in.)
	Mark 3	2.05 mm (0.0807 in.)
	Mark 4	2.10 mm (0.0827 in.)
	Mark 5	2.15 mm (0.0846 in.)
	Mark 6	2.20 mm (0.0866 in.)
Output shaft rear radial ball bearing	Mark B	2.31 mm (0.0909 in.)
	Mark C	2.37 mm (0.0933 in.)
	Mark D	2.43 mm 0.0957 in.)
	Mark E	2.49 mm (0.0980 in.)
	Mark F	2.55 mm (0.1004 in.)
	Mark G	2.61 mm (0.1028 in.)
	Mark H	2.67 mm (0.1051 in.)
	Mark J	2.73 mm (0.1075 in.)
	Mark K	2.79 mm (0.1098 in.)
	Mark L	2.85 mm (0.1122 in.)
	Mark M	2.91 mm (0.1146 in.)
Differential tapered roller bearing adjusting shim thickness		
	Mark AA	2.10 mm (0.0827 in.)
	Mark BB	2.15 mm (0.0846 in.)
	MarK CC	2.20 mm (0.0866 in.)
	Mark DD	2.25 mm (0.0886 in.)
	Mark EE	2.30 mm (0.0906 in.)
	Mark FF	2.35 mm (0.0925 in.)
	Mark GG	2.40 mm (0.0945 in.)
	Mark HH	2.45 mm (0.0965 in.)
	Mark JJ	2.50 mm (0.0984 in.)
	Mark KK	2.55 mm (0.1004 in.)
	Mark LL	2.60 mm (0.1024 in.)
	Mark MM	2.65 mm (0.1043 in.)
	Mark NN	2.70 mm (0.1063 in.)
	Mark PP	2.75 mm (0.1083 in.)
	Mark QQ	2.80 mm (0.1102 in.)
	Mark RR	2.85 mm (0.1122 in.)
	Mark SS	2.90 mm (0.1142 in.)
	Mark TT	2.95 mm (0.1161 in.)
	Mark UU	3.00 mm (0.1181 in.)

SS033–05

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
No. 2 cylinder head cover		7.0	71	62 in.·lbf
Radiator reservoir set bolt		4.9	50	43 in.·lbf
ECM cover x ECM box		6.9	70	61 in.·lbf
ECM box set bolt		6.9	70	61 in.·lbf
Battery carrier x Body	Bolt	18	185	13
	Nut	12	120	9
Clutch line set bolt	Bolt A	12	120	9
(See page MX–4)	Bolt B	4.9	50	43 in.·lbf
Clutch release cylinder x Transaxle		12	120	9
Starter x Transaxle		37	378	28
Transaxle x Engine (From transaxle side)		64	650	47
Transaxle x Engine (From engine side)	Bolt A	47	480	35
(See page MX–4)	Bolt B	23	230	17
No. 1 and No. 2 engine hangers set bolt		38	387	28
Engine left mounting bracket x Transaxle		60	610	44
Engine left mounting bracket x Engine left mounting insulator		80	820	59
Oxygen sensor x Front exhaust pipe		44	450	33
Front exhaust pipe		43	440	32
Pressure feed tube x PS vane pump assembly		40 (44)	410 (450)	30 (33)
Intermediate extension x Control valve shaft		35	360	26
Tube clamp		7.8	80	69 in.·lbf
Pressure feed and return tubes x PS gear assembly		44 (44)	410 (450)	30 (33)
Engine rear mounting insulator x Engine rear mounting bracket		87	890	64
Engine rear mounting bracket x Transaxle		64	650	47
Passenger airbag assembly		20	204	15
Airbag sensor assembly x Body		20	205	15
Steering wheel lock nut		34	350	25
Shift lever assembly x Body		12	120	9
Shift cable retainer x Body		4.9	50	43 in.·lbf
Shift and select control cable bracket		4.9	50	43 in.·lbf
Filler and drain plug		39	400	29
Plug		39	400	29
Vehicle speed sensor		11	115	8
Back–up light switch		40	410	30
Control cable bracket x Transaxle case		25	250	18
Control shaft assembly		12	120	9
Selecting bellcrank assembly x Transmission case		25	250	18
Lever lock pin set nut		12	120	9
Transmission case cover x Transmission case		18	185	13
Lock ball assembly		29	300	22
Control shaft cover assembly x Transmission case		20	200	14
No. 1, No. 2 and No. 3 gear shift fork x Gear shift fork shaft		16	160	12
No. 1 gear shift head x Gear shift fork shaft		16	160	12
Rear bearing retainer x Transmission case		27	280	20

Reverse idler gear shaft lock bolt		29	300	22
Straight screw plug (Gear shift fork shaft)		25	250	18
Straight screw plug (See page MX–13)	Plug A Plug B	13 39	130 400	9 29
Transmission case x Transaxle case		29	300	22
Reverse shift arm bracket x Transaxle case		17	175	13
Output shaft front bearing lock plate set bolt		11	115	8
Transaxle case receiver x Transaxle case		11	115	8
Oil receiver pipe		17	175	13
Ring gear x Differential case		77	790	57

( ): For use without SST

AUTOMATIC TRANSAXLE (U240E)

SS0EB–15

SERVICE DATA

Line pressure (Wheel locked)		
	Engine idling	
	D position	372 – 412 kPa (3.8 – 4.2 kgf/cm^2, 54 – 59 psi)
	R position	672 – 742 kPa (6.9 – 7.6 kgf/cm^2, 97 – 107 psi)
	AT stall (Throttle valve fully opened)	
	D position	931 – 1,031 kPa (9.5 – 10.5 kgf/cm^2, 134 – 149 psi)
	R position	1,768 – 1,968 kPa (18.0 – 20.1 kgf/cm^2, 255 – 284 psi)
Engine stall revolution	D position	2,220 – 2,520 rpm
Time lag	N → D position	Less than 1.2 seconds
	N → R position	Less than 1.5 seconds
Engine idle speed (A/C OFF)	N position	650 ± 50 rpm
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter clutch runout	Max.	0.30 mm (0.0118 in.)
Torque converter clutch installation distance		More than 12.75 mm (0.5020 in.)
Differential oil seal drive in depth	LH side	2.7 ± 0.5 mm (0.106 ± 0.020 in.)
	RH side	0 ± 0.5 mm (0 ± 0.020 in.)
Shift schedule		
D position		
(Throttle valve fully opened)	1 → 2	60 – 67 km/h (37 – 42 mph)
	2 → 3	112 – 123 km/h (70 – 76 mph)
	3 → 4	179 – 191 km/h (111 – 119 mph)
	4 → 3	173 – 186 km/h (107 – 115 mph)
	3 → 2	105 – 116 km/h (65 – 72 mph)
	2 → 1	44 – 50 km/h (27 – 31 mph)
(Throttle valve fully closed)	3 → 4	40 – 45 km/h (25 – 28 mph)
	4 → 3	14 – 19 km/h (9 – 12 mph)
2 position		
(Throttle valve fully opened)	1 → 2	60 – 67 km/h (37 – 42 mph)
	3 → 2	112 – 123 km/h (70 – 76 mph)
	2 → 1	44 – 50 km/h (27 – 31 mph)
L position		
(Throttle valve fully opened)	3 → 2	112 – 123 km/h (70 – 76 mph)
	2 → 1	52 – 58 km/h (32 – 36 mph)
Lock–up point	Throttle valve opening 5 %	
3rd gear	Lock–up ON	220 – 234 km/h (137 – 145 mph)
	Lock–up OFF	220 – 234 km/h (137 – 145 mph)
O/D gear	Lock–up ON	75 – 81 km/h (47 – 50 mph)
	Lock–up OFF	64 – 71 km/h (40 – 44 mph)

SS13Z–17

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Vehicle speed sensor x Transaxle		5.5	56	49 in.·lbf
Input turbine speed sensor x Transaxle		11	115	8
Counter gear speed sensor x Transaxle		11	115	8
ATF temperature sensor x Transaxle		6.6	67	58 in.·lbf
Oil pan x Transaxle		7.8	80	69 in.·lbf
Control cable x Control shaft		12	120	9
Control shaft x Park/neutral position switch		13	130	9
Park/neutral position switch x Transaxle	Bolt	5.4	55	48 in.·lbf
	Nut	6.9	70	61 n.·lbf
Shift solenoid valve x Valve body	12 mm (0.47 in.)	6.6	67	58 in.·lbf
	45 mm (1.77 in.)	11	110	8
Valve body x Transaxle		11	110	8
Oil strainer x Valve body		11	110	8
Drain plug x Oil pan		49	500	36
Steering wheel set nut		34	350	25
Front passenger airbag assembly x Instrument panel reinforcement		20	204	15
Floor shift assembly x Body		12	120	9
Hood set bolt		13	130	9
No. 2 cylinder head cover		7.0	71	62 in.·lbf
ECM case set bolt		6.9	70	61 in.·lbf
ECM set bolt		6.9	70	61 in.·lbf
ECM bracket set bolt		18	185	13
ECM bracket set nut		12	120	9
Radiator reservoir set bolt		4.9	50	43 in.·lbf
Ground cable x Transaxle		18	185	13
Starter x Transaxle		37	378	28
Drain plug x Differential		54	550	40
Stabilizer bar link x Shock absorber		44	450	32
Lower suspension arm x Lower ball joint		142	1,450	105
Drive shaft lock nut		216	2,200	159
Steering knuckle x Tie rod end		49	500	33
Drive shaft bearing lock bolt		64	650	47
Power steering gear assembly set bolt		45	459	33
Center member x Body		39	398	29
Center member x Engine front mounting		52	530	38
Suspension member x Body		157	1,601	116
Engine rear mounting insulator x Engine rear mounting bracket		87	890	64
Engine rear mounting insulator x Suspension member		52	530	38
Engine hanger set bolt		38	387	28
Engine left mounting x Engine left mounting bracket		80	816	59
Torque converter clutch x Drive plate		41	418	30
Transaxle housing x Engine block		See page AX–30		
Drive plate x Crankshaft		88	897	65

AUTOMATIC TRANSAXLE (U341E)

SS16T–02

SERVICE DATA

Line pressure (Wheel locked)		
	Engine idling	
	D position	553 – 623 kPa (5.6 – 6.4 kgf/cm^2, 80 – 100 psi)
	R position	588 – 683 kPa (6.0 – 7.0 kgf/cm^2, 85 – 100 psi)
	at stall (Throttle valve fully opened)	
	D position	1,126 – 1,226 kPa (11.5 – 12.5 kgf/cm^2, 164 – 178 psi)
	R position	1,764 – 1,964 kPa (18.0 – 20.0 kgf/cm^2, 256 – 284 psi)
Engine stall revolution	D and R positions	2,220 — 2,520 rpm
Time lag	N → D position	Less than 1.2 seconds
	N → R position	Less than 1.5 seconds
Engine idle speed (A/C OFF)	N position	750 ± 50 rpm
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter runout	Max.	0.30 mm (0.0118 in.)
Torque converter installation distance		More than 13.3 mm (0.524 in.)
Differential oil seal drive in depth	LH side	2.7 ± 0.5 mm (0.106 ± 0.020 in.)
	RH side	0 ± 0.5 mm (0 ± 0.020 in.)
Shift schedule		
D position		
(Throttle valve fully opened)	1 → 2	57 – 63 km/h (35 – 39 mph)
	2 → 3	112 – 122 km/h (69 – 75 mph)
	3 → O/D	169 – 179 km/h (103 – 110 mph)
	O/D → 3	132 – 141 km/h (81 – 86 mph)
	3 → 2	106 – 114 km/h (65 – 70 mph)
	2 → 1	46 – 50 km/h (28 – 31 mph)
(Throttle valve fully closed)	3 → O/D	46 – 50 km/h (28 – 31 mph)
	O/D → 3	30 – 37 km/h (20 – 23 mph)
2 position		
(Throttle valve fully opened)	1 → 2	57 – 63 km/h (35 – 39 mph)
	3 → 2	106 – 114 km/h (65 – 70 mph)
	2 → 1	42 – 50 km/h (26 – 31 mph)
L position		
(Throttle valve fully opened)	3 → 2	106 – 114 km/h (65 – 70 mph)
	2 → 1	53 – 57 km/h (32 – 35 mph)
Lock–up point	Throttle valve opening 5 %	
3rd gear	Lock–up ON	84 – 90 km/h (51 – 55 mph)
	Lock–up OFF	79 – 84 km/h (48 – 51 mph)
O/D gear	Lock–up ON	56 – 60 km/h (34 – 37 mph)
	Lock–up OFF	53 – 58 km/h (32 – 36 mph)

SS16U–02

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Vehicle speed sensor x Transaxle		5.5	56	49 in.·lbf
Input turbin speed sensor x Transaxle		5.4	55	48 in.·lbf
ATF temperature sensor x Valve body		10	110	8
Oil pan x Transaxle		7.8	80	69 in.·lbf
Control cable x Control shaft lever		12	120	9
Control shaft lever x Park/neutral position switch		13	130	9
Park/neutral position switch x Transaxle	Bolt	5.4	55	48 in.·lbf
	Nut	6.9	70	61 n.·lbf
Shift solenoid valve x Valve body	14 mm (0.55 in.)	6.6	67	58 in.·lbf
	55 mm (2.17 in.)	11	110	8
Valve body x Transaxle		11	110	8
Oil strainer x Valve body		11	110	8
Drain plug x Oil pan		49	500	36
Steering wheel set nut		34	350	25
Front passenger airbag assembly x Instrument panel reinforcement		20	204	15
Floor shift assembly x Body		12	120	9
Hood set bolt		13	130	9
No. 2 cylinder head cover		7.0	71	62 in.·lbf
ECM case set bolt		6.9	70	61 in.·lbf
ECM set bolt		6.9	70	61 in.·lbf
ECM bracket set bolt		18	185	13
ECM bracket set nut		12	120	9
Radiator reservoir set bolt		4.9	50	43 in.·lbf
Ground cable x Transaxle		18	185	13
Starter x Transaxle		37	378	28
Drain plug x Differential		54	550	40
Stabilizer bar link x Shock absorber		44	450	32
Lower suspension arm x Lower ball joint		142	1,450	105
Drive shaft lock nut		216	2,200	159
Steering knuckle x Tie rod end		49	500	33
Drive shaft bearing lock bolt		64	650	47
Power steering gear assembly set bolt		45	459	33
Center member x Body		39	398	29
Center member x Engine front mounting		52	530	38
Suspension member x Body		157	1,601	116
Engine rear mounting insulator x Engine rear mounting bracket		87	890	64
Engine rear mounting insulator x Suspension member		52	530	38
Engine hanger set bolt		38	387	28
Engine left mounting x Engine left mounting bracket		80	816	59
Torque converter clutch x Drive plate		41	420	25
Transaxle housing x Engine block		See page AX–30		
Drive plate x Crankshaft		78	800	58

SUSPENSION AND AXLE

SERVICE DATA

SS04W–19

Cold tire inflation pressure	1ZZ–FE engine models		
	195/60R15 88H P195/60R15 87H	Front, rear	210 kPa (2.1 kgf/cm^2, 29 psi)
	2ZZ–GE engine models		
	205/55R15 87V P205/55R15 87V 205/50R16 87V	Front, rear	220 kPa (2.2 kgf/cm^2, 32 psi)
Front Wheel alignment	Vehicle height		
	Tire size: 195/60R15, P195/60R15	Front*1	190 mm (7.48 in.)
		Rear*2	224 mm (8.82 in.)
	Tire size: 205/55R15, P205/55R15	Front*1	190 mm (7.48 in.)
		Rear*2	226 mm (8.90 in.)
	Tire size: 205/50R16	Front*1	193 mm (7.60 in.)
		Rear*2	225 mm (8.86 in.)
	Camber		
		195/60R15, P195/60R15	–0°28' ± 45' (–0.47° ± 0.75°)
		205/55R15, P205/55R15	–0°25' ± 45' (–0.42° ± 0.75°)
		205/50R16	–0°29' ± 45' (–0.48° ± 0.75°)
		Right–left error	45' (0.75°) or less
	Caster		
		195/60R15, P195/60R15	2°07' ± 45' (2.12° ± 0.75°)
		205/55R15, P205/55R15	2°01' ± 45' (2.02° ± 0.75°)
		205/50R16	2°02' ± 45' (2.03° ± 0.75°)
		Right–left error	45' (0.75°) or less
	Steering axis inclination		
		195/60R15, P195/60R15	13°09' ± 45' (13.15° ± 0.75°)
		205/55R15, P205/55R15	13°04' ± 45' (13.07° ± 0.75°)
		205/50R16	13°12' ± 45' (13.20° ± 0.75°)
		Right–left error	45' (0.75°) or less
	Toe–in (total)		0° ± 12' (0° ± 0.2°, 0 ± 2 mm, 0 ± 0.08 in.)
		Rack end length difference	1.5 mm (0.059 in.) or less
	Wheel angle		
	195/60R15, P195/60R15	Inside wheel	38°41' ± 2° (38.68° ± 2°)
		Outside wheel: Reference	33°20' (33.33°)
	205/55R15, P205/55R15	Inside wheel	38°46' ± 2° (38.77° ± 2°)
		Outside wheel: Reference	33°25' (33.42°)
	205/50R16	Inside wheel	38°38' ± 2° (38.63° ± 2°)
		Outside wheel: Reference	33°19' (33.32°)
Rear wheel alignment	Camber		–1°11' ± 45' (–1.18° ± 0.75°)
		Right–left error	45' (0.75°) or less
	Toe–in (total)		0°18' ± 12' (0.3° ± 0.2°, 3 ± 2 mm, 0.12 ± 0.08 in.)
		Toe–in cross measurement difference	6 mm (0.24 in.) or less
Front axle	Axle bearing backlash	Maximum	0.05 mm (0.0020 in.)
	Axle hub deviation	Maximum	0.07 mm (0.0028 in.)

Front drive shaft	Drive shaft standard length		
	1ZZ–FE (A/T)	RH	851.0 ± 5.0 mm (33.504 ± 0.197 in.)
		LH	565.9 ± 5.0 mm (22.279 ± 0.197 in.)
	1ZZ–FE (M/T) and 2ZZ–GE	RH	845.5 ± 5.0 mm (33.287 ± 0.197 in.)
		LH	563.7 ± 5.0 mm (22.193 ± 0.197 in.)
Front suspension	Lower ball joint turning torque		1.0 – 4.9 N·m (10 – 50 kgf·cm, 8.7 – 43 in.·lbf)
	Stabilizer bar link ball joint turning torque		0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)
Rear axle	Axle bearing backlash	Maximum	0.05 mm (0.0020 in.)
	Axle hub deviation	Maximum	0.07 mm (0.0028 in.)
Rear suspension	Stabilizer bar link ball joint turning torque		0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)

*1: Front measuring point

Measure the distance from the ground to the center of the front side lower suspension arm mounting bolt.

*2: Rear measuring point

Measure the distance from the ground to the center of the rear side lower suspension arm suspension member side set bolt.

SS04X–15

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
FRONT AXLE			
Hub nut	103	1,050	76
Tie rod end lock nut	74	750	54
Steering knuckle x Shock absorber	153	1,560	113
Steering knuckle x Brake caliper	107	1,090	79
Steering knuckle x Tie rod end	49	500	36
Axle hub x Drive shaft	216	2,200	159
Lower ball joint x Lower suspension arm	142	1,450	105
Lower ball joint x Steering knuckle	103	1,050	76
Steering knuckle x Dust cover	8.3	85	74 in.·lbf
ABS speed sensor set bolt	8.0	82	71 in.·lbf
FRONT DRIVE SHAFT			
Drive shaft center bearing case lock bolt	64	650	47
FRONT SUSPENSION			
Suspension support x Body	39	400	29
Suspension support x Piston rod	47	475	34
Flexible hose x Shock absorber	19	192	14
ABS speed sensor wire harness x Shock absorber	8.0	82	71 in.·lbf
Lower suspension arm set bolt	137	1,397	101
PS gear set bolt	58	591	43
Engine front mount x Center member	52	530	38
Engine rear mount x Suspension member	52	530	38
Suspension member set bolt	157	1,600	116
Center member front side set bolt	39	400	29
Stabilizer bar bracket x Suspension member	19	194	14
Stabilizer bar link set nut	44	449	32
REAR AXLE			
Hub nut	103	1,050	76
Brake caliper set bolt	47	475	34
Axle hub set bolt	56	571	41
Upper suspension arm x Axle carrier	74	755	55
Lower suspension arm x Axle carrier	74	755	55
REAR SUSPENSION			
Shock absorber x Lower suspension arm	140	1,428	103
ABS speed sensor wire harness x Lower suspension arm	19	194	14
Spring bracket x Body	80	816	59
Shock absorber center nut	56	571	41
Tailpipe set bolt	43	440	32
Parking brake cable set bolt	5.4	55	48 in.·lbf
Upper suspension arm x Suspension member	74	755	55
Lower suspension arm x Suspension member	74	755	55
Lower suspension arm bracket set bolt	65	663	48
Lower suspension arm bracket x Lower suspension arm	110	1,122	81

Stabilizer bar bracket set bolt	18	184	13
Stabilizer bar link set nut	44	449	32

BRAKE

SERVICE DATA

SS0LM–15

Brake pedal height from asphalt sheet	Standard pedal: Sport pedal:	139.8 – 149.8 mm (5.504 – 5.898 in.) 141.1 – 151.1 mm (5.555 – 5.949 in.)
Brake pedal free play		1 – 6 mm (0.04 – 0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		More than 85 mm (3.35 in.)
Brake booster push rod to piston clearance (w/ accessory tool)		0 mm (0 in.)
Front brake pad thickness	STD	11.5 mm (0.453 in.)
Front brake pad thickness	Minimum	1.0 mm (0.039 in.)
Front brake disc thickness	STD	25.0 mm (0.984 in.)
Front brake disc thickness	Minimum	23.0 mm (0.906 in.)
Front brake disc runout	Maximum	0.05 mm (0.0020 in.)
Rear brake pad thickness	STD	10.0 mm (0.394 in.)
Rear brake pad thickness	Minimum	1.0 mm (0.039 in.)
Rear brake disc thickness	STD	9.0 mm (0.354 in.)
Rear brake disc thickness	Minimum	7.5 mm (0.295 in.)
Rear brake disc runout	Maximum	0.15 mm (0.0059 in.)
Rear brake disc inside diameter	STD	173.0 mm (6.811 in.)
Rear brake disc inside diameter	Maximum	174.0 mm (6.850 in.)
Rear brake drum inside diameter	STD	200.0 mm (7.874 in.)
Rear brake drum inside diameter	Maximum	201.0 mm (7.913 in.)
Drum brake shoe lining thickness	STD	4.0 mm (0.157 in.)
Rear brake drum to shoe clearance		0.6 mm (0.024 in.)
Drum brake shoe lining thickness	Minimum	1.0 mm (0.039 in.)
Parking brake shoe lining thickness	STD	2.0 mm (0.079 in.)
Parking brake shoe lining thickness	Minimum	1.0 mm (0.039 in.)
Parking brake lever travel at 196N (20 Kgf, 44.1 lbf)		7 – 8 clicks
Rear brake clearance between rear shoe and lever		Less than 0.35 mm (0.0138 in.)

SS0LN–13

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder x Brake booster		13	130	9
Brake line union nut		15	155	11
Brake booster clevis lock nut		25	260	19
Brake booster x Pedal bracket		13	130	9
Front disc brake caliper installation bolt		34	350	25
Bleeder plug		8.3	85	74 in.·lbf
Front disc brake torque plate x Steering knuckle		107	1,090	79
Front disc brake caliper x Flexible hose		30	310	22
Rear drum brake wheel cylinder x Backing plate		10	100	7
Rear disc brake caliper installation bolt		47	475	34
ABS actuator assembly x Body		19	195	14
ABS actuator x ABS actuator bracket assembly		5.4	55	48 in.·lbf
Front speed sensor installation bolt		8.0	82	71 in.·lbf
Front speed sensor harness clamp bolt		8.0	82	71 in.·lbf
Rear speed sensor harness clamp bolt	Body	8.0	82	71 in.·lbf
	Lower arm	19	195	14
Pedal bracket x Reinforcement		24	241	17
Brake pedal x Pedal bracket		37	375	27

STEERING

SERVICE DATA

SS16Y–13

POWER STEERING FLUID		
Fluid level rise	Maximum	5 mm (0.20 in.)
Fluid pressure at idle speed with valve closed	Minimum	7,355 kPa (75 kgf/cm^2, 1,067 psi)
STEERING WHEEL		
Steering wheel freeplay	Maximum	30 mm (1.18 in.)
Steering effort at idle speed	Reference	6.5 N·m (65 kgf·cm, 58 in.·lbf)
POWER STEERING VANE PUMP		
Vane pump rotating torque		0.27 N·m (2.8 kgf·cm, 2.4 in.·lbf) or less
Vane pump shaft and front housing bushing oil clearance	STD Maximum	0.021 – 0.043 mm (0.0008 – 0.0017 in.) 0.07 mm (0.0028 in.)
Vane plate height	Minimum	7.6 mm (0.299 in.)
Vane plate thickness	Minimum	1.405 mm (0.0553 in.)
Vane plate length	Minimum	11.993 mm (0.4722 in.)
Vane plate and vane pump rotor groove clearance	Maximum	0.03 mm (0.0012 in.)
Vane plate length	pump rotor and cam ring mark	
	0	12.001 – 12.003 mm (0.47248 – 0.47256 in.)
	1	11.999 – 12.001 mm (0.47240 – 0.47248 in.)
	2	11.997 – 11.999 mm (0.47232 – 0.47240 in.)
	3	11.995 – 11.997 mm (0.47224 – 0.47232 in.)
	4	11.993 – 11.995 mm (0.47216 – 0.47224 in.)
Spring free length	Minimum	35.8 mm (1.409 in.)
POWER STEERING GEAR		
Steering rack runout	Maximum	0.1 mm (0.004 in.)
Total preload	Turning	0.9 – 1.3 N·m (9 – 13 kgf·cm, 8.0 – 11.5 in.·lbf)

SS16Z–16

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
TILT STEERING COLUMN				
Adjusting nut		See page SR–19		
No. 2 tilt lever lock bolt		5.4	55	48 in.·lbf
Tilt steering support x Column tube		15	150	11
No. 2 intermediate shaft assembly x Main shaft assembly		35	360	26
Column assembly set bolt and nut		21	210	15
No. 2 intermediate shaft assembly x Intermediate extension		35	360	26
Steering wheel set nut		50	510	37
Steering wheel pad set screw (Torx® screw)		8.8	90	78 in.·lbf
POWER STEERING VANE PUMP				
Front housing x Rear housing		22	220	16
Rear bracket set bolt		43	440	32
Oil pressure switch		21	210	15
Pressure port union		69	700	51
Suction port union set bolt		12	120	9
PS vane pump assembly set nut		37	370	27
Pressure feed tube clamp set bolt		7.8	80	69 in.·lbf
Pressure feed tube x PS vane pump assembly		40 (44)	410 (450)	30 (33)
POWER STEERING GEAR				
Engine hanger set bolt		38	388	28
Bearing guide nut		40	410	30
Rack housing cap		74	750	54
Rack end x Steering rack		62 (83)	630 (850)	46 (61)
Tie rod end lock nut		74	750	54
Turn pressure tube x Rack housing		23 (25)	230 (250)	17 (18)
Engine rear mount bracket set bolt		64	655	47
Engine rear mount bracket x Engine rear mount insulator		87	890	64
Intermediate extension x Control valve shaft		35	360	26
PS gear assembly set bolt		58	591	43
Front suspension member with lower suspension arm x Frame	Bolt C	157	1,600	116
	Bolt D	157	1,600	116
	Bolt E	39	400	29
Engine front mount insulator x Front suspension member		52	530	38
Engine rear mount insulator x Front suspension member		52	530	38
Stabilizer bar link set nut		44	449	32
Lower suspension arm x Lower ball joint		142	1,450	105
Engine hood x Hinge		13	130	9
Tube clamp		7.8	80	69 in.·lbf
Pressure feed and return tubes x PS gear assembly		40 (44)	410 (450)	30 (33)
Tie rod end x Steering knuckle		49	500	36

( ): For use without SST

SUPPLEMENTAL RESTRAINT SYSTEM

SS061–76

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Steering wheel	34	350	25
Steering wheel pad	8.8	90	78 in.·lbf
Front passenger airbag assembly x Instrument panel reinforcement	20	205	15
Seatback assembly x Seat adjuster	43	440	32
Seat cushion assembly x Seat adjuster	21	210	15
Front seat x Body	37	375	27
Airbag sensor assembly	20	205	15
Front airbag sensor	20	205	15
Side airbag sensor assembly x body	20	205	15
Door side airbag sensor x door	8.0	82	71 in.·lbf

BODY ELECTRICAL

SS0B0–23

SERVICE DATA

SPEEDOMETER (ON–VEHICLE)	
USA:	
Standard indication (mph)	Allowable range (mph)
20	19 – 22
40	39 – 42.5
60	59.5 – 63.5
80	80 – 85
100	100 – 105.5
120	120 – 125.5
CANADA:	
Standard indication (km/h)	Allowable range (km/h)
20	18 – 23
40	40 – 44
60	60 – 64.5
80	80 – 85
100	100 – 105
120	120 – 125.5
140	140 – 146
160	160 – 167
TACHOMETER (ON–VEHICLE)/ DC 13.5 V 25 °C at (77 °F)	
Standard indication	Allowable range
700	700 – 770
1,000	900 – 1,100
2,000	1,850 – 2,150
3,000	2,800 – 3,200
4,000	3,800 – 4,200
5,000	4,800 – 5,200
6,000	5,800 – 6,200
7,000	6,800 – 7,200
FUEL SENDER GAUGE	
Float position mm (in.)	Resistance (Ω)
F: Approx. 75.9 (2.99)	Approx. 3.0
1/2: Approx. 17.2 (0.68)	Approx. 31.6
E: Approx. 50.8 (2.00)	Approx. 110.0
ENGINE COOLANT TEMPERATURE SENDER GAUGE (Resistance)	
Temperature °C (°F)	Resistance (Ω)
50 (122.0)	160 – 240
120 (248.0)	17.1 – 21.2

BODY

TORQUE SPECIFICATION

SS16Q–10

Part tightened	N·m	kgf·cm	ft·lbf
FRONT BUMPER	–	–	–
Front bumper reinforcement x Body	20	200	14
REAR BUMPER	–	–	–
Rear bumper reinforcement x Body	20	200	14
HOOD	–	–	–
Hood hinge x Hood	13	130	9
Hood lock x Body	6.9	70	61 in.·lbf
FRONT DOOR	–	–	–
Door side airbag sensor x Door panel	8.0	82	71 in.·lbf
Outside rear view mirror x Door panel	8.3	85	74 in.·lbf
Upper window stop x Door panel	11	115	8
Door glass x Window regulator	7.8	80	69 in.·lbf
Lower plate x Door panel	4.9	50	43 in.·lbf
Window regulator x Door panel	8.3	85	74 in.·lbf
Door glass female stabilizer x Door panel	4.9	50	43 in.·lbf
Door lock x Door panel Bolt:	4.9	50	43 in.·lbf
Door lock x Door panel Nut:	5.4	55	48 in.·lbf
Door lock x Door panel Screw:	4.9	50	43 in.·lbf
Outside handle x Door panel	5.4	55	48 in.·lbf
Key cylinder x Outside handle	5.4	55	48 in.·lbf
Door hinge x Body	25	260	19
Door hinge x Door panel	25	260	19
Door lock striker x Body	23	230	17
BACK DOOR	–	–	–
Door lock x Door panel	5.4	55	48 in.·lbf
Door handle x Door panel	5.4	55	48 in.·lbf
Door hinge x Door panel	11	115	8
Door hinge x Body	19	196	14
Door lock striker x Body	11	115	8
BACK DOOR STAY	–	–	–
Back door stay x Body	8.3	85	74 in.·lbf
Back door stay x Door panel	26	270	20
FRONT WIPER AND WASHER	–	–	–
Wiper motor x Wiper link assembly	5.4	55	48 in.·lbf
Wiper motor and link assembly x Body	5.4	55	48 in.·lbf
Wiper arm x Wiper motor and link assembly	32	323	23
REAR WIPER AND WASHER	–	–	–
Rear wiper motor x Door panel	5.4	55	48 in.·lbf
Rear wiper arm x Rear wiper motor	5.4	55	48 in.·lbf
ROOF HEADLINING	–	–	–
Drive gear x Sliding roof assembly	5.4	55	48 in.·lbf

INSTRUMENT PANEL		–	–	–
Steering wheel set nut		50	510	37
Passenger airbag assembly x Reinforcement		20	204	15
FRONT SEAT		–	–	–
Front seat x Body		37	375	27
Seat cushion assembly x Seat adjuster		21	210	15
Seatback assembly x Seat adjuster		43	440	32
Side airbag assembly x Seatback frame		5.5	56	49 in.·lbf
REAR SEAT		–	–	–
Seatback assembly x Side hinge		18	185	13
Seatback assembly x Center hinge		18	185	13
Side hinge x Body		7.8	80	69 in.·lbf
Center hinge x Body		18	185	13
Seatback lock striker x Body		18	185	13
Seatback lock x Seatback frame		21	210	15
SEAT BELT		–	–	–
Front seat outer belt shoulder anchor x Body		43	440	32
Front seat outer belt floor anchor x Body		43	440	32
Front seat outer belt retractor x Body	Upper side:	7.5	76	66 in.·lbf
Front seat outer belt retractor x Body	Lower side:	43	440	32
Front seat inner belt x Front seat		43	440	32
Rear seat outer belt retractor x Belt outer anchor bracket		43	440	32
Rear seat outer belt floor anchor x Body		43	440	32
Rear seat inner belt x Body		43	440	32
Belt outer anchor bracket x Body		43	440	32

AIR CONDITIONING

SERVICE DATA

SS0MB–08

Refrigerant charge volume	430 ± 30 g (15.17 ± 1.06 oz.)
Idle–up speed (1ZZ–FE) M/T:	
Magnetic clutch is not engaged	700 ± 50 rpm
Magnetic clutch is engaged	900 ± 50 rpm
Idle–up speed (1ZZ–FE) A/T:	
Magnetic clutch is not engaged	750 ± 50 rpm
Magnetic clutch is engaged	900 ± 50 rpm
Idle–up speed (2ZZ–GE) M/T:	
Magnetic clutch is not engaged	750 ± 50 rpm
Magnetic clutch is engaged	850 ± 50 rpm
Idle–up speed (2ZZ–GE) A/T:	
Magnetic clutch is not engaged	650 ± 50 rpm
Magnetic clutch is engaged	850 ± 50 rpm
Magnetic clutch clearance	0.45 ± 0.10 mm (0.018 ± 0.004 in.)

SS0MC–09

TORQUE SPECIFICATION

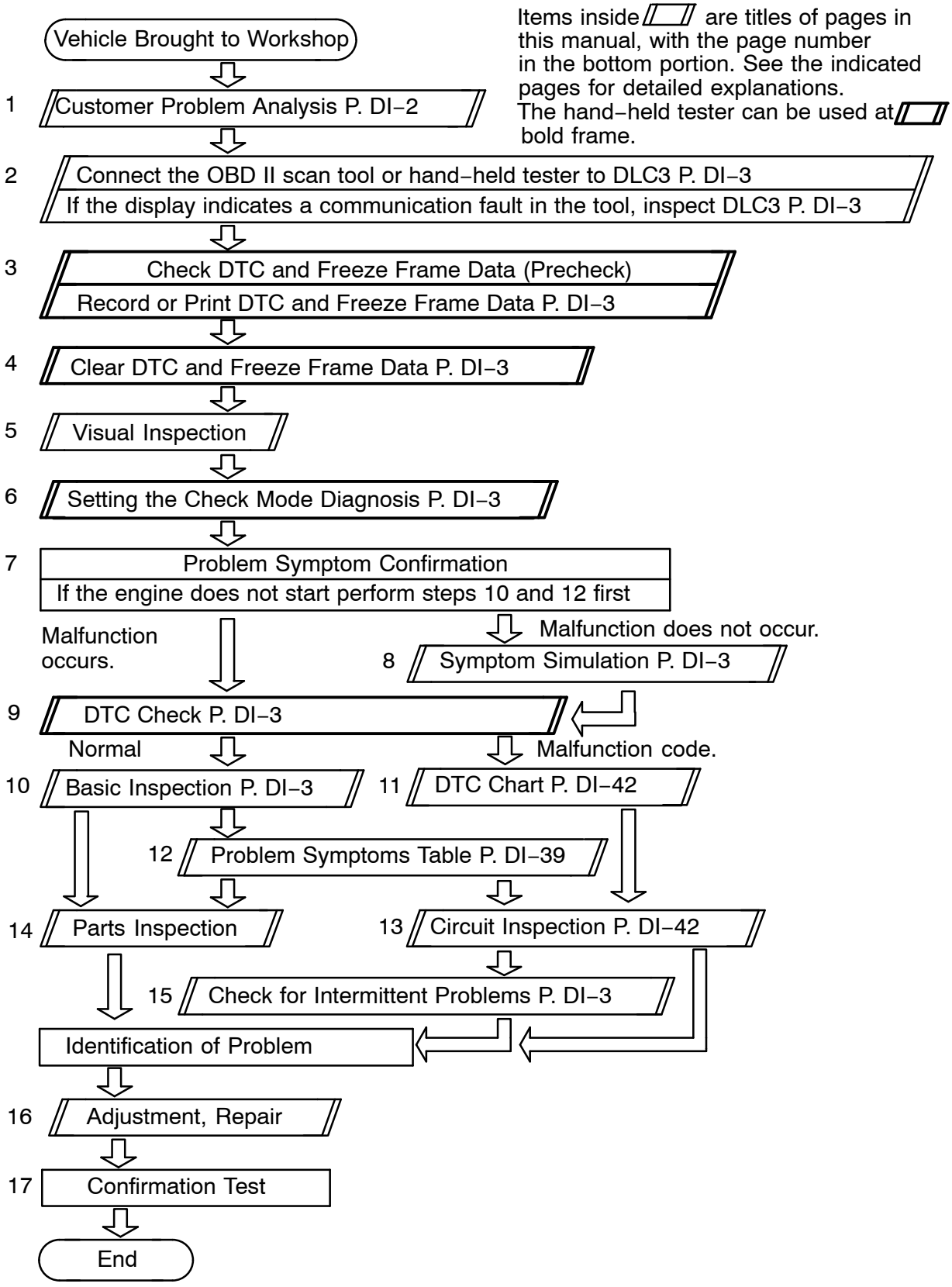
Part tightened		N·m	kgf·cm	ft·lbf
Suction hose x Compressor		10	100	7
Discharge hose x Compressor		10	100	7
Discharge hose x Condenser		5.4	55	48 in.·lbf
Compressor x Engine		25	250	18
Liquid tube x Condenser		5.4	55	48 in.·lbf
Evaporator x Expansion valve		5.4	55	48 in.·lbf
Pressure switch x Liquid tube		10	100	7
Pressure plate x Compressor		13.2	135	9
Liquid lines		10	100	7
Discharge lines		10	100	7
Suction lines		10	100	7
Air pump assembly set bolt	2ZZ–GE	8.0	82	71 in.·lbf
Cruise control actuator set bolt	1ZZ–FE	5.5	56	49 in.·lbf
Engine coolant reservoir set bolt		5.0	51	44 in.·lbf
Center brace set bolt		9.8	100	87 in.·lbf
Upper radiator support set bolt		68	693	50
Upper condenser support set bolt and nut		10	102	88 in.·lbf
Air cleaner case set bolt		5.0	51	41 in.·lbf

ENGINE (1ZZ–FE)

DI37Q–16

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



DI37R–16

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

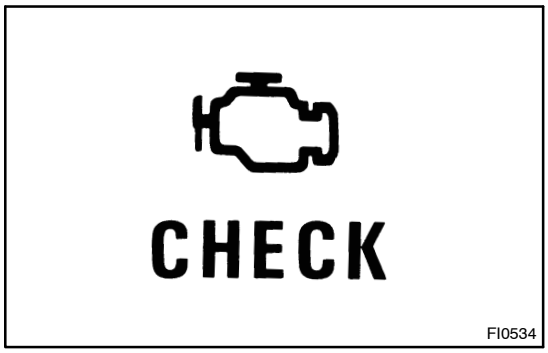
Customer's Name		VIN	
Driver's Name		Production Date	
Data Vehicle Brought in		Licence Plate No.	
Engine model		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Dates Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____°C/____°F)
	Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of malfunction indicator light (MIL)		☐ Remains on	☐ Sometimes light up ☐ Does not light up
DTC Inspection	Normal Mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

DID52–01



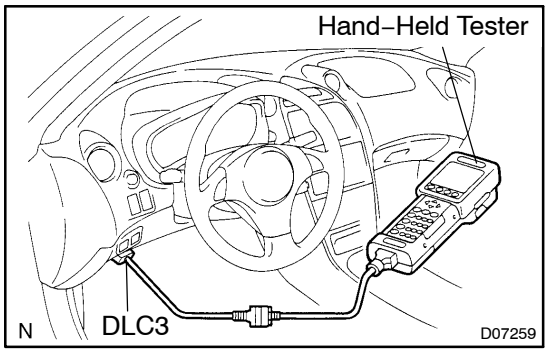
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting On–Board Diagnostic (OBD ll) vehicles, the vehicle must be connected to the OBD ll scan tool (in compliance with SAE J1978) or the hand–held tester. Various data output from the vehicle's ECM can then be read.
- OBD ll regulations require that the vehicle's on–board computer illuminates the Malfunction Indicator Light (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system/components, or 2) the power train control components (which affect vehicle emissions), or 3) The computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–42).

If the malfunction does not reoccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.

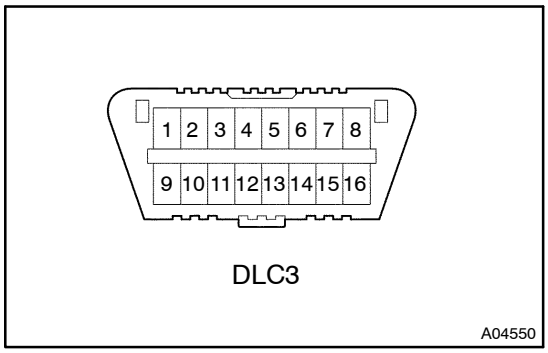


- To check the DTC, connect the hand–held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand–held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the OBD ll scan tool or the hand–held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (See the DTC chart on page DI–42).

- The diagnosis system operates in ”normal mode” during normal vehicle use. In ”normal mode”, 2 trip detection logic* is used to ensure accurate detection of malfunctions. A ”check mode” is also available to technicians as an option. In ”check mode”, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system’s ability to detect malfunctions, including intermittent malfunctions (hand–held tester only) (See step 3).
- *2 trip detection logic:
  When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. This is known as 1st trip detection. If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate. This is known as 2nd trip detection.
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determining if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time when a malfunction occurred.

Priorities for troubleshooting:
When multiple DTCs occur, find out the order in which the DTCs should be inspected by checking the component’s DTC chart. If no instructions are written in the DTC chart, check DTCs in the following order of priority:

(1) DTCs other than fuel trim malfunction DTCs (P0171 and P0172) and misfire DTCs (P0300 to P0304).
(2) Fuel trim malfunction DTCs (P0171 and P0172).
(3) Misfire DTCs (P0300 to P0304).



(b) Check the DLC3.

The vehicle's ECM uses the ISO 9141–2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Symbol	Name	Result
(Terminal No.)	(Reference terminal)	(Condition)
SIL	Bus "+" line	Pulse generation
(7)	(5 – Signal ground)	(During transmission)
CG	Chassis ground	1 Ω or less
(4)	(Body ground)	(Always)
SG	Signal ground	1 Ω or less
(5)	(Body ground)	(Always)
BAT	Battery positive	9 to 14 V
(16)	(Body ground)	(Always)

HINT:

Connect the cable of the hand–held tester to the DLC3, turn the ignition switch ON and attempt to use the hand–held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(c) Inspect the battery voltage.

Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

(d) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

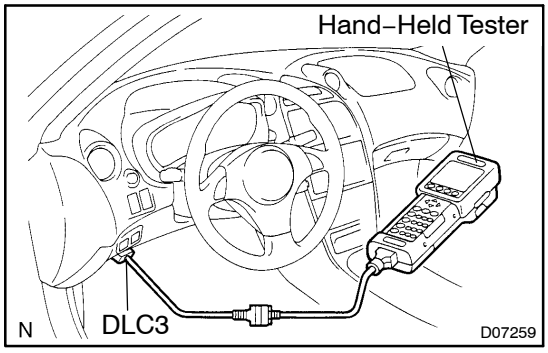
If the MIL is not illuminated, troubleshoot the MIL circuit (See page DI–663).

(2) When the engine is started, the MIL should not illuminate. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Normal Mode)

NOTICE:

- **If no DTC appears in normal mode:**
  On the OBD II scan tool or the hand–held tester, check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979).
- **When the diagnosis system is changed from normal mode to check mode or vice–versa, all DTCs and freeze frame data recorded in normal mode will be erased. Before changing modes, always check and make a note of DTCs and freeze frame data.**



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) Use the OBD II scan tool or the hand–held tester to check the DTCs and freeze frame data and then write them down.
  For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODEDS. For the OBD II scan tool, see its instruction manual.
  (4) See page DI–42 to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the OBD II scan tool (excluding hand–held tester) to check the DTCs, use the normal mode. For DTCs chart subject to ”2 trip detection logic”, perform either of the following actions.

- **Check the pending fault code:**
  For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- **Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL come on and the DTCs are recorded in the ECM.**

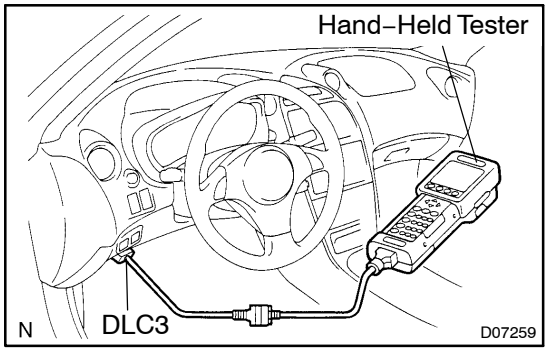
- **Check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool.**

(b) Clearing the DTCs using the OBD II scan tool or the hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester. For the hand–held tester: 1) enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODEDS; and 2) press YES. For the OBD II scan tool, see its instruction manual.

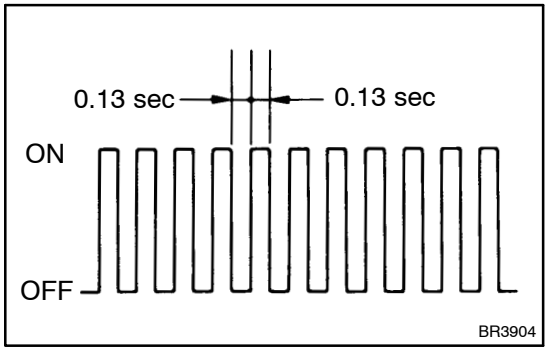
(c) Clearing the DTCs not using the OBD II scan tool or the hand–held tester.
  Remove the EFI fuse from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
  After disconnecting the battery terminal, perform the "INITIALIZE procedure.

3. DTC CHECK (Check Mode)

HINT:
Hand–held tester only:
Check mode has a higher sensitivity to detect malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect.



(a) Follow these steps when preparing to use the hand–held tester check mode.
  (1) Make sure that the items below are true:
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in the P or N position
    - A/C switched OFF
  (2) Turn the ignition switch OFF.
  (3) Connect the hand–held tester to the DLC3.
  (4) Turn the ignition switch ON.
  (5) Change the ECM to check mode with the hand–held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE. Make sure the MIL flashes as shown in the illustration.



NOTICE:
All DTCs and freeze frame data recorded will be erased if: 1) the hand–held tester is used to change the ECM from normal mode to check mode or vice–versa; or 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

(6) Start the engine. The MIL should turn off after the engine starts.
(7) Simulate the conditions of the malfunction described by the customer.
(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTC, freeze frame data and other data.
(9) After checking the DTC, inspect the applicable circuit.

(b) Clearing DTCs using the OBD II scan tool or the hand–held tester.
(1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester. For the hand–held tester: 1) enter the following menus: DIAGNOSIS ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

(c) Clearing the DTCs without using the OBD II scan tool or the hand–held tester.
Remove the EFI fuse from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
After disconnecting the battery terminal, perform the "INITIALIZE" procedure.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing fixed at 5° BTDC	Returned to normal condition
P0110	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temperature is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively VTA ≧ 0.1 V and ≦ 0.95 V
P0325	Max. timing retardation	Ignition switch OFF
P0336	Fuel cut	Returned to normal condition
P0351	Fuel cut	IGF signal is detected for 4 consecutive ignitions

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:
Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect when the ECM is in check mode with hand–held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

(a) Clear the DTCs. (See step 2)
(b) Set the check mode. (See step 3)
(c) Perform a simulation test (See page IN–30).
(d) Check the connector and terminal (See page IN–30).
(e) Wiggle the harness and connector (See page IN–30).

6. BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to page and continue to troubleshoot.**

YES

3	**Does engine start?**

NO → **Go to step 6.**

YES

4	**Check air filter.**

PREPARATION:
Remove the air filter.
CHECK:
Visual check that the air filter is not excessively dirty or oily.

NG → **Repair or replace.**

OK

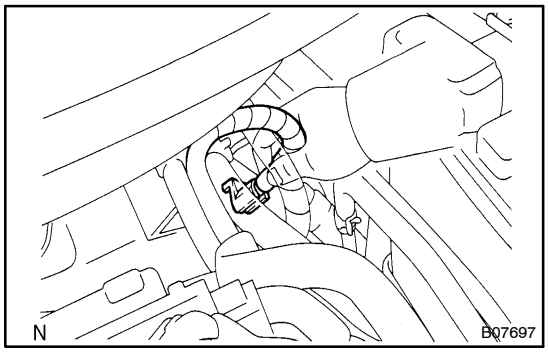
5	**Check idle speed.**

PREPARATION:
(a) Warm up the engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into ”N” position.
(e) Connect the OBD II scan tool or the hand–held tester to DLC3 on the vehicle.
CHECK:
Use CURRENT DATA to check the idle speed.
OK:
Idle speed: 650 to 750 rpm

NG → **Proceed to problem symptoms table on page DI–39.**

OK

6	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Use ACTIVE TEST mode to operate the fuel pump.

HINT:

Please refer to the hand–held tester operator's manual for further details.

(e) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–1).

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

HINT:

At this time, you will hear a fuel flowing noise.

NG	Proceed to page SF–1 and continue to troubleshoot.

OK

7	**Check for spark.**

PREPARATION:

(a) Disconnect the ignition coil assembly from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug the ignition coil assembly.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–39.

7. DATA LIST

HINT:

Using the hand–held tester DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to shorten labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of the hand–held tester.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/Range (Display)	Normal Condition*1	Diagnostic Note
INJECTOR	Injection period of the No.1 cylinder/ Min.: 0 ms, Max.: 32.64 ms	Idling: 1.1 to 2.1 ms	–
IGN ADVANCE	Ignition timing advance for No.1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 10 to 18˚.	–
IAC DUTY RATIO	Duty ratio of the IAC valve/ Min: 0 %, Max: 99 %	Idling: 25 to 35 %	–
CALC LOAD	Calculated load by ECM/ Min.: 0%, Max.: 100%	• Idling: 11.3 to 16.0% • Racing without load (2,500 rpm): 12.3 to 17.9%	–
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	• Idling: 1.4 to 2.0 gm/sec. • Racing without load (2,500 rpm): 5.4 to 7.9 gm/sec.	If value is approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If value is 160.0 gm/s or more: • E2G circuit open
ENGINE SPD	Engine Speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: 650 to 750 rpm	–
COOLANT TEMP	Coolant temperature/ Min.: –40˚C, Max.: 140˚C	After warming up: 80 to 95˚C (176 to 203˚F)	• If value is –40°C (–40°F): sensor circuit is open. • If value is 140°C (284°F) or more: sensor circuit is shorted.
INTAKE AIR	Intake air temperature/ Min.: –40 ˚C, Max.: 140 ˚C	Equivalent to ambient temp. (After cold soak)	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0%, Max.: 100%	• Throttle fully closed: 6 to16% • Throttle fully open: 64 to 98%	Read value with the ignition switch ON (Do not start engine).
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 km/h (0 mph)	Speed indicated on speedometer
O2S B1 S1	Oxygen sensor output voltage of the bank 1 sensor 1/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	Performing INJ VOL or A/F CONTROL function of ACTIVE TEST enables the technician to check the voltage output of each sensor.
O2S B1 S2	Oxygen sensor output voltage of the bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Driving 50 km/h (31 mph): 0.1 to 0.9 V	Performing INJ VOL or A/F CONTROL function of ACTIVE TEST enables the technician to check the voltage output of each sensor.

SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100%, Max.: 100%	0 ± 20%	This item is short–term fuel compensation used to maintain air–fuel ratio at stoichiometric air–fuel ratio
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100%, Max.: 100%	0 ± 20%	This item is overall, long–term fuel compensation that helps to maintain air–fuel ratio at stoichiometric air–fuel ratio (steadies long term deviations of short–term fuel trim from central value)
TOTAL FT #1	Total fuel trim of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.8 to 1.2	–
O2FT B1 S1	Short term fuel trim associated with the bank 1, sensor 1/ Min.: –100%, Max.: 100%	0 ± 20%	Same as SHORT FT #1
O2FT B1 S2	Short term fuel trim associated with the bank 1, sensor 2/ Min.: –100%, Max.: 100%	0 ± 20%	Same as SHORT FT #2
O2 LR B1 S1	Response time of the O2 sensor lean to rich (bank 1, sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 ms	–
O2 RL B1 S1	Response time of the O2 sensor rich to lean (bank 1, sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 ms	–
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	–
CYL #1 – CYL #4	Misfire ratio of the cylinder/ Min.: 0%, Max.: 50%	0%	This item is displayed in only idling
CTP SW	Closed throttle position switch/ ON or OFF	• Throttle fully closed: ON • Throttle open: OFF	–
FUEL SYS #1	Fuel system status (Bank1)/ OL or CL or OLDRIVE or OLFAULT or CLFAULT	Idling after warming up: CL	• OL: Open Loop–has not yet satisfied conditions to go closed loop. • CL: Closed Loop–using oxygen sensor (s) as feed back for fuel control. • OL DRIVE: Open loop due to driving conditions (Power enrichment, deceleration enlargement). • OL FAULT: Open loop due to detected system fault. • CL FAULT: Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control.
FC IDL	Idle fuel cut/ ON or OFF	Fuel cut operation: ON	FC IDL = ”ON” when throttle valve fully closed and engine speed is over 1,500 rpm.
MIL	MIL status/ ON or OFF	MIL ON: ON	–
STARTER SIG	Starter signal/ ON or OFF	Cranking: ON	–
A/C SIG	A/C signal/ ON or OFF	A/C ON: ON	–

PNP SW [NSW]	Park/neutral position switch signal/ ON or OFF	P or N range: ON	–
ELECT LOAD SIG	Electrical load signal/ ON or OFF	Defogger switch ON: ON	–
STOP LIGHT SW	Stop light switch/ ON or OFF	• Brake pedal depressed: ON • Brake pedal released: OFF	–
PS OIL PRESS SW	Power steering signal/ ON or OFF	Steering position is; center: OFF Except center: ON	–
PS SIGNAL	Power steering signal/ ON or OFF	• After engine start: OFF • After steer the steering: ON	–
FUEL PUMP/SPD	Fuel pump/speed status/ ON/H or OFF/M, L	Idling: ON	–
A/C MAG CLUTCH	A/C magnet clutch status/ ON or OFF	A/C magnet clutch ON: ON	–
EVAP VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV operating: ON
VVT CTRL B1	VVT control status (Bank 1)/ ON or OFF	VVT system operation: ON	–

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is in the N or P position, the A/C switch is OFF and all accessory switches are OFF.

8. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester or the OBD II scan tool allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester or the OBD II scan tool.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume. Min.: –12.5%, Max.: 24.8% [Vehicle Condition] Engine speed: 3,000 rpm or less.	• All injectors are tested at once. • Injection volume is gradually changed between –12.5 and 25%
CAN CTRL VSV	[Test Details] Activate the VSV for canister control. ON or OFF	–
TANK BYPASS VSV	[Test Details] Activate the VSV for tank bypass. ON or OFF	–
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control. ON or OFF	–
A/C MAG CLUTCH	[Test Details] Control the A/C magnet clutch. ON or OFF	–
FUEL PUMP / SPD	[Test Details] Control the fuel pump speed. ON or OFF	–
INTAKE AIR CTL VSV	[Test Details] Activate the VSV for intake air control. ON or OFF	–
VVT CTRL B1	[Test Details] Activate the VVT system (Bank 1). ON or OFF	• ON: Rough idle or engine stall • OFF: Normal engine speed
TC/TE1	[Test Details] Connect the TC and TE1. ON or OFF	Switch to the same state as the connection between terminal TC and TE1.
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit. ON or OFF	–

9. DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. When a sensor is being monitored, the next sensor or component will not be monitored until the sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. ”Once per driving cycle” means that the ECM detects the malfunction only one time during a single driving cycle. ”Continuous” means that the ECM detects malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. ”Immediately” means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. ”2 driving cycle” means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

10. TOYOTA/LEXUS PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA/LEXUS name	Definition
Toyota HCAC system, Hydro–carbon Adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve, OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor ”A”	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VSV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve

Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor ”A”, Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor ”A”	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor ”A”	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor ”A”, Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobiliser system, Immobiliser system	Vehicle anti–theft system

11. The monitor will run whenever the following DTCs are not present (Monitor disablement List)

HINT:

The table below shows the ECM monitoring status for the components listed at the top of the table when the DTCs on the left of the table are set.

Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
	P0010,P0020	P0010,P0020	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0010,P0020	P0010,P0020	VVT VSV1,2																			X					X					
P0011	P0011	VVT System1 - Advance				X		X														X					X					
P0012	P0012	VVT System1 - Retard				X		X														X					X					
P0016,P0018	P0016,P0018	VVT System - Misalignment																													
P0021	P0021	VVT System2 - Advance			X	X																X					X					
P0022	P0022	VVT System2 - Retard			X																	X					X					
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X					
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X					
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X			
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0128	P0128	Thermostat																													
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																													
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																													
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X					
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X					
P0325,P0330	P0325-P0333	Knock sensor																										X			
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																				X									
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X									
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X			
P0401	P0401	EGR system (closed)																				X					X				
P0402	P0402	EGR system (open)																				X	X	X	X	X	X				
P0405,P0409	P0405-P0409	Lift sensor																									X				
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X					
P0450,P0451	P0450-P0453	EVAP press sensor																													

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0500	P0500	VSS																				X	X	X	X	X	X	X			
P0511	P0511	IAC valve																					X								
P0510	P0510	Idle switch												X		X						X	X		X	X	X	X			
P0560	P0560	System Voltage																													
P0617	P0617	Starter signal																													
P0705	P0705	Shift lever position switch																													
P0710	P0710-P0713	Trans fluid temp sensor																													
P0720-P0793	P0720-P0793	Output speed sensor																													
P0715-P0717	P0715-P0717	Input speed sensor																													
P0724	P0724	Stop lamp switch																													
P0741-P0796	P0741-P0796	Trans solenoid (function)																													
P0748-P0798	P0748-P0799	Trans solenoid (range)																													
P0850	P0850	PNP switch																										X			
P1010,P1020	P1010,P1020	VVTL																				X					X				
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X					X				
P1126	P1126	Electronic magnet clutch																													
P1129	P1129	Electronic throttle system																													
P1430	P1430	HC adsorber ACT press sensor																													
P2004,6	P2004,6	Intake Manifold Runner Control																													
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
P2102,P2103	P2102,P2103	Throttle motor																													
P2120-P2138	P2120-P2138	Accel position sensor																													
P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X			X	X					
P2226	P2226	BARO sensor																					X		X	X					
P2237,P2240	P2237,P2240	A/F sensor (open)																				X			X	X					
P2423,24	P2423,24	HC Adsorption Catalyst																													
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
P2431	P2431	AIR Pressure Sensor(Rationality)																													
P2440	P2440	AIR control valve stuck open																					X	X	X	X	X				
P2441	P2441	AIR control valve stuck close																					X	X	X	X	X				
P2444	P2444	AIP stuck On																					X	X	X	X	X				
P2445	P2445	AIP stuck Off																					X	X	X	X	X				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																													
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X			X	X					

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																														
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0409	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
	P0325-P0333	Knock sensor																															
	P0335	CKP sensor																															
	P0340,P0341	CMP sensor																															
	P0340-P0346	VVT sensor1,2																															
	P0351-P0358	Ignitor																															
	P0385	CKP sensor 2																															
	P0401	EGR system (closed)																															
	P0402	EGR system (open)																															
	P0405,P0406	EGR Lift sensor																															
	P0409	EGR Lift sensor																															
	P0420,P0430	Catalyst																															
	P0440-P0446	EVAP system																															
	P0450,P0453	EVAP press sensor																															
	P0500	VSS(ECT2sensor)																															
	P0500	VSS(ECT1sensor, non-ECT)																															
	P0500	VSS(M/T)																															
	P0511	IAC valve																															
	P0510	Idle switch																															
	P0560	System Voltage																															
	P0617	Starter signal																															
	P0705	Shift lever position switch																															
	P0710-P0713	Trans fluid temp sensor																															
	P0720-P0793	Output speed sensor																															
	P0715-P0717	Input speed sensor																															
	P0724	Stop lamp switch																															
	P0741-P0796	Trans solenoid (function)*1																															
P0010,P0020	P0010,P0020	VVT VSV1,2																															X
P0011	P0011	VVT System1 - Advance							X	X			X	X					X														
P0012	P0012	VVT System1 - Retard							X	X			X	X					X														
P0016,P0018	P0016,P0018	VVT System - Misalignment																															
P0021	P0021	VVT System2 - Advance							X	X			X	X					X														
P0022	P0022	VVT System2 - Retard							X	X			X	X					X														
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1							X	X			X						X														X
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1							X	X			X						X														
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2											X																				
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																															
P0100,P0101	P0100-P0103	MAF sensor							X	X			X	X				X	X														X
P0105,P0106	P0105-P0108	MAP sensor							X	X			X	X				X	X														X
P0110	P0110-P0113	IAT sensor							X	X				X																			X
P0115,P0116	P0115-P0118	ECT sensor							X	X		X	X	X				X	X														X
P0120,P0121	P0120-P0223,P2135	TP sensor							X	X			X	X			X		X														X
P0125	P0125	Insufficient ECT for Closed Loop							X	X		X	X	X				X	X														X
P0128	P0128	Thermostat																															
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1							X	X			X	X					X														X
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1							X	X			X						X														X
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2											X																				
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																															
P0171,P0172	P0171,P0172	Fuel system							X	X			X	X					X														X
P0300-P0308	P0300-P0308	Misfire											X	X					X														X
P0325,P0330	P0325-P0333	Knock sensor							X	X																							X
P0335	P0335	CKP sensor							X	X			X	X					X														X
P0340, P0341	P0340, P0341	CMP sensor							X	X			X	X					X														X
P0340-P0346	P0340-P0346	VVT sensor1,2																															
P0351-P0358	P0351-P0358	Ignitor							X	X			X	X					X														X
P0385	P0385	CKP sensor 2							X	X			X	X					X														
P0401	P0401	EGR system (closed)											X																				X
P0402	P0402	EGR system (open)											X	X					X														X
P0405,P0409	P0405-P0409	Lift sensor																															
P0420,P0430	P0420,P0430	Catalyst																															
P0442-P0456	P0442-P0456	EVAP system																	X														
P0450,P0451	P0450-P0453	EVAP press sensor												X																			

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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																														
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1
P0500	P0500	VSS							X	X			X	X		▨	▨	▨	X						X	X		X
P0511	P0511	IAC valve																	▨									
P0510	P0510	Idle switch								X			X	X					X	▨								X
P0560	P0560	System Voltage																			▨							
P0617	P0617	Starter signal																				▨						
P0705	P0705	Shift lever position switch																					▨					
P0710	P0710-P0713	Trans fluid temp sensor																						▨				
P0720-P0793	P0720-P0793	Output speed sensor																							▨			X
P0715-P0717	P0715-P0717	Input speed sensor																								▨		
P0724	P0724	Stop lamp switch																									▨	
P0741-P0796	P0741-P0796	Trans solenoid (function)																										▨
P0748-P0798	P0748-P0799	Trans solenoid (range)																							X	X		X
P0850	P0850	PNP switch																	X									X
P1010,P1020	P1010,P1020	VVTL																										
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X									
P1126	P1126	Electronic magnet clutch																										
P1129	P1129	Electronic throttle system																										
P1430	P1430	HC adsorber ACT press sensor												X	X													
P2004,6	P2004,6	Intake Manifold Runner Control																										
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																										
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																										
P2102,P2103	P2102,P2103	Throttle motor																										
P2120-P2138	P2120-P2138	Accel position sensor																										
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X			X						X									X
P2226	P2226	BARO sensor																										X
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X			X						X									X
P2423,24	P2423,24	HC Adsorption Catalyst																										
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																										
P2431	P2431	AIR Pressure Sensor(Rationality)																										
P2440	P2440	AIR control valve stuck open							X	X			X															
P2441	P2441	AIR control valve stuck close							X	X			X															
P2444	P2444	AIP stuck On							X	X			X															
P2445	P2445	AIP stuck Off							X	X			X															
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										X
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X									X

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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

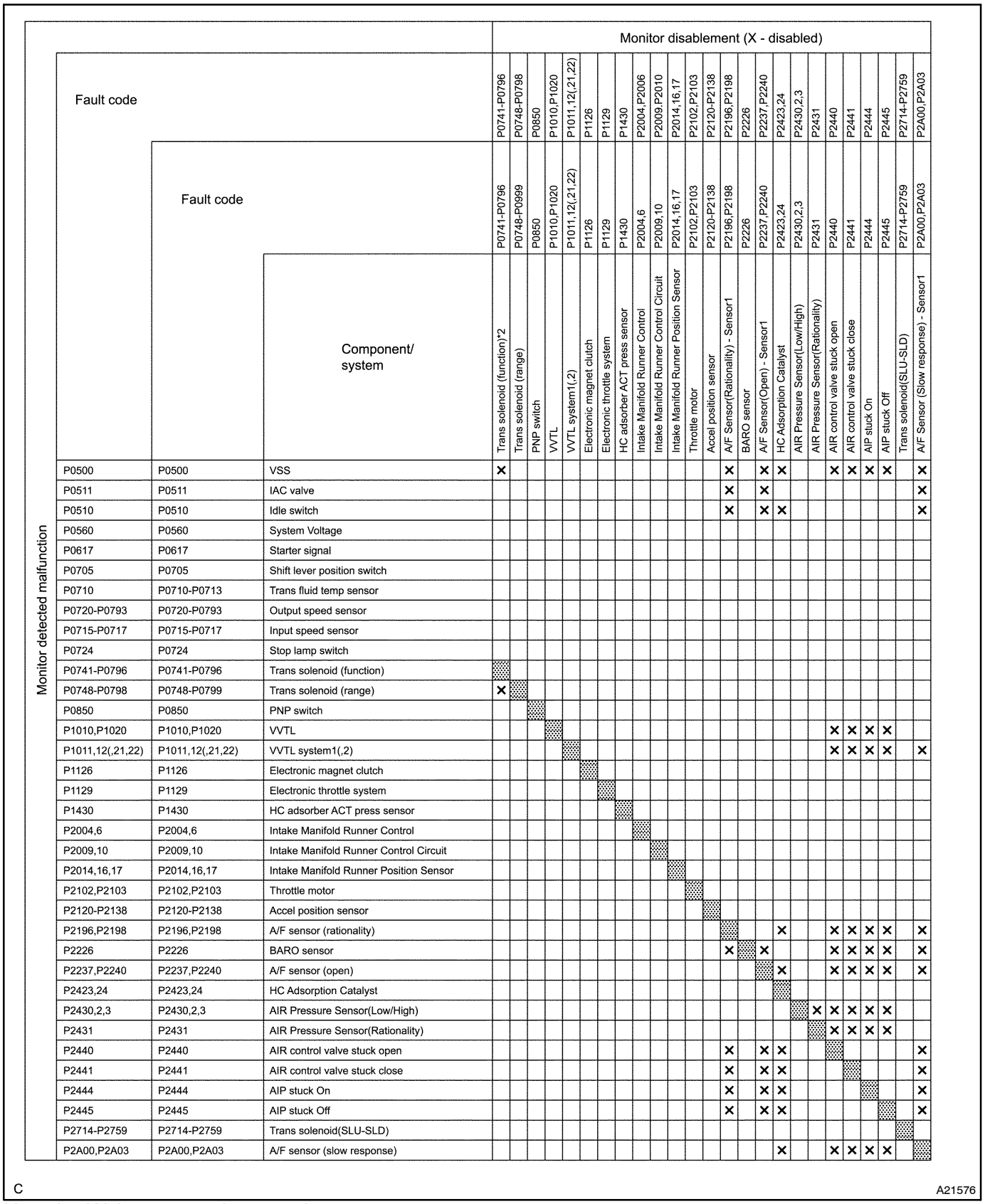
Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
	P0741-P0796	Trans solenoid (function)*2																													
	P0748-P0999	Trans solenoid (range)																													
	P0850	PNP switch																													
	P1010,P1020	VVTL																													
	P1011,12(,21,22)	VVTL system1(,2)																													
	P1126	Electronic magnet clutch																													
	P1129	Electronic throttle system																													
	P1430	HC adsorber ACT press sensor																													
	P2004,6	Intake Manifold Runner Control																													
	P2009,10	Intake Manifold Runner Control Circuit																													
	P2014,16,17	Intake Manifold Runner Position Sensor																													
	P2102,P2103	Throttle motor																													
	P2120-P2138	Accel position sensor																													
	P2196,P2198	A/F Sensor(Rationality) - Sensor1																													
	P2226	BARO sensor																													
	P2237,P2240	A/F Sensor(Open) - Sensor1																													
	P2423,24	HC Adsorption Catalyst																													
	P2430,2,3	AIR Pressure Sensor(Low/High)																													
	P2431	AIR Pressure Sensor(Rationality)																													
	P2440	AIR control valve stuck open																													
	P2441	AIR control valve stuck close																													
	P2444	AIP stuck On																													
	P2445	AIP stuck Off																													
	P2714-P2759	Trans solenoid(SLU-SLD)																													
	P2A00,P2A03	A/F Sensor (Slow response) - Sensor1																													
P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X						
P0011	P0011	VVT System1 - Advance																				X	X	X	X						
P0012	P0012	VVT System1 - Retard																				X	X	X	X						
P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X						
P0021	P0021	VVT System2 - Advance																				X	X	X	X						
P0022	P0022	VVT System2 - Retard																				X	X	X	X						
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X						
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X		X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X												
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X												
P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X		X				
P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X		X				
P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X		X				
P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X		X				
P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X		X				
P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X		X				
P0128	P0128	Thermostat																													
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X						
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X		X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X												
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X												
P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X		X				
P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X		X				
P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X						
P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X		X				
P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X		X				
P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X						
P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X						
P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X		X				
P0401	P0401	EGR system (closed)																	X												
P0402	P0402	EGR system (open)														X		X	X			X	X	X	X		X				
P0405,P0409	P0405-P0409	Lift sensor																													
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X		X				
P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X						

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Note *1: Without input the speed sensor

Note *2: With input the speed sensor



Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																										
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
		P0741-P0796	Trans solenoid (function)*2																											
		P0748-P0999	Trans solenoid (range)																											
		P0850	PNP switch																											
		P1010,P1020	VVTL																											
		P1011,12(,21,22)	VVTL system1(,2)																											
		P1126	Electronic magnet clutch																											
		P1129	Electronic throttle system																											
		P1430	HC adsorber ACT press sensor																											
		P2004,6	Intake Manifold Runner Control																											
		P2009,10	Intake Manifold Runner Control Circuit																											
		P2014,16,17	Intake Manifold Runner Position Sensor																											
		P2102,P2103	Throttle motor																											
		P2120-P2138	Accel position sensor																											
		P2196,P2198	A/F Sensor(Rationality) - Sensor1																											
		P2226	BARO sensor																											
		P2237,P2240	A/F Sensor(Open) - Sensor1																											
		P2423,24	HC Adsorption Catalyst																											
		P2430,2,3	AIR Pressure Sensor(Low/High)																											
		P2431	AIR Pressure Sensor(Rationality)																											
		P2440	AIR control valve stuck open																											
		P2441	AIR control valve stuck close																											
		P2444	AIP stuck On																											
		P2445	AIP stuck Off																											
		P2714-P2759	Trans solenoid(SLU-SLD)																											
		P2A00,P2A03	A/F Sensor (Slow response) - Sensor1																											
	P0500	P0500	VSS	X												X		X	X			X	X	X	X		X
	P0511	P0511	IAC valve													X		X										X
	P0510	P0510	Idle switch													X		X	X									X
	P0560	P0560	System Voltage																											
	P0617	P0617	Starter signal																											
	P0705	P0705	Shift lever position switch																											
	P0710	P0710-P0713	Trans fluid temp sensor																											
	P0720-P0793	P0720-P0793	Output speed sensor																											
	P0715-P0717	P0715-P0717	Input speed sensor																											
	P0724	P0724	Stop lamp switch																											
	P0741-P0796	P0741-P0796	Trans solenoid (function)																											
	P0748-P0798	P0748-P0799	Trans solenoid (range)	X																										
	P0850	P0850	PNP switch																											
	P1010,P1020	P1010,P1020	VVTL																				X	X	X	X		
	P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X	X	X	X		X
	P1126	P1126	Electronic magnet clutch																											
	P1129	P1129	Electronic throttle system																											
	P1430	P1430	HC adsorber ACT press sensor																											
	P2004,6	P2004,6	Intake Manifold Runner Control																											
	P2009,10	P2009,10	Intake Manifold Runner Control Circuit																											
	P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																											
	P2102,P2103	P2102,P2103	Throttle motor																											
	P2120-P2138	P2120-P2138	Accel position sensor																											
	P2196,P2198	P2196,P2198	A/F sensor (rationality)																	X			X	X	X	X		X
	P2226	P2226	BARO sensor													X		X					X	X	X	X		X
	P2237,P2240	P2237,P2240	A/F sensor (open)																X				X	X	X	X		X
	P2423,24	P2423,24	HC Adsorption Catalyst																											
	P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																			X	X	X	X	X		
	P2431	P2431	AIR Pressure Sensor(Rationality)																				X	X	X	X		
	P2440	P2440	AIR control valve stuck open													X		X	X									X
	P2441	P2441	AIR control valve stuck close													X		X	X									X
	P2444	P2444	AIP stuck On													X		X	X									X
	P2445	P2445	AIP stuck Off													X		X	X									X
	P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																											
	P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																	X			X	X	X	X		

C

A21576

Note *1: Without input the speed sensor

Note *2: With input the speed sensor

12. O2S TEST RESULT

INTRODUCTION

The O2S TEST RESULT refers to the results of the engine control module (ECM) when it monitors the oxygen sensor (O2S), and it can be read using the hand–held tester or the generic OBD II scan tool. Based on this, you can find the O2S's conditions.

The ECM monitors the O2S in the various items. You can read the monitor result (TEST DATA) of each monitor item using the O2S TEST RESULT. However, the output value of the TEST DATA is the latest "snap shot" value that is taken after monitoring and therefore it is not dynamic.

In this repair manual, the description of the O2S TEST RESULT (for O2S related DTCs) are written in a table.

This table consists of 5 items:

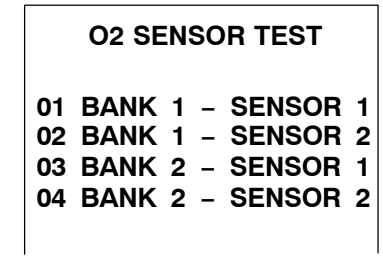
(1) TEST ID (a code applied to each TEST DATA)
(2) Description of TEST DATA
(3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
(4) Unit
(5) Standard Value

If the TEST DATA value appearing on the scan tool is out of the standard value, the O2S is malfunctioning. If it is within the standard value, the O2S is functioning normally. However, if the value is on the border line of the standard value, the O2S may malfunction very soon.

HOW TO READ O2S TEST RESULT USING HAND–HELD TESTER

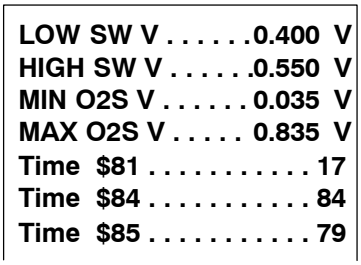
(a) Connect the hand–held tester to the DLC3.

O2S TEST RESULT Screen



(b) On the tester screen, select the following menus: DIAGNOSIS/CARB OBDII/O2S TEST RESULT. A list of the O2S equipped on the vehicle will be displayed.

TEST DATA Screen



(c) Select the desired O2S and press ENTER. The following screen will appear.

(d) Press HELP and ¿simultaneously. More information will appear.

(e) Example:

(1) The hand–held tester displays ”17” as a value of the ”TIME $81” (see the illustration on the left).

(2) Find the Conversion Factor value of ”TIME $81” in the O2S TEST RESULT chart below. 0.3906 is specified for $81 in this chart.

(3) Multiply ”17” in step (1) by 0.3906 (Conversion Factor) in the step (2).

17 x 0.3906 = 6.6 %

(4) If the answer is within the standard value, the ”TIME $81” can be confirmed to be normal.

O2S TEST RESULT Chart

TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

13. CHECKING MONITOR STATUS

NOTICE:

The monitor status (mode 6) is not applicable to the heated oxygen sensor (HO2S). However, HO2S test values can be checked by O2S TEST RESULT (mode 5). Refer to step 12.

(a) Outline

The monitor results and the test values can be checked with the OBDII scan tool.

The engine control module (ECM) monitors the emissions–related components as the thermostat, catalyst converter and evaporative emissions (EVAP), and determines whether they are functioning normally or not. When finished monitoring, the ECM stores the monitor results and the test values.

The monitor result indicates whether the component is functioning normally or not. The test value is the value that was used to determine the monitor result. If the test value is outside the test limit (malfunction criterion), the ECM determines the component is malfunctioning. Some emissions–related components have multiple test values to determine monitor result. If one of these test values is outside test limit, the ECM determines the component is malfunctioning.

(b) Description

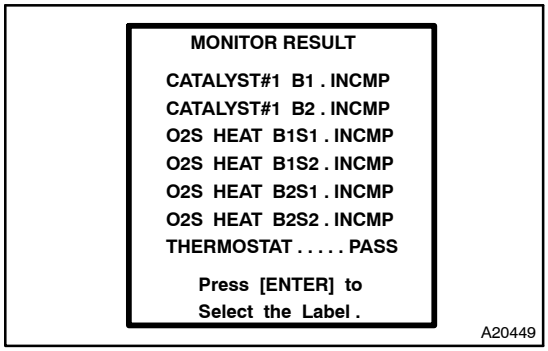
The test value and test limit information are described as shown in the following table. This information is included under ”MONITOR RESULT” in the emissions–related DTC sections:

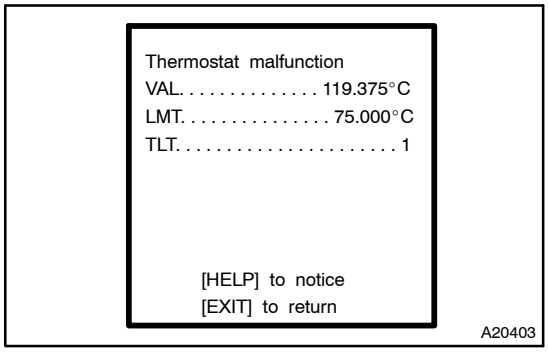
TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Value	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 [°C]	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criterion for thermostat

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBDII scan tools.

(c) Procedure (using hand–held tester)
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch and hand–held tester ON.
(3) Clear DTCs.
(4) Allow the vehicle to drive, in accordance with the applicable drive pattern described in the READINESS MONITOR DRIVE PATTERN section
(see page DI–33)





(5) Select the hand–held tester menus: DIAGNOSIS, ENHANCED OBDII, MONITOR INFO and MONITOR RESULT. The monitor result appears after the component name.
- INCMP indicates the component has not been monitored yet.
- PASS indicates the component is functioning normally.
- FAIL indicates the component is malfunctioning.

(6) Select the component and press ENTER. If the monitor result has been PASS or FAIL, the accuracy test value appears.
- VAL indicates the test value.
- LMT indicates the test limit (malfunction criterion).
- TLT indicates the test limit type.

(7) Compare the test value with the test limit.
- If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
- If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- If the test value is on the borderline of the test limit, a malfunction is concealed in the component.

HINT:
- The monitor result might on rare occasions be PASS even if the malfunction indicator lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

DID53–01

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into the replaced ECM.

HINT:

The VIN is a 17–digit alphanumeric vehicle identification number. A hand–held tester is required to register the VIN.

1. DESCRIPTION

This registration section consists of three parts, Input Instructions, Read VIN and Write VIN.

(a) Input Instructions: Explains the general VIN input instructions using a hand–held tester.

(b) Read VIN: Explains the VIN reading process in a flowchart. This process allows the VIN stored in the ECM to be read, in order to confirm that the two VINs, provided with the vehicle and stored in the vehicle's ECM, are the same.

(c) Write VIN: Explains the VIN writing process in a flowchart. This process allows the VIN to be input into the ECM. If the ECM is changed, or the VINs do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. INPUT INSTRUCTIONS

(a) Hand–held tester

The arrow buttons (UP, DOWN, RIGHT and LEFT) and numerical buttons (0 to 9) are used, in order to input the VIN.

(b) Cursor Operation

To move the cursor around the tester screen, press the RIGHT and LEFT buttons.

(c) Alphabetical Character Input

(1) Press the UP and DOWN buttons to select the desired alphabetical character.

(2) After selection, the cursor should move.

(d) Numeric Character Input

(1) Press the numerical button corresponding to the number that you want to input.

(2) Select or input the correct character using the UP/DOWN buttons, or the numerical buttons.

HINT:

Numerical characters can be selected by using the UP and DOWN buttons.

(e) Correction

(1) After input, the cursor should move.

(2) When correcting the input character(s), put the cursor onto the character using the RIGHT or LEFT button.

(f) Finishing Input Operation

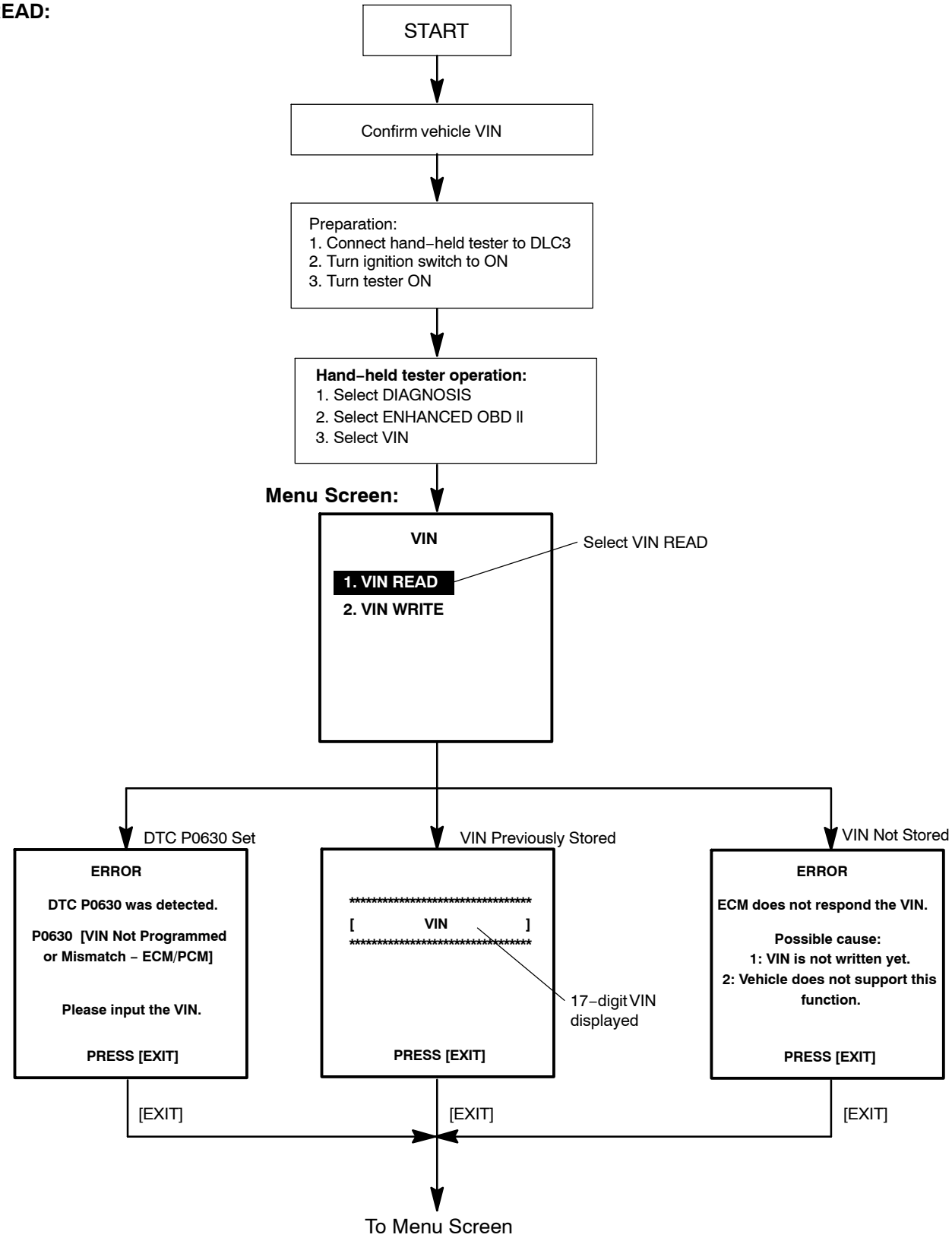
(1) Make sure that the input VIN matches the vehicle VIN after input.

(2) Press the ENTER button on the tester.

3. READ VIN (Vehicle Identification Number)

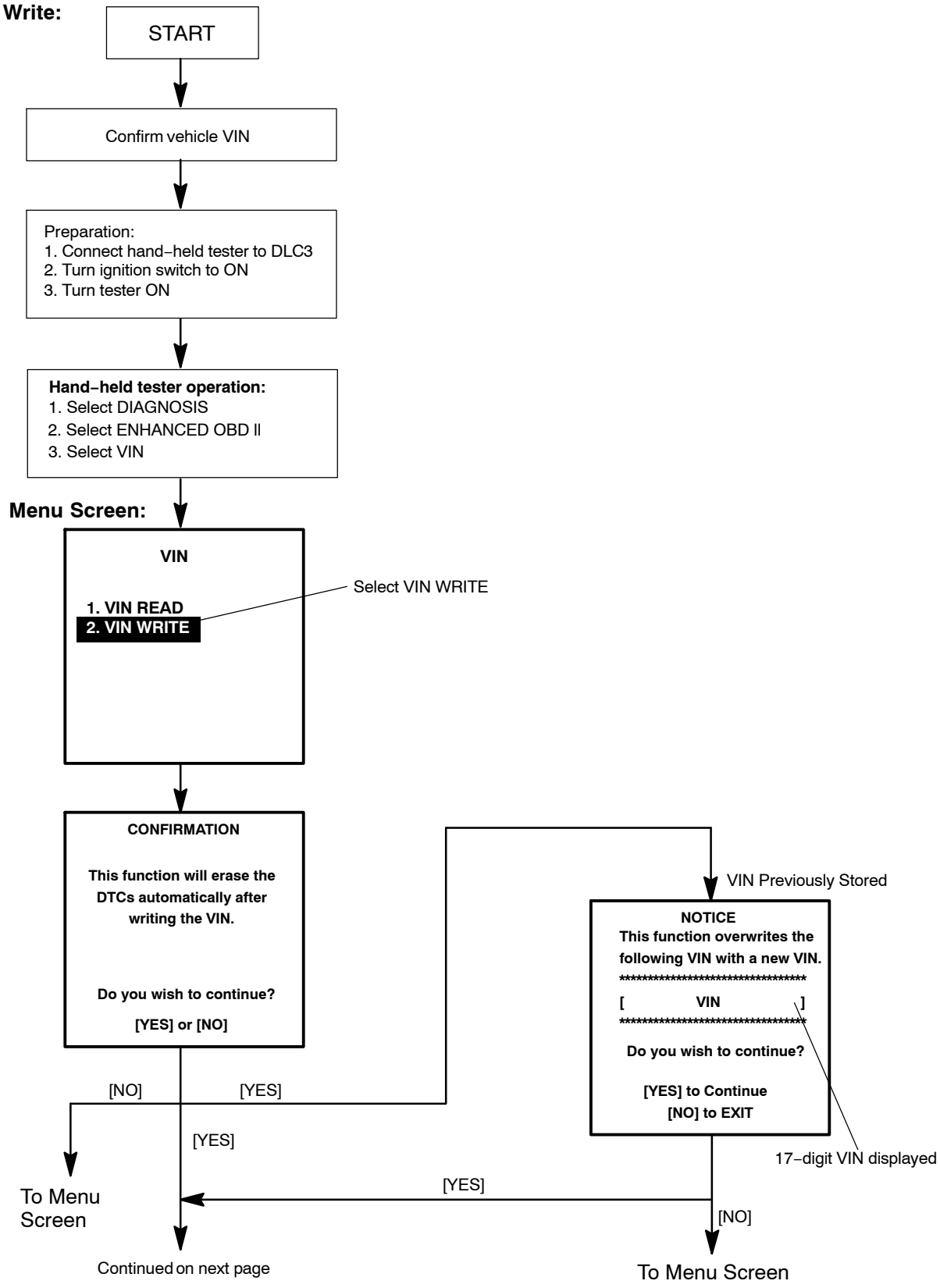
(a) Read VIN using a hand–held tester.

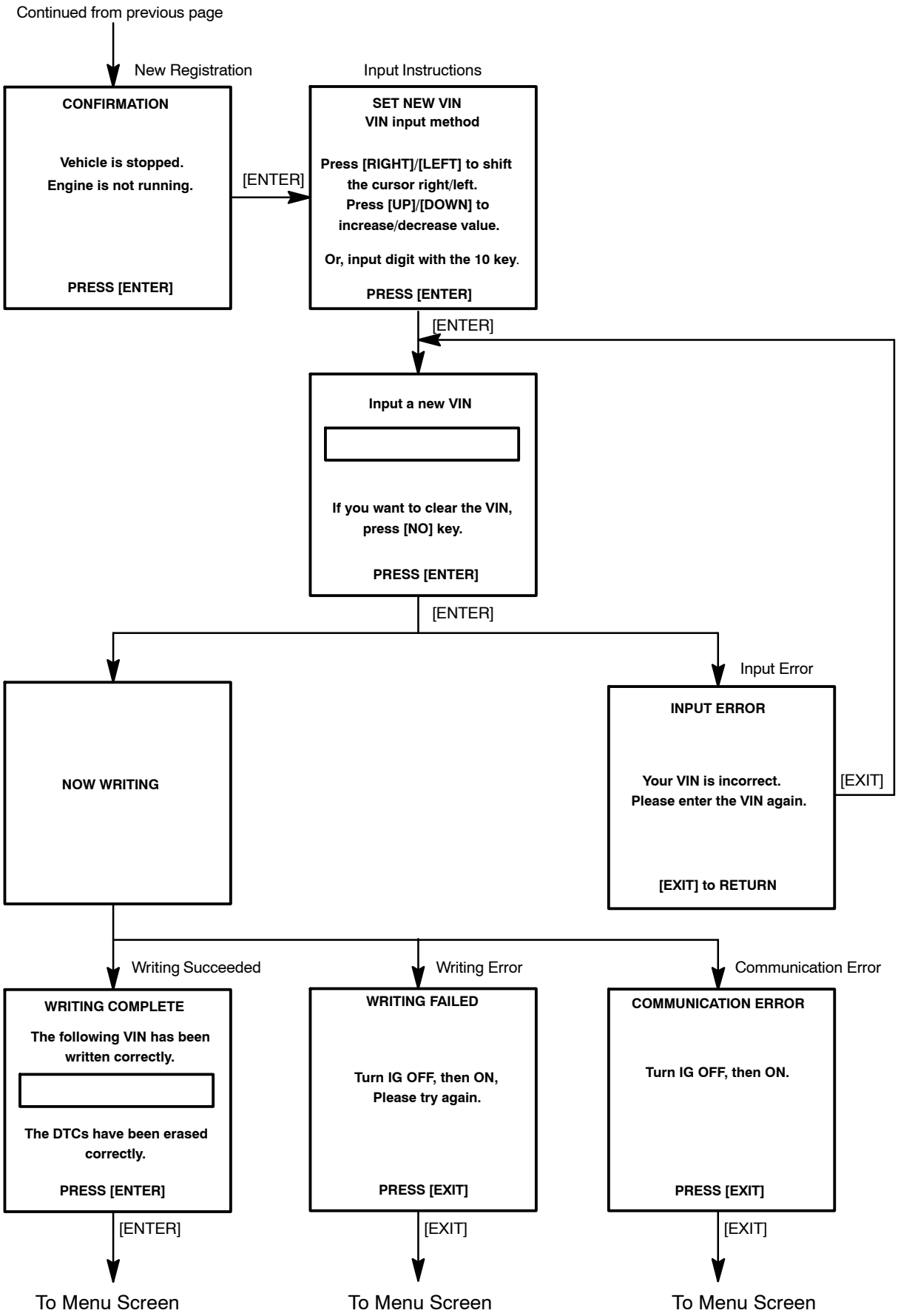
READ:



4. WRITE VIN

(a) Write VIN using the hand–held tester.




Continued from previous page
New Registration
Input Instructions
CONFIRMATION
Vehicle is stopped.
Engine is not running.
PRESS [ENTER]
[ENTER]
SET NEW VIN
VIN input method
Press [RIGHT]/[LEFT] to shift the cursor right/left.
Press [UP]/[DOWN] to increase/decrease value.
Or, input digit with the 10 key.
PRESS [ENTER]
[ENTER]
Input a new VIN
If you want to clear the VIN, press [NO] key.
PRESS [ENTER]
[ENTER]
Input Error
NOW WRITING
INPUT ERROR
Your VIN is incorrect.
Please enter the VIN again.
[EXIT] to RETURN
[EXIT]
Writing Succeeded
Writing Error
Communication Error
WRITING COMPLETE
The following VIN has been written correctly.
The DTCs have been erased correctly.
PRESS [ENTER]
WRITING FAILED
Turn IG OFF, then ON,
Please try again.
PRESS [EXIT]
COMMUNICATION ERROR
Turn IG OFF, then ON.
PRESS [EXIT]
[ENTER]
[EXIT]
[EXIT]
To Menu Screen
To Menu Screen
To Menu Screen

DIBQV–08

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

- The On–Board Diagnostic (OBD II) system is designed to monitor the performance of emission–related components and report any detected abnormalities in the form of Diagnostic Trouble Codes (DTCs). Since the various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors. Many state Inspection and Maintenance (I/M) programs require that vehicles complete their Readiness Monitors prior to beginning an emission test.
- The current status of the Readiness Monitors can be seen by using the hand–held tester with version 9.0 software (or newer), or a generic OBD II Scan tool.
- To view the Readiness Monitor status using the hand–held tester, select ”Monitor Status” from the Enhanced OBD II Menu.
- A status of ”complete” indicates that the necessary conditions have been met to run the performance tests for the related Readiness Monitor.
- The Readiness Monitor will be reset to ”incomplete” if:
  - ECM has lost power (battery or fuse).
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- In the event that any Readiness Monitor shows ”incomplete,” follow the appropriate Readiness Monitor Drive Pattern to active the monitor and change the readiness status to ”complete.”

CAUTION:

Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive patterns.

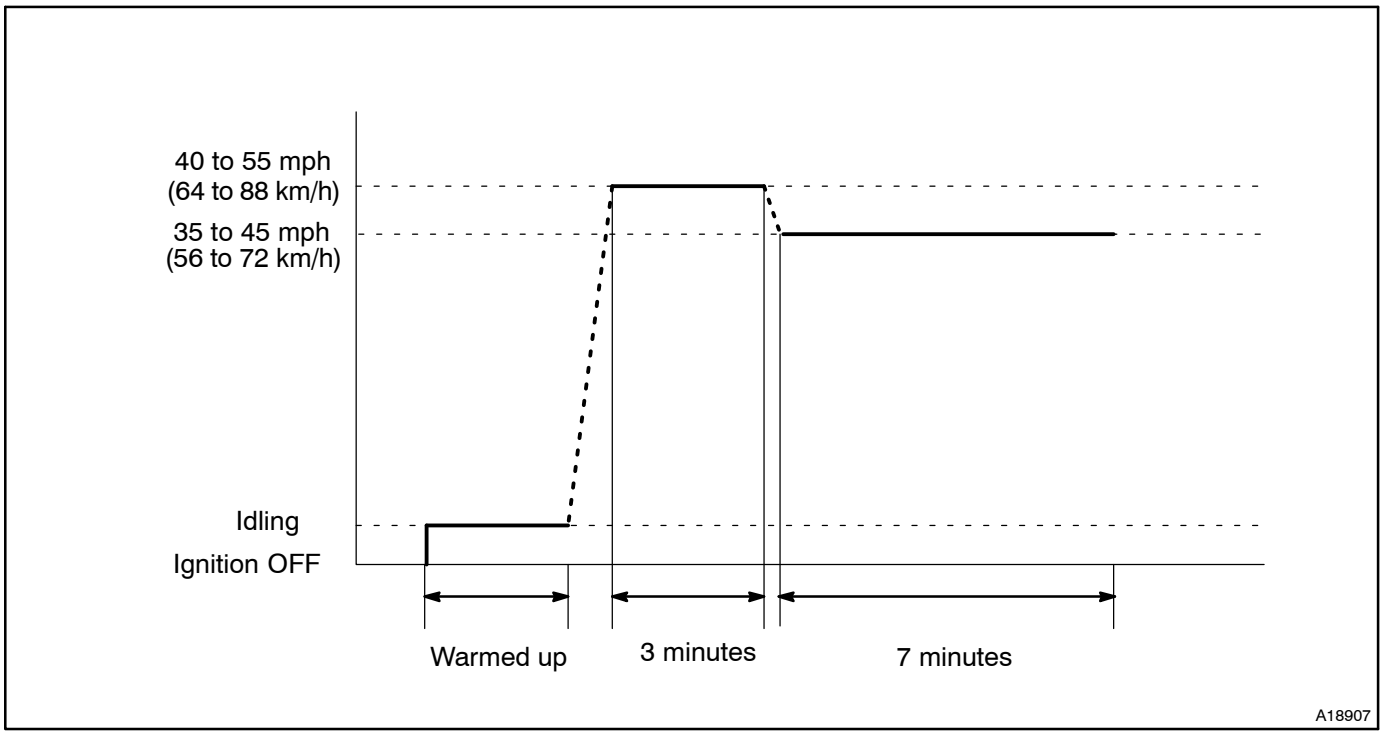
NOTICE:

These drive patterns represent the fastest method to satisfy all necessary conditions which allow the specific readiness monitor to complete.

In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors) the drive pattern can be resumed, and in most cases, the readiness monitor will still set to ”complete”.

To ensure rapid completion of readiness monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

2. CATALYST MONITOR (O2S TYPE)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF.
- Engine Coolant Temperature (ECT) is 75°C (167°F) or greater.
- Intake Air Temperature (IAT) is –10°C (14°F) or greater.

NOTICE:

The readiness test can be completed in cold ambient conditions (less than –10°C / 14°F), if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBD II scan tool to the DLC3 to check monitor status and preconditions.

(2) Drive the vehicle at 40 to 55 mph (64 to 88 km/h) for approximately for 3 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

If IAT is less than 10°C (50°F) when engine was started, drive the vehicle at 40 to 55 mph (64 to 88 km/h) for additional 4 minutes.

(3) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for approximately 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden deceleration as much as possible with the throttle fully closed.

(4) If readiness status does not switch to complete, make sure that the preconditions are met and the ignition switch is turned OFF and then repeat steps (2) and (3).

(5) Release pressure in the fuel tank by removing and then reinstalling the fuel tank cap.

(6) Start the engine and immediately begin driving as directed.

3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:

A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

(a) Cold Soak Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400m) or less

(b) Cold Soak Procedure

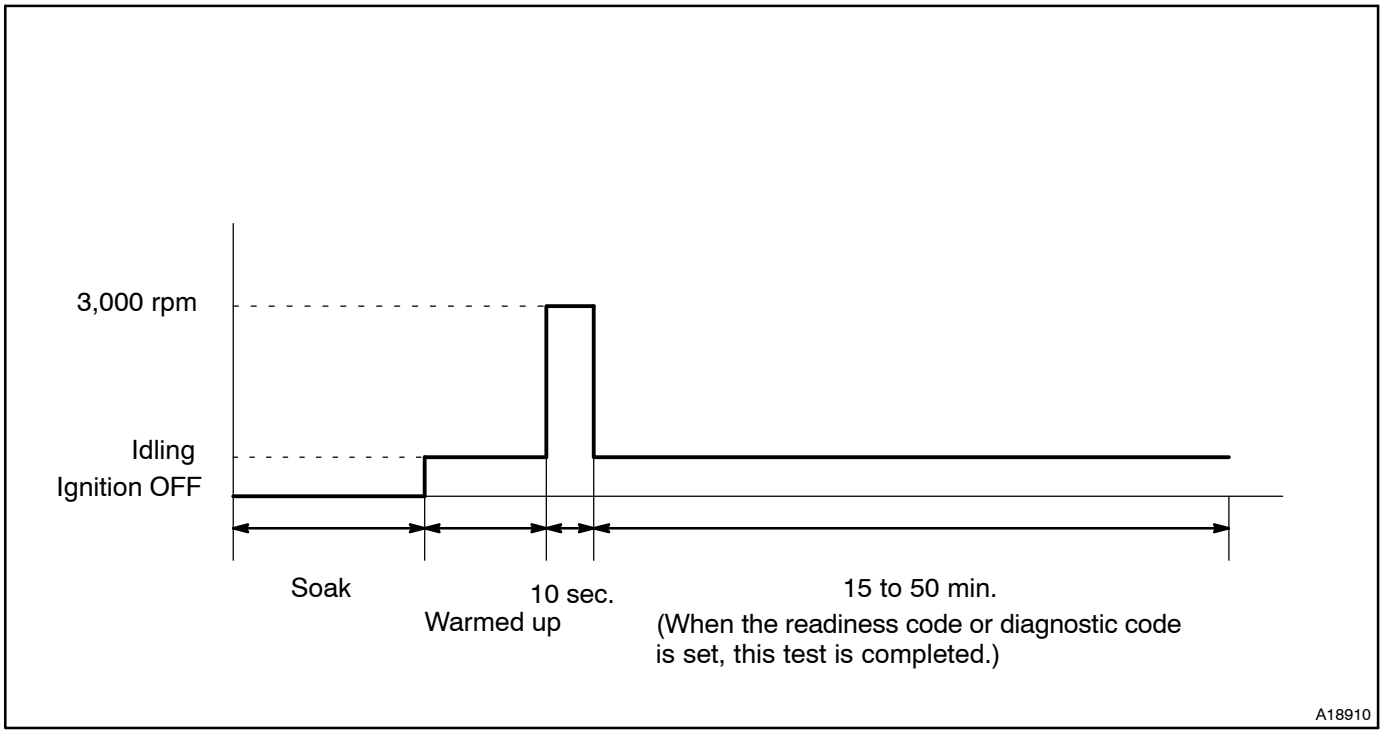
Let the vehicle cold soak for 8 hours or until the difference between IAT and ECT becomes less than 7°C (13°F)

HINT:

Examples:

- Scenario 1
  ECT = 24°C (75°F)
  IAT = 16°C (60°F)
  Difference between ECT and IAT is 8°C (15°F)
  → The monitor will not run because difference between ECT and IAT is greater than 7°C (13°F)
- Scenario 2
  ECT = 21°C (70°F)
  IAT = 20°C (68°F)
  Difference between ECT and IAT is 1°C (2°F)
  → The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

4. EVAP MONITOR (VACUUM PRESSURE MONITOR) (CONTINUED)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 m) or less
- Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- Cold Soak Procedure has been completed
- Before starting the engine, the difference between ECT and IAT must be less than 7°C (13°F)

HINT:

Examples:

- Scenario 1

  ECT = 24°C (75°F)

  IAT = 16°C (60°F)

  Difference between ECT and IAT is 8°C (15°F)

  → The monitor will not run because difference between ECT and IAT is higher than 7°C (13°F)
- Scenario 2

  ECT = 21°C (70°F)

  IAT = 20°C (68°F)

  Difference between ECT and IAT is 1°C (2°F)

  → The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

The readiness test can be completed in cold ambient conditions (less than 40°F / 4.4°C) and/or at high altitudes (more than 7,800 feet / 2,400 m) if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBDII scan tool to DLC3 to check monitor status and preconditions (refer to "a").

(2) Release pressure in fuel tank by removing the fuel tank cap and then reinstalling it.

(3) Start the engine and allow it to idle until ECT becomes 75°C (167°F) or higher.

(4) Run the engine at 3,000 rpm for about 10 seconds.

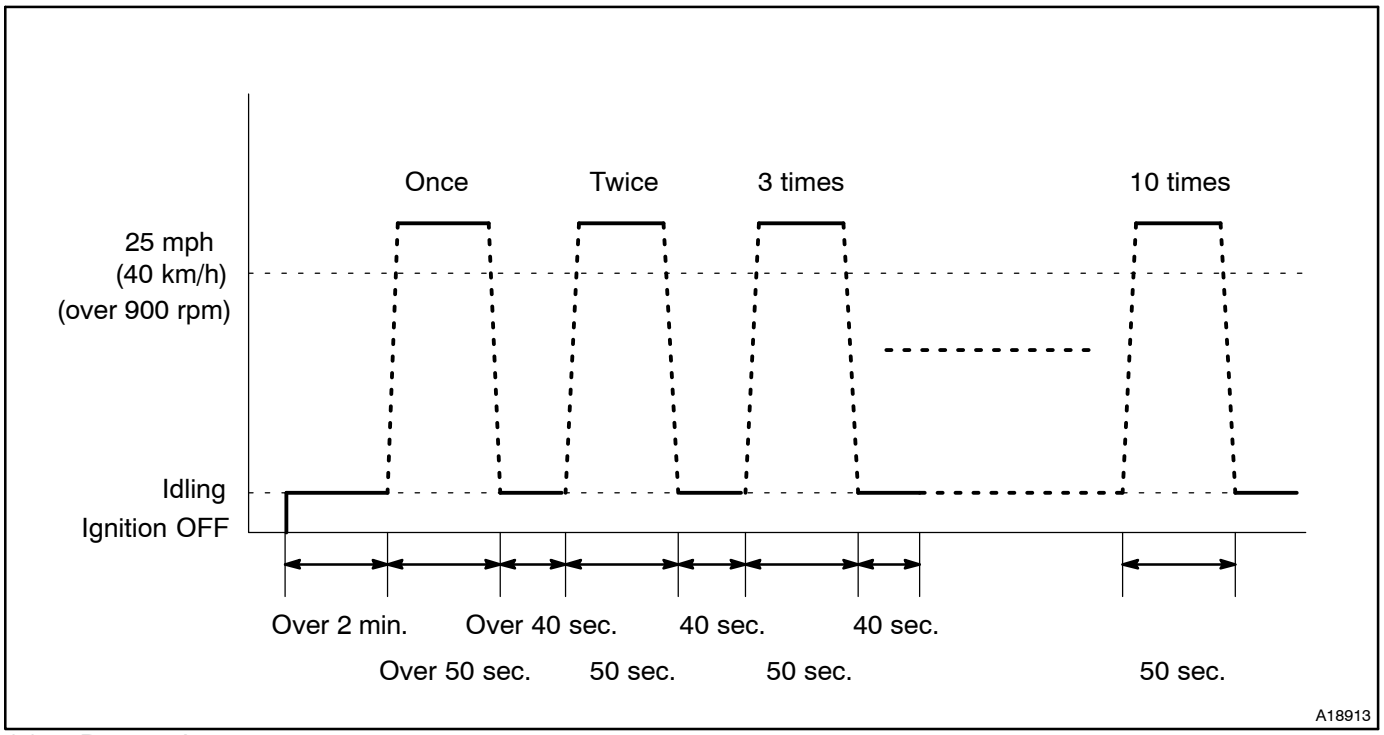
(5) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

NOTICE:

If the vehicle is not equipped with A/C, put a slight load on the engine by doing the following :

- **Securely set the parking brake.**
- **Block the drive wheels with wheel chocks.**
- **Allow the vehicle to idle in drive for 15 to 50 minutes.**

5. OXYGEN SENSOR MONITOR (FRONT AND REAR O2S SYSTEM)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF

(b) Drive Pattern

(1) Connect the OBDII scan tool to DLC3 to check monitor status and preconditions (refer to step "a").

(2) Start the engine and allow it to idle for 2 minutes or more.

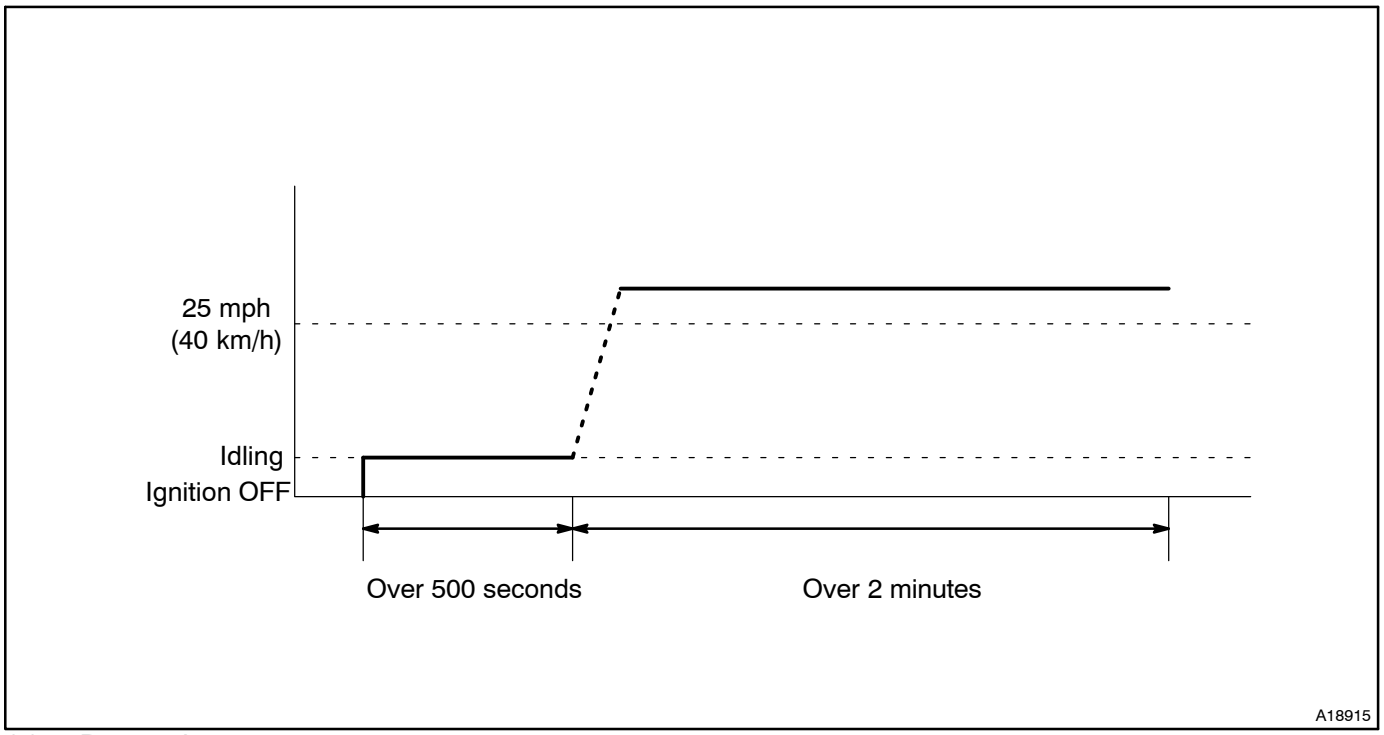
(3) Drive the vehicle at 25 mph (40 km/h) or more for at least 50 seconds.

(4) Stop the vehicle and allow the engine to idle for 40 seconds or more.

(5) Perform steps (3) and (4) ten times.

(6) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure preconditions are met, turn the ignition off and then repeat steps (1) and (5).

6. OXYGEN SENSOR HEATER MONITOR



(a) Preconditions

The monitor will not run unless:

- MIL is OFF

(b) Drive Pattern

(1) Connect the OBDII scan tool to the DLC3 to check monitor status and preconditions (refer to step "a").

(2) Start the engine and allow it to idle for 500 seconds or more.

(3) Drive the vehicle at 25 mph (40 km/h) or more at least 2 minutes.

(4) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure the preconditions are met, turn the ignition off and then repeat steps (2) and (3).

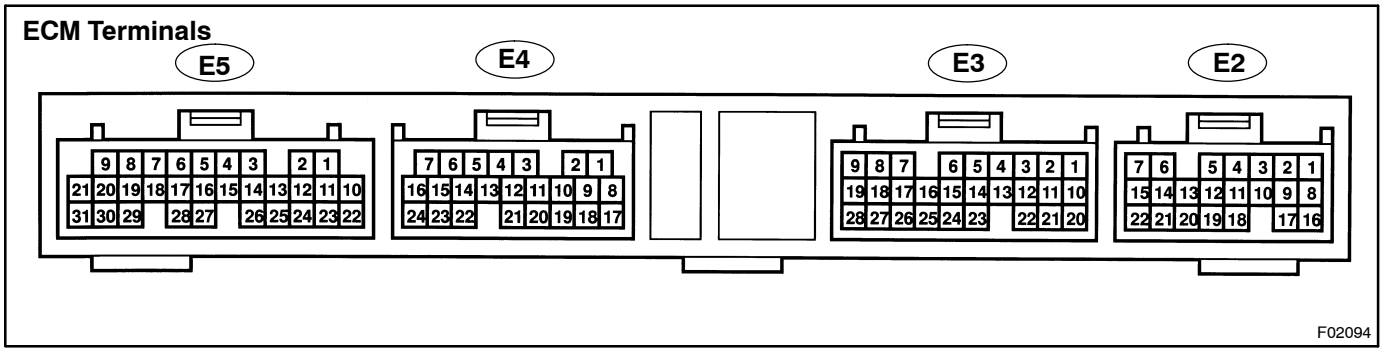
DI37W–18

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	10.Starter 11.Starter relay 12.Park/neutral position switch	ST–1 ST–17 DI–789
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–279 DI–284 IN–20
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–284
Engine cranks normally but difficult to start	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–268 DI–284 EM–3
Difficult to start with cold engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–268 DI–284
Difficult to start with hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–268 DI–284
High engine idle speed (Poor idling)	1. A/C switch circuit 2. ECM power source circuit	– DI–279
Low engine idle speed (Poor idling)	1. A/C switch circuit 2. Fuel pump control circuit	– DI–284
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–284
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–279 DI–284
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–284 DI–785
Surging (Poor driveability)	1. Fuel pump control circuit	DI–284
Engine stalls soon after starting	1. Fuel pump control circuit	DI–284
Engine stalls during A/C operation	1. A/C switch circuit 2. Engine control module (ECM)	– IN–20
Unable to refuel/Difficult to refuel	1. ORVR system	–

DI37V–18

TERMINALS OF ECM



Each ECM terminals standard normal voltage is shown in the table below. In the table, first follow the information under ”Condition”.
Look under ”Symbols (Terminals No.)” for the terminals to be inspected.
The standard normal voltage between the terminals is shown under ”STD Voltage”.
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
BATT (E2 – 1) – E1 (E4 – 17)	W – BR	Always	9 to 14 V
FC (E2 – 3) – E1 (E4 – 17)	G–R – BR	IG switch ON	9 to 14 V
		Idling	0 to 0.3 V
PTNK (E2 – 4) – E1 (E4 – 17)	L–B – BR	IG switch ON, fuel cap taken off	2.9 to 3.7 V
IGSW (E2 – 8) – E1 (E4 – 17)	B–O – BR	IG switch ON	9 to 14 V
W (E2 – 15) – E1 (E4 – 17)	R–B – BR	Idling	9 to 14 V
		IG switch ON	Below 3.0 V
+B (E2 – 16) – E1 (E4 – 17)	B–R – BR	IG switch ON	9 to 14 V
STP (E3 – 6) – E1 (E4 – 17)	G–W – BR	IG switch ON, brake pedal depressed	7.5 to 14 V
		IG switch ON, brake pedal depressed	Below 1.5 V
F/PS (E3 – 8) – E1 (E4 – 17)	P – BR	IG switch ON	Below 1.5 V
VSV (E3 – 9) – E1 (E4 – 17)	R–L – BR	IG switch ON	9 to 14 V
STA (E3 – 11) – E1 (E4 – 17)	L – BR	Cranking	6.0 V or more
HT1B (E3 – 16) – E03 (E2 – 7)	Y–G – W–B	Idling	Below 3.0 V
		IG switch ON	9 to 14 V
MREL (E3 – 21) – E1 (E4 – 17)	L–B – BR	IG switch ON	9 to 14 V
SPD (E3 – 22) – E1 (E4 – 17)	W–R – BR	IG switch ON, rotate driving wheel slowly	Pulse generation
OX1B (E3 – 25) – E2 (E4 – 18)	W – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–112)
TACH (E3 – 27) – E1 (E4 – 17)	BR–W – BR	Idling	Pulse generation
VC (E4 – 2) – E2 (E4 – 18)	R – BR	IG switch ON	9 to 14 V
HT1A (E4 – 3) – E03 (E2 – 7)	Y–R – W–B	Idling	Below 3.0 V
		IG switch ON	9 to 14 V
EVP1 (E4 – 4) – E01 (E5 – 21)	G–O – W–B	IG switch ON	9 to 14 V
VG (E4 – 11) – EVG (E4 – 1)	G–W – Y–G	Idling, A/C switch OFF	1.1 to 1.5 V
OX1A (E4 – 12) – E2 (E4 – 18)	B – BR	Maintain engine speed at 2,500 rpm for 2 min. after warning up	Pulse generation (See page DI–112)
THW (E4 – 14) – E2 (E4 – 18)	G – BR	Idling, Engine coolant temp. at 80 °C (176 °F)	0.2 to 1.0 V
NE+ (E4 – 16) – NE– (E4 – 24)	O – W	Idling	Pulse generation (See page DI–178)

THA (E4 – 22) – E2 (E4 – 18)	L–R – BR	Idling, intake air temp. 20 °C (68 °F)	0.5 to 3.4 V
VTA (E4 – 23) – E2 (E4 – 18)	B–W – BR	IG switch ON, throttle valve fully closed	0.3 to 1.0 V
		IG switch ON, throttle valve fully open	3.2 to 4.9 V
#10 (E5 – 1) – E01 (E5 – 21)	R – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
#20 (E5 – 2) – E01 (E5 – 21)	R–L – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
#30 (E5 – 3) – E01 (E5 – 21)	R–W – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
#40 (E5 – 4) – E01 (E5 – 21)	R–B – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–161)
IGT1 (E5 – 10) – E1 (E4 – 17)	R–B – BR	Idling	Pulse generation (See page DI–187)
IGT2 (E5 – 11) – E1 (E4 – 17)	R–W – BR	Idling	Pulse generation (See page DI–187)
IGT3 (E5 – 12) – E1 (E4 – 17)	G–R – BR	Idling	Pulse generation (See page DI–187)
IGT4 (E5 – 13) – E1 (E4 – 17)	R–Y – BR	Idling	Pulse generation (See page DI–187)
CCV (E5 – 17) – E1 (E4 – 17)	V–W – BR	IG switch ON	9 to 14 V
RSO (E5 – 18) – E01 (E5 – 21)	B–W – W–B	IG switch ON, disconnect E5 of ECM connector	9 to 14 V
MOPS (E5 – 22) – E1 (E4 – 17)	Y–B – BR	Idling	9 to 14 V
OCV+ (E5 – 24) – OCV– (E5 – 23)	G–O – W	IG switch ON	Pulse generation (See page DI–48)
IGF (E5 – 25) – E1 (E4 – 17)	B–Y – BR	IG switch ON	4.5 to 5.5 V
		Idling	Pulse generation (See page DI–187)
KNK1 (E5 – 27) – E1 (E4 – 17)	W – BR	Idling	Pulse generation (See page DI–174)
PS (E5 – 28) – E1 (E4 – 17)	P – BR	IG switch ON	9 to 14 V

DIAIS–03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the ”See page” under the respective ”DTC No.” in the DTC chart.

DTC No.	Detection Item	Trouble Area	MIL*1	Memory
P0010 (DI–48)	OCV Circuit Malfunction (for VVT–i)	• Open or short in OCV circuit • OCV • ECM	○	○
P0011 (DI–53)	VVT System Malfunction (Bank 1)	• Valve timing • OCV • VVT controller assembly • ECM	○	○
P0012 (DI–53)	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)		○	○
P0016 (DI–63)	VVT Sensor/Camshaft Position Sensor Circuit Range/Performance Problem (Bank 1)	• Mechanical system (Timing chain has jumped a tooth, chain is stretched) • ECM	○	○
P0031 (DI–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0032 (DI–65)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0037 (DI–65)	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0038 (DI–65)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0100 (DI–71)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–77)	Mass Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0110 (DI–80)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor (built into mass air flow meter) • ECM	○	○
P0115 (DI–87)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (DI–94)	Engine Coolant Temp. Circuit Range/Performance Problem	• Cooling system • Engine coolant temp. sensor	○	○
P0120 (DI–96)	Throttle/Pedal Position Sensor/Switch ”A” Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (DI–103)	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem	• Throttle position sensor • ECM	○	○

P0125 (DI–105)	Insufficient Coolant Temperature for Closed Loop Fuel Control	• Cooling system • Engine coolant temp. sensor • Thermostat	○	○
P0128 (DI–108)	Thermostat Malfunction	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM	○	○
P0130 (DI–112)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○
P0133 (DI–123)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Air induction system • Fuel pressure • Injector • ECM	○	○
P0134 (DI–132)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • EFI relay • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • ECM • PCV piping	○	○
P0136 (DI–140)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay	○	○
P0138 (DI–140)	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit	○	○
P0171 (DI–148)	System too Lean (Fuel Trim)	• Air induction system • Injector blockage • Mass air flow sensor • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM	○	○

P0172 (DI–148)	System too Rich (Fuel Trim)	• Injector leak, blockage • Mass air flow sensor • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • ECM	○	○
P0300 (DI–161)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temp. sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM	○	○
P0301 (DI–161)	Cylinder 1 Misfire Detected			
P0302 (DI–161)	Cylinder 2 Misfire Detected			
P0303 (DI–161)	Cylinder 3 Misfire Detected			
P0304 (DI–161)	Cylinder 4 Misfire Detected			
P0325 (DI–174)	Knock Sensor 1 Circuit Malfunction (Bank 1)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0335 (DI–178)	Crankshaft Position Sensor ”A” Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM	○	○
P0339 (DI–178)	Crankshaft Position Sensor Circuit Malfunction (During engine running)		○	○
P0340 (DI–183)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has jumped a tooth • ECM	○	○
P0341 (DI–183)	Camshaft Position Sensor ”A” Circuit Range/Performance (Bank 1 or Single Sensor)		○	○
P0351 (DI–187)	Igniter Circuit Malfunction (No.1)	• Ignition system • Open or short in IGF and IGT1 circuit from No.1 ignition coil with igniter to ECM • No.1 ignition coil with igniter • ECM	○	○
P0352 (DI–187)	Igniter Circuit Malfunction (No.2)	• Ignition system • Open or short in IGF and IGT2 circuit from No.2 ignition coil with igniter to ECM • No.2 ignition coil with igniter • ECM	○	○
P0353 (DI–187)	Igniter Circuit Malfunction (No.3)	• Ignition system • Open or short in IGF and IGT3 circuit from No.3 ignition coil with igniter to ECM • No.3 ignition coil with igniter • ECM	○	○

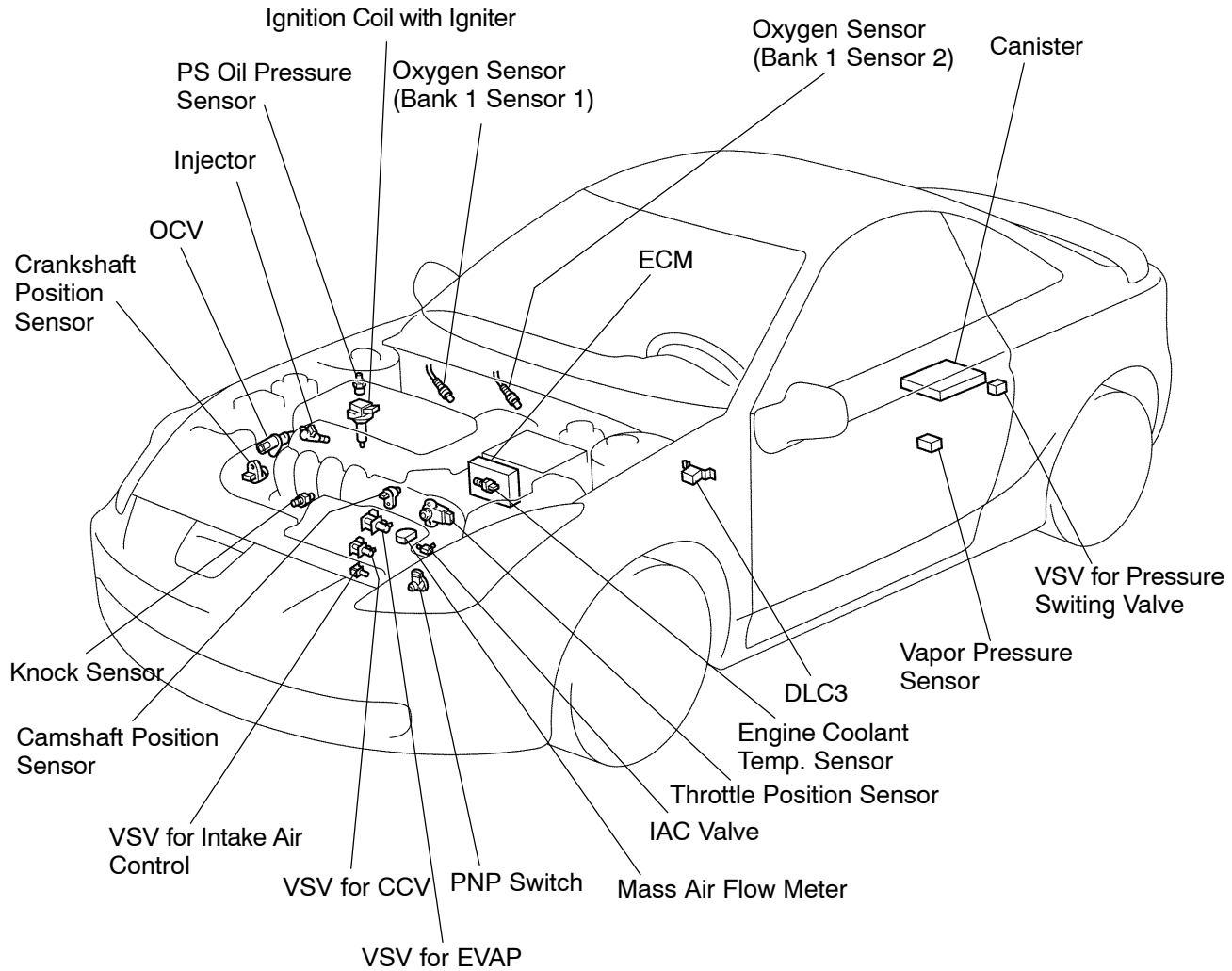
P0354 (DI–187)	Igniter Circuit Malfunction (No.4)	• Ignition system • Open or short in IGF and IGT4 circuit from No.4 ignition coil with igniter to ECM • No.4 ignition coil with igniter • ECM	○	○
P0420 (DI–195)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Three–way catalytic converter	○	○
P0441 (DI–202)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked damaged • ECM	○	○
P0442 (DI–225)	Evaporative Emission Control System Malfunction	• Vacuum hose is cracked, holed, blocked, damaged or disconnected • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0446 (DI–202)	Evaporative Emission Control System Vent Control Malfunction	• Same as DTC No. P0441	○	○
P0451 (DI–247)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0452 (DI–247)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	• Same as DTC No. P0451	○	○
P0453 (DI–247)	Evaporative Emission Control System Pressure Sensor/Switch High Input	• Same as DTC No. P0451	○	○
P0456 (DI–225)	Evaporative Emission Control System Leak Detected (Small Leak)	• Same as DTC No. P0442	○	○

P0500 (DI–253)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	○
P0505 (DI–256)	Idle Control System Malfunction	• Open or short in idle air control (IAC) valve circuit • Idle air control (IAC) valve is stuck or closed • A/C switch circuit • Air induction system • PCV valve and hose • ECM	○	○
P0511 (DI–256)	Idle Control Systemcircuit		○	○
P0560 (DI–265)	ECM BATT Malfunction	• Open in back up power source circuit • EFI fuse • ECM	○	○
P0617 (DI–268)	Starter Relay Circuit High	• Short in Park/Neutral position switch circuit (A/T) • Park/Neutral position switch (A/T) • Clutch start switch (M/T) • ECM	○	○
P0630 (DI–276)	VIN not Programmed or Mismatch – ECM/PCM	• ECM	○	○
P1645 (DI–278)	Body ECU Malfunction	• Body ECU • A/C ECU • Communication bus	–	–

*1: ○ · · · MIL lights up

DI37U–18

PARTS LOCATION



C

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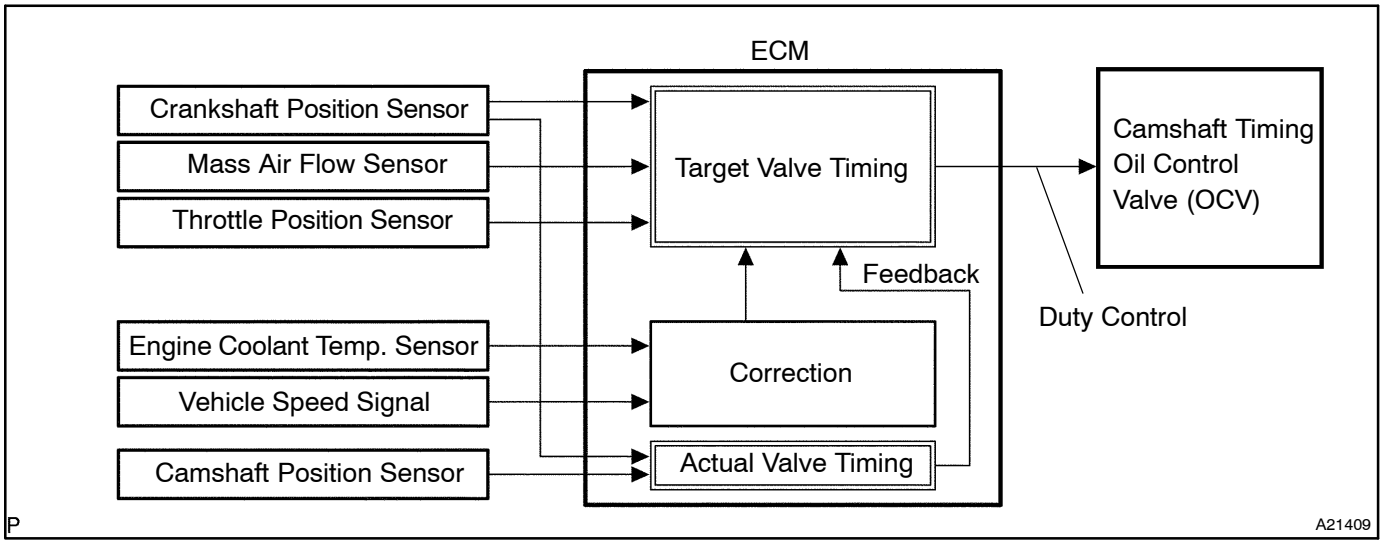
DIC6I–02

CIRCUIT INSPECTION

DTC	P0010	Camshaft Position ”A” Actuator circuit (Bank 1)

CIRCUIT DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target ”duty–cycle” control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as the intake air volume, throttle position and engine coolant temperature. The ECM controls the OCV, based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque and fuel economy improve, and exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using signals from the camshaft position sensor and the crankshaft position sensor, and performs the feedback control. This is how target valve timing is verified by the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P0010	Open or short in Oil Control Valve (OCV) circuit (1 trip detection logic)	• Open or short in oil control valve circuit • Oil control valve • ECM

MONITOR DESCRIPTION

After the ECM sends the ”target” duty–cycle signal to the OCV (Oil Control Valve), the ECM monitors the OCV current to establish an ”actual” duty–cycle. When the actual duty–cycle ratio varies from the forget duty–cycle ratio, the ECM sets a DTC.

MONITOR STRATEGY

Related DTCs	P0010	VVT oil control valve bank 1 range check
Required sensors/components	OCV	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	11 V	13 V
Target duty ratio	–	70%
Starter	OFF	
Current cut status	Not cut	

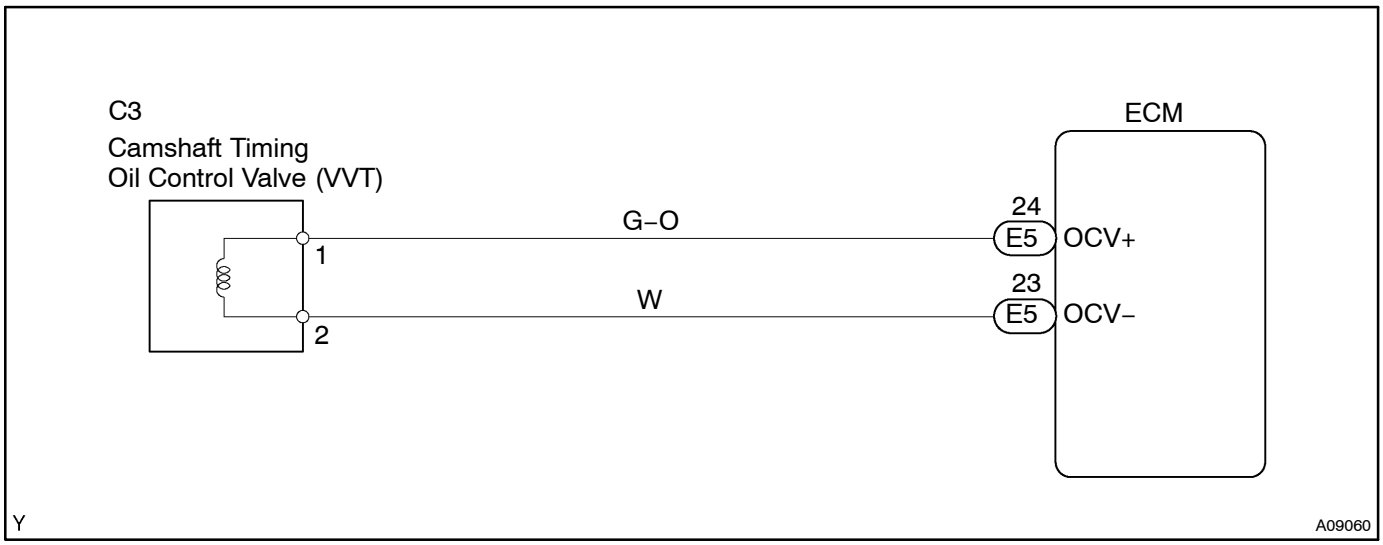
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	A or B
A. Output signal duty for OCV	Output duty ratio is 100% (always ON) but target duty ratio is less than 70%
B. Output signal duty for OCV	Output duty is 3% or less despite the ECM supplying current to the OCV

COMPONENT OPERATING RANGE

Parameter	Standard Value
Output signal duty for OCV	”More than 3%” and ”less than 100%”

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

Hand–held tester:

1	**Check OCV circuit.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the Oil control valve (OCV) by the hand–held tester.

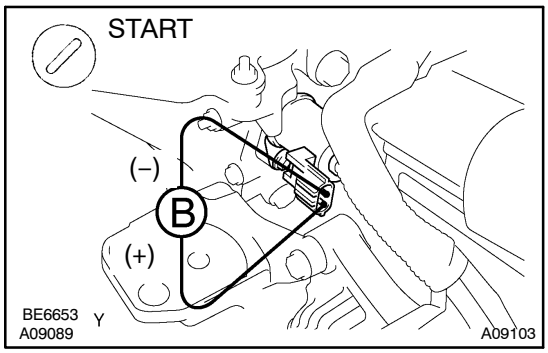
OK:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **Check for intermittent problems (See page DI–3).**

NG

2	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery positive voltage between terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled.

NG → **Replace OCV.**

OK

3	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

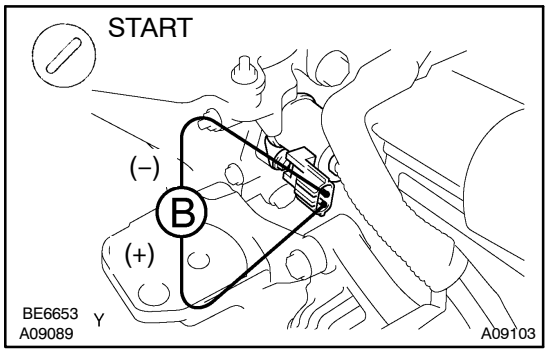
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery positive voltage between terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled

NG → **Replace OCV.**

OK

2	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

DIAIU–03

DTC	P0011	Camshaft Position ”A” –Timing Over– Advanced or System Performance (Bank 1)

DTC	P0012	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P0010 on page DI–48.

DTC	Detecting Condition	Trouble Area
P0011	Valve timing does not change at advanced position (1 trip detection logic) when: • Engine is warmed–up • Engine speed is less than 4000 rpm	• VVT controller assembly • OCV • Valve timing • ECM
P0012	Valve timing does not change at retarded position (2 trip detection logic) when: • Engine is warmed–up • Engine speed is less than 4000 rpm	

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target ”duty–cycle” control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.
Example:
A DTC will be set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and the condition continues for more than 5 sec.; or 2) the OCV is forcibly activated 63 times or more.
Advanced cam DTCs are subject to ”1 trip” detection logic.
Retarded cam DTCs are subject to ”2 trip” detection logic.

MONITOR STRATEGY

Related DTCs	P0011	VVT system advance (Bank 1)
	P0012	VVT system retard (Bank 1)
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Crankshaft position sensor
Frequency of operation	Once per drive cycle	
Duration	10 sec.	
MIL operation	P0011: Immediate P0012: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Battery voltage	11 V	–
Throttle position learing	Completed	
Engine RPM	550 rpm	4,000 rpm
Engine coolant temperature	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Deviation of valve timing	More than 5°CA
OCV activation	63 times or more
Response of valve timing	1 sec./1°CA or more

WIRING DIAGRAM

Refer to DTCs P0010 on page DI–48.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–16).**

NG → **Adjust valve timing.**

OK

2	Check operation of OCV.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the OCV by the hand–held tester.

OK:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NG → **Go to step 4.**

OK

3	Check if DTC outputs reoccur.

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

4	Check oil control valve filter.

NG → **Replace oil control valve filter.**

OK

5	Check oil control valve (See page SF–50).

OK → Go to step 7.

NG

6	Replace oil control valve.

Go

7	Check VVT controller assembly (See page EM–50).

OK → Go to step 9.

NG

8	Replace VVT controller assembly.

Go

9	Check blockage of OCV, oil check valve and oil pipe No.1.

NG → Repair or replace.

OK

10	**Check whether or not DTC P0011 or P0012 is stored.**

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

Replace ECM (See page SF–78).

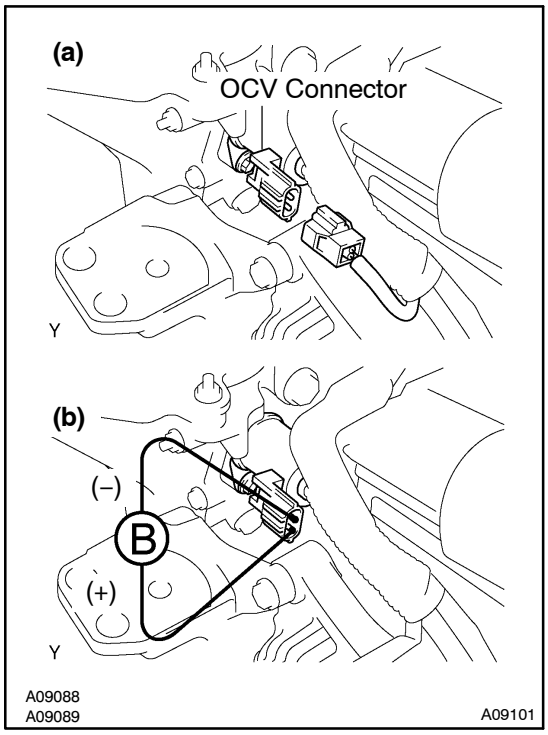
OBD II scan tool (excluding hand–held tester):

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–16).**

NG → **Adjust valve timing.**

OK

2	**Check operation of OCV.**



PREPARATION:
Start the engine.
CHECK:
(a) Check the engine speed when disconnect the OCV connector.
(b) Check the engine speed when apply battery positive voltage between terminals of OCV.
RESULT:

Result	Check (a)	Check (b)
1	Normal engine speed	Rough idle or engine stall
2	Except 1	

2 → **Replace OCV.**

1

3	**Check whether or not DTC P0011 or P0012 is stored.**

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

4	**Check oil control valve filter.**

NG → **Replace oil control valve filter.**

OK

5	**Check oil control valve (See page SF–50).**

OK → **Go to step 7.**

NG

6	**Replace oil control valve.**

Go

7	**Check VVT controller assembly (See page EM–50).**

OK → **Go to step 9.**

NG

8	**Replace VVT controller assembly.**

Go

9	**Check blockage of OCV, oil check valve and oil pipe No. 1.**

NG → **Repair or replace.**

OK

10	**Check whether or not DTC P0011 or P0012 is stored.**

CHECK:

(a) Clear the DTCs.
(b) Warm up the engine and drive the vehicle for 10 minutes or more.
(c) Check DTCs.

OK:

No DTC output.

HINT:

DTCs P0011 or P0012 is present when a foreign object in the engine oil enters the system. These DTCs will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

OK → **VVT system is OK.**

NG

Replace ECM (See page SF–78).

–MEMO–

–MEMO–

DIC6J–02

DTC	P0016	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–178.

DTC No.	DTC Detecting Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has jumped a tooth, chain is stretched) • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target duty–cycle control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle when the engine speed is idling. The ECM closes the OCV to retard the cam. The ECM stores this value as a VVT learning value (When the difference between the target valve timing and the actual valve timing is 5 degrees or less, the ECM stores this in its memory).

If the learning value meets both of the following conditions ((a) and (b)), the ECM interprets this as a defect in the VVT system and sets a DTC.

(a) The VVT learning value is less than 24˚CA (crankshaft angle) or more than 46˚CA.

(b) The above condition continues for more than 18 sec.

MONITOR STRATEGY

Related DTCs	P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 1)
Required sensors/components	Crankshaft position sensor, Camshaft position sensor	
Frequency of operation	Once per drive cycle	
Duration	60 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Engine speed	600 rpm	1,400 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that either of the following conditions 1 or 2 is met:	18 sec. or more
1. VVT angle when camshaft is at the most retarded position	Less than 24°CA
2. VVT angle when camshaft is at the most retarded position	More than 46°CA

WIRING DIAGRAM

Refer to DTC P0335 on page DI–178.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–16).**

NG → **Adjust valve timing (Repair or replace timing chain).**

OK ↓

Replace ECM (See page SF–78).

DIC6K–02

DTC	P0031	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 1)

DTC	P0032	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)

DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)

DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)

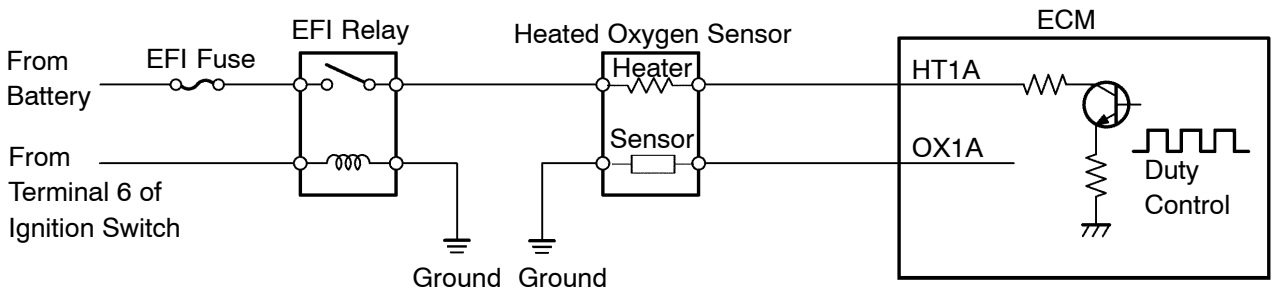
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–112.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing):



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037	Heated current is 0.25 A or less when heater operates with B+ greater than 11.5 V (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
P0032 P0038	Heated current exceeds 3.5 A when heater operates (1 trip detection logic)	

HINT:

- Sensor 1 is the sensor closer to the engine body.
- Sensor 2 is the sensor farther away from the engine body.

MONITOR DESCRIPTION

The sending portion of the heated oxygen sensor has a zirconia element that is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and the difference of the oxygen concentration between the inside and outside surface of the sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0031	Heated oxygen sensor heater current bank 1 sensor 1 (Low current)
	P0032	Heated oxygen sensor heater current bank 1 sensor 1 (High current)
	P0037	Heated oxygen sensor heater current bank 1 sensor 2 (Low current)
	P0038	Heated oxygen sensor heater current bank 1 sensor 2 (High current)
Required sensors/components	Main sensors/components	Heated oxygen sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.3 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
P0031, P0037 (Low current):		
Either of the following conditions is met:	Condition 1 or 2	
1. Following conditions are met:	Conditions (a), (b), (c), (d) and (e)	
(a). Time after engine start	250 sec.	500 sec.
(b). Battery voltage	10.5 V	–
(c). Vehicle speed	–	96.6 km/h (60 mph)
(d). Misfire	Not detected	
(e). Pass/Fail detection in this driving cycle	Not detected	
2. Following conditions are met:	Conditions (a), (b), (c), (d) and (e)	
(a). Time after engine start	500 sec.	–
(b). Battery voltage	10.5 V	–
(c). Vehicle speed	40 km/h (25 mph)	–
(d). Misfire	Not detected	
(e). Pass/Fail detection in this driving cycle	Not detected	
P0032, P0038 (High current):		
Intrusive heating is OFF		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0031, P0037 (Low current):	
Heated oxygen sensor heater current	Less than 0.25 A (at 0.2 sec. after heater ”ON”)
P0032, P0038 (High current):	
Heated oxygen sensor heater current	More than 2 A (while intrusive heating is OFF)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor heater current under the following conditions: (a) Engine has been warmed up (b) Engine is idling (c) Battery voltage is 11 to 14 V	0.4 to 1.0 A

MONITOR RESULT

Refer to page DI–3 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–33).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 1)	Malfunction threshold for HO2S heater
1	$02	Multiply by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM

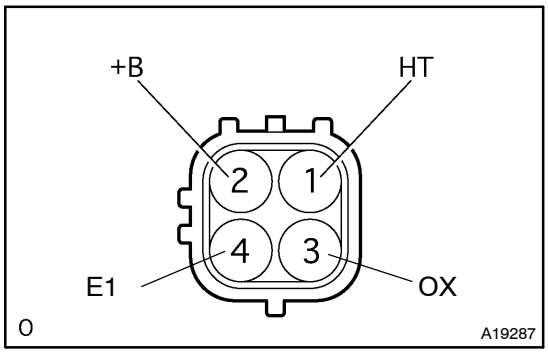
Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check resistance of heated oxygen sensor heater.**



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

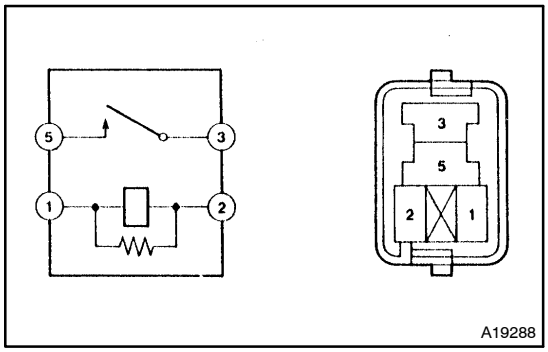
Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))

Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG → **Replace heated oxygen sensor.**

OK

2	**Check EFI relay.**



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

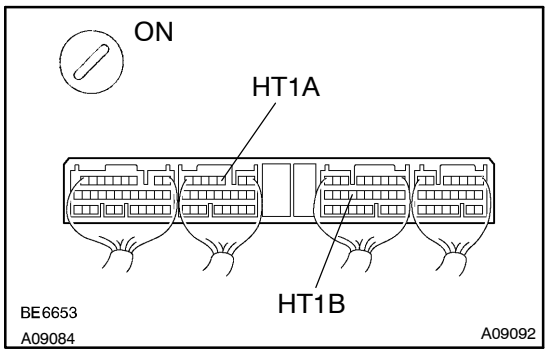
OK:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

3	Check voltage between terminals HT1, HT2 of ECM connectors and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1A, HT1B of ECM connectors and body ground.

HINT:

- Connect terminal HT1A to bank 1 sensor 1.
- Connect terminal HT1B to bank 1 sensor 2.

OK:

Voltage: 9 to 14 V

OK	Replace ECM (See page SF–78).

NG

4	Check for open and short in harness and connector between heated oxygen sensor and ECM, heated oxygen sensor and EFI main relay (Marking: EFI) (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

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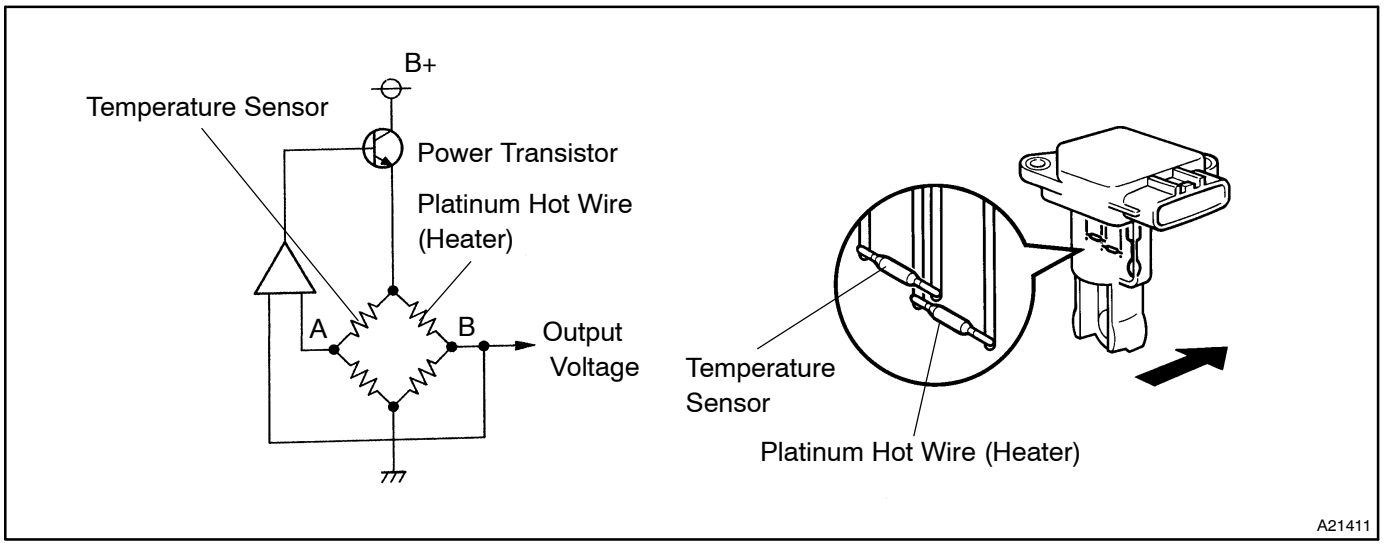
DTC	P0100	Mass or Volume Air Flow Circuit

CIRCUIT DESCRIPTION

The MAF (Mass Air Flow) meter measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermister, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the sensor and the ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and the temperature sensor provides a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit for more than 3 sec. with 4,000 rpm or less engine speed	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

HINT:

After confirming DTC P0100, confirm the mass air flow ratio in the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL” using the hand–held tester or the OBD II scan tool.

Mass Air Flow Value (gm/sec.)	Malfunction
0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• E2G circuit open

MONITOR DESCRIPTION

If there is a defect in the MAF (Mass Air Flow) meter, or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example:
The MAF meter voltage output is less than 0.2 V, or more than 4.9 V, and either condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0100	Mass air flow meter circuit range check (Fluttering)
		Mass air flow meter circuit range check (Low voltage)
		Mass air flow meter circuit range check (High voltage)
Required sensors/components	Mass air flow meter	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (When engine speed is at less than 4,000 rpm) 2 driving cycles (When engine speed is at 4,000 rpm or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

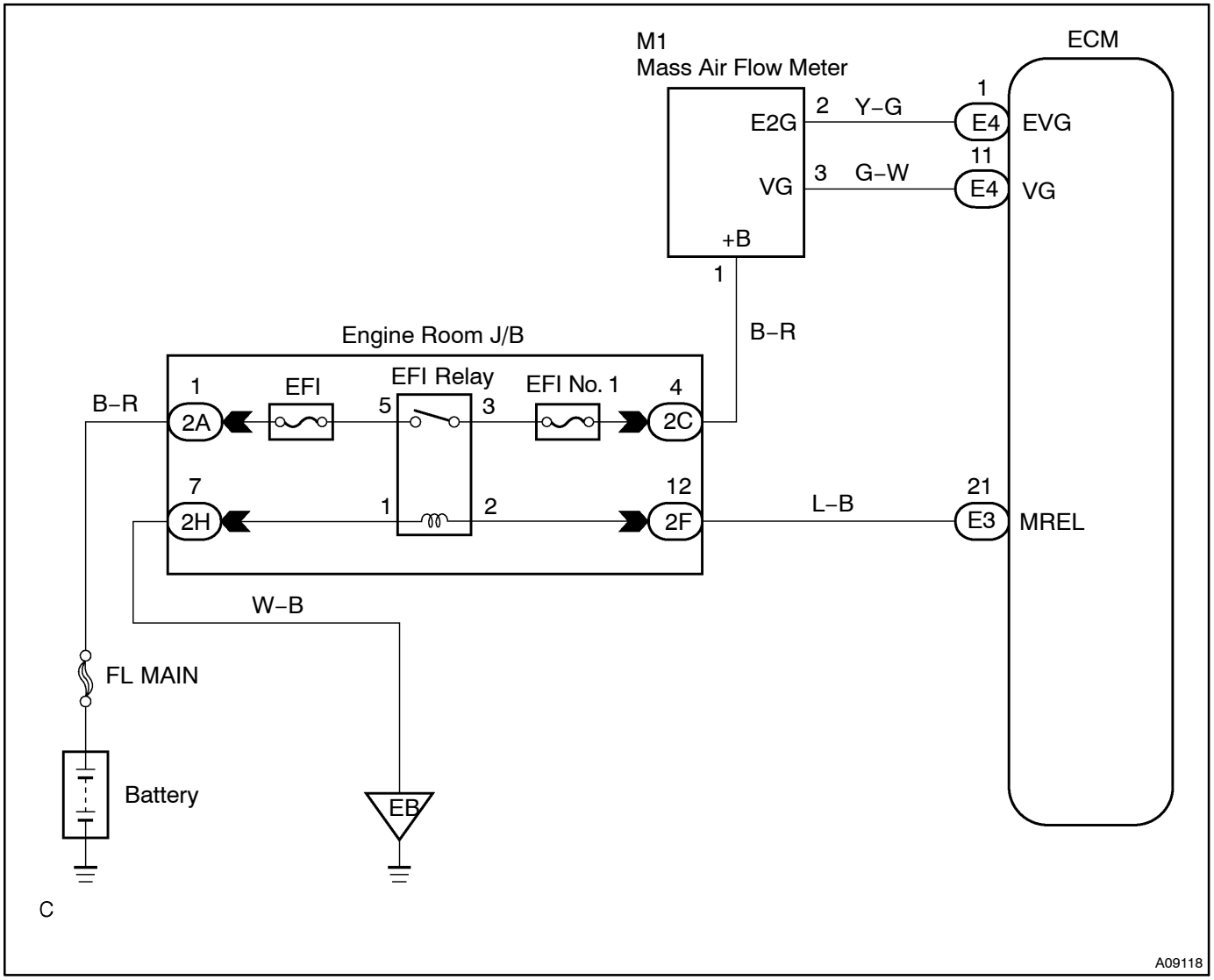
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Mass air flow meter circuit range check (Fluttering):	
Mass air flow meter voltage	Less than 0.2 V, or more than 4.9 V
Mass air flow meter circuit range check (Low voltage):	
Mass air flow meter voltage	Less than 0.2 V
Mass air flow meter circuit range check (High voltage):	
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Mass air flow meter voltage	0.4 to 2.2 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/MAF.

CHECK:

Read mass air flow rate on the OBD II scan tool or hand–held tester.

RESULT:

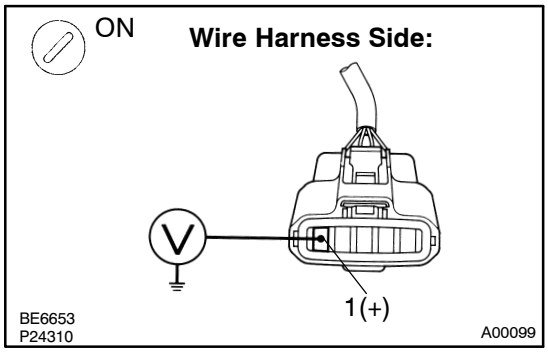
Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

B	**Go to step 6.**
C	**Check for intermittent problems (See page DI–3).**

A

2	Check voltage of mass air flow meter power source.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal 1 of mass air flow meter connector and body ground.

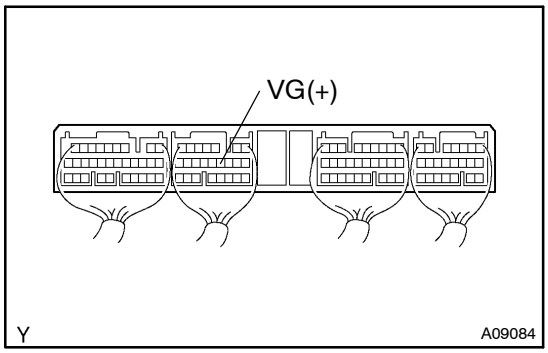
OK:

Voltage: 9 to 14 V

NG	Go to step 5.

OK

3	Check voltage between terminal VG of ECM connector and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Start the engine.

CHECK:

Measure voltage between terminal VG of ECM and body ground while engine is idling.

OK:

Voltage:

1.1 to 1.5 V (P or N position and A/C switch OFF)

OK	Replace ECM (See page SF–78).

NG

4	Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace mass air flow meter.

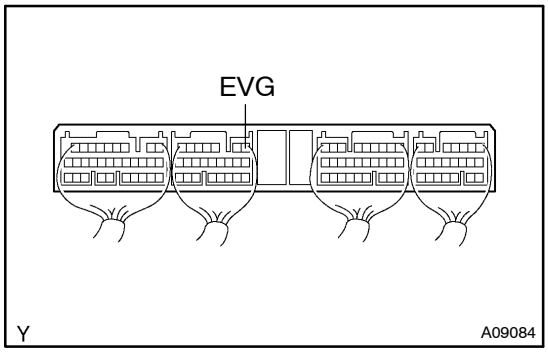
5	**Check for open and short in harness and connector between mass air flow meter and EFI relay (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check ECM power source circuit (See page DI–279).

6	**Check continuity between terminal EVG of ECM connector and body ground.**



PREPARATION:
Remove the ECM cover.
CHECK:
Check continuity between terminal EVG of ECM connector and body ground.
OK:
Below 1 Ω

NG → **Replace ECM (See page SF–78).**

OK

7	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–71.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	• High voltage: Conditions (a), (b) and (c) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed less than 2,000 rpm (b) Engine coolant temperature 70°C (158°F) or higher (c) Voltage output of Mass Air Flow (MAF) meter more than 2.2 V (varies with Throttle Position [TP] sensor voltage) • Low voltage: Conditions (a) and (b) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed more than 300 rpm (b) Voltage output of MAF meter less than 0.93 V (varies with TP sensor voltage)	• Mass air flow meter

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter helps the ECM calculate the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the MAF meter. The ECM interprets this voltage as the intake air amount. If there is a defect in the MAF meter or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

If the voltage is more than 2.2 V with idling or less than 0.4 V without idling, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101	Mass air flow meter rationality
Required sensors/components	Main sensors/components	Mass air flow meter
	Related sensors/components	Engine speed sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	10 sec. (High voltage) 6 sec. (Low voltage)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
High voltage:		
Engine RPM	–	900 rpm
Idle	ON	
Engine coolant temperature	70°C (158°F)	–
Low voltage:		
Engine RPM	0 rpm	–
Throttle position	0.1 V	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Mass air flow meter voltage (High voltage)	More than 2.2 V
Mass air flow meter voltage (Low voltage)	Less than 0.4 V

WIRING DIAGRAM

Refer to DTC P0100 on page DI–71.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0101) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0101 and other DTCs	A
Only P0101	B

HINT:

If any other codes besides P0101 are output, perform the troubleshooting for those DTCs first.

B → **Replace mass air flow meter.**

A

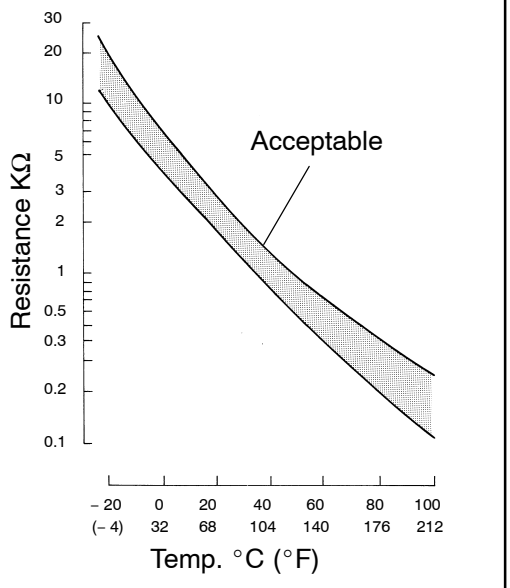
Go to relevant DTC chart (See page DI–42).

DI37Z–17

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

(Fig.1)



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected as voltage changes to the ECM terminal. (See Fig. 1).

The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA via resistor R. That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temperature sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temperature sensor (built into mass air flow meter) • ECM

HINT:

After confirming DTC P0110, confirm the intake air temperature in the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL” using the hand–held tester or OBD II scan tool.

Temperature Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT (Intake Air Temperature) sensor and sets a DTC.

Example:

The sensor voltage output equals to –40°C (–40°F), or more than 140°C (284°F).

MONITOR STRATEGY

Related DTCs	P0110	Intake air temperature sensor range check (Fluttering)
		Intake air temperature sensor range check (Low voltage)
		Intake air temperature sensor range check (High voltage)
Required sensors/components	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

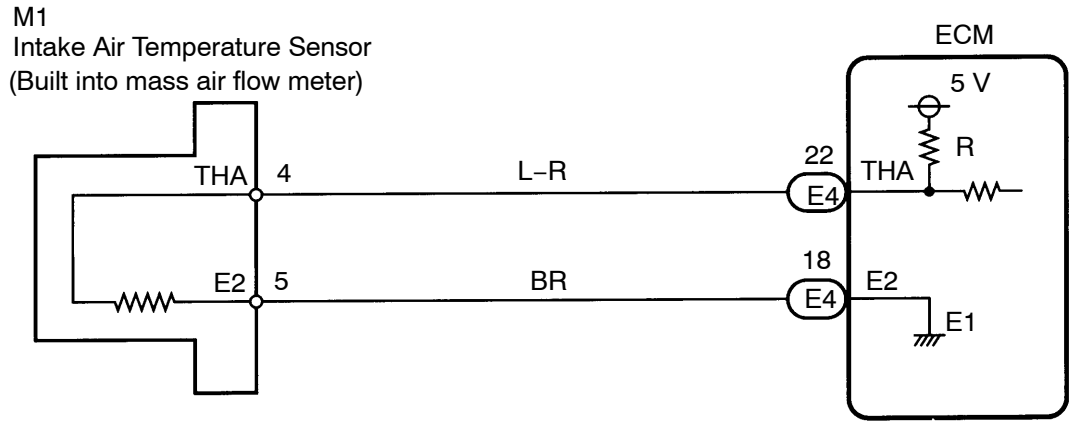
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Intake air temperature sensor range check (Fluttering):	
Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω, or more than 156 kΩ (More than 140°C (284°F), or less than –40°C (–40°F))
Intake air temperature sensor range check (Low voltage):	
Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω (More than 140°C (284°F))
Intake air temperature sensor range check (High voltage):	
Intake air temperature sensor resistance (Intake air temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Intake air temperature sensor resistance	98.5 Ω (140°C (284°F)) to 156 kΩ (–40°C (–40°F))

WIRING DIAGRAM



2005 CELICA (RM1131U)

A00310

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value displayed on the hand–held tester or the OBD II scan tool.

OK:

Same as the actual intake air temperature and temperature displayed on the hand–held tester or OBD II scan tool.

RESULT:

Temperature Displayed	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

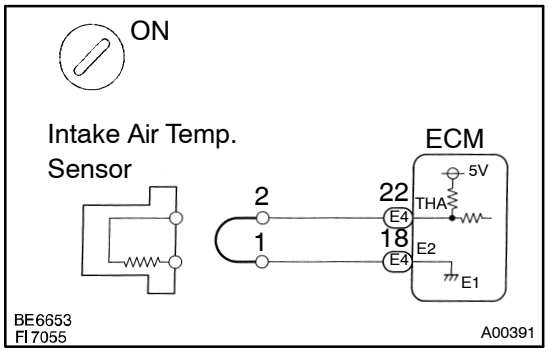
HINT:

- If there is an open circuit, the hand–held tester or the OBD II scan tool indicates –40°C (–40°F).
- If there is a short circuit, the hand–held tester or the OBD II scan tool indicates 140°C (284°F) or more.

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI–3).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the intake temp. sensor connector.
(b) Connect sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or the hand–held tester.

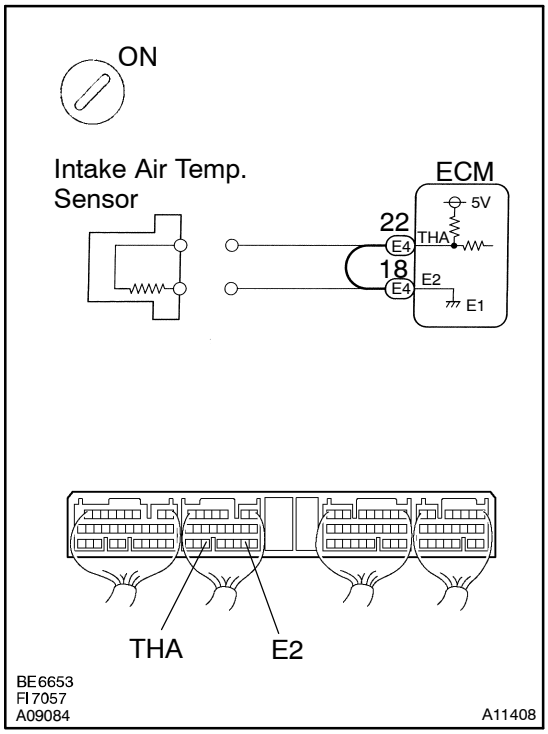
OK:

Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace intake air temperature sensor.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Connect between terminals THA and E2 of the ECM connector.

HINT:

In take air temp. sensor connector is disconnected.

Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

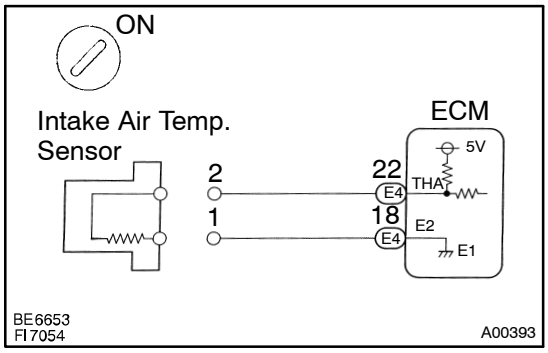
Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

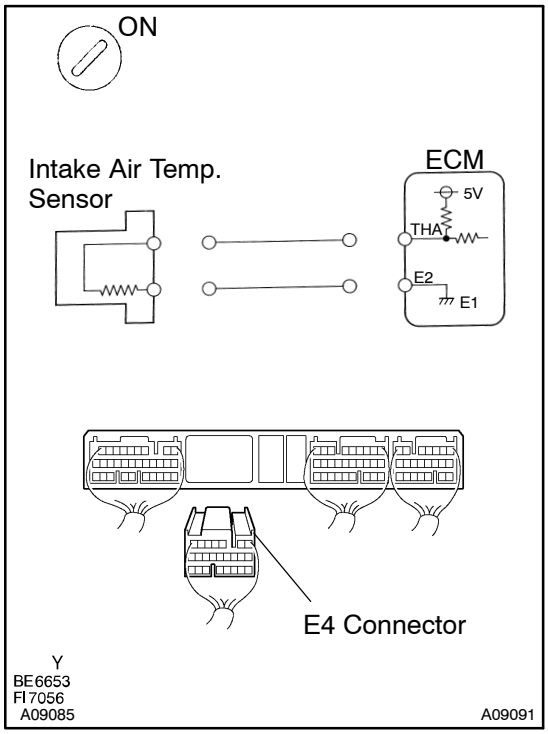
OK:

Temperature value: –40°C (–40°F)

OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E4 connector of the ECM.

HINT:

Intake air temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DI380–17

DTC	P0115	Engine Coolant Temperature Circuit

CIRCUIT DESCRIPTION

A thermistor is built into the Engine Coolant Temperature (ECT) sensor and changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM are the same as the Intake Air Temperature (IAT) sensor.
HINT:
If the ECM detects DTC P0115, it operates fail safe function in which the engine coolant temperature is assumed to be 80˚C (176˚F).

DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temperature sensor circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

HINT:
After confirming DTC ”P0115”, use the OBD II scan tool or the hand–held tester to confirm the engine coolant temperature from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Temp. Displayed	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor.
The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.
Example:
When the ECM calculates that the ECT is less than –40°C (–40°F), or more than 140°C (284°F), and if either condition continues for 0.5. sec. or more, the ECM will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115	Engine coolant temperature sensor range check (Fluttering)
		Engine coolant temperature sensor range check (Low voltage)
		Engine coolant temperature sensor range check (High voltage)
Required sensors/components	Engine coolant temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

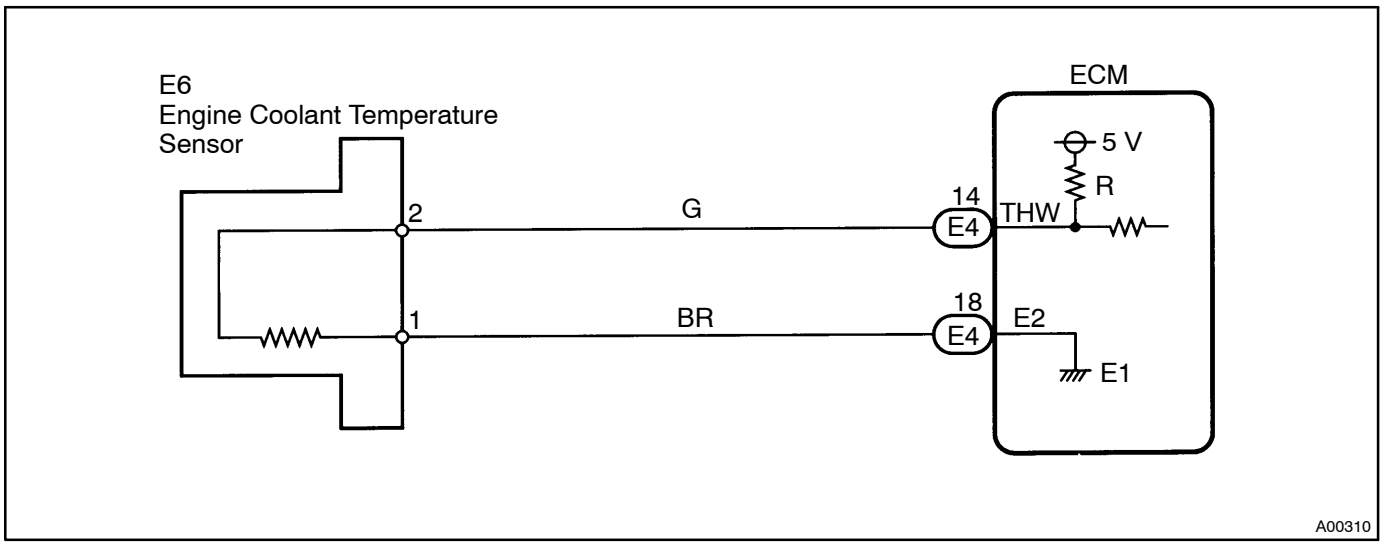
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Engine coolant temperature sensor range check (Fluttering)	
Engine coolant temperature sensor resistance (Coolant temperature)	Less than 79 Ω, or more than 156 kΩ (More than 140°C (284°F), or less than –40°C (–40°F))
Engine coolant temperature sensor range check (Low voltage)	
Engine coolant temperature sensor resistance (Coolant temperature)	Less than 79 Ω (More than 140°C (284°F))
Engine coolant temperature sensor range check (High voltage)	
Engine coolant temperature sensor resistance (Coolant temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor resistance	79 Ω (140°C (284°F)) to 156 kΩ (–40°C (–40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of engine coolant temperature.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value displayed on the hand–held tester or the OBD II scan tool.

OK:

Same value as the actual engine coolant temperature and temperature displayed on the hand–held tester or the OBD II scan tool.

RESULT:

Temperature Displayed	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

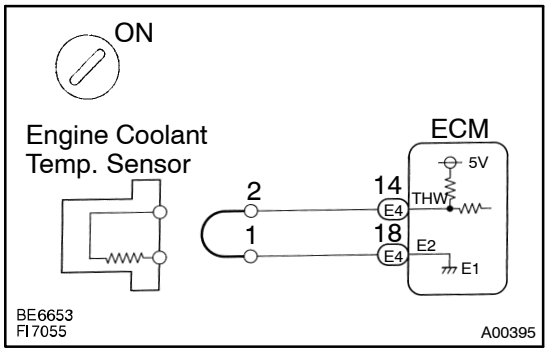
HINT:

- If there is an open circuit, the hand–held tester or the OBD II scan tool indicates –40°C (–40°F).
- If there is a short circuit, the hand–held tester or the OBD II scan tool indicates 140°C (284°F) or more.

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI–3).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

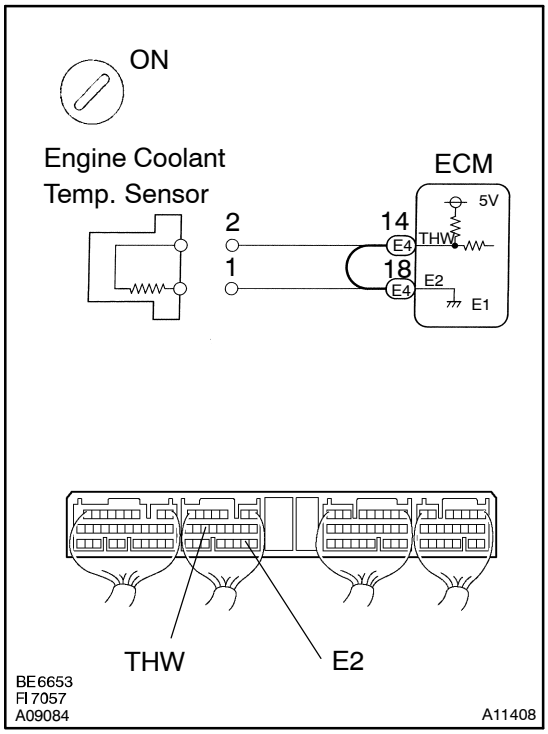
OK:

Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace engine coolant temperature sensor.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Connect between terminals THW and E2 of the ECM connector.

HINT:

Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

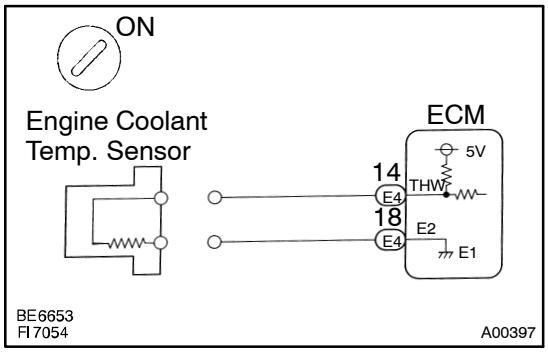
Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

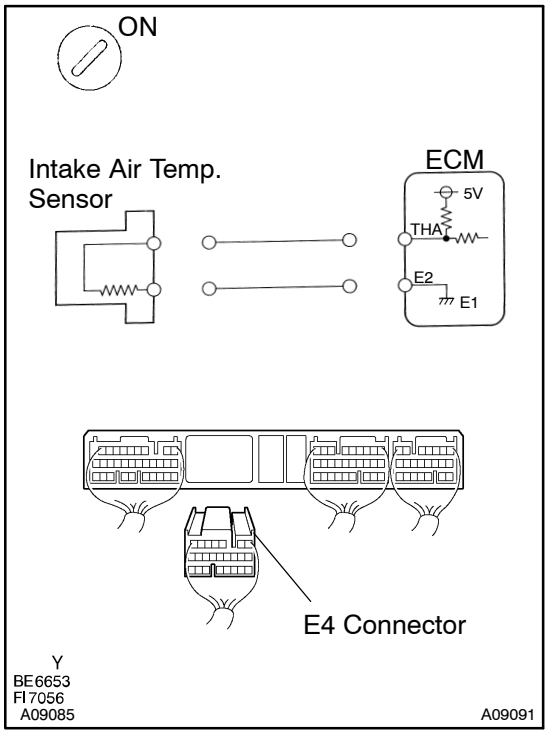
OK:

Temperature value: – 40°C (– 40°F)

OK	Replace engine coolant temperature sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E4 connector of the ECM.

HINT:

Engine coolant temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / COOLANT TEMP.

CHECK:

Read temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DI381–13

DTC	P0116	Engine Coolant Temperature Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–87.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	The ECT is 35°C (95°F) or more but less than 60°C (140°F) when the engine is started, and conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated (b) Engine coolant temperature remains within 3°C (5.4°F) of the initial engine coolant temperature (2 trip detection logic)	• ECT sensor
	• The ECT is more than 60°C (140°F) when the engine is started and the vehicle has accelerated and decelerated • The ECT sensor records a temperature variation is below 1°C (1.8°F) successively 6 times (6 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

(1) Upon starting the engine, the ECT is between 35°C (95°F) and 60°C (140°F). If after driving for 250 sec., the ECT still remains within 3°C (5.4°F) of the starting temperature, a DTC will be set (2 trip detection logic).

(2) Upon starting the engine, the ECT is over 60°C (140°F). If after driving for 250 sec., the ECT still remains within 1°C (1.8°F) of the starting temperature, a DTC will be set (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116	Engine coolant temperature sensor range check (Stuck)
Required sensors/components	Main sensors	Engine coolant temperature sensor
	Related sensors	Intake air temperature sensor, Crankshaft position sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	250 sec.	
MIL operation	2 driving cycles (When temperature is fixed between 35°C (95°F) and 60°C (140°F)) 6 driving cycles (When temperature is fixed at 60°C (140°F) or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Case 1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):		
Cumulative idle off period	250 sec.	–
Speed increase to 30 km/h (18.6 mph) or more	10 times	–
Engine coolant temperature	35°C (95°F)	60°C (140°F)
Intake air temperature	–6.7°C (20°F)	–
Case 2 (When temperature is fixed at 60°C (140°F) or more):		
Engine coolant temperature	60°C (140°F)	104.4°C (220°F)
Intake air temperature	–6.7°C (20°F)	–
Stop and go	Once or more (Stop for 20 sec. or more and accelerate to more than 70 km/h (43 mph) within 40 sec.)	
Steady driving and stop *	Once or more	

*: Vehicle is driven at 65 km/h (40 mph) or more for 30 sec. or more and the vehicle speed reaches 70 km/h (44 mph). The vehicle is decelerated from 65 km/h (40 mph) to 3 km/h (2 mph) or less within 35 sec. and stopped for 10 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):	
Change of engine coolant temperature value	Less than 3°C (5.4°F)
Case2 (When temperature is fixed at 60°C (140°F) or more):	
Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Standard Value
Engine coolant temperature changes with the actual engine coolant temperature

INSPECTION PROCEDURE

HINT:

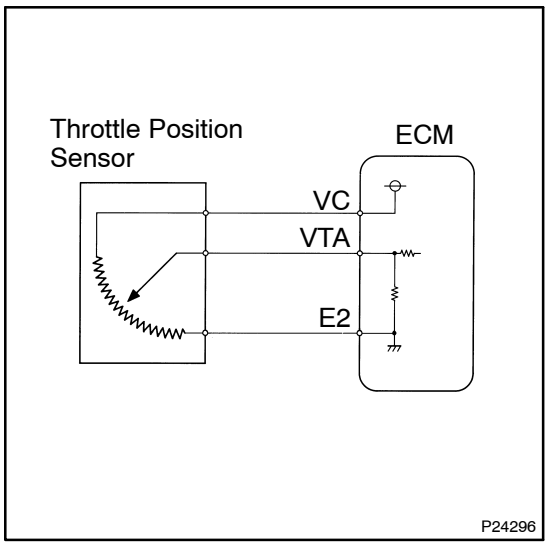
- If DTCs P0115 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace engine coolant temperature sensor.

DIC6L–02

DTC	P0120	Throttle Position Sensor/Switch ”A” Circuit Malfunction

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.3 to 0.8 V is applied to terminal VTA of the ECM. The voltage applied to terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 to 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from this signal input from terminal VTA. Based on the conditions, the air–fuel ratio, power increase, and fuel–cut control, etc. are decided.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues for more than 5 sec.: (a) VTA < 0.1 V (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:
After confirming DTC P0120, confirm the throttle valve opening percentage and closed throttle position switch condition using the hand–held tester or the OBD II scan tool.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve closed	Throttle valve fully open	
0 %	0 %	VC circuit open VTA circuit open or shorted
Approx. 100 %	Approx. 100 %	E2 circuit open

MONITOR DESCRIPTION

The throttle position sensor varies its resistance with the angle of the throttle valve. The ECM applies a regulated reference voltage to the throttle position sensor positive terminal and calculates the angle of the throttle valve based on the current voltage at the throttle position sensor “signal” terminal.
When the throttle valve is near the fully closed position, the output voltage of the throttle position sensor is low. When it is near the fully open position, the output voltage is high.
If the ECM detects that the output voltage of the throttle position sensor is out of the normal range, the ECM interprets this as a malfunction in the throttle position sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0120	Throttle position sensor range check (Fluttering)
		Throttle position sensor range check (Low voltage)
		Throttle position sensor range check (High voltage)
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–3
The typical enabling condition is not available	–

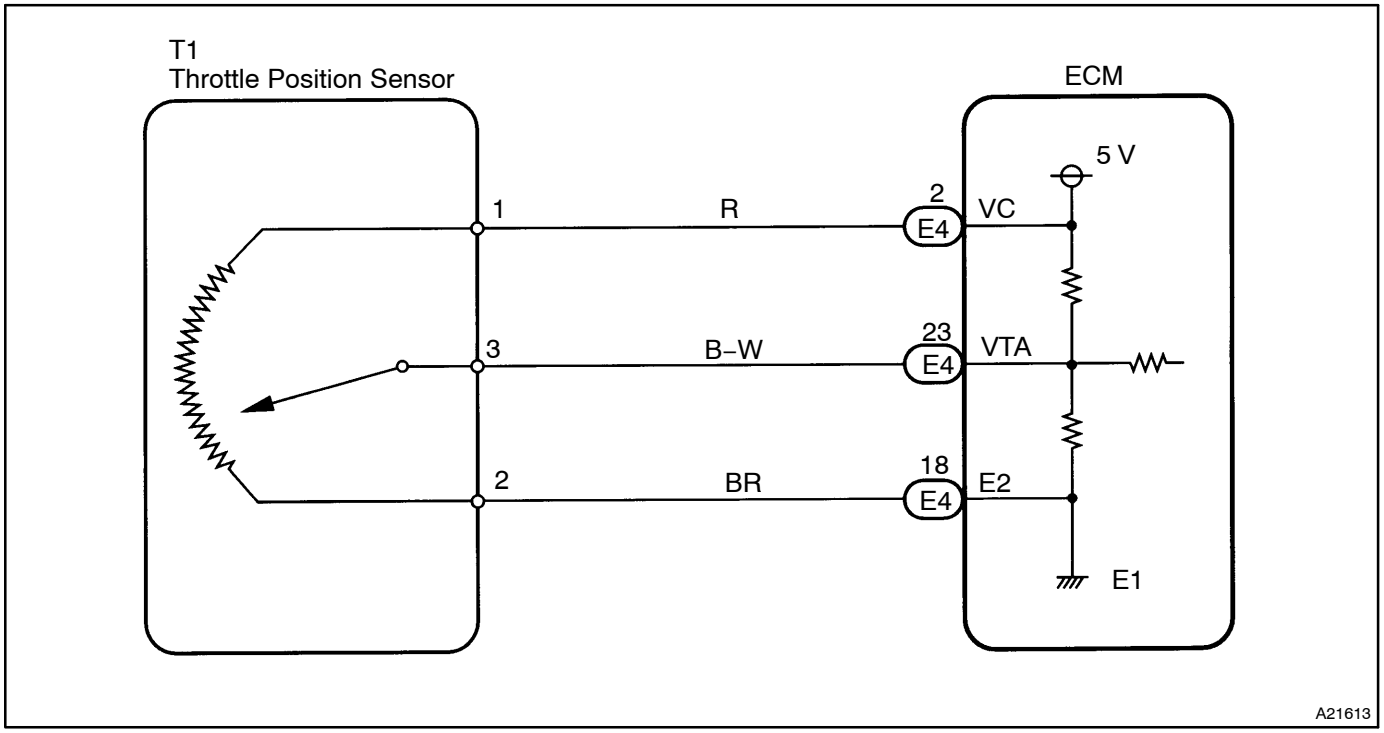
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Throttle position sensor range check (Fluttering)	
Throttle position sensor voltage	Less than 0.1 V, or more than 4.9 V
Throttle position sensor range check (Low voltage)	
Throttle position sensor voltage	Less than 0.1 V
Throttle position sensor range check (High voltage)	
Throttle position sensor voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard value
Throttle position sensor voltage	0.1 to 4.9 V

WIRING DIAGRAM



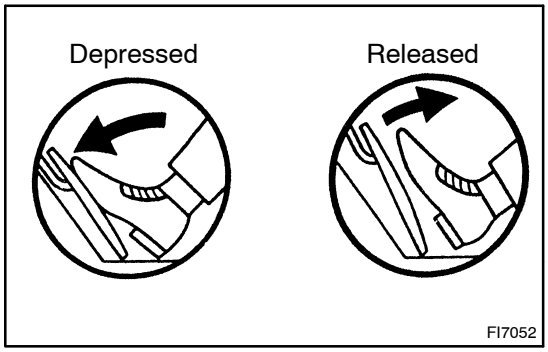
INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester or OBD II scan tool, and read value of throttle valve opening percentage.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / THROTTLE POS.

CHECK:

Read its value displayed on the hand–held tester.

RESULT:

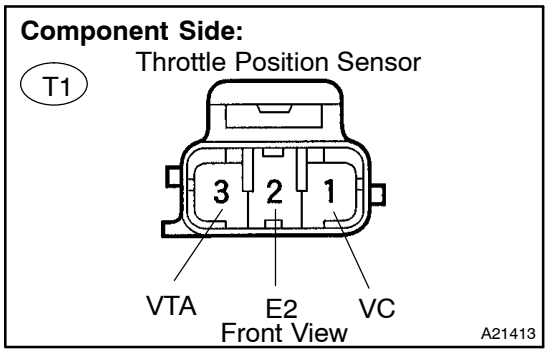
Accelerator Pedal Operation	Throttle Valve Opening Position (%)	Proceed to
Releasing and depressing	0	A
	From approx. 0 to 75	B
	Approx. 100	C

B → **Check for intermittent problems (See page DI–3).**

C → **Go to step 4.**

A

2	**Check throttle position sensor.**



(a) Disconnect the T1 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

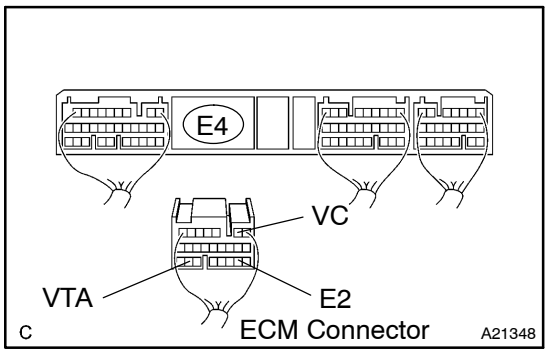
OK:

Tester Connection	Throttle Valve	Specified Condition
VC (T1–1) – E2 (T1–2)	—	2.5 to 5.9 kΩ
VTA (T1–3) – E2 (T1–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **Replace throttle position sensor.**

OK

3	Check for open and short in harness and connector between ECM and throttle position sensor.



PREPARATION:

(a) Reconnect the throttle position sensor connector.
(b) Disconnect the ECM connector.

CHECK:

(a) Measure the resistance between terminals VC and E2 of ECM connector.
(b) Measure the resistance between terminals VTA and E2 of ECM connector.

OK:

Tester Connection	Throttle Valve	Specified Condition
VC (E4–2) – E2 (E4–18)	—	2.5 to 5.9 kΩ
VTA (E4–23) – E2 (E4–18)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

CHECK:

Measure the resistance between the terminals of VC and VTA of ECM connector and body ground.

OK:

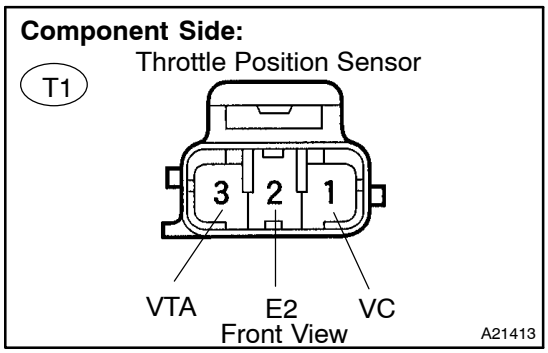
Resistance: 10 kΩ or higher

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

4	Check throttle position sensor.



(a) Disconnect the T1 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

OK:

Tester Connection	Throttle Valve	Specified Condition
VC (T1–1) – E2 (T1–2)	—	2.5 to 5.9 kΩ
VTA (T1–3) – E2 (T1–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG	Replace throttle position sensor.

OK

5	**Check for open and short in harness and connector between ECM and throttle position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

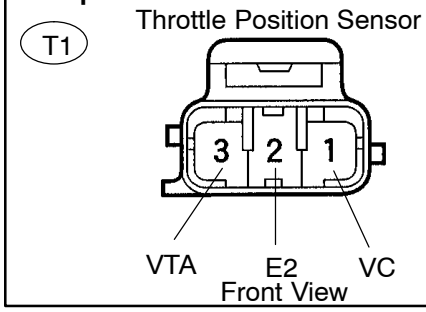
OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check throttle position sensor.**

Component Side:



(a) Disconnect the T1 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

OK:

Tester Connection	Throttle Valve	Specified Condition
VC (T1–1) – E2 (T1–2)	—	2.5 to 5.9 kΩ
VTA (T1–3) – E2 (T1–2)	Fully closed	0.2 to 5.7 kΩ
	Fully open	2.0 to 10.2 kΩ

NG → **Replace throttle position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and throttle position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

DI383–15

DTC	P0121	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–96.

DTC No.	Detection Item	Trouble Area
P0121	After the vehicle speed has been exceeded 30 km/h (19 mph) even once, the output value of the throttle position sensor is out of the applicable range while the vehicle speed is between 30 km/h (19 mph) and 0 km/h (0 mph). (2 trip detection logic)	• Throttle position sensor • ECM

MONITOR DESCRIPTION

The throttle position sensor varies its resistance with the angle of the throttle valve. The ECM applies a regulated reference voltage to the throttle position sensor positive terminal and calculates the angle of the throttle valve based on the current voltage at the throttle position sensor “signal” terminal.
When the throttle valve is near the fully closed position, the output voltage of the throttle position sensor is low. When it is near the fully open position, the output voltage is high.
The ECM checks the indicated angle of the throttle valve during “stop and go” conditions. If the indicated angle (or voltage) in the “closed throttle” position is out of the specified range 8 times or more, the ECM interprets this as a malfunction in the throttle position sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0121	Throttle position sensor rationality
Required sensors/components	Main sensors/components	Throttle position sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	8 times or more	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Malfunction criteria and its threshold are met 8 times from once GO is judged until STOP is judged		
GO: Vehicle speed	30 km/h (18.63 mph)	–
STOP: Vehicle speed	–	0 km/h (0mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Closed throttle position learning value	26.254° (1.05 V) or more or less than 7.456° (0.298 V)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Closed throttle position learning value	Less than 26.254° (1.05 V) and 7.456° (0.298 V) or more

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0121) being output?**

PREPARATION:
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:
Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
”P0121” and other DTCs	A
P0121	B

HINT:
If any other codes besides P0121 is output, perform the troubleshooting for those DTCs first.

B → **Replace throttle position sensor.**

A

Go to relevant DTC chart (See page DI–42).

DIC6M–02

DTC	P0125	Insufficient coolant temperature for closed loop fuel control

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–87.

DTC No.	DTC Detection Condition	Trouble Area
P0125	The engine coolant temperature (ECT) is less than –6.6˚C (20°F) when starting the engine, and 20 minutes after the engine start, the ECT sensor still indicates below 20˚C (68°F)	• Cooling system • Engine coolant temperature sensor • Thermostat
	The ECT is between –6.6˚C (20°F) and 10˚C (50°F) when start, 5 minutes after the start, the ECT sensor still indicates below 20˚C (68°F)	
	The ECT is greater than 10˚C (50°F) when starting the engine, and 2 minutes after the engine start, ECT sensor still indicates below 20˚C (68°F)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual coolant temperature. The ECM applies a voltage to the sensor and the varying resistance of the sensor causes the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start–up. If, after sufficient time has passed, the sensor still reports that the engine is not warmed up enough for closed–loop fuel control, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.

Example:

The engine coolant temperature is 0°C (32°F) at engine start. After 5 min. running time, the ECT sensor still indicates that the engine is not warmed up enough to begin air fuel ratio feedback control of the air–fuel ratio. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0125	Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Cooling system, Thermostat
	Related sensors/components	Mass air flow meter
Frequency of operation	Continuous	
Duration	2 min. (at engine start, engine coolant or intake air temperature of 10˚C (50˚F) or more) 5 min. (at engine start, engine coolant or intake air temperature of –6.6˚C (20˚F) to 10˚C (50˚F)) 20 min. (at engine start, engine coolant or intake air temperature of less than –6.6˚C (20˚F))	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Engine	Running	
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Time until "engine coolant temperature" detection temperature reaches feedback start temperature	
When the temperature at the time of engine starting is 10°C (50°F) or more	Engine coolant temperature is less than "closed–loop enable temperature" 2 min. or more after engine start
When the temperature at the time of engine starting is "–6.6°C (20°F)" to "10°C (50°F)"	Engine coolant temperature is less than "closed–loop enable temperature" 5 min. or more after engine start
When the temperature at the time of engine starting is –6.6°C (20°F) or less	Engine coolant temperature is less than "closed–loop enable temperature" 20 min. or more after engine start

WIRING DIAGRAM

Refer to DTC P0115 on page DI–87.

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115 first.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0125) being output.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0125	A
P0125 and other DTCs	B

HINT:

If any other codes besides P0125 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check thermostat (See page CO–10).**

NG → **Replace thermostat (See page CO–8).**

OK

3	**Check cooling system.**

CHECK:

Check that there is defect cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → **Repair or replace cooling system.**

OK

Replace engine coolant temperature sensor.

DIC6N–02

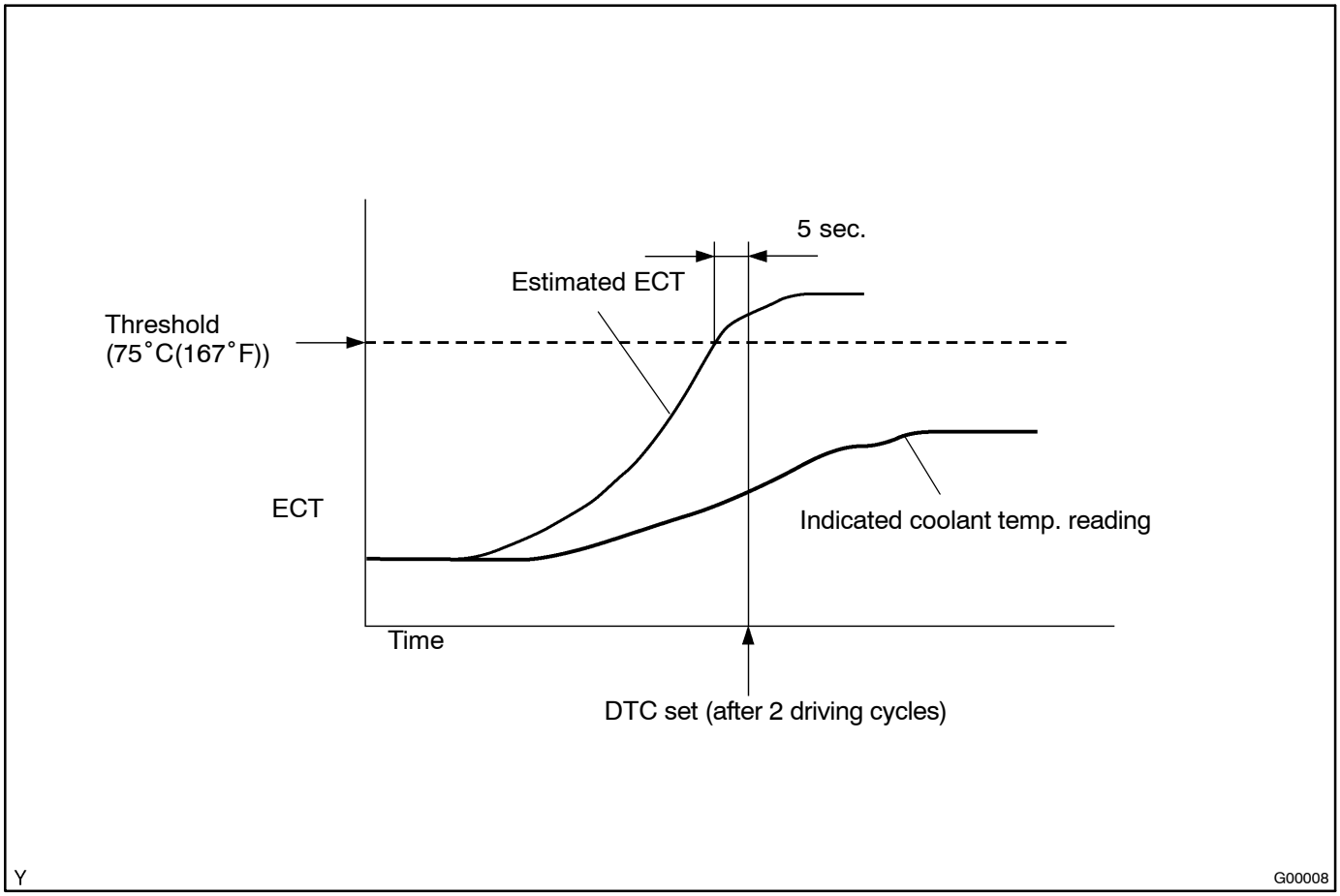
DTC	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

CIRCUIT DESCRIPTION

If the engine coolant temperature (ECT) does not reach 75˚C (167˚F) even if sufficient warm – up time has elapsed.

DTC No.	DTC Detecting condition	Trouble Area
P0128	Conditions (a), (b) and (c) are met: (a) After starting engine, ECT is –10 to 30˚C (–22 to 86˚F) (b) Engine is warmed up (c) THW < 75˚C (167˚F)	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM

MONITOR DESCRIPTION



The ECM estimates the coolant temperature based on starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual ECT (Engine Coolant Temperature). When the estimated coolant temperature reaches 75°C (167°F), the ECM checks the actual ECT. If the actual ECT is less than 75°C (167°F), the ECM will interpret this as a fault in the thermostat or engine cooling system and set a DTC.

MONITOR STRATEGY

Related DTCs	P0128	Thermostat
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Engine cooling system, Thermostat
	Related sensors/components	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	15 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	11.0 V	–
Throttle position learning	Completed	
Intake air temperature at engine start	–10°C (14°F)	35°C (95°F)
Engine coolant temperature at engine start	–10°C (14°F)	35°C (95°F)
Engine coolant temperature at engine start – Intake air temperature at engine start	–15°C (–27°F)	7°C (12.6°F)
Accumulated time that vehicle speed reaches 128 km/h (80 mph) or more	–	20 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that both of the following conditions 1 and 2 are met:	5 sec. or more
1. Estimated engine coolant temperature	75°C (167°F) or more
2. Engine coolant temperature sensor output	Less than 75°C (167°F)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor output value after engine warm–up	75°C (167°F) or more

MONITOR RESULT

Refer to page DI–3 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–3).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 (°C)	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criteria for thermostat

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0128) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0128	A
P0128 and other DTCs	B

HINT:

If any other codes besides P0128 is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check cooling system.**

CHECK:

Check that there is a defect in the cooling system which causes over cool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → **Repair or replace cooling system.**

OK

3	**Check thermostat (See page CO–10).**

NG → **Replace thermostat.**

YES

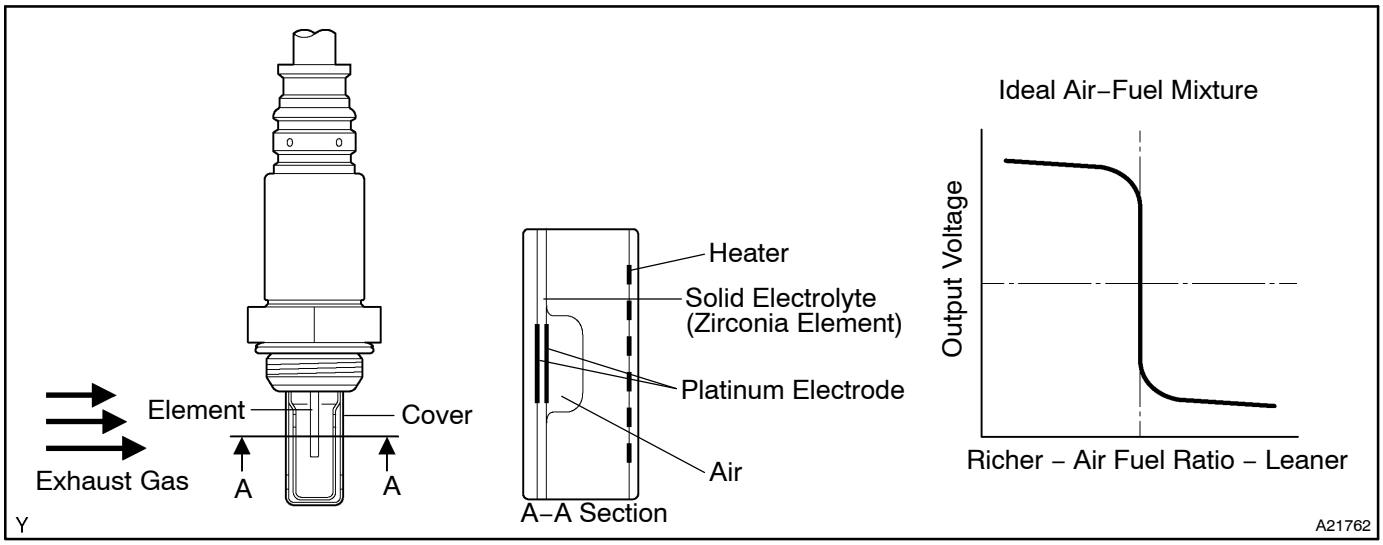
Replace ECM (See page SF–78).

DIC6O–02

DTC	P0130	Oxygen Sensor Circuit (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

The heated oxygen sensor is used to monitor oxygen concentration in the exhaust gas. For optimum catalytic converter operation, the air fuel mixture must be maintained near the ideal stoichiometric ratio. The heated oxygen sensor output voltage changes suddenly in the vicinity of the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air–fuel ratio is nearly stoichiometric.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).
When the air–fuel ratio is richer than the stoichiometric air–fuel ratio, the oxygen will be vanished from the exhaust gas. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V).

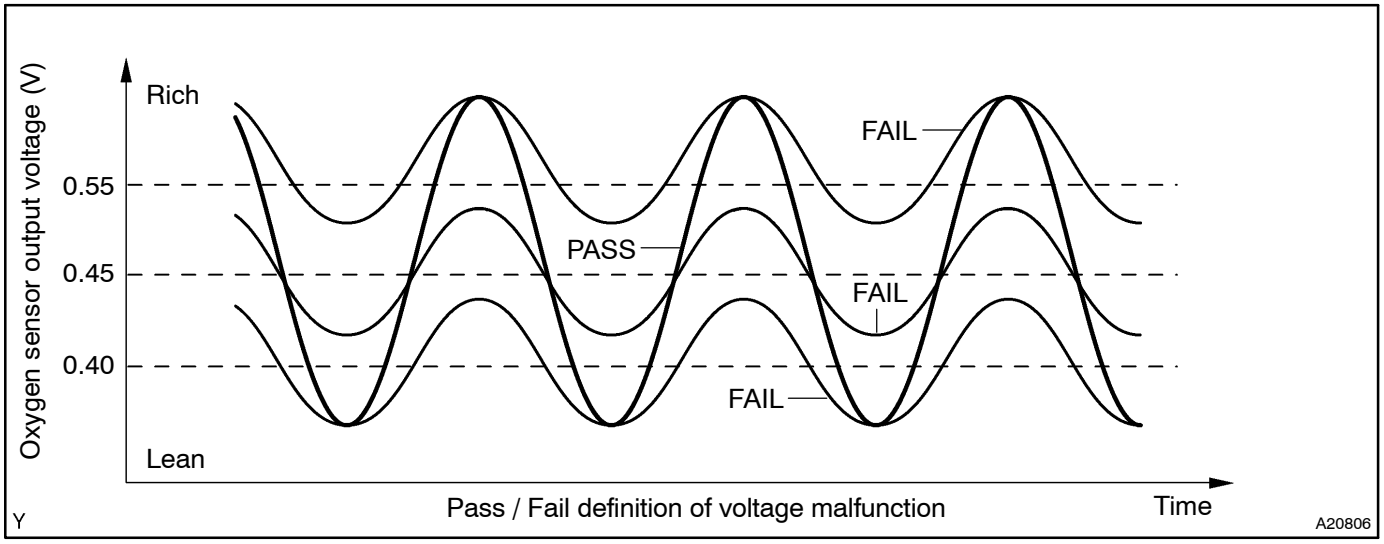


DTC No.	DTC Detection Condition	Trouble Area
P0130	Output voltage of heated oxygen sensor remains at 0.4 V or more, or 0.5 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM

HINT:

- Sensor 1 is the sensor closest to the engine assembly.
- The output voltage of the heated oxygen sensor and the short–term fuel trim value can be read using the hand–held tester or the OBD II scan tool.

MONITOR DESCRIPTION



The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio to be close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gas. The sensor detects oxygen level in the exhaust gas and sends this signal to the ECM.

The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. The heated oxygen sensor generates output voltage between 0 V and 1.0 V in response to the oxygen concentration in exhaust gas. When the output voltage of the heated oxygen sensor is 0.55 V or more, the ECM judges that the air–fuel ratio is RICH. When it is 0.4 V or less, the ECM judges that the air–fuel ratio is LEAN.

Under normal condition, the output voltage from the heated oxygen sensor alternates RICH and LEAN sides periodically. If the heated oxygen sensor outputs RICH signal (or LEAN signal) constantly, or if the heated oxygen sensor cannot output enough voltage to reach the minimum specification, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0130	Front heated oxygen sensor voltage is constant at lean side or rich side
Required sensors/components	Main sensors/components	Front heated oxygen senor
	Related sensors/components	Crank position sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	20 to 36 sec. x (3 times)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
There is a history that following conditions 1 and 2 were met:	20 sec. (Continuously)	
1. Vehicle speed	40 km/h (24.9 mph)	–
2. Engine speed	900 rpm	–
Time after engine start	120 sec.	–
Idle	ON	
Fuel system status	Closed loop	
Vehicle speed	–	5 km/h (3.1 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions 1 or 2 is met:	3 times or more
1. Front oxygen sensor voltage is 0.55 V or less	For 18 sec. or more
2. Front oxygen sensor voltage is 0.4 V or more	For 18 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Heated oxygen sensor voltage in normal condition	0 to 1 V

O2S TEST RESULT

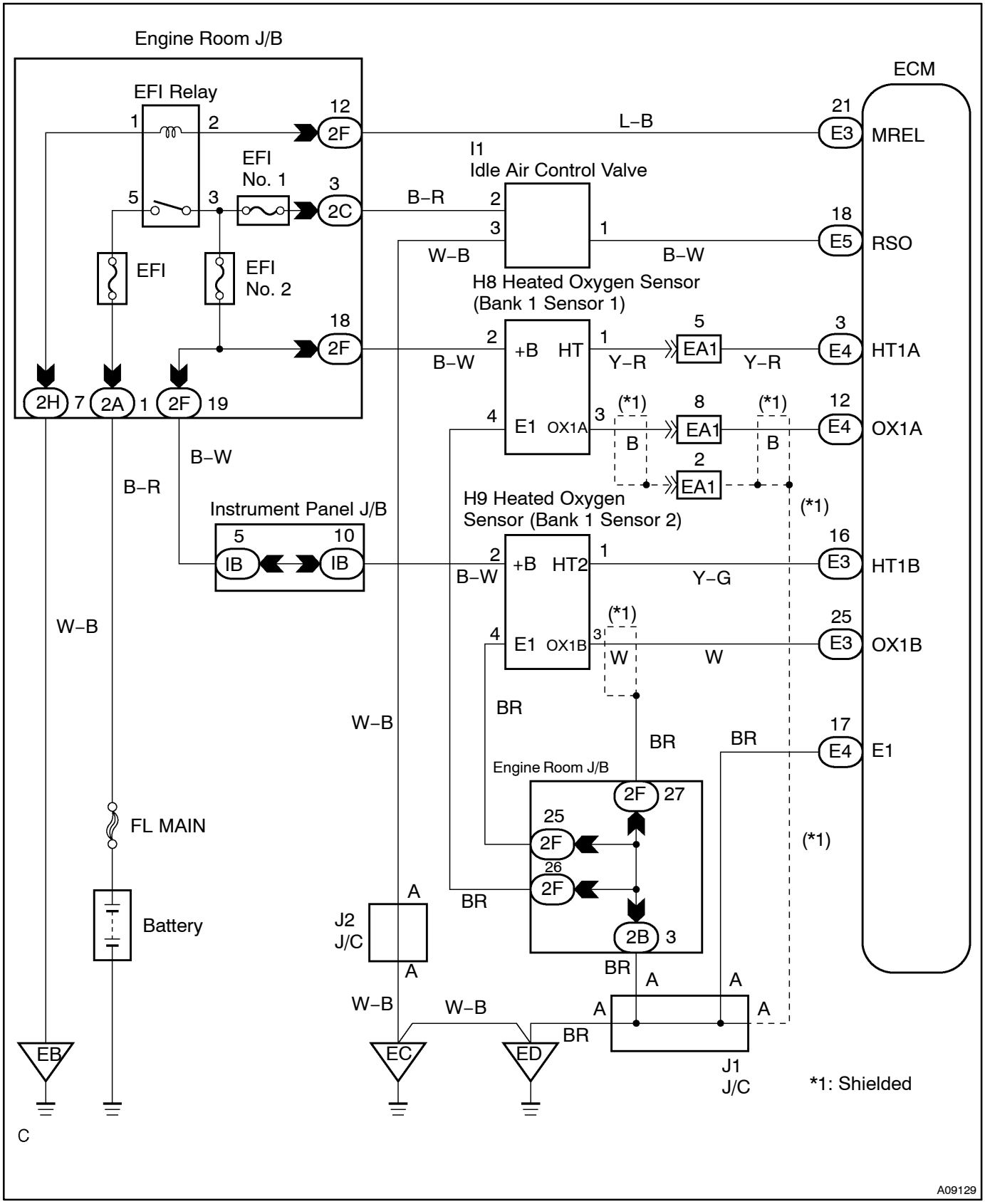
Refer to page DI–3 for detailed information.

Front HO2S voltage monitor

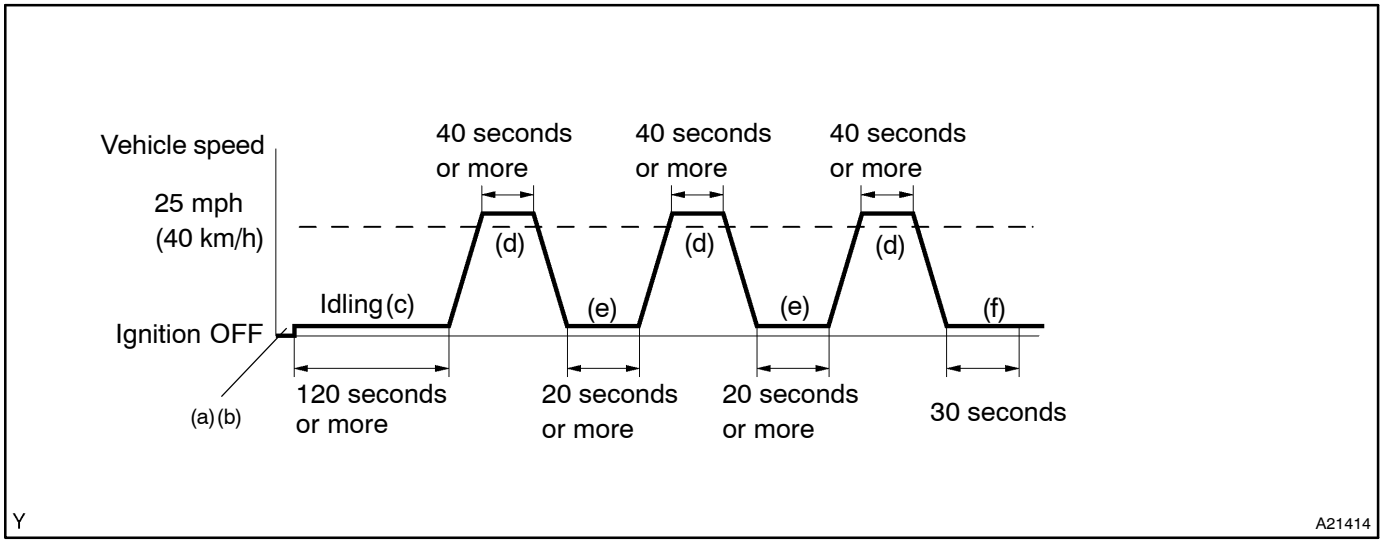
If the HO2S voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value of TEST LIMIT
$07	Minimum front HO2S voltage	N/A	V	Between 0 and 0.4 V
$08	Maximum front HO2S voltage	N/A	V	Between 0.55 and 1.275 V

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the ”normal mode” to the ”check mode” (See page DI–3).
(c) Start the engine and let the engine idle for 120 seconds or more.
(d) Drive the vehicle at 25 mph (40 km/h) or more for 40 seconds or more.
(e) Let the engine idle for 20 seconds or more. Perform steps (d) and (e) at least 3 times.
(f) Let the engine idle for 30 seconds.

HINT:

If a malfunction exists, the MIL will be illuminated on the multi information display during step (f).

NOTICE:

If the conditions in this test are not strictly followed, detection of a malfunction will not occur.

If you do not have the hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

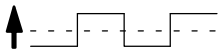
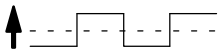
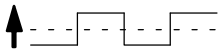
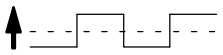
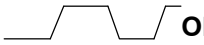
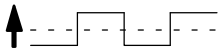
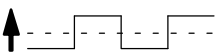
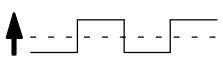
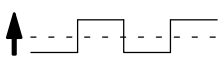
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
+25 % → rich output: More than 0.5 V,
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	—
Case 2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Are there any other codes (besides DTC P0130) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0130	A
”P0130” and other DTCs	B

HINT:

If any other codes besides P0130 is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	Check the output voltage of oxygen sensor during idling.

PREPARATION:

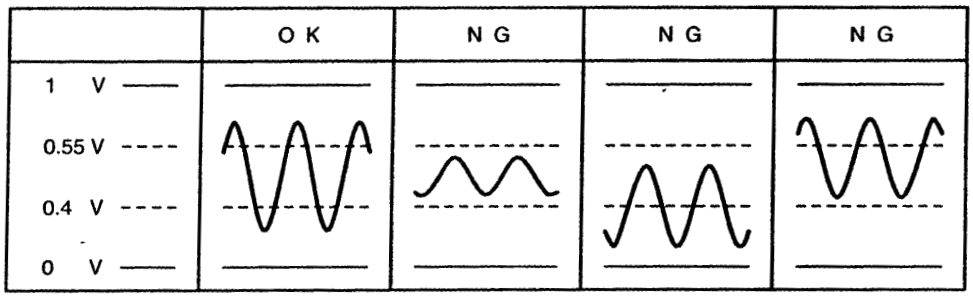
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

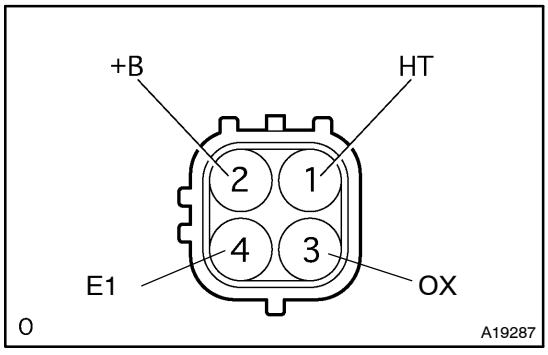
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).



OK	Go to step 9.

NG

3	Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

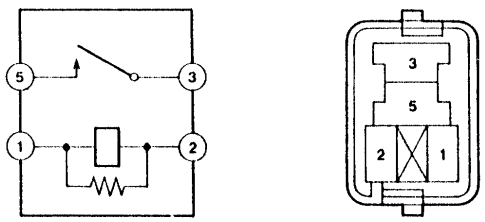
Measure resistance between the terminals HT and +B of the heated oxygen sensor.

Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG	Replace heated oxygen sensor.

OK

4	Check EFI relay.



A19288

PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

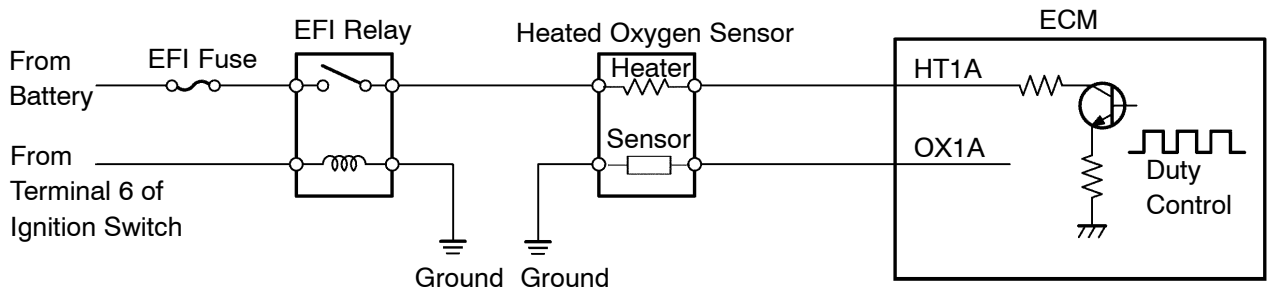
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

5	Check for open and short in harness and connector between ECM and oxygen sensor (bank 1 sensor 1) (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing)



A21410

NG → **Repair or replace harness or connector.**

OK

6	**Check air induction system (See page SF–1).**

CHECK:
Check the air induction system for vacuum leaks.

NG → **Repair or replace induction system.**

OK

7	**Check fuel pressure (See page SF–1).**

CHECK:
Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

Go

10	Is there DTC P130 being output again?

NO → Check for intermittent problems (See page DI–3).

YES

Replace heated oxygen sensor (bank 1 sensor 1).

DTC	P0133	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

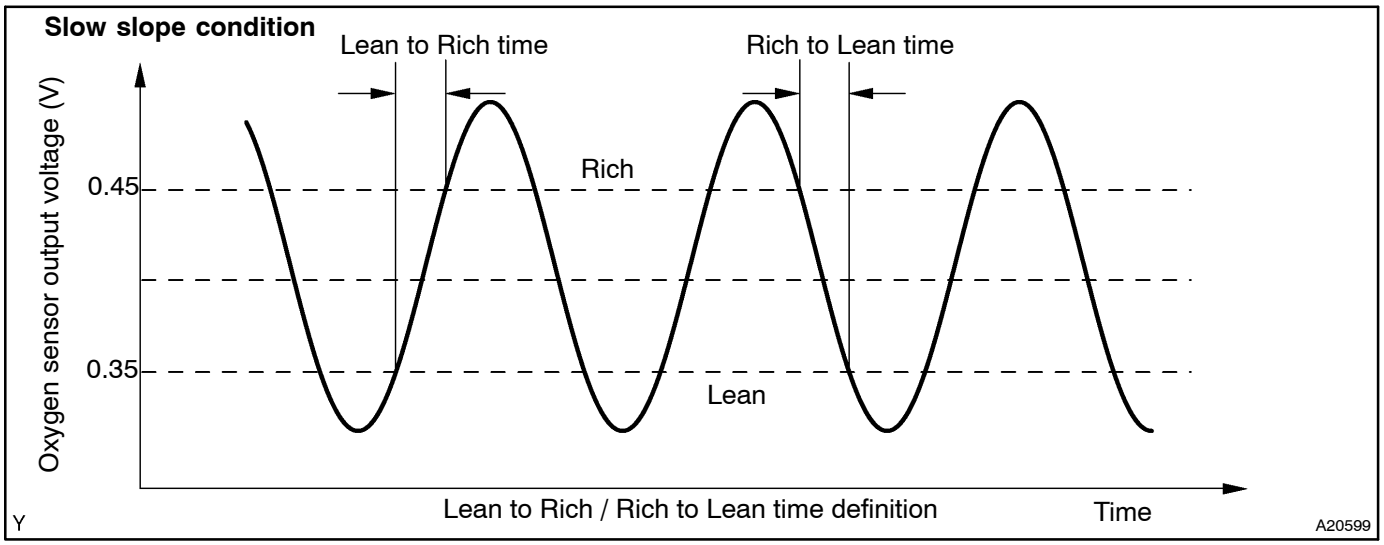
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–65.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	After engine has been warmed up, response time that heated oxygen sensor's output voltage changing between RICH and LEAN is 0.6 second or more during idling. (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • EFI relay • Air induction system • Fuel pressure • Injector • ECM
	Response time of heated oxygen sensor's output voltage in one RICH–LEAN cycle is 6 seconds or more during idling. (2 trip detection logic)	

HINT:
Sensor 1 is the sensor closer to the engine assembly.

MONITOR DESCRIPTION



The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gas. The sensor detects oxygen level in the exhaust gas and sends this signal to the ECM.
The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The heated oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. The heated oxygen sensor generates waveforms of a voltage between 0 V and 1 V in response to the oxygen concentration in exhaust gas. When the output voltage of the heated oxygen sensor is 0.55 V or more, the ECM judges that the air–fuel ratio is RICH. When it is 0.4 V or less, the ECM judges that the air–fuel ratio is LEAN.
The ECM monitors the response feature of the heated oxygen sensor. If the response time of the heated oxygen sensor output status change from RICH to LEAN or vice versa becomes longer, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0133	Front heated oxygen sensor response monitor
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crank position sensor, Vehicle speed sensor, Mass air flow meter
Frequency of operation	Once per driving cycle	
Duration	Within 60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Slow slope condition:		
There is a history that the following conditions were met for 20 sec.:	Condition 1 and 2	
1. Vehicle speed	40 km/h (25 mph)	–
2. Engine RPM	900 rpm	–
Idle	ON	
Vehicle speed	–	5 km/h (3.1 mph)
Fuel system status	Closed loop	
Time after engine start	120 sec.	–
Frequency cruise condition:		
Number of fail judgement is incremented under the following conditions:	(1 and 2) or (3 and 4) is met	
1. Number of cycle time data summation	10 times	–
2. Sum of cycle time data	Sum of cycle threshold	
3. Number of cycle time data summation	1 time	10 times
4. Sum of cycle time data	Sum of cycle threshold x 1.2 x 10 / number of summation	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Slow slope condition:	
Time that output voltage of front heated oxygen sensor increase. from 0.35 V to 0.5 V and that it decreases from 0.5 V to 0.35 V	0.6 sec. or more
Frequency cruise condition:	
Oxygen sensor frequency is judged malfunction under the following conditions:	Both 1 and 2 are met
1. Number of fail judgement	1 time or more
2. Neither pass nor fail determined yet	

COMPONENT OPERATING RANGE

Parameter	Standard value
Voltage output from heated oxygen sensor	Quickly fluctuates between 0.35 V and 0.5 V

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:
Hand–held tester only:
Narrowing down the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished). Perform ACTIVE TEST using hand–held tester (A/F CONTROL).
Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).
HINT:
”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
+25 % → rich output: More than 0.5 V,
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and DTC P0133 will be recorded, and the MIL then comes on.

NOTICE:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Are there any other codes (besides DTC P0133) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs using the hand–held tester or the OBD II scan tool.

RESULT:

Display (DTC output)	Proceed to
P0133	A
P0133 and other DTCs	B

NOTICE:

If any other codes besides P0133 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check the output voltage of oxygen sensor during idling.**

PREPARATION:

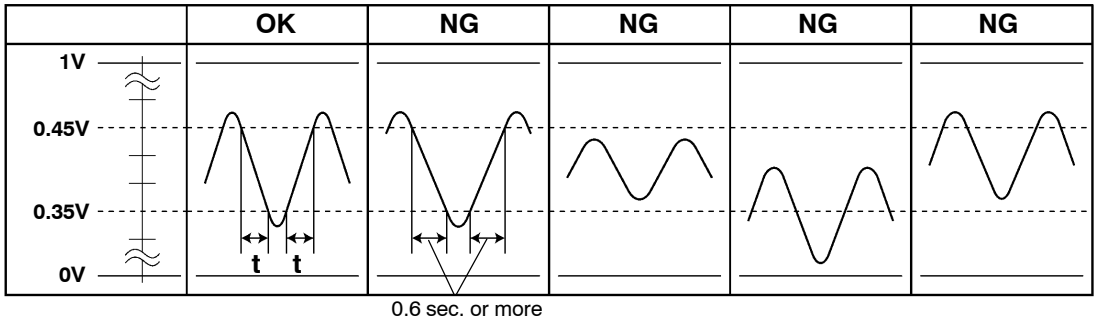
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1.
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

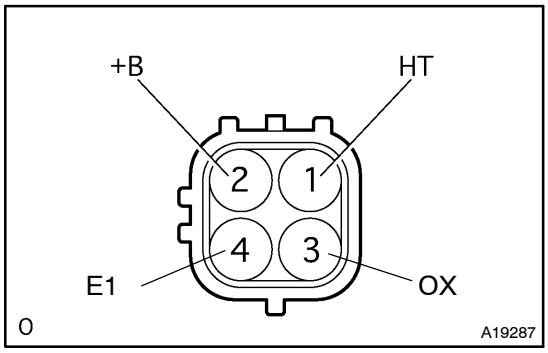
Heated oxygen sensor output voltage:
Alternates between less than 0.35 V and more than 0.45 V, and period of "t" must be less than 0.6 sec. (See the following table).



OK	Go to step 9.

NG

3	Check resistance of heated oxygen sensor heater.

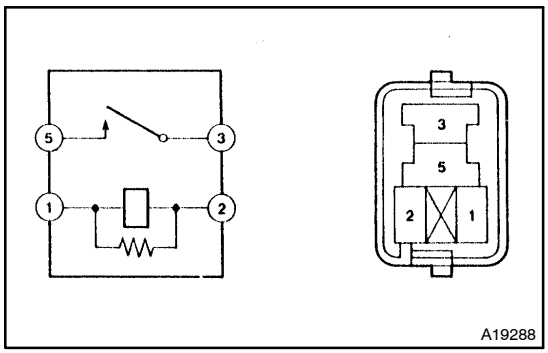


PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.
Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG → **Replace heated oxygen sensor.**

OK

4	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

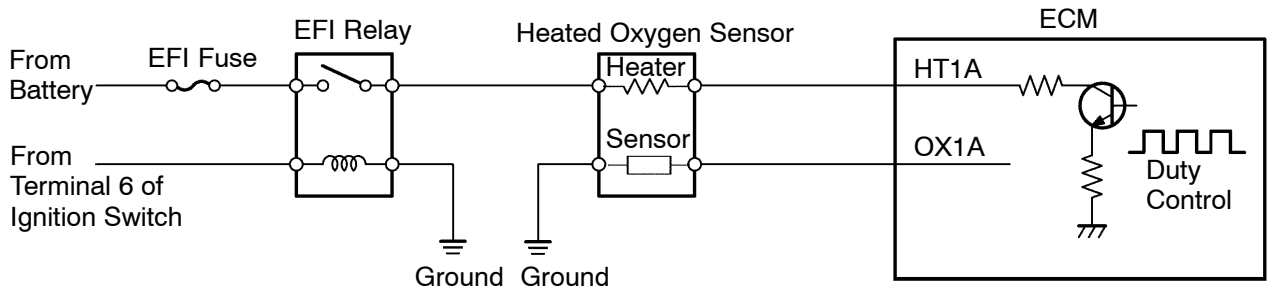
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

5	**Check for open and short in harness and connector between ECM and oxygen sensor (bank 1 sensor 1) (See page IN–30).**

Reference (Bank 1 Sensor 1 System Drawing)



NG → **Repair or replace harness or connector.**

OK ↓

6	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system vacuum leaks.

NG → **Repair or replace induction system.**

OK ↓

7	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK ↓

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern (See page DI–33).**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

Go

10	**Is there DTC P0133 being output again?**

YES → **Check for intermittent problems (See page DI–3).**

NO

Replace heated oxygen sensor (bank 1 sensor 1).

DIC6Q–02

DTC	P0134	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–112.

DTC No.	DTC Detecting Condition	Trouble Area
P0134	After engine is warmed up, heated oxygen sensor (bank 1, 2 sensor 1) output does not indicate RICH (≧0.45 V) even once when conditions (a), (b), (c) and (d) continue for at least 65 sec.: (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 40 to 130 km/h (25 to 81 mph) (c) Throttle valve is not fully closed (d) 180 sec. or more after starting engine	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • Gas leakage in exhaust system • ECM • PCV piping

HINT:
After confirming DTC P0134, check the output voltage of the heated oxygen sensor (bank 1 sensor 1) in the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL” using the hand—held tester or the OBD II scan tool. If the output voltage of the heated oxygen sensor is always less than 0.1 V, the sensor circuit may be open or shorted.

MONITOR DESCRIPTION

The ECM uses the heated oxygen sensor to optimize the air–fuel mixture in closed–loop fuel control. This control helps decrease exhaust emissions by providing the catalyst with a nearly stoichiometric mixture. The sensor detects the oxygen level in the exhaust gas and the ECM uses this data to control the air–fuel ratio. The sensor output voltage ranges from 0 V to 1 V. If the signal voltage is less than 0.4 V, the air–fuel ratio is LEAN. If the signal voltage is more than 0.55 V, the air–fuel ratio is RICH. If the conditions for the closed–loop fuel control are met and after a specified time–period, the sensor’s output signal never indicates RICH, the ECM will conclude that the closed–loop fuel control is malfunctioning. The ECM will illuminate the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0134	Excessive time to enter closed loop
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crank position sensor, Engine coolant temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	65 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Time after following conditions are met:	50 sec.	–
Engine coolant temperature	40°C (104°F)	–
Engine RPM	1,400 rpm	–
Vehicle speed	40 km/h (24.9 mph)	250 km/h (155.4 mph)
Idle	OFF	
Time after engine start	3 min.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Front heated oxygen sensor voltage	Less than 0.45 V

COMPONENT OPERATING RANGE

Parameter	Standard value
In the normal condition, the front heated oxygen sensor voltage	0 to 1 V

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Determining the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

Perform ACTIVE TEST using a hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

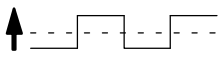
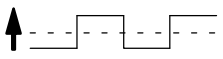
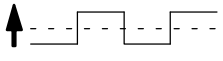
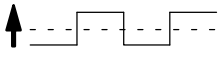
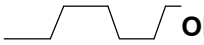
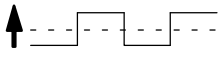
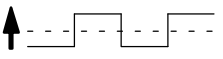
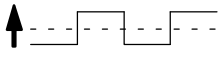
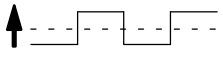
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
+25 % → rich output: More than 0.55 V,
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4V  OK	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4V  OK	—
Case 2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4V  OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4V  OK	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Are there any other codes (besides DTC P0134) being output ?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0134	A
P0134 and other DTCs	B

HINT:

If any other codes besides P0134 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Connect the OBD II scan tool or hand–held tester and read value for voltage output of oxygen sensor (bank 1 sensor 1).**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the engine to the normal operating engine coolant temperature above 75°C (169°F).

CHECK:

Read the output voltage of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

OK:

Heated oxygen sensor outputs a RICH signal (0.45 V or more) at least once.

OK → **Go to step 12.**

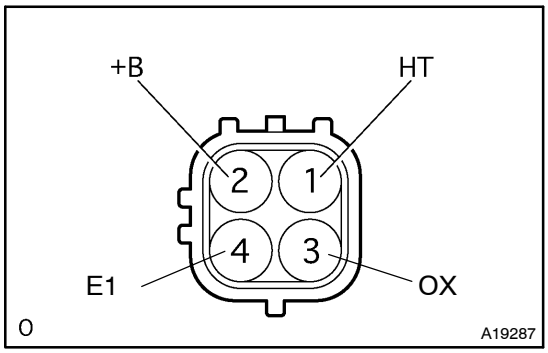
NG

3	Check connection of PCV piping.

NG → Repair or replace PCV piping.

OK

4	Check resistance of heated oxygen sensor heater.



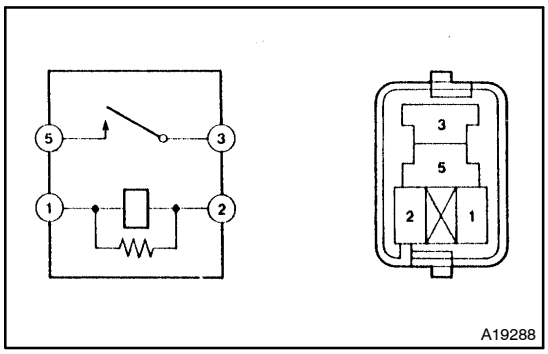
PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.

Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG → Replace heated oxygen sensor.

OK

5	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

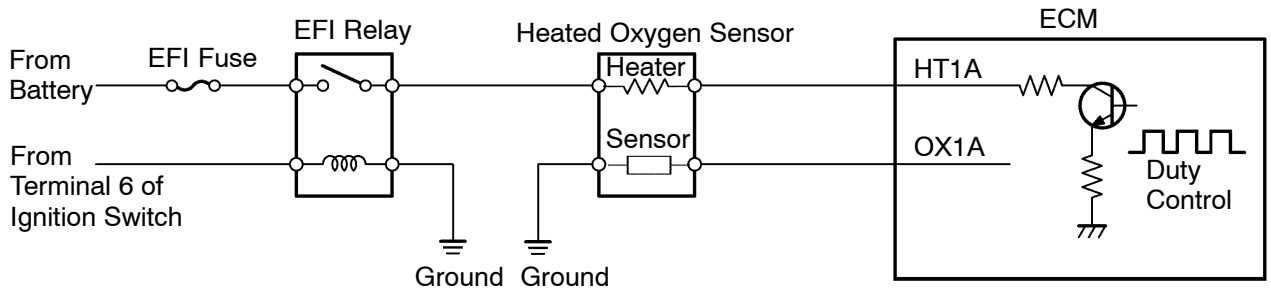
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → Replace EFI relay.

OK

6	**Check for open and short in harness and connector between ECM and oxygen sensor (bank 1 sensor 1) (See page IN–30).**

Reference (Bank 1 Sensor 1 System Drawing)



NG → **Repair or replace harness or connector.**

OK

7	**Check whether misfire is occurred or not by monitoring DTC and data list.**

NG → **Perform troubleshooting for misfire (See page DI–161).**

OK

8	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace induction system.**

OK

9	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK

10	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

11	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

12	**Perform confirmation driving pattern (See page DI–33).**

HINT:

Clear all DTCs prior to performing the confirmation pattern.

Go

13	Is there DTC P0134 being output again?

YES → Replace ECM (See page SF–78).

NO

14	Did vehicle run out of fuel in the past?

NO → Check for intermittent problems.

YES

DTC P0134 is caused by running out of fuel.

DID54–01

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0138	Heated Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–112.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor remains at 0.4 V or more or 0.5 V or less after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Heated oxygen sensor heater • EFI relay
P0138	One of the following conditions is met: • HO2 sensor (sensor 2) voltage does not drop below 0.2 V immediately when fuel–cut starts	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit

MONITOR DESCRIPTION

The ECM monitors the rear heated oxygen sensor in the following 3 items:

(1) If the rear heated oxygen sensor voltage changes between RICH and LEAN while the vehicle is running (repeating acceleration and deceleration), the ECM interprets this as a malfunction and illuminates the MIL, and then sets a DTC.

(2) If the rear heated oxygen sensor voltage does not remain less than 0.05 V for a long period of time while the vehicle is running, the ECM interprets this as a malfunction and illuminates the MIL, and then sets a DTC.

(3) If the sensor's voltage drops below 0.2 V (extremely LEAN status) immediately when the vehicle decelerates and the fuel cut is working. If not, the ECM interprets this as a sensor's response feature deterioration and illuminates the MIL, and then sets DTC.

MONITOR STRATEGY

Related DTCs	P0136: Rear Heated Oxygen (HO2) sensor output voltage P0138: Rear Heated Oxygen (HO2) sensor output voltage
Required sensors/ components (Main)	Rear HO2 sensor
Required sensors/ components (Related)	Mass air flow meter, vehicle speed sensor and engine coolant temperature sensor
Frequency of operation	Continuous: P0138 output voltage Once per driving cycle: Others
Duration	Within 6 minutes: P0136 Within 6 seconds: P0138
MIL operation	Immediate: P0138 output voltage 2 driving cycles: Others
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Case 1 (Output voltage (Crack)):		
Vehicle speed	3 km/h (1.9 mph)	–
Idle	OFF	
Fuel cut	OFF	
Time after fuel cut is turned from ON to OFF	5 sec.	–
Intake air amount per revolution	0.22 g/rev	–
Case 2 (Output voltage):		
All of the following conditions are met:	Conditions 1, 2, 3 and 4	
1. Pass/fail detection in this driving cycle	Not detected	
2. Engine	Running	
3. Time after engine start	0 sec.	–
4. Either of the following conditions is met:	Condition (a) or (b)	
(a) Cumulative time while heated oxygen sensor heater is ON	22 sec.	–
(b) Heated oxygen sensor voltage	0.2 V	–
Case 3 (Slow response):		
Rear oxygen sensor voltage before the fuel cut	0.2 V	–
Catalyst condition	Warmed up	
Engine coolant temperature	70°C (158°F)	–
Fuel cut	Continues	
Pass/fail detection in this driving cycle	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1 (Output voltage (Crack)):	
All of the following conditions are met:	Conditions 1, 2 and 3
1. Cumulative heated oxygen sensor monitor time	190 sec. or more
2. Time while heated oxygen sensor voltage is less than 0.05V	114 sec. or more
3. Maximum heated oxygen sensor rich time (0.45V or more)	Less than 20 sec.
Case 2 (Output voltage):	
Number of heated oxygen sensor voltage ”switching”	0 times or less
”Switching” is counted when the sensor signal crosses the minimum or maximum voltage	
Minimum voltage	0.4 V or less
Maximum voltage	0.5 V or more
Case 3 (Slow response):	
Time until the rear oxygen sensor voltage drops to 0.2 V after fuel cut starts operating	7 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT (MODE 05 DATA)

Refer to page DI–3 for detailed information.

Rear HO2S voltage monitor

If the HO2S sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$07	Minimum rear HO2S voltage	N/A	V
$08	Maximum rear HO2S voltage	N/A	V

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$31	Time to change from LEAN (<0.4 V) to RICH (≧0.5 V)	N/A	sec.
$32	Time to change from RICH (≧0.5 V) to LEAN (<0.4 V)	N/A	sec.

Rear HO2S slow response monitor

If the elapsed time is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$37	Until rear HO2S voltage drops to 0.2 V after fuel–cut starting	N/A	sec.

Rear HO2S element monitor

If all the values ($81, $84, $85 and $87) are out of the standard values, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05 V	Multiplied by 0.3906	%
$84	Percentage of monitoring time when the HO2S voltage is more than 0.7 V	Multiplied by 0.3906	%
$85	Time when the HO2S voltage is 0.45 V or more	Multiplied by 0.2621	sec.
$87	Percentage of monitoring time when the HO2S voltage is more than 0.45 V	Multiplied by 0.3906	%

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

CONFIRMATION DRIVING PATTERN

CAUTION:

Strictly observe posted speed limits, traffic laws, and road conditions when conducting the drive pattern.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch to ON.
(c) Turn the tester ON.
(d) Clear DTCs.
(e) Run the engine at idle for 2 minutes.
(f) Warm up the engine until the engine coolant temperature (ECT) reaches 75˚C (167˚F).
(g) Allow the vehicle to run at 30 mph (48 km/h) or more for 40 seconds or more.
(h) Stop the vehicle and run the engine at idle for 20 seconds or more.
(i) Repeat the steps (g) and (h) at least 8 times in one driving cycle.
(j) Move the shift lever into the second gear.
(k) Depress the accelerator pedal for at least 10 seconds.
(l) Allow the vehicle to run at 30 mph (48 km/h) or more.
(m) Immediately after step (l), release the accelerator pedal for at least 10 seconds without depressing the brake pedal (to execute fuel–cut).
(n) Decelerate the vehicle until the vehicle speed drops less than 6 mph (10 km/h).
(o) Repeat the steps (k), (l), (m) and (n) at least twice in one driving cycle.

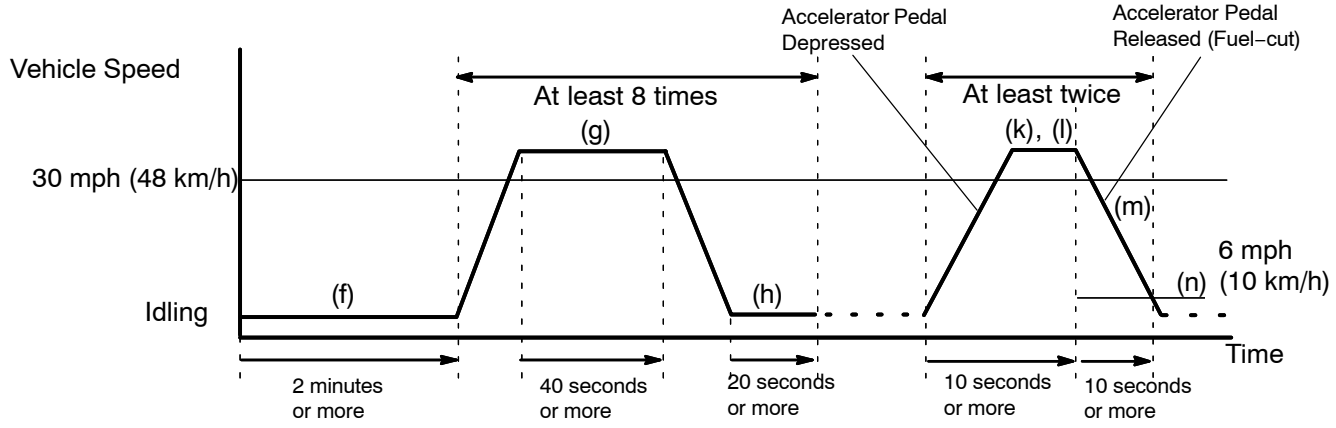
HINT:

The HO2 sensor operates when the following conditions are met:

- 2 minutes or more passed after the engine start.
- The ECT is 75˚C (167˚F) or more.
- Cumulative running time at 30 mph (48 km/h) or more exceeds 6 minutes.
- Closed loop.
- Fuel–cut is operated for 8 seconds or more.

HO2 sensor Monitor Drive Pattern

ECT: 75˚C (167˚F) or more



INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Malfunctioning areas can be found by performing the ACTIVE TEST / A/F CONTROL operation (Heated Oxygen [HO2] sensor or other trouble areas). The A/F CONTROL operation can determine whether the front HO2 sensor (sensor1), rear HO2 sensor (sensor 2) and other potential trouble areas are malfunctioning or not.

(a) Perform A/F CONTROL using the hand–held tester.

HINT:

The A/F Control operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.

(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch to ON and turn the hand–held tester ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) On the hand–held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL operation with the engine idling (press the right or left button).

Result:

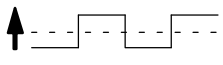
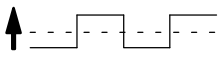
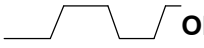
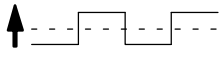
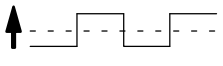
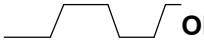
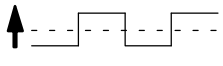
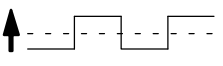
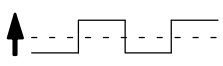
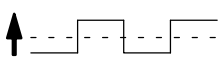
The heated oxygen sensor reacts in accordance with increase and decrease of the fuel injection volume.

+25 % → Rich output: More than 0.5 V

–12.5 % → Lean output: Less than 0.4 V

NOTICE:

The front heated oxygen sensor has an output delay of a few seconds and the rear heated oxygen sensor has a maximum output delay of approximately 20 seconds.

Result	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Main Suspected Trouble Areas
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	—
Case 2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Sensor 1: front sensor (sensor 1, sensor heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  **OK**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Sensor 2: rear sensor (sensor 2, sensor heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage from exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check the graph of the voltage outputs of both front and rear heated oxygen sensors.

To display the graph, enter ACTIVE TEST/ A/F CONTROL / USER DATA, select ”O2S B1S1 and O2S B1S2” by pressing the ”YES” button and then the ”ENTER”. Then press the ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs are set, and the MIL then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the hand–held tester. Freeze frame data records the engine conditions when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- If the OX1B wire from the ECM connector is short–circuited to the +B wire, DTC P0136 is set.

1	**Are there any other codes (besides DTC P0136 or P0138) being output?**

YES → **Go to relevant DTC chart (See page DI–42).**

NO

2	**Check output voltage of heated oxygen sensor.**

PREPARATION:

(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.

(b) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.

CHECK:

Read the voltage output of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm for 3 minutes by using the accelerator pedal.

OK:

Heated oxygen sensor output voltage: Fluctuates repeatedly between less than 0.4 V and more than 0.5 V.

OK → **Go to step 6.**

NG

3	**Inspect heated oxygen sensor (heater resistance) (See page SF–75).**

NG → **Replace heated oxygen sensor.**

OK

4	**Inspect EFI relay (See page SF–56).**

NG → **Replace EFI relay.**

OK

5	Check for open and short in harness and connectors between ECM and heated oxygen sensor (See page IN–30).

NG → Repair or replace harness or connector.

OK ↓

6	Perform confirmation of driving pattern.

GO ↓

7	Is DTC P0136 or P0138 output again?

NO → Check for intermittent problems (See page DI–3).

YES ↓

Replace heated oxygen sensor.

DIC6S–02

DTC	P0171	System too Lean (Bank 1)

DTC	P0172	System too Rich (Bank 1)

CIRCUIT DESCRIPTION

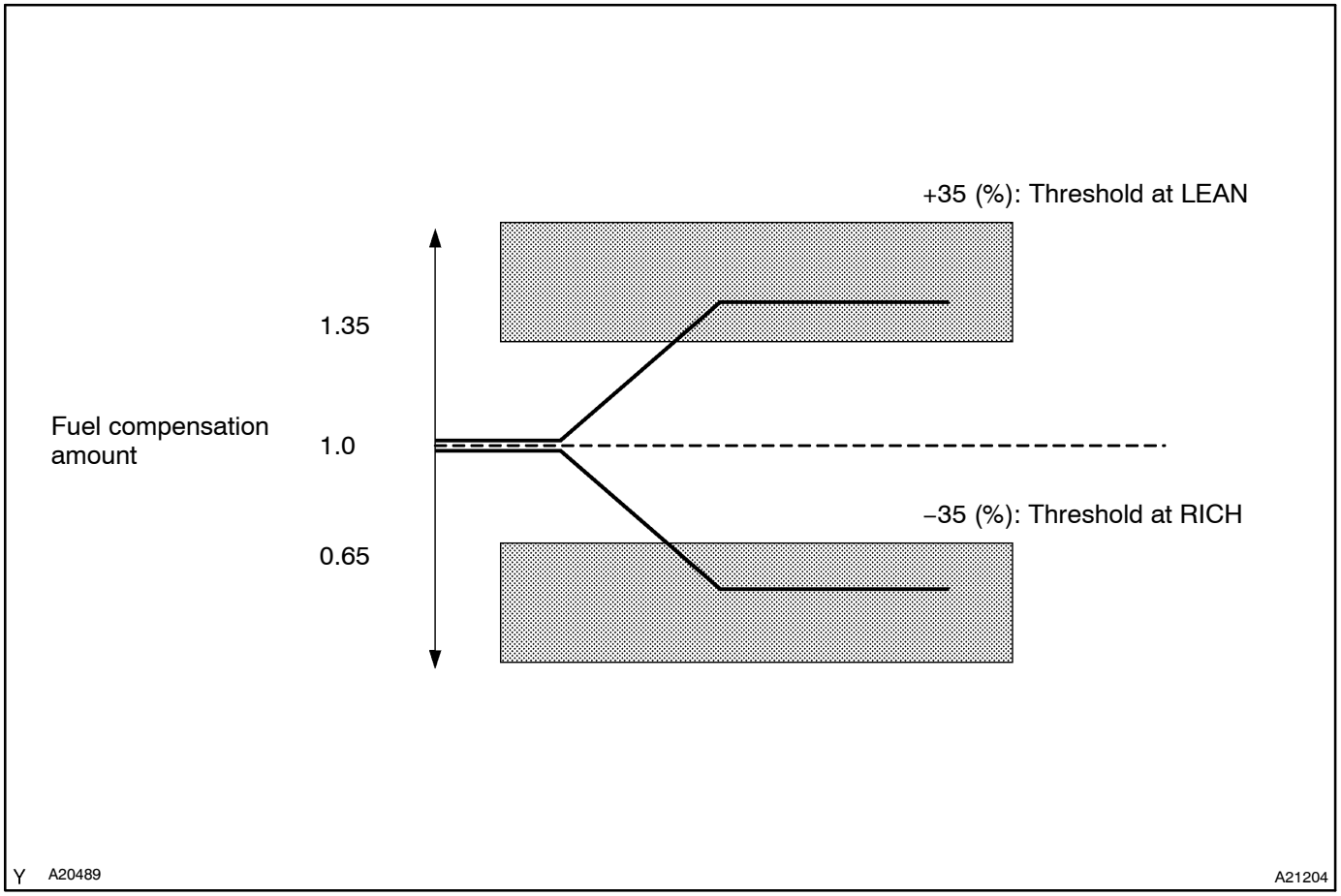
The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short–term fuel trim and the long–term fuel trim.
The short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio. This variance triggers a reduction in the fuel volume if the air–fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.
The long–term fuel trim is the overall fuel compensation carried out in long–term fuel trim to compensate for a continual deviation of the short–term fuel trim from the central value, due to individual engine differences, wear overtime and changes in the operating environment.
If both the short–term fuel trim and the long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated.

DTC No.	DTC Detection Condition	Trouble Area
P0171	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Heated oxygen sensor (bank 1, sensor 1) • EFI relay • PCV valve and hose • ECM
P0172	When air–fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Heated oxygen sensor (bank 1, sensor 1) • EFI relay • ECM

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 may be recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 35 % (engine coolant temperature is more than 75 °C (167°F)), the system is functioning normally.

MONITOR DESCRIPTION



Under closed–loop fuel control, fuel injection amount that deviates from the ECM's estimated fuel amount will cause a change in the long–term fuel trim compensation value. This long–term fuel trim is adjusted when there are persistent deviations in the short–term fuel trim values. And the deviation from a simulated fuel injection amount by the ECM affects a smoothed fuel trim learning value. The smoothed fuel trim learning value is the combination of smoothed short–term fuel trim (fuel feedback compensation value) and smoothed long–term fuel trim (learning value of the air–fuel ratio). When the smoothed fuel trim learning value exceeds the DTC threshold, the ECM interprets this as a fault in the fuel system and sets a DTC.
Example:
If the smoothed fuel trim learning value is more than 1.35 or less than 0.65, the ECM interprets this as a malfunction in the fuel system.

MONITOR STRATEGY

Related DTCs	P0171	Fuel system lean (Bank 1)
	P0172	Fuel system rich (Bank 1)
Required sensors/components	Main sensors/components	Front oxygen sensor
	Related sensors/components	Engine coolant temperature sensor, Mass air flow meter, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	11 V	–
Fuel system	Closed–loop	
Throttle position learning	Completed	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine RPM	–	1,100 rpm
2. Intake air amount per revolution	0.14 g/sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Purge–cut	Executing
Either of the following conditions is met:	Condition 1 or 2
1. Average between short–term fuel trim and long–term fuel trim	35% or more (varies with ECT)
2. Average between short–term fuel trim and long–term fuel trim	–35% or less (varies with ECT)

WIRING DIAGRAM

Refer to DTC P0130 on page DI–112.

INSPECTION PROCEDURE

HINT:
Hand–held tester only:
Determining the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).
Perform ACTIVE TEST using a hand–held tester (A/F CONTROL).
HINT:
”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

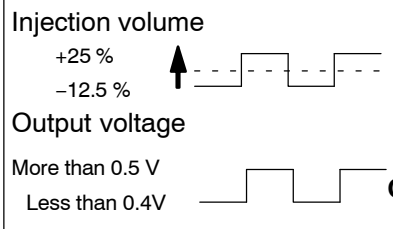
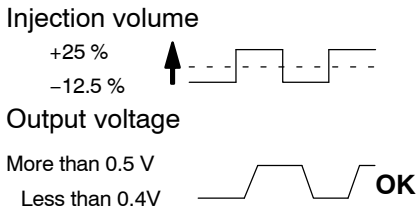
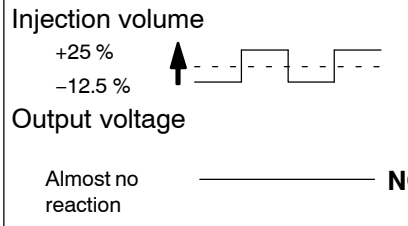
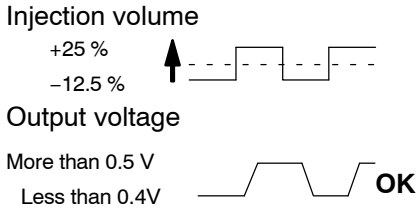
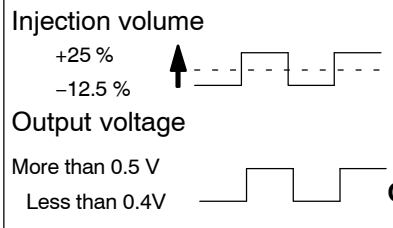
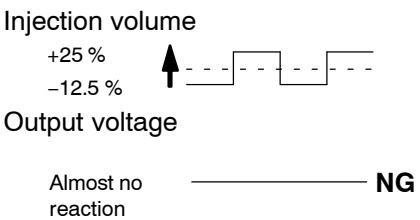
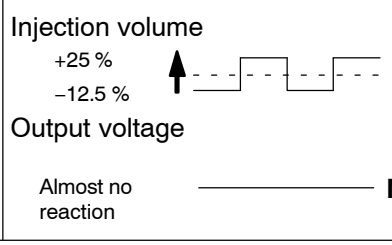
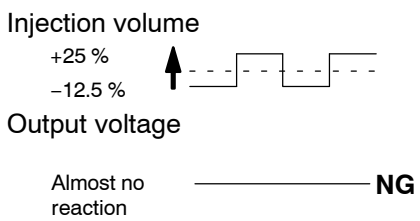
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the injection volume
+25 % → rich output: More than 0.5 V,
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspect trouble area
Case 1			—
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

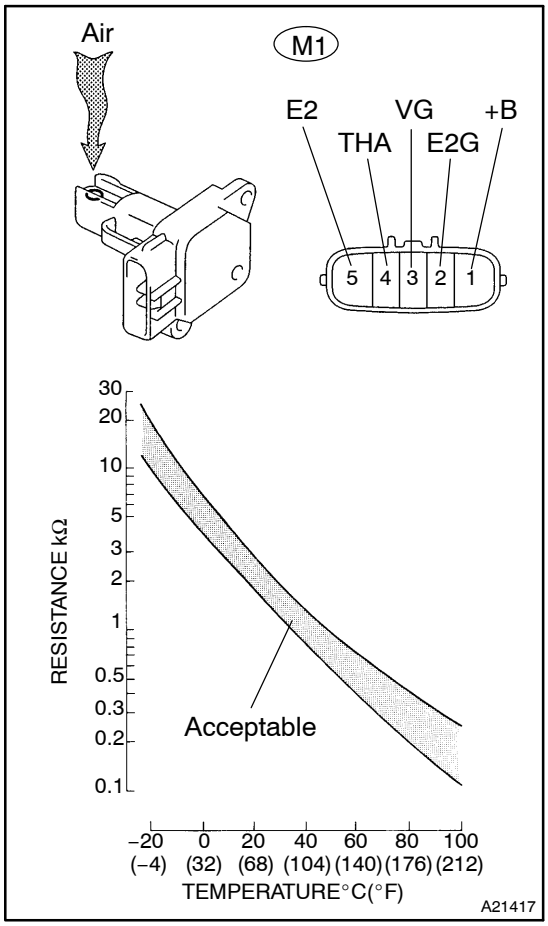
OK

3	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

4	Check mass air flow meter.



PREPARATION:

Remove the mass air flow sensor.

CHECK:

(a) Inspect output voltage.
  (1) Apply battery voltage terminals +B and E2G.
  (2) Connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.
  (3) Blow air into the mass air flow sensor, and check that the voltage fluctuates.

(b) Resistance inspection.
  Measure the resistance between the terminals of the intake air temperature sensor.

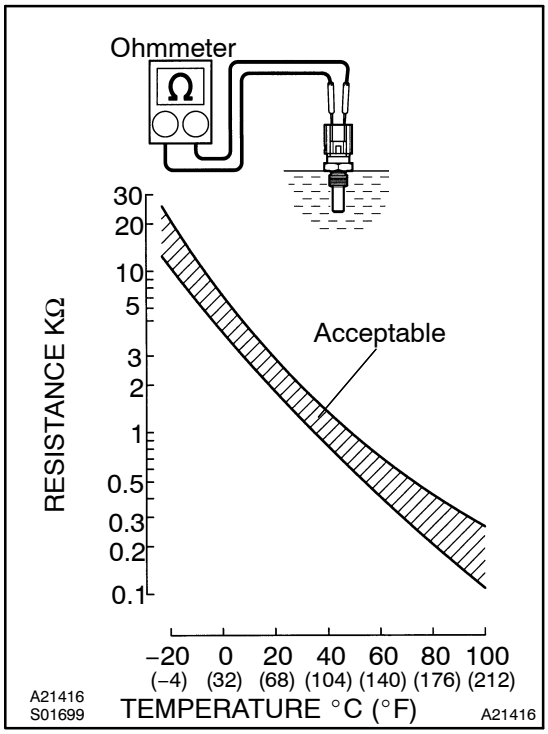
OK:

Tester Connection	Temperature	Specified Condition
THA (M1–4) – E2 (M1–5)	–20 °C (–4 °F)	13.6 to 18.4 kΩ
	20 °C (68 °F)	2.21 to 2.69 kΩ
	60 °C (140 °F)	0.49 to 0.67 kΩ

NG → **Replace mass air flow meter.**

OK

5	Check engine coolant temperature sensor.



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

OK:

Tester Connection	Temperature	Specified Condition
1 – 2	20°C (68°F)	2.32 to 2.59 kΩ
	80°C (176°F)	0.310 to 0.326 kΩ

NOTICE:

If you checking the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **Replace engine coolant temperature sensor.**

OK

6	Check for spark and ignition (See page IG–1).

NG → **Repair or replace.**

OK

7	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK

8	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

9	Check the output voltage of oxygen sensor during idling.

PREPARATION:

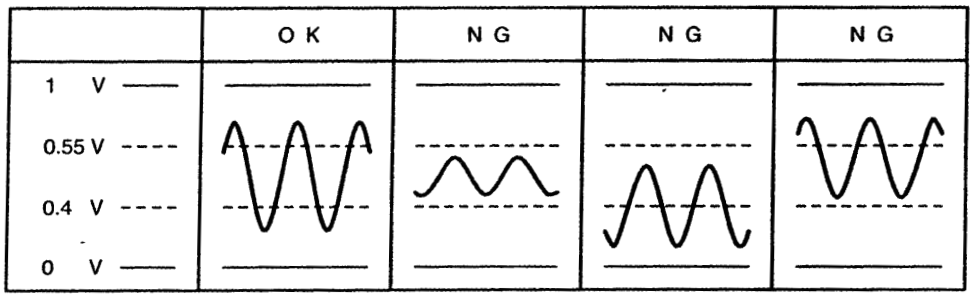
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

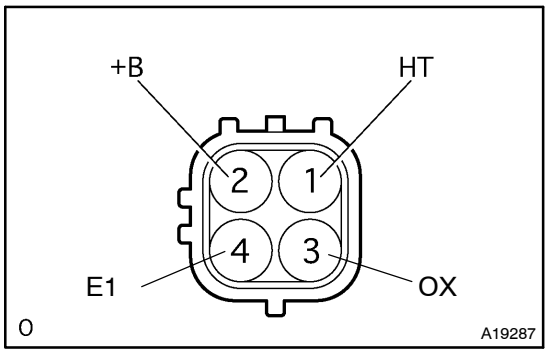
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).



OK	Go to step 17.

NG

10	Check resistance of heated oxygen sensor heater.



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

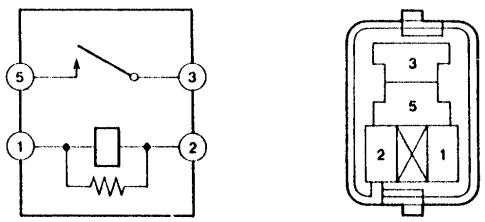
Measure resistance between the terminals HT and +B of the heated oxygen sensor.

Resistance: Bank 1 Sensor 1: 5 to 10 Ω (20 °C (68 °F))
Bank 1 Sensor 2: 11 to 16 Ω (20 °C (68 °F))

NG	Replace heated oxygen sensor.

OK

11	Check EFI relay.



A19288

PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

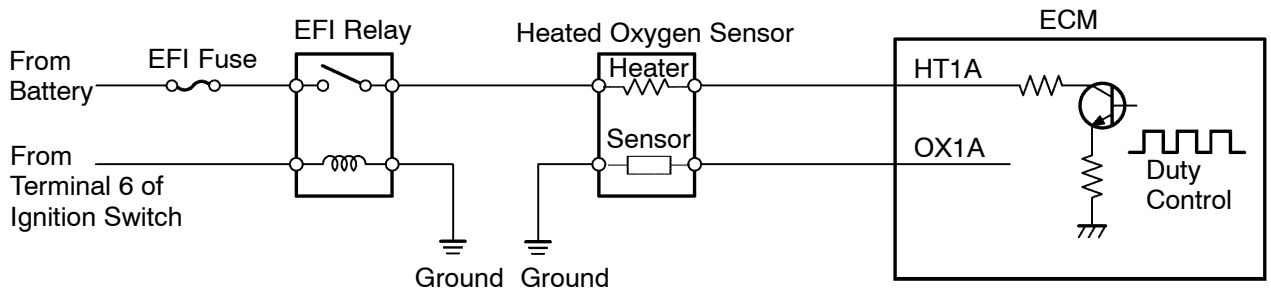
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

12	Check for open and short in harness and connector between ECM and oxygen sensor (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing)



A21410

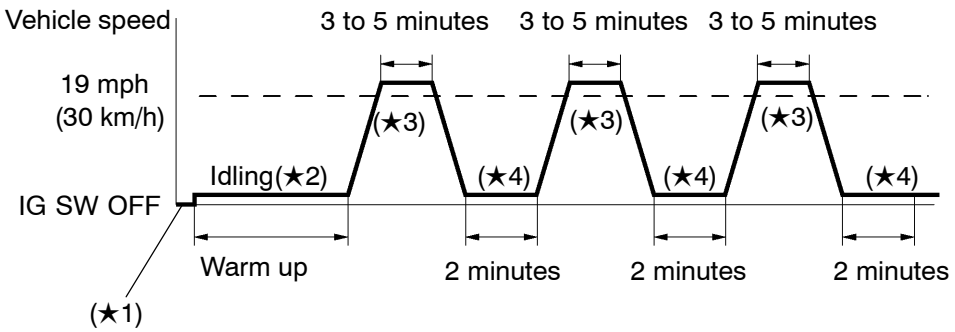
NG → **Repair or replace harness or connector.**

OK

13	**Replace heated oxygen sensor.**

Go

14	**Perform confirmation driving pattern.**



Y A09299 A21418

(a) Disconnect the battery terminal and wait for a minute (clear learning value of the air fuel ratio). (★1)
(b) Connect the hand–held tester to the DLC3. (★1)
(c) Switch the hand–held tester from the normal mode to the check mode (See page DI–3). (★1)
(d) Start the engine and let it idle until engine coolant temperature is 75 °C (167 °F) or more. (★2)
(e) Drive the vehicle at 19 mph (30 km/h) or more for 3 minutes or more. (★3)
(f) Let the engine idle for approx. 2 minutes. (★4)
(g) Perform steps (e) and (g) at least 3 times.

HINT:

If a malfunction exists, the MIL will be illuminated during step (f).

NOTICE:

If the conditions in this test are not strictly followed, detecting a malfunction may be difficult. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (e) to (f), and then do step (f) again.

Go

15	**Is there DTC P0171 or P0172 being output again?**

YES → **Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).**

NO

16	**Confirm if vehicle has run out of fuel in past.**

NO → **Check for intermittent problems (See page DI–3).**

YES

DTC P0171 or P0172 is caused by running out of fuel.

17	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

18	**Is there DTC P0171 or P0172 being output again?**

No → **Go to step 22.**

Yes

19	**Replace heated oxygen sensor.**

Go

20	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

21	**Is there DTC P0171 or P0172 being output again?**

B → **Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).**

A

22	**Confirm if vehicle has run out of fuel in past.**

NO → **Check for intermittent problems (See page DI–3).**

YES

DTC P0171 or P0172 is caused by running out of fuel.

DIC6T–02

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

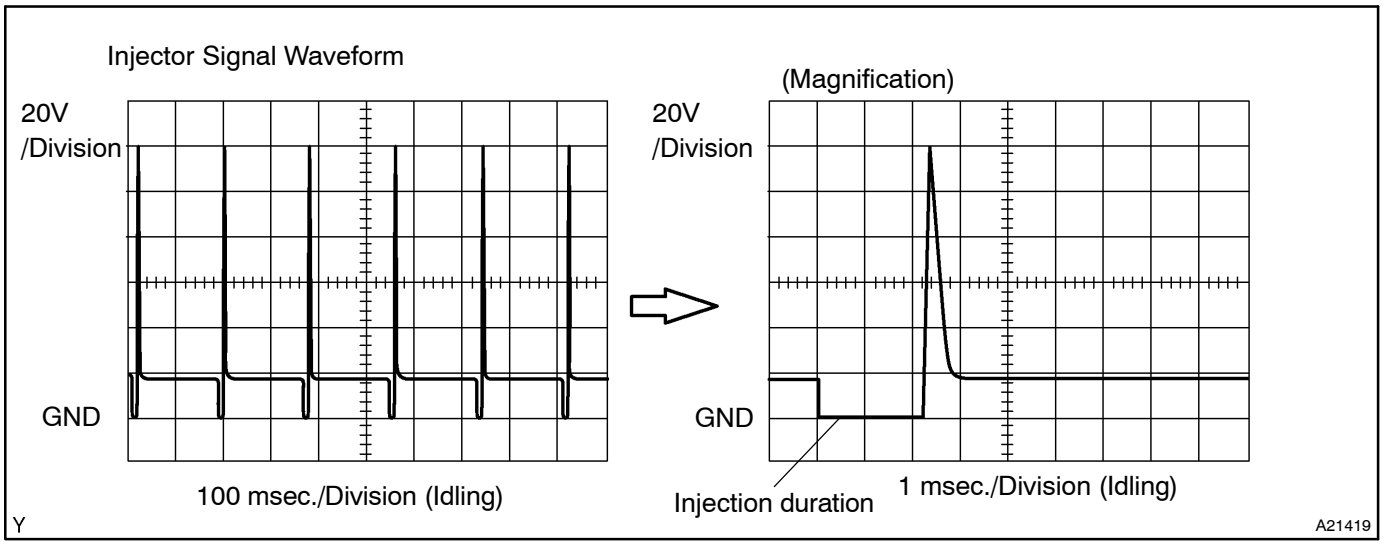
CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) are output in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emission levels. High concentrations of HC can also cause the temperature of the catalyst to increase, possibly damaging the catalyst. To prevent increases in emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring a misfire, the ECM uses both the camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. A misfire is counted when crankshaft rotation speed variations exceed threshold values.
If the misfiring rate exceeds the threshold value and could cause emissions deterioration, the ECM illuminates the MIL.

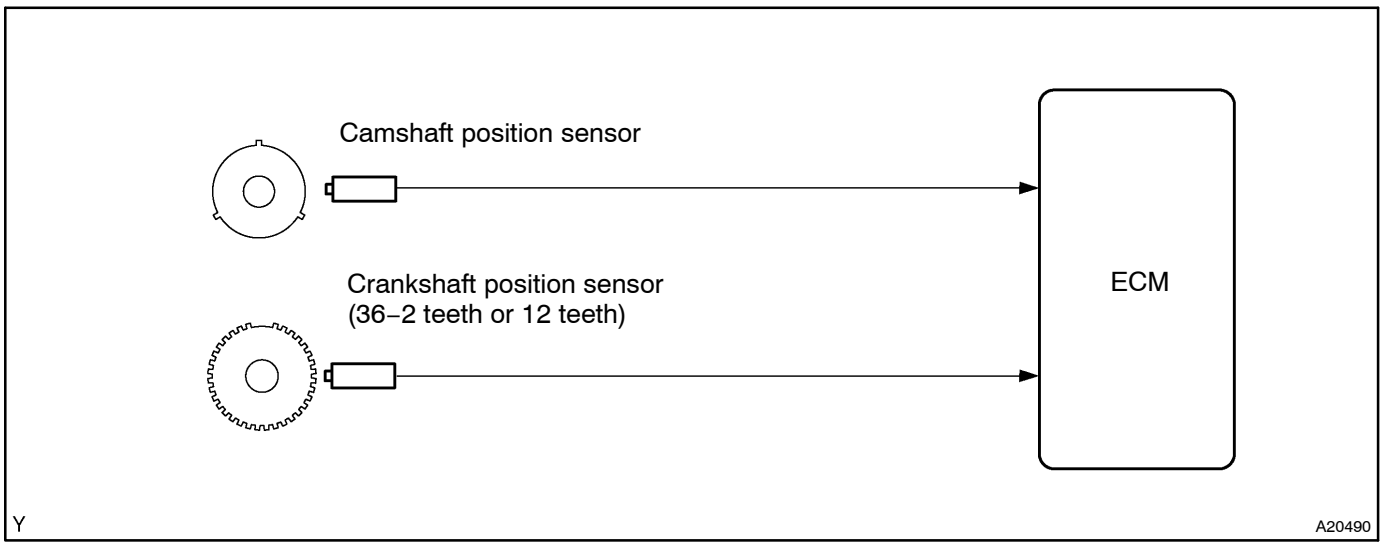
DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinder is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow sensor • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	Misfiring of each cylinder is detected	

HINT:
When codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

Reference: Inspection using oscilloscope
With the engine idling, check the waveform between terminals #10 to #40 and E01 of the ECM connectors.
HINT:
The correct waveform is as shown.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:
The ECM will illuminate the MIL when the percentage of misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will illuminate the MIL. Four occurrences are required to illuminate the MIL 1,000 revolutions after engine start.
The ECM blinks the MIL (MIL blinks immediately) if:

- Within 200 engine revolutions at a high rpm, the threshold for ”percentage of misfire causing catalyst damage” is reached 1 time.
- Within 200 engine revolutions at a normal rpm, the threshold for ”percentage of misfire causing catalyst damage” is reached 3 times.

MONITOR STRATEGY

Related DTCs	P0300	Random/Multiple cylinder misfire detected
	P0301	Cylinder 1 misfire detected
	P0302	Cylinder 2 misfire detected
	P0303	Cylinder 3 misfire detected
	P0304	Cylinder 4 misfire detected
Required sensors/components	Main sensors/components	Camshaft position sensor, Crankshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	Every 1,000 revolutions (soon after engine is started: once, other 4 times) (emission related misfire) Every 200 revolutions (1 or 3 times) (catalyst deteriorating misfire)	
MIL operation	2 driving cycles MIL: ON Immediate: MIL blinking (Catalyst deteriorating misfire)	
Sequence of operation	None	

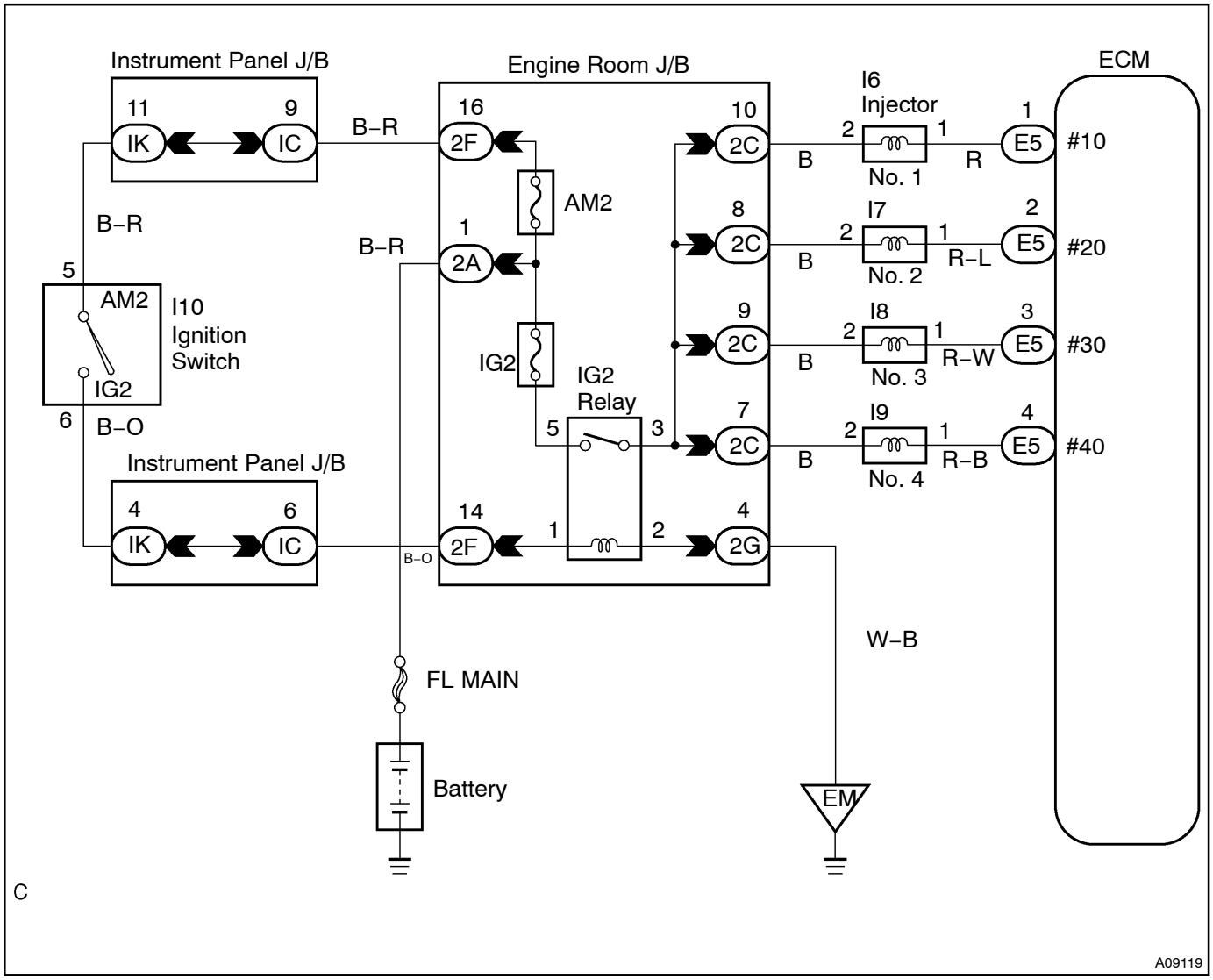
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Battery voltage	8 V	–
Throttle position learning	Completed	
VVT system	Normal operate (by scan tool)	
Engine speed fluctuation	Engine speed should not have changed rapidly	
Engine RPM	450 rpm	7,000 rpm
Engine coolant temperature	–10°C (14°F)	–
Fuel–cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Emission–related–misfire:	
Misfire rate	1.6 % or more
Catalyst–damage–misfire (MIL blinks):	
Number of misfire per 200 revolutions	88 or more (varies with intake air amount and RPM)

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record DTCs and the freeze frame data.
(c) Set the check mode using the hand–held tester (See page DI–3).
(d) Read the value on the misfire counter for each cylinder when idling. If the value is displayed on the misfire counter, skip the following procedure of confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list.

If you have no hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

Do not turn the ignition switch OFF during the confirmation driving pattern. This switches the diagnosis system from the check mode to the normal mode, so all the DTCs and freeze frame data will be erased.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1,000 rpm	4 minutes or more
2,000 rpm	3 minutes and 30 seconds or more
3,000 rpm	1 minute and 30 seconds or more

(f) Check whether there is misfire, and DTC and the freeze frame data. After that, record them.
(g) Turn the ignition switch OFF and wait for at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non–misfire DTCs first.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- On 6 and 8 cylinder engines, misfiring cylinder identification is disabled at high engine speed and only a general misfire fault code P0300 is stored instead of a cylinder specific misfire fault code (P0301 to P0308). If the misfire starts in a high engine speed area or the misfire occurs only in a high engine speed area, only code P0300 will be stored.

When only a general misfire fault code like P0300 is stored:

- Erase the general misfire fault code from the hand–held tester or OBD II scan tool.
- Start the engine and drive the confirmation pattern (See page DI–33).
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Perform repairs on the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing repairs, drive the confirmation pattern again and confirm that no misfire occurs.
- When either of SHORT FT #1, LONG FT #1 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is becoming to RICH (–20 % or less) or LEAN (+20 % or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm–up.
- If the misfire cannot be reproduced, the following reasons may apply: 1) the vehicle has low fuel, 2) improper fuel is being used, and 3) the ignition plug is contaminated.
- Be sure to check the value on the misfire counter after the repair.

1	**Are there any other codes (besides DTC P0300, P0301, P0302, P0303 or P0304) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
”P0300, P0301, P0302, P0303 and/or P0304”	A
”P0300, P0301, P0302, P0303 and/or P0304” and other DTCs	B

HINT:

If any other codes besides P0300, P0301, P0302, P0303 or P0304 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check harness, connector and vacuum hose in engine room.**

CHECK:

(a) Check the connection conditions of the wire harness and connector.
(b) Check for the disconnection, piping and break of the vacuum hose.

NG → **Repair or replace, then confirm that there is no misfire (See confirmation driving pattern).**

OK

3	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

4	**Connect hand–held tester, and read the number of misfire.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#4.

CHECK:

Read the number of misfire on the hand–held tester or the OBD II scan tool.

HINT:

When a misfire is not reproduced, be sure to branch below based on the stored DTC.

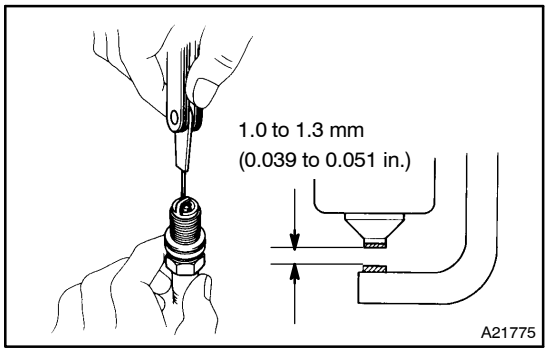
RESULT:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 15.**

A

5	Check spark plug and spark of misfiring cylinder.



PREPARATION:

(a) Disconnect the ignition coil assembly.
(b) Remove the spark plug.

CHECK:

(a) Check for carbon deposits on electrode.
(b) Check the spark plug type (See page IG–1).
(c) Check electrode gap.

OK:

(b) No large carbon deposit present.
Not wet with gasoline or oil.
(c) Electrode gap: 1.0 to 1.3 mm (0.039 to 0.051 in.)

NOTICE:

If adjusting the gap of a new spark plug, bend only the base/ ground" electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.

PREPARATION:

(a) Install the spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground spark plug.

CHECK:

Check if spark occurs while engine is being cracked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK	Go to step 8.

NG

6	**Change normal spark plug and check spark of misfiring cylinder.**

PREPARATION:

(a) Change to the normal spark plug.
  (1) Remove the spark plug that may be faulty from the ignition coil assembly.
  (2) Install the spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK → **Replace spark plug.**

NG

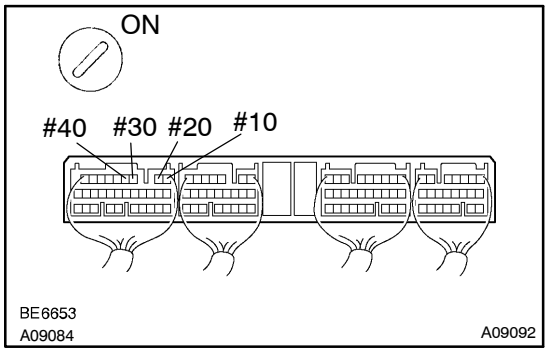
7	**Check for open and short in harness and connector between ignition coil and ECM (See page IN–30).**

OK → **Replace ignition coil with igniter, then confirm that there is no misfire.**

NG

Repair or replace harness or connector.

8	**Check voltage of ECM terminal for injector of failed cylinder.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

OK	**Go to step 11.**

NG

9	**Check resistance of injector of misfiring cylinder (See page SF–22).**

NG	**Replace injector.**

OK

10	**Check for open and short in harness and connector between ignition switch and injector, injector and ECM of misfiring cylinder (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

11	**Check injector injection and volume of misfiring cylinder (See page SF–22).**

NG	**Replace injector.**

OK

12	**Check compression pressure of misfiring cylinder (See page EM–3).**

NG → **Repair or replace.**

OK

13	**Check valve clearance of misfiring cylinder (See page EM–4).**

NG → **Adjust valve clearance.**

OK

14	**Check result of step 4 switch step by number of misfire cylinder.**

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B → **Check for intermittent problems (See page DI–3).**

A

15	**Check valve timing (Check for loose or a jumped tooth of the timing chain) (See page EM–16).**

NG → **Adjust valve timing.**

OK

16	**Check fuel pressure (See page SF–1).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–6).**

OK ↓

17	**Check mass air flow meter.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.

(b) Turn the ignition switch ON.

CHECK:

(a) Check the intake air temperature.

(1) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

OK:

Equivalent to ambient temperature

(b) Check the air flow rate.

(1) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

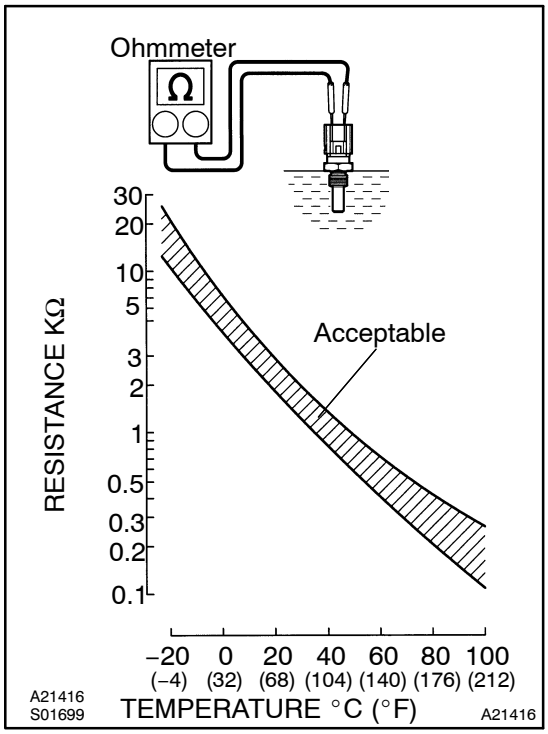
OK:

Condition	Air flow rate (gm/s)
Ignition switch ON (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
From idling to quickly accelerating	Air flow rate fluctuates

NG → **Repair mass air flow meter.**

OK ↓

18	Check engine coolant temperature sensor.



(a) Remove the engine coolant temperature sensor.
(b) Measure the resistance between the terminals of the engine coolant temperature sensor.
Standard:

Tester Connection	Temperature	Specified Condition
1 – 2	20°C (68°F)	2.32 to 2.59 kΩ
	80°C (176°F)	0.310 to 0.326 kΩ

NOTICE:
If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.
HINT:
Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (warm up or allow to cool down) and repeat the test.

NG → **Replace engine coolant temperature sensor.**

OK

19	Check result of step 4 switch step by number of misfire cylinder.

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B → **Go to step 5.**

A

Check intermittent problems (See page DI–3).

DI38A–15

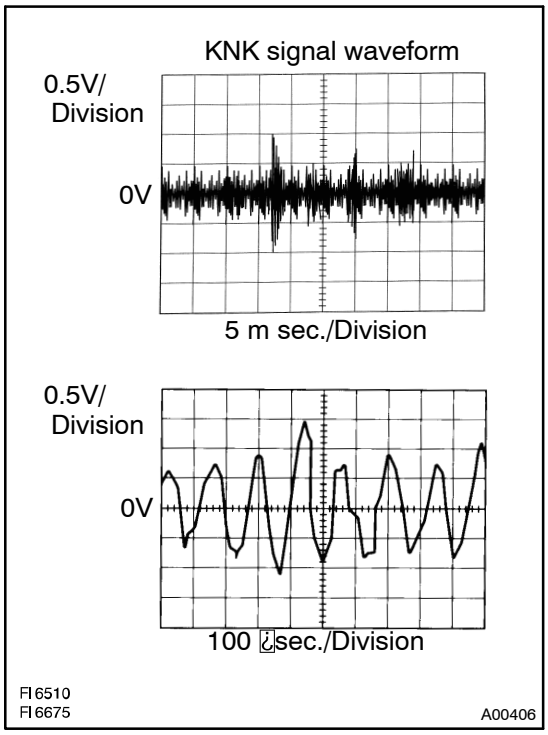
DTC	P0325	Knock Sensor 1 Circuit (Bank 1 or Single Sensor)

CIRCUIT DESCRIPTION

The knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed, 2,000 rpm or more	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM

HINT:
If the ECM detects above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.



Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm), measure between terminal KNK of the ECM connector and body ground.

HINT:
The correct waveforms are as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 80 μ sec.
  (Normal mode vibration frequency of knock sensor: 12.5 kHz

HINT:
If normal mode vibration frequency is not 7.6 kHz the sensor is malfunctioning.

MONITOR DESCRIPTION

The knock sensor located on the cylinder block, detects spark knock.
When spark knock occurs, the sensor pick–up vibrates in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the spark knock.
The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level is too low for more than 10 sec., and if the knock sensor output voltage is out of normal range,the ECM interprets this as a fault in the knock sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0325	Knock sensor (Bank 1) range check or rationality
Required sensors/components	Main sensors/components	Knock sensor
	Related sensors/components	Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	Immediate	
Sequence of operation	None	

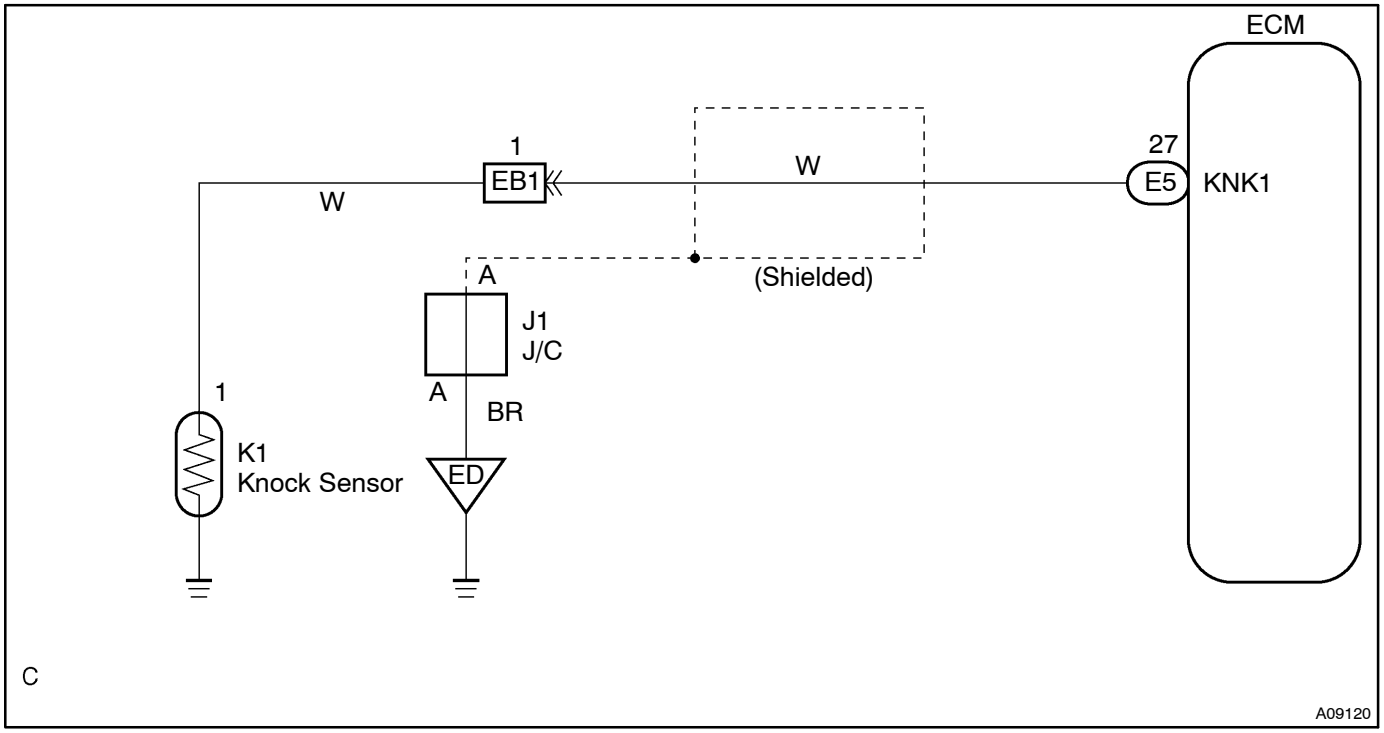
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	10 V	–
Idle	OFF	
Time after engine start	5 sec.	–
Engine coolant temperature	60°C (140°F)	–
Intake air amount per revolution	0.3 g/rev	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Sensor failure is indicated when the knock sensor output level is below the specific threshold for:	10 sec.

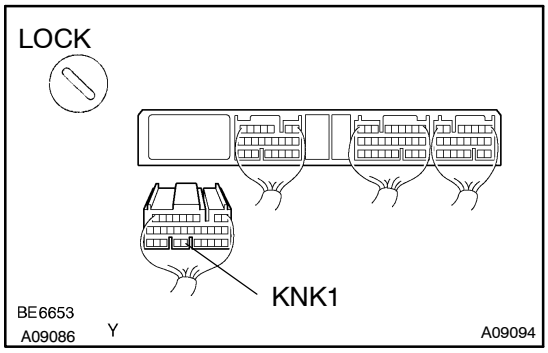
WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check continuity between terminal KNK1 of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E5 connector of the ECM.

CHECK:

Measure resistance between terminal KNK1 of the ECM connector and body ground.

OK:

Resistance: 10 kΩ or higher

OK	**Go to step 3.**

NG

2	**Check knock sensor 1 (See page SF–72).**

NG	**Replace knock sensor 1.**

OK

3	**Check for open and short in harness and connector between ECM and knock sensor 1 (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

4	**Does malfunction disappear when a good knock sensor 1 is installed?**

YES	**Replace knock sensor 1.**

NO

Replace ECM (See page SF–78).

DIC6U–02

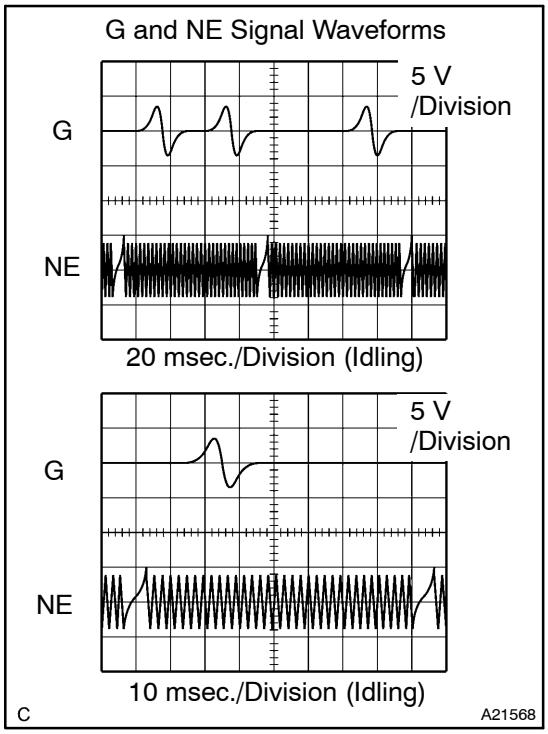
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

DTC	P0339	Crankshaft Position Sensor ”A” Circuit Intermittent

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals for each engine revolution. This sensor monitors a plate (timing rotor) located on the crankshaft timing pulley and is used by the ECM to detect crankshaft angle and engine speed (RPM/NE). As the crankshaft timing pulley rotates through an engine revolution, this sensor communicates the rotation of the NE signal plate as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking. (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	
P0339	If conditions (a) through (c) are met: (a) NE ≧ 1,000 rpm (b) NE signal is not detected for over 50 m sec. (c) Engine is not cranking	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the crankshaft sensor even though the engine is cranking, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0335	Crankshaft position sensor range check or rationality
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Engine speed sensor
Frequency of operation	Continuous	
Duration	Case 1: 4.7 sec. Case 2: 0.016 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

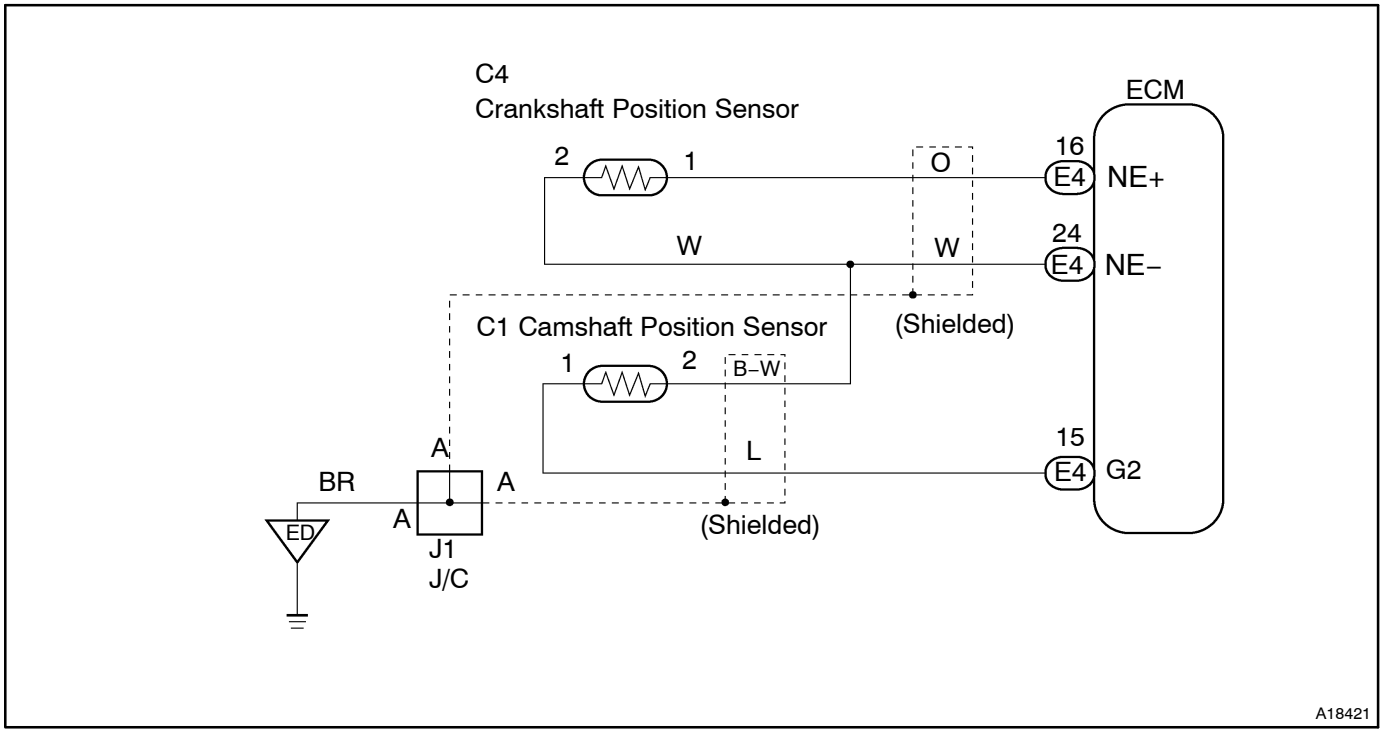
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Case 1:		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
Case 2:		
Engine speed	600 rpm	–
Starter	OFF	
Time after starter turns from ON to OFF	3 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
Engine speed signal	No signal for 4.7 sec.
Case 2:	
Engine speed signal	No signal for 0.016 sec.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL
  (a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
  (b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
  (c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ENGINE SPD.
- The engine speed can be confirmed in DATA LIST using the hand–held tester or OBD II scan tool. If there is no NE signals from the crankshaft position sensor despite the engine revolution, the engine speed will be indicated as zero. If voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower RPM (than the actual RPM).

1	Check resistance of crankshaft position sensor.

Component Side:

Crankshaft Position Sensor



Front View

Y A21420

PREPARATION:

Disconnect the crankshaft position sensor connector.

CHECK:

Measure the resistance between the terminals of the crankshaft position sensor connector.

OK:

Tester Connection	Specified Condition
1 – 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50 °C (122 °F) and "Hot" is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **Replace crankshaft position sensor.**

OK

2	Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

3	Inspect sensor installation.

CHECK:

Check the crankshaft position sensor installation.

NG → **Tighten the sensor.**

OK

4	**Check teeth of crankshaft timing pulley.**

PREPARATION:
Remove the crankshaft angle sensor plate (See page EM–16).
CHECK:
Check the teeth of sensor plate.

NG → **Replace crankshaft timing pulley.**

OK

Replace ECM (See page SF–78).

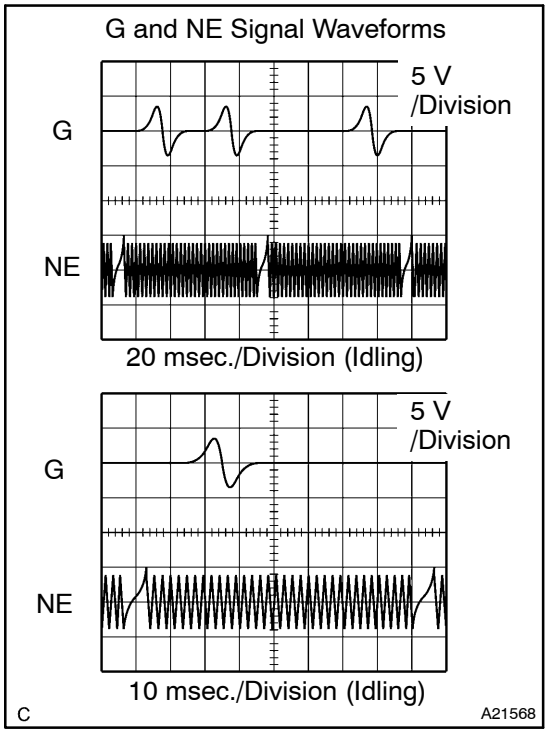
DTC	P0340	Camshaft Position Sensor ”A” Circuit (Bank 1 or Single Sensor)

DTC	P0341	Camshaft Position Sensor ”A” Circuit Range/Performance

CIRCUIT DESCRIPTION

The camshaft position sensor (G2 signal) consists of a magnet, iron core and pickup coil.
The G22+ signal plate has 3 teeth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil changes, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE+ signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE+ signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE+ signals, and the cylinder and the angle of the VVT based on the combination of the G2 and NE+ signals.

DTC No.	DTC Detection Condition	Trouble Area
P0340	• No camshaft position sensor signal to ECM during cranking (2 trip detection logic) • No camshaft position sensor signal to ECM with engine speed 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has a jumped tooth • ECM
P0341	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic) • Hint: Under normal condition, the camshaft position sensor signal is input into the ECM 3 times per 2 engine revolutions	



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the camshaft position sensor even though the engine is cranking, or if the rotations of the camshaft and the crankshaft are not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340	Camshaft position sensor (Bank 1) range check or rationality
	P0341	Camshaft position sensor (Bank 1) range check or rationality
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	P0340 case 1 (no signal): 2 driving cycles P0340 case 2 (mis–aligned), P0341: Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
P0340 Case 1 (No signal):		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
P0340 Case 2 (Mis–aligned):		
Engine speed	600 rpm	–
Starter	OFF	
P0341:		
Engine revolution angle	720°CA	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0340 Case 1 (No signal):	
Camshaft position sensor signal	No signal
P0340 Case 2 (Mis–aligned):	
Crankshaft/camshaft alignment is mis–aligned (judged by comparing the crankshaft position to the camshaft position)	
Camshaft position sensor signal: No input in appropriate timing.	
P0341:	
Crankshaft/Camshaft alignment	Mis–aligned
Camshaft position sensor count	12 or more / 720°CA (= Engine 2 revolutions)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Camshaft position sensor signal input during every 720°CA	3

WIRING DIAGRAM

Refer to DTC P0335 on page DI–178.

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check resistance of camshaft position sensor (Signal generator).**

Component Side:



Camshaft Position Sensor

Y A21420

CHECK:
Measure the resistance between the terminals of camshaft position sensor connector.

Standard:

Tester Connection	Specified Condition
1 – 2	825 to 1,400 Ω at cold
	1,060 to 1,645 Ω at hot

NOTICE:
"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50 °C (122 °F) and "Hot" is from 50 °C (122 °F) to 100 °C (212 °F).

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Inspect sensor installation.**

CHECK:

Check the camshaft position sensor installation.

NG → **Tighten the sensor.**

OK

4	**Inspect camshaft (See page EM–50).**

NG → **Replace camshaft.**

OK

Replace ECM (See page SF–78).

DIC6W–02

DTC	P0351	Igniter Coil ”A” Primary/Secondary Circuit

DTC	P0352	Igniter Coil ”B” Primary/Secondary Circuit

DTC	P0353	Igniter Coil ”C” Primary/Secondary Circuit

DTC	P0354	Igniter Coil ”D” Primary/Secondary Circuit

HINT:

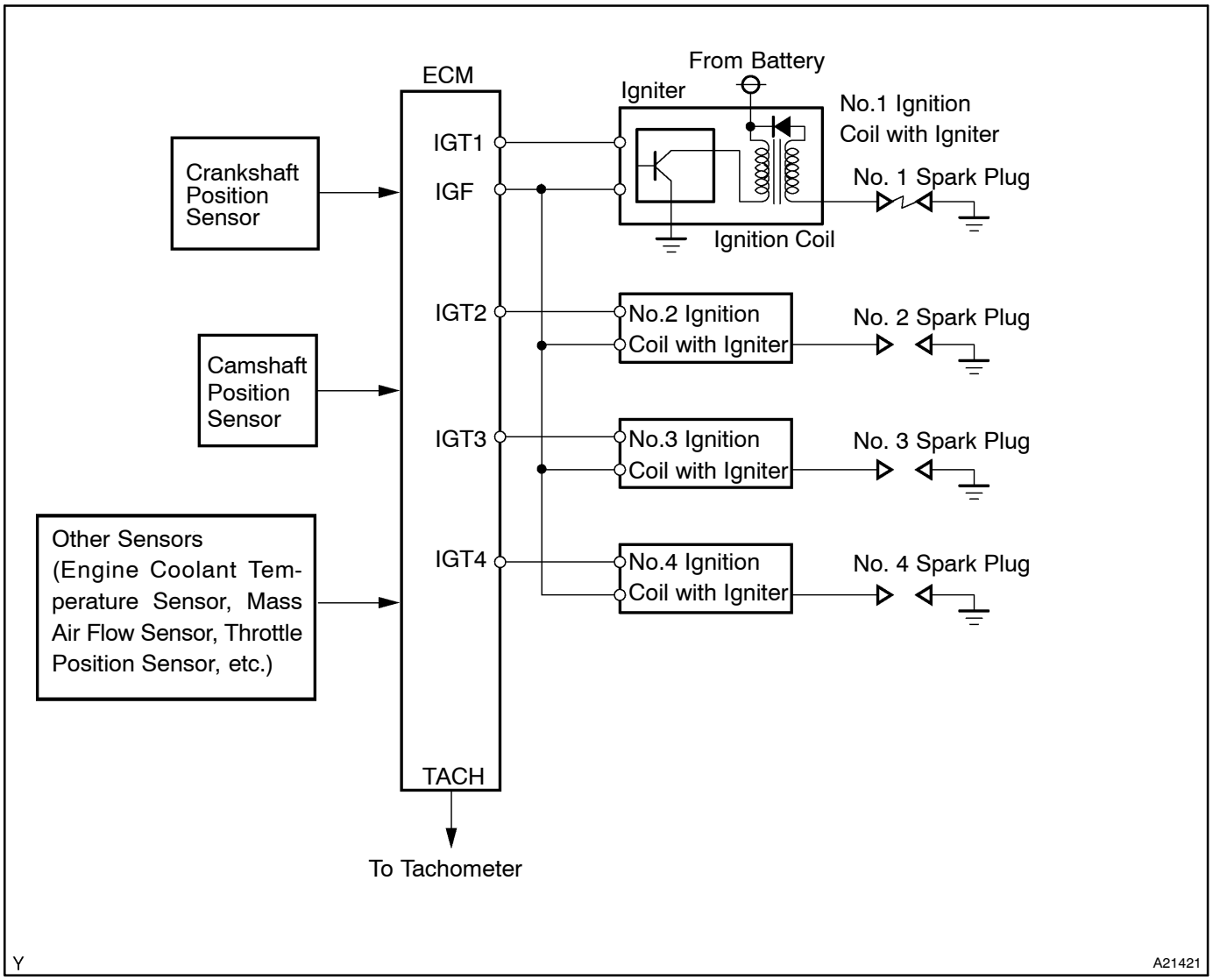
- These DTCs indicate a malfunction related to the primary circuit.
- If DTC P0351 is displayed, check the No.1 ignition coil with igniter circuit.
- If DTC P0352 is displayed, check the No.2 ignition coil with igniter circuit.
- If DTC P0353 is displayed, check the No.3 ignition coil with igniter circuit.
- If DTC P0354 is displayed, check the No.4 ignition coil with igniter circuit.

CIRCUIT DESCRIPTION

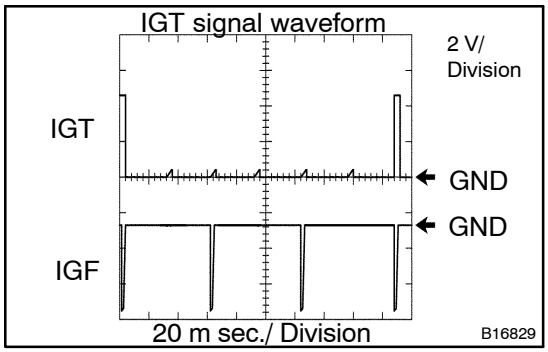
A Direct Ignition System (DIS) is used on this vehicle.

The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, one spark plug is connected to the end of the secondary winding. High–voltage is generated in the secondary winding and is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition signals (IGTs) for each cylinder. Using the IGT, the ECM turns on and off the power transistor inside the igniter, which switches on and off of current to the primary coil. When current to the primary coil is cut off, high–voltage is generated in the secondary coil and this voltage is applied to the spark plugs to create sparks inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation signal (IGF) for each cylinder ignition to the ECM.



DTC No.	DTC Detection Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Ignition system • Open or short in IGF or IGT circuit from ignition coil with igniter to ECM (ignition coil circuit 1 through 4) • No. 1 to No. 4 ignition coil with igniter (primary ignition) • ECM



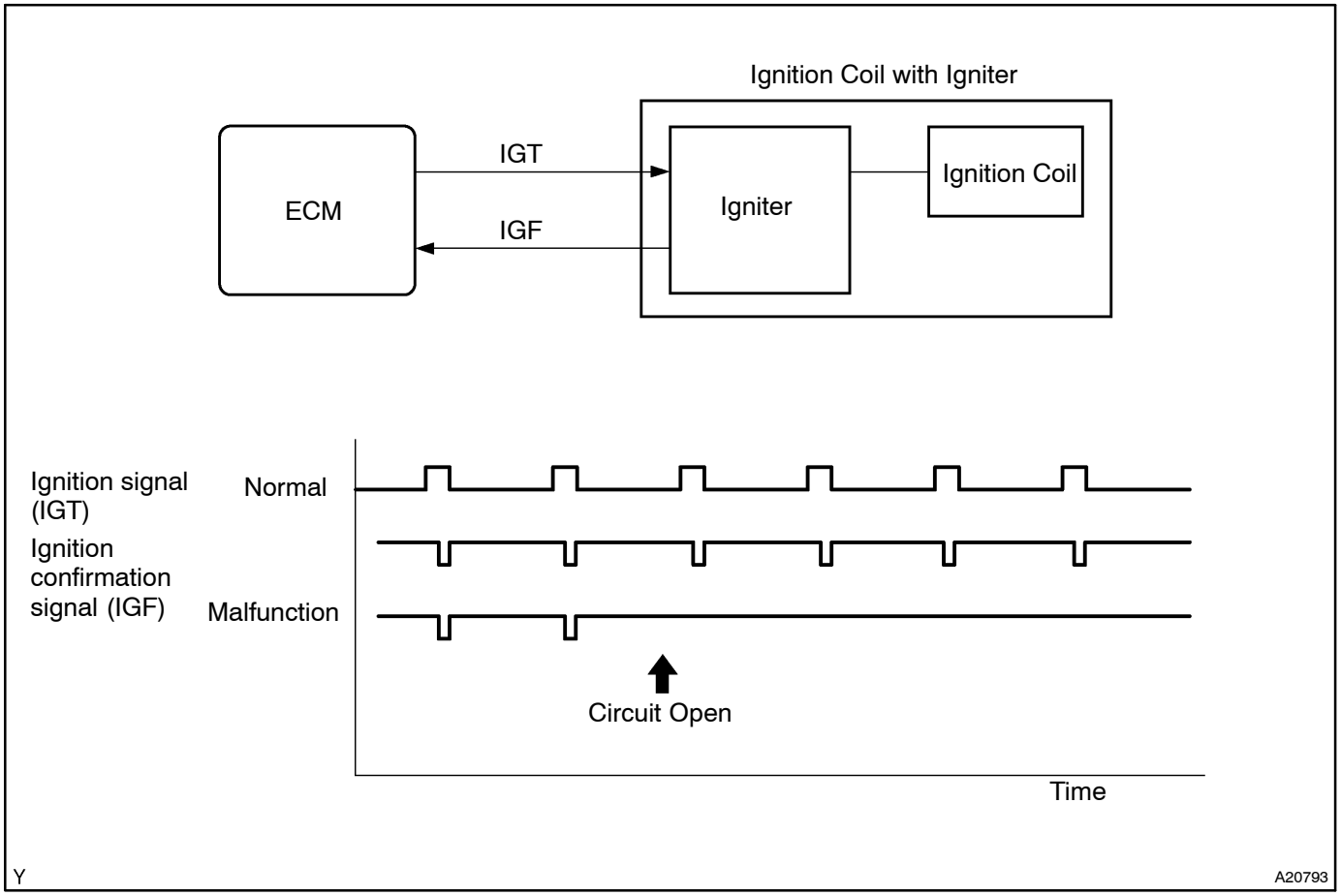
Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check waveform between terminals IGT1 – 4 and E1 of the ECM connector.

HINT:

Correct waveform appears as shown, with rectangle waves.

MONITOR DESCRIPTION



If the ECM does not receive the IGF after sending the IGT, it interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0351	No. 1 ignition coil with igniter circuit malfunction
	P0352	No. 2 ignition coil with igniter circuit malfunction
	P0353	No. 3 ignition coil with igniter circuit malfunction
	P0354	No. 4 ignition coil with igniter circuit malfunction
Required sensors/components	Igniter	
Frequency of operation	Continuous	
Duration	0.256 sec. + 4 sparks	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Either of the following conditions is met:	Condition 1 or 2	
1. Following conditions are met:	Conditions (a) and (b)	
(a) Engine speed	–	500 rpm
(b) Battery voltage	6 V	–
2. Following conditions are met:	Conditions (a) and (b)	
(a) Engine speed	500 rpm	–
(b) Battery voltage	10 V	–

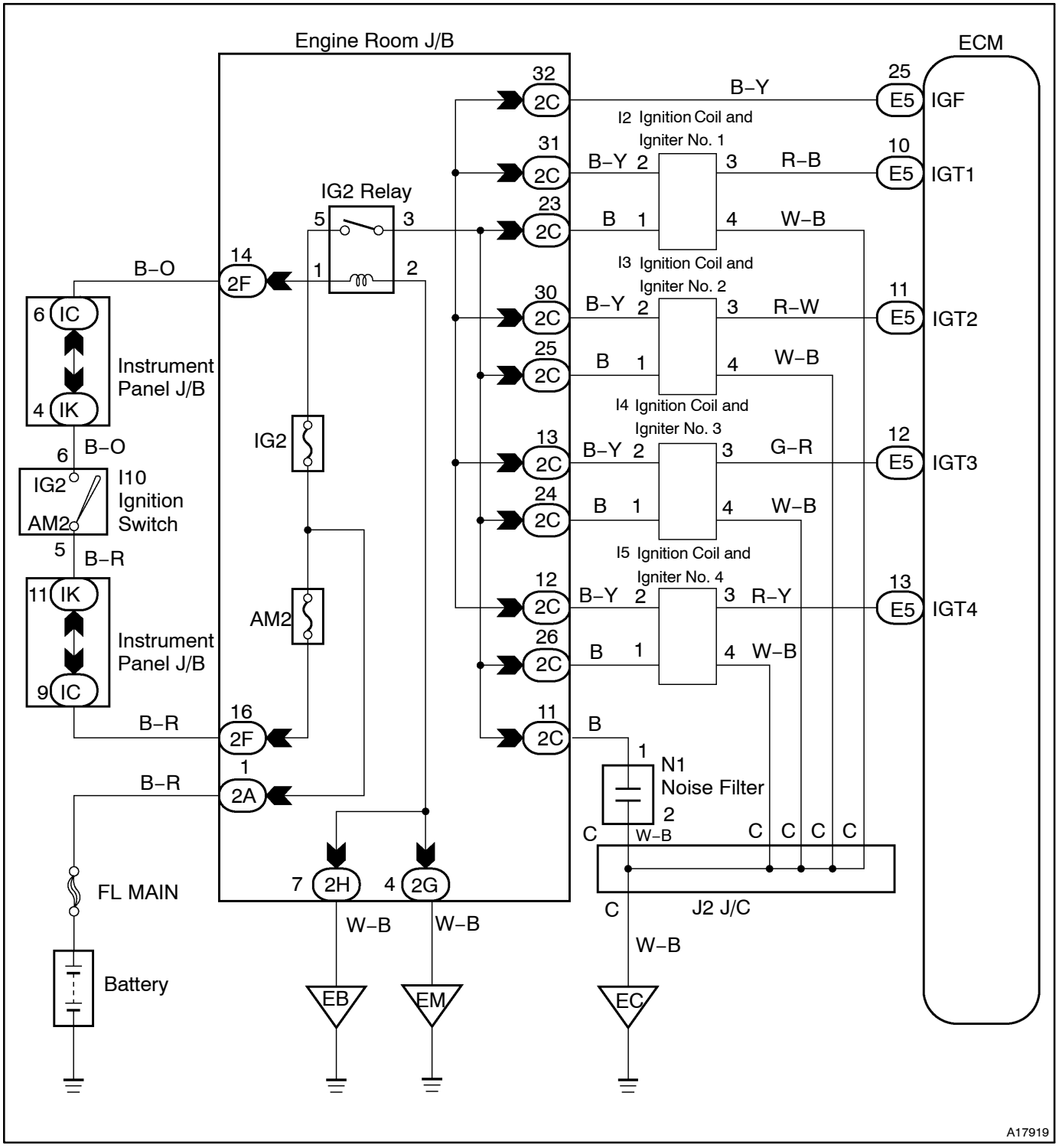
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
”Ignition signal fail count”	More than 2 times
”Ignition signal fail count” is as follows:	When IGF should have returned despite sending IGT.

COMPONENT OPERATING RANGE

Standard Value
Confirmed signal number = ignition signal number

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check spark plug and spark of misfiring cylinder (See page IG–1).**

NG → **Go to step 4.**

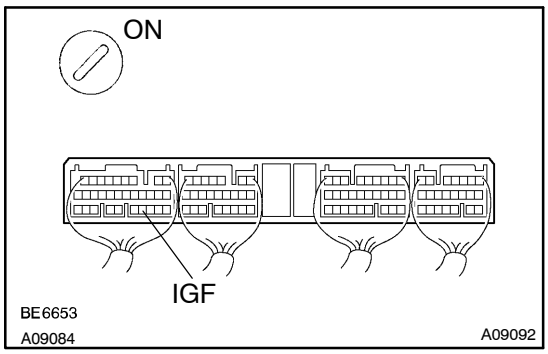
OK

2	**Check for open and short in harness and connector in IGF signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Check voltage between terminals IGF of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.
(b) Disconnect the ignition coil with igniter connector.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGF of the ECM connector and body ground when engine is cranked.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

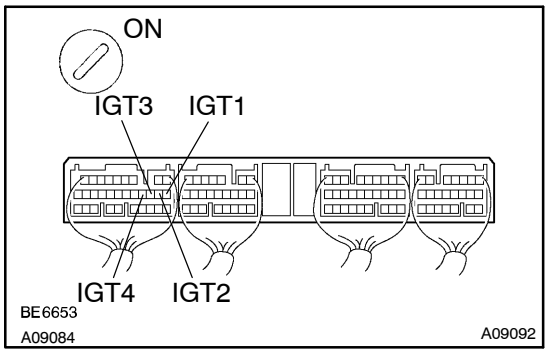
Replace ignition coil with igniter.

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

5	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



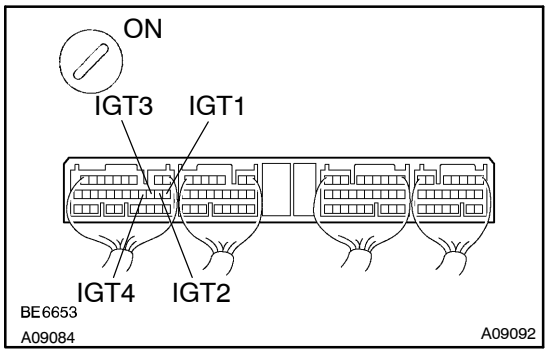
PREPARATION:
Remove the ECM cover.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG → **Replace ECM (See page SF–78).**

OK

6	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



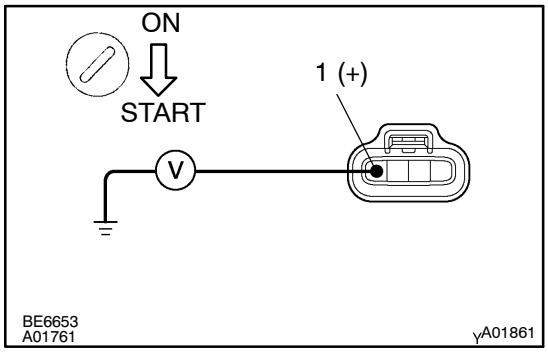
PREPARATION:
Disconnect the ignition coil with igniter connector.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: 4.5 V or more

NG → **Replace ECM (See page SF–78).**

OK

7	Check ignition coil with igniter power source circuit.



PREPARATION:
Disconnect the ignition coil with igniter connector.
CHECK:
Measure voltage between terminal 1 of ignition coil with igniter connector and body ground, when ignition switch is turned to ”ON” and ”START” position.
OK:

Voltage: 9 to 14 V

OK	Repair ignition coil with igniter.

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page SF–78).

NG	Repair or replace harness or connector.

OK

Replace ignition coil with igniter.

DIC6X–02

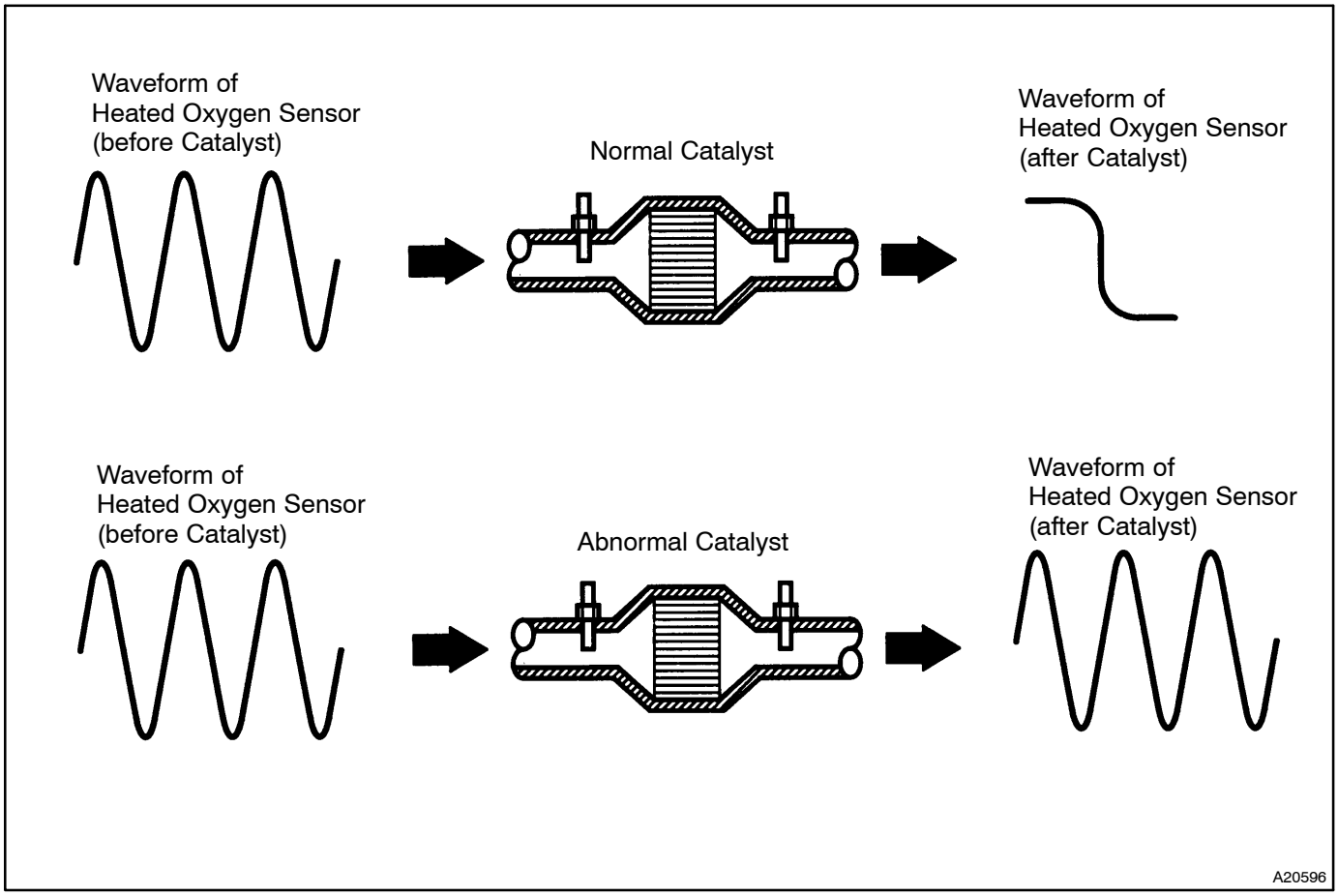
DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

MONITOR DESCRIPTION

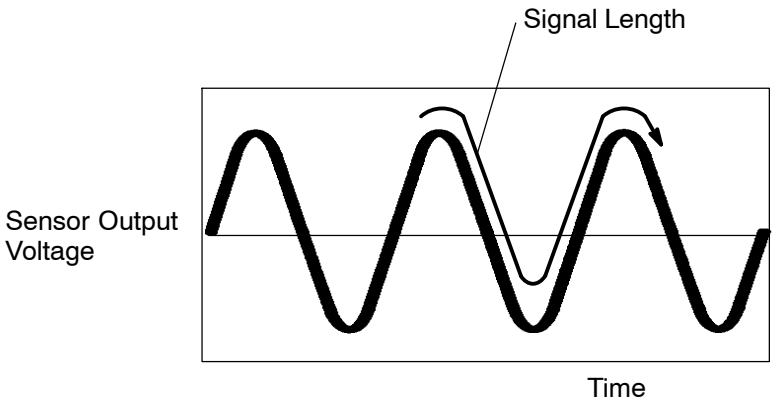
The vehicle is equipped with two heated oxygen sensors. One is mounted upstream from the TWC (Three–Way Catalytic) converter (Front Oxygen Sensor, ”sensor 1”), the second is mounted downstream (Rear Oxygen Sensor ”sensor 2”). The catalyst efficiency monitor compares the sensor 1 and sensor 2 signals in order to calculate TWC ability to store the oxygen.

During normal operation, the TWC stores and releases oxygen as needed. This results in low oxygen variations in the post TWC exhaust stream as shown below.

DTC	Detecting Condition	Trouble Area
P0420	After the engine and the catalyst are warmed up, and while the vehicle is driven within the set vehicle and engine speed range, the waveforms of the oxygen sensors (bank 1 sensor 1 and bank 1 sensor 2) have the same amplitude (2 trip detection logic).	• Front exhaust pipe (catalyst) • Gas leakage in exhaust system • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 2)



Heated Oxygen Sensor Signal Length



MONITOR STRATEGY

Required sensors/components (main)	Catalyst
Required sensors/components (related)	Front and rear heated oxygen sensors
Frequency of operation	Once per driving cycle
Duration	90 sec (30 sec x 3 times)
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Item	Minimum	Maximum
These DTC is not present	See page DI–3	
Accumulated time that all of the following conditions are met:	30 sec	
Battery voltage	11 V	–
Intake air temperature	–10°C (14°F)	–
Idle status	OFF	
MAF	5.1 g/sec	30 g/sec
Engine RPM	–	4500 rpm
Engine coolant temperature	75°C (167°F)	
Fuel system status	Closed loop	
Catalyst temperature	450°C (842°F)	750°C (1382°F)

TYPICAL MALFUNCTION THRESHOLDS

Catalyst deterioration level	0.4 or more
Frequency of detection	3 times

MONITOR RESULT

Refer to page DI–3 for detailed information.

Check the monitor result and test values after performing the drive pattern below.

TID $01: Catalyst monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 0.0078 (no dimension)	Catalyst deterioration level	Malfunction criteria for catalyst deterioration

CONFIRMATION DRIVING PATTERN

(a) Clear the DTC.

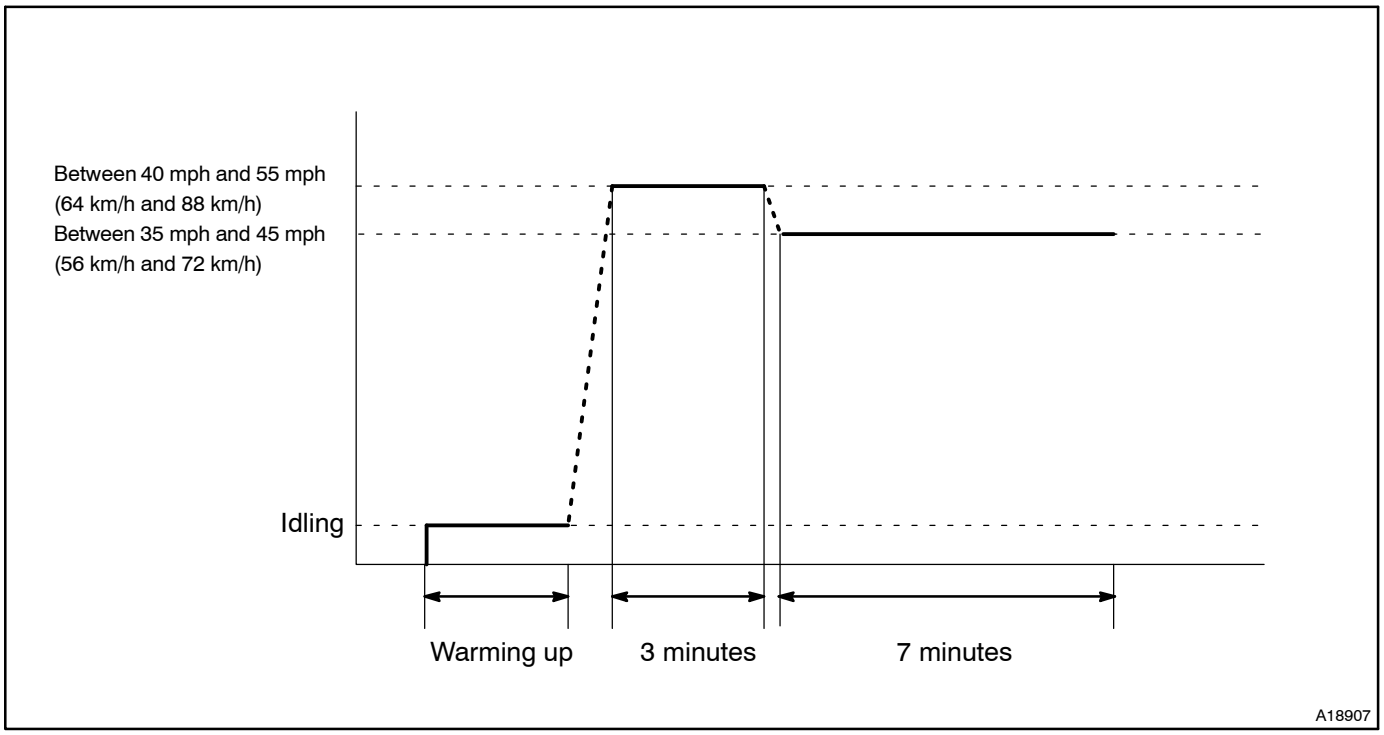
(b) Warm up the engine until the engine coolant temperature reaches 75°C (167°F).

(c) Drive the vehicle at 40 to 55 mph (64 to 88 km/h) for at least 3 minutes.

(d) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for at least 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.



INSPECTION PROCEDURE

1	**Check DTC other than P0420.**

If DTCs other than P0420 are present, troubleshoot those DTCs first.

RESULT:

DTC	Proceed to
P0420	A
P0420 and others	B

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

3	Perform A/F CONTROL active test.

(a) Connect the hand–held tester to the DLC3.
(b) Run the engine at 2500 rpm for 90 seconds.
(c) Allow the engine to idle.
(d) Select from the tester menus: DIAGNOSIS / ENHANCED OBDII / ACTIVE TEST / A/F CONTROL.
(e) Switch the injection volume between +25% and –12.5%, and then check the oxygen sensor voltages.

Result

Go to	Front heated oxygen sensor (sensor 1)	Rear heated oxygen sensor (sensor 2)	Suspected Trouble Area
A	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Catalysts
B	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Front heated oxygen sensor (sensor 1)
C	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage Almost no reaction	Rear heated oxygen sensor (sensor 2)
D	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage Almost no reaction	Extremely rich or lean fuel–trim Exhaust gas leak, etc.

NOTICE:
The front heated oxygen sensor has an output delay of a few seconds.
The rear heated oxygen sensor has a maximum output delay of approximately 20 seconds.

B → Replace heated oxygen sensor (bank 1 sensor 1) (See page EM–117).

C → Replace heated oxygen sensor (bank 1 sensor 2) (See page EM–117).

D → Check fuel trim (See page DI–148).

A

Replace front exhaust pipe (catalyst) (See page EM–117).

–MEMO–

DIC6Y–02

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction

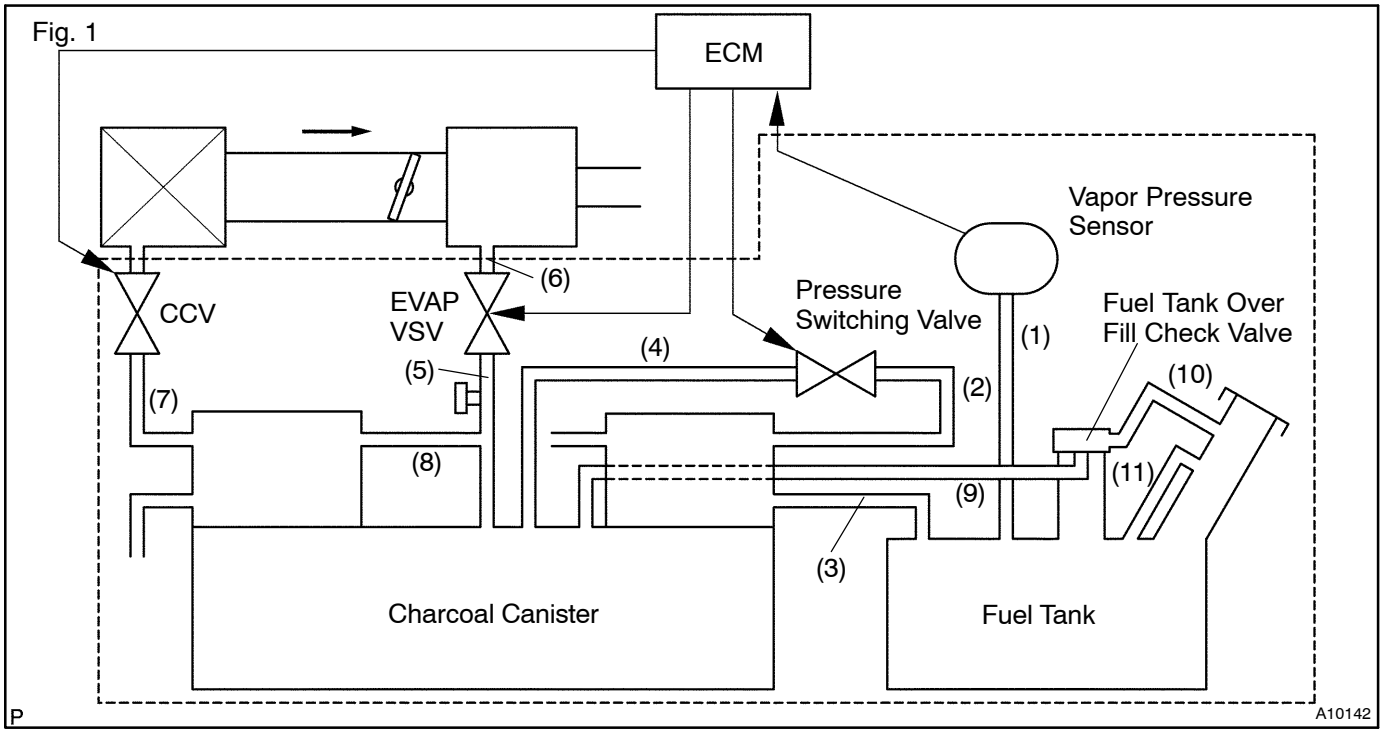
CIRCUIT DESCRIPTION

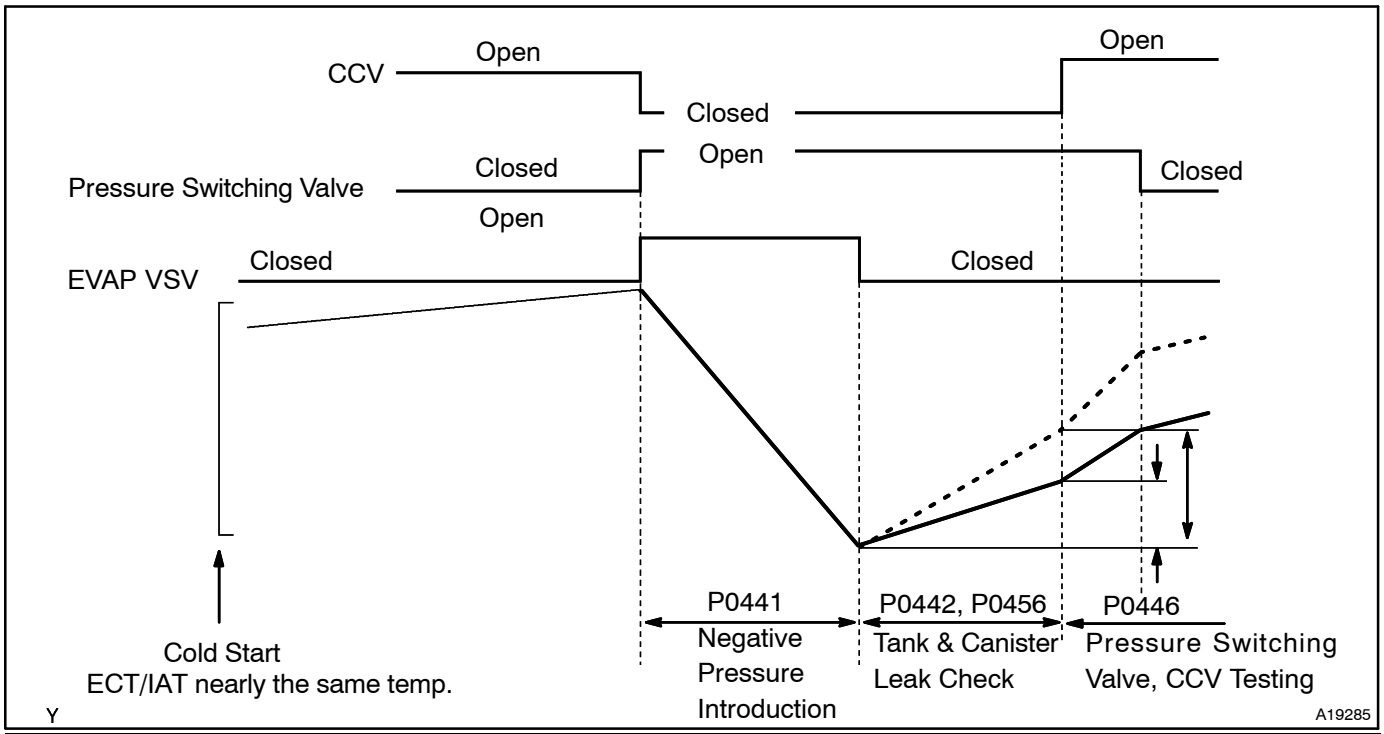
The vapor pressure sensor, canister closed valve (CCV), pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when there is a malfunction in either the EVAP VSV, the pressure switching valve, or in the vapor pressure sensor itself.

Fig. 1





DTC No.	DTC Detecting Condition	Trouble Area
P0441	Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic)	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
	Negative pressure incoming in the charcoal canister and fuel tank does not stop during purge cut–off. (2 trip detection logic)	
P0446	No rising of the fuel tank pressure when commanding the CCV to open after the EVAP leak test	
	No changing of the fuel tank pressure when commanding the pressure switching valve to be checked after the EVAP leak test	
	A high negative pressure (vacuum) does not occur in the system when commanding the EVAP VSV to open with the CCV closed	

HINT:

Typical DTC output of each trouble part is shown in the table below.

Trouble part		Typical DTC output (*1)
Small Leak		”P0442” and / or ”P0456” (*2)
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0442, P0441 and P0446
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0442, P0441 and P0446
CCV	Open Malfunction	P0442, P0441 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0442, P0441 and P0446

*1: ECM may output some other DTC combination.

*2: Refer to P0442 and P0456 on page DI–278.

MONITOR DESCRIPTION

P0441

The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.
The ECM checks for EVAP VSV "stuck open" fault by commanding both valves (EVAP VSV and CCV) to close at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure at this early stage of the test, the ECM determines that the EVAP VSV is stuck open.
The ECM will turn on the MIL and a DTC will be set.

P0446

If there is a malfunction detected in the evaporative emission (EVAP) VSV, the canister closed valve (CCV) and the pressure switching valve, the ECM will illuminate the MIL and set a DTC.
This portion of the EVAP diagnosis checks the following EVAP system functions:

(a) CCV stuck closed.
The ECM checks for a CCV "stuck closed" malfunction by commanding the CCV to open after an EVAP leak test. If the fuel tank pressure does not rise (no vacuum generated), the ECM determines that the CCV is stuck closed. The ECM will turn on the MIL and a DTC will be set.

(b) Pressure switching valve stuck closed.
The ECM checks for a pressure switching valve "stuck closed" malfunction by commanding the pressure switching valve to close after an EVAP leak test. If the fuel tank pressure does not change, the ECM determines that the pressure switching valve is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

(c) EVAP VSV (Purge line to intake manifold) stuck closed.
The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0441	EVAP VSV malfunction
	P0446	Canister close valve stuck closed Pressure switching valve malfunction EVAP VSV malfunction
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	P0441 : 90 sec. P0446 : 10 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
The same as that for DTC P0442		

TYPICAL MALFUNCTION THRESHOLDS

P0441

Detection Criteria	Threshold
Purge VSV stuck closed:	
Fuel tank pressure change during vacuum introduction	Less than 0.933 kPa (7.0 mmHg)
Purge VSV stuck open:	
Either of the following conditions is met:	Condition 1 or 2
1. (Minimum fuel tank pressure before leak check) – (Fuel tank pressure 14 sec. after leak check)	0.467 kPa (3.5 mmHg) or more
2. Fuel tank pressure 14 sec. after leak check	Less than –3.733 kPa (28 mmHg)

P0446

Detection Criteria	Threshold
Case 1: CCV stuck closed	
Fuel tank pressure when the CCV is opened	No change
Case 2: CCV stuck open	
Purge VSV stuck closed	Detected
Case 3: EVAP VSV stuck closed	
Fuel tank pressure after the EVAP VSV is opened and manifold vacuum is introduced to the fuel tank	No change

MONITOR RESULT

Refer to page DI–3 for detailed information.

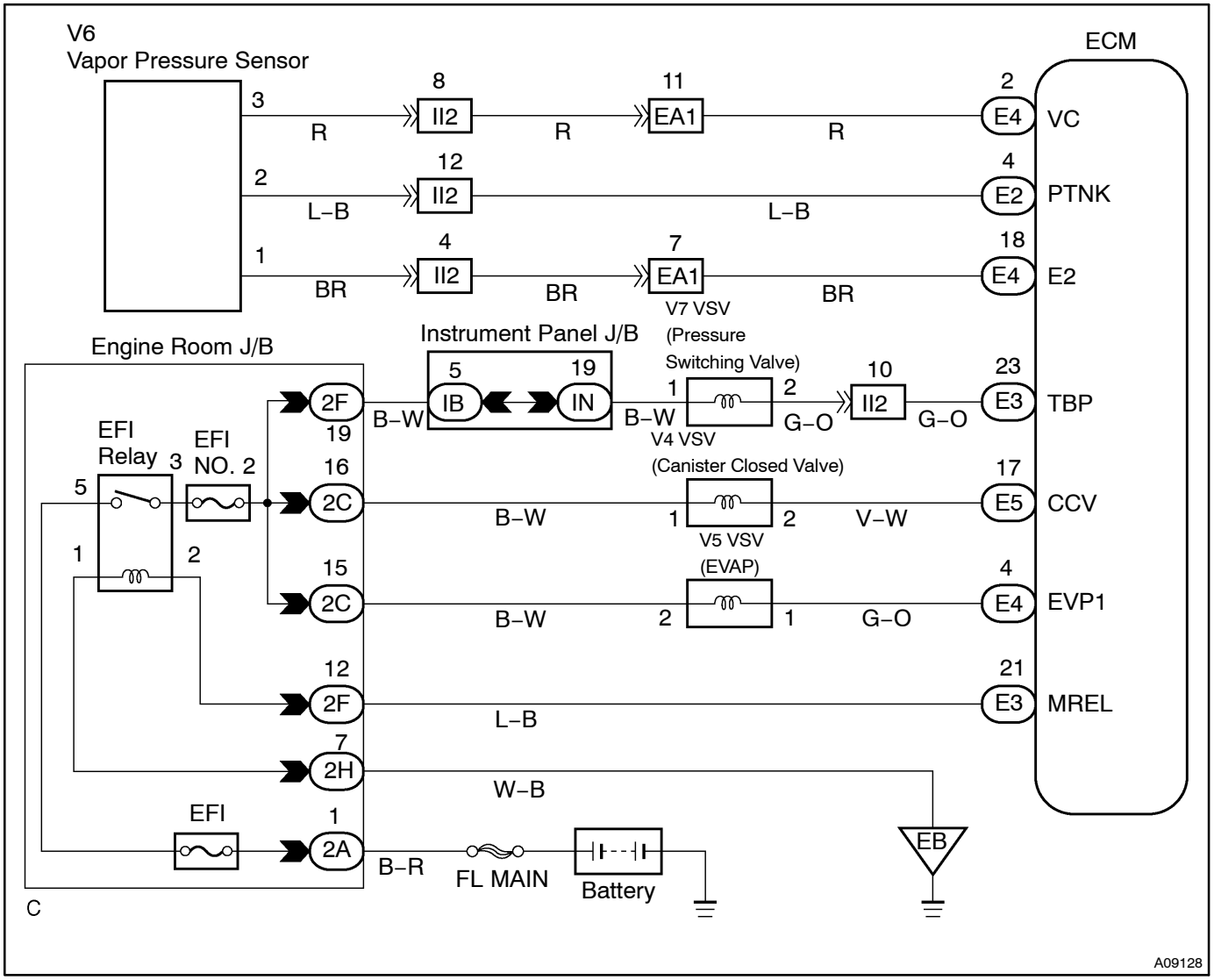
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–3).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0441 (Purge Flow), P0446 (CCV or pressure switching valve), P0451, P0452 or P0453 (See page DI–247) is output with DTC P0442 or P0456 (See page DI–225), first troubleshoot DTC P0441, P0446, P0451, P0452 or P0453. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

Hand–held tester:

1	Check that fuel tank cap meets OEM specifications.

NG → Replace with a cap that meets OEM specifications.

OK

2	Check that fuel tank cap is correctly installed.

NG → Correctly install fuel tank cap.

OK

3	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

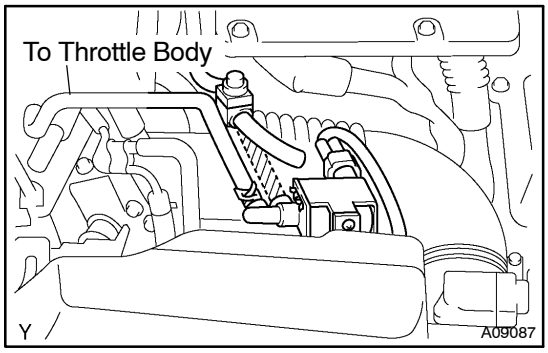
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the ”ENHANCED OBD II / ACTIVE TEST” mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the item ”EVAP VSV (ALON) / ALL” in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG	Repair or replace vacuum hoses.

OK

7	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

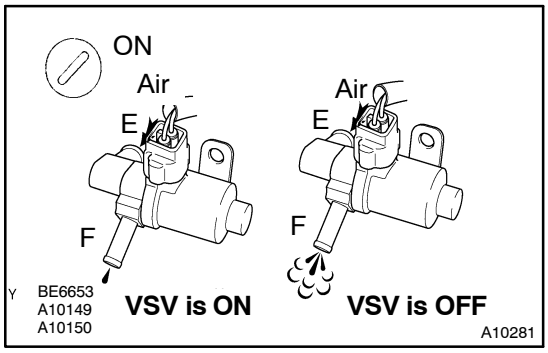
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

9	Check CCV.



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(d) Select the item "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air does not flow from port E to port F.
VSV is OFF:
Air from port E flows out through port F.

OK	Go to step 13.

NG

10	Check vacuum hose between CCV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole damage and blockage.

NG	Repair or replace vacuum hoses.

OK

11	Check operation of CCV (See page SF–63).

NG	Replace CCV.

OK

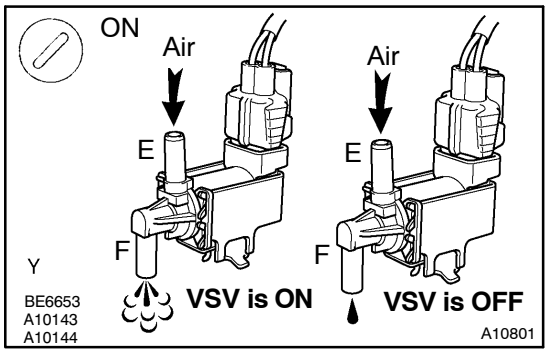
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	**Check pressure switching valve.**



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Select the item "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).
(d) Check the VSV operation when it is operated by the hand–held tester.

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 16.**

NG

14	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

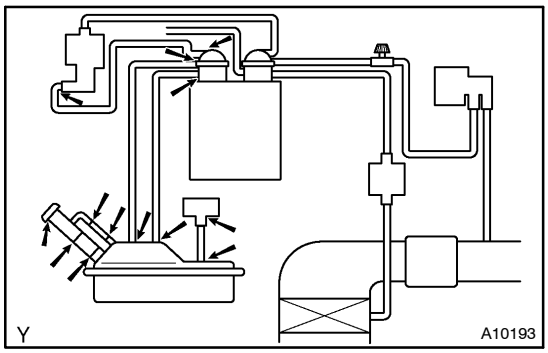
15	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → **Repair or replace evaporative emission leak part.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole and damage.

NG → **Repair or replace vacuum hose.**

OK

18	Check hose and tube between fuel tank and charcoal canister.

CHECK:

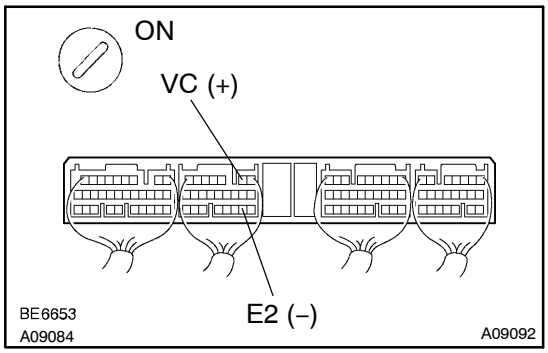
(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.

(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

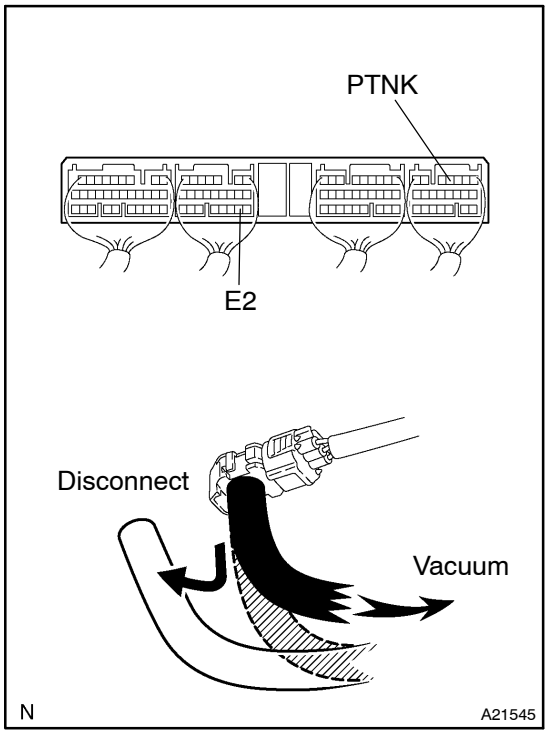
OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK → **Go to step 22.**

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG → **Replace fuel tank inlet valve.**

OK

23	Check fuel tank.

NG → Replace fuel tank.

OK

24	Check charcoal canister for cracks, hole and damage.

NG → Repair or replace charcoal canister.

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	Check that fuel tank cap meets OEM specifications.

NG → Replace with a cap that meets OEM specifications.

OK

2	Check that fuel tank cap is correctly installed.

NG → Correctly install fuel tank cap.

OK

3	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

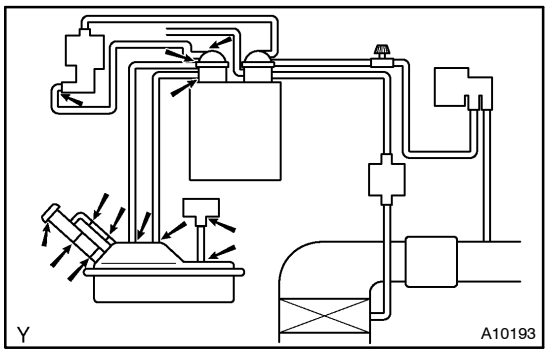
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace evaporative emission leakage point.**

OK

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole and damage.

NG → **Repair or connect VSV or sensor connector.**

OK

7	**Check hose and tube between fuel tank and charcoal canister.**

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

8	**Check vacuum hoses ((8), (9) , (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole damage and blockage.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect or sensor connector.**

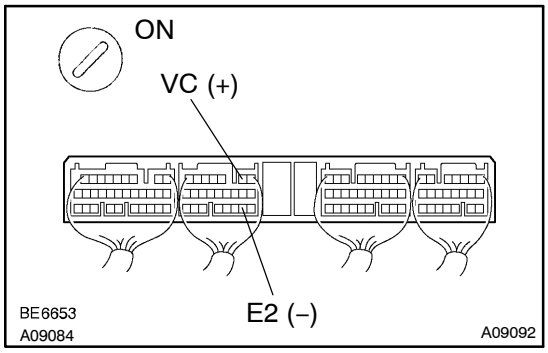
OK

10	**Check charcoal canister for cracks, hole and damage.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

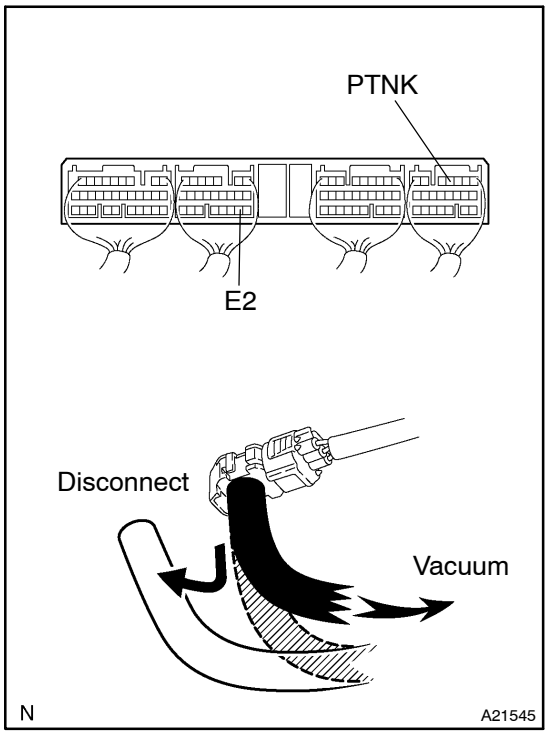
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

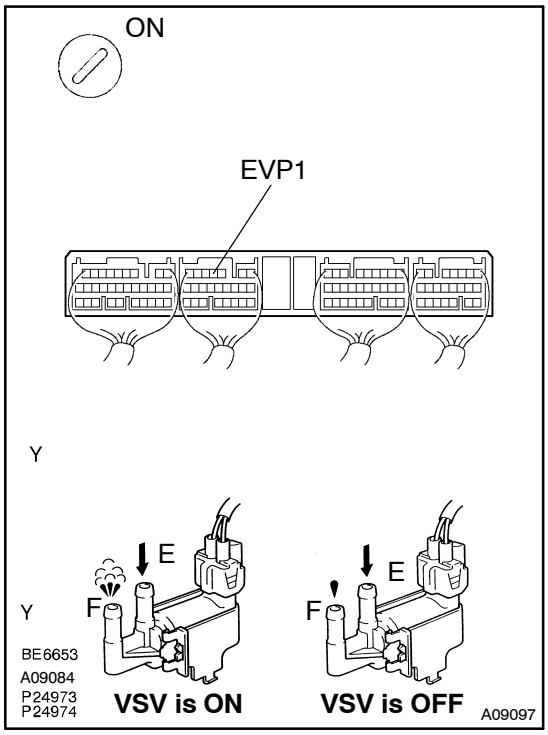
13	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

14	Check EVAP VSV.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP1 of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal EVP1 of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → Go to step 17.

NG

15	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

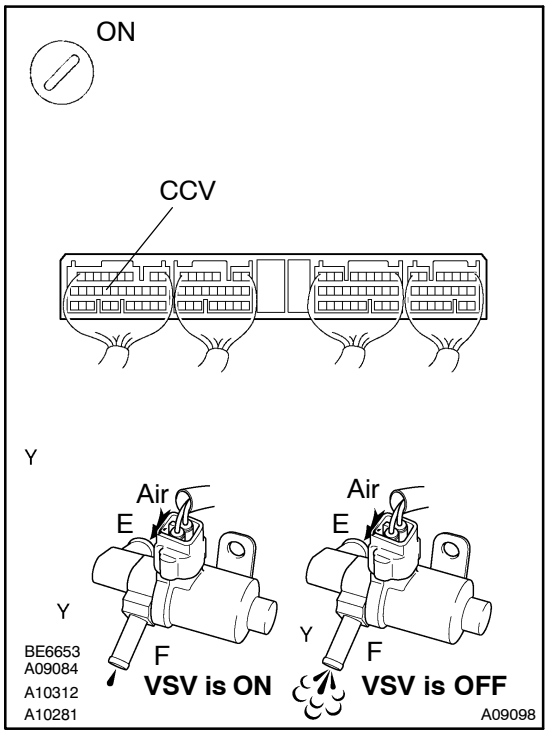
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30)**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal CCV of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal CCV of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air does not flow from port E to port F.
(2) VSV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

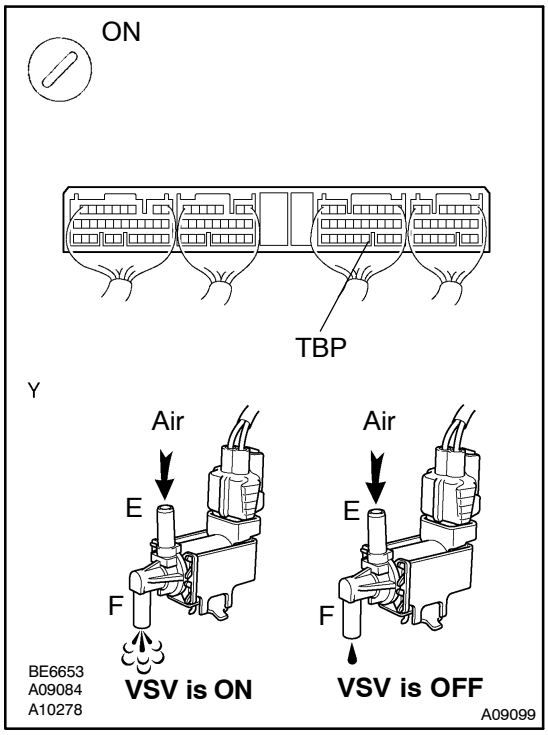
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal TBP of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal TBP of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 23.**

NG

21	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

24	Check fuel tank.

NG → Replace fuel tank.

OK →

It is likely that vehicle user did not properly close fuel tank cap.

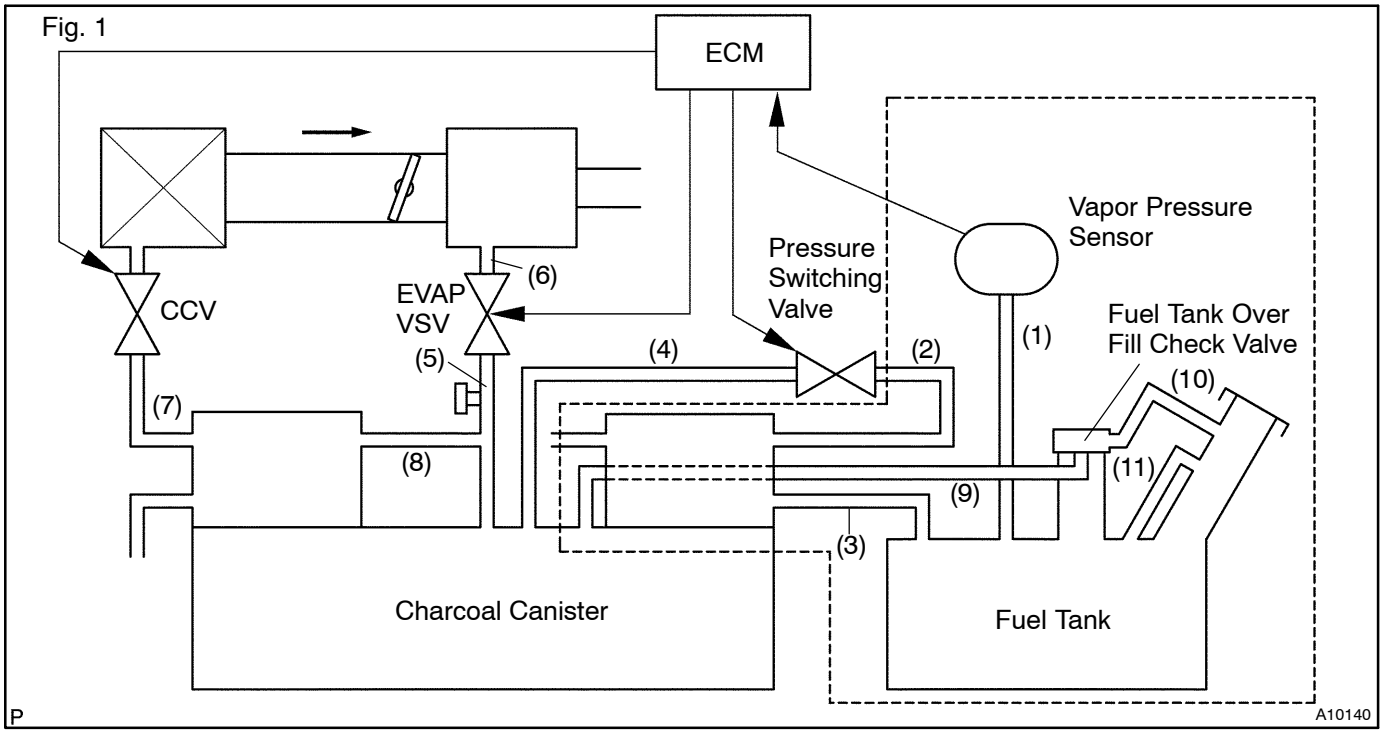
DTC	P0442	Evaporative Emission Control System Leak Detected (Small Leak)

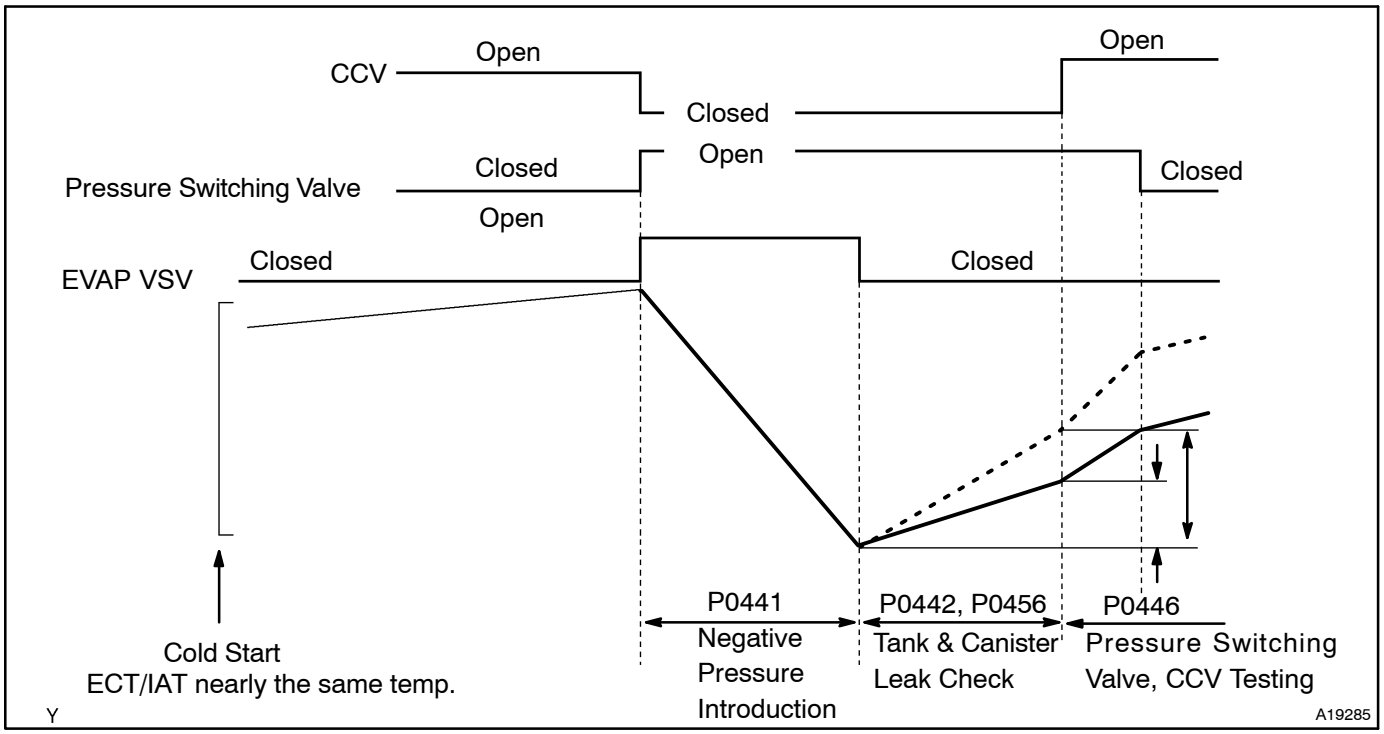
DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)

CIRCUIT DESCRIPTION

The vapor pressure sensor and the canister closed valve (CCV) are used to detect abnormalities in the evaporative emission control system. The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTC P0442 or P0456 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.

Fig. 1





DTC No.	DTC Detection Condition	Trouble Area
P0442	After negative pressure introduction is completed, the pressure in the EVAP system sharply increases. (small leak) (2 trip detection logic)	• Vacuum hose is cracked, holed, blocked, damaged or disconnected • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in circuit for EVAP • EVAP VSV • Open or short in circuit for CCV • CCV • Fuel tank is cracked, holed, or damaged • Charcoal canister is cracked, holed, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
P0456	The pressure in the EVAP system slightly increases while the ECM performs a leak check. (very small leak) (2 trip detection logic)	

HINT:

Typical DTC output of each trouble part is shown in the table below.

Trouble part		Typical DTC output (*1)
Small Leak		P0442 and/or P0456 (*2)
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0441, P0442 and P0446
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0441, P0442 and P0446
CCV	Open Malfunction	P0441, P0442 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0441, P0442 and P0446

*1: ECM may output some other DTCs combination.

*2: Refer to DTC P0441 and P0446 on page DI–202

MONITOR DESCRIPTION

The evaporative emission system consists of the vapor pressure sensor, the CCV (Canister Close Valve), the pressure switching valve and the EVAP VSV (Purge VSV), and those are used to detect malfunctions in the system by ECM.

This test will run once per driving cycle when the ECM detects stable vapor pressure in the fuel tank. While the vehicle is being driven on rough or winding roads, the movement of the fuel in the tank will cause unstable fuel tank vapor pressure and the diagnostic test will not executed.

The ECM performs the following steps:

(a) Closes the CCV (shutting the system)
(b) Checks the stability of the fuel tank pressure. The diagnostic is disabled if the pressure change is more than the specified value.
(c) Opens the EVAP VSV. This introduces a negative pressure from the intake manifold to the fuel tank.
(d) Closes the EVAP VSV to seal the fuel tank for storing the negative pressure.
(e) Monitors the increase in fuel tank pressure for:
    (1) Rapid increase in the internal pressure, i. e. a large leak: 0.040” or more
    (2) A pressure rise just above normal, i. e. a small leak: 0.020”.

If the ECM detects either of the above conditions, it will interpret this as a leak in the EVAP system. The ECM will illuminate the MIL (2 trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0442	Small leak (0.040 inch or more large hole) is detected
	P0456	Very small leak (0.020 inch hole) is detected
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow sensor, Engine coolant temperature sensor EVAP VSV (purge VSV), CCV
Frequency of operation	Once per driving cycles	
Duration	60 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
All:		
Altitude	–	2,400 m (7,872 ft.)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank pressure sensor malfunction	Not detected	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–12.6°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
P0456 (0.02 inch leak):		
Engine coolant temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature	10˚C (50˚F)	–
Vehicle speed change	Vehicle is driven at steady speed	
Time after engine start	–	50 min.
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% (When vehicle speed is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% (When vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairy smooth road)	
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
0.04 inch leak detection	Not detected	
CCV malfunction, pressure switching valve malfunction	Not detected	
Vehicle speed	–	130 km/h (81 mph)
Purge VSV malfunction	Not detected	
P0442 (0.04 inch leak):		
Engine coolant temperature at engine start	10˚C (50˚F)	35˚C (95˚F)
Intake air temperature at engine start	10˚C (50˚F)	35˚C (95˚F)
Intake air temperature	10˚C (50˚F)	–
Vehicle speed change	Vehicle is driven at steady speed	
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% (When vehicle speed is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% (When vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairy smooth road)	

Time after engine start	–	50 min.
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
Purge VSV malfunction	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0456 (0.02 inch leak):	
Both of the following conditios are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.0 kPa (–15 mmHg) point	0.067 kPa (0.5 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.7 kPa (–20 mmHg) point	0.067 kPa (0.5 mmHg) or more
P0442 (0.040 inch leak):	
Both of the following conditios are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.0 kPa (–15 mmHg) point	0.24 kPa (1.8 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is at –2.7 kPa (–20 mmHg) point	0.24 kPa (1.8 mmHg) or more

MONITOR RESULT

Refer to page DI–3 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–3).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

INSPECTION PROCEDURE

Hand–held tester:

1	**Check that fuel tank cap meets OEM specifications.**

NG → **Replace with a cap that meets OEM specifications.**

OK

2	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

3	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

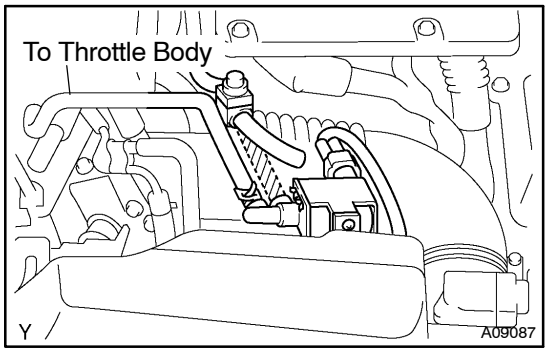
4	**Check filler neck for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → **Replace filler pipe.**

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the item "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG	Repair or replace vacuum hose.

OK

7	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

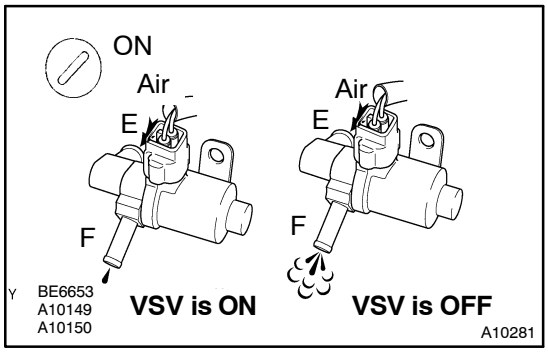
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

9	Check CCV.



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(d) Select the item "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air does not flow from port E to port F.
VSV is OFF:
Air from port E flows out through port F.

OK	Go to step 13.

NG

10	Check vacuum hose between CCV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole damage and blockage.

NG	Repair or replace vacuum hose.

OK

11	Check operation of CCV (See page SF–63).

NG	Replace CCV.

OK

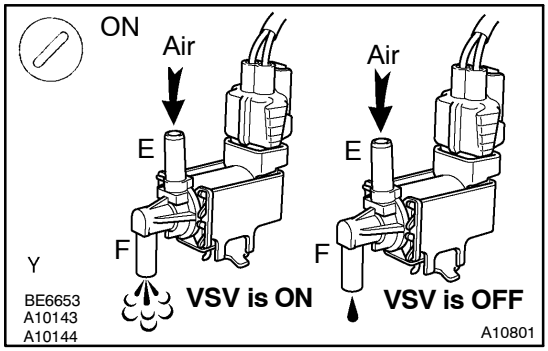
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	**Check pressure switching valve.**



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the item "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

(d) Check the VSV operation when it is operated by the hand–held tester.

CHECK:

Check the VSV operation when it is operated by the hand–held tester.

OK:

VSV is ON:
Air from port E flows out through port F.
VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 16.**

NG

14	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

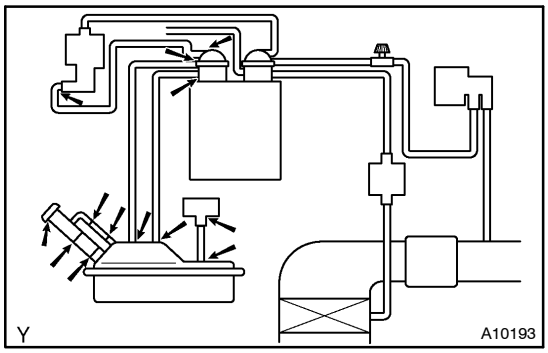
15	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → **Repair or replace evaporative emission leak part.**

OK

17	Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole and damage.

NG → **Repair or replace vacuum hose.**

OK

18	Check hose and tube between fuel tank and charcoal canister.

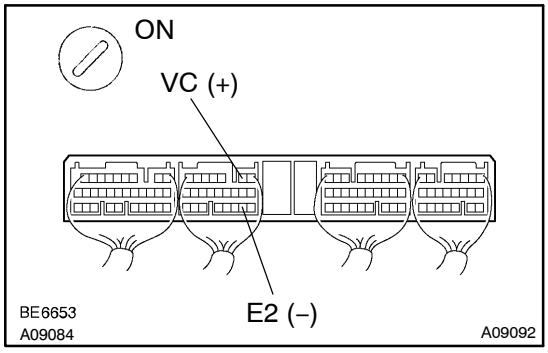
CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

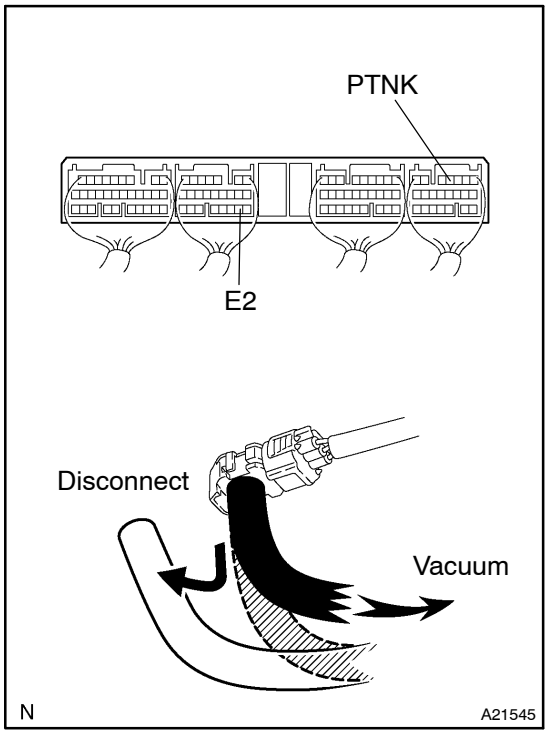
OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 22.

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG	Replace fuel tank inlet valve.

OK

23	Check fuel tank.

NG → Replace fuel tank.

OK

24	Check charcoal canister for cracks, hole and damage.

NG → Repair or replace charcoal canister.

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	Check that fuel tank cap meets OEM specifications.

NG → Replace with a cap that meets OEM specifications.

OK

2	Check that fuel tank cap is correctly installed.

NG → Correctly install fuel tank cap.

OK

3	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

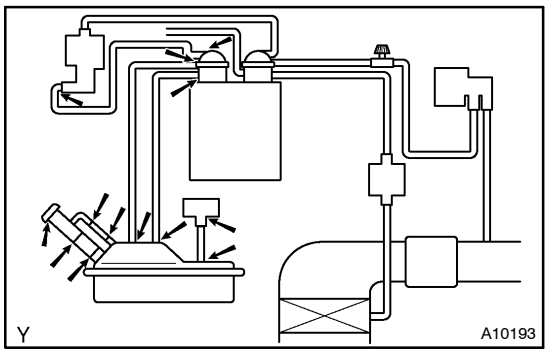
4	Check filler neck for damage.

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace evaporative emission leak part.**

OK

6	Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole and damage.

NG → **Repair or replace vacuum hose.**

OK

7	Check hose and tube between fuel tank and charcoal canister.

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–2), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, hole and damage.

NG → **Repair or replace hose and tube.**

OK

8	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole damage, and blockage.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect or sensor connector.**

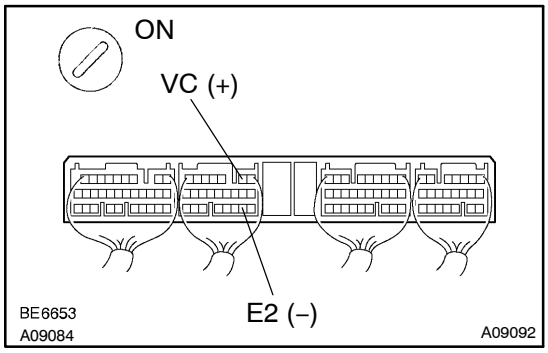
OK

10	**Check charcoal canister for cracks, hole and damage.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

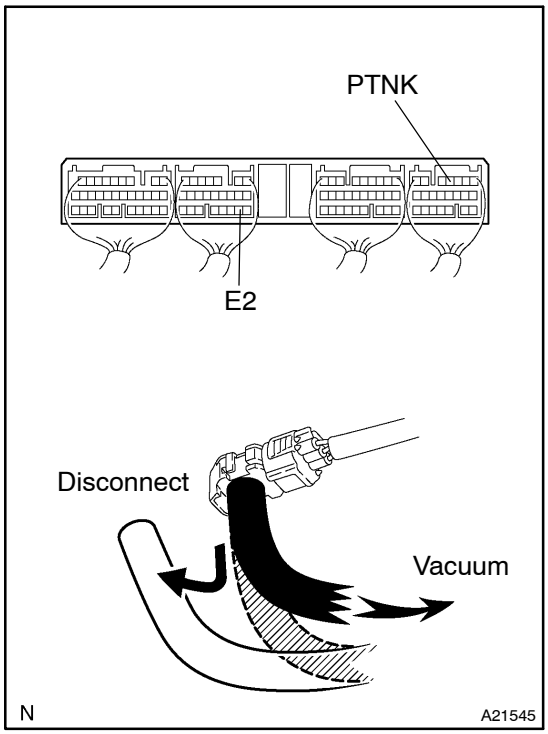
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor at following condition (1) and (2).

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

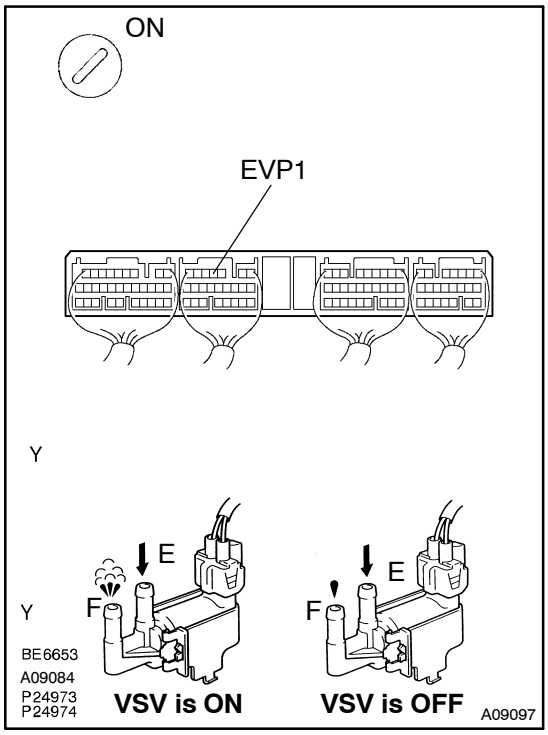
13	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

14	Check EVAP VSV.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP1 of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal EVP1 of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → Go to step 17.

NG

15	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

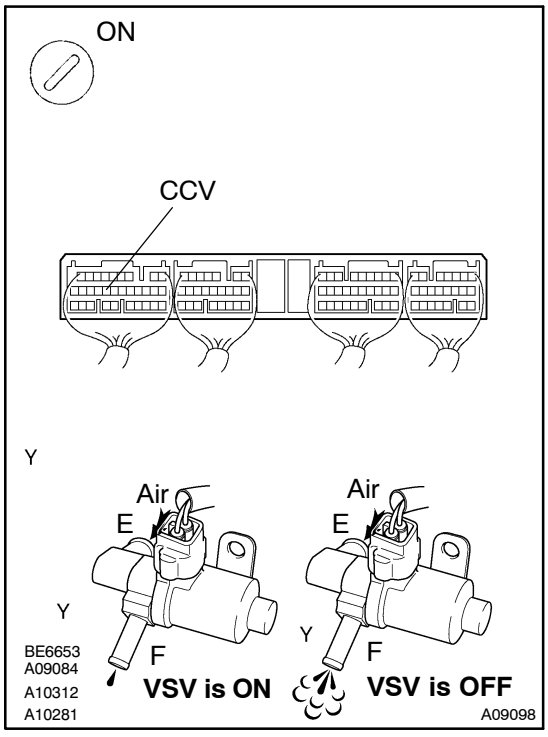
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30)**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal CCV of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal CCV of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air does not flow from port E to port F.
(2) VSV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

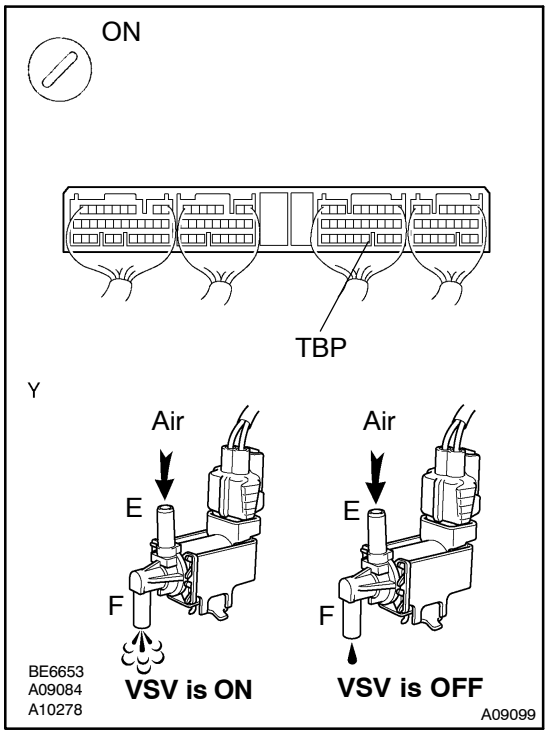
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect between terminal TBP of the ECM connector and body ground (VSV ON).

(2) Disconnect between terminal TBP of the ECM connector and body ground (VSV OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 23.**

NG

21	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

24	Check fuel tank.

NG → Replace fuel tank.

OK →

It is likely that vehicle user did not properly close fuel tank cap.

DID55–01

DTC	P0451	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance

DTC	P0452	Evaporative Emission Control System Pressure Sensor/Switch Low Input

DTC	P0453	Evaporative Emission Control System Pressure Sensor/Switch High Input

MONITOR DESCRIPTION

DTC ”P0451, P0452 or P0453” is recorded by the ECM when the vapor pressure sensor malfunctions.

P0451

The ECM sensor pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
For this DTC P0451, the ECM checks for a ”noisy” sensor or a ”stuck” sensor.
The ECM checks for a ”noisy” sensor by monitoring the fuel tank pressures when the vehicle is stationary and there should be little variation in the tank pressure. If the indicated pressure varies beyond specified limits, the ECM will illuminate the MIL (2–trip detection logic) and a DTC will be set.
The ECM checks for a ”stuck” sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning, The ECM will illuminate the MIL and a DTC will be set.

P0452 and P0453

The ECM sensor pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
If the output voltage of the vapor pressure sensor is out of normal range, the ECM will determine that there is a malfunction in the sensor or sensor circuit.
When pressure indicated by the vapor pressure sensor deviates below –3.999 kPa (–30 mmHg, –1.18 in.Hg) or above 1.999 kPa (15 mmHg, 0.59 in.Hg), the ECM interprets this as a malfunction in the vapor pressure sensor. The ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0451	Vapor pressure sensor output extremely changes under conditions of (a) and (b): (2 trip detection logic) (a) Vehicle speed: 0 km/h (0mph), Engine speed: Idling and pressure switching valve is OFF (b) Vapor pressure sensor value ≧ opening pressure valve of charcoal canister	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0452	10 seconds or less after engine starting, vapor pressure sensor value remains less than the fixed value: (2 trip detection logic)	
P0453	10 seconds or less after engine starting condition, vapor pressure sensor value remains more than the fixed value: (2 trip detection logic)	

MONITOR STRATEGY

P0451

Related DTCs	P0451	Evaporative emission control system pressure sensor range/performance
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	Fuel tank pressure sensor ”Noise” monitor: 10 sec. Fuel tank pressure sensor ”Stuck” monitor: 20 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

P0452 and P0453

Related DTCs	P0452	Evaporative emission control system pressure sensor/switch low input
	P0453	Evaporative emission control system pressure sensor/switch high input
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	17 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0451

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Fuel tank pressure sensor "Noise" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank temperature sensor malfunction (P0452, P0453)	Not detected	
Intake coolant temperature at engine start – Engine coolant temperature at engine start	–7°C (–12.6°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after vehicle stop and idling	5 sec.	15 sec.
Bypass VSV	Closed	
Fuel tank pressure sensor "Stuck" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank temperature sensor malfunction (P0452, P0453)	Not detected	
Intake coolant temperature at engine start – Engine coolant temperature at engine start	–7°C (–12.6°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake air coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after engine start	6 sec.	–

P0452 and P0453

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
Difference between intake air temperature and engine coolant temperature at engine start	–	12°C (21.6°F)
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)

Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

P0451

Detection Criteria	Threshold
Fuel tank pressure sensor "Noise" monitor:	
Frequency that fuel tank pressure change is 0.667 kPa (5.0 mmHg) or more	7 times or more for 10 sec.
Fuel tank pressure sensor "Stuck" monitor:	
Fuel tank pressure change	No change for 20 min.

P0452 and P0453

Detection Criteria	Threshold
P0452:	
Fuel tank pressure	Less than –3.999 kPa (–30 mmHg, –1.18 in.Hg) when engine running
P0453:	
Fuel tank pressure	1.999 kPa (15 mmHg, 0.59 in.Hg) or more when engine running

WIRING DIAGRAM

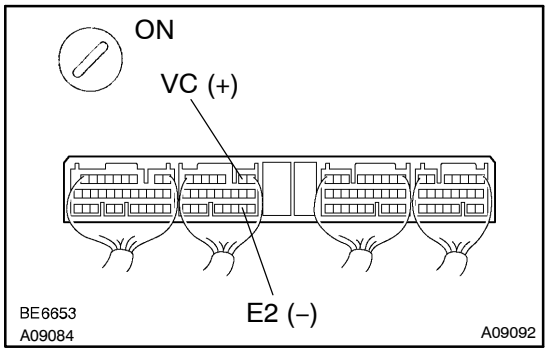
Refer to DTC P0441 on page DI–202.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- If DTC P0441 (Purge Flow), P0446 (CCV) or P0451 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, troubleshoot DTC P0441, P0446 or P0451 first. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

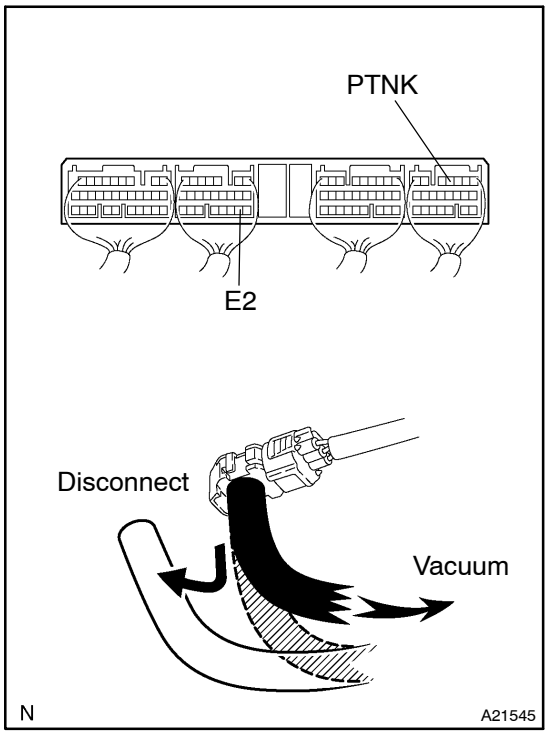
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

2	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

(3) Check the vapor pressure sensor output waveform using a hand–held tester.

NOTICE:

Vacuum applied to vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

(1) Voltage: 2.9 to 3.7 V

(2) Voltage: 0.5 V or less

(3) A consecutive waveform presents.

OK	Check for intermittent problems (See page DI–3).

NG

3	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

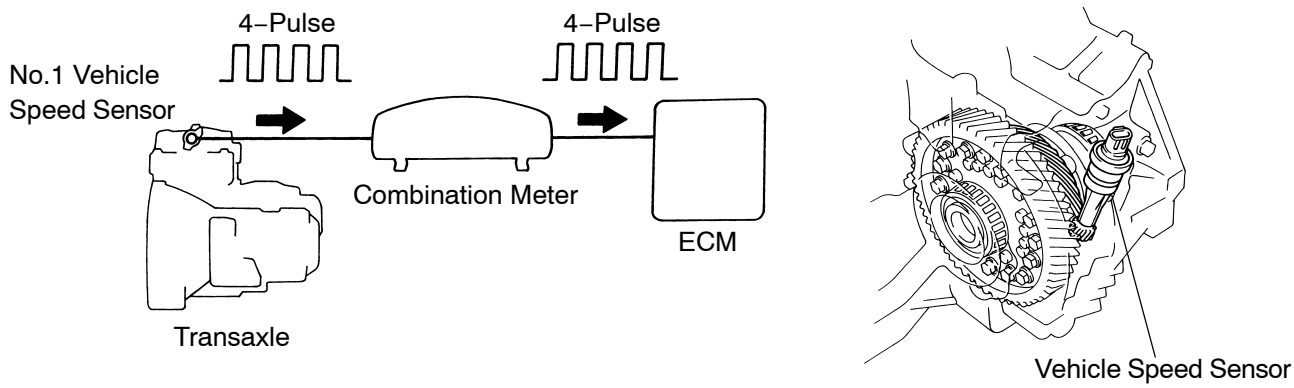
Replace vapor pressure sensor.

DI38H–12

DTC	P0500	Vehicle Speed Sensor Malfunction

CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pluse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	While vehicle is being driven, no vehicle speed sensor signal to ECM (2 trip detection logic)	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM

MONITOR DESCRIPTION

The ECM assumes that the vehicle is driven when over 30 sec. have passed since the park/neutral position switch was turned OFF. If there is no signal from the vehicle speed sensor with these conditions satisfied, the ECM concludes that the vehicle speed sensor is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor ”A” pulse input error
Required sensors/components	Main sensors/components	Vehicle speed sensor
	Related sensors/components	Park/Neutral position switch, Engine coolant temperature sensor, Combination meter
Frequency of operation	Continuous	
Duration	8 sec.	
MIL operation	Manual transaxle: 2 driving cycles Automatic transaxle: Immediate	
Sequence of operation	None	

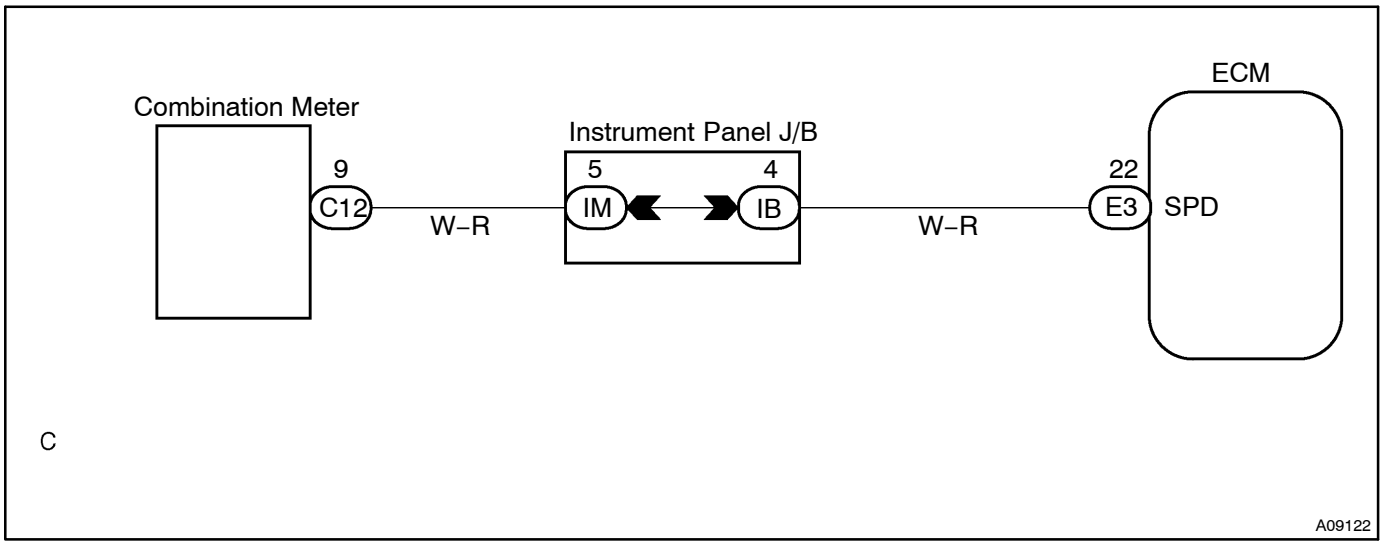
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Manual transaxle:		
Engine coolant temperature	70°C (158°F)	–
Engine speed	2,000 rpm	5,000 rpm
Intake air amount per engine revolution	0.44 g/rev	–
Fuel cut at high engine speed	Not executing	
Automatic tranxaxle:		
Either of the following conditions is met:	A or B	
A. Following conditions are met:	(a) and (b)	
(a) Time after park/neutral position switch turns from ON to OFF	10 sec.	–
(b) Engine coolant temperature	20°C (68°F)	–
B. Following conditions are met:	(a) and (b)	
(a) Time after park/neutral position switch turns from ON to OFF	30 sec.	–
(b) Engine coolant temperature	–	20°C (68°F)
Time after ignition SW is ON	2 sec.	–
Engine speed	Vary with throttle opening angle	
Detection time that intake air temperature is –10°C (14°F) or more	2 sec.	–
Detection time that intake air temperature is less than –10°C (14°F)	8 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Vehicle speed sensor signal	No pulse input

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

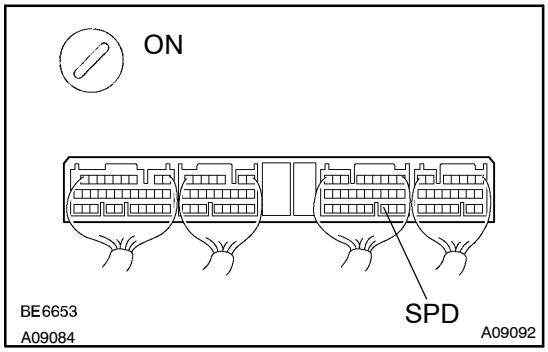
1	**Check operation of speedometer.**

CHECK:
Drive the vehicle and check if the operation of the speedmeter in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer circuit. See combination meter troubleshooting (See page BE–2).**

OK

2	**Check voltage between terminal SPD of ECM connector and body ground.**



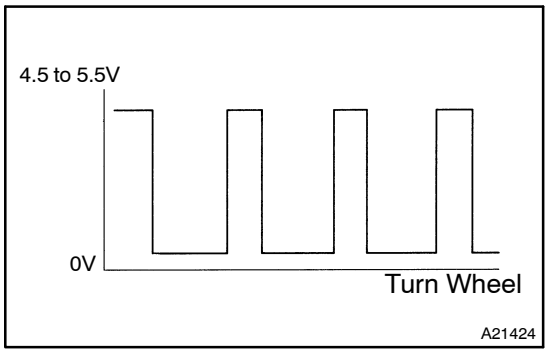
PREPARATION:
(a) Remove the ECM cover.
(b) Shift the shift lever to neutral.
(c) Jack up one of the front wheels.
(d) Turn the ignition switch ON.

CHECK:
Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.

HINT:
The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.



NG → **Repair or replace harness or connector.**

OK

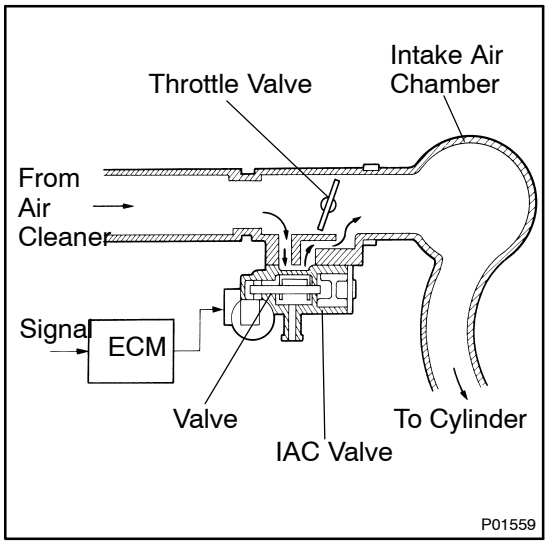
Replace ECM (See page SF–78).

DIC70–02

DTC	P0505	Idle Air Control System

DTC	P0511	Idle Air Control Circuit

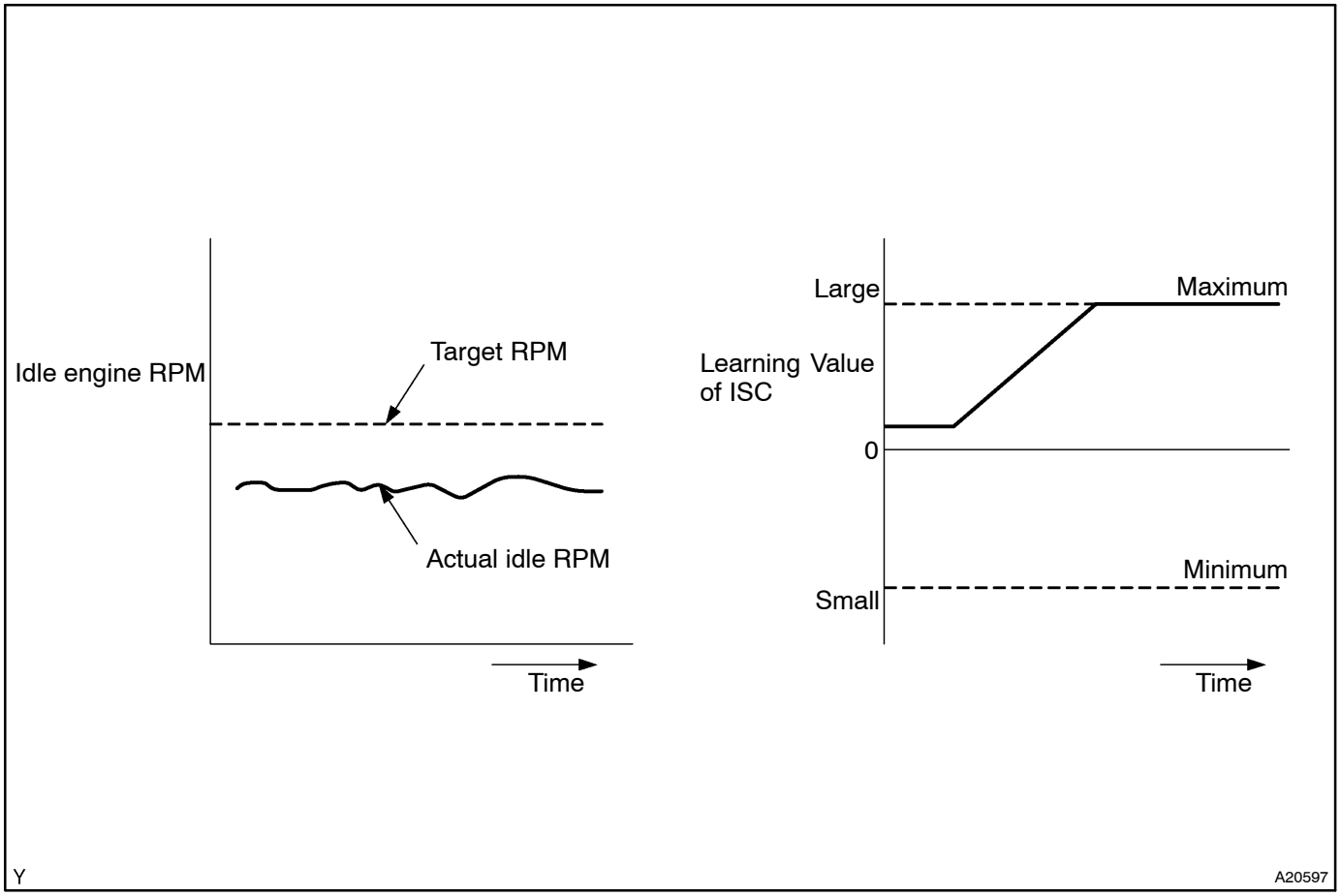
CIRCUIT DESCRIPTION



The rotary solenoid type idle air control (IAC) valve is located under the throttle body and intake air bypassing the throttle valve flows into the IAC valve through the passage.
In this way, the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates the IAC valve only to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle air continues to vary greatly from target speed (2 trip detection logic)	• Open or short in idle air control (IAC) valve circuit • Idle air control (IAC) valve is stuck or closed • A/C switch circuit • Air induction system • PCV valve and hose • ECM
P0511	Open or short in IAC circuit	

MONITOR DESCRIPTION



The idle speed is controlled by the Electronic Throttle Control System (ETCS).
The ETCS is composed of the throttle motor, which operates the throttle valve, and the throttle position sensor, which detects the opening angle of the throttle valve.
The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. The ECM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount, or 2) a learning value of the idle speed control remains at the maximum or minimum five times or more during a driving cycle. The ECM will turn on the MIL and set a DTC.
Example:
If the RPM difference between the target and actual idle engine RPM exceeds 200 rpm (*1) with the vehicle stopped with idling, and this occurs 5 times, or if the learning value angle of the IAC remains at its maximum or minimum angle for 5 seconds, P0505 is detected.
P0511 is detected as an open or short in the IAC circuit if the rate of duty signal input to the IAC valve has stuck at 0 or 100%.
HINT:
*1: RPM threshold varies with engine load.

MONITOR STRATEGY

Related DTCs	P0505	Idle air control valve
	P0511	Idle air control valve
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	P0505 : Once per driving cycle P0511 : Continuous	
Duration	P0505 : 10 min. P0511 : 10 sec.	
MIL operation	P0505 : 2 driving cycles P0511 : Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–3	
P0505		
Battery voltage	11 V	–
Engine coolant temperature	75°C (167°F)	–
Idle	ON (more than 6 sec.)	
Vehicle speed	–	3 km/h (1.9 mph)
Engine speed	400 rpm	–
P0511:		
Output signal duty	10%	90%
Battery voltage	10V	–
Time after first missing of voltage change	10 sec.	–

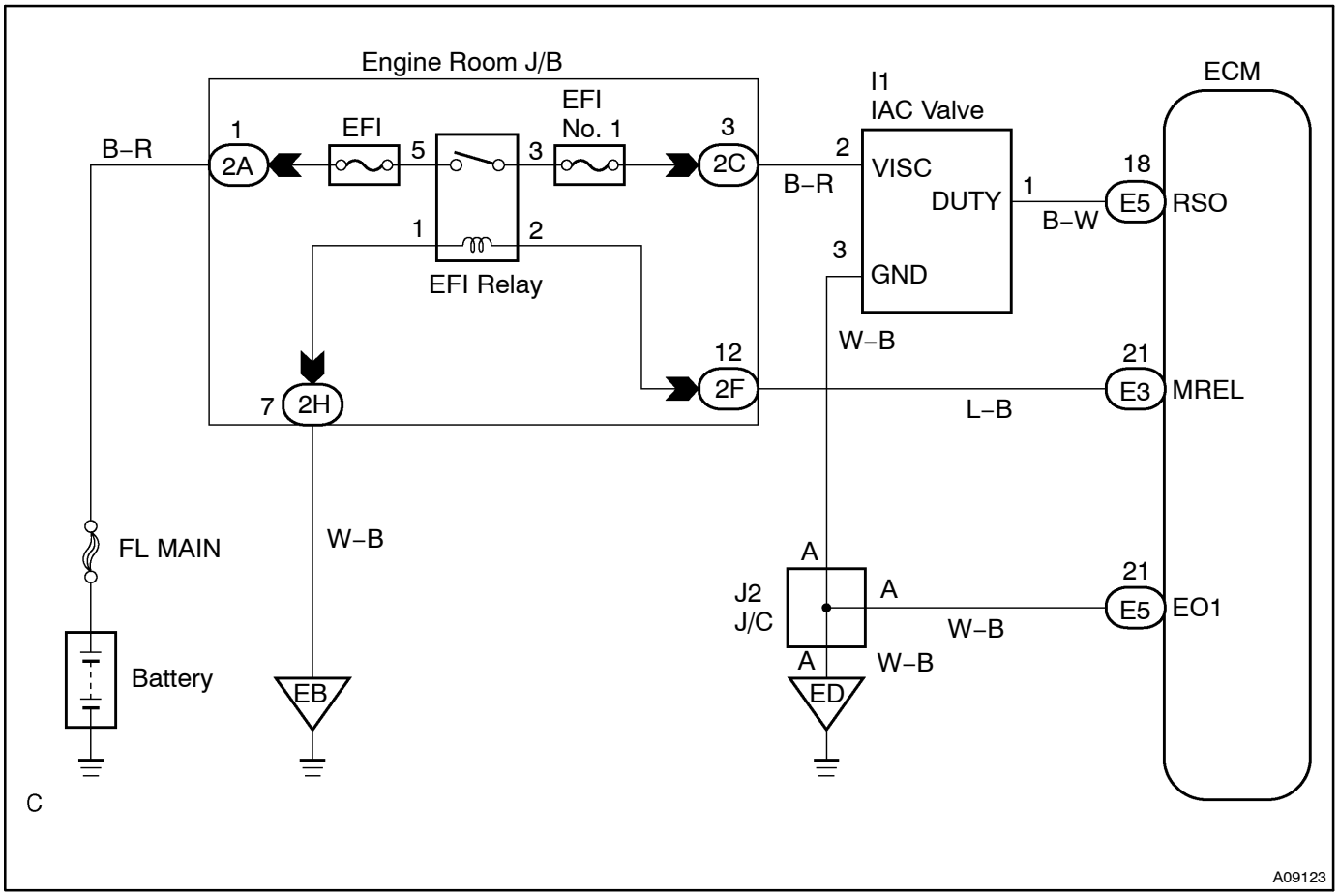
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0505 Functional check:	
Following conditions are met : At idle (After running at more than 10 km/h (6.2 mph) per trip)	Conditions 1, 2 and 3
1. Either of the following conditions is met:	Condition (a) or (b)
(a) Deviation of engine speed (When shift position is in N or A/C is ON)	Less than – 100 rpm or more than 200 rpm
(b) Deviation of engine speed (When shift position is in D or A/C is OFF)	Less than – 100 rpm or more than 150 rpm
2. Either of the following conditions is met:	Condition (a) or (b)
(a) IAC flow rate learning value (A/C OFF)	–0.2 L/sec. or less or 0.88 L/sec. or more
(b) IAC flow rate learning value (A/C ON)	0.22 L/sec. or less or 0.98 L/sec. or more
3. Number of detections	5 times/trip
P0511:	
Number of missing output voltage change	2,000 times or more

COMPONENT OPERATING RANGE

Parameter	Standard value
P0511:	
Time while no missing voltage change	0.5 sec. or more

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- When the throttle position is slightly opened (the accelerator pedal is slightly depressed) because a floor carpet is overlapped on the accelerator pedal, or if not fully releasing the accelerator pedal, etc., DTC P505 will possibly be detected.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Are there any other codes (besides DTC P0505 and P0511) being output?**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF.

CHECK:

Read the DTCs.

RESULT:

Display (DTC Output)	Proceed to
P0505 and P0511	A
P0505, P0511 and other DTCs	B

HINT:

If any other codes besides P0505 and P0511 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–42).**

A

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

3	**Check air induction system.**

CHECK:

Check the air induction system vacuum leaks.

NG → **Repair or replace air induction system.**

OK

4	**Check engine idle speed.**

PREPARATION:

(a) Warm up the engine to the normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the A/C.
(d) Shift the lever into the neutral position.
(e) Connect the hand–held tester to the DLC3.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ISC DUTY RATIO.

CHECK:

Check that the engine RPM varies when changing the ISC duty ratio.

OK:

Engine PRM fluctuates up and down in response to the ISC duty ratio variation.

OK → **Check for intermittent problems (See page DI–3).**

NG

5	**Check A/C signal circuit.**

NG → **Repair or replace A/C signal circuit.**

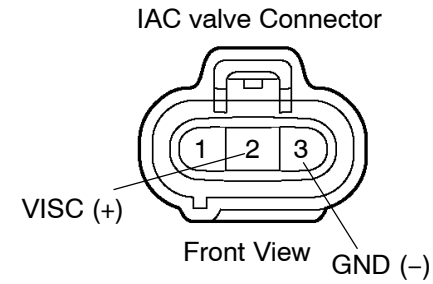
OK

6	**Check blockage of IAC valve and passage to bypass throttle valve.**

NG → **Replace IAC valve.**

OK

7	**Check voltage between terminals VISC and GND of IAC valve connector.**



PREPARATION:

(a) Disconnect the IAC valve connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals VISC and IAC of IAC valve connector.

OK:

Voltage: 9 to 14 V

NG → **Repair or replace harness or connector.**

OK

8	**Check for open and short in harness and connector between IAC valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

9	**Check IAC valve (See page SF–48).**

NG → **Replace IAC valve.**

Ok

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

2	**Check air induction system.**

CHECK:
Check the air induction system vacuum leaks.

NG → **Repair or replace air induction system.**

OK

3	**Check A/C signal circuit.**

NG → **Repair or replace A/C signal circuit.**

OK

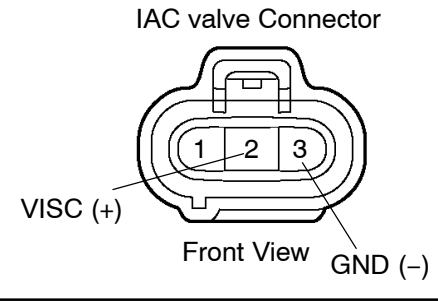
4	**Check blockage of IAC valve and passage to bypass throttle valve.**

NG → **Replace IAC valve.**

OK

5	**Check voltage between terminals VISC and GND of IAC valve connector.**

Wire Harness Side:



PREPARATION:

(a) Disconnect the IAC valve connector.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between the terminals VISC and IAC of IAC valve connector.

OK:

Voltage: 9 to 14 V

NG → **Repair or replace harness or connector.**

OK

6	**Check for open and short in harness and connector between IAC valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

7	**Check IAC valve (See page SF–48).**

NG → **Replace IAC valve.**

OK

Replace ECM (See page SF–78).

DI38N–15

DTC	P0560	System Voltage

MONITOR DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is OFF. This electricity allows the ECM to store data such as DTC history, freeze frame data, fuel trim values, and other data.
If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0560	Open in back up power source circuit	• Open in back up power source circuit • EFI fuse • ECM

HINT:
If DTC P0560 is present, the ECM will not store other DTC.

MONITOR STRATEGY

Related DTCs	P0560	System voltage malfunction
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (*1)	
Sequence of operation	None	

*1: The DTC is set immediately. The MIL will be illuminated after the engine starts in the next time.

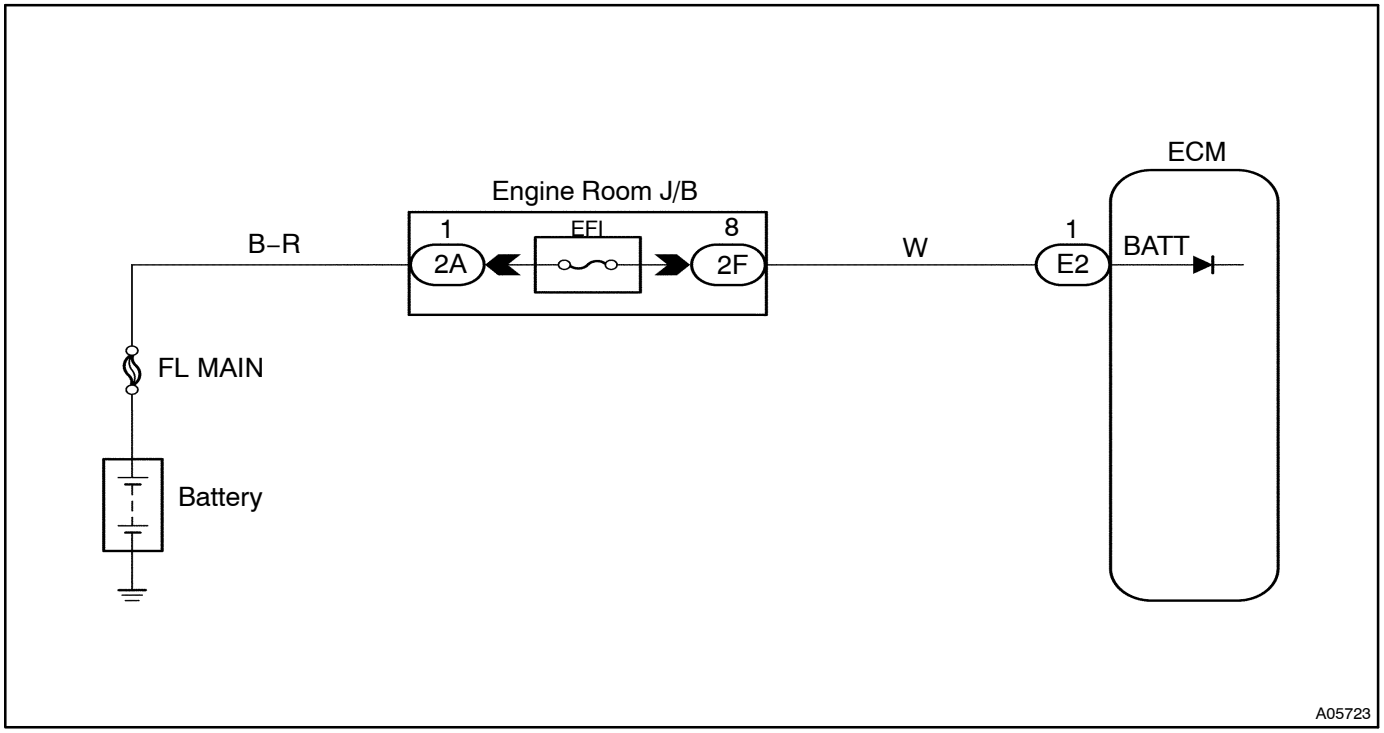
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Stand–by RAM	Initialized	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Battery voltage	Less than 3.5 V

WIRING DIAGRAM

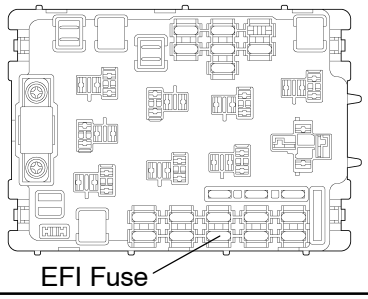


INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check EFI fuse.**

Engine Room J/B



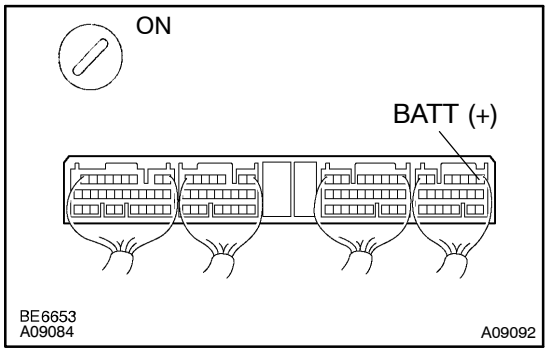
PREPARATION:
Remove the EFI fuse from the engine room J/B.
CHECK:
Check continuity of EFI fuse.
OK:

Continuity

NG → **Check for short in all the harness and components connected to EFI fuse.**

OK

2	Check voltage between terminal BATT of ECM connector and body ground.



PREPARATION:
Remove the ECM cover.
CHECK:
Measure voltage between terminal BATT of the ECM connector and body ground.
OK:

Voltage 9 to 14 V

OK	Check for intermittent problems (See page DI–3).

NG

3	Check for open and short in harness and connector between ECM and EFI fuse, EFI fuse and battery (See page IN–30).

NG	Repair or replace harness or connector.

OK

Check and replace engine room J/B.

DIC71–02

DTC	P0617	Starter Relay Circuit High

MONITOR DESCRIPTION

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. If the vehicle is being driven and the ECM detects the starter control signal (STA), the ECM concludes that the starter control circuit is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	When all conditions (a), (b) and (c) are satisfied when battery (+B) voltage is 10.5 V or more for 20 seconds: (a) Vehicle speed greater than 12 mph (20 km/h) (b) Engine revolution greater than 1,000 rpm (c) STA signal ON	• Short in Park/Neutral position switch circuit (A/T) • Park/Neutral position switch (A/T) • Clutch start switch (M/T) • ECM

MONITOR STRATEGY

Related DTCs	P0617	Starter signal error
Required sensors/components	Main sensors/components	Starter signal
	Related sensors/components	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	20 sec.	
MIL operation	Immediate	
Sequence of operation	None	

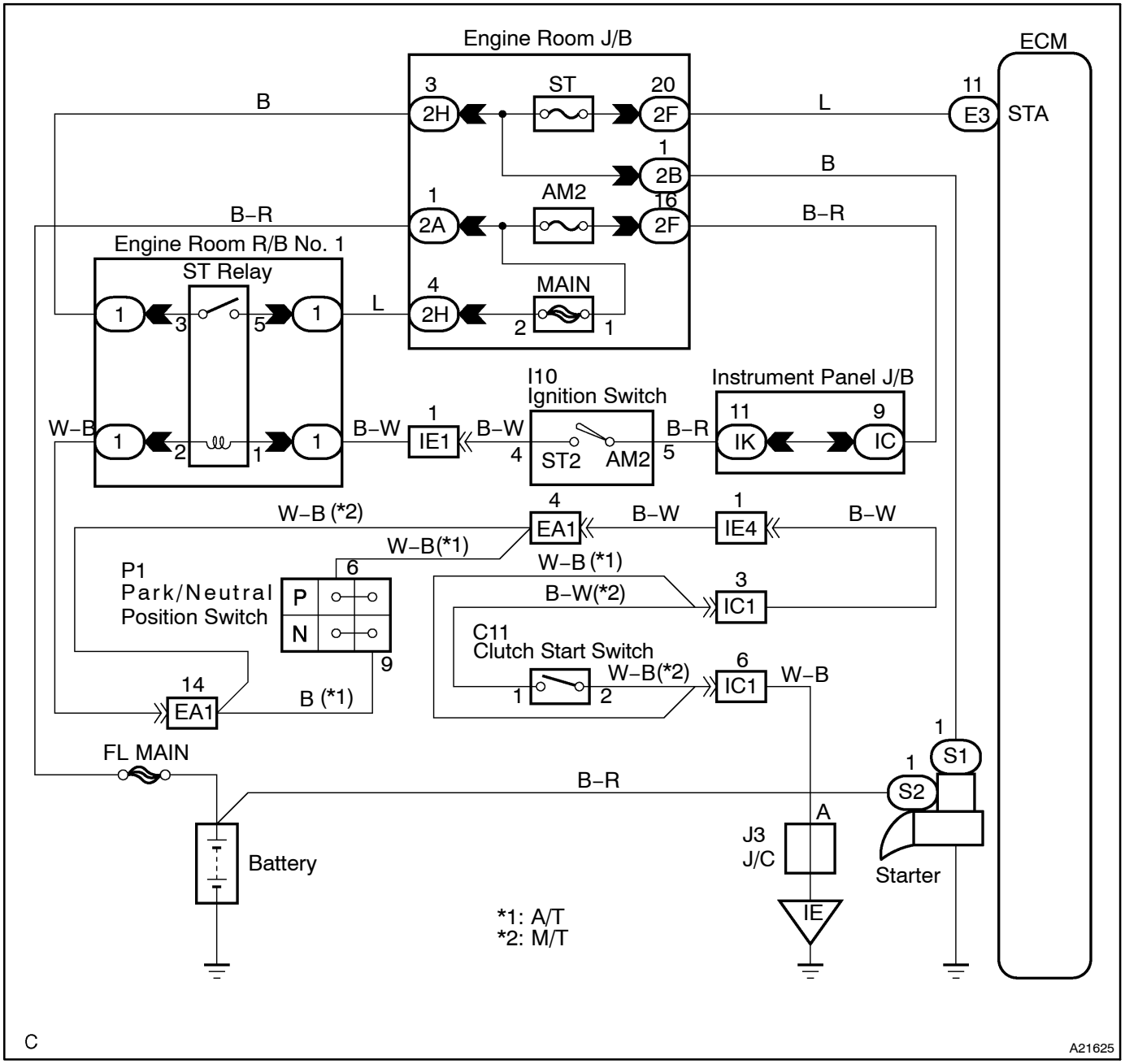
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	10.5 V	–
Vehicle speed	20 km/h (12.4 mph)	–
Engine speed	1,000 rpm	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Starter signal	ON (at ”more than 20 km/h (12.4 mph) and more than 1,000 rpm”)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check STA signal.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED / OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Go to step 5**

NG

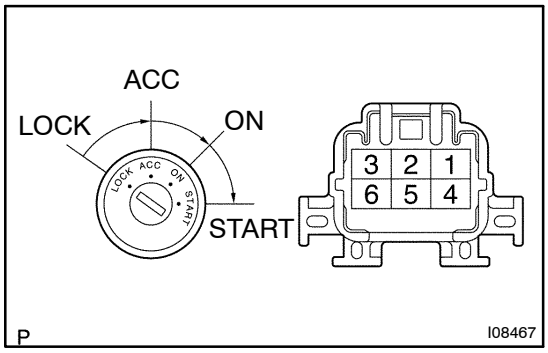
2	**Check park/neutral position switch or clutch start switch.**

(a) Inspect the park/neutral position switch (A/T) (See page DI–789).
(b) Inspect the clutch start switch (M/T) (See page CL–2).

NG → **Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	10 kΩ or higher
ACC	2 – 3	Below 1 Ω
ON	2 – 3 – 4 6 – 7	Below 1 Ω
START	1 – 2 – 4 6 – 7 – 8	Below 1 Ω

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check STA signal.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED / OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Clear DTC (See page DI–3)
Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODE and press YES.
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check the DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

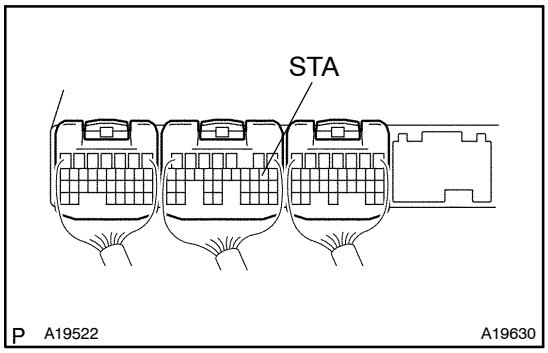
A → **Replace ECM (See page SF–78)**

B →

Check for intermittent problems (See page DI–3)

OBD II scan tool (excluding hand–held tester):

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:

0 V (Ignition switch ON)

6 V or more (Engine cranking)

OK	**Go to step 5.**

NG

2	**Check park/neutral position switch or clutch start switch.**

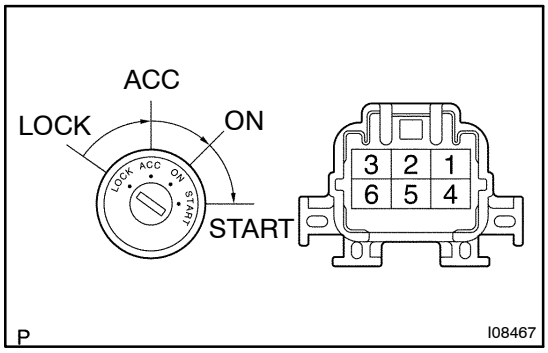
(a) Inspect the park/neutral position switch (A/T) (See page DI–789).

(b) Inspect the clutch start switch (M/T) (See page CL–2).

NG	**Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



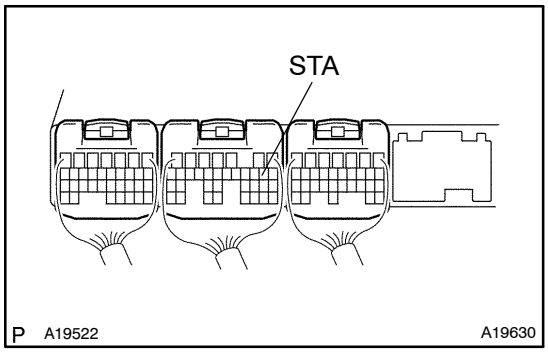
Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	1 MΩ or more
ACC	2 – 3	1 Ω or less
ON	2 – 3 – 4 6 – 7	1 Ω or less
START	1 – 2 – 4 6 – 7 – 8	1 Ω or less

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check voltage between terminal STA of ECM connector and body ground.



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:
0 V (Ignition switch ON)
6 V or more (Engine cranking)

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool main switch ON.
(c) Clear DTC (See page DI–3).
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

A → **Replace ECM (See page SF–78)**

B →

Check for intermittent problems (See page DI–3)

DID56–01

DTC	P0630	VIN not Programmed or Mismatch ECM/PCM

CIRCUIT DESCRIPTION

DTC P0630 is set when the Vehicle Identification Number (VIN) is not stored in the Engine Control Module (ECM) or the input VIN is not accurate. Input the VIN with the hand–held tester.

DTC No.	DTC Detecting Condition	Trouble Area
P0630	• VIN is not stored in ECM. • Input VIN to ECM is not accurate.	ECM

MONITOR STRATEGY

Related DTCs	P0630	VIN not programed
Required sensors/components	Main sensors/components	ECM
	Related sensors/components	–
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–3	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
VIN code	Not programmed

COMPONENT OPERATING RANGE

Prameter	Standard Value
VIN code	Programmed

INSPECTION PROCEDURE

1	**Read current DTC.**

NOTICE:
If P0630 is present, the VIN must be input to the ECM using the hand–held tester. However, all DTCs are cleared automatically by the tester when the VIN is input. If DTCs other than P0630 are present, check them first.

NEXT

2	**Input VIN with hand–held tester (See page DI–29).**

NEXT

END

DI1MG–12

DTC	P1645	Body ECU Malfunction

CIRCUIT DESCRIPTION

ECM receives the operating condition (ON/OFF) of A/C from A/C ECU and it also receives the electrical load information from the body ECU.
ECM uses these information to control the engine (idle up, etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P1645	Condition (a) or (b) continues for 3.0 sec. (a) No communication from body ECU (b) No communication from A/C ECU	• Body ECU • A/C ECU • Communication bus

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air−fuel ratio was lean or rich, and other data from the time the malfunction occurred.
Perform troubleshooting the Multiplex Communication System (See page BE−2).

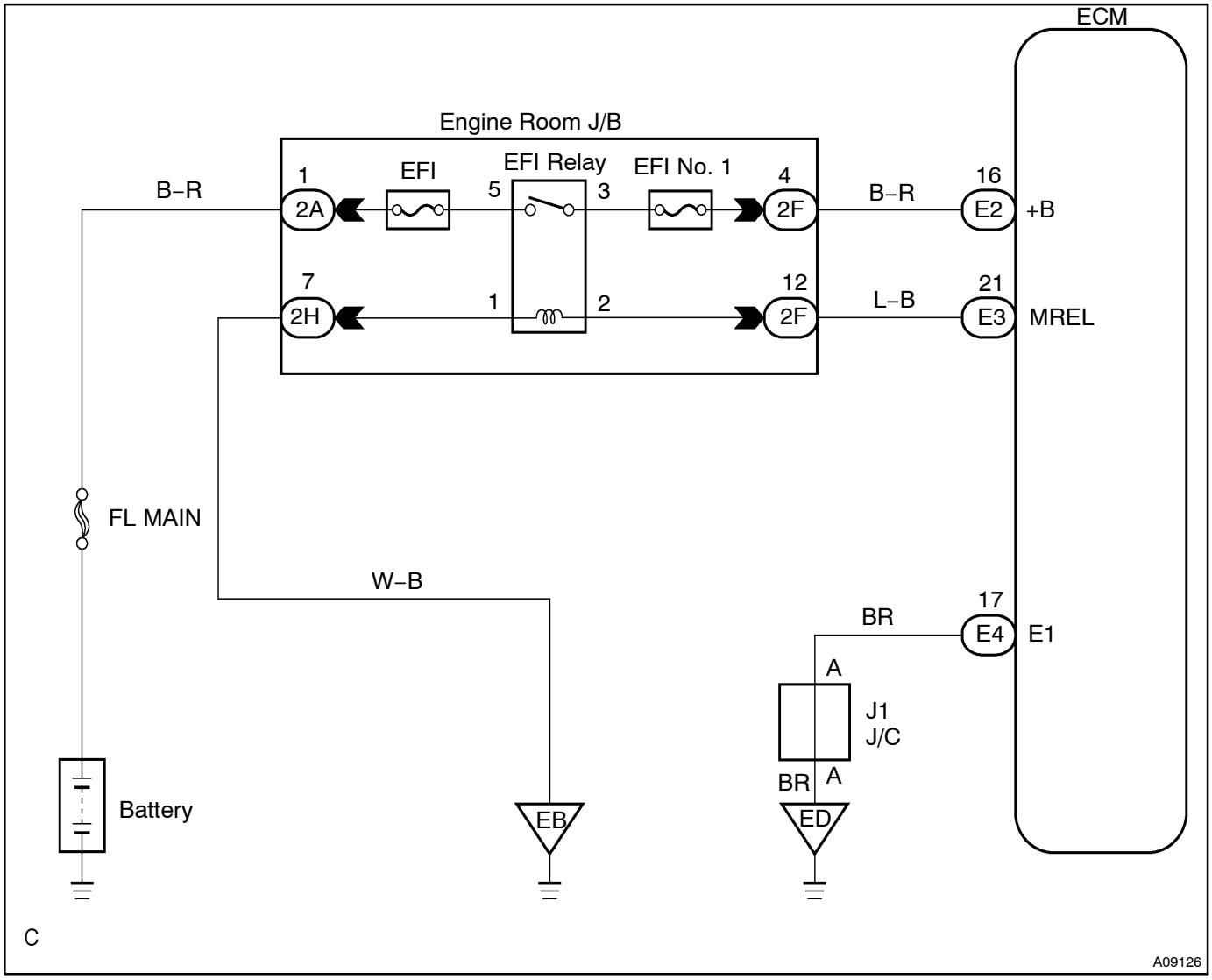
DIC72–02

ECM Power Source Circuit

CIRCUIT DESCRIPTION

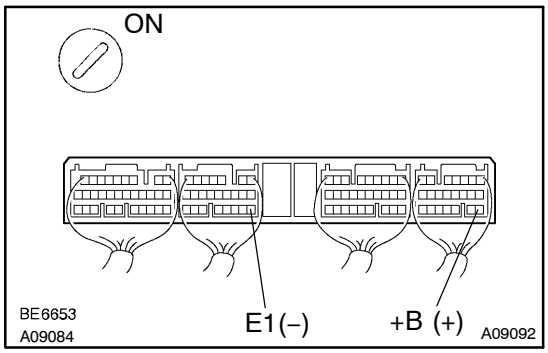
When the ignition switch is turned ON, battery voltage is applied to terminal IGSW of the ECM. The ECM "MREL" output signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.
If the ignition switch is turned OFF, the ECM holds the EFI relay ON for a maximum of 2 seconds to allow for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminals +B and E1 of ECM connector.



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminals +B and E1 of the ECM connector.

OK:
Voltage: 9 to 14 V

OK	Proceed to next circuit inspection shown on problem symptoms table (See page DI–39).

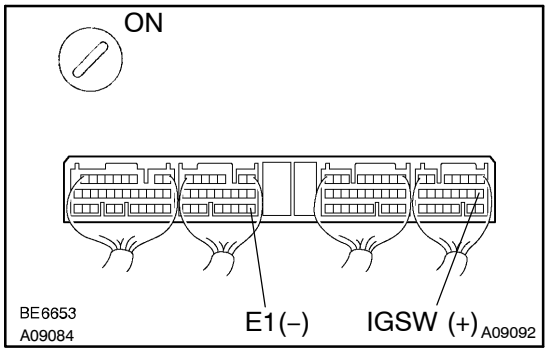
NG

2	Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–30).

NG	Repair or replace harness or connector.

OK

3	Check voltage between terminals IGSW and E1 of ECM connector.



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

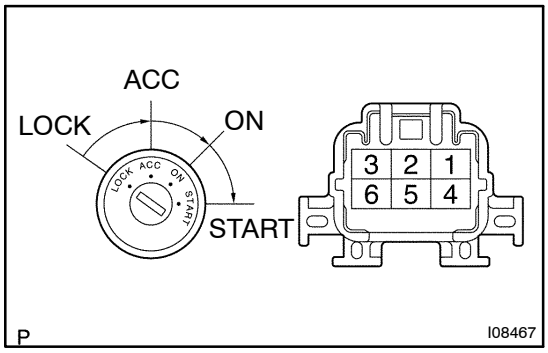
CHECK:
Measure voltage between terminals IGSW and E1 of the ECM connector.

OK:
Voltage: 9 to 14 V

OK	Go to step 5.

NG

4	Check ignition switch.



Check continuity between the connector terminals shown in the chart below.

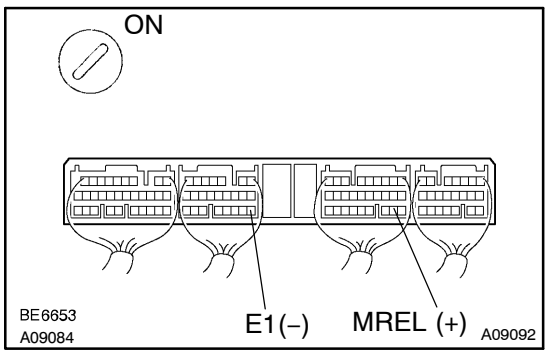
Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	No continuity
ACC	1 – 3	Continuity
ON	1 – 2 – 3 5 – 6	Continuity
START	1 – 2 4 – 5 – 6	Continuity

NG → **Replace ignition switch.**

OK →

Check and repair harness and connector between battery and ignition switch, ignition switch and ECM (See page IN–30).

5	Check voltage between terminals MREL and E1 of ECM connector.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals MREL and E1 of the ECM connector.

OK:

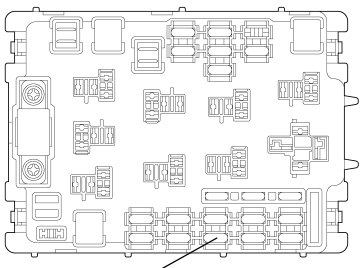
Voltage: 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG →

6	Check EFI fuse.

Engine Room J/B



PREPARATION:
Remove the EFI fuse from the engine room J/B.
CHECK:
Check continuity of EFI fuse.
OK:

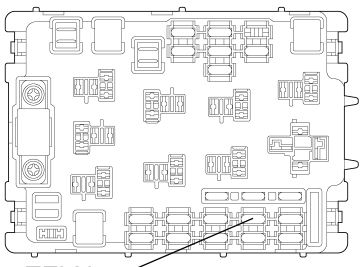
Continuity

NG	Check for short in all the harness and components connected to EFI fuse.

OK

7	Check EFI No. 1 fuse.

Engine Room J/B



PREPARATION:
Remove EFI No. 1 fuse from engine room J/B.
CHECK:
Check continuity of EFI No. 1 fuse.
OK:

Continuity

NG	Check for short in all the harness and components connected to EFI No. 1 fuse.

OK

8	Check EFI main relay (Marking: EFI) (See page SF–56).

NG	Replace EFI main relay.

OK

9	**Check for open and short in harness and connector between EFI relay and ECM, EFI relay and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

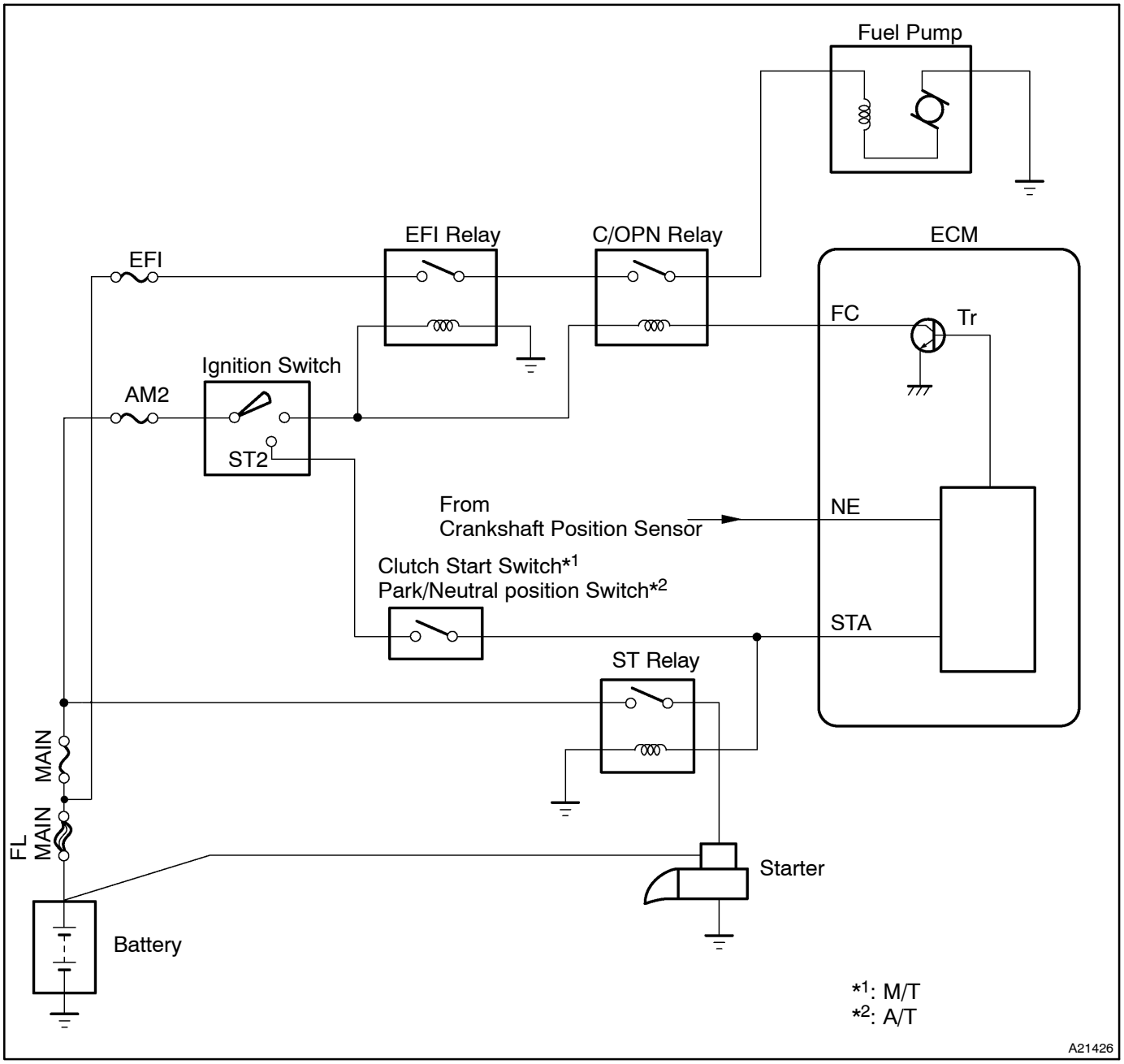
Check and replace harness and connector between terminal +B of ECM and battery positive terminal (See page IN–30).

DIC73–02

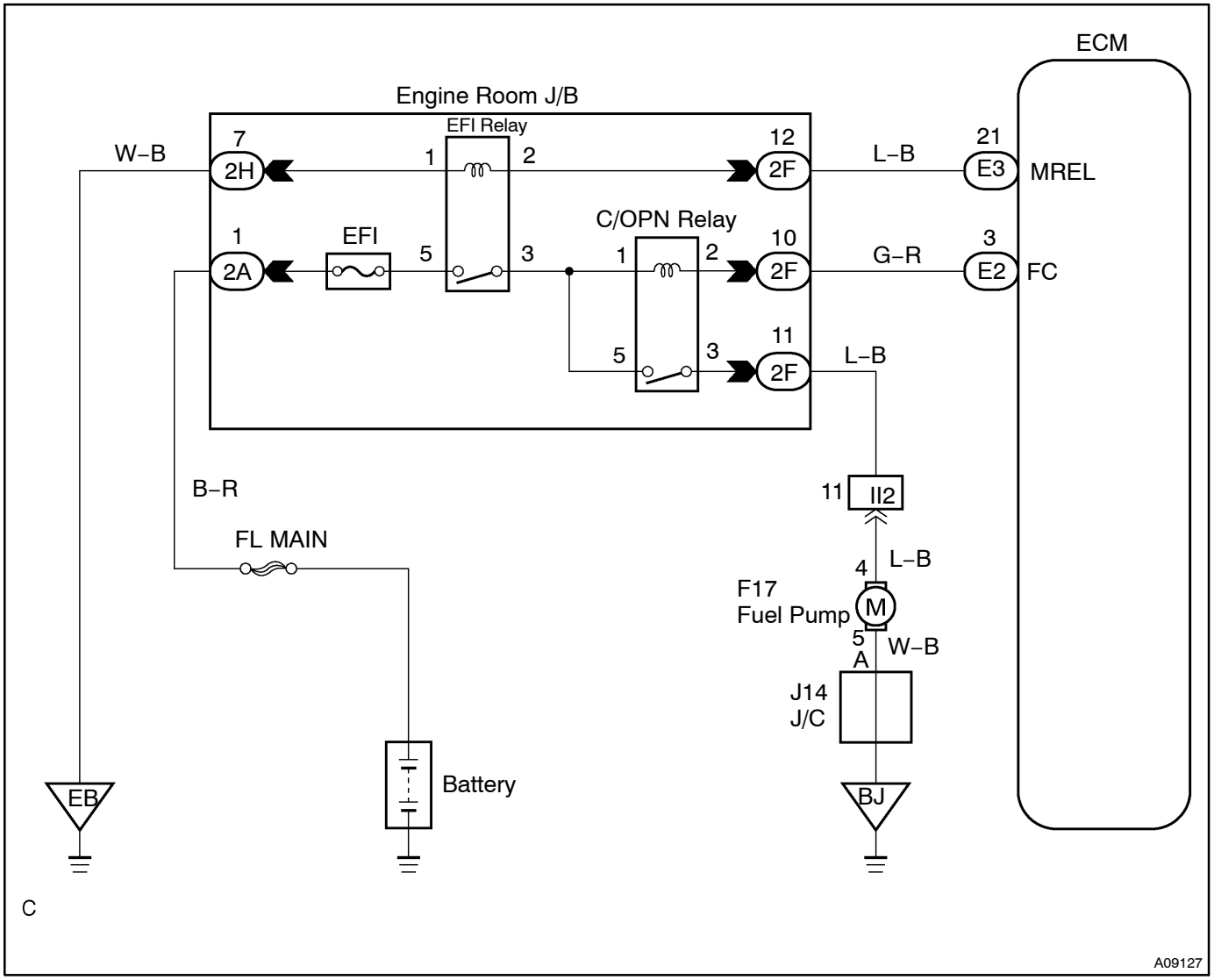
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

Hand–held tester:

1	**Connect the hand–held tester and check operation of fuel pump.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.

CHECK:

Check the relay operation while operating it with the hand–held tester.

OK:

Operating noise can be heard from the relay.

OK → **Go to step 5.**

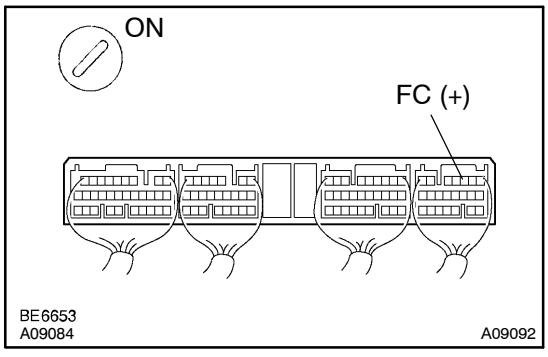
NG

2	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

3	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

4	Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).

NG → Repair or replace harness or connector.

OK ↓

Replace ECM (See page SF–78).

5	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK ↓

6	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

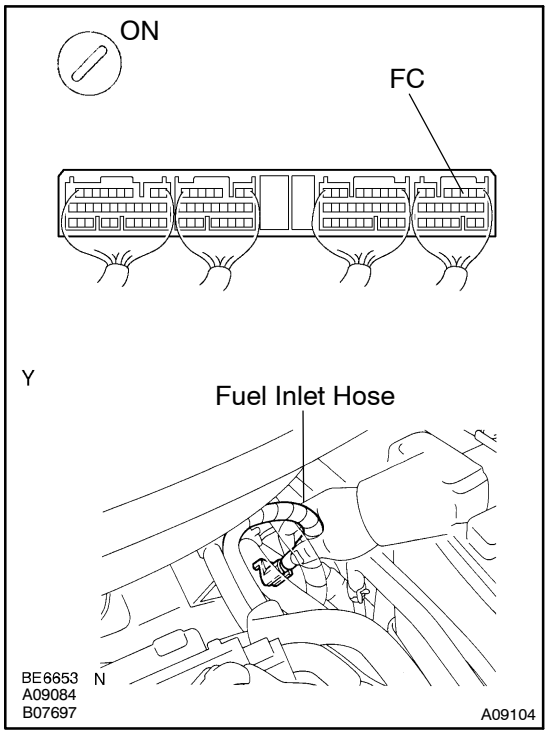
NG → Repair or replace harness or connector.

OK ↓

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	Check operation of fuel pump.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the ECM connector and body ground.

(b) Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in fuel inlet hose.

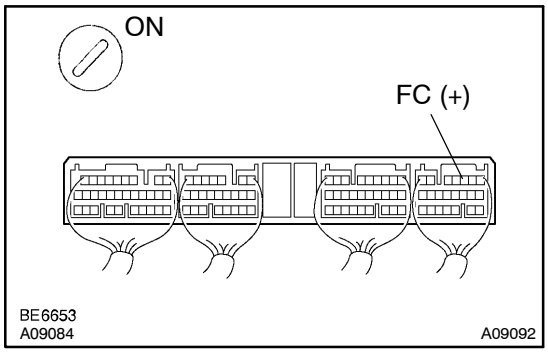
HINT:

At this time, you will hear a fuel return flowing noise.

OK	Proceed to next circuit inspection shown on problem symptoms table (See page DI–39).

NG

2	Check operation of circuit opening relay (Marking: C/OPN).



CHECK:

When connecting between terminal FC of the ECM connector and the body ground, check the relay operation.

OK:

Noise can be heard from the circuit opening relay.

OK	Go to step 6.

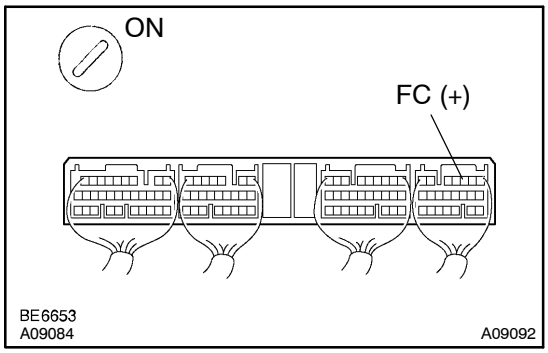
NG

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

4	**Check voltage between terminal FC of ECM and body ground .**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

5	**Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

6	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK

7	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

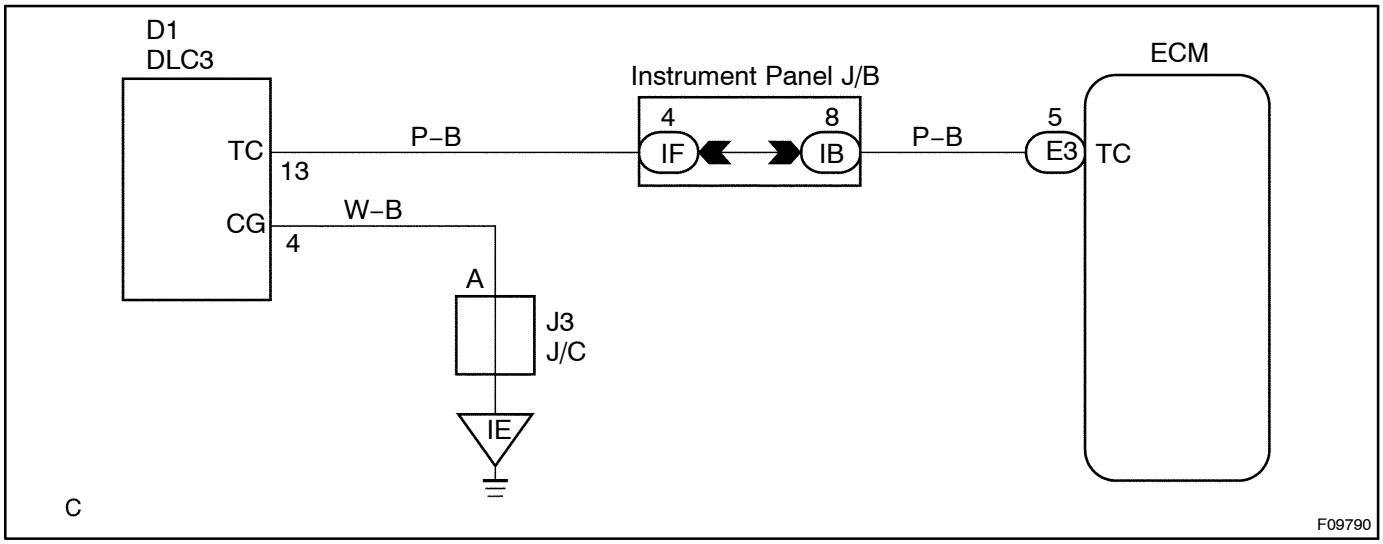
DI7DL–24

TC Terminal Circuit

CIRCUIT DESCRIPTION

Terminal TC and CG are located in the DLC3. When connecting these terminals, DTCs in normal mode or test mode can be read through the MIL flashing in the combination meter.

WIRING DIAGRAM

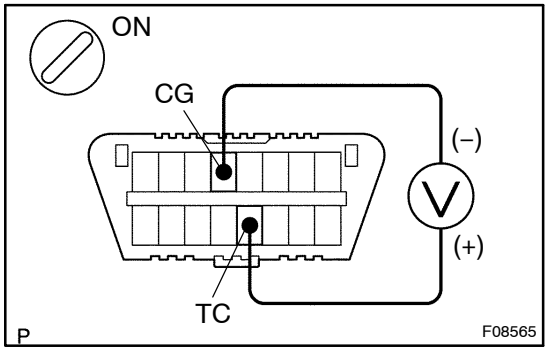


INSPECTION PROCEDURE

HINT:

- Even though terminal TC is not connected with terminal CG, the MIL blinks.
- For the above phenomenon, an open or short in the wire harness, or malfunction inside the ECM is the likely cause.

1	**Check voltage between terminals TC and CG of DLC3.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals TC and CG of the DLC3.

OK:

Voltage: 9 to 14 V

OK	**Replace ECM (See page SF–78).**

NG

2	Check continuity between terminal CG of DLC3 and body ground.

NG → Repair or replace harness or connector.

OK

3	Check for open and short circuit in harness and connector between ECM and DLC3, and DLC3 and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK

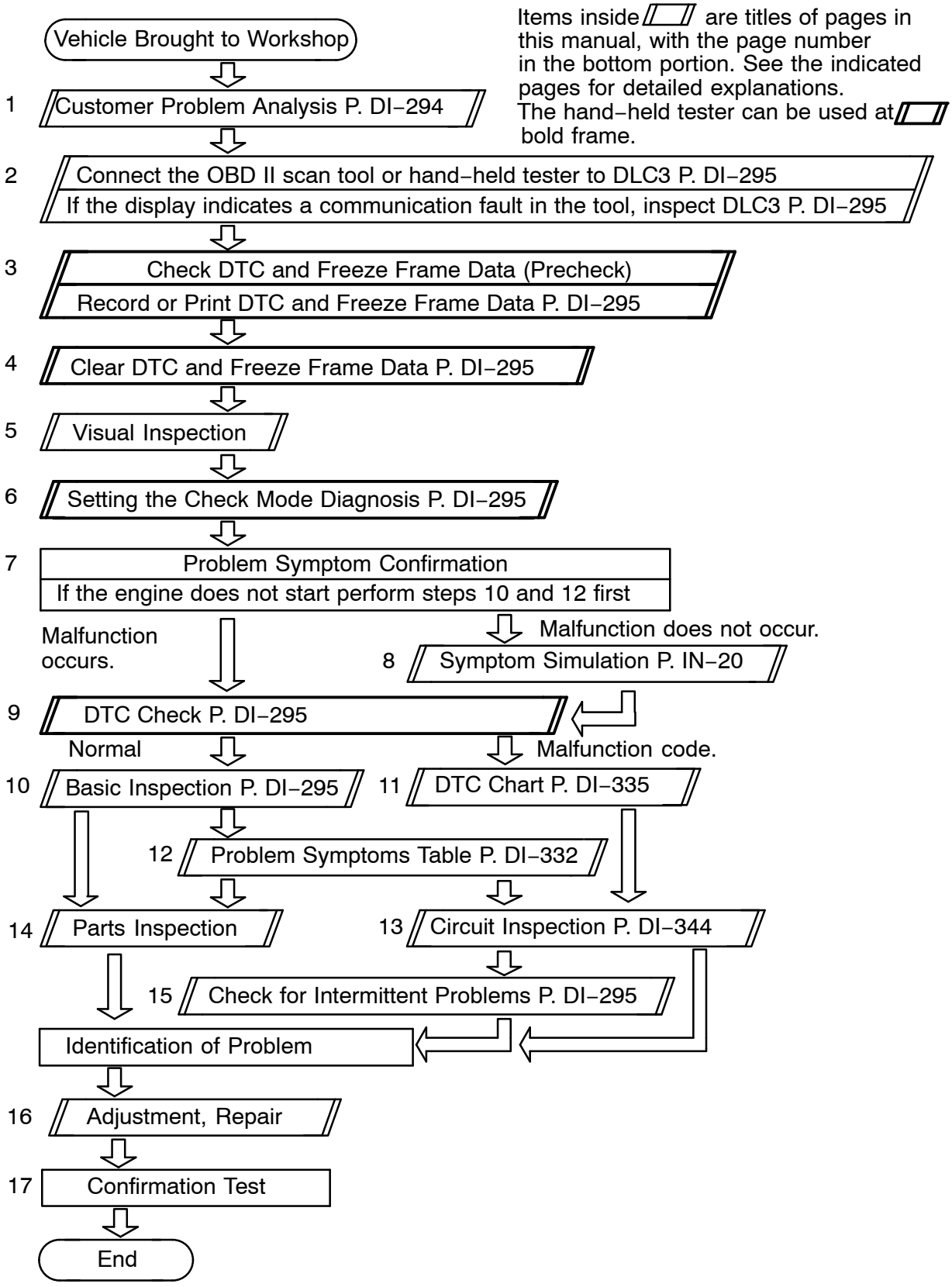
Replace ECM (See page SF–78).

ENGINE (2ZZ–GE)

DI37Q–17

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



DI37R–17

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

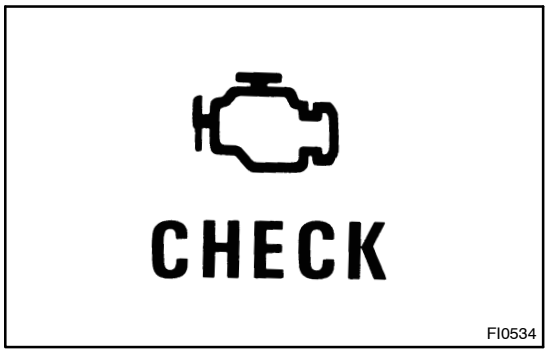
Customer's Name		VIN	
Driver's Name		Production Date	
Data Vehicle Brought in		Licence Plate No.	
Engine model		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Dates Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____˚C/____˚F)
	Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of malfunction indicator light (MIL)		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal Mode (Pre–check)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

DID57–01



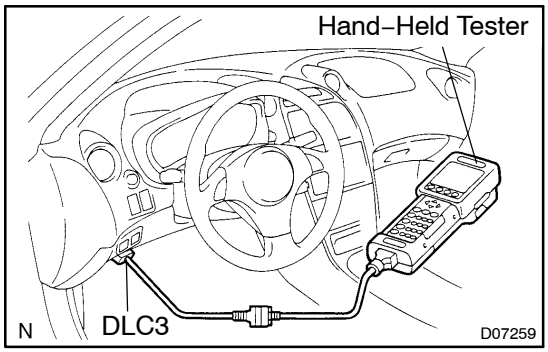
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting On–Board Diagnostic (OBD ll) vehicles, the vehicle must be connected to the OBD ll scan tool (in compliance with SAE J1978) or the hand–held tester. Various data output from the vehicle's ECM can then be read.
- OBD ll regulations require that the vehicle's on–board computer illuminates the Malfunction Indicator Light (MIL) on the instrument panel when the computer detects a malfunction in: 1) the emission control system/components, or 2) the power train control components (which affect vehicle emissions), or 3) the computer. In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–335).

If the malfunction does not reccur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain recorded in the ECM memory.

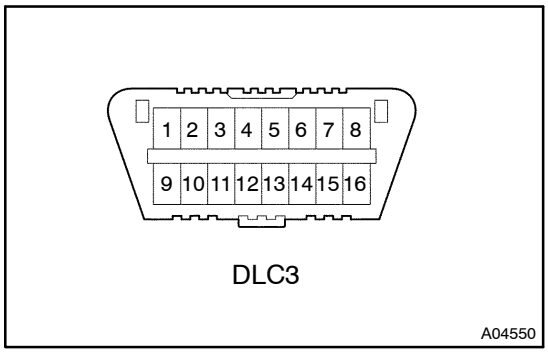


- To check the DTC, connect the hand–held tester or OBD II scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The hand–held tester or OBD II scan tool also enables you to erase the DTC and check the freeze frame data and various forms of engine data (See the instruction manual for the OBD ll scan tool or the hand–held tester). The DTC includes SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set according to the SAE, while manufacturer controlled codes can be set by a manufacturer with certain restrictions (See the DTC chart on page DI–335).

- The diagnosis system operates in ”normal mode” during normal vehicle use. In ”normal mode”, 2 trip detection logic* is used to ensure accurate detection of malfunctions. A ”check mode” is also available to technicians as an option. In ”check mode”, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system’s ability to detect malfunctions, including intermittent malfunctions (hand–held tester only) (See step 3).
- *2 trip detection logic:
  When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. This is known as 1st trip detection. If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate. This is known as 2nd trip detection.
- Freeze frame data:
  The freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determining if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Priorities for troubleshooting:
When multiple DTCs occur, find out the order in which the DTCs should be inspected by checking the component’s DTC chart. If no instructions are written in the DTC chart, check DTCs in the following order of priority:

(1) DTCs other than fuel trim malfunction DTCs (P0171 and P0172) and misfire DTCs (P0300 to P0304).
(2) Fuel trim malfunction DTCs (P0171 and P0172).
(3) Misfire DTCs (P0300 to P0304).



(b) Check the DLC3.
The vehicle's ECM uses the ISO 9141–2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Symbol	Name	Result
(Terminal No.)	(Reference terminal)	(Condition)
SIL	Bus "+" line	Pulse generation
(7)	(5 – Signal ground)	(During transmission)
CG	Chassis ground	1 Ω or less
(4)	(Body ground)	(Always)
SG	Signal ground	1 Ω or less
(5)	(Body ground)	(Always)
BAT	Battery positive	9 to 14 V
(16)	(Body ground)	(Always)

HINT:
Connect the cable of the hand–held tester to the DLC3, turn the ignition switch ON and attempt to use the hand–held tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(c) Inspect the battery voltage.
Battery Voltage: 11 to 14 V
If voltage is below 11 V, recharge the battery before proceeding.

(d) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

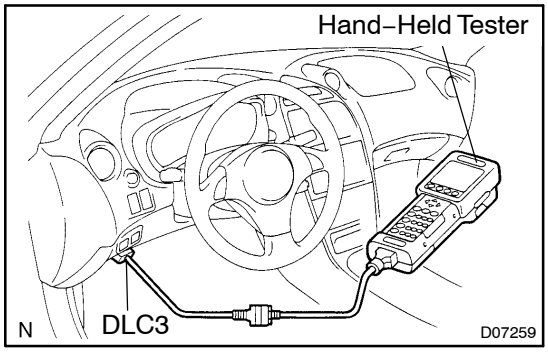
HINT:
If the MIL is not illuminated, troubleshoot the MIL circuit (See page DI–663).

(2) When the engine is started, the MIL should not illuminate. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

2. DTC CHECK (Normal Mode)

NOTICE:

- **If no DTC appears in normal mode:**
  On the OBD II scan tool or the hand–held tester, check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979).
- **When the diagnosis system is changed from normal mode to check mode or vice–versa, all DTCs and freeze frame data recorded in normal mode will be erased. Before changing modes, always check and make a note of DTCs and freeze frame data.**



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) Use the OBD II scan tool or the hand–held tester to check the DTCs and freeze frame data and then write them down.
  For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES. For the OBD II scan tool, see its instruction manual.
  (4) See page DI–295 to confirm the details of the DTCs.

NOTICE:

When simulating a symptom with the OBD II scan tool (excluding hand–held tester) to check the DTCs, use the normal mode. For DTC chart subject to ”2 trip detection logic”, perform either of the following actions.

- **Check the pending fault code:**
  For the hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- **Turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL comes on and the DTCs are recorded in the ECM.**

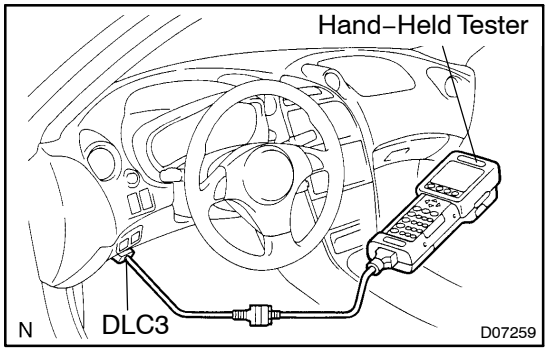
- **Check the pending fault code using the Continuous Test Results function (Mode 7 for SAE J1979) on the OBD II scan tool.**

(b) Clear the DTCs using the OBD II scan tool or the hand–held tester.
  (1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
  (2) Turn the ignition switch ON.
  (3) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester For the hand–held tester: 1) enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

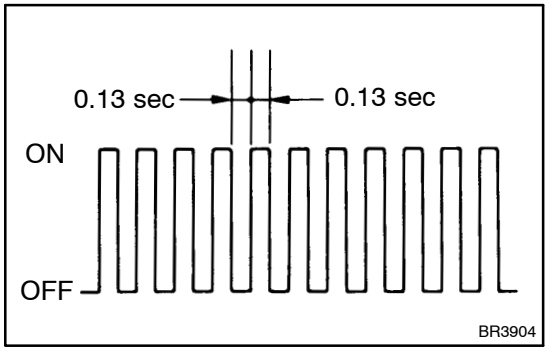
(c) Clear the DTCs not using the OBD II scan tool or the hand–held tester.
  Remove the EFI and ETCS fuses from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
  After disconnecting the battery terminal, perform the ”INITIALIZE procedure.

3. DTC CHECK (Check Mode)

HINT:
Hand–held tester only:
Check mode has a higher sensitivity to detect malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect.



(a) Follow these steps when preparing to use the hand–held tester check mode.
  (1) Make sure that the items below are true:
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in the P or N position
    - A/C switched OFF
  (2) Turn the ignition switch OFF.
  (3) Connect the hand–held tester to the DLC3.
  (4) Turn the ignition switch ON.
  (5) Change the ECM to check mode with the hand–held tester. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE. Make sure the MIL flashes as shown in the illustration.



NOTICE:
All DTCs and freeze frame data recorded will be erased if: 1) the hand–held tester is used to change the ECM from normal mode to check mode or vice–versa; or 2) during check mode, the ignition switch is turned from ON to ACC or OFF.

(6) Start the engine. The MIL should turn off after the engine starts.
(7) Simulate the conditions of the malfunction described by the customer.
(8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTC, freeze frame data and other data.
(9) After checking the DTC, inspect the applicable circuit.

(b) Clear DTCs using the OBD II scan tool or the hand–held tester.
(1) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(2) Turn the ignition switch ON.
(3) Erase DTCs and freeze frame data with the OBD II scan tool (complying with SAE J1978) or the hand–held tester. For the hand–held tester: 1) enter the following menus: DIAGNOSIS ENHANCED OBD II / DTC INFO / CLEAR CODES; and 2) press YES. For the OBD II scan tool, see its instruction manual.

(c) Clear the DTCs without using the OBD II scan tool or the hand–held tester.
Remove the EFI and ETCS fuses from the engine room J/B for more than 60 seconds, or disconnect the battery terminal for more than 60 seconds.
After disconnecting the battery terminal, perform the "INITIALIZE" procedure.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0031 P0032 P0037 P0038	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0100 P0101 P0102	Ignition timing calculated from engine speed	Returned to normal condition
P0110 P0112 P0113	Intake air temperature is fixed at 20°C (68°F)	Returned to normal condition
P0115 P0117 P0118	Engine coolant temperature is fixed at 80°(176°F)	Returned to normal condition

P0120 P0121 P0122 P0123 P0220 P0222 P0223 P0604 P0607 P2102 P2103 P2111 P2112 P2118 P2119 P2135	If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly. If the accelerator pedal is depressed quickly, the vehicle may speed up and slow down erratically.	”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.
P0325 P0330	Max. timing retardation	Ignition switch OFF
P0351 P0352 P0353 P0354	Fuel cut	IGF signal is detected for 4 consecutive ignitions
P2120 P2121 P2122 P2123 P2125 P2127 P2128 P2138	The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.	”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

5. CHECK FOR INTERMITTENT PROBLEMS

Hand–held tester only:

Inspect the vehicle’s ECM using check mode. Intermittent problems are easier to detect when the ECM is in check mode with hand–held tester. In check mode, the ECM uses 1 trip detection logic, which has a higher sensitivity to malfunctions than normal mode (default), which uses 2 trip detection logic.

(a) Clear the DTCs (See step 2).
(b) Set the check mode (See step 3).
(c) Perform a simulation test (See page IN–20).
(d) Check the connector and terminal (See page IN–30).
(e) Wiggle the harness and connector (See page IN–30).

6. BASIC INSPECTION

When the malfunction is not confirmed in the DTC check, troubleshooting should be carried out in all the possible circuits considered as causes of the problem. In many cases, by carrying out the basic engine check shown in the following flowchart, the location causing the problem can be found quickly and efficiently. Therefore, using this check is essential in the engine troubleshooting.

1	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to page ST–15 and ST–17, and continue to troubleshoot.**

YES

3	**Does engine start?**

NO → **Go to step 6.**

YES

4	**Check air filter.**

PREPARATION:

Remove the air filter.

CHECK:

Visually check that the air filter is not excessively dirty or oily.

NG → **Repair or replace.**

OK

5	Check idle speed.

PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into ”N” position.
(e) Connect the OBD II scan tool or hand–held tester to DLC3 on the vehicle.

CHECK:

Use CURRENT DATA to check the idle speed.

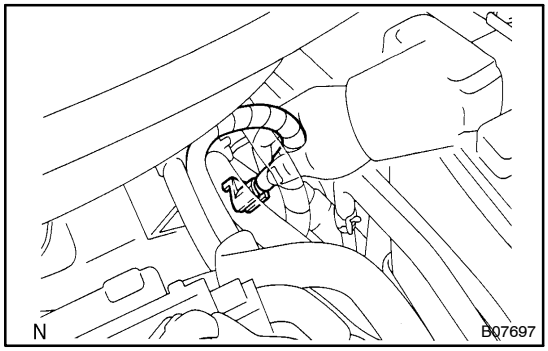
OK:

Idle speed:
(M/T): 750 to 850 rpm
(A/T): 700 to 800 rpm

NG → **Proceed to problem symptoms table on page DI–332.**

OK

6	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Use ACTIVE TEST mode to operate the fuel pump.

HINT:

Please refer to the hand–held tester operator’s manual for further details.

(e) If you have no hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–6).

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

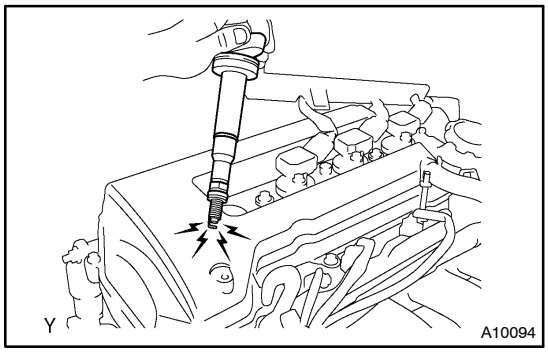
HINT:

At this time, you will hear a fuel flowing noise.

NG → **Proceed to page SF–6 and continue to troubleshoot.**

OK

7	Check for spark.



PREPARATION:

(a) Disconnect the ignition coil assembly.
(b) Remove the spark plug.
(c) Install the spark plug the ignition coil assembly.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–332.

7. DATA LIST

HINT:

Using the hand–held tester DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to shorten labor time.

NOTICE:

In the table below, the values listed under ”Normal Condition” are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
(g) According to the display on tester, read the ”DATA LIST”.

Hand–held Tester Display	Measurement Item/Range (Display)	Normal Condition *1	Diagnostic Note
INJECTOR	Injection period of the No. 1 cylinder/ Min.: 0 ms, Max: 32.64 ms	Idling: 0.8 to 2.0 ms	—
IGN ADVANCE	Ignition timing advance for No. 1 cylinder/ Min.: –64 deg., Max.: 63.5 deg.	Idling: BTDC 4 to 12˚	—
IAC DUTY RATIO	Intake air control valve duty ratio Opening ratio rotary solenoid type ISC valve/ Min.: 0 %, Max.: 99 %	Idling: 25 to 45 % Running without load (2,500 rpm): 25 to 45 %	—
CALC LOAD	Calculated load by ECM/ Min.: 0 %, Max.: 100 %	Idling: 9.1 to 20.0 % Running without load (2,500 rpm): 11.0 to 23.0 %	—
MAF	Air flow rate from MAF sensor/ Min.: 0 gm/s, Max.: 655 gm/s	Idling: 1.5 to 5.0 gm/s. Racing without load (2,500 rpm): 5.0 to 15.0 gm/s	If the value is approximately 0.0 gm/s: • Mass air flow meter power source circuit open • VG circuit open or short If the value is 160.0 gm/s or more: • E2G circuit open
ENGINE SPD	Engine speed/ Min.: 0 rpm, Max.: 16,383 rpm	Idling: 750 to 850 rpm	—
COOLANT TEMP	Coolant temperature/ Min.: –40 °C, Max.: 140 °C	After warming up: 80 to 95˚C (176 to 203˚F)	• If the value is –40°C (–40°F): sensor circuit is open • If the value is greater than 140°C (284°F): sensor circuit is shorted
INTAKE AIR	Intake air temperature/ Min.: –40 °C, Max.: 140 °C	Equivalent to Ambient Temperature	
THROTTLE POS	Absolute throttle position sensor/ Min.: 0 %, Max.: 100 %	Throttle fully closed: 8 to 18 % Throttle fully open: 64 to 98 %	Read the value with the ignition switch ON (Do not start engine)
CTP SW	Closed throttle position switch/ ON or OFF	Throttle fully closed: ON Throttle open: OFF	—
VEHICLE SPD	Vehicle speed/ Min.: 0 km/h, Max.: 255 km/h	Vehicle stopped: 0 mph (0 km/h)	—

O2S B1 S1	Heated oxygen sensor output voltage for bank 1 sensor 1/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	Performing the INJ VOL or A/F CONTROL function of the ACTIVE TEST enables the technician to check the voltage output of each sensor
O2S B1 S2	Heated oxygen sensor output voltage for bank 1 sensor 2/ Min.: 0 V, Max.: 1.275 V	Idling: 0.1 to 0.9 V	
VAPOR PRESS	Vapor pressure/ Min.: –4.125 kPa, Max.: 2.125 kPa	Fuel tank cap removed: 0 kPa	Pressure inside the fuel tank can be read by the vapor pressure sensor
SHORT FT #1	Short term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20%	—
LONG FT #1	Long term fuel trim of bank 1/ Min.: –100 %, Max.: 100 %	0 ± 20%	This item is the overall fuel compensation The long–term fuel trim is carried out to compensate a continual deviation from the theoretical central value caused by the short–term fuel trim
TOTAL FT #1	Total fuel trim of bank 1: Average value for fuel trim system of bank 1/ Min.: 0.5, Max.: 1.496	Idling: 0.5 to 1.4	—
O2FT B1 S1	Short term fuel trim associated with the bank 1 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #1
O2FT B1 S2	Short term fuel trim associated with the bank 1 sensor 2/ Min.: –100 %, Max.: 100 %	0 ± 20 %	Same as SHORT FT #2
FUEL SYS #1	Fuel system status (Bank 1)/ OL or CL or OL DRIVE or OL FAULT or CL FAULT	Idling after warming up: CLOSED	• OL: Open loop has not yet satisfied conditions to go closed loop • CL: Closed loop using heated oxygen sensor(s) as feed back for fuel control • OL DRIVE: Open loop due to driving conditions (fuel enrichment) • OL FAULT: Open loop due to detected system fault • CL FAULT: Closed loop but one of heated oxygen sensors, which is used for fuel control, is functioning improperly
FC IDL	Fuel cut idle/ON or OFF	Fuel cut operating: ON	FC IDL = ”ON” when throttle valve is fully closed and engine speed is over 1,500 rpm
O2 LR B1 S1	Response time of the heated oxygen sensor, lean to rich (bank 1 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
O2 RL B1 S1	Response time of the heated oxygen sensor, from rich to lean (bank 1 sensor 1)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
MIL	MIL status/ ON or OFF	MIL ON: ON	—
STARTER SIG	Starter signal/ON or OFF	Cranking: ON	—
A/C SIG	A/C signal/ON or OFF	A/C ON: ON	—
ELECT LOAD SIG	Electrical load signal / ON or OFF	Defogger switch ON: ON	—

PS OIL PRESS SW	Power steering signal / ON or OFF	When the steering wheel position is straightforward: OFF Other than above: ON	—
PS SIGNAL	Power steering signal/ ON or OFF	When the steering wheel is turned	This signal is usually ON status until the Ignition switch is turned OFF
FUEL PUMP / SPD	Fuel pump / speed status / ON/H or OFF/M,L	Idling: ON	—
A/C MAG CLUTCH	A/C magnet clutch status / ON or OFF	A/C magnet clutch ON: ON	—
EVAP VSV	VSV status for EVAP control/ ON or OFF	VSV operating: ON	VSV for EVAP is controlled by the ECM (ground side duty control)
VVT CTRL B1	VVT control status (bank 1)/ ON or OFF	VVT system operation: ON	—
IGNITION	Ignition counter/ Min.: 0, Max.: 400	0 to 400	—
CYL #1, #2, #3, #4	Misfire ratio of the cylinder 1 to 4/ Min.: 0 %, Max.: 50 %	0 %	This item is displayed in only idling
MISFIRE LOAD	Engine load for first misfire range/ Min.: 0 g/rev, Max.: 3.98 g/rev	Misfire 0: 0 g/rev	—
MISFIRE RPM	Engine RPM for first misfire range/ Min.: 0 rpm, Max.: 6,375 rpm	Misfire 0: 0 rpm	—
O2 LR B1 S2	Response time of the heated oxygen sensor, lean to rich (bank 1 sensor 2)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
FC TAU	Fuel cut TAU: Fuel cut during very light load	Fuel cut operating: ON	The fuel cut is performed under very light load to prevent the engine combustion from becoming incomplete
O2 RL B1 S2	Response time of the heated oxygen sensor, rich to lean (bank 1 sensor 2)/ Min.: 0 ms, Max.: 16,711 ms	Idling after warming up: 0 to 1,000 m/s	—
SECOND AIR VSV	VSV status for secondary air control	VSV operating: ON	—
INTAKE AIR CTL VSV	VSV status for intake air control/ ON or OFF	VSV operating: ON	—
SECONDARY AIR	Second air system status/ ON or OFF	Second air system operating: ON	—
2ND AIR PRESS	Second air system status/ Min.: 0 kPs, Max.: 225 kPs	Second air system operating: ON: 2.5 kpa or more OFF: 2.5 kpa or less	—
CHECK MODE	Check mode/ON or OFF	Check mode ON:OFF	—

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is in the N or P position, the A/C switch is OFF and all accessory switches are OFF.

8. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester or the OBD II scan tool allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one method to shorten diagnostic time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of the hand–held tester or the OBD II scan tool.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Hand–held Tester Display	Test Details	Diagnostic Note
INJ VOL	[Test Details] Control the injection volume Min.: –12.5 %, Max.: 24.8 % [Vehicle Condition] Engine speed: 3,000 rpm or less	• All injectors are tested at once • Injection volume is gradually changed between –12.5 and 25%
A/F CONTROL	[Test Details] Control the injection volume –12.5 or 25 % (Change the injection volume –12.5 % or 25 %.) [Vehicle Condition] Engine speed: 3,000 rpm or less	The following A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the A/F sensor and heated oxygen sensor For displaying the graph indication, enter ”ACTIVE TEST/A/F CONTROL/USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button
IAC DUTY RATIO	[Test Details] Control the ISC duty ratio 0 to 90 % [Vehicle Condition] • Engine speed: Idling (CTP switch ON) • Vehicle speed: 0 mph (0 km/h) • Battery voltage: 8.5 V or more	–
CAN CTRL VSV	[Test Details] Activate the VSV for canister control ON or OFF	–
TANK BYPASS VSV	[Test Details] Activate the VSV for tank bypass ON or OFF	–
EVAP VSV (ALONE)	[Test Details] Activate the VSV for EVAP control ON or OFF	–
A/C MAG CLUTCH	[Test Details] Control the A/C magnet clutch ON or OFF	–
FUEL PUMP / SPD	[Test Details] Control the fuel pump ON or OFF	–

VVT CTRL B1	[Test Details] Activate the VVT system (Bank 1) ON or OFF	• ON: Rough idle or engine stall • OFF: Normal engine speed
TC/TE1	[Test Details] Connect the TC and TE1 ON or OFF	–
FC IDL PROHBT	[Test Details] Control the idle fuel cut prohibit ON or OFF	–
SECOND AIR VSV	[Test Details] Active the VSV for secondary air ON or OFF	–
INTAKE AIR CTL VSV	[Test Details] Activate the VSV for intake air control ON or OFF	–
VVTL CTRL B1	[Test Details] Control the idle fuel cut prohibit ON or OFF	• ON: Rough idle or engine stall • OFF: Normal engine speed

9. DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. When a sensor is being monitored, the next sensor or component will not be monitored until the sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. ”Once per driving cycle” means that the ECM detects the malfunction only one time during a single driving cycle. ”Continuous” means that the ECM detects malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. ”Immediately” means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. ”2 driving cycle” means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

10. TOYOTA/LEXUS PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA/LEXUS name	Definition
Toyota HCAC system, Hydro–carbon Adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve, OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor ”A”	Crankshaft position sensor

Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VSV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor ”A”, Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor ”A”	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic transmission
Intermediate shaft speed sensor ”A”	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor ”A”, Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid

Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobiliser system, Immobiliser system	Vehicle anti–theft system

11. The monitor will run whenever the following DTCs are not present (Monitor disablement List)

HINT:

The table below shows the ECM monitoring status for the components listed at the top of the table when the DTCs on the left of the table are set.

Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
	P0010,P0020	P0031,32,51,52	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0010,P0020	P0010,P0020	VVT VSV1,2																			X					X					
P0011	P0011	VVT System1 - Advance				X		X														X					X					
P0012	P0012	VVT System1 - Retard				X		X														X					X					
P0016,P0018	P0016,P0018	VVT System - Misalignment																													
P0021	P0021	VVT System2 - Advance			X	X																X					X					
P0022	P0022	VVT System2 - Retard			X																	X					X					
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X					
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X					
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X			
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0128	P0128	Thermostat																													
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																													
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																													
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X					
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X					
P0325,P0330	P0325-P0333	Knock sensor																										X			
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																				X									
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X									
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X			
P0401	P0401	EGR system (closed)																				X					X				
P0402	P0402	EGR system (open)																				X	X	X	X	X	X				
P0405,P0409	P0405-P0409	Lift sensor																									X				
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X					
P0450,P0451	P0450-P0453	EVAP press sensor																													

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Monitor detected malfunction

Fault code			Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
Fault code			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
		Component/ system	VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0500	P0500	VSS																				X	X	X	X	X	X	X			
P0511	P0511	IAC valve																					X								
P0510	P0510	Idle switch												X		X						X	X		X	X	X	X			
P0560	P0560	System Voltage																													
P0617	P0617	Starter signal																													
P0705	P0705	Shift lever position switch																													
P0710	P0710-P0713	Trans fluid temp sensor																													
P0720-P0793	P0720-P0793	Output speed sensor																													
P0715-P0717	P0715-P0717	Input speed sensor																													
P0724	P0724	Stop lamp switch																													
P0741-P0796	P0741-P0796	Trans solenoid (function)																													
P0748-P0798	P0748-P0799	Trans solenoid (range)																													
P0850	P0850	PNP switch																										X			
P1010,P1020	P1010,P1020	VVTL																				X					X				
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X					X				
P1126	P1126	Electronic magnet clutch																													
P1129	P1129	Electronic throttle system																													
P1430	P1430	HC adsorber ACT press sensor																													
P2004,6	P2004,6	Intake Manifold Runner Control																													
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
P2102,P2103	P2102,P2103	Throttle motor																													
P2120-P2138	P2120-P2138	Accel position sensor																													
P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X			X	X					
P2226	P2226	BARO sensor																					X		X	X					
P2237,P2240	P2237,P2240	A/F sensor (open)																				X			X	X					
P2423,24	P2423,24	HC Adsorption Catalyst																													
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
P2431	P2431	AIR Pressure Sensor(Rationality)																													
P2440	P2440	AIR control valve stuck open																					X	X	X	X	X				
P2441	P2441	AIR control valve stuck close																					X	X	X	X	X				
P2444	P2444	AIP stuck On																					X	X	X	X	X				
P2445	P2445	AIP stuck Off																					X	X	X	X	X				
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																													
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X			X	X					

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Monitor detected malfunction			Monitor disablement (X - disabled)																									
Fault code			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
	Fault code		P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
		Component/ system	Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1
P0010,P0020	P0010,P0020	VVT VSV1,2																										X
P0011	P0011	VVT System1 - Advance							X	X			X	X					X									
P0012	P0012	VVT System1 - Retard							X	X			X	X					X									
P0016,P0018	P0016,P0018	VVT System - Misalignment																										
P0021	P0021	VVT System2 - Advance							X	X			X	X					X									
P0022	P0022	VVT System2 - Retard							X	X			X	X					X									
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1							X	X			X						X									X
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1							X	X			X						X									
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2											X															
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																										
P0100,P0101	P0100-P0103	MAF sensor							X	X			X	X				X	X									X
P0105,P0106	P0105-P0108	MAP sensor							X	X			X	X				X	X									X
P0110	P0110-P0113	IAT sensor							X	X				X														X
P0115,P0116	P0115-P0118	ECT sensor							X	X		X	X	X				X	X									X
P0120,P0121	P0120-P0223,P2135	TP sensor							X	X			X	X			X		X									X
P0125	P0125	Insufficient ECT for Closed Loop							X	X		X	X	X				X	X									X
P0128	P0128	Thermostat																										
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1							X	X			X	X					X									X
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1							X	X			X						X									X
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2											X															
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																										
P0171,P0172	P0171,P0172	Fuel system							X	X			X	X					X									X
P0300-P0308	P0300-P0308	Misfire											X	X					X									X
P0325,P0330	P0325-P0333	Knock sensor	▒						X	X																		X
P0335	P0335	CKP sensor		▒					X	X			X	X					X									X
P0340, P0341	P0340, P0341	CMP sensor			▒				X	X			X	X					X									X
P0340-P0346	P0340-P0346	VVT sensor1,2				▒																						
P0351-P0358	P0351-P0358	Ignitor					▒		X	X			X	X					X									X
P0385	P0385	CKP sensor 2						▒	X	X			X	X					X									
P0401	P0401	EGR system (closed)							▒				X															X
P0402	P0402	EGR system (open)								▒			X	X					X									X
P0405,P0409	P0405-P0409	Lift sensor									▒	▒																
P0420,P0430	P0420,P0430	Catalyst											▒															
P0442-P0456	P0442-P0456	EVAP system												▒					X									
P0450,P0451	P0450-P0453	EVAP press sensor												X	▒													

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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0325,P0330	P0335	P0340,P0341	P0340,P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
	P0325-P0333	Knock sensor																													
	P0335	CKP sensor																													
	P0340,P0341	CMP sensor																													
	P0340-P0346	VVT sensor1,2																													
	P0351-P0358	Ignitor																													
	P0385	CKP sensor 2																													
	P0401	EGR system (closed)																													
	P0402	EGR system (open)																													
	P0405,P0406	EGR Lift sensor																													
	P0409	EGR Lift sensor																													
	P0420,P0430	Catalyst																													
	P0440-P0446	EVAP system																													
	P0450-P0453	EVAP press sensor																													
	P0500	VSS(ECT2sensor)																													
	P0500	VSS(ECT1sensor, non-ECT)																													
	P0500	VSS(M/T)																													
	P0511	IAC valve																													
	P0510	Idle switch																													
	P0560	System Voltage																													
	P0617	Starter signal																													
	P0705	Shift lever position switch																													
	P0710-P0713	Trans fluid temp sensor																													
	P0720-P0793	Output speed sensor																													
	P0715-P0717	Input speed sensor																													
	P0724	Stop lamp switch																													
	P0741-P0796	Trans solenoid (function)																													
	P0748-P0798	Trans solenoid (range)																													
P0500	P0500	VSS							X	X			X	X					X						X	X		X			
P0511	P0511	IAC valve																													
P0510	P0510	Idle switch								X			X	X					X									X			
P0560	P0560	System Voltage																													
P0617	P0617	Starter signal																													
P0705	P0705	Shift lever position switch																													
P0710	P0710-P0713	Trans fluid temp sensor																													
P0720-P0793	P0720-P0793	Output speed sensor																												X	
P0715-P0717	P0715-P0717	Input speed sensor																													
P0724	P0724	Stop lamp switch																													
P0741-P0796	P0741-P0796	Trans solenoid (function)																													
P0748-P0798	P0748-P0799	Trans solenoid (range)																							X	X		X			
P0850	P0850	PNP switch																	X									X			
P1010,P1020	P1010,P1020	VVTL																													
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X												
P1126	P1126	Electronic magnet clutch																													
P1129	P1129	Electronic throttle system																													
P1430	P1430	HC adsorber ACT press sensor												X	X																
P2004,6	P2004,6	Intake Manifold Runner Control																													
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
P2102,P2103	P2102,P2103	Throttle motor																													
P2120-P2138	P2120-P2138	Accel position sensor																													
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X			X						X									X			
P2226	P2226	BARO sensor																										X			
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X			X						X									X			
P2423,24	P2423,24	HC Adsorption Catalyst																													
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
P2431	P2431	AIR Pressure Sensor(Rationality)																													
P2440	P2440	AIR control valve stuck open							X	X			X																		
P2441	P2441	AIR control valve stuck close							X	X			X																		
P2444	P2444	AIP stuck On							X	X			X																		
P2445	P2445	AIP stuck Off							X	X			X																		
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										X			
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X									X			

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Note *1: Without input the speed sensor

Note *2: With input the speed sensor

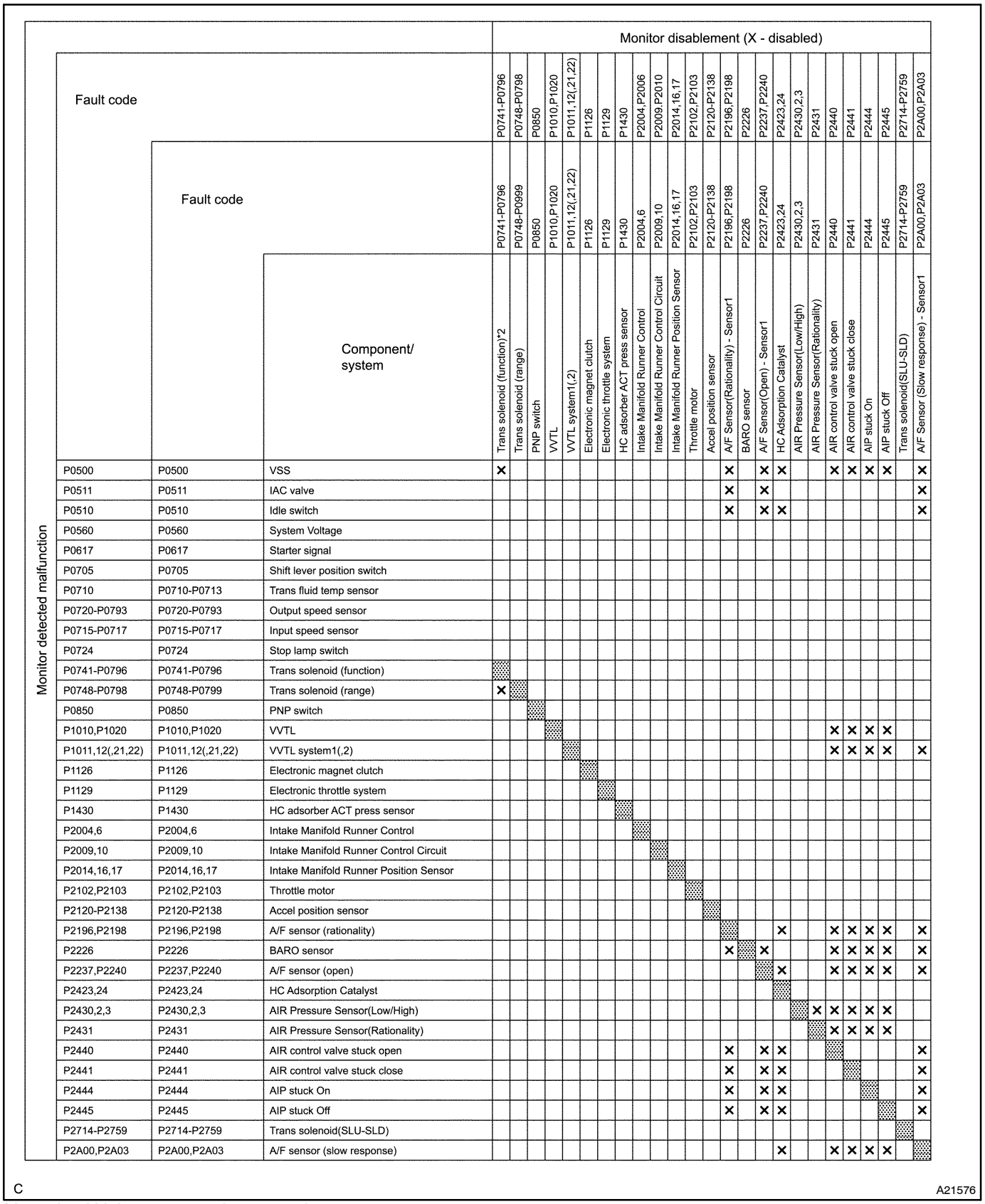
Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
				Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1(,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Adsorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
	P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X		
	P0011	P0011	VVT System1 - Advance																				X	X	X	X		
	P0012	P0012	VVT System1 - Retard																				X	X	X	X		
	P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X		
	P0021	P0021	VVT System2 - Advance																				X	X	X	X		
	P0022	P0022	VVT System2 - Retard																				X	X	X	X		
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X		
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X		X
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X								
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X								
	P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X		X
	P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X		X
	P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X		X
	P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X		X
	P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X		X
	P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X		X
	P0128	P0128	Thermostat																									
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X		
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X		X
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X								
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X								
	P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X		X
	P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X		X
	P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X		
	P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X		X
	P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X		X
	P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X		
	P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X		
	P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X		X
	P0401	P0401	EGR system (closed)																	X								
	P0402	P0402	EGR system (open)														X		X	X			X	X	X	X		X
	P0405,P0409	P0405-P0409	Lift sensor																									
	P0420,P0430	P0420,P0430	Catalyst																									
	P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X		X
	P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X		

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Note *1: Without input the speed sensor

Note *2: With input the speed sensor



Note *1: Without input the speed sensor

Note *2: With input the speed sensor

12. O2S TEST RESULT

INTRODUCTION

The O2S TEST RESULT refers to the results of the engine control module (ECM) when it monitors the oxygen sensor (O2S), and it can be read using the hand–held tester or the generic OBD II scan tool. Based on this, you can find the O2S's conditions.

The ECM monitors the O2S in the various items. You can read the monitor result (TEST DATA) of each monitor item using the O2S TEST RESULT. However, the output value of the TEST DATA is the latest "snapshot" value that is taken after monitoring and therefore it is not dynamic.

In this repair manual, the description of the O2S TEST RESULT (for O2S related DTCs) are written in a table.

This table consists of 5 items:

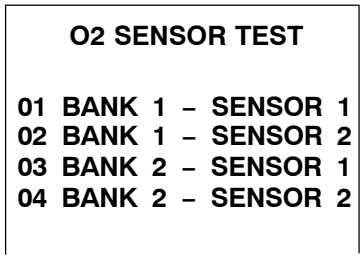
(1) TEST ID (a code applied to each TEST DATA)
(2) Description of TEST DATA
(3) Conversion Factor (When Conversion Factor has a value written in the table, multiply the TEST DATA value appearing on the scan tool by the Conversion Factor value. The result will be the required value.)
(4) Unit
(5) Standard Value

If the TEST DATA value appearing on the scan tool is out of the standard value, the O2S is malfunctioning. If it is within the standard value, the O2S is functioning normally. However, if the value is on the borderline of the standard value, the O2S may malfunction very soon.

HOW TO READ O2S TEST RESULT USING HAND–HELD TESTER

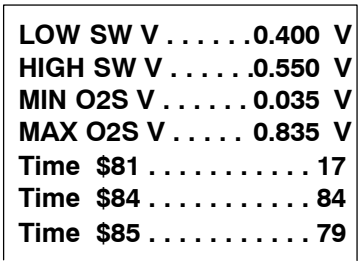
(a) Connect the hand–held tester to the DLC3.

O2S TEST RESULT Screen



(b) On the tester screen, select the following menus: DIAGNOSIS/CARB OBDII/O2S TEST RESULT. A list of the O2S equipped on the vehicle will be displayed.

TEST DATA Screen



(c) Select the desired O2S and press ENTER. The following screen will appear.

(d) Press HELP and simultaneously. More information will appear.

(e) Example:

(1) The hand–held tester displays ”17” as a value of the ”TIME $81” (see the illustration on the left).

(2) Find the Conversion Factor value of ”TIME $81” in the O2S TEST RESULT chart below. 0.3906 is specified for $81 in this chart.

(3) Multiply ”17” in step (1) by 0.3906 (Conversion Factor) in the step (2).

17 x 0.3906 = 6.6 %

(4) If the answer is within the standard value, the ”TIME $81” can be confirmed to be normal.

O2S TEST RESULT Chart

TEST ID	Description of TEST DATA	Conversion Factor	Unit	Standard Value
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05V	Multiply 0.3906	%	Within 60 %

13. CHECKING MONITOR STATUS

NOTICE:

The monitor status (mode 6) is not applicable to the heated oxygen sensor (HO2S). However, HO2S test values can be checked by O2S TEST RESULT (mode 5). Refer to step 12.

(a) Outline

The monitor results and the test values can be checked with the OBDII scan tool.

The engine control module (ECM) monitors the emissions–related components as the thermostat, catalyst converter and evaporative emissions (EVAP), and determines whether they are functioning normally or not. When finished monitoring, the ECM stores the monitor results and the test values.

The monitor result indicates whether the component is functioning normally or not. The test value is the value that was used to determine the monitor result. If the test value is outside the test limit (malfunction criterion), the ECM determines the component is malfunctioning. Some emissions–related components have multiple test values to determine monitor result. If one of these test values is outside test limit, the ECM determines the component is malfunctioning.

(b) Description

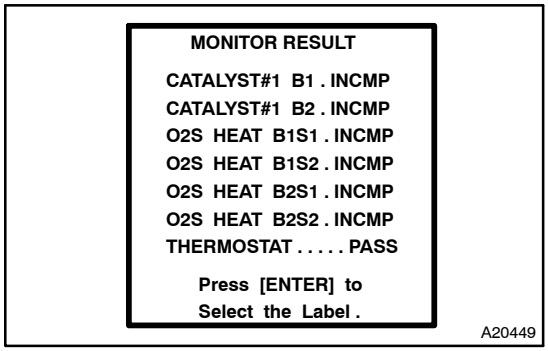
The test value and test limit information are described as shown in the following table. This information is included under ”MONITOR RESULT” in the emissions–related DTC sections:

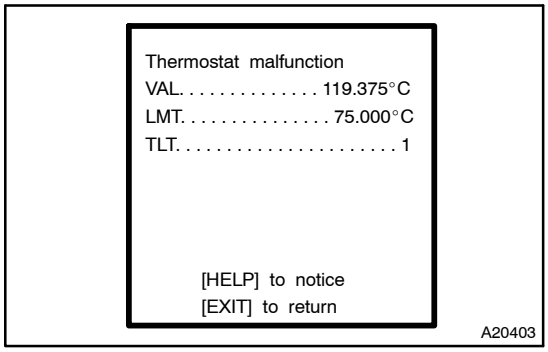
TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Value	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 [°C]	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criterion for thermostat

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBDII scan tools.

(c) Procedure (using hand–held tester)
(1) Connect the hand–held tester to the DLC3.
(2) Turn the ignition switch and hand–held tester ON.
(3) Clear DTCs.
(4) Allow the vehicle to drive, in accordance with the applicable drive pattern described in the READINESS MONITOR DRIVE PATTERN section
(see page DI–33)





(5) Select the hand–held tester menus: DIAGNOSIS, ENHANCED OBDII, MONITOR INFO and MONITOR RESULT. The monitor result appears after the component name.
- INCMP indicates the component has not been monitored yet.
- PASS indicates the component is functioning normally.
- FAIL indicates the component is malfunctioning.

(6) Select the component and press ENTER. If the monitor result has been PASS or FAIL, the accuracy test value appears.
- VAL indicates the test value.
- LMT indicates the test limit (malfunction criterion).
- TLT indicates the test limit type.

(7) Compare the test value with the test limit.
- If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
- If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- If the test value is on the borderline of the test limit, a malfunction is concealed in the component.

HINT:
- The monitor result might on rare occasions be PASS even if the malfunction indicator lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

DID58–01

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into the replaced ECM.

HINT:

The VIN is a 17–digit alphanumeric vehicle identification number. A hand–held tester is required to register the VIN.

1. DESCRIPTION

This registration section consists of three parts, Input Instructions, Read VIN and Write VIN.

(a) Input Instructions: Explains the general VIN input instructions using a hand–held tester.

(b) Read VIN: Explains the VIN reading process in a flowchart. This process allows the VIN stored in the ECM to be read, in order to confirm that the two VINs, provided with the vehicle and stored in the vehicle's ECM, are the same.

(c) Write VIN: Explains the VIN writing process in a flowchart. This process allows the VIN to be input into the ECM. If the ECM is changed, or the VINs do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. INPUT INSTRUCTIONS

(a) Hand–held tester

The arrow buttons (UP, DOWN, RIGHT and LEFT) and numerical buttons (0 to 9) are used, in order to input the VIN.

(b) Cursor Operation

To move the cursor around the tester screen, press the RIGHT and LEFT buttons.

(c) Alphabetical Character Input

(1) Press the UP and DOWN buttons to select the desired alphabetical character.

(2) After selection, the cursor should move.

(d) Numeric Character Input

(1) Press the numerical button corresponding to the number that you want to input.

(2) Select or input the correct character using the UP/DOWN buttons, or the numerical buttons.

HINT:

Numerical characters can be selected by using the UP and DOWN buttons.

(e) Correction

(1) After input, the cursor should move.

(2) When correcting the input character(s), put the cursor onto the character using the RIGHT or LEFT button.

(f) Finishing Input Operation

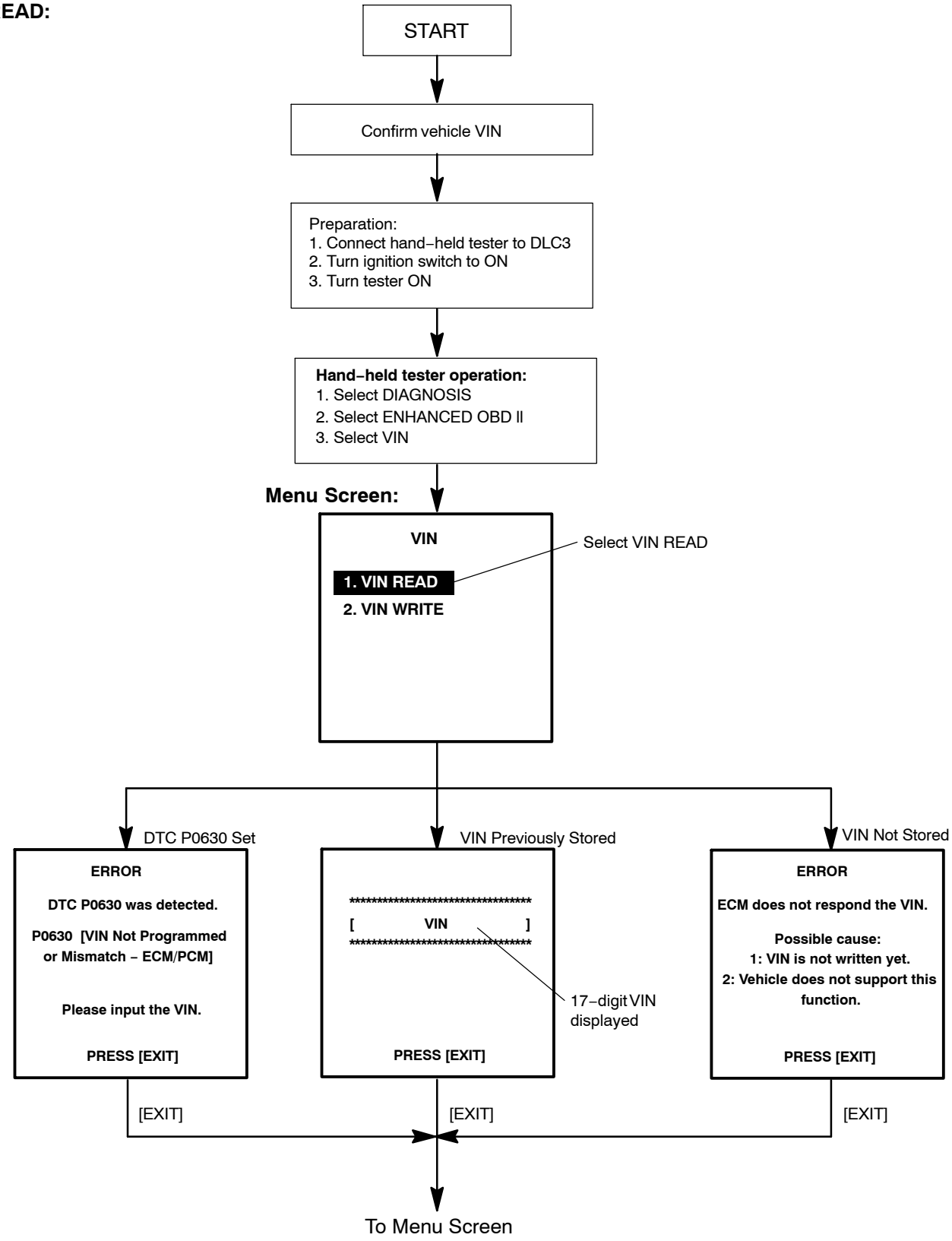
(1) Make sure that the input VIN matches the vehicle VIN after input.

(2) Press the ENTER button on the tester.

3. READ VIN (Vehicle Identification Number)

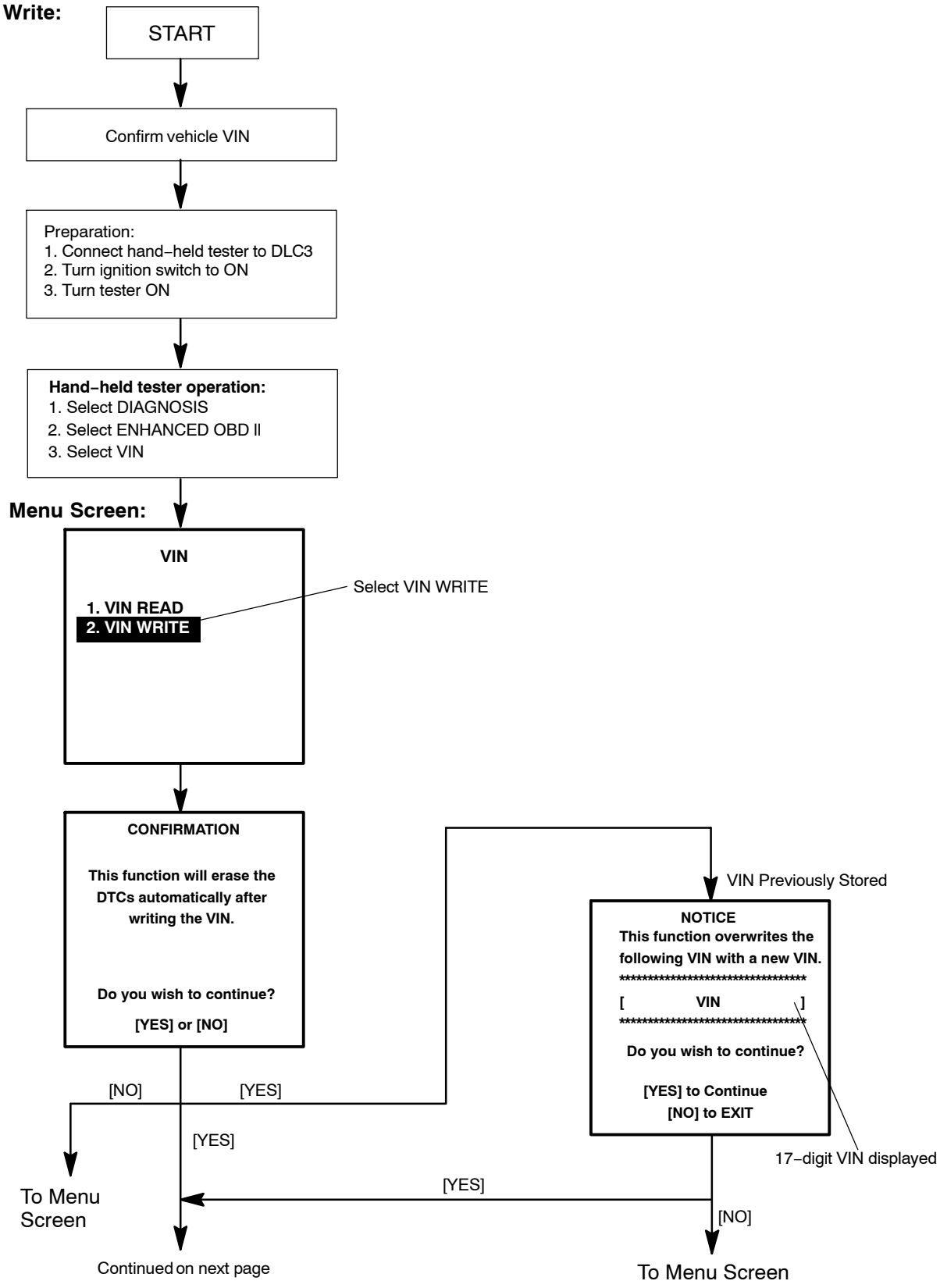
(a) Read VIN using a hand–held tester.

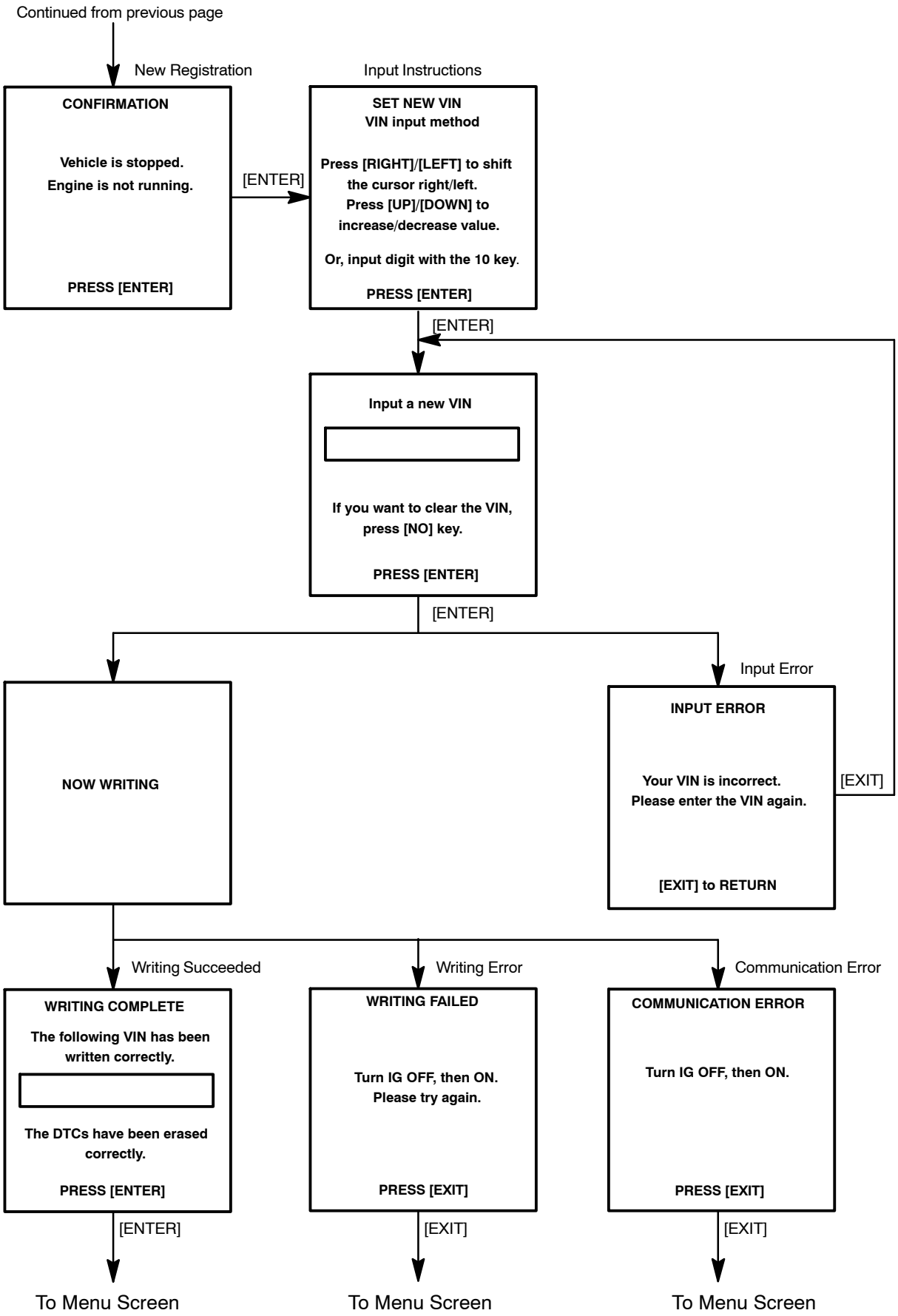
READ:



4. WRITE VIN

(a) Write VIN using the hand–held tester.




Continued from previous page
New Registration
Input Instructions
CONFIRMATION
Vehicle is stopped.
Engine is not running.
PRESS [ENTER]
[ENTER]
SET NEW VIN
VIN input method
Press [RIGHT]/[LEFT] to shift the cursor right/left.
Press [UP]/[DOWN] to increase/decrease value.
Or, input digit with the 10 key.
PRESS [ENTER]
[ENTER]
Input a new VIN
If you want to clear the VIN, press [NO] key.
PRESS [ENTER]
[ENTER]
Input Error
NOW WRITING
INPUT ERROR
Your VIN is incorrect.
Please enter the VIN again.
[EXIT] to RETURN
[EXIT]
Writing Succeeded
Writing Error
Communication Error
WRITING COMPLETE
The following VIN has been written correctly.
The DTCs have been erased correctly.
PRESS [ENTER]
WRITING FAILED
Turn IG OFF, then ON.
Please try again.
PRESS [EXIT]
COMMUNICATION ERROR
Turn IG OFF, then ON.
PRESS [EXIT]
[ENTER]
[EXIT]
[EXIT]
To Menu Screen
To Menu Screen
To Menu Screen

DIBQV–09

READINESS MONITOR DRIVE PATTERN

1. PURPOSE OF THE READINESS TESTS

- The On–Board Diagnostic (OBD II) system is designed to monitor the performance of emission–related components and report any detected abnormalities in the form of Diagnostic Trouble Codes (DTCs). Since the various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors. Many state Inspection and Maintenance (I/M) programs require that vehicles complete their Readiness Monitors prior to beginning an emissions test.
- The current status of the Readiness Monitors can be seen by using the hand–held tester with version 9.0 software (or newer), or a generic OBD II Scan tool.
- To view the Readiness Monitor status using the hand–held tester, select ”Monitor Status” from the Enhanced OBD II Menu.
- A status of ”complete” indicates that the necessary conditions have been met to run the performance tests for the related Readiness Monitor.
- The Readiness Monitor will be reset to ”incomplete” if:
  - ECM has lost power (battery or fuse).
  - DTCs have been cleared.
  - The conditions for running the Readiness Monitor have not been met.
- In the event that any Readiness Monitor shows ”incomplete,” follow the appropriate Readiness Monitor Drive Pattern to active the monitor and change the readiness status to ”complete.”

CAUTION:

Strictly observe of posted speed limits, traffic laws, and road conditions when performing these drive patterns.

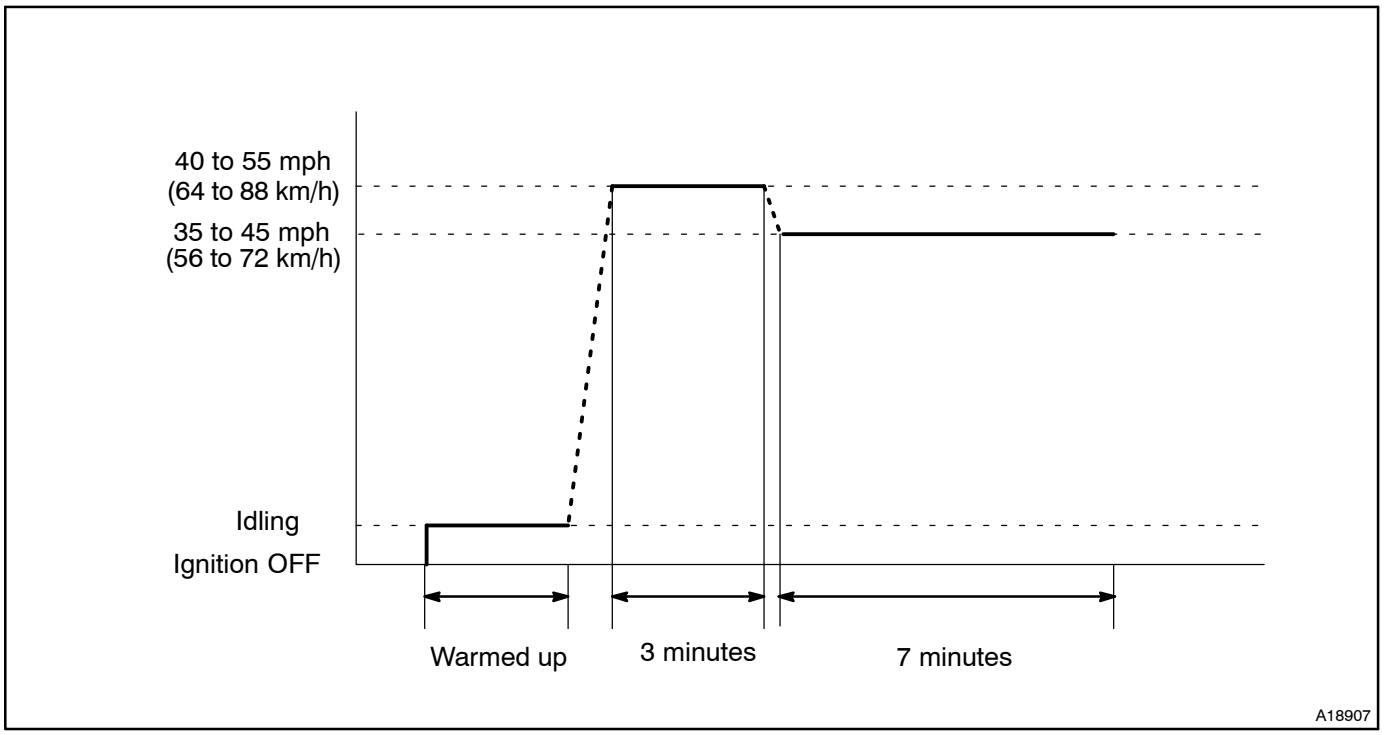
NOTICE:

These drive patterns represent the fastest method to satisfy all necessary conditions which allow the specific readiness monitor to complete.

In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors) the drive pattern can be resumed, and in most cases, the readiness monitor will still set to ”complete”.

To ensure rapid completion of readiness monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

2. CATALYST MONITOR (O2S TYPE)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF.
- Engine Coolant Temperature (ECT) is 75°C (167°F) or greater.
- Intake Air Temperature (IAT) is –10°C (14°F) or greater

NOTICE:

The readiness test can be completed in cold ambient conditions (less than –10°C / 14°F), if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBD II scan tool to the DLC3 to check monitor status and preconditions.

(2) Drive the vehicle at 40 to 55 mph (64 to 88 km/h) for approximately 3 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

If IAT is less than 10°C (50°F) when engine was started, drive the vehicle at 40 to 55 mph (64 to 88 km/h) for additional 4 minutes.

(3) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for approximately 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden deceleration as much as possible with the throttle fully closed.

(4) If readiness status does not switch to complete, make sure that the preconditions are met and the ignition switch is turned OFF and then repeat steps (2) and (3).

(5) Release pressure in the fuel tank by removing and then reinstalling the fuel tank cap.

(6) Start the engine and immediately begin driving as directed.

3. EVAP MONITOR (VACUUM PRESSURE MONITOR)

NOTICE:

A cold soak must be performed prior to conducting the drive pattern to complete the Internal Pressure Readiness Monitor.

(a) Cold Soak Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400m) or less

(b) Cold Soak Procedure

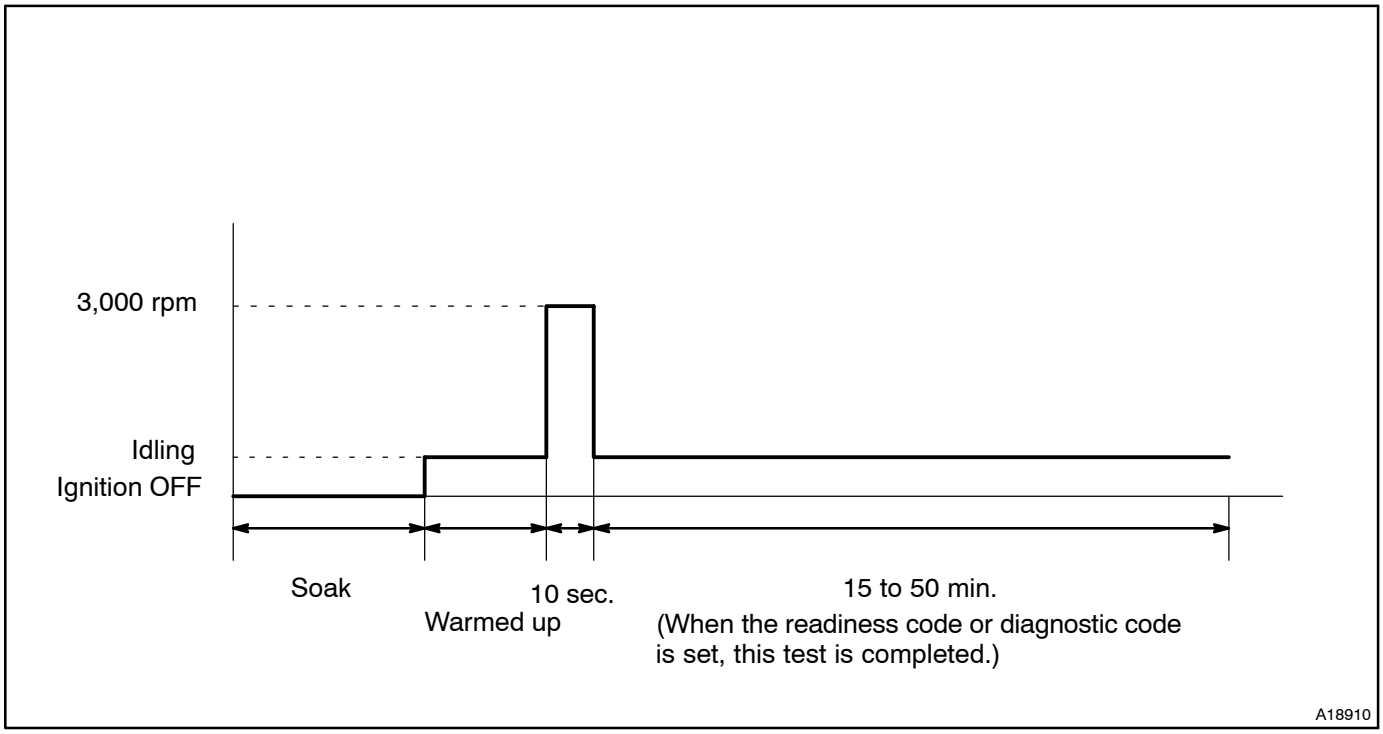
Let the vehicle cold soak for 8 hours or until the difference between IAT and ECT becomes less than 7°C (13°F)

HINT:

Examples:

- Scenario 1
  ECT = 24°C (75°F)
  IAT = 16°C (60°F)
  Difference between ECT and IAT is 8°C (15°F)
  → The monitor will not run because difference between ECT and IAT is greater than 7°C (13°F)
- Scenario 2
  ECT = 21°C (70°F)
  IAT = 20°C (68°F)
  Difference between ECT and IAT is 1°C (2°F)
  → The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

4. EVAP MONITOR (VACUUM PRESSURE MONITOR) (CONTINUED)



(a) Preconditions

The monitor will not run unless:

- MIL is OFF
- Fuel level is approximately 1/2 to 3/4
- Altitude is 7,800 feet (2,400 m) or less
- Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- Cold Soak Procedure has been completed
- Before starting the engine, the difference between ECT and IAT must be less than 7°C (13°F)

HINT:

Examples:

- Scenario 1

  ECT = 24°C (75°F)

  IAT = 16°C (60°F)

  Difference between ECT and IAT is 8°C (15°F)

  → The monitor will not run because difference between ECT and IAT is higher than 7°C (13°F)
- Scenario 2

  ECT = 21°C (70°F)

  IAT = 20°C (68°F)

  Difference between ECT and IAT is 1°C (2°F)

  → The monitor will run because difference between ECT and IAT is less than 7°C (13°F)

The readiness test can be completed in cold ambient conditions (less than 40°F / 4.4°C) and/or at high altitudes (more than 7,800 feet / 2,400 m) if the drive pattern is repeated a second time after cycling the ignition off.

(b) Drive Pattern

(1) Connect the OBDII scan tool to DLC3 to check monitor status and preconditions (refer to (a)).

(2) Release pressure in fuel tank by removing the fuel tank cap and then reinstall it.

(3) Start the engine and allow it to idle until ECT becomes 75°C (167°F) or higher.

(4) Run the engine at 3,000 rpm for approximately 10 seconds.

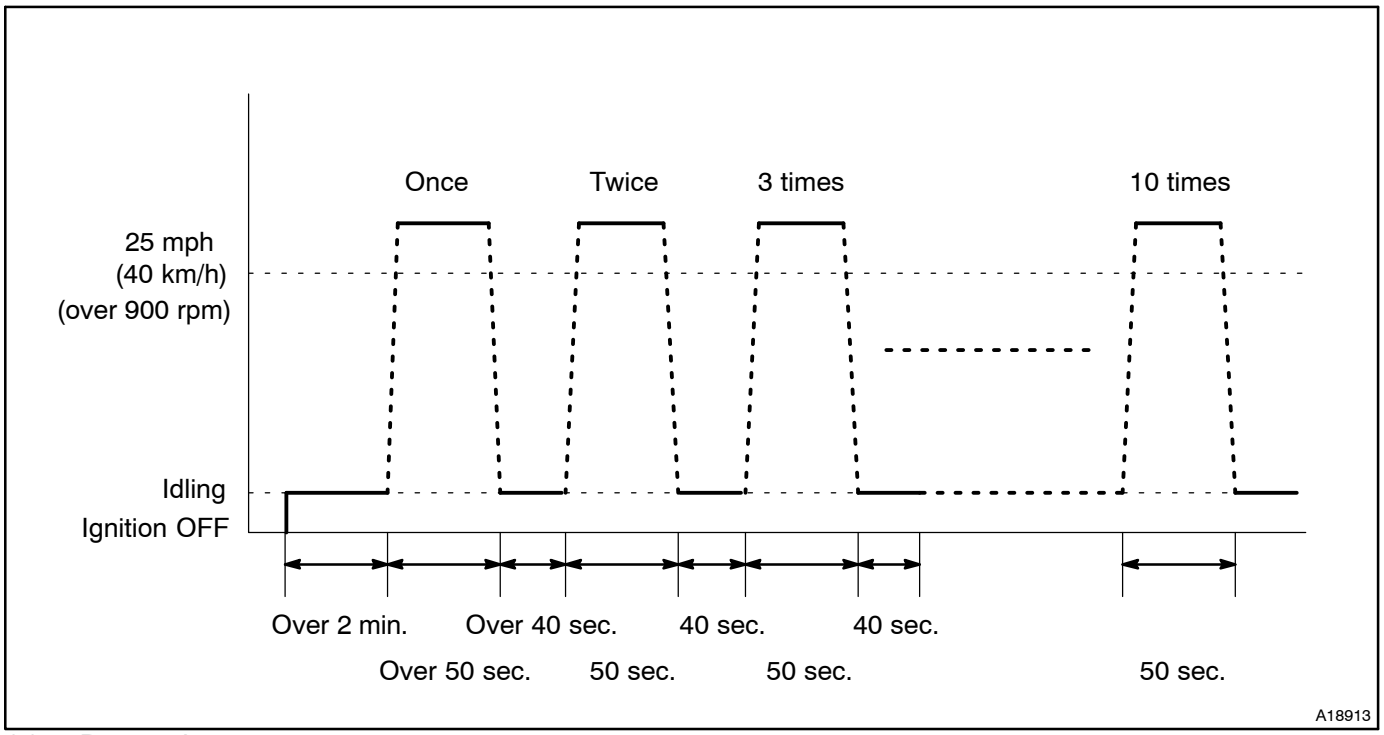
(5) Allow the engine to idle with the A/C ON (to create slight load) for 15 to 50 minutes.

NOTICE:

If the vehicle not equipped with A/C, put a slight load on the engine by doing the following :

- **Securely set the parking brake.**
- **Block the drive wheels with wheel chocks.**
- **Allow the vehicle to idle in drive for 15 to 50 minutes.**

5. OXYGEN SENSOR MONITOR (FRONT AND REAR O2S SYSTEM)



(a) Preconditions

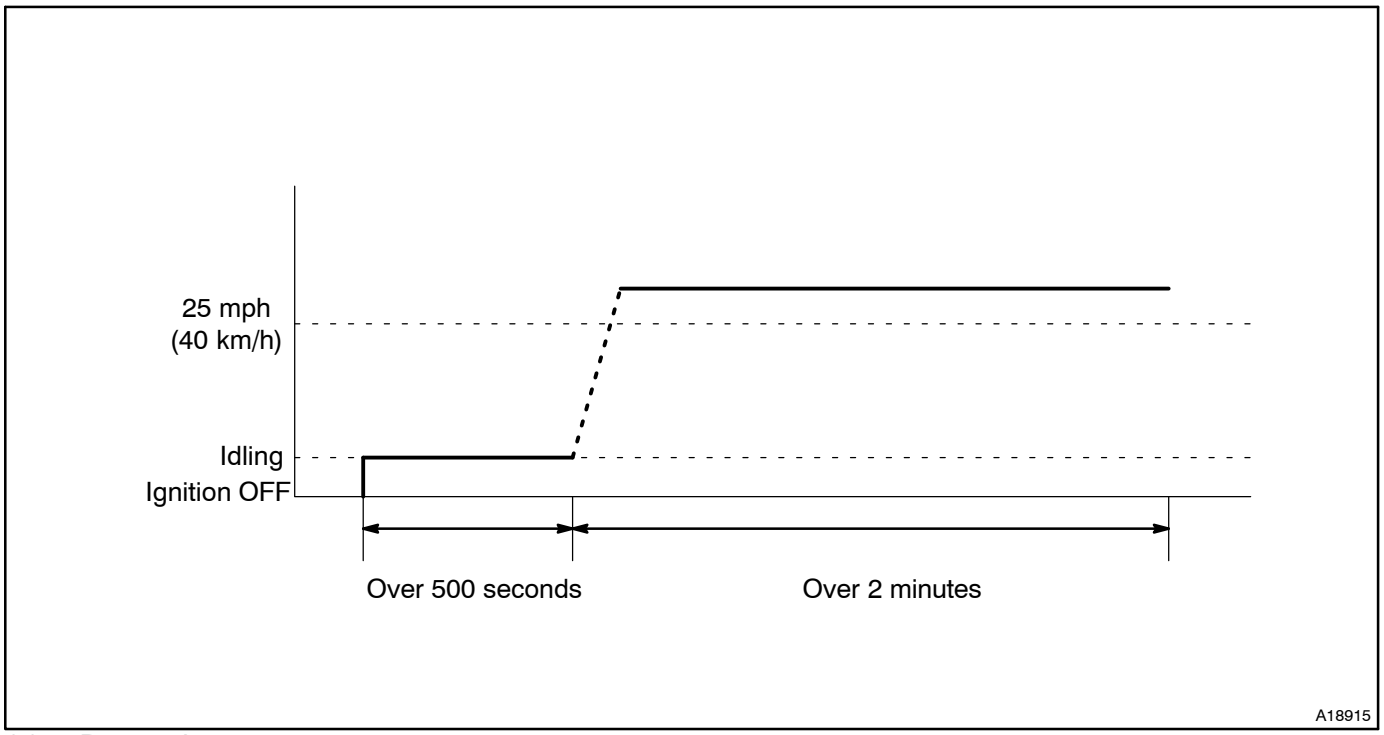
The monitor will not run unless:

- MIL is OFF

(b) Drive Pattern

(1) Connect the OBDII scan tool to DLC3 to check monitor status and preconditions (refer to (a)).
(2) Start the engine and allow it to idle for 2 minutes or more.
(3) Drive the vehicle at 25 mph (40 km/h) or more for at least 50 seconds.
(4) Stop the vehicle and allow the engine to idle for 40 seconds or more.
(5) Perform steps (3) and (4) ten times.
(6) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure preconditions are met, turn the ignition off and then repeat steps (1) and (5).

6. OXYGEN SENSOR HEATER MONITOR



(a) Preconditions

The monitor will not run unless:

- MIL is OFF

(b) Drive Pattern

(1) Connect the OBDII scan tool to the DLC3 to check monitor status and preconditions (refer to (a)).

(2) Start the engine and allow it to idle for 500 seconds or more.

(3) Drive the vehicle at 25 mph (40 km/h) or more for at least 2 minutes.

(4) Check the status of the readiness monitor on the scan tool display. If readiness status did not switch to complete, ensure the preconditions are met, turn the ignition off and then repeat steps (2) and (3).

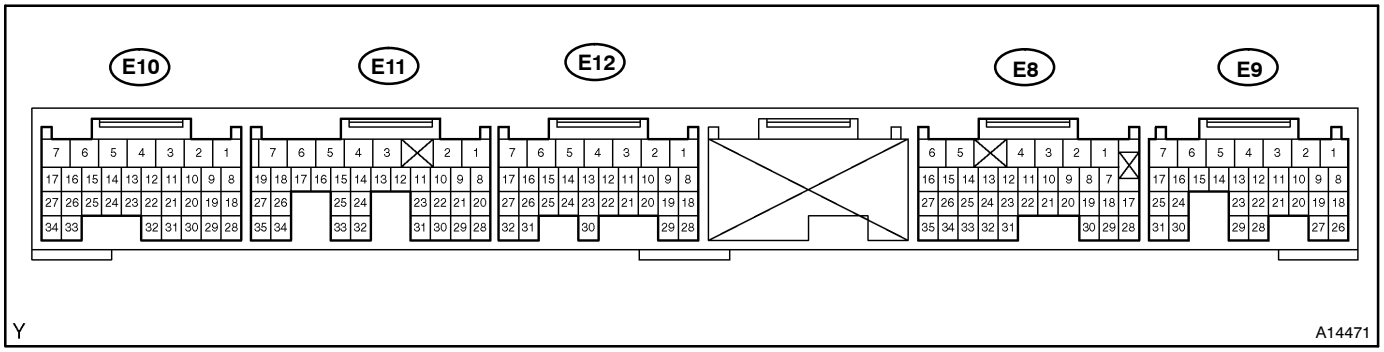
DI37W–19

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	2. Starter 3. Starter relay 4. Park/neutral position switch	ST–15 ST–17 DI–701
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–652 DI–656 IN–30
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–656
Engine cranks normally but difficult to start	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–571 DI–656 EM–3
Difficult to start with cold engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–571 DI–656
Difficult to start with hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–571 DI–656
High engine idle speed (Poor idling)	1. A/C switch circuit 2. ECM power source circuit	– DI–652
Low engine idle speed (Poor idling)	1. A/C switch circuit 2. Fuel pump control circuit	– DI–656
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–656
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–652 DI–656
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–656 DI–698
Surging (Poor driveability)	1. Fuel pump control circuit	DI–656
Engine stalls soon after starting	1. Fuel pump control circuit	DI–656
Engine stalls during A/C operation	1. A/C switch circuit 2. Engine control module (ECM)	– IN–30
Unable to refuel/Difficult to refuel	1. ORVR system	–

DIAJY–03

TERMINALS OF ECM



Each ECM terminals' standard voltage is shown in the table below. In the table, first follow the information under "Condition".
Look under "Symbols (Terminals No.)" for the terminals to be inspected.
The standard normal voltage between the terminals is shown under "STD Voltage".
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage
+B (E9–1) – E1 (E12–1)	B–R – BR	IG switch ON	9 to 14 V
BATT (E9–3) – E1 (E12–1)	W–L – BR	Always	9 to 14 V
TBP (E9–4) – E1 (E12–1)	G–O – BR	IG Switch ON, Disconnect vacuum hose from VSV for pressure switching valve	9 to 14 V
TACH (E9–5) – E1 (E12–1)	BR–W – BR	Idling	Pulse generation
MREL (E9–8) – E1 (E12–1)	GR – BR	IG switch ON	9 to 14 V
IGSW (E9–9) – E1 (E12–1)	B–O – BR	IG switch ON	9 to 14 V
FC (E9–10) – E1 (E12–1)	G–R – BR	IG switch ON	9 to 14 V
W (E9–11) – E1 (E12–1)	R–B – BR	IG switch ON	Below 3.0 V
SIL (E9–18) – E1 (E12–1)	W – BR	During transmission	Pulse generation
PTNK (E9–21) – E2 (E10–28)	L–B – BR	Ignition switch ON	2.9 to 3.7 V
		Apply vacuum 4.0 kPa (30 mmHg, 1.18 in.Hg)	Below 0.5 V
VPA (E9–22) – EPA (E9–28)	L–Y – L–R	IG switch ON, Accelerator pedal released	0.3 to 0.9 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
VPA2 (E9–23) – EPA2 (E9–29)	L–O – LG–R	IG switch ON, Accelerator pedal released	1.8 to 2.7 V
		IG switch ON, Accelerator pedal depressed	4.7 to 5.1 V
VCPA (E9–26) – EPA (E9–28)	L–W – L–R	IG switch ON	4.5 to 5.5 V
VCP2 (E9–27) – EPA2 (E9–29)	L – LG–R	IG switch ON	4.5 to 5.5 V
ACMG (E8–2) – E1 (E12–1)	Y–O – BR	A/C switch ON (at idling)	Below 3.0 V
		A/C switch OFF	9 to 14 V
+BM (E8–6) – E1 (E12–1)	W–R – BR	Always	9 to 14 V
ST1– (E8–12) – E1 (E12–1)	R–Y – BR	Brake pedal is depressed	Below 1.5 V
		Brake pedal is released	7.5 to 14 V
SPD (E8–17) – E1 (E12–1)	W–R – BR	IG switch ON, Rotate driving wheel slowly	Pulse generation (See page DI–552)
STP (E8–19) – E1 (E12–1)	G–W – BR	Brake pedal is depressed	7.5 to 14 V
		Brake pedal is released	Below 1.5 V
M+ (E12–3) – E1 (E12–1) M– (E12–2) – E1 (E12–1)	B – BR W – BR	Idling	Pulse generation (See page DI–582)
HT1B (E12–6) – E1 (E12–1)	Y–G – BR	Idling	Below 3.0 V
		IG switch ON	9 to 14 V

EVP (E12–11) – E1 (E12–1)	G–Y – BR	IG switch ON	9 to 14 V
CCV (E12–12) – E1 (E12–1)	V–W – BR	IG switch ON	9 to 14 V
OCVL+ (E12–14) – OCVL– (E12–13)	L–W – L–B	Engine speed at 6,000 rpm or more	9 to 14 V
OCV+ (E12–16) – OCV– (E12–15)	G–O – W	IG switch ON	Pulse generation (See page DI–349)
G22+ (E12–27) – NE– (E10–34)	L – W	Idling	Pulse generation (See page DI–477)
KNK1 (E11–2) – EKNK (E11–1)	B – W	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (See page DI–472)
HT1A (E11–4) – E1 (E12–1)	Y–R – BR	Idling	Below 3.0 V
		IG switch ON	9 to 14 V
STA (E11–9) – E1 (E12–1)	L – BR	Shift lever range P or N, ignition switch START	6.0 V or more
OX1A (E11–23) – E1 (E12–1) OX1B (E11–29) – E1 (E12–1)	B – BR R – BR	Maintain engine speed at 2,500 rpm for 90 sec. after warming up	Pulse generation (See page DI–494)
VG (E11–24) – EVG (E11–32)	G–W – Y–G	Idling, P or N range, A/C switch OFF	0.5 to 3.0 V
#10 (E10–1) – E01 (E10–7) #20 (E10–2) – E01 (E10–7) #30 (E10–3) – E01 (E10–7) #40 (E10–4) – E01 (E10–7)	L–R – W–B L–O – W–B L–B – W–B L – W–B	IG switch ON	9 to 14 V
		Idling	Pulse generation (See page DI–459)
IGT1 (E10–8) – E1 (E12–1) IGT2 (E10–9) – E1 (E12–1) IGT3 (E10–10) – E1 (E12–1) IGT4 (E10–11) – E1 (E12–1)	R–G – BR GR–R – BR G–R – BR R–Y – BR	Idling	Pulse generation (See page DI–486)
VC (E10–18) – E2 (E10–28)	R–B – BR	IG switch ON	4.5 to 5.5 V
THW (E10–19) – E2 (E10–28)	G – BR	Idling, Engine coolant temp. 80°C (176°F)	0.2 to 1.0 V
THA (E10–20) – E2 (E10–28)	Y–R – BR	Idling, Intake air temp. 20°C (68°F)	0.5 to 3.4 V
VTA (E10–21) – E2 (E10–28)	B–W – BR	IG switch ON, Accelerator pedal released	0.4 to 1.0 V
		IG switch ON, Accelerator pedal depressed	3.2 to 4.8 V
IGF (E10–24) – E1 (E12–1)	B–Y – BR	IG switch ON	4.5 to 5.5 V
		Idling	Pulse generation (See page DI–486)
NE+ (E10–27) – NE– (E10–34)	O – W	Idling	Pulse generation (See page DI–477)
VTA2 (E10–31) – E2 (E10–28)	B–L – BR	IG switch ON, Accelerator pedal released	2.0 to 2.9 V
		IG switch ON, Accelerator pedal depressed	4.7 to 5.1 V

DIAJX–03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for the codes listed in the table below. For details of each code, refer to the page under the ”See page” for the respective ”DTC No.” in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	MIL*1	Memory
P0010 (DI–344)	Camshaft Position ”A” Actuator Circuit (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–i • ECM	○	○
P0011 (DI–349)	Camshaft Position ”A” –Timing Over– Advanced or System Performance (Bank 1)	• Valve timing • Oil control valve for VVT–i • VVT controller assembly • ECM	○	○
P0012 (DI–349)	Camshaft Position ”A” –Timing Over– Retarded (Bank 1)	• Same as DTC No. P0011	○	○
P0016 (DI–358)	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	• Mechanical system (Timing chain has a jumped tooth, chain is stretched) • ECM	○	○
P0031 (DI–360)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 1)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0032 (DI–360)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0037 (DI–360)	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)	• Open in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0038 (DI–360)	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)	• Short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM	○	○
P0100 (DI–366)	Mass or Volume Air Flow Circuit	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–372)	Mass or Volume Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0102 (DI–366)	Mass or Volume Air Flow Circuit Low Input	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0103 (DI–366)	Mass or Volume Air Flow Circuit High Input	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0110 (DI–375)	Intake Air Temperature Circuit	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○

P0112 (DI–375)	Intake Air Temperature Circuit Low Input	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0113 (DI–375)	Intake Air Temperature Circuit High Input	• Open in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM	○	○
P0115 (DI–382)	Engine Coolant Temperature Circuit	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0116 (DI–389)	Engine Coolant Temperature Circuit Range/Performance Problem	• Cooling system • Engine coolant temperature sensor	○	○
P0117 (DI–382)	Engine Coolant Temperature Circuit Low Input	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0118 (DI–382)	Engine Coolant Temperature Circuit High Input	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM	○	○
P0120 (DI–391)	Throttle Pedal Position Sensor/ Switch "A" Circuit	• Throttle position sensor • ECM	○	○
P0121 (DI–402)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0122 (DI–391)	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low Input	• Throttle position sensor • VC circuit open • VTA1 circuit short • ECM	○	○
P0123 (DI–391)	Throttle/Pedal Position Sensor/ Switch "A" Circuit High Input	• Throttle position sensor • VTA1 circuit open • E2 circuit open • VC and VTA1 circuits are short–circuited • ECM	○	○
P0125 (DI–404)	Insufficient Coolant Temperature for Closed Loop Fuel Control	• Cooling system • Engine coolant temperature sensor • Thermostat	○	○
P0128 (DI–407)	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM	○	○
P0130 (DI–411)	Oxygen Sensor Circuit (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○
P0133 (DI–422)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor circuit (Bank 1 Sensor 1) • Heated oxygen sensor (Bank 1 Sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM	○	○

P0134 (DI–431)	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • PCV hose connection • PCV valve and hose • Injector • Gas leakage in exhaust system • PCV piping • ECM	○	○
P0136 (DI–439)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • EFI relay	○	○
P0138 (DI–439)	Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit	○	○
P0171 (DI–446)	System too Lean (Bank 1)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM	○	○
P0172 (DI–446)	System too Rich (Bank 1)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • ECM	○	○
P0220 (DI–391)	Throttle/Pedal Position Sensor/ Switch ”B” Circuit	• Throttle position sensor • ECM	○	○
P0222 (DI–391)	Throttle/Pedal Position Sensor/ Switch ”B” Circuit Low Input	• Throttle position sensor • VTA2 circuit short • VC circuit open • ECM	○	○
P0223 (DI–391)	Throttle/Pedal Position Sensor/ Switch ”B” Circuit High Input	• Throttle position sensor • VTA2 circuit open • E2 circuit open • VC and VTA2 circuits are short–circuited • ECM	○	○

P0300 (DI–459)	Random/Multiple Cylinder Misfire Detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • VVT–L system (locker arm) • PCV hose connection • PCV hose • ECM	○*2	○
P0301 (DI–459)	Cylinder 1 Misfire Detected		○*2	○
P0302 (DI–459)	Cylinder 2 Misfire Detected		○*2	○
P0303 (DI–459)	Cylinder 3 Misfire Detected		○*2	○
P0304 (DI–459)	Cylinder 4 Misfire Detected		○*2	○
P0327 (DI–472)	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0328 (DI–472)	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0335 (DI–477)	Crankshaft Position Sensor ”A” Circuit	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM	○	○
P0339 (DI–477)	Crankshaft Position Sensor ”A” Circuit Intermittent	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate • ECM	○	○
P0340 (DI–482)	Camshaft Position Sensor ”A” Circuit (Bank 1 or Single Sensor)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has a jumped tooth • ECM	○	○
P0341 (DI–482)	Camshaft Position Sensor ”A” Circuit Range/Performance (Bank 1 or Single Sensor)		○	○
P0351 (DI–486)	Ignition Coil ”A” Primary/Secondary Circuit	• Open or short in IGF and IGT1 circuit from No. 1 ignition coil with igniter to ECM • No. 1 ignition coil with igniter • Ignition system • ECM	○	○
P0352 (DI–486)	Ignition Coil ”B” Primary/Secondary Circuit	• Open or short in IGF and IGT2 circuit from No. 2 ignition coil with igniter to ECM • No. 2 ignition coil with igniter • Ignition system • ECM	○	○
P0353 (DI–486)	Ignition Coil ”C” Primary/Secondary Circuit	• Open or short in IGF and IGT3 circuit from No. 3 ignition coil with igniter to ECM • No. 3 ignition coil with igniter • Ignition system • ECM	○	○
P0354 (DI–486)	Ignition Coil ”D” Primary/Secondary Circuit	• Open or short in IGF and IGT4 circuit from No. 4 ignition coil with igniter to ECM • No. 4 ignition coil with igniter • Ignition system • ECM	○	○

P0420 (DI–494)	Catalyst System Efficiency Below Threshold (Bank 1)	• Gas leakage in exhaust system • Heated oxygen sensor • Three–way catalytic converter	○	○
P0441 (DI–501)	Evaporative Emission Control System Incorrect Purge Flow	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0442 (DI–524)	Evaporative Emission Control System Leak Detected (Small Leak)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • EVAP VSV • Open or short in VSV circuit for CCV • CCV • Open or short in VSV circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, or damaged • Charcoal canister is cracked, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM	○	○
P0446 (DI–501)	Evaporative Emission Control System Vent Control Circuit	• Same as DTC No. P0441	○	○
P0451 (DI–545)	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0452 (DI–545)	Evaporative Emission Control System Pressure Sensor/Switch Low Input	• Open in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0453 (DI–545)	Evaporative Emission Control System Pressure Sensor/Switch High Input	• Short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0456 (DI–524)	Evaporative Emission Control System Leak Detected (Very Small Leak)	• Same as DTC No. P0442	○	○
P0500 (DI–552)	Vehicle Speed Sensor ”A”	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	○

P0503 (DI–552)	Vehicle Speed Sensor "A" Intermittent/Erratic/High	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	–	○
P0504 (DI–556)	Brake Switch "A"/"B" Correlation	• Short in stop lamp switch signal circuit • Stop lamp fuse • Stop lamp switch • ECM	–	○
P0505 (DI–562)	Idle Air Control System	• Air induction system • Electric throttle control system • Electric throttle control system circuit • PCV piping • ECM	○	○
P0560 (DI–566)	System Voltage	• Open in back–up power source circuit • EFI fuse • ECM	○	○
P0604 (DI–569)	Internal Control Module Random Access Memory (RAM) Error	• ECM	○	○
P0606 (DI–569)	ECM/PCM Processor	• ECM	○	○
P0607 (DI–569)	Control Module Performance	• ECM	○	○
P0617 (DI–571)	Starter Relay Circuit High	• Park/neutral position switch (A/T) • Clutch start switch (M/T) • Starter relay • Ignition switch • ECM	○	○
P0630 (DI–579)	VIN not Programmed or Mismatch – ECM/PCM	• ECM	○	○
P0657 (DI–569)	Actuator Supply Voltage Circuit / Open	• ECM	○	○
P1645 (DI–581)	Body ECU Malfunction	• Body ECU • A/C ECU • Communication bus	○	○
P2102 (DI–582)	Throttle Actuator Control Motor Circuit Low	• Open in throttle control motor circuit • Throttle control motor • ECM	○	○
P2103 (DI–582)	Throttle Actuator Control Motor Circuit High	• Short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body assembly • ECM	○	○
P2111 (DI–586)	Throttle Actuator Control System – Stuck Open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve	○	○
P2112 (DI–586)	Throttle Actuator Control System – Stuck Closed	• Same as DTC No. P2111	○	○
P2118 (DI–589)	Throttle Actuator Control Motor Current Range/Performance	• Open in ETCS power source circuit • ETCS fuse • ECM	○	○
P2119 (DI–594)	Throttle Actuator Control Throttle Body Range/Performance	• Electric throttle control system • ECM	○	○

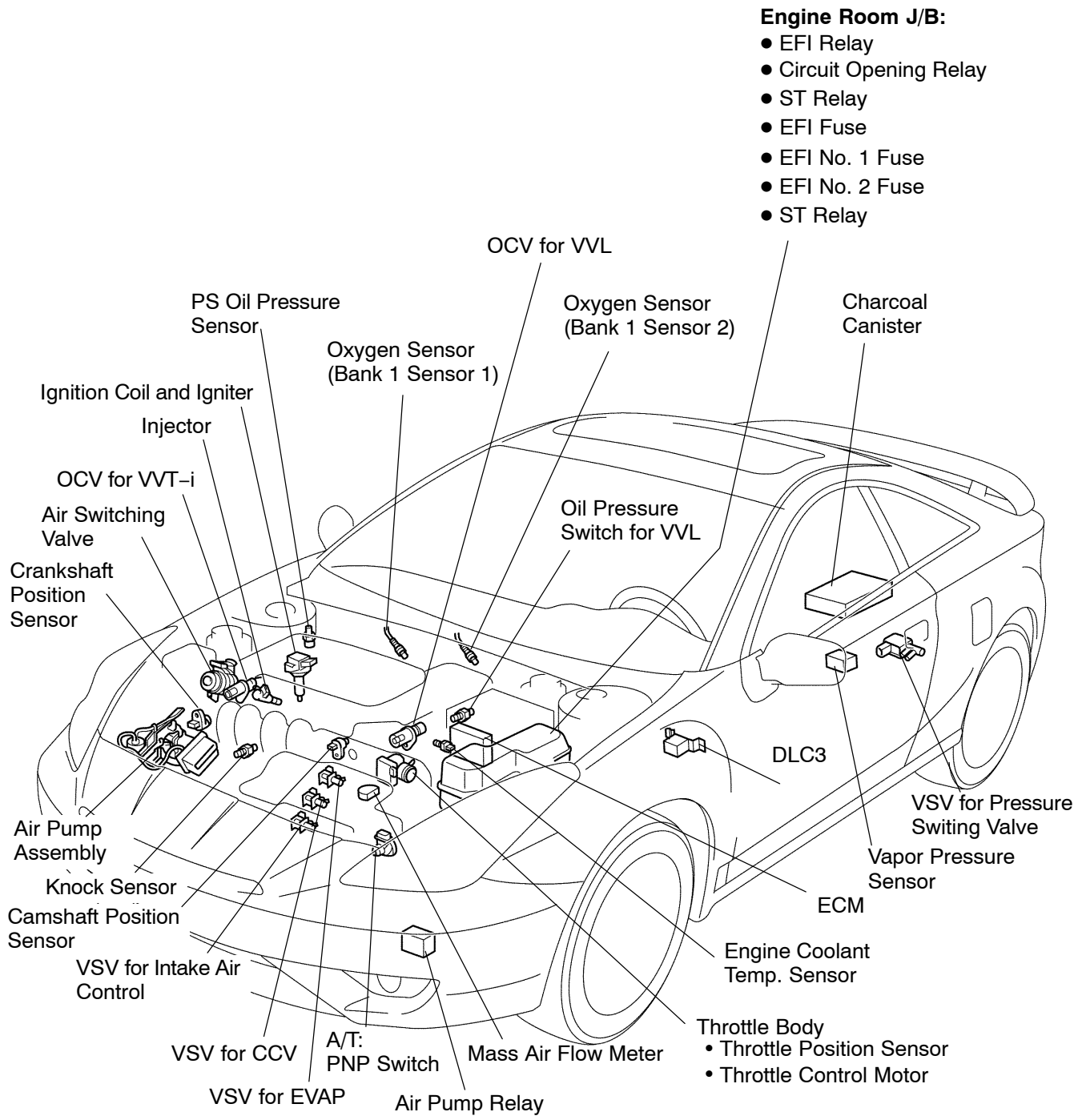
P2120 (DI–597)	Throttle/Pedal Position Sensor/ Switch "D" Circuit	• Accelerator pedal position sensor • ECM	○	○
P2121 (DI–607)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Range/Performance	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM	○	○
P2122 (DI–597)	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	• Accelerator pedal position sensor • Open in VCP1 circuit • VPA circuit open or ground short • ECM	○	○
P2123 (DI–597)	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	• Accelerator pedal position sensor • Open in EPA circuit • ECM	○	○
P2125 (DI–597)	Throttle/Pedal Position Sensor/ Switch "E" Circuit	• Accelerator pedal position sensor • ECM	○	○
P2127 (DI–597)	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	• Accelerator pedal position sensor • Open in VCP2 circuit • VPA2 circuit open or ground short • ECM	○	○
P2128 (DI–597)	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	• Accelerator pedal position sensor • Open in EPA2 circuit • ECM	○	○
P2135 (DI–391)	Throttle Pedal Position Sensor/ Switch "A" / "B" Voltage Correlation	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor • ECM	○	○
P2138 (DI–597)	Throttle Pedal Position Sensor/ Switch "D" / "E" Voltage Correlation	• VPA and VPA2 circuit are short circuited • Accelerator pedal position sensor • ECM	○	○
P2195 (DI–411)	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)	• Same as DTC No. P0130	○	○
P2196 (DI–411)	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)		○	○
P2430 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Bank 1	• Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM	○	○
P2431 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1		○	○
P2432 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low Bank 1		○	○
P2433 (DI–611)	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low Bank 1		○	○
P2440 (DI–617)	Secondary Air Injection System Switching Valve Stuck Open Bank 1	• VSV • Air switching valve • Open or short in VSV circuit • Pressure sensor • Open or short in pressure sensor circuit • ECM	○	○

P2441 (DI–617)	Secondary Air Injection System Switching Valve Stuck Closed Bank 1	• VSV • Air switching valve • Open or short in VSV circuit • Vacuum hose and check valve • Air injection hose • Pressure sensor • Open or short in pressure sensor circuit • ECM	○	○
P2444 (DI–628)	Secondary Air Injection System Pump Stuck On Bank 1	• Short in air pump circuit • Pressure sensor • Air pump assembly • Open or short in pressure sensor circuit • ECM	○	○
P2445 (DI–628)	Secondary Air Injection System Pump Stuck OFF Bank 1	• Air pump fuse • Vacuum hose • Air pump assembly • Open in air pump circuit • Secondary air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM	○	○
P2645 (DI–640)	OCV for VVTL Circuit (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–L • Oil pressure switch for VVT–L • ECM	○	○
P2646 (DI–645)	OCV for VVTL Close Malfunction (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–L • Oil pressure switch for VVT–L • ECM	○	○
P2647 (DI–645)	OCV for VVTL Open Malfunction (Bank 1)	• Open or short in oil control valve circuit • Oil control valve for VVT–L • Oil pressure switch for VVT–L • ECM	○	○

*1: MIL lights up.
*2: MIL lights up or blinks.
*: – .... MIL does not light up, ○ .... MIL lights up

DI37U–19

PARTS LOCATION



C

A21565

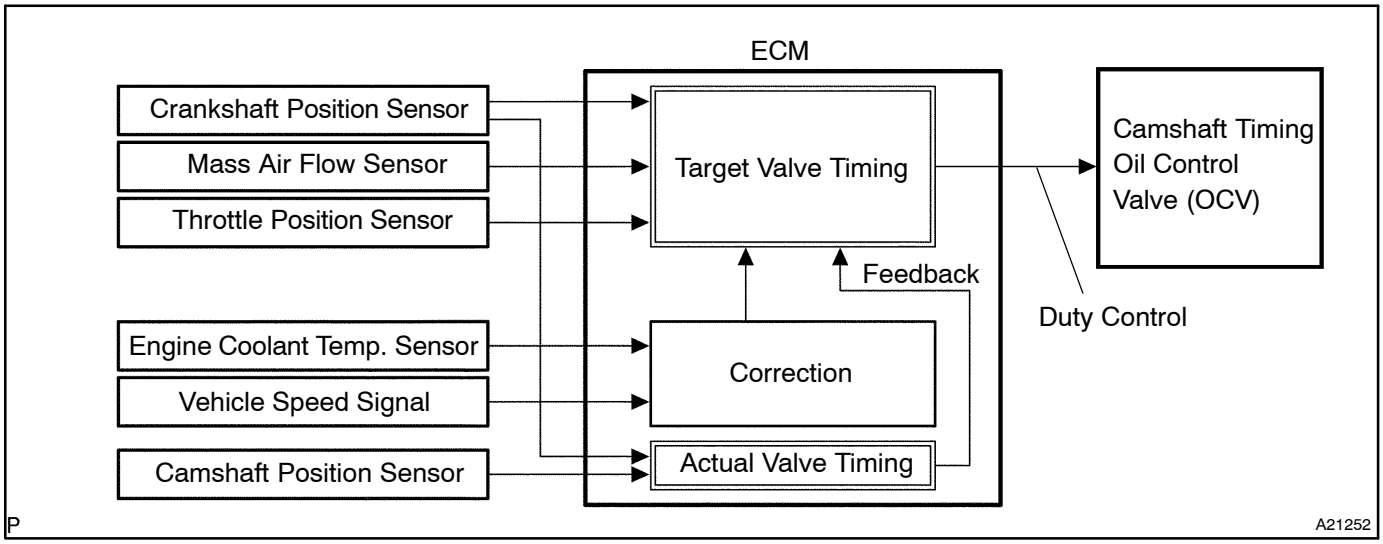
DIC75–02

CIRCUIT INSPECTION

DTC	P0010	Camshaft Position ”A” Actuator circuit (Bank 1)

CIRCUIT DESCRIPTION

The Variable Valve Timing (VVT) system includes the ECM, the Oil Control Valve (OCV) and the VVT controller. The ECM sends a target ”duty–cycle” control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. Camshaft timing control is performed based on engine operation conditions such as the intake air volume, throttle position and engine coolant temperature. The ECM controls the OCV, based on the signals output from the sensors. The VVT controller regulates the intake camshaft angle using oil pressure through the OCV. As a result, the relative position between the camshaft and the crankshaft is optimized, and the engine torque and fuel economy improve, and exhaust emissions decrease under overall driving conditions. Also, the ECM detects the actual valve timing using signals from the camshaft position sensor and crankshaft position sensor, and performs the feedback control. This is how target valve timing is verified by the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P0010	Open or short in Oil Control Valve (OCV) circuit (1 trip detection logic)	• Open or short in oil control valve circuit • Oil control valve for VVT–i • ECM

MONITOR DESCRIPTION

After the ECM sends the ”target” duty–cycle signal to the OCV (Oil Control Valve), the ECM monitors the OCV current to establish an ”actual” duty–cycle. When the actual duty–cycle ratio varies from the target duty–ratio, the ECM sets a DTC.

MONITOR STRATEGY

Related DTCs	P0010	VVT oil control valve bank 1 range check
Required sensors/components	OCV	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery Voltage	11 V	13 V
Target duty ratio	–	70%
Starter	OFF	
Current cut status	Not cut	

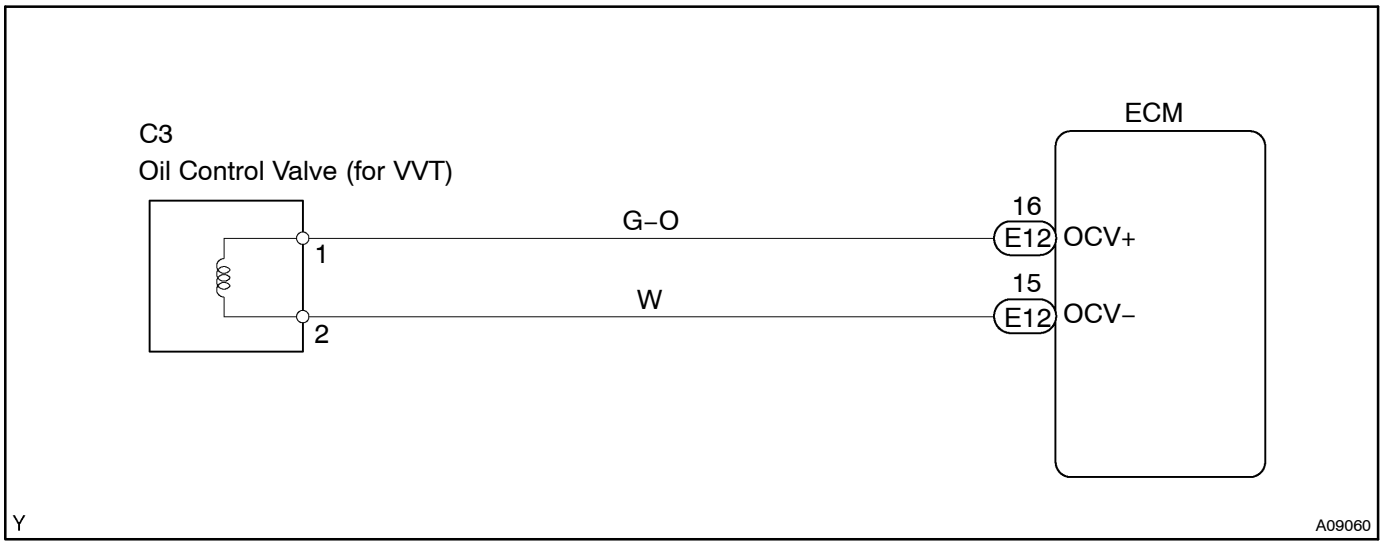
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following condition is met:	A or B
A. Output signal duty for OCV	Output duty ratio is 100% (always ON) but target duty ratio is less than 70%
B. Output signal duty for OCV	Output duty ratio is 3% or less despite the ECM supplying the current to the OCV

COMPONENT OPERATING RANGE

Parameter	Standard Value
Output signal duty for OCV	Between 3% and 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check OCV circuit.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the OCV by the hand–held tester.

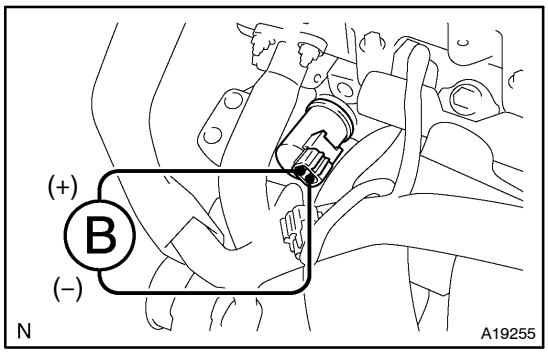
OK:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

OK → **Check for intermittent problems (See page DI–295).**

NG

2	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled.

NG → **Replace OCV.**

OK

3	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

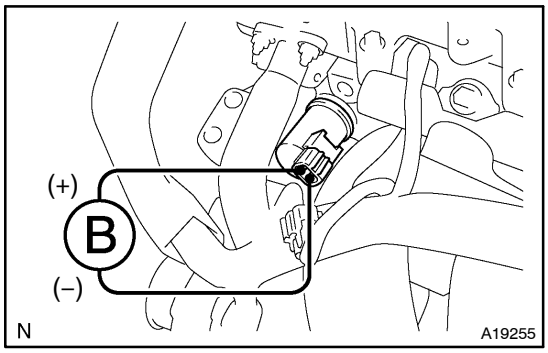
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check operation of OCV.**



PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV connector.
(c) Apply battery voltage between the terminals of the OCV.

CHECK:

Check the engine speed.

OK:

Rough idle or engine stalled

NG → **Replace OCV.**

OK

2	**Check for open and short in harness and connector between OCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page SF–78).

DTC	P0011	Camshaft Position ”A” –Timing Over–Advanced or System Performance (Bank 1)

DTC	P0012	Camshaft Position ”A” –Timing Over–Retarded (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTCs P0010 on page DI–344.

DTC No.	DTC Detecting Condition	Trouble Area
P0011	Advanced cam timing: After engine is warmed up and engine speed is at 550 to 4,000 rpm, condition (a) continues. (1 trip detection logic) (a) Valve timing does not change from current valve timing (The problem of the advanced OCV.)	• Valve timing • Oil control valve for VVT–i • VVT controller assembly • ECM
P0012	Retarded cam timing: After engine is warmed up and engine speed is at 550 to 4,000 rpm, condition (a) continues. (2 trip detection logic) (a) Valve timing does not change from current valve timing (The problem of the retarded OCV.)	• Same as DTC No. P0011

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target ”duty–cycle” control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft.
Example:
A DTC will be set if: 1) the difference between the target and actual valve timing is more than 5 degrees of the crankshaft angle (CA) and the condition continues for more than 4.5 sec.; or 2) the OCV is forcibly activated 63 times or more.
Advanced cam DTCs are subject to ”1 trip” detection logic.
Retarded cam DTCs are subject to ”2 trip” detection logic.

MONITOR STRATEGY

Related DTCs	P0011	VVT system advanced (Bank 1)
	P0012	VVT system retarded (Bank 1)
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Crankshaft position sensor
Frequency of operation	Once per driving cycle	
Duration	10 sec.	
MIL operation	P0011: Immediate P0012: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Throttle position learning	Completed	
Engine RPM	550 rpm	4,000 rpm
Engine coolant temperature	75°C (167°F)	100°C (212°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
OCV actiation	63 times or more
Deviation of valve timing	More than 10°CA (Crankshaft angle)
Response of valve timing	1 sec./°CA or more (Valve timing does not change)

WIRING DIAGRAM

Refer to DTCs P0010 on page DI–344.

INSPECTION PROCEDURE

HINT:

Advanced timing over (Valve timing is out of specified range)	P0011
Retarded timing over (Valve timing is out of specified range)	P0012

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check valve timing (Check for loose and jumped tooth of timing chain) (See page EM–26).**

NG → **Adjust valve timing.**

OK

2	Check operation of OCV.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and warm it up.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VVT CTRL B1.

CHECK:

Check the engine speed when operating the OCV by the hand–held tester.

OK:

Tester Operation	Specified Condition
OCV is OFF	Normal engine speed
OCV is ON	Rough idle or engine stall

NG → **Go to step 4.**

OK →

3	Check if DTC output reoccurs.

PREPARATION:

(a) Clear the DTCs.
  (1) Operating the hand–held tool to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTCs using the hand–held tool.

OK:

No DTC output.

OK → **VVT system OK***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG →

4	Check oil control valve filter.

NG → Replace oil control valve filter.

OK

5	Check oil control valve (See page SF–54).

OK → Go to step 7.

NG

6	Replace oil control valve.

Go

7	Check VVT controller assembly (See page EM–50).

OK → Go to step 9.

NG

8	Replace VVT controller assembly (See page EM–44).

Go

9	Check blockage of OCV, oil check valve and oil pipe No. 1.

NG → Repair or replace.

OK

10	Check whether or not DTC P0011 or P0012 is stored.

PREPARATION:

(a) Clear the DTCs.
Operate the hand–held tester to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTC using the hand–held tester.

OK:

No DTC output.

OK → **VVT system is OK.***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

Replace ECM (See page SF–78).

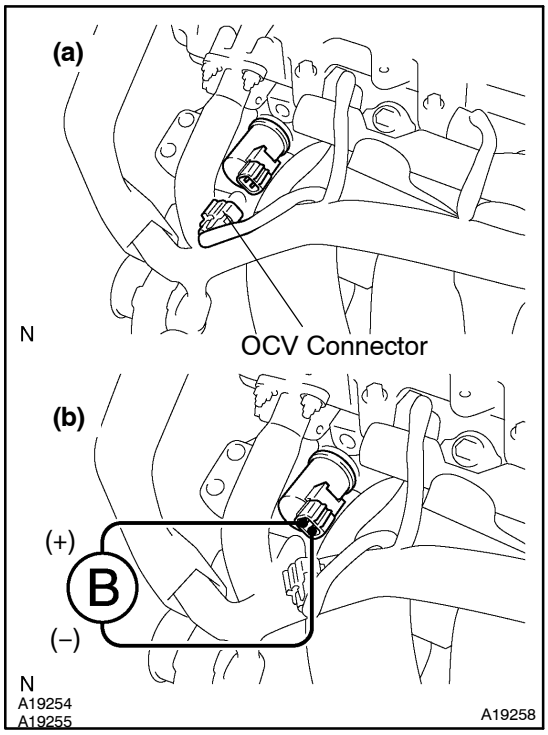
OBD II scan tool (excluding hand–held tester):

1	**Check valve timing (Check for looseness and jumped tooth of timing chain) (See page EM–26).**

NG → **Adjust valve timing.**

OK

2	**Check operation of OCV.**



PREPARATION:

Start the engine.

CHECK:

(a) Check the engine speed when disconnecting the OCV connector.

(b) Check the engine speed when applying battery voltage between the terminals of the OCV.

RESULT:

Result	Check (a)	Check (b)
1	Normal engine speed	Rough idle or engine stall
2	Except 1	

2 → **Go to step 4.**

1

3	**Check if DTC output reoccurs.**

PREPARATION:

(a) Clear the DTCs.
Operate the OBD II scan tool to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTCs using the OBD II scan tool.

OK:

No DTC output.

OK → **VVT system OK***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

4	**Check oil control valve filter.**

NG → **Replace oil control valve filter.**

OK

5	**Check OCV (See page SF–54).**

OK → **Go to step 7.**

NG

6	**Replace OCV (See page EM–44).**

Go

7	Check VVT controller assembly (See page EM–50).

OK → Go to step 9.

NG

8	Replace VVT controller assembly (See page EM–44).

Go

9	Check blockage of OCV, oil check valve and oil pipe No. 1.

NG → Repair or replace.

OK

10	Check whether or not DTC P0011 or P0012 is stored.

PREPARATION:

(a) Clear the DTCs.
Operate the OBD II scan tool to erase the codes, or disconnect the battery terminal or remove the EFI fuse for more than 60 seconds.
(b) Start and warm up the engine.
(c) Drive the vehicle around for 10 minutes or more.

CHECK:

Read output DTC using the OBD II scan tool.

OK:

No DTC output.

OK → **VVT system is OK.***

*: DTCs P0011 and P0012 are output when a foreign object in the engine oil enters the system. These codes will stay even if the system returns to normal after a short time. Foreign objects are filtered out by the oil filter.

NG

Replace ECM (See page SF–78).

DIC76–02

DTC P0016 Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)

CIRCUIT DESCRIPTION

Refer to P0335 on page DI–477.

DTC No.	DTC Detecting Condition	Trouble Area
P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (2 trip detection logic)	• Mechanical system (Timing chain has a jumped tooth, chain is stretched) • ECM

MONITOR DESCRIPTION

The ECM optimizes the valve timing using the VVT (Variable Valve Timing) system to control the intake valve camshaft. The VVT system includes the ECM, the OCV (Oil Control Valve) and the VVT controller. The ECM sends a target duty–cycle control signal to the OCV. This control signal, sent to the OCV, regulates the oil pressure applied to the VVT controller. The VVT controller can advance or retard the intake valve camshaft. The ECM calibrates the valve timing of the VVT system by setting the camshaft to the maximum retard angle when the engine is idling. The ECM closes the OCV to retard the cam. The ECM stores this value as VVT learning value (When the difference between the target valve timing and the actual valve timing is 5 degrees or less, the ECM stores this in its memory).

If the learning value meets both of the following conditions ((a) and (b)), the ECM interprets this as a defect in the VVT system and sets a DTC.

(a) VVT learning value is less than 19˚CA (crankshaft angle), or more than 41˚CA.

(b) Above condition continues for more than 18 sec.

MONITOR STRATEGY

Related DTCs	P0016	Deviation in crankshaft position sensor signal and camshaft position sensor signal (Bank 1)
Required sensors/components	Crankshaft position sensor, Camshaft position sensor	
Frequency of operation	Once per driving cycle	
Duration	60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Engine RPM	600 rpm	1,400 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that either of the following conditions 1 or 2 is met:	18 sec. or more
1. VVT angle when camshaft is retarded maximum	Less than 19°CA
2. VVT angle when camshaft is retarded maximum	More than 41°CA

WIRING DIAGRAM

2005 CELICA (RM1131U)

Refer to DTC P0335 on page DI–477.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check valve timing (Check for loosen and jumped tooth of timing chain).**

NG → **Adjust valve timing (Repair or replace timing chain).**

OK

Replace ECM (See page SF–78).

DIC77–02

DTC	P0031	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 1)

DTC	P0032	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 1)

DTC	P0037	Oxygen Sensor Heater Control Circuit Low (Bank 1 Sensor 2)

DTC	P0038	Oxygen Sensor Heater Control Circuit High (Bank 1 Sensor 2)

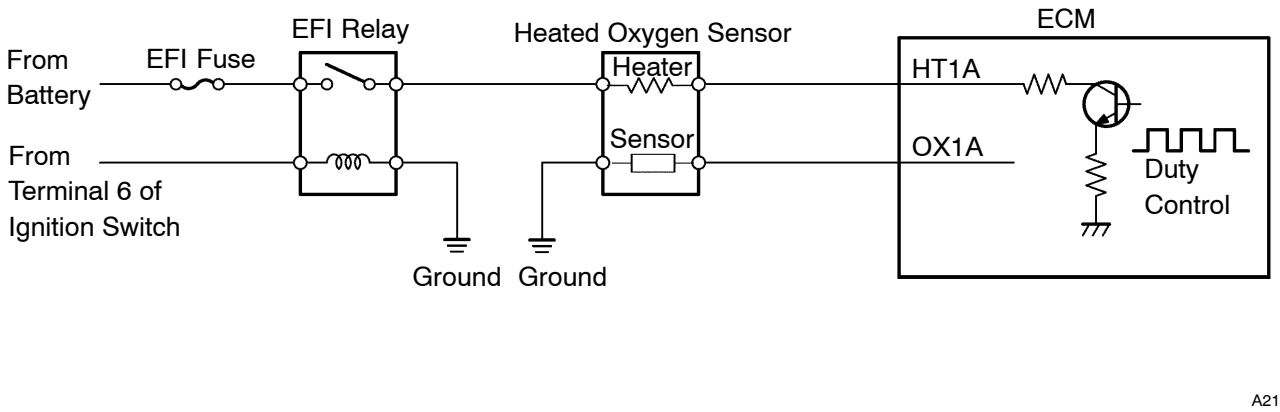
CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

HINT:

The ECM provides a pulse width modulated control circuit to adjust current through the heater. The heated oxygen sensor heater circuit uses a relay on the B+ side of the circuit.

Reference (Bank 1 Sensor 1 System Drawing):



DTC No.	DTC Detection Condition	Trouble Area
P0031 P0037	Heater current is 0.25 A or less when heater operates with B+ greater than 11.5 V (1 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • EFI relay • ECM
P0032 P0038	Heater current exceeds 3.5 A when heater operates (1 trip detection logic)	

HINT:

- Sensor 1 is to the sensor closer to the engine body.
- Sensor 2 is to the sensor farther away from the engine body.

MONITOR DESCRIPTION

The sending portion of the heated oxygen sensor has a zirconia element which is used to detect oxygen concentration in the exhaust. If the zirconia element is at the proper temperature and difference of the oxygen concentration between the inside and outside surface of sensor is large, the zirconia element will generate voltage signals. In order to increase the oxygen concentration detecting capacity in the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor. When current in the sensor is out of the standard operating range, the ECM interprets this as a fault in the heated oxygen sensor and sets a DTC.

Example:

The ECM will set a high current DTC if the current in the sensor is more than 2 A when the heater is OFF. Similarly, the ECM will set a low current DTC if the current is less than 0.25 A when the heater is ON.

MONITOR STRATEGY

Related DTCs	P0031	Heated oxygen sensor heater current bank 1 sensor 1 (Low current)
	P0032	Heated oxygen sensor heater current bank 1 sensor 1 (High current)
	P0037	Heated oxygen sensor heater current bank 1 sensor 2 (Low current)
	P0038	Heated oxygen sensor heater current bank 1 sensor 2 (High current)
Required sensors/components	Main sensors/components	Heated oxygen sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.2 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P0031, P0037 (Low current):		
Either of the following conditions is met:	A or B	
A. Following conditions are met:	1, 2, 3, 4 and 5	
1. Time after engine start	250 sec.	500 sec.
2. Battery voltage	10.5 V	–
3. Vehicle speed	–	90 km/h (56 mph)
4. Misfire	Not detected	
5. Pass/Fail detection in this driving cycle	Not detected	
B. Following conditions are met:	1, 2, 3, 4 and 5	
1. Time after engine start	500 sec.	–
2. Battery voltage	10.5 V	–
3. Vehicle speed	64 km/h (40 mph)	–
4. Misfire	Not detected	
5. Pass/Fail detection in this driving cycle	Not detected	
P0032, P0038 (High current):		
Intrusive heating is OFF		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0031, P0037 (Low current):	
Heated oxygen sensor heater current	Less than 0.25 A (at 0.2 sec. after heater "ON")
P0032, P0038 (High current):	
Heated oxygen sensor heater current	More than 2 A (while intrusive heating is OFF)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor heater current under following conditions: • Engine is idling • Heated oxygen sensor is warmed up • Battery voltage is 11 to 14 V	0.4 to 1.0 A

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $04: HO2S heater

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 1)	Malfunction threshold for HO2S heater
1	$02	Multiplied by 0.000076 (A)	Maximum HO2S heater current (Bank 1 Sensor 2)	Malfunction threshold for HO2S heater

WIRING DIAGRAM

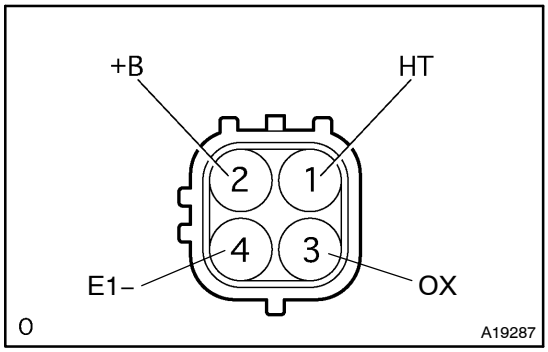
Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check resistance of heated oxygen sensor heater.**



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

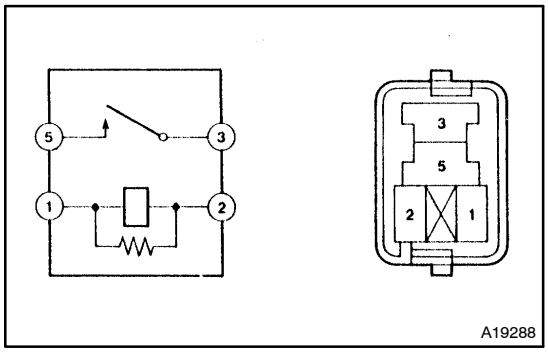
OK:

Resistance: 11 to 16 Ω (20°C)

NG → **Replace heated oxygen sensor.**

OK

2	Check EFI relay.



PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

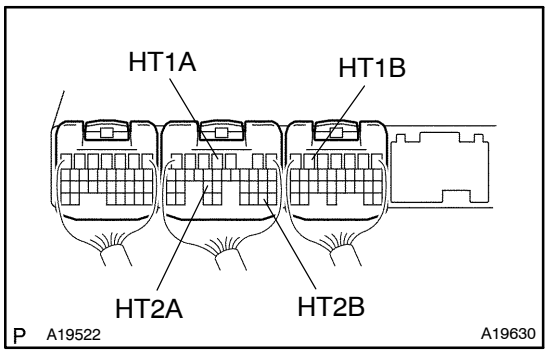
OK:

Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

3	Check voltage between terminals HT1A, HT2A, HT1B, HT2B of ECM connectors and body ground.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals HT1A, HT2A, HT1B, HT2B of the ECM connectors and body ground.

HINT:

- Connect terminal HT1A to bank 2 sensor 1.
- Connect terminal HT2A to bank 1 sensor 1.
- Connect terminal HT1B to bank 1 sensor 2.
- Connect terminal HT2B to bank 2 sensor 2.

OK:

Voltage: 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

4	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and heated oxygen sensor, and heated oxygen sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

DI09B–27

DTC	P0100	Mass or Volume Air Flow Circuit

DTC	P0102	Mass or Volume Air Flow Circuit Low Input

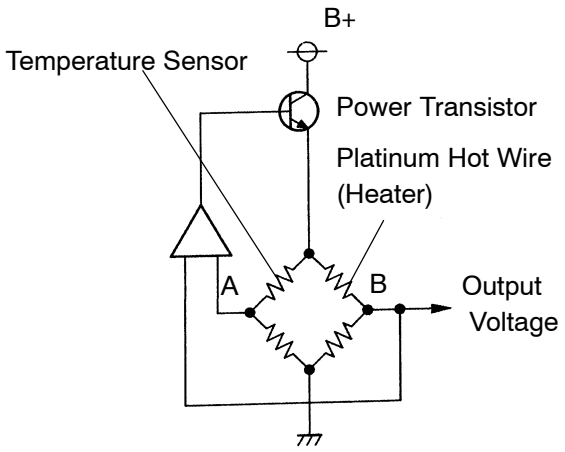
DTC	P0103	Mass or Volume Air Flow Circuit High Input

CIRCUIT DESCRIPTION

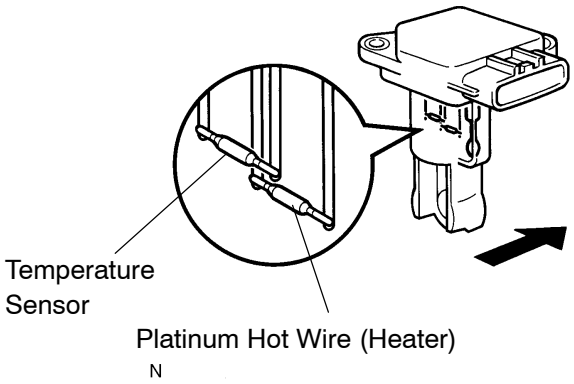
The MAF (Mass Air Flow) meter measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the airflow through the sensor and the ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and the temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.



FI6929
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A09707

DTC No.	DTC Detection Condition	Trouble Area
P0100	When the mass air flow meter circuit has an open or short for more than 3 seconds under the 4,000 rpm engine speed	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0102	When the mass air flow meter circuit has an open for more than 3 seconds under the 4,000 rpm engine speed	
P0103	When the mass air flow meter circuit has a short for more than 3 seconds under the 4,000 rpm engine speed	

HINT:

After confirming DTC P0100, P0102 or P0103, confirm the mass air flow ratio in the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL” using the hand–held tester or the OBD II scan tool.

Mass Air Flow Value (gm/sec.)	Malfunction
Approximately 0.0	• Mass air flow meter power source circuit open • VG circuit open or short
271.0 or more	• EVG circuit open

MONITOR DESCRIPTION

If there is a defect in the MAF (Mass Air Flow) meter or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.
Example:
The MAF meter voltage output is less than 0.2 V, or more than 4.9 V, and either the condition continues for more than 3 sec.

MONITOR STRATEGY

Related DTCs	P0100	Mass air flow meter circuit range check (Fluttering)
	P0102	Mass air flow meter circuit range check (Low voltage)
	P0103	Mass air flow meter circuit range check (High voltage)
Required sensors/components	Mass air flow meter	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (When engine speed is less than 4,000rpm) 2 driving cycles (When engine speed is 4,000 rpm or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

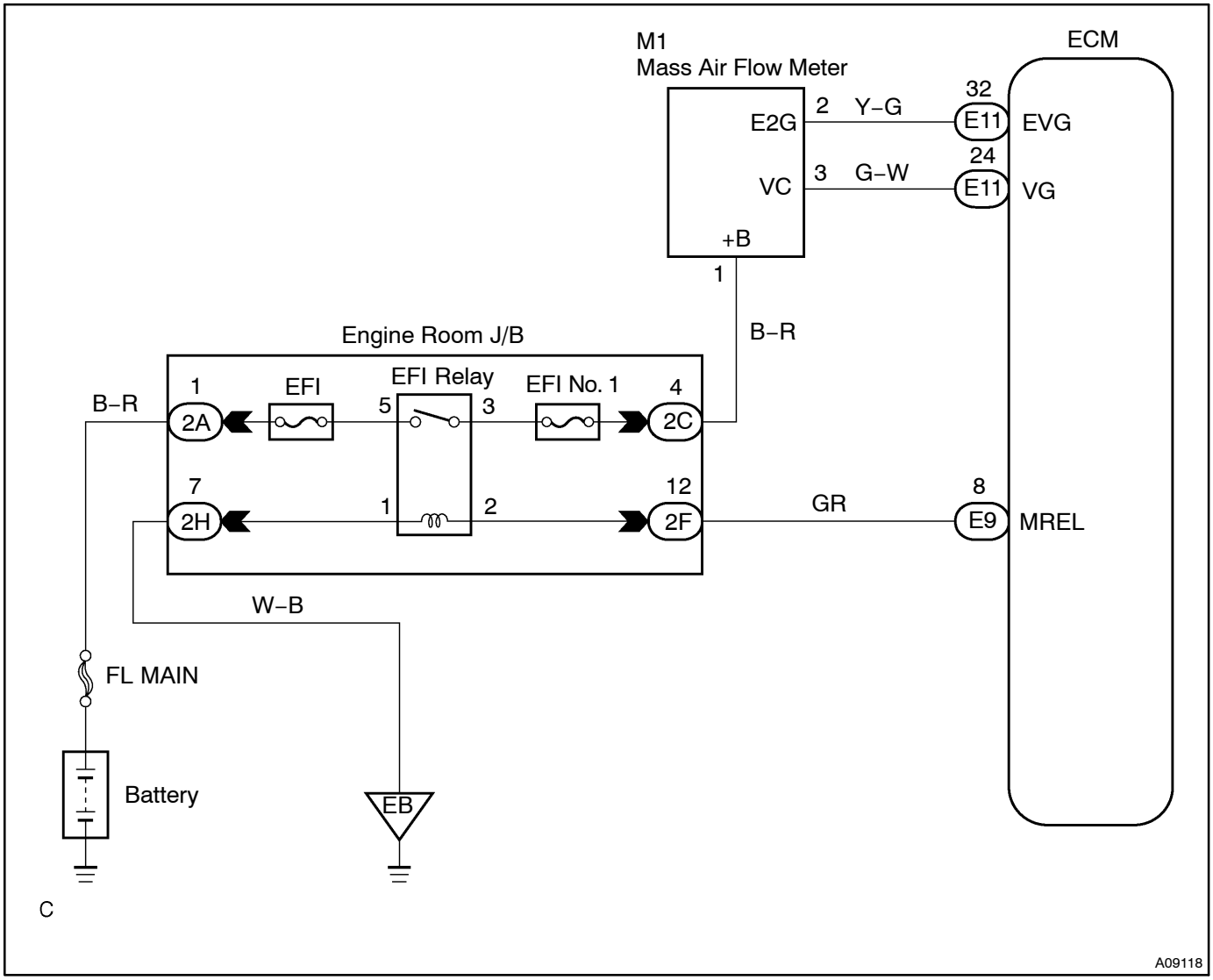
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0100:	
Mass air flow meter voltage	Less than 0.2 V or more than 4.9 V
P0102:	
Mass air flow meter voltage	Less than 0.2 V
P0103:	
Mass air flow meter voltage	More than 4.9 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Mass air flow meter voltage	0.4 to 2.2 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL/MAF.

CHECK:

Read the mass air flow rate on the OBD II scan tool or the hand–held tester.

RESULT:

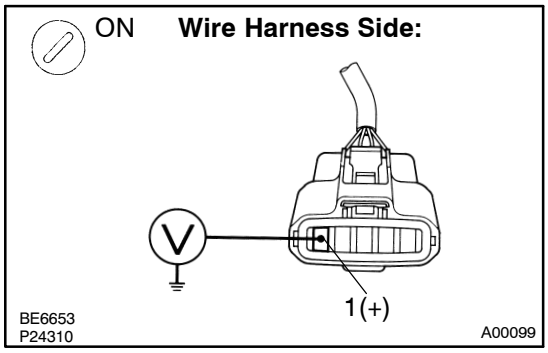
Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

*1: The value must be changed when the throttle valve is opened or closed.

B	**Go to step 6.**
C	**Check for intermittent problems (See page DI–295).**

A

2	Check voltage of mass air flow meter power source.



PREPARATION:
(a) Disconnect the mass air flow meter connector.
(b) Turn ignition switch ON.

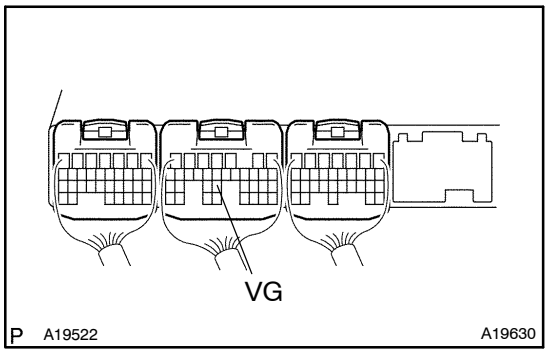
CHECK:
Measure voltage between terminal 1 of mass air flow meter connector and body ground.

OK:
Voltage: 9 to 14 V

NG	Go to step 5.

OK

3	Check voltage between terminal VG of ECM connector and body ground.



PREPARATION:
(a) Remove the ECM cover.
(b) Start the engine.

CHECK:
Measure the voltage between terminal VG of the ECM connector and body ground while the engine is idling.

OK:
Voltage:
1.1 to 1.5 V (P or N position and A/C switch OFF)

OK	Replace ECM (See page SF–78).

NG

4	Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace mass air flow meter.

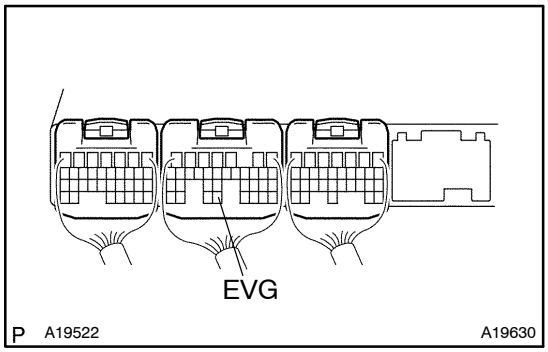
5	**Check for open and short in harness and connector between EFI relay (Marking: EFI) and mass air flow meter.**

NG → **Repair or replace harness or connector.**

OK

Check ECM power source circuit (See page DI–652).

6	**Check continuity between terminal EVG of ECM connector and body ground.**



PREPARATION:
Remove the ECM cover.
CHECK:
Check the continuity between terminal EVG of the ECM connector and body ground.
OK:

Continuity (1 Ω or less)

NG → **Replace ECM (See page SF–78).**

OK

7	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

DTC	P0101	Mass or Volume Air Flow Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–372.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	• High voltage: Conditions (a), (b) and (c) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed less than 2,000 rpm (b) Engine coolant temperature 70°C (158°F) or higher (c) Voltage output of Mass Air Flow (MAF) meter more than 2.2 V (varies with Throttle Position [TP] sensor voltage) • Low voltage: Conditions (a) and (b) continue for more than 10 seconds (2 trip detection logic): (a) Engine speed more than 300 rpm (b) Voltage output of MAF meter less than 0.93 V (varies with TP sensor voltage)	• Mass air flow meter

MONITOR DESCRIPTION

The MAF (Mass Air Flow) meter helps the ECM calculate the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air. By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, changing their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the MAF meter. The ECM interprets this voltage as the intake air amount. If there is a defect in the MAF meter or an open or short circuit, the voltage level will deviate from the normal operating range. The ECM interprets this deviation as a defect in the MAF meter and sets a DTC.

Example:

If the voltage is more than 2.2 V with idling or less than 0.4 V without idling, the ECM interprets this as a defect in the MAF meter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0101	Mass air flow meter rationality
Required sensors/components	Main sensors/components	Mass air flow meter
	Related sensors/components	Engine speed sensor, Engine coolant temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
High voltage:		
Engine RPM	–	2,000 rpm
MAF meter voltage	–	4.9 V
Engine coolant temperature	70°C (158°F)	–
Low voltage:		
Engine RPM	300 rpm	–
MAF meter voltage	0.2 V	–
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
High voltage:	
Mass air flow meter voltage	More than 2.2 V (varies with throttle position sensor voltage)
Low voltage:	
Mass air flow meter voltage	Less than 0.65 V (varies with throttle position sensor voltage)

WIRING DIAGRAM

Refer to DTC P0100 on page DI–366.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0101) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0101 and other DTCs	A
P0101	B

HINT:

If any other codes besides P0101 are output, perform the troubleshooting for those DTCs first.

B → **Replace mass air flow meter.**

A → **Go to relevant DTC chart (See page DI–335).**

DI37Z–18

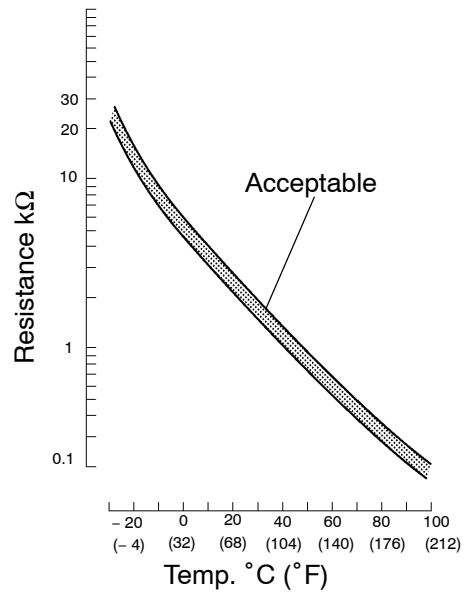
DTC	P0110	Intake Air Temperature Circuit

DTC	P0112	Intake Air Temperature Circuit Low Input

DTC	P0113	Intake Air Temperature Circuit High Input

CIRCUIT DESCRIPTION

Fig. 1



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The resistance varies as voltage changes to the ECM terminal. (See Fig. 1).

The intake air temperature sensor is connected to the ECM. The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.

That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 sec.	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 sec.	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 sec.	

HINT:

After confirming DTC "P0110, P0112 or P0113", use the hand–held tester or the OBD II scan tool to confirm the intake air temperature in the "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL".

Temperature Displayed	Malfunction
–40°C (–40°F)	Open circuit
140°C (284°F) or more	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the IAT (Intake Air Temperature). When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT sensor and sets a DTC.
Example:
The sensor voltage output is equal to –40°C (–40°F), or more than 140°C (284°F).

MONITOR STRATEGY

Related DTCs	P0110	Intake air temperature sensor range check (Fluttering)
	P0112	Intake air temperature sensor range check (Low resistance)
	P0113	Intake air temperature sensor range check (High resistance)
Required sensors/components	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

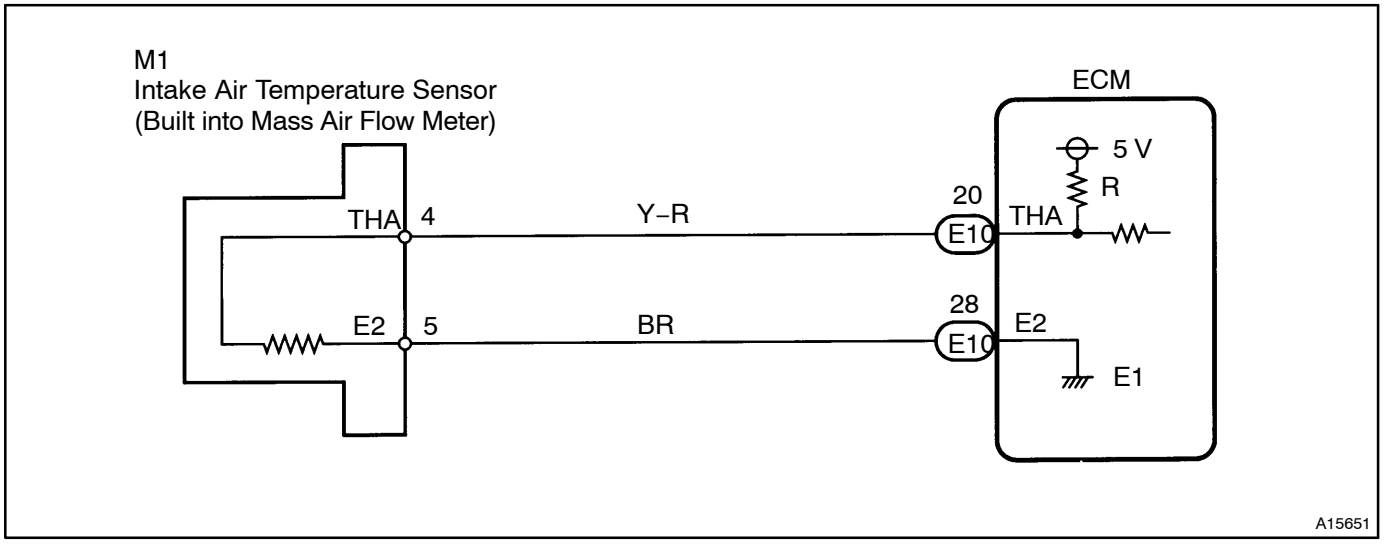
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0110:	
Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω, or more than 156 kΩ (More than 140°C (284°F), or less than –40°C (–40°F))
P0112:	
Intake air temperature sensor resistance (Intake air temperature)	Less than 98.5 Ω (More than 140°C (284°F))
P0113:	
Intake air temperature sensor resistance (Intake air temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Intake air temperature sensor resistance	98.5 Ω (140°C (284°F)) to 156 kΩ (–40°C (–40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Same as actual intake air temperature and temperature displayed on the hand–held tester or OBD II scan tool.

RESULT:

Displayed Temperature	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as air temperature near to the intake)	C

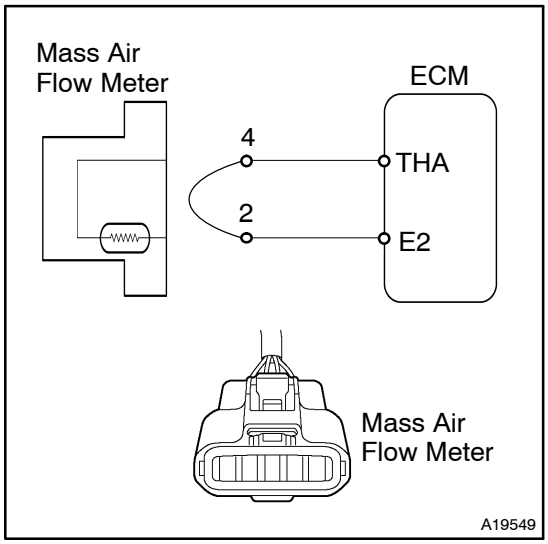
HINT:

- If there is open circuit, the OBD II scan tool or the hand–held tester indicates –40°C (–40°F).
- If there is short circuit, the OBD II scan tool or the hand–held tester indicates 140°C (284°F) or more.

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI–295).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

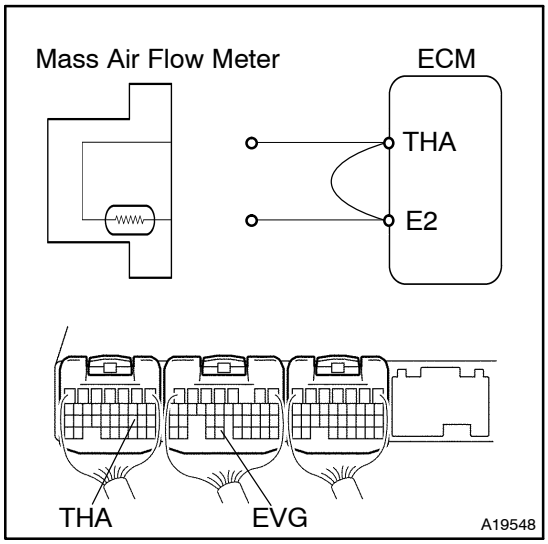
OK:

Temperature value: 140°C (284°F) or more

OK → **Confirm good connection at sensor. If OK, replace mass air flow meter.**

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.
(b) Connect between terminals THA and EVG of the ECM connector.
(c) Turn the ignition switch ON.

HINT:

The mass air flow meter connector is disconnected. Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

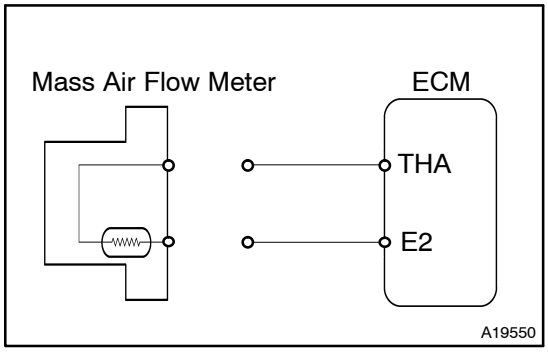
Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

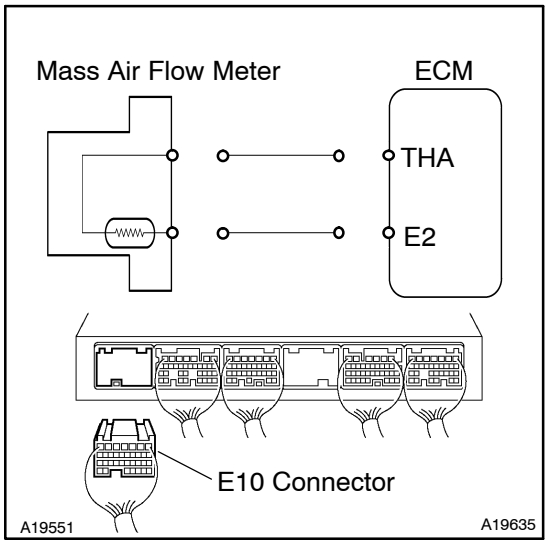
OK:

Temperature value: –40°C (–40°F)

OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Disconnect the E10 connector from the ECM.

HINT:

The mass air flow meter connector is disconnected.

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / INTAKE AIR.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DI380–18

DTC	P0115	Engine Coolant Temperature Circuit

DTC	P0117	Engine Coolant Temperature Circuit Low Input

DTC	P0118	Engine Coolant Temperature Circuit High Input

CIRCUIT DESCRIPTION

A thermistor is built into the Engine Coolant Temperature (ECT) sensor and changes the resistance value according to the engine coolant temperature.
The structure of the sensor and connection to the ECM are the same as the Intake Air Temperature (IAT) sensor.
HINT:
If the ECM detects the DTC P0115, it operates fail safe function in which the engine coolant temperature is assumed to be 80˚C (176˚F).

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0115	Step 1	Open or short in engine coolant temperature sensor circuit for 0.5 sec.	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117	Step 4	Short in engine coolant temperature sensor circuit for 0.5 sec.	
P0118	Step 2	Open in engine coolant temperature sensor circuit for 0.5 sec.	

HINT:
After confirming DTC ”P0115, P0117 or P0118”, use the OBD II scan tool or the hand–held tester to confirm the engine coolant temperature from the DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL.

Displayed Temperature	Malfunction
–40˚C (–40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The resistance varies as output voltage from the sensor changes.
The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Example:
The ECM calculates that the ECT is less than –40°C (–40°F), or more than 140°C (284°F), and either condition continues for 0.5 sec. or more, the ECM will set a DTC.

MONITOR STRATEGY

Related DTCs	P0115	Engine coolant temperature sensor range check (Fluttering)
	P0117	Engine coolant temperature sensor range check (Low resistance)
	P0118	Engine coolant temperature sensor range check (High resistance)
Required sensors/components	Engine coolant temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

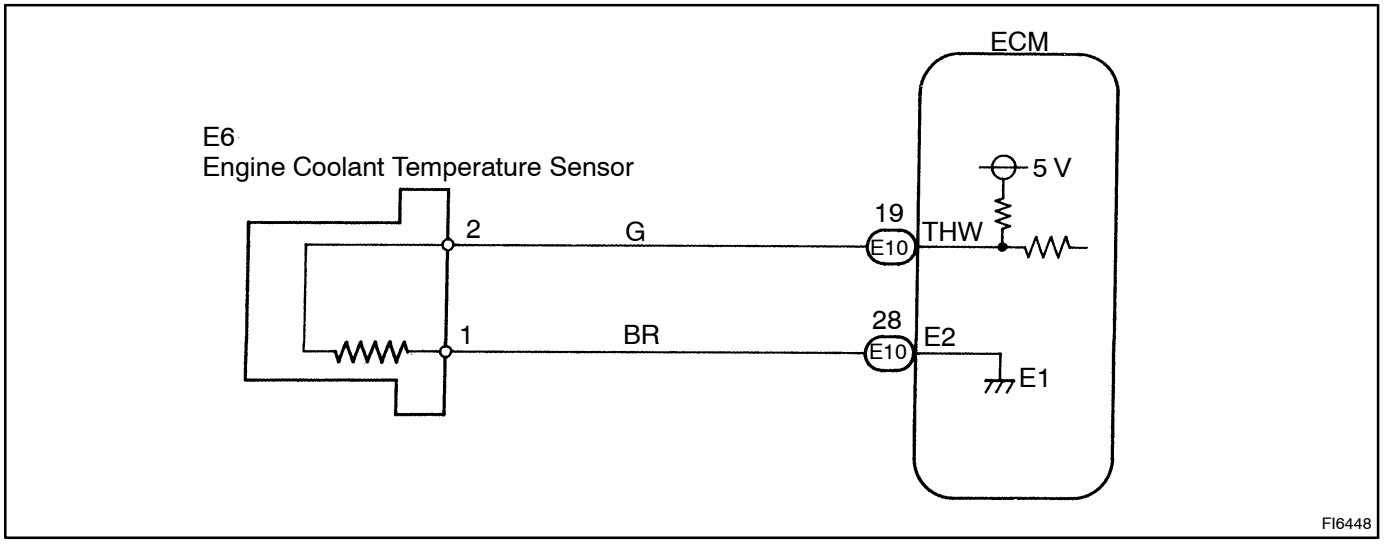
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0115:	
Engine coolant temperature sensor resistance (coolant temperature)	Less than 79 Ω or more than 156 kΩ (More than 140°C (284°F) or less than –40°C (–40°F))
P0117:	
Engine coolant temperature sensor resistance (coolant temperature)	Less than 79 Ω (More than 140°C (284°F))
P0118:	
Engine coolant temperature sensor resistance (coolant temperature)	More than 156 kΩ (Less than –40°C (–40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor resistance	79 Ω (140°C (284°F)) to 156 kΩ (–40°C (–40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect OBD II scan tool or hand–held tester, and read value of engine coolant temperature.**

PREPARATION:

(a) Connect the OBD II scan tool or hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or hand–held tester main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Same as actual engine coolant temperature and temperature displayed on the hand–held tester or the OBD II scan tool.

RESULT:

Displayed Temperature	Proceed to
–40°C (–40°F)	A
140°C (284°F) or more	B
OK (Same as air temperature near to the intake)	C

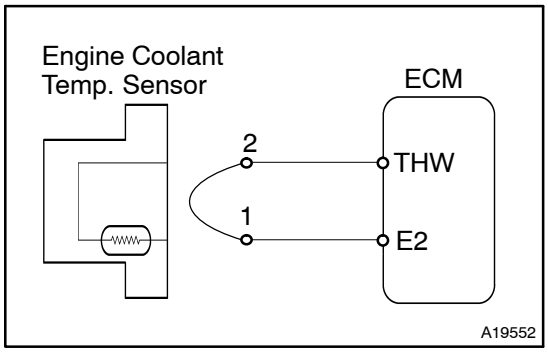
HINT:

- If there is open circuit, the OBD II scan tool or the hand–held tester indicates –40°C (–40°F).
- If there is short circuit, the OBD II scan tool or the hand–held tester indicates 140°C (284°F) or more.

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI–295).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

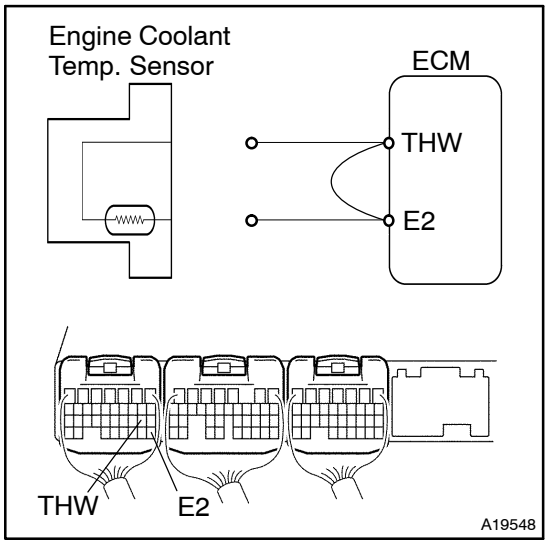
OK:

Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace engine coolant temperature sensor.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.

(b) Connect between terminals THW and E2 of the ECM connector.

HINT:

The engine coolant temperature sensor connector is disconnected. Before checking, do a visual and contact pressure checks for the ECM connector (See page IN–30).

(c) Turn the ignition switch ON.

(d) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

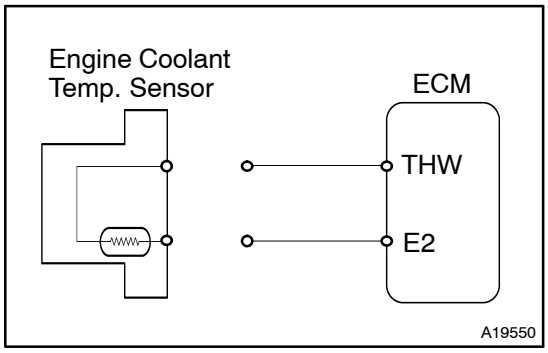
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminals E2 and THW, repair or replace harness.

NG

Confirm good connection at ECM. If OK, replace ECM (See page SF–78).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temperature sensor connector.
(b) Turn the ignition switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

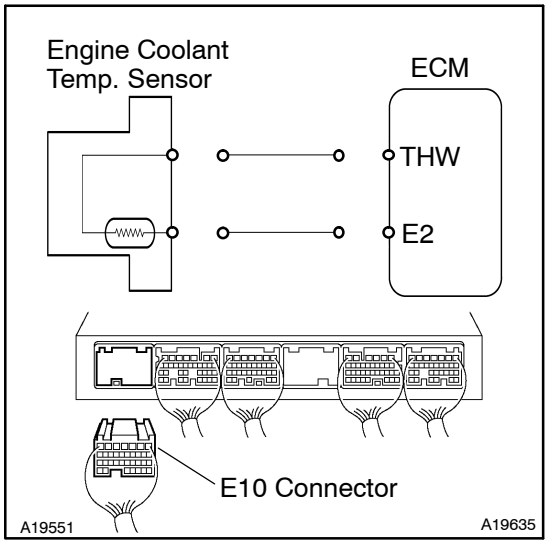
OK:

Temperature value: –40°C (–40°F)

OK	Replace engine coolant temperature sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the ECM cover.
(b) Disconnect the E10 connector from the ECM.

HINT:

The engine coolant temperature sensor connector is disconnected.

(c) Turn the ignition switch ON.
(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL DADA / COOLANT TEMP.

CHECK:

Read the temperature value on the OBD II scan tool or hand–held tester.

OK:

Temperature value: –40°C (–40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF–78).

DI381–14

DTC	P0116	Engine Coolant Temperature Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–382.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	The engine coolant temperature is 35°C (95°F) or more but less than 60°C (140°F) when the engine is started, and conditions (a) and (b) are met: (a) Vehicle has accelerated and decelerated. (b) Engine coolant temperature remains within 3°C (5.4°F) of the initial engine coolant temperature (2 trip detection logic)	• Engine coolant temperature sensor
	• The engine coolant temperature is more than 60°C (140°F) when the engine is started and the vehicle has accelerated and decelerated • The engine coolant temperature sensor records a temperature variation of below 1°C (1.8°F) successively 6 times (6 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the engine coolant temperature. The ECT sensor has a thermistor that varies its resistance depending on the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The variations in resistance are reflected in the voltage output from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the ECT sensor and sets a DTC.

Examples:

(1) Upon starting the engine, the ECT is between 35°C (95°F) and 60°C (140°F). If, after driving for 250 sec., the ECT still remains within 3°C (5.4°F) of the starting temperature, a DTC will be set (2 trip detection logic).

(2) Upon starting the engine, the ECT is over 60°C (140°F). If, after driving for 250 sec., the ECT still remains within 1°C (1.8°F) of the starting temperature, a DTC will be set (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116	Engine coolant temperature sensor range check (Stuck)
Required sensors/components	Main sensors/components	Engine coolant temperature sensor
Required sensors/components	Related sensors/components	Intake air temperature sensor, Crankshaft position sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	250 sec.	
MIL operation	2 driving cycles (When temperature is fixed between 35°C (95°F) and 60°C (140°F)) 6 driving cycles (When temperature is fixed at 60°C (140°F) or more)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Case 1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):		
Cumulative idle off period	250 sec.	–
Speed increased by 30 km/h (18.6 mph) or more	10 times	–
Engine coolant temperature	35°C (95°F)	60°C (140°F)
Intake air temperature after engine start	–6.7°C (20°F)	–
Case 2 (When temperature is fixed at 60°C (140°F) or more):		
Engine coolant temperature at engine start	60°C (140°F)	–
Intake air temperature	–6.7°C (20°F)	–
Stop and go	Once or more (Stop for 20 sec. or more and accelerate to more than 70 km/h (43.5 mph) within 40 sec.)	
Steady driving and stop *	Once or more	

*: Vehicle is driven at 65 km/h (40.4 mph) or more for 30 sec. or more and the vehicle speed reaches 70 km/h (43.5 mph). The vehicle is decelerated from 65 km/h (40.4 mph) to 3 km/h (1.86 mph) or less within 35 sec. and stopped for 10 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case1 (When temperature is fixed between 35°C (95°F) and 60°C (140°F)):	
Change of engine coolant temperature value	Less than 3°C (5.4°F)
Case2 (When temperature is fixed at 60°C (140°F) or more):	
Change of engine coolant temperature value	1°C (1.8°F) or less

COMPONENT OPERATING RANGE

Standard Value
Engine coolant temperature changes with the actual engine coolant temperature

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace engine coolant temperature sensor.

DIAK1–03

DTC	P0120	Throttle Pedal Position Sensor/Switch ”A” Circuit

DTC	P0122	Throttle Pedal Position Sensor/Switch ”A” Circuit Low Input

DTC	P0123	Throttle Pedal Position Sensor/Switch ”A” Circuit High Input

DTC	P0220	Throttle/Pedal Position Sensor/Switch ”B” Circuit

DTC	P0222	Throttle Pedal Position Sensor/Switch ”B” Circuit Low Input

DTC	P0223	Throttle Pedal Position Sensor/Switch ”B” Circuit High Input

DTC	P2135	Throttle/Pedal Position Sensor/Switch ”A”/”B” Voltage Correction

HINT:
This is repair procedure of ”throttle position sensor”.

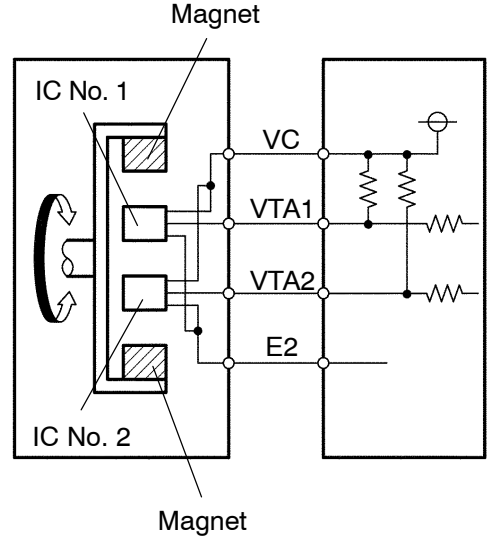
CIRCUIT DESCRIPTION

HINT:

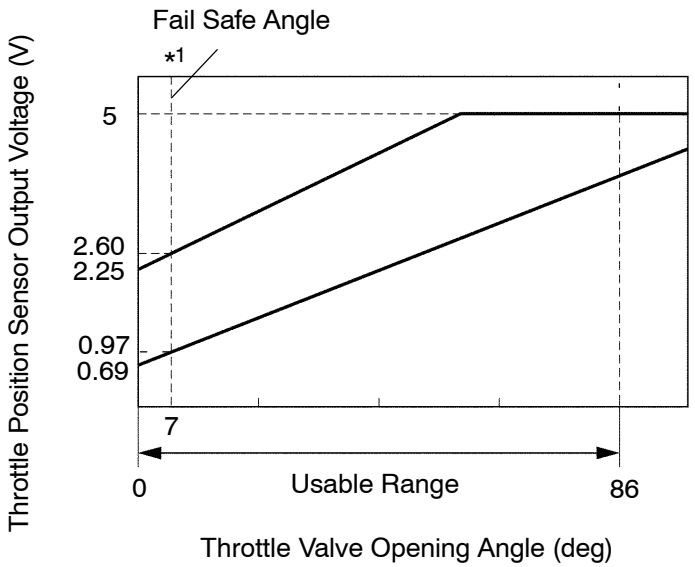
- This Electrical Throttle Control System (ETCS) does not use a throttle cable.
- This throttle position sensor is a non–contact type.

The throttle position sensor is mounted on the throttle body. It detects the opening angle of the throttle valve. This sensor is electronically controlled and uses Hall–effect elements, so that accurate control and reliability can be obtained. The throttle position sensor has 2 sensor elements/signal outputs: VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. Voltage applied to VTA1 and VTA2 changes between 0 V and 5 V depending on the opening angle of the throttle valve. This sensor includes 2 signals, VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.

The ECM judges the current opening angle of the throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to driver inputs.



A19755



Throttle Valve Fully Closed
(Throttle opening position expressed as percentage
(VAT1) 0 to 20 %)

Throttle Valve Fully Opened
(Throttle opening position expressed as percentage
(VAT1) 64 to 96 %)

*1 : Fail Safe Angle 7°
(Throttle opening position expressed as percentage
(VAT1) 8 to 20 %)

A19802

DTC No.	DTC Detection Condition	Main trouble
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 10 sec. with idling, but for 2 sec. without idling (Open or short in throttle position sensor circuit)		
P0122	(a) VTA1 ≦ 0.2 V	• Throttle position sensor • VTA1 circuit short • VC circuit open • ECM
P0123	(a) VTA1 ≧ 4.8 V	• Throttle position sensor • VTA1 circuit open • E2 circuit open • VC and VTA1 circuits are short–circuited • ECM
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA1 ≦ 0.2 V or VTA1 ≧ 4.8 V	• Throttle position sensor • ECM
P0222	(a) VTA2 ≦ 0.5 V	• Throttle position sensor • VTA2 circuit short • VC circuit open • ECM
P0223	(a) VTA2 ≧ 4.8 V and 0.2 ≦ VTA1 ≦ 1.8 V	• Throttle position sensor • VTA2 circuit open • E2 circuit open • VC and VTA2 circuits are short–circuited • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) VTA2 ≦ 0.5 V or VTA2 ≧ 4.8 V and 0.2 ≦ VTA1 ≦ 1.8 V	• Throttle position sensor • ECM
P2135	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) |VTA1 – VTA2| ≦ 0.02 V (b) VTA1 ≦ 0.2 V and VTA2 ≦ 0.5 V	• VTA1 and VTA2 circuits are short–circuited • Throttle position sensor • ECM

HINT:

- After confirming DTCs, use the hand–held tester or the OBD II scan tool to confirm the throttle valve opening percentage and closed throttle position switch condition.
- The THROTTLE POS means the VTA1 signal and the THROTTLE POS #2 means the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal released	Accelerator pedal fully depressed
THROTTLE POS	6 to 20 %	64 to 96 %
THROTTLE POS #2	2.15 to 3.05 V	4.5 to 5.5 V

MONITOR DESCRIPTION

The ECM uses throttle position sensor to monitor the throttle valve opening angle.

(a) There is an expected specific voltage difference between VTA1 and VTA2 for each throttle opening angle.

- If the difference between VTA1 and VTA2 is incorrect, the ECM interprets this as a fault and will set a DTC.

(b) VTA1 and VTA2 have each specific voltage operating range.

- If VTA1 or VTA2 is out of the normal operating range, the ECM interprets this as a fault and will set a DTC.

(c) VTA1 and VTA2 should never be close to the same voltage levels.

- If the difference between VTA1 and VTA2 is within 0.02 V, the ECM interprets this as a short circuit in the throttle position sensor system and will set a DTC.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel infection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0120	Throttle position sensor (sensor 1) range check (Fluttering)
	P0122	Throttle position sensor (sensor 1) range check (Low voltage)
	P0123	Throttle position sensor (sensor 1) range check (High voltage)
	P0220	Throttle position sensor (sensor 2) range check (Fluttering)
	P0222	Throttle position sensor (sensor 2) range check (Low voltage)
	P0223	Throttle position sensor (sensor 2) range check (High voltage)
	P2135	Throttle position sensor range check (Correlation)
Required sensors/components	Throttle position sensor	
Frequency of operation	Continuous	
Duration	2 sec.: Accelerator pedal ON 10 sec.: Accelerator pedal OFF	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
Throttle control motor power	ON

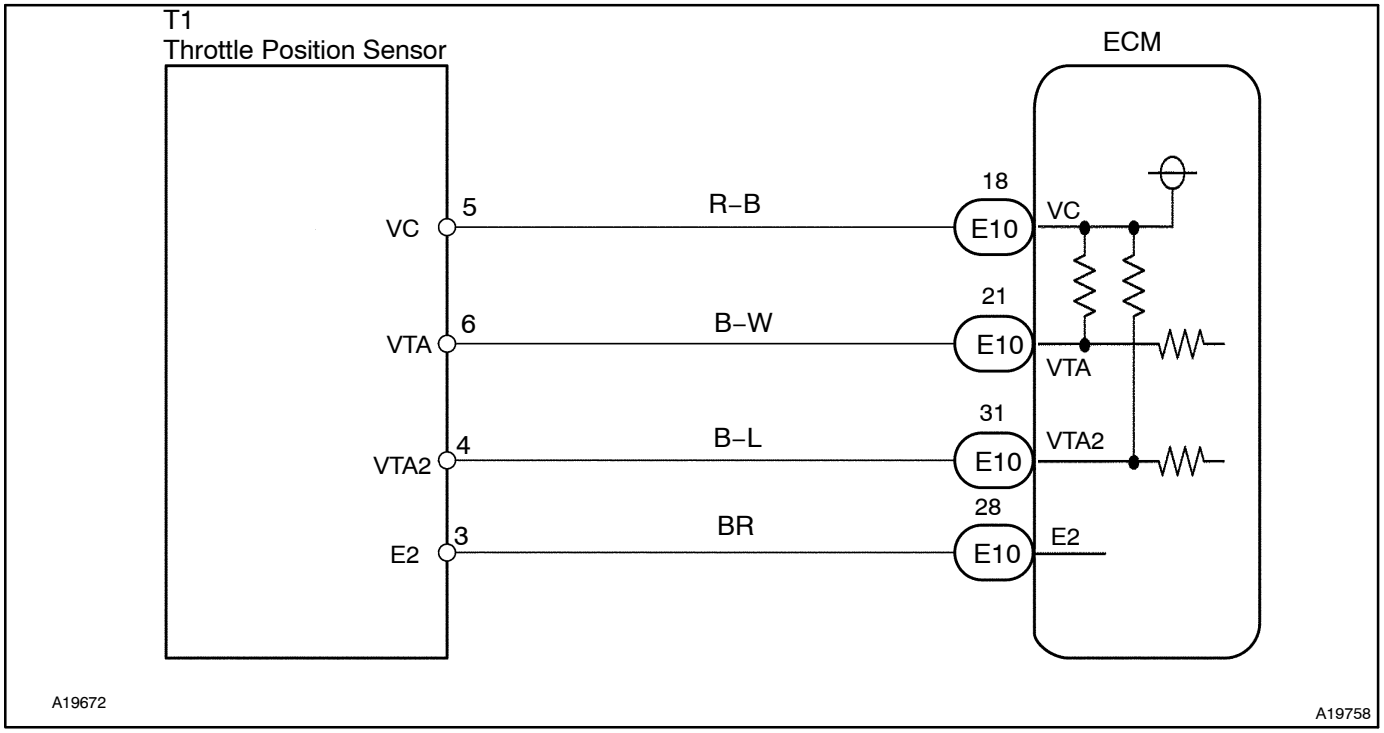
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0120:	
VTA1 voltage	0.2 V or less or 4.8 V or more
P0122:	
VTA1 voltage	0.2 V or less
P0123:	
VTA1 voltage	4.8 V or more
P0220:	
VTA2 voltage	0.5 V or less, or 4.97 V or more
P0222:	
VTA2 voltage	0.5 V or less
P0223:	
Both of the following conditions are met:	A and B
A. VTA1 voltage	0.2 V or more and 1.8 V or less
B. VTA2 voltage	4.97 V or more
P2135:	
Difference between VTA1 and VTA2 voltages	0.02 V or less
Both of the following conditions are met:	A and B
A. VTA1 voltage	0.2 V or less
B. VTA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle position sensor VTA1 voltage	0.6 to 3.96 V
Throttle position sensor VTA2 voltage	2.25 to 5.0 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester, and read the voltage for throttle position sensor data.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / THROTTLE POS and THROTTLE POS#2.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Result:

Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	about 16 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
6 to 20 %	2.15 to 3.05 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	B

B	**Go to step 5.**

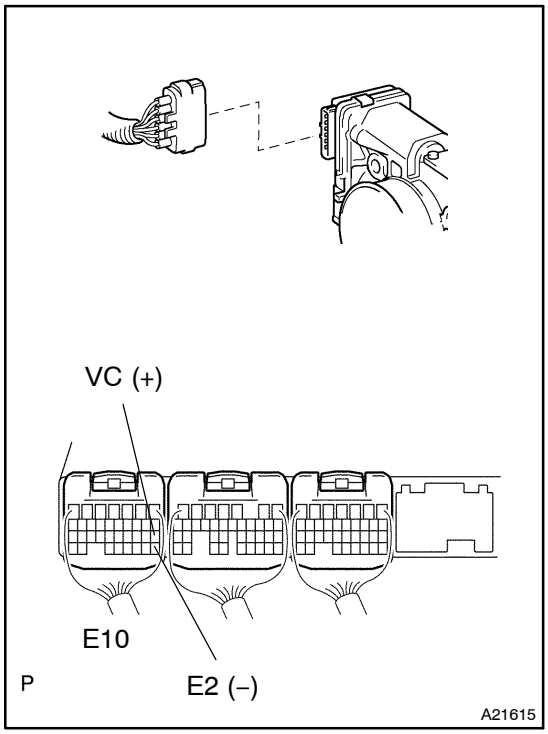
A

2	**Check for open and short in harness and connector in VC, VTA1, VTA2 and E2 circuits between ECM and throttle position sensor (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

3	Check voltage between terminals VC and E2 of ECM connector.



PREPARATION:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the throttle position sensor connector.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

4	Replace throttle body (See page SF–42).

Go

5	Check if DTC output recur.

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC (See page DI–295).

RESULT:

Display (DTC Output)	Proceed to
”P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135” are output again	A
No DTC output	B

OK → **System is OK.**

NG

Replace ECM (See page SF–78).

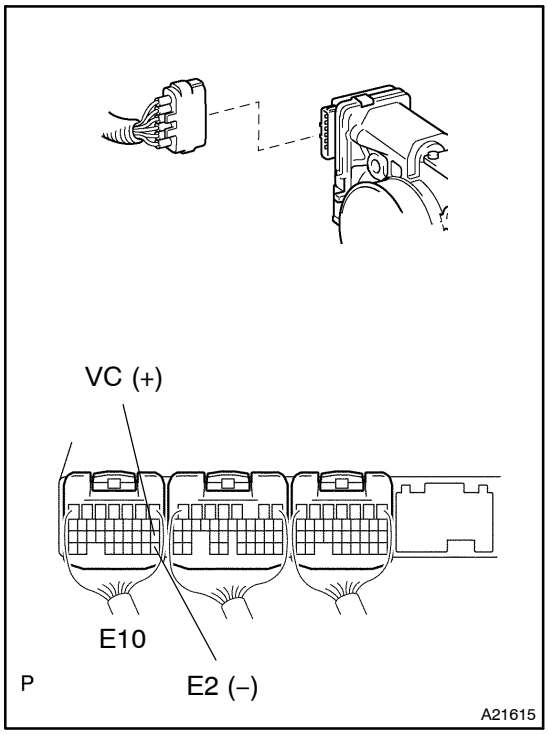
OBD II scan tool (excluding hand–held tester):

1	**Check for open and short in harness and connector in VC, VTA1, VTA2 and E2 circuits between ECM and throttle position sensor (See page IN–30)**

NG → **Repair or replace harness and connector.**

OK

2	**Check voltage between terminals VC and E2 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the throttle position sensor connector.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

3	**Replace throttle body (See page SF–42).**

Go

4	**Check if DTC output recur.**

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.

CHECK:

Read the DTC (See page DI–295).

RESULT:

Display (DTC Output)	Proceed to
”P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135” are output again	A
No DTC output	B

B → **System is OK.**

A

Replace ECM (See page SF–78).

DI383–16

DTC	P0121	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem

HINT:
This is the procedure of ”throttle position sensor”.

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–391.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	Condition (a) continues for 10 sec. with idling, but for 2 sec. without idling : (a) Difference between VTA and VTA2 is out of threshold	Throttle body Assy (Throttle position sensor)

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle.
This sensor includes two signals, VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.
There is a specific voltage difference between VTA1 and VTA2 for each throttle opening angle.
If the voltage output difference between the VTA1 and VTA2 deviates from the normal operating range, the ECM interprets this as a malfunction of the throttle position sensor. The ECM will turn on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel infection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P0121	Throttle position sensor rationality
Required sensors/components	Main sensors/components	Throttle position sensor
	Related sensors/components	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Either of the following conditions is met:	Condition 1 or 2	
1. Ignition switch	ON	
2. ETCS power	ON	
Throttle sensor open/short malfunction	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
TP sensor 1 – [TP sensor 2 x 0.8 (corrected by learning value)]	Less than 0.8 V, or more than 1.6 V

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace throttle position sensor (See page SF–42).

DIC78–02

DTC	P0125	Insufficient coolant temperature for closed loop fuel control

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–382.

DTC No.	DTC Detection Condition	Trouble area
P0125	THW or THA is less than –7°C (19.4°F) at engine start, 20 minutes or more after starting engine, and ECT sensor value is 20°C (68°F) or less (2 trip detection logic)	• Cooling system • Engine coolant temperature sensor • Thermostat
	THW and THA is between –7°C (19.4°F) and 10°C (50°F) at engine start, 5 minutes or more after starting engine, and ECT sensor value is 20°C (68°F) or less (2 trip detection logic)	
	THW and THA greater than 10°C (50°F) at engine start, 2 minutes or more after starting engine, and ECT sensor value is 30°C (86°F) or less (2 trip detection logic)	

MONITOR DESCRIPTION

The ECT (Engine Coolant Temperature) sensor is used to monitor the temperature of the engine coolant. The resistance of the sensor varies with the actual coolant temperature. The ECM applies a voltage to the sensor and the varying resistance of the sensor causes the signal voltage to vary. The ECM monitors the ECT signal voltage after engine start–up. If, after sufficient time has passed, the sensor still reports that the engine is not warmed up enough for closed–loop fuel control, the ECM interprets this as a fault in the sensor or cooling system and sets a DTC.

Example:

The engine coolant temperature is 0°C (32°F) at engine start. After 5 min. running time, the ECT sensor still indicates that the engine is not warmed up enough to begin air fuel ratio feedback control of the air–fuel ratio. The ECM interprets this as a fault in the sensor or cooling system and will set a DTC.

MONITOR STRATEGY

Related DTCs	P0125	Insufficient coolant temperature for closed loop fuel control
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Cooling system, Thermostat
	Related sensors/components	Mass air flow meter
Frequency of operation	Continuous	
Duration	• 2 min. (at engine start, engine coolant or intake air temperature of 10°C (50°F) or more) • 5 min. (at engine start, engine coolant or intake air temperature of –6.6°C (20°F) to 10°C (50°F)) • 20 min. (at engine start, engine coolant or intake air temperature of less than –6.6°C (20°F))	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Fuel cut	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Time until ”engine coolant temperature” detection temperature reaches feedback start temperature	
When the temperature at engine start is 10°C (50°F) or more	Engine coolant temperature is less than ”closed–loop enable temperature” when 2 min. or more passed after engine start
When the temperature at engine start is ”–6.6°C (20°F)” to ”10°C (50°F)”	Engine coolant temperature is less than ”closed–loop enable temperature” when 5 min. or more passed after engine start
When the temperature at engine start is –6.6°C (20°F) or less	Engine coolant temperature is less than ”closed–loop enable temperature” when 20 min. or more passed after engine start

INSPECTION PROCEDURE

HINT:

- If DTCs P0115, P0116, P0117, P0118 and P0125 are output simultaneously, the engine coolant temperature sensor circuit may be open or shorted. Perform the troubleshooting of DTC P0115, P0117 or P0118 first.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0125) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) On the display of the hand–held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC Output)	Proceed to
P0125	A
”P0125” and other DTCs	B

HINT:

If any other codes besides ”P0125” is output, perform the troubleshooting for those codes first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check thermostat (See page CO–10).**

NG → **Replace thermostat (See page CO–9).**

OK

3	**Check cooling system.**

CHECK:

Check that there is defect cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → **Repair or replace cooling system.**

OK

Replace engine coolant temperature sensor.

DIC79–02

DTC	P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

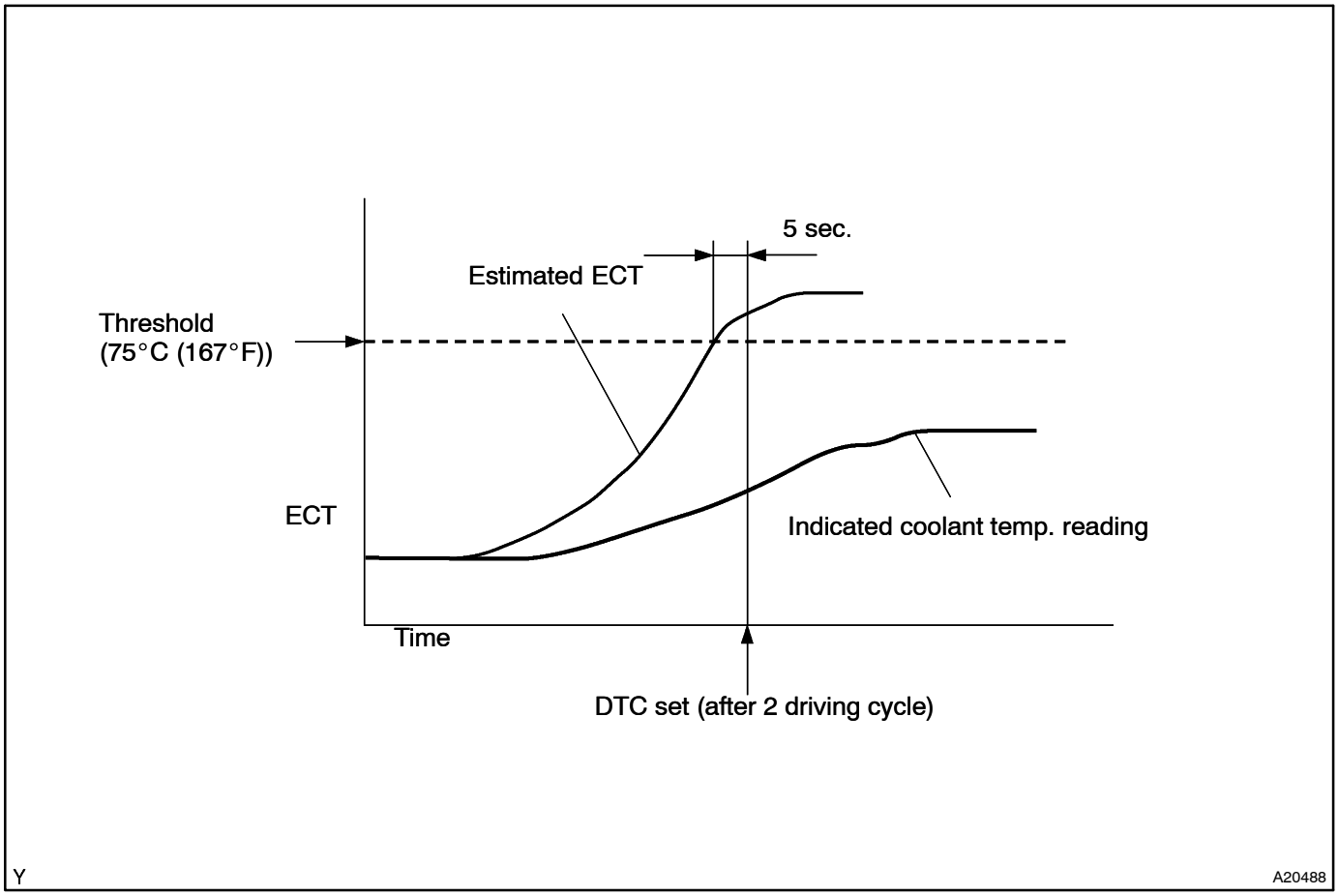
HINT:
This is the procedure of ”thermostat” malfunction detection.

CIRCUIT DESCRIPTION

If the engine coolant temperature (ECT) does not reach 75˚C (167˚F) despite sufficient warm – up time has elapsed.

DTC No.	DTC Detecting Condition	Trouble Area
P0128	Conditions (a), (b) and (c) are met: (a) Cold start (b) Engine is warmed up (c) THW < 75˚C (167˚F)	• Thermostat • Cooling system • Engine coolant temperature sensor • ECM

MONITOR DESCRIPTION



The ECM estimates the coolant temperature based on starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual ECT. When the estimated coolant temperature reaches 75°C (167°F), the ECM checks the actual ECT. If the actual ECT is less than 75°C (167°F), the ECM will interpret this as a fault in the thermostat or engine cooling system and set a DTC.

MONITOR STRATEGY

Related DTCs	P0128	Thermostat
Required sensors/components	Main sensors/components	Engine coolant temperature sensor, Engine cooling system, Thermostat
	Related sensors/components	Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	15 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery voltage	11.0 V	–
Throttle position learning	Completed	
Engine coolant temperature at engine start – Intake air temperature at engine start	–15°C (–27°F)	7°C (12.6°F)
Intake air temperature at engine start	–10°C (14°F)	35°C (95°F)
Engine coolant temperature at engine start	–10°C (14°F)	35°C (95°F)
Accumulated time that vehicle speed is 128 km/h (80 mph) or more	–	20 sec.

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Duration that both of following conditions 1 and 2 are met:	5 sec. or more
1. Estimated engine coolant temperature	75°C (167°F) or more
2. Engine coolant temperature sensor output value	Less than 75°C (167°F)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Engine coolant temperature sensor output value after engine is warmed up	75°C (167°F) or more

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $08: Thermostat

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiply by 0.625 and subtract 40 (°C)	ECT sensor output when estimated ECT has reached to malfunction criterion	Malfunction criteria for thermostat

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check cooling system.**

CHECK:

Check that there is defective cooling system which causes overcool, such as abnormal radiator fan operation, modified cooling system and so on.

NG → **Repair or replace cooling system.**

OK

2	**Check thermostat (See page CO–10).**

NG → **Replace thermostat.**

YES

3	**Are there any other codes (besides DTC P0128) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0128	A
”P0128” and other DTCs	B

HINT:

If any other codes besides P0128 is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

Replace ECM (See page SF–78).

DIC7A–02

DTC	P0130	Oxygen Sensor Circuit (Bank 1 Sensor 1)

DTC	P2195	Oxygen Sensor Signal Stuck Lean (Bank 1 Sensor 1)

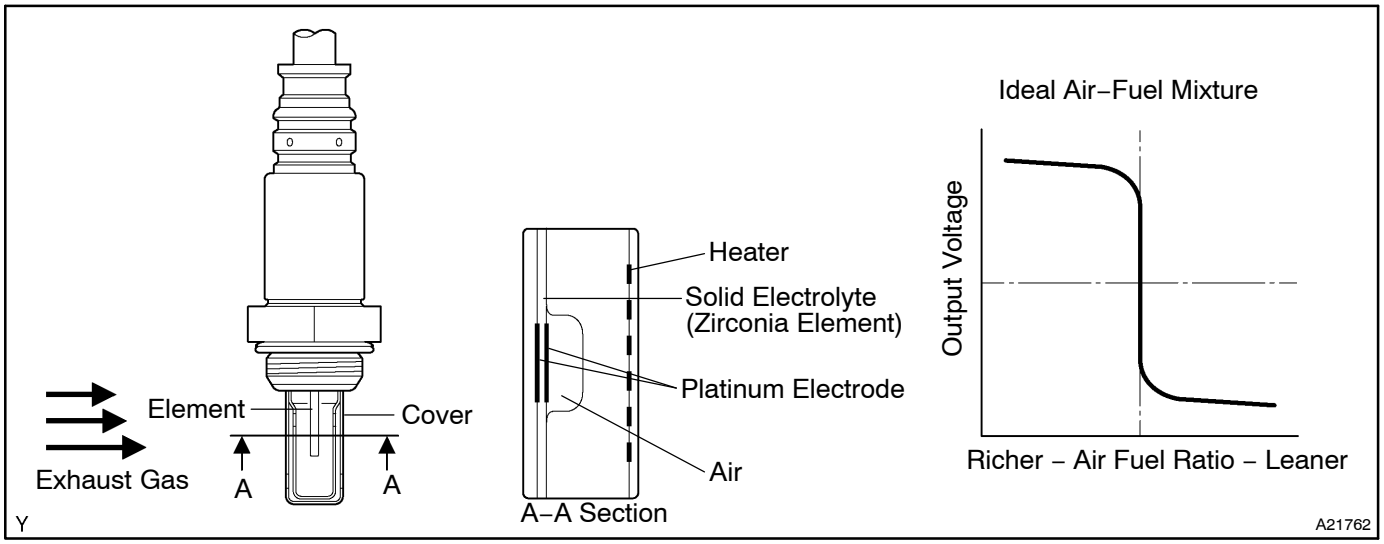
DTC	P2196	Oxygen Sensor Signal Stuck Rich (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

The heated oxygen sensor is used to monitor oxygen concentration in the exhaust gas. For optimum catalytic converter operation, the air fuel mixture must be maintained near the ideal stoichiometric ratio. The heated oxygen sensor output voltage changes suddenly in the vicinity of the stoichiometric ratio. The ECM adjusts the fuel injection time so that the air–fuel ratio is nearly stoichiometric.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust gas increases. And the heated oxygen sensor informs the ECM of the LEAN condition (low voltage, i.e. less than 0.45 V).

When the air–fuel ratio is richer than the stoichiometric air–fuel ratio, the oxygen will be vanished from the exhaust gas. And the heated oxygen sensor informs the ECM of the RICH condition (high voltage, i.e. more than 0.45 V).

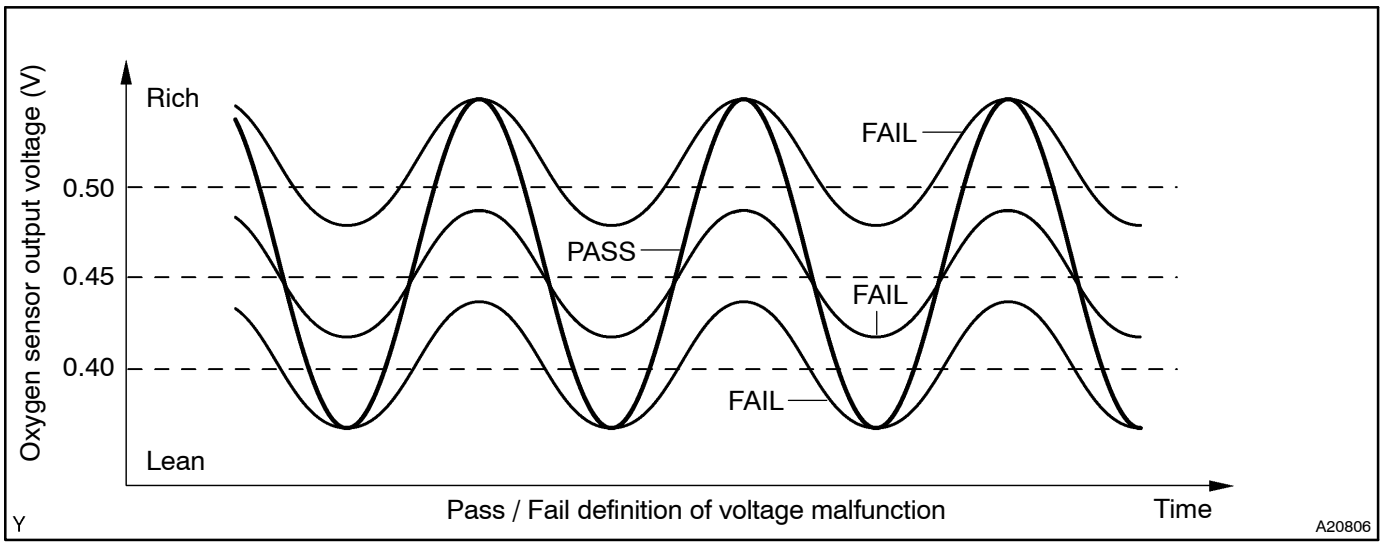


DTC No.	DTC Detection Condition	Trouble Area
P0130	Output voltage of heated oxygen sensor remains at 0.4 V or more, or 0.5 V or less, during idling after engine is warmed up (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM
P2195	Output voltage of heated oxygen sensor remains at 0.5 V or less, during idling after engine is warmed up (2 trip detection logic)	
P2196	Output voltage of heated oxygen sensor remains at 0.4 V or more, during idling after engine is warmed up (2 trip detection logic)	

HINT:

- Sensor 1 is the sensor closer to the engine body.
- The output voltage of the heated oxygen sensor and the short—term fuel trim value can be read using the OBD II scan tool or the hand—held tester.

MONITOR DESCRIPTION



The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio near to the stoichiometric air–fuel ratio. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM. This maximizes the catalytic converter's ability to purify the exhaust gas.

The heated oxygen sensor element consists of the platinum coated zirconia and heating element. The inner surface of sensor element is exposed to the outside air, and the outer surface of sensor element is exposed to the exhaust gas. The sensor generates between 0 V and 1 V of the voltage output in response to the oxygen concentration in the exhaust gas. The sensor's output voltage varies suddenly in the vicinity of the stoichiometric air–fuel ratio.

Under a normal condition, the output voltage from the heated oxygen sensor alternates between RICH and LEAN sides periodically. When it is 0.4 V or less, the air–fuel ratio is judged as LEAN.

If the heated oxygen sensor outputs RICH signal (or LEAN signal) constantly, or if the heated oxygen sensor cannot output enough voltage to reach the minimum specification, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0130	Front heated oxygen sensor voltage is constant
	P2195	Front heated oxygen sensor voltage is constant at lean side
	P2196	Front heated oxygen sensor voltage is constant at rich side
Required sensors/components	Main sensors/components	Front heated oxygen senor
	Related sensors/components	Crank position sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	20 to 36 sec. x (3 time)	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
There is a history that the following conditions A and B were met:	30 sec. (Continuously)	–
A. Vehicle speed	40 km/h (25 mph)	–
B. Engine speed	900 rpm	–
Time after engine start	120 sec.	–
Idle	ON	
Fuel system status	Closed loop	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0130:	
Front oxygen sensor voltage is 0.5 V or less for 28 sec. or more	1 time or more
Front oxygen sensor voltage is 0.4 V or more for 28 sec. or more	1 time or more
P2195:	
Front heated oxygen sensor voltage is 0.5 V or less for 28 sec.	1 time or more
P2196:	
Front heated oxygen sensor voltage is 0.4 V or more for 28 sec.	1 time or more

COMPONENT OPERATING RANGE

Parameter	Standard value
Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT

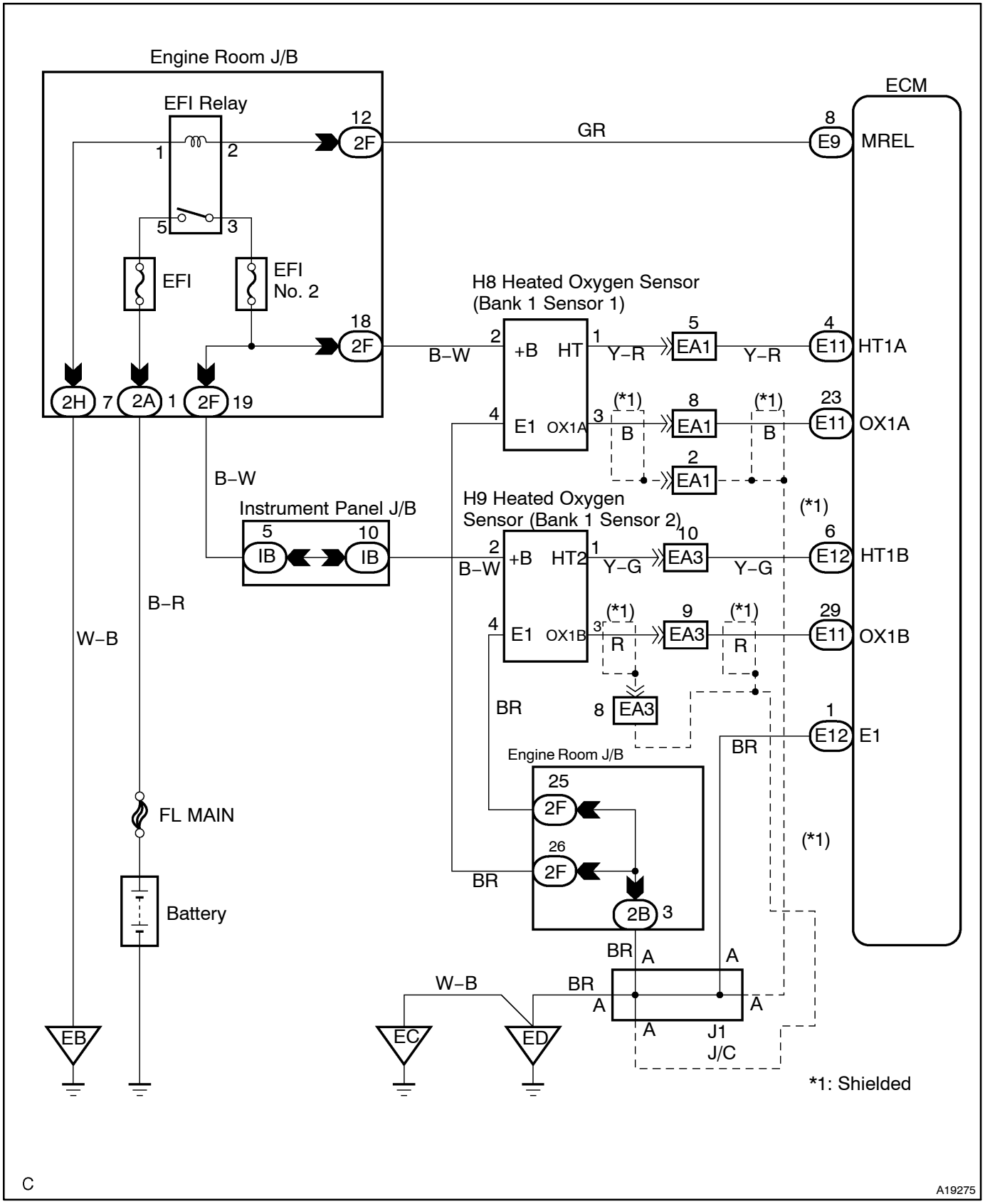
Refer to page DI–295 for detailed information.

Front HO2S voltage monitor

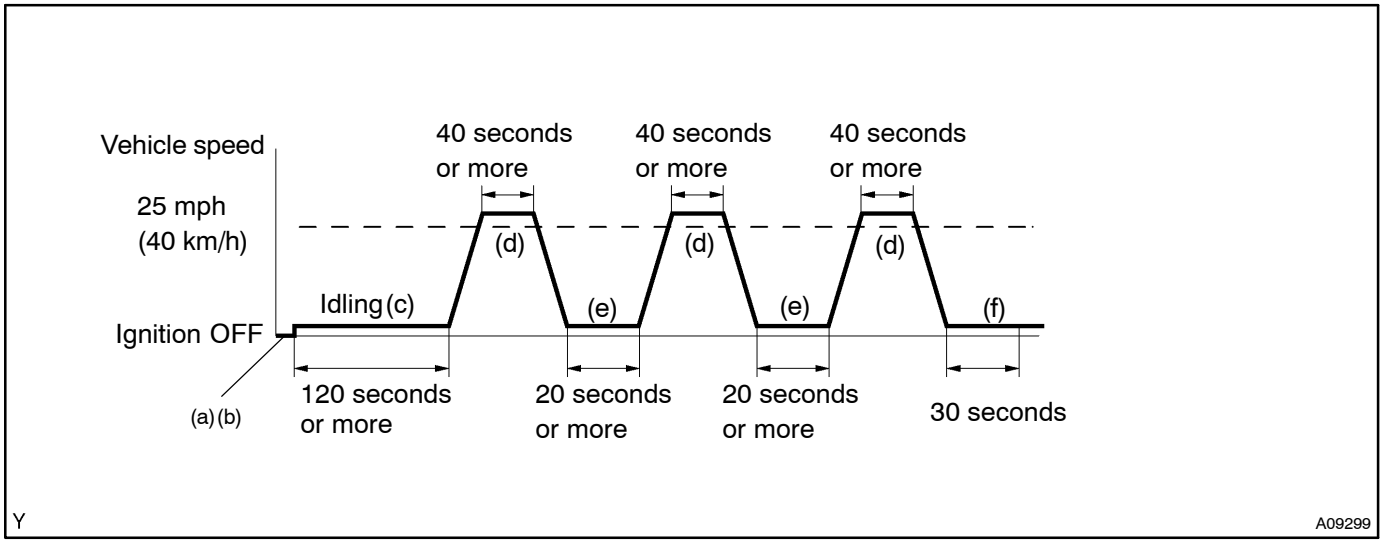
If the HO2S voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$07	Minimum front HO2S voltage	Multiplied by 0.005	V
$08	Maximum front HO2S voltage	Multiplied by 0.005	V

WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from the normal mode to the check mode (See page DI–295).
(c) Start the engine and let the engine idle for 120 seconds or more.
(d) Drive the vehicle at 25 mph (40 km/h) or more for 40 seconds or more.
(e) Let the engine idle for 20 seconds or more. Perform steps (d) and (e) at least 3 times.
(f) Let the engine idle for 30 seconds.

HINT:

If a malfunction exists, the MIL will be illuminated on the multi information display during step (f).

NOTICE:

If the conditions in this test are not strictly followed, detection of a malfunction will not occur.
If you do not have the hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

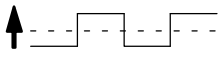
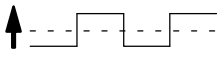
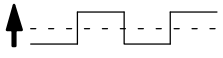
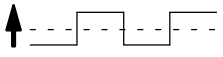
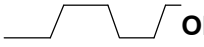
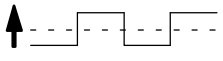
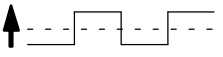
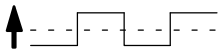
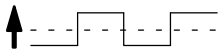
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine speed at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
+25 % → rich output: More than 0.5 V,
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is approximately 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	—
Case 2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA”, then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and heated oxygen sensor DTCs will be recorded, and the MIL then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Are there any other codes (besides DTC P0130, P2195 or P2196) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0130, P2195 and/or P2196	A
P0130, P2195 and/or P2196 and other DTCs	B

HINT:

If any other codes besides P0130, P2195 and/or P2196 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:

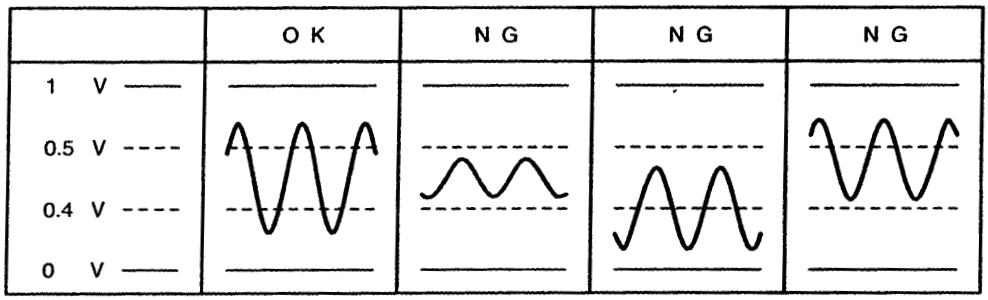
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor while idling.

OK:

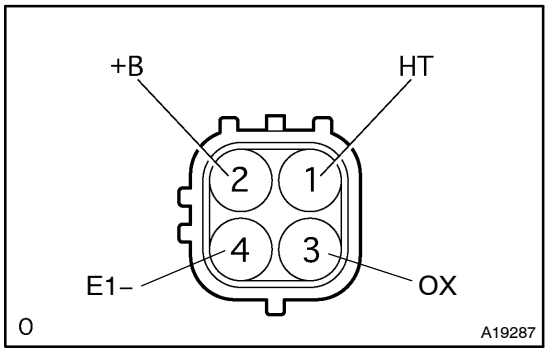
Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).



OK	**Go to step 9.**

NG

3	**Check resistance of heated oxygen sensor heater.**



PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

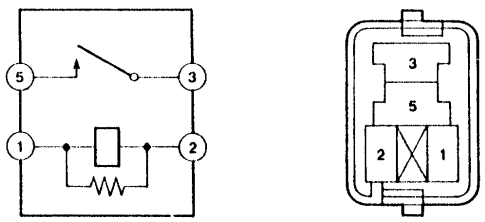
OK:

Resistance: 11 to 16 Ω (20°C)

NG	**Replace heated oxygen sensor.**

OK

4	Check EFI relay.



A19288

PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

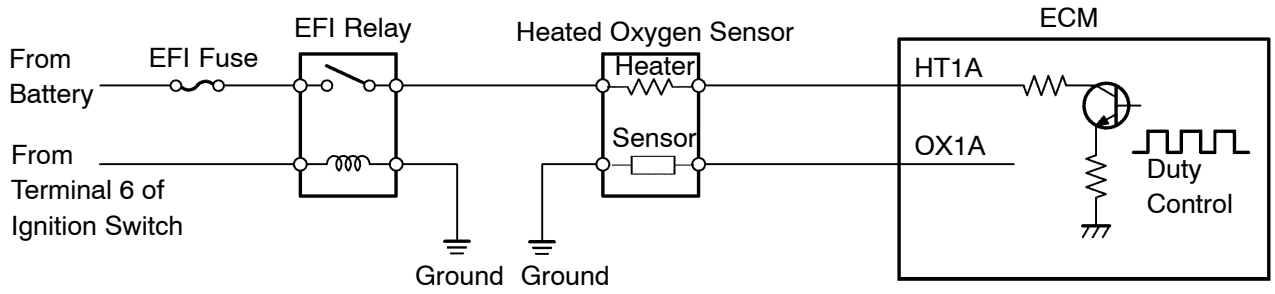
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

5	Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing):



A21253

NG → **Repair or replace harness or connector.**

OK

6	**Check air induction system.**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace induction system.**

OK

7	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–1).**

OK

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern.**

HINT:

Clear all DTCs prior to performing the confirmation driving pattern.

Go

10	Is there DTC P0130, P2195 or P2196 being output again?

NO → Check for intermittent problems (See page DI–295).

YES

Replace heated oxygen sensor (bank 1 sensor 1).

DIC7B–02

DTC	P0133	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

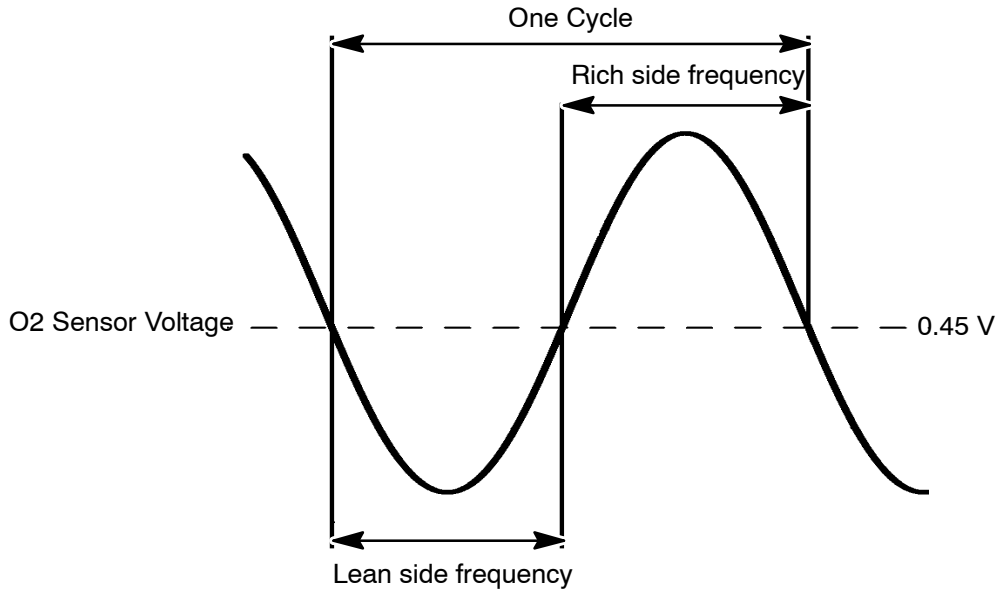
DTC No.	DTC Detecting Condition	Trouble Area
P0133	Response time of heated oxygen sensor's output voltage in one RICH–LEAN cycle is a specific time or more during vehicle running. (2 trip detection logic)	• Open or short in heated oxygen sensor circuit (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • Injector • ECM

HINT:
Sensor 1 is the sensor closest to the engine assembly.

MONITOR DESCRIPTION

The ECM uses the heated oxygen sensor information to regulate the air–fuel ratio close to a stoichiometric ratio. This maximizes the catalytic converter's ability to purify the exhaust gas. The sensor detects oxygen levels in the exhaust gas and sends this signal to the ECM.
The inner surface of the sensor element is exposed to outside air. The outer surface of the sensor element is exposed to exhaust gas. The sensor element is made of platinum coated zirconia and includes an integrated heating element. The heated oxygen sensor has the characteristic, whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. The heated oxygen sensor generates waveforms of a voltage between 0 V and 1 V in response to the oxygen concentration in exhaust gas. When the output voltage of the heated oxygen sensor is 0.55 V or more, the ECM judges that the air–fuel ratio is RICH. When it is 0.40 V or less, the ECM judges that the air–fuel ratio is LEAN.
The ECM monitors the response feature of the heated oxygen sensor. If the response time of the sensor output status change from RICH to LEAN or vice versa becomes longer, the ECM interprets this as a malfunction in the heated oxygen sensor and sets a DTC.

Frequency condition:



MONITOR STRATEGY

Related DTCs	P0133	Front heated oxygen sensor response monitor
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crankshaft position sensor, Vehicle speed sensor, Mass air flow meter
Frequency of operation	Once per driving cycle	
Duration	Within 60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Slow slope condition:		
There is a history that the following conditions were met for 1 sec.:	Condition 1 and 2	
1. Vehicle speed	40 km/h (25 mph)	–
2. Engine RPM	900 rpm	–
Idle	ON	
Vehicle speed	–	5 km/h (3.1 mph)
Fuel system status	Closed–loop	
Time after engine start	120 sec.	–
Frequency cruise condition:		
Number of fail judgment is incremented when:	(1 and 2) or (3 and 4) is met	
1. Number of cycle time data summation	10 times	–

2. Sum of cycle time data	Sum of cycle threshold	
3. Number of cycle time data summation	1 time	10 times
4. Sum of cycle time data	Sum of cycle threshold x 1.2 x 10 / number of summation	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Slow slope condition:	
Time that output voltage of front heated oxygen sensor increase. from 0.35 V to 0.45 V and that it decreases from 0.45 V to 0.35 V	1 sec. or more
Frequency cruise condition:	
Oxygen sensor frequency is judged malfunction under the following conditions:	Both 1 and 2 are met
1. Number of fail judgement	1 time or more
2. Neither pass nor fail determined yet	

COMPONENT OPERATING RANGE

Parameter	Standard value
Voltage output of the front heated oxygen sensor rapidly fluctuates between 0.4 V and 0.5 V	

O2S TEST RESULT

Refer to page DI–295 for detailed information.

Front HO2S frequency monitor (cruse)

If the $90 is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$90	Remained value of that average of switching frequency is subtracted from average of switching frequency threshold	Multiply by 0.04096 plus 5.2	sec.

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

Narrowing down the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished). Perform ACTIVE TEST using hand–held tester (A/F CONTROL).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.”
(5) Perform ”A/F CONTROL” with the engine in an idle condition (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of injection volume
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of the A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

NOTICE:

If the vehicle is short of fuel, the air–fuel ratio becomes LEAN and DTC P0133 will be recorded, and the MIL then comes on.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Are there any other codes (besides DTC P0133) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0133	A
P0133 and other DTC	B

HINT:

If any other codes besides P0133 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:

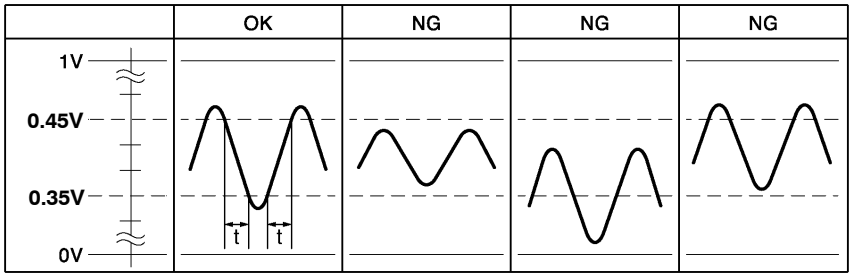
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates between less than 0.35 V and more than 0.45 V, and period of "t" must exist less than 0.6 second (See the following table).



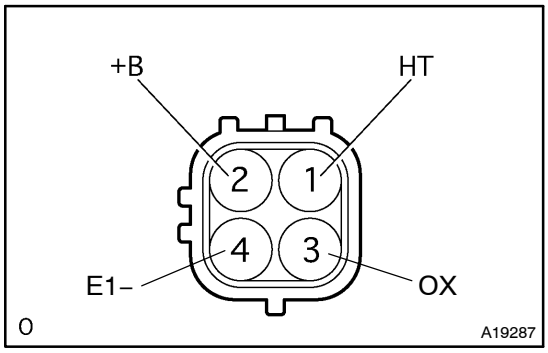
N

A21255

OK → **Go to step 9.**

NG

3	Check resistance of heated oxygen sensor heater.



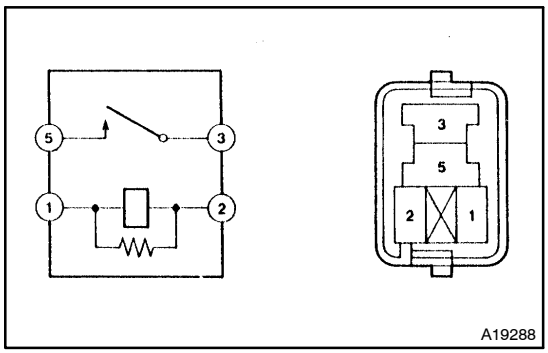
PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.
OK:

Resistance: 11 to 16 Ω (20°C)

NG	Replace heated oxygen sensor.

OK

4	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

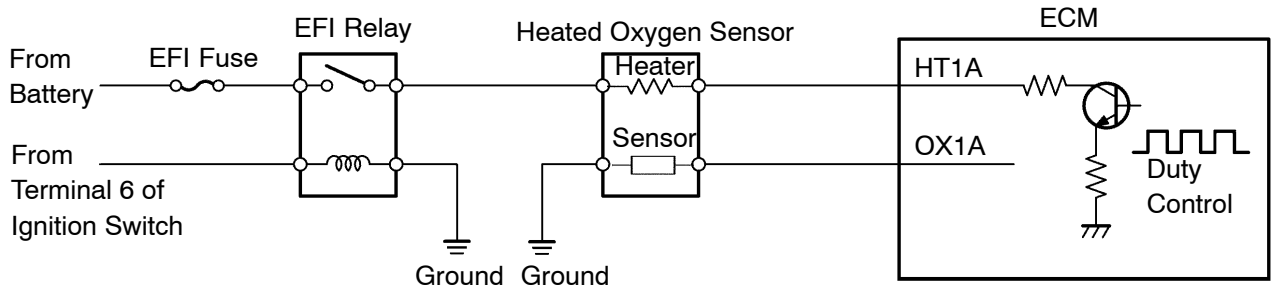
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG	Replace EFI relay.

OK

5	**Check for open and short in harness and connector between ECM and heated oxygen sensor (Bank 1 Sensor 1) (See page IN–30).**

Reference (Bank 1 Sensor 1 System Drawing):



NG → **Repair or replace harness or connector.**

OK

6	**Check air induction system.**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK

7	**Check fuel pressure (See page SF–6).**

CHECK:

Check fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK

8	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

9	**Perform confirmation driving pattern (See page DI–411).**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern.

Go

10	**Is there DTC P0133 being output again?**

NO → **Check for intermittent problems (See page DI–295).**

YES

Replace heated oxygen sensor (bank 1 sensor 1).

DIC7C–02

DTC	P0134	Oxygen Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

DTC No.	DTC Detecting Condition	Trouble Area
P0134	After engine is warmed up, heated oxygen sensor (bank 1 sensor 1) output does not indicate RICH (greater than 0.45 V) even once when conditions (a), (b), (c), (d) and (e) continue for more than 65 seconds (1 trip detection logic) : (a) Engine speed: 1,400 rpm or more (b) Vehicle speed: 24.8 mph (40 km/h) or more (c) Throttle valve is not fully closed (d) 180 seconds or more after starting engine (e) Engine coolant temperature is more than 40 °C (104 °F)	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1) • Heated oxygen sensor heater (bank 1 sensor 1) • EFI relay • Air induction system • Fuel pressure • PCV hose connection • PCV valve and hose • Injector • Gas leakage in exhaust system • PCV piping • ECM

HINT:

- Sensor 1 is the sensor closer to the engine body.
- After confirming DTC P0134, check the output voltage of the heated oxygen sensor (bank 1 sensor 1) in the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL” using the hand–held tester or the OBD II scan tool. If the output voltage of the heated oxygen sensor is always less than 0.1 V, the sensor circuit may be open or shorted.

MONITOR DESCRIPTION

The ECM uses the heated oxygen sensor to optimize the air–fuel mixture in closed–loop fuel control. This control helps decrease exhaust emissions by providing the catalyst with a nearly stoichiometric mixture. The sensor detects the oxygen level in the exhaust gas and the ECM uses this data to control the air–fuel ratio. The sensor output voltage ranges from 0 V to 1 V. If the signal voltage is less than 0.4 V, the air–fuel ratio is LEAN. If the signal voltage is more than 0.5 V, the air–fuel ratio is RICH. If the sensor does not indicate RICH even once despite the conditions for the closed–loop fuel control being met and a specified time period has passed, the ECM will conclude that the closed–loop fuel control is malfunctioning. The ECM will illuminate the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0134	Excessive time to enter closed–loop
Required sensors/components	Main sensors/components	Front heated oxygen sensor
	Related sensors/components	Crankshaft position sensor, Engine coolant temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	65 sec.	
MIL operation	1 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Time after following conditions are met:	50 sec.	–
Engine coolant temperature	40°C (104°F)	–
Engine RPM	1,400 rpm	–
Vehicle speed	40 km/h (25 mph)	–
Idle	OFF	
Time after engine start	180 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Front heated oxygen sensor voltage	Less than 0.45 V

COMPONENT OPERATING RANGE

Parameter	Standard value
Front heated oxygen sensor voltage in the normal condition	0 to 1 V

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

To determine the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

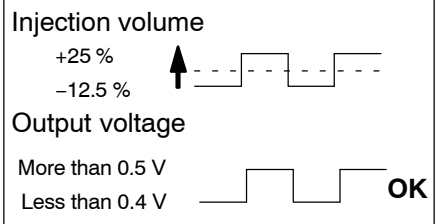
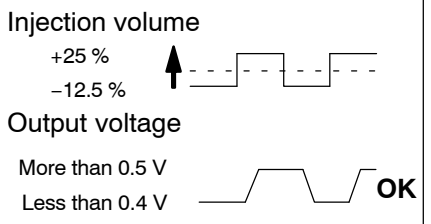
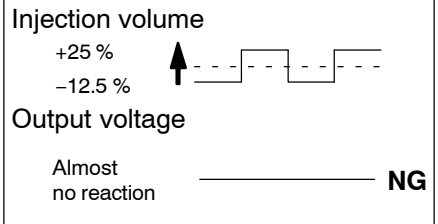
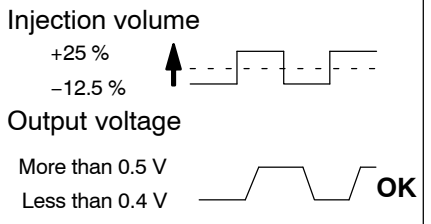
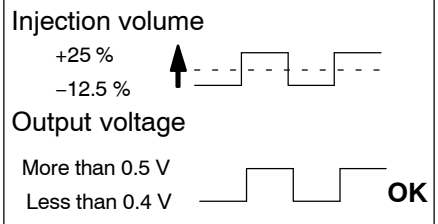
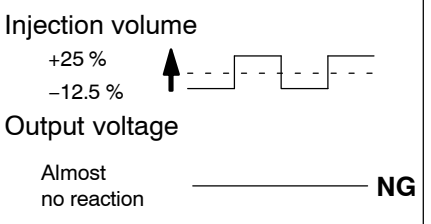
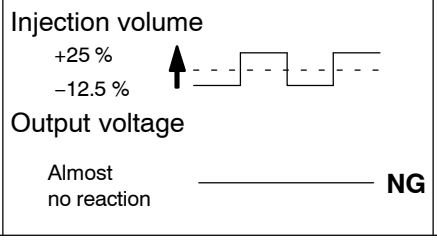
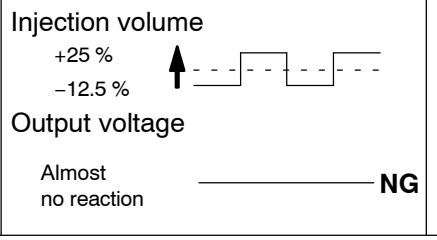
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 seconds.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform ”A/F CONTROL” with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the injection volume
+25 % → rich output: More than 0.5 V,
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1			—
Case 2			Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3			Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4			Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of the A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Are there any other codes (besides DTCs P0134) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0134	A
P0134 and other DTCs	B

HINT:

If any other codes besides P0134 are output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Connect OBD II scan tool or hand–held tester, and read value for voltage output of heated oxygen sensor (bank 1 sensor 1).**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the engine to the normal operating engine coolant temperature above 75°C (169°F).

CHECK:

Read the output voltage of the heated oxygen sensor when the engine speed is suddenly increased.

HINT:

Quickly accelerate the engine to 4,000 rpm 3 times by using the accelerator pedal.

OK:

Heated oxygen sensor outputs a RICH signal (0.45 V or more) at least once.

OK → **Go to step 12.**

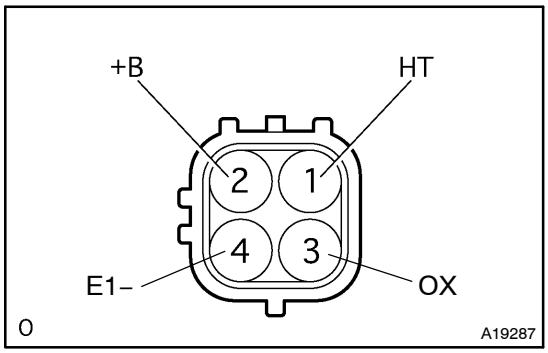
NG

3	Check connection of PCV piping.

NG → Repair or replace PCV piping.

OK

4	Check resistance of heated oxygen sensor heater.

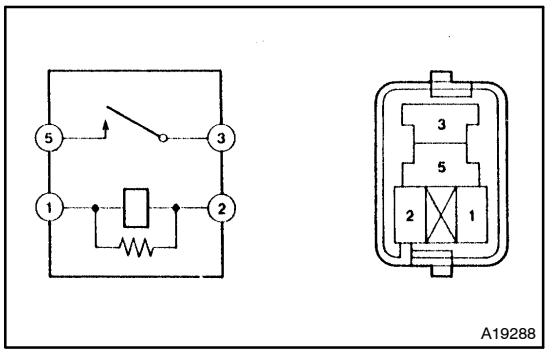


PREPARATION:
Disconnect the heated oxygen sensor connector.
CHECK:
Measure resistance between the terminals HT and +B of the heated oxygen sensor.
OK:
Resistance: 11 to 16 Ω (20°C)

NG → Replace heated oxygen sensor.

OK

5	Check EFI relay.



PREPARATION:
Remove the EFI relay from the engine room J/B.
CHECK:
Inspect the EFI relay.
OK:

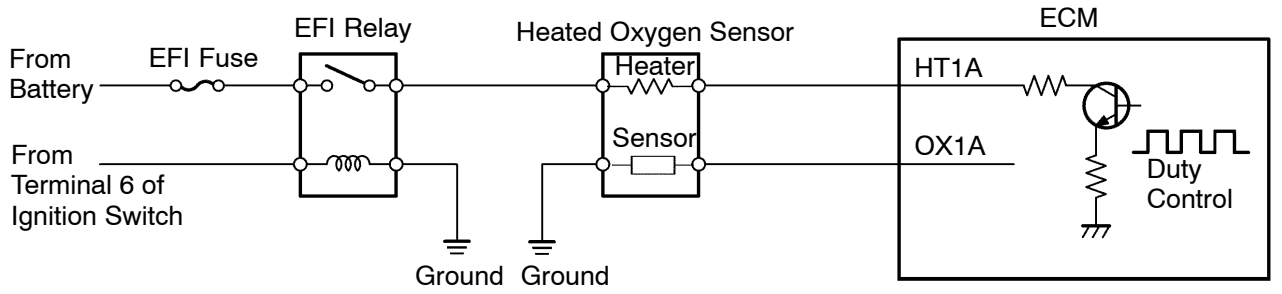
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → Replace EFI relay.

OK

6	**Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–30).**

Reference (Bank 1 Sensor 1 System Drawing):



NG → **Repair or replace harness or connector.**

OK

7	**Check whether misfire is occurred or not by monitoring DTC and data list.**

NG → **Perform troubleshooting for misfire (See page DI–459).**

OK

8	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK

9	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK

10	**Check injector injection (See page SF–22)**

NG → **Replace injector.**

OK

11	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

Replace heated oxygen sensor (bank 1, sensor 1).

12	**Perform confirmation of driving pattern (See page DI–411).**

HINT:

Clear all DTCs prior to performing the confirmation pattern.

Go

13	Is there DTCs P0134 being output again?

YES → Replace ECM (See page SF–78).

NO

14	Did vehicle run out of fuel in past?

NO → Check for intermittent problems (See page DI–295).

YES

DTCs P0134 are caused by running out of fuel.

DID59–01

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

DTC	P0138	Heated Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0130 on page DI–411.

DTC No.	DTC Detection Condition	Trouble Area
P0136	Either of the following conditions is met: • HO2 sensor (sensor 2) voltage remains LEAN (below 0.4 V) or RICH (above 0.5 V) while the vehicle is repeating acceleration and deceleration for 4 to 8 minutes • HO2 sensor (sensor 2) voltage remains extremely low for a long time	• Open or short in HO2 sensor (sensor 2) circuit • HO2 sensor (sensor 2) • HO2 sensor heater (sensor 2) • EFI relay
P0138	Either of the following conditions is met: • HO2 sensor (sensor 2) voltage does not drop below 0.2 V immediately when fuel–cut starts • HO2 sensor output voltage is 1.2 V or more for 10 seconds	• HO2 sensor (sensor 2) • Short in HO2 sensor (sensor 2) circuit

MONITOR DESCRIPTION

The ECM monitors the HO2 sensor (sensor 2) as follows:

- The HO2 sensor voltage does not remain RICH (above 0.5 V) or LEAN (below 0.4 V) while the vehicle is accelerated and decelerated for 4 to 8 minutes. If the voltage remains either RICH or LEAN, the ECM interprets this as a malfunction, illuminates the MIL and sets a DTC.
- The HO2 sensor voltage does not remain less than 0.05 V for a long time while the vehicle is running. If the voltage remains less than 0.05 V for a long time, the ECM interprets this as a malfunction, illuminates the MIL and sets a DTC.
- The sensor voltage drops below 0.2 V (extremely LEAN condition) immediately when the vehicle decelerates and fuel–cut operates. If the voltage does not drop below 0.2 V, the ECM determines that the response feature of the sensor has deteriorated, illuminates the MIL and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0136	Heated rear oxygen sensor output voltage (Crack) (Bank 1)
		Heated rear oxygen sensor output voltage (Bank 1)
		Heated rear oxygen sensor slow response (Bank 1)
	P0138	Heated rear oxygen sensor output voltage (Bank 1)
Required sensors/components	Main sensors/components	Rear heated oxygen sensor
	Related sensors/components	Mass air flow meter, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	P0136: Within 6 min. P0138: Within 10 sec.	
MIL operation	P0138 (Output voltage): Immediate Others: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P0136: Output voltage (crack)		
Vehicle speed	3 km/h (1.875 mph)	–
Idle	OFF	
Fuel cut	OFF	
Time after fuel cut ON to OFF	15 sec.	–
Intake air amount per revolution	0.24 g/rev	–
P0136: Output voltage		
All of the following conditions are met:	A, B, C and D	
A. Pass/fail detection in this driving cycle	Not detected	
B. Engine	Running	
C. Time after engine start	0 sec.	–
D. Either of the following conditions is met:	(a) or (b)	
(a) Cumulative time while heated oxygen sensor heater is ON	22 sec.	–
(b) At once more heated oxygen sensor voltage	0.2 V	–
P0138: Slow response		
Rear oxygen sensor voltage before the fuel cut	0.2 V or more	–
Catalyst condition	Warmed up	
Engine coolant temperature	70°C (158°F)	–
Fuel cut	Operating	

P0138: Output voltage		
Engine	Running	
Battery voltage	11 V	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0136: Output voltage (crack)	
Following conditions are met:	A, B and C
A. Cumulative heated oxygen sensor monitor time	200 sec. or more
B. Duration while heated oxygen sensor voltage is less than 0.05V	120 sec. or more
C. Maximum heated oxygen sensor rich time (0.45V or more)	Less than 20 sec.
P0136: Output voltage	
Number of heated oxygen sensor voltage ”switching”	0 time or less
”Switching” is counted when the sensor signal crosses the minimum or maximum voltage	
Minimum voltage	0.4 V or less
Maximum voltage	0.5 V or more
P0138: Slow response	
Time until the rear oxygen sensor voltage drops to 0.2 V after fuel cut starts operating	7 sec. or more
P0138: Output voltage	
Duration while oxygen sensor output voltage is 1.2 V or more	10 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Heated oxygen sensor voltage	0 to 1 V

O2S TEST RESULT (MODE 05 DATA)

Refer to page DI–295 for detailed information.

Rear HO2S voltage monitor

If the HO2S sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$07	Minimum rear HO2S voltage	Multiplied by 0.005	V
$08	Maximum rear HO2S voltage	Multiplied by 0.005	V

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$31	Time to change from Lean (<0.4 V) to Rich (≧0.5 V)	Multiplied by 0.04	sec.
$32	Time to change from Rich (≧0.5 V) to Lean (<0.4 V)	Multiplied by 0.04	sec.

Rear HO2S slow response monitor

If the elapsed time is out of the standard value, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$37	Time until rear HO2S voltage drops to 0.2 V after fuel–cut starting	Multiplied by 0.04	sec.

Rear HO2S element monitor

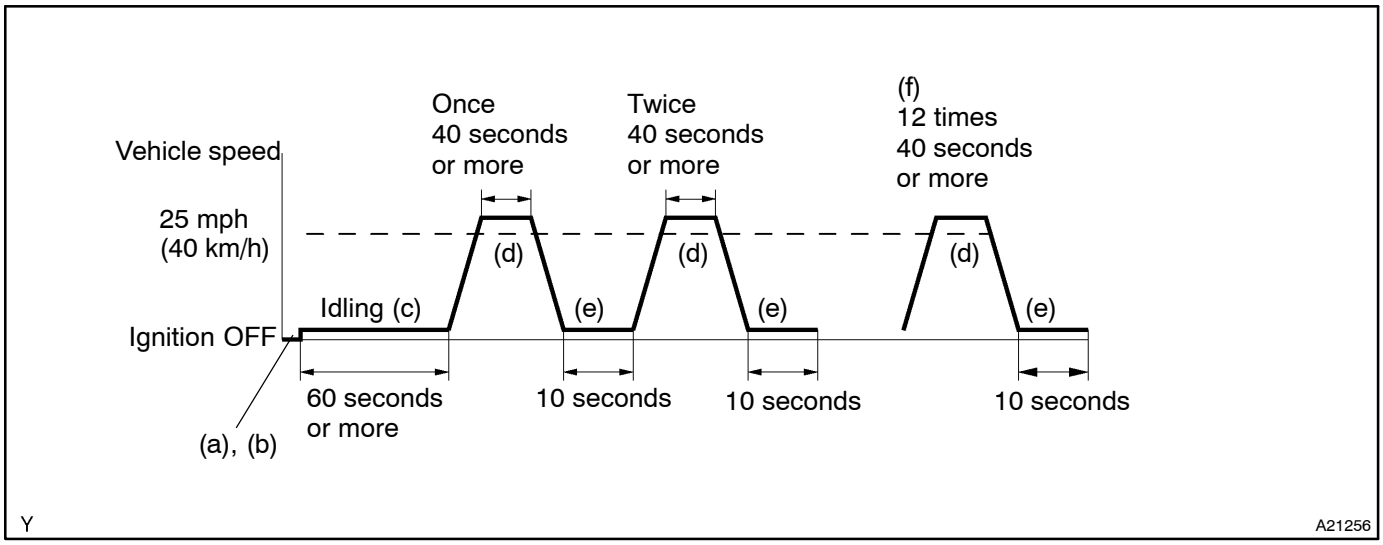
If all the values ($81, $84, $85 and $87) are out of the standard values, the ECM interprets this as a malfunction.

TEST ID	Description of TEST DATA	Conversion Factor	Unit
$81	Percentage of monitoring time when the HO2S voltage is less than 0.05 V	Multiplied by 0.3906	%
$84	Percentage of monitoring time when the HO2S voltage is more than 0.7 V	Multiplied by 0.3906	%
$85	Time when the HO2S voltage is 0.45 V or more	Multiplied by 0.2621	sec.
$87	Percentage of monitoring time when the HO2S voltage is 0.45 V or more	Multiplied by 0.3906	%

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

CONFIRMATION DRIVING PATTERN



(a) Connect the hand–held tester to the DLC3.
(b) Switch the hand–held tester from normal mode to check mode (See page DI–295).
(c) Start the engine and run at idle for 60 seconds or more.
(d) Drive the vehicle at 25 mph (40 km/h) or more for 40 seconds or more.
(e) Run the engine at idle for 10 seconds or more.
(f) Perform steps (d) and (e) 12 times.

HINT:

If a malfunction exists, the MIL will be illuminated on the multi information display during step (f).

NOTICE:

If the conditions in this test are not strictly followed, a malfunction will not be detected. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps from (c) to (f), then perform steps from (c) to (f) again.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

To determine the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running it at 2,500 rpm for approximately 90 seconds.
(4) Select the menu ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.”
(5) Perform ”A/F CONTROL” with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the injection volume
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is approximately 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	—
Case 2	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 % Output voltage More than 0.5 V Less than 0.4 V **OK**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 % Output voltage Almost no reaction **NG**	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following the A/F CONTROL procedure enables the technician to check the graph of the voltage outputs of both the heated oxygen sensors.
To display the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” and then ”ENTER” button before pressing ”F4” button.
HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0136 or P0138) being output?**

YES → **Go to relevant DTC chart (See page DI–335).**

NO

2	**Check output voltage of heated oxygen sensor.**

PREPARATION:
(a) Connect the OBD II scan tool or the hand–held tester to the DLC3.
(b) After warming up the engine, run the engine at 2,500 rpm for 3 minutes.
CHECK:
Read the voltage output of the heated oxygen sensor when the engine speed is suddenly increased.
HINT:
Quickly run the engine to 4,000 rpm for 3 minutes by using the accelerator pedal.
OK:

Heated oxygen sensor output voltage: Fluctuates repeatedly between less than 0.4 V and more than 0.5 V.

OK → **Go to step 6.**

NG

3	**Inspect heated oxygen sensor (heater resistance) (See page SF–75).**

NG → **Replace heated oxygen sensor.**

OK

4	Inspect EFI relay (See page SF–56).

NG → Replace EFI relay.

OK

5	Check for open and short in harness and connectors between ECM and heated oxygen sensor (See page IN–30).

NG → Repair or replace harness or connector.

OK

6	Perform confirmation of driving pattern.

GO

7	Is DTC P0136 or P0138 output again?

NO → Check for intermittent problems (See page DI–295).

YES

Replace heated oxygen sensor.

DIC7E–02

DTC	P0171	System too Lean (Bank 1)

DTC	P0172	System too Rich (Bank 1)

CIRCUIT DESCRIPTION

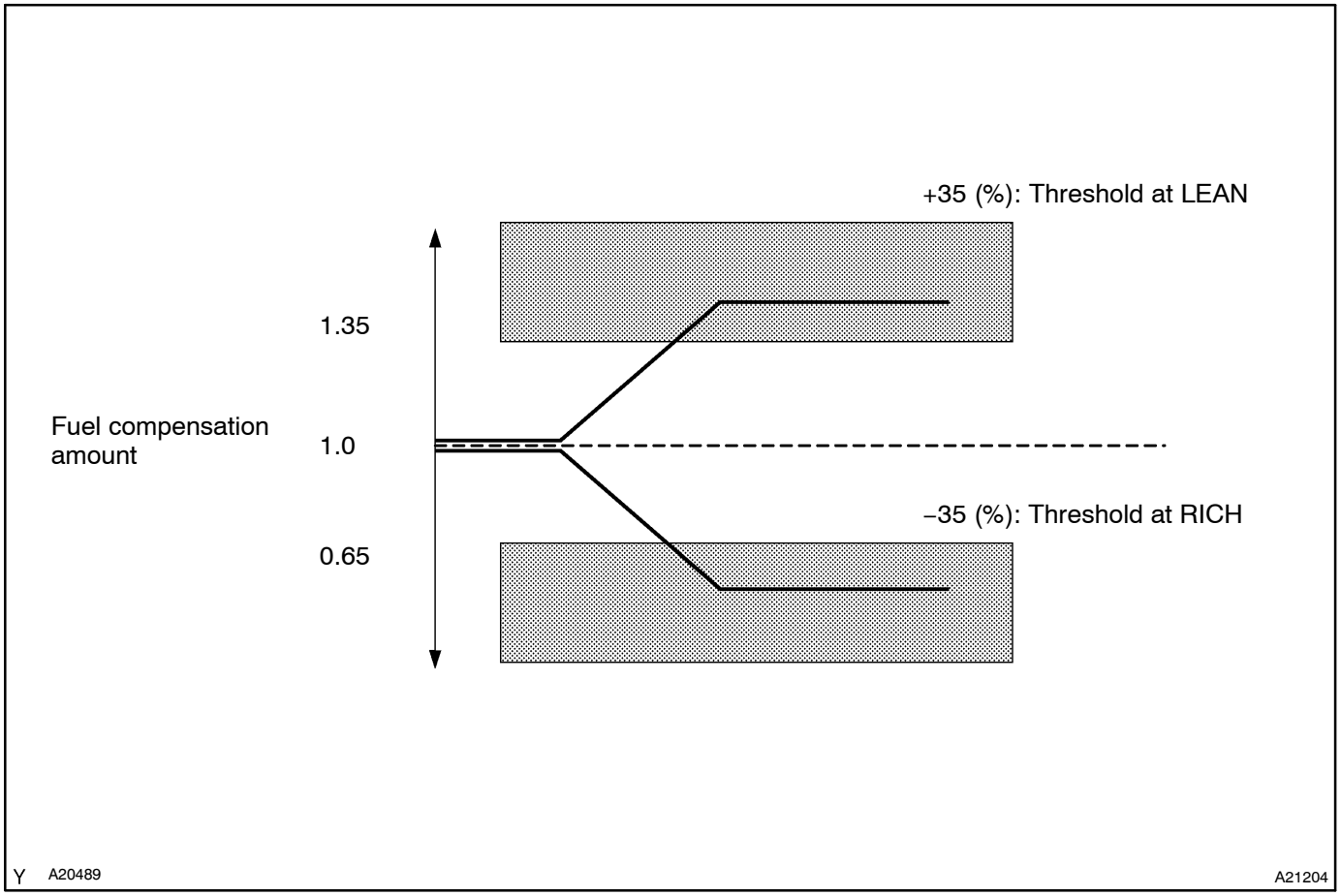
The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim includes the short–term fuel trim and the long–term fuel trim.
The short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at stoichiometric air–fuel ratio. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the stoichiometric air–fuel ratio. This variance triggers a reduction in the fuel volume if the air–fuel ratio is RICH, and an increase in the fuel volume if it is LEAN.
The long–term fuel trim is the overall fuel compensation and carried out in long–term fueltrim to compensate a continual deviation from the theoretical central value by the short–term fuel trim, due to individual engine's specifications and engine deterioration with time.
If both short–term and long–term fuel trims are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL is illuminated.

DTC No.	DTC Detection Condition	Trouble Area
P0171	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be in error on LEAN side (2 trip detection logic)	• Air induction system • Injector blockage • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • PCV valve and hose • PCV hose connection • ECM
P0172	When air–fuel ratio feedback is stable after warming up the engine, fuel trim is considered to be in error on RICH side (2 trip detection logic)	• Injector leak, blockage • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Gas leakage in exhaust system • Open or short in heated oxygen sensor (bank 1, sensor 1) circuit • Heated oxygen sensor (bank 1, sensor 1) • Heated oxygen sensor heater (bank 1, sensor 1) • EFI relay • ECM

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 may be recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 35 % (engine coolant temperature is more than 75 °C (167°F)), the system is functioning normally.

MONITOR DESCRIPTION



Under closed–loop fuel control, fuel injection amounts that deviate from the ECM's estimated fuel amount will cause a change in the long–term fuel trim compensation value. This long–term fuel trim is adjusted when there are persistent deviations in the short–term fuel trim values. And the deviation from a simulated fuel injection amount by the ECM affects a smoothed fuel trim learning value. The smoothed fuel trim learning value is the combination of smoothed short–term fuel trim (fuel feedback compensation value) and smoothed long–term fuel trim (learning value of the air–fuel ratio). When the smoothed fuel trim learning value exceeds the DTC threshold, the ECM interprets this as a fault in the fuel system and sets a DTC.
Example:
If the smoothed fuel trim learning value is more than +35% or less than –35%, the ECM interprets this as a malfunction in the fuel system.

MONITOR STRATEGY

Related DTCs	P0171	Fuel system lean (Bank 1)
	P0172	Fuel system rich (Bank 1)
Required sensors/components	Main sensors/components	Front oxygen sensor
	Related sensors/components	Engine coolant temperature sensor, Mass air flow meter, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Fuel system status	Closed–loop	
Throttle position learning	Completed	
Either of the following conditions is met:	Condition 1 or 2	
1. Engine RPM	–	1,100 rpm
2. Intake air amount per revolution	0.15 g/sec. or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Purge–cut	Executing
Either of the following conditions is met:	Condition 1 or 2
1. Average between short–term fuel trim and long–term fuel trim	35% or more (varies with ECT)
2. Average between short–term fuel trim and long–term fuel trim	–35% or less (varies with ECT)

WIRING DIAGRAM

Refer to DTC P0130 on page DI–411.

INSPECTION PROCEDURE

HINT:

Hand–held tester only:

To determine the trouble area is possible by performing ”A/F CONTROL” ACTIVE TEST (heated oxygen sensor or other trouble areas can be distinguished).

(a) Perform ACTIVE TEST using the hand–held tester (A/F CONTROL).

HINT:

”A/F CONTROL” is the ACTIVE TEST which changes the injection volume to –12.5 % or +25 %.

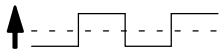
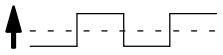
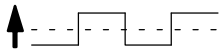
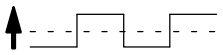
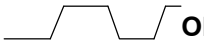
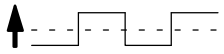
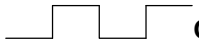
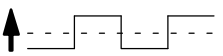
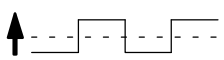
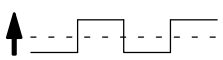
(1) Connect the hand–held tester to the DLC3 on the vehicle.
(2) Turn the ignition switch ON.
(3) Warm up the engine by running the engine at 2,500 rpm for approximately 90 sec.
(4) Select the item ”DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL”.
(5) Perform ”A/F CONTROL” with the engine idling (press the right or left button).

RESULT:

Heated oxygen sensor reacts in accordance with increase and decrease of the injection volume
+25 % → rich output: More than 0.5 V
–12.5 % → lean output: Less than 0.4 V

NOTICE:

There is a delay of few seconds in the sensor 1 (front sensor) output, and there is about 20 seconds delay at maximum in the sensor 2 (rear sensor).

	Output voltage of heated oxygen sensor (sensor 1: front sensor)	Output voltage of heated oxygen sensor (sensor 2: rear sensor)	Mainly suspected trouble area
Case 1	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	—
Case 2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Sensor 1: front sensor (sensor 1, heater, sensor 1 circuit)
Case 3	Injection volume +25 % –12.5 %  Output voltage More than 0.5 V Less than 0.4 V  OK	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Sensor 2: rear sensor (sensor 2, heater, sensor 2 circuit)
Case 4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Injection volume +25 % –12.5 %  Output voltage Almost no reaction NG	Extremely rich or lean actual air–fuel ratio (Injector, fuel pressure, gas leakage in exhaust system, etc.)

The following of the A/F CONTROL procedure enables the technician to check and graph the voltage outputs of both the heated oxygen sensors.

For displaying the graph indication, enter ”ACTIVE TEST / A/F CONTROL / USER DATA,” then select ”O2S B1S1 and O2S B1S2” by pressing ”YES” button and push ”ENTER” button before pressing ”F4” button.

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- A high heated oxygen sensor (sensor 1) voltage (0.5 V or more) could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A low heated oxygen sensor (sensor 1) voltage (0.4 V or less) could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

1	**Check air induction system (See page SF–1).**

CHECK:

Check the air induction system for vacuum leaks.

NG → **Repair or replace air induction system.**

OK

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

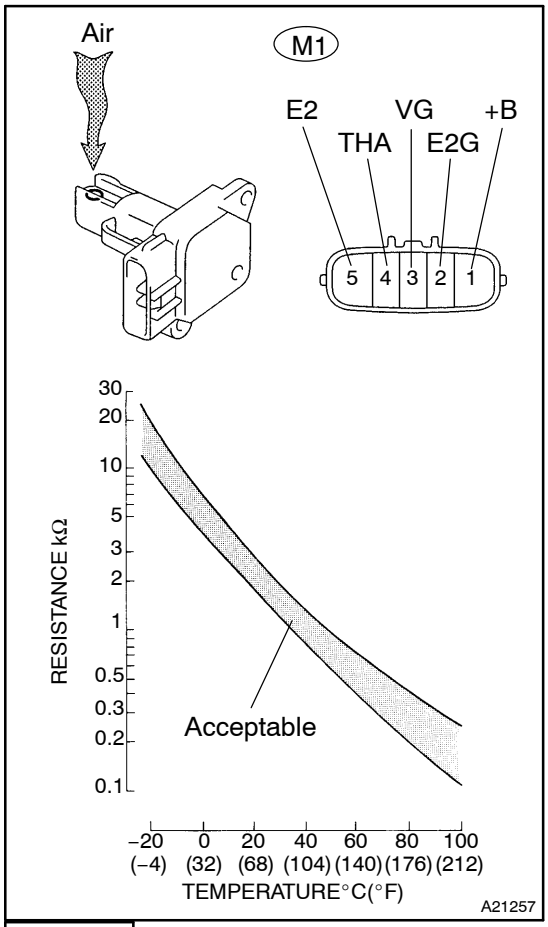
OK

3	**Check injector injection (See page SF–22).**

NG → **Replace injector.**

OK

4	Check mass air flow meter.



OK

PREPARATION:

Remove the mass air flow meter.

CHECK:

(a) Check the output voltage.
  (1) Apply the battery voltage terminals +B and E2G.
  (2) Connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.
  (3) Blow air into the mass air flow meter, and check that the voltage fluctuates.

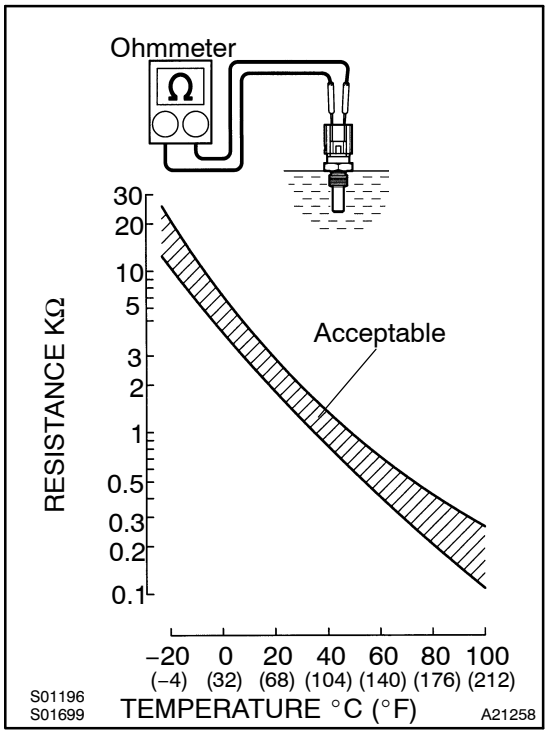
(b) Inspect the resistance
  (1) Measure the resistance between the terminals of the intake air temperature sensor.

OK:

Tester Connection	Temperature	Specified Condition
THA (M1–4) – E2 (M1–5)	–20 °C (–4 °F)	13.6 to 18.4 kΩ
	20 °C (68 °F)	2.21 to 2.69 kΩ
	60 °C (140 °F)	0.49 to 0.67 kΩ

NG → **Replace mass air flow meter.**

5	Check engine coolant temperature sensor.



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

OK:

Tester Connection	Temperature	Specified Condition
1 – 2	20°C (68°F)	2.32 to 2.59 kΩ
	80°C (176°F)	0.310 to 0.326 kΩ

NOTICE:

If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (by warming up or cooling down) and repeat the test.

(a) Reinstall the engine coolant temperature sensor.

NG → **Replace engine coolant temperature sensor.**

OK

6	Check for spark and ignition (See page IG–1).

NG → **Repair or replace.**

OK

7	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK

8	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

9	Check output voltage of heated oxygen sensor (bank 1 sensor 1) during idling.

PREPARATION:

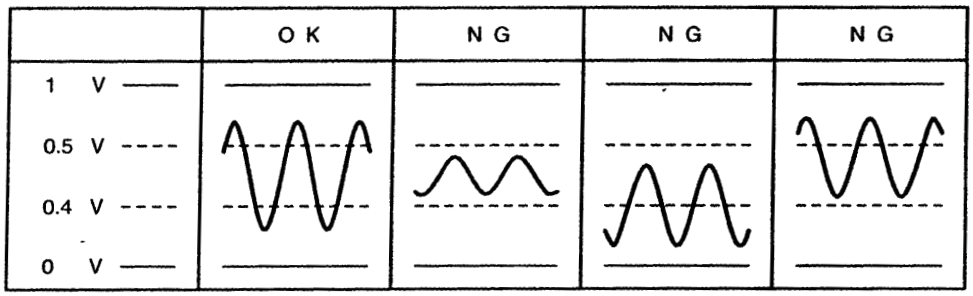
(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Whe using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / O2S B1S1."
(d) Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approximately 90 seconds.

CHECK:

Read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.5 V (See the following table).

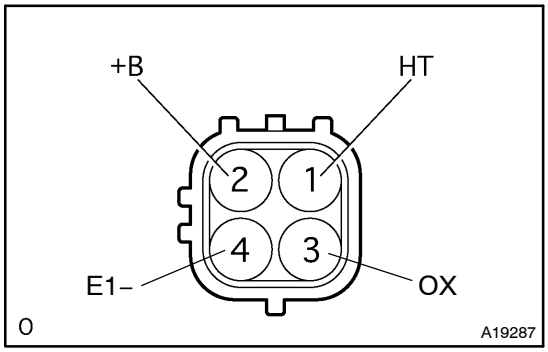


A21259

OK	Go to step 17.

NG

10	Check resistance of heated oxygen sensor heater.



A19287

PREPARATION:

Disconnect the heated oxygen sensor connector.

CHECK:

Measure resistance between the terminals HT and +B of the heated oxygen sensor.

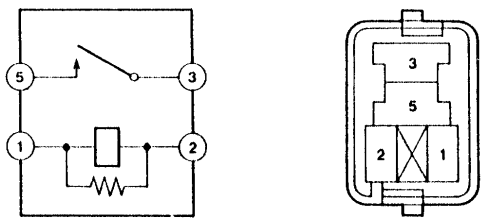
OK:

Resistance: 11 to 16 Ω (20°C)

NG	Replace heated oxygen sensor.

OK

11	Check EFI relay.



A19288

PREPARATION:

Remove the EFI relay from the engine room J/B.

CHECK:

Inspect the EFI relay.

OK:

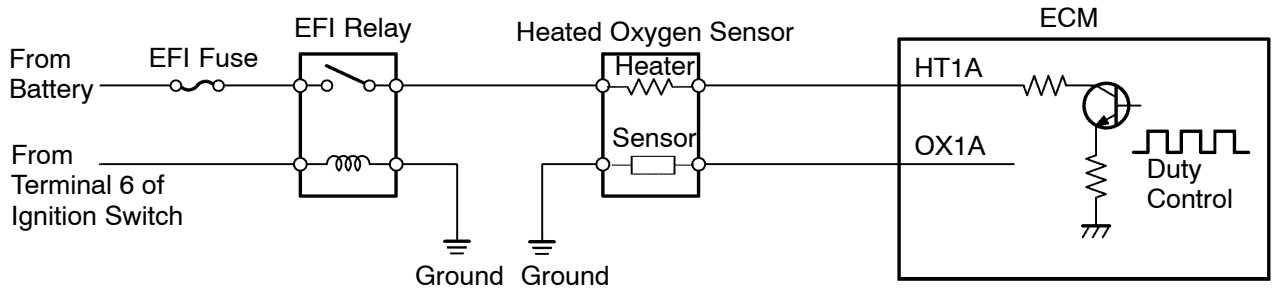
Tester Connection	Specified Condition
1 – 2	Continuity
3 – 5	No continuity
	Continuity (Apply battery voltage to terminals 1 and 2)

NG → **Replace EFI relay.**

OK

12	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–30).

Reference (Bank 1 Sensor 1 System Drawing):



A21253

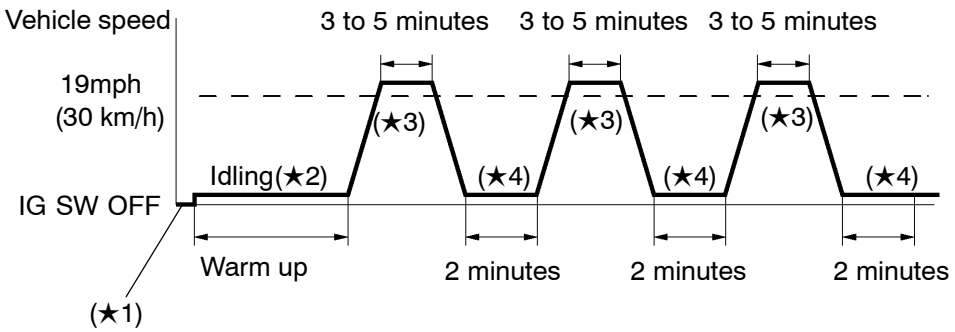
NG → **Repair or replace harness or connector.**

OK

13	**Replace heated oxygen sensor.**

Go

14	**Perform confirmation driving pattern.**



Y A09299 A21418

(a) Disconnect the battery terminal and wait for a minute (clear learning value of the air fuel ratio). (★1)
(b) Connect the hand–held tester to the DLC3. (★1)
(c) Switch the hand–held tester from the normal mode to the check mode (See page DI–295). (★1)
(d) Start the engine and let it idle until engine coolant temperature is 75 °C (167 °F) or more. (★2)
(e) Drive the vehicle at 19 mph (30 km/h) or more for 3 minutes or more. (★3)
(f) Let the engine idle for approx. 2 minutes. (★4)
(g) Perform steps (e) and (g) at least 3 times.

HINT:

If a malfunction exists, the MIL will be illuminated during step (f).

NOTICE:

If the conditions in this test are not strictly followed, detecting a malfunction may be difficult. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (e) to (f), and then perform step (f) again.

Go

15	**Is there DTC P0171 or P0172 being output again?**

YES → **Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).**

NO

16	**Confirm if vehicle has run out of fuel in the past.**

NO → **Check for intermittent problems (See page DI–295).**

YES

DTC P0171 or P0172 is caused by fuel shortage.

17	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

18	**Is there DTC P0171 or P0172 being output again?**

NO → **Go to step 22.**

YES

19	**Replace heated oxygen sensor.**

Go

20	**Perform confirmation driving pattern.**

HINT:
Clear all DTCs prior to performing the confirmation driving pattern (Refer to step 14).

Go

21	Is there DTC P0171 or P0172 being output again?

YES → Replace ECM (See page SF–78) and perform confirmation driving pattern (Refer to step 14).

NO

22	Confirm if vehicle has run out of fuel in the past.

NO → Check for intermittent problems (See page DI–295).

YES

DTC P0171 or P0172 is caused by fuel shortage.

DIC7F–02

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

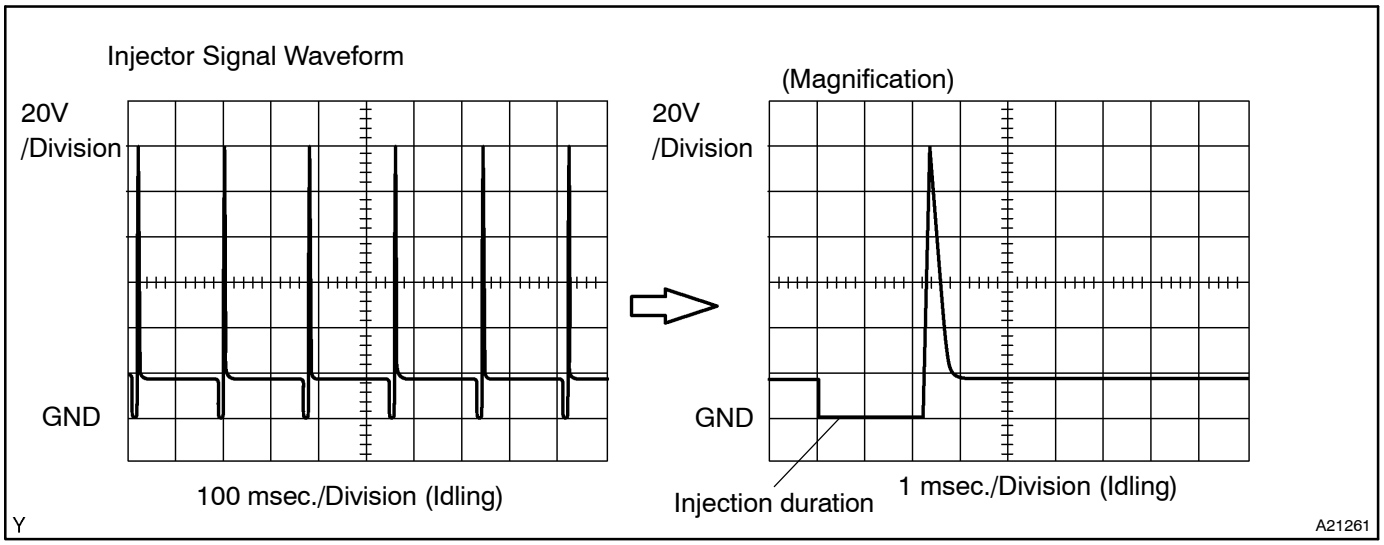
CIRCUIT DESCRIPTION

When a misfire occurs in the engine, hydrocarbons (HC) are output in high concentrations. If this HC concentration is high enough, there could be an increase in exhaust emission levels. High concentrations of HC passing through the catalyst also cause the temperature of the catalyst to increase, possibly damaging the catalyst. To prevent this increase in the emissions and limit the possibility of thermal damage, the ECM monitors the misfire rate. When the temperature of the catalyst reaches a point of thermal degradation, the ECM will blink the MIL. For monitoring misfire, the ECM uses both camshaft position sensor and the crankshaft position sensor. The camshaft position sensor is used to identify misfiring cylinders and crankshaft position sensor is used to measure variations in the crankshaft rotation speed. A misfire is counted when crankshaft rotation speed variations exceed threshold values.
The ECM illuminates the MIL if the misfiring rate exceeds a threshold value, which could cause emission deterioration.

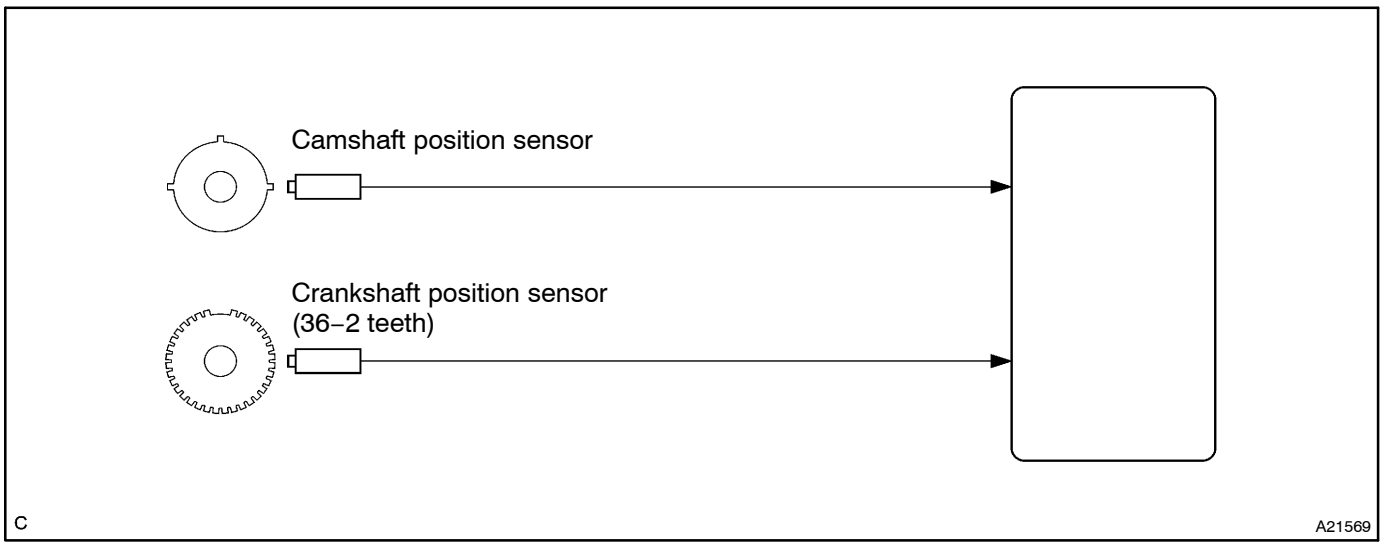
DTC No.	DTC Detection Condition	Trouble Area
P0300	Misfiring of random cylinder is detected	• Open or short in engine wire • Connector connection • Vacuum hose connection • Ignition system • Injector • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve clearance • Valve timing • VVTL–i system (rocker arm) • PCV hose connection • PCV hose • ECM
P0301 P0302 P0303 P0304	Misfiring of each cylinder is detected	

HINT:
When codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires have been detected and recorded at different times.

Reference: Inspection by using oscilloscope
With the engine idling, check the waveform between terminals #10 to #40 and E01 of the ECM connectors.
HINT:
The correct waveform is as shown in the illustration.



MONITOR DESCRIPTION



The ECM illuminates the MIL (2 trip detection logic) if:
The ECM will illuminate the MIL when the percentage of misfire exceeds the specified limit per 1,000 engine revolutions. One occurrence of excessive misfire during engine start will illuminate the MIL. Four occurrences are required to illuminate the MIL 1,000 revolutions after engine start.
The ECM blinks the MIL (the MIL blinks immediately) if:

- Within 200 engine revolutions at a high rpm, the threshold for ”percentage of misfire causing catalyst damage” is reached 1 time.
- Within 200 engine revolutions at a normal rpm, the threshold for ”percentage of misfire causing catalyst damage” is reached 3 time.

MONITOR STRATEGY

Related DTCs	P0300	Random/Multiple cylinder misfire detected
	P0301	Cylinder 1 misfire detected
	P0302	Cylinder 2 misfire detected
	P0303	Cylinder 3 misfire detected
	P0304	Cylinder 4 misfire detected
Required sensors/components	Main sensors/components	Camshaft position sensor, Crankshaft position sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Throttle position sensor
Frequency of operation	Continuous	
Duration	Every 1,000 revolutions (soon after engine is started: 1 time; other: 4 times) (emission related misfire) Every 200 revolutions (1 or 3 times) (catalyst deteriorating misfire)	
MIL operation	2 driving cycles: MIL ON Immediate: MIL blinking (Catalyst deteriorating misfire)	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

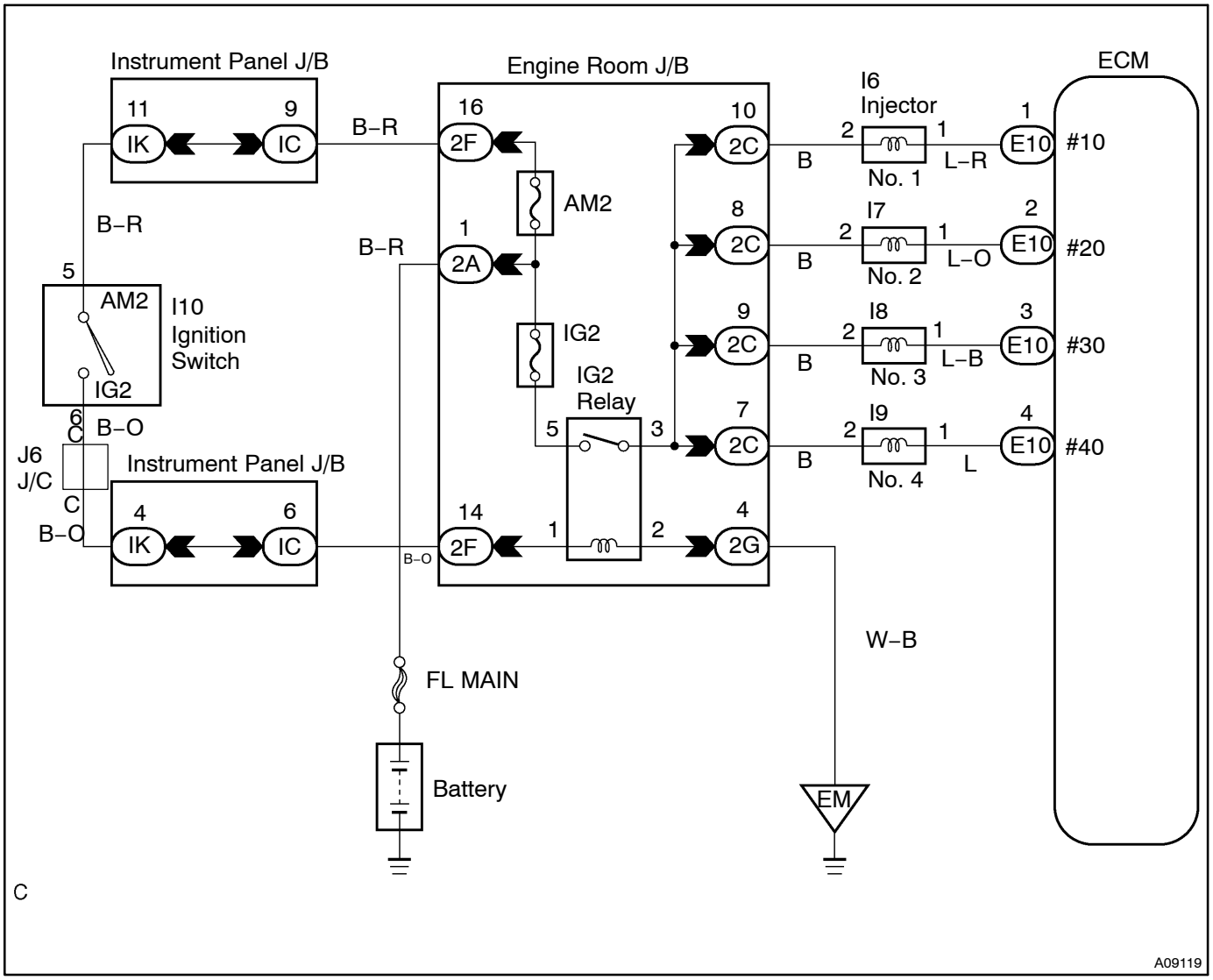
Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	8 V	–
Throttle position learning	Completed	
VVT sytem	Not operated by scan tool	
Engine RPM	400 rpm	7,800 rpm
All of the following conditions are met:	Condition 1 and 2	
1. Engine coolant temperature	–10°C (14°F)	–
2. Either of the following conditions is met:	Condition (a) or (b)	
(a) Engine coolant temperature at engine start	–7°C (19°F)	–
(b) Engine coolant temperature	20°C (68°F)	–
Fuel–cut	OFF	
Monitor period of emission – related – misfire:		
First 1,000 revolutions after engine start, or check mode	Crankshaft 1,000 revolutions	
Except above	Crankshaft 1,000 revolutions x 4	
Monitor period of catalyst – damage – misfire:		
All of the following conditions 1, 2 and 3 are met	Crankshaft 200 revolutions	
1. Driving cycle	1st	
2. Check mode	OFF	
3. Engine RPM	–	4,000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Monitor period of emission – related – misfire:	
Misfire rate	1.3 % or more
Monitor period of catalyst – damage – misfire:	
Number of misfire per 200 revolutions	101 or more (varies with engine RPM and intake air amount)

WIRING DIAGRAM

Refer to DTC P0351 on page DI–486 for the wiring diagram of ignition system.



CONFIRMATION DRIVING PATTERN

(a) Connect the hand–held tester to the DLC3.
(b) Record DTCs and the freeze frame data.
(c) Select the check mode using the hand–held tester (See page DI–295).
(d) Read the value on the misfire counter for each cylinder with the engine idling. If the value is displayed on the misfire counter, skip the following procedure of the confirmation driving.
(e) Drive the vehicle several times with the engine speed, load and surrounding range shown as ENGINE SPD, CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the DATA LIST.

If you have no hand–held tester, turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again.

HINT:

Do not turn the ignition switch OFF during the confirmation driving pattern. This switches the diagnosis system from the check mode to the normal mode, so all the DTCs and freeze flame data will be erased.

Engine Speed	Time
Idling	5 minutes and 45 seconds or more
1,000 rpm	4 minutes or more
2,000 rpm	2 minutes and 30 seconds or more
3,000 rpm	1 minute and 30 seconds or more

(f) Check whether there is misfire or not by monitoring the DTC and the freeze frame data. After that, record them.
(g) Turn the ignition switch OFF and wait at least 5 seconds.

INSPECTION PROCEDURE

HINT:

- If DTCs besides misfire DTCs are memorized simultaneously, troubleshoot the non–misfire DTCs first.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- If the misfire does not occur when the vehicle is brought to the workshop, the misfire can be confirmed by reproducing the condition of the freeze frame data. Also, after finishing the repair, confirm that there is no misfire (See confirmation driving pattern).
- For 6 or 8 cylinder engines, misfiring cylinder identification is disabled at high engine speed and only a general misfire fault code P0300 is stored instead of a cylinder specific misfire fault code (P0301 to P0308). If the misfire starts in a high engine speed area or the misfire occurs only in a high engine speed area, only code P0300 will be stored.

  When only a general misfire fault code like P0300 is stored:
- Erase the general misfire fault code using the hand–held tester or OBD II scan tool.
- Start the engine and drive the confirmation pattern.
- Read the value of the misfire ratio for each cylinder. Or read the DTC.
- Repair the cylinder that has a high misfire ratio. Or repair the cylinder indicated by the DTC.
- After finishing repairs, drive the confirmation pattern again and confirm that no misfire occurs.
- When either SHORT FT #1 or LONG FT #1 in the freeze frame data is over the range of ±20 %, there is a possibility that the air–fuel ratio is becoming to RICH (–20 % or less) or LEAN (+20 % or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during engine warm–up.
- If the misfire cannot be reproduced, the following is suspected: 1) the vehicle has low fuel, 2) improper fuel is being used, or 3) the ignition plug is contaminated.

- Be sure to check the value on the misfire counter after the repair.

1	**Are there any other codes (besides DTC P0300, P0301, P0302, P0303 or P0304) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P0300, P0301, P0302, P0303 and/or P0304	A
P0300, P0301, P0302, P0303 and/or P0304 and other DTCs	B

HINT:

If any other codes besides P0300, P0301, P0302, P0303 and/or P0304 are output, perform the trouble-shooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check harness, connector and vacuum hose in engine room.**

CHECK:

(a) Check the connection conditions of the wire harness and connector.
(b) Check for the disconnection, piping and break of the vacuum hose.

NG → **Repair or replace, then confirm that there is no misfire (See confirmation driving pattern).**

OK

3	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

4	**Connect hand–held tester, and read the number of misfire.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Start the engine.
(d) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / CYL#1 to CYL#4.

CHECK:

Read the number of misfire cylinder on the hand–held tester or the OBD II scan tool.
HINT:
When a misfire is not reproduced, be sure to branch below based on the stored DTC.

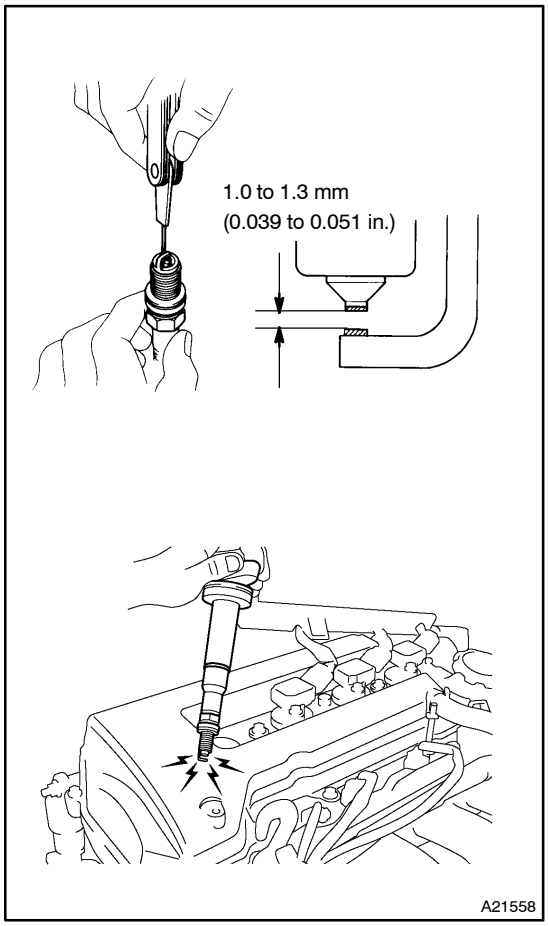
RESULT:

High Misfire Rate Cylinder	Proceed to
1 or 2 cylinders	A
More than 3 cylinders	B

B → **Go to step 15.**

A

5	Check spark plug and spark of misfiring cylinder.



PREPARATION:

(a) Disconnect the ignition coil assembly.
(b) Remove the spark plug.

CHECK:

(a) Check for carbon deposits on electrode.
(b) Check the spark plug type (See page IG–1).
(c) Check electrode gap.

OK:

(b) No large carbon deposit present.
Not wet with gasoline or oil.
(c) Electrode gap: 1.0 to 1.3 mm (0.039 to 0.051 in.)

NOTICE:

If adjusting the gap of a new spark plug, bend only the base/ ground" electrode. Do not touch the tip. Never attempt to adjust the gap of a used plug.

PREPARATION:

(a) Install the spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground spark plug.

CHECK:

Check if spark occurs while engine is being cracked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

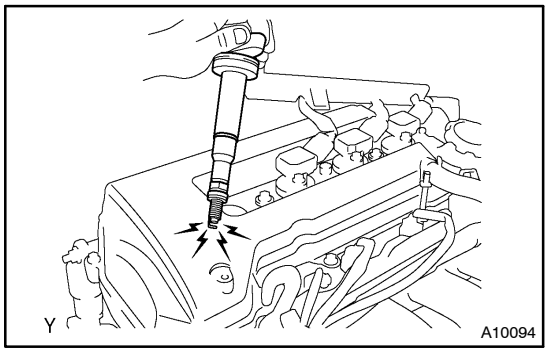
OK:

Spark jumps across electrode gap.

OK	Go to step 8.

NG

6	Change normal spark plug and check spark of misfiring cylinder.



PREPARATION:

(a) Change to the normal spark plug.
  (1) Remove the spark plug that may be faulty from the ignition coil assembly.
  (2) Install another spark plug to the ignition coil assembly.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:

Check if spark occurs while the engine is being cranked.

CAUTION:

Always disconnect each injector connector.

NOTICE:

Do not crank the engine for more than 2 seconds.

OK:

Spark jumps across electrode gap.

OK	Replace spark plug.

NG

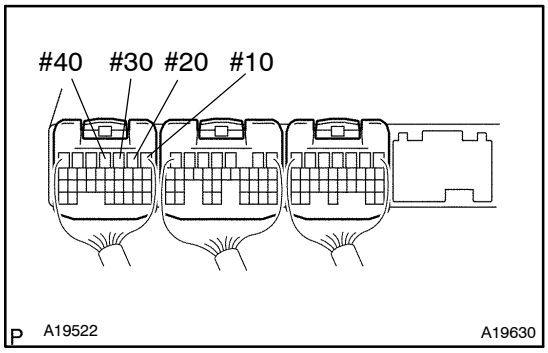
7	Check for open and short in harness and connector between ignition coil and ECM (See page IN–30).

OK	Replace ignition coil with igniter, then confirm that there is no misfire.

NG

Repair or replace harness or connector.

8	**Check voltage of ECM terminal for injector of failed cylinder.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

OK	**Go to step 11.**

NG

9	**Check resistance of injector of misfiring cylinder (See page SF–18).**

NG	**Replace injector.**

OK

10	**Check for open and short in harness and connector between ignition switch and injector, injector and ECM of misfiring cylinder (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

11	**Check injector injection and volume of misfiring cylinder (See page SF–22).**

NG	**Replace injector.**

OK

12	**Check compression pressure of misfiring cylinder (See page EM–3).**

NG → **Repair or replace.**

OK

13	**Check valve clearance of misfiring cylinder (See page EM–4).**

NG → **Adjust valve clearance.**

OK

14	**Check result of step 4 switch step by number of misfire cylinder.**

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B → **Check for intermittent problems (See page DI–295).**

A

15	**Check valve timing (Check for loose or a jumped tooth of the timing chain) (See page EM–26).**

NG → **Adjust valve timing.**

OK

16	**Check fuel pressure (See page SF–6).**

CHECK:

Check the fuel pressure (high or low pressure).

NG → **Check and repair fuel pump, fuel pipe line and filter (See page SF–1).**

OK

17	**Check mass air flow meter.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.

(b) Turn the ignition switch ON.

CHECK:

(a) Check the intake air temperature.

(1) When using hand–held tester, enter the following menu: ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR”.

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

OK:

Equivalent to ambient temperature

(b) Check the air flow rate.

(1) When using hand–held tester, enter the following menu: ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / MAF”.

(2) Read its value displayed on the hand–held tester or the OBD II scan tool.

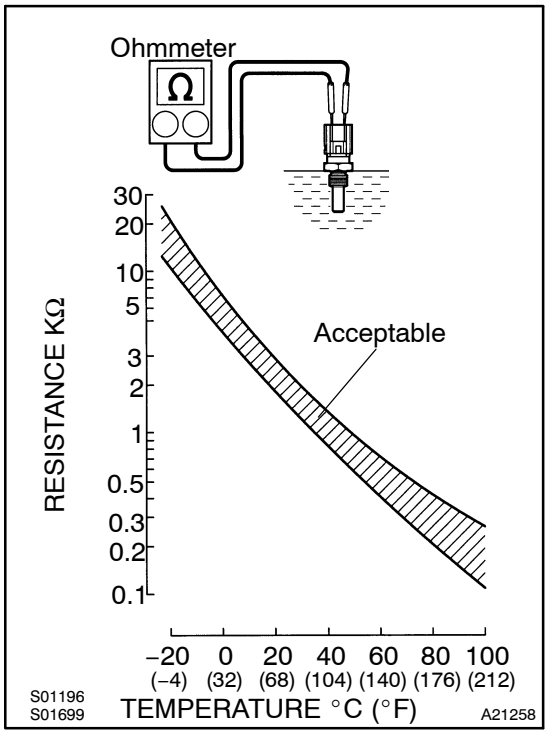
OK:

Condition	Air flow rate (gm/s)
Ignition switch ON (do not start engine)	0
Idling	4 to 6
Running without load (2,500 rpm)	13 to 20
From idling to quickly accelerating	Air flow rate fluctuates

NG → **Replace mass air flow meter.**

OK

18	Check engine coolant temperature sensor (See page SF–67).



PREPARATION:

Remove the engine coolant temperature sensor.

CHECK:

Measure the resistance between the terminals of the engine coolant temperature sensor.

OK:

Tester Connection	Temperature	Specified Condition
1 – 2	20°C (68°F)	2.32 to 2.59 kΩ
	80°C (176°F)	0.310 to 0.326 kΩ

NOTICE:

If you check the engine coolant temperature sensor in water, be careful not to allow water to go into the terminals. After checking, dry the sensor.

HINT:

Alternate procedure: Connect an ohmmeter to the installed engine coolant temperature sensor and read the resistance. Use an infrared thermometer to measure the engine temperature in the immediate vicinity of the sensor. Compare these values to the resistance/temperature graph. Change the engine temperature (by warming up or cooling down) and repeat the test.

(a) Reinstall the engine coolant temperature sensor.

NG	Replace engine coolant temperature sensor.

OK

19	Check result of step 4 switch step by number of misfire cylinder.

High misfire rate cylinder	Proceed to
1 or 2 cylinders	A
more than 3 cylinders	B

B	Go to step 5.

A

Check intermittent problems (See page DI–295).

DID5A–01

DTC	P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)

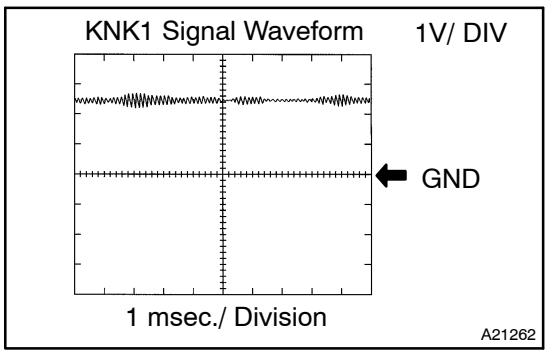
DTC	P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)

CIRCUIT DESCRIPTION

The flat type knock sensor (non–resonant type) has a structure that can detect vibrations in a wide frequency, from about 6 kHz to 15 kHz, and has the following features.
Knock sensors are fitted to the right bank and left bank of the cylinder block to detect the engine knocking. Each sensor contains a piezoelectric element which generates a voltage when it becomes deformed. This occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, the ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0327	Output voltage of the knock sensor is 0.5 V or less	• Short in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM
P0328	Output voltage of the knock sensor is 4.5 V or more	• Open in knock sensor circuit • Knock sensor (under–torqued or loose) • ECM

HINT:
If the ECM detects the DTC P0327 and P0328, it enters the fail–safe mode in which the corrective retarded angle value is set to the maximum value.



Reference: Inspection by using the oscilloscope.
After warning up, run the engine at 4,000 rpm, and check the waveform between terminals KNK1 and EKNK of the ECM connector.

MONITOR DESCRIPTION

The knock sensor located on the cylinder block detects spark knock.
When spark knock occurs, the sensor pick–up vibrates in a specific frequency range. When the ECM detects the voltage in this frequency range, it retards the ignition timing to suppress the knock.
The ECM also senses background engine noise with the knock sensor and uses this noise to check for faults in the sensor. If the knock sensor signal level is too low for more than 10 sec. and if the knock sensor output voltage is out of the normal range, the ECM interprets this as a fault in the knock sensor and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0327	Knock sensor (Bank 1) range check (Low voltage)
	P0328	Knock sensor (Bank 1) range check (High voltage)
Required sensors/components	Main sensors/components	Knock sensor
	Related sensors/components	Crankshaft position sensor, Camshaft position sensor, Engine coolant temperature sensor, Mass air flow meter
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

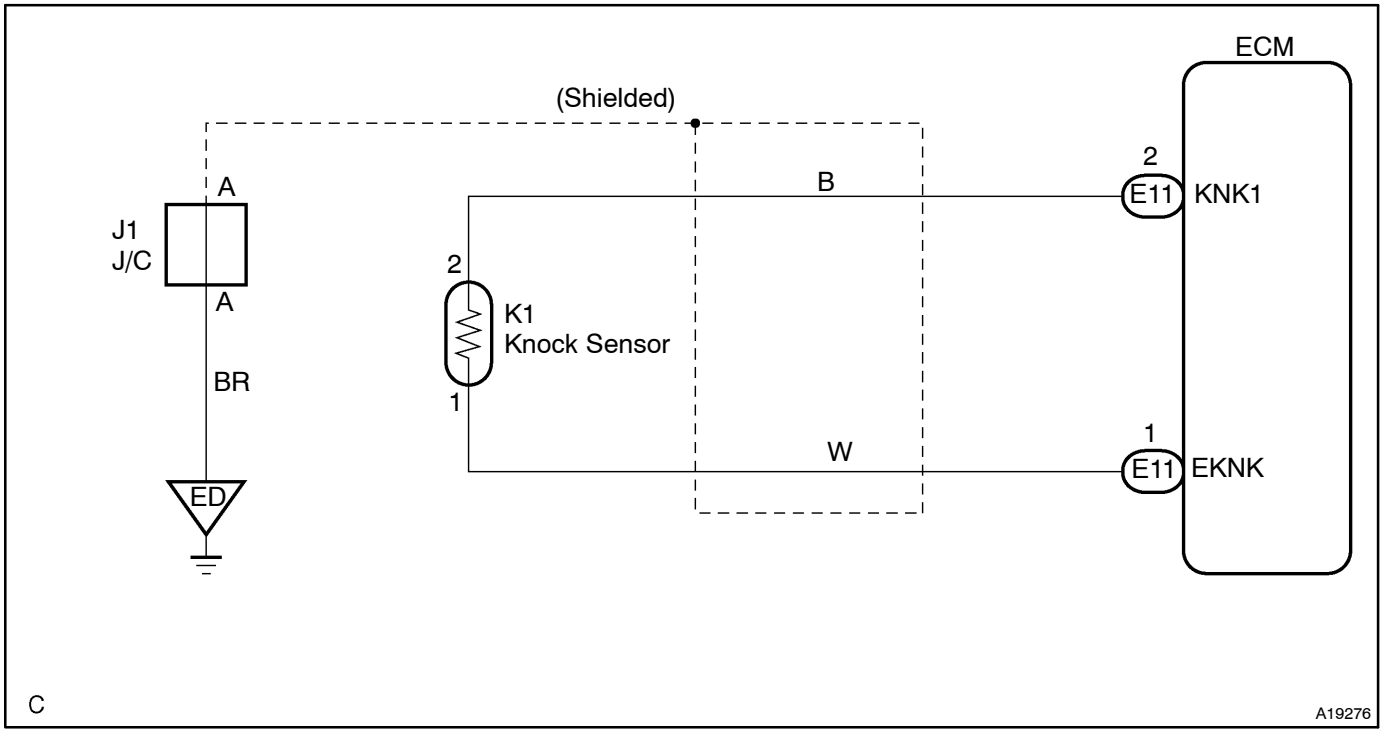
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	10.5 V	–
Time after engine start	5 sec.	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0327:	
Knock sensor voltage	Less than 0.5 V
P0328:	
Knock sensor voltage	More than 4.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	Read output DTC.

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Clear the DTCs.
(e) Warm up the engine.
(f) Run the engine at 3,000 rpm for 10 seconds or more.

CHECK:

Read the DTCs.

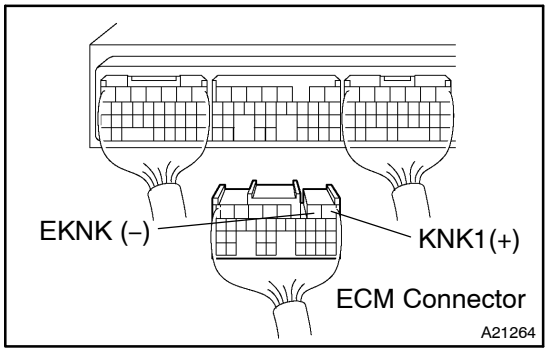
RESULT:

Display (DTC output)	Proceed to
P0327 and/or P0328	A
No output	B

B → **Check for intermittent problems (See page DI–295)**

A

2	Check for open and short in harness and connector between ECM and knock sensor.



PREPARATION:

Disconnect the E11 ECM connector.

CHECK:

Measure the resistance between the terminals of the ECM connector.

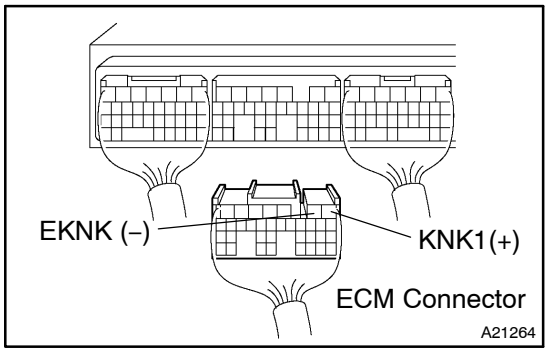
OK:

Resistance: 120 to 280 kΩ at 20 °C (68 °F)

NG → **Go to step 4.**

OK

3	Check voltage between terminals KNK1 and EKNK of ECM connector.



PREPARATION:
(a) Disconnect the E11 ECM connector.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between the terminals of the ECM connector.

OK:
Voltage: 4.5 to 5.5 V

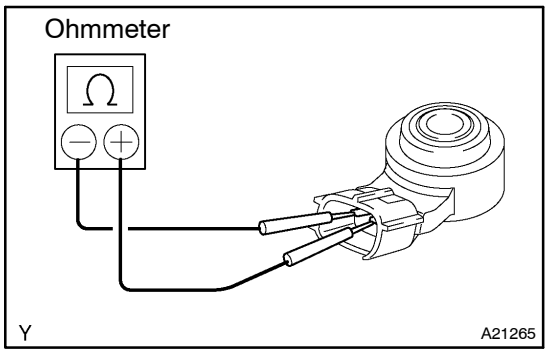
NG → **Replace ECM (See page SF–78).**

OK →

Check for intermittent problems (See page DI–295).

NOTICE:
Fault may be intermittent. Check wire harness and connectors carefully.

4	Check knock sensor.



PREPARATION:
Remove the knock sensor.

CHECK:
Measure the resistance between the terminals.

OK:
Resistance: 120 to 280 kΩ at 20°C (68°F)

NG → **Replace knock sensor.**

OK →

Repair or replace harness or connector.

DIC7H–02

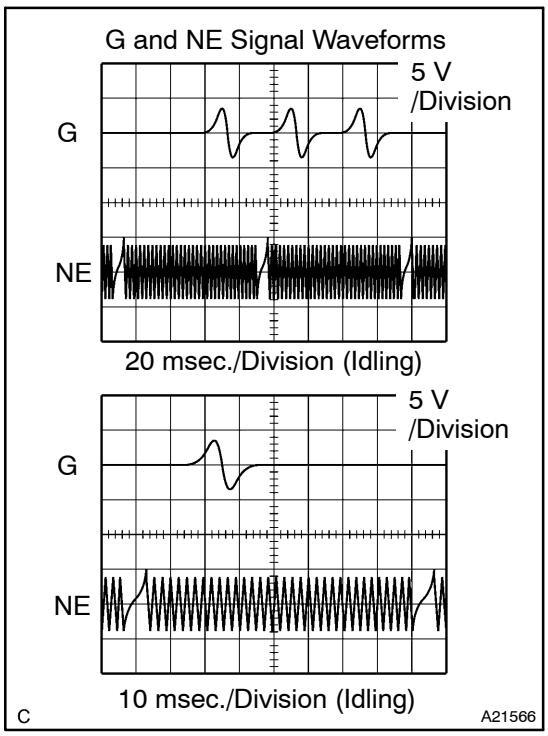
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

DTC	P0339	Crankshaft Position Sensor ”A” Circuit Intermittent

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a magnet, iron core and pickup coil.
The NE signal plate (crankshaft position sensor plate) has 34 teeth and is installed on the crankshaft. The NE signal sensor generates 34 signals for each engine revolution. This sensor monitors a plate (timing rotor) located on the crankshaft timing pulley and is used by the ECM to detect crankshaft angle and engine speed (RPM/NE). As the crankshaft timing pulley rotates through an engine revolution, this sensor communicates the rotation of the NE signal plate as a pulse signal to the ECM. Based on the signal, the ECM controls fuel injection time and ignition timing.

DTC No.	DTC Detection Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Signal plate (crankshaft) • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	
P0339	In conditions (a), (b) and (c), no crankshaft position sensor (NE+) signal is input for 0.05 second or more (a) Engine revolution is 1,000 rpm or more (b) STA signal is OFF (c) 3 seconds or more have elapsed after STA signal is switched from ON to OFF	



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there are no signals from the crankshaft sensor even though the engine is cranking, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0335	Crankshaft position sensor range check or rationality
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Engine speed sensor
Frequency of operation	Continuous	
Duration	Case 1: 4.7 sec. Case 2: 0.016 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

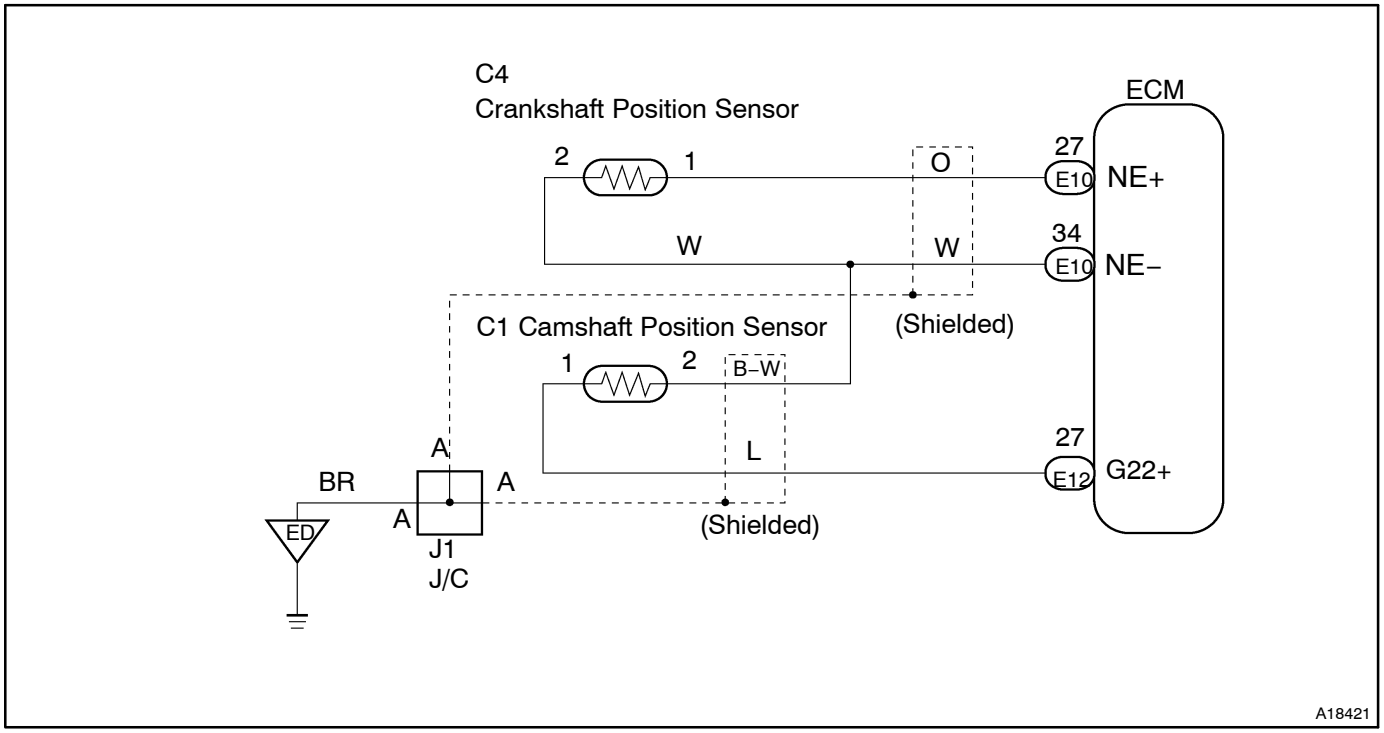
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Case 1:		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
Case 2:		
Engine speed	600 rpm	–
Starter	OFF	
Time after starter turns from ON to OFF	3 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1:	
Engine speed signal	No signal for 4.7 sec.
Case 2:	
Engine speed signal	No signal for 0.016 sec.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- READ VALUE OF HAND–HELD TESTER OR OBD II SCAN TOOL
  (a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
  (b) Start the engine and push the hand–held tester or the OBD II scan tool main switch ON.
  (c) Select the menu ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ENGINE SPD.”
- The engine speed can be confirmed in DATA LIST using the hand–held tester or OBD II scan tool. If there are no NE signals from the crankshaft position sensor despite running the engine, the engine speed will be indicated as zero. If the voltage output of the crankshaft position sensor is insufficient, the engine speed will be indicated as lower RPM (than the actual RPM).

1	Check resistance of crankshaft position sensor.

Component Side:

Crankshaft Position Sensor



Front View

Y A21267

(a) Disconnect the crankshaft position sensor connector.
(b) Measure the resistance between the terminals of the crankshaft position sensor connector.

OK:

Tester Connection	Specified Condition
1 – 2	1,630 to 2,740 Ω at cold
	2,065 to 3,225 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **Replace crankshaft position sensor.**

OK

2	Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

3	Inspect sensor installation.

CHECK:

Check the crankshaft position sensor installation.

NG → **Tighten sensor.**

OK

4	**Check teeth of signal plate.**

PREPARATION:

Remove the crankshaft angle sensor plate (See page EM–19).

CHECK:

Check the teeth of sensor plate.

NG → **Replace signal plate.**

OK

Replace ECM (See page SF–78).

DIC7I–02

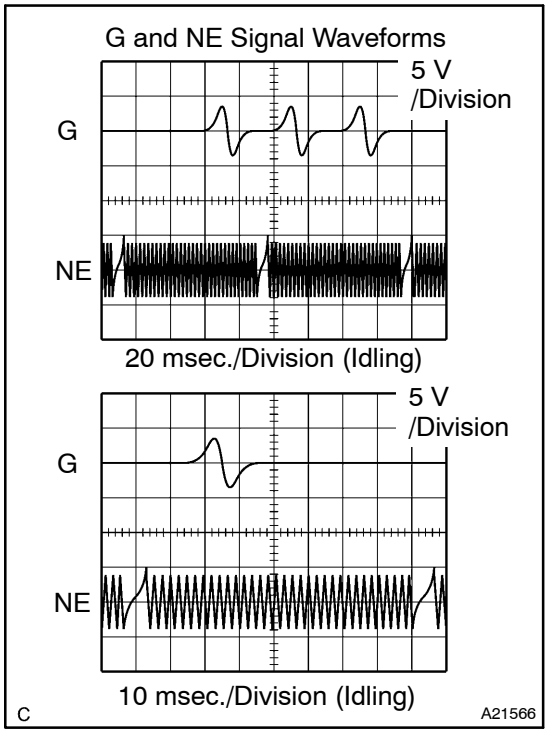
DTC	P0340	Camshaft Position Sensor ”A” Circuit (Bank 1 or Single Sensor)

DTC	P0341	Camshaft Position Sensor ”A” Circuit Range/Performance (Single Sensor)

CIRCUIT DESCRIPTION

The camshaft position sensor (G signal) consists of a magnet iron core and pickup coil.
The G signal plate has 3 teeth on its outer circumference and is installed on the camshaft timing pulley. When the camshafts rotate, protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating voltage in the pickup coil.
The NE signal plate (crankshaft timing pulley) has 34 teeth and is installed to the crankshaft. The NE signal sensor generates 34 signals at every engine revolution. The ECM detects the crankshaft angle and the engine revolution based on the NE signal, and the cylinder and angle of VVT based on the combination of the G and NE signal.

DTC No.	DTC Detection Condition	Trouble Area
P0340	• No camshaft position sensor signal to ECM during cranking (2 trip detection logic) • No camshaft position sensor signal to ECM at engine speed 600 rpm or more (1 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Camshaft timing pulley • Timing chain has a jumped tooth • ECM
P0341	While crankshaft rotates twice, camshaft position sensor signal is input to ECM 12 times or more (1 trip detection logic) • Hint: Under normal condition, the signal from the sensor is regularly input into the ECM 3 times per 2 engine revolutions	



Reference: Inspection by using the oscilloscope.
HINT:
The correct waveform is as shown on the left.

Item	Contents
Terminal	CH1: G+ – NE– CH2: NE+ – NE–
Equipment Setting	5V/Division, 20ms/Division
Condition	During cranking or idling

MONITOR DESCRIPTION

If there is no signal from the camshaft position sensor even though the engine is cranking, or if the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

MONITOR STRATEGY

Related DTCs	P0340	Camshaft position sensor (Bank 1) range check or rationality
	P0341	Camshaft position sensor (Bank 1) range check or rationality
Required sensors/components	Main sensors/components	Camshaft position sensor
	Related sensors/components	Crankshaft position sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	P0340 case 1 (no signal): 2 driving cycles P0340 case 2 (mis–aligned), P0341: Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P0340 Case 1 (No signal):		
Starter	ON	
Minimum battery voltage while starter is ON	–	11 V
P0340 Case 2 (Mis–aligned):		
Engine speed	600 rpm	–
Starter	OFF	
P0341:		
Starter	After OFF to ON timing	
Engine revolution angle	720°CA	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0340 Case 1 (No signal):	
Camshaft position sensor signal	No signal
P0340 Case 2 (Mis–aligned):	
Crankshaft/camshaft (judged by comparing the crankshaft position to the camshaft position)	
Camshaft position sensor signal: No input in appropriate timing.	
P0341:	
Crankshaft/Camshaft alignment	Mis–aligned
Camshaft position sensor count	12 or more / 720°CA (= Engine 2 revolutions)

COMPONENT OPERATING RANGE

Parameter	Standard Value
Camshaft position sensor signal input during every 720°CA	3

WIRING DIAGRAM

Refer to DTC P0335 on page DI–477.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check resistance of camshaft position sensor (See page IG–1).**

Component Side:



Camshaft Position Sensor

Y A21267

CHECK:

Measure the resistance between the terminals of camshaft position sensor connector.

OK:

Tester Connection	Specified Condition
1 – 2	835 to 1,400 Ω at cold
	1,060 to 1,645 Ω at hot

NOTICE:

"Cold" and "Hot" shown above mean the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

NG → **Replace camshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Inspect sensor installation.**

CHECK:

Check the camshaft position sensor installation.

NG → **Tighten sensor.**

OK

4	**Check teeth of camshaft timing pulley.**

NG → **Replace camshaft timing pulley.**

OK

Replace ECM (See page SF–78).

DIC7J–02

DTC	P0351	Igniter Coil ”A” Primary/Secondary Circuit

DTC	P0352	Igniter Coil ”B” Primary/Secondary Circuit

DTC	P0353	Igniter Coil ”C” Primary/Secondary Circuit

DTC	P0354	Igniter Coil ”D” Primary/Secondary Circuit

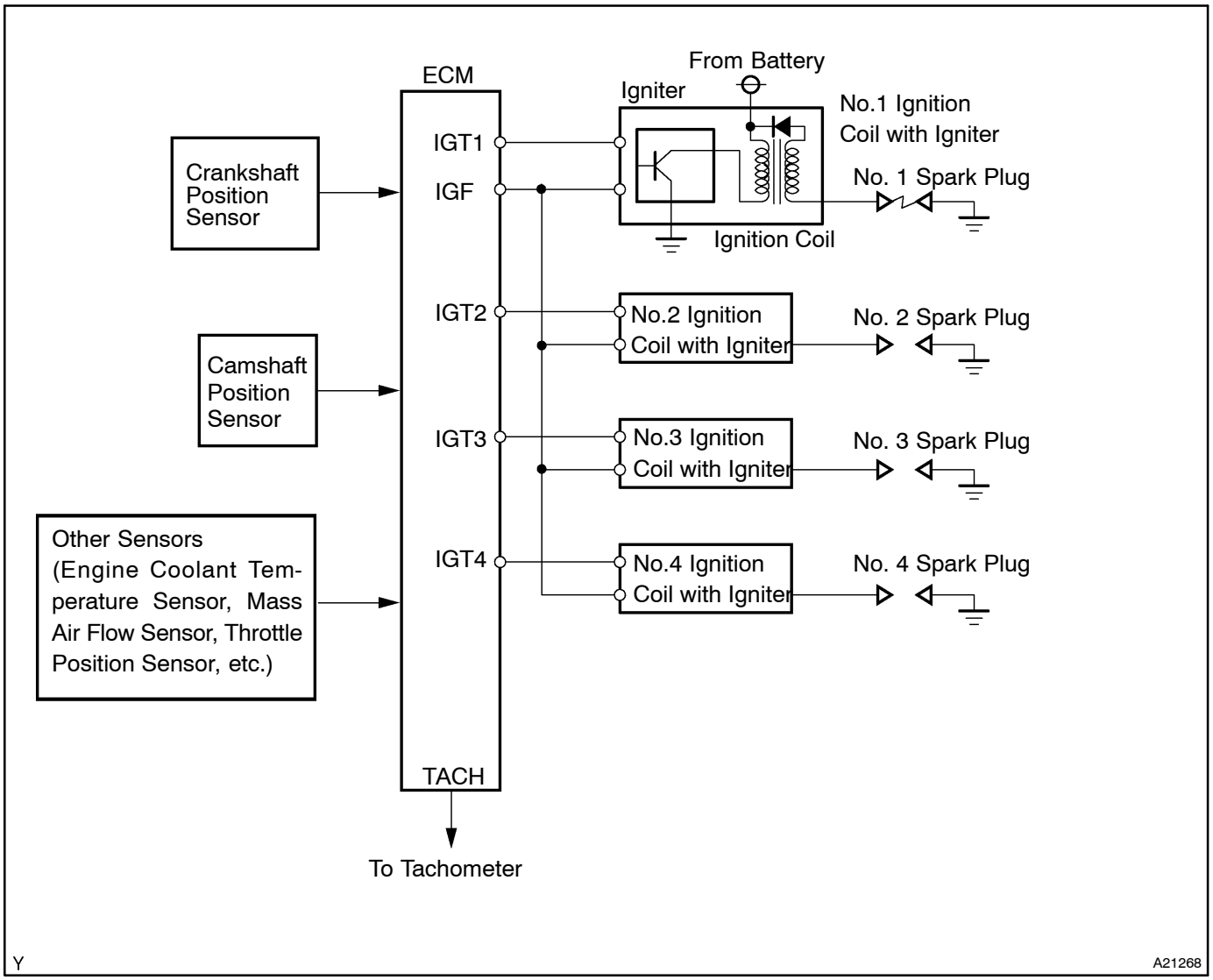
HINT:

- These DTCs indicate a malfunction related to the primary circuit.
- If DTC P0351 is present, check the No. 1 ignition coil with igniter circuit.
- If DTC P0352 is present, check the No. 2 ignition coil with igniter circuit.
- If DTC P0353 is present, check the No. 3 ignition coil with igniter circuit.
- If DTC P0354 is present, check the No. 4 ignition coil with igniter circuit.

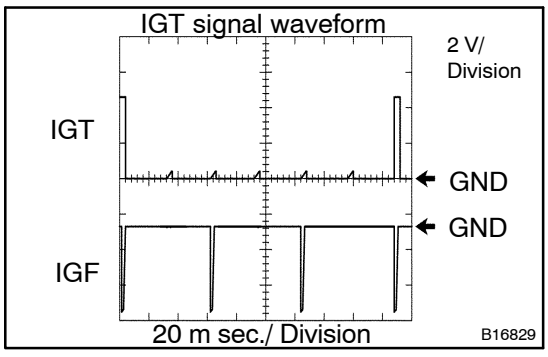
CIRCUIT DESCRIPTION

A Direct Ignition System (DIS) is used on this vehicle. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 1–cylinder ignition system which ignites one cylinder with one ignition coil. In the 1–cylinder ignition system, the one spark plug is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plug. The spark of the spark plug passes from the center electrode to the ground electrode.

The ECM determines the ignition timing and outputs the ignition (IGT) signals for each cylinder. Using the IGT signal, the ECM turns on and off the power transistor inside the igniter and this switches on and off of the current to the primary coil. When the current flow to the primary coil is cut off, high–voltage is generated in the secondary coil and this voltage is applied to the spark plugs to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back the ignition confirmation (IGF) signal for each cylinder ignition to the ECM.



DTC No.	DTC Detecting Condition	Trouble Area
P0351 P0352 P0353 P0354	No IGF signal to ECM while engine is running	• Open or short in IGF and IGT1 – IGT4 circuit from ignition coil with igniter to ECM • No. 1 to No. 4 ignition coil with igniter • Ignition system • ECM



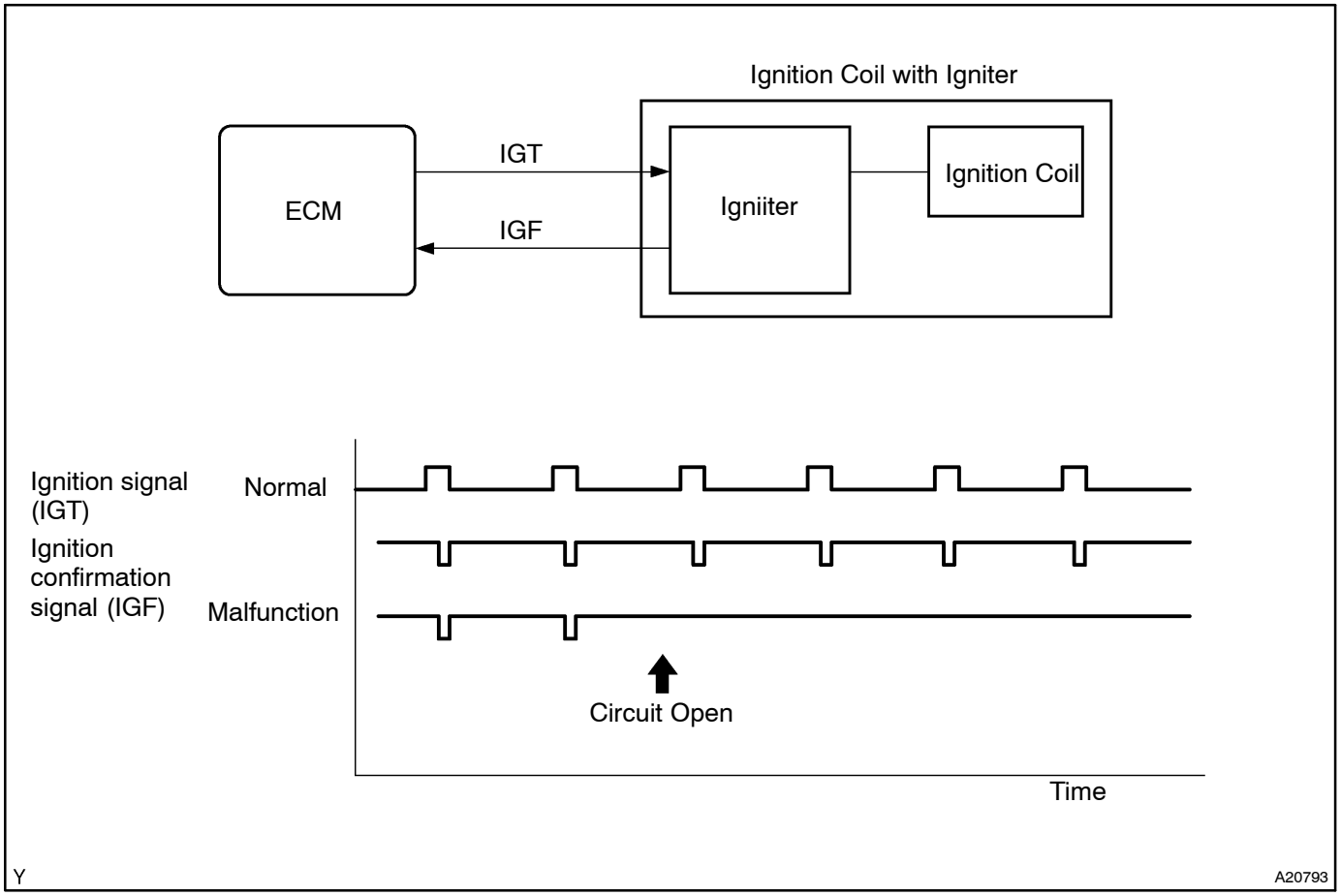
Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check waveform between terminals IGT1 – 4 and E1 of the ECM connector.

HINT:

The correct waveform appears as shown, with rectangle waves.

MONITOR DESCRIPTION



If the ECM does not receive the IGF after sending the IGT, it interprets this as a fault in the igniter and sets a DTC.

MONITOR STRATEGY

Related DTCs	P0351	No. 1 ignition coil with igniter circuit malfunction
	P0352	No. 2 ignition coil with igniter circuit malfunction
	P0353	No. 3 ignition coil with igniter circuit malfunction
	P0354	No. 4 ignition coil with igniter circuit malfunction
Required sensors/components	Igniter	
Frequency of operation	Continuous	
Duration	0.256 sec. + 4 sparks	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Either of the following conditions is met:	A or B	
A. Following conditions are met:	(a) and (b)	
(a) Engine speed	–	500 rpm
(b) Battery voltage	6 V	–
B. Following conditions are met:	(a) and (b)	
(a) Engine speed	500 rpm	–
(b) Battery voltage	10 V	–

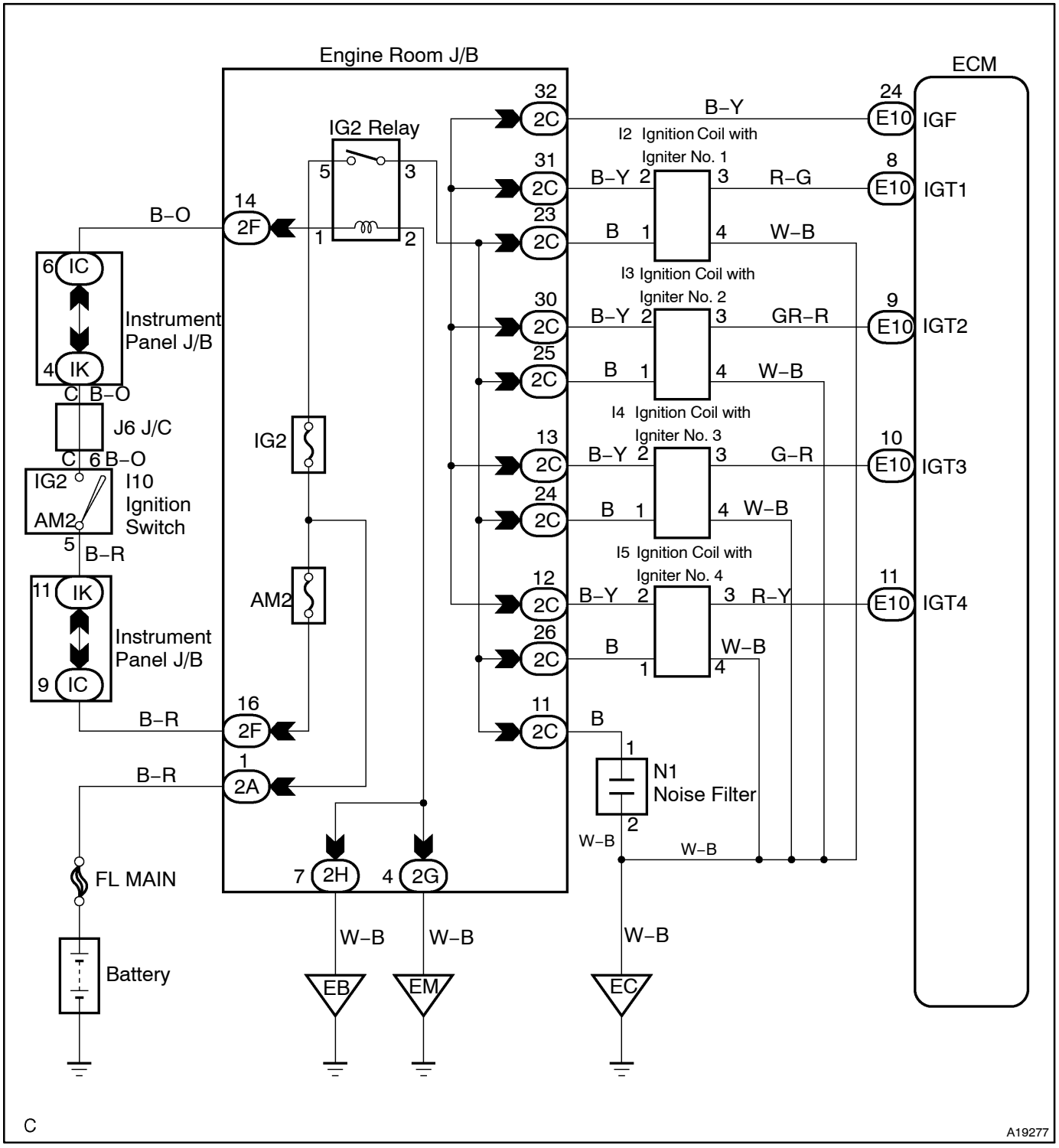
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
”Ignition signal fail count”	More than 2 times
Condition when ”ignition signal fail count” works:	IGF should have returned despite sending IGT.

COMPONENT OPERATING RANGE

Standard Value
Confirmed signal number equals to ignition signal number

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check spark plug and spark of misfiring cylinder (See page IG–1).**

NG → **Go to step 4.**

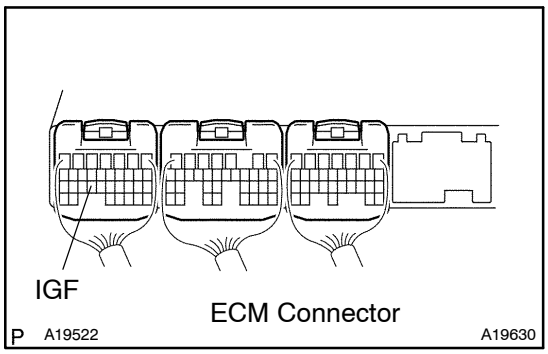
OK

2	**Check for open and short in harness and connector in IGF signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Check voltage between terminals IGF of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.
(b) Disconnect the ignition coil with igniter connector.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGF of the ECM connector and body ground when engine is cranked.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

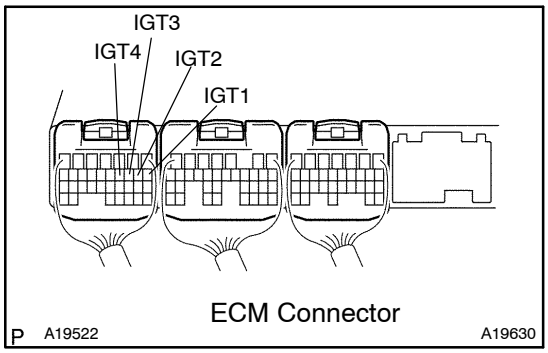
Replace ignition coil with igniter.

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and ignition coil with igniter (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

5	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



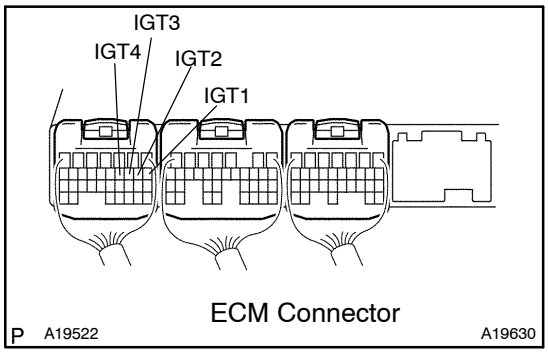
PREPARATION:
Remove the ECM cover.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG → **Replace ECM (See page SF–78).**

OK

6	**Check voltage between terminals IGT1 to 4 of ECM connector and body ground.**



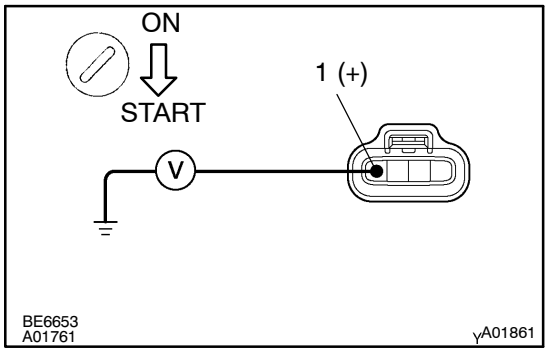
PREPARATION:
Disconnect the ignition coil with igniter connector.
CHECK:
Measure voltage between terminals IGT1 to 4 of the ECM connector and body ground when engine is cranked.
OK:

Voltage: 4.5 V or more

NG → **Replace ECM (See page SF–78).**

OK

7	Check ignition coil with igniter power source circuit.



PREPARATION:

Disconnect the ignition coil with igniter connector.

CHECK:

Measure the voltage between terminal 1 of the ignition coil with igniter connector and body ground when the ignition switch is turned to ON and START position.

OK:

Voltage: 9 to 14 V

NG → **Repair ignition coil with igniter power source circuit.**

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil with igniter (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Replace ignition coil with igniter.

DIC7K–02

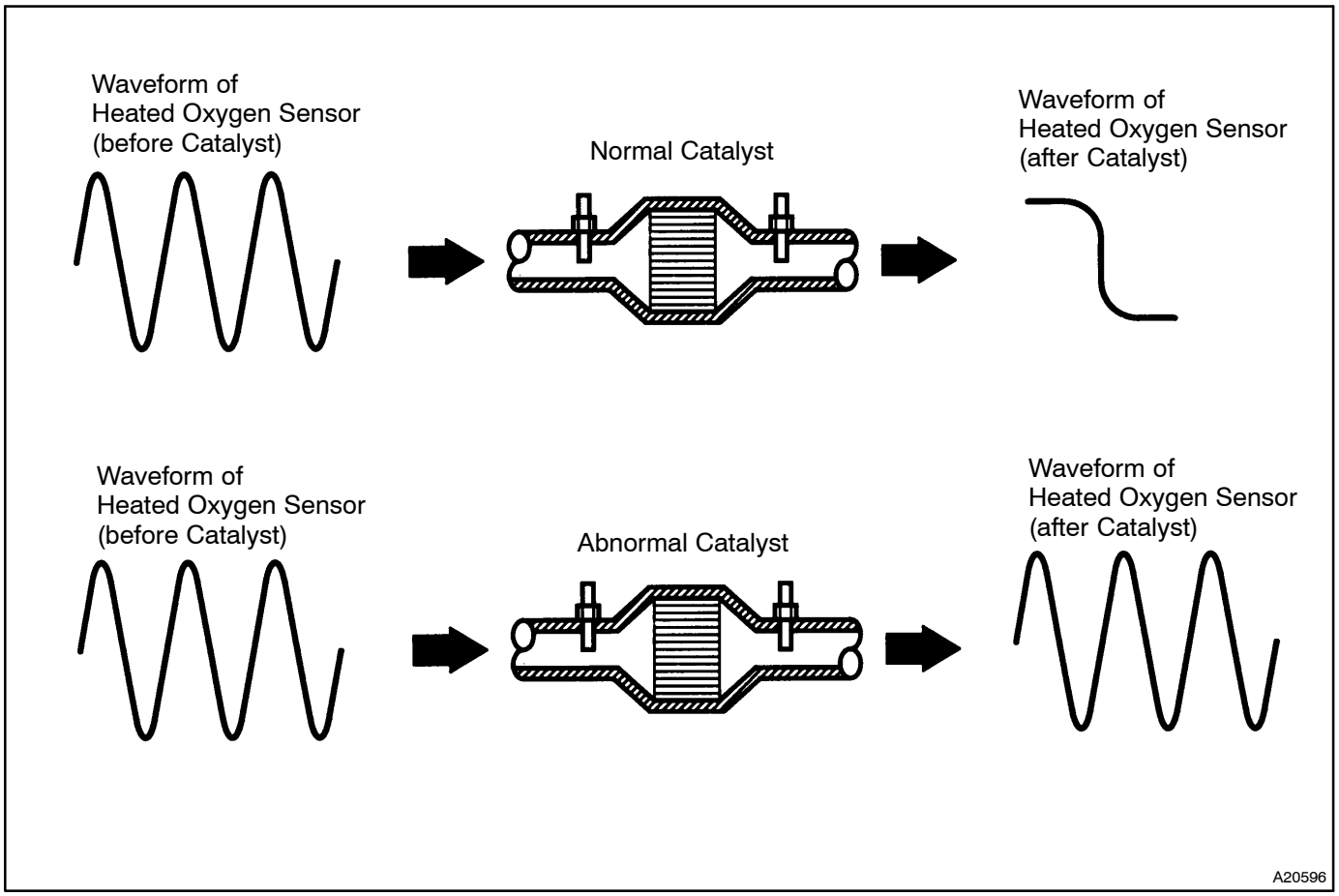
DTC	P0420	Catalyst System Efficiency Below Threshold (Bank 1)

MONITOR DESCRIPTION

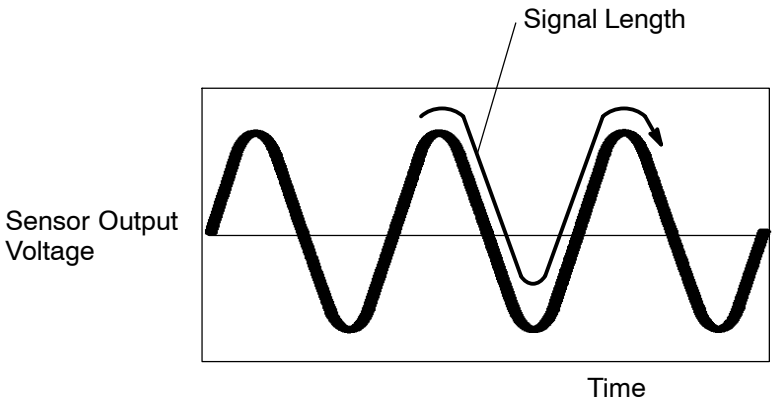
The vehicle is equipped with two heated oxygen sensors. One is mounted upstream from the TWC (Three–Way Catalytic) converter (Front Oxygen Sensor, ”sensor 1”), the second is mounted downstream (Rear Oxygen Sensor ”sensor 2”). The catalyst efficiency monitor compares the sensor 1 and sensor 2 signals in order to calculate TWC ability to store the oxygen.

During normal operation, the TWC stores and releases oxygen as needed. This results in low oxygen variations in the post TWC exhaust stream as shown below.

DTC	Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, each waveform of heated oxygen sensors has the same amplitude (2 trip detection logic).	• Front exhaust pipe (catalyst) • Gas leakage in exhaust system • Heated oxygen sensor



Heated Oxygen Sensor Signal Length



MONITOR STRATEGY

Required sensors/components (main)	
Required sensors/components (related)	Front and rear heated oxygen sensors
Frequency of operation	Once per driving cycle
Duration	90 sec
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
These DTCs are not present	See page DI–295	
Accumulated time that all of the following conditions are met:	30 sec	
Battery voltage	11 V	–
Intake air temperature	–10°C (14°F)	–
Idle status	OFF	
Intake air amount	8 g/sec.	25 g/sec.
Engine RPM	–	4,500 rpm
Engine coolant temperature	75°C (167°F)	–
Catalyst temperature (M/T)	500°C (932°F)	900°C (1652°F)
Catalyst temperature (A/T)	480°C (896°F)	750°C (1382°F)
Fuel system status	Closed loop	

TYPICAL MALFUNCTION THRESHOLDS

Catalyst deterioration level	M/T: 0.5 or more A/T: 0.45 or more
Frequency of detection	3 times

MONITOR RESULT (MODE 6)

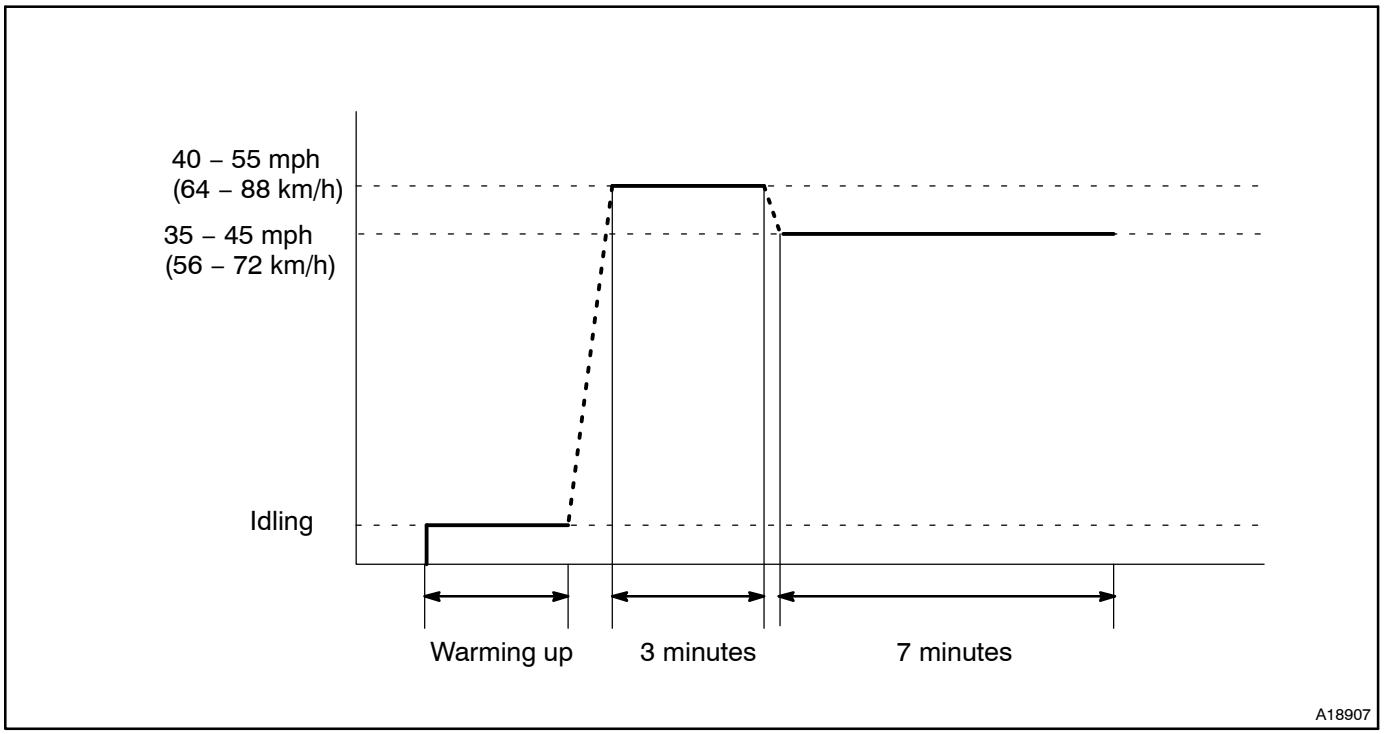
Refer to page DI–295 for detailed information.

Check the monitor result and test values after performing the drive pattern below.

TID $01: Catalyst monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 0.0078 (no dimension)	Catalyst deterioration level	Malfunction criteria for catalyst deterioration

CONFIRMATION DRIVING PATTERN



(a) Clear the DTC.

(b) Warm up the engine until the engine coolant temperature reaches 75°C (167°F).

(c) Drive the vehicle at 40 to 55 mph (64 to 88 km/h) for at least 3 minutes.

(d) Drive the vehicle at 35 to 45 mph (56 to 72 km/h) for at least 7 minutes.

NOTICE:

Drive with smooth throttle operation and avoid sudden acceleration.

INSPECTION PROCEDURE

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P0420) being output?**

If a DTC other than P0420 is set, troubleshoot for the DTC first.

RESULT:

DTC	Proceed to
P0420	A
P0420 and others	B

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check gas leakage on exhaust system.**

NG → **Repair or replace exhaust gas leakage point.**

OK

3	**Perform A/F CONTROL active test.**

(a) Connect the hand–held tester to the DLC3.
(b) Run the engine at 2500 rpm for 90 seconds.
(c) Allow the engine to idle.
(d) Select from the tester menus: DIAGNOSIS / ENHANCED OBDII / ACTIVE TEST / A/F CONTROL.
(e) Switch the injection volume between +25% and –12.5%, and then check the oxygen sensor voltages.

Result

Go to	Heated oxygen sensor (Bank 1 Sensor 1)	Heated oxygen sensor (Bank 1 Sensor 2)	Suspected Trouble Area
A	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Catalysts
B	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage More than 0.5 V Less than 0.4 V	Heated oxygen sensor (Bank 1 Sensor 1)
C	Injection volume +25 % –12.5% Output voltage More than 0.55 V Less than 0.4 V	Injection volume +25 % –12.5% Output voltage Almost no reaction	Heated oxygen sensor (Bank 1 Sensor 2)
D	Injection volume +25 % –12.5% Output voltage Almost no reaction	Injection volume +25 % –12.5% Output voltage Almost no reaction	Extremely rich or lean fuel–trim, etc.

NOTICE:
The front heated oxygen sensor has an output delay of a few seconds.
The rear heated oxygen sensor has a maximum output delay of approximately 20 seconds.

B → Replace heated oxygen sensor (bank 1 sensor 1) (See page EM–117).

C → Replace heated oxygen sensor (bank 1 sensor 2) (See page EM–117).

D → Check fuel trim (See page DI–445).

A

Replace front exhaust pipe (catalyst) (See page EM–117).

–MEMO–

DIC7L–02

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Circuit

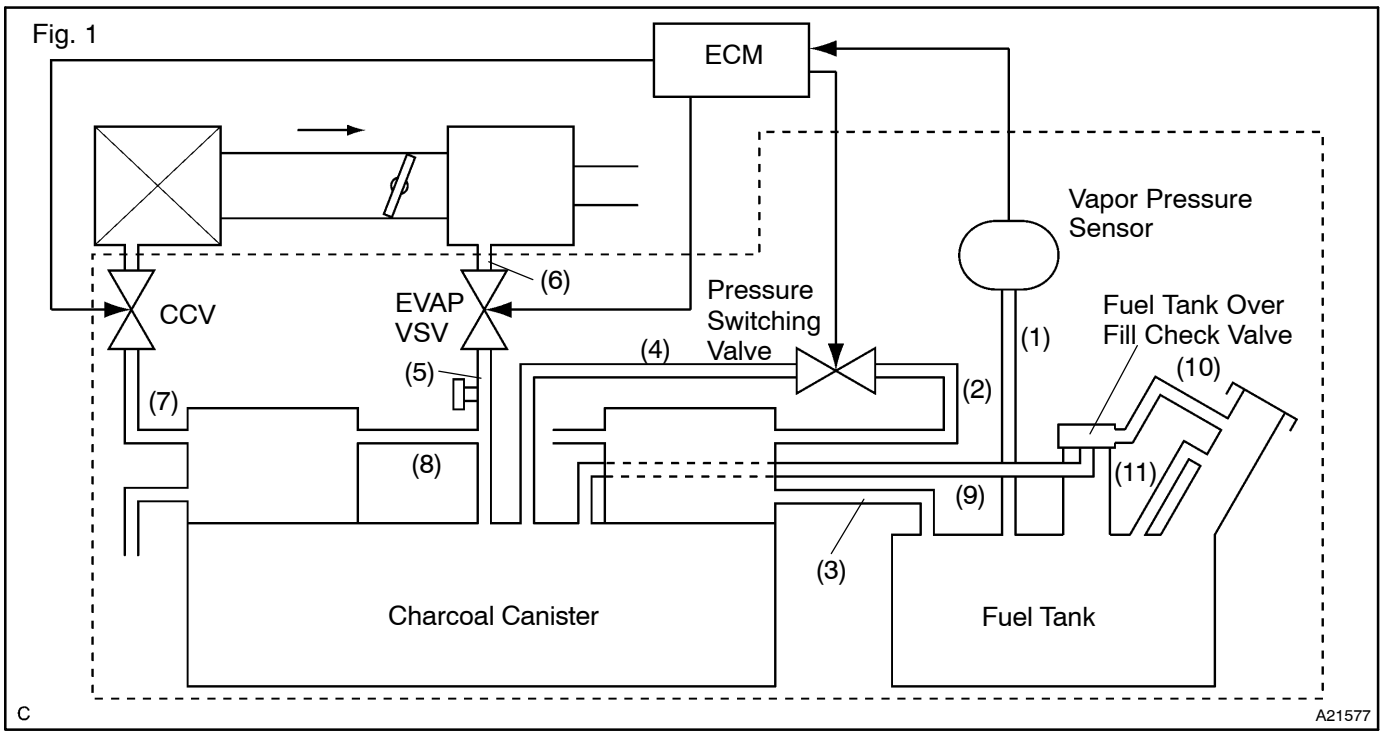
CIRCUIT DESCRIPTION

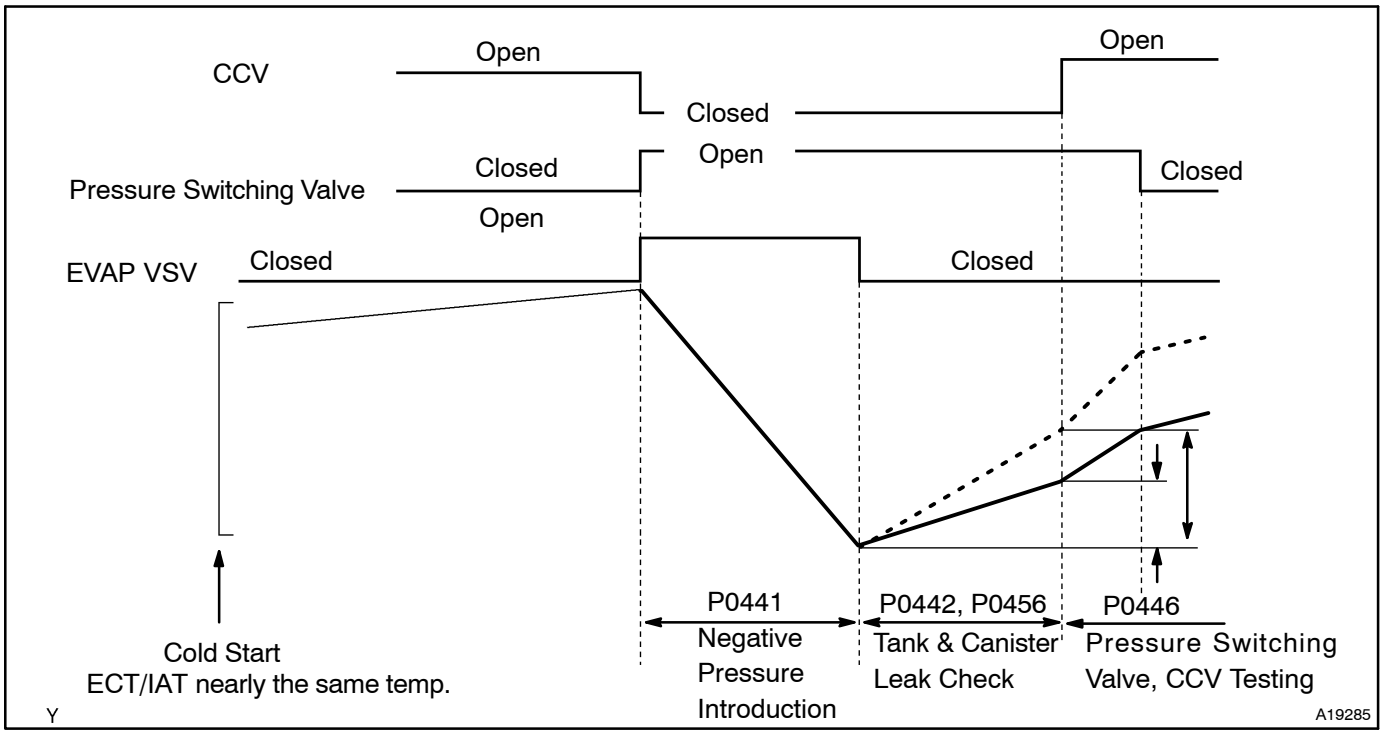
The vapor pressure sensor, canister closed valve (CCV), and pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when there is a malfunction in one of the EVAP VSV or the pressure switching valve, or in the vapor pressure sensor itself.

Fig. 1





MONITOR DESCRIPTION

P0441

The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.

The ECM checks for EVAP VSV "stuck open" fault by commanding both valves (EVAP VSV and CCV) to close at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure at this early stage of the test, the ECM determines that the EVAP VSV is stuck open.

The ECM will turn on the MIL and a DTC will be set.

P0446

If there is a malfunction detected in the evaporative emission (EVAP) VSV, the canister closed valve (CCV) and the bypass valve, the ECM will illuminate the MIL and set a DTC.

This portion of the EVAP diagnosis checks the following EVAP system functions:

(a) CCV stuck closed.
The ECM checks for a CCV "stuck closed" malfunction by commanding the CCV to open after an EVAP leak test. If the fuel tank pressure does not rise (no vacuum generated), the ECM determines that the CCV is stuck closed. The ECM will turn on the MIL and a DTC will be set.

(b) Pressure switching valve stuck closed.
The ECM checks for a pressure switching valve "stuck closed" malfunction by commanding the pressure switching valve to close after an EVAP leak test. If the fuel tank pressure does not change, the ECM determines that the pressure switching valve is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

(c) EVAP VSV (Purge line to intake manifold) stuck closed.
The ECM checks for a stuck closed malfunction in the EVAP VSV by commanding it to open with the CCV closed. If a high negative pressure does not develop in the fuel tank, the ECM determines that the EVAP VSV remains closed. The ECM turns on the MIL and a DTC is set.

DTC No.	DTC Detecting Condition	Trouble Area
P0441	Pressure in charcoal canister and fuel tank does not drop during purge control (2 trip detection logic)	• Vacuum hose is cracked, holed, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in circuit for EVAP VSV • EVAP VSV • Open or short in circuit for CCV • CCV • Open or short in circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, holed or damaged • Charcoal canister is cracked, holed or damaged • Fuel tank over fill check valve is cracked damaged • ECM
	Negative pressure incoming in the charcoal canister and fuel tank does not stop during purge cut–off. (2 trip detection logic)	
P0446	No rising of the fuel tank pressure when commanding the CCV to open after the EVAP leak test	
	No changing of the fuel tank pressure when commanding the pressure switching valve to be checked after the EVAP leak test	
	A high negative pressure (vacuum) does not occur in the system when commanding the EVAP VSV to open with the CCV closed	

HINT:

Typical DTC output of each trouble part is shown in the table below.

Trouble part		Typical DTC output (*1)
Small Leak		”P0442” and/or ”P0456” (*2)
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0442, P0441 and P0446
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0442, P0441 and P0446
CCV	Open Malfunction	P0442, P0441 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0442, P0441 and P0446

*1: ECM may output some other DTC combination.

*2: Refer to P0442 and P0456 on page DI–524.

MONITOR STRATEGY

Related DTCs	P0441	EVAP VSV malfunction
	P0446	Canister close valve stuck closed Pressure switching valve malfunction EVAP VSV malfunction
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Engine coolant temperature sensor, Intake air temperature sensor, Vehicle speed sensor
Frequency of operation	Once per driving cycle	
Duration	P0441 : 90 sec. P0446 : 10 sec.	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
The same as that for DTC P0442		

TYPICAL MALFUNCTION THRESHOLDS

P0441

Detection Criteria	Threshold
Either the following conditions is met:	A or B
A. Following conditions are met:	(a) and (b)
(a) Fuel tank pressure at the vacuum introduction start	–1.6 kPa (–12 mmHg, –0.47 in.Hg) or more
(b) Difference between the fuel tank pressure at the vacuum introduction start and completion	Less than 0.9 kPa (7 mmHg, 0.27 in.Hg)
B. Following conditions are met for 14 sec.:	(a) and (b)
A. Difference between ”minimum” fuel tank pressure before the leak check and fuel tank pressure at 14 sec. after the leak check	0.46 kPa or more (3.5 mmHg, 0.14 in.Hg)
(b) Fuel tank pressure 14 sec. after the leak check	Less than –3.7 kPa (–28 mmHg, –1.1 in.Hg)

P0446

Detection Criteria	Threshold
Case 1: CCV stuck closed	
Fuel tank pressure when the CCV is opened after an EVAP leak check	Not changing
Case 2: Pressure switching valve malfunction	
Fuel tank pressure when the pressure switching valve is closed after an EVAP leak check	Not changing
Case 3: EVAP VSV stuck closed	
Fuel tank pressure after the EVAP VSV is opened and manifold vacuum is introduced to the fuel tank	Not changing

MONITOR RESULT

Refer to page DI–295 for detailed information.

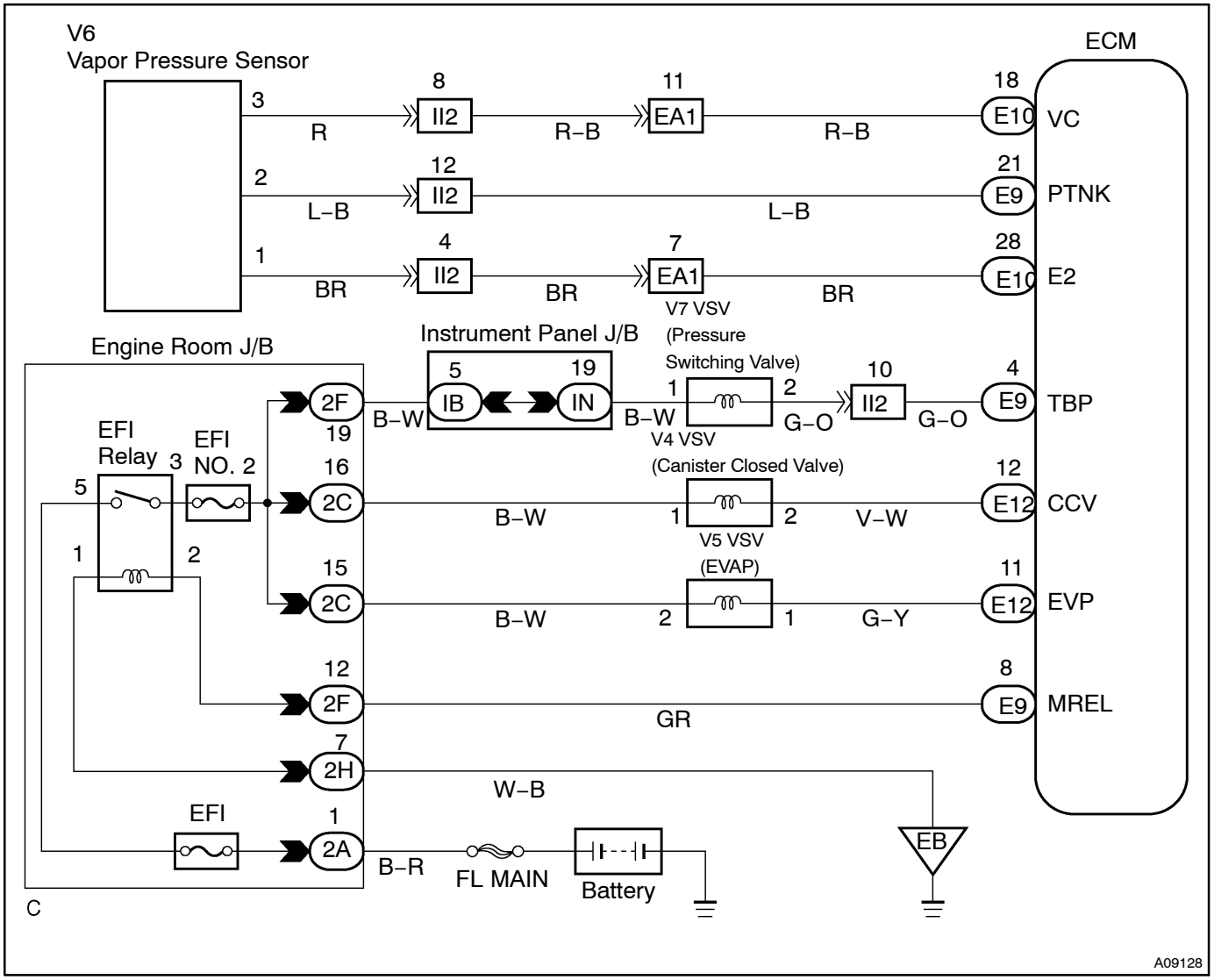
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplyied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTC P0441 (Purge Flow), P0446 (CCV or pressure switching valve), P0451, P0452 or P0453 (See page DI–545) is output with DTC P0442 or P0456 (See page DI–524), first troubleshoot DTC P0441, P0446, P0451, P0452 or P0453. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

Hand–held tester:

1	Check that fuel tank cap meets OEM specifications.

NG → Replace with a cap that meets OEM specifications.

OK

2	Check that fuel tank cap is correctly installed.

NG → Correctly install fuel tank cap.

OK

3	Check fuel tank cap (See page EC–6).

NG → Replace fuel tank cap.

OK

4	Check filler neck for damage.

PREPARATION:

Remove the fuel tank cap.

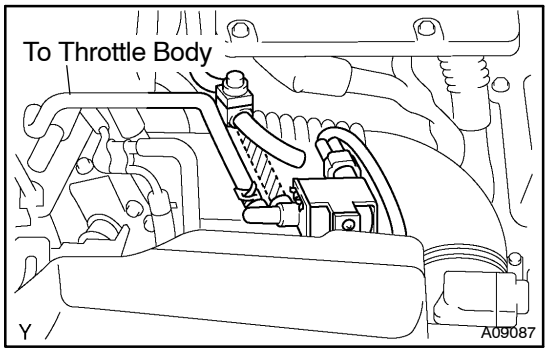
CHECK:

Visually inspect the filler neck for damage.

NG → Replace filler pipe.

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the menu "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes, damages and blockage.

NG	Repair or replace vacuum hose.

OK

7	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

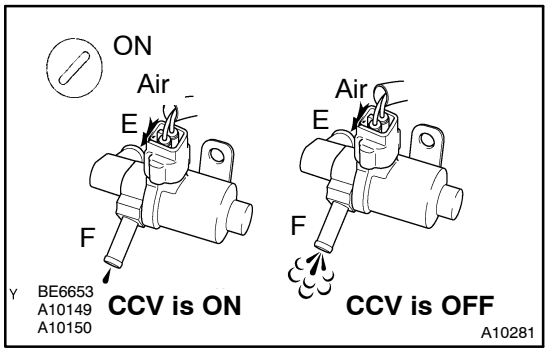
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

9	Check CCV.



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(d) Select the menu "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the CCV operation when it is operated by the hand–held tester.

OK:

CCV is ON:
Air does not flow from port E to port F.
CCV is OFF:
Air from port E flows out through port F.

OK	Go to step 13.

NG

10	Check vacuum hose between CCV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes damages, and blockage.

NG	Repair or replace vacuum hose.

OK

11	Check operation of CCV (See page SF–63).

NG	Replace CCV.

OK

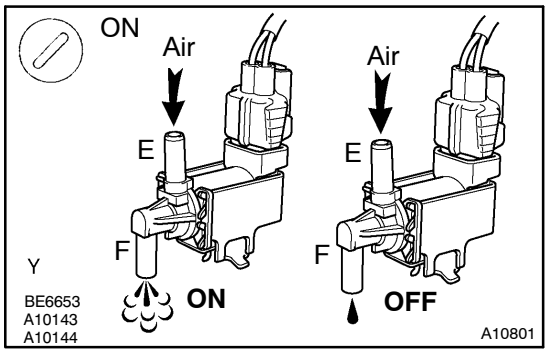
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	**Check pressure switching valve.**



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the menu "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

CHECK:

Check the pressure switching valve operation when it is operated by the hand–held tester.

OK:

Pressure switching valve is ON:
Air from port E flows out through port F.
Pressure switching valve is OFF:
Air does not flow from port E to port F.

OK → **Go to step 16.**

NG

14	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

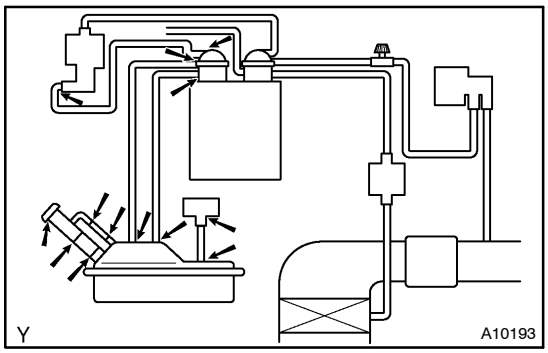
15	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Fuel tank filler pipe
- Hoses and tubes around fuel tank

NG → **Repair or replace evaporative emission leak point.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes and damages.

NG → **Repair or replace vacuum hose.**

OK

18	Check hose and tube between fuel tank and charcoal canister.

CHECK:

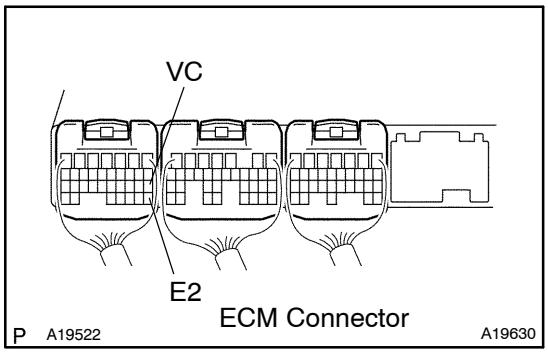
(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.

(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

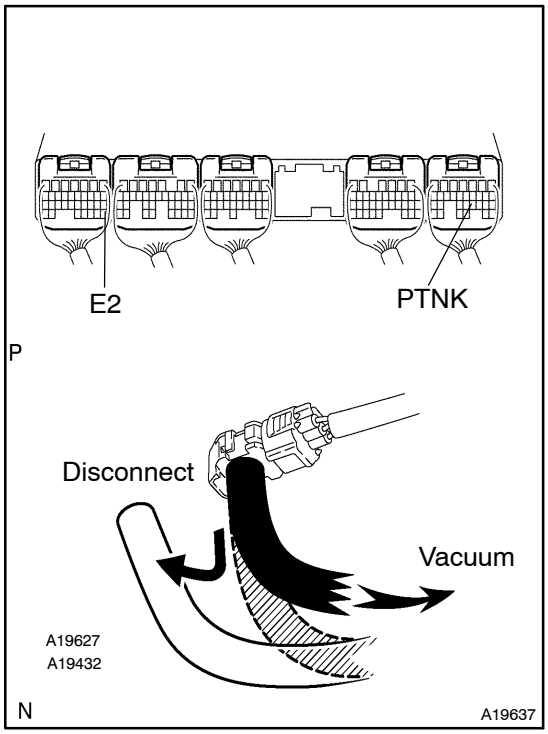
OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK → **Go to step 22.**

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG → **Replace fuel tank inlet valve.**

OK

23	Check fuel tank.

NG → Replace fuel tank.

OK

24	Check charcoal canister for cracks, holes and damages.

NG → Repair or replace charcoal canister.

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check that fuel tank cap meets OEM specifications.**

NG → **Replace with a cap that meets OEM specifications.**

OK

2	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

3	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

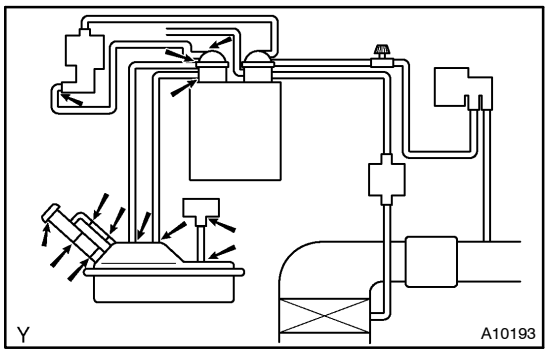
4	**Check filler neck for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → **Replace filler pipe.**

OK

5	Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace evaporative emission leak part.**

OK

6	Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes and damages.

NG → **Repair or connect VSV or sensor connector.**

OK

7	Check hose and tube between fuel tank and charcoal canister.

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

8	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes, damages, and blockage.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

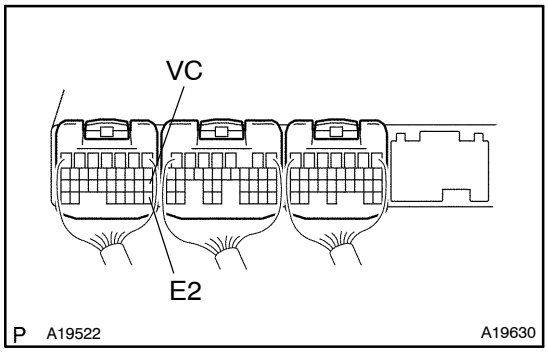
OK

10	**Check charcoal canister for cracks, holes and damages.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

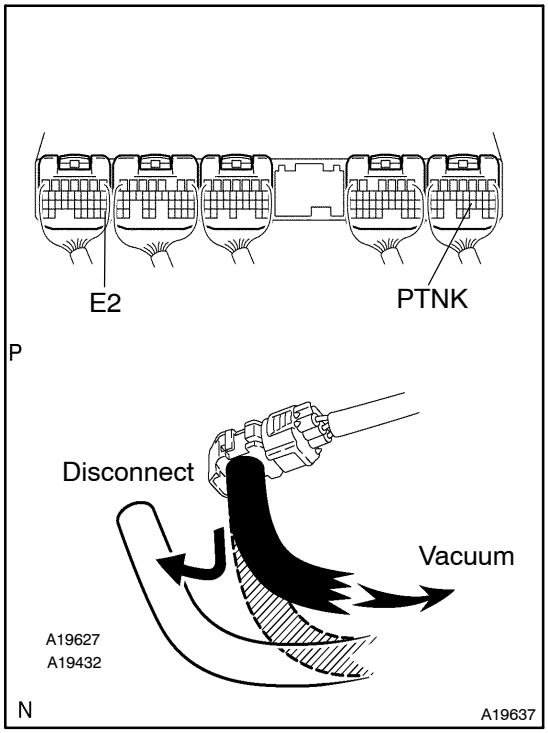
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

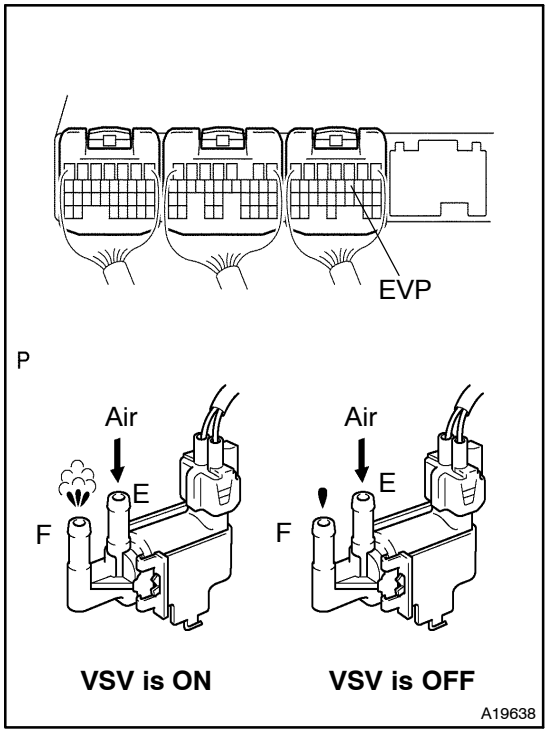
13	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

14	**Check EVAP VSV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect the terminal EVP of the ECM connector and body ground (ON).

(2) Disconnect the terminal EVP of the ECM connector and body ground (OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → **Go to step 17.**

NG

15	**Check operation of EVAP VSV (See page SF–61).**

NG → **Replace EVAP VSV.**

OK

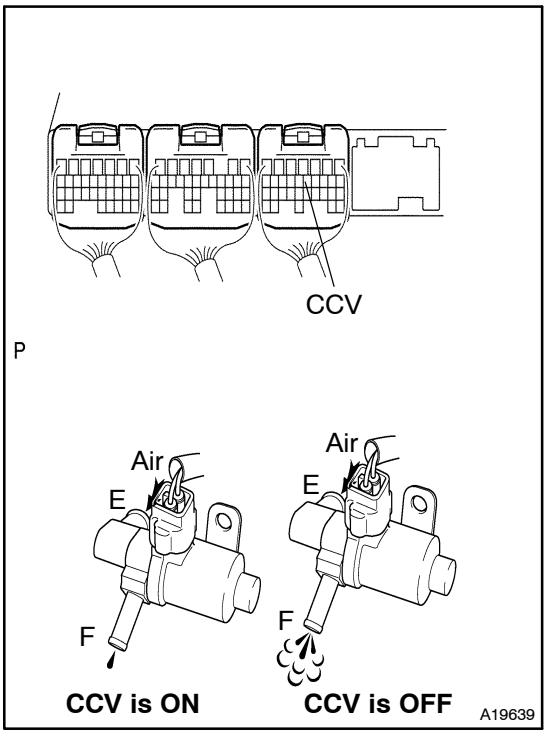
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the CCV function.

(1) Connect the terminal CCV of the ECM connector and body ground (ON).

(2) Disconnect the terminal CCV of the ECM connector and body ground (OFF).

OK:

(1) CCV is ON:
Air does not flow from port E to port F.
(2) CCV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

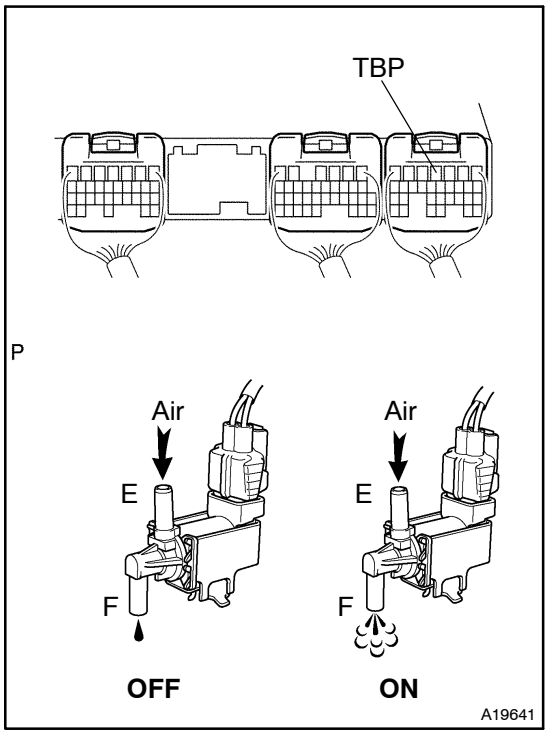
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the pressure switching valve function.

(1) Connect the terminal TBP of the ECM connector and body ground (ON).

(2) Disconnect the terminal TBP of the ECM connector and body ground (OFF).

OK:

(1) Pressure switching vavle is ON:
Air from port E flows out through port F.
(2) Pressure switching valve is OFF:
Air does not from flow port E to port F.

OK → **Go to step 23.**

NG

21	**Check operation of pressure switching valve (See page SF–65).**

NG → **Replace pressure switching valve.**

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK

24	Check fuel tank.

NG → Replace fuel tank.

OK

It is likely that vehicle user did not properly close fuel tank cap.

DIC7M–02

DTC	P0442	Evaporative Emission Control System Leak Detected (Small Leak)

DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)

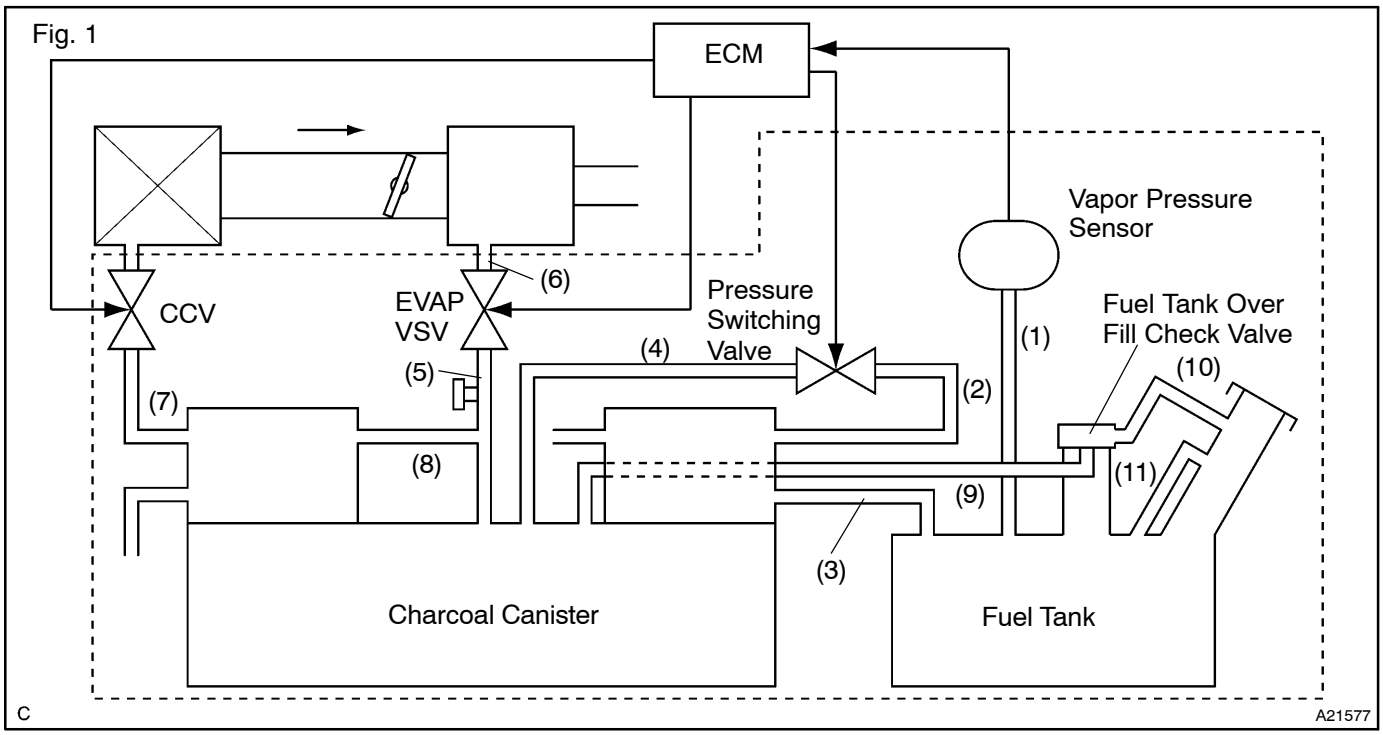
CIRCUIT DESCRIPTION

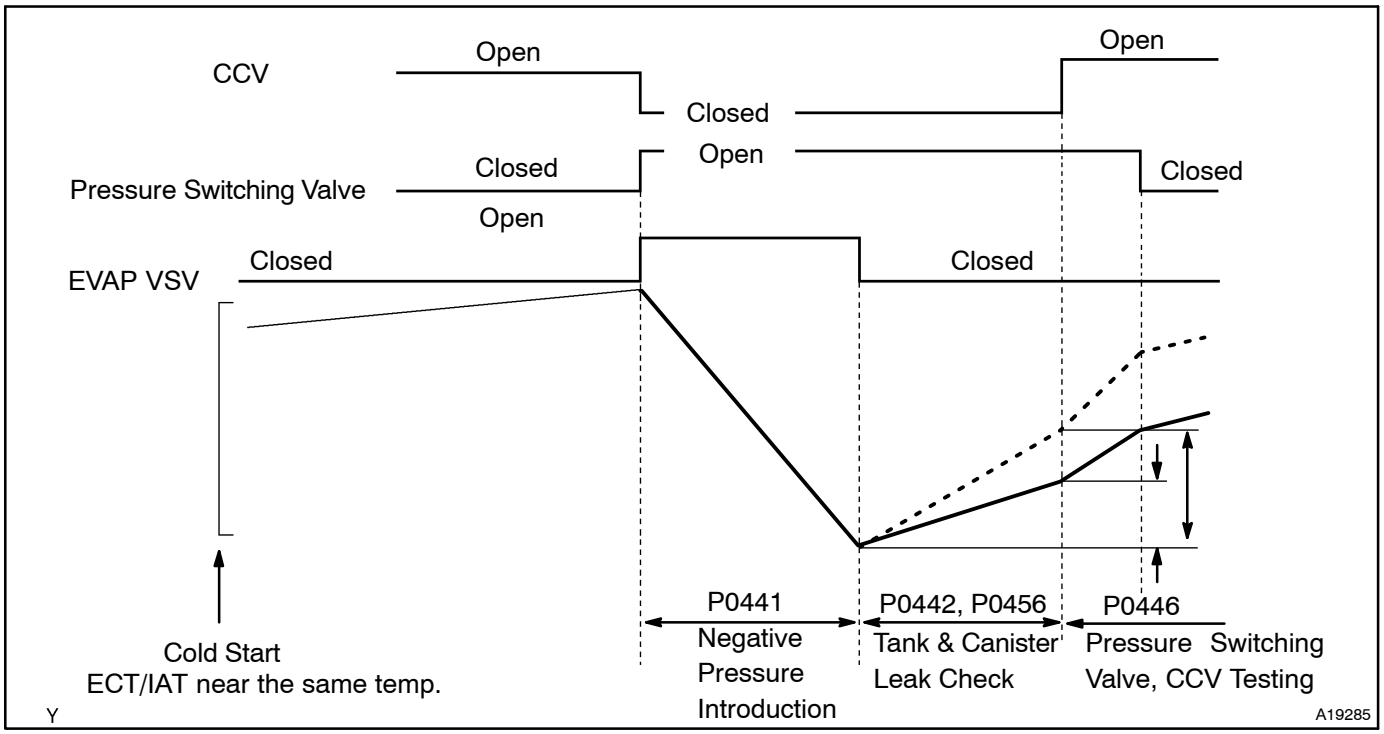
The vapor pressure sensor, canister closed valve (CCV) and pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTC P0442 or P0456 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.

Fig. 1





DTC No.	DTC Detection Condition	Trouble Area
P0442	After negative pressure introduction is completed, the pressure in the EVAP system sharply increases (small leak) (2 trip detection logic)	• Fuel tank cap is incorrectly installed • Fuel tank cap is cracked or damaged • Vacuum hose is cracked, blocked, damaged or disconnected ((1), (2), (3), (4), (5), (6), (7), (8), (9), (10) and (11) in Fig. 1) • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in circuit for EVAP VSV • EVAP VSV • Open or short in circuit for CCV • CCV • Open or short in circuit for pressure switching valve • Pressure switching valve • Fuel tank is cracked, or damaged • Charcoal canister is cracked, or damaged • Fuel tank over fill check valve is cracked or damaged • ECM
P0456	The pressure in the EVAP system slightly increases while the ECM performs a leak check (very small leak) (2 trip detection logic)	

HINT:

Typical DTC output of each trouble part

Trouble part		Typical DTC output (*1)
Small Leak		”P0442” and/or ”P0456”
Medium Leak (ex: Vacuum hose loose)		P0442
Large Leak (ex: Fuel tank cap loose)		P0442 and P0441 and P0446 (*2)
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0442 and P0441 and P0446
CCV	Open Malfunction	P0442 and P0441 and P0446
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P0446
	Close Malfunction	P0442 and P0441 and P0446

*1: ECM may output some other DTC combination.

*2: Refer to DTC P0441 and P0446 on page DI–501.

MONITOR DESCRIPTION

The evaporative emission system consists of the vapor pressure sensor, the CCV (Canister Closed Valve), the pressure switching valve and the EVAP VSV (Purge VSV), and those are used to detect malfunctions in the system by ECM.

This test will run once per driving cycle when the ECM detects stable vapor pressure in the fuel tank. While the vehicle is being driven on rough or winding roads, the movement of the fuel in the tank will cause unstable fuel tank vapor pressure and the diagnostic test will not executed.

The ECM performs the following steps:

(a) Closes the CCV. (shuts the system)

(b) Checks the stability of the fuel tank pressure. If the variation in the pressure is greater than the specified value, disables the diagnosis.

(c) Opens the EVAP VSV to introduce a negative pressure (vacuum) from the intake manifold into the fuel tank.

(d) Closes the EVAP VSV to seal the fuel tank for storing the negative pressure.

(e) Monitors the negative pressure in the fuel tank for:

(1) Rapid decrease, i.e. a large leak, 0.040 inch or more

(2) Decrease greater than the normal value

If the ECM detects either of the above conditions, the ECM interprets this as a leak in the EVAP system. The ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0442	Small leak (0.040 inch or more large hole) is detected
	P0456	Very small leak (0.020 inch hole) is detected
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor EVAP VSV (purge VSV), CCV
Frequency of operation	Once per driving cycle	
Duration	60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
All:		
Altitude	–	2,400 m (7,872 ft.)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank pressure sensor malfunction	Not detected	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated at scan tool	
P0456 (0.020 inch leak):		
Engine coolant temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature	10˚C (50˚F)	–
Vehicle speed change	Vehicle is driven at steady speed	
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% or more (when intake air amount is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% or more (when vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairly smooth road)	
Time after engine start	–	50 min.
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
0.040 inch leak	Not detected	
CCV malfunction, bypass VSV malfunction	Not detected	
Vehicle speed	–	130 km/h (80.6 mph)
Purge VSV malfunction	Not detected	
P0442 (0.040 inch leak):		
Engine coolant temperature at engine start	10˚C (50˚F)	35˚C (95˚F)
Intake air temperature at engine start	10˚C (50˚F)	35˚C (95˚F)
Intake air temperature	10˚C (50˚F)	–
Either of the following conditions is met:	Condition 1 or 2	
1. Purge duty cycle	15% or more (when intake air amount is 8 g/sec. or more)	–
2. Purge concentration for 30 sec.	–5%/% or more (when vehicle speed is less than 10 km/h (6.2 mph))	–
Fuel slosh	No sloshing (i.e fairly smooth road)	
Vehicle speed change	Vehicle is driven at steady speed	

Time after engine start	–	50 min.
Fuel tank pressure change before vacuum introduction	Minimum change	
Fuel level	–	90%
Purge VSV malfunction	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0456 (0.020 inch leak):	
Both of the following conditions are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.0 kPa (–15 mmHg)	0.067 kPa (0.5 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.7 kPa (–20 mmHg)	0.067 kPa (0.5 mmHg) or more
P0442 (0.040 inch leak):	
Both of the following conditions are met:	Condition 1 and 2
1. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.0 kPa (–15 mmHg)	0.24 kPa (1.8 mmHg) or more
2. Fuel tank pressure change for 5 sec. when fuel tank pressure is –2.7 kPa (–20 mmHg)	0.24 kPa (1.8 mmHg) or more

Refer to page DI–295 for detailed information on Checking Monitor Status.

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $02: EVAP system – Vacuum monitor

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
1	$01	Multiplied by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criteria for EVAP VSV
1	$02	Multiplied by 0.0458 subtract 2.93 (mmHg)	Test value of canister closed valve (CCV) and bypass VSV: Determined by fuel tank pressure change at switching over CCV and bypass VSV	Malfunction criteria for CCV and bypass VSV
0	$03	Multiplied by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.04 inch leak
0	$04	Multiplied by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criteria for 0.02 inch leak

INSPECTION PROCEDURE

Hand–held tester:

1	**Check that fuel tank cap meets OEM specifications.**

NG → **Replace with a cap that meets OEM specifications.**

OK

2	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

3	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

4	**Check filler neck for damage.**

PREPARATION:

Remove the fuel tank cap.

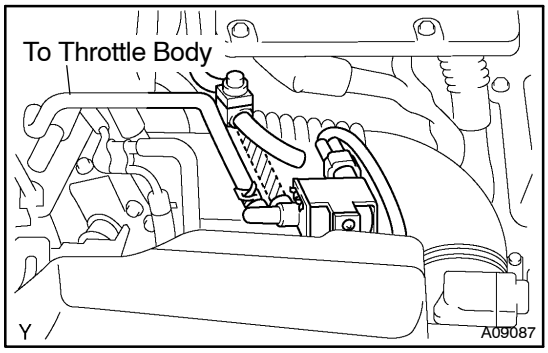
CHECK:

Visually inspect the filler neck for damage.

NG → **Replace filler pipe.**

OK

5	Check purge flow.



PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.
(c) Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
(d) Start the engine.
(e) Select the menu "EVAP VSV (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV (Press the right or left button).

CHECK:

When the EVAP VSV is operated by the hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 9.

NG

6	Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes, damages and blockage.

NG	Repair or replace vacuum hose.

OK

7	**Check operation of EVAP VSV (See page SF–61).**

NG → **Replace EVAP VSV.**

OK

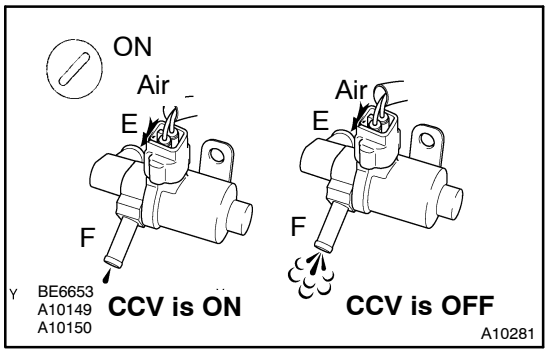
8	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

9	**Check CCV.**



PREPARATION:

(a) Disconnect the vacuum hose for the CCV from the charcoal canister.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

(c) Select the ”ENHANCED OBD II / ACTIVE TEST” mode on the hand–held tester.

(d) Select the menu ”CAN CTRL VSV / ALL” in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the CCV operation when it is operated by the hand–held tester.

OK:

CCV is ON:
Air does not flow from port E to port F.
CCV is OFF:
Air from port E flows out through port F.

OK → **Go to step 13.**

NG

10	**Check vacuum hose between CCV and charcoal canister.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes damages, and blockage.

NG → **Repair or replace vacuum hose.**

OK

11	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

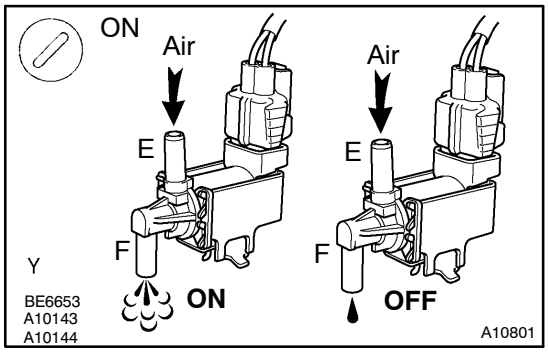
12	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

13	Check pressure switching valve.



PREPARATION:

(a) Turn the ignition switch ON and push the hand–held tester main switch ON.

(b) Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand–held tester.

(c) Select the menu "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (Press the right or left button).

CHECK:

Check the pressure switching valve operation when it is operated by the hand–held tester.

OK:

Pressure switching valve is ON:
Air from port E flows out through port F.
Pressure switching valve is OFF:
Air does not flow from port E to port F.

OK	Go to step 16.

NG

14	Check operation of pressure switching valve (See page SF–65).

NG	Replace pressure switching valve.

OK

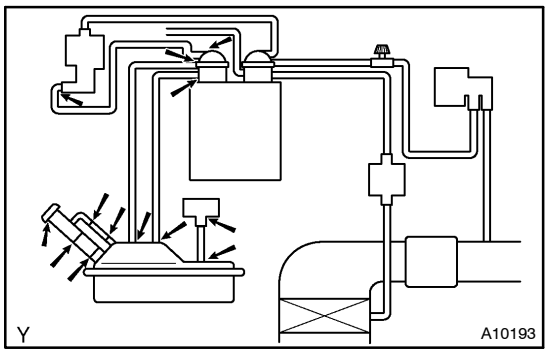
15	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

16	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace evaporative emission leak part.**

OK

17	**Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes and damages.

NG → **Repair or replace vacuum hose.**

OK

18	**Check hose and tube between fuel tank and charcoal canister.**

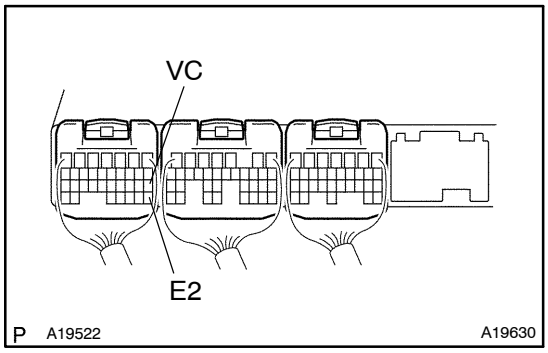
CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

19	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

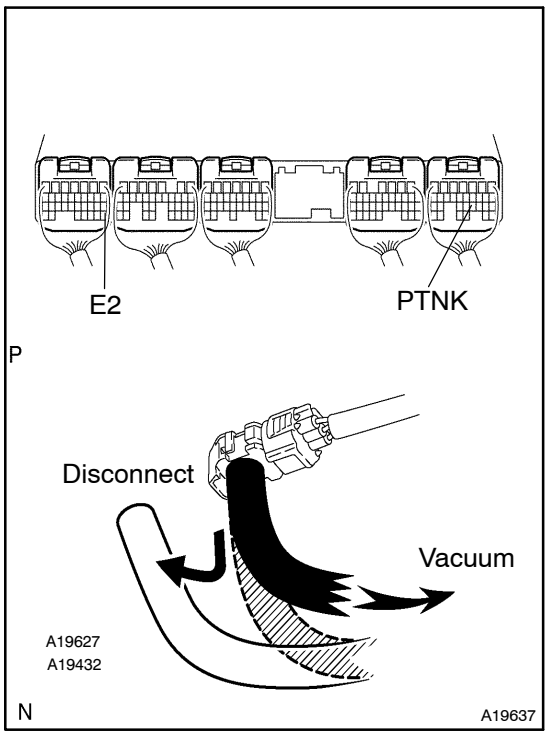
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

20	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 22.

NG

21	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK →

Replace ECM (See page SF–78).

22	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK →

23	Check fuel tank.

NG → Replace fuel tank.

OK →

24	Check charcoal canister for cracks, holes and damages.

NG → Repair or replace charcoal canister.

OK →

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check that fuel tank cap meets OEM specifications.**

NG → **Replace with a cap that meets OEM specifications.**

OK

2	**Check that fuel tank cap is correctly installed.**

NG → **Correctly install fuel tank cap.**

OK

3	**Check fuel tank cap (See page EC–6).**

NG → **Replace fuel tank cap.**

OK

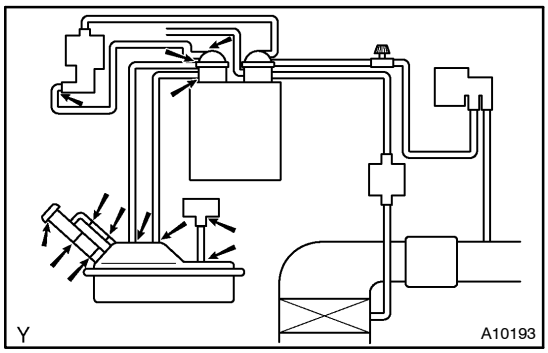
4	**Check filler neck for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → **Replace filler pipe.**

OK

5	**Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG → **Repair or replace evaporative emission leak part.**

OK

6	**Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes and damages.

NG → **Repair or replace vacuum hose.**

OK

7	**Check hose and tube between fuel tank and charcoal canister.**

CHECK:

(a) Check for proper connection of the fuel tank and fuel evap pipe (See page EC–6), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
(b) Check the hose and tube for cracks, holes and damages.

NG → **Repair or replace hose and tube.**

OK

8	**Check vacuum hoses ((8), (9), (10) and (11) in Fig. 1 in circuit description).**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, holes damage, and blockages.

NG → **Repair or replace vacuum hose.**

OK

9	**Check connector for EVAP VSV, connector for CCV, connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

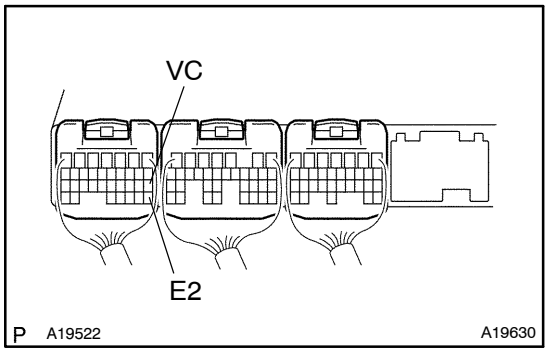
OK

10	**Check charcoal canister for cracks, holes and damages.**

NG → **Check and replace charcoal canister.**

OK

11	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

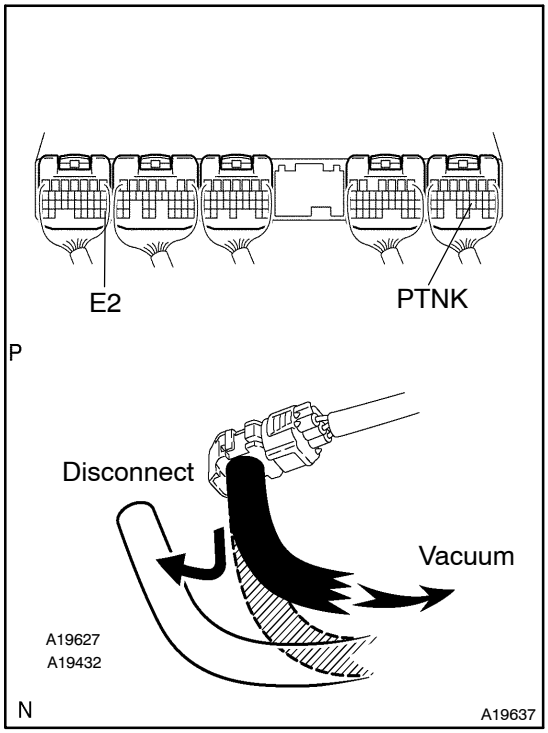
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

12	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connector under following condition (1) and (2).

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK	Go to step 14.

NG

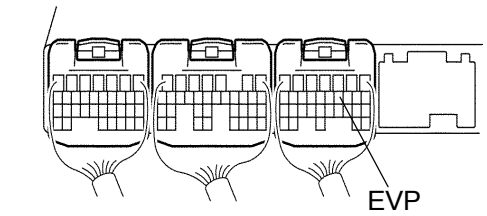
13	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

14	Check EVAP VSV.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the VSV function.

(1) Connect the terminal EVP of the ECM connector and body ground (ON).

(2) Disconnect the terminal EVP of the ECM connector and body ground (OFF).

OK:

(1) VSV is ON:
Air from port E flows out through port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK → Go to step 17.

NG

15	Check operation of EVAP VSV (See page SF–61).

NG → Replace EVAP VSV.

OK

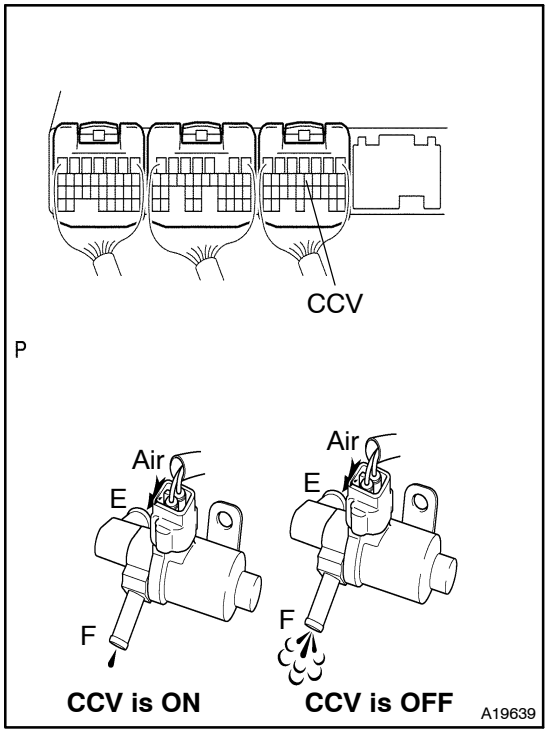
16	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and EVAP VSV, and EVAP VSV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

17	**Check CCV.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the CCV function.

(1) Connect the terminal CCV of the ECM connector and body ground (ON).

(2) Disconnect the terminal CCV of the ECM connector and body ground (OFF).

OK:

(1) CCV is ON:
Air does not flow from port E to port F.
(2) CCV is OFF:
Air from port E flows out through port F.

OK → **Go to step 20.**

NG

18	**Check operation of CCV (See page SF–63).**

NG → **Replace CCV.**

OK

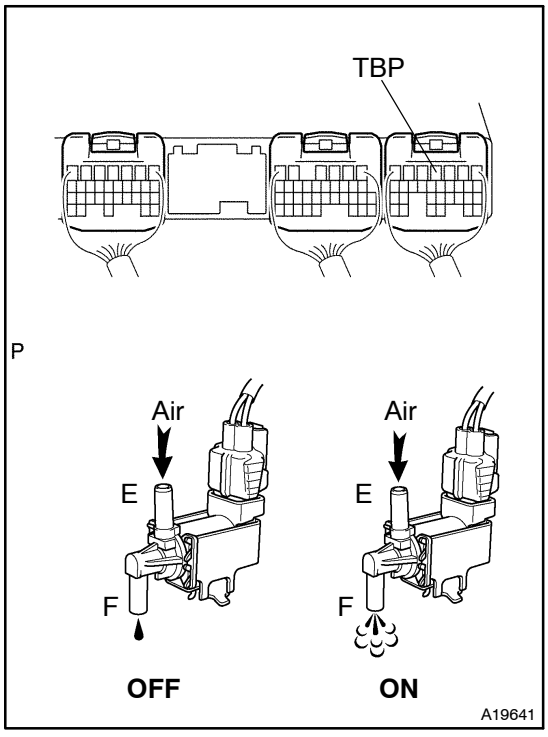
19	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and CCV, and CCV and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

20	**Check pressure switching valve.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Check the pressure switching valve function.

(1) Connect the terminal TBP of the ECM connector and body ground (ON).

(2) Disconnect the terminal TBP of the ECM connector and body ground (OFF).

OK:

(1) Pressure switching vavle is ON:
Air from port E flows out through port F.
(2) Pressure switching valve is OFF:
Air does not flow from port E to port F.

OK → **Go to step 23.**

NG

21	Check operation of pressure switching valve (See page SF–65).

NG → Replace pressure switching valve.

OK

22	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and pressure switching valve, and pressure switching valve and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

23	Check fuel tank inlet valve.

NG → Replace fuel tank inlet valve.

OK

24	Check fuel tank.

NG → Replace fuel tank.

OK

It is likely that vehicle user did not properly close fuel tank cap.

DTC	P0451	Evaporative Emission Control System Pressure Sensor/Switch Range/Performance

DTC	P0452	Evaporative Emission Control System Pressure Sensor/Switch Low Input

DTC	P0453	Evaporative Emission Control System Pressure Sensor/Switch High Input

MONITOR DESCRIPTION

DTC ”P0451, P0452 or P0453” is recorded by the ECM when the vapor pressure sensor malfunctions.

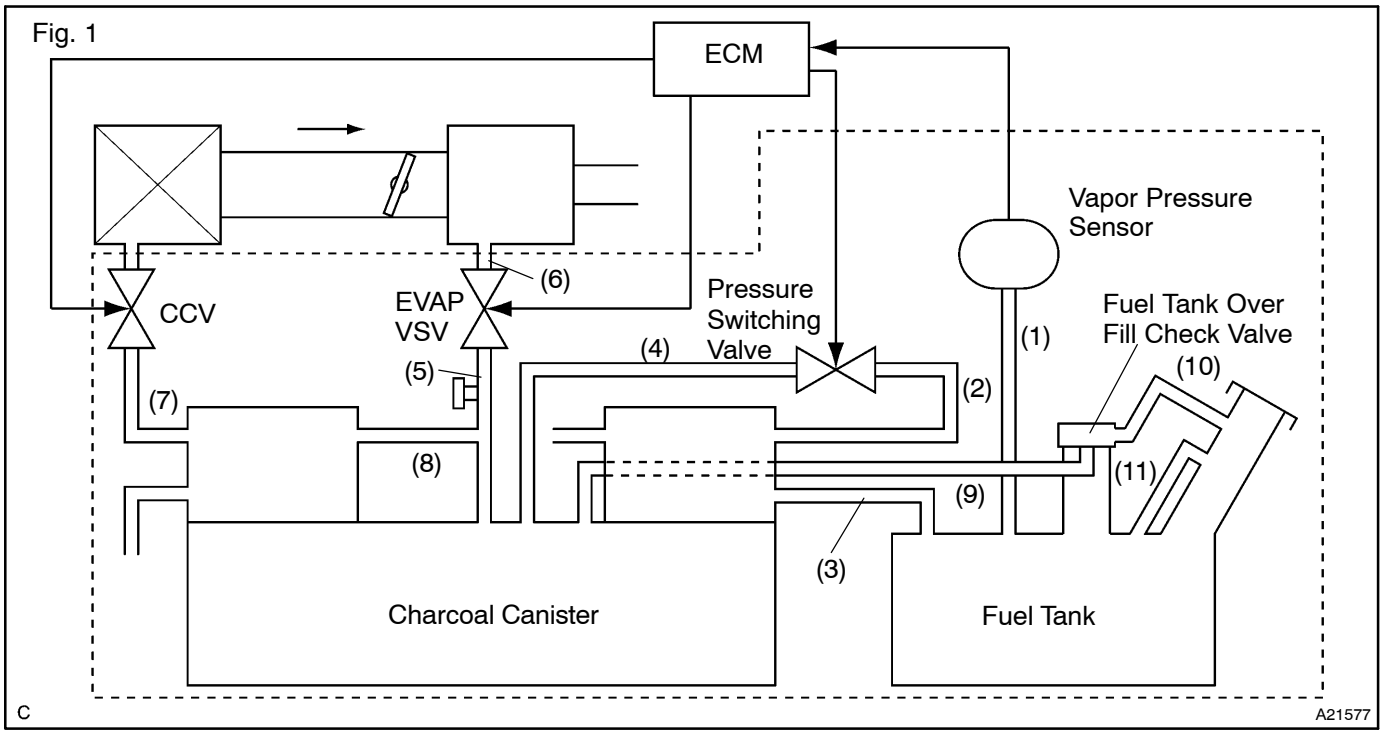
P0451

The ECM monitors pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
For this DTC P0451, the ECM checks for a ”noisy” sensor or a ”stuck” sensor.
The ECM checks for a ”noisy” sensor by monitoring the fuel tank pressures when the vehicle is stationary and there should be little variation in the tank pressure. If the indicated pressure value exceeds specified limits, the ECM will illuminate the MIL and a DTC will be set.
The ECM checks for a ”stuck” sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure value does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning. The ECM will illuminate the MIL and a DTC will be set.

P0452 and P0453

The ECM monitors pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
If the output voltage of the vapor pressure sensor is out of normal range, the ECM will determine that there is a malfunction in the sensor or sensor circuit.
When pressure indicated by the vapor pressure sensor goes below –3.999 kPa (–30 mmHg, –1.18 in.Hg) or above 1.999 kPa (15 mmHg, 0.59 in.Hg), the ECM interprets this as a malfunction in the vapor pressure sensor. The ECM will turn on the MIL and a DTC will be set.

Fig. 1



DTC No.	DTC Detecting Condition	Trouble Area
P0451	Vapor pressure sensor output extremely changes under conditions of (a) and (b): (2 trip detection logic) (a) Vehicle speed: 0 km/h (0mph), Engine speed: Idling and pressure switching valve is OFF (b) Vapor pressure sensor value ≧ opening pressure valve of charcoal canister	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM
P0452	Open in vapor pressure sensor circuit	
P0453	Short in vapor pressure sensor circuit	

MONITOR STRATEGY

P0451

Related DTCs	P0451	Evaporative emission control system pressure sensor range/performance
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	Fuel tank pressure sensor ”Noise” monitor: 10sec. Fuel tank pressure sensor ”Stuck” monitor: 20 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

P0452 and P0453

Related DTCs	P0452	Evaporative emission control system pressure sensor/switch low input
	P0453	Evaporative emission control system pressure sensor/switch high input
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow meter, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	17 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0451

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Fuel tank pressure sensor "Noise" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Fuel tank pressure sensor malfunction (P0452, P0453)	Not detected	
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake air temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after vehicle stop and idling	5 sec.	15 sec.
Bypass VSV	Closed	
Fuel tank pressure sensor "Stuck" monitor:		
Altitude	–	2,400 m (7,872 ft)
Battery voltage	11 V	–
Throttle position learning	Completed	
Vapor pressure sensor	No malfunction	
Fuel tank pressure sensor malfunction (P0452, P0453)	Not detected	
Intake air temperature at engine start – Engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
EVAP VSV, CCV, bypass VSV	Not operated by scan tool	
Engine coolant temperature at engine start	4.4°C (40°F)	35°C (95°F)
Intake air temperature at engine start	4.4°C (40°F)	35°C (95°F)
Time after engine start	6 sec.	–

P0452 and P0453

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Difference between intake air temperature and engine coolant temperature at engine start	–	12°C (22°F)
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

P0451

Detection Criteria	Threshold
Fuel tank pressure sensor "Noise" monitor:	
Frequency that fuel tank pressure change is 0.667 kPa (5 mmHg) or more	7 times or more for 10 sec.
Fuel tank pressure sensor "Stuck" monitor:	
Fuel tank pressure change	No change for 20 min. or more

P0452 and P0453

Detection Criteria	Threshold
P0452:	
Fuel tank pressure	Less than –3.999 kPa (–30 mmHg)
P0453:	
Fuel tank pressure	1.999 kPa (15 mmHg) or more

WIRING DIAGRAM

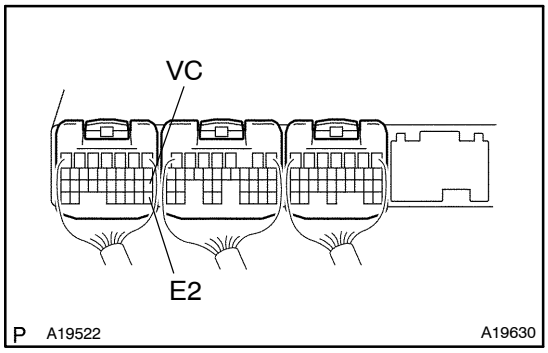
Refer to DTC P0441 on page DI–501.

INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may be open.
- If DTC P0441 (Purge Flow), P0446 (CCV), P0451, P0452 or P0453 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, troubleshoot DTC P0441, P0446, P0451, P0452 or P0453 first. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
- If the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1	Check voltage between terminals VC and E2 of ECM connector.



CHECK:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

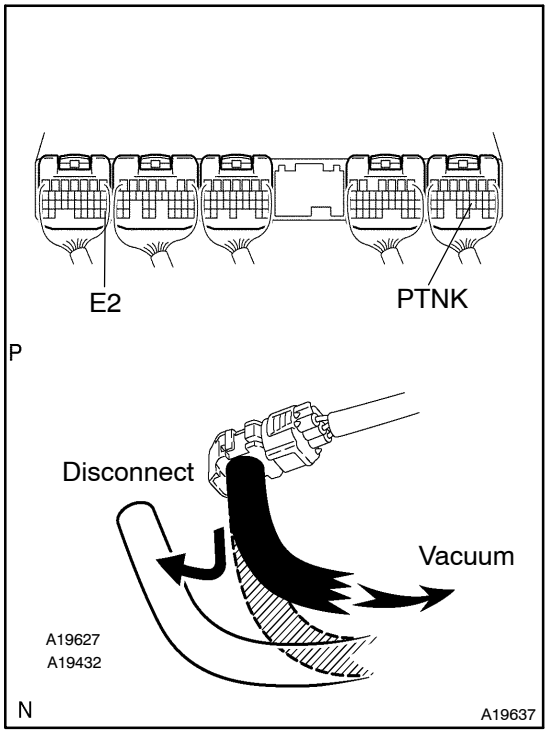
OK:

Voltage: 4.5 to 5.5 V

NG	Replace ECM (See page SF–78).

OK

2	Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

(3) Check the vapor pressure sensor output waveform using a hand–held tester.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

OK:

(1) Voltage: 2.9 to 3.7 V

(2) Voltage: 0.5 V or less

(3) A consecutive waveform presents.

OK	Replace ECM (See page SF–78).

NG

3	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace vapor pressure sensor.

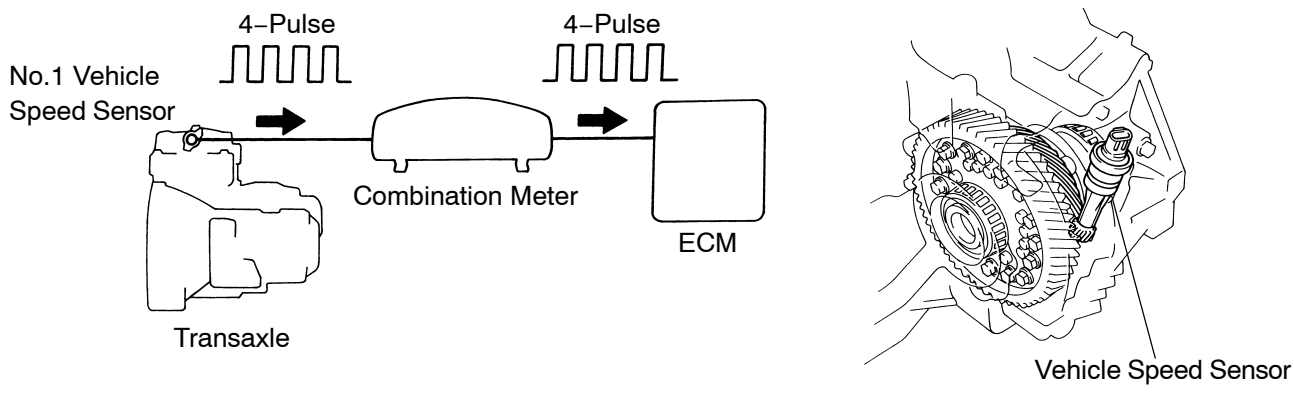
DI38H–13

DTC	P0500	Vehicle Speed Sensor ”A”

DTC	P0503	Vehicle Speed Sensor ”A” Intermittent/ Erratic/High

CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pluse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500 P0503	During vehicle is being driven, no vehicle speed sensor signal to ECM (2 trip detection logic)	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM

MONITOR DESCRIPTION

The ECM assumes that the vehicle is being driven when over 30 sec. have passed since the park/neutral position switch was turned OFF. If there is no signal from the vehicle speed sensor when these conditions are satisfied, the ECM concludes that the vehicle speed sensor is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P0500	Vehicle speed sensor "A" pulse input error
Required sensors/components	Main sensors/components	Vehicle speed sensor
	Related sensors/components	Engine coolant temperature sensor, Combination meter
Frequency of operation	Continuous	
Duration	Case 1: 8 sec. Case 2: 1 sec.	
MIL operation	Case 1: 2 driving cycles Case 2: Immediate	
Sequence of operation	None	

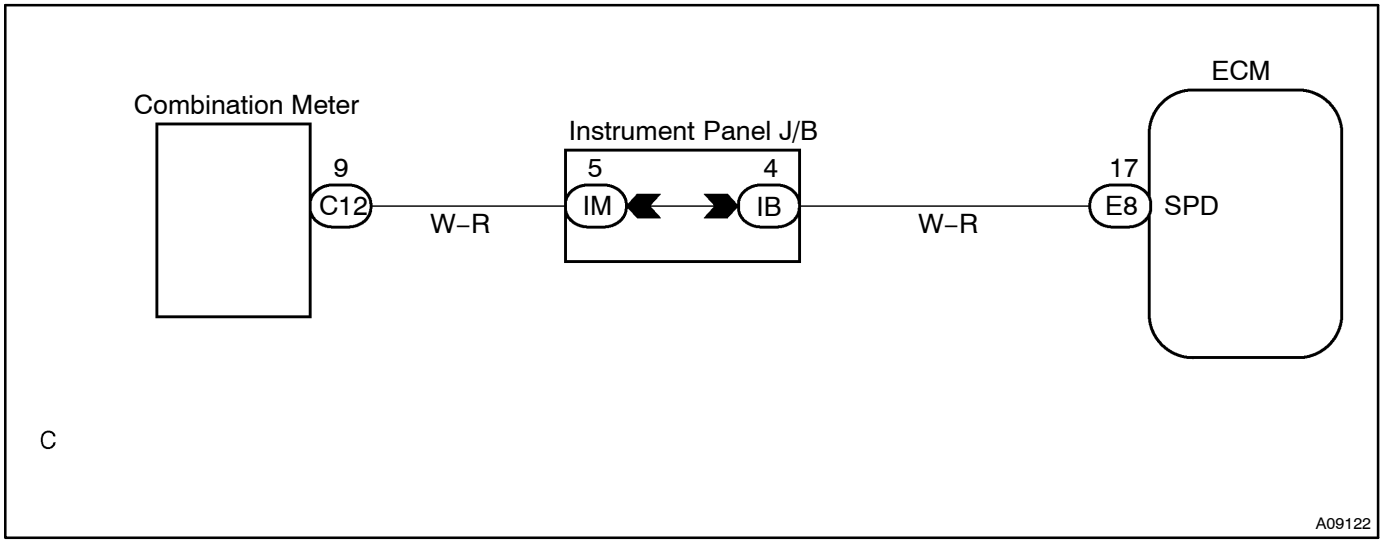
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Case 1 (MT):		
Engine coolant temperature	70°C (158°F)	–
Engine speed	2,000 rpm	4,000 rpm
Intake air amount per engine revolution	0.34 g/rev	–
Fuel cut at high engine speed	Not executing	
Case 2 (AT):		
Engine	Running	
Either of the following conditions are met:	A or B	
A. All of the following conditions are met:	(a) and (b)	
(a) Time after park/neutral position switch turns from ON to OFF	2 sec.	–
(b) Engine coolant temperature	20°C (68°F)	–
B. One of the following conditions are met:	(a), (b) or (c)	
(a) Time after park/neutral position switch turns from ON to OFF	30 sec.	–
(b) Engine coolant temperature	–	20°C (68°F)
(c) Time after ignition switch is ON	2 sec.	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Sensor signal	No pulse input

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

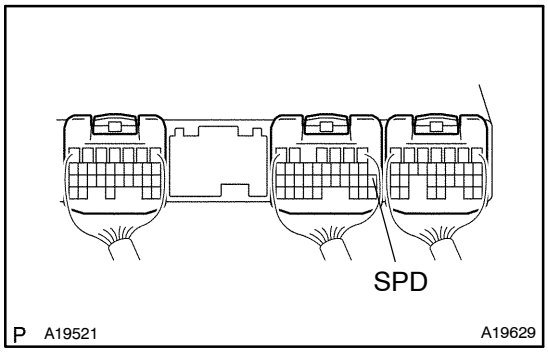
1	**Check operation of speedometer.**

CHECK:
Drive the vehicle and check if the operation of the speedmeter in the combination meter is normal.
HINT:
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer circuit. See combination meter troubleshooting (See page BE–2).**

OK

2	Check voltage between terminal SPD of ECM connector and body ground.



PREPARATION:

(a) Remove the ECM cover.
(b) Shift the shift lever to neutral.
(c) Jack up one of the front wheels.
(d) Turn the ignition switch ON.

CHECK:

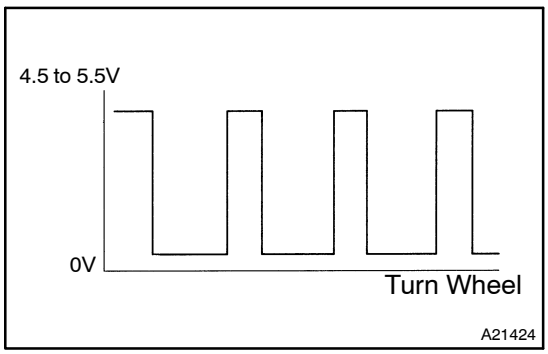
Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.

HINT:

The output voltage should fluctuate up and down similarly to the diagram on the left when the wheel is turned slowly.



NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

DIC7N–02

DTC	P0504	Brake Switch ”A”/”B” Correlation

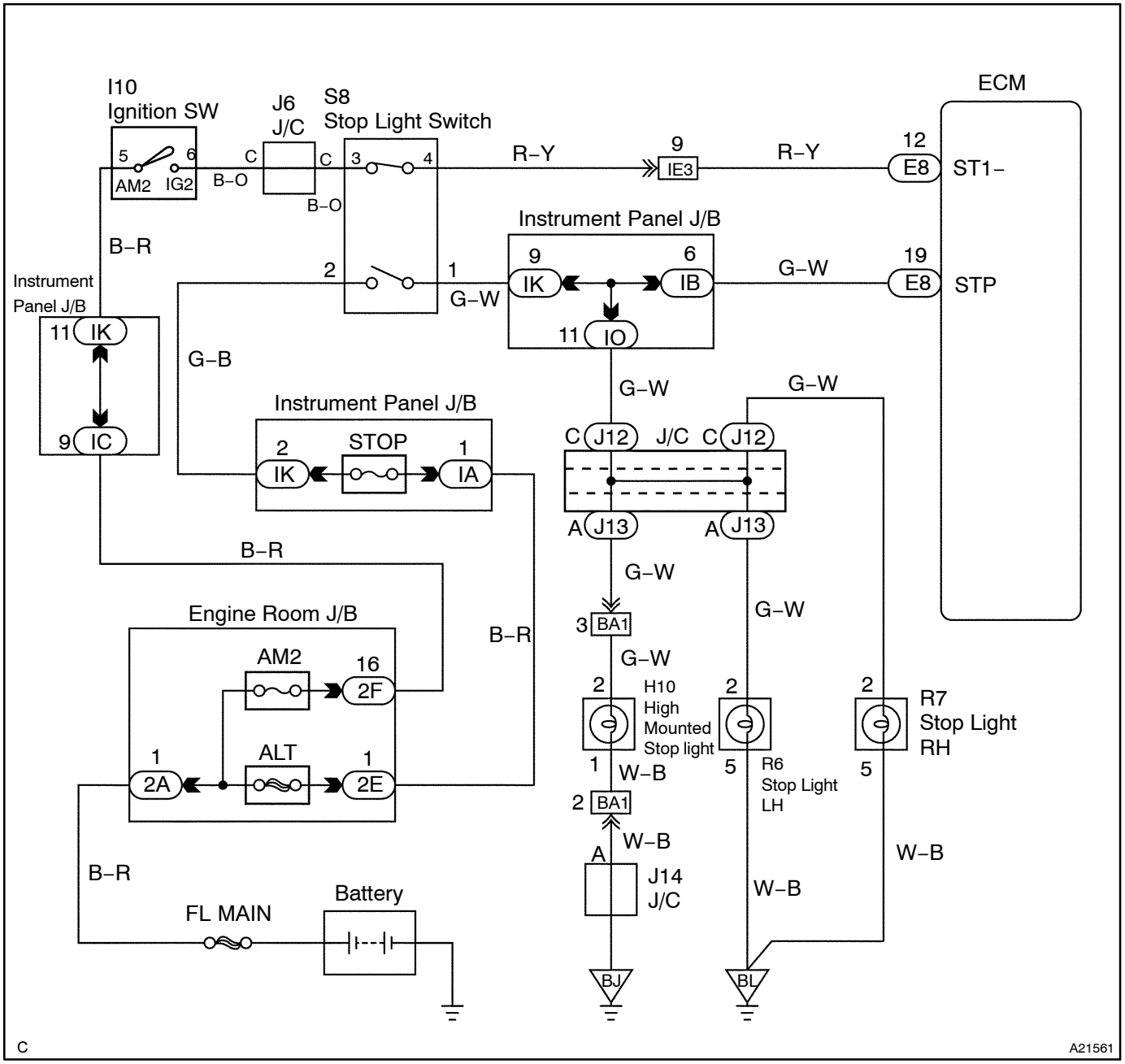
CIRCUIT DESCRIPTION

In addition to turning on the stop lamp, the stop light switch signals are used for a variety of engine and transmission functions as well as the stop lamp. This switch is designed with two complementary signal outputs: STP and ST1–. The ECM analyzes these signal outputs to detect malfunctions in the stop lamp switch.
HINT:
Normal condition is as shown in the table.

Signal	Brake pedal released	In transition	Brake pedal depressed
STP	OFF	ON	ON
ST1–	ON	ON	OFF

DTC No.	DTC Detection Condition	Trouble Area
P0504	Conditions (a), (b) and (c) continue for 0.5 seconds or more: (a) Ignition switch ON (b) Brake pedal released (c) STP signal is OFF when the ST1– signal is OFF	• Short in stop lamp switch signal circuit • Stop lamp fuse • Stop lamp switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check operation of stop light.**

PREPARATION:
Check if the stop lights come on and go off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit (See page BE–37).**

OK ↓

2	**Check STOP fuse.**

PREPARATION:
Remove the STOP fuse from the instrument panel J/B.
CHECK:
Check the continuity of the STOP fuse.
OK:

Continuity

NG → **Check for short in all harness and components connected to STOP fuse.**

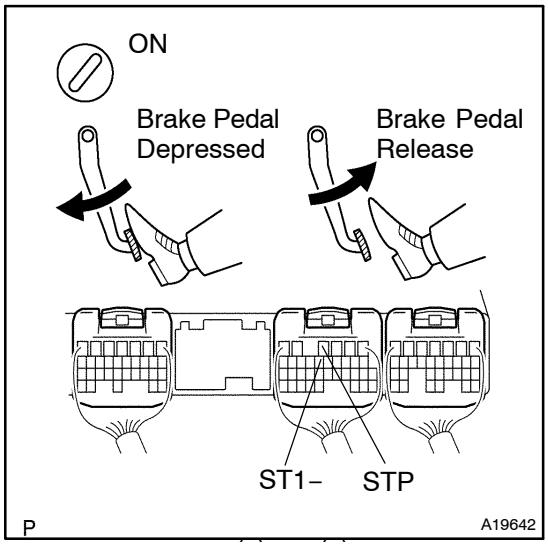
OK ↓

3	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK ↓

4	Check STP signal and ST1– voltage.



PREPARATION:

(a) Connect the to the DLC3.
(b) Turn the ignition switch ON and hand–held tester main switch ON.
(c) Enter the following menu: "DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STOP LIGHT SW".

CHECK:

(a) Read the STP signal on the hand–held tester.
(b) Measure the voltage between terminals ST1– and body ground.

OK:

Brake Pedal	STP Signal	ST1– Voltage
Depressed	ON	Below 1.5 V
Released	OFF	7.5 to 14 V

OK → **Check for intermittent problems (See page DI–295).**

NG

5	Check harness and connector between ECM and stop light switch (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check operation of stop light.**

PREPARATION:

Check if the stop lights come on and go off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit (See page BE–37).**

OK

2	**Check STOP fuse.**

PREPARATION:

Remove the STOP fuse from the instrument panel J/B.

CHECK:

Check the continuity of the STOP fuse.

OK:

Continuity

NG → **Check for short in all harness and components connected to STOP fuse.**

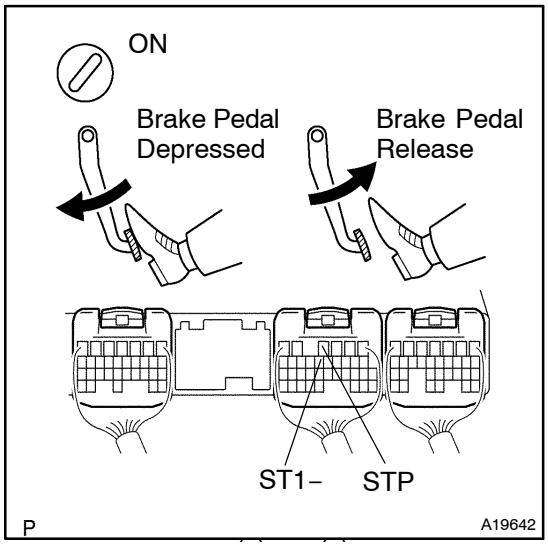
OK

3	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK

4	Check voltage between terminal STP and ST1– of ECM and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Check voltage between terminal STP and ST1– of ECM and body ground.

OK:

Brake Pedal	STP Voltage	ST1– Voltage
Depressed	7.5 to 14 V	Below 1.5 V
Released	Below 1.5 V	7.5 to 14 V

OK → **Check for intermittent problems (See page DI–295).**

NG

5	Check harness and connector between ECM and stop light switch (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

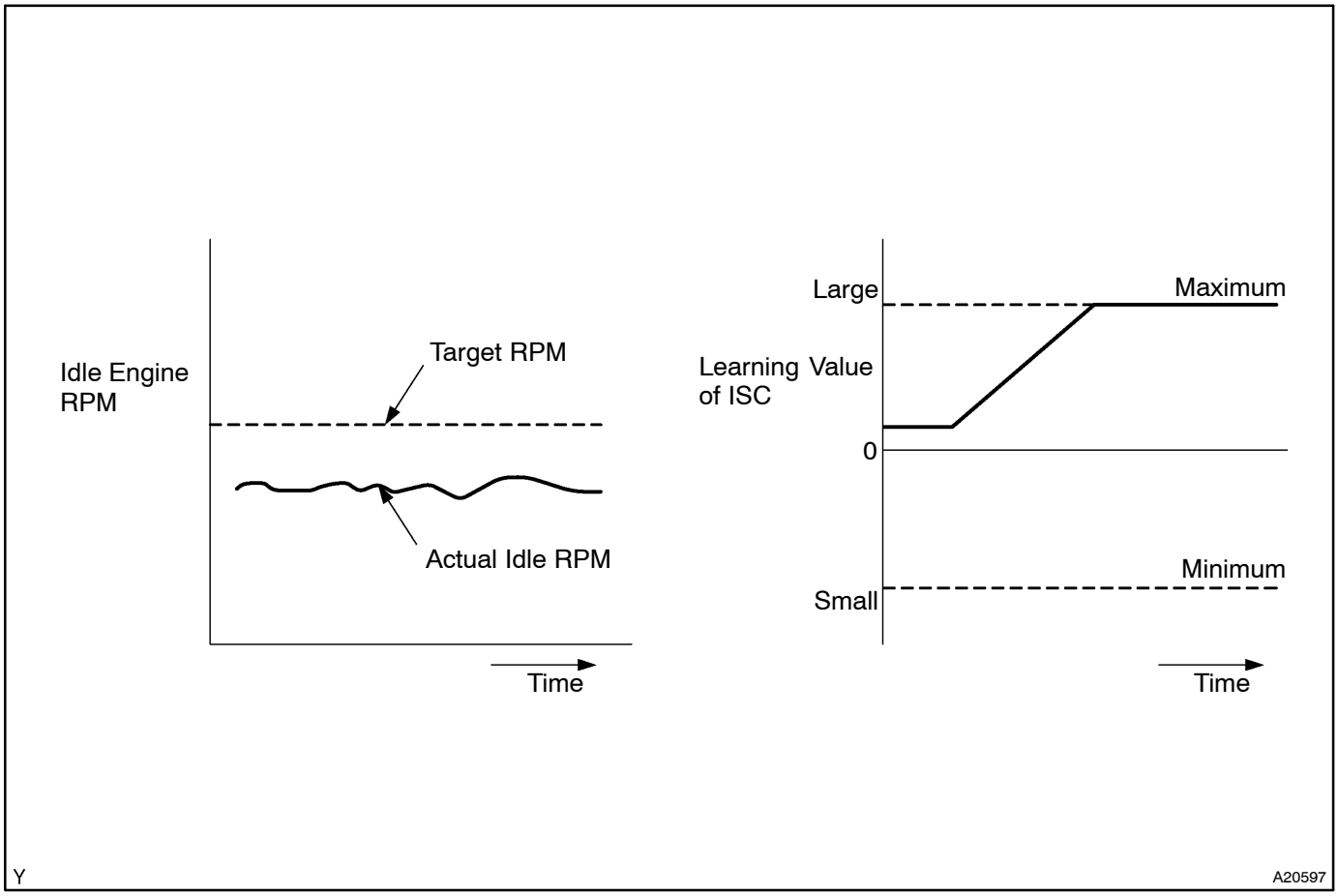
Replace ECM (See page SF–78).

DIC7O–02

DTC	P0505	Idle Air Control System

MONITOR DESCRIPTION

The idle speed is controlled by the ETCS (Electronic Throttle Control System).
The ETCS is composed of the throttle motor which operates the throttle valve, and the throttle position sensor, which detects the opening angle of the throttle valve.
The ECM controls the throttle motor to provide the proper throttle valve opening angle to obtain the target idle speed.
The ECM regulates the idle speed by opening and closing the throttle valve using the ETCS. The TCM concludes that the idle speed control ECM function is malfunctioning if: 1) the actual idle RPM varies more than the specified amount, or 2) a learning value of the idle speed control remains at the maximum or minimum five times or more during a driving cycle. The ECM will turn on the MIL and set a DTC.
Example:
If the actual idle RPM varies from the target idle RPM by more than 200 (*1) rpm five times during a drive cycle, the ECM will turn on the MIL and a DTC will be set.
HINT:
*1: RPM threshold varies with engine load.



DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (Function check 2 trip detection logic) (Range check 1 trip detection logic)	• Air induction system • Electric throttle control system • PCV piping

MONITOR STRATEGY

Related DTCs	P0505	Idle air control valve
Required sensors/components	Main sensors/components	Crankshaft position sensor
	Related sensors/components	Vehicle speed sensor, Engine coolant temperature sensor
Frequency of operation	Once per driving cycle	
Duration	10 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Engine	Running	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Frequency that both of the following conditions (a) and (b) are met:	5 times or more
(a). Engine RPM – target engine RPM	Less than –100 rpm, or more than 200 rpm (intake air temperature is 0°C (32°F) or more) Less than –100 rpm, or more than 300 rpm (intake air temperature is less than 0°C (32°F))
(b). Vehicle condition	Stop after vehicle was driven by 10 km/h (6.25 mph) or more
2. Frequency that both of the following conditions (a) and (b) are met:	Once
(a). Engine RPM – target engine RPM	Less than –100 rpm, or more than 200 rpm (intake air temperature is 0°C (32°F) or more) Less than –100 rpm, or more than 300 rpm (intake air temperature is less than 0°C (32°F))
(b). IAC flow rate learning value	0.43 or less, or more than 2.75

COMPONENT OPERATING RANGE

Parameter	Standard value
P0505:	
Time while no missing voltage change	0.5 sec. or more

INSPECTION PROCEDURE

HINT:

- When the throttle position is slightly opened (the accelerator pedal is slightly depressed) because a floor carpet is overlapped on the accelerator pedal, or if the accelerator pedal is not fully released, etc., DTC P505 may be detected.
- Read freeze frame data using the hand—held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides P0505) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) On the hand–held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool.

RESULT:

Display (DTC Output)	Proceed to
P0505	A
P0505 and other DTCs	B

HINT:

If any other codes besides P0505 is output, perform the troubleshooting for those codes first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check connection of PCV piping.**

NG → **Repair or replace PCV piping.**

OK

3	**Check air induction system.**

CHECK:

Check for vacuum leaks in air induction system.

NG → **Repair or replace air induction system.**

OK

Check electric throttle control system (See page SF–39).

DI38N–16

DTC	P0560	System Voltage

MONITOR DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is OFF. This electricity allows the ECM to store data such as DTC history, freeze frame data, fuel trim values, and other data. If the battery voltage falls below a minimum level, the ECM will conclude that there is a fault in the power supply circuit. The next time the engine starts, the ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detecting Condition	Trouble Area
P0560	Open in back up power source circuit	• Open in back up power source circuit • EFI fuse • ECM

HINT:
If DTC P0560 appears, the ECM does not store other DTC.

MONITOR STRATEGY

Related DTCs	P0560	System voltage malfunction
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	Immediate (*1)	
Sequence of operation	None	

*1: The DTC is set immediately. The MIL will be illuminated after the engine starts in the next time.

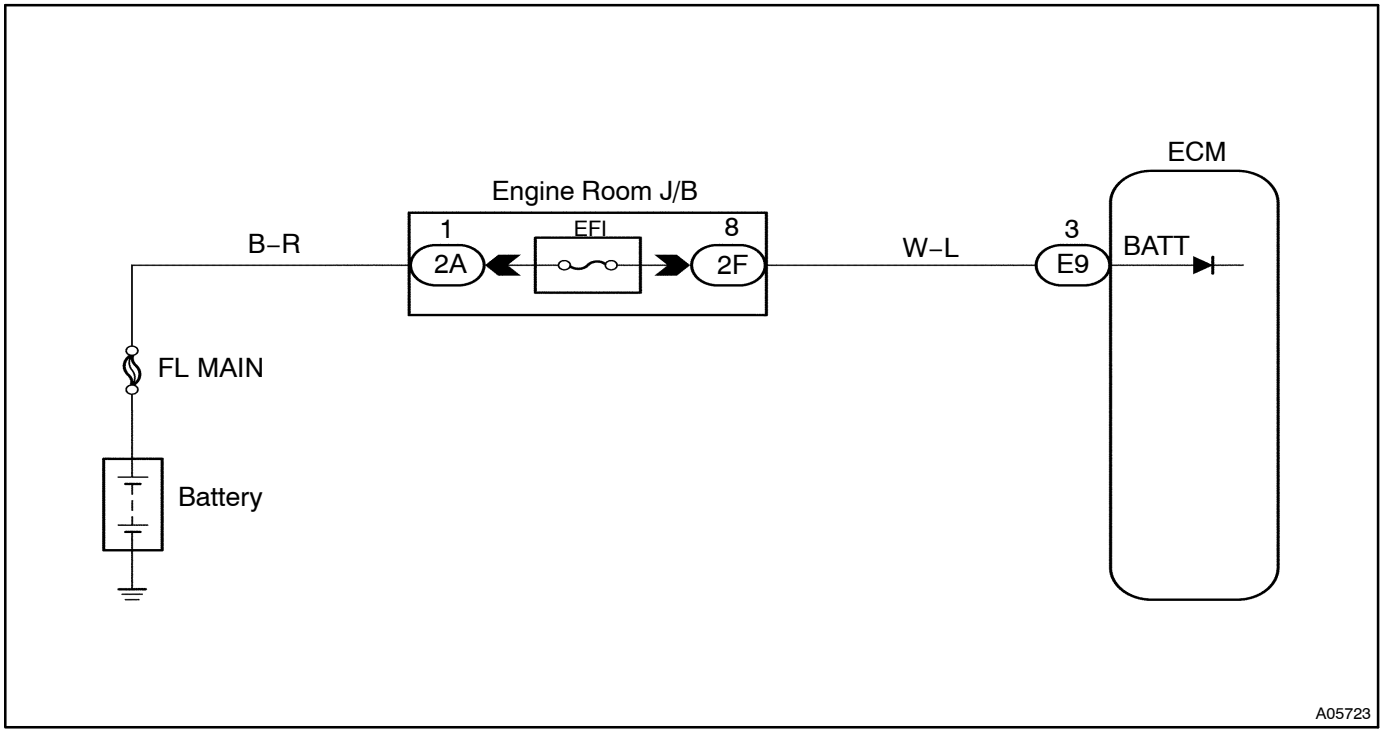
TYPICAL MALFUNCTION THRESHOLDS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Stand–by RAM	Initialized	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Battery voltage	Less than 3.5 V

WIRING DIAGRAM



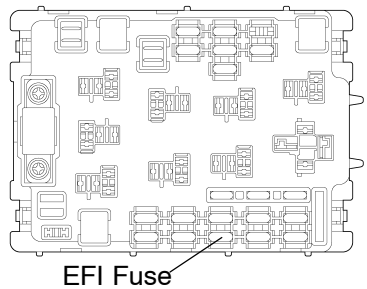
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check EFI fuse of engine room J/B.**

Engine Room J/B



PREPARATION:

Remove the EFI fuse from the engine room J/B.

CHECK:

Check the continuity of the EFI fuse.

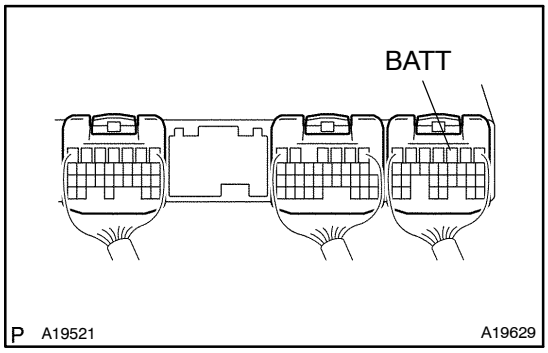
OK:

Continuity

NG	**Check for short in all harness and components connected to EFI fuse.**

OK

2	**Check voltage between terminal BATT of ECM connector and body ground.**



PREPARATION:
Remove the ECM cover.
CHECK:
Measure the voltage between terminal BATT of the ECM connector and body ground.
OK:
Voltage: 9 to 14 V

OK	**Replace ECM (See page SF–78).**

NG

3	**Check for open or short in harness and connector between ECM and EFI No. 1 fuse, EFI fuse and battery (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

Check and replace engine room J/B.

DI3IK–11

DTC	P0604	Internal Control Module Random Access Memory (RAM) Error

DTC	P0606	ECM/PCM Processor

DTC	P0607	Control Module Performance

DTC	P0657	Actuator Supply Voltage Circuit / Open

MONITOR DESCRIPTION

The ECM continuously monitors its internal memory status, internal circuits, and output signals to the throttle actuator. This self–check ensures that the ECM is functioning properly. If any malfunction is detected, the ECM will set the appropriate DTC and illuminate the MIL.
The ECM memory status is diagnosed by internal ”mirroring” of the main CPU and the sub CPU to detect RAM (Random Access Memory) errors. The two CPUs also perform continuous mutual monitoring.
The ECM sets a DTC if: 1) outputs from the 2 CPUs are different and deviate from the standards, 2) the signals to the throttle actuator deviate from the standards, 3) a malfunction is found in the throttle actuator supply voltage, and 4) any other ECM malfunction is found.

DTC No.	DTC Detecting Condition	Trouble Area
P0604 P0606 P0607 P0657	ECM malfunction	• ECM

MONITOR STRATEGY

Related DTCs	P0604	RAM (Random Access Memory) error range check
	P0606	TP (Throttle position) and APP (Accel pedal position) sensor circuit in ECM
	P0607	ECM range check
	P0657	ETCS (Electrical throttle control) power supply circuit in ECM
Required sensors/components	ECM	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
The typical enabling condition is not available	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0604:	
RAM	RAM check failure
P0606:	
Either of the following conditions is met:	Condition 1 or 2
1. Difference between TP of main CPU and TP of sub CPU	0.3 V or more
2. Difference between APP of main CPU and APP of sub CPU	0.3 V or more
P0607:	
Either of the following conditions is met:	Condition 1 or 2
1. All of the following conditions are met:	Condition (a), (b) and (c)
(a) CPU reset	1 time or more
(b) Difference between TP and APP learing values	0.4 V or more
(c) Electronic throttle actuator	OFF
2. CPU reset	2 times or more
P0657:	
ETCS power supply when ignition switch is turned from OFF to ON	7 V or more

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air−fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Replace ECM (See page SF–78).

DIC7P–02

DTC	P0617	Starter Relay Circuit High

MONITOR DESCRIPTION

While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. If the vehicle is being driven and the ECM detects the starter control signal (STA), the ECM concludes that the starter control circuit is malfunctioning. The ECM will turn on the MIL and a DTC will be set.

DTC No.	DTC Detection Condition	Trouble Area
P0617	All conditions (a), (b) and (c) are satisfied for 20 seconds with battery (+B) voltage 10.5 V or more (a) Vehicle speed ≧ 20 km/h (12.4 mph) (b) Engine revolution ≧ 1,000 rpm (c) STA signal ON	• Park/neutral position switch (A/T) • Clutch start switch (M/T) • Starter relay circuit • Ignition switch • ECM

MONITOR STRATEGY

Related DTCs	P0617	Starter signal error
Required sensors/components	Main sensors/components	Starter signal
	Related sensors/components	Vehicle speed sensor, Engine speed sensor
Frequency of operation	Continuous	
Duration	20 sec.	
MIL operation	Immediate	
Sequence of operation	None	

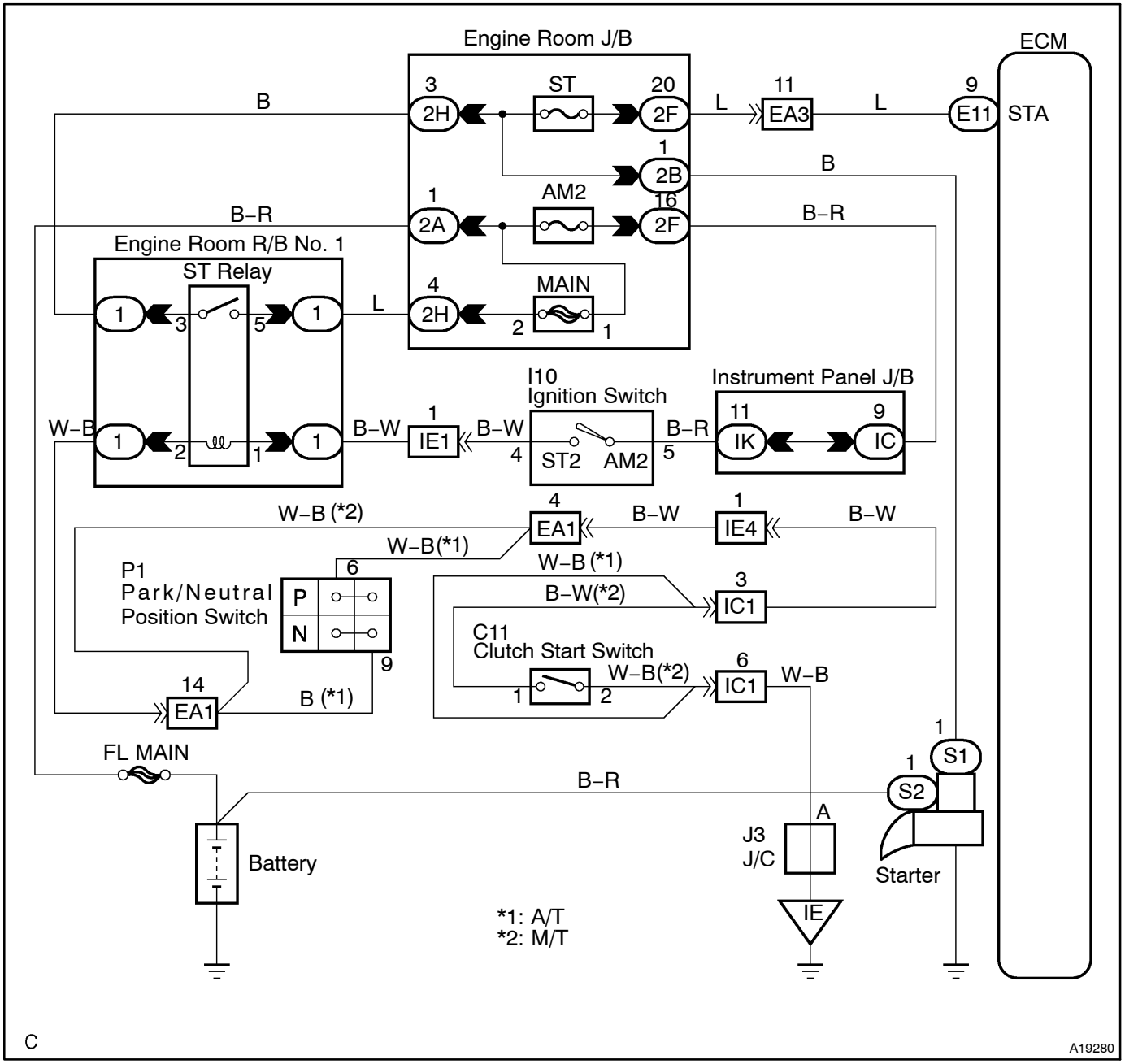
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery voltage	10.5 V	–
Vehicle speed	20 km/h (12.4 mph)	–
Engine RPM	1,000 rpm	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Starter signal	ON (at ”more than 20 km/h (12.4 mph) and more than 1,000 rpm”)

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Check STA signal.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Go to step 5.**

NG

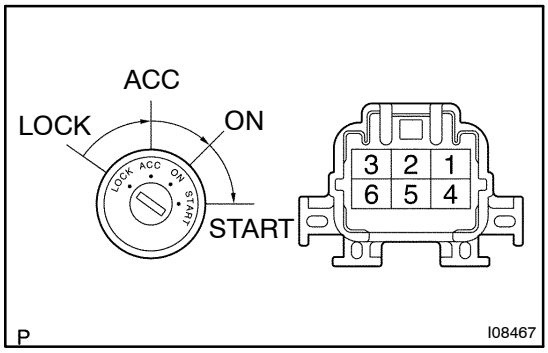
2	**Check park/neutral position switch or clutch start switch.**

(a) Inspect the park/neutral position switch (A/T)(See page DI–701).
(b) Inspect the clutch start switch (M/T)(See page CL–2).

NG → **Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	1MΩ or more
ACC	2 – 3	1Ω or less
ON	2 – 3 – 4 6 – 7	1Ω or less
START	1 – 2 – 4 6 – 7 – 8	1Ω or less

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check STA signal.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / STARTER SIG.

CHECK:

Read the STA signal on the hand–held tester while the starter is operating.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the OBD II scan tool.
(b) Turn the ignition switch ON and OBD II scan tool main switch ON.
(c) Clear DTC (See page DI–295)
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

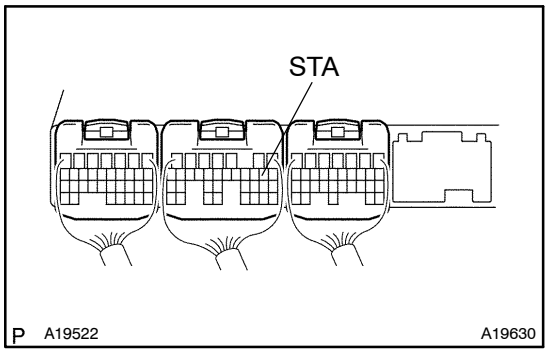
A → **Replace ECM (See page SF–78).**

B →

Check for intermittent problems (See page DI–295).

OBD II scan tool (excluding hand–held tester):

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:

0 V (Ignition switch ON)

6 V or more (Engine cranking)

OK	**Go to step 5.**

NG

2	**Check park/neutral position switch or clutch start switch.**

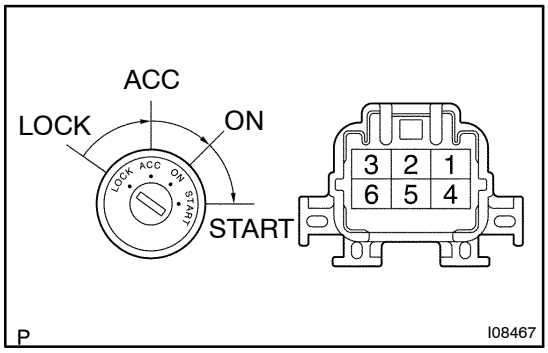
(a) Inspect the park/neutral position switch (A/T)(See page DI–701).

(b) Inspect the clutch start switch (M/T)(See page CL–2).

NG	**Replace park/neutral position switch or clutch start switch. Go to next step 5 after the replacement.**

OK

3	Check ignition switch.



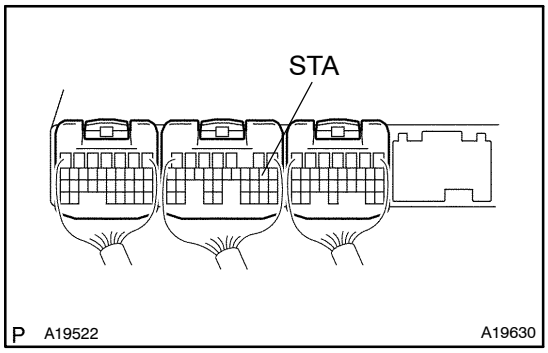
Check continuity between the connector terminals shown in the chart below.

Switch	Terminal No.	Resistance
LOCK	All Terminal to Terminal	10 kΩ or higher
ACC	2 – 3	Below 1Ω
ON	2 – 3 – 4 6 – 7	Below 1Ω
START	1 – 2 – 4 6 – 7 – 8	Below 1Ω

NG → **Replace ignition switch.**
Go to next step 5 after the replacement.

OK

4	Check voltage between terminal STA of ECM connector and body ground.



PREPARATION:
(a) Remove the ECM cover.
(b) Turn the ignition switch ON.

CHECK:
Measure the voltage between terminal STA of the ECM connector and body ground during the engine cranking.

OK:

Voltage:
0 V (Ignition switch ON)
6 V or more (Engine cranking)

NG → **Repair or replace harness or connector.**

OK

5	Check DTC reoccur

PREPARATION:

(a) Connect the OBD II scan tool.
(b) Turn the ignition switch ON and OBD II scan tool main switch ON.
(c) Clear DTC (See page DI–295).
(d) Drive the vehicle more than 40 km/h (25 mph) for 20 seconds or more.

CHECK:

Check DTC reoccur.

RESULT:

Display (DTC Output)	Proceed to
P0617	A
No DTC output	B

A → **Replace ECM (See page SF–78).**

B → **Check for intermittent problems (See page DI–295).**

DID5B–01

DTC	P0630	VIN not Programmed or Mismatch – ECM/ PCM

CIRCUIT DESCRIPTION

DTC P0630 is set when the Vehicle Identification Number (VIN) is not stored in the Engine Control Module (ECM) or the input VIN is not accurate. Input the VIN with the hand–held tester.

DTC No.	DTC Detecting Condition	Trouble Area
P0630	• VIN is not stored in ECM. • Input VIN to ECM is not accurate.	ECM

MONITOR STRATEGY

Related DTCs	P0630	VIN not programed
Required sensors/components	Main sensors/components	ECM
	Related sensors/components	–
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
VIN code	Not programmed

COMPONENT OPERATING RANGE

Parameter	Standard value
VIN code	Programmed

INSPECTION PROCEDURE

1	**Read current DTC.**

NOTICE:
If P0630 is present, the VIN must be input to the ECM using the hand–held tester. However, all DTCs are cleared automatically by the tester when the VIN is input. If DTCs other than P0630 are present, check them first.

NEXT

2	**Input VIN with hand–held tester (See page DI–322).**

NEXT

END

DI1MG–13

DTC	P1645	Body ECU Malfunction

CIRCUIT DESCRIPTION

ECM receives the operating condition (ON/OFF) of A/C from A/C ECU and it also receives the electrical load information from the body ECU.
ECM uses the information to control the engine (idle up, etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P1645	Condition (a) or (b) continues for 3.0 sec. (a) No communication from body ECU (b) No communication from A/C ECU	• Body ECU • A/C ECU • Communication bus

INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand−held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air−fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.
Perform troubleshooting the Multiplex Communication System (See page DI−1184).

DIC7Q–02

DTC	P2102	Throttle Actuator Control Motor Circuit Low

DTC	P2103	Throttle Actuator Control Motor Circuit High

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM and it opens and closes the throttle valve.
The opening angle of the throttle valve is detected by the throttle position sensor which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to control the throttle motor and monitor the throttle opening angle as the ECM responds to driver inputs.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2102	Conditions (a) and (b) continue for 2.0 seconds: (a) Throttle control motor output duty 80 % or more (b) Throttle control motor current 0.5 A or less	• Open in throttle control motor circuit • Throttle control motor • ECM
P2103	Either of following conditions is met: • Throttle control motor current 10 A or more (0.1 seconds) • Throttle control motor current 7 A or more (0.6 seconds)	• Short in throttle control motor circuit • Throttle control motor • Throttle valve • Throttle body assy • ECM

MONITOR DESCRIPTION

The ECM monitors the current through the electronic throttle motor and detects malfunctions or open circuit in the throttle motor based on the voltage of the current. When the current deviates from the standard, the ECM concludes that there is a fault in the throttle motor.
Or, if the throttle valve is not functioning properly (for example, stuck ON), the ECM concludes that there is a fault and turns on the MIL and a DTC is set.
Example:
The current is more than 10 A. Or the current is less than 0.5 A when the motor driving duty ratio is exceeding 80%. The ECM concludes that the current is out of the specified range, turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel infection (Intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2102	Throttle actuator control motor current (Low current)
	P2103	Throttle actuator control motor current (High current)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

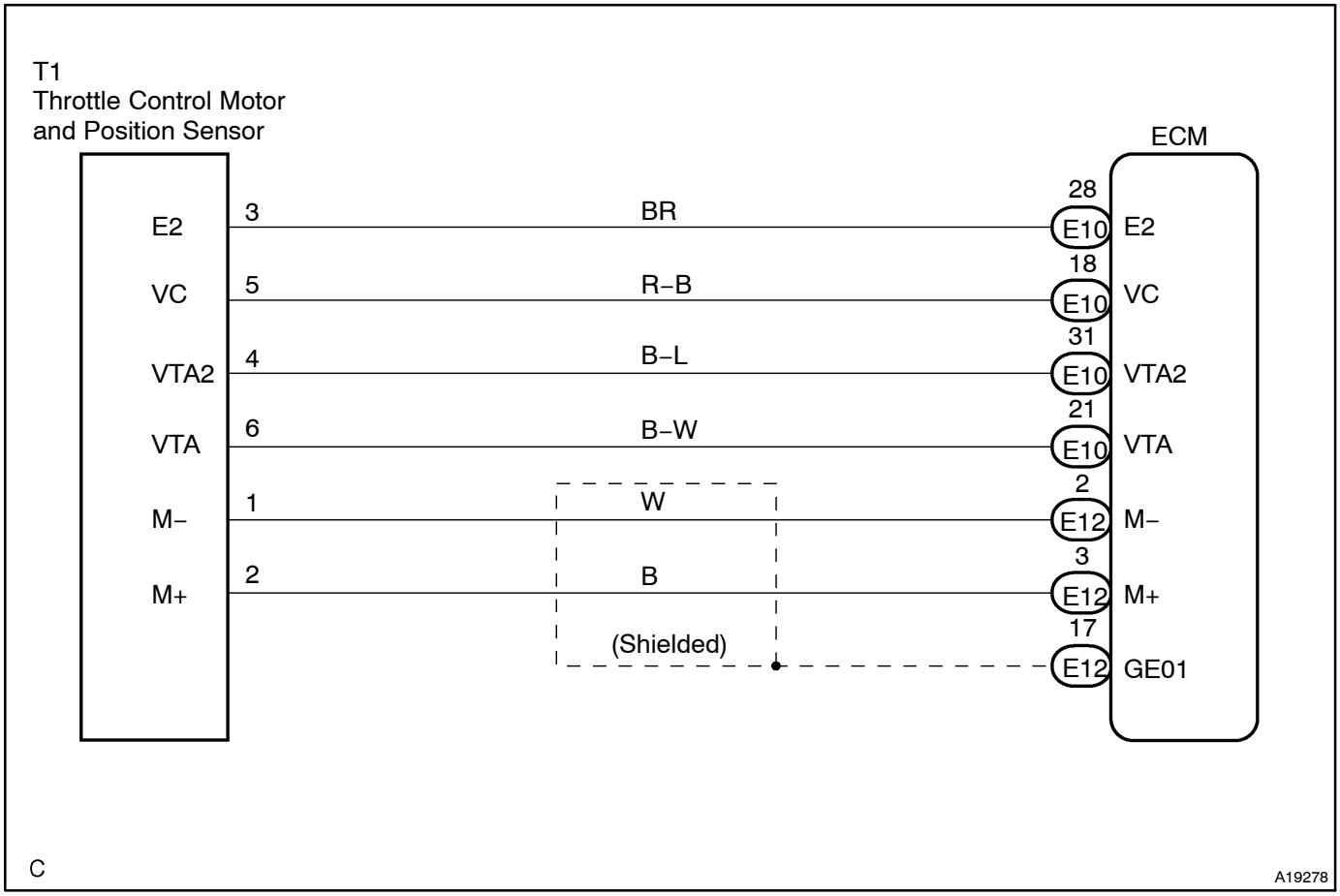
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P2102:		
Throttle motor	ON	
Duty–cycle ratio to open throttle actuator	80%	–
Throttle actuator power supply	8 V	–
Motor current change during the last 0.016 sec.	–	0.2 A
P2103:		
Throttle motor	ON	
Either of the following conditions is met:	A or B	
A. Throttle actuator power supply	8 V	–
B. Throttle actuator power	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2102:	
Throttle motor current	Less than 0.5 A (when motor drive duty 80% or more)
P2103:	
Throttle motor current	More than 10 A (0.1 sec.) More than 7 A (0.6 sec.)

WIRING DIAGRAM

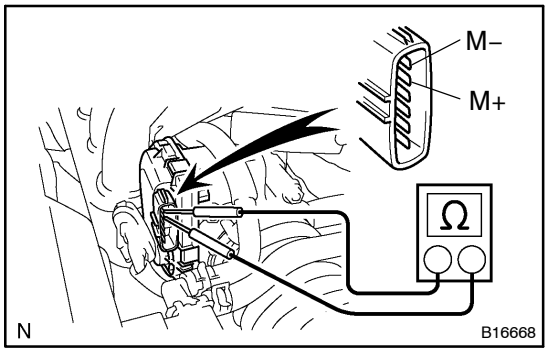


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check throttle control motor.**



PREPARATION:

Disconnect the throttle control motor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the throttle control motor.

OK:

Resistance: 0.3 to 100 Ω at 20°C (68°F)

NG → **Replace throttle control motor (See page SF–42).**

OK

2	**Check for open and short in harness and connector between throttle control motor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	**Visually check throttle valve.**

PREPARATION:

Remove the intake air connector.

CHECK:

Check between the throttle valve and the housing for foreign objects. Also, check if the valve can open and close smoothly.

NG → **Remove foreign objects and clean throttle body.**

OK

Replace ECM (See page SF–78).

DIC7R–02

DTC	P2111	Throttle Actuator Control System –Stuck Open

DTC	P2112	Throttle Actuator Control System –Stuck Closed

CIRCUIT DESCRIPTION

The throttle motor is operated by the ECM. It opens and closes the throttle valve using gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body. The throttle position sensor provides feedback to the ECM to control the throttle motor and set the throttle valve angle in response to driver input.

HINT:

This Electrical Throttle Control System (ETCS) is not used on the throttle cable.

DTC No.	DTC Detection Condition	Trouble Area
P2111	Throttle motor locked during ECM order to open	• Throttle control motor circuit • Throttle control motor • Throttle body • Throttle valve
P2112	Throttle motor locked during ECM order to close	• Same as DTC No. P2111

MONITOR DESCRIPTION

The ECM concludes that there is a malfunction of the ETCS when the throttle valve remains at a fixed angle despite high drive current from the ECM. The ECM will turn on the MIL and a DTC will be set.

FAIL SAFE

If the Electronic Throttle Control System (ETCS) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimal speed.

If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.

If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2111	Throttle motor actuator lock (Open)
	P2112	Throttle motor actuator lock (Closed)
Required sensors/components	Main sensors/components	Throttle actuator motor
	Related sensors/components	Throttle position sensor
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
P2111:		
System guard*	ON	
Throttle motor current	2 A	–
Throttle motor duty to close side	80%	–
P2112:		
System guard*	ON	
Throttle motor current	2 A	–
Throttle motor duty to open side	80%	–
System guard*		
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current cut operation	Not executing	
Throttle actuator power supply	4 V	–
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2111:	
Throttle position sensor voltage change for 0.016 sec.	Less than 0.1 V for 0.5 sec.
P2112:	
Throttle position sensor voltage change for 0.016 sec.	Less than 0.1 V for 0.5 sec.

WIRING DIAGRAM

Refer to DTC P2102 DI–582.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Visually check throttle valve.**

PREPARATION:

Remove the intake air connector.

CHECK:

Check between the throttle valve and the housing for foreign objects. Also, check if the valve can open and close smoothly.

NG → **Remove foreign object and clean throttle body.**

OK

2	**Check if DTC outputs reoccur.**

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start and warm up the engine.
(c) Run the engine.
(d) Fully depress and release the accelerator pedal in a moment.

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool (See page DI–295).

RESULT:

Display (DTC Output)	Proceed to
No DTC output	A
DTC P2111 or P2112 output reoccur	B

B → **Replace ECM (See page SF–78).**

A

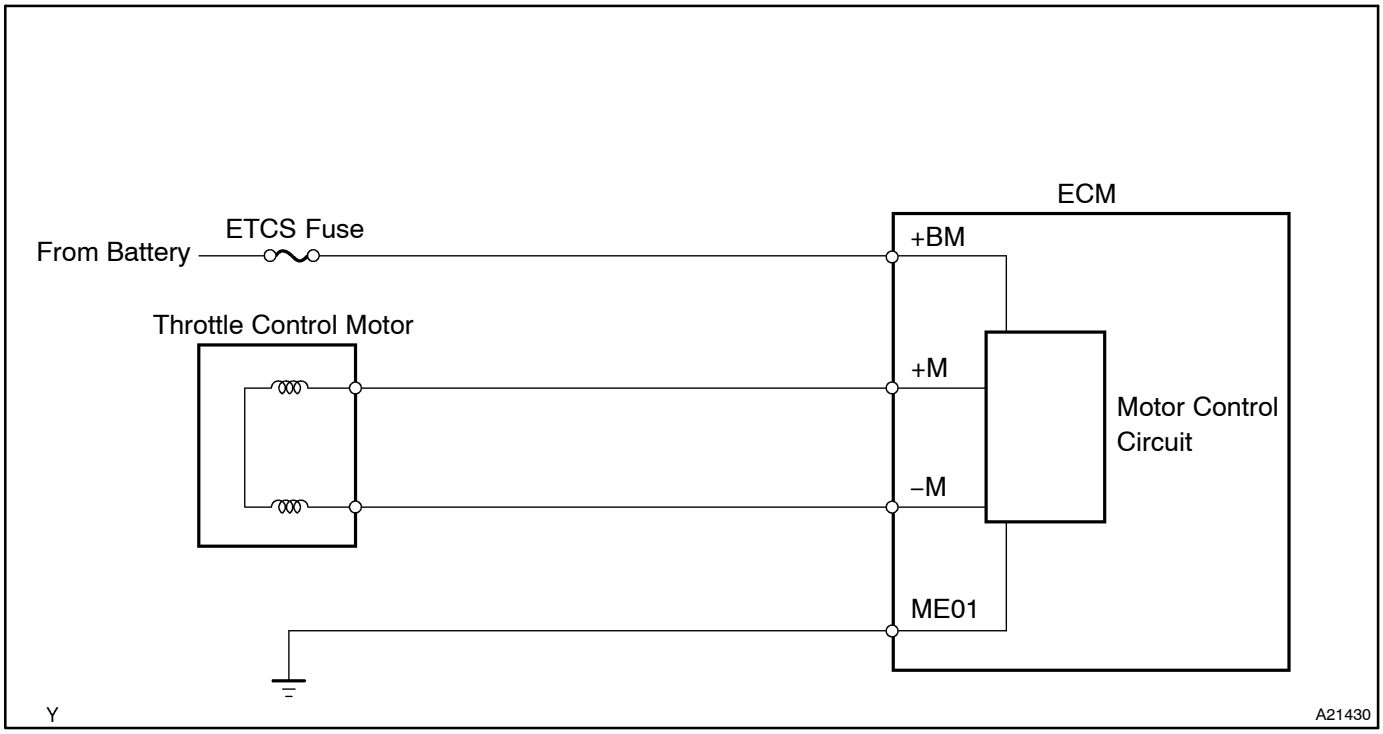
Check for intermittent problems (See page DI–295).

DIC7S–02

DTC	P2118	Throttle Actuator Control Motor Current Range/Performance

CIRCUIT DESCRIPTION

The Electronic Throttle Control System (ETCS) has a dedicated power supply circuit. The voltage (+BM) is monitored and when the voltage is low (less than 4 V), the ECM concludes that the ETCS has a fault and current to the throttle control motor is cut.
When the voltage becomes unstable, the ETCS itself becomes unstable. For this reason, when the voltage is low, current to the motor is cut. If repairs are made and the system has returned to normal, turn the ignition switch OFF. The ECM then allows current to flow to the motor and the motor can be restarted.
HINT:
This Electrical Throttle Control System (ETCS) does not use a throttle cable.



DTC No.	DTC Detection Condition	Trouble Area
P2118	Open in ETCS power source circuit	• Open in ETCS power source circuit • ETCS fuse • ECM

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the electronic throttle motor +BM. When the power supply voltage drops below 0.4 V for 0.8 seconds, the ECM concludes that the power supply circuit has an open circuit. The MIL is turned on and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel infection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a "pass" condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2118	Throttle actuator motor power supply line range check (Low voltage)
Required sensors/components	Throttle actuator motor	
Frequency of operation	Continuous	
Duration	0.8 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Actuator power	ON	
Battery voltage	8 V	–

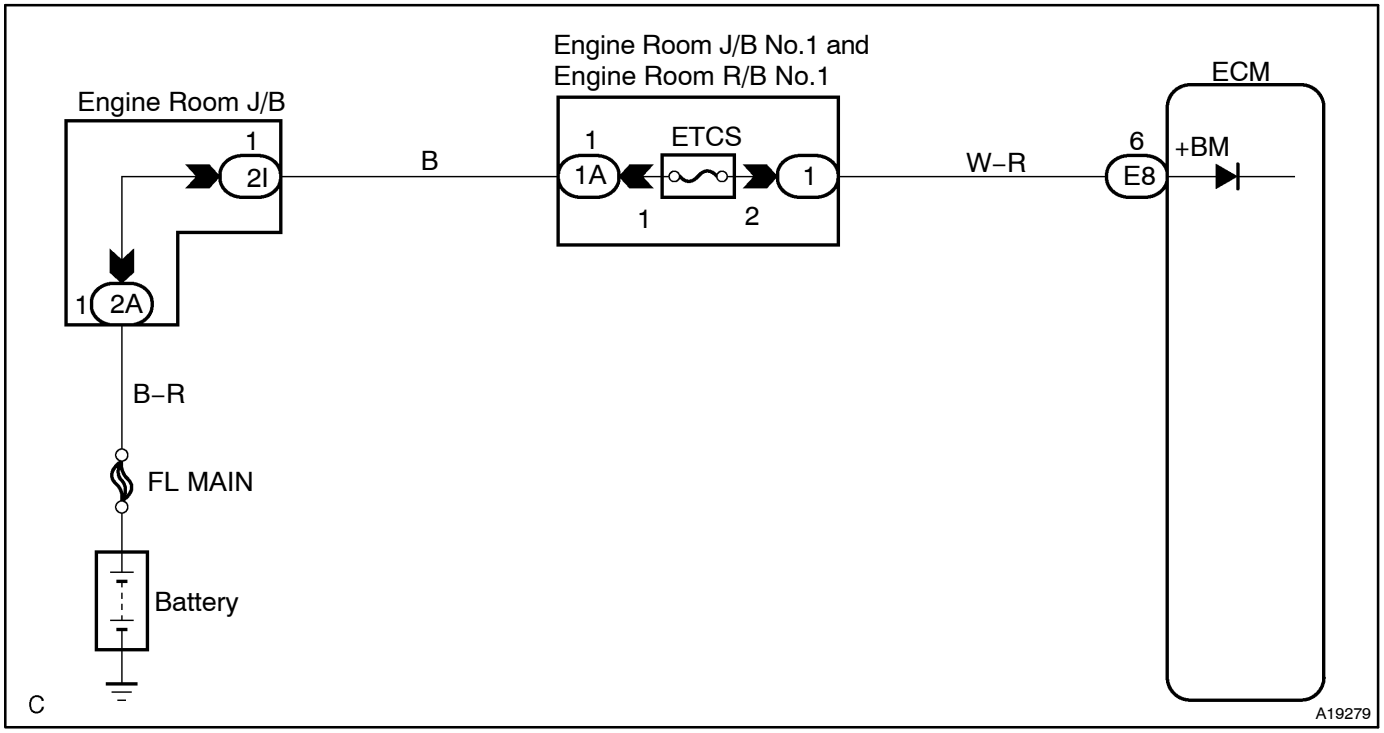
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Throttle actuator motor power supply voltage	Less than 4 V

COMPONENT OPERATING RANGE

Parameter	Standard Value
Throttle actuator motor power supply voltage	9 to 14 V

WIRING DIAGRAM

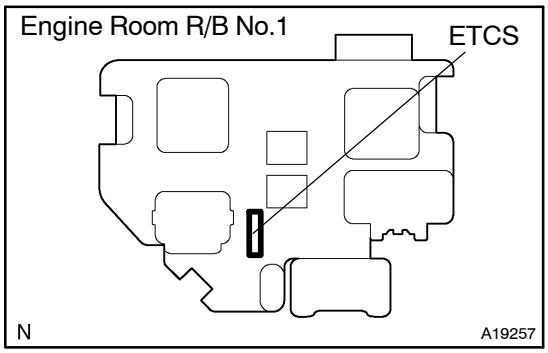


INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Check ETCS fuse.**



PREPARATION:

Remove the ETCS fuse from the engine room R/B No.1.

CHECK:

Check the continuity of the ETCS fuse.

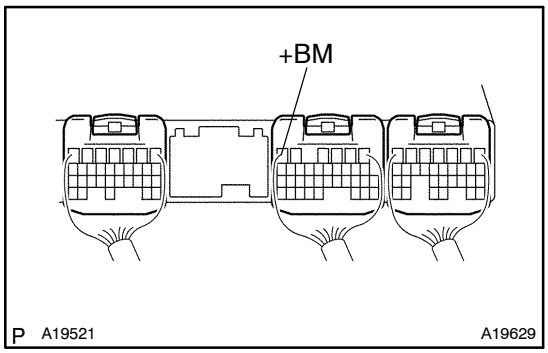
OK:

Continuity

NG → **Check for short in all harness and components connected to ETCS fuse.**

OK

2	**Check voltage between terminal +BM of ECM connector and body ground.**



PREPARATION:

Remove the glove compartment door (See page SF–78).

CHECK:

Measure the voltage between terminal +BM of the ECM connector and body ground.

OK:

Voltage: 9 to 14 V

OK → **Check for intermittent problems (See page DI–295).**

NG

3	**Check for open and short in harness and connector between ECM and ETCS fuse, ETCS fuse and battery (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check engine room R/B No. 1.

DIAKC–03

DTC	P2119	Throttle Actuator Control Throttle Body Range/Performance

CIRCUIT DESCRIPTION

The Electric Throttle Control System (ETCS) is composed of a throttle motor that operates the throttle valve, a throttle position sensor that detects the opening angle of the throttle valve, an accelerator pedal position sensor that detects the accelerator pedal position, and the ECM that controls the ETCS system.
The ECM operates the throttle motor to position the throttle valve for proper response to driver inputs. The throttle position sensor, which is mounted on the throttle body, detects the opening angle of the throttle valve and provides this signal to the ECM so that the ECM can regulate the throttle motor.

DTC No.	DTC Detecting Condition	Trouble Area
P2119	Throttle opening angle continues to vary greatly from target throttle opening angle	• Electric throttle control system • ECM

MONITOR DESCRIPTION

The ECM determines the ”actual” throttle angle based on the throttle position sensor signal. The ”actual” throttle position is compared to the ”target” throttle position commanded by the ECM. If the difference of these two values exceeds a specified limit, the ECM interprets this as a fault in the ETCS (Electronic Throttle Control System). The ECM turns on the MIL and a DTC is set.

FAIL SAFE

If the ETCS (Electronic Throttle Control System) has a malfunction, the ECM cuts off current to the throttle control motor. The throttle control valve returns to a predetermined opening angle (approximately 16°) by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel–cut) and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue at a minimum speed.
If the accelerator pedal is depressed firmly and slowly, the vehicle can be driven slowly.
If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2119	Electronic throttle control system failure
Required sensors/components	Main sensors/components	Throttle actuator motor
	Related sensors/components	Throttle position sensor
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI–295	
System guard*	ON	
System guard*		
Throttle actuator	ON	
Throttle actuator duty calculation	Executing	
Throttle position sensor	Fail determined	
Throttle actuator current cut operation	Not executing	
Throttle actuator power supply	4 V	–
Throttle actuator	Fail determined	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Either of the following conditions is met:	Condition 1 or 2
1. Commanded closed TP – current closed TP	0.3 V or more for 1 sec.
2. Commanded open TP – current open TP	0.3 V or more for 0.6 sec.

COMPONENT OPERATING RANGE

Standard Value
Commanded throttle position and current throttle position are nearly the same

WIRING DIAGRAM

Refer to DTC P2102 on page DI–582.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Are there any other codes (besides DTC P2119) being output?**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) When using hand–held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool.

RESULT:

Display (DTC Output)	Proceed to
Only P2119 is output	A
P2119 and other DTC are output	B

HINT:

If any other codes besides P2119 are output, perform the troubleshooting for those codes first.

B → **Go to relevant DTC chart (See page DI–335).**

A

2	**Check if DTC outputs reoccur.**

PREPARATION:

(a) Clear the DTC (See page DI–295).
(b) Start and warm up the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Perform the stall test.
Move the shift lever to D Position and fully depress the accelerator pedal for 5 seconds. Then release the pedal for 5 seconds or more.

CHECK:

Read the DTC using the hand–held tester or the OBD II scan tool (See page DI–295).

OK:

No DTC output.

OK → **System is normal.**

NG

Replace throttle body.

DTC	P2120	Throttle/Pedal Position Sensor/Switch ”D” Circuit

DTC	P2122	Throttle/Pedal Position Sensor/Switch ”D” Circuit Low Input

DTC	P2123	Throttle/Pedal Position Sensor/Switch ”D” Circuit High Input

DTC	P2125	Throttle/Pedal Position Sensor/Switch ”E” Circuit

DTC	P2127	Throttle/Pedal Position Sensor/Switch ”E” Circuit Low Input

DTC	P2128	Throttle/Pedal Position Sensor/Switch ”E” Circuit High Input

DTC	P2138	Throttle/Pedal Position Sensor/Switch ”D”/”E” Voltage Correlation

HINT:
This is the repair procedure for the ”accelerator pedal position sensor”.

CIRCUIT DESCRIPTION

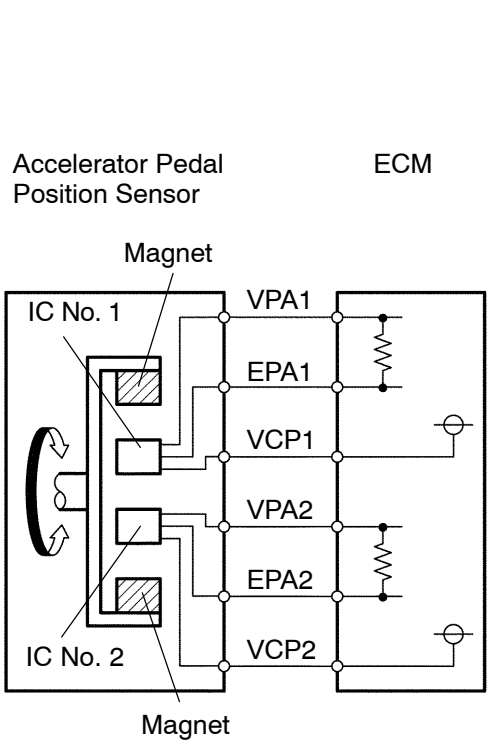
HINT:

- This electrical throttle system does not use a throttle cable.
- This accelerator pedal position sensor is a non–contact type.

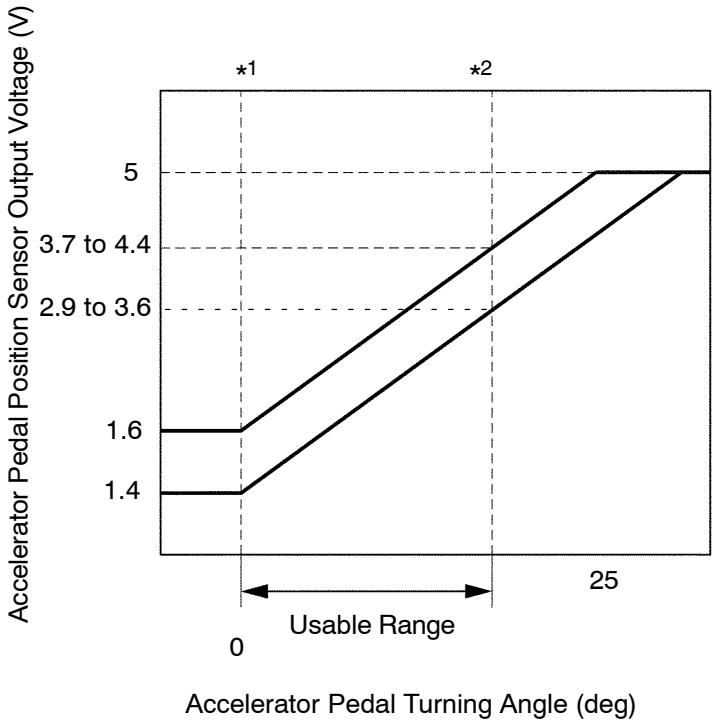
The accelerator pedal position sensor is mounted on the accelerator pedal to detect the angle of the accelerator pedal. This sensor is electronically controlled and uses Hall–effect elements.

In the accelerator pedal position sensor, the voltage applied to terminals VPA and VPA2 of the ECM changes between 0 V and 5 V in proportion to the angle of the accelerator pedal. The VPA is a signal to indicate the actual accelerator pedal angle and is used for the engine control. VPA2 is used to detect malfunctions of the sensor itself.

The ECM judges the current angle of the accelerator pedal from these signals input from terminals VPA and VPA2, and the ECM controls the throttle motor based on these signals.



A19694



*1 : Accelerator Pedal Fully Released

*2 : Accelerator Pedal Fully Depressed

A19803

DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA is 0.2 V or less and VPA2 is 0.97 deg or more, or VPA is 4.8 V or more	• Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA is 0.2 V or less (b) VPA2 is 0.97 deg or more	• Accelerator pedal position sensor • Open in VCP1 circuit • VPA circuit open or ground short • ECM
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA is 4.8 V or more	• Accelerator pedal position sensor • Open in EPA circuit • ECM
P2125	Condition (a) continues for 0.5 sec. or more: (a) (VPA2 is 0.5 V or less and VPA is 0.97 deg or more) or (VPA2 is 4.8 V or more and VPA is between 0.2 V and 3.45 V)	• Accelerator pedal position sensor • ECM
P2127	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 is 0.5 V or less (b) VPA is 0.97 deg or more	• Accelerator pedal position sensor • Open in VCP2 circuit • VPA2 circuit open or ground short • ECM
P2128	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 is 4.8 V or more (b) VPA is 0.2 V or more and VPA is 3.45 V or less	• Accelerator pedal position sensor • Open in EPA2 circuit • ECM
P2138	Condition (a) or (b) continues for 2.0 sec. or more: (a) Difference between VPA and VPA2 is 0.02 V or less (b) VPA is 0.2 V or less and VPA2 is 0.5 V or less	• VPA and VPA2 circuits are short–circuited • Accelerator pedal position sensor • ECM

HINT:

After confirming DTCs ”P2120, P2122, P2123, P2125, P2127, P2128 and P2138”, use the hand–held tester or the OBD II scan tool to confirm the accelerator pedal position sensor output voltage.

Trouble Area	Accelerator pedal position expressed as voltage output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EPA circuit open	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

MONITOR DESCRIPTION

When VPA or VPA2 deviates from the standard, or the difference between the voltage outputs of the two sensors is less than the threshold, the ECM concludes that there is a defect in the accelerator pedal position sensor. The ECM turns on the MIL and a DTC is set.

Example:

The voltage output of the VPA is below 0.2 V or exceeds 4.8 V.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving.
If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.
If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2120	Accelerator position sensor 1 (VPA) range check (Fluttering)
	P2122	Accelerator position sensor 1 (VPA) range check (Low voltage)
	P2123	Accelerator position sensor 1 (VPA) range check (High voltage)
	P2125	Accelerator position sensor 2 (VPA2) range check (Fluttering)
	P2127	Accelerator position sensor 2 (VPA2) range check (Low voltage)
	P2128	Accelerator position sensor 2 (VPA2) range check (High voltage)
	P2138	Accelerator position sensor correlation range check
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	2 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page DI–295
Throttle control motor power	ON

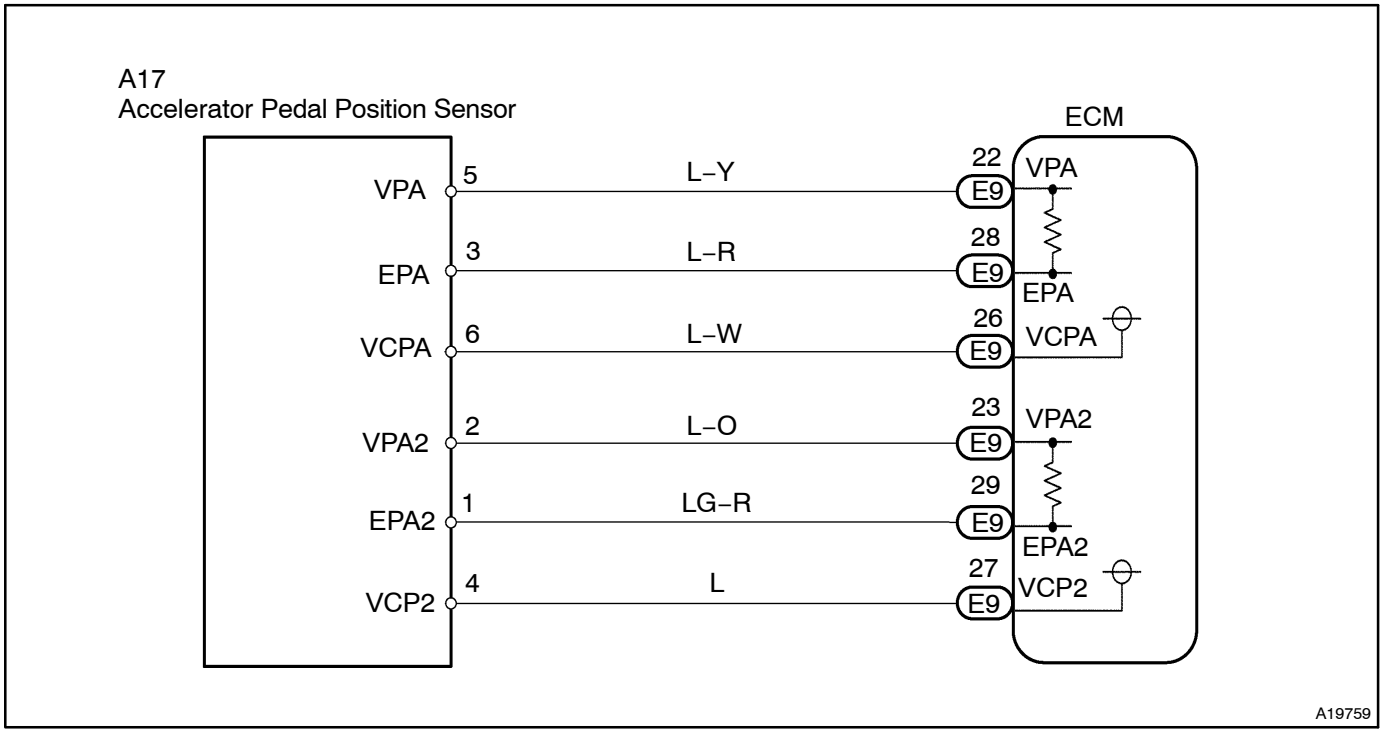
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2120:	
Either of the following conditions is met:	Condition 1 or 2
1. VPA1 voltage when VPA2 is 0.97° or more	0.2 V or less
2. VPA1 voltage	4.8 V or more
P2122:	
VPA1 voltage when VPA2 is 0.97° or more	0.2 V or less
P2123:	
VPA1 voltage	4.8 V or more
P2125:	
Either of the following conditions is met:	Condition 1 or 2
1. VPA2 voltage when VPA1 is 0.97° or more	0.5 V or less
2. VPA2 voltage when VPA1 is 0.2 to 3.45 V	4.8 V or more
P2127:	
VPA2 voltage when VPA1 is 0.97° or more	0.5 V or less
P2128:	
VPA2 voltage when VPA1 is 0.2 to 3.45 V	4.8 V or more
P2138:	
Either of the following conditions is met:	Condition 1 or 2
1. Difference between VPA1 and VPA2 voltages	0.02 V or less
2. Both of the following conditions are met:	(a) and (b)
(a) VPA1 voltage	0.2 V or less
(b) VPA2 voltage	0.5 V or less

COMPONENT OPERATING RANGE

Parameter	Standard Value
VPA voltage	More than 0.2 V and less than 4.8 V
VPA2 voltage	More than 0.5 V and Less than 4.8 V
Difference between VPA and VPA2 voltages	More than 0.02 V

WIRING DIAGRAM



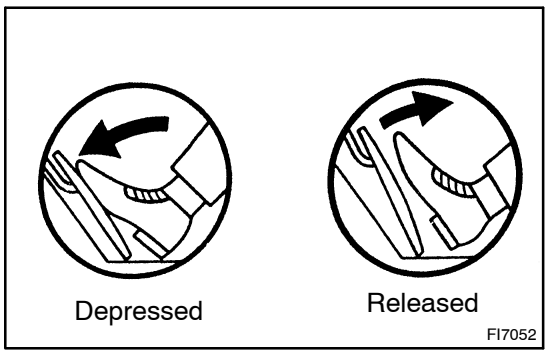
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester, and read the voltage for accelerator pedal position sensor data.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Accelerator pedal	VPA1	VPA2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK	**Go to step 5.**

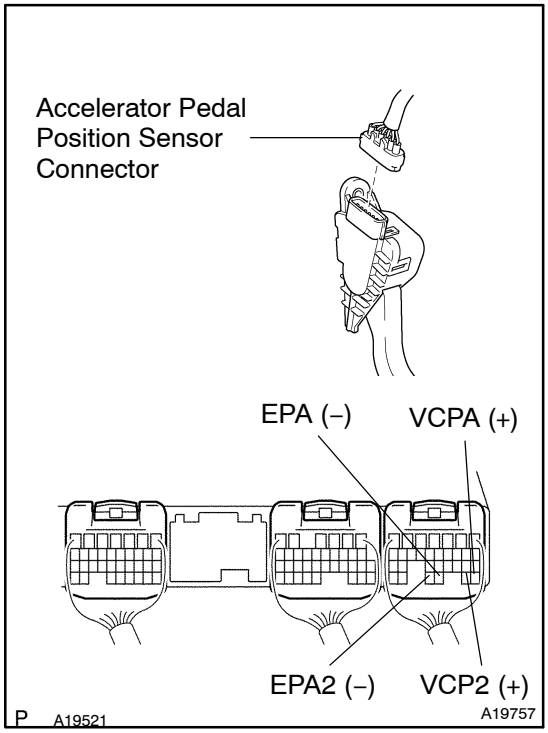
NG

2	**Check for open and short in harness and connector in VCPA, VCP2, VPA, VPA2 EPA and EPA2 circuit between ECM and accelerator pedal position sensor (See page IN–30)**

NG → **Repair or replace harness and connector.**

OK

3	**Check voltage between terminals VCPA and EPA, and VCP2 and EPA2 of ECM terminals.**



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the accelerator pedal position sensor connector.

CHECK:

Measure the voltage between terminals VCPA and EPA, and VCP2 and EPA2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

4	**Replace accelerator pedal assembly (See page SF–76).**

Go

5	**Check if DTC output recur?**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Clear the DTC by hand–held tester, or disconnect the battery terminals or remove the EFI fuses and ETCS fuses (Clear DTCs).
(c) Start the engine.
(d) Drive the engine at idle for 15 sec. or more.

CHECK:

Read the DTC output.

OK:

No DTC output.

OK → **System is OK.**

NG

Replace ECM (See page SF–78).

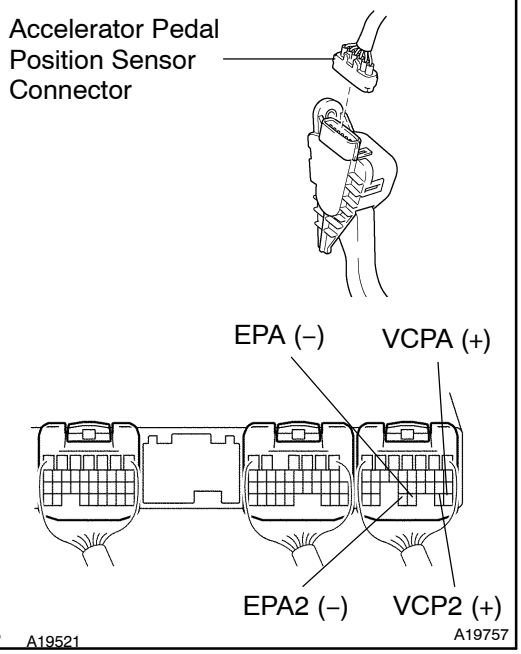
OBD II scan tool (excluding hand–held tester):

1	**Check for open and short in harness and connector in VCPA, VCP2, VPA, VPA2 EPA and EPA2 circuit between ECM and accelerator pedal position sensor (See page IN–30)**

NG → **Repair or replace harness or connector.**

OK

2	**Check voltage between terminals VCPA and EPA, and VCP2 and EPA2 of ECM terminals.**



CHECK:

(a) Remove the ECM cover.
(b) Turn the ignition switch ON.
(c) Disconnect the accelerator pedal position sensor connector.

CHECK:

Measure the voltage between terminals VCPA and EPA, and VCP2 and EPA2 of the ECM connector.

OK:

Voltage: 4.5 to 5.5 V

NG → **Replace ECM (See page SF–78).**

OK

3	**Replace accelerator pedal position sensor (See page SF–76).**

Go

4	**Check if DTC output recur?**

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.
(b) Disconnect the battery terminals or remove the EFI fuse and ETCS fuses (Clear DTCs).
(c) Start the engine.
(d) Drive the engine at idle for 15 sec. or more.

CHECK:

Read the DTC output.

OK:

No DTC output.

OK → **System is OK.**

NG

Replace ECM (See page SF–78).

DIC7T–02

DTC	P2121	Throttle/Pedal Position Sensor/Switch ”D” Circuit Range/Performance

HINT:
This is repair procedure for the ”accelerator pedal position sensor”.

CIRCUIT DESCRIPTION

Refer to DTC P2120 on page DI–597.

DTC No.	DTC Detecting Condition	Trouble Area
P2121	Condition (a) continues for 0.5 seconds: (a) Difference between VPA and VPA2 is out of threshold	• Accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM

MONITOR DESCRIPTION

The accelerator pedal position sensor is mounted on the accelerator pedal bracket. The accelerator pedal position sensor has 2 sensor elements/signal outputs: VPA1 and VPA2. VPA1 is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA1. When the difference between the voltage outputs of VPA1 and VPA2 deviates from the standard, the ECM concludes the accelerator pedal position sensor has a malfunction. The ECM turns on the MIL and a DTC is set.

FAIL SAFE

The accelerator pedal position sensor has two (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to limp mode. In limp mode, the remaining circuit is used to calculate the accelerator pedal opening to allow the vehicle to continue driving.
If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.
If a ”pass” condition is detected and then the ignition switch is turned OFF, the fail–safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2121	Accelerator position sensor (rationality)
Required sensors/components	Accelerator position sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Either of the following conditions is met	Condition 1 or 2	
1. Ignition switch	ON	
2. Throttle control motor power	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Difference between VPA1 voltage (learned value) and VPA2 voltage (learned value)	Less than 0.4 V, or more than 1.2 V

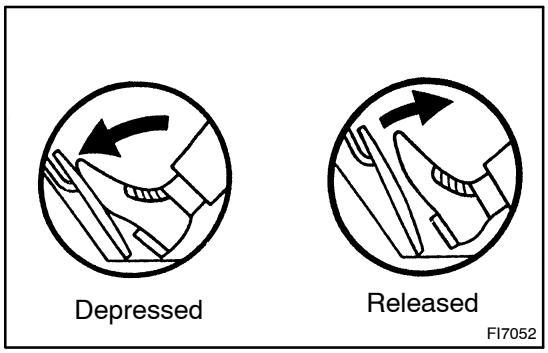
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester:

1	**Connect hand–held tester, and read the voltage for accelerator pedal position sensor data.**



PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:

Accelerator pedal	VPA1	VPA2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK	**Replace ECM (See page SF–78).**

NG

2	**Check for open and short in harness and connector between accelerator pedal position sensor and ECM (See page IN–30).**

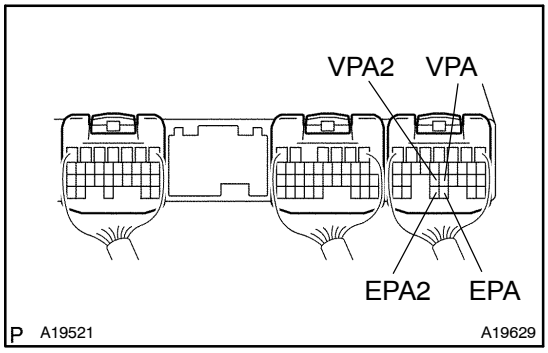
NG → **Repair or replace harness or connector.**

OK

Replace accelerator pedal position sensor.

OBD II scan tool (excluding hand–held tester):

1	**Check voltage between terminals VPA and EPA, VPA2 and EPA2 of ECM terminals.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VPA and EPA, VPA2 and EPA2 of the ECM connectors.

OK:

Accelerator Pedal Position	Tester Connection	Tester Connection
	VPA – EPA	VPA2 – EPA2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK → **Replace ECM (See page SF–78).**

NG

2	**Check for open and short in harness and connector between accelerator pedal position sensor and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace accelerator pedal assembly (See page SF–76).

DIC7U–02

DTC	P2430	Secondary Air Injection System Air Flow/ Pressure Sensor Circuit Bank 1

DTC	P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1

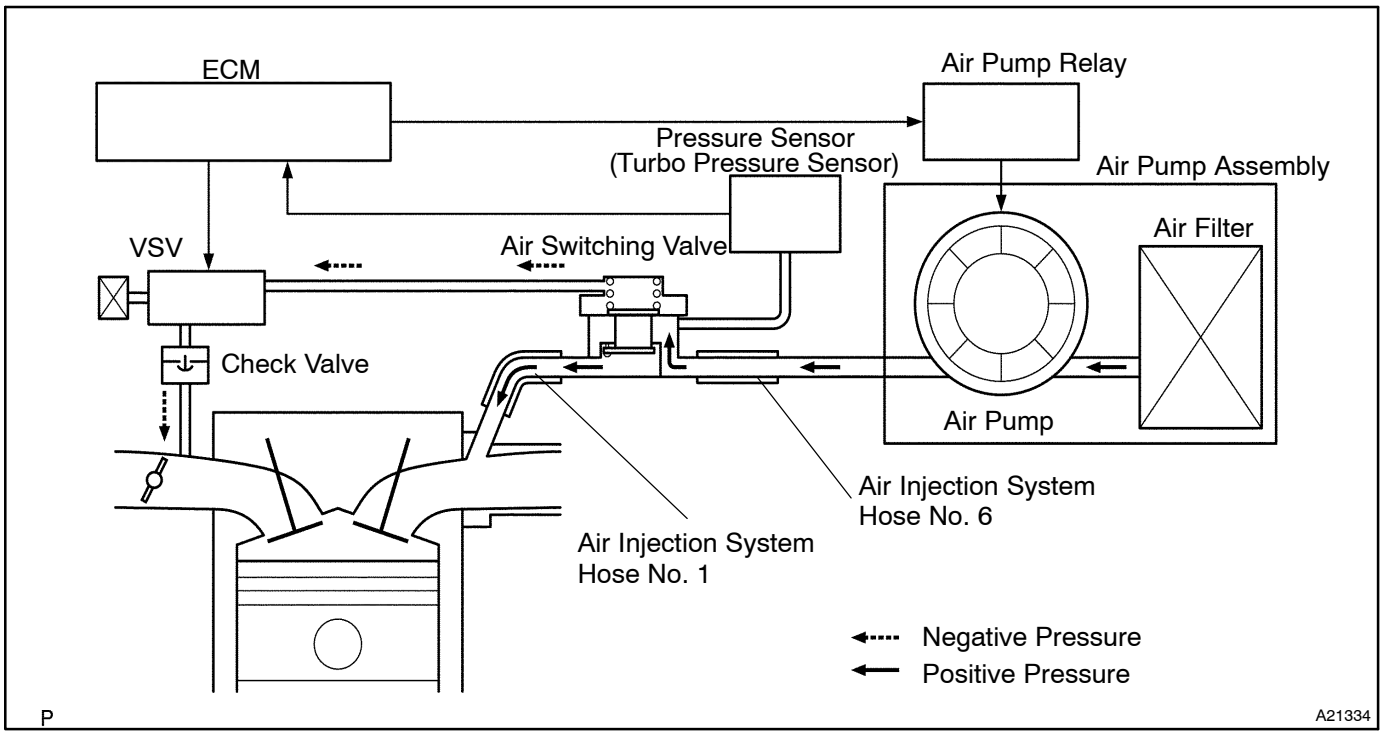
DTC	P2432	Secondary Air Injection System Air Flow/ Pressure Sensor Circuit Low Bank 1

DTC	P2433	Secondary Air Injection System Air Flow/ Pressure Sensor Circuit High Bank 1

CIRCUIT DESCRIPTION

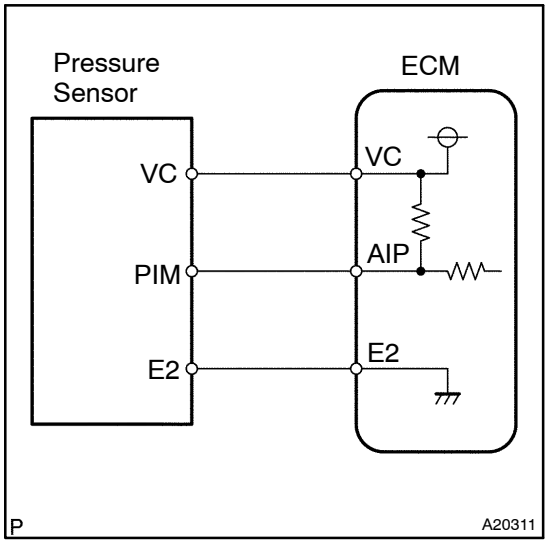
To accelerate the activation of catalyst when warming up the engine, the air injection system pumps the secondary air to the exhaust manifold. The secondary air is supplied by the air pump and is pumped to the exhaust manifold through the air switching valve. Open and close movement of the air switching valve is regulated by the vacuum switching valve (VSV).The air pump and the air switching valve are observed by the ECM and are used to detect a malfunction in this system.

The ECM monitors the secondary air injection system and detects a malfunction using a pressure sensor located on the air switching valve.



DTC No.	DTC Detecting Condition	Trouble Area
P2430	While the engine is running, voltage output of the pressure sensor indicates 0.1V or less, or indicates 4.8V or more	• Pressure sensor • Open or short in pressure sensor circuit • Vacuum hose • Check valve • ECM
P2431	The pressure sensor indicates less than 45 kPa (338 mHg), or more than 135 kPa (1013 mHg)	
P2432	While the engine is running, voltage output of pressure sensor remains below 0.1V	
P2433	While the engine is running, voltage output of the pressure sensor remains above 4.8V	

MONITOR DESCRIPTION



The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system.
If there is a defect in the sensor or the sensor circuit, the voltage level will deviate from the normal operating range, the ECM interprets this deviation as a defect in the pressure sensor circuit and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2430	Air flow/Pressure sensor circuit range check (Fluttering)
	P2431	Air flow/Pressure sensor circuit rationality
	P2432	Air flow/Pressure sensor circuit range check (Low voltage)
	P2433	Air flow/Pressure sensor circuit range check (High voltage)
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	P2430, P2432, P2433: 0.5 sec. P2431: 5 sec.	
MIL operation	P2430, P2432, P2433: Immediate P2431: 2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	8 V	–
Ignition switch	ON	
Starter	OFF	
Time after starter is turned from ON to OFF	2 sec.	–

TYPICAL MALFUNCTION THRESHOLD

Detection Criteria	Threshold
P2430:	
Air pressure sensor voltage	Less than 0.1 V, or more than 4.815 V
P2432:	
Air pressure sensor voltage	Less than 0.1V
P2433:	
Air pressure sensor voltage	More than 4.815 V
P2431:	
Air pressure	Less than 45 kPa (338 mmHg), or more than 135 kPa (1013 mmHg)

COMPONENT OPERATING RANGE

Parameter	Standard value
Air pressure sensor voltage	Between 0.1 V and 4.8 V

MONITOR RESULT

Refer to page DI–295 for detailed information.

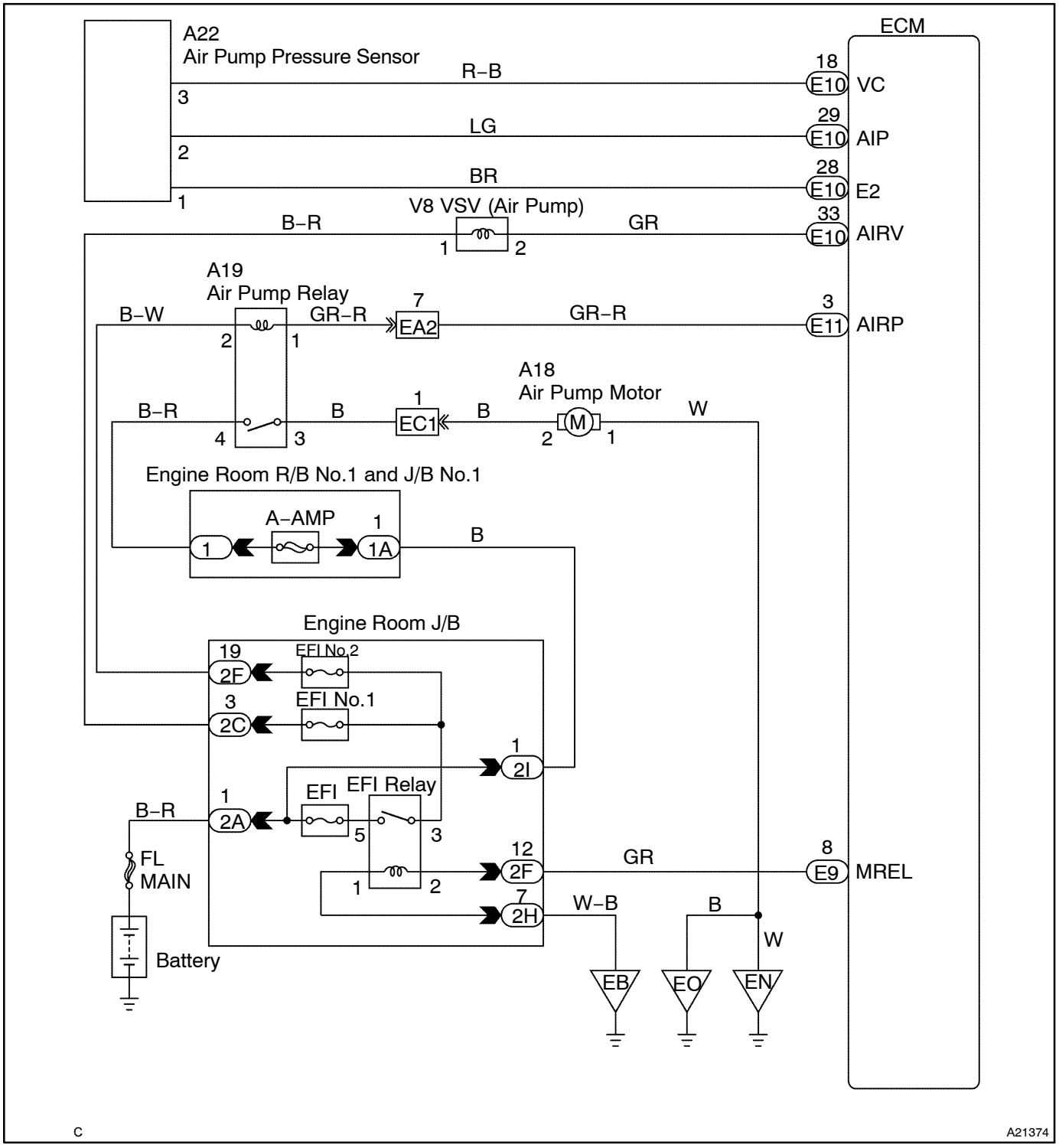
The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $0A: Secondary air injection (AIR) system

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 65.536 (no dimension)	Test value of AIR system malfunction	Malfunction criteria for AIR system malfunction
1	$02	Multiplied by 8.192 (no dimension)	Test value of AIR control valve stuck open	Malfunction criteria for AIR control valve stuck open
1	$03	Multiplied by 8.192 (no dimension)	Test value of AIR pump stuck ON	Malfunction criteria for AIR pump stuck ON

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

To check the pressure condition in the secondary air passage, the hand–held tester is available.

(a) Connect the hand–held tester to the DLC3 on the vehicle.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SECOND AIR VSV / ALL or USER DATA (press the right or left button).

NOTICE:

When selecting USER DATA, select ”SECONDARY AIR” and ”SECOND AIR VSV” on the screen by pressing the ”YES” button on the tester.

HINT:

When operating the VSV in the secondary air system, the air pump is also operated at the same time.

(e) Check that the SECONDARY AIR, SECOND AIR VSV and 2ND AIR PRESS on the hand–held tester indicate the same conditions as the chart below.

NOTICE:

This test allows the technician to operate the VSV for only 5 seconds. If you perform the test again, more than 30 seconds interval must be required after the previous test is done.

Tester Operation	Specified Condition		2ND AIR PRESS (*3)
	SECONDARY AIR (*1)	SECOND AIR VSV (*2)	
VSV is ON	ON	ON	2.5 kPa or more
VSV is OFF	OFF	OFF	less than 2.5 kPa

HINT:

*1: Means the signal output from the ECM to operate the air pump.

*2: Means the signal output from the ECM to operate the VSV.

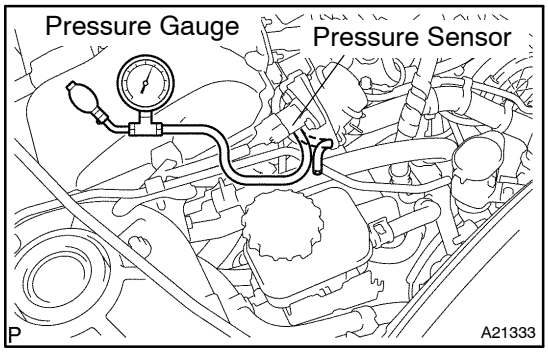
*3: Means the difference between the air pressure inside the air pressure sensor and the atmospheric pressure. When the pressure inside the secondary air injection system is equal to the atmospheric pressure, the hand–held tester displays ”0 kPa”.

1	**Check for open and short in harness and connector between pressure sensor and ECM (See page IN–30).**

NG → **Repair or replace harness and connector.**

OK

2	Inspect ECM (AIP voltage).



PREPARATION:

(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Connect the hand–held tester to the DLC3 on the vehicle.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON (Do not start engine).
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.

CHECK:

Check that the pressure displayed on the hand–held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

NG → **Replace pressure sensor (See page EC–14).**

OK →

Replace ECM (See page SF–78).

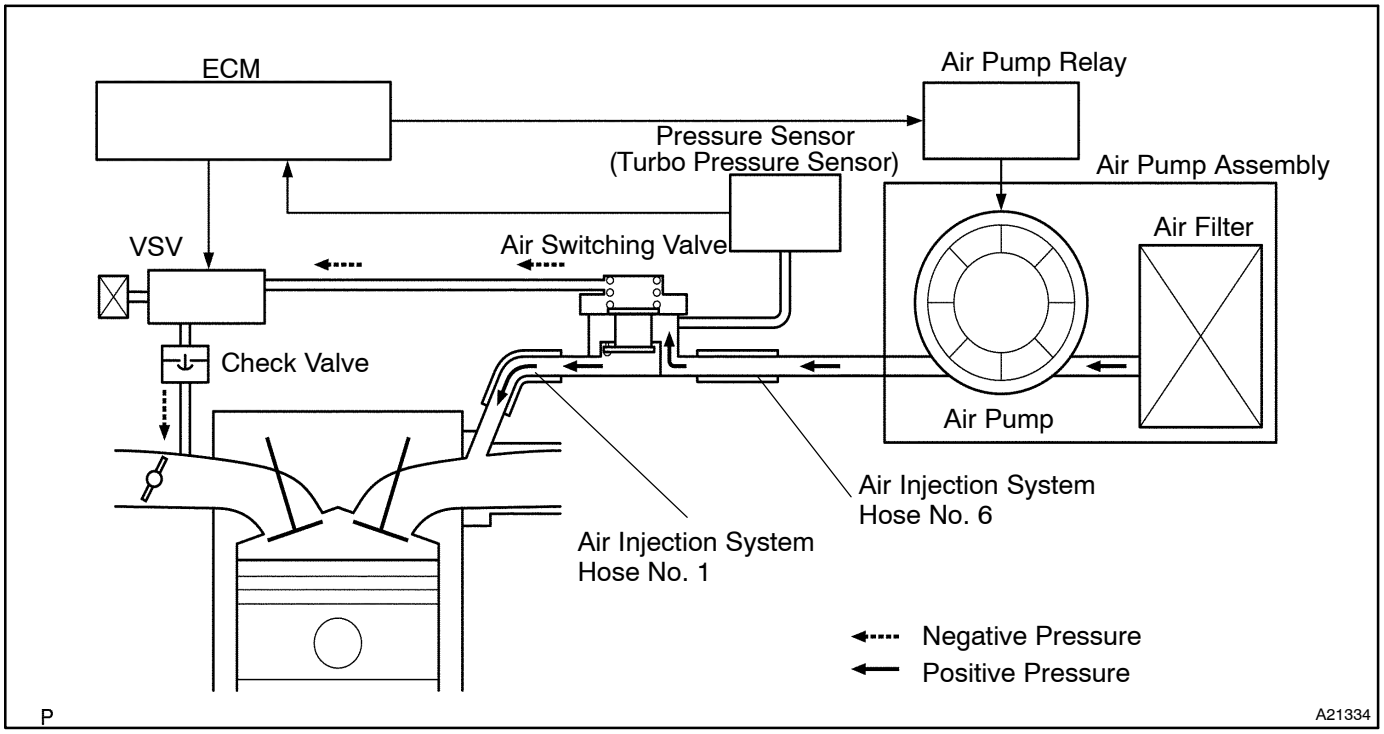
DIC7V–02

DTC	P2440	Secondary Air Injection System Switching Valve Stuck Open Bank 1

DTC	P2441	Secondary Air Injection System Switching Valve Stuck Close Bank 1

CIRCUIT DESCRIPTION

To accelerate the activation of catalyst when warming up the engine, the air injection system pumps the secondary air to the exhaust manifold by pressure. The secondary air is supplied by the air pump and it is pumped to the exhaust manifold through the air switching valve. Open and close movement of the air switching valve is regulated by the vacuum switching valve (VSV).The air pump and the air switching valve are observed by the ECM and are used to detect a malfunction in this system.
The ECM monitors the secondary air injection system and detects a malfunction using a pressure sensor located on the air switching valve.



DTC No.	DTC Detection Condition	Trouble Area
P2440	Although the ECM has ordered the VSV to close the air switching valve while the engine is running but the pressure sensor detects pulsation of the exhaust gas	• VSV • Air switching valve • Open or short in VSV circuit • Pressure sensor • Open or short in pressure sensor circuit • ECM
P2441	Although the ECM has ordered the VSV to open the air switching valve while the engine is running but the pressure sensor is unable to detect pulsation of the exhaust gas	• VSV • Air switching valve • Open or short in VSV circuit • Vacuum hose and check valve • Air injection hose • Pressure sensor • Open or short in pressure sensor circuit • ECM

MONITOR DESCRIPTION

The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system. The sensor detects an exhaust pressure in the secondary air passage.

If the ECM receives the pulsation signal from the sensor despite the ECM ordering the VSV to close the air switching valve, or if the ECM has not received the signal from the sensor despite the ECM ordering the VSV to open the valve, the ECM interprets this as a fault in the secondary air injection system and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2440	AIR control valve stuck open
	P2441	AIR control valve stuck closed
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	2 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Atmosphere pressure	45 kPa (0.46 kg/cm^2)	–
Engine	Running	
P2440:		
Air pump and air switching valve: OFF	10 sec.	–
P2441:		
Air pump and air switching valve: ON	6 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2440:	
Number of times the following condition is met:	4 times or more
Cumulative pressure pulsation of secondary air injection	30 kPa (0.3 kg/cm^2) or more (Vary with smoothed pressure of secondary air injection)
P2441:	
Number of times the following condition is met:	4 times or more
Cumulative pressure pulsation of secondary air injection	20 kPa (0.2 kg/cm^2) or less (Vary with smoothed pressure of secondary air injection)

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $0A: Secondary air injection (AIR) system

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 65.536 (no dimension)	Test value of AIR system malfunction	Malfunction criteria for AIR system malfunction
1	$02	Multiplied by 8.192 (no dimension)	Test value of AIR control valve stuck open	Malfunction criteria for AIR control valve stuck open
1	$03	Multiplied by 8.192 (no dimension)	Test value of AIR pump stuck ON	Malfunction criteria for AIR pump stuck ON

WIRING DIAGRAM

Refer to DTC P2430 on page DI–611.

INSPECTION PROCEDURE

Hand–held tester:

HINT:

To check the pressure condition in the secondary air passage, the hand–held tester is available.

1	**Is the DTC P2440 or P2441 being output?**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2440 or P2441	A
P2440, P2441 and other DTCs	B

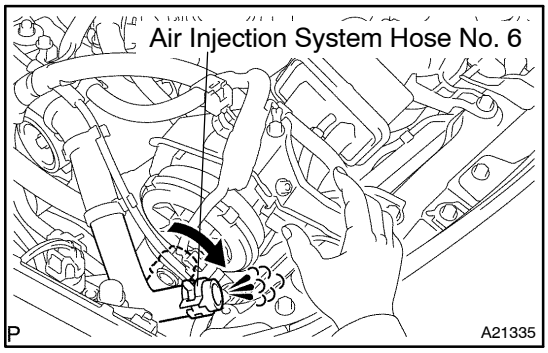
HINT:

If any other codes besides P2440 or P2441 are output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	Check VSV for secondary air injection system.



PREPARATION:

(a) Connect the hand–held tester to the DLC3 on the vehicle.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Disconnect the air injection system hose No. 6.
(d) Start the engine.
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST/SECOND AIR VSV / ALL or USER DATA (press the right or left button).

NOTICE:

When selecting USER DATA, select SECONDARY AIR" and "SECOND AIR VSV" on the screen by pressing the "YES" button on the tester.

HINT:

When operating the VSV in the secondary air system, the air pump is also operated at the same time.

CHECK:

Put your hand at the disconnected hose end, and check that the exhaust gas pressure pulsation is applied to your hand when turning on the VSV for air switching valve with the ACTIVE TEST. And also check that the exhaust gas pressure pulsation is not applied to your hand when turning off the VSV for air switching valve.

NOTICE:

This test allows the technician to operate the VSV for only 5 seconds. If you perform the test again, more than 30 seconds interval must be required after the previous test is done.

HINT:

"SECONDARY AIR (air pump)" means the signal output from the ECM to operate the air pump.

OK	Go to step 9.

NG

3	**Check air injection system No. 1 hose.**

CHECK:

(a) Check that the air injection hose No. 1 is securely connected to both exhaust manifold and air switching valve.

(b) Inspect the air injection hose No. 1 for blockage or damage.

NG → **Repair or replace air injection system No. 1 hose.**

OK

4	**Check stored DTC.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

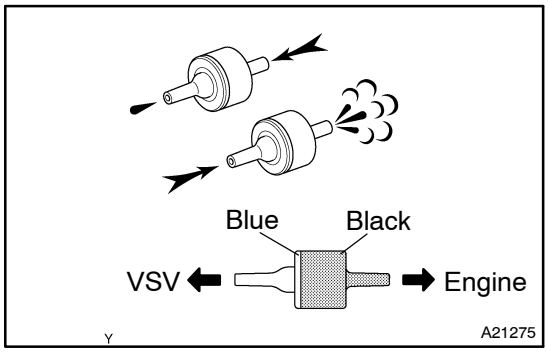
Read the DTC using the hand–held tester.

Display (DTC Output)	Proceed to
P2440	A
P2441	B

A → **Go to step 6.**

B

5	Check vacuum hose and check valve.



CHECK:

(a) Check each vacuum hose connection between the pressure sensor and air switching valve, the air switching valve and the VSV, and the VSV and intake manifold.
(b) Inspect the vacuum hose for blockage or damage.
(c) Check that check valve is correctly installed.
(d) Check that there is air–flow in the check valve from the VSV to the engine. Also, check that there is no air–flow in the opposite side.

NG	Repair or replace vacuum hose and check valve.

OK

6	Check air switching valve (See page EC–12).

NG	Replace air switching valve.

OK

7	Check vacuum switch valve (See page EC–12).

NG	Replace vacuum switching valve.

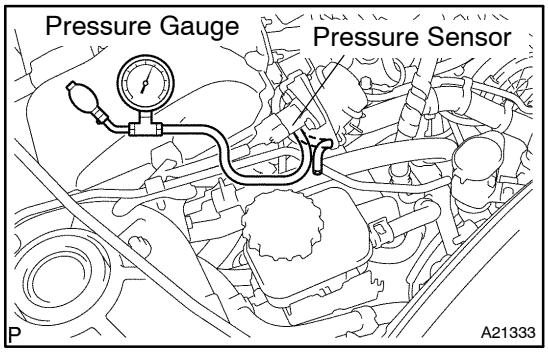
OK

8	Check for open and short in harness and connector between ECM and VSV for secondary air injection system.

NG	Repair or replace harness or connector.

OK

9	Inspect ECM (air voltage).



PREPARATION:

(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Connect the hand–held tester to the DLC3 on the vehicle.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON (Do not start engine).
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.

CHECK:

Check that the pressure displayed on the hand–held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

NG → **Replace pressure sensor.**

OK →

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Is the DTC P2440 or P2441 being output.**

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool main switch ON.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2440 or P2441	A
P2440, P2441 and other DTCs	B

HINT:

If any other codes besides P2440 or P2441 are output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	**Check stored DTC.**

CHECK:

Read the DTC using the OBD II scan tool.

Display (DTC Output)	Proceed to
P2440	A
P2441	B

A → **Go to step 4.**

B

3	Check air injection system No. 1 hose.

CHECK:

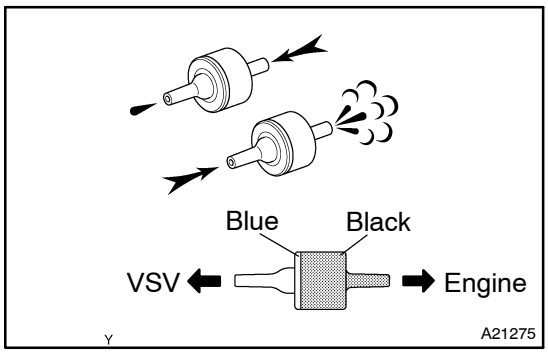
(a) Check that the air injection hose No. 1 is securely connected to both exhaust manifold and air switching valve.

(b) Inspect the air injection hose No. 1 for blockage or damage.

NG → **Repair or replace air injection system No. 1 hose.**

OK

4	Check vacuum hose and check valve.



CHECK:

(a) Check each vacuum hose connection between the pressure sensor and air switching valve, the air switching valve and the VSV, and the VSV and intake manifold.

(b) Inspect the vacuum hose for blockage or damage.

(c) Check that check valve is correctly installed.

(d) Check that there is air–flow in the check valve from the VSV to the engine. Also, check that there is no air–flow in the opposite side.

NG → **Repair or replace vacuum hose and check valve.**

OK

5	Check air switching valve (See page EC–12).

NG → **Replace air switching valve.**

OK

6	**Check vacuum switch valve (See page EC–12).**

NG → **Replace vacuum switching valve.**

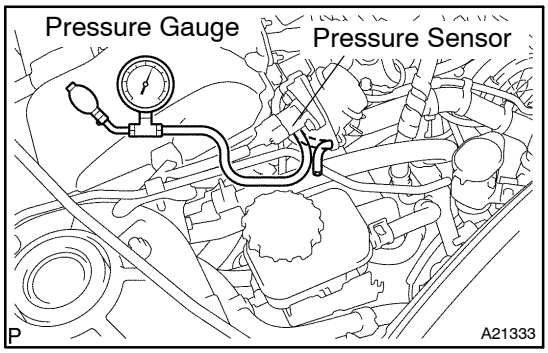
OK

7	**Check for open and short in harness and connector between ECM and VSV for secondary air injection system (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

8	**Inspect ECM (air voltage).**



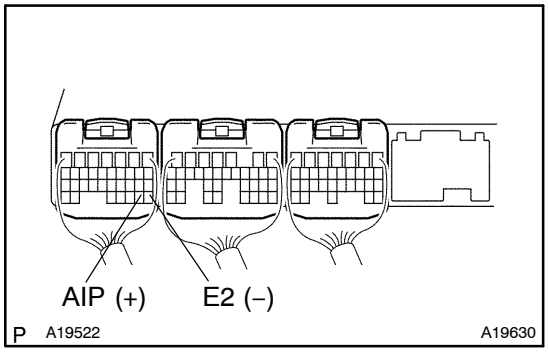
PREPARATION:

(a) Connect the pressure gauge to the air pressure sensor as shown in the illustration.

(b) Turn the ignition switch ON (Do not start engine).

CHECK:

Check for voltage change between terminals AIP and E2 of the ECM connector when applying the pressure to the pressure sensor with the pressure gauge.



NG → **Replace pressure sensor.**

OK

Replace ECM (See page SF–78).

DIC7W–02

DTC	P2444	Secondary Air Injection System Pump Stuck On Bank 1

DTC	P2445	Secondary Air Injection System Pump Stuck Off Bank 1

CIRCUIT DESCRIPTION

Refer to DTC P2430 on page DI–611.

DTC No.	DTC Detection Condition	Trouble Area
P2444	The secondary air pressure is more than 2.5 kPa (19 mmHg) despite the ECM ordering the air pump to turn off	• Short in air pump circuit • Pressure sensor • Air pump assembly • Open or short in pressure sensor circuit • ECM
P2445	The secondary air pressure is less than 2.5 kPa (19 mmHg) despite the ECM ordering the air pump to turn on	• Air pump fuse • Vacuum hose • Air pump assembly • Open in air pump circuit • Secondary air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM

MONITOR DESCRIPTION

The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system. The sensor measures the pressure in the secondary air passage and sends a signal to the ECM.

If the pressure level from the sensor has not reached a certain level despite the ECM turning on the air pump, or if the pressure level exceeds the threshold despite the ECM turning off the air pump, the ECM interprets this as a fault in the secondary air injection system and sets a DTC.

MONITOR STRATEGY

Related DTCs	P2444	Air pump stuck ON
	P2445	Air pump stuck OFF
Required sensors/components	Pressure sensor	
Frequency of operation	Continuous	
Duration	2 min.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
Battery voltage	11 V	–
Atmosphere pressure	45 kPa (0.46 kg/cm^2)	–
Engine	Running	
P2444:		
Air pump and air switching valve: OFF	10 sec.	–
P2445:		
Air pump and air switching valve: ON	6 sec.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P2444:	
Number of times the following conditions 1 and 2 are met:	4 times or more
1. Smoothed pressure of secondary air injection	2.5 kPa (0.025 kg/cm^2) or more
2. Cumulative pressure pulsation of secondary air injection	20 kPa (0.2 kg/cm^2) or less, or 30 kPa (0.3 kg/cm^2) or more (Vary with smoothed pressure of secondary air injection)
P2445:	
Number of times the following conditions 1 and 2 are met:	4 times or more
1. Smoothed pressure of secondary air injection	Less than 2.5 kPa (0.025 kg/cm^2)
2. Cumulative pressure pulsation of secondary air injection	20 kPa (0.2 kg/cm^2) or less, or 30 kPa (0.3 kg/cm^2) or more (Vary with smoothed pressure of secondary air injection)

MONITOR RESULT

Refer to page DI–295 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (see page DI–326).

- TID (Test Identification Data) is assigned to each emissions–related component.
- TLT (Test Limit Type):
  If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
  If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification Data) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD II scan tools.

TID $0A: Secondary air injection (AIR) system

TLT	CID	Unit Conversion	Description of Test Data	Description of Test Limit
0	$01	Multiplied by 65.536 (no dimension)	Test value of AIR system malfunction	Malfunction criteria for AIR system malfunction
1	$02	Multiplied by 8.192 (no dimension)	Test value of AIR control valve stuck open	Malfunction criteria for AIR control valve stuck open
1	$03	Multiplied by 8.192 (no dimension)	Test value of AIR pump stuck ON	Malfunction criteria for AIR pump stuck ON

WIRING DIAGRAM

Refer to DTC P2430 on page DI–611.

INSPECTION PROCEDURE

Hand–held tester:

HINT:

To check the pressure condition in the secondary air passage, the hand–held tester is available.

1	**Is the DTC P2444 and P2445 being output.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

(c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2444 or P2445	A
”P2444, P2445” and other DTCs	B

HINT:

If any other codes besides P2444 or P2445 is output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	**Perform active test by hand–held tester (VSV for secondary air injection system).**

PREPARATION:

(a) Connect the hand–held tester to the DLC3 on the vehicle.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Start the engine.
(d) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SECOND AIR VSV / ALL or USER DATA (press the right or left button).

NOTICE:

When selecting USER DATA, select SECONDARY AIR" and "SECOND AIR VSV" on the screen by pressing the "YES" button on the tester.

HINT:

When operating the VSV in the secondary air system, the air pump is also operated at the same time.

CHECK:

Check that the SECONDARY AIR, SECOND AIR VSV and 2ND AIR PRESS on the hand–held tester indicate the same conditions as the chart below.

NOTICE:

This test allows the technician to operate the VSV for only 5 seconds. If you perform the test again, more than 30 seconds interval must be required after the previous test is done.

Tester Operation	Specified Condition		
	SECONDARY AIR (*1)	SECOND AIR VSV (*2)	2ND AIR PRESS (*3)
VSV is ON	ON	ON	2.5 kPa (19 mmHg) or more
VSV is OFF	OFF	OFF	less than 2.5 kPa (19 mmHg)

HINT:

*1: Means the signal output from the ECM to operate the air pump.
*2: Means the signal output from the ECM to operate the VSV.
*3: Means the difference between the air pressure inside the air pressure sensor and the atmospheric pressure. When the pressure inside the secondary air injection system is equal to the atmospheric pressure, the hand–held tester displays "0 kPa."

NG → **Go to step 12.**

OK

3	Check stored DTC.

PREPARATION:

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand–held tester main switch ON.
(c) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES."

CHECK:

Read the DTC using the hand–held tester.

Display (DTC Output)	Proceed to
P2444	A
P2445	B

A → **Go to step 10.**

B

4	Check vacuum hose.

CHECK:

(a) Check the vacuum hose connection between the pressure sensor and air switching valve.
(b) Inspect the vacuum hose for blockage or damage.

NG → **Repair or replace vacuum hose.**

OK

5	Check connection of secondary air injection system piping.

CHECK:

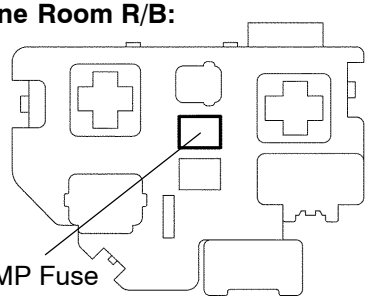
(a) Check that all the pipes and hoses between the air pump and air switching valve are securely connected.
(b) Inspect the pipe and hoses for blockage or damage.

NG → **Repair or replace secondary air injection system piping.**

OK

6	Check A–AMP fuse.

Engine Room R/B:



PREPARATION:
Remove the A–AMP fuse from the engine room R/B.
CHECK:
Check the resistance in the A–AMP fuse.
OK:
Below 1 Ω

NG → **Check for short in all harnesses and components connected fuse.**

OK

7	Check air pump relay (See page EC–17).

NG → **Replace air pump relay.**

OK

8	Check voltage of air pump motor power source.

Wire Harness Side:
Air Pump Assembly Connector



(a) Disconnect the air pump motor connector.
(b) Measure voltage between terminal 4 of the air pump assembly connector and body ground.
Standard: 9 to 14 V

NG → **Repair air pump power source circuit.**

OK

9	Check for open in harness and connector between air pump motor and body ground.

Wire Harness Side:

Air Pump Assembly Connector



Front View

A21278

(a) Disconnect the air pump assembly connector.
(b) Check the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
Air Pump Assembly (A22–2) – Body ground	Below 1 Ω

(c) Reconnect the air pump assembly connector.

NG → **Repair or replace harness or connector.**

OK

10	Inspect air pump assy (See page EC–12).

NG → **Replace air pump assy (See page EC–14).**

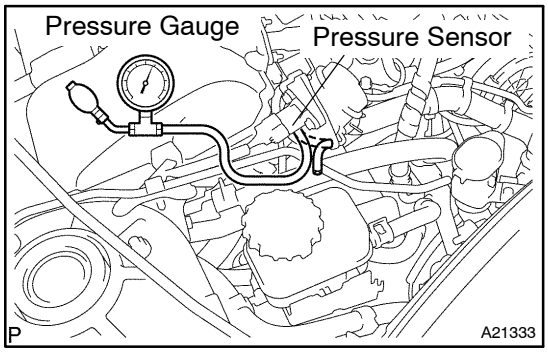
OK

11	Check for open and short in harness and connector between ECM and air pump relay (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

12	Inspect ECM (air voltage).



(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Connect the hand–held tester to the DLC3 on the vehicle.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON (Do not start engine).
(d) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / 2ND AIR PRESS.
(e) Check that the pressure displayed on the hand–held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

NG → **Replace pressure sensor.**

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Is the DTC P2444 or P2445 being output.**

PREPARATION:

(a) Connect the OBD II scan tool to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool main switch ON.

CHECK:

Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2444 or P2445	A
P2444, P2445 and other DTCs	B

HINT:

If any other codes besides P2444 or P2445 are output, perform the troubleshooting for those DTCs first.

B → **Go to DTC chart (See page DI–335).**

A

2	**Check stored DTC.**

Read the DTC using the OBD II scan tool.

Display (DTC Output)	Proceed to
P2444	A
P2445	B

A → **Go to step 9.**

B

3	**Check vacuum hose.**

NG → **Repair or replace vacuum hose.**

OK

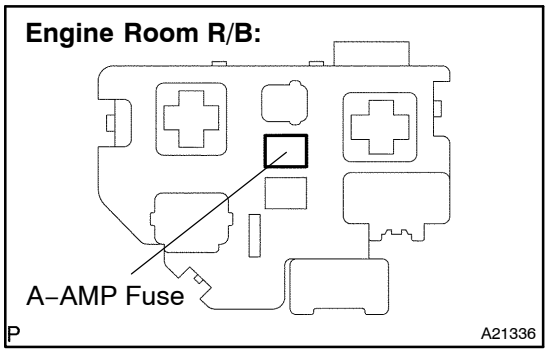
4	**Check connection of secondary air injection system piping.**

(a) Check that all the pipes and hoses between the air pump and the air switch are securely connected.
(b) Inspect the pipe and hoses for blockage or damage.

NG → **Repair or replace secondary air injection system piping.**

OK

5	**Inspect A–AMP fuse.**



PREPARATION:
Remove the A–AMP fuse from the engine room R/B.
CHECK:
Check the resistance in the A–AMP fuse.
OK:
Below 1 Ω

NG → **Check for short in all harnesses and components connected to fuse.**

OK

6	**Check air pump relay (See page EC–17).**

NG → **Replace air pump relay.**

OK

7	Check voltage of air pump motor power source.

Wire Harness Side:

Air Pump Assembly Connector



Front View

A21278

(a) Disconnect the air pump motor connector.
(b) Measure voltage between terminal 2 of the air pump assembly connector and body ground.
Standard: 9 to 14 V

NG → **Repair air pump power source circuit.**

OK

8	Check for open in harness and connector between air pump motor and body ground.

NG → **Repair or replace harness or connector.**

OK

9	Check air pump assy (See page EC–12).

NG → **Replace air pump assy (See page EC–14).**

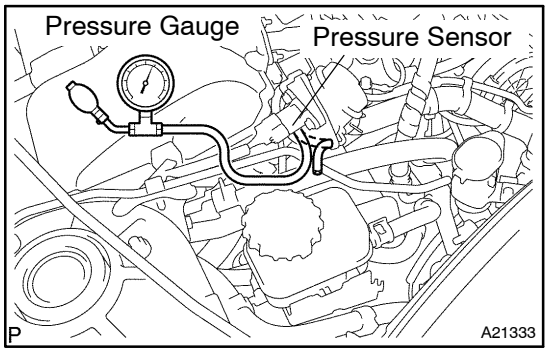
OK

10	Check for open and short in harness and connector between ECM and air pump relay (See page IN–30).

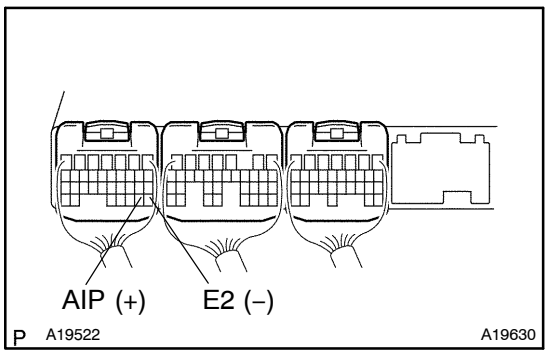
NG → **Repair or replace harness or connector.**

OK

11	Inspect ECM (air voltage).



(a) Connect the pressure gauge to the pressure sensor as shown in the illustration.
(b) Turn the ignition switch ON (Do not start engine).
(c) Check for voltage changes between terminals AIP and E2 of the ECM connector when applying the pressure to the pressure sensor with the pressure gauge.



NG → **Replace pressure sensor.**

OK →

Replace ECM (See page SF–78).

DIC7X–02

DTC	P2645	OCV for VVTL Circuit (Bank 1)

CIRCUIT DESCRIPTION

In order to improve the engine performance at both high and low engine speeds, the VVTL–i system varies valve lift using the standard cam and high lift cam. This provides the high power engine performance as well as an emission reduction and good fuel economy.
When the engine speed reaches 6,000 rpm, the ECM sends signals the OCV for VVTL–i to switch the effective cam from standard one to high lift one hydraulically.
The ECM controls the OCV to apply hydraulic pressure to the piston in the rocker arm and switches the rocker arm by locking the slipper for high speed.

DTC No.	DTC Detecting Condition	Trouble Area
P2645	Open or short in oil control valve for VVTL circuit	• Open or short in OCV circuit • OCV for VVTL–i • Oil pressure switch for VVTL–i • ECM

MONITOR DESCRIPTION

When the engine RPM is high, the VVTL–i actuator advances shims under the high–lift cam followers using engine oil pressure. Switching to the high–lift cam increases the valve lift as well as the intake air volume and exhaust capacity. These changes increase the engine's power output.
When the engine RPM is 6,000 rpm or more, the ECM increases the OCV control signal duty–ratio and it opens the oil passage to the VVTL–i actuator. The engine oil pressure powered actuator advances the cam follower shims and valves begin using the high–lift cam.
The ECM senses the current flow to the OCV to determine the "actual" duty–ratio of the control signal. If the duty–ratio is out of the normal range, the ECM interprets this as a malfunction in the OCV. The ECM will illuminate the MIL and a DTC will be set.

MONITOR STRATEGY

Related DTCs	P2645	OCV for VVTL–i circuit is open/shorted
Required sensors/components	OCV for VVTL–i	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

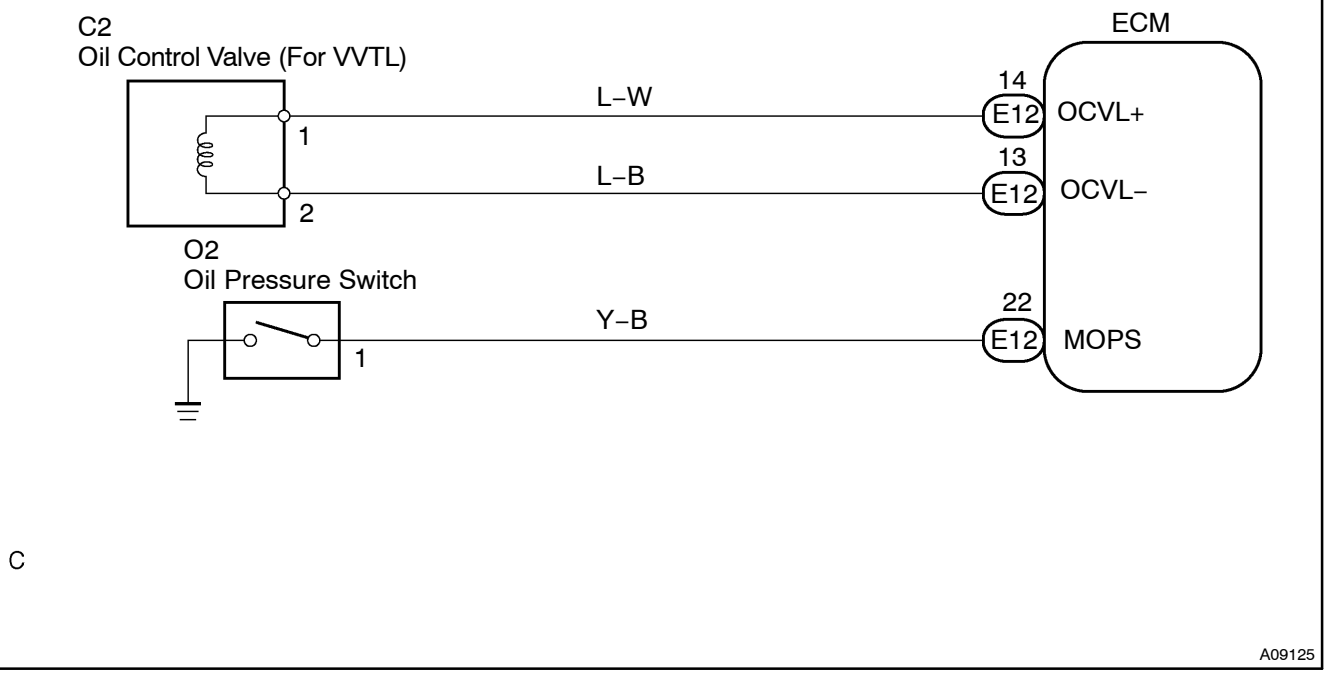
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present	See page DI–295	
Battery Voltage	11 V	–
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Hybrid IC diagnosis signal	Fail

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

Hand–held tester

1	**Check OCV for VVTL circuit.**

PREPARATION:

(a) Start the engine and warmed it up.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ALL/VVTL CTRL B1.
(e) Maintain engine speed at 1,500 to 2,500 rpm.

CHECK:

Check the engine speed when operate the OCV for VVTL by the hand–held tester.

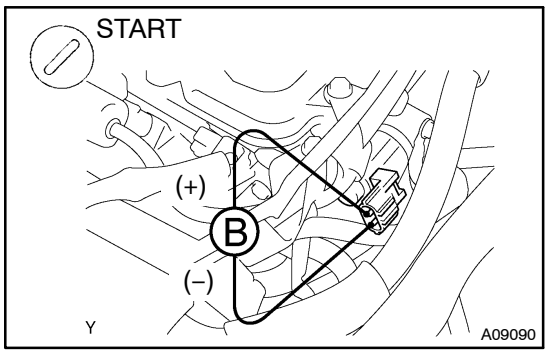
OK:

Tester Operation	Specified Condition
VVTL CTRL B1 is OFF (OCV is OFF)	Normal engine speed
VVTL CTRL B1 is ON (OCV is ON)	Rough engine speed or engine stalled

OK → **Check for intermitten problems (See page DI–295).**

NG

2	**Check operation of OCV for VVTL.**



PREPARATION:

Start the engine and warmed it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.
(2) Apply the battery voltage between the terminals of the camshaft timing oil control valve.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

B → **Replace OCV for VVTL.**

A

3	**Check voltage between terminals OVL+ and OVL– of ECM connector (See page DI–333).**

NG → **Replace ECM (See page SF–78).**

OK

4	**Check for open and short in harness and connector between OCV for VVTL and ECM (See page IN–30).**

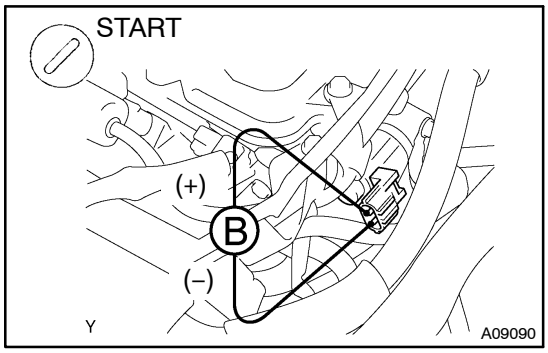
NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester)

1	**Check operation of OCV for VVTL.**



PREPARATION:

Start the engine and warm it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.

(2) Apply the battery voltage between the terminals of the camshaft timing oil control valve.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

NG → **Replace OCV for VVTL.**

OK

2	**Check voltage between terminals OVL+ and OVL– of ECM connector (See page DI–333).**

NG → **Replace ECM (See page SF–78).**

OK

3	**Check for open and short in harness and connector between OCV for VVTL and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

DIC7Y–02

DTC	P2646	OCV for VVTL Close Malfunction (Bank 1)

DTC	P2647	OCV for VVTL Open Malfunction (Bank 1)

CIRCUIT DESCRIPTION

Refer to DTC P2645 on page DI–640.

DTC No.	DTC Detecting Condition	Trouble Area
P2646	In the condition that the water temperature is 60 °C or more, the engine speed is 6,000 rpm or more, and the oil pressure switch is off for 1 sec. or more.	• Open or short in OCV circuit • OCV for VVT–L • Oil pressure switch for VVT–L • ECM
P2647	In the condition that the engine speed is 6,000 rpm or less and the oil pressure switch is on for 5 sec. or more.	

MONITOR DESCRIPTION

When the engine RPM is high, the VVTL–i actuator advances shims under the high–lift cam followers using engine oil pressure. Switching to the high–lift cam increases the valve lift as well as the intake air volume and exhaust capacity. These changes increase the engine's power output.

When the engine RPM is 6,500 rpm or more, the ECM increases the OCV control signal duty–ratio and it opens the oil passage to VVTL–i actuator. The engine oil pressure powered actuator advances the cam follower shims and valves begin using the high–lift cam.

The VVTL–i oil pressure switch senses the engine oil pressure applied to the VVTL–i system and the ECM judges which cam (standard cam or high–lift cam) is used based on the switch output. If the engine oil pressure applied to the VVTL–i system is high when the standard cam is required by the ECM or if the pressure is low when the high–lift cam is required, the ECM will determine that there is a malfunction in the OCV for VVTL and set a DTC.

MONITOR STRATEGY

Related DTCs	P2646	Cam does not change to high–lift cam
	P2647	Cam does not change to standard cam
Required sensors/components	Main sensors/components	Oil pressure switch for VVTL–i
	Related sensors/components	Vehicle speed sensor, ECT sensor, Crankshaft position sensor
Frequency of operation	Continuous	
Duration	Within 5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI–295	
High–lift cam condition:		
ECT	60°C (140°F)	–
Vehicle speed	10 km/h (6 mph)	–
Time after engine start	Within 5 sec.	–
Engine RPM	6,500 rpm	–
Standard cam condition:		
Except high–lift cam condition (Engine RPM is less than 6,500 rpm)		

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Cam does not change to standard cam	
Oil pressure switch for VVTL under standard cam condition	ON (Oil pressure is applied to VVTL–i system) for 5 sec. or more
Case 2: Cam does not change to high–lift cam	
Oil pressure switch for VVTL under high–lift cam condition	OFF (Oil pressure is not applied to VVTL–i system) for 1 sec. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Oil pressure switch for VVTL–i under standard cam condition	OFF
Oil pressure switch for VVTL–i under high–lift cam condition	ON

WIRING DIAGRAM

Refer to DTC P2645 on page DI–640.

INSPECTION PROCEDURE

Hand–held tester:

1	**Check OCV for VVTL circuit.**

PREPARATION:

(a) Start the engine and warm it up.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ALL/VVTL CTRL B1.
(e) Maintain engine speed at 1,500 to 2,500 rpm.

CHECK:

Check the engine speed when operate the OCV for VVTL by the hand–held tester.

OK:

Tester Operation	Specified Condition
VVTL CTRL B1 is OFF (OCV is OFF)	Normal engine speed
VVTL CTRL B1 is ON (OCV is ON)	Rough engine speed or engine stalled

OK → **Check for intermitten problems (See page DI–295).**

NG

2	**Check oil pressure switch for VVTL**

PREPARATION:

(a) Start the engine and warm it up.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the hand–held tester main switch ON.
(d) Enter the following menu: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / ALL / VVTL CTRL B1.
(e) Disconnect the oil pressure switch for VVTL connector.
(f) Maintain the engine speed at 3,500 to 4,000 rpm.

CHECK:

Check for continuity between the oil pressure switch and body ground when operating the OCV by hand–held tester.

OK:

Tester Operation	Specified Condition
VVTL CTRL B1 is OFF (OCV is OFF)	No continuity
VVTL CTRL B1 is ON (OCV is ON)	Continuity

OK → **Replace oil pressure switch.**

NG

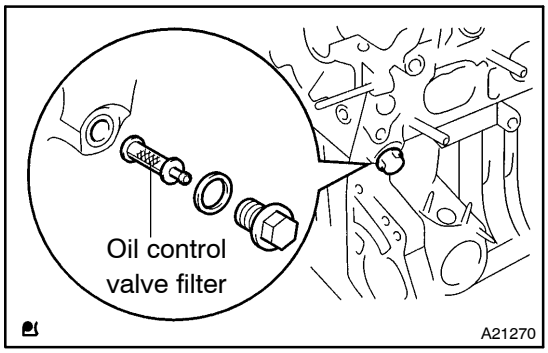
3	**Check for open and short in harness and connector between oil pressure switch for VVTL and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

4	**Check oil control valve filter.**



PREPARATION:

(a) Remove the generator. (See page CH–7)

(b) Remove the oil control valve filter.

CHECK:

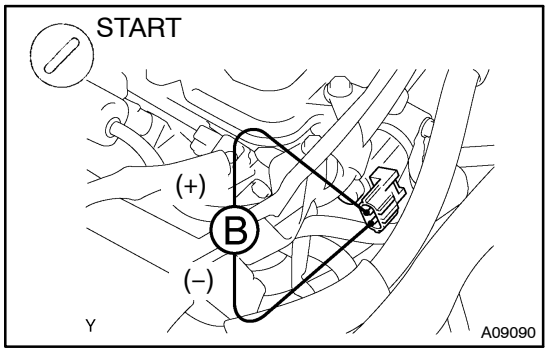
Check the oil control valve filter.

Confirm that the filter is clear.

NG → **Replace oil control valve filter.**

OK

5	Check operation of OCV for VVTL.



PREPARATION:

Start the engine and warmed it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.

(2) Apply the battery voltage between the terminals of the camshaft timing oil control valve.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

B → **Replace OCV for VVTL.**

A

Check for intermittent problems (See page DI–295).

OBD II scan tool (excluding hand–held tester):

1	**Check oil pressure switch for VVTL.**

PREPARATION:

(a) Disconnect the oil pressure switch for VVTL connector.
(b) Ignition switch OFF.

CHECK:

Measure continuity between the oil pressure switch and body ground.

OK:

No continuity

PREPARATION:

(a) Start the engine and warm it up.
(b) Disconnect the OCV for VVTL connector.
(c) Maintain engine speed at 6,500 rpm.

CHECK:

Measure continuity between the oil pressure switch and body ground when applying battery voltage between terminals of the OCV.

OK:

VVTL system is OFF (OCV is OFF): No continuity
VVTL system is ON (OCV is ON): Continuity

NG → **Replace oil pressure switch.**

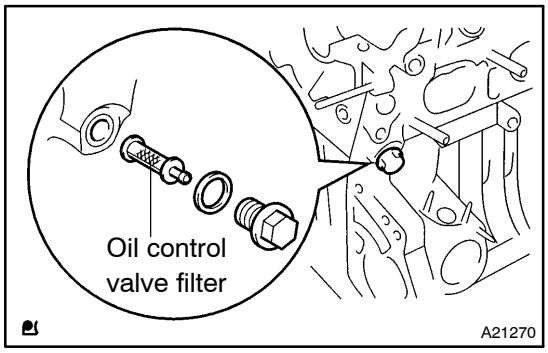
OK

2	**Check for open and short in harness and connector between oil pressure switch for VVTL and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

3	Check oil control valve filter.



PREPARATION:

(a) Remove the generator. (See page CH–7)

(b) Remove the oil control valve filter.

CHECK:

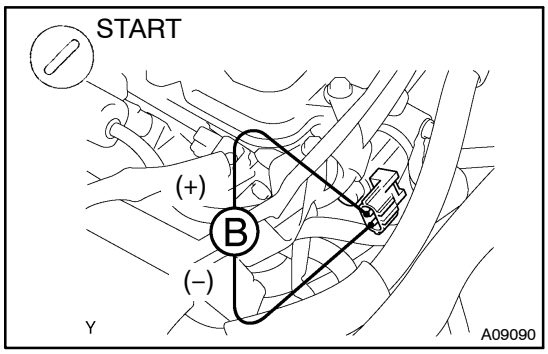
Check the oil control valve filter.

Confirm that the filter is clear.

NG → **Replace oil control valve filter.**

OK

4	Check operation of OCV for VVTL.



PREPARATION:

Start the engine and warm it up.

CHECK:

Check the engine speed at (1) and (2).

(1) Disconnect the C2 camshaft timing oil control valve connector.

(2) Apply battery voltage between the terminals of the OCV.

RESULT:

Proceed to	Check (1)	Check (2)
A	Normal engine speed	Rough idle or engine stall
B	Conditions other than above	

OK:

Engine stalled.

B → **Replace OCV for VVTL.**

A

Check for intermittent problems (See page DI–295).

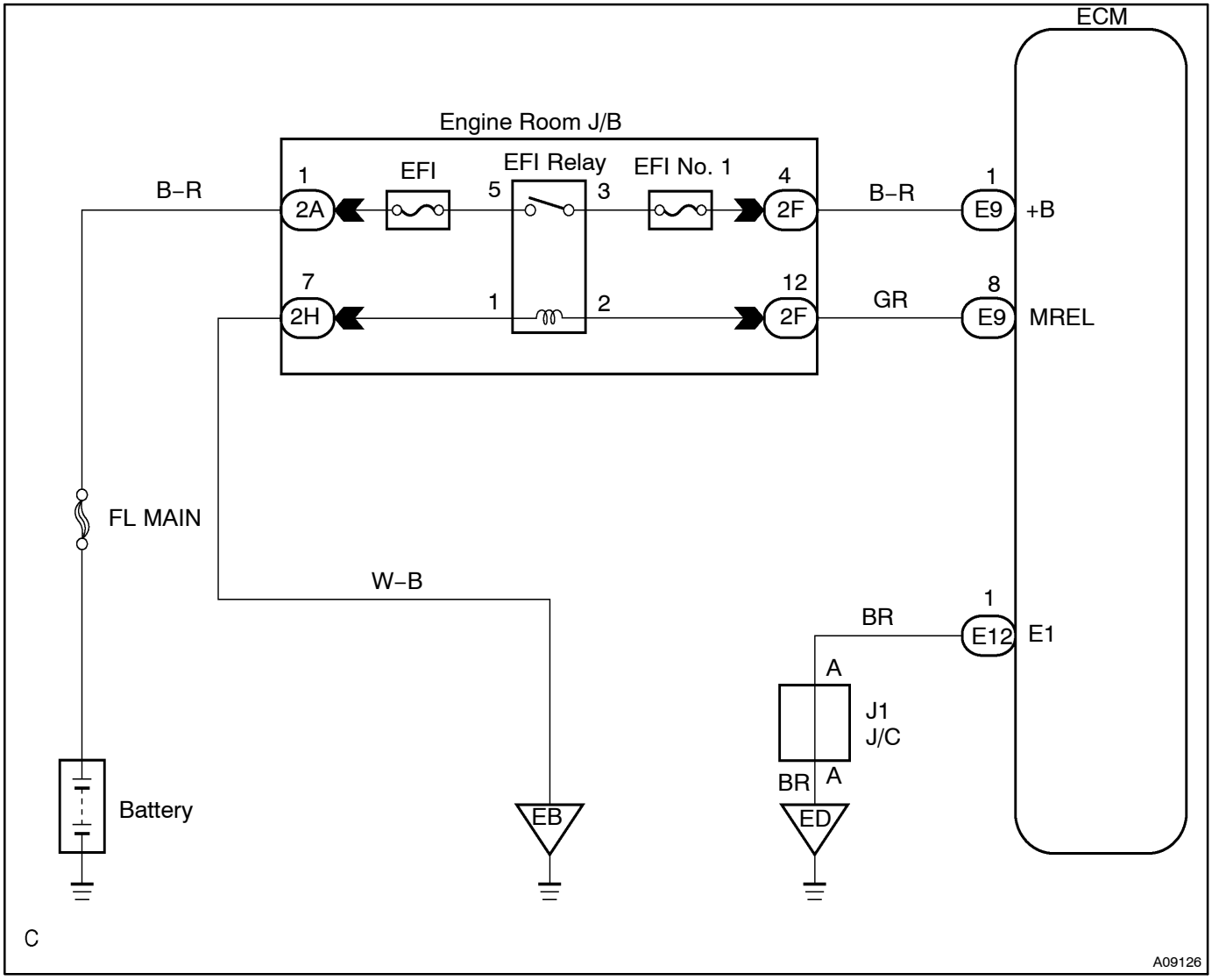
DIC7Z–02

ECM Power Source Circuit

CIRCUIT DESCRIPTION

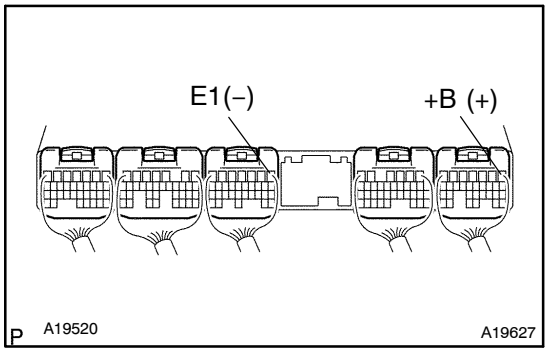
When the ignition switch is turned ON, battery voltage is applied to terminal IGSW of the ECM. The ECM "MREL" output signal causes current to flow to the coil, closing the contacts of the EFI relay and supplying power to terminal +B of the ECM.
If the ignition switch is turned OFF, the ECM holds the EFI relay ON for a maximum of 2 seconds to allow for the initial setting of the throttle valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals +B and E1 of the ECM connector.

OK:

Voltage: 9 to 14 V

OK	**Replace ECM (See page SF–78).**

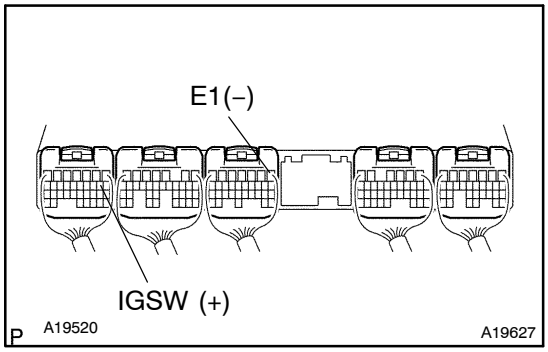
NG

2	**Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–30).**

NG	**Repair or replace harness or connector.**

OK

3	**Check voltage between terminals IGSW and E1 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals IGSW and E1 of the ECM connector.

OK:

Voltage: 9 to 14 V

OK	**Go to step 5.**

NG

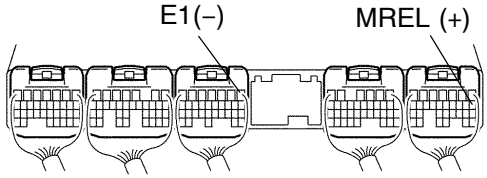
4	**Check ignition switch (See page BE–15).**

NG → **Replace ignition switch.**

OK

Check and repair harness and connector between battery and ignition switch, ignition switch and ECM (See page IN–30).

5	**Check voltage between terminals MREL and E1 of ECM connector.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals MREL and E1 of the ECM connector.

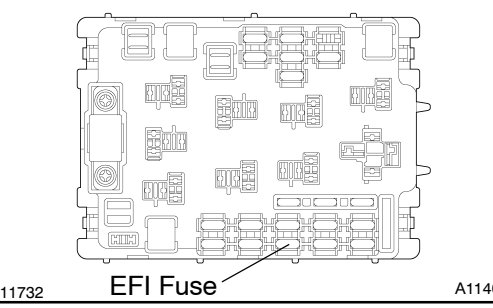
OK:

Voltage: 9 to 14 V

OK → **Repace ECM (See page SF–78).**

NG

6	**Check EFI fuse.**



PREPARATION:

Remove the EFI fuse from the engine room J/B.

CHECK:

Check continuity of EFI fuse.

OK:

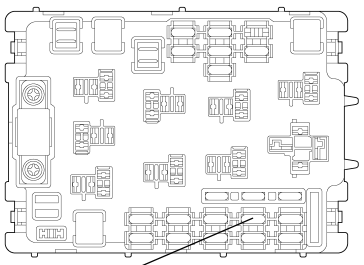
Continuity

NG → **Check for short in all the harness and components connected to EFI fuse.**

OK

7	**Check EFI No. 1 fuse.**

Engine Room J/B



PREPARATION:

Remove IGN fuse from engine room J/B.

CHECK:

Check continuity of EFI No. 1 fuse.

OK:

Continuity

NG → **Check for short in all the harness and components connected to EFI No. 1 fuse.**

OK

8	**Check EFI main relay (Marking: EFI) (See page SF–56).**

NG → **Replace EFI main relay.**

OK

9	**Check for open and short in harness and connector between EFI relay and ECM, EFI relay and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

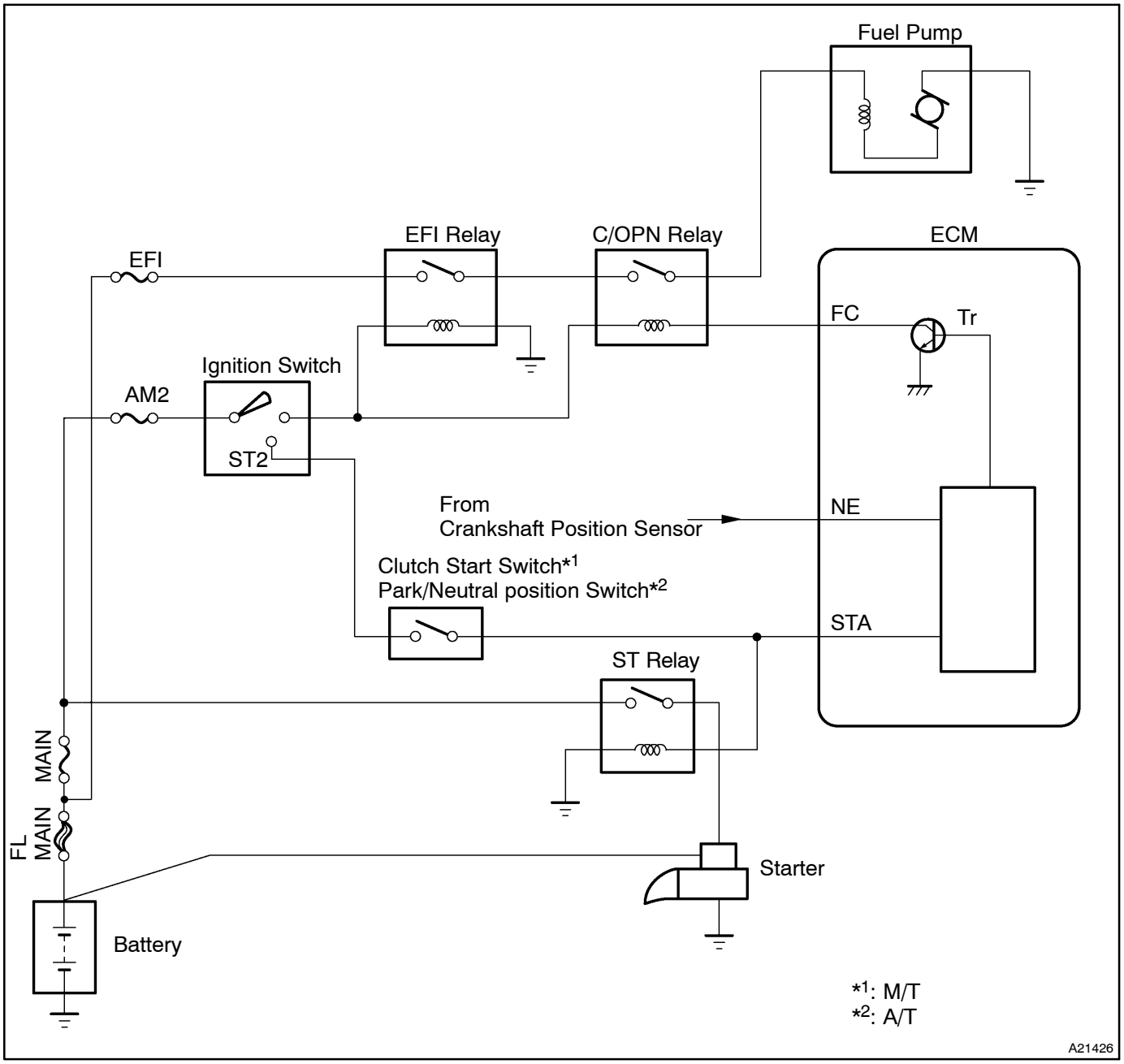
Check and replace harness and connector between terminal +B of ECM and battery positive terminal (See page IN–30).

DIC80–02

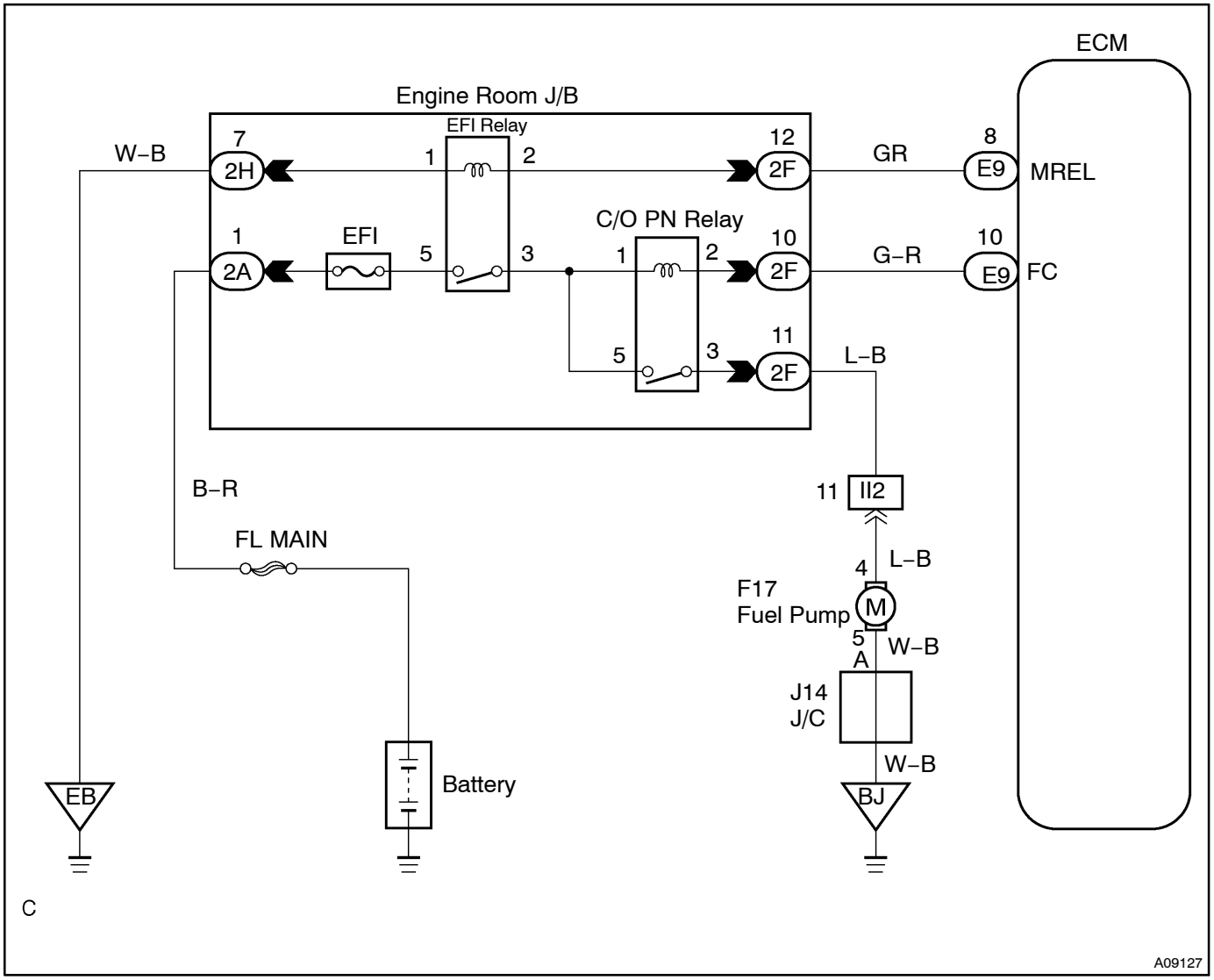
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST2 of the ignition switch to the starter relay coil and also current flows to terminal STA of the ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to the coil of the circuit opening relay, the relay switches on, power is supplied to the fuel pump and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



WIRING DIAGRAM



INSPECTION PROCEDURE

Hand–held tester:

1	**Connect the hand–held tester and check operation of fuel pump (See page DI–295).**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / FUEL PUMP / SPD.

CHECK:

Check if operating sounds can be heard while operating the relay with the hand–held tester.

OK:

Operating sounds can be heard from the relay.

OK → **Go to step 5.**

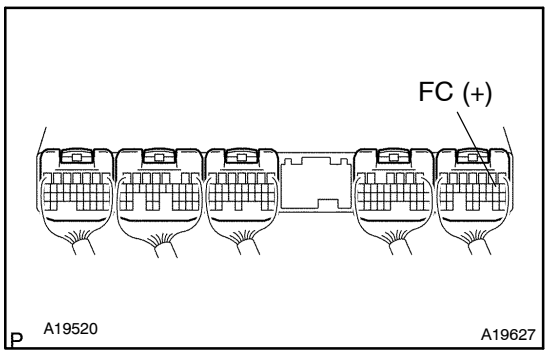
NG

2	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

3	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

4	Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).

NG → Repair or replace harness or connector.

OK

5	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

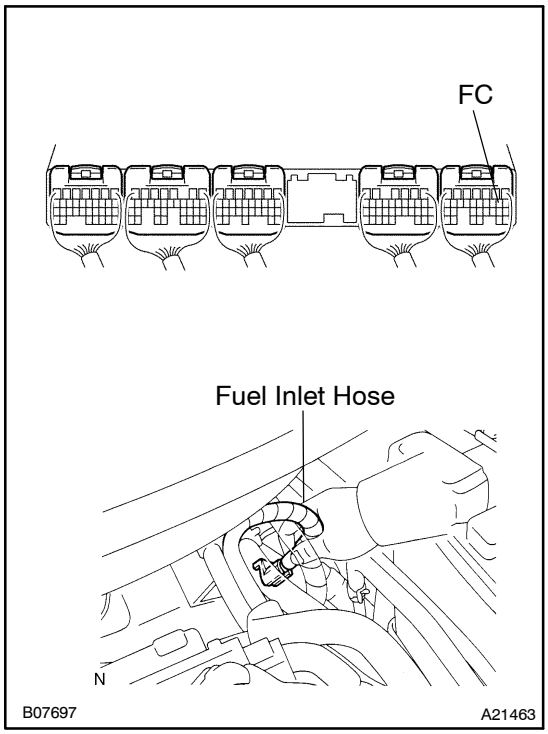
NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

OBD II scan tool (excluding hand–held tester):

1	**Check operation of fuel pump.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of the ECM connector and body ground.

(b) Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in fuel inlet hose.

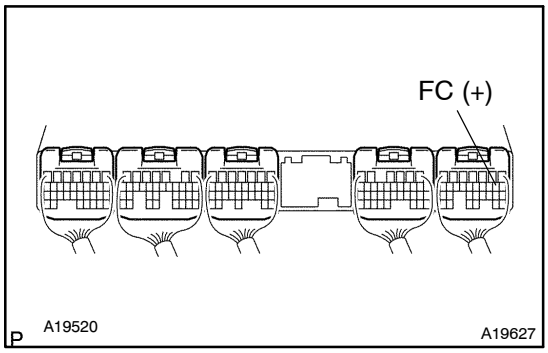
HINT:

At this time, you will hear a fuel return flowing noise.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–332).**

NG

2	**Check operation of circuit opening relay (Marking: C/OPN).**



CHECK:

When connecting between terminal FC of the ECM connector and the body ground, check the relay operation.

OK:

Noise can be heard from the circuit opening relay.

OK → **Go to step 6.**

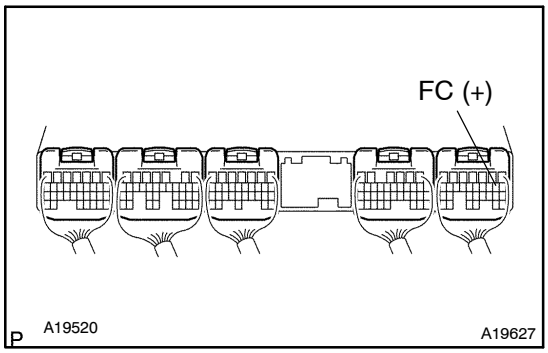
NG

3	**Check circuit opening relay (Marking: C/OPN) (See page SF–57).**

NG → **Replace circuit opening relay.**

OK

4	**Check voltage between terminal FC of ECM and body ground.**



PREPARATION:

(a) Remove the ECM cover.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of the ECM and body ground.

OK:

Voltage 9 to 14 V

OK → **Replace ECM (See page SF–78).**

NG

5	**Check for open and short in harness and connector between circuit opening relay (Marking: C/OPN) and ECM, circuit opening relay (Marking: C/OPN) and ignition switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Replace ECM (See page SF–78).

6	Check fuel pump (See page SF–6).

NG → Repair or replace fuel pump.

OK

7	Check for open in harness and connector between circuit opening relay (Marking: C/OPN) and fuel pump, fuel pump and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace ECM (See page SF–78).

DIC81–02

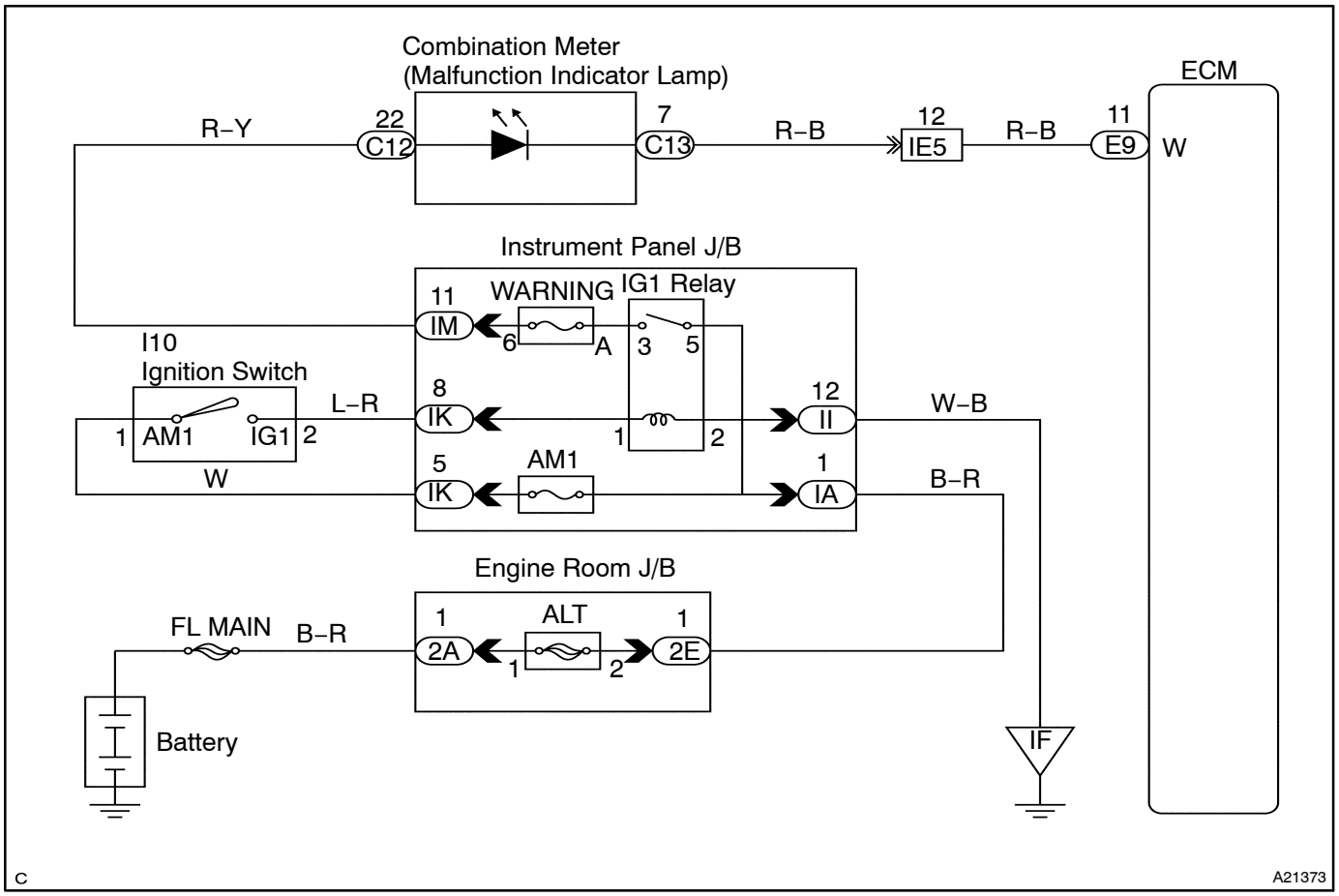
MIL Circuit

CIRCUIT DESCRIPTION

The ignition switch provides circuit power and the ECM provides the circuit ground that illuminates the MIL. MIL operation is checked visually:

It should be illuminated when the ignition is first turned on. If the MIL is off all of the time or on all of the time, use the procedure below to troubleshoot it. The MIL is used to indicate the ECM's detection of vehicle malfunction. Follow this procedure using the hand–held tester or an OBD II scan tool to determine the cause of the problem and to check the MIL.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot each trouble symptom in accordance with the chart below.

MIL remains on	Start inspection from step 1
MIL is not illuminated	Start inspection from step 3

1	**Clear DTC.**

PREPARATION:

(a) Connect the hand–held tester or the OBD II scan tool to the DLC 3.
(b) Turn the ignition switch ON and push the hand–held tester or the OBD II scan tool main switch ON.
(c) Read the DTCs (See page DI–295).
(d) Clear the DTCs (See page DI–295).

CHECK:

Check that MIL is not illuminated.

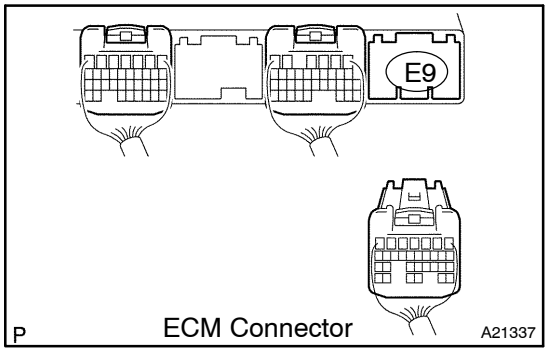
OK:

MIL is not illuminated

OK → **Repair circuit indicated by output DTC (See page DI–335).**

NG

2	**Check for short in wire harness.**



PREPARATION:

(a) Disconnect the E9 ECM connector.
(b) Turn the ignition switch ON.

CHECK:

Check that MIL is not illuminated.

OK:

MIL is not illuminated

OK → **Replace ECM (See page SF–78).**

NG

Check and repair harness and connector between combination meter and ECM (See page IN–30).

3	**Check that MIL is illuminated.**

CHECK:

Check that MIL is illuminated when turning the ignition switch ON.

OK:

MIL is illuminated

OK → **System OK.**

NG

4	**Check combination meter assy (MIL circuit).**

See the combination meter troubleshooting on page (See page BE–50).

NG → **Repair or replace bulb or combination meter assembly.**

OK

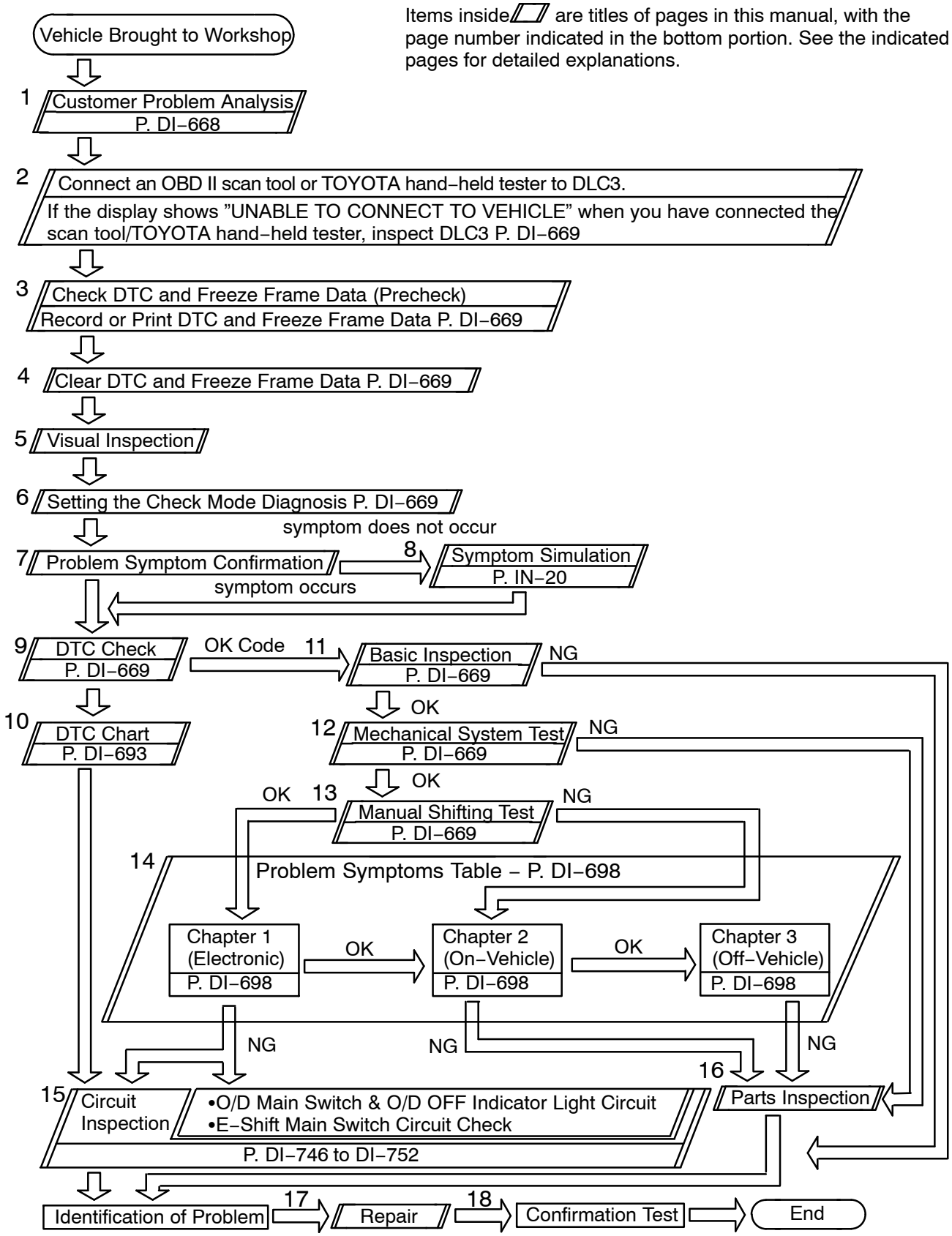
Check and repair harness and connector between combination meter and ECM (See page IN–30).

AUTOMATIC TRANSAXLE (U240E)

DI4YY–09

HOW TO PROCEED WITH TROUBLESHOOTING

Items inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



DIBZW–10

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or the ECM (See page DI–669).

HINT:

Initialization can not be completed by only disconnecting the battery terminal.

DI4YZ–05

CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transaxle System Check Sheet	Inspector's Name :

Customer's Name		VIN	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any position ☐ Particular position)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive position)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

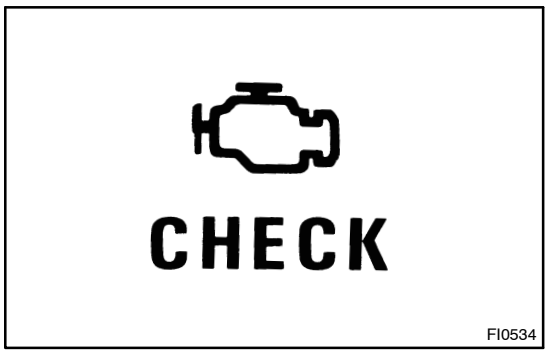
DIC6C–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

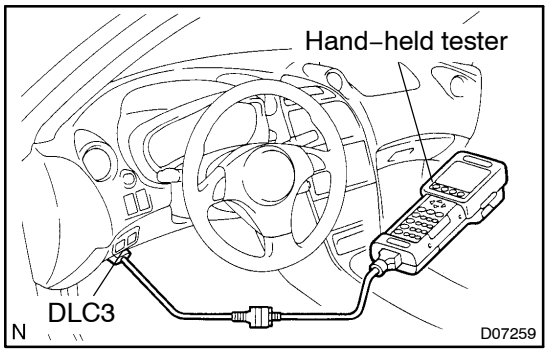
(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect an OBD II scan tool complying with SAE J1987 or hand–held tester, to the vehicle and read off various data output from the vehicle's ECM.



- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page DI–335).

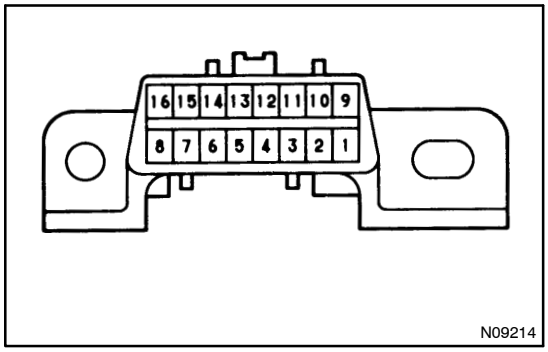
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect an OBD II scan tool or hand–held tester to DLC3 on the vehicle. The OBD II scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For operating instructions, see the instruction book).
- DTCs include SAE controlled codes and Manufacturer controlled codes.
  SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–693).

- The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2–trip detection logic (*) to prevent erroneous detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (Hand–held tester) (See page DI–669).
- *2–trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory.

If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up.

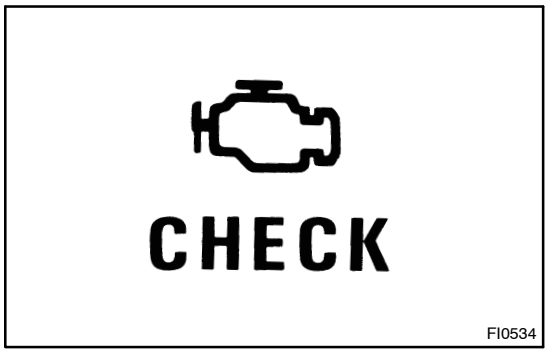


(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Tester connection	Condition	Specified condition
7 (Bus ⊕ Line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis Ground) – Body	Always	1 Ω or less
5 (Signal Ground) – Body	Always	1 Ω or less
16 (B^+) – Body	Always	9 to 14 V

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of OBD II scan tool or hand–held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page BE–2).

(2) When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

Hand–held tester only: When the diagnostic system is switched from normal mode to check mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

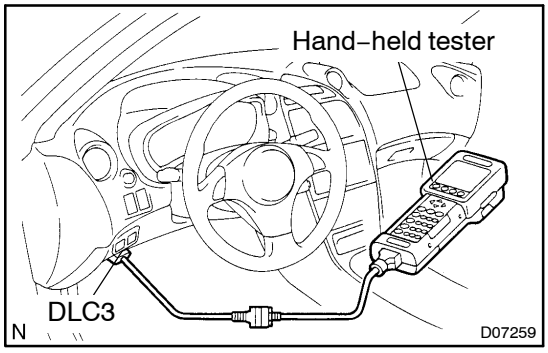
(1) Prepare an OBD II scan tool (complying with SAE J1978) or hand–held tester.

(2) Connect the OBD II scan tool or hand–held tester to DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn the OBD II scan tool or hand–held tester switch ON.

(4) Use the OBD II scan tool or hand–held tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).

(5) See page DI–693 to confirm the details of the DTCs.



NOTICE:

When simulating symptoms with an OBD II scan tool (excluding hand–held tester) to check the DTCs, use normal mode. For codes on the DTCs chart subject to "2–trip detection logic", turn the ignition switch off after the symptoms have been simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL comes on on the instrument panel and DTCs are recorded in the ECM.

(c) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Connect the OBD II scan tool or hand–held tester to the DLC3.
(2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
(3) When you use hand–held tester:
Select the item ”DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button”.

HINT:
When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool’s instruction book for operating instructions.)

(d) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the ”INITIALIZE” procedure.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only: Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

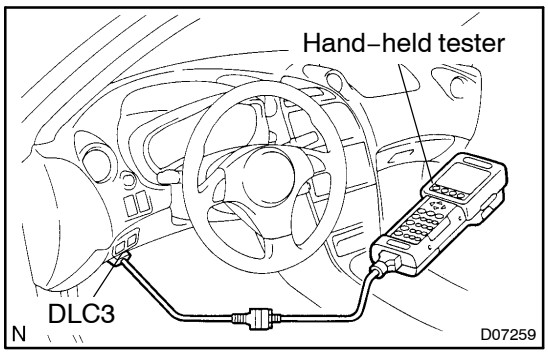
(a) Check the DTC.

(1) Check the initial conditions.

- Battery voltage 11 V or more.
- Throttle valve fully closed.
- Transaxle in P position.
- Air conditioning switched off.

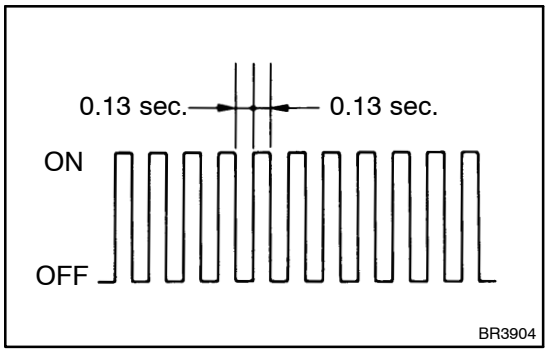
(2) Turn the ignition switch off.

(3) Prepare a hand–held tester.



(4) Connect the hand–held tester to DLC3 at the lower side of the instrument panel.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch off, as turning it off switches the diagnosis system from Check mode to Normal mode, which erases all DTCs, etc.

(10) After checking the DTC, inspect the applicable circuit.

(b) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Connect the OBD II scan tool or hand–held tester to the DLC3.
(2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
(3) When you use hand–held tester:
Select the item ”DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button”.

HINT:
When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool’s instruction book for operating instructions.)

(c) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the ”INITIALIZE” procedure.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the labor time.

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the ”ON” button of the OBD II scan tool or the hand–held tester.
(f) Select the item ”DIAGNOSIS/ENHANCED OBD II/DATA LIST”.
(g) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • D(O/D OFF): 1st, 2nd or 3rd • D(O/D ON): 1st, 2nd, 3rd or 4th (O/D)	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
PNP SW [NSW]	PNP SW Status/ ON or OFF	Ignition Key position is; START: ON Except START: OFF	←
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: OFF	
OVERDRV CUT SW2	O/D SW Status/ ON or OFF	• IG SW ON: ON ↓ • O/D SW Push: OFF ↓ • O/D SW Push: ON	←
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40 °C (–40 °F) max.: 225 °C (437 °F)	80 °C (176 °F) (After Stall Test)	If the value is ”–40 °C (–40 °F)” or ”225 °C (437 °F)”, ATF temp. sensor circuit is opened or shorted.
SPD (NC)	Counter Gear Speed display: 50 r/min	D Position is warmed up,4th (O/D); Same as input shaft speed	←

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the ”ON” button of the the hand–held tester.
(f) Select the item ”DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the DSL operation.
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–

6. DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. When a sensor is being monitored, the next sensor or component will not be monitored until the sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. ”Once per driving cycle” means that the ECM detects the malfunction only one time during a single driving cycle. ”Continuous” means that the ECM detects malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met.

Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. ”Immediately” means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. ”2 driving cycle” means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

7. TOYOTA/LEXUS PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA/LEXUS name	Definition
Toyota HCAC system, Hydro–carbon Adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve, OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor ”A”	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VSV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor

Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor ”A”, Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor ”A”	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor ”A”	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor ”A”, Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobiliser system, Immobiliser system	Vehicle anti–theft system

8. The monitor will run whenever the following DTCs are not present (Monitor Disablement List)

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the ”X” mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction

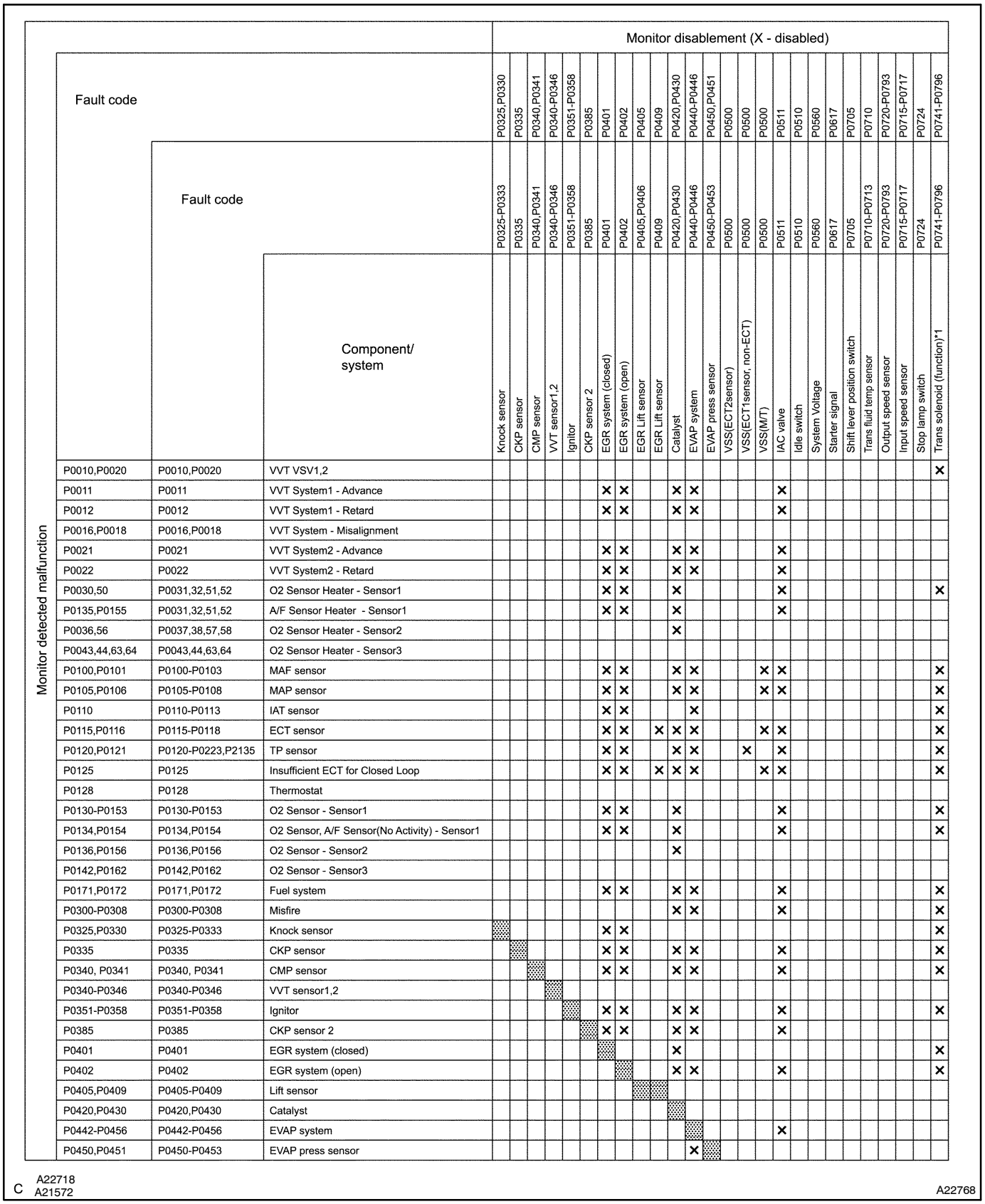
Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
	P0010,P0020	P0010,P0020	P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
			VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0010,P0020	P0010,P0020	VVT VSV1,2																			X					X					
P0011	P0011	VVT System1 - Advance				X		X														X					X					
P0012	P0012	VVT System1 - Retard				X		X														X					X					
P0016,P0018	P0016,P0018	VVT System - Misalignment																													
P0021	P0021	VVT System2 - Advance			X	X																X									
P0022	P0022	VVT System2 - Retard			X	X																X					X				
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X					
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X					
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X			
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0128	P0128	Thermostat																													
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X			X	X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X			X	X	X			
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																													
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																													
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X	X				
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X					
P0325,P0330	P0325-P0333	Knock sensor																										X			
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																				X									
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X					X				
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X			
P0401	P0401	EGR system (closed)																				X					X				
P0402	P0402	EGR system (open)																				X	X	X	X	X	X				
P0405,P0409	P0405-P0409	Lift sensor																													
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X					
P0450,P0451	P0450-P0453	EVAP press sensor																													

C A21570 A22717

Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
				P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
				P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
				VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
	P0500	P0500	VSS																				X	X	X	X	X	X	X			
	P0511	P0511	IAC valve																					X								
	P0510	P0510	Idle switch												X		X						X	X		X	X	X	X			
	P0560	P0560	System Voltage																													
	P0617	P0617	Starter signal																													
	P0705	P0705	Shift lever position switch																													
	P0710	P0710-P0713	Trans fluid temp sensor																													
	P0720-P0793	P0720-P0793	Output speed sensor																													
	P0715-P0717	P0715-P0717	Input speed sensor																													
	P0724	P0724	Stop lamp switch																													
	P0741-P0796	P0741-P0796	Trans solenoid (function)																													
	P0748-P0798	P0748-P0799	Trans solenoid (range)																													
	P0850	P0850	PNP switch																													X
	P1010,P1020	P1010,P1020	VVTL																				X						X			
	P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X						X			
	P1126	P1126	Electronic magnet clutch																													
	P1129	P1129	Electronic throttle system																													
	P1430	P1430	HC adsorber ACT press sensor																													
	P2004,6	P2004,6	Intake Manifold Runner Control																													
	P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
	P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
	P2102,P2103	P2102,P2103	Throttle motor																													
	P2120-P2138	P2120-P2138	Accel position sensor																													
	P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X				X	X				
	P2226	P2226	BARO sensor																					X			X	X				
	P2237,P2240	P2237,P2240	A/F sensor (open)																				X				X	X				
	P2423,24	P2423,24	HC Adsorption Catalyst																													
	P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
	P2431	P2431	AIR Pressure Sensor(Rationality)																													
	P2440	P2440	AIR control valve stuck open																					X	X	X	X	X				
	P2441	P2441	AIR control valve stuck close																					X	X	X	X	X				
	P2444	P2444	AIP stuck On																					X	X	X	X	X				
	P2445	P2445	AIP stuck Off																					X	X	X	X	X				
	P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																													
	P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X				X	X				

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A21571



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A22768

Monitor detected malfunction

Fault code	Fault code	Component/system	Monitor disablement (X - disabled)																												
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796			
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796			
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1			
P0500	P0500	VSS							X	X			X	X					X						X	X		X			
P0511	P0511	IAC valve																													
P0510	P0510	Idle switch								X			X	X					X									X			
P0560	P0560	System Voltage																													
P0617	P0617	Starter signal																													
P0705	P0705	Shift lever position switch																													
P0710	P0710-P0713	Trans fluid temp sensor																													
P0720-P0793	P0720-P0793	Output speed sensor																												X	
P0715-P0717	P0715-P0717	Input speed sensor																													
P0724	P0724	Stop lamp switch																													
P0741-P0796	P0741-P0796	Trans solenoid (function)																													
P0748-P0798	P0748-P0799	Trans solenoid (range)																							X	X		X			
P0850	P0850	PNP switch																	X									X			
P1010,P1020	P1010,P1020	VVTL																													
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X												
P1126	P1126	Electronic magnet clutch																													
P1129	P1129	Electronic throttle system																													
P1430	P1430	HC adsorber ACT press sensor												X	X																
P2004,6	P2004,6	Intake Manifold Runner Control																													
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
P2102,P2103	P2102,P2103	Throttle motor																													
P2120-P2138	P2120-P2138	Accel position sensor																													
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X			X						X									X			
P2226	P2226	BARO sensor																										X			
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X			X						X									X			
P2423,24	P2423,24	HC Adsorption Catalyst																													
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
P2431	P2431	AIR Pressure Sensor(Rationality)																													
P2440	P2440	AIR control valve stuck open							X	X			X																		
P2441	P2441	AIR control valve stuck close							X	X			X																		
P2444	P2444	AIP stuck On							X	X			X																		
P2445	P2445	AIP stuck Off							X	X			X																		
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										X			
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X									X			

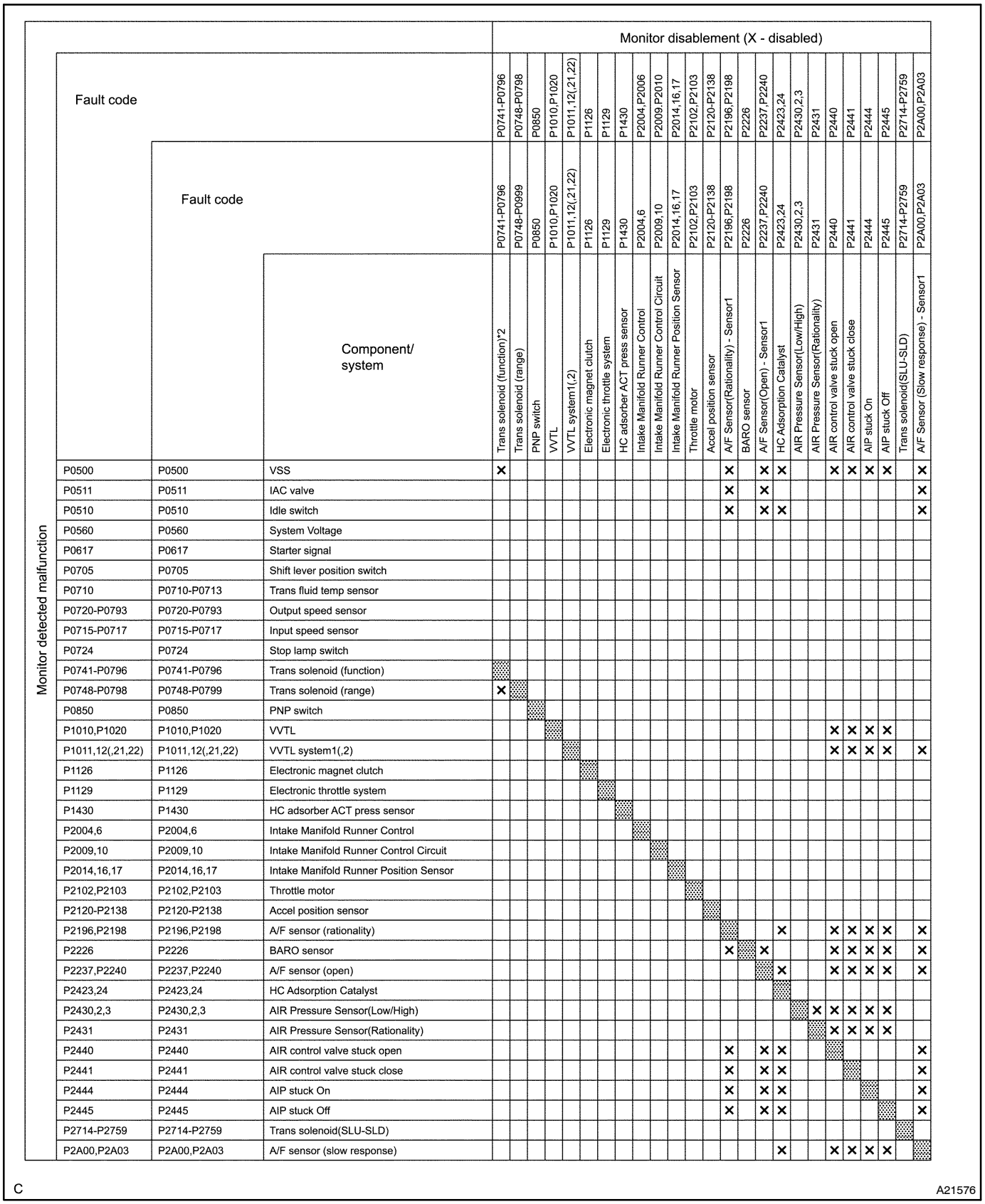
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A21573

Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
				Trans solenoid (function)*2	Trans solenoid (range)	PNP switch	VVTL	VVTL system1(,2)	Electronic magnet clutch	Electronic throttle system	HC adsorber ACT press sensor	Intake Manifold Runner Control	Intake Manifold Runner Control Circuit	Intake Manifold Runner Position Sensor	Throttle motor	Accel position sensor	A/F Sensor(Rationality) - Sensor1	BARO sensor	A/F Sensor(Open) - Sensor1	HC Adsorption Catalyst	AIR Pressure Sensor(Low/High)	AIR Pressure Sensor(Rationality)	AIR control valve stuck open	AIR control valve stuck close	AIP stuck On	AIP stuck Off	Trans solenoid(SLU-SLD)	A/F Sensor (Slow response) - Sensor1
	P0010,P0020	P0010,P0020	VVT VSV1,2																				X	X	X	X		
	P0011	P0011	VVT System1 - Advance																				X	X	X	X		
	P0012	P0012	VVT System1 - Retard																				X	X	X	X		
	P0016,P0018	P0016,P0018	VVT System - Misalignment																				X	X	X	X		
	P0021	P0021	VVT System2 - Advance																				X	X	X	X		
	P0022	P0022	VVT System2 - Retard																				X	X	X	X		
	P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																	X			X	X	X	X		
	P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1														X		X	X			X	X	X	X		X
	P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2														X			X								
	P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																	X								
	P0100,P0101	P0100-P0103	MAF sensor				X	X									X		X	X			X	X	X	X		X
	P0105,P0106	P0105-P0108	MAP sensor				X	X									X		X	X			X	X	X	X		X
	P0110	P0110-P0113	IAT sensor									X					X		X				X	X	X	X		X
	P0115,P0116	P0115-P0118	ECT sensor	X			X	X				X					X		X	X			X	X	X	X		X
	P0120,P0121	P0120-P0223,P2135	TP sensor														X		X	X			X	X	X	X		X
	P0125	P0125	Insufficient ECT for Closed Loop	X			X										X		X	X			X	X	X	X		X
	P0128	P0128	Thermostat																									
	P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																	X			X	X	X	X		
	P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1														X		X	X			X	X	X	X		X
	P0136,P0156	P0136,P0156	O2 Sensor - Sensor2														X			X								
	P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																	X								
	P0171,P0172	P0171,P0172	Fuel system														X		X	X			X	X	X	X		X
	P0300-P0308	P0300-P0308	Misfire														X		X	X			X	X	X	X		X
	P0325,P0330	P0325-P0333	Knock sensor																				X	X	X	X		
	P0335	P0335	CKP sensor				X	X									X		X	X			X	X	X	X		X
	P0340, P0341	P0340, P0341	CMP sensor				X	X									X		X	X			X	X	X	X		X
	P0340-P0346	P0340-P0346	VVT sensor1,2																				X	X	X	X		
	P0351-P0358	P0351-P0358	Ignitor																	X			X	X	X	X		
	P0385	P0385	CKP sensor 2				X	X									X		X	X			X	X	X	X		X
	P0401	P0401	EGR system (closed)																	X								
	P0402	P0402	EGR system (open)														X		X	X			X	X	X	X		X
	P0405,P0409	P0405-P0409	Lift sensor																									
	P0420,P0430	P0420,P0430	Catalyst																									
	P0442-P0456	P0442-P0456	EVAP system														X		X				X	X	X	X		X
	P0450,P0451	P0450-P0453	EVAP press sensor																				X	X	X	X		

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Note *1: Without input speed sensor

Note *2: With input speed sensor

9. PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not up–shift, down–shift, or the shift point is too high or too low, conduct the following road test to confirm the automatic shift schedule and simulate the problem symptoms.

10. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 to 80 °C (122 to 176 °F).

(a) D position test

Shift into the D position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.

Check that 1 → 2, 2 → 3 and 3 → O/D up–shifts take place, and that the shift points conform to the automatic shift schedule (See page SS–42).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Coolant temp. is 60 °C (140 °F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60 °C (140 °F) or less.)

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shifts.

(3) Check for abnormal noises and vibration.

Drive in the D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick–down operation.

While driving in the D position, 2nd, 3rd and O/D gears, check that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule (See page SS–42).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) M position test

Shift to the M position, depress the accelerator pedal and check the following points.

Shift operations.

Pressing the transmission shift switch to ”Up” or ” Down” makes the transmission up–shifted or down–shifted respectively.

Without pressing the switch, it is not automatically shifted to either up or down.

When a vehicle is stopped, it is automatically down–shifted to 1st gear.

HINT:

Manual shift prohibition control (1. When the ATF temperature is low. 2. When down–shifting causes engine overrun. 3. When down–shifting is required continuously, down–shifting to 1st gear may not be performed. 4. When the ATF temp. is high, up–shifting to O/D is not performed.)

(c) 2 position test
Shift into the 2 position and fully depress the accelerator pedal and check the following points.
(1) Check up–shift operation.
Check that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–42).

HINT:
There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.
While driving in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(d) L position test
Shift into the L position and fully depress the accelerator pedal and check the following points.
(1) Check no up–shift.
While driving in the L position, check that there is no up–shift to 2nd gear.
(2) Check engine braking.
While driving in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(e) R position test
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.

CAUTION:
Before conducting this test ensure that the test area is free from people and obstruction.

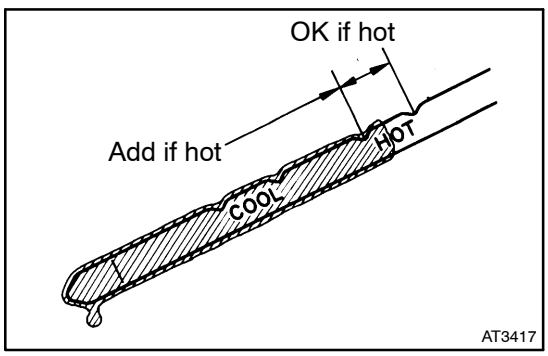
(f) P position test
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

11. BASIC INSPECTION

(a) Check the fluid level.

HINT:

- Drive the vehicle so that the engine and transaxle are at normal operating temperature.
Fluid temp.: 70 to 80 °C (158 to 176 °F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is changed or the engine does not run.



(1) Park the vehicle on a level surface and set the parking brake.
(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.
(3) Pull out the dipstick and wipe it clean.
(4) Push it back fully into the pipe.

(5) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add new fluid.

Fluid type: ATF Type T–IV

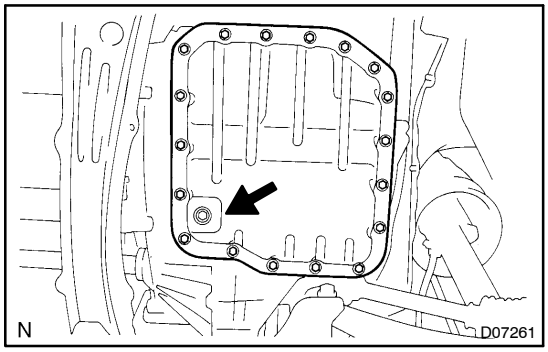
Capacity: 4.1 liters (4.3 US qts, 3.6 Imp. qts)

NOTICE:

Do not overfill.

(b) Check the fluid condition.

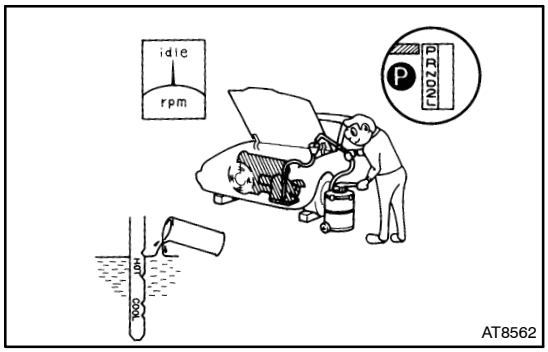
If the fluid smells burnt or is black, change it.



(c) Replace the ATF.

(1) Remove the drain plug and drain the fluid.

(2) Reinstall the drain plug securely.



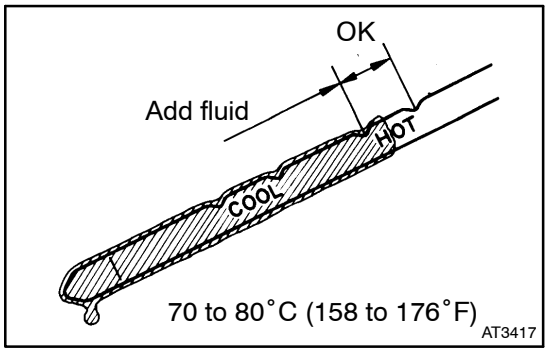
(3) With the engine OFF add new fluid through the oil filler pipe.

Fluid type: ATF Type T–IV

Capacity: 4.1 liters (4.3 US qts, 3.6 Imp. qts)

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(6) Check the fluid level at the normal operating temperature, 70 to 80 °C (158 to 176 °F), and add as necessary.

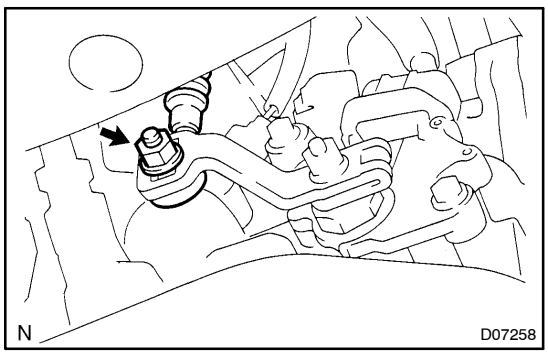
NOTICE:

Do not overfill.

(d) Check the fluid leaks.

Check for leaks in the transaxle.

If there are leaks, it is necessary to repair or replace O–rings, gaskets, oil seals, plugs or other parts.



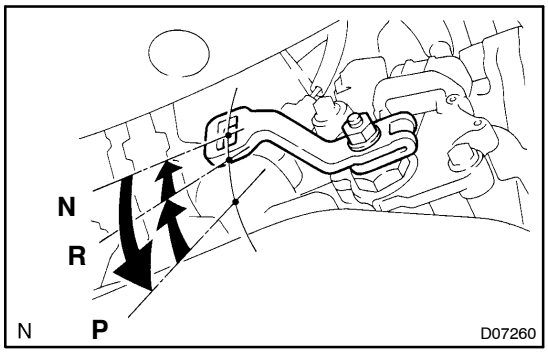
(e) Inspect and adjust the shift lever position.

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is aligned with the correct position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(1) Loosen the nut on the shift lever.

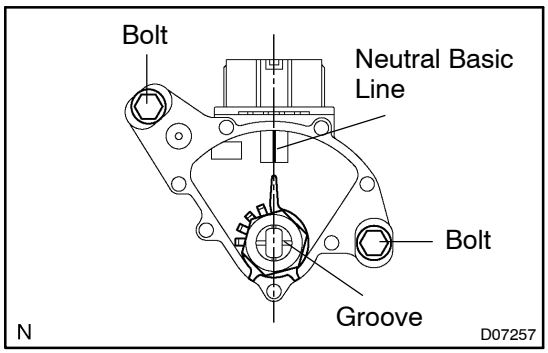
(2) Push the control shaft fully downward.



(3) Return the control shaft lever 2 notches to N position.
(4) Set the shift lever to N position.
(5) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.

Torque: 13 N·m (130 kgf·cm, 9 in.·lbf)

(6) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.



(f) Inspect and adjust the park/neutral position.
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If it is not as stated above, carry out the following adjustment procedures.

(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolt.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

For continuity inspection of the park/neutral position switch, see page DI–701.

(g) Check the idle speed.
Idle speed: 650 ± 50 rpm
(In N position and air conditioner OFF)

12. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.
The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the test at normal operating fluid temperature 50 to 80 °C (122 to 176 °F).**
- **Do not continuously run this test for longer than 10 seconds.**
- **To ensure safety, conduct this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the 4 wheels.
(2) Connect an OBD II scan tool or hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressed firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,370 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall engine speed is low in D and R positions	• Engine output may be insufficient • Stator one–way clutch is operating properly HINT: If the value is larger or smaller than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall engine speed is high in D position	• Line pressure too low • Forward clutch slipping • No.2 one–way clutch not operating properly • O/D clutch slipping
(c) Stall engine speed is high in R position	• Line pressure too low • Direct clutch slipping • 1st & reverse brake slipping • O/D clutch slipping
(d) Stall engine speed is high in D and R positions	• Line pressure too low • Improper fluid level • O/D one–way clutch not operating properly

(b) Measure the time lag.

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, and 1st & reverse brake.

NOTICE:

- **Do the test at normal operating fluid temperature 50 to 80 °C (122 to 176 °F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Connect an OBD II scan tool or hand–held tester to DLC3.

(2) Fully apply the parking brake.

(3) Start the engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N position and air conditioner OFF)

(4) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag: N → D Less than 1.2 seconds

(5) In the same manner, measure the time lag for N → R.

Time lag: N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than specified):

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • O/D one–way clutch not operating
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st & reverse brake worn • O/D one–way clutch not operating properly

13. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid temperature 50 to 80 °C (122 to 176 °F)**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

(1) Warm up the ATF.

(2) Remove the test plug on the transaxle case front left side and connect SST (See page AX–30 for the location to connect SST).

SST 09992–00095 (09992–00231, 09992–00271)

(3) Fully apply the parking brake and check the 4 wheels.

(4) Connect an OBD II scan tool or hand–held tester to DLC3.

(5) Start the engine and check idling speed.

(6) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(7) Measure the line pressure when the engine is idling.

(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(9) In the same manner, do the test in R position.

Specified line pressure:

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	372 to 412 (3.8 to 4.2, 54 to 59)	672 to 742 (6.9 to 7.6, 97 to 107)
Stall	931 to 1,031 (9.5 to 10.5, 134 to 149)	1,768 to 1,968 (18.0 to 20.1, 255 to 284)

Evaluation:

Problem	Possible cause
If the measured values at all position are higher	• Throttle valve defective • Regulator valve defective
If the measured values at all position are lower	• Throttle valve defective • Regulator valve defective • Oil pump defective • O/D direct clutch defective
If pressure is low in the D position only	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only	• R position circuit fluid leakage • Direct clutch defective • 1st & reverse brake defective

14. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors. Disconnecting the solenoid wire disables electrically-controlled automatic gear shifting. In this case, operating the shift level is the only way to shift the transaxle gear. If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem.

(a) Turn the ignition switch OFF.
(b) Disconnect the solenoid wire connector.
(c) Warm up the engine.
(d) Drive the vehicle.
(e) Check the transaxle operation when the shift lever is moved into L, 2 and D ranges.

Standard:

Shift Lever	Operation
L to 2	No shift (Not change)
2 to D	No shift (Not change)
D to 2	No shift (Not change)
2 to L	No shift (Not change)

(f) Turn the ignition switch OFF.
(g) Connect the solenoid wire connector.
(h) Clear DTCs.

HINT:

When the solenoid wire is disconnected, the transaxle gear will be set as listed below:

Shift Lever	Gear
P	Parking
R	Reverse
N	Neutral
D	3rd
2	3rd
L	3rd

15. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or the ECM.

NOTICE:

Hand–held tester only

HINT:

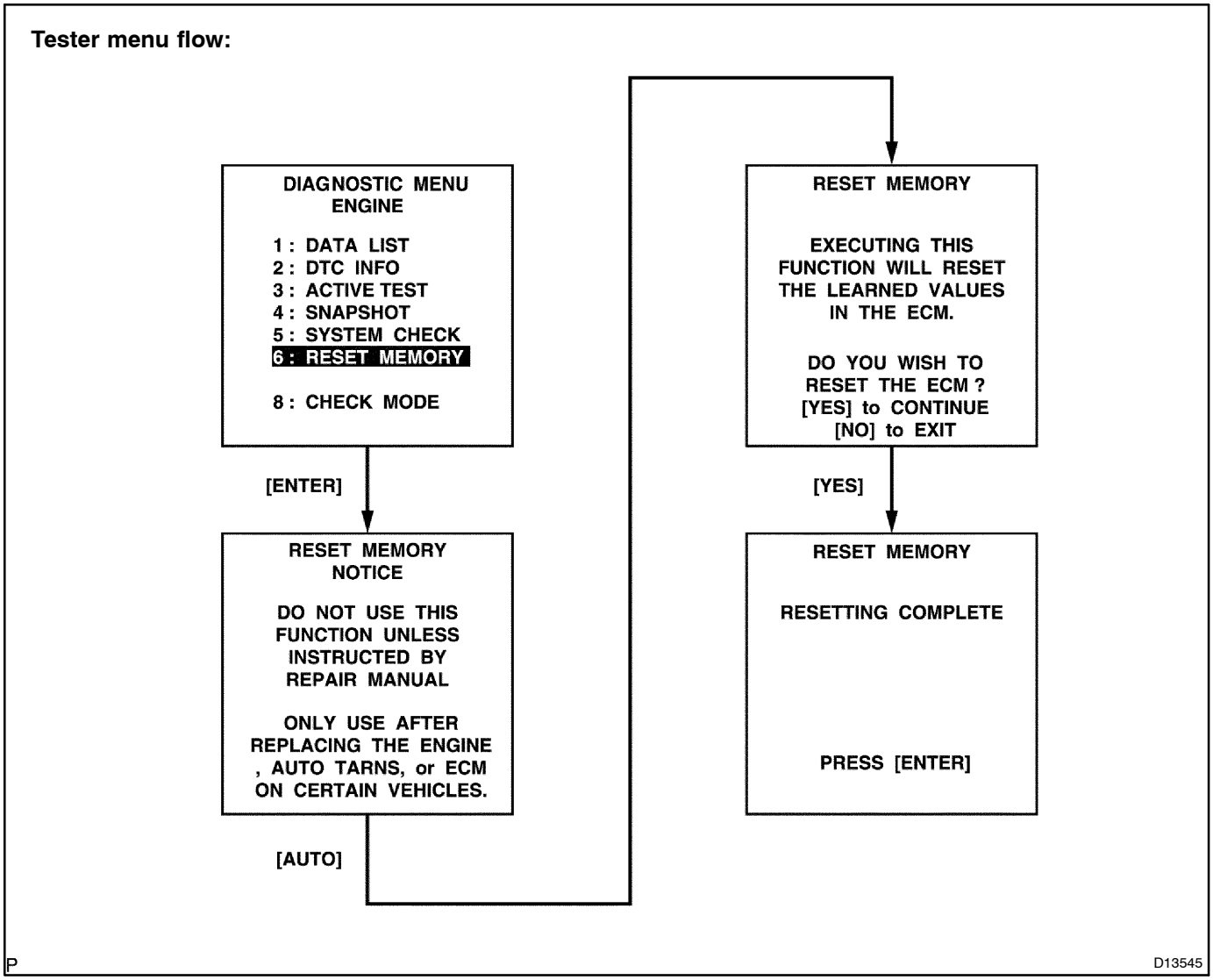
The ECM memorizes the condition that the ECT controls the automatic transaxle assy and engine assy according to those characteristics. Therefore, when the automatic transaxle assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch to the ON position and push the hand–held tester main switch on.
(d) Select the item "DIAGNOSIS/ENHANCED OBD II".
(e) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



DI4Z0-11

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

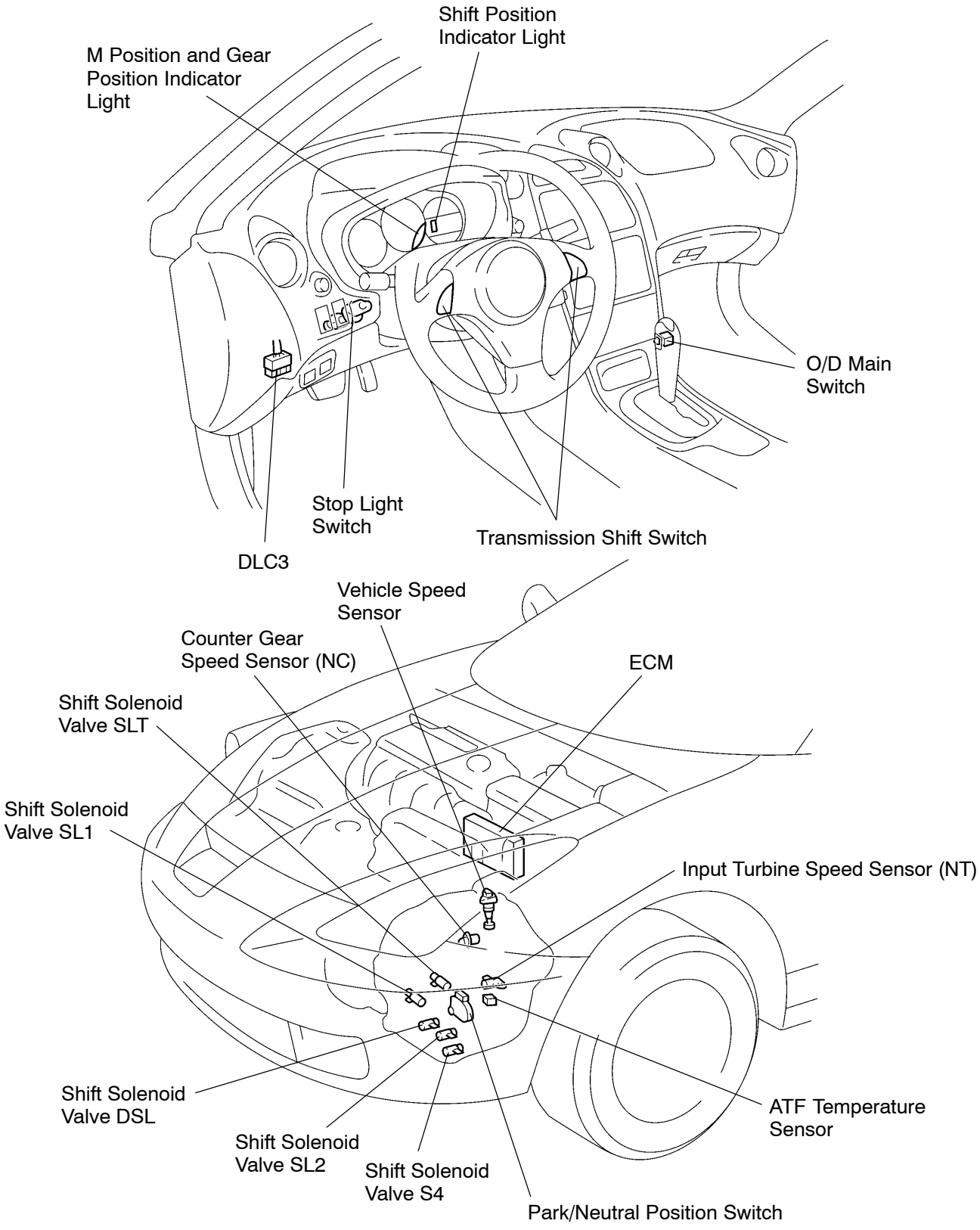
* : –...MIL does not light up /●...MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 (DI–552)	Vehicle Speed Sensor ”A”	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0705 (DI–701)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Open or short in park/neutral position switch circuit • Park/neutral position switch • E–shift main switch circuit • Multiplex communication circuit • ECM	●	○
P0710 (DI–706)	Transmission Fluid Temperature Sensor ”A” Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0711 (DI–710)	Transmission Fluid Temperature Sensor ”A” Performance	• Transaxle fluid level • ATF temperature sensor • ECM	●	○
P0712 (DI–706)	Transmission Fluid Temperature Sensor ”A” Circuit Low Input	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0713 (DI–706)	Transmission Fluid Temperature Sensor ”A” Circuit High Input		●	○
P0717 (DI–713)	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transaxle assembly	●	○
P0724 (DI–716)	Brake Switch ”B” Circuit High	• Short in stop light switch circuit • Stop light switch • ECM	●	○
P0741 (DI–718)	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)	• Shift solenoid valve DSL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch	●	○
P0746 (DI–722)	Pressure Control Solenoid ”A” Performance (Shift Solenoid Valve SL1)	• Shift solenoid valve SL1 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0748 (DI–728)	Pressure Control Solenoid ”A” Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0766 (DI–722)	Shift Solenoid ”D” Performance (Shift Solenoid Valve S4)	• Shift solenoid valve S4 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0776 (DI–722)	Pressure Control Solenoid ”B” Performance (Shift Solenoid Valve SL2)	• Shift solenoid valve SL2 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0778 (DI–728)	Pressure Control Solenoid ”B” Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0793 (DI–735)	Intermediate Shaft Speed Sensor ”A”	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM	●	○

P0982 (DI–728)	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S4)	• Open or short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983 (DI–728)	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S4)		●	○
P2716 (DI–738)	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○
P2769 (DI–742)	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	• Short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	●	○
P2770 (DI–742)	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)	• Open in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM	●	○

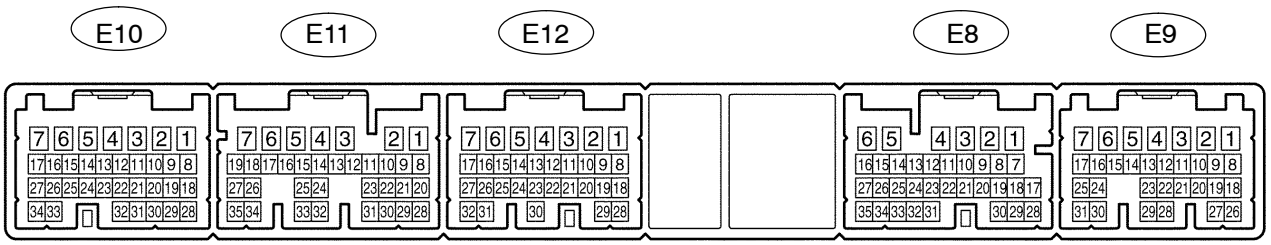
DI6KX–04

PARTS LOCATION



DI4ZQ–10

TERMINALS OF ECM



D11582

Each ECM terminals standard normal voltage is shown in the table below. In the table, first follow the information under ”Condition”.
Look under ”Symbols (Terminals No.)” for the terminals to be inspected.
The standard normal voltage between the terminals is shown under ”STD Voltage”.
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage
ODLP (E8–7) ⇔ E1 (E12–1)	BR–Y ⇔ BR	O/D main switch ON (O/D OFF)	Below 3 V
		O/D main switch OFF (O/D ON)	9 – 14 V
L (E8–8) ⇔ E1 (E12–1)	Y–B ⇔ BR	IG switch ON and Shift lever L position	10 – 14 V
		IG switch ON and Shift lever other than L position	Below 1 V
2 (E8–9) ⇔ E1 (E12–1)	L–O ⇔ BR	IG switch ON and Shift lever 2 position	10 – 14 V
		IG switch ON and Shift lever other than 2 position	Below 1 V
D (E8–10) ⇔ E1 (E12–1)	L–W ⇔ BR	IG switch ON and Shift lever D position	10 – 14 V
		IG switch ON and Shift lever other than D position	Below 1 V
R (E8–11) ⇔ E1 (E12–1)	R–B ⇔ BR	IG switch ON and Shift lever R position	10 – 14 V
		IG switch ON and Shift lever other than R position	Below 1 V
SPD (E8–17) ⇔ E1 (E12–1)	W–R ⇔ BR	IG switch ON and Turn one front wheel slowly	Pulse signal is output Below 1 ↔ 4–6 V
SFTD (E8–21) ⇔ E1 (E12–1)	P–L ⇔ BR	IG ON and ”Down” transmission shift switch pressed	Below 1 V
		IG ON and ”Down” transmission shift switch repressed	10 – 14 V
SFTU (E8–22) ⇔ E1 (E12–1)	L–R ⇔ BR	IG ON and ”UP” transmission shift switch pressed	Below 1 V
		IG ON and ”UP” transmission shift switch repressed	10 – 14 V
P (E9–6) ⇔ E1 (E12–1)	P ⇔ BR	IG switch ON and Shift lever P position	10 – 14 V
		IG switch ON and Shift lever other than P position	Below 1 V
N (E9–7) ⇔ E1 (E12–1)	P–L ⇔ BR	IG switch ON and Shift lever N position	10 – 14 V
		IG switch ON and Shift lever other than N position	Below 1 V
ODMS (E9–16) ⇔ E1 (E12–1)	BR–R ⇔ BR	IG switch ON	10 – 14 V
		IG switch ON and Press continuously O/D main switch	Below 1 V
SLT+ (E10–17) ⇔ SLT– (E10–16)	Y–L ⇔ Y–G	IG switch ON	10 – 14 V
THO (E10–30) ⇔ E2 (E10–28)	GR–L ⇔ BR	ATF temperature: 110 °C (230 °F) or more	Below 1.5 V
DSL (E11–11) ⇔ E1 (E12–1)	P–L ⇔ BR	IG switch ON	Below 1 V
		Vehicle driving under lock–up position	10 – 14 V
S4 (E11–13) ⇔ E1 (E12–1)	Y ⇔ BR	IG switch ON	Below 1 V
		O/D gear	10 – 14 V
		Except O/D gear	Below 1 V

SL2+ (E11–17) ⇔ SL2– (E11–16)	BR–Y ⇔ O	IG switch ON	Below 1 V
		1st or 2nd gear	10 – 14 V
		3rd or O/D gear	Below 1 V
SL1+ (E11–19) ⇔ SL1– (E11–18)	G–R ⇔ V	IG switch ON	10 – 14 V
		1st or 2nd gear	10 – 14 V
		3rd or O/D gear	Below 1 V
NC+ (E11–26) ⇔ NC– (E11–34)	P–B ⇔ G–O	Engine is running	Below 1 and 4 – 5 V
NT+ (E11–27) ⇔ NT– (E11–35)	W–L ⇔ B–R	Engine is running	Below 1 and 4 – 5 V

DI501–06

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic circuit matrix chart

Chapter 2: On–vehicle repair matrix chart

Chapter 3: Off–vehicle repair matrix chart

If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.

If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

Chapter 1: Electronic circuit matrix chart

Symptom	Suspected Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	ECM	IN–30
No up–shift (3rd → O/D)	2. O/D main switch circuit 3. ECM	DI–746 IN–30
No down–shift (O/D → 3rd)	ECM	IN–30
No down–shift (A particular gear, from 3rd to 1st gear, is not down–shifted)	ECM	IN–30
No lock–up or No lock–up off	ECM	IN–30
Shift point too high or too low	ECM	IN–30
Up–shift to 2nd while in L position	ECM	IN–30
Up–shift to 3rd while in 2 position	ECM	IN–30
Up–shift to O/D from 3rd while O/D main switch is OFF	1. O/D main switch circuit 2. ECM	DI–746 IN–30
Up–shift to O/D from 3rd while engine is cold	ECM	IN–30
Harsh engagement (N → D)	ECM	IN–30
Harsh engagement (Lock–up)	ECM	IN–30
Harsh engagement (Any driving position)	ECM	IN–30
Poor acceleration	ECM	IN–30
Engine stalls when starting off or stopping	ECM	IN–30
No E–shift system	1. E–shift main switch circuit 2. Transmission shift switch circuit 3. ECM	DI–752 DI–749 IN–30

Chapter 2: On–vehicle repair
(★: U240E automatic transaxle repair manual Pub. No. RM740U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Manual valve 2. Primary regulator valve 3. Off–vehicle repair matrix chart	★ ★ –
Vehicle does not move in R position	Off–vehicle repair matrix chart	–
No up–shift (1st → 2nd)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	3–4 shift valve	★
No down–shift (3rd → 2nd)	2–3 shift valve	★
No down–shift (2nd → 1st)	1–2 shift valve	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → R)	1. C_2 accumulator 2. Off–vehicle repair matrix chart	★
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (2nd → 3rd)	C_2 accumulator	★
Harsh engagement (3rd → O/D)	B_0 accumulator	★
Harsh engagement (O/D → 3rd)	1. C_0 accumulator 2. B_0 accumulator	★ ★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	★ –
No engine braking (1st: L position)	Off–vehicle repair matrix chart	–
No engine braking (2nd: 2 position)	Off–vehicle repair matrix chart	–
No kick–down	1. 1–2 shift valve 2. 2–3 shift valve 3. 3–4 shift valve	★ ★ ★

Chapter 3: Off–vehicle repair
(★: U240E automatic transaxle repair manual Pub. No. RM740U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Front and rear planetary gear 2. U/D planetary gear 3. U/D one–way clutch (F_2) 4. Forward clutch (C_1) 5. U/D brake (B_3)	★ ★ ★ ★ ★
Vehicle does not move in R position	1. Front and rear planetary gear unit 2. U/D planetary gear unit 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. 1st & reverse brake (B_2)	★ ★ ★ ★ ★
No up–shift (1st → 2nd)	1. No. 1 one–way clutch (F_1) 2. 2nd brake (B_1)	★ ★
No up–shift (2nd → 3rd)	Direct clutch (C_2)	★
No up–shift (3rd → O/D)	U/D clutch (C_3)	★
No lock–up or No lock–up off	Torque converter clutch	AX–36
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. U/D one–way clutch (F_2) 3. No. 1 one–way clutch (F_1)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	AX–36
Slip or shudder (Forward position: After warm–up)	1. Torque converter clutch 2. Forward clutch (C_1) 3. Direct clutch (C_2) 4. U/D brake (C_3) 5. No. 1 one–way clutch (F_1) 6. U/D one–way clutch (F_2)	AX–36 ★ ★ ★ ★ ★
Slip or shudder (R position)	1. Direct clutch (C_2) 2. 1st & reverse brake (B_2)	★ ★
Slip or shudder (1st)	No. 1 one–way clutch (F_1)	★
Slip or shudder (2nd)	1. U/D one–way clutch (F_2) 2. 2nd brake (B_1)	★ ★
Slip or shudder (3rd)	Direct clutch (C_2)	★
Slip or shudder (O/D)	U/D clutch (C_3)	★
No engine braking (1st – 3rd: D position)	U/D brake (B_3)	★
No engine braking (1st: L position)	1st & reverse brake (B_2)	★
No engine braking (2nd: 2 position)	2nd brake (B_1)	★
Poor acceleration (All position)	1. Torque converter clutch 2. U/D planetary gear	AX–36 ★
Poor acceleration (O/D)	1. U/D clutch (C_3) 2. U/D planetary gear	★ ★
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	AX–36

DI4ZS-10

CIRCUIT INSPECTION

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (P, R, N, D 2 and L) from the park/neutral position switch.

DTC No.	DTC Detection Condition	Trouble Area
P0705	Two or more of the following signals are detected at the same time for 0.5 seconds or more. (b) P range signal ON (c) R range signal ON (d) N range signal ON (e) D range signal ON (f) M range signal ON (g) 2 range signal ON (h) L range signal ON	• Short in park/neutral position switch circuit • Park/neutral position switch • E–shift main switch circuit • Multiplex communication circuit • ECM

MONITOR DESCRIPTION

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the vehicle is in P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N or D, the ECM interprets this as a fault in the switch. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705	Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present.	See page DI–669	
The typical enabling condition is not available.	–	

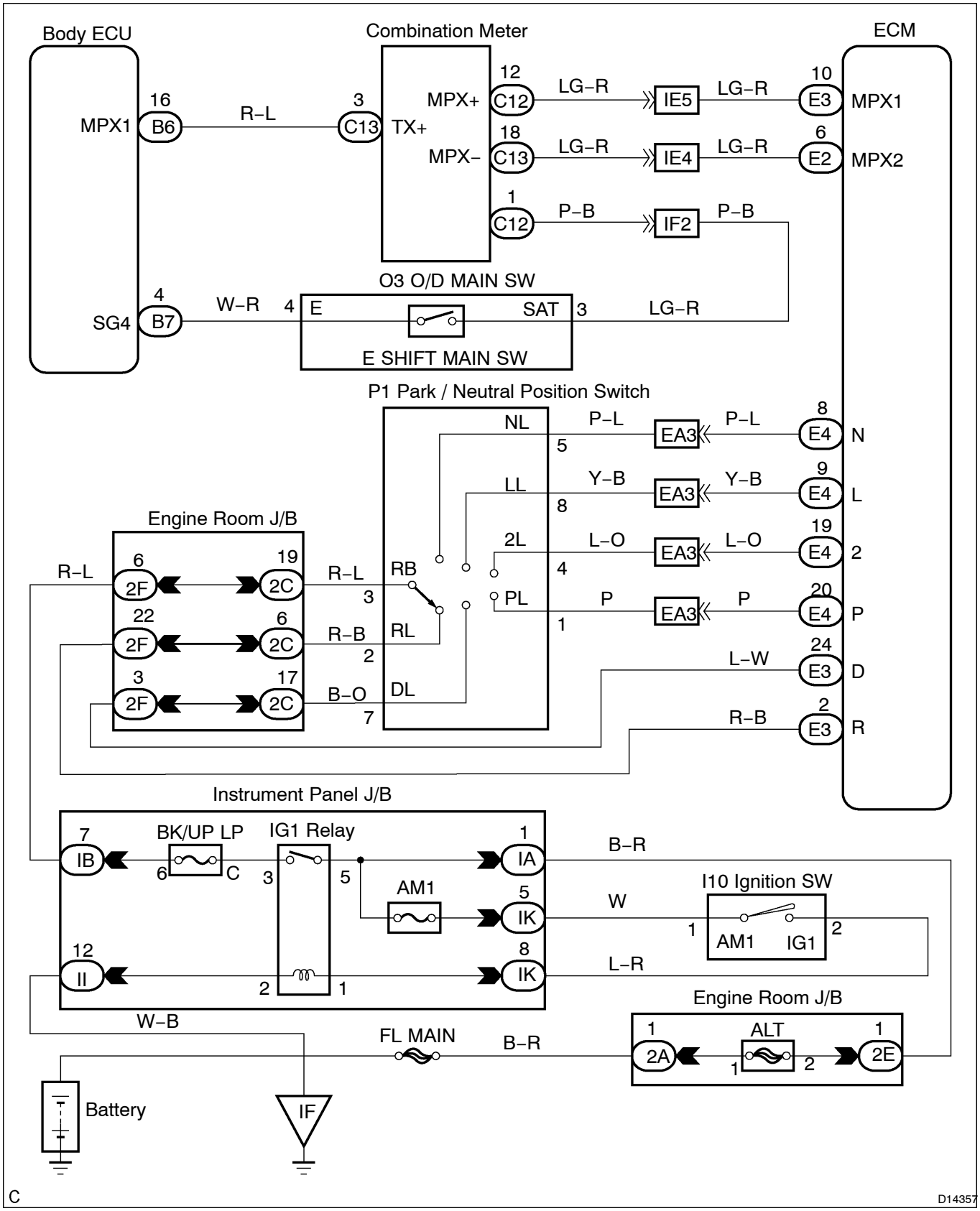
TYPICAL MALFUNCTION THRESHOLDS

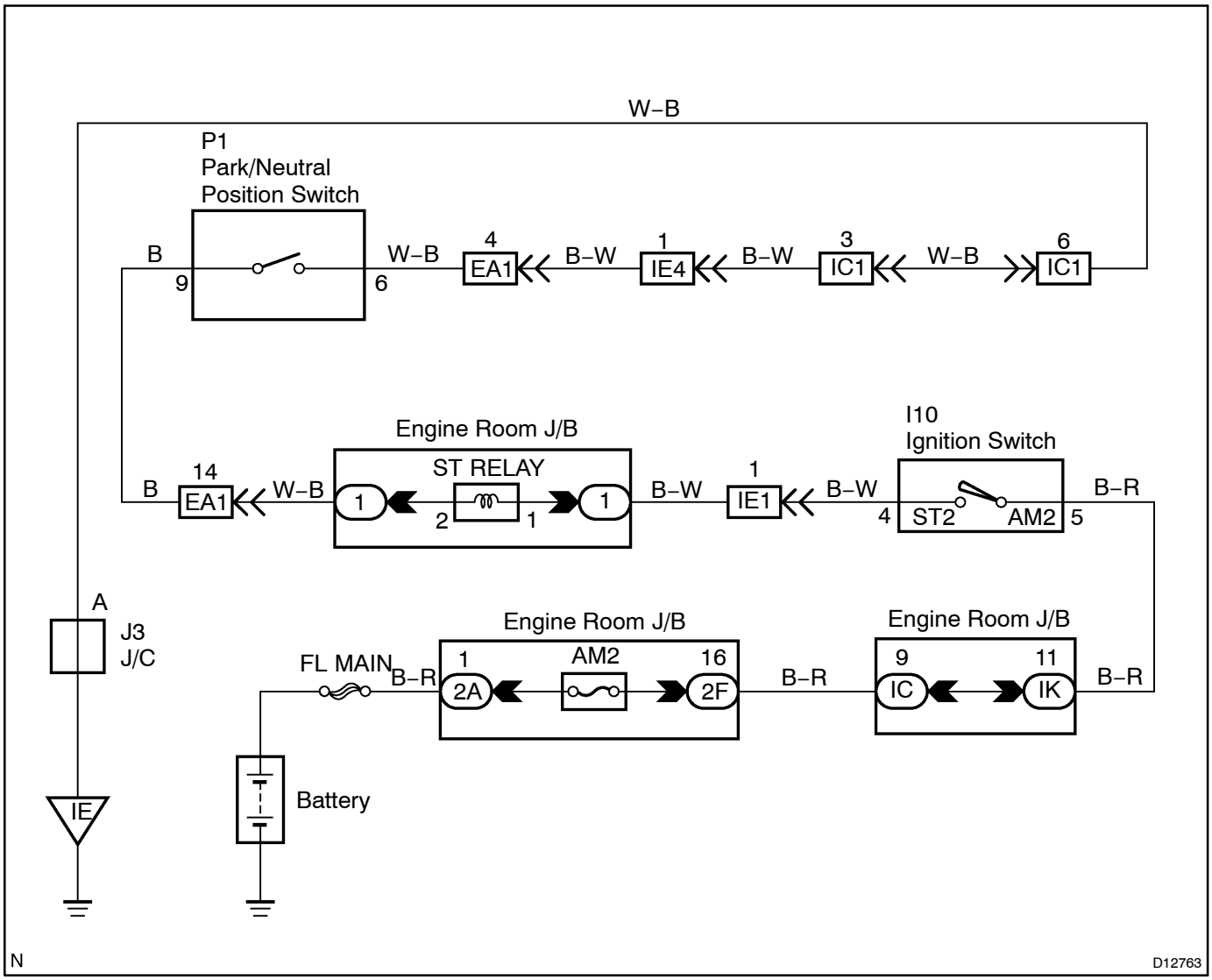
Detection criteria	Threshold
Either of the following conditions is met: Condition (A) or (B)	
Condition (A)	
Number of the following signal input at the same time	2 or more
P switch	ON
R switch	
N switch	
D switch	
2 switch	
L switch	
Condition (B)	
When shift lever is in M position, one of following conditions is met.	
P switch	ON
R switch	
N switch	
2 switch	
L switch	

COMPONENT OPERATING RANGE

Parameter	Standard value
Park/neutral position switch	The park/neutral position switch sends only one signal to the ECM

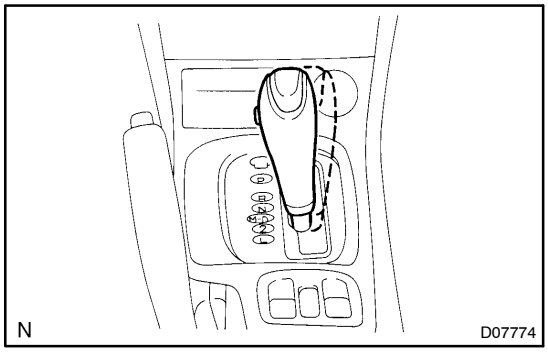
WIRING DIAGRAM




W–B
P1
Park/Neutral
Position Switch
B
9
W–B
6
4
EA1
B–W
1
IE4
B–W
3
IC1
W–B
6
IC1
Engine Room J/B
ST RELAY
B
14
EA1
W–B
1
2
1
1
B–W
1
IE1
B–W
I10
Ignition Switch
4
ST2
AM2
5
B–R
A
J3
J/C
IE
FL MAIN
B–R
Engine Room J/B
1
2A
AM2
16
2F
B–R
Engine Room J/B
9
IC
11
IK
B–R
Battery
N
D12763

INSPECTION PROCEDURE

1	**Check operation of M indicator light.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the M indicator light on the combination meter when shift lever is moved to D range and M range.

OK:

Shift Lever Position	Specified Condition
M	”M” indicator light comes on
Except M	”M” indicator light goes off

NG → **Go to step 2**

OK

Go to step 4

2	**Check the E–shift main switch circuit (See page DI–752).**

NG → **Repair E–shift main switch circuit.**

OK

3	**Check multiplex communication circuit (See page DI–1184).**

NG → **Repair multiplex communication circuit.**

OK

4	Read PNP, REVERSE, 2ND and LOW signals.

When using TOYOTA hand–held tester:

PREPARATION:

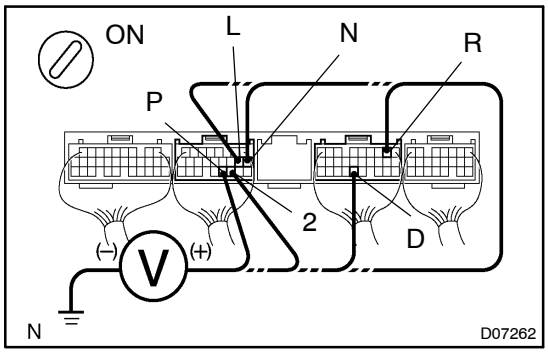
(a) Remove the DLC3 cover.
(b) Connect a TOYOTA hand–held tester to the DLC3.
(c) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Shift lever into the P, R, N, D, 2 and L positions, and read the NSW, REVERSE, 2ND DRIVE and LOW signals on the TOYOTA hand–held tester.

OK:

Shift position	Signal
2	2ND OFF → ON
L	LOW OFF → ON
D	DRIVE OFF → ON
R	REVERSE OFF → ON
P, N	NSW OFF → ON



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminals P, R, N, D, 2 and L of ECM and body ground when the shift lever is shifted to the following positions.

OK:

Position	P–Body ground	R–Body ground	N–Body ground	D–Body ground	2–Body ground	L–Body ground
P	9 – 14 V	0 V	0 V	0 V	0 V	0 V
R	0 V	9 – 14 V	0 V	0 V	0 V	0 V
N	0 V	0 V	9 – 14 V	0 V	0 V	0 V
D	0 V	0 V	0 V	9 – 14 V	0 V	0 V
2	0 V	0 V	0 V	0 V	9 – 14 V	0 V
L	0 V	0 V	0 V	0 V	0 V	9 – 14 V

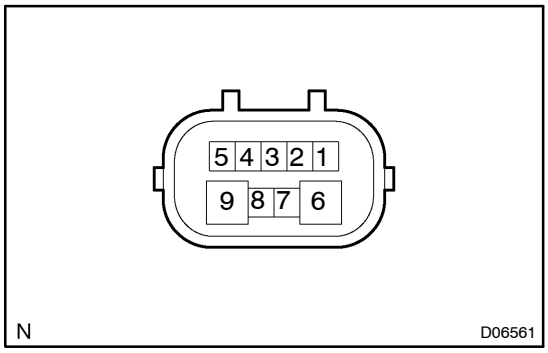
HINT:

*: The voltage will drop slightly due to lighting up of the back up light.

OK → **Check and replace the ECM (See page IN–30).**

NG

5	Check park/neutral position switch.



PREPARATION:

Remove the park/neutral position switch.

CHECK:

Check continuity between each terminal shown below when the shift lever is moved to each position.

Shift position	Terminal No. to continuity	
P	6 – 9	1 – 3
R	2 – 3	–
N	6 – 9	3 – 5
D	3 – 7	–
2	3 – 4	–
L	3 – 8	–

OK:

There is continuity.

NG → **Replace the park/neutral position switch.**

OK

Repair or replace harness or connector between battery and park/neutral position switch, park/neutral position switch and ECM (See page IN–30).

DTC	P0710	Transmission Fluid Temperature Sensor ”A” Circuit

DTC	P0712	Transmission Fluid Temperature Sensor ”A” Circuit Low Input

DTC	P0713	Transmission Fluid Temperature Sensor ”A” Circuit High Input

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0710	(a) and (b) is detected momentarily within 0.5 sec. when neither P0712 or P0713 is not detected (1–trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. HINT: Within 0.5 sec. the malfunction switches from (a) to (b) or from (b) to (a)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712	ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1–trip detection logic).	
P0713	DTC is detected for 0.5 sec. or more (1–trip detection logic). ATF temperature sensor resistance is more than 156 kΩ after started engine for 15 minutes or more.	

MONITOR DESCRIPTION

The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

*1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.

*2: –40°C (–40°F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the OBD II scan tool or hand–held tester display.

MONITOR STRATEGY

Related DTCs	P0710	ATF temperature sensor/Range check (Fluttering)
	P0712	ATF temperature sensor/Range check (Low resistance)
	P0713	ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Range check (Fluttering, Low resistance)		
The typical enabling condition is not available.	–	–
Range check (High resistance)		
Time after engine start	15 min. or more	–

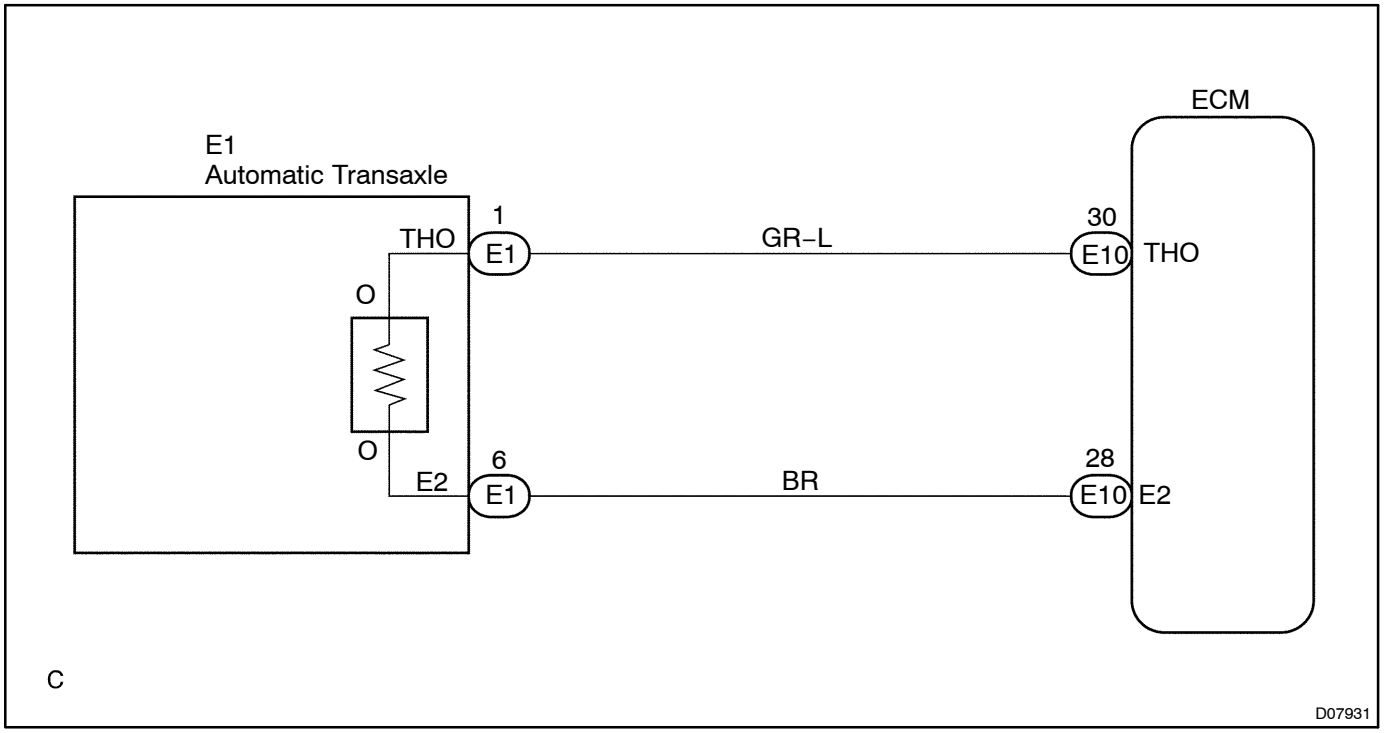
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Fluttering)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω or More than 156 kΩ
Range check (Low resistance)	
TFT sensor resistance	Less than 79 Ω
Range check (High resistance)	
TFT sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

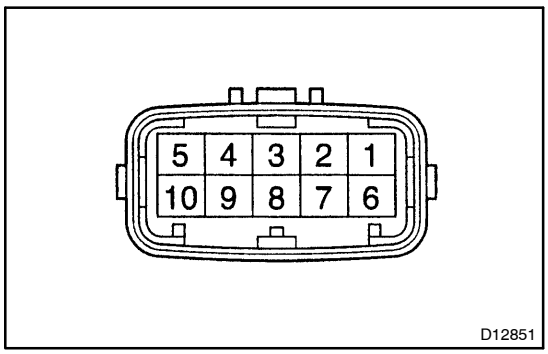
Parameter	Standard value
TFT sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ATF temperature sensor.**



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure resistance between terminals 1 and 6 of transmission wire connector.

OK:

90 Ω to 156 kΩ

HINT:

Refer to the table below for resistance values according to ATF temperature.

ATF temperature	Specified condition
10°C (50°F)	6.4 kΩ
25°C (77°F)	3.5 kΩ
110°C (230°F)	0.2 kΩ

Measure resistance between terminals 1 and 6 of the transmission wire connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG	**Replace the ATF temperature sensor (transmission wire).**

OK

2	**Check harness and connector between ATF temperature sensor and ECM (See page IN–30).**

NG → **Repair or replace the harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DIC6D–02

DTC	P0711	Transmission Fluid Temperature Sensor ”A” Performance

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2–trip detection logic) (a) After 12 sec. of engine start, temp. of atmosphere and that of engine coolant is more than –10˚C (b) After normal driving for over 17 min. and 9 km (6 miles), ATF temp. is less than 10˚C	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault of the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 10°C (50°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.
When the ATF temperature is 110°C (230°F) or more after 17 minutes of engine cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0711	ATF temperature sensor ”A”/Rationality check
Required sensors/Components	Main	ATF temperature sensor (TFT sensor)
Required sensors/Components	Sub	ECT sensor, IAT sensor
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
ECT (Engine coolant temperature)	–15˚C (5˚F) or more	–
Time after engine start	16 min. and 40 sec. or more	–
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
IAT (Intake air temperature) sensor circuit	Not circuit malfunction	
Time after engine start	18 min. and 20 sec.	
Driving distance after engine start	9 km (5.6 mile) or more	–

IAT (12 sec. after engine start)	–10°C (14°F) or more	–
ECT (12 sec. after engine start)	–10°C (14°F) or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
TFT (transmission fluid temperature)	Less than 10°C (50°F)

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature)	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM

See page DI–706.

INSPECTION PROCEDURE

1	**Check other DTCs output (in addition to DTC P0711)**

PREPARATION:

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the ”ON” button of the OBD II scan tool or the hand–held tester.
(f) Select the item ”DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES”.

CHECK:

Read the DTCs using the OBD II scan tool or the hand–held tester.

RESULT:

Display (DTC output)	Proceed to
Only ”P0711” is output	A
”P0711” and other DTCs	B

HINT:

If any other codes besides ”P0711” is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–693).**

A

2	**Check transaxle fluid level (See page DI–669).**

NG → **Add fluid (See page DI–669).**

OK

Replace the transmission wire (ATF temperature sensor) (See page AX–6).

DIC6E–02

DTC	P0717	Turbine Speed Sensor Circuit No Signal

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shifting.

DTC No.	DTC Detection Condition	Trouble Area
P0717	All conditions below are detected for 5 secs. or more (1–trip detection logic) (a) Gear change not being performed (b) Gear position: 2nd, 3rd, 4th or 5th (c) T/M input shaft rpm: 300 rpm or less (d) T/M output shaft rpm: 1,000 rpm or more (e) Park/neutral position switch: OFF (f) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation	• Open or short in input turbine (NT) speed sensor circuit • Input turbine (NT) speed sensor • ECM • Automatic transaxle assembly

MONITOR DESCRIPTION

The NT terminal of the ECM detects the revolving signal from speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in the 2nd, 3rd or O/D gear position in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717	Input/Turbine speed sensor/Verify pulse input
Required sensors/Components	Speed sensor (NT), Speed sensor (NC)	
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
Shift change	Shift change is completed before starting next shift change operation	
ECM selected gear	2nd, 3rd, 4th or 5th	
Output shaft rpm	1,000 rpm or more	–
NSW switch	OFF	
R switch	OFF	
L switch	OFF	
Engine	Running	

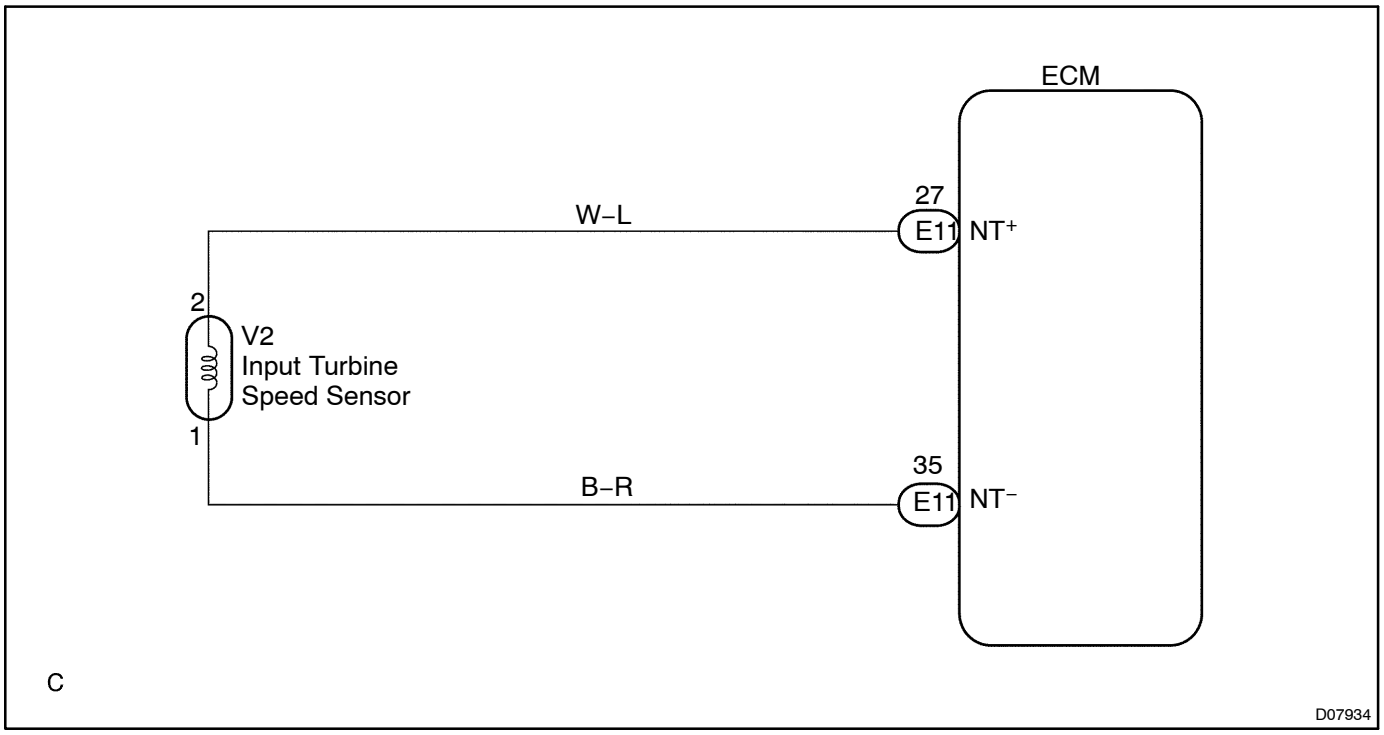
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

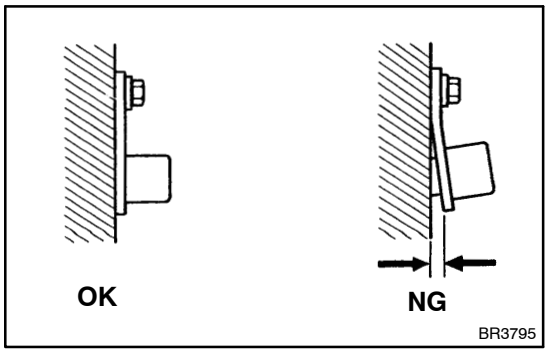
Parameter	Standard value
Speed sensor (NT)	Turbine speed is equal to engine speed when lock–up ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor (NT) installation.**

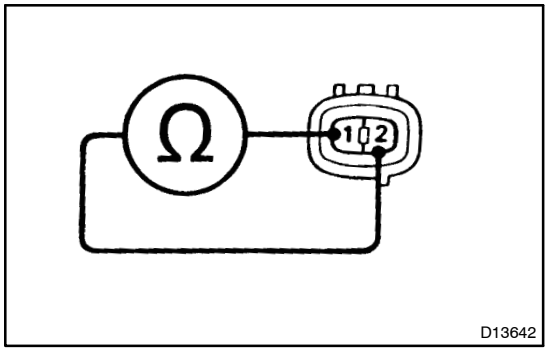


CHECK:
Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **Tighten the speed sensor (NT) properly.**

OK

2	**Check speed sensor (NT) .**



PREPARATION:
Remove the NT speed sensor from transaxle.
CHECK:
Measure resistance between terminals 1 and 2 of speed sensor.
OK:
Resistance: 620 ± 60 Ω at 20 °C (68 °F)

NG → **Replace the speed sensor NT.**

OK

3	**Check harness and connector between ECM and speed sensor NT (See page IN–30).**

NG → **Repair or replace harness and connector.**

OK

Check and replace the ECM (See page IN–30).

DI4Z1–07

DTC	P0724	Brake Switch ”B” Circuit High

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling, while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is operated, this switch sends a signals to ECM. Then the ECM cancels operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	Stop light switch remains ON while vehicle running (2–trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

When the stop light switch remains ON during ”stop and go” driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop and go (3 km/h (2 mph) to 30 km/h (19 mph)) 5 times for two driving cycles in order to detect malfunction.

MONITOR STRATEGY

Related DTCs	P0724	Stop light switch/Range check/Rationality
Required sensors/Components	Main	Stop light switch
Required sensors/Components	Sub	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	GO and STOP 5 times	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See pageDI–669	
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once	
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once	
Battery voltage	8 V or more	–
Starter	OFF	
Ignition switch	ON	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Brake switch	Remain ON during GO and STOP 5 times

WIRING DIAGRAM

See page DI–556.

INSPECTION PROCEDURE

1	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK

2	**Check harness and connector between ECM and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DI4ZX–09

DTC	P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)

SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve DSL, valve body and torque converter clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P0741	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range. (2–trip detection logic)	• Shift solenoid valve DSL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch

MONITOR DESCRIPTION

Torque converter lock–up is controlled by the ECM based on speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock–up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests ”lock–up” by applying control voltage to shift solenoid DSL. When the DSL is turned on, solenoid DSL applies pressure to the lock–up relay valve and locks the torque converter clutch.
If the ECM detects no lock–up after lock–up has been requested or if it detects lock–up when it is not requested, the ECM interprets this as a fault in the torque converter clutch performance. The ECM will turn on the MIL and store the DTC.
Example:
When any of the following is met, the system judges it as a malfunction.

(a) There is a difference in rotation between before and after torque converters even when the ECM commands lock–up.
(Engine speed is at least 75 rpm greater than input speed.)

(b) There is no difference in rotation between before and after torque converters even when the ECM commands lock–up off.
(The difference between engine speed and input speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741	Shift solenoid valve DSL/OFF malfunction
		Shift solenoid valve DSL/ON malfunction
Required sensors/Components	Main	Shift solenoid valve DSL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor (VPA1), Mass air flow meter (MAF), ATF temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous	
Duration	OFF malfunction	3.5 sec.
	ON malfunction (A)	1.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

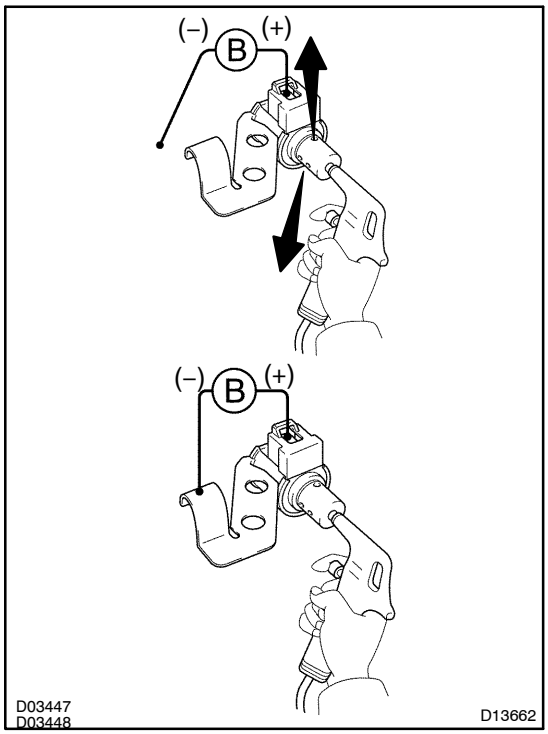
Item	Specification	
	Minimum	Maximum
ALL		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	”D”	
TFT (transmission fluid temperature)	–20°C (–4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve S4 circuit	Not circuit malfunction	
Shift solenoid valve DSL circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM lock–up command	ON	
ECM selected gear	3rd or 4th	
Vehicle speed	25 km/h (15.5 mph) or more	–
ON malfunction		
ECM lock–up command	OFF	
ECM selected gear	3rd or 4th	
Throttle valve opening angle	8% or more	–
Vehicle speed	25 to 60 km/h (15.5 to 37.2 mph)	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Either of the following conditions is met: OFF malfunction or ON malfunction	
OFF malfunction	
Engine speed – Input (turbine) speed	100 rpm or more
ON malfunction	
Difference between engine speed and input (turbine) speed	Less than 35 rpm
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection	

INSPECTION PROCEDURE

1	**Check solenoid valve DSL operation.**



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve DSL.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the solenoid valve closes.

OK:

(a) Solenoid valve does leak air.

(b) Solenoid valve closes.

NG → **Replace the solenoid valve DSL.**

OK

2	**Check valve body (See page DI–698).**

NG → **Repair or replace the valve body.**

OK

Replace the torque converter clutch (See page AX–30).

DTC	P0746	Pressure Control Solenoid ”A” Performance (Shift Solenoid Valve SL1)

DTC	P0766	Shift Solenoid ”D” Performance (Shift Solenoid Valve S4)

DTC	P0776	Pressure Control Solenoid ”B” Performance (Shift Solenoid Valve SL2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0746 P0766 P0776	During normal driving, the gear required by the ECM does not match the actual gear (2–trip detection logic)	• Shift solenoid valve SL1/SL2/S4 is stuck open or closed • Valve body is blocked up or stuck

HINT:
Check the shift solenoid valve SL1 when DTC P0746 is output, check the shift solenoid valve SL2 when DTC P0776 is output and check shift solenoid S4 when DTC P0766 is output.

MONITOR DESCRIPTION

P0746

The ECM commands gear shifts by turning the shift solenoid valves ”ON/OFF”. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or O/D gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL.
Example:
When either condition (a) or (b) is met, the ECM detects a malfunction.
(a) The ECM commands the 1st gear, but the actual gear is 2nd.
(b) The ECM commands the 2nd gear, but the actual gear is 1st.

P0766, P0776

The ECM commands gear shifts by turning the shift solenoid valves ”ON/OFF”. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or O/D gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

P0746

Related DTCs	P0746	Shift solenoid valve SL1/OFF malfunction
		Shift solenoid valve SL1/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	ECT sensor, ATF temperature sensor, Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	OFF malfunction, ON malfunction (A)	0.8 sec.
	ON malfunction (B)	1 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

P0766

Related DTCs	P0766	Shift solenoid valve S4/ON malfunction
		Shift solenoid valve S4/OFF malfunction
Required sensors/Components	Main	Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	ECT sensor, ATF temperature sensor, Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

P0776

Related DTCs	P0776	Shift solenoid valve SL2/OFF malfunction
		Shift solenoid valve SL2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL2
Required sensors/Components	Sub	ECT sensor, ATF temperature sensor, Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.8 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0746

Item	Specification	
	Minimum	Maximum
ALL		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (–4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve S4 circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (varies with engine speed)	–
ON malfunction (A)		
ECM selected gear	2nd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (varies with engine speed)	–
ON malfunction (B)		
ECM lock–up command	OFF	
ECM selected gear	3rd or 4th	

P0766

Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (–4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	

Shift solenoid valve S4 circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM selected gear	4th	
Throttle valve opening angle	7% or more	–
Vehicle speed	10 km/h (6.2 mph) or more	–
ON malfunction		
ECM selected gear	3rd	
Throttle valve opening angle	7% or more	–
Vehicle speed	10 km/h (6.2 mph) or more	–

P0776

Item	Specification	
	Minimum	Maximum
ALL		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
TFT (transmission fluid temperature)	–20°C (4°F) or more	–
TFT sensor circuit	Not circuit malfunction	
ECT sensor circuit	Not circuit malfunction	
Turbine speed sensor circuit	Not circuit malfunction	
Intermediate shaft speed sensor circuit	Not circuit malfunction	
Output speed sensor circuit	Not circuit malfunction	
Shift solenoid valve SL1 circuit	Not circuit malfunction	
Shift solenoid valve SL2 circuit	Not circuit malfunction	
Shift solenoid valve S4 circuit	Not circuit malfunction	
Electronic throttle system	Not circuit malfunction	
OFF malfunction		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (varies with engine speed)	–
Throttle valve opening angle	15 % or more	–
ON malfunction		
ECM selected gear	3rd or 4th	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (vary with engine speed)	–

TYPICAL MALFUNCTION THRESHOLDS

P0746

Detection criteria	Threshold
Either of the following conditions is met: OFF malfunction, or ON malfunction (A) and (B)	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction	
Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63
ON malfunction (A)	
Input (turbine) speed/Intermediate shaft speed	2.72 to 2.86
ON malfunction (B)	
Engine speed – Input (turbine) speed	250 rpm or more

P0766

Detection criteria	Threshold
Either of the following conditions is met: OFF malfunction or ON malfunction	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction	
Intermediate shaft speed/Output speed	1.34 to 1.48
ON malfunction	
Intermediate shaft speed/Output speed	0.95 to 1.09

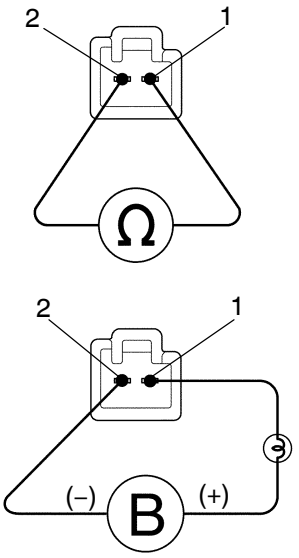
P0776

Detection criteria	Threshold
Either of the conditions is met: OFF malfunction or ON malfunction	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction	
Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
ON malfunction	
Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63

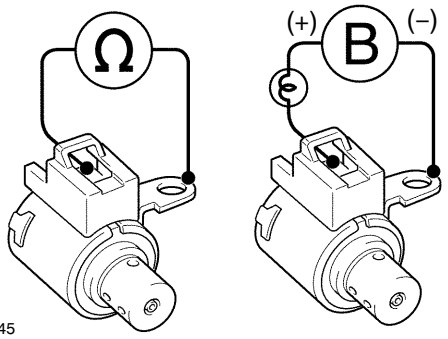
INSPECTION PROCEDURE

1	**Check shift solenoid valve SL1, SL2 or S4 operation.**

Shift solenoid valve SL1 and SL2



Shift solenoid valve S4



D03445
D03446
D03424 D03423
D03724

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Remove the shift solenoid valve SL1, SL2 or S4.

CHECK:

Check Solenoid Resistance:

(a) Shift solenoid valve SL1 or SL2:
Measure resistance between terminals 1 and 2 of solenoid connector.
(b) Shift solenoid valve S4:
Measure resistance between terminal 1 of solenoid connector and solenoid body.

Check Solenoid Operation:

(a) Shift solenoid valve SL1 or SL2:
Connect the positive (+) lead with an 23W bulb to terminal 1 and the negative (–) lead to terminal 2 of solenoid connector, then check the movement of the valve.
(b) Shift solenoid valve S4:
Connect the positive (+) lead with an 23W bulb to terminal 1 of solenoid connector and the negative (–) lead to the solenoid valve body, then check the movement of the valve.

OK:

Resistance: 5.1 – 5.5 Ω
The shift solenoid valve makes operation noise.

NG → **Replace the shift solenoid valve SL1, SL2 or S4.**

OK

Check the valve body (See page DI–698).

DI4ZY–08

DTC	P0748	Presser Control Solenoid ”A” Electrical (Shift Solenoid Valve SL1)

DTC	P0778	Presser Control Solenoid ”B” Electrical (Shift Solenoid Valve SL2)

DTC	P0982	Shift Solenoid ”D” Control Circuit Low (Shift Solenoid Valve S4)

DTC	P0983	Shift Solenoid ”D” Control Circuit High (Shift Solenoid Valve S4)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF of the shift solenoid valves SL1 and SL2 controlled by ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC No.	DTC Detecting Condition	Trouble Area
P0748 P0778	The ECM checks for an open or short circuit in the shift solenoid valves SL1 and SL2. (a) When the solenoid is energized, the duty ratio exceed 75 %. (b) When the solenoid is not energized, the duty ratio is less than 3 %.	• Open or short in shift solenoid valve SL1/SL2 circuit • Shift solenoid valve SL1/SL2 • ECM
P0982	ECM detects short in solenoid valve No. 2 circuit 2 times when solenoid valve No. 2 is operated (2–trip detection logic).	• Short in shift solenoid valve No. 4 circuit • Shift solenoid valve No. 4 • ECM
P0983	ECM detects open in solenoid valve No. 2 circuit 2 times when solenoid valve No. 2 is not operated (2–trip detection logic).	• Open in shift solenoid valve No. 4 circuit • Shift solenoid valve No. 4 • ECM

HINT:

Check the shift solenoid valve SL1 when DTC P0748 is output, check the shift solenoid valve SL2 when DTC P0778 is output and check the shift solenoid valve S4 when DTCs P0982 and P0983 are output.

Fail safe function:
If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve DSL OFF at the same time. If both solenoids are malfunction, hydraulic control cannot be performed electronically and must be done manually.
Manual shifting as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

NORMAL				SHIFT SOLENOID SL1 MALFUNCTIONING								SHIFT SOLENOID SL2 MALFUNCTIONING			
				Driving at 3rd or O/D				Driving at 1st or 2nd							
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON → OFF	OFF	3rd	X	ON	OFF	2nd	ON → OFF	X	OFF	3rd
OFF	ON	OFF	2nd	X	ON → OFF	OFF	3rd	X	ON	OFF	2nd	OFF	X	OFF	3rd
	OFF	OFF	3rd	X	OFF	OFF	3rd	X	OFF → ON	OFF → ON	3rd		X	OFF	3rd
	OFF	ON	O/D	X	OFF	ON	O/D	X	OFF → ON	ON	3rd		X	ON	O/D

SHIFT SOLENOID S4 MALFUNCTIONING				SHIFT SOLENOID SL1 AND SL2 MALFUNCTIONING				SHIFT SOLENOID SL1 AND S4 MALFUNCTIONING							
								Driving at 3rd or O/D				Driving at 1st or 2nd			
Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	X	1st	X	X	OFF	3rd	X	ON → OFF	X	3rd	X	ON	X	2nd
OFF	ON	X	2nd	X	X	OFF	3rd	X	ON → OFF	X	3rd	X	ON	X	2nd
	OFF	X	3rd	X	X	OFF	3rd	X	OFF	X	3rd	X	OFF → ON	X	2nd
	OFF	X	3rd	X	X	ON	O/D	X	OFF	X	3rd	X	OFF → ON	X	2nd

SHIFT SOLENOID SL2 AND S4 MALFUNCTIONING				SHIFT SOLENOID SL1, SL2 AND S4 MALFUNCTIONING			
Solenoid Valve			Gear	Solenoid Valve			Gear
SL1	SL2	S4		SL1	SL2	S4	
ON → OFF	X	X	3rd	X	X	X	3rd
OFF	X	X	3rd	X	X	X	3rd
	X	X	3rd	X	X	X	3rd
	X	X	3rd	X	X	X	3rd

MONITOR DESCRIPTION

The ECM commands gearshift by turning the shift solenoid valves ”ON/OFF”. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition ”ON/OFF” (In case of an open or short circuit, the ECM stops sending current to the circuit.).

MONITOR STRATEGY

P0748, P0778

Related DTCs	P0748	Shift solenoid valve SL1/Range check
	P0778	Shift solenoid valve SL2/Range check
Required sensors/Components	P0748: Shift solenoid valve SL1	
	P0778: Shift solenoid valve SL2	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

P0982, P0983

Related DTCs	P0982	Shift solenoid valve S4/Range check (Low resistance)
	P0983	Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0748, P0778

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Solenoid current cut status	Not cut	
Battery voltage	11 V or more	–
CPU commanded duty	19 % or more	–
Ignition switch	ON	
Starter	OFF	

P0982, P0983

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Range check (Low resistance)		
Shift solenoid valve	ON	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	
Range check (High resistance)		
Shift solenoid valve	OFF	
Battery voltage	8 V or more	–
Ignition switch	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

P0748, P0778

Detection criteria	Threshold
Solenoid status from IC	Fail (Open or short)

P0982, P0983

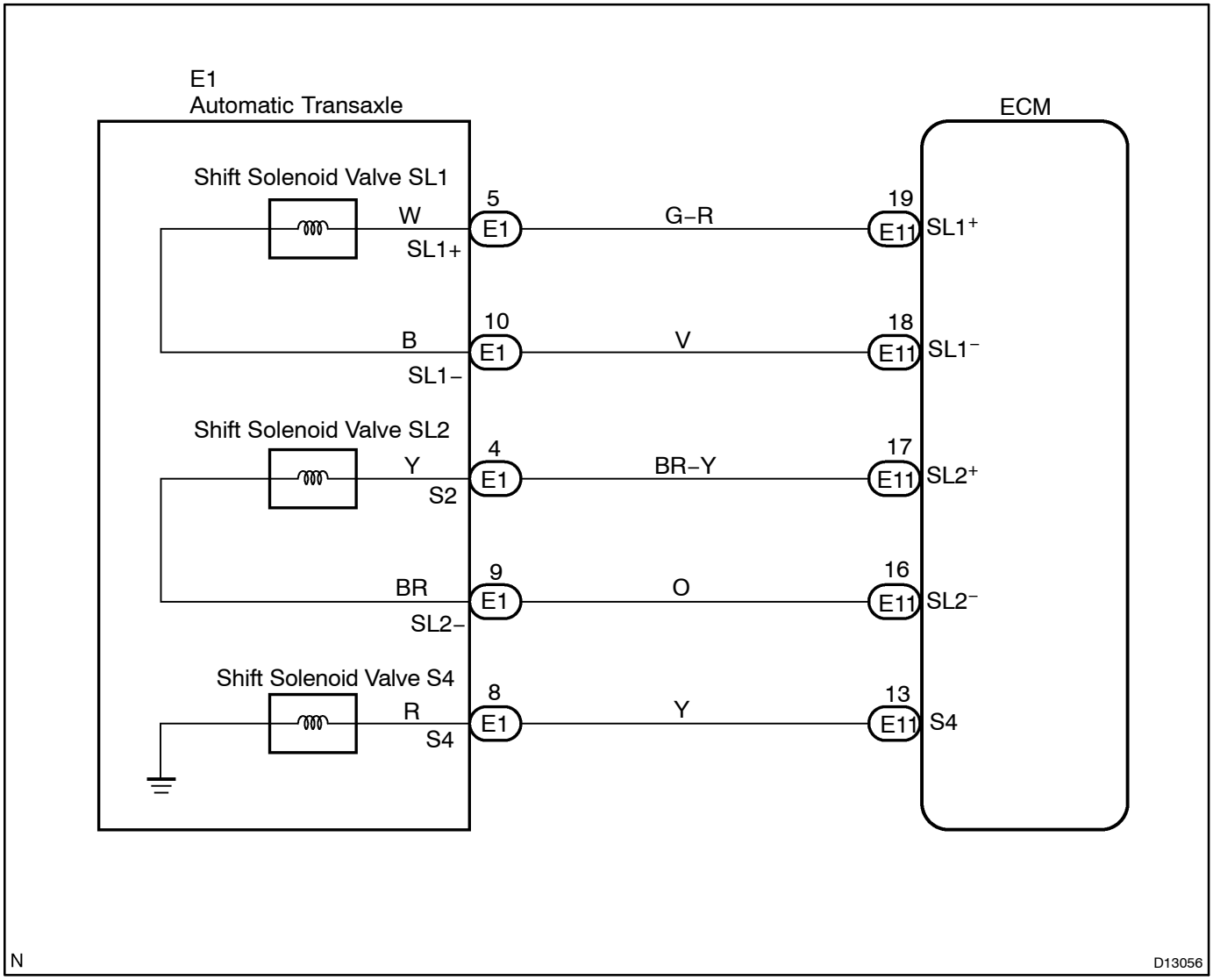
Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or more

COMPONENT OPERATING RANGE

P0748, P0778

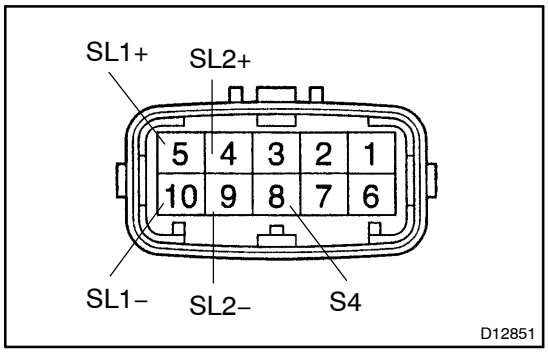
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check transmission wire.**



PREPARATION:

Disconnect the transmission wire connector.

CHECK:

(a) Measure resistance between terminal SL1+ and SL2– of transmission wire connector.

(b) Measure resistance between terminal SL2+ and SL2– of transmission wire connector.

(c) Measure resistance between terminal S4 of transmission wire connector and body ground.

OK:

Resistance: 5.0 to 5.6 Ω at 20 °C (68°F)

CHECK:

Measure resistance between terminals SL1+, SL1–, SL2+ and SL2– of the transmission wire connector and body ground.

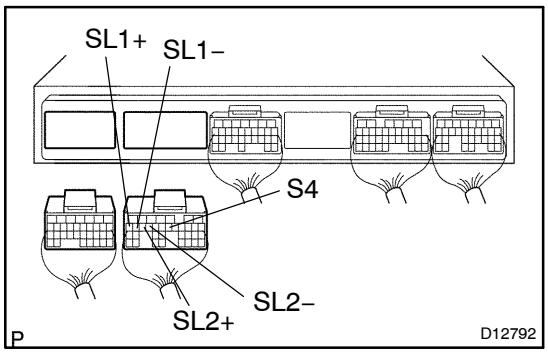
OK:

Resistance: 1 MΩ or higher

NG	**Go to step 3.**

OK

2	**Measure resistance between terminals SL1+, SL1–, SL2+, SL2– and S4 of ECM connector.**



PREPARATION:

(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector of the ECM.

CHECK:

Measure resistance between SL1+, SL1–, SL2+, SL2–, and S4 of ECM connector.

OK:

Resistance: 5.0 to 5.6 Ω at 20 °C (68°F)

CHECK:

Measure resistance between terminals SL1+, SL1–, SL2+ and SL2– of the transmission wire connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG → **Repair or replace the harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

3	**Check shift solenoid valve SL1, SL2 or S4 (See page DI–722).**

NG → **Replace the shift solenoid valve SL1, SL2 or S4.**

OK

Repair or replace the transmission wire (See page AX–6).

DIC6F–02

DTC	P0793	Intermediate Shaft Speed Sensor ”A”

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the input turbine speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shifting.

DTC No.	DTC Detecting Condition	Trouble Area
P0793	All conditions below are detected for 5 secs. or more (1–trip detection logic) (a) Gear change not being performed (b) Counter gear rpm: Less than 300 rpm (c) T/M output shaft rpm: 1,000 rpm or more (d) Park/neutral position switch: OFF (e) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation	• Open or short in speed sensor (NC) circuit • Speed sensor (NC) • ECM

MONITOR DESCRIPTION

The NC terminal of ECM detects the revolving signal from speed sensor (NC) (output rpm). The ECM outputs a gearshift signal comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in the 2nd, 3rd or O/D gear position in the shift position of D, if the counter gear revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
When the ECM detects this malfunction, the ECM performs the fail–safe function and outputs a gearshift signal based on the signal from the speed sensor (NT).
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0793	Direct clutch speed sensor/Verify pulse input
Required sensors/Components	Speed sensor (NC), Speed sensor (NT), Park/neutral position switch	
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITION

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
Engine	Running	
NSW switch	OFF	
Output shaft rpm	1,000 rpm or more	–

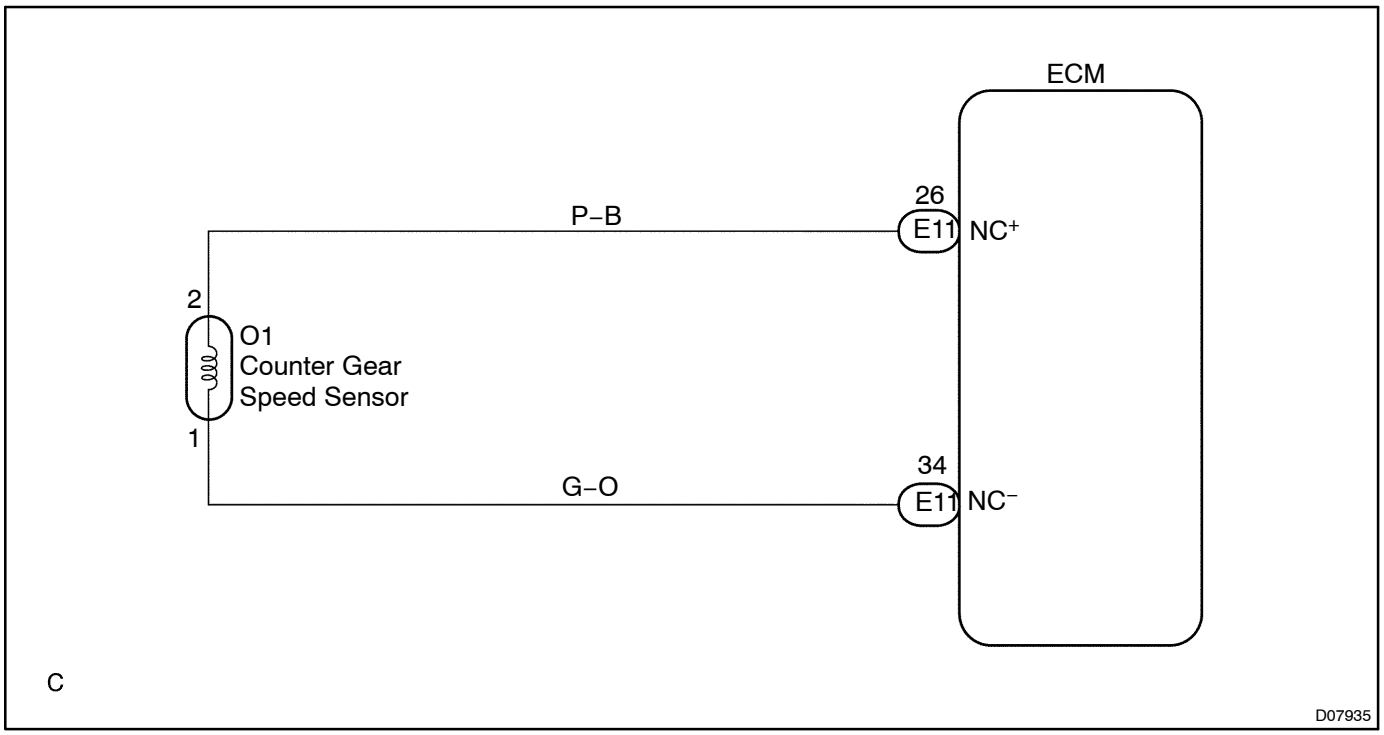
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

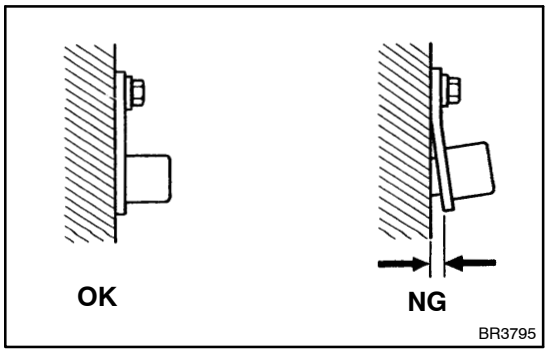
Parameter	Standard value
Counter gear speed sensor	When shift position is D: 3rd (After warming up the engine) • Output shaft speed becomes close to the input shaft speed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor (NC) installation.**

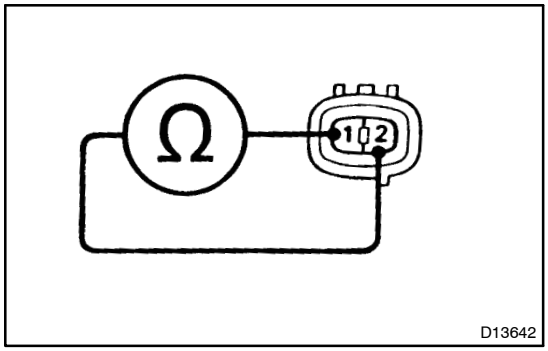


CHECK:
Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **Tighten the speed sensor (NC) properly.**

OK

2	**Check speed sensor (NC) .**



PREPARATION:
Remove the NC speed sensor from transaxle.
CHECK:
Measure resistance between terminals 1 and 2 of speed sensor.
OK:
Resistance: 620 ± 60 Ω at 20 °C (68 °F)

NG → **Replace the speed sensor (NC).**

OK

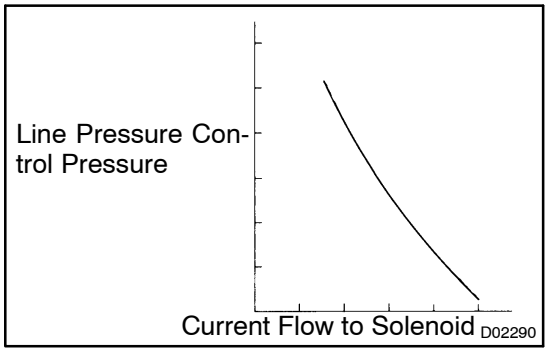
3	**Check harness and connector between ECM and speed sensor (NC) (See page IN–30).**

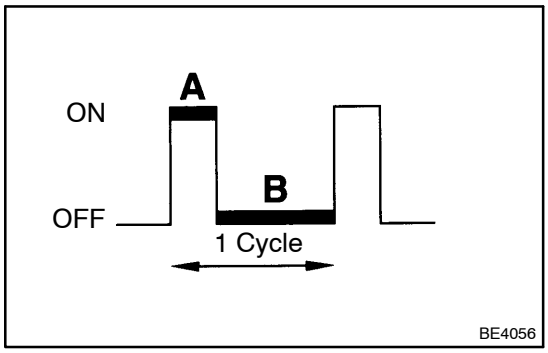
NG → **Repair or replace harness and connector.**

OK

Check and replace the ECM (See page IN–30)

DTC	P2716	Pressure Control Solenoid ”D” Electrical (Shift Solenoid Valve SLT)



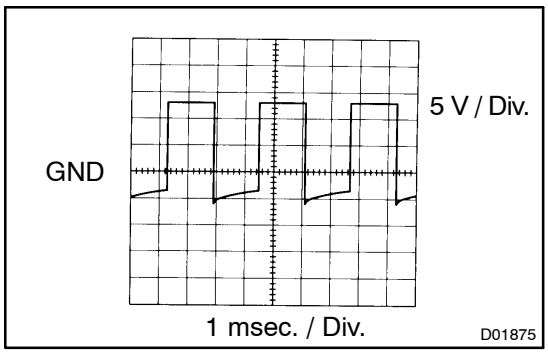


CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates line pressure) causes the solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate line pressure according to the accelerator pedal effort, or engine power output detected.
This controls the line pressure and provides smooth shifting characteristics.
Upon receiving the throttle valve opening angle signal, ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure, generating throttle pressure.
(*) Duty Ratio:
The duty ratio is the ratio of the period of continuity in one cycle. For example, if ”A” is the period of continuity in one cycle, and ”B” is the period of non–continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$

DTC No.	DTC Detecting Condition	Trouble Area
P2716	(a) or (b) condition below is detected 1 second or more. (1–trip detection logic) (a) SLT⁻ terminal: 0V (b) SLT⁻ terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM



Reference:
Waveform between terminals SLT+ and SLT– during engine idling.

MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716	Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–669	
Solenoid current cut status	Not cut	
Battery voltage	11 V or more	–
CPU command duty to SLT	19% or more	–
Ignition switch	ON	
Starter	OFF	

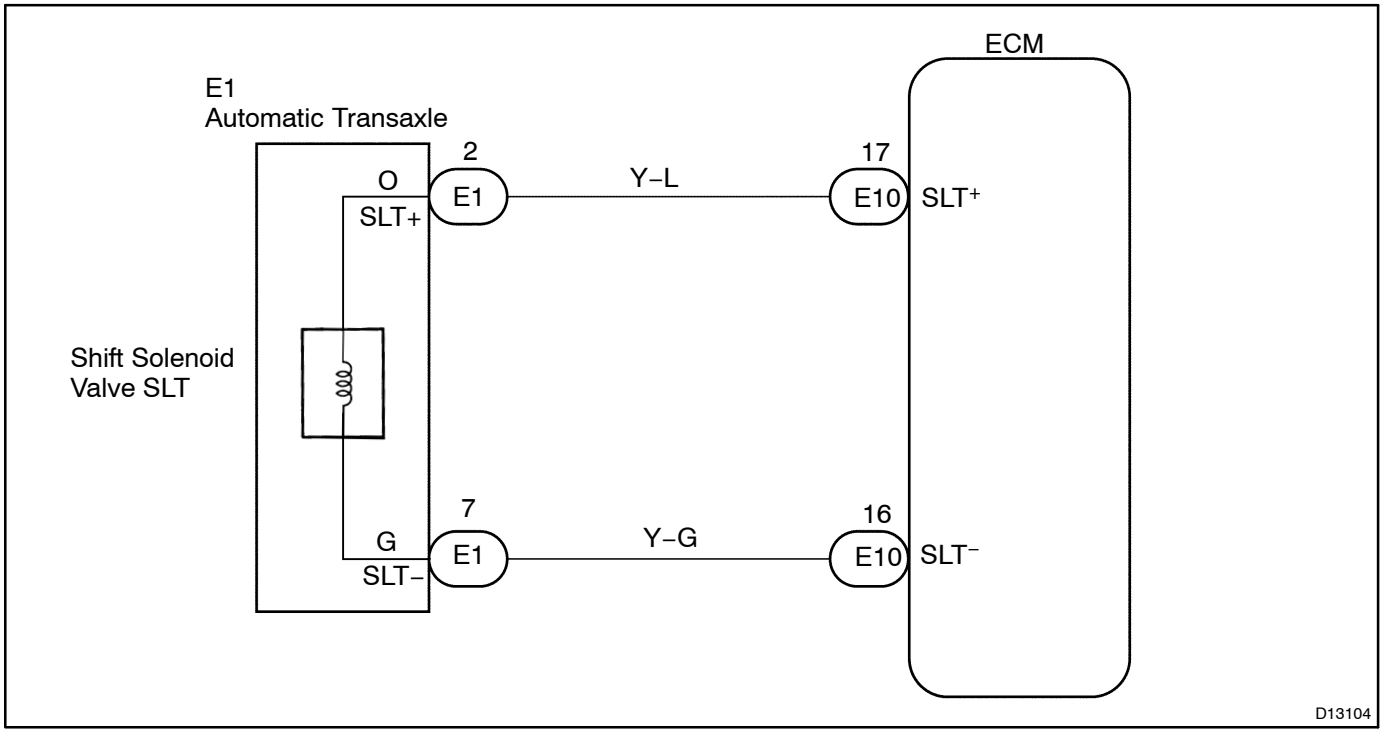
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

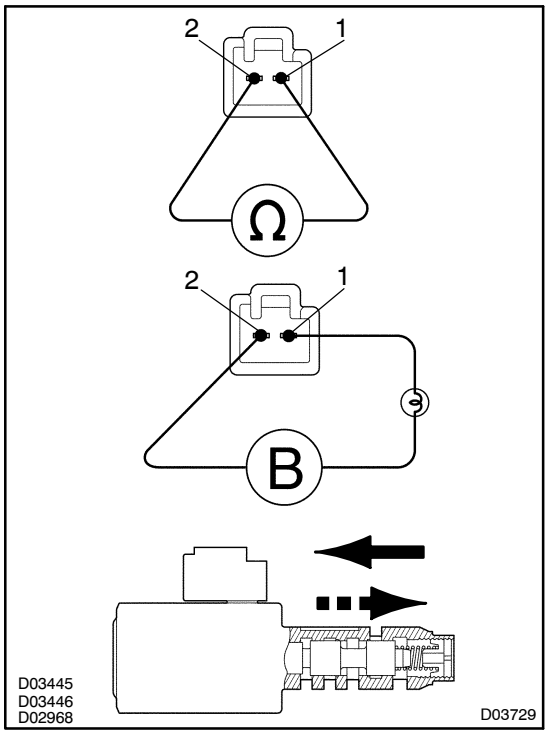
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check shift solenoid valve SLT.**



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.

Check solenoid resistance:

CHECK:

Measure resistance between terminals 1 and 2 of solenoid connector.

OK:

Resistance: 5.0 to 5.6 Ω

Check solenoid operation:

CHECK:

Connect positive (+) lead with an 8 to 10W bulb to terminal 1 of solenoid connector and negative (–) lead to terminal 2, then check the movement of the valve.

OK:

When battery positive voltage is applied.	Valve moves in ■■➡ direction in illustration at right.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration at left.

NG → **Replace shift solenoid valve SLT.**

OK

2	**Check harness and connector between shift solenoid valve SLT and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DIC6G–02

DTC	P2769	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)

DTC	P2770	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)

CIRCUIT DESCRIPTION

The shift solenoid valve DSL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P2769 P2770	Either (a) or (b) are detected for 1 time. (2–trip detection logic) (a) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized.	• Open or short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM

Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

MONITOR DESCRIPTION

Based on the signals from the Throttle Position Sensor, the Airflow Meter and the Crankshaft Position Sensor, the ECM sends a signal to the DSL Solenoid Valve to regulate the hydraulic pressure and provide smoother gearshifts. The shift–solenoid valve DSL responds to commands from the ECM. The valve controls the look–up relay valve to perform the torque–converter lock–up function. If the ECM detects an open or short circuit for shift–solenoid DSL, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2669	Shift solenoid valve DSL/Range check (Low resistance)
	P2770	Shift solenoid valve DSL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve DSL	
Frequency of operation	Continuous	
Duration	0.064 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

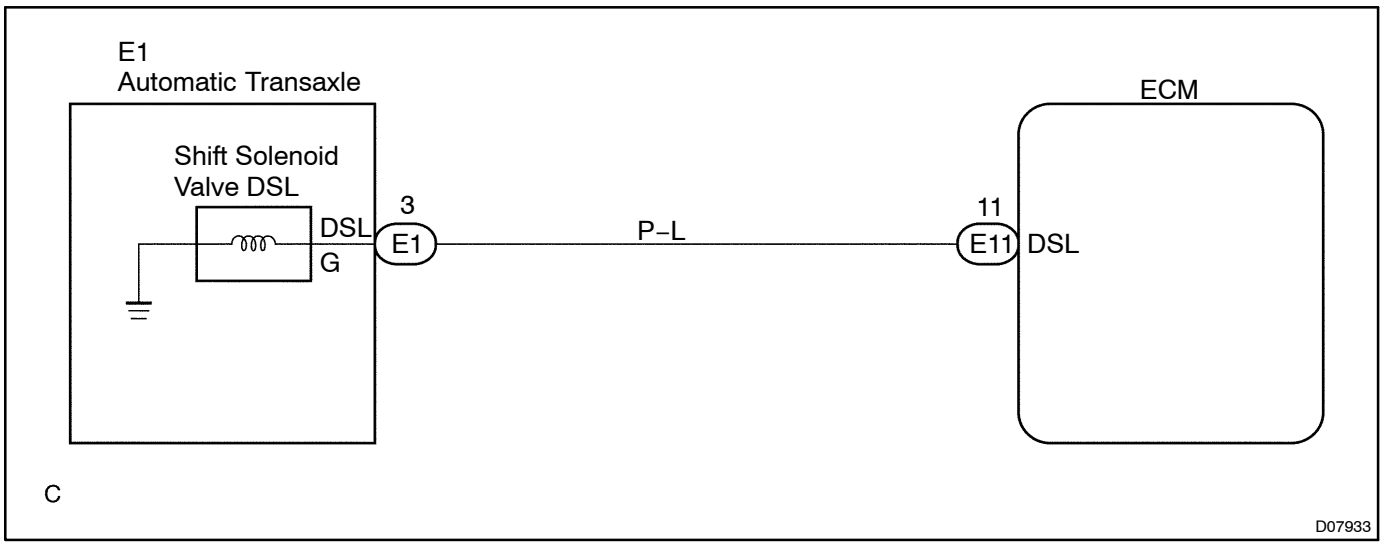
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–669	
Range check (Low resistance)		
Solenoid current cut status	Not cut	
Shift solenoid valve	ON	
Battery voltage	8 V or more	–
Ignition	ON	
Starter	OFF	
Range check (High resistance)		
Shift solenoid valve	ON	
Battery voltage	8 V or more	–
Ignition	ON	
Starter	OFF	

TYPICAL MALFUNCTION THRESHOLDS

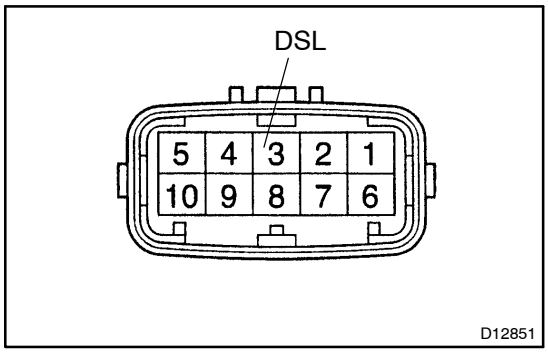
Detection criteria	Threshold
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission wire.

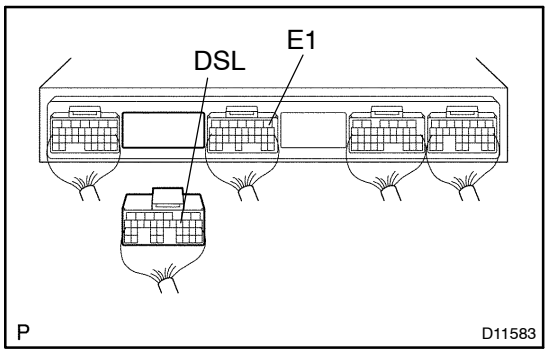


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between DSL of transmission wire and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Go to step 3.**

OK

2	Measure resistance between terminals DSL of ECM and body ground.



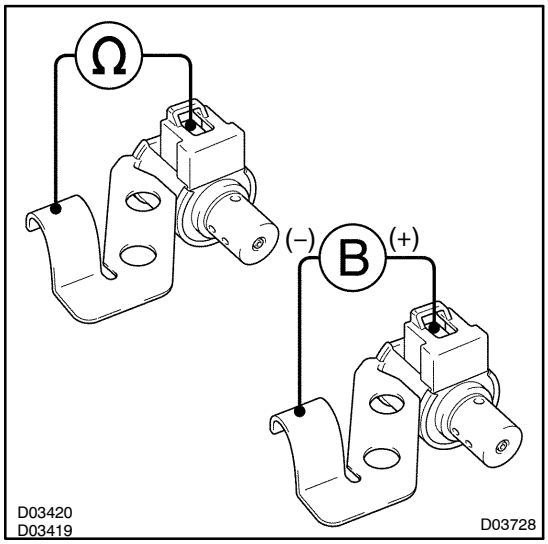
PREPARATION:
(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector from ECM.
CHECK:
Measure resistance between terminals DSL and E1 of ECM.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Repair or replace the harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve DSL.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the shift solenoid valve DSL connector.
(d) Remove the shift solenoid valve DSL.

CHECK:

(a) Measure resistance between terminal DSL of shift solenoid valve and solenoid body.
(b) Connect positive (+) lead to terminal of solenoid connector, negative (–) lead to solenoid body.

OK:

(a) Resistance: 11 to 15 Ω
(b) The shift solenoid valve DSL makes operation noise.

NG → **Replace the shift solenoid valve DSL.**

OK

Repair or replace the transmission wire (See page AX–6).

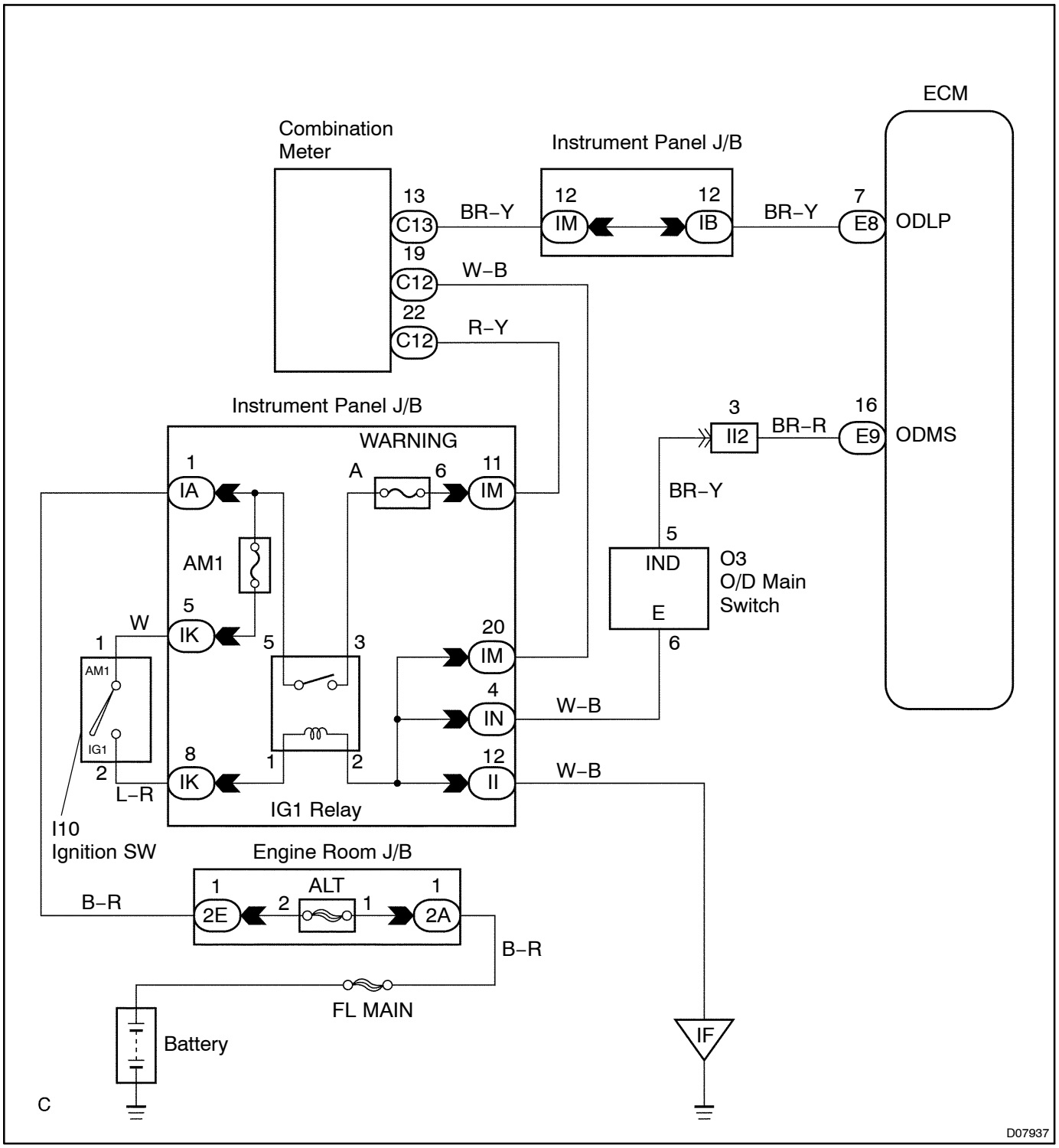
DI69O–13

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch is a momentary type switch. When pressing the O/D main switch, the O/D OFF indicator light lights up and ECM prohibits shifting to O/D, and when pressing it again, the O/D OFF indicator light goes off and ECM allows shifting to O/D. Turning the ignition switch off will reset the O/D OFF indicator light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of O/D main switch**

PREPARATION:
Turn the ignition switch ON.
CHECK:
(a) Check O/D OFF indicator light when O/D main switch is pushed in to ON.
(b) Check O/D OFF indicator light when O/D main switch is pushed again.
OK:
(a) O/D OFF indicator light lights up.
(b) O/D OFF indicator light goes off.

OK	**Proceed to next inspection shown on problem symptoms tables (See page DI–698).**

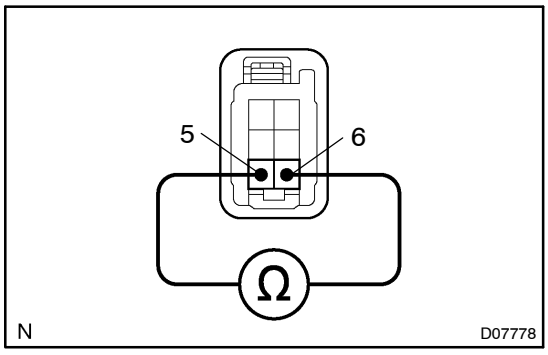
NG

2	**Check and replace the combination meter (See page BE–2).**

NG	**Replace the combination meter.**

OK

3	**Check O/D main switch.**



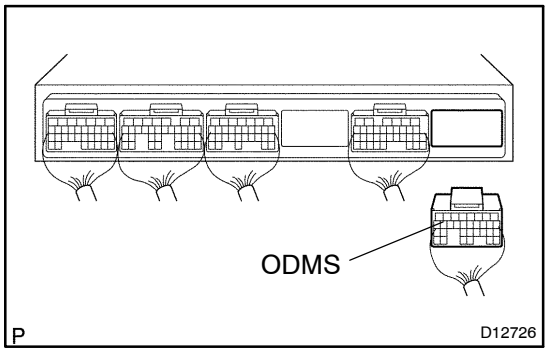
PREPARATION:
Disconnect the O/D main switch connector.
CHECK:
Check continuity between terminals 5 and 6 of O/D main switch connector.
OK:

O/D main switch condition	Specified condition
Press continuously O/D main switch	Continuity
Release O/D main switch	No continuity

NG	**Replace and repair O/D main switch.**

OK

4	Check harness and connector between terminal ODMS of ECM and body ground.



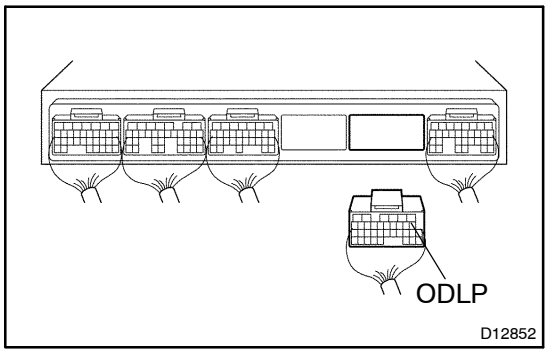
PREPARATION:
Disconnect the connector of ECM.
CHECK:
Check continuity between terminal ODMS of ECM and body ground when O/D main switch is ON and OFF.
OK:

O/D main switch	Specified voltage
Press continuously O/D main switch	Continuity
Release O/D main switch	No Continuity

NG → **Repair or replace harness or connector (See page IN–30).**

OK

5	Check voltage between terminal ODLP of ECM and body ground.



PREPARATION:
(a) Disconnect the connector of ECM.
(b) Turn the ignition switch ON.
CHECK:
Check voltage between terminal ODLP of ECM and body ground.
OK:
Voltage: 9 to 14 V

NG → **Repair or replace harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

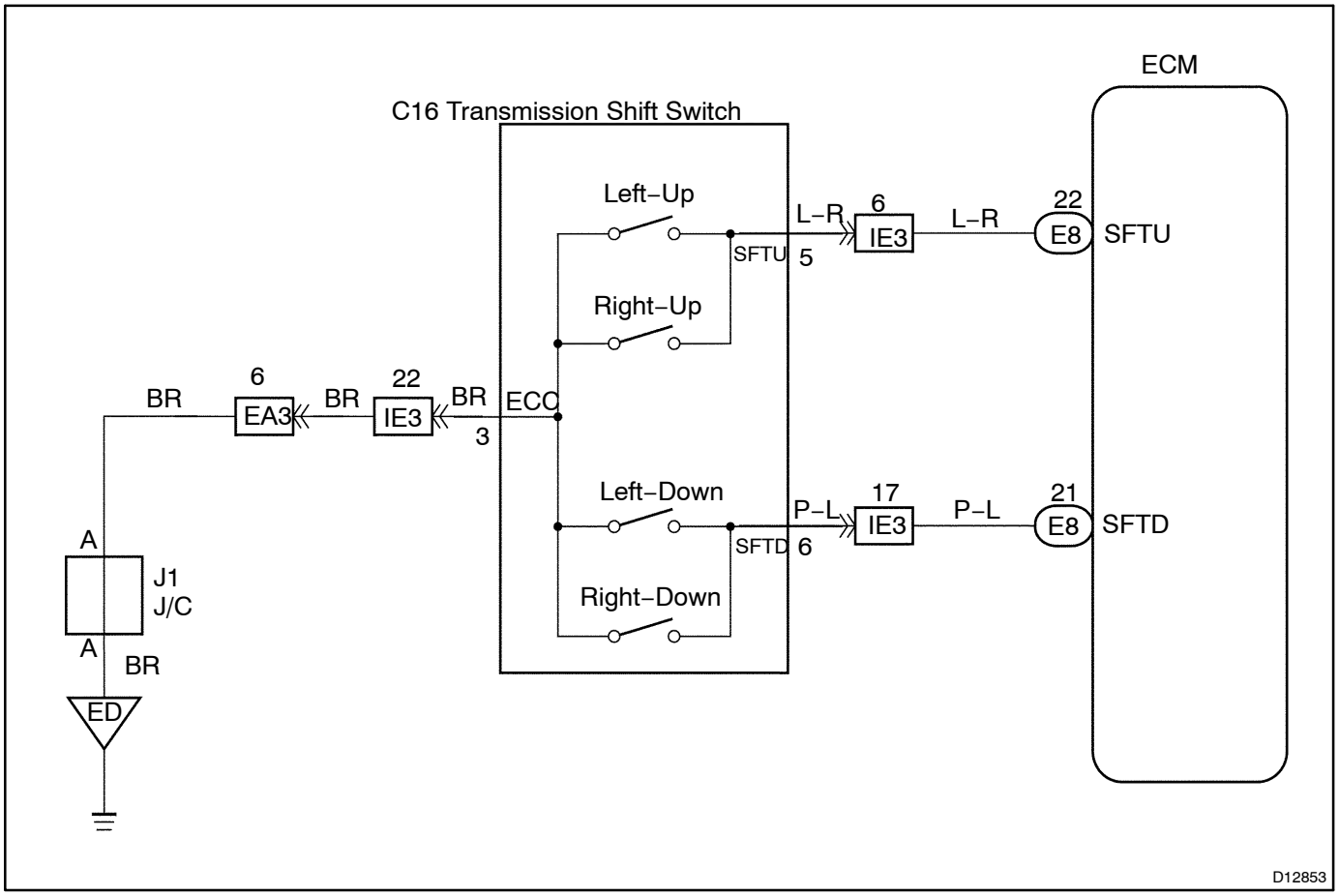
DI25Z–13

Transmission Shift Switch Circuit

CIRCUIT DESCRIPTION

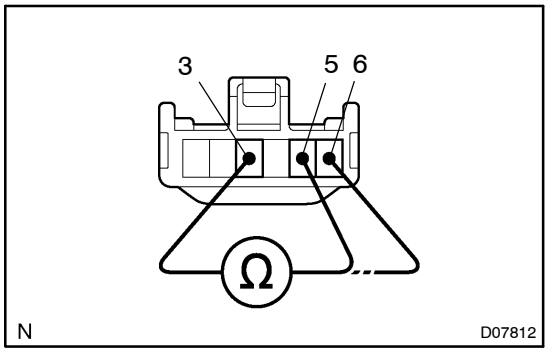
When shifting the shift lever to the M position, using the transmission shift switch, it is possible to shift to the 2 to 4 positions.
Pressing ”Up switch” once shifts up 1 position, and pressing ”Down switch” once shifts down 1 position respectively.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission shift switch.



PREPARATION:

(a) Remove the steering wheel pad.

(b) Disconnect the transmission shift switch connector.

CHECK:

Check continuity between each terminal of transmission shift switch connector.

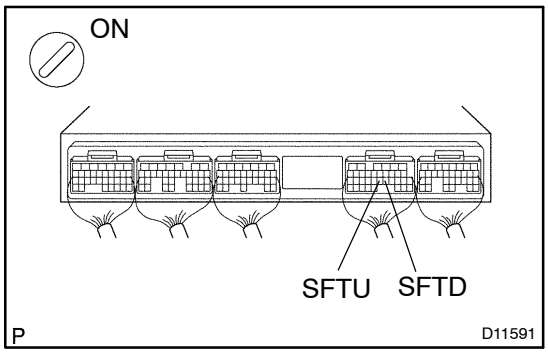
OK:

Switch condition	Tester connection	Specified value
"Up" switch pressed	3 – 5	No continuity
"Up" switch released		Continuity
"Down" switch pressed	3 – 6	No continuity
"Down" switch released		Continuity

NG → **Replace the steering wheel.**

OK

2	Check voltage between each of terminals SFTU and SFTD of ECM and body ground.



PREPARATION:

(a) Turn ignition switch ON.

(b) Remove the ECM with connectors still connected.

CHECK:

Check voltage between each terminal of SFTU and SFTD of ECM and body ground.

OK:

Switch condition	Tester connection	Specified condition
"Up" switch held pressed	SFTU – Body ground	Below 1.5 V
"Up" switch released		10 to 14 V
"Down" switch held pressed	SFTD – Body ground	Below 1.5 V
"Down" switch released		10 to 14 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–698).**

NG

3	**Check harness and connector between ECM and transmission shift switch, transmission shift switch and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

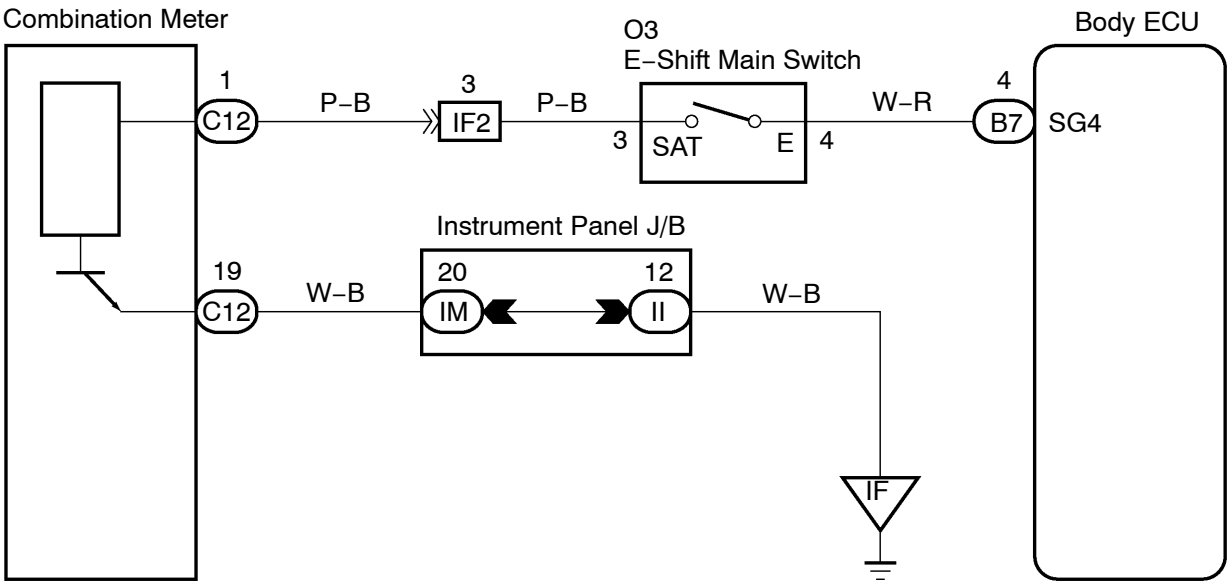
DIAJ6–03

E–Shift Main Switch Circuit

CIRCUIT DESCRIPTION

When the shift lever is shifted from the D to M position (the E–shift main switch is pressed), ”M” on the combination meter lights up. When the ”M” on the combination meter turns off, or when the ”M” on the combination meter is flashing, the system may be defective or the ATF temperature may be excessively high or low.

WIRING DIAGRAM



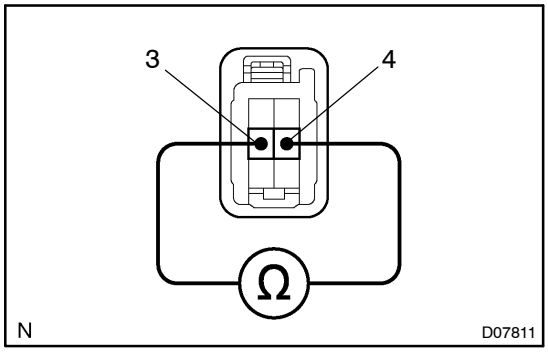
INSPECTION PROCEDURE

”M” position indicator light flashes.

When the ATF temperature is too high or low, the M position indicator light flashes. If this happens, shift the shift lever to the D position and shift it back to the M position after the ATF temperature increase or decrease. If the M position indicator light is still flashing, check if DTC P0710, P0712, or P0713 is displayed or not and inspect the transmission shift main switch circuit.

”M” position indicator light does not light up.

1	**Check E–shift main switch.**



PREPARATION:

Remove the E–shift main switch.

CHECK:

Check continuity between each terminal of the E–shift main switch.

OK:

Shift Lever Position	Tester connection	Specified value
M	3 – 4	Continuity
Except M	3 – 4	No continuity

NG → **Replace the E–shift main switch (See page AX–17).**

OK

2	**Check and replace the combination meter (See page BE–50).**

NG → **Replace the combination meter.**

OK

3	**Check harness and connector between body ECU and E–shift main switch, E–shift main switch and combination meter (See page IN–30).**

NG → **Repair or replace the harness or connector.**

OK

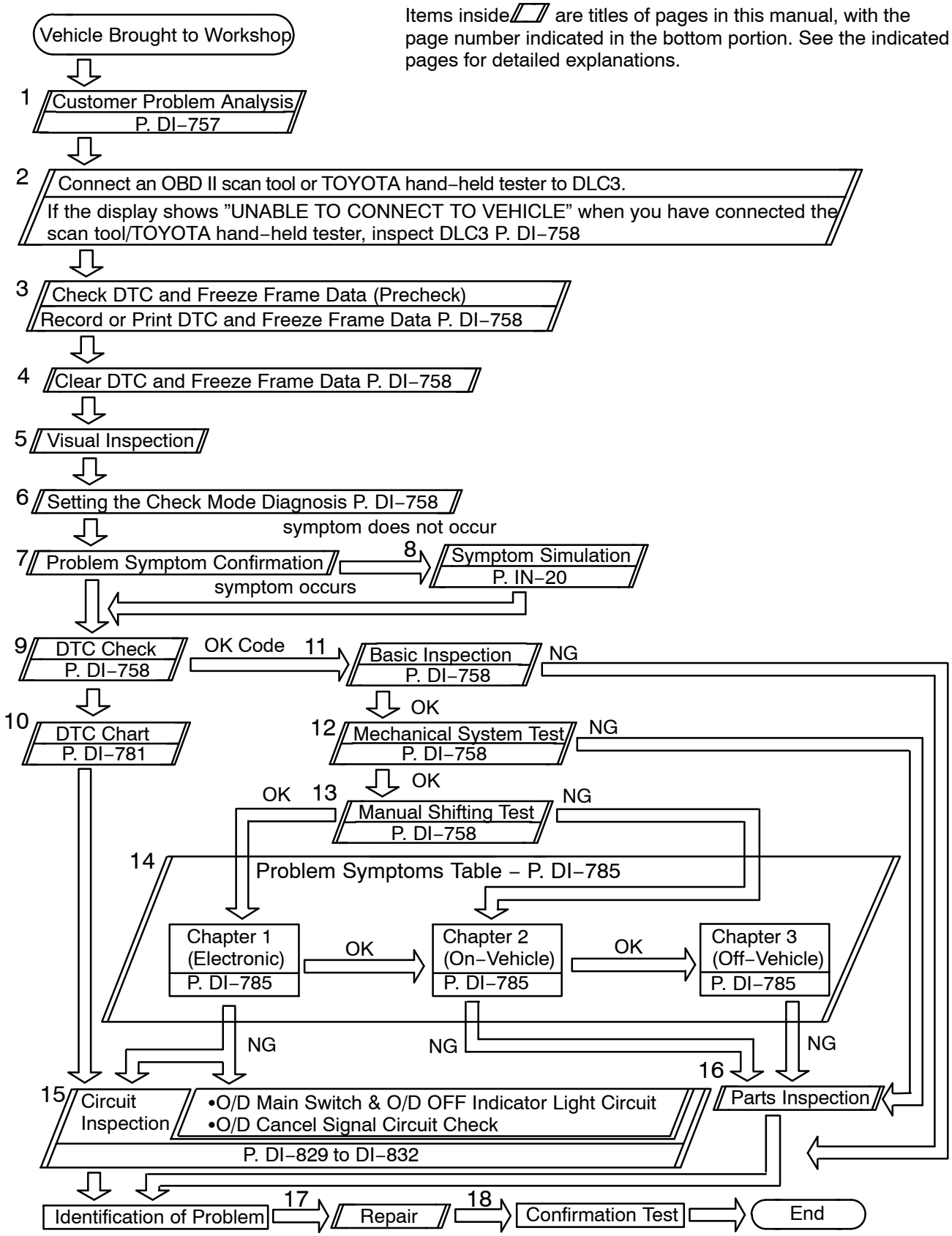
Proceed to next circuit inspection shown in problem symptoms table (See page DI–698).

AUTOMATIC TRANSAXLE (U341E)

DI4YY–10

HOW TO PROCEED WITH TROUBLESHOOTING

Items inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



DIBZW–11

PRECAUTION

NOTICE:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or the ECM (See page DI–758).

HINT:

Initialization can not be completed by only disconnecting the battery terminal.

DI4YZ-06

CUSTOMER PROBLEM ANALYSIS CHECK

Automatic Transaxle System Check Sheet	Inspector's Name :

Customer's Name		VIN	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move (☐ Any position ☐ Particular position)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive position)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code ☐ Malfunction code (DTC)
	2nd Time	☐ Normal code ☐ Malfunction code (DTC)

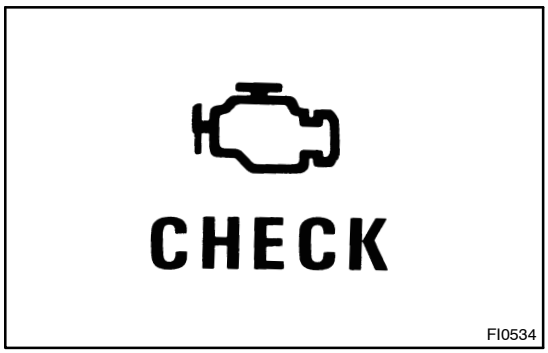
DIC69–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

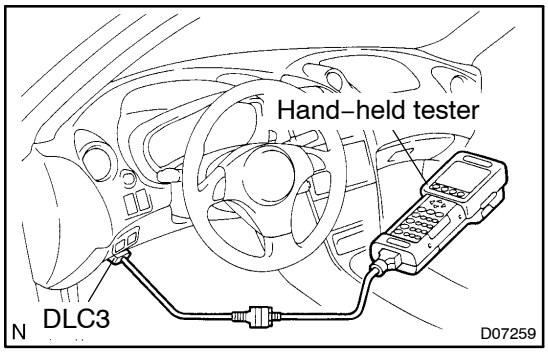
(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect the vehicle to an OBD II scan tool complying with SAE J1987 or hand–held tester, and read off various data output from the vehicle's ECM.



- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page DI–42).

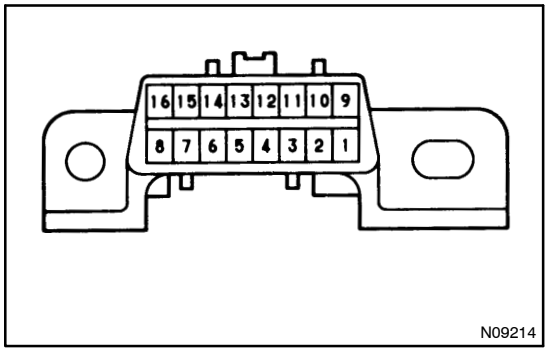
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect an OBD II scan tool or hand–held tester to DLC3 on the vehicle. The OBD II scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For operating instructions, see the instruction book).
- DTCs include SAE controlled codes and Manufacturer controlled codes.
  SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–781).

- The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2–trip detection logic (*) to prevent erroneous detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up and for a malfunction that is only detected once or momentarily (Hand–held tester) (See page DI–758).
- *2–trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory.

If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up .

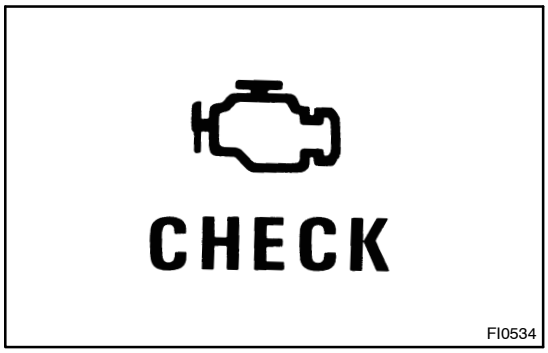


(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Tester connection	Condition	Specified condition
7 (Bus ⊕ Line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis Ground) – Body	Always	1 Ω or less
5 (Signal Ground) – Body	Always	1 Ω or less
16 (B^+) – Body	Always	9 to 14 V

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of OBD II scan tool or hand–held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page BE–2).

(2) When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

Hand–held tester only: When the diagnostic system is switched from normal mode to check mode, it erases all DTCs and freeze frame data recorded in normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

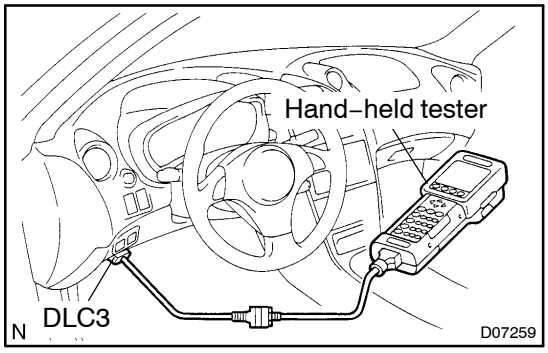
(1) Prepare an OBD II scan tool (complying with SAE J1978) or hand–held tester.

(2) Connect the OBD II scan tool or hand–held tester to DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn the OBD II scan tool or hand–held tester switch ON.

(4) Use the OBD II scan tool or hand–held tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).

(5) See page DI–781 to confirm the details of the DTCs.



NOTICE:

When simulating symptoms with an OBD II scan tool (excluding hand–held tester) to check the DTCs, use normal mode. For codes on the DTCs chart subject to "2–trip detection logic", turn the ignition switch off after the symptoms have been simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL comes on on the instrument panel and DTCs are recorded in the ECM.

(c) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Connect the OBD II scan tool or hand–held tester to the DLC3.
(2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
(3) When you use hand–held tester:
Select the item ”DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button”.

HINT:
When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool’s instruction book for operating instructions.)

(d) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the ”INITIALIZE” procedure.

3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

Hand–held tester only: Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

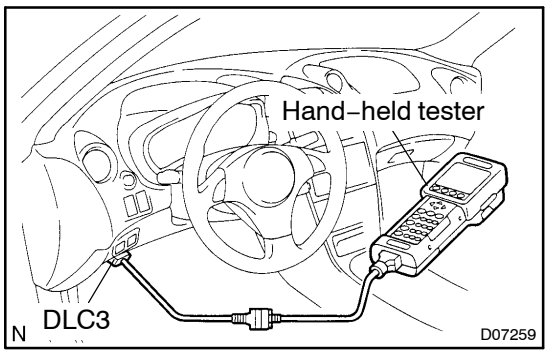
(a) Check the DTC.

(1) Check the initial conditions.

- Battery voltage 11 V or more.
- Throttle valve fully closed.
- Transaxle in P position.
- Air conditioning switched off.

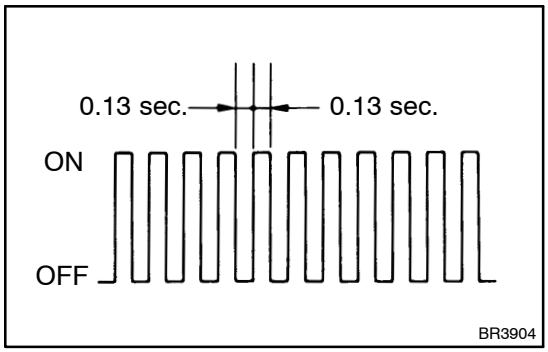
(2) Turn the ignition switch off.

(3) Prepare a hand–held tester.



(4) Connect the hand–held tester to DLC3 at the lower side of the instrument panel.

(5) Turn the ignition switch ON and switch the hand–held tester ON.



(6) Switch the hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Be sure not to turn the ignition switch off, as turning it off switches the diagnosis system from Check mode to Normal mode, which erases all DTCs, etc.

(10) After checking the DTC, inspect the applicable circuit.

(b) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
(1) Connect the OBD II scan tool or hand–held tester to the DLC3.
(2) Turn the ignition switch to the ON position and push the OBD II scan tool or the hand–held tester main switch on.
(3) When you use hand–held tester:
Select the item ”DIAGNOSIS/ENHANCED OBD II/ DTC INFO/CLEAR CODES [YES] button”.

HINT:
When operating the OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool’s instruction book for operating instructions.)

(c) When not using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. But if you disconnect the battery terminal, you should do the ”INITIALIZE” procedure.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one of the methods to shorten the labor time.

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the ”ON” button of the OBD II scan tool or the hand–held tester.
(f) Select the item ”DIAGNOSIS/ENHANCED OBD II/DATA LIST”.
(g) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th (O/D)	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • D(O/D OFF): 1st, 2nd or 3rd • D(O/D ON): 1st, 2nd, 3rd or 4th (O/D)	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
PNP SW [NSW]	PNP SW Status/ ON or OFF	Ignition Key position is; START: ON Except START: OFF	←
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D: ON Except D: OFF	
OVERDRV CUT SW1	CCS O/D Cancel Signal/ ON or OFF	• O/D Cancel Signal input: ON • O/D Cancel Signal not input: OFF	←
OVERDRV CUT SW2	O/D SW Status/ ON or OFF	• IG SW ON: ON ↓ • O/D SW Push: OFF ↓ • O/D SW Push: ON	←
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: –40 °C (–40 °F) max.: 225 °C (437 °F)	80 °C (176 °F) (After Stall Test)	If the value is ”–40 °C (–40 °F)” or ”225 °C (437 °F)”, ATF temp. sensor circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the ”ON” button of the the hand–held tester.
(f) Select the item ”DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.
LOCK UP	[Test Details] Control the shift solenoid SL to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the SL operation.
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–

6. DEFINITION OF TERMS

Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. When a sensor is being monitored, the next sensor or component will not be monitored until the sensor monitoring is finished.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. ”Once per driving cycle” means that the ECM detects the malfunction only one time during a single driving cycle. ”Continuous” means that the ECM detects malfunction every time an enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met.

Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. ”Immediately” means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. ”2 driving cycle” means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

7. TOYOTA/LEXUS PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA/LEXUS name	Definition
Toyota HCAC system, Hydro–carbon Adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve, OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor ”A”	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VSV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor

Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor ”A”, Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor ”A”	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor ”A”	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor ”A”, Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobiliser system, Immobiliser system	Vehicle anti–theft system

8. The monitor will run whenever the following DTCs are not present (Monitor Disablement List)

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the ”X” mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

Monitor detected malfunction

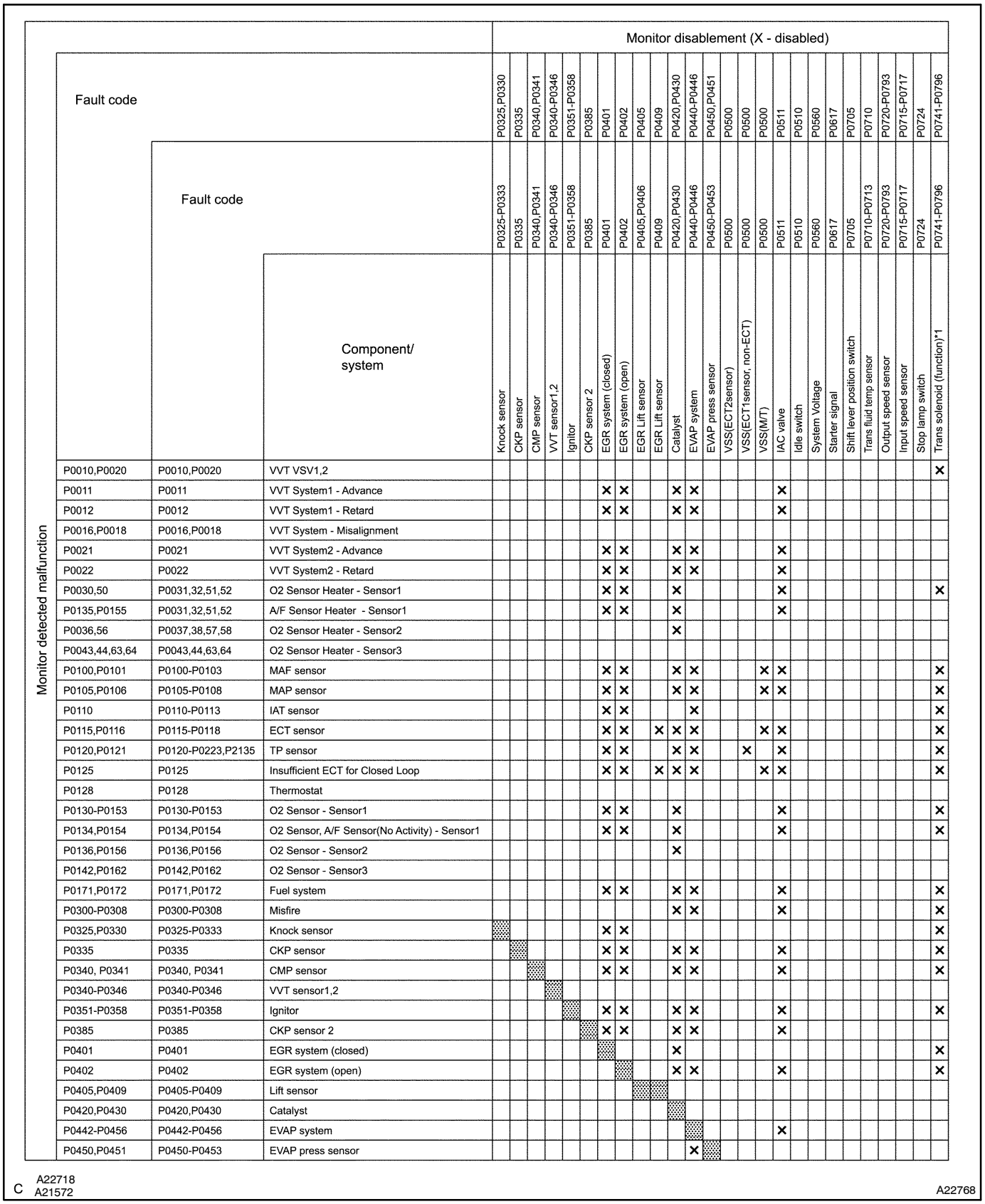
Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
			P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
	P0010,P0020	P0010,P0020	VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
P0010,P0020	P0010,P0020	VVT VSV1,2																			X					X					
P0011	P0011	VVT System1 - Advance				X		X														X					X					
P0012	P0012	VVT System1 - Retard				X		X														X					X					
P0016,P0018	P0016,P0018	VVT System - Misalignment																													
P0021	P0021	VVT System2 - Advance			X	X																X					X					
P0022	P0022	VVT System2 - Retard			X	X																X					X					
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																				X	X	X	X	X	X				
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1																				X			X	X	X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2																							X	X					
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																								X					
P0100,P0101	P0100-P0103	MAF sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0105,P0106	P0105-P0108	MAP sensor		X	X		X	X											X		X	X	X	X	X	X	X	X			
P0110	P0110-P0113	IAT sensor																			X	X	X	X	X	X		X			
P0115,P0116	P0115-P0118	ECT sensor		X	X	X	X	X						X		X					X	X	X	X	X	X	X	X			
P0120,P0121	P0120-P0223,P2135	TP sensor												X		X							X	X	X	X	X	X			
P0125	P0125	Insufficient ECT for Closed Loop		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0128	P0128	Thermostat																					X								
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																				X		X	X	X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1								X												X	X		X	X	X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2																								X					
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																									X				
P0171,P0172	P0171,P0172	Fuel system																				X	X	X	X	X					
P0300-P0308	P0300-P0308	Misfire							X													X	X	X	X	X					
P0325,P0330	P0325-P0333	Knock sensor																										X			
P0335	P0335	CKP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340, P0341	P0340, P0341	CMP sensor		X	X		X	X						X		X						X	X	X	X	X	X	X			
P0340-P0346	P0340-P0346	VVT sensor1,2																				X									
P0351-P0358	P0351-P0358	Ignitor		X	X		X	X														X					X				
P0385	P0385	CKP sensor 2												X		X						X	X	X	X	X	X	X			
P0401	P0401	EGR system (closed)																				X					X				
P0402	P0402	EGR system (open)																				X	X	X	X	X	X				
P0405,P0409	P0405-P0409	Lift sensor																													
P0420,P0430	P0420,P0430	Catalyst																													
P0442-P0456	P0442-P0456	EVAP system																					X	X	X	X					
P0450,P0451	P0450-P0453	EVAP press sensor																													

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Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
				P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0030,50	P0135,P0155	P0036,56	P0043,44,63,64	P0100	P0101	P0105	P0106	P0110	P0115	P0116	P0120,P0121	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
				P0010,P0020	P0011	P0012	P0016,P0018	P0021	P0022	P0031,32,51,52	P0031,32,51,52	P0037,38,57,58	P0043,44,63,64	P0100-P0103	P0101	P0105-P0108	P0106	P0110-P0113	P0115-P0118	P0116	P0120-P0223,P2135	P0125	P0128	P0130-P0153	P0134,P0154	P0136,P0156	P0142,P0162	P0171,P0172	P0300-P0308			
				VVT VSV1,2	VVT System1 -Advance	VVT System1 - Retard	VVT System - Misalignment	VVT System2 - Advance	VVT System2 - Retard	O2 Sensor Heater - Sensor1	A/F Sensor Heater - Sensor1	O2 Sensor Heater - Sensor2	O2 Sensor Heater - Sensor3	MAF sensor	MAF sensor	MAP sensor	MAP sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for Closed Loop	Thermostat	O2 Sensor -Sensor1	O2 Sensor, A/F Sensor(No Activity) - Sensor1	O2 Sensor - Sensor2	O2 Sensor - Sensor3	Fuel system	Misfire			
	P0500	P0500	VSS													X							X	X	X	X	X	X	X			
	P0511	P0511	IAC valve																				X									
	P0510	P0510	Idle switch												X		X						X	X		X	X	X	X	X		
	P0560	P0560	System Voltage																													
	P0617	P0617	Starter signal																													
	P0705	P0705	Shift lever position switch																													
	P0710	P0710-P0713	Trans fluid temp sensor																													
	P0720-P0793	P0720-P0793	Output speed sensor																													
	P0715-P0717	P0715-P0717	Input speed sensor																													
	P0724	P0724	Stop lamp switch																													
	P0741-P0796	P0741-P0796	Trans solenoid (function)																													
	P0748-P0798	P0748-P0799	Trans solenoid (range)																													
	P0850	P0850	PNP switch																													X
	P1010,P1020	P1010,P1020	VVTL																				X						X			
	P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)																				X						X			
	P1126	P1126	Electronic magnet clutch																													
	P1129	P1129	Electronic throttle system																													
	P1430	P1430	HC adsorber ACT press sensor																													
	P2004,6	P2004,6	Intake Manifold Runner Control																													
	P2009,10	P2009,10	Intake Manifold Runner Control Circuit																													
	P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																													
	P2102,P2103	P2102,P2103	Throttle motor																													
	P2120-P2138	P2120-P2138	Accel position sensor																													
	P2196,P2198	P2196,P2198	A/F sensor (rationality)																				X				X	X				
	P2226	P2226	BARO sensor																					X			X	X				
	P2237,P2240	P2237,P2240	A/F sensor (open)																				X				X	X				
	P2423,24	P2423,24	HC Adsorption Catalyst																													
	P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																													
	P2431	P2431	AIR Pressure Sensor(Rationality)																													
	P2440	P2440	AIR control valve stuck open																					X	X	X	X	X				
	P2441	P2441	AIR control valve stuck close																					X	X	X	X	X				
	P2444	P2444	AIP stuck On																					X	X	X	X	X				
	P2445	P2445	AIP stuck Off																					X	X	X	X	X				
	P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																													
	P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)																				X				X	X				

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																														
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796						
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796						
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1						
P0010,P0020	P0010,P0020	VVT VSV1,2																									X						
P0011	P0011	VVT System1 - Advance							X	X			X	X					X														
P0012	P0012	VVT System1 - Retard							X	X			X	X					X														
P0016,P0018	P0016,P0018	VVT System - Misalignment																															
P0021	P0021	VVT System2 - Advance							X	X			X	X					X														
P0022	P0022	VVT System2 - Retard							X	X			X	X					X														
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1							X	X			X						X									X					
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1							X	X			X						X														
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2											X																				
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																															
P0100,P0101	P0100-P0103	MAF sensor							X	X			X	X				X	X									X					
P0105,P0106	P0105-P0108	MAP sensor							X	X			X	X				X	X									X					
P0110	P0110-P0113	IAT sensor							X	X				X														X					
P0115,P0116	P0115-P0118	ECT sensor							X	X		X	X	X				X	X									X					
P0120,P0121	P0120-P0223,P2135	TP sensor							X	X			X	X			X		X									X					
P0125	P0125	Insufficient ECT for Closed Loop							X	X		X	X	X				X	X									X					
P0128	P0128	Thermostat																															
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1							X	X			X						X									X					
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1							X	X			X						X									X					
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2											X																				
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																															
P0171,P0172	P0171,P0172	Fuel system							X	X			X	X					X									X					
P0300-P0308	P0300-P0308	Misfire											X	X					X									X					
P0325,P0330	P0325-P0333	Knock sensor							X	X																		X					
P0335	P0335	CKP sensor							X	X			X	X					X									X					
P0340, P0341	P0340, P0341	CMP sensor							X	X			X	X					X									X					
P0340-P0346	P0340-P0346	VVT sensor1,2																															
P0351-P0358	P0351-P0358	Ignitor							X	X			X	X					X									X					
P0385	P0385	CKP sensor 2							X	X			X	X					X														
P0401	P0401	EGR system (closed)											X															X					
P0402	P0402	EGR system (open)											X	X					X									X					
P0405,P0409	P0405-P0409	Lift sensor																															
P0420,P0430	P0420,P0430	Catalyst																															
P0442-P0456	P0442-P0456	EVAP system																	X														
P0450,P0451	P0450-P0453	EVAP press sensor												X																			

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Monitor detected malfunction

Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																														
			P0325,P0330	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0451	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0385	P0401	P0402	P0405,P0406	P0409	P0420,P0430	P0440-P0446	P0450-P0453	P0500	P0500	P0500	P0511	P0510	P0560	P0617	P0705	P0710-P0713	P0720-P0793	P0715-P0717	P0724	P0741-P0796
			Knock sensor	CKP sensor	CMP sensor	VVT sensor1,2	Ignitor	CKP sensor 2	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor	VSS(ECT2sensor)	VSS(ECT1sensor, non-ECT)	VSS(M/T)	IAC valve	Idle switch	System Voltage	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function)*1
P0500	P0500	VSS							X	X			X	X					X						X	X		X
P0511	P0511	IAC valve																	X									
P0510	P0510	Idle switch								X			X	X					X									X
P0560	P0560	System Voltage																										
P0617	P0617	Starter signal																										
P0705	P0705	Shift lever position switch																										
P0710	P0710-P0713	Trans fluid temp sensor																										
P0720-P0793	P0720-P0793	Output speed sensor																										X
P0715-P0717	P0715-P0717	Input speed sensor																										
P0724	P0724	Stop lamp switch																										
P0741-P0796	P0741-P0796	Trans solenoid (function)																										
P0748-P0798	P0748-P0799	Trans solenoid (range)																							X	X		X
P0850	P0850	PNP switch																	X									X
P1010,P1020	P1010,P1020	VVTL																										
P1011,12(,21,22)	P1011,12(,21,22)	VVTL system1(,2)							X	X			X	X					X									
P1126	P1126	Electronic magnet clutch																										
P1129	P1129	Electronic throttle system																										
P1430	P1430	HC adsorber ACT press sensor												X	X													
P2004,6	P2004,6	Intake Manifold Runner Control																										
P2009,10	P2009,10	Intake Manifold Runner Control Circuit																										
P2014,16,17	P2014,16,17	Intake Manifold Runner Position Sensor																										
P2102,P2103	P2102,P2103	Throttle motor																										
P2120-P2138	P2120-P2138	Accel position sensor																										
P2196,P2198	P2196,P2198	A/F sensor (rationality)							X	X			X						X									X
P2226	P2226	BARO sensor																										X
P2237,P2240	P2237,P2240	A/F sensor (open)							X	X			X						X									X
P2423,24	P2423,24	HC Adsorption Catalyst																										
P2430,2,3	P2430,2,3	AIR Pressure Sensor(Low/High)																										
P2431	P2431	AIR Pressure Sensor(Rationality)																										
P2440	P2440	AIR control valve stuck open							X	X			X															
P2441	P2441	AIR control valve stuck close							X	X			X															
P2444	P2444	AIP stuck On							X	X			X															
P2445	P2445	AIP stuck Off							X	X			X															
P2714-P2759	P2714-P2759	Trans solenoid(SLU-SLD)																										X
P2A00,P2A03	P2A00,P2A03	A/F sensor (slow response)							X	X			X						X									X

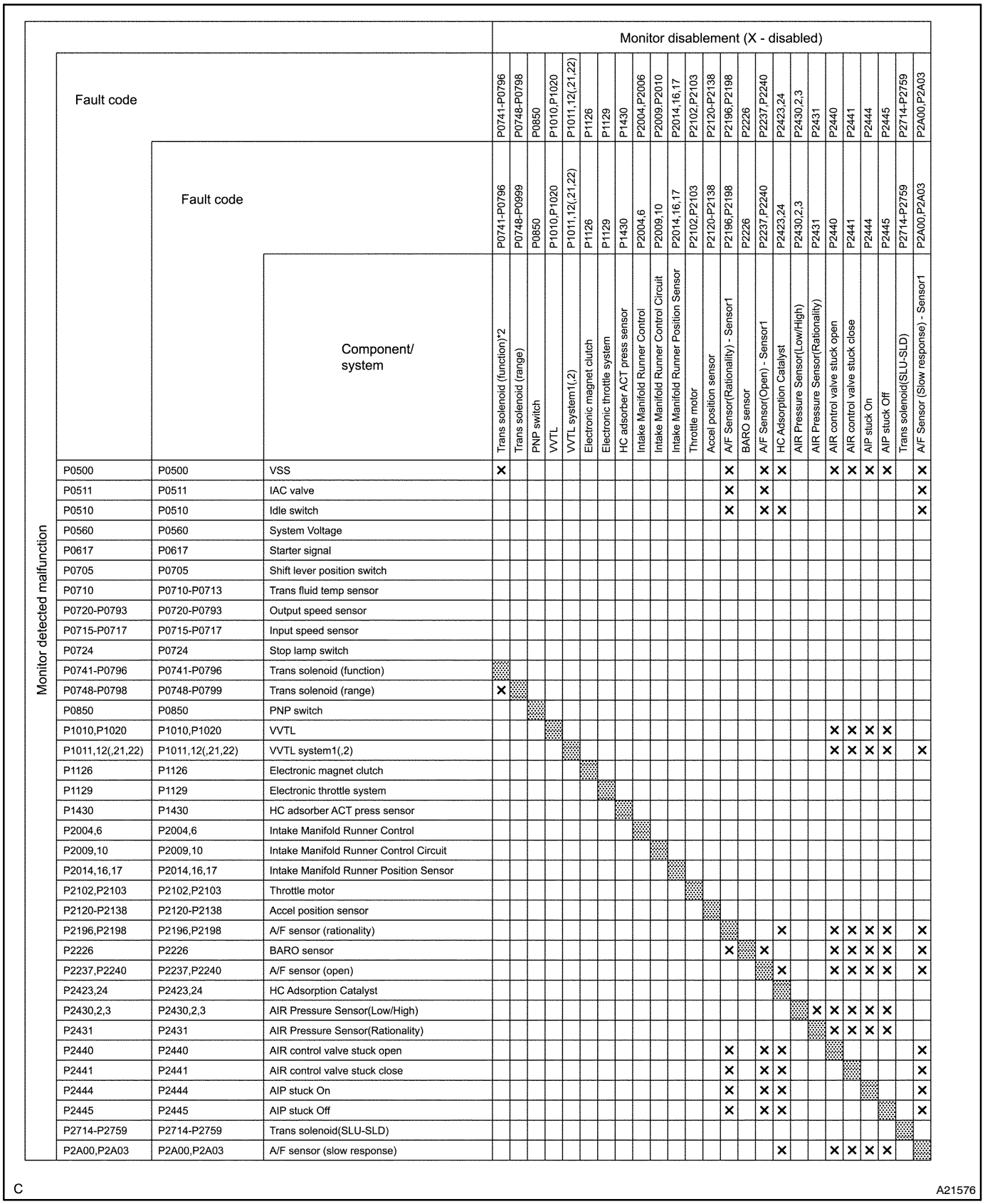
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Monitor detected malfunction	Fault code	Fault code	Component/ system	Monitor disablement (X - disabled)																												
				P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1011,12(,21,22)	P1126	P1129	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2102,P2103	P2120-P2138	P2196,P2198	P2226	P2237,P2240	P2423,24	P2430,2,3	P2431	P2440	P2441	P2444	P2445	P2714-P2759	P2A00,P2A03
		P0741-P0796	Trans solenoid (function)*2																													
		P0748-P0999	Trans solenoid (range)																													
		P0850	PNP switch																													
		P1010,P1020	VVTL																													
		P1011,12(,21,22)	VVTL system1(,2)																													
		P1126	Electronic magnet clutch																													
		P1129	Electronic throttle system																													
		P1430	HC adsorber ACT press sensor																													
		P2004,6	Intake Manifold Runner Control																													
		P2009,10	Intake Manifold Runner Control Circuit																													
		P2014,16,17	Intake Manifold Runner Position Sensor																													
		P2102,P2103	Throttle motor																													
		P2120-P2138	Accel position sensor																													
		P2196,P2198	A/F Sensor(Rationality) - Sensor1																													
		P2226	BARO sensor																													
		P2237,P2240	A/F Sensor(Open) - Sensor1																													
		P2423,24	HC Adsorption Catalyst																													
		P2430,2,3	AIR Pressure Sensor(Low/High)																													
		P2431	AIR Pressure Sensor(Rationality)																													
		P2440	AIR control valve stuck open																													
		P2441	AIR control valve stuck close																													
		P2444	AIP stuck On																													
		P2445	AIP stuck Off																													
		P2714-P2759	Trans solenoid(SLU-SLD)																													
		P2A00,P2A03	A/F Sensor (Slow response) - Sensor1																													
P0010,P0020	P0010,P0020	VVT VSV1,2																					X	X	X	X						
P0011	P0011	VVT System1 - Advance																					X	X	X	X						
P0012	P0012	VVT System1 - Retard																					X	X	X	X						
P0016,P0018	P0016,P0018	VVT System - Misalignment																					X	X	X	X						
P0021	P0021	VVT System2 - Advance																					X	X	X	X						
P0022	P0022	VVT System2 - Retard																					X	X	X	X						
P0030,50	P0031,32,51,52	O2 Sensor Heater - Sensor1																		X			X	X	X	X						
P0135,P0155	P0031,32,51,52	A/F Sensor Heater - Sensor1															X		X	X			X	X	X	X		X				
P0036,56	P0037,38,57,58	O2 Sensor Heater - Sensor2															X			X												
P0043,44,63,64	P0043,44,63,64	O2 Sensor Heater - Sensor3																		X												
P0100,P0101	P0100-P0103	MAF sensor				X	X										X		X	X			X	X	X	X		X				
P0105,P0106	P0105-P0108	MAP sensor				X	X										X		X	X			X	X	X	X		X				
P0110	P0110-P0113	IAT sensor										X					X		X				X	X	X	X		X				
P0115,P0116	P0115-P0118	ECT sensor	X			X	X					X					X		X	X			X	X	X	X		X				
P0120,P0121	P0120-P0223,P2135	TP sensor															X		X	X			X	X	X	X		X				
P0125	P0125	Insufficient ECT for Closed Loop	X			X											X		X	X			X	X	X	X		X				
P0128	P0128	Thermostat																														
P0130-P0153	P0130-P0153	O2 Sensor - Sensor1																		X			X	X	X	X						
P0134,P0154	P0134,P0154	O2 Sensor, A/F Sensor(No Activity) - Sensor1															X		X	X			X	X	X	X		X				
P0136,P0156	P0136,P0156	O2 Sensor - Sensor2															X			X												
P0142,P0162	P0142,P0162	O2 Sensor - Sensor3																		X												
P0171,P0172	P0171,P0172	Fuel system															X		X	X			X	X	X	X		X				
P0300-P0308	P0300-P0308	Misfire															X		X	X			X	X	X	X		X				
P0325,P0330	P0325-P0333	Knock sensor																					X	X	X	X						
P0335	P0335	CKP sensor				X	X										X		X	X			X	X	X	X		X				
P0340, P0341	P0340, P0341	CMP sensor				X	X										X		X	X			X	X	X	X		X				
P0340-P0346	P0340-P0346	VVT sensor1,2																					X	X	X	X						
P0351-P0358	P0351-P0358	Ignitor																		X			X	X	X	X						
P0385	P0385	CKP sensor 2				X	X										X		X	X			X	X	X	X		X				
P0401	P0401	EGR system (closed)																		X												
P0402	P0402	EGR system (open)															X		X	X			X	X	X	X		X				
P0405,P0409	P0405-P0409	Lift sensor																														
P0420,P0430	P0420,P0430	Catalyst																														
P0442-P0456	P0442-P0456	EVAP system															X		X				X	X	X	X		X				
P0450,P0451	P0450-P0453	EVAP press sensor																					X	X	X	X						

C

A21575



Note *1: Without input speed sensor
Note *2: With input speed sensor

9. PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not up–shift, down–shift, or the shift point is too high or too low, conduct the following road test to confirm the automatic shift schedule and simulate the problem symptoms.

10. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 to 80 °C (122 to 176 °F).

(a) D position test

Shift into the D position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.

Check that 1 → 2, 2 → 3 and 3 → O/D up–shifts take place, and that the shift points conform to the automatic shift schedule (See page SS–44).

HINT:

- O/D Gear Up–shift Prohibition Control (1. Coolant temp. is 60 °C (140 °F) or less. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
- O/D Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60 °C (140 °F) or less.)

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shifts.

(3) Check for abnormal noises and vibration.

Drive in the D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick–down operation.

While driving in the D position, 2nd, 3rd and O/D gears, check that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule (See page SS–44).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) 2 position test

Shift into the 2 position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.

Check that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–44).

HINT:

There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.

While driving in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(c) L position test
Shift into the L position and fully depress the accelerator pedal and check the following points.
(1) Check no up–shift.
While driving in the L position, check that there is no up–shift to 2nd gear.
(2) Check engine braking.
While driving in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(d) R position test
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.

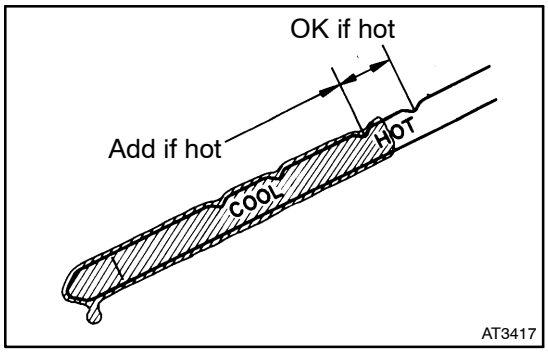
CAUTION:
Before conducting this test ensure that the test area is free from people and obstruction.

(e) P position test
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

11. BASIC INSPECTION

(a) Check the fluid level.

HINT:
- Drive the vehicle so that the engine and transaxle are at normal operating temperature.
Fluid temp.: 70 to 80 °C (158 to 176 °F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is changed or the engine does not run.

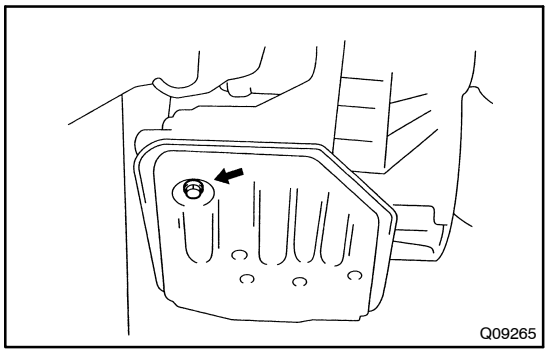


(1) Park the vehicle on a level surface and set the parking brake.
(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.
(3) Pull out the dipstick and wipe it clean.
(4) Push it back fully into the pipe.
(5) Pull it out and check that the fluid level is in the HOT range.

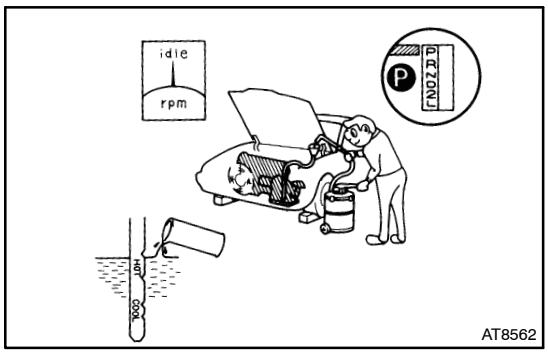
If the level is at the low side, add new fluid.
Capacity: 2.9 liters (3.1 US qts, 2.6 Imp. qts)

NOTICE:
Do not overfill.

(b) Check the fluid condition.
If the fluid smells burnt or is black, change it.



(c) Replace the ATF.
(1) Remove the drain plug and drain the fluid.
(2) Reinstall the drain plug securely.

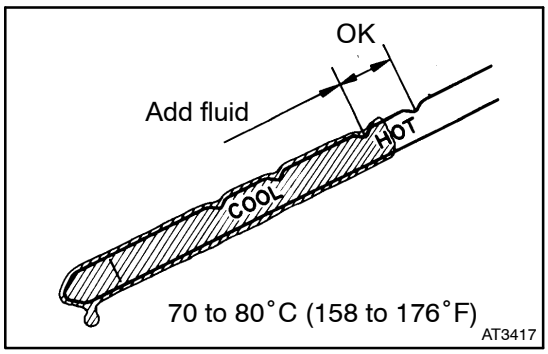


(3) With the engine OFF add new fluid through the oil filler pipe.

Fluid type: ATF Type T–IV

Capacity: 2.9 liters (3.1 US qts, 2.6 Imp. qts)

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.
(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



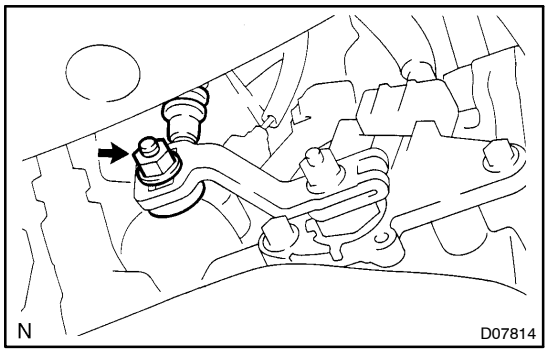
(6) Check the fluid level at the normal operating temperature, 70 to 80 ˚C (158 to 176 ˚F), and add as necessary.

NOTICE:

Do not overfill.

(d) Check the fluid leaks.
Check for leaks in the transaxle.

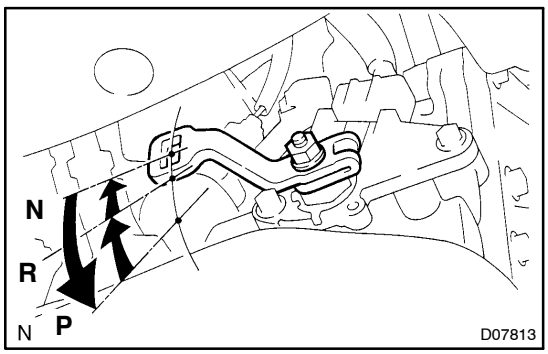
If there are leaks, it is necessary to repair or replace O–rings, gaskets, oil seals, plugs or other parts.



(e) Inspect and adjust the shift lever position.
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is aligned with the correct position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

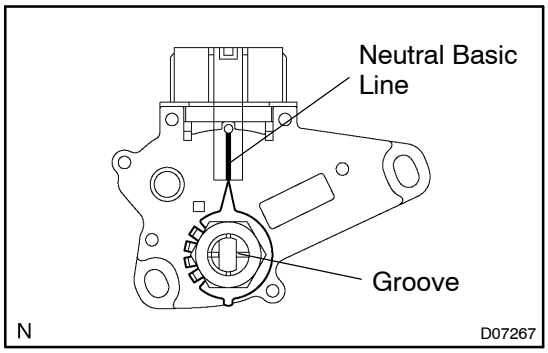
(1) Loosen the nut on the shift lever.
(2) Push the control shaft fully downward.



(3) Return the control shaft lever 2 notches to N position.
(4) Set the shift lever to N position.
(5) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(6) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.



(f) Inspect and adjust the park/neutral position.
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If it is not as stated above, carry out the following adjustment procedures.

(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolt.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

For continuity inspection of the park/neutral position switch, see page DI–789.

(g) Check the idle speed.
Idle speed: 750 ± 50 rpm
(In N position and air conditioner OFF)

12. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.
The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the test at normal operating fluid temperature 50 to 80 °C (122 to 176 °F).**
- **Do not continuously run this test for longer than 10 seconds.**
- **To ensure safety, conduct this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the 4 wheels.
(2) Connect an OBD II scan tool or hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressed firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,220 to 2,520 rpm

(7) Do the same test in R position.

Stall speed: 2,220 to 2,520 rpm

Evaluation:

Problem	Possible cause
(a) Stall engine speed is low in D and R positions	• Engine output may be insufficient • Stator one–way clutch is operating properly HINT: If the value is larger or smaller than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall engine speed is high in D position	• Line pressure too low • Forward clutch slipping • No.2 one–way clutch not operating properly
(c) Stall engine speed is high in R position	• Line pressure too low • Reverse clutch slipping • 1st & reverse brake slipping
(d) Stall engine speed is high in D and R positions	• Line pressure too low • Improper fluid level

(b) Measure the time lag.
When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the No. 2 one–way clutch, reverse clutch, forward clutch, and 1st & reverse brake.

NOTICE:

- **Do the test at normal operating fluid temperature 50 to 80 °C (122 to 176 °F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Connect an OBD II scan tool or hand–held tester to DLC3.
(2) Fully apply the parking brake.
(3) Start the engine and check idle speed.
Idle speed: 750 ± 50 rpm (In N position and air conditioner OFF)
(4) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.
Time lag: N → D Less than 1.2 seconds
(5) In the same manner, measure the time lag for N → R.
Time lag: N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than specified):

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • No. 2 one–way clutch not operating
N → R time lag is longer	• Line pressure too low • Reverse clutch worn • 1st & reverse brake worn

13. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid temperature 50 to 80 °C (122 to 176 °F)**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

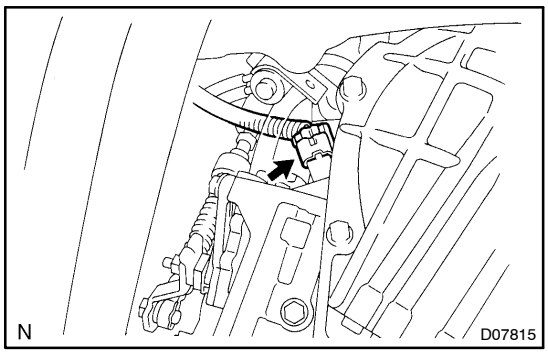
(1) Warm up the ATF.
(2) Remove the test plug on the transaxle case front left side and connect SST (See page AX–30 for the location to connect SST).
SST 09992–00095 (09992–00231, 09992–00271)
(3) Fully apply the parking brake and check the 4 wheels.
(4) Connect an OBD II scan tool or hand–held tester to DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressed firmly on the brake pedal and shift into D position.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same manner, do the test in R position.
Specified line pressure:

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	372 to 412 (3.8 to 4.2, 54 to 60)	553 to 623 (5.6 to 6.4, 80 to 90)
Stall	1,126 to 1,226 (11.5 to 12.5, 164 to 178)	1,764 to 1,964 (18.0 to 20.0, 256 to 284)

If the measured pressure is not within specification, recheck the throttle cable adjustment and retest.

Evaluation:

Problem	Possible cause
If the measured values at all position are higher	• Shift solenoid valve SLT • Regulator valve defective
If the measured values at all position are lower	• Shift solenoid valve SLT • Regulator valve defective • Oil pump defective
If pressure is low in the D position only	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only	• R position circuit fluid leakage • Reverse clutch defective • 1st & reverse brake defective



14. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors. Disconnecting the solenoid wire disables electrically-controlled automatic gear shifting. In this case, operating the shift level is the only way to shift the transaxle gear. If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem.

(a) Turn the ignition switch OFF.
(b) Disconnect the solenoid wire connector.
(c) Warm up the engine.
(d) Drive the vehicle.
(e) Check the transaxle operation when the shift lever is moved into L, 2 and D ranges.

Standard:

Shift Lever	Operation
L to 2	No shift (Not change)
2 to D	No shift (Not change)
D to 2	No shift (Not change)
2 to L	No shift (Not change)

(f) Turn the ignition switch OFF.
(g) Connect the solenoid wire connector.
(h) Clear DTCs.

HINT:

When the solenoid wire is disconnected, the transaxle gear will be set as listed below:

Shift Lever	Gear
P	Parking
R	Reverse
N	Neutral
D	3rd
2	3rd
L	3rd

15. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assy, engine assy or the ECM.

NOTICE:

Hand–held tester only

HINT:

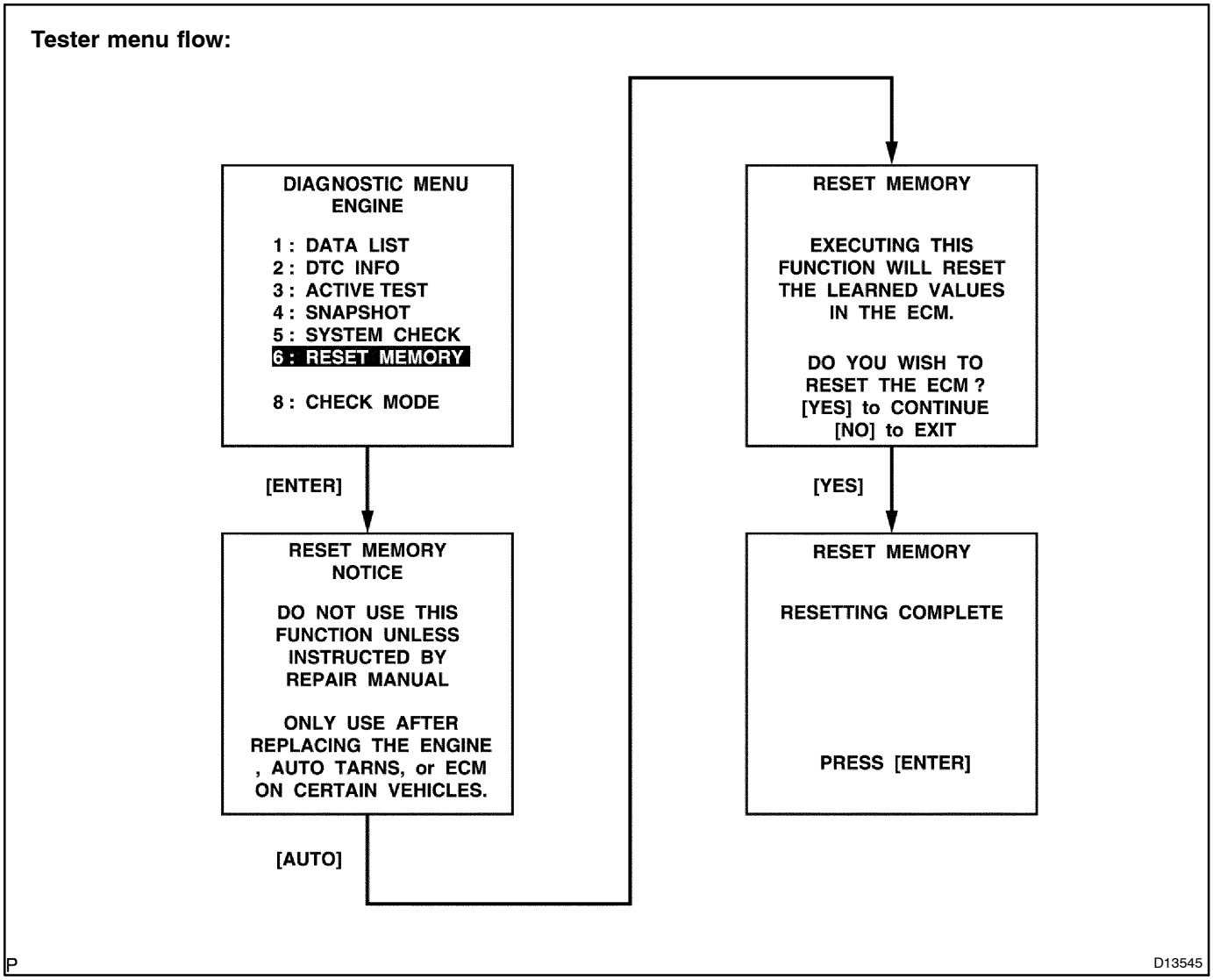
The ECM memorizes the condition that the ECT controls the automatic transaxle assy and engine assy according to those characteristics. Therefore, when the automatic transaxle assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch to the ON position and push the hand–held tester main switch on.
(d) Select the item "DIAGNOSIS/ENHANCED OBD II".
(e) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



DI4Z0–12

DIAGNOSTIC TROUBLE CODE CHART

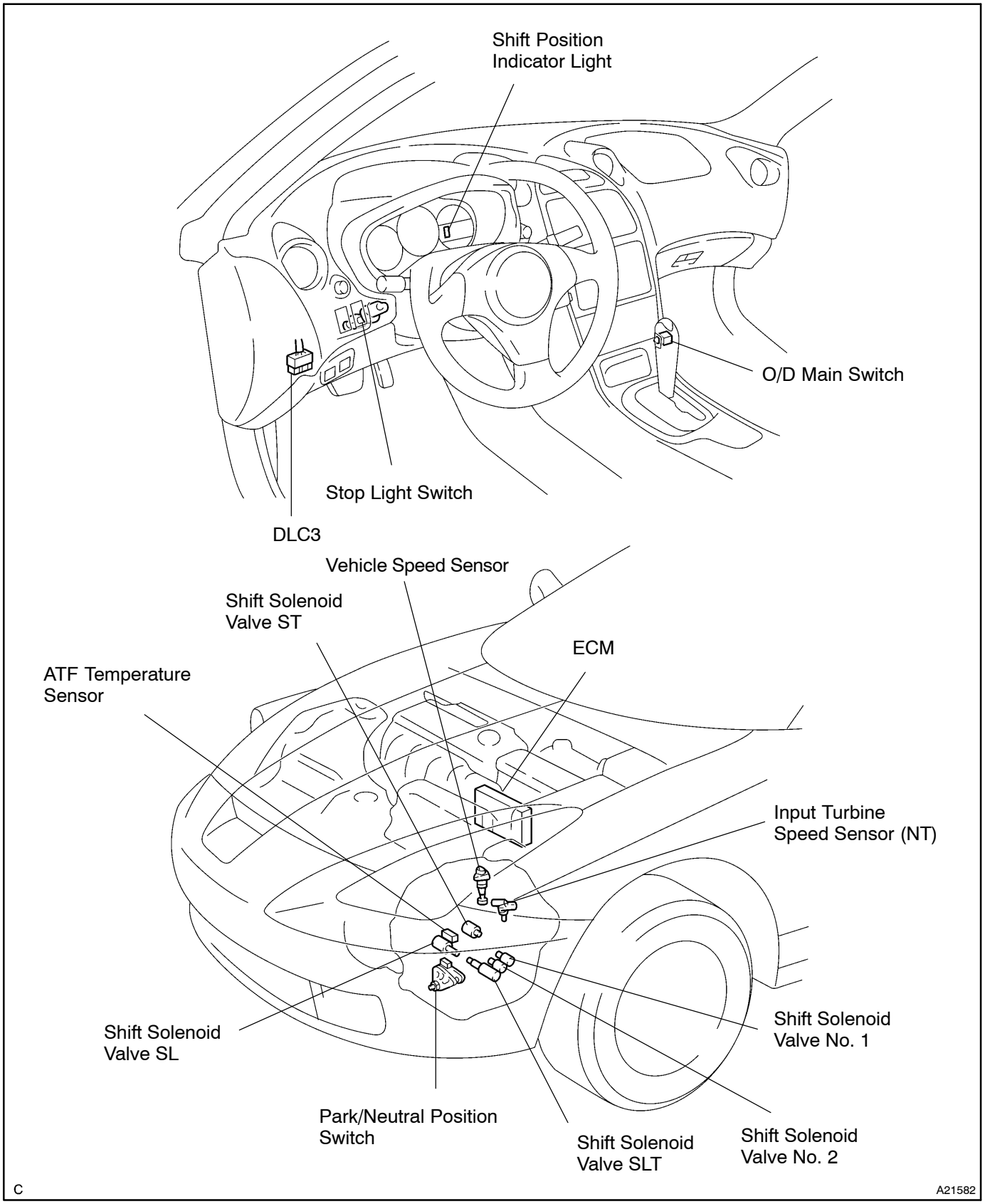
If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

* : –...MIL does not light up /●...MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 (DI–253)	Vehicle Speed Sensor ”A”	• Combination meter • Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	●	○
P0705 (DI–789)	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0710 (DI–794)	Transmission Fluid Temperature Sensor ”A” Circuit	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0711 (DI–797)	Transmission Fluid Temperature Sensor ”A” Performance	• Transaxle fluid level • ATF temperature sensor	●	○
P0717 (DI–800)	Turbine Speed Sensor Circuit No Signal	• Open or short in input turbine speed sensor (NT) circuit • Input turbine speed sensor (NT) • ECM	●	○
P0724 (DI–803)	Brake Switch ”B” Circuit High	• Short in stop light switch circuit • Stop light switch • ECM	●	○
P0741 (DI–805)	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve SL)	• Shift solenoid valve SL is stuck open or closed • Valve body is blocked up or stuck • Lock–up clutch • Automatic transaxle (clutch, brake or gear etc.)	●	○
P0743 (DI–809)	Torque Converter Clutch Circuit Electrical (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P0751 (DI–812)	Shift Solenoid ”A” Performance (Shift Solenoid Valve S1)	• Shift solenoid valve No. 1 is stuck open or closed • Valve body is blocked up or stuck • ECM	●	○
P0753 (DI–817)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve S1)	• Open or short in shift solenoid valve No. 1 circuit • Shift solenoid valve No. 1 • ECM	●	○
P0756 (DI–812)	Shift Solenoid ”B” Performance (Shift Solenoid Valve S2)	• Shift solenoid valve No. 2 is stuck open or closed • Valve body is blocked up or stuck • ECM	●	○
P0758 (DI–817)	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve S2)	• Open or short in shift solenoid valve No. 2 circuit • Shift solenoid valve No. 2 • ECM	●	○
P0785 (DI–821)	Shift/Timing Solenoid (Sift Solenoid Valve ST)	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM	●	○
P2716 (DI–825)	Pressure Control Solenoid ”D” Electrical (Sift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○

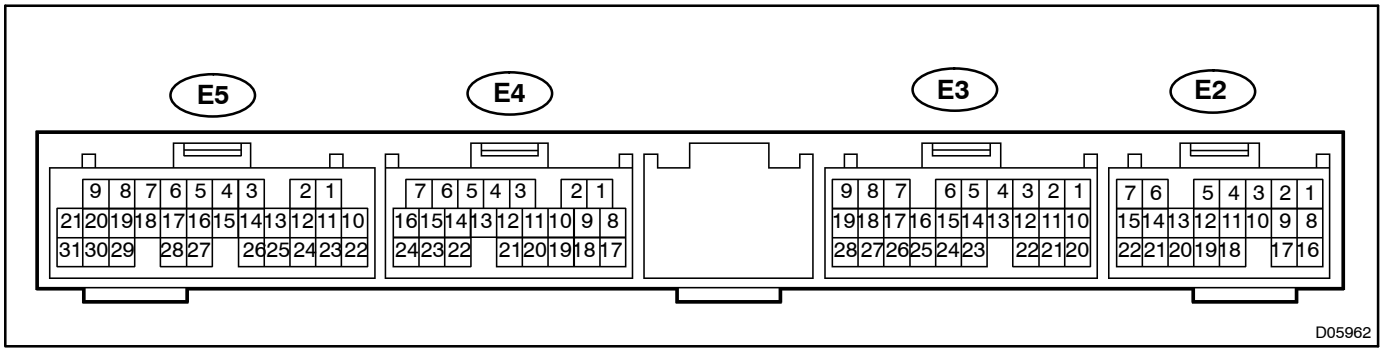
DI6N4–04

PARTS LOCATION



DI4ZQ–11

TERMINALS OF ECM



Each ECM terminals standard normal voltage is shown in the table below. In the table, first follow the information under ”Condition”.
Look under ”Symbols (Terminals No.)” for the terminals to be inspected.
The standard normal voltage between the terminals is shown under ”STD Voltage”.
Use the illustration above as a reference for the ECM terminals.

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
S1 (E5–8) ↔ E1 (E4–17)	BR–Y ↔ BR	IG switch ON	10 – 14 V
		1st or 2nd gear	10 – 14 V
		3rd or O/D gear	Below 1 V
S2 (E5–20) ↔ E1 (E4–17)	Y ↔ BR	IG switch ON	10 – 14 V
		1st or O/D gear	10 – 14 V
		2nd or 3rd gear	Below 1 V
SL (E5–19) ↔ E1 (E4 – 17)	G–W ↔ BR	IG switch ON	Below 1 V
		Vehicle driving under lock–up position	10 – 14 V
SLT^+ (E5–6) ↔ SLT^- (E5–5)	Y–R ↔ Y–G	IG switch ON	10 – 14 V
OD1 (E3–1) ↔ E1 (E4–17)	B ↔ BR	IG switch ON	5 – 6 V
ODLP (E3–19) ↔ E1 (E4–17)	BR–Y ↔ BR	O/D main switch ON (O/D OFF)	Below 1 V
		O/D main switch OFF (O/D ON)	10 – 14 V
L (E4–9) ↔ E1 (E4–17)	Y–B ↔ BR	IG switch ON and Shift lever L position	10 – 14 V
		IG switch ON and Shift lever other than L position	Below 1 V
2 (E4–19) ↔ E1 (E4–17)	L–Y ↔ BR	IG switch ON and Shift lever 2 position	10 – 14 V
		IG switch ON and Shift lever other than 2 position	Below 1 V
R (E3–2) ↔ E1 (E4–17)	R–B ↔ BR	IG switch ON and Shift lever R position	10 – 14 V
		IG switch ON and Shift lever other than R position	Below 1 V
D (E3–24) ↔ E1 (E4–17)	B–O ↔ BR	IG switch ON and Shift lever D position	10 – 14 V
		IG switch ON and Shift lever other than D position	Below 1 V
N (E4–8) ↔ E1 (E4–17)	P–L ↔ BR	IG switch ON and Shift lever N position	10 – 14 V
		IG switch ON and Shift lever other than N position	Below 1 V
THO (E4–13) ↔ E2 (E4–18)	GR–L ↔ BR	IG switch ON and ATF temperature 110 °C (230 °F)	Below 1 V
ST (E5–29) ↔ E1 (E4–17)	BR–W ↔ BR	IG switch ON	Below 1 V
		IG switch ON and R gear	10 – 14 V
P (E4–20) ↔ E1 (E4–17)	P ↔ BR	IG switch ON and Shift lever P position	10 – 14 V
		IG switch ON and Shift lever other than P position	Below 1 V
SPD (E3–22) ↔ E1 (E4–17)	W–R ↔ BR	IG switch ON and rotate driving wheel slowly	Pulse generation

ODMS (E2–5) ↔ E1 (E4–17)	BR–Y ↔ BR	IG switch ON	10 – 14 V
		IG switch ON and Press continuously O/D main switch	Below 1 V
NT^+ (E5–16) ↔ NT^- (E5–15)	W–L ↔ B	Engine is running	Pulse signal is output below 1 ↔ 4 to 5 V

DI67T–08

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic circuit matrix chart

Chapter 2: On–vehicle repair matrix chart

Chapter 3: Off–vehicle repair matrix chart

If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.

If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	ECM	–
No up–shift (3rd → O/D)	1. O/D main switch and O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–829 DI–832 –
No down–shift (A particular gear, from 1st to 3rd gear, is not down–shifted)	ECM	–
No down–shift (O/D → 3rd)	1. O/D main switch and O/D OFF indicator light circuit 2. ECM	DI–829 –
No lock–up	ECM	–
No lock–up OFF	ECM	–
Shift point too high or too low	ECM	–
Up–shift to O/D from 3rd while O/D main switch is OFF	ECM	–
Up–shift to O/D from 3rd while engine is cold	ECM	–
No kick–down	ECM	–
Engine stalls when starting off or stopping	ECM	–

Chapter 2: On–vehicle Repair
(★: U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM735U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Manual valve 2. Primary regulator valve 3. Secondary regulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Vehicle does not move in R position	1. Manual valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (1st → 2nd)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (2nd → 3rd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	★ –
No up–shift (3rd → O/D)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	★ –
No down–shift (O/D → 3rd)	3–4 shift valve	★
No down–shift (3rd → 2nd)	2–3 shift valve	★
No down–shift (2nd → 1st)	1–2 shift valve	★
No lock–up or No lock–up off	1. Lock–up relay valve 2. Lock–up control valve 3. Solenoid relay valve 4. Solenoid modulator valve 5. Off–vehicle repair matrix chart	★ ★ ★ ★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Accumulator control valve 3. Off–vehicle repair matrix chart	★ ★ –
Harsh engagement (N → R)	1. C_3 accumulator 2. Accumulator control valve 3. Reverse control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Accumulator control valve 3. Lock–up control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Harsh engagement (1st → 2nd)	1. B_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (2nd → 3rd)	1. C_2 accumulator 2. Accumulator control valve	★ ★
Harsh engagement (3rd → O/D)	1. B_1 accumulator 2. Accumulator control valve 3. 3–4 shift timing valve	★ ★ ★
Harsh engagement (O/D → 3)	1. 3–4 shift timing valve 2. 4–3 shift timing valve	★ ★
Harsh engagement (D, 2, L position)	Coat relay valve	★
Slip or shudder (Forward and reverse)	1. Oil strainer 2. Off–vehicle repair matrix chart	AX–9 –
No engine braking (1st: L position)	1. Reverse control valve 2. Off–vehicle repair matrix chart	★ –
No engine braking (2nd: 2 position)	3–4 shift valve	★

No kick–down	1. 1–2 shift valve 2. 2–3 shift valve 3. 3–4 shift valve	★ ★ ★
Poor acceleration	SLT damper	★

Chapter 3: Off–vehicle Repair
(★: U341E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM735U)

Symptom	Suspected Area	See page
Vehicle does not move in any forward positions and reverse position	1. Planetary gear unit 2. Forward clutch 3. One–way clutch No. 2 4. Reverse Clutch 5. 1st and reverse brake	★ ★ ★ ★ ★
Vehicle does not move in R position	1. Planetary gear unit 2. Reverse Clutch 3. 1st and reverse brake	★ ★ ★
No up–shift (1st → 2nd)	1. 2nd brake 2. One–way clutch No. 1	★ ★
No up–shift (2nd → 3rd)	Direct clutch	★
No up–shift (3rd → O/D)	O/D and 2nd brake	★
No lock–up or No lock–up off	Torque converter clutch	AX–36
Harsh engagement (N → D)	1. Forward clutch 2. One–way clutch No. 2	★ ★
Harsh engagement (N → R)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Harsh engagement (Lock–up)	Torque converter clutch	AX–36
Harsh engagement (1st → 2nd)	1. 2nd brake 2. One–way clutch No. 1	★ ★
Harsh engagement (2nd → 3rd)	Direct clutch	★
Harsh engagement (3rd → O/D)	O/D and 2nd brake	★
Slip or shudder (Forward position)	1. Torque converter clutch 2. Forward clutch 3. Direct clutch 4. O/D and 2nd brake 5. 2nd brake 6. One–way clutch No. 1 7. One–way clutch No. 2	AX–36 ★ ★ ★ ★ ★ ★
Slip or shudder (Reverse position)	1. Reverse clutch 2. 1st and reverse brake	★ ★
Slip or shudder (1st)	One–way clutch No. 2	★
Slip or shudder (2nd)	1. 2nd brake 2. One–way clutch No. 1	★ ★
Slip or shudder (3rd)	Direct clutch	★
Slip or shudder (O/D)	O/D and 2nd brake	★
No engine braking (1st: L position)	1st and reverse brake	★
No engine braking (2nd: 2 position)	O/D and 2nd brake	★
Poor acceleration (All position)	Torque converter clutch	AX–36
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	AX–36

DIAJ8–03

CIRCUIT INSPECTION

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)

CIRCUIT DESCRIPTION

The neutral start switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (P, R, N, D, 2 and L) from the park/neutral position switch.

DTC No.	DTC Detecting Condition	Trouble Area
P0705	(2–trip detection logic) • 2 or more switches are ON simultaneously for P, R, N, D, 2 and L positions.	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM

MONITOR DESCRIPTION

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the vehicle is in P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N or D, the ECM interprets this as a fault in the switch. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705	Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
The typical enabling condition is not available.	–	

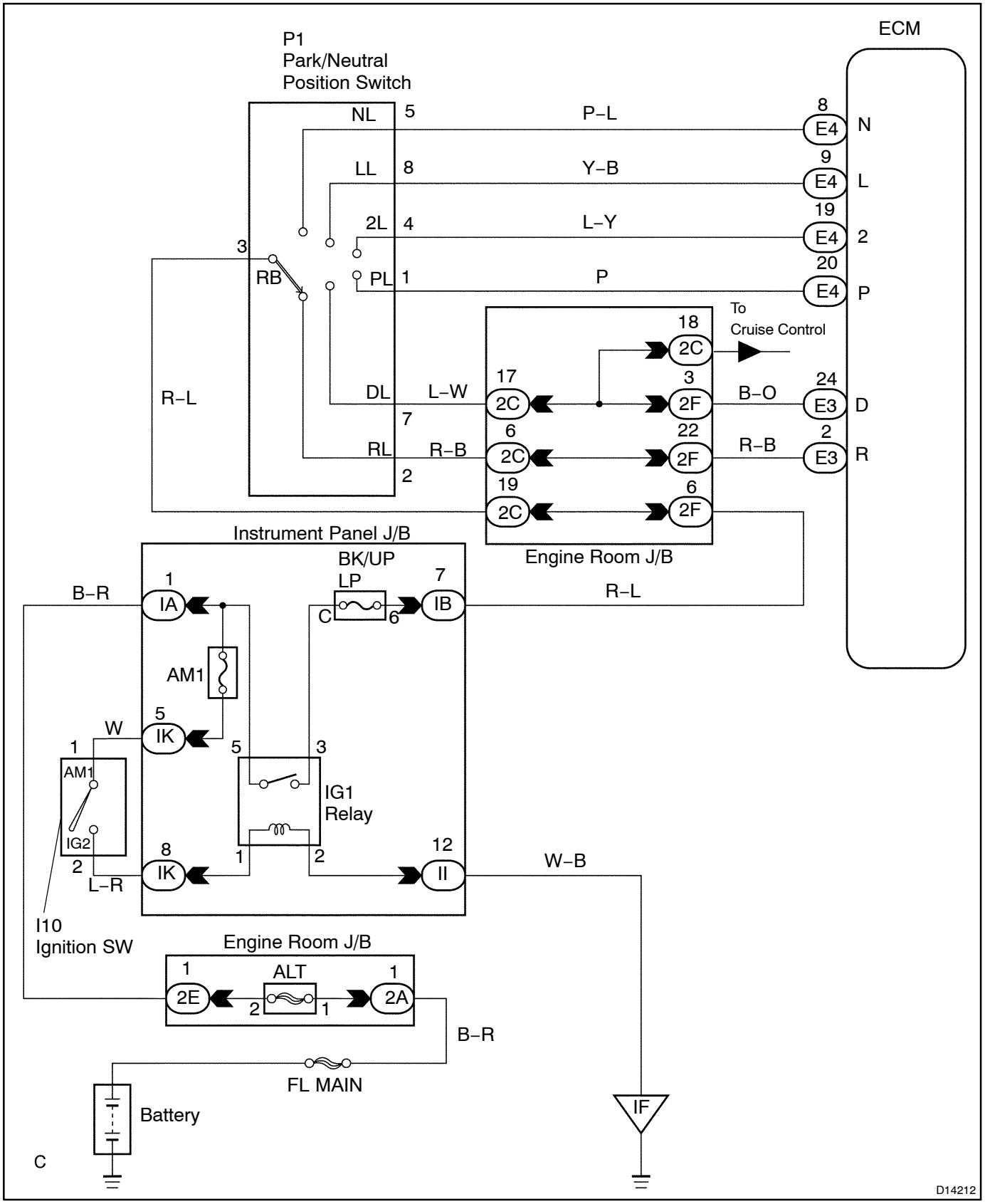
TYPICAL MALFUNCTION THRESHOLDS

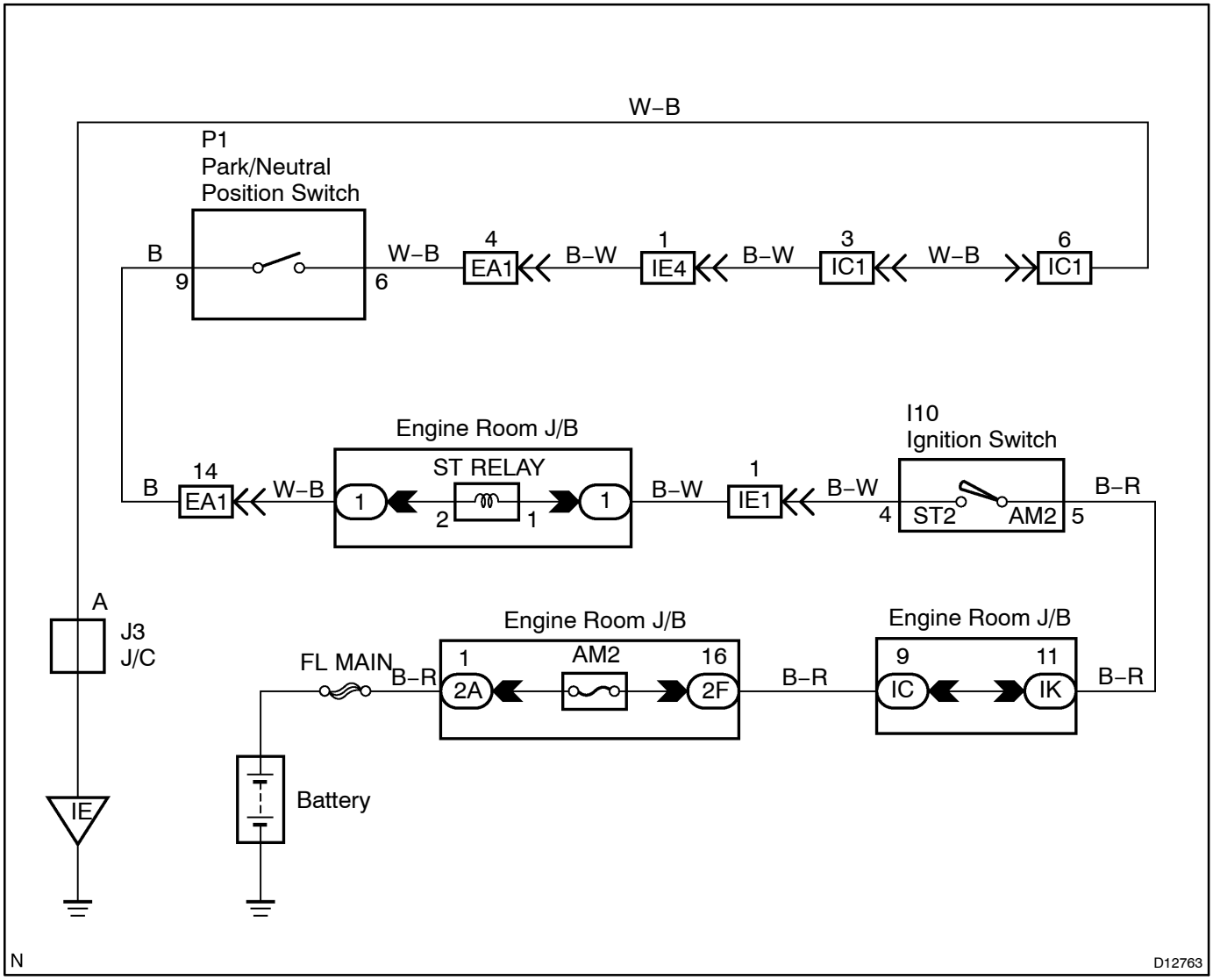
Detection criteria	Threshold
Number of the following signal input at the same time	2 or more
P switch	ON
R switch	
N switch	
D switch	
2 switch	
L switch	

COMPONENT OPERATING RANGE

Parameter	Standard value
Park/neutral position switch	The park/neutral switch sends only one signal to the ECM

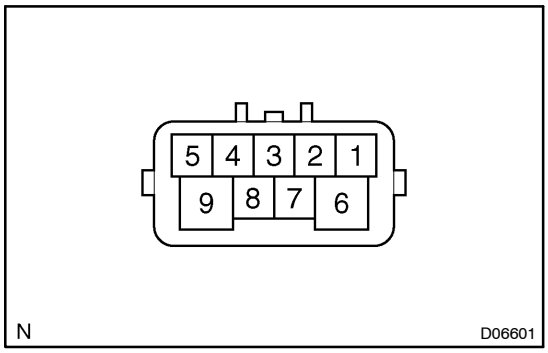
WIRING DIAGRAM




W–B
P1
Park/Neutral
Position Switch
B
9
6
W–B
4
EA1
B–W
1
IE4
B–W
3
IC1
W–B
6
IC1
Engine Room J/B
ST RELAY
B
14
EA1
W–B
1
2
1
1
B–W
1
IE1
B–W
I10
Ignition Switch
4
ST2
AM2
5
B–R
A
J3
J/C
IE
FL MAIN
B–R
Engine Room J/B
1
2A
AM2
16
2F
B–R
Engine Room J/B
9
IC
11
IK
B–R
Battery
N
D12763

INSPECTION PROCEDURE

1	**Check park/neutral position switch.**



PREPARATION:

Remove the park/neutral position switch.

CHECK:

Check continuity between each terminal shown below when the shift lever is moved to each position.

Shift position	Terminal No. to continuity	
P	1 – 3	6 – 9
R	2 – 3	–
N	3 – 5	6 – 9
D	3 – 7	–
2	3 – 4	–
L	3 – 8	–

OK:

There is continuity.

NG → **Replace the park/neutral position switch.**

OK

2	**Check harness and connector between ECM and park/neutral position switch (See page IN–30).**

NG → **Repair or replace the harness and connector.**

OK

Check and replace the ECM (See page IN–30).

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more. (1–trip detection logic) (a) Temperature sensor resistance is less than 79 Ω (b) After the engine has been operating for 15 minutes or more, the resistance at the temp. sensor is more than 156 kΩ	• Open or short in ATF temp. sensor circuit • ATF temp. sensor • ECM

MONITOR DESCRIPTION

The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

*1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.

*2: –40°C (–40°F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the OBD II scan tool or hand–held tester display.

MONITOR STRATEGY

Related DTCs	P0710	ATF temperature sensor/Range check (Chattering)
		ATF temperature sensor/Range check (Low resistance)
		ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Range check (Chattering, Low resistance)		
The typical enabling condition is not available.	–	–
Range check (High resistance)		
Time after engine start	15 min. or more	–

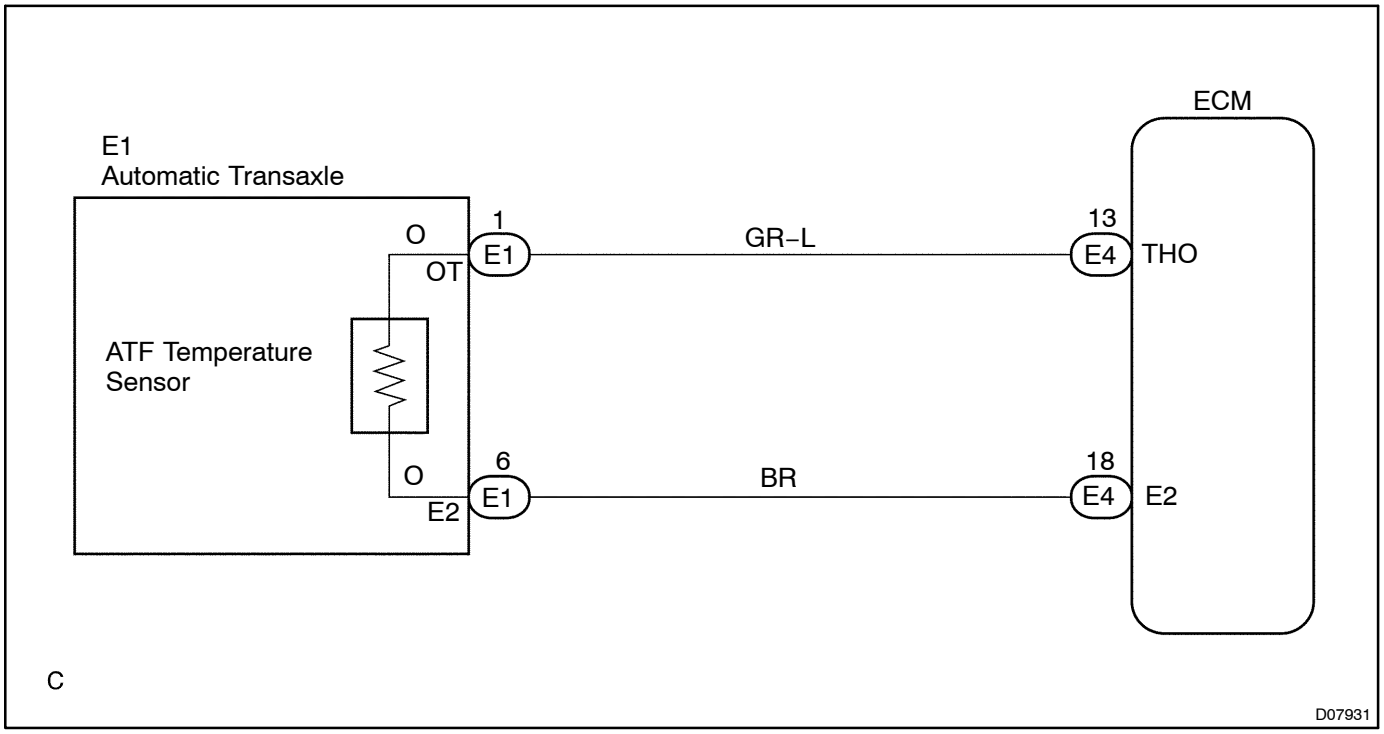
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Range check (Chattering)	
TFT (transmission fluid temperature) sensor resistance	Less than 79 Ω, more than 156 kΩ
Range check (Low resistance)	
TFT sensor resistance	Less than 79 Ω
Range check (High resistance)	
TFT sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

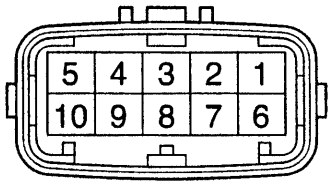
Parameter	Standard value
TFT sensor	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ATF temperature sensor.



D12851

PREPARATION:

Disconnect the transmission wire connector.

CHECK:

Measure resistance between terminals 1 and 6 of transmission wire connector.

OK:

90 Ω to 156 kΩ

HINT:

Refer to the table below for resistance values according to ATF temperature.

ATF temperature	Specified condition
10°C (50°F)	6.4 kΩ
25°C (77°F)	3.5 kΩ
110°C (230°F)	0.2 kΩ

Measure resistance between terminals 1 and 6 of the transmission wire connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG → **Replace the ATF temperature sensor (transmission wire).**

OK

2	Check harness and connector between ATF temperature sensor and ECM (See page IN–30).

NG → **Repair or replace the harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DIC6A–02

DTC	P0711	Transmission Fluid Temperature Sensor ”A” Performance

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0711	Both (a) and (b) is detected. (2–trip detection logic) (a) After 12 seconds of the engine start, the temp. of the atmosphere and that of the engine coolant is more than –10˚C. (b) After a normal driving for over 18 minutes and 20 seconds and 9 km (6 miles), the ATF temp. is less than 20˚C.	• Transaxle fluid level • ATF temperature sensor

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault of the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.
When the ATF temperature is 110°C (230°F) or more after 18 minutes of engine cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0711	ATF temperature sensor /Rationality check
Required sensors/Components	Main	ATF temperature sensor (TFT sensor)
Required sensors/Components	Sub	IAT sensor, ECT sensor
Frequency of operation	Continuous	
Duration	3 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction	
ECT (Engine coolant temperature) sensor circuit	Not circuit malfunction	
IAT (Intake air temperature) sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
Time after engine start	16 min. and 40 sec. or more	–
Duration time from TFT (transmission fluid temperature): Less than 20°C (68°F)	3 sec. or more	–
ECT	–15°C (5°F) or more	–
Time after engine start	18 min. and 20 sec.	
Driving distance after engine start	9 km (5.6 mile) or more	–
IAT (12 sec. after engine start)	–10°C (14°F) or more	–
ECT (12 sec. after engine start)	–10°C (14°F) or more	–

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
TFT (transmission fluid temperature)	Less than 20°C (68°F)

COMPONENT OPERATING RANGE

Parameter	Standard value
TFT (transmission fluid temperature)	Atmospheric temperature to approx. 130°C (266°F)

WIRING DIAGRAM

See page DI–794.

INSPECTION PROCEDURE

1	**Check other DTCs output (in addition to DTC P0711)**

PREPARATION:

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or hand–held tester to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the ”ON” button of the OBD II scan tool or the hand–held tester.
(f) Select the item ”DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES”.

CHECK:

Read the DTCs using the OBD II scan tool or the hand–held tester.

RESULT:

Display (DTC output)	Proceed to
Only ”P0711” is output	A
”P0711” and other DTCs	B

HINT:

If any other codes besides ”P0711” is output, perform the troubleshooting for those DTCs first.

B → **Go to relevant DTC chart (See page DI–781).**

A

2	**Check transaxle fluid level (See page DI–758).**

NG → **Add fluid (See page DI–758).**

OK

Replace the transmission wire (ATF temperature sensor) (See page AX–5).

DIC6B–02

DTC	P0717	Turbine Speed Sensor Circuit No Signal

CIRCUIT DESCRIPTION

This sensor detects the rotation speed of the input turbine. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shifting.

DTC No.	DTC Detecting Condition	Trouble Area
P0717	The ECM detects conditions (a), (b), (c), (d) and (e) continuity for 5 secs. or more. (1–trip detection logic) (a) Gear change not being performed (b) Gear position: 2nd, 3rd or 4th gear (c) Solenoid valves and park/neutral position switch are normal (d) T/M input shaft rpm: 300 rpm or less (e) T/M output shaft rpm: 1,000 rpm or more	• Open or short in input turbine speed sensor (NT) circuit • Input turbine speed sensor (NT) • ECM

MONITOR DESCRIPTION

The NT terminal of the ECM detects the revolving signal from speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in the 2nd, 3rd, 4th or 5th gear position in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717	Speed sensor (NT)/Verify pulse input
Required sensors/Components	Speed sensor (NT), Speed sensor (NC)	
Frequency of operation	Continuous	
Duration	5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Shift change	Shift change is completed and before starting next shift change operation	
ECM selected gear	2nd, 3rd or 4th	
Output shaft rpm	1,000 rpm or more	–
NSW switch	OFF	
R switch	OFF	
L switch	OFF	
Engine	Running	

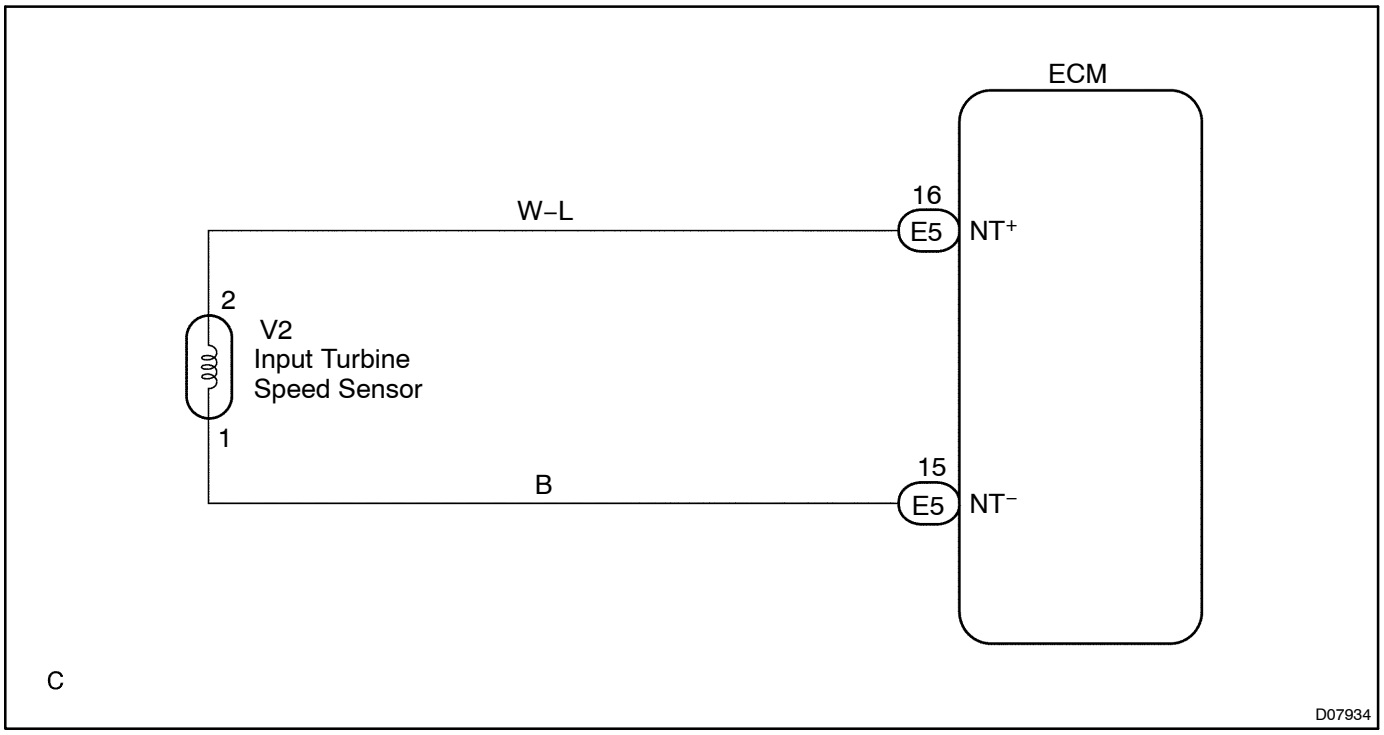
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

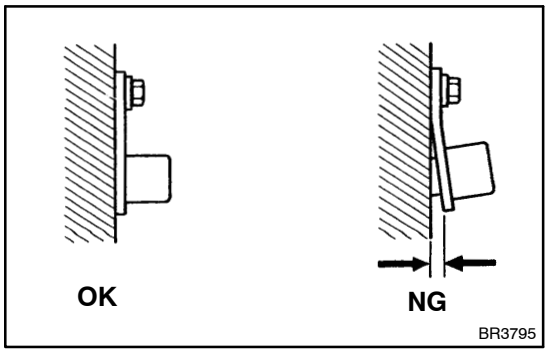
Parameter	Standard value
Speed sensor (NT)	Turbine speed is equal to engine speed when lock–up ON.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor (NT) installation.**

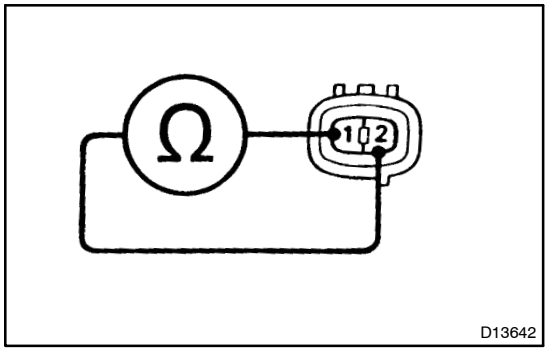


CHECK:
Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **Tighten the speed sensor (NT) properly.**

OK

2	**Check speed sensor (NT) .**



PREPARATION:
Remove the NT speed sensor from transaxle.
CHECK:
Measure resistance between terminals 1 and 2 of speed sensor.
OK:
Resistance: 620 ± 60 Ω at 20 °C (68 °F)

NG → **Replace the speed sensor (NT).**

OK

3	**Check harness and connector between ECM and speed sensor (NT) (See page IN–30).**

NG → **Repair or replace harness and connector.**

OK

Check and replace the ECM (See page IN–30).

DIAJB–03

DTC	P0724	Brake Switch ”B” Circuit High

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling, while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is operated, this switch sends a signals to ECM. Then the ECM cancels operation of the lock–up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	Stop light switch remains ON while vehicle running (2–trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

When the stop light switch remains ON during ”stop and go” driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop and go (3 km/h (2 mph) to 30 km/h (19 mph)) 5 times for two driving cycles in order to detect malfunction.

MONITOR STRATEGY

Related DTCs	P0724	Stop light switch/Range check/Rationality
Required sensors/Components	Main	Stop light switch
Required sensors/Components	Sub	Vehicle speed sensor
Frequency of operation	Continuous	
Duration	GO and STOP 5 times	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once	
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once	

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Brake switch	Remain ON during GO and STOP 5 times

WIRING DIAGRAM

See page DI–1068.

INSPECTION PROCEDURE

1	**Check stop light switch (See page BE–37).**

NG → **Replace stop light switch.**

OK

2	**Check harness and connector between ECM and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace the ECM (See page IN–30).

DIAJC–03

DTC	P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve SL)

SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch or automatic transaxle (clutch, brake or gear etc.).

DTC No.	DTC Detecting Condition	Trouble Area
P0741	• Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range. (2–trip detection logic) • When lock–up is ON, clutch or brake slips or gear is broken. (2–trip detection logic)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

Torque converter lock–up is controlled by the ECM based on speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock–up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests ”lock–up” by applying control voltage to shift solenoid SL. When the SL is turned on, solenoid SL applies pressure to the lock–up relay valve and locks the torque converter clutch.
If the ECM detects no lock–up after lock–up has been requested or if it detects lock–up when it is not requested, the ECM interprets this as a fault in the torque converter clutch performance. The ECM will turn on the MIL and store the DTC.
Example:
When any of the following is met, the system judges it as a malfunction.

(a) There is a difference in rotation between before and after torque converters even when the ECM commands lock–up.
(Engine speed is at least 100 rpm greater than input speed.)

(b) There is no difference in rotation between before and after torque converters even when the ECM commands lock–up off.
(The difference between engine speed and input speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741	Shift solenoid valve SL/OFF malfunction
		Shift solenoid valve SL/ON malfunction
Required sensors/Components	Main	Shift solenoid valve SL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor (VPA1), Mass air flow meter (MAF), ATF temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous	
Duration	OFF malfunction	3.5 sec.
	ON malfunction	1.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

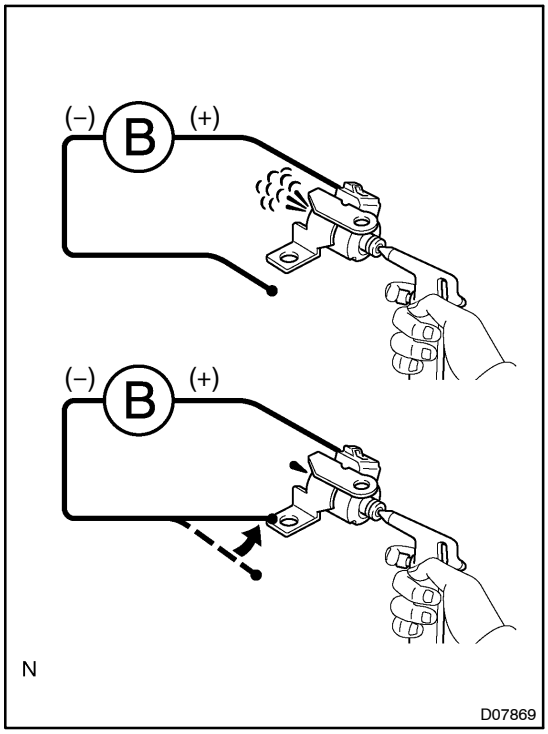
Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Vehicle speed	25 km/h (15.5 mph) or more	–
Transmission range	”D”	
ECM selected gear	3rd or 4th	
ECT sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Shift solenoid valve SL circuit	Not circuit malfunction	
Input (turbine) speed sensor circuit	Not circuit malfunction	
Internal counter shaft speed sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
OFF malfunction		
ECM lock–up command	ON	
ON malfunction		
ECM lock–up command	OFF	
Throttle valve opening angle	8% or more	–
Vehicle speed	–	Less than 60 km/h (37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
OFF malfunction	
Engine speed – Input (turbine) speed	100 rpm or more
ON malfunction	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection	
Difference between egine speed and Input (turbine) speed	Less than 35 rpm

INSPECTION PROCEDURE

1	**Check solenoid valve SL operation**



PREPARATION:

(a) Remove the oil pan.

(b) Remove the solenoid valve SL.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the solenoid valve closes.

OK:

(a) Solenoid valve does leak air.

(b) Solenoid valve closes.

NG → **Replace the solenoid valve SL.**

OK

2	Check valve body (See page DI–785).

NG → Repair or replace the valve body.

OK

3	Check the torque converter clutch (See page AX–36).

NG → Repair the torque converter clutch.

OK

Repair the transaxle (See page AX–30).

DIAJD–03

DTC	P0743	Torque Converter Clutch Circuit Electrical (Shift Solenoid Valve SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

DTC No.	DTC Detecting Condition	Trouble Area
P0743	Either (a) or (b) is detected for 1 time. (2–trip detection logic) (a) Solenoid resistance is 8 Ω or less when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more when solenoid is not energized.	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

MONITOR DESCRIPTION

Based on the signals from the Throttle Position Sensor, the Airflow Meter and the Crankshaft Position Sensor, the ECM sends a signal to the SL Solenoid Valve to regulate the hydraulic pressure and provide smoother gearshifts. The shift–solenoid valve SL responds to commands from the ECM. The valve controls the look–up relay valve to perform the torque–converter lock–up function. If the ECM detects an open or short circuit for shift–solenoid SL, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0743	Shift solenoid valve SL/Range check (Low resistance)
		Shift solenoid valve SL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SL	
Frequency of operation	Continuous	
Duration	0.032 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

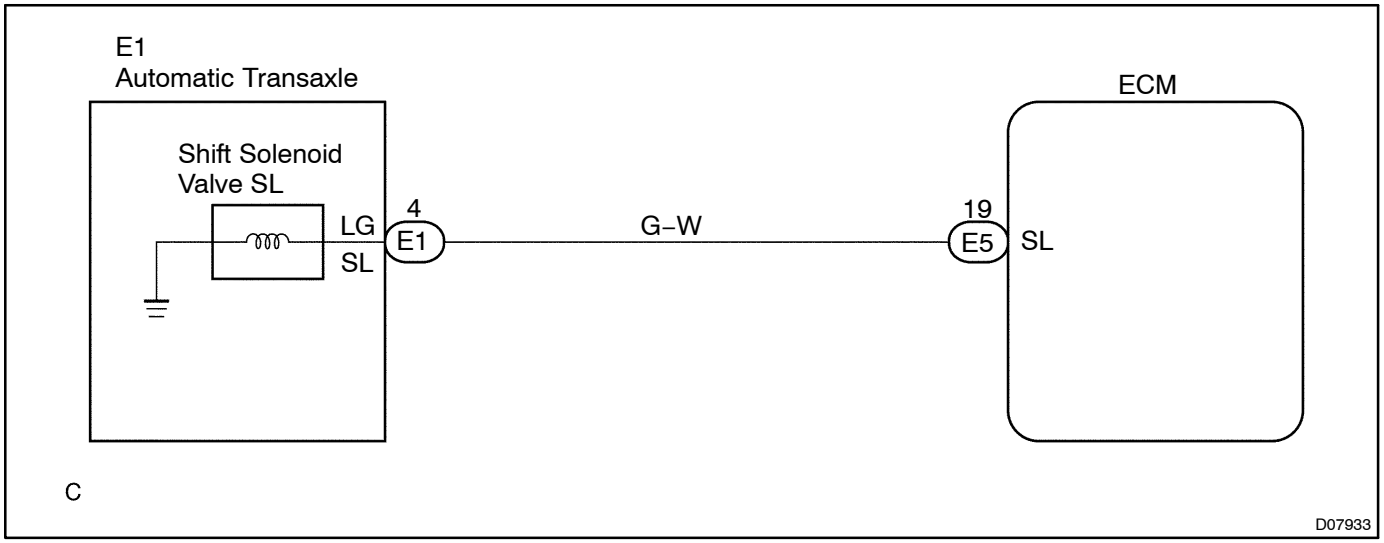
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
The typical enabling condition is not available.	–	

TYPICAL MALFUNCTION THRESHOLDS

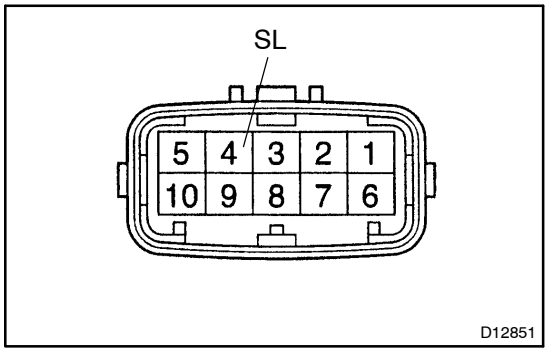
Detection criteria	Threshold
Either of the following conditions is met: Range check (Low resistance) or (high resistance)	
Low resistance	
Shift solenoid vavle SL resistance	8 Ω or less
High resistance	
Shift solenoid vavle SL resistance	100 kΩ or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check transmission wire.**

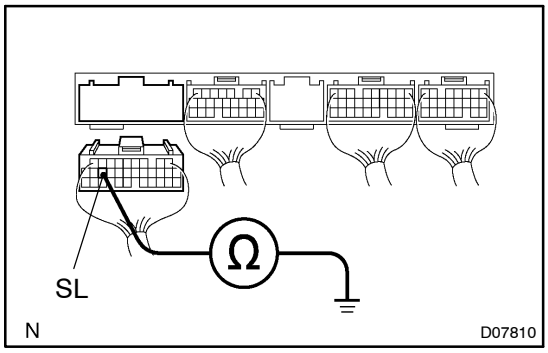


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between SL of transmission wire and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Go to step 3.**

OK

2	Measure resistance between terminal SL of ECM and body ground.



PREPARATION:

(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector from ECM.

CHECK:

Measure resistance between terminal SL of ECM and body ground.

OK:

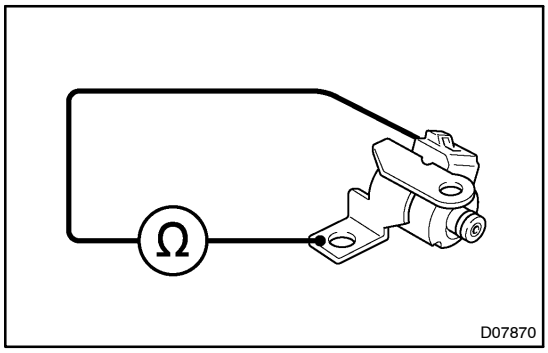
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Repair or replace the harness or connector (See page IN–30).

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve SL.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the shift solenoid valve SL connector.
(d) Remove the shift solenoid valve SL.

CHECK:

Measure resistance between terminal SL of shift solenoid valve and solenoid body.

OK:

Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Replace the shift solenoid valve SL.

OK

Repair or replace the transmission wire (See page AX–5).

DTC	P0751	Shift Solenoid ”A” Performance (Shift Solenoid Valve S1)

DTC	P0756	Shift Solenoid ”B” Performance (Shift Solenoid Valve S2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0751 P0756	During normal driving, the gear required by the ECM does not match the actual gear (2–trip detection logic)	• Shift solenoid valve No. 1/No. 2 is stuck open or closed • Valve body is blocked up or stuck • ECM

HINT:
Check the shift solenoid valve No. 1 when DTC P0751 is output and check the shift solenoid valve No. 2 when DTC P0756 is output.

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ”ON/OFF”. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or O/D gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

P0751

Related DTCs	P0751	Shift solenoid valve S1/OFF malfunction
		Shift solenoid valve S1/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	OFF malfunction (A)	0.85 sec.
	OFF malfunction (B), ON malfunction (A) & (B)	0.8 sec.
MIL operation	2 driving cycles	
Sequence of operation	None	

P0756

Related DTCs	P0756	Shift solenoid valve S2/OFF malfunction
		Shift solenoid valve S2/ON malfunction
Required sensors/Components	Main	Shift solenoid valve S2, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Required sensors/Components	Sub	Throttle position sensor, Vehicle speed sensor
Frequency of operation	Continuous	
Duration	0.85 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

P0751

Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	"D"	
ECT sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Input (turbine) speed sensor circuit	Not circuit malfunction	
Internal counter shaft speed sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	15% or more and 7.0% at engine speed 1,900 rpm (varies with engine speed)	–
OFF malfunction (B)		
Current ECM selected gear	4th	
Last ECM selected gear	3rd	
ON malfunction (A)		
Current ECM selected gear	4th	
Last ECM selected gear	3rd	
ON malfunction (B)		
ECM selected gear	4th	
"Throttle valve opening angle at current ECM selected gear" – "Throttle valve opening angle at last ECM selected gear"	–	Less than 20%
"Vehicle speed at current ECM" – "Vehicle speed at last ECM selected gear"	–	Less than 15 km/h (9.3 mph)
Vehicle speed (current)	–	Less than 85 km/h (52.8 mph)
Throttle valve opening angle (current)	–	Less than 35%
Engine speed (current)	3,200 rpm or more	–

P0756

Item	Specification	
	Minimum	Maximum
All		
ECT (Engine Coolant Temperature)	60°C (140°F) or more	–
Transmission range	”D”	
ECT sensor circuit	Not circuit malfunction	
Shift solenoid valve S1 circuit	Not circuit malfunction	
Shift solenoid valve S2 circuit	Not circuit malfunction	
Input (turbine) speed sensor circuit	Not circuit malfunction	
Internal counter shaft speed sensor circuit	Not circuit malfunction	
Throttle sensor circuit	Not circuit malfunction	
OFF malfunction (A)		
ECM selected gear	1st	
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph)	
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
OFF malfunction (B)		
ECM selected gear	3rd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
OFF malfunction (C)		
ECM selected gear	4th	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
ON malfunction (A)		
ECM selected gear	2nd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
ON malfunction (B)		
ECM selected gear	3rd	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–
ON malfunction (C)		
ECM selected gear	4th	
Vehicle speed	10 km/h (6.2 mph) or more	–
Throttle valve opening angle	7.0% or more at engine speed 1,900rpm (varies with engine speed)	–

TYPICAL MALFUNCTION THRESHOLDS

P0751

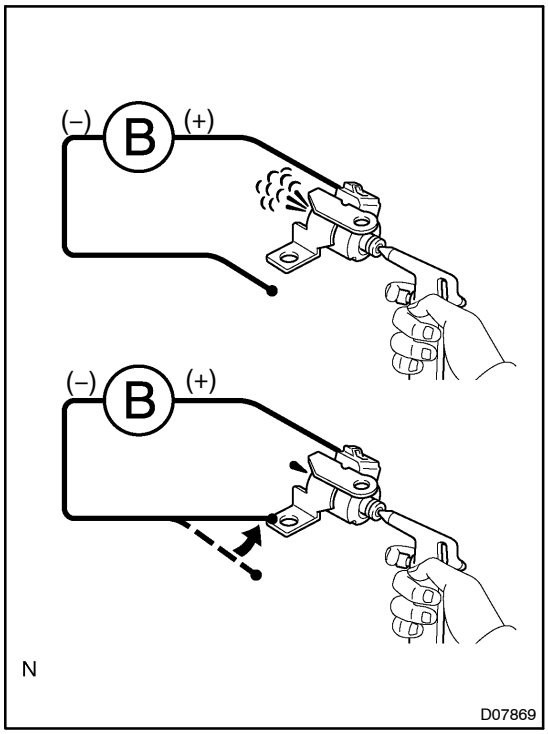
Detection criteria	Threshold
[OFF malfunction]	
Both of the following conditions are met: OFF malfunction (A) and (B)	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A)	
Input speed/Output speed	0.64 to 0.78
OFF malfunction (B)	
Input speed/Output speed	Change as follows 0.95 to 1.09 (Last) ↓ 0.64 to 0.78 (Current)
[ON malfunction]	
Both of the following conditions are met: ON malfunction (A) and (B)	
ON malfunction (A)	
Input speed/Output speed	Not changed as follows 0.95 to 1.09 (Last) ↓ 0.64 to 0.78 (Current)
ON malfunction (B)	
NE current – NE last	1,100 rpm or more

P0756

Detection criteria	Threshold
[OFF malfunction]	
All of the following conditions are met: OFF malfunction (A), (B) and (C)	
2 detections are necessary per driving cycle: 1st detection; temporary flag ON 2nd detection; pending fault code ON	
OFF malfunction (A)	
Input speed/Output speed	1.50 to 1.80
OFF malfunction (B)	
Input speed/Output speed	0.95 to 1.09
OFF malfunction (C)	
Input speed/Output speed	0.95 to 1.09
[ON malfunction]	
All of the following conditions are met: ON malfunction (A), (B) and (C)	
ON malfunction (A)	
Input speed/Output speed	2.75 to 3.35
ON malfunction (B)	
Input speed/Output speed	0.64 to 0.78
ON malfunction (C)	
Input speed/Output speed	0.64 to 0.78

INSPECTION PROCEDURE

1	**Check shift solenoid valve No. 1 or No. 2 operation.**



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

(a) By applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does leak air.

(b) When battery voltage is supplied to the shift solenoid valve, check that the valve closes.

OK:

(a) Solenoid valve does leak air.

(b) Solenoid valve closes.

NG → **Replace the shift solenoid valve No. 1 or No. 2.**

OK

2	**Check the valve body (See page DI–785).**

NG → **Repair or replace the valve body.**

OK

Repair or replace the transaxle.

DI32W–11

DTC	P0753	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve S1)

DTC	P0758	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve S2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF of the shift solenoid valve No. 1 and No. 2 controlled by ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Range	NORMAL			SHIFT SOLENOID VALVE NO. 1 MALFUNCTIONING			SHIFT SOLENOID VALVE NO. 2 MALFUNCTIONING			BOTH SHIFT SOLENOID VALVES MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		
D	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
	OFF	ON	O/D	X	ON	O/D	OFF	X	3rd	3rd
2	ON	ON	1st	X	OFF	3rd	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd
	OFF	OFF	3rd	X	OFF	3rd	OFF	X	3rd	3rd
L	ON	ON	1st	X	OFF	1st	ON	X	2nd	3rd
	ON	OFF	2nd	X	OFF	3rd	ON	X	2nd	3rd

X: Malfunctions

HINT:

Check the sift solenoid valve No. 1 when DTC P0753 is output and check the shift solenoid valve No. 2 when DTC P0758 is output.

DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	The ECM checks for an open or short circuit in the shift solenoid valve No. 1/No. 2 circuit when it changes. The ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once, but it does not blink the MIL. After ECM detects condition (a) or (b) continuously 2 times or more in 1–trip, it causes the MIL to light up until condition (a) or (b) disappears. After that, if the ECM detects condition (a) or (b) once, it starts lighting up MIL again. (a) Solenoid resistance is 8 Ω or less (short circuit) when the solenoid is energized. (b) Solenoid resistance is 100 kΩ or more (open circuit) when the solenoid is not energized.	• Open or short in shift solenoid valve No. 1/No. 2 circuit • Shift solenoid valve No. 1/No. 2 • ECM

Fail safe function:
If either of the solenoid valve circuits develops an open or short, the ECM turns the other solenoid valve ON and OFF to shift to the gear positions shown in the table on the previous page. The ECM also turns the shift solenoid valve ST OFF at the same time. If both solenoids malfunction, hydraulic control cannot be performed electronically and must be done manually.
Manual shifting as shown in the table on the previous page must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

MONITOR DESCRIPTION

The ECM commands gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail–safe function and turns the other shift solenoid valves in good condition "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.).

MONITOR STRATEGY

Related DTCs	P0753	Shift solenoid valve S1/Range check (Low resistance)
		Shift solenoid valve S1/Range check (High resistance)
	P0758	Shift solenoid valve S2/Range check (Low resistance)
		Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	P0753: Shift solenoid valve S1	
	P0758: Shift solenoid valve S2	
Frequency of operation	Continuous	
Duration	0.032 sec.	
MIL operation	Immediate	
Sequence of operation	None	

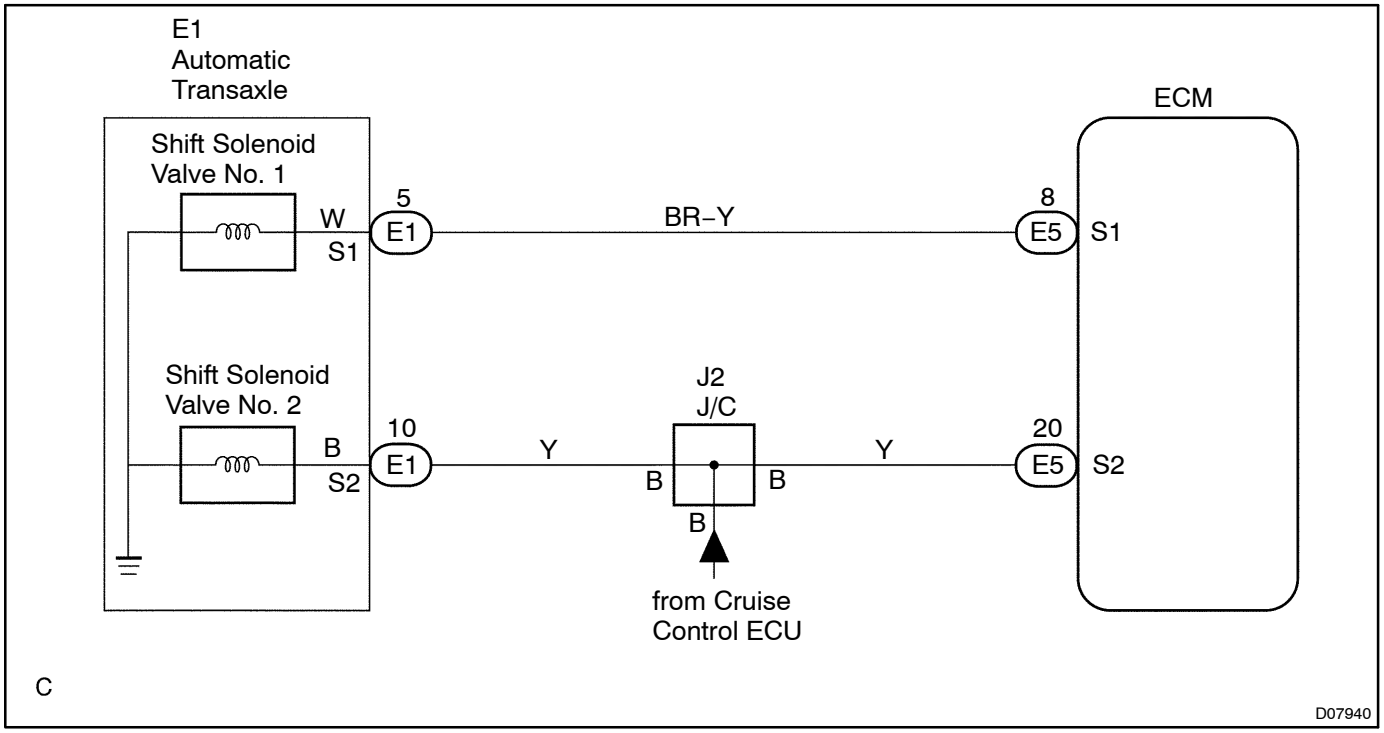
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present.	See page DI–758	
Range check (Low resistance)		
Shift solenoid valve	ON	
Range check (High resistance)		
Shift solenoid valve	OFF	

TYPICAL MALFUNCTION THRESHOLDS

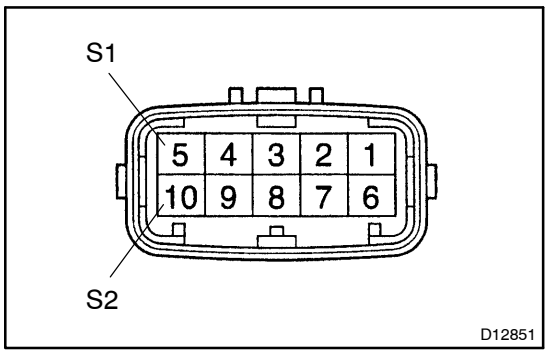
Detection criteria	Threshold
Either of the following conditions is met: Range check (Low resistance) or (High resistance)	
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or more

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check transmission wire.**

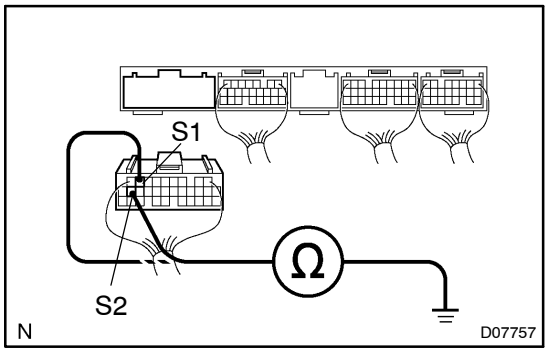


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between S1 and S2 of transmission wire connector and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68°F)

NG	**Go to step 3.**

OK

2	Measure resistance between terminal S1 or S2 of ECM and body ground.



PREPARATION:

(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector of the ECM.

CHECK:

Measure resistance between terminal S1 or S2 of ECM and body ground.

OK:

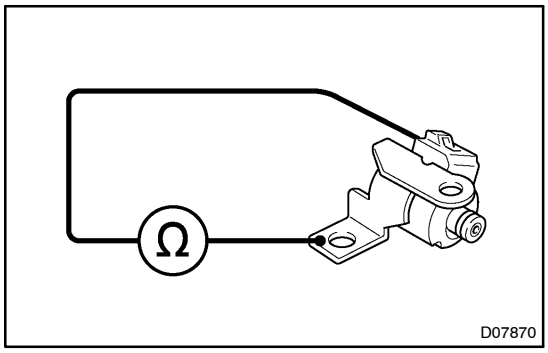
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Repair or replace the harness or connector (See page IN–30).

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve No. 1 or No. 2.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.
(d) Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

Measure resistance between solenoid connector and body ground.

OK:

Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG	Replace the solenoid valve.

OK

Repair or replace transmission wire (See page IN–30).

DIAJF–03

DTC	P0785	Shift/Timing Solenoid (Shift Solenoid Valve ST)

CIRCUIT DESCRIPTION

Shift solenoid valve ST is switched ON–OFF by a signal from ECM so that let in or out timing of 2nd brake is adjusted by operating orifice control valve. Therefore, ST solenoid operates when letting in or out reverse clutch.
If it is broken, the shift shock becomes big.

DTC No.	DTC Detecting Condition	Trouble Area
P0785	ECM memorizes DTC P0785 if (a) or (b) condition below is detected once or more. (1–trip detection logic) (a) Solenoid resistance is 8 Ω or lower (short circuit) when solenoid energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized.	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM

MONITOR DESCRIPTION

The ECM reduces the gear shift shock when shifting from the N position to the D position and from 3rd gear to 4th gear by regulating the hydraulic line pressure. To regulate the pressure, the ECM controls shift–solenoid ST with a duty–cycle signal that adjusts the line–pressure.
If the ECM detects an open or short in the shift–solenoid ST circuit, it will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0785	Shift solenoid valve ST/Range check (Low resistance)
		Shift solenoid valve ST/Range check (High resistance)
Required sensors/Components	Shift solenoid valve ST	
Frequency of operation	Continuous	
Duration	0.032 sec.	
MIL operation	Immediate	
Sequence of operation	None	

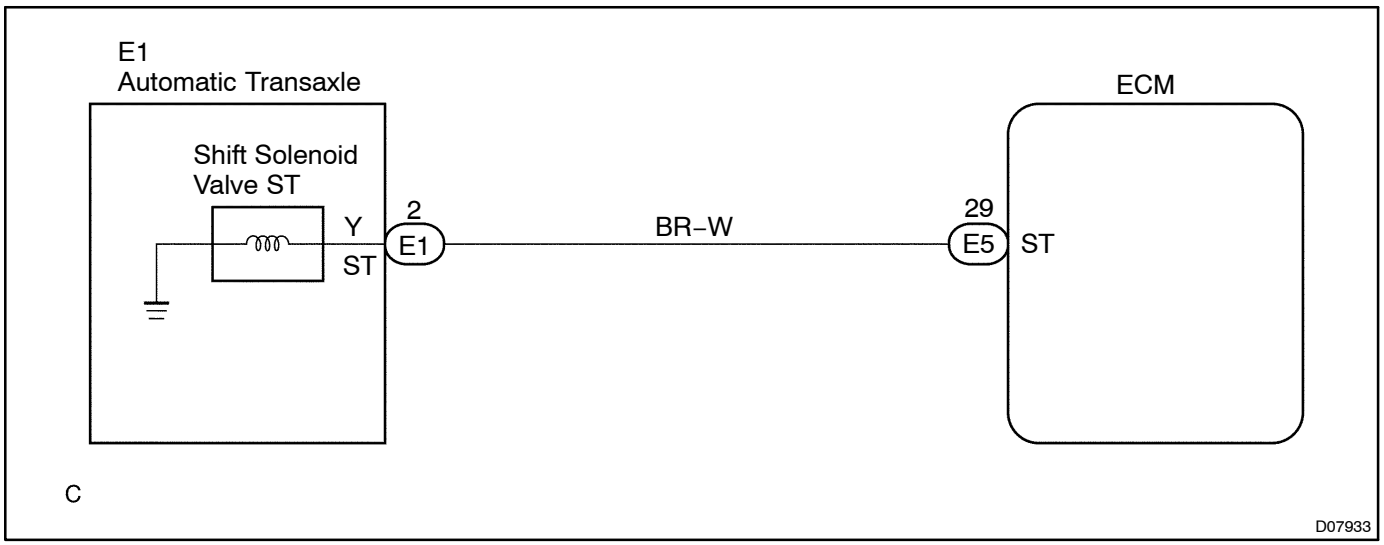
TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Range check (Low resistance)		
Shift solenoid valve	ON	
Range check (High resistance)		
Shift solenoid valve	OFF	

TYPICAL MALFUNCTION THRESHOLDS

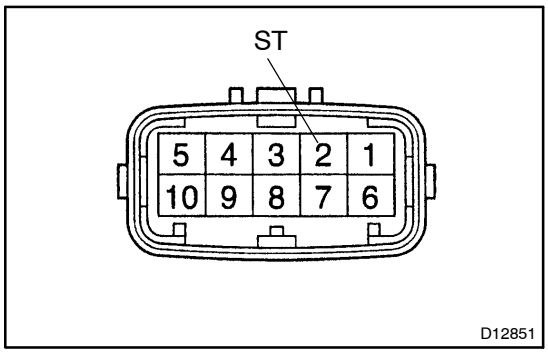
Detection criteria	Threshold
Either of the following conditions is met: Range check (Low resistance) or (High resistance)	
Range check (Low resistance)	
Shift solenoid valve resistance	8 Ω or less
Range check (High resistance)	
Shift solenoid valve resistance	100 kΩ or less

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check transmission wire.

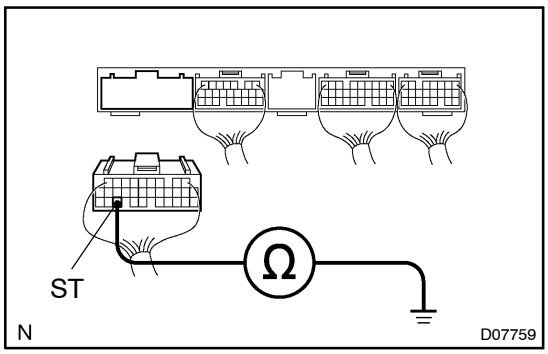


PREPARATION:
Disconnect the transmission wire connector.
CHECK:
Measure resistance between ST of transmission wire and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Go to step 3.**

OK

2	Measure resistance between terminal ST of ECM and body ground.



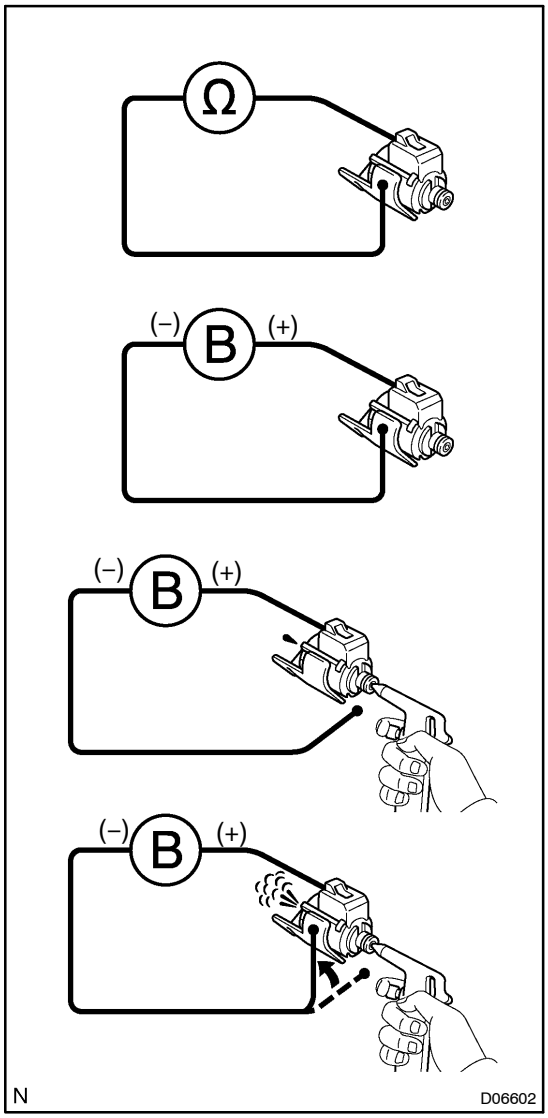
PREPARATION:
(a) Connect the transmission wire connector.
(b) Remove the ECM hood.
(c) Disconnect the connector from ECM.
CHECK:
Measure resistance between terminal ST of ECM and body ground.
OK:
Resistance: 11 to 15 Ω at 20 °C (68 °F)

NG → **Repair or replace the harness or connector (See page IN–30).**

OK

Check and replace the ECM (See page IN–30).

3	Check shift solenoid valve ST.



Electrical check:

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Remove the shift solenoid valve ST.

CHECK:

(a) Measure resistance between solenoid connector and body ground.
(b) Connect positive ⊕ lead to terminal of solenoid connector, negative ⊖ lead to solenoid body.

OK:

(a) Resistance: 11 to 15 Ω at 20 °C (68 °F)
(b) The solenoid makes an operating noise.

Mechanical check:

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.
(d) Remove the shift solenoid valve ST.

CHECK:

(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valves do not leak air.
(b) When battery voltage is supplied to the shift solenoid valves, check that the solenoid valve opens.

OK:

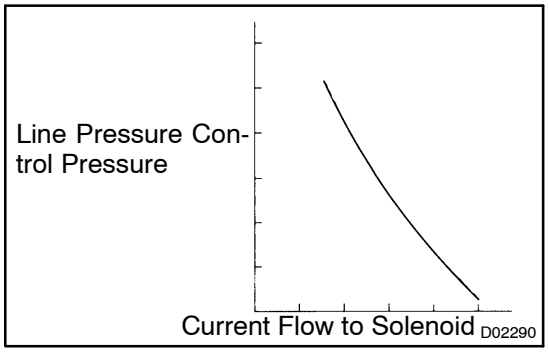
(a) Solenoid valve does not leak air.
(b) Solenoid valve opens.

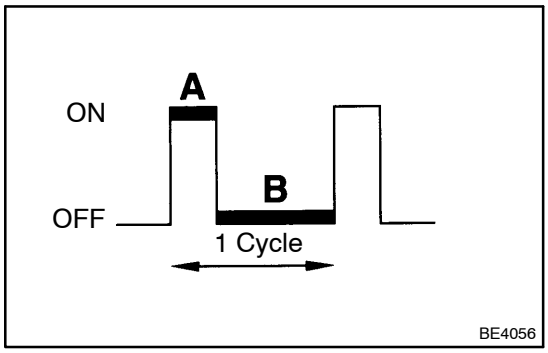
NG → **Replace the shift solenoid valve ST.**

OK

Repair or replace the transmission wire (See page AX–5).

DTC	P2716	Pressure Control Solenoid ”D” Electrical (Shift Solenoid Valve SLT)





CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates line pressure) causes the shift solenoid valve SLT, under electronic control, to precisely and minutely modulate and generate line pressure according to the accelerator pedal effort, or engine power output detected.

This controls the line pressure and provides smooth shifting characteristics.

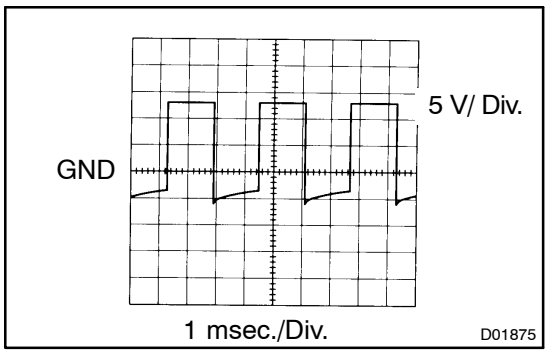
Upon receiving the throttle valve opening angle signal, ECM controls the line pressure by sending a predetermined (*) duty ratio to the solenoid valve, modulating the line pressure, generating throttle pressure.

(*) Duty Ratio:

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$

DTC No.	DTC Detecting Condition	Trouble Area
P2716	(a) or (b) condition below is detected 1 second or more. (1–trip detection logic) (a) SLT^- terminal: 0V (b) SLT^- terminal: 12V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM



HINT:

Refer to the chart for the waveform between terminals SLT^+ and SLT^- during engine idling.

MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P2716	Shift solenoid valve SLT/Range check
Required sensors/Components	Shift solenoid valve SLT	
Frequency of operation	Continuous	
Duration	1 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever this DTC is not present.	See page DI–758	
Solenoid current shout OFF	Not cut	
Battery voltage	11 V or more	–
CPU command duty ratio to SLT	19% or more	–
Starter	OFF	

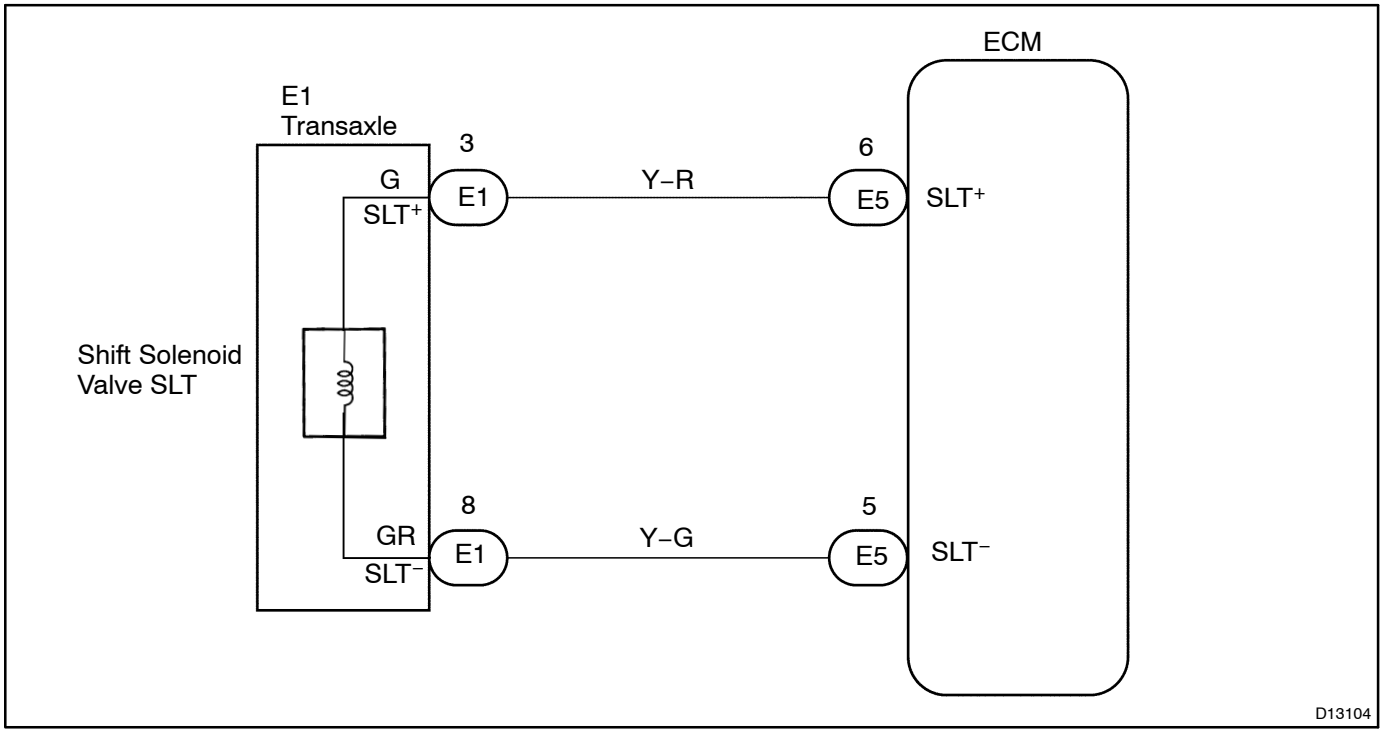
TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Diagnostic signal from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

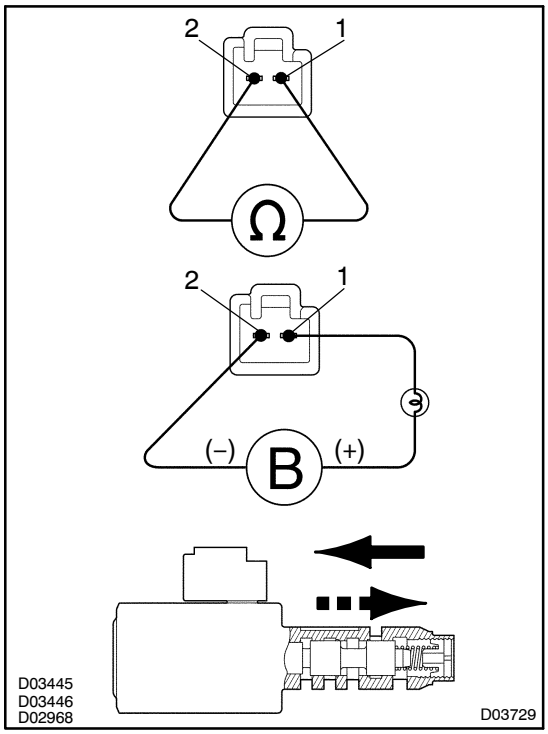
Parameter	Standard value
Output signal duty	Less than 100%

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check shift solenoid valve SLT.



PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the solenoid connector.

Check solenoid resistance:

CHECK:

Measure resistance between terminals 1 and 2 of solenoid connector.

OK:

Resistance: 5.0 to 5.6 Ω at 20 °C (68 °F)

Check solenoid operation:

CHECK:

Connect positive (+) lead with an 5 to 6 W bulb to terminal 1 of solenoid connector and negative (–) lead to terminal 2, then check the movement of the valve.

HINT:

The solenoid valve operates with the current of 0.9 – 1.0 A.

OK:

When battery positive voltage is applied.	Valve moves in ■■➡ direction in illustration.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration.

NG → **Replace SLT solenoid valve.**

OK ↓

2	Check harness and connector between shift solenoid valve SLT and ECM (See page IN–30).

NG → **Repair or replace harness or connector.**

OK ↓

Check and replace the ECM (See page IN–30).

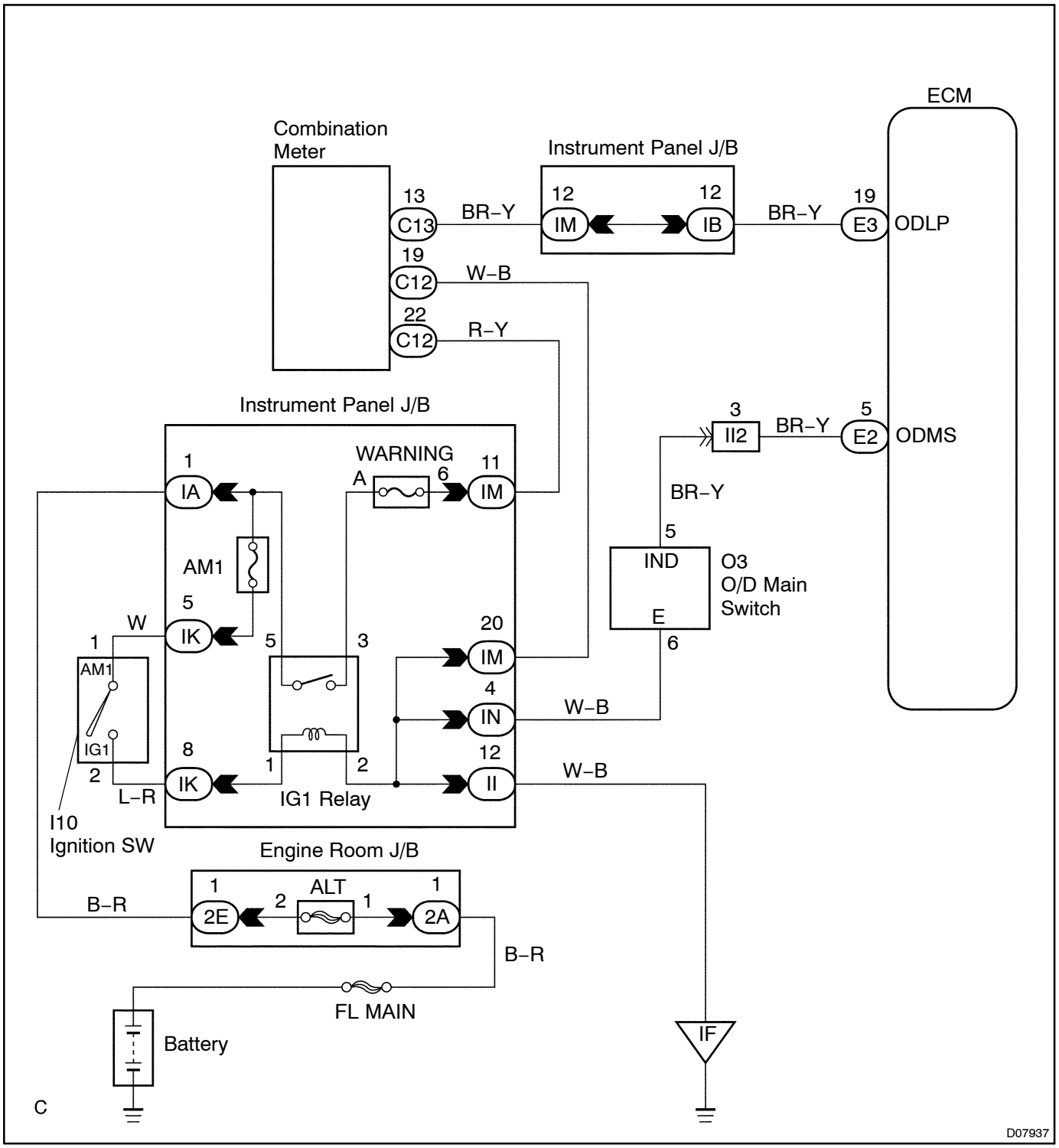
DI69O–14

O/D Main Switch & O/D OFF Indictor Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch is a momentary type switch. When pressing the O/D main switch, the O/D OFF indicator light lights up and ECM prohibits shifting to O/D, and when pressing it again, the O/D OFF indicator light goes off and ECM allows shifting to O/D. Turning the ignition switch off will reset the O/D OFF indicator light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of O/D main switch.**

PREPARATION:
Turn the ignition switch ON.
CHECK:
(a) Check O/D OFF indicator light when O/D main switch is pushed in to ON.
(b) Check O/D OFF indicator light when O/D main switch is pushed again.
OK:
(a) O/D OFF indicator light lights up.
(b) O/D OFF indicator light goes off.

OK → **Proceed to next inspection shown on problem symptoms tables (See page DI–785).**

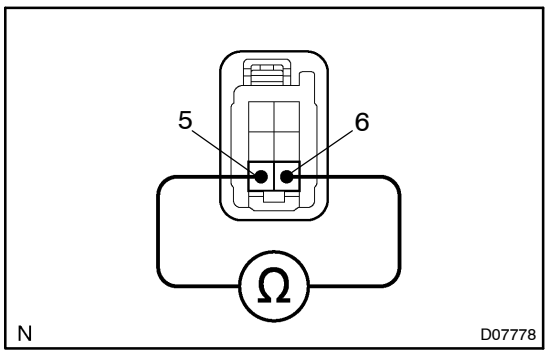
NG

2	**Check and replace the combination meter (See page BE–2).**

NG → **Replace the combination meter.**

OK

3	**Check O/D main switch.**



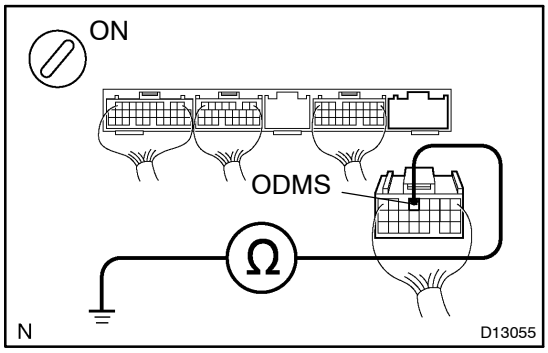
PREPARATION:
Disconnect the O/D main switch connector.
CHECK:
Check continuity between terminals 5 and 6 of O/D main switch connector.
OK:

O/D main switch condition	Specified condition
Press continuously O/D main switch	Continuity
Release O/D main switch	No continuity

NG → **Replace and repair O/D main switch.**

OK

4	Check harness and connector between terminal ODMS of ECM and body ground.



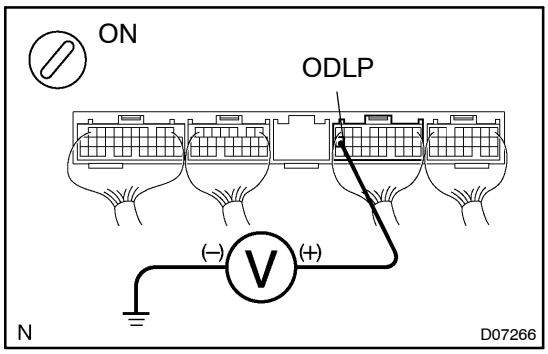
PREPARATION:
Disconnect the connector of ECM.
CHECK:
Check continuity between terminal ODMS of ECM and body ground when O/D main switch is ON and OFF.
OK:

O/D main switch	Specified voltage
Press continuously O/D main switch	Continuity
Release O/D main switch	No Continuity

NG → **Repair or replace harness or connector (See page IN–30).**

OK

5	Check voltage between terminal ODLP of ECM and body ground.



PREPARATION:
(a) Disconnect the connector of ECM.
(b) Turn the ignition switch ON.
CHECK:
Check voltage between terminal ODLP of ECM and body ground.
OK:
Voltage: 7.5 to 14 V

NG → **Repair or replace harness or connector (See page IN–30).**

OK

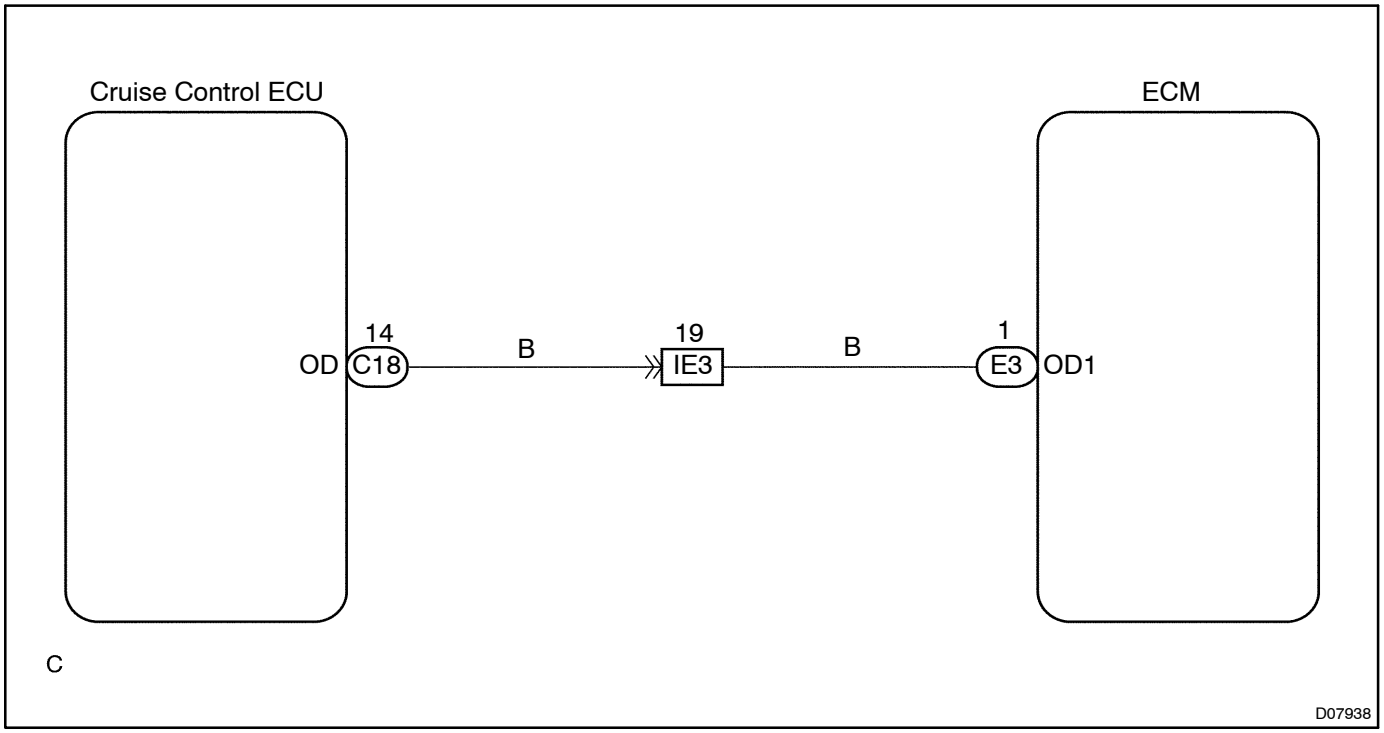
Check and replace the ECM (See page IN–30).

O/D Cancel Signal Circuit

CIRCUIT DESCRIPTION

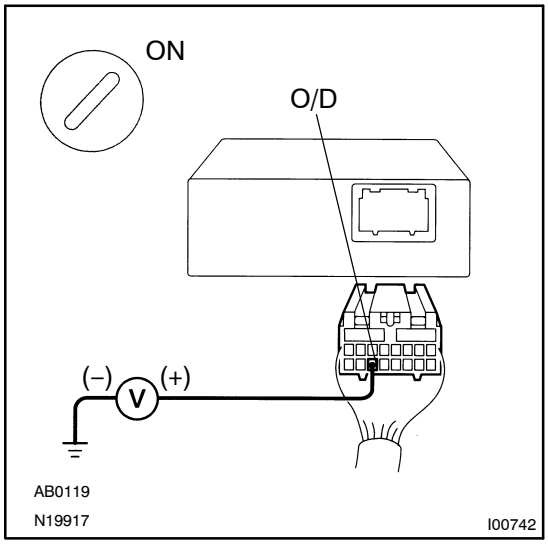
While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruising overdrive may be prohibited temporarily under some condition.
The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels overdrive shifting until these signals are discontinued.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal OD of cruise control ECU harness side connector and body ground.**



PREPARATION:

(a) Disconnect the cruise control ECU connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal OD of cruise control ECU harness side connector and body ground.

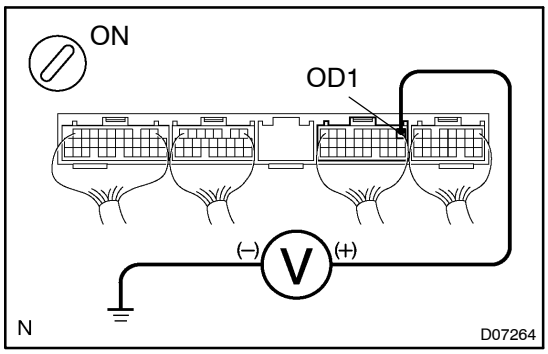
OK:

Voltage: 10 to 14 V

OK	**Check and replace the cruise control ECU.**

NG

2	**Check voltage between terminal OD1 of ECM and body ground.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminal OD1 of ECM and body ground.

OK:

Voltage: 10 to 14 V

OK	**Repair or replace the harness or connector (See page IN–30).**

NG

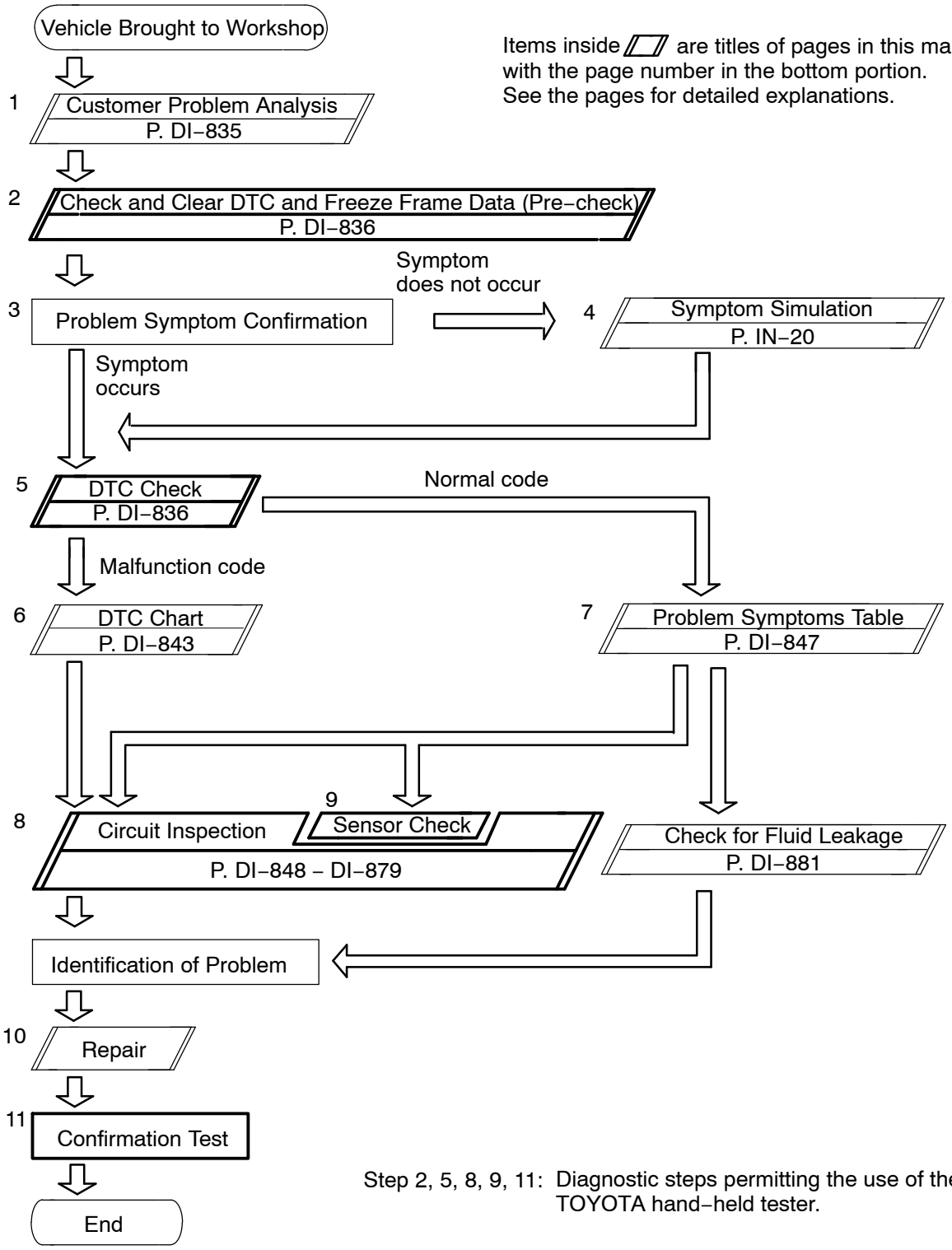
Check and replace the ECM (See page IN–30).

ANTI–LOCK BRAKE SYSTEM WITH ELECTRONIC BRAKE FORCE DISTRIBUTION (EBD)

DI6M7–06

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



Step 2, 5, 8, 9, 11: Diagnostic steps permitting the use of the TOYOTA hand–held tester.

Fail safe function:
When a failure occurs in the ABS system, the ABS warning light comes on and the ABS operation is prohibited. In addition to this, when the failure which disables the EBD operation occurs, the brake warning light comes on as well and the EBD operation is prohibited.

DI6M8–03

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

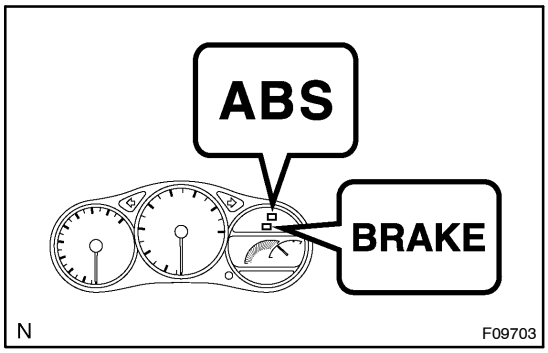
Customer's Name		**Registration No.**	
		Registration Date	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not comes on
	BRAKE Warning Light Abnormal	☐ Remains ON ☐ Does not come on

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DIAIJ–04



PRE–CHECK

1. DIAGNOSIS SYSTEM

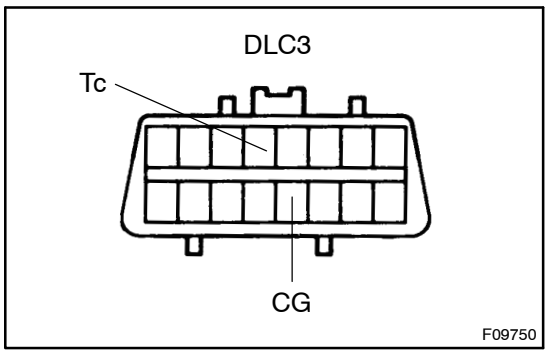
(a) Release the parking brake lever.

(b) Check the indicator.

When the ignition switch is turned ON, check that the ABS warning light and the BRAKE warning light come on for approx. 3 seconds.

HINT:

- When the parking brake is applied or the level of the brake fluid is low, the BRAKE warning light come on.
- If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit or BRAKE warning light circuit (See page DI–872 or DI–875).



(c) In the case of not using TOYOTA hand –held tester: Check DTC.

(1) Using SST, connect terminal Tc and CG of DLC3.

SST 09843–18040

(2) Turn the ignition switch to ON.

(3) Read DTC from the ABS warning light on the combination meter.

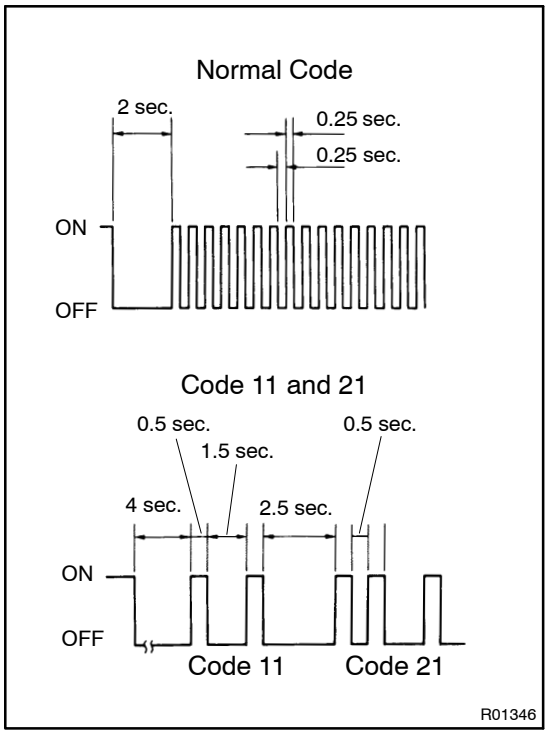
HINT:

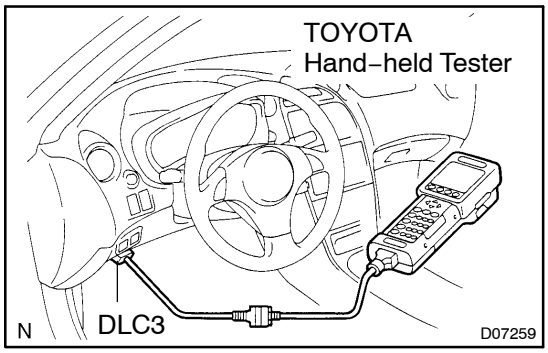
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–877 or DI–872).
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

(4) Codes are explained in the code table on page DI–843.

(5) After completing the check, disconnect terminal Tc and CG, and turn off the display.

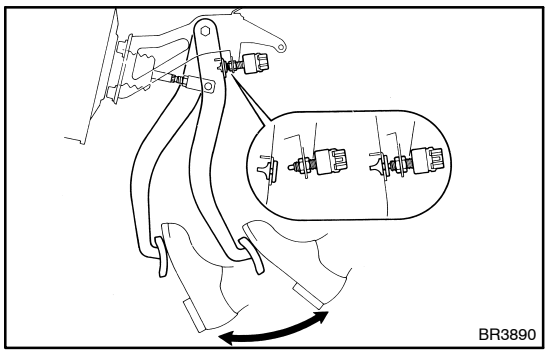
If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed first.



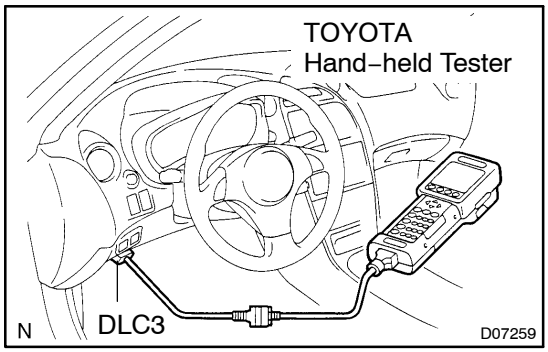


(d) In the case of using TOYOTA hand–held tester:
Check the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Read DTC by following the prompts on the tester screen.

HINT:
Please refer to the TOYOTA hand–held tester operator's manual for further details.



(e) In case of not using TOYOTA hand–held tester:
Clear the DTC.
(1) Using SST, connect terminals Tc and CG of DLC3.
SST 09843–18040
(2) Turn the ignition switch to ON.
(3) Clear the DTC stored in ECU by depressing the brake pedal 8 times or more within 5 seconds.
(4) Check that the warning light shows the normal code.
(5) Remove the SST from the terminals of DLC3.
SST 09843–18040



(f) In the case of using TOYOTA hand–held tester:
Clear the DTC.
(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch to ON.
(3) Operate the TOYOTA hand–held tester to erase the codes.

HINT:
Please refer to the TOYOTA hand–held tester operator's manual for further details.

2. DATA LIST

HINT:

By the DATA LIST displayed by the TOYOTA hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch to ON.

(c) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF		
SOL RELAY	Solenoid relay / ON or OFF		
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake released	
ABS OPERT FR	ABS operation (FR) / BEFORE or OPERATE	BEFORE : No ABS operation (FR) OPERATE : During ABS operation (FR)	
ABS OPERT FL	ABS operation (FL) / BEFORE or OPERATE	BEFORE : No ABS operation (FL) OPERATE : During ABS operation (FL)	
ABS OPERT RR	ABS operation (RR) / BEFORE or OPERATE	BEFORE : No ABS operation (RR) OPERATE : During ABS operation (RR)	
ABS OPERT RL	ABS operation (RL) / BEFORE or OPERATE	BEFORE : No ABS operation (RL) OPERATE : During ABS operation (RL)	
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.5 V or over TOO LOW : Below 9.5 V	
SFRR	ABS solenoid (SFRR) ON / OFF		

SFRH	ABS solenoid (SFRH) ON / OFF		
SFLR	ABS solenoid (SFLR) ON / OFF		
SFLH	ABS solenoid (SFLH) ON / OFF		
SRRR (SRR)	ABS solenoid (SRRR (SRR)) ON / OFF		
SRRH (SRH)	ABS solenoid (SRRH (SRH)) ON / OFF		
SRLR	ABS solenoid (SRLR) ON / OFF		
SRLH	ABS solenoid (SRLH) ON / OFF		
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	Supported	
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 20	

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the TOYOTA hand–held tester allows the relay, the actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON.

(c) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid (SFRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid (SFLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR	Turns ABS solenoid (SRRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid (SRLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH) ON / OFF	Operation of solenoid (clicking sound) can be heard

SFRR & SFRH	Turns ABS solenoid SFRR & SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRH & SRR	Turns ABS solenoid SRH & SRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SOL RELAY	Turns ABS solenoid relay ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter

4. FREEZE FRAME DATA

(a) The vehicle (sensor) status at the occurrence of abnormality of the diagnosis code and during the ABS operation can be memorized and displayed using the TOYOTA hand–held tester.

(b) Only one record of the freeze frame data is stored, however, the freeze frame data during the ABS operating is always up–dated. After the storage of the freeze frame data, up to 31 ignition ”ON” operations are stored and displayed.

HINT:

If the ignition switch ”ON” operation exceeds 31 times, ”31” appears on the display.

(c) If the diagnosis code abnormality occurs, the freeze frame data at the occurrence of the abnormality is stored but the ABS actuation data is deleted.

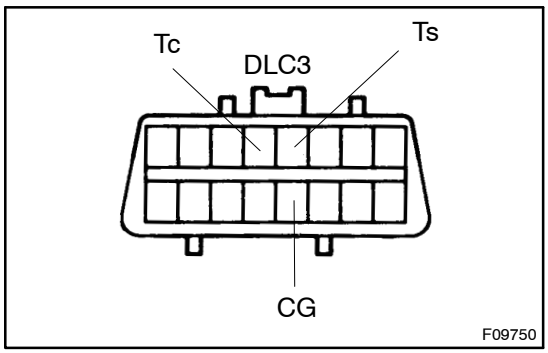
Hand–held Tester Display	Measurement Item	Reference Value*
VEHICLE SPD	Wheel speed reading	Speed indication of a meter
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Number of operations of ignition switch ON after memorizing freeze frame data	0 – 31
SYSTEM	System status	ABS activated: ABS Fail safe mode activated: FAIL SF No system activated: NO SYS

*: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

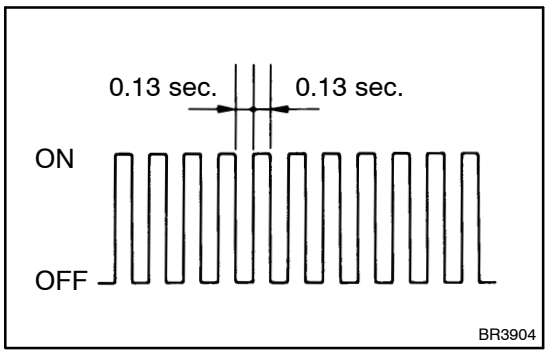
5. SPEED SENSOR SIGNAL

HINT:

- If the ignition switch is turned from ON to ACC or LOCK during test mode, DTC of sensor check function will be erased.
- During test mode, ECU records all DTC of sensor check function. By preforming sensor signal check, the codes are erased if normality is confirmed. The codes remain if abnormality is found.



(a) In case of not using TOYOTA hand–held tester:
Check the speed sensor signal.
(1) Turn the ignition switch to OFF.
(2) Using SST, connect terminal Ts and CG of DLC3.
SST 09843–18040
(3) Start the engine.



(4) Check that the ABS warning light blinks.

HINT:

If the ABS warning light does not blink, inspect the ABS warning light circuit and the Ts circuit (See page DI–872 and DI–879).

(5) Drive vehicle straight forward.

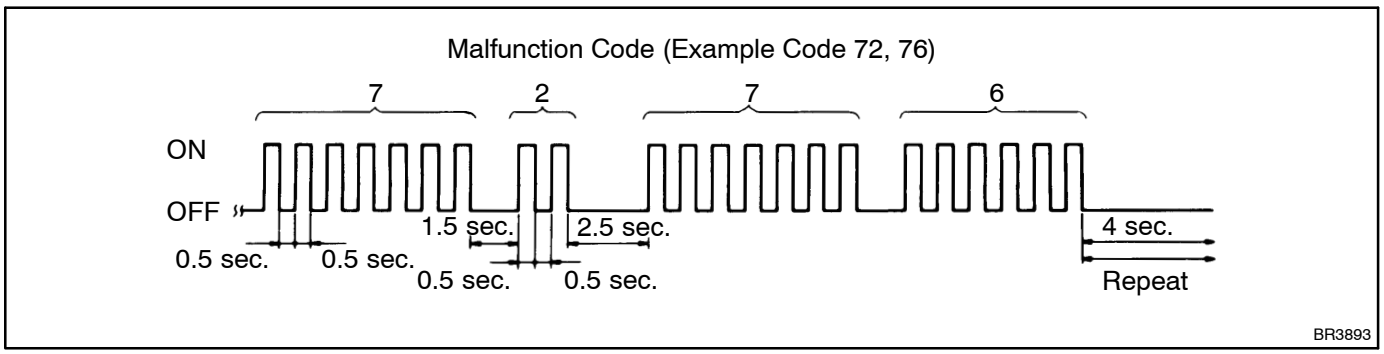
HINT:

Drive vehicle faster than 45 km/h (28 mph) for several seconds.

(6) Stop the vehicle.
(7) Using SST, connect terminal Tc and CG of DLC3.
SST 09843–18040
(8) Read the number of times of the ABS warning light blinks.

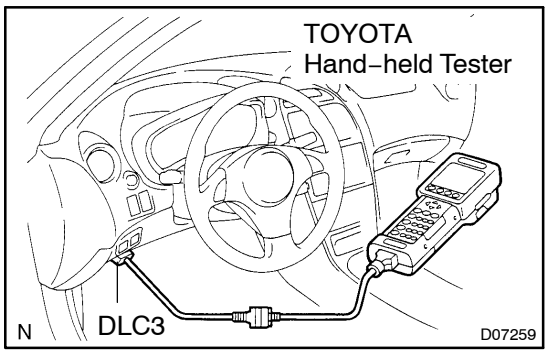
HINT:

- See the list of DTC shown on the DTC chart (See page DI–843).
- If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



(9) After doing the check, disconnect the SST from terminal Ts and CG, Tc and CG of DLC3, and turn the ignition switch to OFF.

SST 09843–18040



(b) In case of using TOYOTA hand–held tester:
Check DTC.

(1) Hook up the TOYOTA hand–held tester to the DLC3.
(2) Do step (3) to (6) on the previous page.
(3) Read DTC by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operator's manual for further details.

DI6MA–03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- Using SST 09843–18040, connect the terminals Tc and CG of the DLC3.
- If any abnormality is not found as inspecting parts, inspect ECU.
- If a malfunction code is displayed during the DTC check, check the circuit listed for the code. For details of each code, turn to the page referred to under the ”See page” for respective ”DTC No.” in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area
C0278/11 (DI–860)	Open circuit in ABS solenoid relay circuit	• ABS solenoid relay • ABS solenoid relay circuit • ABS actuator
C0279/12 (DI–860)	Short circuit in ABS solenoid relay circuit	
C0273/13 (DI–857)	Open circuit in ABS motor relay circuit	• ABS motor relay • ABS motor relay circuit • ABS actuator
C0274/14 (DI–857)	Short circuit in ABS motor relay circuit	
C0226/21 (DI–855)	Open or short circuit in 2–position solenoid circuit for right front wheel	• ABS actuator • SFRR or SFRH circuit
C0236/22 (DI–855)	Open or short circuit in 2–position solenoid circuit for left front wheel	• ABS actuator • SFLR or SFLH circuit
C0246/23 (DI–855)	Open or short circuit in 2–position solenoid circuit for right rear wheel	• ABS actuator • SRRR or SRRH circuit
C0256/24 (DI–855)	Open or short circuit in 2–position solenoid circuit for left rear wheel	• ABS actuator • SRLR or SRLH circuit
C0200/31 (DI–848)	Right front wheel speed sensor signal malfunction	• Right front or left front speed sensor • Each speed sensor circuit • Speed sensor rotor
C0205/32 (DI–848)	Left front wheel speed sensor signal malfunction	
C0210/33 (DI–848)	Right rear wheel speed sensor signal malfunction	• Right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor • Rear axle hub
C0215/34 (DI–848)	Left rear wheel speed sensor signal malfunction	
C1235/35 (DI–848)	Foreign matter is stuck on the tip of the right front sensor	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor
C1236/36 (DI–848)	Foreign matter is stuck on the tip of the left front sensor	
C1238/38 (DI–848)	Foreign matter is stuck on the tip of the right rear sensor	
C1239/39 (DI–848)	Foreign matter is stuck on the tip of the left rear sensor	
C1241/41 (DI–863)	Power source voltage down	• Battery • Charging system • Power source circuit
C1249/49 (DI–866)	Open circuit in stop light switch circuit	• Stop light switch • Stop light switch circuit • Stop light bulb

C1251/51 (DI–868)	Pump motor is locked	• ABS pump motor
Always ON (DI–870)	Malfunction in ECU	• Battery • Charging system • Skid control ECU

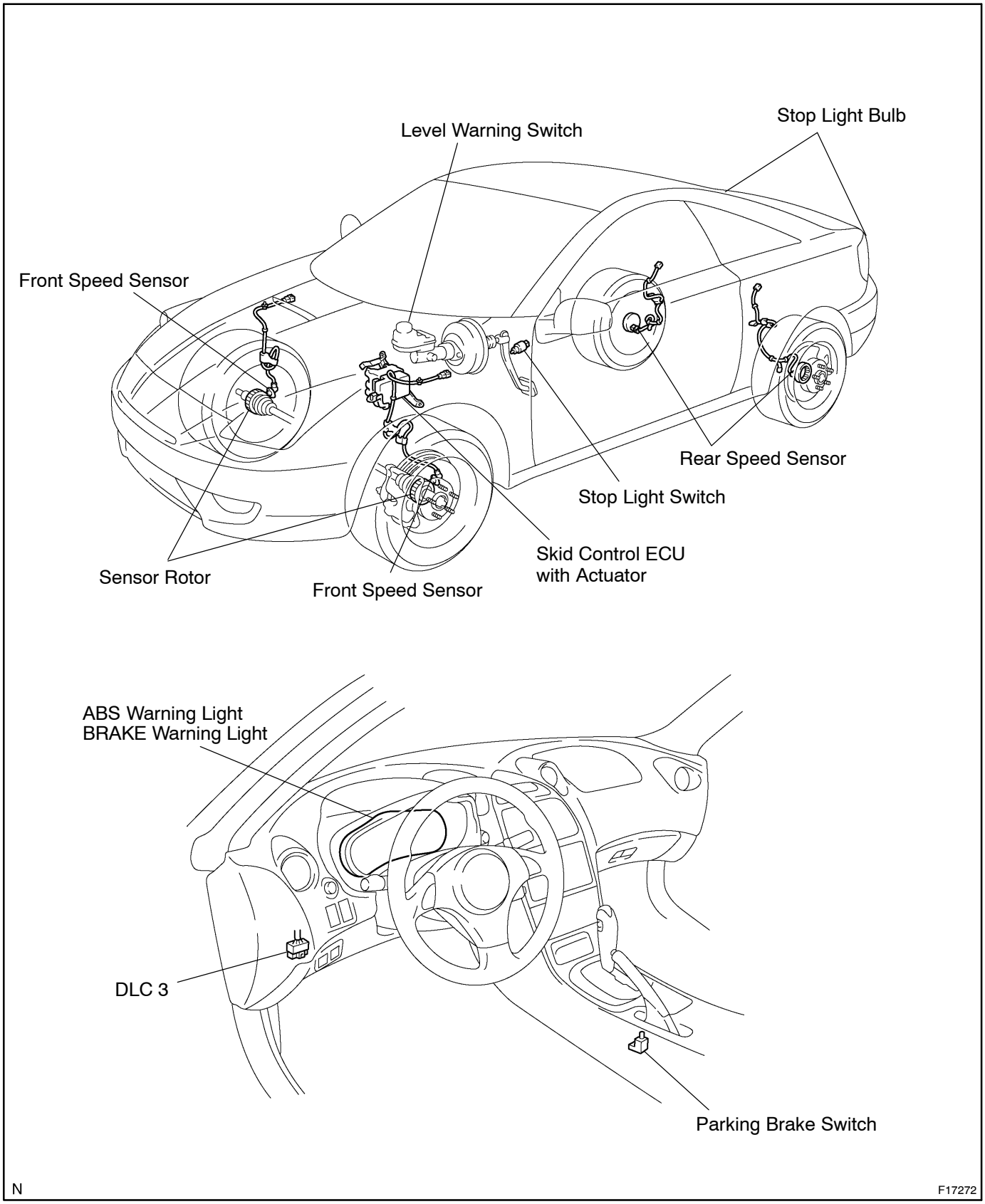
HINT:
There is a case that hand–held tester cannot be used when the ABS warning light remains ON.

DTC of speed sensor check function:

Code No.	Diagnosis	Trouble Area
C1271/71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Right front speed sensor rotor
C1272/72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Left front speed sensor rotor
C1273/73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Right rear speed sensor rotor
C1274/74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Left rear speed sensor rotor
C1275/75	Abnormal change in output voltage of right front speed sensor	Right front speed sensor rotor
C1276/76	Abnormal change in output voltage of left front speed sensor	Left front speed sensor rotor
C1277/77	Abnormal change in output voltage of right rear speed sensor	Right rear speed sensor rotor
C1278/78	Abnormal change in output voltage of left rear speed sensor	Left rear speed sensor rotor

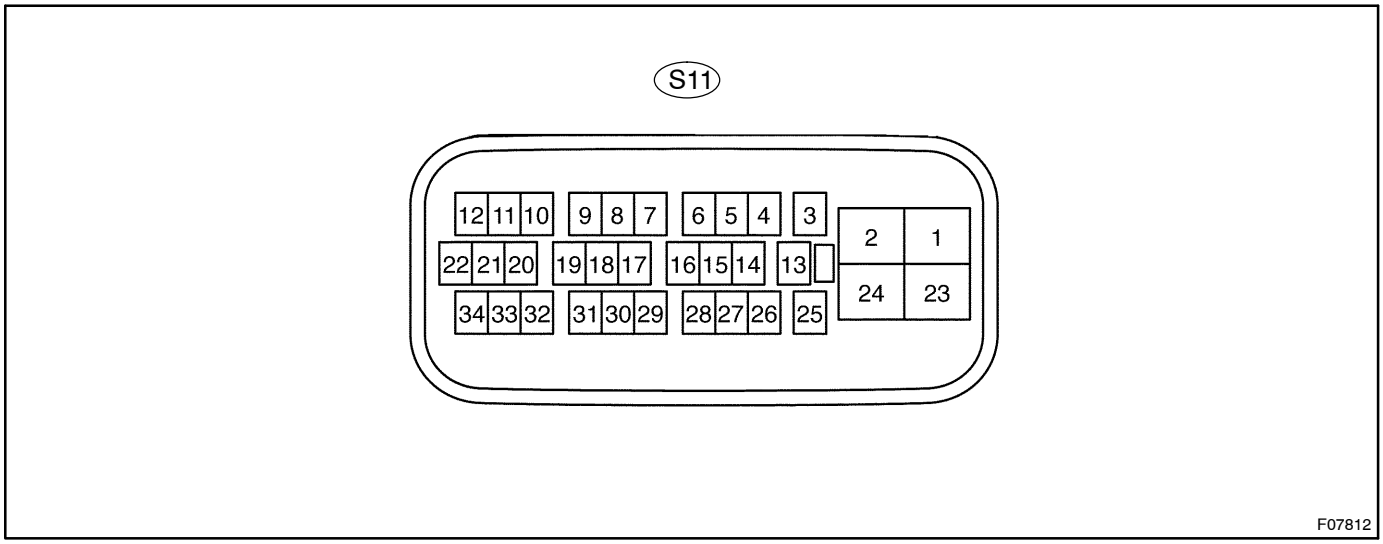
DI6MB–05

PARTS LOCATION



DI6SJ–12

TERMINALS OF ECU



F07812

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
+BS (S11–1) – GND1, 2 (S11–2, 24)	B–W ↔ W–B	Always	11 – 14
PN (S11–5) – GND1, 2 (S11–2, 24)	G–W ↔ W–B	IG switch ON, shift lever is in P position	10 – 14
		IG switch ON, shift lever is in N position	
FL+ (S11–9) – FL– (S11–8)	Y – BR	IG switch ON, slowly turn left front wheel	AC generation
STP (S11–10) – GND1, 2 (S11–2, 24)	G–W ↔ W–B	Stop light switch ON	10 – 14
		Stop light switch OFF	Below 1.0
RL+ (S11–11) – RL– (S11–12)	R ↔ G	IG switch ON, slowly turn left rear wheel	AC generation
WA (S11–13) – GND1, 2 (S11–2, 24)	V ↔ W–B	IG switch ON, ABS warning light ON	10 – 14
		IG switch ON, ABS warning light OFF	Below 2.0
D/G (S11–14) – GND1, 2 (S11–2, 24)	W ↔ W–B	IG switch ON	10 – 14
TS (S11–15) – GND1, 2 (S11–2, 24)	W–R ↔ W–B	IG switch ON	10 – 14
TC (S11–16) – GND1, 2 (S11–2, 24)	P–B ↔ W–B	IG switch ON	10 – 14
PKB (S11–18) – GND1, 2 (S11–2, 24)	R–B ↔ W–B	IG switch ON, parking switch ON	Below 1.0
		IG switch ON, parking switch OFF	10 – 14
+BM (S11–23) – GND1, 2 (S11–2, 24)	B–R ↔ W–B	Always	11 – 14
IG1 (S11–25) – GND1, 2 (S11–2, 24)	B–O ↔ W–B	IG switch ON	10 – 14
SP1 (S11 – 26) – GND1, 2 (S11–2, 24)	L–B ↔ W–B	Vehicle drives at about 20 km/h (12 mph)	Pulse generation
FR+ (S11–31) – FR– (S11–30)	P ↔ L	IG switch ON, slowly turn right front wheel	AC generation
BRL (S11–32) – GND1, 2 (S11–2, 24)	GR ↔ W–B	IG switch ON, brake warning light ON	10 – 14
		IG switch ON, brake warning light OFF	Below 2.0
RR+ (S11–33) – RR– (S11–34)	W ↔ B	IG switch ON, slowly turn right rear wheel	AC generation

DI6MD–05

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing Skid Control ECU, sensor or etc., turn the IG switch OFF.

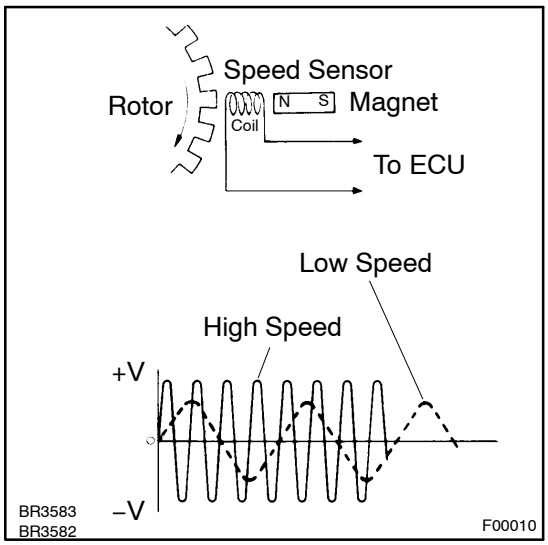
Symptom	Suspect Area	See page
ABS does not operate	Only when 1. to 4. are all normal and the problem is still occurring, replace the Skid Control ECU. 3. Check the DTC reconfirming that the normal code is output. 4. IG power source circuit 5. Speed sensor circuit 6. Check the ABS actuator with a TOYOTA hand–held tester. If abnormal, check the hydraulic circuit for leakage (See page DI–881).	 DI–836 DI–863 DI–848 BR–48
ABS does not operate efficiently	Only when 1. to 4. are all normal and the problem is still occurring, replace the Skid Control ECU. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the ABS actuator with a TOYOTA hand–held tester. If abnormal, check the hydraulic circuit for leakage (See page DI–881).	 DI–836 DI–848 DI–866 BR–48
ABS warning light abnormal	1. ABS warning light circuit 2. Skid Control ECU	DI–872
BRAKE warning light abnormal	1. BRAKE warning light circuit 2. Skid Control ECU	DI–875
DTC check cannot be done	Only when 1. and 2. are all normal and the problem is still occurring, replace the Skid Control ECU. 1. ABS warning light circuit 2. Tc terminal circuit	 DI–872 DI–877
Speed sensor signal check cannot be done	1. Ts terminal circuit 2. Skid Control ECU	DI–879

DI6SL–09

CIRCUIT INSPECTION

DTC	C0200/31 to C1239/39	Speed Sensor Circuit

CIRCUIT DESCRIPTION



The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and the rear rotors each have 48 serrations.

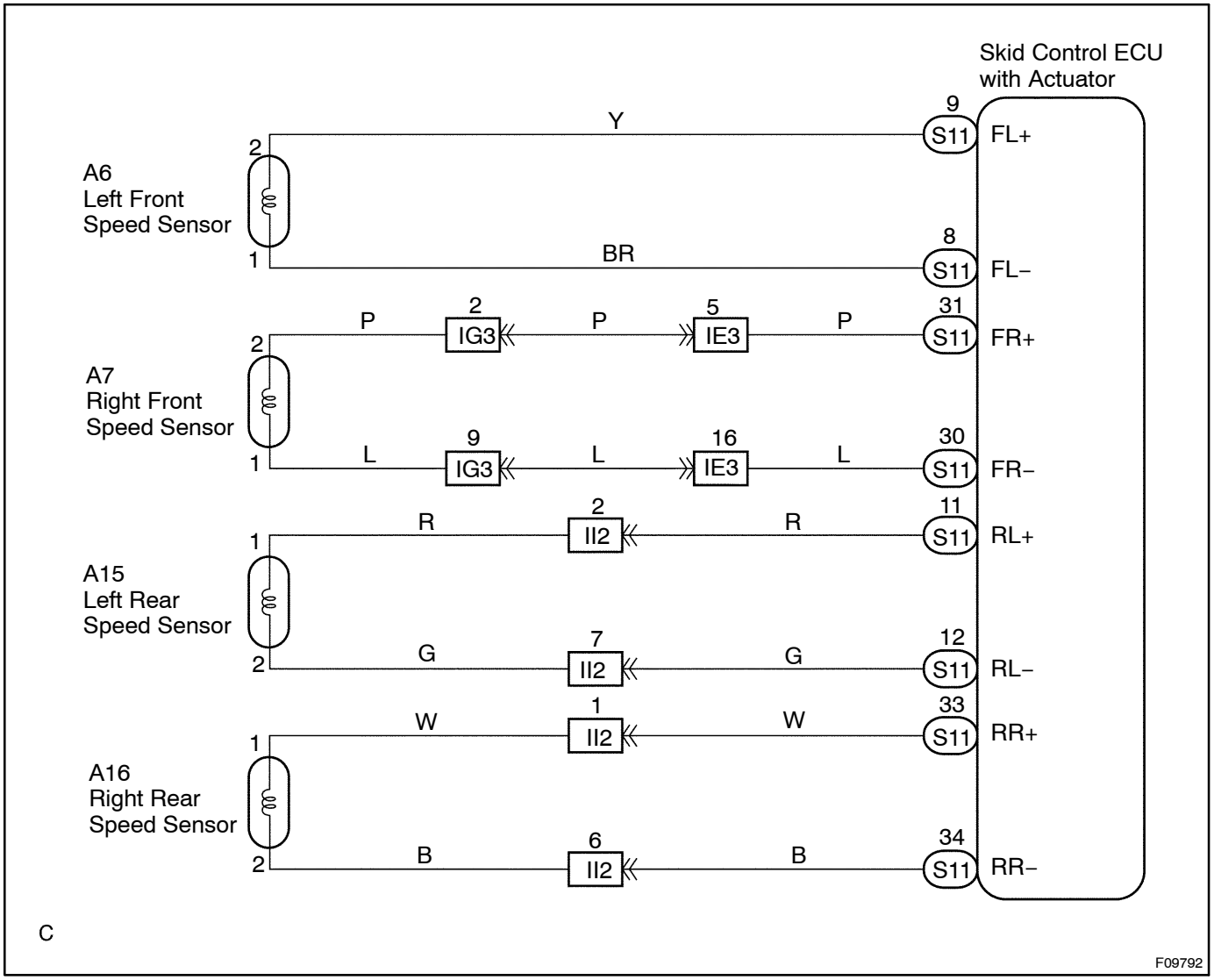
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
C0200/31 C0205/32	Detection of any of conditions from 1. through 3.: 1. Vehicle speed is at 10 km/h (6 mph) or more and the speed sensor signal circuit is open or short circuit continues for 15 sec. or more. 2. Momentary interruption of the speed sensor signal occurs 7 times or more. 3. Open circuit condition of the speed sensor signal circuit continues for 0.5 sec. or more.	• Right front or left front speed sensor • Each speed sensor circuit • Speed sensor rotor
C0210/33 C0215/34		• Right rear and left rear speed sensor • Each speed sensor circuit • Speed sensor rotor • Rear axle hub
C1235/35 C1236/36 C1238/38 C1239/39	Vehicle speed is at 20 km/h (12mph) or more and interference on the speed sensor signal continues for 5 sec. or more.	• Right front, left front, right rear or left rear speed sensor • Each speed sensor circuit • Speed sensor rotor

HINT:

- DTC No. C0200/31 and C1235/35 is for the right front speed sensor.
- DTC No. C0205/32 and C1236/36 is for the left front speed sensor.
- DTC No. C0210/33 and C1238/38 is for the right rear speed sensor.
- DTC No. C0215/34 and C1239/39 is for the left rear speed sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Start the inspection from step 1 in the case of using the TOYOTA hand–held tester and start from step 2 in the case of not using the TOYOTA hand–held tester.

1	**Check output value of speed sensor.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the DATA LIST mode on the TOYOTA hand–held tester.

CHECK:

Check that there is no difference between the speed value output from the speed sensor displayed on the TOYOTA hand–held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference between the two displayed speed values.

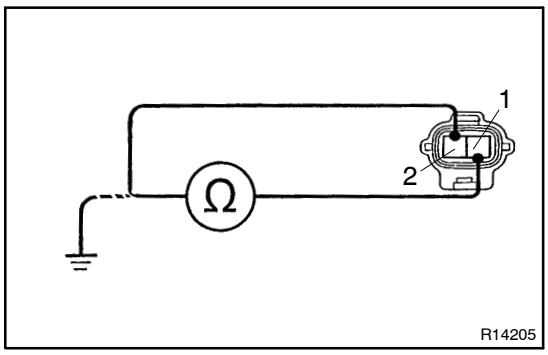
HINT:

There is tolerance of ± 10 % in the speedometer indication.

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

2	**Check speed sensor.**



Front:

PREPARATION:

(a) Remove the front fender liner.
(b) Make sure that there is no looseness at the connector lock part and the connecting part of the connector.
(c) Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector.

OK:

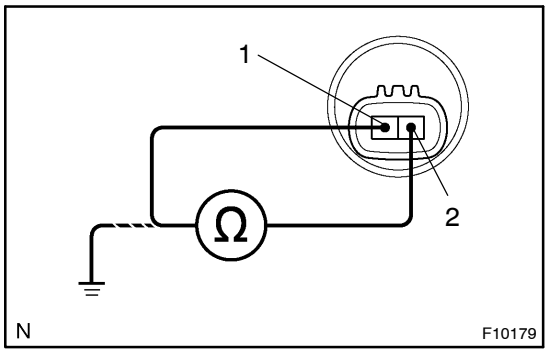
Resistance: 1.4 – 1.8 kΩ at 20 °C

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 10 MΩ or higher



Rear speed sensor:

PREPARATION:

(a) Make sure that there is no looseness at the connector lock part and the connecting part of the connector.

(b) Disconnect the speed sensor connector at hub bearing .

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector.

OK:

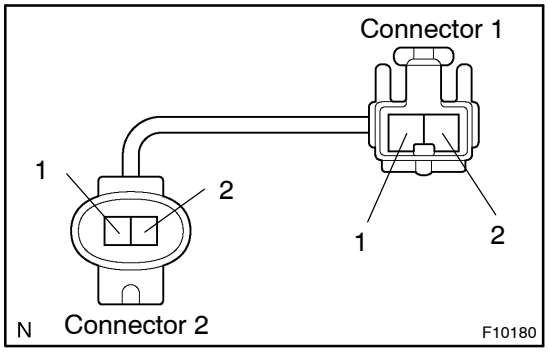
Resistance: 2.2 kΩ or less

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher



Rear speed sensor sub–wire harness:

PREPARATION:

(a) Remove the seat cushion and the seatback.

(b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.

(c) Disconnect the speed sensor sub–wire harness connector inside vehicle.

CHECK:

(a) Measure the resistance between terminal 1 of connector 1 and terminal 2 of connector 2.

(b) Measure the resistance between terminal 2 of connector 1 and terminal 1 of connector 2.

OK:

Resistance: below 1 Ω

CHECK:

Measure the resistance between terminal 1 and 2 of speed sensor connector 1 and body ground.

OK:

Resistance: 10 MΩ or higher

NG → **Replace speed sensor or sub–wire harness.**

NOTICE:

Check the speed sensor signal last (See page DI–836).

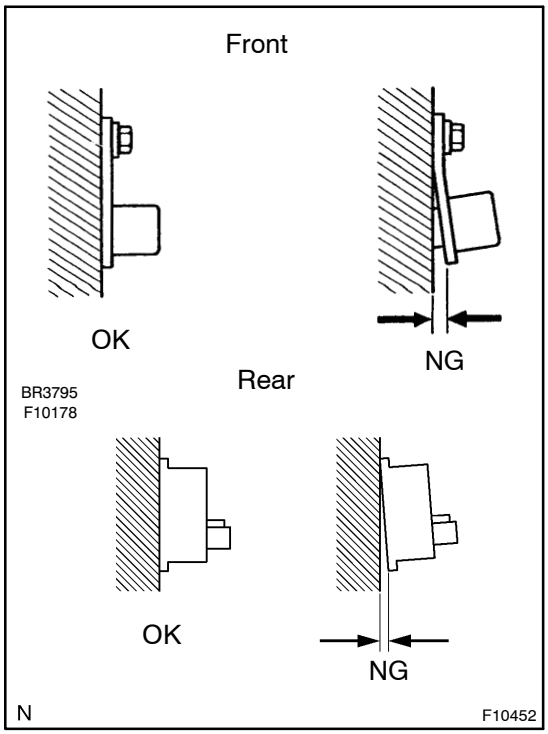
OK

3	**Check for open and short circuit in harness and connector between each speed sensor and Skid Control ECU (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

4	**Check speed sensor installation.**



CHECK:

Check the speed sensor installation.

OK:

Front:

The installation bolt is tightened properly and there is no clearance between the sensor and the steering knuckle.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

Rear:

There is no clearance between the sensor and the rear axle carrier.

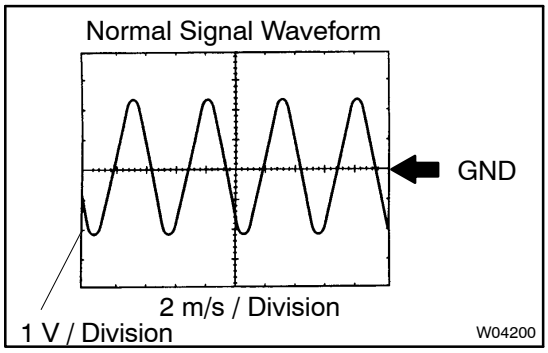
NG → **Replace speed sensor.**

NOTICE:

Check the speed sensor signal again at the end of the procedure (See page DI–836).

OK

5	Check speed sensor and sensor rotor serrations.



REFERENCE: INSPECTION USING OSCILLOSCOPE

PREPARATION:

(a) Disconnect the Skid Control ECU connector.

(b) Connect the oscilloscope to the terminal FR+ – FR–, FL+ – FL–, RR+ – RR– and RL+ – RL– of the Skid Control ECU harness side connector.

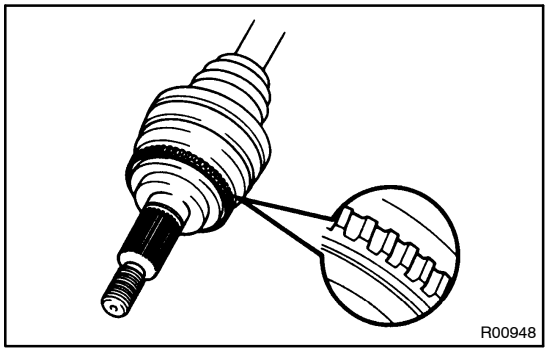
CHECK:

Drive the vehicle with about 30 km/h (19 mph), and check the signal waveform.

OK	Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

NG

6	Check sensor rotor and sensor tip.



Front:

PREPARATION:

Remove the front drive shaft (See page SA–21).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

PREPARATION:

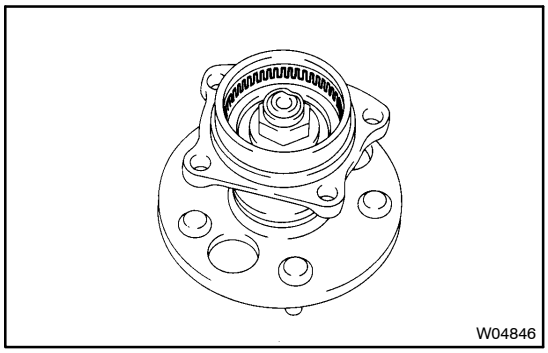
Remove the front speed sensor (See page BR–54).

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



Rear:

PREPARATION:

Remove the rear speed sensor (See page BR–57).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.

NG → **Replace sensor rotor or speed sensor.**

NOTICE:

Check the speed sensor signal again at the end of the procedure (See page DI–836).

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

DI6SM–11

DTC	C0226/21 to C0256/24	ABS Solenoid Valve Circuit

CIRCUIT DESCRIPTION

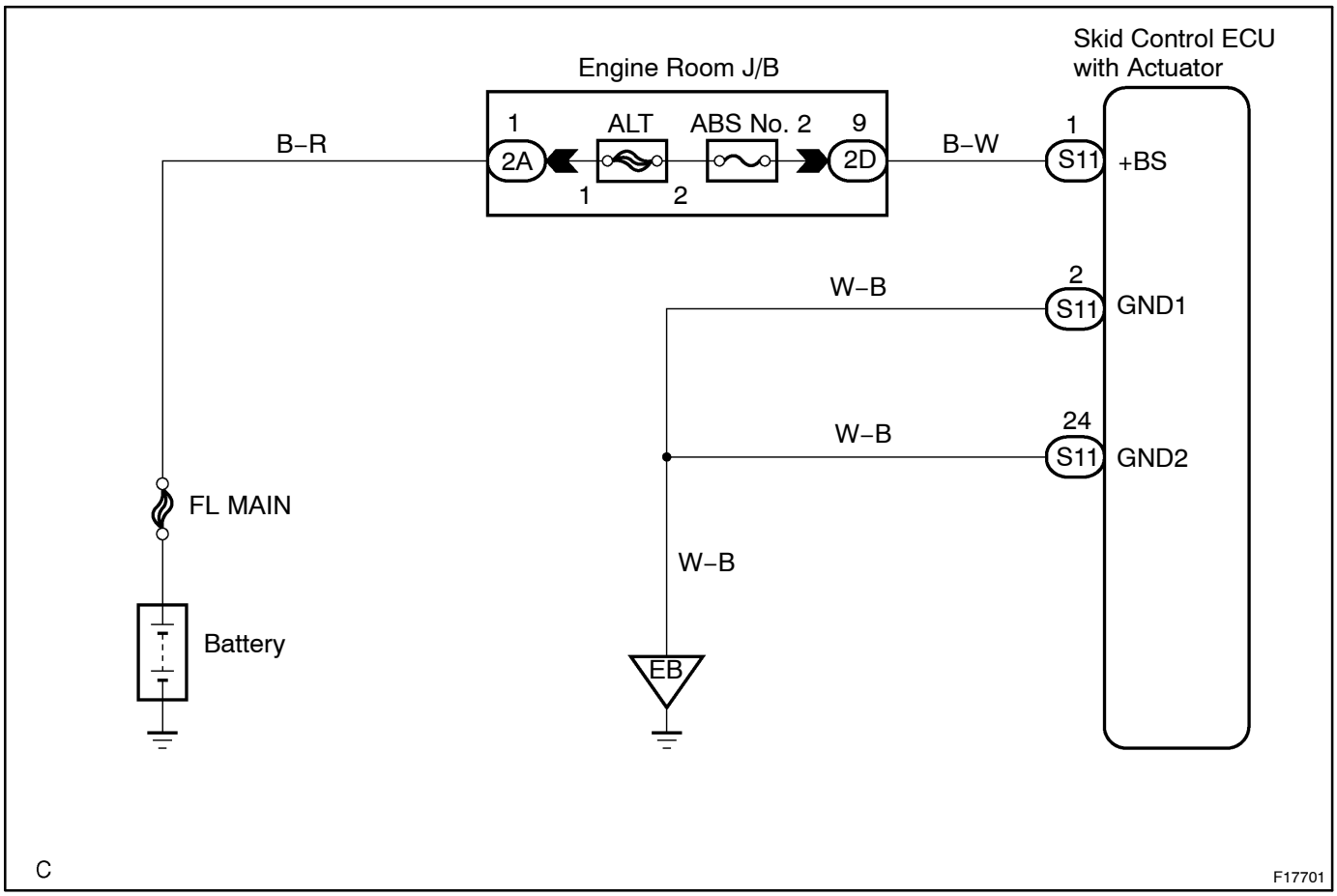
The ABS solenoid valve turns on when signals are sent from the ECU and controls the pressure operating the wheel cylinders, thus the braking force is controlled.

DTC No.	DTC Detection Condition	Trouble Area
C0226/21 C0236/22	1. When solenoid relay is ON and IG1 terminal voltage is 9.5 – 18.5 V, solenoid circuit is open or short for 0.05 sec. or longer 2. IG1 terminal voltage of skid control ECU is 9.5 – 18.5 V, and while ABS is control in operation, there is solenoid relay contact OFF for 0.05 sec. or longer.	• ABS actuator • SFRR, SFRH, SFLR or SFLH circuit
C0246/23 C0256/24		• ABS actuator • SRRR, SRRH, SRLR or SRLH circuit

HINT:

- DTC No. C0226/21 is for right front solenoid valve.
- DTC No. C0236/22 is for left front solenoid valve.
- DTC No. C0246/23 is for right rear solenoid valve.
- DTC No. C0256/24 is for left rear solenoid valve.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check the DTC once more.**

PREPARATION:

(a) Clear DTC (See page DI–836).

(b) Turn the ignition switch to OFF.

CHECK:

Turn the ignition switch to ON, and check that the same DTC is stored in the memory.

YES → **Replace ABS Actuator Assembly.**

NO

2	**Perform ACTIVE TEST by TOYOTA hand–held tester.**

(a) Select the item ”ABS SOLENOID RELAY” in the ACTIVE TEST and operate the ABS solenoid relay on the TOYOTA hand–held tester.

(b) Operat the ABS solenoid relay by the TOYOTA hand–held tester.

CHECK:

Check that the same DTC is stored in the memeoty.

NO → **No problem.**

YES

Replace ABS Actuator Assembly.

DIAIK–04

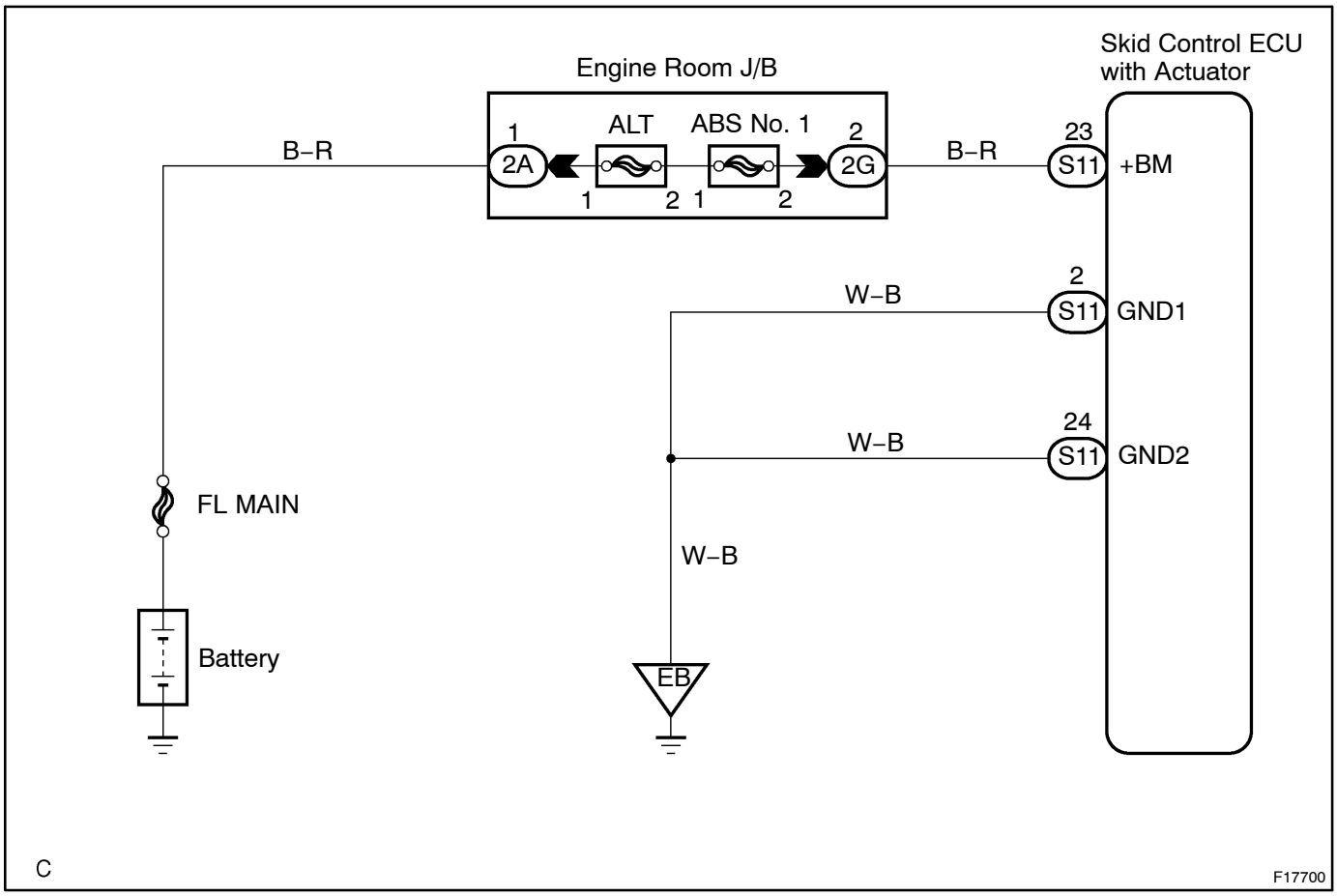
DTC	C0273/13, C0274/14	ABS Motor Relay Circuit

CIRCUIT DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS is activated, ECU switches the ABS motor relay ON and operates the ABS pump motor.

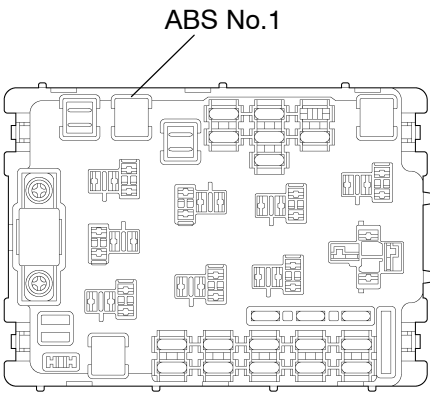
DTC No.	DTC Detection Condition	Trouble Area
C0273/13	• IG1 terminal voltage is from 9.5 V to 18.5 V and the relay contact OFF condition remains for 0.2 sec. or more, despite turning the relay ON during the initial check or while ABS is in operation. • IG1 terminal voltage decreases in 9.5 V or less and the relay contact OFF condition remains for 0.2 sec. or more, despite turning the relay ON during the initial check or while ABS is in operation.	• ABS actuator • ABS motor relay • ABS motor relay circuit
C0274/14	The relay contact ON condition continues for 4 sec. when the relay is OFF.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ABS No.1 fuse.



PREPARATION:

Remove the ABS No.1 fuse from Engine Room J/B.

CHECK:

Check continuity of the ABS No.1 fuse.

OK:

Continuity

NG → **Check for short circuit in all the harness and components connected to ABS No.1 fuse (See attached wiring diagram).**

OK

2	Check the DTC once more.

PREPARATION:

(a) Clear the DTC (See page DI–836).

(b) Turn the ignition switch to OFF.

CHECK:

Turn the ignition switch to ON, and check that the same DTC is stored in the memory.

YES → **Replace ABS Actuator Assembly.**

NO

3	Check ABS motor relay operation.

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the operation sound of the ABS motor individually when operating it with the TOYOTA hand–held tester.

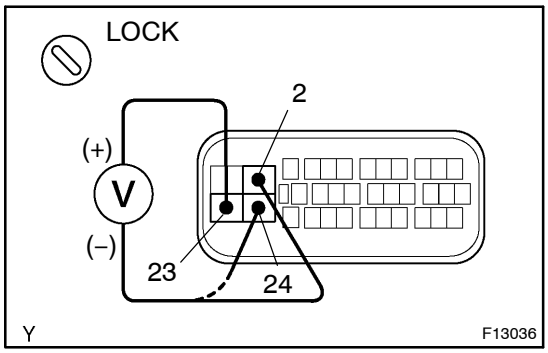
OK:

The operation sound of the ABS motor should be heard.

NG → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

OK

4	Check voltage between terminals +BM (23) and GND (2, 24) of Skid Control ECU connector.



PREPARATION:

Disconnect the Skid Control ECU connector.

CHECK:

Measure the voltage between terminal 23 and 2, 24 of the Skid Control ECU harness side connector.

OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

If the same code is still output after the DTC is deleted, check the contact condition of each connection. If the connection is normal, the ECU may be defective.

DIAIL–04

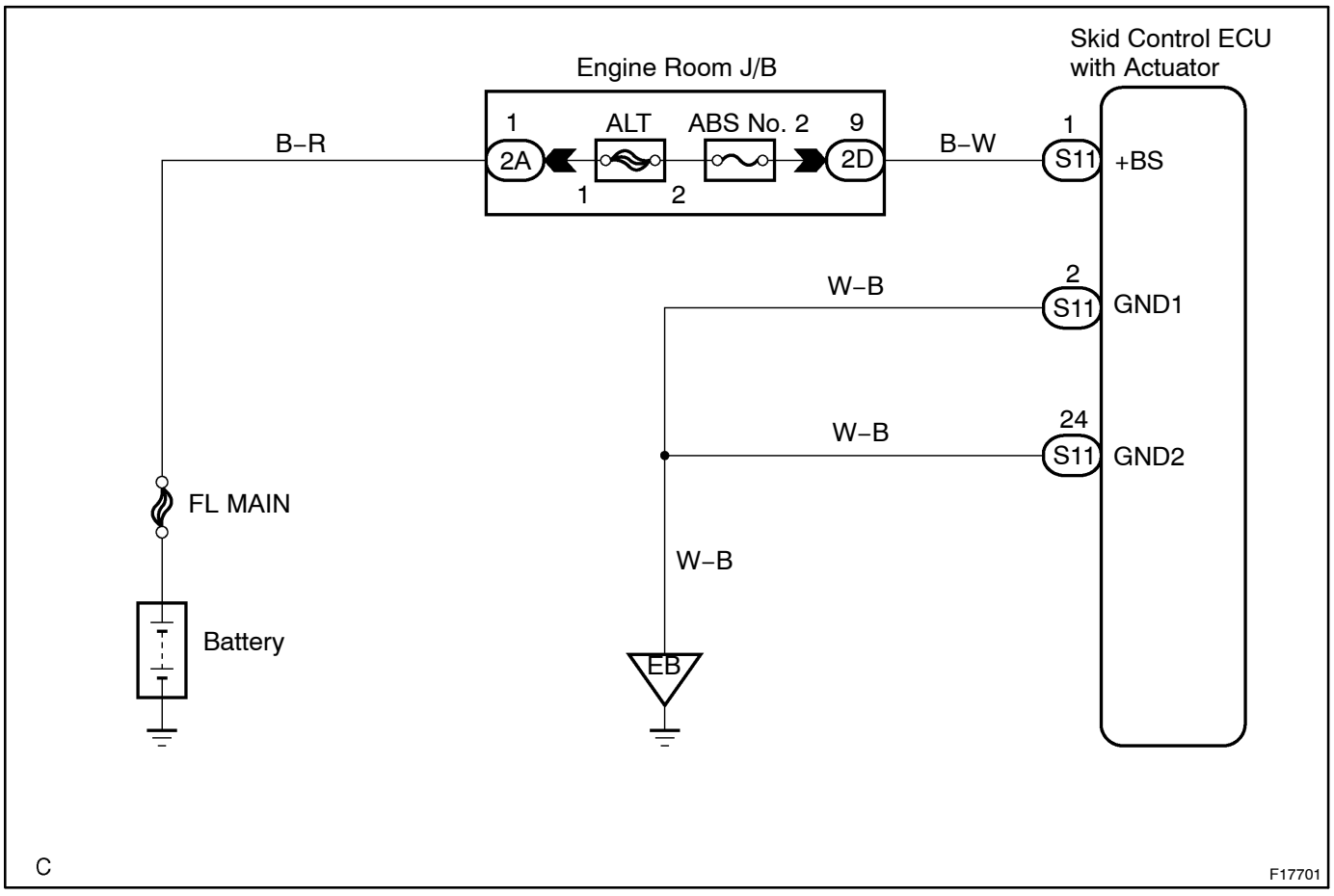
DTC	C0278/11, C0279/12	ABS Solenoid Relay Circuit

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, and if the initial check is OK, the relay turns on.

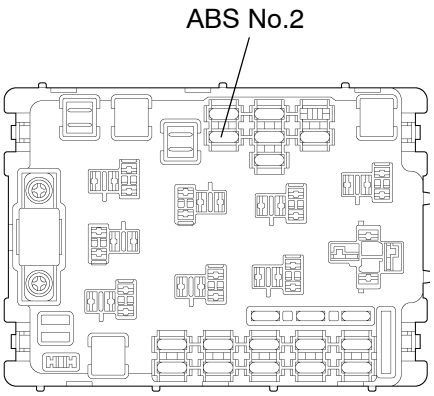
DTC No.	DTC Detection Condition	Trouble Area
C0278/11	• IG1 terminal voltage is from 9.5 V to 18.5 V and the relay contact OFF condition continues for 0.2 sec. or more. • IG1 terminal voltage decreases in 9.5 V or less because of the relay ON driving, and the relay contact OFF condition elapses for 0.2 sec. or more.	• ABS solenoid relay • ABS solenoid relay circuit • ABS actuator
C0279/12	Immediately after IG switch has been turned ON, when the solenoid relay is OFF.	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ABS No.2 fuse.



PREPARATION:

Remove the ABS No.2 fuse from the Engine Room J/B.

CHECK:

Check continuity of ABS No.2 fuse.

OK:

Continuity

NG → **Check for short circuit in all the harness and components connected to ABS No.2 fuse (See attached wiring diagram).**

OK

2	Check the DTC once more.

PREPARATION:

(a) Clear DTC (See page DI–836).
(b) Turn the ignition switch to OFF.

CHECK:

Turn the ignition switch to ON, and check that the same DTC is stored in the memory.

YES → **Replace ABS Actuator Assembly.**

NO

3	**Check ABS solenoid relay operation.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the operation sound of the ABS solenoid relay when operating it with the TOYOTA hand–held tester.

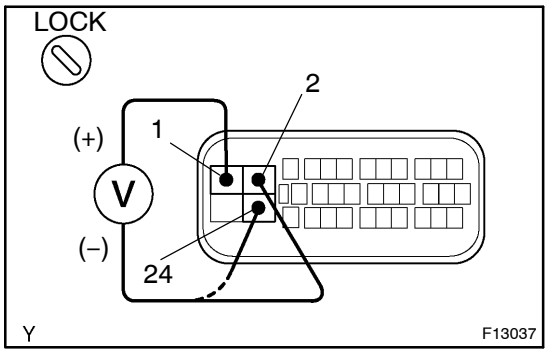
OK:

The operation sound of the ABS solenoid relay should be heard.

NG → **Check and replace ABS Actuator Assembly.**

OK

4	**Check voltage between terminals +BS (1) and GND (2, 24) of skid control ECU.**



PREPARATION:

Disconnect the Skid Control ECU connector.

CHECK:

Measure the voltage between terminal 1 and 2, 24 of the Skid Control ECU harness side connector.

OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

If the same code is still output after the DTC is deleted, check the contact condition of each connection. If the connection is normal, the ECU may be defective.

DI6SP–12

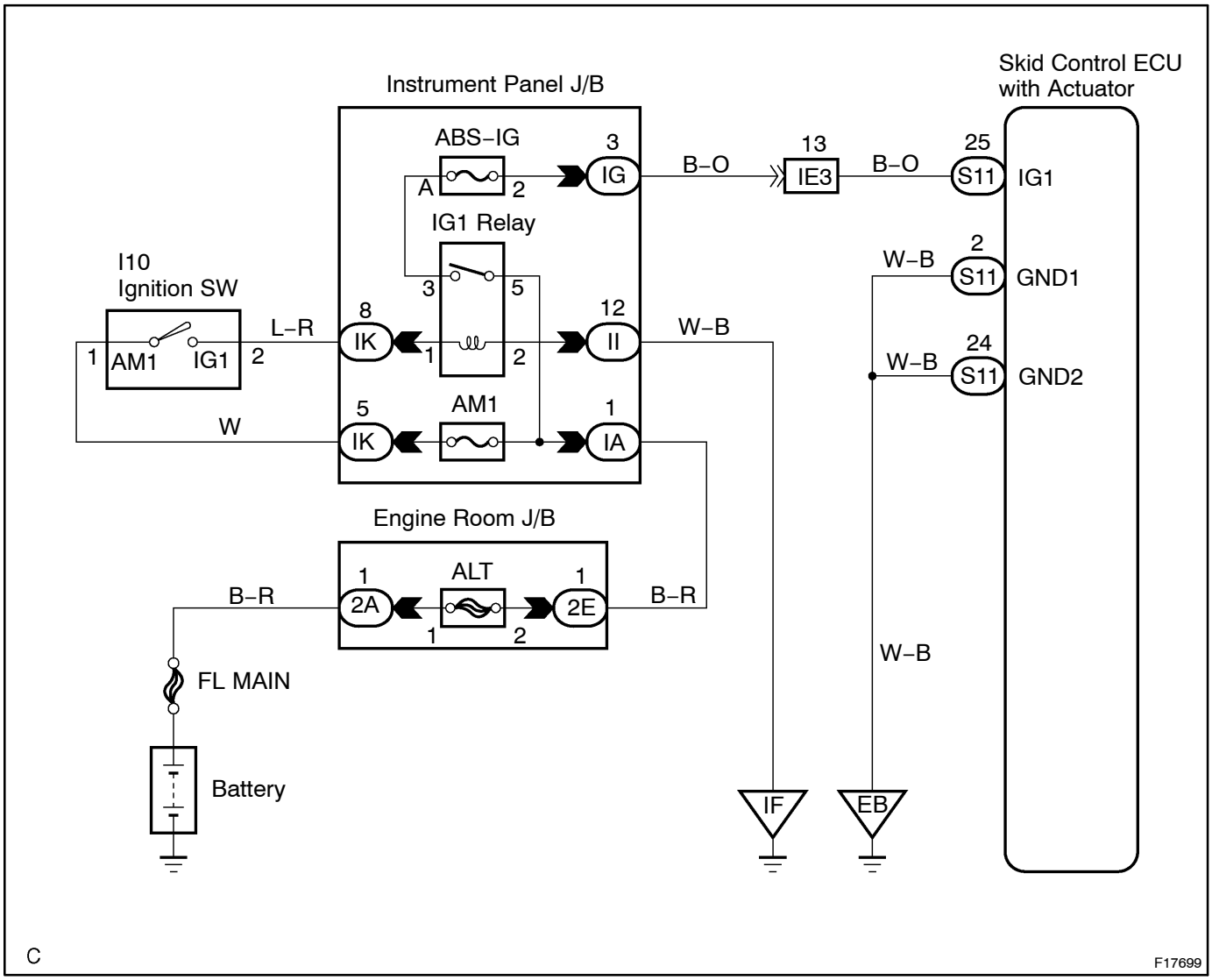
DTC	C1241/41	IG Power Source Circuit

CIRCUIT DESCRIPTION

This is the power source of ECU, hence of CPU, and of the ABS actuator.

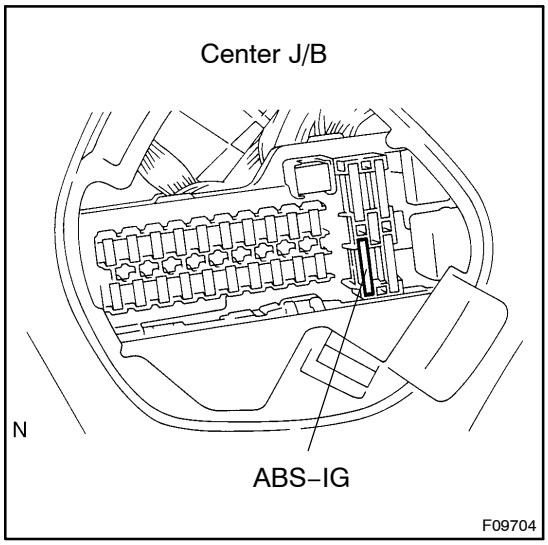
DTC No.	DTC Detection Condition	Trouble Area
C1241/41	Condition 1. or 2. is detected: 1. Vehicle speed is at 3 km/h (1.9 mph) or more and ECU terminal IG1 voltage is 9.5 V or less, which continues for 10 sec. or more 2. When IG terminal voltage is less than 9.5 V, there is open circuit in the motor relay or in the solenoid relay, or the solenoid circuit malfunction.	• Battery • Charging system • Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS–IG fuse.**



PREPARATION:

Remove the ABS–IG fuse from Center J/B.

CHECK:

Check continuity of the ABS–IG fuse.

OK:

Continuity

NG → **Check for short circuit in all the harness and components connected to ABS–IG fuse (See attached wiring diagram).**

OK

2	**Check battery positive voltage.**

OK:

Voltage: 10 – 14 V

NG → **Check and repair the charging system (See page IN–30).**

OK

3	Check voltage of the ECU IG power source.

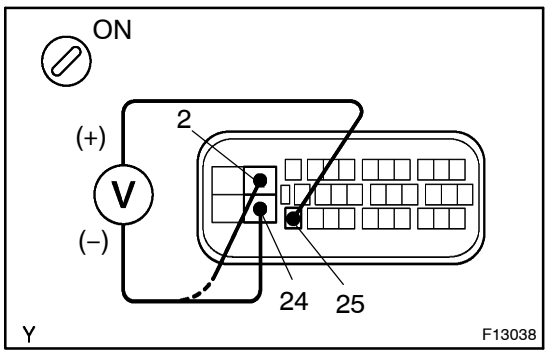
PREPARATION:

In the case of using the hand–held tester:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the item "IG VOLTAGE" in the DATA LIST and read its value displayed on the TOYOTA hand–held tester.
(d) Check the voltage condition output from the ECU and displayed on theTOYOTA hand–held tester.

CHECK:

OK: "Normal" is displayed. (Voltage: 10 – 14 V)



PREPARATION:

In the case of not using the hand–held tester:

(a) Disconnect the Skid Control ECU connector.
(b) Turn the ignition switch to ON.

PREPARATION:

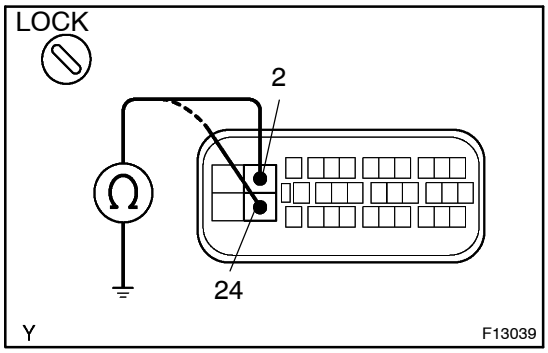
Measure the voltage between terminal 25 and 2 or 24 of the skid control ECU connector.

OK: 10 – 14 V

OK	Check or replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

NG

4	Check continuity between terminals GND (2, 24) of Skid Control ECU connector and body ground.



CHECK:

Measure the resistance between terminal 2 and 24 of Skid Control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG	Repair or replace harness or connector.

OK

Check for open circuit in harness and connector between Skid Control ECU and ABS–IG fuse (See page IN–30).

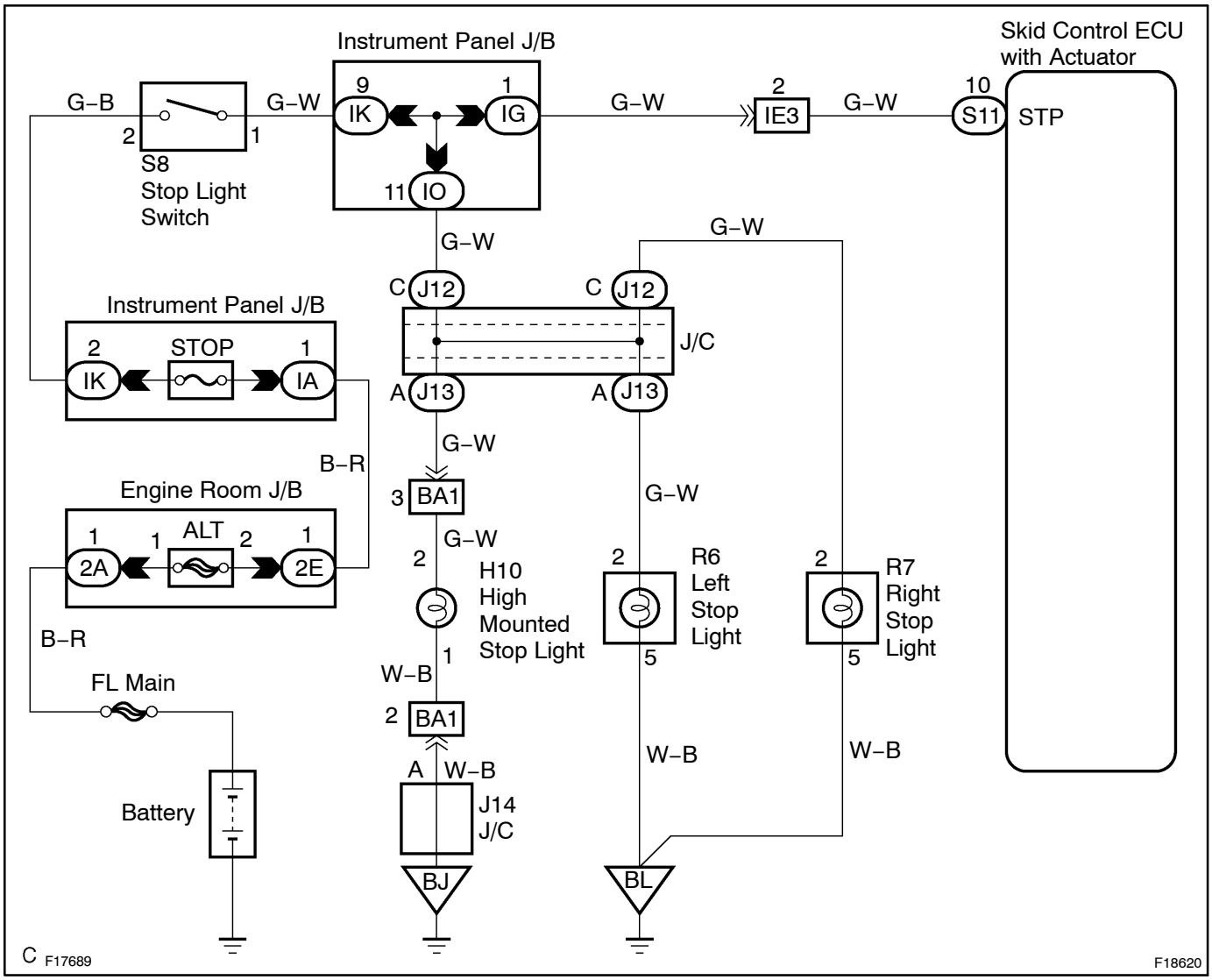
DI6SQ–09

DTC	C1249/49	Stop Light Switch Circuit

CIRCUIT DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1249/49	When IG1 terminal voltage is from 9.5 V to 18.5 V and ABS is not in operation, the open circuit of the stop light switch circuit continues for 0.3 sec. or more.	• Stop lamp switch • Stop light switch circuit • Stop light bulb

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

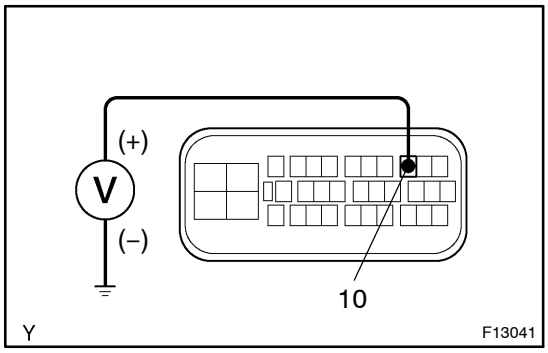
CHECK:

Check that stop light comes on when brake pedal is depressed and goes off when brake pedal is released.

NG → **Repair stop light circuit (See page BE–37).**

OK

2	**Check voltage between terminal STP (10) of Skid Control ECU and body ground.**



PREPARATION:

Disconnect Skid Control ECU connector.

CHECK:

Measure the voltage between terminal 10 of Skid Contorl ECU harness side connector and body ground when brake pedal is depressed.

OK:

Voltage: 10 – 14 V

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

3	**Check for open circuit in harness and connector between Skid Control ECU and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Contorl ECU (ABS Actuator Assembly). (See page IN–30)

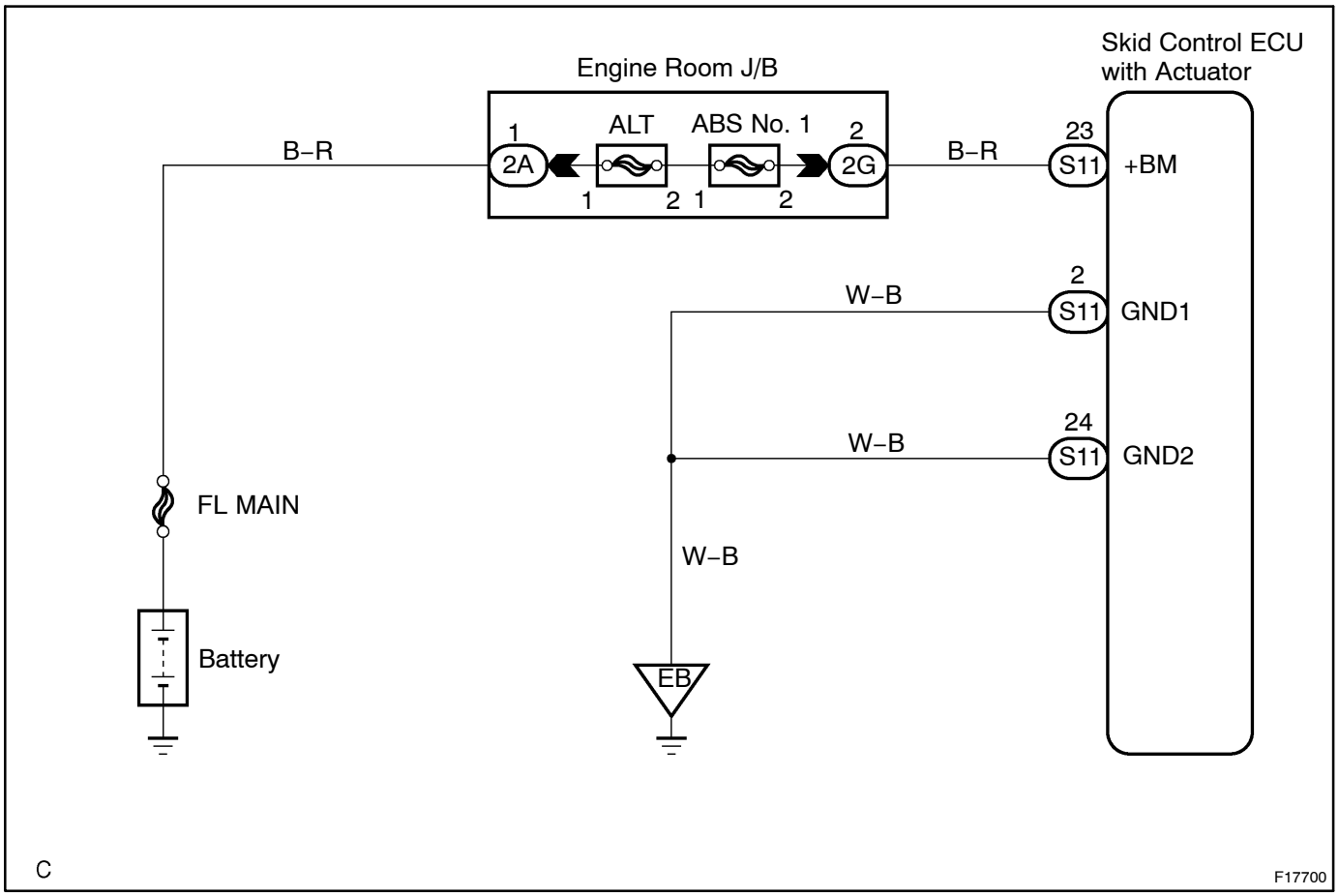
DIAIM–04

DTC	C1251/51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
C1251/51	When the actuator pump drive motor does not rotate correctly.	ABS pump motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS pump motor operation.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check the operation sound of the ABS pump motor when operating it with the TOYOTA hand–held tester.

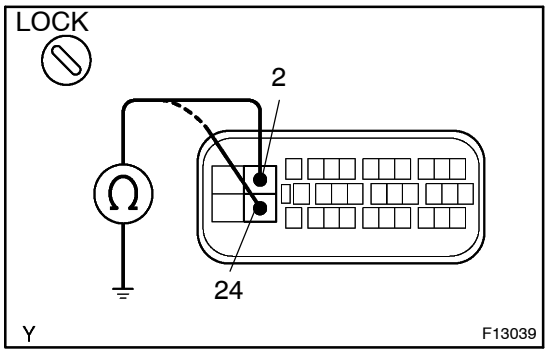
OK:

The operation sound of the ABS pump motor should be heard.

OK → **Proceed to next circuit inspection shown in problem symptoms chart (See page DI–847).**

NG

2	**Check continuity between terminals GND (2, 24) of Skid Control ECU connector and body ground.**



CHECK:

Measure the resistance between terminals 2 and 24 of Skid Control ECU harness side connector and body ground.

OK:

Resistance: 1 Ω or less

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

DI6MM–04

DTC	Always ON	Skid Control ECU Malfunction

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Detection of any conditions in 1. and 2.: 1. Skid control ECU internal malfunction is detected 2. There is a malfunction in the ECU internal circuit	• Battery • Charging system • Skid control ECU

INSPECTION PROCEDURE

1	Is DTC output?

Check DTC on page DI–836.

YES → Repair circuit indicated by the code output.

NO

2	Is normal code displayed?

YES → Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

NO

3	Does ABS warning light go off?

YES → Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

NO

4	**Check battery positive voltage.**

CHECK:

Check the battery positive voltage.

OK:

10 – 14 V

NG → **Check and repair the charging system. (See page CH–2)**

OK

5	**Check ABS warning light.**

PREPARATION:

(a) Disconnect the connector from the Skid Comtrol ECU.

(b) Connect the terminal WA (S11 – 13) of the wire harness and the terminal GND (S11 – 2, 24) of the wire harness.

(c) Turn the ignition switch to ON.

CHECK:

Check the ABS warning light goes off.

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

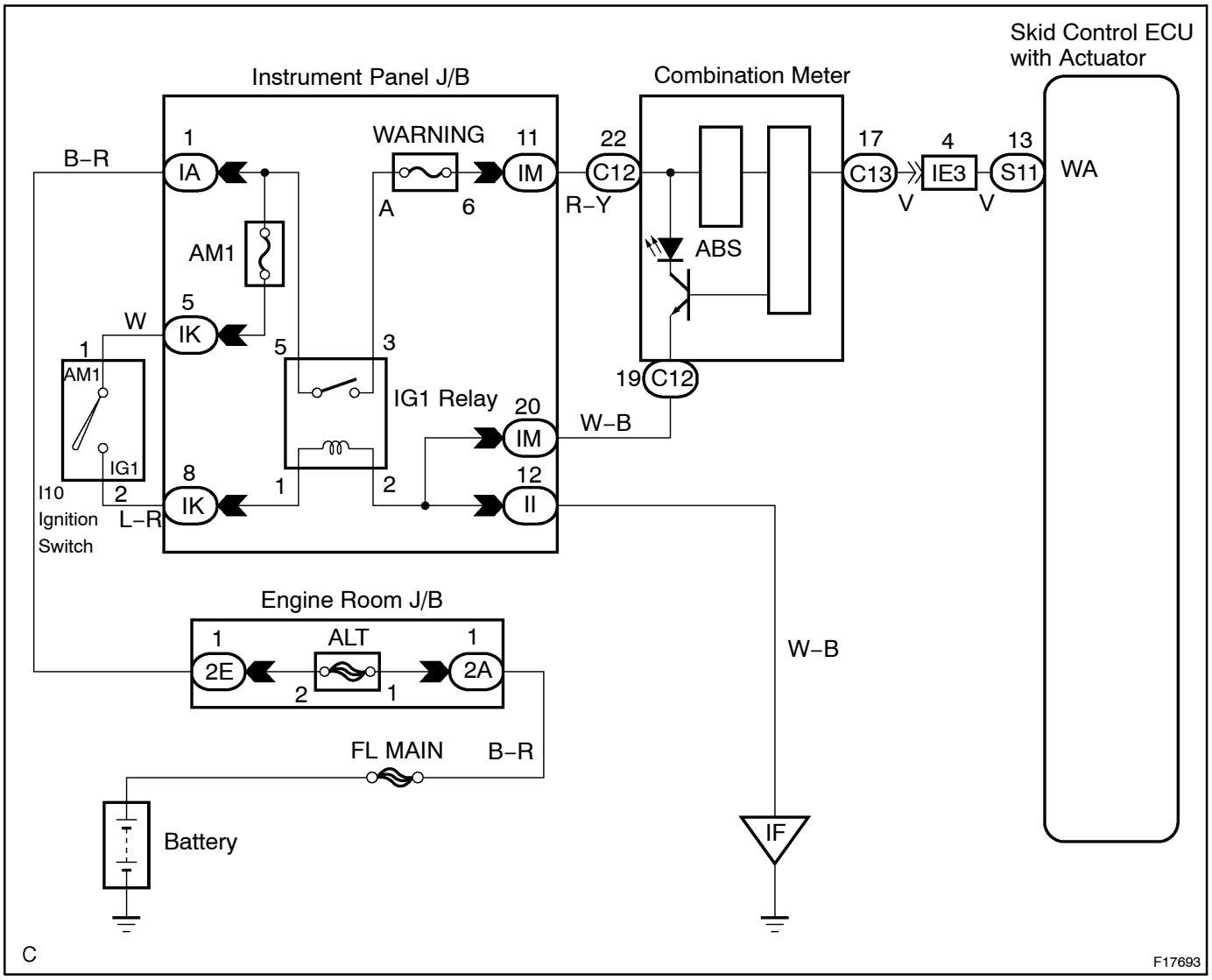
Check for short circuit in harness and connector between ABS warning light, combination meter and Skid Control ECU (See page IN–30).

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If ECU detects trouble, it turns on the ABS warning light, and prohibit the ABS control at the same time. At this time, the ECU records a DTC in memory.
Connect terminal TC and CG of the DLC3 to make the ABS warning light blink and output DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Troubleshoot in accordance with the chart below for each trouble symptom.

ABS warning light does not come on	*1
ABS warning light remains on	*2

*1: Start the inspection from step 1 in the case of using the TOYOTA hand–held tester and start from step 2 in the case of not using TOYOTA hand–held tester.

*2: After inspection of step 3, start the inspection from step 4 in the case of using the TOYOTA hand–held tester and start from step 5 in the case of not using TOYOTA hand–held tester.

1	**Check operation of the ABS warning light.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check that ”ON” of the ABS warning light can be shown on the combination meter using the TOYOTA hand–held tester.

HINT:

ABS warning light turns ”OFF” automatically 2 seconds after it is turnd ”ON”.

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

2	**Check ABS warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair bulb or combination meter assembly.**

OK

3	**Check that the ECU connector is securely connected to the ECU.**

NO → **Connect the connector to the ECU.**

YES

Check for open circuit in harness and connector between combination meter and ABS ECU (See page IN–30).

4	**Check operation of the ABS warning light (See step 1).**

OK → **Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)**

NG

5	**Is DTC output?**

Check DTC on page DI–836.

YES → **Repair circuit indicated by the output code.**

NO

Check for short circuit in harness and connector between DLC3 and Skid Control ECU (See page IN–30).

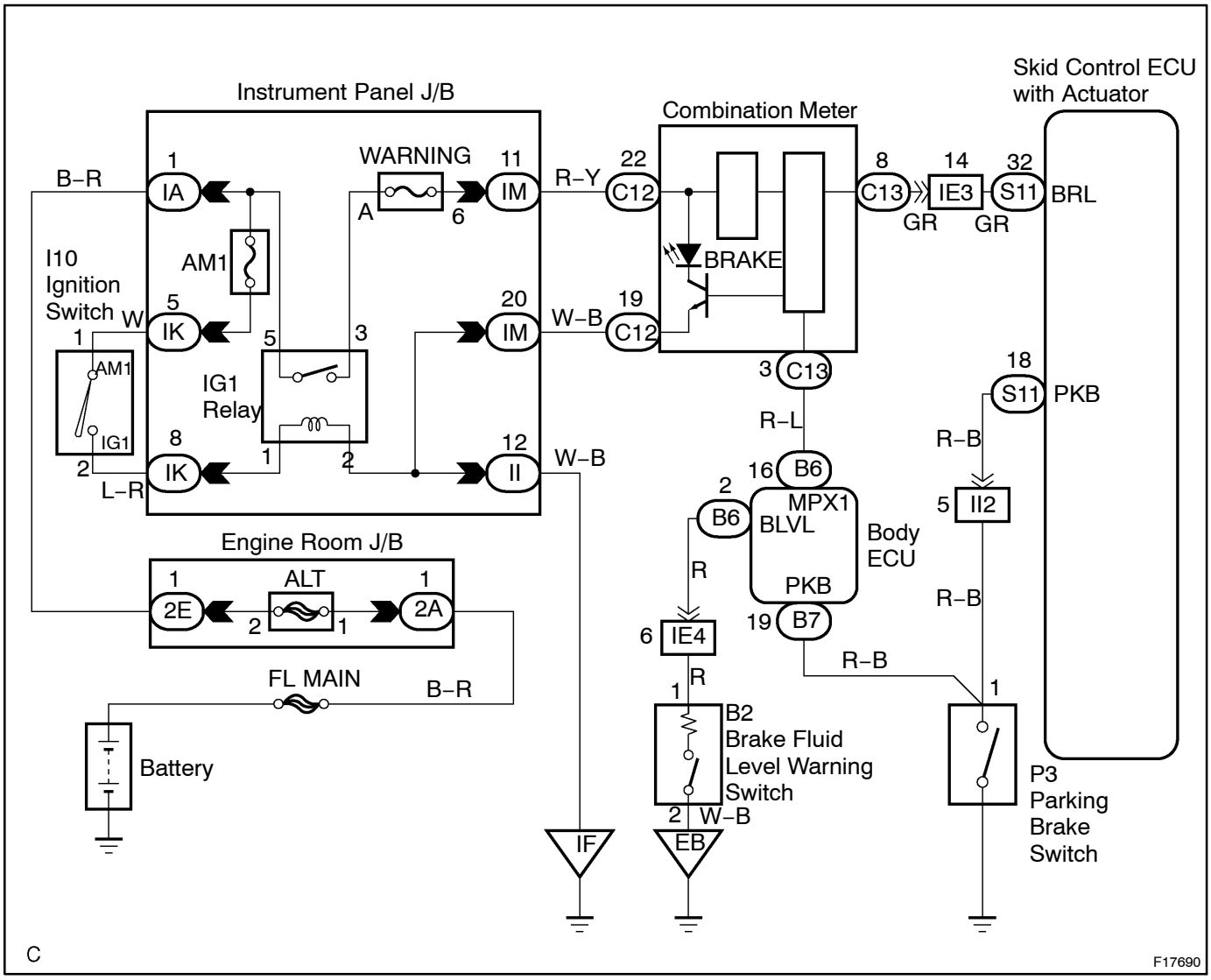
DI6MO–05

BRAKE Warning Light Circuit

CIRCUIT DESCRIPTION

The BRAKE warning light comes on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check parking brake switch circuit (See page BE–2).**

NG → **Repair or replace parking brake switch circuit.**

OK

2	**Check brake fluid level warning switch circuit (See page BE–2).**

NG → **Repair or replace brake fluid level warning switch circuit.**

OK

3	**Is DTC output for ABS?**

Check DTC on page DI–836.

Yes → **Repair circuit indicated by the output code.**

No

4	**Check BRAKE warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Repair or replace combination meter.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

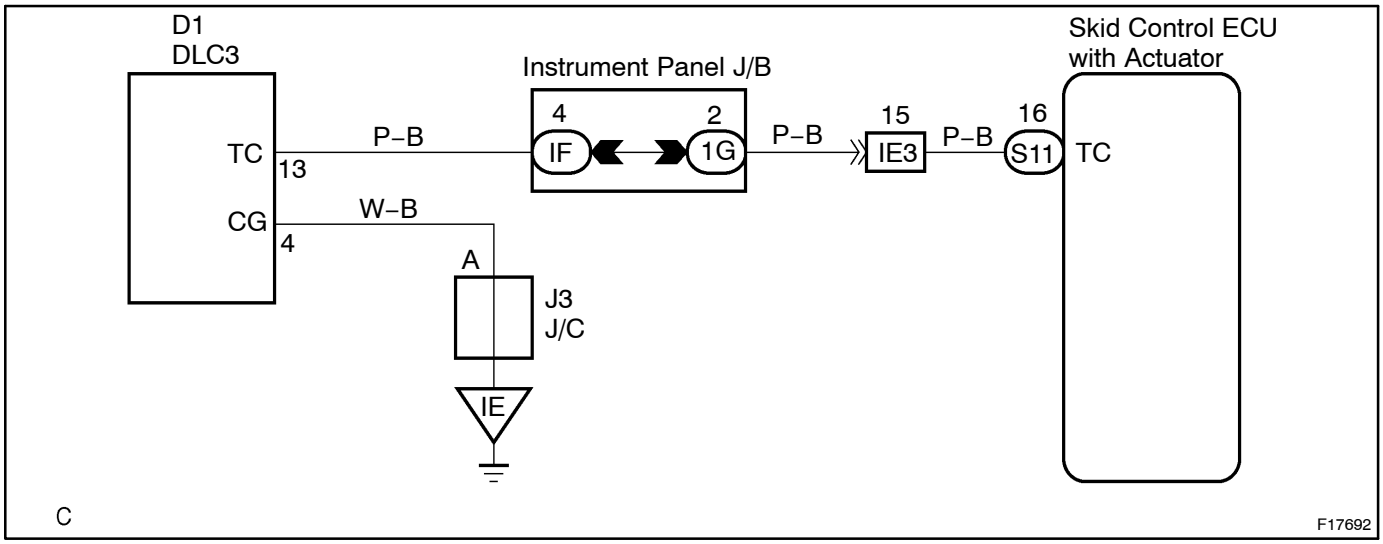
DIAIN–04

TC Terminal Circuit

CIRCUIT DESCRIPTION

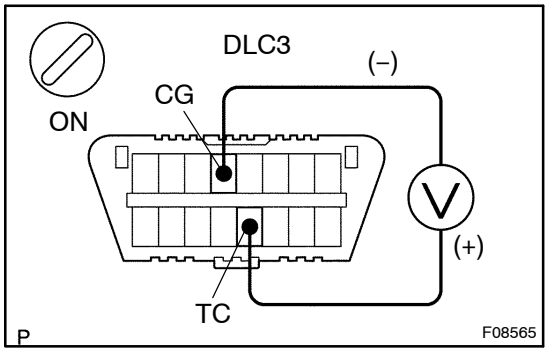
Connecting between terminal TC and CG of the DLC3 causes the ECU to display DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals TC and CG of DLC3.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between terminal TC and CG of DLC3.

OK:

Voltage: 10 – 14 V

NG → **Go to step 3.**

OK

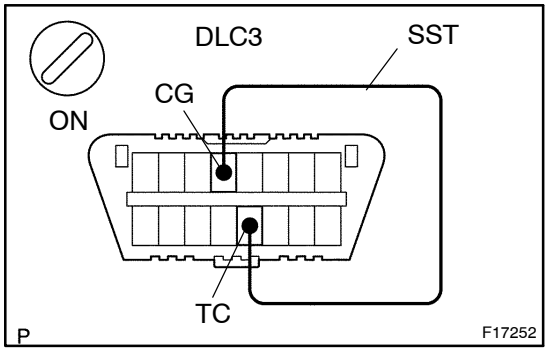
2	**Check for open and short circuit in harness and connector between Skid Control ECU and DLC3, DLC3 and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

3	**Check ABS warning light.**



(a) Using SST, connect the terminal TC and CG of the DLC3.
SST 09843–18040

(b) Turn the ignition switch to ON.

(c) Check the ABS warning light.

OK:

ABS warning light blinks

OK → **END**

NG

Check and replace Skid Control ECU (ABS Actuato Assembly). (See page IN–30)

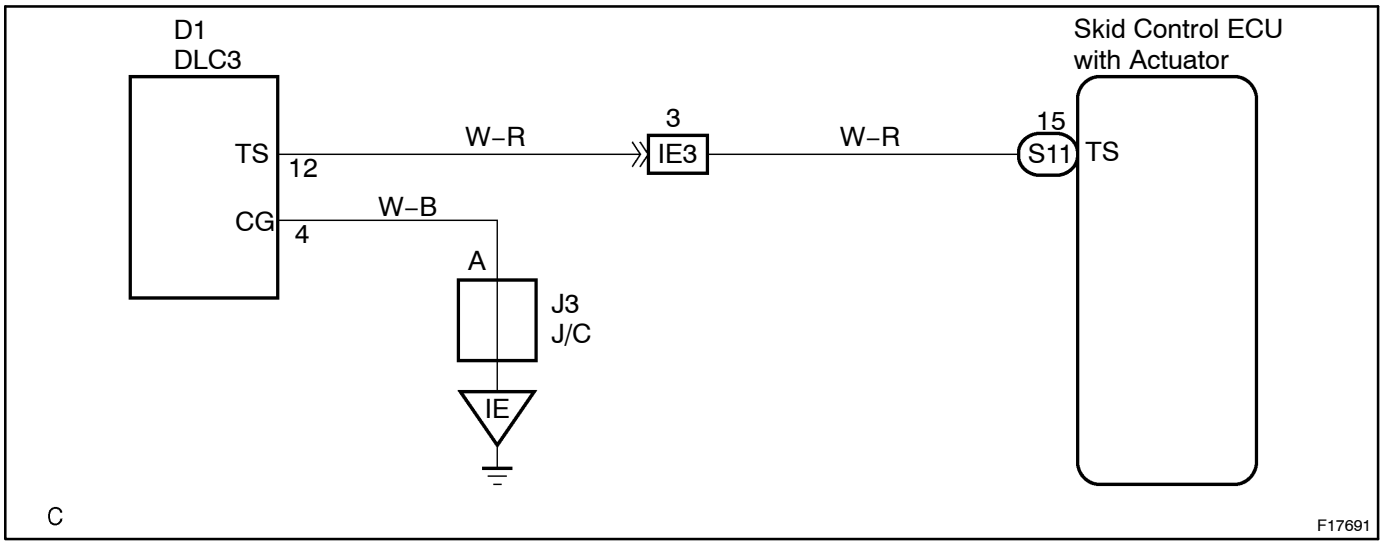
DIAIO–04

TS Terminal Circuit

CIRCUIT DESCRIPTION

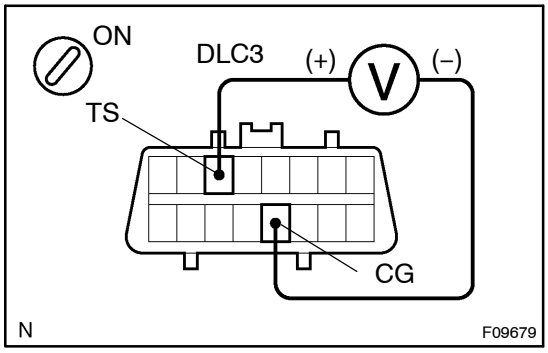
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminal TS and CG of the DLC3 starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals TS and CG of DLC3.**



CHECK:

(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal TS and CG of DLC3.

OK:

Voltage: 10 – 14 V

NG → **Go to step 3.**

OK

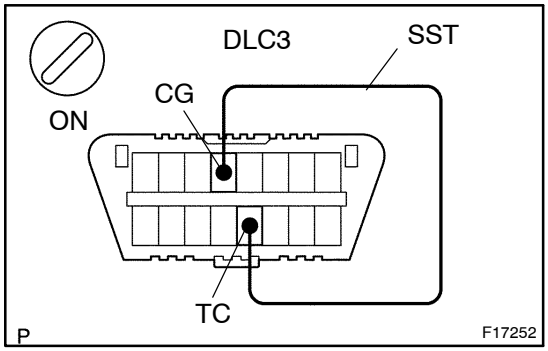
2	**Check for open and short circuit in harness and connector between Skid Control ECU and DLC3, DLC3 and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace Skid Control ECU (ABS Actuator Assembly). (See page IN–30)

3	**Check ABS warning light.**



(a) Using SST, connect the terminal TC and CG of the DLC3.
SST 09843–18040
(b) Turn the ignition switch to ON.
(c) Check the ABS warning light.

OK:

ABS warning light blinks

OK → **END**

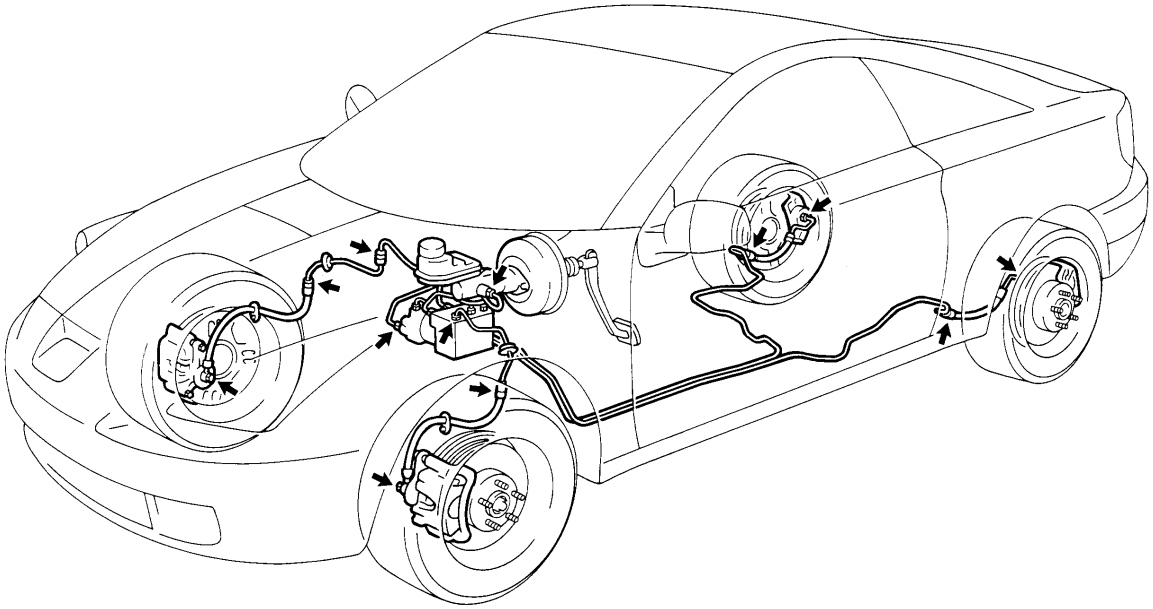
NG

Check and replace Skid Control ECU (ABS Actuato Assembly). (See page IN–30)

DI6MR–05

Check for Fluid Leakage

Check for fluid leakage from the actuator or the hydraulic lines.



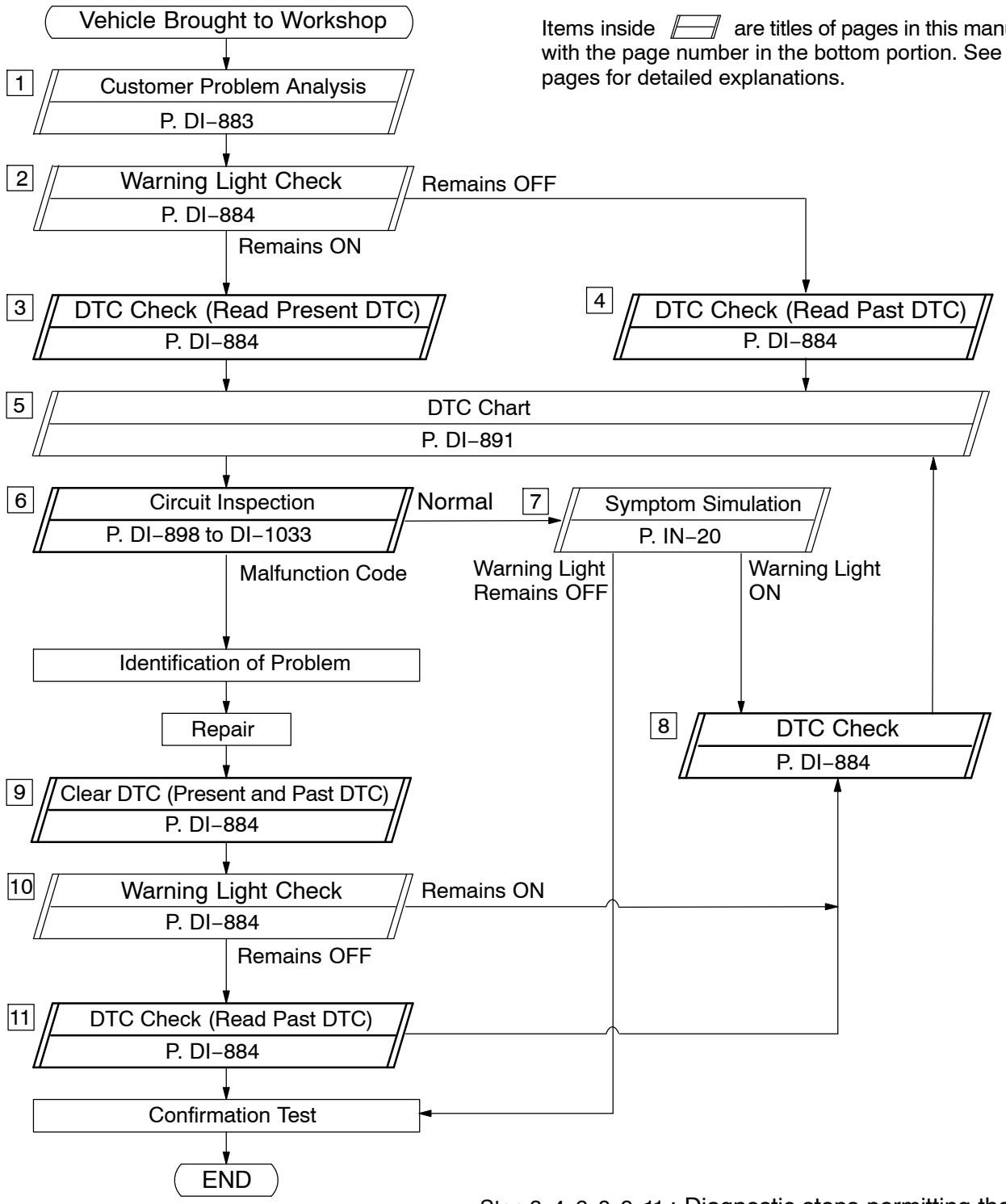
N

F09765

SUPPLEMENTAL RESTRAINT SYSTEM

DI6OW–26

HOW TO PROCEED WITH TROUBLESHOOTING



Step 3, 4, 6, 8, 9, 11 : Diagnostic steps permitting the use of the TOYOTA hand–held tester.

DI6OX–16

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name _____

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date Problem Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	**Approx.**

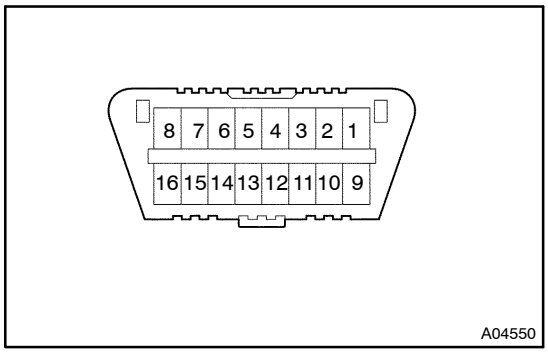
Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Conditions	
Details of Problem	

Vehicle Inspection, Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

Diagnosis System Inspection

SRS Warning Light Inspection	**1st Time**	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
	2nd Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
DTC Inspection	**1st Time**	☐ Normal Code ☐ Malfunction Code [Code.]
	2nd Time	☐ Normal Code ☐ Malfunction Code [Code.]

DIAIP–03



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Check the DLC3.

HINT:

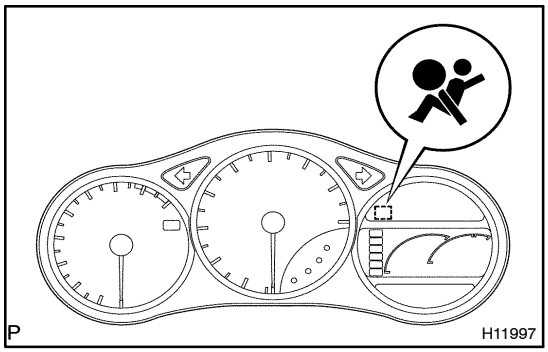
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of the DLC3 complies wire SAE J1962 and matches the ISO 9141–2 format.

Terminal No.	Connection/Voltage or Resistance	Condition
7	Bus + Line/Pulse generation	During Transmission
4	Chassis Ground ⇔Body Ground/1 Ω or less	Always
16	Battery Positive ⇔ Body Ground/9 – 14 V	Always

HINT:

If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



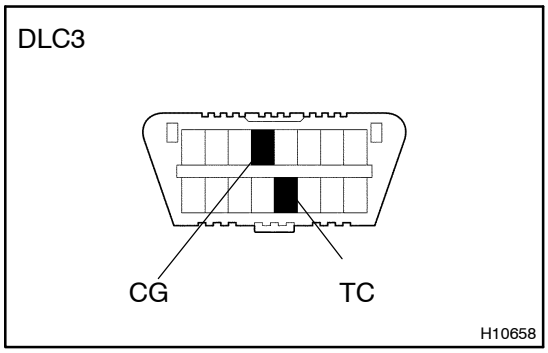
2. SRS WARNING LIGHT CHECK

(a) Turn the ignition switch to ON, and check that the SRS warning light comes on.

(b) Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

- When the ignition switch is at ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction code.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes comes on even when the ignition switch is OFF. In this case, a short in the SRS warning light circuit is possible. Proceed to "SRS warning light circuit malfunction" on page DI–1028.



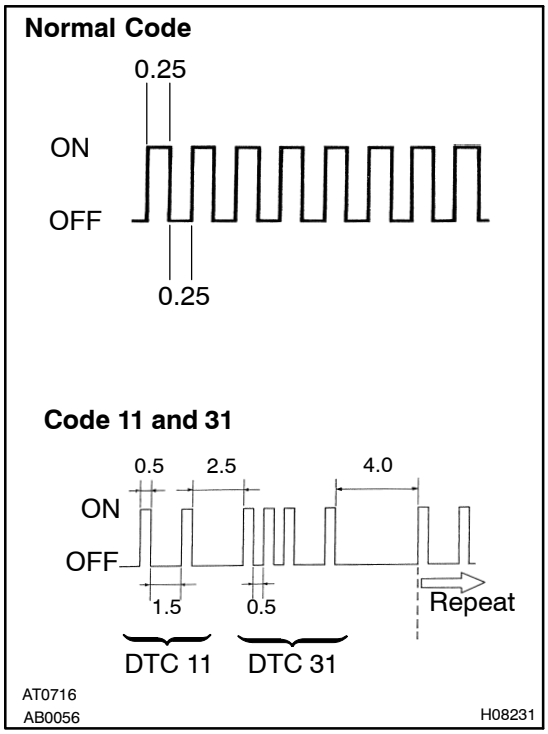
3. DTC CHECK (Using diagnosis check wire)

(a) Present troubles codes:
Output the DTC.
(1) Turn the ignition switch to ON, and wait for approx. 60 seconds.
(2) Using SST, connect terminal TC and CG of the DLC3.
SST 09843–18040

NOTICE:
Pay attention to the terminal connecting position to avoid a malfunction.

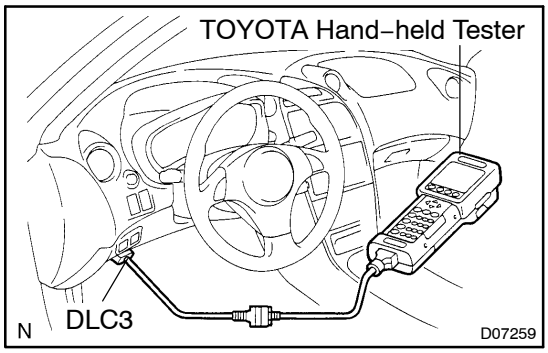
(b) Past troubles codes:
Output the DTC.
(1) Using SST, connect terminal TC and CG of the DLC3.
SST 09843–18040
(2) Turn the ignition switch to ON, and wait for approx. 60 seconds.

NOTICE:
Pay attention to the terminal connecting position to avoid a malfunction.



(c) Read the DTC.
Read the DTC by connecting the blinking times. As an example, the blinking patterns of normal, 11 and 31 are shown in the illustration.
- Normal code indication
  The light blinks 2 times per second.
- Malfunction code indication
  The first blinking indicates the first DTC. Second blinking occurs after 1.5–second of pausing.

If there are 2 or more codes, there will be a 2.5–second pause between each code. After all the codes are shown, there will be a 4.0–second pausing, and they will all be repeated.
HINT:
- If 2 or more malfunctions are found, the indication starts from the smaller numbered code.
- If the light does not blink or comes out at all, or if DTCs are indicated without a connection of the terminals, proceed to the ”TC terminal circuit inspection” on page DI–1033.



4. DTC CHECK (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC3.

(b) Read the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operator's manual for further details.

5. DTC CLEARANCE (Not using service wire)

When the ignition switch is turned off, the diagnostic trouble code is cleared.

HINT:

Depending on the DTC, the code might not be cleared by turning the ignition switch OFF.

In this case, proceed to the next step.

6. DTC CLEARANCE (Using service wire)

(a) Connect the 2 service wires to terminal TC and AB of DLC3.

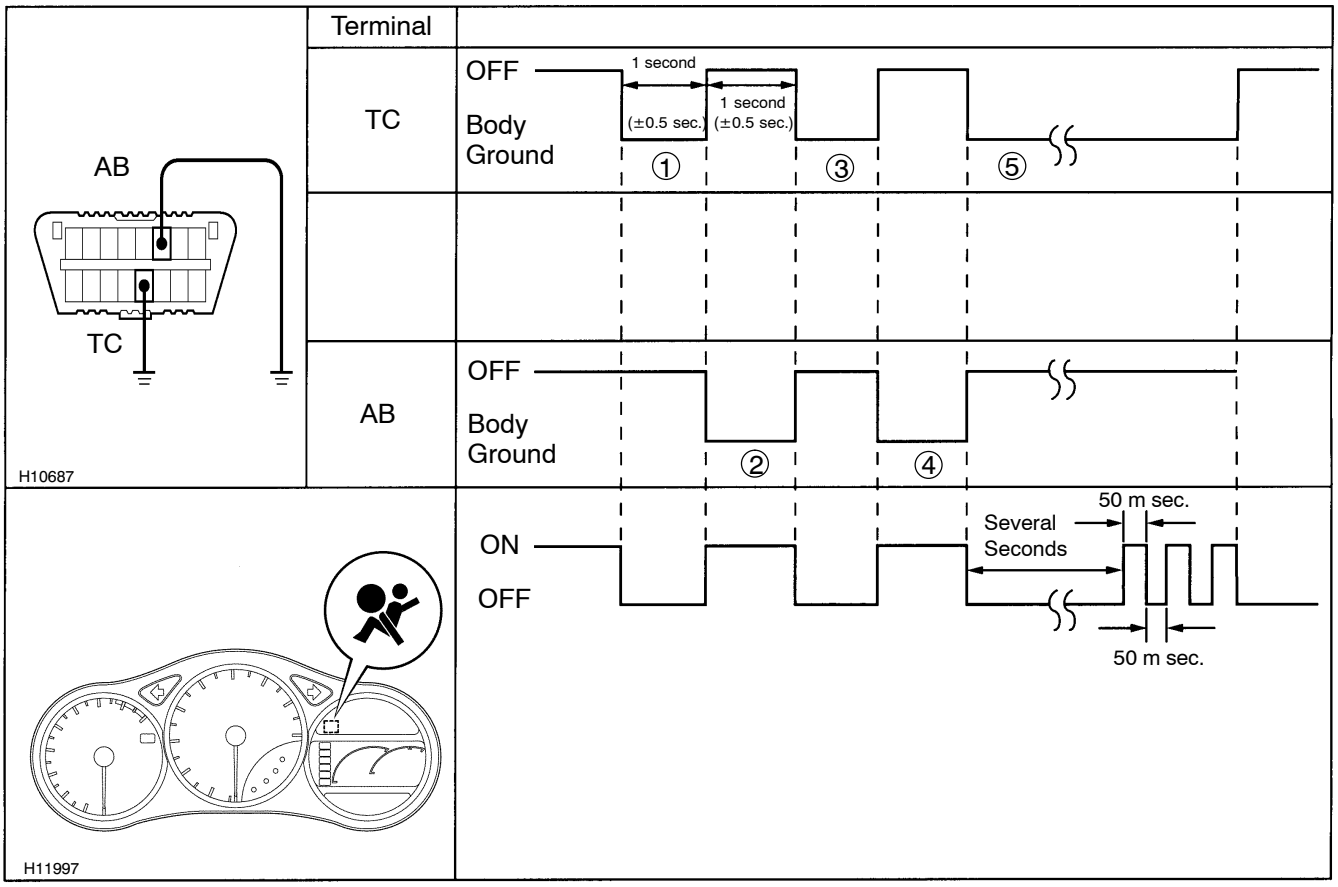
(b) Turn the ignition switch to ON, and wait for approx. 6 seconds.

(c) Starting with the TC terminal, ground alternately terminal TC and terminal AB twice each in cycles of 1.0 second. Make sure that the terminals are grounded. Ensure the terminal Tc remain grounded.

HINT:

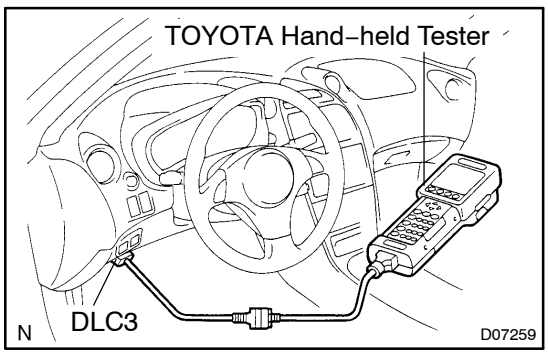
When alternately grounding terminal TC and AB, release ground from one terminal and immediately ground the other terminal within an interval of 0.2 seconds.

If DTCs are not cleared, repeat the above procedure until the codes are cleared.



H12014

(d) Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 – m sec. cycle to indicate the codes which have been cleared.



7. DTC CLEARANCE (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC3.

(b) Clear the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operation's manual for further details.

8. RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

An airbag activation prevention mechanism is built into the connector for the squib circuit of the SRS.

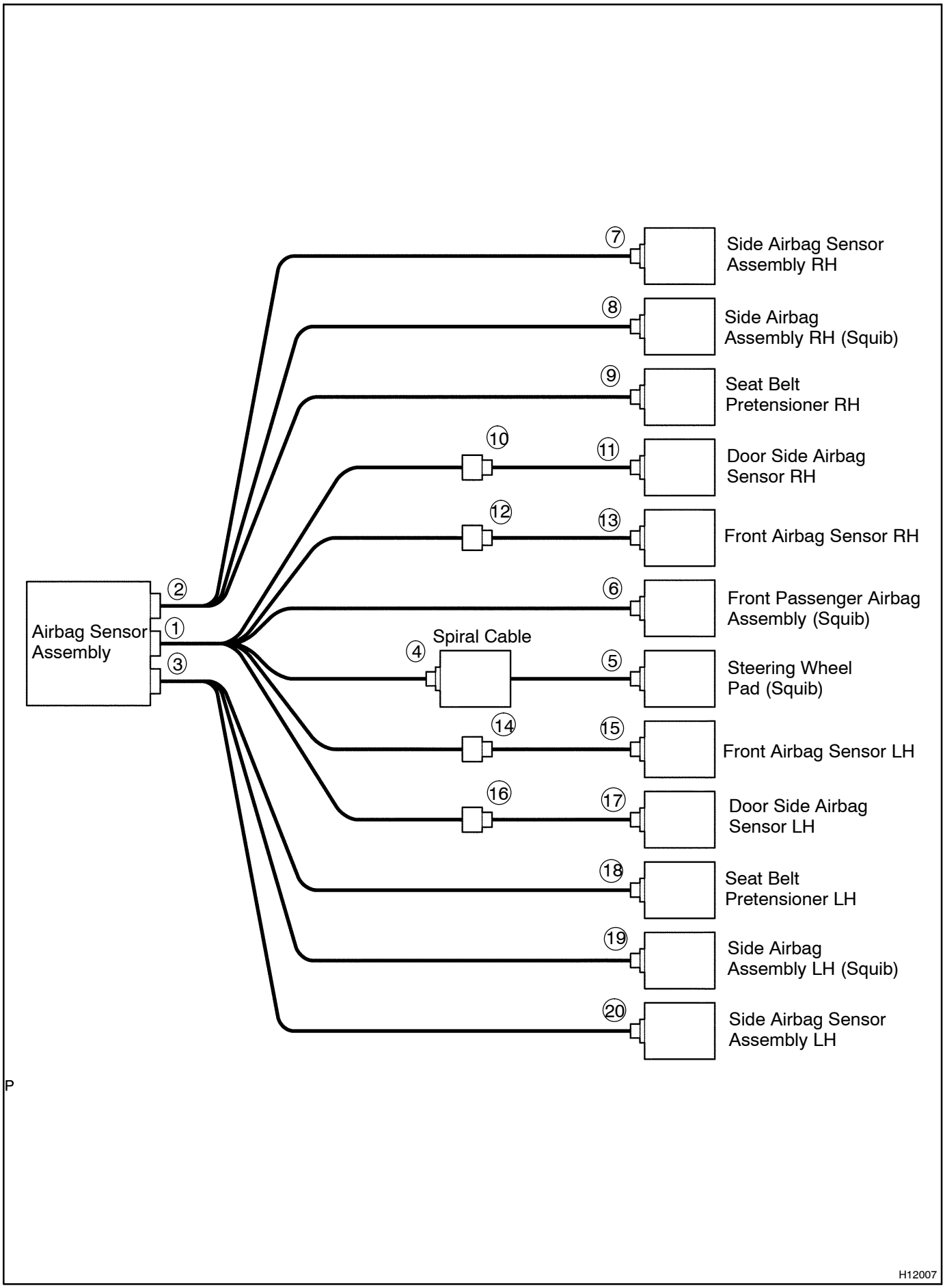
As explained in the troubleshooting later, insert a paper with the same thickness as the male terminal between the terminal and the short spring to release it (Refer to illustrations on next 2 pages).

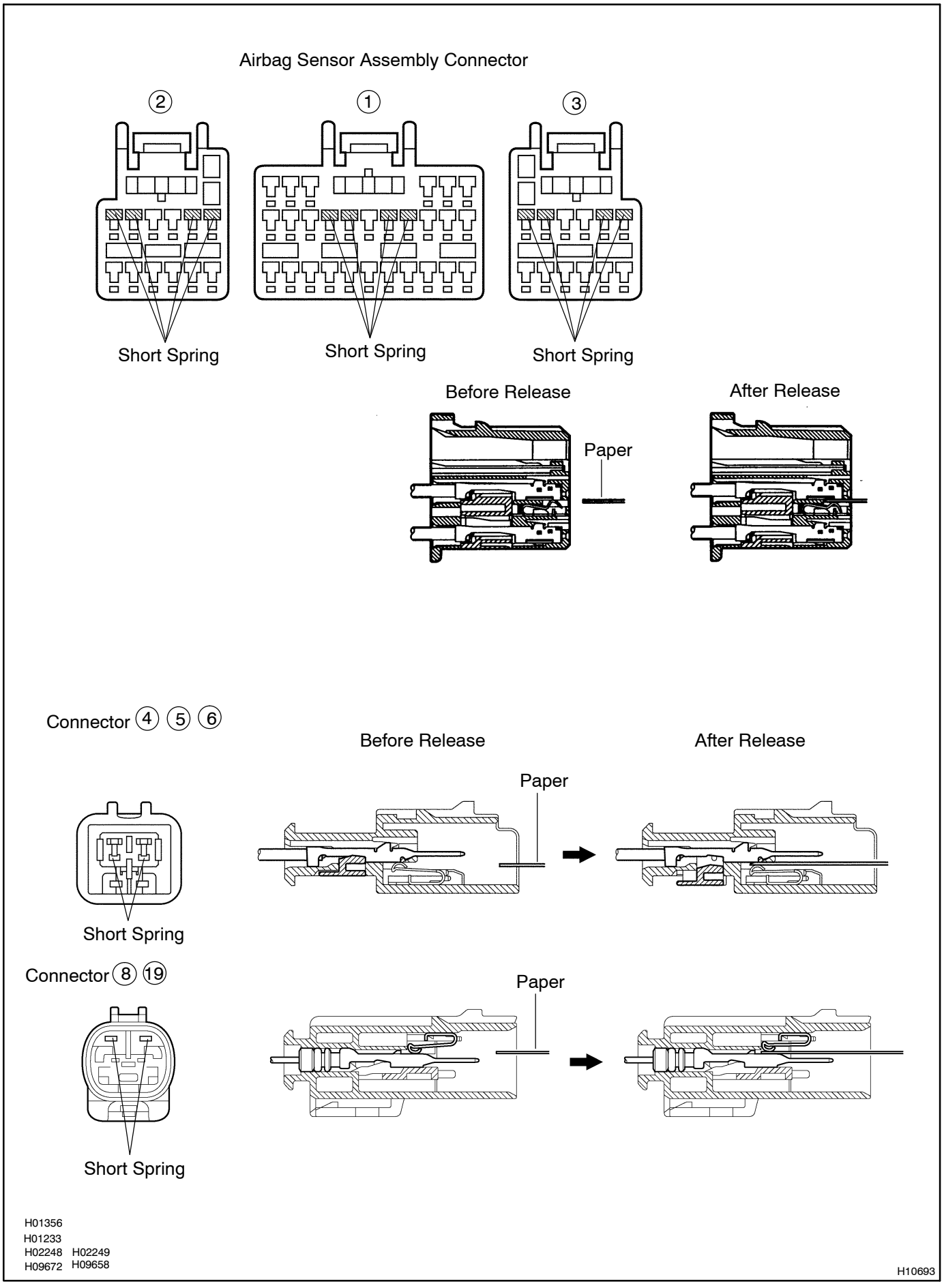
CAUTION:

Never release the airbag activation prevention mechanism on the squib connector.

NOTICE:

- **Do not release the airbag activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **To prevent the terminal and the short spring to be damaged, always use a paper with the same thickness as the male terminals.**


Airbag Sensor Assembly
2
1
3
Spiral Cable
4
7
Side Airbag Sensor Assembly RH
8
Side Airbag Assembly RH (Squib)
9
Seat Belt Pretensioner RH
10
11
Door Side Airbag Sensor RH
12
13
Front Airbag Sensor RH
6
Front Passenger Airbag Assembly (Squib)
5
Steering Wheel Pad (Squib)
14
15
Front Airbag Sensor LH
16
17
Door Side Airbag Sensor LH
18
Seat Belt Pretensioner LH
19
Side Airbag Assembly LH (Squib)
20
Side Airbag Sensor Assembly LH
P
H12007



H01356
H01233
H02248 H02249
H09672 H09658

H10693

DI6OZ–31

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below (Proceed to the page given for that circuit.).

DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
B0100/13 (DI–898)	• Short in D squib circuit	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0101/14 (DI–903)	• Open in D squib circuit	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0102/11 (DI–907)	• Short in D squib circuit (to ground)	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0103/12 (DI–911)	• Short in D squib circuit (to B+)	• Steering wheel pad (squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire	ON
B0105/53 (DI–915)	• Short in P squib circuit	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0106/54 (DI–919)	• Open in P squib circuit	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0107/51 (DI–922)	• Short in P squib circuit (to ground)	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0108/52 (DI–925)	• Short in P squib circuit (to B+)	• Front passenger airbag assembly (squib) • Airbag sensor assembly • Instrument panel wire	ON
B0110/43 (DI–928)	• Short in side squib RH circuit	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0111/44 (DI–932)	• Open in side squib RH circuit	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0112/41 (DI–938)	• Short in side squib RH circuit (to ground)	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0113/42 (DI–938)	• Short in side squib RH circuit (to B+)	• Side airbag assembly RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0115/47 (DI–941)	• Short in side squib LH circuit	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0116/48 (DI–945)	• Open in side squib LH circuit	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink

DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
B0117/45 (DI–948)	• Short in side squib LH circuit (to ground)	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0118/46 (DI–951)	• Short in side squib LH circuit (to B+)	• Side airbag assembly LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0130/63 (DI–954)	• Short in P/T squib RH circuit	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0131/64 (DI–958)	• Open in P/T squib RH circuit	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0132/61 (DI–961)	• Short in P/T squib RH circuit (to ground)	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0133/62 (DI–964)	• Short in P/T squib RH circuit (to B+)	• Seat belt pretensioner RH (squib) • Airbag sensor assembly • Floor wire	Blink
B0135/73 (DI–967)	• Short in P/T squib LH circuit	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0136/74 (DI–971)	• Open in P/T squib LH circuit	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0137/71 (DI–974)	• Short in P/T squib LH circuit (to ground)	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B0138/72 (DI–977)	• Short in P/T squib LH circuit (to B+)	• Seat belt pretensioner LH (squib) • Airbag sensor assembly • Floor wire	Blink
B1100/31 (DI–980)	• Airbag sensor assembly malfunction	• Airbag sensor assembly	ON
B1140/32 (DI–982)	• Side airbag sensor assembly RH malfunction	• Side airbag sensor assembly RH • Airbag sensor assembly • Floor wire	Blink
B1141/33 (DI–988)	• Side airbag sensor assembly LH malfunction	• Side airbag sensor assembly LH • Airbag sensor assembly • Floor wire	Blink
B1142/B1143/34 (DI–994)	• Door side airbag sensor RH malfunction	• Door side airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Front door RH wire	ON
B1144/B1145/35 (DI–1002)	• Door side airbag sensor LH malfunction	• Door side airbag sensor LH • Airbag sensor assembly • Instrument panel wire • Front door LH wire	ON
B1156/B1157/15 (DI–1010)	• Front airbag sensor RH malfunction	• Front airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Engine room No. 2 wire	ON

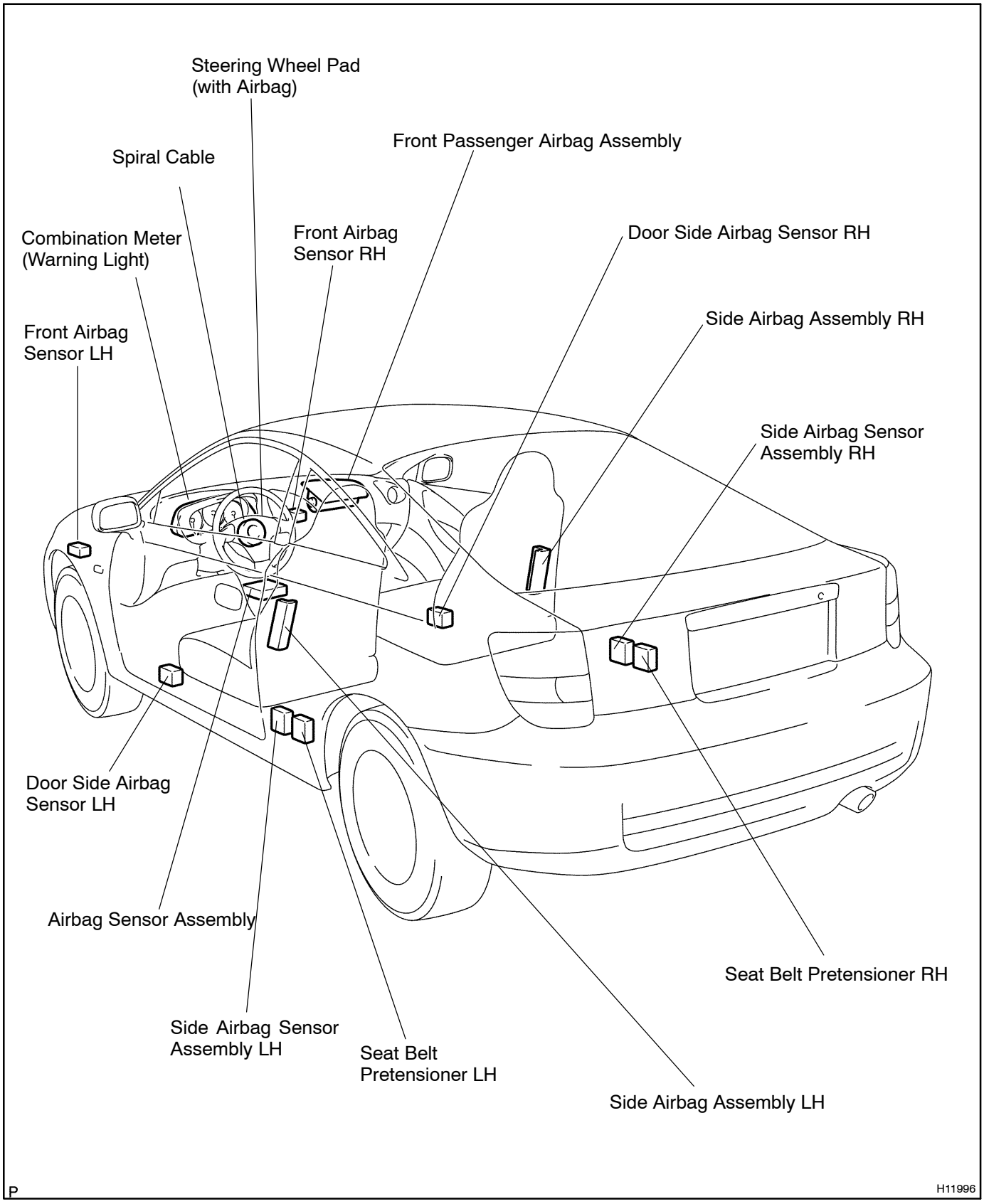
DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
B1158/B1159/16 (DI–1018)	• Front airbag sensor LH malfunction	• Front airbag sensor LH • Airbag sensor assembly • Instrument panel wire • Engine room main wire	ON
Normal (DI–1025)	• System normal	–	OFF
	• Voltage source drop	• Battery • Airbag sensor assembly	ON

HINT:

- When the SRS warning light remains lit up and the DTC is the normal code, a voltage source drop is possible.
  This malfunction is not stored in memory by the airbag sensor assembly and if the power source voltage returns to normal, the SRS warning light will automatically go out.
- When 2 or more codes are indicated, smaller numbered code will be shown first.
- If a code not listed on the chart is displayed, the airbag sensor assembly is at fault.
- In the case of any malfunction concerning any open circuit, ground short, or B+ short due to any squib, another malfunction code may not be detected. In this case, correct the malfunction currently indicated and then perform malfunction diagnosis again. Another malfunction code may then be detected.

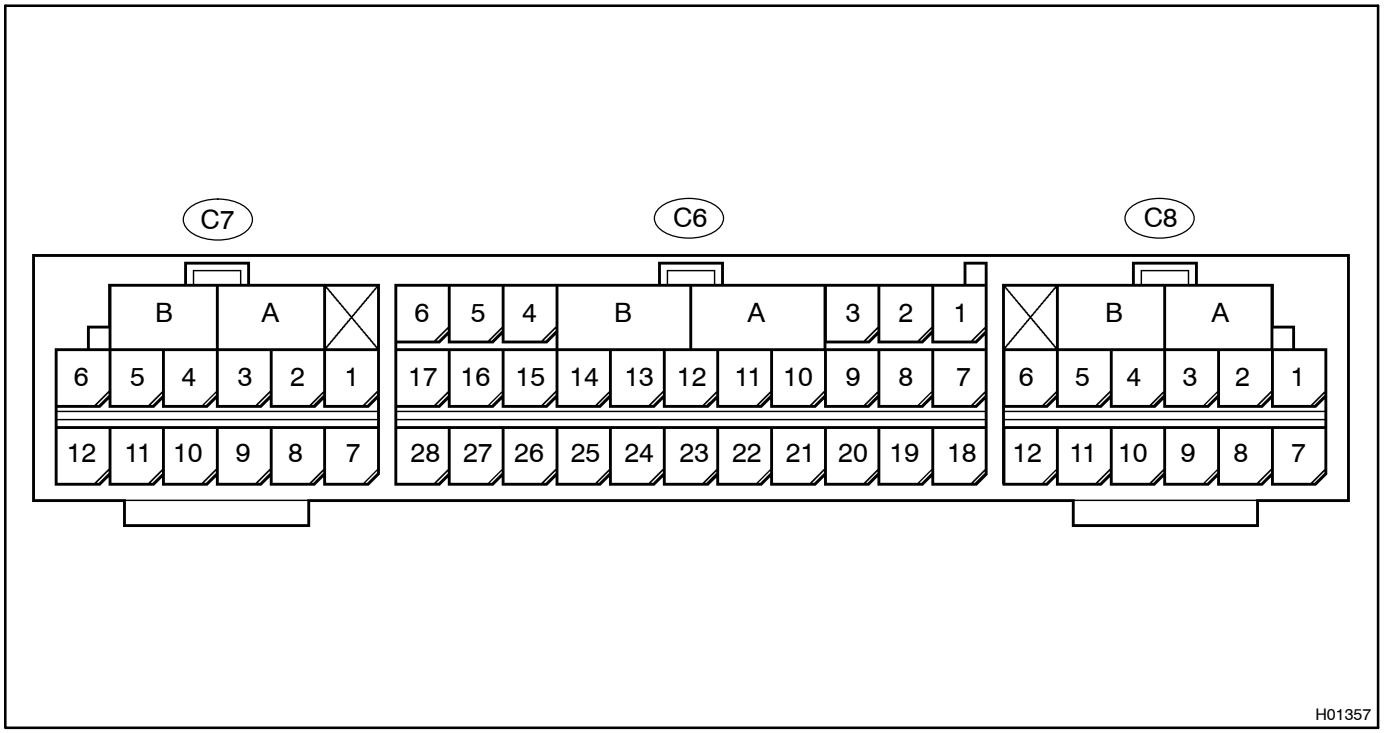
DI6P0-25

PARTS LOCATION



DI6P1–33

TERMINALS OF ECU



No.	Symbol	Terminal Name
A	–	Electrical Connector Check Mechanism
B	–	Electrical Connector Check Mechanism
C6 – 3	LA	SRS Warning Light
C6 – 5	IG2	Power Source
C6 – 6	IG1	Power Source
C6 – 7	DMR+	Door Side Airbag Sensor RH
C6 – 8	DMR–	Door Side Airbag Sensor RH
C6 – 9	+SR	Front Airbag Sensor RH
C6 – 10	P+	Squib (Passenger)
C6 – 11	P–	Squib (Passenger)
C6 – 12	SIL	Diagnosis
C6 – 13	D–	Squib (Driver)
C6 – 14	D+	Squib (Driver)
C6 – 15	+SL	Front Airbag Sensor LH
C6 – 16	DML–	Door Side Airbag Sensor LH
C6 – 17	DML+	Door Side Airbag Sensor LH
C6 – 19	TC	Diagnosis
C6 – 20	–SR	Front Airbag Sensor RH
C6 – 23	GSW2	ECM
C6 – 26	–SL	Front Airbag Sensor LH
C6 – 27	E1	Ground
C6 – 28	E2	Ground
C7 – 1	PL–	Squib (Seat Belt Pretensioner, LH)
C7 – 2	PL+	Squib (Seat Belt Pretensioner, LH)
C7 – 5	SFL+	Squib (Side, LH)

No.	Symbol	Terminal Name
C7 – 6	SFL–	Squib (Side, LH)
C7 – 7	VUPL	Side Airbag Sensor Assembly LH
C7 – 9	SSL+	Side Airbag Sensor Assembly LH
C7 – 10	FSL	Side Airbag Sensor Assembly LH
C7 – 11	LBE+	Body ECU
C7 – 12	ESL	Side Airbag Sensor Assembly LH
C8 – 1	SFR–	Squib (Side, RH)
C8 – 2	SFR+	Squib (Side, RH)
C8 – 5	PR+	Squib (Pretensioner, RH)
C8 – 6	PR–	Squib (Pretensioner, RH)
C8 – 7	ESR	Side Airbag Sensor Assembly RH
C8 – 9	FSR	Side Airbag Sensor Assembly RH
C8 – 10	SSR+	Side Airbag Sensor Assembly RH
C8 – 12	VUPR	Side Airbag Sensor Assembly RH

DI6P2-14

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
• With the ignition switch in ON position, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed.	• SRS warning light circuit	DI–1028
• SRS warning light is always lit up even when ignition switch is in the LOCK position.		
• With the ignition switch in ON position, the SRS warning light does not light up.		
• DTC is not displayed.	• TC terminal circuit	DI–1033
• SRS warning light is always lit up at the time of DTC check procedure.		
• DTC is displayed without TC and CG terminal connection.		

DI6P3-31

CIRCUIT INSPECTION

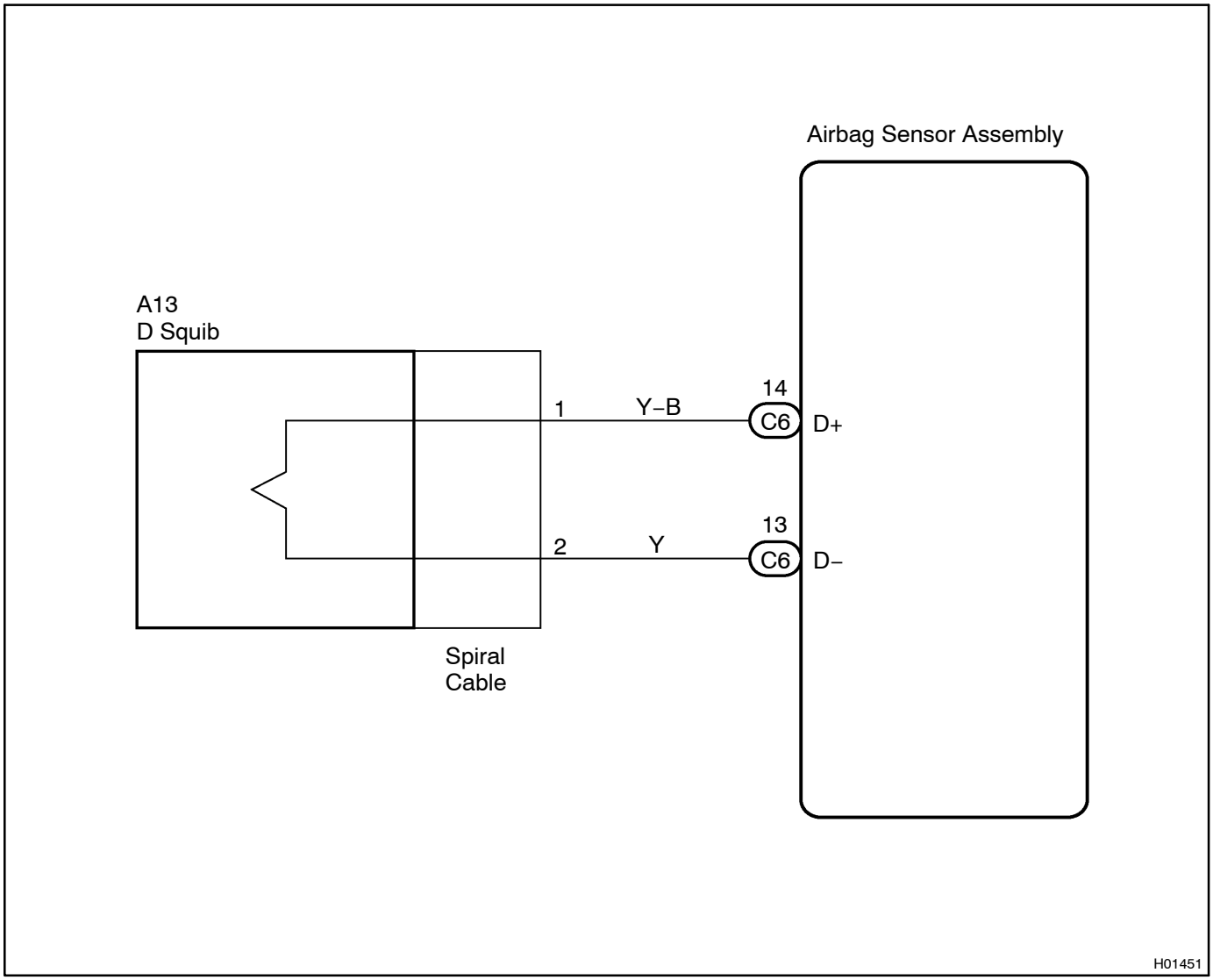
DTC	B0100/13	Short in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0100/13 is recorded when a short is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0100/13	• Short in D squib wire harness • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

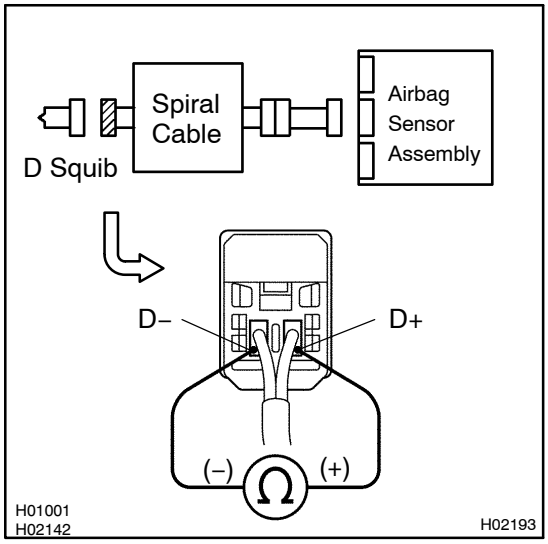
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check D squib wire harness.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector on the airbag sensor assembly side between the steering wheel pad (D squib) and the airbag sensor assembly (See page DI–884).

CHECK:

Measure the resistance between D+ and D– on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

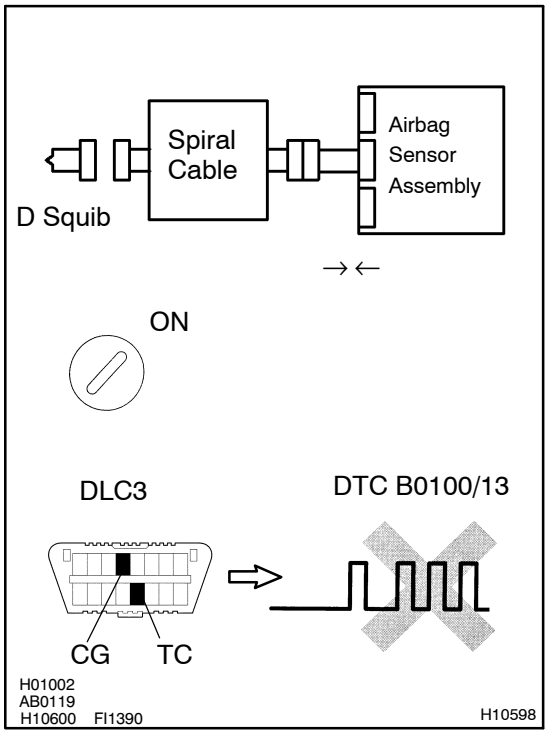
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 5.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0100/13 is not output.

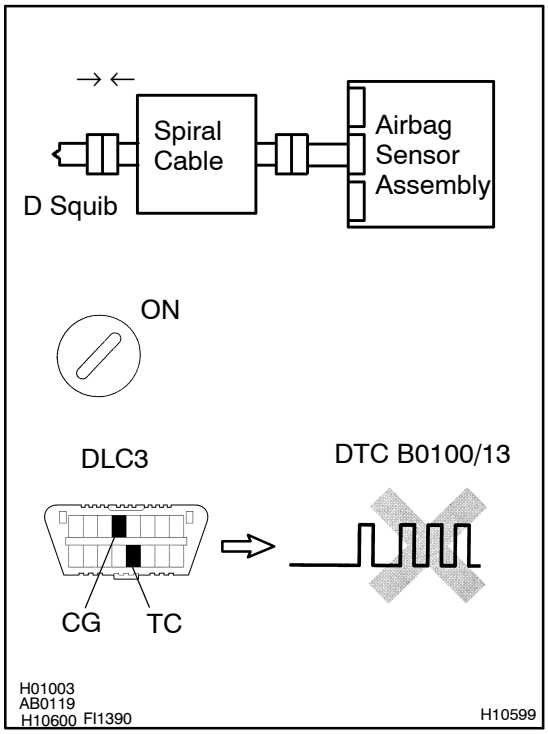
HINT:

Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check D squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the steering wheel pad (D squib) to the spiral cable.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0100/13 is not output.

HINT:

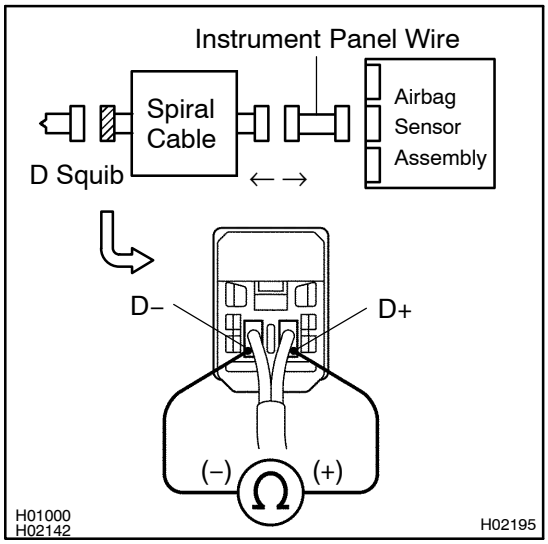
Codes other than code B0100/13 may be output at this time, but they are not relevant to this check.

NG	Replace steering wheel pad (D squib).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5	Check spiral cable.



PREPARATION:

(a) Disconnect the spiral cable connector from the instrument panel wire.

(b) Release the airbag activation prevention mechanism built in the spiral cable connector on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between D+ and D– of the spiral cable connector on the steering wheel pad (D squib) side.

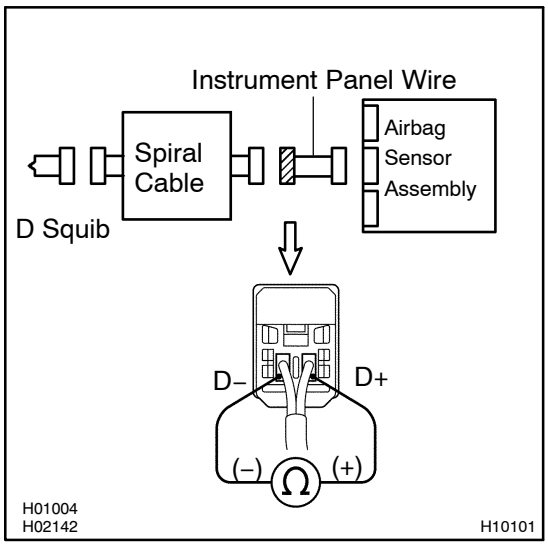
OK:

Resistance: 1 MΩ or Higher

NG → **Replace spiral cable.**

OK

6	Check instrument panel wire.



PREPARATION:

Release the airbag activation prevention mechanism built in the instrument panel wire connector on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between D+ and D– of the instrument panel wire connector on the spiral cable side.

OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace instrument panel wire.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6P4–21

DTC	B0101/14	Open in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0101/14 is recorded when an open is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0101/14	• Open in D squib wire harness • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

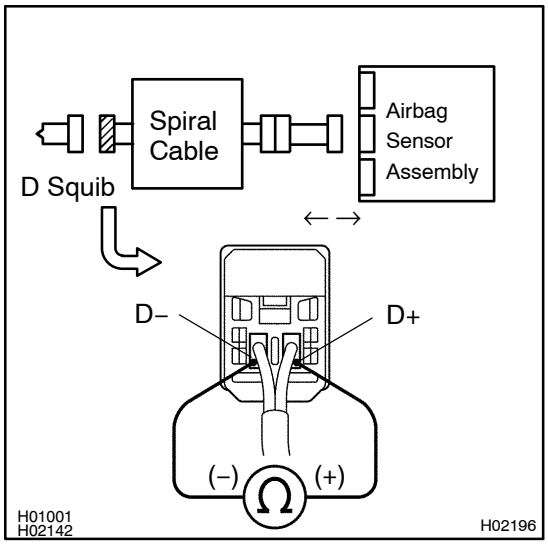
WIRING DIAGRAM

See page DI–898.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check D squib wire harness.



CHECK:

Measure the resistance between D+ and D– on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

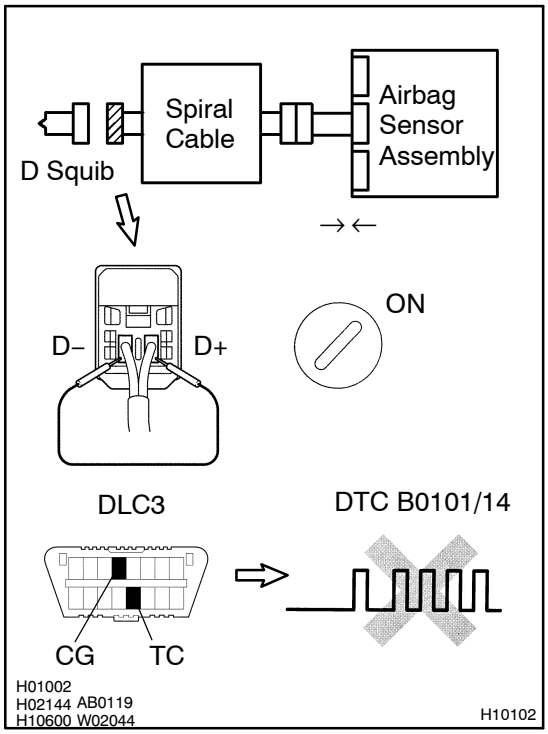
OK:

Resistance: Below 1 Ω

NG → **Go to step 5.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect D+ and D– of the connector on the spiral cable side between the airbag sensor assembly and the steering wheel pad (D squib).
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0101/14 is not output.

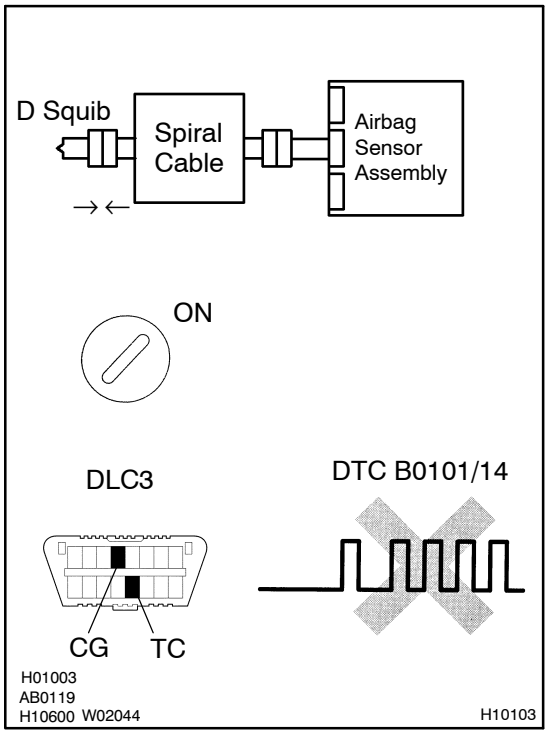
HINT:

Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check D squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the steering wheel pad (D squib) to the spiral cable.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0101/14 is not output.

HINT:

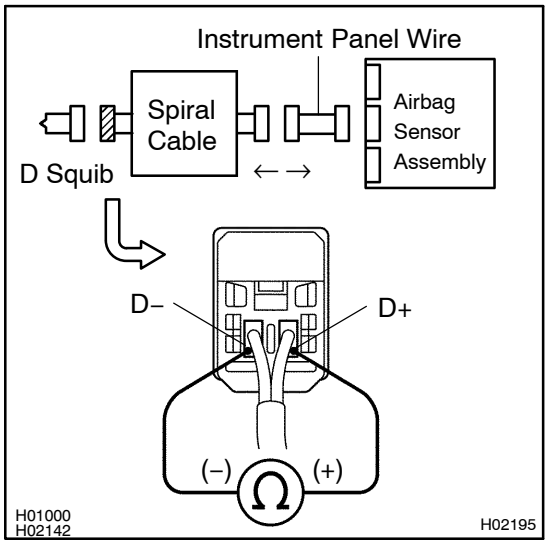
Codes other than code B0101/14 may be output at this time, but they are not relevant to this check.

NG	Replace steering wheel pad (D squib).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5	Check spiral cable.



PREPARATION:
Disconnect the spiral cable connector from the instrument panel wire.

CHECK:
Measure the resistance between D+ and D– of the spiral cable connector on the steering wheel pad (D squib) side.

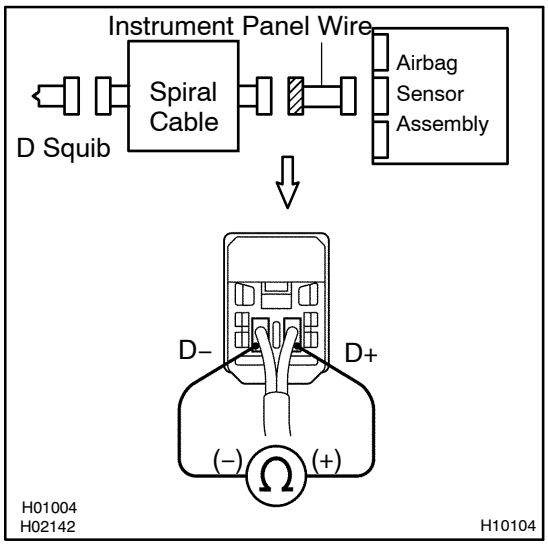
OK:

Resistance: Below 1 Ω

NG	Replace spiral cable.

OK

6	Check instrument panel wire.



CHECK:
Measure the resistance between D+ and D– of the instrument panel wire connector on the spiral cable side.

OK:

Resistance: Below 1 Ω

NG	Repair or replace instrument panel wire.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6P5–21

DTC	B0102/11	Short in D Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0102/11 is recorded when a ground short is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0102/11	• Short in D squib wire harness (to ground) • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

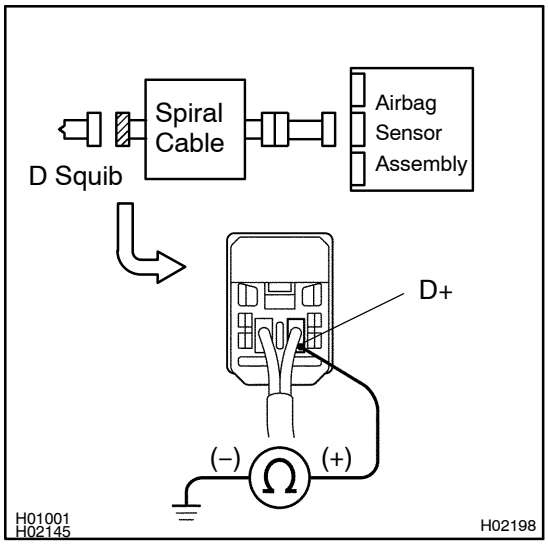
WIRING DIAGRAM

See page DI–898.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check D squib wire harness.



CHECK:

Measure the resistance between the body ground and D+ on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

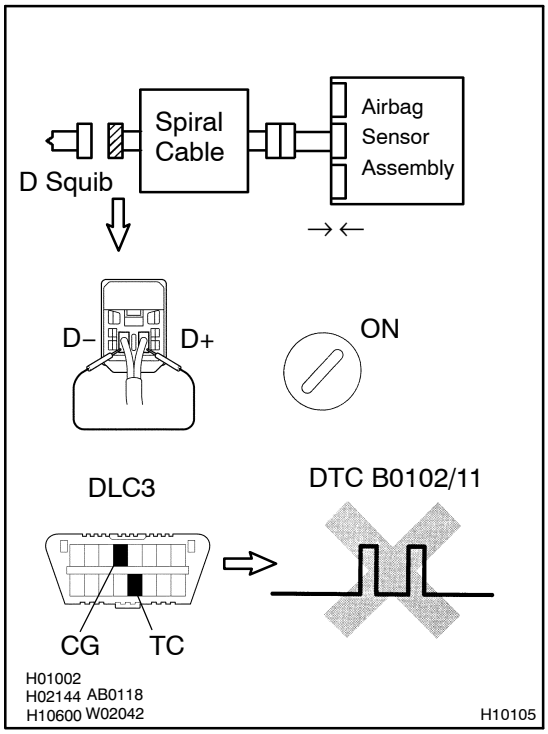
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 5.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect D+ and D– of the connector on the spiral cable side between the airbag sensor assembly and the steering wheel pad (D squib).
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0102/11 is not output.

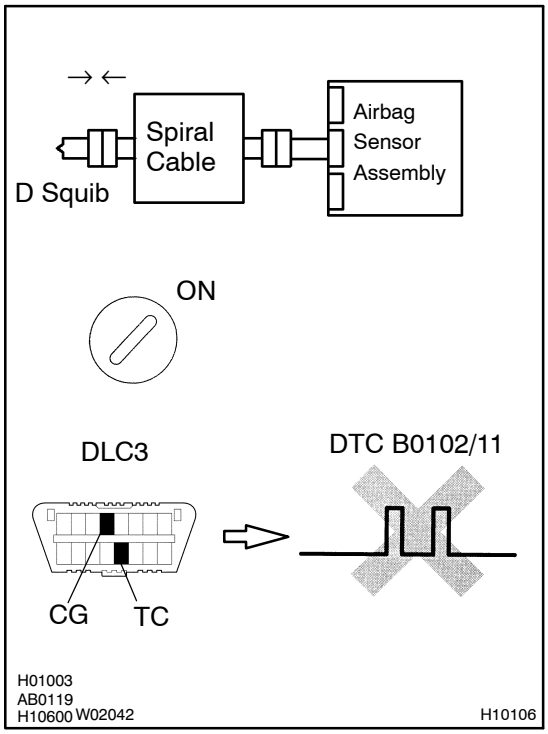
HINT:

Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check D squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the steering wheel pad (D squib) to the spiral cable.
(d) Connect negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0102/11 is not output.

HINT:

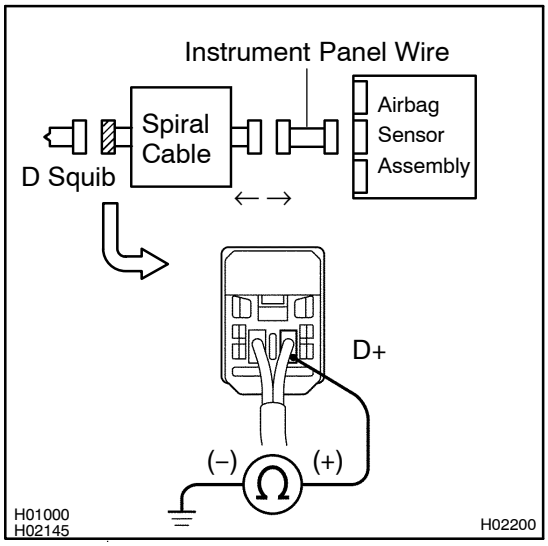
Codes other than code B0102/11 may be output at this time, but they are not relevant to this check.

NG → **Replace steering wheel pad (D squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

5	Check spiral cable.

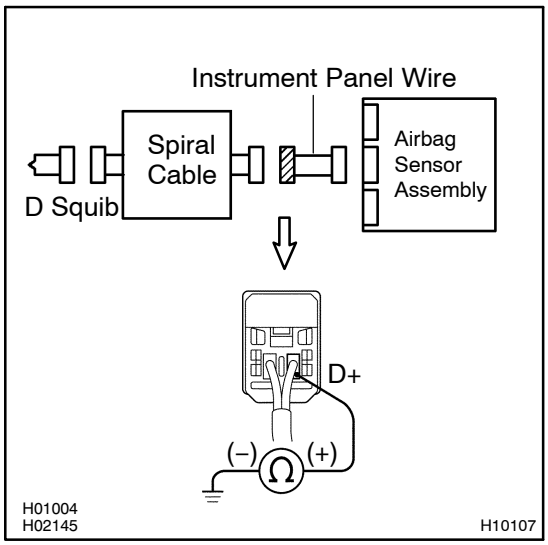


PREPARATION:
Disconnect the spiral cable connector from the instrument panel wire.
CHECK:
Measure the resistance between the body ground and D+ of the spiral cable connector on the steering wheel pad (D squib) side.
OK:
Resistance: 1 MΩ or Higher

NG → **Replace spiral cable.**

OK

6	Check instrument panel wire.



CHECK:
Measure the resistance between the body ground and D+ of the instrument panel wire connector on the spiral cable side.
OK:
Resistance: 1 MΩ or Higher

NG → **Repair or replace instrument panel wire.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6P6–23

DTC	B0103/12	Short in D Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The D squib circuit consists of the airbag sensor assembly, the spiral cable and the steering wheel pad. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0103/12 is recorded when a B+ short is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0103/12	• Short in D squib wire harness (to B+) • D squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Instrument panel wire

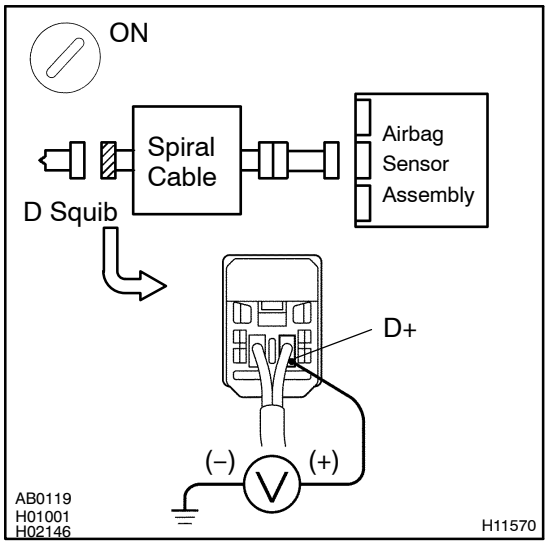
WIRING DIAGRAM

See page DI–898.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check D squib wire harness.



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and D+ on the steering wheel pad (D squib) side between the airbag sensor assembly and the steering wheel pad (D squib).

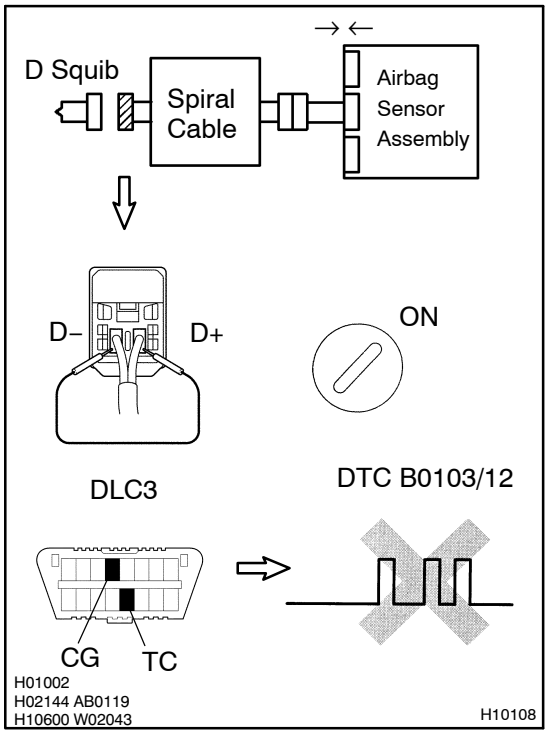
OK:

Voltage: Below 1 V

NG	Go to step 5.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect D+ and D– of the connector on the spiral cable side between the airbag sensor assembly and the steering wheel pad (D squib).
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0103/12 is not output.

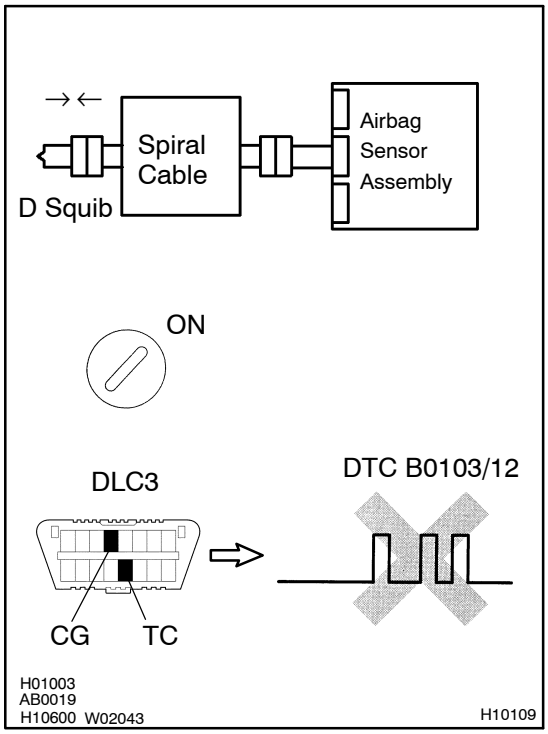
HINT:

Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check D squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the steering wheel pad (D squib) to the spiral cable.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0103/12 is not output.

HINT:

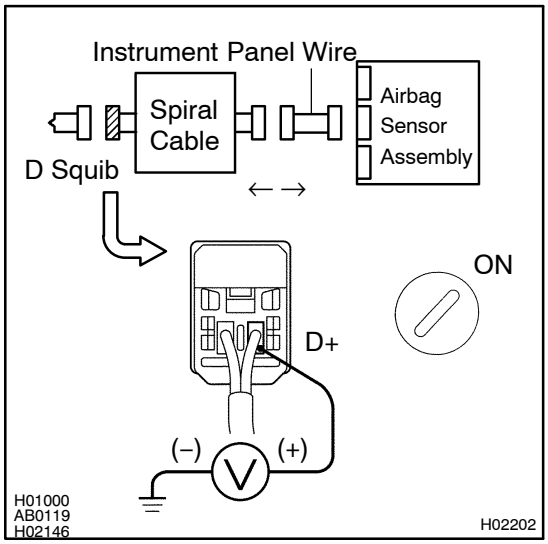
Codes other than code B0103/12 may be output at this time, but they are not relevant to this check.

NG → **Replace steering wheel pad (D squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

5	Check spiral cable.



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the spiral cable connector from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and D+ of the spiral cable connector on the steering wheel pad (D squib) side.

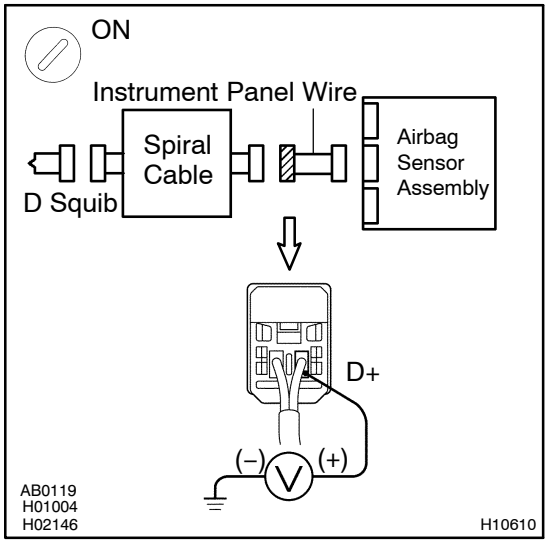
OK:

Voltage: Below 1 V

NG	Replace spiral cable.

OK

6	Check instrument panel wire.



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and D+ of the instrument panel wire connector on the spiral cable side.

OK:

Voltage: Below 1 V

NG	Repair or replace instrument panel wire.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6P7–34

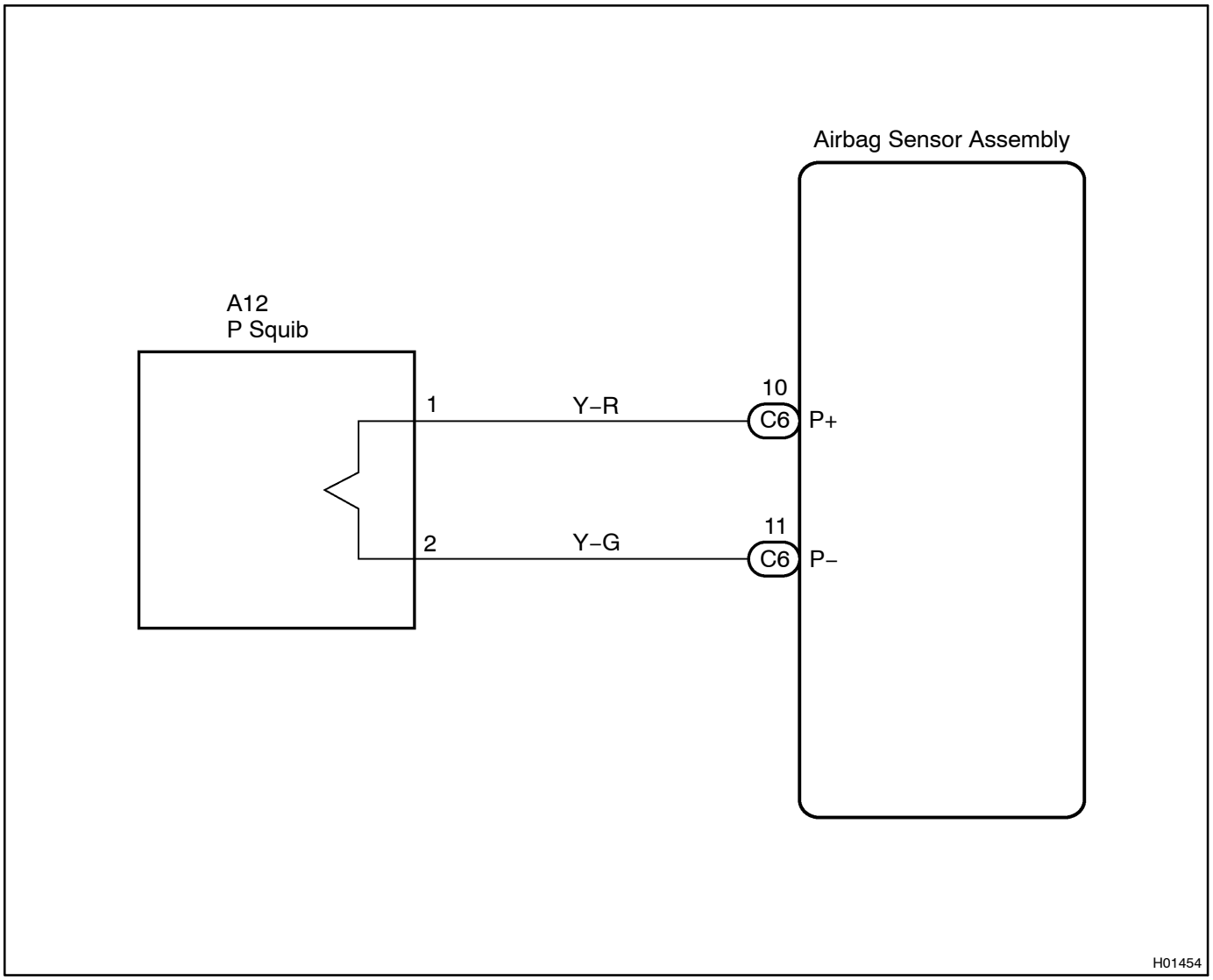
DTC	B0105/53	Short in P Squib Circuit

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0105/53 is recorded when a short is detected in the P squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0105/53	• Short in P squib wire harness • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

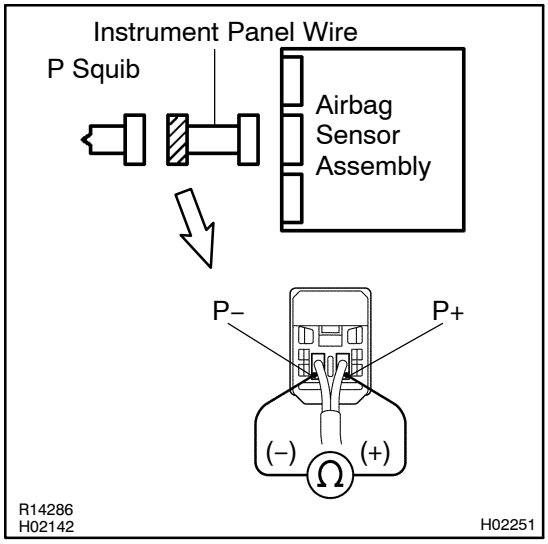
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the instrument panel wire connector on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

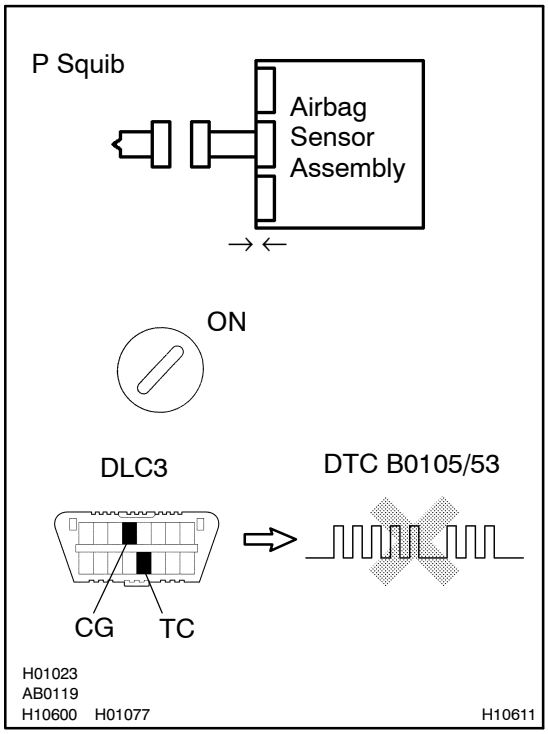
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0105/53 is not output.

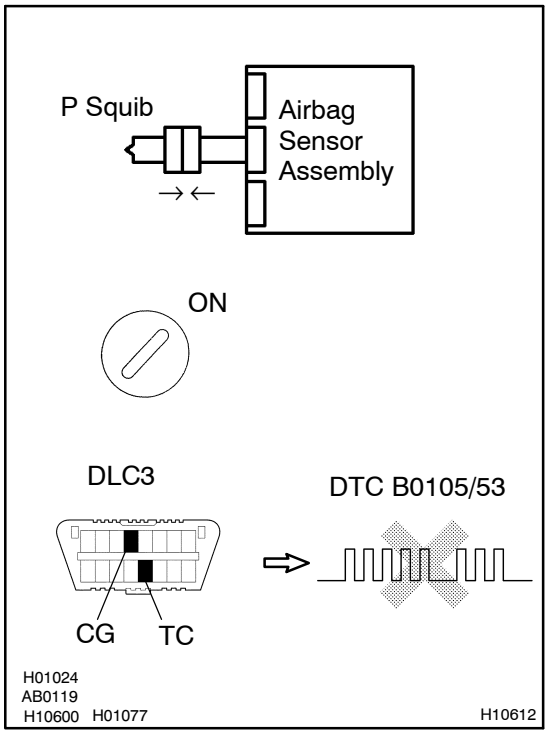
HINT:

Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check P squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0105/53 is not output.

HINT:

Codes other than code B0105/53 may be output at this time, but they are not relevant to this check.

NG → **Replace front passenger airbag assembly (P squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6P8–20

DTC	B0106/54	Open in P Squib Circuit

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0106/54 is recorded when an open is detected in the P squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0106/54	• Open in P squib wire harness • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

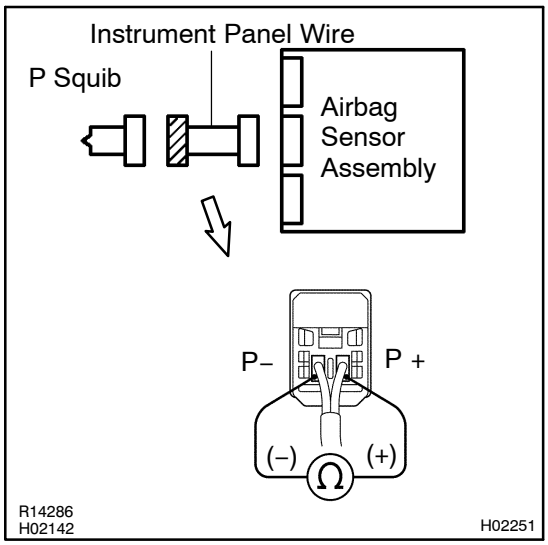
WIRING DIAGRAM

See page DI–915.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



CHECK:

Measure the resistance between P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

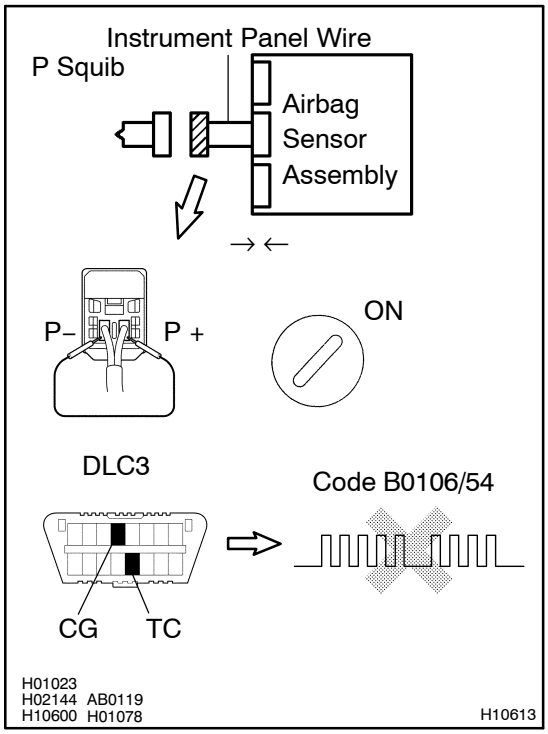
OK:

Resistance: Below 1 Ω

NG → **Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0106/54 is not output.

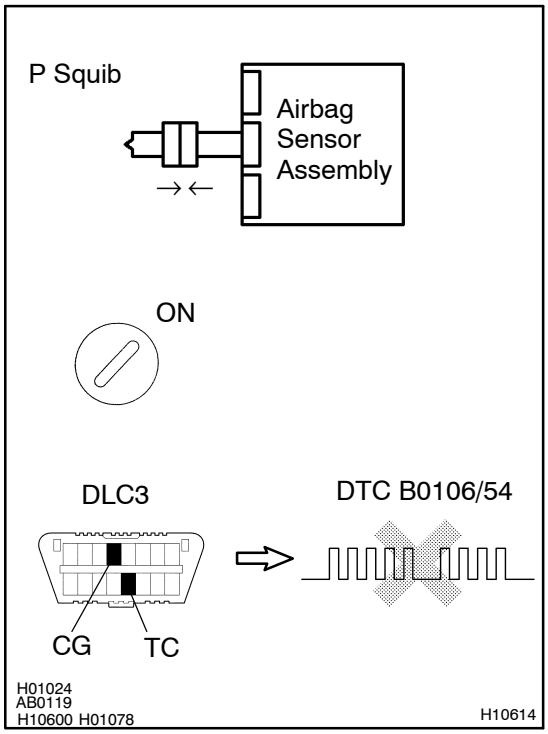
HINT:

Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0106/54 is not output.

HINT:

Codes other than code B0106/54 may be output at this time, but they are not relevant to this check.

NG → **Replace front passenger airbag assembly (P squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC	B0107/51	Short in P Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0107/51 is recorded when ground short is detected in the P squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0107/51	• Short in P squib wire harness (to ground) • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

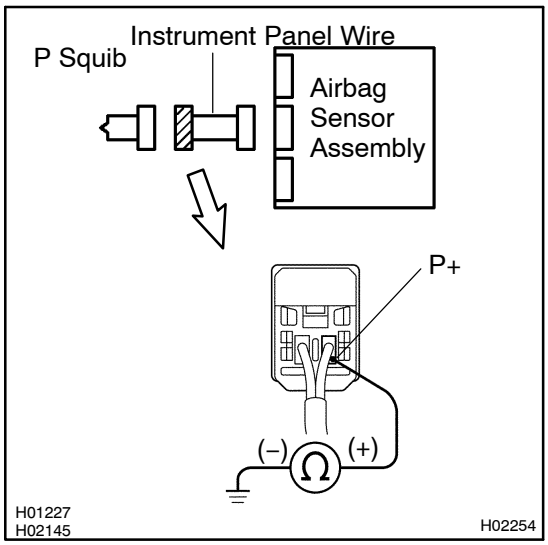
WIRING DIAGRAM

See page DI–915.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



CHECK:

Measure the resistance between the body ground and P+ of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

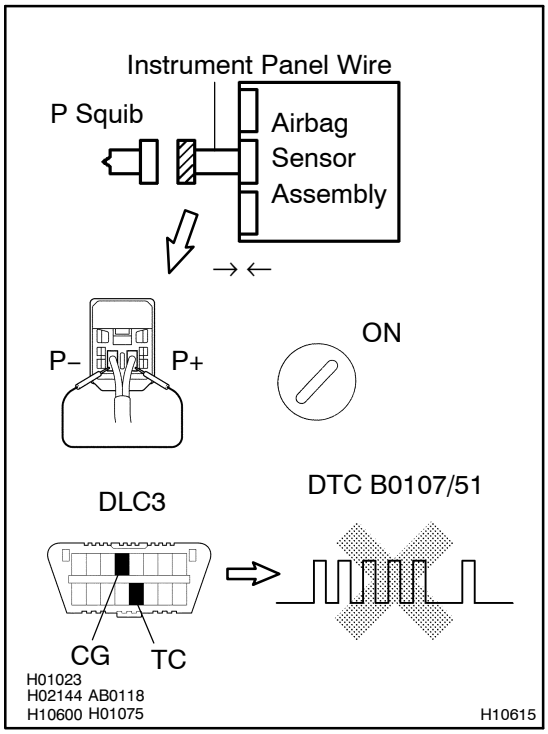
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0107/51 is not output.

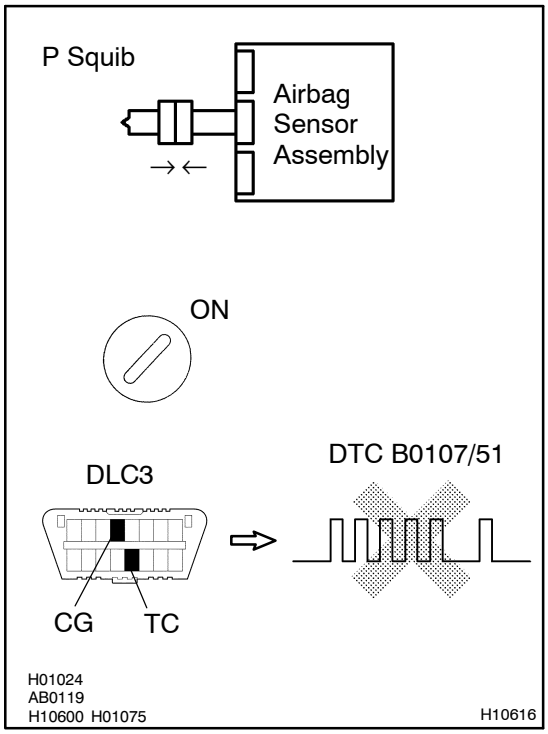
HINT:

Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0107/51 is not output.

HINT:

Codes other than code B0107/51 may be output at this time, but they are not relevant to this check.

NG → **Replace front passenger airbag assembly (P squib).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PA–19

DTC	B0108/52	Short in P Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and the front passenger airbag assembly.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0108/52 is recorded when a B+ short is detected in the P squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0108/52	• Short in P squib wire harness (to B+) • P squib malfunction • Airbag sensor assembly malfunction	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Instrument panel wire

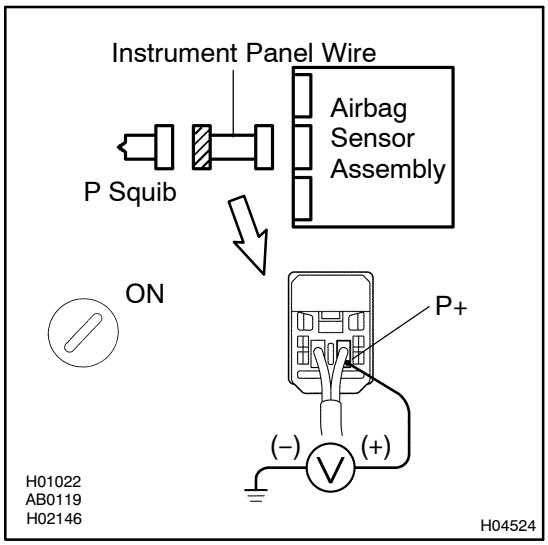
WIRING DIAGRAM

See page DI–915.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check instrument panel wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and P+ of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.

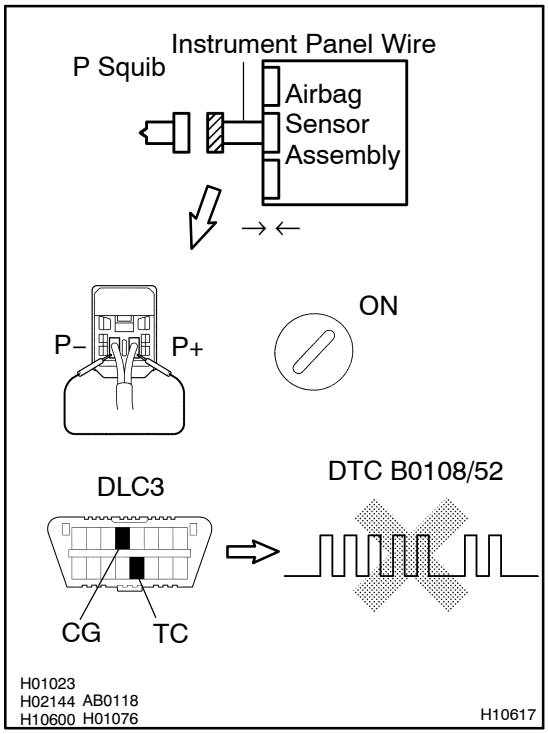
OK:

Voltage: Below 1 V

NG	**Repair or replace instrument panel wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect P+ and P– of the instrument panel wire connector on the front passenger airbag assembly (P squib) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0108/52 is not output.

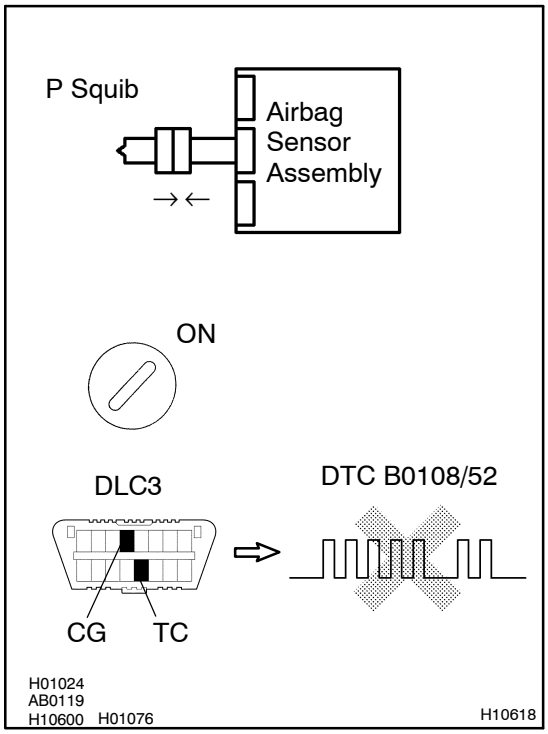
HINT:

Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P squib.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front passenger airbag assembly (P squib) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0108/52 is not output.

HINT:

Codes other than code B0108/52 may be output at this time, but they are not relevant to this check.

NG	Replace front passenger airbag assembly (P squib).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PB–44

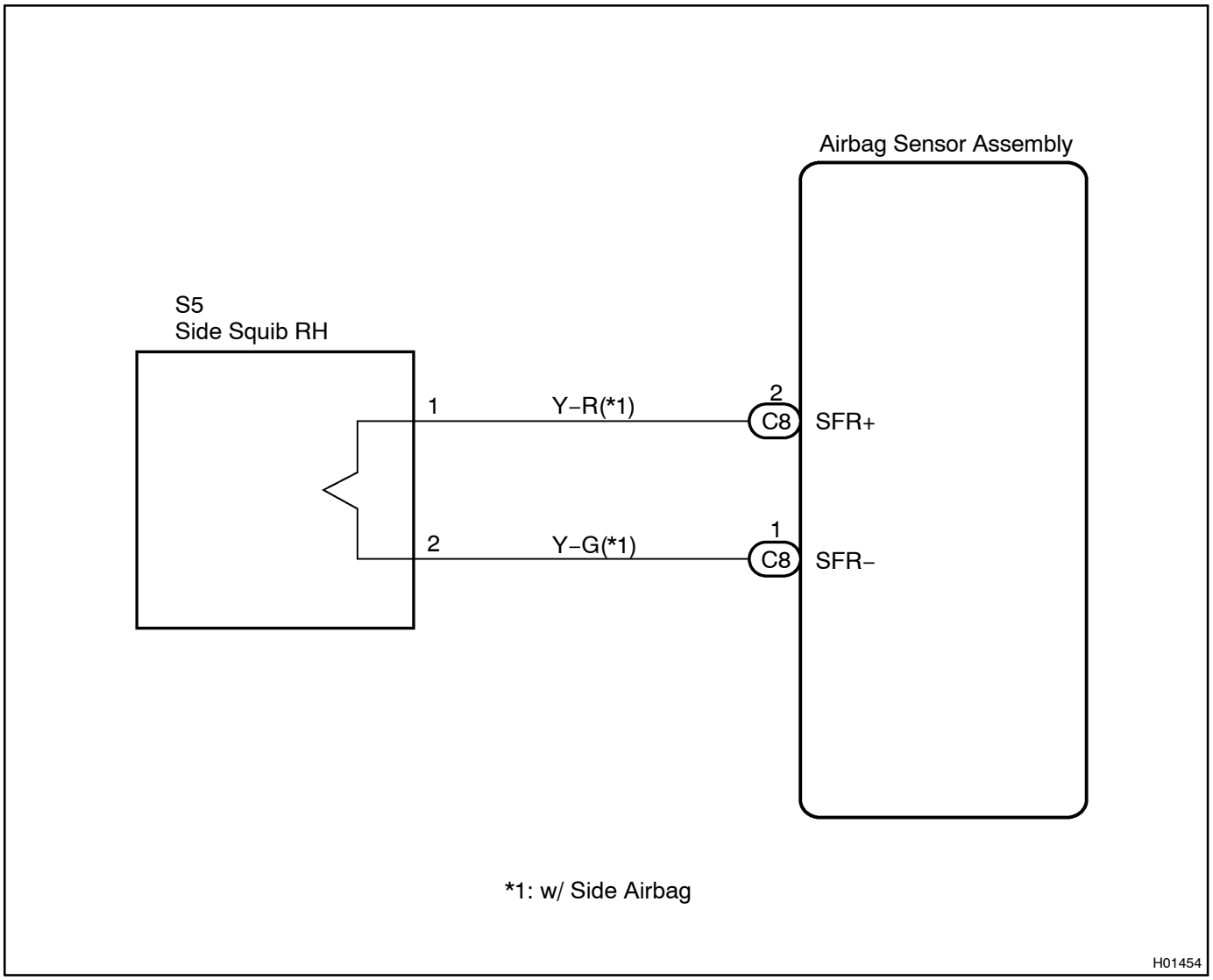
DTC	B0110/43	Short in Side Squib RH Circuit

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0110/43 is recorded when a short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0110/43	• Short in side squib RH wire harness • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

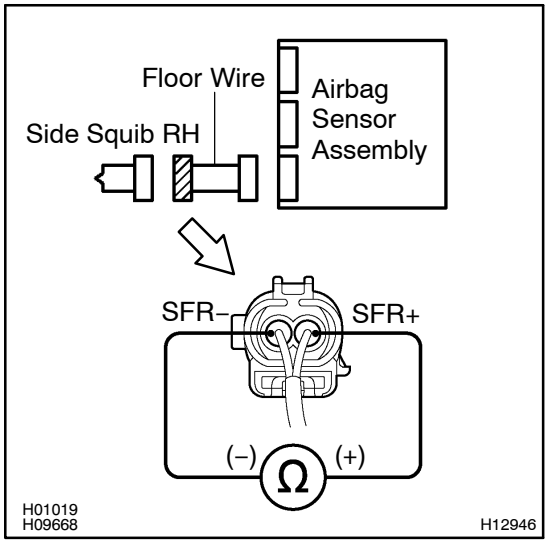
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.

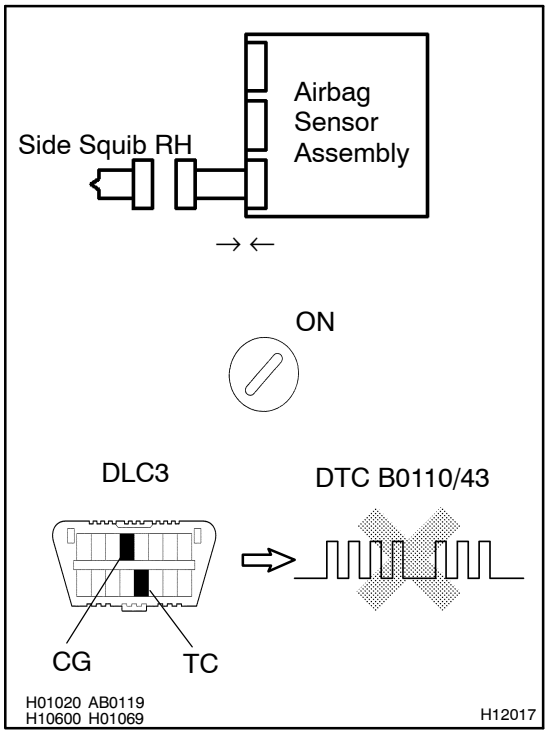
OK:

Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch or ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0110/43 is not output.

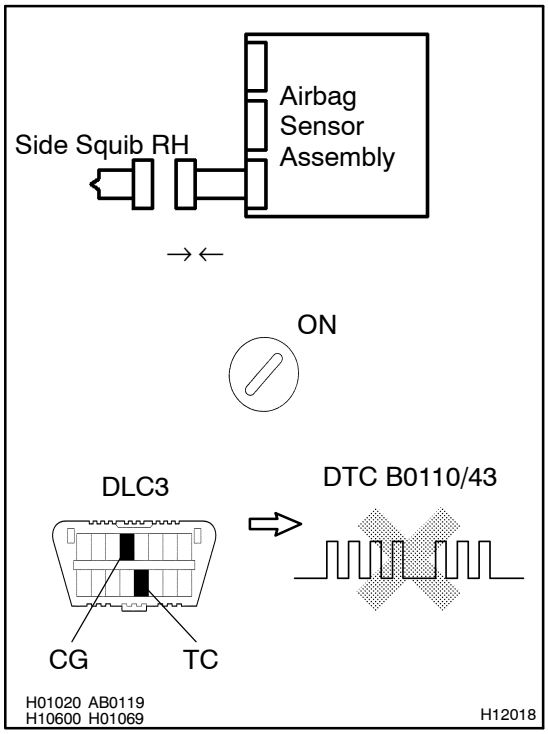
HINT:

Codes other than code B0110/43 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

4	Check side squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0110/43 is not output.

HINT:
Codes other than code B0110/43 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PC–27

DTC	B0111/44	Open in Side Squib RH Circuit

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0111/44 is recorded when an open is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0111/44	• Open in side squib RH wire harness • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

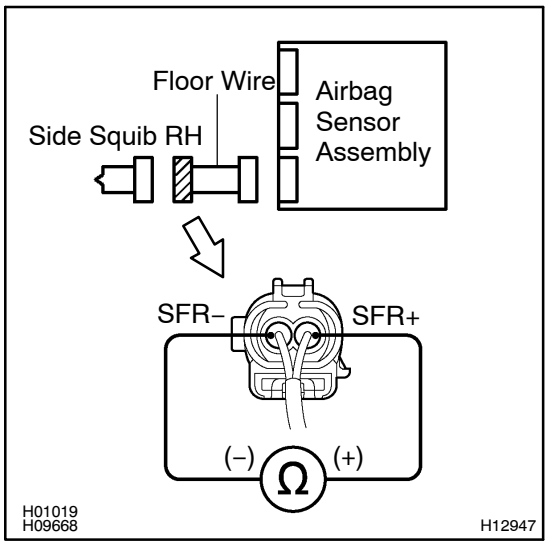
WIRING DIAGRAM

See page DI–928.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.

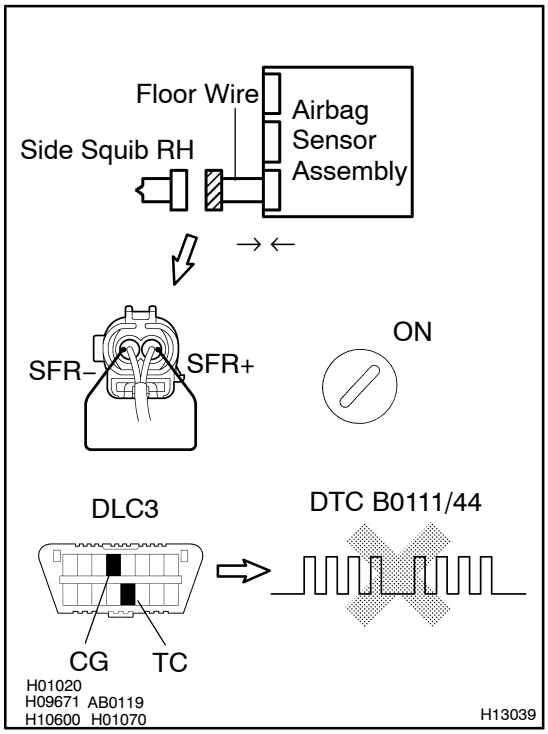
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0111/44 is not output.

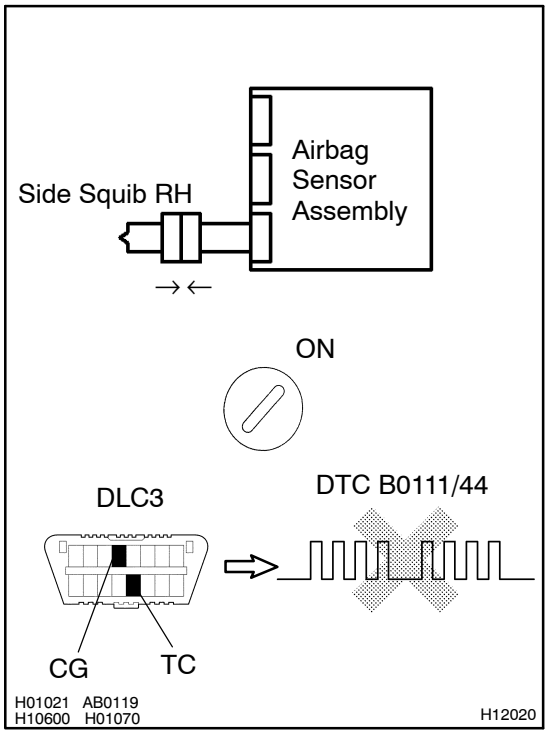
HINT:

Codes other than code B0111/44 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0111/44 is not output.

HINT:
Codes other than code B0111/44 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC	B0112/41	Short in Side Squib RH Circuit (to Ground)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0112/41 is recorded when ground short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0112/41	• Short in side squib RH wire harness (to ground) • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

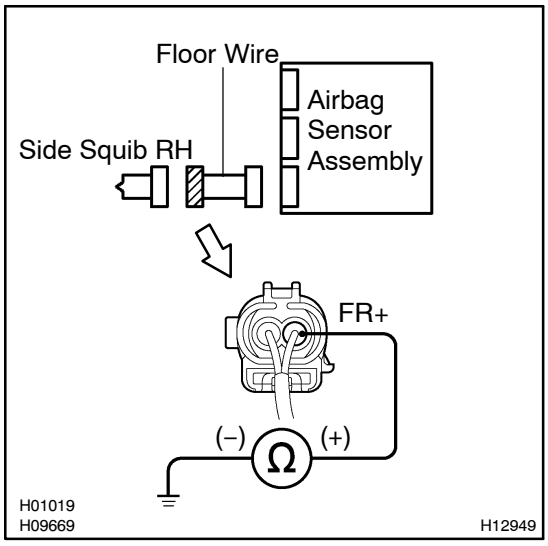
WIRING DIAGRAM

See page DI–928.

INSPECTION PROCEDURE

1	Prepare for inspection (See step 1 on page DI–1025).

2	Check floor wire.



CHECK:

Measure the resistance between the body ground and SFR+ of the floor wire connector on the side airbag assembly RH (side squib RH) side.

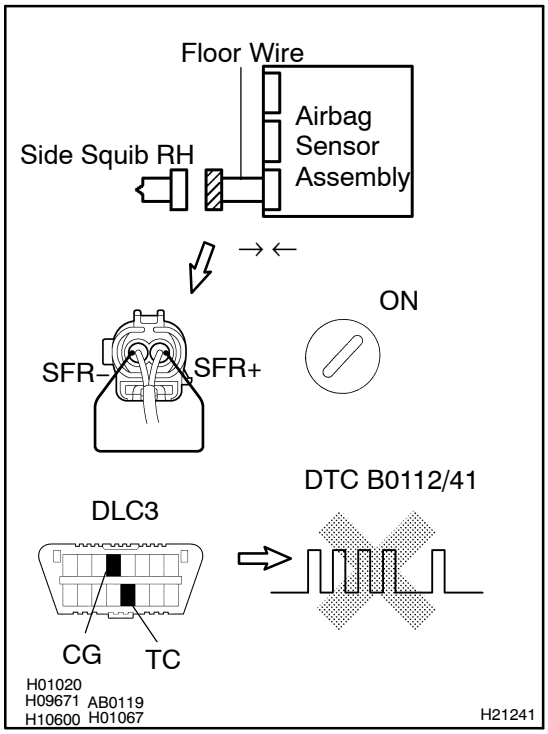
OK:

Resistance: 1 MΩ or Higher

NG	Repair or replace floor wire.

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0112/41 is not output.

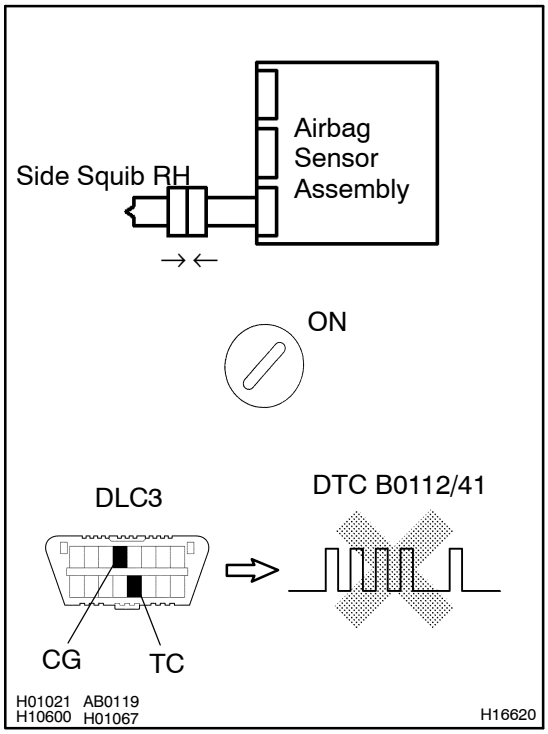
HINT:

Codes other than code B0112/41 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0112/41 is not output.

HINT:

Codes other than code B0112/41 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DTC	B0113/42	Short in Side Squib RH Circuit (to B+)

CIRCUIT DESCRIPTION

The side squib RH circuit consists of the airbag sensor assembly and the side airbag assembly RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0113/42 is recorded when a B+ short is detected in the side squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0113/42	• Short in side squib RH wire harness (to B+) • Side squib RH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly RH (Side squib RH) • Airbag sensor assembly • Floor wire

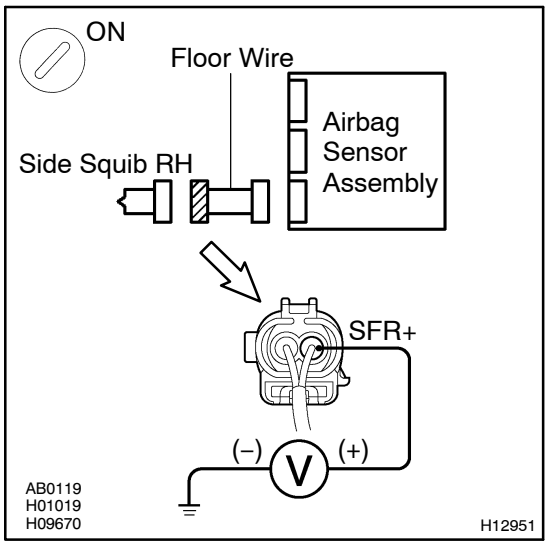
WIRING DIAGRAM

See page DI–928.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–884).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and SFR+ of the floor wire connector on the side airbag assembly RH (side squib RH) side.

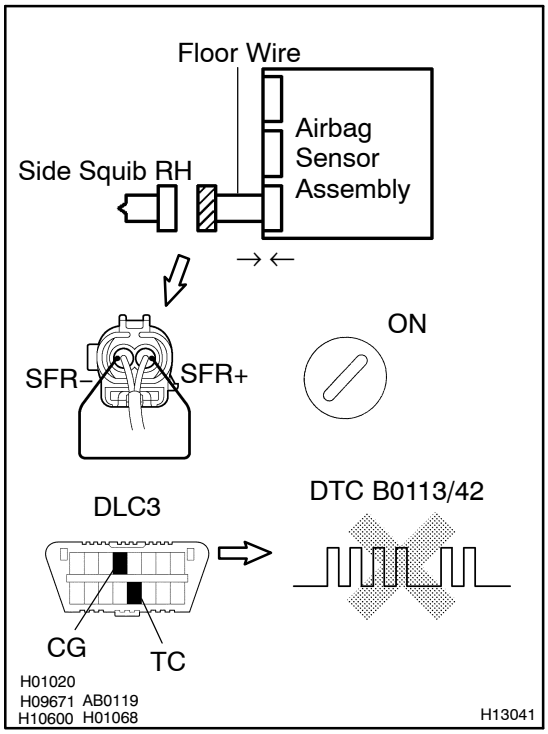
OK:

Voltage: Below 1 V

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFR+ and SFR– of the floor wire connector on the side airbag assembly RH (side squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0113/42 is not output.

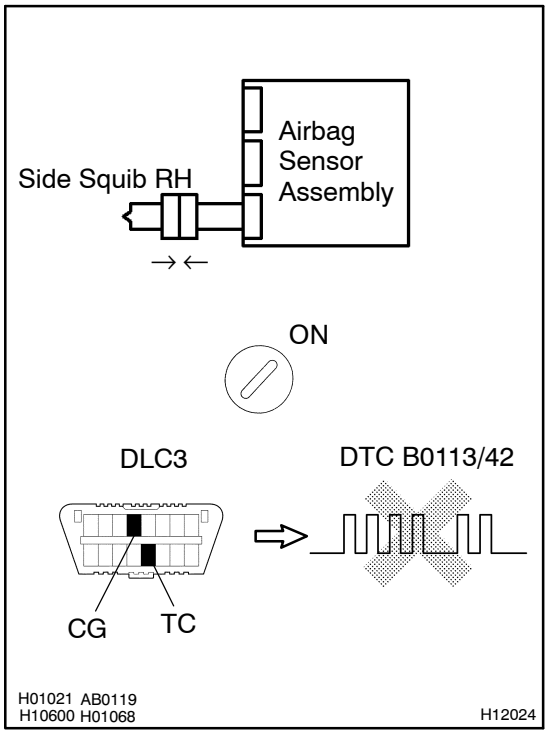
HINT:

Codes other than code B0113/42 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly RH (side squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0113/42 is not output.

HINT:

Codes other than code B0113/42 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly RH (side squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PF–46

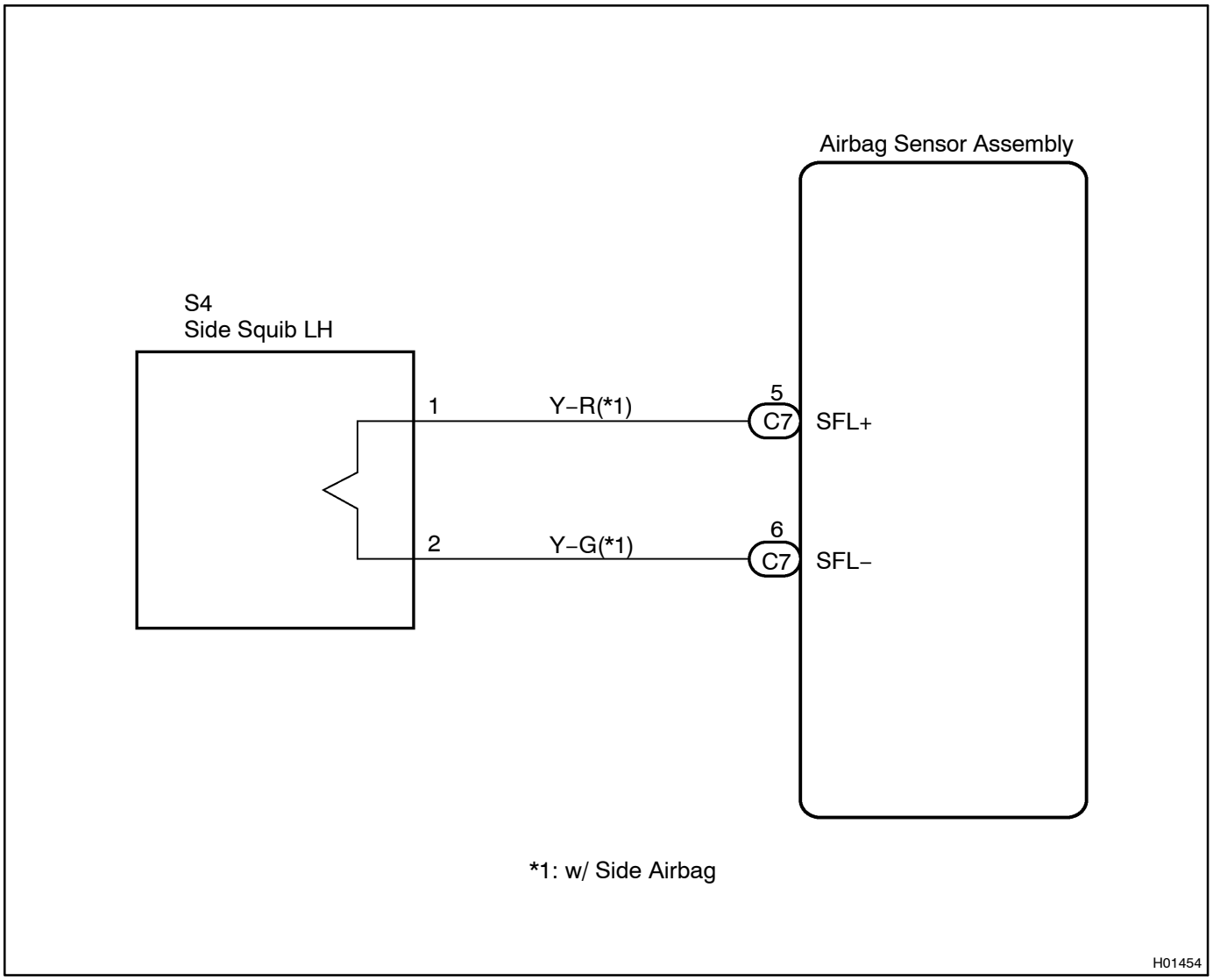
DTC	B0115/47	Short in Side Squib LH Circuit

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0115/47 is recorded when a short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0115/47	• Short in side squib LH wire harness • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

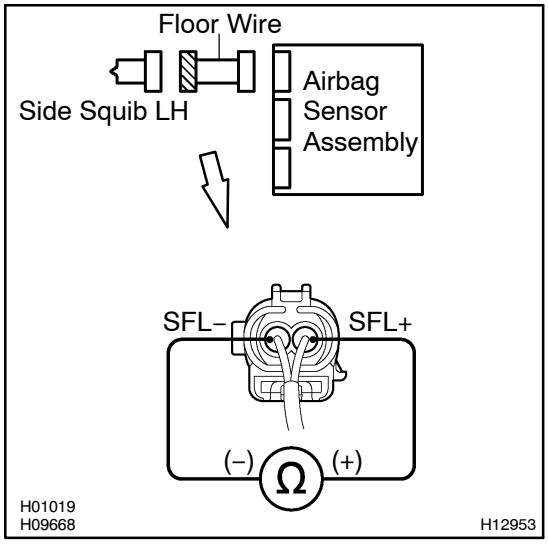
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.

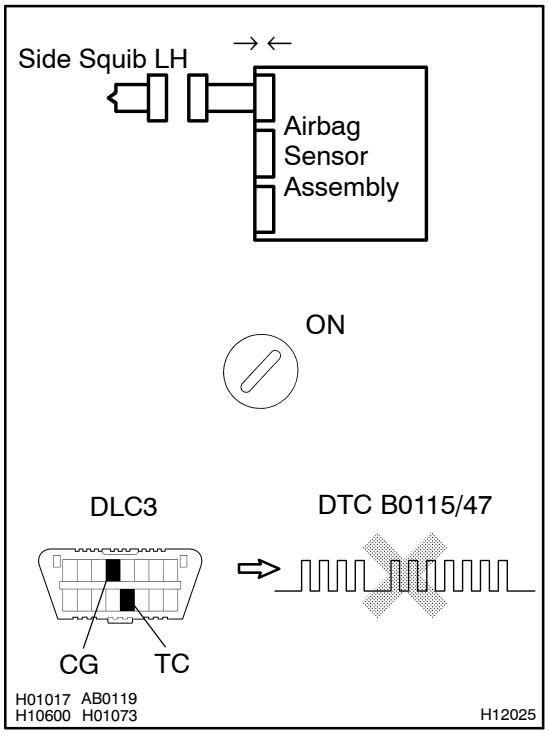
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0115/47 is not output.

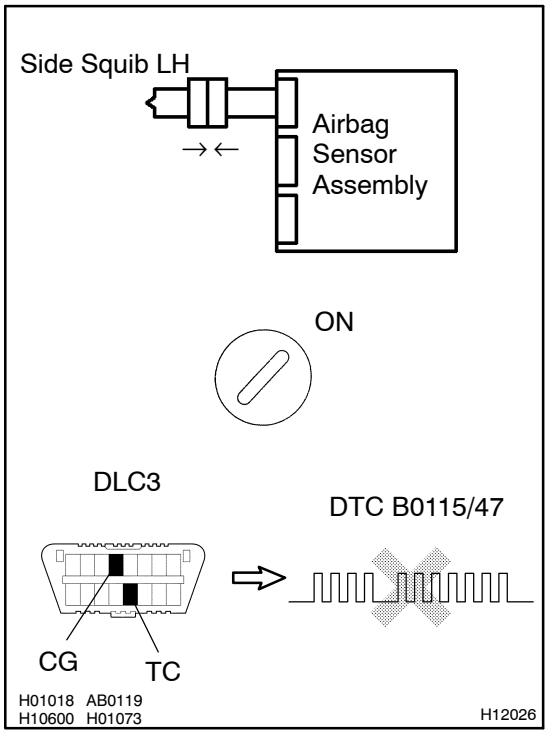
HINT:

Codes other than code B0115/47 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly LH connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0115/47 is not output.

HINT:

Codes other than code B0115/47 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly LH (side squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PG–28

DTC	B0116/48	Open in Side Squib LH Circuit

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0116/48 is recorded when an open is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0116/48	• Open in side squib LH wire harness • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

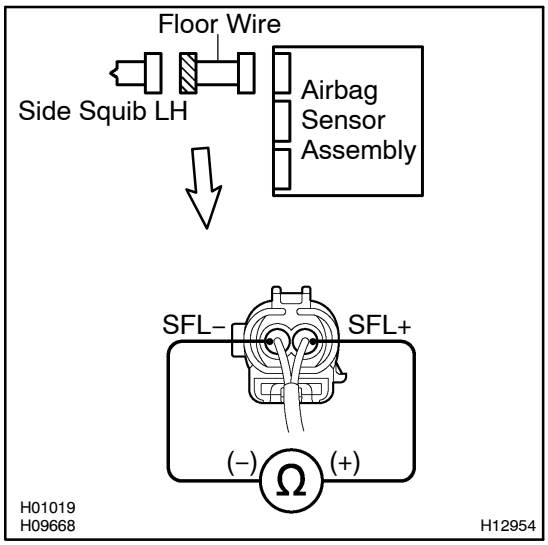
WIRING DIAGRAM

See page DI–941.

INSPECTION PROCEDURE

1	**Prepare for inspection. (See step 1 on page DI–1025)**

2	**Check floor wire.**



CHECK:

Measure the resistance between SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.

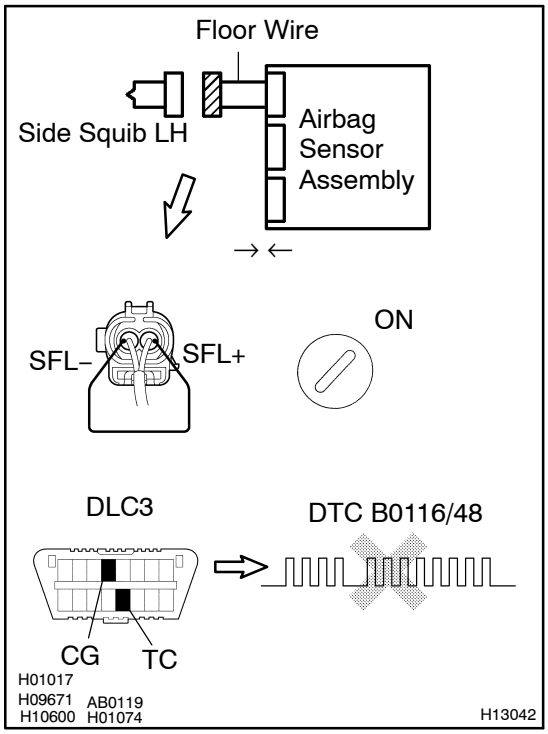
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0116/48 is not output.

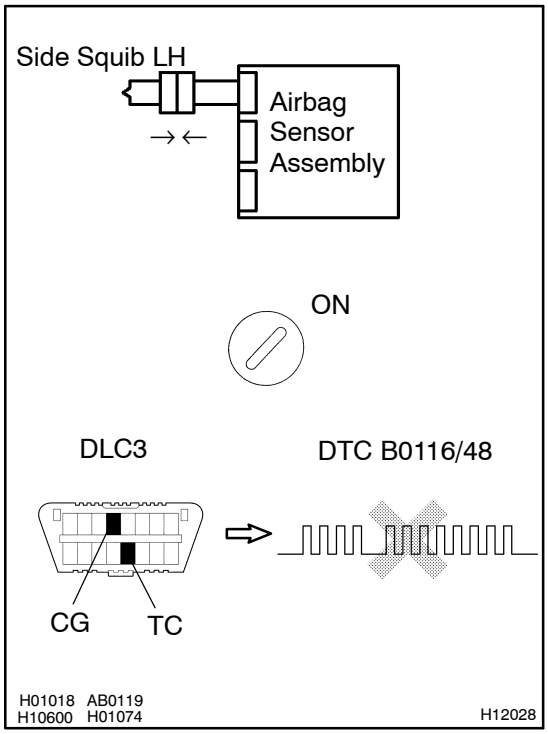
HINT:

Codes other than code B0116/48 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly LH (side squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0116/48 is not output.

HINT:

Codes other than code B0116/48 may be output at this time, but they are not relevant to this check.

NG	Replace side airbag assembly LH (side squib LH).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC	B0117/45	Short in Side Squib LH Circuit (to Ground)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0117/45 is recorded when ground short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0117/45	• Short in side squib LH wire harness (to ground) • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

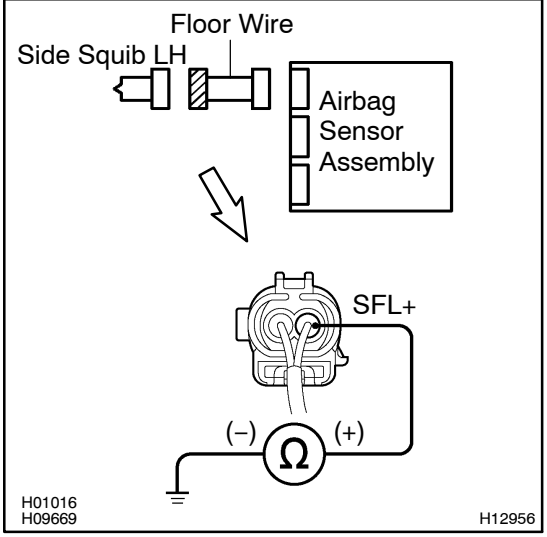
WIRING DIAGRAM

See page DI–941.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**

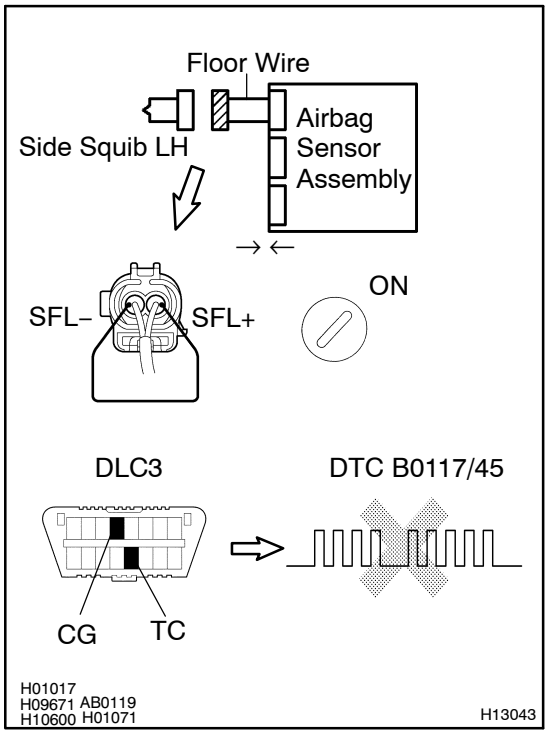


CHECK:
Measure the resistance between the body ground and SFL+ of the floor wire connector on the side airbag assembly LH (side squib LH) side.
OK:
Resistance: 1 MΩ or Higher

NG	**Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0117/45 is not output.

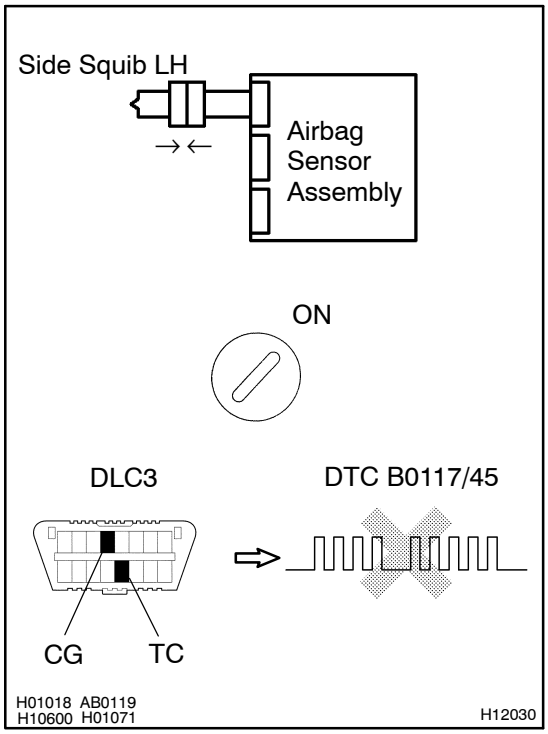
HINT:

Codes other than code B0117/45 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly LH (side squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0117/45 is not output.

HINT:
Codes other than code B0117/45 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly LH (side squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PI–28

DTC	B0118/46	Short in Side Squib LH Circuit (to B+)

CIRCUIT DESCRIPTION

The side squib LH circuit consists of the airbag sensor assembly and the side airbag assembly LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0118/46 is recorded when a B+ short is detected in the side squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0118/46	• Short in side squib LH wire harness (to B+) • Side squib LH malfunction • Airbag sensor assembly malfunction	• Side airbag assembly LH (Side squib LH) • Airbag sensor assembly • Floor wire

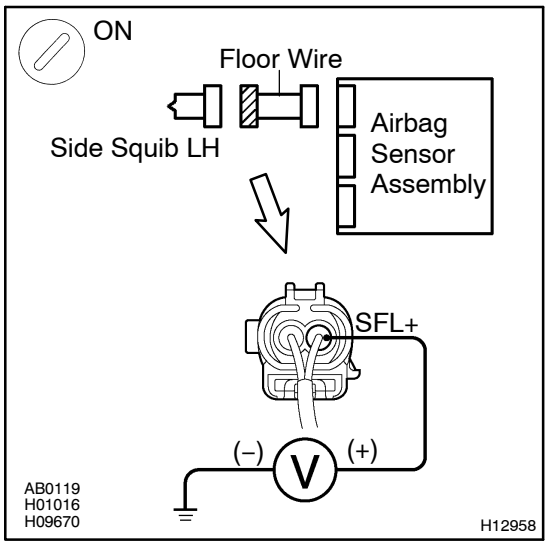
WIRING DIAGRAM

See page DI–941.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and SFL+ of the floor wire connector on the side airbag assembly LH (side squib LH) side.

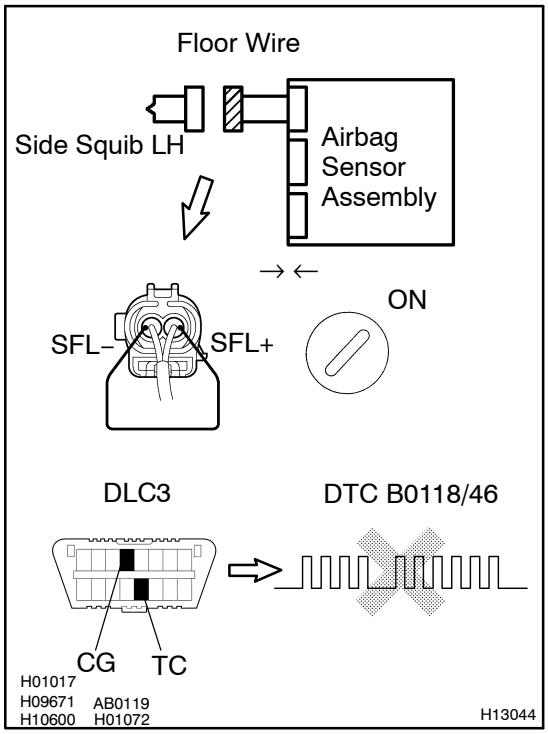
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect SFL+ and SFL– of the floor wire connector on the side airbag assembly LH (side squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0118/46 is not output.

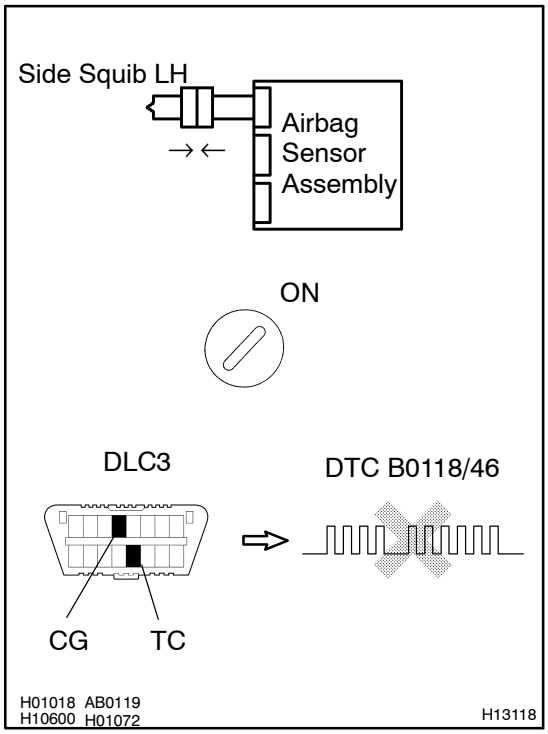
HINT:

Codes other than code B0118/46 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check side squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the side airbag assembly LH (side squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0118/46 is not output.

HINT:

Codes other than code B0118/46 may be output at this time, but they are not relevant to this check.

NG → **Replace side airbag assembly LH (side squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PJ–34

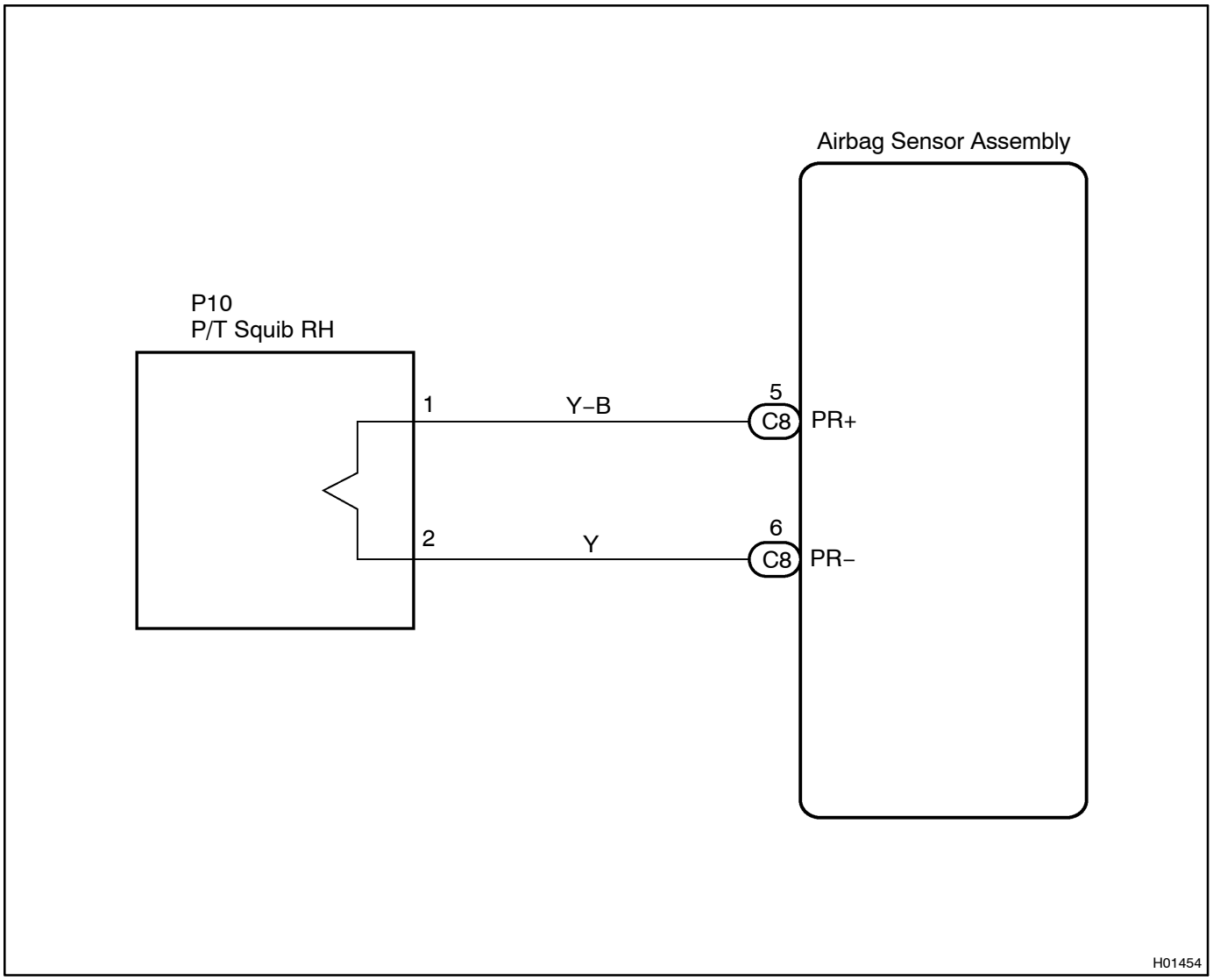
DTC	B0130/63	Short in P/T Squib RH Circuit

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0130/63 is recorded when a short is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0130/63	• Short in P/T squib RH wire harness • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

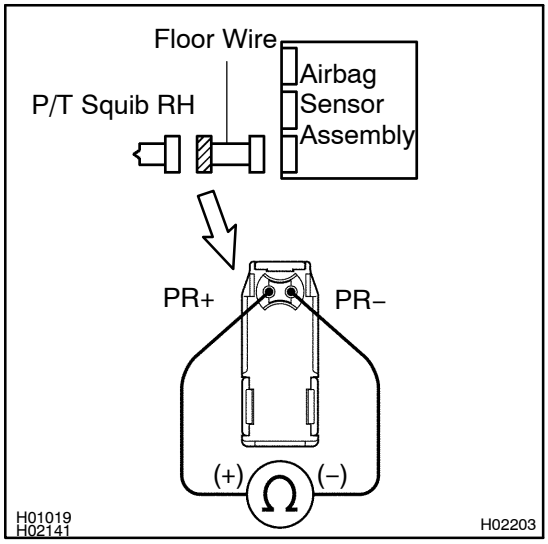
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side (See page DI–884).

CHECK:

Measure the resistance between PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

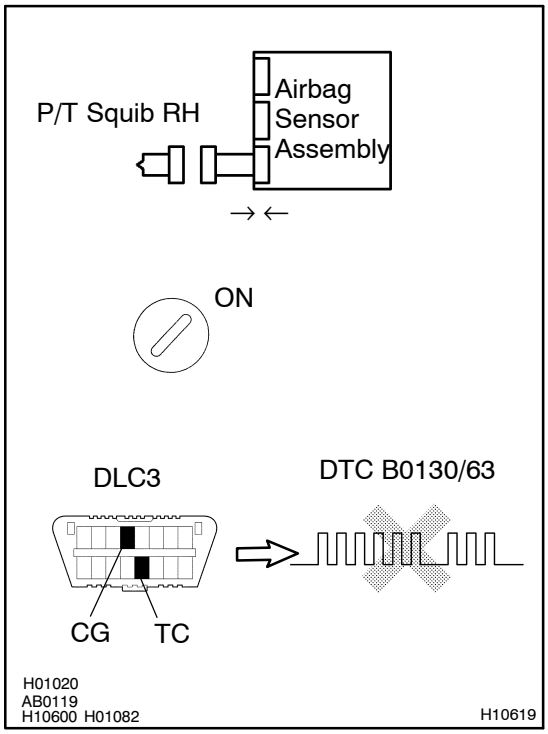
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0130/63 is not output.

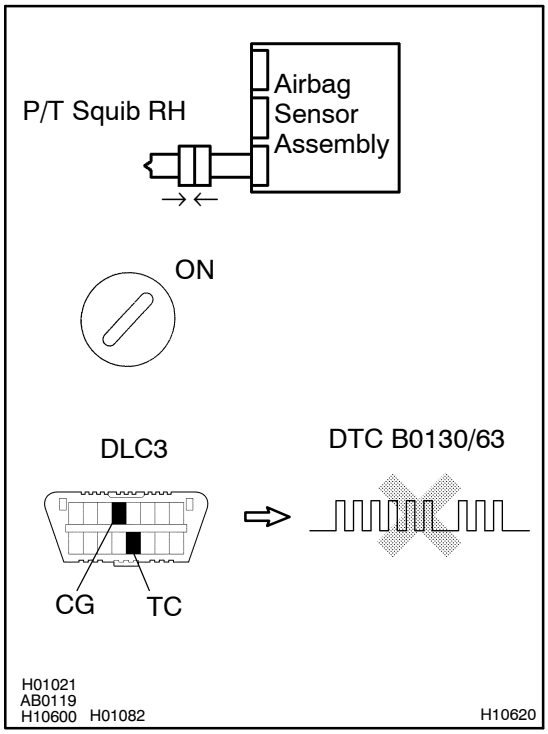
HINT:

Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0130/63 is not output.

HINT:
Codes other than code B0130/63 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PK–23

DTC	B0131/64	Open in P/T Squib RH Circuit

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0131/64 is recorded when an open is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0131/64	• Open in P/T squib RH wire harness • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

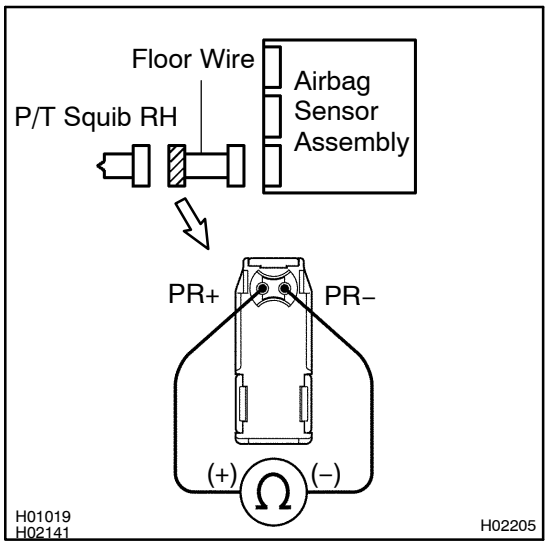
WIRING DIAGRAM

See page DI–954.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

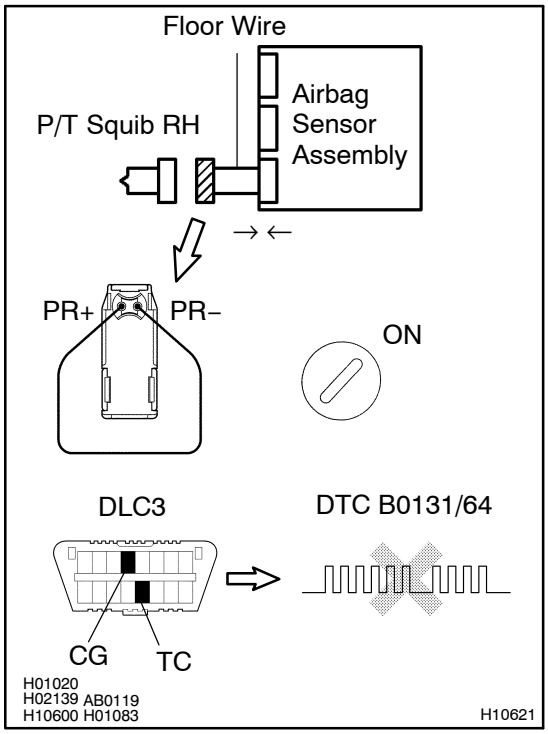
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0131/64 is not output.

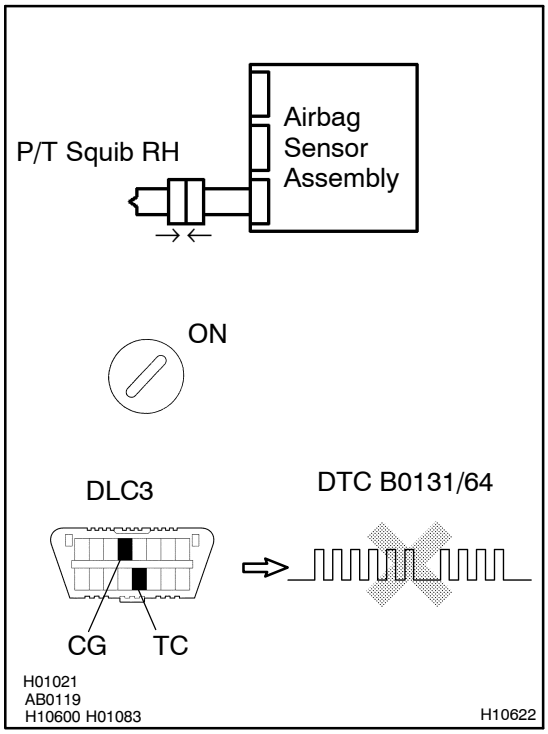
HINT:

Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0131/64 is not output.

HINT:
Codes other than code B0131/64 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC	B0132/61	Short in P/T Squib RH Circuit (to Ground)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0132/61 is recorded when a ground short is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0132/61	• Short in P/T squib RH wire harness (to ground) • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

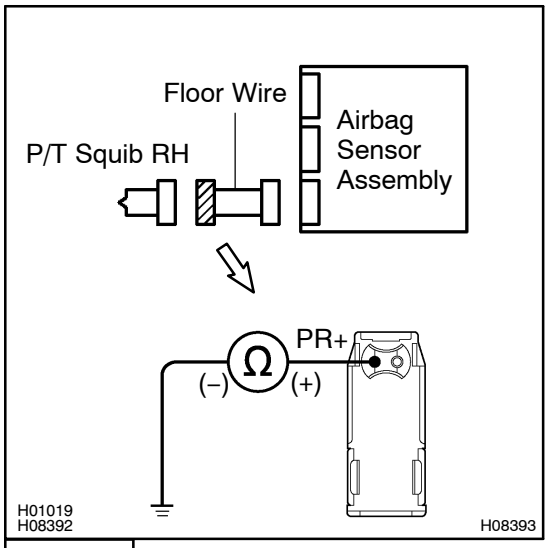
WIRING DIAGRAM

See page DI–954.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between the body ground and PR+ of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

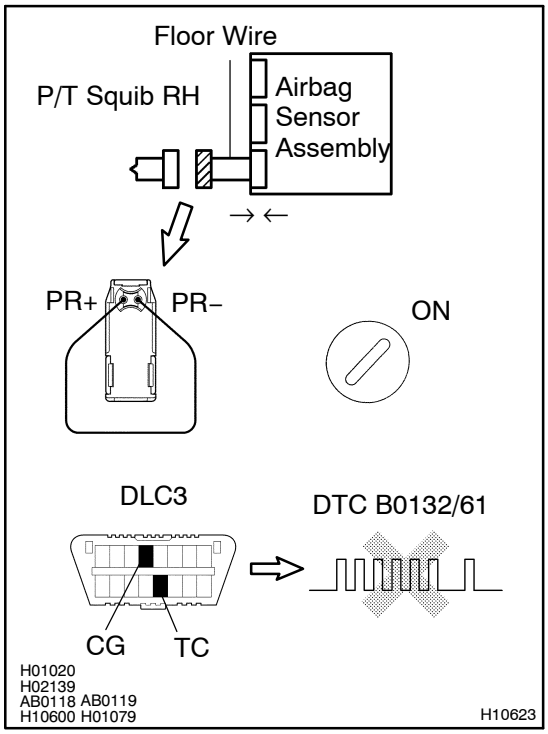
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.

(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.

(b) Clear the DTC stored in memory (See page DI–884).

(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.

(d) Turn the ignition switch to ON, and wait at least for 10 seconds.

(e) Check the DTC (See page DI–884).

OK:

DTC B0132/61 is not output.

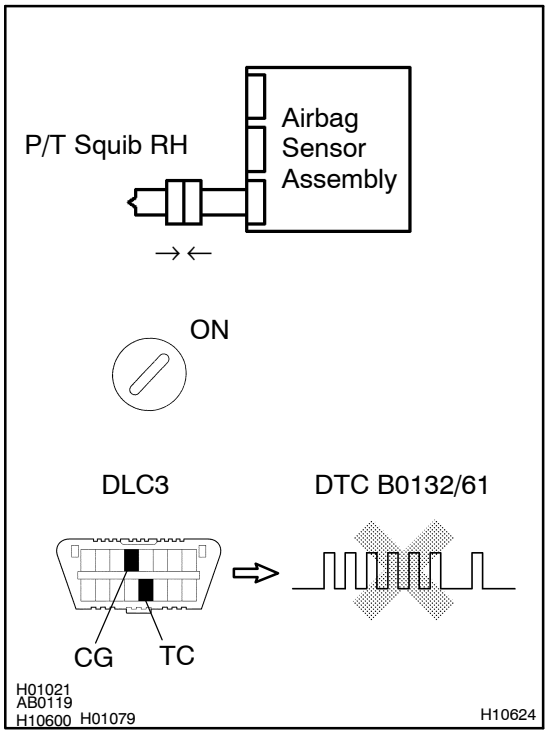
HINT:

Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0132/61 is not output.

HINT:

Codes other than code B0132/61 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DTC	B0133/62	Short in P/T Squib RH Circuit (to B+)

CIRCUIT DESCRIPTION

The P/T squib RH circuit consists of the airbag sensor assembly and the seat belt pretensioner RH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0133/62 is recorded when a B+ short is detected in the P/T squib RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0133/62	• Short in P/T squib RH wire harness (to B+) • P/T squib RH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner RH (P/T squib RH) • Airbag sensor assembly • Floor wire

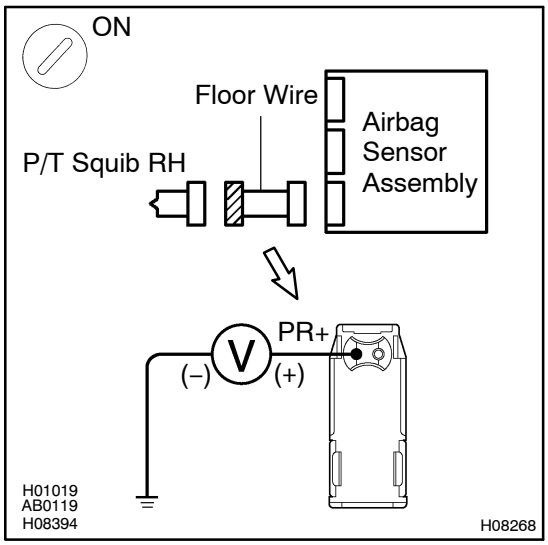
WIRING DIAGRAM

See page DI–954.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and PR+ of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.

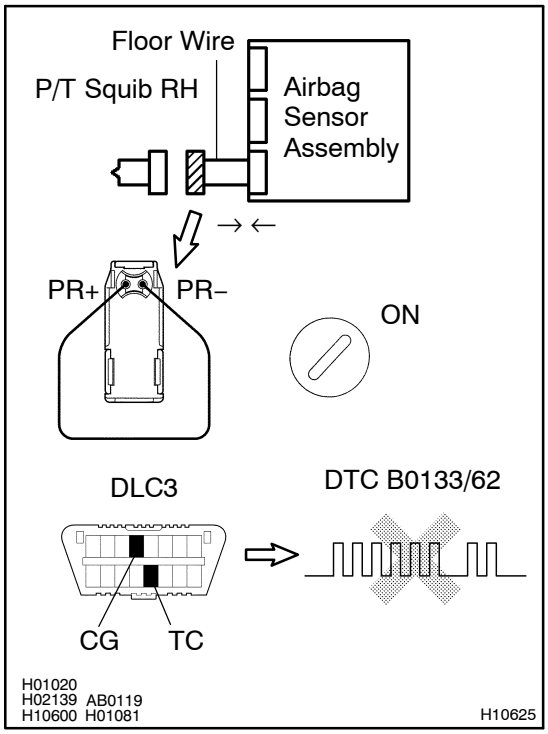
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PR+ and PR– of the floor wire connector on the seat belt pretensioner RH (P/T squib RH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0133/62 is not output.

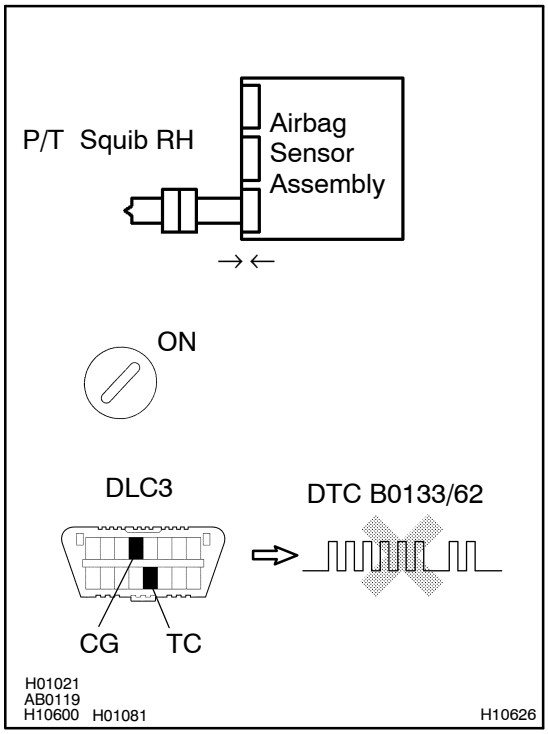
HINT:

Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib RH.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner RH (P/T squib RH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0133/62 is not output.

HINT:
Codes other than code B0133/62 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner RH (P/T squib RH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PN–34

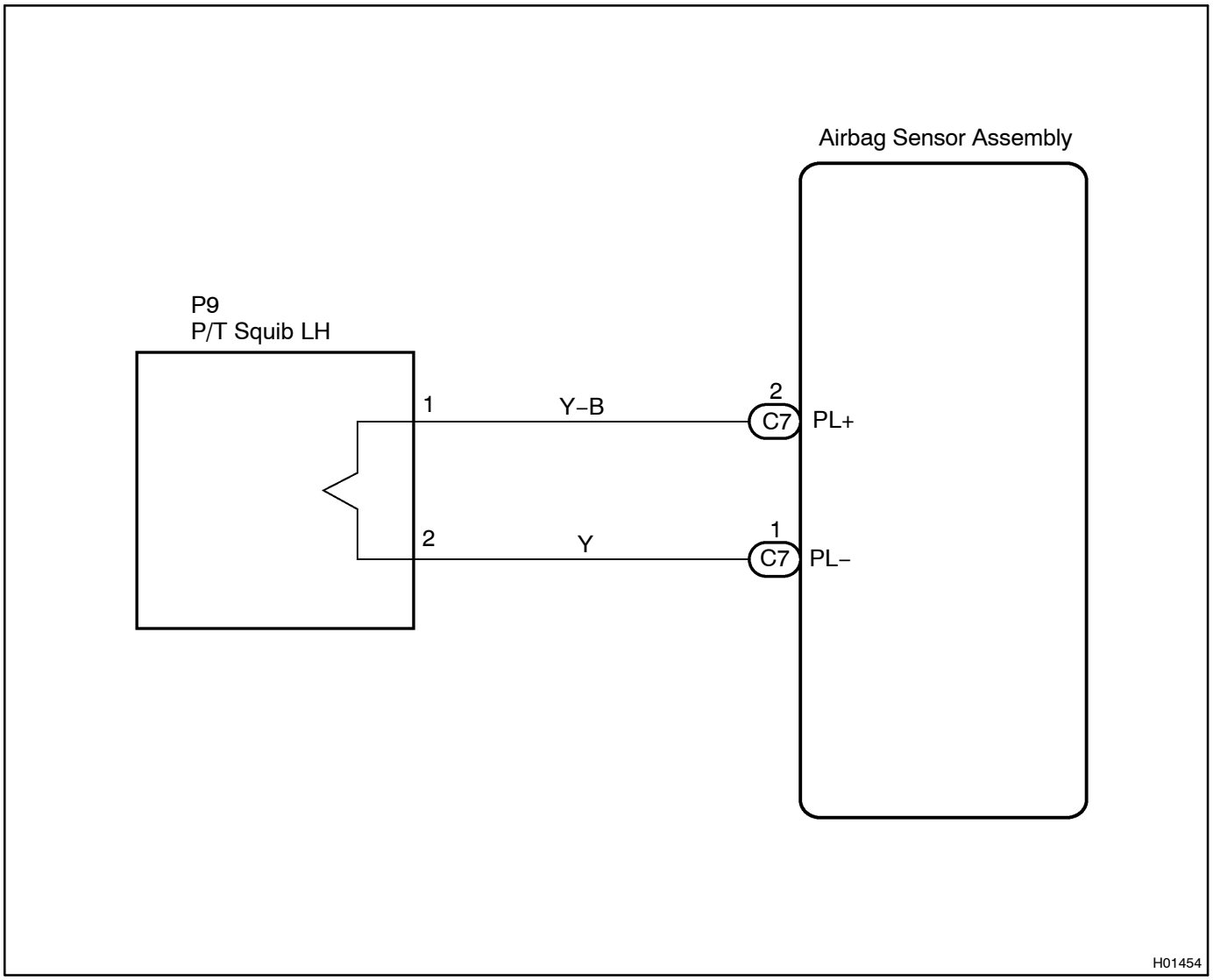
DTC	B0135/73	Short in P/T Squib LH Circuit

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0135/73 is recorded when a short is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0135/73	• Short in P/T squib LH wire harness • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

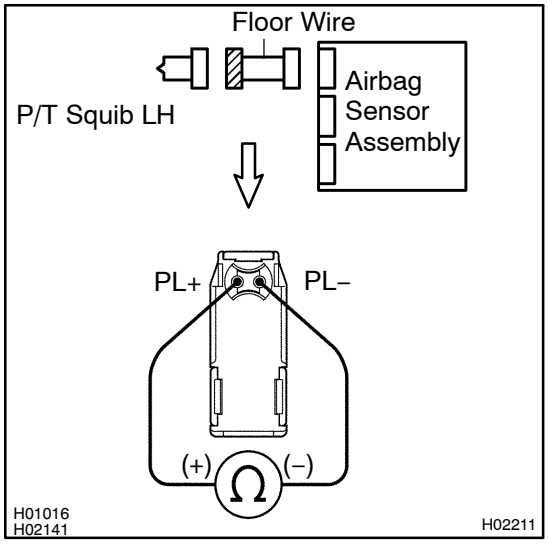
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



PREPARATION:

Release the airbag activation prevention mechanism built in the connector of the floor wire on the airbag sensor assembly side.(See page DI–884).

CHECK:

Measure the resistance between PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

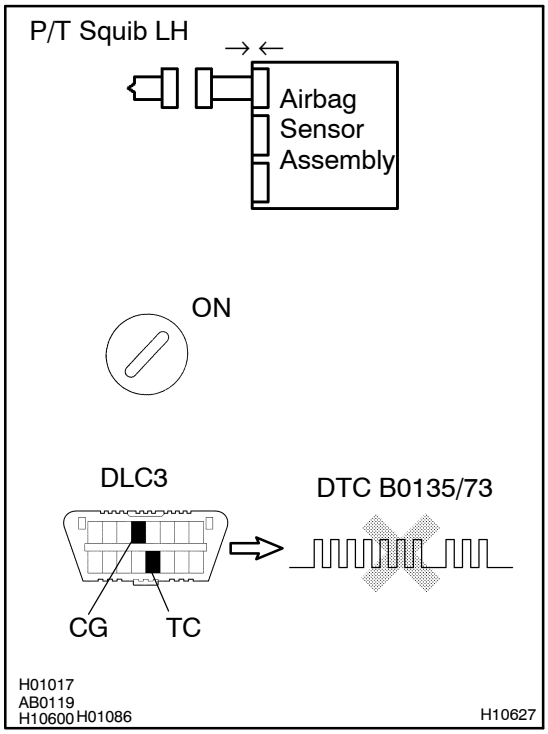
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0135/73 is not output.

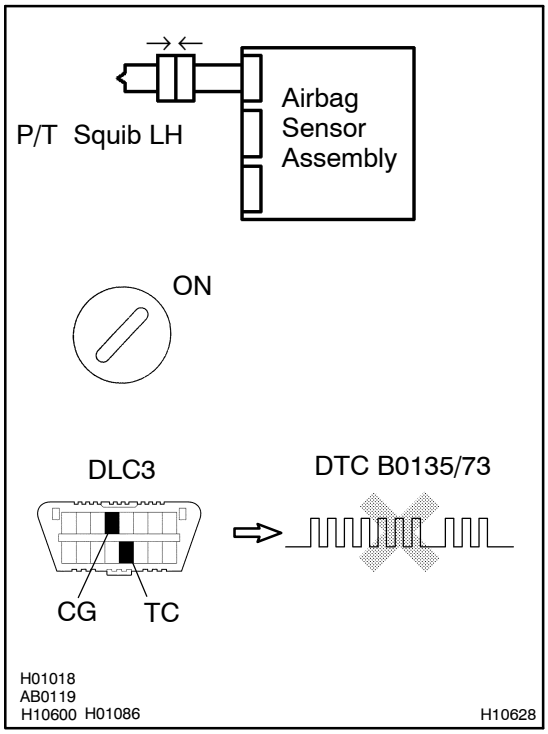
HINT:

Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0135/73 is not output.

HINT:
Codes other than code B0135/73 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PO–23

DTC	B0136/74	Open in P/T Squib LH Circuit

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0136/74 is recorded when an open is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0136/74	• Open in P/T squib LH wire harness • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

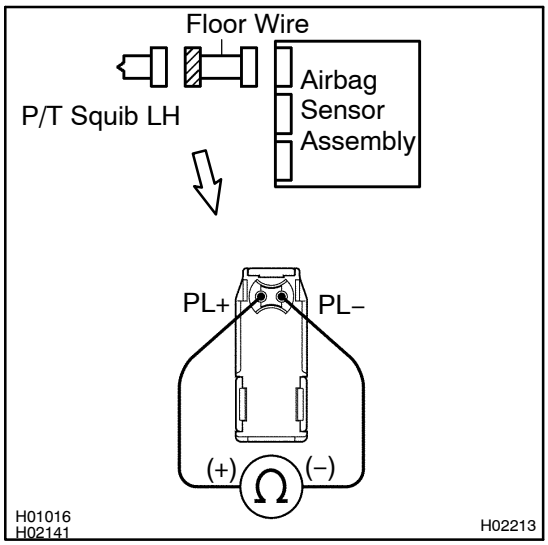
WIRING DIAGRAM

See page DI–967.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

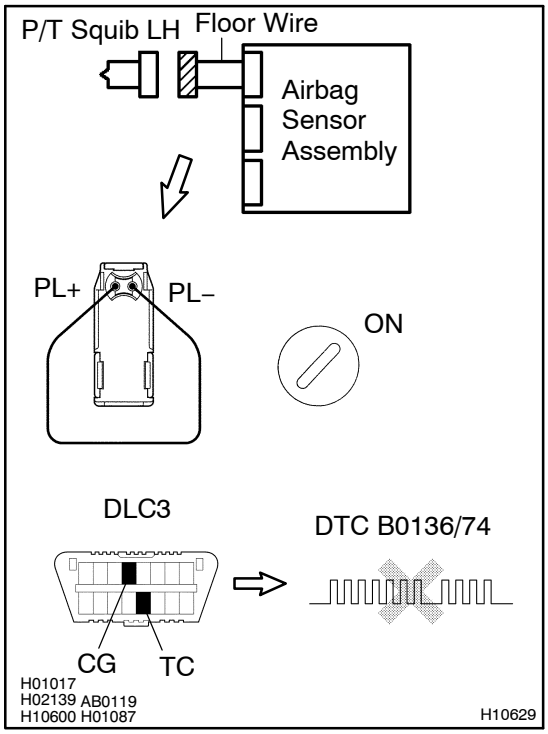
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0136/74 is not output.

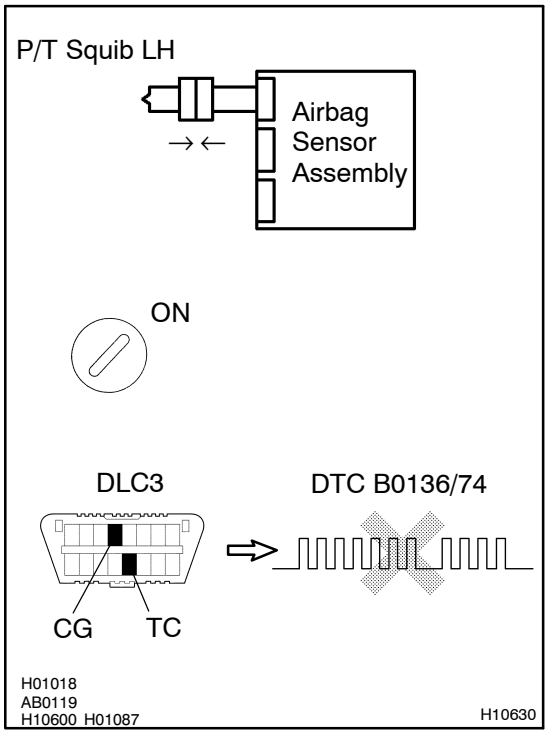
HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0136/74 is not output.

HINT:

Codes other than code B0136/74 may be output at this time, but they are not relevant to this check.

NG	Replace seat belt pretensioner LH (P/T squib LH).

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PP–23

DTC	B0137/71	Short in P/T Squib LH Circuit (to Ground)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0137/71 is recorded when a ground short is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0137/71	• Short in P/T squib LH wire harness (to ground) • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

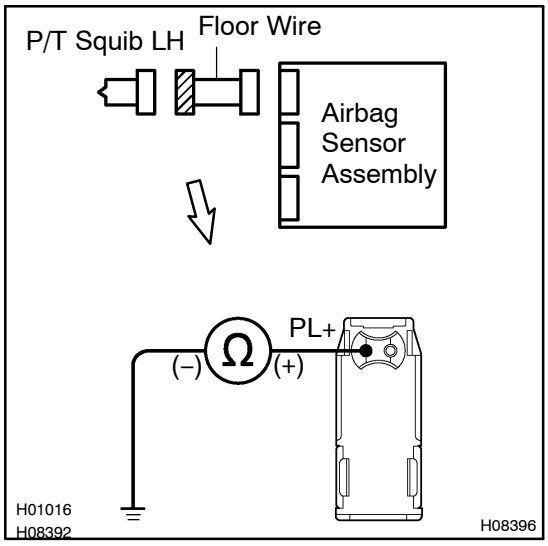
WIRING DIAGRAM

See page DI–967.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

Measure the resistance between the body ground and PL+ of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

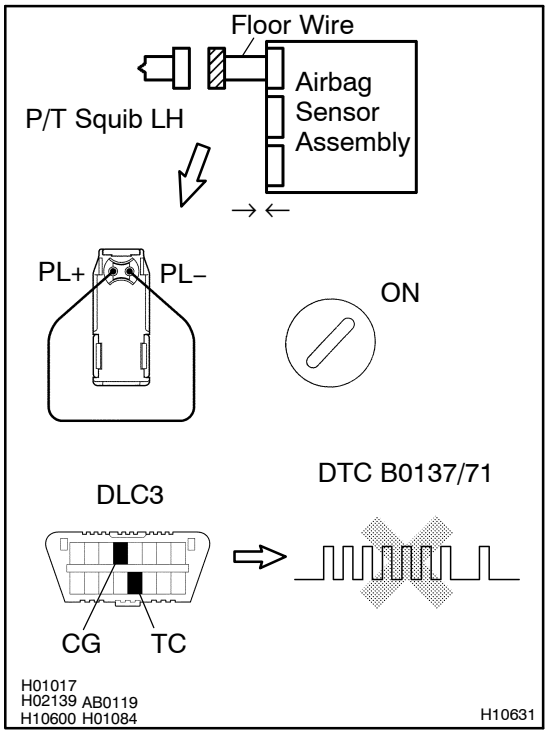
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0137/71 is not output.

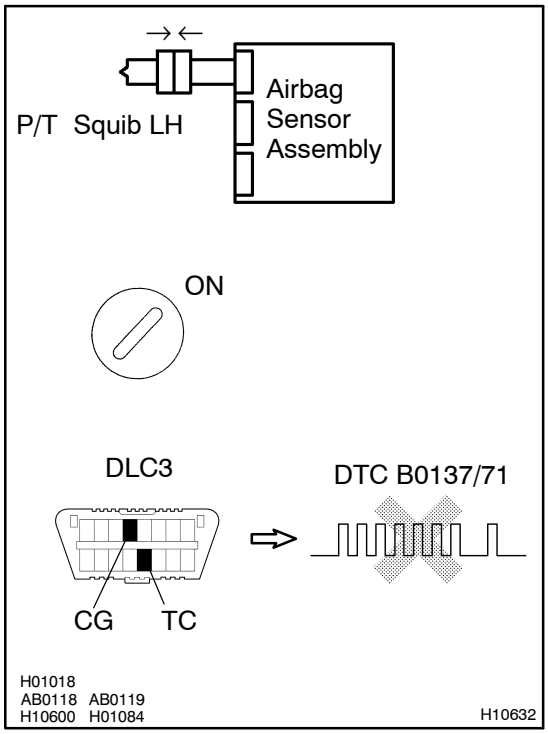
HINT:

Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0137/71 is not output.

HINT:
Codes other than code B0137/71 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PQ–23

DTC	B0138/72	Short in P/T Squib LH Circuit (to B+)

CIRCUIT DESCRIPTION

The P/T squib LH circuit consists of the airbag sensor assembly and the seat belt pretensioner LH.
It causes the SRS to deploy when the SRS deployment conditions are satisfied.
For details of the function of each component, see OPERATION on page RS–2.
DTC B0138/72 is recorded when a B+ short is detected in the P/T squib LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B0138/72	• Short in P/T squib LH wire harness (to B+) • P/T squib LH malfunction • Airbag sensor assembly malfunction	• Seat belt pretensioner LH (P/T squib LH) • Airbag sensor assembly • Floor wire

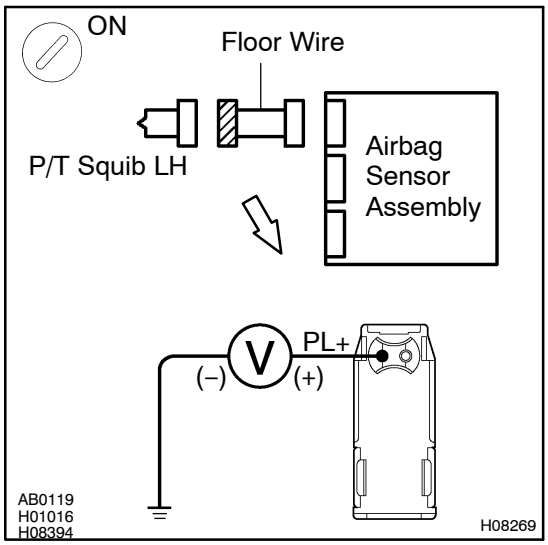
WIRING DIAGRAM

See page DI–967.

INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check floor wire.**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and PL+ of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.

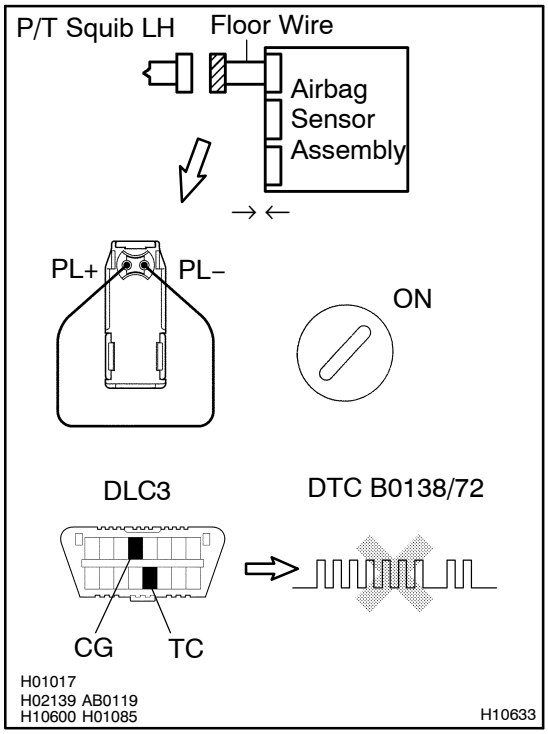
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

3	Check airbag sensor assembly.



PREPARATION:

(a) Connect the connector to the airbag sensor assembly.
(b) Using a service wire, connect PL+ and PL– of the floor wire connector on the seat belt pretensioner LH (P/T squib LH) side.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0138/72 is not output.

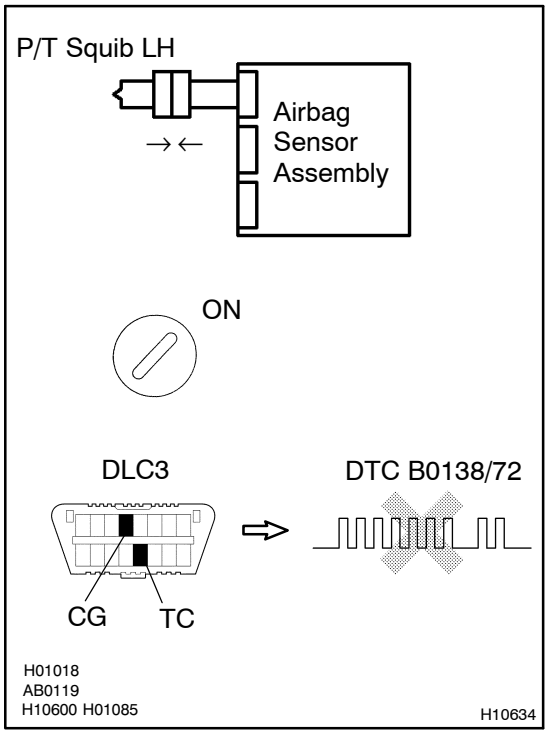
HINT:

Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

4	Check P/T squib LH.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the seat belt pretensioner LH (P/T squib LH) connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B0138/72 is not output.

HINT:
Codes other than code B0138/72 may be output at this time, but they are not relevant to this check.

NG → **Replace seat belt pretensioner LH (P/T squib LH).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check. If the malfunctioning part can not be detected by the simulation method, replace all SRS components including the wire harness.

DI6PR–21

DTC	B1100/31	Airbag Sensor Assembly Malfunction

CIRCUIT DESCRIPTION

The airbag sensor assembly consists of the airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc.
It receives signals from the airbag sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.
DTC B1100/31 is recorded when occurrence of a malfunction in the airbag sensor assembly is detected.

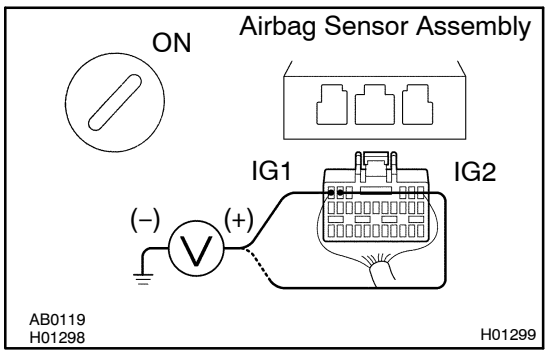
DTC No.	DTC Detecting Condition	Trouble Area
B1100/31	• Airbag sensor assembly malfunction	• Airbag sensor assembly

INSPECTION PROCEDURE

HINT:
When a malfunction code other than code B1100/31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code B1100/31.

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check voltage at IG1 and IG2 of airbag sensor assembly.**



CHECK:

(a) Turn the ignition switch to ON.
(b) Measure the voltage between the body ground and each of terminals IG1 and IG2 of the airbag sensor assembly connector.

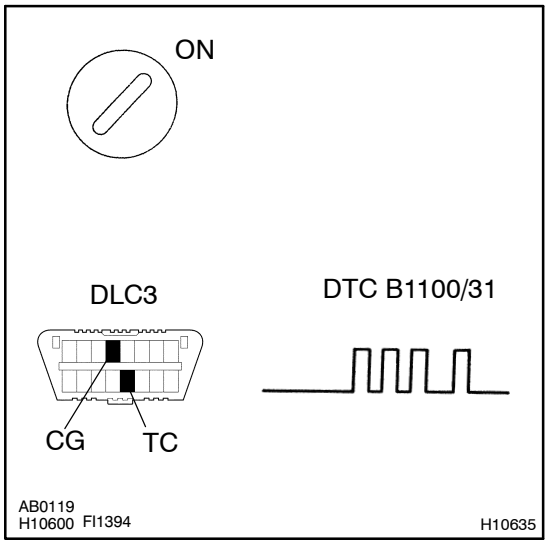
OK:

Voltage: 10 – 14 V

NG	**Check that an abnormality occurs on the battery and charging system.**

OK

3	Is DTC B1100/31 output again?



PREPARATION:

Clear the DTC (See page DI–884).

CHECK:

(a) Turn the ignition switch to LOCK, and wait at least for 10 seconds.

(b) Turn the ignition switch to ON, and wait at least for 10 seconds.

(c) Repeat operation in step (a) and (b) at least 5 times.

(d) Check the DTC (See page DI–884).

OK:

DTC B1100/31 is output.

HINT:

Codes other than code B1100/31 may be output at this time, but they are not relevant to this check.

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–20).**

YES

Replace airbag sensor assembly.

DIAIQ–03

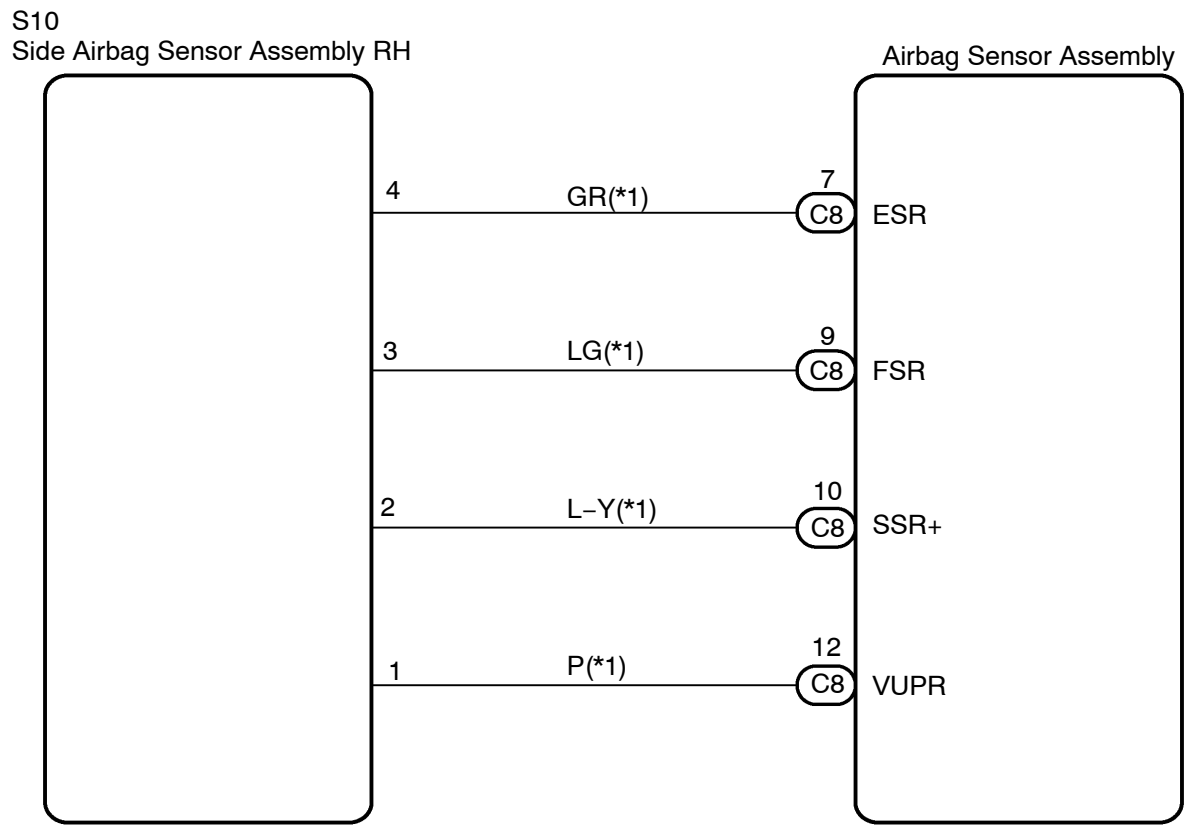
DTC	B1140/32	Side Airbag Sensor Assembly RH Malfunction

CIRCUIT DESCRIPTION

The side airbag sensor assembly RH consists of the safing sensor, diagnosis circuit and lateral deceleration sensor, etc.
It receives signals from the lateral deceleration sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.
DTC B1140/32 is recorded when occurrence of a malfunction in the side airbag sensor assembly RH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1140/32	• Side airbag sensor assembly RH malfunction	• Side airbag sensor assembly RH • Floor wire • Airbag sensor assembly

WIRING DIAGRAM

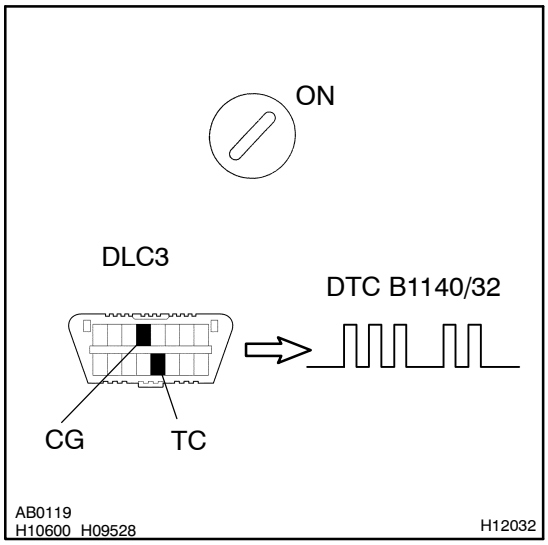


*1: w/ Side Airbag

H01450

INSPECTION PROCEDURE

1	Is DTC B1140/32 output?



CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B1140/32 is output.

HINT:

Codes other than code B1140/32 may be output at this time, but they are not relevant to this check.

NO → **The malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

YES

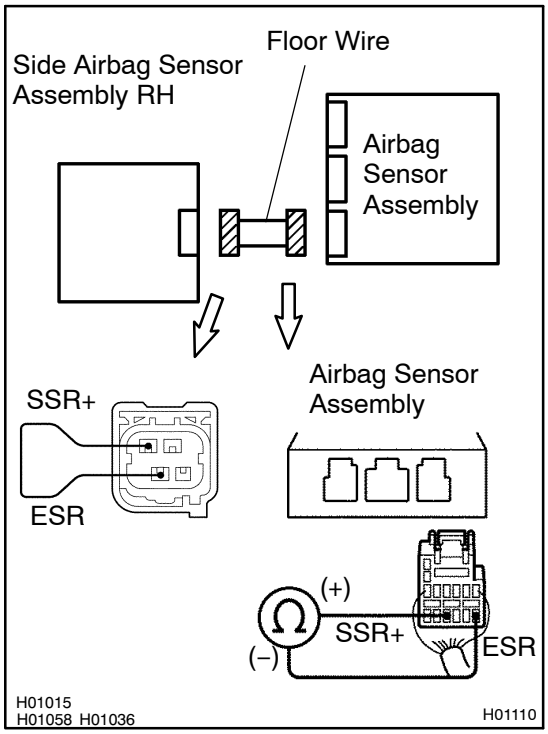
2	Is connector of side airbag sensor assembly RH properly connected?

NO → **Connect connector.**

YES

3	Prepare for inspection (See step 1 on DI–1025).

4	Check floor wire.



PREPARATION:

Using a service wire, connect SSR+ and ESR of the floor wire connector on the side airbag sensor assembly RH side.

CHECK:

Measure the resistance between SSR+ and ESR of the floor wire connector on the airbag sensor assembly side.

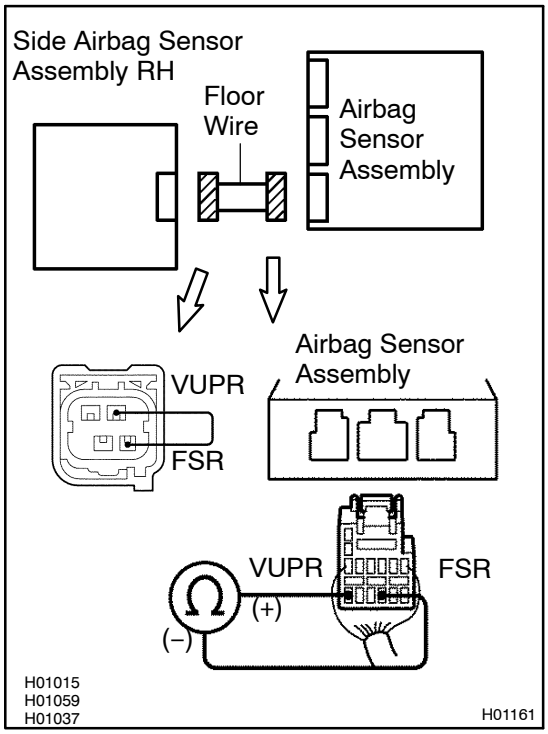
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

5	Check floor wire.



PREPARATION:

Measure the resistance between VUPR and FSR of the floor wire connector on the airbag sensor assembly side.

CHECK:

Measure the resistance between the body ground and each of SSR+, VUPR and FSR of the floor wire connector on the airbag sensor assembly side.

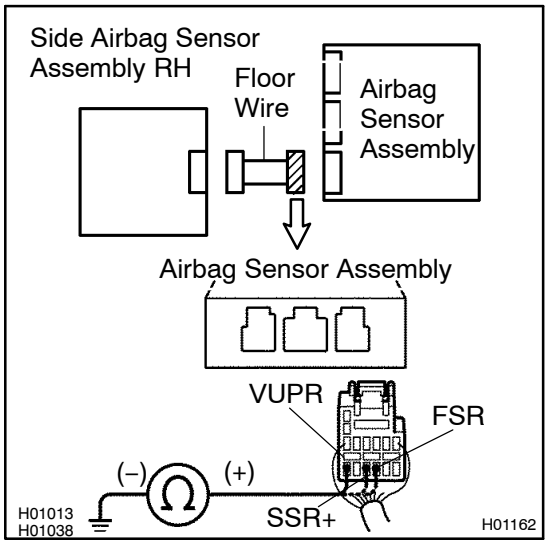
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

6	Check floor wire (to ground).



CHECK:

Measure the resistance between the body ground and each of SSR+, VUPR and FSR of the floor wire connector on the airbag sensor assembly side.

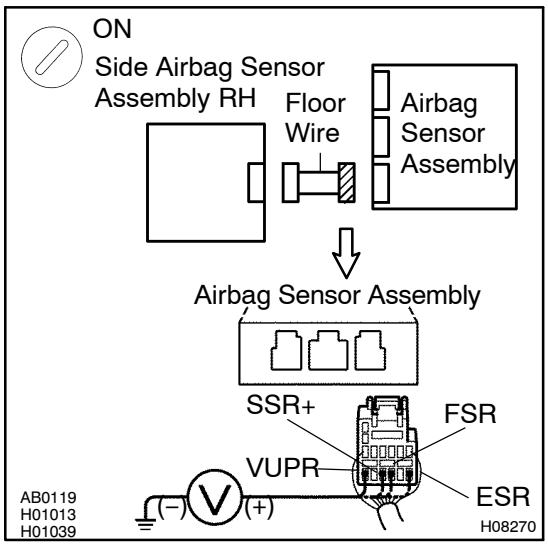
OK:

Resistance: 1M Ω or Higher

NG → **Repair or replace floor wire.**

OK

7	Check floor wire (to B+).



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of VUPR, SSR+, FSR and ESR of the floor wire connector on the airbag sensor assembly side.

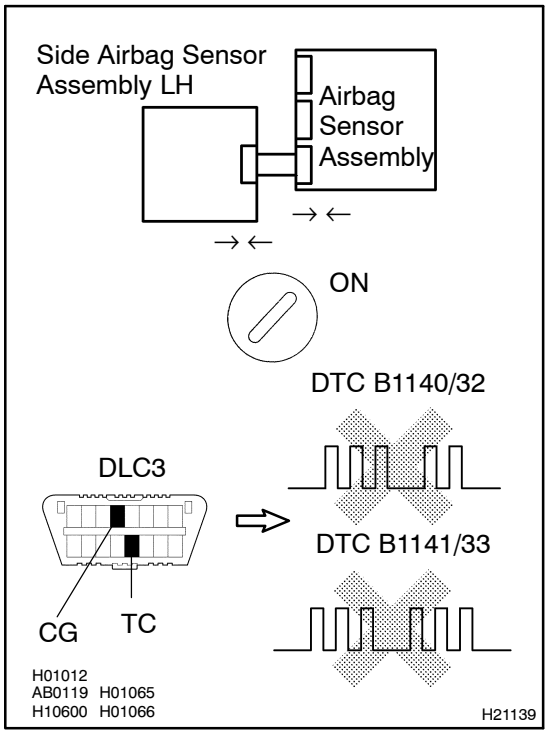
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

8	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to airbag sensor assembly.
(d) Change the side airbag sensor assembly LH position with RH position.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

Neither DTC B1140/32 nor B1141/33 are not output.

HINT:

Codes other than code B1140/32 or B1141/33 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly (DTC B1140/32 is output).**

NG → **Replace side airbag sensor assembly RH (DTC B1141/33 is output).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

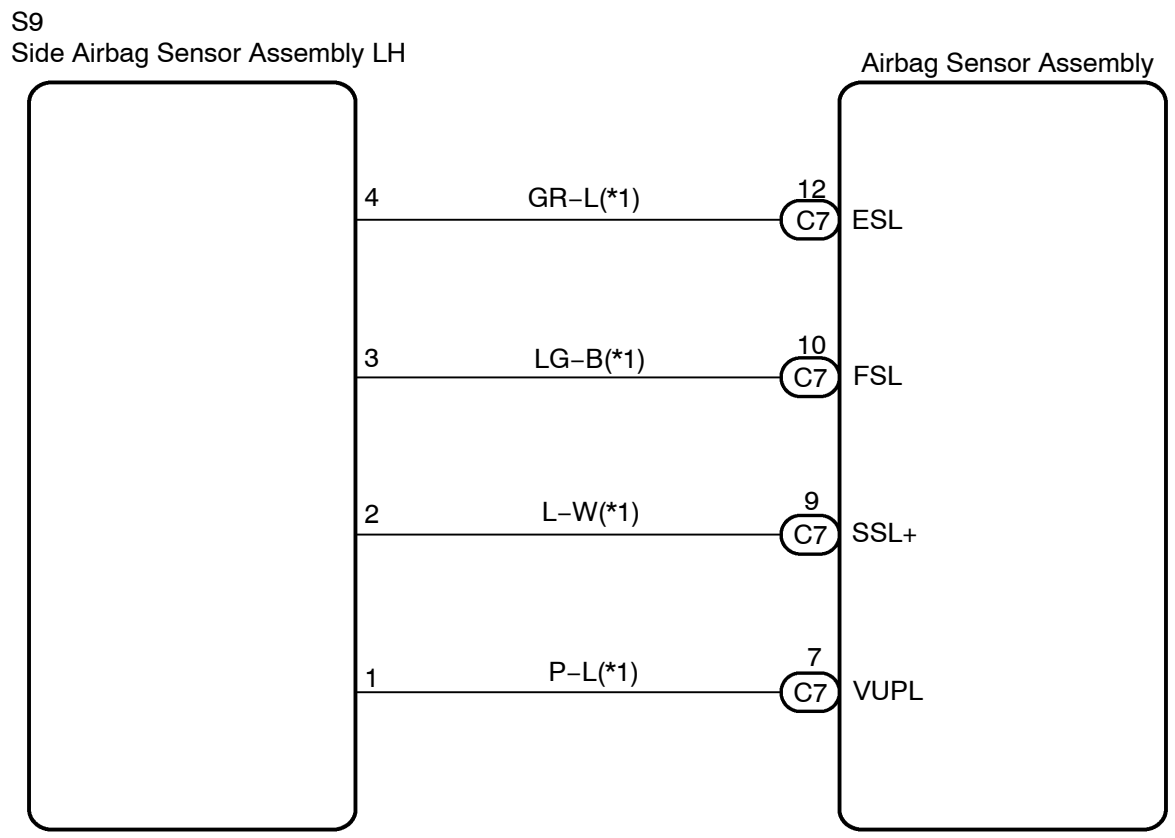
DTC	B1141/33	Side Airbag Sensor Assembly LH Malfunction

CIRCUIT DESCRIPTION

The side airbag sensor assembly LH consists of the safing sensor, diagnosis circuit and lateral deceleration sensor, etc.
It receives signals from the lateral deceleration sensor, judges whether or not the SRS must be activated, and detects diagnosis system malfunction.
DTC B1141/33 is recorded when occurrence of a malfunction in the side airbag sensor assembly LH is detected.

DTC No.	DTC Detecting Condition	Trouble Area
B1141/33	• Side airbag sensor assembly LH malfunction	• Side airbag sensor assembly LH • Floor wire • Airbag sensor assembly

WIRING DIAGRAM

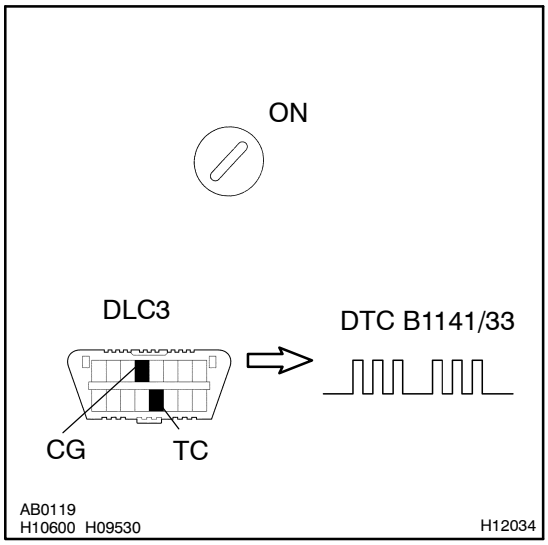


*1: w/ Side Airbag

H01450

INSPECTION PROCEDURE

1	Is DTC B1141/33 output?



CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B1141/33 is output.

HINT:

Codes other than code B1141/33 may be output at this time, but they are not relevant to this check.

NO → **The malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

YES

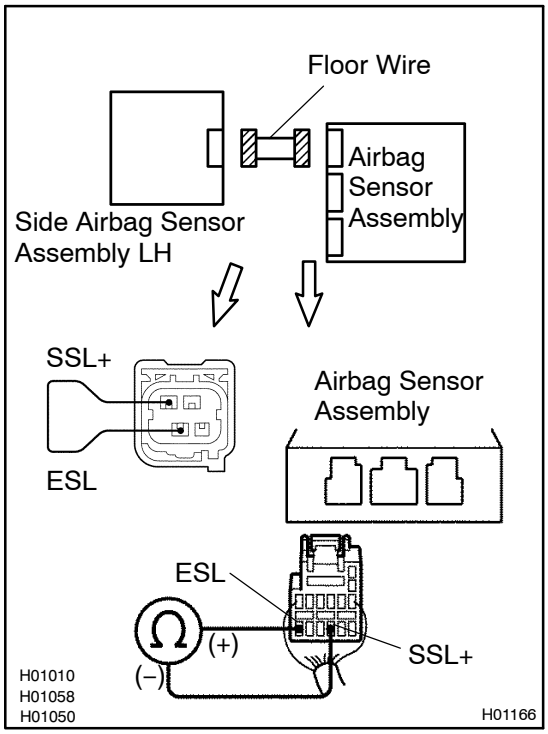
2	Is connector of side airbag sensor assembly LH properly connected?

NO → **Connect connector.**

YES

3	Prepare for inspection (See step 1 on page DI–1025).

4	Check floor wire.



PREPARATION:

Using a service wire, connect SSL+ and ESL of the floor wire connector on the side airbag sensor assembly LH side.

CHECK:

Measure the resistance between SSL+ and ESL of the floor wire connector on the airbag sensor assembly side.

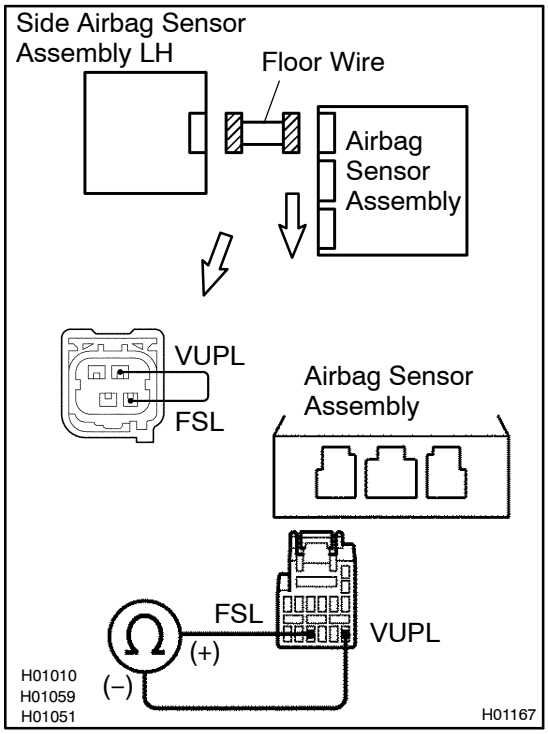
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

5	Check floor wire.



PREPARATION:

Using a service wire, connect VUPL and FSL of the floor wire connector on the side airbag sensor assembly LH side.

CHECK:

Measure the resistance between VUPL and FSL of the floor wire connector on the airbag sensor assembly side.

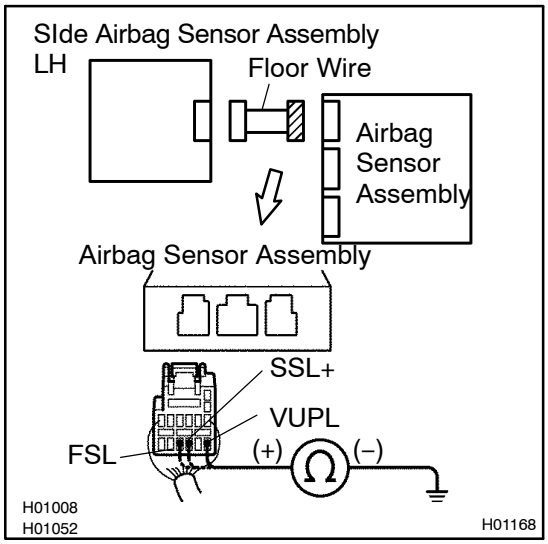
OK:

Resistance: Below 1 Ω

NG → **Repair or replace floor wire.**

OK

6	Check floor wire (to ground).



CHECK:

Measure the resistance between the body ground and each of VUPL, SSL+ and FSL of the floor wire connector on the airbag sensor assembly side.

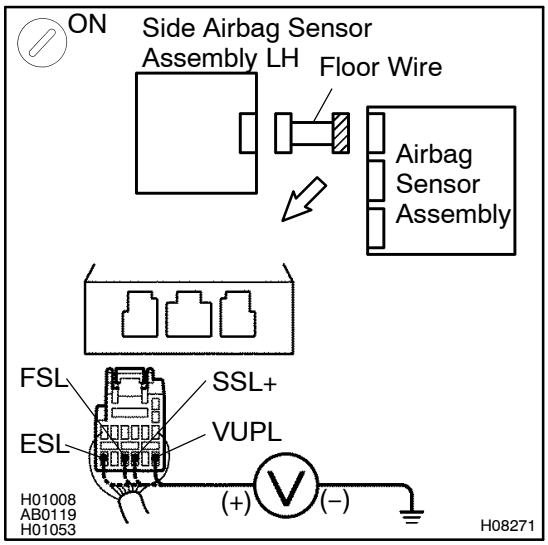
OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace floor wire.**

OK

7	Check floor wire (to B+).



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of VUPL, SSL+, FSL and ESL of the floor wire connector on the airbag sensor assembly side.

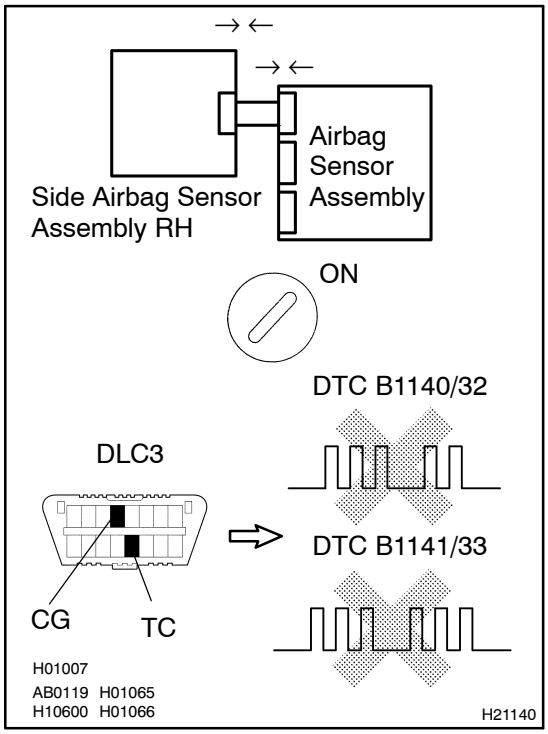
OK:

Voltage: Below 1 V

NG → **Repair or replace floor wire.**

OK

8	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the connector to the airbag sensor assembly.
(d) Change the side airbag sensor assembly RH position with LH position.
(e) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

Neither DTC B1141/33 nor B1140/32 are not output.

HINT:

Codes other than code B1141/33 or B1141/32 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly (DTC B1141/33 is output).**

NG → **Replace side airbag sensor assembly LH (DTC B1140/32 is output).**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DI6PU–09

DTC	B1142/B1143/34	Door Side Airbag Sensor RH Malfunction

CIRCUIT DESCRIPTION

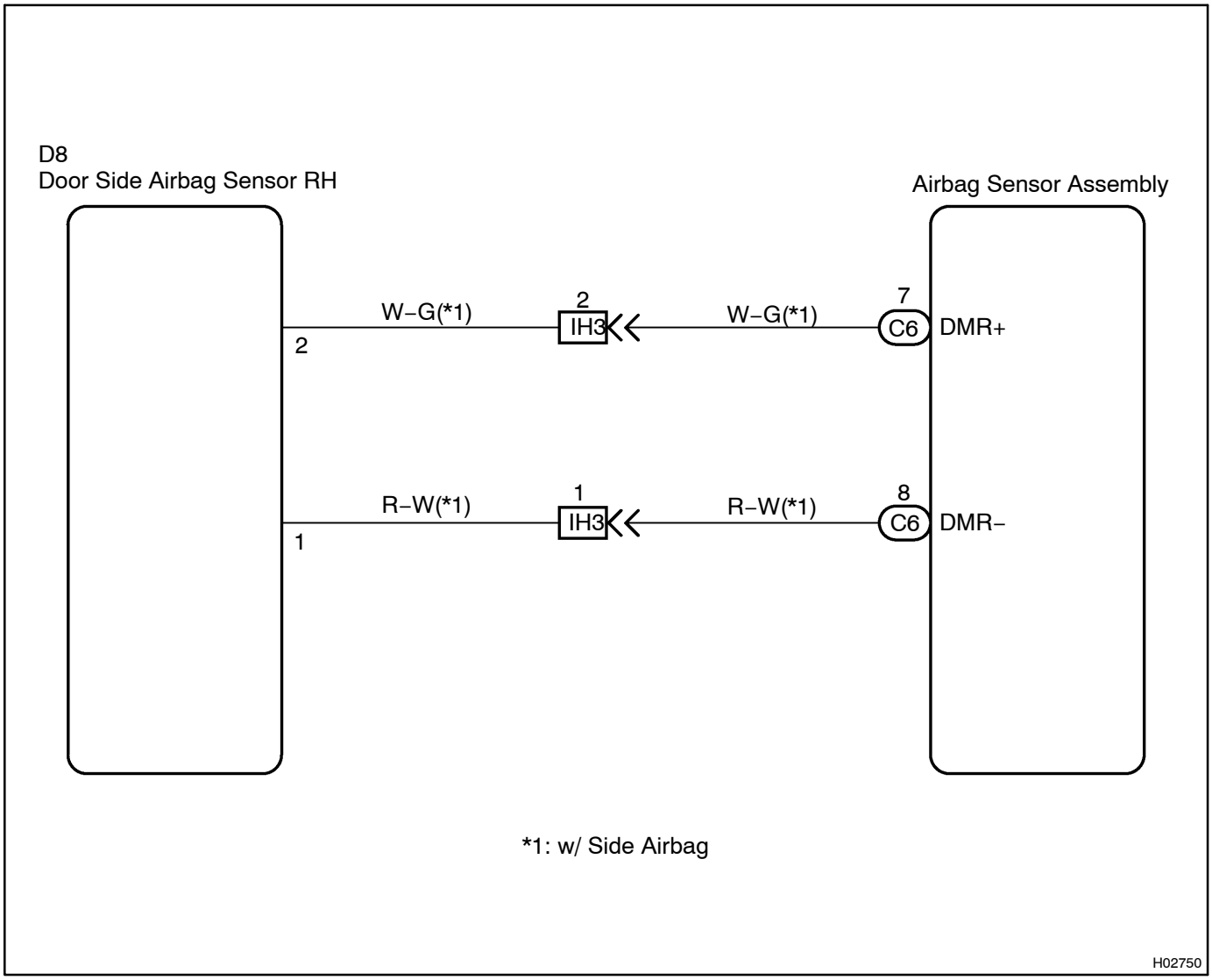
The door side airbag sensor RH circuit consists of the airbag sensor assembly and the door side airbag sensor RH.

For details of the function of each component, see OPERATION on page RS–2.

DTC B1142/B1143/34 is recorded when a malfunction is detected in the door side airbag sensor RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1142/B1143/34	• Short in door side airbag sensor RH wire harness (to B+) • Short in door side airbag sensor RH wire harness (to Ground) • Door side airbag sensor RH malfunction	• Door side airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Front door RH wire

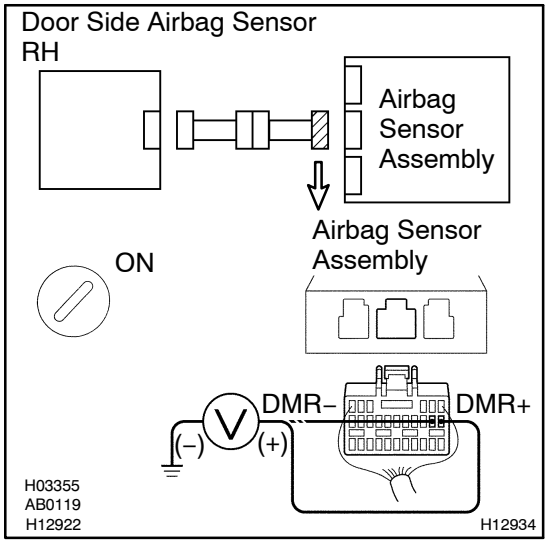
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DMR+ and DMR– on the airbag sensor assembly side between the door side airbag sensor RH and the airbag sensor assembly.

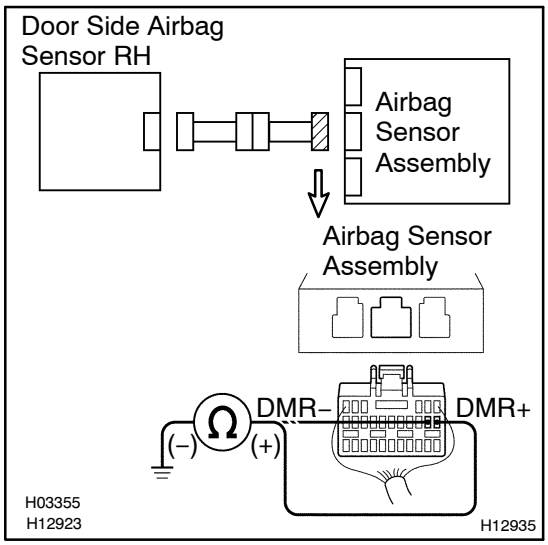
OK:

Voltage: Below 1 V

NG	**Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and each of DMR+ and DMR– on the airbag sensor assembly side between the door side airbag sensor RH and the airbag sensor assembly.

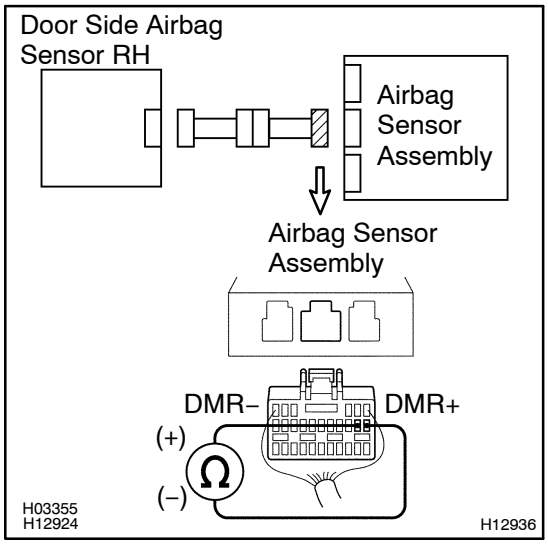
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between DMR+ and DMR– on the airbag sensor assembly side between the airbag sensor assembly and the door side airbag sensor RH.

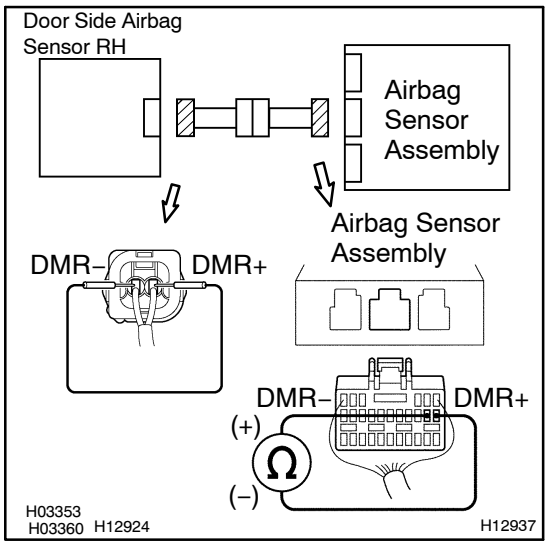
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 10.**

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect DMR+ and DMR– on the door side airbag sensor RH side between the airbag sensor assembly and the door side airbag sensor RH.

CHECK:

Measure the resistance between DMR+ and DMR– on the airbag sensor assembly side between the airbag sensor assembly and the door side airbag sensor RH.

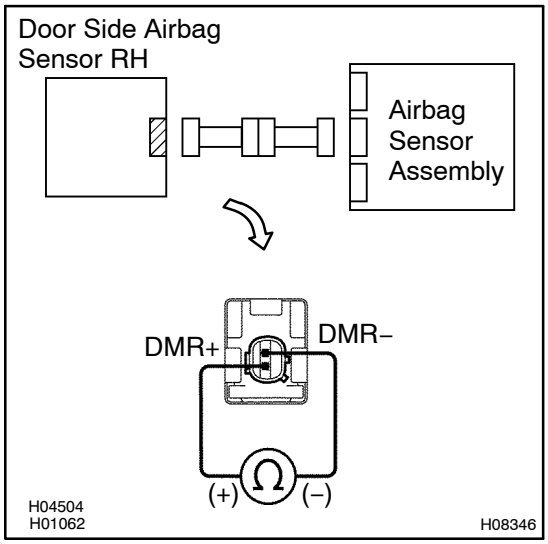
OK:

Resistance: Below 1 Ω

NG → **Go to step 11.**

OK

6	Check door side airbag sensor RH.



CHECK:

Measure the resistance between DMR+ and DMR– of the door side airbag sensor RH.

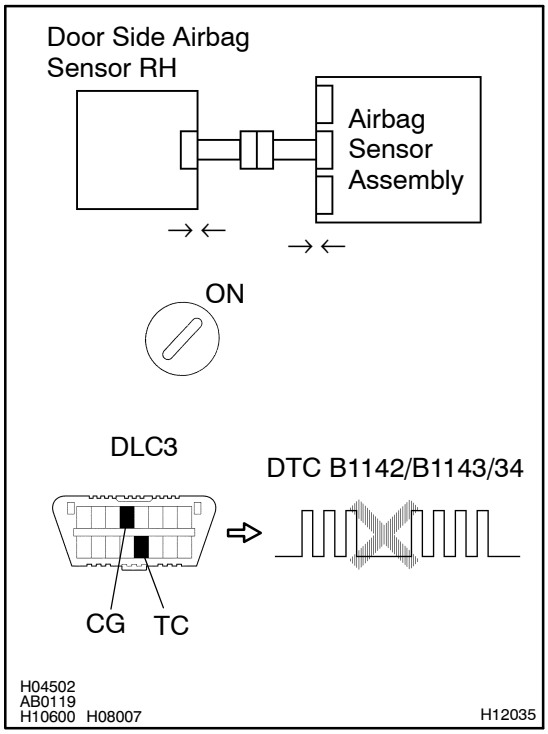
OK:

Resistance: 300 – 1500 Ω

NG → **Replace door side airbag sensor RH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the door side airbag sensor RH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B1142/B1143/34 is not output.

HINT:

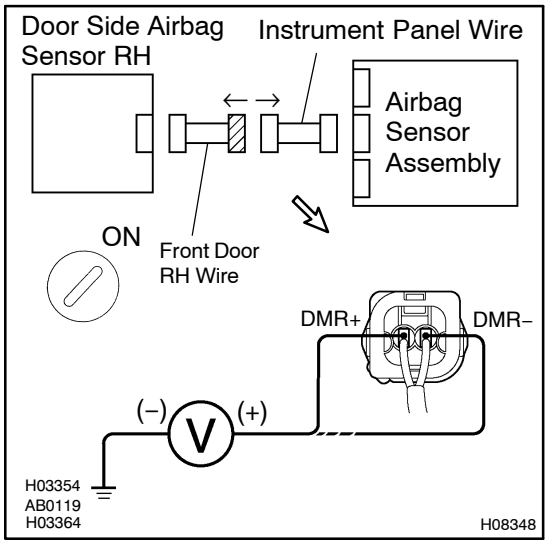
Codes other than code B1142/B1143/34 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check front door RH wire (to B+).



PREPARATION:

Disconnect the front door RH wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

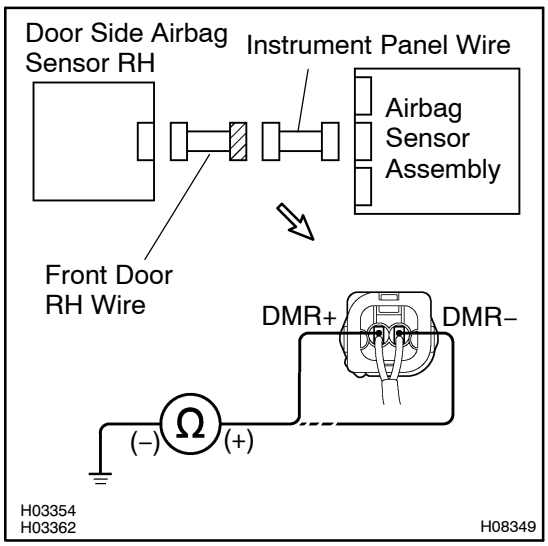
Voltage: Below 1 V

NG	Repair or replace front door RH wire.

OK

Repair or replace instrument panel wire.

9	Check front door RH wire (to ground).



PREPARATION:

Disconnect the front door RH wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and each of DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

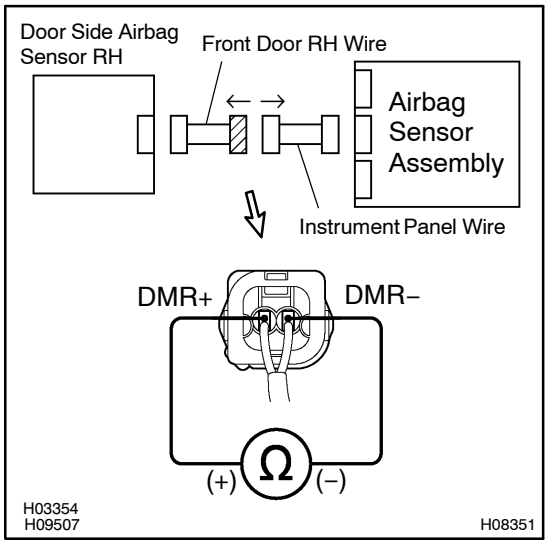
Resistance: 1 MΩ or Higher

NG	Repair or replace front door RH wire.

OK

Repair or replace instrument panel wire.

10	Check front door RH wire.



PREPARATION:

Disconnect the front door RH wire from the instrument panel wire.

CHECK:

Measure the resistance between DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

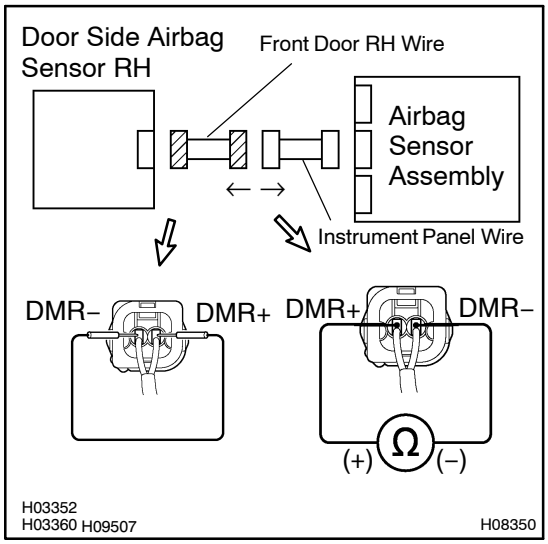
Resistance: 1 MΩ or Higher

NG → **Repair or replace front door RH wire.**

OK

Repair or replace instrument panel wire.

11	Check front door RH wire.



PREPARATION:

(a) Disconnect the front door RH wire from the instrument panel wire.

(b) Using a service wire, connect DMR+ and DMR– of the front door RH wire connector on the door side airbag sensor RH side.

CHECK:

Measure the resistance between DMR+ and DMR– of the front door RH wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace front door RH wire.**

OK

Repair or replace instrument panel wire.

DI6PV–09

DTC	B1144/B1145/35	Door Side Airbag Sensor LH Malfunction

CIRCUIT DESCRIPTION

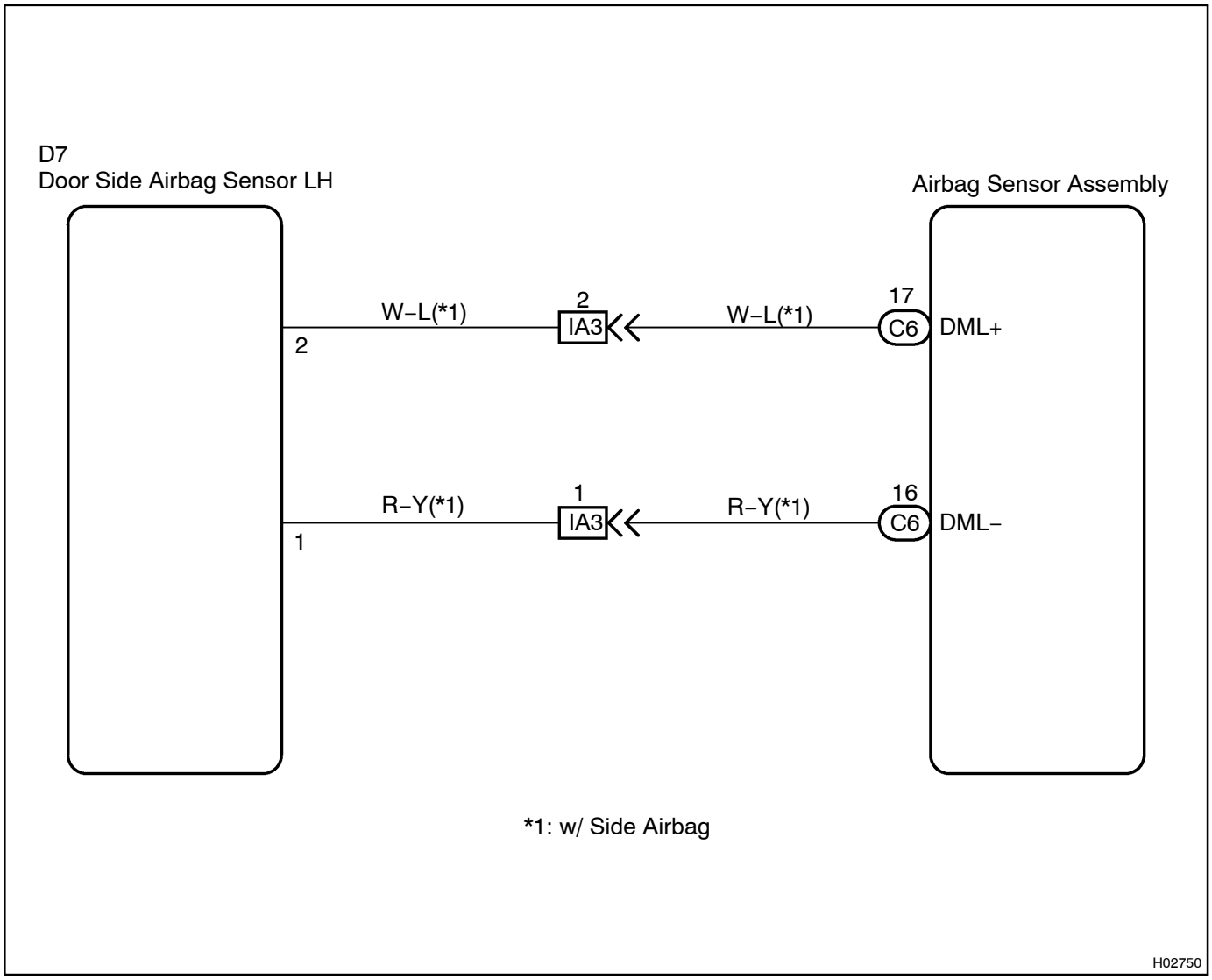
The door side airbag sensor LH circuit consists of the airbag sensor assembly and the door side airbag sensor LH.

For details of the function of each component, see OPERATION on page RS–2.

DTC B1144/B1145/35 is recorded when malfunction is detected in the door side airbag sensor LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1144/B1145/35	• Short in door side airbag sensor LH wire harness (to B+) • Short in door side airbag sensor LH wire harness (to Ground) • Door side airbag sensor LH malfunction	• Door side airbag sensor LH • Airbag sensor assembly • Instrument panel wire • Front door LH wire

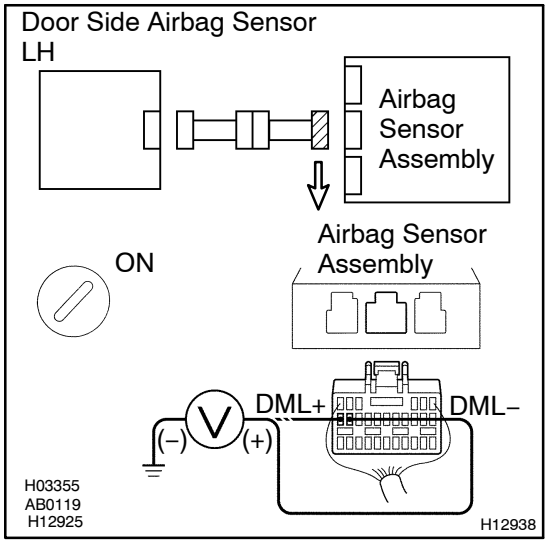
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly.

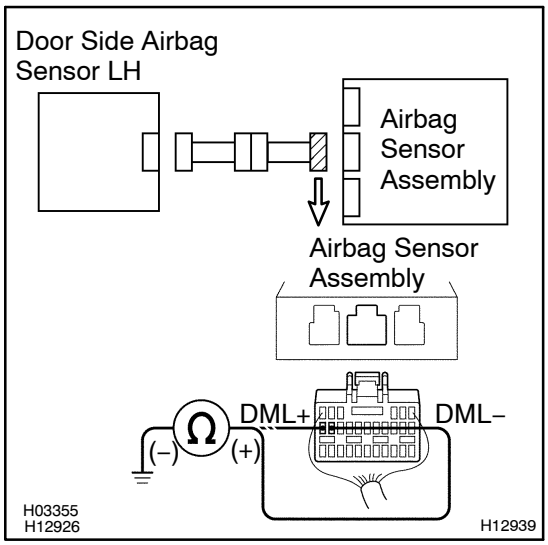
OK:

Voltage: Below 1 V

NG	**Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and each of DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly.

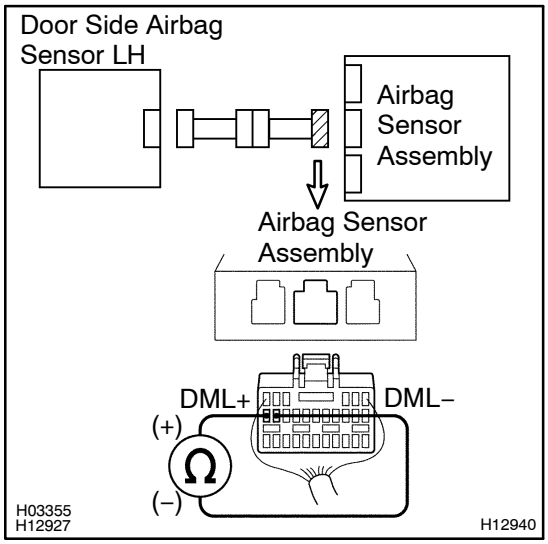
OK:

Resistance: 1 MΩ or Higher

NG	**Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly side.

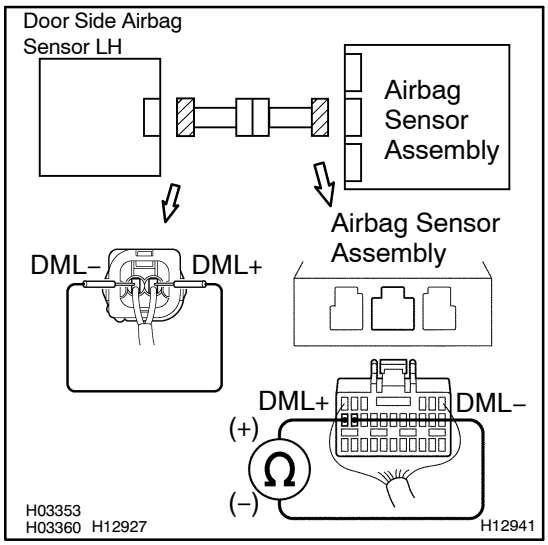
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect DML+ and DML– on the door side airbag sensor LH side between the airbag sensor assembly and the door side airbag sensor LH.

CHECK:

Measure the resistance between DML+ and DML– on the airbag sensor assembly side between the door side airbag sensor LH and the airbag sensor assembly side.

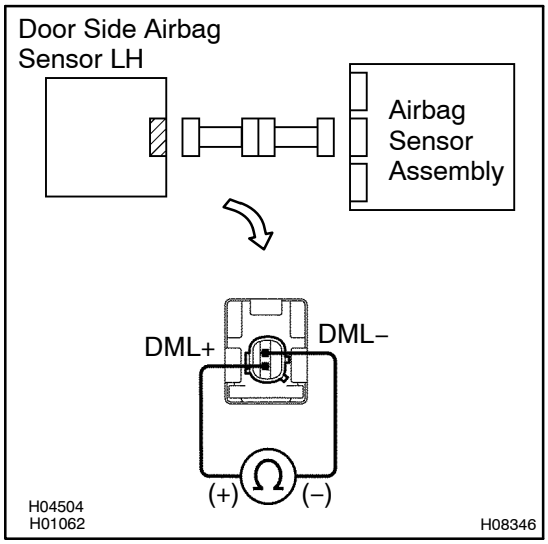
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check door side airbag sensor LH.



CHECK:

Measure the resistance between DML+ and DML– of the door side airbag sensor LH.

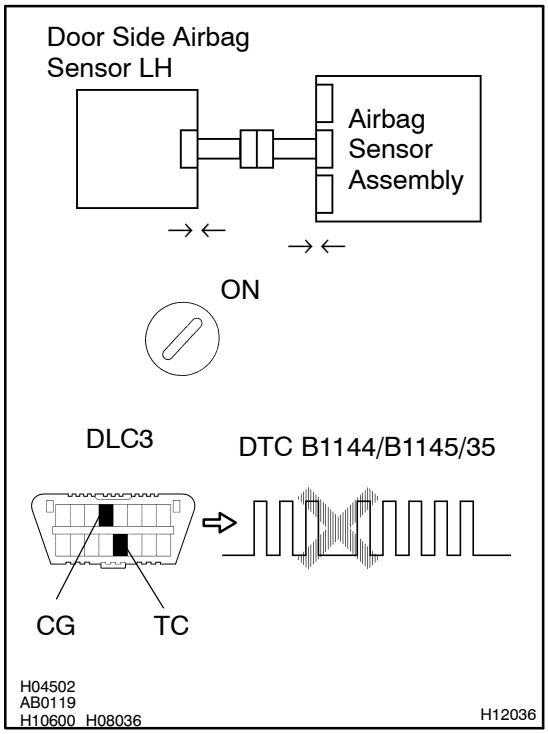
OK:

Resistance: 300 – 1500 Ω

NG → **Replace door side airbag sensor LH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the door side airbag sensor LH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B1144/B1145/35 is not output.

HINT:

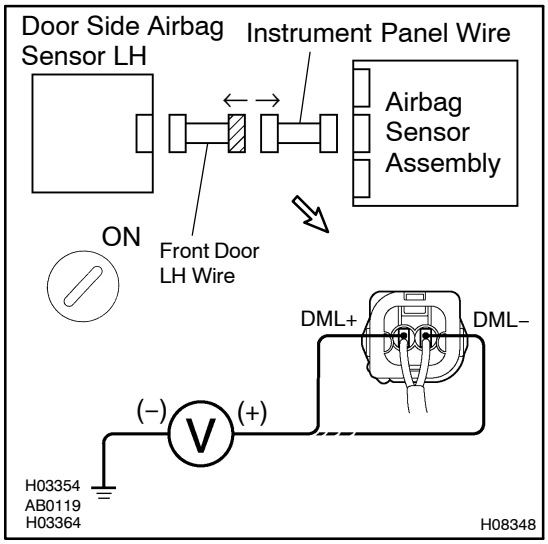
Codes other than code B1144/B1145/35 may be output at this time, but they are not relevant to this check.

NG → **Replace airbag sensor assembly.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check front door LH wire (to B+).



PREPARATION:

Disconnect the front door LH wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

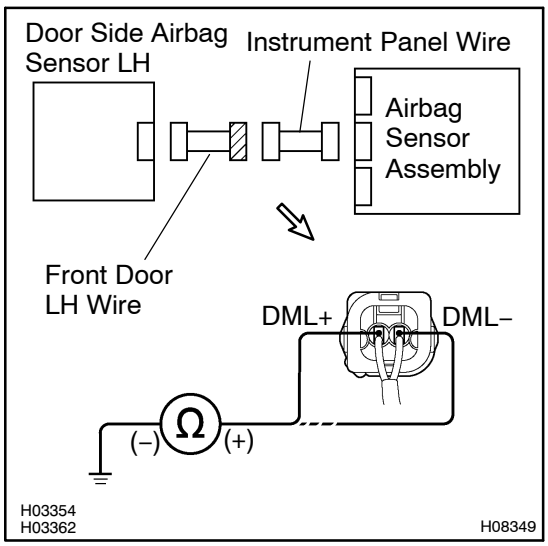
Voltage: Below 1 V

NG	Repair or replace front door LH wire.

OK

Repair or replace instrument panel wire.

9	Check front door LH wire (to ground).



PREPARATION:

Disconnect the front door LH wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and each of DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

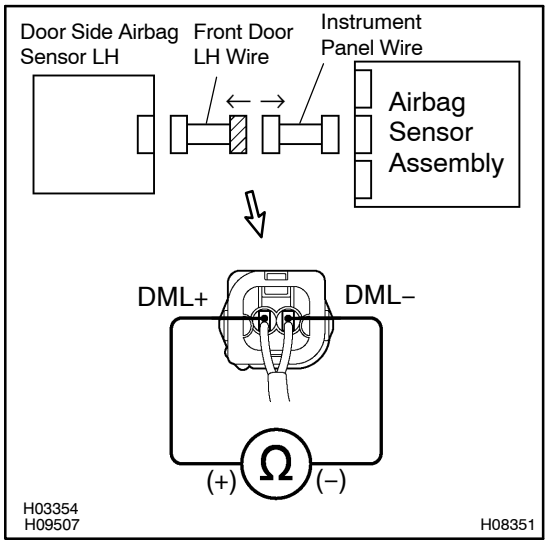
Resistance: 1 MΩ or Higher

NG	Repair or replace front door LH wire.

OK

Repair or replace instrument panel wire.

10	Check front door LH wire.



PREPARATION:

Disconnect the front door LH wire from the instrument panel wire.

CHECK:

Measure the resistance between DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

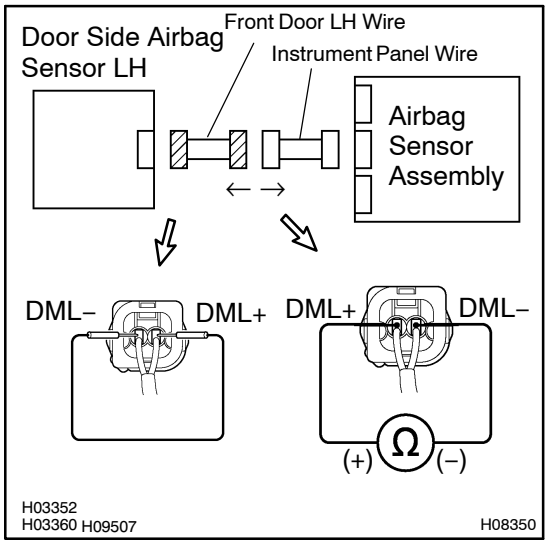
Resistance: 1 MΩ or Higher

NG → **Repair or replace front door LH wire.**

OK

Repair or replace instrument panel wire.

11	Check front door LH wire.



PREPARATION:

(a) Disconnect the front door LH wire from the instrument panel wire.

(b) Using a service wire, connect DML+ and DML– of the front door LH wire connector on the door side airbag sensor LH side.

CHECK:

Measure the resistance between DML+ and DML– of the front door LH wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace front door LH wire.**

OK

Repair or replace instrument panel wire.

DI6PW–24

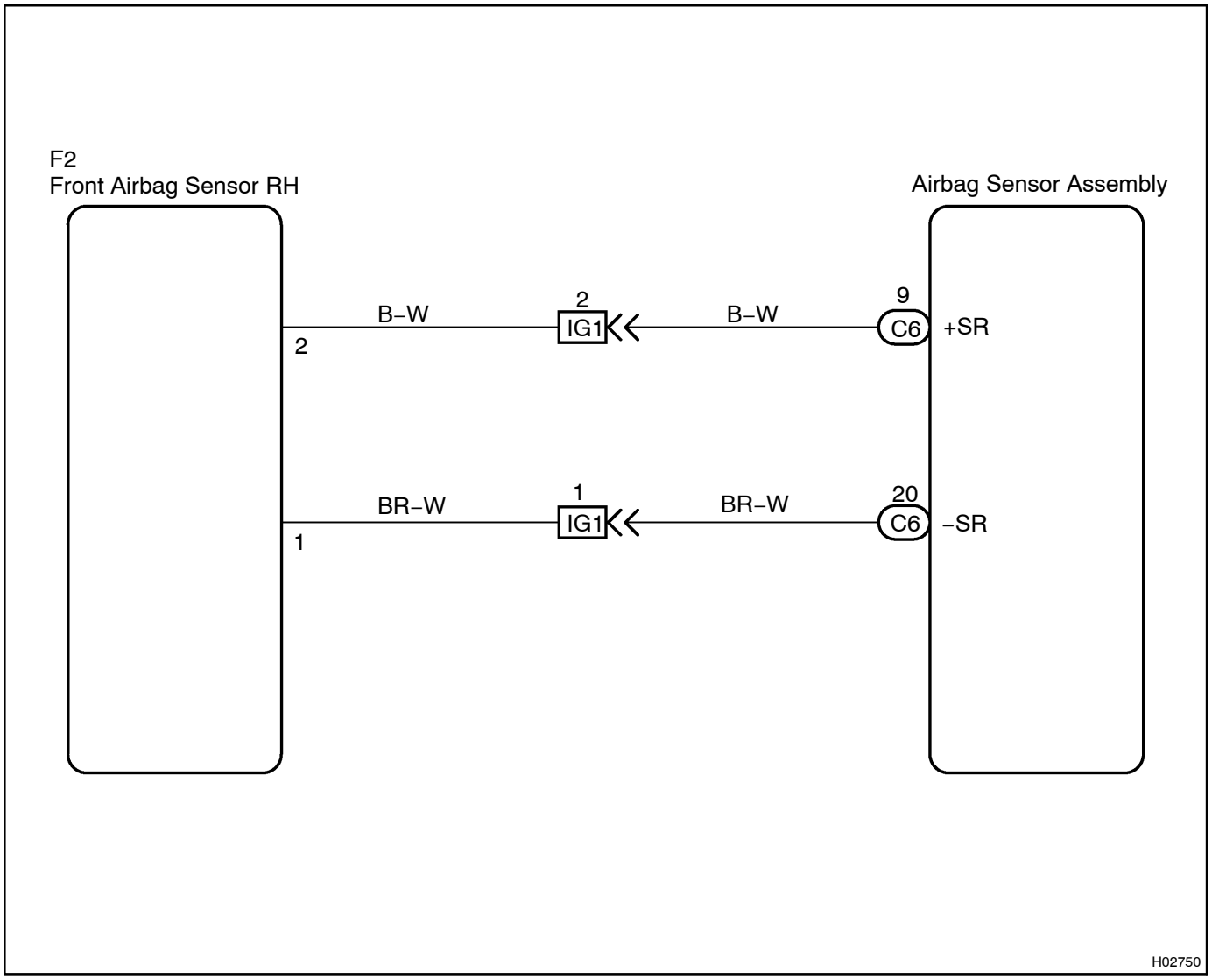
DTC	B1156/B1157/15	Front Airbag Sensor RH Malfunction

CIRCUIT DESCRIPTION

The front airbag sensor RH circuit consists of the airbag sensor assembly and the front airbag sensor RH. For details of the function of each component, see OPERATION on page RS–2.
DTC B1156/B1157/15 is recorded when a malfunction is detected in the front airbag sensor RH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1156/B1157/15	• Front airbag sensor RH malfunction	• Front airbag sensor RH • Airbag sensor assembly • Instrument panel wire • Engine room No. 2 wire

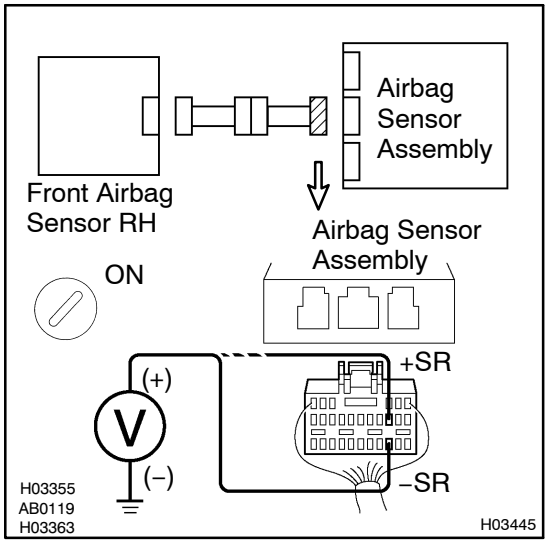
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

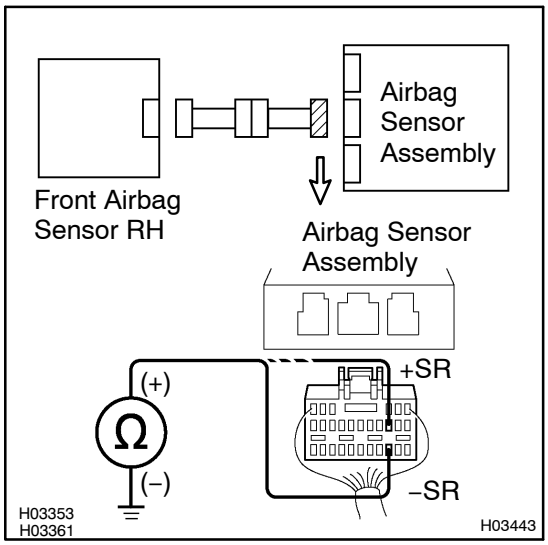
OK:

Voltage: Below 1 V

NG → **Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and each of +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

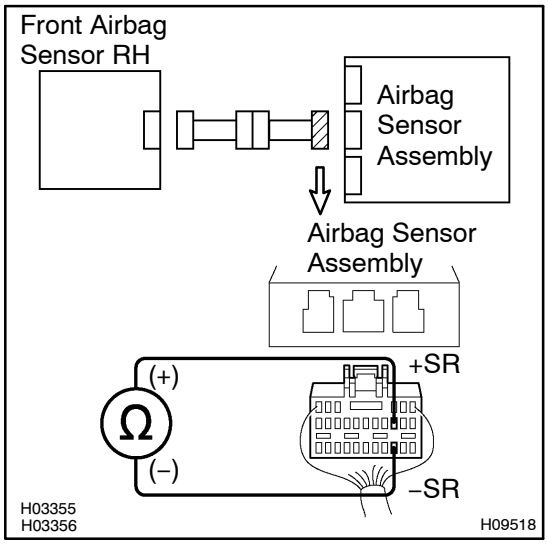
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

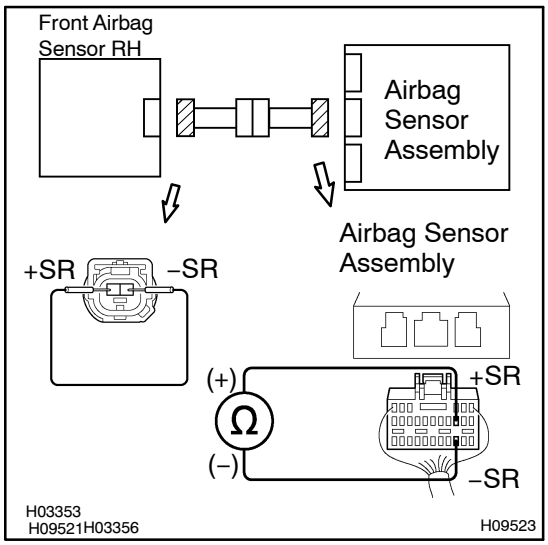
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect +SR and –SR on the front airbag sensor RH side between the airbag sensor assembly and the front airbag sensor RH.

CHECK:

Measure the resistance between +SR and –SR on the airbag sensor assembly side between the front airbag sensor RH and the airbag sensor assembly.

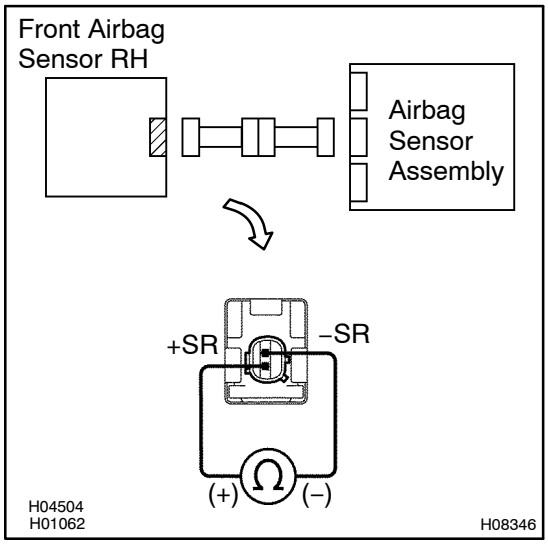
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check front airbag sensor RH.



CHECK:

Measure the resistance between +SR and –SR of the front airbag sensor RH.

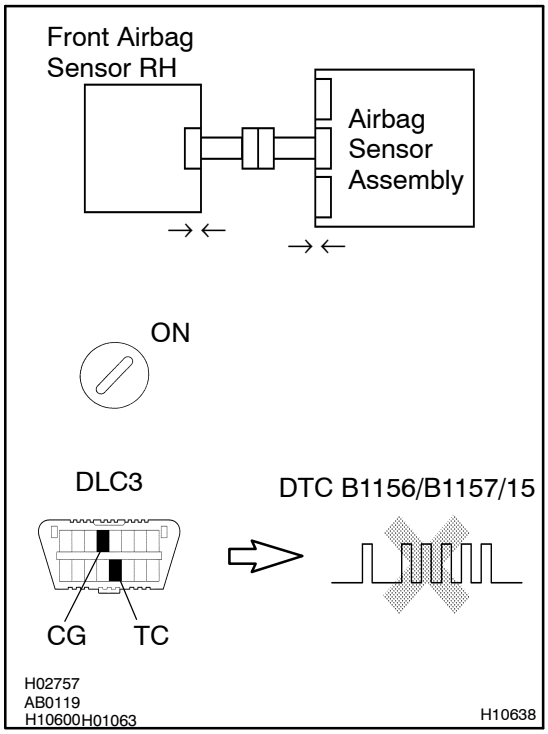
OK:

Resistance: 300 – 1500 Ω

NG → **Replace front airbag sensor RH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front airbag sensor RH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B1156/B1157/15 is not output.

HINT:

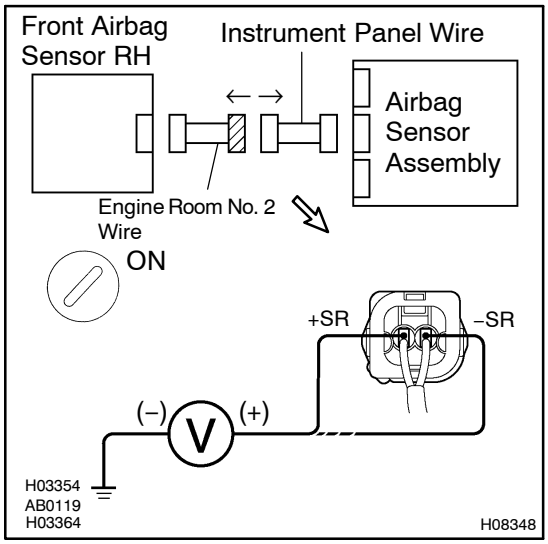
Codes other than code B1156/B1157/15 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check engine room No. 2 wire (to B+).



PREPARATION:

Disconnect the engine room No. 2 wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

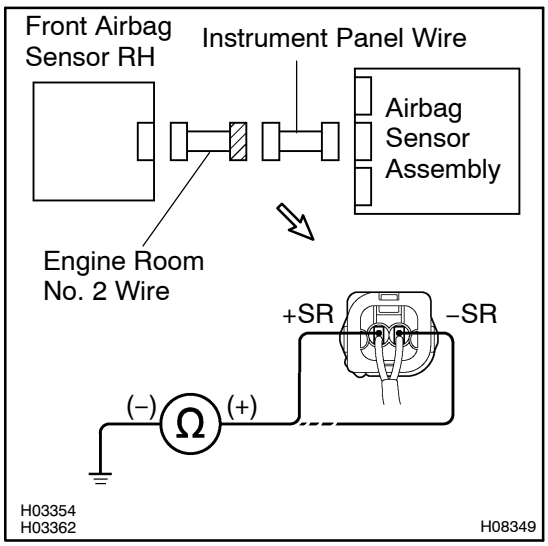
Voltage: Below 1 V

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

9	Check engine room No. 2 wire (to ground).



PREPARATION:

Disconnect the engine room No. 2 wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground an each of +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

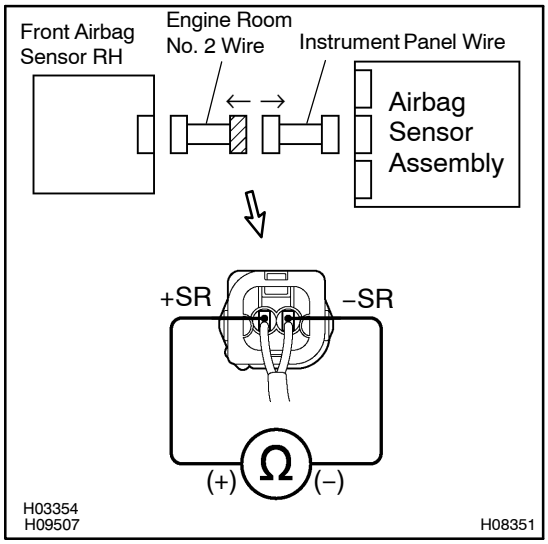
Resistance: 1 MΩ or Higher

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

10	Check engine room No. 2 wire.



PREPARATION:

Disconnect the engine room No. 2 wire from the instrument panel wire.

CHECK:

Measure the resistance between +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

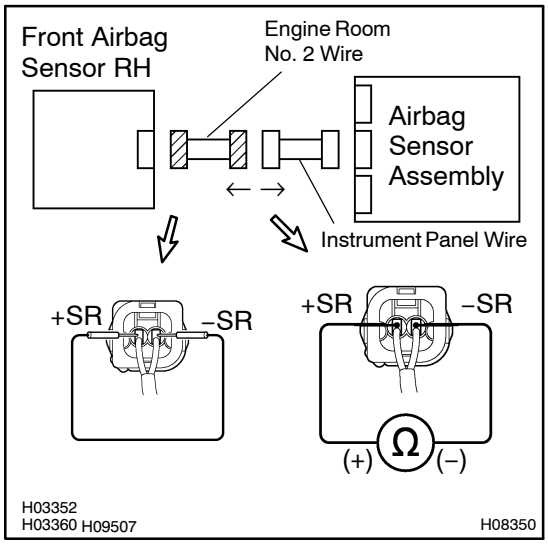
Resistance: 1 MΩ or Higher

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

11	Check engine room No. 2 wire.



PREPARATION:

(a) Disconnect the engine room No. 2 wire from the instrument panel wire.

(b) Using a service wire, connect +SR and –SR of the engine room No. 2 wire connector on the front airbag sensor RH side.

CHECK:

Measure the resistance between +SR and –SR of the engine room No. 2 wire connector on the instrument panel wire side.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace engine room No. 2 wire.**

OK

Repair or replace instrument panel wire.

DI6PX–23

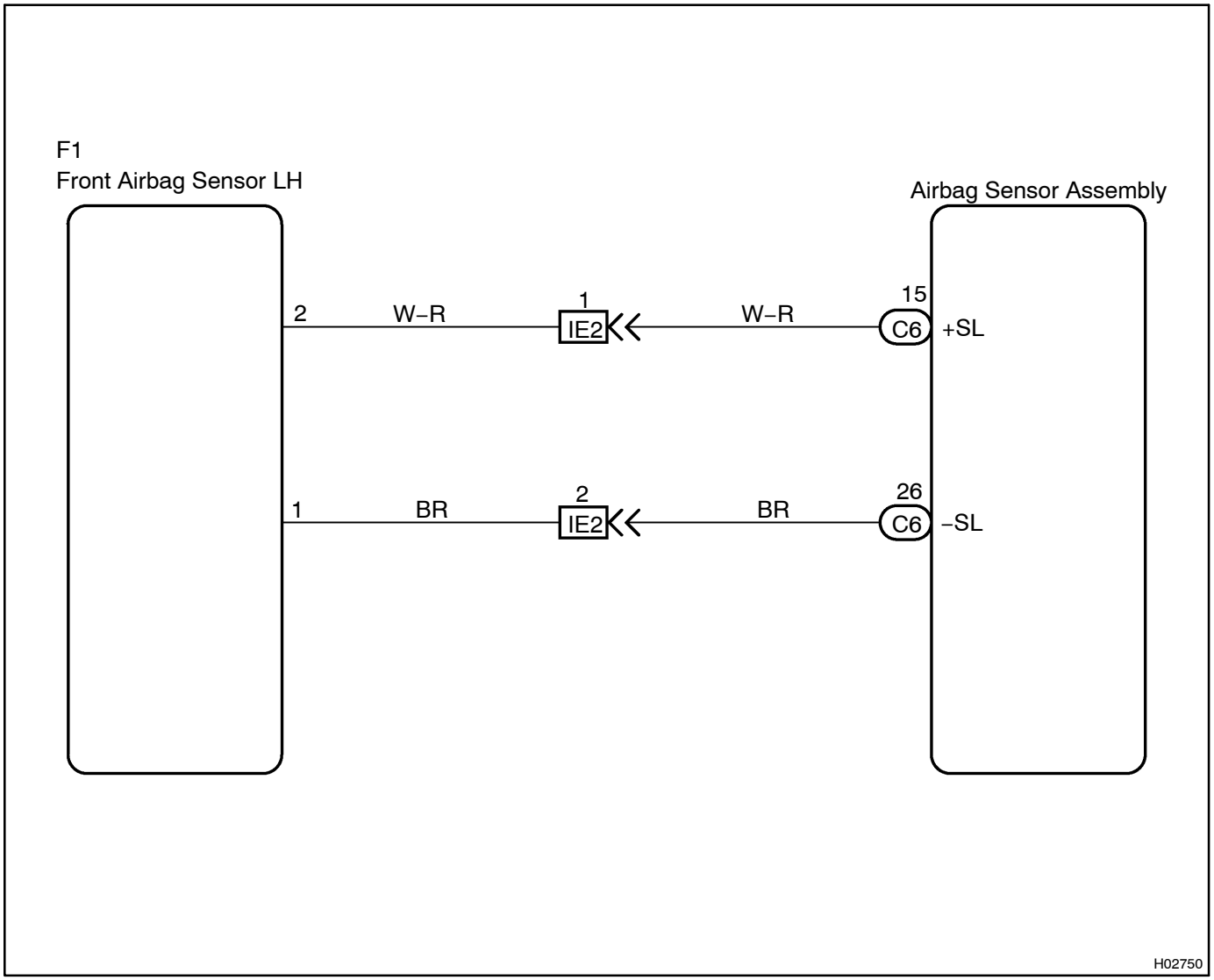
DTC	B1158/B1159/16	Front Airbag Sensor LH Malfunction

CIRCUIT DESCRIPTION

The front airbag sensor LH circuit consists of the airbag sensor assembly and the front airbag sensor LH. For details of the function of each component, see OPERATION on page RS–2.
DTC B1158/B1159/16 is recorded when malfunction is detected in the front airbag sensor LH circuit.

DTC No.	DTC Detecting Condition	Trouble Area
B1158/B1159/16	• Front airbag sensor LH malfunction	• Front airbag sensor LH • Airbag sensor assembly • Wire harness • Engine room main wire

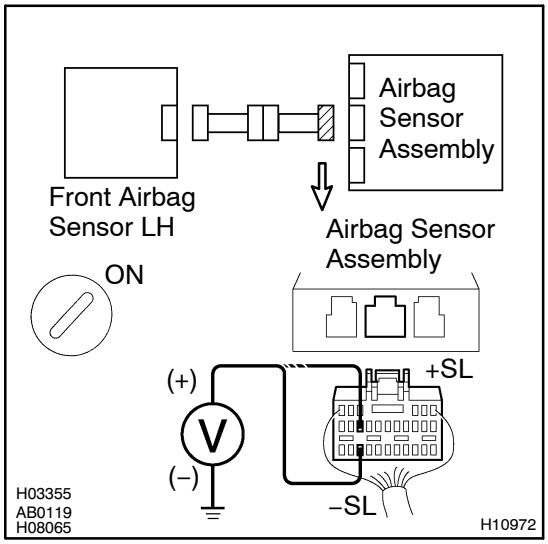
WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Check wire harness (to B+).**



CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

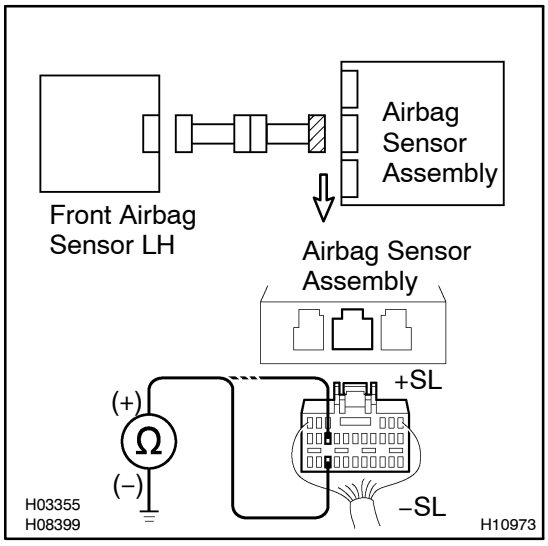
OK:

Voltage: Below 1 V

NG → **Go to step 8.**

OK

3	**Check wire harness (to ground).**



CHECK:

Measure the resistance between the body ground and +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

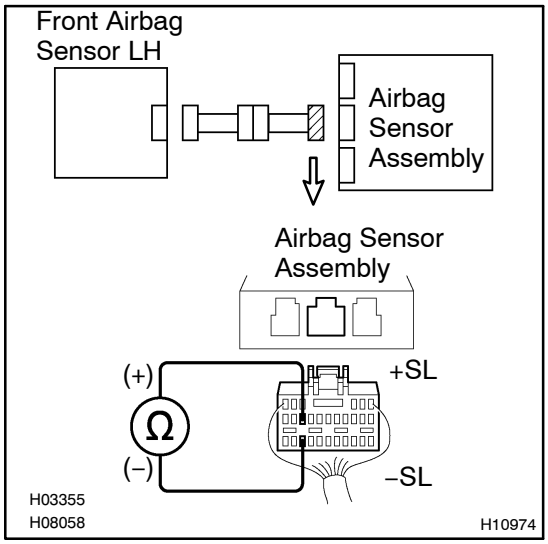
OK:

Resistance: 1 MΩ or Higher

NG → **Go to step 9.**

OK

4	Check wire harness.



CHECK:

Measure the resistance between +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

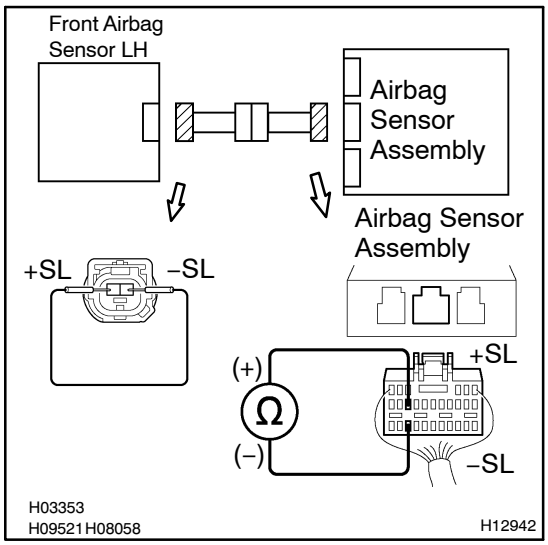
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 10.

OK

5	Check wire harness.



PREPARATION:

Using a service wire, connect +SL and –SL on the front airbag sensor LH side between the airbag sensor assembly and the front airbag sensor LH.

CHECK:

Measure the resistance between +SL and –SL on the airbag sensor assembly side between the front airbag sensor LH and the airbag sensor assembly.

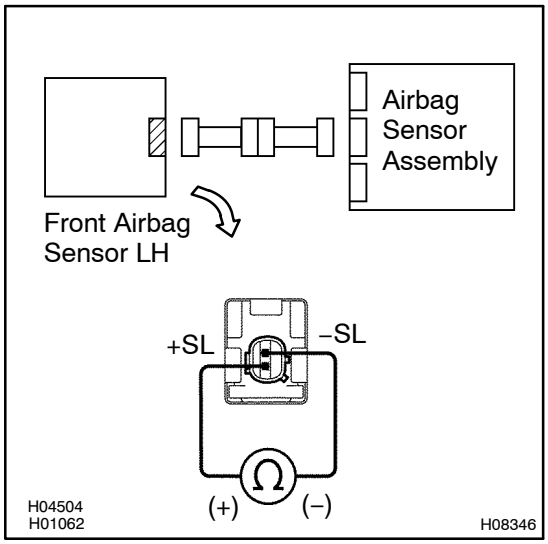
OK:

Resistance: Below 1 Ω

NG	Go to step 11.

OK

6	Check front airbag sensor LH.



CHECK:

Measure the resistance between +SL and –SL of the front airbag sensor LH.

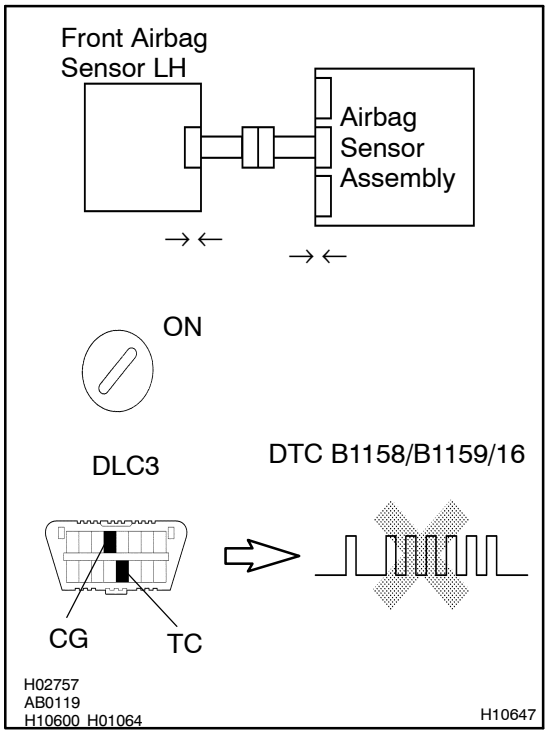
OK:

Resistance: 300 – 1500 Ω

NG → **Replace front airbag sensor LH.**

OK

7	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Connect the front airbag sensor LH connector and airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.

CHECK:

(a) Turn the ignition switch to ON, and wait at least for 10 seconds.
(b) Clear the DTC stored in memory (See page DI–884).
(c) Turn the ignition switch to LOCK, and wait at least for 10 seconds.
(d) Turn the ignition switch to ON, and wait at least for 10 seconds.
(e) Check the DTC (See page DI–884).

OK:

DTC B1158/B1159/16 is not output.

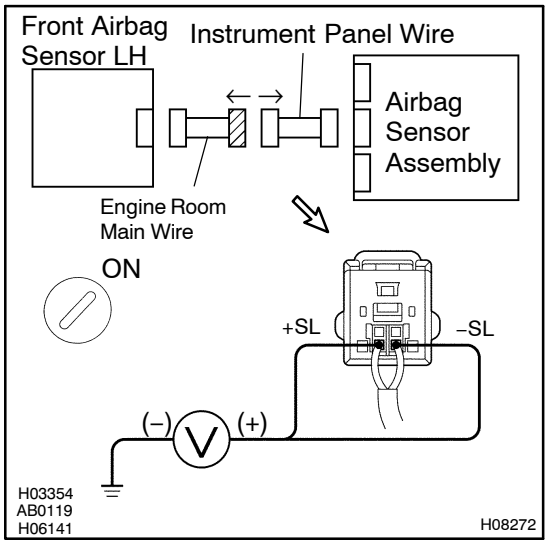
HINT:
Codes other than code B1158/B1159/16 may be output at this time, but they are not relevant to this check.

NG	Replace airbag sensor assembly.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

8	Check engine room main wire (to B+).



PREPARATION:

Disconnect the engine room main wire from the instrument panel wire.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

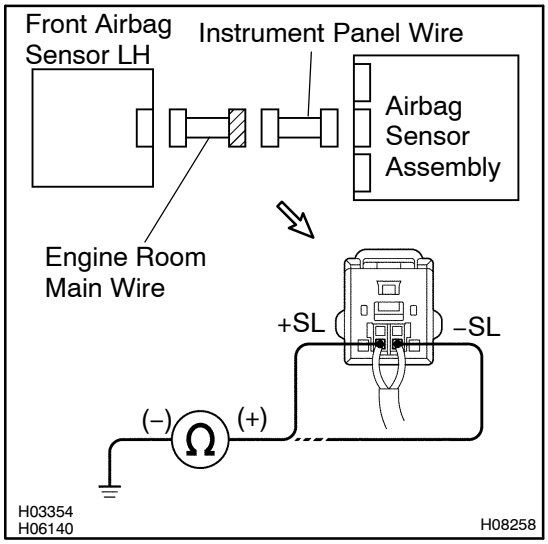
Voltage: Below 1 V

NG	Repair or replace engine room main wire.

OK

Repair or replace instrument panel wire.

9	Check engine room main wire (to ground).



PREPARATION:

Disconnect the engine room main wire from the instrument panel wire.

CHECK:

Measure the resistance between the body ground and +SL and –SL of the engine room main wire connector on the instrument panel wire side.

OK:

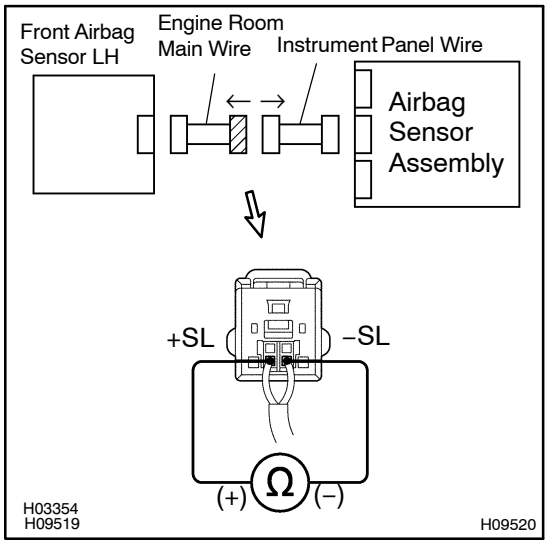
Resistance: 1 MΩ or Higher

NG	Repair or replace engine room main wire.

OK

Repair or replace instrument panel wire.

10	Check engine room main wire.



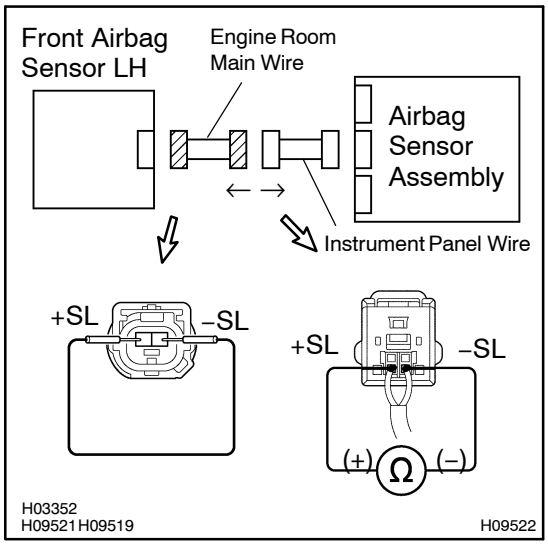
PREPARATION:
Disconnect the engine room main wire from the instrument panel wire.
CHECK:
Measure the resistance between +SL and –SL of the engine room main wire connector on the instrument panel wire side.
OK:
Resistance: 1 MΩ or Higher

NG → **Repair or replace engine room main wire.**

OK

Repair or replace instrument panel wire.

11	Check engine room main wire.



PREPARATION:
(a) Disconnect the engine room main wire from the instrument panel wire.
(b) Using a service wire, connect +SL and –SL of the engine room main wire connector on the front airbag sensor assembly side.
CHECK:
Measure the resistance between +SL and –SL of the engine room main wire connector on the instrument panel wire side.
OK:
Resistance: Below 1 Ω

NG → **Repair or replace engine room main wire.**

OK

Repair or replace instrument panel wire.

DI6PY–25

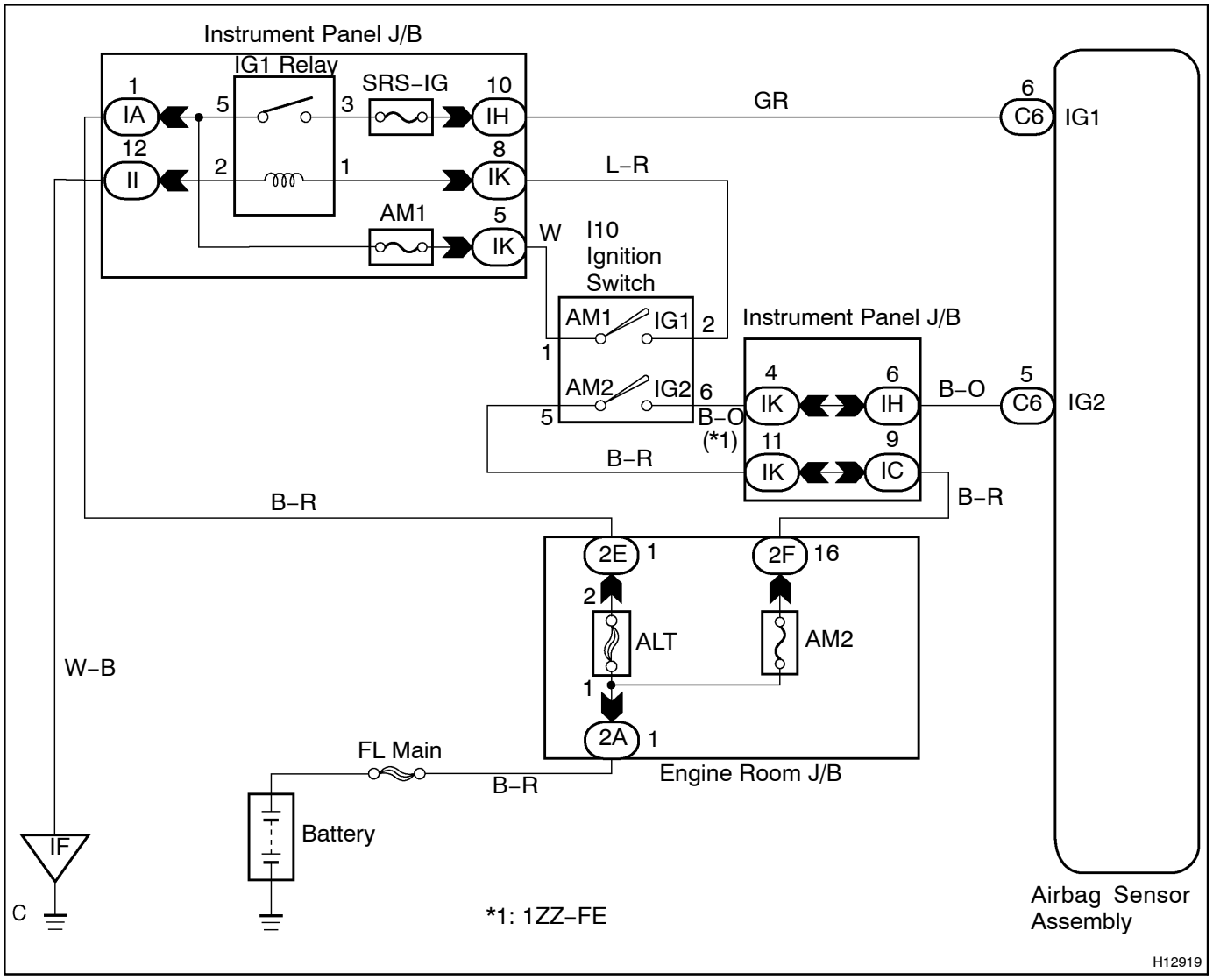
DTC	Normal	Source Voltage Drop

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the airbag sensor assembly in case the source voltage drops.
When the battery voltage drops, the voltage–increase circuit (DC–DC converter) functions to increase the voltage of the SRS to normal voltage.
The diagnosis system malfunction display for this circuit is differ from the other circuits in that when the SRS warning light remains on and the DTC shows a normal code, source voltage drop is indicated.
Malfunction in this circuit is not recorded in the airbag sensor assembly, and when the source voltage returns to normal, the SRS warning light automatically goes off.

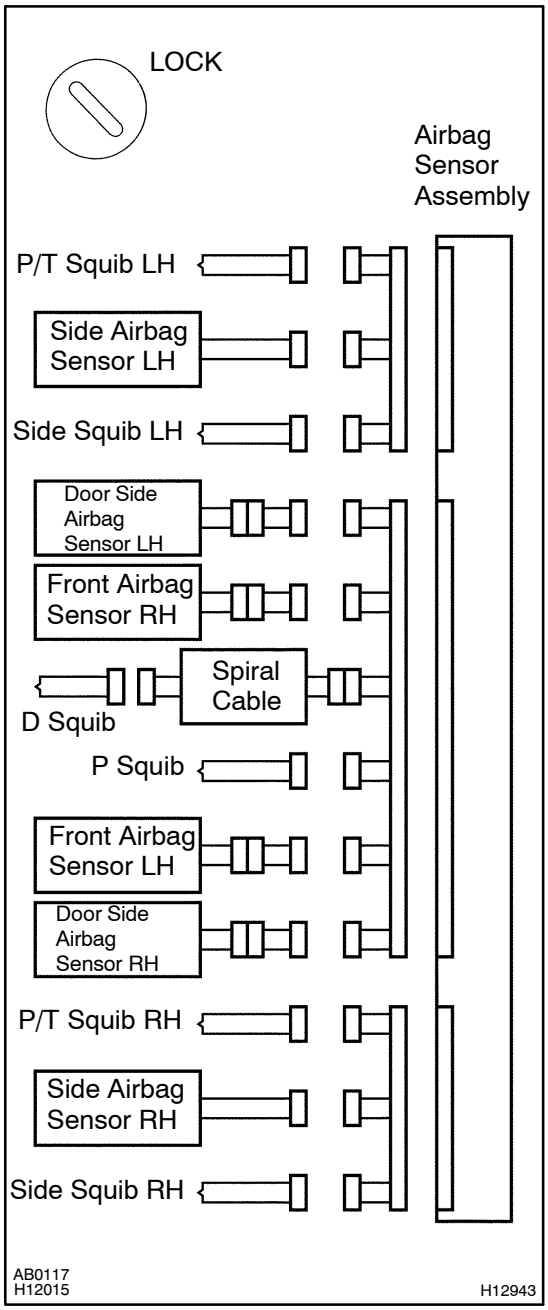
DTC No.	Diagnosis
(Normal)	Source voltage drop

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Prepare for inspection.**



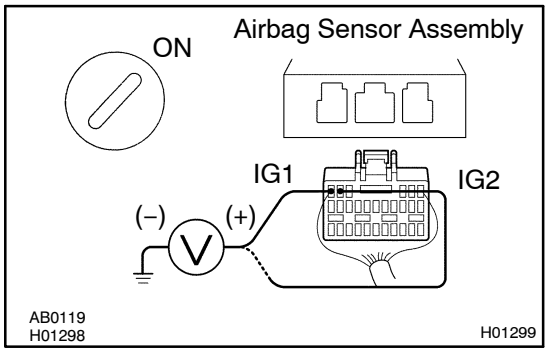
PREPARATION:

(a) Disconnect negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(b) Remove the steering wheel pad (See page SR–13).
(c) Disconnect the connector of the front passenger airbag assembly (See page RS–27).
(d) Disconnect the connector of the side airbag assembly RH and LH (See page RS–40).
(e) Disconnect the connector of the seat belt pretensioner RH and LH (See page BO–109).
(f) Disconnect the connectors of the airbag sensor assembly (See page RS–53).
(g) Disconnect the connector of the front airbag sensor RH and LH (See page RS–58).
(h) Disconnect the connector of the side airbag sensor assembly RH and LH (See page RS–63).
(i) Disconnect the connector of the door side airbag sensor RH and LH (See page RS–68).

CAUTION:

Store the steering wheel pad, front passenger airbag assembly and side airbag assembly with the front surface facing upward.

2	Check source voltage.



PREPARATION:

Connect the negative (–) terminal cable to the battery.

CHECK:

(a) Turn the ignition switch to ON.

(b) Measure the voltage between the body ground and each of IG1 and IG2 on the airbag sensor assembly and operate electric system (defogger, wiper, headlight, heater blower, etc.).

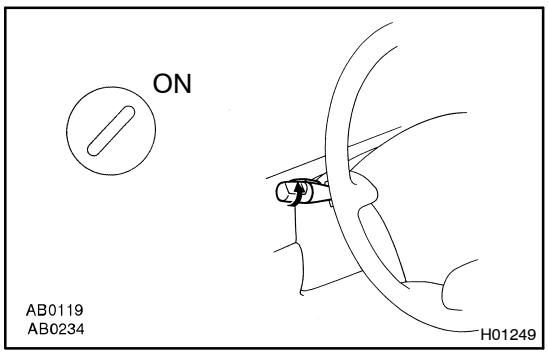
OK:

Voltage: 10 – 14 V

NG	Check harness between battery and airbag sensor assembly, and check battery and charging system.

OK

3	Does SRS warning light turn off?



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Connect the steering wheel pad connector.

(c) Connect the front passenger airbag assembly connector.

(d) Connect the side airbag assembly connectors.

(e) Connect the seat belt pretensioner connectors.

(f) Connect the airbag sensor assembly connectors.

(g) Connect the front airbag sensor connectors.

(h) Connect the side airbag sensor assembly connectors.

(i) Connect the door side airbag sensor connectors.

(j) Turn the ignition switch to ON.

CHECK:

Operate electric system (defogger, wiper, headlight, heater blower, etc.) and check that SRS warning light goes off.

NO	Check for DTCs. If a DTC is output, perform troubleshooting for the DTC. If a normal code is output, replace airbag sensor assembly.

YES

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

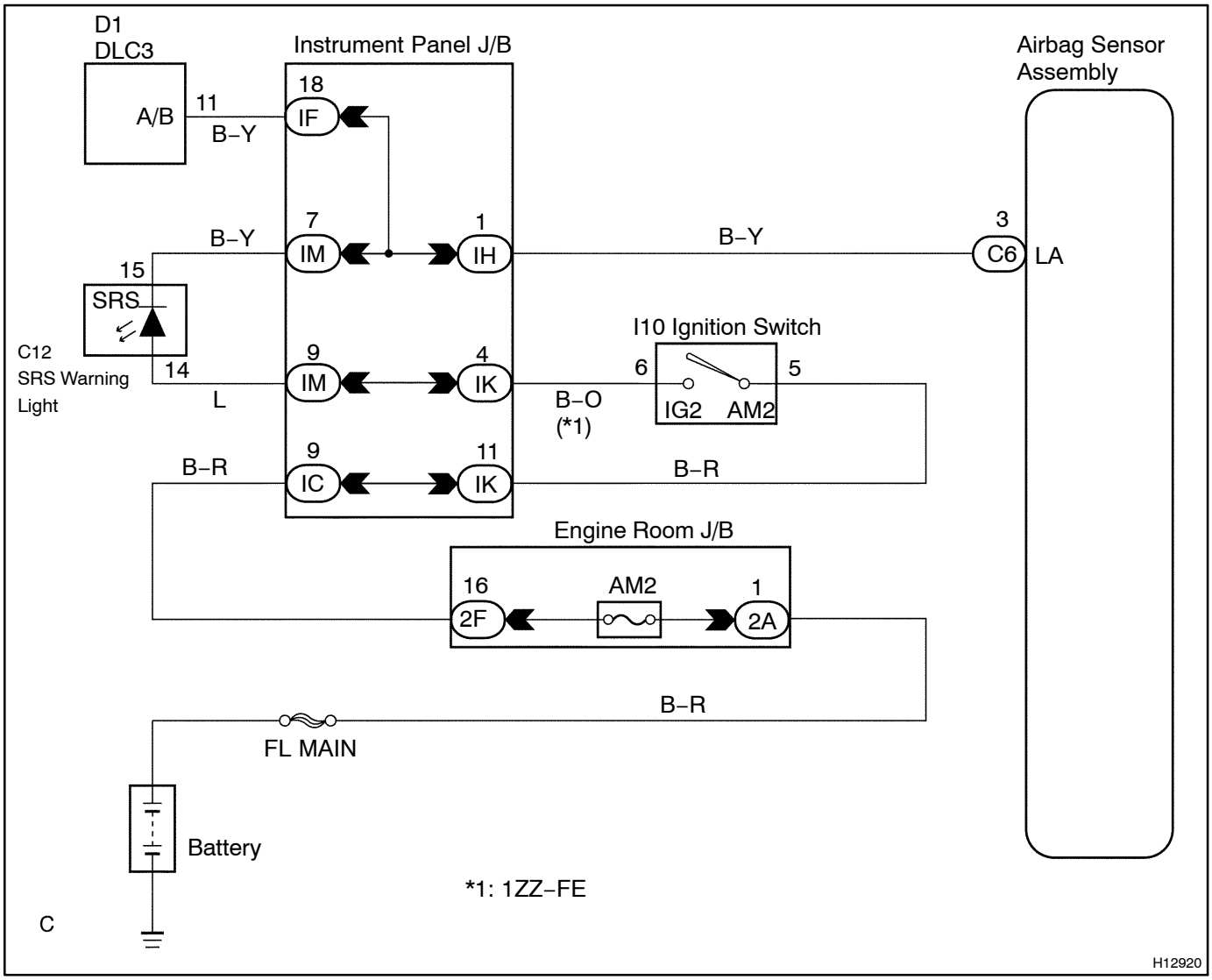
DI6PZ–16

SRS Warning Light Circuit Malfunction

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from the LOCK position to ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality.
When terminals TC and CG of the DLC3 are connected, the DTC is displayed by blinking the SRS warning light.

WIRING DIAGRAM

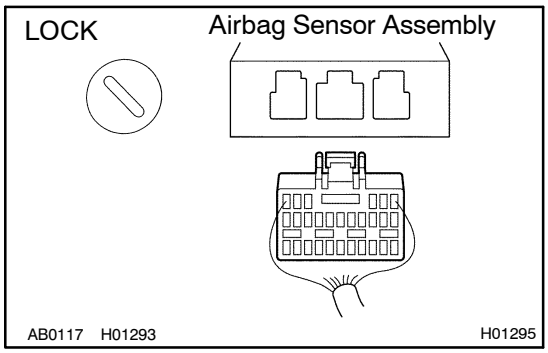


INSPECTION PROCEDURE

Always lights up, when ignition switch is in LOCK position

1	**Prepare for inspection (See step 1 on page DI–1025).**

2	**Does SRS warning light turn off?**



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the airbag sensor assembly connector.
(d) Connect the negative (–) terminal cable to the battery.

CHECK:

Check operation of SRS warning light.

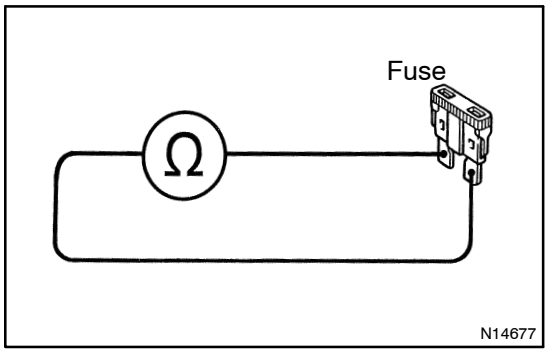
NO → **Check SRS warning light circuit or terminal AB circuit of DLC3.**

YES

Replace airbag sensor assembly.

Does not light up, when ignition switch is turned to ON

1	**Check AM2 Fuse.**

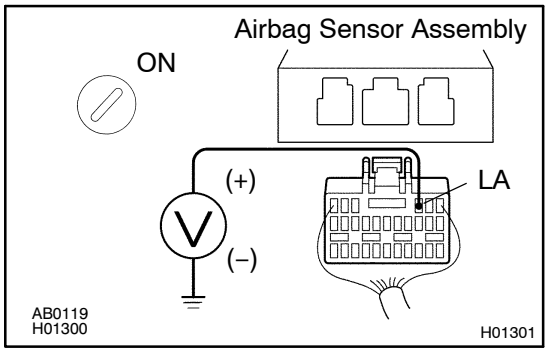


PREPARATION:
Remove the AM2 fuse.
CHECK:
Check continuity of the AM2 fuse.
OK:
Continuity
HINT:
- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, install it.

NG	**Go to step 5.**

OK

2	**Prepare for inspection (See step 1 on page DI–1025).**

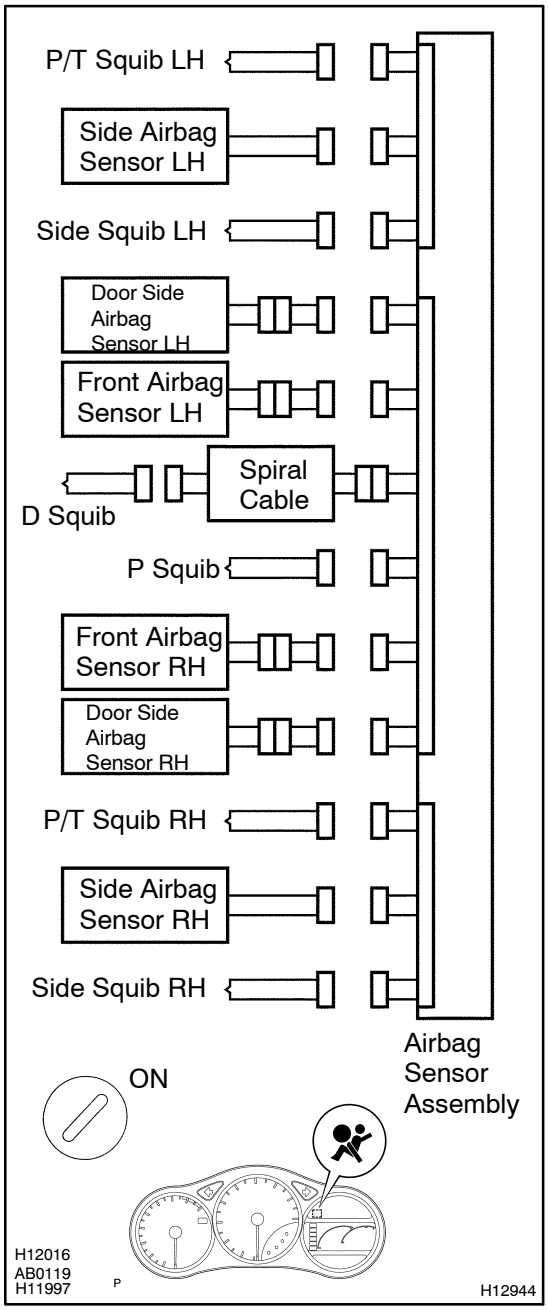


PREPARATION:
(a) Connect the negative (–) terminal cable to the battery.
(b) Turn the ignition switch to ON.
CHECK:
Measure the voltage between the body ground and LA terminal of the harness side connector of the airbag sensor assembly.
OK:
Voltage: 10 – 14 V

NG	**Check combination meter or repair SRS warning light circuit.**

OK

4	Does SRS warning light come on?



PREPARATION:

(a) Disconnect the negative (–) terminal cable from the battery.
(b) Connect the airbag sensor assembly connectors.
(c) Connect the negative (–) terminal cable to the battery, and wait at least for 2 seconds.
(d) Turn the ignition switch to ON.

CHECK:

Check operation of the SRS warning light.

NO → **Check terminal LA of airbag sensor assembly. If normal, replace airbag sensor assembly.**

YES

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

5	**Is new AM2 fuse burnt out again?**

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–20).**

YES

Check harness between AM2 fuse and SRS warning light.

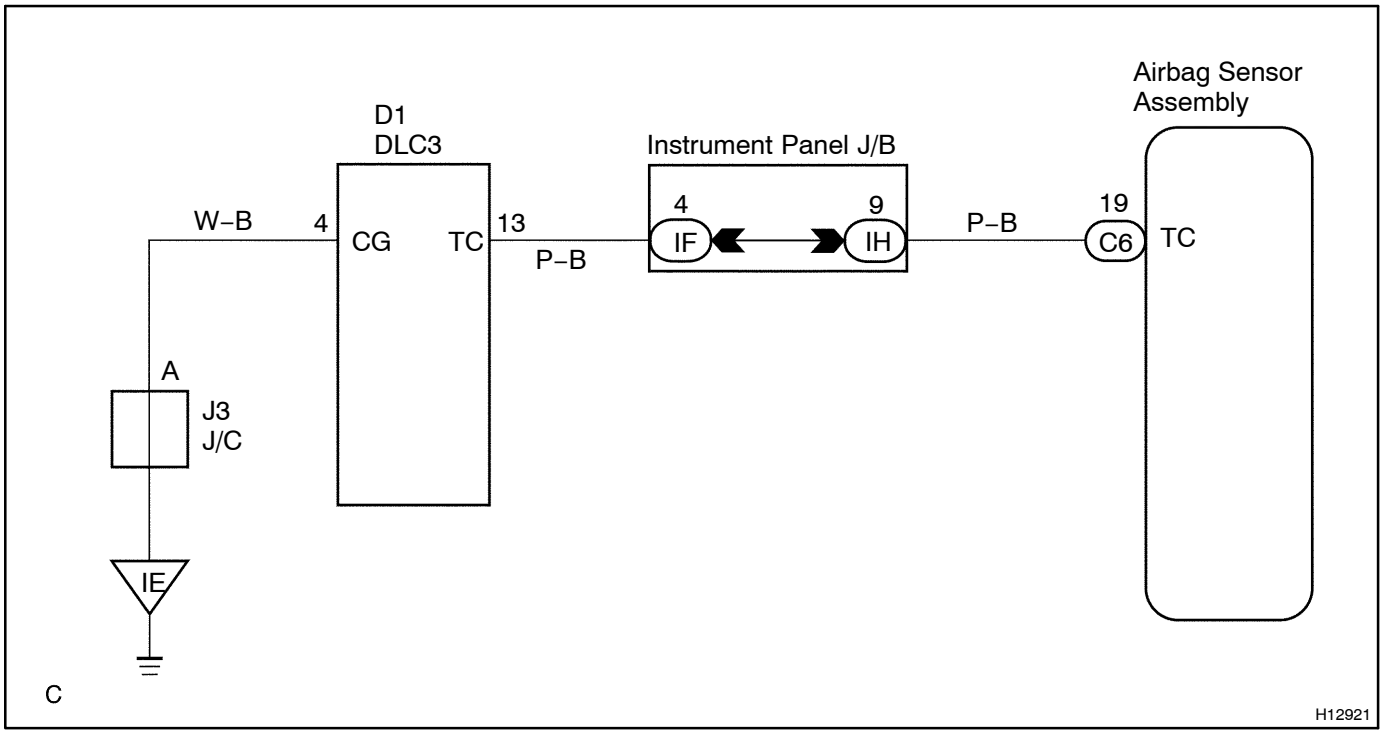
DI6Q0–19

TC Terminal Circuit

CIRCUIT DESCRIPTION

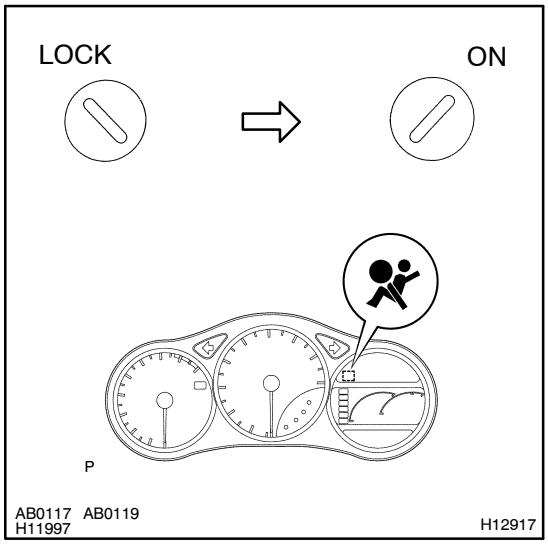
DTC output mode is set by connecting terminal TC and CG of the DLC3 the airbag sensor assembly. The DTCs are displayed by blinking the SRS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE
If the DTC is not displayed, do the following troubleshooting.

1	**Does SRS warning light light up for approx. 6 seconds?**

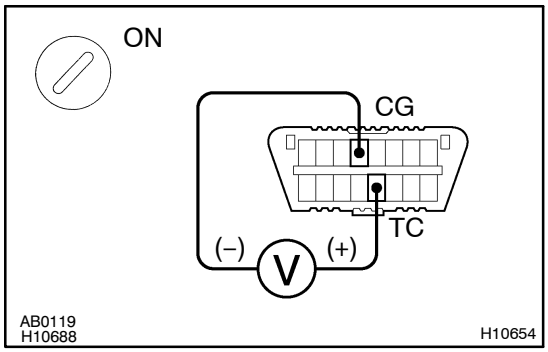


CHECK:
Check operation of the SRS warning light after ignition switch is turned from LOCK position to ON position.

NO → **Check SRS warning light system (See page DI–1028).**

YES

2	**Check voltage between terminal TC and CG of DLC3.**

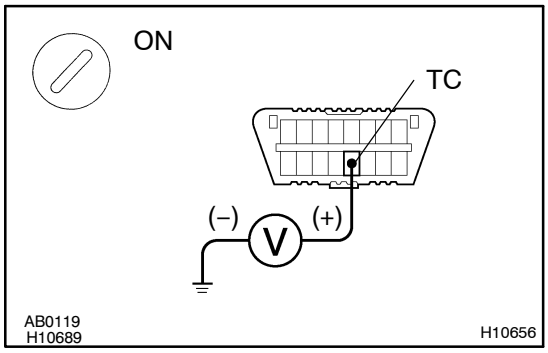


PREPARATION:
Turn the ignition switch to ON.
CHECK:
Measure the voltage between terminal TC and CG of DLC3.
OK:
Voltage: 10 – 14 V

OK → **Go to step 4.**

NG

3	Check voltage between terminal TC of DLC3 and body ground.



CHECK:

Measure the voltage between terminal TC of DLC3 and body ground.

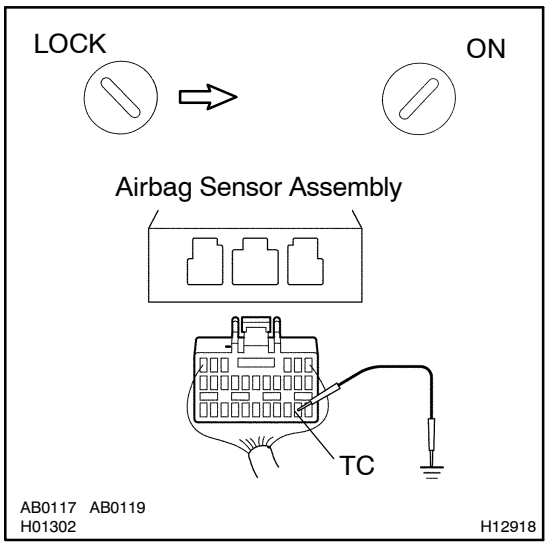
OK:

Voltage: 10 – 14 V

OK	Check harness between terminal CG of DLC3 and body ground.

NG

4	Check airbag sensor assembly.



PREPARATION:

(a) Turn the ignition switch to LOCK.
(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.
(c) Disconnect the airbag sensor assembly connector.
(d) Insert service wire into terminal TC from back side as shown in the illustration.
(e) Connect the airbag sensor assembly connector with service wire.
(f) Connect the negative (–) terminal cable to the battery.
(g) Turn the ignition switch to ON, and wait at least for 60 seconds.
(h) Connect service wire of terminal TC to body ground.

CHECK:

Check operation of the SRS warning light.

OK:

SRS waning light comes on.

NOTICE:

Pay due attention to the terminal connecting position to avoid a malfunction.

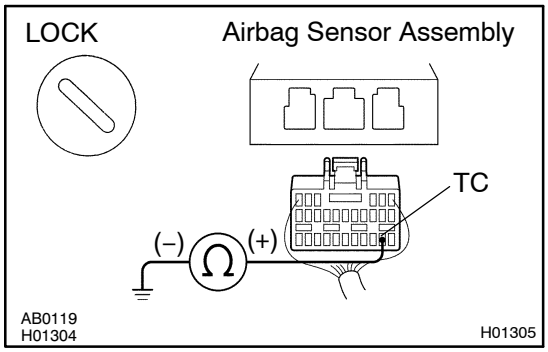
OK	Check harness between the airbag sensor assembly and DLC3.

NG

Replace airbag sensor assembly.

If the DTC is displayed without a DTC check procedure, perform the following troubleshooting.

1	**Check resistance between terminal Tc of airbag sensor assembly and body ground.**



PREPARATION:

(a) Turn the ignition switch to LOCK.

(b) Disconnect the negative (–) terminal cable from the battery, and wait at least for 90 seconds.

(c) Disconnect the airbag sensor assembly connector.

CHECK:

Check resistance between terminal TC of the airbag sensor assembly connector and the body ground.

OK:

Resistance: 1 MΩ or Higher

NG → **Repair or replace harness or connector.**

OK

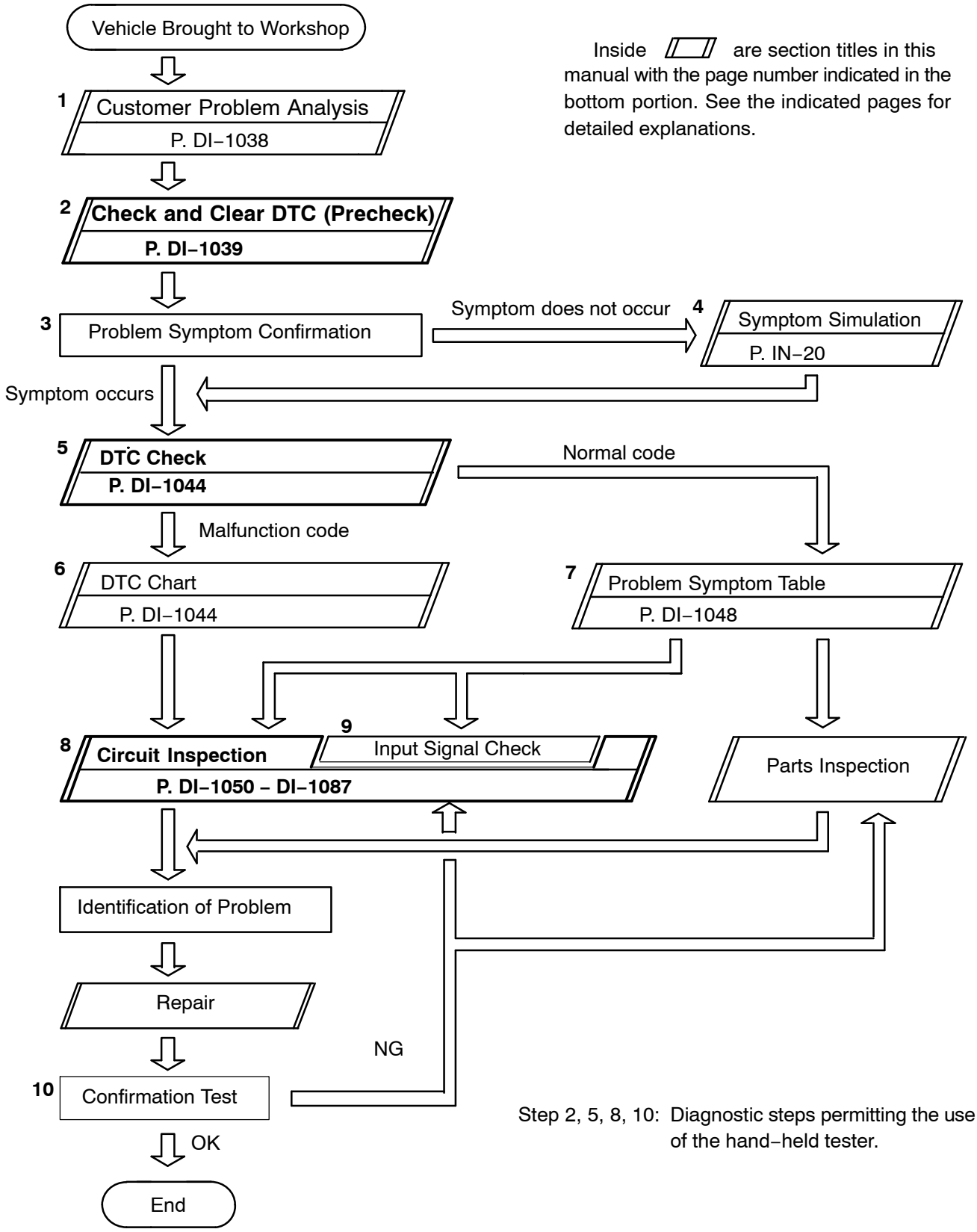
Replace airbag sensor assembly.

CRUISE CONTROL SYSTEM (1ZZ–FE)

DI08F–29

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



Inside ▱ are section titles in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the hand–held tester.

DI08G–15

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

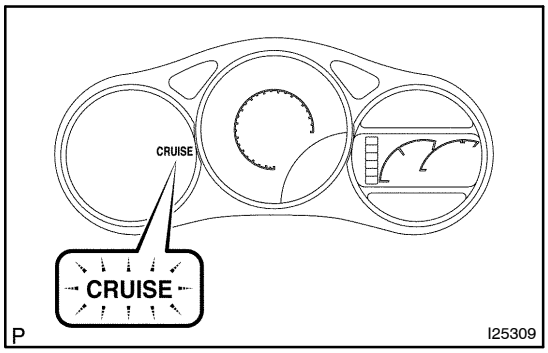
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km** **Mile**

Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	How Often does Problem Occurs	☑ Continuous ☑ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km** **Mile**

Symptoms	☑ Auto cancel occurs	● Driving condition ☐ City driving ☐ Freeway ☐ Uphill ☐ Downhill ● After cancel occurred, did the driver activate cruise control again? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ Except D position shift ☐ At 40 km/h (25 mph) or less ☐ When control SW turns to CANCEL position
	☐ Cruise control malfunction	☐ Slip to acceleration side ☐ Slip to deceleration side ☐ Hunting occurs ☐ O/D cut off does not occur ☐ O/D does not return
	☐ Switch malfunction	☐ SET ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL
	☐ Cruise MAIN indicator light	☐ Remains ON ☐ Does not come on ☐ Blinking

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI1KS–20



PRE–CHECK

1. DIAGNOSIS SYSTEM

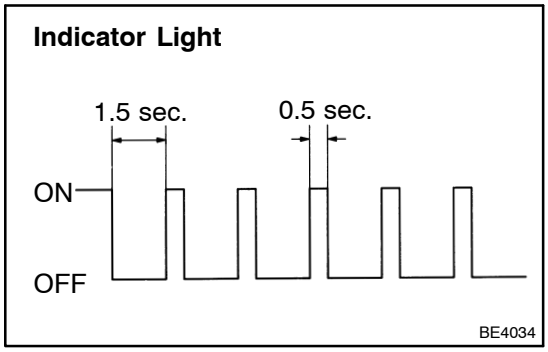
(a) Check the indicator.

(1) Turn the ignition switch ON.

(2) Check that the CRUISE MAIN indicator light comes ON when the cruise control main switch is turned ON, and that the indicator light goes OFF when the main switch is turned OFF.

HINT:

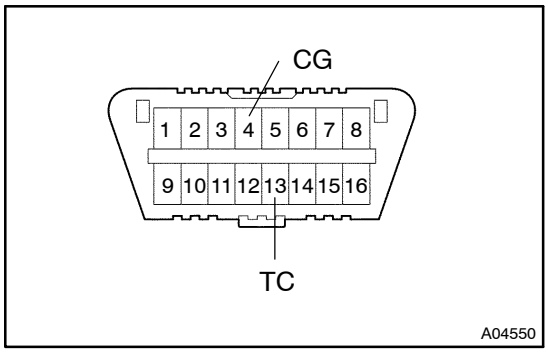
If the indicator check failed, proceed to troubleshooting (See page BE–46) for the combination meter section.



(b) Check the DTC.

HINT:

If a malfunction occurs in the No. 1 vehicle speed sensor or actuator, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and turns on and off the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stored in the memory as DTC.



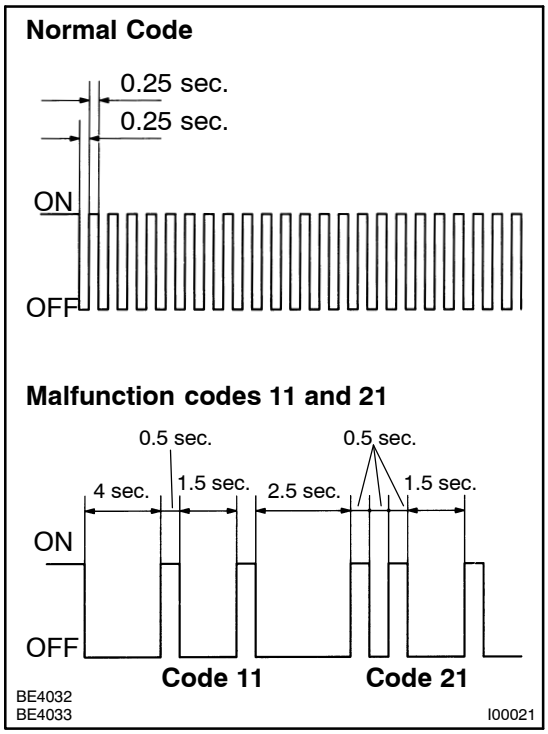
(c) Output of DTC using diagnosis check wire.

(1) Turn the ignition switch ON.

(2) Using SST, connect terminal Tc and CG of DLC3.

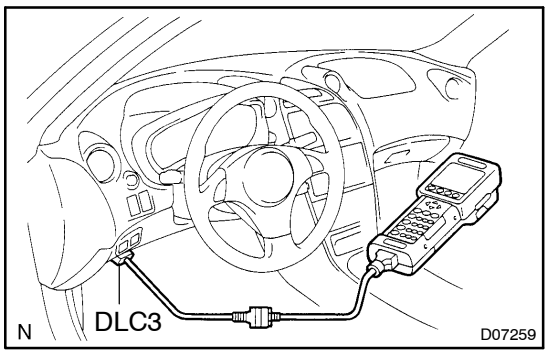
SST 09843–18040

(3) Read the DTC on the CRUISE MAIN indicator light.



HINT:

- If the DTC is not output, inspect the diagnosis circuit (See page DI–1085).
- As an example, the blinking patterns of normal code, code 11 and code 21 are shown in the illustration.



2. USING HAND–HELD TESTER

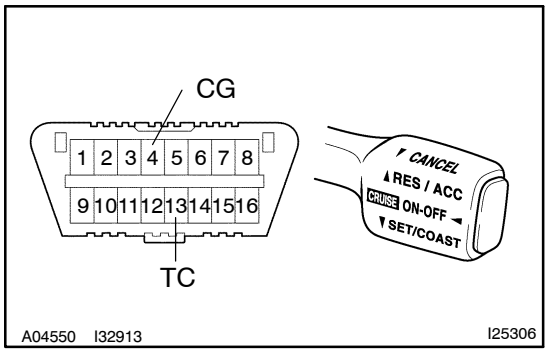
(a) Hook up the hand–held tester to the DLC3.

(b) Monitor the ECU data by following the prompts on the tester screen.

HINT:

Hand–held tester has a ”Snapshot” function which records the monitored data.

Please refer to the hand–held tester operator’s manual for further details.



3. DTC CLEARANCE (ERASE MODE)

HINT:

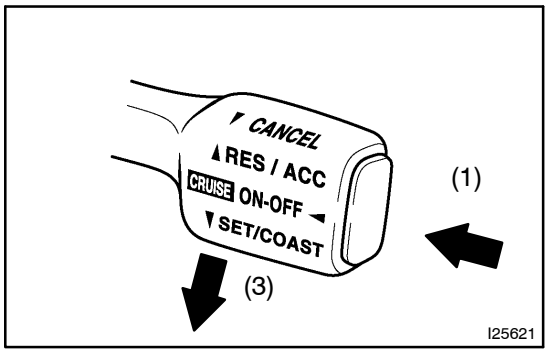
When operating the erase mode, diagnosis detection does not work.

(a) Drive at about 15 km/h or below.

(b) Using SST, connect terminal Tc and CG of DLC3.
SST 09843–18040

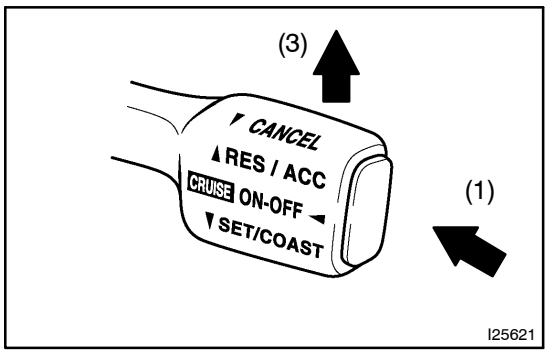
(c) Pull the cruise control switch to CANCEL.

(d) Under the condition mentioned above, turn on the cruise control main switch 5 times within 3 seconds.

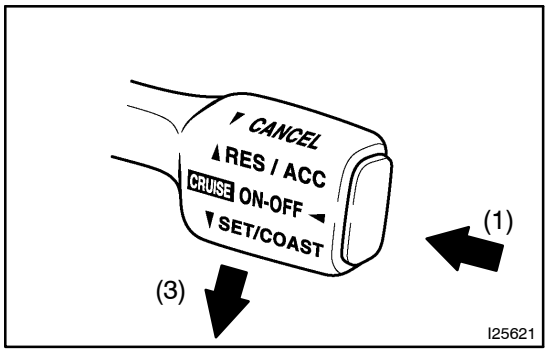


4. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

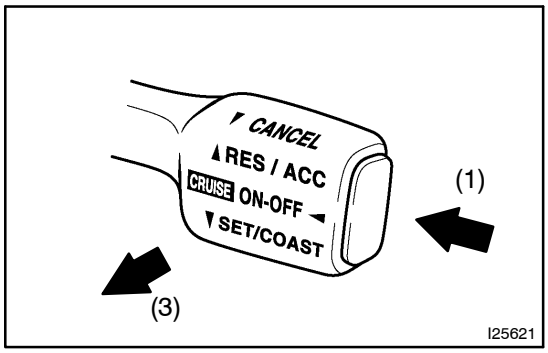
(a) Inspect the SET switch.
- (1) Press the main switch button to ON.
- (2) Drive at a desired speed [40 km/h (25 mph) or higher].
- (3) Push down the control switch to the SET/COAST.
- (4) After releasing the switch, check that the vehicle cruises at the desired speed.



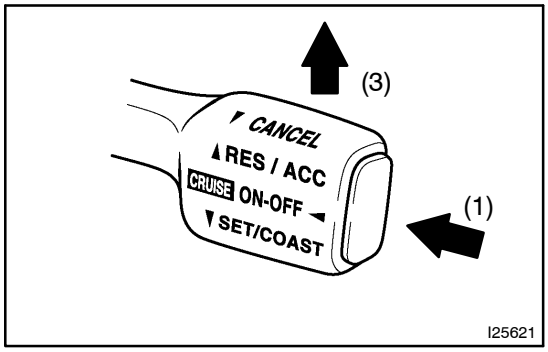
(b) Inspect the ACCEL switch.
- (1) Press the main switch button to ON.
- (2) Drive at a desired speed [40 km/h (25 mph) or higher].
- (3) Check that the vehicle speed increases while the control switch is pushed up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
- (4) Momentarily push up the control switch to the RES/ACC position, and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).



(c) Inspect the COAST switch.
- (1) Press the main switch button to ON.
- (2) Drive at a desired speed [40 km/h (25 mph) or higher].
- (3) Check that the vehicle speed decreases while the control switch is pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
- (4) Momentarily push down the control switch to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).

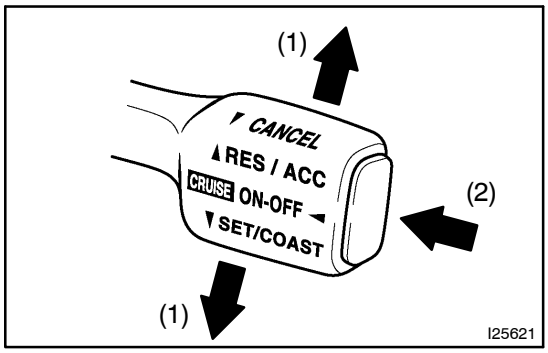


(d) Inspect the CANCEL switch.
(1) Press the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When performing one of the following actions, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Push the main switch button to OFF.
- Pull the cruise control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Press the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When performing one of the followings action, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Push the main switch button to OFF.

(4) When the control switch is pushed up to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed before the cancellation.



5. INPUT SIGNAL CHECK

HINT:

(1) For check No.1 to No.3:

Turn ignition switch ON.

(2) For check No.4:

- Jack up the vehicle.
- Start the engine.
- Shift to D position.

(a) Push down the control switch to push up the SET/COAST or push up the RES/ACC position and hold it down or up (1).

(b) Push the main switch ON (2).

(c) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds.

(d) Turn the SET/COAST or RES/ACC switch OFF.

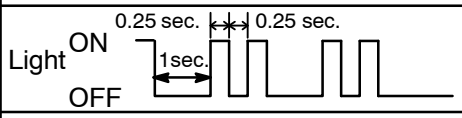
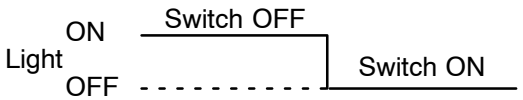
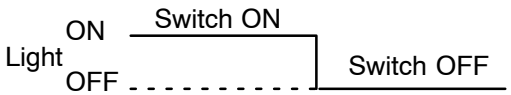
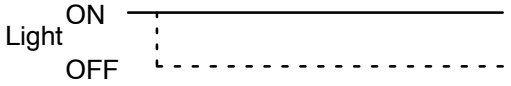
(e) Operate each switch as listed in the table below.

(f) Read the blinking pattern of the CRUISE MAIN indicator light.

(g) After performing the check, turn the main switch OFF.

HINT:

When 2 or more signals are input to the ECU, the lower numbered code will be displayed first.

No.	Operation Method	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
1	Turn SET/COAST switch ON		SET/COAST switch circuit is normal
2	Turn RES/ACC switch ON		RES/ACC switch circuit is normal
3	Turn CANCEL switch ON		CANCEL switch circuit is normal
	Turn stop light switch ON Depress brake pedal		Stop light switch circuit is normal
	Turn PNP switch OFF (Shift to except D position)		PNP switch circuit is normal
	Turn clutch switch OFF (Depress clutch pedal)		Clutch switch circuit is normal
4	Drive at about 40 km/h (25 mph)or higher		Vehicle Speed Sensor is normal
	Drive at about 40 km/h (25 mph) or below		

DI08I–19

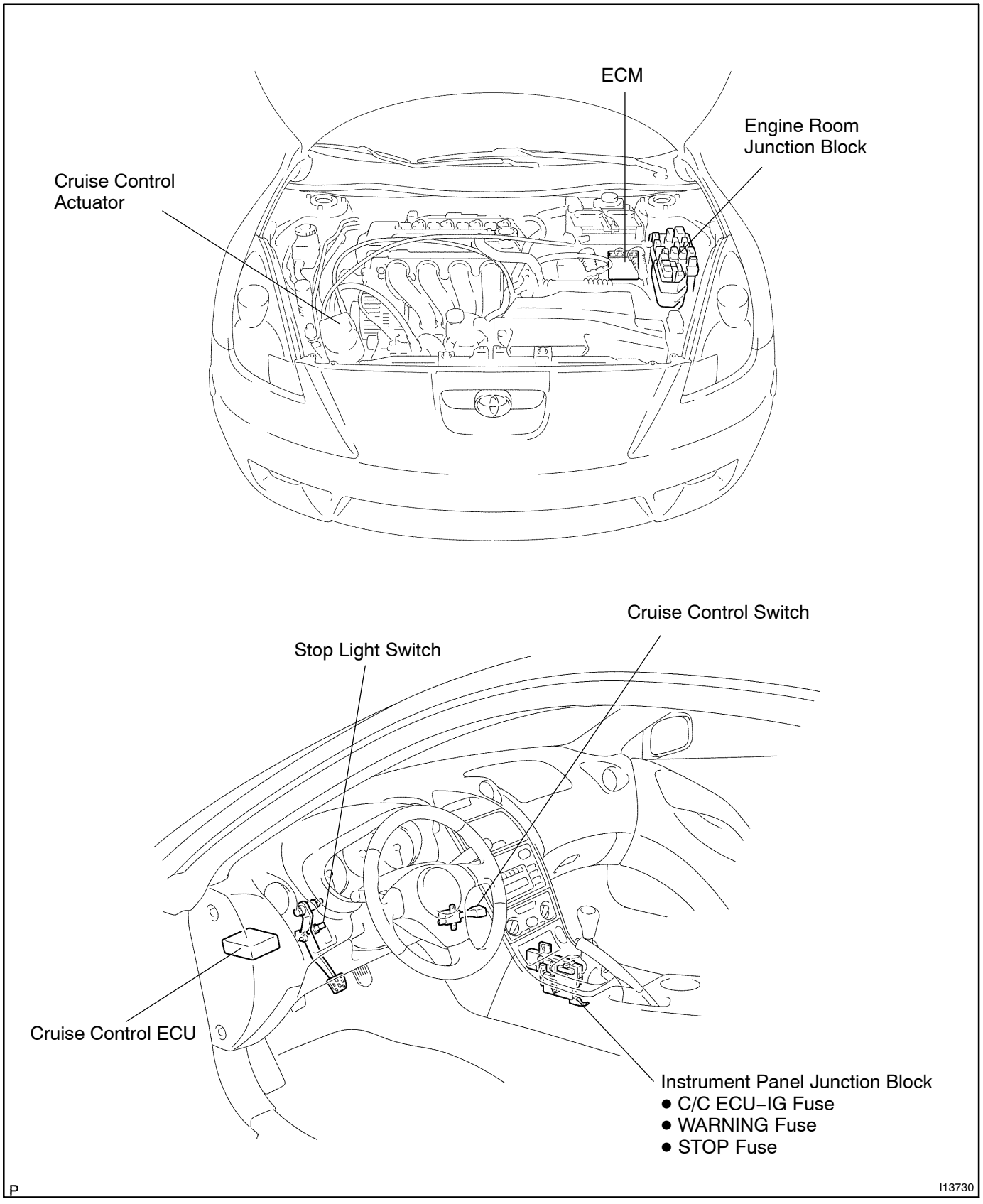
DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No. (See Page)	Circuit Inspection	Trouble Area
11, 15 (DI–1050)	Actuator Motor Circuit	• Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU
12, 43 (DI–1052)	Actuator Magnetic Clutch Circuit	• STOP Fuse • Stop light switch • Actuator magnetic clutch • Harness or connector between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground • Cruise control ECU
14 (DI–1056)	Actuator Mechanical Malfunction	• Actuator motor (actuator lock: motor, arm) • Cruise control ECU
21 (DI–1058)	Open in Vehicle Speed Sensor Circuit	• Combination meter • Harness or connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor • Vehicle speed sensor • Cruise control ECU
23 (DI–1062)	Vehicle Speed Signal Abnormal	• Vehicle speed sensor • Cruise control ECU
41	Cruise control ECU	• Cruise control ECU
42	Source voltage drop	• Power source

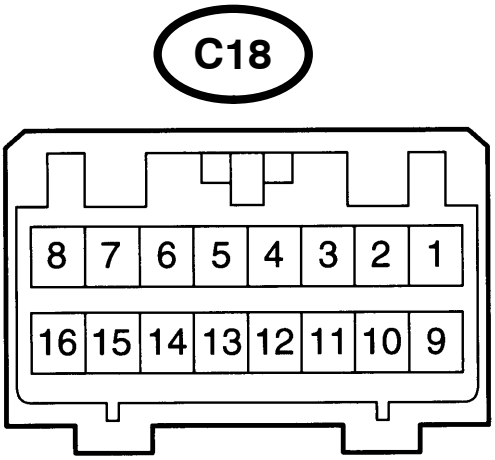
DI6QT–06

PARTS LOCATION



DI1KT–23

TERMINALS OF ECU



I00293

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
STP– ↔ GND (C18–2 ↔ C18–16)	G–W ↔ W–B	Depress brake pedal	10 – 16 V
		Release brake pedal	Below 1 V
D ↔ GND (C18–3 ↔ C18–16)	B–Y ↔ W–B	Shift to positions except D	Below 1 V
		Shift to D position	10 – 16 V
D ↔ GND (C18–3 ↔ C18–16)	B–Y ↔ W–B	Clutch pedal is depressed	10 – 16 V
		Clutch pedal is released	Below 1 V
PI ↔ GND (C18–4 ↔ C18–16)	Y–B ↔ W–B	Ignition switch ON Cruise control main switch OFF	10 – 16 V
TC ↔ GND (C18–5 ↔ C18–16)	P–B ↔ W–B	Ignition switch ON	10 – 16 V
		Ignition switch ON Connect terminals Tc and E1 of diagnostic check connector	Below 1 V
ECT ↔ GND (C18–6 ↔ C18–16)	Y ↔ W–B	During driving Gear position 3rd	10 – 16 V
		During driving Gear position O/D	Below 1 V
MC ↔ GND (C18–7 ↔ C18–16)	R–W ↔ W–B	During cruise control driving COAST switch held ON	9 – 15 V
		During cruise control driving ACC switch held ON	Below 1 V
L ↔ GND (C18–8 ↔ C18–16)	G–B ↔ W–B	During cruise control driving	9 – 15 V
		Except during cruise control driving	Below 1 V
B ↔ GND (C18–9 ↔ C18–16)	B–O ↔ W–B	Ignition switch ON	10 – 16 V
CCS ↔ GND (C18–10 ↔ C18–16)	W ↔ W–B	Ignition switch ON	10 – 16 V
		Ignition switch ON MAIN switch held ON	4.2 – 8.8 V
		Ignition switch ON SET/COAST switch held ON	2.5 – 6.3 V
		Ignition switch ON RES/ACC switch held ON	0.8 – 3.7 V

SPD ↔ GND (C18–12 ↔ C18–16)	W–R ↔ W–B	Engine start Car stoppage.	Below 1.5 V or 4.7 – 16 V
		During driving (Pulse generated).	3 – 7 V
IDL ↔ GND (C18–13 ↔ C18–16)	L–W ↔ W–B	Ignition switch ON Throttle valve fully opened.	10 – 16 V
		Ignition switch ON Throttle valve fully closed.	Below 1.5 V
OD ↔ GND (C18–14 ↔ C18–16)	B ↔ W–B	During cruise control driving O/D switch ON.	10 – 16 V
		During cruise control driving O/D switch OFF (3rd driving)	Below 1 V
MO ↔ GND (C18–15 ↔ C18–16)	P–L ↔ W–B	During cruise control driving ACC switch hold ON	9 – 15 V
		During cruise control driving COAST switch hold ON	Below 1 V
GND ↔ Body Ground (C18–16 ↔ Body Ground)	W–B ↔ Body Ground	Always	Below 1 V

DI08L–31

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occurring or CANCEL occurring (DTC is normal).	1. Main Switch Circuit (Cruise control switch) 2. Vehicle Speed Sensor 3. Control Switch Circuit (Cruise control switch) 4. Stop Light Switch Circuit 5. Park/Neutral Position Switch Circuit (A/T) 6. Clutch Switch Circuit (M/T) 7. Actuator Motor Circuit 8. Cruise Control Cable 9. Cruise Control ECU	DI–1063 DI–1058 DI–1063 DI–1068 DI–1075 DI–1078 DI–1078 DI–1050 DI–1078
SET not occurring or CANCEL occurring (DTC does not output).	1. ECU Power Source Circuit 2. Cruise Control ECU	DI–1080 DI–1078
Actual vehicle speed deviates above or below the set speed.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Electronically Controlled Transmission Communication Circuit 4. Actuator Motor Circuit 5. Idle Signal Circuit (Main throttle position sensor) 6. Cruise Control ECU	DI–1050 DI–1058 DI–1072 DI–1078 DI–1066 DI–1078
Gear shifting frequently between 3rd and O/D when driving on uphill road (Hurting).	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI–1072 DI–1078
Cruise control cannot be cancelled even when brake pedal is depressed.	1. Cruise Control Cable 2. Stop Light Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1068 DI–1078 DI–1078
Cruise control cannot be cancelled even when transmission is shifted to ”N” position.	1. Cruise Control Cable 2. Park/Neutral Position Switch Circuit (A/T) 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1075 DI–1078 DI–1078
Cruise control cannot be cancelled even when clutch pedal is depressed.	1. Cruise Control Cable 2. Clutch Switch Circuit (M/T) 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1078 DI–1078 DI–1078
Control switch does not operate (SET/COAST, ACC/RES, CANCEL not possible).	1. Cruise Control Cable 2. Control Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1078 DI–1078 DI–1078
SET is possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1058 DI–1078 DI–1078
Poor response is in ACCEL and RESUME modes.	1. Cruise Control Cable 2. Electronically Controlled Transmission Communication Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–1050 DI–1072 DI–1078 DI–1078
O/D does not resume even though the road is not uphill.	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI–1072 DI–1078
DTC memory is erased.	1. Cruise Control ECU	DI–1078

DTC is not output, or is output when should not be.	1. Diagnosis Circuit 2. Cruise Control ECU	DI–1085 DI–1078
Cruise MAIN indicator light remains ON or fails to come on.	1. Cruise MAIN Indicator Light Switch Circuit	DI–1083

DI08M–34

CIRCUIT INSPECTION

DTC	11, 15	Actuator Motor Circuit

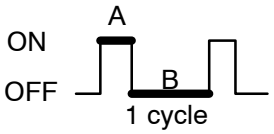
CIRCUIT DESCRIPTION

The actuator motor is operated by signals from the ECU. Acceleration and deceleration signals are transmitted according to the changes in the Duty Ratio (See below).

Duty Ratio

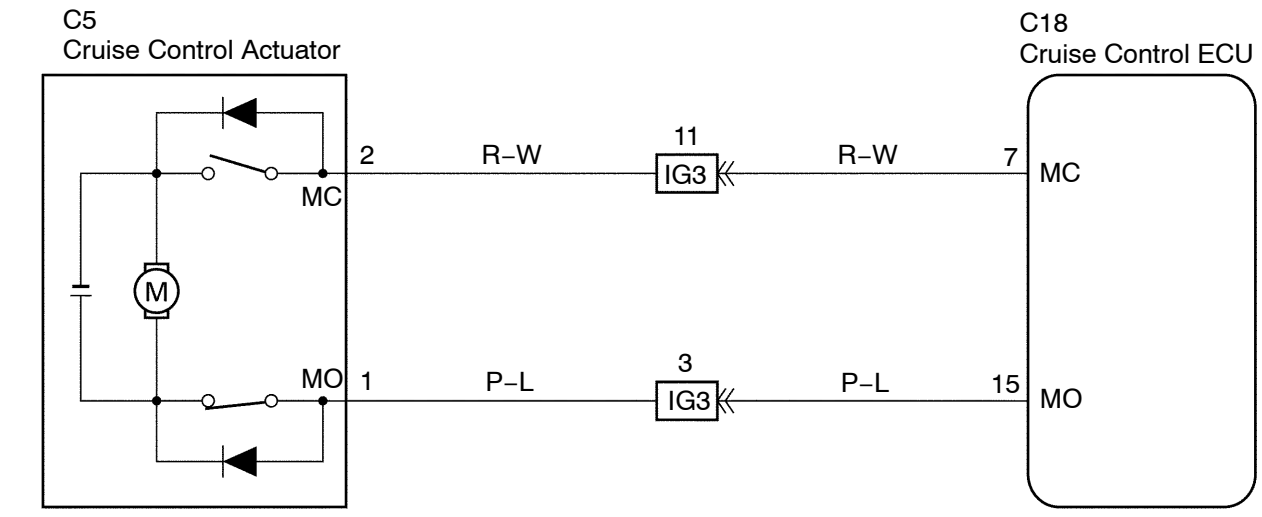
The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, B is the period of non–continuity.

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$



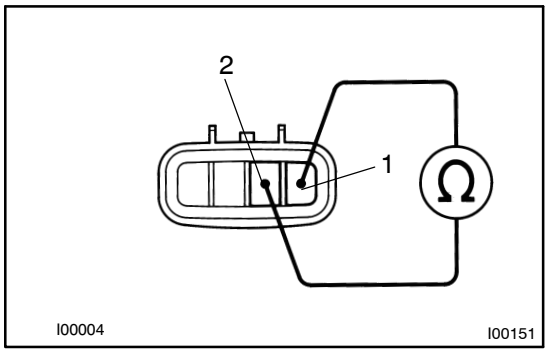
DTC No.	Detection Item	Trouble Area
11	Short in actuator motor circuit.	• Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU
15	Open in actuator motor circuit.	• Actuator motor

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check resistance between terminals MO and MC of actuator motor.**



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure the resistance between terminal 1 and 2.

HINT:

If the control plate is in fully opened or fully closed positions, the resistance cannot be measured.

OK:

Resistance: more than 4.2 Ω

NG → **Replace cruise control actuator.**

OK

2	**Check for open and short in harness and connectors between cruise control ECU and actuator motor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08N–32

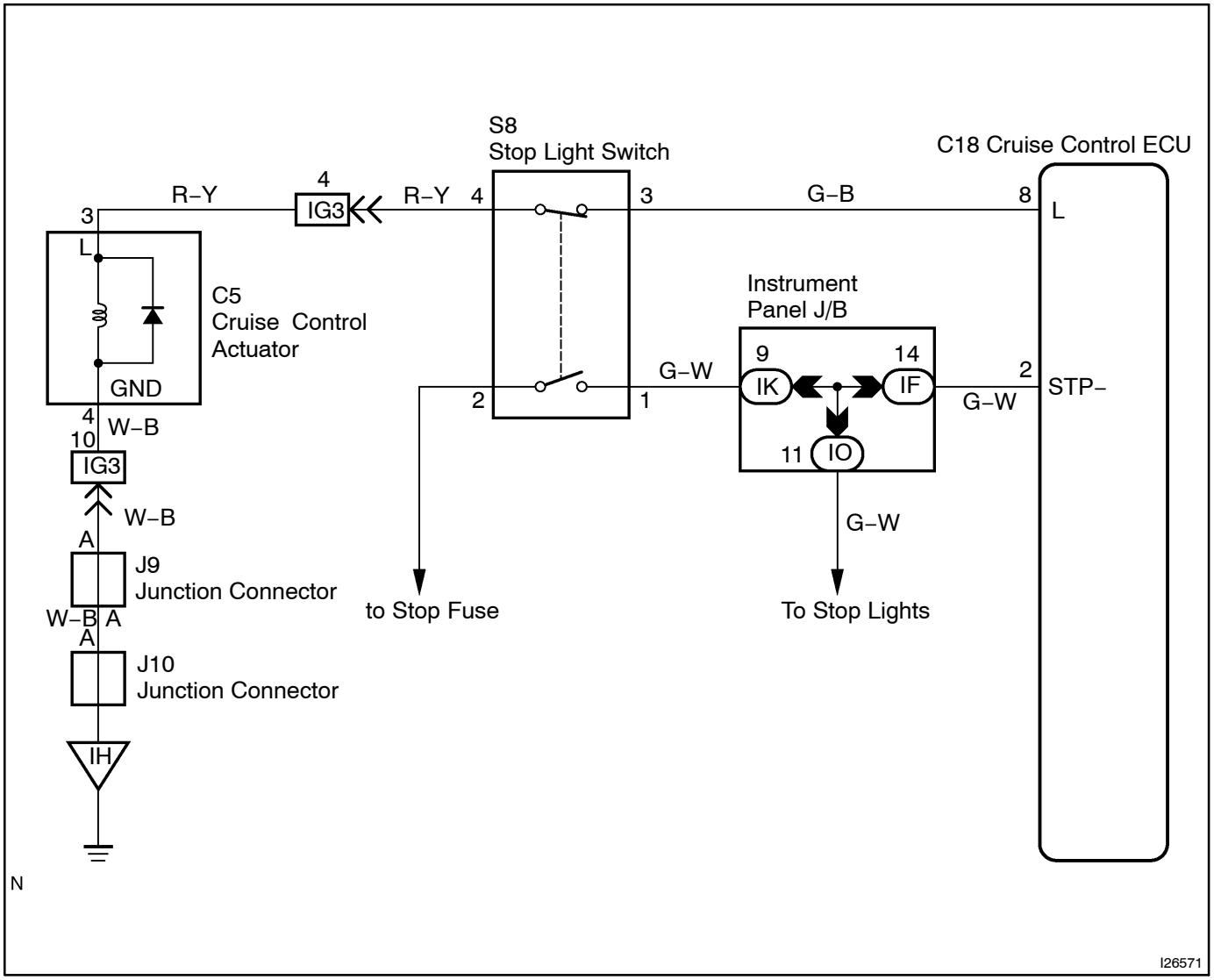
DTC	12, 43	Actuator Magnetic Clutch Circuit

CIRCUIT DESCRIPTION

This circuit turns on the magnetic clutch inside the actuator during the cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or speed sensor, etc. during the cruise control operation, the rotor shaft between the motor and control plate is released.
When the brake pedal is depressed, the stop light switch is turned on and the power supply to the magnetic clutch is mechanically cut, and therefore the magnetic clutch is turned OFF.
When driving downhill, if the vehicle speed exceeds the set speed by 15 km/h (9 mph), the ECU turns the safety magnet clutch OFF. If the vehicle speed later drops by 10 km/h (6 mph) from that speed, cruise control at the set speed is resumed.

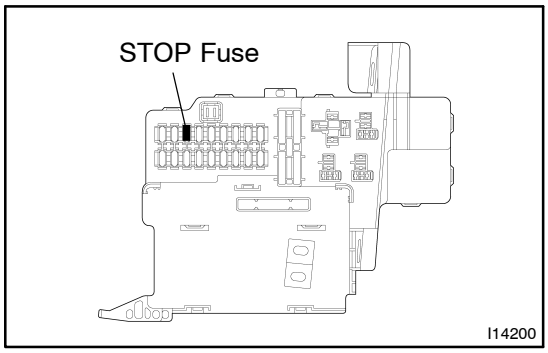
DTC No.	Detection Item	Trouble Area
12, 43	Short in actuator magnetic clutch circuit. Open (0.8 sec.) in actuator magnetic clutch circuit.	• STOP Fuse • Stop light switch • Actuator magnetic clutch • Harness or connector between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground • Cruise control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check STOP fuse.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Remove the STOP fuse from the instrument panel junction block.

CHECK:

Check fuse continuity.

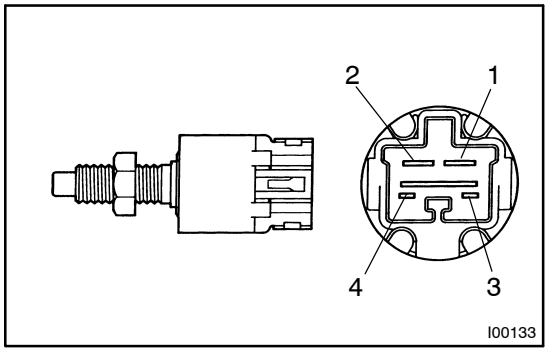
OK:

There is continuity.

NG	Replace STOP fuse.

OK

2	Check stop light switch.



PREPARATION:

Disconnect the stop light switch connector.

CHECK:

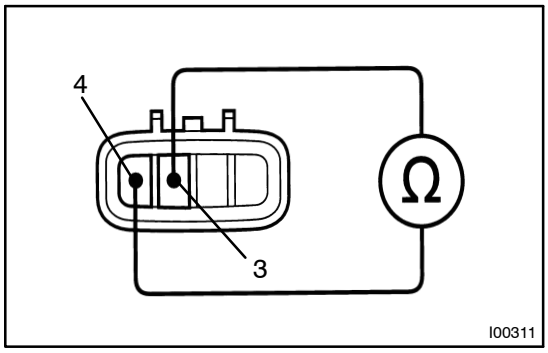
Check continuity between terminals.

Switch position	Continuity
Switch pin free (Brake pedal depressed)	1 – 2
Switch pin pushed in (Brake pedal released)	3 – 4

NG	Replace stop light switch.

OK

3	**Check resistance between terminals L and GND of actuator magnetic clutch.**



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure the resistance between terminal 3 and 4.

OK:

Resistance: 34.65 – 42.35 Ω.

NG → **Replace cruise control actuator.**

OK

4	**Check for open and short in harness and connectors between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08O–29

DTC	14	Actuator Mechanical Malfunction

CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU.

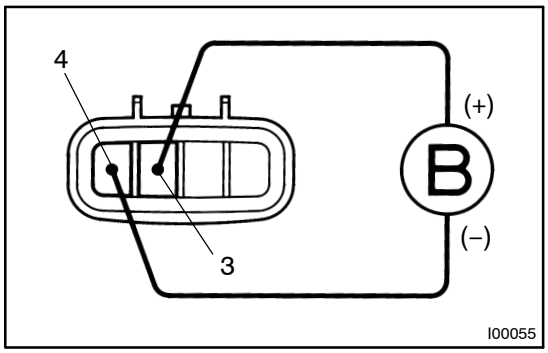
DTC No.	Detection Item	Trouble Area
14	Cruise control actuator mechanical malfunction.	• Actuator lock: (motor, arm) • Actuator motor • Cruise control ECU

WIRING DIAGRAM

See page DI–1052.

INSPECTION PROCEDURE

1	Check cruise control actuator arm locking operation



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

(a) Connect the battery positive (+) lead to terminal 3, and the battery negative (–) lead to terminal 4 of the actuator.

NOTICE:

Do not connect the high tension cables to the wrong battery terminal. The cruise control actuator will be damaged.

(b) Move the control plate by hand.

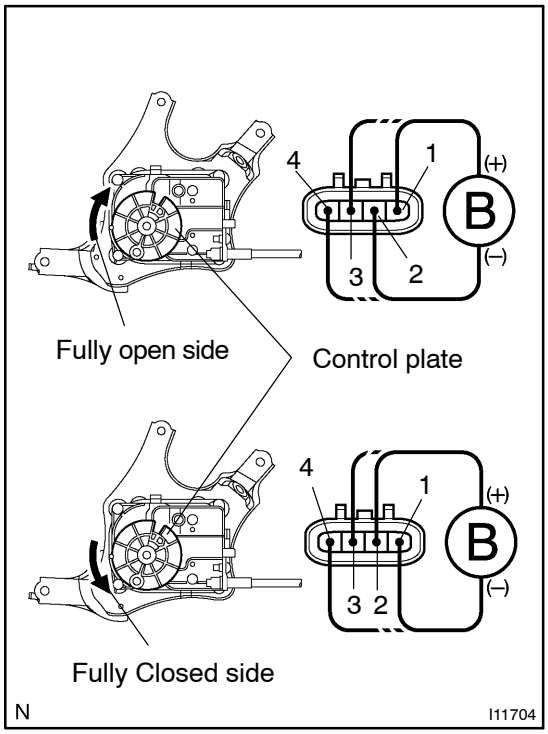
OK:

Control plate does not move.

NG	Replace cruise control actuator.

OK

2	Check cruise control actuator operation.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Connect the battery positive (+) lead to terminal 1 and 3 of the actuator, and connect the battery negative (–) lead to terminal 2 and 4 of the actuator.

OK:

Control arm moves to fully open side

CHECK:

Connect the battery positive (+) lead to terminal 2 and 3 of the actuator, and connect the battery negative (–) lead to terminal 1 and 4 of the actuator.

OK:

Control arm moves to fully closed side

NG → **Replace cruise control actuator.**

OK

3	Check harness and connector between cruise control ECU and cruise control actuator (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08P–41

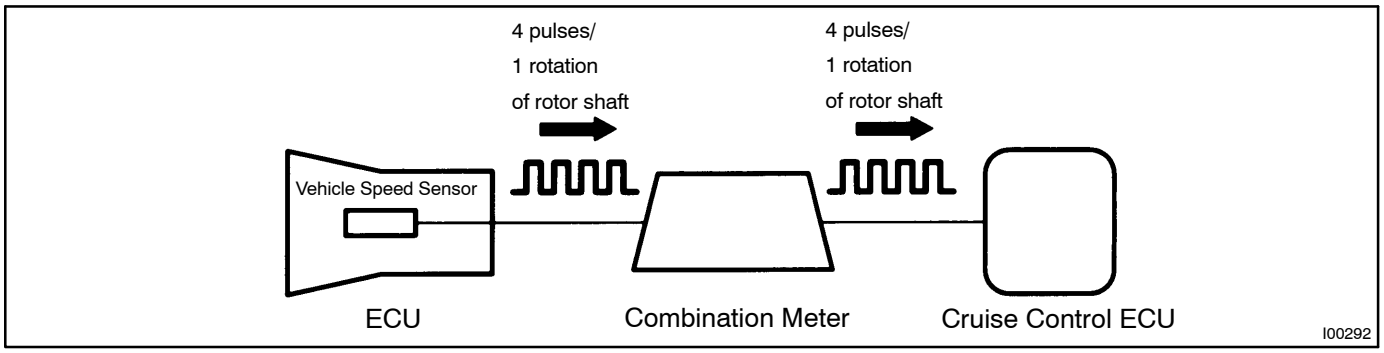
DTC	21	Open in Vehicle Speed Sensor Circuit

CIRCUIT DESCRIPTION

The signal from the vehicle speed sensor circuit is sent to the cruise control ECU as a vehicle speed signal. The rotor shaft is driven by the gear of the transmission.

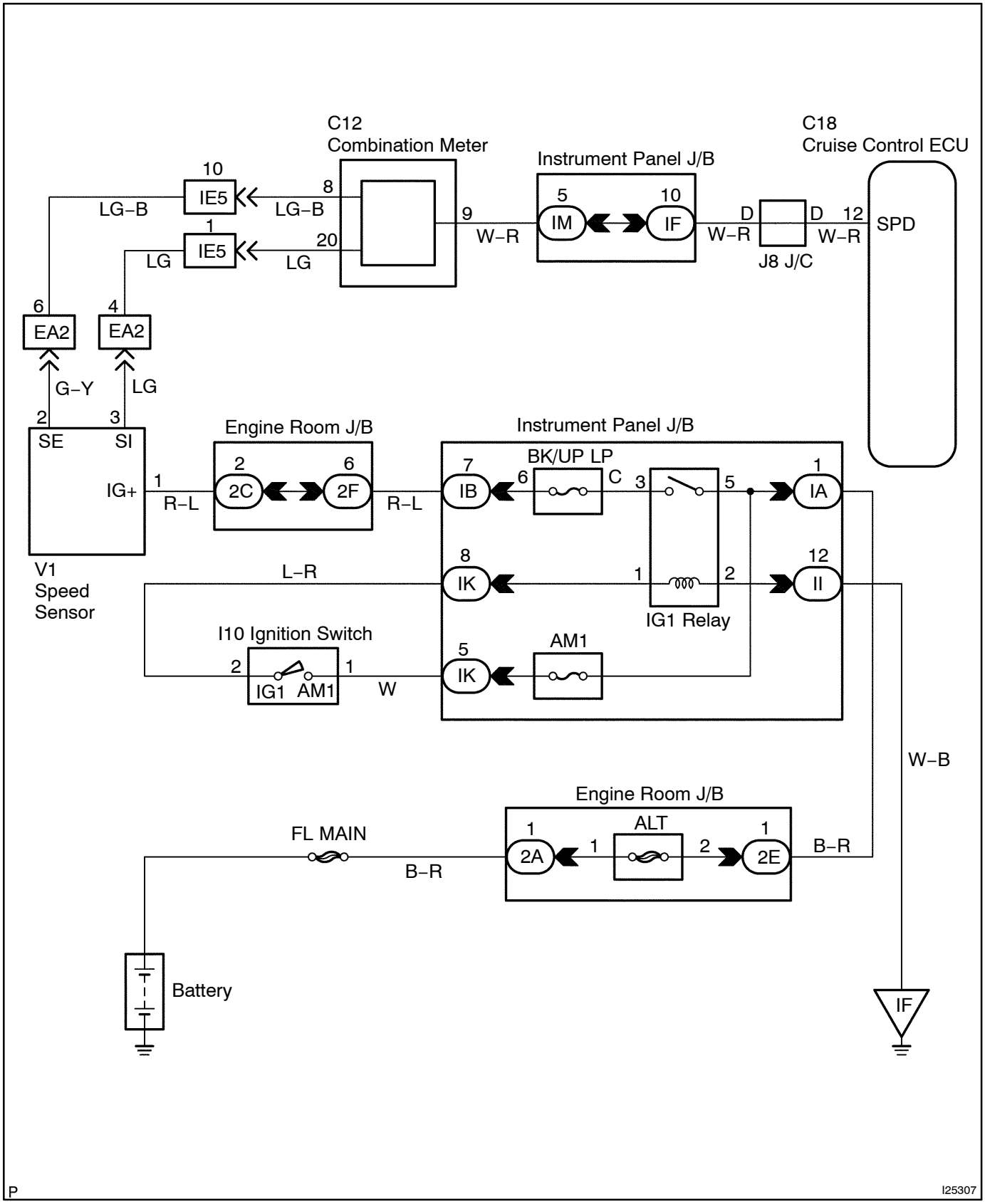
For each rotation of the shaft, the vehicle speed sensor sends a 4–pulse signal through the combination meter to the cruise control ECU (See the following installation).

ECU calculates the vehicle speed from this pulse frequency.



DTC No.	Detection Item	Trouble Area
21	Speed signal is not input to the cruise control ECU while cruise control is set.	• Combination meter • Harness or connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor • Vehicle speed sensor • Cruise control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Drive at about 40 km/h (25 mph) or below	Light: ON — OFF
Drive at about 40 km/h (25 mph) or higher	Light: ON / OFF (blinking)

CHECK:

(a) See input signal check on page DI–1058.

(b) Check indicator light operation when driving a vehicle above 40 km/h (25 mph) and below 40 km/h (25 mph).

OK:

Vehicle speed below 40 km/h (25 mph):
Indicator light remains on

Vehicle speed above 40 km/h (25 mph):
Indicator light blinks

OK → **Check and replace cruise control ECU (See page IN–30).**

NG

2	**Check speedometer circuit (See Combination meter troubleshooting on page BE–46).**

NG → **Repair or replace harness, connector or combination meter assembly.**

OK

3	**Check harness and connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

4	**Check vehicle speed sensor (See page BE–50).**

NG → **Replace vehicle speed sensor.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08Q–23

DTC	23	Vehicle Speed Signal Abnormal

CIRCUIT DESCRIPTION

See page DI–1058.

DTC No.	Detection Item	Trouble Area
23	Vehicle speed sensor pulse is abnormal.	• Vehicle speed sensor • Cruise control ECU

WIRING DIAGRAM

See page DI–1058.

INSPECTION PROCEDURE

1	Check vehicle speed sensor (See page BE–50).

NG → Replace vehicle speed sensor.

OK →

Check and replace cruise control ECU (See page IN–30).

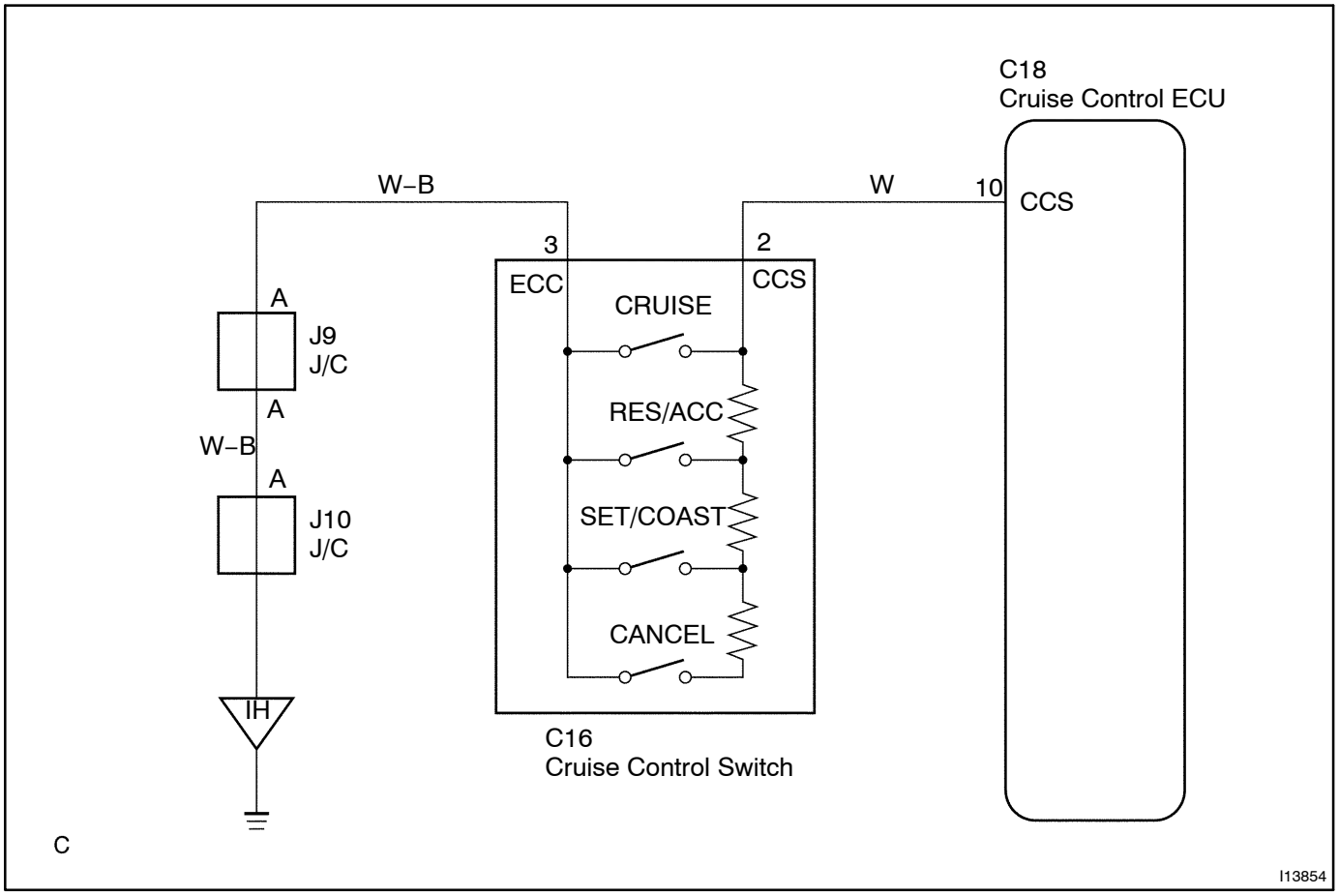
DI08R–37

Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Input signal check.

Input Signal	Indicator Light Blinking Pattern
SET/COAST switch	ON / OFF — 2 Pulses
RESUME/ACCEL switch	ON / OFF — 3 Pulses
CANCEL switch	ON / OFF — SW OFF, SW ON

PREPARATION:

See input signal check on page DI–1039.

CHECK:

Check the indicator light operation when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned on.

OK:

SET/COAST, RESUME/ACCEL switch

The signals shown in the table on the left should be output when each switch is ON. The signal should disappear when the switch is turned OFF.

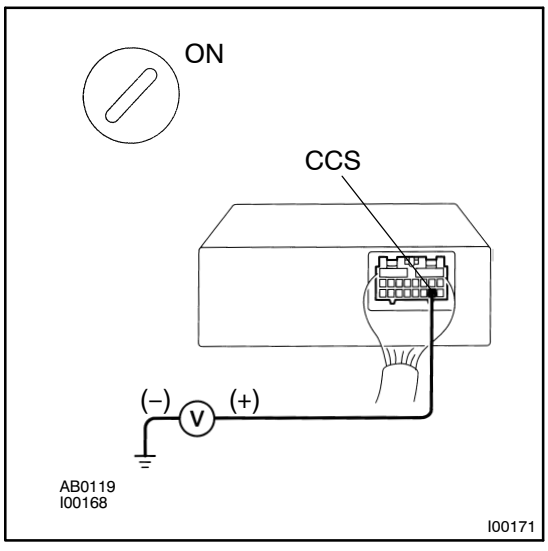
CANCEL switch

The indicator light should go off when the cancel switch is turned ON.

OK	Wait and see.

NG

2	Check voltage between terminals CCS of cruise control ECU connector and body ground.



PREPARATION:

(a) Remove ECU with connector being connected.

(b) Turn ignition switch ON.

CHECK:

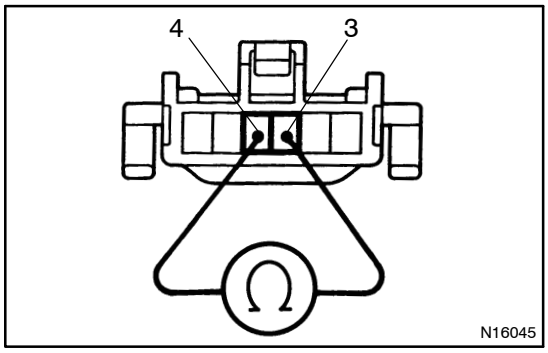
Measure the voltage between terminal 10 of ECU connector and body ground when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

Switch position	Voltage
Neutral	10 – 16
RES/ACC	2.3 – 4.5
SET/COAST	4.5 – 8.1
CANCEL	6.6 – 11.4

OK	Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).

NG

3	**Check control switch.**



PREPARATION:

(a) Remove the steering wheel center pad.

(b) Disconnect the control switch connector.

CHECK:

Measure the resistance between terminal 3 and 4 of the control switch connector when control switch is operated.

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	210 – 270
SET/COAST	570 – 690
CANCEL	1390 – 1690

NG → **Replace control switch.**

OK

4	**Check harness and connector between cruise control ECU and cruise control switch, cruise control switch and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

5	**Input signal check (See step 1).**

OK → **Wait and see.**

NG

Check and replace cruise control ECU (See page IN–30).

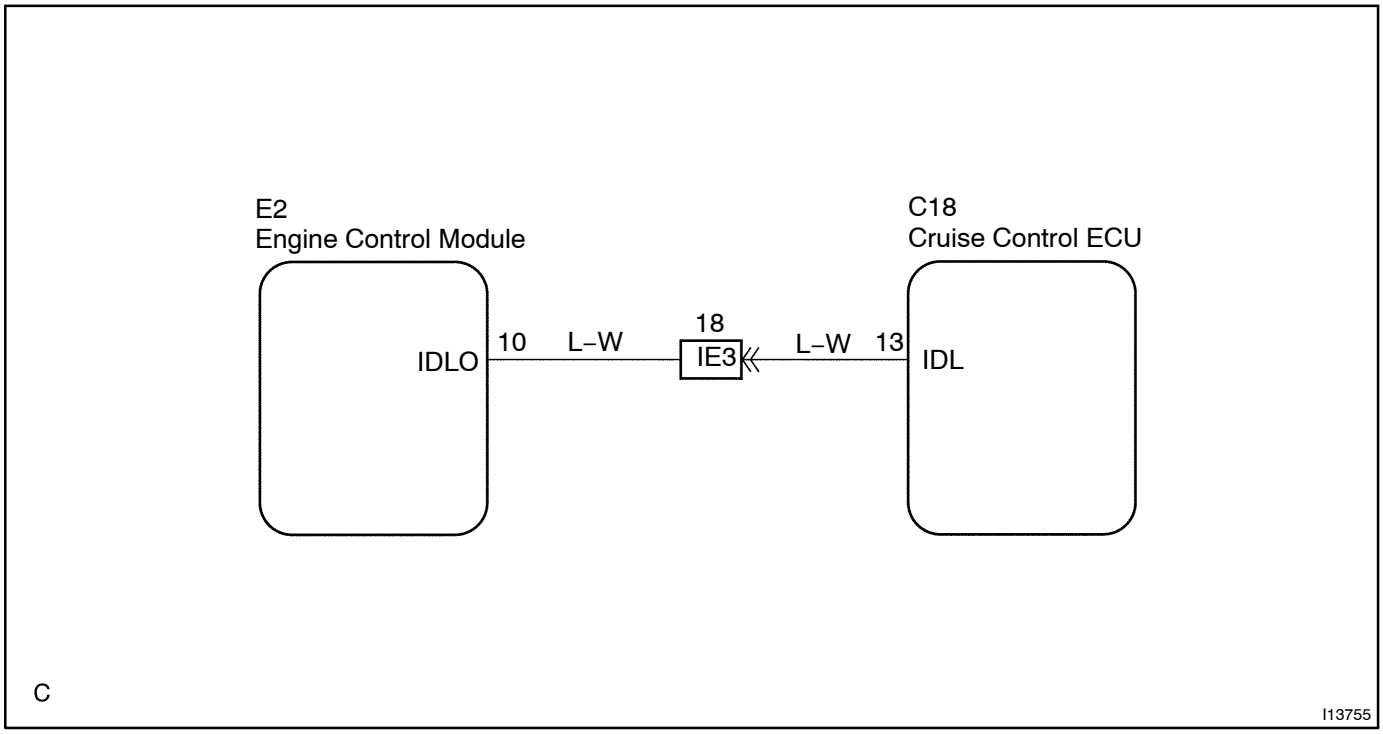
DI3VK–14

Idle Signal Circuit

CIRCUIT DESCRIPTION

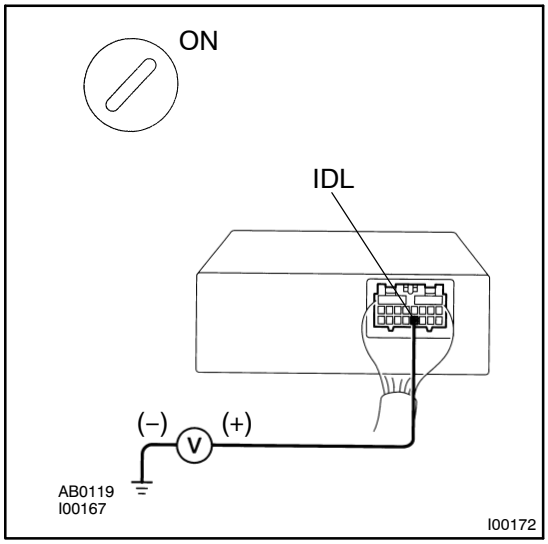
When the idle switch is turned ON, a signal is sent to the ECU. The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor value to enable accurate cruise control at the set speed. Since there will also be a problem when the idle switch malfunctions, inspect both the switch and the engine if the idle switch is faulty.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal IDL of cruise control ECU connector and body ground.**



PREPARATION:

(a) Remove ECU with connector being connected.
(b) Disconnect the cruise control ECU connector.
(c) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal IDL of the ECU connector and body ground when the throttle valve is fully opened and fully closed.

OK:

Throttle valve position	Voltage
Fully opened	10 – 14 V
Fully closed	Below 2 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

2	**Check for open and short in harness and connector between cruise control ECU and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08T–36

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to ECU. When ECU receives this signal, it cancels the cruise control.

A fail–safe function is provided so that the cruise control is canceled normally when there is a malfunction in the stop light signal circuit.

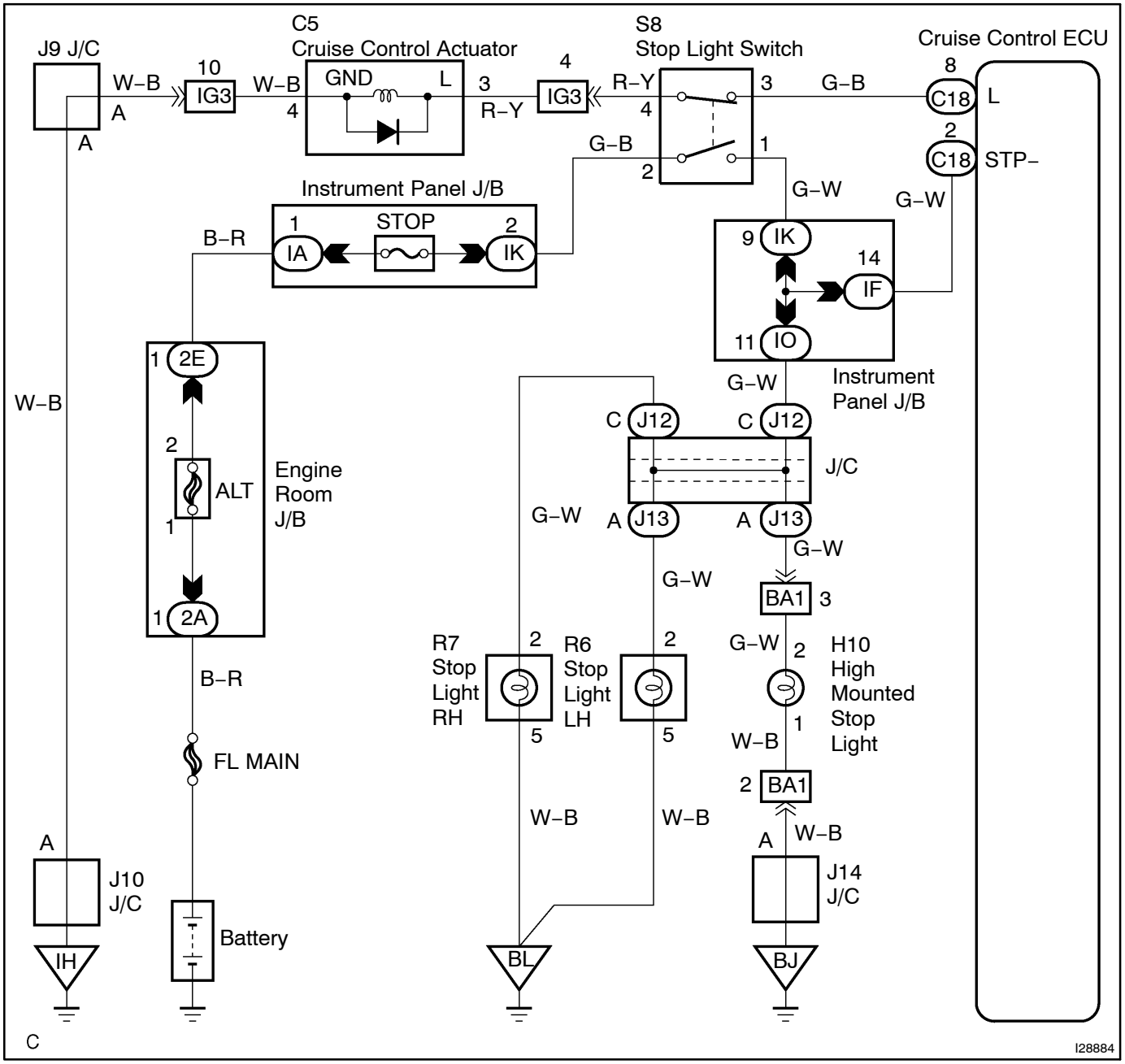
The cancellation occurs when the battery positive voltage is applied to terminal STP–.

When the brake is ON, battery positive voltage is applied to terminal STP– of the ECU via the stop fuse and the stop light switch, and then the ECU turns the cruise control OFF.

Even if the harness connected to terminal STP– has an open circuit, the cruise control will be turned OFF.

Also, when the brake is ON, the magnetic clutch circuit is cut mechanically by the stop light switch, turning the cruise control OFF (See page DI–1052 for operation of the magnetic clutch).

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

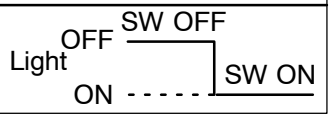
CHECK:

Check that stop light comes on when the brake pedal is depressed, and turns off when the brake pedal is released.

NG → **Check stop light system (See page BE–2).**

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Stop Light switch ON	

CHECK:

(a) See input signal check on DI–1039.

(b) Check the indicator light when the brake pedal is depressed.

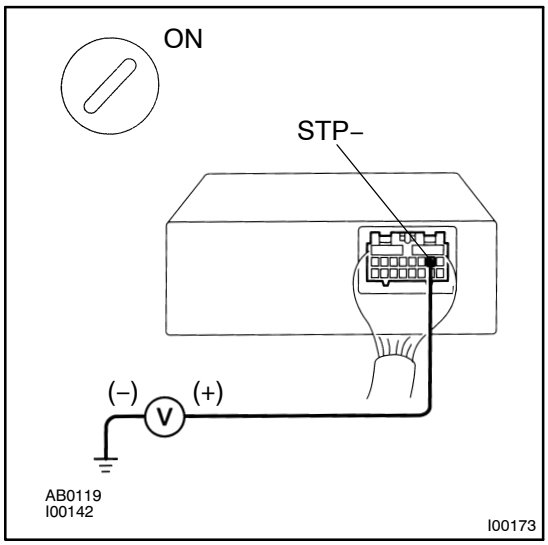
OK:

The indicator light goes OFF when the brake pedal is depressed.

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

3	**Check voltage between terminal STP– of cruise control ECU connector and body ground.**



PREPARATION:

(a) Remove ECU with connectors being connected.

(b) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal STP– of the cruise control ECU connector and body ground when the brake pedal is depressed and released.

OK:

Depressed	10 – 14 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

4	**Check for open in harness and connectors between terminal STP– of cruise control ECU and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08U–35

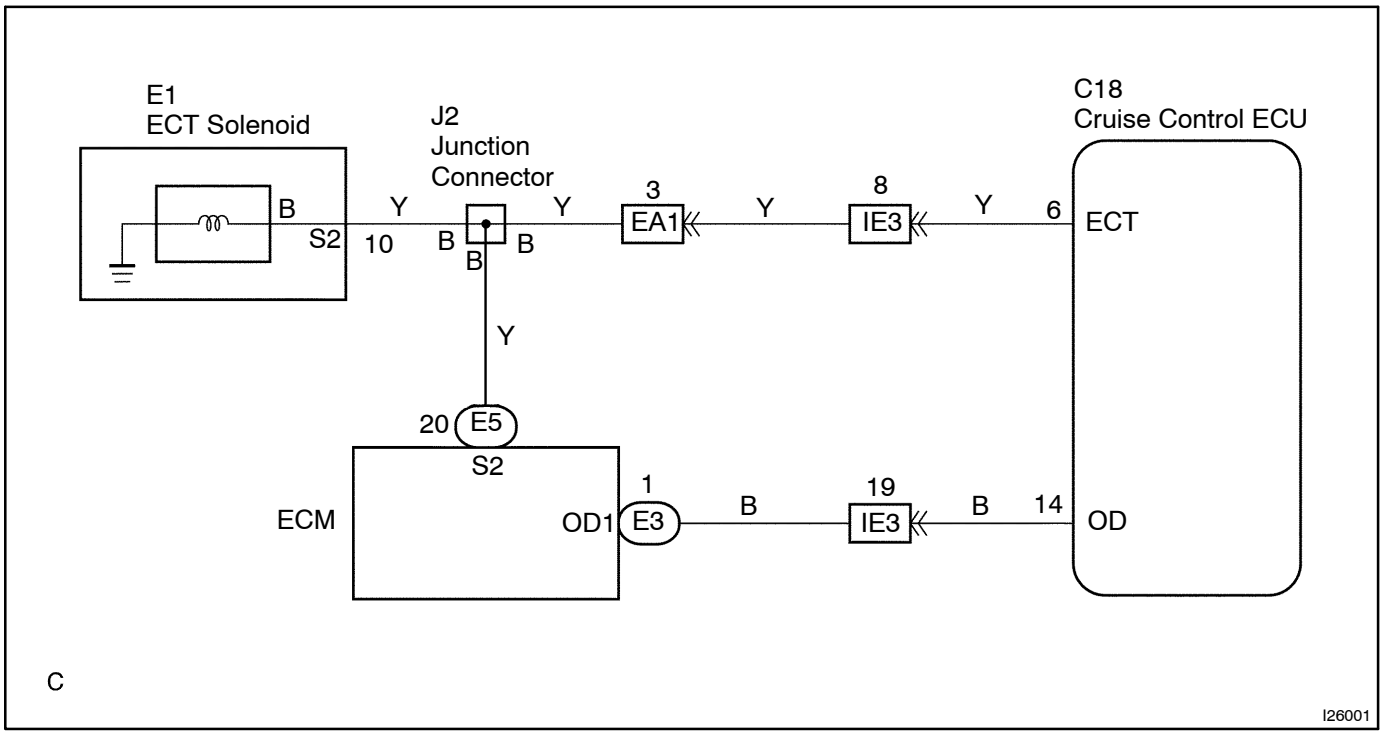
Electronically Controlled Transmission Communication Circuit

CIRCUIT DESCRIPTION

When driving uphill under the cruise control and the shift–down occurred in the electronically controlled transmission, the cruise control ECU sends a signal there to suspend the shift–up until the vehicle reaches the top of the hill. This will provide smooth driving, and there is no need for ON–OFF overdrive operation. Terminal ECT of the cruise control ECU detects the shift change signal (output to electronically controlled transmission No. 2 solenoid) from ECM.

If the vehicle speeds down and when terminal ECT receives the shift–down signal, ECU sends a signal from terminal OD to ECM to stop the overdrive until the end of the uphill slope, and the gear shift points in the electronically controlled transmission are changed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of overdrive.**

PREPARATION:

Test drive after engine warms up.

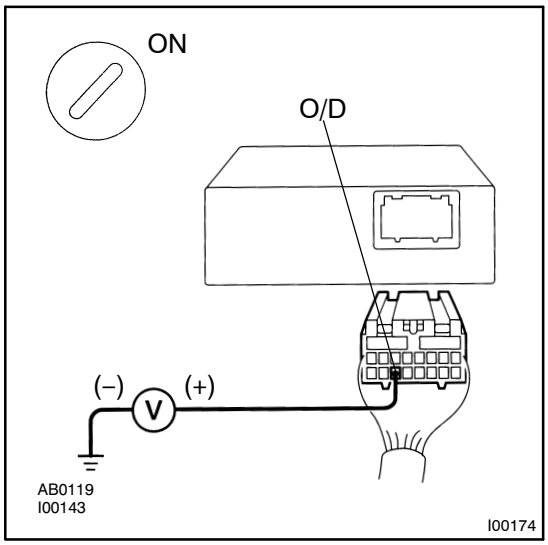
CHECK:

Check that the overdrive ON ↔ OFF occurs by operating the O/D switch ON–OFF.

NG → **Check and repair electronically controlled transmission (See page DI–666 or DI–755).**

OK

2	**Check voltage between terminal OD of harness side connector of cruise control ECU and body ground.**



PREPARATION:

(a) Remove ECU with connector being connected.
(b) Turn the ignition switch ON.
(c) Disconnect the ECU connector.

CHECK:

Measure the voltage between terminal OD of the harness side connector of ECU and body ground.

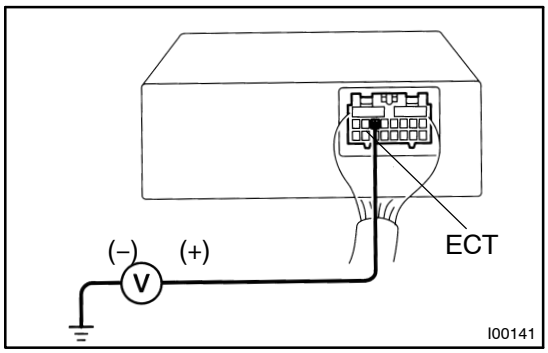
OK:

Voltage: 10 – 14 V

NG → **Go to step 5.**

OK

3	**Check voltage between terminal ECT of cruise control ECU connector and body ground (On test drive).**



PREPARATION:

(a) Connect the ECU connector.

(b) Test drive after engine warms up.

CHECK:

Check the voltage between terminal ECT of ECU connector and body ground when O/D switch is ON and OFF.

OK:

OD switch position	Voltage
ON	8 – 14 V
OFF	Below 0.5 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

4	**Check harness and connector between terminal ECT of cruise control ECU and electronically controlled transmission solenoid (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU.

5	**Check harness and connector between terminal OD of cruise control ECU and terminal OD1 of ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

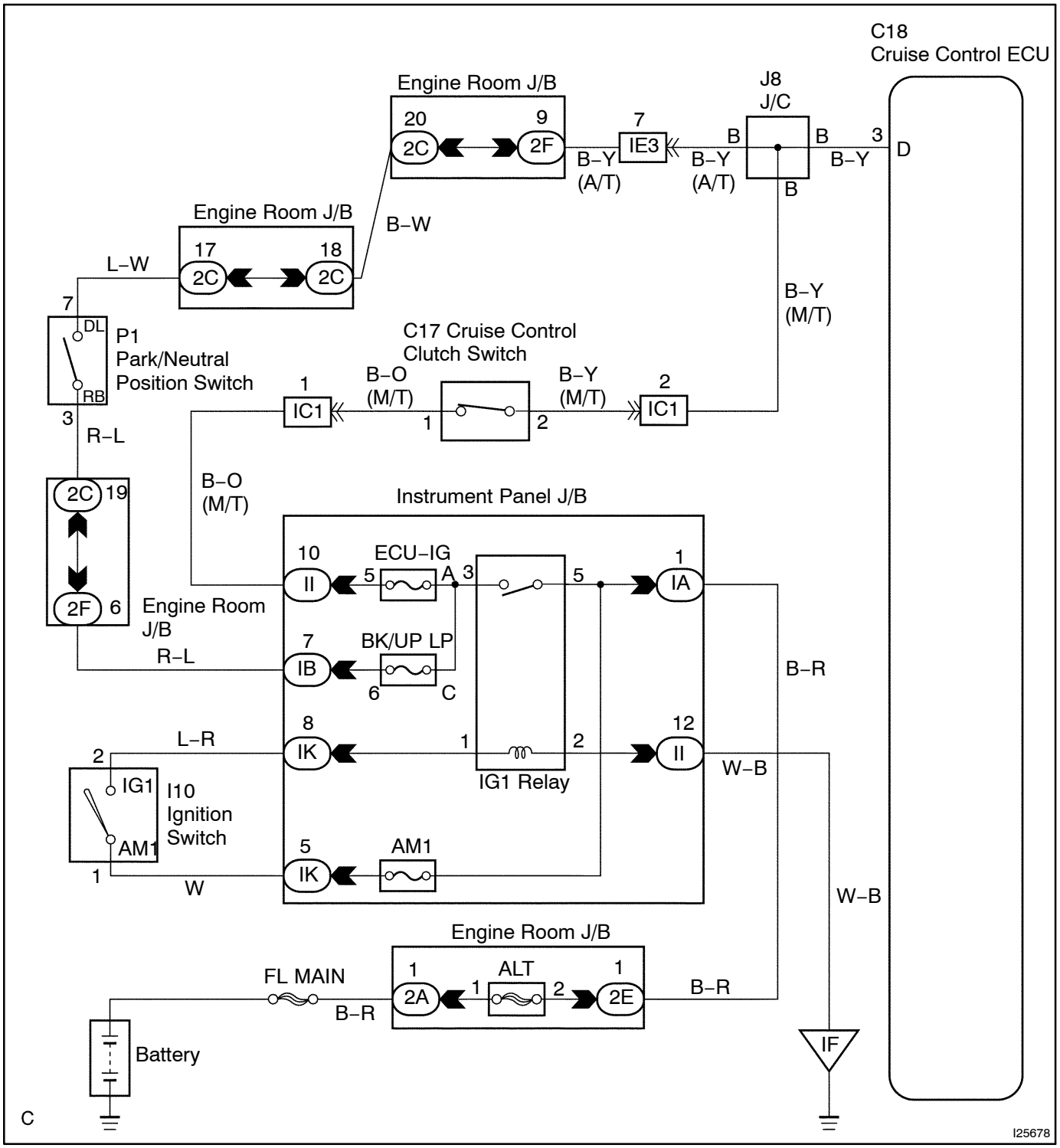
DI08V–38

Park/Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

When the shift position is except D, a signal is sent from the park/neutral position switch to ECU. When this signal is input during cruise control driving, ECU cancels the cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check starter operation.**

CHECK:

Check that the starter operates normally and the engine starts.

NG → **Proceed to engine troubleshooting (See page DI–1).**

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Turn PNP switch OFF (Shift to positions except D)	Light: ON — SW ON; OFF - - - SW OFF

PREPARATION:

See input signal check on page DI–1039.

CHECK:

Check the indicator light when shifting into positions except D.

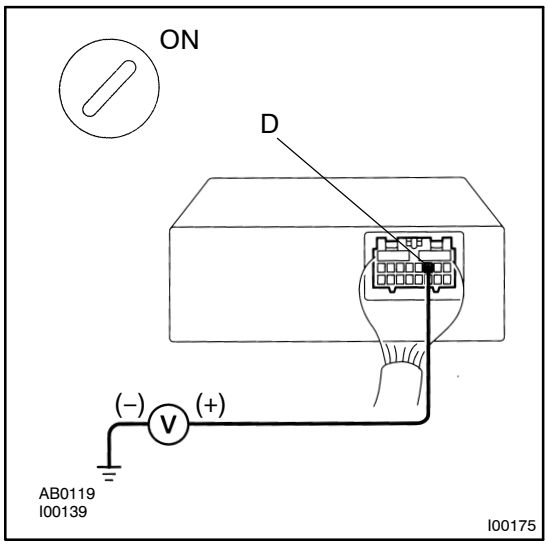
OK:

The indicator light goes off when shifting into positions except D.

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

3	**Check voltage between terminal D of cruise control ECU connector and body ground.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal D of ECU connector and body ground when shifting into D position and the other positions.
OK:

Shift Position	Voltage
D position	10 – 14 V
Other positions	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

4	**Check harness and connector between cruise control ECU and park/neutral position switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI08W–12

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the cruise control ECU. When the signal is input to the cruise control ECU during cruise control driving, the cruise control ECU cancels cruise control.

WIRING DIAGRAM

Refer to PNP switch circuit on page DI–1075.

INSPECTION PROCEDURE

1	**Check starter operation.**

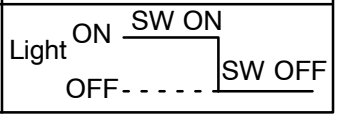
CHECK:

Check that the starter operates normally and the engine starts.

NG → **Proceed to engine troubleshooting.**

OK ↓

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Clutch switch OFF (Depress clutch pedal)	

PREPARATION:

See input signal check on page DI–1039.

CHECK:

Check the indicator lights when clutch pedal is depressed.

OK:

The indicator light goes off when shifting into clutch pedal is depressed.

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

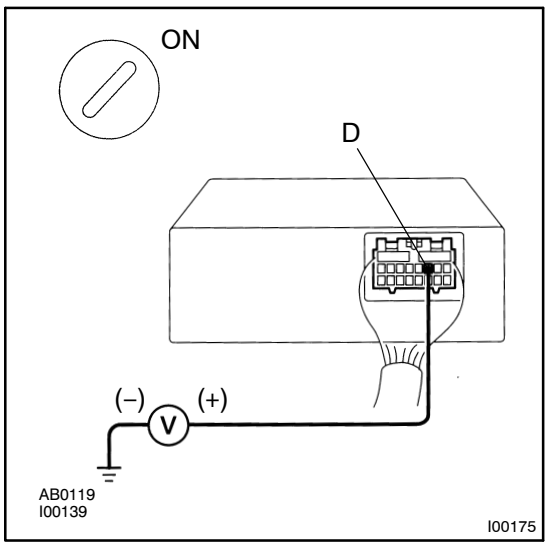
NG ↓

3	**Inspect clutch switch.**

NG → **Replace clutch switch**

OK

4	**Check voltage between terminal D of cruise control ECU and body ground.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal D of the cruise control ECU connector and body ground when clutch pedal is depressed and pushed in.

OK:

Condition	Voltage
Clutch pedal depressed	10 – 14 V
Clutch pedal pushed in	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

5	**Check for open in harness and connector between ECU and C/C ECU–IG fuse (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

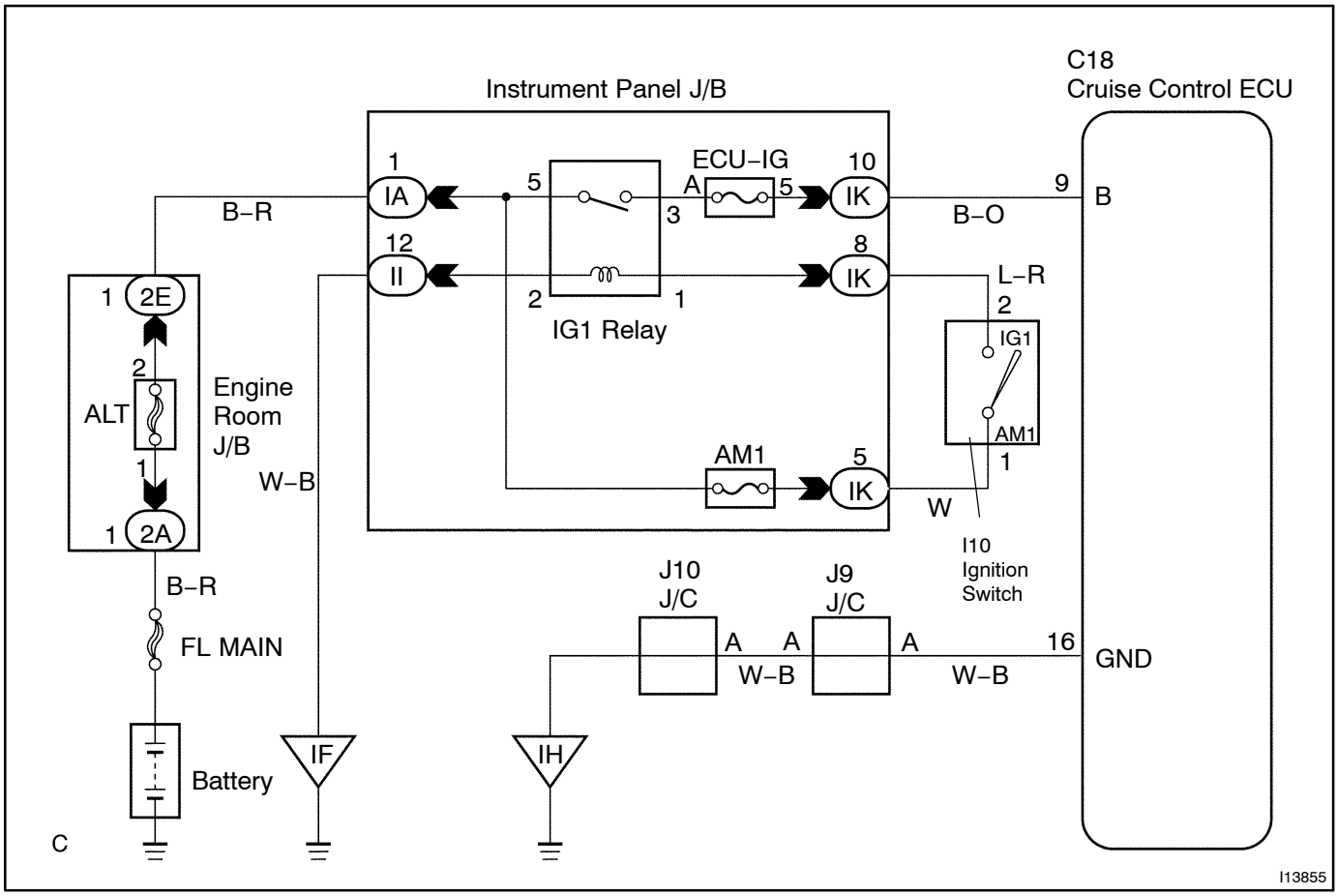
DI08X–37

ECU Power Source Circuit

CIRCUIT DESCRIPTION

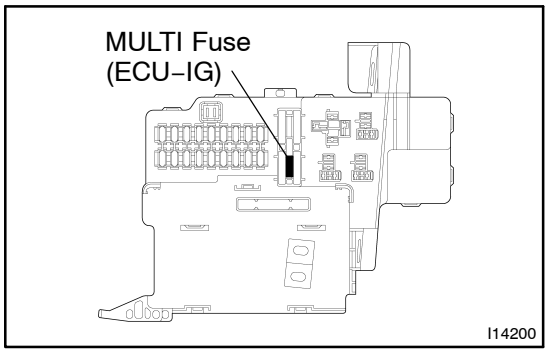
The ECU power source supplies a power to the actuator and sensors, etc. when terminal GND and the cruise control ECU case are grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ECU–IG fuse.



PREPARATION:

Remove the ECU–IG fuse from the instrument panel junction block.

CHECK:

Check the continuity of ECU–IG fuse.

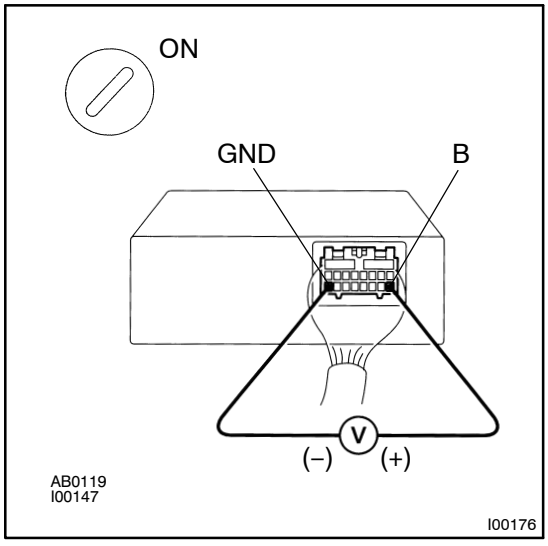
OK:

Continuity

NG → **Check for short in all the harness and components connected to ECU–IG fuse.**

OK

2	Check voltage between terminals B and GND of cruise control ECU connector.



PREPARATION:

(a) Remove ECU with connector being connected.

(b) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal B and GND of the ECU connector.

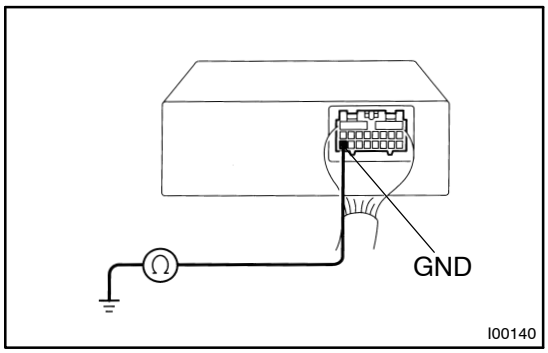
OK:

Voltage: 10 – 14 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

3	Check resistance between terminal GND of cruise control ECU connector and body ground.



CHECK:

Measure the resistance between terminal GND of the ECU connector and body ground.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace harness or connector.**

OK

Check and repair harness and connector between cruise control ECU and battery (See page IN–30).

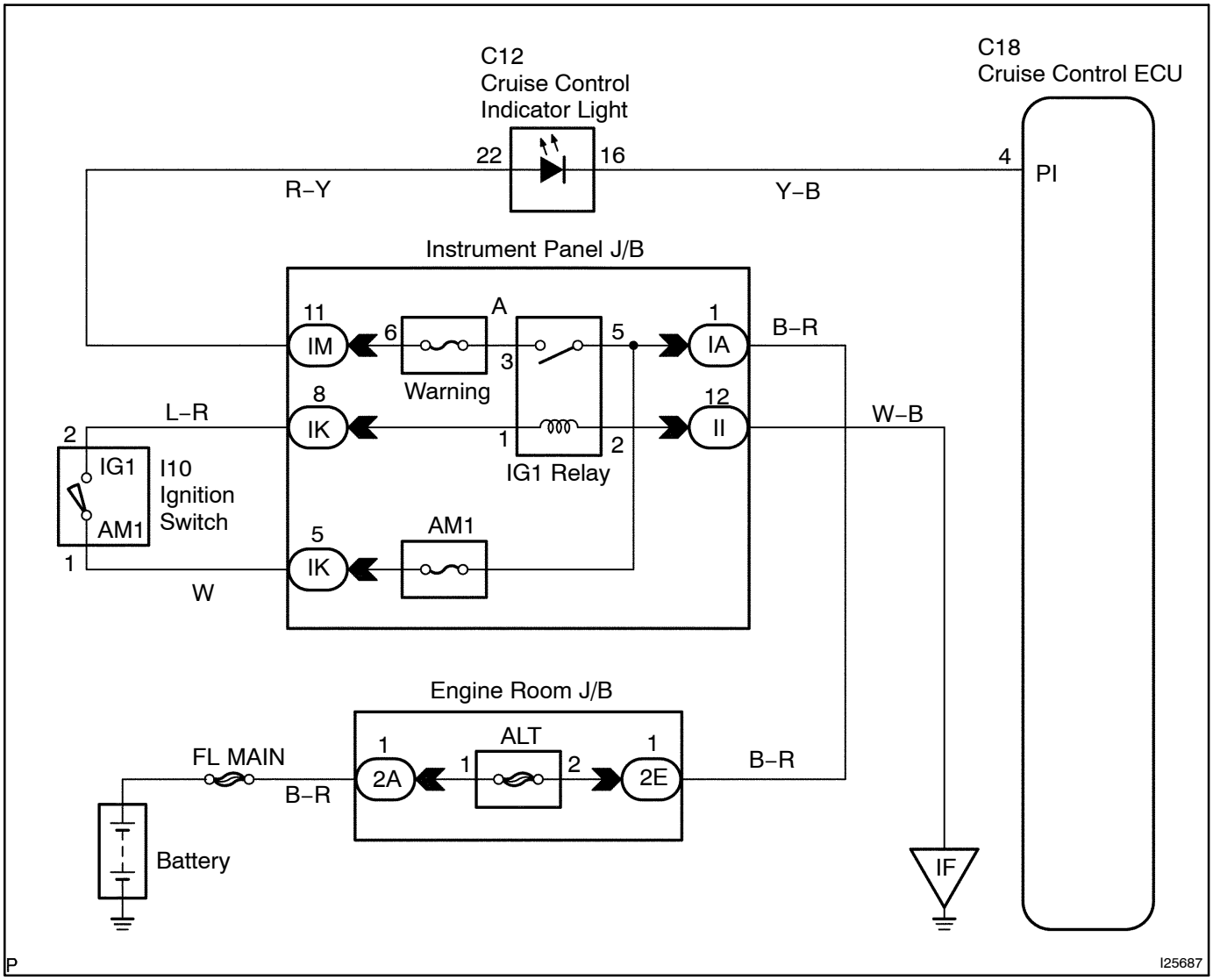
DI090–59

CRUISE MAIN Indicator Light Circuit

CIRCUIT DESCRIPTION

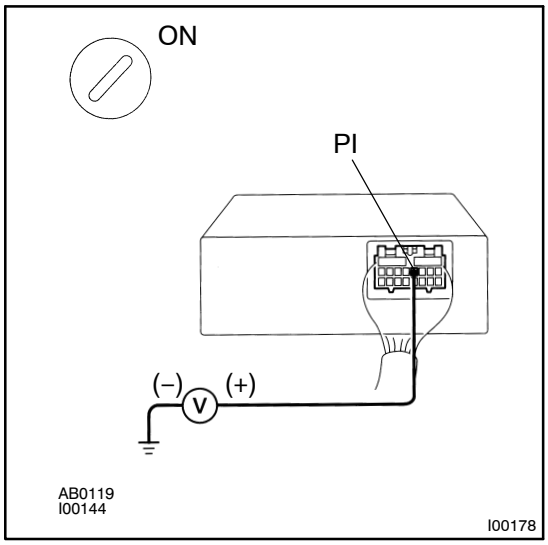
When the cruise control main switch is turned ON, CRUISE MAIN indicator light comes on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals PI and GND of cruise control ECU connector.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal PI and GND of the cruise control ECU connector when main switch is ON and OFF.

OK:

Switch position	Voltage
OFF	10 – 16 V
ON	Below 1.2 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

2	**Check combination meter (See page BE–46).**

NG → **Replace combination meter.**

OK

Check and replace cruise control ECU (See page IN–30).

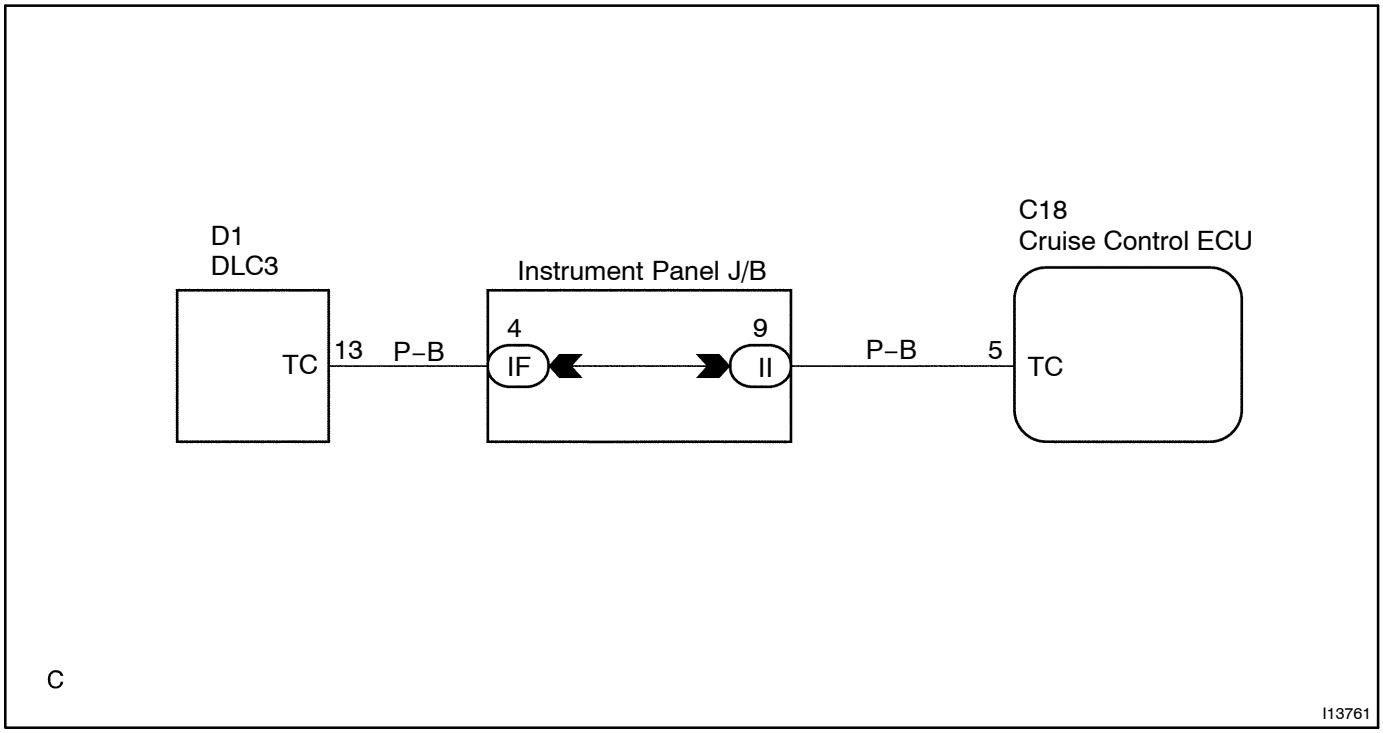
DI091–36

Diagnosis Circuit

CIRCUIT DESCRIPTION

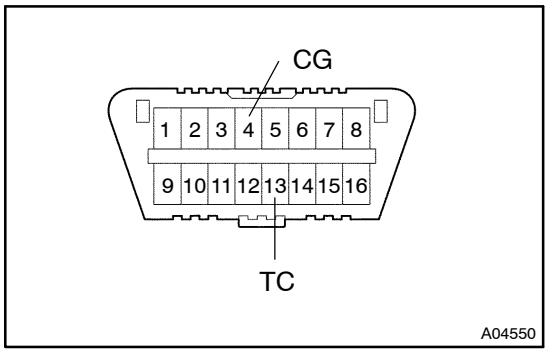
This circuit sends a signal to ECU which outputs DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and CG of DLC3.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal Tc and CG of DLC3.

OK:

Voltage: 10 – 14 V

OK → **Proceed to next circuit inspection shown in problem symptom table (See page DI–1048).**

NG

2	**Check harness and connector between cruise control ECU and DLC3, DLC3 and body ground (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–30).

DI092-15

Actuator Control Cable

INSPECTION PROCEDURE

1	**Actuator control cable inspection**

CHECK:

(a) Check that the actuator and the control cable throttle link are properly installed and that the cable and link are connected correctly.

(b) Check that the actuator and the bell crank operate smoothly.

(c) Check that the cable is not too loose or too tight.

OK:

Freeplay: less than 10 mm

HINT:

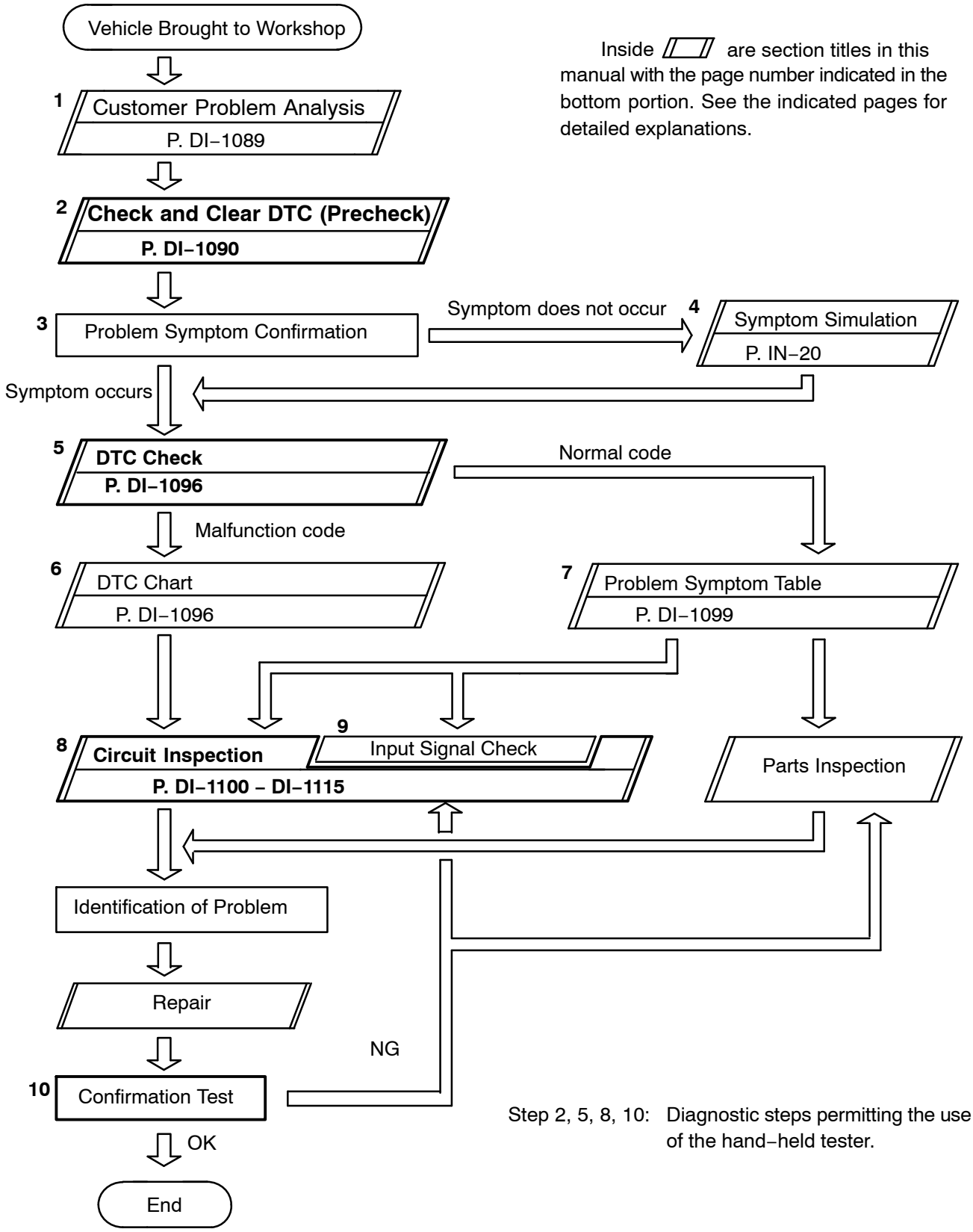
- If the control cable is too loose, the vehicle's loss of speed going uphill will be large.
- If the control cable is too tight, the idle RPM will become high.

CRUISE CONTROL SYSTEM (2ZZ–GE)

DIAJJ–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



Inside ▱ are section titles in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the hand–held tester.

DIAJK–03

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

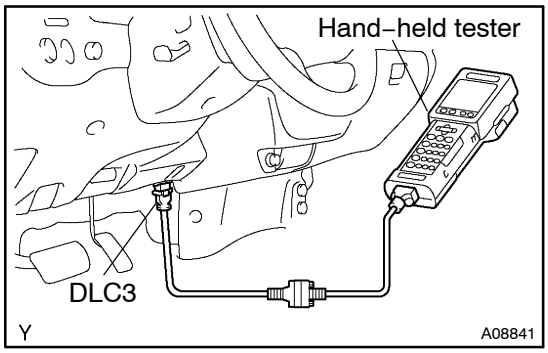
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	Frequency Problem Occurs?	☑ Continuous ☑ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km Mile**

Symptoms	☑ Auto cancel occurs	● Driving condition ☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill ● After cancel occurred, did the driver activate cruise control again? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ With clutch switch ON ☐ Except D position shift ☐ When control SW turns to CANCEL position
	☐ Cruise control malfunction	☐ Slip to acceleration side ☐ Slip to deceleration side ☐ Hunting occurs ☐ O/D cut off does not occur ☐ O/D does not return
	☐ Switch malfunction	☐ SET ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL
	☐ Cruise main indicator light	☐ Remains ON ☐ Does not come on ☐ Blinks

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DIAJL–04



PRE–CHECK

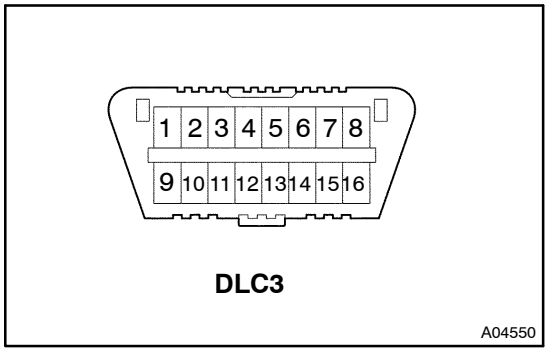
1. DIAGNOSIS SYSTEM

(a) Description

ECM controls the function of the cruise control on a vehicle.

Data on the cruise control and on DTC can be read from the DLC3 on the vehicle. If CRUISE MAIN indicator does not come on after the DTC check, there is a malfunction on the cruise control.

Use the hand–held tester or SST to check and solve the problem.



(b) Check the DLC3.

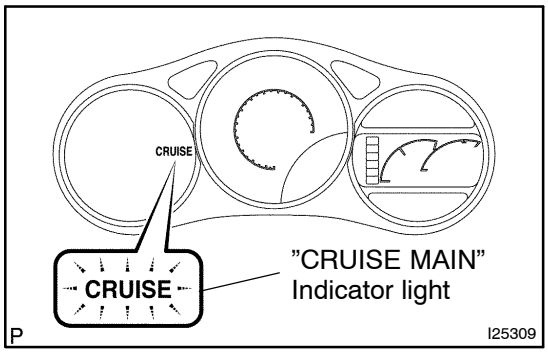
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Terminal No.	Connection/Specified Condition	Condition
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
7	Bus ⊕ Line / Pulse Generation	During Communication
16	Battery Positive ↔ Body Ground / 9 – 14 V	Always

HINT:

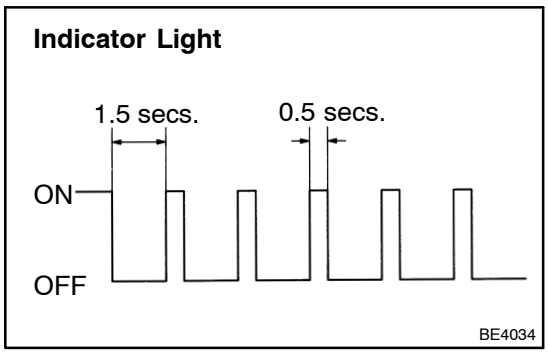
If the display shows "UNABLE TO CONNECT TO VEHICLE" as connecting the hand–held tester to the DLC3 and turning the ignition ON, there is a problem either on the vehicle or on the tool.

- If communication is normal when connecting the tool to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when connecting the tool to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual in that case.



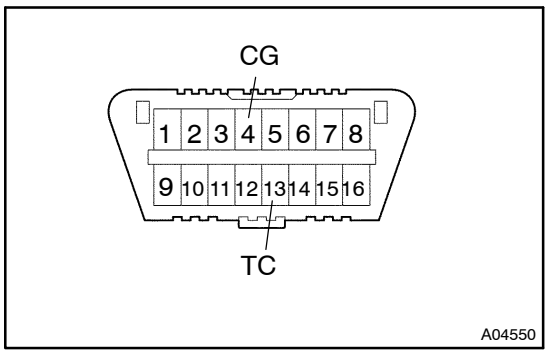
(c) Check the indicator.
(1) Turn the ignition switch to ON.
(2) Check that the CRUISE MAIN indicator light comes ON when the cruise control main switch is turned ON, and that the indicator light goes off when the main switch is turned OFF.

HINT:
If the indicator check failed, proceed to troubleshooting for the combination meter section. (See page BE–50)

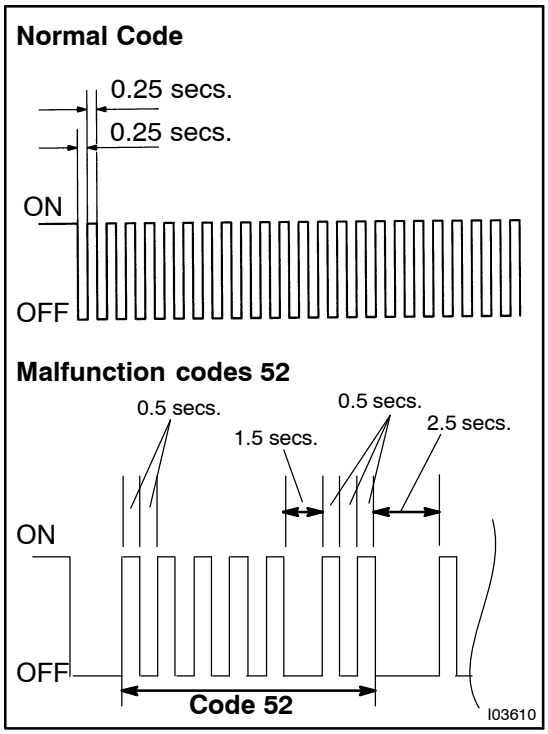


(d) Check the DTC.

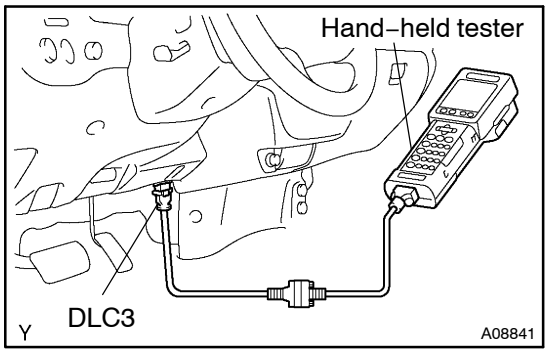
HINT:
If a malfunction occurs on the speed sensor or on the stop light switch, etc. during cruise control driving, ECU actuates AUTO CANCEL of the cruise control and turns ON and OFF the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stored in the memory as a diagnostic trouble code.



(e) Output DTC using diagnosis check wire.
(1) Turn the ignition switch ON.
(2) Using SST, connect terminal TC and CG of DLC3.
SST 09843–18040
(3) Read DTC on the CRUISE MAIN indicator light.



HINT:
- If the DTC is not indicated, inspect the cruise main indicator light circuit and the diagnosis circuit (See page DI–1109, DI–1115).
- As an example, the blinking pattern of normal code and code 52 are shown on the illustration.



2. USING HAND–HELD TESTER

(a) Hook up the hand–held tester to the DLC3.
(b) Monitor the ECU data by following the prompt on the tester screen.

HINT:
Hand–held tester has a ”Snapshot” function which records the monitored data.
Please refer to the hand–held tester operator’s manual for further details.

3. DATA LIST

HINT:
By using the DATA LIST displayed by the hand–held tester, you can read the value of the switch, the sensor and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) According to the display on tester, read the ”DATA LIST”.

Item	Measurement Item / Display (Range)	Normal Condition	Diagnostic Note
VEHICLE SPD	Vehicle speed / min.: 0km/h (0mph), max.: 255km/h (158mph)	Actual vehicle speed	–
MEMORY SPD	Cruise control memorized speed / min.: 0km/h (0mph), max.: 255km/h (158mph)	Memorized speed : Cruise control activated	–
THROTTLE	Required throttle opening angle / min.: 0°, max.: 125°	Required throttle opening angle (0° – 84°) : Cruise control activated	–
CCS READY S	Cruise control system standby condition (Sub CPU) / ON or OFF	ON ⇔ OFF : Change ON/OFF each time Main SW is pressed in.	”1”
CCS READY M	Cruise control system standby condition (Main CPU) / ON or OFF	ON ⇔ OFF : Change ON/OFF each time Main SW is pressed in.	”1”
CANCEL SW	CANCEL SW signal / ON or OFF	ON : CANCEL SW ON OFF : CANCEL SW OFF	–
SET/COAST SW	SET/COAST SW signal / ON or OFF	ON : SET/COAST SW ON OFF : SET/COAST SW OFF	–
RES/ACC SW	RES/ACC SW signal / ON or OFF	ON : RES/ ACC SW ON OFF : RES/ACC SW OFF	–
STP LIGHT SW2 M	Stop light SW signal (Main CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW2 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
STP LIGHT SW1 S	Stop light SW signal (Sub CPU) / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	–
SHIFT D POS	PNP SW signal (D position) / ON or OFF	ON : Shift D position OFF : Except shift D position	–
CRUISE CTRL	Cruise control system active condition / ON or OFF	ON : Cruise control activated OFF : Cruise control inactivated	–
CCS INDICATOR M	Cruise indicator signal (Main CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”
CCS INDICATOR S	Cruise indicator signal (Sub CPU) / ON or OFF	ON : ”CCS READY” ON OFF : ”CCS READY” OFF	”2”

MAIN SW (SUB)	Main SW signal (Sub CPU) / ON or OFF	ON : Main SW ON (Pressed in) OFF Main SW OFF (Pressed out)	”3”
MAIN SW (MAIN)	Main SW signal (Main CPU) / ON or OFF	ON : Main SW ON (Pressed in) OFF Main SW OFF (Pressed out)	”3”

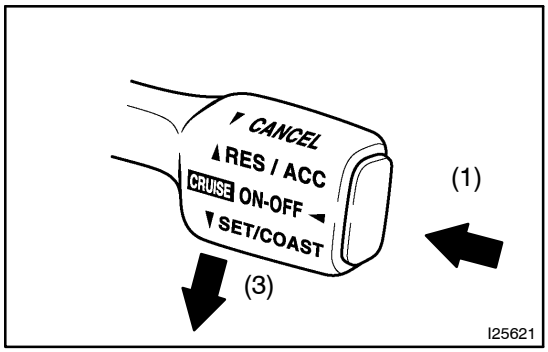
HINT:
”3” is OK but ”1” is NG → ECM failure
”1” is OK but ”2” is NG → DTC output or ECM failure
”3” is OK but the cruise indicator does not turn on → Indicator or W/H or ECM failure

4. DTC CLEARANCE

(a) Following actions will erase the DTC and the freeze frame data.
  (1) Hand–Held Tester:
  Operating the hand–held tester to erase the codes.
  (2) EXCEPT Hand–Held Tester:
  Disconnect the battery terminals or EFI NO.1 fuse.

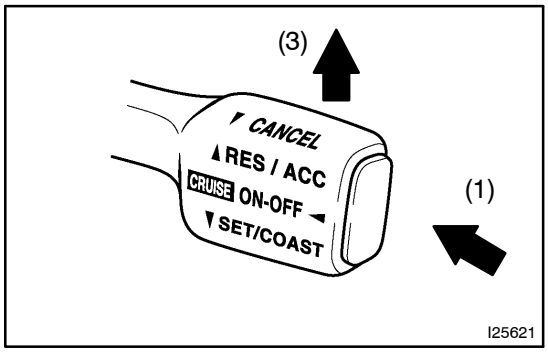
(b) After completing repairs, DTC retained in the memory can be cleared by removing the EFI NO.1 fuse more than 1 minutes with the ignition switch OFF.

(c) Check that the normal code is displayed after connecting the fuse.



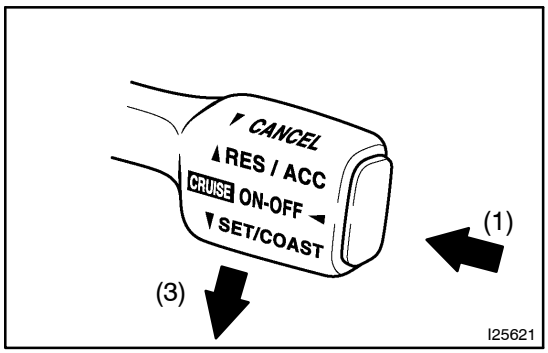
5. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

(a) Inspect the SET switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed [40 km/h (25 mph) or higher].
  (3) Push down the control switch to the SET/COAST.
  (4) After releasing the switch, check that the vehicle cruises at the desired speed.

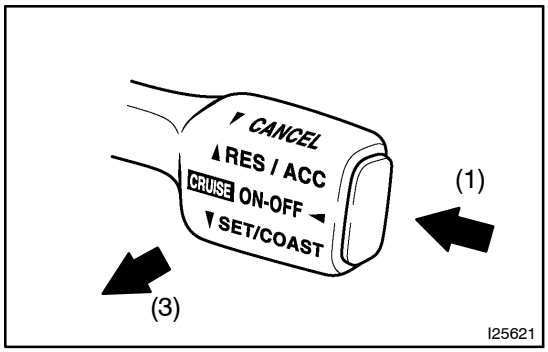


(b) Inspect the ACCEL switch.
  (1) Push the main switch button to ON.
  (2) Drive at a desired speed [40 km/h (25 mph) or higher].
  (3) Check that the vehicle speed increases while the control switch is pulled up to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.

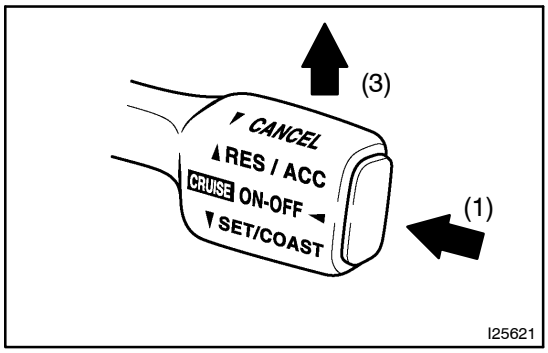
(4) Momentarily push the control switch upward to the RES/ACC, and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).



(c) Inspect the COAST switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) Check that the vehicle speed decreases while the control switch is pushed down to SET/COAST, and the vehicle cruises at the set speed when the switch is released.
(4) Momentarily push the control switch downward to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).

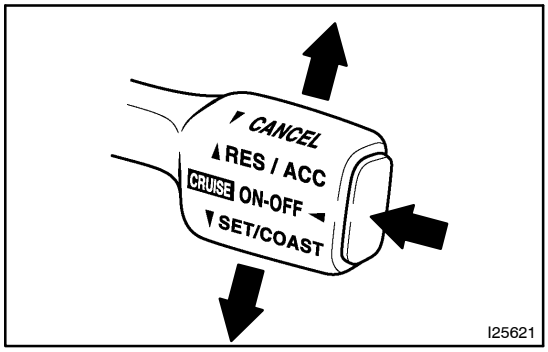


(d) Inspect the CANCEL switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Push the main switch button to OFF.
- Pull the cruise control switch to CANCEL.



(e) Inspect the RESUME switch.
(1) Push the main switch button to ON.
(2) Drive at a desired speed [40 km/h (25 mph) or higher].
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal.
- Depress the clutch pedal. (M/T)
- Shift to except D position. (A/T)
- Pull the cruise control switch to CANCEL.

(4) After the control switch is pulled up to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed prior to the cancellation.



6. INPUT SIGNAL CHECK (Using hand–held tester)

(a) Connect the hand–held tester to DLC3.
(b) Check the control switch (ON–OFF, CANCEL, SET/COAST, RES/ACC).

DIAJM–02

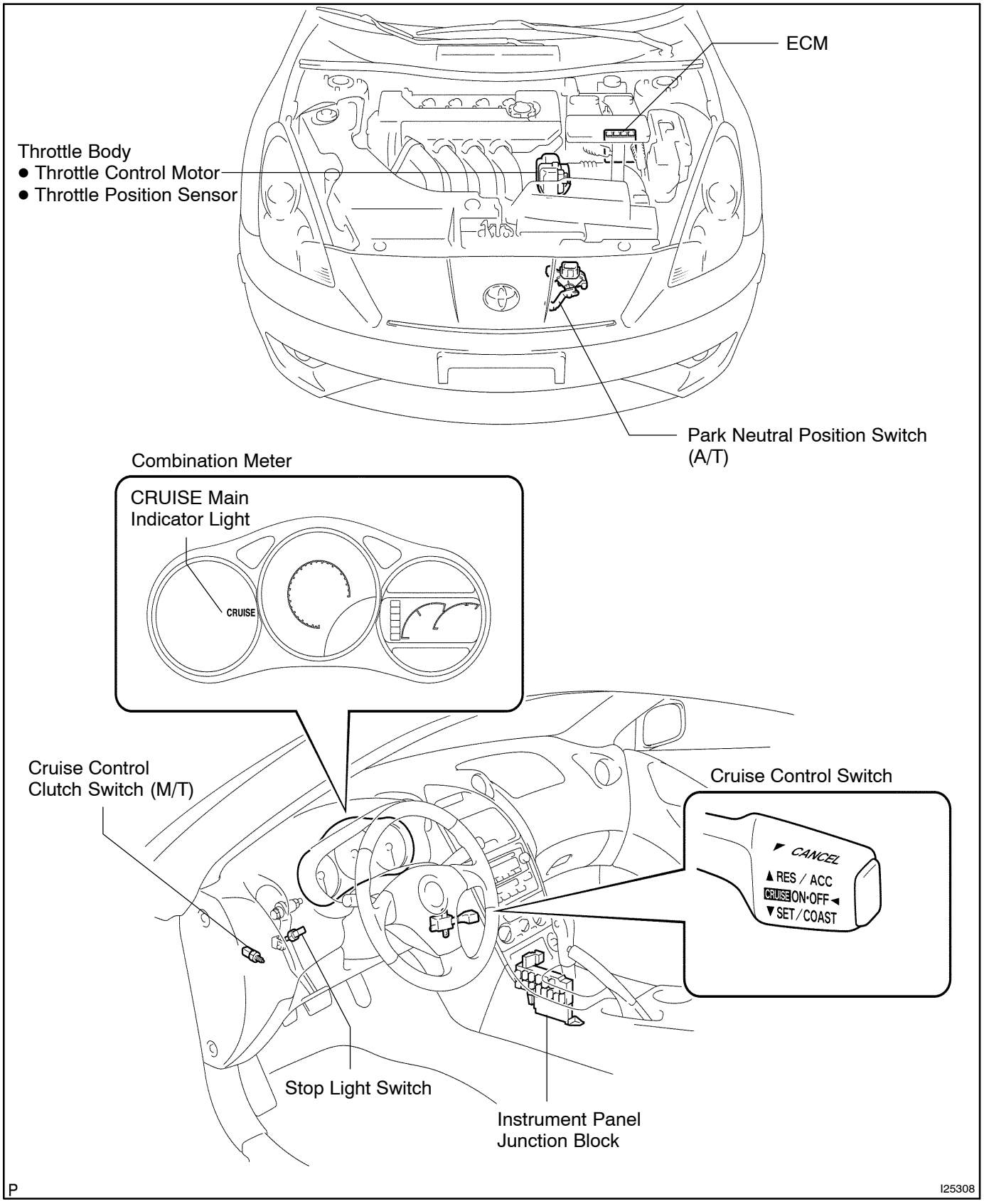
DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is indicated during the DTC check, check the circuit listed for that code in the table below, and proceed to the appropriate page.

DTC No. (See Page)	Circuit Inspection	Trouble Area
P0500/21 (DI–1100)	Vehicle Speed Sensor ”A”	• Combination meter • Vehicle speed sensor • Wire harness or connector • ECM
P0503/23 (DI–1100)	Vehicle speed sensor ”A” Intermittent/Erratic/High	
P0571/52 (DI–1101)	Brake switch ”A” Circuit	• Stop light switch • Wire harness or connector • ECM
P0607/54 (DI–1105)	Control module performance	• ECM

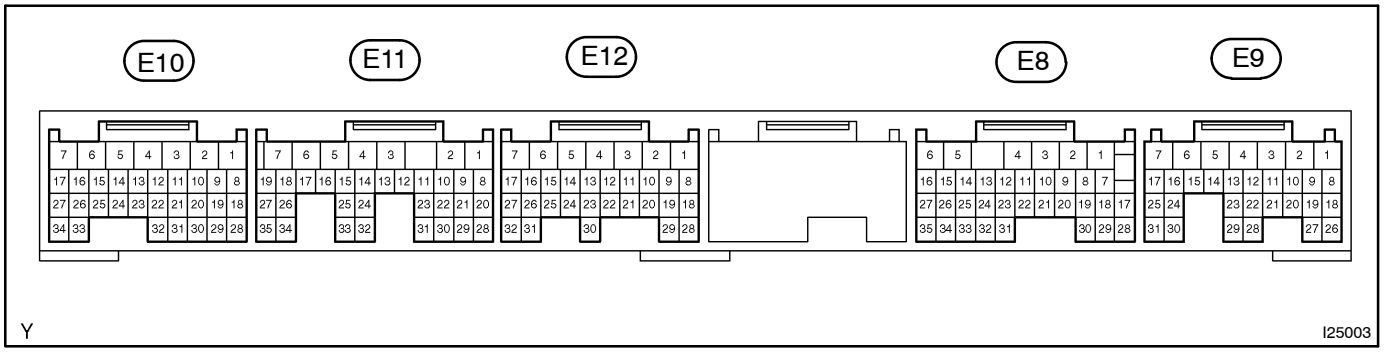
DIAJN–03

PARTS LOCATION



DIAJO–03

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage
STP ↔ E1 (E8–19 ↔ E12–1)	G–W ↔ BR	Depress brake pedal	7.5 – 14 V
		Release brake pedal	Below 1 V
CCS ↔ E1 (E8–24 ↔ E12–1)	W–G ↔ BR	Ignition switch ON	9 – 14 V
		Ignition switch ON CANCEL switch hold ON	6 – 10.1 V
		Ignition switch ON SET/COAST switch hold ON	4 – 7.1 V
		Ignition switch ON RES/ACC switch hold ON	2.1 – 4 V
		Ignition switch ON MAIN switch hold ON	Below 1 V
PI ↔ E1 (E8–13 ↔ E12–1)	Y–G ↔ BR	Ignition switch ON Cruise control main switch ON	0 – 3 V
		Ignition switch ON Cruise control main switch OFF	9 – 14 V
ST1– ↔ E1 (E8–12 ↔ E12–1)	R–Y ↔ BR	Depress brake pedal	Below 1 V
		Release brake pedal	7.5 – 14 V

DIAJP–03

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occurring or CANCEL occurring. (DTC is Normal)	1. Input Signal Circuit 2. Vehicle Speed Sensor Circuit 3. Stop Light Switch Circuit 4. Park/Neutral Position Switch Circuit (A/T) 5. Clutch Switch Circuit (M/T) 6. ECM	DI–1105 DI–1100 DI–1101 DI–738 or DI–825 DI–1106 DI–293
SET not occurring or CANCEL occurring. (DTC is not output)	ECM	DI–293
Actual vehicle speed deviates above or below the set speed.	1. Input Signal Circuit 2. ECM	DI–1105 DI–293
Gear shifting occurs frequently between 3rd and O/D when driving on uphill road. (Hurting)	ECM	DI–293
Cruise control cannot be cancelled, even when the brake pedal is depressed.	1. Stop Light Switch Circuit 2. ECM	DI–1101 DI–293
Cruise control cannot be cancelled, even when the transmission is shifted to ”N” position.	1. Park/Neutral Position Switch Circuit (A/T) 2. Clutch Switch Circuit (M/T) 3. ECM	DI–738 or DI–825 DI–1106 DI–293
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	1. Cruise Control Switch Circuit 2. ECM	DI–1063 DI–293
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Input Signal Circuit 2. ECM	DI–1105 DI–293
Poor response in ACCEL and RESUME modes.	ECM	DI–293
O/D does not resume, even though the road is not uphill.	ECM	DI–293
DTC memory is erased.	ECM	DI–293
DTC is not output, or is output when it should not be.	1. Diagnosis Circuit 2. ECM	– DI–293
Cruise MAIN indicator light remains ON or fails to come on.	1. Input Signal Circuit 2. ECM	DI–1105 DI–293
Cruise MAIN indicator light does not come on.	Cruise MAIN Indicator Light Circuit	DI–1109

DIAJQ–02

CIRCUIT INSPECTION

DTC	P0500/21	Vehicle Speed Sensor ”A”

DTC	P0503/23	Vehicle Speed Sensor ”A” Intermittent/Erratic/High

CIRCUIT DESCRIPTION

See page DI–552.

DTC No.	DTC Detecting Condition	Trouble Area
P0500/21 P0503/23	No vehicle speed sensor signal to ECM under following conditions (a) and (b): (2 trip detection logic) (f) Park/Neutral position switch is OFF (g) Vehicle is being driven	• Combination meter • Harness or connector between ECM and vehicle speed sensor • Vehicle speed sensor • ECM

WIRING DIAGRAM

See page DI–552.

INSPECTION PROCEDURE

See page DI–552.

DIAJR–03

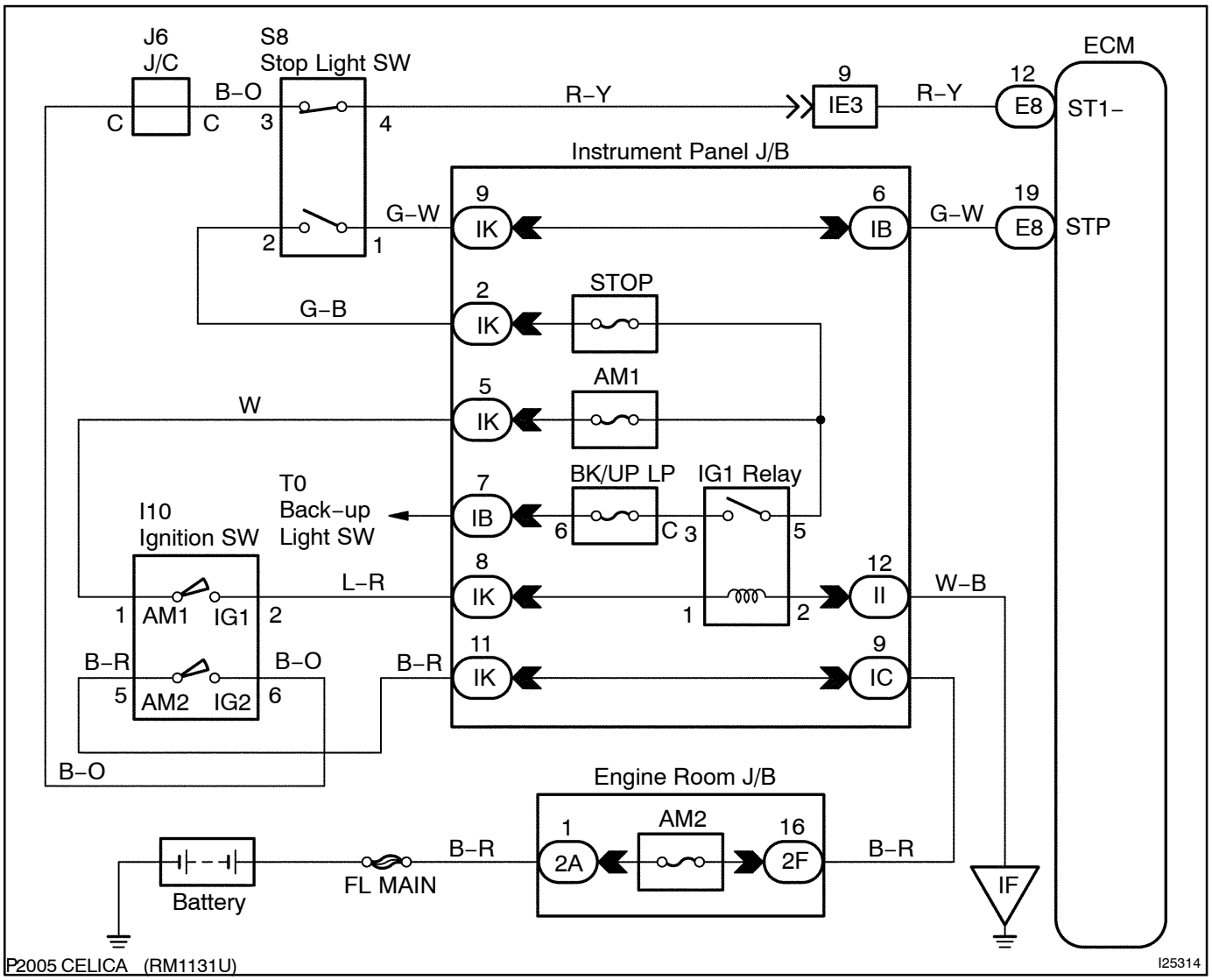
DTC	P0571/52	Brake Switch ”A” Circuit

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to ECM. When ECM receives this signal, it cancels the cruise control.
A fail–safe function is provided to maintain normal driving, even if there is a malfunction in the stop light signal circuit.
The cancel condition occurs when the battery positive voltage is supplied to terminal STP.
When the stop light switch is on, battery positive voltage is applied through the STOP fuse and the stop light switch to terminal STP of the ECM, and the ECM turns the cruise control OFF.
If the harness connected to terminal STP has an open circuit, terminal STP will have battery positive voltage and the cruise control will be turned OFF.

DTC No.	DTC Detecting Condition	Trouble Area
P0571/52	Stop Light switch does not turn off even once the vehicle is driven	• Stop light switch • Harness or connector between ECM and stop light switch circuit • ECM

WIRING DIAGRAM



P2005 CELICA (RM1131U)

I25314

INSPECTION PROCEDURE

HINT:

When using the hand–held tester, start the inspection from step 1. Otherwise, start from step 2.

1	**Check stop light switch using hand–held tester.**

PREPARATION:

(a) Connect the hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the hand–held tester main switch ON.

CHECK:

Select the item ”STOP LIGHT SW” in the DATA LIST and read the displayed value.

OK:

Brake pedal depressed: ON

Brake pedal released: OFF

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

NG

2	**Check operation of stop light.**

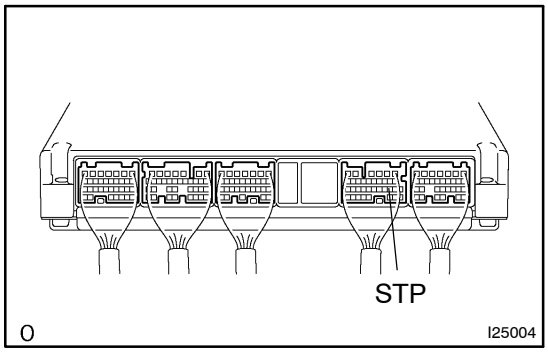
CHECK:

Check that the stop light comes on when the brake pedal is depressed, and turns off when the brake pedal is released.

NG → **Check stop light system (See page BE–37).**

OK

3	Check voltage between terminal STP of ECM connector and body ground.



PREPARATION:

(a) Remove ECM with connectors being connected.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal STP of ECM connector and body ground when the brake pedal is depressed and released.

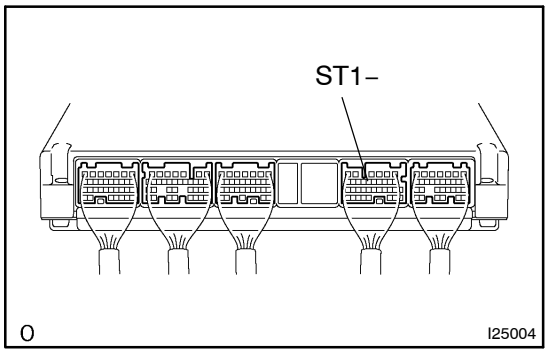
OK:

Depressed	10 – 14 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

NG

4	Check voltage between terminal ST1– of ECM connector and body ground.



PREPARATION:

(a) Remove ECM with connectors being connected.

(b) Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal ST1– of ECM connector and body ground when the brake pedal is depressed and released.

OK:

Depressed	Below 1 V
Released	10 – 14 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

NG

5	**Check wire harness and connector between terminal STP of ECM and stop light switch, and terminal ST1– of ECM and stop light switch (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

DIAJS–02

DTC	P0607/54	Input Signal Control Module Performance Abnormal

CIRCUIT DESCRIPTION

This DTC indicates the internal abnormalities of ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0607/54	• Cruise control input signal abnormal. • Stop light switch input signal abnormal.	• ECM

INSPECTION PROCEDURE

Check and replace ECM (See page IN–30).

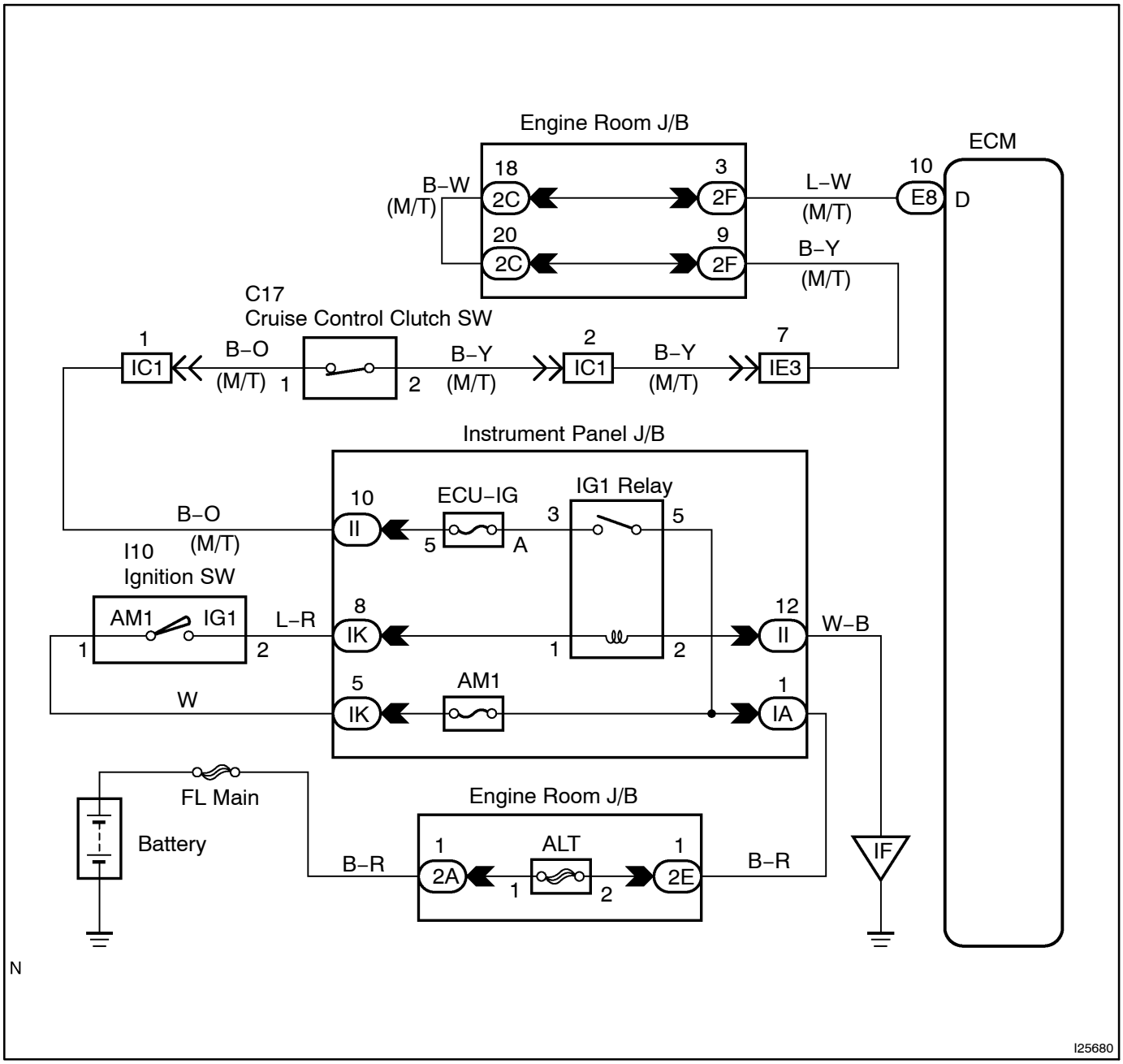
DIAJT–03

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the ECM. When the signal is input to the ECM during the cruise control driving, the cruise control ECU cancels the cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Input signal check.

Input Signal	Indicator Light Blinking Pattern
Clutch switch OFF (Depress clutch pedal)	Light: ON → SW ON; OFF - - - - - → SW OFF

PREPARATION:

See input signal check on page DI–1090.

CHECK:

Check the indicator lights when clutch pedal is depressed.

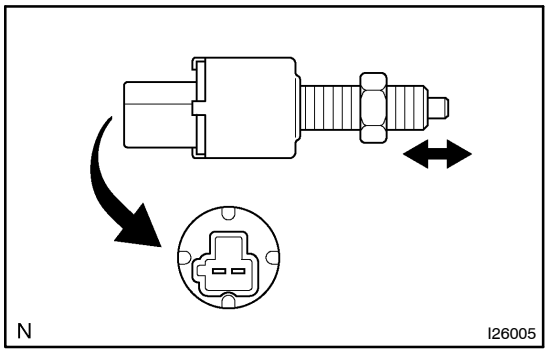
OK:

The indicator light goes off when the clutch pedal is depressed.

OK	Proceed to next circuit inspection shown in problem symptom table (See page DI–1099).

NG

2	Inspect clutch switch assy.



(a) Disconnect the clutch switch connector.

(b) Check that the continuity exists when the clutch switch assy is operated.

OK:

Switch Position	Specified condition
Switch pin free	No continuity
Switch pin pushed in	Continuity

NG	Replace clutch switch assy.

OK

3	**Check for open in harness and connector between ECU and GAUGE fuse (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

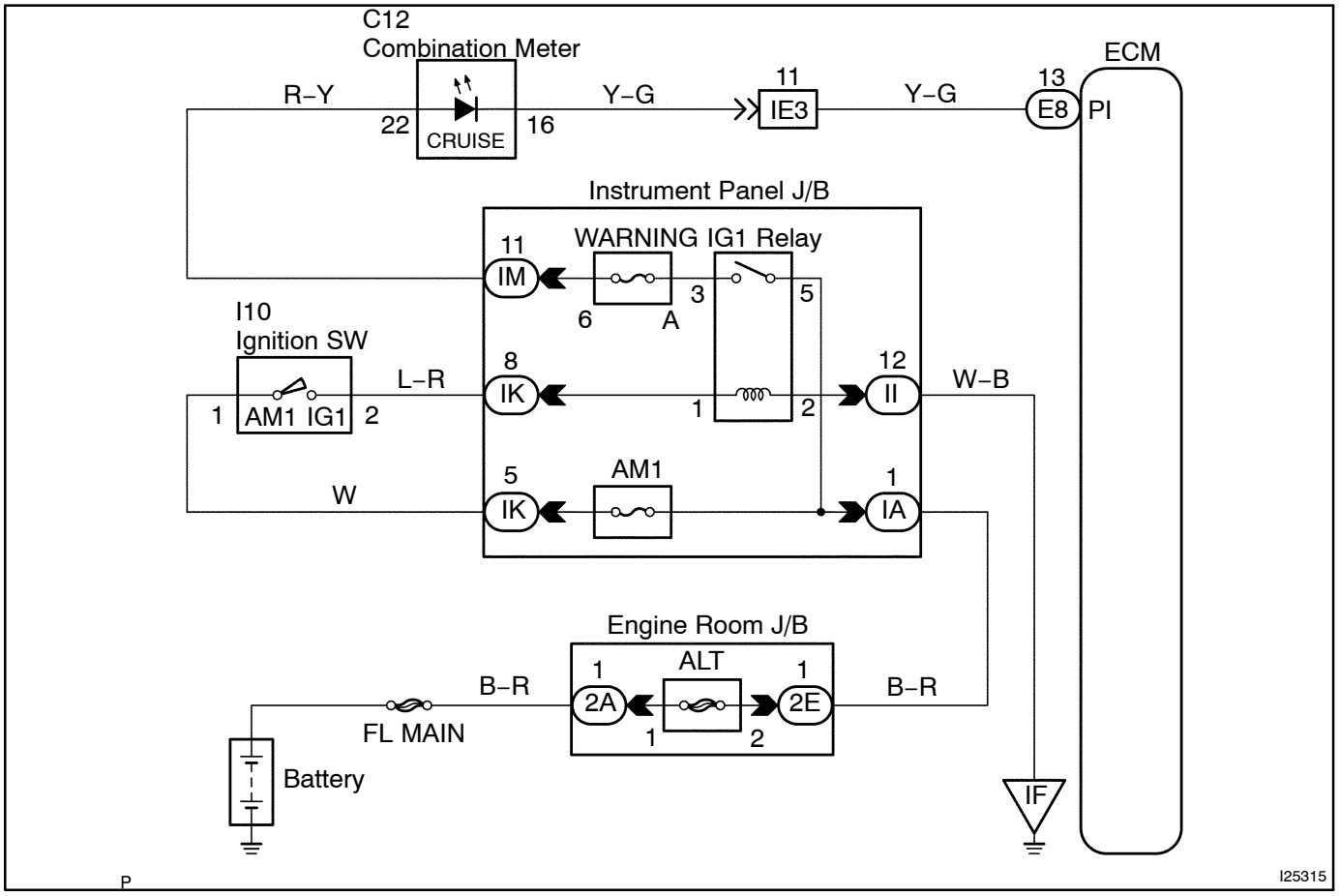
DIAJU–03

CRUISE MAIN Indicator Light Circuit

CIRCUIT DESCRIPTION

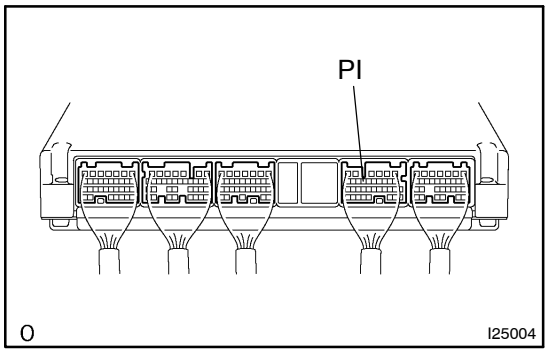
When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal PI and GND of ECM connector.**



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure the voltage between terminal PI and GND of ECM connector when main switch is turned on and off.

OK:

Switch position	Voltage
OFF	9 – 14 V
ON	0 – 3 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1099).**

NG

2	**Check combination meter (See page BE–50).**

NG → **Replace combination meter.**

OK

Check and replace ECM (See page IN–30).

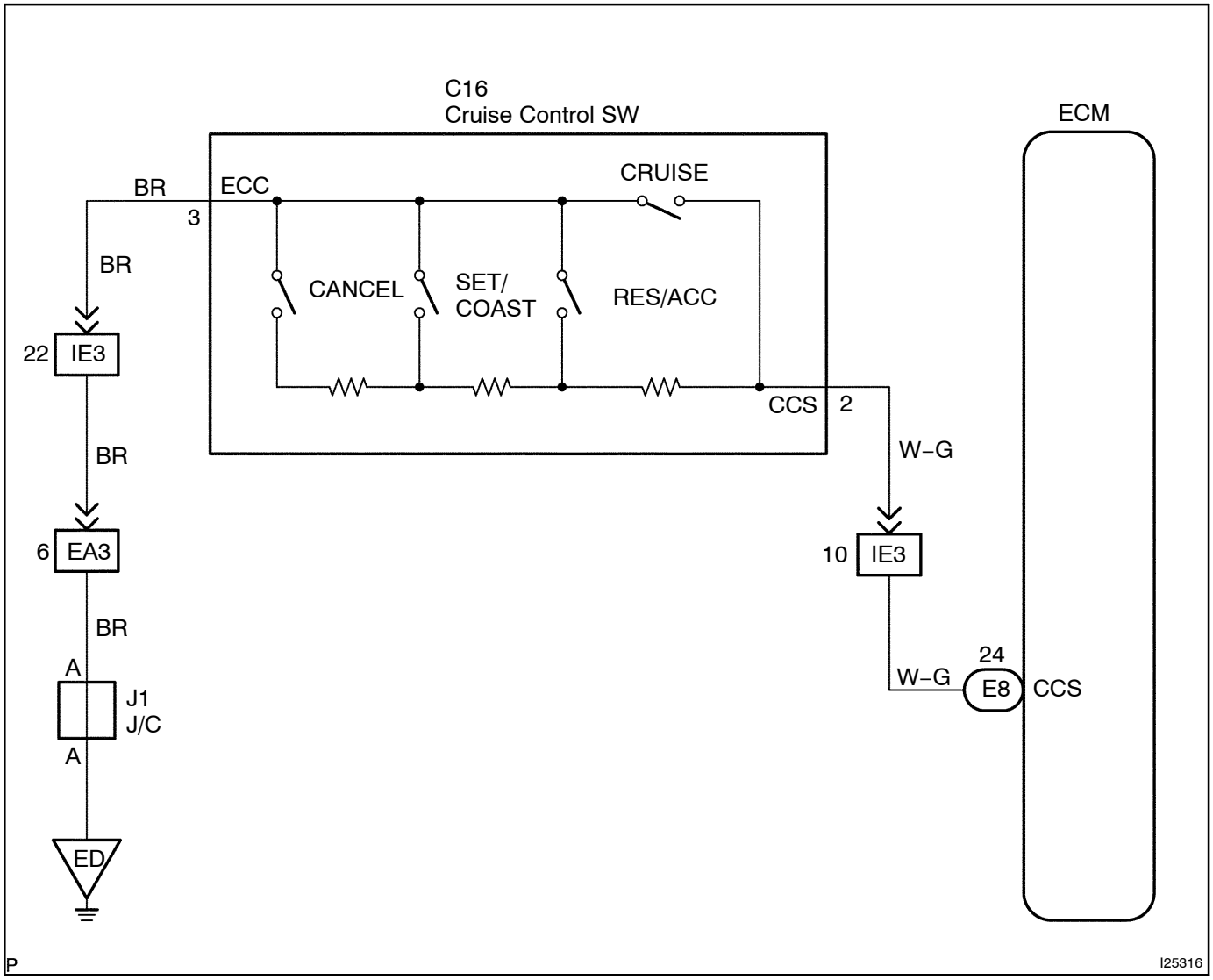
DIAJV–03

Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

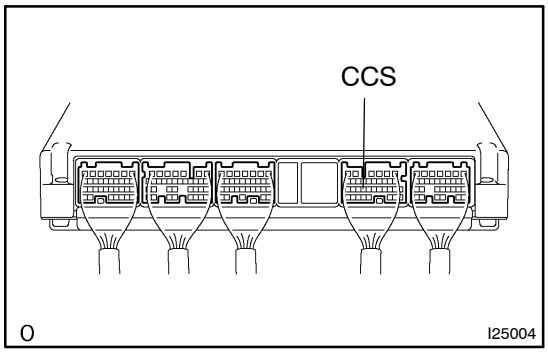
This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals CCS of ECM connector and body ground.**



PREPARATION:

(a) Remove ECM with connectors being connected.

(b) Turn the ignition switch ON.

CHECK:

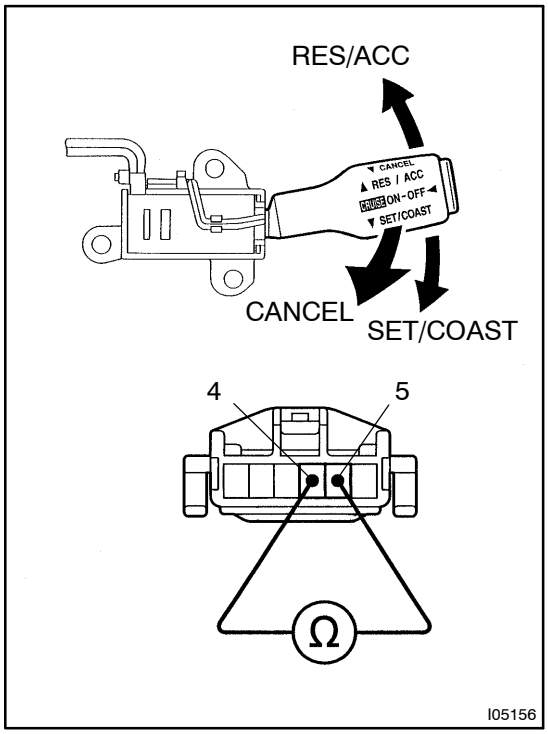
Measure the voltage between terminal CCS of ECM connector and body ground when each of the SET/COAST, RES/ACC and CANCEL is turned ON.

Switch position	Voltage (V)
Neutral	9 – 14 V
RES/ACC	2.1 – 4 V
SET/COAST	4 – 7.1 V
CANCEL	6 – 10.1 V

NG → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).**

OK

2	Check cruise control switch continuity.



PREPARATION:

(a) Remove the steering wheel center pad.

(b) Disconnect the cruise control switch connector.

CHECK:

(a) Measure the resistance between terminal 4 and 5 of the cruise control switch connector when the control switch is operated.

OK:

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	210 – 270
SET/COAST	560 – 700
CANCEL	1380 – 1700

(b) Check the continuity between terminal 4 and 5 of the control switch connector when main switch is held on and off.

OK:

Switch position	Tester connection	Specified condition
OFF	4 – 5	No continuity
ON	4 – 5	Continuity

NG → **Replace control switch.**

OK

3	Check harness and connector between ECM and cruise control switch, cruise control switch and body ground (See page IN–30).

NG → **Repair or replace harness or connector.**

OK

4	Check cruise control indicator light (See combination meter).

NG → Replace combination meter.

OK →

Check and replace ECM (See page IN–30).

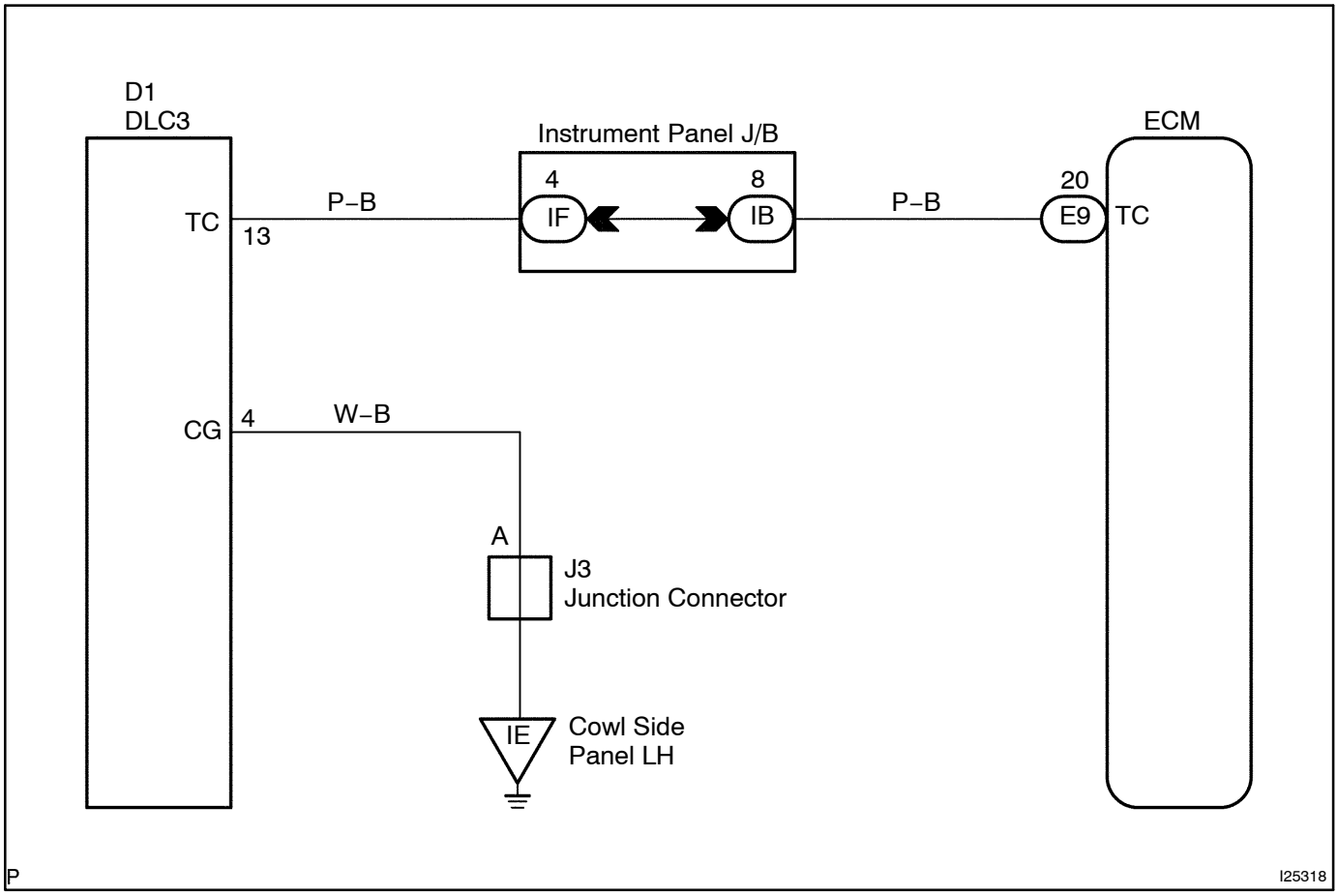
DIAJW–03

DIAGNOSIS CIRCUIT

CIRCUIT DESCRIPTION

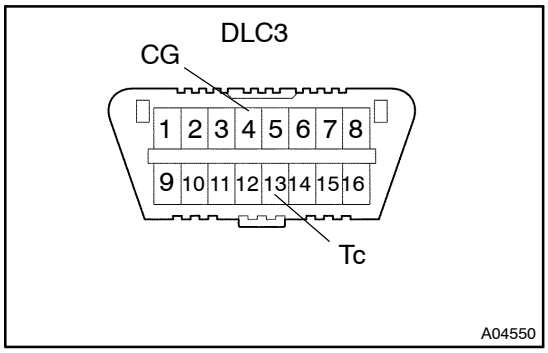
This circuit operates when conducting the DTC check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Inspect DLC3 terminal voltage.



(a) Turn the ignition switch to ON.
(b) Measure the voltage between terminal 13 (Tc) and 4 (CG) of DLC3.

OK:

Voltage: 10 – 16 V

OK	Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099).

NG

2	Check harness and connector.

(a) Check for open and short circuit in the harness and the connector between ECM and DLC3 (See page IN–30).
(b) Check for open and short circuit in the harness and the connector between DLC3 and body ground (See page IN–30).

NG	Repair or replace harness or connector.

OK

Proceed to next circuit inspection shown in problem symptoms table (See page DI–1099)

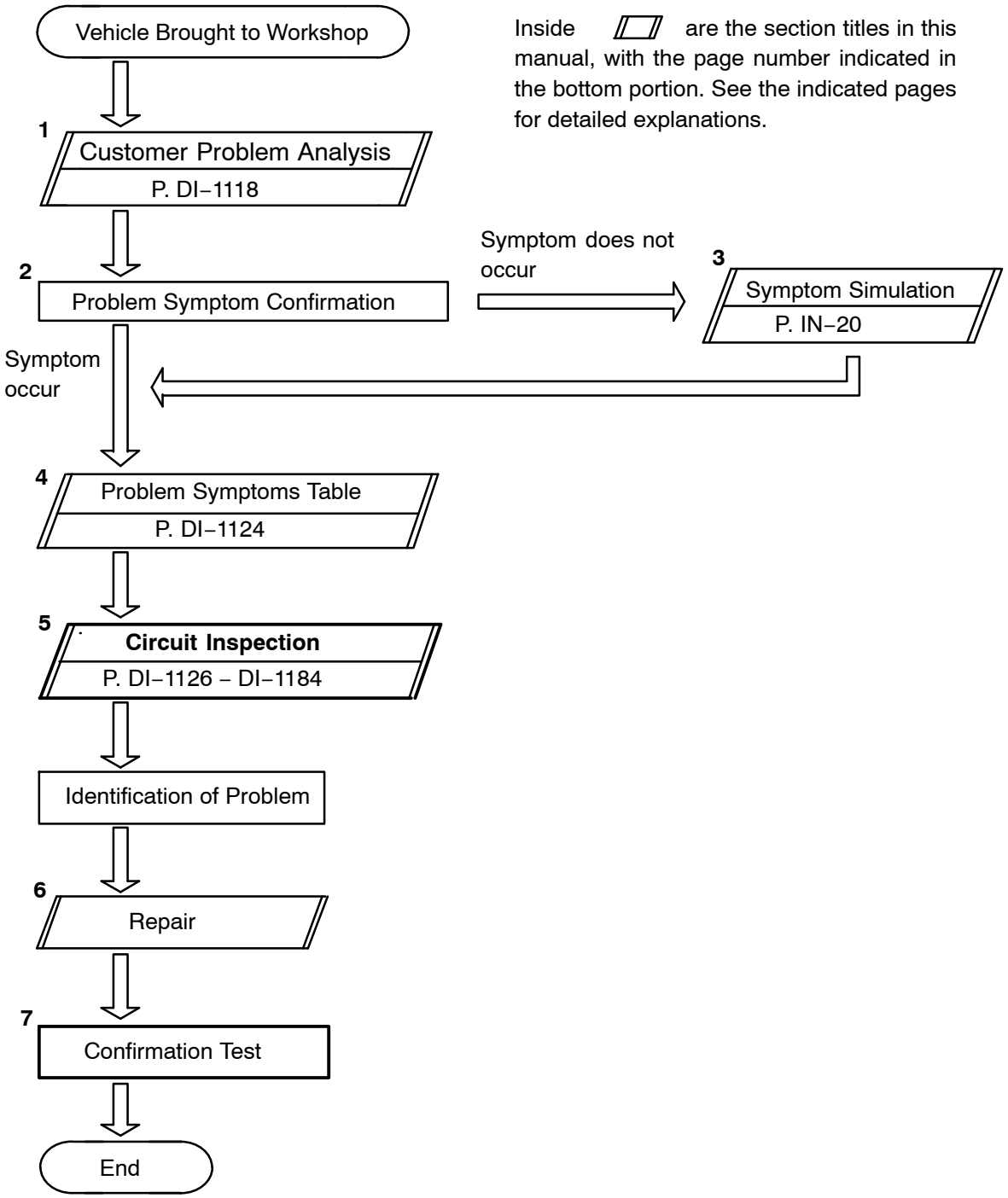
BODY CONTROL SYSTEM

DI62C–13

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

This ECU is connected to the multiplex communication system. Therefore, be sure to check that there is no troubles in the multiplex communication system before performing the troubleshooting.



Step 6, 8 : Diagnostic steps permitting the use of the hand–held tester.

DI62D-08

CUSTOMER PROBLEM ANALYSIS CHECK

BODY CONTROL SYSTEM Check Sheet

Inspector's name: _____

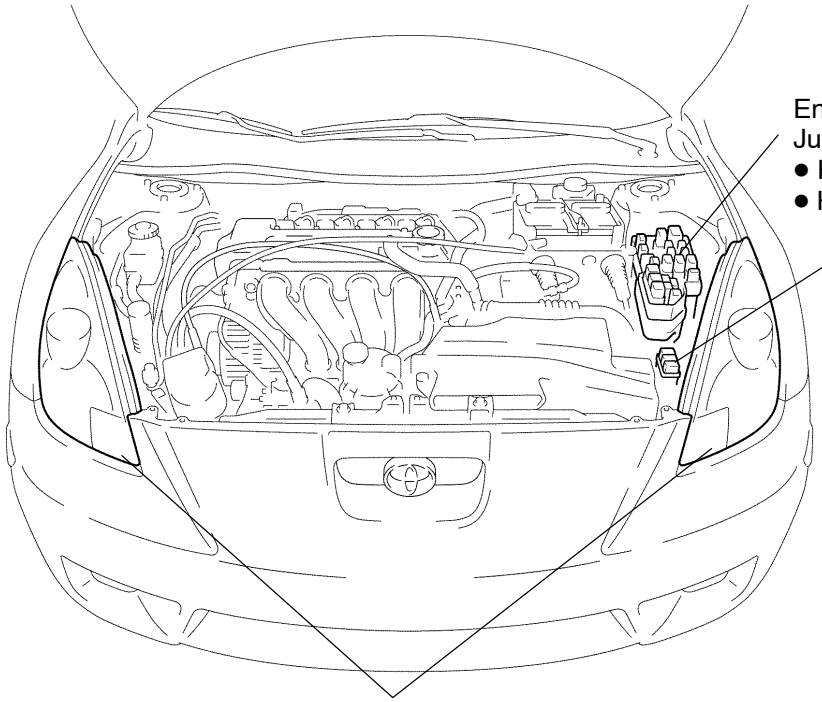
Customer's Name		**VIN**	
		Production Date	
		Licence No.	
Date Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

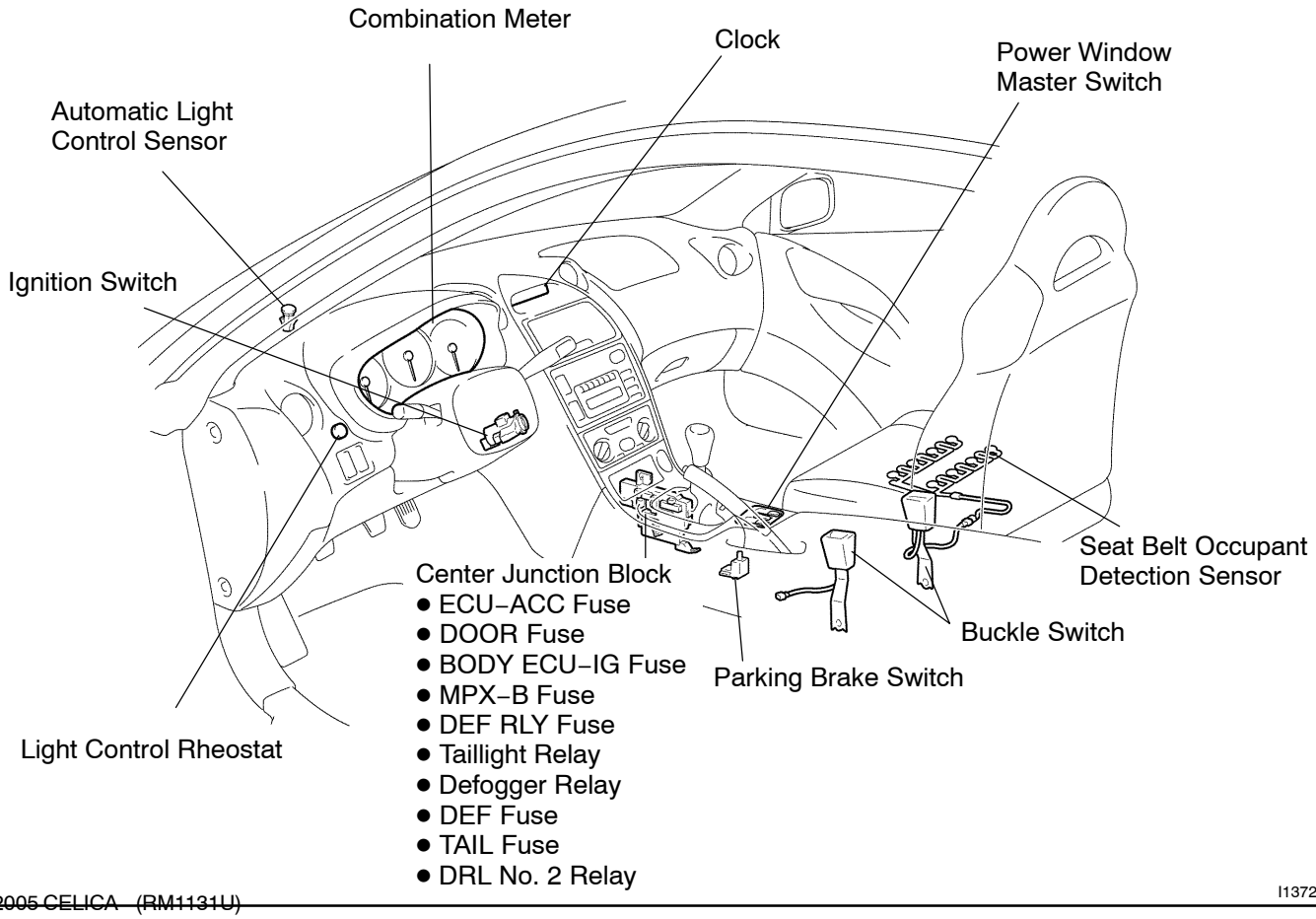
Date Problem First Occurred		/ /
Frequency Problem Occurs		¿ Constant ¿ Sometimes (times per day, month) ¿ Once only
Weather Conditions When Problem Occurred	**Weather**	¿ Fine ¿ Cloudy ¿ Rainy ¿ Snowy ¿ Various/ Others
	Outdoor Temperature	¿ Hot ¿ Warm ¿ Cool ¿ Cold (Approx. °F (°C))

Malfunction System	¿ Key Reminder System
	¿ Light Control System
	¿ Daytime Running Light System
	¿ Combination Meter (Open door warning light)
	¿ Light Auto Turn Off System
	¿ Illuminated Entry System
	¿ Seat Belt Warning
	¿ Power Window Control System
	¿ Power Door Lock Control System
	¿ Wireless Door Lock Control System
	¿ Others

DI6QU–03

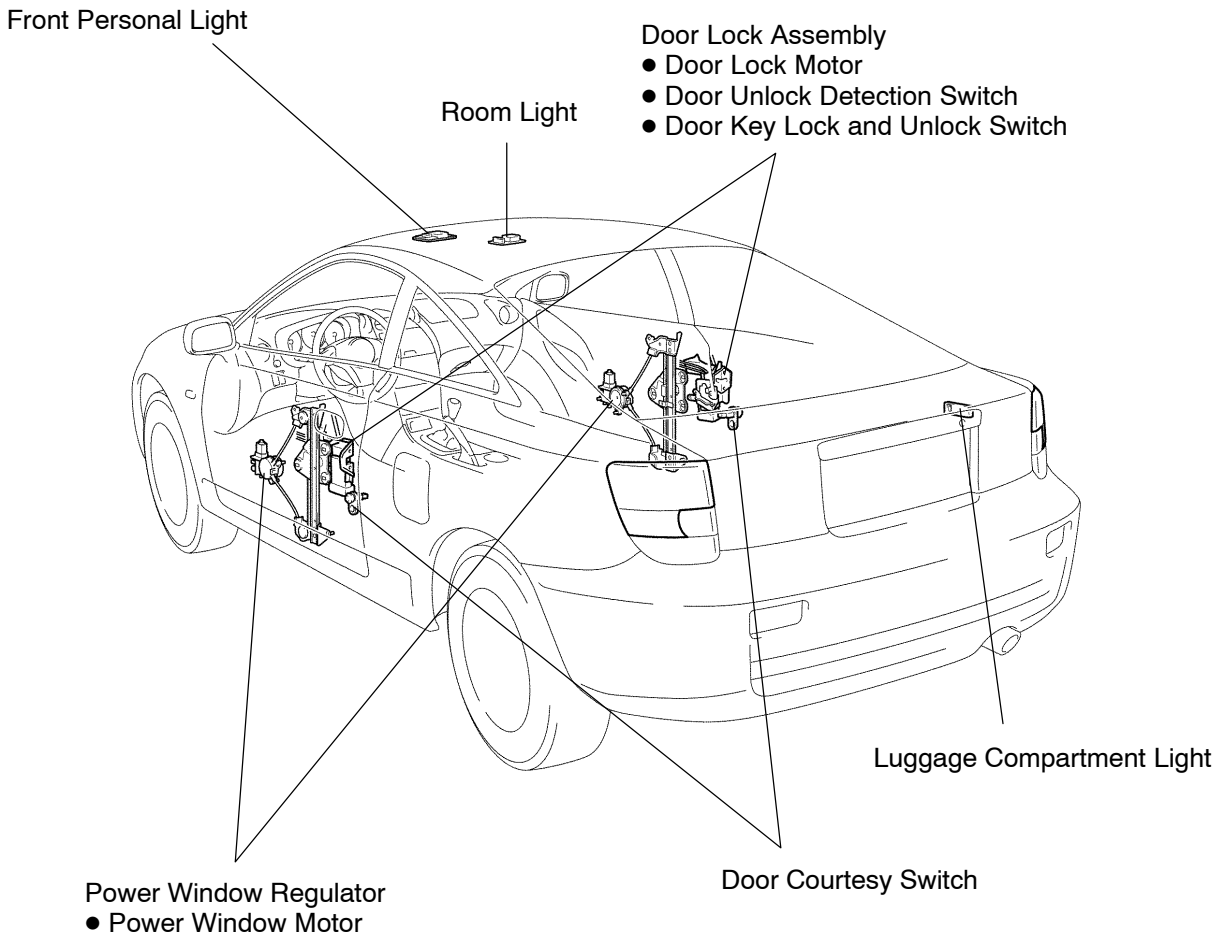
PARTS LOCATION





P

I13725


Front Personal Light
Room Light
Door Lock Assembly
● Door Lock Motor
● Door Unlock Detection Switch
● Door Key Lock and Unlock Switch
Luggage Compartment Light
Power Window Regulator
● Power Window Motor
Door Courtesy Switch

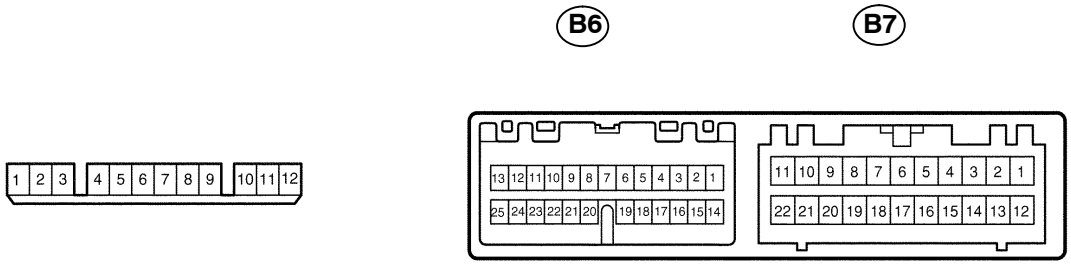
P

I13726

DI6QV–06

TERMINALS OF ECU

Body ECU:



P

I25679

Terminals No. (Symbols)	Wiring Color	Condition	STD Voltage
1 – 11 (TRLY – E)	–	Light control switch OFF	10 – 14 V
		Light control switch TAIL or HEAD	Below 1 V
2 – 11 (DEFB – E)	–	Always	10 – 14 V
3 – 11 (IG – E)	–	Ignition switch OFF or ACC	Below 1 V
		Ignition switch ON	10 – 14 V
4 – 11 (DEF – E)	–	Defogger switch OFF	10 – 14 V
		Defogger switch ON	Below 1 V
5 – 11 (B – E)	–	Always	10 – 14 V
6 – 11 (L2 – E)	–	Door key lock and unlock switch OFF	Approx. 5 V
		Door key lock and unlock switch ON	Below 1 V
7 – 9 (ACT– – ACT+)	–	Door lock operating	10 – 14 V
8 – 11 (B – E)	–	Always	10 – 14 V
10 – 11 (HRLY – E)	–	Light control switch OFF or TAIL	10 – 14 V
		Light control switch HEAD	Below 1 V
11 – Body ground (E – Body ground)	–	Always	Below 1 V
12 – 11 (ACC – E)	–	Ignition switch OFF	Below 1 V
		Ignition switch ACC or ON	10 – 14 V
B6–1 – 11 (PWS – E)	GR	Sliding roof ECU communication circuit	–
B6–2 – 11 (BLVL – E)	R	Parking brake switch ON (parking brake is used)	Below 1 V
		Parking brake switch OFF (parking brake is not used)	Approx. 5V
B6–3 – 11 (CLTS – E)	LG – B	Automatic light control sensor communication circuit	–
B6–4 – 11 (CLTB – E)	G – W	Automatic light control sensor communication circuit	–

Terminals No. (Symbols)	Wiring Color	Condition	STD Voltage
B6–5 – 11 (T – E)	LG	Light control switch OFF	10 – 14 V
		Light control switch TAIL or HEAD	Below 1 V
B6–9 – 11 (KSW – E)	Y	Key is inserted	Below 1 V
		Key is not inserted	10 – 14 V
B6–10 – 11 (LP – E)	R – W	Each door is opened	Below 2 V
		All doors are closed	10 – 14 V
B6–11 – 11 (SG1 – E)	W – L	Key is inserted	Below 1 V
		Key is not inserted	10 – 14 V
B6–12 – 11 (HF – E)	P – B	Light control switch HIGH beam or FLASH	Below 1 V
		Light control switch OFF or LOW beam	Approx. 5.7 V
B6–13 – 9 (ACTD – ACT+)	L – R	Driver door (operates)	10 – 14 V
B6–14 – 11 (HORN – E)	L – B	Horn sound	Below 1 V
		Horn does not sound	10 – 14 V
B6–16 – 11 (MPX1 – E)	R – L	Multiplex communication circuit	–
B6–17 – 11 (L – E)	Y – G	Engine running	Below 1 V
B6–18 – 11 (H – E)	R – L	Light control switch OFF or TAIL	Approx. 5.7 V
		Light control switch HEAD	Below 1 V
B6–19 – 11 (HU – E)	P – L	Headlight dimmer switch LOW	Approx. 5.7 V
		Headlight dimmer switch HIGH or FLASH	Below 1 V
B6–20 – 11 (LSWP – E)	G	Except driver's door is unlocked	Below 1 V
		Except driver's door is locked	Approx. 5.7 V
B6–21 – 11 (LSWD – E)	B	Driver door is unlocked	Below 1 V
		Driver door is locked	Approx. 5.7 V
B6–22 – 11 (UL2 – E)	Y – B	Passenger door key lock and unlock switch OFF	Approx. 5.0 V
		Passenger door key lock and unlock switch ON	Below 1 V
B6–24 – 11 (CLTE – E)	LG – R	Automatic light control sensor communication circuit	–
B6–25 – 11 (UL3 – E)	Y – B	Driver door key lock and unlock switch OFF	Approx. 5.0 V
		Driver door key lock and unlock switch ON	Below 1 V
B7–1 – 11 (SG2 – E)	W – L	Always	Below 1 V
B7–2 – 11 (SG3 – E)	W	Always	Below 1 V
B7–3 – 11 (FU– – E)	BR – W	Always	Below 1 V
B7–7 – 11 (DBKL – E)	L	Driver seat belt buckle switch ON (belt fastened)	Below 1 V
		Driver seat belt buckle switch OFF (belt unfastened)	10 – 14 V
B7–18 – 11 (BLTW – E)	P	Driver seat belt buckle switch ON (belt fastened)	Below 1 V
		Driver seat belt buckle switch OFF (belt unfastened)	10 – 14 V
B7–9 – 11 (PRG – E)	R – B	Wireless door lock control receiver communication circuit	–

Terminals No. (Symbols)	Wiring Color	Condition	STD Voltage
B7–10 – 11 (RDA – E)	V	Wireless door lock control receiver communication circuit	–
B7–11 – 11 (P/W – E)	Y – B	Key–off power window operation	10 – 14 V
B7–12 – 11 (FUA – E)	Y – R	Ignition switch ON and fuel sender gauge float down	Approx. 0.3 V
		Ignition switch ON and fuel sender gauge float up	Approx. 4.6 V
B7–13 – 11 (FU+ – E)	Y – G	Ignition switch ON	Approx. 5.0 V
B7–14 – 11 (PBKL – E)	L – Y	Passenger seat belt buckle switch ON (belt fastened)	Below 1 V
		Passenger seat belt buckle switch OFF (belt unfastened)	Approx. 5.0 V
B7–15 – 11 (L1 – E)	V – W	Door lock manual switch OFF or UNLOCK	Below 1 V
		Door lock manual switch LOCK	Approx. 5.0 V
B7–16 – 11 (UL1 – E)	P – B	Door lock manual switch OFF or LOCK	Below 1 V
		Door lock manual switch UNLOCK	Approx. 5.0 V
B7–17 – 11 (DRL – E)	L – W	Daytime running light system operates when DRL ON	Below 1 V
B7–4 – 11 (SG4 – E)	W – R	Sport mode switch OFF	10 – 14 V
		Sport mode switch ON	Below 1 V
B7–19 – 11 (PKB – E)	R – B	Parking brake is used	Below 1 V
		Parking brake is not used	10 – 14 V
B7–20 – 11 (DCTY – E)	R – Y	Driver door opened	Below 1 V
		Driver door closed	10 – 14 V
B7–21 – 11 (PCTY – E)	R	Passenger door opened	Below 1 V
		Passenger door closed	10 – 14 V
B7–22 – 11 (LGCY – E)	LG	Luggage door opened	Below 1 V
		Luggage door closed	10 – 14 V

DI62G–13

PROBLEM SYMPTOMS TABLE

DOOR LOCK CONTROL

Symptom	Suspect Area	See page
Lock or unlock cannot be operated with door lock control S/W.	1. Door lock control switch circuit (Master switch) 2. Body ECU	DI–1155 IN–30
Door key linked function does not operate.	1. Door key lock and unlock switch circuit 2. Body ECU	DI–1162 IN–30
Key confinement prevention function does not operate.	1. Key unlock switch circuit 2. Body ECU	DI–1147 IN–30
Only one of the door does not lock and unlock.	1. Door lock motor circuit 2. Body ECU	DI–1158 IN–30
Luggage compartment door opener function does not operate.	1. Luggage component door courtesy switch circuit 2. Body ECU	DI–1166 IN–30

WIRELESS DOOR LOCK CONTROL

Symptom	Suspect Area	See page
All functions of wireless door lock control system do not operate.	1. Transmitter 2. Wireless tuner circuit 3. Key unlock warning switch circuit 4. Body ECU	BE–76 DI–1168 DI–1147 IN–30
Lock (or unlock) function does not operate.	1. Door key lock and unlock switch circuit 2. Door unlock detection switch circuit 3. Body ECU	DI–1162 DI–1160 IN–30
Automatic lock function operates even if any door is opened within 30 seconds after all doors are unlocked by wireless door lock control system .	1. Door courtesy switch circuit 2. Body ECU	DI–1164 IN–30

ILLUMINATED ENTRY

Symptom	Suspect Area	See page
Illuminated entry does not operate.	1. Illumination circuit 2. Body ECU	DI–1144 IN–30

HEADLIGHT AND TAILLIGHT SYSTEM:

Symptom	Suspect Area	See page
Headlight does not come on.	1. Light control switch circuit 2. Headlight control relay circuit 3. Body ECU	DI–1140 DI–1132 IN–30
Taillight does not come on.	1. Light control switch circuit 2. Taillight relay circuit 3. Body ECU	DI–1140 DI–1130 IN–30
Automatic light control system does not operate.	1. Automatic light control sensor circuit 2. Light switch circuit 3. Body ECU	DI–1182 DI–1140 IN–30
Auto turn–off system does not operate.	1. Driver door courtesy switch circuit 2. Body ECU	DI–1164 IN–30

OTHERS

Symptom	Suspect Area	See page
Driver seat belt warning light does not go off.	1. Driver buckle switch circuit 2. Combination meter 3. Body ECU	DI–1149 IN–30
Passenger seat belt warning light does not go off.	1. Passenger buckle switch circuit 2. Clock 3. Body ECU	DI–1149 IN–30
Rear window defogger does not operate.	1. Defogger relay circuit 2. Defogger switch 3. Body ECU	DI–1170 BE–58 IN–30
Body ECU does not operate.	1. Power source circuit 2. Body ECU	DI–1126 IN–30
Fuel sender gauge does not operate.	1. Fuel sender gauge circuit 2. Combination meter system 3. Body ECU	DI–1172 BE–50 IN–30

DI6QW–07

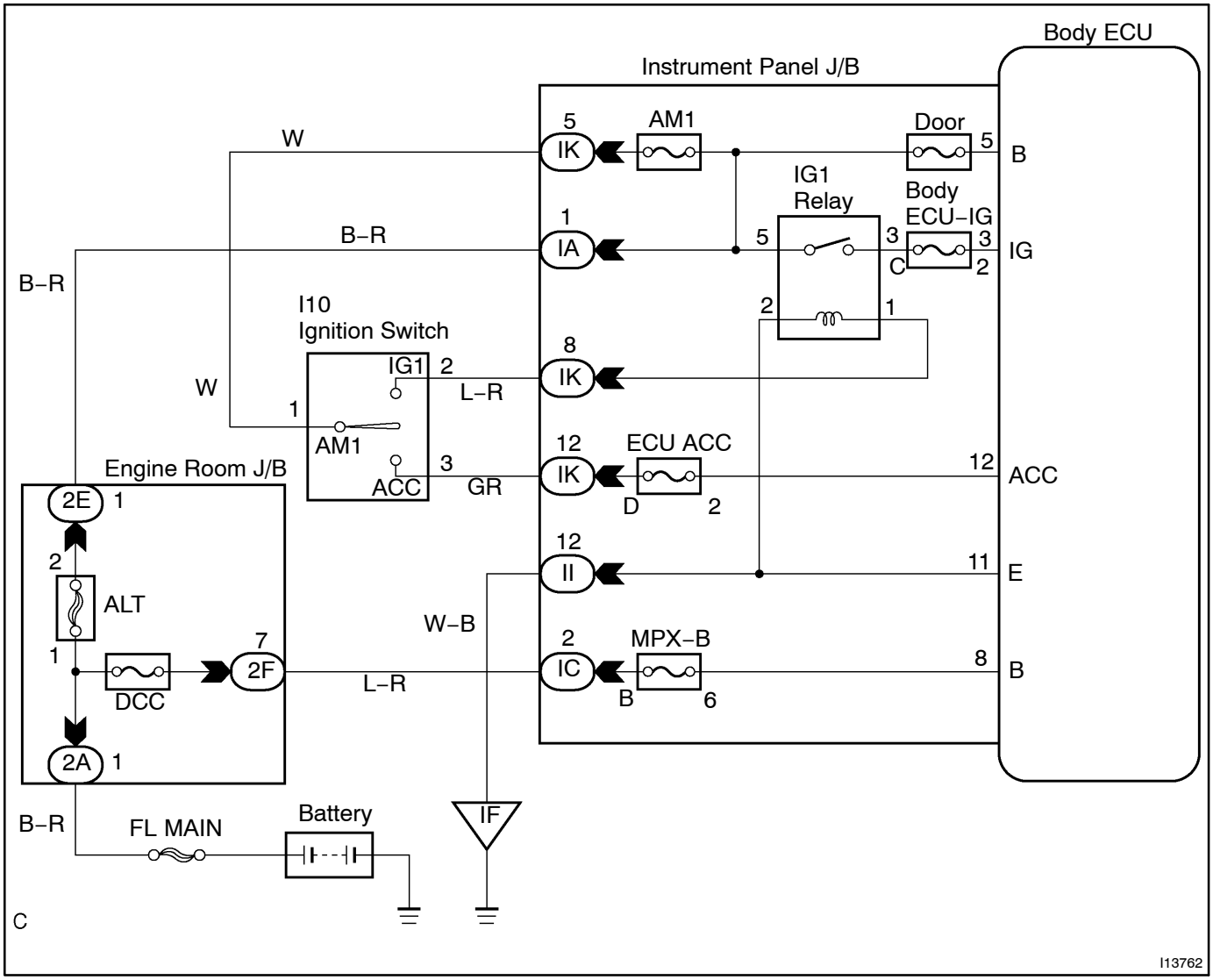
CIRCUIT INSPECTION

Power Source Circuit

CIRCUIT DESCRIPTION

This circuit provides power to operate the Body ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check MPX–B, ACC, AM1 and DOOR fuse.**

CHECK:

Check continuity of MPX–B, ACC, AM1 and DOOR fuse.

OK:

Continuity

NG → **Replace the failure fuse.**

OK

2	**Check voltage between terminals B, B and E of Body ECU connector.**

PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the Body ECU connector.

CHECK:

Measure the voltage between terminal B, B and E.

OK:

Voltage: 10 – 14V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).**

NG

3	**Check wireharness and connector between Body ECU and body ground (See page IN–30).**

NG → **Repair or replace wire harness or connector.**

OK

Check and repair wire harness and connector between Body ECU and battery.

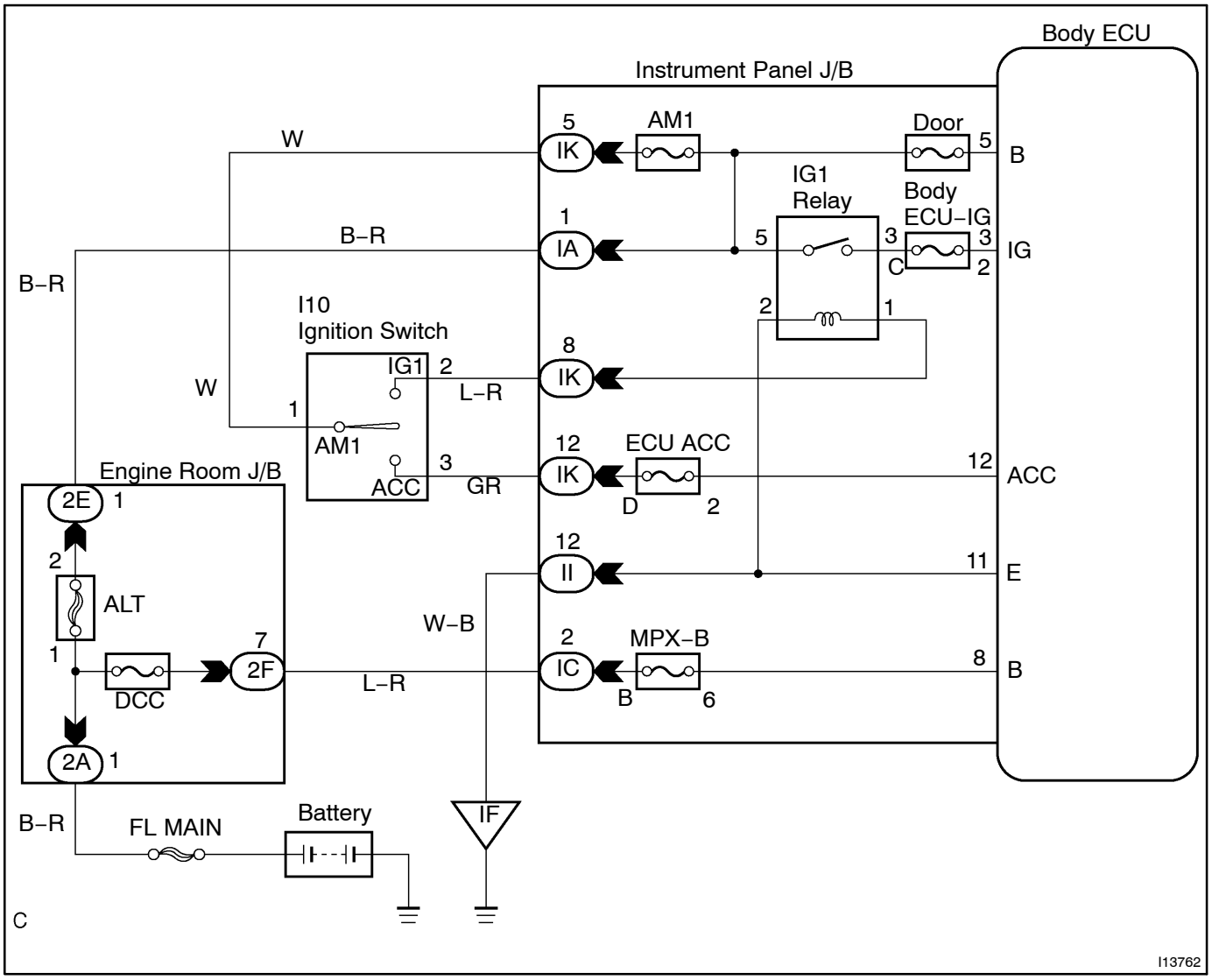
DI6QX–05

Ignition Switch Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned to the ACC position, battery voltage is applied to terminal ACC of ECU, and when the ignition switch is turned to the ON position, battery voltage is applied to terminal IG of ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check BODY ECU–IG and ECU–ACC fuse.**

CHECK:

Check continuity of BODY ECU–IG and ECU–ACC fuse.

OK:

Continuity

NG → **Replace the failure fuse.**

OK

2	**Check voltage between terminals ACC, IG and E of Body ECU connector.**

PREPARATION:

Turn ignition switch ON.

CHECK:

Measure the voltage between terminal ACC, IG, and E.

OK:

Voltage: 10 – 14V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).**

NG

3	**Check wire harness and connector between Body ECU and body ground (See page IN–30).**

NG → **Repair or replace wire harness or connector.**

OK

Check and repair wire harness and connector between Body ECU and battery.

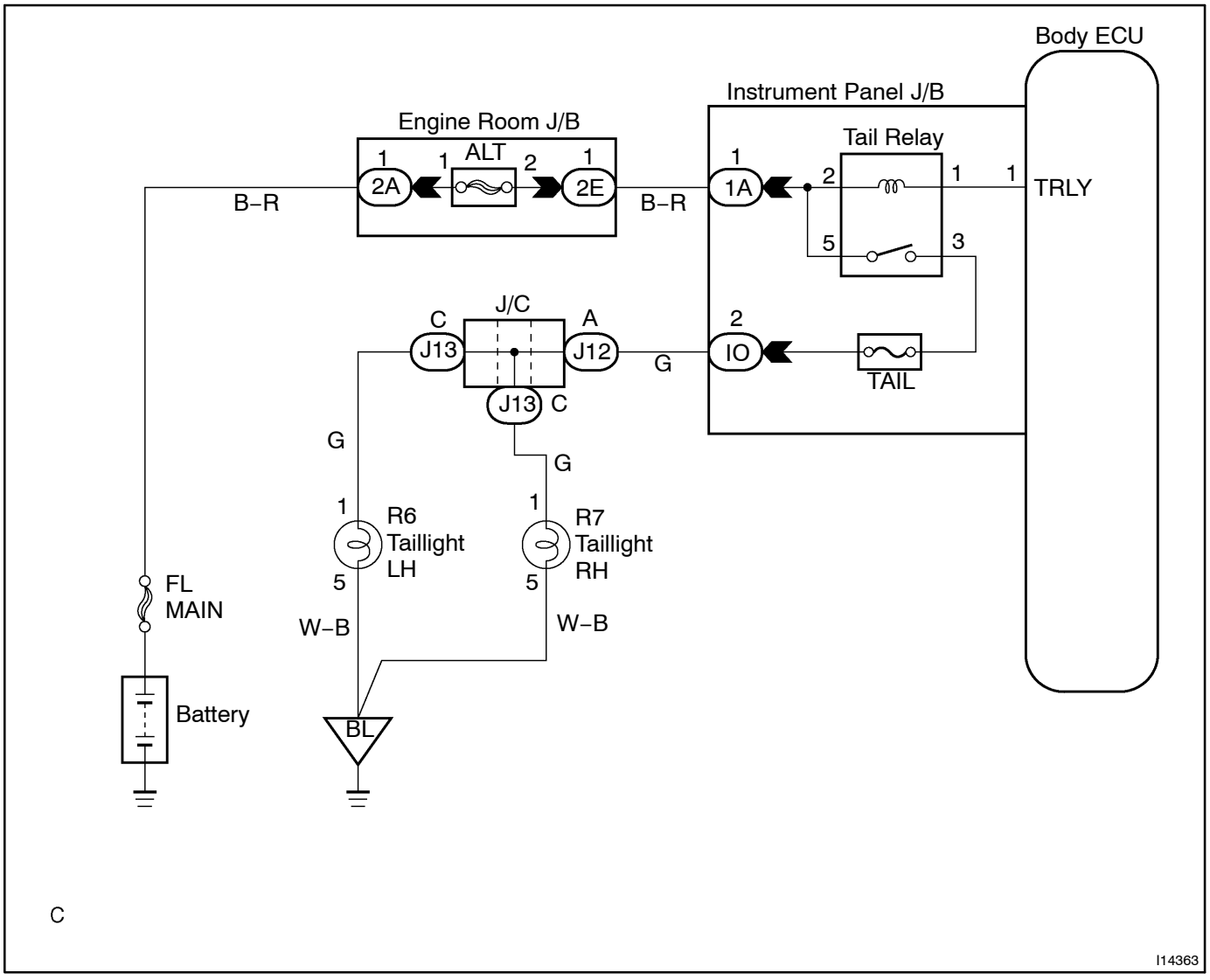
DI6QY–10

Taillight Relay Circuit

CIRCUIT DESCRIPTION

Taillight relay will be ”ON” by operating the taillight switch. The transistor which activates the taillight relay has two sorts: one is activated by the taillight switch for fail–safe and the other is activated by CPU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check taillight relay (See page BE–18).

NG → Replace the taillight relay.

OK

2	Check wire harness and connector between taillight relay and Body ECU, battery and taillight relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

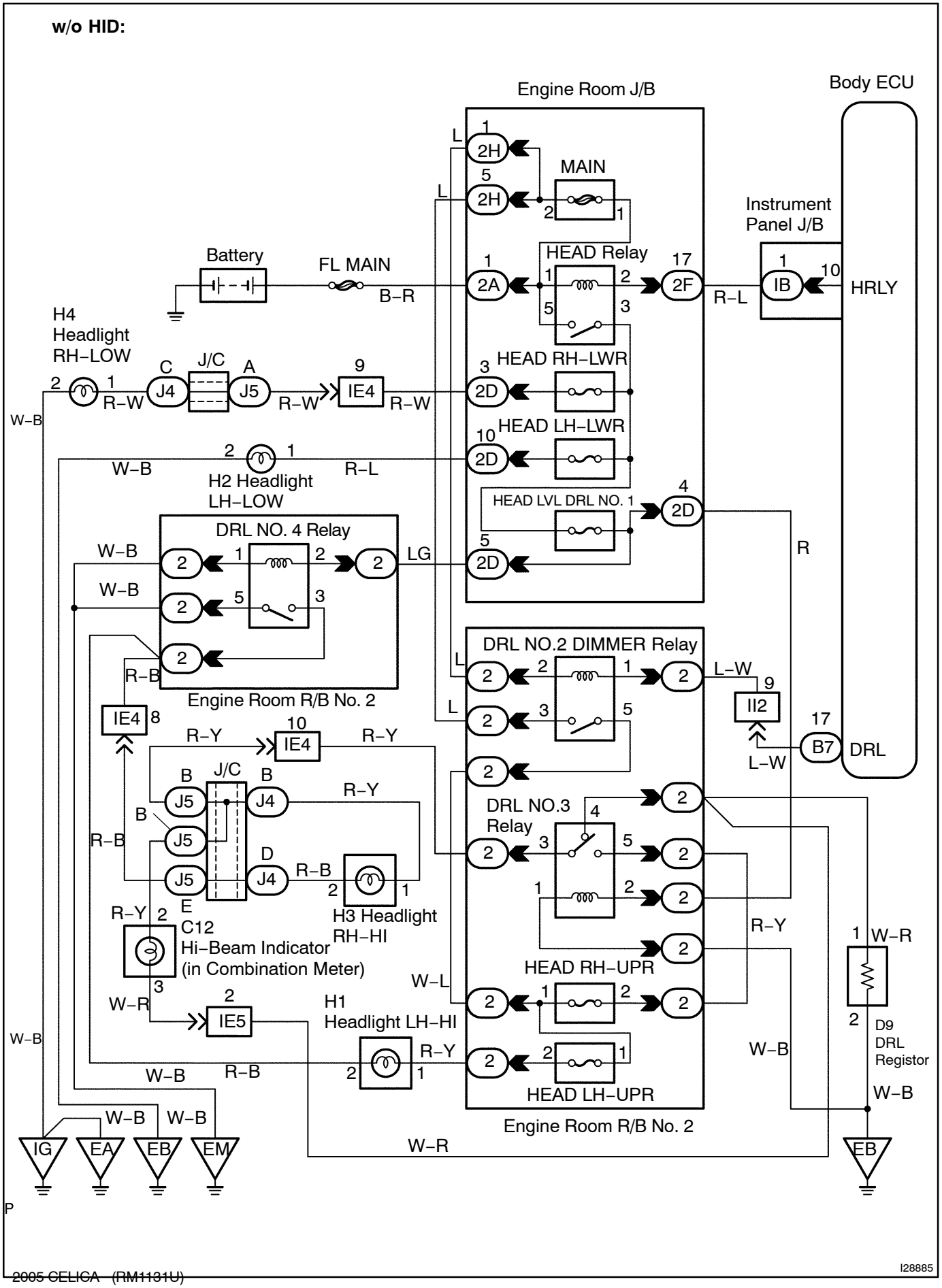
DIAJH–03

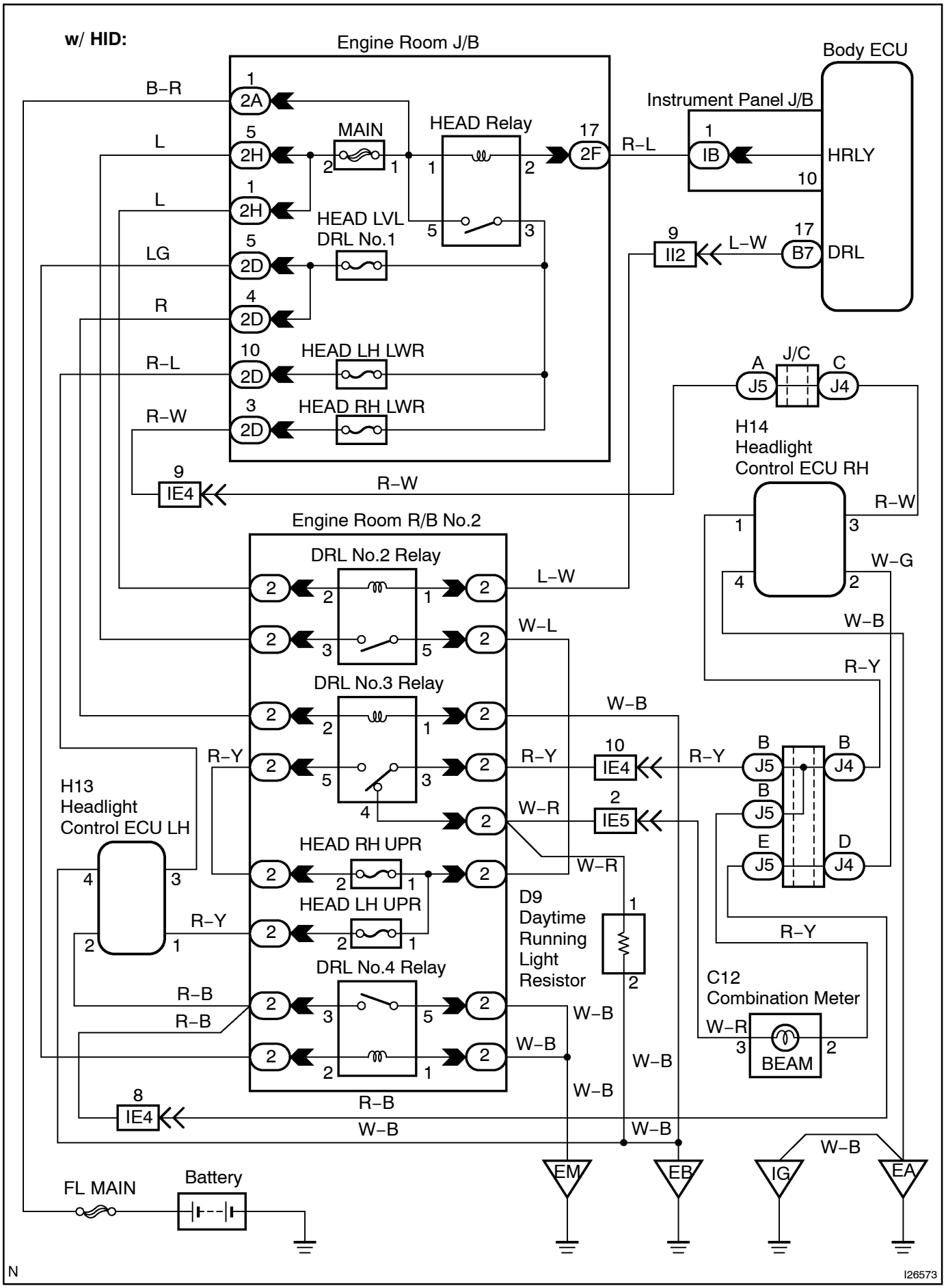
Headlight Relay Circuit

CIRCUIT DESCRIPTION

Headlight relay will be ”ON” by operating the headlight switch. The transistor which activates the headlight relay has two sorts: one is activated directly by the headlight switch for fail–safe and the other is activated by CPU. The one activated by CPU has two systems and prevents the headlight to be turned off at the time of trouble with one system in the automatic operation circuit.

WIRING DIAGRAM




w/ HID:
Engine Room J/B
Body ECU
Instrument Panel J/B
B–R
L
L
LG
R
R–L
R–W
MAIN
HEAD Relay
HEAD LVL
DRL No.1
HEAD LH LWR
HEAD RH LWR
2A
2H
2H
2D
2D
2D
2D
2F
IB
HRLY
DRL
L–W
II2
B7
IE4
R–W
J/C
A
C
J5
J4
H14
Headlight
Control ECU RH
W–G
W–B
R–Y
Engine Room R/B No.2
DRL No.2 Relay
DRL No.3 Relay
DRL No.4 Relay
HEAD RH UPR
HEAD LH UPR
L–W
W–L
W–B
W–R
R–Y
R–B
H13
Headlight
Control ECU LH
D9
Daytime
Running
Light
Resistor
IE5
B
D
E
C12
Combination Meter
BEAM
EM
EB
IG
EA
FL MAIN
Battery
N
I26573

INSPECTION PROCEDURE

1	Check headlight relay (See page BE–18).

NG → Replace the headlight relay.

OK

2	Check wire harness and connector between headlight relay and Body ECU, battery and headlight relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

DIAJI–03

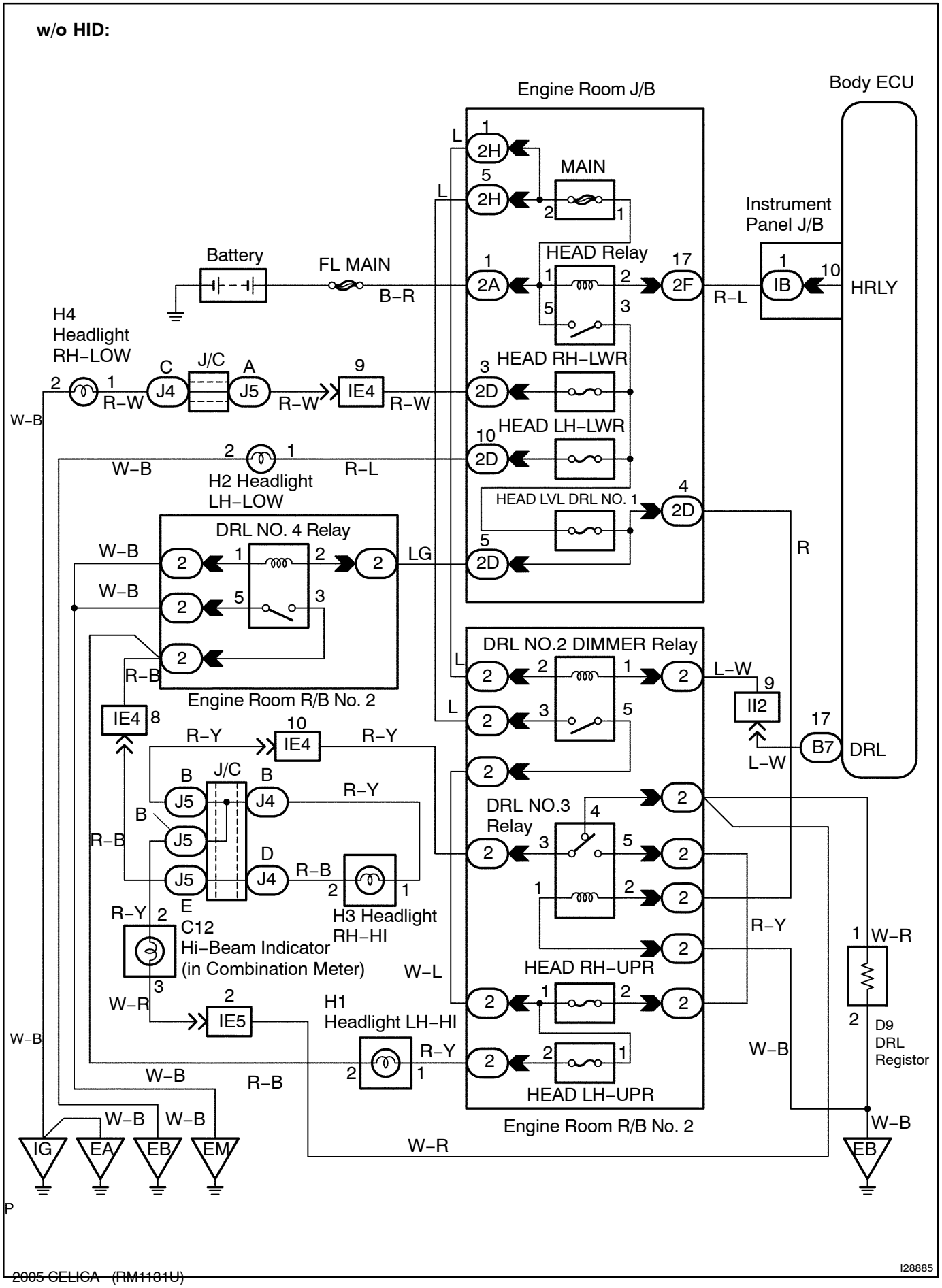
Daytime Running Light No. 2, No. 3, No. 4 Relay Circuit

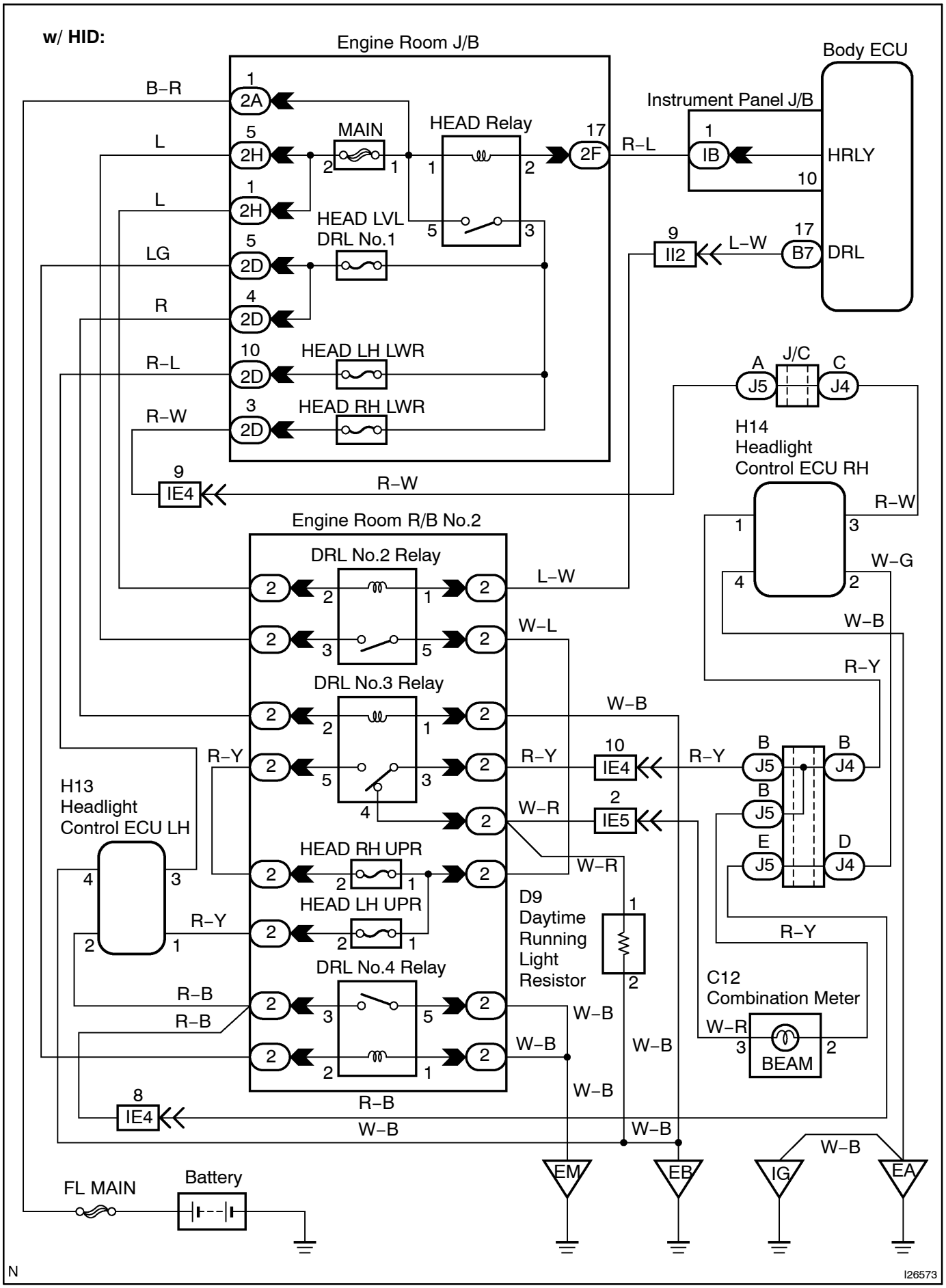
CIRCUIT DESCRIPTION

When the light control switch is set to OFF or TAIL after the following conditions are satisfied simultaneously with the ignition switch ON, the headlight comes on by control of the body ECU.

- The parking brake switch is OFF.
- The generator is ON (Engine running)

WIRING DIAGRAM




w/ HID:
Engine Room J/B
Body ECU
Instrument Panel J/B
B–R
L
L
LG
R
R–L
R–W
MAIN
HEAD Relay
HEAD LVL
DRL No.1
HEAD LH LWR
HEAD RH LWR
2A
2H
2H
2D
2D
2D
2D
2F
IB
HRLY
DRL
L–W
R–W
IE4
II2
B7
J/C
A
C
J5
J4
H14
Headlight
Control ECU RH
W–G
W–B
R–Y
Engine Room R/B No.2
DRL No.2 Relay
DRL No.3 Relay
DRL No.4 Relay
W–L
W–B
R–Y
W–R
HEAD RH UPR
HEAD LH UPR
H13
Headlight
Control ECU LH
IE5
D9
Daytime
Running
Light
Resistor
C12
Combination Meter
BEAM
R–B
W–B
FL MAIN
Battery
EM
EB
IG
EA
N
I26573

INSPECTION PROCEDURE

1	Check D.R.L. No. 2, No. 3, No. 4 relay (See page BE–18).

NG → Replace the D.R.L. No. 2 relay.

OK

2	Check wire harness and connector between D.R.L. No. 2 relay and Body ECU, battery and D.R.L. No. 2 relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

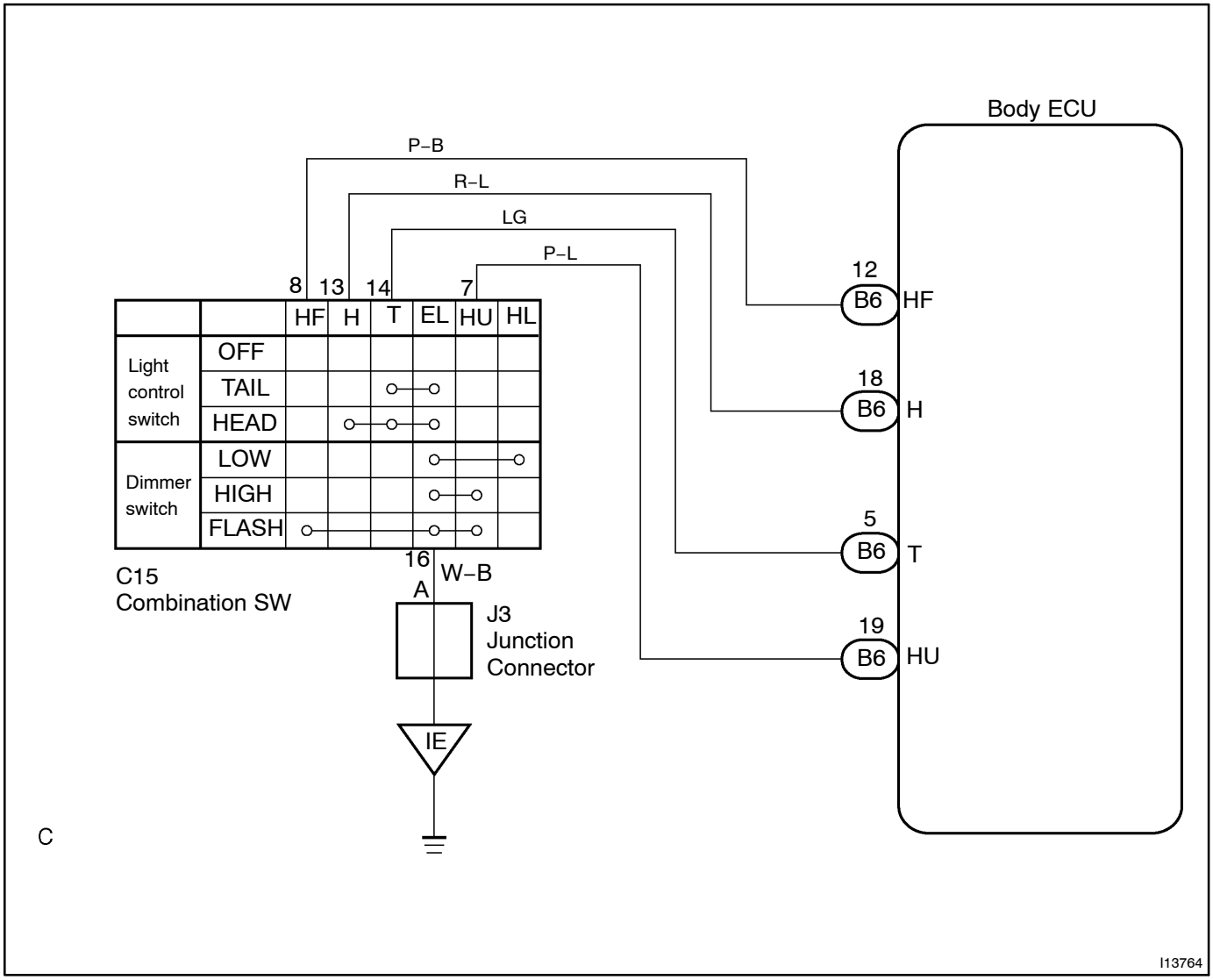
DI5VO–14

Light Control Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the light control switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check light control switch (See page BE–18).

NG → Replace the headlight control switch.

OK

2	Check wire harness and connector between headlight control switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

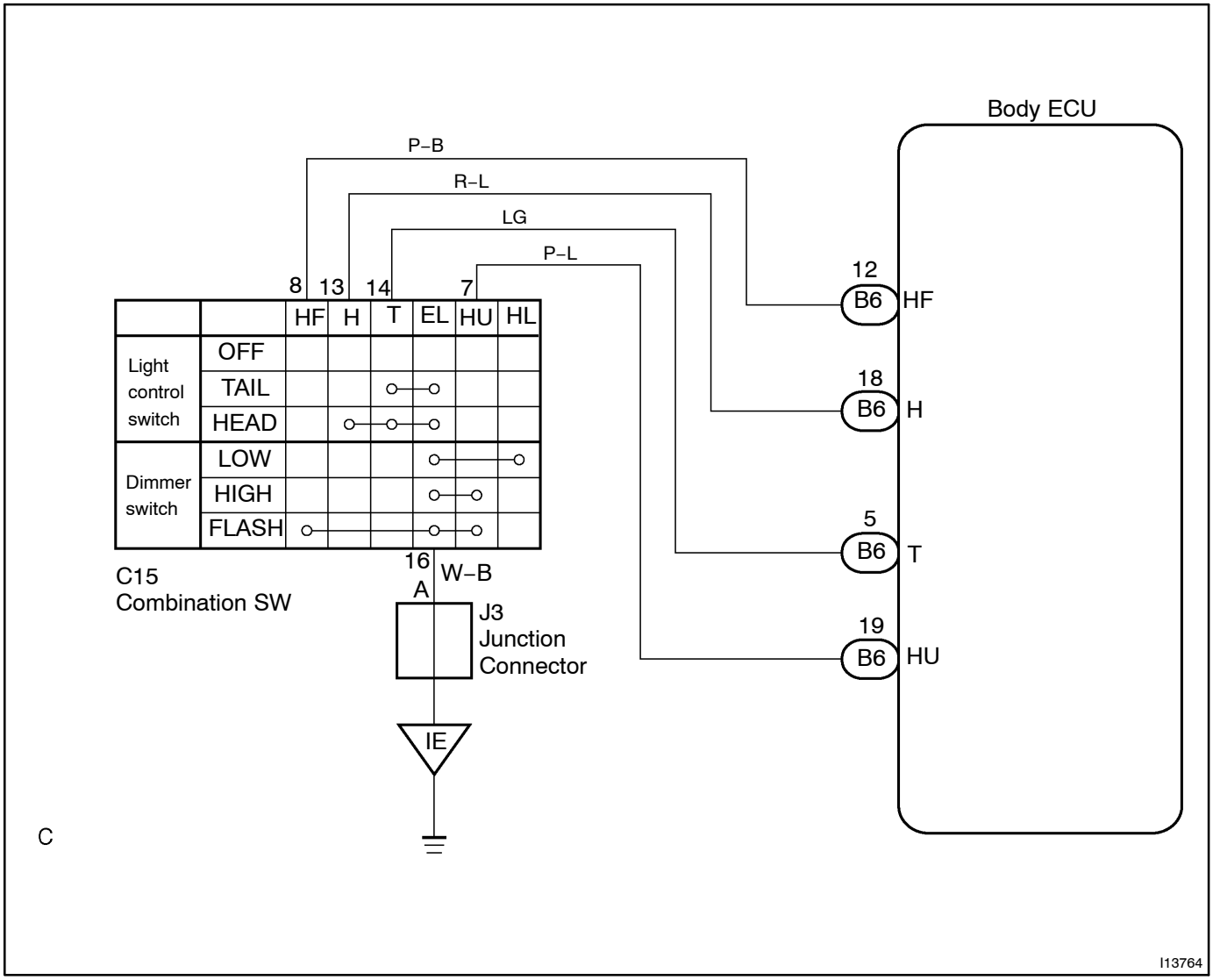
DI5VO–15

Headlight Dimmer Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the headlight dimmer switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check headlight dimmer switch (See page BE–18).

NG → Replace the headlight dimmer switch.

OK

2	Check wire harness and connector between headlight dimmer switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

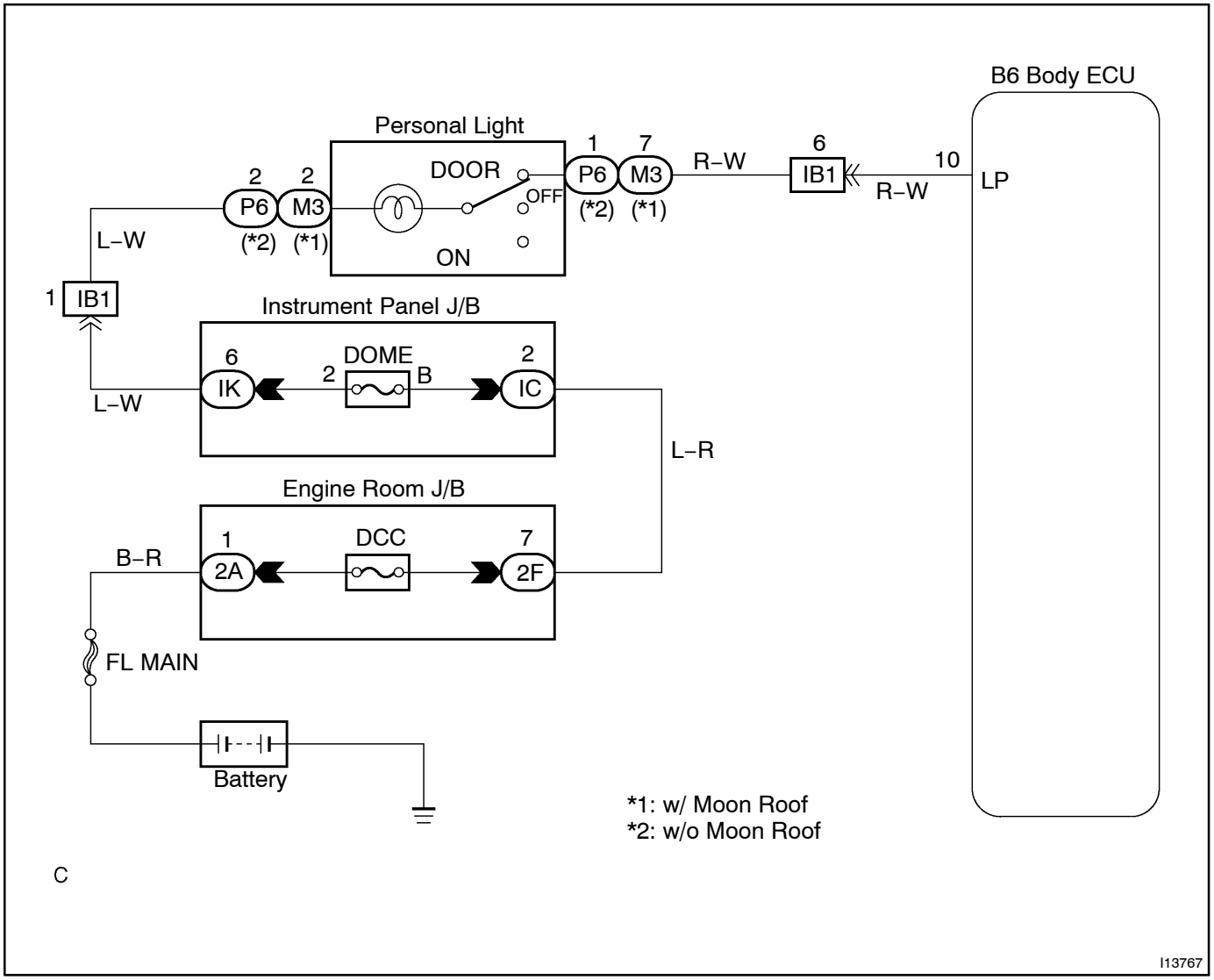
DI6R0–04

Illumination Circuit

CIRCUIT DESCRIPTION

Receiving the courtesy signal from the Body ECU will make the interior light, the ignition light and the courtesy light to come on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check DOME fuse.

NG → Replace the fuse.

OK

2	Check illumination light (See page BE–32).

NG → Replace the failure light.

OK

3	Check wire harness and connector between each illumination light and Body ECU, battery and each illumination light (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

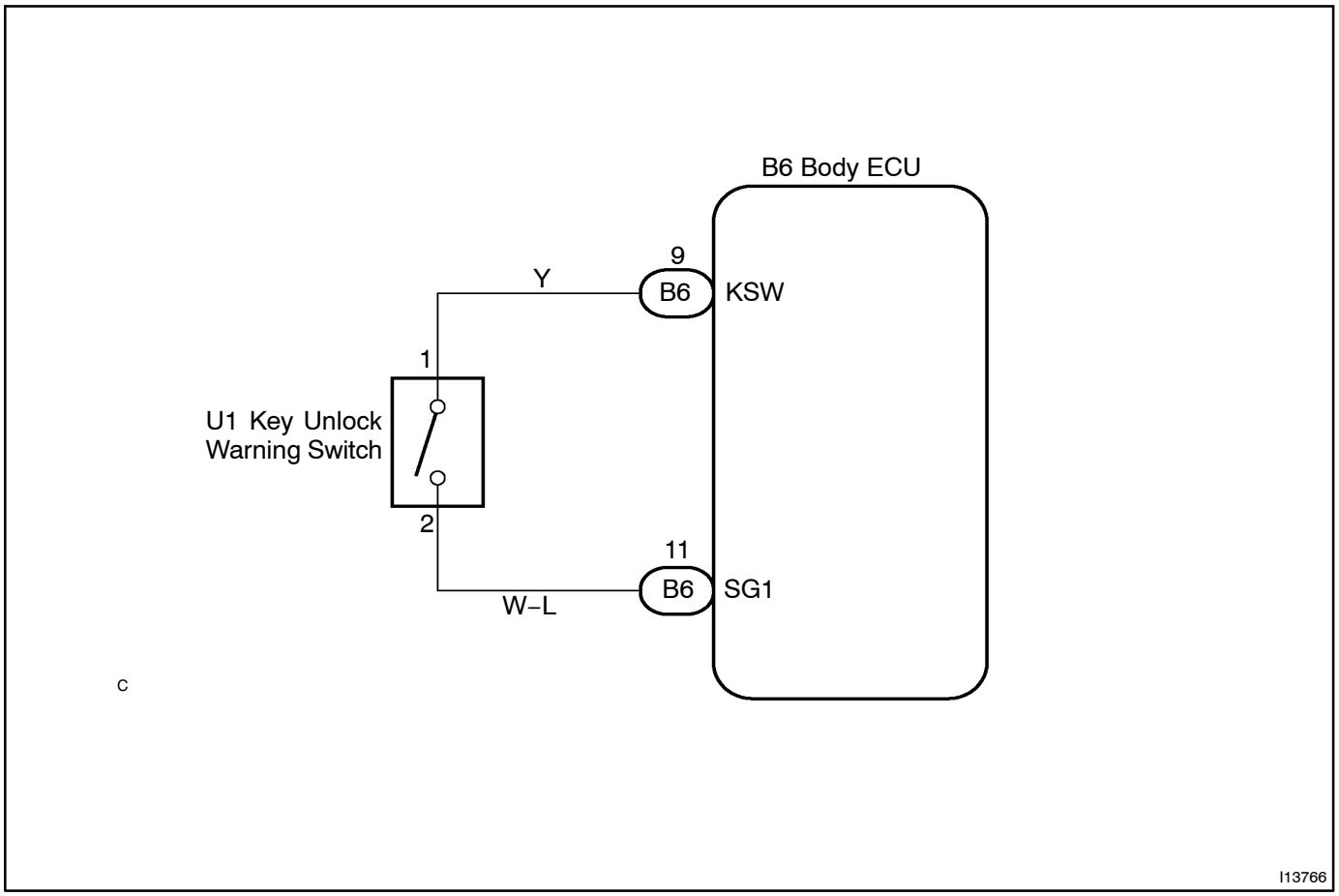
DI6R1–06

Key Unlock Warning Switch Circuit

CIRCUIT DESCRIPTION

The key unlock warning switch comes on when the ignition key is inserted in the key cylinder and goes off when the ignition key is removed.
ECU operates the key confinement prevention function while the key unlock warning switch is on.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check key unlock warning switch (See page BE–15).

NG → Replace the key unlock warning switch.

OK

2	Check wire harness and connector between key unlock warning switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

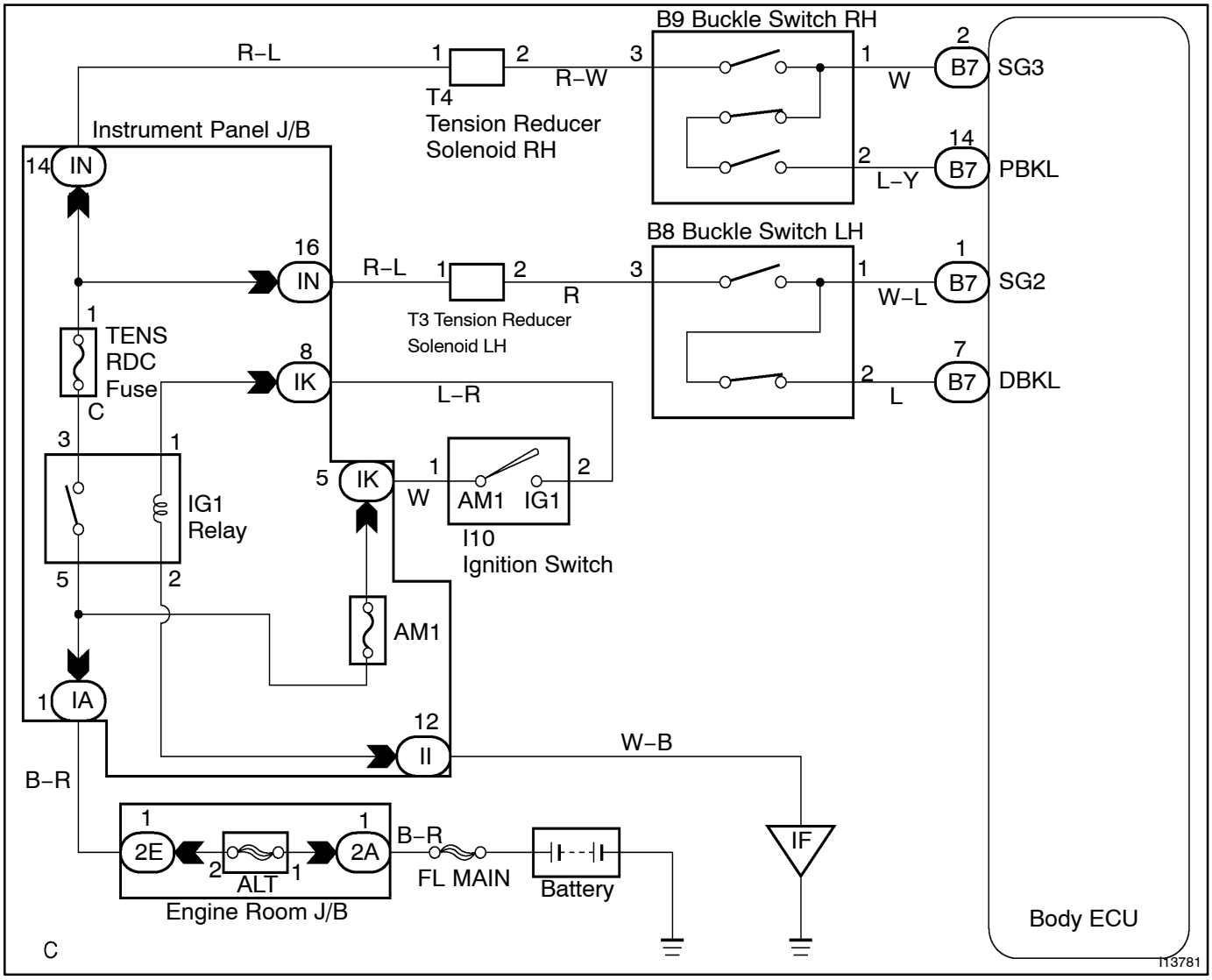
DI6R2–07

Driver Buckle Switch Circuit

CIRCUIT DESCRIPTION

When the buckle switch of the driver's seat is ON with the ignition switch ON, the body ECU sends a signal to turn on the seat belt warning light for the driver's seat and to sound a buzzer.
When the buckle switch of the passenger seat is ON and the passenger seat belt occupant detecting sensor is ON with the ignition switch ON, the body ECU sends a signal to turn on the seat belt warning light for the passenger seat.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check buckle switch (See page BE–50).

NG → Replace the buckle switch.

OK

2	Check wire harness and connector between buckle switch and body ground (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

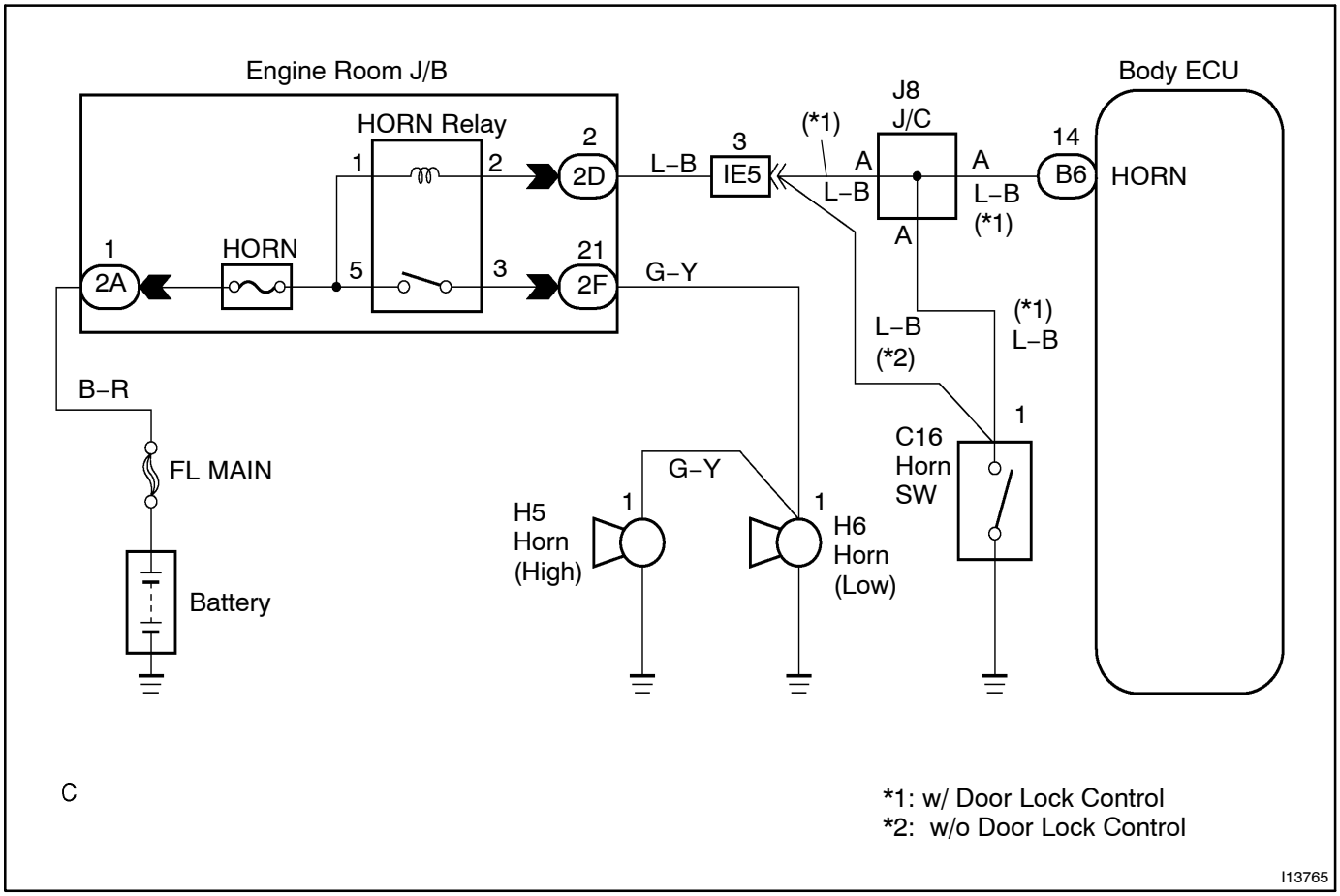
DI2A3–11

Horn Circuit

CIRCUIT DESCRIPTION

The horn is connected to and activated by the body ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check horn (See page BE–131).

NG → Replace the horn.

OK

2	Check wire harness and connector between horn relay and body ECU, battery and horn relay (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

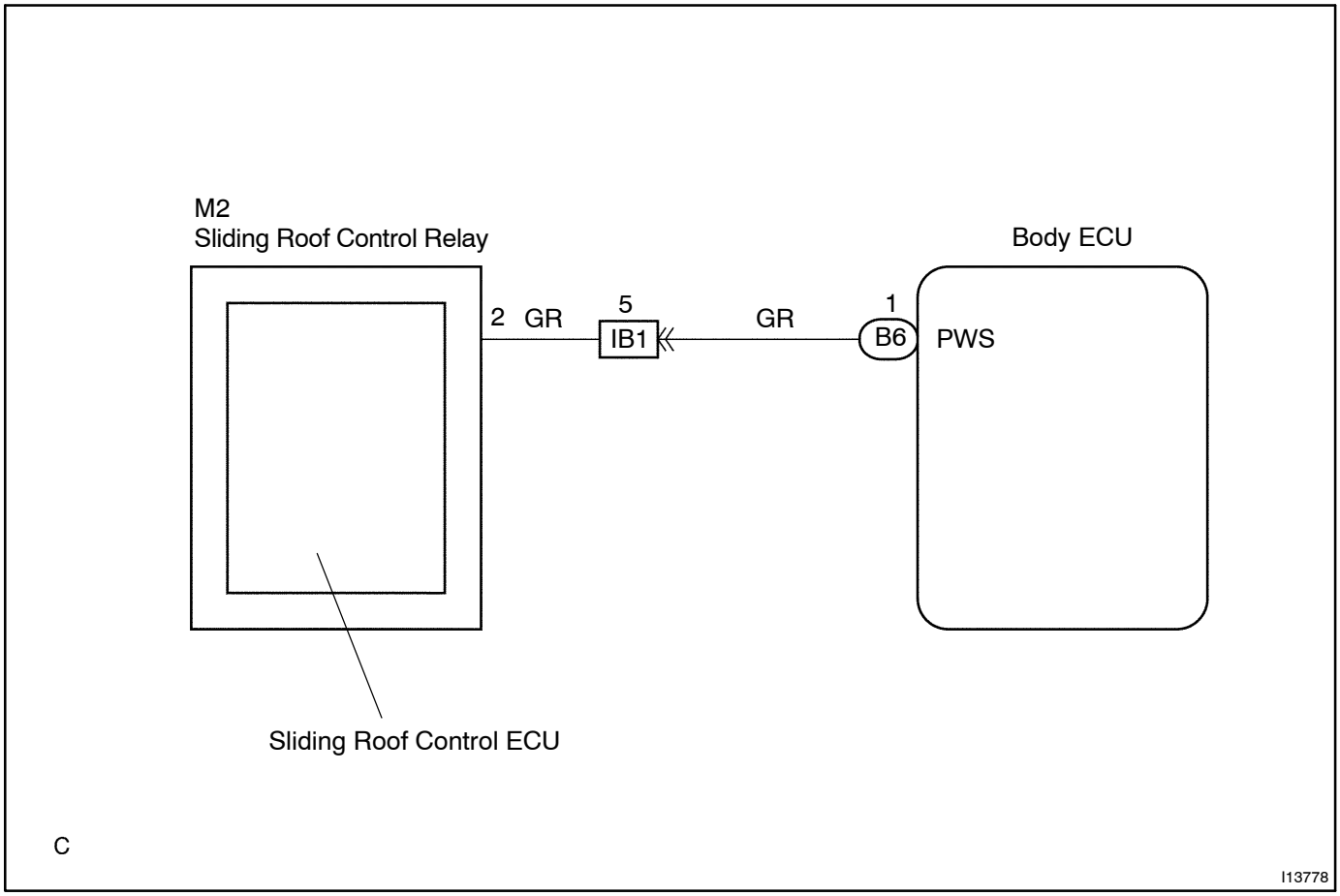
DI5W4–06

PWS Circuit

CIRCUIT DESCRIPTION

The body ECU operates the power window and the sliding roof when the ignition switch is ON or within 43 sec. after the ignition switch is turned OFF or until the driver's side door is opened in that period.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check wire harness and connector between sliding roof control assembly and Body ECU (See page IN–30).**

NG → **Repair or replace wire harness or connector.**

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

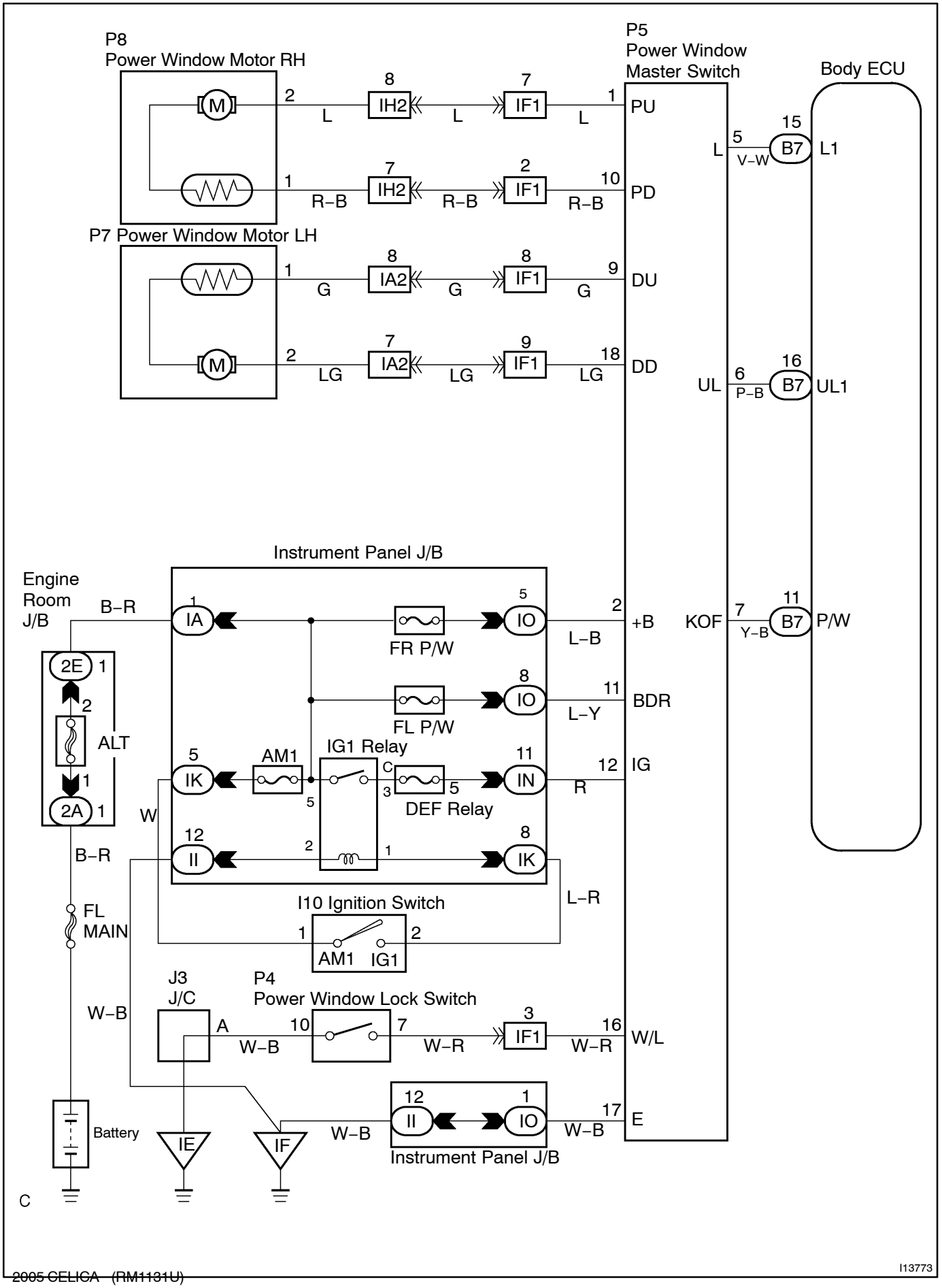
DI6R3–04

Power Window Master Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the power window master switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check the power window master switch (See page BE–62).

NG → Replace the power window master switch.

OK

2	Check wire harness and connector between power window master switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

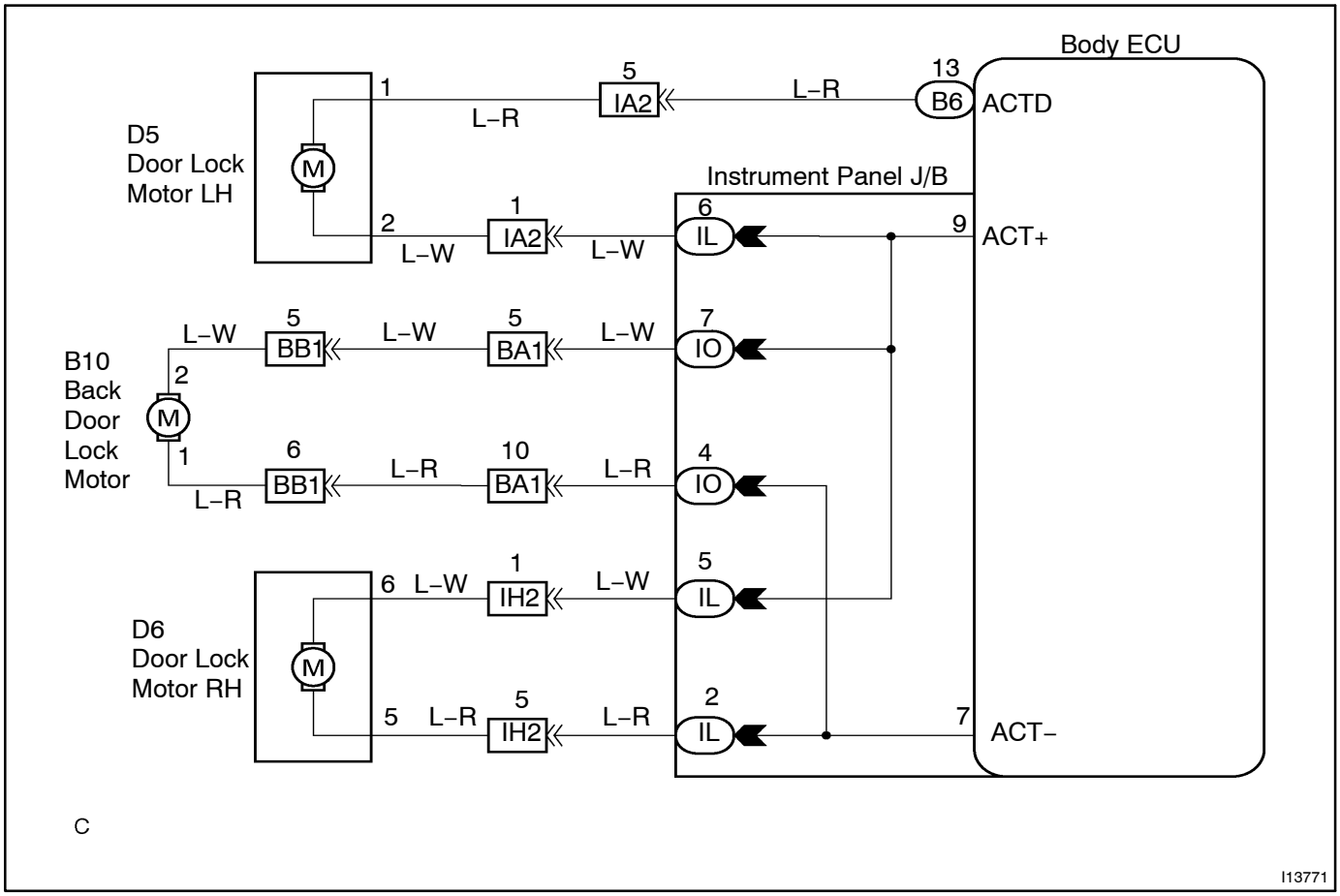
DI6R4–07

Door Lock Motor Circuit

CIRCUIT DESCRIPTION

When the door switch is set to LOCK, the body ECU outputs a signal to lock all of the doors.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check door lock motor (See page BE–66).

NG → Replace the door lock motor.

OK

2	Check wire harness and connector between door lock motor and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

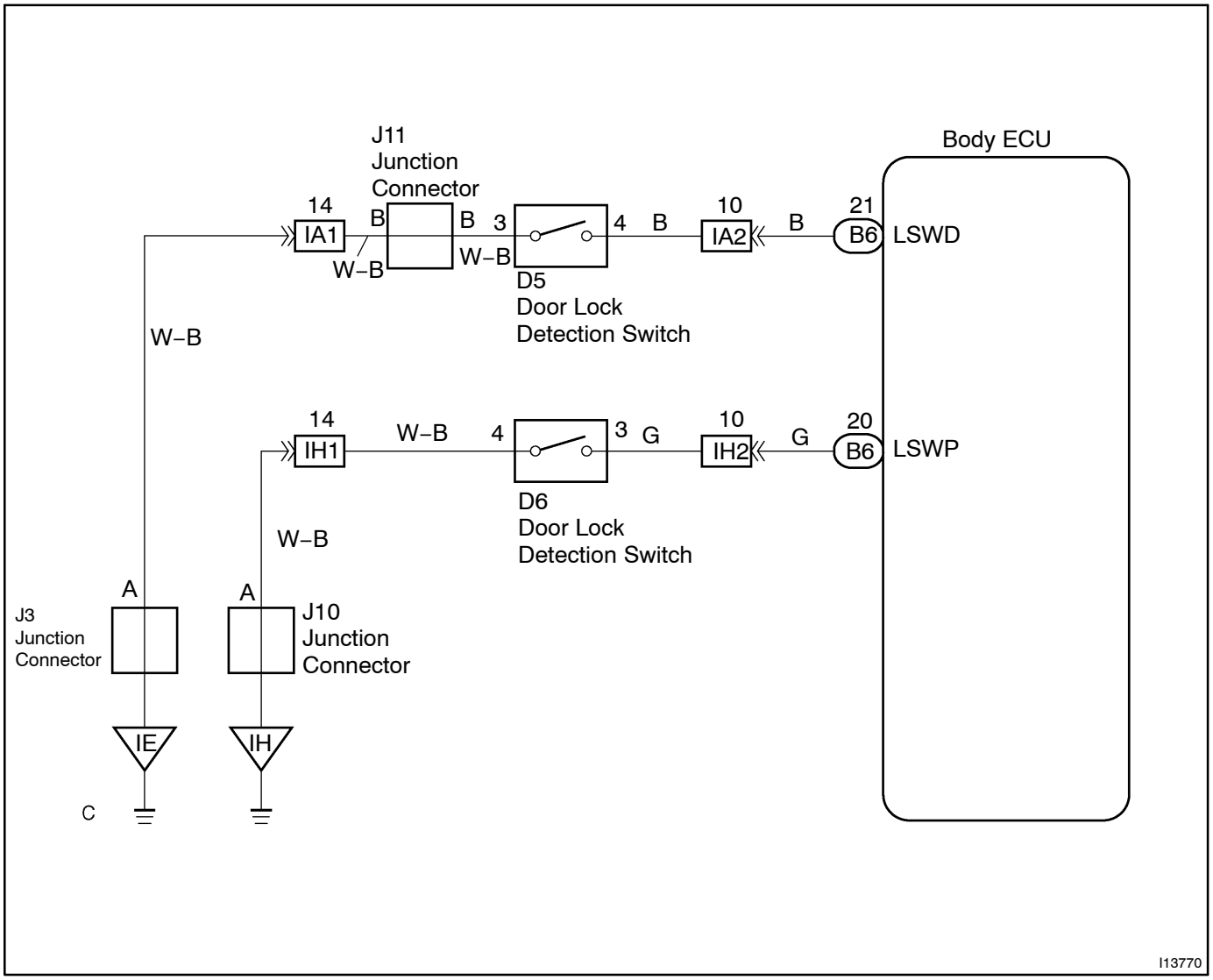
DI6R5–09

Door Unlock Detection Switch Circuit

CIRCUIT DESCRIPTION

The door unlock detection switch is built in the door lock motor assembly. This switch is ON when the door lock knob is in the unlock position and OFF when the lock knob is in the lock position. The ECU detects the door lock knob conditions in this circuit. This system is used as one of the operating conditions for the key confinement prevention function.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check door unlock detection switch (See page BE–66).

NG → Replace the door unlock detection switch.

OK

2	Check wire harness and connector between door unlock detection switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

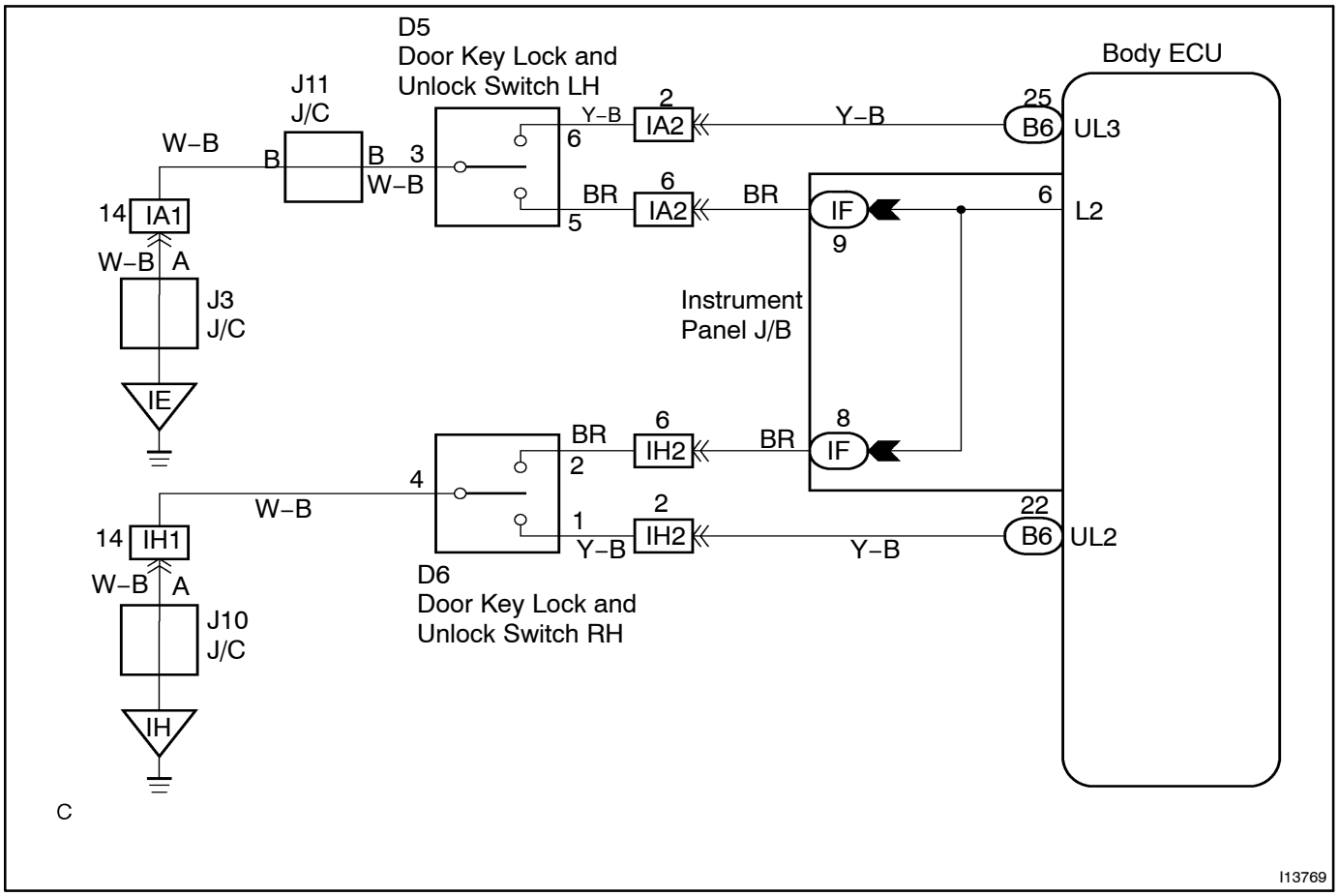
DI6R6–09

Door Key Lock and Unlock Switch Circuit

CIRCUIT DESCRIPTION

The door key lock and unlock switch are built in the door key cylinder. When the key is turned to the lock side, terminal 3 of the switch is grounded and when the key is turned to the unlock side, terminal 2 of the switch is grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check the door key lock and unlock switch (See page BE–66).

NG → Replace the door key lock and unlock switch.

NG

2	Check wire harness and connector between door key lock and unlock switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

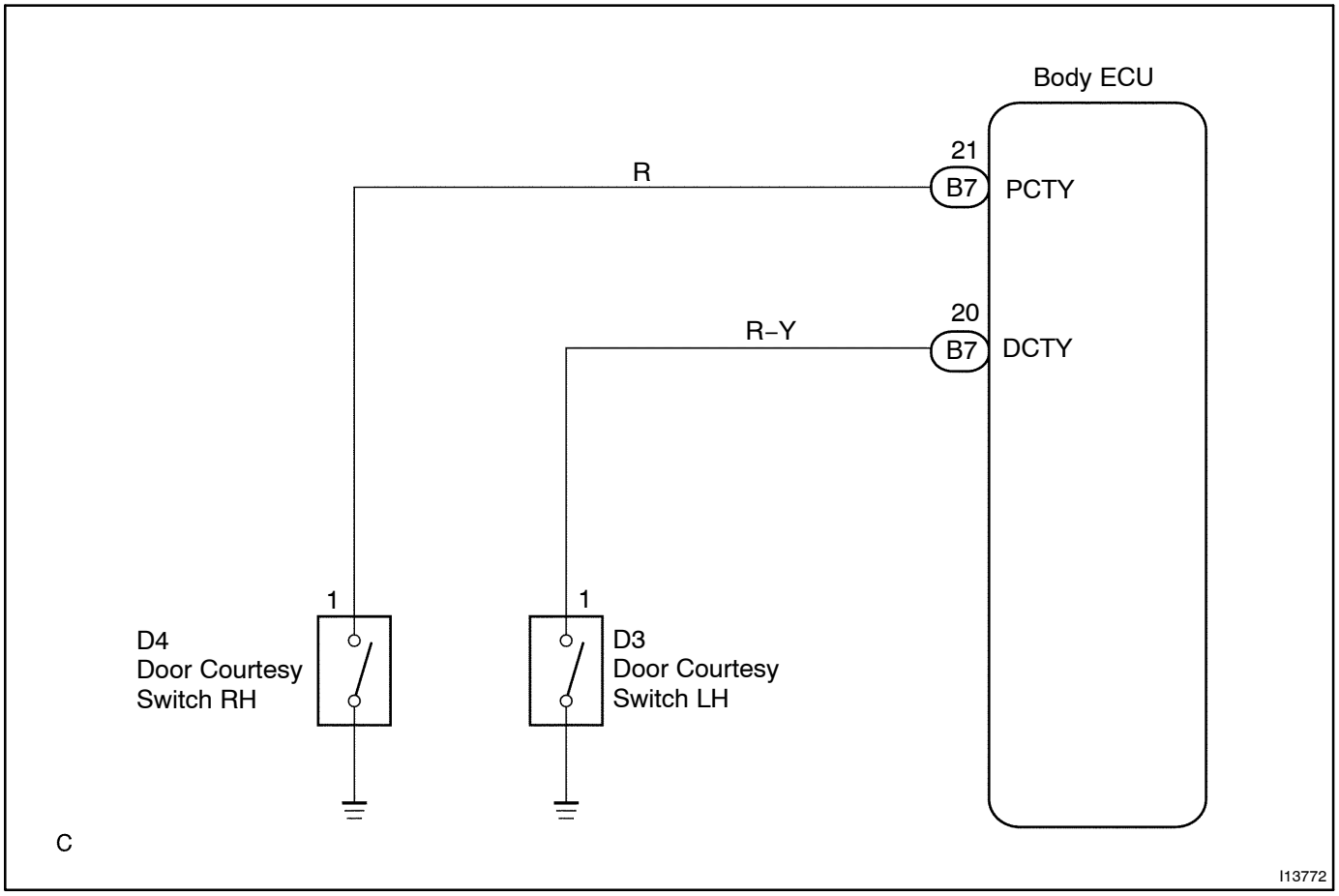
DI6R7–07

Door Courtesy Switch Circuit

CIRCUIT DESCRIPTION

The door courtesy switch comes on when the door is opened and goes off when door is closed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check courtesy switch (See page BE–32).

NG → Replace the courtesy switch.

OK

2	Check that there is a grounding malfunction caused by looseness of the tighten screw.

NG → Install screw.

OK

3	Check wire harness and connector between courtesy light and body ECU, courtesy switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

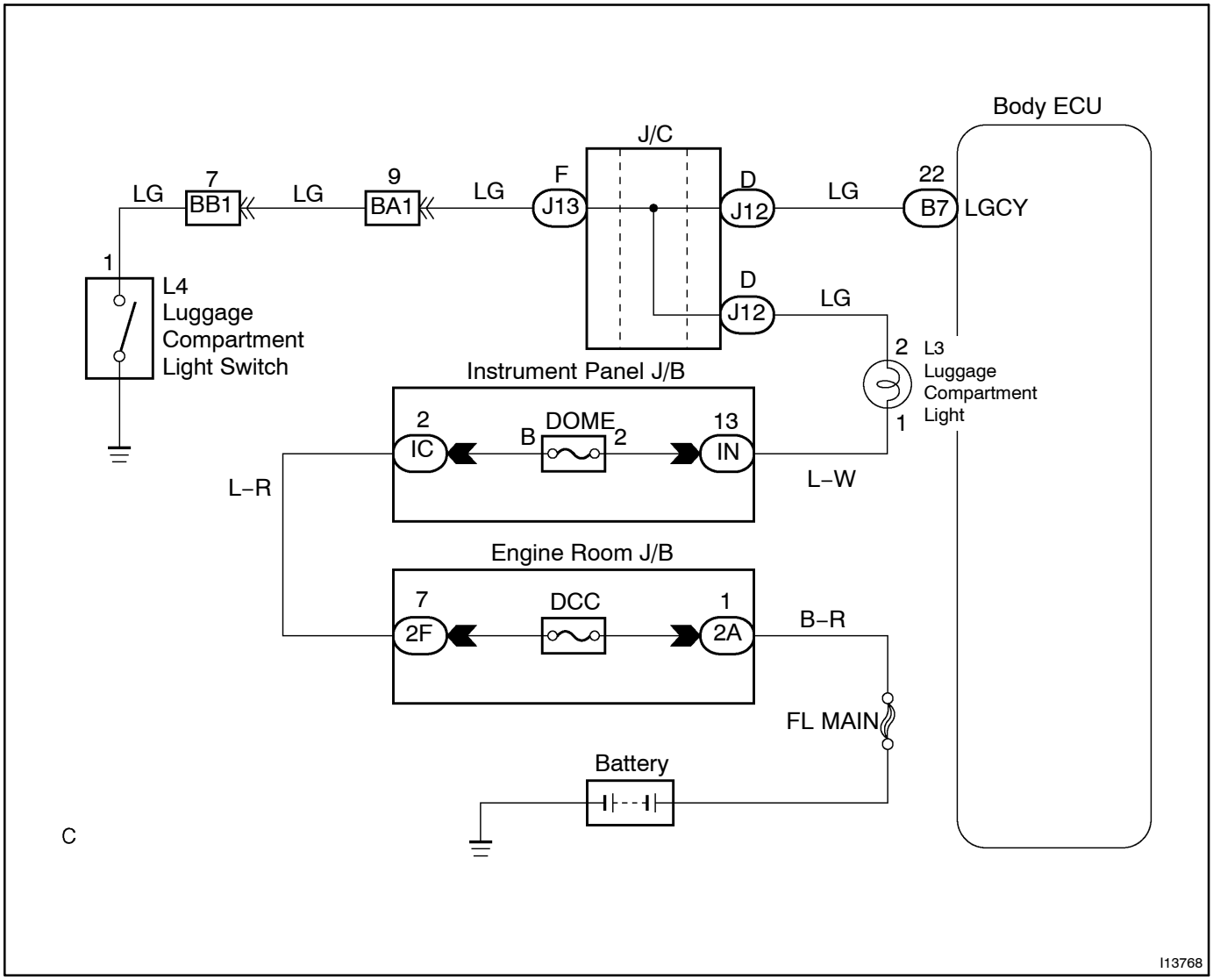
DI6R8–05

Luggage Courtesy Switch Circuit

CIRCUIT DESCRIPTION

The luggage courtesy switch comes on when luggage compartment door is opened and goes off when luggage compartment door is closed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check luggage courtesy switch (See page BE–32).

NG → Replace the luggage courtesy switch.

OK

2	Check wire harness and connector between luggage courtesy switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

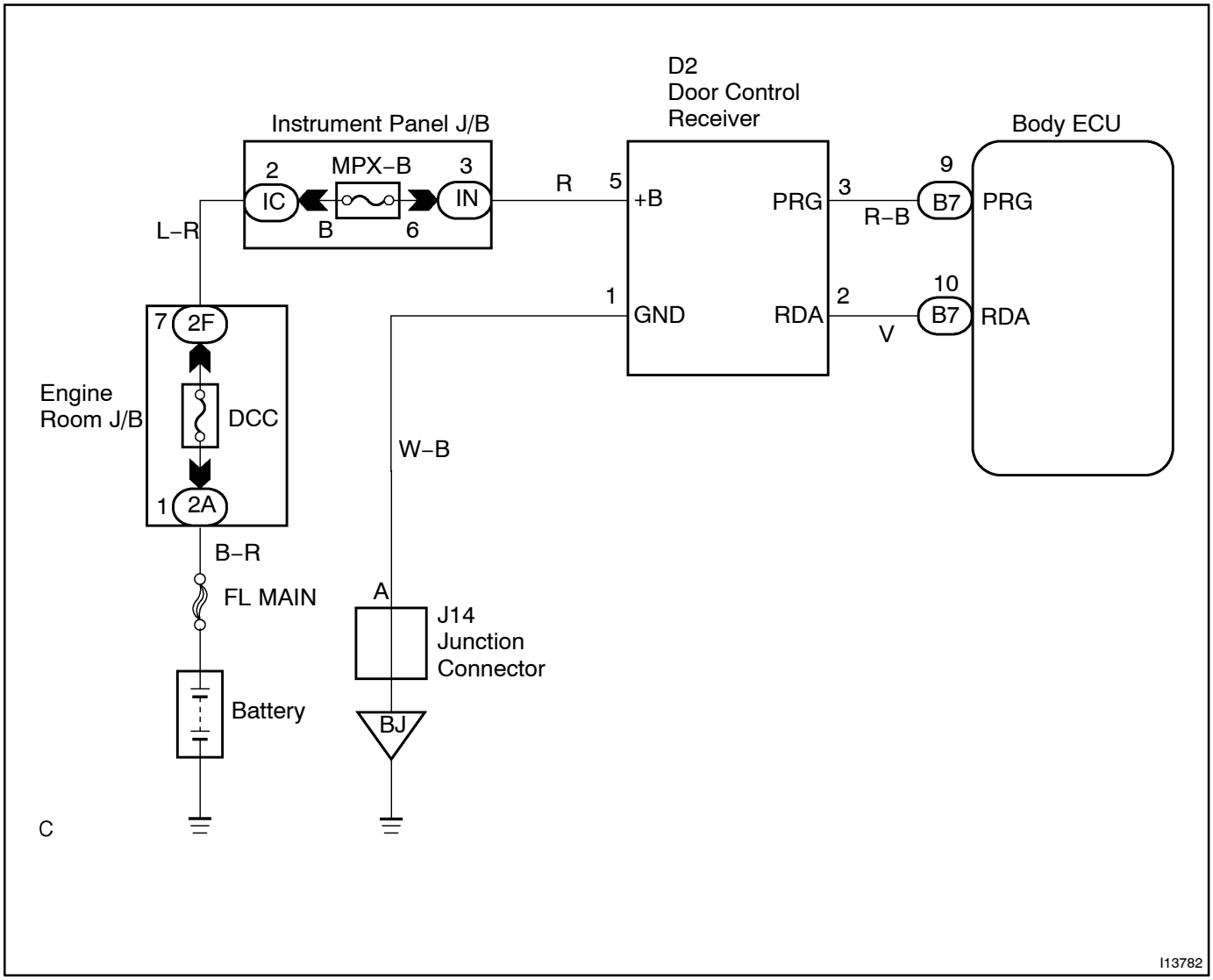
DI6R9–06

Wireless Door Lock Tuner Circuit

CIRCUIT DESCRIPTION

The signal from the transmitter will be input to the body ECU through RDA line. RDA line is diagnosed by the Body ECU, so check DTC also in case of the failure of the wireless function.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check wire harness.**

PREPARATION:

Disconnect connectors of the wireless door lock tuner and the Body ECU.

CHECK:

Check continuity between terminal PRG of the wireless door lock tuner and PRG of Body ECU.

OK:

Continuity

NG → **Repair or replace wire harness.**

OK

2	**Check the wireless door lock tuner.**

CHECK:

Replace the wireless door lock tuner and check if it recovers normally.

OK:

Must be recovered normally.

NG → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).**

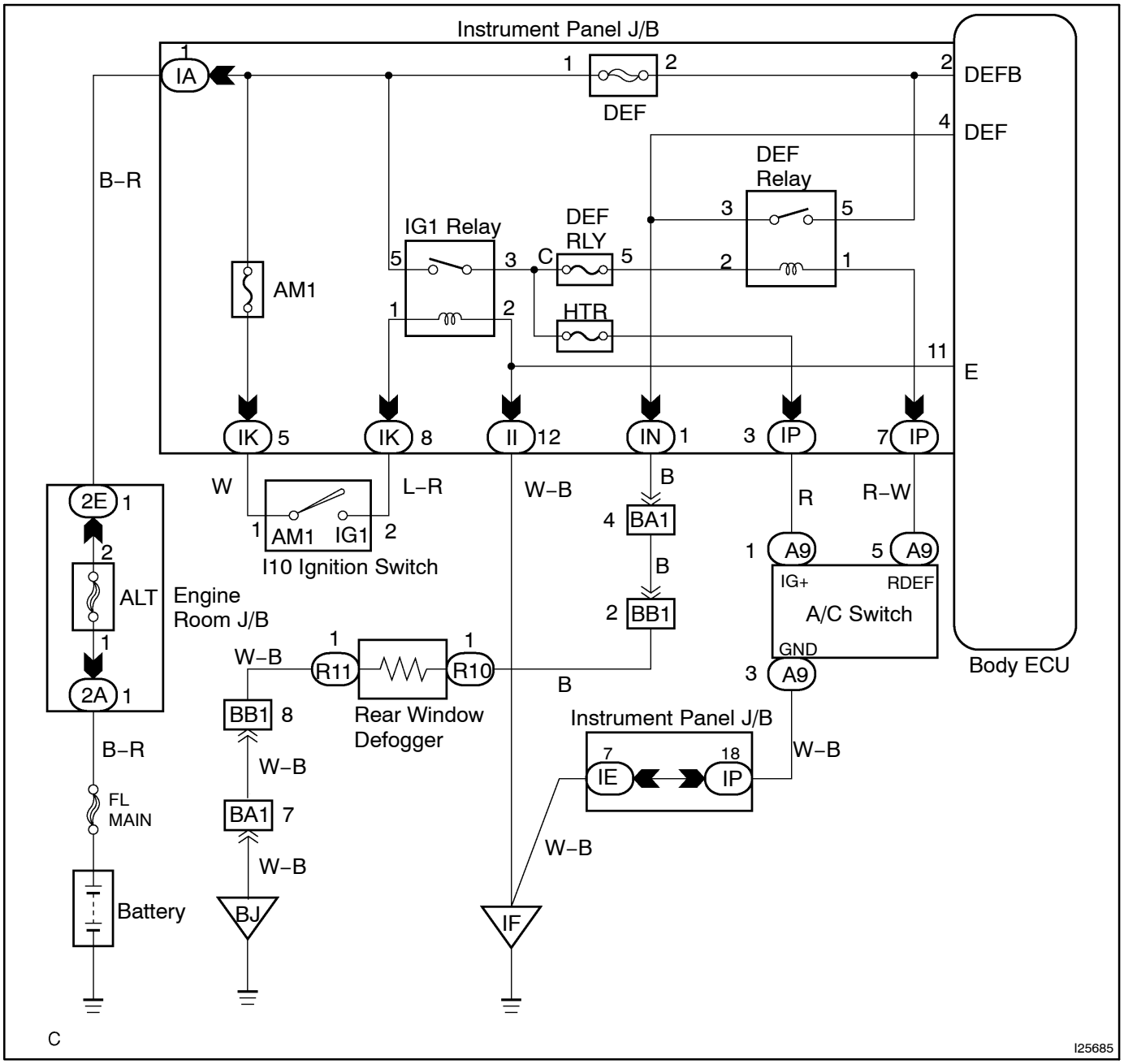
OK

Failure of the original wireless door lock tuner.

DI6RA–05

Rear Defogger Relay Circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check rear defogger relay (See page BE–58).

NG → Replace the rear defogger relay.

OK

2	Check wire harness and connector between rear defogger relay and body ECU, front defogger relay and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

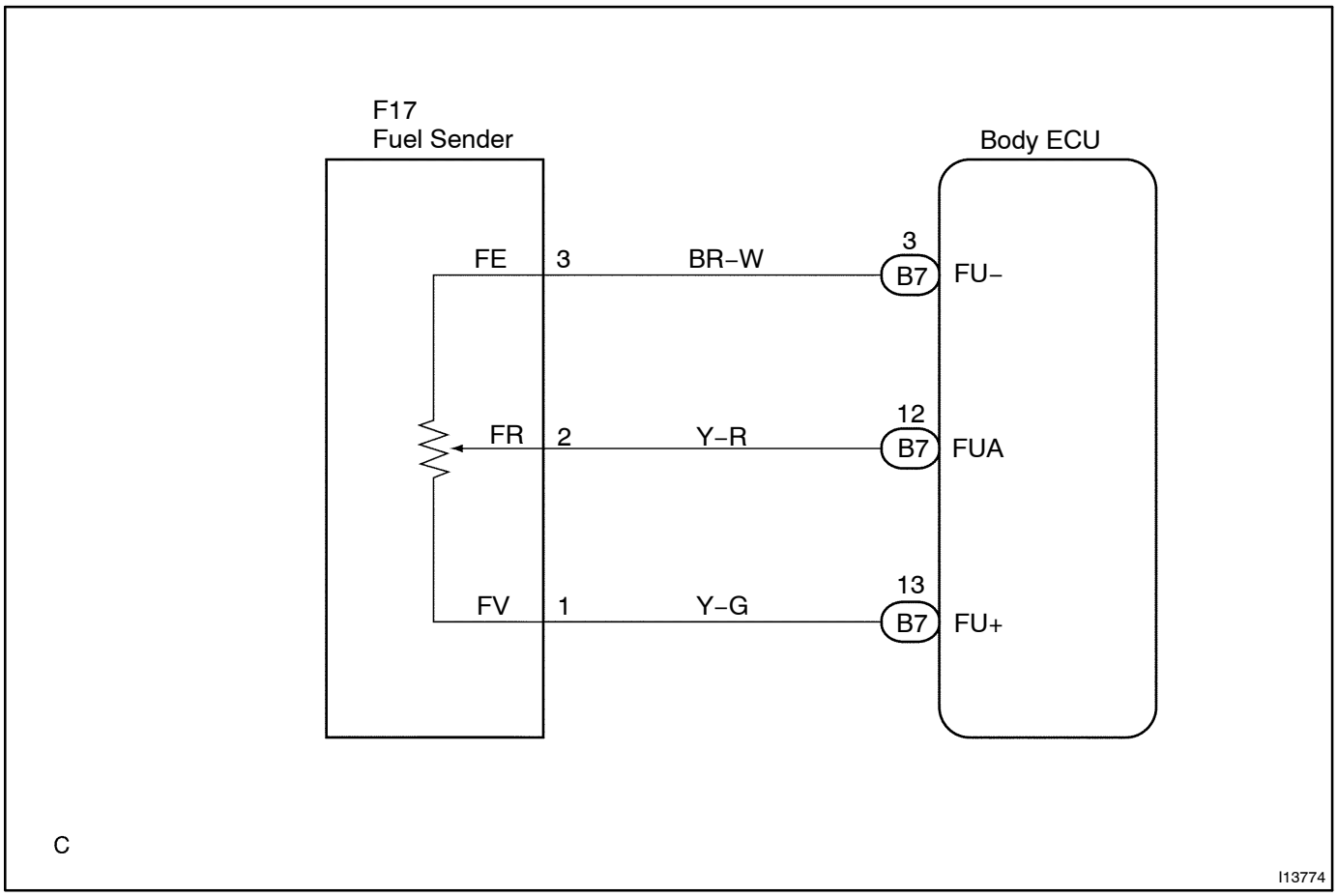
DI6RB–04

Fuel Sender Gauge Circuit

CIRCUIT DESCRIPTION

This circuit detects sensor signals from the fuel sender gauge.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check fuel sender gauge (See page BE–50).

NG → Replace the fuel sender gauge.

OK

2	Check wire harness and connector between fuel sender gauge and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

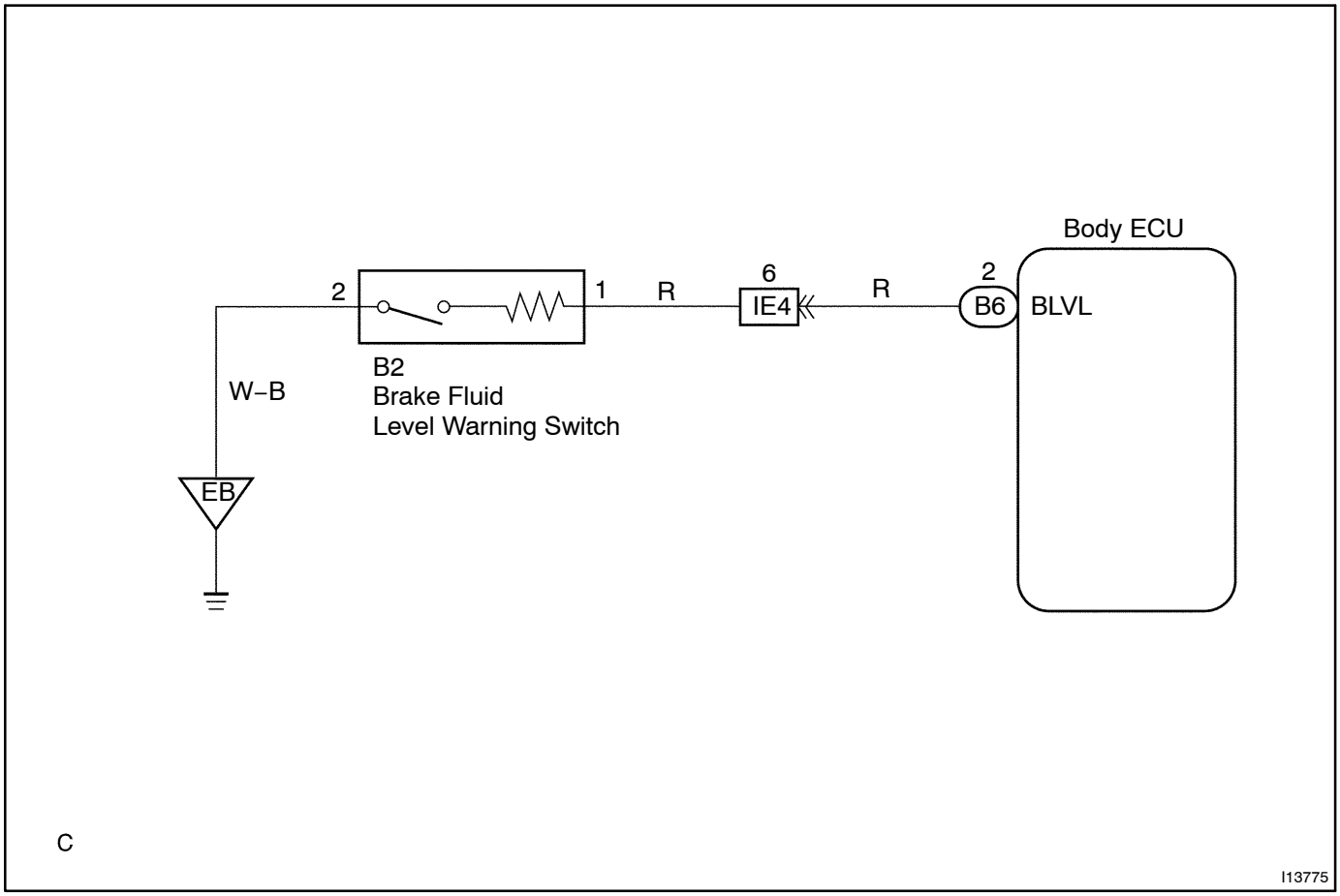
DI2AJ–11

Brake Fluid Level Warning Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects abnormality of the brake fluid level.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check brake fluid level warning switch (See page BE–50).

NG → Replace the brake fluid level warning switch.

OK

2	Check wire harness and connector between brake fluid level warning switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

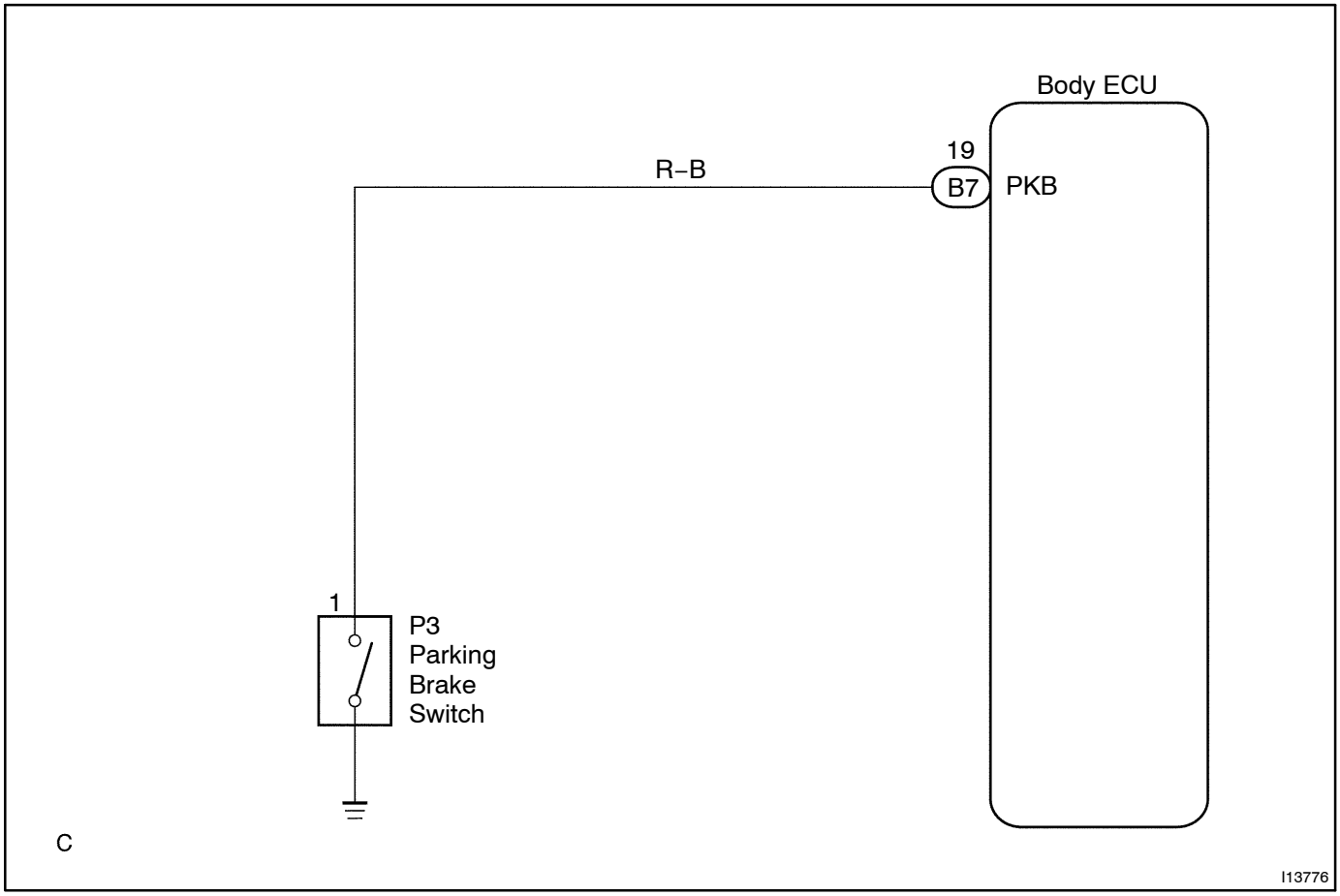
DI5W2–06

Parking Brake Switch Circuit

CIRCUIT DESCRIPTION

This circuit detects the state of the parking brake switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check parking brake switch (See page BE–50).

NG → Replace the parking brake switch.

OK

2	Check wire harness and connector between parking brake switch and Body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

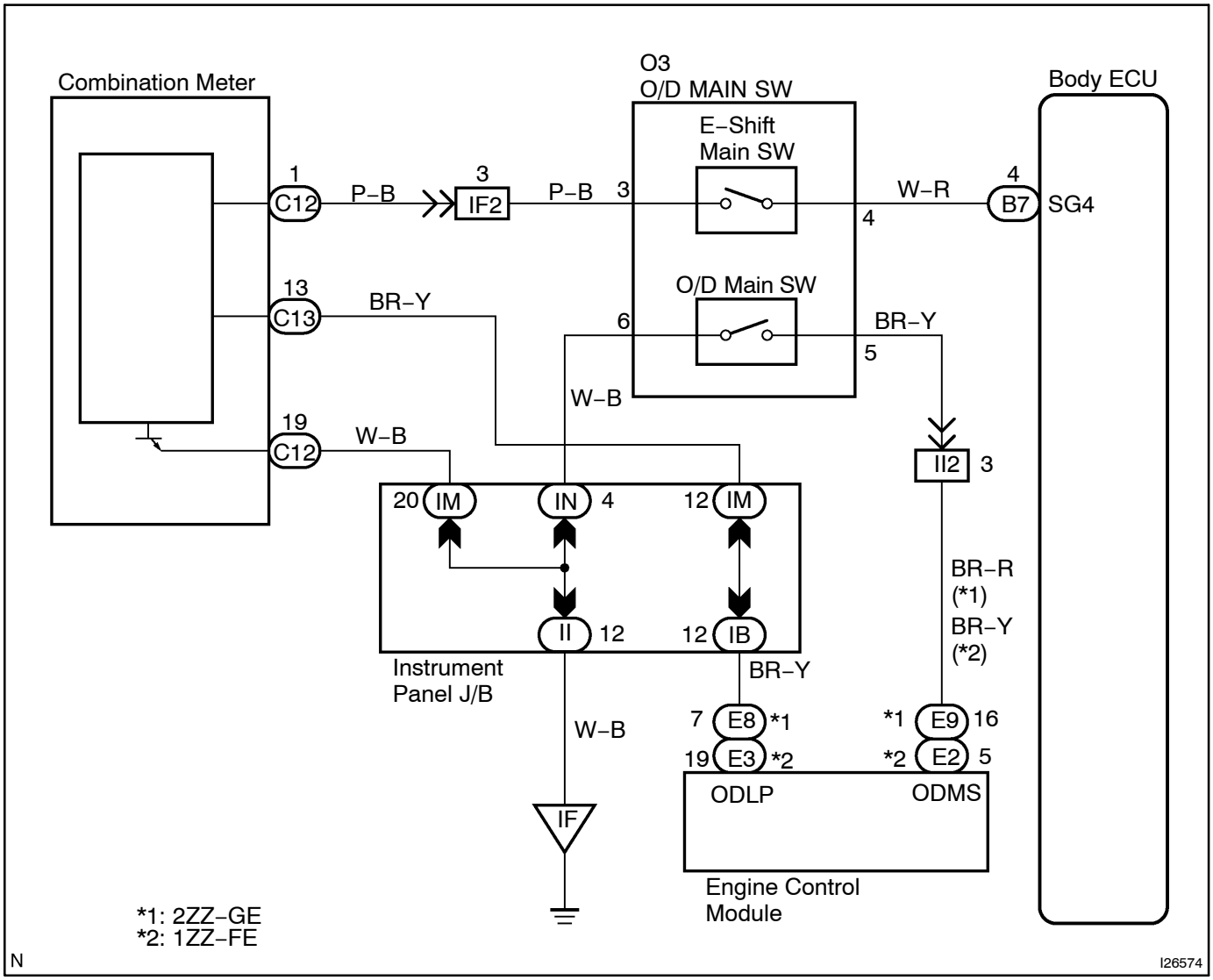
DI29Z–11

O/D Main Switch Circuit

CIRCUIT DESCRIPTION

The body ECU detects the state of O/D main switch.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check O/D main switch (See page DI–746, DI–829).

NG → Replace the O/D main switch.

OK

2	Check wire harness and connector between O/D main switch and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page DI–1124).

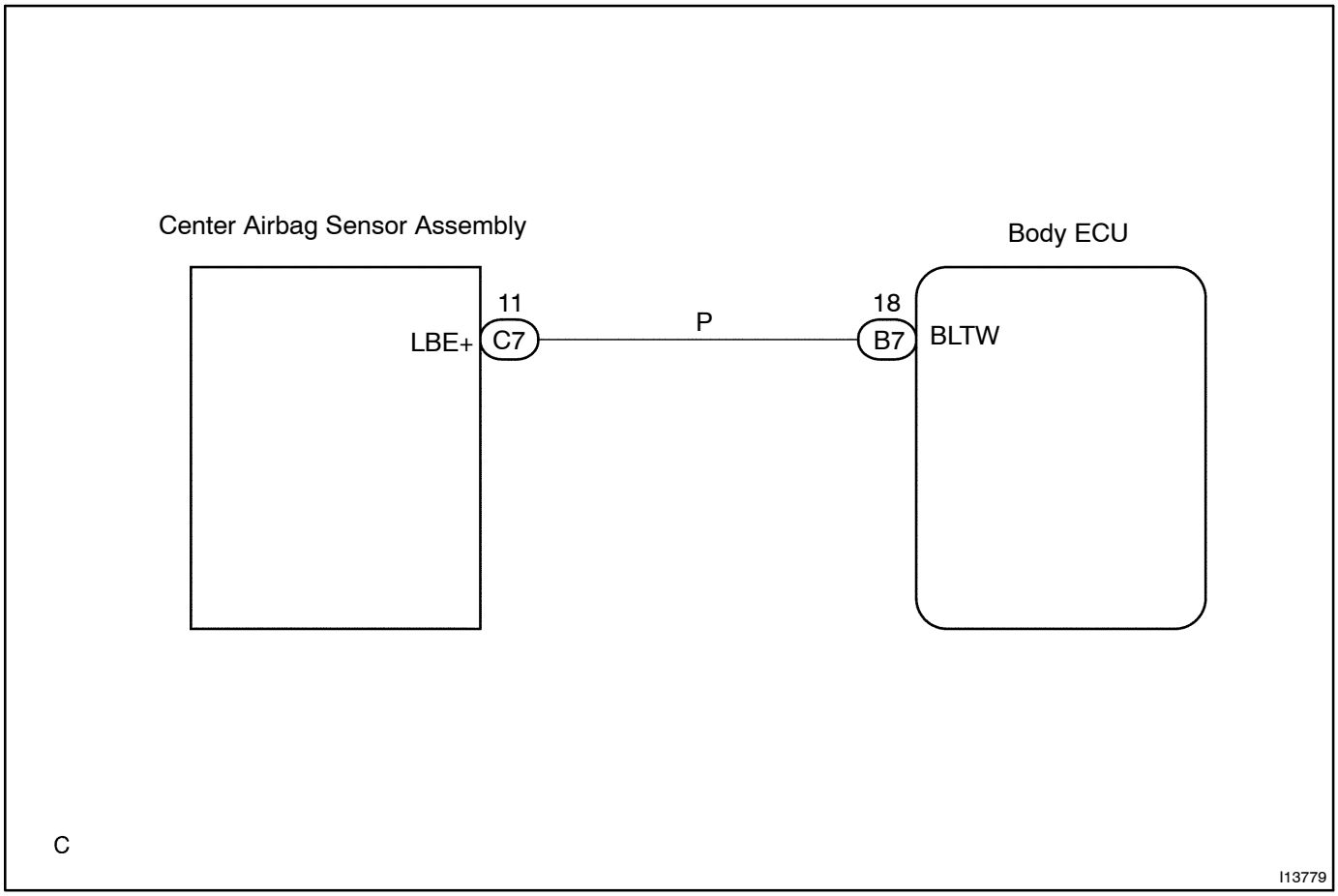
DI1T3–07

Airbag Sensor Assembly Communication Circuit

CIRCUIT DESCRIPTION

Signals received at the body ECU, such as the passenger seat occupant detection sensor signal, are transmitted to the airbag sensor assembly.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check for open and short in wire harness and connector between body ECU and airbag sensor assembly (See page IN–30).**

NG → **Repair or replace wire harness and connector.**

OK

2	**Check the airbag sensor assembly (See page DI–882).**

NG → **Replace the airbag sensor assembly.**

OK

Replace the body ECU.

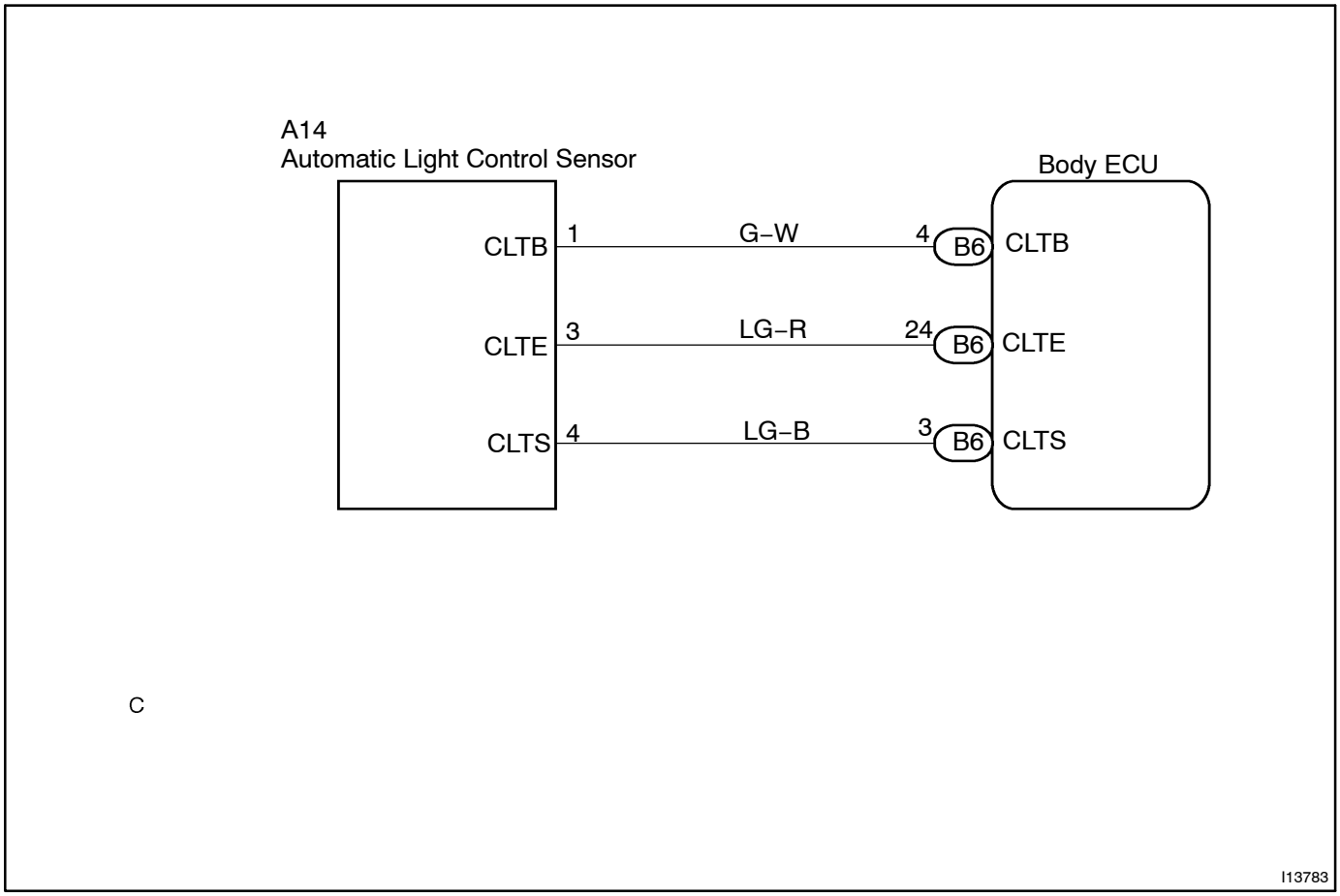
DI1SU–06

Light Sensor Circuit

CIRCUIT DESCRIPTION

This circuit detects signals output from the light control sensor.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check light sensor (See page BE–18).

NG → Replace the light sensor.

OK

2	Check wire harness and connector between light sensor and body ECU (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Replace the body ECU.

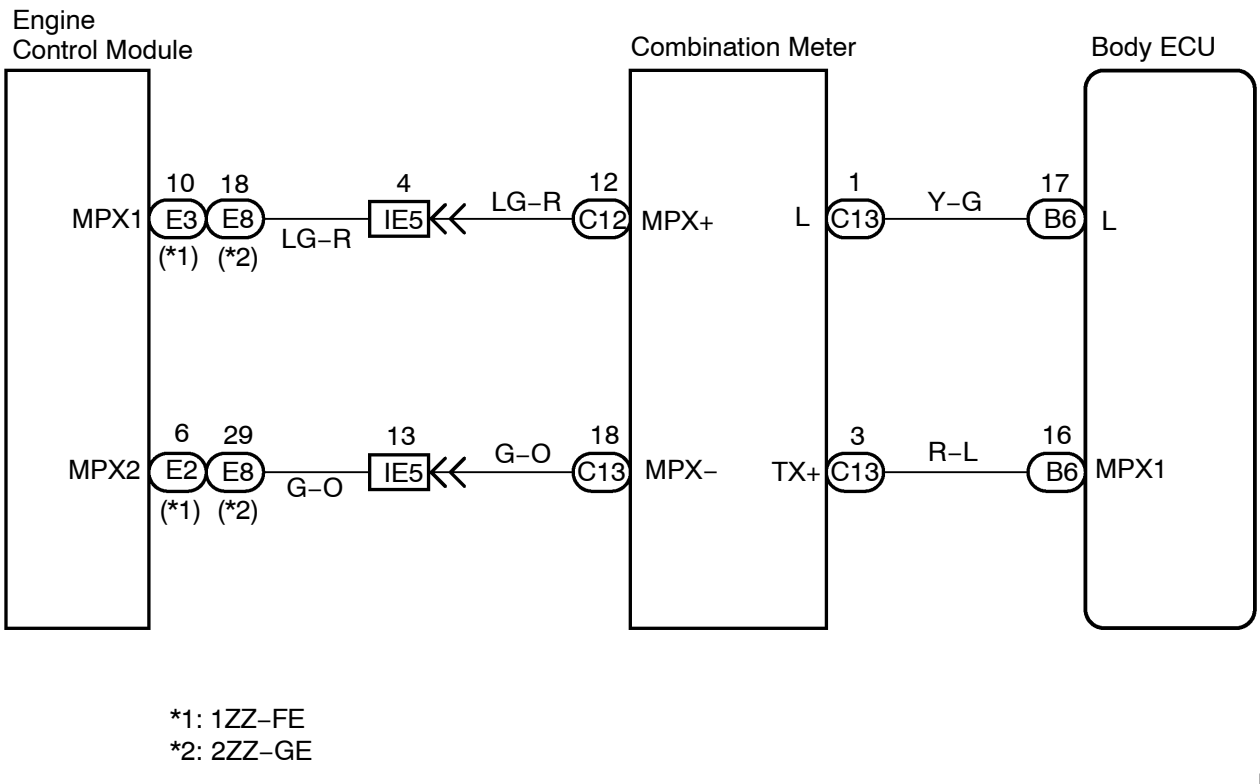
DI6RC–04

Multiplex Communication Circuit

CIRCUIT DESCRIPTION

Signals are transmitted between ECM and the combination meter through the communication circuit.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ECM (See page DI–1).

NG → Replace the ECM.

OK

2	Check combination meter (See page BE–50).

NG → Replace the combination meter.

OK

3	Check wire harness and connector between combination meter and body ECU, ECM and combination meter (See page IN–30).

NG → Repair or replace wire harness or connector.

OK

Replace the body ECU.

CO/HC

INSPECTION

EM05J–22

HINT:

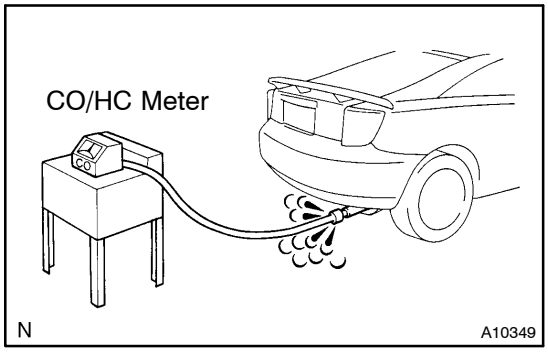
This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INSTALL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) Air pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
(f) SFI system wiring connectors fully plugged
(g) Ignition timing check correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

Complete the measuring with 3 minutes.

HINT:

When doing the 2 mode (idle and 2,500 rpm) test, these measurement order prescribed by the applicable local regulations.

If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.

- Check heated oxygen sensor operation (See page DI–112 or DI–411).
- See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Problems	Causes
Normal	High	Rough idle	4. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords 5. Incorrect valve clearance 6. Leaky intake and exhaust valves 7. Leaky cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hoses • Intake manifold • Throttle body • IAC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI systems: • Faulty pressure regulator • Defective ECT sensor • Defective IAT sensor • Faulty ECM • Faulty injectors • Faulty throttle position sensor

COMPRESSION

INSPECTION

EM05K–18

HINT:

If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

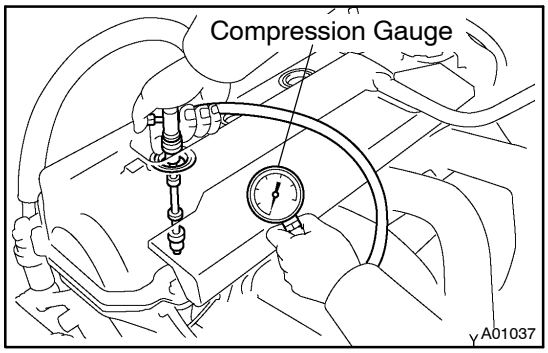
1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. REMOVE IGNITION COIL (See page IG–6)

3. REMOVE SPARK PLUGS

4. INSPECT CYLINDER COMPRESSION PRESSURE



(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

HINT:

Always use a fully charged battery to obtain engine speed of 250 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

NOTICE:

This measurement must be done in as short a time as possible.

Compression pressure:
1ZZ–FE 1,500 kPa (15.3 kgf/cm^2, 218 psi)
2ZZ–GE 1,400 kPa (14.3 kgf/cm^2, 203 psi) or more
Minimum pressure:
1ZZ–FE 1,000 kPa (10.2 kgf/cm^2, 145 psi)
2ZZ–GE 1,000 kPa (10.2 kgf/cm^2, 145 psi)
Difference between each cylinder:
1ZZ–FE 100 kPa (1.0 kgf/cm^2, 15 psi) or less
2ZZ–GE 110 kPa (1.1 kgf/cm^2, 16 psi) or less

(e) If the cylinder compression in one more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

5. REINSTALL SPARK PLUGS

6. INSTALL IGNITION COIL (See page IG–7)

VALVE CLEARANCE

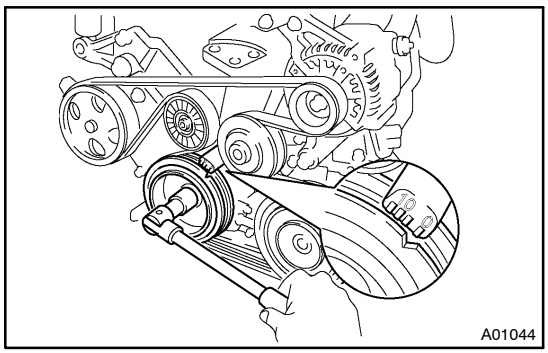
ADJUSTMENT

EM15Q–06

HINT:

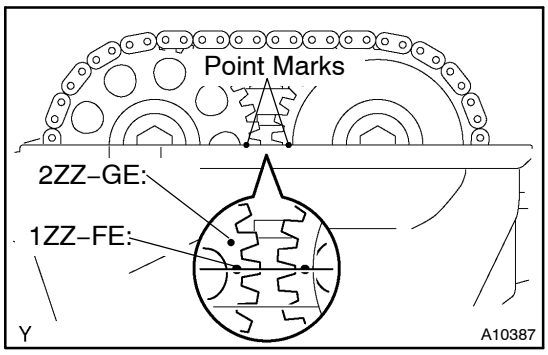
Inspect and adjust the valve clearance when the engine is cold.

1. REMOVE CYLINDER HEAD COVER (See page EM–19)



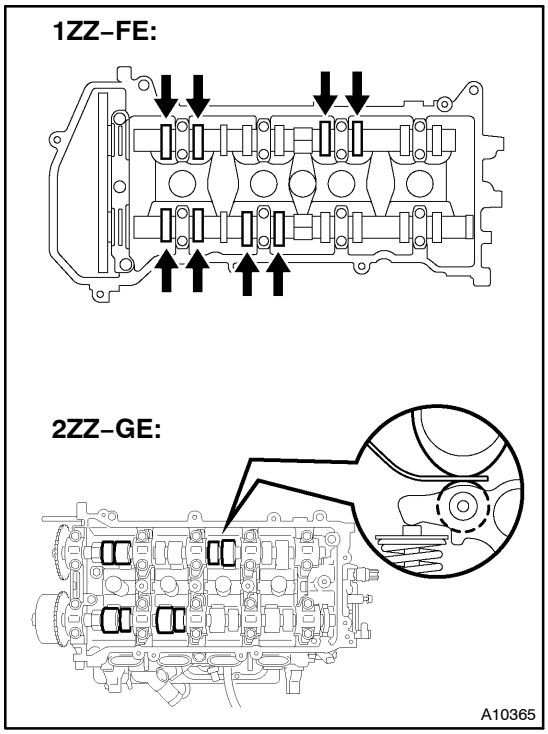
2. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the timing chain cover.



(b) Check that the point marks of the camshaft timing sprockets are in straight line on the timing chain cover surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



3. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement of adjusting shim.

Valve clearance (Cold):

1ZZ–FE:

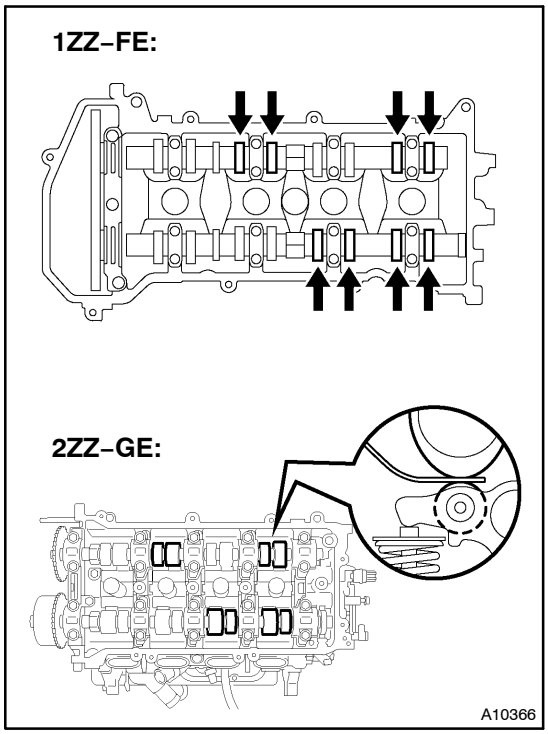
Intake 0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust 0.25 – 0.35 mm (0.010 – 0.014 in.)

2ZZ–GE:

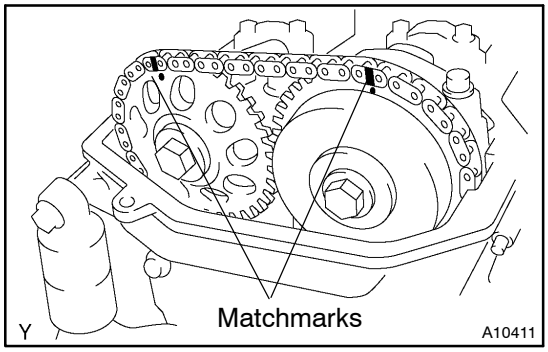
Intake 0.08 – 0.18 mm (0.0031 – 0.0071 in.)

Exhaust 0.22 – 0.32 mm (0.0087 – 0.0126 in.)



(b) Turn the crankshaft 1 revolution (360°) and align the mark as above (See procedure in step 2).

(c) Check only the valves indicated as shown. Measure the valve clearance (See procedure in step (a)).

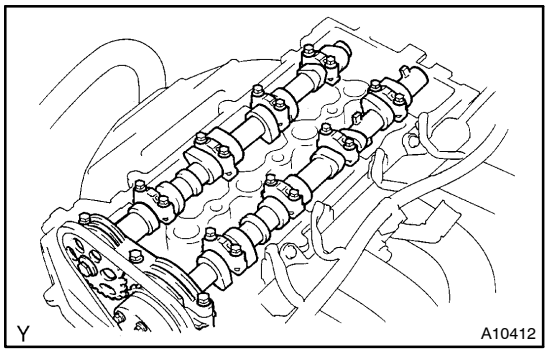


4. 1ZZ–FE:
ADJUST VALVE CLEARANCE

(a) Set the No. 1 cylinder to the TDC/compression (See procedure in step 2).

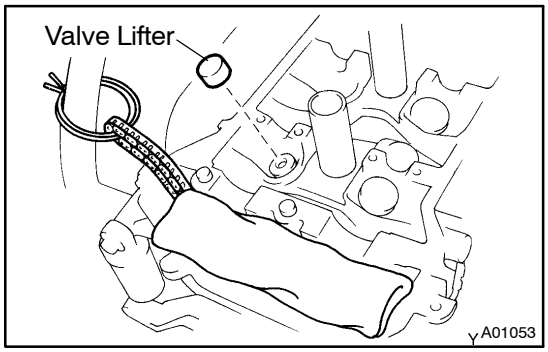
(b) Place matchmarks on the timing chain and camshaft timing sprockets.

(c) Remove the 2 bolts and chain tensioner.



(d) Remove the camshaft and timing sprocket assemblies (See page EM–44).
  (1) 19 camshaft bearing cap bolts
  (2) 9 camshaft bearing caps (No. 1 & No. 3)
  (3) Exhaust camshaft and timing sprocket assembly
  (4) Intake camshaft and timing sprocket assembly

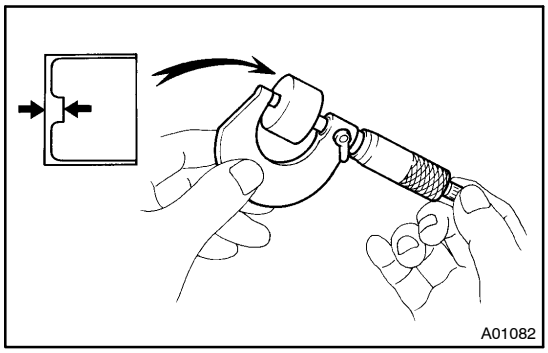
HINT:
When holding the timing chain, disconnect the timing chain from the camshaft timing sprocket.



(e) Tie the timing chain with a string as shown in the illustration.

NOTICE:
- **Be careful not to drop anything inside the timing chain cover.**
- **Do not allow the chain to come into contact with water or dust.**

(f) Remove the valve lifters.

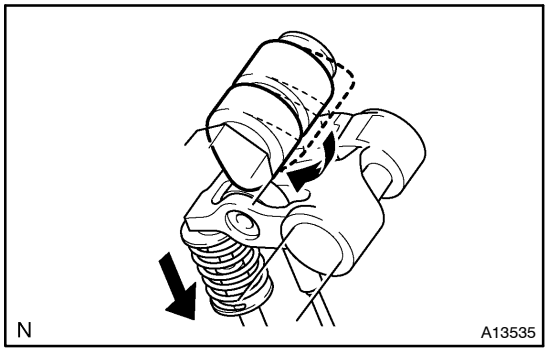


(g) Determine the size of the replaced valve lifter according to these Formula or Charts:
- Using a micrometer, measure the thickness of the removed lifter.
- Calculate the thickness of a new lifter so the valve clearance comes within the specified value.

T..... Thickness of used lifter
A..... Measured valve clearance
N..... Thickness of new lifter
Intake: N = T + (A – 0.20 mm (0.008 in.))
Exhaust: N = T + (A – 0.30 mm (0.012 in.))

- Select a new lifter with a thickness as close as possible to the calculated values.

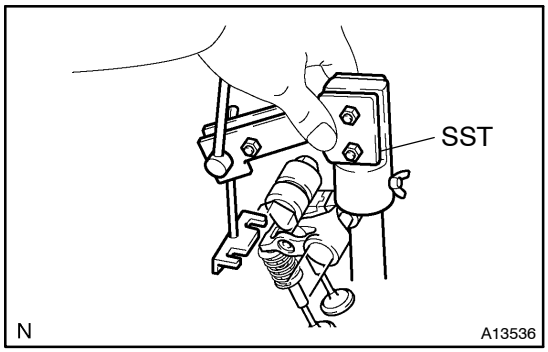
HINT:
Lifter are available in 35 sizes in increments of 0.020 mm (0.0008 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).



5. 2ZZ–GE:
ADJUST VALVE CLEARANCE

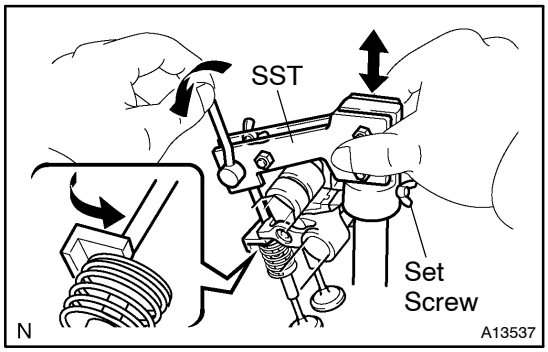
(a) Set the SST.
(1) Turn the crankshaft so that the related rocker arm, where the valve clearance is adjusted, is fully pushed down.

NOTICE:
Remove the spark plug and take off the compression.



(2) Insert SST into the plug tube.
SST 09248–77010 (09248–07010)

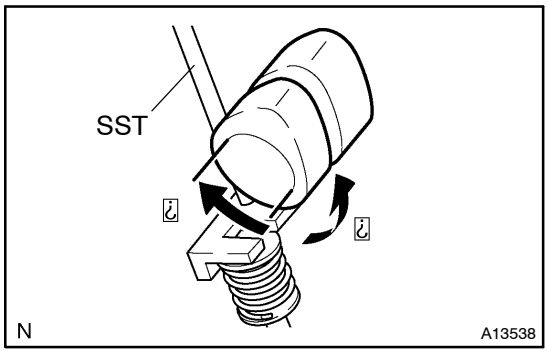
NOTICE:
- **SST cannot be inserted unless the set screw is loosened.**
- **Make sure that the camshaft is in the same condition as step (1).**



(3) Operate the lever so that SST's seat surface comes to contact with the valve retainer and lock them with the set screw.

NOTICE:
- **Clearance between the valve retainer and SST's seat surface is not allowed.**
- **Care should be taken not to make clearance when inserting SST, since a presence of clearance may unlock the keeper.**

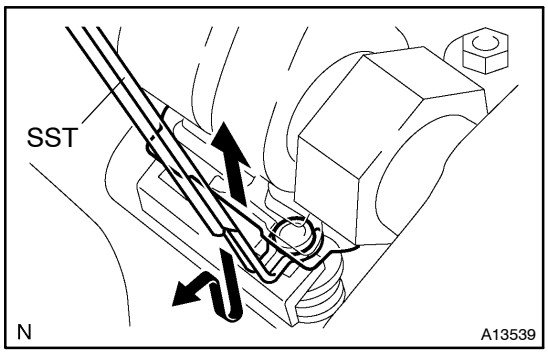
(4) Lock the set screw on the plug tube side of SST.



(5) Rotate the crankshaft so that the camshaft is positioned as shown in the illustration.

NOTICE:

- **Pay attention to the direction of the rotation to prevent the nose of the camshaft from interfering with the SST's shaft.**
- **Do not rotate the crankshaft excessively.**



(b) Remove the adjusting shim.

(1) Lift the rocker arm to make a room and remove the adjusting shim using SST.

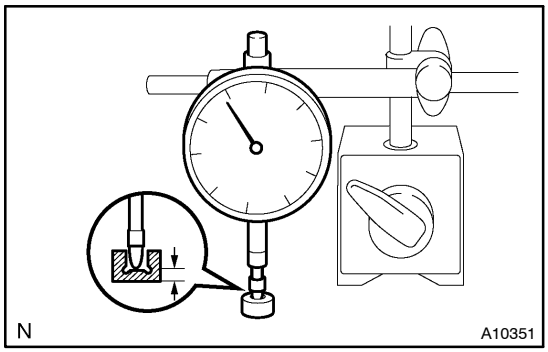
SST 09248–77010 (09248–07020)

NOTICE:

Do not remove SST in the condition that the adjusting shim is removed.

HINT:

- Setting SST from the right above makes the removal easy.
- If there is not enough room, reset SST.



(2) Determine the size of the replaced shim according to these Formula or Charts:

- Using dial indicator, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so the valve clearance comes within the specified value.

T..... Thickness of used shim

A..... Measured valve clearance

N..... Thickness of new shim

Intake: N = T+ (A – 0.13 mm (0.0051 in.)) x 1.5

Exhaust: N = T+ (A – 0.27 mm (0.0106 in.)) x 1.5

- Select a new shim with a thickness as close as possible to the calculated values.

HINT:

Shim are available in 41 size in increments of 0.020 mm (0.0008 in.), from 2.000 mm (0.0787 in.) to 2.800 mm (0.1102 in.).

1ZZ–FE: Valve Lifter Selection Chart (Intake)

Measured clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 – 0.030 (0.0000 – 0.0012)									06	06	06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56
0.031 – 0.050 (0.0012 – 0.0020)							06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58
0.051 – 0.070 (0.0020 – 0.0028)						06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60
0.071 – 0.090 (0.0028 – 0.0035)					06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62
0.091 – 0.110 (0.0036 – 0.0043)				06	06	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62	64
0.111 – 0.130 (0.0044 – 0.0051)			06	06	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66
0.131 – 0.149 (0.0052 – 0.0059)		06	06	06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.150 – 0.250 (0.0059 – 0.0098)																																																									
0.251 – 0.270 (0.0099 – 0.0106)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74
0.271 – 0.290 (0.0107 – 0.0114)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	74	74	
0.291 – 0.310 (0.0115 – 0.0122)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	74	74		
0.311 – 0.330 (0.0122 – 0.0130)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74			
0.331 – 0.350 (0.0130 – 0.0138)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74					
0.351 – 0.370 (0.0138 – 0.0146)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74						
0.371 – 0.390 (0.0146 – 0.0154)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74						
0.391 – 0.410 (0.0154 – 0.0161)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74	74						
0.411 – 0.430 (0.0162 – 0.0169)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74									
0.431 – 0.450 (0.0170 – 0.0177)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74	74											
0.451 – 0.470 (0.0178 – 0.0185)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74														
0.471 – 0.490 (0.0185 – 0.0193)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																
0.491 – 0.510 (0.0193 – 0.0201)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																		
0.511 – 0.530 (0.0201 – 0.0209)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																			
0.531 – 0.550 (0.0209 – 0.0217)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																				
0.551 – 0.570 (0.0217 – 0.0224)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																					
0.571 – 0.590 (0.0225 – 0.0232)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																					
0.591 – 0.610 (0.0233 – 0.0240)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																					
0.611 – 0.630 (0.0241 – 0.0248)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																					
0.631 – 0.650 (0.0248 – 0.0256)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																					
0.651 – 0.670 (0.0256 – 0.0264)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74																					
0.671 – 0.690 (0.0264 – 0.0272)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74																					
0.691 – 0.710 (0.0272 – 0.0280)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74																					
0.711 – 0.730 (0.0280 – 0.0287)	58	60	62	64	66	68	70	72	74	74	74	74	74	74																							
0.731 – 0.750 (0.0288 – 0.0295)	60	62	64	66	68	70	72	74	74	74	74	74																									
0.751 – 0.770 (0.0296 – 0.0303)	62	64	66	68	70	72	74	74	74	74																											
0.771 – 0.790 (0.0304 – 0.0311)	64	66	68	70	72	74	74	74																													
0.791 – 0.810 (0.0311 – 0.0319)	66	68	70	72	74	74	74																														
0.811 – 0.830 (0.0319 – 0.0327)	68	70	72	74	74	74																															
0.831 – 0.850 (0.0327 – 0.0335)	70	72	74	74	74																																
0.851 – 0.870 (0.0335 – 0.0343)	72	74	74	74																																	
0.871 – 0.890 (0.0343 – 0.0350)	74	74	74																																		
0.891 – 0.910 (0.0351 – 0.0358)	74	74																																			
0.911 – 0.930 (0.0359 – 0.0366)	74																																				

Intake valve clearance (Cold):
0.15 – 0.25 mm (0.006 – 0.010 in.)

EXAMPLE: The 5.250 mm (0.2067 in.) lifter is installed, and the measured clearance is 0.400 mm (0.0157 in.).
Replace the 5.250 mm (0.2067 in.) lifter with a new No. 48 lifter.

New lifter thickness mm (in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

A01234

1ZZ–FE: Valve Lifter Selection Chart (Exhaust)

Measured clearance mm (in.) \ Installed lifter thickness mm (in.)	5.060 (0.1992)	5.080 (0.2000)	5.100 (0.2008)	5.120 (0.2016)	5.140 (0.2024)	5.160 (0.2031)	5.180 (0.2039)	5.200 (0.2047)	5.210 (0.2051)	5.220 (0.2055)	5.230 (0.2059)	5.240 (0.2063)	5.250 (0.2067)	5.260 (0.2071)	5.270 (0.2075)	5.280 (0.2079)	5.290 (0.2083)	5.300 (0.2087)	5.310 (0.2091)	5.320 (0.2094)	5.330 (0.2098)	5.340 (0.2102)	5.350 (0.2106)	5.360 (0.2110)	5.370 (0.2114)	5.380 (0.2118)	5.390 (0.2122)	5.400 (0.2126)	5.410 (0.2130)	5.420 (0.2134)	5.430 (0.2138)	5.440 (0.2142)	5.450 (0.2146)	5.460 (0.2150)	5.470 (0.2154)	5.480 (0.2157)	5.490 (0.2161)	5.500 (0.2165)	5.510 (0.2169)	5.520 (0.2173)	5.530 (0.2177)	5.540 (0.2181)	5.550 (0.2185)	5.560 (0.2189)	5.570 (0.2193)	5.580 (0.2197)	5.590 (0.2201)	5.600 (0.2205)	5.620 (0.2213)	5.640 (0.2220)	5.660 (0.2228)	5.680 (0.2236)	5.700 (0.2244)	5.720 (0.2252)	5.740 (0.2260)
0.000 – 0.030 (0.0000 – 0.0012)																			06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	36	38	40	42	44	46
0.031 – 0.050 (0.0012 – 0.0020)																06	06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	38	40	42	44	46	48
0.051 – 0.070 (0.0020 – 0.0028)														06	06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	40	42	44	46	48	50
0.071 – 0.090 (0.0028 – 0.0035)												06	06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	42	44	46	48	50	52
0.091 – 0.110 (0.0036 – 0.0043)										06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	44	46	48	50	52	54
0.111 – 0.130 (0.0044 – 0.0051)									06	06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56
0.131 – 0.150 (0.0052 – 0.0059)								06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58
0.151 – 0.170 (0.0059 – 0.0067)						06	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	50	52	54	56	58	60
0.171 – 0.190 (0.0067 – 0.0075)					06	06	06	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62
0.191 – 0.210 (0.0075 – 0.0083)				06	06	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	54	56	58	60	62	64
0.211 – 0.230 (0.0083 – 0.0091)			06	06	06	08	10	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	56	58	60	62	64	66
0.231 – 0.249 (0.0091 – 0.0098)		06	06	06	08	10	12	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	58	60	62	64	66	68
0.250 – 0.350 (0.0098 – 0.0138)																																																										
0.351 – 0.370 (0.0138 – 0.0146)	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	74	74
0.371 – 0.390 (0.0146 – 0.0154)	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	74	74	
0.391 – 0.410 (0.0154 – 0.0161)	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	74	74	74		
0.411 – 0.430 (0.0162 – 0.0169)	18	20	22	24	26	28	30	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74			
0.431 – 0.450 (0.0170 – 0.0177)	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	68	68	70	70	72	72	74	74	74	74	74				
0.451 – 0.470 (0.0178 – 0.0185)	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74					
0.471 – 0.490 (0.0185 – 0.0193)	24	26	28	30	32	34	36	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74						
0.491 – 0.510 (0.0193 – 0.0201)	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74								
0.511 – 0.530 (0.0201 – 0.0209)	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74										
0.531 – 0.550 (0.0209 – 0.0217)	30	32	34	36	38	40	42	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74												
0.551 – 0.570 (0.0217 – 0.0224)	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74														
0.571 – 0.590 (0.0225 – 0.0232)	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																
0.591 – 0.610 (0.0233 – 0.0240)	36	38	40	42	44	46	48	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																		
0.611 – 0.630 (0.0241 – 0.0248)	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																				
0.631 – 0.650 (0.0248 – 0.0256)	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																						
0.651 – 0.670 (0.0256 – 0.0264)	42	44	46	48	50	52	54	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																							
0.671 – 0.690 (0.0264 – 0.0272)	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																							
0.691 – 0.710 (0.0272 – 0.0280)	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																							
0.711 – 0.730 (0.0280 – 0.0287)	48	50	52	54	56	58	60	62	64	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																							
0.731 – 0.750 (0.0288 – 0.0295)	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	74	74	74	74																							
0.751 – 0.770 (0.0296 – 0.0303)	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	74	74	74	74																							
0.771 – 0.790 (0.0304 – 0.0311)	54	56	58	60	62	64	66	68	70	70	72	72	74	74	74	74	74	74	74	74																							
0.791 – 0.810 (0.0311 – 0.0319)	56	58	60	62	64	66	68	70	72	72	74	74	74	74	74	74																											
0.811 – 0.830 (0.0319 – 0.0327)	58	60	62	64	66	68	70	72	74	74	74	74	74	74																											
0.831 – 0.850 (0.0327 – 0.0335)	60	62	64	66	68	70	72	74	74	74	74	74																													
0.851 – 0.870 (0.0335 – 0.0343)	62	64	66	68	70	72	74	74	74	74																													
0.871 – 0.890 (0.0343 – 0.0350)	64	66	68	70	72	74	74	74																															
0.891 – 0.910 (0.0351 – 0.0358)	66	68	70	72	74	74	74																																
0.911 – 0.930 (0.0359 – 0.0366)	68	70	72	74	74	74																																	
0.931 – 0.950 (0.0367 – 0.0374)	70	72	74	74	74																																		
0.951 – 0.970 (0.0374 – 0.0382)	72	74	74	74																																			
0.971 – 0.990 (0.0382 – 0.0390)	74	74	74																																				
0.991 – 1.010 (0.0390 – 0.0398)	74	74																																					
1.011 – 1.030 (0.0398 – 0.0406)	74																																						

Exhaust valve clearance (Cold):

0.25 – 0.35 mm (0.010 – 0.014 in.)

EXAMPLE: The 5.340 mm (0.2102 in.) lifter is installed, and the measured clearance is 0.440 mm (0.0173 in.).

Replace the 5.340 mm (0.2102 in.) lifter with a new No. 48 lifter.

New lifter thickness mm (in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 (0.1992)	30	5.300 (0.2087)	54	5.540 (0.2181)
08	5.080 (0.2000)	32	5.320 (0.2094)	56	5.560 (0.2189)
10	5.100 (0.2008)	34	5.340 (0.2102)	58	5.580 (0.2197)
12	5.120 (0.2016)	36	5.360 (0.2110)	60	5.600 (0.2205)
14	5.140 (0.2024)	38	5.380 (0.2118)	62	5.620 (0.2213)
16	5.160 (0.2031)	40	5.400 (0.2126)	64	5.640 (0.2220)
18	5.180 (0.2039)	42	5.420 (0.2134)	66	5.660 (0.2228)
20	5.200 (0.2047)	44	5.440 (0.2142)	68	5.680 (0.2236)
22	5.220 (0.2055)	46	5.460 (0.2150)	70	5.700 (0.2244)
24	5.240 (0.2063)	48	5.480 (0.2157)	72	5.720 (0.2252)
26	5.260 (0.2071)	50	5.500 (0.2165)	74	5.740 (0.2260)
28	5.280 (0.2079)	52	5.520 (0.2173)		

2ZZ–GE: Valve Shim Selection Chart (Intake)

Measure clearance mm(in.) \ Installed shim thickness mm(in.)	2.000 (0.0787)	2.020 (0.0795)	2.040 (0.0803)	2.060 (0.0811)	2.080 (0.0819)	2.100 (0.0872)	2.120 (0.0835)	2.140 (0.0843)	2.160 (0.0850)	2.180 (0.0858)	2.190 (0.0862)	2.200 (0.0866)	2.210 (0.0870)	2.220 (0.0874)	2.230 (0.0878)	2.240 (0.0882)	2.250 (0.0886)	2.260 (0.0890)	2.270 (0.0894)	2.280 (0.0898)	2.290 (0.0902)	2.300 (0.0906)	2.310 (0.0909)	2.320 (0.0913)	2.330 (0.0917)	2.340 (0.0921)	2.340 (0.0921)	2.350 (0.0925)	2.360 (0.0929)	2.370 (0.0933)
0.000 - 0.030 (0.0000 - 0.0012)										00	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20
0.031 - 0.050 (0.0012 - 0.0020)								00	02	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24
0.051 - 0.070 (0.0020 - 0.0028)							00	02	04	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26
0.071 - 0.079 (0.0028 - 0.0031)					00	02	04	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30
0.080 - 0.180 (0.0031 - 0.0071)																														
0.181 - 0.200 (0.0071 - 0.0079)	06	08	10	12	14	16	18	20	22	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44
0.201 - 0.220 (0.0097 - 0.0087)	10	12	14	16	18	20	22	24	26	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48
0.221 - 0.240 (0.0087 - 0.0094)	12	14	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50
0.241 - 0.260 (0.0095 - 0.0102)	16	18	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54
0.261 - 0.280 (0.0103 - 0.0110)	18	20	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56
0.281 - 0.300 (0.0111 - 0.0118)	22	24	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60
0.301 - 0.320 (0.0119 - 0.0126)	24	26	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62
0.321 - 0.340 (0.0126 - 0.0134)	28	30	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66
0.341 - 0.360 (0.0134 - 0.0142)	30	32	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68
0.361 - 0.380 (0.0142 - 0.0150)	34	36	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72
0.381 - 0.400 (0.0150 - 0.0157)	36	38	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74
0.401 - 0.420 (0.0158 - 0.0165)	40	42	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78
0.421 - 0.440 (0.0166 - 0.0173)	42	44	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80
0.441 - 0.460 (0.0174 - 0.0181)	46	48	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80				
0.461 - 0.480 (0.0181 - 0.0189)	48	50	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80						
0.481 - 0.500 (0.0189 - 0.0197)	52	54	56	58	60	62	64	66	68	70	72	72	74	74	76	76	78	78	80	80										
0.501 - 0.520 (0.0197 - 0.0205)	54	56	58	60	62	64	66	68	70	72	74	74	76	76	78	78	80	80												
0.521 - 0.540 (0.0205 - 0.0213)	58	60	62	64	66	68	70	72	74	76	78	78	80	80																
0.541 - 0.560 (0.0213 - 0.0220)	60	62	64	66	68	70	72	74	76	78	80	80																		
0.561 - 0.580 (0.0221 - 0.0228)	64	66	68	70	72	74	76	78	80																					
0.581 - 0.600 (0.0229 - 0.0236)	66	68	70	72	74	76	78	80																						
0.601 - 0.620 (0.0237 - 0.0244)	70	72	74	76	78	80																								
0.621 - 0.640 (0.0244 - 0.0252)	72	74	76	78	80																									
0.641 - 0.660 (0.0252 - 0.0260)	76	78	80																											
0.661 - 0.680 (0.0260 - 0.0268)	78	80																												
0.681 - 0.700 (0.0268 - 0.0276)	80																													

Measure clearance mm(in.) \ Installed shim thickness mm(in.)	2.380 (0.0937)	2.390 (0.0941)	2.400 (0.0945)	2.410 (0.0949)	2.420 (0.0953)	2.430 (0.0957)	2.440 (0.0961)	2.450 (0.0965)	2.460 (0.0969)	2.470 (0.0972)	2.480 (0.0976)	2.490 (0.0980)	2.500 (0.0984)	2.510 (0.0988)	2.520 (0.0992)	2.530 (0.0996)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.660 (0.1047)	2.680 (0.1055)	2.700 (0.1063)	2.720 (0.1071)	2.740 (0.1079)	2.760 (0.1087)	2.780 (0.1094)	2.800 (0.1102)
0.000 - 0.030 (0.0000 - 0.0012)	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	42	44	46	48	50	52	54	56	58	60	62	64
0.031 - 0.050 (0.0012 - 0.0020)	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56	58	60	62	64	66	68
0.051 - 0.070 (0.0020 - 0.0028)	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58	60	62	64	66	68	70
0.071 - 0.079 (0.0028 - 0.0031)	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62	64	66	68	70	72	74
0.080 - 0.180 (0.0031 - 0.0071)																															
0.181 - 0.200 (0.0071 - 0.0079)	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	66	68	70	72	74	76	78	80				
0.201 - 0.220 (0.0097 - 0.0087)	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	70	72	74	76	78	80						
0.221 - 0.240 (0.0087 - 0.0094)	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	76	78	80							
0.241 - 0.260 (0.0095 - 0.0102)	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	76	78	80	82								
0.261 - 0.280 (0.0103 - 0.0110)	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	78	80										
0.281 - 0.300 (0.0111 - 0.0118)	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80												
0.301 - 0.320 (0.0119 - 0.0126)	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80													
0.321 - 0.340 (0.0126 - 0.0134)	68	68	70	70	72	72	74	74	76	76	78	78	80	80																	
0.341 - 0.360 (0.0134 - 0.0142)	70	70	72	72	74	74	76	76	78	78	80	80																			
0.361 - 0.380 (0.0142 - 0.0150)	74	74	76	76	78	78	80	80																							
0.381 - 0.400 (0.0150 - 0.0157)	76	76	78	78	80	80																									
0.401 - 0.420 (0.0158 - 0.0165)	80	80																													
0.421 - 0.440 (0.0166 - 0.0173)																															
0.441 - 0.460 (0.0174 - 0.0181)																															
0.461 - 0.480 (0.0181 - 0.0189)																															
0.481 - 0.500 (0.0189 - 0.0197)																															
0.501 - 0.520 (0.0197 - 0.0205)																															
0.521 - 0.540 (0.0205 - 0.0213)																															
0.541 - 0.560 (0.0213 - 0.0220)																															
0.561 - 0.580 (0.0221 - 0.0228)																															
0.581 - 0.600 (0.0229 - 0.0236)																															
0.601 - 0.620 (0.0237 - 0.0244)																															
0.621 - 0.640 (0.0244 - 0.0252)																															
0.641 - 0.660 (0.0252 - 0.0260)																															
0.661 - 0.680 (0.0260 - 0.0268)																															
0.681 - 0.700 (0.0268 - 0.0276)																															

New Shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness	Shim No.	Thickness
00	2.000 (0.0787)	28	2.280 (0.0898)	56	2.560 (0.1008)
02	2.020 (0.0795)	30	2.300 (0.0906)	58	2.580 (0.1016)
04	2.040 (0.0803)	32	2.320 (0.0913)	60	2.600 (0.1024)
06	2.060 (0.0811)	34	2.340 (0.0921)	62	2.620 (0.1031)
08	2.080 (0.0819)	36	2.360 (0.0929)	64	2.640 (0.1039)
10	2.100 (0.0827)	38	2.380 (.0.0937)	66	2.660 (0.1047)
12	2.120 (0.0835)	40	2.400 (0.0945)	68	2.680 (0.1055)
14	2.140 (0.0843)	42	2.420 (0.0953)	70	2.700 (0.1063)
16	2.160 (0.0850)	44	2.440 (0.0961)	72	2.720 (0.1071)
18	2.180 (0.0858)	46	2.460 (0.0969)	74	2.740 (0.1079)
20	2.200 (0.0866)	48	2.480 (0.0976)	76	2.760 (0.1087)
22	2.220 (0.0874)	50	2.500 (0.0984)	78	2.780 (0.1094)
24	2.240 (0.0882)	52	2.520 (0.0992)	80	2.800 (0.1102)
26	2.260 (0.0890)	54	2.540 (0.1000)		

Intake valve clearance (Cold):
0.10 – 0.16 mm (0.0039 – 0.0063 in.)

EXAMPLE: The 2.200 mm (0.0826 in.) shim is installed, and the measured clearance is 0.400 mm (0.0157 in.).
Replace the 2.600 mm (0.1024 in.) shim with a new No. 60 shim.

A10466

2ZZ–GE: Valve Shim Selection Chart (Exhaust)

Measure clearance mm(in.) \ Installed shim thickness mm(in.)	2.000 (0.0787)	2.020 (0.0795)	2.040 (0.0803)	2.060 (0.0811)	2.080 (0.0819)	2.100 (0.0872)	2.120 (0.0835)	2.140 (0.0843)	2.160 (0.0850)	2.180 (0.0858)	2.190 (0.0862)	2.200 (0.0866)	2.210 (0.0870)	2.220 (0.0874)	2.230 (0.0878)	2.240 (0.0882)	2.250 (0.0886)	2.260 (0.0890)	2.270 (0.0894)	2.280 (0.0898)	2.290 (0.0902)	2.300 (0.0906)	2.310 (0.0909)	2.320 (0.0913)	2.330 (0.0917)	2.340 (0.0921)	2.340 (0.0921)	2.350 (0.0925)	2.360 (0.0929)	2.370 (0.0933)
0.000 – 0.030 (0.0000 – 0.0012)																														
0.031 – 0.050 (0.0012 – 0.0020)																												00	04	04
0.051 – 0.070 (0.0020 – 0.0028)																								00	02	02	04	04	06	06
0.071 – 0.090 (0.0028 – 0.0035)																					00	00	02	02	04	04	06	06	08	08
0.091 – 0.110 (0.0036 – 0.0043)																		00	02	02	04	04	06	06	08	08	10	10	12	12
0.111 – 0.130 (0.0044 – 0.0051)															00	00	02	02	04	04	06	06	08	08	10	10	12	12	14	14
0.131 – 0.150 (0.0052 – 0.0059)												00	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18
0.151 – 0.170 (0.0059 – 0.0067)										00	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20
0.171 – 0.190 (0.0067 – 0.0075)								00	02	04	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24
0.191 – 0.210 (0.0075 – 0.0083)							00	02	04	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26
0.221 – 0.219 (0.0083 – 0.0086)					00	02	04	06	08	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30
0.220 – 0.320 (0.0087 – 0.0126)																														
0.321 – 0.340 (0.0126 – 0.0134)	06	08	10	12	14	16	18	20	22	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44
0.341 – 0.360 (0.0134 – 0.0142)	08	10	12	14	16	18	20	22	24	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46
0.361 – 0.380 (0.0142 – 0.0150)	12	14	16	18	20	22	24	26	28	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50
0.381 – 0.400 (0.0150 – 0.0157)	16	18	20	22	24	26	28	30	32	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54
0.401 – 0.420 (0.0158 – 0.0165)	18	20	22	24	26	28	30	32	34	36	38	38	40	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56
0.421 – 0.440 (0.0166 – 0.0173)	22	24	26	28	30	32	34	36	38	40	42	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60
0.441 – 0.460 (0.0174 – 0.0181)	24	26	28	30	32	34	36	38	40	42	44	44	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62
0.461 – 0.480 (0.0181 – 0.0189)	28	30	32	34	36	38	40	42	44	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66
0.481 – 0.500 (0.0189 – 0.0197)	30	32	34	36	38	40	42	44	46	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68
0.501 – 0.520 (0.0197 – 0.0205)	34	36	38	40	42	44	46	48	50	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72
0.521 – 0.540 (0.0205 – 0.0213)	36	38	40	42	44	46	48	50	52	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74
0.541 – 0.560 (0.0213 – 0.0220)	40	42	44	46	48	50	52	54	56	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78
0.561 – 0.580 (0.0221 – 0.0228)	42	44	46	48	50	52	54	56	58	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80
0.581 – 0.600 (0.0229 – 0.0236)	46	48	50	52	54	56	58	60	62	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80				
0.601 – 0.620 (0.0237 – 0.0244)	48	50	52	54	56	58	60	62	64	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80						
0.621 – 0.640 (0.0244 – 0.0252)	52	54	56	58	60	62	64	66	68	70	72	72	74	74	76	76	78	78	80	80										
0.641 – 0.660 (0.0252 – 0.0260)	54	56	58	60	62	64	66	68	70	72	74	74	76	76	78	78	80	80												
0.661 – 0.680 (0.0260 – 0.0268)	58	60	62	64	66	68	70	72	74	76	78	78	80	80																
0.681 – 0.700 (0.0268 – 0.0276)	60	62	64	66	68	70	72	74	76	78	80	80																		
0.701 – 0.720 (0.0276 – 0.0283)	64	66	68	70	72	74	76	78	80																					
0.721 – 0.740 (0.0284 – 0.0291)	66	68	70	72	74	76	78	80																						
0.741 – 0.760 (0.0292 – 0.0299)	70	72	74	76	78	80																								
0.761 – 0.780 (0.0300 – 0.0307)	72	74	76	78	80																									
0.781 – 0.800 (0.0307 – 0.0315)	76	78	80																											
0.801 – 0.820 (0.0315 – 0.0323)	80																													
0.821 – 0.840 (0.0323 – 0.0331)	80																													

Measure clearance mm(in.) \ Installed shim thickness mm(in.)	2.380 (0.0937)	2.390 (0.0941)	2.400 (0.0945)	2.410 (0.0949)	2.420 (0.0953)	2.430 (0.0957)	2.440 (0.0961)	2.450 (0.0965)	2.460 (0.0969)	2.470 (0.0972)	2.480 (0.0976)	2.490 (0.0980)	2.500 (0.0984)	2.510 (0.0988)	2.520 (0.0992)	2.530 (0.0996)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.660 (0.1047)	2.680 (0.1055)	2.700 (0.1063)	2.720 (0.1071)	2.740 (0.1079)	2.760 (0.1087)	2.780 (0.1094)	2.800 (0.1102)
0.000 – 0.030 (0.0000 – 0.0012)	00	00	02	02	04	04	06	06	08	08	10	10	12	12	14	14	16	16	18	20	22	24	26	28	30	32	34	36	38	40	42
0.031 – 0.050 (0.0012 – 0.0020)	06	06	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	26	28	30	32	34	36	38	40	42	44	46	48
0.051 – 0.070 (0.0020 – 0.0028)	08	08	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	28	30	32	34	36	38	40	42	44	46	48	50
0.071 – 0.090 (0.0028 – 0.0035)	10	10	12	12	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	30	32	34	36	38	40	42	44	46	48	50	52
0.091 – 0.110 (0.0036 – 0.0043)	14	14	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	34	36	38	40	42	44	46	48	50	52	54	56
0.111 – 0.130 (0.0044 – 0.0051)	16	16	18	18	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	36	38	40	42	44	46	48	50	52	54	56	58
0.131 – 0.150 (0.0052 – 0.0059)	20	20	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	40	42	44	46	48	50	52	54	56	58	60	62
0.151 – 0.170 (0.0059 – 0.0067)	22	22	24	24	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	42	44	46	48	50	52	54	56	58	60	62	64
0.171 – 0.190 (0.0067 – 0.0075)	26	26	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	46	48	50	52	54	56	58	60	62	64	66	68
0.191 – 0.210 (0.0075 – 0.0083)	28	28	30	30	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	48	50	52	54	56	58	60	62	64	66	68	70
0.221 – 0.219 (0.0083 – 0.0086)	32	32	34	34	36	36	38	38	40	40	42	42	44	44	46	46	48	48	50	52	54	56	58	60	62	64	66	68	70	72	74
0.220 – 0.320 (0.0087 – 0.0126)																															
0.321 – 0.340 (0.0126 – 0.0134)	46	46	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	66	68	70	72	74	76	78	80	80			
0.341 – 0.360 (0.0134 – 0.0142)	48	48	50	50	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	68	70	72	74	76	78	80					
0.361 – 0.380 (0.0142 – 0.0150)	52	52	54	54	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	72	74	76	78	80							
0.381 – 0.400 (0.0150 – 0.0157)	56	56	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	76	78	80									
0.401 – 0.420 (0.0158 – 0.0165)	58	58	60	60	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	78	80										
0.421 – 0.440 (0.0166 – 0.0173)	62	62	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80												
0.441 – 0.460 (0.0174 – 0.0181)	64	64	66	66	68	68	70	70	72	72	74	74	76	76	78	78	80	80													
0.461 – 0.480 (0.0181 – 0.0189)	68	68	70	70	72	72	74	74	76	76	78	78	80	80																	
0.481 – 0.500 (0.0189 – 0.0197)	70	70	72	72	74	74	76	76	78	78	80	80																			
0.501 – 0.520 (0.0197 – 0.0205)	74	74	76	76	78	78	80	80																							
0.521 – 0.540 (0.0205 – 0.0213)	76	76	78	78	80	80																									
0.541 – 0.560 (0.0213 – 0.0220)	80	80																													

New Shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness	Shim No.	Thickness
00	2.000 (0.0787)	28	2.280 (0.0898)	56	2.560 (0.1008)
02	2.020 (0.0795)	30	2.300 (0.0906)	58	2.580 (0.1016)
04	2.040 (0.0803)	32	2.320 (0.0913)	60	2.600 (0.1024)
06	2.060 (0.0811)	34	2.340 (0.0921)	62	2.620 (0.1031)
08	2.080 (0.0819)	36	2.360 (0.0929)	64	2.640 (0.1039)
10	2.100 (0.0827)	38	2.380 (.0.0937)	66	2.660 (0.1047)
12	2.120 (0.0835)	40	2.400 (0.0945)	68	2.680 (0.1055)
14	2.140 (0.0843)	42	2.420 (0.0953)	70	2.700 (0.1063)
16	2.160 (0.0850)	44	2.440 (0.0961)	72	2.720 (0.1071)
18	2.180 (0.0858)	46	2.460 (0.0969)	74	2.740 (0.1079)
20	2.200 (0.0866)	48	2.480 (0.0976)	76	2.760 (0.1087)
22	2.220 (0.0874)	50	2.500 (0.0984)	78	2.780 (0.1094)
24	2.240 (0.0882)	52	2.520 (0.0992)	80	2.800 (0.1102)
26	2.260 (0.0890)	54	2.540 (0.1000)		

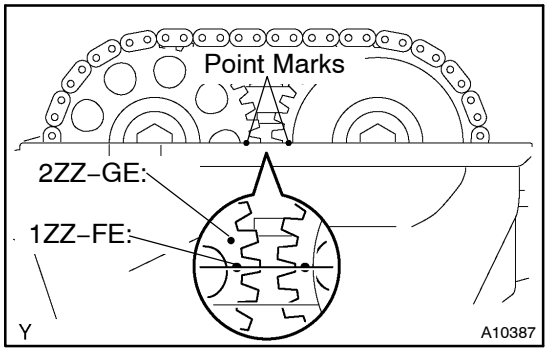
Exhaust valve clearance (Cold):
0.24 – 0.30 mm (0.0094 – 0.0118 in.)

EXAMPLE: The 2.200 mm (0.0862 in.) shim is installed, and the measured clearance is 0.500 mm (0.0197 in.).
Replace the 2.540 mm (0.1000 in.) shim with a new No. 54 shim.

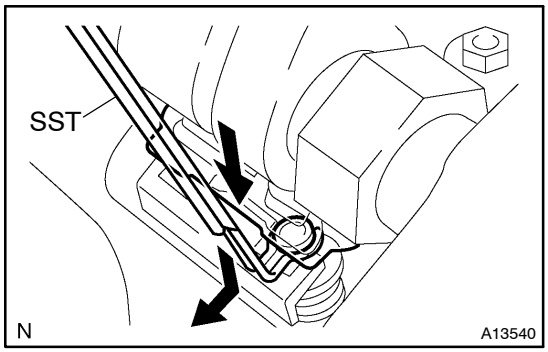
A10467

6. 1ZZ–FE:
REINSTALL CAMSHAFT

(a) Reinstall the valve lifters (See page EM–63).
(b) Align the crankshaft pulley groove with the timing mark ”0” of the timing chain cover.
(c) Hold the timing chain, and place the intake camshaft and timing sprocket assembly.
(d) Align the matchmarks on the timing chain and camshaft timing sprocket.
(e) Reinstall the camshaft and timing sprocket assemblies (See page EM–67).



(f) Check that the point marks of the camshaft timing sprockets are in straight line on the timing chain cover surface as shown in the illustration.
(g) Check that the matchmarks are on the timing chain and camshaft timing sprockets.
(h) Install the chain tensioner (See page EM–26).
(i) Recheck the valve clearance (See procedure in step 3).
(j) Check the valve timing (See page EM–26).

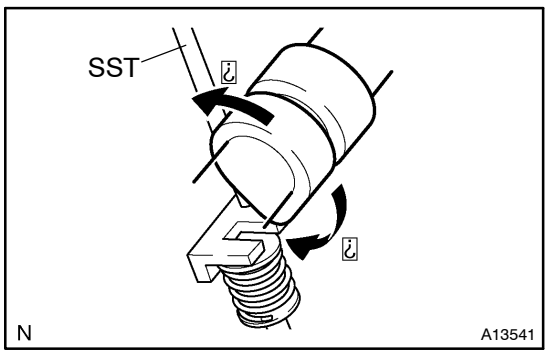


7. 2ZZ–GE:
REINSTALL ADJUSTING SHIM

(a) Lift the rocker arm to make a room and use SST, install the adjusting shim.

HINT:

- Setting SST from the right above makes the removal easy.
- To remove SST from the adjusting shim, it is advisable to push down the rocker arm.



(b) Turn the crankshaft so that the related rocker arm, where the valve clearance is adjusted, is fully pushed down.

NOTICE:

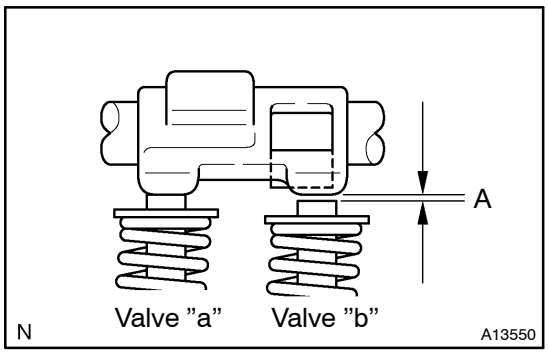
- **Pay attention to the direction of the rotation to prevent the nose of the camshaft from interfering with the SST’s shaft.**
- **Do not rotate the crankshaft excessively.**

(c) After loosening the 2 set screws of SST, remove SST itself.
SST 09248–77010 (09248–07010)

8. REINSTALL CYLINDER HEAD COVER
(See page EM–26)

9. IF VALVE OR ROCKER ARM IS REPLACED, REPLACE SHIM AS FOLLOWS

(a) Install a standard shim of 2.400 mm (0.0945 in.) thickness at low temperature and install the rocker arm.



(b) While pressing the rocker arm, measure the clearance ”A” of valve ”b” in the condition that a clearance of the other value is 0mm (0 in.).

(c) To adjust the valve hight, replace a shim of valve ”b” with a shim that has thickness of t_1.
t_1 = A + 2.400

(d) After adjusting the valve hight, adjust the clearance as described from step 3.

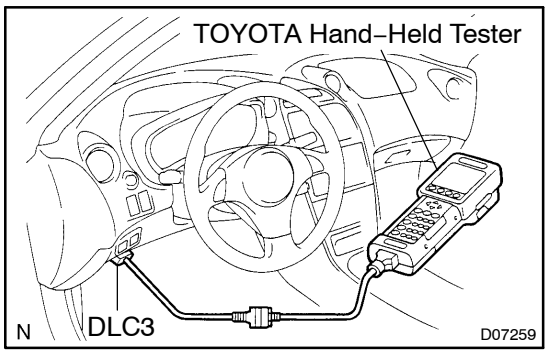
IGNITION TIMING

EM15P–06

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

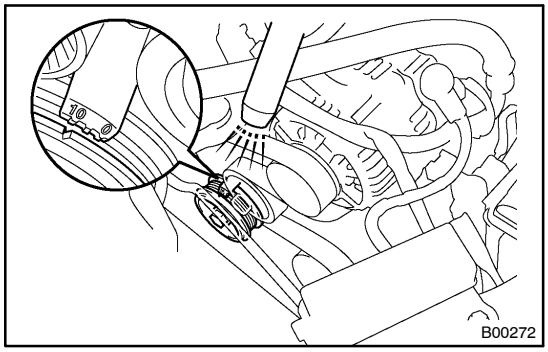


2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operator's for further details.

3. CONNECT TIMING LIGHT TO ENGINE



4. INSPECT IGNITION TIMING

Using a timing light, check the ignition timing.

Ignition timing:
1ZZ–FE:
10 – 18° BTDC @ idle
2ZZ–GE:
8 – 12° BTDC @ idle
(Transmission in neutral position)

HINT:

After engine rpm is kept at 1,000 – 1,300 rpm for 5 seconds, check that it returns to idle speed.

5. DISCONNECT TIMING LIGHT FROM ENGINE

6. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

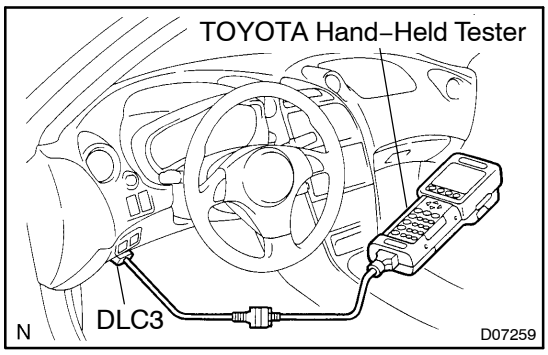
IDLE SPEED

EM05N–09

INSPECTION

1. INSTALL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All vacuum lines properly connected
(e) SFI system wiring connectors fully plugged
(f) All operating accessories switched OFF
(g) Ignition timing check correctly
(h) Transmission in neutral position
(i) Air conditioning switched OFF



2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3.
(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operator's manual for further details.

3. INSPECT IDLE SPEED

(a) Race the engine at 2,500 rpm for approx. 90 seconds.
(b) Check the idle speed.

Idle speed (w/ Cooling fan OFF):
1ZZ–FE
M/T 700 ± 50 rpm
A/T 750 ± 50 rpm
2ZZ–GE
M/T 800 ± 50 rpm
A/T 750 ± 50 rpm

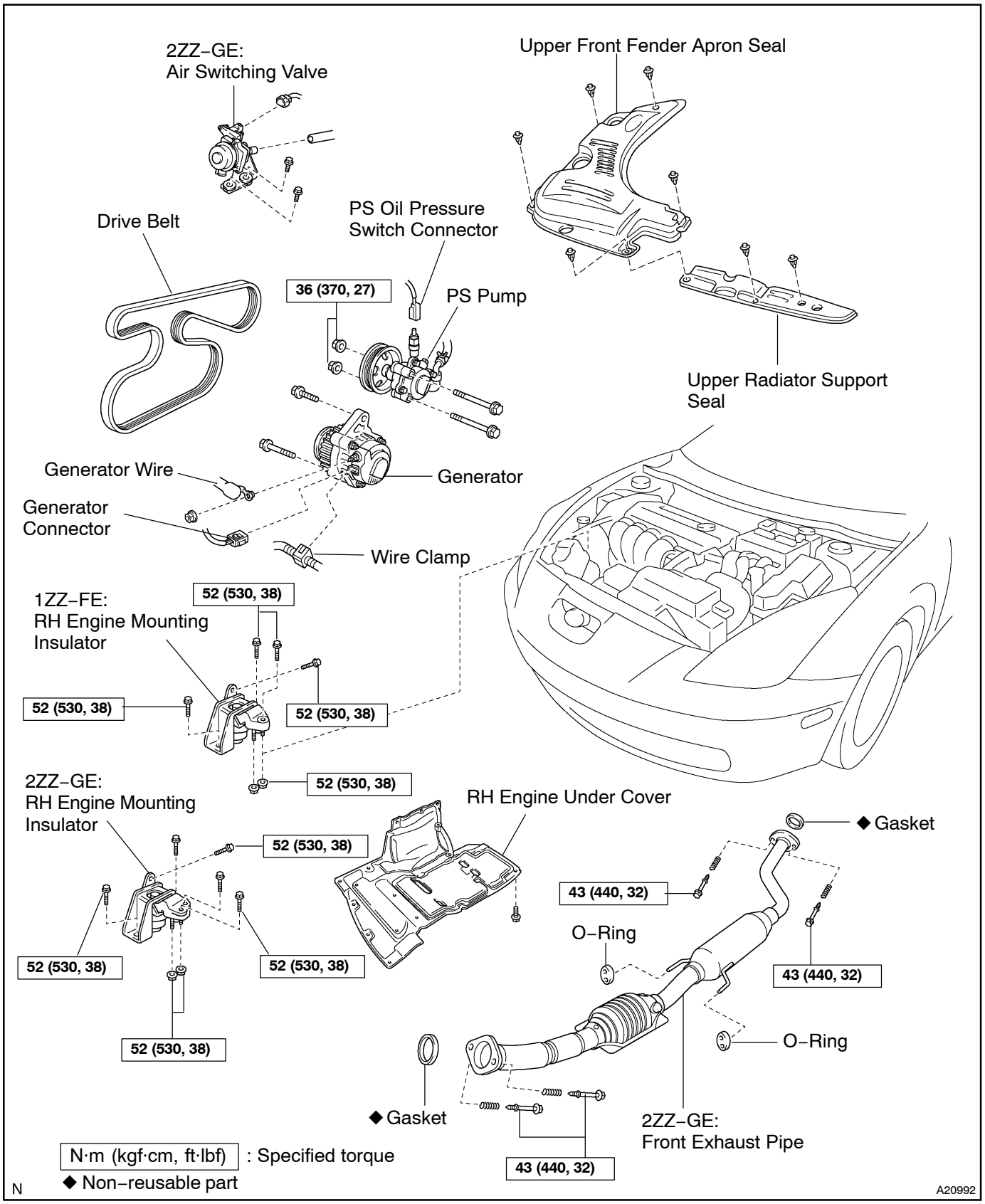
If the idle speed is not as specified, check the IAC valve and air intake system.

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

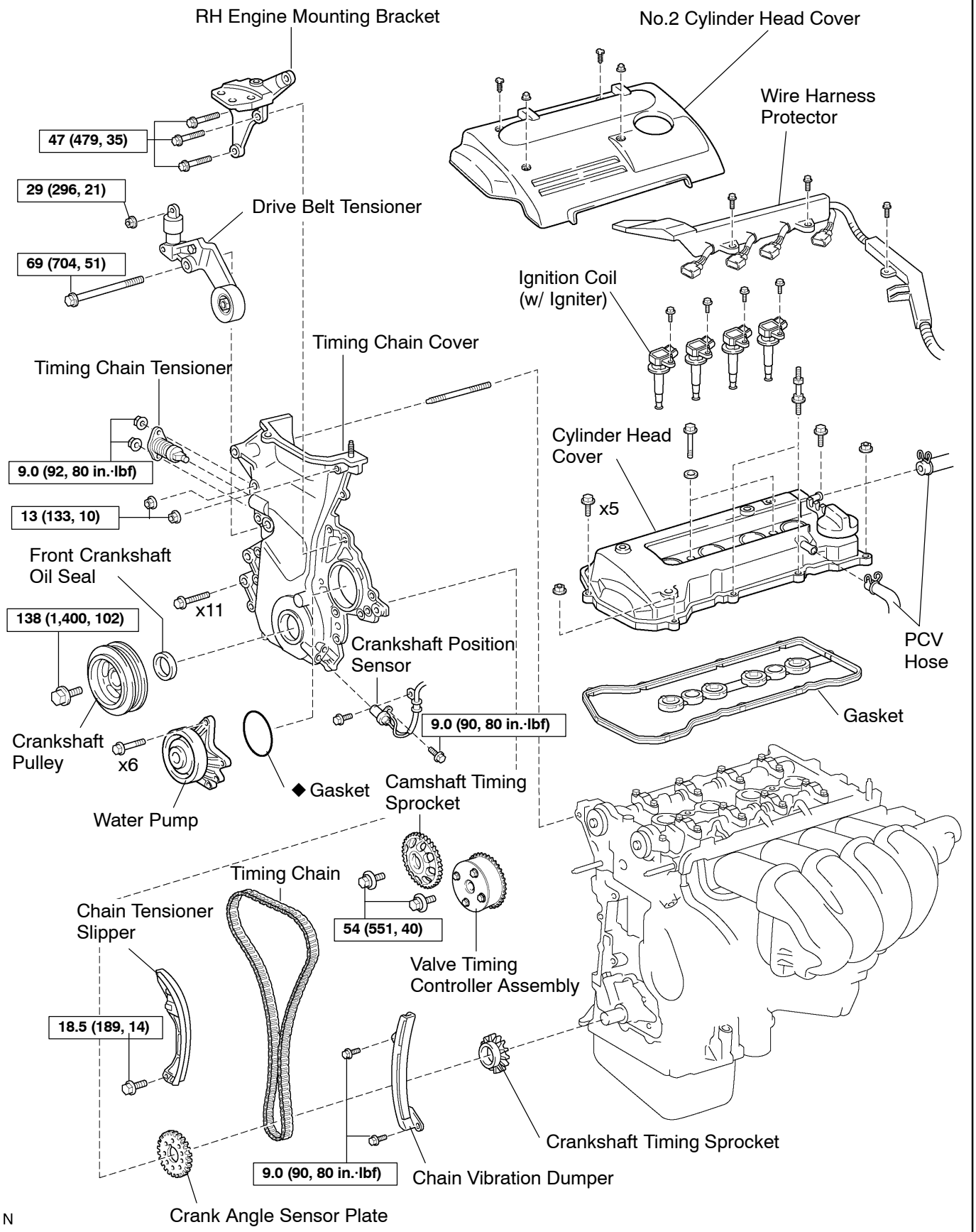
TIMING CHAIN

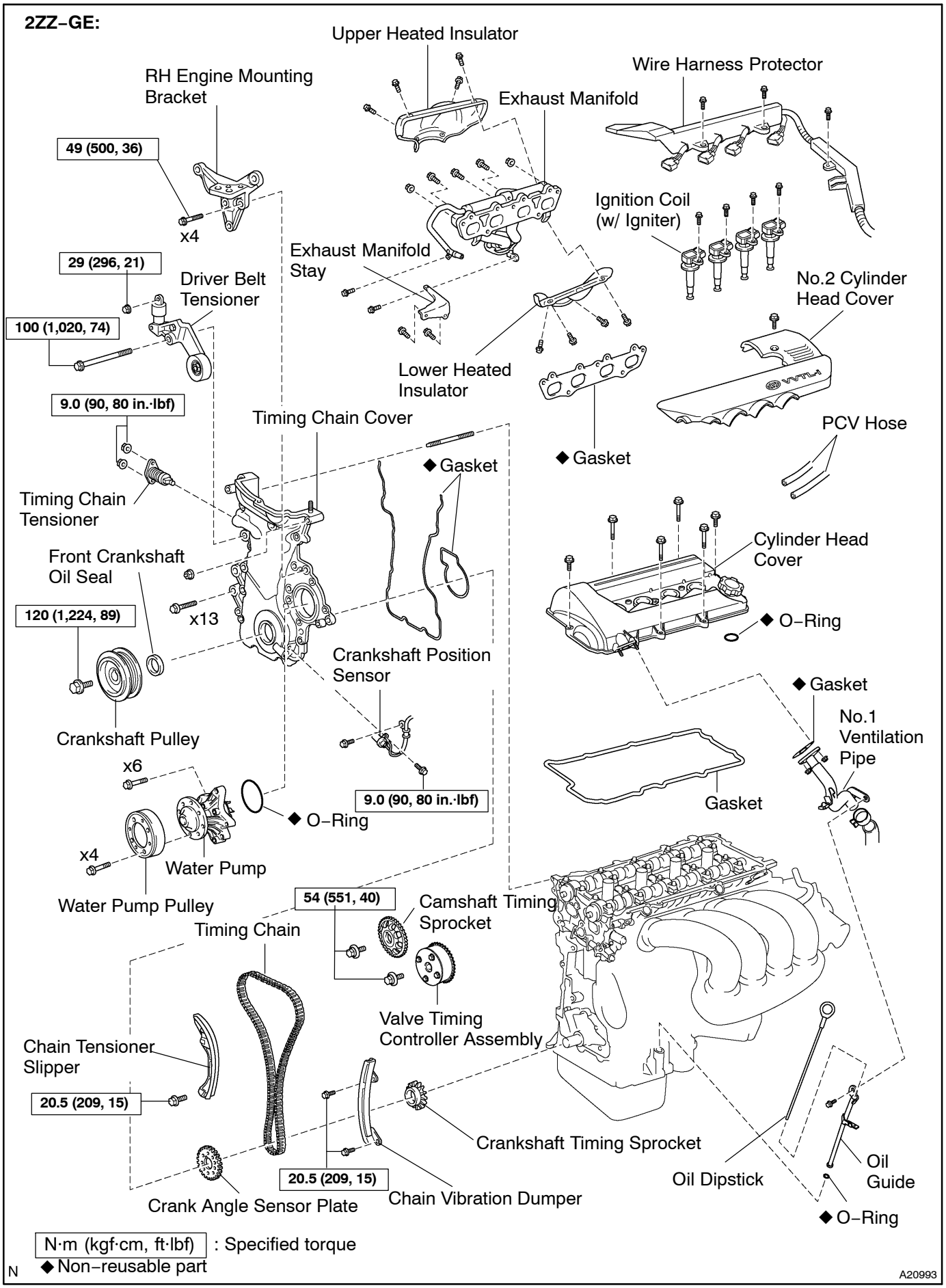
COMPONENTS

EM15R–06



1ZZ–FE:


RH Engine Mounting Bracket
No.2 Cylinder Head Cover
Wire Harness Protector
47 (479, 35)
29 (296, 21)
Drive Belt Tensioner
69 (704, 51)
Ignition Coil (w/ Igniter)
Timing Chain Cover
Timing Chain Tensioner
9.0 (92, 80 in.·lbf)
13 (133, 10)
Cylinder Head Cover
x5
Front Crankshaft Oil Seal
x11
138 (1,400, 102)
Crankshaft Position Sensor
PCV Hose
Gasket
9.0 (90, 80 in.·lbf)
Crankshaft Pulley
x6
◆ Gasket
Camshaft Timing Sprocket
Water Pump
Timing Chain
Chain Tensioner Slipper
54 (551, 40)
Valve Timing Controller Assembly
18.5 (189, 14)
Crankshaft Timing Sprocket
9.0 (90, 80 in.·lbf)
Chain Vibration Dumper
Crank Angle Sensor Plate
N
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A21000


2ZZ–GE:
Upper Heated Insulator
RH Engine Mounting Bracket
Wire Harness Protector
Exhaust Manifold
49 (500, 36)
x4
Ignition Coil (w/ Igniter)
Exhaust Manifold Stay
29 (296, 21)
Driver Belt Tensioner
No.2 Cylinder Head Cover
100 (1,020, 74)
Lower Heated Insulator
◆ Gasket
9.0 (90, 80 in.·lbf)
Timing Chain Cover
PCV Hose
◆ Gasket
Timing Chain Tensioner
Cylinder Head Cover
Front Crankshaft Oil Seal
x13
◆ O–Ring
120 (1,224, 89)
Crankshaft Position Sensor
◆ Gasket
No.1 Ventilation Pipe
Crankshaft Pulley
x6
9.0 (90, 80 in.·lbf)
Gasket
◆ O–Ring
x4
Water Pump
Water Pump Pulley
54 (551, 40)
Camshaft Timing Sprocket
Timing Chain
Valve Timing Controller Assembly
Chain Tensioner Slipper
20.5 (209, 15)
Crankshaft Timing Sprocket
Oil Dipstick
Oil Guide
20.5 (209, 15)
Chain Vibration Dumper
Crank Angle Sensor Plate
◆ O–Ring
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
N
A20993

EM1W6–04

REMOVAL

1. REMOVE UPPER FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL

2. DRAIN ENGINE COOLANT

3. REMOVE RH FRONT WHEEL

4. REMOVE RH ENGINE UNDER COVER

5. 2ZZ–GE:
REMOVE AIR SWITCHING VALVE (See page EC–15)

6. REMOVE DRIVE BELT AND GENERATOR (See page CH–7)

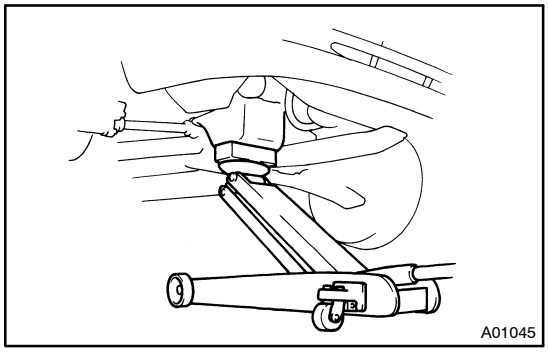
7. DISCONNECT PS PUMP FROM ENGINE

(a) Disconnect the PS oil pressure switch connector.

(b) Remove the 2 nuts and through bolts, and disconnect the PS pump from the engine (See page SR–26).

HINT:

Put aside the pump and suspend it to the cowl with a string.

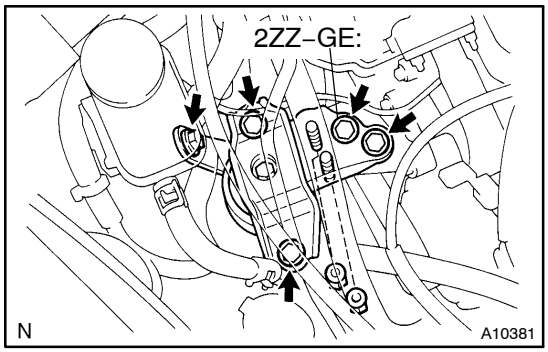


8. REMOVE RH ENGINE MOUNTING INSULATOR

(a) Set the jack to the engine.

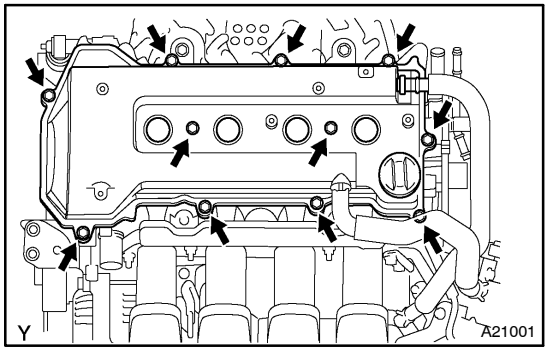
HINT:

Place a wooden block between the jack and engine.



(b) 1ZZ–FE:
Remove the 4 bolts, 2 nuts and RH engine mounting insulator.

(c) 2ZZ–GE:
Remove the 5 bolts, 2 nuts and RH engine mounting insulator.



9. 1ZZ–FE:
REMOVE CYLINDER HEAD COVER

(a) Remove the 2 nuts, 2 clips and No. 2 cylinder head cover.

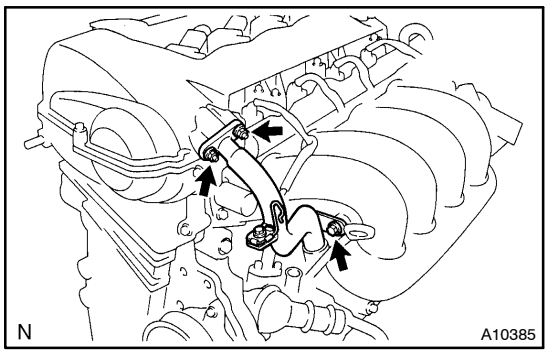
(b) Remove the 4 ignition coils (See page IG–6).

(c) Disconnect the 2 PCV hoses from the cylinder head.

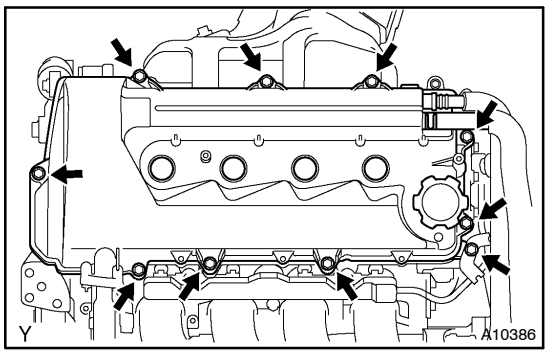
(d) Remove the 9 bolts, 2 seal washers, 2 nuts, cylinder head cover and gasket.

10. 2ZZ–GE:
REMOVE CYLINDER HEAD COVER

(a) Remove the 4 bolts and No. 2 cylinder head cover.
(b) Remove the ignition coils (See page IG–6).
(c) Disconnect the 2 PCV hoses from the cylinder head cover.



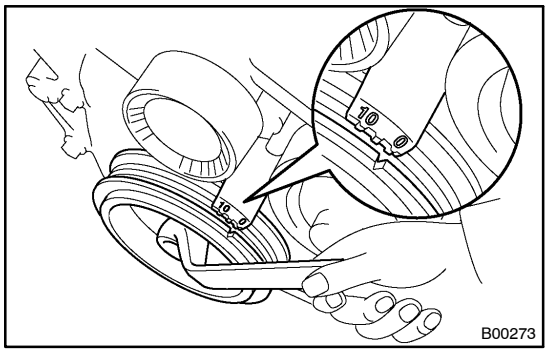
(d) Remove the 2 nuts, bolt and disconnect the No. 3 ventilation hose from the No. 1 ventilation pipe.
(e) Remove the No. 1 ventilation pipe and gasket.



(f) Remove the 9 bolts, wire harness protector, cylinder head cover and gasket.
(g) Remove the O–ring from the cylinder head cover.

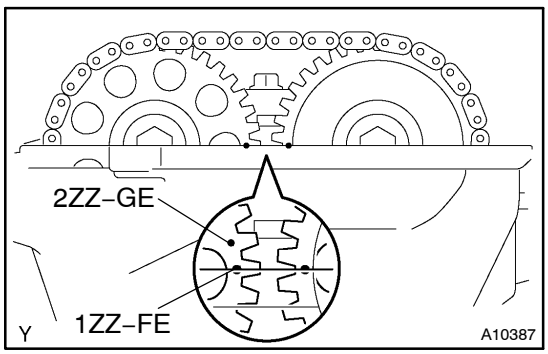
11. SET NO.1 CYLINDER TO TDC/COMPRESSION

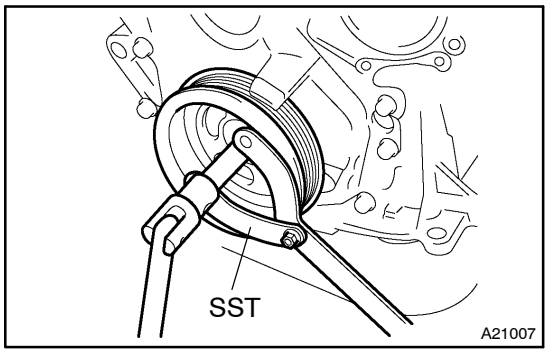
(a) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.



(b) Check that the point marks of the camshaft timing sprockets are in straight line on the timing chain cover surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

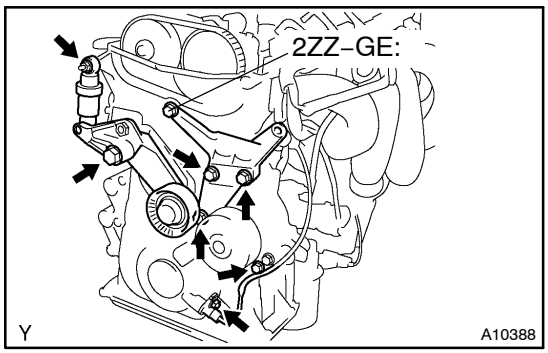




12. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)

(b) Remove the crankshaft pulley from the crankshaft.



13. DISCONNECT CRANKSHAFT POSITION SENSOR FROM TIMING CHAIN COVER

Remove the 2 bolts and crankshaft position sensor.

14. REMOVE DRIVE BELT TENSIONER

Remove the bolt, nut and drive belt tensioner.

15. REMOVE RH ENGINE MOUNTING BRACKET

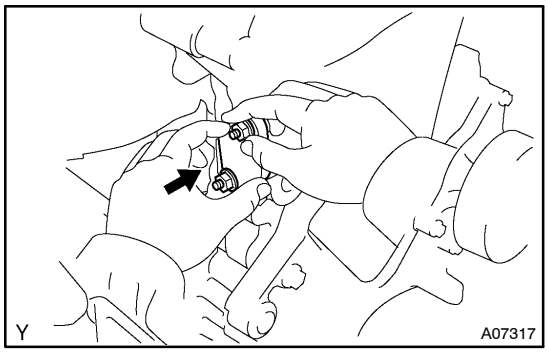
(a) 1ZZ–FE:
Remove the 3 bolts and mounting bracket.

(b) 2ZZ–GE:
Remove the 4 bolts and mounting bracket.

16. 2ZZ–GE:
REMOVE FRONT EXHAUST PIPE (See page EM–44)

17. 2ZZ–GE:
REMOVE EXHAUST MANIFOLD STAY (See page EM–44)

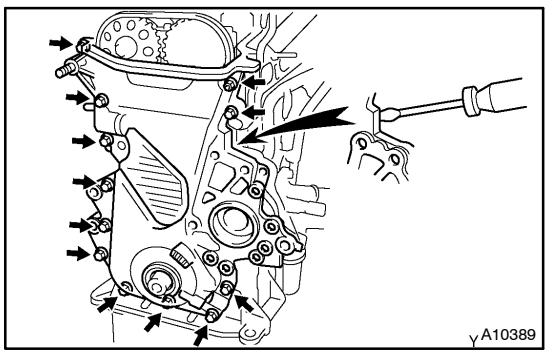
18. 2ZZ–FE:
REMOVE EXHAUST MANIFOLD (See page EM–44)



19. REMOVE CHAIN TENSIONER

Remove the 2 nuts and chain tensioner.

20. REMOVE WATER PUMP (See page CO–5)



21. 1ZZ–FE:
REMOVE TIMING CHAIN COVER

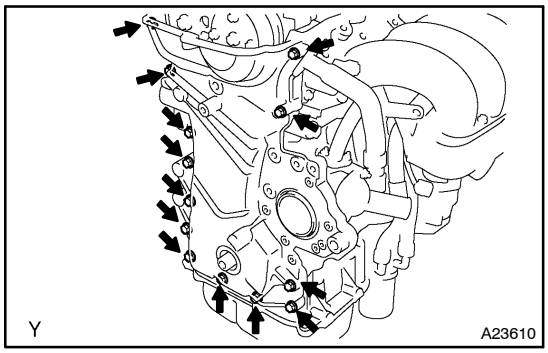
(a) Remove the 11 bolts and nut.

(b) Using a torx® wrench socket (E8), remove the stud bolt.

(c) Remove the timing chain cover by prying the portions between the cylinder head and cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the timing chain cover, cylinder head and cylinder block.



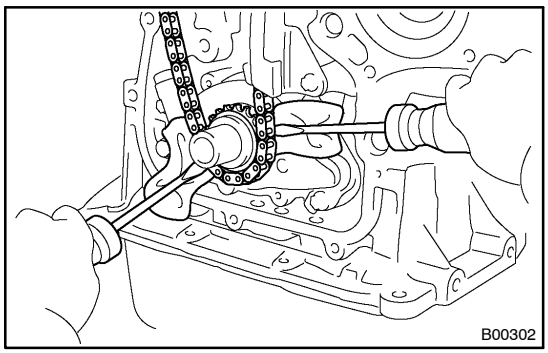
22. 2ZZ–GE:
REMOVE TIMING CHAIN COVER

(a) Remove the 13 bolts.
(b) Using a torx® wrench socket (E8), remove the stud bolt.
(c) Remove the timing chain cover and 2 gaskets.

23. REMOVE CRANK ANGLE SENSOR PLATE

24. REMOVE CHAIN TENSIONER SLIPPER

Remove the bolt and slipper.



25. REMOVE TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET

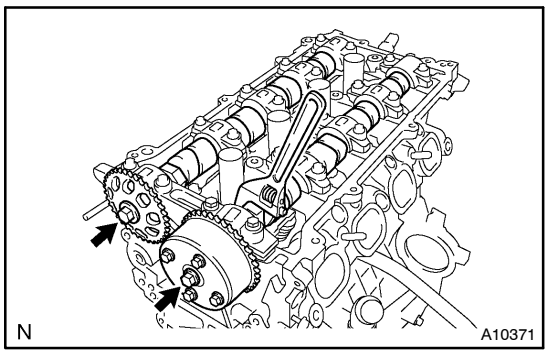
If the crankshaft timing sprocket cannot be removed by hand, use 2 screwdrivers.

NOTICE:

Position shop rags as shown to prevent damage.

26. REMOVE CHAIN VIBRATION DAMPER

Remove the 2 bolts and damper.



27. REMOVE VALVE TIMING CONTROL ASSEMBLY AND CAMSHAFT TIMING SPROCKET

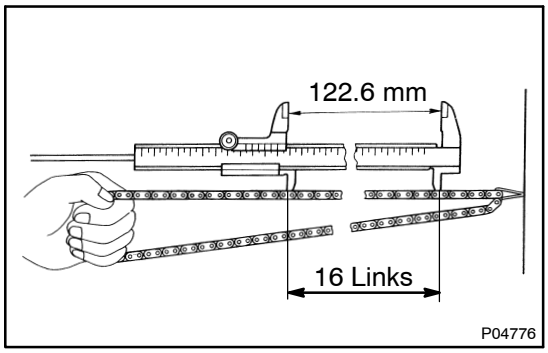
Hold the hexagonal head wrench portion of the camshaft with a wrench, and remove the bolt, valve timing controller assembly and timing sprocket.

NOTICE:

- **Be careful not to damage the cylinder head and valve lifter with the wrench.**
- **Do not disassemble the valve timing controller assembly.**

EM05Q–13

INSPECTION



1. INSPECT TIMING CHAIN AND TIMING SPROCKETS

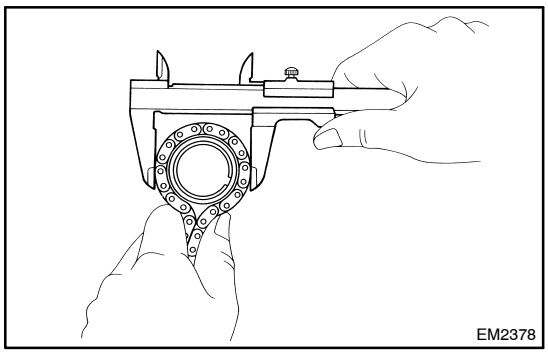
(a) Using a vernier calipers, measure the length of 16 links with the chain dully stretched.

Maximum chain elongation: 122.6 mm (4.827 in.)

If the elongation is greater than maximum, replace the chain.

HINT:

Make the same measurements pulling at 3 or more places selected at random.



(b) Wrap the chain around the timing sprocket.

(c) Using a vernier calipers, measure the timing sprocket diameter with the chain.

NOTICE:

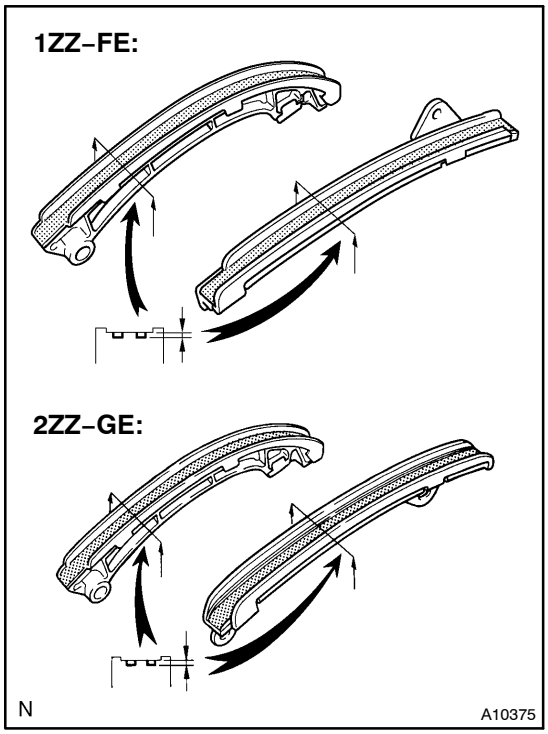
Vernier calipers must contact the chain rollers for measuring.

Minimum sprocket diameter (w/ Chain):

Camshaft 97.3 mm (3.831 in.)

Crankshaft 51.6 mm (2.031 in.)

If the diameter is less than minimum, replace the chain and sprockets.

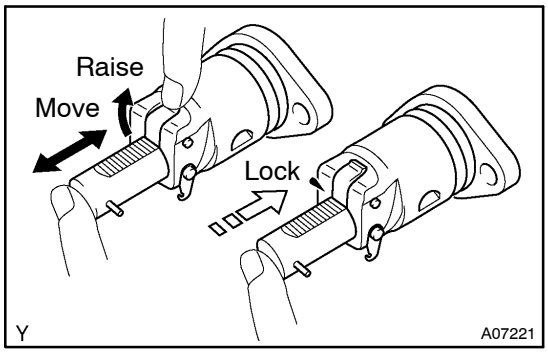


2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

Measure the chain tensioner slipper and vibration damper wears.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the slipper and/or damper.



3. INSPECT CHAIN TENSIONER

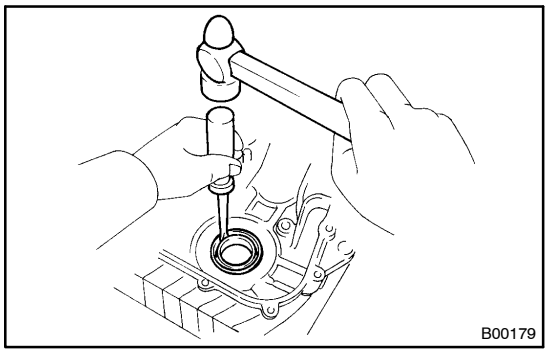
(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

(b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

4. INSPECT OIL JET (See page LU–11)

EM05R–10

REPLACEMENT



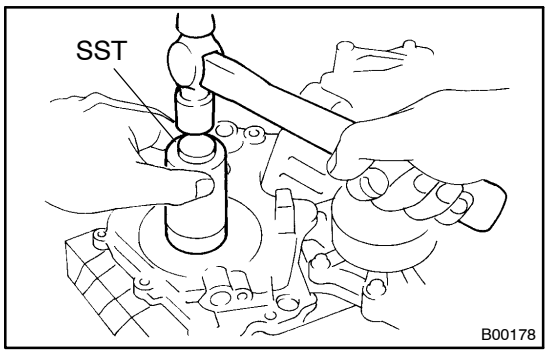
HINT:

There are 2 methods ((a) and (b)) to replace the oil seal as follows:

REPLACE CRANKSHAFT FRONT OIL SEAL

(a) If timing chain cover is removed from cylinder block.

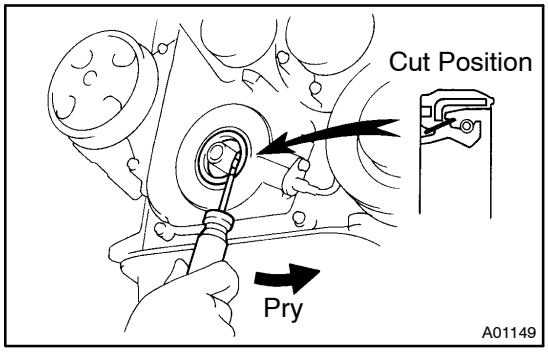
(1) Using a screwdriver and a hammer, tap out the oil seal.



(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.

SST 09309–37010

(3) Apply MP grease to the oil seal lip.



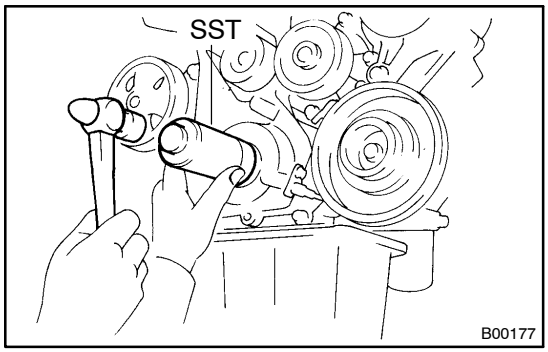
(b) If timing chain cover is installed to the cylinder block.

(1) Using a knife, cut off the oil seal lip.

(2) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft. Tape the screwdriver tip.

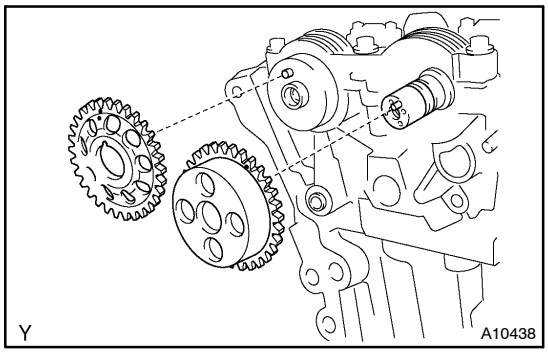


(3) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.

SST 09309–37010

EM15S–08

INSTALLATION



1. INSTALL VALVE TIMING CONTROLLER ASSEMBLY AND CAMSHAFT TIMING SPROCKET

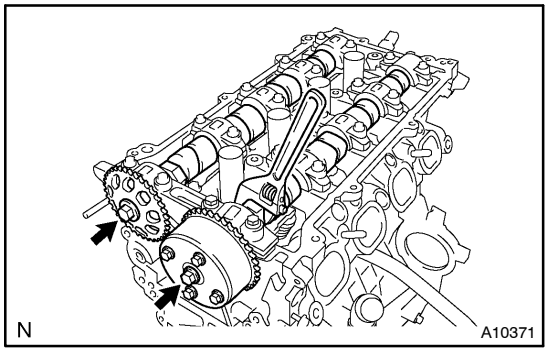
(a) Apply engine oil in the range from the tip of the intake camshaft to 16 mm from that tip.

(b) Align the timing mark on the value timing controller assembly with the knock pin, and install the value timing controller assembly to the camshaft.

NOTICE:

Do not push valve timing controller assembly to the camshaft forcibly when installing it.

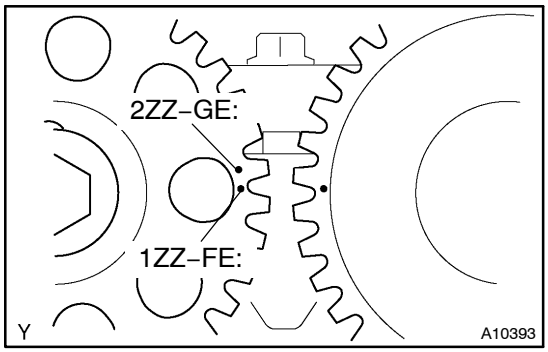
(c) Align the knock pin hole in the camshaft timing sprocket with the knock pin of the camshaft, and exhaust the sprocket to the camshaft.



(d) Temporarily install the timing sprocket bolt.

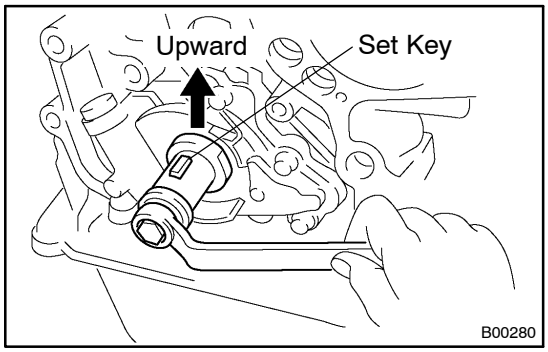
(e) Hold the hexagon wrench head portion of the camshaft with a wrench, and tighten the timing sprocket bolt.

Torque: 54 N·m (551 kgf·cm, 40 ft·lbf)

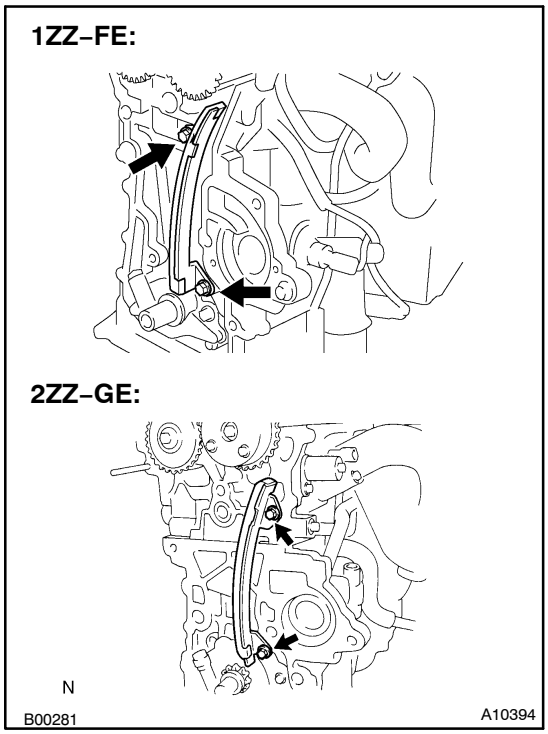


2. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the hexagonal wrench head portion of the camshafts, and align the point marks of the camshaft timing sprockets.



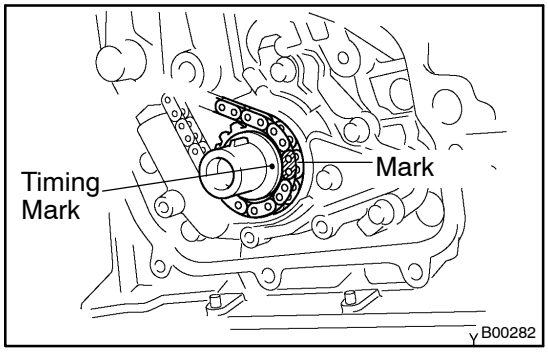
(b) Using a crankshaft pulley bolt, turn the crankshaft and set the set key on the crankshaft upward.



3. INSTALL CHAIN VIBRATION DAMPER

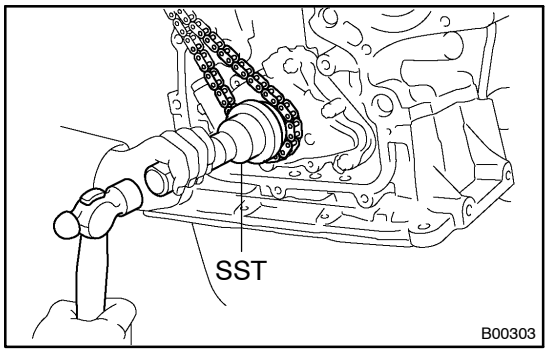
Install the damper with the 2 bolts.

Torque:
1ZZ–FE 9.0 N·m (92 kgf·cm, 80 in.·lbf)
2ZZ–GE 20.5 N·m (209 kgf·cm, 15 ft·lbf)

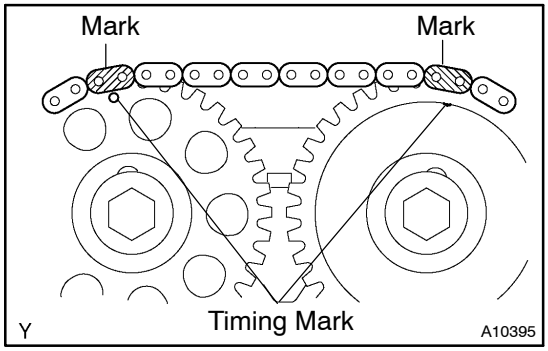


4. INSTALL TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET

(a) Install the timing chain on the crankshaft timing sprocket with the yellow color link aligned with the timing mark on the crankshaft timing sprocket.

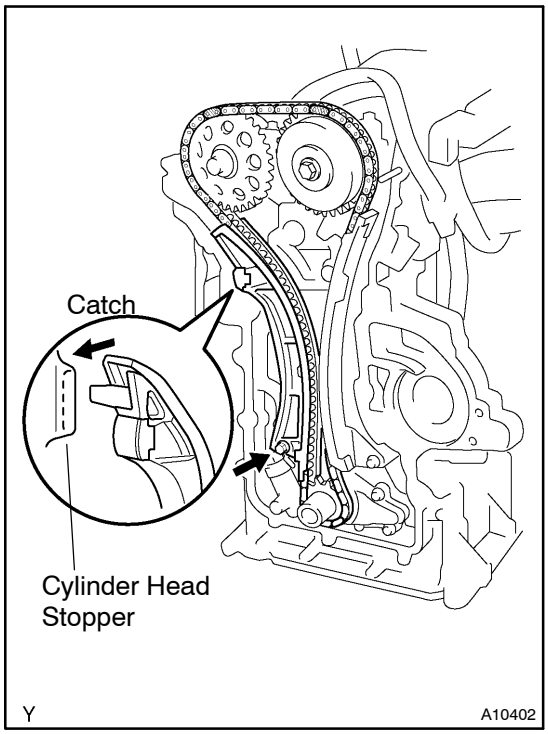


HINT:
If necessary, install the sprocket with SST.
SST 09223–22010



(b) 1ZZ–FE:
Install the timing chain on the camshaft timing sprockets with the yellow color links aligned with the timing marks on the camshaft timing sprockets.

(c) 2ZZ–GE:
Install the timing chain on the camshaft timing sprockets with the orange color links aligned with the timing marks on the camshaft timing sprockets.



(d) Check that the tension between the intake camshaft timing sprocket and crankshaft timing sprocket.

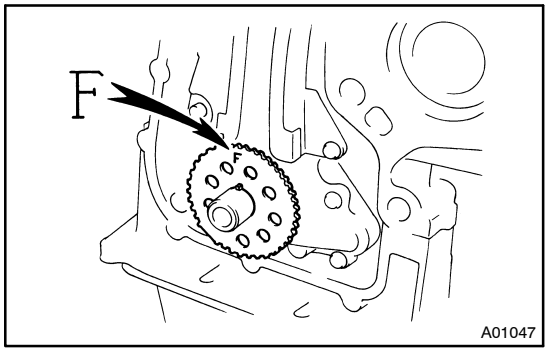
5. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the slipper with the bolt.

Torque:
1ZZ–FE 18.5 N·m (189 kgf·cm, 14 ft·lbf)
2ZZ–GE 20.5 N·m (209 kgf·cm, 15 ft·lbf)

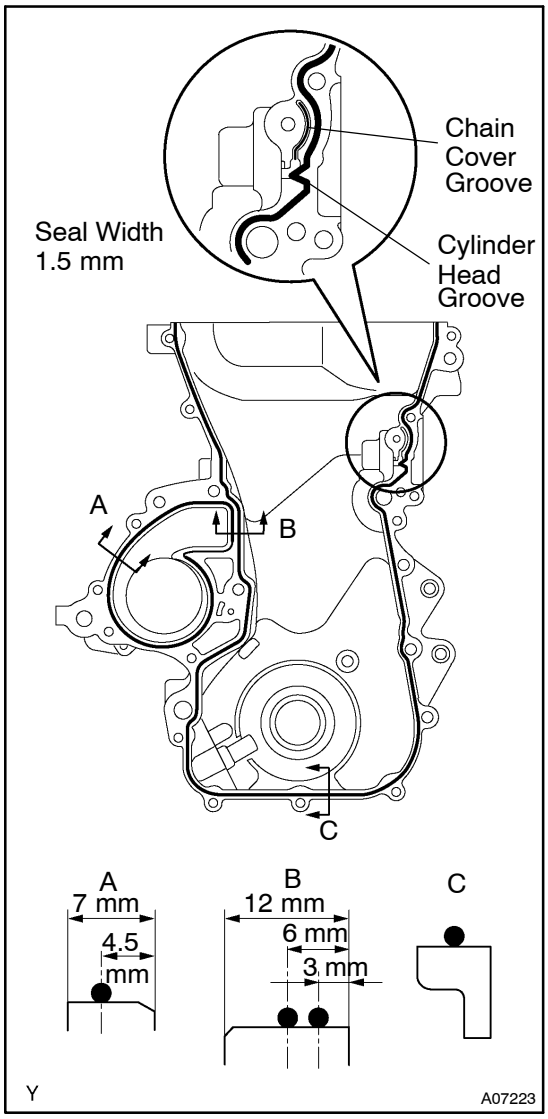
(b) Check that the slipper moves is caught on the cylinder head stopper.

NOTICE:
DO not turn the crankshaft.



6. INSTALL CRANK ANGLE SENSOR PLATE

Install the plate with the ”F” mark facing forward.



7. 1ZZ–FE:

INSTALL TIMING CHAIN COVER AND WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

- Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the timing chain cover as shown in the illustration.

Seal packing:

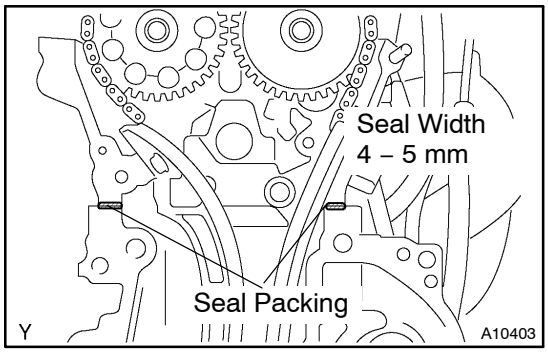
Part No. 08826 – 00100 or equivalent

- Install a nozzle that has been cut to a 1.5 mm (0.16 – 0.20 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Apply seal packing to 2 locations as shown in the illustration.

Seal packing:

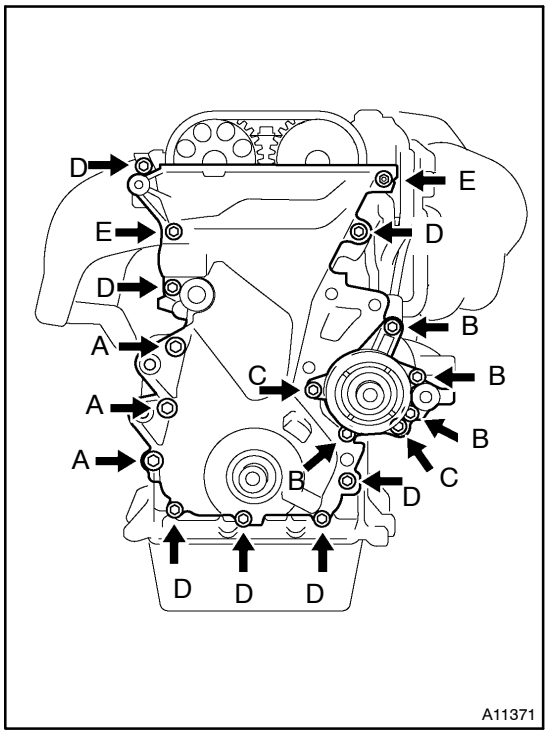
Part No. 08826 – 00080 or equivalent

- Install a nozzle that has been cut to a 1.5 mm (0.16 – 0.20 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(d) Install the timing chain cover, O–ring and water pump with the 16 bolts and 2 nuts. Uniformly tighten the bolts and nut in several passes.

Torque:
10 mm head:
9 N·m (92 kgf·cm, 80 in.·lbf) for C
13 N·m (133 kgf·cm, 10 ft·lbf) for D and E
11 N·m (113 kgf·cm, 8 ft·lbf) for B
12 mm head:
18.5 N·m (189 kgf·cm, 14 ft·lbf) for A

NOTICE:

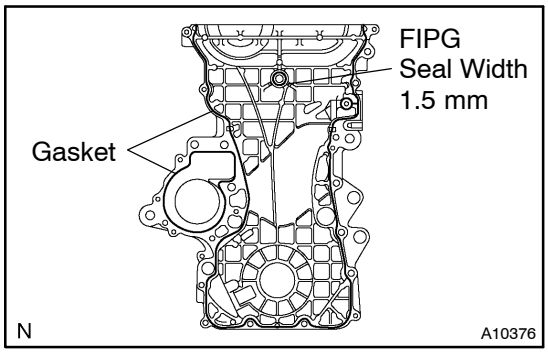
- **Pay attention not to wrap the chain and slipper over the chain cover seal line.**
- **After installing the chain cover, must install the mounting bracket and water pump within 15 minutes.**

HINT:

Each bolt length in indicated in the illustration.

A 45 mm (1.77 in.)
B 35 mm (1.38 in.)
C 22 mm (0.87 in.)
D 25 mm (0.98 in.)

(e) Using a torx® wench socket (E8), install the stud bolt.
Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)



8. 2ZZ–GE:

INSTALL TIMING CHAIN COVER AND WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover, cylinder head and cylinder block.

- Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the timing chain cover as shown in the illustration.

Seal packing:

Part No. 08826–00100 or equivalent

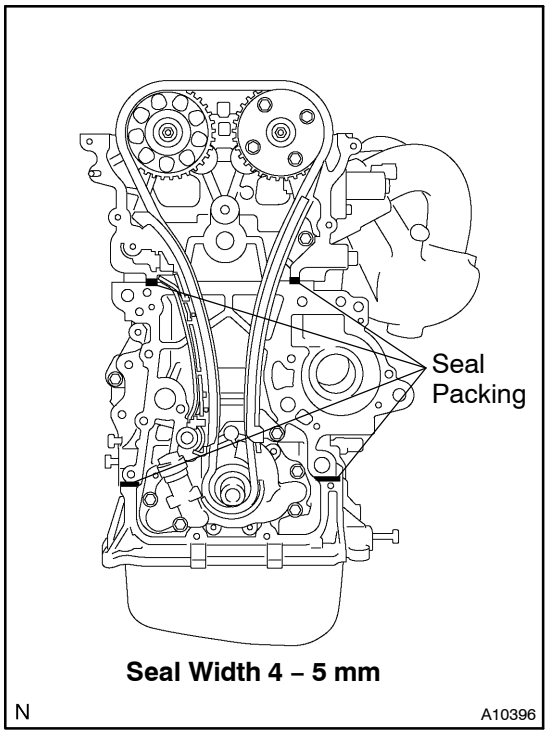
- Install a nozzle that has been cut to a 1.5 mm opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the 2 gasket to the timing chain cover as shown in the illustration.



(d) Apply seal packing to 4 locations as shown in the illustration.

Seal packing:

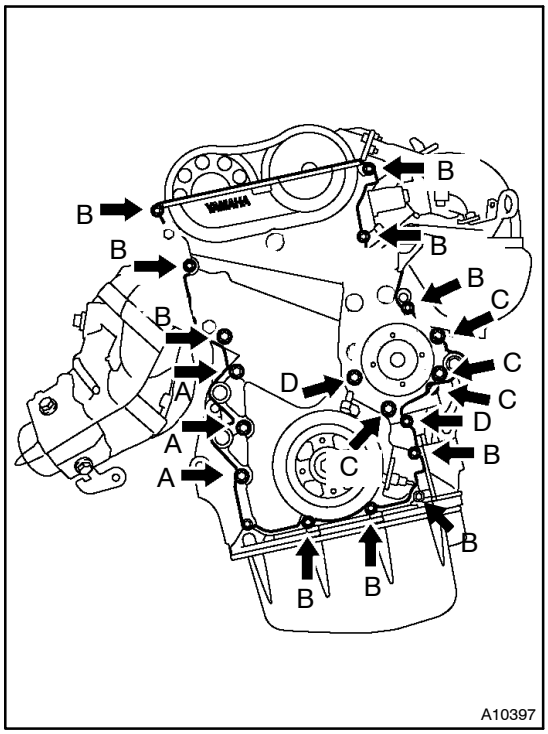
Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(e) Install the timing chain cover, O–ring and water pump with the 19 bolts. Uniformly tighten the bolts in several passes.
Torque:
A: 21 N·m (214 kgf·cm, 15 ft·lbf)
B: 11 N·m (113 kgf·cm, 8 ft·lbf)
C: 9.0 N·m (92 kgf·cm, 80 in.·lbf)
D: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

NOTICE:

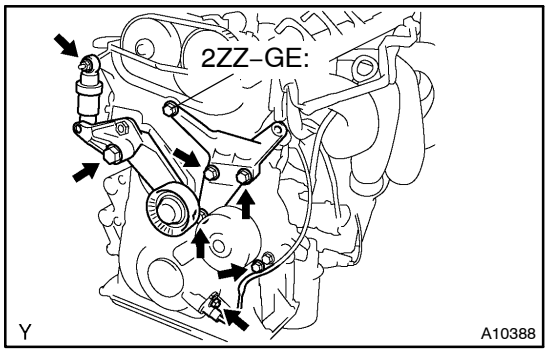
- **Pay attention not to wrap the chain and slipper over the chain cover seal line.**
- **After install the chain cover, must install the mounting bracket and water pump within 15 minutes.**

(f) Using a torx® wrench socket (E8), install the stud bolt.
Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

9. 2ZZ–GE:
INSTALL EXHAUST MANIFOLD (See page EM–67)

10. 2ZZ–GE:
INSTALL EXHAUST MANIFOLD STAY
(See page EM–67)

11. 2ZZ–GE:
INSTALL FRONT EXHAUST PIPE (See page EM–67)



12. 1ZZ–FE:
INSTALL RH ENGINE MOUNTING BRACKET

(a) Apply seal packing to threads of the mounting bolt.
Seal packing:
Part No. 08826 – 00080 or equivalent

HINT:
Do not apply seal packing to 2 or 3 threads of the bolt end.

(b) Install the mounting bracket with the 3 bolts.
Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

13. 2ZZ–GE:
INSTALL RH ENGINE MOUNTING BRACKET

Install the mounting bracket with the 4 bolts.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

14. INSTALL DRIVE BELT TENSIONER

(a) Check the appearance before installing the drive belt tensioner.

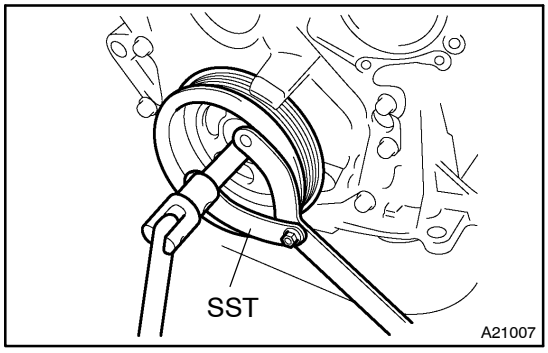
If in case of having the oil leakage, crack, and etc., replace the drive belt tensioner.

(b) Install the drive belt tensioner.
Torque:
Bolt
1ZZ–FE 69 N·m (704 kgf·cm, 51 ft·lbf)
2ZZ–GE 100 N·m (1,020 kgf·cm, 74 ft·lbf)
Nut 29 N·m (296 kgf·cm, 21 ft·lbf)

(c) Hook the tool on the hexagonal portion of the drive belt tensioner bracket and operate drive belt tensioner 3 times with full stroke.

HINT:
Take 3 seconds or more for 1 full stroke.

15. INSTALL CRANKSHAFT POSITION SENSOR
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

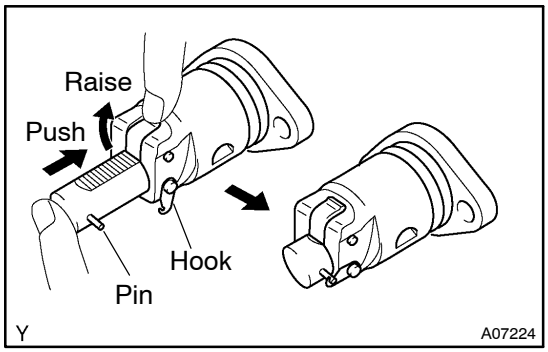


16. INSTALL CRANKSHAFT PULLEY

(a) Clean the crankshaft pulley inside.

(b) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

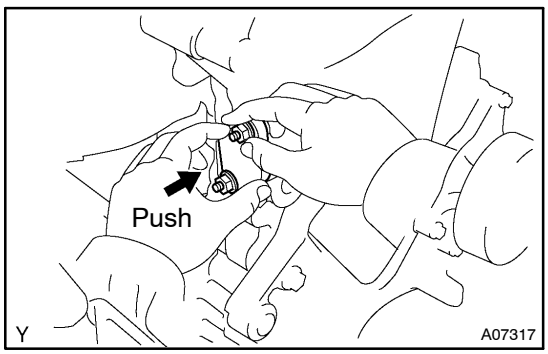
(c) Using SST, install the pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque:
1ZZ–FE 138 N·m (1,409 kgf·cm, 102 ft·lbf)
2ZZ–GE 120 N·m (1,224 kgf·cm, 89 ft·lbf)



17. INSTALL CHAIN TENSIONER

(a) Check the chain tensioner.
(See page EM–16)

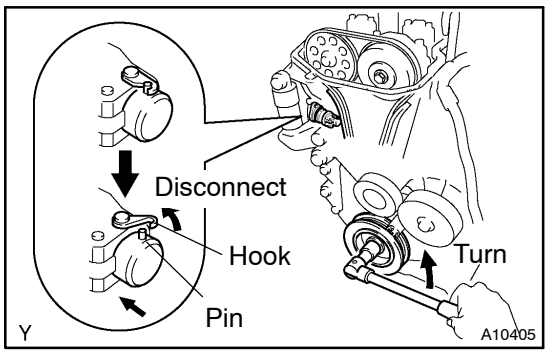
(b) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.



(c) Insert the O–ring with your hand until it reaches to the chamfering position and install nut temporally. Then, by tightening the nut, insert the chain tensioner to the installation position.

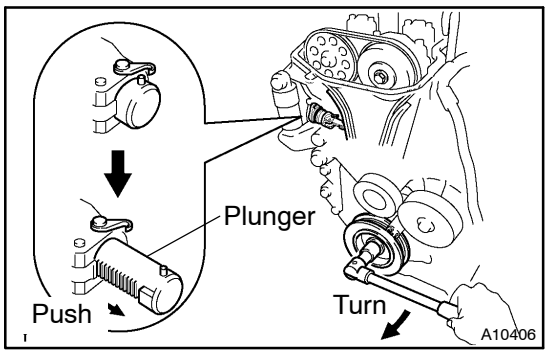
HINT:
- In the case that the hook is released while pushing in, apply the hook again and push the tensioner in.
- Pay attention not to catch the O–ring as it is built in the chain tensioner previously.

(d) Tighten the 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

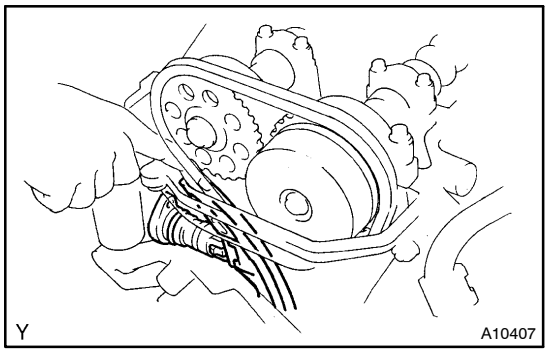


18. SET CHAIN TENSION

(a) Turn the crankshaft counterclockwise, and disconnect the plunger knock pin from the hook.



(b) Turn the crankshaft clockwise, and check that the slipper is pushed by the plunger.

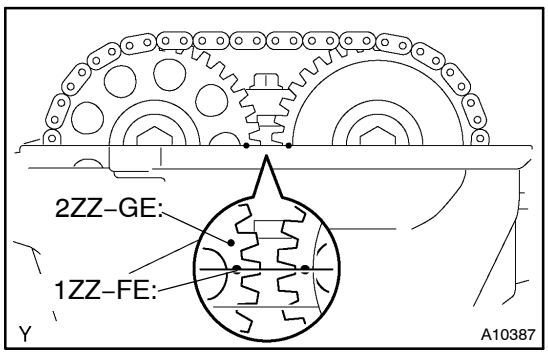


HINT:
If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released from the knock pin and the plunger springs out.

19. CHECK VALVE TIMING

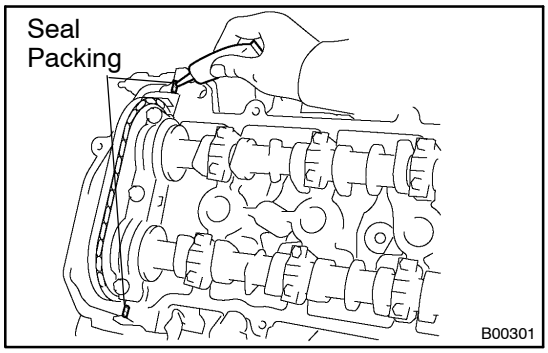
(a) Turn the crankshaft pulley, and align its groove with timing mark ”0” of the timing chain cover.

NOTICE:
Always turn the crankshaft clockwise.



(b) Check that the point marks of the camshaft timing sprockets are in straight line on the timing chain cover surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360˚) and align the marks as above.



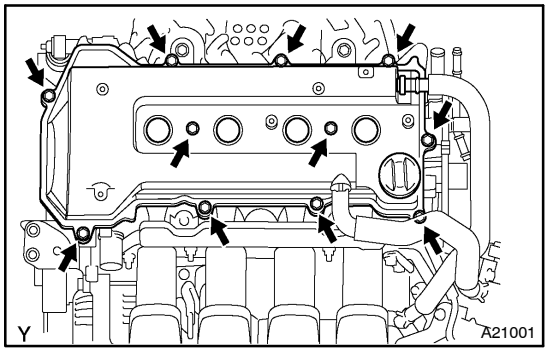
20. 1ZZ–FE:
INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to 2 locations as shown in the illustration.
Seal packing:
Part No. 08826 – 00080 or equivalent

(c) Install the gasket to the cylinder head cover.

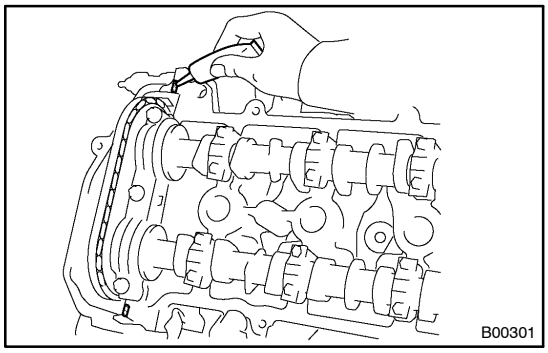
HINT:
Part must be assembled within 3 minutes of application. Otherwise the material must be remove and reapplied.



(d) Install the cylinder head cover with the 9 bolts, 2 seal washers and 2 nuts.
Uniformly tighten the bolts and nuts, in the several passes, in the sequence shown.
Torque:
w/o washer
11 N·m (113 kgf·cm, 8 ft·lbf)
w/ washer
9.0 N·m (92 kgf·cm, 80 in.·lbf)

(e) Connect the 2 PCV hoses to the cylinder head cover.

(f) Install the ignition coil (See page IG–7).



21. 2ZZ–GE:
INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

HINT:
When FIPG on the head cover gasket side cannot be eliminated completely, replace the gasket.

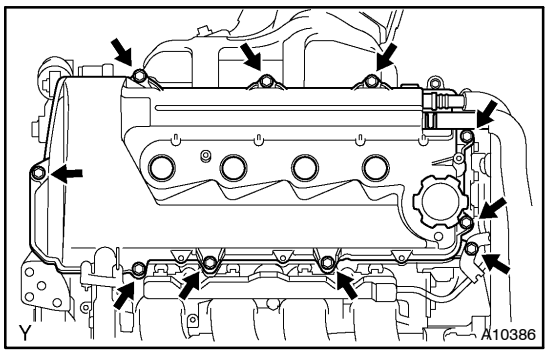
(b) Apply seal packing to 2 locations as shown in the illustration.
Seal packing:
Part No. 08826–00080 or equivalent

(c) Install the gasket to the cylinder head cover.

HINT:

Part must be assembled within 3 minutes of application. Otherwise the material must be remove and reapplied.

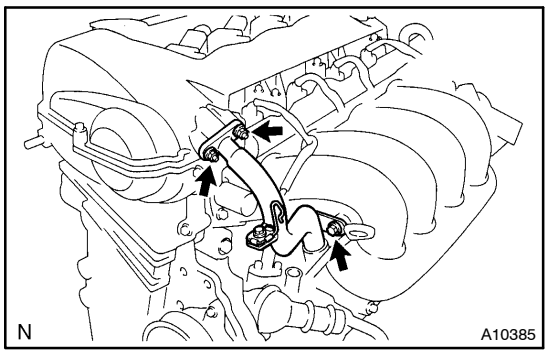
(d) Install a new O–ring to the cylinder head cover.



(e) Install the cylinder head cover and wire harness protector with the9 bolts. Uniformly tighten the bolts, in the several passes, in the sequence shown.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

(f) Connect the 2 PCV hoses to the cylinder head cover.

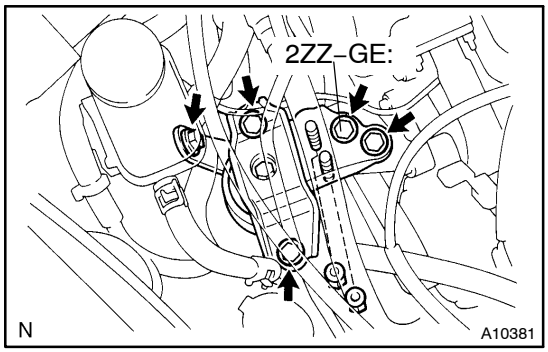


(g) Install a new gasket and No. 1 ventilation pipe with 2 nuts and bolt.

Torque:
Nut 10 N·m (100 kgf·cm, 7 ft·lbf)
Bolt 25 N·m (255 kgf·cm, 18 ft·lbf)

(h) Connect the No. 3 ventilation hose to the No. 1 ventilation pipe.

(i) Install the ignition coil (See page IG–7).



22. INSTALL RH ENGINE MOUNTING INSULATOR

(a) 1ZZ–FE:
Install the RH engine mounting insulator with the 4 bolts and 2 nuts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

(b) 2ZZ–GE:
Install the RH engine mounting insulator with the 5 bolts and 2 nuts.

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

23. INSTALL PS PUMP

(a) Install the PS pump with the 2 through bolts and nuts.

Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

(b) Install the PS pump pulley with the pulley nut.

(c) Connect the PS oil pressure switch connector.

24. INSTALL GENERATOR AND DRIVE BELT
(See page CH–17)

25. 2ZZ–GE:
INSTALL AIR SWITCHING VALVE (See page EC–18)

26. INSTALL RH ENGINE UNDER COVER

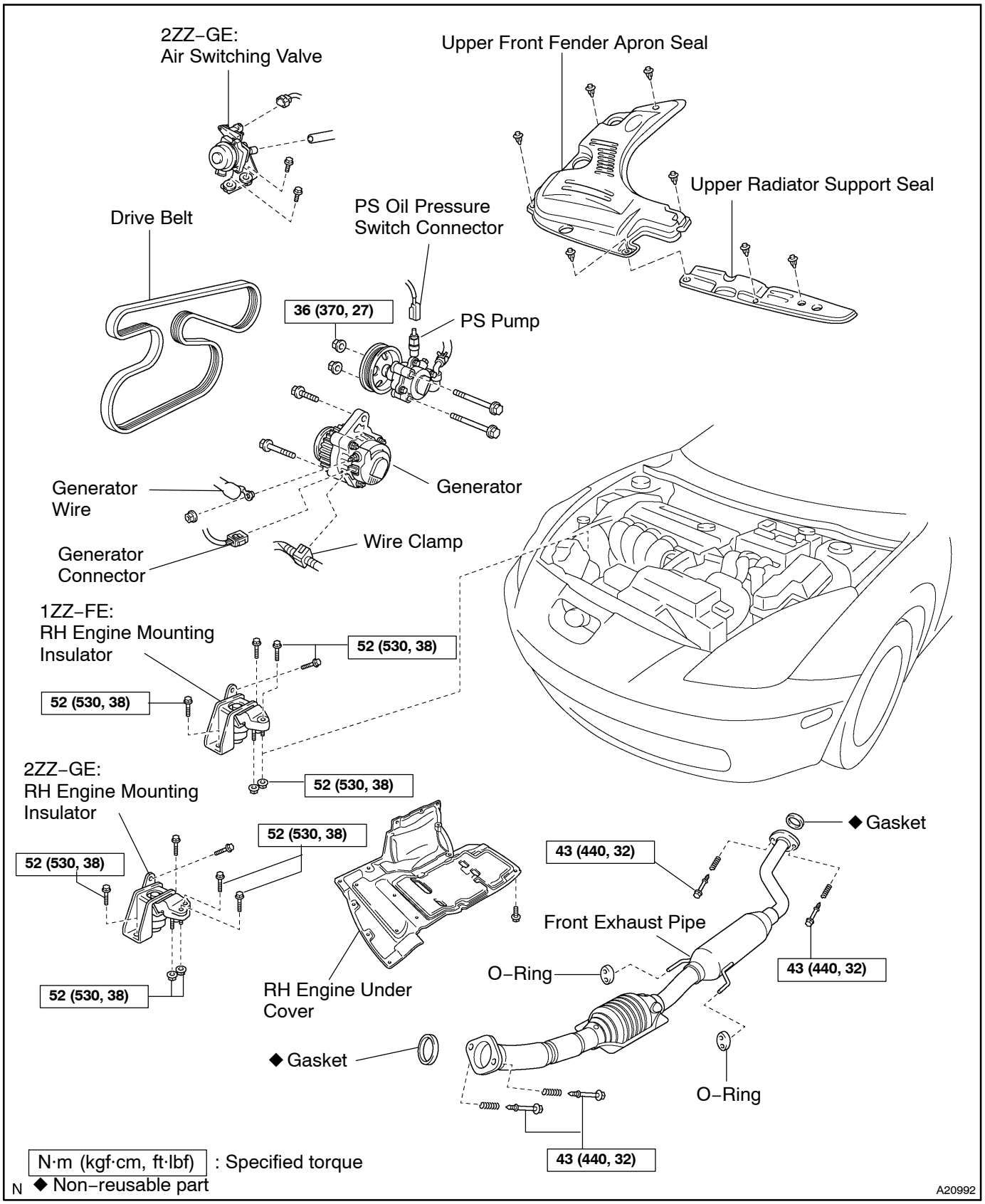
27. INSTALL RH FRONT WHEEL

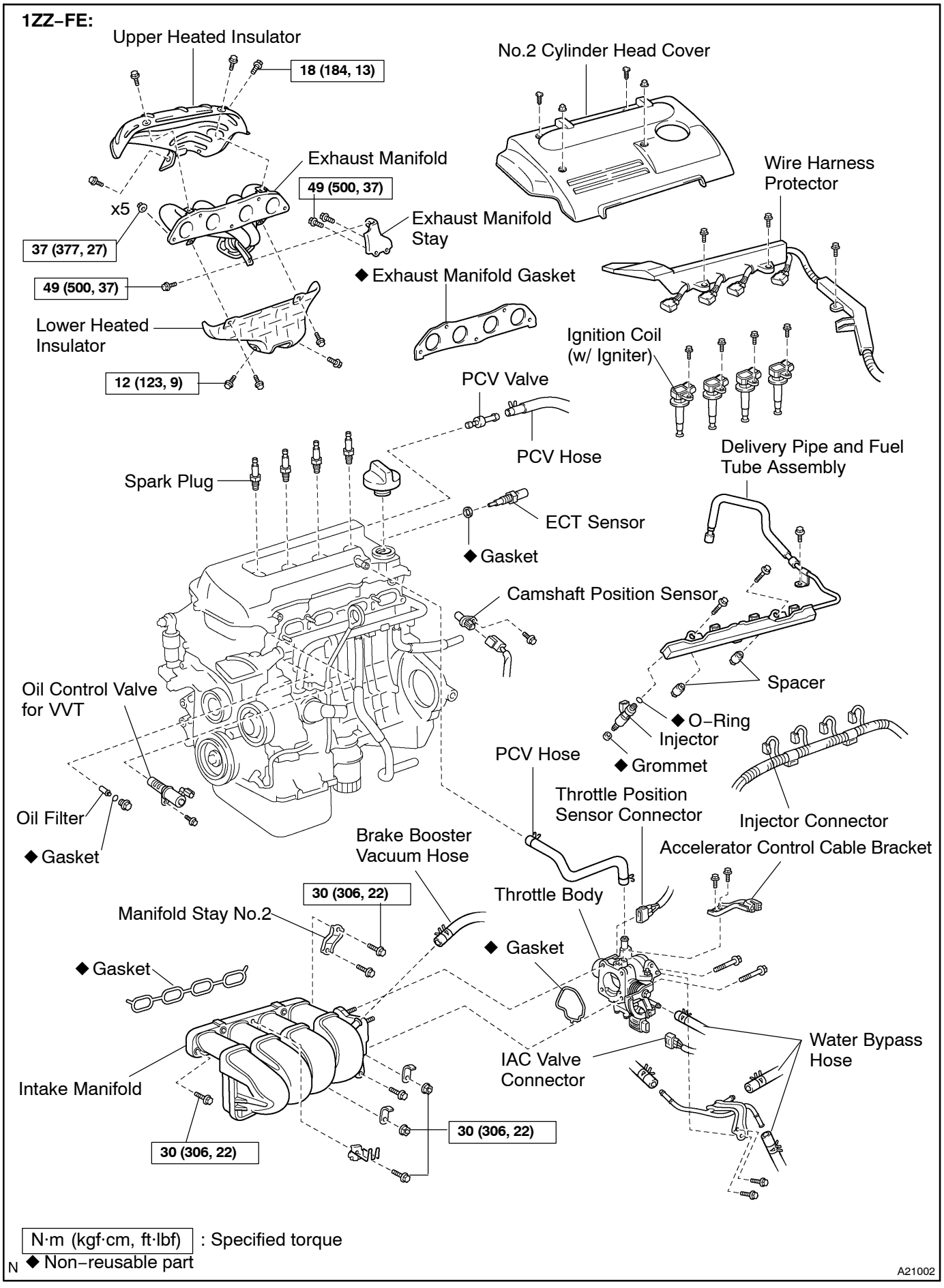
28. **FILL WITH ENGINE COOLANT (See page CO–2)**
29. **INSTALL FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL**
30. **START ENGINE AND CHECK FOR COOLANT LEAKS**

CYLINDER HEAD

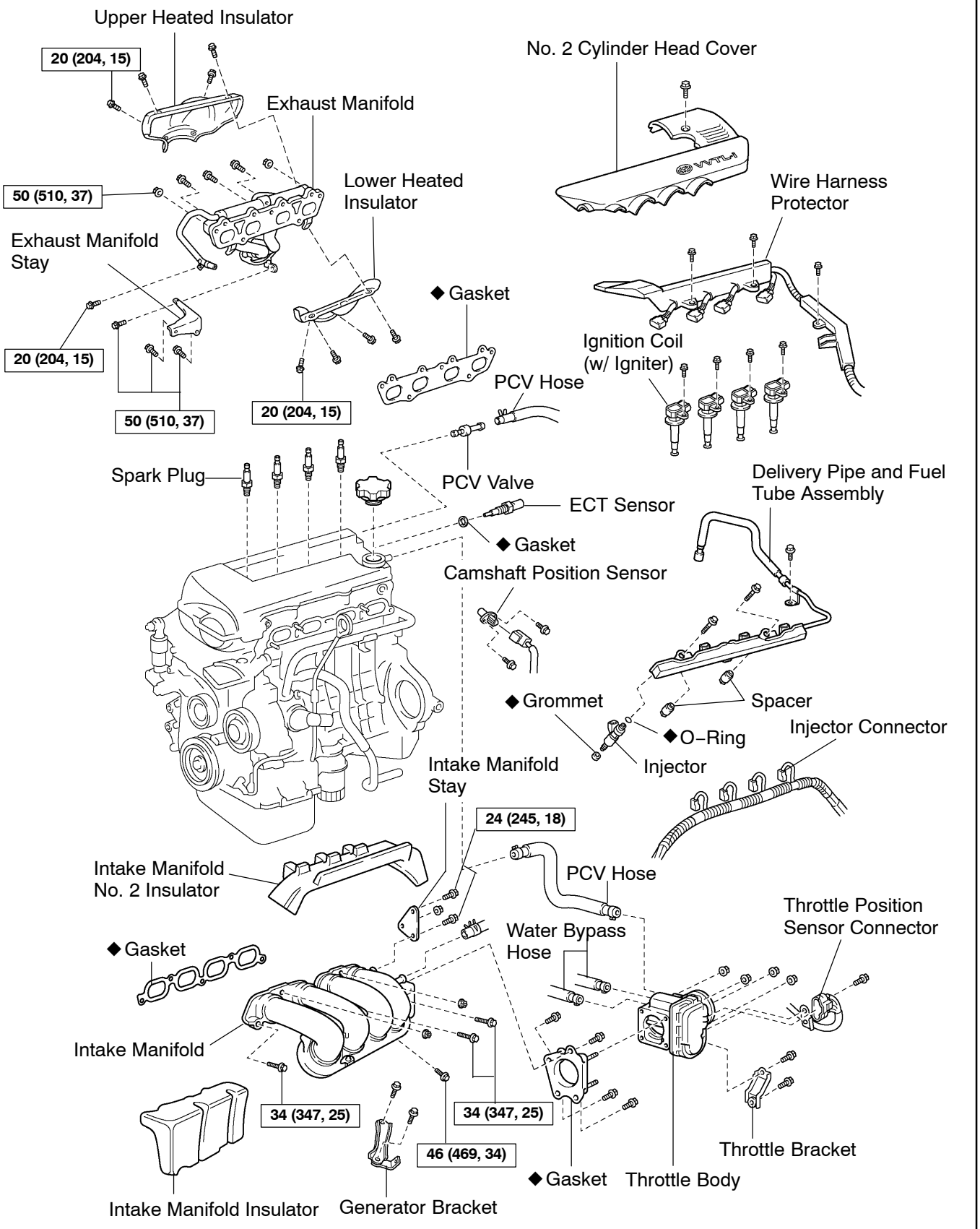
COMPONENTS

EM15T–06




1ZZ–FE:
Upper Heated Insulator
18 (184, 13)
No.2 Cylinder Head Cover
Exhaust Manifold
49 (500, 37)
x5
37 (377, 27)
Exhaust Manifold Stay
Wire Harness Protector
49 (500, 37)
◆ Exhaust Manifold Gasket
Lower Heated Insulator
12 (123, 9)
Ignition Coil (w/ Igniter)
PCV Valve
PCV Hose
Delivery Pipe and Fuel Tube Assembly
Spark Plug
ECT Sensor
◆ Gasket
Camshaft Position Sensor
Spacer
Oil Control Valve for VVT
◆ O–Ring
Injector
◆ Grommet
PCV Hose
Throttle Position Sensor Connector
Injector Connector
Oil Filter
◆ Gasket
Brake Booster Vacuum Hose
Accelerator Control Cable Bracket
30 (306, 22)
Manifold Stay No.2
Throttle Body
◆ Gasket
◆ Gasket
Water Bypass Hose
IAC Valve Connector
Intake Manifold
30 (306, 22)
30 (306, 22)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
A21002

2ZZ–GE:

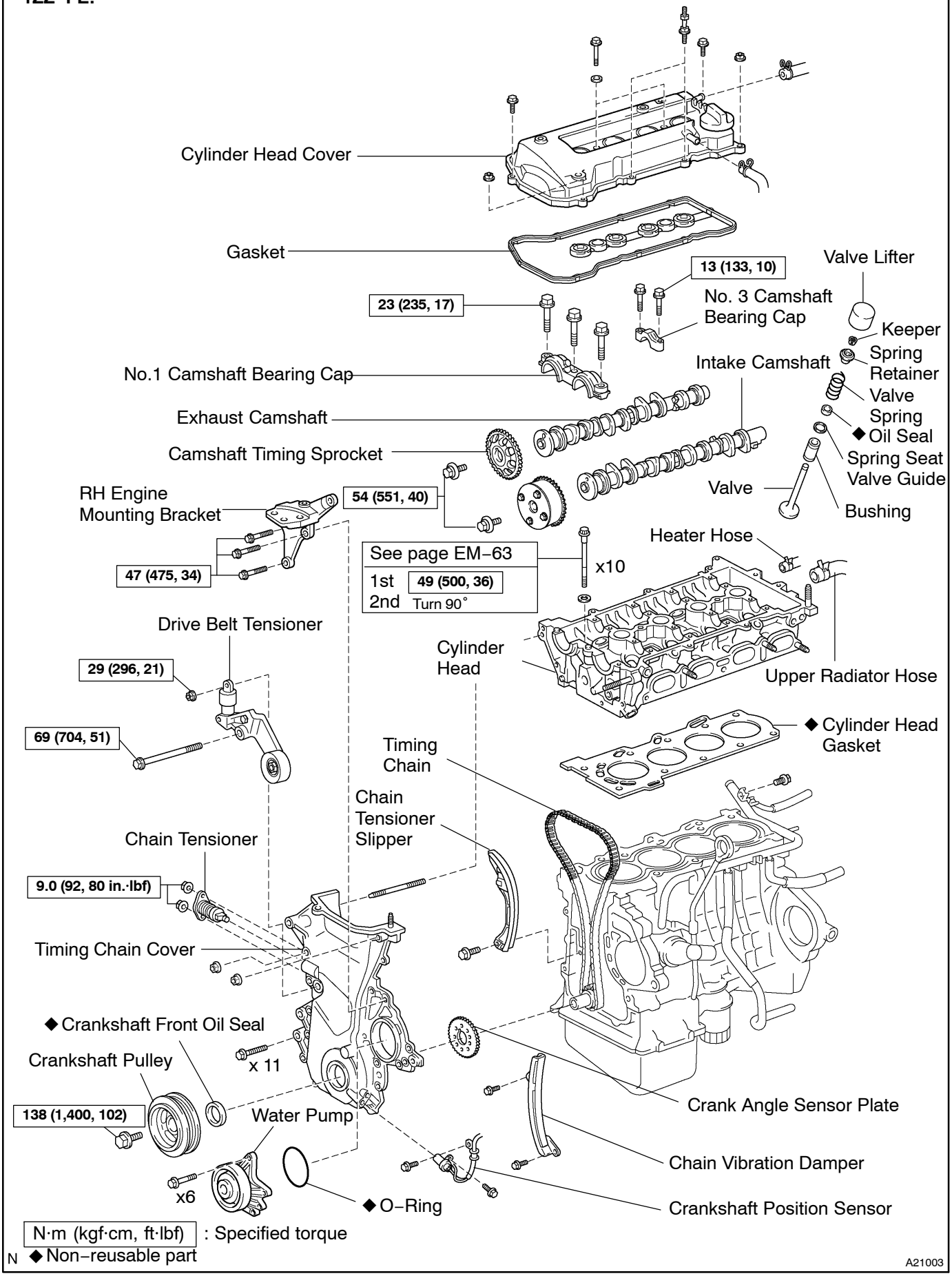


N·m (kgf·cm, ft·lbf) : Specified torque

N ◆ Non–reusable part

A20994

1ZZ–FE:

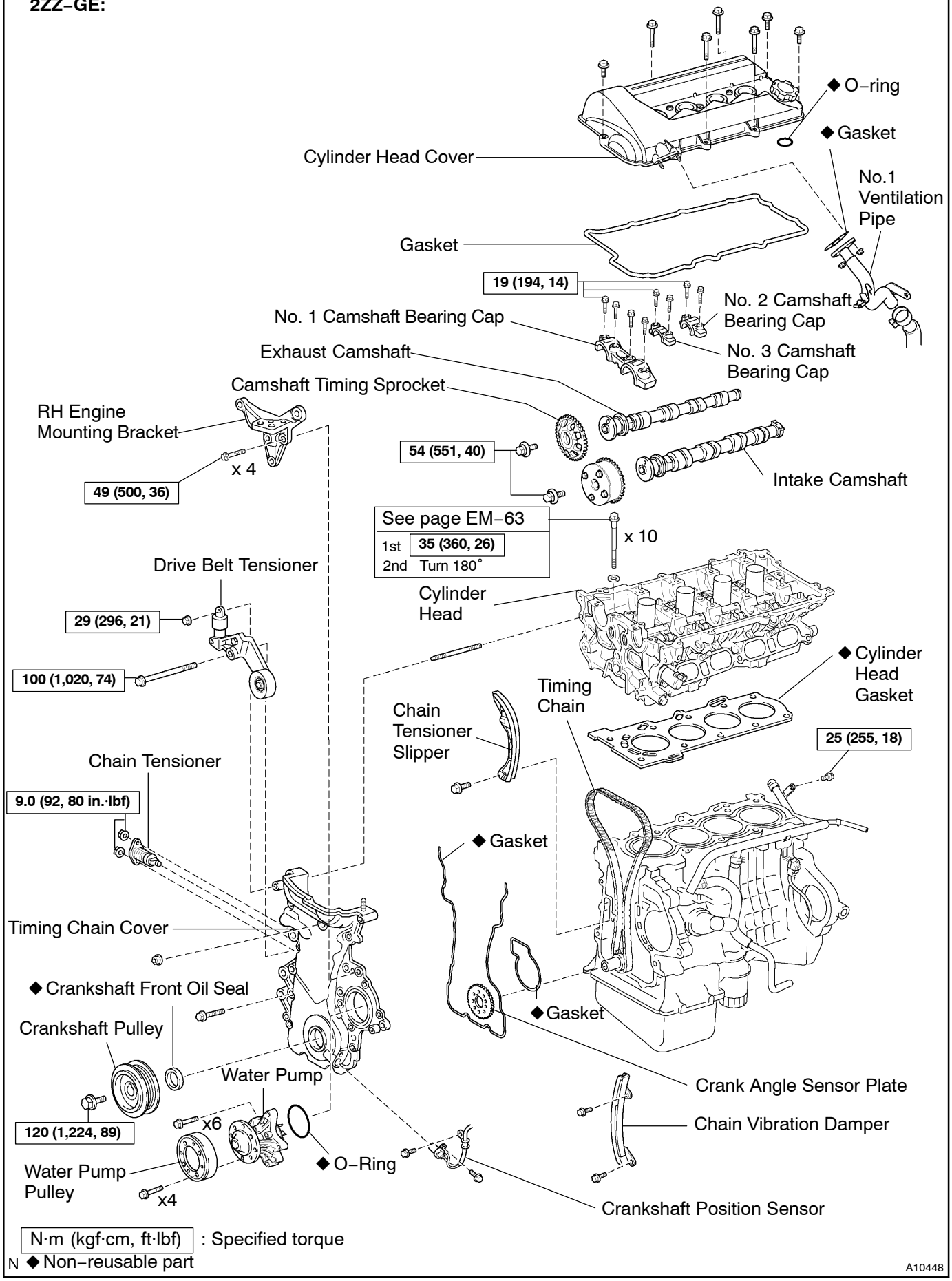


N·m (kgf·cm, ft·lbf) : Specified torque

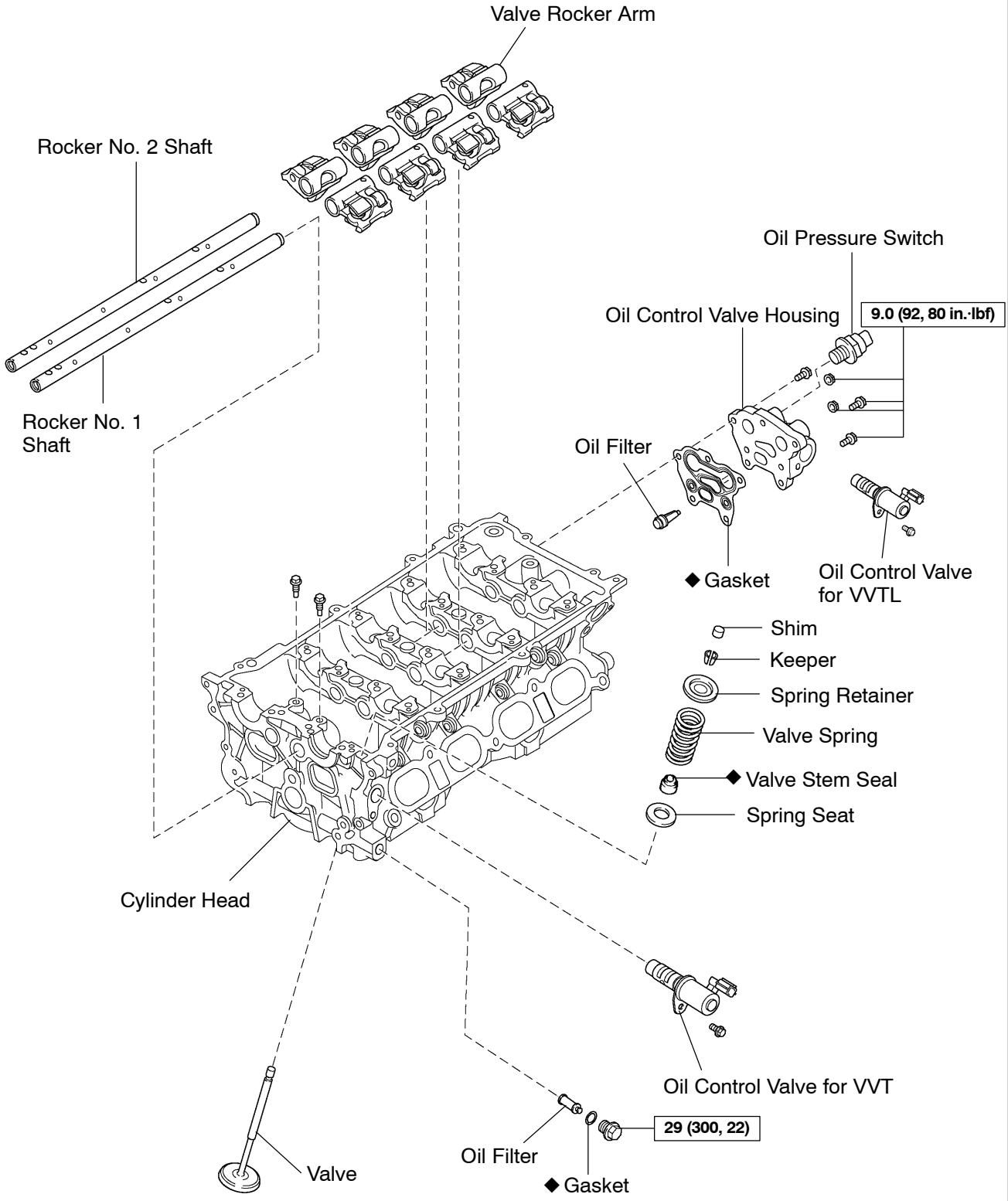
N ◆Non–reusable part

A21003

2ZZ–GE:


◆ O–ring
◆ Gasket
Cylinder Head Cover
No.1 Ventilation Pipe
Gasket
19 (194, 14)
No. 2 Camshaft Bearing Cap
No. 1 Camshaft Bearing Cap
No. 3 Camshaft Bearing Cap
Exhaust Camshaft
Camshaft Timing Sprocket
RH Engine Mounting Bracket
x 4
49 (500, 36)
54 (551, 40)
Intake Camshaft
See page EM–63
1st 35 (360, 26)
2nd Turn 180°
x 10
Drive Belt Tensioner
Cylinder Head
29 (296, 21)
100 (1,020, 74)
◆ Cylinder Head Gasket
Timing Chain
Chain Tensioner Slipper
25 (255, 18)
Chain Tensioner
9.0 (92, 80 in.·lbf)
◆ Gasket
Timing Chain Cover
◆ Crankshaft Front Oil Seal
Crankshaft Pulley
Water Pump
Crank Angle Sensor Plate
120 (1,224, 89)
x6
Chain Vibration Damper
◆ O–Ring
Water Pump Pulley
x4
Crankshaft Position Sensor
N·m (kgf·cm, ft·lbf) : Specified torque
N ◆ Non–reusable part
A10448

2ZZ–GE



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part

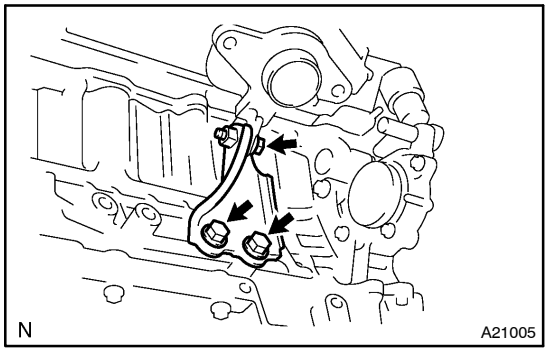
N

A23920

EM15U–06

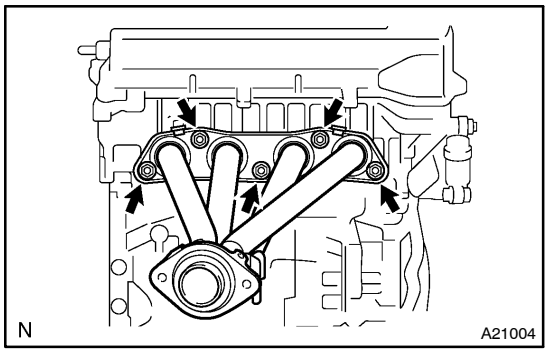
REMOVAL

1. **REMOVE BATTERY**
2. **REMOVE ECU BOX (See page EM–76)**
3. **DRAIN ENGINE COOLANT**
4. **DISCONNECT ENGINE COOLANT RESERVOIR**
5. **REMOVE AIR CLEANER ASSEMBLY**
6. **1ZZ–FE:**
   DISCONNECT ACCELERATOR CABLE
7. **2ZZ–GE:**
   REMOVE AIR SWITCHING VALVE (See page EC–15)
8. **REMOVE DRIVE BELT AND ALTERNATOR**
   (See page CH–7)
9. **REMOVE EXHAUST PIPE (See page EM–76)**

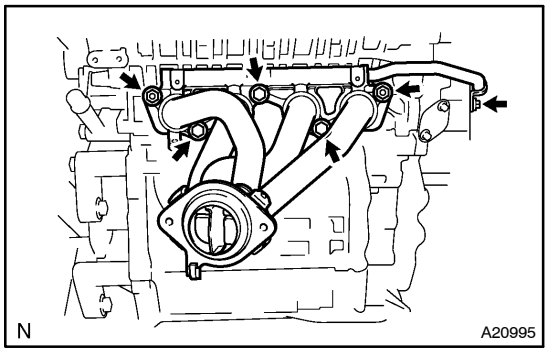


10. **1ZZ–FE:**
    REMOVE EXHAUST MANIFOLD

(a) Remove the 3 bolts and exhaust manifold stay.
(b) Remove the 4 bolts and upper heat insulator.



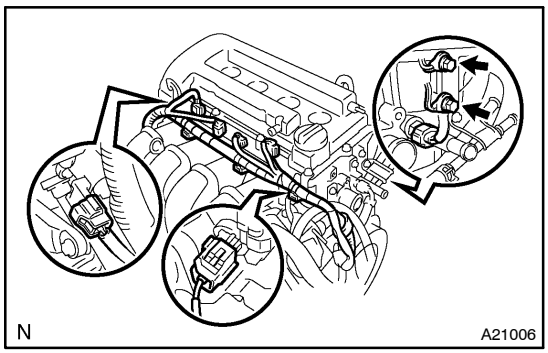
(c) Remove the 5 nuts, exhaust manifold and gasket.
(d) Remove the 4 bolts and lower heat insulator.



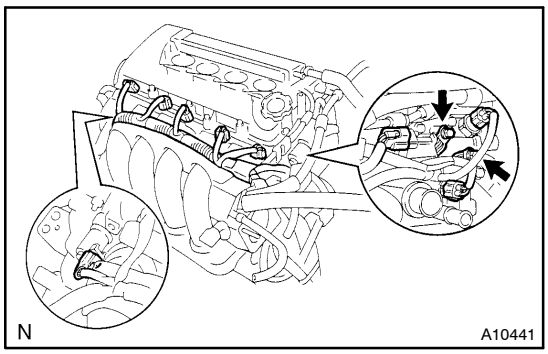
11. **2ZZ–GE:**
    REMOVE EXHAUST MANIFOLD

(a) Remove the 4 bolts and exhaust manifold stay.
(b) Remove the 5 bolts and upper heat insulator.
(c) Remove the 4 bolts, 2 nuts, exhaust manifold and gasket.
(d) Remove the 4 bolts and lower heat insulator.

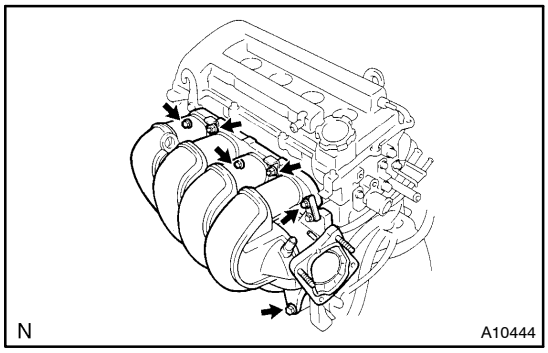
12. REMOVE IGNITION COIL (See page IG–6)
13. REMOVE SPARK PLUG (See page IG–1)
14. REMOVE PCV HOSES
15. REMOVE THROTTLE BODY (See page SF–35 or SF–42)
16. REMOVE INJECTOR (See page SF–21)



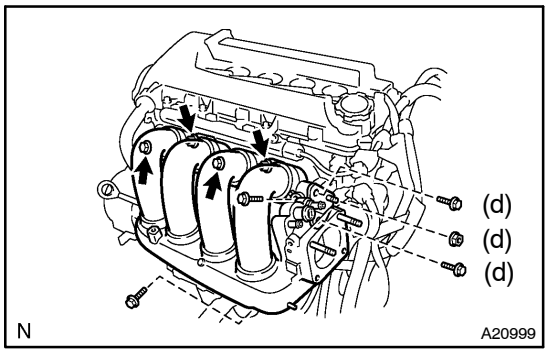
17. 1ZZ–FE:
DISCONNECT ENGINE WIRE FROM CYLINDER HEAD
(a) Disconnect the ECT sensor connector.
(b) Disconnect the camshaft position sensor connector.
(c) Disconnect the oil control valve for VVT connector.
(d) Disconnect the 2 ground wires.
(e) Disconnect the 2 clamps and engine wire protector from the intake manifold.



18. 2ZZ–GE:
DISCONNECT ENGINE WIRE FROM CYLINDER HEAD
(a) Disconnect the ECT sensor connector.
(b) Disconnect the camshaft position sensor connector.
(c) Disconnect the oil control valve for VVT connectors.
(d) Disconnect the oil control valve for VVTL connectors.
(e) Disconnect the oil pressure switch connector.
(f) Disconnect the 2 ground wires.
(g) Remove the 2 bolts, and disconnect the engine wire.
(h) Remove the intake manifold No. 2 insulator.



19. 1ZZ–FE:
REMOVE INTAKE MANIFOLD
(a) Disconnect the EVAP hose for ORVR.
(b) Disconnect the brake booster vacuum hose.
(c) Remove the 4 bolts, 2 nuts, intake manifold, 2 wire harness stays and gasket.



20. 2ZZ–GE:
REMOVE INTAKE MANIFOLD

(a) Disconnect the EVAP hose for ORVR.
(b) Disconnect the brake booster vacuum hose.
(c) Remove the bolt and disconnect the No. 1 ventilation pipe and oil dipstick and guide.
(d) Remove the 2 bolts, nut and stay.
(e) Remove the 4 bolts, 2 nuts, intake manifold and gasket.
(f) Remove the intake manifold insulator.

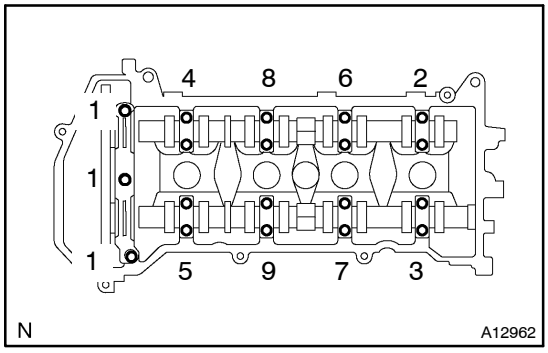
21. REMOVE CAMSHAFT POSITION SENSOR

22. REMOVE ECT SENSOR

23. REMOVE PCV VALVE AND GROMMET

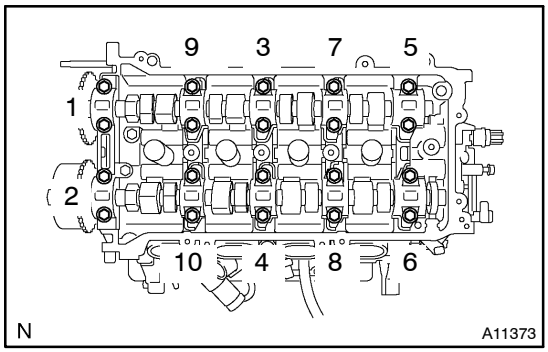
24. REMOVE OIL FILLER CAP

25. REMOVE CAMSHAFT TIMING SPROCKETS
(See page IG–9)



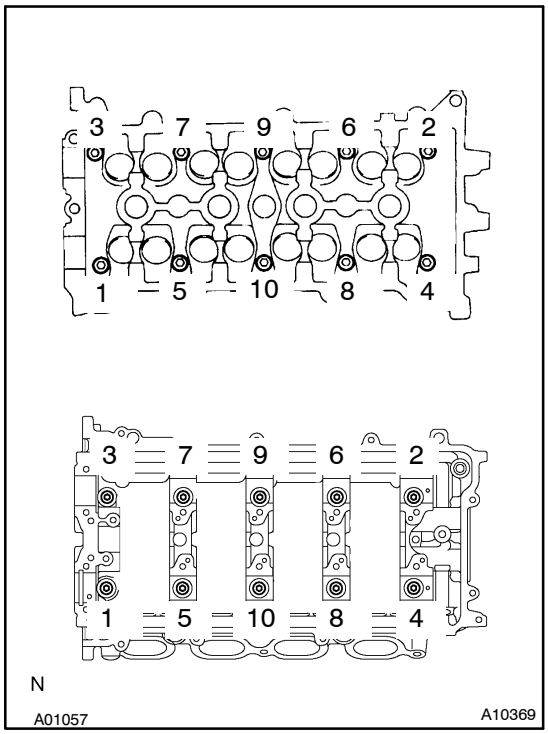
26. 1ZZ–FE:
REMOVE CAMSHAFT

Uniformly loosen and remove the 19 bearing cap bolts, in several passes, in the sequence shown, and remove the 9 bearing caps, intake and exhaust camshafts.



27. 2ZZ–GE:
REMOVE CAMSHAFT

Uniformly loosen and remove the 20 bearing cap bolts, in several passes, in the sequence shown, and remove the 9 bearing caps intake and exhaust camshaft.



28. REMOVE CYLINDER HEAD

(a) Disconnect the upper radiator hoses from the water hose union.

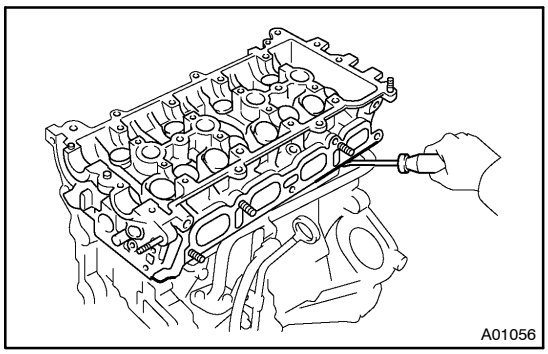
(b) Disconnect the heater water hose from the water hose union.

(c) Using a 10 mm bi–hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown. Remove the 10 cylinder head bolts and plate washers.

NOTICE:

Head warpage or cracking could result from removing bolts in an incorrect order.

(d) Remove the bolt holding the water bypass pipe to the cylinder head.



(e) Lift the cylinder from the dowels on the cylinder block and replace the cylinder head on wooden blocks on a bench.

HINT:

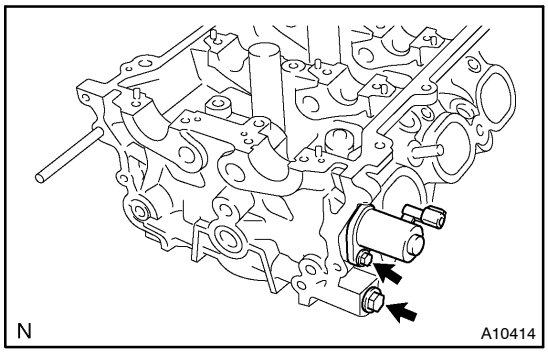
If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

EM15V–02

DISASSEMBLY

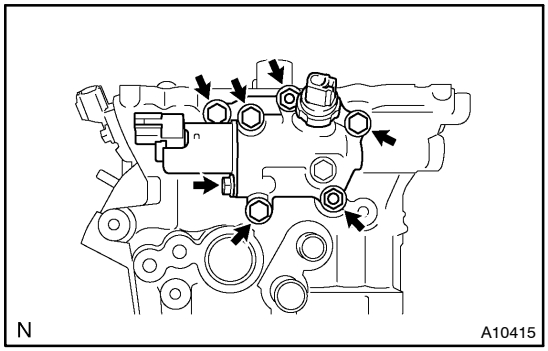


1. REMOVE OIL CONTROL VALVE for VVT

Remove the bolt and cam timing oil control valve.

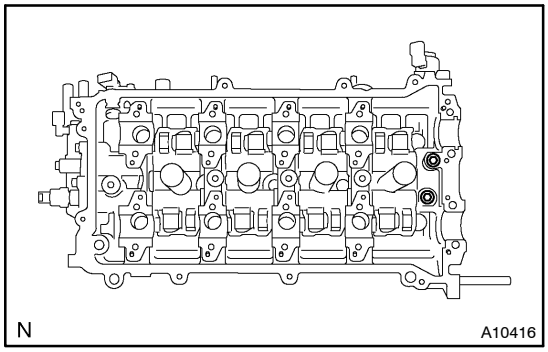
2. REMOVE OIL CONTROL VALVE FILTER

Remove the bolt, gasket and oil control valve filter.



3. 2ZZ–GE:
REMOVE OIL CONTROL VALVE HOUSING

(a) Remove the bolt and oil control valve for VVTL.
(b) Using SST, remove the oil pressure switch.
SST 09816–30010
(c) Remove the 3 bolts, 2 nuts, oil control valve housing and gasket.
(d) Remove the oil control valve filter.



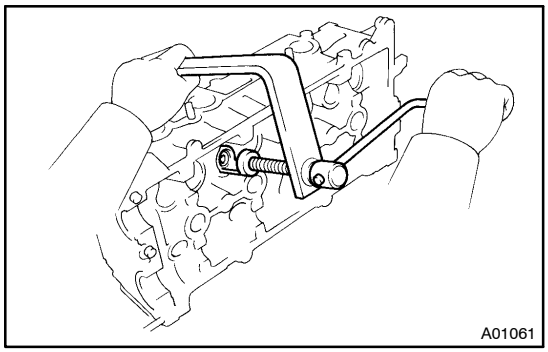
4. 2ZZ–GE:
REMOVE VALVE ROCKER ARM

(a) Remove the 2 bolts, rocker No. 1 and No. 2 shafts.
(b) Remove the 8 valve rocker arms.

HINT:
Arrange the rocker arms in the correct order.

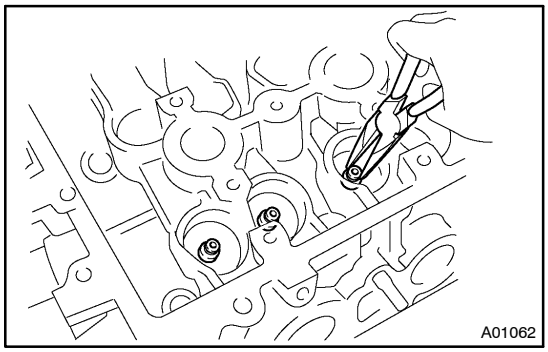
5. REMOVE VALVE LIFTERS

HINT:
Arrange the valve lifters in the correct order.

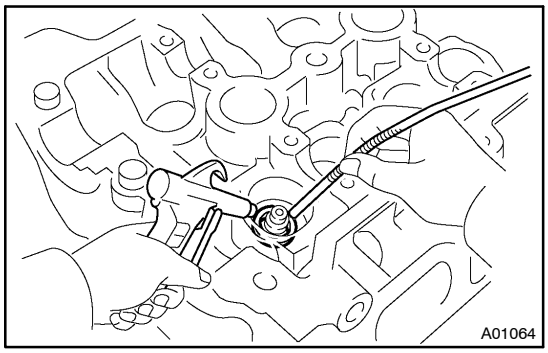


6. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202–70020 (09202–00020)
(b) Remove the spring retainer.
(c) Remove the valve spring.
(d) Remove the valve.



(e) Using needle–nose pliers, remove the oil seal.



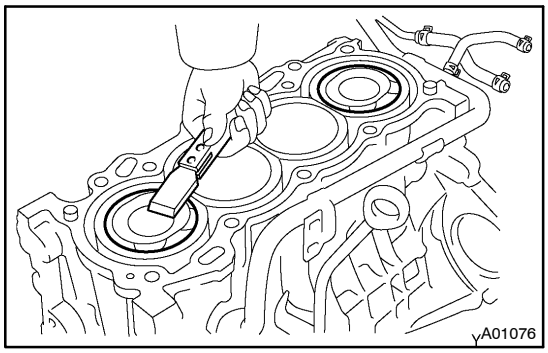
(f) Using compressed air and magnetic finger, remove the spring seat by blowing air.

HINT:

Arrange the valves, valve springs, spring seats, and spring retainers in the correct order.

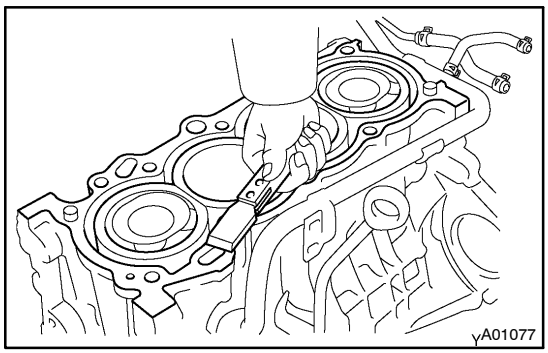
EM15W–08

INSPECTION



1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston surface.

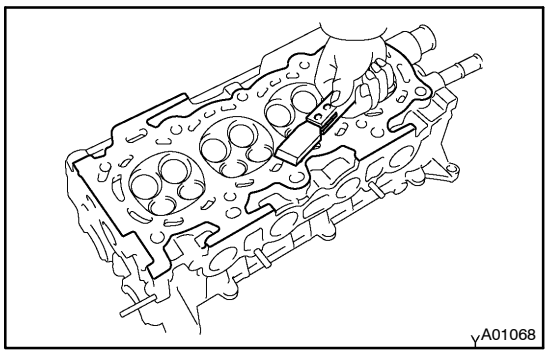


(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high pressure compressed air.

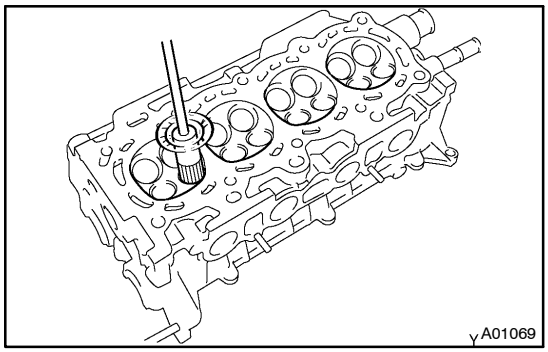


2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket materials from the cylinder block contact surface.

NOTICE:

Be careful not to scratch the cylinder block contact surface.

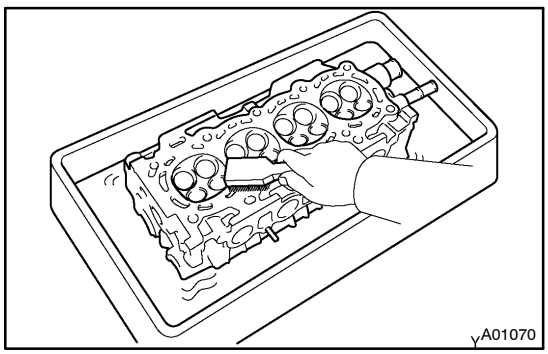


3. CLEAN COMBUSTION CHAMBERS

Using a wire brush, remove all the carbon from the combustion chambers.

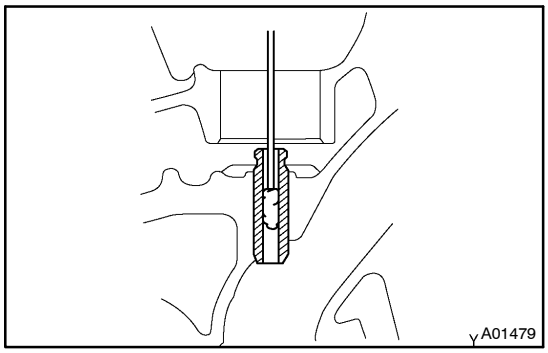
NOTICE:

Be careful not to scratch the cylinder block contact surface.



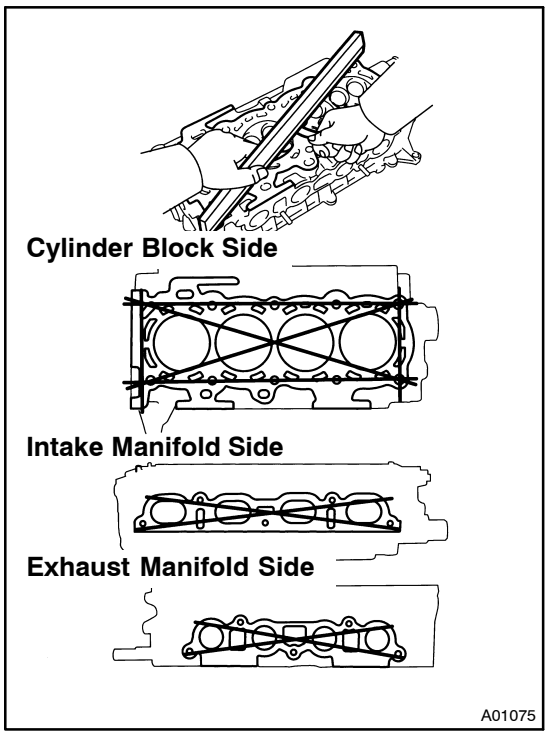
4. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean the cylinder head.



5. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.

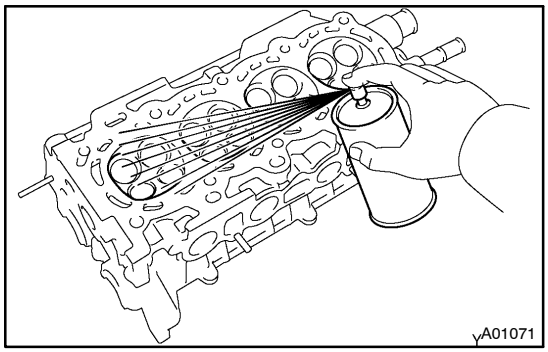


6. INSPECT FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

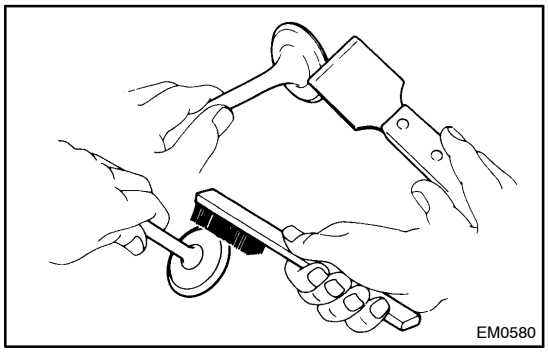
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT FOR CRACKS

Using a dye penetrate, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

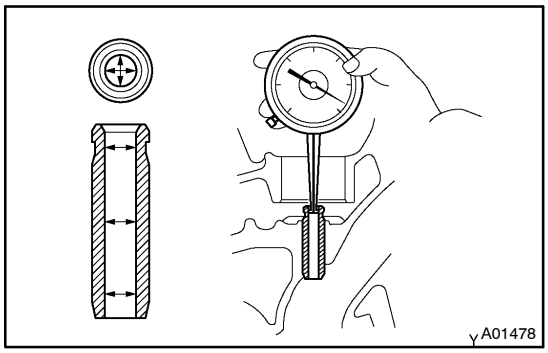
If cracked, replace the cylinder head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

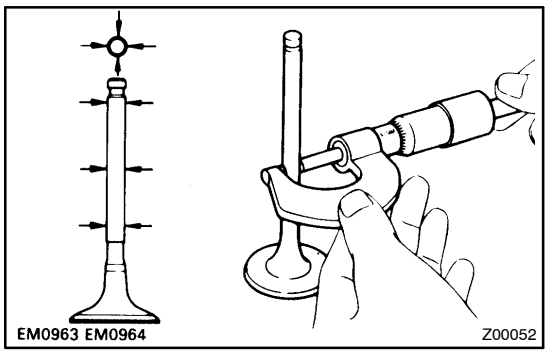
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:
1ZZ–FE 5.510 – 5.530 mm (0.2169 – 0.2177 in.)
2ZZ–GE 5.500 – 5.518 mm (0.2165 – 0.2172 in.)



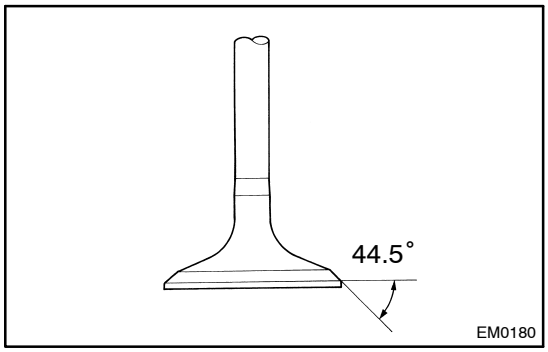
(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
1ZZ–FE
Intake 5.470 – 5.485 mm (0.2154 – 0.2159 in.)
Exhaust 5.465 – 5.480 mm (0.2152 – 0.2157 in.)
2ZZ–GE
Intake 5.460 – 5.475 mm (0.21496 – 0.21555 in.)
Exhaust 5.445 – 5.470 mm (0.21437 – 0.21535 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:
1ZZ–FE
Intake 0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust 0.030 – 0.065 mm (0.0012 – 0.0026 in.)
2ZZ–GE
Intake 0.025 – 0.058 mm (0.00098 – 0.00228 in.)
Exhaust 0.030 – 0.063 mm (0.00118 – 0.00248 in.)
Maximum oil clearance:
1ZZ–FE
Intake 0.08 mm (0.0031 in.)
Exhaust 0.10 mm (0.0039 in.)
2ZZ–GE
0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

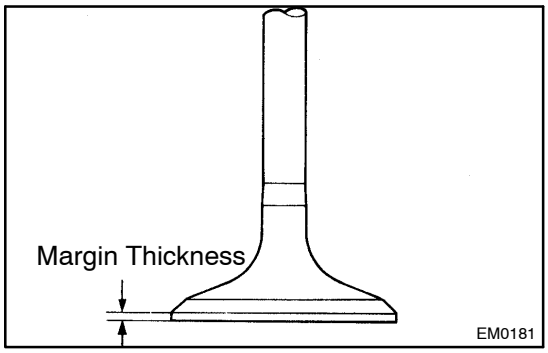


10. INSPECT VALVES

(a) Check the valve is ground to the correct valve face angle.
Valve face angle: 44.5°

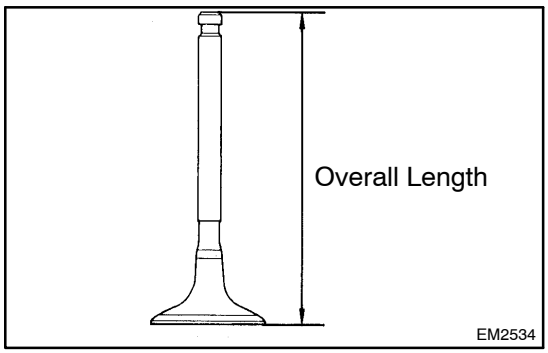
(b) Check that the surface of the valve for wear.

If the valve face is worn, replace the valve.



(c) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.7 mm (0.028 in.)

If the margin thickness is less than minimum, replace the valve.

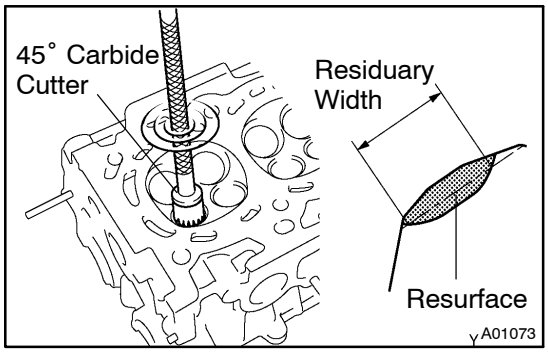


(d) Check the valve overall length.
Standard overall length:
1ZZ–FE
Intake 88.65 mm (3.4902 in.)
Exhaust 88.69 mm (3.4917 in.)
2ZZ–GE
Intake 111.3 mm (4.382 in.)
Exhaust 111.7 mm (4.398 in.)
Minimum overall length:
1ZZ–FE
Intake 88.35 mm (3.4783 in.)
Exhaust 88.39 mm (3.4799 in.)
2ZZ–GE
Intake 110.9 mm (4.366 in.)
Exhaust 111.3 mm (4.382 in.)

If the overall length is less than minimum, replace the valve.

(e) Check the surface of the valve stem tip for wear.

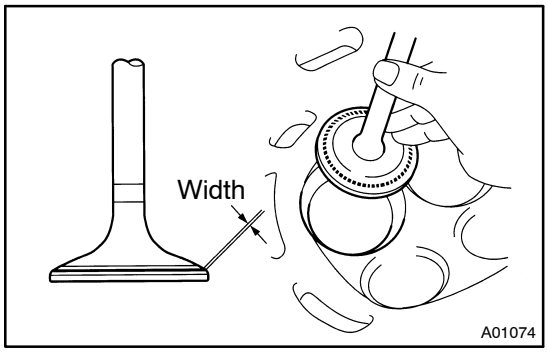
If the valve stem tip is worn, replace the valve.



11. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.

(b) After resurfacing the valve seat 45°, measure the residuary width of the valve seat 45°.
Minimum residuary length:
Intake 3.3 mm (0.130 in.)
Exhaust 3.2 mm (0.126 in.)



If the valve seat 45° residuary width less than minimum, replace the cylinder head.

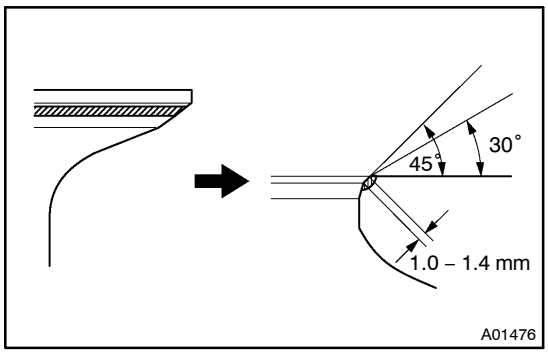
(c) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

(d) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.

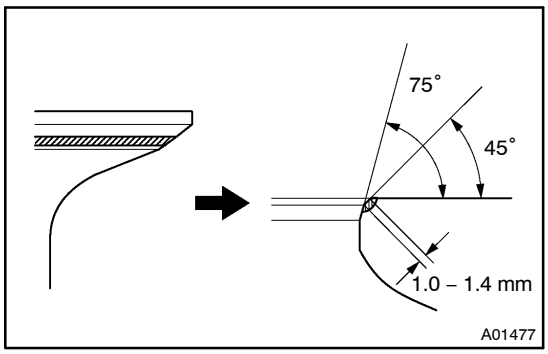
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

1.0 – 1.4 mm (0.039 – 0.055 in.)

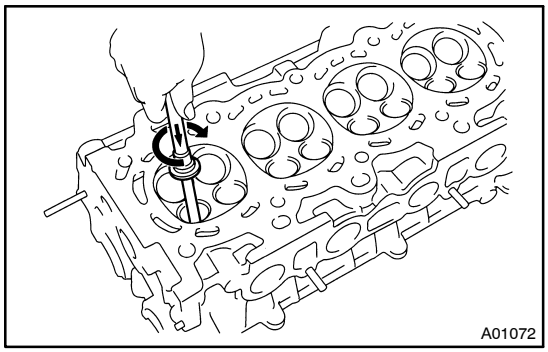
If not, correct the valve seats as follows:



(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

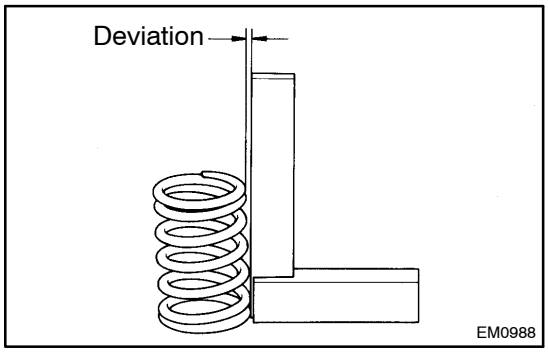


(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



(e) Hand–lap the valve and valve seat with an abrasive compound.

(f) After hand–lapping, clean the valve and valve seat.



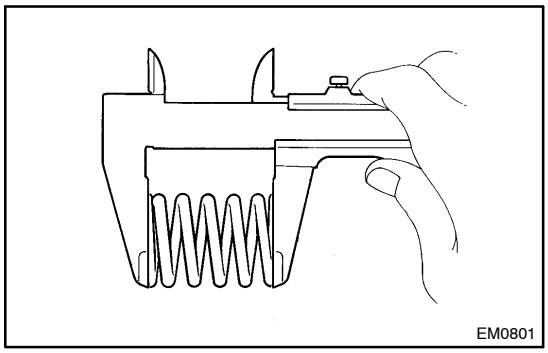
12. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the deviation of the valve spring.

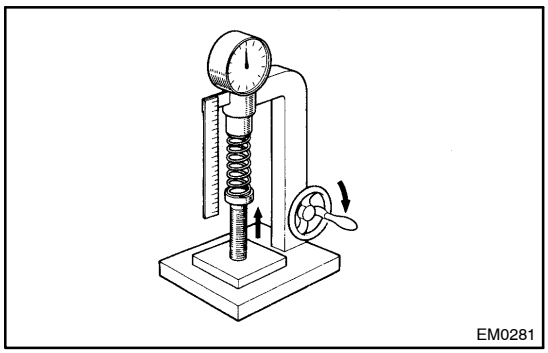
Maximum deviation: 1.6 mm (0.063 in.)

Maximum angle (reference): 2°

If the deviation is greater than maximum, replace the valve spring.

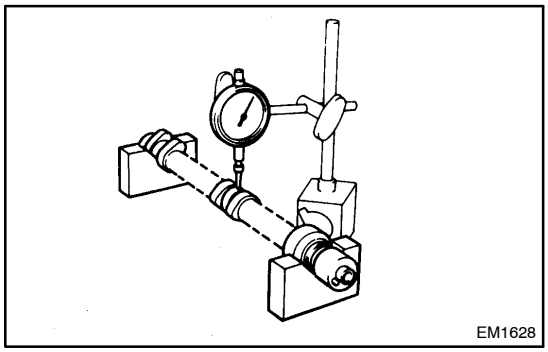


(b) Using vernier calipers, measure the free length of the valve spring.
Free length:
1ZZ–FE 45.90 mm (1.8070 in.)
2ZZ–GE
Intake 46.4 mm (1.830 in.)
Exhaust 46.5 mm (1.831 in.)



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.
Installed tension:
1ZZ–FE
139.6 – 154.4 N (14.2 – 15.8 kgf, 31.3 – 34.8 lbf)
at 33.6 mm (1.323 in.)
2ZZ–GE
Intake
220.2 – 243.8 N (22.5 – 24.7 kgf, 49.6 – 55.5 lbf)
at 38.5 mm (1.516 in.)
Exhaust
208.2 – 229.8 N (21.2 – 23.4 kgf, 47.6 – 52.6 lbf)
at 38.5 mm (1.516 in.)
Maximum working tension:
1ZZ–FE
244.9 – 276.1 N (25.5 – 28.1 kgf, 56.2 – 61.9 lbf)
at 24.6 mm (0.969 in.)
2ZZ–GE
Intake
533 – 589 N (54.4 – 60.1 kgf, 119.9 – 132.5 lbf)
at 27.3 mm (1.075 in.)
Exhaust
495.5 – 548.5 N (50.5 – 55.9 kgf, 111.3 – 123.2 lbf)
at 28.5 mm (1.122 in.)

If the installed tension is not as specified, replace the valve spring

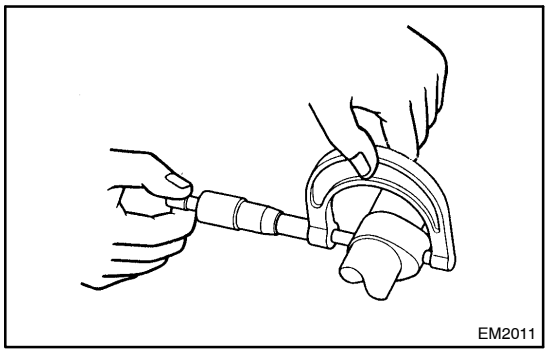


13. INSPECT CAMSHAFT FOR RUNOUT

(a) Place the camshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.
Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the camshaft.

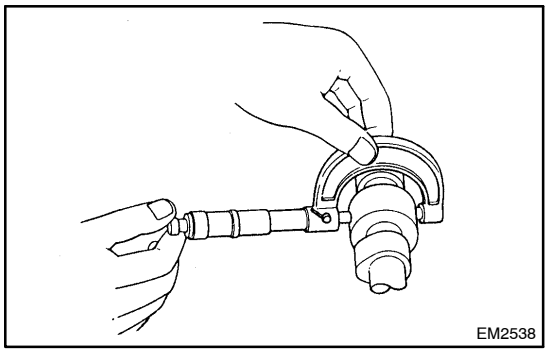

EM2011

14. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
1ZZ–FE:
Intake 44.333 – 44.433 mm (1.7454 – 1.7493 in.)
Exhaust 43.761 – 43.861 mm (1.7229 – 1.7268 in.)
2ZZ–GE:
INTAKE
No. 1 40.607 – 40.707 mm (1.59586 – 1.59979 in.)
No. 2 38.769 – 38.869 mm (1.52362 – 1.52755 in.)
2ZZ–GE:
EXHAUST
No. 1 40.019 – 40.119 mm (1.57275 – 1.57668 in.)
No. 2 38.863 – 38.963 mm (1.52732 – 1.53125 in.)
Minimum cam lobe height:
1ZZ–FE:
Intake 44.18 mm (1.7394 in.)
Exhaust 43.61 mm (1.7169 in.)
2ZZ–GE:
Intake
No.1 40.45 mm (1.5925 in.)
No.2 38.61 mm (1.5201 in.)
Exhaust
No.1 39.86 mm (1.5693)
No.2 38.71 mm (1.5240)

If the cam lobe height is less than minimum, replace the camshaft.

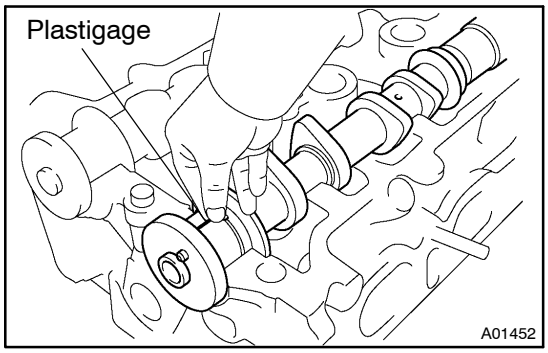

EM2538

15. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

1ZZ–FE:
No.1 journal diameter:
34.449 – 34.465 mm (1.3563 – 1.3569 in.)
Others journal diameter:
22.949 – 22.965 mm (0.9035 – 0.9041 in.)
2ZZ–GE:
No.1 journal diameter:
34.449 – 34.465 mm (1.35626 – 1.35689 in.)
Other journal diameter:
27.949 – 27.965 mm (1.10035 – 1.10098 in.)

If the journal diameter is not as specified, check the oil clearance.

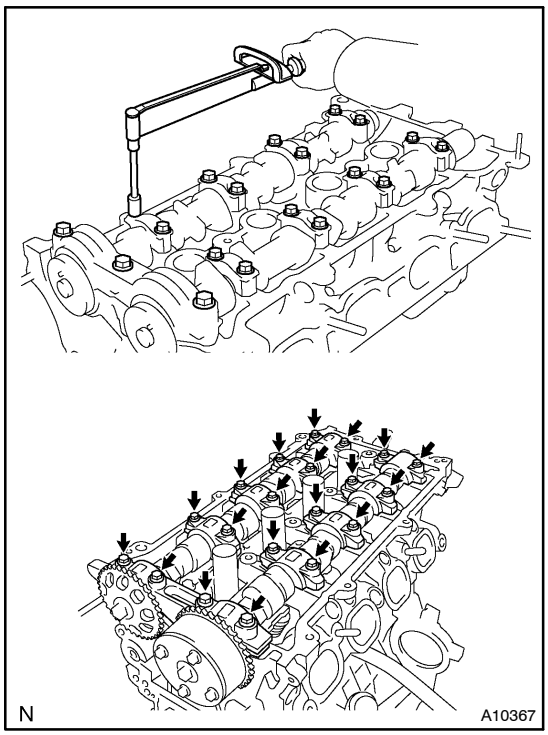


16. INSPECT CAMSHAFT JOURNAL CLEARANCE

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journal.

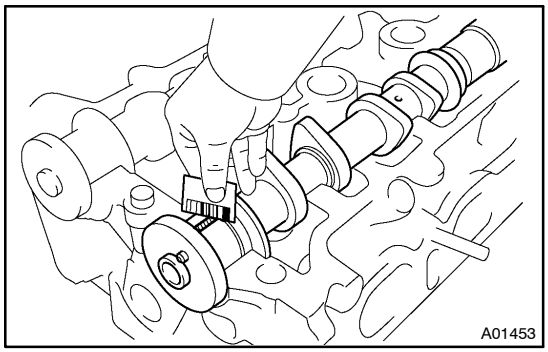


(d) Install the bearing caps (See page EM–67).

Torque:
1ZZ–FE:
No.1 23 N·m (235 kgf·cm, 17 ft·lbf)
No.3 13 N·m (133 kgf·cm, 10 ft·lbf)
2ZZ–GE: 18.5 N·m (189 kgf·cm, 14 ft·lbf)

NOTICE:
Do not turn the camshaft.

(e) Remove the bearing caps.



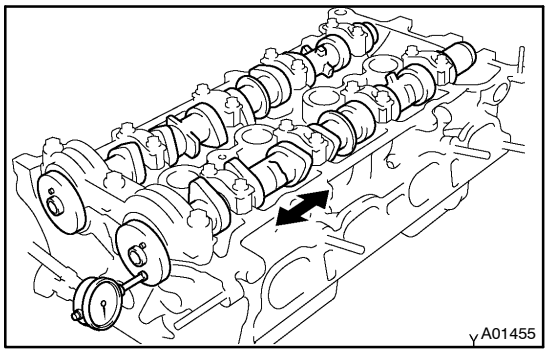
(f) Measure the plastigage at its widest point.

1ZZ–FE:
Standard oil clearance:
0.035 – 0.072 mm (0.0014 – 0.0028 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)
2ZZ–GE:
Standard oil clearance:
No. 1 journal 0.035 – 0.076 mm (0.00138 – 0.00299 in.)
Other journal 0.035 – 0.072 mm (0.00138 – 0.00283 in.)
Maximum oil clearance:
0.10 mm (0.039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.

(h) Remove the camshafts.



17. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts (See page EM–67).

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

1ZZ–FE:

Standard thrust clearance:

0.040 – 0.095 mm (0.0016 – 0.0037 in.)

Maximum thrust clearance:

0.11 mm (0.0043 in.)

2ZZ–GE:

Standard thrust clearance:

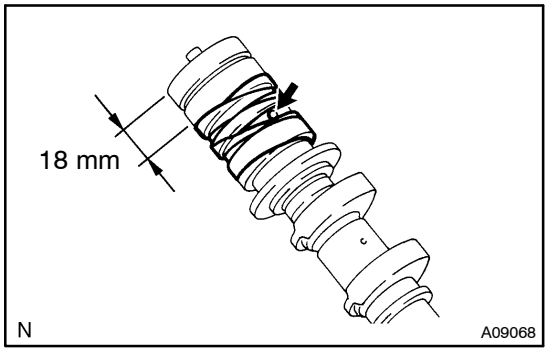
0.04 – 0.14 mm (0.0016 – 0.0055 in.)

Maximum thrust clearance:

0.15 mm (0.0059 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(c) Remove the camshafts.



18. INSPECT VALVE TIMING CONTROLLER ASSEMBLY

(a) Apply vinyl tape to all the ports except the one indicated by the arrow in the illustration.

NOTICE:

Do not apply tape in the range from the tip of the camshaft to 18 mm from that tip.

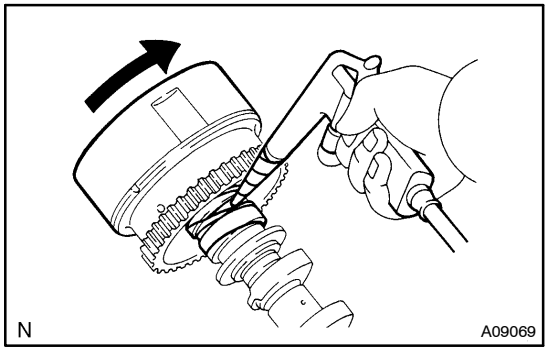
(b) Install the valve timing controller assembly.

Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)

NOTICE:

Do not push valve timing controller assembly to the camshaft forcibly when installing it.

(c) Check that the valve timing controller assembly will not turn.



(d) Wind tape around the tip of the air gun and apply air of approx. 100 kPa (1 kgf/cm^2, 14 psi) to the port of the camshaft.

NOTICE:

When the oil splashes, wipe it off with a shop rag and the likes.

HINT:

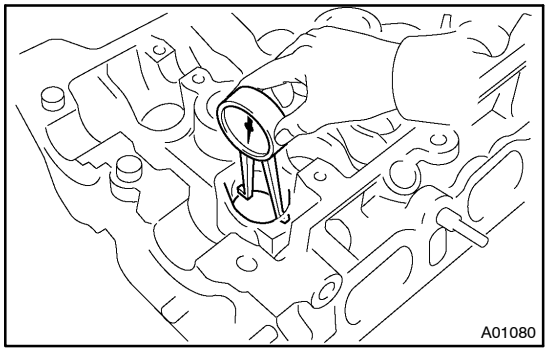
Perform this in order to release the lock pin for the maximum delay angle locking.

(e) Under the condition of (d), turn the valve timing controller assembly to the advance angel side (the arrow marked direction in the illustration) with your hand.
Standard: Must turn

HINT:
Depending on the air pressure, the valve timing controller assembly will turn to the advance angle side without applying force by hand. Also, under the condition that the pressure can be hardly applied because of the air leakage from the port, there may be the case that the lock pin could be hardly released.

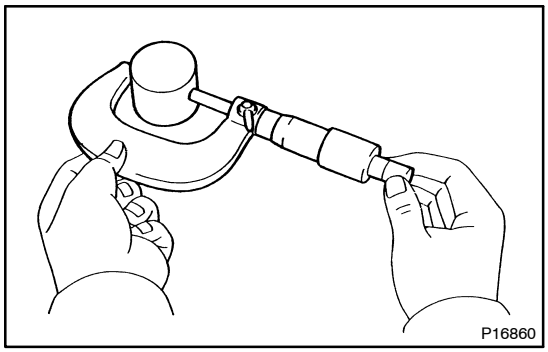
(f) Except the position where the lock pin meets at the maximum delay angle, let the valve timing controller assembly turn back and forth and check the movable range and that there is no disturbance.
Standard: Movable smoothly in the range about 30°

(g) Turn the valve timing controller assembly with your hand and lock it at the maximum delay angel position.



19. 1ZZ–FE:
INSPECT VALVE LIFTERS AND LIFTER BORES

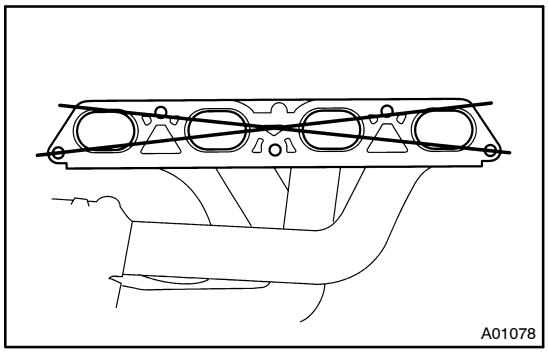
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 – 31.025 mm (1.2205 – 1.2215 in.)



(b) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.059 mm (0.0009 – 0.0023 in.)
Maximum oil clearance:
0.079 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

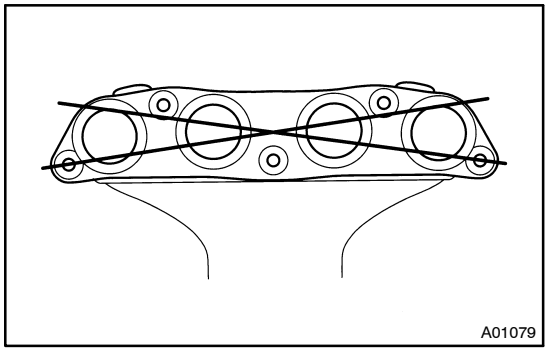


20. INSPECT INTAKE MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the manifold.

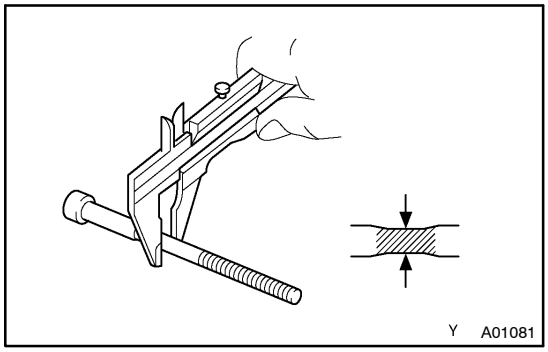


21. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.70 mm (0.0276 in.)

If warpage is greater than maximum, replace the manifold.

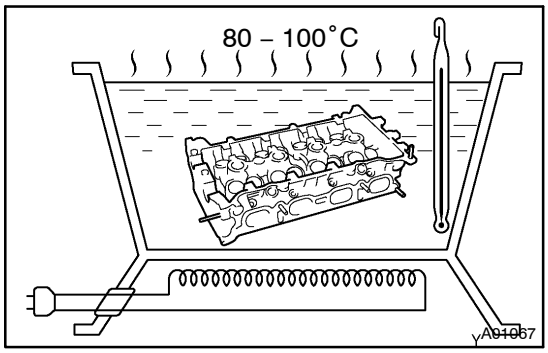


22. INSPECT CYLINDER HEAD BOLTS

Standard outside diameter:
9.0 – 9.2 mm (0.354 – 0.362 in.)
Minimum outside diameter:
9.0 mm (0.354 in.)

If the outer diameter is less than minimum, replace the bolt.

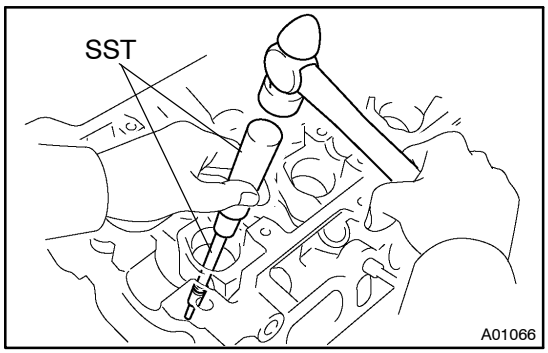
EM05X–14



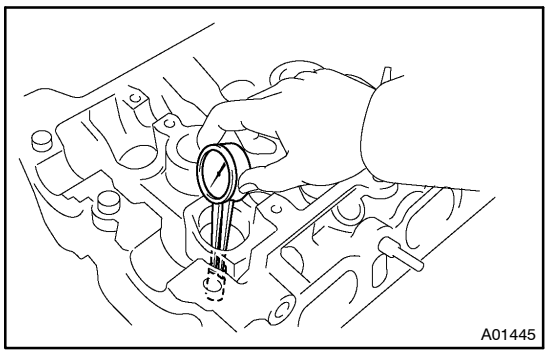
REPLACEMENT

REPLACE VALVE GUIDE BUSHINGS

(a) Gradually heat the cylinder head to 110 – 130 °C (230 – 266 °F).



(b) Using SST and a hammer, tap out the guide bushing.
SST 09201–01055, 09950–70010 (09951–07100)



(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
10.285 – 10.306 (0.4049 – 0.4057)	Use STD
10.335 – 10.356 (0.4068 – 0.4077)	Use O/S 0.05

(d) 1ZZ–FE:
Select the new guide bushing (STD or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 10.306 mm (0.4057 in.), machine the bushing bore to the following dimension:

10.335 – 10.356 mm (0.4068 – 0.4077 in.)

If the bushing bore diameter of the cylinder head is greater than 10.356 mm (0.4077 in.), replace the cylinder head.

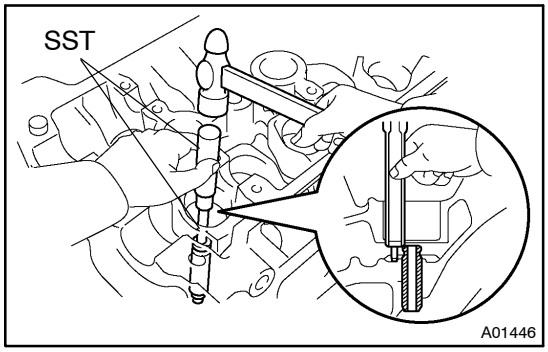
(e) 1ZZ–FE:
Gradually heat the cylinder head to 80 – 100 °C (176 – 212 °F).

Both intake and exhaust

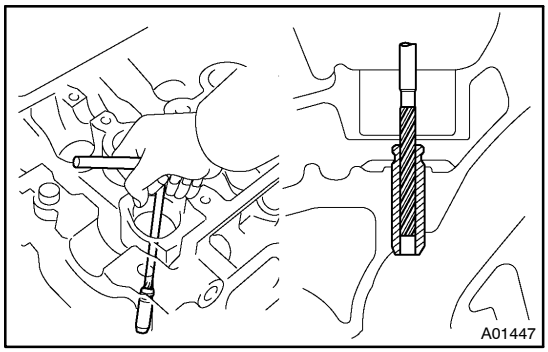
Bushing bore diameter mm (in.)	Bushing size
10.488 – 10.506 (0.4129 – 0.4136)	Use STD
10.538 – 10.556 (0.4149 – 0.4156)	Use O/S 0.05

(f) 2ZZ–GE:
Select the new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 10.506 mm (0.4136 in.), machine the bushing bore to the following dimension:
10.538 – 10.556 mm (0.4149 – 0.4156 in.)
If the bushing bore diameter of the cylinder head is greater than 10.556 mm (0.4156 in.), replace the cylinder head.

(g) 2ZZ–GE:
Gradually heat the cylinder head to 110 – 130 °C (230 – 266 °F).



(h) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.
SST 09201–01055, 09950–70010 (09951–07100)
Protrusion height:
1ZZ–FE 8.7 – 9.1 mm (0.342 – 0.358 in.)
2ZZ–GE 15.3 – 15.7 mm (0.602 – 0.618 in.)



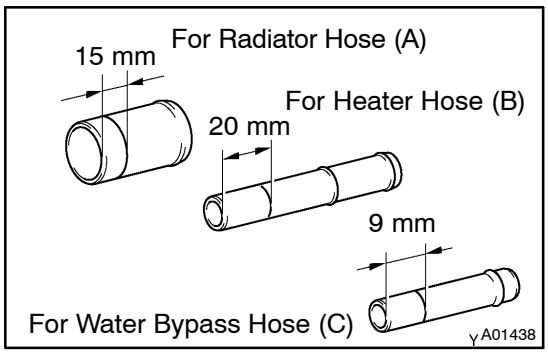
(i) Using a sharp 5.5 mm reamer, ream the guide bushing to obtain the standard specified clearance
(See page EM–50) between the guide bushing and valve stem.

EM15X–02

REASSEMBLY

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace oil seals with new ones.

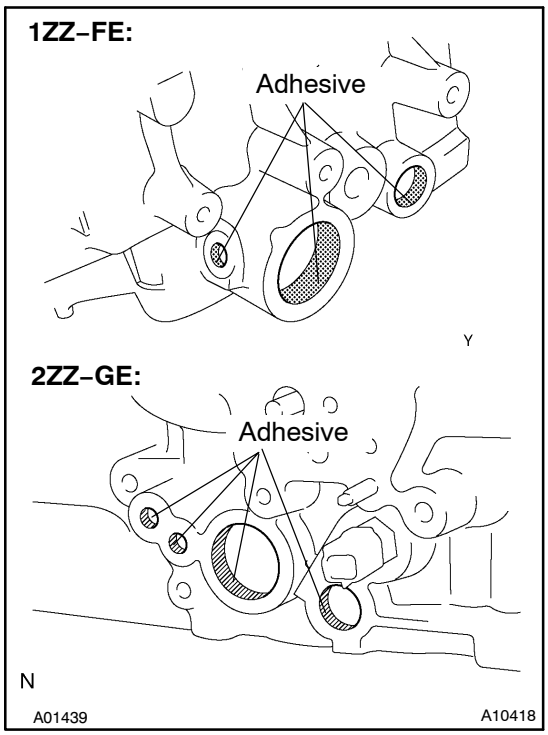


1. INSTALL WATER HOSE UNIONS

HINT:

When using a new cylinder head, water hose unions must be installed.

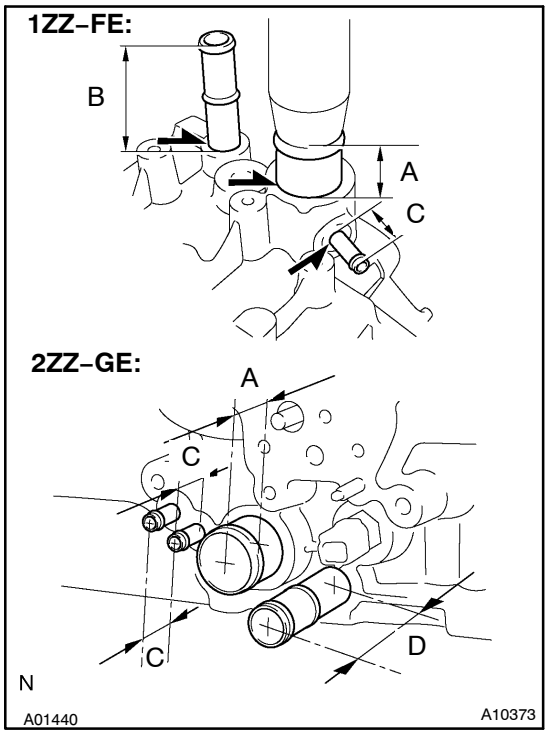
(a) Mark the standard position away from the edge, onto the water hose union.



(b) Apply adhesive to the water hose union hole of the cylinder head.

Adhesive:

Part No.08833–00070, THREE BOND 1324 or equivalent

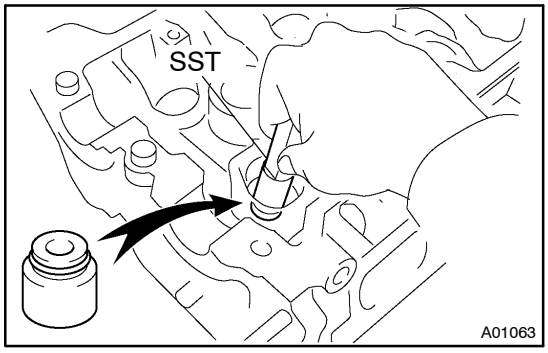


(c) Using a press, press in a new water hose union until there is protruding from the cylinder head.

Standard protrusion:
A 29 mm (1.14 in.)
B 66.5 mm (2.618 in.)
C 24 mm (0.95 in.)
D 69.8 mm (2.630 in.)

NOTICE:

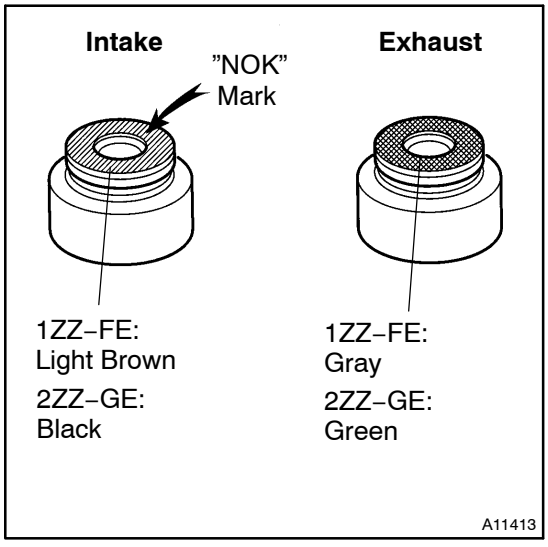
Avoid pressing a new water hose union in too far by measuring the amount of protrusion while pressing.



2. INSTALL VALVES

(a) Install the spring seat.

(b) Using SST, push in a new oil seal.
SST 09201–41020

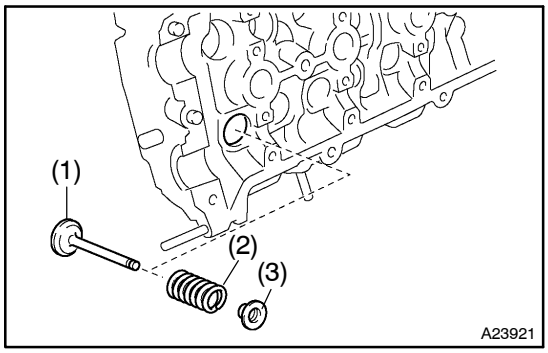


HINT:

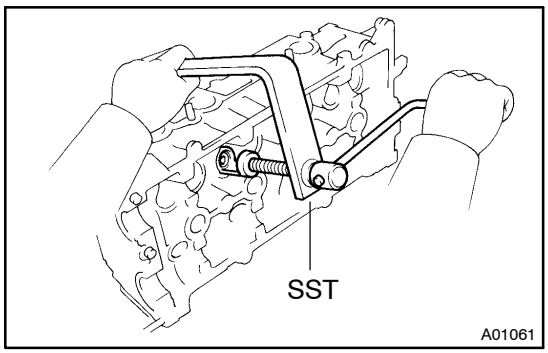
- 1ZZ–FE:
  The intake valve oil seal is light brown and the exhaust valve oil seal is gray.
- 2ZZ–GE:
  The intake valve oil seal is black and the exhaust valve oil seal is green.

NOTICE:

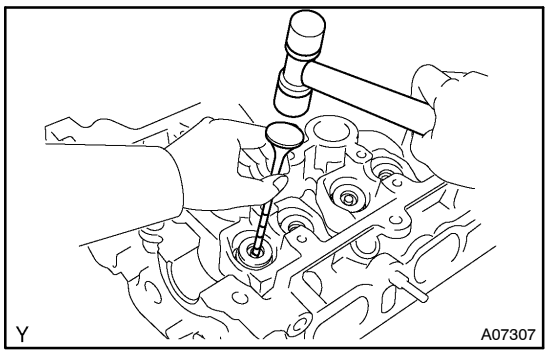
Pay much attention assembling the oil seal for intake and exhaust. Assembling the wrong one may cause a failure.



(c) Install the valve (1), valve spring (2), and spring retainer (3).



(d) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (09202–00020)



(e) Using a plastic–faced hammer and the valve stem (not in use) tip wound with vinyl tape, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the valve stem tip.

3. INSTALL VALVE LIFTERS

(a) Install the valve lifter.

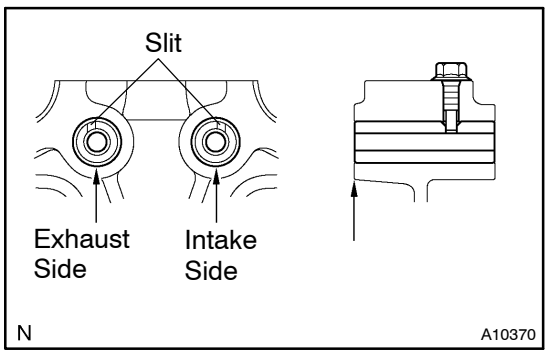
(b) Check that the valve lifter rotates smoothly by hand.

4. 2ZZ–GE:

INSTALL VALVE ROCKER ARM

(a) Set the 8 valve rocker arms.

(b) Install the rocker No. 1 and No. 2 shaft with the 2 bolts.
Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)



HINT:

- Position the slit of the locker shaft in the direction shown in the illustration.
- Align the locker shaft end with the cylinder head end.

5. 2ZZ–GE:

INSTALL OIL CONTROL VALVE HOUSING

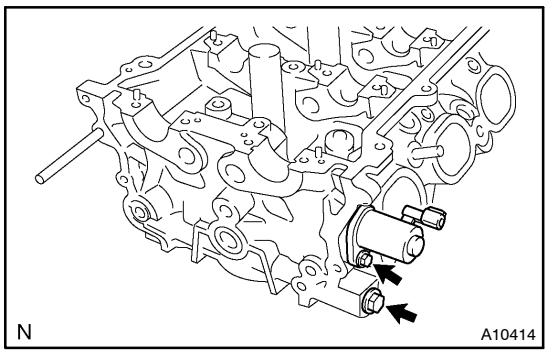
(a) Install the oil control valve filter.

(b) Install the gasket and oil control valve housing with the 3 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(c) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Using SST, install the oil pressure switch.
SST 09816–30010
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(e) Install the oil control valve for VVTL with the bolt.



6. INSTALL CONTROL VALVE for VVT

Install the oil control valve for VVT with the bolt.

7. INSTALL OIL CONTROL VALVE FILTER

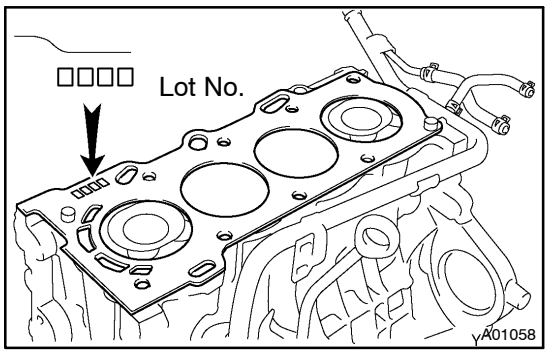
Install the oil control valve filter and new gasket with the bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

EM1W7–03

INSTALLATION

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



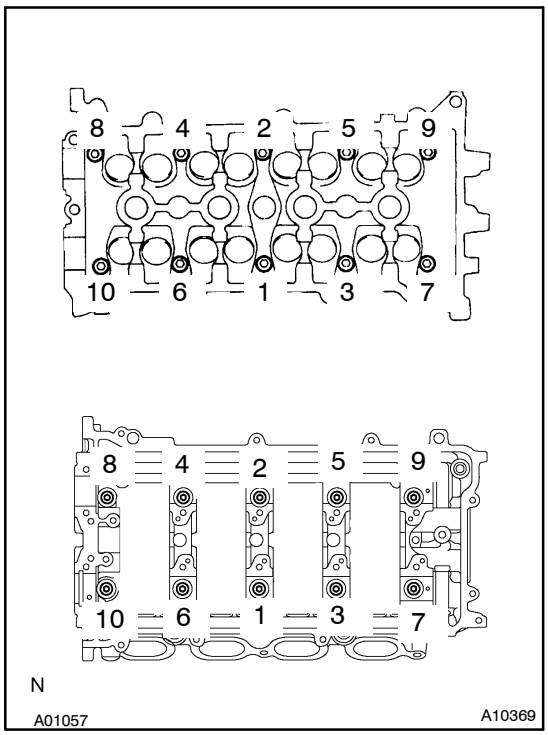
1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

(a) Place a new cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.

NOTICE:

Be careful of the installation direction.

(b) Place the cylinder head quietly in order not to damage the gasket with the bottom part of the head.



2. INSTALL CYLINDER HEAD BOLTS

HINT:

- The cylinder head bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.

(a) Apply a light coat if engine oil on the threads and under the heads of the cylinder head bolts.

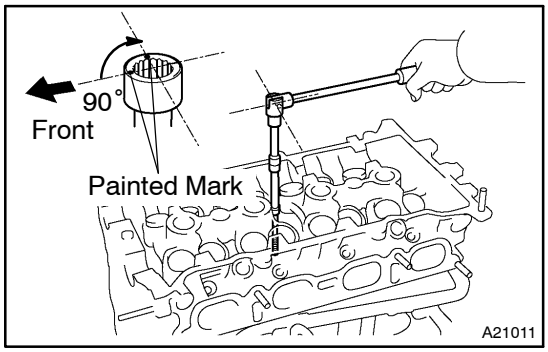
(b) Using a 10 mm bi–hexagon wrench, install and uniformly tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Torque:

1ZZ–FE: 49 N·m (500 kgf·cm, 36 ft·lbf)

2ZZ–GE: 35 N·m (375 kgf·cm, 26 ft·lbf)

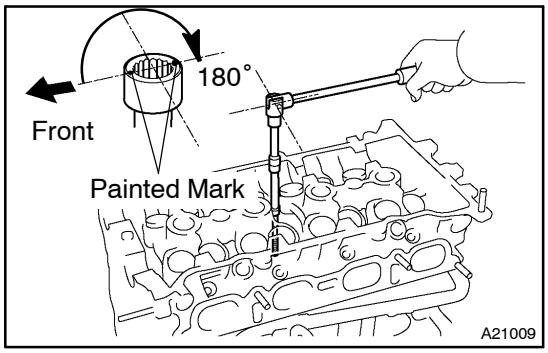
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



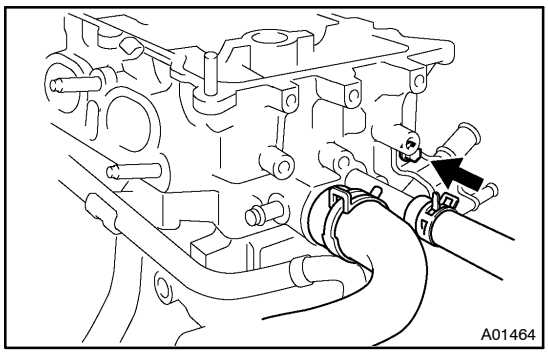
(c) Mark the front of the cylinder head bolt with paint.

(d) 1ZZ–FE:

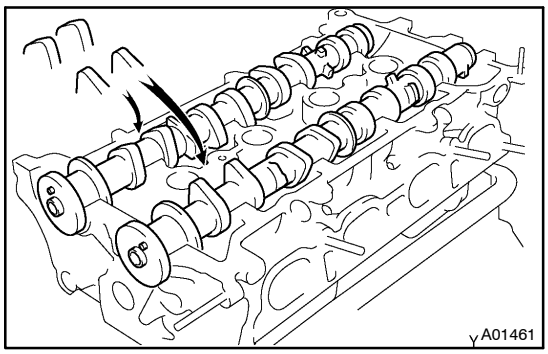
Retighten the cylinder head bolts 90° in the numerical order shown and check that the paint mark is not at a 90° angle to the front.



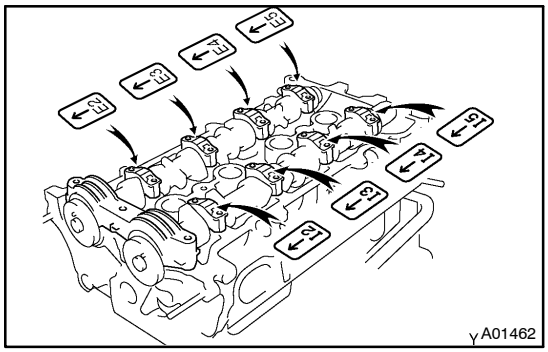
(e) 2ZZ–GE:
Retighten the cylinder head bolts 180° in the numerical order shown and check that the paint mark is not at a 180° angle to the front.



(f) Install the bolt holding the water bypass pipe to the cylinder head.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)
(g) Connect the upper radiator hose to the water hose unions.
(h) Connect the heater hose to the water hose unions.

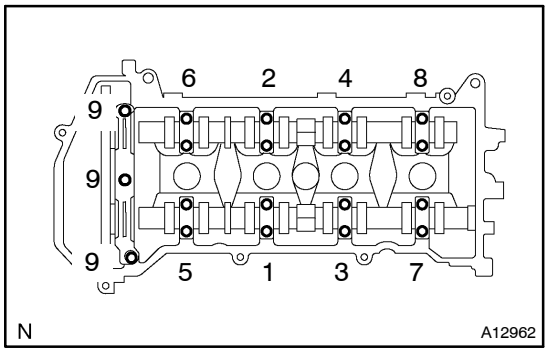


3. INSTALL CAMSHAFTS
(a) Place the 2 camshafts on the cylinder head with the No. 1 cam lobes facing as shown the illustration.

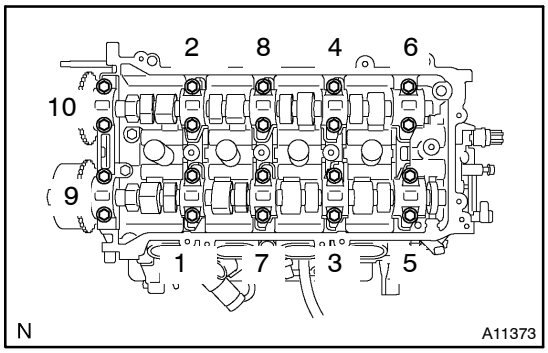


(b) Install the bearing caps in their proper locations.
HINT:
- 1ZZ–FE:
  No. 3 camshaft bearing cap has a number and front mark.
- 2ZZ–GE:
  No. 2, No.3 camshaft bearing cap has a number and front mark.

(c) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.



(d) 1ZZ–FE:
Install and uniformly tighten the 19 bearing cap bolts.
After tightening the No. 1 camshaft bearing cap, tighten them in several passes, in the sequence shown.
Torque:
No. 1 23 N·m (235 kgf·cm, 17 ft·lbf)
No. 3 13 N·m (133 kgf·cm, 10 ft·lbf)



(e) 2ZZ–GE:
Install and uniformly tighten the 20 bearing cap bolts. After tightening the No. 1 camshaft bearing cap, tighten them in several passes, in the sequence shown.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

4. CHECK AND ADJUST VALVE CLEARANCE (See page EM–4)

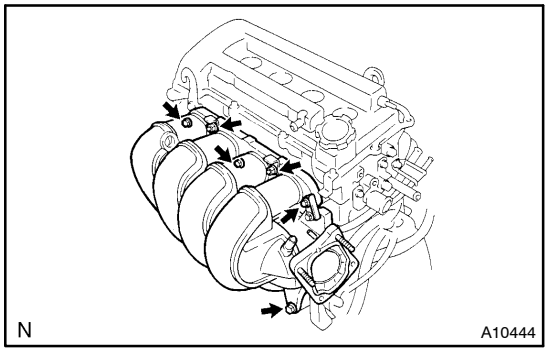
5. INSTALL CAMSHAFT TIMING SPROCKETS AND VALVE TIMING CONTROLLER ASSEMBLY (See page EM–26)

6. INSTALL OIL FILTER CAP

7. INSTALL GROMMET AND PCV VALVE

8. INSTALL ECT SENSOR (See page SF–67)

9. INSTALL CAMSHAFT POSITION SENSOR (See page IG–10)

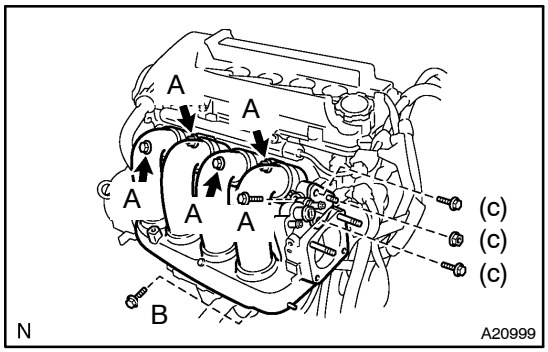


10. 1ZZ–FE:
INSTALL INTAKE MANIFOLD

(a) Install a new gasket, 2 wire harness stays and the intake manifold with the 4 bolts and 2 nuts.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

(b) Connect the brake booster vacuum hose.

(c) Connect the EVAP hose for ORVR.



11. 2ZZ–GE:
INSTALL INTAKE MANIFOLD

(a) Install the intake manifold insulator to the cylinder block.

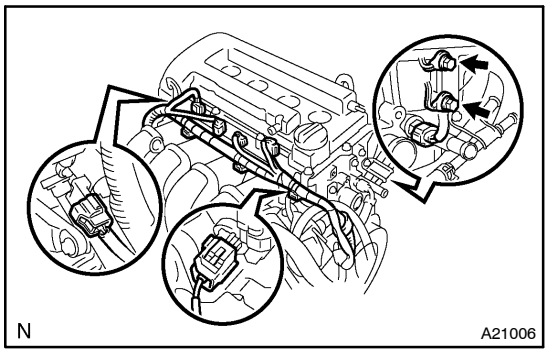
(b) Install a new gasket and the intake manifold with the 4 bolts and 2 nuts.
Torque:
A: 34 N·m (347 kgf·cm, 27 ft·lbf)
B: 46 N·m (469 kgf·cm, 34 ft·lbf)

(c) Install the stay with the 2 bolts and nut.
Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)

(d) Install the No.1 ventilation pipe, oil dipstick and guide with the bolt.
Torque: 24 N·m (245 kgf·cm, 18 ft·lbf)

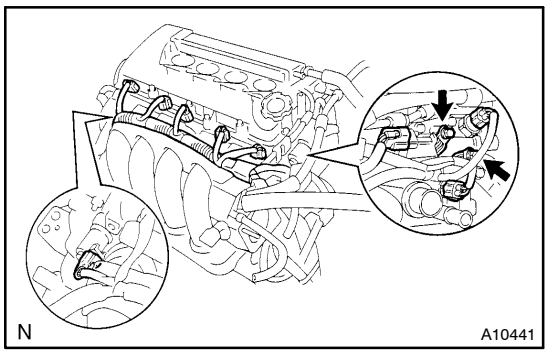
(e) Connect the brake booster vacuum hose.

(f) Connect the EVAP hose for ORVR.



12. 1ZZ–FE:
CONNECT ENGINE WIRE TO CYLINDER HEAD

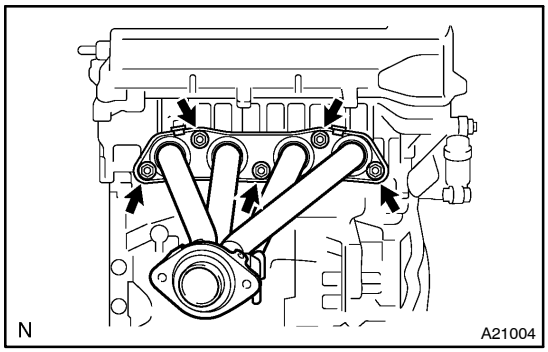
(a) Connect the 2 clamps of engine wire to the intake manifold.
(b) Connect the 2 ground cables.
(c) Connect the oil control valve for VVT connector.
(d) Connect the camshaft position sensor connector.
(e) Connect the ECT sensor connector.



13. 2ZZ–GE:
CONNECT ENGINE WIRE TO CYLINDER HEAD

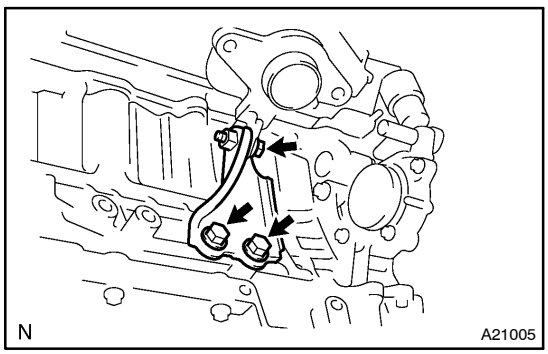
(a) Install the intake manifold insulator No. 2.
(b) Connect the 2 ground cables.
(c) Connect the oil pressure switch connector.
(d) Connect the oil control valve for VVT connector.
(e) Connect the oil control valve for VVTL connector.
(f) Connect the camshaft position sensor connector.
(g) Connect the ECT sensor connector.
(h) Install the accelerator cable bracket with the 2 bolts.

14. INSTALL INJECTORS (See page SF–24)
15. INSTALL THROTTLE BODY (See page SF–38 or SF–44)
16. INSTAL PCV HOSES
17. INSTALL SPARK PLUGS (See page IG–1)
18. INSTALL IGNITION COIL (See page IG–7)

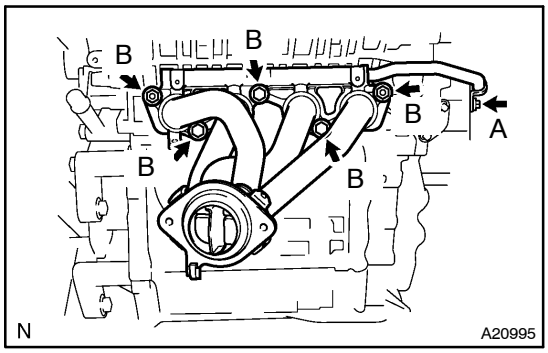


19. 1ZZ–FE:
INSTALL EXHAUST MANIFOLD

(a) Install the lower heat insulator with the 4 bolts.
Torque: 12 N·m (123 kgf·cm, 9 ft·lbf)
(b) Install a new gasket and the exhaust manifold with the 5 nuts. Uniformly tighten the nuts in several passes.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)
(c) Install the upper heat insulator with the 4 bolts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)



(d) Install the exhaust manifold stay with the 3 bolts.
Torque: 49 N·m (500 kgf·cm, 37 ft·lbf)



20. 2ZZ–GE:
INSTALL EXHAUST MANIFOLD

(a) Install the lower heat insulator with the 4 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

(b) Install the exhaust manifold with the 4 bolts and 2 nuts.
Torque:
A:20 N·m (204 kgf·cm, 15 ft·lbf)
B:50 N·m (510 kgf·cm, 37 ft·lbf)

(c) Install the upper heat insulator with the 4 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

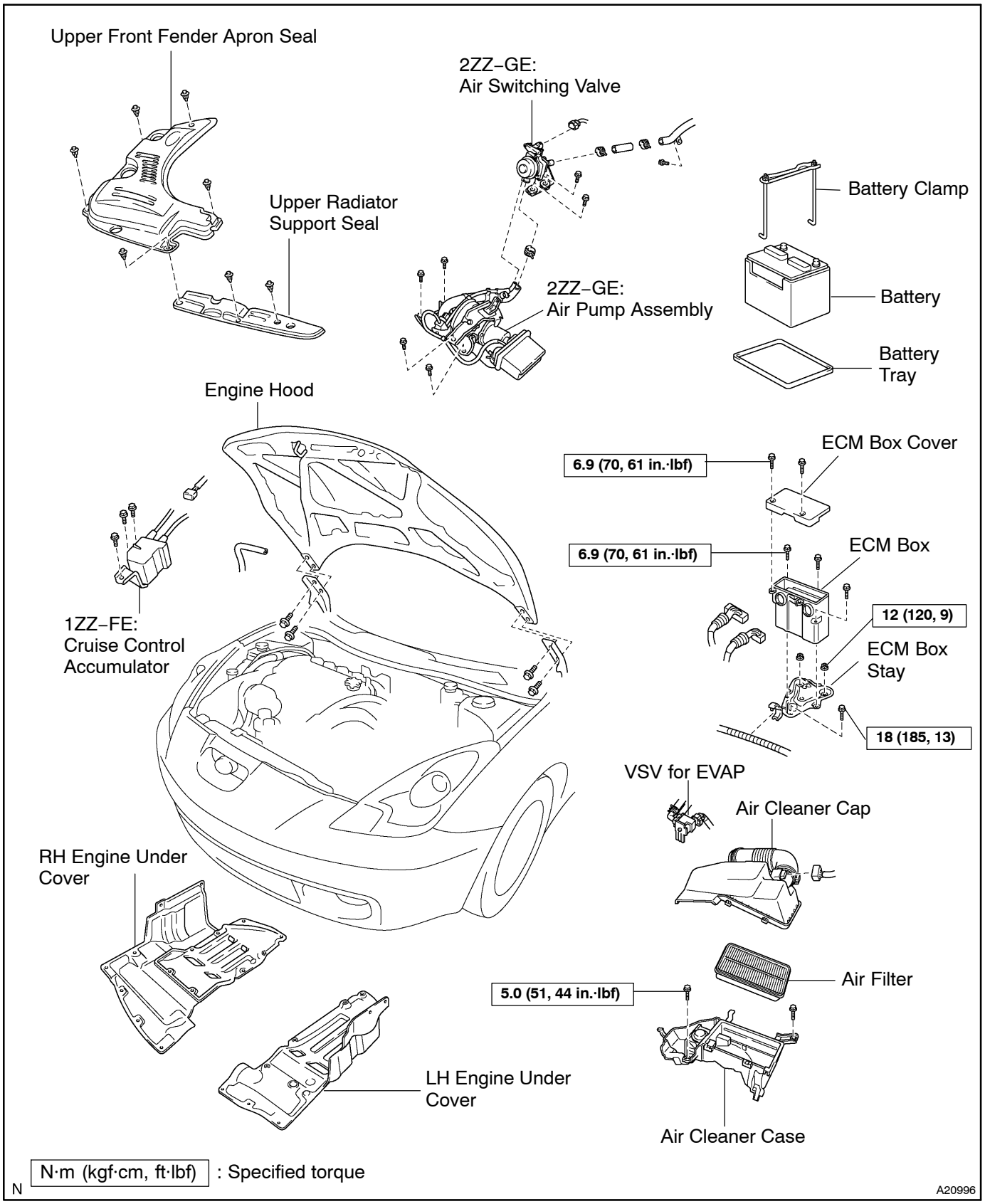
(d) Install the exhaust manifold stay with the 3 bolts.
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

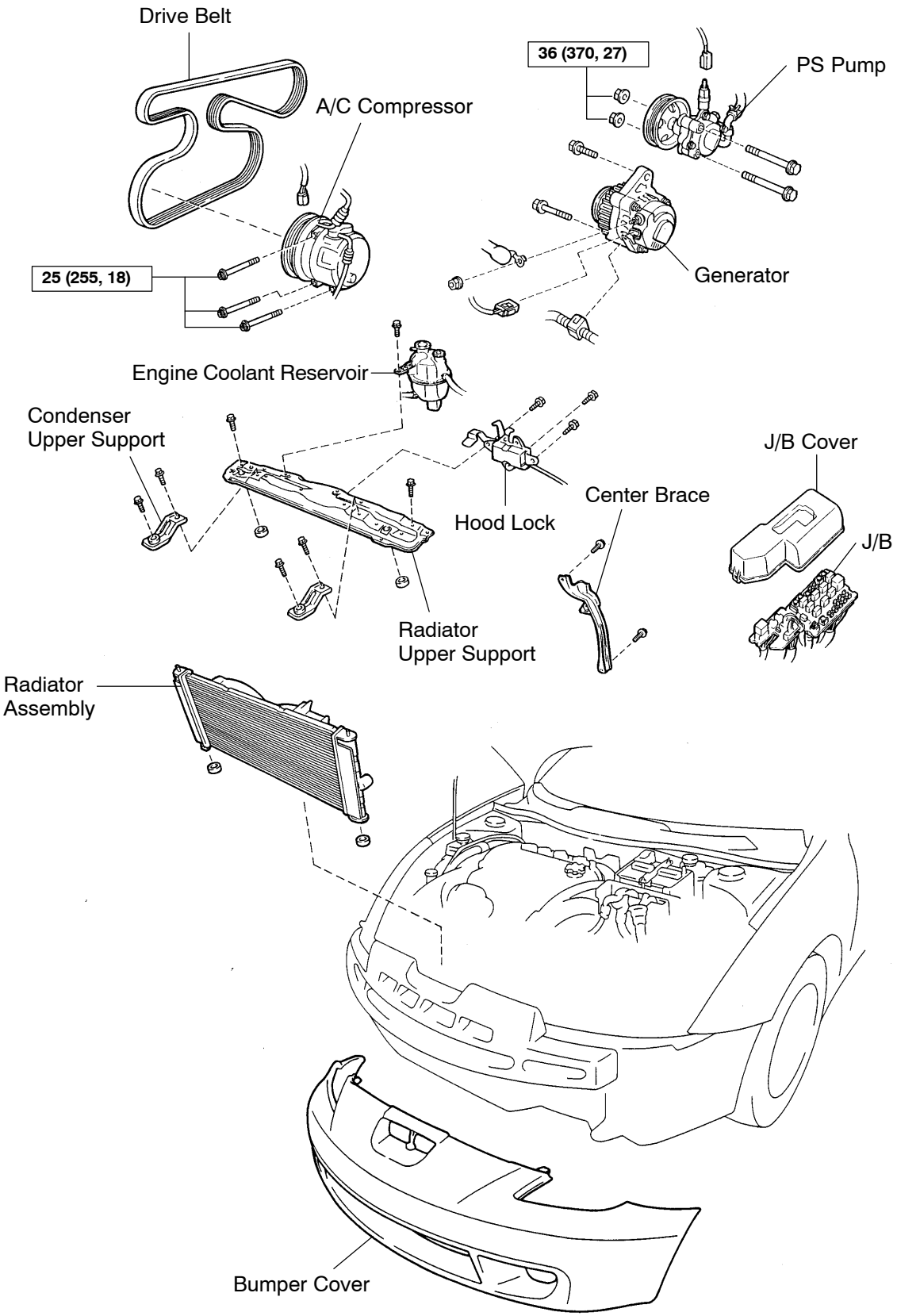
21. INSTALL EXHAUST PIPE (See page EM–82)
22. INSTALL GENERATOR AND DRIVE BELT (See page CH–17)
23. 2ZZ–GE:
INSTALL AIR SWITCHING VALVE (See page EC–18)
24. 1ZZ–FE:
CONNECT ACCELERATOR CABLE
25. INSTALL AIR CLEANER ASSEMBLY
26. INSTALL ECM BOX (See page EM–82)
27. INSTALL BATTERY
28. FILL WITH ENGINE COOLANT (See page CO–2)
29. START ENGINE AND CHECK FOR LEAKS
30. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

ENGINE UNIT

COMPONENTS

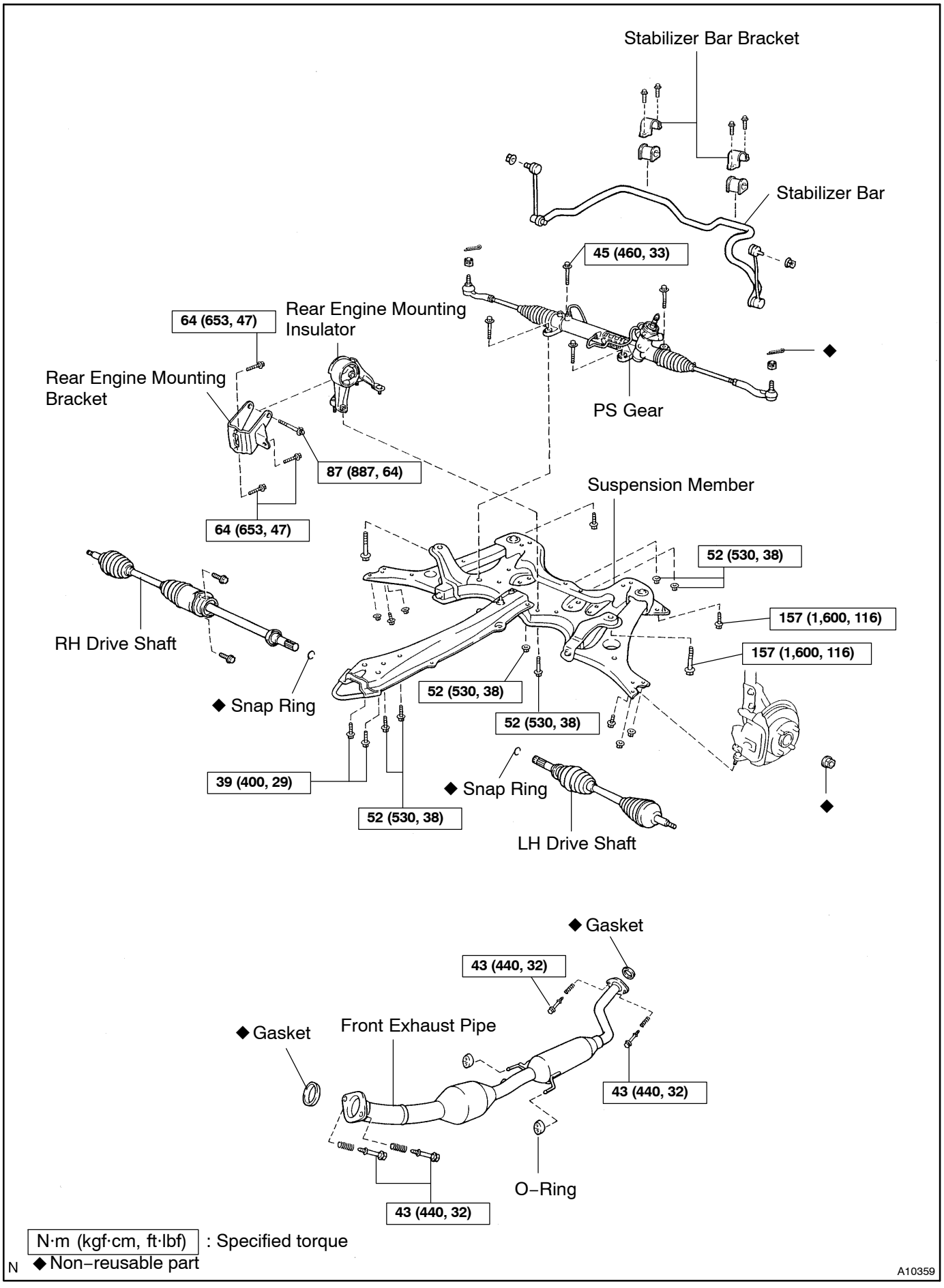
EM15Z–03

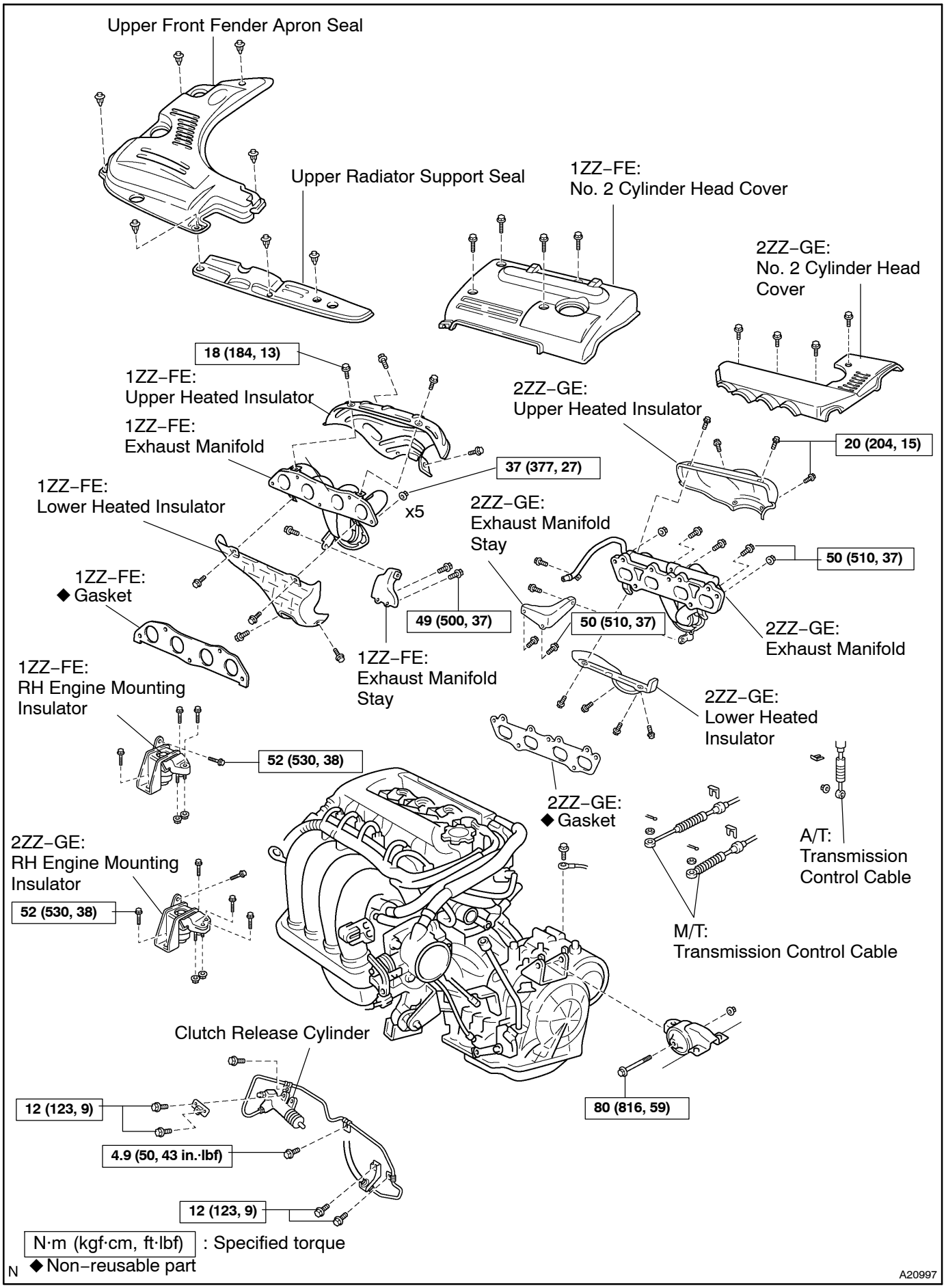




N N·m (kgf·cm, ft·lbf) : Specified torque

A10358

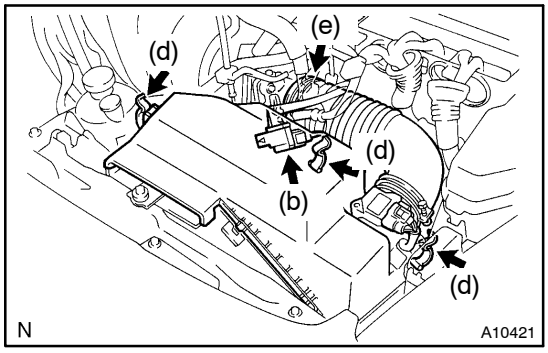

Stabilizer Bar Bracket
Stabilizer Bar
45 (460, 33)
64 (653, 47)
Rear Engine Mounting Insulator
Rear Engine Mounting Bracket
PS Gear
87 (887, 64)
64 (653, 47)
Suspension Member
52 (530, 38)
157 (1,600, 116)
RH Drive Shaft
157 (1,600, 116)
◆ Snap Ring
52 (530, 38)
52 (530, 38)
39 (400, 29)
◆ Snap Ring
52 (530, 38)
LH Drive Shaft
◆ Gasket
43 (440, 32)
◆ Gasket
Front Exhaust Pipe
43 (440, 32)
O–Ring
43 (440, 32)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
N
A10359


Upper Front Fender Apron Seal
Upper Radiator Support Seal
1ZZ–FE:
No. 2 Cylinder Head Cover
2ZZ–GE:
No. 2 Cylinder Head Cover
18 (184, 13)
1ZZ–FE:
Upper Heated Insulator
1ZZ–FE:
Exhaust Manifold
37 (377, 27)
x5
2ZZ–GE:
Upper Heated Insulator
20 (204, 15)
1ZZ–FE:
Lower Heated Insulator
2ZZ–GE:
Exhaust Manifold
Stay
50 (510, 37)
1ZZ–FE:
◆ Gasket
49 (500, 37)
50 (510, 37)
2ZZ–GE:
Exhaust Manifold
1ZZ–FE:
Exhaust Manifold
Stay
1ZZ–FE:
RH Engine Mounting
Insulator
2ZZ–GE:
Lower Heated
Insulator
52 (530, 38)
2ZZ–GE:
◆ Gasket
A/T:
Transmission
Control Cable
2ZZ–GE:
RH Engine Mounting
Insulator
52 (530, 38)
M/T:
Transmission Control Cable
Clutch Release Cylinder
12 (123, 9)
80 (816, 59)
4.9 (50, 43 in.·lbf)
12 (123, 9)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
N
A20997

EM160–04

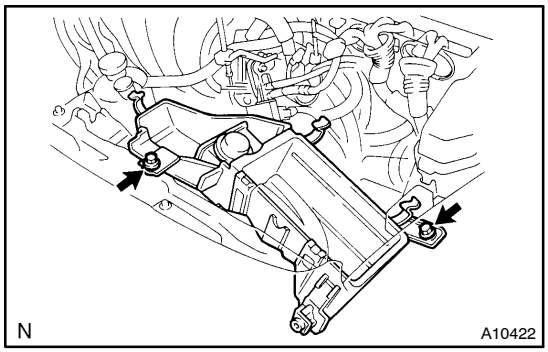
REMOVAL

1. **REMOVE BATTERY AND TRAY**
2. **REMOVE HOOD**
3. **REMOVE ENGINE UNDER COVERS**
4. **DRAIN ENGINE COOLANT**
5. **DRAIN ENGINE OIL**
6. **DRAIN TRANSAXLE OIL**
7. **REMOVE BUMPER COVER AND HEAD LIGHT**
8. **2ZZ–GE:**
   REMOVE AIR SWITCHING VALVE (See page EC–15)
9. **2ZZ–GE:**
   REMOVE AIR PUMP ASSEMBLY (See page EC–15)



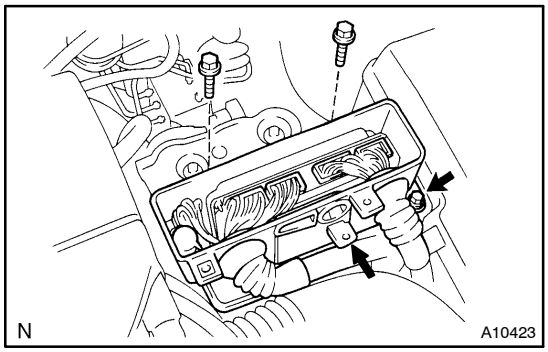
10. REMOVE AIR CLEANER CAP

(a) Disconnect the MAF meter connector.
(b) Disconnect the VSV for EVAP.
(c) Disconnect the 2 hoses.
(d) Disconnect the 3 clamps, and disconnect the air cleaner cap from the air cleaner case.
(e) Loosen the hose clamp, and disconnect the air cleaner hose from the throttle body.



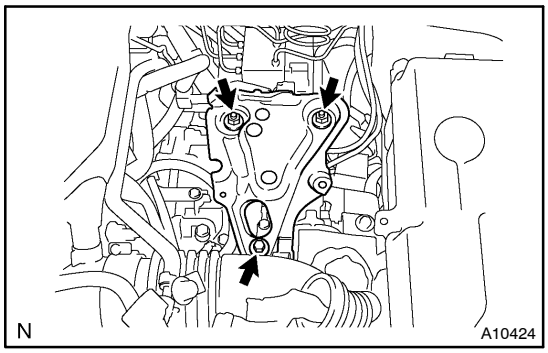
11. REMOVE AIR CLEANER CASE

(a) Remove the air filter.
(b) Disconnect the hose from the VSV for Canister Closed VALVE (CVC).
(c) Disconnect the hose from the intake air control valve.
(d) Remove the 2 bolts, and disconnect the air cleaner case.
(e) Disconnect the 2 hoses from the air cleaner case.

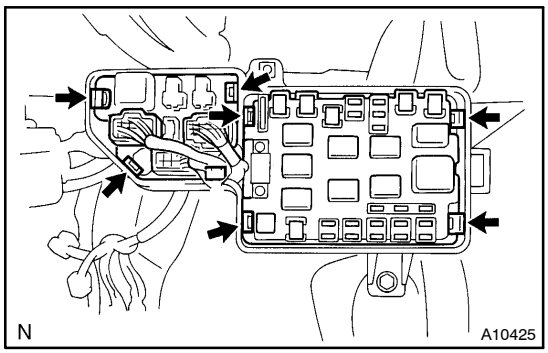


12. REMOVE ECM BOX

(a) Remove the 2 bolts and ECM cover.
(b) Disconnect the 4 connectors from the ECM.
(c) Disconnect the 2 connectors from the ECM box.
(d) Remove the ECM from the ECM box.
(e) Disconnect the clamp from the ECM box.
(f) Disconnect the 2 engine wires from the ECM box.
(g) Remove the 3 bolts and ECM box.

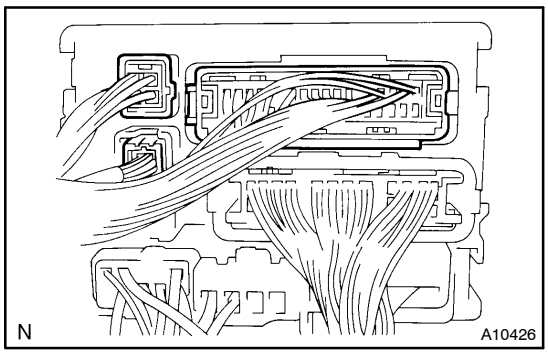


(h) Remove the 2 nuts, bolt and ECM box stay.

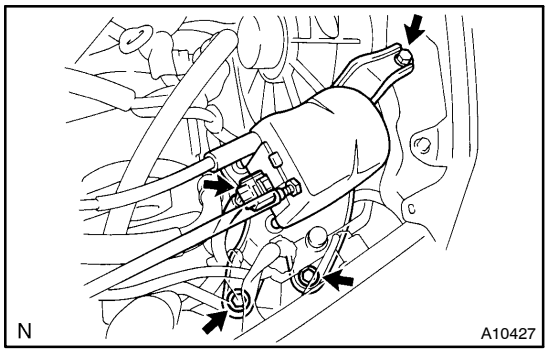


13. DISCONNECT ENGINE WIRE FROM ENGINE COMPARTMENT RELAY BOX

(a) Remove the relay box upper cover.
(b) Disconnect the 3 connectors.
(c) Disconnect the 7 claws and J/B from the relay box.



(d) Disconnect the 3 connectors.
(e) Disconnect the engine wire from the relay box.

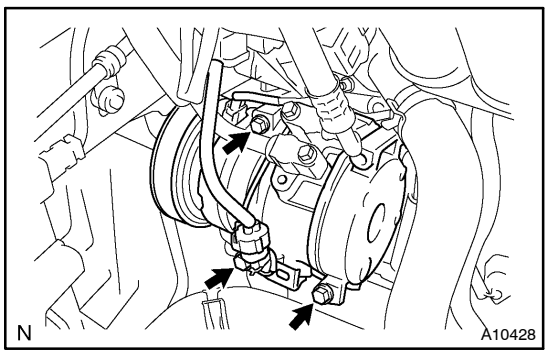


14. w/ Cruise Control System:
DISCONNECT CRUISE CONTROL ACTUATOR

(a) Disconnect the actuator connector.
(b) Remove the 3 bolts and disconnect the actuator from the body.

15. REMOVE RADIATOR ASSEMBLY (See page CO–17)

16. REMOVE DRIVE BELT AND GENERATOR (See page CH–7)



17. w/ A/C:
DISCONNECT A/C COMPRESSOR

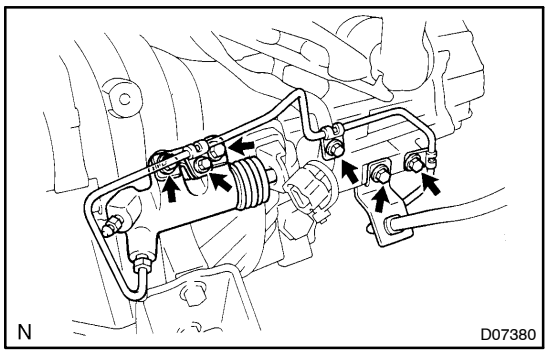
(a) Disconnect the A/C compressor connector.
(b) Remove the 3 bolts, and disconnect the A/C compressor from the engine.

HINT:
Suspend the A/C compressor securely.

18. DISCONNECT TUBE AND HOSE

(a) Disconnect the fuel tube from the fuel pipe on vehicle side.

(b) Disconnect the 2 heater hoses from the engine side.
(c) Disconnect the brake booster vacuum hose.

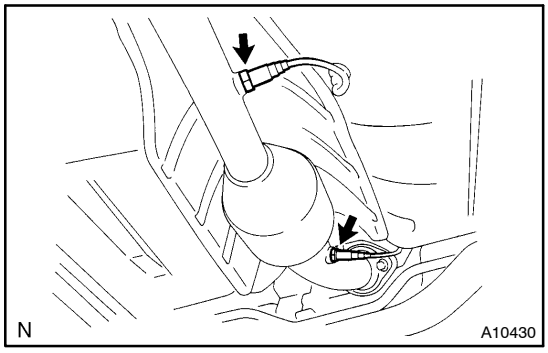


19. M/T:
DISCONNECT CLUTCH RELEASE CYLINDER
(a) Remove the 3 bolts, and disconnect the brackets from the transaxle.
(b) Remove the 2 bolts, and disconnect the release cylinder from the transaxle.

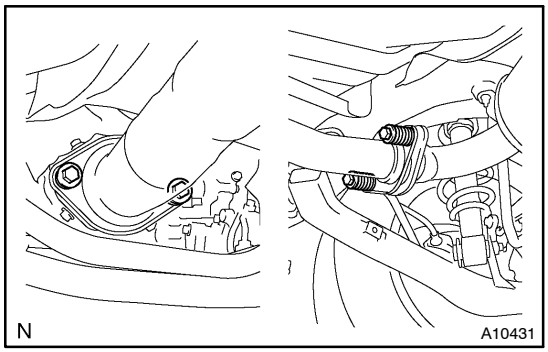
20. DISCONNECT TRANSAXLE CONTROL CABLE (S)

21. DISCONNECT 2 GROUND CABLES

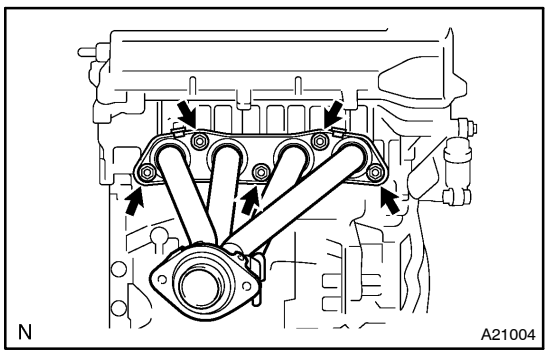
22. REMOVE DRIVE SHAFT (See page SA–21)



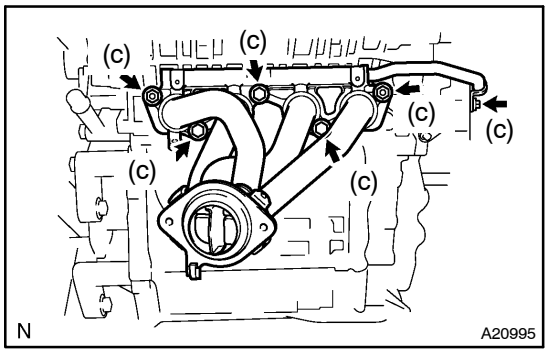
23. REMOVE EXHAUST PIPE
(a) Disconnect the 2 heated oxygen sensors.



(b) Remove the 4 bolts and springs.
(c) Disconnect the 2 O–rings, and remove the exhaust pipe and 2 gaskets.



24. 1ZZ–FE:
REMOVE EXHAUST MANIFOLD
(a) Remove the 4 bolts and upper heat insulator.
(b) Remove the 3 bolts and exhaust manifold stay.
(c) Remove the 5 nuts, exhaust manifold and gasket.



25. 2ZZ–GE:
REMOVE EXHAUST MANIFOLD

(a) Remove the 5 bolts and upper heat insulator.
(b) Remove the 4 bolts and exhaust manifold stay.
(c) Remove the 2 nuts, 4 bolts, exhaust manifold and gasket.

26. DISCONNECT PS PUMP

(a) Disconnect the PS oil pressure switch connector.
(b) Remove the 2 nuts and through bolts, and disconnect the PS pump from the engine (See page SR–26).

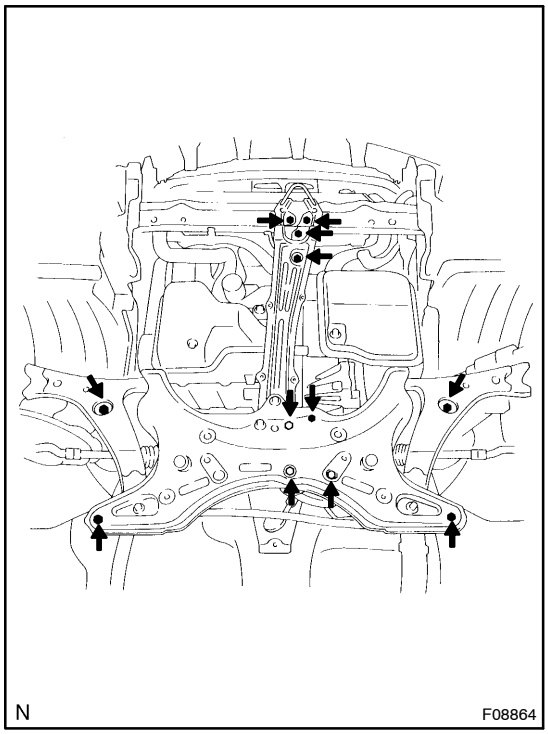
HINT:
Put aside the pump and suspend it to the cowl with a string.

27. REMOVE STABILIZER BAR BRACKET
(See page SA–52)

28. DISCONNECT PS GEAR

Remove the 4 bolts, and disconnect the PS gear from the suspension member.

HINT:
Suspend the PS gear securely.

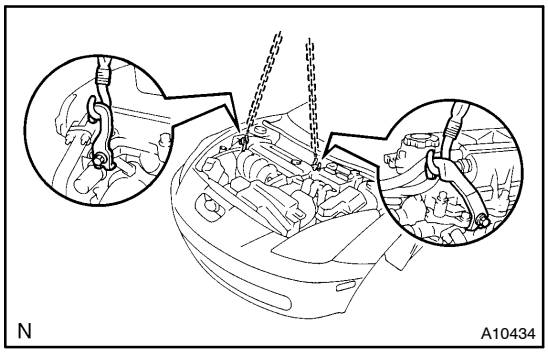


29. REMOVE SUSPENSION MEMBER

Remove the 9 bolts, 3 nuts and suspension member.

30. ATTACH ENGINE SLIDING DEVICE TO ENGINE HANGER

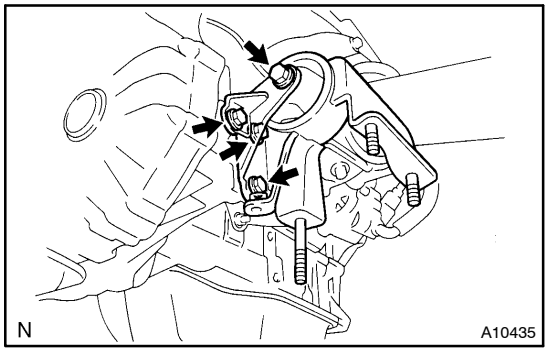
(a) Remove the 4 bolts and No. 2 cylinder head cover.
(b) Disconnect the PCV hoses from the cylinder head cover.



(c) Install the 2 engine hangers in the correct direction.
Engine hanger part No.:
1ZZ–FE
Front: 12281–22021
Rear: 12281–15040 or 12281–15050
Bolt: 91512–B1016
2ZZ–GE
Front: 12281–88600
Rear: 12282–88600
Bolt: 91512–61020
Torque: 38 N·m (388 kgf·cm, 28 ft·lbf)

(d) Attach the engine sling device to the engine hangers.

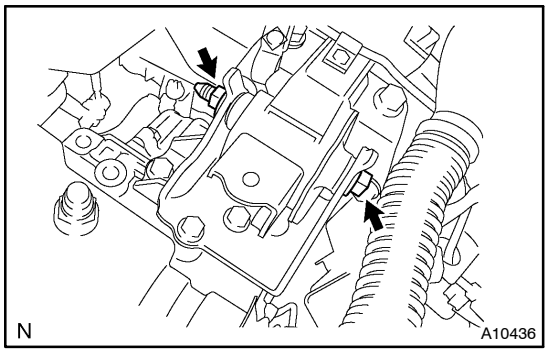
CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.



31. REMOVE REAR ENGINE MOUNTING

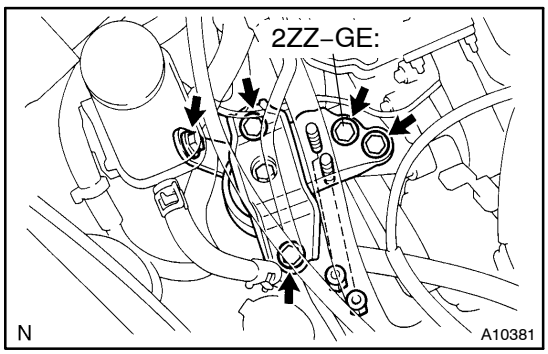
(a) Remove the through bolt and rear engine mounting insulator.

(b) Remove the 3 bolts and rear engine mounting bracket.



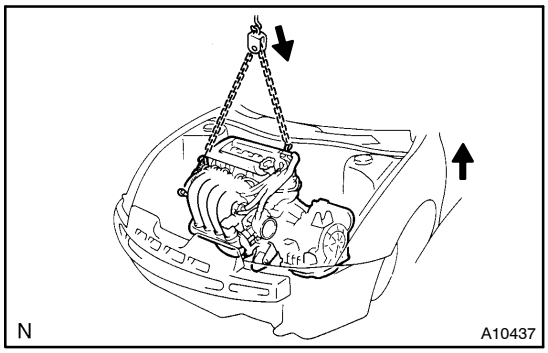
32. REMOVE ENGINE AND TRANSAXLE ASSEMBLY

(a) Remove the LH engine mounting through bolt and nut.



(b) 1ZZ–FE:
Remove the 4 bolts, 2 nuts and RH engine mounting insulator.

(c) 2ZZ–GE:
Remove the 5 bolts, 2 nuts and RH engine mounting insulator.



(d) Lower the engine out of vehicle slowly and carefully, and raise the vehicle.

HINT:

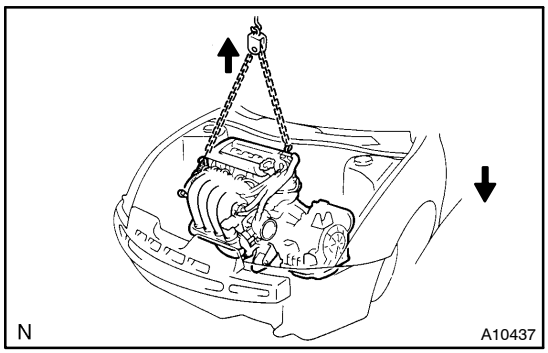
Make sure the engine is clear of all wiring, hoses and cables.

(e) Place the engine and transaxle assembly onto the stand.

33. SEPARATE ENGINE AND TRANSAXLE
(C56 M/T: See page MX–4)
(C60 M/T: See page MX–4)
(U240E A/T: See page AX–31)
(U341E A/T: See page AX–31)

INSTALLATION

1. ASSEMBLY ENGINE AND TRANSAXLE
(C56 M/T: See page MX–9)
(C60 M/T: See page MX–9)
(U240E A/T: See page AX–35)
(U341E A/T: See page AX–35)

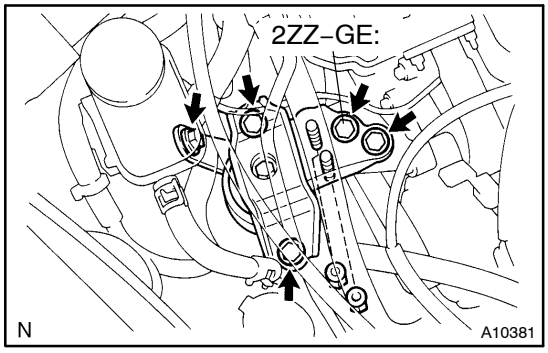


2. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

(a) Attach the engine sling device to the engine hangers.

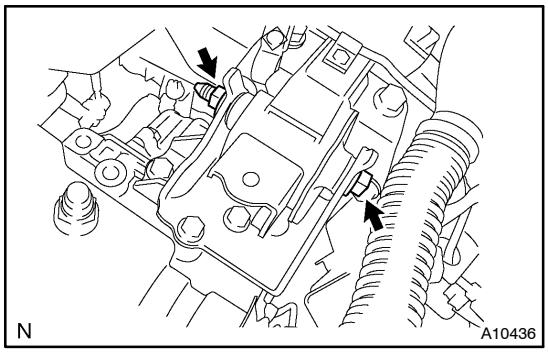
(b) Slowly lower the vehicle, and raise the engine into the engine compartment.

(c) Keep the engine level, and align RH and LH mountings with the body bracket.



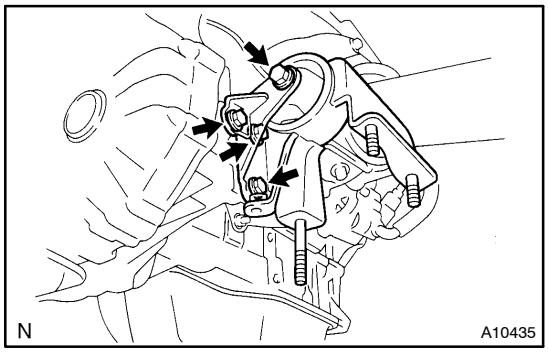
(d) 1ZZ–FE:
Install the RH engine mounting insulator with the 4 bolts and 2 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

(e) 2ZZ–GE:
Install the RH engine mounting insulator with the 5 bolts and 2 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)



(f) Install the LH engine mounting through bolt and nut.
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

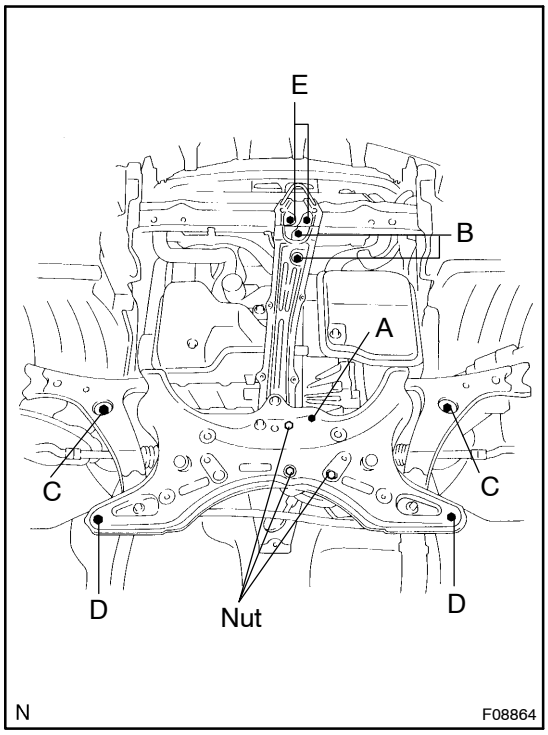
3. REMOVE ENGINE SLING DEVICE



4. INSTALL REAR ENGINE MOUNTING

(a) Install the rear engine mounting bracket with the 3 bolts.
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)

(b) Temporarily install the rear engine mounting insulator with the through bolt.



5. INSTALL SUSPENSION MEMBER

(a) Install the suspension member with the 9 bolts and 3 nuts.
Torque:
A 52 N·m (530 kgf·cm, 38 ft·lbf)
B 52 N·m (530 kgf·cm, 38 ft·lbf)
C 157 N·m (1,600 kgf·cm, 116 ft·lbf)
D 157 N·m (1,600 kgf·cm, 116 ft·lbf)
E 39 N·m (400 kgf·cm, 29 ft·lbf)
Nut 52 N·m (530 kgf·cm, 32 ft·lbf)

(b) Tighten the rear engine mounting through bolt.
Torque: 87 N·m (887 kgf·cm, 64 ft·lbf)

6. CONNECT PS GEAR

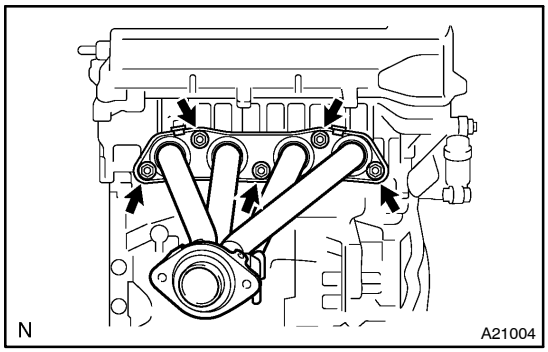
Install the PS gear with the 4 bolts.
Torque: 45 N·m (460 kgf·cm, 33 ft·lbf)

7. INSTALL STABILIZER BAR BRACKET
(See page SA–54)

8. CONNECT PS PUMP

(a) Install the PS pump with the 2 through bolts and nuts (See page SR–34).
Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

(b) Connect the PS oil pressure switch connector.

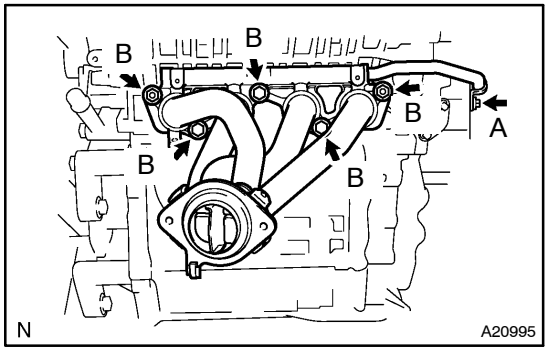


9. 1ZZ–FE:
INSTALL EXHAUST MANIFOLD

(a) Install the gasket and exhaust manifold with the 5 nuts.
Torque: 37 N·m (377 kgf·cm, 27 ft·lbf)

(b) Install the exhaust manifold stay with the 3 bolts.
Torque: 49 N·m (500 kgf·cm, 37ft·lbf)

(c) Install the upper heat insulator with the 4 bolts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

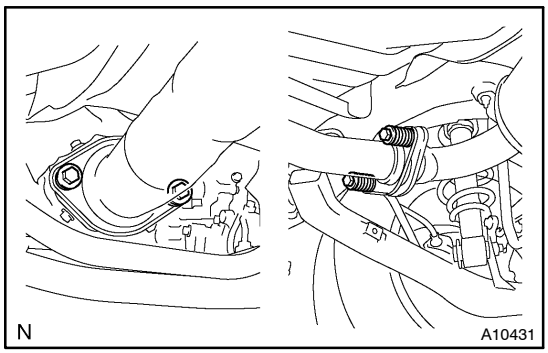


10. 2ZZ–GE:
INSTALL EXHAUST MANIFOLD

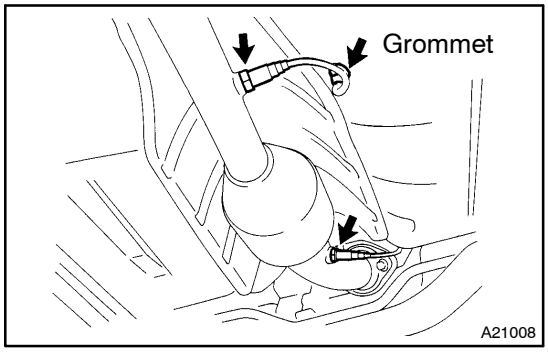
(a) Install the gasket and exhaust manifold with the 2 nuts and 4 bolts.
Torque:
A:20 N·m (204 kgf·cm, 15 ft·lbf)
B:50 N·m (510 kgf·cm, 37 ft·lbf)

(b) Install the exhaust manifold stay with the 3 bolts.
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

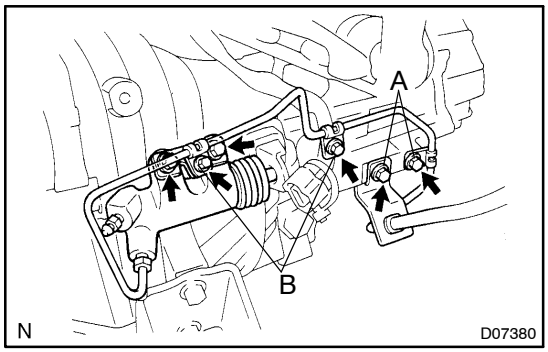
(c) Install the upper heat insulator with the 4 bolts.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)



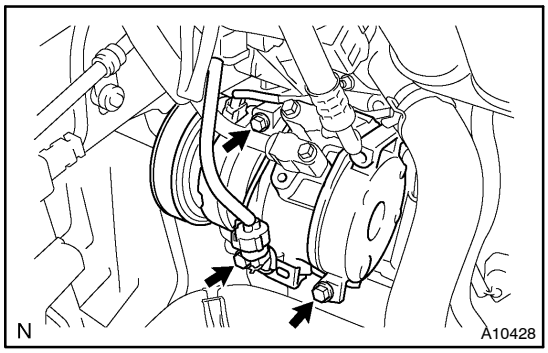
11. INSTALL EXHAUST PIPE
(a) Install new 2 gaskets and exhaust pipe.
(b) Connect the 2 O–rings.
(c) Install the 4 springs and bolts.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



(d) Connect the 2 heated oxygen sensors.
(See page EM–117)
12. INSTALL DRIVE SHAFT (See page SA–33)
13. CONNECT 2 GROUND CABLES
14. CONNECT TRANSAXLE CONTROL CABLE (S)



15. M/T:
CONNECT CLUTCH RELEASE CYLINDER
(a) Install the release cylinder with the 2 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
(b) Install the brackets with the 3 bolts.
Torque:
Bolt A 12 N·m (120 kgf·cm, 9 ft·lbf)
Bolt B 4.9 N·m (50 kgf·cm, 43 in.·lbf)
16. CONNECT TUBE AND HOSE
(a) Connect the brake booster vacuum hose.
(b) Connect the 2 heater hoses to the engine side.
(c) Connect the fuel tube to the fuel pipe on vehicle side.



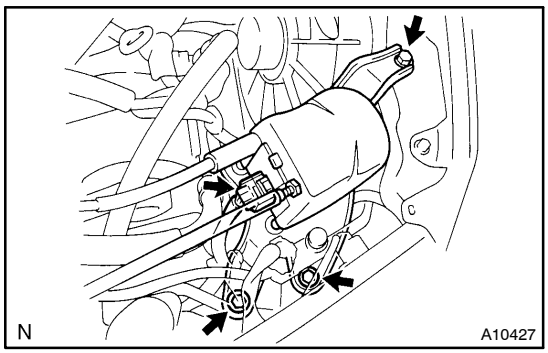
17. w/ A/C:
INSTALL A/C COMPRESSOR

(a) Install the A/C compressor with the 3 bolts.
Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)

(b) Connect the A/C compressor connector.

18. INSTALL GENERATOR AND DRIVE BELT (See page CH–17)

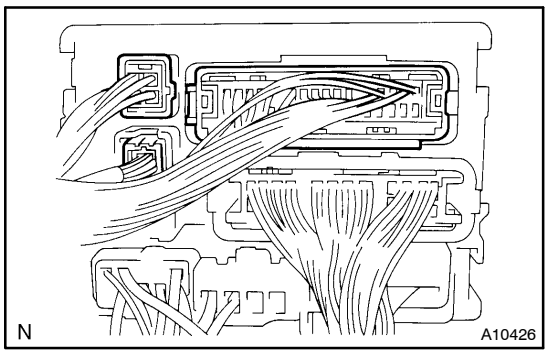
19. INSTALL RADIATOR ASSEMBLY (See page CO–23)



20. w/ Cruise Control System:
INSTALL CRUISE CONTROL ACTUATOR

(a) Install the actuator with the 3 bolts.

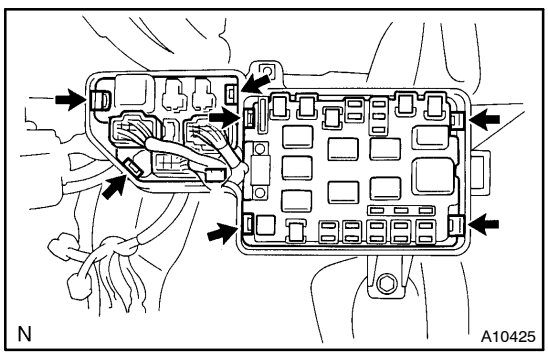
(b) Connect the actuator connector.



21. CONNECT ENGINE WIRE TO ENGINE COMPARTMENT RELAY BOX

(a) Install the engine wire to the relay box.

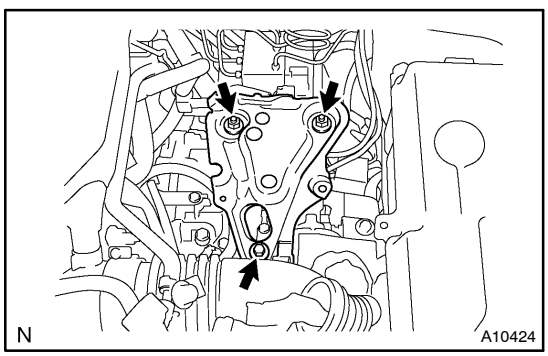
(b) Connect the 3 connectors.



(c) Connect the J/B to the relay box.

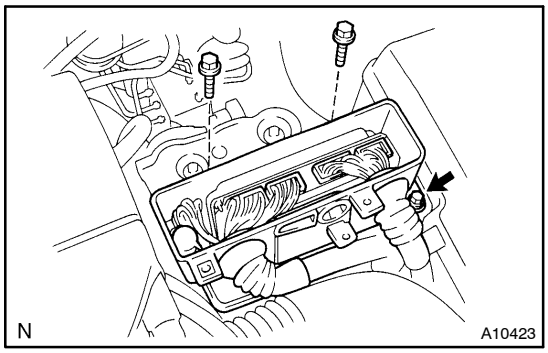
(d) Connect the 3 connectors.

(e) Install the relay box upper cover.

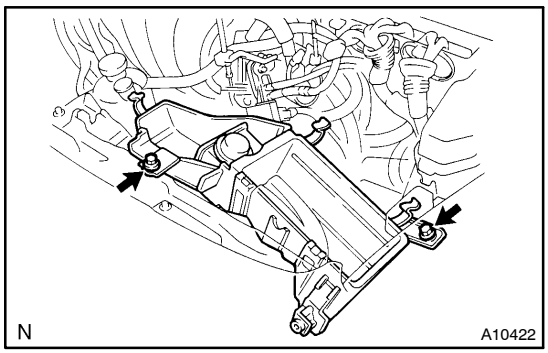


22. INSTALL ECM BOX

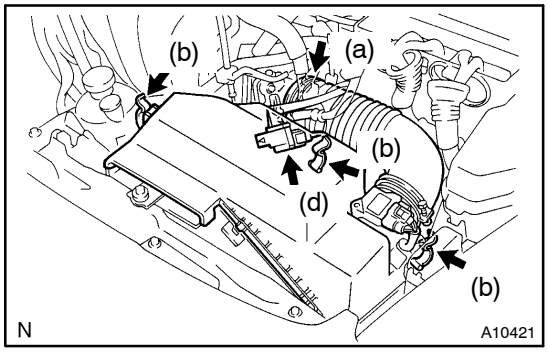
(a) Install the ECM box stay with the 2 nuts and bolt.
Torque:
Nut 12 N·m (120 kgf·cm, 9 ft·lbf)
Bolt 18 N·m (185 kgf·cm, 13 ft·lbf)



(b) Instal the ECM box with the 3 bolts.
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)
(c) Connect the 2 engine wires to the ECM box.
(d) Connect the clamp to the ECM box.
(e) Install the ECM to the ECM box.
(f) Connect the 2 connectors to the ECM box.
(g) Connect the 4 connectors to the ECM
(h) Install the ECM cover with the 2 bolts.
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)



23. INSTALL AIR CLEANER CASE
(a) Connect the 2 hoses to the air cleaner case.
(b) Install the air cleaner case with the 2 bolts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)
(c) Connect the hose to the intake air control valve.
(d) Connect the hose to the VSV for canister closed valve (CVC).
(e) Install the air filter.



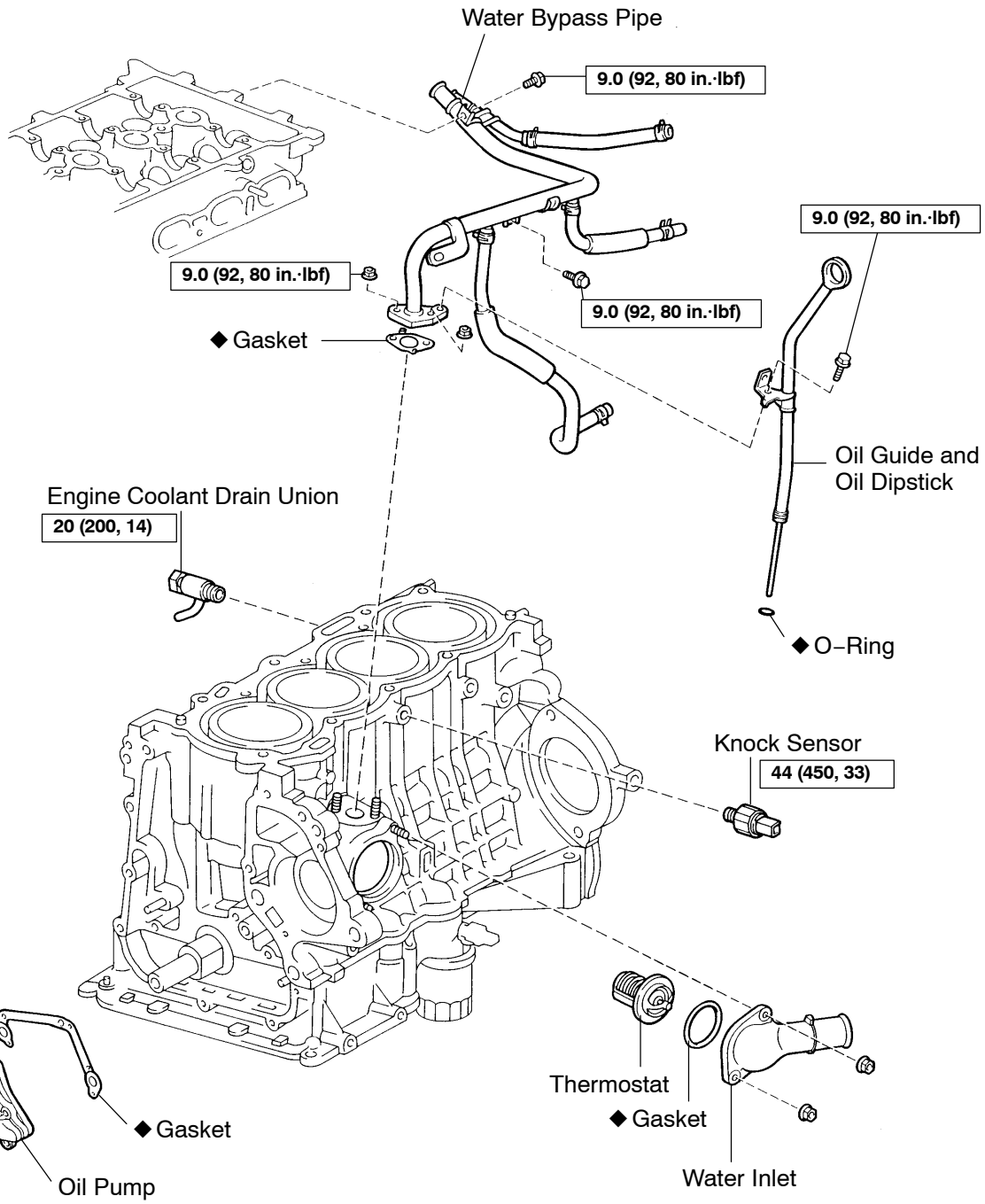
24. INSTALL AIR CLEANER CAP
(a) Install the air cleaner hose to the throttle body with the hose clamp.
(b) Connect the air cleaner cap to the air cleaner case with the 3 clamps.
(c) Connect the 2 hoses.
(d) Connect the VSV for EVAP.
(e) Connect the MAF meter connector.
25. 2ZZ–GE:
INSTALL AIR PUMP ASSEMBLY (See page EC–18)
26. 2ZZ–GE:
INSTALL AIR SWITCHING VALVE (See page EC–18)
27. INSTALL HEADLIGHT AND BUMPER COVER
28. INSTALL BATTERY AND TRAY
29. FILL WITH TRANSAXLE OIL
30. FILL WITH ENGINE OIL
31. FILL WITH ENGINE COOLANT (See page CO–2)
32. START ENGINE AND CHECK FOR LEADS
33. PERFORM ENGINE ADJUSTMENT
34. CHECK FRONT WHEEL ALIGNMENT
35. INSTALL ENGINE UNDER COVERS
36. INSTALL ENGINE HOOD
37. ROAD TEST VEHICLE
Check for abnormal noises, shock slippage, correct shift points and smooth operation.
38. RECHECK ENGINE COOLANT AND OIL LEVELS

CYLINDER BLOCK

COMPONENTS

EM162–08

1ZZ–FE:

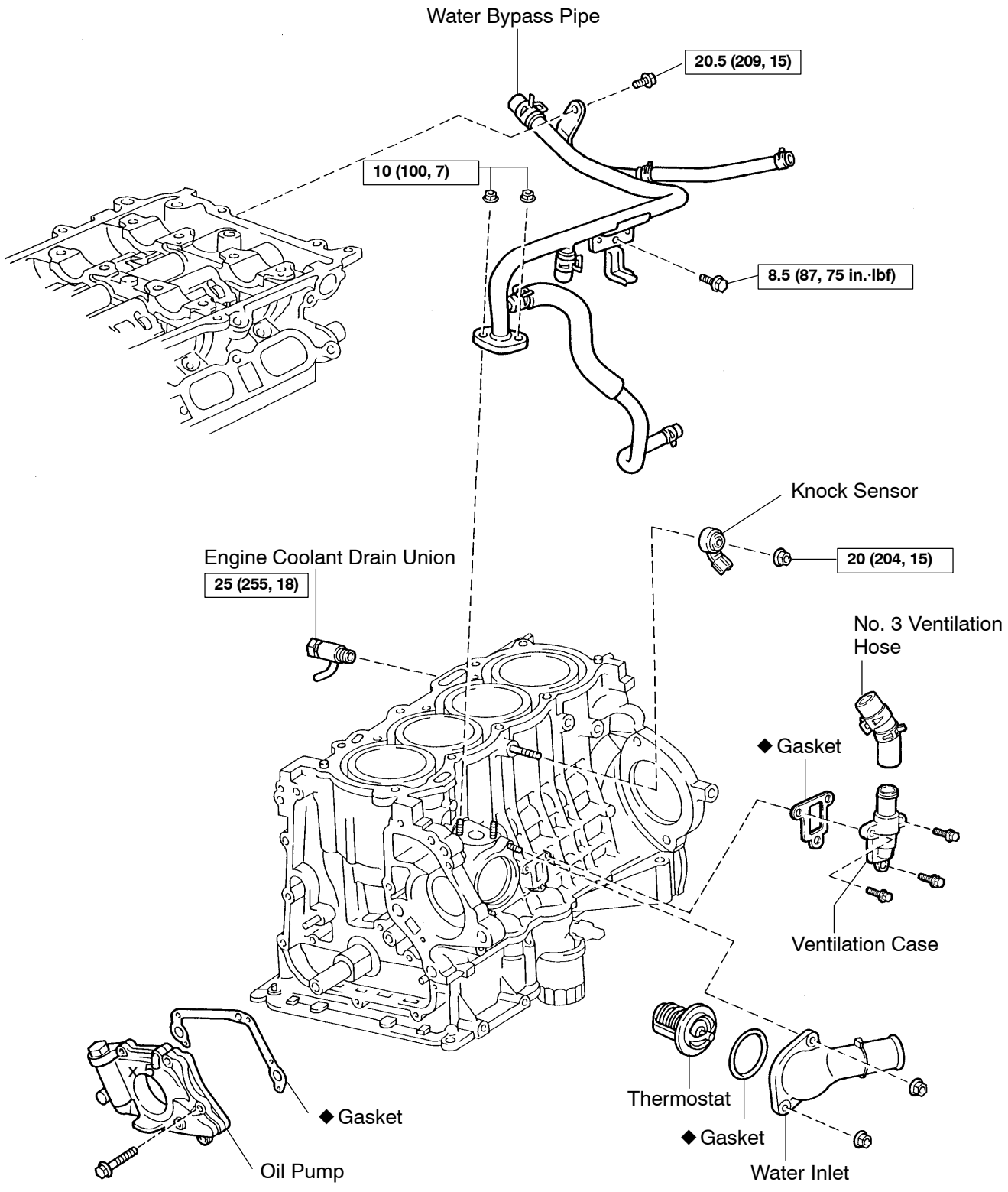


N·m (kgf·cm, ft·lbf) : Specified torque

N ◆ Non–reusable part

A10449

2ZZ–GE:

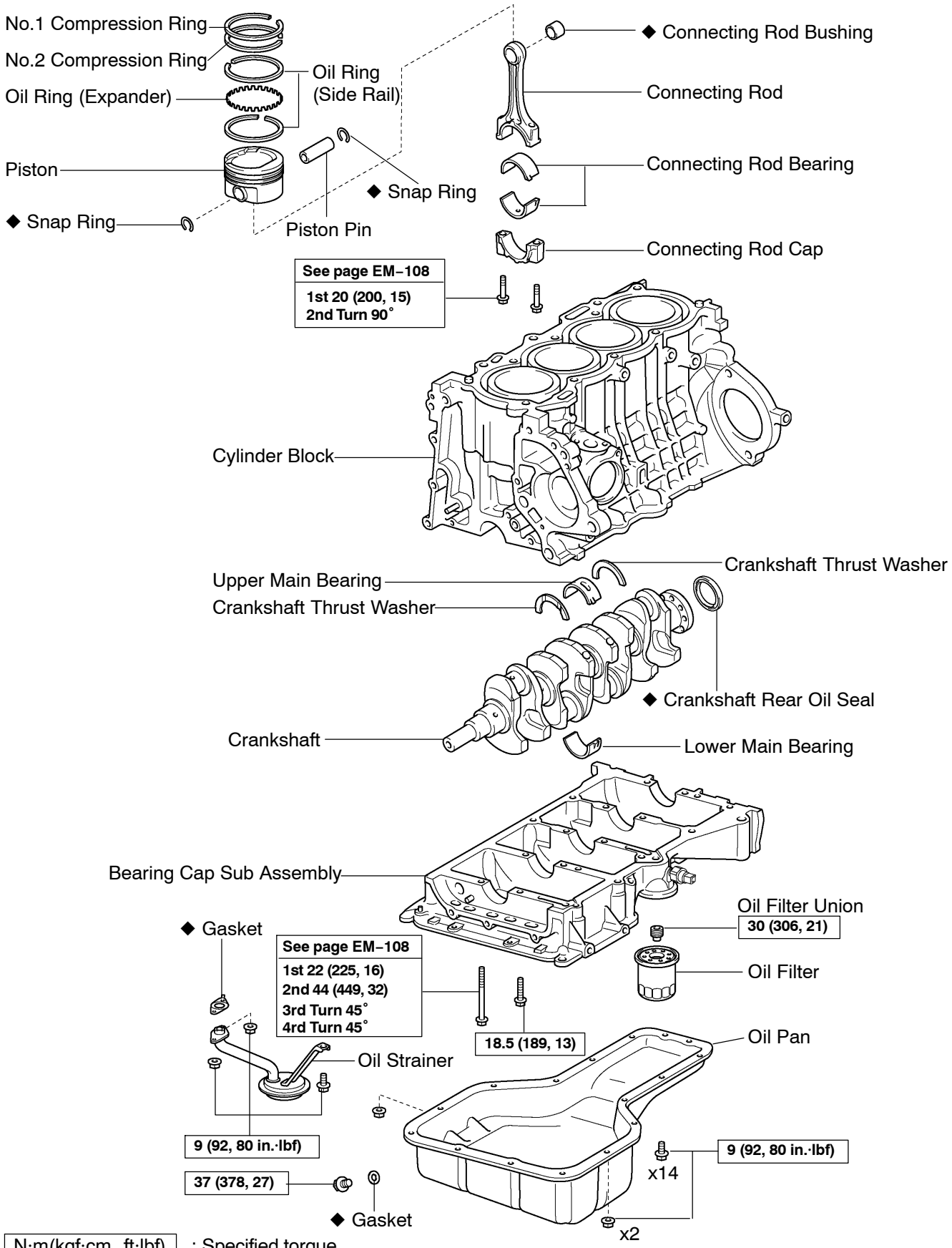


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

A17323

1ZZ–FE:

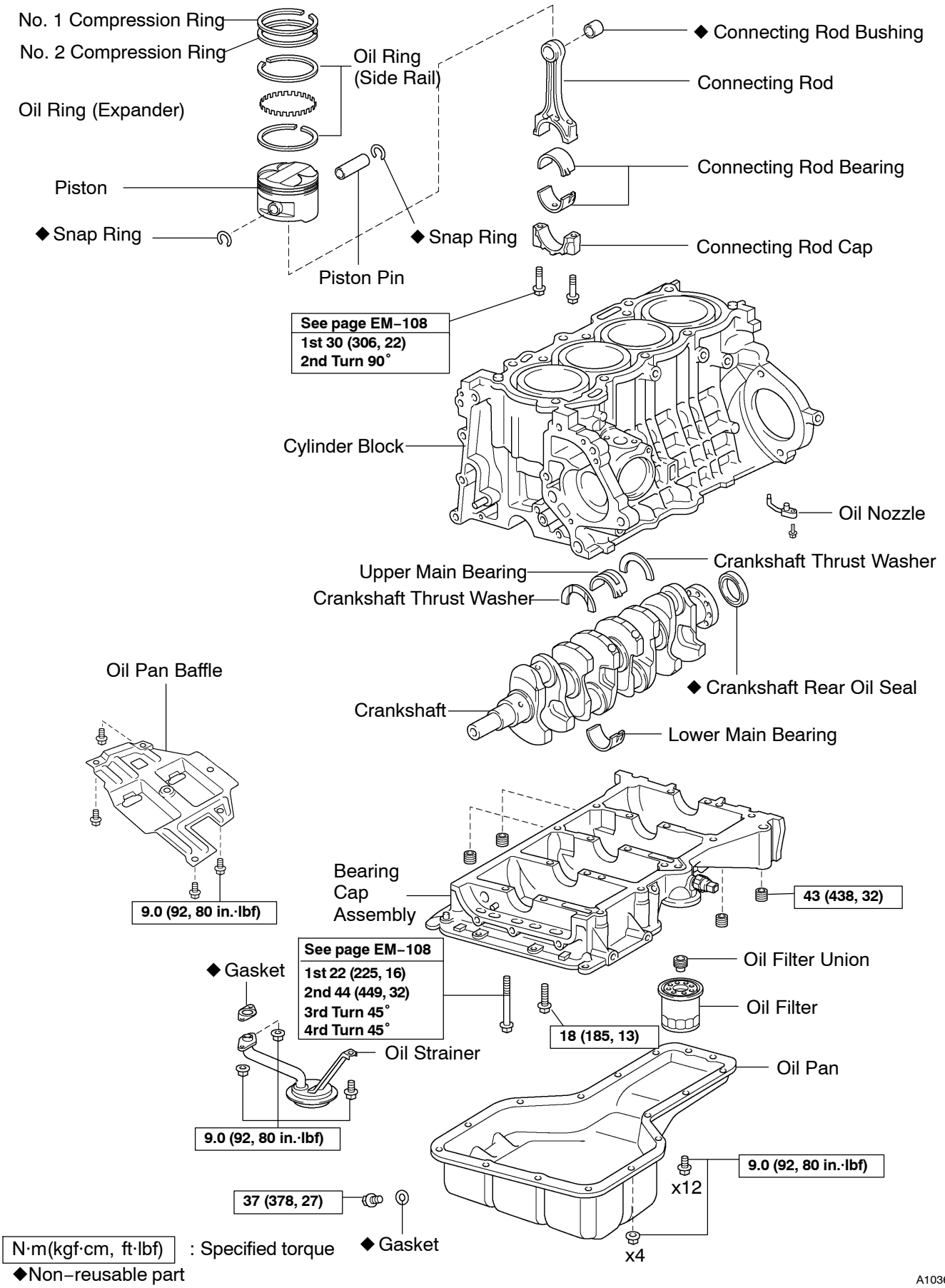


N·m(kgf·cm, ft·lbf) : Specified torque

◆Non–reusable part

A01210

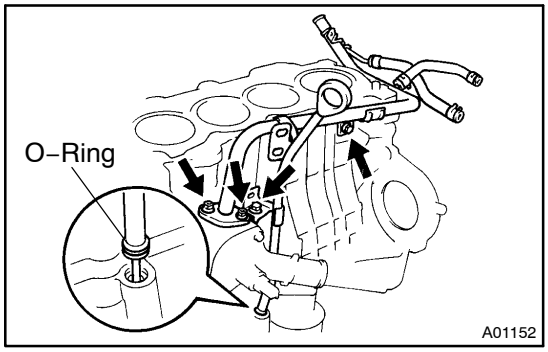
2ZZ–GE:


No. 1 Compression Ring
No. 2 Compression Ring
Oil Ring (Side Rail)
Oil Ring (Expander)
Piston
◆ Snap Ring
◆ Snap Ring
Piston Pin
◆ Connecting Rod Bushing
Connecting Rod
Connecting Rod Bearing
Connecting Rod Cap
See page EM–108
1st 30 (306, 22)
2nd Turn 90°
Cylinder Block
Oil Nozzle
Upper Main Bearing
Crankshaft Thrust Washer
Crankshaft Thrust Washer
◆ Crankshaft Rear Oil Seal
Crankshaft
Lower Main Bearing
Oil Pan Baffle
9.0 (92, 80 in.·lbf)
Bearing Cap Assembly
43 (438, 32)
See page EM–108
1st 22 (225, 16)
2nd 44 (449, 32)
3rd Turn 45°
4rd Turn 45°
◆ Gasket
Oil Filter Union
Oil Filter
18 (185, 13)
Oil Strainer
Oil Pan
9.0 (92, 80 in.·lbf)
9.0 (92, 80 in.·lbf)
x12
37 (378, 27)
◆ Gasket
x4
N·m(kgf·cm, ft·lbf) : Specified torque
◆Non–reusable part
N
A10361

EM163–06

DISASSEMBLY

1. **M/T:**
   REMOVE FLYWHEEL
2. **A/T:**
   REMOVE DRIVE PLATE
3. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
4. **REMOVE TIMING CHAIN AND SPROCKETS (See page EM–19)**
5. **REMOVE ENGINE WIRE**
6. **REMOVE CYLINDER HEAD (See page EM–44)**



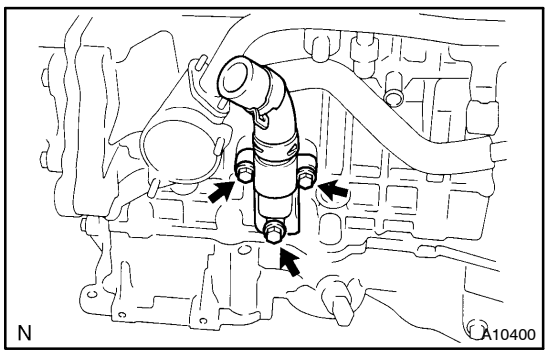
7. **1ZZ–FE:**
   REMOVE OIL DIPSTICK AND GUIDE

(a) Remove the bolt and oil dipstick and guide.
(b) Remove the O–ring from the dipstick.

8. **REMOVE WATER BYPASS PIPE**

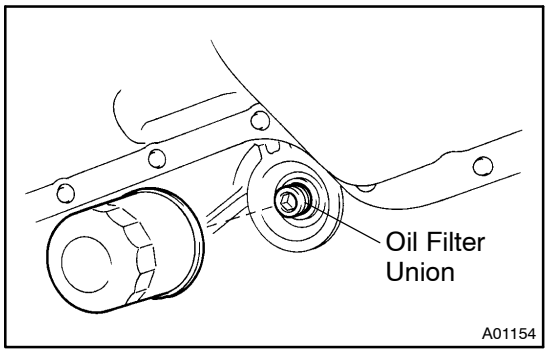
Remove the 2 nuts, bolts and water bypass pipe.

9. **REMOVE THERMOSTAT (See page CO–9)**
10. **REMOVE KNOCK SENSOR**
11. **REMOVE ENGINE COOLANT DRAIN UNION**
12. **REMOVE OIL PUMP (See page LU–9)**



13. **2ZZ–GE:**
    REMOVE VENTILATION CASE

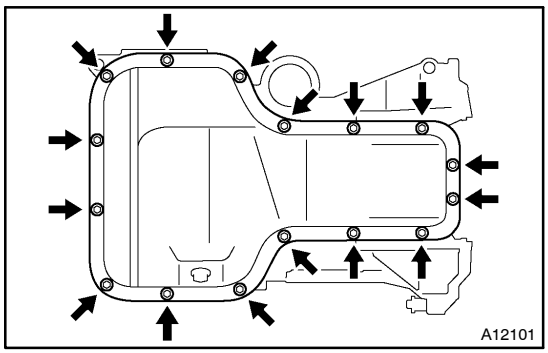
(a) Remove the 3 nuts, ventilation case and gasket.
(b) Remove the clip and No. 3 ventilation hose.



14. REMOVE OIL FILTER (See page LU–3)

15. REMOVE OIL FILTER UNION

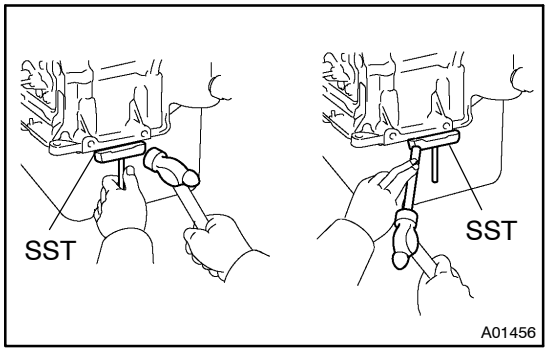
Using a 12 mm hexagon wrench, remove the oil filter union.



16. REMOVE OIL PAN

(a) 1ZZ–FE:
Remove the 14 bolts and 2 nuts.

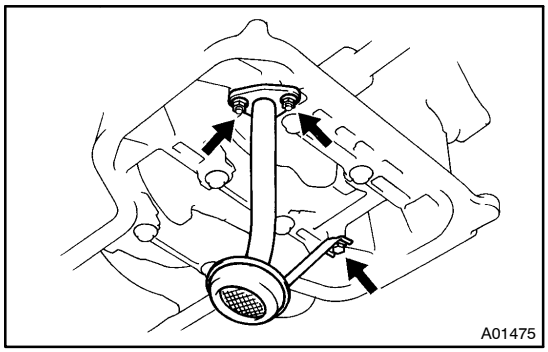
(b) 2ZZ–GE:
Remove the 12 bolts and 4 nuts.



(c) Insert the blade of SST between the bearing cap sub–assembly and oil pan, and cut off applied sealer and remove the oil pan.
SST 09032–00101

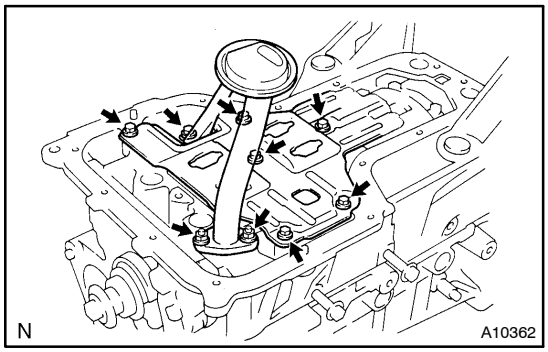
NOTICE:

- **Be careful not to the damage the oil pan contact surface of the bearing cap sub–assembly.**
- **Be careful not to damage the oil pan flange.**



17. 1ZZ–FE:
REMOVE OIL STRAINER

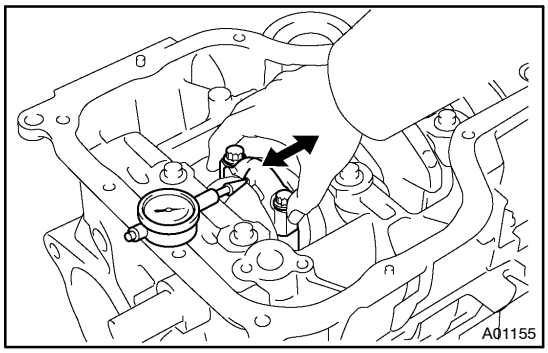
Remove the 2 nuts, bolt, oil strainer and gasket.



18. 2ZZ–GE:
REMOVE OIL STRAINER AND OIL PAN BAFFLE

(a) Remove the 2 nuts, bolt, oil strainer and gasket.

(b) Remove the 4 bolts, 2 nuts and oil pan baffle.



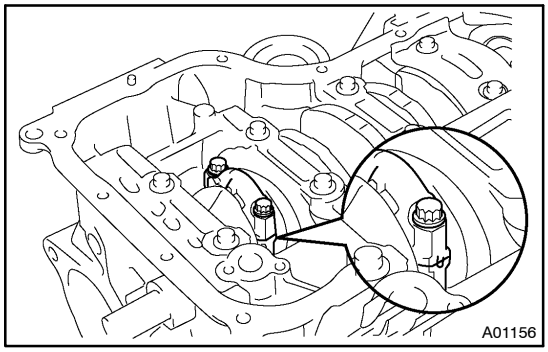
19. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:
0.160 – 0.342 mm (0.0063 – 0.0135 in.)
Maximum thrust clearance:
0.342 mm (0.0135 in.)

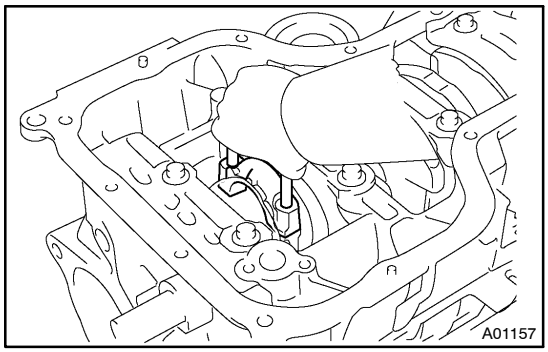
If the thrust clearance is greater than maximum, replace the connecting rod assembly(s). If necessary, replace the crankshaft.

Connecting rod thickness:
19.788 – 19.840 mm (0.7791 – 0.7811 in.)



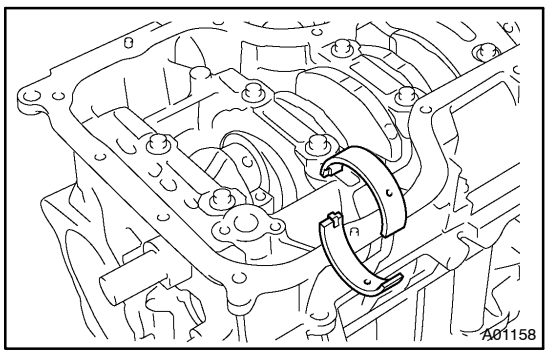
20. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
(b) Remove the 2 connecting rod cap bolts.



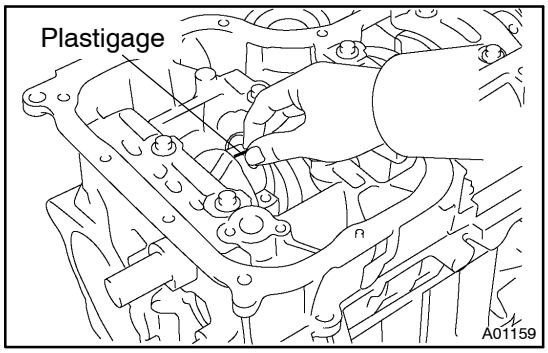
(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:
Keep the lower bearing inserted with the connecting rod cap.

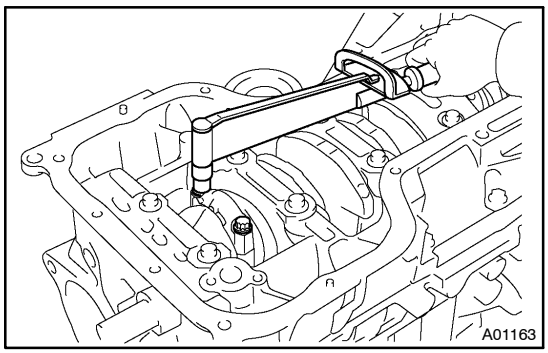


(d) Clean the crank pin and bearing.
(e) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings.
If necessary, replace the crankshaft.



(f) Lay a strip of Plastigage the crank pin.

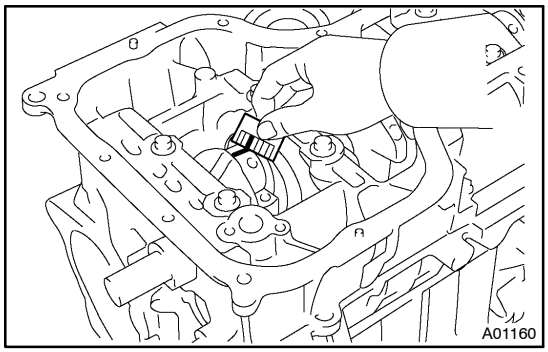


(g) Install the connecting rod cap with the 2 bolts (See page EM–108).
Torque:
1st:
1ZZ–FE: 20 N·m (204 kgf·cm, 15 ft·lbf)
2ZZ–GE: 30 N·m (306 kgf·cm, 22 ft·lbf)
2nd: Turn extra 90°

NOTICE:

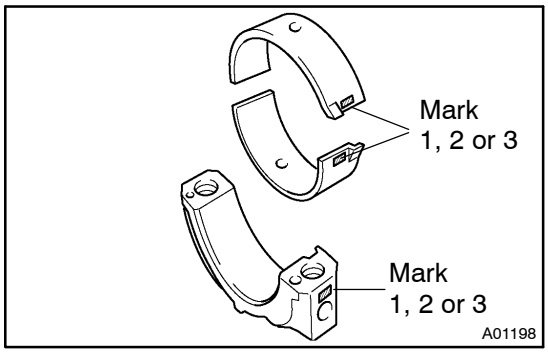
Do not turn the crankshaft.

(h) Remove the 2 bolts, connecting rod cap and lower bearing. (See procedure (b) and (c) above)



(i) Measure the Plastigage at its widest point.
Standard oil clearance:
1ZZ–FE:
0.028 – 0.060 mm (0.0011 – 0.0024 in.)
2ZZ–GE:
0.028 – 0.052 mm (0.0011 – 0.0020 in.)
Maximum oil clearance;
0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.



HINT:
If replacing a bearing, replace it with one having the same number as marked on the connecting rod. There are 3 sizes of standard bearings, marked ”1”, ”2” and ”3” accordingly.

Reference

Standard bearing center wall thickness

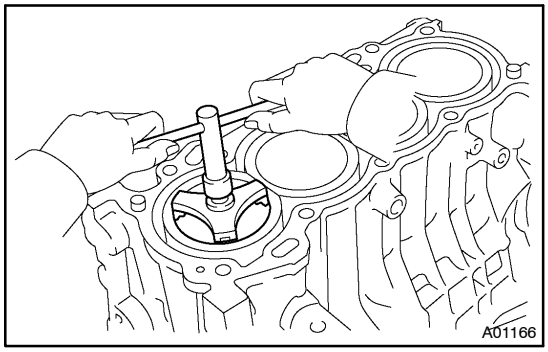
1ZZ–FE:

Mark	mm (in.)
”1”	1.486 – 1.490 (0.0585 – 0.0587)
”2”	1.490 – 1.494 (0.0587 – 0.0588)
”3”	1.494 – 1.498 (0.0588 – 0.0590)

2ZZ–GE:

Mark	mm (in.)
”1”	1.482 – 1.486 (0.0583 – 0.0585)
”2”	1.486 – 1.490 (0.0585 – 0.0587)
”3”	1.490 – 1.494 (0.0587 – 0.0588)

(j) Completely remove the Plastigage.



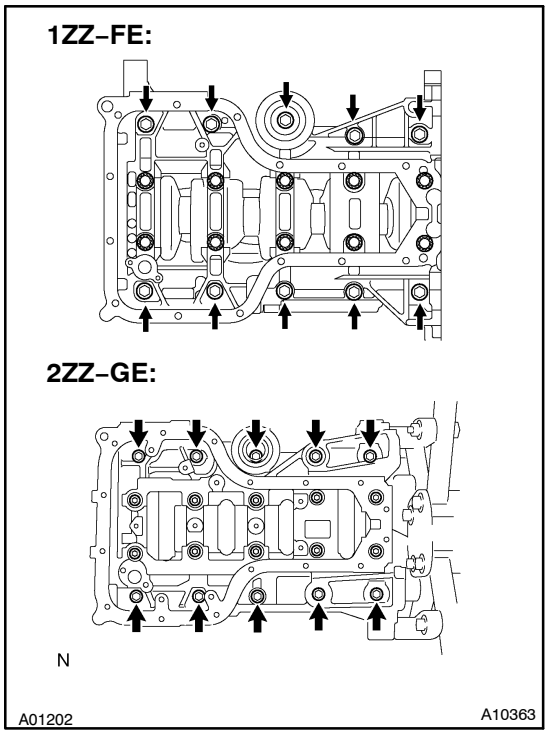
21. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

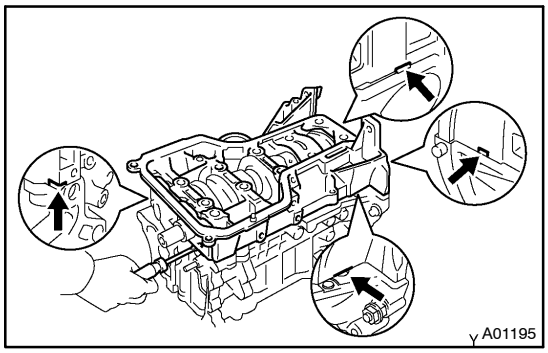


22. REMOVE BEARING CAP SUB–ASSEMBLY AND CRANKSHAFT REAR OIL SEAL, AND CHECK OIL CLEARANCE

(a) 2ZZ–GE:
Remove the 4 screw plugs from the bearing cap sub–assembly.

(b) Remove the 10 hexagon head bearing cap sub–assembly bolts.

(c) Uniformly loosen and remove the 10 bearing cap sub–assembly bolts, in several passes, in the sequence shown.



(d) Using a screwdriver, remove the bearing cap sub–assembly by prying the portions between the cylinder block and bearing cap sub–assembly. Remove the 5 lower main bearings.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and bearing cap sub–assembly.

HINT:

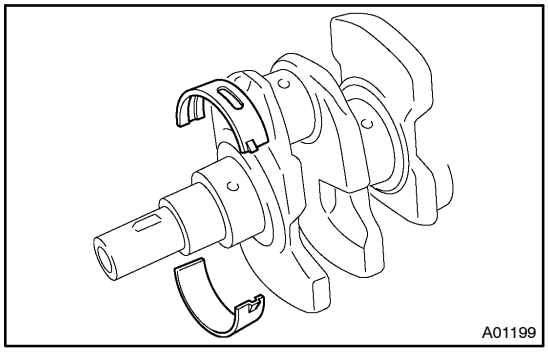
Keep the lower bearing and bearing cap sub–assembly together.

(e) Remove the crankshaft rear oil seal.

(f) Lift out the crankshaft.

HINT:

Keep the upper bearings together with the cylinder block.

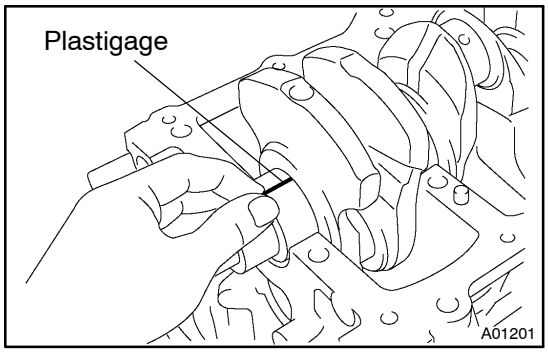


(g) Clean each main journal and bearing.

(h) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings.

If necessary, replace the crankshaft.



(i) Place the crankshaft on the cylinder block.

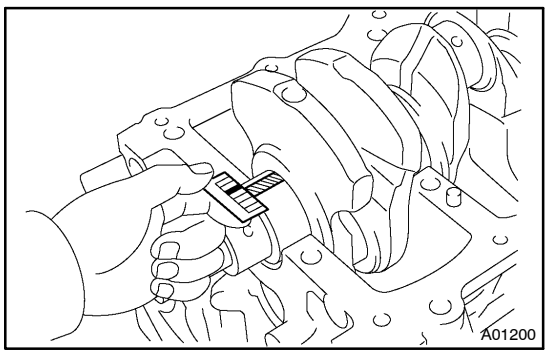
(j) Lay a strip of Plastigage across each journal.

(k) Install the bearing cap sub–assembly (See page EM–108).

NOTICE:

Do not turn the crankshaft.

(l) Remove the bearing cap sub–assembly (See procedures (a) to (e) above).



(m) Measure the Plastigage at its widest point.

Standard oil clearance:

1ZZ–FE:

0.015 – 0.032 mm (0.0006 – 0.0013 in.)

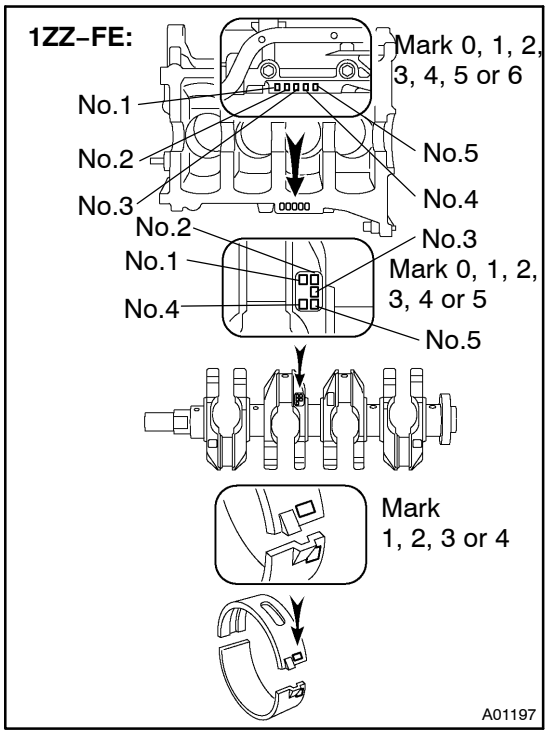
2ZZ–GE:

0.016 – 0.032 mm (0.0006 – 0.0013 in.)

Maximum oil clearance:

0.050 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.

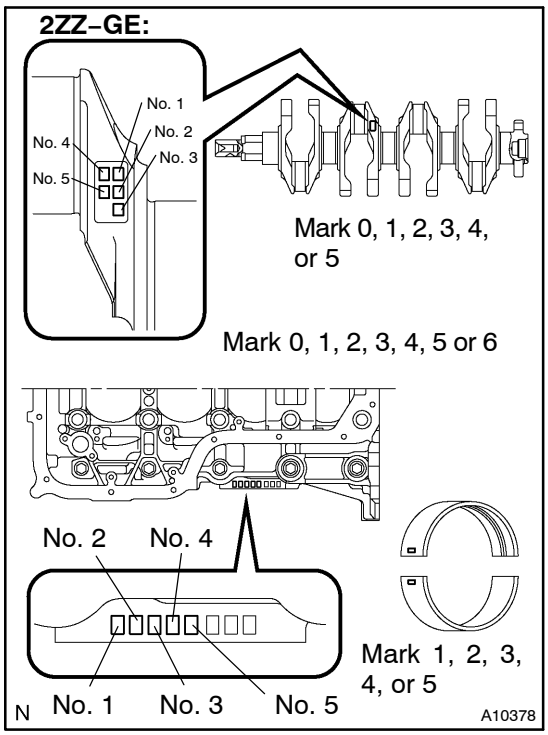


(n) 1ZZ–FE:

If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 4 sizes of standard bearings, marked ”1”, ”2”, ”3” and ”4” accordingly.

	Total number		” ”: Number mark	
Cylinder block (A) + Crankshaft (B)	0 – 2	3 – 5	6 – 8	9 –11
Use bearing	”1”	”2”	”3”	”4”

EXAMPLE: Cylinder block ”4” (A)
+ Crankshaft ”3” (B)
= Total number 7 (Use bearing ”3”)



(o) 2ZZ–GE:

If using standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, refer to the following table to select bearing.

Standard bearings selection chart

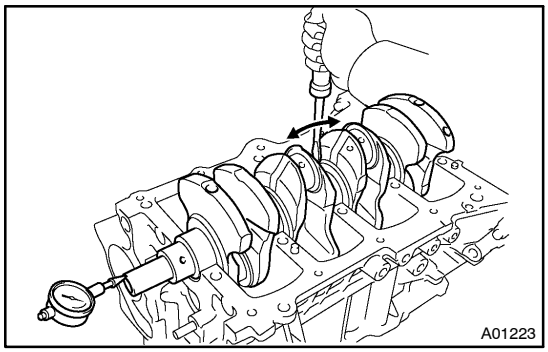
Cylinder block Number mark	Crank shaft number mark					
	0	1	2	3	4	5
0	1	1	1	2	2	2
1	1	1	2	2	2	3
2	1	2	2	2	3	3
3	2	2	2	3	3	3
4	2	3	3	3	4	4
5	3	3	3	4	4	4
6	3	3	4	4	4	5

EXAMPLE: Cylinder block ”4”, Crank shaft ”3”, Use bearing ”3”

Reference

Item	Mark	mm (in.)
Cylinder block main journal bore diameter (A)	”0”	52.000 – 52.003 (2.0472 – 2.0473)
	”1”	52.003 – 52.005 (2.0473 – 2.0474)
	”2”	52.005 – 52.007 (2.0474 – 2.0475)
	”3”	52.007 – 52.010 (2.0475 – 2.0476)
	”4”	52.010 – 52.012 (2.0476 – 2.0477)
	”5”	52.012 – 52.014 (2.0477 – 2.0478)
	”6”	52.014 – 52.016 (2.0478 – 2.0479)
Crankshaft main journal diameter (B)	”0”	47.998 – 48.000 (1.8897 – 1.8898)
	”1”	47.996 – 47.998 (1.8896 – 1.8897)
	”2”	47.994 – 47.996 (1.8895 – 1.8896)
	”3”	47.992 – 47.994 (1.8894 – 1.8895)
	”4”	47.990 – 47.992 (1.8893 – 1.8894)
	”5”	47.988 – 47.990 (1.8892 – 1.8893)
1ZZ–FE: Standard bearing center wall thickness	”1”	1.993 – 1.996 (0.0785 – 0.0786)
	”2”	1.996 – 1.999 (0.0786 – 0.0787)
	”3”	1.999 – 2.002 (0.0787 – 0.0788)
	”4”	2.002 – 2.005 (0.0788 – 0.0789)
2ZZ–GE Standard bearing center wall thickness	”1”	1.989 – 1.992 (0.0783 – 0.0784)
	”2”	1.992 – 1.995 (0.0784 – 0.0785)
	”3”	1.995 – 1.998 (0.0785 – 0.0787)
	”4”	1.998 – 2.001 (0.0787 – 0.0788)
	”5”	2.001 – 2.004 (0.0788 – 0.0789)

(p) Completely remove the Plastigage.



23. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.04 – 0.24 mm (0.0016 – 0.0094 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

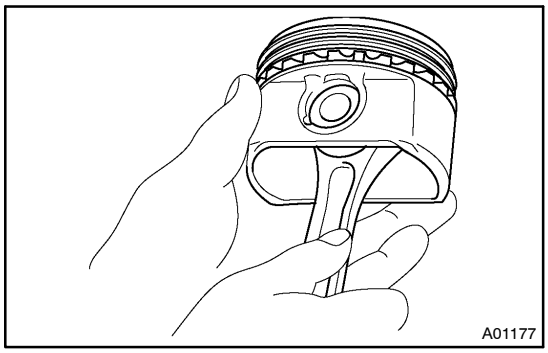
Thrust washer thickness:
2.430 – 2.480 mm (0.0957 – 0.0976 in.)

24. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the 5 upper main bearings and 2 thrust washers from the cylinder block.

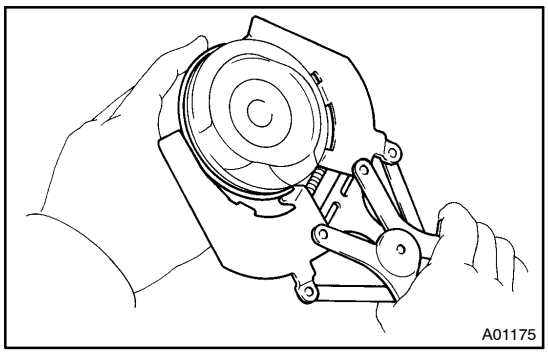
HINT:
Arrange the main bearings and thrust washers in the correct order.



25. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.



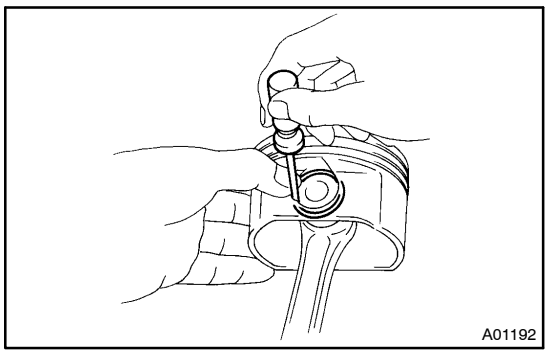
26. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.

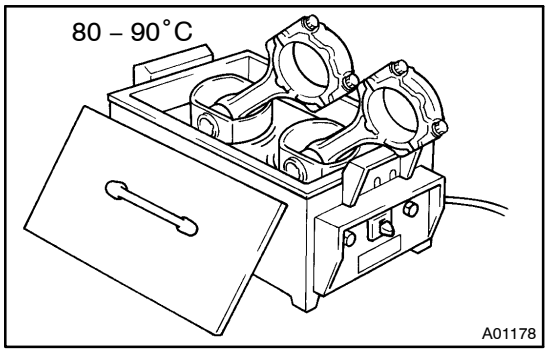
HINT:

Arrange the piston rings in the correct order only.



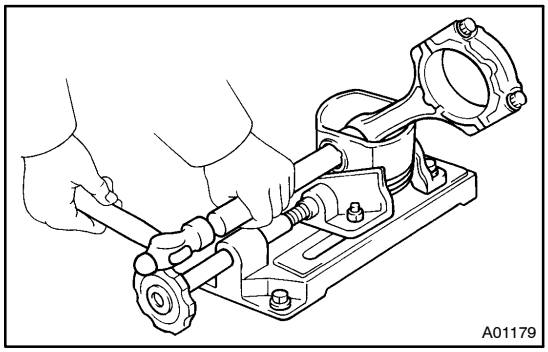
27. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.



(b) 1ZZ–FE:

Gradually heat the piston to 80 – 90°C (176 – 194°F).



(c) 1ZZ–FE:

Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

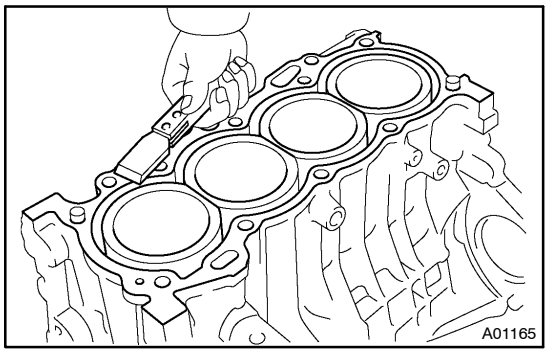
HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

(d) 2ZZ–GE:

Remove the pin and connecting rod from the piston.

EM164–07



INSPECTION

1. REMOVE GASKET MATERIAL

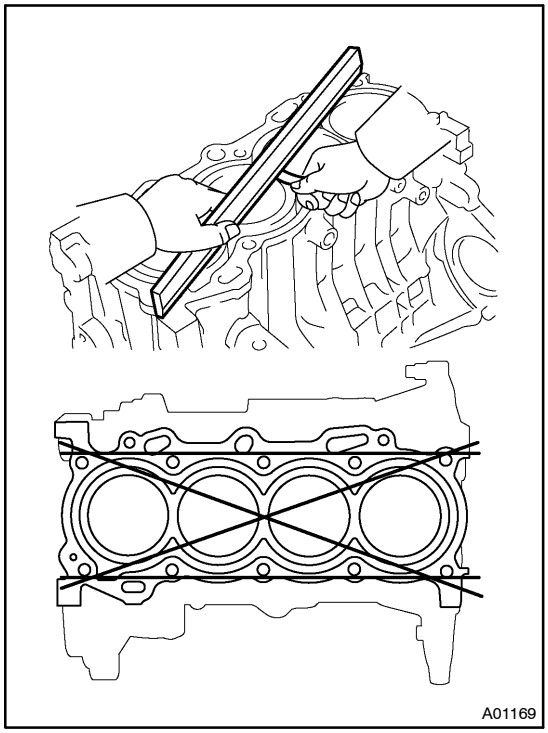
Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, thoroughly clean the cylinder block.

NOTICE:

If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block, so always wash the cylinder block at a temperature of 45°C (133°F) or less.

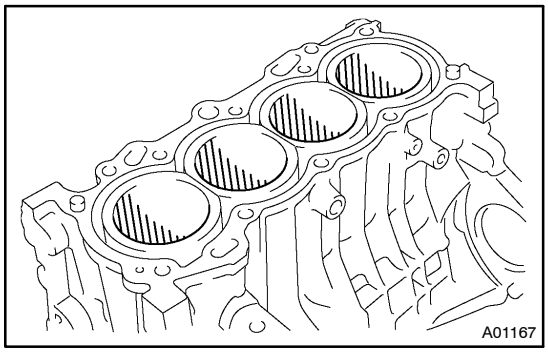


3. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

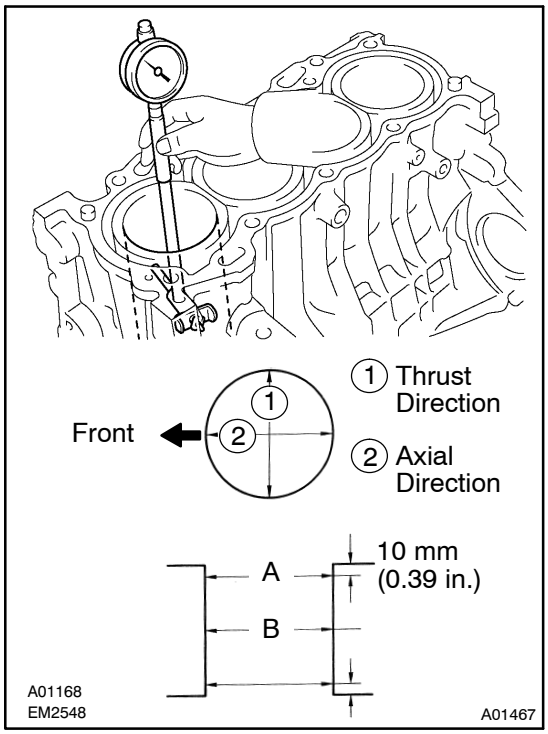
If warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.

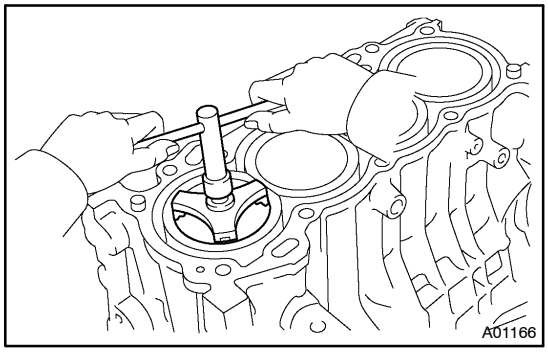


5. INSPECT CYLINDER BORE DIAMETER

(a) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

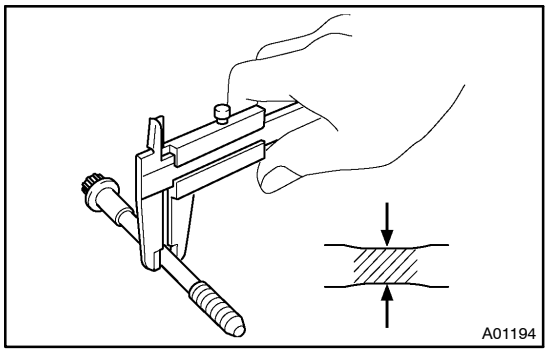
Standard diameter:
1ZZ–FE 79.00 – 79.01 mm (3.1102 – 3.1107 in.)
2ZZ–GE 82.00 – 82.01 mm (3.2283 – 3.2289 in.)
Maximum diameter:
1ZZ–FE 79.13 mm (3.1153 in.)
2ZZ–GE 82.13 mm (3.2335 in.)
Difference limit: 0.10 mm (0.0039 in.)

If the average diameter of 4 position is greater than maximum, replace the cylinder block.



6. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.

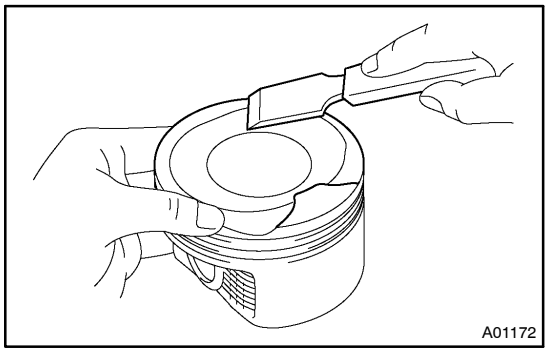


7. INSPECT 12 POINTED HEAD BEARING CAP SUB–ASSEMBLY BOLTS

Using vernier calipers, measure the tension portion diameter of the bolt.

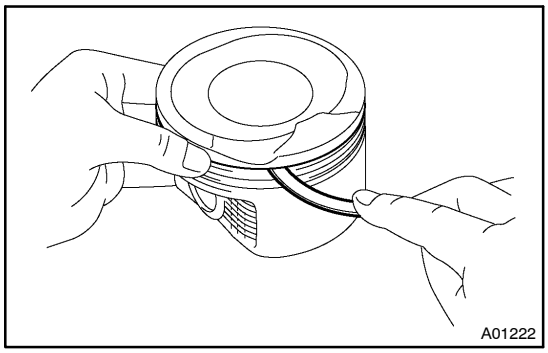
Standard diameter: 7.3 – 7.5 mm (0.287 – 0.295 in.)
Minimum diameter: 7.3 mm (0.287 in.)

If the diameter is less than minimum, replace the bolt.

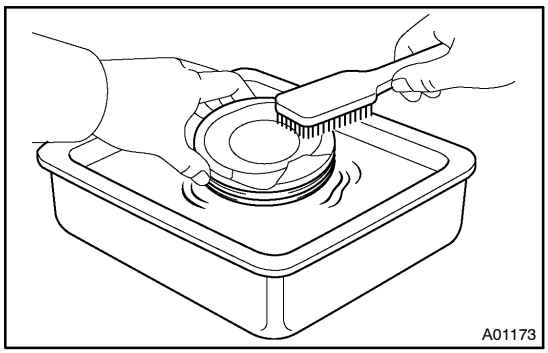


8. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.



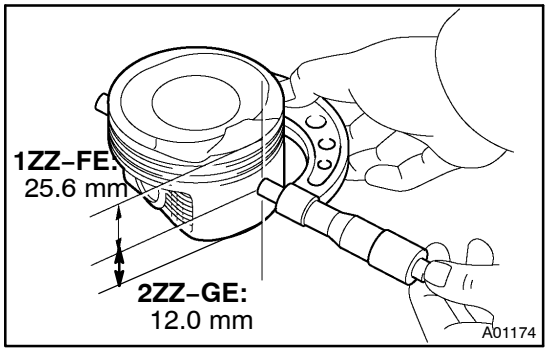
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



9. INSPECT PISTON OIL CLEARANCE

(a) 1ZZ–FE:

Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 25.6 mm (1.008 in.) from the piston head.

(b) 2ZZ–GE:

Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 12.0 mm (0.048 in.) from the piston bottom.

Piston diameter:

1ZZ–FE:

78.925 – 78.935 mm (3.1073 – 3.1077 in.)

2ZZ–GE:

81.975 – 81.993 mm (3.2274 – 3.2281 in.)

(c) Measure the cylinder bore diameter in the thrust directions (See procedure in step 5).

(d) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

1ZZ–FE:

0.065 – 0.088 mm (0.0026 – 0.0035 in.)

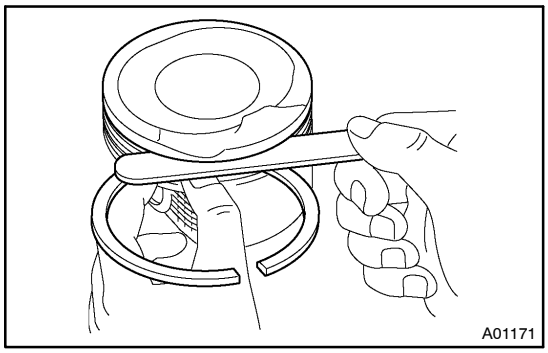
2ZZ–GE:

0.007 – 0.038 mm (0.0003 – 0.0015 in.)

Maximum oil clearance:

0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace all the 4 pistons. If necessary, replace the cylinder block.

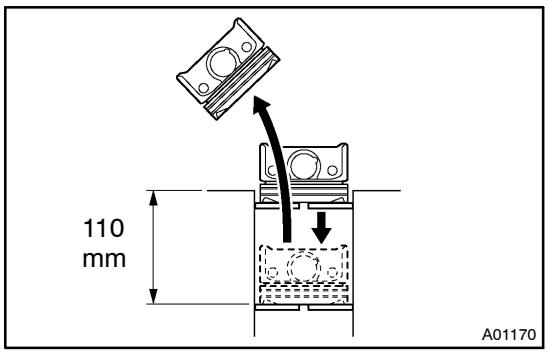


10. INSPECT PISTON RING GROOVE CLEARANCE

Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Ring groove clearance:
0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance is not as specified, replace the piston.

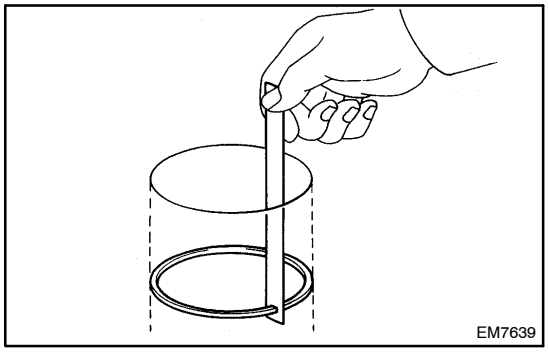


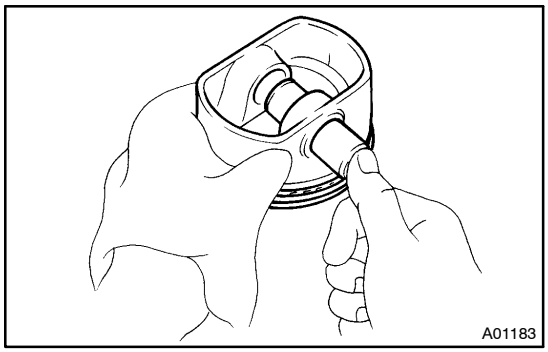
11. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.
(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.
(c) Using a feeler gauge, measure the end gap.

Standard end gap:
No.1 0.25 – 0.35 mm (0.0098 – 0.0138 in.)
No.2 0.35 – 0.50 mm (0.0138 – 0.0197 in.)
Oil (Side rail) 0.15 – 0.40 mm (0.0059 – 0.0157 in.)
Maximum end gap:
No.1 1.05 mm (0.0413 in.)
No.2 1.20 mm (0.0472 in.)
Oil (Side rail) 1.05 mm (0.0413 in.)

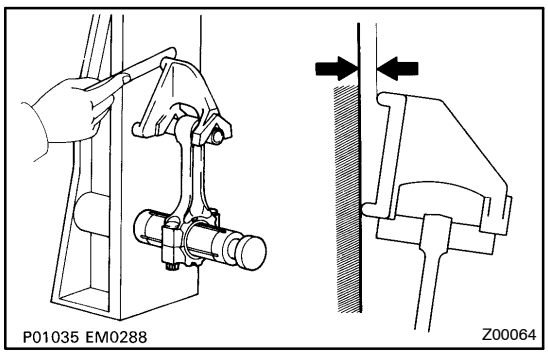
If the end gap is greater than maximum, replace the piston ring.
If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.





12. INSPECT PISTON PIN FIT

At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.



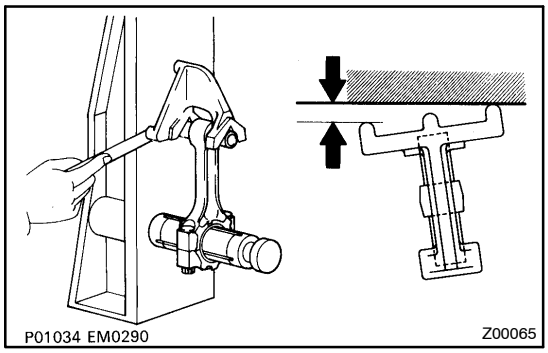
13. INSPECT CONNECTING ROD ALIGNMENT

Using a rod aligner and feeler gauge, check the connecting rod alignment.

- Check for out–of–alignment

Maximum out–of alignment:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

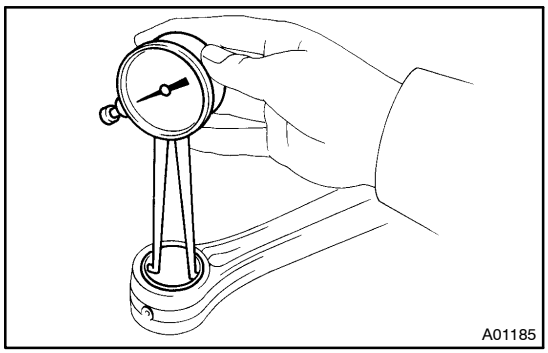
If out–of alignment is greater than maximum, replace the connecting rod assembly.



- Check for twist

Maximum twist:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

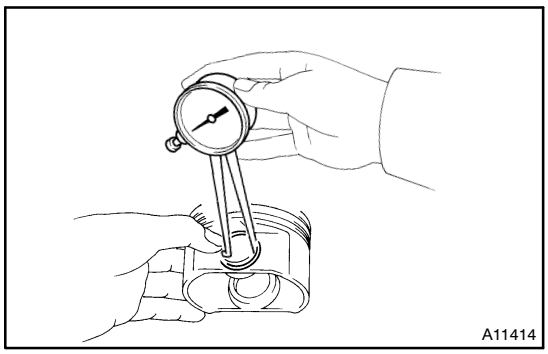
If twist is greater than maximum, replace the connecting rod assembly.



14. INSPECT PISTON PIN OIL CLEARANCE

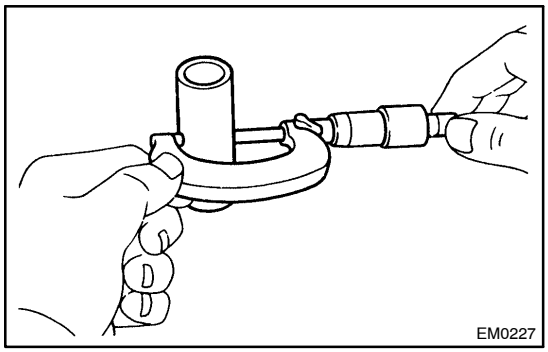
(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:
1ZZ–FE 20.012 – 20.021 mm (0.7879 – 0.7882 in.)
2ZZ–GE 20.011 – 20.023 mm (0.7878 – 0.7883 in.)



(b) 2ZZ–GE:
Using caliper gauge, measure the inside diameter of the piston bushing.

Bushing inside diameter:
20.013 – 20.025 mm (0.7879 – 0.7884 in.)



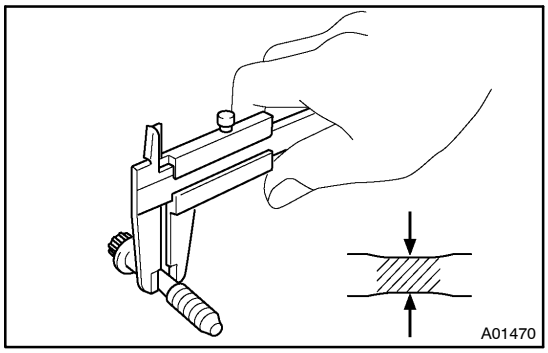
(c) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:
1ZZ–FE 20.004 – 20.013 mm (0.7876 – 0.7879 in.)
2ZZ–GE 20.004 – 20.016 mm (0.7876 – 0.7880 in.)

(d) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:
1ZZ–FE 0.005 – 0.011 mm (0.0002 – 0.0004 in.)
2ZZ–GE
Piston x Piston pin
0.005 – 0.013 mm (0.0002 – 0.0005 in.)
Piston pin x Connecting rod
0.005 – 0.009 mm (0.0002 – 0.0004 in.)
Maximum oil clearance:
0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.

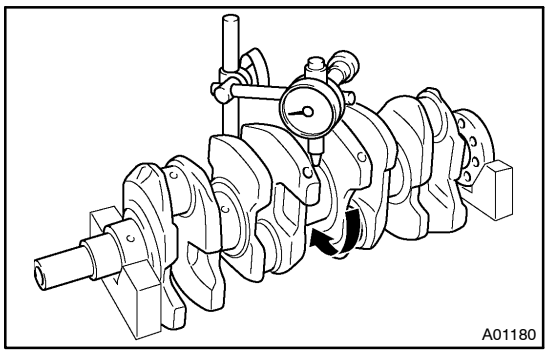


15. INSPECT CONNECTING ROD BOLTS

Using a vernier calipers, measure the tension portion diameter of the bolt.

Standard diameter: 6.6 – 6.7 mm (0.260 – 0.264 in.)
Minimum diameter: 6.4 mm (0.252 in.)

If the diameter is less than minimum, replace the bolt.

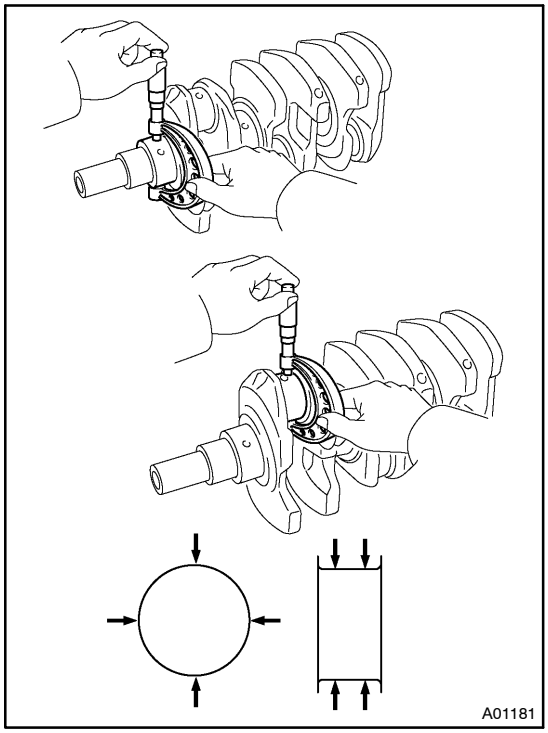


16. INSPECT CRANKSHAFT FOR CIRCLE RUNOUT

(a) Place the crankshaft on V–blocks.
(b) Using a dial indicator, measure the circle runout, as shown in the illustration.

Maximum circle runout: 0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the crankshaft.



17. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:
47.988 – 48.000 mm (1.8893 – 1.8898 in.)
Crank pin diameter:
1ZZ–FE:
43.992 – 44.000 mm (1.7320 – 1.7323 in.)
2ZZ–GE:
44.992 – 45.000 mm (1.7713 – 1.7717 in.)

If the diameter is not as specified, check the oil clearance (See page EM–91).
If necessary, replace the crankshaft.

(b) Check each main journal and crank pin for taper and out–of–round as shown.

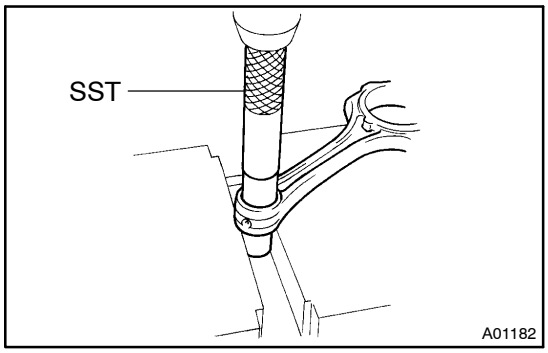
Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper and out–of round is greater than maximum, replace the crankshaft.

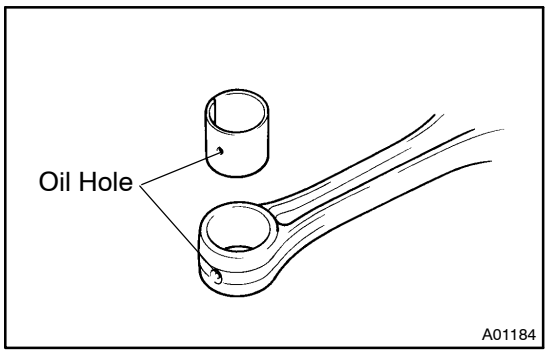
EM066–12

REPLACEMENT

1. REPLACE CONNECTING ROD BUSHINGS

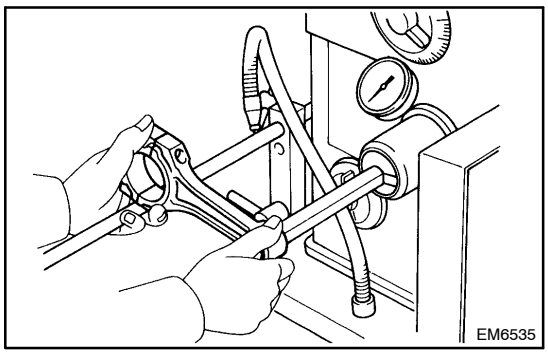


(a) Using SST and a press, press out the bushing.
SST 09222–30010

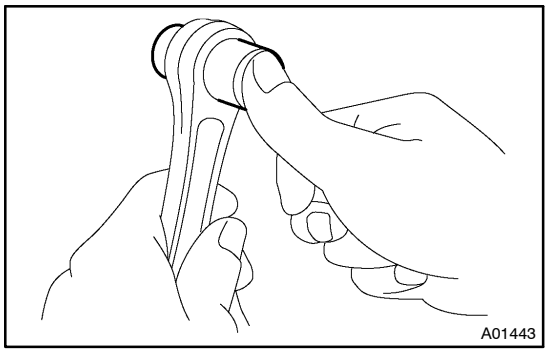


(b) Align the oil hoses of a new bushing and the connecting rod.

(c) Using SST and a press, press in the bushing.
SST 09222–30010

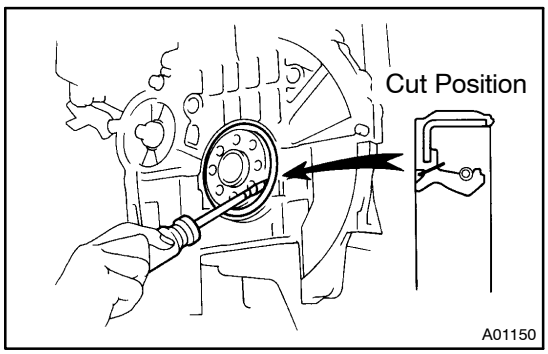


(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (See page EM–100) between the bushing and piston pin.



(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

2. REPLACE CRANKSHAFT REAR OIL SEAL



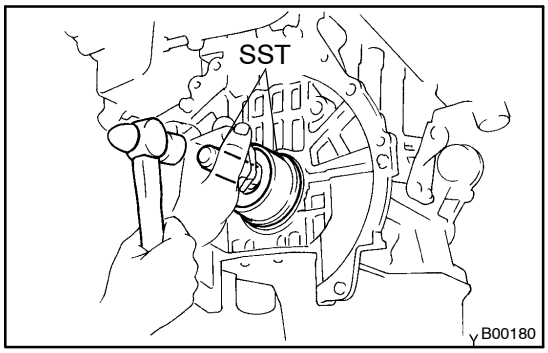
If rear oil seal is installed to cylinder block.

(a) Using a knife cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

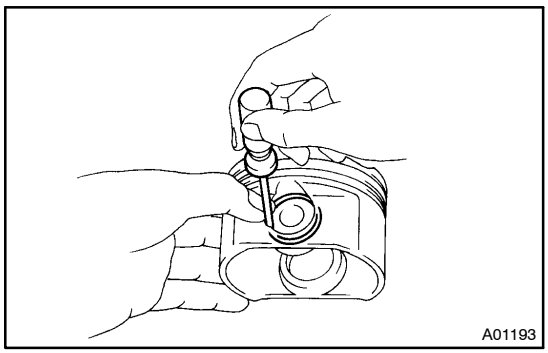
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07100)

EM165–05

REASSEMBLY

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.

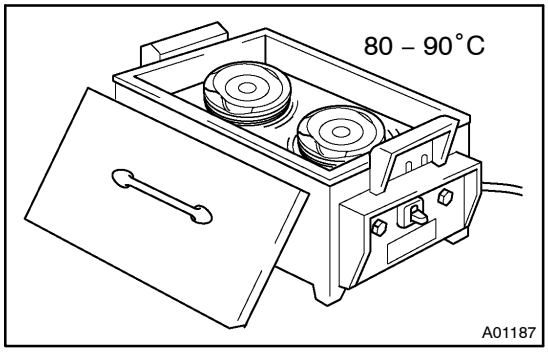


1. ASSEMBLE PISTON AND CONNECTING ROD

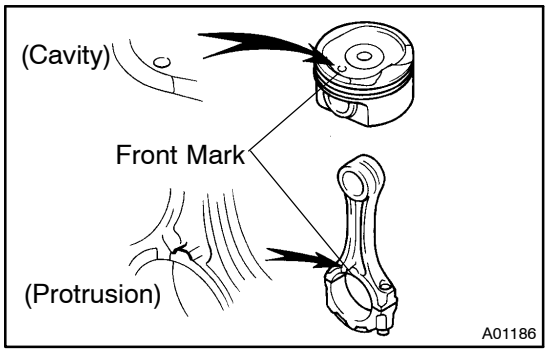
(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

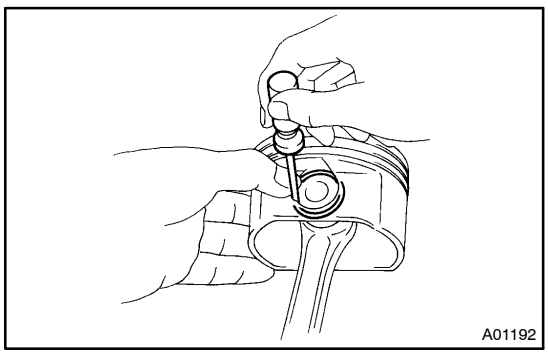


(b) 1ZZ–FE:
Gradually heat the piston to 80 – 90˚C (176 – 194˚F).



(c) Coat the piston pin with engine oil.

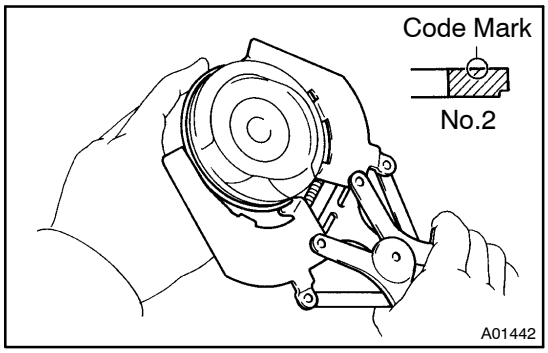
(d) Align the front marks on the piston and connecting rod, and push in the piston with your thumb.



(e) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not as aligned with the pin hole cutout portion of the piston.

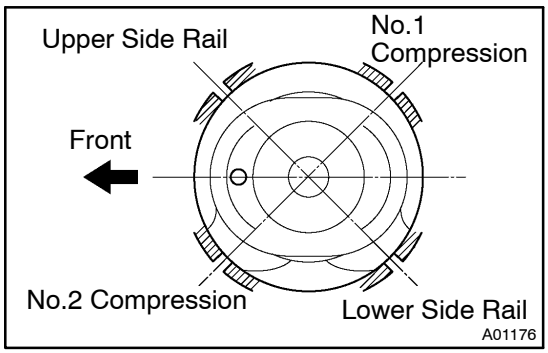


2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.

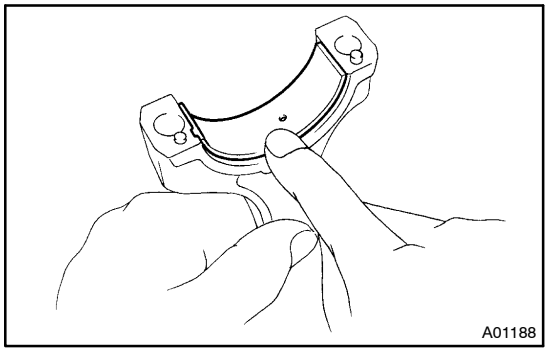
(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark :
1ZZ–FE: T or 2R
2ZZ–GE: T



(c) Position the piston rings so that the ring ends are as shown.

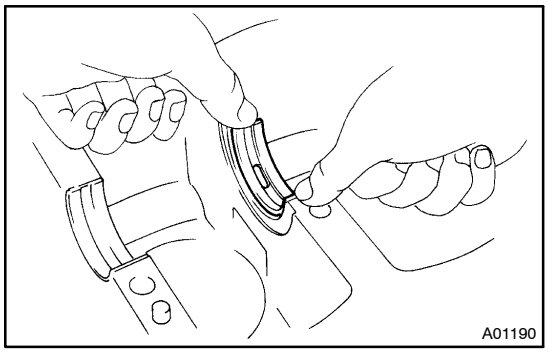
NOTICE:
Do not align the ring ends.



3. INSTALL CONNECTING ROD BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

(b) Install the bearings in the connecting rod and connecting rod cap.

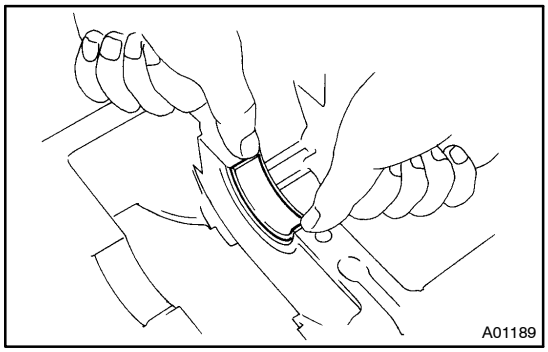


4. INSTALL MAIN BEARINGS

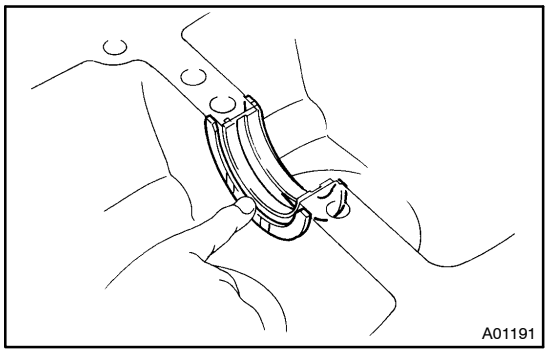
HINT:
Upper bearings have an oil groove and oil holes; Lower bearings do not.

(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.

NOTICE:
Install the bearing with the oil hole in the cylinder block.



(b) Align the bearing claw with the claw grove of the main bearing cap, and push in the 5 lower bearings.

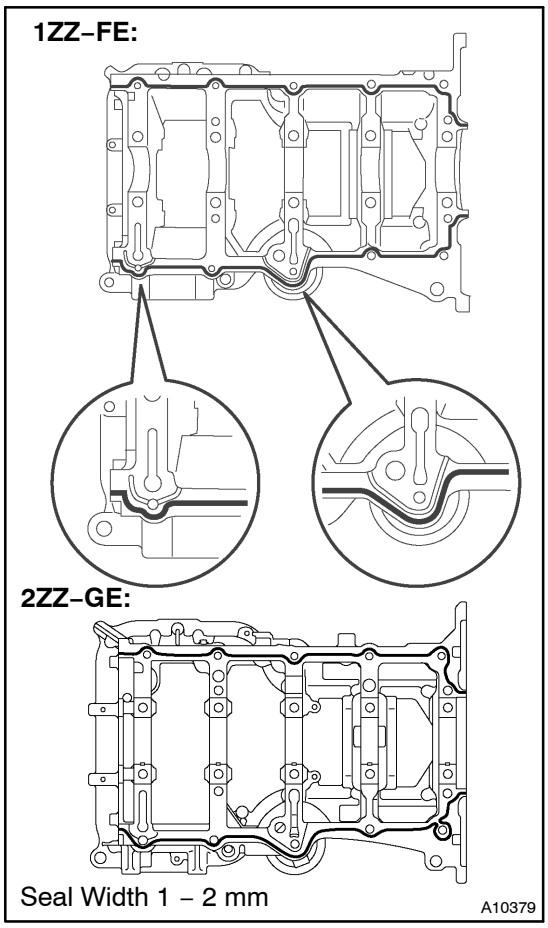


5. INSTALL THRUST WASHERS

Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

6. PLACE CRANKSHAFT ON CYLINDER BLOCK

7. PLACE BEARING CAP SUB–ASSEMBLY ON CYLINDER BLOCK



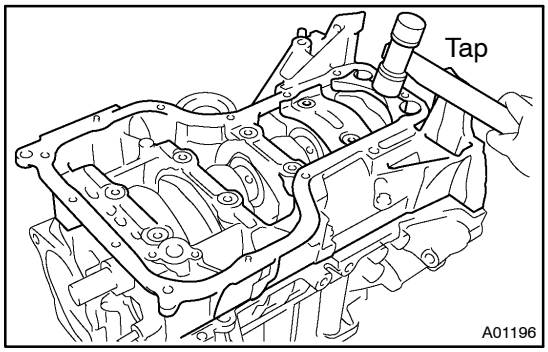
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the bearing cap sub–assembly and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose materials.
- Using a non–reusable solvent, clean both sealing surfaces.

(b) Apply seal packing to the bearing cap sub–assembly as shown in the illustration.

Seal packing:
Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 1 – 2 mm (0.004 – 0.08 in.) opening.

HINT:

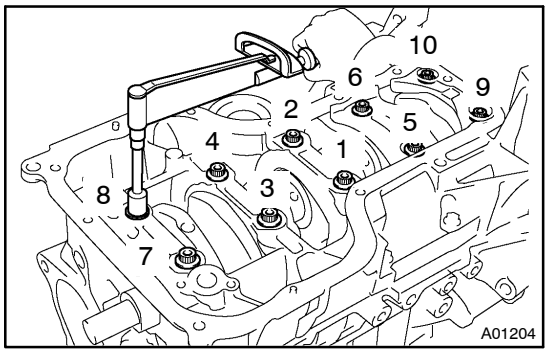
Avoid applying an excessive amount to the surface.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Using a plastic–faced hammer, lightly tap the bearing cap sub–assembly to ensure a proper fit.

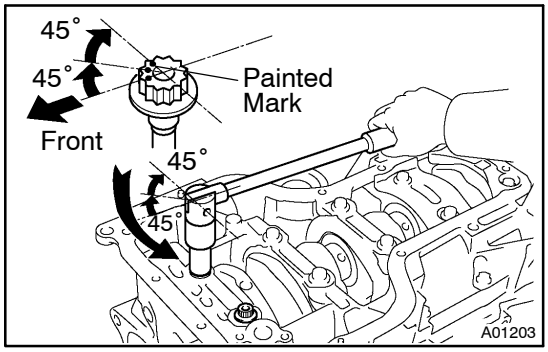
8. INSTALL 12 POINTED HEAD BEARING CAP SUB–ASSEMBLY BOLTS

HINT:
- The bearing cap sub–assembly bolts are tightened in 3 progressive steps (steps (b), (c) and (e)).
- If any of the bearing cap sub–assembly bolts in broken or deformed, replace it.



(a) Apply a light coat of engine oil on the threads and under the bearing cap sub–assembly bolts.
(b) Install and uniformly tighten the 10 bearing cap sub–assembly bolts, in several passes, in the sequence shown.
Torque: 22 N·m (225 kgf·cm, 16 ft·lbf)
(c) Retighten the bearing cap sub–assembly bolts, in several passes, in the sequence shown.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

If any of the bearing cap sub–assembly bolts does not meet the torque specification, replace the bearing cap sub–assembly bolt.

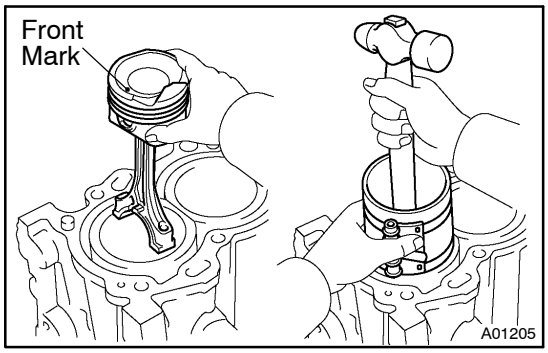


(d) Mark the front of the bearing cap sub–assembly bolts with paint.
(e) Retighten the bearing cap sub–assembly bolts by 45° and 45° in the numerical order shown.
(f) Check that the painted mark is now at a 90° angle to the front.

9. INSTALL HEXAGON HEAD BEARING CAP SUB–ASSEMBLY BOLTS

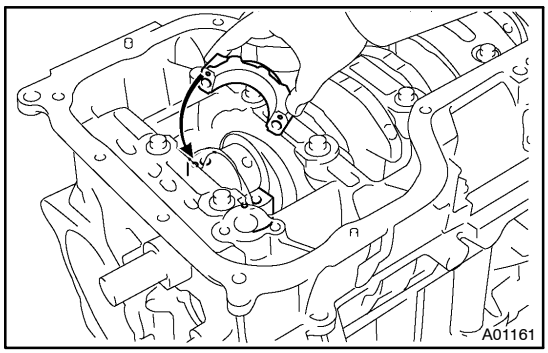
(a) Install and uniformly tighten the 10 bearing cap sub–assembly bolts in several passes.
Torque:
1ZZ–FE: 18.5 N·m (189 kgf·cm, 14 ft·lbf)
2ZZ–GE: 18 N·m (185 kgf·cm, 13 ft·lbf)
(b) Check that the crankshaft turns smoothly.
(c) 2ZZ–GE:
Apply adhesive to 2 or 3 threads, and install the 4 screw plugs.
Adhesive:
Part No. 08833 – 00070, THREE BOND 1324, or equivalent
Torque: 43 N·m (438 kgf·cm, 32 ft·lbf)

10. CHECK CRANKSHAFT THRUST CLEARANCE (See page EM–100)



11. INSTALL PISTON AND CONNECTING ROD ASSEMBLES

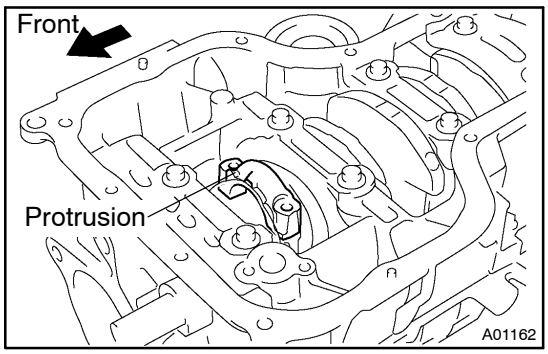
Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



12. PLACE CONNECTING ROD CAP ON CONNECTING ROD

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Align the pin dowels of the connecting rod cap with the pins of the connecting rod, and install the connecting rod.

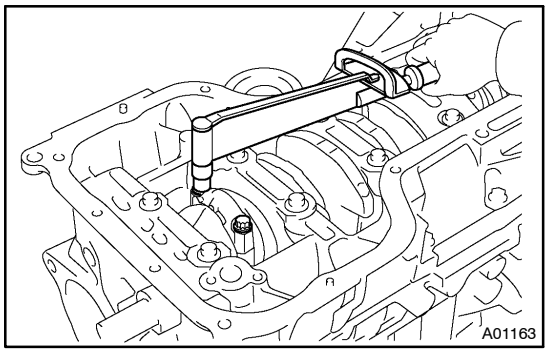


(c) Check that the protrusion of the connecting rod cap is facing in the correct direction.

13. INSTALL CONNECTING ROD CAP BOLTS

HINT:

- The connecting rod cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the connecting rod cap bolts is broken or deformed, replace it.

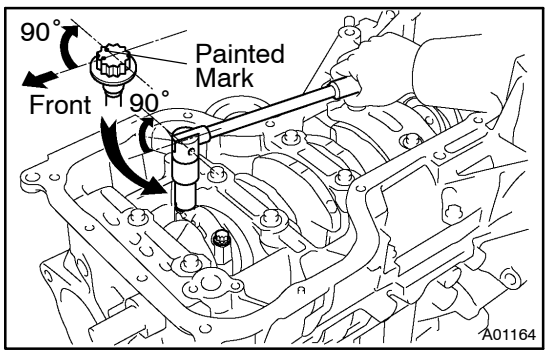


(a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.

(b) Install and alternately tighten the 2 connecting rod cap bolts in several passes.

Torque:
1ZZ–FE: 20 N·m (204 kgf·cm, 15 ft·lbf)
2ZZ–GE: 30 N·m (306 kgf·cm, 22 ft·lbf)

If any of the connecting rod cap bolts does not meet the torque specification, replace the connecting rod cap bolts.



(c) Mark the front of the connecting cap bolts with paint.

(d) Retighten the cap bolts by 90° as shown.

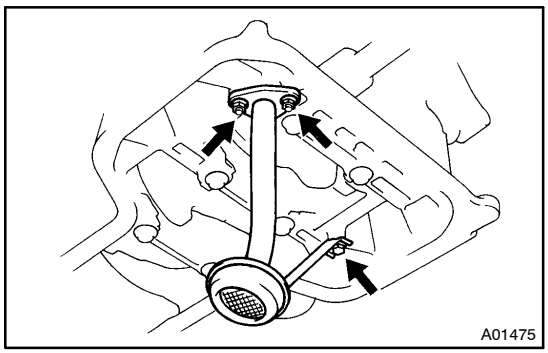
(e) Check that the painted mark is now at a 90° angle to the front.

(f) Check that the crankshaft turns smoothly.

14. CHECK CONNECTING ROD THRUST CLEARANCE (See page EM–100)

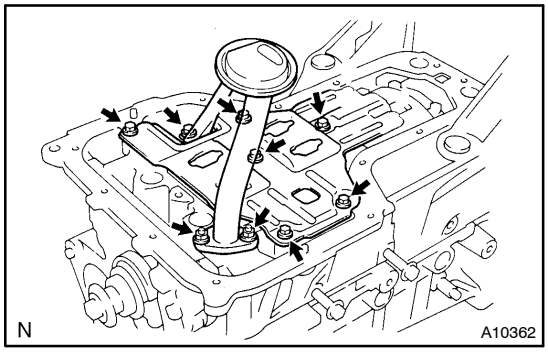
15. INSTALL REAR CRANKSHAFT OIL SEAL (See page EM–106)

HINT:
Wipe seal packing away from the contact surface of the cylinder block assembly and oil seal.



16. 1ZZ–FE:
INSTALL OIL STRAINER

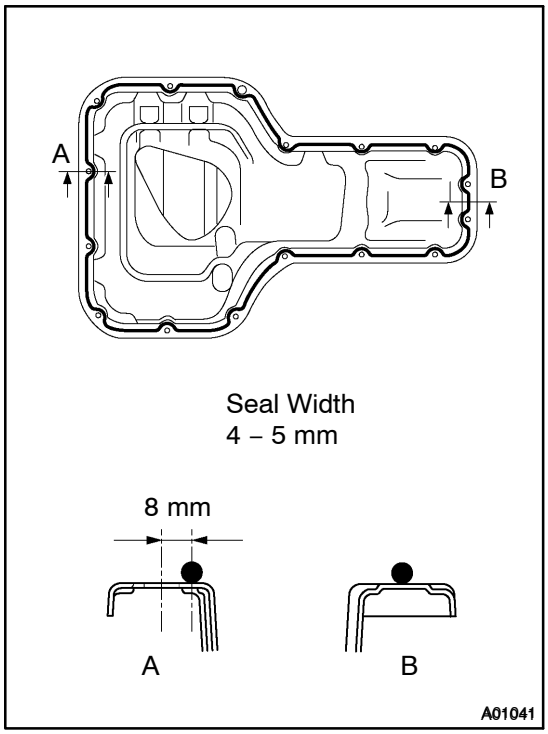
Install a new gasket and the oil strainer with the 2 nuts and bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



17. 2ZZ–GE:
INSTALL OIL PAN BAFFLE AND OIL STRAINER

(a) Install the oil pan baffle with the 4 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

(b) Install a new gasket and oil strainer with the 2 nuts and bolt.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)



18. INSTALL OIL PAN

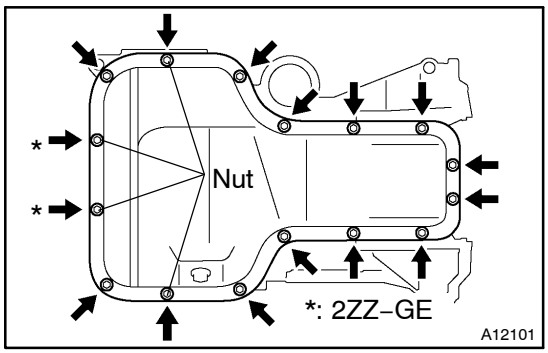
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the main bearing cap and oil pan.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE:
Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.
Seal packing:
Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 4 – 5 mm (0.16 – 0.20 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



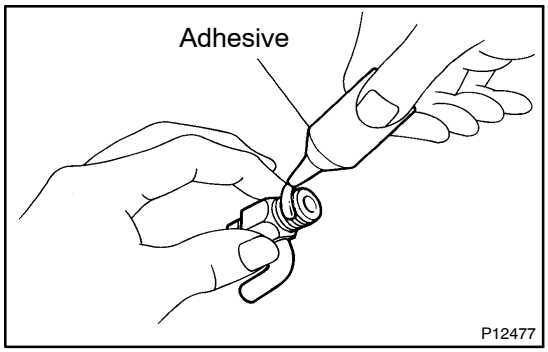
(c) 1ZZ–FE:
Install the oil pan with the 14 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

(d) 2ZZ–GE:
Install the oil pan with the 12 bolts and 4 nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

19. INSTALL OIL FILTER UNION
Torque: 30 N·m (306 kgf·cm, 21 ft·lbf)

20. INSTALL OIL FILTER (See page LU–3)

21. INSTALL OIL PUMP (See page LU–14)



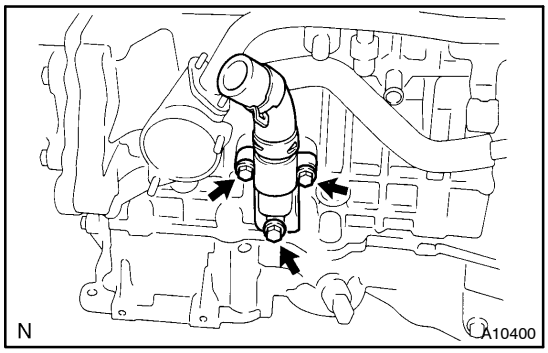
22. INSTALL ENGINE COOLANT DRAIN UNION

(a) Apply adhesive to 2 or 3 threads.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the drain union.
Torque:
1ZZ–FE 20 N·m (200 kgf·cm, 14 ft·lbf)
2ZZ–GE 25 N·m (255 kgf·cm, 18 ft·lbf)

HINT:
After applying the specified torque, rotate the drain union clockwise until its drain port is facing downward.

23. INSTALL KNOCK SENSOR
Torque:
1ZZ–FE 44 N·m (450 kgf·cm, 33 ft·lbf)
2ZZ–GE 20 N·m (204 kgf·cm, 15 ft·lbf)

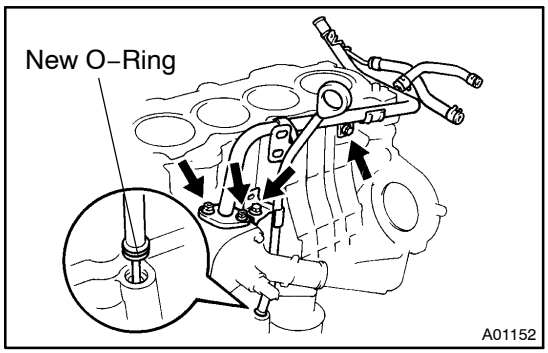


24. 2ZZ–GE:
INSTALL VENTILATION CASE

(a) Install a new gasket and ventilation case with the 3 bolts.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

(b) Install the No. 3 ventilation hose and connect the clip.

25. INSTALL THERMOSTAT (See page CO–11)



26. INSTALL WATER BYPASS PIPE
Torque:
1ZZ–FE 9.0 N·m (92 kgf·cm, 80 in.·lbf)
2ZZ–GE
Bolt 8.5 N·m (87 kgf·cm, 75 in.·lbf)
Nut 10 N·m (100 kgf·cm, 7 ft·lbf)

27. 1ZZ–FE:
INSTALL OIL DIPSTICK AND GUIDE

(a) Install a new O–ring on the dipstick guide.

(b) Apply soapy water on the O–ring.

(c) Connect the dipstick guide end to the main bearing cap.

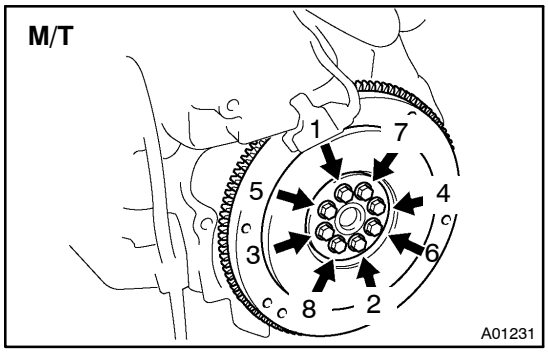
(d) Install the dipstick guide with the bolt.
Torque: 11 N·m (113 kgf·cm, 8 ft·lbf)

28. INSTALL CYLINDER HEAD (See page EM–67)

29. INSTALL ENGINE WIRE

30. INSTALL TIMING SPROCKETS AND TIMING CHAIN (See page EM–26)

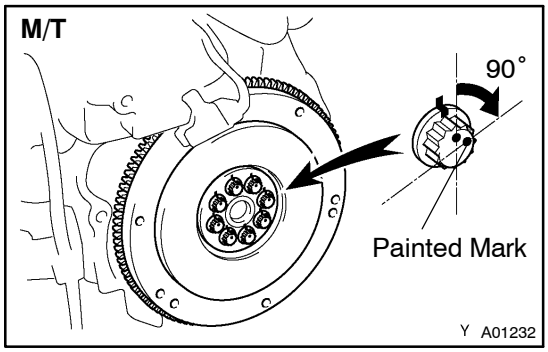
31. REMOVE ENGINE STAND



32. M/T:
INSTALL FLYWHEEL

HINT:
The flywheel bolts are tightened in 2 progressive steps, (a) and (c).

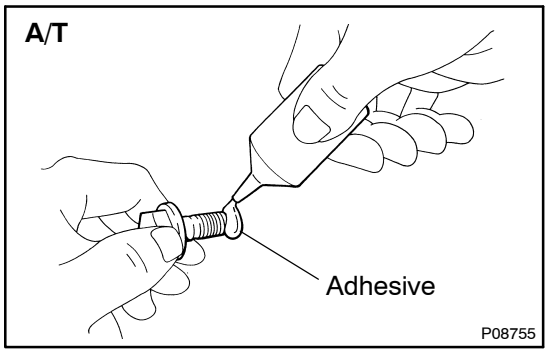
(a) Install and uniformly tighten the 8 mounting bolts, in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



(b) Mark the flywheel bolt with paint.

(c) Retighten the flywheel bolts by an additional 90°.

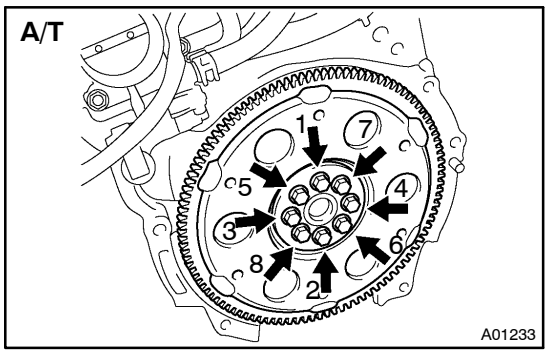
(d) Check that the painted mark in now at a 90° angle to (b).



33. A/T:
INSTALL DRIVE PLATE

(a) Install the front spacer, drive plate and rear plate on the crankshaft.

(b) Apply adhesive to 2 or 3 threads of the mounting bolt end.
Adhesive:
Part No. 08833–00070, THREE BOND or equivalent

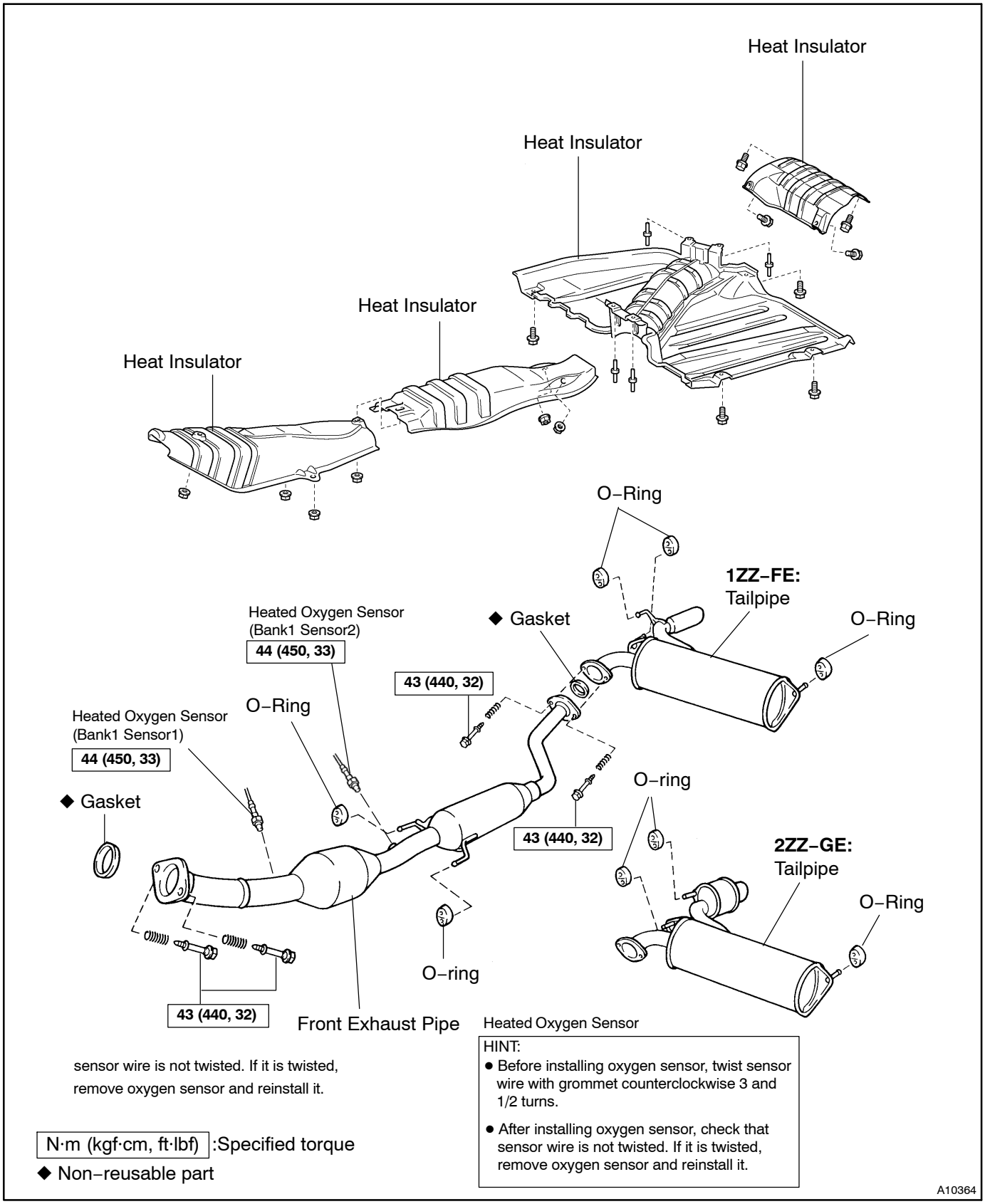


(c) Install and uniformly tighten the 8 mounting bolts, in several passes, in the sequence shown.
Torque: 88 N·m (897 kgf·cm, 65 ft·lbf)

EXHAUST SYSTEM

COMPONENTS

EM166–09



sensor wire is not twisted. If it is twisted, remove oxygen sensor and reinstall it.

Heated Oxygen Sensor

HINT:

- Before installing oxygen sensor, twist sensor wire with grommet counterclockwise 3 and 1/2 turns.
- After installing oxygen sensor, check that sensor wire is not twisted. If it is twisted, remove oxygen sensor and reinstall it.

N·m (kgf·cm, ft·lbf) :Specified torque

◆ Non–reusable part

A10364

EMISSION CONTROL SYSTEM

EC02E–16

PURPOSE

The emission control systems are installed to reduce the amount of CO, HC and NOx exhausted from the engine ((3) and (4)), to prevent the atmospheric release of blow–by gas–containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).
The function of each system is shown in these table.

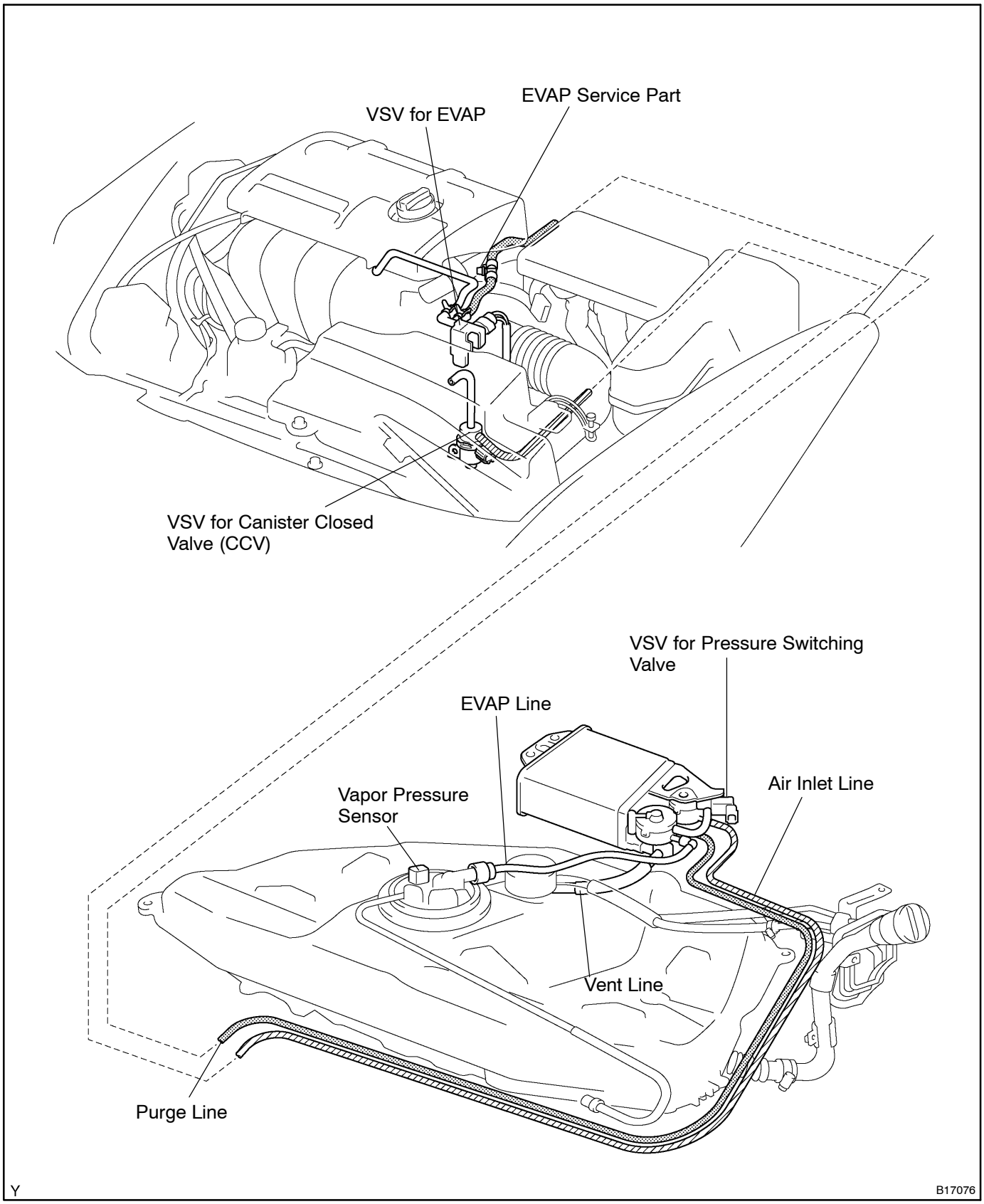
System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Three–way Catalytic Converter	TWC	Reduces HC, CO and NOx
(4) Sequential Multi–port Fuel Injection*	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

Remark: *For inspection and repair of the SFI system, refer to the SF section of this manual.

PARTS LAYOUT AND SCHEMATIC DRAWING

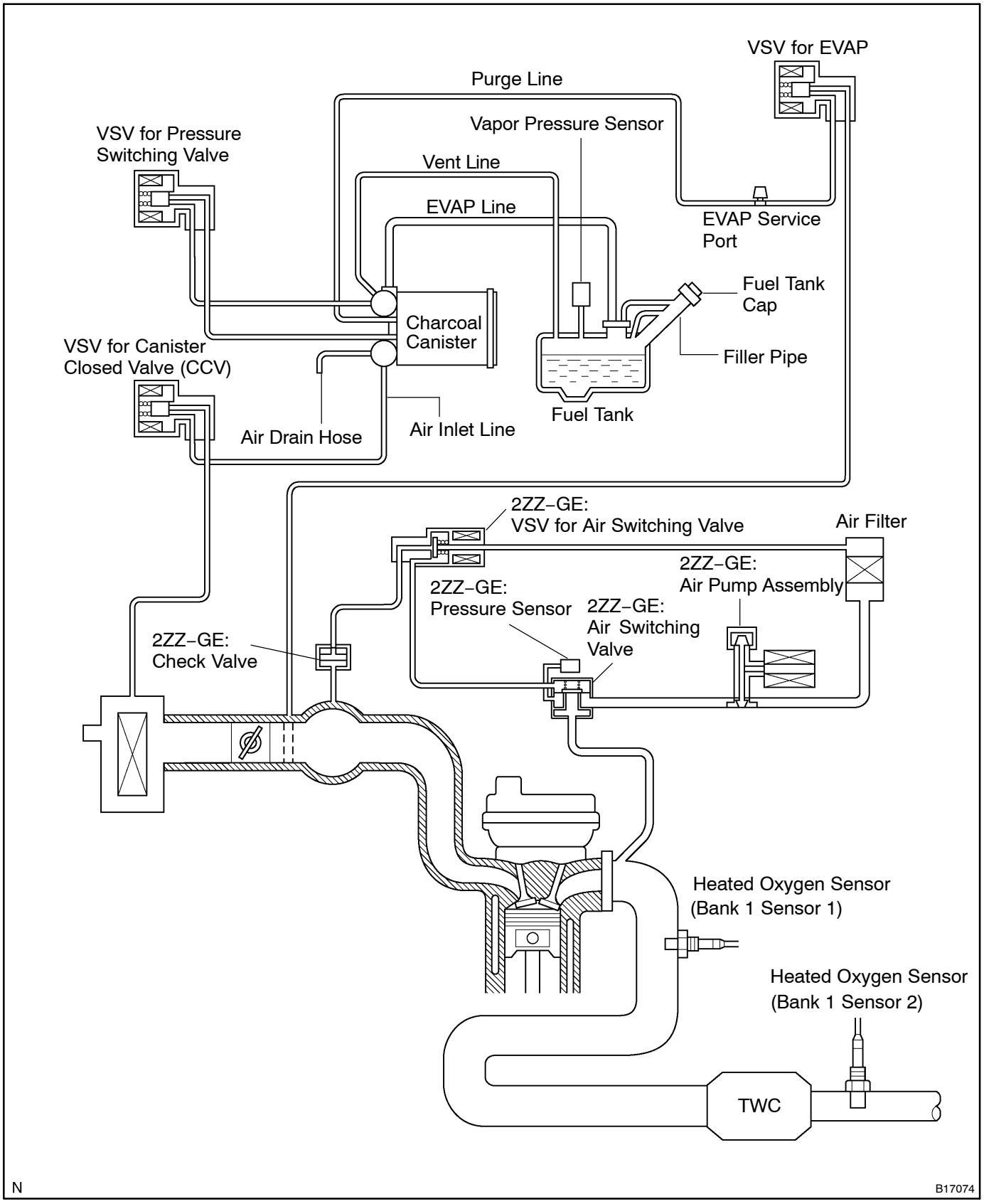
LOCATION

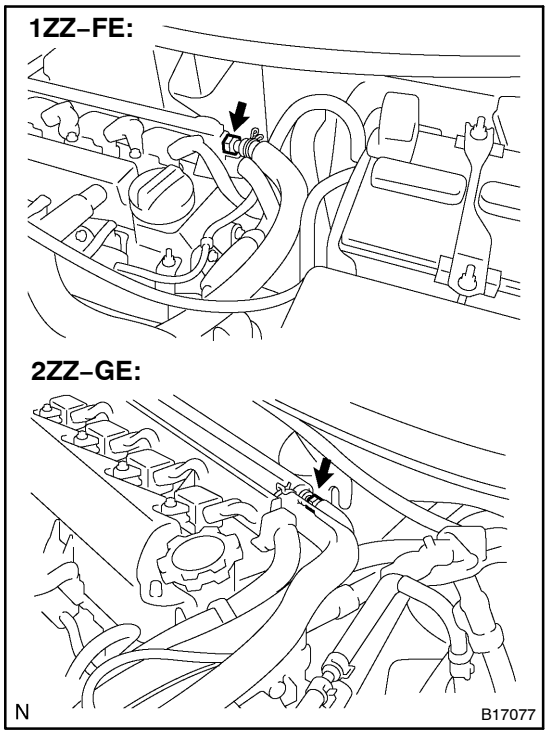
EC02F–34



EC02G–33

DRAWING





POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

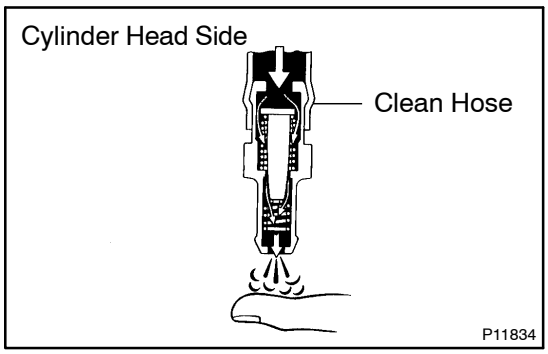
EC02H–20

INSPECTION

1. REMOVE PCV VALVE

(a) Disconnect the PCV hose from the PCV valve.

(b) Remove the PCV valve.



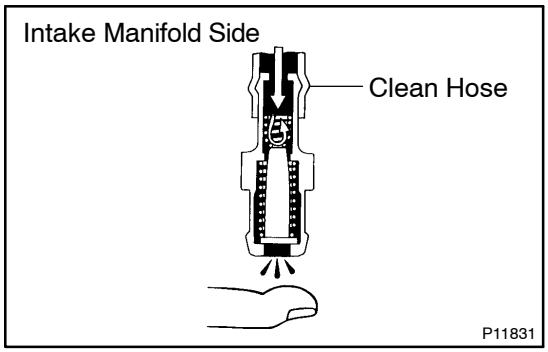
2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

(a) Blow air into the cylinder head side, and check that air passes through easily.

CAUTION:

Do not suck air through the valve. Petroleum substances inside the valve are harmful.

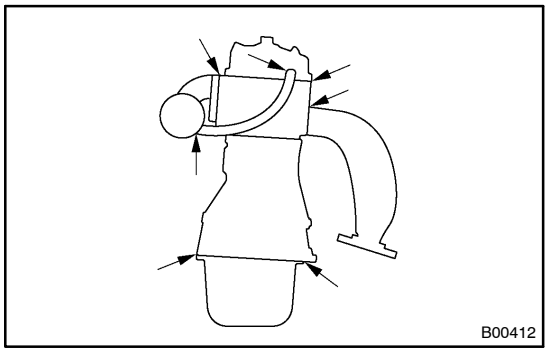


(b) Blow air into the intake manifold side, and check that air passes through with difficulty.

If operation is not as specified, replace the PCV valve.

4. REMOVE CLEAN HOSE FROM PCV VALVE

5. REINSTALL PCV VALVE



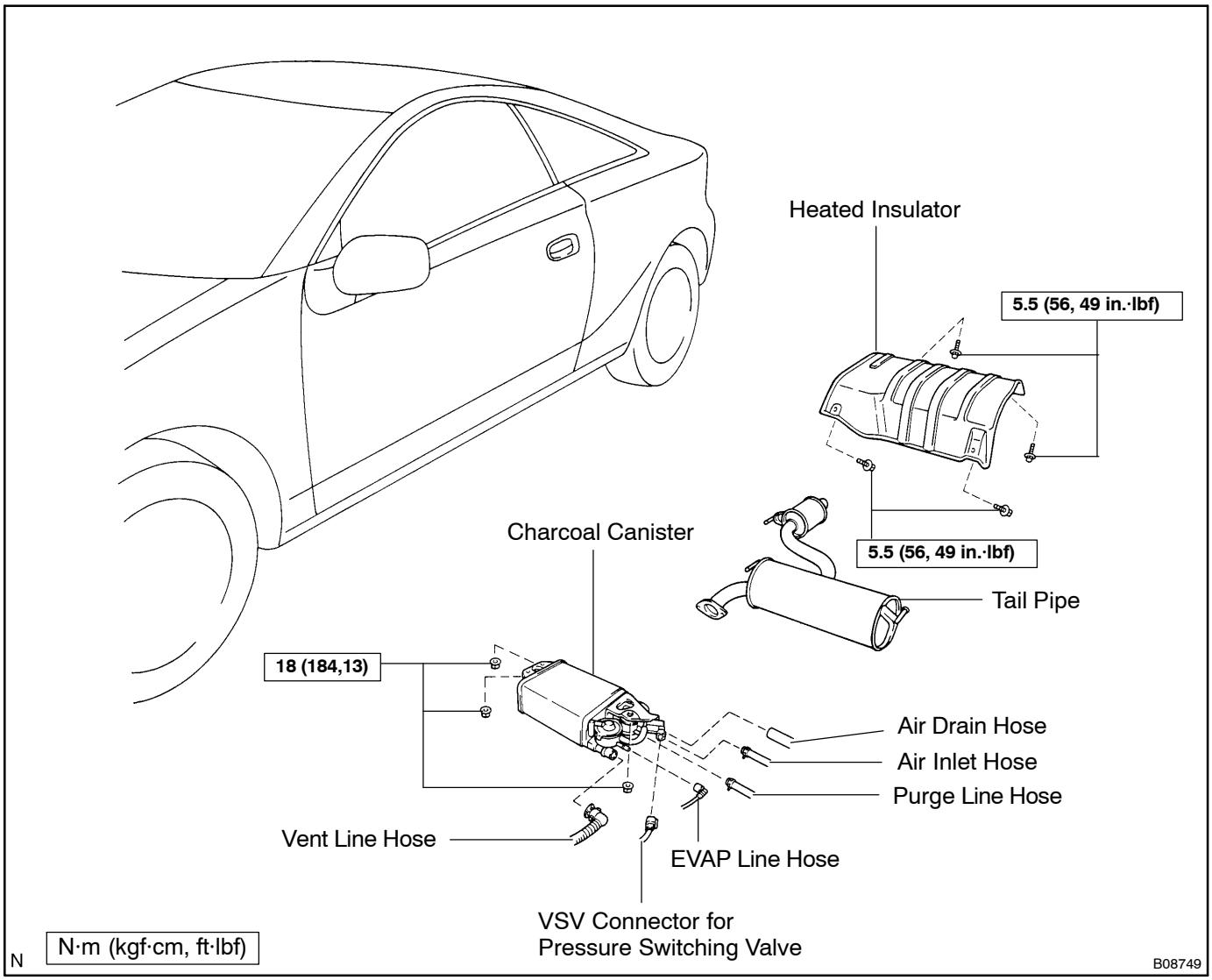
6. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

COMPONENTS

EC02I–15



EC0DR–08

INSPECTION

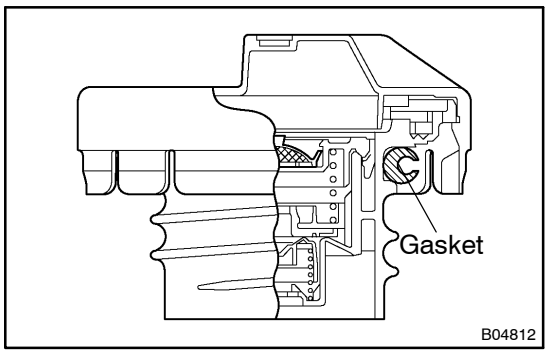
1. REMOVE EXHAUST TAIL PIPE AND HEATED INSULATOR (See page EM–117)

2. INSPECT LINES AND CONNECTORS

Visually check for loose connections, sharp bends or damage.

3. INSPECT FUEL TANK FILLER PIPE

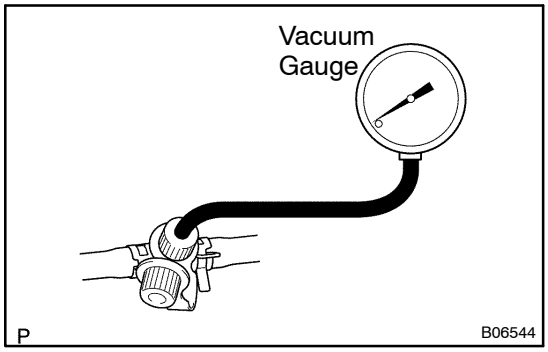
Visually check for deformation, cracks or fuel leakage.



4. INSPECT FUEL TANK CAP

Visually check if the cap and/or gasket are deformed or damaged.

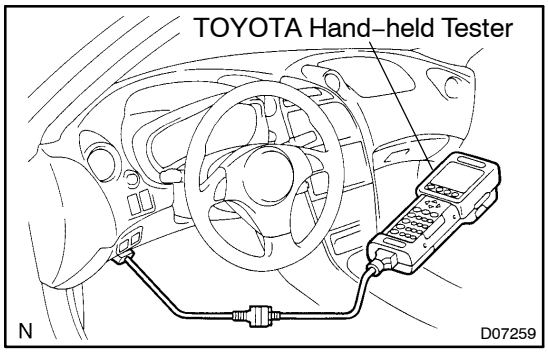
If necessary, repair or replace the cap.



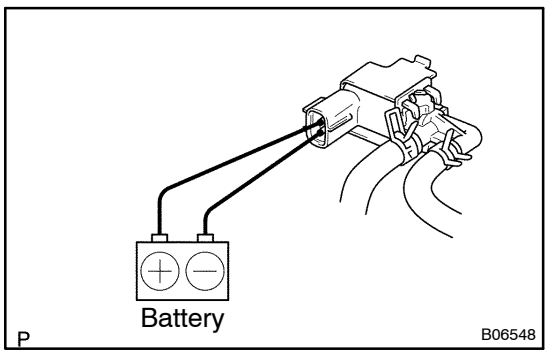
5. INSPECT EVAP SYSTEM LINE

(a) Warm up the engine and stop the engine.
Allow the engine to warm up to normal operating temperature.

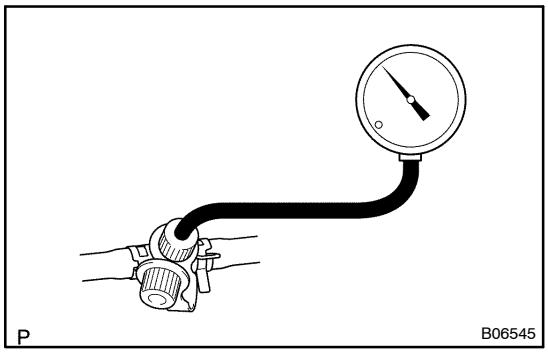
(b) Install a vacuum gauge (EVAP control system test equipment vacuum gauge) to the EVAP service port on the purge line.



(c) TOYOTA hand–held tester:
Forced driving of the VSV for the EVAP.
(1) Connect a TOYOTA hand–held tester to the DLC3.
(2) Start the engine.
(3) Push the TOYOTA hand–held tester main switch ON.
(4) Use the ACTIVE TEST mode on the TOYOTA hand–held tester to operate the VSV for the EVAP.



(d) If you have no TOYOTA hand–held tester:
Forced driving of the VSV for the EVAP.
(1) Disconnect the VSV connector for the EVAP.
(2) Connect the positive (+) and negative (–) leads from the battery to the VSV terminals for the EVAP.
(3) Start the engine.



(e) Check the vacuum at idle.
Vacuum:
Maintain at 0.368 – 19.713 in.Hg (5 – 268 in.Aq) for over 5 seconds

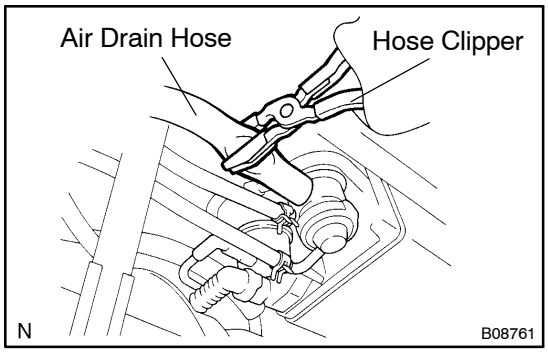
HINT:
If the vacuum does not change, you can conclude that the hose connecting the VSV to the service port has come loose or is blocked, or the VSV is malfunctioning.

(f) If you have TOYOTA hand–held tester:
Conclude forced driving of the VSV for the EVAP.
(1) Stop the engine.
(2) Disconnect the TOYOTA hand–held tester from the DLC3.

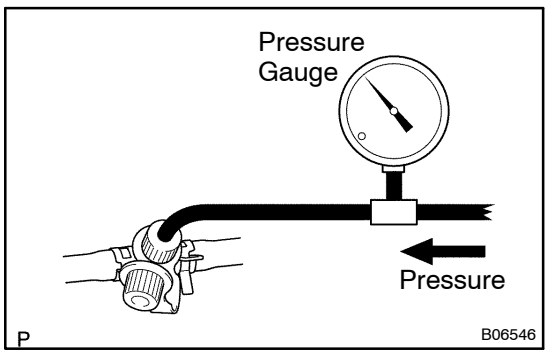
(g) If you have no TOYOTA hand–held tester:
Conclude forced driving of the VSV for the EVAP.
(1) Stop the engine.
(2) Disconnect the positive (+) and negative (–) leads from the battery, and from the VSV terminals for the EVAP.
(3) Connect the VSV connector for the EVAP.

(h) Disconnect the vacuum gauge from the EVAP service port on the purge line.

(i) Connect a pressure gauge to the EVAP service port on the purge line.

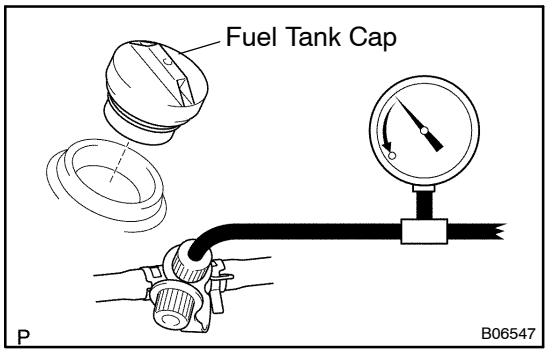


(j) Check the pressure.
(1) Close off the air drain hose at the marked position of the canister with a hose clipper or similar instrument.



(2) Add the pressure (13.5 – 15.5 in.Aq) from the EVAP service port.
Pressure:
2 minutes after the pressure is added, the gauge should be over 7.7 – 8.8 in.Aq.

HINT:
If you can't add pressure, you can conclude that the hose connecting the VSV–canister–fuel tank has slipped off or the VSV is open.

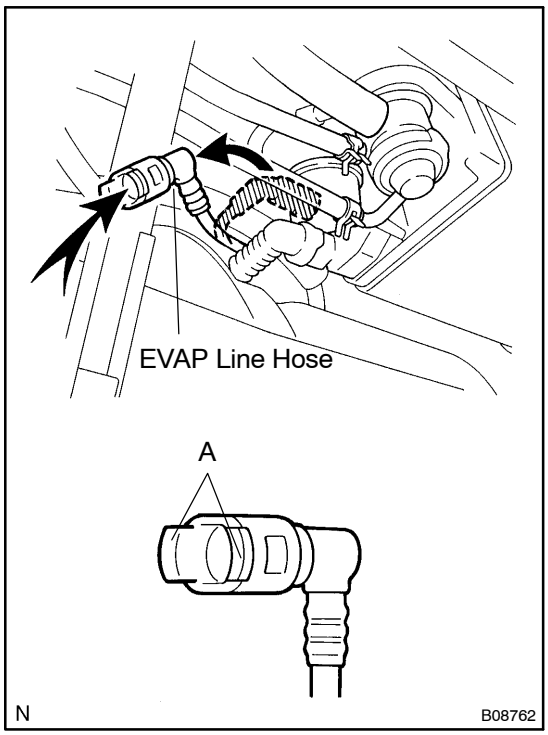


(3) Check if the pressure decreases when the fuel tank cap is removed while adding pressure.

HINT:

If the pressure does not decrease when the filler cap is removed, then you can conclude that the hose connecting the service port to the fuel tank is blocked, etc.

(k) Disconnect the pressure gauge from the EVAP service port on the purge line.



6. CHECK AIRTIGHTNESS IN FUEL TANK AND FILLER PIPE

(a) Disconnect the EVAP line hose from the charcoal canister.
  (1) Pinch portion A.
  (2) Pull out the connector.

(b) Pressurize and make the internal pressure in the fuel tank 4 kPa (41 gf/cm^2, 0.58 psi).

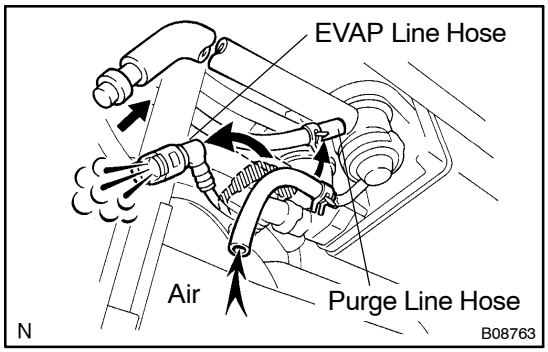
(c) Check that the internal pressure of the fuel tank can be held for 1 minute.

(d) Check the connected portions of each hose and pipe.

(e) Check the installed parts on the fuel tank.

If there is no abnormality, replace the fuel tank and filler pipe.

(f) Reconnect the EVAP line hose to the charcoal canister.



7. INSPECT FUEL CUTOFF VALVE AND FILL CHECK VALVE

(a) Disconnect the purge line hose and EVAP line hose from the charcoal canister.

(b) Plug the cap to the air drain hose.

(c) Pressurize 4 kPa (41 gf/cm^2, 0.58 psi) to the purge port and check that there is ventilation through the EVAP line hose.

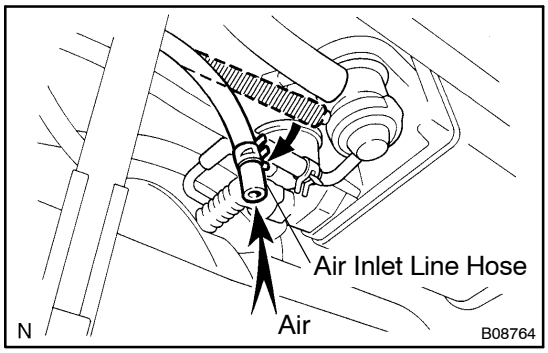
HINT:

In the condition that the fuel is full, as the float value of the fill check valve is closed and has no ventilation, it is necessary to check the fuel amount (volume).

(d) Check if there is anything stuck in the vent line hose and EVAP line hose.

If there is nothing stuck in them, replace the fuel cut off valve and fill check valve.

(e) Reconnect the purge line hose and EVAP line hose to the charcoal canister.

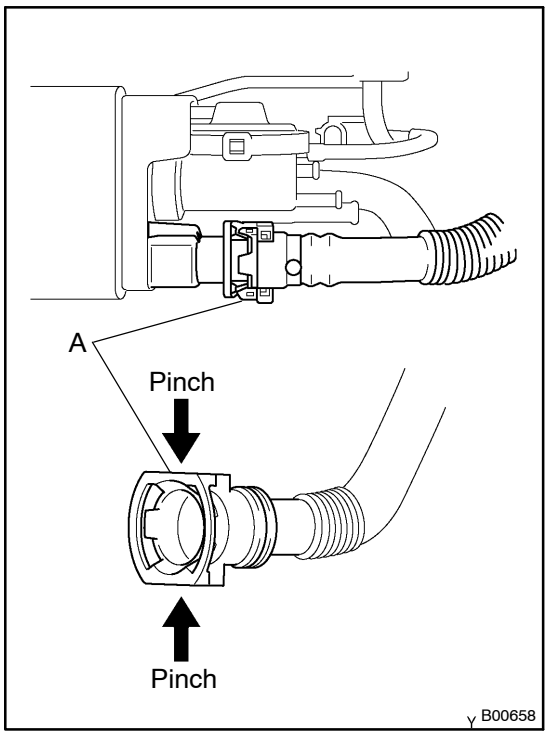


8. CHECK AIR INLET LINE

(a) Disconnect the air inlet line hose from the charcoal canister.

(b) Check that there is ventilation in the air inlet line.

(c) Reconnect the air inlet line hose to the charcoal canister.



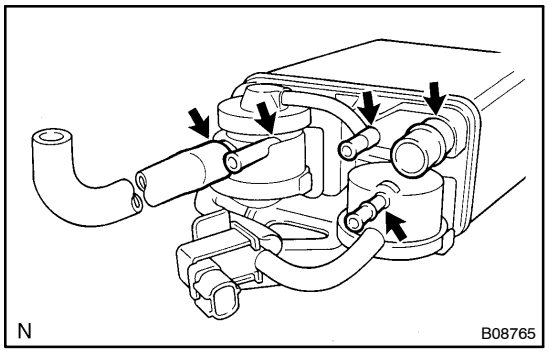
9. REMOVE CHARCOAL CANISTER ASSEMBLY

(a) Disconnect the VSV connector.

(b) Disconnect the purge line hose, EVAP line hose and air inlet line hose from the charcoal canister.

(c) Disconnect the vent line hose from charcoal canister.
- (1) Push the connector deep inside.
- (2) Pinch portion A.
- (3) Pull out the connector.

(d) Remove the 3 nuts and charcoal canister assembly.

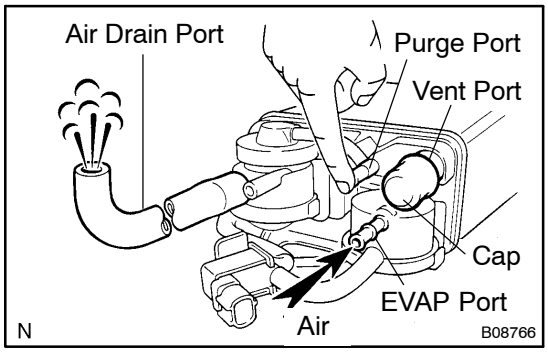


10. INSPECT CHARCOAL CANISTER

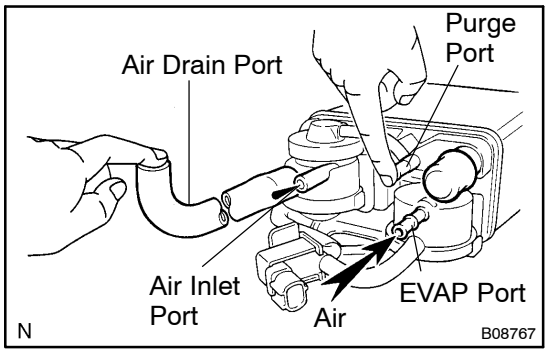
(a) Visually check the charcoal canister for cracks or damage.

HINT:

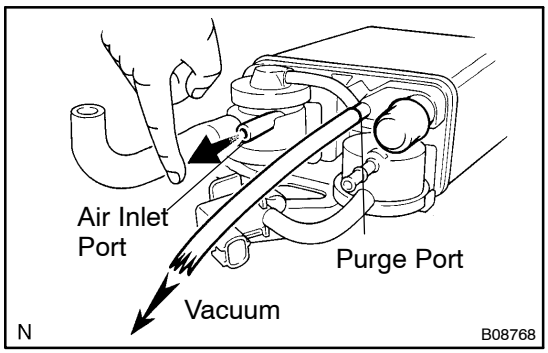
Be sure to check the areas indicated by the allow marks. These areas are especially prone to cracking.



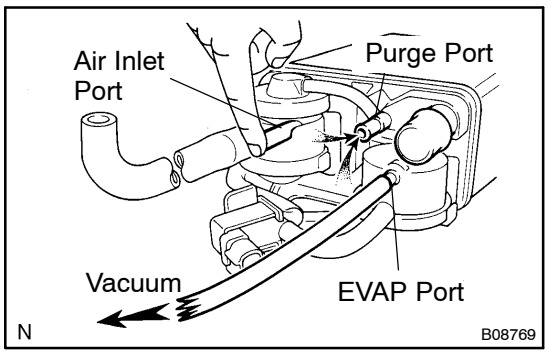
(b) Inspect the charcoal canister operation.
- (1) Plug the vent port with a cap.
- (2) While holding the purge port closed, blow air (1.76 kPa, 18 gf/cm^2, 0.26 psi) into the EVAP port and check that air flows from the air drain port.



(3) While holding the purge port and the air drain port closed, blow air (1.76 kPa, 18 gf/cm^2, 0.26 psi) into the EVAP port and check that air does not flow from the air inlet port.



(4) Apply vacuum (3.43 kPa, 25.7 mmHg, 1.01 in.Hg) to the purge port, check that the vacuum does not decrease when the air inlet port is closed, and check that the vacuum decreases when the air inlet port is released.



(5) While holding the air inlet port closed, apply vacuum (3.43 kPa, 25.7 mmHg, 1.01 in.Hg) to the EVAP port and check that air flows into the purge port.

If a problem is found, replace the charcoal canister.

(6) Remove the cap from the vent port.

11. INSPECT VSV FOR EVAP
(See page SF–61)

12. INSPECT VSV FOR CANISTER CLOSED VALVE (CCV)
(See page SF–63)

13. INSPECT VAPOR PRESSURE SENSOR
(See page SF–69)

14. REINSTALL CHARCOAL CANISTER ASSEMBLY

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EC02K–12

INSPECTION

1. CHECK TWC FOR DENTS OR DAMAGE

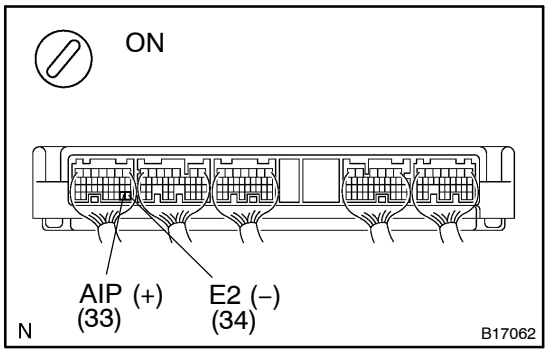
If any port of the heat insulator is damaged or dented to the extent that it contacts the three–way catalytic converter, repair or replace it.

2. CHECK EXHAUST PIPE CONNECTIONS FOR LOOSENESS OR DAMAGE

3. CHECK EXHAUST PIPE CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

4. CHECK HEAT INSULATOR FOR DAMAGE

5. CHECK FOR ADEQUATE CLEARANCE BETWEEN EXHAUST SYSTEM AND HEAT INSULATOR ON THE BODY



SECONDARY AIR INJECTION SYSTEM (2ZZ–GE)

EC0NB–03

ON–VEHICLE INSPECTION

1. INSPECT PRESSURE SENSOR

(a) Turn the ignition switch to the ON position.

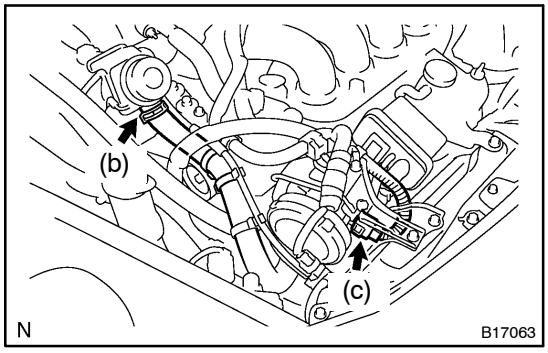
(b) Measure the voltage between terminals AIP and E2 of the ECM connector.

Voltage: 1.0 to 2.2 V

2. REMOVE UPPER FRONT FENDER APRON SEAL

3. REMOVE UPPER RADIATOR SUPPORT SEAL

4. DISCONNECT HOSE

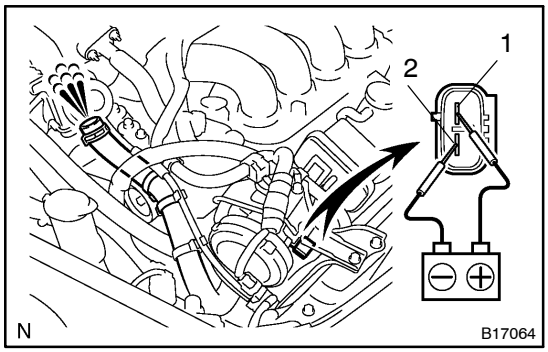


5. CHECK OPERATION AIR PUMP ASSEMBLY

(a) Using a plier, grip the claws of the hose clip and slide the clip along the air hose.

(b) Disconnect the air hose.

(c) Disconnect the air pump connector.

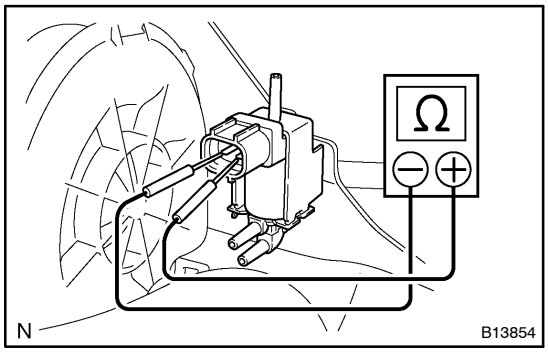


Test conditions:

- Water temperature: –15 °C – 45 °C (5 °F – 113 °F)
- Engine running: Below 7,100 rpm
- Battery voltage: Above 10.5 V
- DTC: No displayed

(d) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2 than check that air flow from the air hose.

If operation is not as specified, replace the air pump assembly.



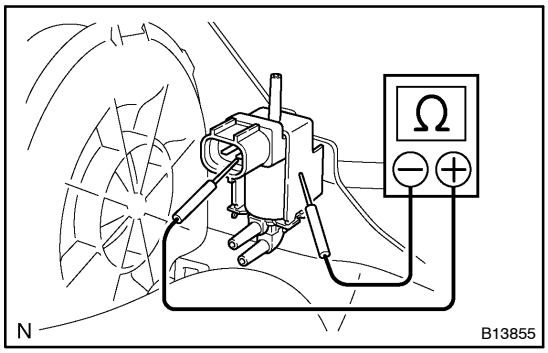
6. INSPECT VSV FOR OPEN CIRCUIT

(a) Disconnect the 3 hoses.

(b) Remove the screw and VSV for air pump.

Using an ohmmeter, check that there is continuity between the terminals.

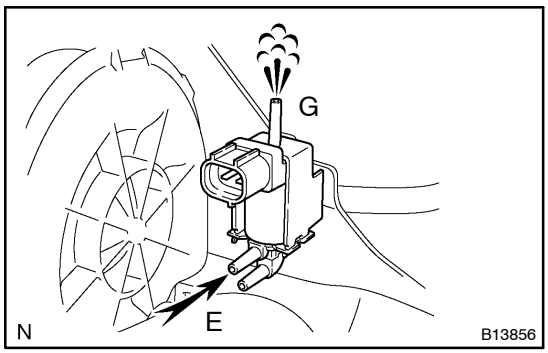
Resistance: 37 – 44 Ω at 20 °C (68 °F)



7. INSPECT VSV FOR GROUND

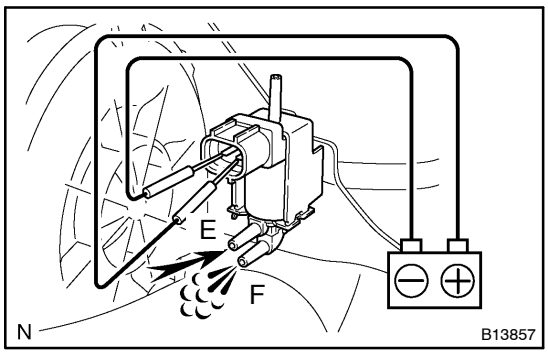
Using an ohmmeter, check that there is no continuity between each termianl and the body.

If there is continuity, replace the VSV.



8. INSPECT VSV OPERATION

(a) Check that air flows from ports E to G.



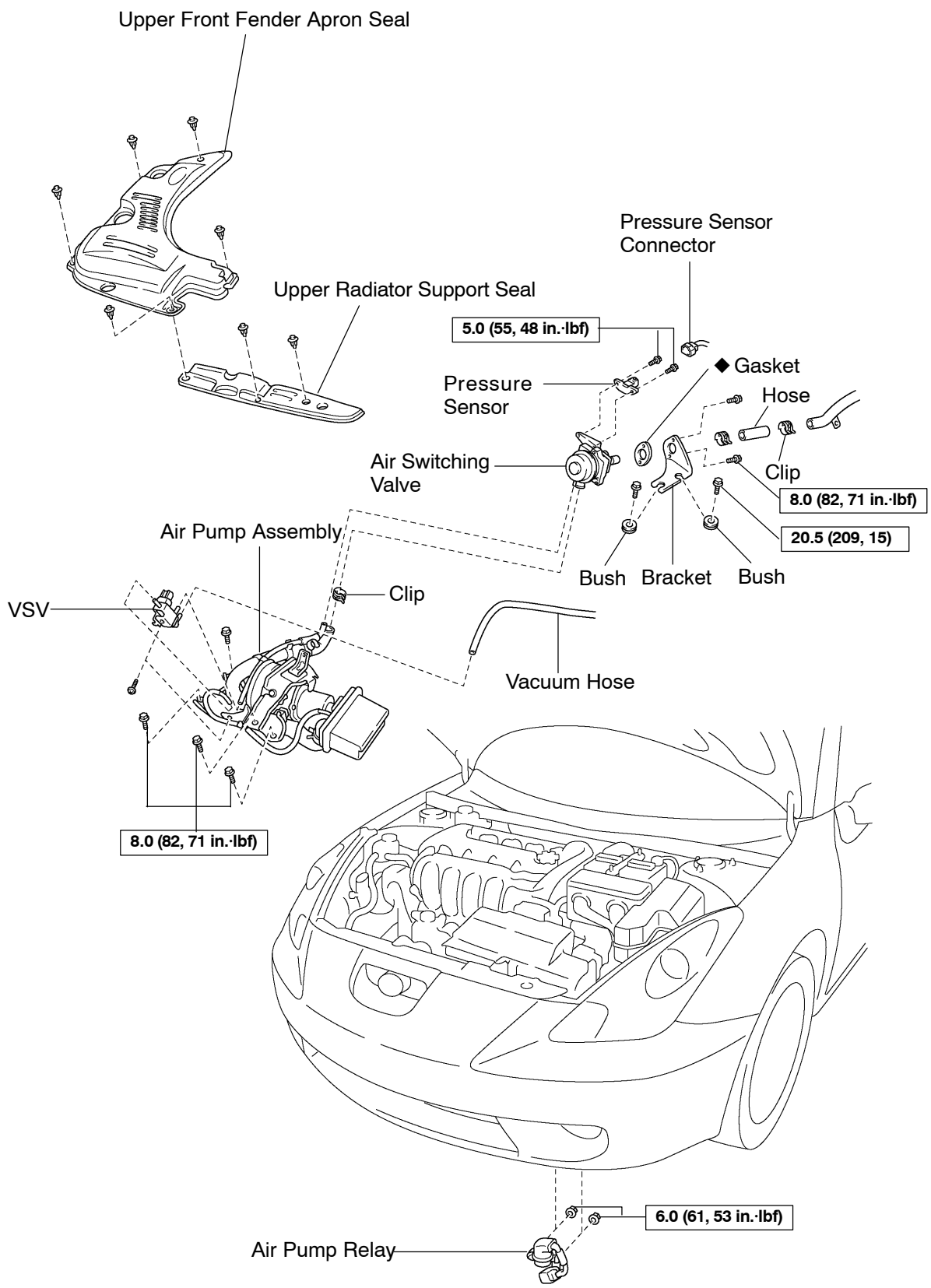
(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from ports E to F.

If operation is not as specified, replace the VSV.

EC0KD–02

COMPONENTS



N

N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

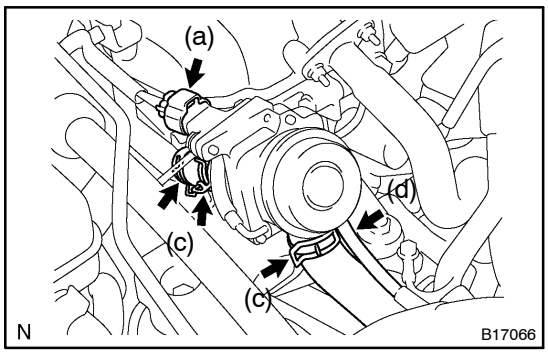
B17065

EC0NC–01

REMOVAL

1. REMOVE UPPER FRONT FENDER APRON SEAL

2. REMOVE UPPER RADIATOR SUPPORT SEAL



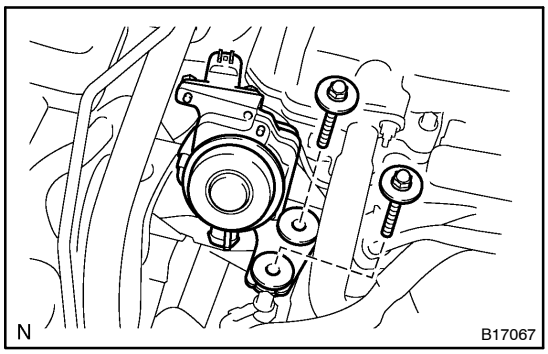
3. REMOVE AIR SWITCHING VALVE

(a) Disconnect the pressure sensor connector.

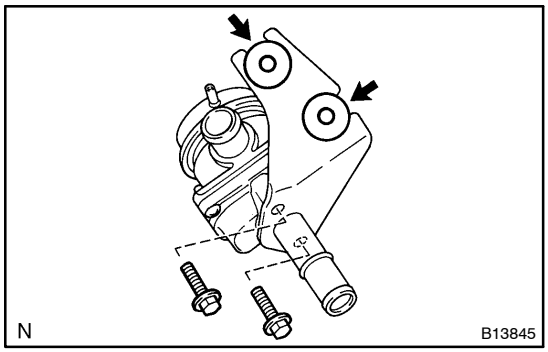
(b) Using a plier, grip the claws of the hose clips and slide the clips along the hoses.

(c) Disconnect the 2 air hoses.

(d) Disconnect the vacuum hoses.

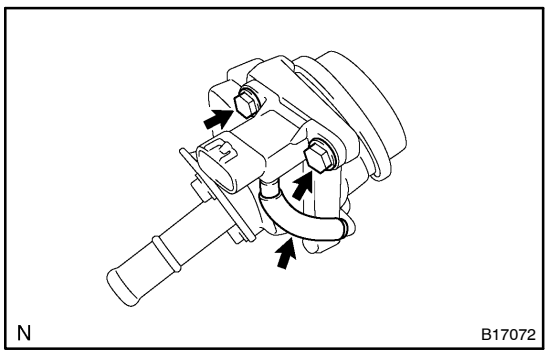


(e) Remove the 2 bolts and air switching valve.
Torque: 20.5 N·m (209 kgf·cm, 15 ft·lbf)



(f) Remove the 2 bolts and bracket.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

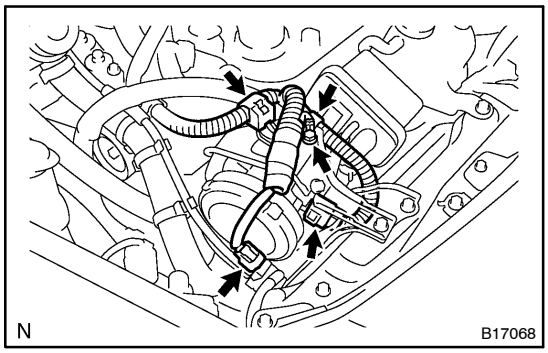
(g) Remove the 2 bushes.



4. REMOVE PRESSURE SENSOR

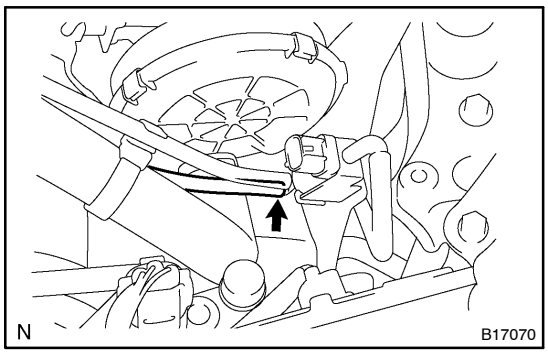
(a) Remove the vacuum hose.

(b) Remove the 2 bolts and pressure sensor.
Torque: 5.0 N·m (55 kgf·cm, 48 in.·lbf)

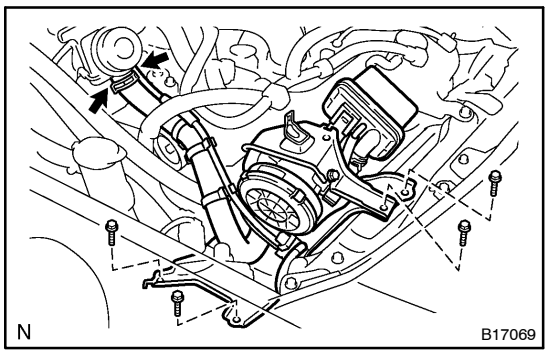


5. REMOVE AIR PUMP ASSEMBLY

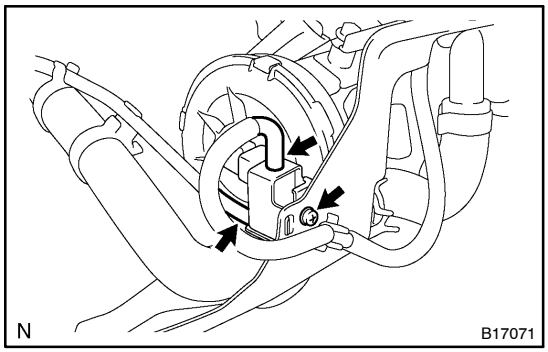
(a) Disconnect the wire harness from the air pump bracket.
(b) Remove the bolt and disconnect the ground cable.
(c) Disconnect the connectors.



(d) Disconnect the vacuum hose from the F port of VSV.

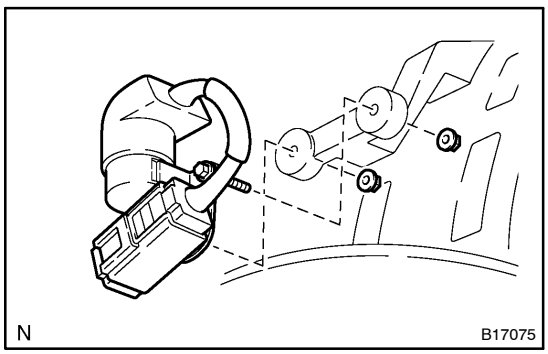


(e) Remove the 4 bolts and air pump assembly.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



6. REMOVE VSV

(a) Disconnect the 2 vacuum hoses.
(b) Remove the bolt and VSV.

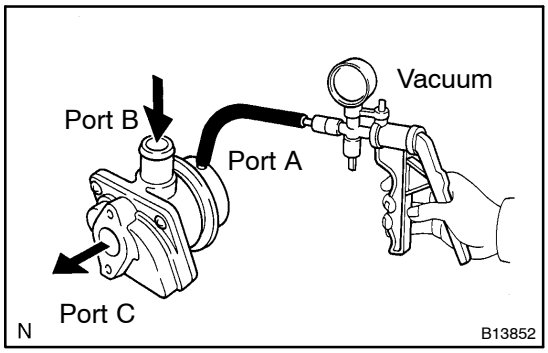


7. REMOVE AIR PUMP RELAY

(a) Disconnect the air pump relay connector.
(b) Remove the 2 nuts and air pump relay from the body bracket.

EC0ND–01

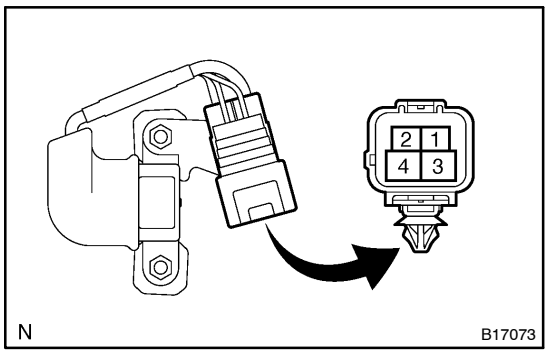
INSPECTION



1. INSPECT AIR SWITCHING VALVE

(a) Apply vacuum (28 kPa (286 gf/cm^2, 4.07 psi) to port A, blow air into port B and check that air is discharged from port C.

If operation is not as specified, replace the air switching valve.



2. INSPECT AIR PUMP RELAY

(a) Using an ohmmeter, check the continuity between each terminals.

Terminal No.	Specified Condition
1 ↔ 2	Continuity
3 ↔ 4	No Continuity

(b) Check that there is the continuity between the terminal 3 and the 4 when battery voltage applyed between the terminal 1 and terminal 2.

If operation is not as specified, replace the air pump relay.

EC0KG–05

INSTALLATION

Installation is in the reverse order of removal (See page EC–15).

SFI SYSTEM

SF0Z7–08

PRECAUTION

1. BEFORE WORKING ON THE FUEL SYSTEM, DISCONNECT THE NEGATIVE (–) TERMINAL CABLE FROM THE BATTERY

HINT:

Any diagnostic trouble code retained by the computer will be erased when the negative (–) terminal cable is removed from the battery. Therefore, if necessary, read the diagnosis before removing the negative (–) terminal cable from the battery.

2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON THE FUEL SYSTEM

3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS

4. MAINTENANCE PRECAUTIONS

(a) In event of engine misfire, these precautions should be taken.
  (1) Check proper connection to battery terminals, etc.
  (2) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
  (3) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

(b) Precautions when handling oxygen sensor.
  (1) Do not allow oxygen sensor to drop or hit against an object.
  (2) Do not allow the sensor to come into contact with water.

If vehicle is Equipped with Mobile Radio System (HAM, CB, etc.)

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

5. AIR INDUCTION SYSTEM

(a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of turn.

(b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of turn.

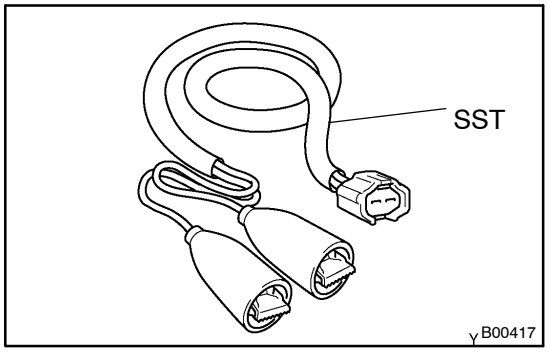
6. ELECTRONIC CONTROL SYSTEM

(a) Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch to LOCK or disconnecting the negative (–) terminal cable from the battery.

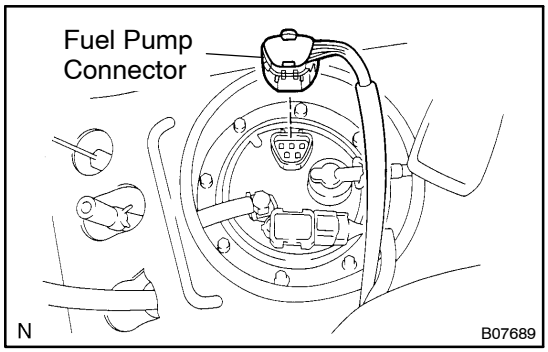
HINT:

Always check the diagnostic trouble code before disconnecting the negative (–) terminal cable from the battery.

(b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
(c) Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.
(d) Be careful during troubleshooting as there are numerous transistor circuit, and even slight terminal contact can cause further troubles.
(e) Do not open the ECM cover.
(f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
(g) Parts should be replaced as an assembly.
(h) Care should be taken when pulling out and inserting wiring connectors.
  (1) Release the lock and pull out the connector, pulling on the connectors.
  (2) Fully insert the connector and check that it is locked.

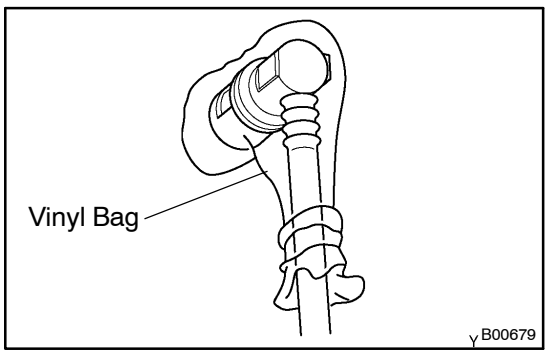


(i) Use SST for inspection or test of the injector or its wiring connector.
SST 09842–30080

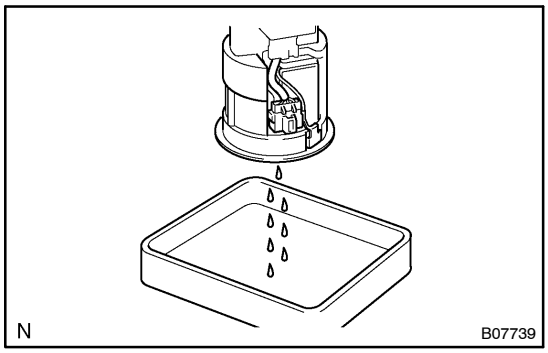


7. FUEL SYSTEM

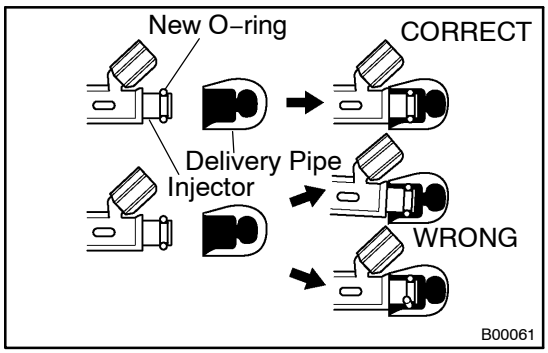
(a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe these procedures.
  (1) Disconnect the fuel pump connector.
  (2) Start the engine. After the engine has stopped on its own, turn the ignition switch to LOCK.
  (3) Disconnect the fuel tube (See page SF–11).
  (4) Drain the fuel remained inside the fuel tube.



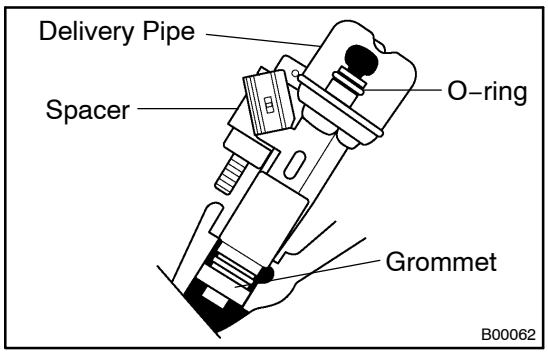
  (5) Prevent the disconnected fuel tube from damaging and mixing foreign objects by covering them with a vinyl bag.



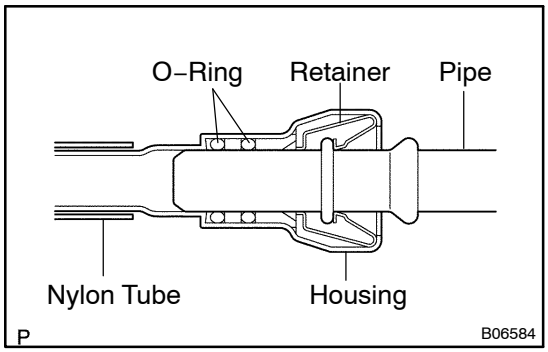
(6) Put a container under the connection.



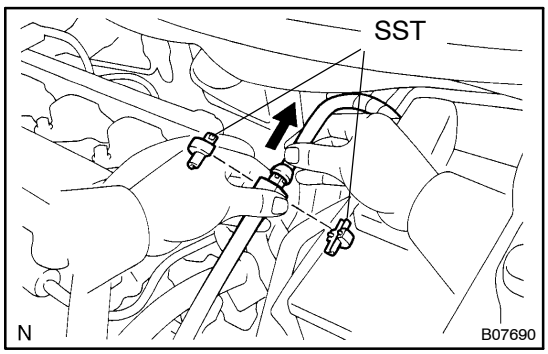
(b) Observe these precautions when removing and installing the injector.
(1) Never reuse the O–ring.
(2) When placing a new O–ring on the injector, take care not to damage it in any way.
(3) Coat a new O–ring with spindle oil or gasoline before installing never use engine, gear or brake oil.



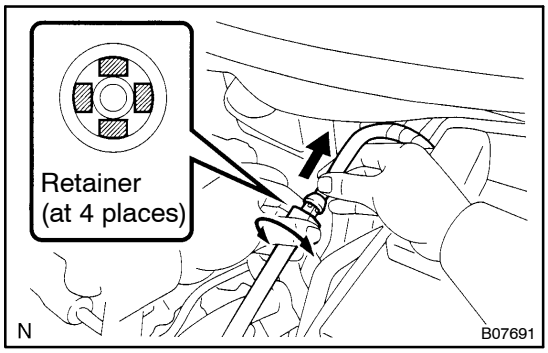
(c) Install the injector to the delivery pipe and cylinder head, as shown in the illustration. Before in installing the injector, must apply spindle oil or gasoline on the place where a delivery pipe or a cylinder head touches on O–ring of the injector.



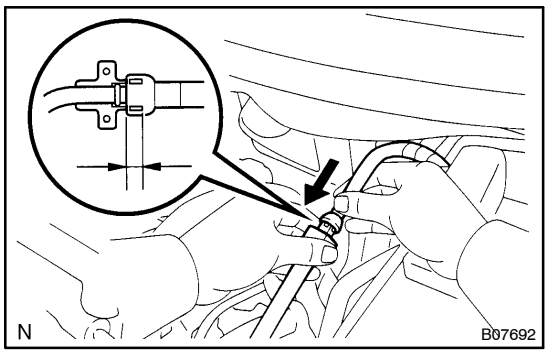
(d) Observe these precautions when disconnecting the fuel delivery pipe. The structure of the metallic connector is shown as left.
(1) Remove the fuel pipe clamp.



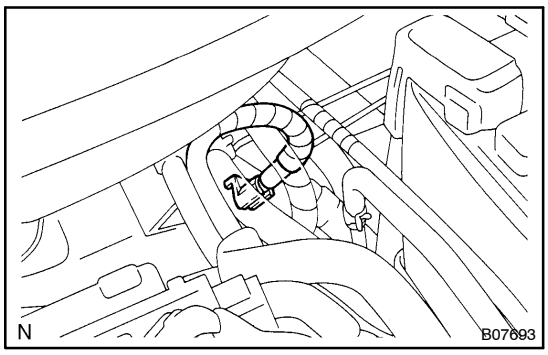
(2) Get the metallic connector of the fuel tube assembly, pull it out towards the rear and hold it as it is.
(3) Assemble SST to the connection as shown.
SST 09268–21010



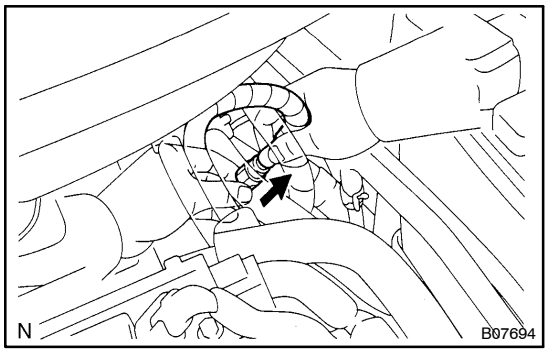
(4) Turn SST, align the retainers inside the connector with SST chamfered parts and insert SST into the connector.



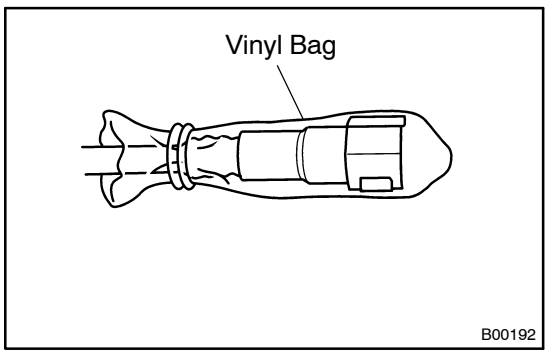
(5) Hold SST as it at step 4, push the connector towards SST to put the retainers on SST chamfered parts.
(6) Slide SST and the connector together towards the fuel tube assembly.



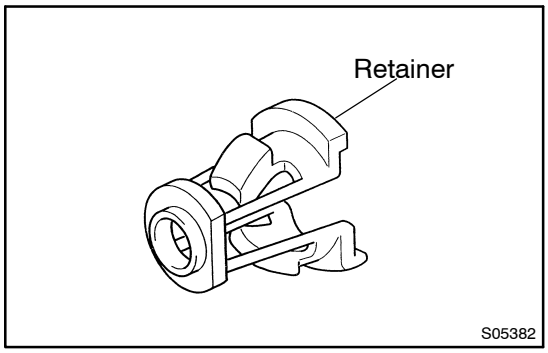
(e) Observe these precautions when disconnecting the fuel tube connector (quick type).
(1) Remove the fuel pipe clamp.
(2) Check if there is any dirt like mud on the pipe and around the connector before disconnecting them and clean the dirt away.



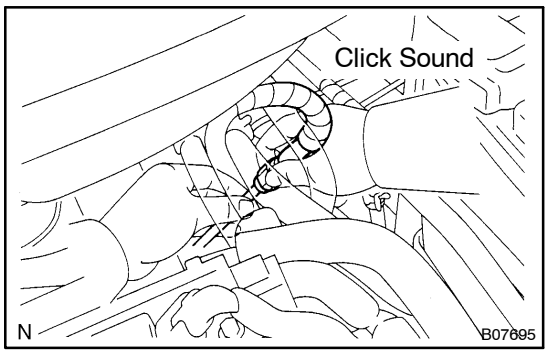
(3) Be sure to disconnect with hands.
(4) When the connector and the pipe are stuck, pinch the retainer between the hands, push and pull the connector to free to disconnect and pull it out. Do not use any tool at this time.
(5) Inspect if there is any dirt or the likes on the seal surface of the disconnected pipe and clean it away.



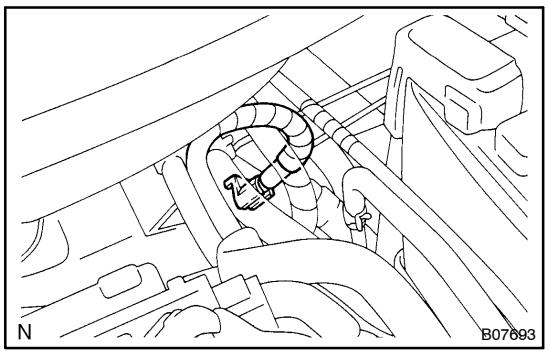
(6) Prevent the disconnected pipe and connector from damaging and mixing foreign objects by covering them with a vinyl bag.



(f) Observe these precautions when connecting the fuel tube connector (quick type).
(1) Do not reuse the retainer removed from the pipe.
(2) Must use hands without using tools when to remove the retainer from the pipe.
(3) Check if there is any damage or foreign objects on the connected part of the pipe.

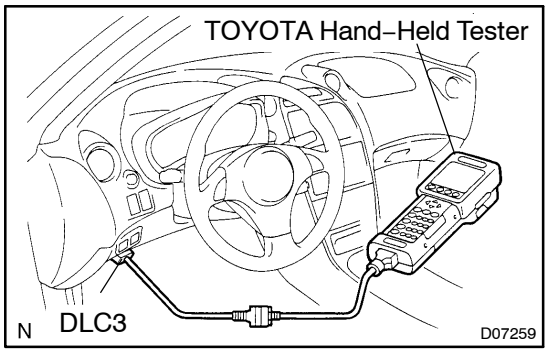


(4) Match the axis of the connector with axis of the pipe, and push in the connector until retainer makes a ”click” sound. In case that the connections is tight, apply little amount of new engine oil on the tip of the pipe.
(5) After having finished the connection, check if the pipe and the connector are securely connected by pulling them.

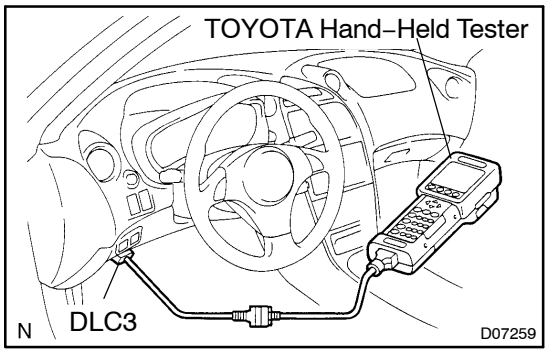


(6) Install the fuel pipe clamp.
(7) Check if there is any fuel leakage.

(g) Observe these precautions when handling nylon tube.
(1) Pay attention not to turn the connected part of the nylon tube and the quick connector with force when connecting them.
(2) Pay attention not to kink the nylon tube.
(3) Do not remove the nylon tube.
(4) Must not close the piping with the nylon tube by bending it.



(h) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON and push TOYOTA hand–held tester main switch ON.
(3) Select the active test mode on the TOYOTA hand–held tester.
(4) Please refer to the TOYOTA hand–held tester operator’s manual for further details.
(5) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See page SF–6)
(6) Check that there are no leaks from any part of the fuel system.
(7) Turn the ignition switch to LOCK.
(8) Disconnect the TOYOTA hand–held tester from the DLC3.



FUEL PUMP

SF098–13

ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Connect the TOYOTA hand–held tester to the DLC3.

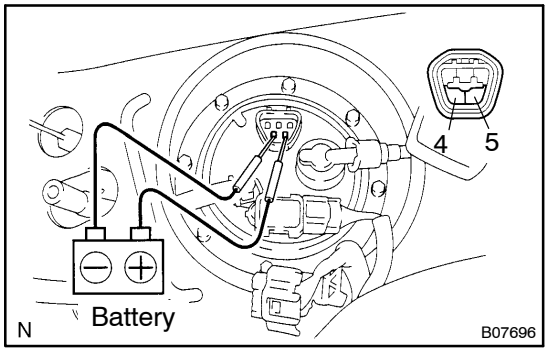
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

NOTICE:

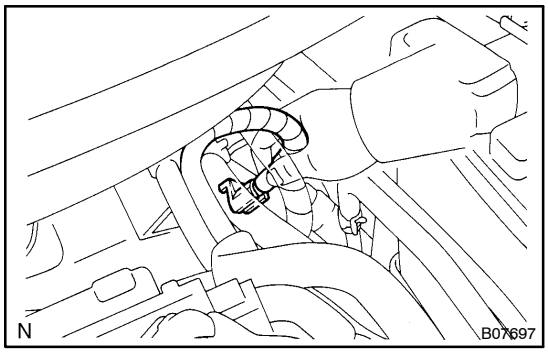
Do not start the engine.

(c) Select the active test mode on the TOYOTA hand–held tester.

(d) Please refer to the TOYOTA hand–held tester operator's manual for further details.



(e) If you have no TOYOTA hand–held tester, connect the positive (+) lead from the battery to terminal 4 of the connecter, and the negative (–) lead to terminal 5.



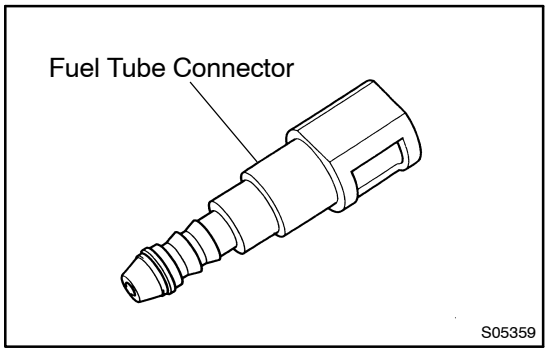
(f) Check that there is pressure in the fuel inlet pipe from the fuel line.

HINT:

If there is fuel pressure, you will hear the sound if fuel following.
If there is no pressure, check these parts, Fusible link, Fuses, EFI Main relay, Fuel pump, ECM, and Witting connector.

(g) Turn the ignition switch to LOCK.

(h) Disconnect the TOYOTA hand–held tester from the DLC3.

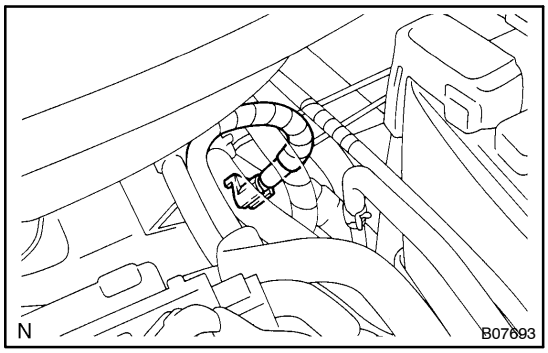


2. CHECK FUEL PRESSURE

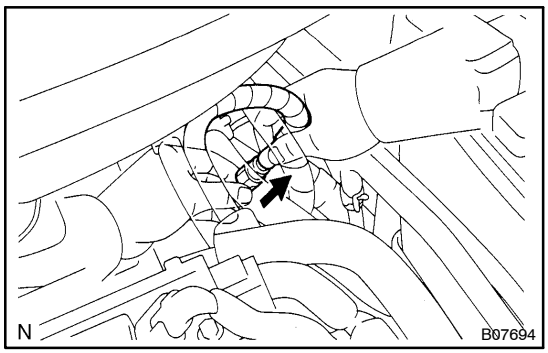
(a) Check the battery positive voltage is above 12 V.

(b) Disconnect the negative (–) terminal cable from the battery.

(c) Purchase the new fuel tube and take out the fuel tube connector from its pipe.
Part No.:
1ZZ–FE: 23901–22100
2ZZ–GE: 23271–88600



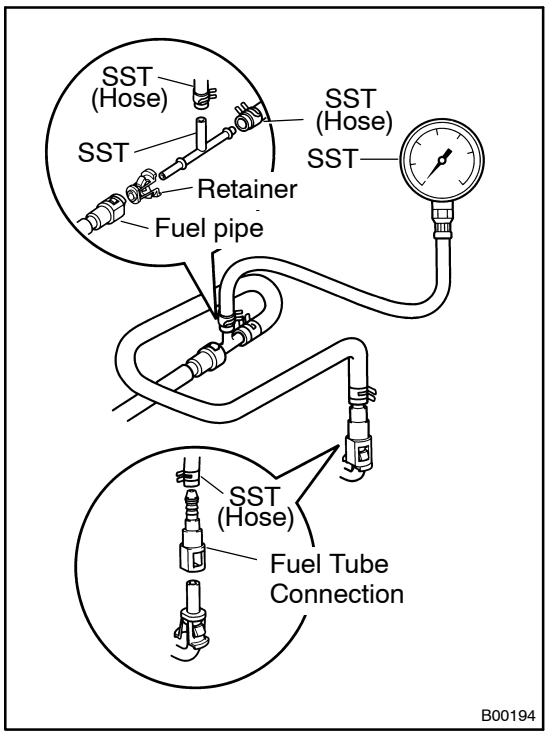
(d) Remove the fuel pipe clamp.



(e) Disconnect the fuel tube (fuel tube connector) from the fuel pipe.

CAUTION:

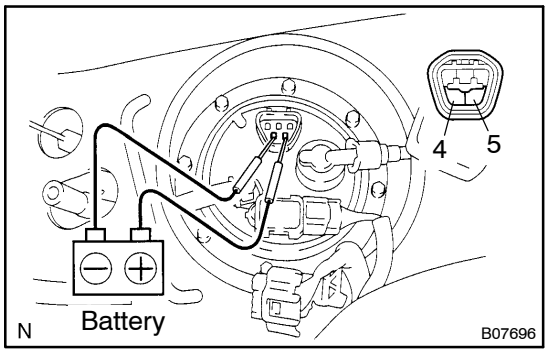
- **Perform disconnecting operations of the fuel tube connector (quick type) after observing the precautions.**
- **As there is retained pressure in the fuel pipe line, prevent if from splashing inside the engine comportment.**



(f) Install SST (pressure gauge) as shown in the illustration by using SST and fuel tube connector.
SST 09268–41047 (95336–08070), 09268–45014 (09268–41200, 09268–41220, 09268–41250)

(g) Wipe off any splattered gasoline.

(h) Reconnect the negative (–) terminal cable to the battery.



(i) Connect the TOYOTA hand–held tester to the DLC3.

If you have no TOYOTA hand–held tester, connect the positive (+) lead from the battery to terminal 4 of the connecter, and the negative (–) lead to terminal 5.

(j) Measure the fuel pressure.

Fuel pressure:

301 – 347 kPa (3.1 – 3.5 kgf/cm^2, 44 – 50 psi)

If pressure is high, replace the fuel pressure regulator.

If pressure is low, check the Fuel hoses and connections, Fuel pump, Fuel filter, and Fuel pressure regulator.

(k) Disconnect the TOYOTA hand–held tester from the DLC3.

(l) Start the engine.

(m) Measure the fuel pressure at idle.

Fuel pressure:

301 – 347 kPa (3.1 – 3.5 kgf/cm^2, 44 – 50 psi)

(n) Stop the engine.

(o) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

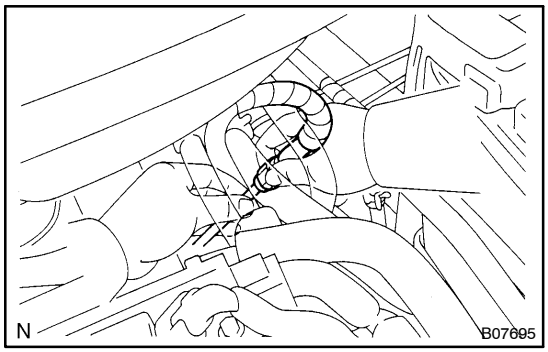
Fuel pressure:

147 kPa (1.5 kgf/cm^2, 21 psi) or more

If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.

(p) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully, remove the SST and fuel tube connector to prevent gasoline from splashing.

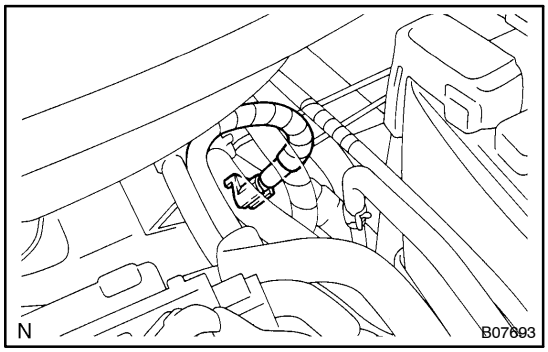
SST 09268–41047 (95336–08070), 09268–45014 (09268–41200, 09268–41220, 09268–41250)



(q) Reconnect the fuel tube (fuel tube connector).

CAUTION:

Perform connecting operations of the fuel tube connector (quick type) after observing the precautions.



(r) Install the fuel pipe clamp.

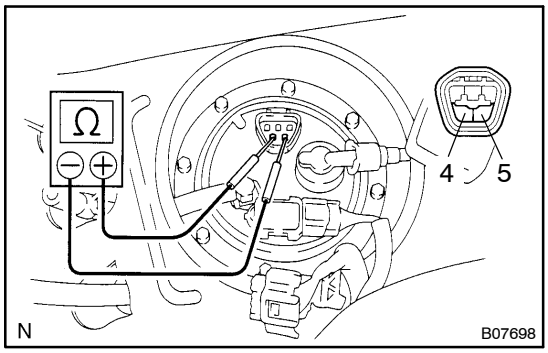
(s) Reconnect the negative (–) terminal cable to the battery.

(t) Check for fuel leakage.

3. REMOVE REAR SEAT CUSHION

4. REMOVE FLOOR SERVICE HOLE COVER

5. DISCONNECT FUEL PUMP & SENDER GAUGE CONNECTOR

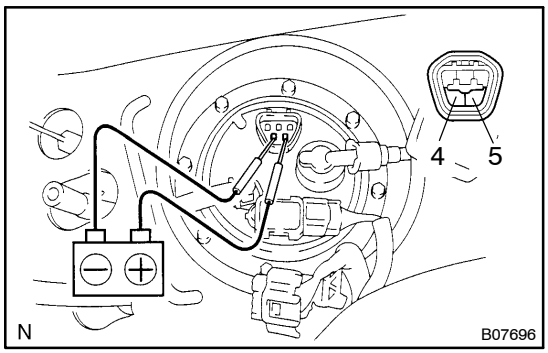


6. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between terminals 4 and 5.

Resistance: 0.2 – 3.0 Ω at 20°C (68 °F)

If the resistance is not as specified, replace the fuel pump.



7. INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 4 of the connector and the negative (–) terminal 5. Check that the pump operates.

NOTICE:

- **These tests must be done quickly (within 10 seconds) to prevent the coil burning out.**
- **Keep fuel pump as far away from the battery as possible.**
- **Always do the switching at the battery side.**

If operation is not as specified, replace the fuel pump or lead wire.

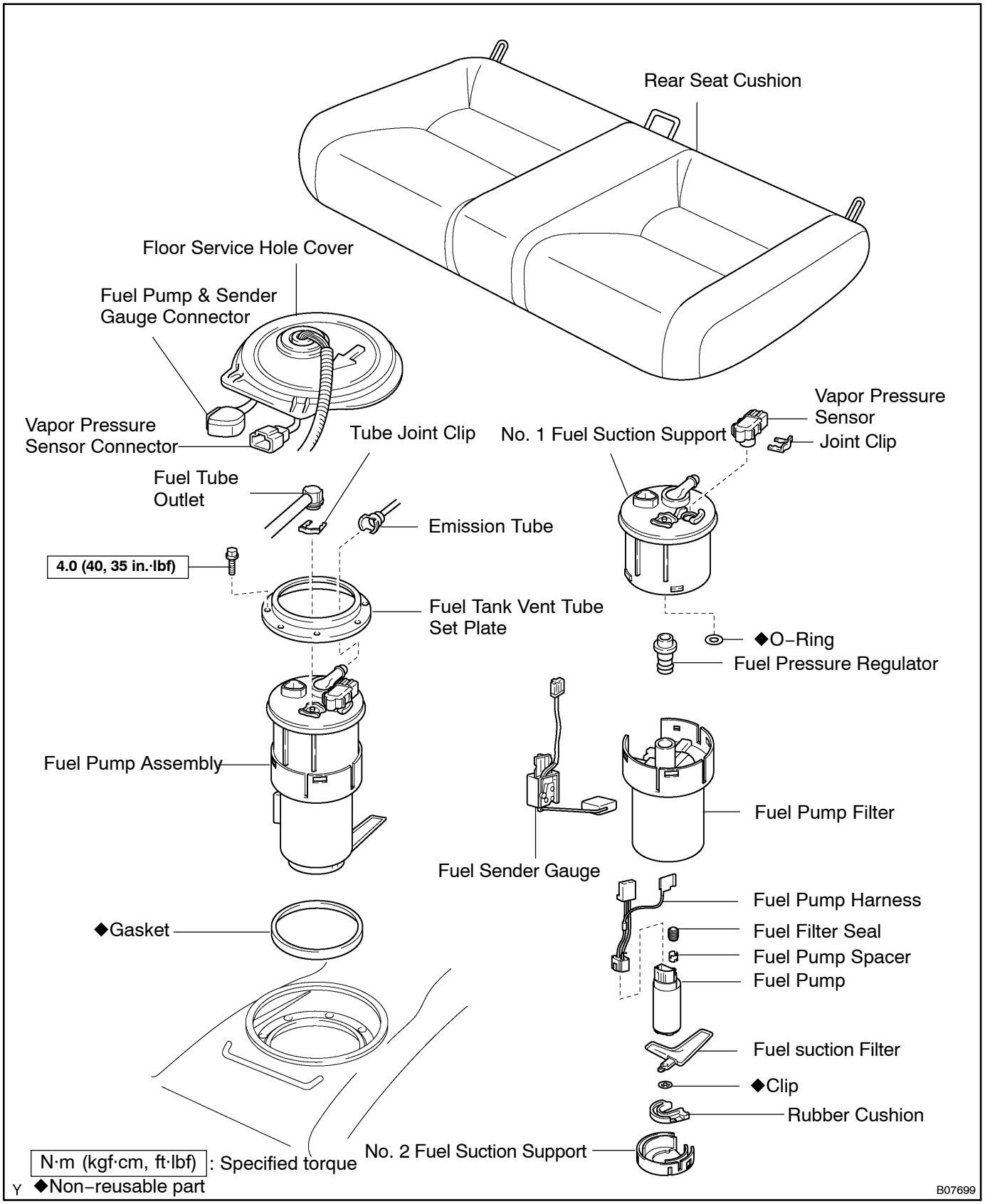
8. RECONNECT FUEL PUMP & SENDER GAUGE CONNECTOR

9. REINSTALL FLOOR SERVICE HOLE COVER

10. REINSTALL REAR SEAT CUSHION

SF099–12

COMPONENTS



SF09A–14

REMOVAL

CAUTION:

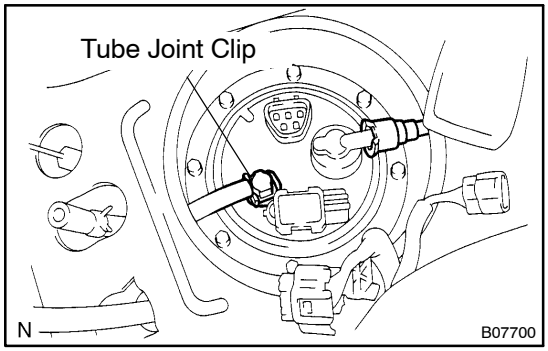
Do not smoke or work near an open flame when working on the fuel pump.

1. REMOVE REAR SEAT CUSHION

2. REMOVE FLOOR SERVICE HOLE COVER

3. DISCONNECT FUEL PUMP & SENDER GAUGE CONNECTOR AND VAPOR PRESSURE SENSOR CONNECTOR

4. DISCONNECT FUEL TUBE AND EMISSION TUBE

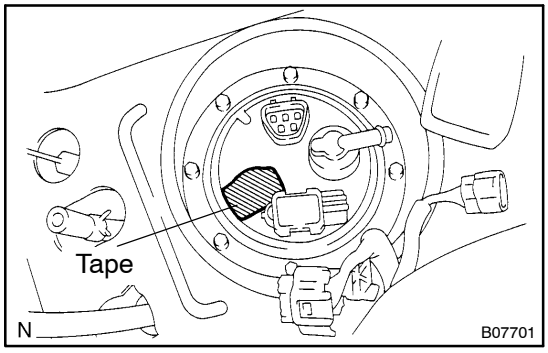


(a) Wash away the mud, dust and the likes on the fuel suction plate with water.

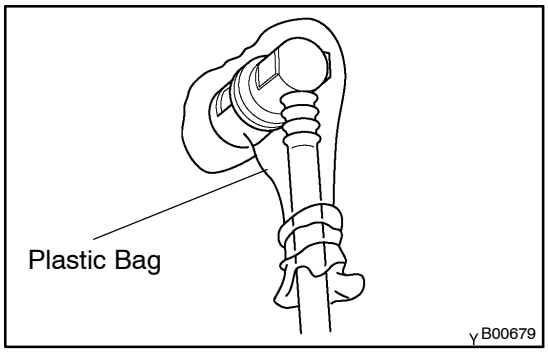
(b) Pull off the tube joint clip from the No. 1 fuel suction plate.

(c) Disconnect the fuel tube from the fuel pump assembly.

(d) Disconnect the emission tube from the fuel pump assembly.

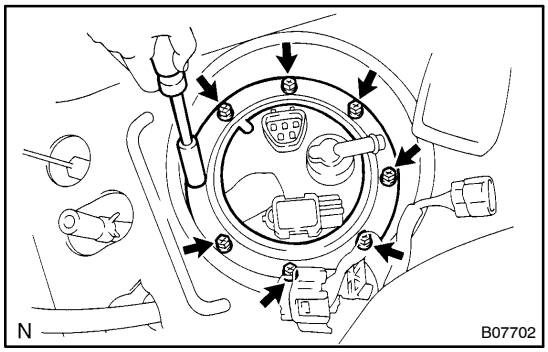


(e) Attach the tape in order to protect the port portion from the dust.



(f) Protect the disconnected fuel tube from damage and foreign material by covering it with a plastic bag.

5. REMOVE FUEL PUMP ASSEMBLY FROM FUEL TANK



(a) Remove the 8 bolts and fuel tank vent tube set plate.

(b) Pull out the fuel pump assembly.

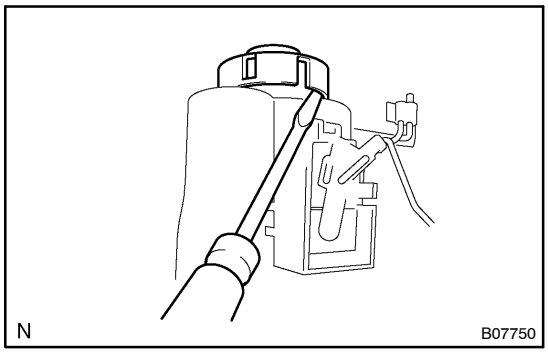
NOTICE:

- **Do not damage the fuel pump filter.**
- **Be careful that the arm of the sender gauge should not bent.**

(c) Remove the gasket from the pump assembly.

SF13P–09

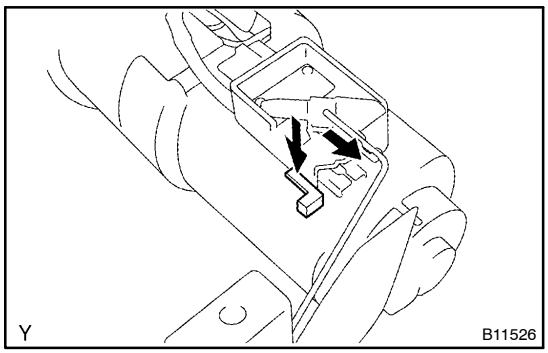
DISASSEMBLY



1. REMOVE NO. 2 FUEL SUCTION SUPPORT

(a) Using a small screwdriver, remove the No. 2 fuel suction support.

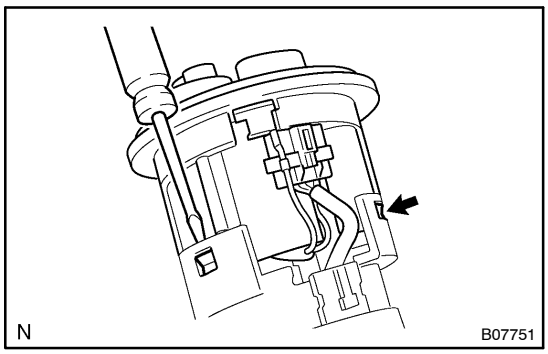
(b) Remove the rubber cushion.



2. REMOVE NO. 1 FUEL SUCTION SUPPORT

(a) Disconnect the fuel sender gauge connector and earth plate.

(b) While pressing the lock of the fuel pump filter, slide the fuel sender gauge and remove it.



(c) Using a small screwdriver, remove the No. 1 fuel suction support.

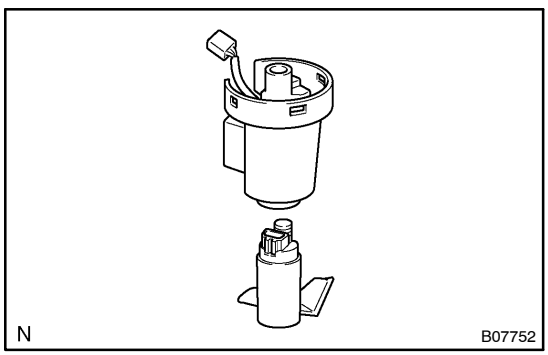
NOTICE:

Do not damage the fuel suction support and fuel suction plate.

(d) Disconnect the fuel pump harness from the No. 1 fuel suction support and fuel pump.

3. REMOVE VAPOR PRESSURE SENSOR

Pull off the joint clip and remove the vapor pressure sensor from No. 1 fuel suction support.

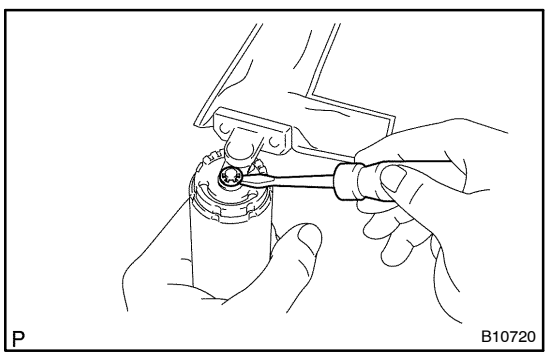


4. REMOVE FUEL PUMP

Remove the pump from the fuel filter.

5. REMOVE FUEL PRESSURE REGULATOR

Pull out the fuel pressure regulator and O–ring from the fuel filter.



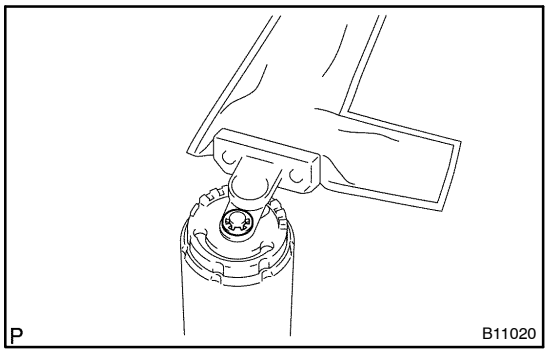
6. REMOVE FUEL SUCTION FILTER

(a) Using a small screwdriver, pry out the clip.

(b) Pull out the suction filter.

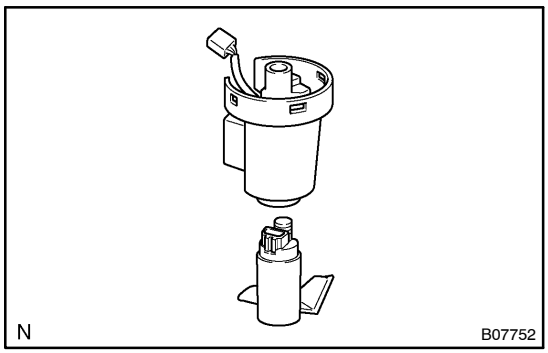
SF13Q–09

REASSEMBLY



1. INSTALL FUEL SUCTION FILTER

Install the suction filter with a new clip.



2. INSTALL FUEL PUMP

Connect the fuel pump to the fuel filter.

3. INSTALL FUEL PRESSURE REGULATOR

(a) Install the O–ring to the pressure regulator.

HINT:

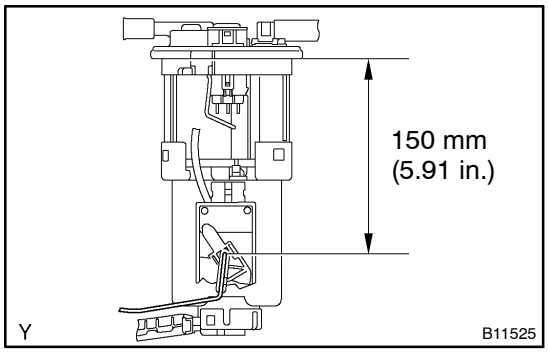
Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.

(b) Connect the pressure regulator to the fuel filter.

4. INSTALL NO. 1 FUEL SUCTION SUPPORT

(a) Connect the fuel pump harness to the No. 1 fuel suction support and fuel pump.

(b) Install the No. 1 fuel suction support to the fuel filter.



(c) Install the fuel sender gauge to the fuel pump filter so that the distance between the No.1 fuel suction support and the float fulcrum of the fuel sender gauge is 150 mm (5.91 in.).

(d) Connect the fuel sender gauge connector and earth plate.

5. INSTALL NO. 2 FUEL SUCTION SUPPORT

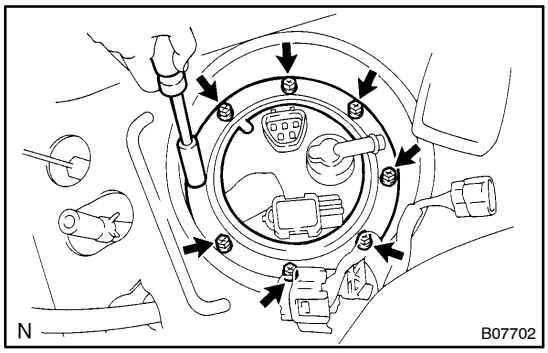
(a) Install the rubber cushion.

(b) Install the No. 2 fuel suction support to the No. 1 fuel suction support.

6. INSTALL VAPOR PRESSURE SENSOR

Install the vapor pressure sensor and connect the joint clip to the No. 1 fuel suction support.

SF09D–13



INSTALLATION

1. INSTALL FUEL PUMP ASSEMBLY

(a) Install the new gasket to the fuel pump assembly.

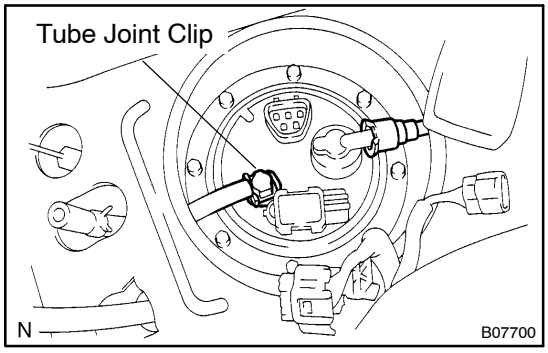
(b) Install the fuel pump assembly to the fuel tank.

NOTICE:

- **Do not damage the fuel pump filter.**
- **Be careful that the arm of the sender gauge should not bent.**

(c) Install the 8 bolts and fuel tank vent tube set plate from the fuel tank.

Torque: 4.0 N·m (40 kgf·cm, 35 in.·lbf)



2. CONNECT FUEL TUBE

(a) Clean up around the fuel tube.

(b) Connect the fuel tube and emission tube to the fuel pump assembly.

(c) Connect the tube joint clip to the fuel suction plate.

3. CONNECT FUEL PUMP AND SENDER GAUGE CONNECTOR AND VAPOR PRESSURE SENSOR CONNECTOR

HINT:

Start the engine, check for fuel leakage.

4. INSTALL FLOOR SERVICE HOLE COVER

(a) Install the service hole cover.

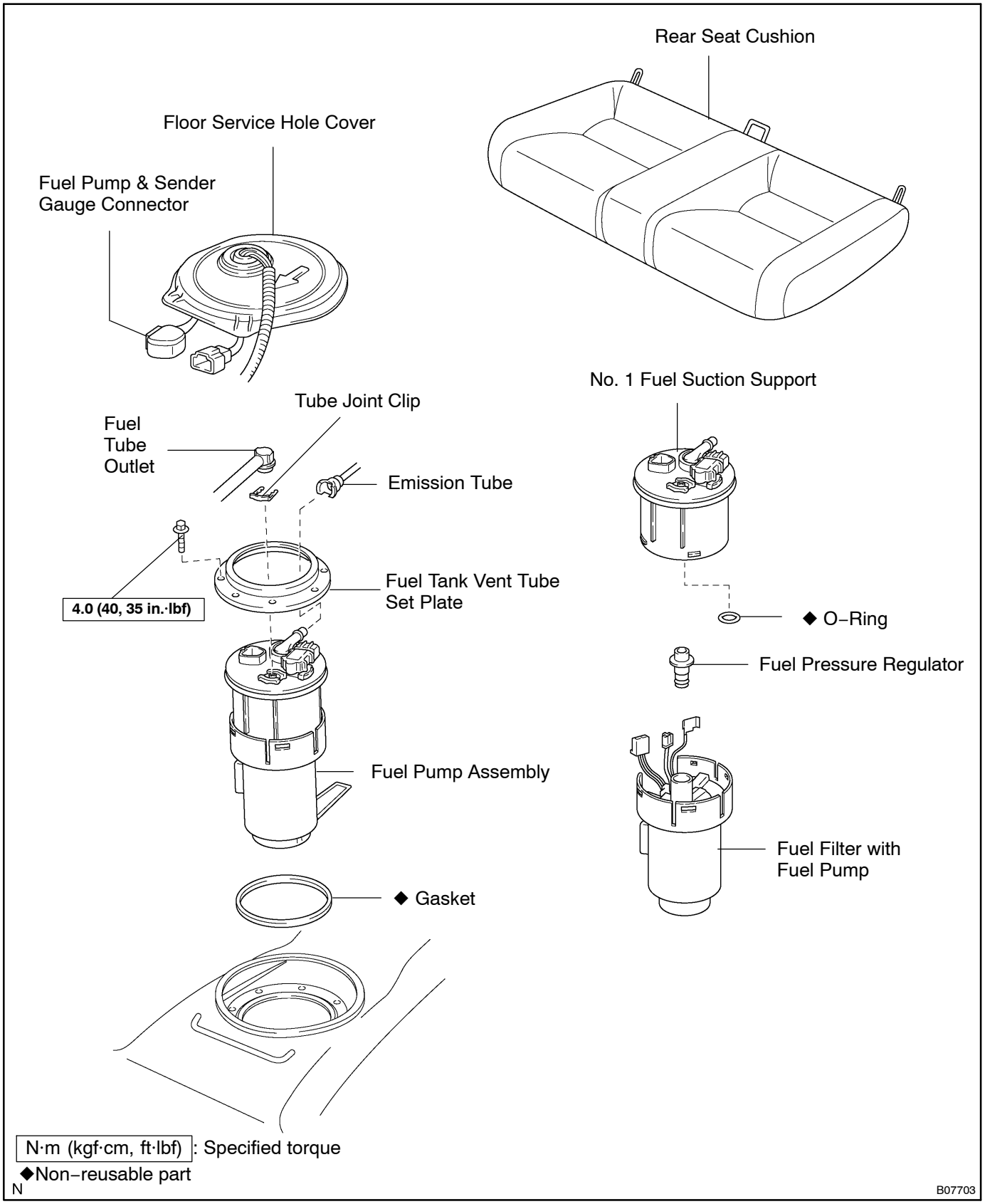
(b) Install the floor carpet.

5. INSTALL REAR SEAT CUSHION

FUEL PRESSURE REGULATOR

SF09E–12

COMPONENTS



SF13R–07

REMOVAL

1. REMOVE FUEL PUMP ASSEMBLY FROM FUEL TANK (See page SF–11)

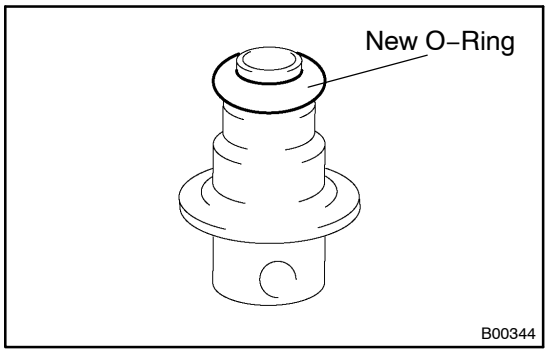
2. REMOVE NO. 1 FUEL SUCTION SUPPORT (See page SF–12)

3. REMOVE FUEL PRESSURE REGULATOR

(a) Pull out the pressure regulator.

(b) Remove the O–ring from the pressure regulator.

SF0Z6–14



INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

(a) Install the O–ring to the pressure regulator.

HINT:

Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.

(b) Connect the pressure regulator from the fuel filter.

2. INSTALL NO. 1 FUEL SUCTION SUPPORT
(See page SF–13)

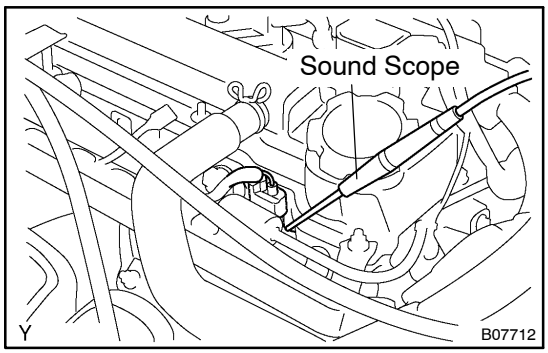
3. INSTALL FUEL PUMP ASSEMBLY TO FUEL TANK
(See page SF–14)

INJECTOR

SF15O–10

ON–VEHICLE INSPECTION

1. REMOVE NO. 2 CYLINDER HEAD COVER



2. CHECK OPERATION SOUND FROM EACH INJECTOR

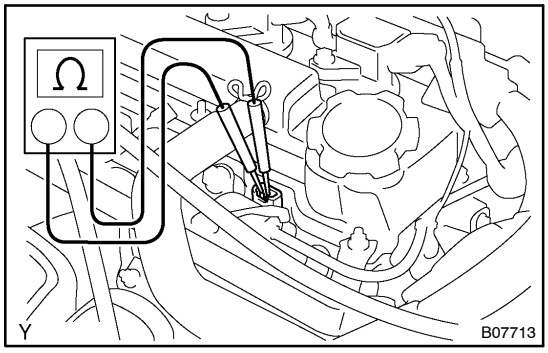
(a) Connect the PCV hose to cylinder head cover.

(b) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.

(c) If you have no sound scope, you can check the injector transmission operation with your finger.

If no sound or unusual sound is heard, check the wiring connector, injector signal from the ECM.

(d) Disconnect the PCV hose from cylinder head cover.



3. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 13.4 – 14.2 Ω at 20°C (68°F)

If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

4. INSTALL WIRE HARNESS PROTECTOR COVER

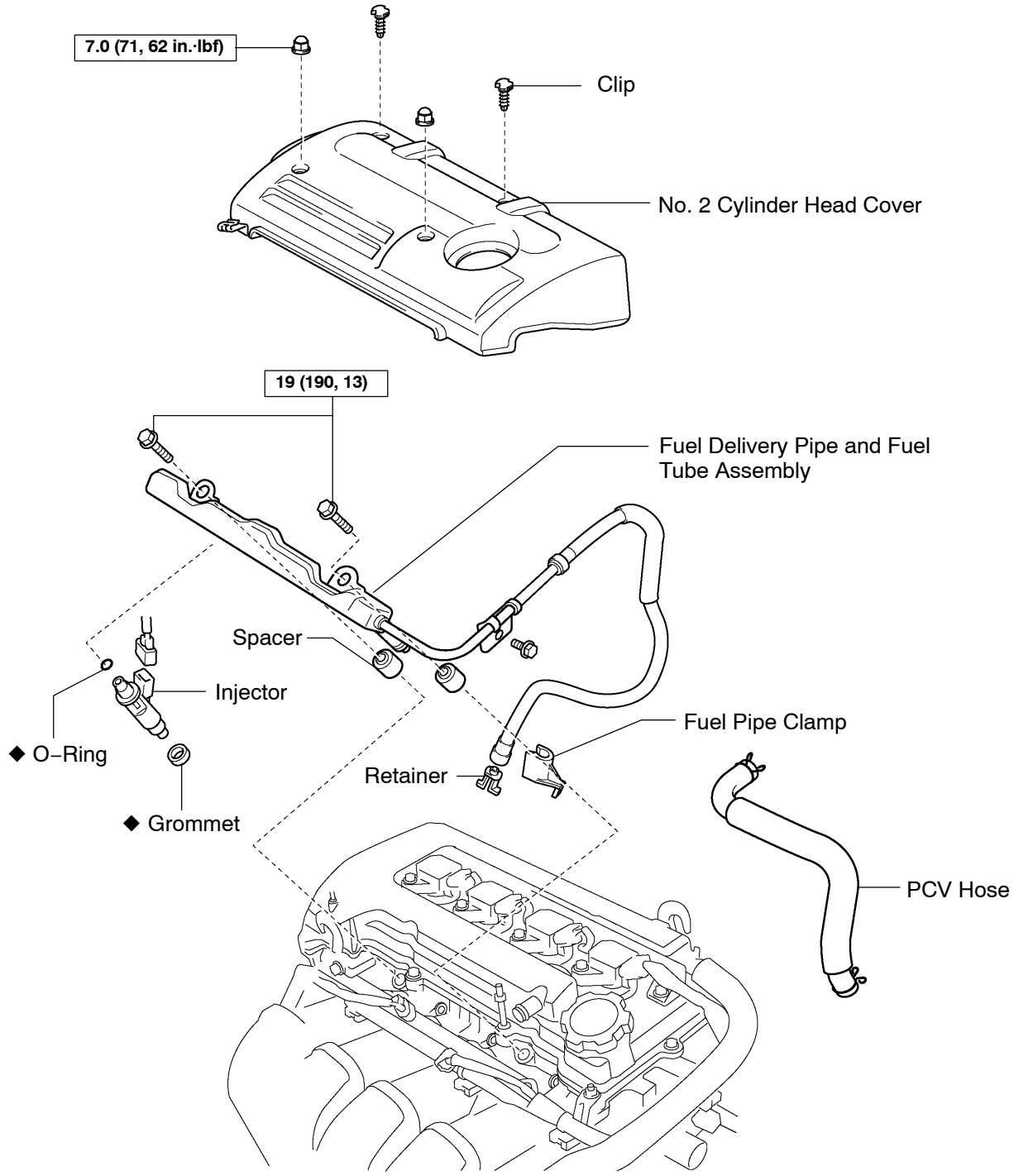
(a) Install the wire harness protector cover with bolt and 2 nuts.

(b) Connect the PCV hose to cylinder head cover.

SF15P–05

COMPONENTS

1ZZ–FE:



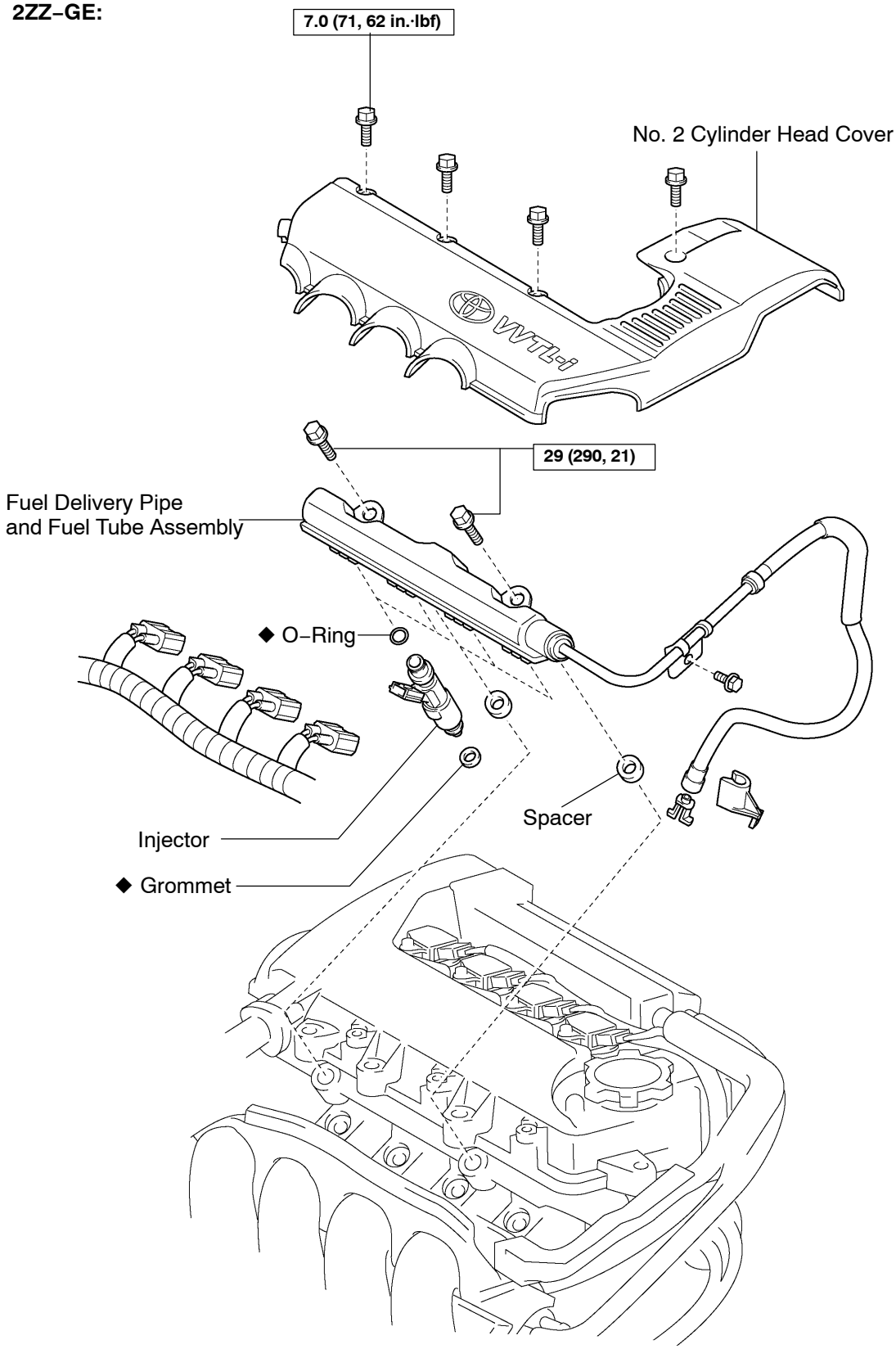
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

Y

B09173

2ZZ–GE:



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

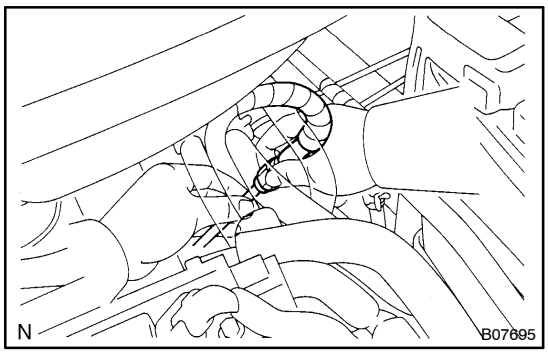
B07714

SF15Q–08

REMOVAL

1. REMOVE NO. 2 CYLINDER HEAD COVER

2. 1ZZ–FE:
REMOVE PCV HOSE



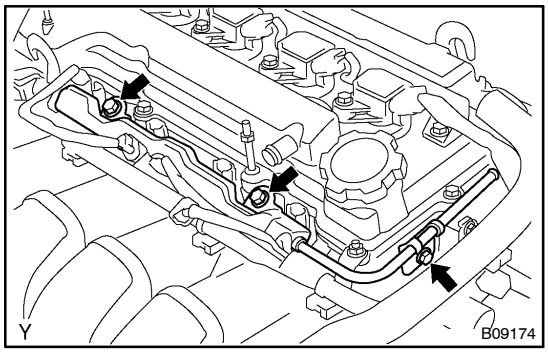
3. DISCONNECT FUEL TUBE

(a) Remove the fuel pipe clamp.

(b) Disconnect the fuel tube (fuel tube connector) from the fuel pipe.

CAUTION:

- **Perform disconnecting operations of the fuel tube connector (quick type) after observing the precautions.**
- **As there is retained pressure in the fuel pipe line, prevent it from splashing inside the engine compartment.**



4. REMOVE DELIVERY PIPE AND INJECTORS

NOTICE:

Be careful not to drop the injectors when removing the delivery pipe.

(a) Disconnect the 4 injector connectors from injector.

(b) Remove the 3 bolts and delivery pipe together with the 4 injectors and fuel pipe.

(c) Remove the 2 spacers from the cylinder head.

(d) Pull out the 4 injectors from the delivery pipe.

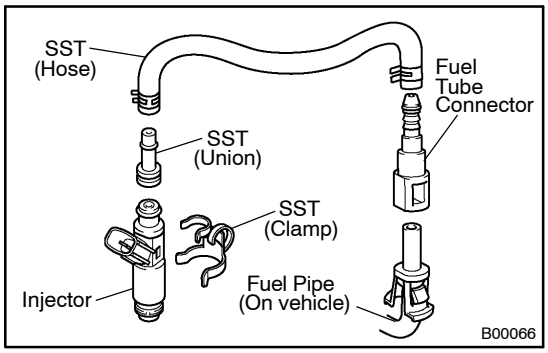
(e) Remove the O–ring and grommet from each injector.

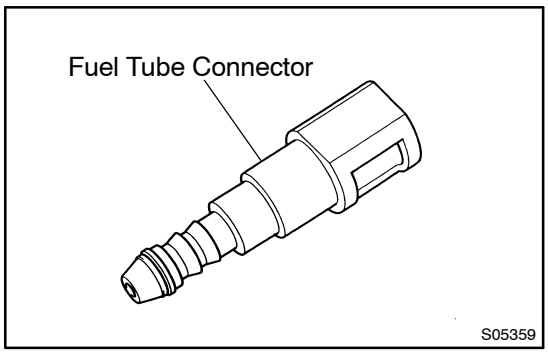
SF09K–17

INSPECTION

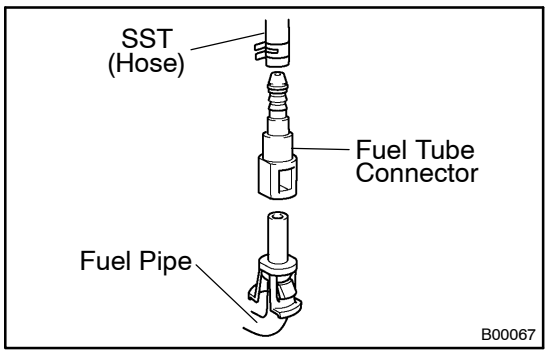
1. INSPECT INJECTOR INSPECTION

CAUTION:
Keep injector clear of sparks during the test.



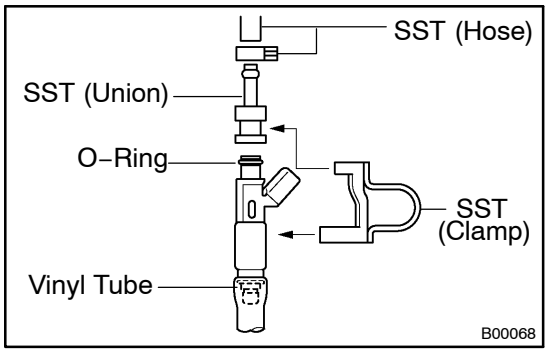


(a) Purchase the new fuel tube and take out the fuel tube connector from its pipe.
Part No. 23901–22010



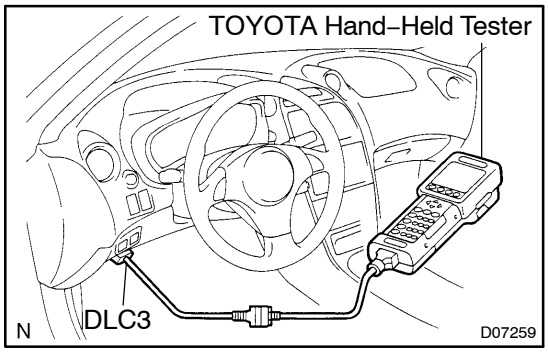
(b) Connect SST (hose) and fuel tube connector to the fuel pipe.
SST 09268–41047

CAUTION:
Perform connecting operations of the fuel tube connector (quick type) after observing the precautions.



(c) Install the grommet and O–ring to the injector.
(d) Connect SST (union and hose) to the injector, and hold the injector to prevent gasoline from splashing out.
SST 09268–41047
(e) Put the injector into a graduated cylinder.

HINT:
Install a suitable vinyl tube onto the injector to prevent gasoline from splashing out.

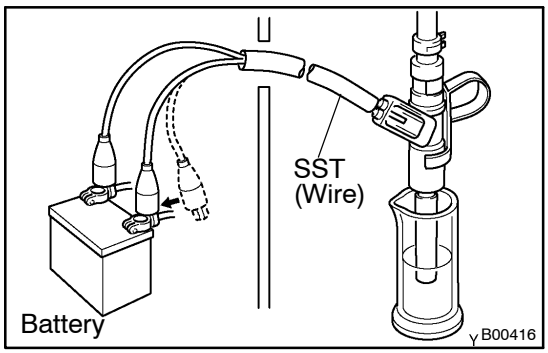


(f) Connect the TOYOTA hand–held tester to the DLC3.
(g) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

NOTICE:
Do not start the engine.

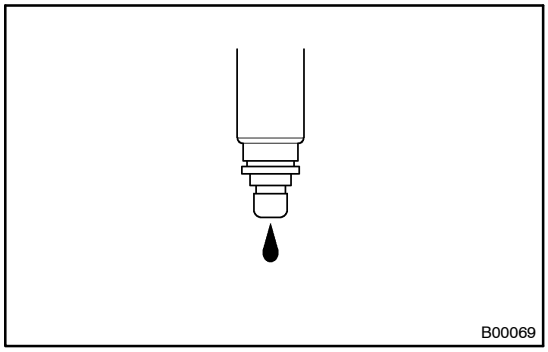
(h) Select the active test mode on the TOYOTA hand–held tester.
(i) Please refer to the TOYOTA hand–held tester operator's manual for further details.

(j) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–18).



(k) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30080
Volume:
47 – 58 cm^3 (2.7 – 3.3 cu in.) per 15 sec.
Difference between each injector:
10 cm^3 (0.6 cu in.) or less

If the injection volume is not as specified, replace the injector.



2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30080
Fuel drop:
1 drop or less per 12 minutes

(b) Turn the ignition switch to LOCK.

(c) Disconnect the negative (–) terminal cable from the battery.

(d) Remove the SST and fuel tube connector.
SST 09268–41047

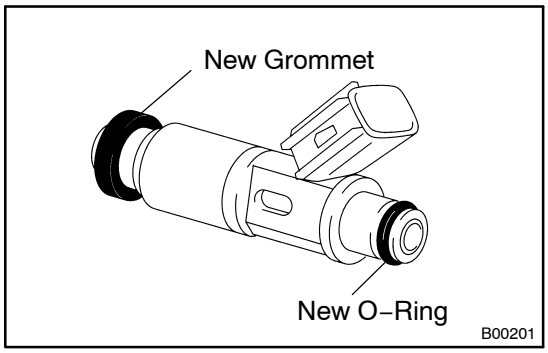
CAUTION:

- **Perform disconnecting operations of the fuel tube connector (quick type) after observing the precautions.**
- **As there is retained pressure in the fuel pipe line, prevent it from splashing inside the engine compartment.**

(e) Disconnect the TOYOTA hand–held tester from the DLC3.

SF09L–12

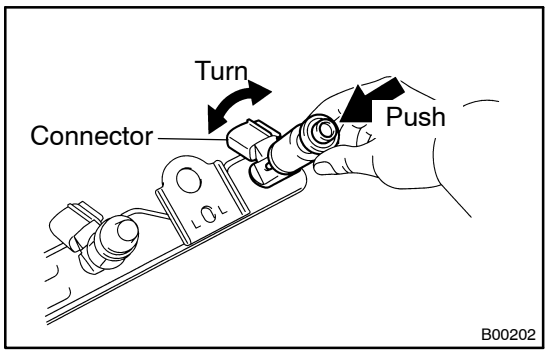
INSTALLATION



1. INSTALL INJECTORS AND DELIVERY PIPES

(a) Install the grommet to each injector.

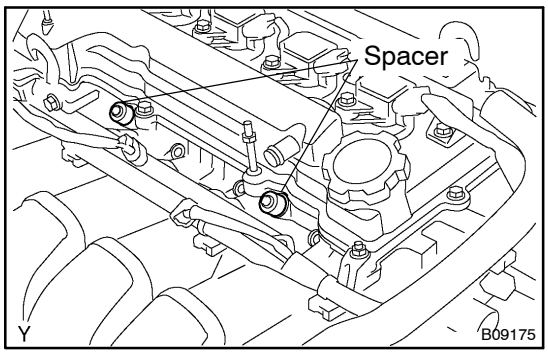
(b) Apply a light coat of spindle oil or gasoline to new O–ring and install them to each injector.



(c) Apply a light coat of spindle oil or gasoline on the place where a delivery pipe touches on O–ring.

(d) While turning the injector clockwise and counterclockwise, push it to the delivery pipes. Install the 4 injectors.

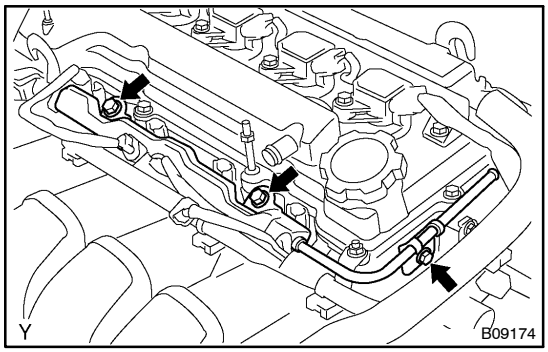
(e) Position the injector connector outward.



(f) Place the 2 spacers in position on the cylinder head.

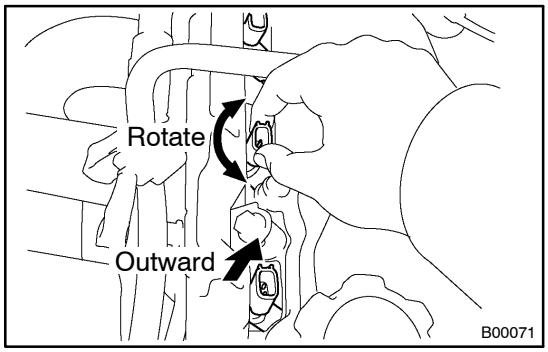
(g) Apply a light coat of spindle oil or gasoline on the place where a cylinder head touches an O–ring of the injector.

(h) Place the delivery pipe and fuel pipe together with the 4 injectors in position on the cylinder head.



(i) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.

(j) Temporarily install the bolt holding the fuel pipe to the cylinder head.

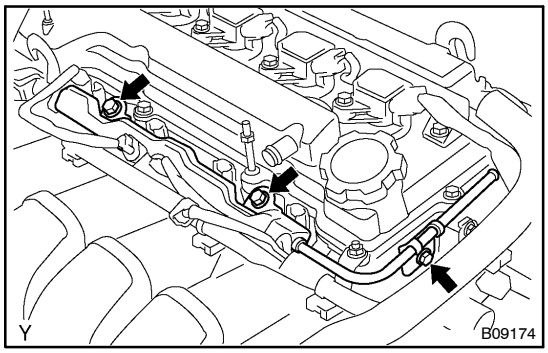


(k) Check that the injectors rotate smoothly.

HINT:

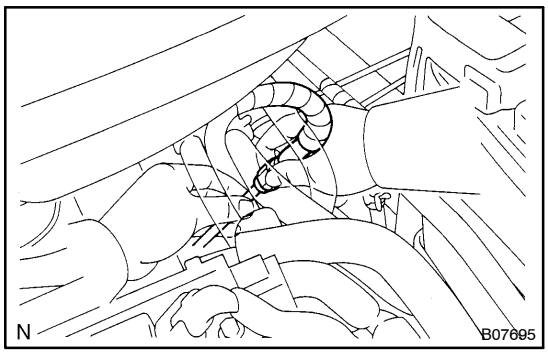
If injectors do not rotate smoothly, the probable cause is incorrect installation of O–ring. Replace the O–ring.

(l) Position the injector connector outward.



(m) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque:
1ZZ–FE: 19 N·m (190 kgf·cm, 14 ft·lbf)
2ZZ–GE: 29 N·m (290 kgf·cm, 21 ft·lbf)

(n) Tighten the bolt holding the fuel pipe to the cylinder head.
Torque: 9 N·m (92 kgf·cm, 7 ft·lbf)



2. CONNECT FUEL TUBE

(a) Connect the fuel tube (fuel tube connector) to the fuel pipe.

CAUTION:

Perform connecting operations of the connector (quick type) after observing the precautions.

(b) Install the fuel pipe clamp.

3. INSTALL NO. 2 CYLINDER HEAD COVER

FUEL TANK AND LINE

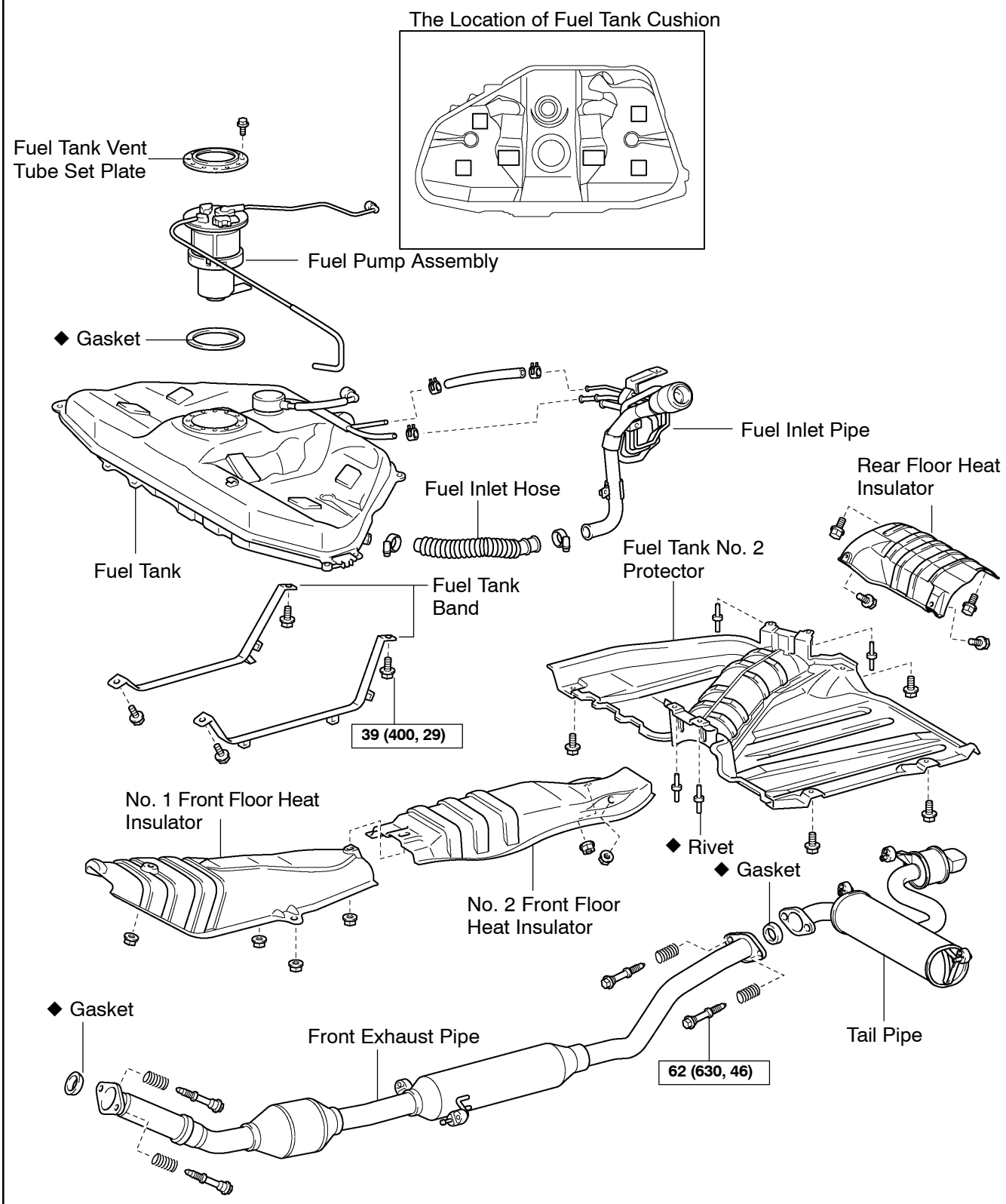
SF09M–06

PRECAUTION

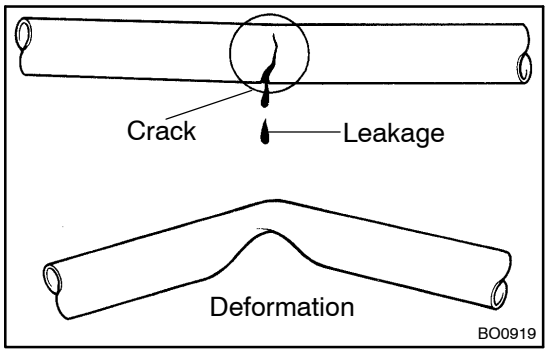
- **Always use new gaskets when replacing the fuel tank or component parts.**
- **Apply the proper torque to all parts tightened.**

SF09N–14

COMPONENTS



SF09O–16

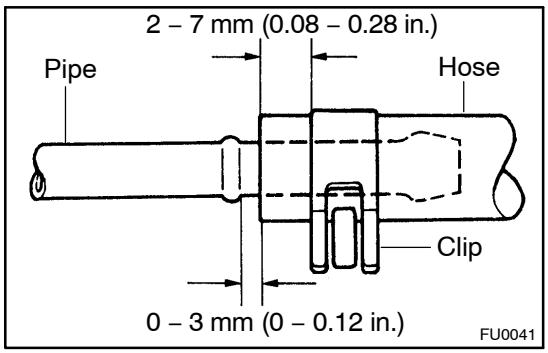


INSPECTION

INSPECT FUEL TANK AND LINE

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.
(b) Check the fuel tank for deformation, cracks fuel leakage or tank band looseness.
(c) Check the filter neck for damage or fuel leakage.
(d) Hose and tube connections are as shown in the illustration.

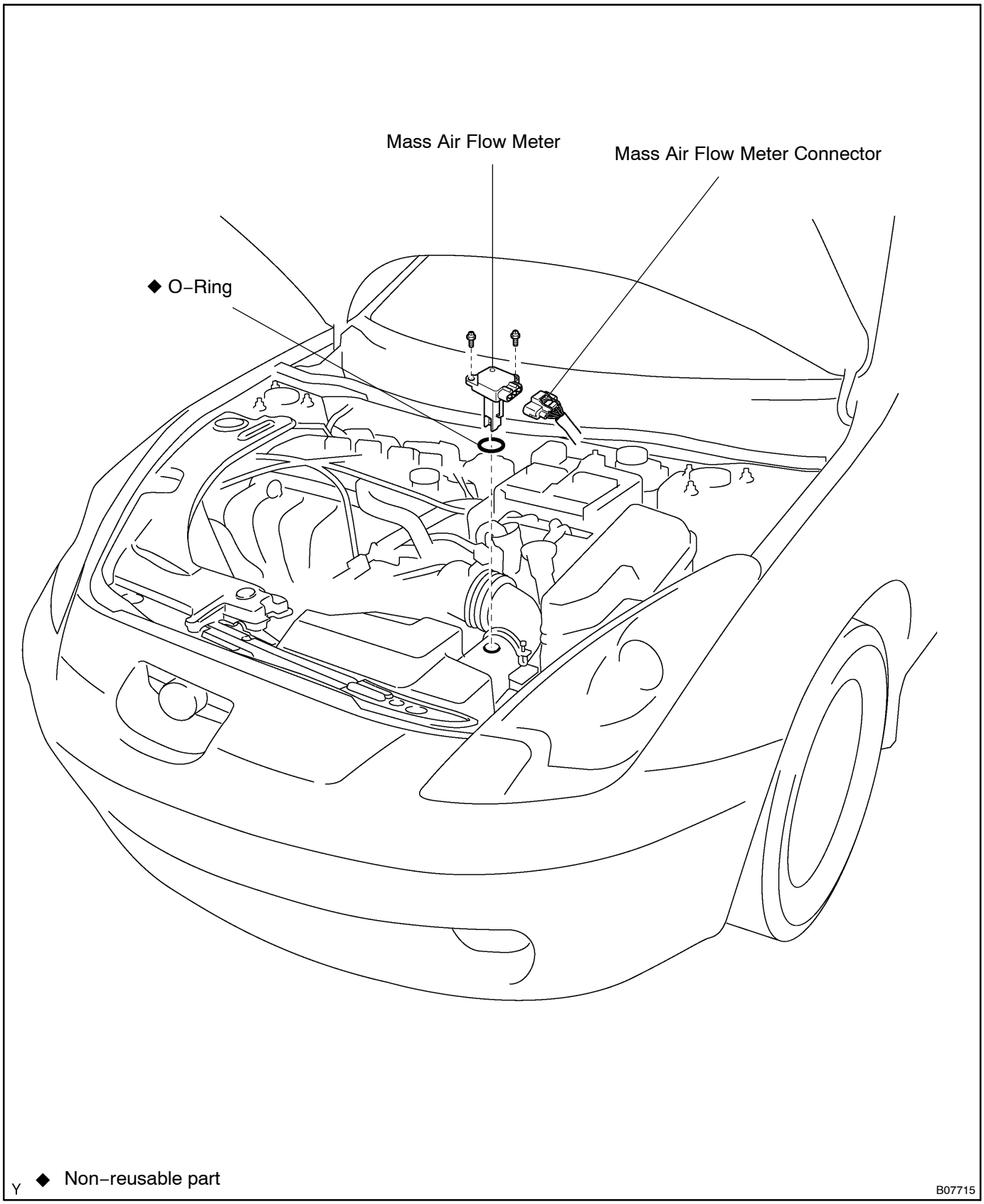
If a problem is found, repair or replace the part as necessary.



MASS AIR FLOW (MAF) METER

COMPONENTS

SF07P–13



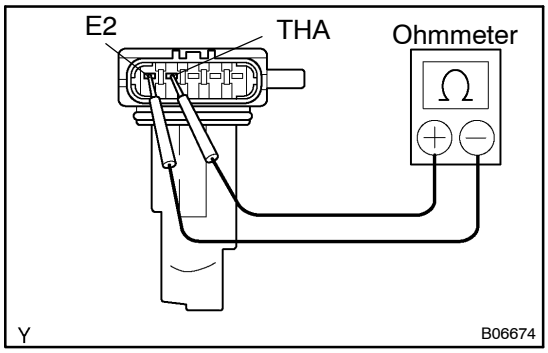
FI0M7–14

REMOVAL

REMOVE AIR FLOW METER

Remove the 2 screws, air flow meter and O–ring.

FI0M8–16



INSPECTION

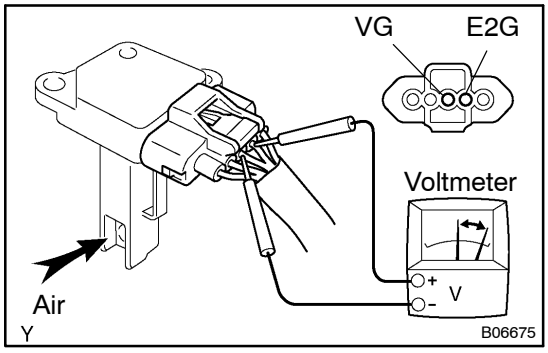
1. INSPECT MAF METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2.

Resistance:

Terminals	Resistance	Temperature
THA – E2	13.6 – 18.4 kΩ	–20°C (–4°F)
THA – E2	2.21 – 2.69 kΩ	20°C (68°F)
THA – E2	0.49 – 0.67 kΩ	60°C (140°F)

If the resistance is not as specified, replace the MAF meter.



2. INSPECT MAF METER OPERATION

(a) Connect the MAF meter connector.
(b) Turn the ignition switch to ON.
(c) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E2G.
(d) Blow air into the MAF meter, and check that the voltage fluctuates.

If operation is not as specified, replace the MAF meter.

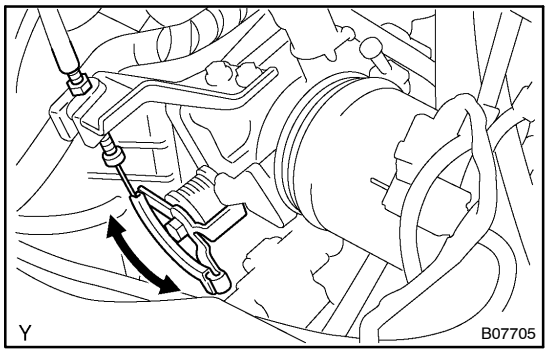
(e) Turn the ignition switch LOCK.
(f) Disconnect the MAF meter connector.

FI0M9–14

INSTALLATION

INSTALL AIR FLOW METER

Install the air flow meter and a new O–ring with 2 screws.



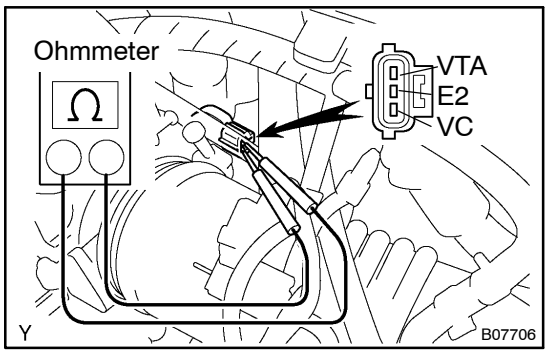
THROTTLE BODY (1ZZ–FE)

SF09P–24

ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

Check that the throttle linkage moves smoothly.



2. INSPECT THROTTLE POSITION SENSOR

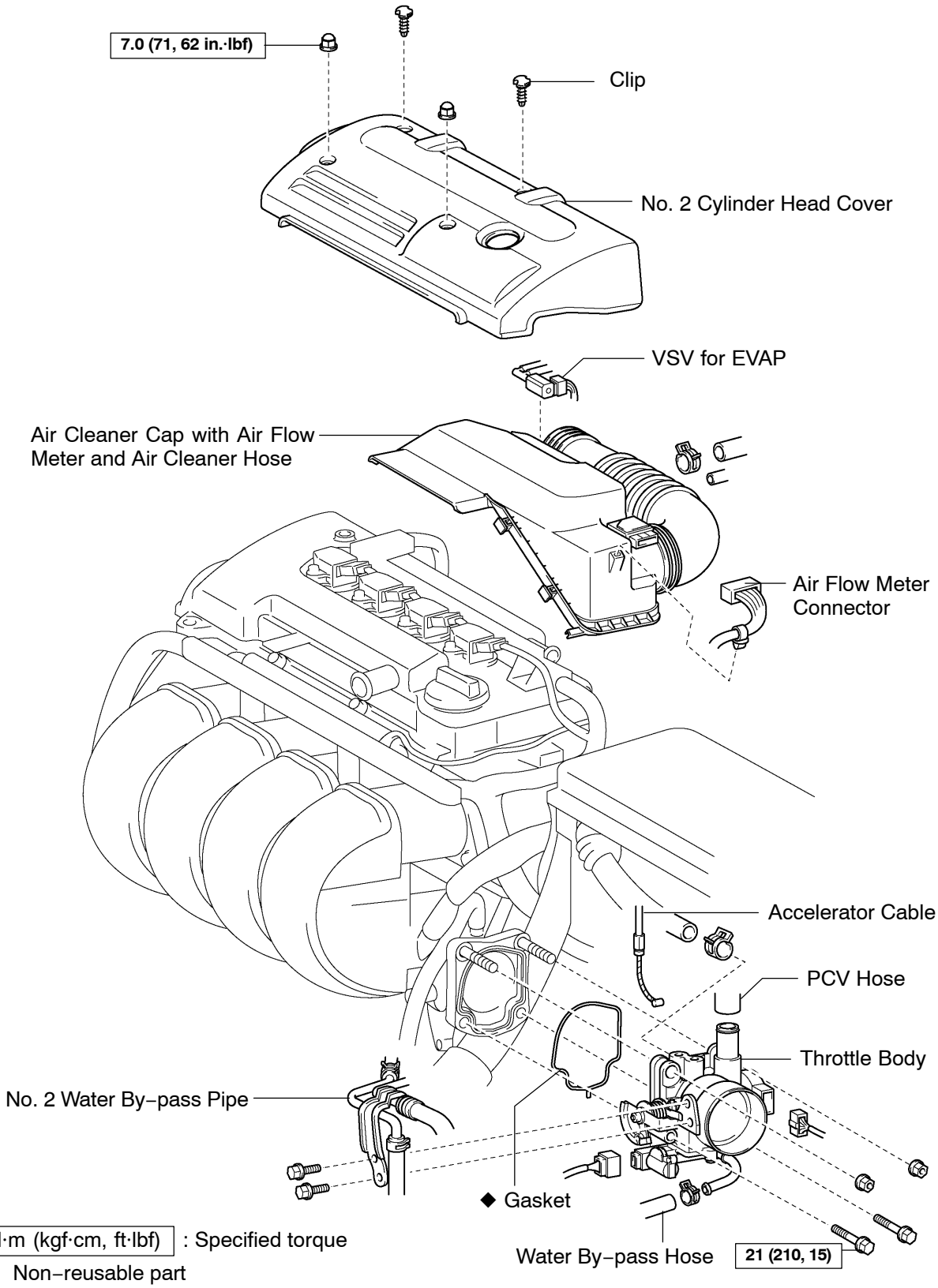
(a) Remove the air cleaner assembly with air flow meter.
(b) Disconnect the throttle position sensor connector.
(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

(d) Reconnect the throttle position sensor connector.
(e) Reinstall the air cleaner assembly with air flow meter.

SF1V7–02

COMPONENTS



SF09R–05

REMOVAL

1. DRAIN ENGINE COOLANT

2. DISCONNECT ACCELERATOR CABLE

3. REMOVE NO. 2 CYLINDER HEAD COVER

4. REMOVE AIR CLEANER HOSE AND CAP WITH MAF METER

(a) Disconnect the VSV for EVAP.

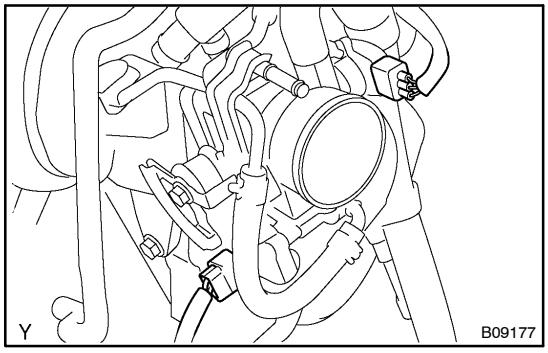
(b) Disconnect the 2 air hoses from air cleaner cap.

(c) Loosen the air cleaner hose clamp bolt.

(d) Disconnect the mass air flow meter connector.

(e) Disconnect the 3 air cleaner cap clips.

(f) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the air cleaner hose.

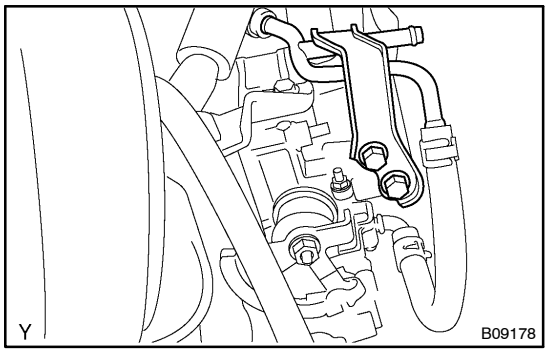


5. REMOVE THROTTLE BODY

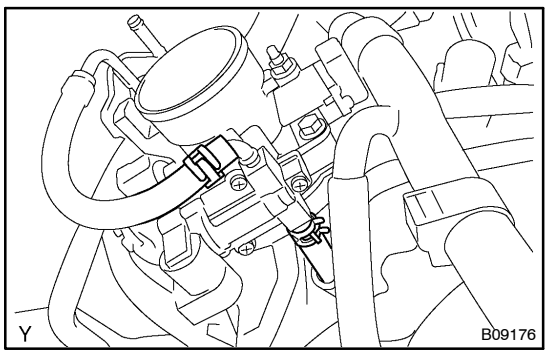
(a) Disconnect the throttle position sensor connector.

(b) Disconnect the IAC valve connector.

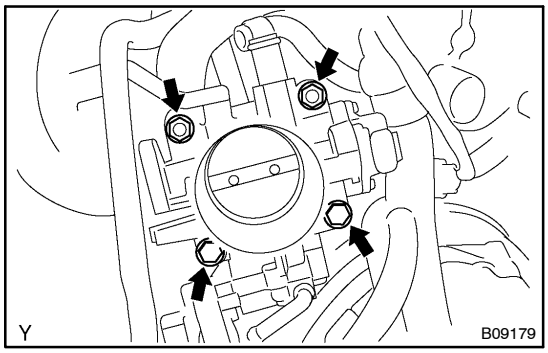
(c) Disconnect the PCV hose from throttle body.



(d) Remove the 2 bolts and disconnect the No. 2 water by–pass pipe.



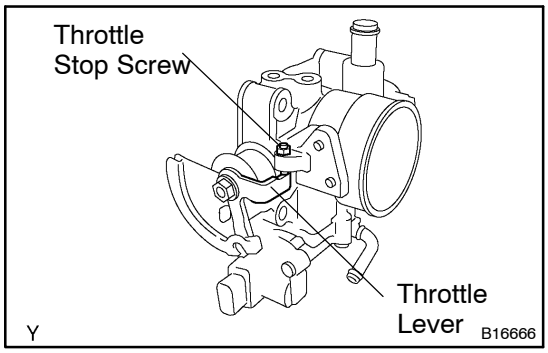
(e) Disconnect the 2 water by–pass hoses.



(f) Remove the 2 bolts, 2 nuts and throttle body from the intake manifold.

(g) Remove the throttle body gasket.

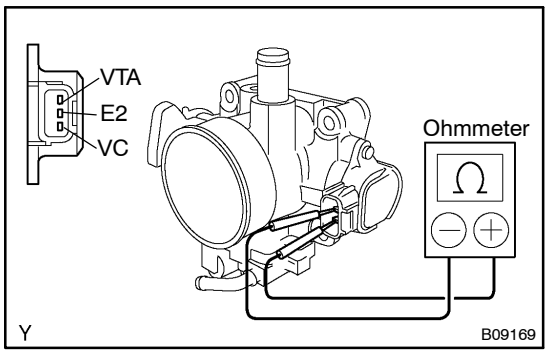
SF09S–14



INSPECTION

1. INSPECT THROTTLE VALVE

Check that there is no clearance between the throttle stop screw and throttle lever when the closed throttle position.



2. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, measure the resistance between each terminal.

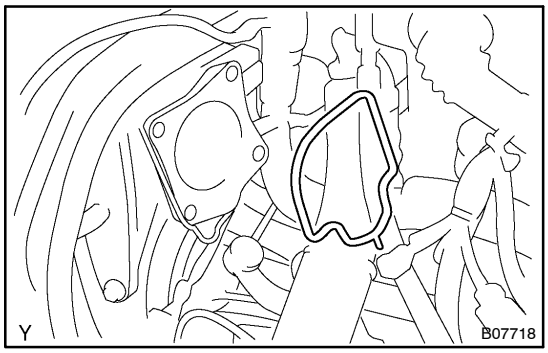
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

SF169–04

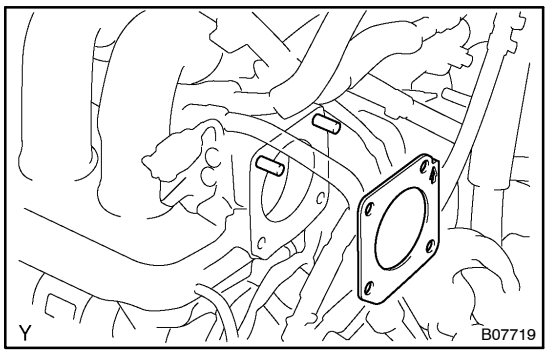
INSTALLATION

1. INSTALL THROTTLE BODY

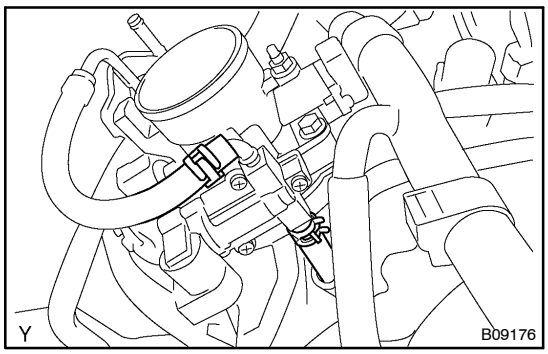
(a) Install a new gasket on the intake manifold, as shown in the illustration.



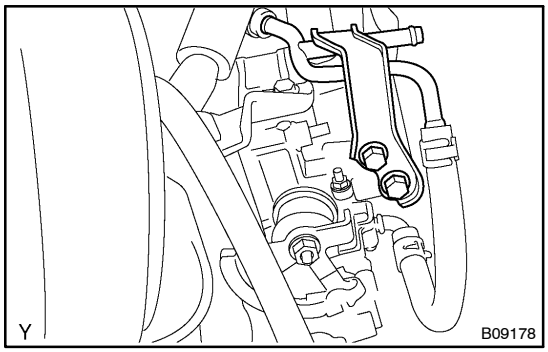
(b) Install the throttle body with the 2 bolts and 2 nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



(c) Connect the 2 water by–pass hoses to the throttle body.



(d) Install the No. 2 water by–pass pipe with the 2 bolts.

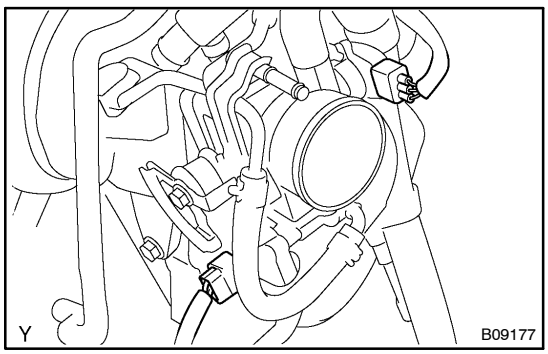


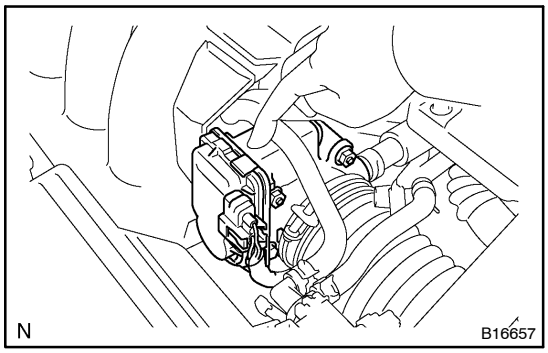
(e) Connect the IAC valve connector.
(f) Connect the throttle position sensor connector.
(g) Connect the PCV hose to throttle body.

2. INSTALL AIR CLEANER HOSE AND CAP WITH MAF METER

3. INSTALL NO. 2 CYLINDER HEAD COVER

4. FILL RADIATOR WITH ENGINE COOLANT





THROTTLE BODY (2ZZ–GE)

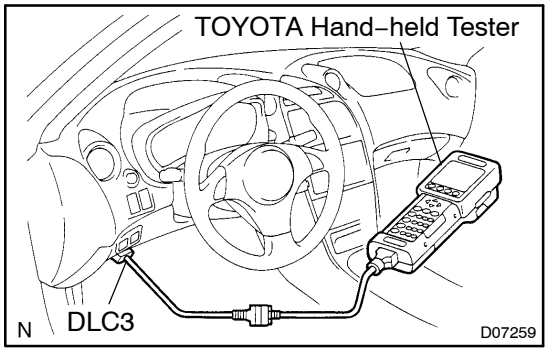
FI0ZU–02

ON–VEHICLE INSPECTION

1. INSPECT SYSTEM OPERATION

(a) Inspect the throttle control motor for operating sound.
  (1) Turn the ignition switch to ON.
  (2) When turning the accelerator pedal, check the running sound of the motor.

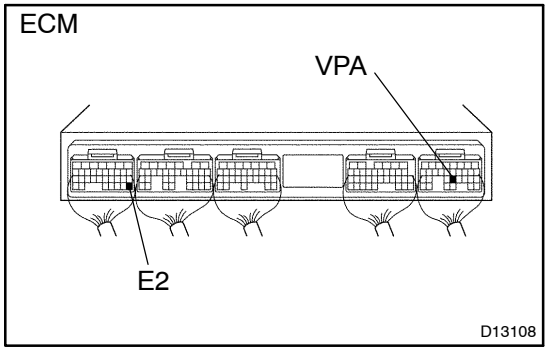
If operation is not as specified, check the throttle control motor (See step 3), wiring and ECM.



(b) Inspect the accelerator pedal position sensor.
  (1) Connect the TOYOTA hand–held tester to the DLC3.
  (2) Turn the ignition switch to ON.
  (3) Check that the MIL does not light up.
  (4) When turning the accelerator pedal position sensor lever to the full–open position, check that the throttle valve opening percentage (THROTTLE POS) of the CURRENT DATA showns the standard value.

Standard throttle valve opening percentage:
60% or more

If operation is not as specified, check that the accelerator pedal position sensor (See page DI–391), wiring and ECM.



If you have no TOYOTA hand–held tester, measure voltage between terminals VPA and E2 of the ECM connector (See page DI–333).

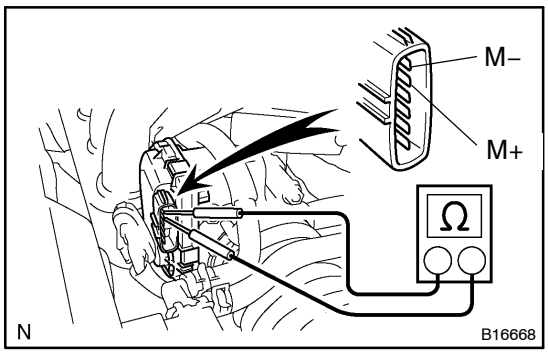
(c) Inspect the idle speed.
  (1) Start the engine and check that the MIL does not light up.
  (2) Allow the engine to warm up to normal operating temperature.

(3) Turn the A/C conditioning ON to OFF, and check the idle speed.

Idle speed (Transmission in neutral):
AT: 750 ± 50 rpm
MT: 800 ± 50 rpm

NOTICE:
Perform inspection under condition without electrical load.

(d) After checking the above (b) to (d), perform the driving test and check that there is no sense of incongruity.



2. INSPECT THROTTLE CONTROL MOTOR

(a) Disconnect the throttle control motor connector.

(b) Using an ohmmeter, measure the motor resistance between terminal 1 (M–) and 2 (M+).

Motor resistance: 0.3 – 100 Ω at 20˚C (68˚F)

If the resistance is not as specified, replace the throttle body (See page SF–42).

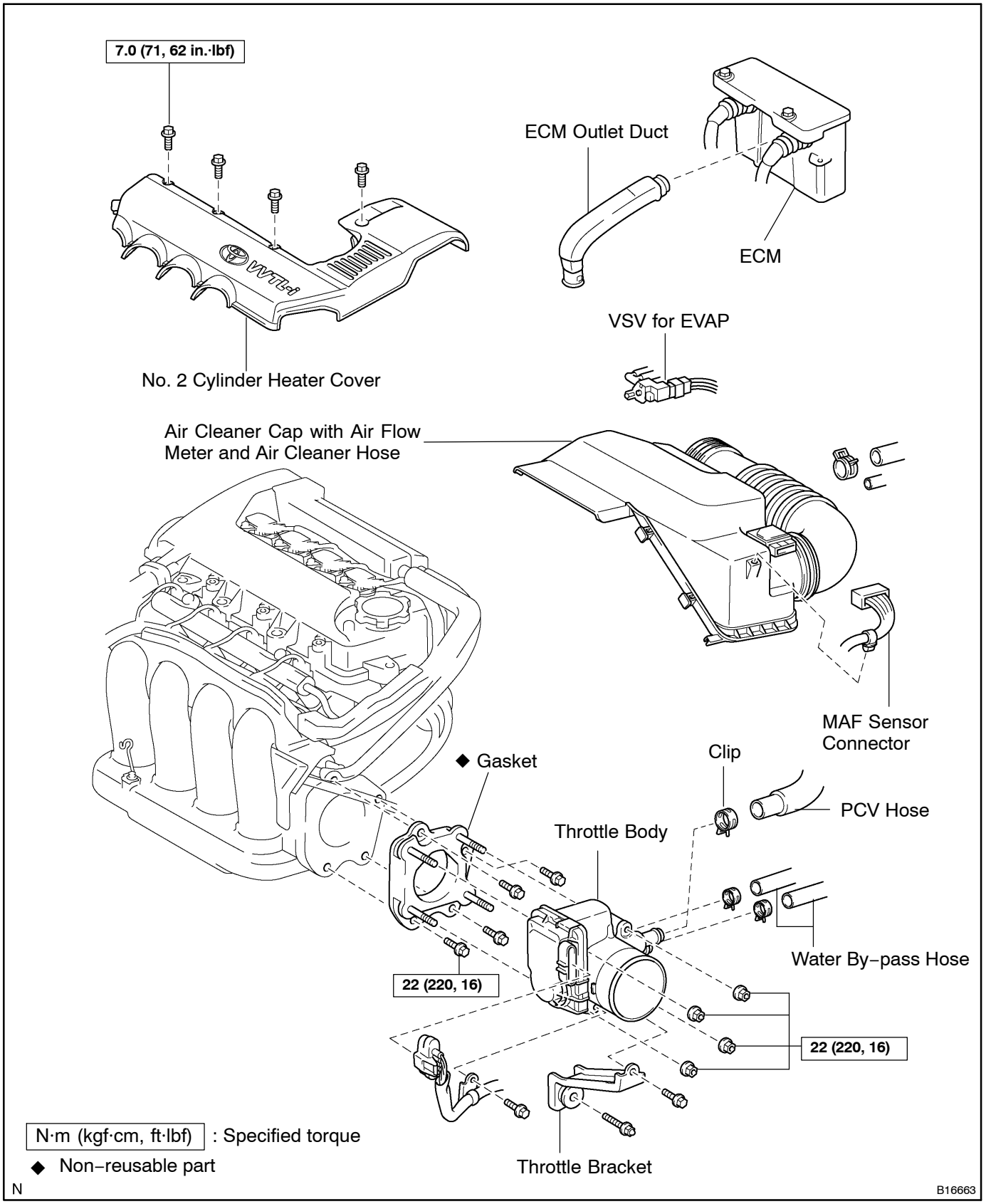
(c) Reconnect the throttle control motor connector.

3. INSPECT THROTTLE POSITION SENSOR (See page DI–597)

If necessary, replace the throttle position sensor (See page SF–76).

FI0ZR–02

COMPONENTS



FI0ZS–03

REMOVAL

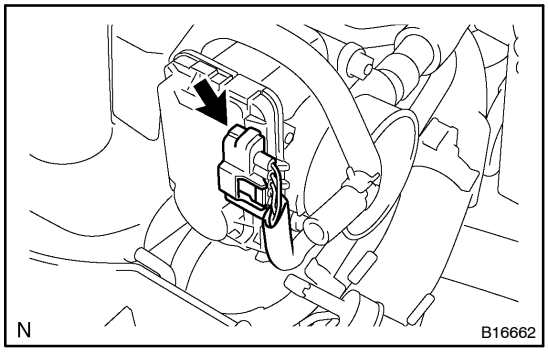
1. DISCONNECT BATTERY NEGATIVE TERMINAL

2. DRAIN ENGINE COOLANT

3. REMOVE NO.2 CYLINDER HEAD COVER

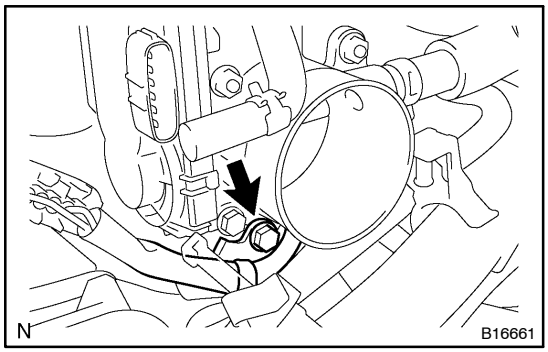
4. REMOVE AIR CLEANER HOSE AND CAP WITH MAF METER

(a) Disconnect the VSV for EVAP.
(b) Disconnect the 2 air hoses from air cleaner cap.
(c) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the mass air flow meter connector.
(e) Disconnect the 3 air cleaner cap clips.
(f) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the air cleaner hose.



5. DISCONNECT THROTTLE BODY CONNECTOR

Disconnect the throttle body connector.

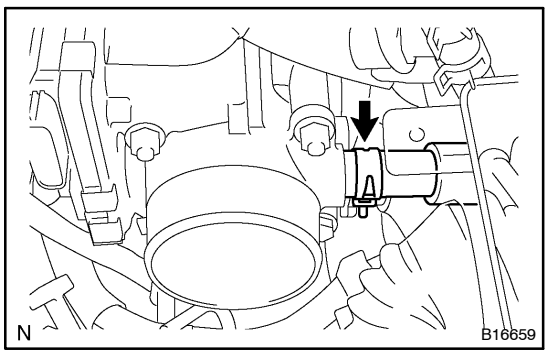


6. DISCONNECT THROTTLE BODY WIRE HARNESS CLAMP

Remove the bolt and disconnect the throttle body wire harness clamp from the throttle body.

7. REMOVE THROTTLE BRACKET

Remove the 2 bolts and throttle bracket from the throttle body.

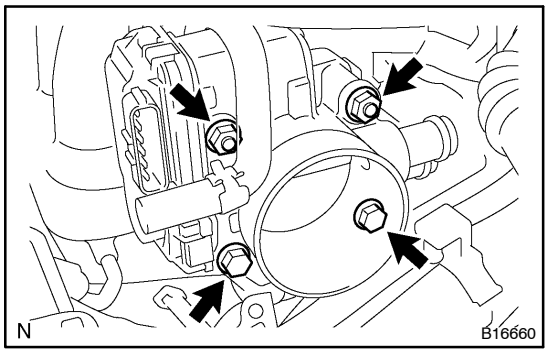


8. DISCONNECT PCV HOSE

Slid the clip and disconnect the PCV hose.

9. DISCONNECT 2 WATER BY–PASS HOSES

Slid the clips and disconnect the 2 water by–pass hoses.



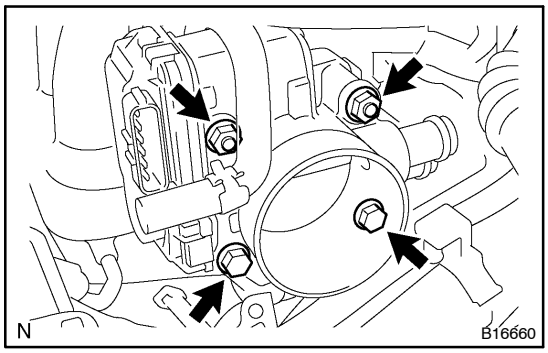
10. REMOVE THROTTLE BODY

(a) Remove the 4 nuts and throttle body from the intake manifold.

(b) Remove the 4 bolts and throttle body gasket.

FI0ZT–02

INSTALLATION



1. INSTALL THROTTLE BODY

(a) Install a new gasket on the intake manifold with the 4 bolts.

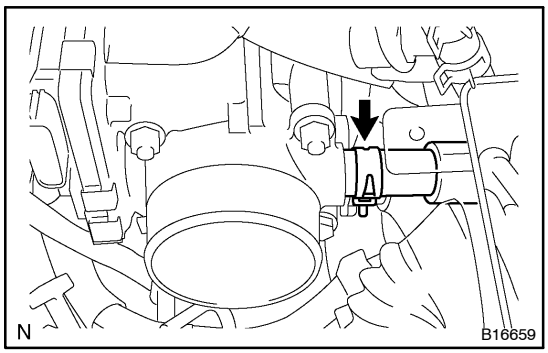
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

(b) Install the throttle body with the 4 nuts.

Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

2. CONNECT 2 WATER BYPASS HOSES

Connect the 2 water bypass hoses with the clips.

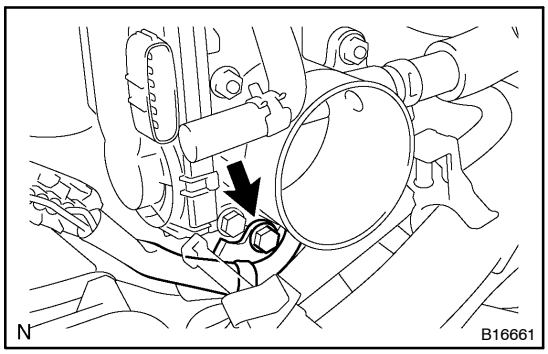


3. CONNECT PCV HOSE

Connect the PCV hose with the clip.

4. INSTALL THROTTLE BRACKET

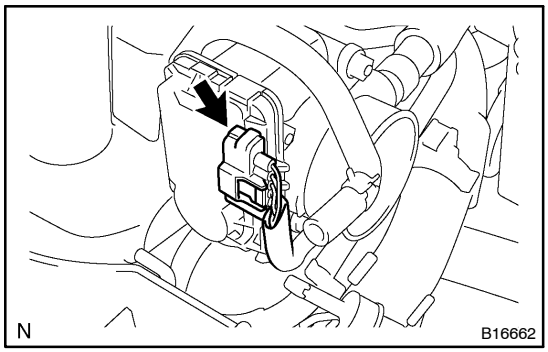
Install the throttle bracket with the 2 bolts.



5. CONNECT THROTTLE BODY WIRE HARNESS CLAMP

Connect the throttle body wire harness clamp with the bolt to the throttle body.

Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)



6. CONNECT THROTTLE BODY CONNECTOR

Connect the throttle body connector.

7. INSTALL AIR CLEANER HOSE AND CAP WITH MAF METER

8. INSTALL No.2 CYLINDER HEAD COVER

9. FILL RADIATOR WITH ENGINE COOLANT

10. CONNECT BATTERY NEGATIVE TERMINAL

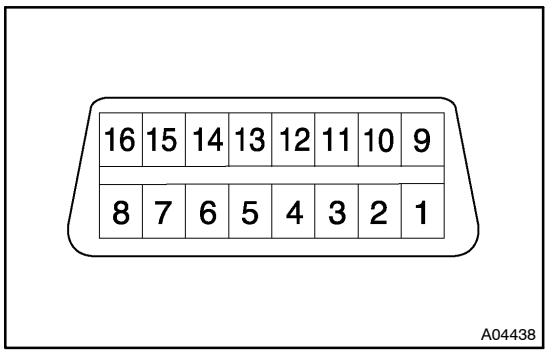
IDLE AIR CONTROL (IAC) VALVE

SF09U–12

ON–VEHICLE INSPECTION

INSPECT IAC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral
- A/C switch OFF



(b) Using SST, connect terminals TC and CG of the DLC3.
SST 09843–18020

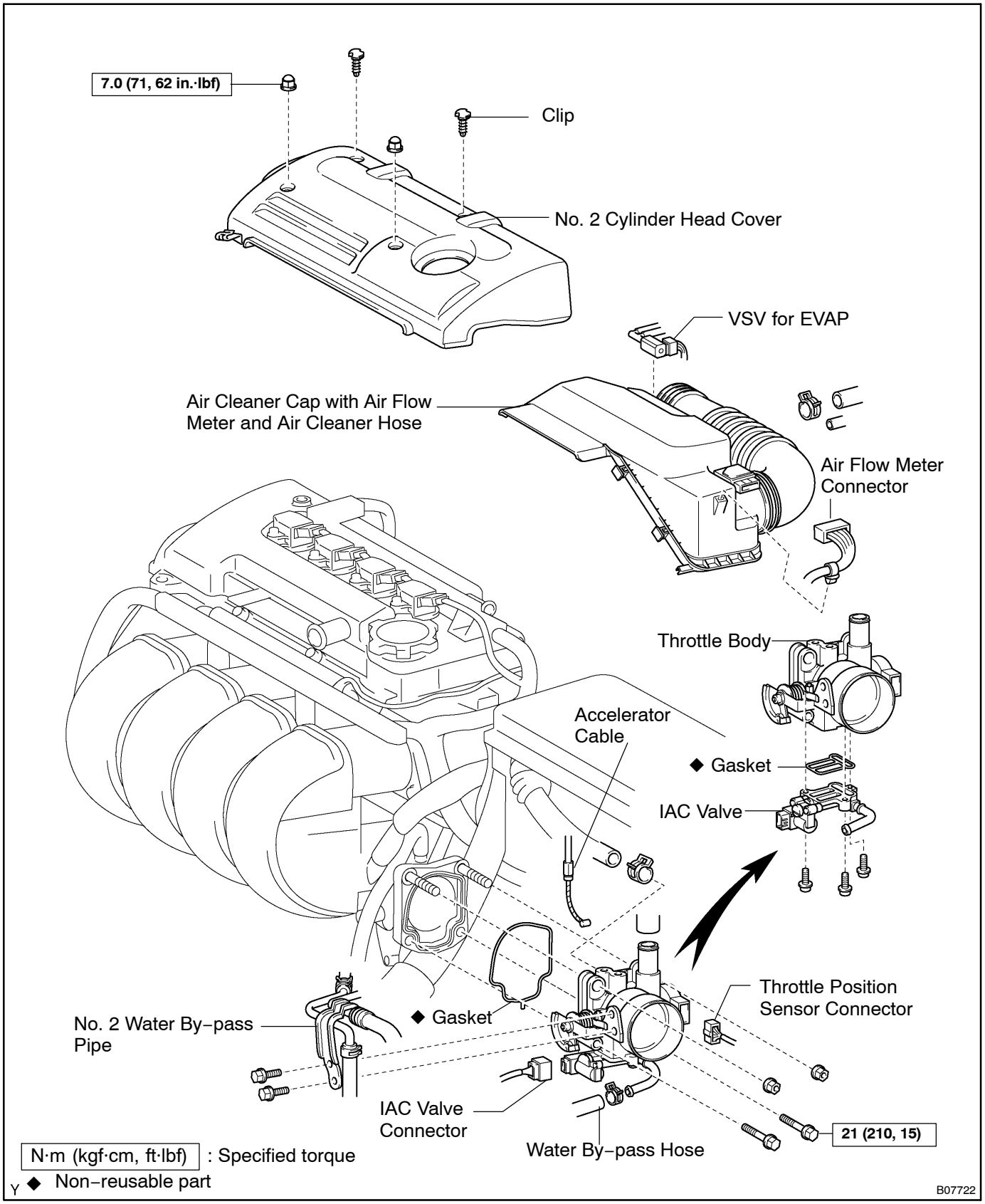
(c) After engine speed are kept at 900 – 1,300 rpm for 5 seconds, check that they return to idle speed.

If the rpm operation is not as specified, check the IAC valve, wiring and ECM.

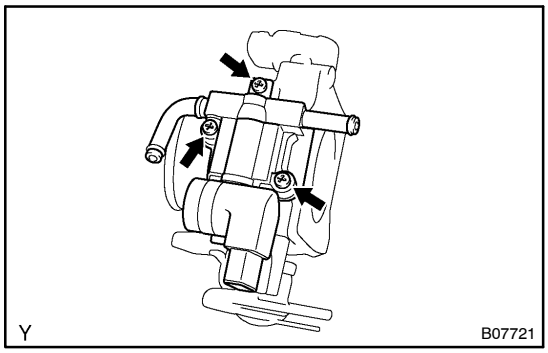
(d) Remove the SST from the DLC3.
SST 09843–18020

SF1V8–02

COMPONENTS



SF09W–11



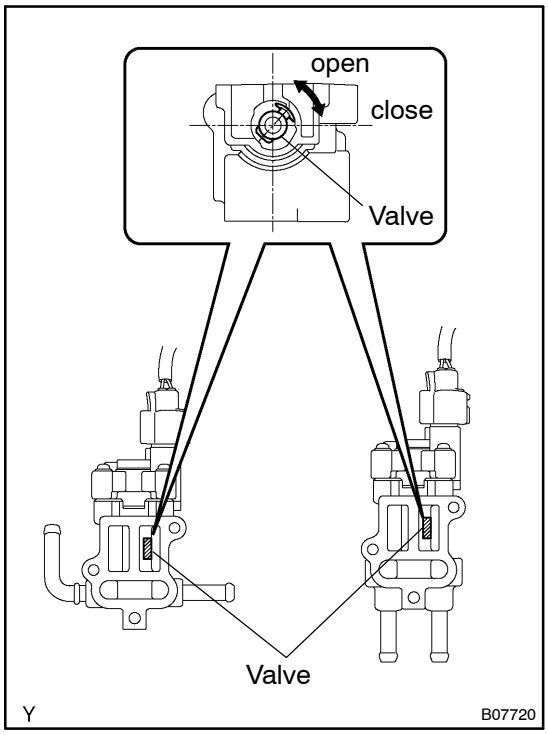
REMOVAL

1. REMOVE THROTTLE BODY
(See page SF–35)

2. REMOVE IAC VALVE

Remove the 4 screws, IAC valve and gasket.

SF09X–10



INSPECTION

INSPECT IAC VALVE OPERATION

(a) Check that the IAC valve is half opened.
(b) Connect the IAC valve connector to the IAC valve.
(c) Disconnect the ECT sensor connector from the ECT sensor.
(d) Turn the ignition switch ON.
(e) Check that the IAC valve moves.

HINT:

Repeat connecting and disconnecting of IAC valve connector several times and check the operation of the valve.

If operation is not as specified, replace the IAC valve.

(f) Turn the ignition switch OFF.
(g) Connect the ECT sensor connector to the ECT sensor.
(h) Disconnect the IAC valve connector from the IAC valve.

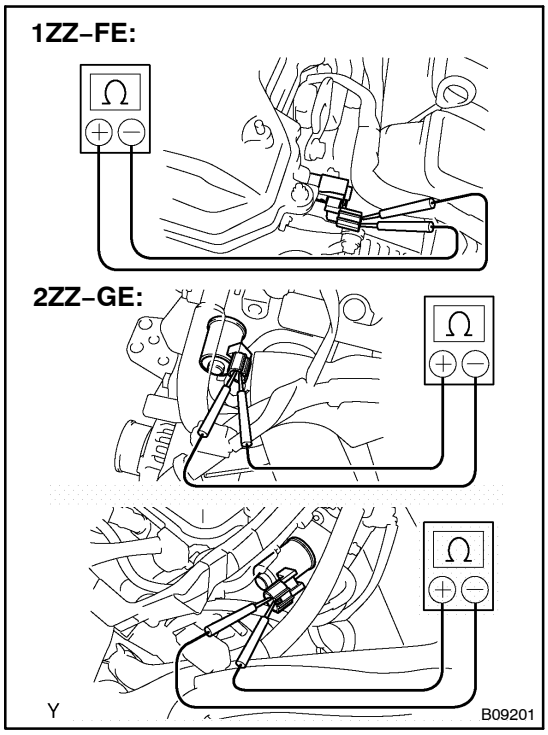
SF09Y–07

INSTALLATION

Installation is in reverse order of removal (See page SF–47).

HINT:

Install the IAC valve with a new gasket.



CAMSHAFT TIMING OIL CONTROL VALVE

SF0SL–26

ON–VEHICLE INSPECTION

INSPECT OIL CONTROL VALVE RESISTANCE

(a) Remove the No. 2 cylinder head cover.
(b) 2ZZ–GE:
Disconnect the 2 PCV hoses.
(c) Disconnect the oil control valve connector.
(d) Using an ohmmeter, measure the resistance between the terminals.
Resistance: 6.9 – 7.9 Ω at 20˚C (68˚F)

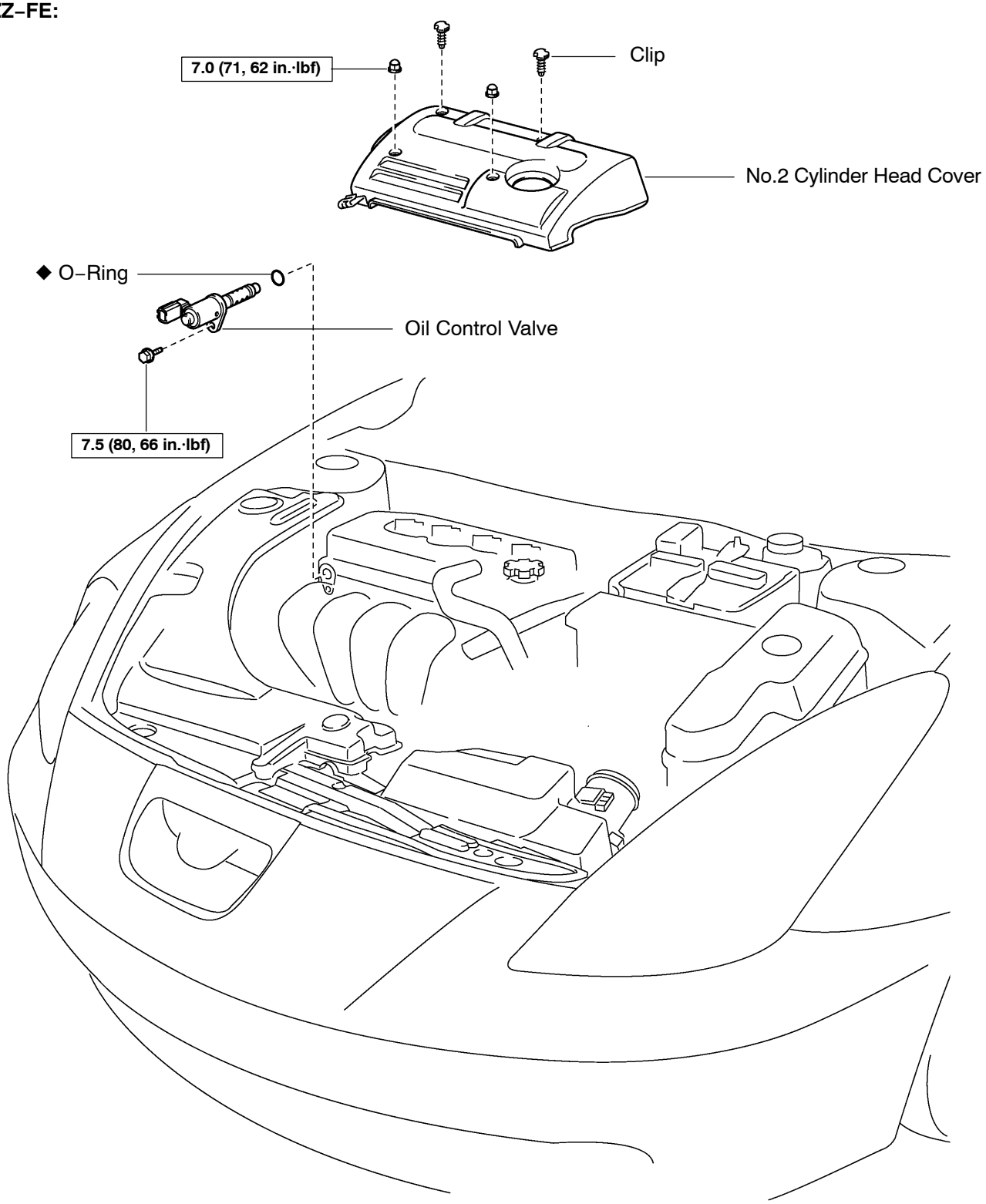
If the resistance is not as specified, replace the valve.

(e) Reconnect the oil control valve connector.
(f) Reinstall the V–bank cover.

SF15V–05

COMPONENTS

1ZZ–FE:

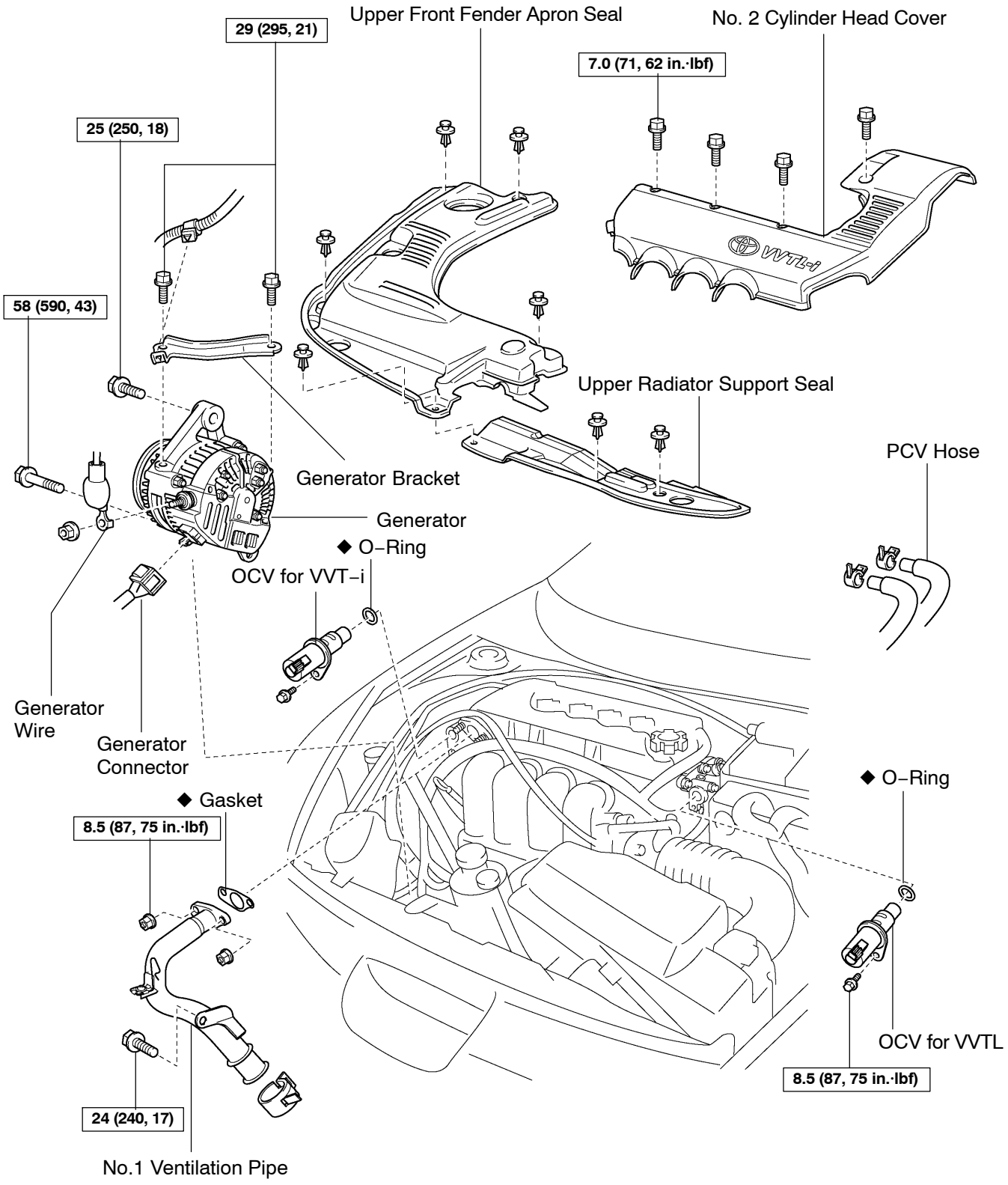


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

B09200

2ZZ–GE:



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

B07724

SF0ZY–10

REMOVAL

1. REMOVE NO. 2 CYLINDER HEAD COVER

2. 2ZZ–GE:
DISCONNECT 2 PCV HOSES, UPPER FRONT FENDER APRONS EAL AND UPPER RADIATOR SUPPORT SEAL

3. 2ZZ–GE:
REMOVE GENERATOR (See page CH–7)

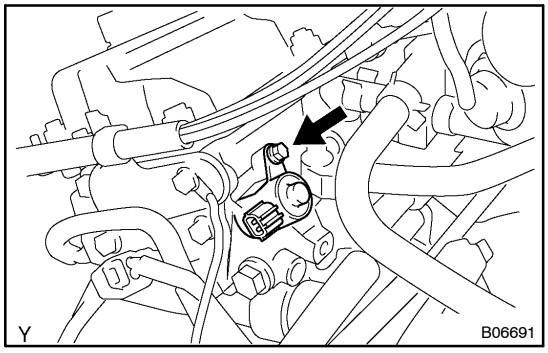
4. 2ZZ–GE:
REMOVE NO. 1 VENTILATION PIPE

(a) Remove the 2 nuts, bolt and gasket.

HINT:

At the time of installation, please refer to the following items.
Use a new gasket.

(b) Remove the hose clamp and disconnect No.1 ventilation pipe.



5. 1ZZ–FE:
REMOVE CAMSHAFT TIMING OIL CONTROL VALVE

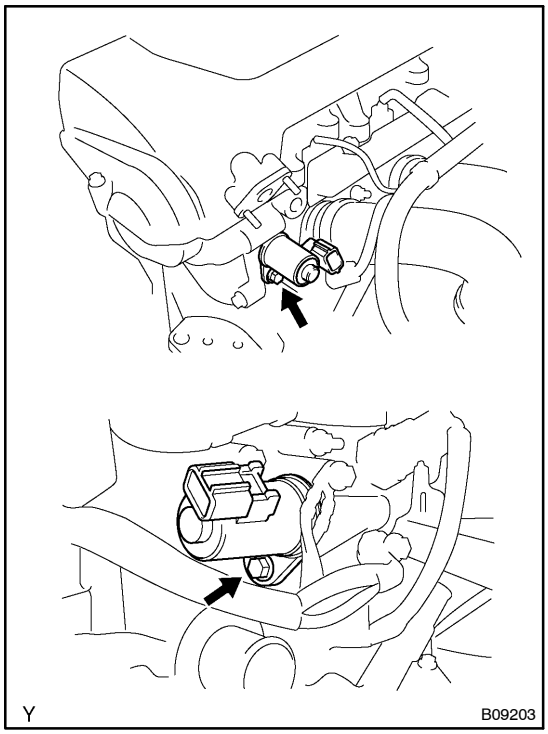
(a) Disconnect the oil control valve connector.

(b) Remove the bolt and oil control valve.
Torque: 7.5 N·m (80 kgf·cm, 66 in.·lbf)

(c) Remove the O–ring from the oil control valve.

HINT:

At the time of installation, please refer to the following items.
Use a new O–ring.



6. 2ZZ–GE:
REMOVE 2 CAMSHAFT TIMING OIL CONTROL VALVES

(a) Disconnect the oil control valve connector.

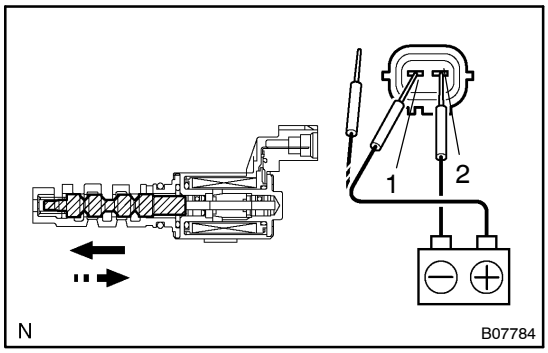
(b) Remove the 2 bolts and oil control valves.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

(c) Remove the O–ring from the each oil control valve.

HINT:

At the time of installation, please refer to the following items.
Use a new O–ring.

SF0SO–19



INSPECTION

INSPECT CAMSHAFT OIL CONTROL VALVE OPERATION

Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, and check the movement of the valve.

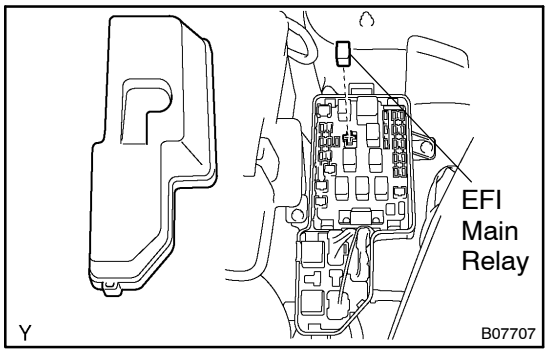
Battery positive voltage is applied	Valve moves in ← direction
Battery positive voltage is cut off	Valve moves in ⇢ direction

If operation is not as specified, replace the valve.

SF0SP–13

INSTALLATION

Installation is in the reverse order of removal. (See page SF–53)

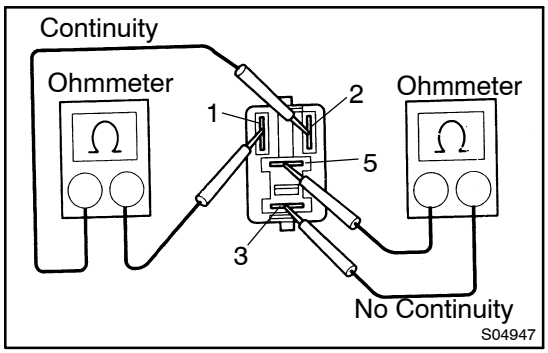


EFI MAIN RELAY

SF09Z–26

INSPECTION

1. REMOVE EFI MAIN RELAY (Marking: EFI)



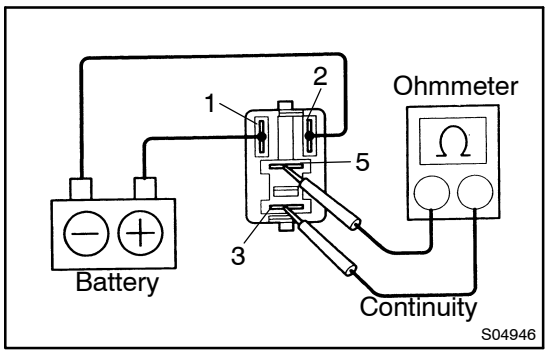
2. INSPECT EFI MAIN RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



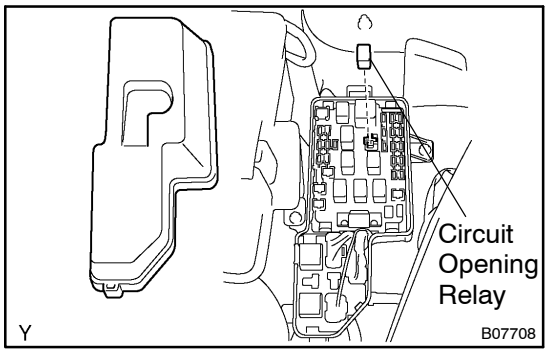
3. INSPECT EFI MAIN RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL EFI MAIN RELAY

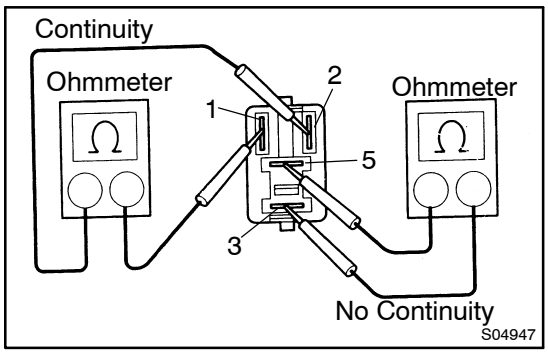


CIRCUIT OPENING RELAY

SF0A0–22

INSPECTION

1. REMOVE CIRCUIT OPENING RELAY



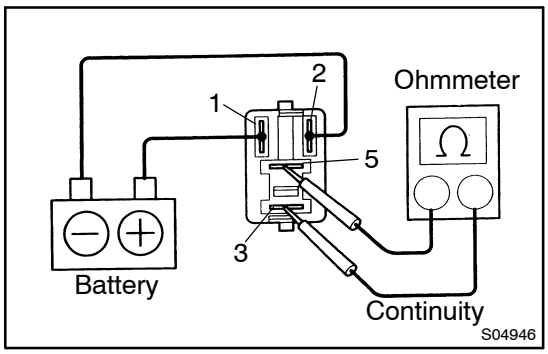
2. INSPECT CIRCUIT OPENING RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



3. INSPECT CIRCUIT OPENING RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

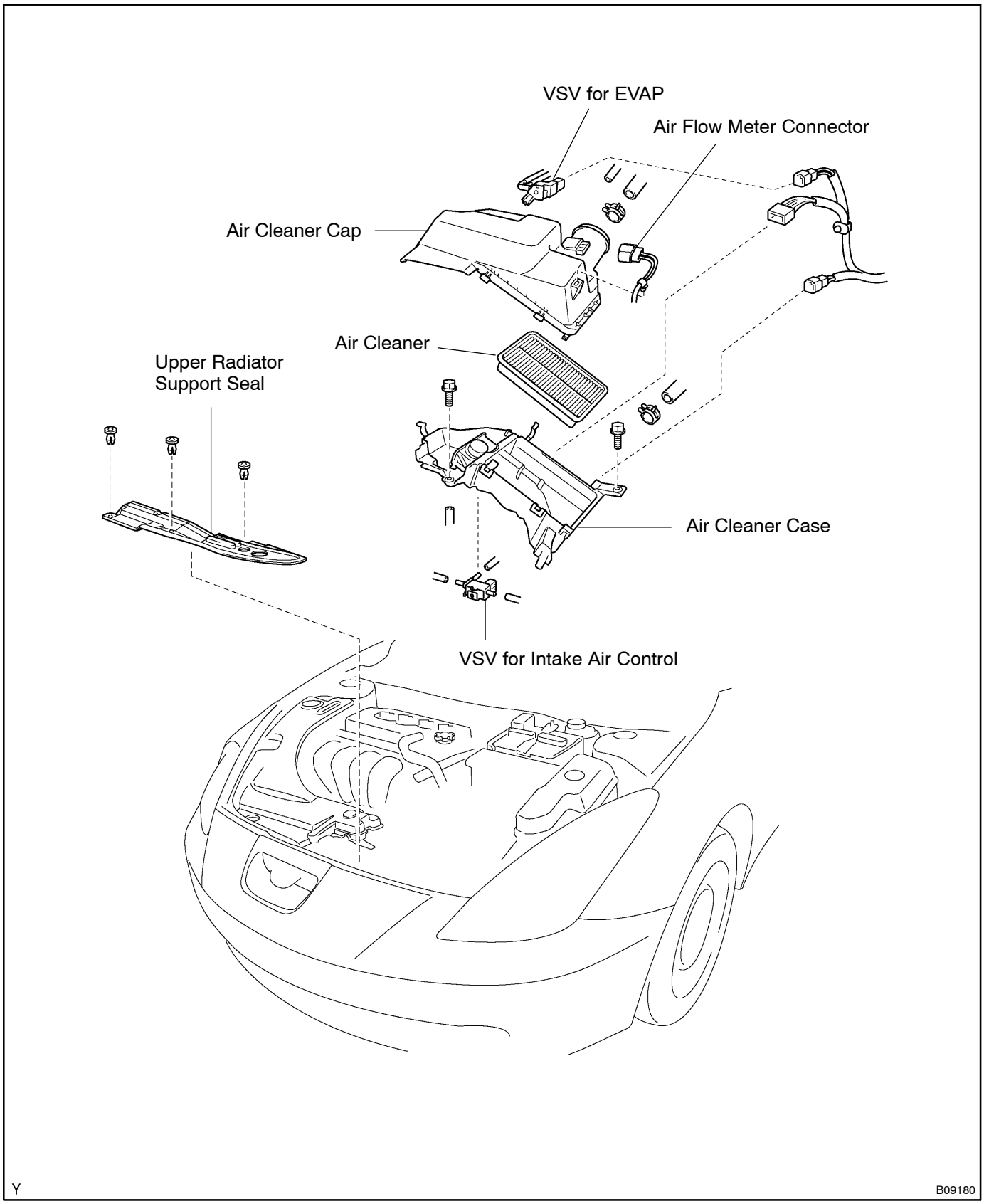
If there is no continuity, replace the relay.

4. REINSTALL CIRCUIT OPENING RELAY

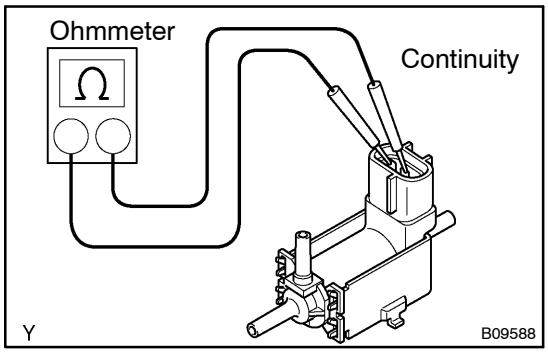
VSV FOR INTAKE AIR CONTROL VALVE

COMPONENTS

SF0Y8–11



SF0PM–14

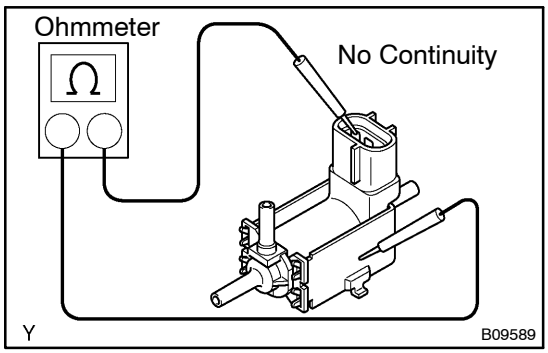


INSPECTION

INSPECT VSV

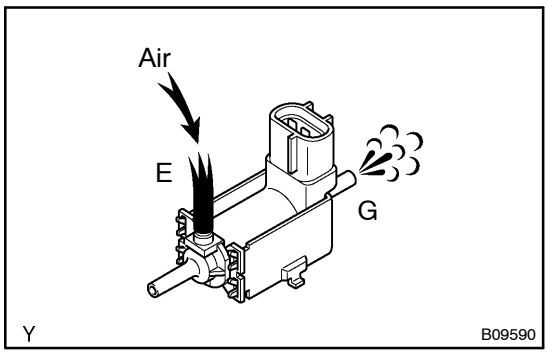
(a) Inspect the VSV for open circuit.
Using an ohmmeter, check that there is no continuity between the terminals.
Resistance: 37 – 44 Ω at 20˚C (68˚F)

If there is no continuity, replace the VSV.

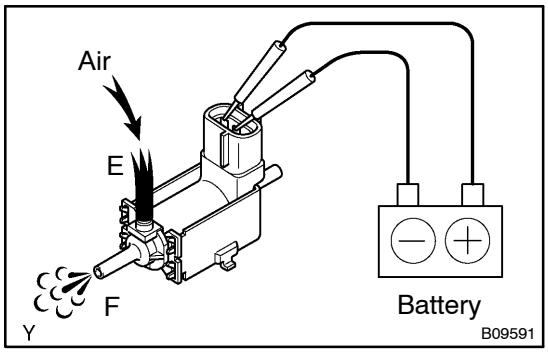


(b) Inspect the VSV for ground.
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



(c) Inspect the VSV operation.
(1) Check that air flows from ports E to G.



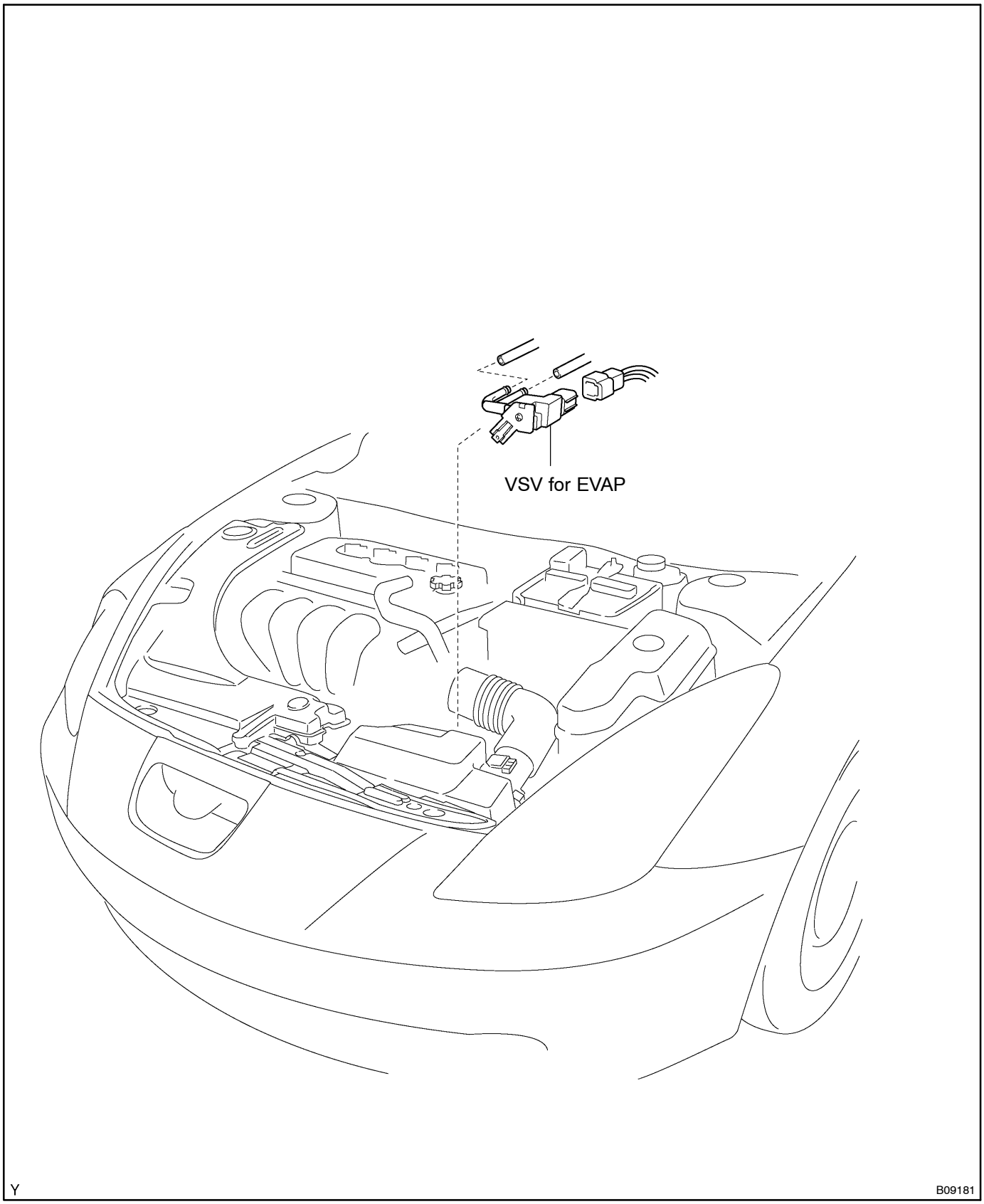
(2) Apply battery positive voltage across the terminals.
(3) Check that air flows from ports E to F.

If operation is not as specified, replace the VSV.

VSV FOR EVAPORATIVE EMISSION (EVAP)

COMPONENTS

SF15W–07

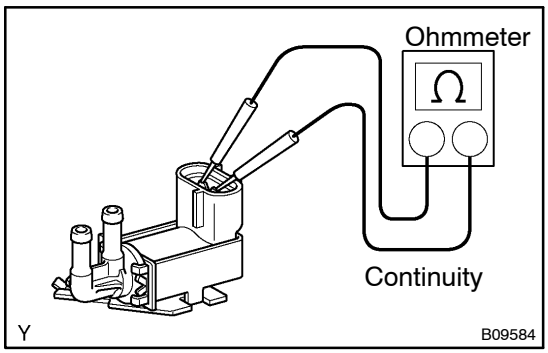


SF15X–10

INSPECTION

1. REMOVE VSV

(a) Disconnect the 2 EVAP hoses from the VSV.
(b) Disconnect the VSV connector.
(c) Remove the bolt and VSV.

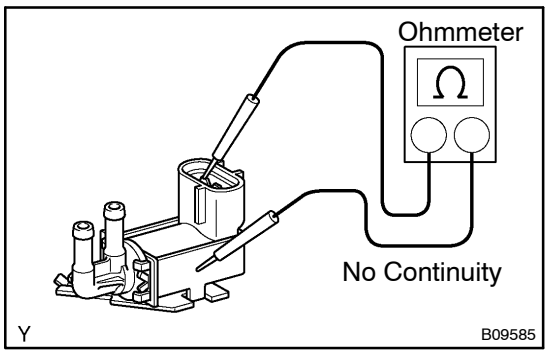


2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 27 – 33 Ω at 20˚C (68˚F)

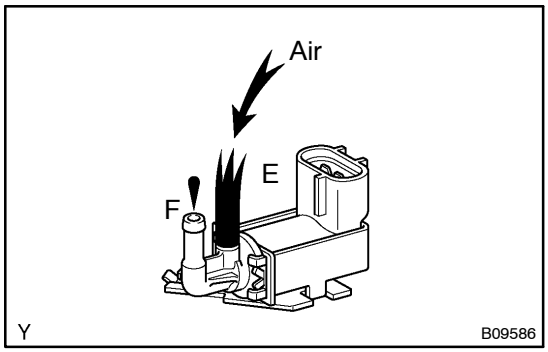
If there is no continuity, replace the VSV.



3. INSPECT VSV FOR GROUND

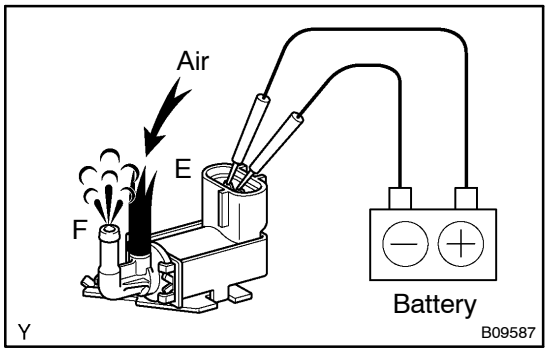
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



4. INSPECT VSV OPERATION

(a) Check that air flows with difficulty from port E to port F.



(b) Apply battery voltage across the terminals.
(c) Check that air flows from port E to port F.

If operation is not as specified, replace the VSV.

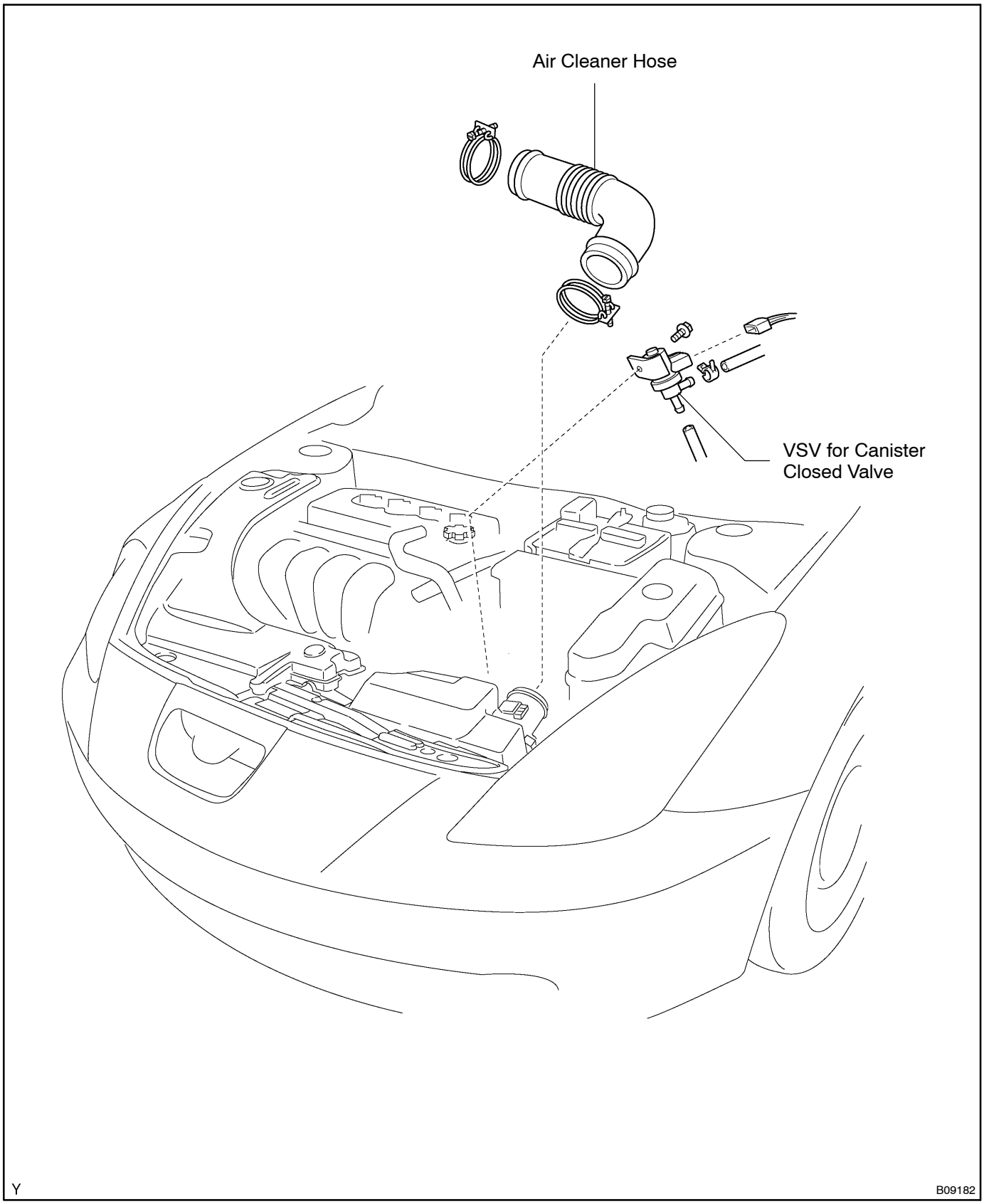
5. REINSTALL VSV

(a) Install the VSV with the bolt.
(b) Connect the VSV with the bolt.
(c) Connect the 2 EVAP hoses to the VSV.

VSV FOR CANISTER CLOSED VALVE (CCV)

SF15Y–08

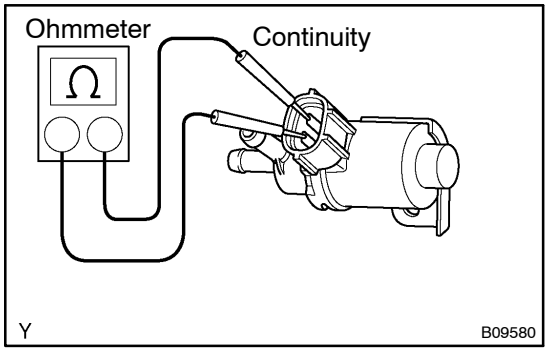
COMPONENTS



SF15Z–09

INSPECTION

1. REMOVE VSV



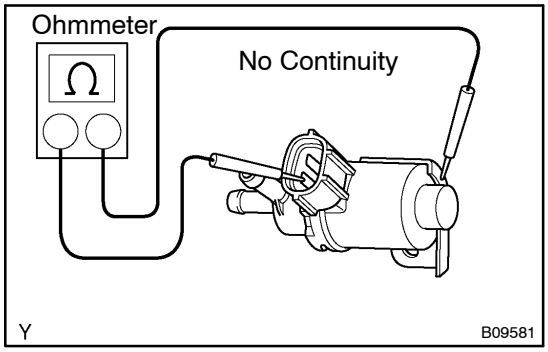
2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

At 20°C (68°F)	24 – 30 Ω

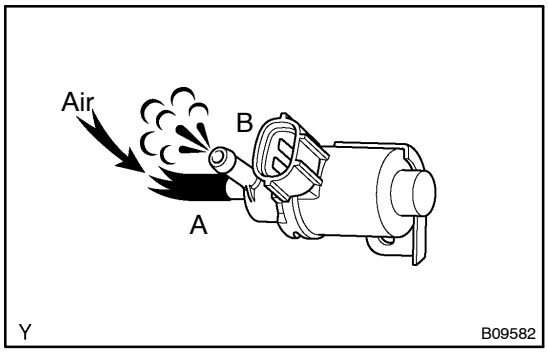
If there is no continuity, replace the VSV.



3. INSPECT VSV FOR GROUND

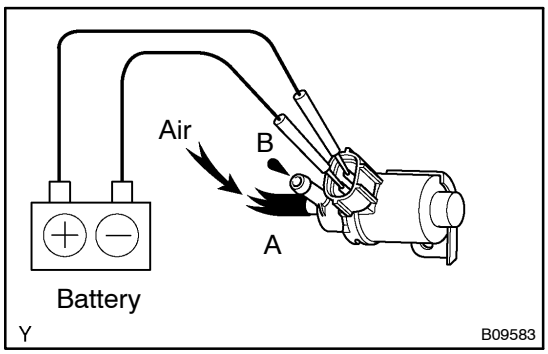
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is no continuity, replace the VSV.



4. INSPECT VSV OPERATION

(a) Check that air flows from ports A to B.



(b) Apply battery positive voltage across the terminals.

(c) Check that air does not flow from ports A to B.

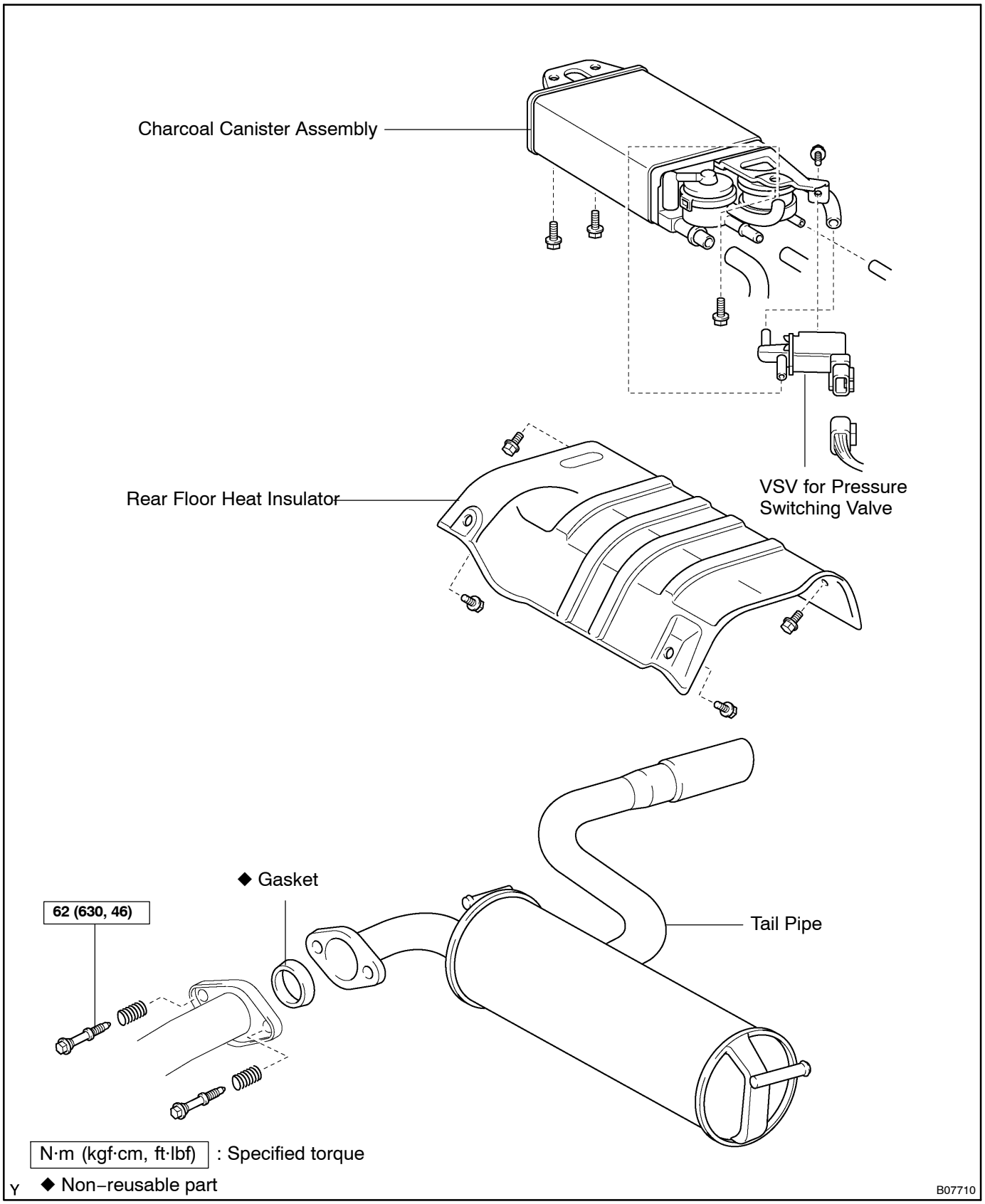
If operation is not as specified, replace the VSV.

5. REINSTALL VSV

VSV FOR PRESSURE SWITCHING VALVE

COMPONENTS

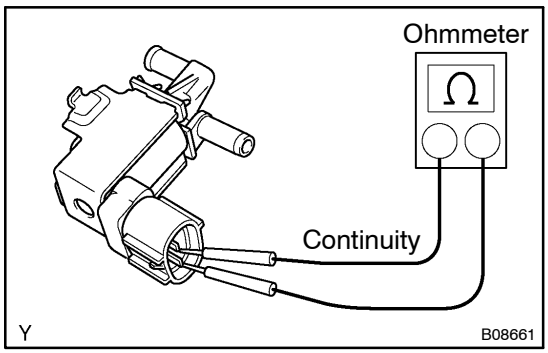
SF160–07



SF161–09

INSPECTION

1. REMOVE VSV



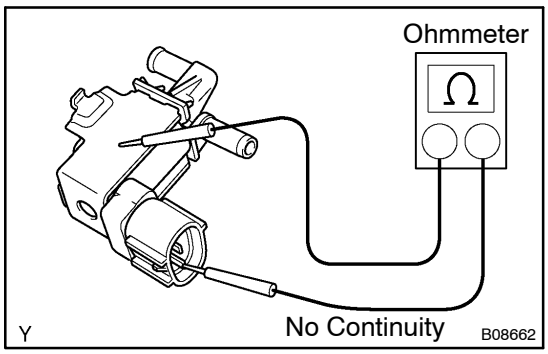
2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

At 20°C (68°F)	37 – 44 Ω
At 120°C (248°F)	51 – 62 Ω

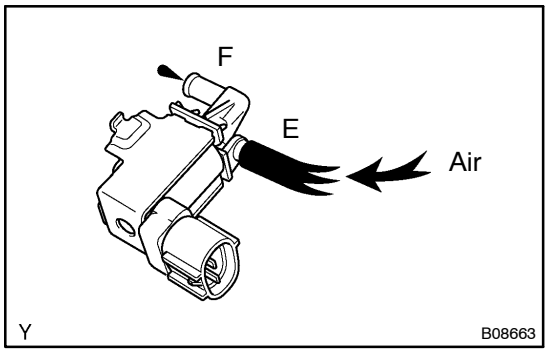
If there is no continuity, replace the VSV.



3. INSPECT VSV FOR GROUND

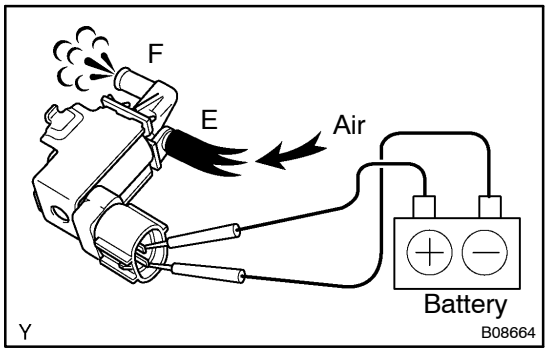
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is no continuity, replace the VSV.



4. INSPECT VSV OPERATION

(a) Check that air does not flow from ports E to F.



(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from ports E to F.

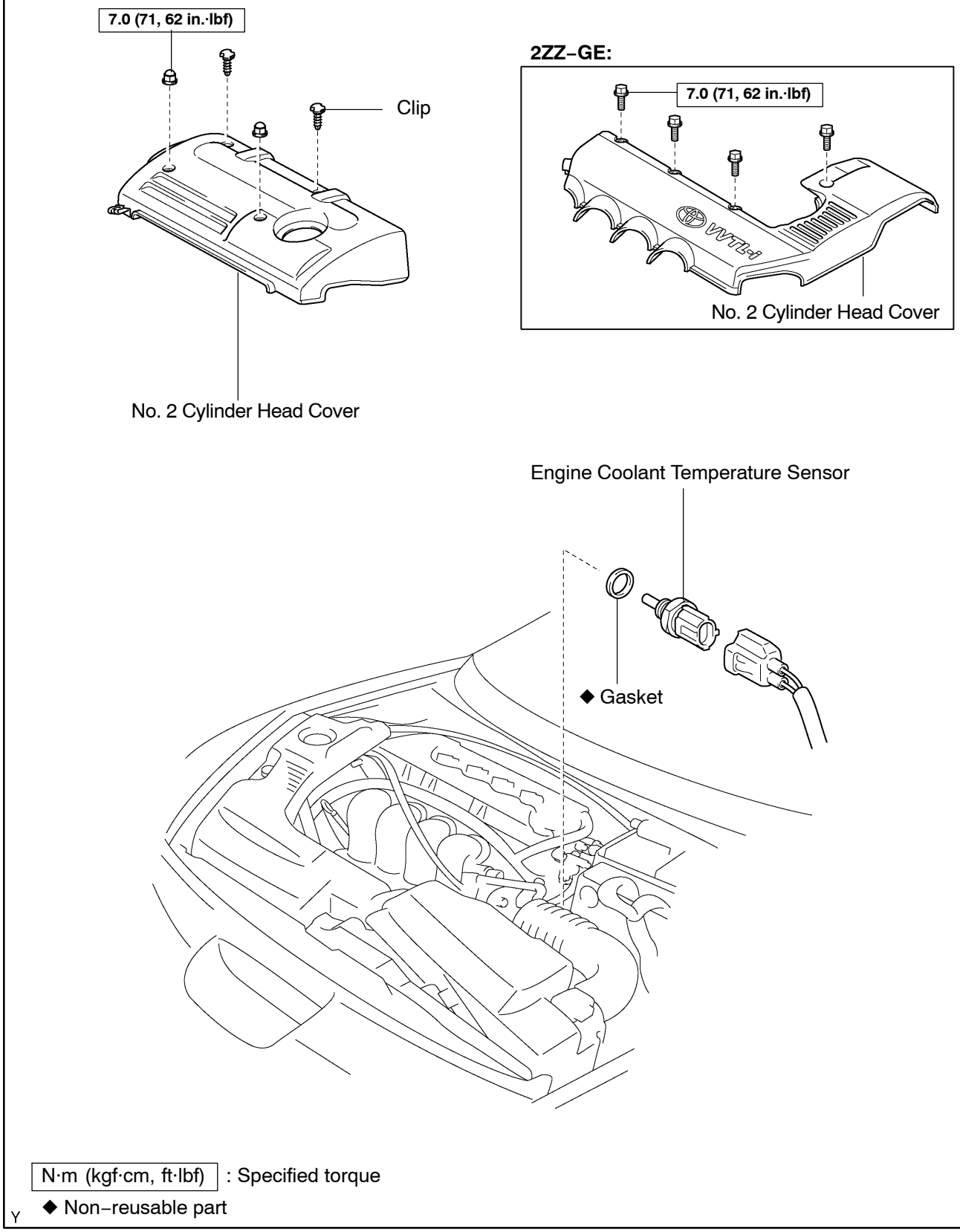
If operation is not as specified, replace the VSV.

5. REINSTALL VSV

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

SF162–10

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

B09183

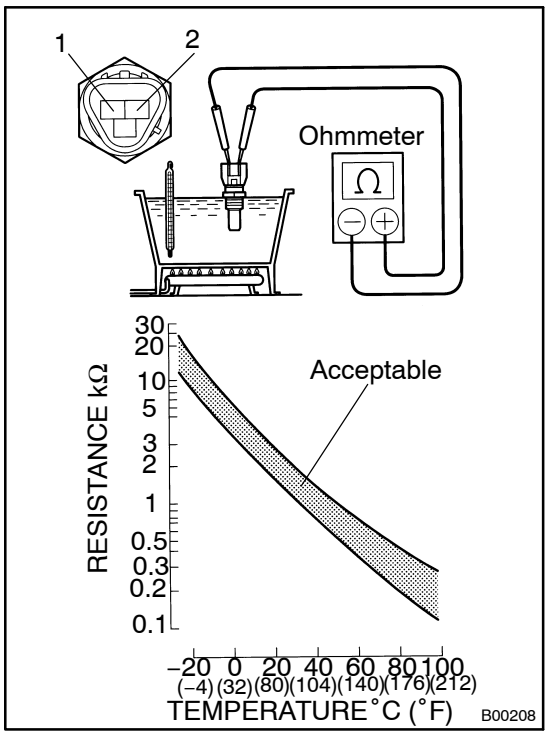
SF163–05

INSPECTION

1. DRAIN ENGINE COOLANT

2. REMOVE NO.2 CYLINDER HEAD COVER

3. REMOVE ECT SENSOR



4. INSPECT ECT SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals 1 (E2) and 2 (THW).

Resistance: Refer to the graph

If the resistance is not as specified, replace the ECT sensor.

5. REINSTALL ECT SENSOR

Install a new gasket to the ECT sensor.

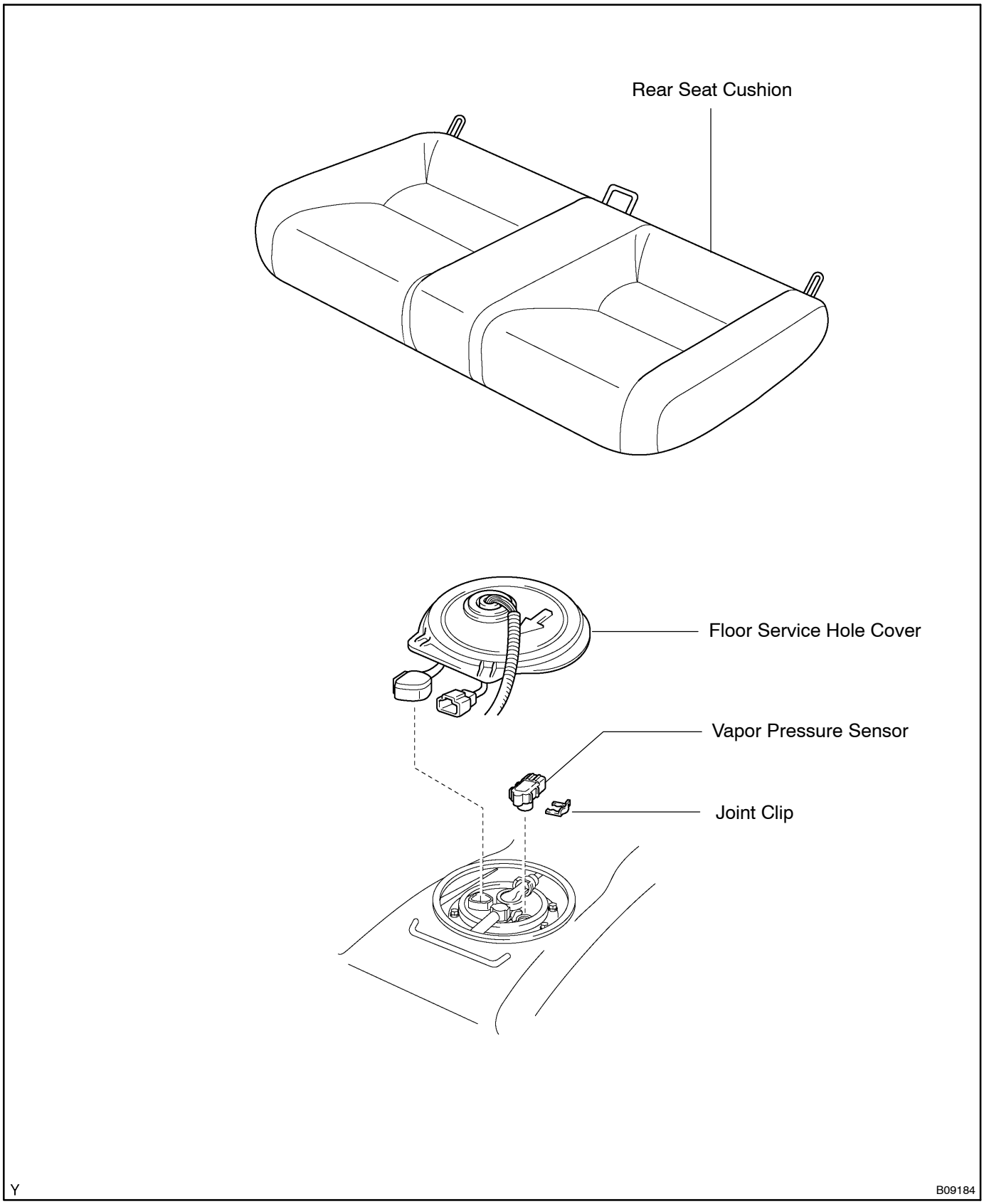
6. REINSTALL NO.2 CYLINDER HEAD COVER

7. FILL RADIATOR WITH ENGINE COOLANT

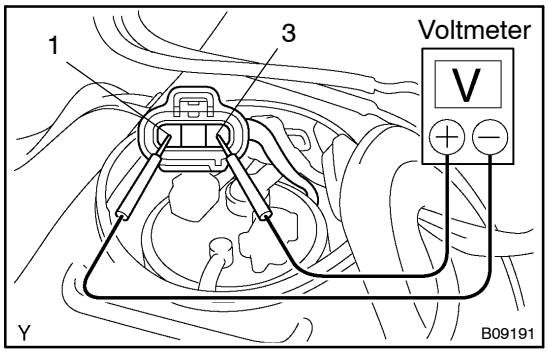
VAPOR PRESSURE SENSOR

COMPONENTS

SF164–09



SF165–04



INSPECTION

1. INSPECT POWER SOURCE VOLTAGE OF VAPOR PRESSURE SENSOR

(a) Disconnect the vapor pressure sensor connector.

HINT:

Near the fuel tank.

(b) Turn the ignition switch ON.

(c) Using a voltmeter, measure the voltage between connector terminals 1 and 3 of the wiring harness side.

Voltage: 4.5 – 5.5 V

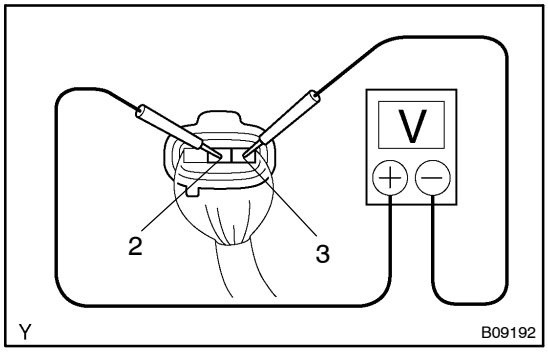
(d) Turn the ignition switch to LOCK.

(e) Reconnect the vapor pressure sensor connector.

2. INSPECT POWER OUTPUT OF VAPOR PRESSURE SENSOR

(a) Turn the ignition switch ON.

(b) Remove the fuel tank cap.



(c) Connect a voltmeter to terminals 2 and 3, and measure the output voltage.

Voltage: 3.0 – 3.6 V

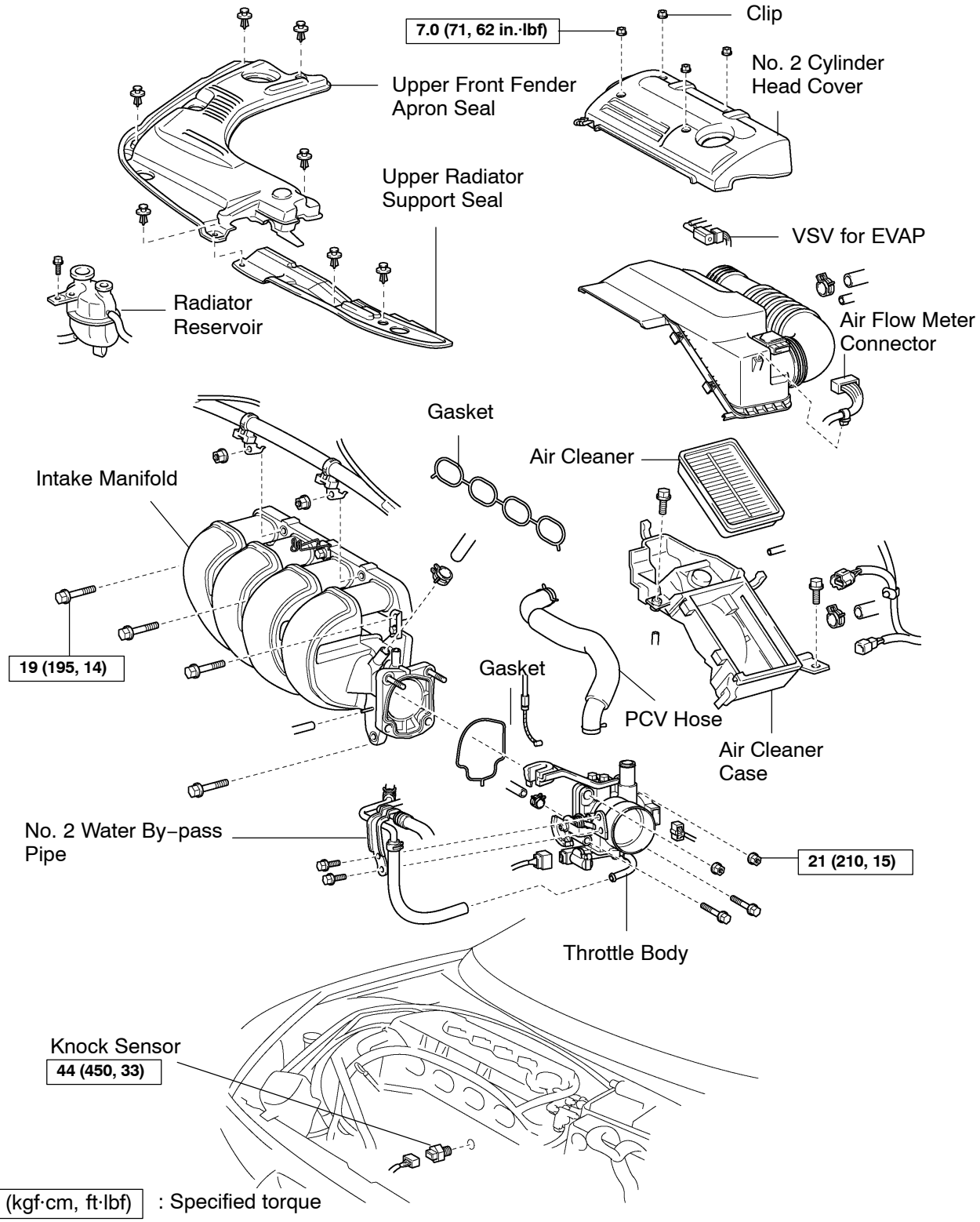
(d) Reinstall the fuel tank cap.

KNOCK SENSOR

COMPONENTS

SF166–04

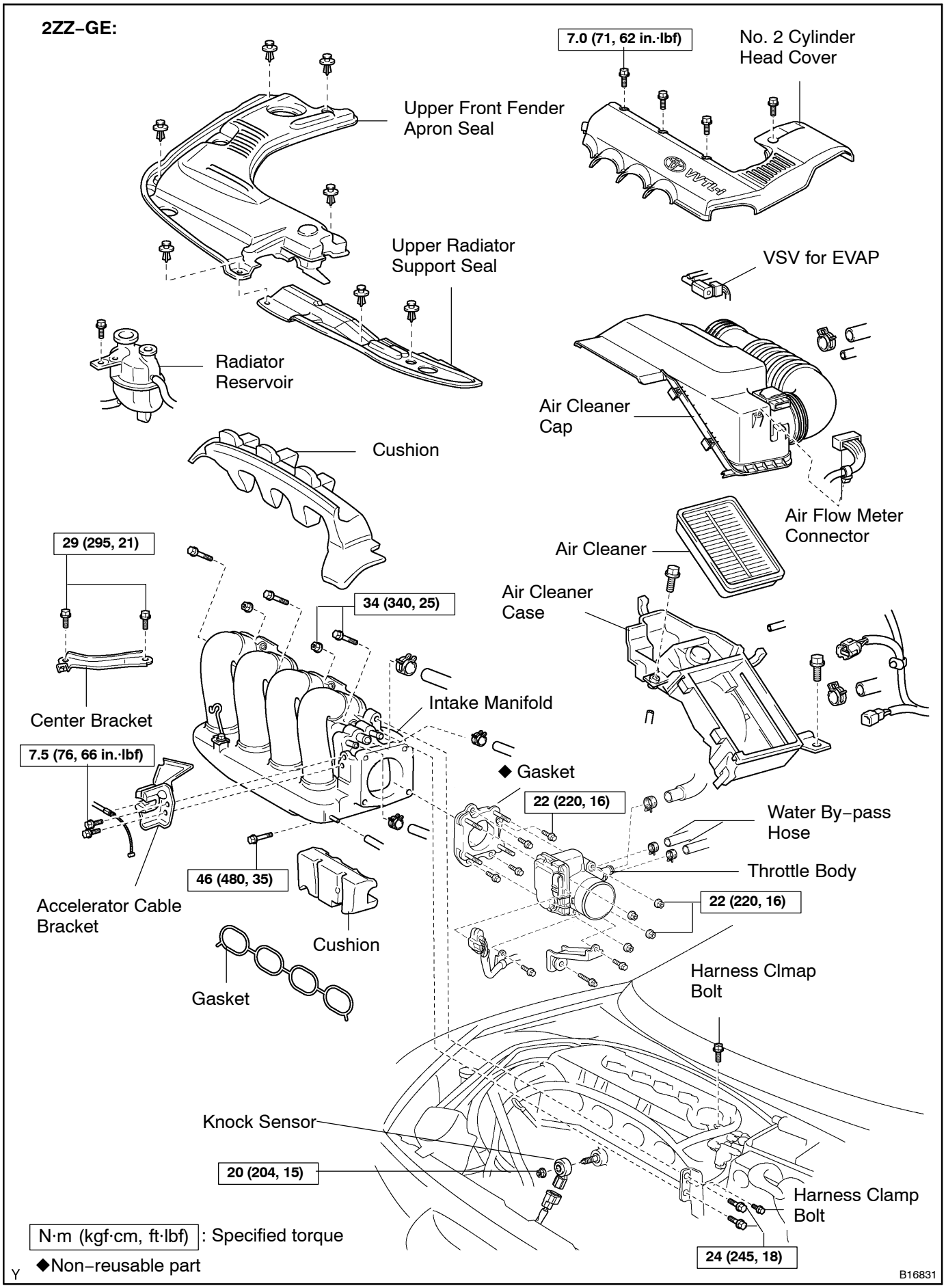
1ZZ–FE:



N·m (kgf·cm, ft·lbf) : Specified torque

◆Non–reusable part

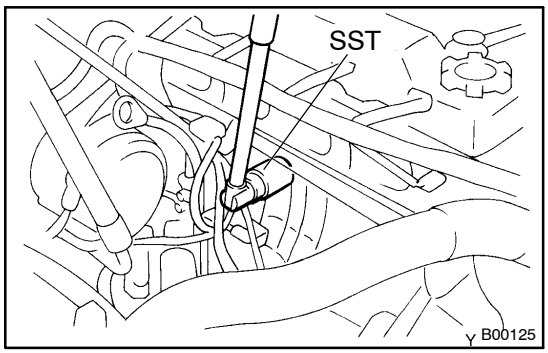
B09187


2ZZ–GE:
7.0 (71, 62 in.·lbf)
No. 2 Cylinder Head Cover
Upper Front Fender Apron Seal
Upper Radiator Support Seal
VSV for EVAP
Radiator Reservoir
Air Cleaner Cap
Cushion
Air Flow Meter Connector
Air Cleaner
29 (295, 21)
34 (340, 25)
Air Cleaner Case
Center Bracket
Intake Manifold
7.5 (76, 66 in.·lbf)
◆ Gasket
22 (220, 16)
Water By–pass Hose
Throttle Body
46 (480, 35)
Accelerator Cable Bracket
Cushion
22 (220, 16)
Gasket
Harness Clmap Bolt
Knock Sensor
20 (204, 15)
Harness Clamp Bolt
24 (245, 18)
N·m (kgf·cm, ft·lbf) : Specified torque
◆Non–reusable part
B16831

SF1T1–03

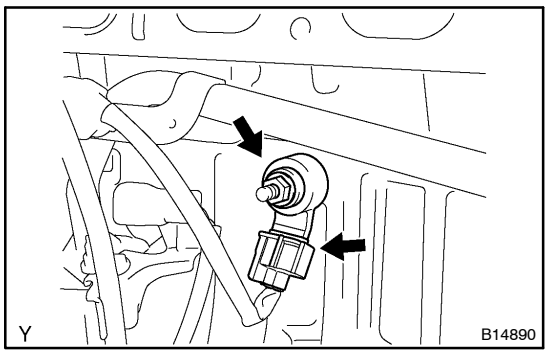
INSPECTION

1. **REMOVE THROTTLE BODY**
   (See page SF–35 or SF–42)
2. **REMOVE RADIATOR RESERVOIR**
   (See page CO–17)
3. **REMOVE INTAKE MANIFOLD**
   (See page EM–44)



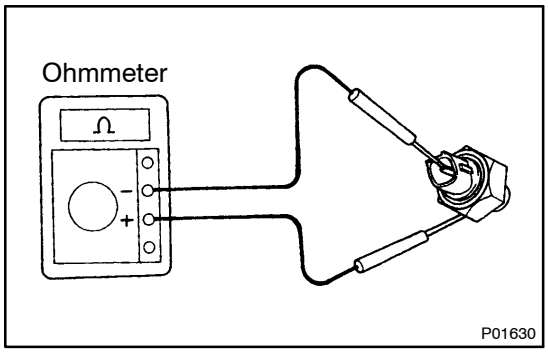
4. **1ZZ–FE:**
   REMOVE KNOCK SENSOR

(a) Disconnect the knock sensor connector.
(b) Using SST, remove the knock sensor.
SST 09816–30010



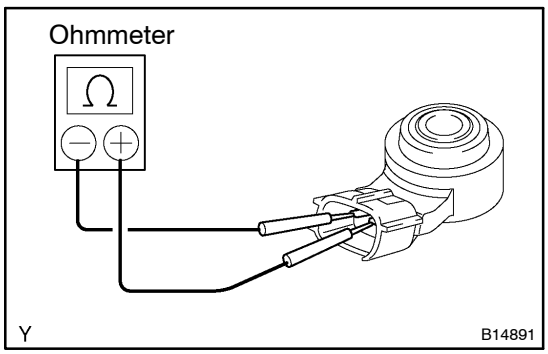
5. **2ZZ–GE:**
   REMOVE KNOCK SENSOR

(a) Disconnect the knock sensor connector.
(b) Remove the nut and knock sensor.



6. **1ZZ–FE:**
   INSPECT KNOCK SENSOR

Using an ohmmeter, check that there is continuity between the terminal and body.
If there is continuity, replace the sensor.



7. **2ZZ–GE:**
   INSPECT KNOCK SENSOR

Using an ohmmeter, measure the resistance between terminals.

Resistance: 120 – 280 kΩ at 20°C (68°F)

If the resistance is not specified, replace the sensor.

8. **1ZZ–FE:**
   REINSTALL KNOCK SENSOR

(a) Using SST, install the knock sensor.
SST 09816–30010

(b) Connect the knock sensor connector.

9. 2ZZ–GE:
REINSTALL KNOCK SENSOR

(a) Install the knock sensor with the nut.

(b) Connect the knock sensor connector.

10. REINSTALL INTAKE MANIFOLD
(See page EM–67)

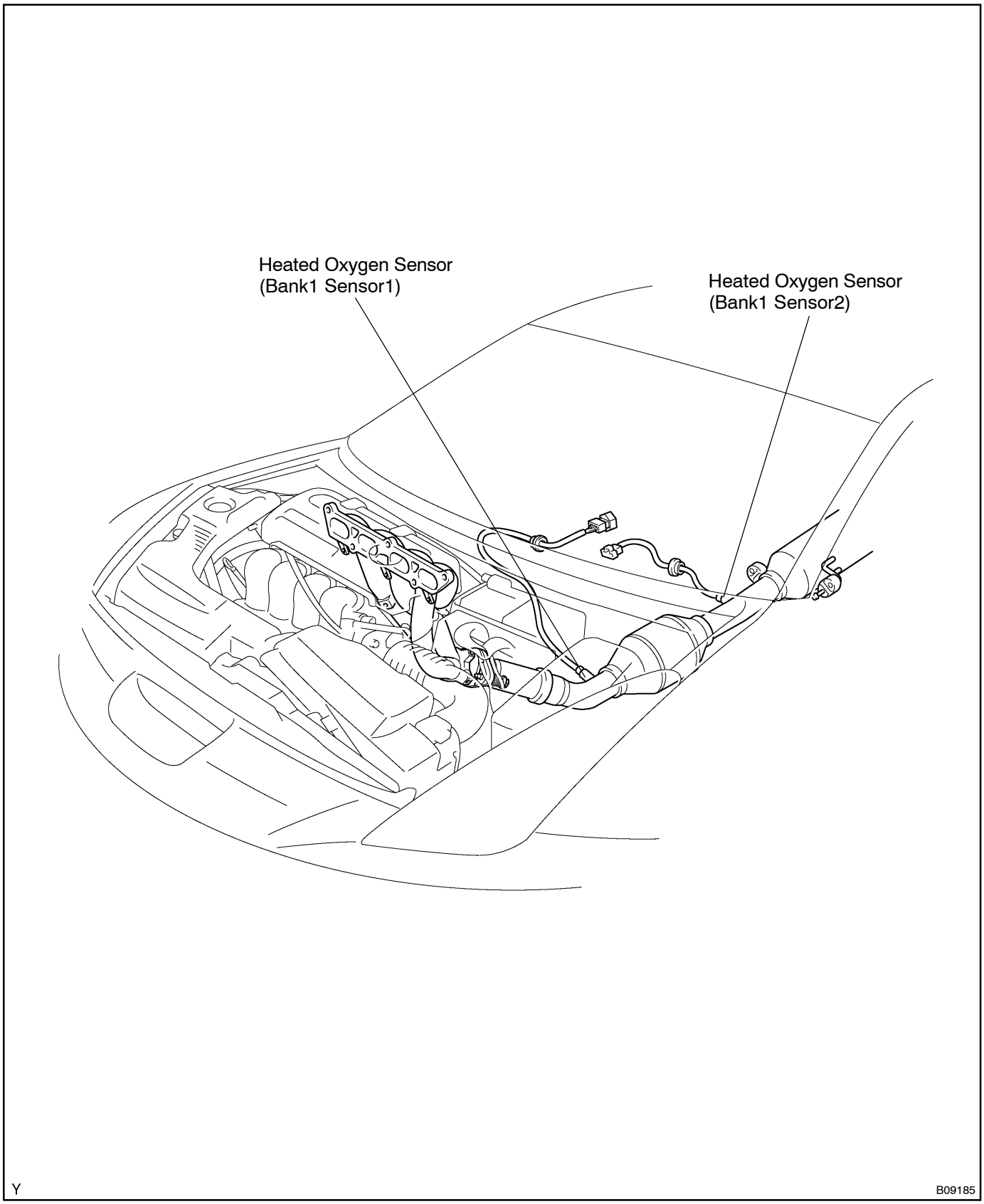
11. REINSTALL RADIATOR RESERVOIR
(See page CO–23)

12. REINSTALL THROTTLE BODY
(See page SF–35 or SF–42)

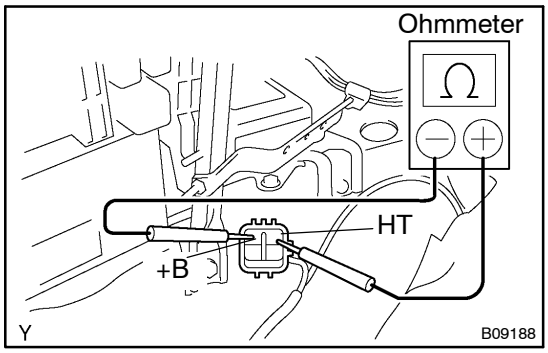
HEATED OXYGEN SENSOR

COMPONENTS

SF167–09



SF0AA–09



INSPECTION

1. INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSOR (Bank1 Sensor1)

(a) Disconnect the oxygen sensor connector.

(b) Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

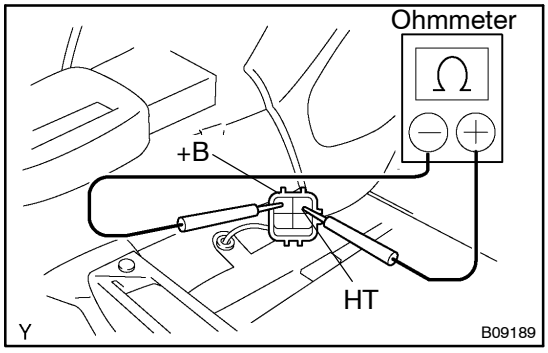
1ZZ–FE: 5 – 10 Ω at 20°C (68°F)

2ZZ–GE: 11 – 16 Ω at 20°C (68°F)

If the resistance is not as specified, replace the sensor.

Torque: 44 N·m (450 kgf·cm, 31 ft·lbf)

(c) Reconnect the oxygen sensor connector.



2. INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSOR (Bank1, Sensor2)

(a) Remove the passenger's seat.

(b) Take out the floor carpet.

(c) Disconnect the oxygen sensor connector.

(d) Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance: 11 – 16 Ω at 20°C (68°F)

If the resistance is not as specified, replace the sensor.

Torque: 44 N·m (450 kgf·cm, 31 ft·lbf)

(e) Reconnect the oxygen sensor connector.

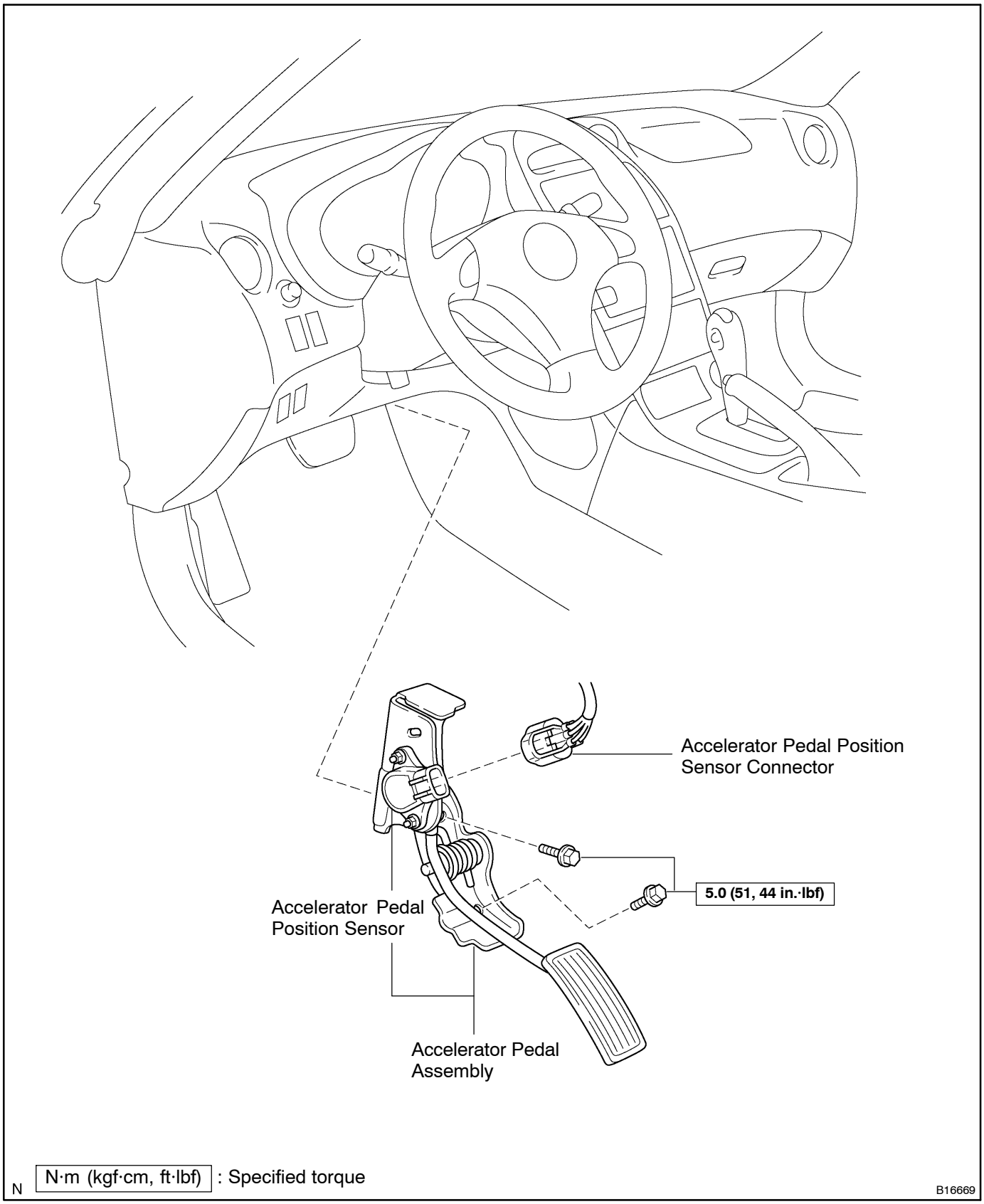
(f) Resistance the floor carpet.

(g) Reinstall the passenger's seat.

ACCELERATOR PEDAL POSITION SENSOR

SF1V5–02

COMPONENTS



N N·m (kgf·cm, ft·lbf) : Specified torque

B16669

SF1V6–02

INSPECTION

INSPECT ACCELERATOR PEDAL POSITION SENSOR (See page DI–391)

If necessary, replace the accelerator pedal assembly.

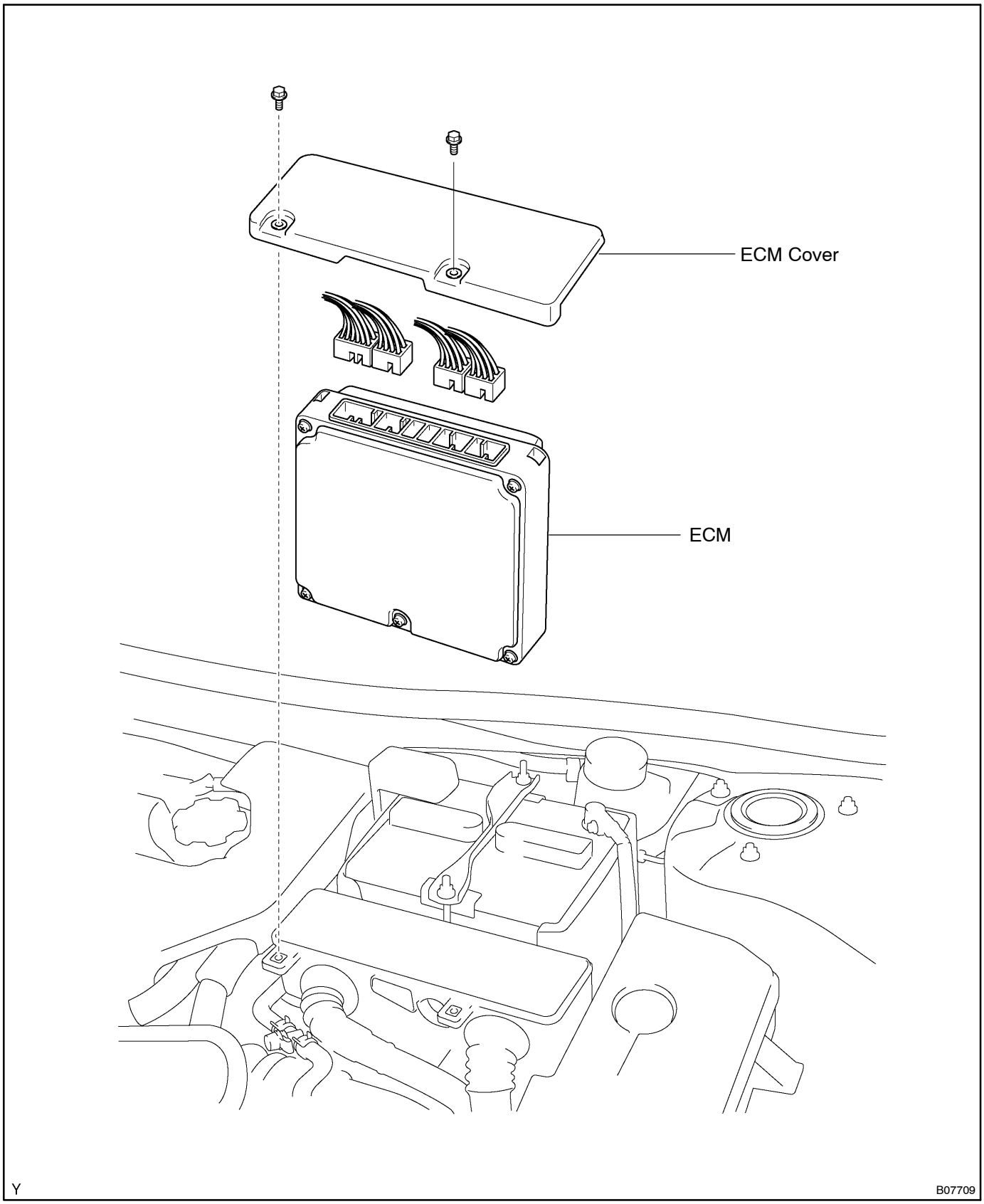
NOTICE:

- **Be care not to give a shock to the accelerator pedal assembly.**
- **Be care not to disassemble the accelerator pedal assembly.**

ENGINE CONTROL MODULE (ECM)

SF0OF–13

COMPONENTS



SF0OG–10

INSPECTION

1. REMOVE ECM
2. INSPECT ECM (See page DI–40 or DI–333)
3. REINSTALL ECM

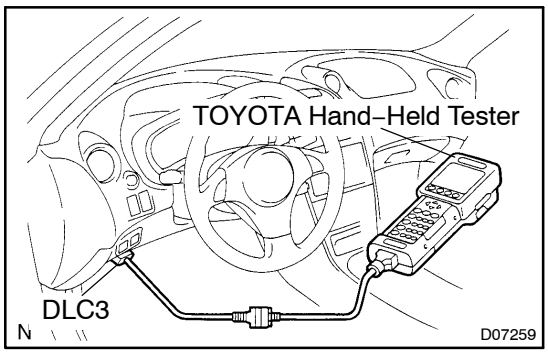
FUEL CUT RPM

SF0AD–23

INSPECTION

1. WARM UP ENGINE

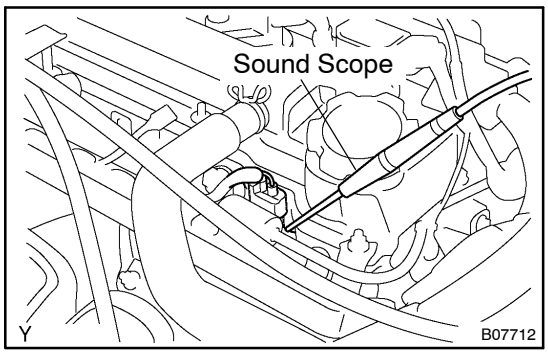
Allow the engine to warm up to normal operating temperature.



2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBD II scan tool operator's manual for further details.



3. INSPECT FUEL CUT OFF RPM

(a) Increase the engine speed to at least 3,500 rpm.

(b) Use a sound scope to check for injector operating noise.

(c) Check that when the throttle lever is released injector, operation noise stops momentary and then resumes.

HINT:

Measure with the A/C OFF.

Fuel return rpm: 1,400 rpm

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

COOLANT

INSPECTION

CO04D–19

HINT:

Check the coolant level when the engine is cold.

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

The engine coolant level should be between the ”LOW” and ”FULL” line.

If low, check for leaks and add ”Toyota Super Long Life Coolant” or similar high quality ethylene glycol based non–silicate, non–amine, non–nitrite, and non–borate coolant with long–life hybrid organic acid technology up to the ”FULL” line.

2. CHECK ENGINE COOLANT QUALITY

(a) Remove the reservoir cap.

CAUTION:

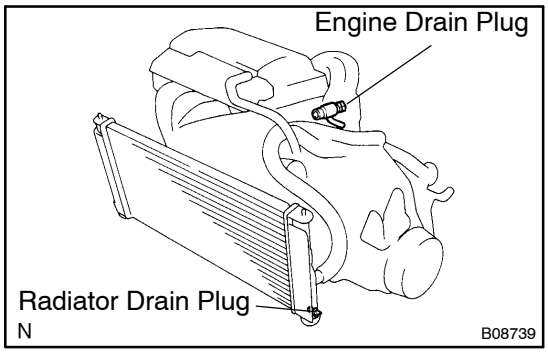
To avoid the danger of being burned, do not remove the reservoir the cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) There should not be any excessive deposits of rust or scale around the reservoir cap or reservoir filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.

(c) Reinstall the reservoir cap.

CO0WX–09



REPLACEMENT

HINT:

For replacing the heater parts such a heater core or heater hose, refer to AC–29.

1. DRAIN ENGINE COOLANT

(a) Remove the reservoir cap.

CAUTION:

To avoid the danger of being burned, do not remove the reservoir cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

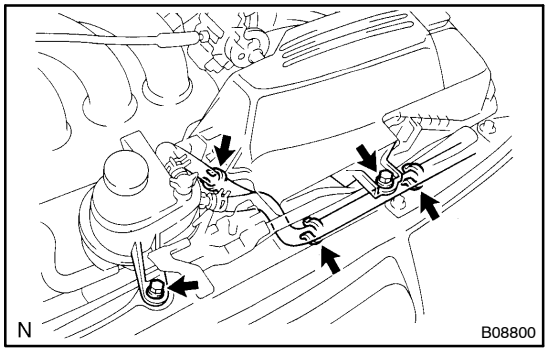
(b) Loosen the radiator drain plug (on the left under side of the radiator tank) and engine drain plug on the engine coolant drain union (on the left rear of the cylinder block), and drain the coolant.

(c) Close the drain plugs.

Torque: 12.7 N·m (130 kgf·cm, 9 ft·lbf) for engine

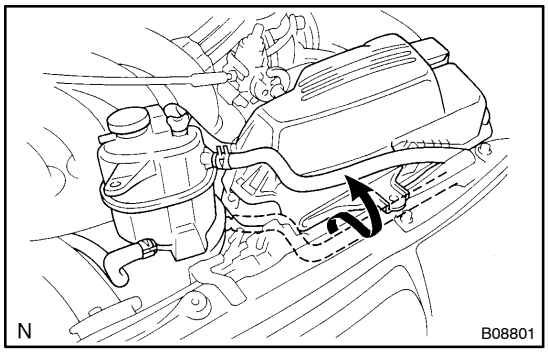
2. FILL ENGINE COOLANT

(a) Remove the upper front fender apron seal and upper radiator support seal.



(b) Remove the 2 bolts.

(c) Disconnect the 3 clamps and 2 hoses, then place hoses on air cleaner case.



(d) Lift the engine coolant reservoir and hook it on a hood latch to fix.

(e) Remove the bleeder plug.

(f) Slowly fill the cooling system with coolant.

Capacity:

1ZZ–FE:

M/T	5.7 liters (6.0 US qts, 5.0 lmp. qts)
A/T	5.6 liters (5.9 US qts, 4.9 lmp. qts)

2ZZ–GE:

M/T	5.9 liters (6.2 US qts, 5.2 lmp. qts)
A/T	5.8 liters (6.1 US qts, 5.1 lmp. qts)

NOTICE:

Do not use plain water alone.

HINT:

- Use of improper coolants may damage the engine cooling system.

- Use "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non–silicate, non–amine, non–nitrite, and non–borate coolant with long–life hybrid organic acid technology.
- New Toyota vehicles are filled with Toyota Super Long Life Coolant (color is pink, premixed ethylene glycol concentration is approximately 50 % and freezing temperature is –35°C (–31°F)). When replacing the coolant, Toyota Super long Life Coolant is recommended.
- Observe the coolant level inside the radiator by pressing the inlet and outlet radiator hoses several times by hand. if the coolant level goes down, add the coolant.
- When the level can not be lowered before the supply of the 3.7 liters coolant, squeeze the radiator lower hose several times while blocking the hole in the bleeder plug with a finger, and surely supply the coolant.

(g) Start the engine with the reservoir cap and the bleeder plug removed and warm it up until the cooling fan blows first and then stops.

HINT:

At this time, the A/C switch should be OFF.

(h) Additionally supply 500 cc coolant with the engine idling.

(i) Install the bleeder plug and reservoir cap.

HINT:

Close the reservoir cap by marking approx. 2.5 rotations until clicks is heard.

(j) Repeat 5 sec. engine operation at 3,000 rpm and 5 sec. idling alternately for 15 min. or more.

(k) After complete cooling of the engine, the level shall be between Low and FULL.

HINT:

After warming–up of engine, the level shall be over the FULL.

(l) Connect the 2 hoses and clamps.

(m) Install the 2 bolts.

(n) Install the cover.

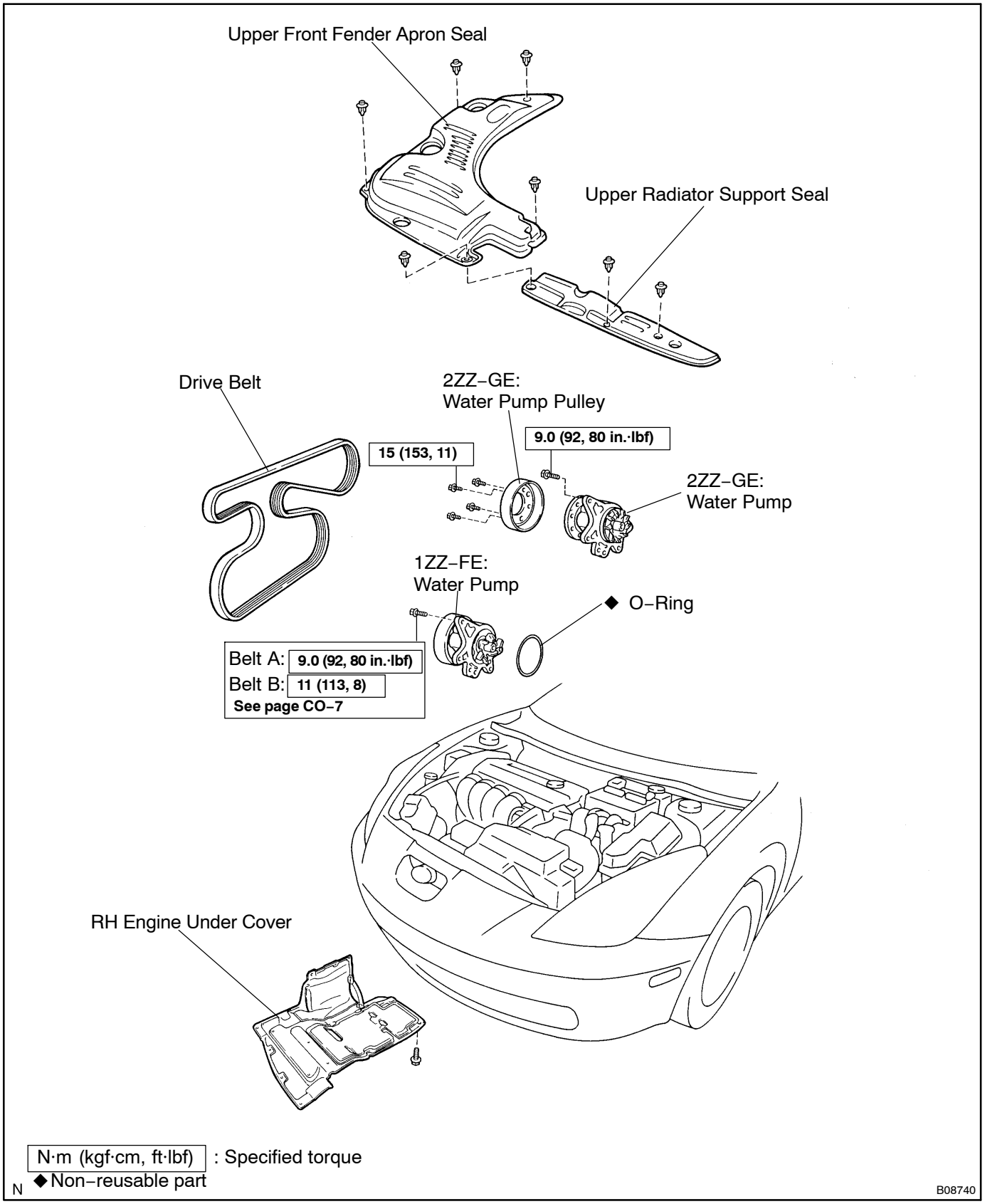
3. CHECK FOR COOLANT LEAKS

4. CHECK ENGINE COOLANT SPECIFIC GRAVITY CORRECT

WATER PUMP

COMPONENTS

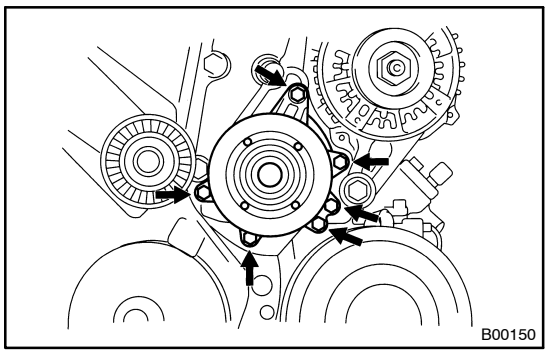
CO04F–27



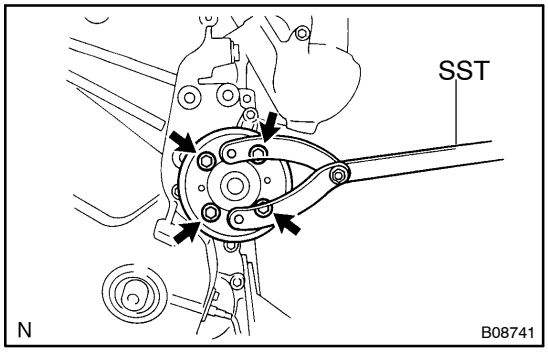
CO0WY–06

REMOVAL

1. REMOVE RH ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. REMOVE DRIVE BELT (See page CH–7)



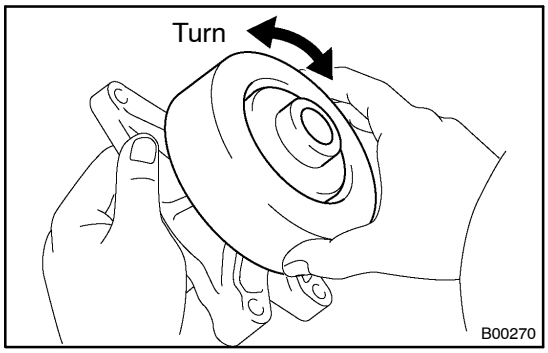
4. 1ZZ–FE:
   REMOVE WATER PUMP
(a) Remove the 6 bolts, water pump and O–ring.
(b) Clean up the engine coolant from the water chamber room.



5. 2ZZ–GE:
   REMOVE WATER PUMP
(a) Using SST, remove the 4 water pump pulley set bolts.
    SST 09960–10010 (09962–01000, 09963–00600)
(b) Remove the water pump pulley.
(c) Remove the 6 bolts, water pump and O–ring.
(d) Clean up the engine coolant from the water chamber room.

NOTICE:
Do not remove the RH engine mounting bracket and generator when the water pump alone is replaced.

CO04H–19



INSPECTION

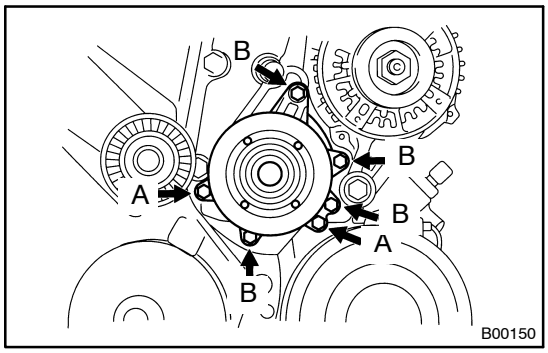
INSPECT WATER PUMP

(a) Visually check the drain hole for coolant leakage.
If leakage is found, replace the water pump.

(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.

CO0WZ–07



INSTALLATION

1. 1ZZ–FE:

INSTALL WATER PUMP

(a) Place a new O–ring on the timing chain cover.

(b) Install the water pump with the 6 bolts.

Torque:

Bolt A 9.0 N·m (92 kgf·cm, 80 in.·lbf)

Bolt B 11 N·m (113 kgf·cm, 8 ft·lbf)

HINT:

Each bolt length is indicated in the illustration.

A: 30 mm (1.18 in.)

B: 35 mm (1.38 in.)

2. 2ZZ–GE:

INSTALL WATER PUMP

(a) Place a new O–ring on the timing chain cover.

(b) Install the water pump with the 6 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

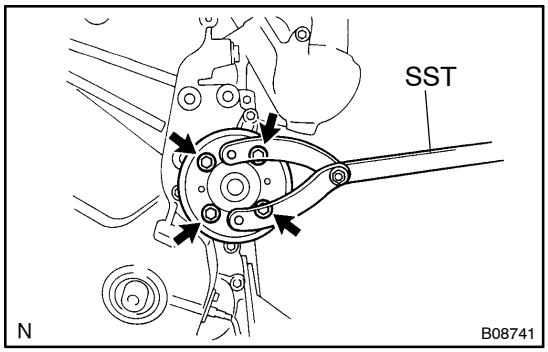
HINT:

Each bolt length is indicated in the illustration.

A: 30 mm (1.18 in.)

B: 35 mm (1.38 in.)

(c) Install the water pump pulley.



(d) Using SST, tighten the 4 water pump pulley set bolts.

SST 09960–10010 (09962–01000, 09963–00600)

Torque: 15 N·m (153 kgf·cm, 11 ft·lbf)

3. INSTALL RH ENGINE UNDER COVER

4. INSTALL DRIVE BELT

(See page CH–17)

5. FILL WITH ENGINE COOLANT

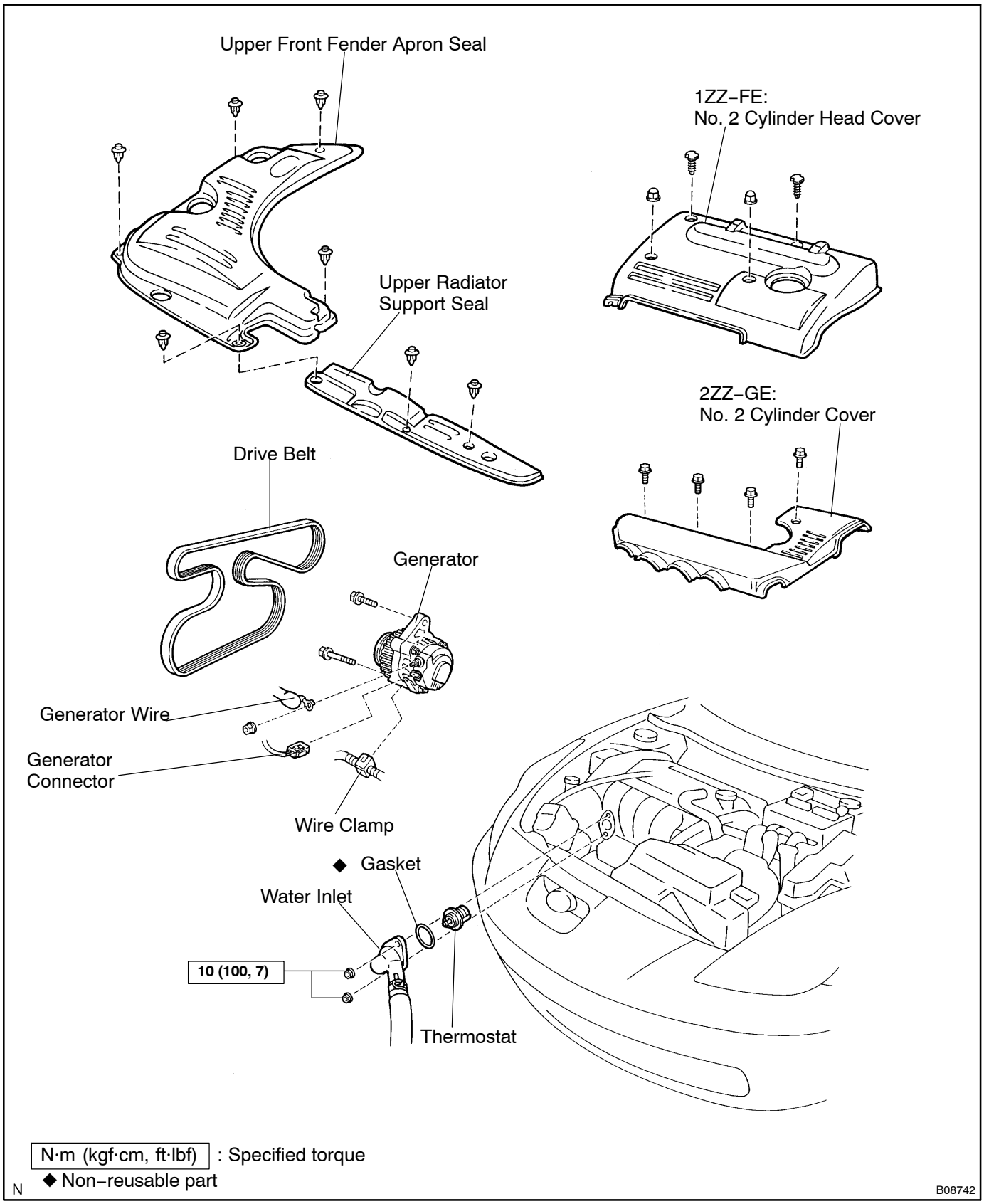
6. START ENGINE AND CHECK FOR LEAKS

7. RECHECK ENGINE COOLANT LEVEL

THERMOSTAT

COMPONENTS

CO04J–27



CO04K–21

REMOVAL

HINT:

Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. DRAIN ENGINE COOLANT

2. REMOVE DRIVE BELT AND GENERATOR
(See page CH–7)

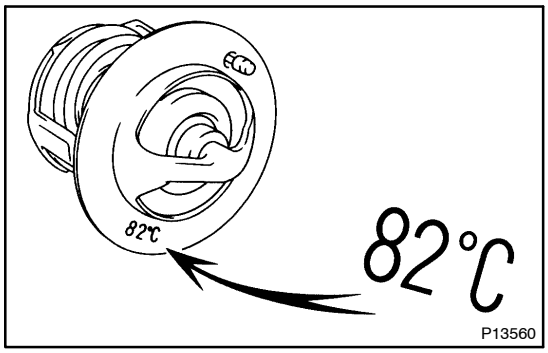
3. REMOVE WATER INLET AND THERMOSTAT

(a) Remove the 2 nuts, and disconnect the water inlet from the cylinder block.

(b) Remove the thermostat.

(c) Remove the gasket from the thermostat.

CO04L–24

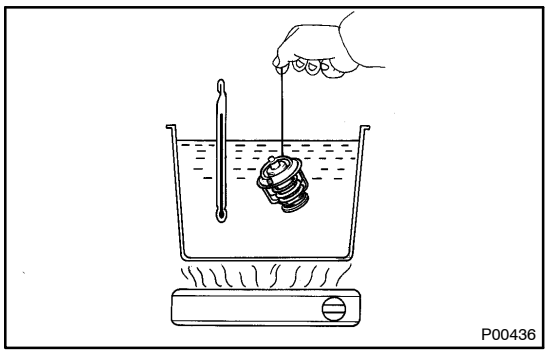


INSPECTION

INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.

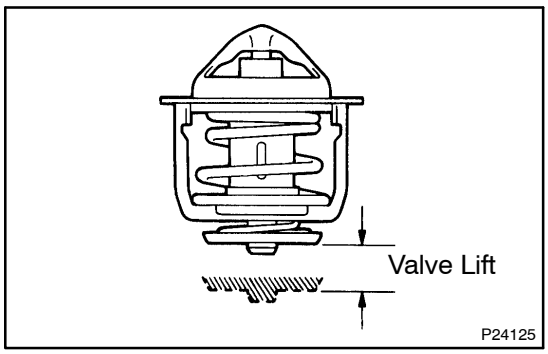


(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:
80.0 – 84.0°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



(c) Check the valve lift.

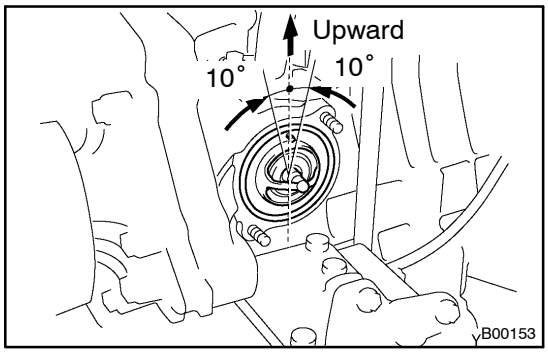
Valve lift: 10 mm (0.39 in.) or more at 90°C (194°F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).

If not closed, replace the thermostat.

CO04M–15



INSTALLATION

1. PLACE THERMOSTAT IN CYLINDER BLOCK

(a) Install a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve upward.

HINT:

The jiggle valve may be set within 10° of either side of the prescribed position.

2. INSTALL WATER INLET

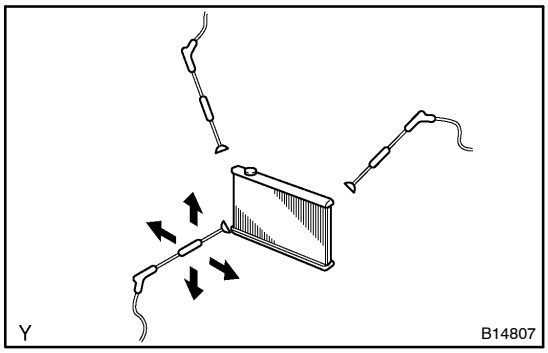
Install the water inlet with the 2 nuts.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

3. INSTALL GENERATOR AND DRIVE BELT
(See page CH–17)

4. FILL WITH ENGINE COOLANT

5. START ENGINE, AND CHECK FOR COOLANT LEAKS



RADIATOR

CO1B0–05

ON–VEHICLE CLEANING

INSPECT FINS FOR BLOCKAGE

If fins are clogged, wash them with water or a steam cleaner and dry with compressed air.

NOTICE:

- **If the distance between the steam cleaner and the core is too close, there is a possibility of damaging the fin, so keep the following injection distance.**

Injection Pressure	Injection Distance
2,942 – 4,903 kpa (30 – 50 kg/cm^2, 427 –711 psi)	300 mm (11.811 in)
4,903 – 7,845 kpa (50 – 80 kg/cm^2, 711 – 1,138 psi)	500 mm (19.685 in)

- **If the fins are bent, straighten them with a screwdriver or pliers.**
- **Never apply water directly onto the electronic components.**

CO04O–27

ON–VEHICLE INSPECTION

1. REMOVE RESERVOIR CAP

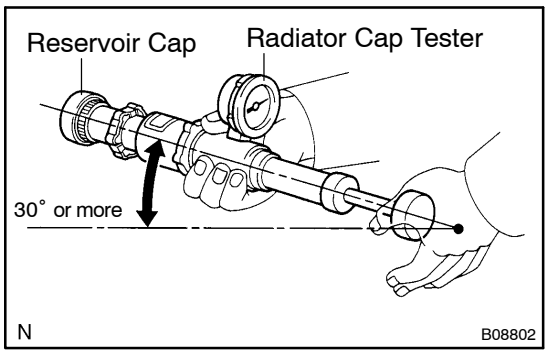
CAUTION:

To avoid the danger of being burned, do not remove the reservoir cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

2. INSPECT RESERVOIR CAP

NOTICE:

- **If the reservoir cap has contaminations, always rinse it with water.**
- **Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.**
- **When performing steps (a) and (b) below, keep the radiator cap tester at an angle of over 30° above the horizontal.**



(a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.

Pump speed: 1 push/(3 seconds or more)

NOTICE:

Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the reservoir cap.

(b) Pump the tester and measure the relief valve opening pressure.

Pump speed: 1 push within 1 second

NOTICE:

This pump speed is for the first pump only (in order to close the vacuum valve). After this, the pump speed can be reduced.

Standard opening pressure:

93 – 123 kPa (0.95 – 1.25 kgf/cm^2, 13.5 – 17.8 psi)

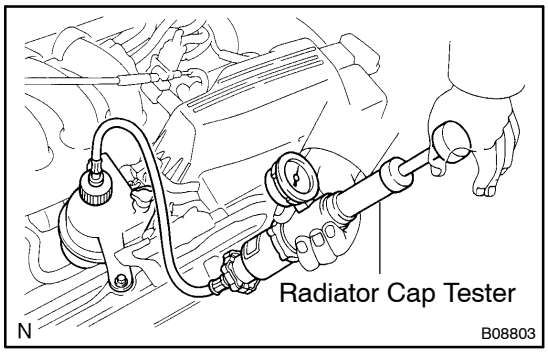
Minimum opening pressure:

79 kPa (0.8 kgf/cm^2, 11.5 psi)

HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the reservoir cap.



3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

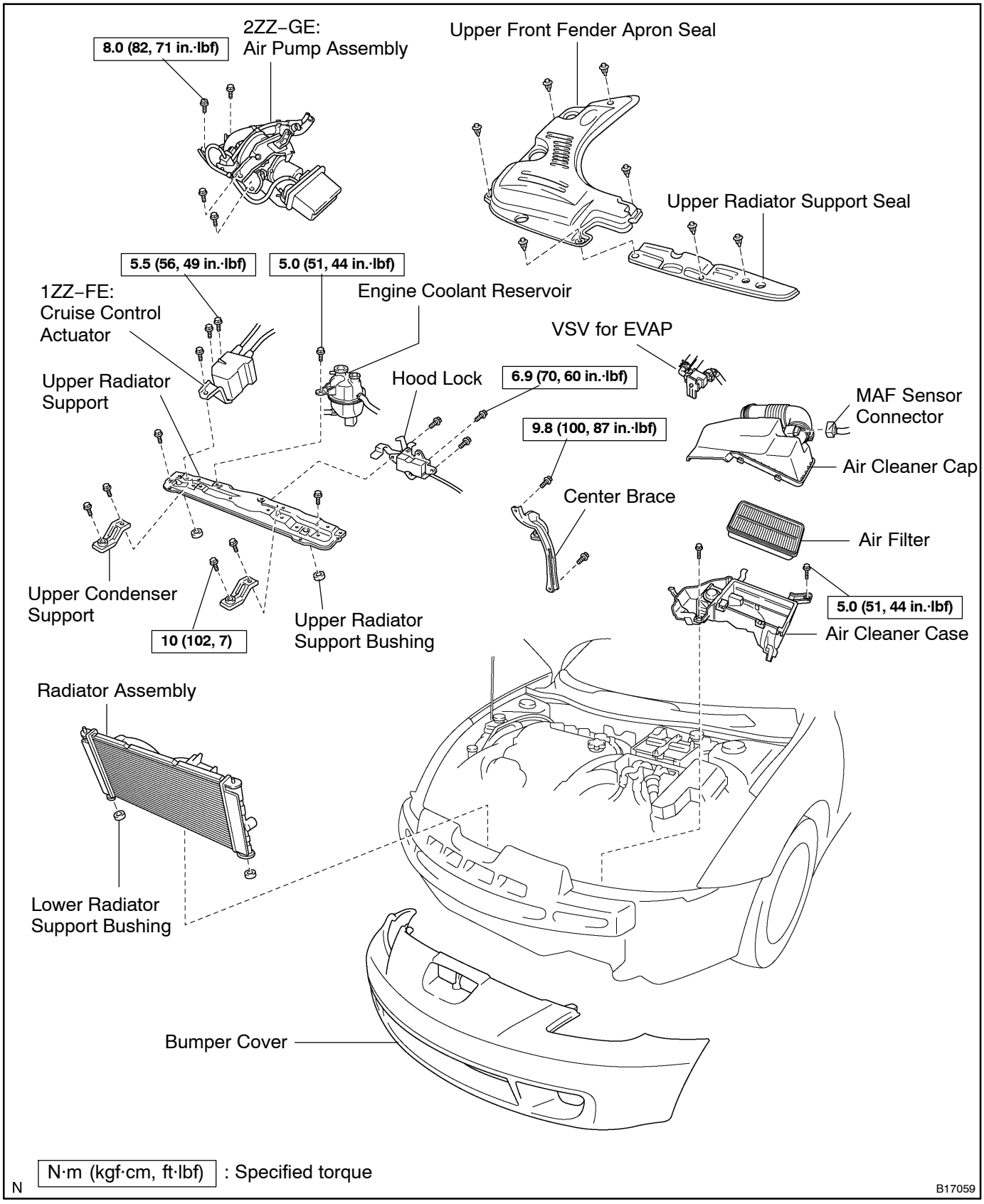
(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 psi), and check that the pressure does not drop.

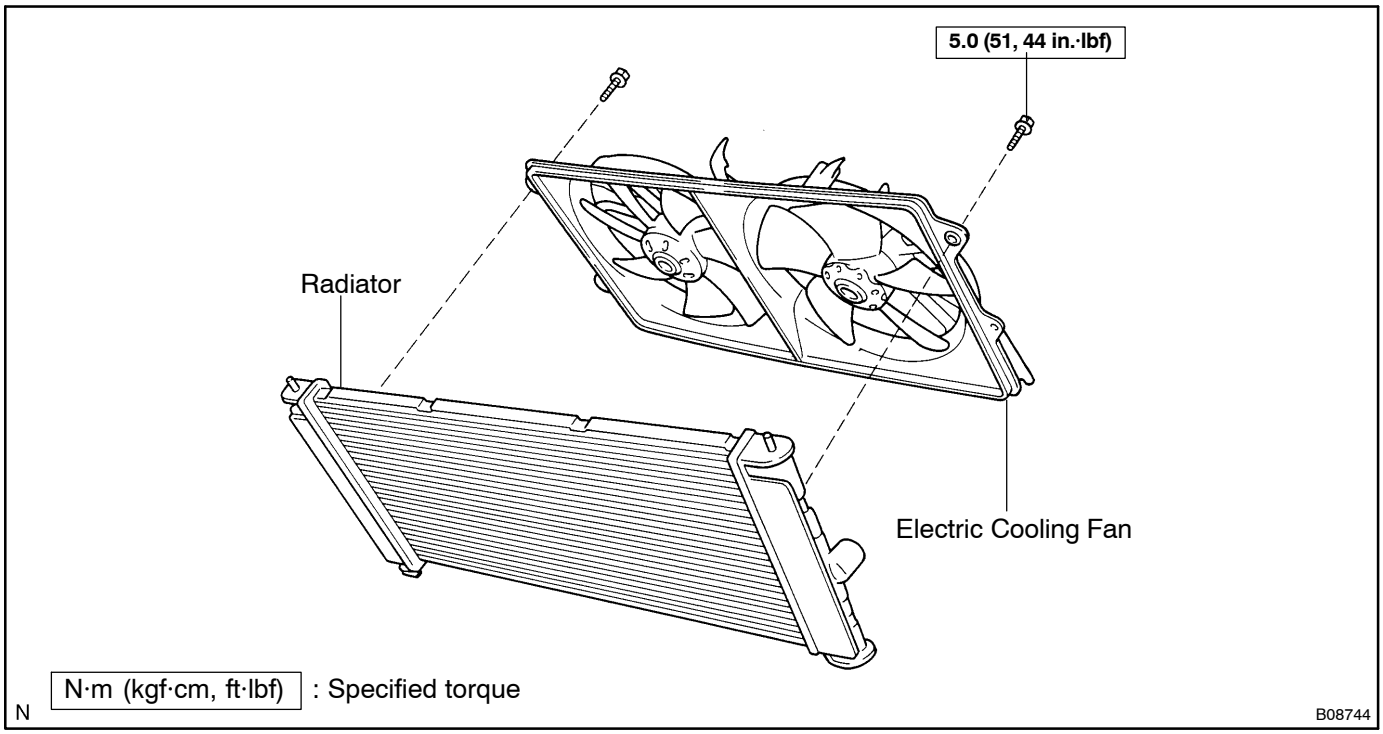
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

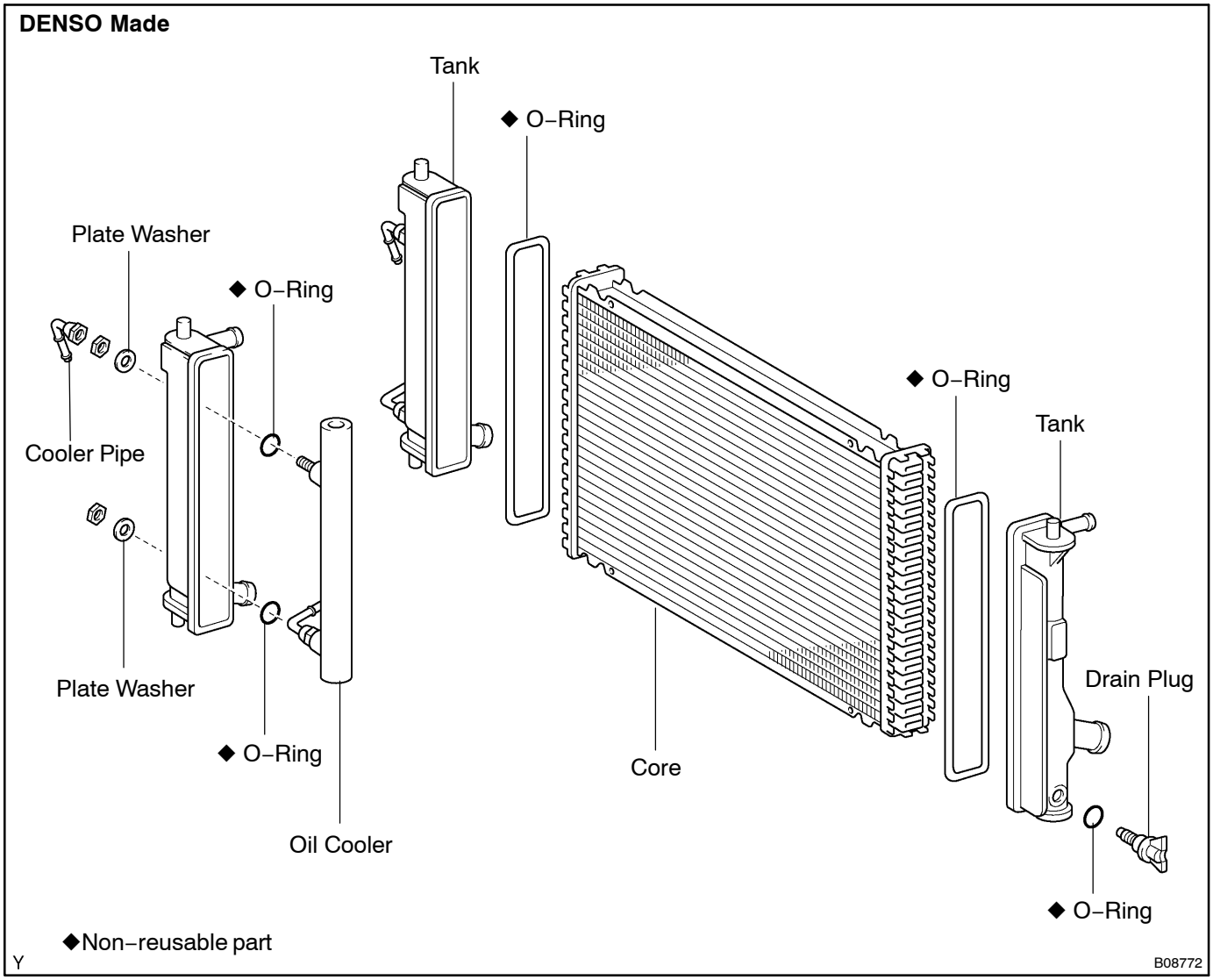
4. REINSTALL RESERVOIR CAP

CO04P–12

COMPONENTS




5.0 (51, 44 in.·lbf)
Radiator
Electric Cooling Fan
N·m (kgf·cm, ft·lbf) : Specified torque
N
B08744


DENSO Made
Tank
◆ O–Ring
Plate Washer
◆ O–Ring
Cooler Pipe
◆ O–Ring
Tank
Plate Washer
◆ O–Ring
Drain Plug
Core
Oil Cooler
◆ O–Ring
◆Non–reusable part
Y
B08772

CO0X4–09

REMOVAL

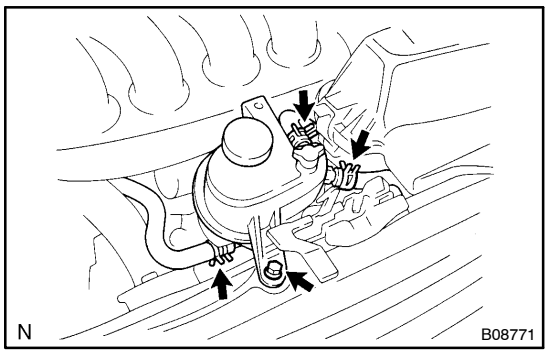
1. REMOVE UPPER FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL

2. DRAIN ENGINE COOLANT

3. REMOVE BUMPER COVER (See page BO–4)

4. 2ZZ–GE:
REMOVE AIR PUMP ASSEMBLY (See page EC–15)

5. REMOVE AIR CLEANER



6. REMOVE ENGINE COOLANT RESERVOIR

(a) Disconnect the 3 radiator reservoir hoses.

(b) Remove the bolt and engine coolant reservoir.

7. REMOVE RADIATOR ASSEMBLY

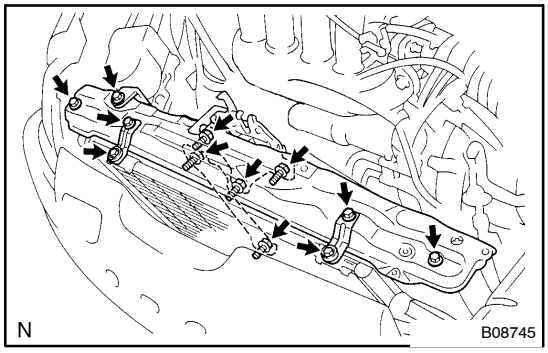
(a) Disconnect the No. 1 electric cooling fan connector.

(b) Disconnect the No. 2 electric cooling fan connector.

(c) Disconnect the upper radiator hose.

(d) Disconnect the lower radiator hose.

(e) Disconnect the 2 A/T oil cooler hoses.



(f) Remove the 3 bolts, and disconnect the hood lock.

(g) Remove the 2 bolts and center brace.

(h) Remove the 4 bolts and 2 upper condenser supports.

(i) w/ Cruise control system:
Remove the bolt, and disconnect the cruise control actuator.

(j) Remove the 2 bolts and radiator upper support.

(k) Remove the 2 upper radiator support bushings.

(l) Remove the radiator assembly.

(m) Remove the 2 lower radiator support bushings.

8. REMOVE ELECTRIC COOLING FAN FROM RADIATOR

Remove the 2 bolts and cooling fan assembly.

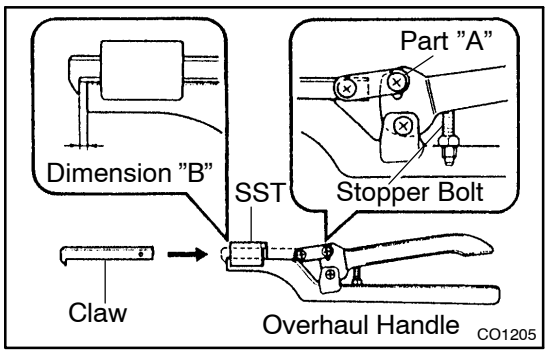
CO04R–10

DISASSEMBLY

1. REMOVE DRAIN PLUG

(a) Remove the drain plug.

(b) Remove the O–ring.



2. DENSO Made:
ASSEMBLE SST

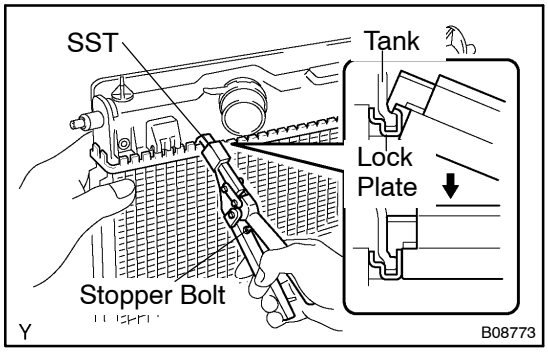
SST 09230–01010

(a) Install the claw to the overhaul handle, inserting it in the hole in part ”A” as shown in the diagram.

(b) While gripping the handle, adjust the stopper bolts so that dimension ”B” shown in the diagram is 0.2 – 0.3 mm (0.008 – 0.012 in.).

NOTICE:

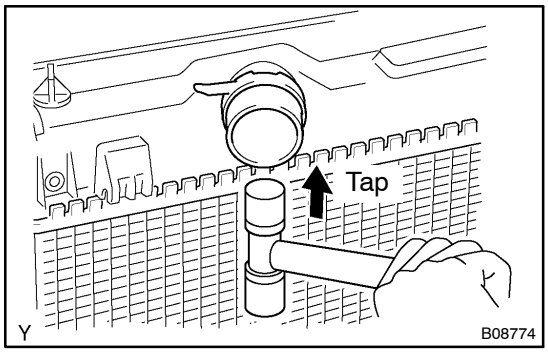
If this adjustment is not done the claw may be damaged.



3. DENSO Made:
UNCAULK LOCK PLATES

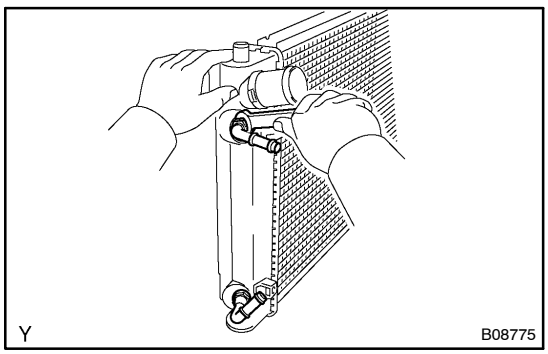
Using SST to release the caulking, squeeze the handle until stopped by the stopper bolts.

SST 09230–01010



4. DENSO Made:
REMOVE TANKS AND O–RINGS

Lightly tap the bracket of the radiator (or radiator inlet or outlet) with a soft–faced hammer, and remove the tank and the O–ring.



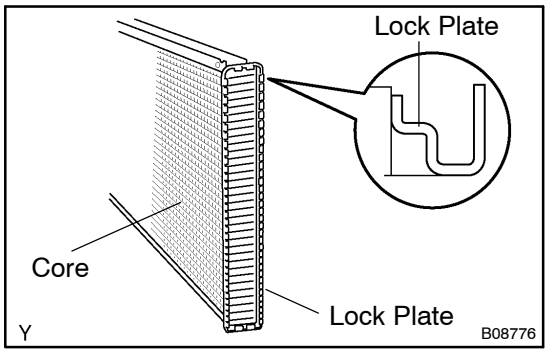
5. A/T (DENSO Made):
REMOVE OIL COOLER FROM LOWER TANK

(a) Loosen the nut, and remove the cooler pipe.

(b) Remove the 2 nuts and 2 plate washers.

(c) Remove the oil cooler and 2 O–rings.

CO04S–22



INSPECTION

DENSO Made:

INSPECT LOCK PLATE FOR DAMAGE

HINT:

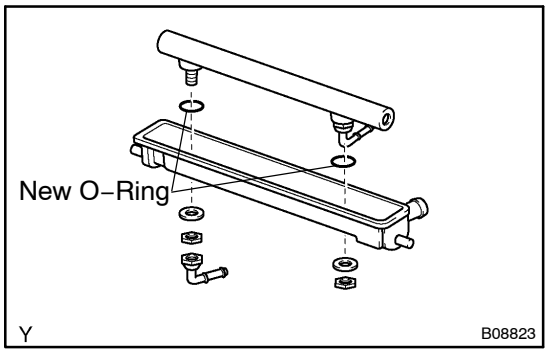
- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged.

NOTICE:

The radiator can only be recaulked 2 times. After the 2nd time, the radiator core must be replaced.

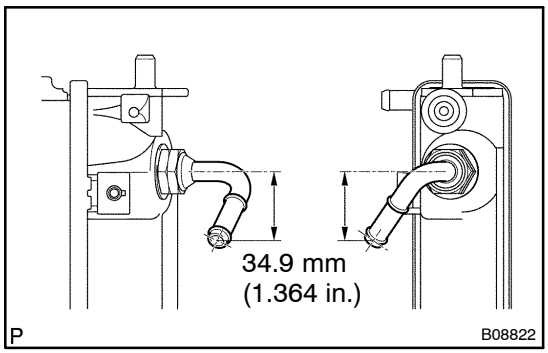
CO0X5–02

REASSEMBLY

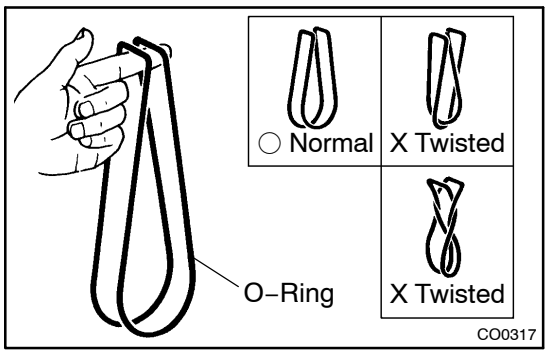


1. A/T (DENSO Made):
INSTALL OIL COOLER TO LOWER TANK

(a) Clean the O–ring contact surface of the lower tank and oil cooler.
(b) Install 2 new O–rings to the oil cooler.
(c) Install the oil cooler to the lower tank.
(d) Install the 2 plate washers and 2 nuts.
Torque: 8.34 N·m (85 kgf·cm, 74 in.·lbf)



(e) Install the cooler pipe in the direction indicated as shown in the illustration.
Torque: 14.7 N·m (150 kgf·cm, 11 ft·lbf)

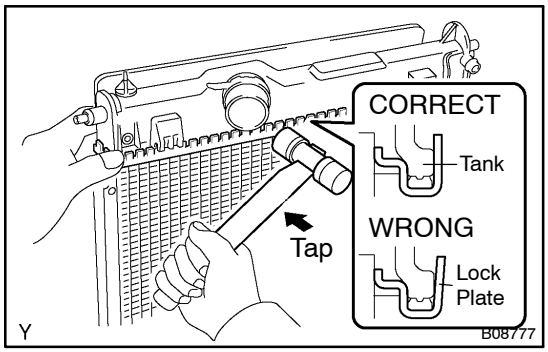


2. DENSO Made:
INSTALL NEW O–RINGS AND TANKS

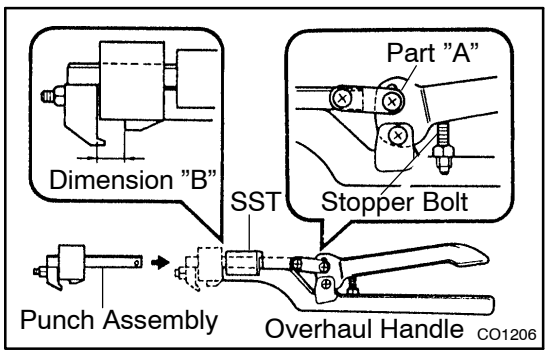
(a) After checking that there are no foreign objects in the lock plate groove, install the new O–ring without twisting it.

HINT:
When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.

(b) Install the tank without damaging the O–ring.



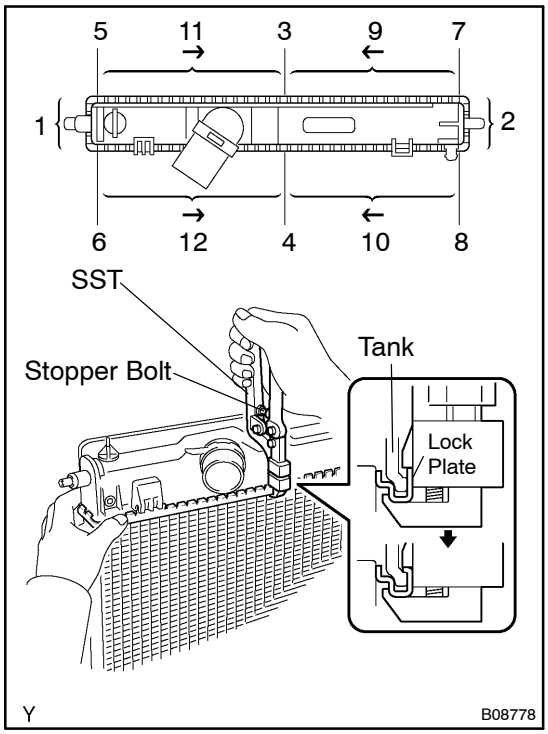
(c) Tap the lock prate with a soft–faced hammer so that there is no gap between it and the tank.



3. DENSO Made:
ASSEMBLE SST

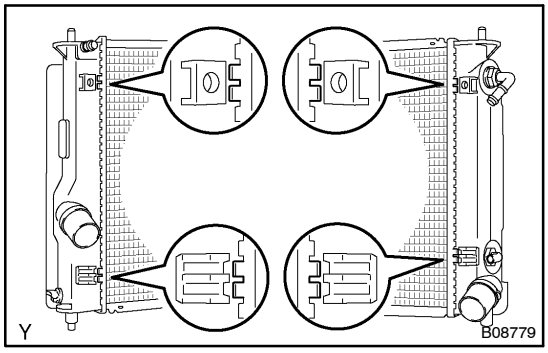
SST 09230–01010, 09231–14010

(a) Install the punch assembly to the overhaul handle, inserting it in the hole in part "A" as shown in the illustration.
(b) While gripping the handle, adjust the stopper bolt so that dimension "B" is as shown in the illustration.
Dimension: 8.4 mm (0.331 in.)



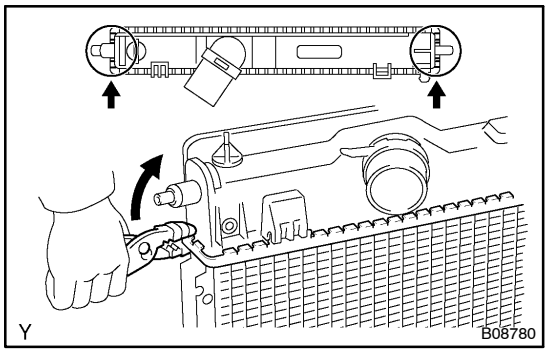
4. DENSO Made:
CAULK LOCK PLATE

(a) Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopped plate.
SST 09230–01010

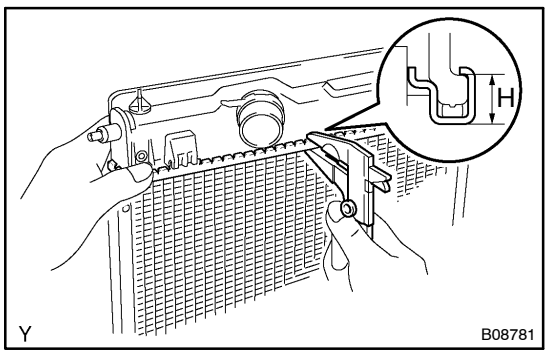


HINT:

- Do not stake the areas protruding around the pipes, brackets or tank rids.



- The points shown in the illustration and oil cooler near here (A/T) cannot be staked with SST. Use wrap vinyl tape around the tip of a pair or similar object and be careful not to damage the core plates.

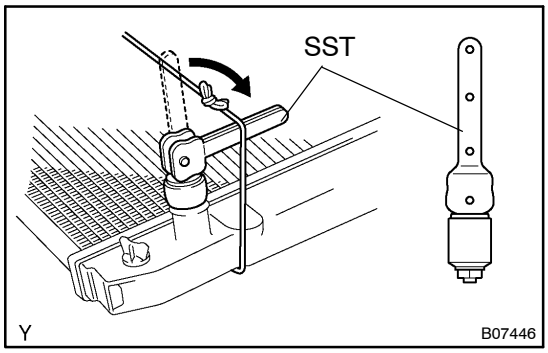


(b) Check the lock plate height (H) after completing the caulking.
Plate height: 7.40 – 7.80 mm (0.2913 – 0.3071 in.)

If not within the specified height, adjust the stopper bolt of the handle again and caulk again.

5. INSTALL DRAIN PLUG

(a) Install a new O–ring to the drain plug.
(b) Install the drain plug.



6. INSPECT FOR WATER LEAKS

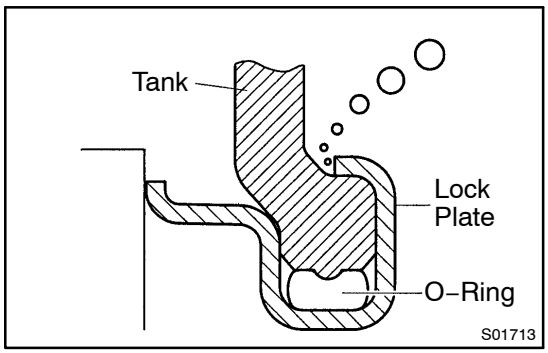
(a) Tighten the drain plug.

(b) Install the engine coolant reservoir.

(c) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230–01010

(d) Using a radiator cap tester, apply pressure to the radiator.
Test pressure: 177 kPa (1.8 kgf/cm^2, 26 psi)

(e) Submerge the radiator in water.



(f) Inspect for leaks.

HINT:

On radiators with resin tanks, there is a clearance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before doing the water leak test, first swish the radiator around in the water until all bubbles disappear.

CO0X3–08

INSTALLATION

1. INSTALL ELECTRIC COOLING FAN TO RADIATOR

Install the cooling fan with the 2 bolts.

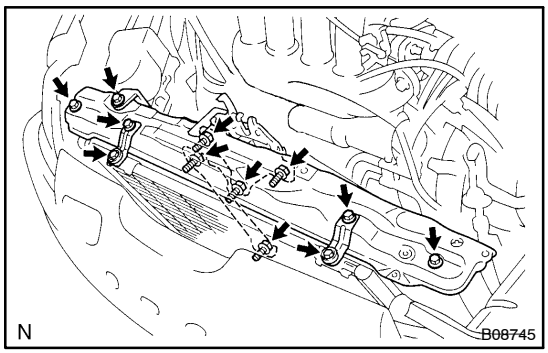
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

2. INSTALL RADIATOR ASSEMBLY

(a) Install the 2 lower radiator support bushings.

(b) Install the radiator assembly.

(c) Install the 2 upper radiator support bushings.



(d) Install the radiator upper support with the 2 bolts.

(e) w/ Cruise control system:
Install the cruise control actuator with the 3 bolts.

(f) Install the 2 upper condenser supports with the 4 bolts.

(g) Install the center brace with the 2 bolts.

(h) Install the hood lock with the 3 bolts.

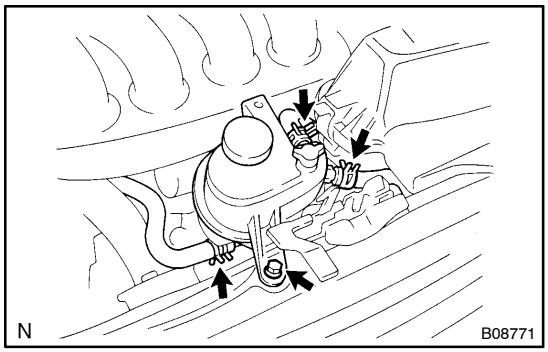
(i) Connect the 2 A/T oil cooler hoses.

(j) Connect the lower radiator hose.

(k) Connect the upper radiator hose.

(l) Connect the No. 1 electric cooling fan connector.

(m) Connect the No. 2 electric cooling fan connector.



3. INSTALL ENGINE COOLANT RESERVOIR

(a) Install the engine coolant reservoir with the bolt.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

(b) Connect the 3 radiator reservoir hoses.

4. INSTALL AIR CLEANER

5. 2ZZ–GE:
INSTALL AIR PUMP ASSEMBLY (See page EC–18)

6. INSTALL BUMPER COVER (See page BO–4)

7. FILL WITH ENGINE COOLANT

8. INSTALL UPPER FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL

9. START ENGINE AND CHECK FOR COOLANT LEAKS

ELECTRIC COOLING FAN

CO0X0–06

ON–VEHICLE INSPECTION

1. CHECK COOLING FAN OPERATION WITH LOW TEMPERATURE (Below 83°C (181°F))

(a) Turn the ignition switch ON.

(b) Check that the cooling fan stops.

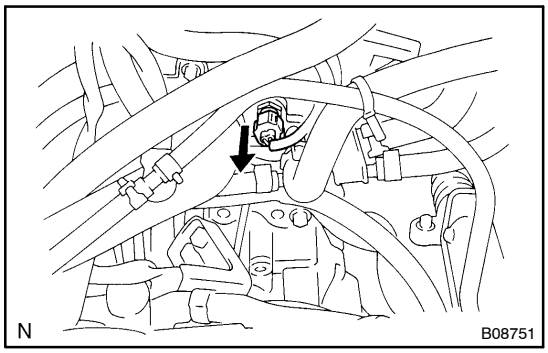
If not, check the cooling fan relay and ECT sensor, and check for a separated connector or severed wire between the cooling fan relay and ECT sensor.

(c) Disconnect the ECT sensor connector.

(d) Check that the cooling fan rotates.

If not, check the engine main relay, cooling fan relay, cooling fan, fuses, and check for short circuit between the cooling fan relay and ECT sensor.

(e) Reconnect the ECT sensor connector.

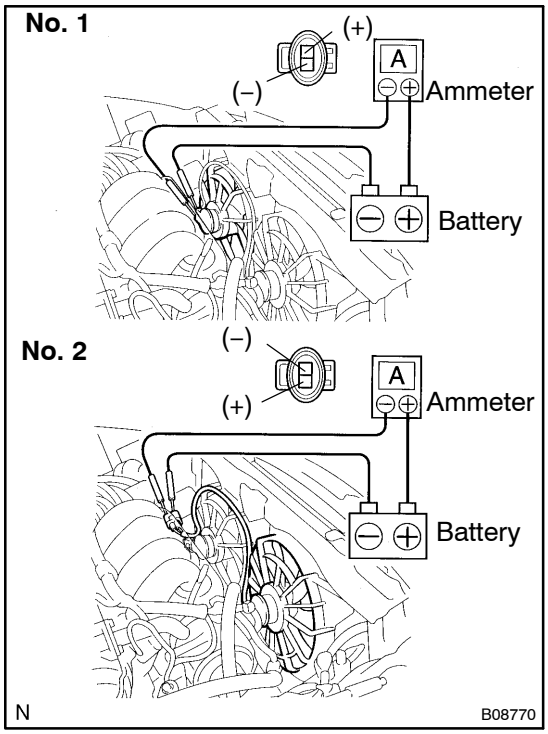


2. CHECK COOLING FAN OPERATION WITH HIGH TEMPERATURE (Above 93°C (199°F))

(a) Start the engine, and raise coolant temperature to above 93°C (199°F).

(b) Check that the cooling fan rotates.

If not, replace the ECT sensor.



3. INSPECT COOLING FANS

(a) Disconnect the cooling fan connector.

(b) Connect battery and ammeter to the connector.

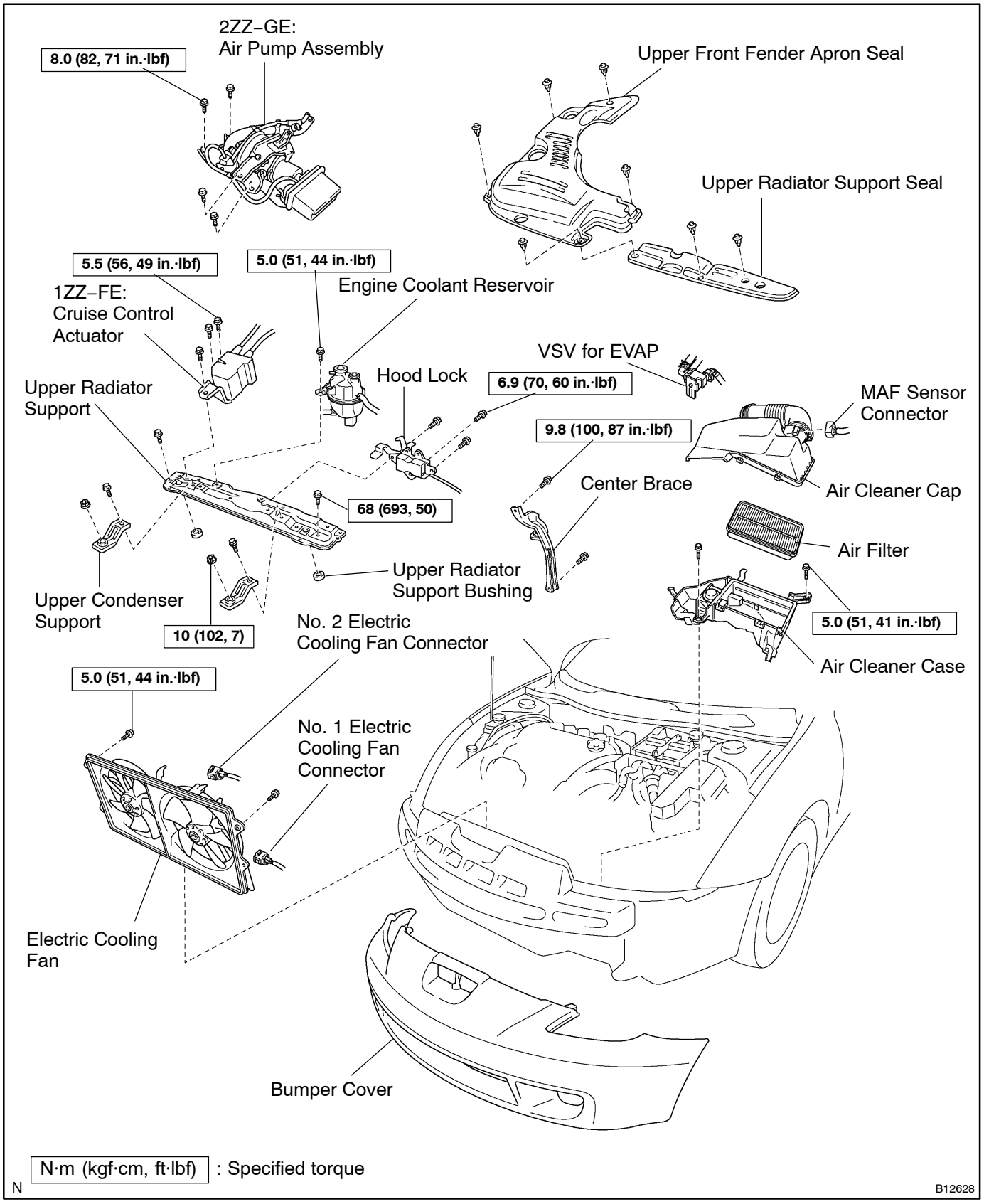
(c) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage: 5.2 – 8.2 A

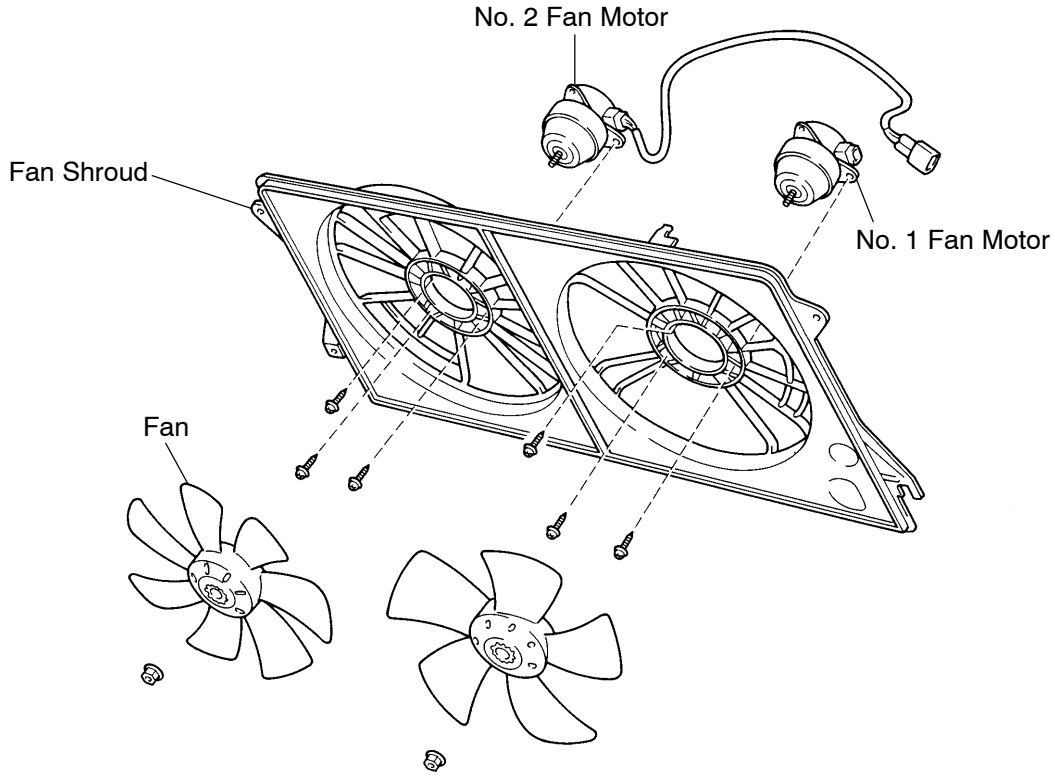
(d) Reconnect the cooling fan connector.

CO04W–13

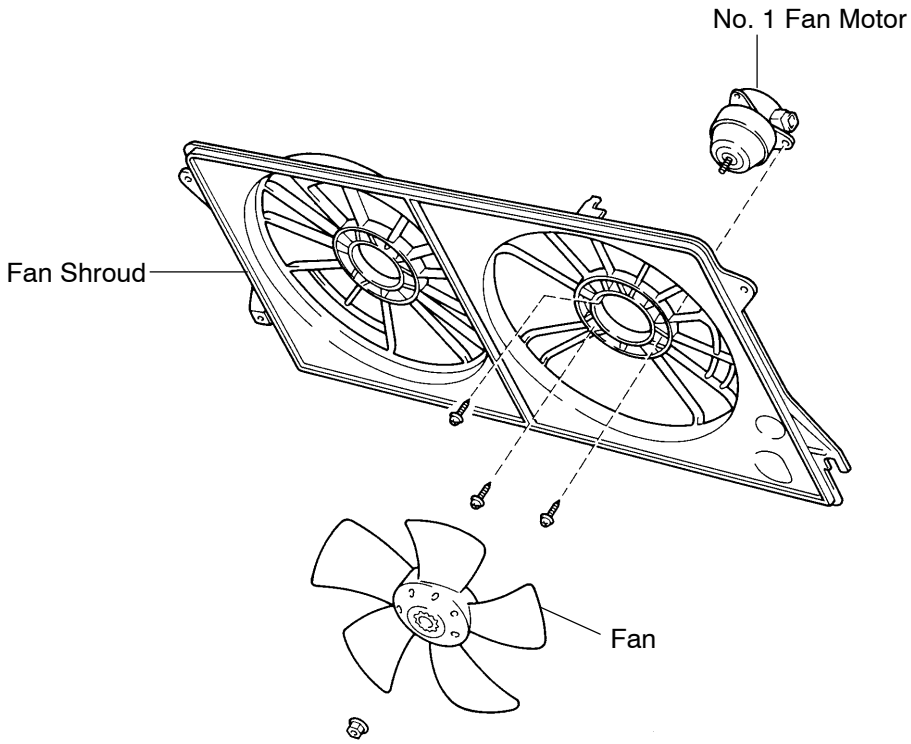
COMPONENTS



w/ A/C



w/o A/C



N

B08788

CO04X–09

REMOVAL

1. REMOVE UPPER FRONT FENDER APRON SEAL AND UPPER RADIATOR SUPPORT SEAL

2. 2ZZ–GE:
REMOVE AIR PUMP ASSEMBLY (See page EC–15)

3. DRAIN ENGINE COOLANT

4. REMOVE BUMPER COVER (See page BO–4)

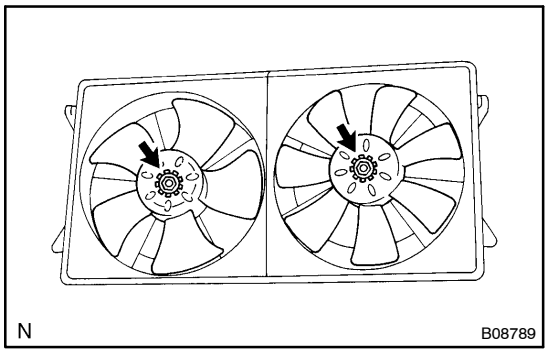
5. REMOVE RADIATOR UPPER SUPPORT

(a) Remove the air cleaner assembly.
(b) Remove the engine coolant reservoir.
(c) Remove the 3 bolts, and disconnect the hood lock.
(d) Remove the 2 bolts and center brace.
(e) Remove the 4 bolts and 2 upper condenser supports.
(f) w/ Cruise control system:
Remove the bolt, and disconnect the cruise control actuator.
(g) Remove the 2 bolts and radiator upper support.

6. REMOVE COOLING FAN

(a) Disconnect the 2 cooling fan connectors.
(b) Remove the 2 bolts and cooling fan.

CO04Y–13



DISASSEMBLY

1. REMOVE FAN(S)

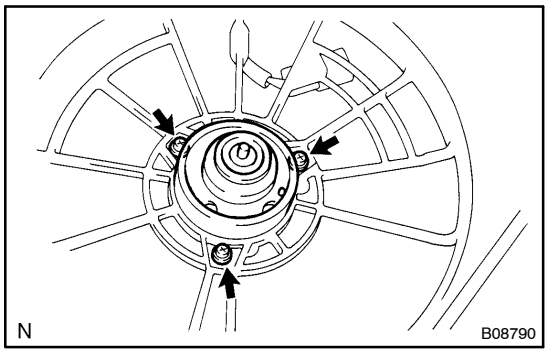
Remove the nut and fan.

2. REMOVE FAN MOTOR(S)

(a) Disconnect the wire and connector holder from the fan shroud.

(b) Remove the 3 screws and fan motor.

CO0X1-02

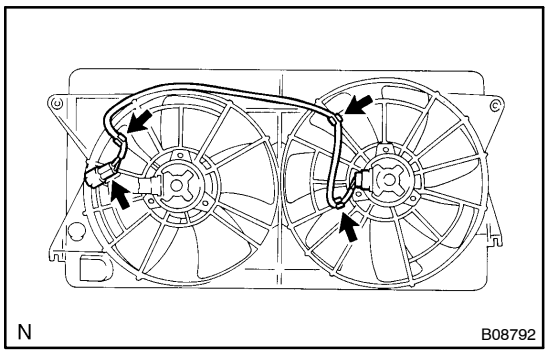


REASSEMBLY

1. INSTALL FAN MOTOR(S)

(a) Install the fan motor with the 3 screws.

Torque: 2.55 N·m (26 kgf·cm, 23 in.·lbf)



(b) Install the wire and connector holder to the fan shroud.

2. INSTALL FAN(S)

Install the fan with the nut.

Torque: 6.18 N·m (63 kgf·cm, 55 in.·lbf)

CO0X2–05

INSTALLATION

1. INSTALL COOLING FAN

(a) Install the cooling fan with the 2 bolts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

(b) Connect the 2 cooling fan connectors.

2. INSTALL RADIATOR UPPER SUPPORT

(a) Install the radiator upper support with the 2 bolts.

(b) w/ Cruise control system:
Install the cruise control actuator with the 3 bolts.

(c) Install the 2 upper condenser supports with the 4 bolts.

(d) Install the center brace with the 2 bolts.

(e) Install the hood lock with the 3 bolts.

(f) Install the engine coolant reservoir.

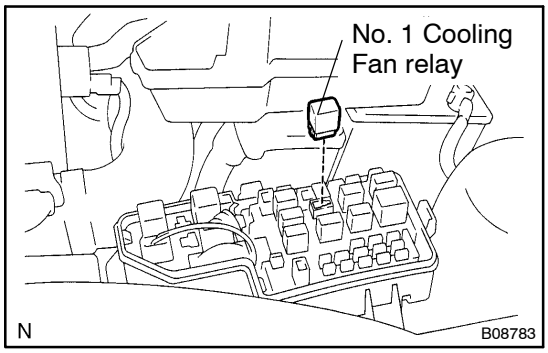
(g) Install the air cleaner assembly.

3. INSTALL FRONT BUMPER (See page BO–4)

4. 2ZZ–GE:
INSTALL AIR PUMP ASSEMBLY (See page EC–18)

5. FILL WITH ENGINE COOLANT

6. START ENGINE AND CHECK FOR COOLANT LEAKS



COOLING FAN RELAY

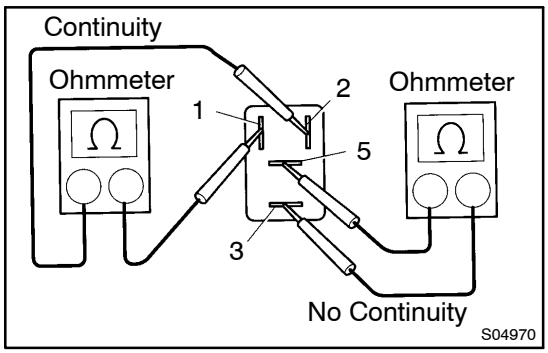
CO054–11

INSPECTION

1. INSPECT NO. 1 COOLING FAN RELAY

(a) Remove the relay box cover.

(b) Remove the No. 1 cooling fan relay. (Marking: FAN No. 1)



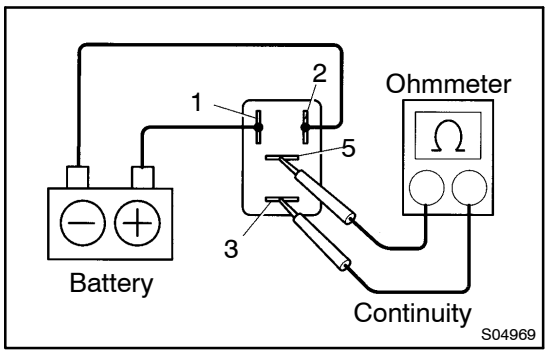
(c) Inspect the No. 1 cooling fan relay continuity.

(1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



(d) Inspect the No. 1 cooling fan relay operation.

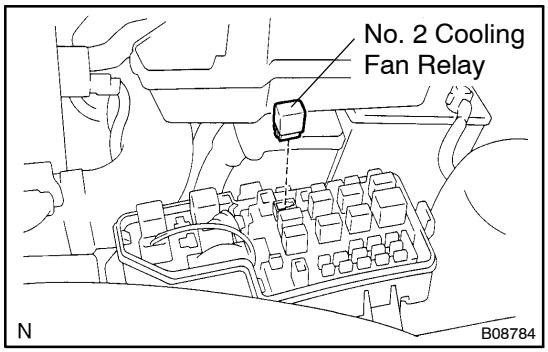
(1) Apply battery positive voltage across terminals 1 and 2.

(2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

(e) Reinstall the No. 3 cooling fan relay.

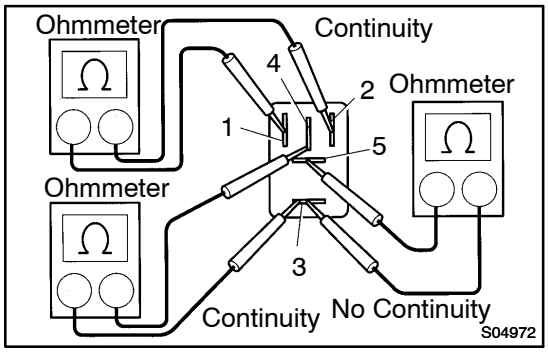
(f) Reinstall the relay box cover.



2. w/ A/C:
INSPECT NO. 2 COOLING FAN RELAY

(a) Remove the relay box cover.

(b) Remove the No. 2 cooling fan relay. (Marking: FAN No. 2)



(c) Inspect the No. 2 cooling fan relay continuity.

(1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

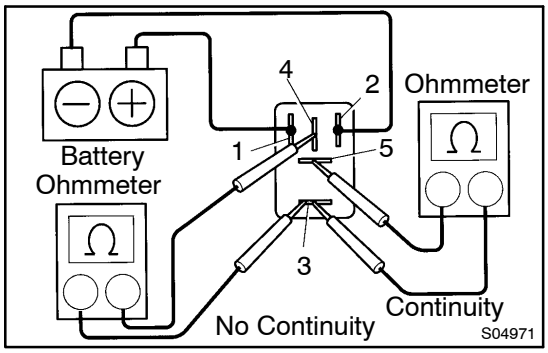
If there is no continuity, replace the relay.

(2) Check that there is continuity between terminals 3 and 4.

If there is no continuity, replace the relay.

(3) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



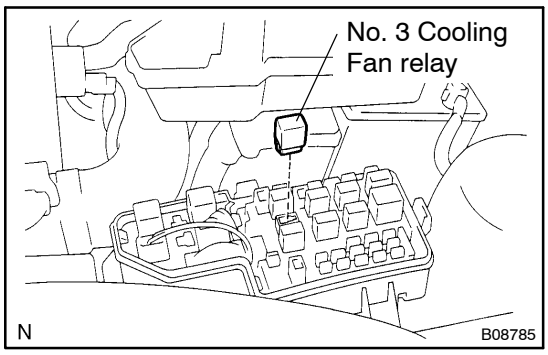
(d) Inspect the No. 2 cooling fan relay operation.
  (1) Apply battery positive voltage across terminals 1 and 2.
  (2) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If there is continuity, replace the relay.

  (3) Check that there is continuity between terminals 3 and 5.

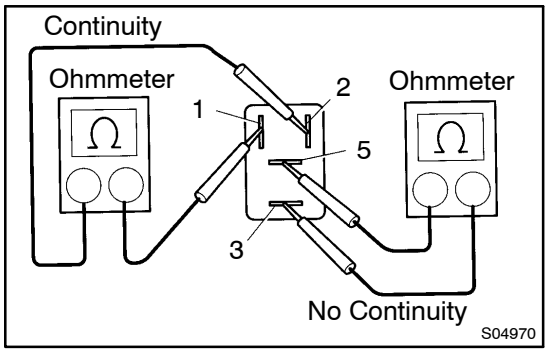
If there is no continuity, replace the relay.

(e) Reinstall the No. 2 cooling fan relay.
(f) Reinstall the relay box cover.



3. w/ A/C:
INSPECT NO. 3 COOLING FAN RELAY

(a) Remove the relay box cover.
(b) Remove the No. 3 cooling fan relay. (Marking: FAN No. 3)

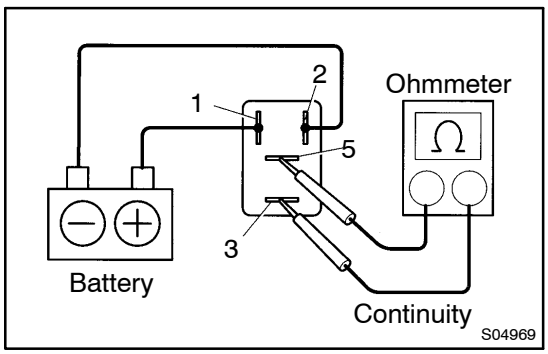


(c) Inspect the No. 3 cooling fan relay continuity.
  (1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

  (2) Check that there is no continuity between terminals 3 and 5.

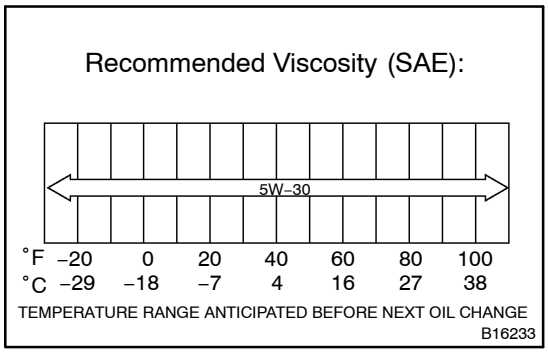
If there is continuity, replace the relay.



(d) Inspect the No. 3 cooling fan relay operation.
  (1) Apply battery positive voltage across terminals 1 and 2.
  (2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

(e) Reinstall the No. 3 cooling fan relay.
(f) Reinstall the relay box cover.



OIL AND FILTER

INSPECTION

LU0II–09

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade SL Energy–Conserving or ILSAC multi-grade engine oil.

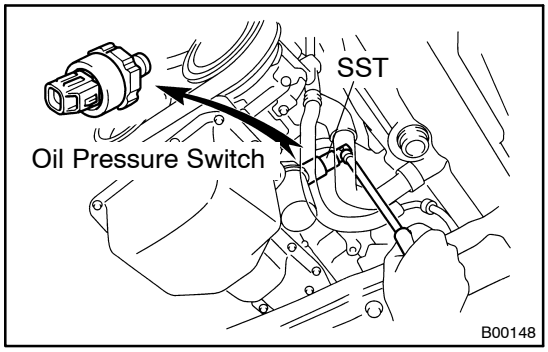
2. CHECK ENGINE OIL LEVEL

After warming up the engine and then 5 minutes after the engine stop, oil level should be between the ”L” and ”F” marks on the dipstick.

If low, check for leakage and add oil up to the ”F” mark.

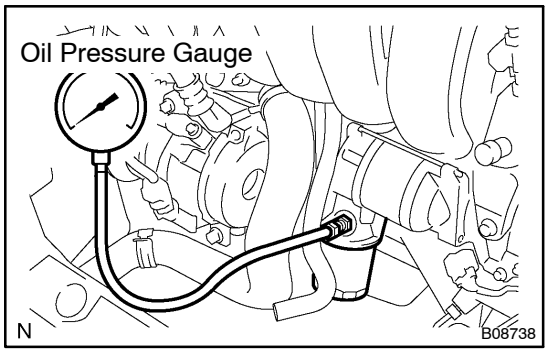
NOTICE:

Do not fill with engine oil above the ”F” mark.



3. REMOVE OIL PRESSURE SWITCH AND INSTALL OIL PRESSURE GAUGE

(a) Using SST, remove the oil pressure switch.
SST 09816–30010



(b) Install the oil pressure gauge.

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

Oil pressure:

At idle speed

1ZZ–FE 29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

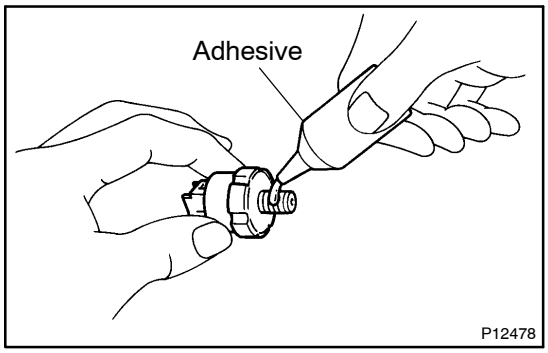
2ZZ–GE 39.2 kPa (0.4 kgf/cm^2, 5.7 psi) or more

At 3,000 rpm

294 – 539 kPa (3.0 – 5.5 kgf/cm^2, 43 – 78 psi)

6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.



(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Using SST, install the oil pressure switch.
SST 09816–30010
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

7. START ENGINE AND CHECK FOR LEAKS

LU02L–24

REPLACEMENT

CAUTION:

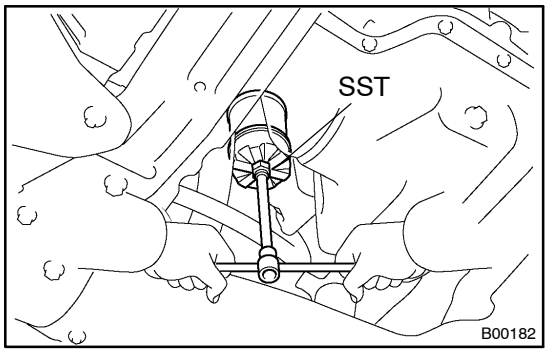
- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.**

1. REMOVE CENTER ENGIEN UNDER COVER

2. DRAIN ENGINE OIL

(a) Remove the oil filter cap.

(b) Remove the oil drain plug, and drain the oil into a container.



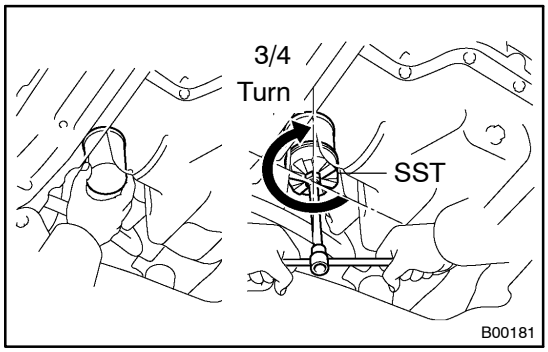
3. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–06501

(b) Check and clean the oil filter installation surface.

(c) Check the part number of the new oil filter is as same as old one.

(d) Apply clean engine oil to the gasket of a new oil filter.



(e) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(f) Using SST, tighten it an additional 3/4 turn.
SST 09228–06501

4. REFILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 37 N·m (378 kgf·cm, 27 ft·lbf)

(b) Fill with fresh engine oil.

Capacity
1ZZ–FE
Drain and refill:
w/ Oil filter change: 3.7 liters (3.9 US qts, 3.3 lmp. qts)
w/o Oil filter change: 3.5 liters (3.7 US qts, 3.1 lmp. qts)
Dry fill: 4.2 liters (4.4 US qts, 3.7 lmp. qts)
2ZZ–GE
w/ Oil filter change: 4.4 liters (4.8 US qts, 4.0 lmp. qts)
w/o Oil filter change: 4.2 liters (4.6 US qts, 3.8 lmp. qts)
Dry fill: 4.8 liters (5.1 US qts, 4.2 lmp. ats)

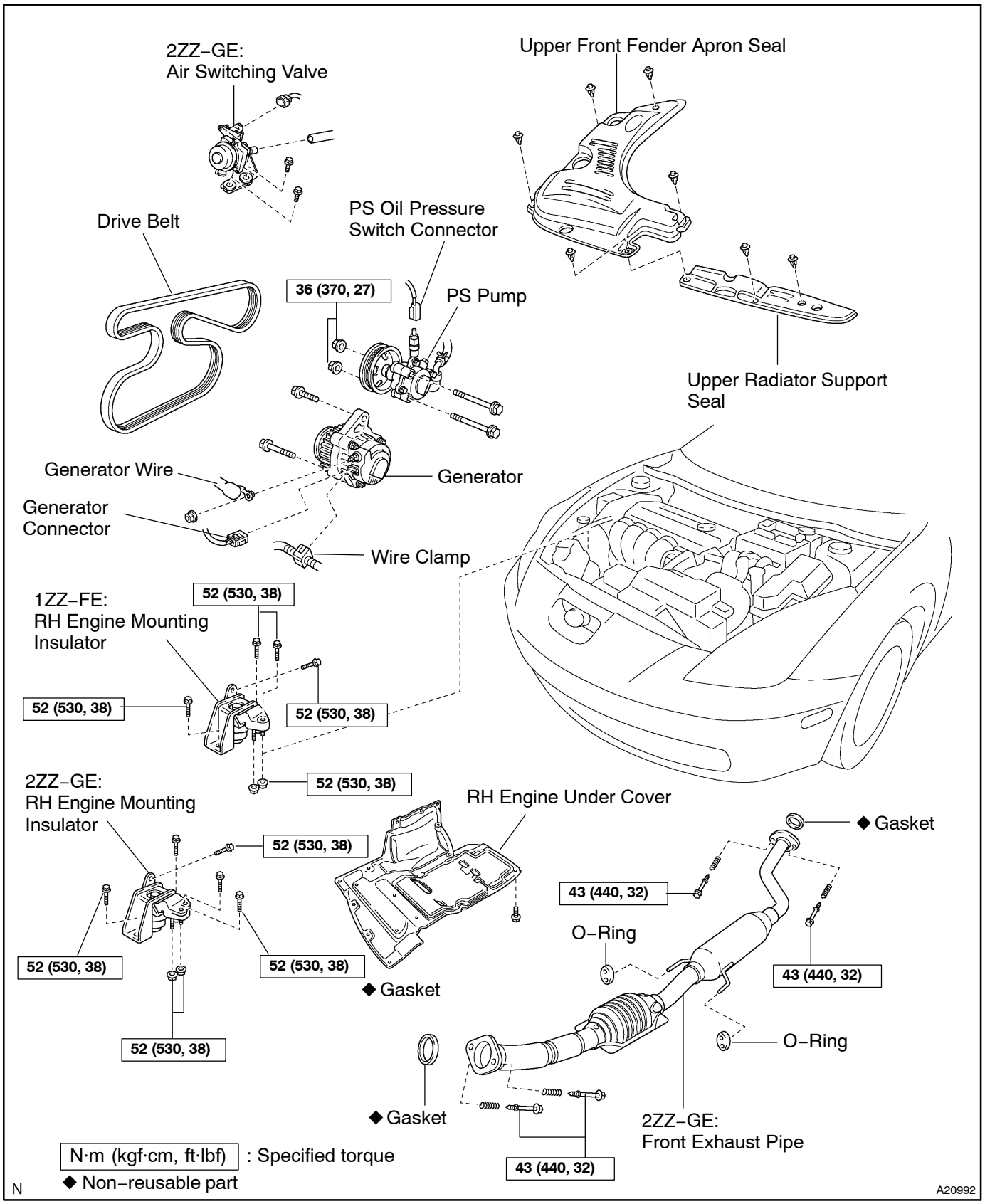
(c) Install the oil filter cap.

5. START ENGINE AND CHECK FOR OIL LEAKS
6. INSTALL CENTER ENGINE UNDER COVER
7. RECHECK ENGINE OIL LEVEL

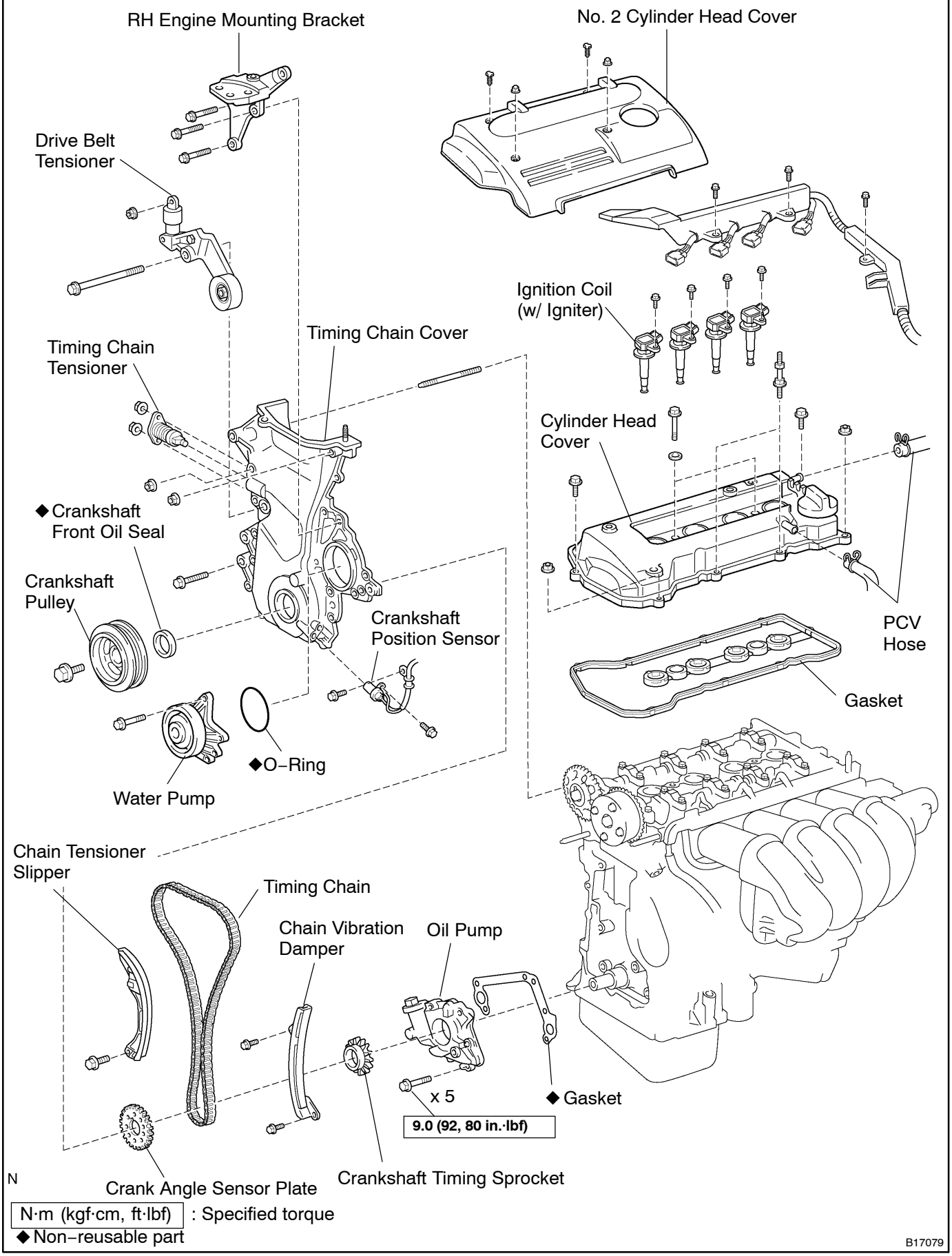
OIL PUMP

COMPONENTS

LU0IG–08

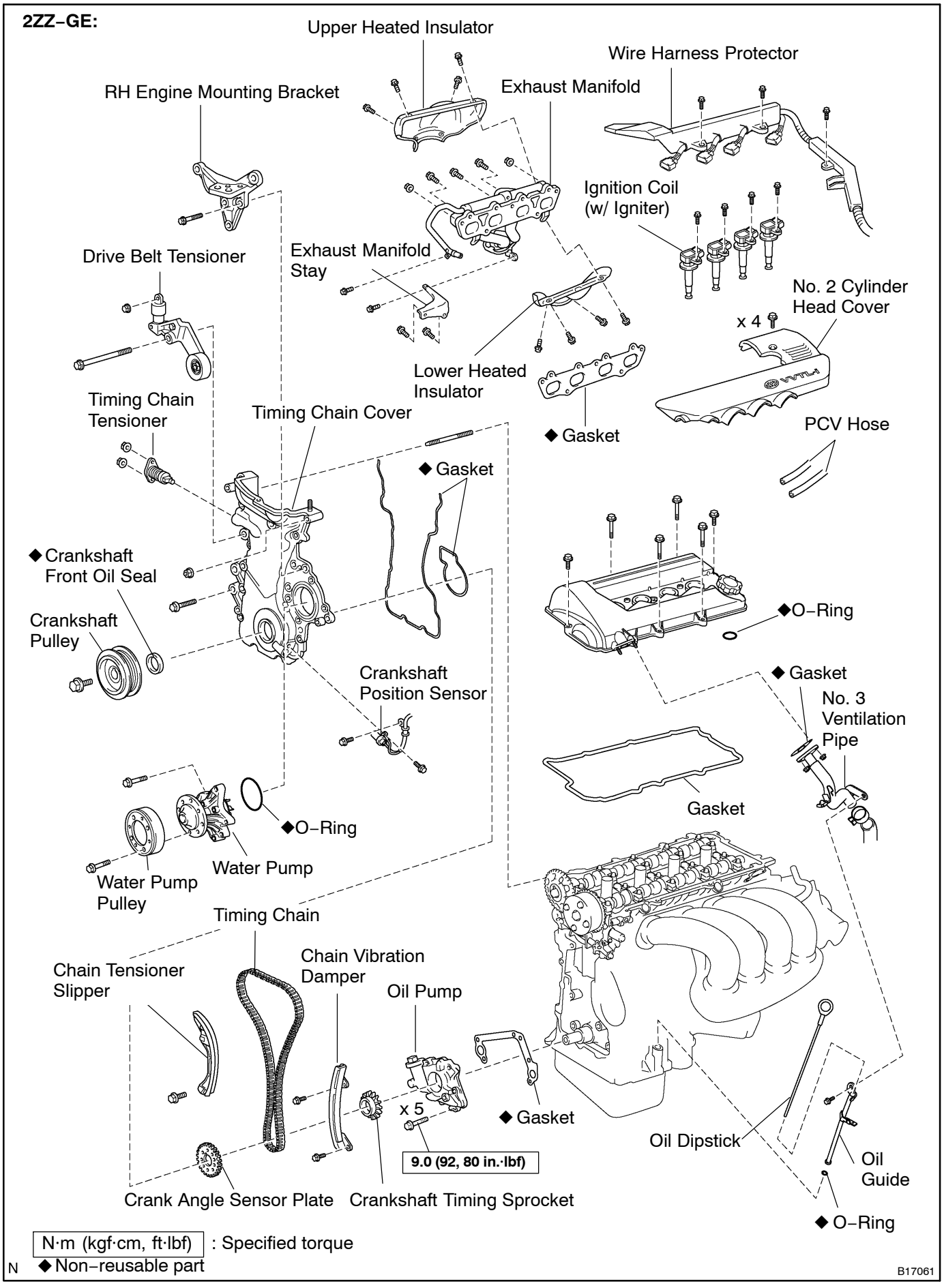


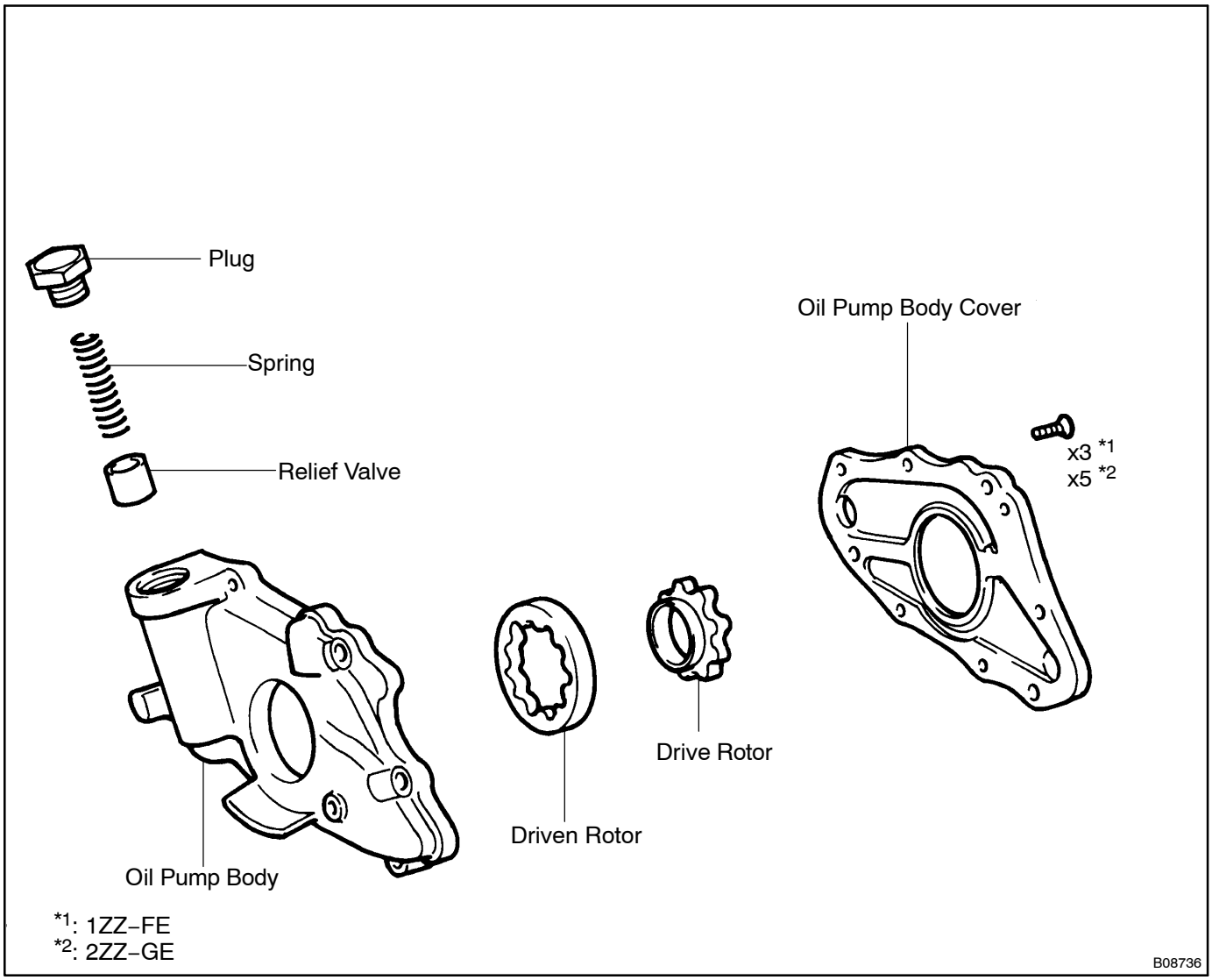
1ZZ–FE:



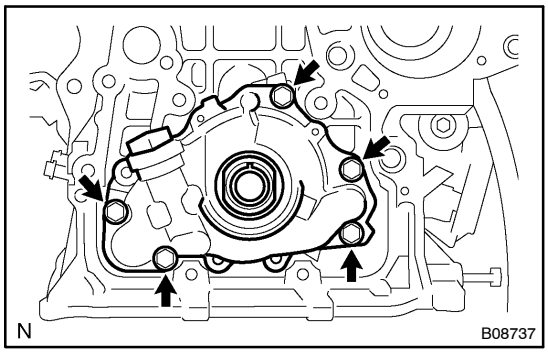
N·m (kgf·cm, ft·lbf) : Specified torque
◆Non–reusable part

B17079


2ZZ–GE:
Upper Heated Insulator
Wire Harness Protector
RH Engine Mounting Bracket
Exhaust Manifold
Ignition Coil
(w/ Igniter)
Drive Belt Tensioner
Exhaust Manifold
Stay
No. 2 Cylinder
Head Cover
x 4
Lower Heated
Insulator
◆ Gasket
Timing Chain
Tensioner
Timing Chain Cover
PCV Hose
◆ Gasket
◆ Crankshaft
Front Oil Seal
◆ O–Ring
Crankshaft
Pulley
Crankshaft
Position Sensor
◆ Gasket
No. 3
Ventilation
Pipe
Gasket
◆ O–Ring
Water Pump
Water Pump
Pulley
Timing Chain
Chain Tensioner
Slipper
Chain Vibration
Damper
Oil Pump
x 5
◆ Gasket
Oil Dipstick
9.0 (92, 80 in.·lbf)
Oil
Guide
Crank Angle Sensor Plate
Crankshaft Timing Sprocket
◆ O–Ring
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
N
B17061


Plug
Spring
Relief Valve
Oil Pump Body Cover
x3 *1
x5 *2
Drive Rotor
Driven Rotor
Oil Pump Body
*1: 1ZZ–FE
*2: 2ZZ–GE
B08736

LU02N–20



REMOVAL

1. **DRAIN ENGINE OIL**
2. **REMOVE TIMING CHAIN AND CRANKSHAFT TIMING SPROCKET (See pages EM–19)**
3. **REMOVE OIL PUMP**

Remove the 5 bolts, oil pump and gasket.

LU02O–08

DISASSEMBLY

1. REMOVE RELIEF VALVE

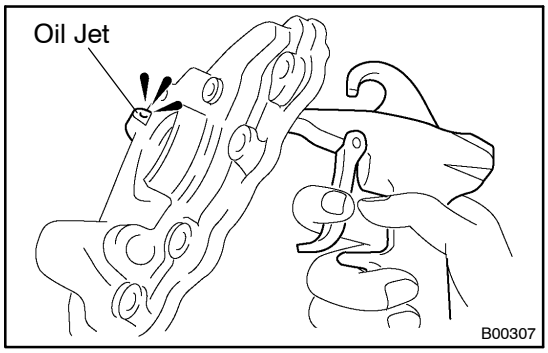
Remove the plug, spring and relief valve.

2. REMOVE DRIVE AND DRIVEN ROTORS

(a) 1ZZ–FE:
Remove the 3 screws, pump body cover, drive and driven rotors.

(b) 2ZZ–GE:
Remove the 5 screws, pump body cover, drive and driven rotors.

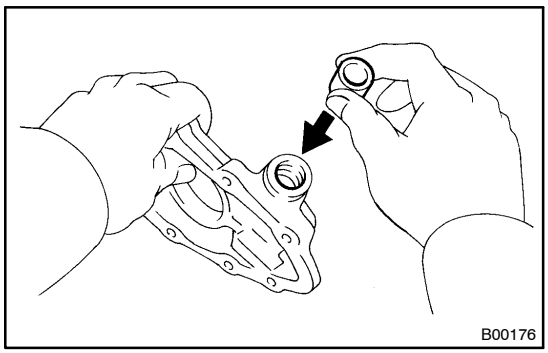
LU02P–13



INSPECTION

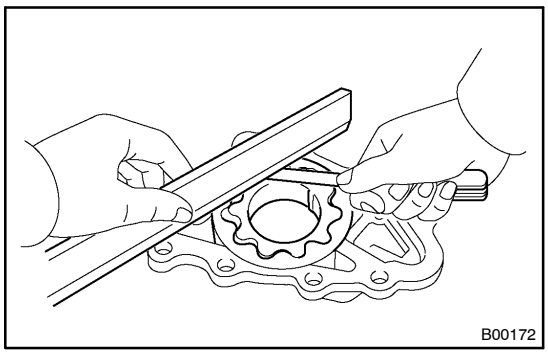
1. INSPECT OIL JET

Check the oil jet for damage or clogging.
If necessary, replace the oil pump assembly.



2. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If it does not, replace the relief valve. If necessary, replace the oil pump assembly.

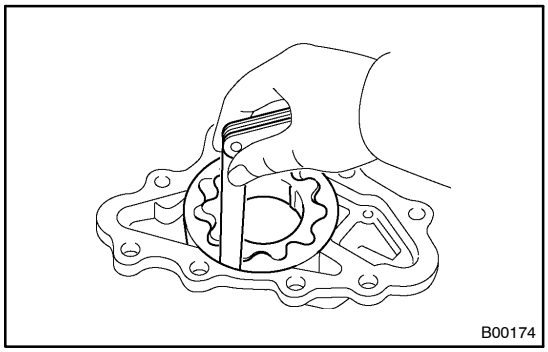


3. INSPECT ROTOR SIDE CLEARANCE

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance:
1ZZ–FE 0.025 – 0.071 mm (0.00098 – 0.00280 in.)
2ZZ–GE 0.030 – 0.080 mm (0.00118 – 0.00314 in.)
Maximum side clearance:
1ZZ–FE 0.071 mm (0.00280 in.)
2ZZ–GE 0.160 mm (0.00630 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

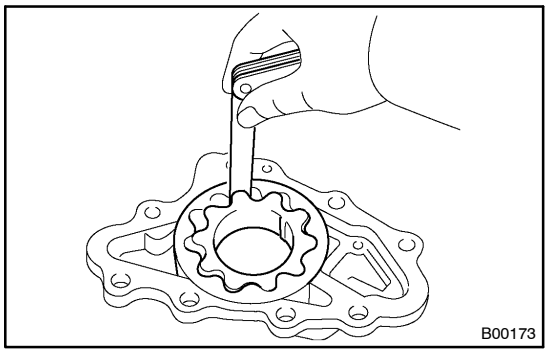


4. INSPECT ROTOR BODY CLEARANCE

Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance:
1ZZ–FE 0.260 – 0.325 mm (0.01024 – 0.01280 in.)
2ZZ–GE 0.125 – 0.180 mm (0.00492 – 0.00709 in.)
Maximum body clearance:
0.325 mm (0.01280 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



5. INSPECT ROTOR TIP CLEARANCE

Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:

1ZZ–FE 0.040 – 0.160 mm (0.00157 – 0.00630 in.)

2ZZ–GE 0.060 – 0.180 mm (0.00236 – 0.00709 in.)

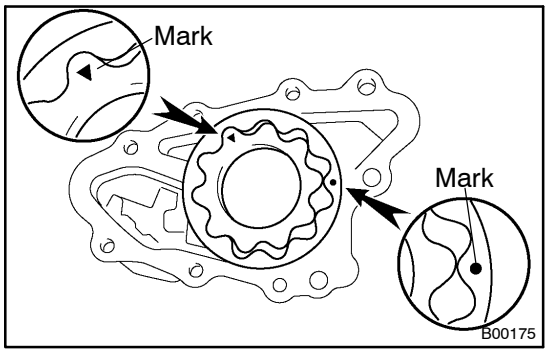
Maximum tip clearance:

1ZZ–FE 0.16 mm (0.00630 in.)

2ZZ–GE 0.35 mm (0.01378 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.

LU02Q–14



REASSEMBLY

1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.

(b) 1ZZ–FE:
Install the pump body cover with the 3 screws.
Torque: 10.5 N·m (107 kgf·cm, 8 ft·lbf)

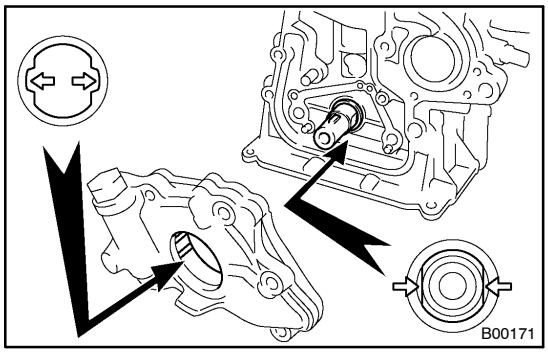
(c) 2ZZ–GE:
Install the pump body cover with the 5 screws.
Torque: 10.5 N·m (107 kgf·cm, 8 ft·lbf)

2. INSTALL RELIEF VALVE

Insert the relief valve and spring into the pump body hole, and install the plug.

Torque:
1ZZ–FE: 37 N·m (375 kgf·cm, 27 ft·lbf)
2ZZ–GE: 49 N·m (500 kgf·cm, 36 ft·lbf)

LU02R–13



INSTALLATION

1. INSTALL OIL PUMP

(a) Place a new gasket on the cylinder block.

(b) Engage the spline teeth of the oil pump drive rotor with the large teeth of the crankshaft, and slide the oil pump.

(c) Install the oil pump with the 5 bolts.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

2. INSTALL CRANKSHAFT TIMING SPROCKET AND TIMING CHAIN (See pages EM–26)

3. FILL ENGINE WITH OIL

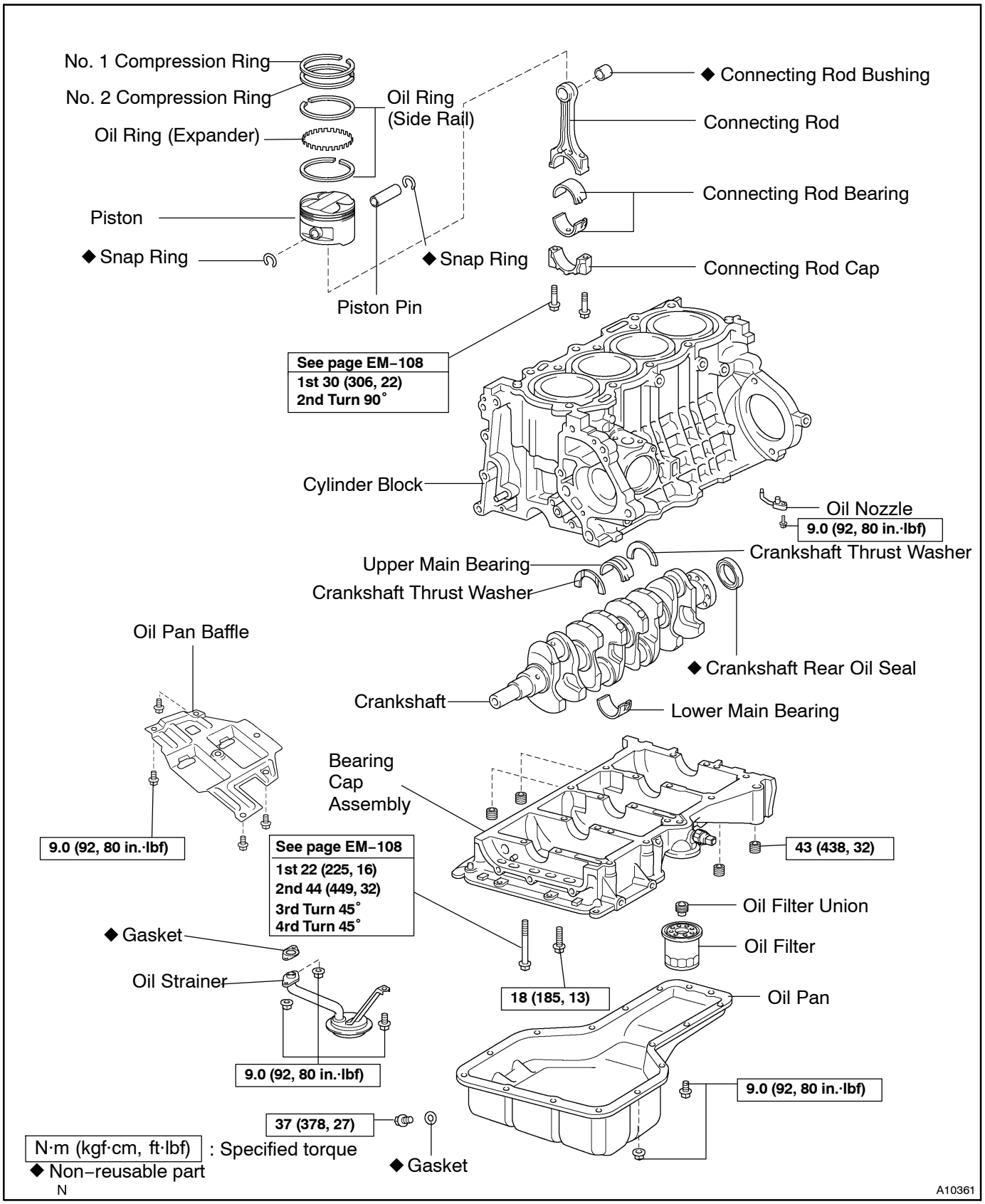
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL

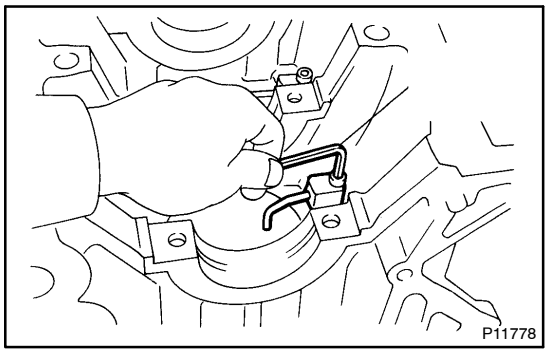
OIL NOZZLE (2ZZ–GE)

COMPONENTS

LU0IH–07



LU0ID–06



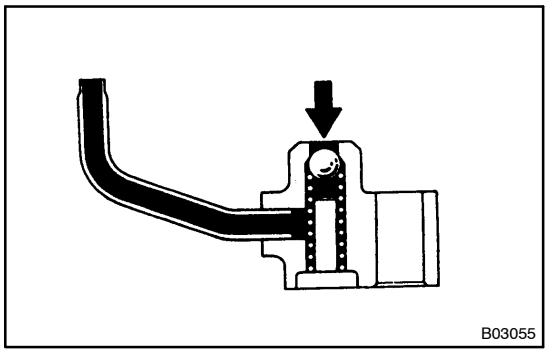
REMOVAL

1. REMOVE CRANKSHAFT (See page EM–91)

2. REMOVE OIL NOZZLE (WITH RELIEF VALVE)

Using a 5 mm hexagon wrench, remove the bolt and oil nozzle.

LU0IE–06

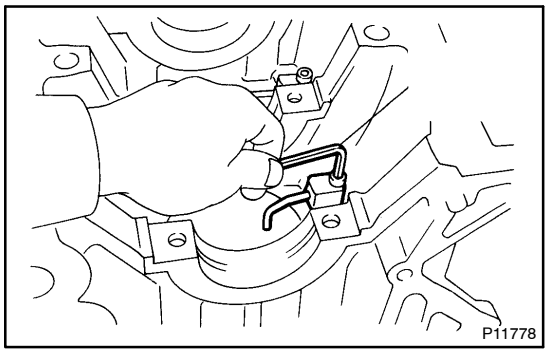


INSPECTION

INSPECT RELIEF VALVE (OIL NOZZLE)

Push the valve with a wooden stick to check if it is stuck.
If stuck, replace the relief valve.

LU0IF–06



INSTALLATION

1. INSTALL OIL NOZZLE (WITH RELIEF VALVE)

Using a 5 mm hexagon wrench, install the oil nozzle with the bolt.

Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

2. INSTALL CRANKSHAFT (See page EM–108)

IGNITION SYSTEM

IG0FA–07

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in these sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. INSPECT IGNITION COIL (WITH IGNITER) AND SPARK TEST

Check that the spark occurs.

(1) Remove the ignition coils (with igniter).
(See page IG–6)
(2) Using a 16 mm (0.63 in.) plug wrench, remove the spark plugs.
(3) Install the spark plugs to each ignition coils (with igniter), and connect the ignition coil connectors.
(4) Disconnect the 4 injector connectors.
(5) Ground the spark plugs.
(6) Check if spark occurs while engine is being cranked.

NOTICE:

To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 5 – 10 seconds at time.

If the spark does not occur, do the test as follows:

SPARK TEST

↓ NO

CHECK CONNECTION OF IGNITION COIL CONNECTOR → BAD → Connect securely.

↓ OK

CHANGE IT TO NORMAL IGNITION COIL (WITH IGNITER) AND PERFORM SPARK TEST AGAIN → OK → Replace the ignition coil (with igniter).

↓ NO

CHECK POWER SUPPLY TO IGNITION COIL (WITH IGNITER)
1. Turn ignition switch to ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.

→ BAD → Check wiring between ignition switch to ignition coil (with igniter).

↓ OK

CHECK RESISTANCE OF CAMSHAFT POSITION SENSOR (See step 3)

	Cold	Hot
Resistance:	**1,630 – 2,740 Ω**	**2,065 – 3.225 Ω**

→ BAD → Replace the camshaft position sensor.

↓ OK

CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR (See step 4)

	Cold	Hot
Resistance:	**985 – 1,600 Ω**	**1,265 – 1,890 Ω**

→ BAD → Replace the crankshaft position sensor.

↓ OK

CHECK IGT SIGNAL FROM ECM (See page DI–187 or DI–486) → BAD → Check ECM (See page IN–30)

↓ OK

REPAIR WIRING BETWEEN IGNITION COIL AND ECM

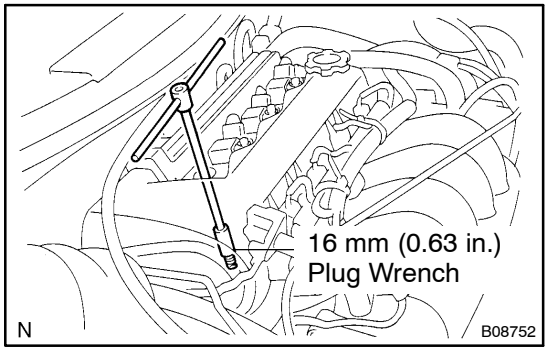
(7) Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.

Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

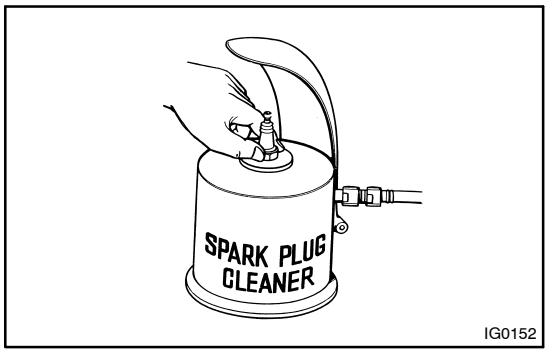
(8) Install the ignition coils (with igniter). (See page IG–7)

2. INSPECT SPARK PLUGS

(a) Remove the ignition coils (with igniter). (See page IG–6)



(b) Using a 16 mm (0.63 in.) plug wrench, remove the spark plugs.



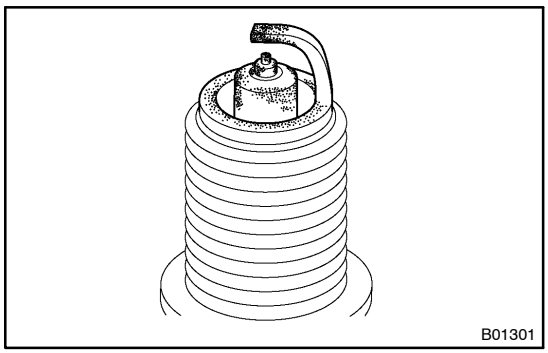
(c) Clean the spark plugs.

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

Air pressure: Below 588 kPa (6 kgf/cm^2, 85 psi)
Duration: 20 seconds or less

HINT:

If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



(d) Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

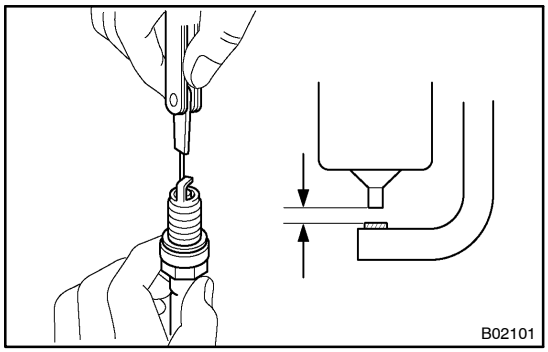
Recommended spark plug:

1ZZ–FE:

DENSO made	SK16R11
NGK made	IFR5A11

2ZZ–GE:

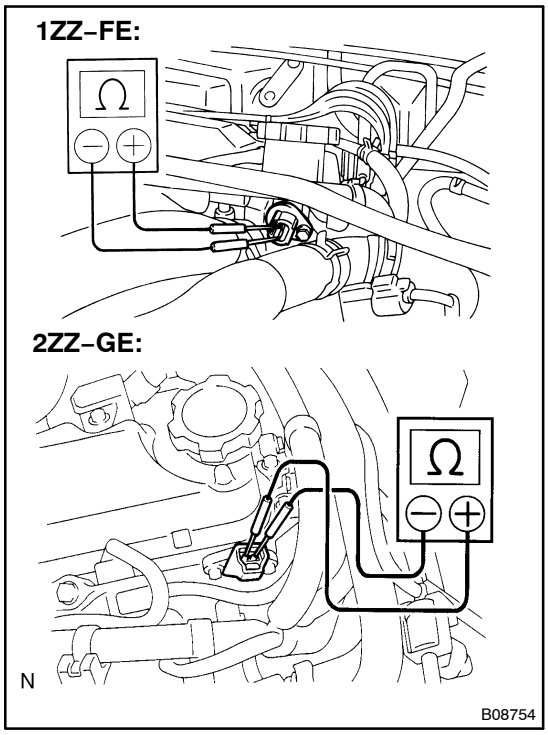
DENSO made	SK20R11
NGK made	IFR6A11



(e) Adjust electrode gap.
Carefully bend the outer electrode to obtain the correct electrode gap.
Electrode gap: 1.1 mm (0.043 in.)

(f) Using a 16 mm (0.63 in.) plug wrench, install the spark plugs.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

(g) Install the ignition coils (with igniter).
(See page IG–7)



3. INSPECT CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.

(b) Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold	835 – 1,400 Ω
Hot	1,060 – 1,645 Ω

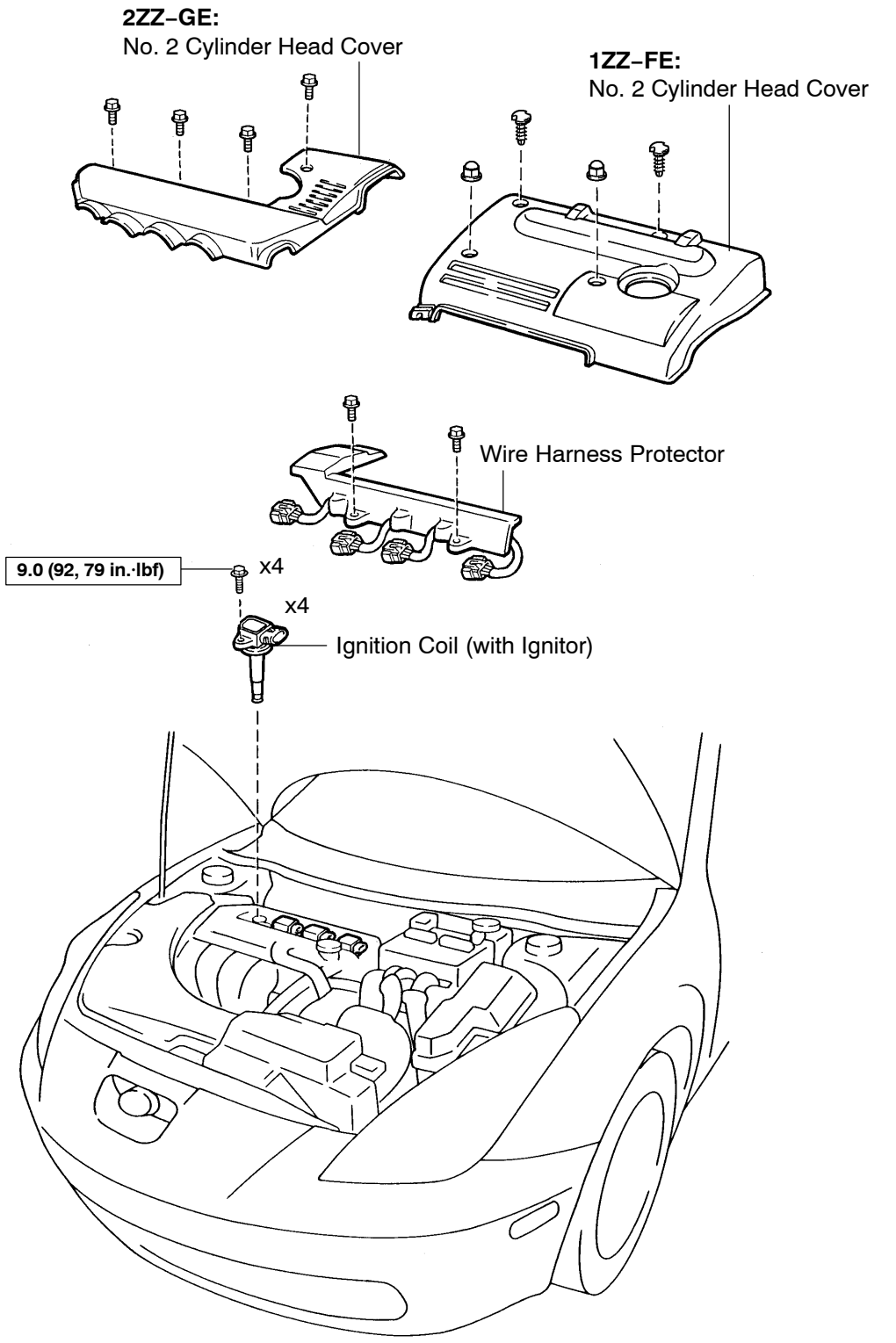
If the resistance is not as specified, replace the camshaft position sensor.

(c) Connect the camshaft position sensor connector.

IGNITION COIL

COMPONENTS

IG0BO–19



N·m (kgf·cm, ft·lbf) : Specified torque

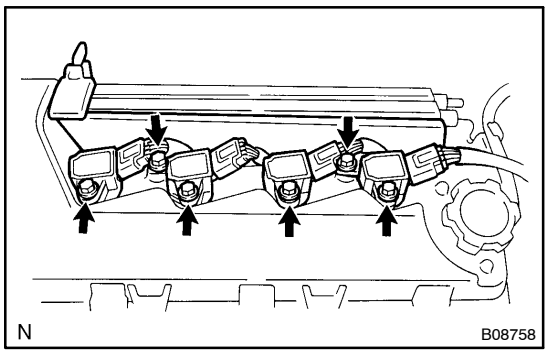
N

B08757

IG0BP–07

REMOVAL

1. REMOVE NO. 2 CYLINDER HEAD COVER



2. REMOVE IGNITION COILS (WITH IGNITER) FROM SPARK PLUGS

(a) Remove the 2 bolts and disconnect the wire harness protector.

(b) Disconnect the 4 ignition coil connectors.

(c) Remove the 4 bolts and pull out the 4 ignition coils (with igniter).

Torque: 9.0 N·m (92 kgf·cm, 79 in.·lbf)

IG0BQ–06

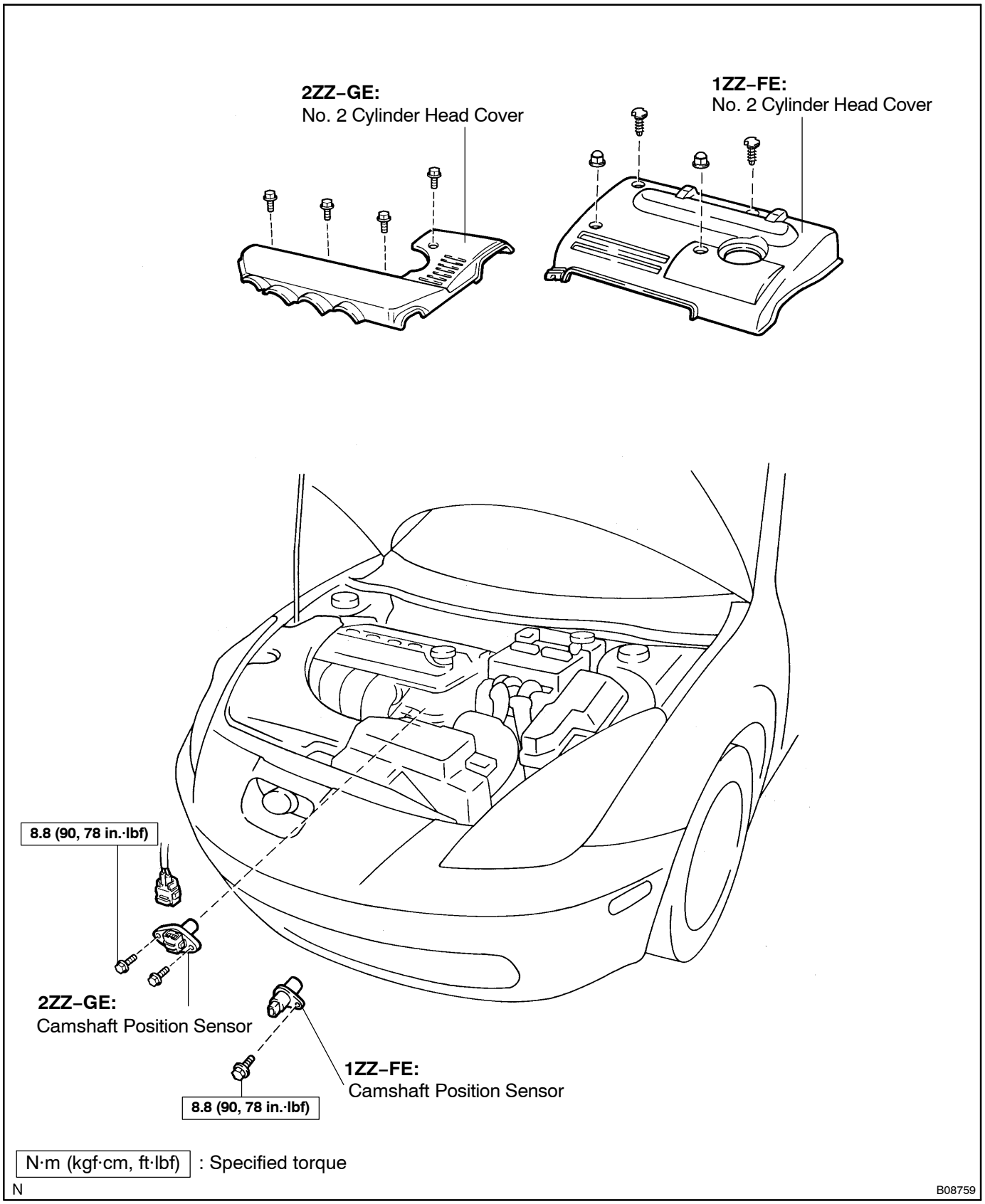
INSTALLATION

Installation is in the reverse order of removal (See page IG–6).

CAMSHAFT POSITION SENSOR

IG0BR–18

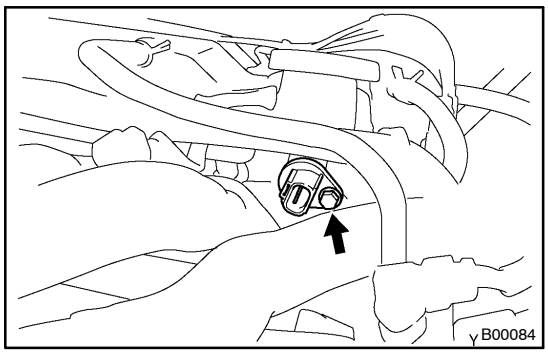
COMPONENTS



IG0F6–05

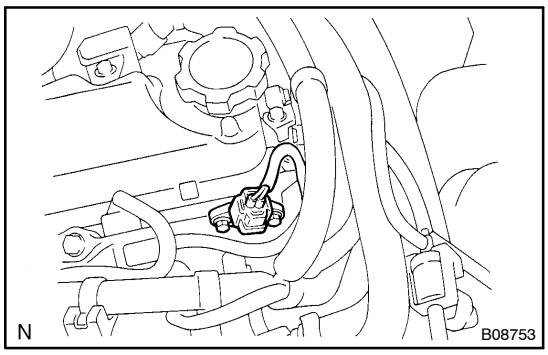
REMOVAL

1. REMOVE NO. 2 CYLINDER HEAD COVER



2. 1ZZ–FE:
REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the connector.
(b) Remove the bolt and camshaft position sensor.
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)



3. 2ZZ–GE:
REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the connector.
(b) Remove the 2 bolts and camshaft position sensor.
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

IG0EQ–05

INSTALLATION

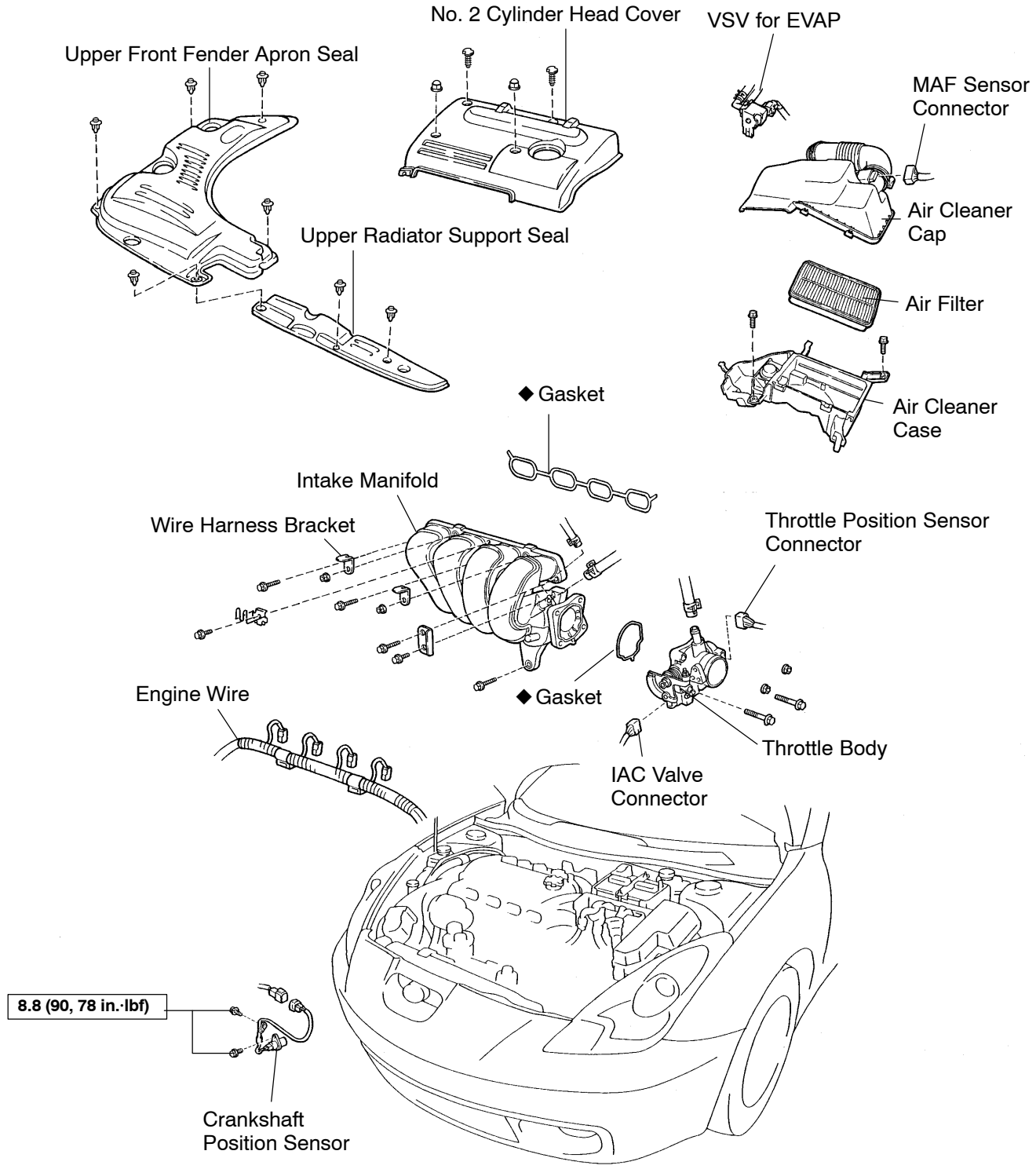
Installation is in the reverse order of removal (See page IG–9).

CRANKSHAFT POSITION SENSOR

IG0F9–03

COMPONENTS

1ZZ–FE:



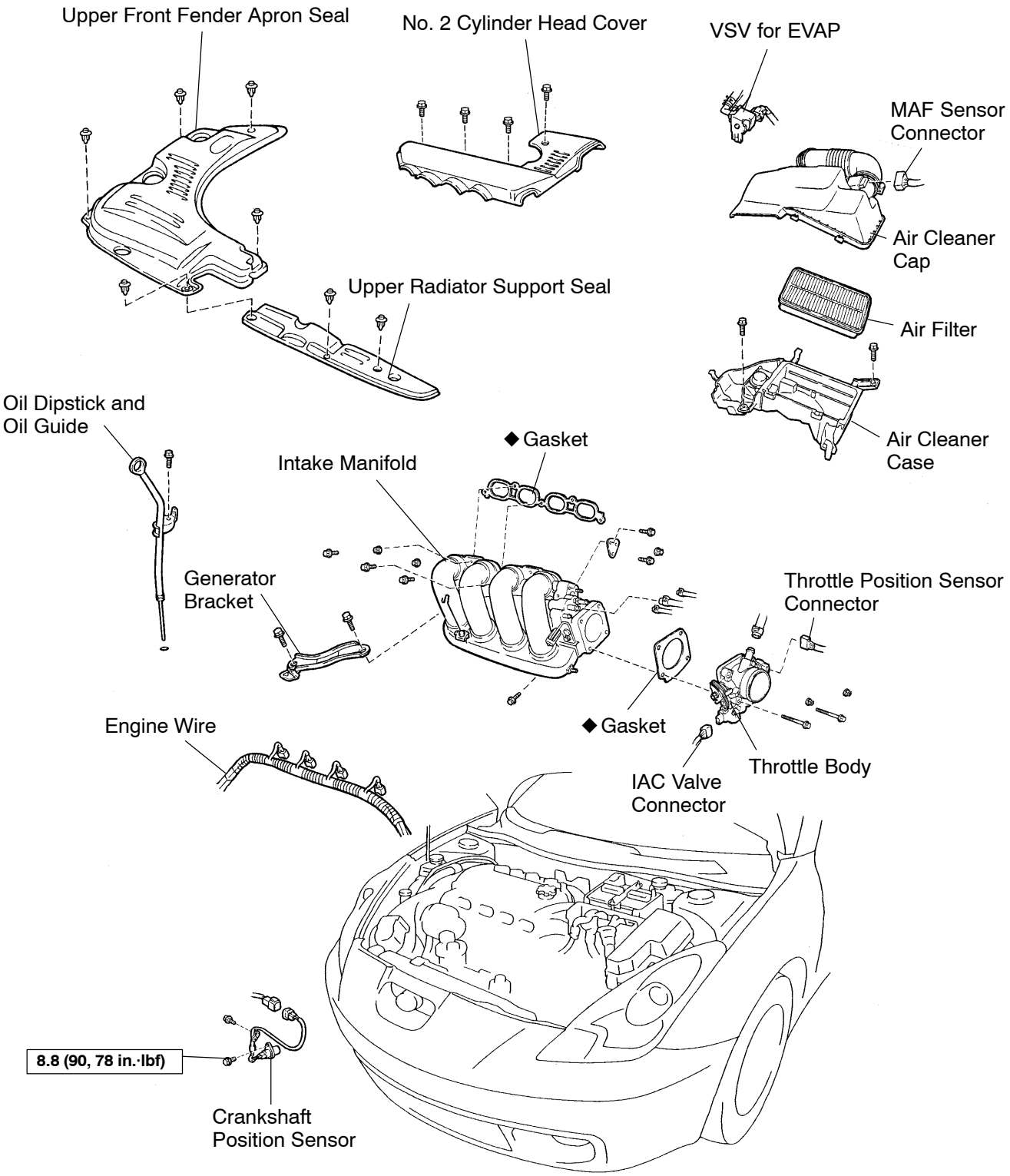
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

N

B08804

2ZZ–GE:



N

N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

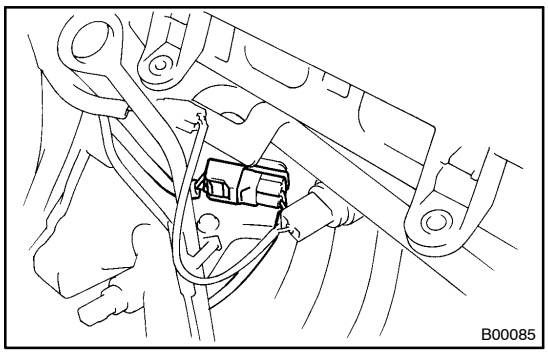
B09366

IG0F7–02

REMOVAL

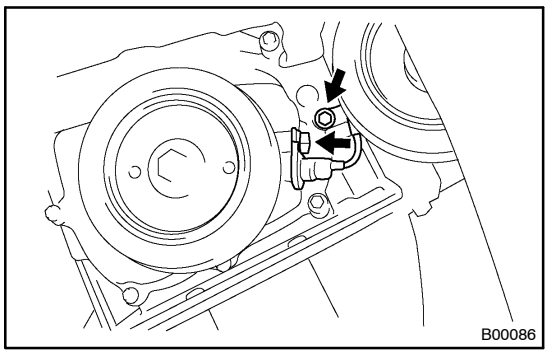
1. REMOVE INTAKE MANIFOLD (See page EM–44)

2. REMOVE ENGINE UNDER COVER RH



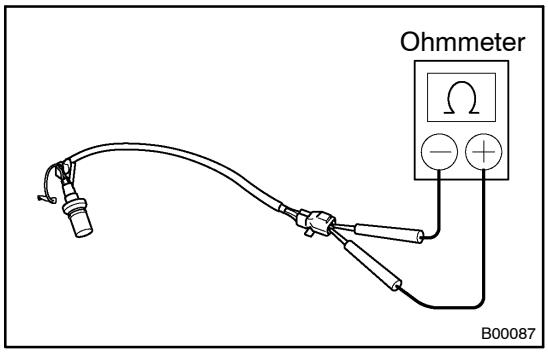
3. REMOVE CRANKSHAFT POSITION SENSOR

(a) Disconnect the crankshaft position sensor connector.



(b) Remove the 2 bolt and crankshaft position sensor.
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

IG0F8–05



INSPECTION

NOTICE:

”Cold” and ”Hot” in these sentences express the temperature of the sensor itself. ”Cold” is from –10˚C (14˚F) to 50˚C (122˚F) and ”Hot” is from 50˚C (122˚F) to 100˚C (212˚F).

INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold: 1,630 – 2,740 Ω

Hot: 2,065 – 3,225 Ω

If the resistance is not as specified, replace the crankshaft position sensor.

IG0BW–07

INSTALLATION

Installation is in the reverse order of removal (See page IG–13).

STARTING SYSTEM

ST02L–09

ON–VEHICLE INSPECTION

NOTICE:

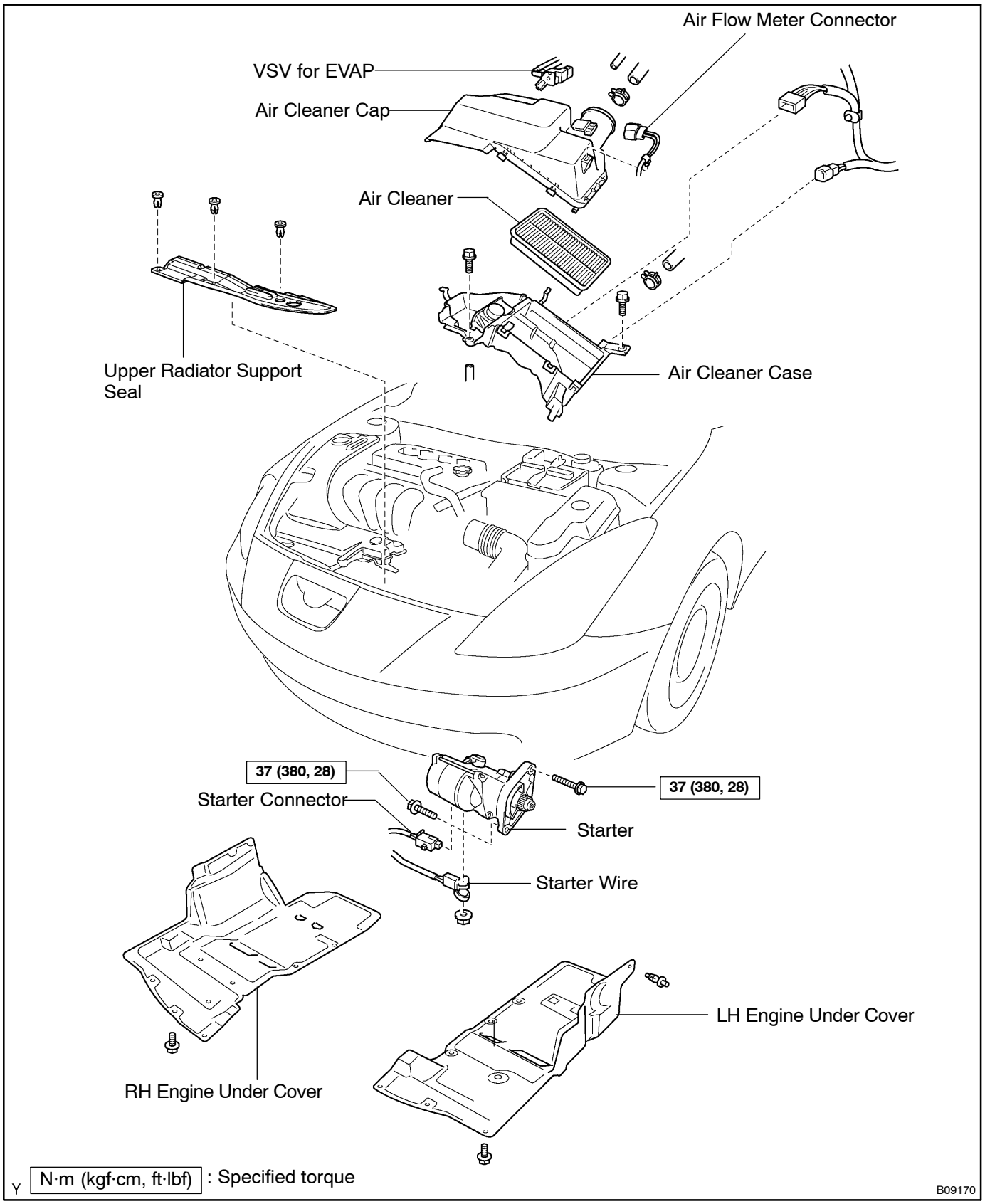
Before changing the starter, check the following items again:

- **Connector connection**
- **Accessory installation, e.g.: theft deterrent system**

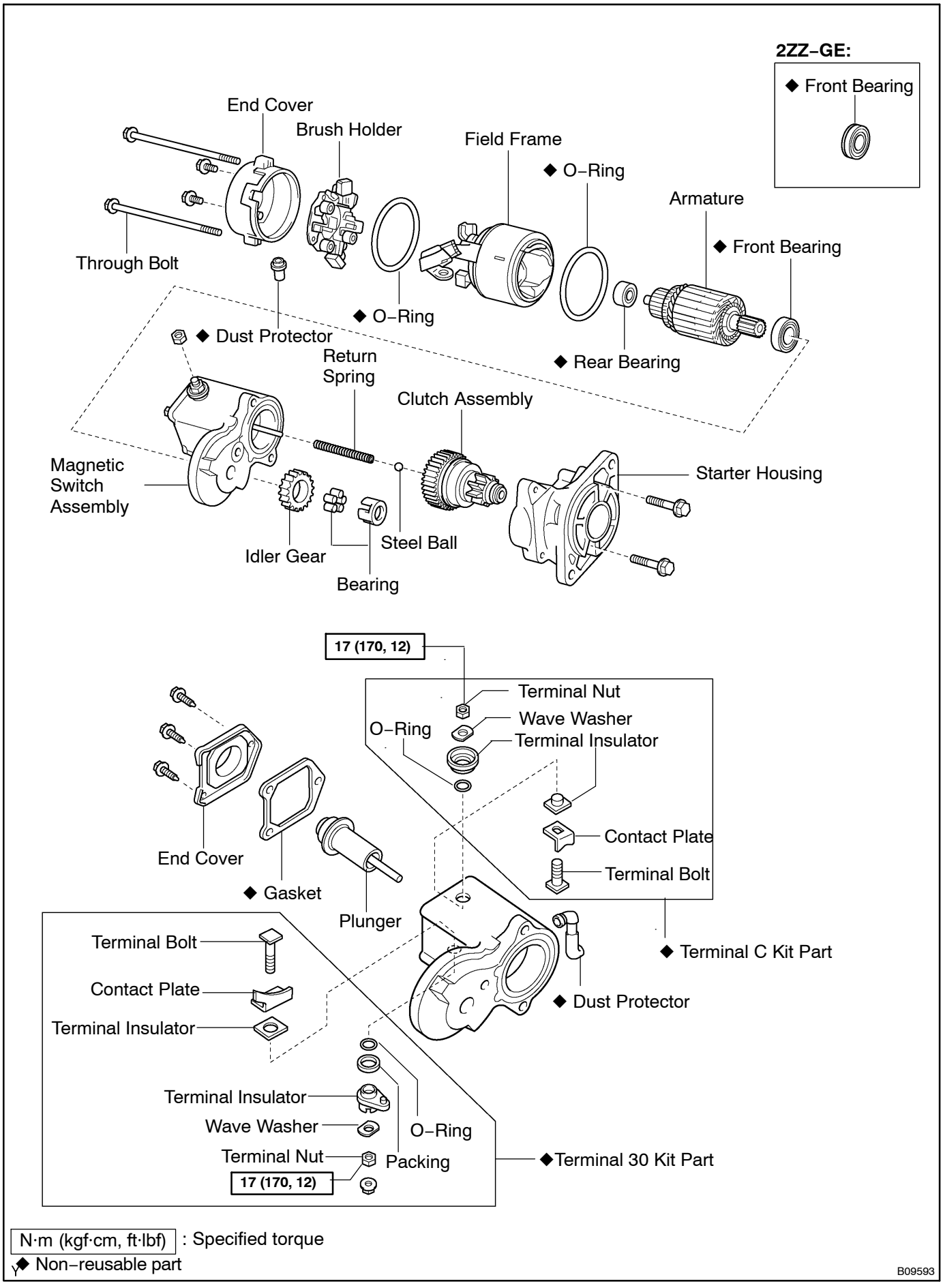
STARTER

COMPONENTS

ST02M–12



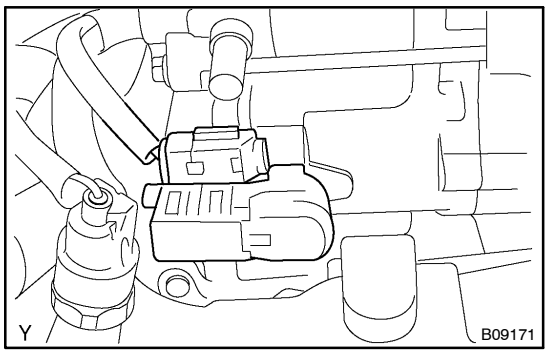
+


2ZZ–GE:
◆ Front Bearing
End Cover
Brush Holder
Field Frame
◆ O–Ring
Armature
◆ Front Bearing
Through Bolt
◆ O–Ring
◆ Dust Protector
Return Spring
Clutch Assembly
◆ Rear Bearing
Magnetic Switch Assembly
Starter Housing
Idler Gear
Steel Ball
Bearing
17 (170, 12)
Terminal Nut
Wave Washer
O–Ring
Terminal Insulator
Contact Plate
Terminal Bolt
End Cover
◆ Gasket
Plunger
◆ Terminal C Kit Part
◆ Dust Protector
Terminal Bolt
Contact Plate
Terminal Insulator
Terminal Insulator
Wave Washer
O–Ring
Terminal Nut
Packing
17 (170, 12)
◆Terminal 30 Kit Part
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
B09593

ST0HO–06

REMOVAL

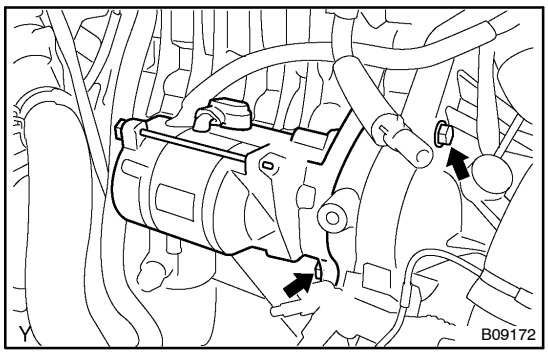
1. **REMOVE UPPER RADIATOR SUPPORT SEAL**
2. **REMOVE AIR CLEANER ASSEMBLY**
   (See page EM–76)
3. **REMOVE RH AND LH ENGINE UNDER COVER**



4. **REMOVE STARTER**

(a) Disconnect the starter connector.

(b) Remove the nut, and disconnect the starter wire.

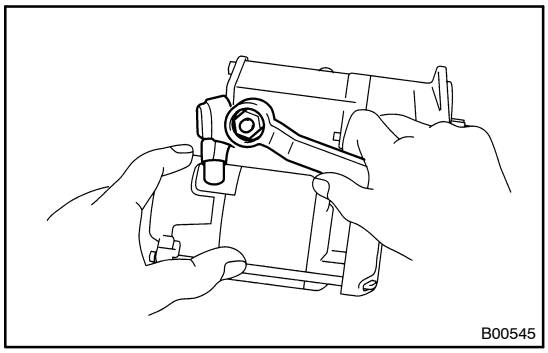


(c) Remove the 2 bolts and starter.

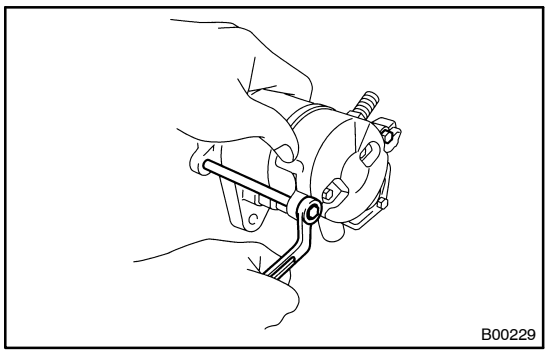
ST0HP–02

DISASSEMBLY

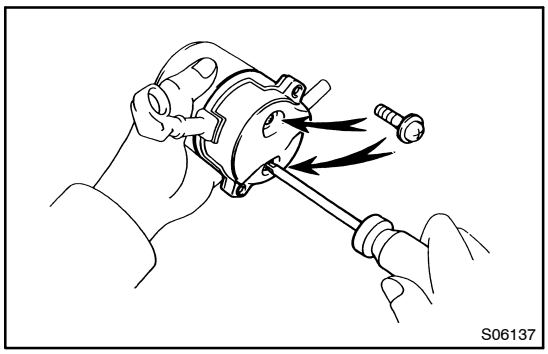
1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY



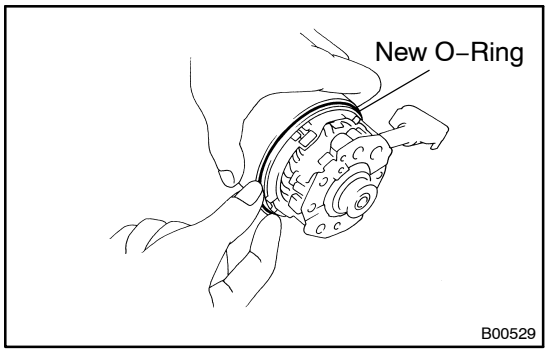
(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.



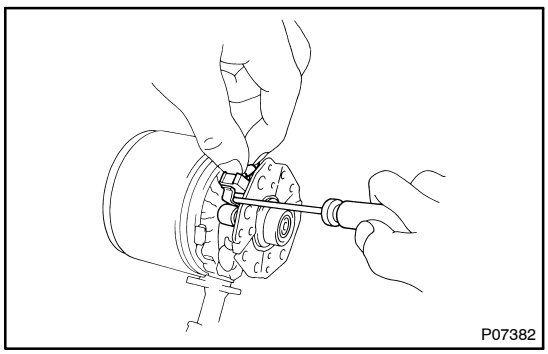
(b) Remove the 2 through bolts.



(c) Remove the 2 screws and end cover from the field frame.



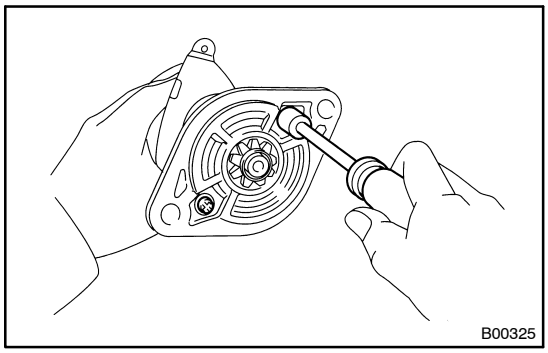
(d) Remove the O–ring from the field frame.



(e) Using a screwdriver, hold the spring tank back and disconnect the brush from the brush holder. Disconnect the 4 brushes and remove the brush holder.

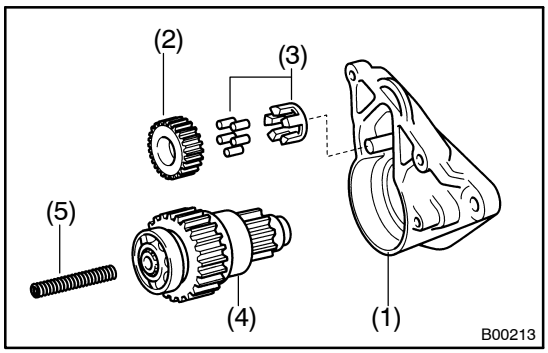
(f) Pull out the field frame from the magnetic switch assembly.

(g) Remove the O–ring.

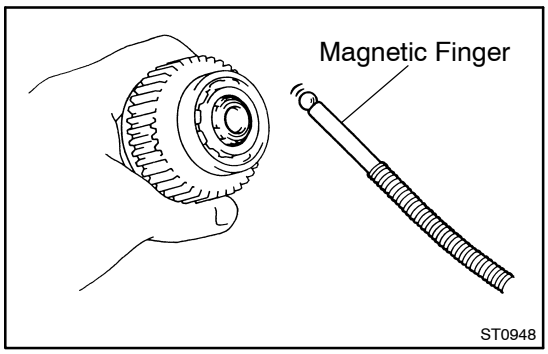


2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEARS

(a) Remove the 2 bolts.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

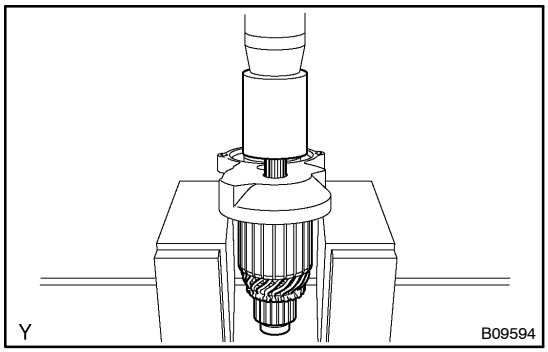


(b) Remove these parts from the magnetic switch assembly:
(1) Starter housing
(2) Idler gear
(3) Bearing
(4) Clutch assembly
(5) Return spring



3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.



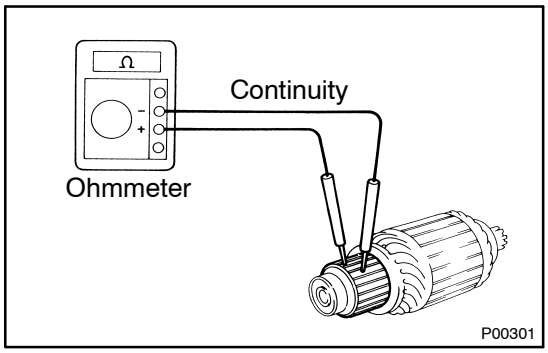
4. REMOVE ARMATURE FROM MAGNETIC SWITCH ASSEMBLY

(a) 1ZZ–FE
Remove the armature from the magnetic switch assembly.

(b) 2ZZ–GE:
Using a press, remove the armature from the magnetic switch assembly.

ST0FP–10

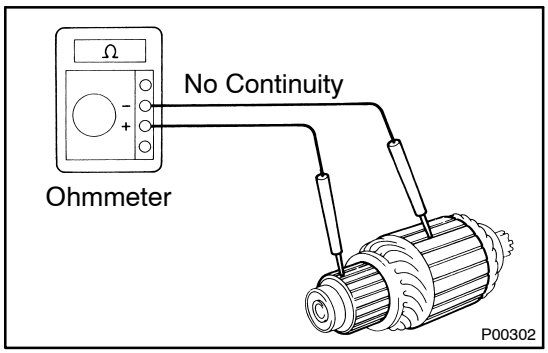
INSPECTION



1. INSPECT ARMATURE COIL COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.



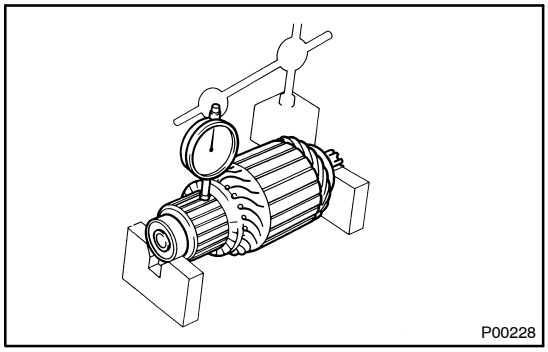
2. INSPECT ARMATURE COIL COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct with sandpaper (No.400) or a lathe.



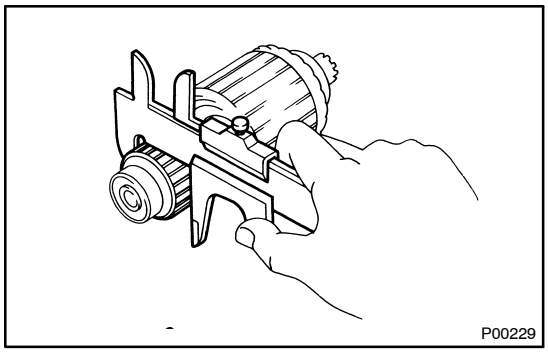
4. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V–blocks.

(b) Using a dial gauge, measure the circle runout.

Maximum circle runout:
0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.

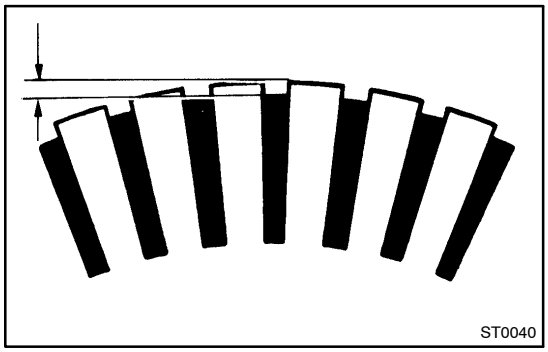


5. INSPECT COMMUTATOR DIAMETER

Using vernier calipers,measure the commutator diameter.

Standard diameter:
30 mm (1.18 in.)
Minimum diameter:
29 mm (1.14 in.)

If the diameter is less than minimum, replace the armature.

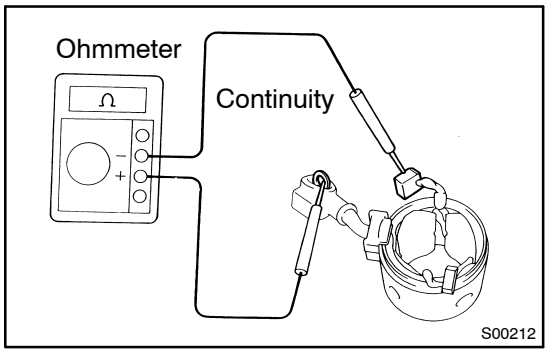


6. INSPECT COMMUTATOR UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth:
0.6 mm (0.024 in.)
Minimum undercut depth:
0.2 mm (0.008 in.)

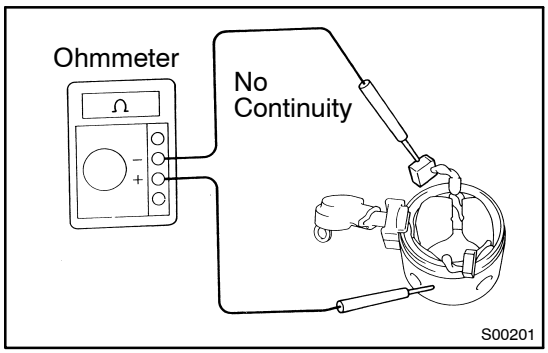
If the undercut depth is less than minimum, correct it with a hacksaw blade.



7. INSPECT FIELD FRAME (FIELD COIL) FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

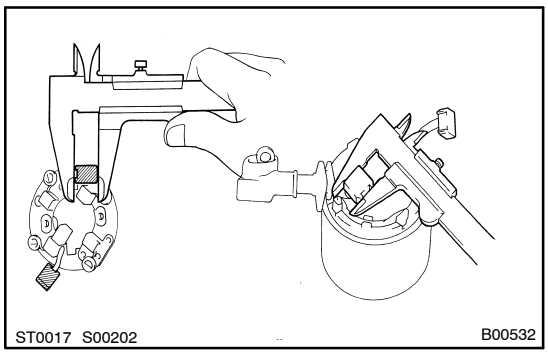
If there is no continuity, replace the field frame.



8. INSPECT FIELD FRAME (FIELD COIL) GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If the is continuity, repair or replace the field frame.

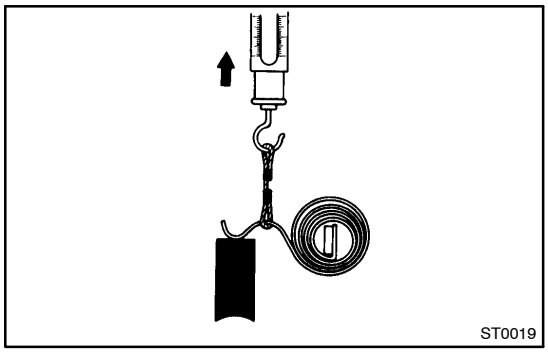


9. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

Standard length:
15.5 mm (0.610 in.)
Minimum length:
10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.

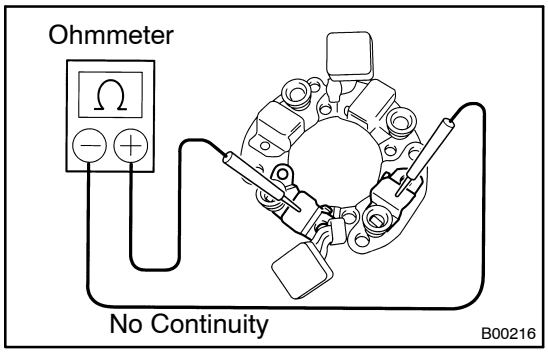


10. INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

14 kW type
Standard spring installed load:
17.6 – 23.5 N (1.80 – 2.40 kgf, 4.0 – 5.3 lbf)
Minimum spring installed load:
11.8 N (1.20 kgf, 2.6 lbf)
1.2 kW type
Standard spring installed load:
13.7 – 19.6 N (1.40 – 2.0 kgf, 3.1 – 4.6 lbf)
Minimum spring installed load:
8.8 N (0.9 kgf, 2.0 lbf)

If the installed load is not within specification, replace the brush springs.



11. INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.

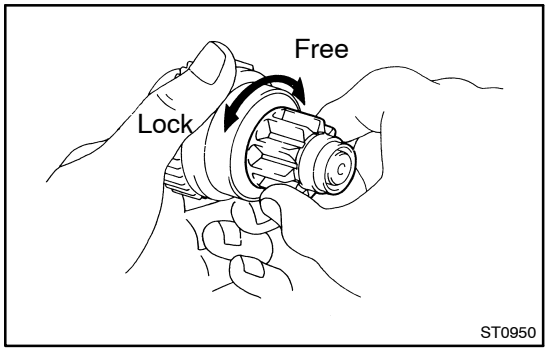
If there is continuity, repair or replace the brush holder.

12. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

If damaged, also check the drive plate ring gear for wear or damage.

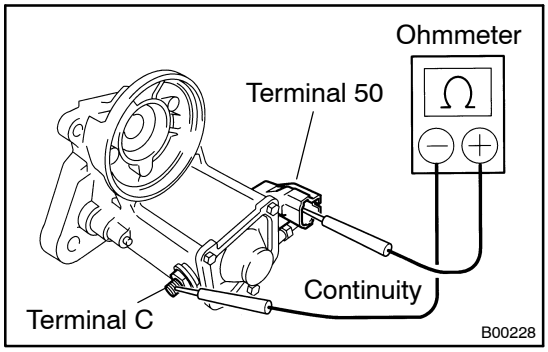


13. INSPECT CLUTCH

Rotate the clutch pinion gear clockwise, and check that it turns freely.

Try to rotate the clutch pinion gear counter–clockwise and check that it locks.

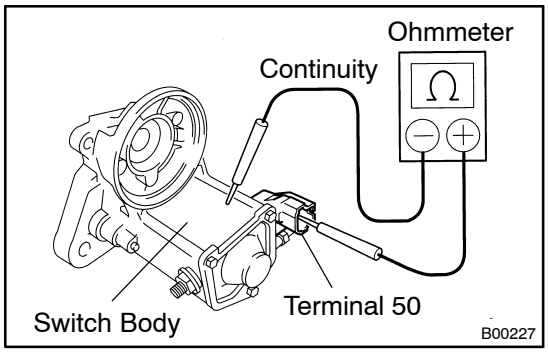
If necessary, replace the clutch assembly.



14. DO MAGNETIC SWITCH PULL–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, check and replace the magnetic switch.

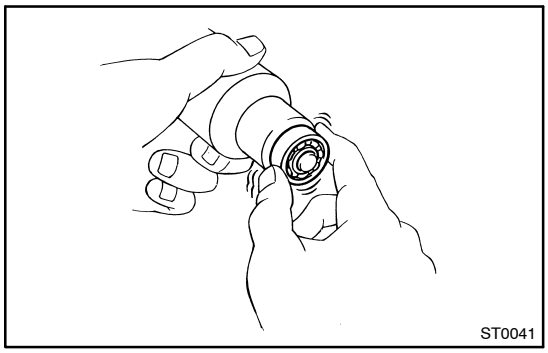


15. DO MAGNETIC SWITCH HOLD–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

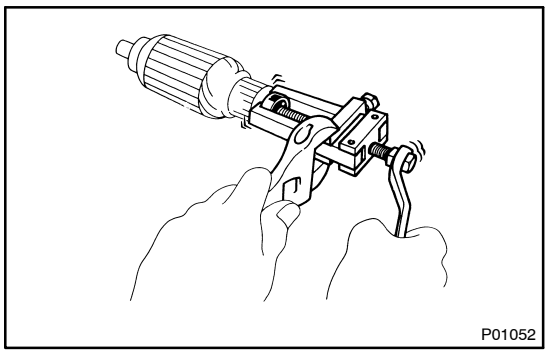
ST0FQ–09



REPLACEMENT

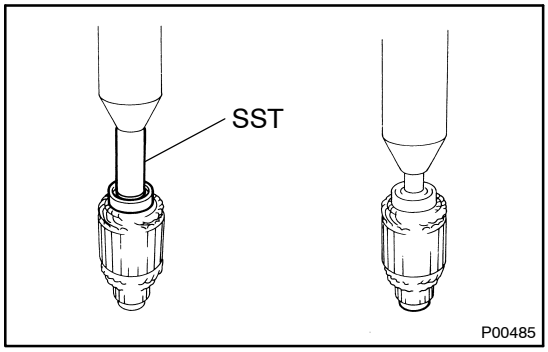
1. INSPECT BEARING

Turn the bearing by hand while applying inward force.
If resistance is felt or if the sticks, replace the bearing.



2. REPLACE BEARINGS

(a) Using SST, remove the bearing.
SST 09286–46011

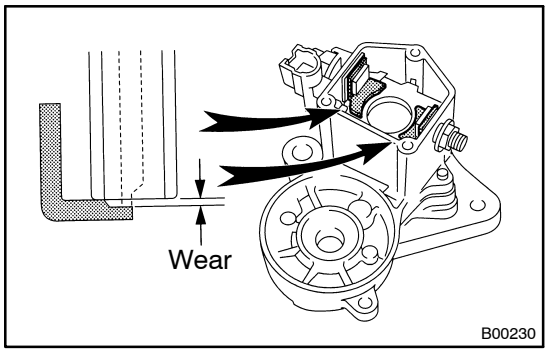


(b) Using SST and a press, press in a new front bearing.
SST 09820–00031

(c) Using a press, press in a new rear bearing.

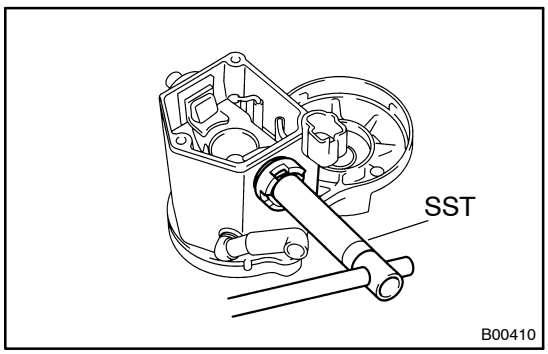
3. REMOVE MAGNETIC SWITCH END COVER

(a) Remove the 3 bolts, end cover, gasket and plunger.



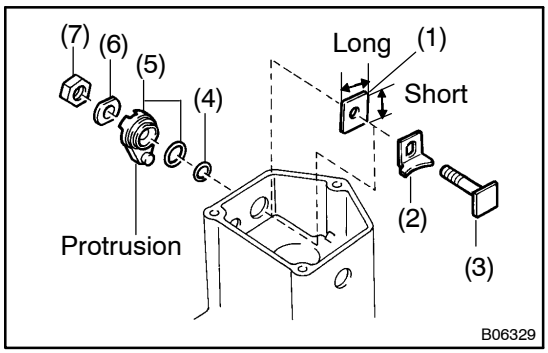
(b) Inspect the contact plate for wear.
Using vernier calipers, measure the contact plate for depth of wear.
Maximum wear: 0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.



(c) Remove the terminal kit parts.
(1) Using SST, loosen the terminal nuts.
SST 09810–38140
(2) Terminal C:
Remove the terminal nut,wave washer, terminal insulator (outside), O–ring, terminal bolt, contact plate and terminal insulator (inside).

(3) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O–ring, terminal bolt, contact plate, and terminal insulator (inside).



(d) Temporarily install a new terminal 30 kit parts.
(1) Install a terminal insulator (inside).

NOTICE:

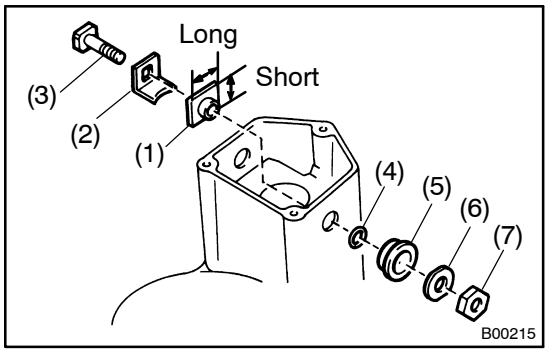
Be careful to install the terminal insulator in the correct direction.

(2) Install a contact plate.
(3) Install a terminal bolt.
(4) Install a O–ring.
(5) Install a packing and terminal insulator (outside). Install the packing to the terminal insulator, and install them.

HINT:

Match the protrusion of the insulator with the indentation of the housing.

(6) Install a wave washer.
(7) Install a terminal nut.

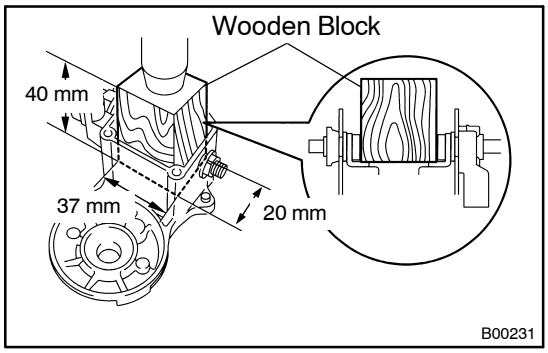


(e) Temporarily install new terminal C kit parts.
(1) Install a terminal insulator (inside).
(2) Install a contact plate.
(3) Install a terminal bolt.
(4) Install a O–ring.
(5) Install a terminal insulator (outside).
(6) Install a wave washer.
(7) Install a terminal nut.

NOTICE:

Be careful to install the terminal insulator (inside) in the correct direction.

(f) Temporarily tighten the terminal nuts.



(g) Tighten terminal nut.

(1) Put a wooden block on the contact plate and press it down with a hand press.

Dimensions of wooden block:
20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)
Press force:
981 N (100 kgf, 221 lbf)

NOTICE:

Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.

Gauge pressure:

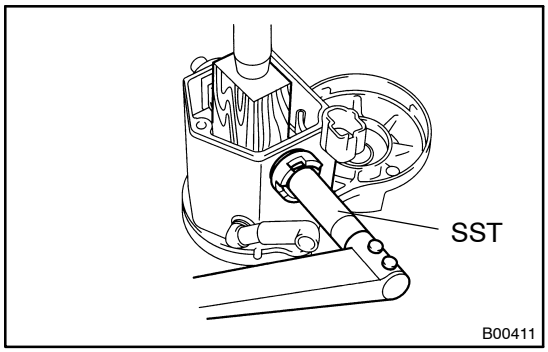
$$(kgf/cm^2) = \frac{100\ kgf}{\left(\frac{\text{Ram diameter (cm)}}{2}\right)^2 \times 3.14(\pi)}$$

$$(psi) = \frac{221\ ibf}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14\ (\pi)}$$

(kpa) = (kgf/cm^2) x 98.1

(kpa) = (psi) x 6.9

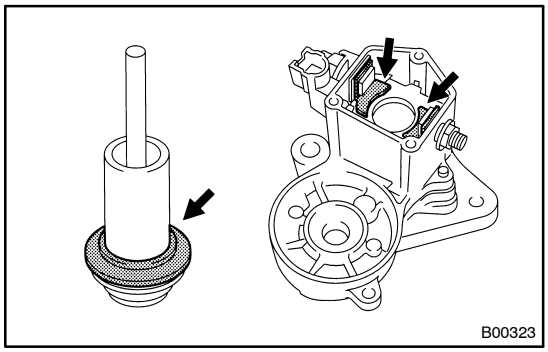
If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.



(2) Using SST, tighten the nuts to the specified torque.
SST 09810–38140
Torque: 17 N·m (173 kgf·cm, 12 ft·lbf)

NOTICE:

If the nut is over tightened, it may cause cracks on the inside of the insulator.



(h) Clean contact surfaces of contact plate and plunger.
Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.

(i) Reinstall magnetic switch end cover.
Install the plunger, new gasket, and cover with the 3 bolts.
Torque: 2.5 N·m (26 kgf·cm, 23 in.·lbf)

ST0HQ–02

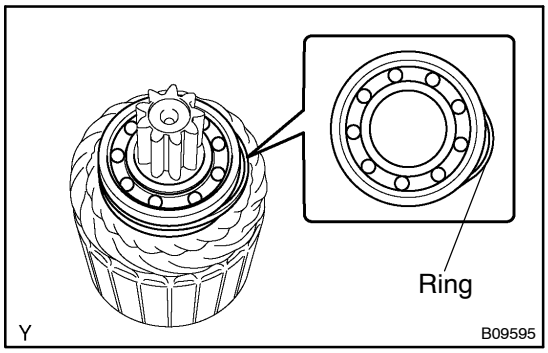
REASSEMBLY

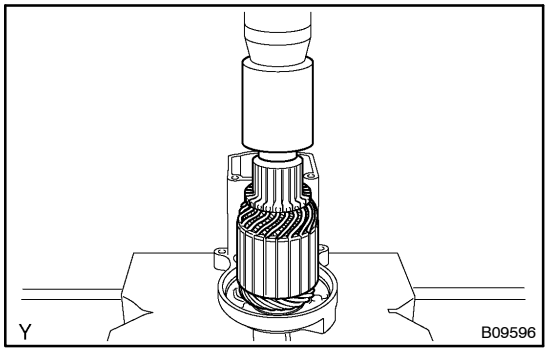
HINT:

Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

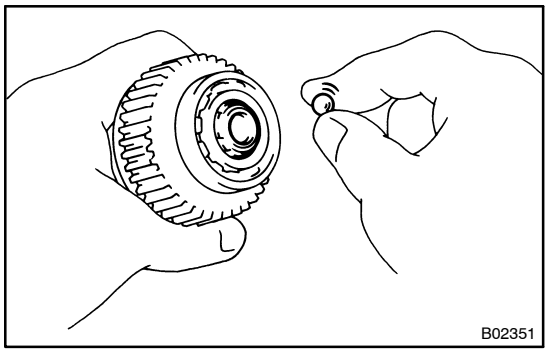
1. INSTALL ARMATURE TO MAGNETIC SWITCH ASSEMBLY

(a) 2ZZ–GE:
Rotating the ring of the front bearing, set it properly so that the projection of the ring is positioned in the narrowest part.



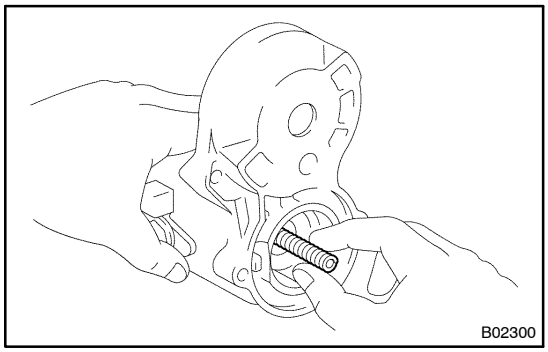


(b) Apply grease to the armature bearings.
(c) 1ZZ–FE:
Install the armature to the magnetic switch assembly.
(d) 2ZZ–GE:
Using a press, install the armature to the magnetic switch assembly.



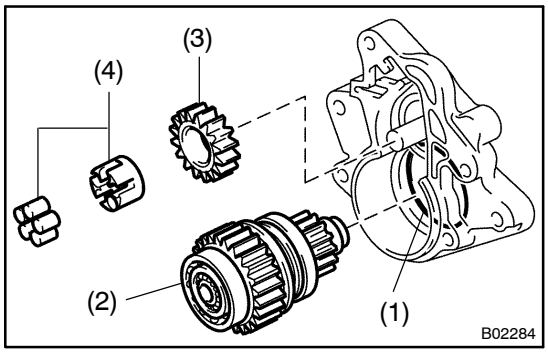
2. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.



3. INSTALL STARTER HOUSING, CLUTCH ASSEMBLY AND GEARS

(a) Apply grease to the return spring.
(b) Insert the return spring into the magnetic switch hole.



(c) Place these parts on the starter housing:
  (1) New O–ring
  (2) Starter clutch assembly
  (3) Idler gear
  (4) Bearing

(d) Install the starter housing to the magnetic switch with the 2 screws.
  Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

4. INSTALL FIELD FRAME

(a) Install a new O–ring to the groove of the filed frame.

(b) Align the protrusion of the field frame with the groove of the magnetic switch, and install the field frame.

5. INSTALL BRUSH HOLDER

(a) Place the brush holder on the field frame.

(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the 4 brushes.

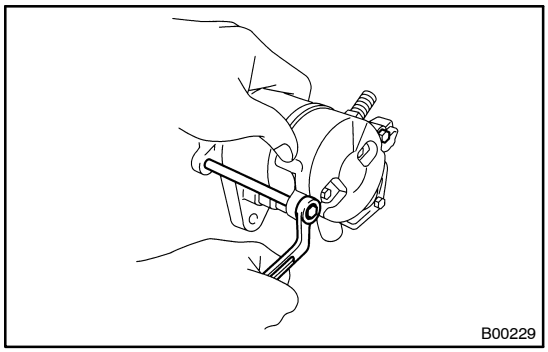
NOTICE:

Check that the positive (+) lead wires are not grounded.

6. INSTALL END COVER

(a) Install a new O–ring to the groove of the field frame.

(b) Install the end cover to the field frame with the 2 screws.
  Torque: 3.8 N·m (39 kgf·cm, 34 in.·lbf)



(c) Install the field frame and armature assembly with the 2 through bolts.
  Torque: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

(d) Connect the lead wire to terminal C with the nut.
  Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

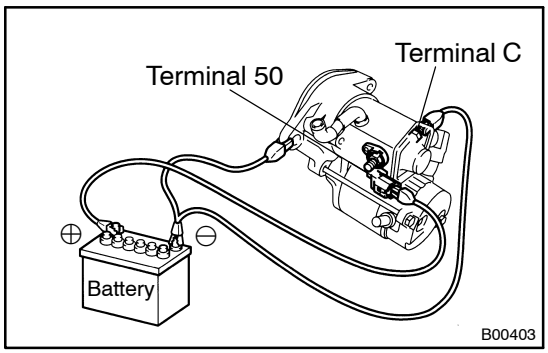
7. INSTALL NEW DUST PROTECTOR

ST02S–13

TEST

NOTICE:

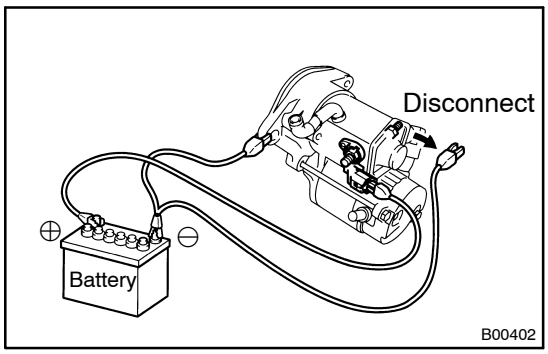
These tests must be performed within 3 to 5 seconds to avoid burning out the coil.



1. DO PULL–IN TEST

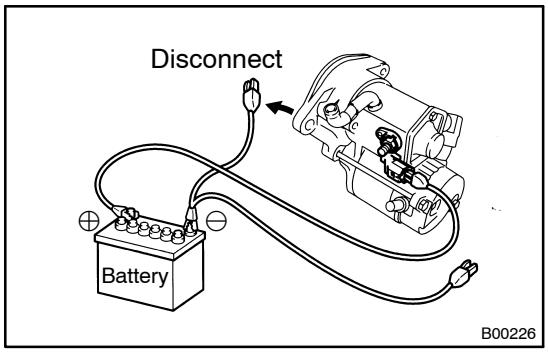
(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.



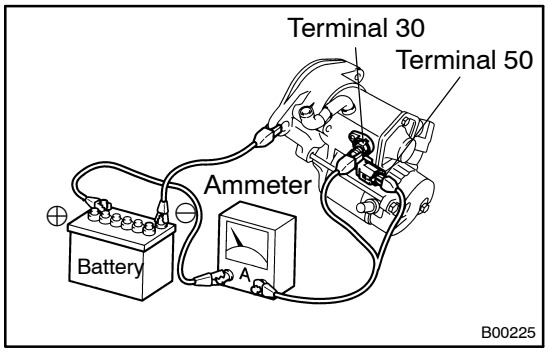
2. DO HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the clutch pinion gear remains out.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns inward.



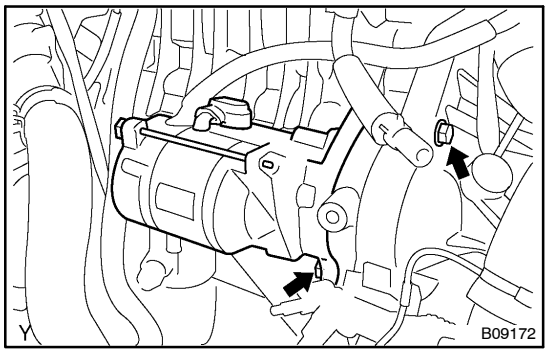
4. DO NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

Specified current: 90 A or less at 11.5 V

ST0HR–06



INSTALLATION

1. INSTALL STARTER

(a) Install the 2 bolts and starter.

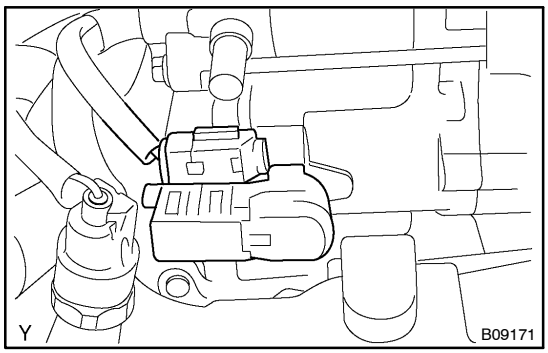
HINT:

Each bolt length is indicated in the illustration.

Bolt length

A 64 mm (2.72 in.)

B 54 mm (2.13 in.)



(b) Connect the starter wire, and install the nut.

(c) Connect the starter connector.

2. INSTALL RH AND LH ENGINE UNDER COVER

3. INSTALL AIR CLEANER ASSEMBLY

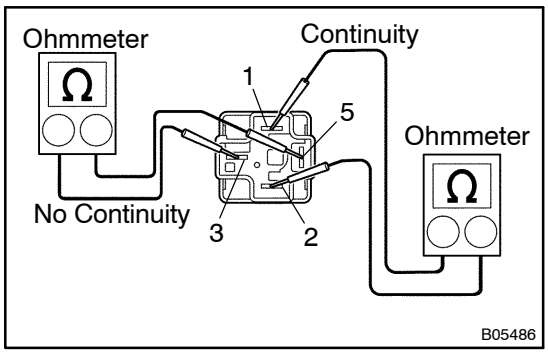
4. INSTALL UPPER RADIATOR SUPPORT SEAL

STARTER RELAY

ST02U–07

INSPECTION

1. REMOVE STARTER RELAY (Marking: ST)



2. INSPECT STARTER RELAY

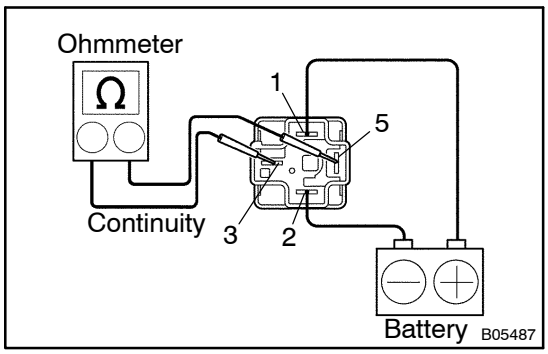
(a) Inspect the relay continuity.

(1) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(2) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



(b) Inspect the relay operation.

(1) Apply battery positive voltage across terminals 1 and 2.

(2) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

3. REINSTALL STARTER RELAY

CHARGING SYSTEM

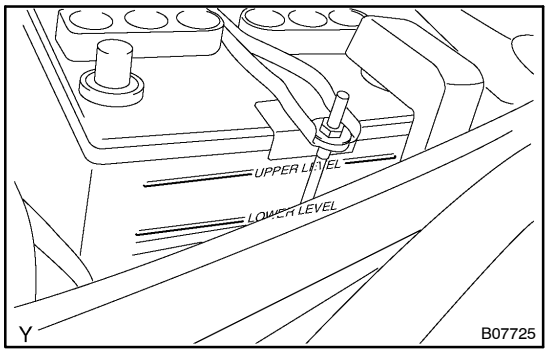
CH021–07

PRECAUTION

- **Check that the battery cables are connected to the correct terminals.**
- **Disconnect the battery cables when the battery is given a quick charge.**
- **Do not perform tests with a high voltage insulation resistance tester.**
- **Never disconnect the battery while the engine is running.**

CH0KD–02

ON–VEHICLE INSPECTION



1. CHECK BATTERY ELECTROLYTE LEVEL

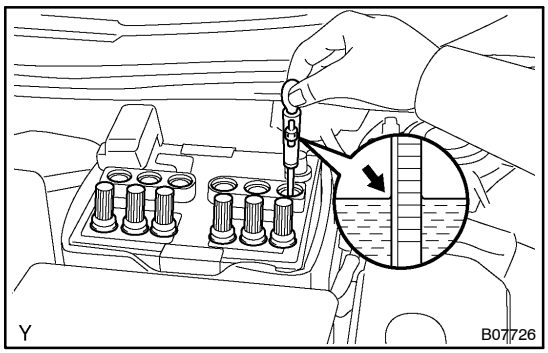
Check the electrolyte quantity of each cell.

Maintenance–Free Battery:

If under the lower level, replace the battery (or add distilled water if possible) and check the charging system.

Except Maintenance–Free Battery:

If under the lower level, add distilled water.

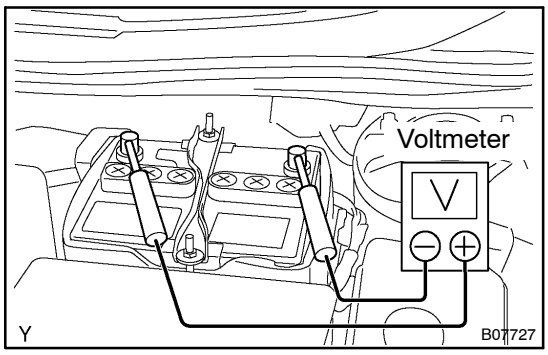


2. Except Maintenance–Free Battery: CHECK BATTERY SPECIFIC GRAVITY

Check the specific gravity of each cell.

Standard specific gravity:
1.25 – 1.29 at 20°C (68°F)

If the specific gravity is less than specification, charge the battery.



3. CHECK BATTERY VOLTAGE

(a) After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.

(b) Turn the ignition switch OFF and turn off the electrical systems.

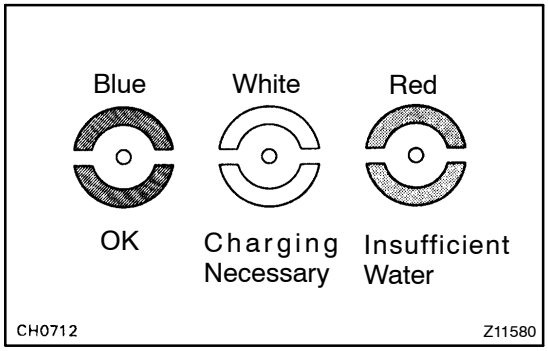
(c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: 12.5 – 12.9 V at 20°C (68°F)

If the voltage is less than specification, charge the battery.

HINT:

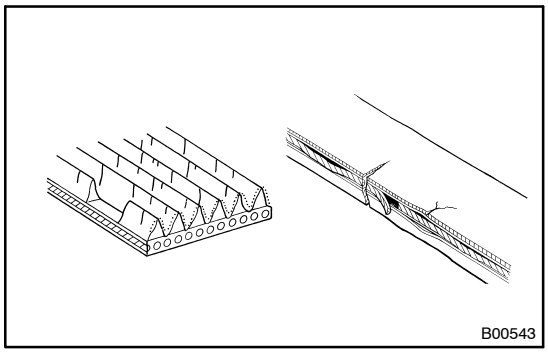
Check the indicator as shown in illustration.



4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link, H–fuses and fuses for continuity.



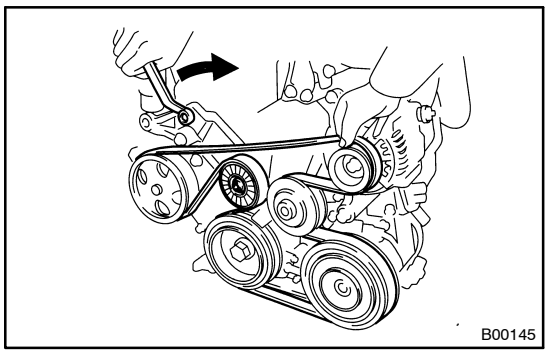
5. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

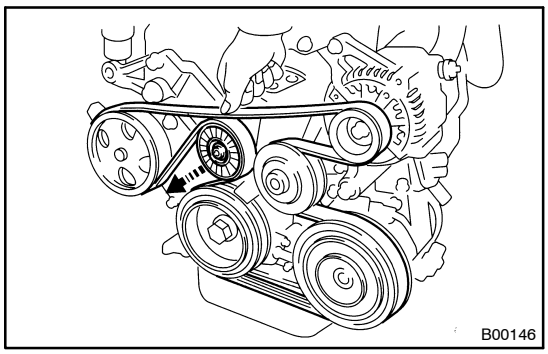
If any defect has been found, replace the drive belt.

HINT:

- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



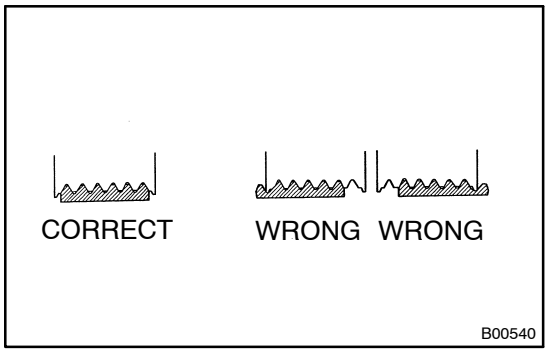
- The drive belt tension can be released by turning the belt tensioner clockwise.



(b) Check the belt tensioner operation.

- Check that belt tensioner moves downward when the drive belt is pressed down at the points indicated in the illustration with approx. 98 N (10 kgf, 22.0 lbf) of force.
- Check the alignment of the belt tensioner pulley to make sure the drive belt will not slip off the pulley.

If necessary, replace the belt tensioner.



HINT:

- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belts, run the engine for about 5 minutes and check the belt tension existing.

6. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the generator while the engine is running.

7. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ”ON”. Check that the discharge warning light comes on.

(b) Start the engine. Check that the light goes off.

If the light does not operate as specified, troubleshoot the discharge warning light circuit.

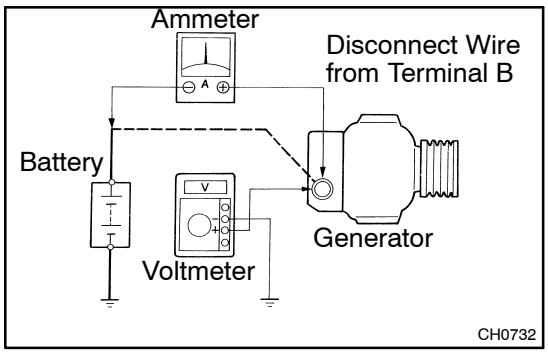
8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT:

If a battery/generator tester is available, connect the tester to the charging circuit as permanufacturer's instructions.

(a) If a tester is not available, connect a voltmeter to the charging circuit as follows:

- Disconnect to the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter.
- Connect the positive (+) lead of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.



(b) Check the charging circuit as follows:

With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.2 – 14.8 V

If the value is not specified, check the generator.

9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "H".

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

If the ammeter reading is less than standard amperage, repair the generator.

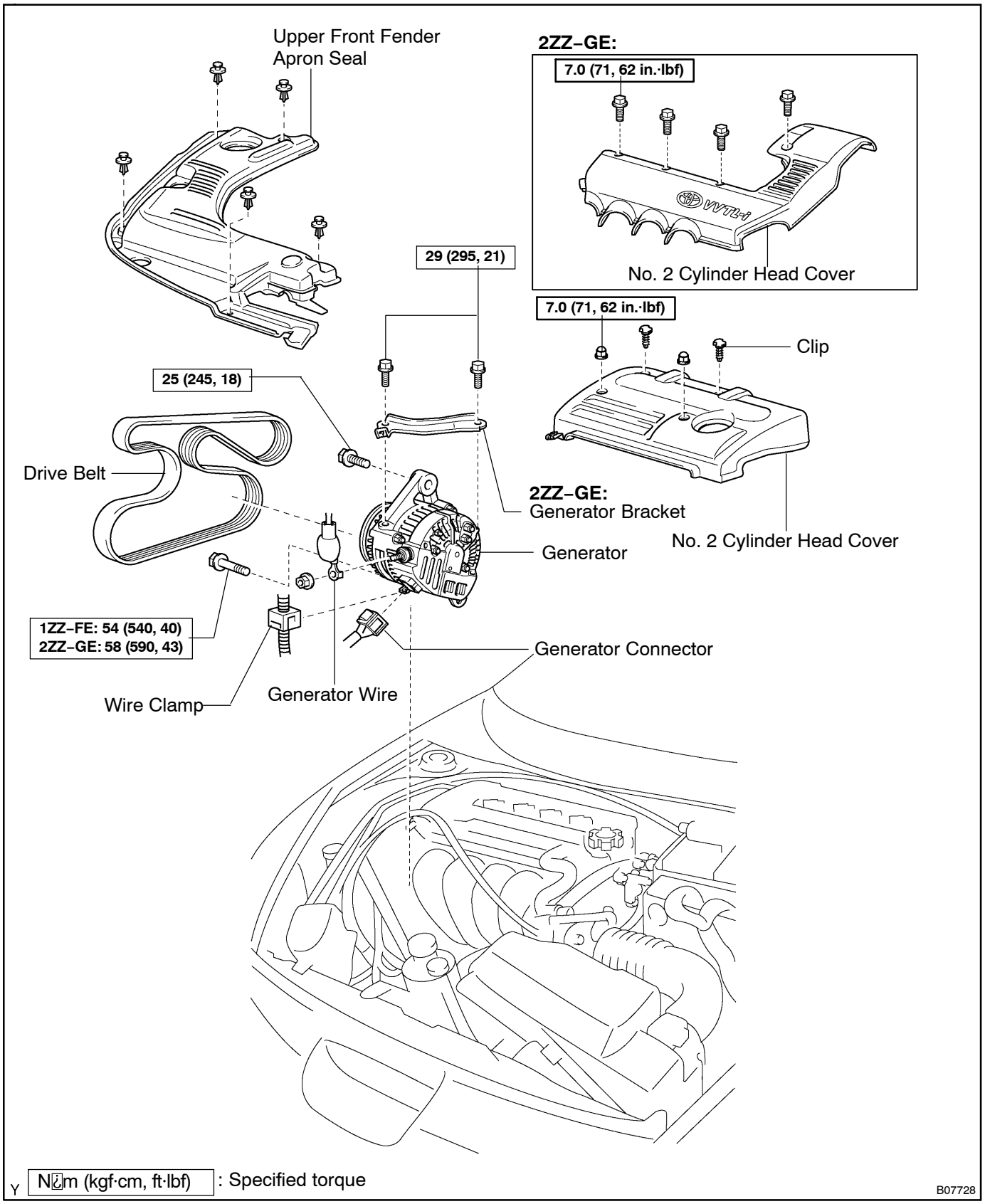
HINT:

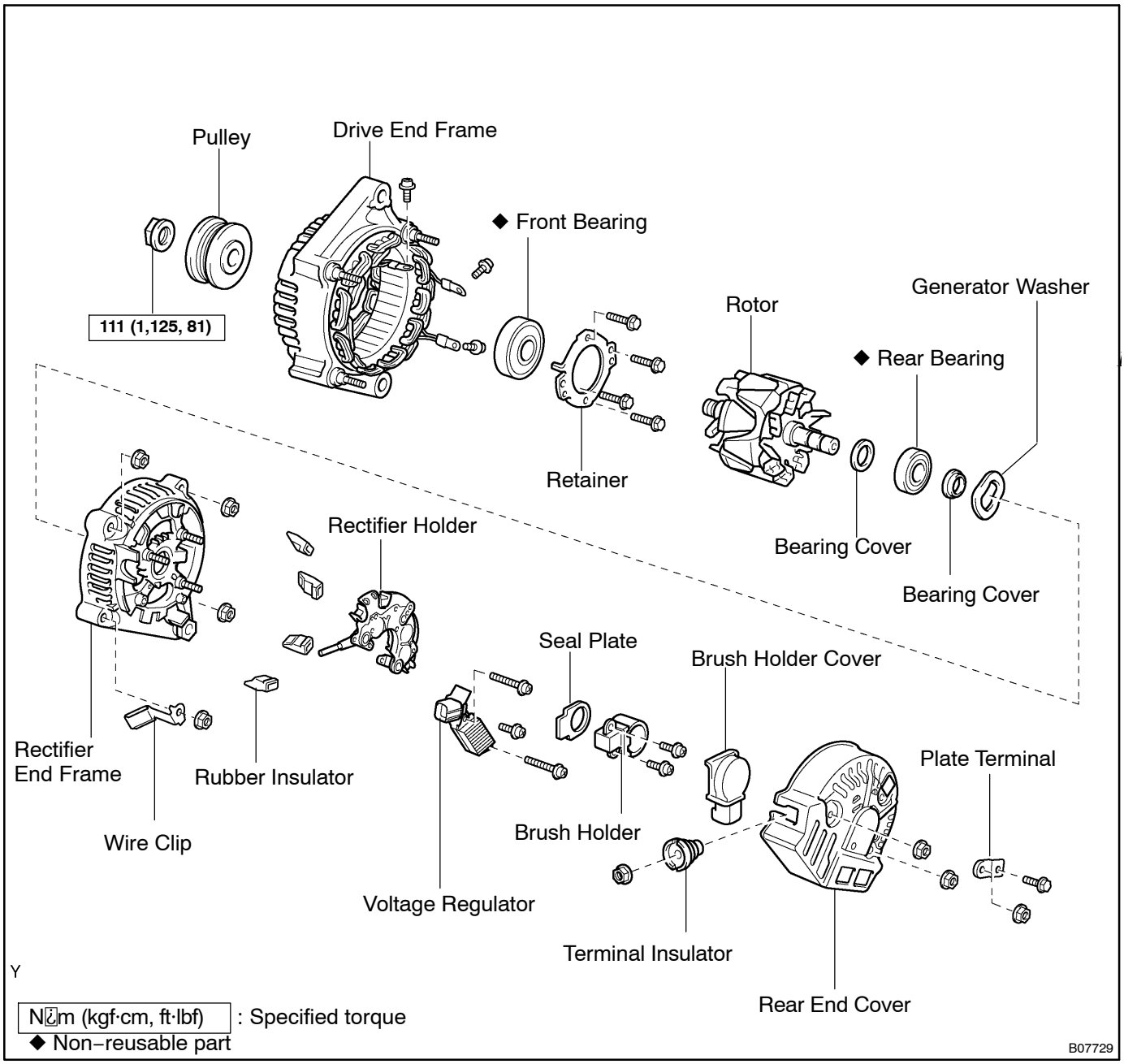
If the battery is fully charged, the indication will sometimes be less than standard amperage.

GENERATOR

COMPONENTS

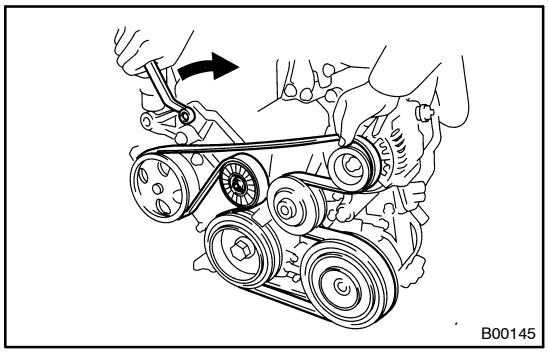
CH023–14




Pulley
Drive End Frame
◆ Front Bearing
111 (1,125, 81)
Rotor
Generator Washer
◆ Rear Bearing
Retainer
Bearing Cover
Bearing Cover
Rectifier Holder
Seal Plate
Brush Holder Cover
Plate Terminal
Rectifier End Frame
Rubber Insulator
Wire Clip
Brush Holder
Voltage Regulator
Terminal Insulator
Rear End Cover
Y
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
B07729

CH024–09

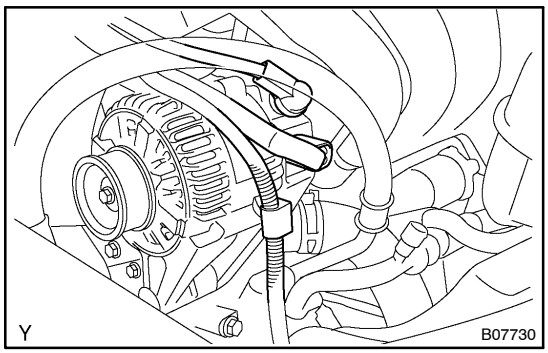
REMOVAL



1. REMOVE DRIVE BELT

(a) Turn the drive belt tensioner clockwise to relieve tension on the belt, and then remove the belt.

(b) Carefully return the tensioner to the unloaded position.



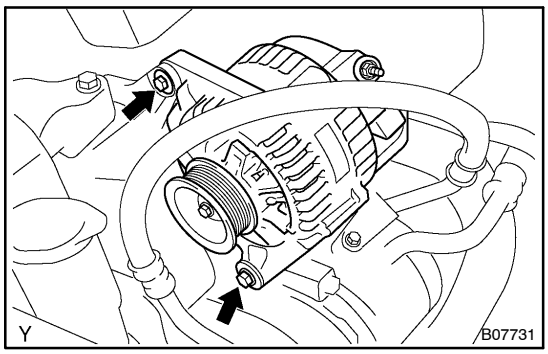
2. REMOVE GENERATOR

(a) Disconnect the wire clamp from the wire clip on the rectifier end frame.

(b) Remove the rubber cap and nut, and disconnect the generator wire.

(c) Disconnect the generator connector.

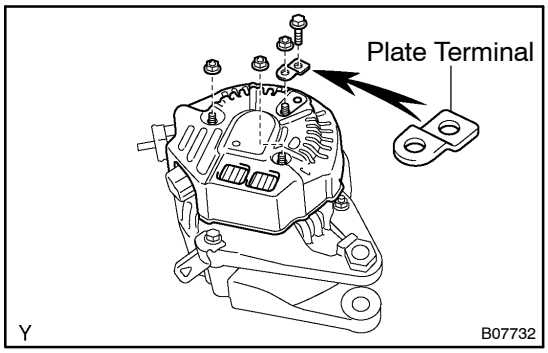
(d) 2ZZ–GE:
Remove the 2 bolts and generator bracket.



(e) Remove the 2 bolts and generator.

CH025–09

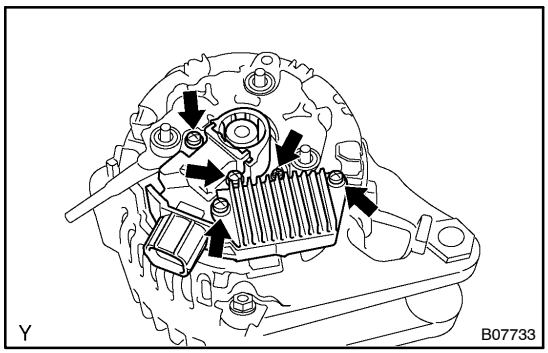
DISASSEMBLY



1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

(b) Remove the bolt, 3 nuts, plate terminal and end cover.

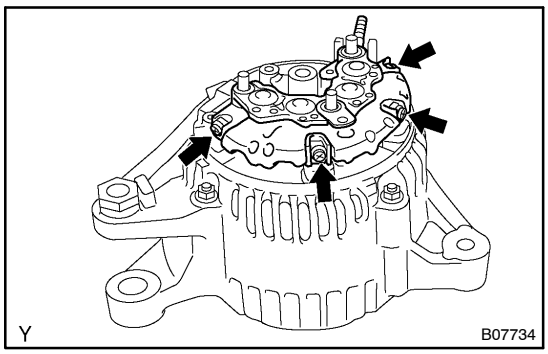


2. REMOVE BRUSH HOLDER AND VOLTAGE REGULATOR

(a) Remove the brush holder cover from the brush holder.

(b) Remove the 5 screws, brush holder and voltage regulator.

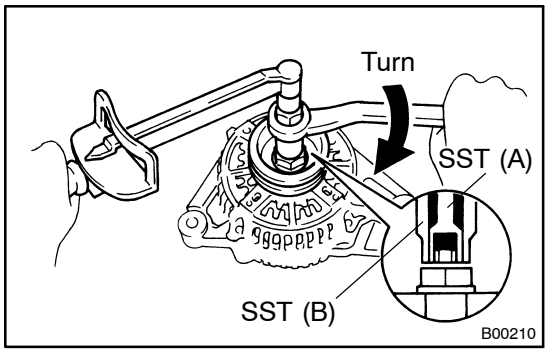
(c) Remove the seal plate from the rectifier end frame.



3. REMOVE RECTIFIER HOLDER

(a) Remove the 4 screws and rectifier holder.

(b) Remove the 4 rubber insulators.



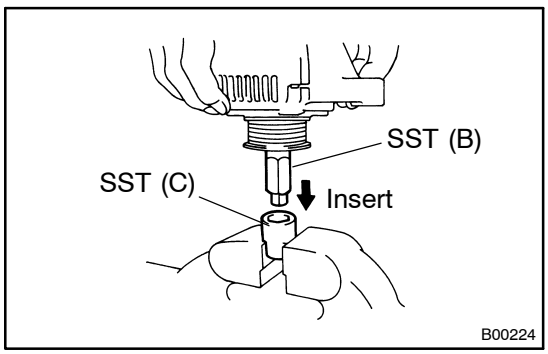
4. REMOVE PULLEY

(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820–63011

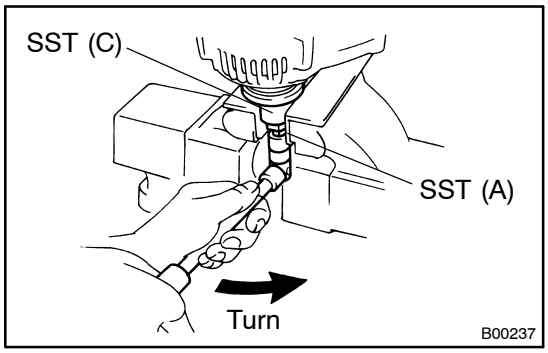
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that SST (A) is secured to the rotor shaft.



(c) Mount SST (C) in a vise.

(d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).

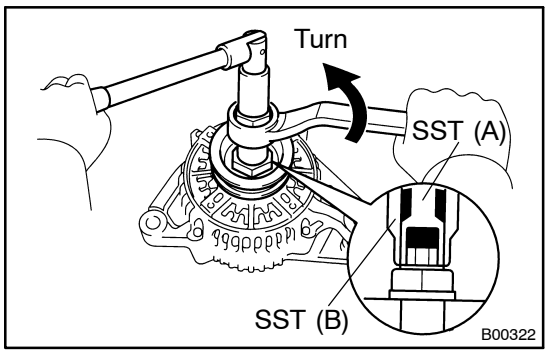


(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

NOTICE:

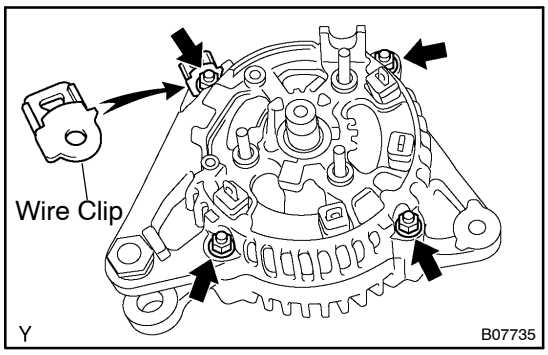
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

(f) Remove the generator from SST (C).



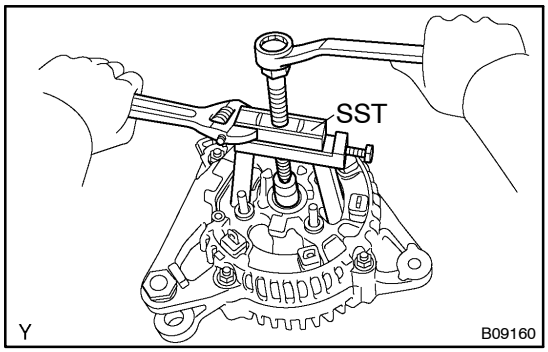
(g) Turn SST (B), and remove SST (A and B).

(h) Remove the pulley nut and pulley.



5. REMOVE RECTIFIER END FRAME

(a) Remove the 4 nuts and wire clip.



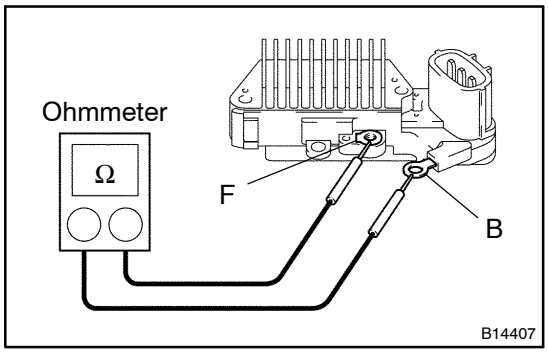
(b) Using SST, remove the rectifier end frame.
SST 09286–46011

(c) Remove the generator washer from the rotor

6. REMOVE ROTOR FROM DRIVE END FRAME

CH0KE–02

INSPECTION



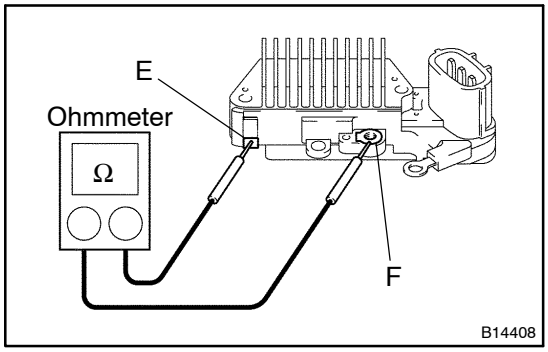
1. INSPECT VOLTAGE REGULATOR

(a) Using an ohmmeter, check the continuity between terminals F and B.

Standard:

When the positive and negative poles between terminals F and B are exchanged, there is continuity in one way but no continuity in another way.

If the continuity is not as specified, replace the voltage regulator.

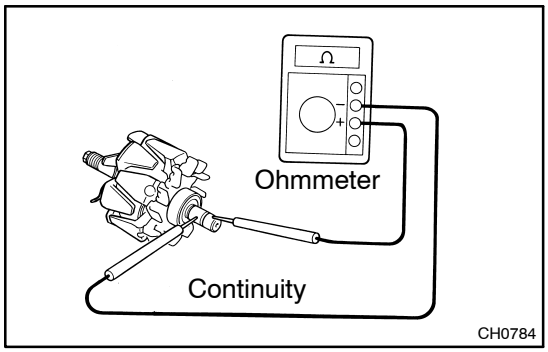


(b) Using an ohmmeter, check the continuity between terminals F and E.

Standard:

When the positive and negative poles between terminals F and E are exchanged, there is continuity in one way but no continuity in another way.

If the continuity is not as specified, replace the voltage regulator.



2. INSPECT ROTOR FOR OPEN CIRCUIT

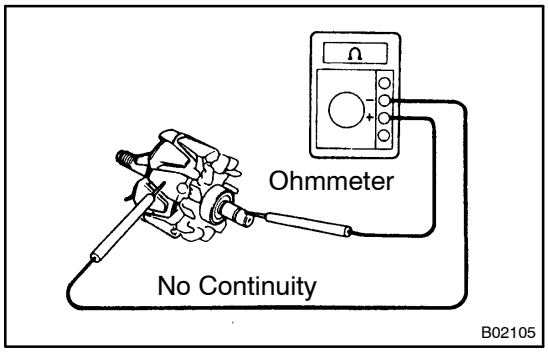
Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:

MT 2.7 – 3.1 Ω at 20°C (68°F)

AT 2.1 – 2.5 Ω at 20°C (68°F)

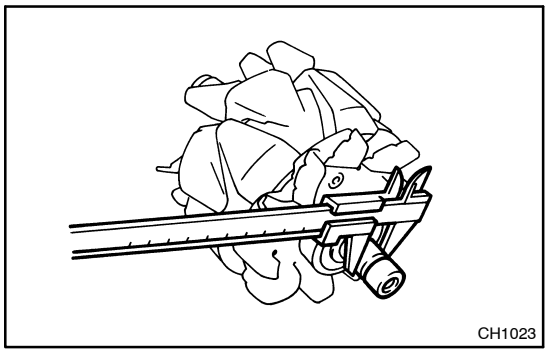
If there is no continuity, replace the rotor.



3. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



4. INSPECT SLIP RINGS

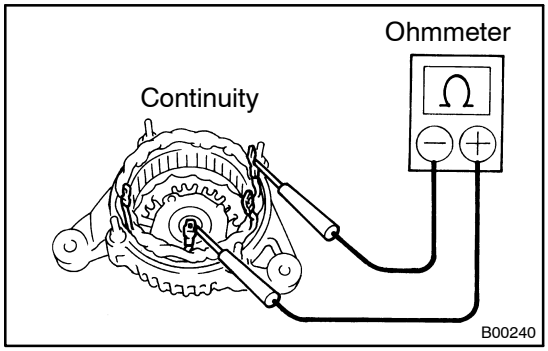
(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter:
14.2 – 14.4 mm (0.559 – 0.567 in.)
Minimum diameter:
12.8 mm (0.504 in.)

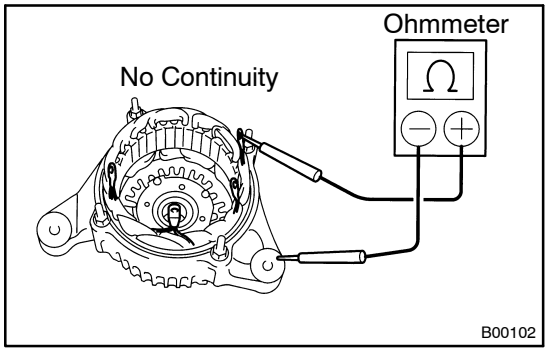
If the diameter is less than minimum, replace the rotor.



5. INSPECT STATOR (DRIVE END FRAME) FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

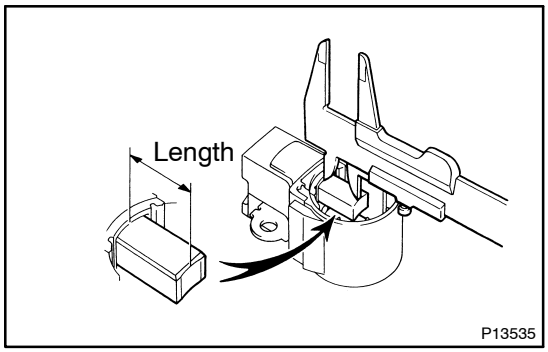
If there is no continuity, replace the drive end frame assembly



6. INSPECT STATOR (DRIVE END FRAME) FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly

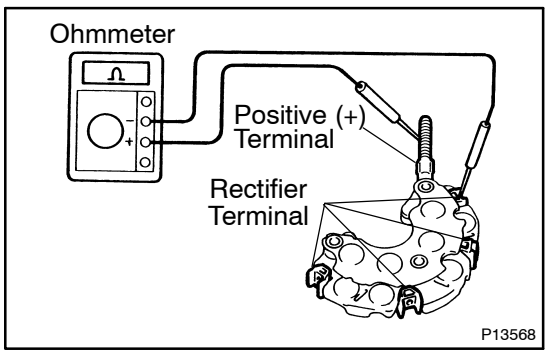


7. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length.

Standard exposed length:
9.5 ~ 11.5 mm (0.374 ~ 0.453 in.)
Minimum exposed length:
1.5 mm (0.059 in.)

If the exposed length is less than minimum, replace the brush holder assembly.



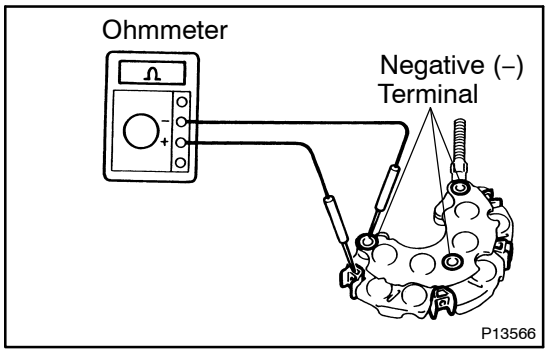
8. INSPECT POSITIVE RECTIFIER HOLDER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.



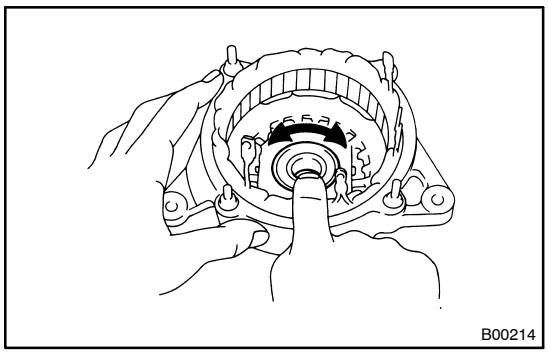
9. INSPECT NEGATIVE RECTIFIER HOLDER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

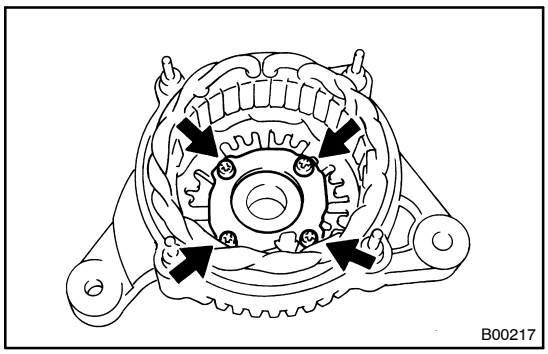
(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.



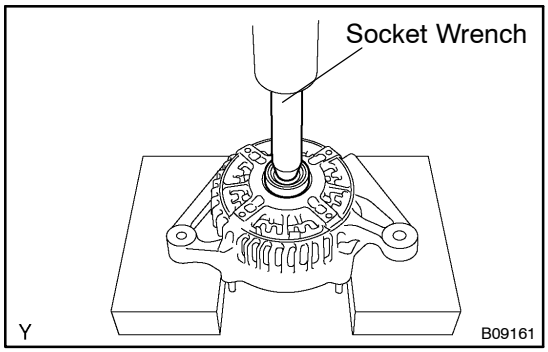
10. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

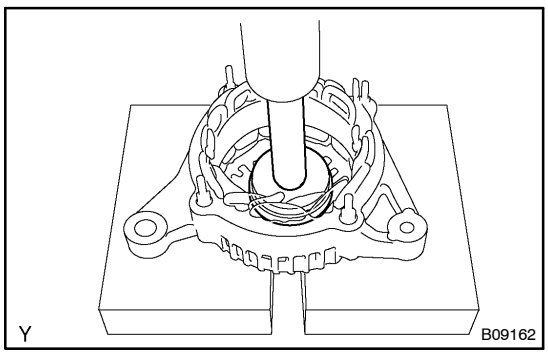


11. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the 4 screws, bearing retainer and bearing.

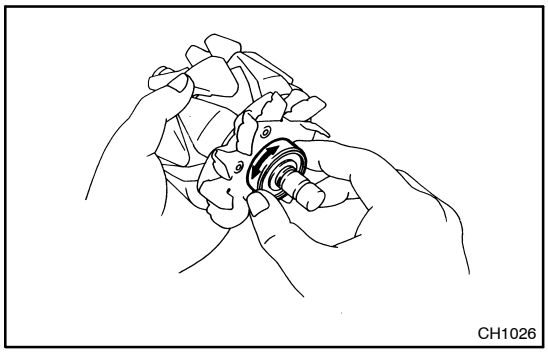


(b) Using SST and a press, press out the bearing.
SST 09950–60010 (09951–00350) 09950–70010 (09951–07100)



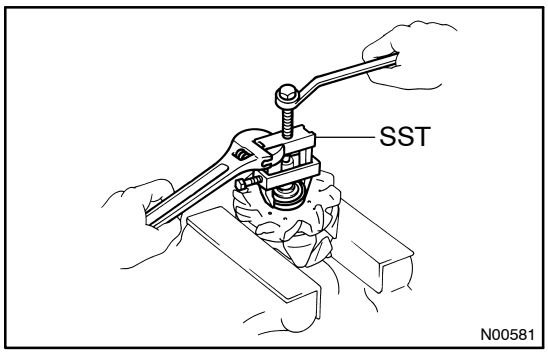
(c) Using SST and a press, press in a new bearing.
SST 09950–60010 (09951–00530) 09950–70010 (09951–07100)

(d) Install the bearing retainer with the 4 screws.
Torque: 3.0 N·m (31 kgf·cm, 27 in.·lbf)



12. INSPECT REAR BEARING

Check that the bearing is not rough or worn.



13. IF NECESSARY, REPLACE REAR BEARING

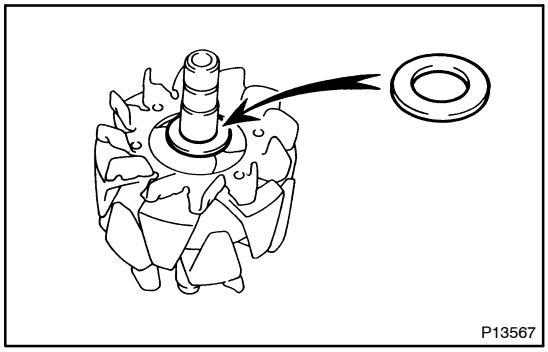
(a) Using SST, remove the bearing cover (outside) and bearing.

SST 09820–00021

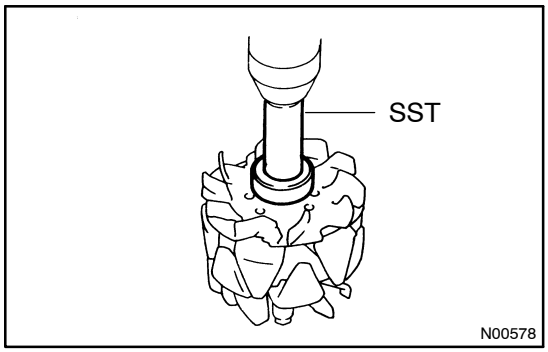
NOTICE:

Be careful not to damage the fan.

(b) Remove the bearing cover (inside).

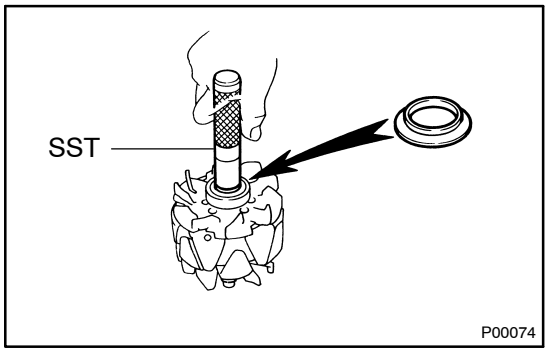


(c) Place the bearing cover (inside) on the rotor.



(d) Using SST and a press, press in a new bearing.

SST 09820–00031

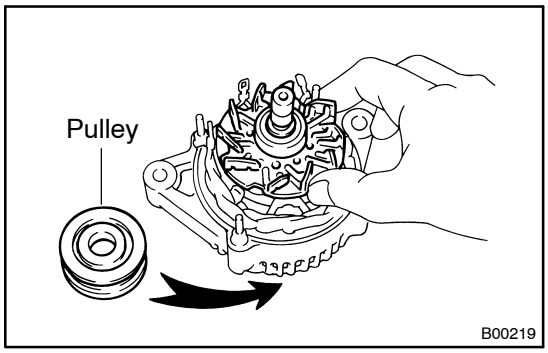


(e) Using SST, push in the bearing cover (outside).

SST 09285–76010

CH0CB–10

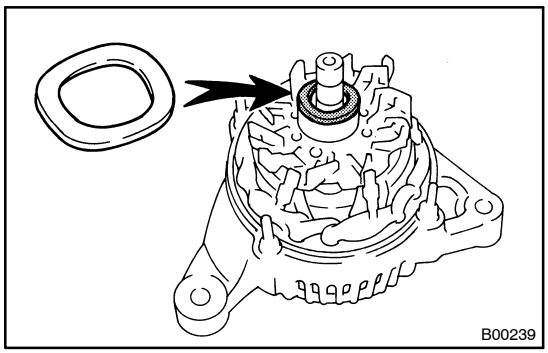
REASSEMBLY



1. INSTALL ROTOR TO DRIVE END FRAME

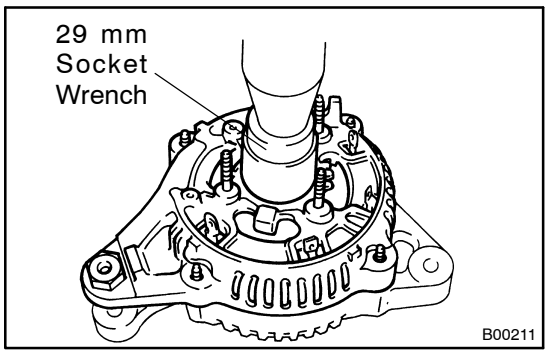
(a) Place the drive end frame on the pulley.

(b) Install the rotor to the drive end frame.

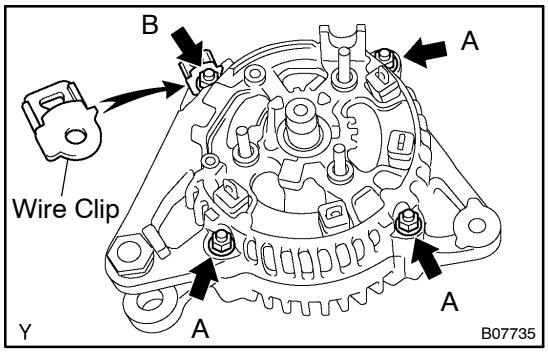


2. INSTALL RECTIFIER END FRAME

(a) Place the generator washer on the rotor.

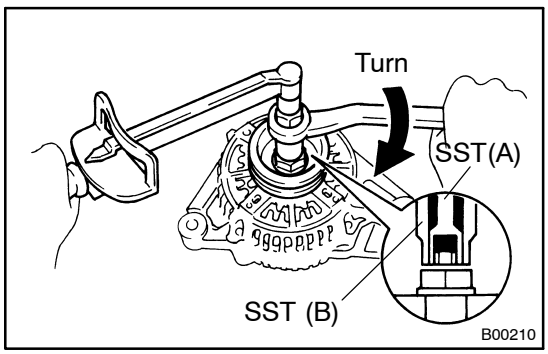


(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



(c) Install the wire clip and 4 nuts.

Torque:
Nut A 4.5 N·m (46 kgf·cm, 40 in.·lbf)
Nut B 5.4 N·m (55 kgf·cm, 48 in.·lbf)

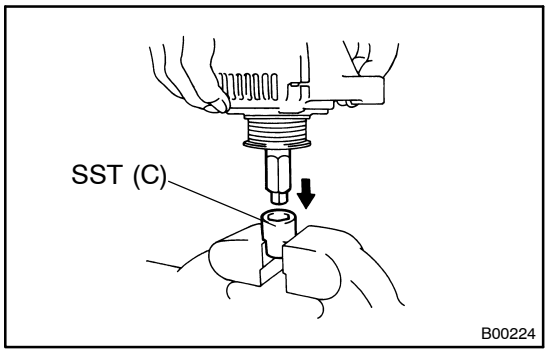


3. INSTALL PULLEY

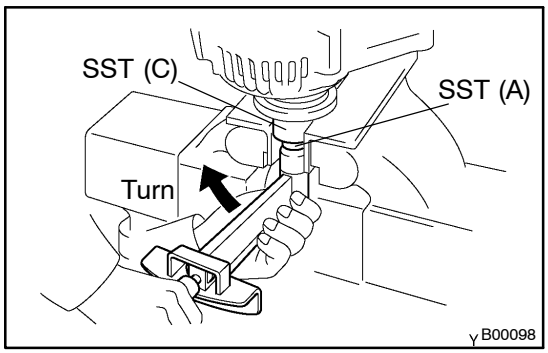
(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820–63011
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

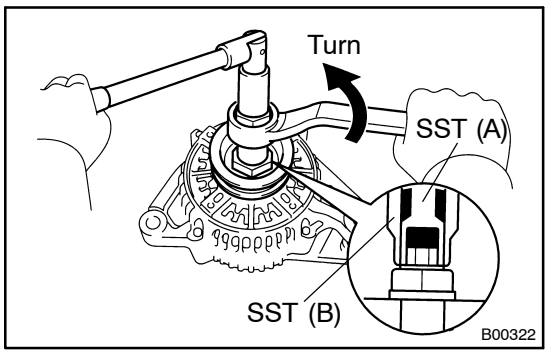
(c) Check that SST (A) is secured to the pulley shaft.



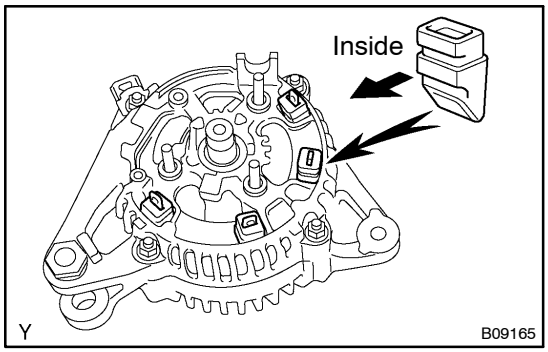
(d) Mount SST (C) in a vise.
(e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



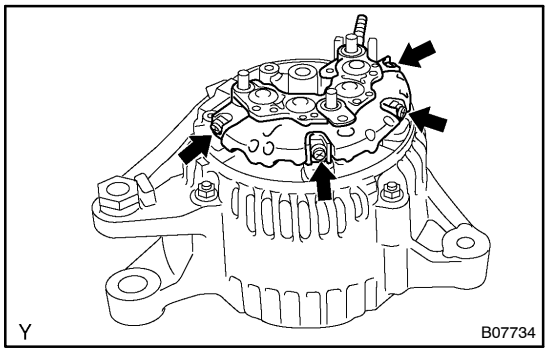
(f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 111 N·m (1,125 kgf·cm, 81 ft·lbf)
(g) Remove the generator from SST (C).



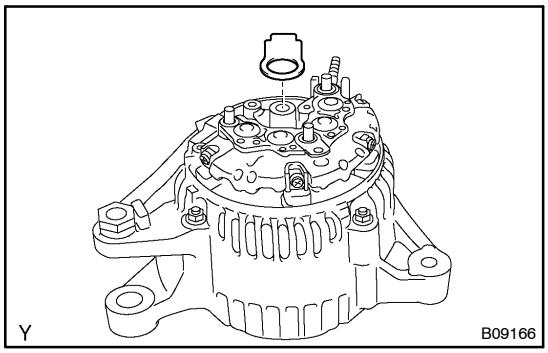
(h) Turn SST (B), and remove SST (A and B).



4. INSTALL RECTIFIER HOLDER
(a) Install the 4 rubber insulators on the lead wires.
NOTICE:
Be careful of the rubber insulators installation direction.

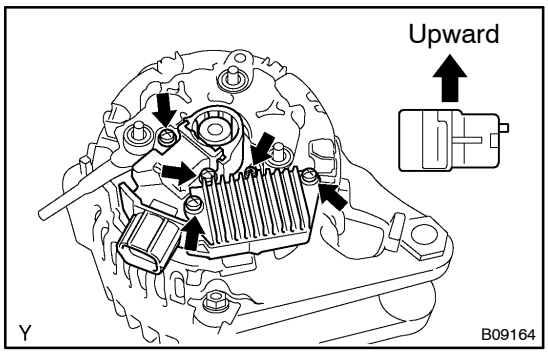


(b) Install the rectifier holder while pushing it with the 4 screws
Torque: 2.9 N·m (30 kgf·cm, 26 in.·lbf)



5. INSTALL VOLTAGE REGULATOR AND BRUSH HOLDER

(a) Place the seal plate on the rectifier end frame.



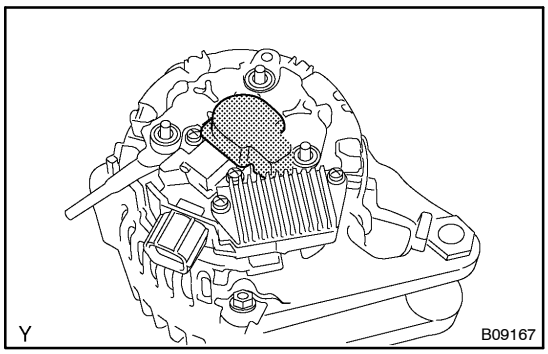
(b) Place the voltage regulator and brush holder on the rectifier end frame.

NOTICE:

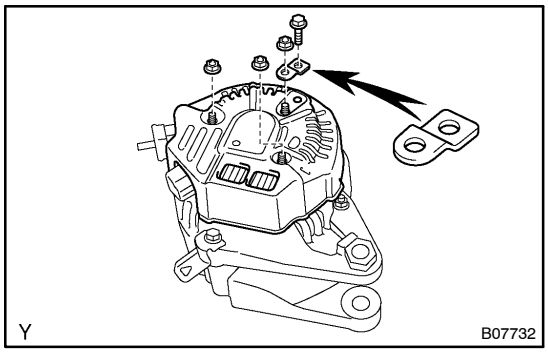
Be careful of the holder installation direction.

(c) Install the 5 screws.

Torque: 2.0 N·m (20 kgf·cm, 18 in.·lbf)



(d) Place the brush holder cover on the brush holder.



6. INSTALL REAR END COVER

(a) Install the end cover and plate terminal with the bolt and 3 nuts.

Torque:

Nut 4.4 N·m (45 kgf·cm, 39 in.·lbf)

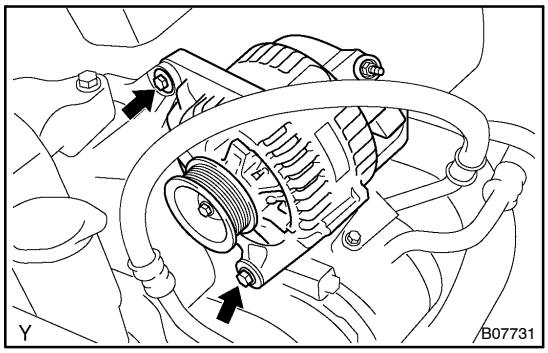
Bolt 3.9 N·m (39 kgf·cm, 35 in.·lbf)

(b) Install the terminal insulator with the nut.

Torque: 4.1 N·m (42 kgf·cm, 36 in.·lbf)

7. CHECK THAT ROTOR ROTATES SMOOTHLY

CH028–07



INSTALLATION

1. INSTALL GENERATOR

(a) Install the 2 bolts and generator.
Torque:
14 mm head 25 N·m (250 kgf·cm, 18 ft·lbf)
17 mm head
1ZZ–FE: 54 N·m (550 kgf·cm, 40 ft·lbf)
2ZZ–GE: 58 N·m (590 kgf·cm, 43 ft·lbf)

(b) 2ZZ–GE:
Install the generator bracket with the 2 bolts.
Torque: 29 N·m (295 kgf·cm, 21ft·lbf)

(c) Connect the generator connector.

(d) Connect the generator wire, and install the nut and rubber cap.

(e) Connect the generator wire, and install the rubber cap and nut.

2. INSTALL DRIVE BELT

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

CL02N–12

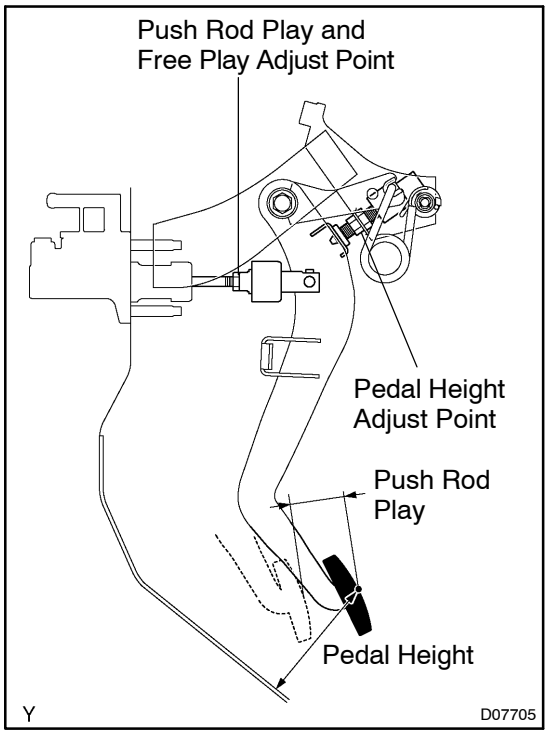
Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Clutch grabs/chatters	4. Engine mounting (Loosen)	–
	5. Clutch disc (Runout is excessive)	CL–14
	6. Clutch disc (Oily)	CL–14
	7. Clutch disc (Worn out)	CL–14
	8. Clutch disc torsion rubber (Damaged)	CL–14
	9. Clutch disc (Glazed)	CL–14
	10.Diaphragm spring (Out of tip alignment)	CL–14
Clutch pedal spongy	1. Clutch line (Air in line)	–
	2. Master cylinder cup (Damaged)	CL–4
	3. Release cylinder cup (Damaged)	CL–9
Clutch noisy	1. Release bearing (Worn, dirty, or damaged)	CL–14
	2. Clutch disc torsion rubber (Damaged)	CL–14
Clutch slips	1. Clutch pedal (Free play out of adjustment)	CL–2
	2. Clutch disc (Oily)	CL–14
	3. Clutch disc (Worn out)	CL–14
	4. Diaphragm spring (Damaged)	CL–14
	5. Pressure plate (Distortion)	CL–14
	6. Flywheel (Distortion)	–
Clutch does not disengage	1. Clutch pedal (Free play out of adjustment)	CL–2
	2. Clutch line (Air in line)	–
	3. Master cylinder cup (Damaged)	CL–4
	4. Release cylinder cup (Damaged)	CL–9
	5. Clutch disc (out of true)	CL–14
	6. Clutch disc (Runout is excessive)	CL–14
	7. Clutch disc (Lining broken)	CL–14
	8. Clutch disc (Dirty or burned)	CL–14
	9. Clutch disc (Oily)	CL–14
	10.Clutch disc (Lack of spline grease)	CL–14
	11.Diaphragm spring (Damaged)	CL–14
	12.Diaphragm spring (Out of tip alignment)	CL–14
	13.Pressure plate (Distortion)	CL–14

CL09K–03

CLUTCH PEDAL

INSPECTION



1. CHECK PEDAL HEIGHT

Pedal height from asphalt sheet:

Standard pedal:

135.6 – 145.6 mm (5.339 – 5.732 in.)

Sport pedal:

136.9 – 146.9 mm (5.390 – 5.783 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Loosen the lock nut and turn the stopper bolt until the height is correct.

(b) Tighten the lock nut.

3. CHECK PEDAL FREE PLAY AND PUSH ROD PLAY

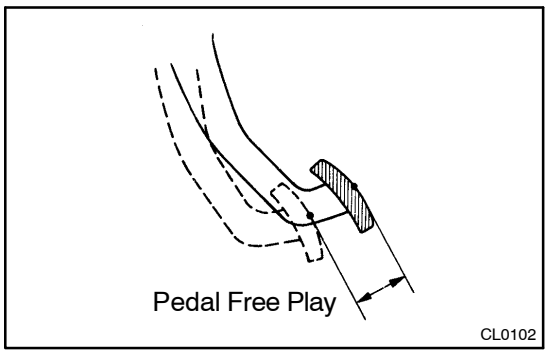
(a) Depress the pedal until clutch resistance begins to be felt.

Pedal free play: 1.0 – 5.0 mm (0.039 – 0.197 in.)

(b) Gently push on the pedal until the resistance begins to increase a little.

Push rod play at pedal top:

5.0 – 15.0 mm (0.197 – 0.591 in.)

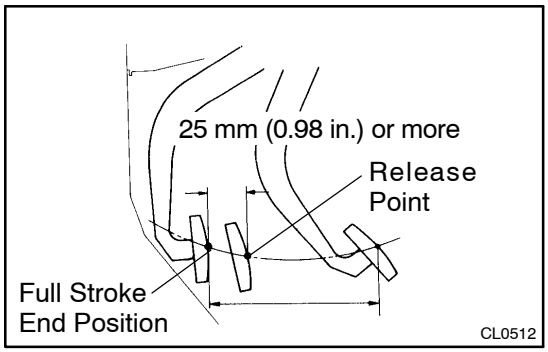


4. IF NECESSARY, ADJUST PEDAL FREE PLAY AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the push rod until the free play and push rod play are correct.

(b) Tighten the lock nut.

(c) After adjusting the pedal free play, check the pedal height.



5. CHECK CLUTCH RELEASE POINT

(a) Pull the parking brake lever and install wheel stopper.

(b) Start and idle the engine.

(c) Without depressing the clutch pedal, slowly shift the shift lever into reverse position until the gears contact.

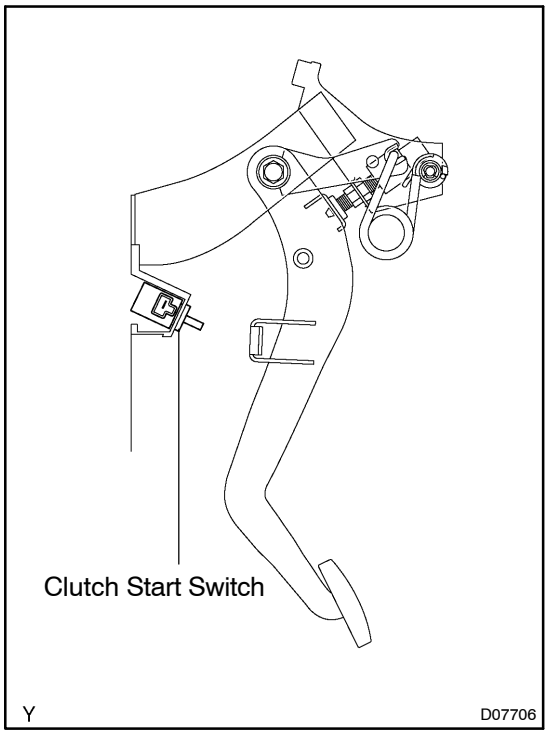
(d) Gradually depress the clutch pedal and measure the stroke distance from the point the gear noise stops (release point) to the full stroke end position.

Standard distance: 25 mm (0.98 in.) or more

(From pedal stroke end position to release point)

If the distance is not as specified, perform the following operations.

- Inspect pedal height.
- Inspect push rod play and pedal free play.
- Bleed the clutch line.
- Inspect the clutch cover and disc.

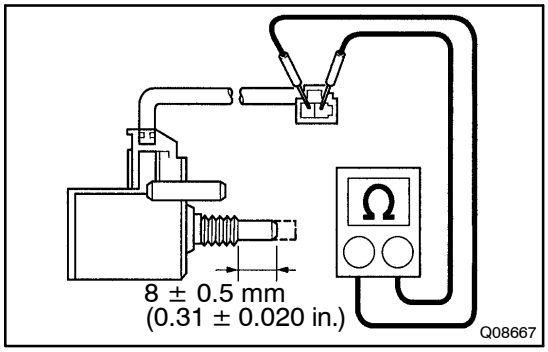


6. CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

If necessary, replace the clutch start switch.



7. INSPECT CLUTCH START SWITCH CONTINUITY

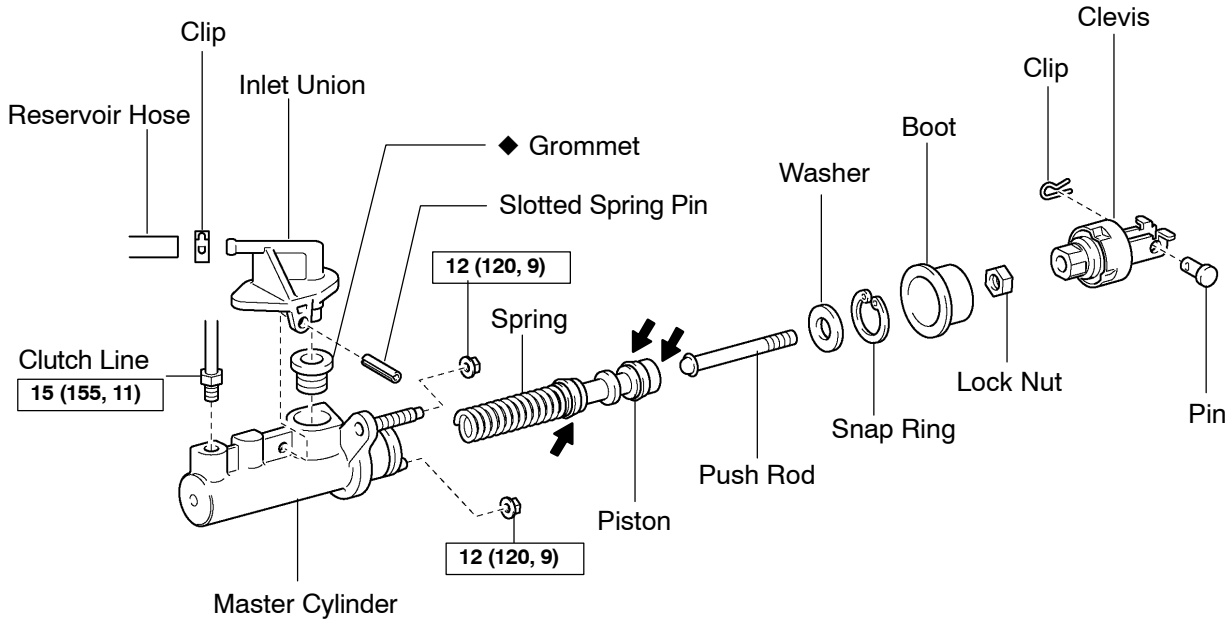
Check the continuity between terminals when the switch is ON and OFF.

Switch position	Condition
ON (pushed)	Continuity
OFF (free)	No continuity

CLUTCH MASTER CYLINDER

COMPONENTS

CL09E–04



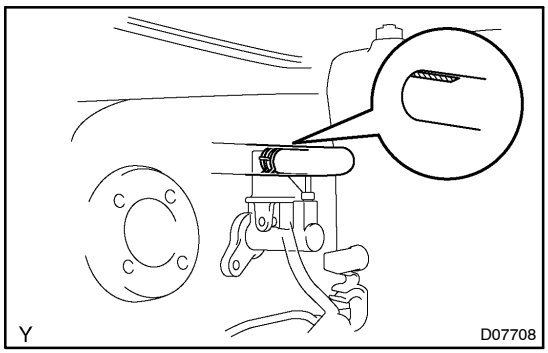
Y N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
⬅ Lithium soap base glycol grease

D07726

CL017–10

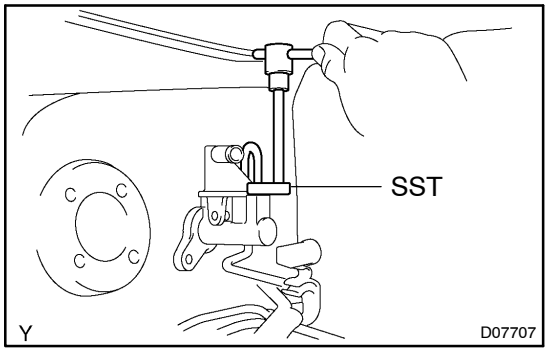
REMOVAL

1. REMOVE BRAKE BOOSTER (See page BR–17)



2. DISCONNECT RESERVOIR HOSE

(a) Using pliers, disconnect the clip.
(b) Disconnect the reservoir hose from the inlet union.
(c) Use a container to catch the fluid.



3. DISCONNECT CLUTCH LINE

(a) Using SST, disconnect the clutch line.
SST 09023–00101
(b) Use a container to catch the fluid.

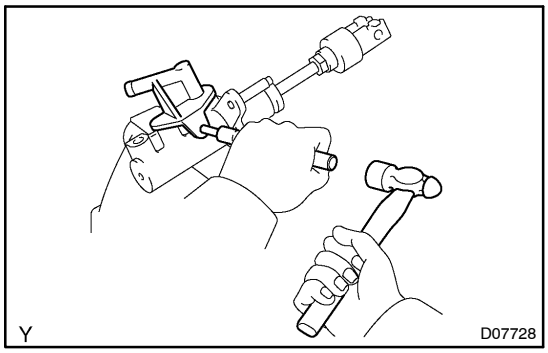
4. REMOVE CLIP AND PIN

Using needle–nose pliers, remove the clip and pin.

5. REMOVE 2 MOUNTING NUTS AND PULL OUT MASTER CYLINDER

CL09L–10

DISASSEMBLY



1. REMOVE INLET UNION

(a) Using a pin punch (3 mm) and hammer, drive out the slotted spring pin.

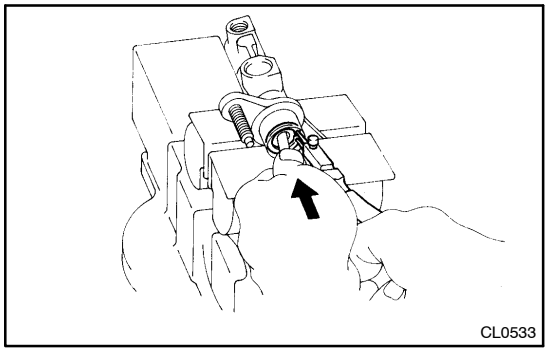
(b) Remove the inlet union.

(c) Remove the grommet.

2. REMOVE CLEVIS

Loosen the lock nut to remove the clevis and remove the lock nut.

3. REMOVE BOOT FROM CYLINDER



4. REMOVE PUSH ROD

(a) While pushing the push rod, using snap ring pliers, remove the snap ring.

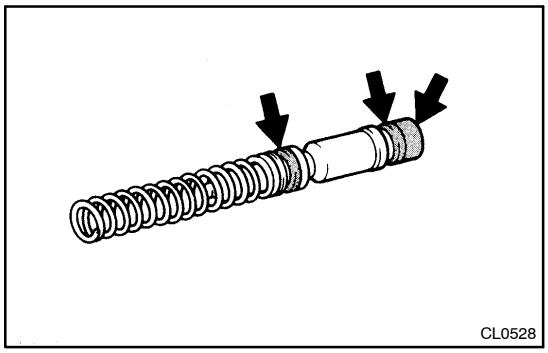
(b) Pull out the push rod and washer.

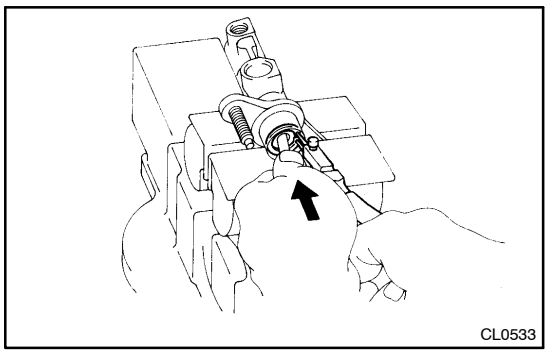
5. REMOVE PISTON WITH SPRING FROM CYLINDER

CL09M–09

REASSEMBLY

1. **COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN IN ILLUSTRATION**
2. **INSERT PISTON WITH SPRING INTO CYLINDER**



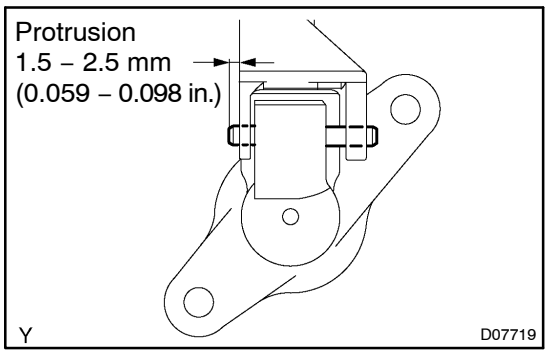


3. **INSTALL PUSH ROD**

(a) Install the washer to the push rod.

(b) Push the push rod into the piston, using snap ring pliers, install the snap ring.

4. **INSTALL BOOT TO CYLINDER**
5. **TEMPORARILY INSTALL LOCK NUT AND CLEVIS**



6. **INSTALL INLET UNION**

(a) Install a new grommet.

(b) Install the inlet union.

(c) Using a pin punch (3 mm) and hammer, drive in the slotted spring pin.

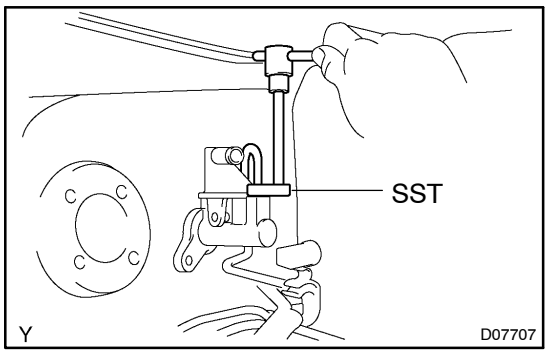
CL09G–07

INSTALLATION

1. INSTALL MASTER CYLINDER WITH 2 MOUNTING NUTS

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

2. INSTALL PIN AND CLIP

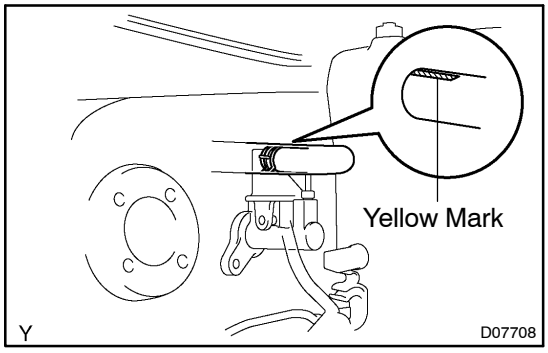


3. CONNECT CLUTCH LINE

Using SST, connect the clutch line.

SST 09023–00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)



4. CONNECT RESERVOIR HOSE

(a) Connect the reservoir hose to the inlet union.

NOTICE:

Facing the yellow mark upwards.

(b) Using pliers, connect the clip.

5. INSTALL BRAKE BOOSTER (See page BR–18)

6. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM (See page BR–4)

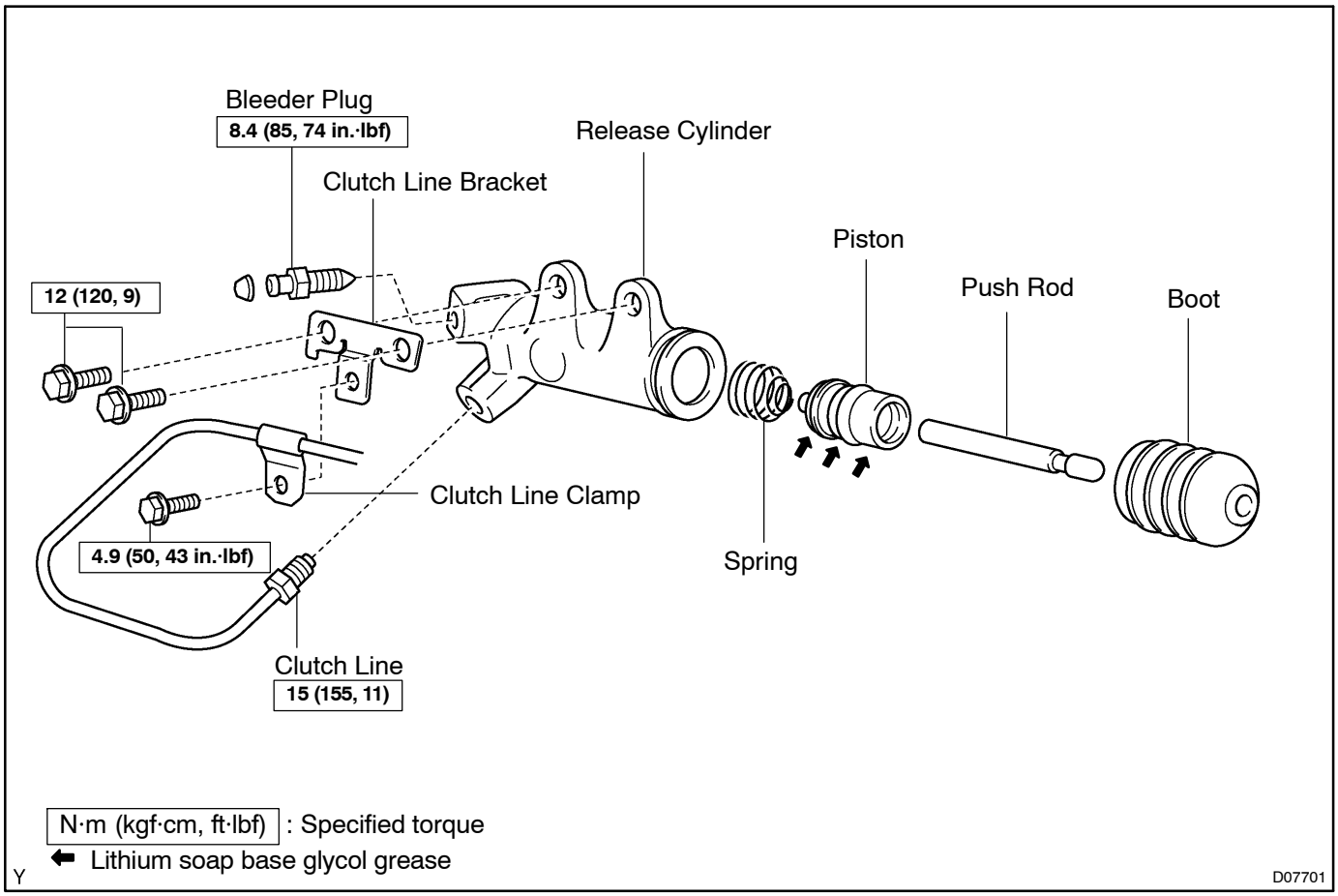
7. ADJUST CLUTCH PEDAL (See page CL–2)

8. CHECK FOR LEAKS

CLUTCH RELEASE CYLINDER

CL02U–13

COMPONENTS



CL09H–07

REMOVAL

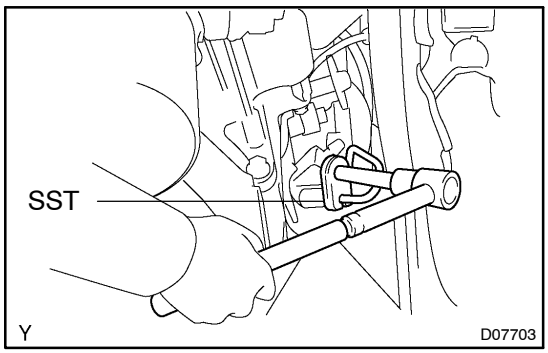
1. DISCONNECT CLUTCH LINE

(a) Raise the vehicle.

CAUTION:

Make sure that the vehicle is securely supported.

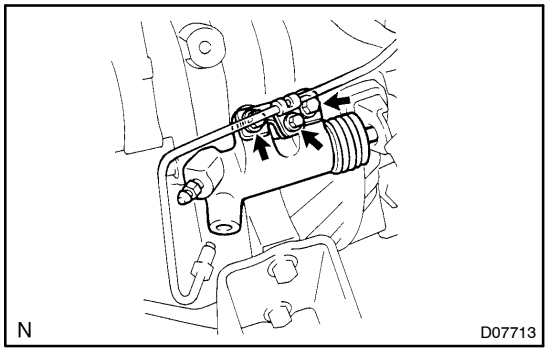
(b) Remove the LH and RH engine under covers.



(c) Using SST, disconnect the clutch line.
SST 09023–00101

(d) Use a container to catch the fluid.

(e) Lower the vehicle.



2. REMOVE RELEASE CYLINDER

(a) Remove the air cleaner case assembly with the air hose.

(b) Remove the clutch line clamp set bolt.

(c) Remove the 2 bolts, clutch line bracket and release cylinder.

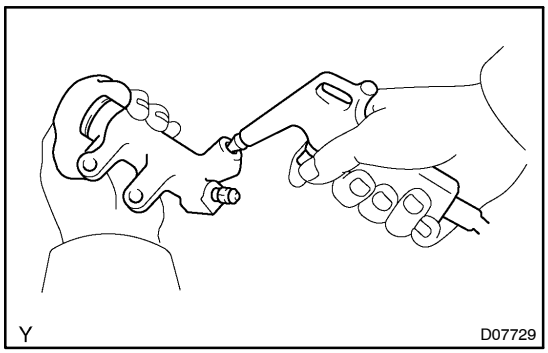
CL02F–10

DISASSEMBLY

1. REMOVE BOOT AND PUSH ROD

(a) Pull out the boot with the push rod.

(b) Remove the boot from the push rod.



2. REMOVE PISTON AND SPRING

Using compressed air, remove the piston with the spring from the cylinder.

NOTICE:

- **Blowing off the air may cause the piston's jump–out. When removing the piston, hold it with your hand using a waste cloth.**
- **Take care not to splash brake fluid when air–blowing.**

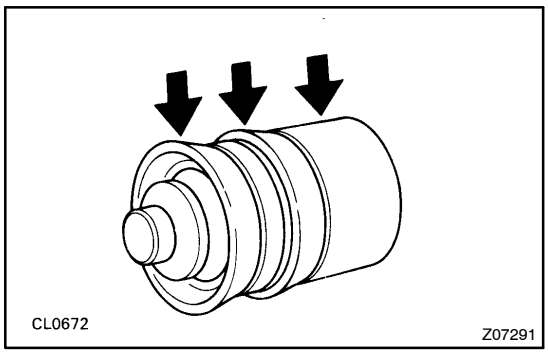
3. REMOVE BLEEDER PLUG

CL02G–10

REASSEMBLY

1. INSTALL BLEEDER PLUG

Torque: 8.4 N·m (85 kgf·cm, 74 in.·lbf)



2. COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

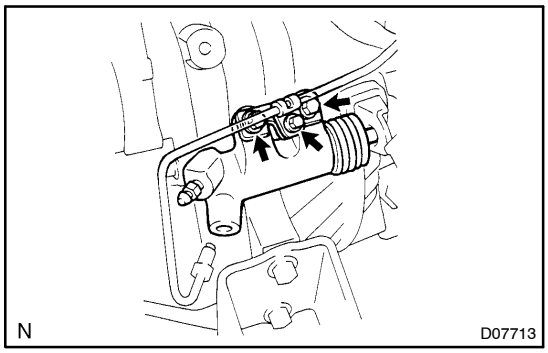
3. INSTALL PISTON AND SPRING INTO CYLINDER

4. INSTALL BOOT AND PUSH ROD

(a) Install the push rod to the boot.

(b) Install the boot with the push rod to the cylinder.

CL09I–07



INSTALLATION

1. INSTALL RELEASE CYLINDER

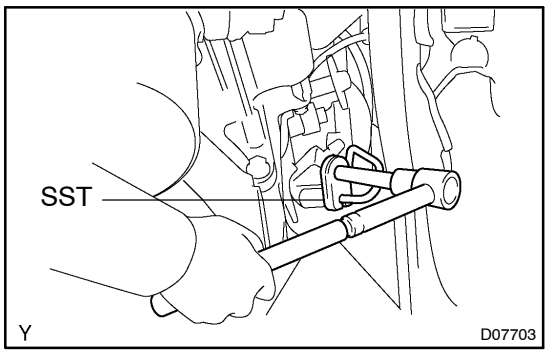
(a) Install the release cylinder and clutch line bracket with the 2 bolts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

(b) Install the clutch line clamp to the clutch line bracket with the bolt.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

(c) Install the air cleaner case assembly with the air hose.



2. CONNECT CLUTCH LINE AND BLEED CLUTCH SYSTEM

(a) Raise the vehicle.

CAUTION:

Make sure that the vehicle is securely supported.

(b) Using SST, connect the clutch line.

SST 09023–00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

(c) Fill the brake reservoir tank with brake fluid and bleed clutch system.

(d) Check for the leaks.

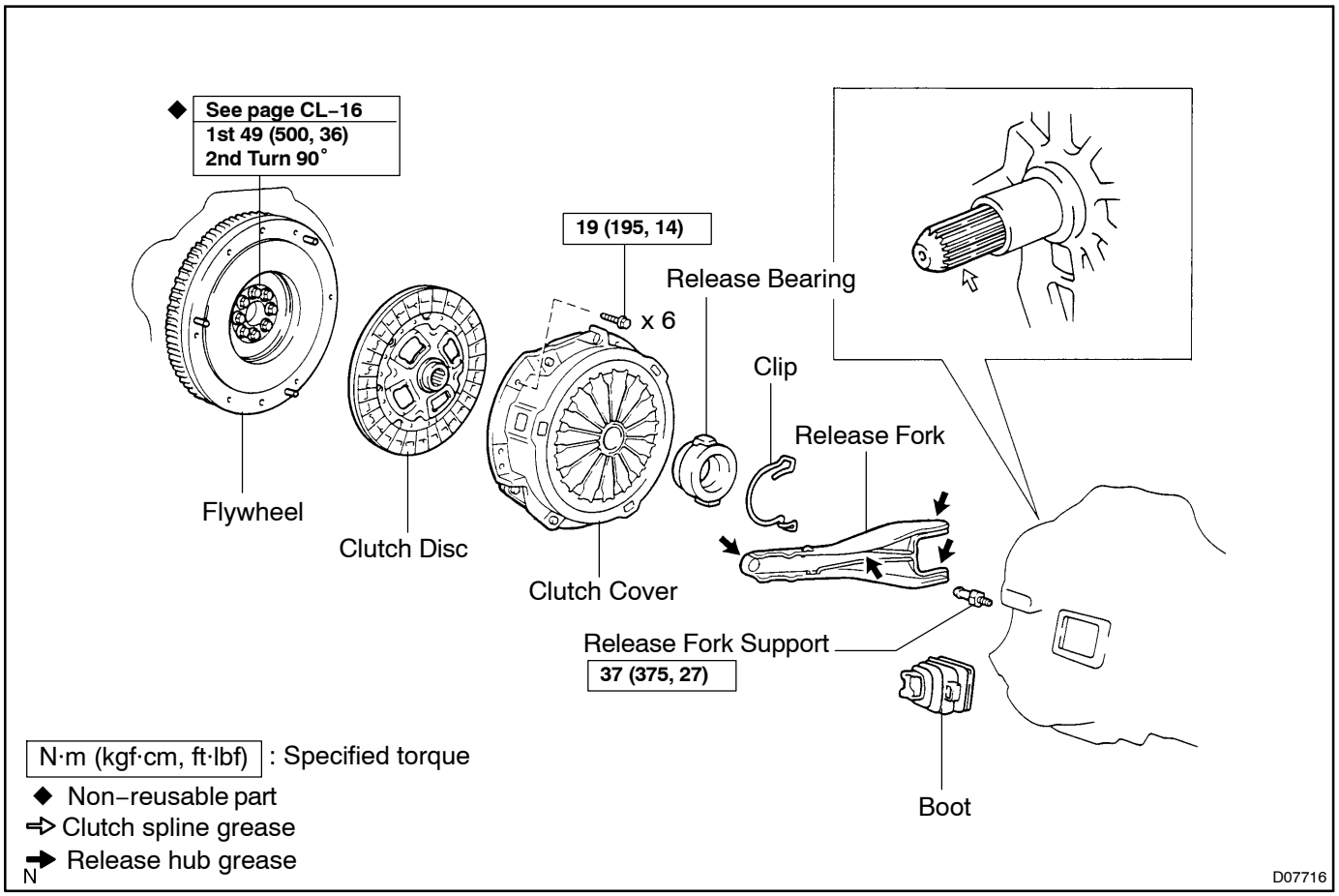
(e) Install the LH and RH engine under covers.

(f) Lower the vehicle.

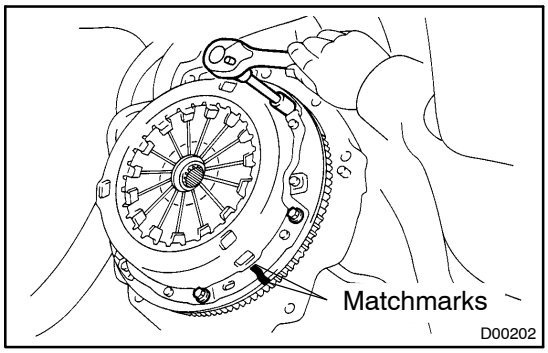
CLUTCH UNIT

COMPONENTS

CL02Z–13



CL030–14



REMOVAL

1. REMOVE TRANSAXLE FROM ENGINE
(C56: See page MX–4)
(C60: See page MX–4)

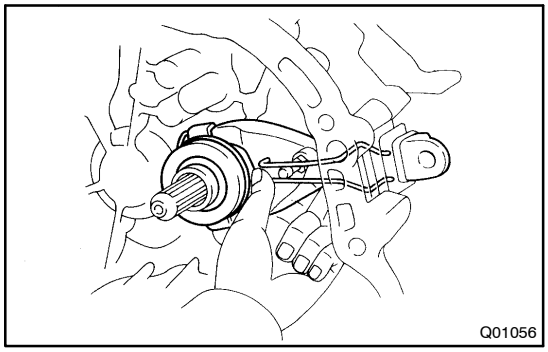
2. REMOVE CLUTCH COVER AND DISC

(a) Align the matchmark on the clutch cover with the one on the flywheel.

(b) Loosen each set bolt one turn at a time until spring tension is released.

(c) Remove the set bolts, and pull off the clutch cover with the clutch disc.

NOTICE:
Do not drop the clutch disc.



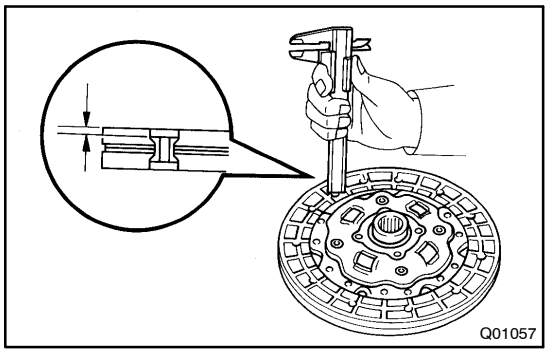
3. REMOVE RELEASE BEARING AND FORK FROM TRANSAXLE

Remove the release bearing with the fork together and then separate them.

4. REMOVE RELEASE FORK SUPPORT AND BOOT

CL031–09

INSPECTION

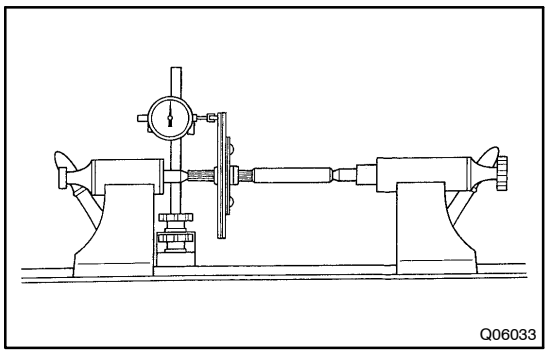


1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using vernier calipers, measure the rivet head depth.

Minimum rivet depth: 0.3 mm (0.012 in.)

If necessary, replace the clutch disc.

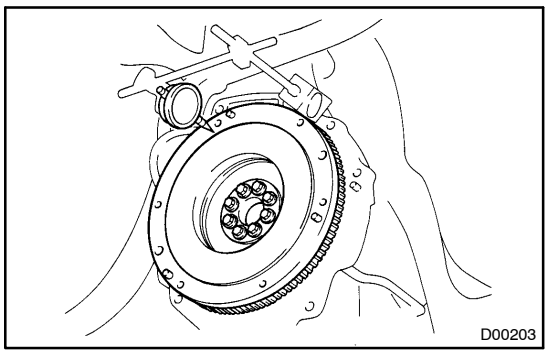


2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.

Maximum runout: 0.8 mm (0.031 in.)

If necessary, replace the clutch disc runout.

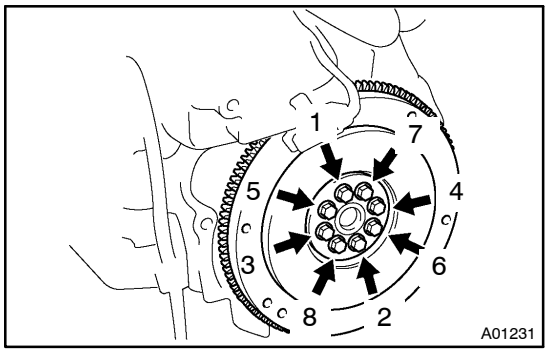


3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator, check the flywheel runout.

Maximum runout: 0.1 mm (0.004 in.)

If necessary, replace the flywheel.

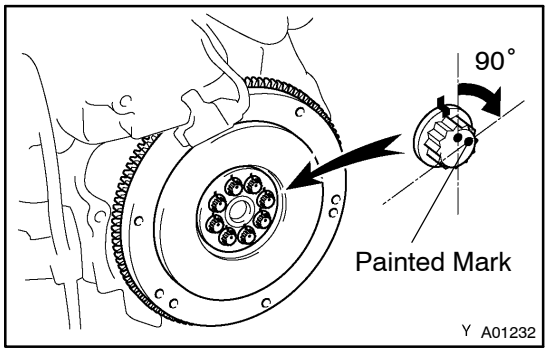


HINT:

The flywheel bolts are tightened in 2 progressive steps, (1) and (3).

(1) Install and uniformly tighten the 8 mounting bolts, in several passes, in the sequence shown.

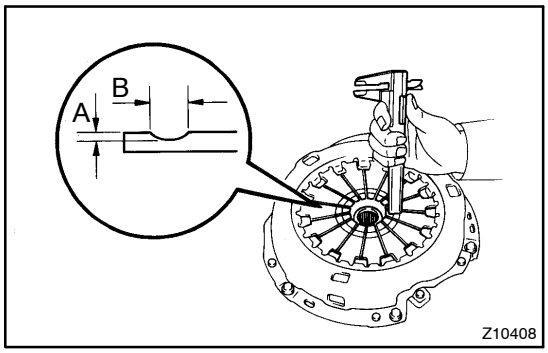
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



(2) Mark the flywheel bolt with paint.

(3) Retighten the flywheel bolts by an additional 90°.

(4) Check that the painted mark in now at a 90° angle to (2).



4. INSPECT DIAPHRAGM SPRING FOR WEAR

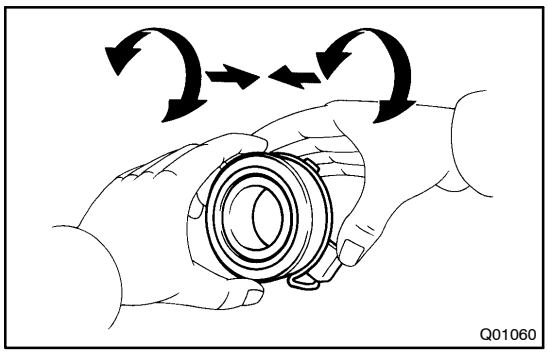
Using vernier calipers, measure the diaphragm spring for depth and width of wear.

Maximum:

A (Depth): 0.5 mm (0.020 in.)

B (Width): 6.0 mm (0.236 in.)

If necessary, replace the clutch cover.



5. INSPECT RELEASE BEARING

Turn the bearing by hand while applying force in the axial direction.

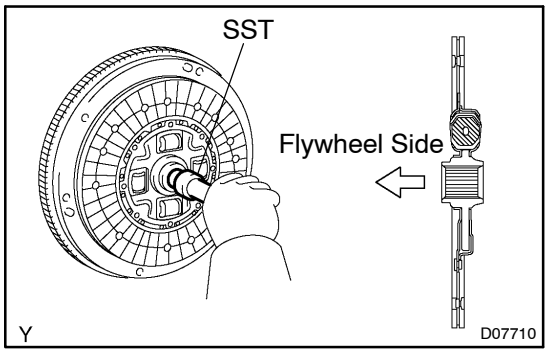
HINT:

The bearing is permanently lubricated and requires no cleaning or lubrication.

If necessary, replace the release bearing.

CL032–14

INSTALLATION



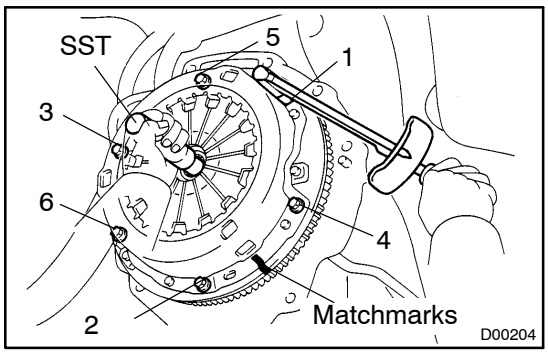
1. INSTALL CLUTCH DISC AND CLUTCH COVER ON FLYWHEEL

(a) Insert SST in the clutch disc, then insert them in the flywheel.

SST 09301–00210

HINT:

Take care not to insert clutch disc in the wrong direction.



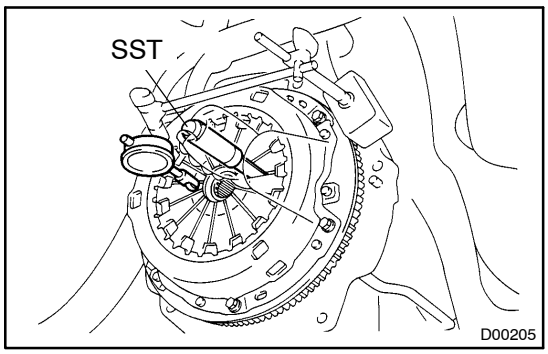
(b) Align the matchmarks on the clutch cover and flywheel.

(c) Following the procedures shown in the illustration, tighten the 6 bolts in the order starting the bolt locating near the knock pin on the top.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

HINT:

- Following the order in the illustration, tighten the bolts at a time evenly.
- Move SST up and down, right and left lightly, after checking that the disc is in the center, tighten the bolts.



2. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

Using a dial indicator with roller instrument, check the diaphragm spring tip alignment.

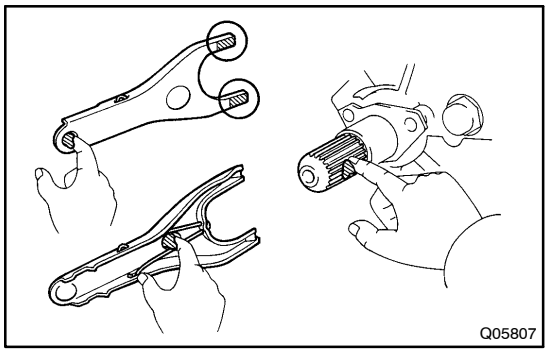
Maximum non–alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, using SST, adjust the diaphragm spring tip alignment.

SST 09333–00013

3. INSTALL BOOT AND RELEASE FORK SUPPORT TO TRANSAXLE

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)



4. APPLY RELEASE HUB GREASE

Apply release hub grease to the release fork and hub contact, release fork and push rod contact and release fork pivot points.

Sealant:

Part No. 08887–01806, RELEASE HUB GREASE or equivalent

5. APPLY CLUTCH SPRING GREASE

Apply clutch spline grease to the input shaft spline.

Sealant:

Part No. 08887–01706, CLUTCH SPLINE GREASE or equivalent

6. INSTALL RELEASE BEARING AND FORK TO TRANSAXLE

Install the bearing to the release fork, and then install them to the transaxle.

7. INSTALL TRANSAXLE TO ENGINE

(C56: See page MX–9)

(C60: See page MX–9)

TROUBLESHOOTING

MX002–15

PROBLEM SYMPTOMS TABLE

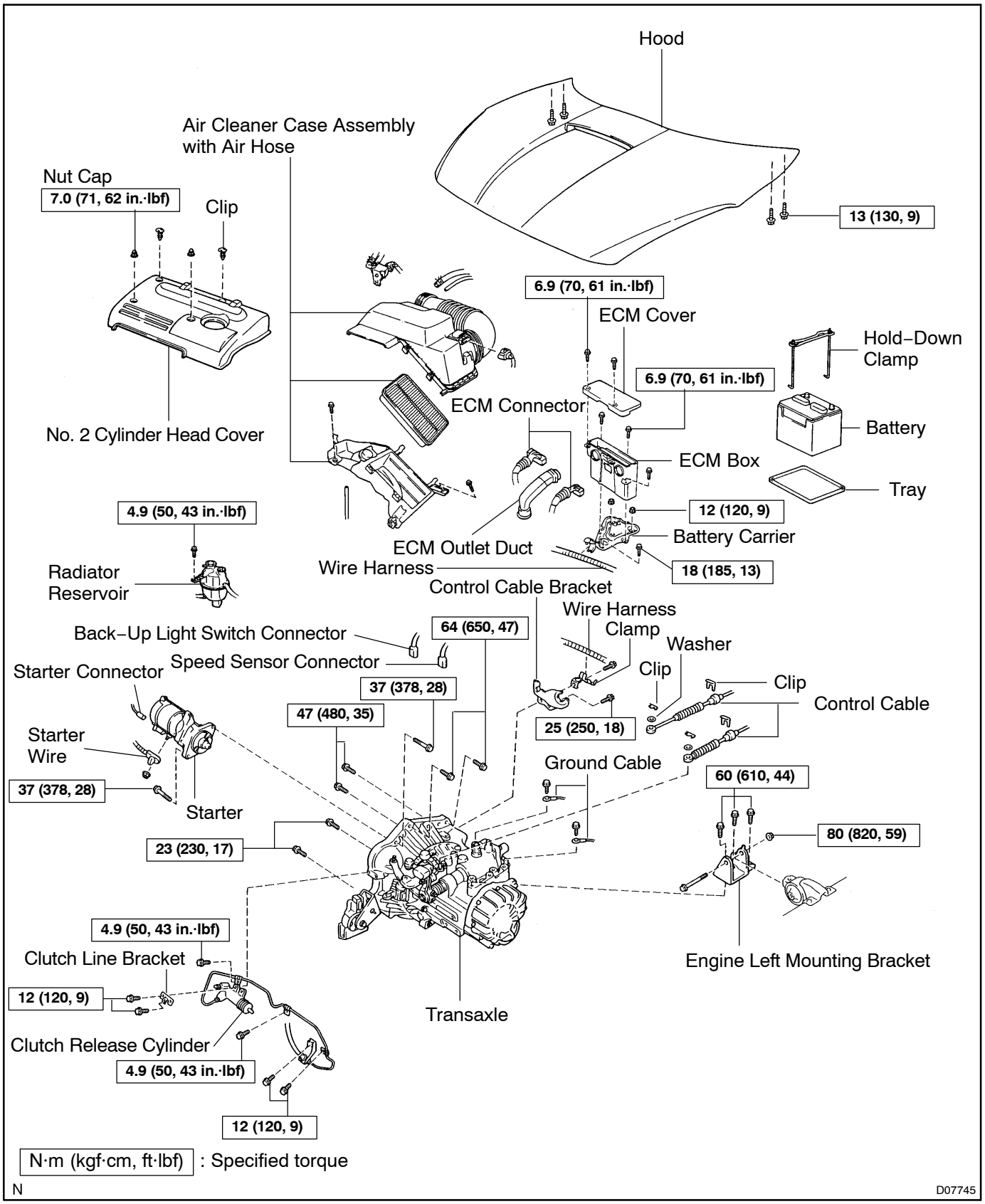
Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace parts.

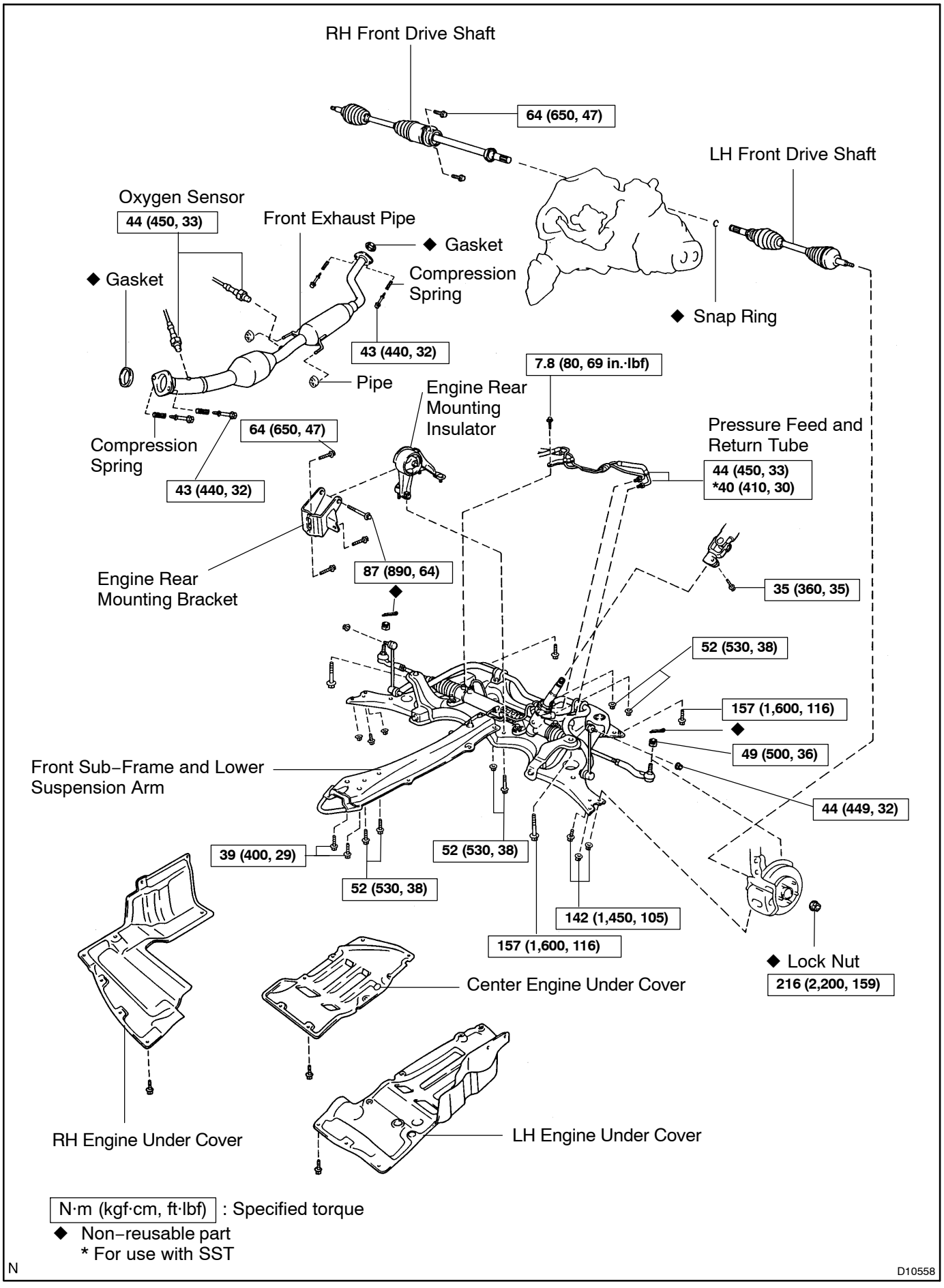
Symptom	Suspect Area	See page
Noise	1. Oil (Level low)	MX–4
	2. Oil (Wrong)	MX–4
	3. Gear (Worn or damaged)	MX–10
	4. Bearing (Worn or damaged)	MX–10
Oil leakage	1. Oil (Level too high)	MX–4
	2. Gasket (Damaged)	MX–4
	3. Oil seal (Worn or damaged)	MX–4
	4. O–Ring (Worn or damaged)	MX–4
Hard to shift or will not shift	1. Control cable (Faulty)	MX–53
	2. Synchronizer ring (Worn or damaged)	MX–4 MX–30 MX–39
	3. Shifting key spring (Damaged)	MX–4 MX–30 MX–39
Jumps out of gear	1. Locking ball spring (Damaged)	MX–4
	2. Gear shift fork (Worn)	MX–4
	3. Gear (Worn or damaged)	MX–4
	4. Bearing (Worn or damaged)	MX–4

MANUAL TRANSAXLE UNIT

COMPONENTS

MX09F–08





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
* For use with SST

N

D10558

MX0ER–04

REMOVAL

1. REMOVE HOOD

HINT:

At the time of installation, please refer to the following item.

Adjust the hood (See page BO–9).

2. REMOVE NO. 2 CYLINDER HEAD COVER

Remove the 2 nut caps, clips and No. 2 cylinder head cover.

Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

3. DISCONNECT RADIATOR RESERVOIR

Remove the bolt and disconnect the radiator reservoir.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

4. REMOVE BATTERY

5. REMOVE AIR CLEANER CASE ASSEMBLY WITH AIR HOSE AND ECM BOX

(a) Remove the 2 bolts and ECM cover.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

(b) Disconnect the ECM connectors from the ECM.

(c) Remove the ECM outlet duct.

(d) Remove the air cleaner case assembly with the air hose.

(e) Remove the 3 bolts and ECM box.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

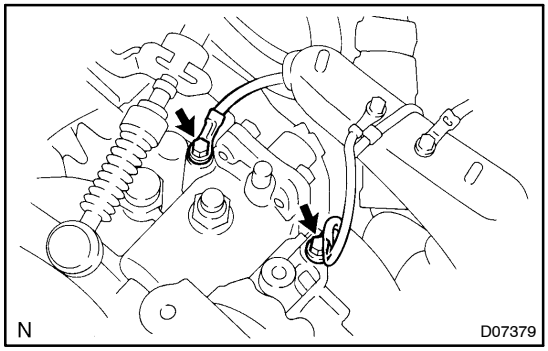
(f) Disconnect the wire harness, and remove the 2 nuts, bolt and battery carrier.

Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)

6. DISCONNECT CONTROL CABLE

(a) Remove the 2 clips and washers.

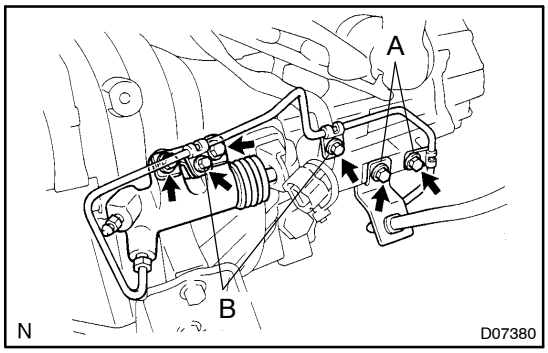
(b) Remove the 2 clips and disconnect the control cables from the transaxle.



7. DISCONNECT GROUND CABLE

Remove the 2 set bolts of the 2 ground cables from the transaxle.

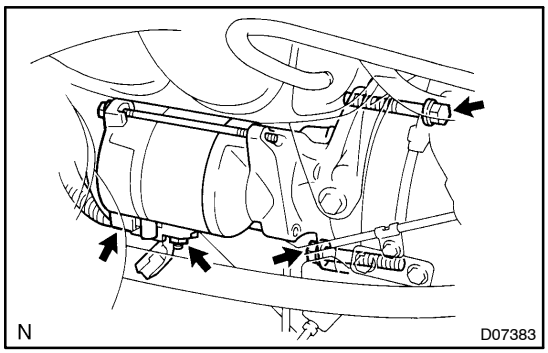
8. DISCONNECT SPEED SENSOR AND BACK–UP LIGHT SWITCH CONNECTORS



9. DISCONNECT CLUTCH RELEASE CYLINDER

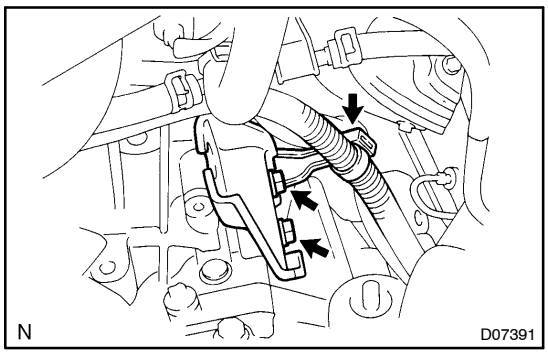
(a) Remove the 4 set bolts of the clutch line.
Torque:
Bolt A: 12 N·m (120 kgf·cm, 9 ft·lbf)
Bolt B: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

(b) Remove the 2 set bolts of the clutch release cylinder and clutch line bracket.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



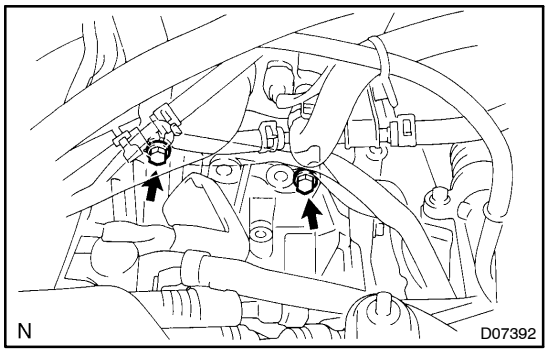
10. REMOVE STARTER

(a) Disconnect the starter connector.
(b) Remove the nut and disconnect the starter wire.
(c) Remove the 2 bolts and starter.
Torque: 37 N·m (378 kgf·cm, 28 ft·lbf)



11. REMOVE CONTROL CABLE BRACKET

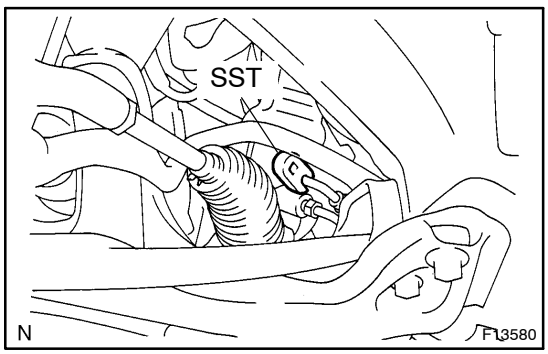
(a) Disconnect the wire harness from the clamp.
(b) Remove the 2 bolts, clamp and control cable bracket from the transaxle.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



12. REMOVE 2 TRANSAXLE UPPER SIDE MOUNTING BOLTS
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

13. DISCONNECT RH AND LH TIE ROD ENDS
(See page SA–13)

14. DISCONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY (See page SR–13)

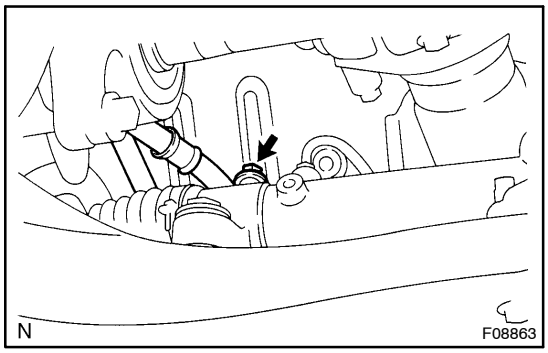


15. DISCONNECT PRESSURE FEED AND RETURN TUBES

Using SST, disconnect the pressure feed and return tubes.
SST 09023–38401
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

HINT:

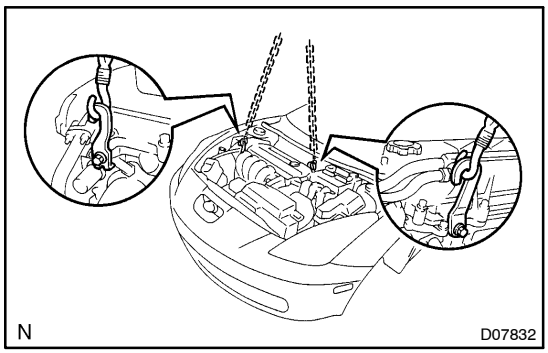
- Use torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.



16. DISCONNECT TUBE CLAMP

Remove the bolt and disconnect the tube clamp.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)



17. ATTACH ENGINE SLING DEVICE TO ENGINE HANGER

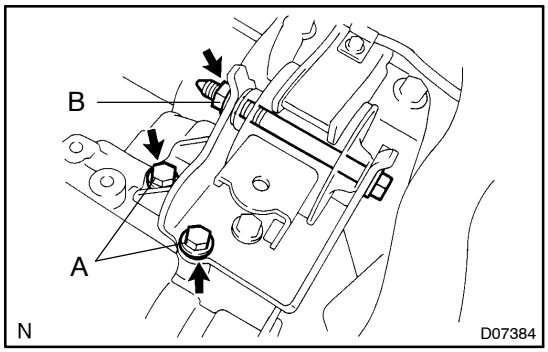
(a) Disconnect the 2 PCV hoses.

(b) Install the No. 1 and No. 2 engine hangers in the correct direction.

Parts No.:
No. 1 engine hanger: 12281–22021
No. 2 engine hanger: 12281–15040 or 12281–15050
Bolt: 91512–B1016
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

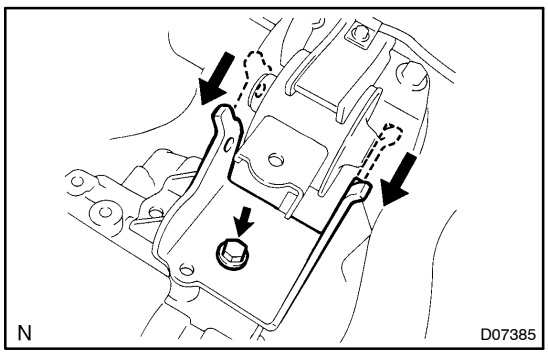
(c) Attach the engine chain hoist to the engine hangers.

CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.



18. REMOVE ENGINE LEFT MOUNTING BRACKET 3 SET BOLTS AND NUT

Torque:
Bolt A: 60 N·m (610 kgf·cm, 44 ft·lbf)
Nut B: 80 N·m (820 kgf·cm, 59 ft·lbf)



19. REMOVE ENGINE LEFT MOUNTING BRACKET

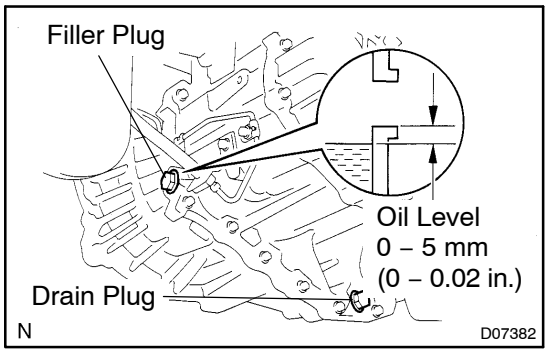
Lower the transaxle side, and remove the bolt and engine left mounting bracket.

Torque: 60 N·m (610 kgf·cm, 44 ft·lbf)

20. RAISE VEHICLE

CAUTION:
Make sure that the vehicle is securely supported.

21. REMOVE CENTER, LH AND RH ENGINE UNDER COVERS



22. DRAIN TRANSAXLE OIL
Oil grade: API GL–4 or GL–5
Viscosity: SAE 75W–90
Capacity: 1.9 liters (2.0 US qts, 1.7 Imp. qts)
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

23. REMOVE LH AND RH FRONT DRIVE SHAFTS
(See page SA–19)

24. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the 2 heated oxygen sensors.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

HINT:
At the time of installation, please refer to the following items.

- Before installing the heated oxygen sensor, twist the sensor wire counterclockwise 3 and 1/2 turns.
- After installing the heated oxygen sensor, check that the sensor wire is not twisted. If it is twisted, remove the heated oxygen sensor and reinstall it.

(b) Remove the 4 bolts, compression springs and 2 gaskets.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

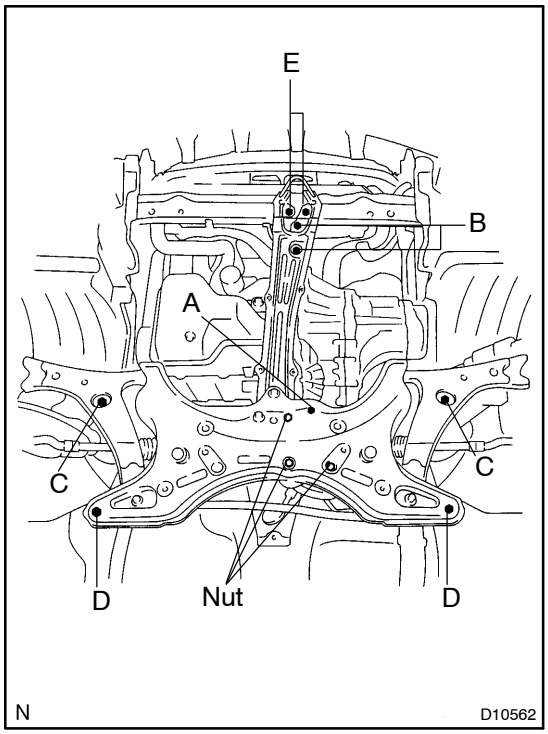
(c) Disconnect the front exhaust pipe from the pipe supports and remove it.

25. DISCONNECT LOWER BALL JOINT FROM LOWER SUSPENSION ARM (See page SA–43)

26. DISCONNECT STABILIZER BAR LINK

(a) Remove the nut and disconnect the stabilizer bar link.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Employ the same manner described above to the other side.



27. DISCONNECT ENGINE REAR MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Remove the bolt (bolt A) and 3 nuts, and disconnect the engine rear mount insulator and front suspension member.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

28. DISCONNECT ENGINE FRONT MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Remove the 2 bolts (bolt B) and disconnect the engine front mount insulator and front suspension member.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

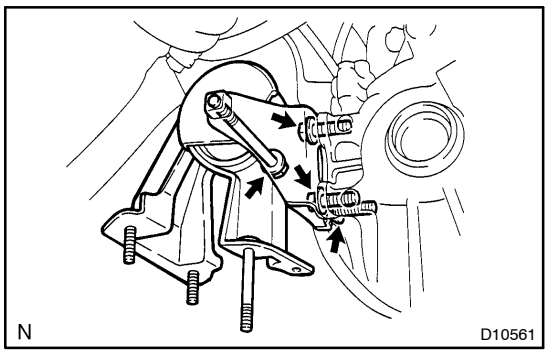
29. SUPPORT FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM

Using a transmission jack, support the front suspension member with lower suspension arm.

30. REMOVE FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM AND PS GEAR ASSEMBLY

Remove the 6 bolts (bolt C, D and E) and front suspension member with lower suspension arm and PS gear assembly.

Torque:
Bolt C: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt D: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt E: 39 N·m (400 kgf·cm, 29 ft·lbf)



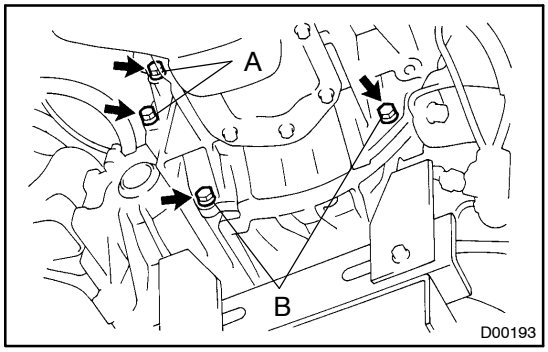
31. REMOVE ENGINE REAR MOUNTING INSULATOR AND BRACKET

(a) Remove the bolt and engine rear mounting insulator.
Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

(b) Remove the 3 bolts and engine rear mounting bracket.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

32. JACK UP TRANSAXLE SLIGHTLY

Using a transmission jack, support the transaxle.



33. REMOVE 4 TRANSAXLE LOWER SIDE MOUNTING BOLTS
Torque:
Bolt A: 47 N·m (480 kgf·cm, 35 ft·lbf)
Bolt B: 23 N·m (230 kgf·cm, 17 ft·lbf)

34. REMOVE TRANSAXLE

Lower the engine left side and remove the transaxle from the engine.

HINT:

At the time of installation, please refer to the following items.

- Align the input shaft with the clutch disc and install the transaxle to the engine.
- Temporarily tighten the transaxle mounting bolts.

MX09H–11

INSTALLATION

Installation is in the reverse order of removal. (See page MX–4)

HINT:

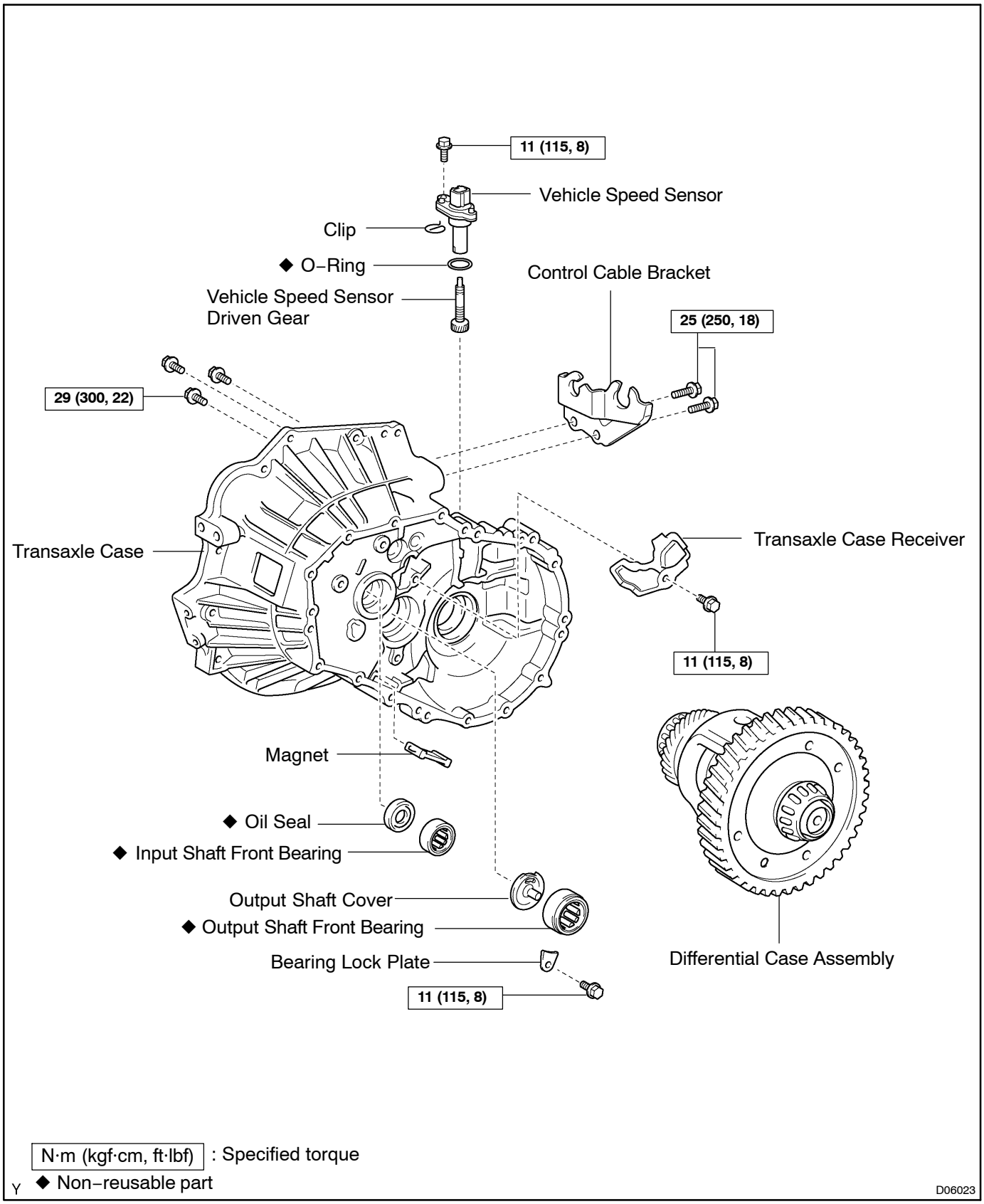
After installation, check and inspect items as follows.

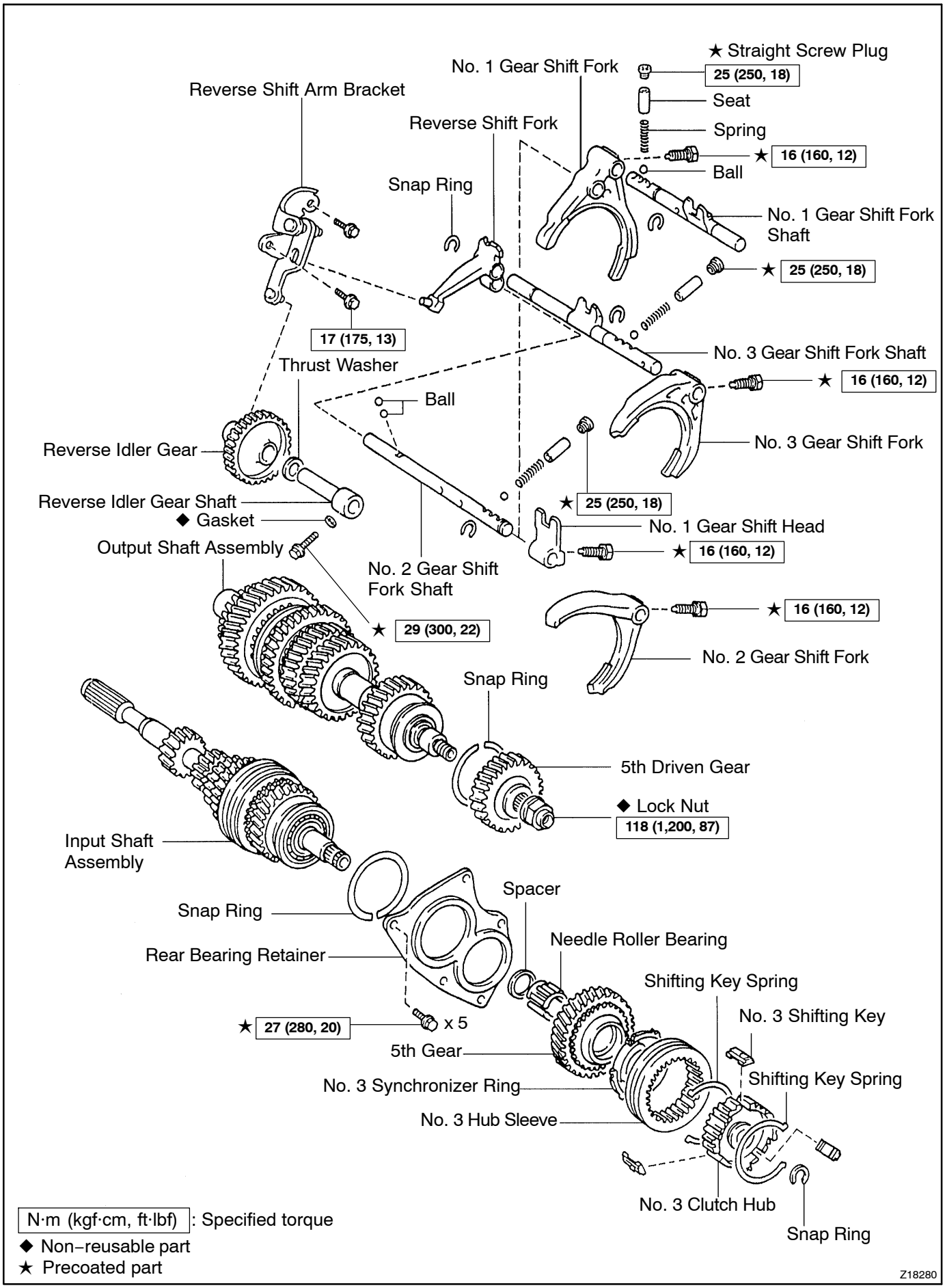
- Bleed power steering system (See page SR–4).
- Front wheel alignment (See page SA–5).
- Do the road test.

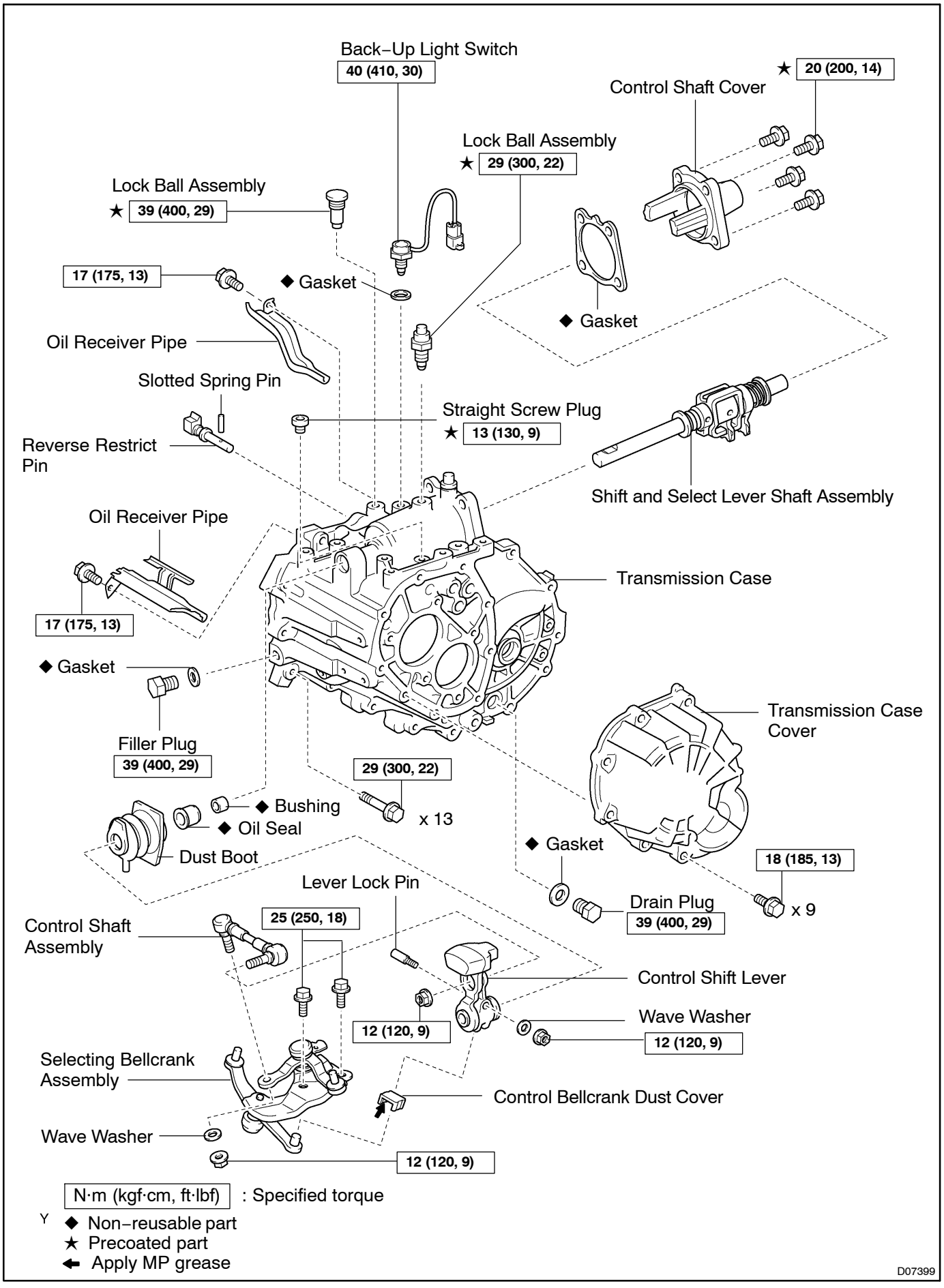
MANUAL TRANSAXLE ASSEMBLY

COMPONENTS

MX006–17




★ Straight Screw Plug
25 (250, 18)
No. 1 Gear Shift Fork
Reverse Shift Arm Bracket
Seat
Reverse Shift Fork
Spring
★ 16 (160, 12)
Ball
Snap Ring
No. 1 Gear Shift Fork Shaft
★ 25 (250, 18)
17 (175, 13)
No. 3 Gear Shift Fork Shaft
Thrust Washer
★ 16 (160, 12)
Ball
Reverse Idler Gear
No. 3 Gear Shift Fork
Reverse Idler Gear Shaft
★ 25 (250, 18)
◆ Gasket
No. 1 Gear Shift Head
Output Shaft Assembly
★ 16 (160, 12)
No. 2 Gear Shift Fork Shaft
★ 16 (160, 12)
★ 29 (300, 22)
No. 2 Gear Shift Fork
Snap Ring
5th Driven Gear
◆ Lock Nut
118 (1,200, 87)
Input Shaft Assembly
Spacer
Snap Ring
Needle Roller Bearing
Rear Bearing Retainer
Shifting Key Spring
No. 3 Shifting Key
★ 27 (280, 20)
x 5
5th Gear
Shifting Key Spring
No. 3 Synchronizer Ring
No. 3 Hub Sleeve
No. 3 Clutch Hub
Snap Ring
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
★ Precoated part
Z18280


Back–Up Light Switch
40 (410, 30)
★ 20 (200, 14)
Control Shaft Cover
Lock Ball Assembly
★ 29 (300, 22)
Lock Ball Assembly
★ 39 (400, 29)
17 (175, 13)
◆ Gasket
◆ Gasket
Oil Receiver Pipe
Slotted Spring Pin
Straight Screw Plug
★ 13 (130, 9)
Reverse Restrict Pin
Shift and Select Lever Shaft Assembly
Oil Receiver Pipe
Transmission Case
17 (175, 13)
◆ Gasket
Transmission Case Cover
Filler Plug
39 (400, 29)
29 (300, 22)
x 13
◆ Bushing
◆ Oil Seal
Dust Boot
◆ Gasket
18 (185, 13)
x 9
Lever Lock Pin
Drain Plug
39 (400, 29)
Control Shaft Assembly
25 (250, 18)
Control Shift Lever
Wave Washer
12 (120, 9)
12 (120, 9)
Selecting Bellcrank Assembly
Control Bellcrank Dust Cover
Wave Washer
12 (120, 9)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
★ Precoated part
Apply MP grease
D07399

MX09I–03

DISASSEMBLY

1. REMOVE FILLER PLUG AND DRAIN PLUG WITH 2 GASKETS

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

2. REMOVE VEHICLE SPEED SENSOR

(a) Remove the bolt and vehicle speed sensor.

Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

(b) Using a small screwdriver, remove the clip from the vehicle speed sensor.

(c) Remove the vehicle speed sensor driven gear from the speed sensor.

(d) Using a small screwdriver, remove the O–ring from the vehicle speed sensor.

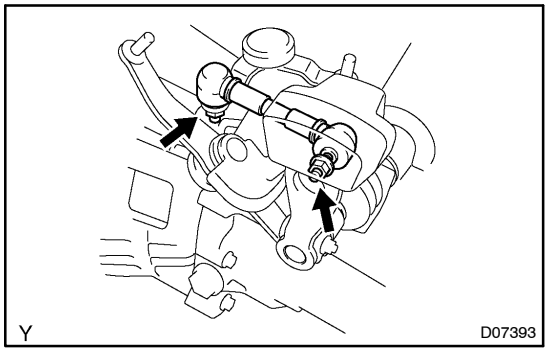
3. REMOVE BACK–UP LIGHT SWITCH WITH GASKET

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

4. REMOVE CONTROL CABLE BRACKET

Remove the 2 bolts and control cable bracket.

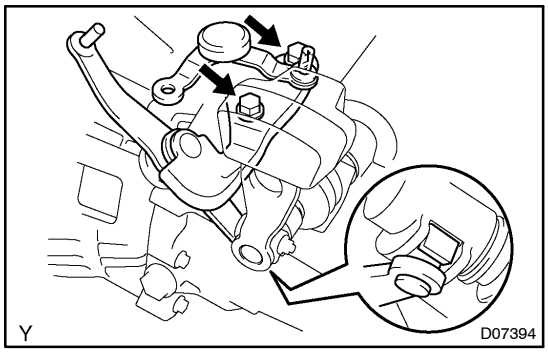
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



5. REMOVE CONTROL SHAFT ASSEMBLY

Remove the 2 nuts, wave washer and control shaft assembly.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



6. REMOVE SELECTING BELLCRANK ASSEMBLY

(a) Remove the 2 bolts and selecting bellcrank assembly.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

NOTICE:

At the time of reassembly, please refer to the following item.

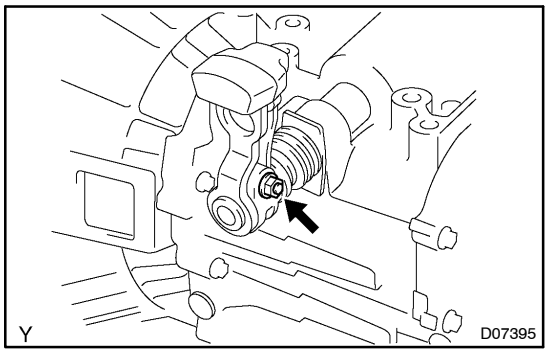
Fit the selecting bellcrank assembly pin part with the dust cover into a groove in the control shift lever.

(b) Remove the control bellcrank dust cover from the selecting bellcrank assembly.

NOTICE:

At the time of reassembly, please refer to the following item.

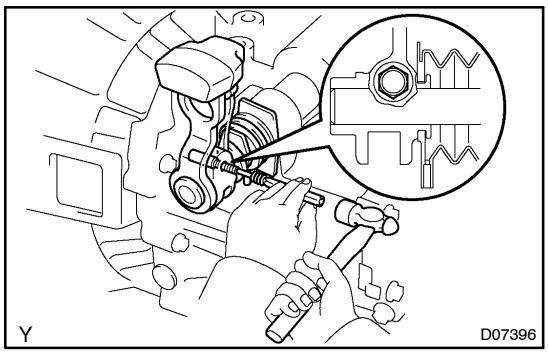
Apply MP grease to the inside circumferential surface of the control bellcrank dust cover.



7. REMOVE CONTROL SHIFT LEVER AND DUST BOOT

(a) Remove the nut and wave washer.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



(b) Using a pin punch and hammer, drive out the lever lock pin.

NOTICE:

At the time of reassembly, please refer to the following item.

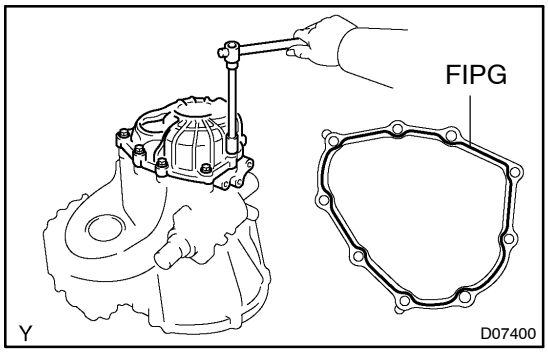
When fixing the lever lock pin, properly position the shaft groove.

(c) Remove the control shift lever and dust boot.

NOTICE:

At the time of reassembly, please refer to the following items.

- **Install the dust boot into a groove in the control shift lever.**
- **Be sure to install the dust boot in the correct direction, as shown in the illustration.**



8. REMOVE TRANSMISSION CASE COVER

(a) Remove the 9 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) Using a brass bar and hammer, carefully tap the projection of the transmission case cover to remove the transmission case cover from the transmission case.

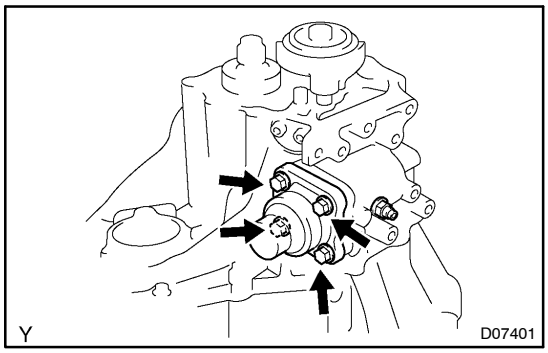
HINT:

At the time of reassembly, please refer to the following item.

Apply FIPG to the transmission case cover, as shown in the illustration.

FIPG:

Part No. 08826–00090, THREE BOND 1281 or equivalent



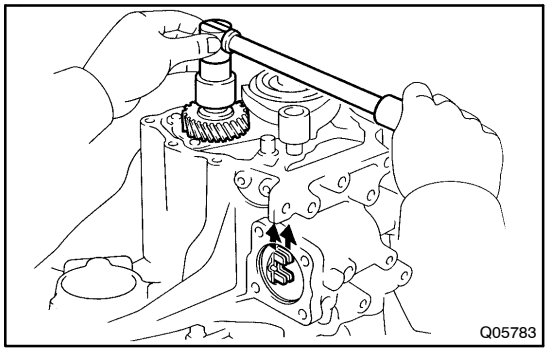
9. REMOVE LOCK BALL ASSEMBLY AND CONTROL SHAFT COVER

(a) Remove the lock ball assembly.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(b) Remove the 4 bolts and control shaft cover with the gasket.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

10. REMOVE SHIFT AND SELECT LEVER SHAFT ASSEMBLY

NOTICE:
At the time of reassembly, please refer to the following item.
Set the claws of the shift interlock plate into the shift head part of the gear shift fork shaft securely.



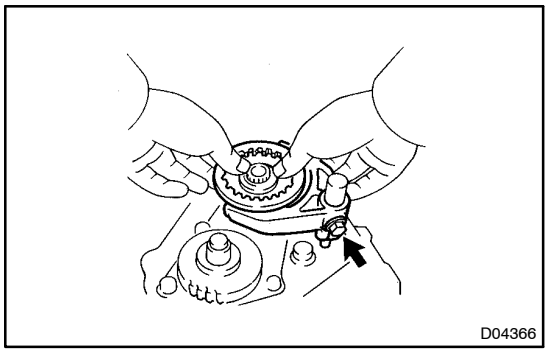
11. REMOVE LOCK NUT

(a) Engage the gear double meshing.

(b) Using a chisel and hammer, loosen the staked part of the nut.

(c) Remove the lock nut.
Torque: 118 N·m (1,200 kgf·cm, 87 ft·lbf)

(d) Disengage the gear double meshing.

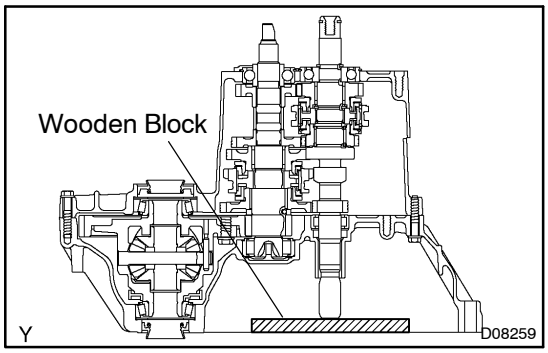


12. REMOVE NO. 3 HUB SLEEVE AND NO. 3 GEAR SHIFT FORK

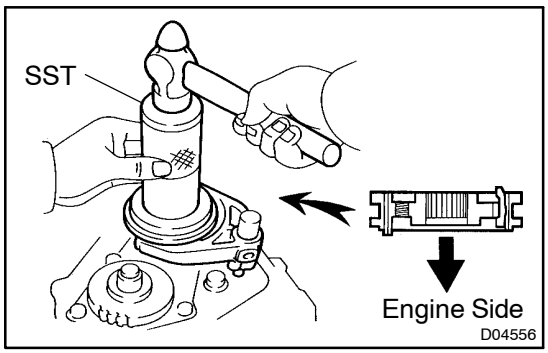
(a) Remove the bolt from the No. 3 gear shift fork.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Remove the No. 3 hub sleeve with the No. 3 gear shift fork.

HINT:
At the time of reassembly, please refer to the following items.
- Install the No. 3 clutch hub assembly to the No. 3 hub sleeve.



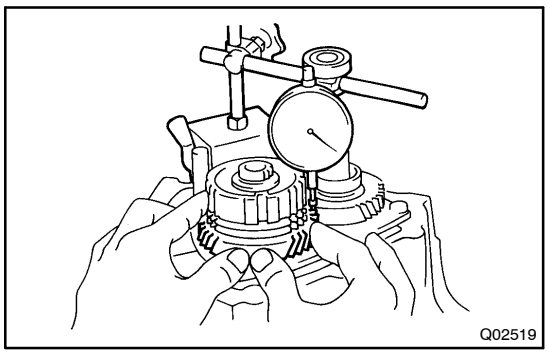
- Before driving in the No. 3 clutch hub assembly, place the suitable sized wooden block on the rear side of the input shaft, as shown in the illustration. When driving it in, fix the input shaft firmly so that it is not pushed downward. Otherwise the input shaft rear radial ball bearing is overloaded, it might be damaged.



- Using SST and a hammer, drive in the No. 3 hub sleeve assembly with the No. 3 gear shift fork.
  SST 09636–20010

NOTICE:

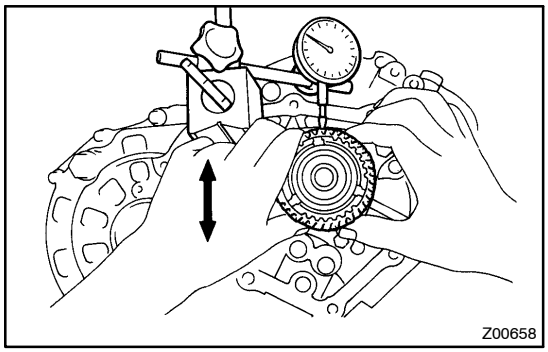
- **Be sure to install the No. 3 hub sleeve assembly in the correct direction, as shown in the illustration.**
- **Align the No. 3 synchronizer ring slots with the No. 3 shifting keys.**



13. INSPECT 5TH GEAR THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance.

Standard clearance:
0.10 – 0.57 mm (0.0039 – 0.0224 in.)
Maximum clearance:
0.57 mm (0.0224 in.)

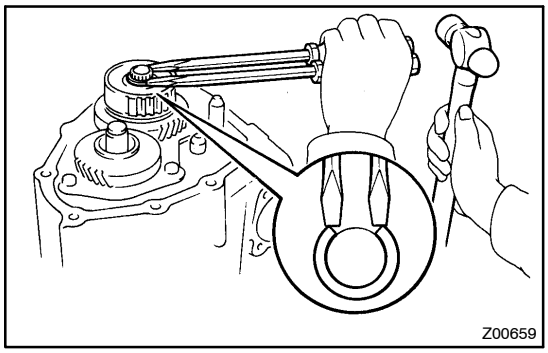


14. INSPECT 5TH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance.

Standard clearance:
KOYO made:
0.015 – 0.058 mm (0.0006 – 0.0023 in.)
NSK made:
0.015 – 0.056 mm (0.0006 – 0.0022 in.)
Maximum clearance:
KOYO made: 0.058 mm (0.0023 in.)
NSK made: 0.056mm (0.0022 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.



15. REMOVE NO. 3 CLUTCH HUB AND 5TH GEAR

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

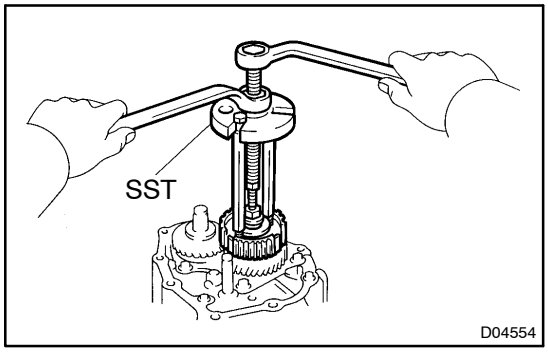
HINT:

At the time of reassembly, please refer to the following item.

Select a snap ring from the table below that will make the thrust clearance of the No. 3 clutch hub less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.25 (0.0886)	E	2.49 (0.0980)
B	2.31 (0.0909)	F	2.55 (0.1004)
C	2.37 (0.0933)	G	2.61 (0.1028)
D	2.43 (0.0957)	–	–

(b) Using a screwdriver, remove the shifting key spring from the No. 3 clutch hub.



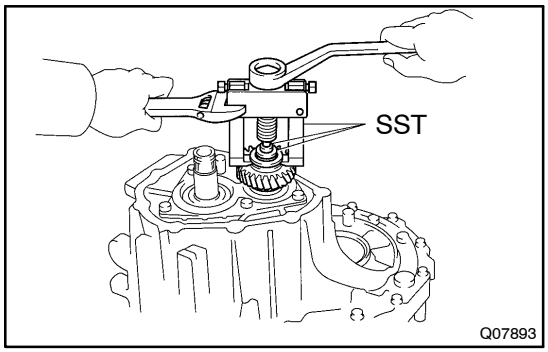
(c) Install a bolt and washer to the tip of the input shaft and using SST, remove the No. 3 clutch hub.

SST 09950–30012

HINT:

Select a bolt whose outer diameter is smaller than the screw hole of the input shaft so that it can be turned easily.

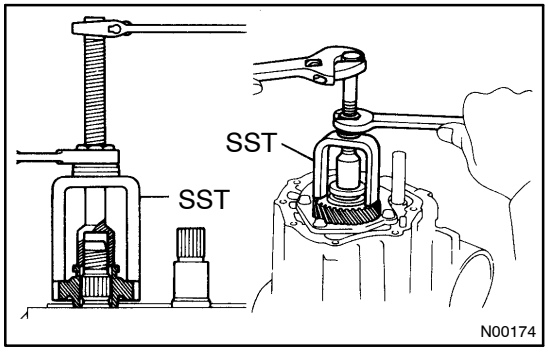
(d) Remove the No. 3 synchronizer ring, 5th gear, needle roller bearing and spacer.



16. REMOVE 5TH DRIVEN GEAR

Using SST, remove the 5th driven gear.

SST 09628–62011, 09950–40011 (09957–04010), 09950–60010 (09951–00230)

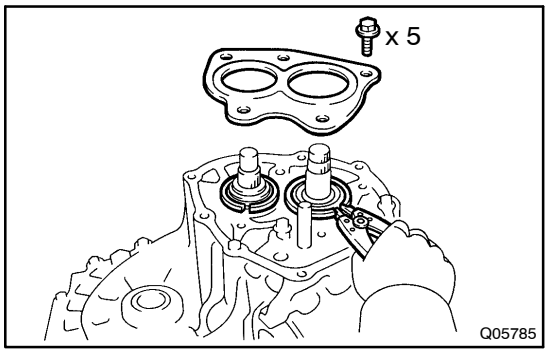


HINT:

At the time of reassembly, please refer to the following item.

Using SST, install the 5th driven gear.

SST 09309–12020



17. REMOVE REAR BEARING RETAINER

Remove the 5 bolts and rear bearing retainer.

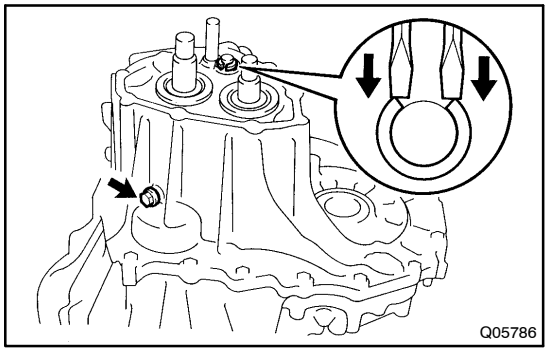
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

18. REMOVE BEARING SNAP RING

Using a snap ring expander, remove the 2 snap rings.

HINT:

If it is difficult to remove and install the snap rings, pull up the shafts.

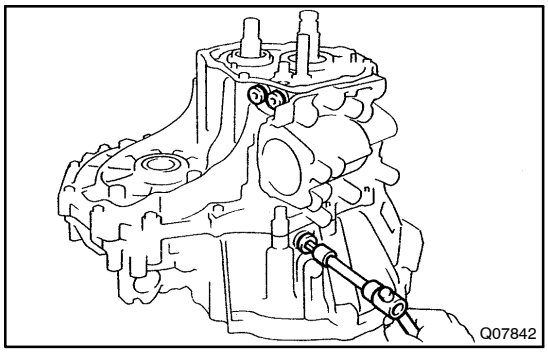


19. REMOVE REVERSE IDLER GEAR SHAFT LOCK BOLT AND GASKET

Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

20. REMOVE SNAP RING FROM NO. 2 SHIFT FORK SHAFT

Using 2 screwdrivers and a hammer, tap out the snap ring.

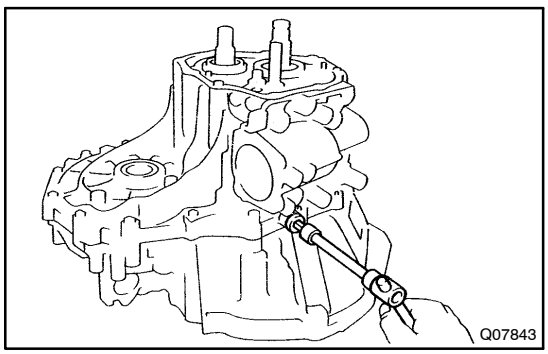


21. REMOVE STRAIGHT SCREW PLUG, SEAT, SPRING AND BALL

(a) Using a hexagon wrench, remove the 3 straight screw plugs.

Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

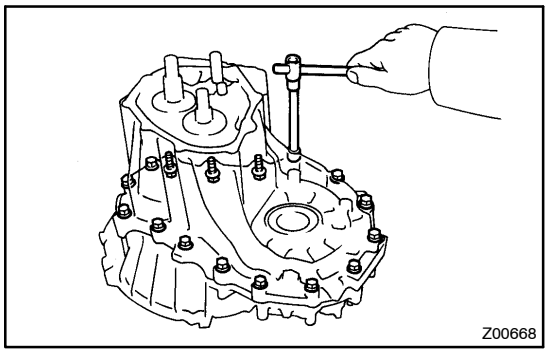
(b) Using a magnetic finger, remove the 3 seats, springs and balls.



22. REMOVE LOCK BALL ASSEMBLY

Using a hexagon wrench, remove the lock ball assembly.

Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

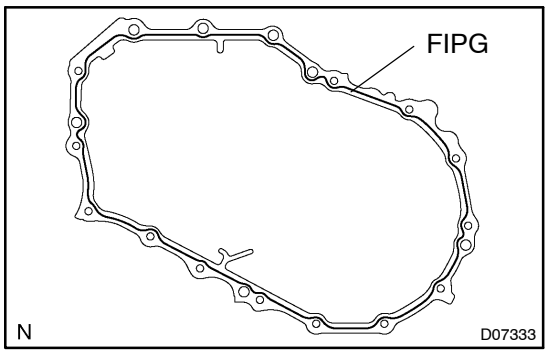


23. REMOVE TRANSMISSION CASE

(a) Remove the 16 bolts.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(b) Using a plastic hammer, carefully tap the projection of the transmission case to remove the transmission case from the transaxle case.



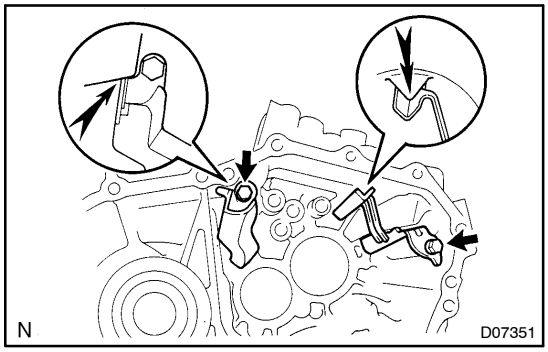
HINT:

At the time of reassembly, please refer to the following item.

Apply FIPG to the transaxle case, as shown in the illustration.

FIPG:

Part No. 08826–00090, THREE BOND 1281 or equivalent



24. REMOVE OIL RECEIVER PIPE

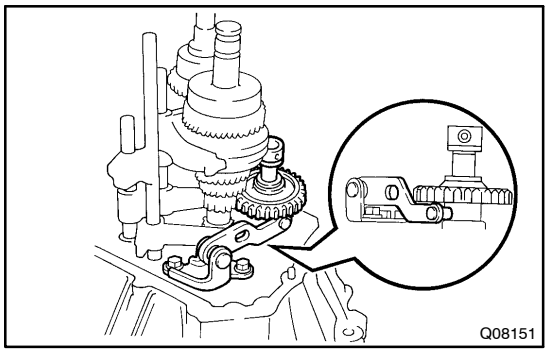
Remove the 2 bolts and oil receiver pipes from the transmission case.

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)

NOTICE:

At the time of reassembly, please refer to the following items.

- **Prevent the oil receiver pipes from being deformed.**
- **Install the oil receiver pipes while placing it against the transmission case, as shown in the illustration.**



25. REMOVE REVERSE IDLER GEAR, THRUST WASHER AND SHAFT

26. REMOVE REVERSE SHIFT ARM BRACKET

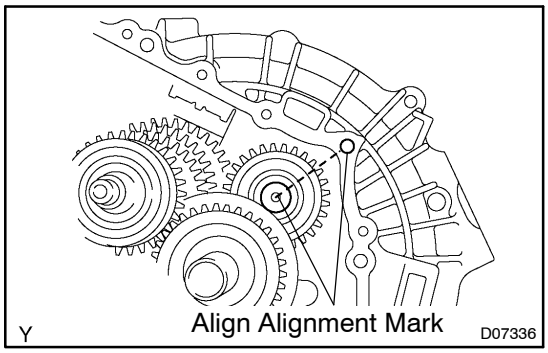
Remove the 2 bolts and reverse shift arm bracket.

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)

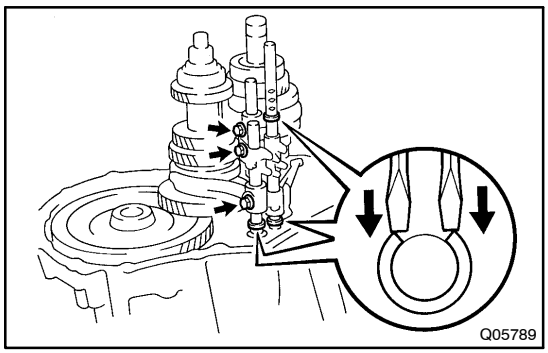
NOTICE:

At the time of reassembly, please refer to the following items.

- **Set the pin on the top of the reverse shift arm into a groove on the reverse idler gear.**
- **Fit the claw of the reverse shift arm bracket with the notch of the input shaft front bearing.**



- **Install the reverse idler gear, thrust washer and shaft, as shown in the illustration.**



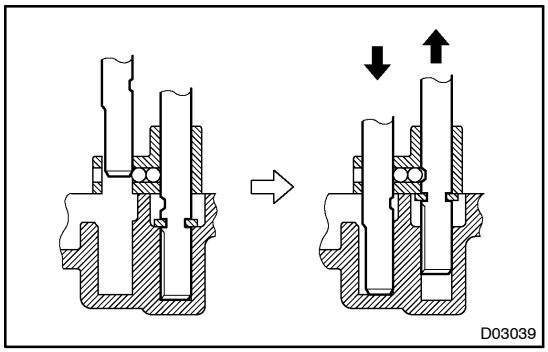
27. REMOVE GEAR SHIFT FORK AND GEAR SHIFT FORK SHAFT

(a) Using 2 screwdrivers and a hammer, tap out the 3 snap rings from each gear shift fork shaft.

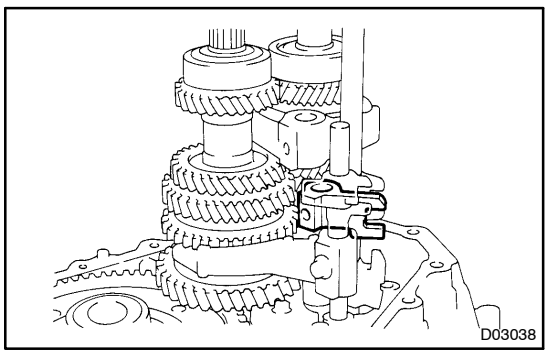
(b) Remove the 3 bolts from the No. 1 gear shift head, No. 1 and No. 2 gear shift forks.

Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

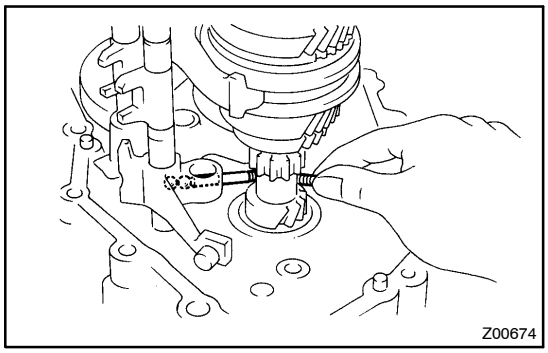
(c) Pull up the No. 3 gear shift fork shaft, remove the No. 2 gear shift fork shaft.



NOTICE:
At the time of reassembly, please refer to the following item.
To avoid the interference of the 2 balls, lift up the No. 3 gear shift fork shaft at the position shown in the illustration.



(d) Remove the No. 1 gear shift head.



(e) Using a magnetic finger, remove the 2 balls from the reverse shift fork.
(f) Remove the No. 3 gear shift fork shaft and reverse shift fork.
(g) Pull out the No. 1 gear shift fork shaft.
(h) Remove the No. 1 and No. 2 gear shift forks.

28. REMOVE INPUT AND OUTPUT SHAFTS TOGETHER FROM TRANSAXLE CASE

29. REMOVE DIFFERENTIAL CASE ASSEMBLY

NOTICE:

At the time of reassembly, please refer to the following item.

Before reassembly, inspect the differential tapered roller bearing preload. (See page MX–50)

30. REMOVE MAGNET FROM TRANSAXLE CASE

31. DISASSEMBLE NO. 3 CLUTCH HUB ASSEMBLY

(a) Using a screwdriver, remove the shifting key spring.

NOTICE:

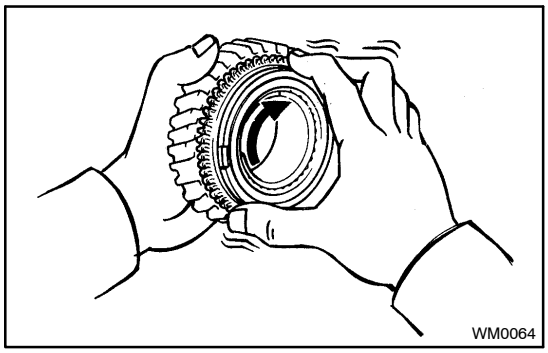
At the time of reassembly, please refer to the following item.

Position the shifting key springs so that their end gaps are not aligned.

(b) Remove the 3 No. 3 shifting keys from the No. 3 clutch hub.

MX09J–02

INSPECTION



1. INSPECT 5TH GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

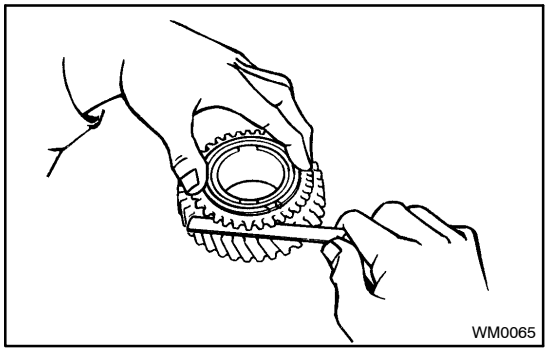
(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



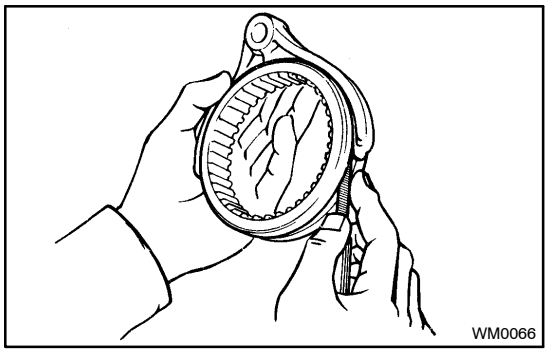
(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.5 mm (0.020 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.



2. INSPECT GEAR SHIFT FORK AND HUB SLEEVE CLEARANCE

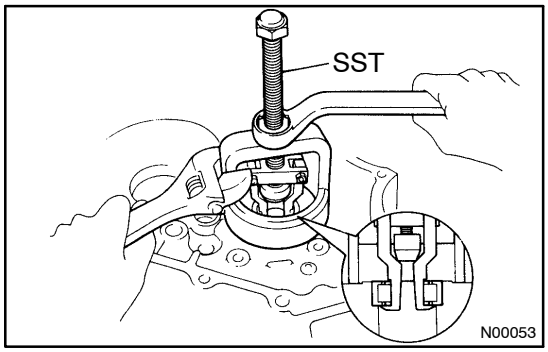
Using a feeler gauge, measure the clearance between the hub sleeve and gear shift fork.

Maximum clearance: 0.5 mm (0.020 in.)

If the clearance exceeds the maximum, replace the gear shift fork or hub sleeve.

3. REMOVE TRANSAXLE CASE RECEIVER

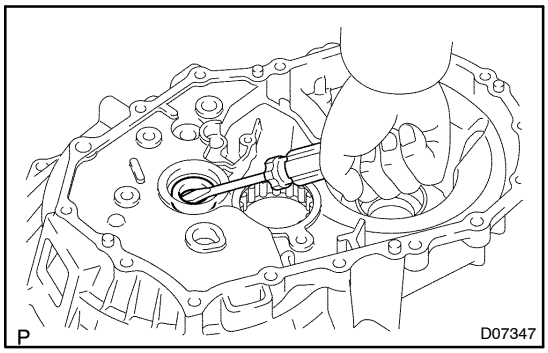
Remove the bolt and transaxle case receiver from the transaxle case.



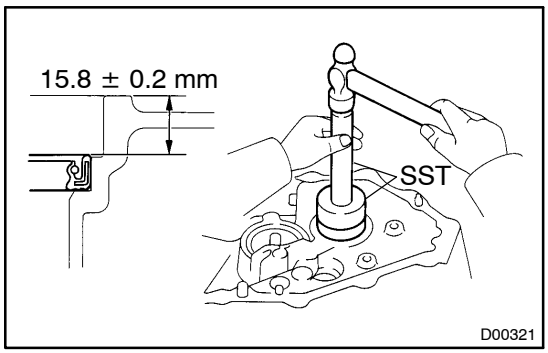
4. IF NECESSARY, REPLACE INPUT SHAFT FRONT BEARING AND OIL SEAL

(a) Using SST, remove the input shaft front bearing.

SST 09612–65014

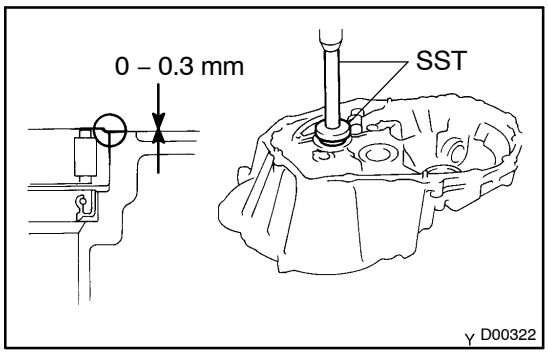


(b) Using a screwdriver, remove the oil seal.



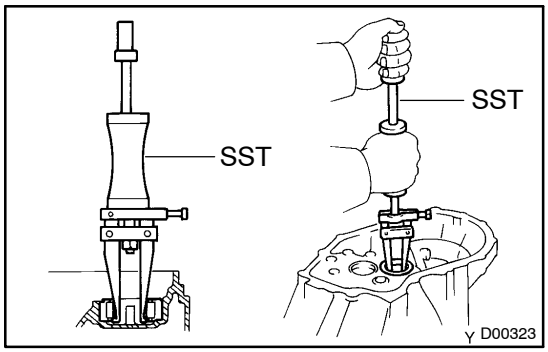
(c) Using SST and a hammer, drive in a new oil seal.
SST 09950–60010 (09951–00360), 09950–70010 (09951–07150)
Drive in depth: 15.8 ± 0.2 mm (0.622 ± 0.008 in.)

(d) Coat the lip of the oil seal with MP grease.



(e) Using SST and a press, install a new input shaft front bearing.
SST 09950–60010 (09951–00400), 09950–70010 (09951–07150)
Drive in depth: 0 – 0.3 mm (0 – 0.012 in.)

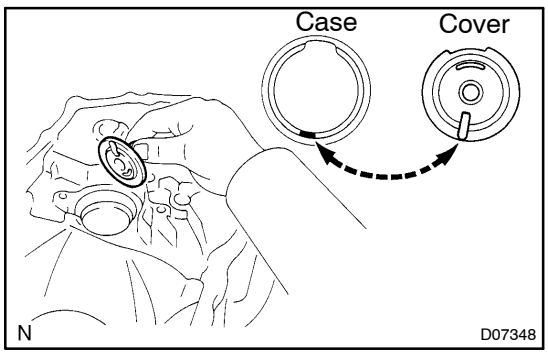
NOTICE:
Be sure to install a new bearing in the correct direction, as shown in the illustration.



5. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING AND OUTPUT SHAFT COVER

(a) Remove the bolt and bearing lock plate.

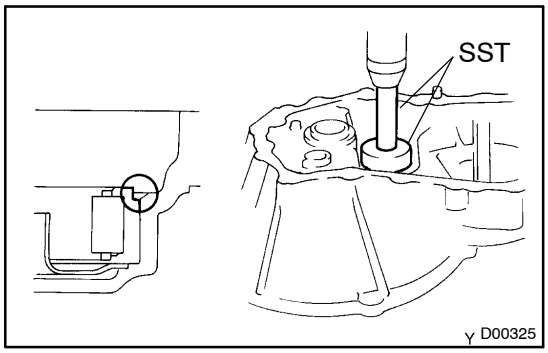
(b) Using SST, pull out the output shaft front bearing.
SST 09308–00010



(c) Remove the output shaft cover.

(d) Install the output shaft cover.

NOTICE:
Install the output shaft cover projection into the case side hollow.



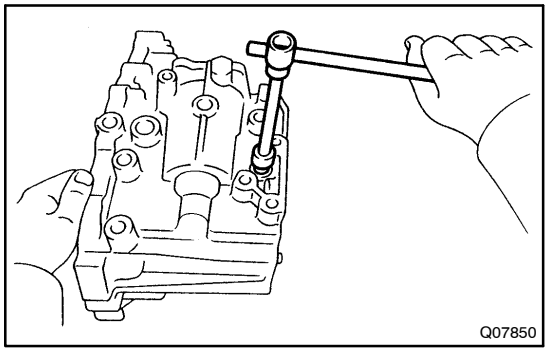
(e) Using SST and a press, install a new output shaft front bearing.
SST 09950–60010 (09951–00560), 09950–70010 (09951–07150)

NOTICE:
- **Be sure to install a new bearing in the correct direction, as shown in the illustration.**
- **When replacing the output shaft front bearing, replace the output shaft front bearing inner race along with it.**

(f) Install the bearing lock plate with the bolt.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

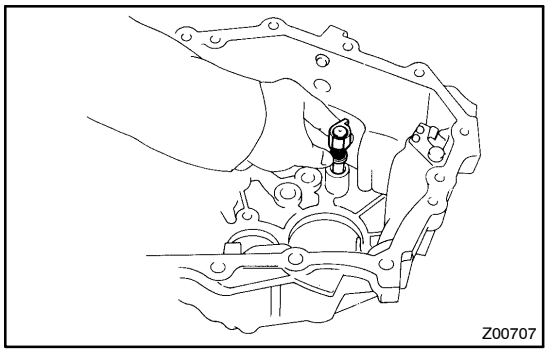
6. INSTALL TRANSAXLE CASE RECEIVER

Install the transaxle case receiver to the transaxle case with the bolt.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

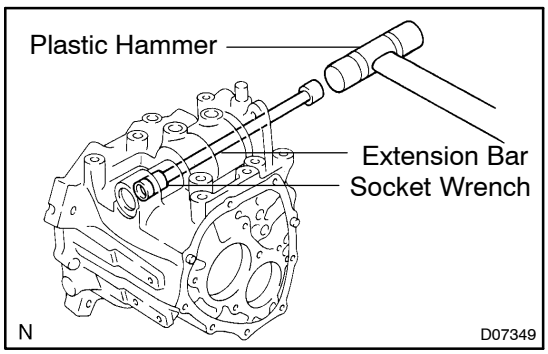


7. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Using a hexagon wrench, remove the straight screw plug.
(b) Using a pin punch and hammer, drive out the slotted spring pin.



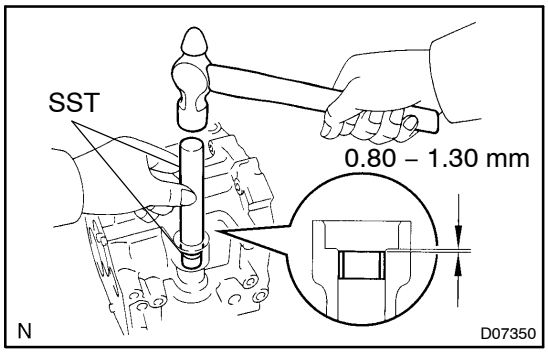
(c) Replace the reverse restrict pin.
(d) Using a pin punch and hammer, drive in the slotted spring pin.
(e) Apply sealant to the screw plug threads.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(f) Using a hexagon wrench, install the straight screw plug.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



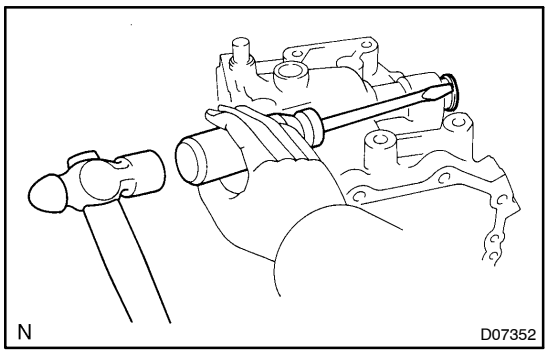
8. IF NECESSARY, REPLACE TRANSMISSION CASE BUSHING

(a) Using a socket wrench (12 mm), extension bar and plastic hammer, drive out the bushing.

NOTICE:
When driving out the bushing, be careful not to damage the transmission case by the socket wrench.

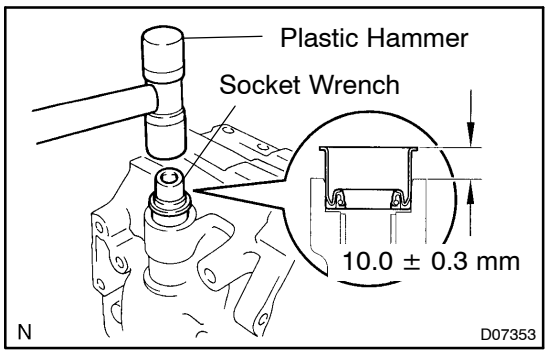


(b) Using SST and a hammer, drive in a new bushing.
SST 09950–60010 (09951–00180), 09950–70010 (09951–07100)
Drive in depth: 0.80 – 1.30 mm (0.0315 – 0.0512 in.)



9. IF NECESSARY, REPLACE TRANSMISSION CASE OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



(b) Using a socket wrench (17 mm) and plastic hammer, drive in a new oil seal.
Drive in depth: 10.0 ± 0.3 mm (0.394 ± 0.012 in.)

(c) Coat the lip of the oil seal with MP grease.

MX009–10

REASSEMBLY

Reassembly is in the reverse order of disassembly. (See page MX–13)

NOTICE:

When working with FIPG material, you must observe the followings.

- **Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

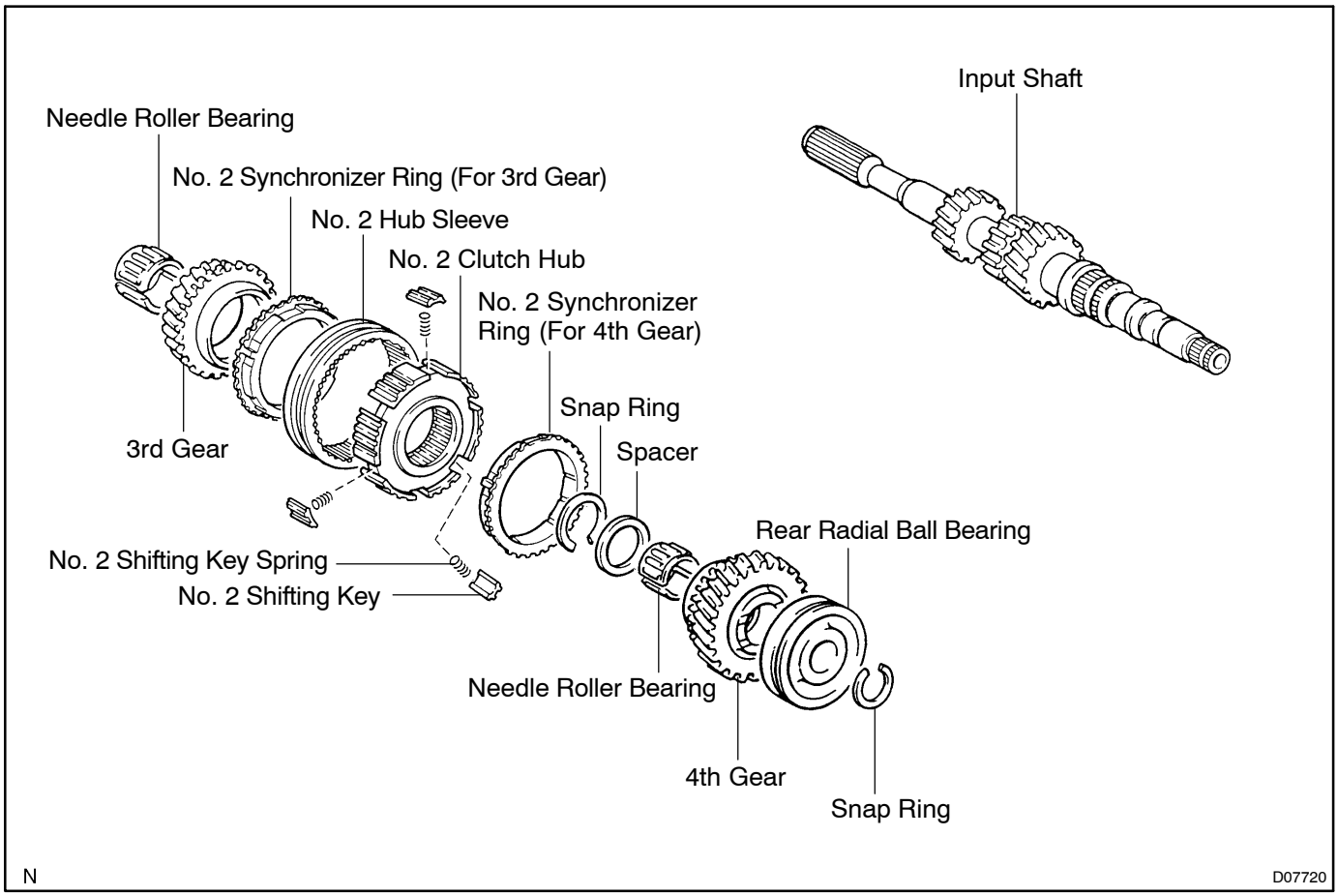
HINT:

Coat all of the sliding and rotating surfaces with gear oil before reassembly.

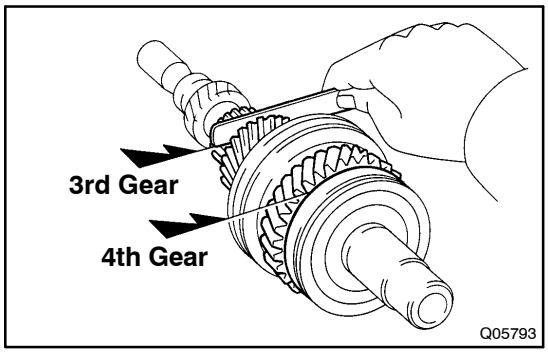
INPUT SHAFT

COMPONENTS

MX09K–10



MX09L–14

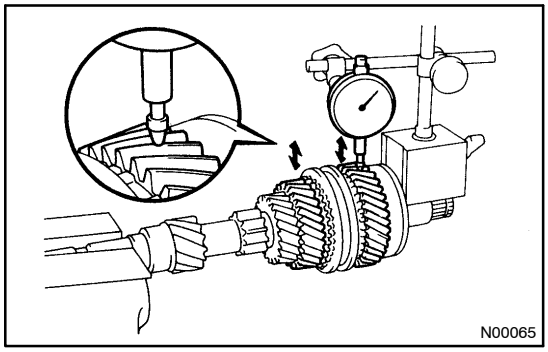


DISASSEMBLY

1. INSPECT 3RD AND 4TH GEARS THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:
3rd gear: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)
4th gear: 0.10 – 0.55 mm (0.0039 – 0.0217 in.)
Maximum clearance:
3rd gear: 0.35 mm (0.0138 in.)
4th gear: 0.55 mm (0.0217 in.)



2. INSPECT 3RD AND 4TH GEARS RADIAL CLEARANCE

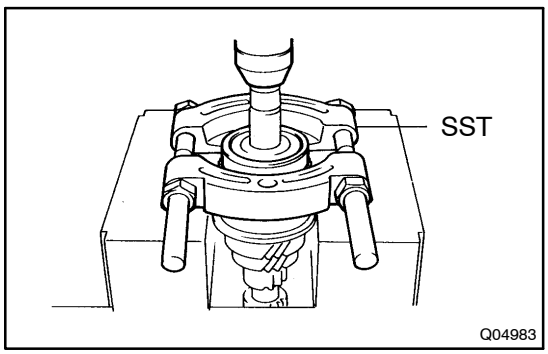
Using a dial indicator, measure the radial clearance between the gear and shaft.

Standard clearance:
KOYO made:
0.015 – 0.058 mm (0.0006 – 0.0023 in.)
NSK made:
0.015 – 0.056 mm (0.0006 – 0.0022 in.)
Maximum clearance:
KOYO made: 0.058 mm (0.0023 in.)
NSK made: 0.056 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.

3. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.
HINT:
Take care not to damage the journal surface of the input shaft.



4. REMOVE REAR RADIAL BALL BEARING, 4TH GEAR, NEEDLE ROLLER BEARING, SPACER AND NO. 2 SYNCHRONIZER RING (FOR 4TH GEAR) FROM INPUT SHAFT

(a) Using SST and a press, remove the rear radial ball bearing and 4th gear.
SST 09950–00020

HINT:
Support the input shaft assembly by hand so that it will not be dropped off.

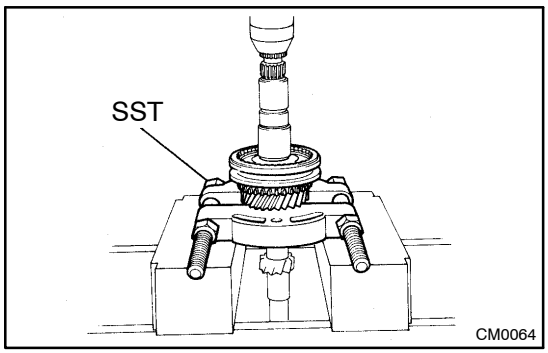
(b) Remove the needle roller bearings, spacer and No. 2 synchronizer ring (for the 4th gear).

5. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

Take care not to damage the journal surface of the input shaft.



6. REMOVE NO. 2 HUB SLEEVE ASSEMBLY, 3RD GEAR, NO. 2 SYNCHRONIZER RING (FOR 3RD GEAR) AND NEEDLE ROLLER BEARING

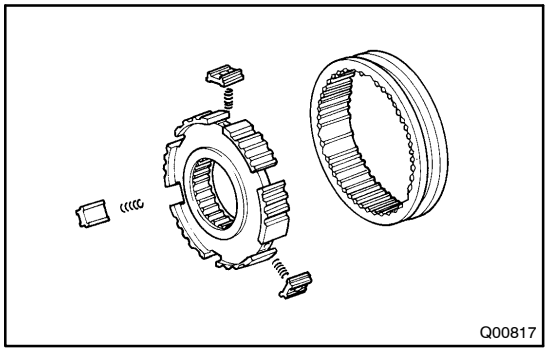
(a) Using SST and a press, remove the No. 2 hub sleeve assembly, 3rd gear and No. 2 synchronizer ring (for the 3rd gear).

SST 09950–00020

HINT:

Support the input shaft by hand so that it will not be dropped off.

(b) Remove the needle roller bearings.



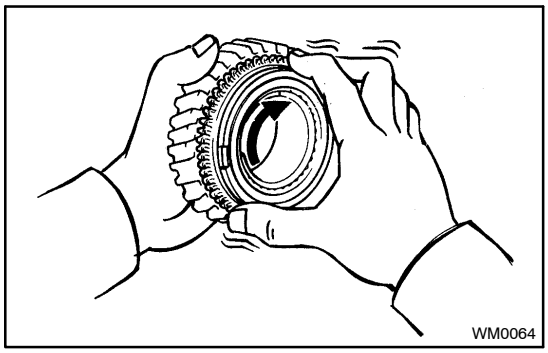
7. DISASSEMBLE NO. 2 HUB SLEEVE ASSEMBLY

(a) Remove the No. 2 hub sleeve from the No. 2 clutch hub.

(b) Remove the 3 No. 2 shifting keys and No. 2 shifting key springs from the No. 2 clutch hub.

MX09M–11

INSPECTION



1. INSPECT SYNCHRONIZER RING

(a) Check for wear or damage.

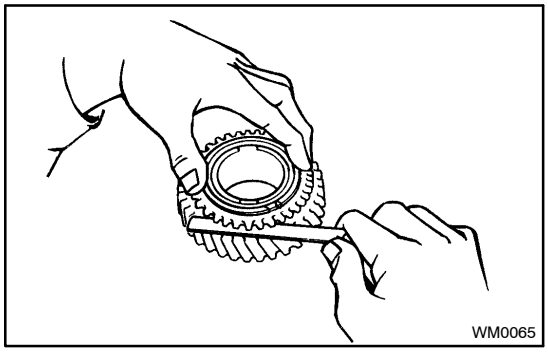
(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance:

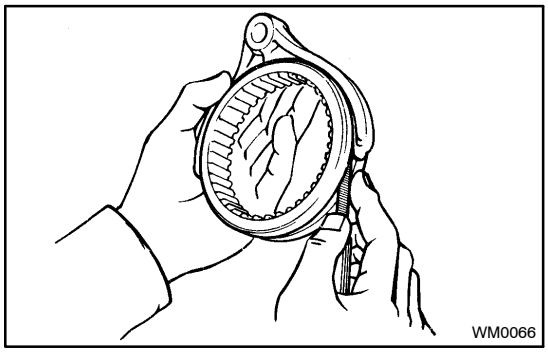
3rd gear: 0.65 mm (0.0256 in.)

4th gear: 0.75 mm (0.0295 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

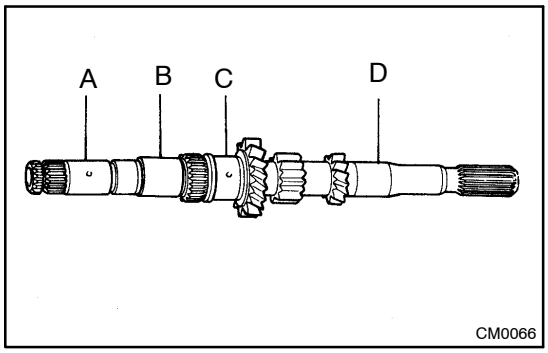


2. INSPECT GEAR SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeve and gear shift fork.

Maximum clearance: 0.35 mm (0.014 in.)

If the clearance exceeds the maximum, replace the gear shift fork or hub sleeve.



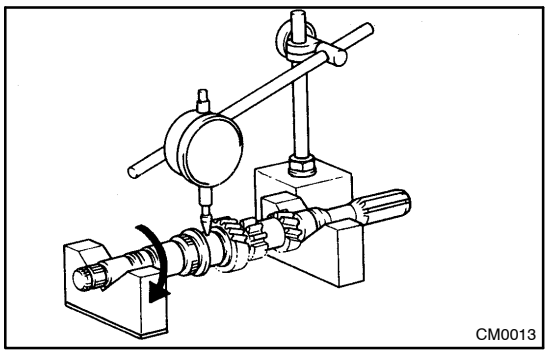
3. INSPECT INPUT SHAFT

(a) Check the input shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum outer diameter:
Part A: 24.885 mm (0.9797 in.)
Part B: 28.985 mm (1.1411 in.)
Part C: 30.985 mm (1.2199 in.)
Part D: 24.985 mm (0.9837 in.)

If the outer diameter is less than the minimum, replace the input shaft.



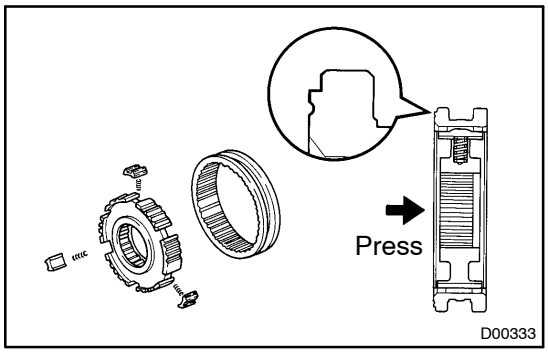
(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

If the runout exceeds the maximum, replace the input shaft.

MX09N–11

REASSEMBLY



HINT:

Coat all of the sliding and rotating surfaces with gear oil before reassembly.

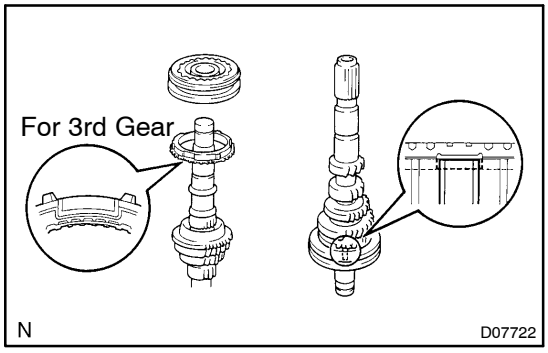
1. ASSEMBLE NO. 2 HUB SLEEVE ASSEMBLY

(a) Install the 3 No. 2 shifting key springs and No. 2 shifting keys to the No. 2 clutch hub.

(b) Install the No. 2 hub sleeve to the No. 2 clutch hub.

NOTICE:

Assemble the No. 2 hub sleeve and No. 2 clutch hub in the direction shown in the illustration.



2. INSTALL NEEDLE ROLLER BEARING, 3RD GEAR, NO. 2 SYNCHRONIZER RING (FOR 3RD GEAR) AND NO. 2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

(a) Apply gear oil to the needle roller bearings and install it.

(b) Install the 3rd gear and No. 2 synchronizer ring (for the 3rd gear).

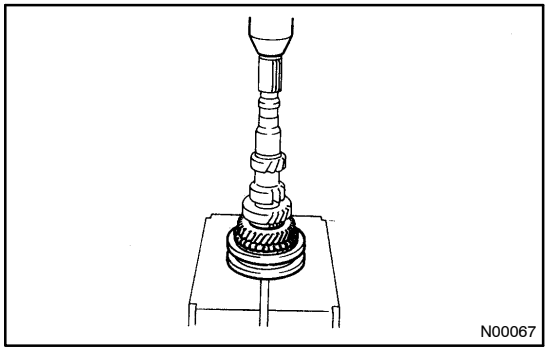
NOTICE:

Distinguish the No. 2 synchronizer ring (for the 3rd gear) by the teeth on the synchronizer ring.

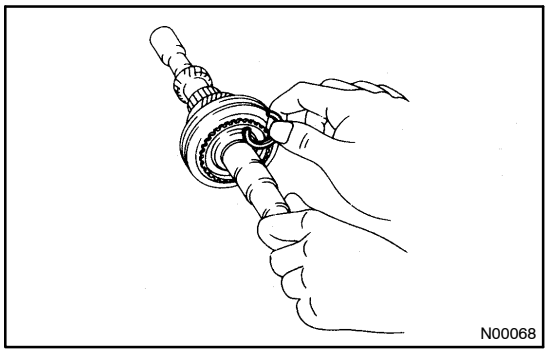
(c) Install the No. 2 hub sleeve assembly so that the No. 2 synchronizer ring slots and No. 2 shifting keys are aligned.

NOTICE:

Be sure to install the No. 2 hub sleeve assembly in the correct direction, as shown in the illustration.



(d) Using a press, install the No. 2 hub sleeve assembly.



3. INSTALL SNAP RING

(a) Select a snap ring from the table below that will make the thrust clearance of the No. 2 clutch hub less than 0.1 mm (0.0039 in.).

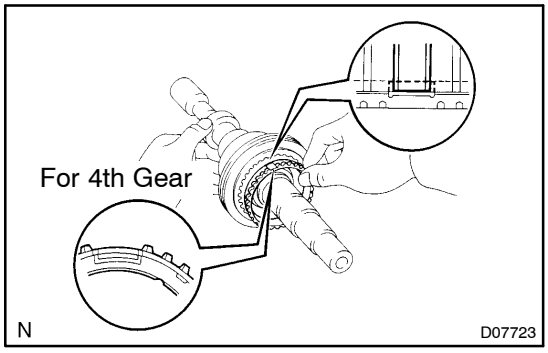
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	2.30 (0.0906)	3	2.48 (0.0976)
1	2.36 (0.0929)	4	2.54 (0.1000)
2	2.42 (0.0953)	5	2.60 (0.1024)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:

Take care not to damage the journal surface of the input shaft.

4. INSPECT 3RD GEAR THRUST CLEARANCE
(See page MX–28)



5. INSTALL SPACER, NEEDLE ROLLER BEARING, NO. 2 SYNCHRONIZER RING (FOR 4TH GEAR), 4TH GEAR AND REAR RADIAL BALL BEARING

(a) Install the spacer.

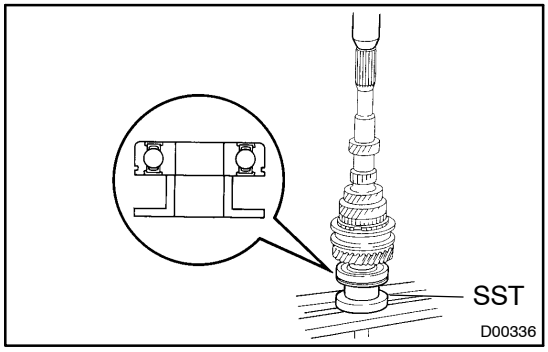
(b) Apply gear oil to the needle roller bearings and install it.

(c) Place the No. 2 synchronizer ring (for the 4th gear) on the No. 2 hub sleeve assembly and align the No. 2 synchronizer ring slots with the No. 2 shifting keys.

(d) Install the 4th gear.

NOTICE:

Distinguish the No. 2 synchronizer ring (for the 4th gear) by the teeth on the synchronizer ring.



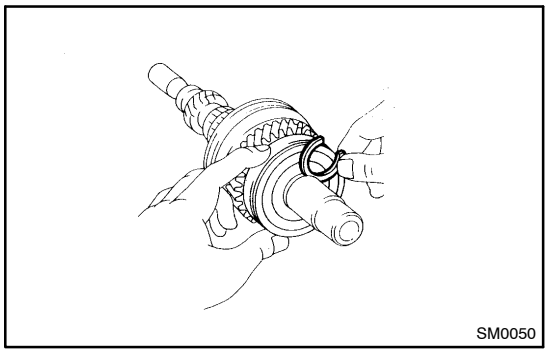
(e) Using SST and a press, install the rear radial ball bearing.
SST 09608–00071

NOTICE:

Be sure to install the rear radial ball bearing in the correct direction, as shown in the illustration.

HINT:

Set SST to the bearing inner race securely.


SM0050

6. INSTALL SNAP RING

(a) Select a snap ring from the table below that will make the thrust clearance of the rear radial ball bearing less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.29 (0.0902)	D	2.47 (0.0972)
B	2.35 (0.0925)	E	2.53 (0.0996)
C	2.41 (0.0949)	F	2.59 (0.1020)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:

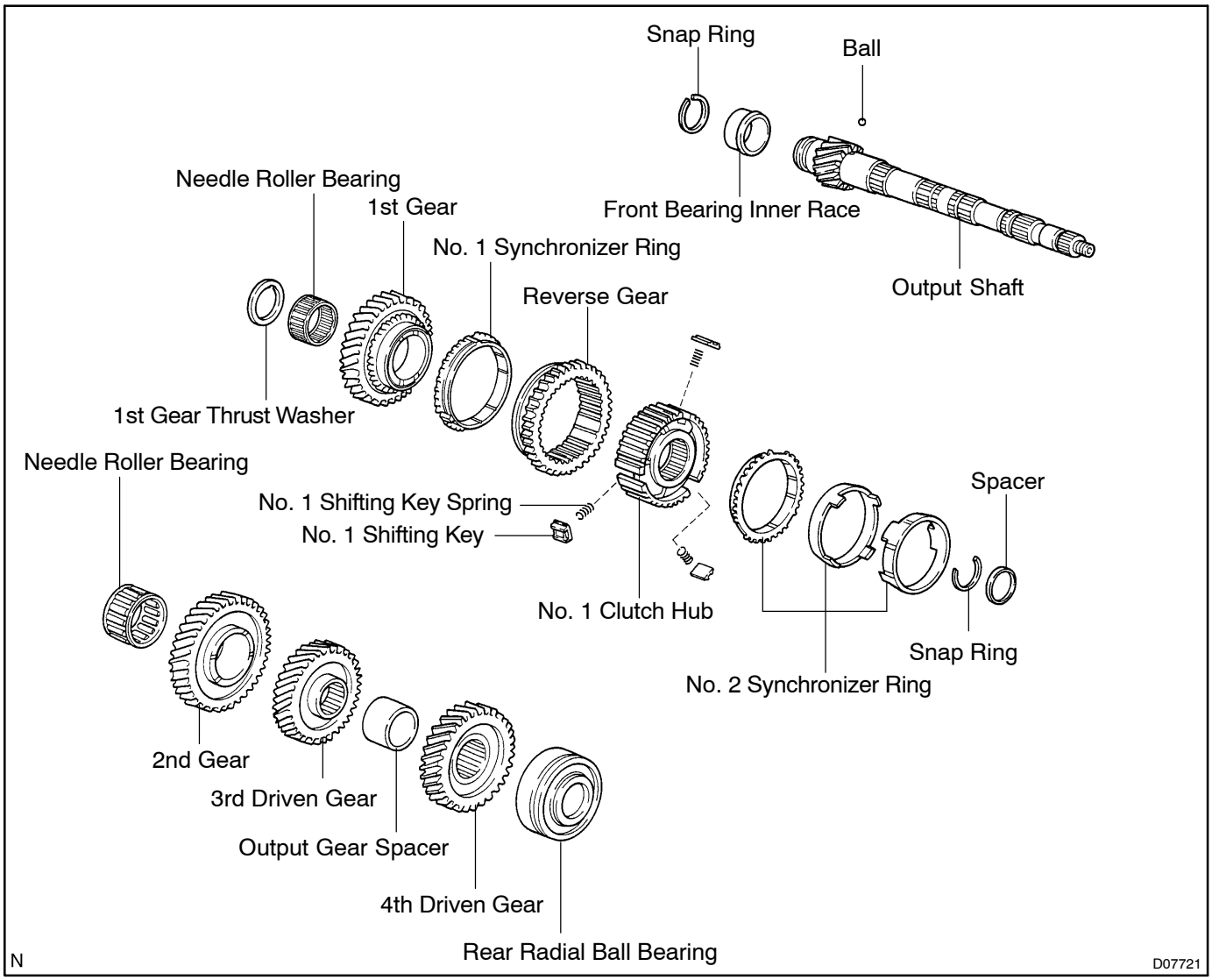
Take care not to damage the journal surface of the input shaft.

7. INSPECT 4TH GEAR THRUST CLEARANCE
(See page MX–28)

OUTPUT SHAFT

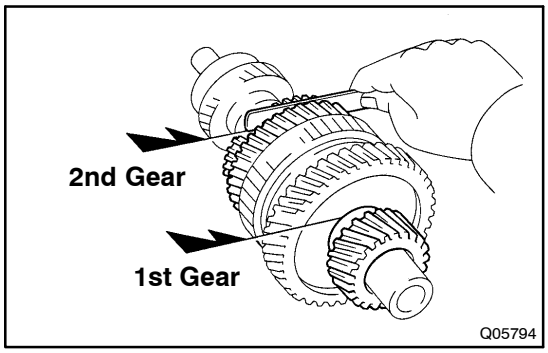
COMPONENTS

MX09O–10



MX09P–13

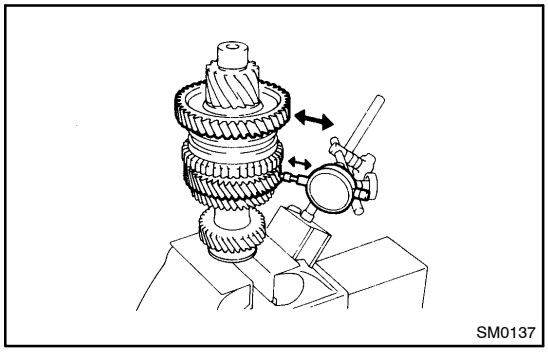
DISASSEMBLY



1. INSPECT 1ST AND 2ND GEARS THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:
1st gear: 0.10 – 0.40 mm (0.0039 – 0.0157 in.)
2nd gear: 0.10 – 0.55 mm (0.0039 – 0.0217 in.)
Maximum clearance:
1st gear: 0.40 mm (0.0157 in.)
2nd gear: 0.55 mm (0.0217 in.)

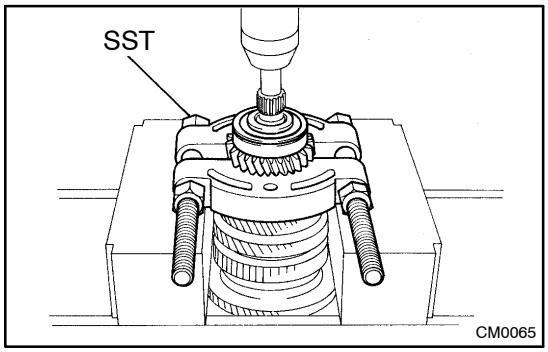


2. INSPECT 1ST AND 2ND GEARS RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance between the gear and shaft.

Standard clearance:
KOYO made:
0.015 – 0.058 mm (0.0006 – 0.0023 in.)
NSK made:
0.015 – 0.056 mm (0.0006 – 0.0022 in.)
Maximum clearance:
KOYO made: 0.058 mm (0.0023 in.)
NSK made: 0.056 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.

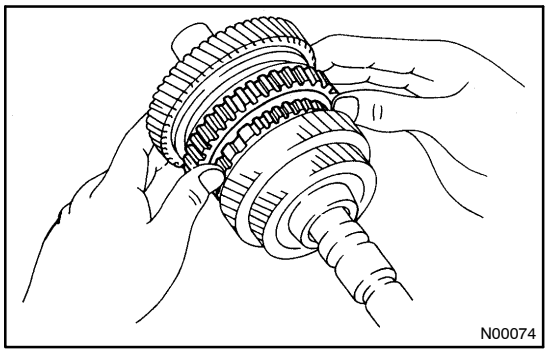


3. REMOVE REAR RADIAL BALL BEARING, 4TH DRIVEN GEAR AND OUTPUT GEAR SPACER FROM OUTPUT SHAFT

(a) Using SST and a press, remove the rear radial ball bearing and 4th driven gear.
SST 09950–00020

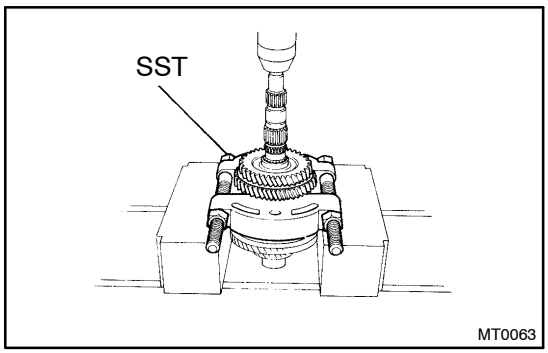
HINT:
Support the output shaft assembly by hand so that it will not be dropped off.

(b) Remove the output gear spacer.



4. REMOVE 3RD DRIVEN GEAR, 2ND GEAR, NEEDLE ROLLER BEARING, SPACER AND NO. 2 SYNCHRONIZER RING

(a) Shift the reverse gear into the 1st gear.



(b) Using SST and a press, remove the 3rd driven gear and 2nd gear.
SST 09950–00020

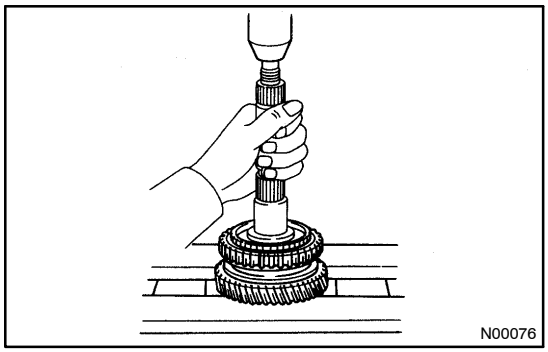
HINT:
Support the output shaft assembly by hand so that it will not be dropped off.

(c) Remove the needle roller bearing, spacer and No. 2 synchronizer rings.

5. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.



6. REMOVE REVERSE GEAR ASSEMBLY, 1ST GEAR, NO. 1 SYNCHRONIZER RING, NEEDLE ROLLER BEARING, 1ST GEAR THRUST WASHER AND BALL

(a) Using a press, remove the reverse gear assembly, 1st gear and No. 1 synchronizer ring.

HINT:
Support the output shaft assembly by hand so that it will not be dropped off.

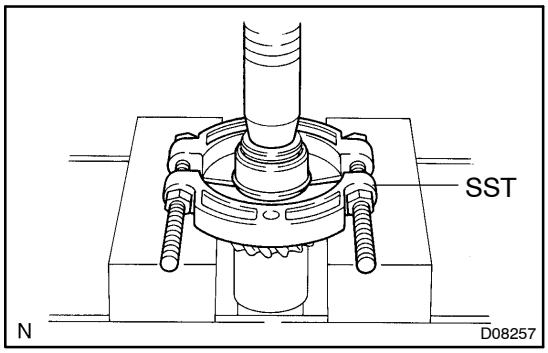
(b) Remove the needle roller bearing and 1st gear thrust washer.

(c) Using a magnetic finger, remove the ball.

7. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.



8. REMOVE FRONT BEARING INNER RACE

Using SST and a press, remove the front bearing inner race.

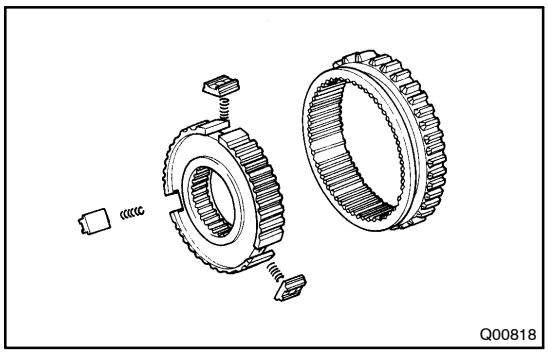
SST 09950–00020

NOTICE:

When replacing the front bearing inner race, replace the output shaft front bearing along with it.

HINT:

Support the output shaft by hand so that it will not be dropped off.

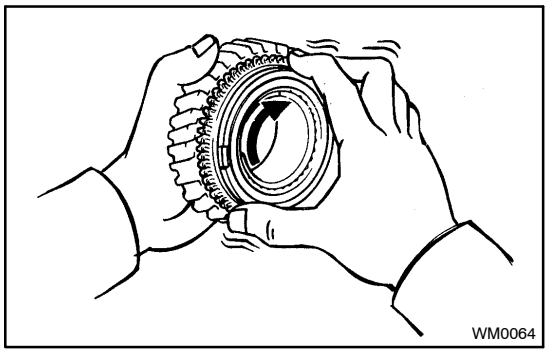


9. DISASSEMBLE REVERSE GEAR ASSEMBLY

(a) Remove the reverse gear from the No. 1 clutch hub.

(b) Remove the 3 No. 1 shifting keys and No. 1 shifting key springs from the No. 1 clutch hub.

MX09Q–11



INSPECTION

1. INSPECT 1ST GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

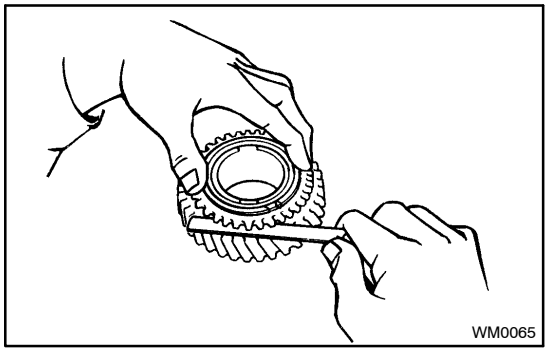
(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



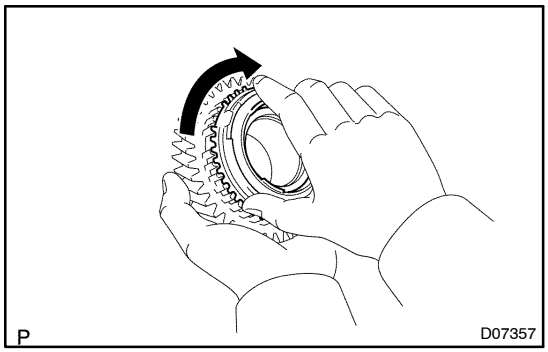
(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.75 mm (0.0295 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

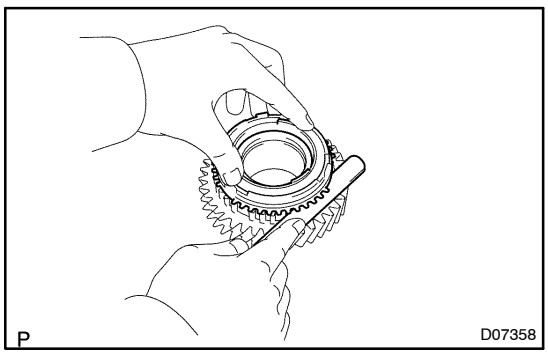


2. INSPECT 2ND GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

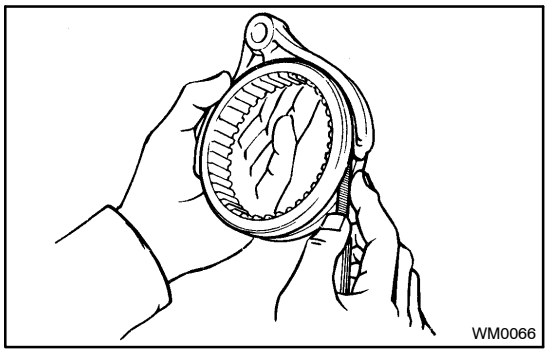
If the braking effect is insufficient, replace the synchronizer ring.



(c) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.70 mm (0.0276 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

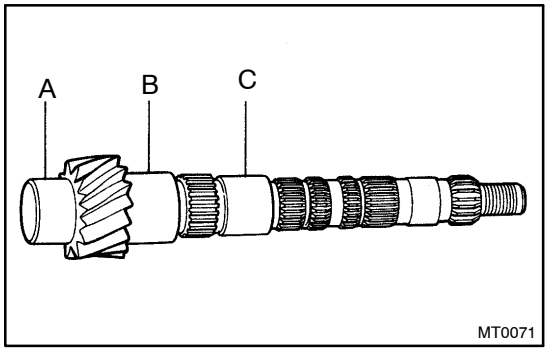


3. INSPECT GEAR SHIFT FORK AND REVERSE GEAR CLEARANCE

Using a feeler gauge, measure the clearance between the reverse gear and gear shift fork.

Maximum clearance: 0.35 mm (0.014 in.)

If the clearance exceeds the maximum, replace the gear shift fork or hub sleeve.



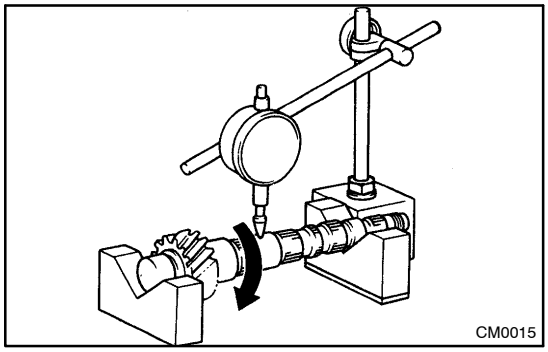
4. INSPECT OUTPUT SHAFT

(a) Check the output shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the output shaft journal surface.

Minimum outer diameter:
Part A: 32.985 mm (1.2986 in.)
Part B: 37.985 mm (1.4955 in.)
Part C: 31.985 mm (1.2592 in.)

If the outer diameter is less than the minimum, replace the output shaft.



(c) Using a dial indicator, check the shaft runout.

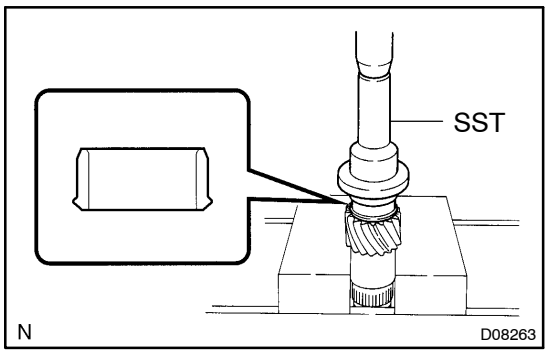
Maximum runout: 0.03 mm (0.0012 in.)

If the runout exceeds the maximum, replace the output shaft.

MX09R–12

REASSEMBLY

HINT:
Coat all of the sliding and rotating surfaces with gear oil before reassembly.



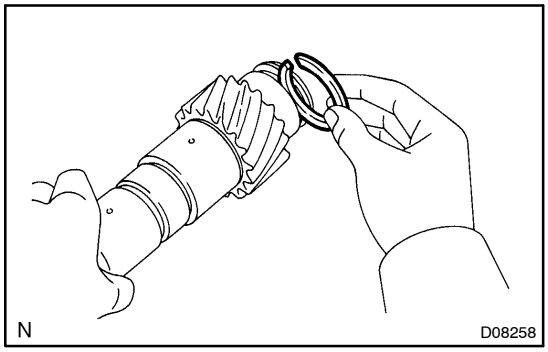
1. INSTALL FRONT BEARING INNER RACE

Using SST and a press, install the front bearing inner race.

SST 09223–50010

NOTICE:

Be sure to install the front bearing inner race in the correct direction, as shown in the illustration.



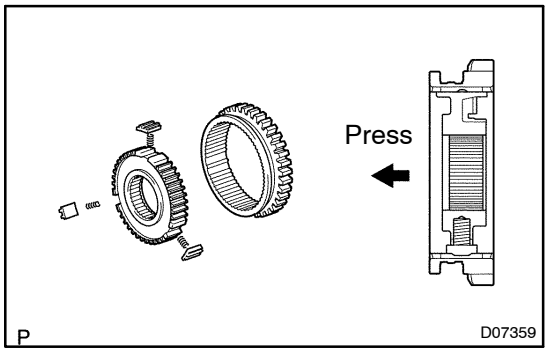
2. INSTALL SNAP RING

(a) Select a snap ring from the table below that will make the thrust clearance of the front bearing inner race less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
7	1.85 (0.0728)	3	2.05 (0.0807)
8	1.90 (0.0748)	4	2.10 (0.0827)
1	1.95 (0.0768)	5	2.15 (0.0846)
2	2.00 (0.0787)	6	2.20 (0.0866)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.



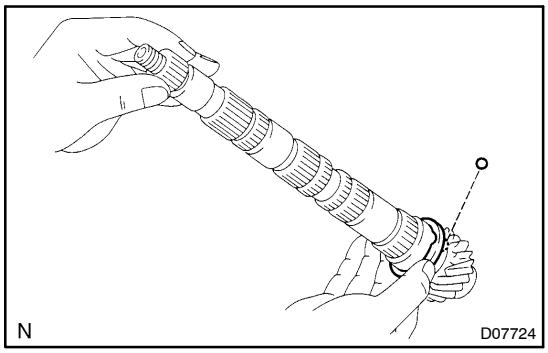
3. ASSEMBLE REVERSE GEAR ASSEMBLY

(a) Install the 3 No. 1 shifting key springs and No. 1 shifting keys to the No. 1 clutch hub.

(b) Install the No. 1 clutch hub to the reverse gear.

NOTICE:

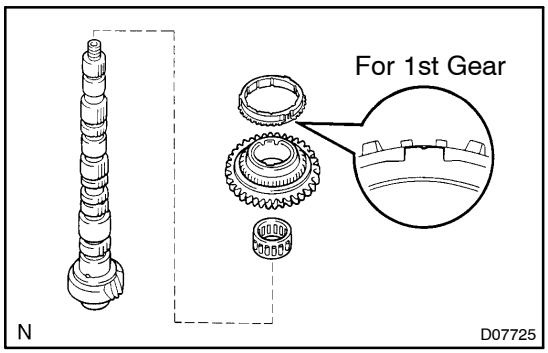
Assemble the No. 1 clutch hub and reverse gear in the direction shown in the illustration.



4. INSTALL BALL, 1ST GEAR THRUST WASHER, NEEDLE ROLLER BEARING, 1ST GEAR, NO. 1 SYNCHRONIZER RING AND REVERSE GEAR ASSEMBLY TO OUTPUT SHAFT

(a) Using a magnetic finger, install the ball to the output shaft.

(b) Fit the 1st gear thrust washer groove securely over the locking ball when installing the thrust on the output shaft.

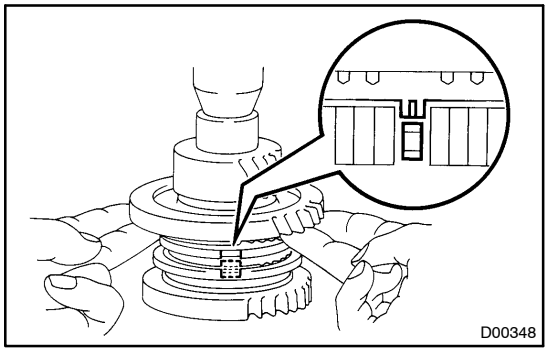


(c) Apply gear oil to the needle roller bearing and install it.

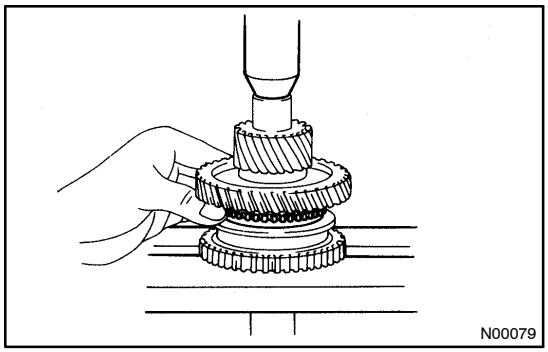
(d) Install the 1st gear and No. 1 synchronizer ring.

NOTICE:

Distinguish the No. 1 synchronizer ring by the teeth on the synchronizer ring.



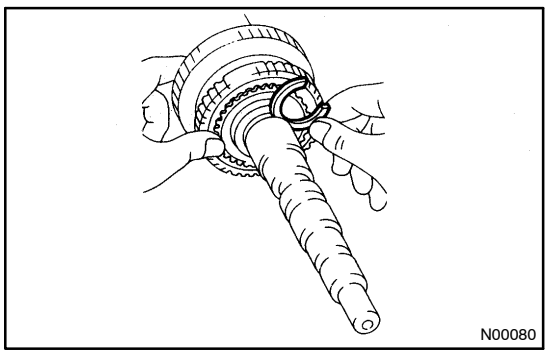
(e) Place the reverse gear assembly and align the No. 1 synchronizer ring slots with the No. 1 shifting keys.



(f) Using a press, install the reverse gear assembly.

NOTICE:

- **Be sure to install the reverse gear assembly in the correct direction, as shown in the illustration.**
- **When installing, make sure that the ball is placed in a groove of the 1st gear thrust washer.**



5. INSTALL SNAP RING

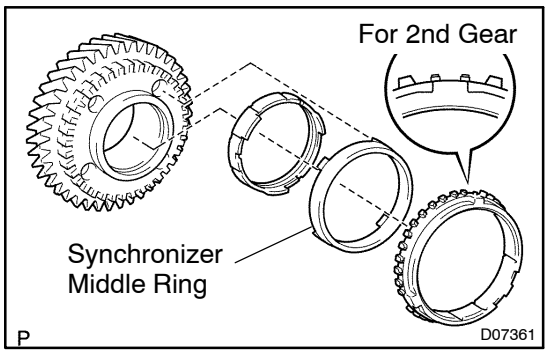
(a) Select a snap ring from the table below that will make the thrust clearance of the No. 1 clutch hub less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.50 (0.0984)	D	2.68 (0.1055)
B	2.56 (0.1008)	E	2.74 (0.1079)
C	2.62 (0.1031)	F	2.80 (0.1102)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.

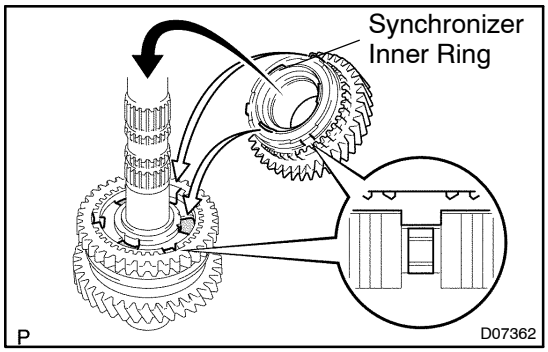
6. INSPECT 1ST GEAR THRUST CLEARANCE
(See page MX–36)



7. INSTALL SPACER, NEEDLE ROLLER BEARING, NO. 2 SYNCHRONIZER RING, 2ND GEAR AND 3RD DRIVEN GEAR

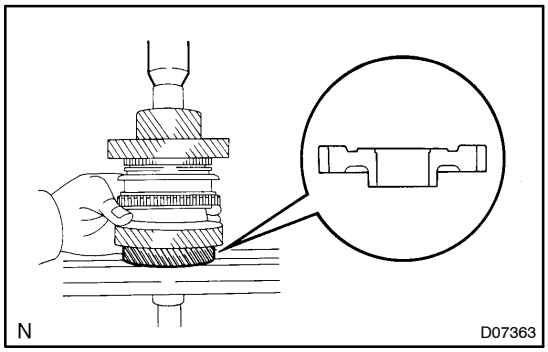
(a) Install the spacer.
(b) Apply gear oil to the needle roller bearing and install it.
(c) Place the No. 2 synchronizer rings on the 2nd gear.

NOTICE:
- **Properly fit the synchronizer middle ring claws into the holes in the 2nd gear.**
- **Distinguish the No. 2 synchronizer ring by the teeth on the synchronizer ring.**



(d) Place the 2nd gear with the No. 2 synchronizer rings and align the No. 2 synchronizer ring slots with the No. 1 shifting keys.

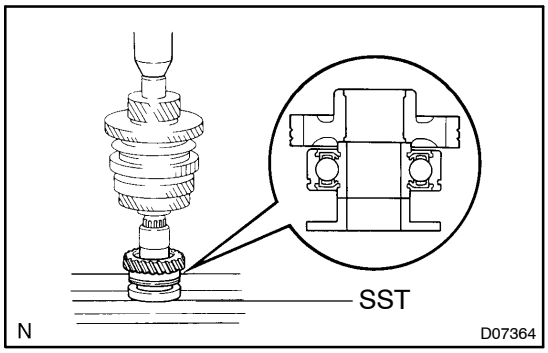
NOTICE:
Fit the synchronizer inner ring claws into the slots in the No. 1 clutch hub.



(e) Using a press, install the 3rd driven gear.

NOTICE:
Be sure to install the 3rd driven gear in the correct direction, as shown in the illustration.

8. INSPECT 2ND GEAR THRUST CLEARANCE
(See page MX–36)



9. INSTALL OUTPUT GEAR SPACER, 4TH DRIVEN GEAR AND REAR RADIAL BALL BEARING

(a) Install the output gear spacer.

(b) Using SST and a press, install the 4th driven gear and rear radial ball bearing.

SST 09608–00071

NOTICE:

Be sure to install the 4th driven gear and rear radial ball bearing in the correct direction, as shown in the illustration.

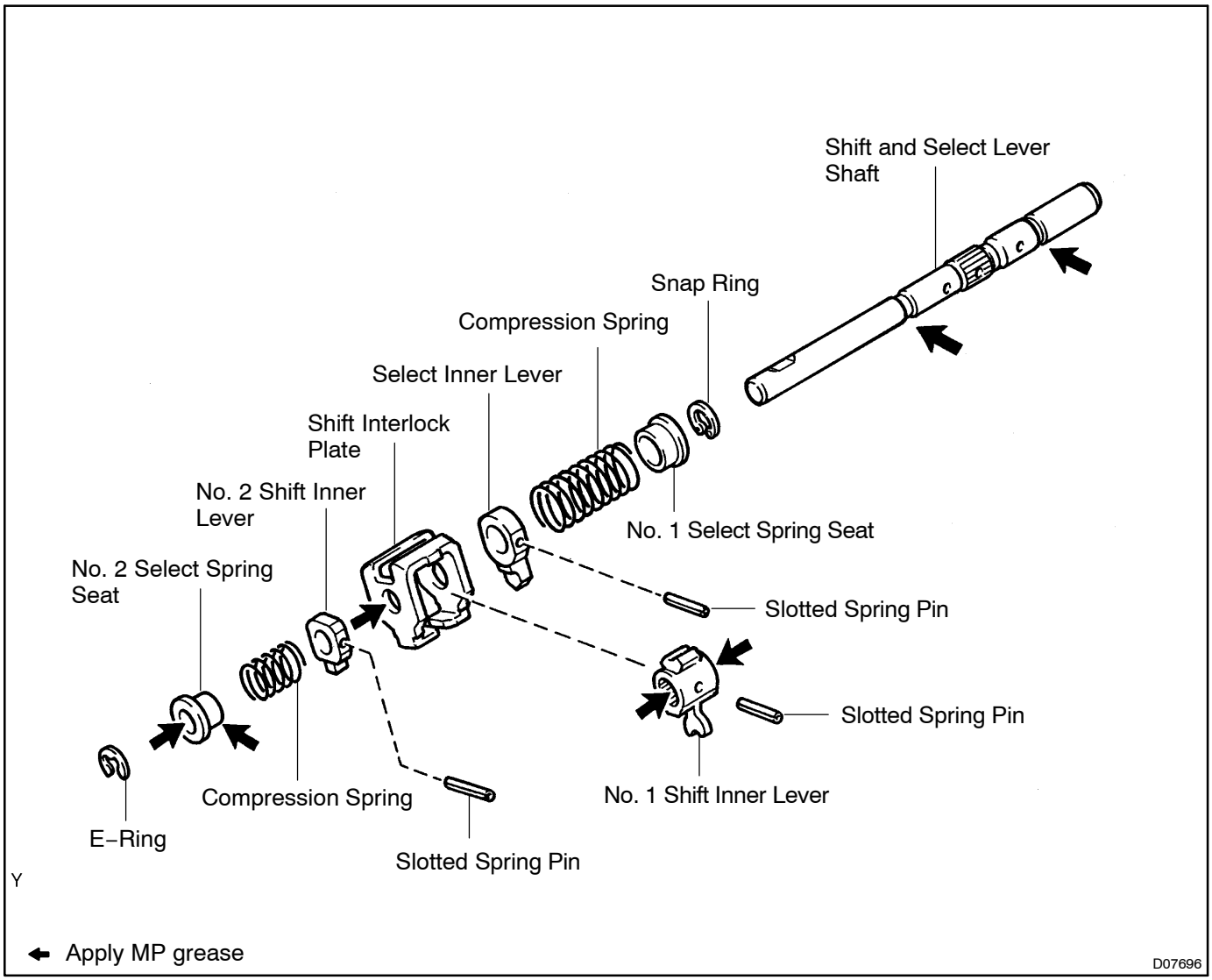
HINT:

Set SST to the bearing inner race securely.

SHIFT AND SELECT LEVER SHAFT

COMPONENTS

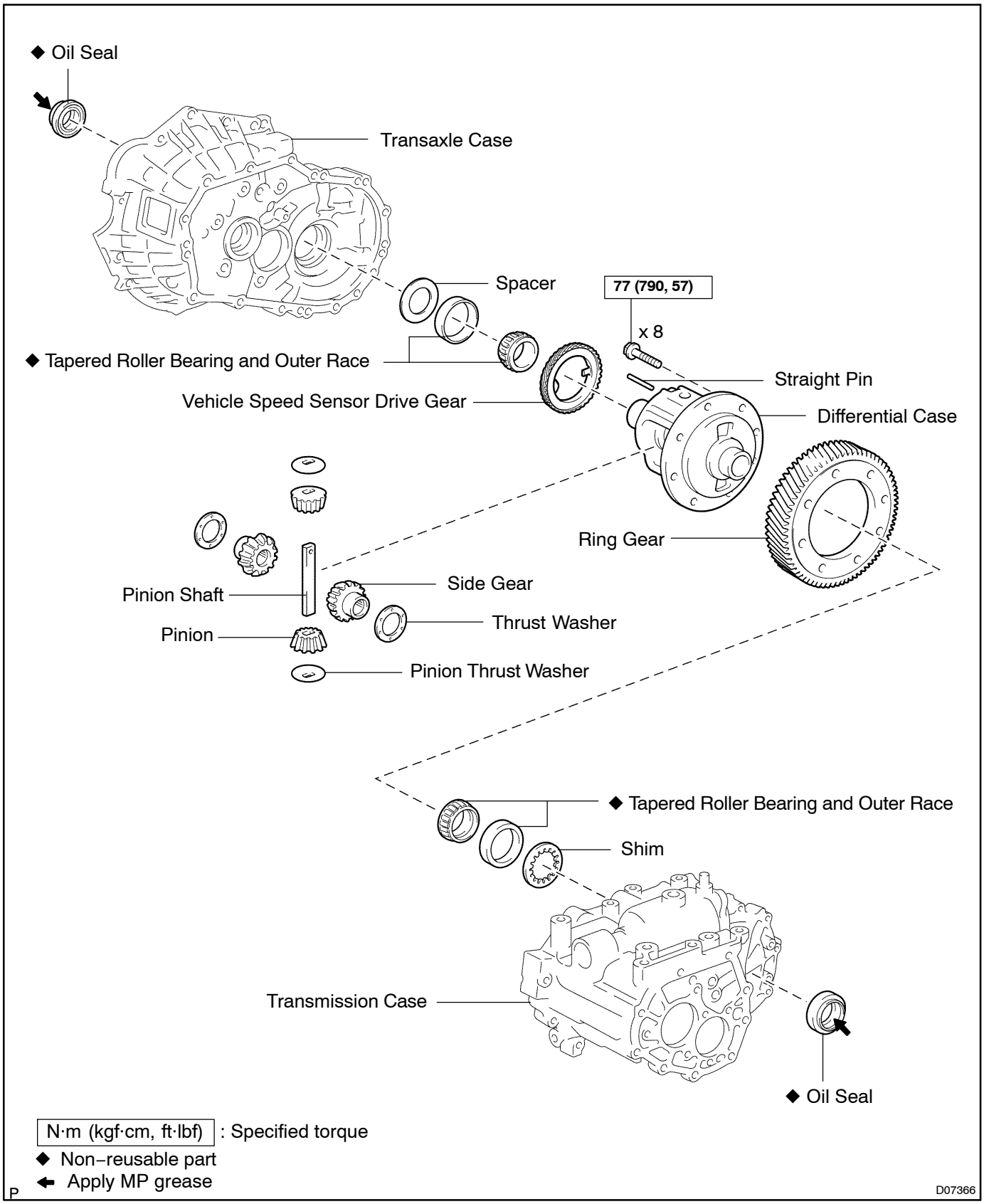
MX00I–16



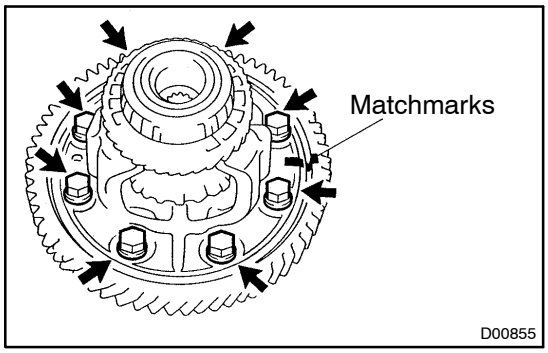
DIFFERENTIAL CASE

COMPONENTS

MX09S–10



MX09T–04



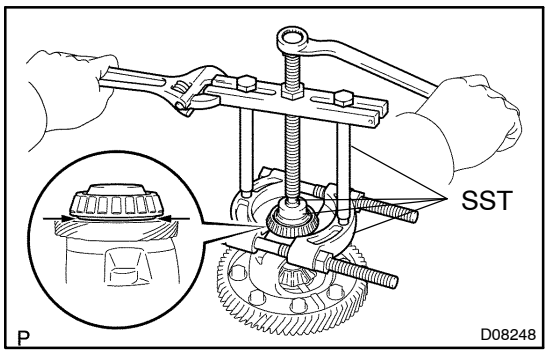
DISASSEMBLY

1. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.

(b) Remove the 8 bolts.

(c) Using a copper hammer, tap on the ring gear to remove it from the differential case.



2. Vehicle speed sensor drive gear side: REMOVE TAPERED ROLLER BEARING FROM DIFFERENTIAL CASE

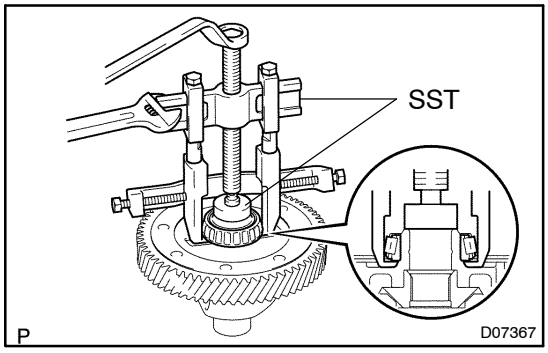
(a) Using SST, remove the tapered roller bearing.

SST 09950–00020, 09950–00030, 09950–40011 (09957–04010), 09950–60010 (09951–00350)

HINT:

Set the claw of SST to the bearing inner race securely.

(b) Remove the vehicle speed sensor drive gear.



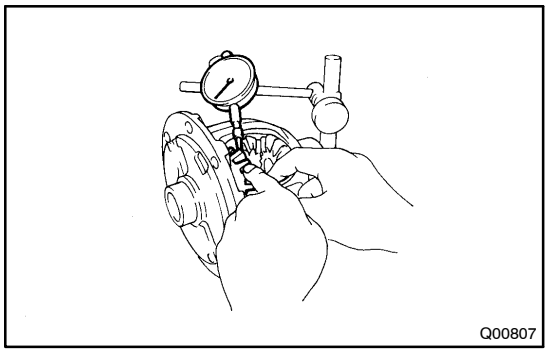
3. Ring gear side: REMOVE TAPERED ROLLER BEARING FROM DIFFERENTIAL CASE

Using SST, remove the tapered roller bearing.

SST 09950–40011, 09950–60010 (09951–00350)

HINT:

Set the claw of SST to the bearing inner race at the position where the differential case is indented.



4. INSPECT SIDE GEAR BACKLASH

Using a dial indicator, measure the backlash of one side gear while holding one pinion toward the differential case.

Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

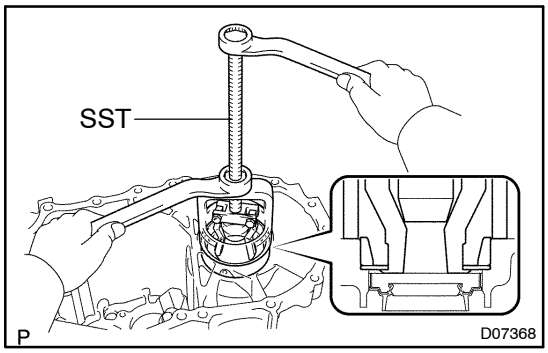
If the backlash is not within the specification, install the correct thrust washer to the side gears.

5. DISASSEMBLE DIFFERENTIAL CASE

(a) Using a pin punch and hammer, drive out the straight pin.

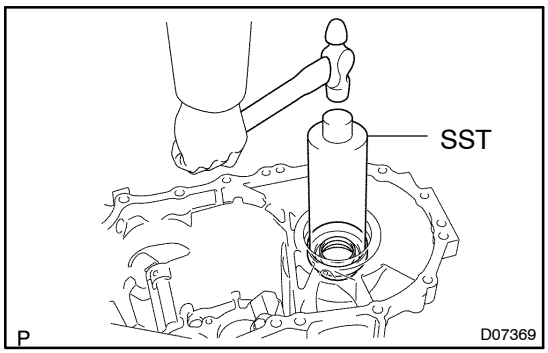
(b) Remove the pinion shaft from the differential case.

(c) Remove the 2 pinions and side gears with the 4 thrust washers from each gear.

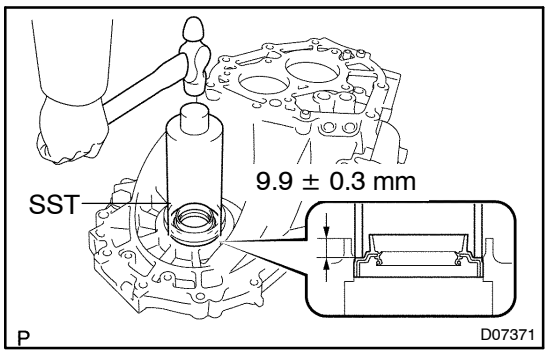


6. Transmission case side:
IF NECESSARY, REPLACE OIL SEAL AND TAPERED ROLLER BEARING OUTER RACE

(a) Using SST, pull out the tapered roller bearing outer race and shim.
SST 09612–65014



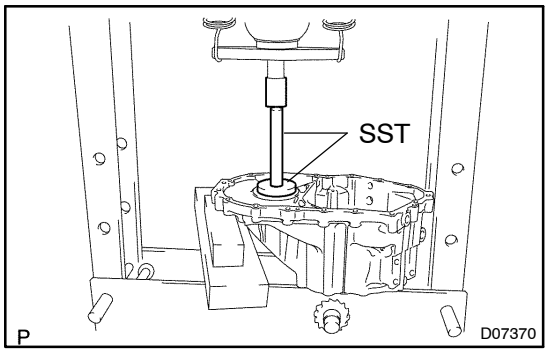
(b) Using SST and a hammer, drive out the oil seal.
SST 09226–10010



(c) Using SST and a hammer, drive in a new oil seal.
SST 09226–10010
Drive in depth: 9.9 ± 0.3 mm (0.390 ± 0.012 in.)

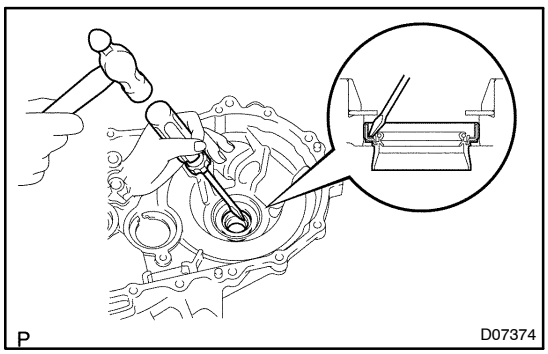
(d) Coat the lip of the oil seal with MP grease.

(e) Place the shim into the differential case.



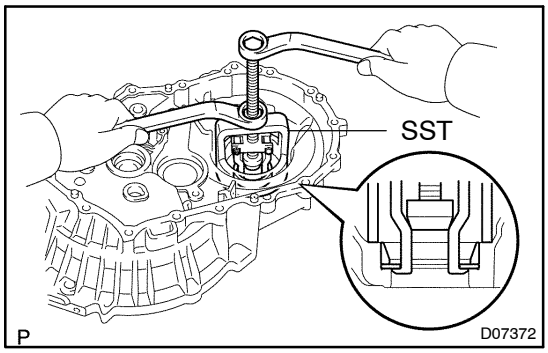
(f) Using SST and a press, install the tapered roller bearing outer race.
SST 09950–60020 (09951–00710), 09950–70010 (09951–07150)

NOTICE:
When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.



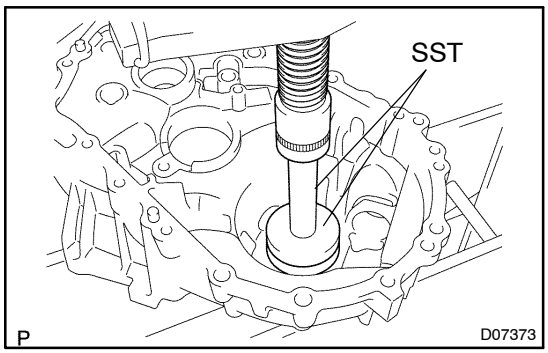
7. Transaxle case side:
IF NECESSARY, REPLACE OIL SEAL AND TAPERED ROLLER BEARING OUTER RACE

(a) Using a screwdriver and hammer, drive out the oil seal.



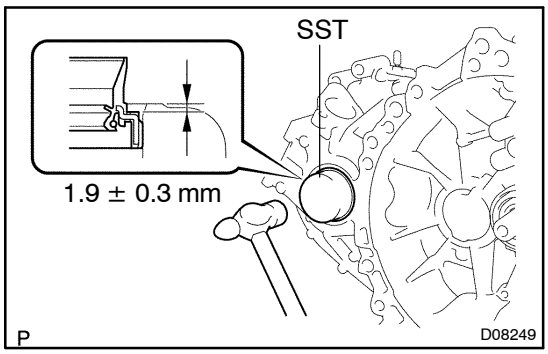
(b) Using SST, pull out the tapered roller bearing outer race and spacer.
SST 09612–65014

(c) Place the spacer into the differential case.



(d) Using SST and a press, install the tapered roller bearing outer race.
SST 09950–60020 (09951–00680), 09950–70010 (09951–07150)

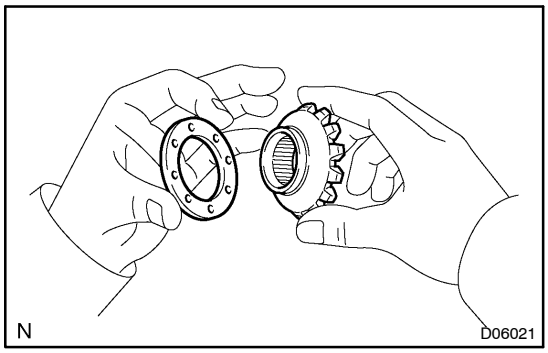
NOTICE:
When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.



(e) Using SST and a hammer, drive in a new oil seal.
SST 09710–28021 (09710–08041)
Drive in depth: 1.9 ± 0.3 mm (0.075 ± 0.012 in.)

(f) Coat the lip of the oil seal with MP grease.

MX09U–04



REASSEMBLY

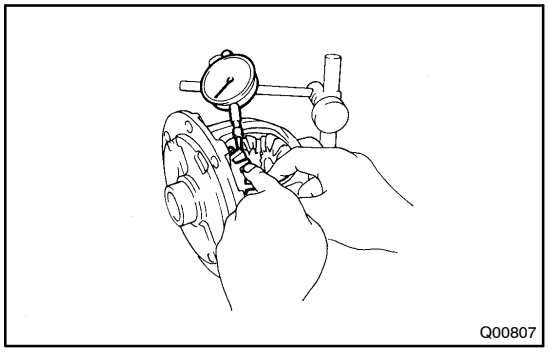
1. ASSEMBLE DIFFERENTIAL CASE

(a) Install the correct thrust washers and side gears.
Refer to the table below, select thrust washers which will ensure that the backlash is within the specification. Try to select washers of the same size for both sides.
Standard backlash:
0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Thickness mm (in.)	Thickness mm (in.)
0.95 (0.0374)	1.10 (0.0433)
1.00 (0.0394)	1.15 (0.0453)
1.05 (0.0413)	1.20 (0.0472)

(b) Install the thrust washers and side gears in the differential case.

(c) Install the pinion shaft.

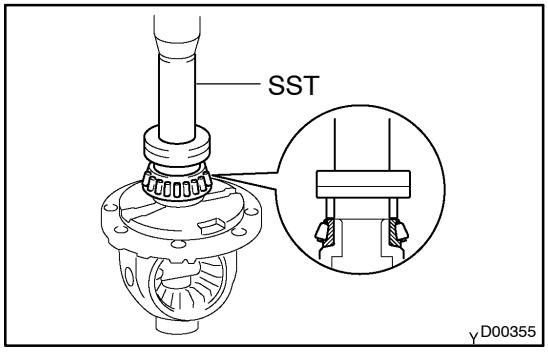


(d) Using a dial indicator, check the side gear backlash.
Measure the side gear backlash while holding one pinion toward the differential case.
Standard backlash:
0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specification, install a thrust washer of different thickness.

(e) Using a pin punch and hammer, drive in the straight pin through the differential case and hole in the pinion shaft.

(f) Using a chisel and hammer, caulk the pin holes around the circumference of the differential case.

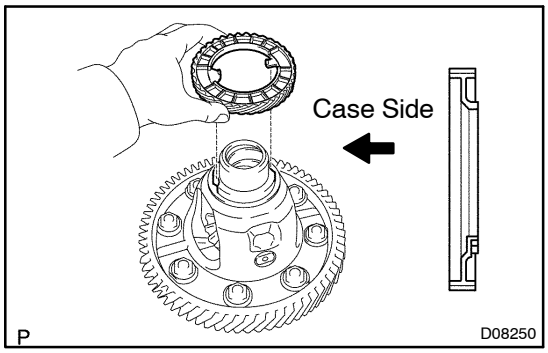


2. Ring gear side: INSTALL TAPERED ROLLER BEARING

Using SST and a press, install the tapered roller bearing.
SST 09350–32014 (09351–32120, 09351–32140)

NOTICE:
When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.

HINT:
Set SST to the bearing inner race securely.

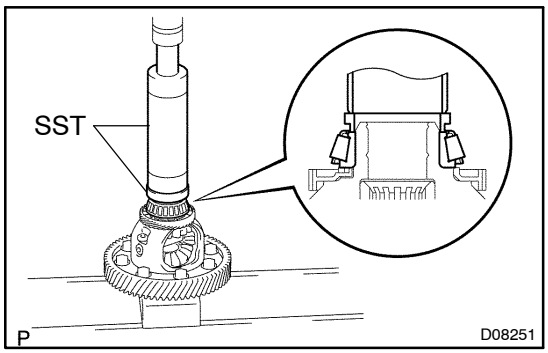


3. Vehicle speed sensor drive gear side: INSTALL TAPERED ROLLER BEARING

(a) Place the vehicle speed sensor drive gear in position to stop it turning, and install the vehicle speed sensor drive gear.

NOTICE:

Be sure to install the vehicle speed sensor drive gear in the correct direction, as shown in the illustration.



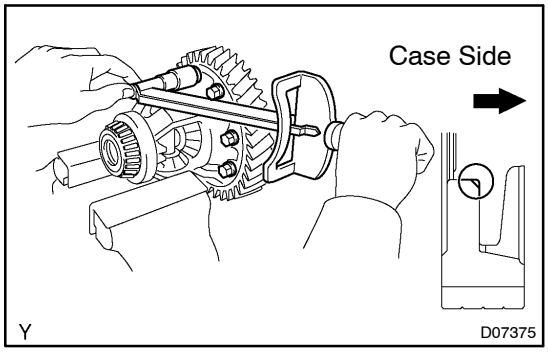
(b) Using SST and a press, install a new side bearing.
SST 09316–60011 (09316–00011), 09350–32014 (09351–32120)

NOTICE:

When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.

HINT:

Set SST to the bearing inner race securely.



4. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear in boiling water.

(c) Carefully take the ring gear out of the water.

(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

HINT:

Align the matchmarks on the differential case and contact the ring gear.

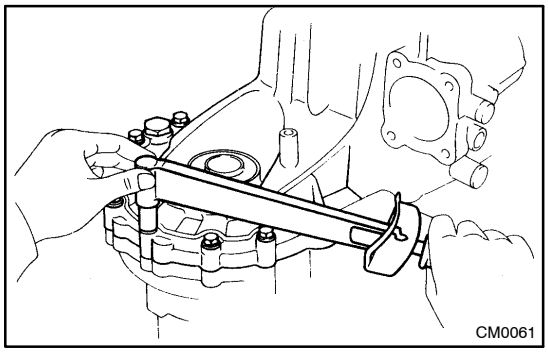
(e) Temporarily install the 8 set bolts.

CAUTION:

The ring gear set bolts should not be tightened until the ring gear has cooled sufficiently.

(f) After the ring gear has cooled sufficiently, torque the ring gear set bolts uniformly at a time.

Torque: 77 N·m (790 kgf·cm, 57 ft·lbf)



5. INSPECT DIFFERENTIAL TAPERED ROLLER BEARING PRELOAD

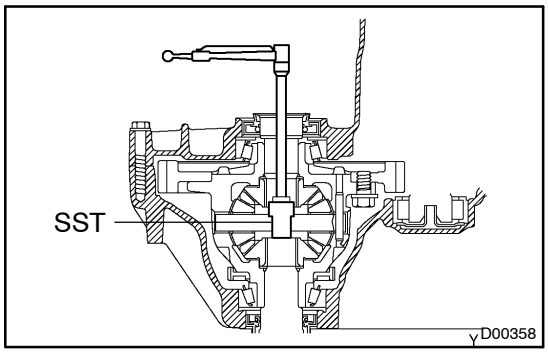
NOTICE:

Perform this only when replacing the tapered roller bearing and outer race of the differential case.

(a) Install the differential case assembly to the transaxle case.

(b) Install the transmission case to the transaxle case with the 16 bolts.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



(c) Using SST and a torque wrench, turn the differential case assembly right and left 2 or 3 times to allow the bearings to settle.
SST 09564–32011

(d) Using SST and a torque wrench, measure the preload.
SST 09564–32011
Preload (at starting):
New bearing
0.8 – 1.6 N·m (8 – 16 kgf·cm, 6.9 – 13.9 in.·lbf)
Reused bearing
0.5 – 1.0 N·m (5 – 10 kgf·cm, 4.3 – 8.7 in.·lbf)

If the preload is not within the specification, remove the transmission case side outer race of the tapered roller bearing with SST (See page MX–47). Select an appropriate shim.
HINT:
The preload will change by about 0.3 – 0.4 N·m (3 – 4 kgf·cm, 2.6 – 3.5 in.·lbf) corresponding to a change of 0.05 mm (0.0020 in.) in shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
AA	2.10 (0.0827)	LL	2.60 (0.1024)
BB	2.15 (0.0846)	MM	2.65 (0.1043)
CC	2.20 (0.0866)	NN	2.70 (0.1063)
DD	2.25 (0.0886)	PP	2.75 (0.1083)
EE	2.30 (0.0906)	QQ	2.80 (0.1102)
FF	2.35 (0.0925)	RR	2.85 (0.1122)
GG	2.40 (0.0945)	SS	2.90 (0.1142)
HH	2.45 (0.0965)	TT	2.95 (0.1161)
JJ	2.50 (0.0984)	UU	3.00 (0.1181)
KK	2.55 (0.1004)	–	–

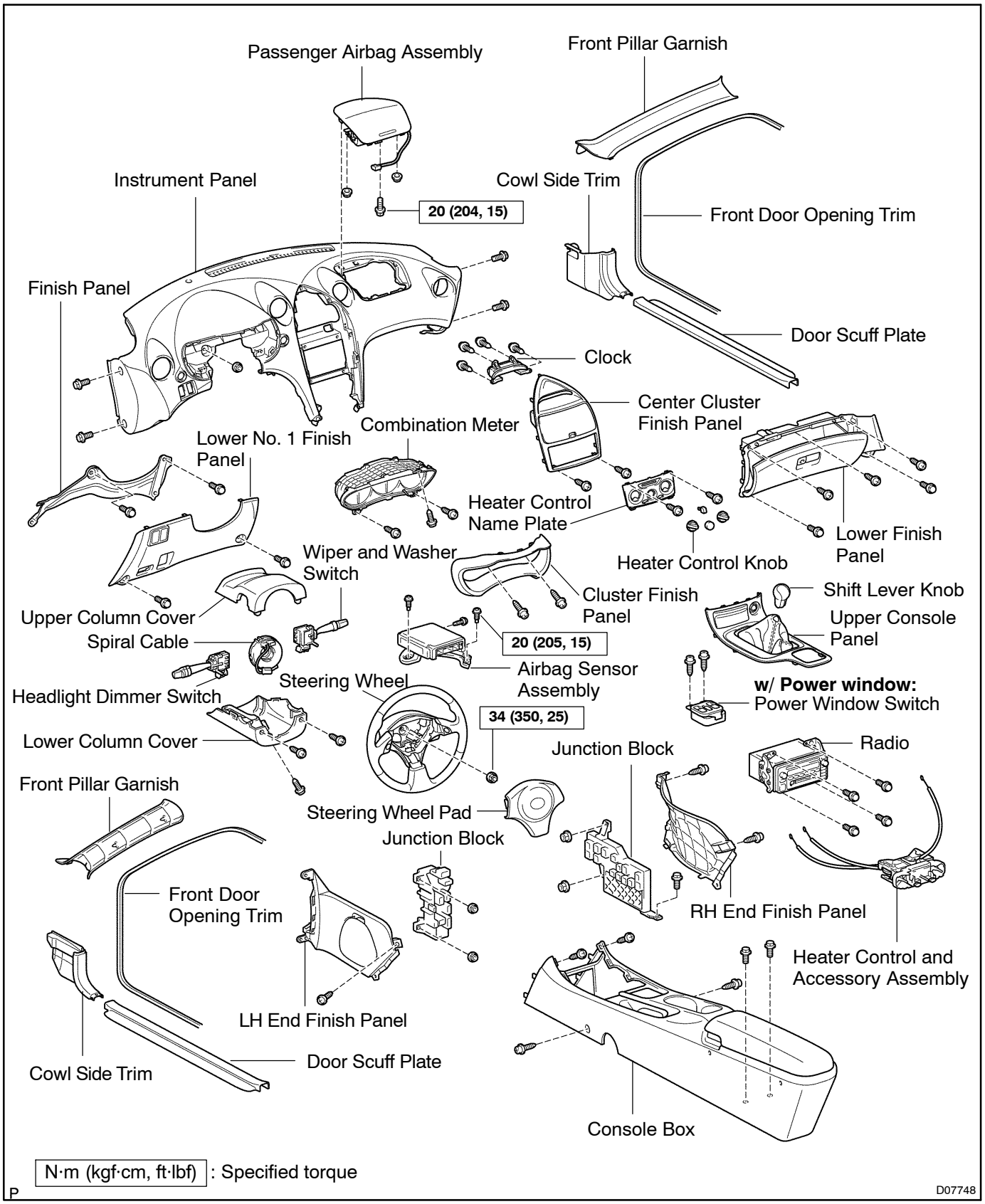
(e) Remove the 16 bolts and transmission case.

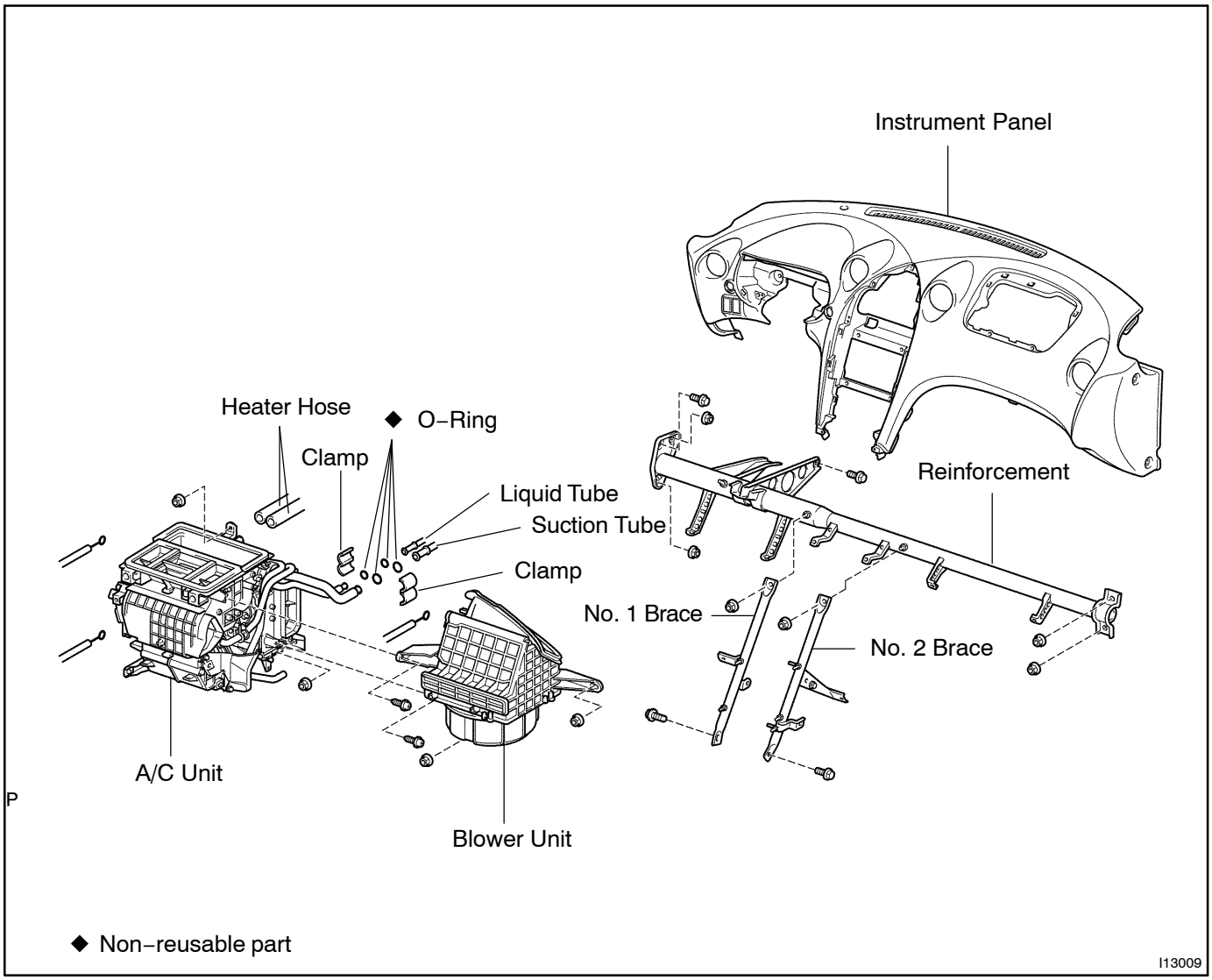
(f) Remove the differential case assembly.

SHIFT LEVER AND CONTROL CABLE

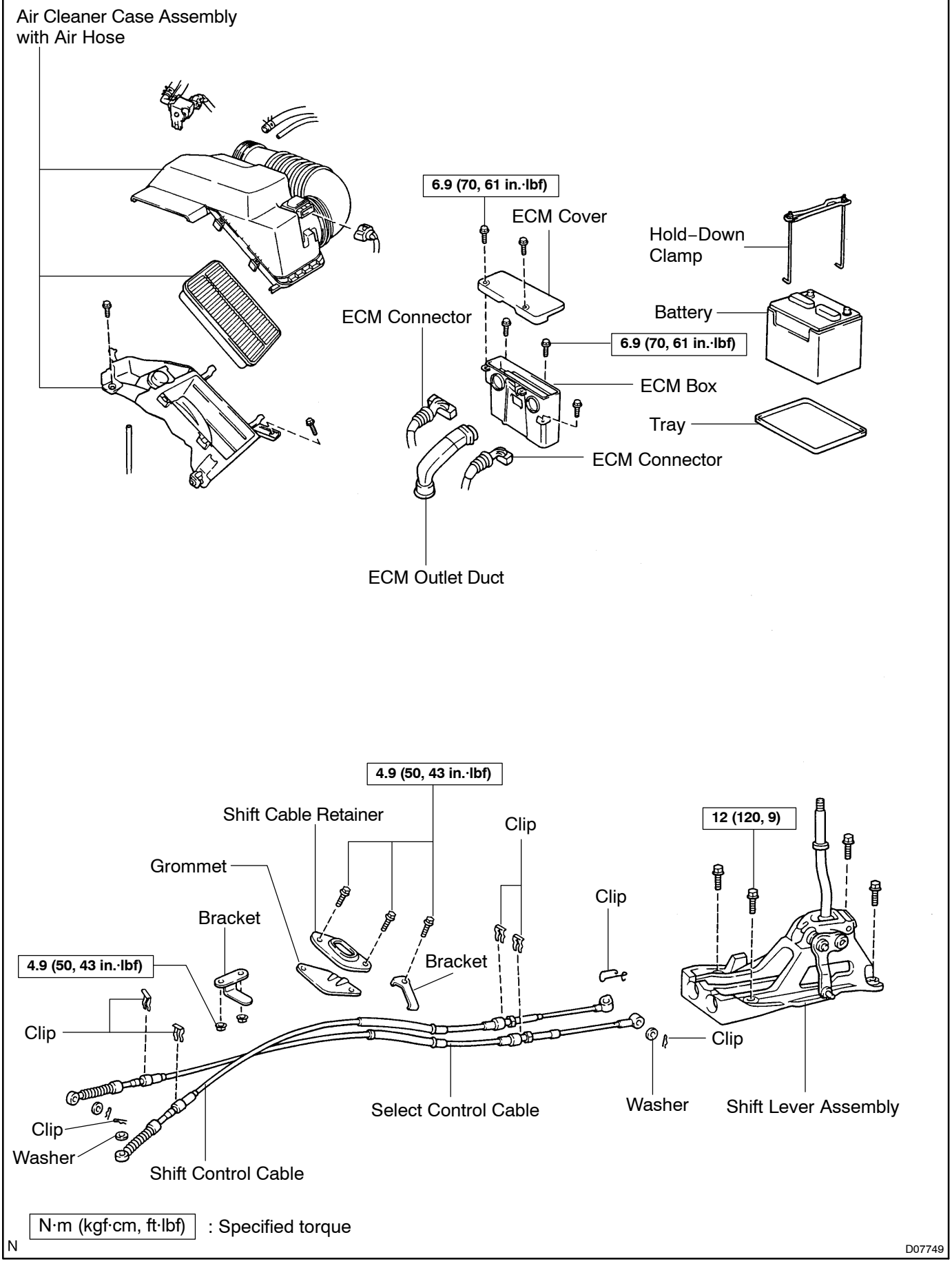
COMPONENTS

MX09V–06




Instrument Panel
Heater Hose
◆ O–Ring
Clamp
Liquid Tube
Suction Tube
Clamp
Reinforcement
No. 1 Brace
No. 2 Brace
A/C Unit
Blower Unit
◆ Non–reusable part
I13009

P


Air Cleaner Case Assembly with Air Hose
6.9 (70, 61 in.·lbf)
ECM Cover
Hold–Down Clamp
ECM Connector
Battery
6.9 (70, 61 in.·lbf)
ECM Box
Tray
ECM Connector
ECM Outlet Duct
4.9 (50, 43 in.·lbf)
Shift Cable Retainer
Clip
12 (120, 9)
Grommet
Clip
Bracket
Bracket
4.9 (50, 43 in.·lbf)
Clip
Clip
Clip
Select Control Cable
Washer
Shift Lever Assembly
Clip
Washer
Shift Control Cable
N·m (kgf·cm, ft·lbf) : Specified torque
N
D07749

TROUBLESHOOTING

MX01B–06

PROBLEM SYMPTOMS TABLE

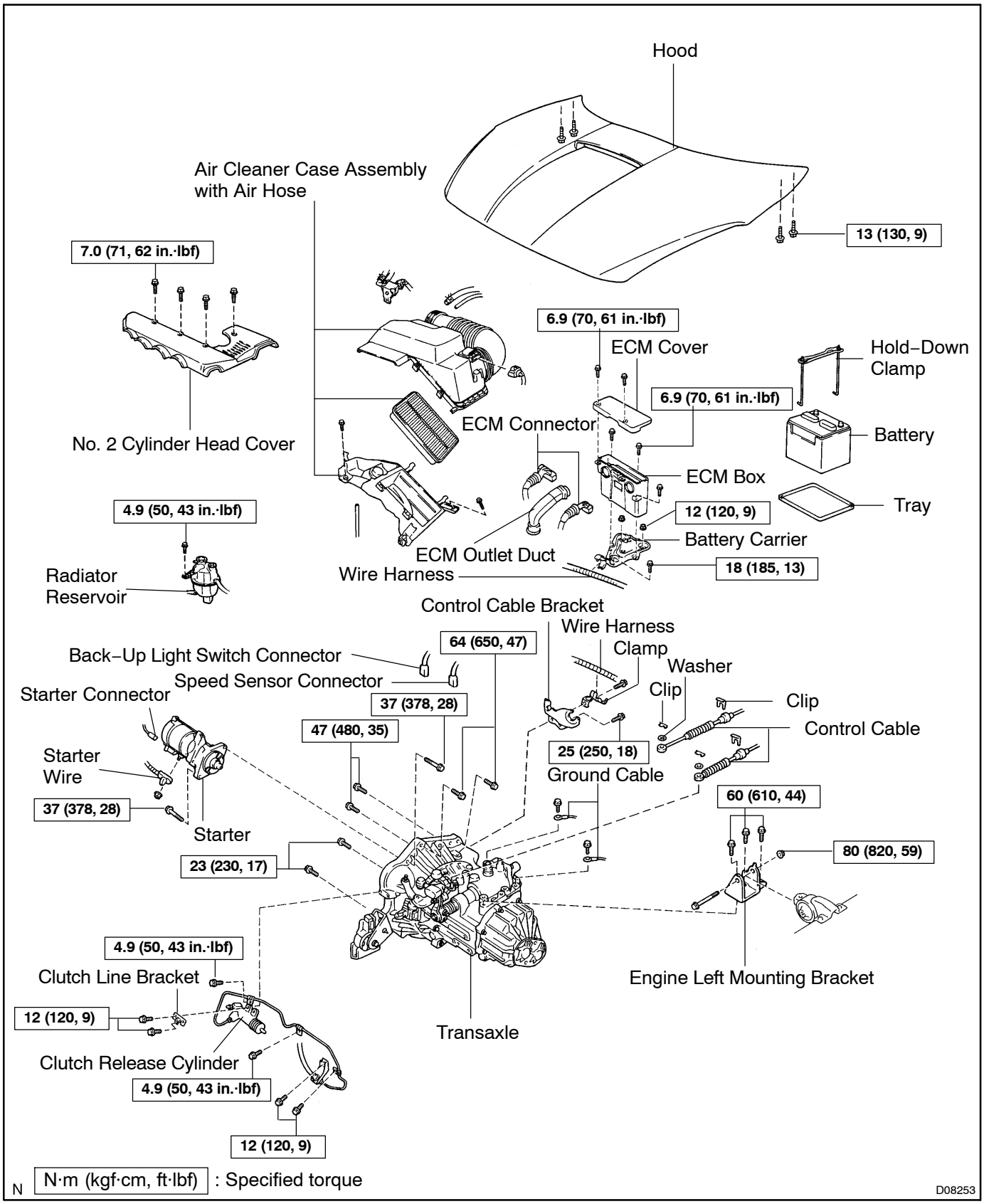
Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

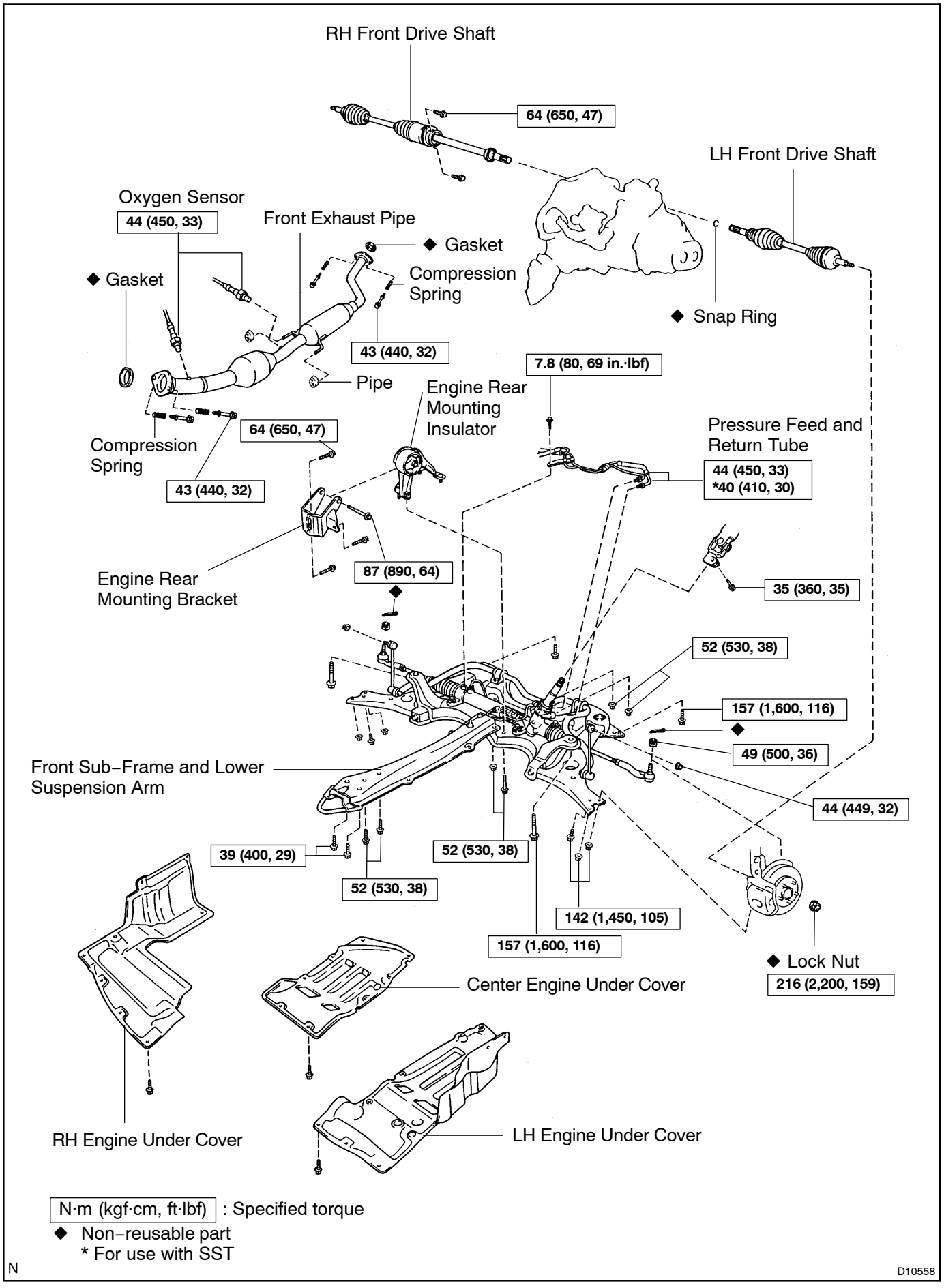
Symptom	Suspect Area	See page
Noise	1. Oil (Level low)	MX–4
	2. Oil (Wrong)	MX–4
	3. Gear (Worn or damaged)	MX–10
	4. Bearing (Worn or damaged)	MX–10
Oil leakage	1. Oil (Level too high)	MX–4
	2. Gasket (Damaged)	MX–10
	3. Oil seal (Worn or damaged)	MX–10
	4. O–Ring (Worn or damaged)	MX–10
Hard to shift or will not shift	1. Control cable (Faulty)	MX–58
	2. Synchronizer ring (Worn or damaged)	MX–25
		MX–33
		MX–42
	3. Shifting key spring (Damaged)	MX–25
		MX–33
		MX–42
Jumps out of gear	1. Locking ball spring (Damaged)	MX–25
	2. Gear shift fork (Worn)	MX–25
	3. Gear (Worn or damaged)	MX–25
	4. Bearing (Worn or damaged)	MX–25
Reverse shift warning buzzer does not sound	1. GAUGE fuse	BE–10
	2. Ignition switch	BE–14
	3. Back–up light switch	MX–56
	4. Reverse shift warning buzzer	MX–56
	5. Wire harness	–

MANUAL TRANSAXLE UNIT

COMPONENTS

MX09X–05





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
* For use with SST

N

D10558

MX09Y–03

REMOVAL

1. REMOVE HOOD

HINT:

At the time of installation, please refer to the following item.

Adjust the hood. (See page BO–9)

2. REMOVE NO. 2 CYLINDER HEAD COVER

Remove the 4 bolts and No. 2 cylinder head cover.

Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

3. DISCONNECT RADIATOR RESERVOIR

Remove the bolt and disconnect the radiator reservoir.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

4. REMOVE BATTERY

5. REMOVE AIR CLEANER CASE ASSEMBLY WITH AIR HOSE AND ECM BOX

(a) Remove the 2 bolts and ECM cover.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

(b) Disconnect the ECM connectors from the ECM.

(c) Remove the ECM outlet duct.

(d) Remove the air cleaner case assembly with the air hose.

(e) Remove the 3 bolts and ECM box.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

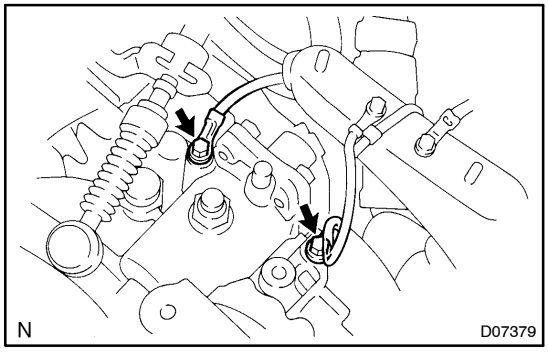
(f) Disconnect the wire harness, and remove the 2 nuts, bolt and battery carrier.

Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)

6. DISCONNECT CONTROL CABLE

(a) Remove the 2 clips and washers.

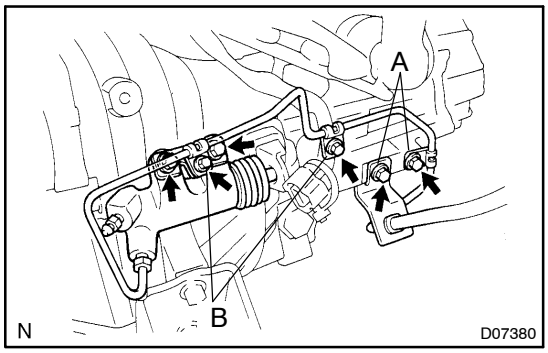
(b) Remove the 2 clips and disconnect the control cables from the transaxle.



7. DISCONNECT GROUND CABLE

Remove the 2 set bolts of the 2 ground cables from the transaxle.

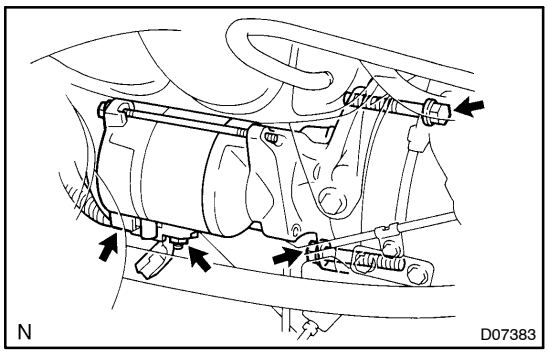
8. DISCONNECT SPEED SENSOR AND BACK–UP LIGHT SWITCH CONNECTORS



9. DISCONNECT CLUTCH RELEASE CYLINDER

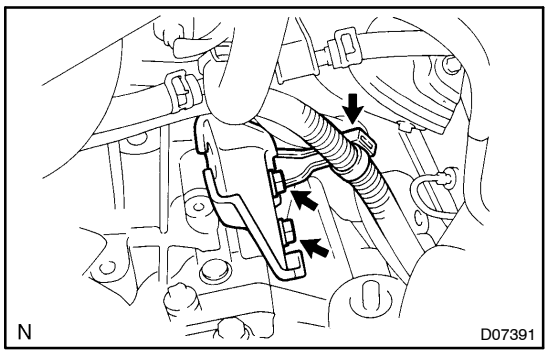
(a) Remove the 4 set bolts of the clutch line.
Torque:
Bolt A: 12 N·m (120 kgf·cm, 9 ft·lbf)
Bolt B: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

(b) Remove the 2 set bolts of the clutch release cylinder and clutch line bracket.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



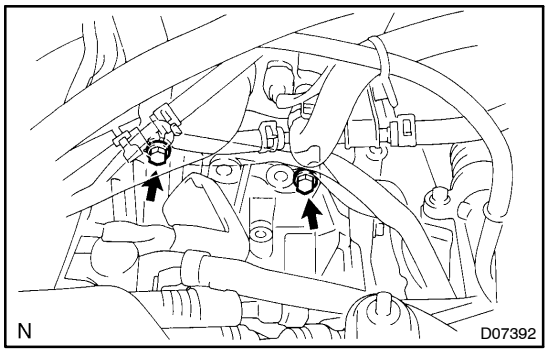
10. REMOVE STARTER

(a) Disconnect the starter connector.
(b) Remove the nut and disconnect the starter wire.
(c) Remove the 2 bolts and starter.
Torque: 37 N·m (378 kgf·cm, 28 ft·lbf)



11. REMOVE CONTROL CABLE BRACKET

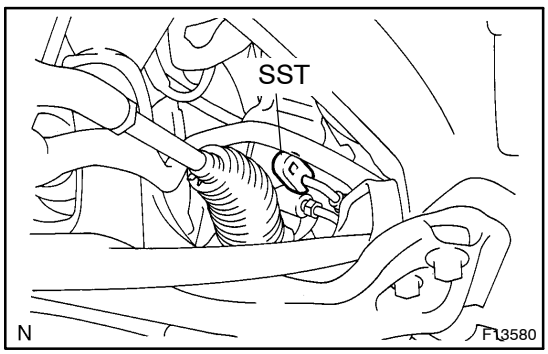
(a) Disconnect the wire harness from the clamp.
(b) Remove the 2 bolts, clamp and control cable bracket from the transaxle.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



12. REMOVE 2 TRANSAXLE UPPER SIDE MOUNTING BOLTS
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

13. DISCONNECT RH AND LH TIE ROD ENDS (See page SA–13)

14. DISCONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY (See page SR–13)

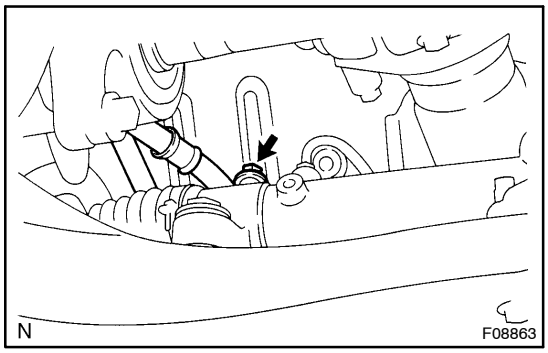


15. DISCONNECT PRESSURE FEED AND RETURN TUBES

Using SST, disconnect the pressure feed and return tubes.
SST 09023–38400
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

HINT:

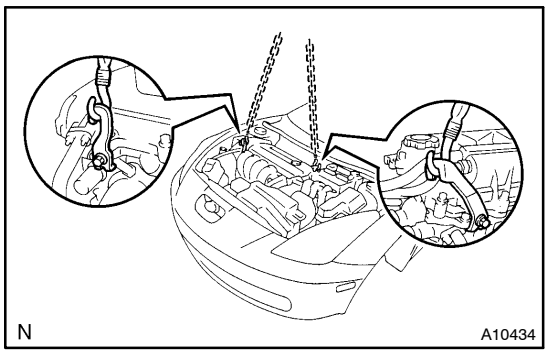
- Use torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.



16. DISCONNECT TUBE CLAMP

Remove the bolt and disconnect the tube clamp.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)



17. ATTACH ENGINE SLING DEVICE TO ENGINE HANGER

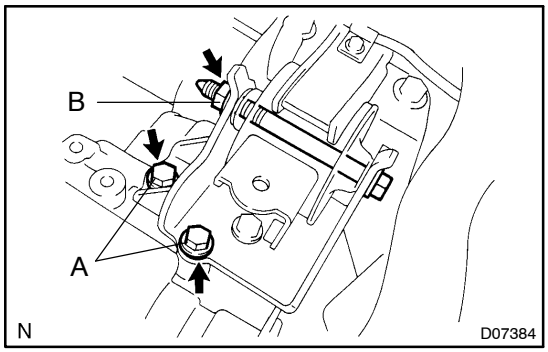
(a) Disconnect the 2 PCV hoses.

(b) Install the No. 1 and No. 2 engine hangers in the correct direction.

Parts No.:
No. 1 engine hanger: 12281–88600
No. 2 engine hanger: 12282–88600
Bolt: 91512–61020
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

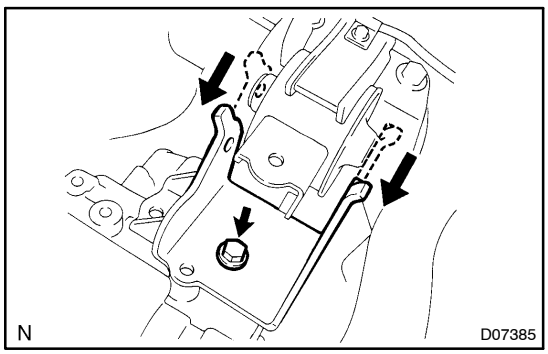
(c) Attach the engine chain hoist to the engine hangers.

CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.



18. REMOVE ENGINE LEFT MOUNTING BRACKET 3 SET BOLTS AND NUT

Torque:
Bolt A: 60 N·m (610 kgf·cm, 44 ft·lbf)
Nut B: 80 N·m (820 kgf·cm, 59 ft·lbf)



19. REMOVE ENGINE LEFT MOUNTING BRACKET

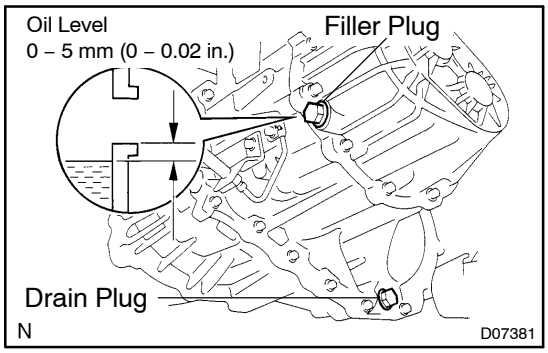
Lower the transaxle side, and remove the bolt and engine left mounting bracket.

Torque: 60 N·m (610 kgf·cm, 44 ft·lbf)

20. RAISE VEHICLE

CAUTION:
Make sure that the vehicle is securely supported.

21. REMOVE CENTER, LH AND RH ENGINE UNDER COVERS



22. DRAIN TRANSAXLE OIL
Oil grade: API GL–4 or GL–5
Viscosity: SAE 75W–90
Capacity: 2.3 liters (2.4 US qts, 2.0 Imp. qts)
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

23. REMOVE LH AND RH FRONT DRIVE SHAFTS
(See page SA–21)

24. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the 2 heated oxygen sensors.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

HINT:
At the time of installation, please refer to the following items.

- Before installing the heated oxygen sensor, twist the sensor wire counterclockwise 3 and 1/2 turns.
- After installing the heated oxygen sensor, check that the sensor wire is not twisted. If it is twisted, remove the heated oxygen sensor and reinstall it.

(b) Remove the 4 bolts, compression springs and 2 gaskets.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

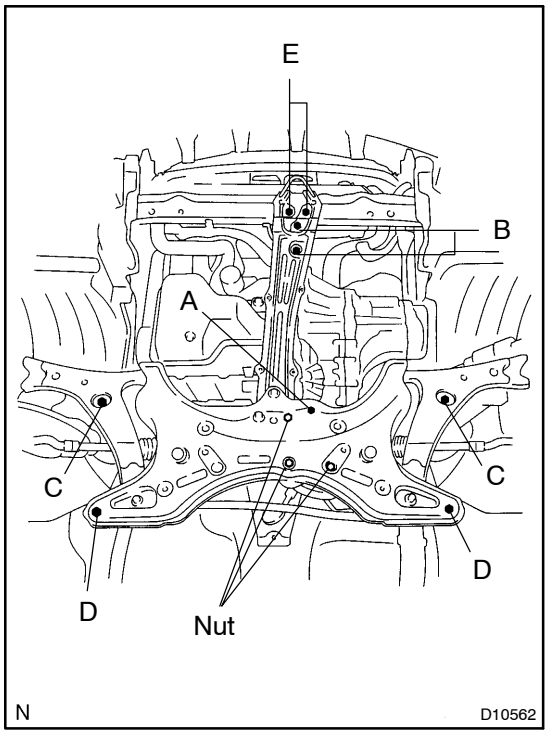
(c) Disconnect the front exhaust pipe from the pipe supports and remove it.

25. DISCONNECT LOWER BALL JOINT FROM LOWER SUSPENSION ARM (See page SA–43)

26. DISCONNECT STABILIZER BAR LINK

(a) Remove the nut and disconnect the stabilizer bar link.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Employ the same manner described above to the other side.



27. DISCONNECT ENGINE REAR MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Remove the bolt (bolt A) and 3 nuts, and disconnect the engine rear mount insulator and front suspension member.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

28. DISCONNECT ENGINE FRONT MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Remove the 2 bolts (bolt B) and disconnect the engine front mount insulator and front suspension member.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

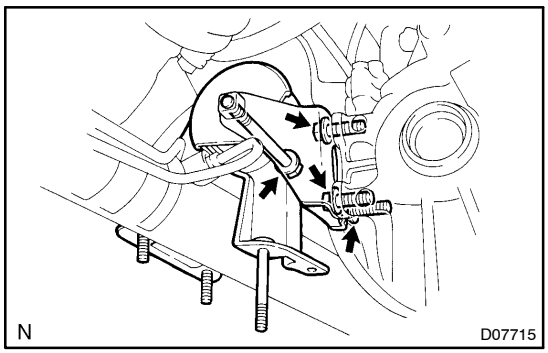
29. SUPPORT FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM

Using a transmission jack, support the front suspension member with lower suspension arm.

30. REMOVE FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM AND PS GEAR ASSEMBLY

Remove the 6 bolts (bolt C, D and E) and front suspension member with lower suspension arm and PS gear assembly.

Torque:
Bolt C: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt D: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt E: 39 N·m (400 kgf·cm, 29 ft·lbf)



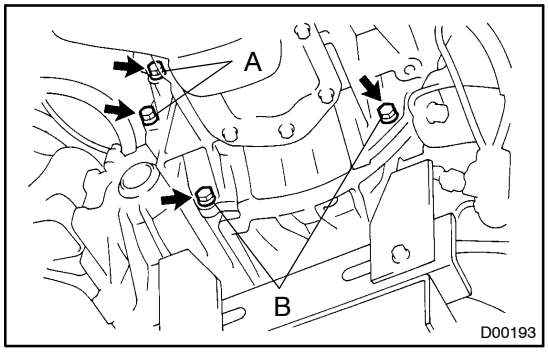
31. REMOVE ENGINE REAR MOUNTING INSULATOR AND BRACKET

(a) Remove the bolt and engine rear mounting insulator.
Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

(b) Remove the 3 bolts and engine rear mounting bracket.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

32. JACK UP TRANSAXLE SLIGHTLY

Using a transmission jack, support the transaxle.



33. REMOVE 4 TRANSAXLE LOWER SIDE MOUNTING BOLTS
Torque:
Bolt A: 47 N·m (480 kgf·cm, 35 ft·lbf)
Bolt B: 23 N·m (230 kgf·cm, 17 ft·lbf)

34. REMOVE TRANSAXLE

Lower the engine left side and remove the transaxle from the engine.

HINT:

At the time of installation, please refer to the following items.

- Align the input shaft with the clutch disc and install the transaxle to the engine.
- Temporarily tighten the transaxle mounting bolts.

MX01E–07

INSTALLATION

Installation is in the reverse order of removal. (See page MX–4)

HINT:

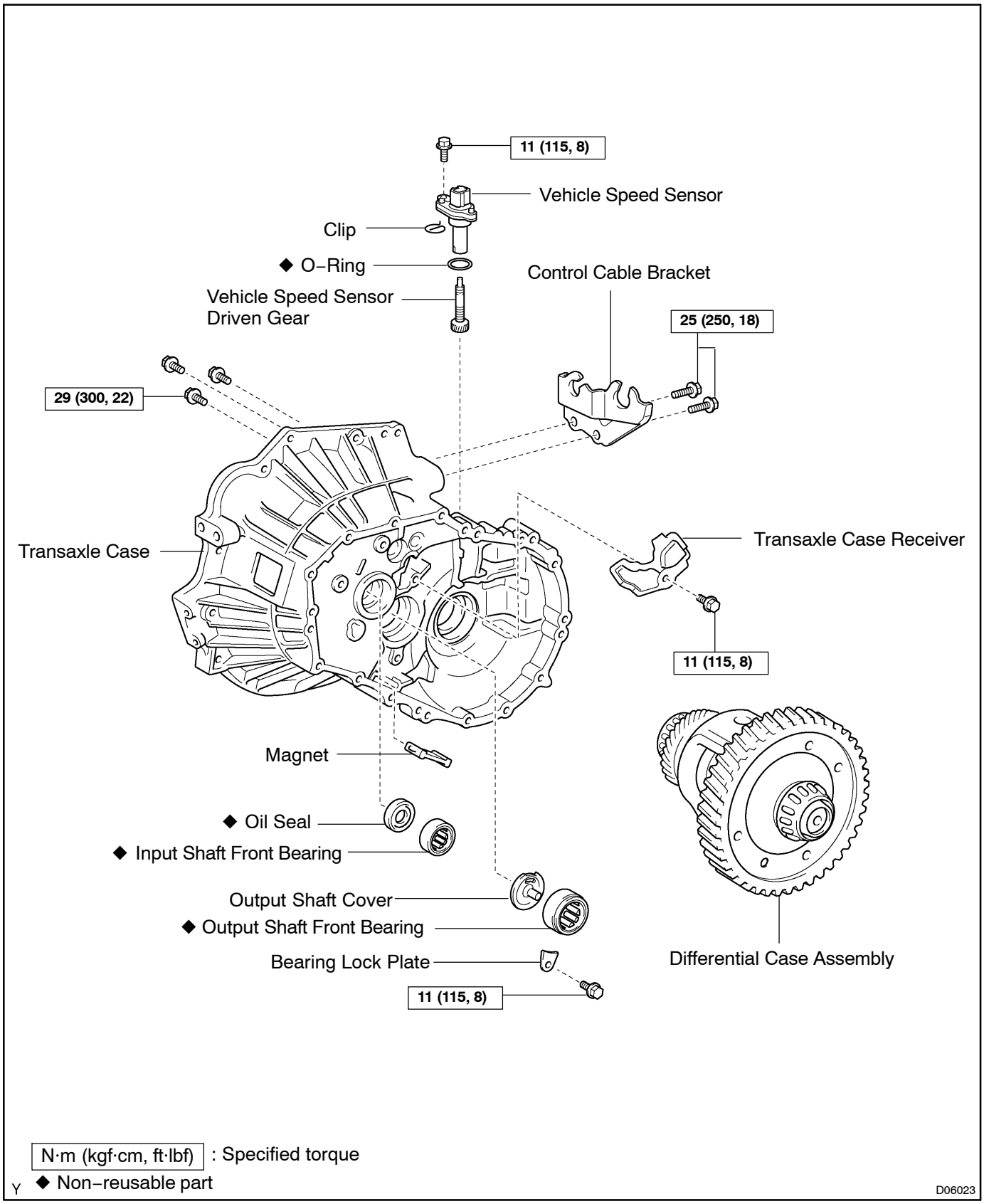
After installation, check and inspect items as follows.

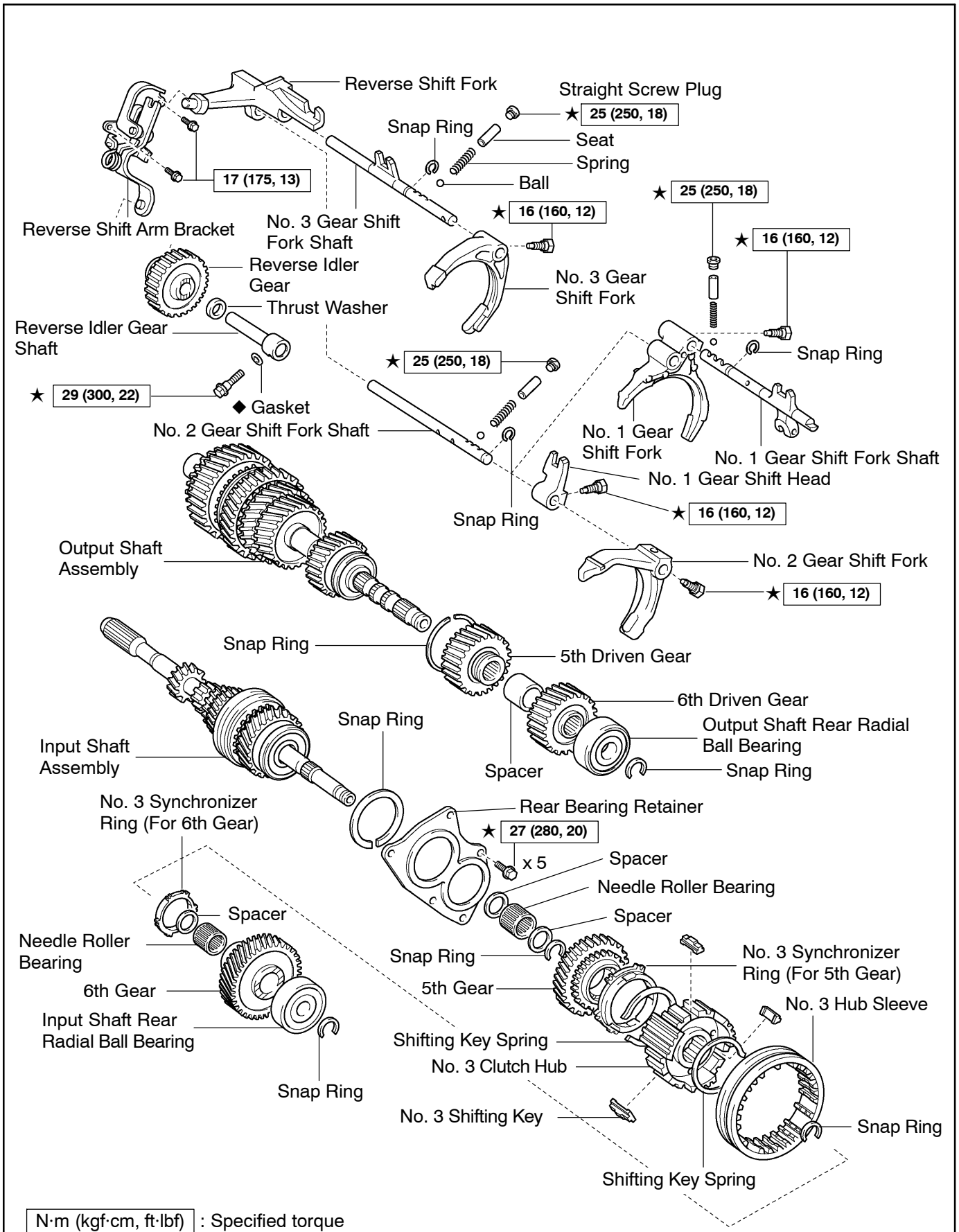
- Bleed power steering system (See page SR–4).
- Front wheel alignment. (See page SA–5)
- Do the road test.

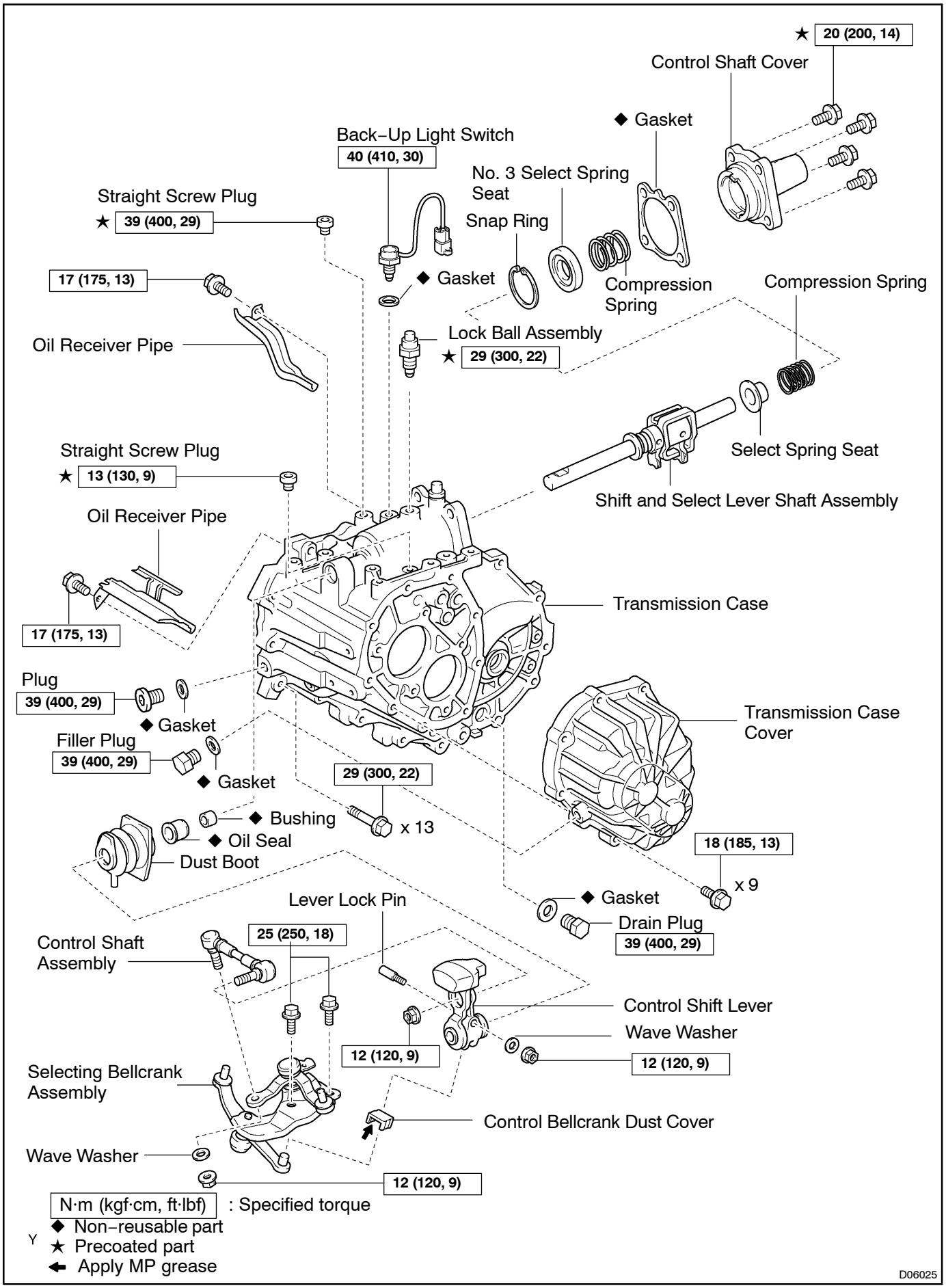
MANUAL TRANSAXLE ASSEMBLY

COMPONENTS

MX01F–05




Reverse Shift Fork
Straight Screw Plug
★ 25 (250, 18)
Snap Ring
Seat
Spring
Ball
17 (175, 13)
Reverse Shift Arm Bracket
No. 3 Gear Shift Fork Shaft
★ 16 (160, 12)
★ 25 (250, 18)
★ 16 (160, 12)
Reverse Idler Gear
Thrust Washer
No. 3 Gear Shift Fork
Reverse Idler Gear Shaft
★ 25 (250, 18)
Snap Ring
★ 29 (300, 22)
◆ Gasket
No. 2 Gear Shift Fork Shaft
No. 1 Gear Shift Fork
No. 1 Gear Shift Fork Shaft
No. 1 Gear Shift Head
Snap Ring
★ 16 (160, 12)
Output Shaft Assembly
No. 2 Gear Shift Fork
★ 16 (160, 12)
Snap Ring
5th Driven Gear
6th Driven Gear
Snap Ring
Output Shaft Rear Radial Ball Bearing
Input Shaft Assembly
Spacer
Snap Ring
No. 3 Synchronizer Ring (For 6th Gear)
Rear Bearing Retainer
★ 27 (280, 20)
x 5
Spacer
Needle Roller Bearing
Spacer
Spacer
Needle Roller Bearing
Snap Ring
No. 3 Synchronizer Ring (For 5th Gear)
6th Gear
5th Gear
No. 3 Hub Sleeve
Input Shaft Rear Radial Ball Bearing
Shifting Key Spring
No. 3 Clutch Hub
Snap Ring
No. 3 Shifting Key
Snap Ring
Shifting Key Spring
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
★ Precoated part
Y
D06024


★ 20 (200, 14)
Control Shaft Cover
◆ Gasket
Back–Up Light Switch
40 (410, 30)
No. 3 Select Spring Seat
Straight Screw Plug
★ 39 (400, 29)
Snap Ring
17 (175, 13)
◆ Gasket
Compression Spring
Compression Spring
Oil Receiver Pipe
Lock Ball Assembly
★ 29 (300, 22)
Straight Screw Plug
★ 13 (130, 9)
Select Spring Seat
Shift and Select Lever Shaft Assembly
Oil Receiver Pipe
17 (175, 13)
Transmission Case
Plug
39 (400, 29)
◆ Gasket
Transmission Case Cover
Filler Plug
39 (400, 29)
◆ Gasket
29 (300, 22)
x 13
◆ Bushing
◆ Oil Seal
Dust Boot
18 (185, 13)
x 9
◆ Gasket
Lever Lock Pin
Drain Plug
39 (400, 29)
25 (250, 18)
Control Shaft Assembly
Control Shift Lever
Wave Washer
12 (120, 9)
12 (120, 9)
Selecting Bellcrank Assembly
Control Bellcrank Dust Cover
Wave Washer
12 (120, 9)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
★ Precoated part
Apply MP grease
Y
D06025

MX09Z–04

DISASSEMBLY

1. REMOVE FILLER PLUG AND DRAIN PLUG WITH 2 GASKETS

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

2. REMOVE VEHICLE SPEED SENSOR

(a) Remove the bolt and vehicle speed sensor.

Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

(b) Using a small screwdriver, remove the clip from the vehicle speed sensor.

(c) Remove the vehicle speed sensor driven gear from the speed sensor.

(d) Using a small screwdriver, remove the O–ring from the vehicle speed sensor.

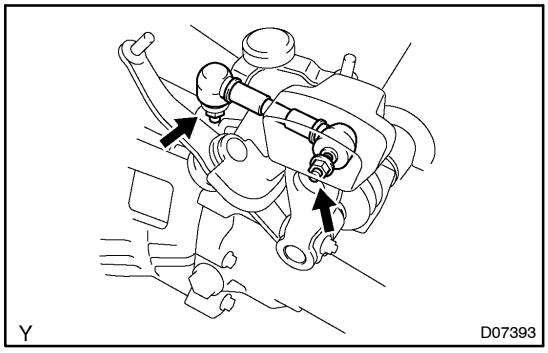
3. REMOVE BACK–UP LIGHT SWITCH WITH GASKET

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

4. REMOVE CONTROL CABLE BRACKET

Remove the 2 bolts and control cable bracket.

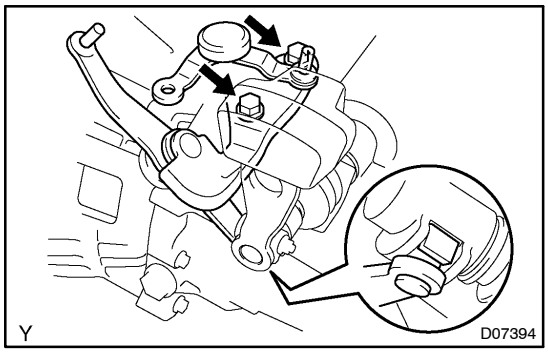
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



5. REMOVE CONTROL SHAFT ASSEMBLY

Remove the 2 nuts, wave washer and control shaft assembly.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



6. REMOVE SELECTING BELLCRANK ASSEMBLY

(a) Remove the 2 bolts and selecting bellcrank assembly.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

NOTICE:

At the time of reassembly, please refer to the following item.

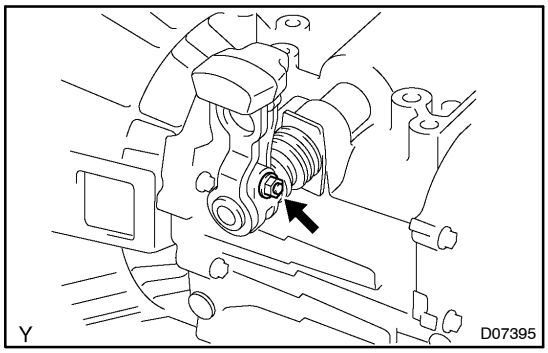
Fit the selecting bellcrank assembly pin part with the dust cover into a groove in the control shift lever.

(b) Remove the control bellcrank dust cover from the selecting bellcrank assembly.

NOTICE:

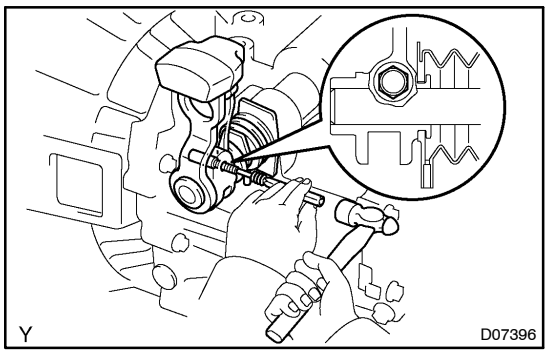
At the time of reassembly, please refer to the following item.

Apply MP grease to the inside circumferential surface of the control bellcrank dust cover.



7. REMOVE CONTROL SHIFT LEVER AND DUST BOOT

(a) Remove the nut and wave washer.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



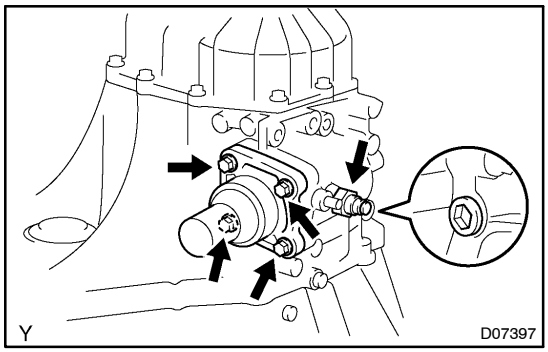
(b) Using a pin punch and hammer, drive out the lever lock pin.

NOTICE:
At the time of reassembly, please refer to the following item.
When fixing the lever lock pin, properly position the shaft groove.

(c) Remove the control shift lever and dust boot.

NOTICE:
At the time of reassembly, please refer to the following items.

- **Install the dust boot into a groove in the control shift lever.**
- **Be sure to install the dust boot in the correct direction, as shown in the illustration.**

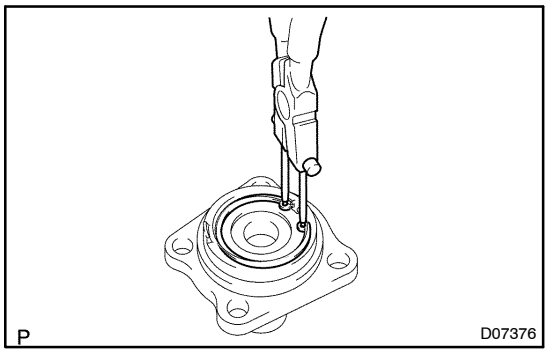


8. REMOVE PLUG, LOCK BALL ASSEMBLY AND CONTROL SHAFT COVER ASSEMBLY

(a) Using a hexagon wrench, remove the plug and gasket.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Remove the lock ball assembly.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

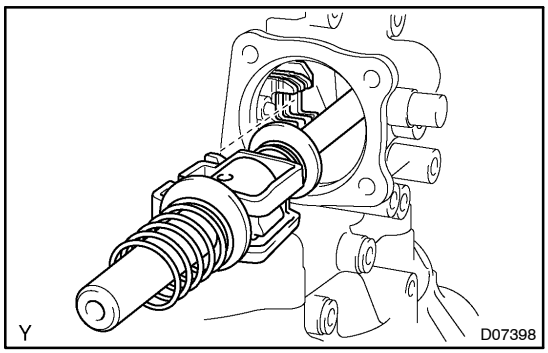
(c) Remove the 4 bolts and control shaft cover assembly with the gasket.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



9. DISASSEMBLE CONTROL SHAFT COVER ASSEMBLY

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the No. 3 select spring seat and compression spring.



10. REMOVE SHIFT AND SELECT LEVER SHAFT ASSEMBLY

(a) Remove the shift and select lever shaft assembly.

NOTICE:

At the time of reassembly, please refer to the following item.

Set the claws of the shift interlock plate into the shift head part of the gear shift fork shaft securely.

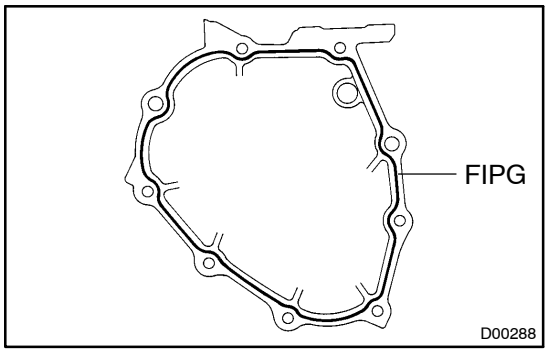
(b) Remove the select spring seat and compression spring from the shift and select lever shaft assembly.

11. REMOVE TRANSMISSION CASE COVER

(a) Remove the 9 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) Carefully tap the projection of the transmission case cover with a brass bar and hammer and remove it.



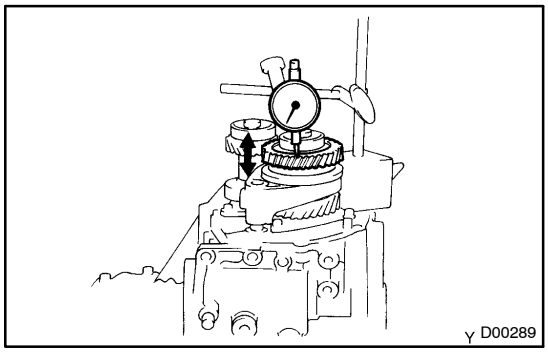
HINT:

At the time of reassembly, please refer to the following item.

Apply FIPG to the transmission case side, as shown in the illustration.

FIPG:

Part No. 08826–00090, THREE BOND 1281 or equivalent



12. INSPECT 6TH GEAR THRUST CLEARANCE

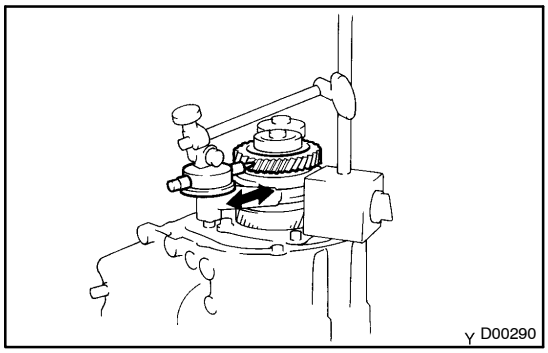
Using a dial indicator, measure the thrust clearance.

Standard clearance:

0.10 – 0.60 mm (0.0039 – 0.0236 in.)

Maximum clearance:

0.60 mm (0.0236 in.)

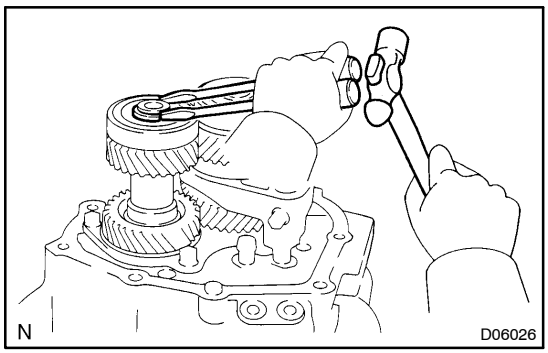


13. INSPECT 6TH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance.

Standard clearance:
0.009 – 0.050 mm (0.0003 – 0.0020 in.)
Maximum clearance:
0.050 mm (0.0020 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.



14. REMOVE OUTPUT SHAFT REAR RADIAL BALL BEARING, 6TH DRIVEN GEAR AND SPACER

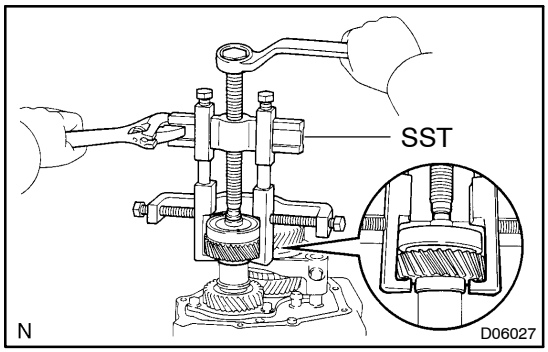
(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

At the time of reassembly, please refer to the following item.

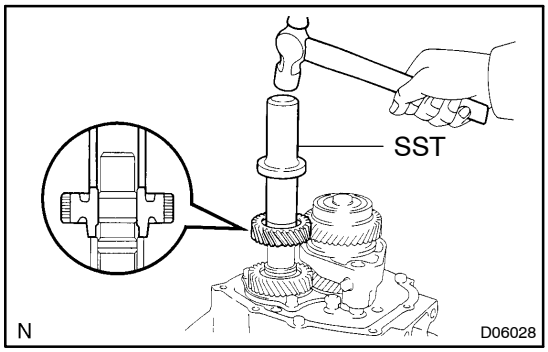
Select a snap ring from the table below that will make the thrust clearance of the output shaft rear radial ball bearing less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
B	2.31 (0.0909)	H	2.67 (0.1051)
C	2.37 (0.0933)	J	2.73 (0.1075)
D	2.43 (0.0957)	K	2.79 (0.1098)
E	2.49 (0.0980)	L	2.85 (0.1122)
F	2.55 (0.1004)	M	2.91 (0.1146)
G	2.61 (0.1028)	–	–



(b) Using SST, remove the rear radial ball bearing and 6th driven gear.

SST 09950–40011 (09951–04010, 09952–04010, 09953–04030, 09954–04010, 09955–04021, 09957–04010, 09958–04011)



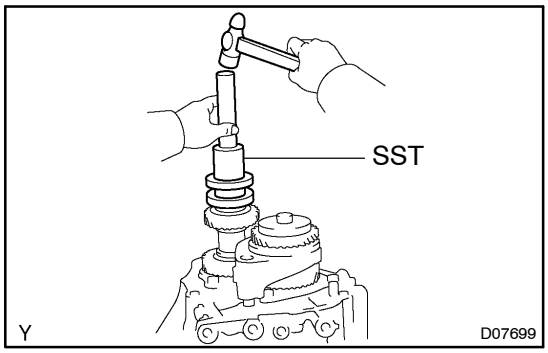
HINT:

At the time of reassembly, please refer to the following items.

- Using SST and a hammer, drive in the 6th driven gear.
  SST 09325–12010

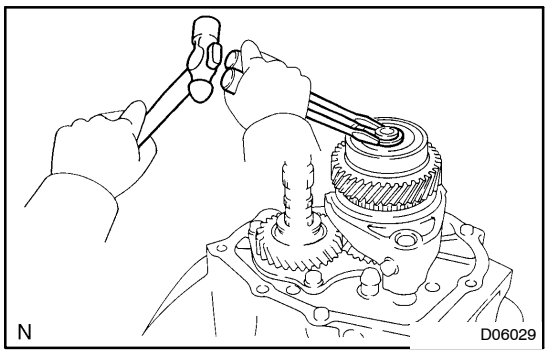
NOTICE:

Be sure to install the 6th driven gear in the correct direction, as shown in the illustration.



- Set SST to the rear radial ball bearing inner race securely, drive in the bearing with a hammer.
  SST 09517–12010

(c) Remove the spacer.

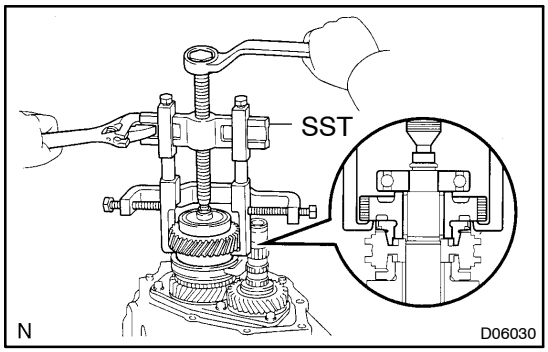


15. REMOVE INPUT SHAFT REAR RADIAL BALL BEARING AND 6TH GEAR

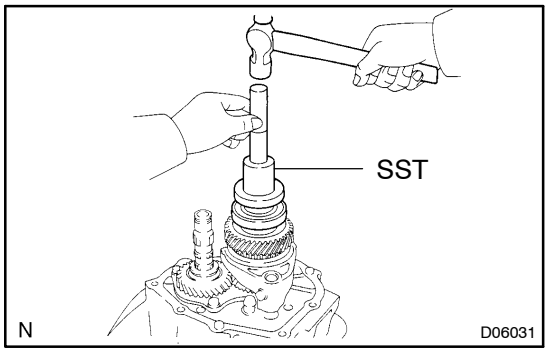
(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:
At the time of reassembly, please refer to the following item.
Select a snap ring from the table below that will make the thrust clearance of the No. 3 clutch hub less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.70 (0.0669)	G	2.00 (0.0787)
B	1.75 (0.0689)	H	2.05 (0.0807)
C	1.80 (0.0709)	J	2.10 (0.0827)
D	1.85 (0.0728)	K	2.15 (0.0846)
E	1.90 (0.0748)	L	2.20 (0.0866)
F	1.95 (0.0768)	M	2.25 (0.0886)

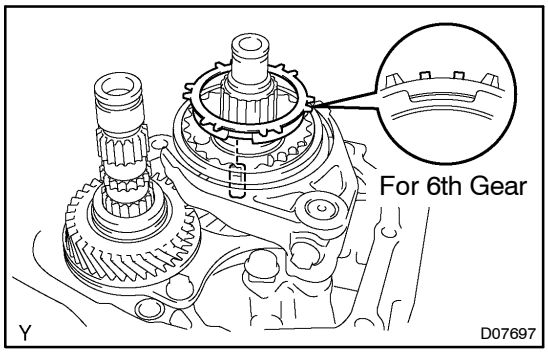


(b) Using SST, remove the rear radial ball bearing and 6th gear.
SST 09950–40011 (09951–04010, 09952–04010, 09953–04030, 09954–04010, 09955–04021, 09957–04010, 09958–04011)



HINT:
At the time of reassembly, please refer to the following item.
Set SST to the rear radial ball bearing inner race securely, drive in the bearing with a hammer.
SST 09517–12010

(c) Remove the needle roller bearing and spacer.

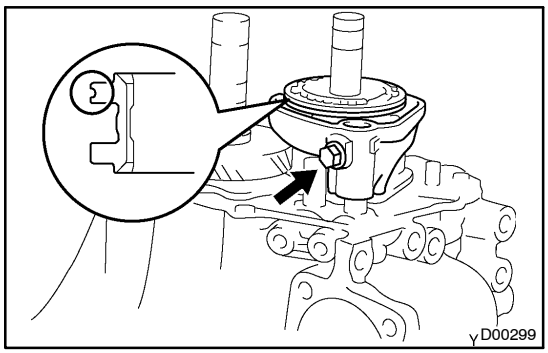


16. REMOVE NO. 3 SYNCHRONIZER RING (FOR 6TH GEAR)

NOTICE:

At the time of reassembly, please refer to the following items.

- **Align the No. 3 synchronizer ring slots with the No. 3 shifting keys.**
- **Distinguish the No. 3 synchronizer ring (for the 6th gear) by the teeth on the synchronizer ring.**



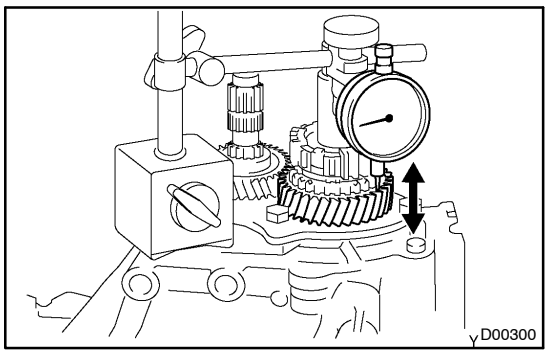
17. REMOVE NO. 3 GEAR SHIFT FORK AND NO. 3 HUB SLEEVE

Remove the bolt, No. 3 gear shift fork and No. 3 hub sleeve.

Sealant:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



18. INSPECT 5TH GEAR THRUST CLEARANCE

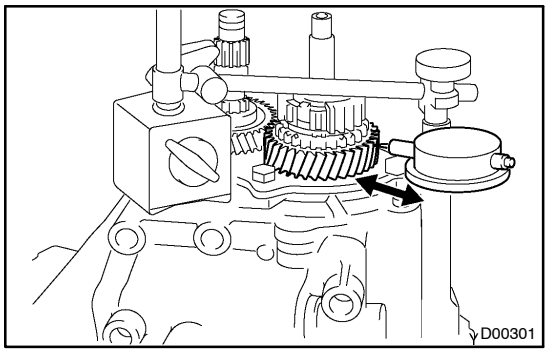
Using a dial indicator, measure the thrust clearance.

Standard clearance:

0.10 – 0.62 mm (0.0039 – 0.0244 in.)

Maximum clearance:

0.62 mm (0.0244 in.)



19. INSPECT 5TH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance.

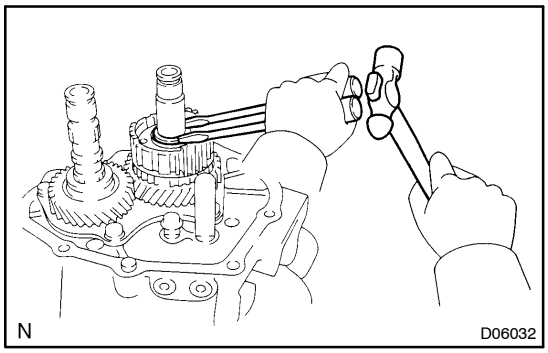
Standard clearance:

0.015 – 0.056 mm (0.0006 – 0.0022 in.)

Maximum clearance:

0.056 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.



20. REMOVE 5TH GEAR, NO. 3 SYNCHRONIZER RING (FOR 5TH GEAR) AND NO. 3 CLUTCH HUB ASSEMBLY

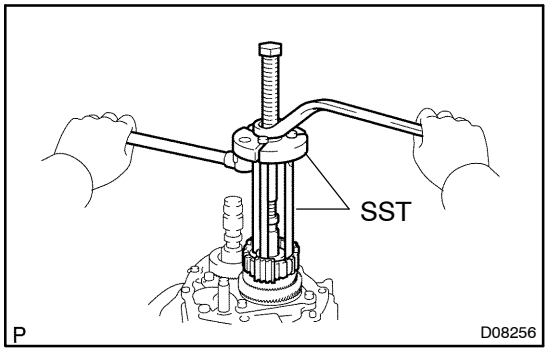
(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

At the time of reassembly, please refer to the following item.

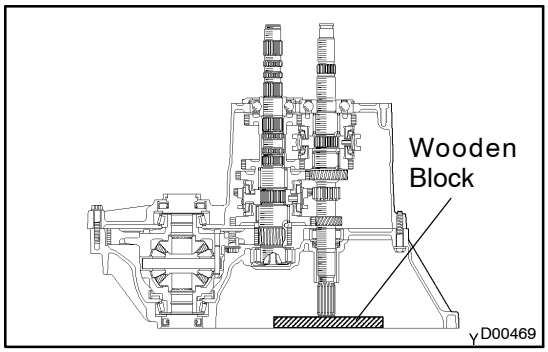
Select a snap ring from the table below that will make the thrust clearance of the No. 3 clutch hub less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.75 (0.0689)	F	2.00 (0.0787)
B	1.80 (0.0709)	G	2.05 (0.0807)
C	1.85 (0.0728)	H	2.10 (0.0827)
D	1.90 (0.0748)	J	2.15 (0.0846)
E	1.95 (0.0768)	–	–



(b) Using SST, remove the No. 3 clutch hub assembly.

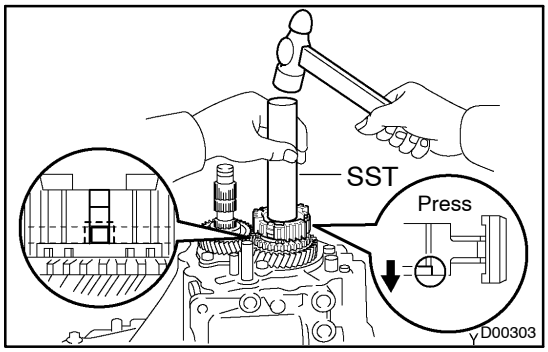
SST 09950–30012 (09951–03010, 09953–03010), 09950–50013 (09954–05031)



HINT:

At the time of reassembly, please refer to the following items.

- Before driving in the No. 3 clutch hub assembly and input shaft rear radial ball bearing, place the suitable sized wooden block on the rear side of the input shaft, as shown in the illustration. When driving them in, fix the input shaft firmly so that it is not pushed downward. Otherwise the input shaft center bearing is overloaded, it might be damaged.

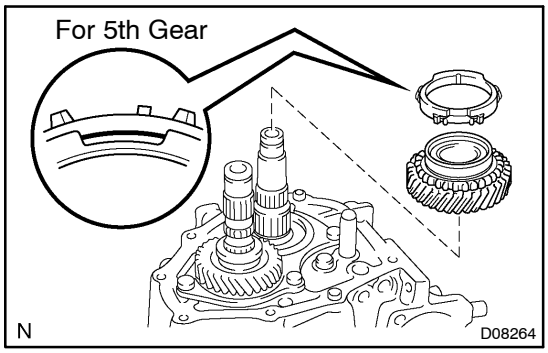


- Using SST and a hammer, drive in the No. 3 clutch hub assembly.

  SST 09612–22011

NOTICE:

- **Align the No. 3 synchronizer ring slots with the No. 3 shifting keys.**
- **Be sure to install the No. 3 clutch hub assembly in the correct direction, as shown in the illustration.**



(c) Remove the No. 3 synchronizer ring (for the 5th gear) and 5th gear from the input shaft.

NOTICE:

At the time of reassembly, please refer to the following item.

Distinguish the No. 3 synchronizer ring (for the 5th gear) by the teeth on the synchronizer ring.

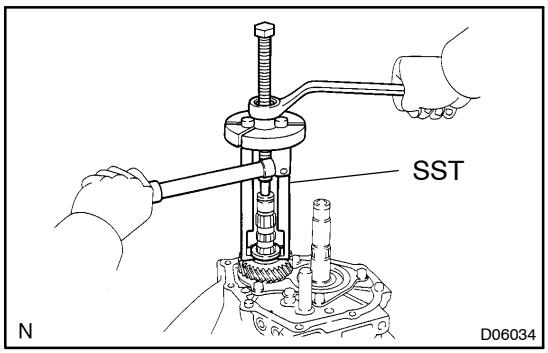
(d) Using 2 screwdrivers and a hammer, tap out the snap ring.

(e) Remove the needle roller bearing and 2 spacers.

21. REMOVE 5TH DRIVEN GEAR

Using SST, remove the 5th driven gear.

SST 09950–30012 (09951–03010, 09953–03010, 09954–03010, 09955–03021)

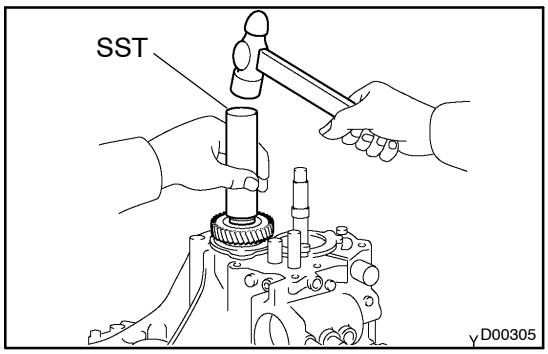


HINT:

At the time of reassembly, please refer to the following item.

Using SST and a hammer, drive in the 5th driven gear.

SST 09612–22011



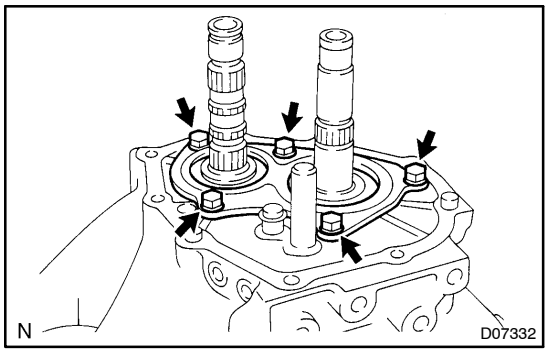
22. REMOVE REAR BEARING RETAINER

Remove the 5 bolts and rear bearing retainer.

Sealant:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

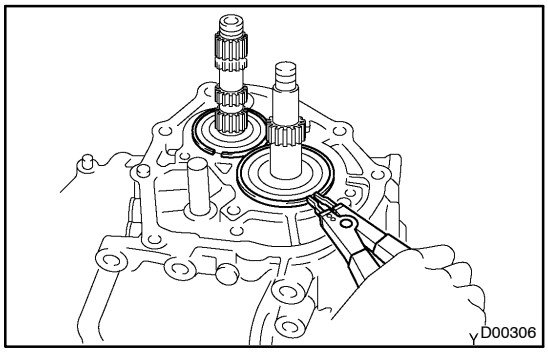


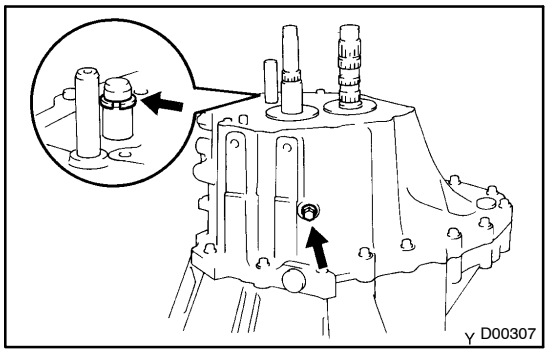
23. REMOVE BEARING SNAP RING

Using a snap ring expander, remove the 2 snap rings.

HINT:

If it is difficult to remove and install the snap rings, pull up the shafts.





24. REMOVE REVERSE IDLER GEAR SHAFT LOCK BOLT AND GASKET

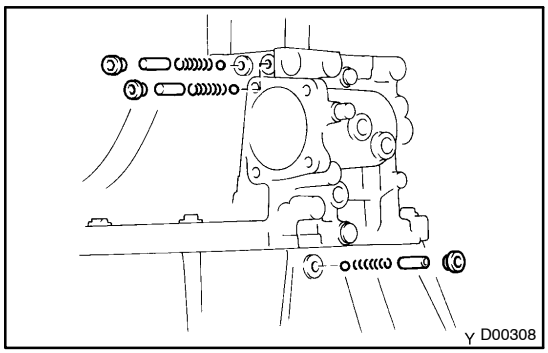
Sealant:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

25. REMOVE SNAP RING FROM NO. 2 SHIFT FORK SHAFT

Using 2 screwdrivers and a hammer, tap out the snap ring.



26. REMOVE STRAIGHT SCREW PLUG, SEAT, SPRING AND BALL

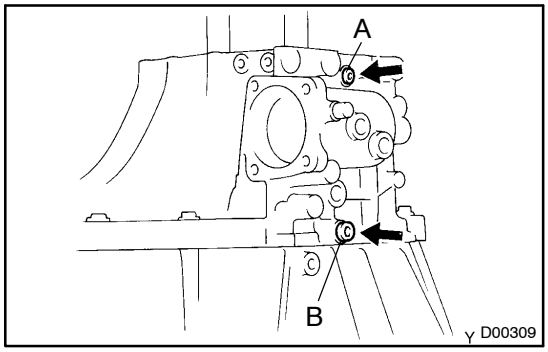
(a) Using a hexagon wrench, remove the 3 straight screw plugs.

Sealant:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Using a magnetic finger, remove the 3 seats, springs and balls.



27. REMOVE STRAIGHT SCREW PLUG

Using a hexagon wrench, remove the 2 straight screw plugs.

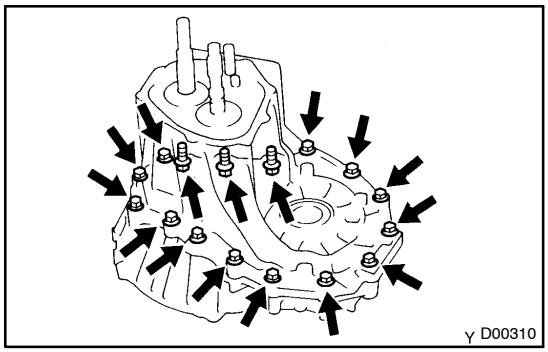
Sealant:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque:

Plug A: 13 N·m (130 kgf·cm, 9 ft·lbf)

Plug B: 39 N·m (400 kgf·cm, 29 ft·lbf)

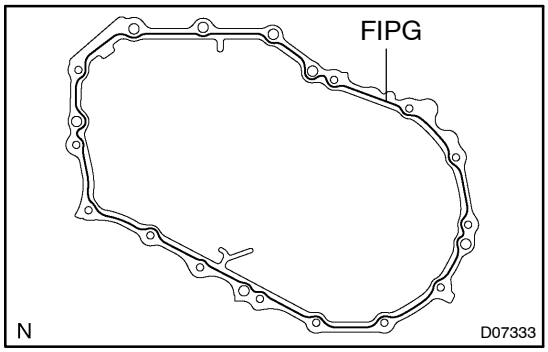


28. REMOVE TRANSMISSION CASE

(a) Remove the 16 bolts.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(b) Carefully tap the transmission case with a plastic hammer and remove it.



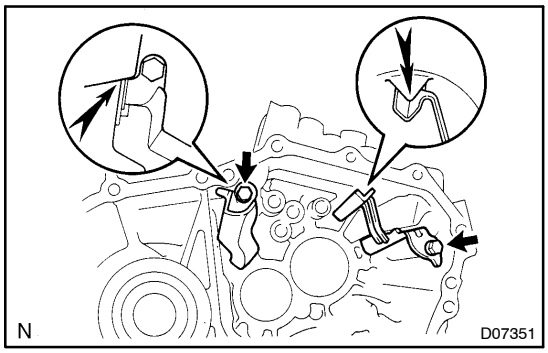
HINT:

At the time of reassembly, please refer to the following item.

Apply FIPG to the transaxle case side, as shown in the illustration.

FIPG:

Part No. 08826–00090, THREE BOND 1281 or equivalent



29. REMOVE OIL RECEIVER PIPE

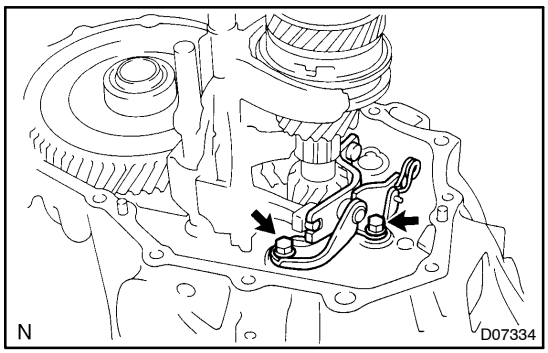
Remove the 2 bolts and oil receiver pipes from the transmission case.

Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)

NOTICE:

At the time of reassembly, please refer to the following items.

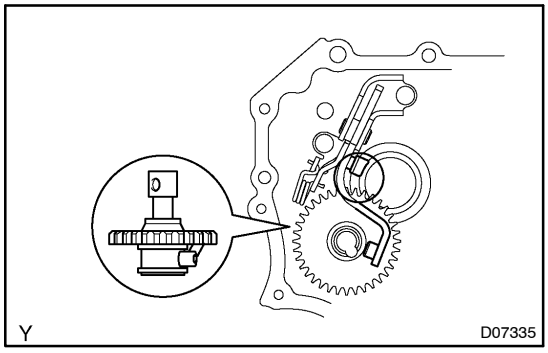
- **Prevent the oil receiver pipes from being deformed.**
- **Install the oil receiver pipes while placing it against the transmission case, as shown in the illustration.**



30. REMOVE REVERSE SHIFT ARM BRACKET

Remove the 2 bolts and reverse shift arm bracket.

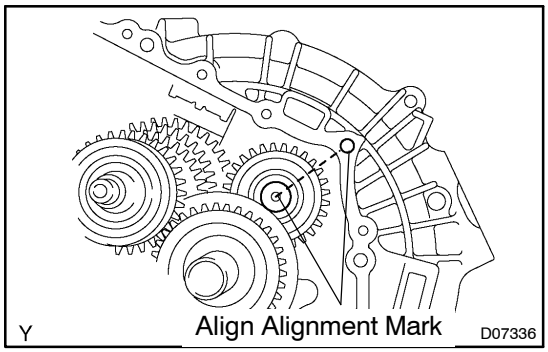
Torque: 17 N·m (175 kgf·cm, 13 ft·lbf)



NOTICE:

At the time of reassembly, please refer to the following items.

- **Set the pin on the top of the reverse shift arm into a groove on the reverse idler gear.**
- **Fit the claw of the reverse shift arm bracket with the notch of the input shaft front bearing.**

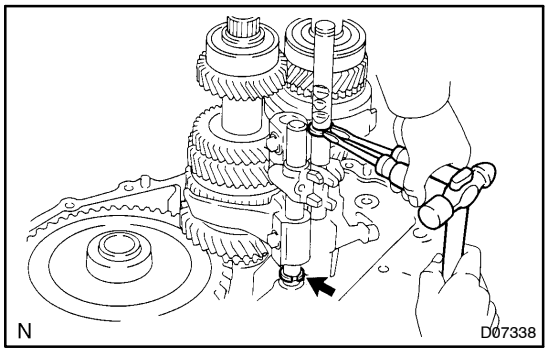


31. REMOVE REVERSE IDLER GEAR, THRUST WASHER AND SHAFT

NOTICE:

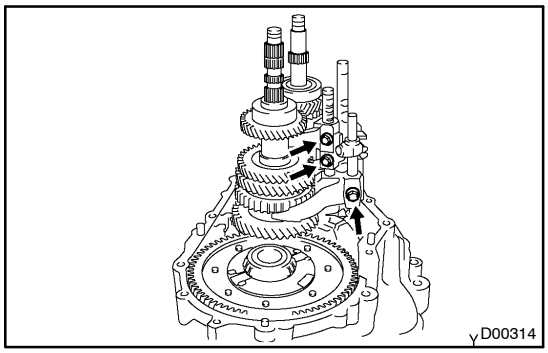
At the time of reassembly, please refer to the following item.

Install the reverse idler gear, thrust washer and shaft, as shown in the illustration.

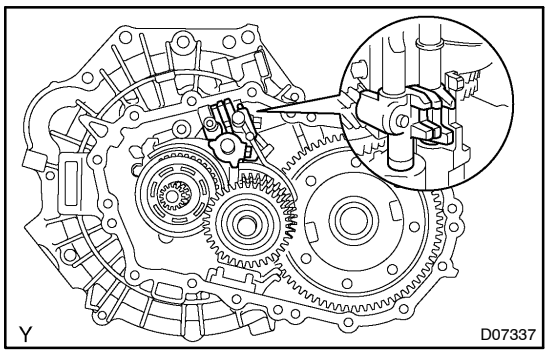


32. REMOVE GEAR SHIFT FORK SHAFT SNAP RING

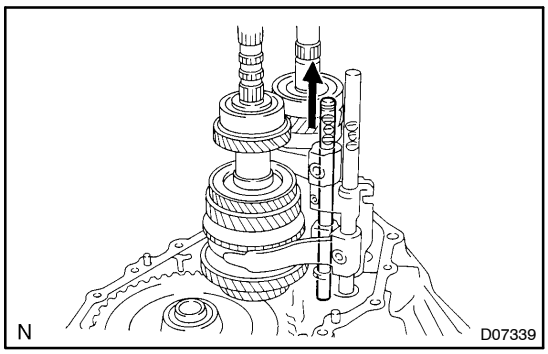
Using 2 screwdrivers and a hammer, tap out the 2 snap rings from the No. 1 and No. 3 gear shift fork shafts.



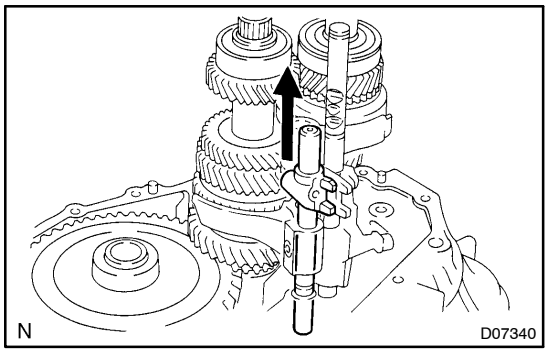
33. REMOVE NO. 1 GEAR SHIFT HEAD, NO. 1 AND NO. 2 GEAR SHIFT FORKS 3 SET BOLTS
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



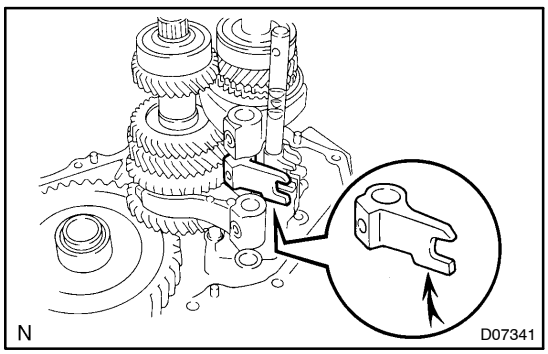
NOTICE:
At the time of reassembly, please refer to the following item.
Make sure that the 3 gear shift heads are positioned, as shown in the illustration.



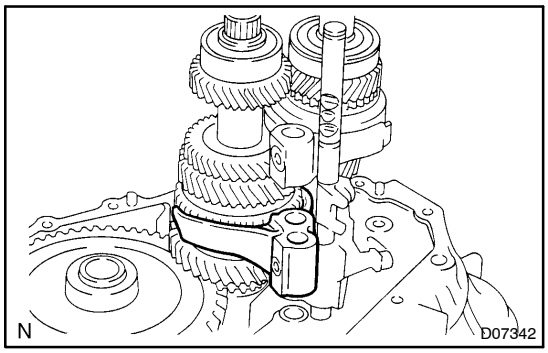
34. REMOVE NO. 2 GEAR SHIFT FORK SHAFT
Remove the No. 2 gear shift fork shaft from the No. 2 gear shift fork, No. 1 gear shift head, No. 1 gear shift fork, reverse shift fork and transaxle case.



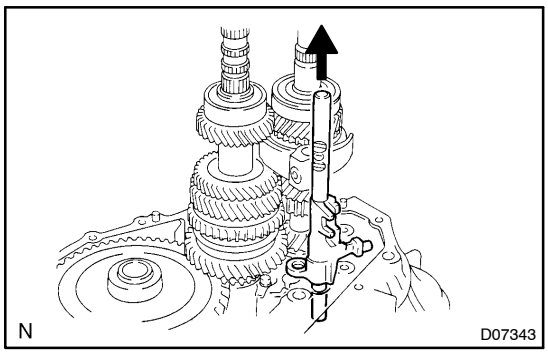
35. REMOVE NO. 1 GEAR SHIFT FORK SHAFT
Remove the No. 1 gear shift fork shaft from the No. 1 gear shift fork and transaxle case.



36. REMOVE NO. 1 GEAR SHIFT HEAD



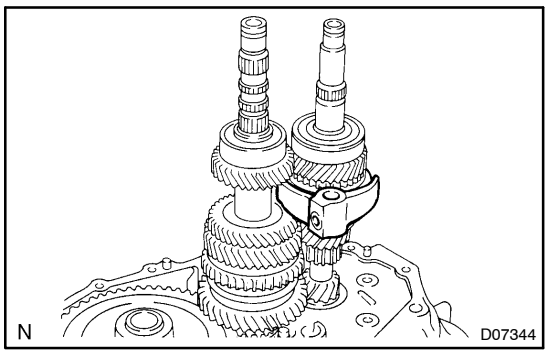
37. REMOVE NO. 1 GEAR SHIFT FORK FROM REVERSE GEAR GROOVE



38. REMOVE NO. 3 GEAR SHIFT FORK SHAFT AND REVERSE SHIFT FORK

(a) Remove the No. 3 gear shift fork shaft from the reverse shift fork and transaxle case.

(b) Remove the reverse shift fork.



39. REMOVE NO. 2 GEAR SHIFT FORK FROM NO. 2 HUB SLEEVE GROOVE

40. REMOVE INPUT AND OUTPUT SHAFTS TOGETHER FROM TRANSAXLE CASE

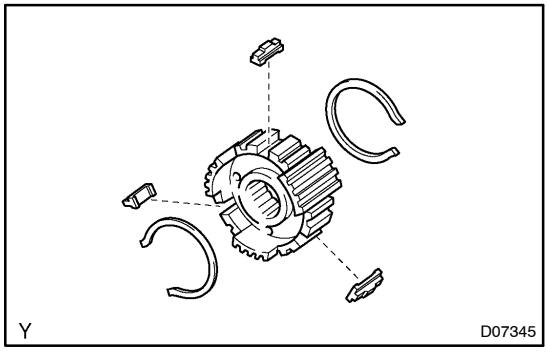
41. REMOVE DIFFERENTIAL CASE ASSEMBLY

NOTICE:

At the time of reassembly, please refer to the following item.

Before reassembly, inspect the differential tapered roller bearing preload. (See page MX–53)

42. REMOVE MAGNET FROM TRANSAXLE CASE



43. DISASSEMBLE NO. 3 CLUTCH HUB ASSEMBLY

(a) Using a screwdriver, remove the 2 shifting key springs.

NOTICE:

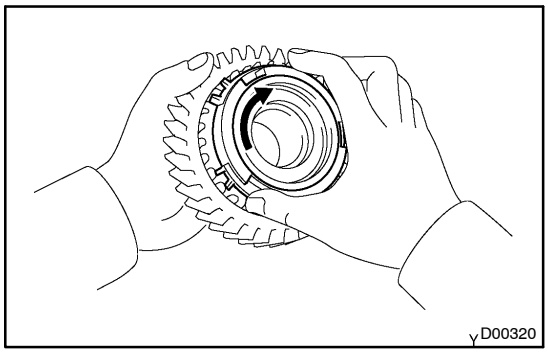
At the time of reassembly, please refer to the following item.

Position the shifting key springs so that their end gaps are not aligned.

(b) Remove the 3 No. 3 shifting keys from the No. 3 clutch hub.

MX0A0–03

INSPECTION



1. INSPECT 5TH AND 6TH GEARS SYNCHRONIZER RING

(a) Check for wear or damage.

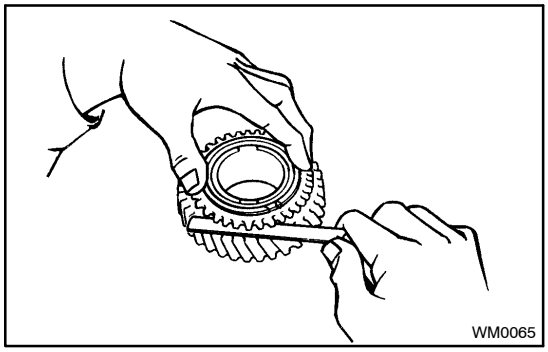
(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



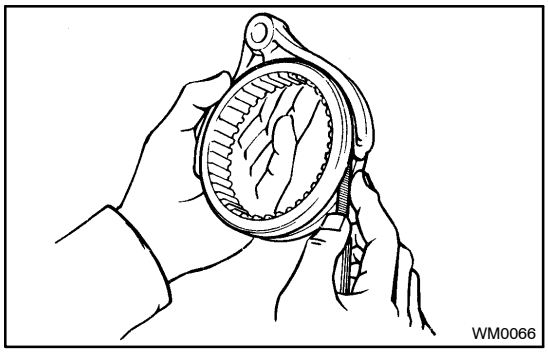
(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.75 mm (0.0295 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.



2. INSPECT GEAR SHIFT FORK AND HUB SLEEVE CLEARANCE

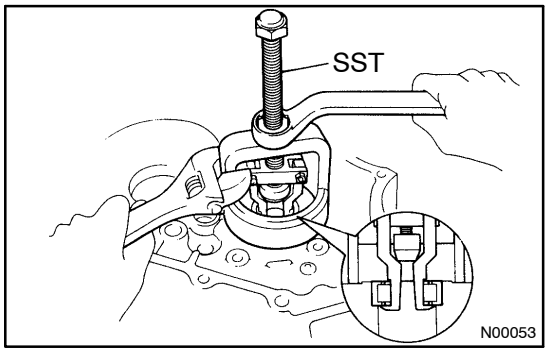
Using a feeler gauge, measure the clearance between the hub sleeve and gear shift fork.

Maximum clearance: 0.89 mm (0.035 in.)

If the clearance exceeds the maximum, replace the gear shift fork or hub sleeve.

3. REMOVE TRANSAXLE CASE RECEIVER

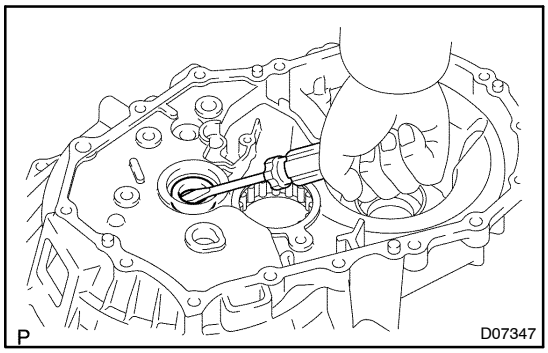
Remove the bolt and transaxle case receiver from the transaxle case.



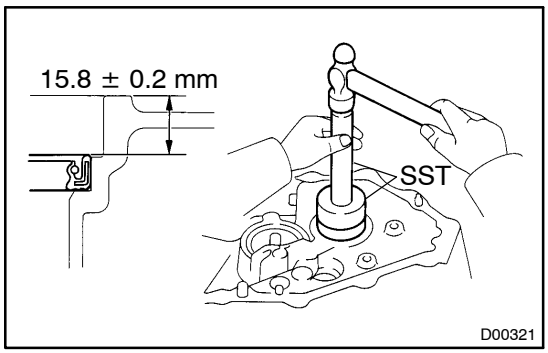
4. IF NECESSARY, REPLACE INPUT SHAFT FRONT BEARING AND OIL SEAL

(a) Using SST, remove the input shaft front bearing.

SST 09612–65014

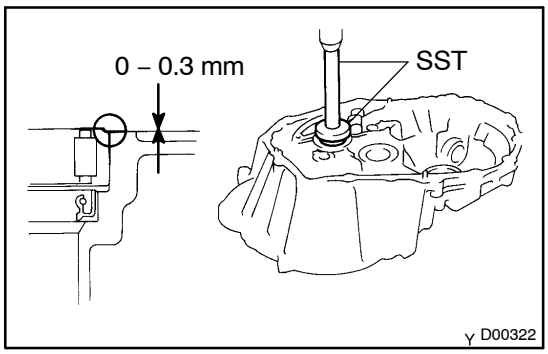


(b) Using a screwdriver, remove the oil seal.



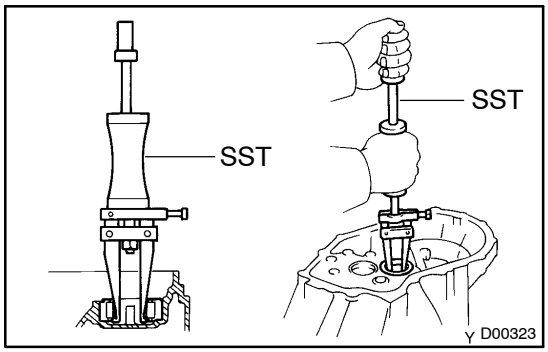
(c) Using SST and a hammer, drive in a new oil seal.
SST 09950–60010 (09951–00360), 09950–70010 (09951–07150)
Drive in depth: 15.8 ± 0.2 mm (0.622 ± 0.008 in.)

(d) Coat the lip of the oil seal with MP grease.



(e) Using SST and a press, install a new input shaft front bearing.
SST 09950–60010 (09951–00400), 09950–70010 (09951–07150)
Drive in depth: 0 – 0.3 mm (0 – 0.012 in.)

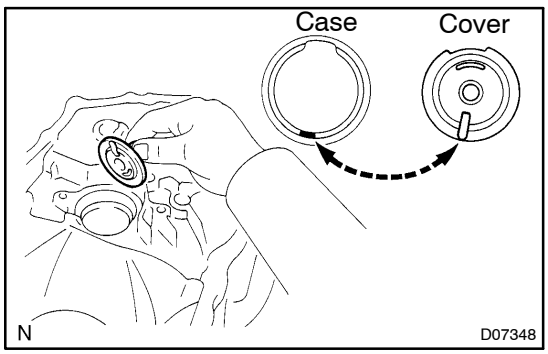
NOTICE:
Be sure to install a new bearing in the correct direction, as shown in the illustration.



5. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING AND OUTPUT SHAFT COVER

(a) Remove the bolt and bearing lock plate.

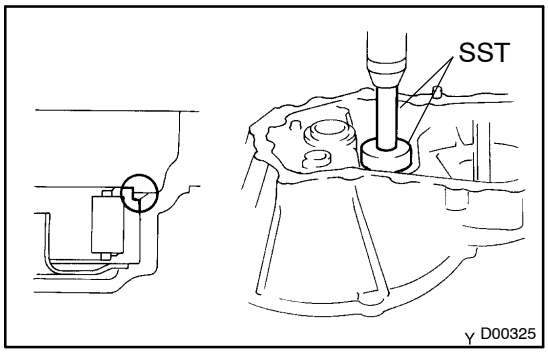
(b) Using SST, pull out the output shaft front bearing.
SST 09308–00010



(c) Remove the output shaft cover.

(d) Install the output shaft cover.

NOTICE:
Install the output shaft cover projection into the case side hollow.



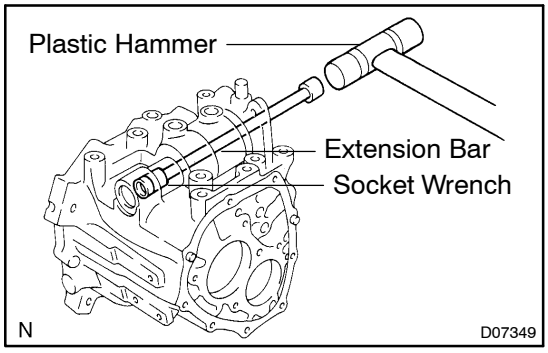
(e) Using SST and a press, install a new output shaft front bearing.
SST 09950–60010 (09951–00560), 09950–70010 (09951–07150)

NOTICE:
Be sure to install a new bearing in the correct direction, as shown in the illustration.

(f) Install the bearing lock plate with the bolt.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

6. INSTALL TRANSAXLE CASE RECEIVER

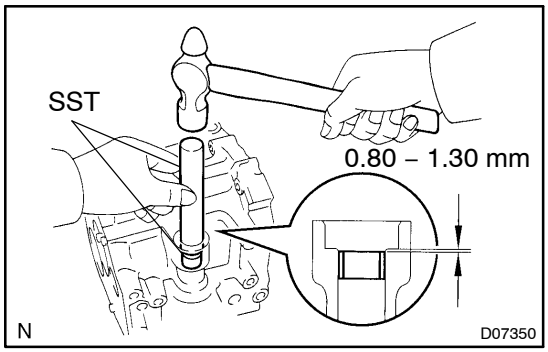
Install the transaxle case receiver to the transaxle case with the bolt.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)



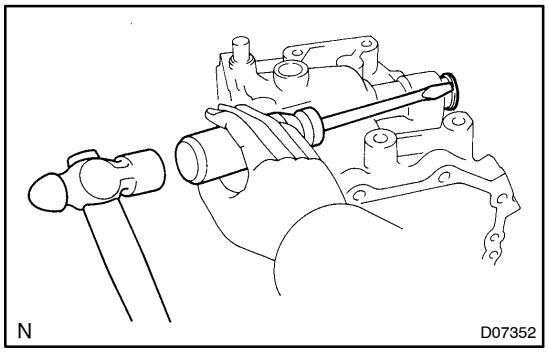
7. IF NECESSARY, REPLACE TRANSMISSION CASE BUSHING

(a) Using a socket wrench (12 mm), extension bar and plastic hammer, drive out the bushing.

NOTICE:
When driving out the bushing, be careful not to damage the transmission case by the socket wrench.

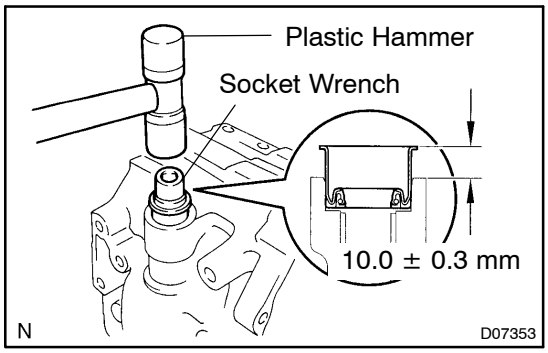


(b) Using SST and a hammer, drive in a new bushing.
SST 09950–60010 (09951–00180), 09950–70010 (09951–07100)
Drive in depth: 0.80 – 1.30 mm (0.0315 – 0.0512 in.)



8. IF NECESSARY, REPLACE TRANSMISSION CASE OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



(b) Using a socket wrench (17 mm) and plastic hammer, drive in a new oil seal.
Drive in depth: 10.0 ± 0.3 mm (0.394 ± 0.012 in.)

(c) Coat the lip of the oil seal with MP grease.

MX01I–05

REASSEMBLY

Reassembly is in the reverse order of disassembly. (See page MX–13)

NOTICE:

When working with FIPG material, you must observe the followings.

- **Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

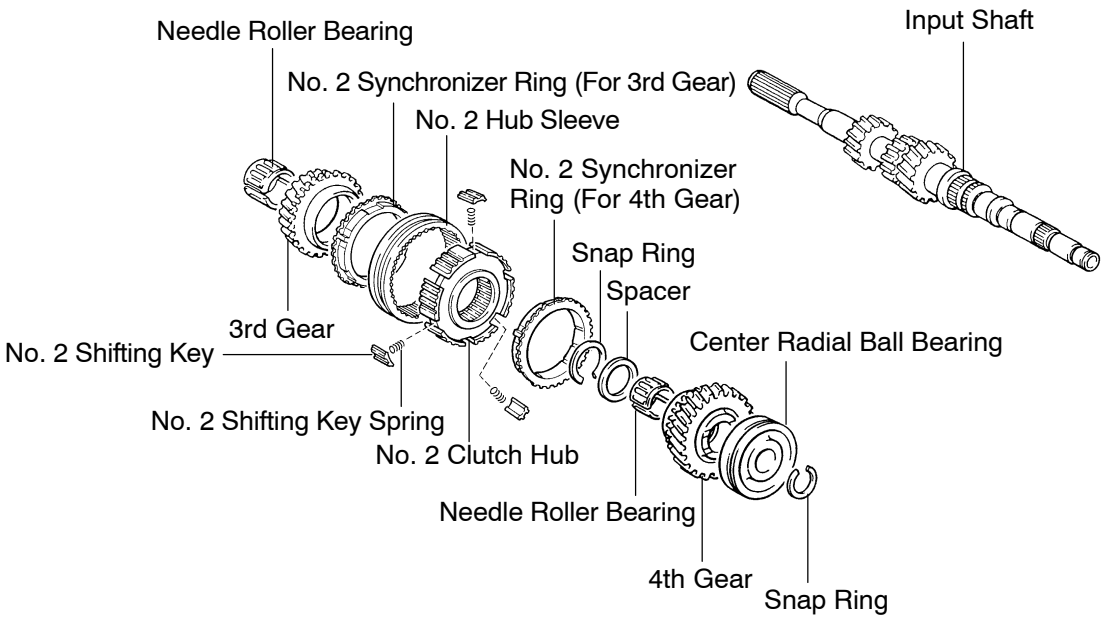
HINT:

Coat all of the sliding and rotating surfaces with gear oil before reassembly.

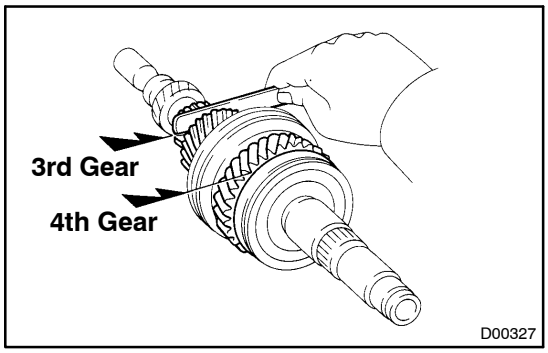
INPUT SHAFT

COMPONENTS

MX01J–04



MX01K–03

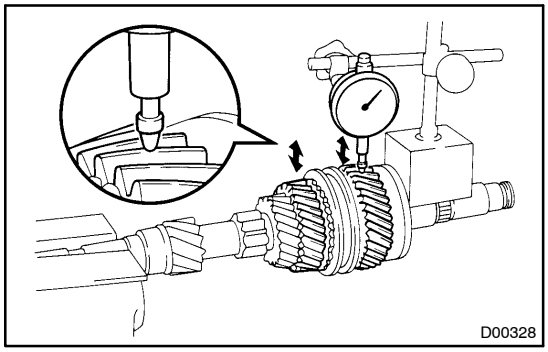


DISASSEMBLY

1. INSPECT 3RD AND 4TH GEARS THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:
3rd gear: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)
4th gear: 0.10 – 0.55 mm (0.0039 – 0.0217 in.)
Maximum clearance:
3rd gear: 0.35 mm (0.0138 in.)
4th gear: 0.55 mm (0.0217 in.)



2. INSPECT 3RD AND 4TH GEARS RADIAL CLEARANCE

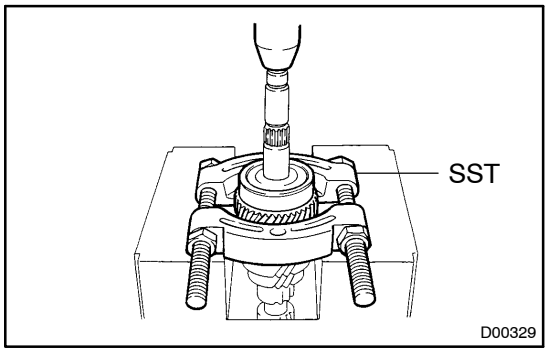
Using a dial indicator, measure the radial clearance between the gear and shaft.

Standard clearance:
KOYO made:
0.015 – 0.058 mm (0.0006 – 0.0023 in.)
NSK made:
0.015 – 0.056 mm (0.0006 – 0.0022 in.)
Maximum clearance:
KOYO made: 0.058 mm (0.0023 in.)
NSK made: 0.056 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.

3. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.
HINT:
Take care not to damage the journal surface of the input shaft.



4. REMOVE CENTER RADIAL BALL BEARING, 4TH GEAR, NEEDLE ROLLER BEARING, SPACER AND NO. 2 SYNCHRONIZER RING (FOR 4TH GEAR) FROM INPUT SHAFT

(a) Using SST and a press, remove the center radial ball bearing and 4th gear.
SST 09950–00020

HINT:
Support the input shaft assembly by hand so that it will not be dropped off.

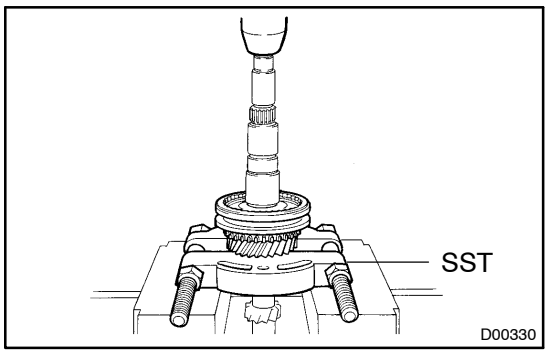
(b) Remove the needle roller bearings, spacer and No. 2 synchronizer ring (for the 4th gear).

5. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

Take care not to damage the journal surface of the input shaft.



6. REMOVE NO. 2 HUB SLEEVE ASSEMBLY, 3RD GEAR, NO. 2 SYNCHRONIZER RING (FOR 3RD GEAR) AND NEEDLE ROLLER BEARING

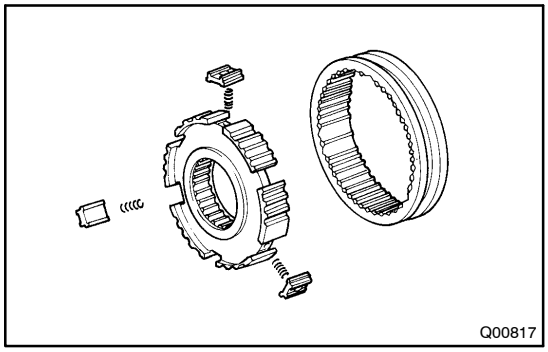
(a) Using SST and a press, remove the No. 2 hub sleeve assembly, 3rd gear and No. 2 synchronizer ring (for the 3rd gear).

SST 09950–00020

HINT:

Support the input shaft by hand so that it will not be dropped off.

(b) Remove the needle roller bearings.



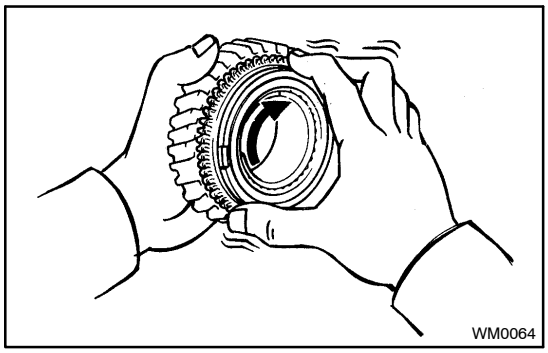
7. DISASSEMBLE NO. 2 HUB SLEEVE ASSEMBLY

(a) Remove the No. 2 hub sleeve from the No. 2 clutch hub.

(b) Remove the 3 No. 2 shifting keys and No. 2 shifting key springs from the No. 2 clutch hub.

MX01L–04

INSPECTION



1. INSPECT SYNCHRONIZER RING

(a) Check for wear or damage.

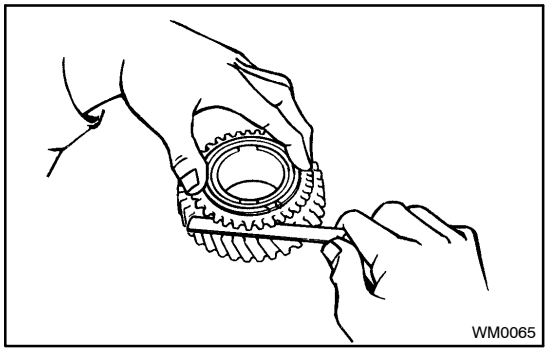
(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance:

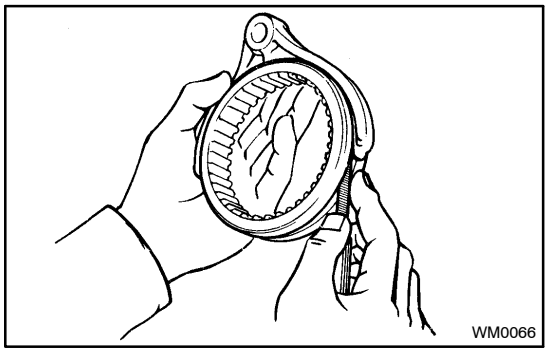
3rd gear: 0.65 mm (0.0256 in.)

4th gear: 0.75 mm (0.0295 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

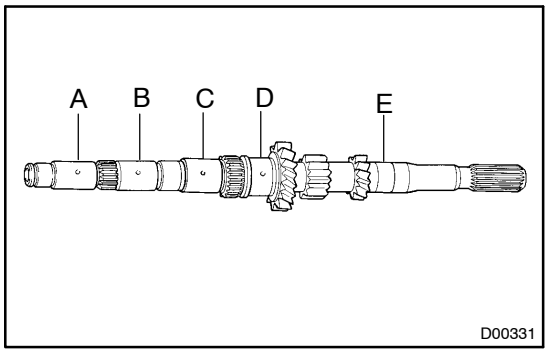


2. INSPECT GEAR SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeve and gear shift fork.

Maximum clearance: 0.35 mm (0.014 in.)

If the clearance exceeds the maximum, replace the gear shift fork or hub sleeve.



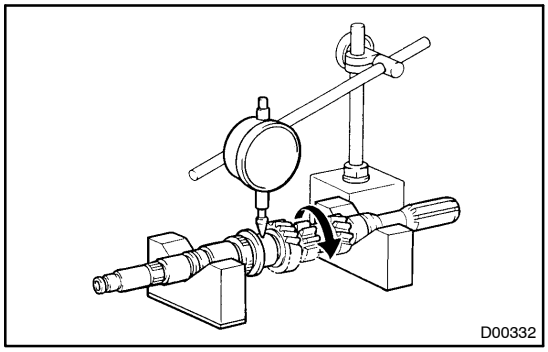
3. INSPECT INPUT SHAFT

(a) Check the input shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum outer diameter:
Part A: 21.991 mm (0.8658 in.)
Part B: 24.885 mm (0.9797 in.)
Part C: 28.985 mm (1.1411 in.)
Part D: 30.985 mm (1.2199 in.)
Part E: 24.985 mm (0.9837 in.)

If the outer diameter is less than the minimum, replace the input shaft.



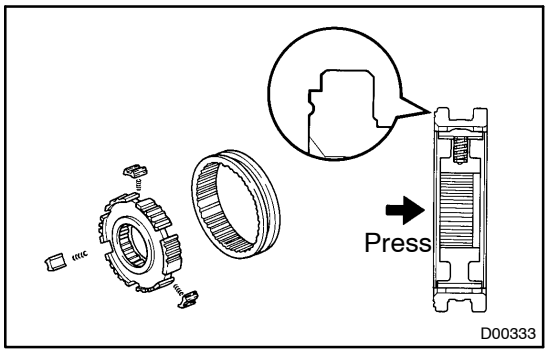
(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

If the runout exceeds the maximum, replace the input shaft.

MX01M–04

REASSEMBLY



HINT:

Coat all of the sliding and rotating surfaces with gear oil before reassembly.

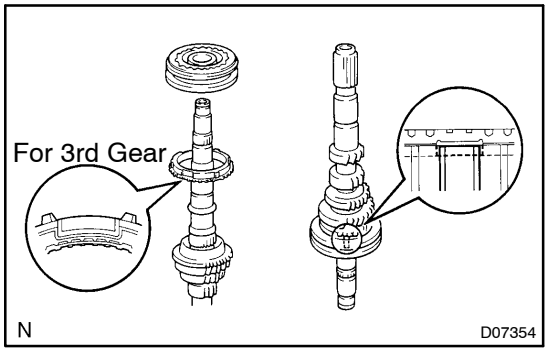
1. ASSEMBLE NO. 2 HUB SLEEVE ASSEMBLY

(a) Install the 3 No. 2 shifting key springs and No. 2 shifting keys to the No. 2 clutch hub.

(b) Install the No. 2 hub sleeve to the No. 2 clutch hub.

NOTICE:

Assemble the No. 2 hub sleeve and No. 2 clutch hub in the direction shown in the illustration.



2. INSTALL NEEDLE ROLLER BEARING, 3RD GEAR, NO. 2 SYNCHRONIZER RING (FOR 3RD GEAR) AND NO. 2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

(a) Apply gear oil to the needle roller bearings and install it.

(b) Install the 3rd gear and No. 2 synchronizer ring (for the 3rd gear).

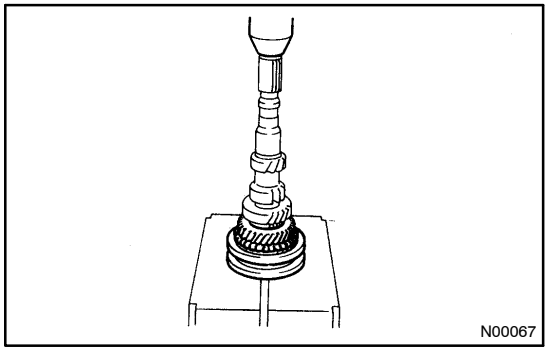
NOTICE:

Distinguish the No. 2 synchronizer ring (for the 3rd gear) by the teeth on the synchronizer ring.

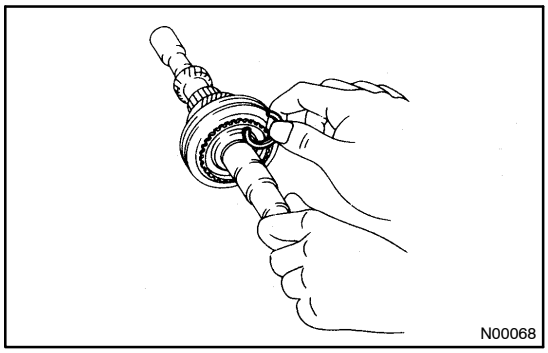
(c) Install the No. 2 hub sleeve assembly so that the No. 2 synchronizer ring slots and No. 2 shifting keys are aligned.

NOTICE:

Be sure to install the No. 2 hub sleeve assembly in the correct direction, as shown in the illustration.



(d) Using a press, install the No. 2 hub sleeve assembly.



3. INSTALL SNAP RING

(a) Select a snap ring from the table below that will make the thrust clearance of the No. 2 clutch hub less than 0.1 mm (0.0039 in.).

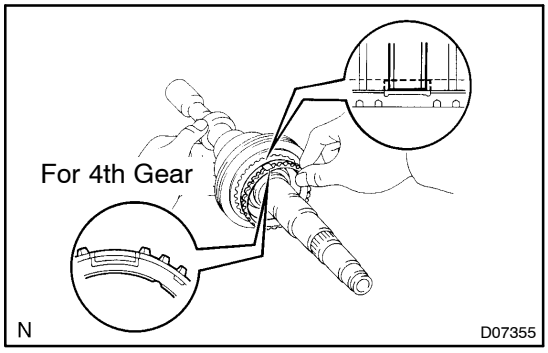
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	2.30 (0.0906)	3	2.48 (0.0976)
1	2.36 (0.0929)	4	2.54 (0.1000)
2	2.42 (0.0953)	5	2.60 (0.1024)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:

Take care not to damage the journal surface of the input shaft.

4. INSPECT 3RD GEAR THRUST CLEARANCE
(See page MX–31)



5. INSTALL SPACER, NEEDLE ROLLER BEARING, NO. 2 SYNCHRONIZER RING (FOR 4TH GEAR), 4TH GEAR AND CENTER RADIAL BALL BEARING

(a) Install the spacer.

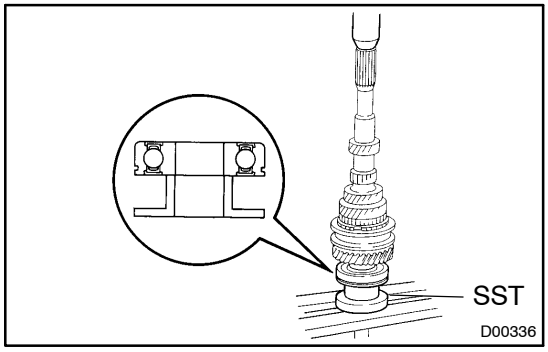
(b) Apply gear oil to the needle roller bearings and install it.

(c) Place the No. 2 synchronizer ring (for the 4th gear) on the No. 2 hub sleeve assembly and align the No. 2 synchronizer ring slots with the No. 2 shifting keys.

(d) Install the 4th gear.

NOTICE:

Distinguish the No. 2 synchronizer ring (for the 4th gear) by the teeth on the synchronizer ring.



(e) Using SST and a press, install the center radial ball bearing.

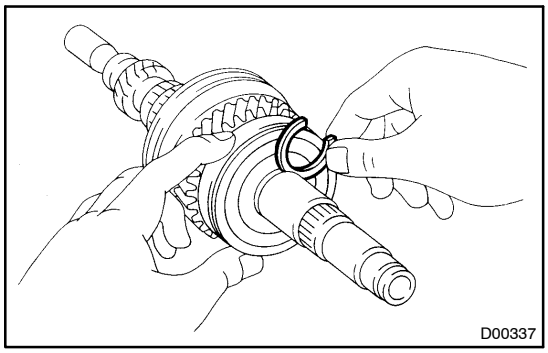
SST 09608–00071

NOTICE:

Be sure to install the center radial ball bearing in the correct direction, as shown in the illustration.

HINT:

Set SST to the bearing inner race securely.



6. INSTALL SNAP RING

(a) Select a snap ring from the table below that will make the thrust clearance of the center radial ball bearing less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.29 (0.0902)	D	2.47 (0.0972)
B	2.35 (0.0925)	E	2.53 (0.0996)
C	2.41 (0.0949)	F	2.59 (0.1020)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:

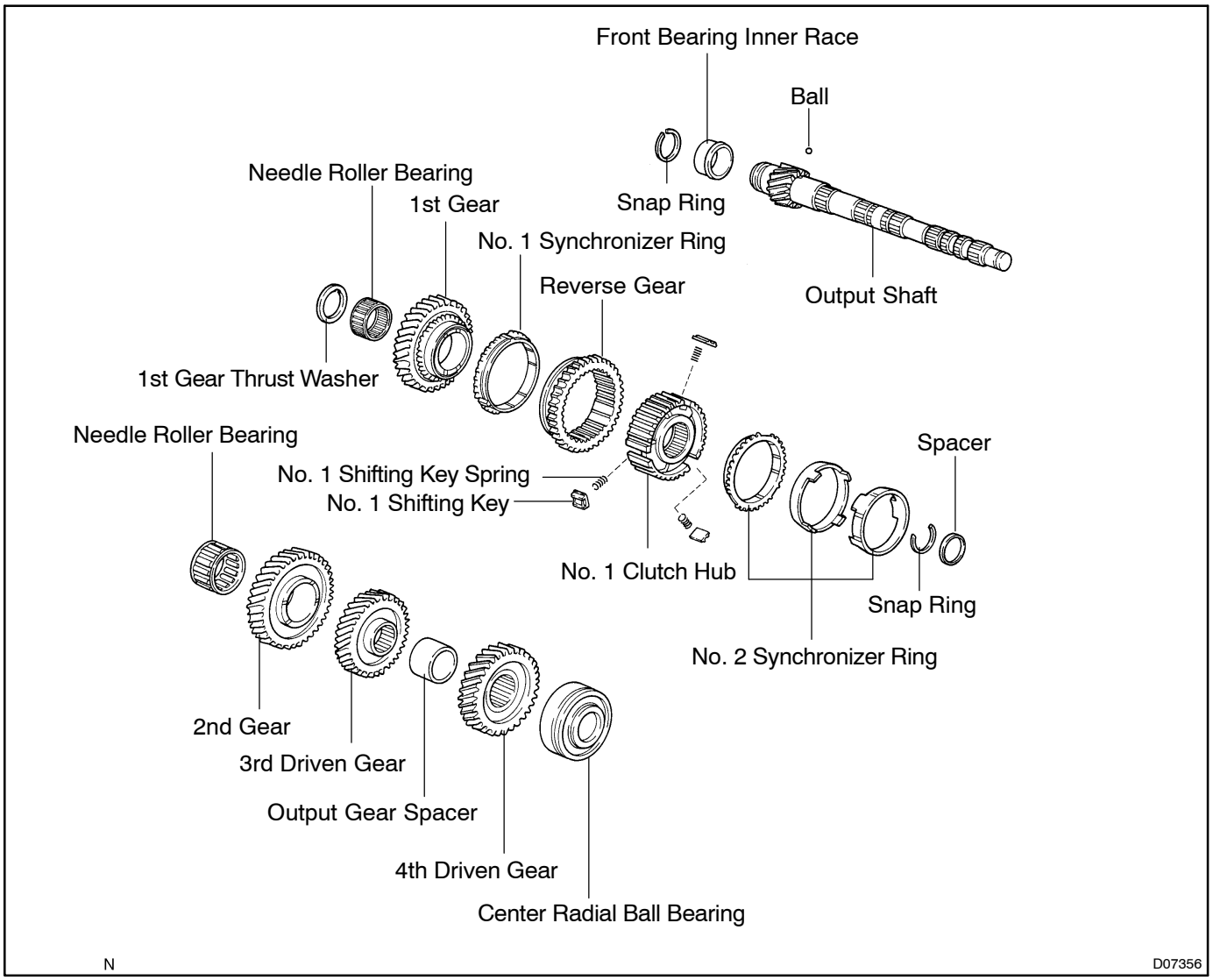
Take care not to damage the journal surface of the input shaft.

7. INSPECT 4TH GEAR THRUST CLEARANCE
(See page MX–31)

OUTPUT SHAFT

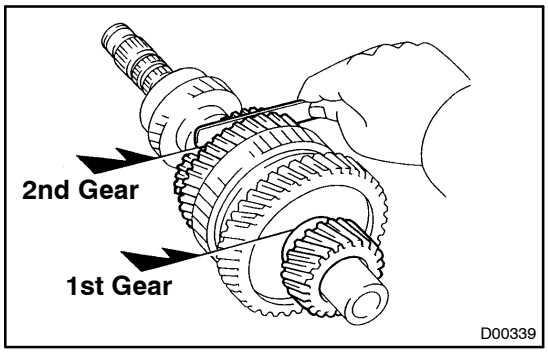
COMPONENTS

MX01N–06



MX0A1–02

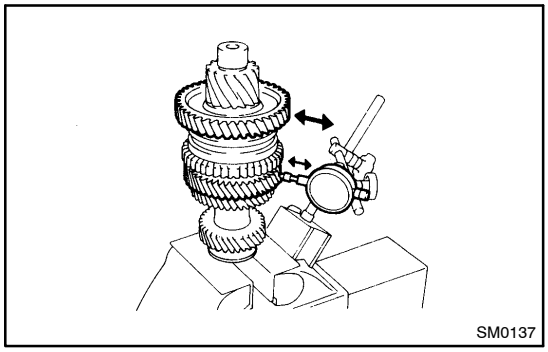
DISASSEMBLY



1. INSPECT 1ST AND 2ND GEARS THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:
1st gear: 0.10 – 0.40 mm (0.0039 – 0.0157 in.)
2nd gear: 0.10 – 0.55 mm (0.0039 – 0.0217 in.)
Maximum clearance:
1st gear: 0.40 mm (0.0157 in.)
2nd gear: 0.55 mm (0.0217 in.)

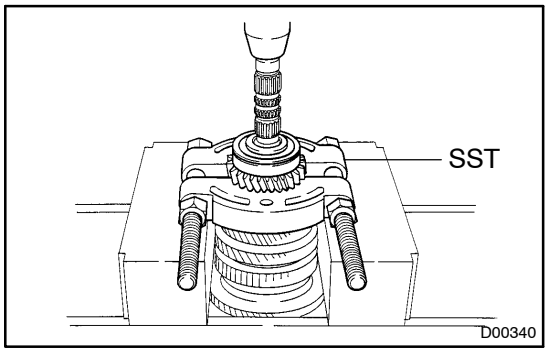


2. INSPECT 1ST AND 2ND GEARS RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance between the gear and shaft.

Standard clearance:
KOYO made:
0.015 – 0.058 mm (0.0006 – 0.0023 in.)
NSK made:
0.015 – 0.056 mm (0.0006 – 0.0022 in.)
Maximum clearance:
KOYO made: 0.058 mm (0.0023 in.)
NSK made: 0.056 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.

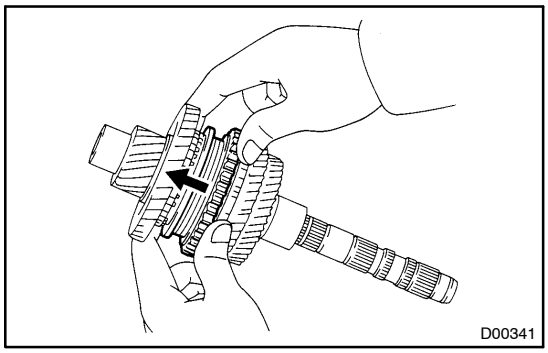


3. REMOVE CENTER RADIAL BALL BEARING, 4TH DRIVEN GEAR AND OUTPUT GEAR SPACER FROM OUTPUT SHAFT

(a) Using SST and a press, remove the center radial ball bearing and 4th driven gear.
SST 09950–00020

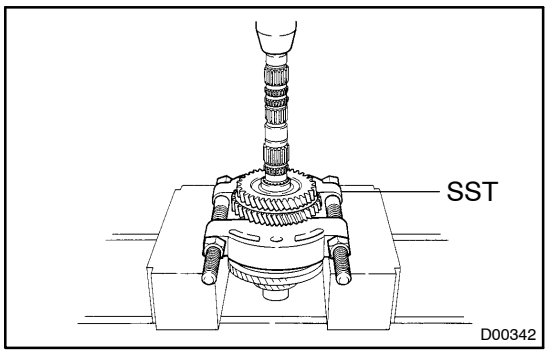
HINT:
Support the output shaft assembly by hand so that it will not be dropped off.

(b) Remove the output gear spacer.



4. REMOVE 3RD DRIVEN GEAR, 2ND GEAR, NEEDLE ROLLER BEARING, SPACER AND NO. 2 SYNCHRONIZER RING

(a) Shift the reverse gear into the 1st gear.



(b) Using SST and a press, remove the 3rd driven gear and 2nd gear.
SST 09950–00020

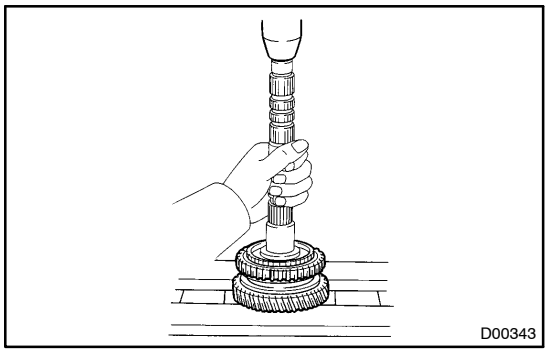
HINT:
Support the output shaft assembly by hand so that it will not be dropped off.

(c) Remove the needle roller bearing, spacer and No. 2 synchronizer rings.

5. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.



6. REMOVE REVERSE GEAR ASSEMBLY, 1ST GEAR, NO. 1 SYNCHRONIZER RING, NEEDLE ROLLER BEARING, 1ST GEAR THRUST WASHER AND BALL

(a) Using a press, remove the reverse gear assembly, 1st gear and No. 1 synchronizer ring.

HINT:
Support the output shaft assembly by hand so that it will not be dropped off.

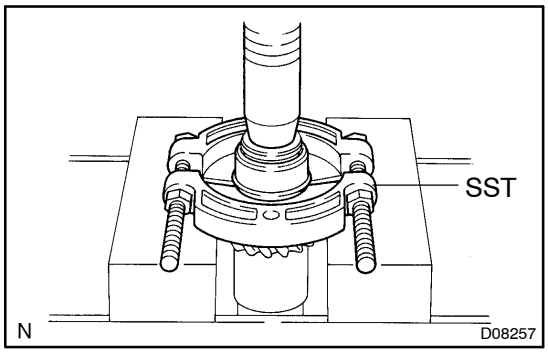
(b) Remove the needle roller bearing and 1st gear thrust washer.

(c) Using a magnetic finger, remove the ball.

7. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.



8. REMOVE FRONT BEARING INNER RACE

Using SST and a press, remove the front bearing inner race.

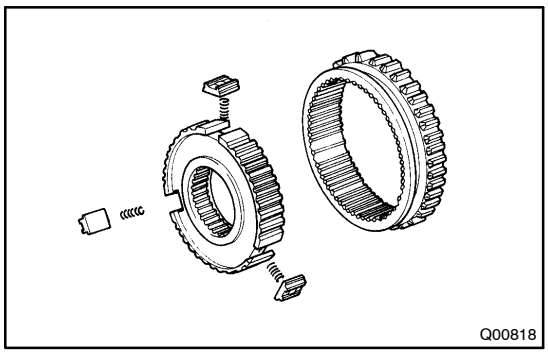
SST 09950–00020

NOTICE:

When replacing the front bearing inner race, replace the output shaft front bearing along with it.

HINT:

Support the output shaft by hand so that it will not be dropped off.



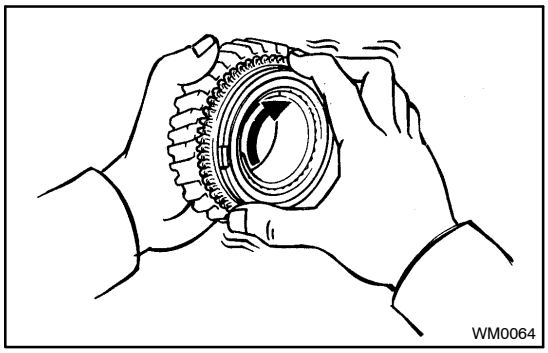
9. DISASSEMBLE REVERSE GEAR ASSEMBLY

(a) Remove the reverse gear from the No. 1 clutch hub.

(b) Remove the 3 No. 1 shifting keys and No. 1 shifting key springs from the No. 1 clutch hub.

MX0A2–03

INSPECTION



1. INSPECT 1ST GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

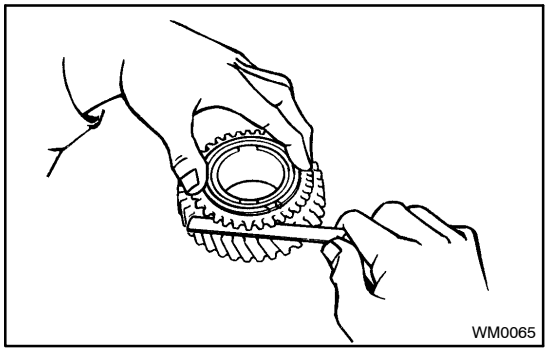
(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



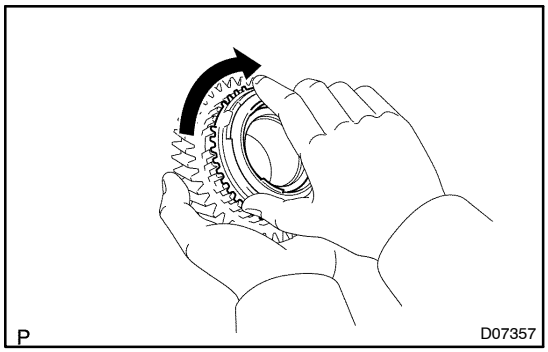
(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.75 mm (0.0295 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

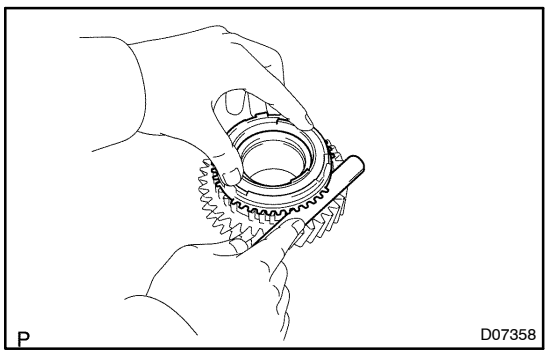


2. INSPECT 2ND GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

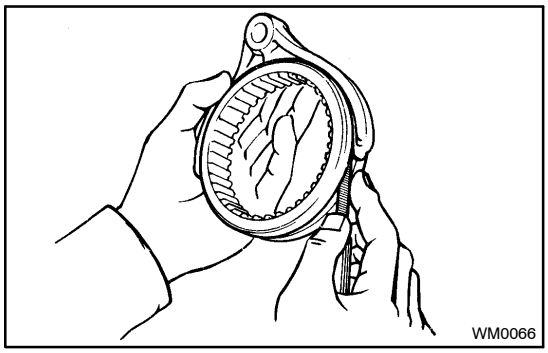
If the braking effect is insufficient, replace the synchronizer ring.



(c) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.70 mm (0.0276 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

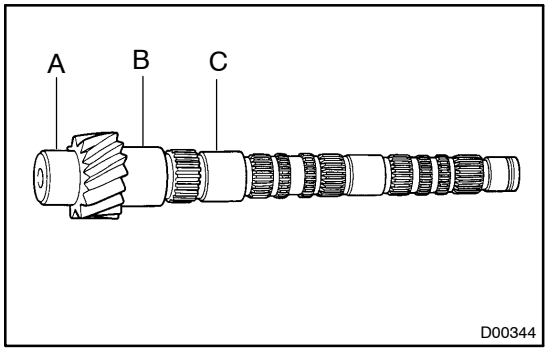


3. INSPECT GEAR SHIFT FORK AND REVERSE GEAR CLEARANCE

Using a feeler gauge, measure the clearance between the reverse gear and gear shift fork.

Maximum clearance: 0.35 mm (0.014 in.)

If the clearance exceeds the maximum, replace the gear shift fork or hub sleeve.



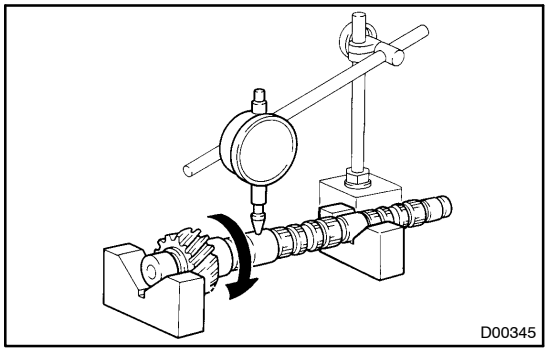
4. INSPECT OUTPUT SHAFT

(a) Check the output shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the output shaft journal surface.

Minimum outer diameter:
Part A: 32.985 mm (1.2986 in.)
Part B: 37.985 mm (1.4955 in.)
Part C: 31.985 mm (1.2592 in.)

If the outer diameter is less than the minimum, replace the output shaft.



(c) Using a dial indicator, check the shaft runout.

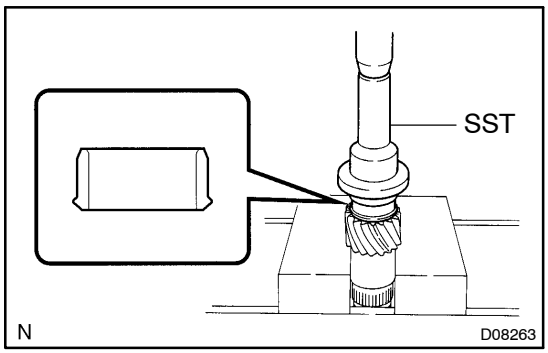
Maximum runout: 0.03 mm (0.0012 in.)

If the runout exceeds the maximum, replace the output shaft.

MX0A3–03

REASSEMBLY

HINT:
Coat all of the sliding and rotating surfaces with gear oil before reassembly.



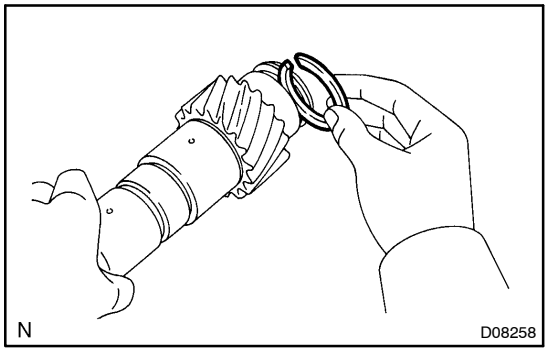
1. INSTALL FRONT BEARING INNER RACE

Using SST and a press, install the front bearing inner race.

SST 09223–50010

NOTICE:

Be sure to install the front bearing inner race in the correct direction, as shown in the illustration.



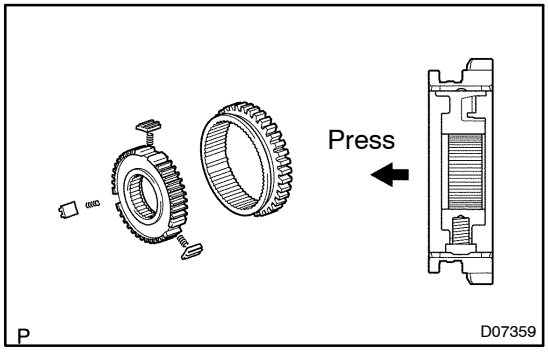
2. INSTALL SNAP RING

(a) Select a snap ring from the table below that will make the thrust clearance of the front bearing inner race less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
7	1.85 (0.0728)	3	2.05 (0.0807)
8	1.90 (0.0748)	4	2.10 (0.0827)
1	1.95 (0.0768)	5	2.15 (0.0846)
2	2.00 (0.0787)	6	2.20 (0.0866)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.



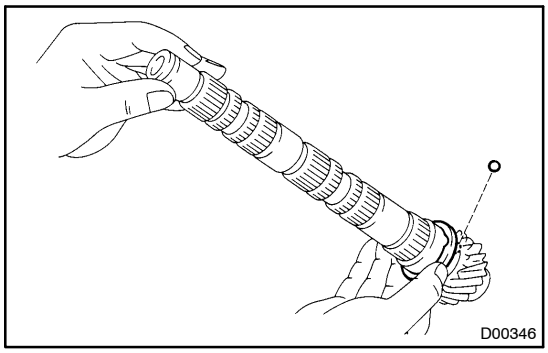
3. ASSEMBLE REVERSE GEAR ASSEMBLY

(a) Install the 3 No. 1 shifting key springs and No. 1 shifting keys to the No. 1 clutch hub.

(b) Install the No. 1 clutch hub to the reverse gear.

NOTICE:

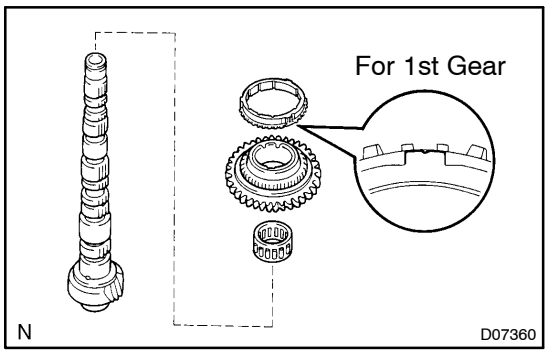
Assemble the No. 1 clutch hub and reverse gear in the direction shown in the illustration.



4. INSTALL BALL, 1ST GEAR THRUST WASHER, NEEDLE ROLLER BEARING, 1ST GEAR, NO. 1 SYNCHRONIZER RING AND REVERSE GEAR ASSEMBLY TO OUTPUT SHAFT

(a) Using a magnetic finger, install the ball to the output shaft.

(b) Fit the 1st gear thrust washer groove securely over the locking ball when installing the thrust on the output shaft.

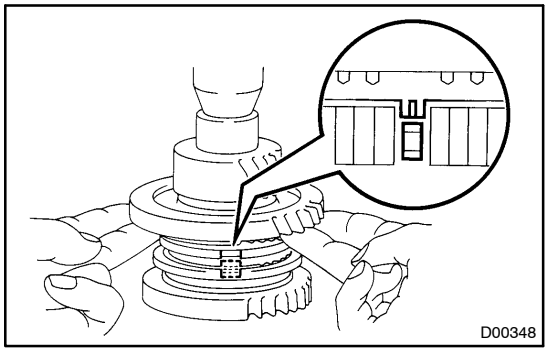


(c) Apply gear oil to the needle roller bearing and install it.

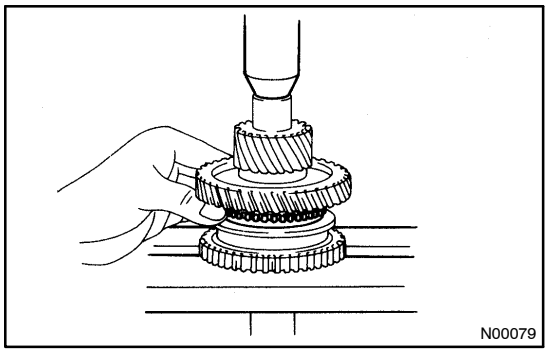
(d) Install the 1st gear and No. 1 synchronizer ring.

NOTICE:

Distinguish the No. 1 synchronizer ring by the teeth on the synchronizer ring.



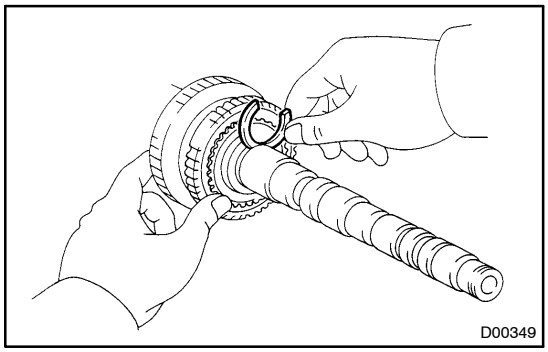
(e) Place the reverse gear assembly and align the No. 1 synchronizer ring slots with the No. 1 shifting keys.



(f) Using a press, install the reverse gear assembly.

NOTICE:

- **Be sure to install the reverse gear assembly in the correct direction, as shown in the illustration.**
- **When installing, make sure that the ball is placed in a groove of the 1st gear thrust washer.**



5. INSTALL SNAP RING

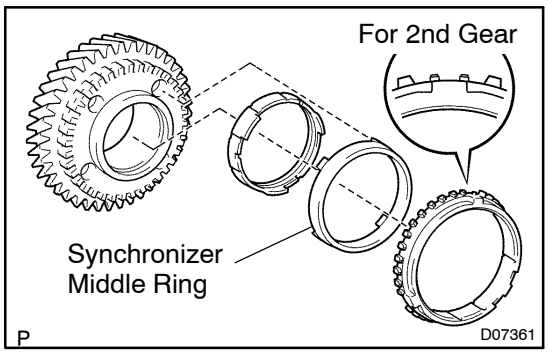
(a) Select a snap ring from the table below that will make the thrust clearance of the No. 1 clutch hub less than 0.1 mm (0.0039 in.).

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.50 (0.0984)	D	2.68 (0.1055)
B	2.56 (0.1008)	E	2.74 (0.1079)
C	2.62 (0.1031)	F	2.80 (0.1102)

(b) Using a screwdriver and hammer, tap in the snap ring.

HINT:
Take care not to damage the journal surface of the output shaft.

6. INSPECT 1ST GEAR THRUST CLEARANCE (See page MX–39)

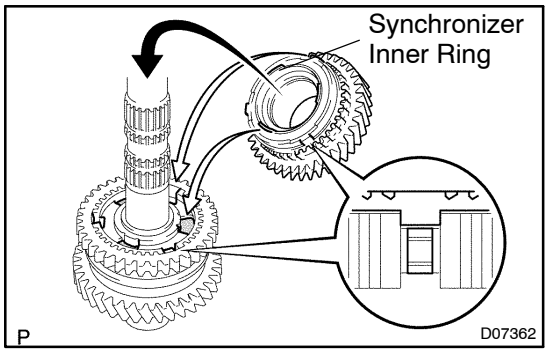


7. INSTALL SPACER, NEEDLE ROLLER BEARING, NO.2 SYNCHRONIZER RING, 2ND GEAR AND 3RD DRIVEN GEAR

(a) Install the spacer.
(b) Apply gear oil to the needle roller bearing and install it.
(c) Place the No. 2 synchronizer rings on the 2nd gear.

NOTICE:

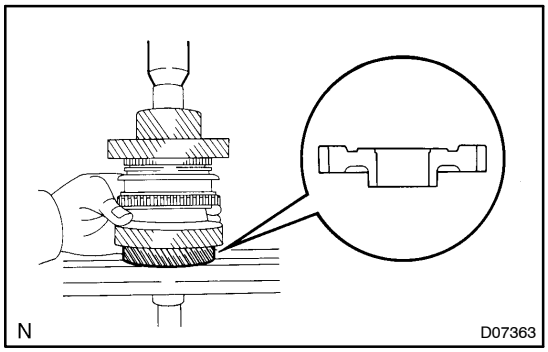
- **Properly fit the synchronizer middle ring claws into the holes in the 2nd gear.**
- **Distinguish the No. 2 synchronizer ring by the teeth on the synchronizer ring.**



(d) Place the 2nd gear with the No. 2 synchronizer rings and align the No. 2 synchronizer ring slots with the No. 1 shifting keys.

NOTICE:

Fit the synchronizer inner ring claws into the slots in the No. 1 clutch hub.

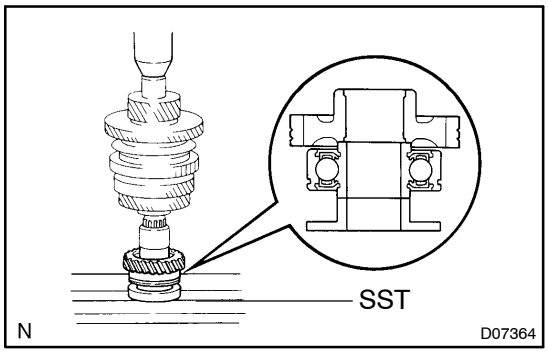


(e) Using a press, install the 3rd driven gear.

NOTICE:

Be sure to install the 3rd driven gear in the correct direction, as shown in the illustration.

8. INSPECT 2ND GEAR THRUST CLEARANCE (See page MX–39)



9. INSTALL OUTPUT GEAR SPACER, 4TH DRIVEN GEAR AND CENTER RADIAL BALL BEARING

(a) Install the output gear spacer.

(b) Using SST and a press, install the 4th driven gear and center radial ball bearing.

SST 09608–00071

NOTICE:

Be sure to install the 4th driven gear and center radial ball bearing in the correct direction, as shown in the illustration.

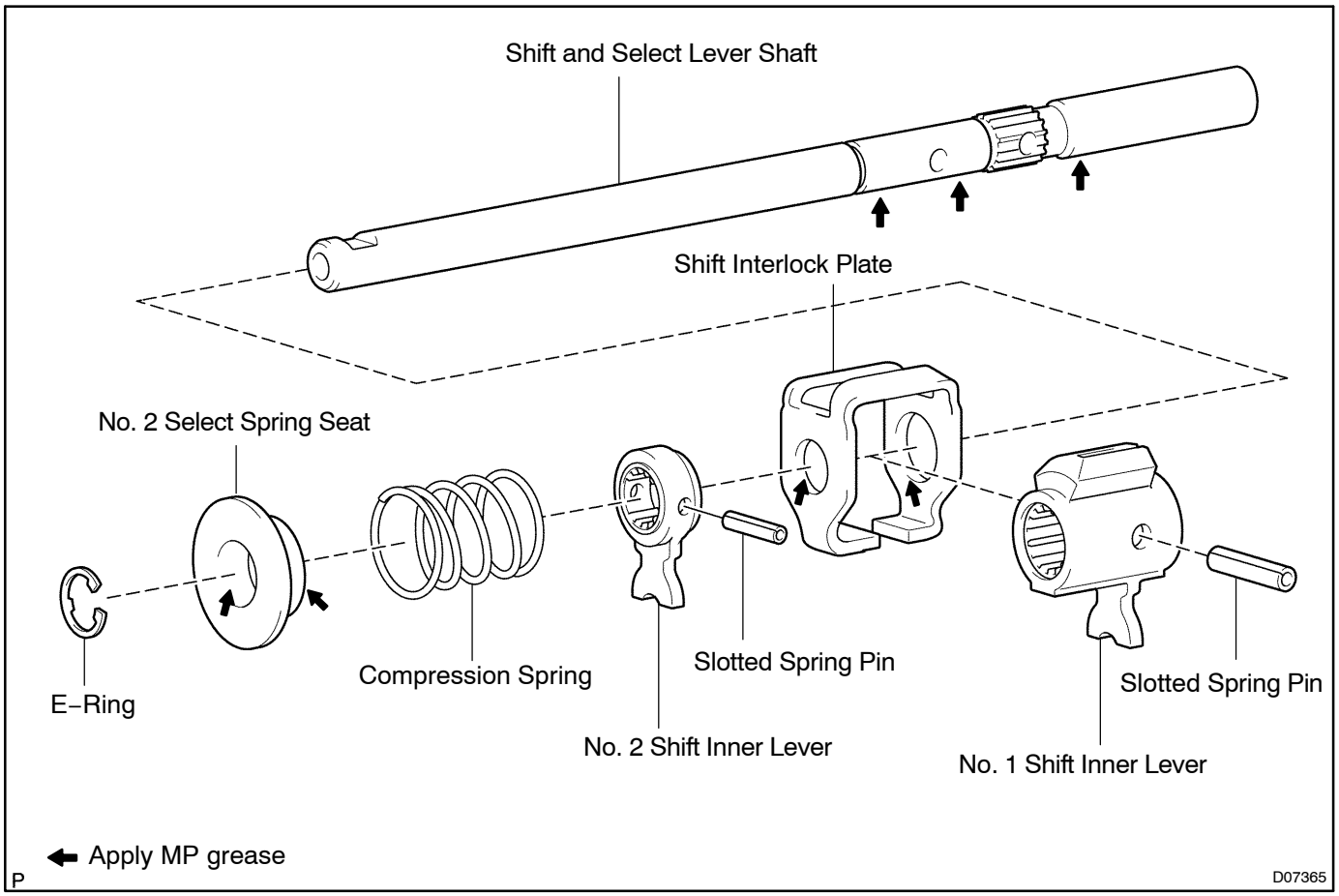
HINT:

Set SST to the bearing inner race securely.

SHIFT AND SELECT LEVER SHAFT

COMPONENTS

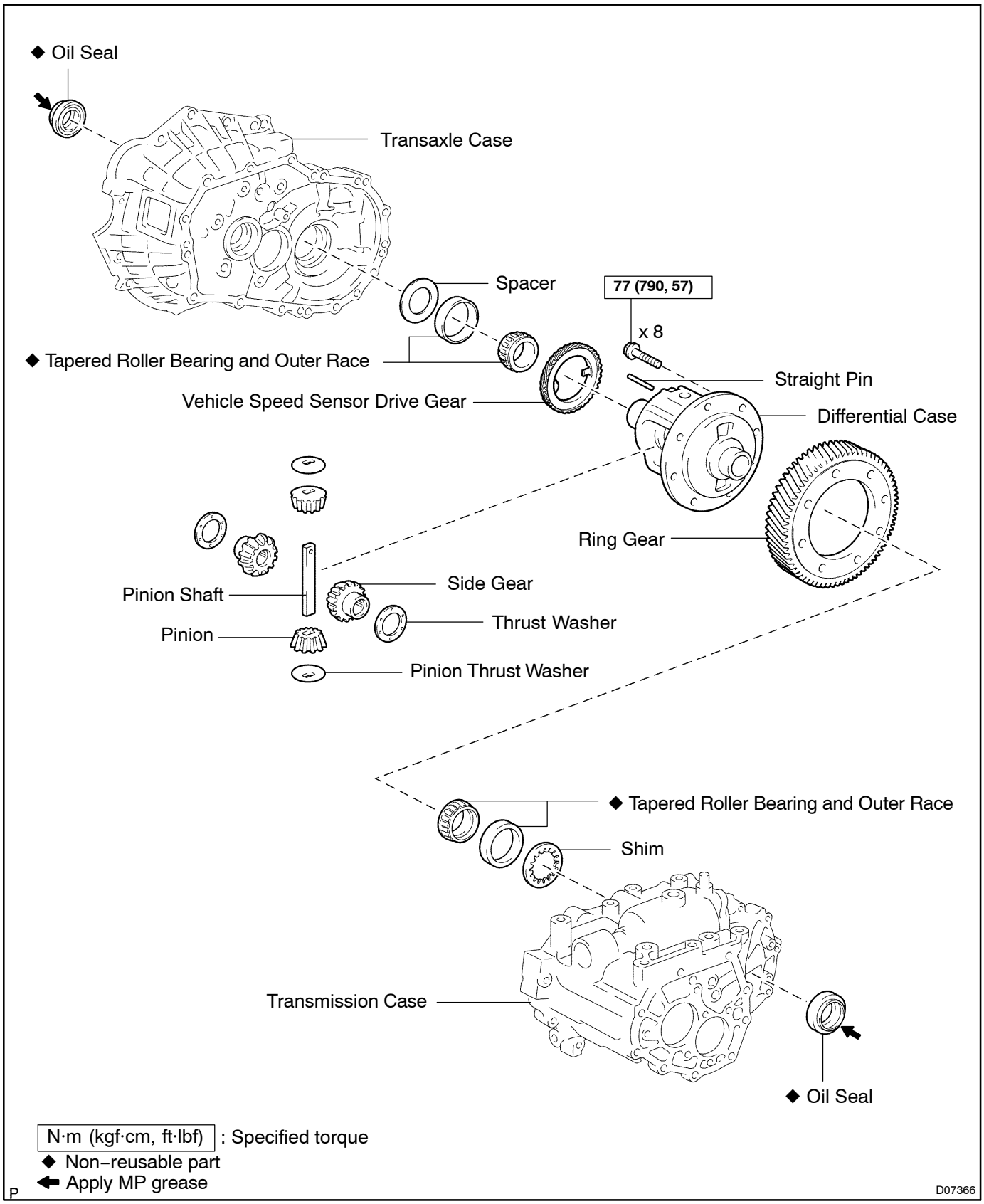
MX01R–04



DIFFERENTIAL CASE

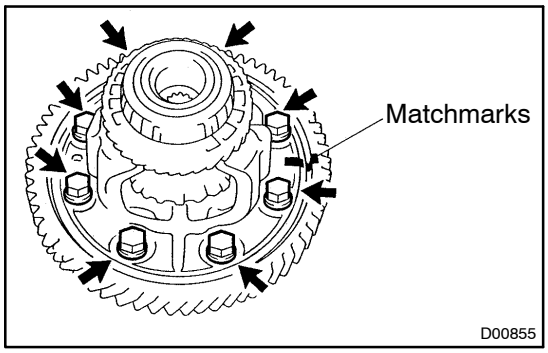
COMPONENTS

MX01S–05



MX0A4–03

DISASSEMBLY

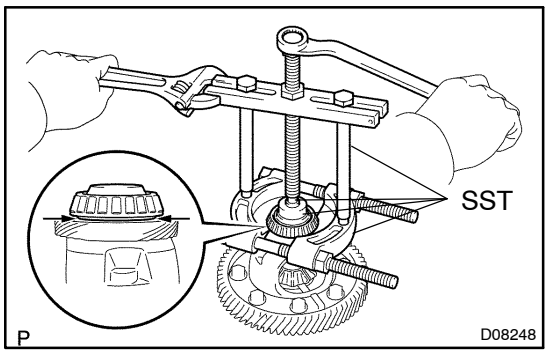


1. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.

(b) Remove the 8 bolts.

(c) Using a copper hammer, tap on the ring gear to remove it from the differential case.



2. Vehicle speed sensor drive gear side: REMOVE TAPERED ROLLER BEARING FROM DIFFERENTIAL CASE

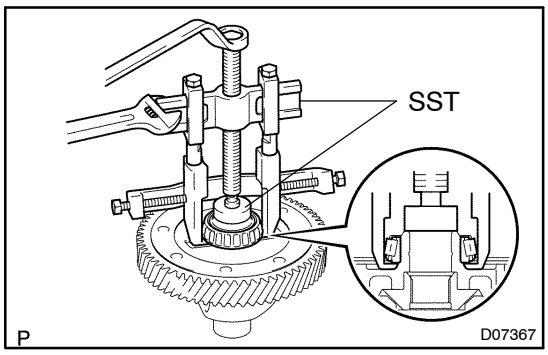
(a) Using SST, remove the tapered roller bearing.

SST 09950–00020, 09950–00030, 09950–40011 (09957–04010), 09950–60010 (09951–00350)

HINT:

Set the claw of SST to the bearing inner race securely.

(b) Remove the vehicle speed sensor drive gear.



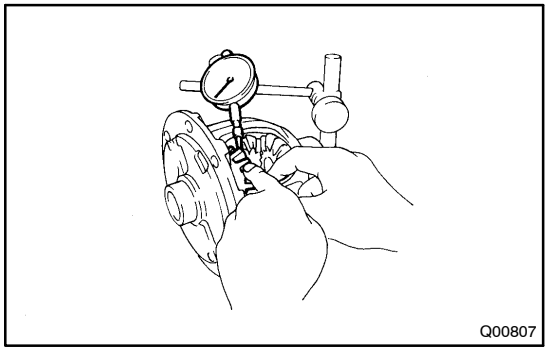
3. Ring gear side: REMOVE TAPERED ROLLER BEARING FROM DIFFERENTIAL CASE

Using SST, remove the tapered roller bearing.

SST 09950–40011 (09951–04010, 09952–04010, 09953–04020, 09954–04010, 09955–04061, 09957–04010, 09958–04011), 09950–60010 (09951–00350)

HINT:

Set the claw of SST to the bearing inner race at the position where the differential case is indented.



4. INSPECT SIDE GEAR BACKLASH

Using a dial indicator, measure the backlash of one side gear while holding one pinion toward the differential case.

Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

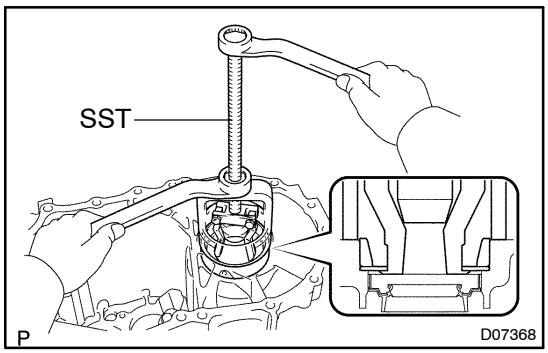
If the backlash is not within the specification, install the correct thrust washer to the side gears.

5. DISASSEMBLE DIFFERENTIAL CASE

(a) Using a pin punch and hammer, drive out the straight pin.

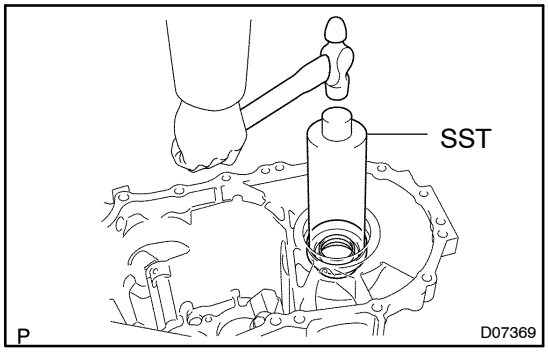
(b) Remove the pinion shaft from the differential case.

(c) Remove the 2 pinions and side gears with the 4 thrust washers from each gear.

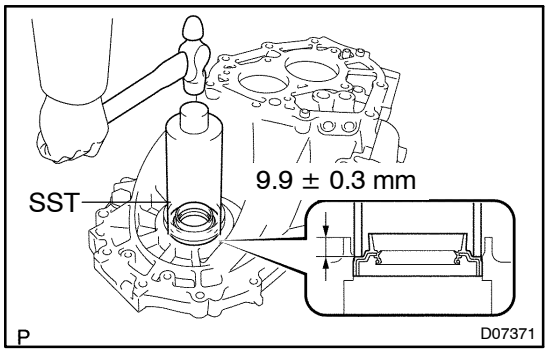


6. Transmission case side:
IF NECESSARY, REPLACE OIL SEAL AND TAPERED ROLLER BEARING OUTER RACE

(a) Using SST, pull out the tapered roller bearing outer race and shim.
SST 09612–65014



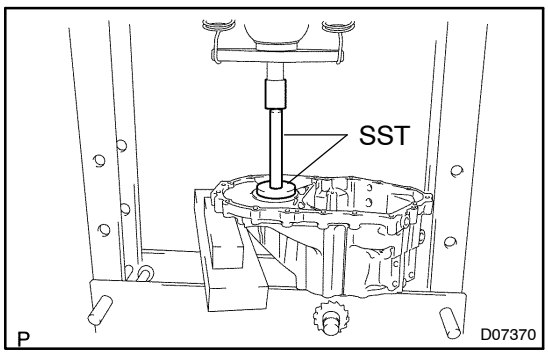
(b) Using SST and a hammer, drive out the oil seal.
SST 09226–10010



(c) Using SST and a hammer, drive in a new oil seal.
SST 09226–10010
Drive in depth: 9.9 ± 0.3 mm (0.390 ± 0.012 in.)

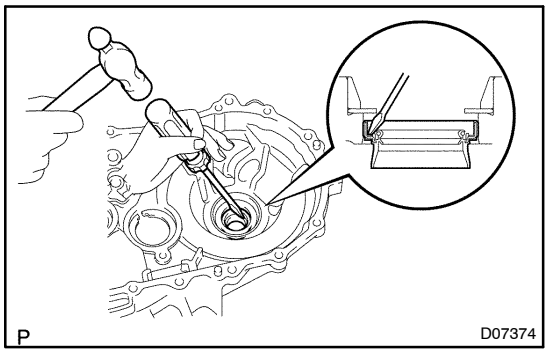
(d) Coat the lip of the oil seal with MP grease.

(e) Place the shim into the differential case.



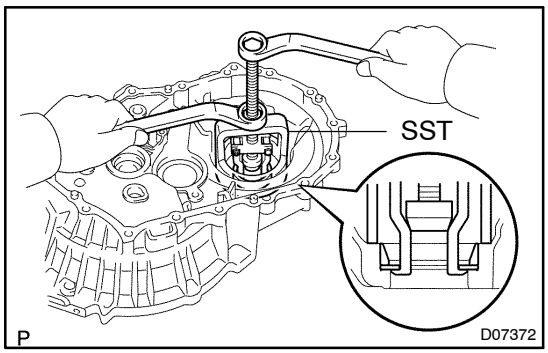
(f) Using SST and a press, install the tapered roller bearing outer race.
SST 09950–60020 (09951–00710), 09950–70010 (09951–07150)

NOTICE:
When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.



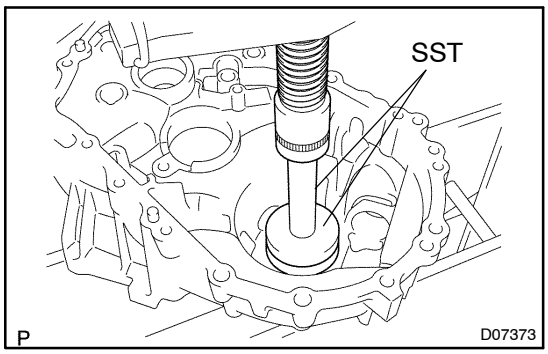
7. Transaxle case side:
IF NECESSARY, REPLACE OIL SEAL AND TAPERED ROLLER BEARING OUTER RACE

(a) Using a screwdriver and hammer, drive out the oil seal.



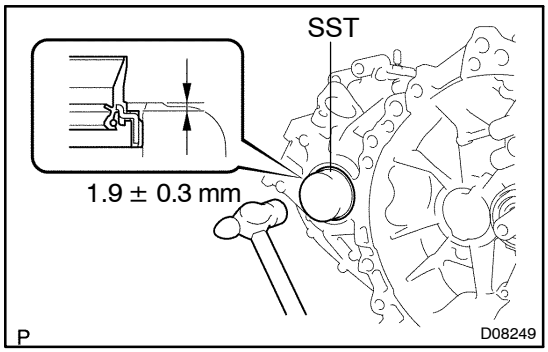
(b) Using SST, pull out the tapered roller bearing outer race and spacer.
SST 09612–65014

(c) Place the spacer into the differential case.



(d) Using SST and a press, install the tapered roller bearing outer race.
SST 09950–60020 (09951–00680), 09950–70010 (09951–07150)

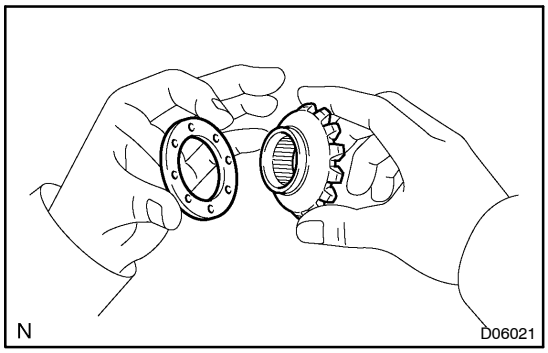
NOTICE:
When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.



(e) Using SST and a hammer, drive in a new oil seal.
SST 09710–28021 (09710–08041)
Drive in depth: 1.9 ± 0.3 mm (0.075 ± 0.012 in.)

(f) Coat the lip of the oil seal with MP grease.

MX01U–04



REASSEMBLY

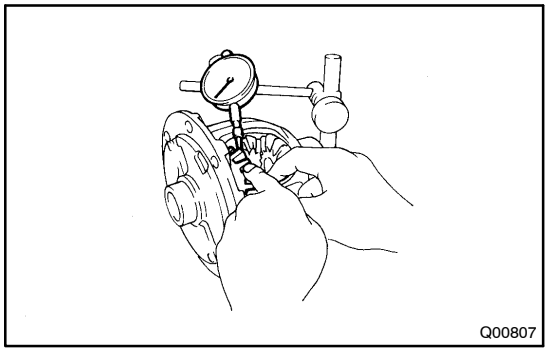
1. ASSEMBLE DIFFERENTIAL CASE

(a) Install the correct thrust washers and side gears.
Refer to the table below, select thrust washers which will ensure that the backlash is within the specification. Try to select washers of the same size for both sides.
Standard backlash:
0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Thickness mm (in.)	Thickness mm (in.)
0.95 (0.0374)	1.10 (0.0433)
1.00 (0.0394)	1.15 (0.0453)
1.05 (0.0413)	1.20 (0.0472)

(b) Install the thrust washers and side gears in the differential case.

(c) Install the pinion shaft.

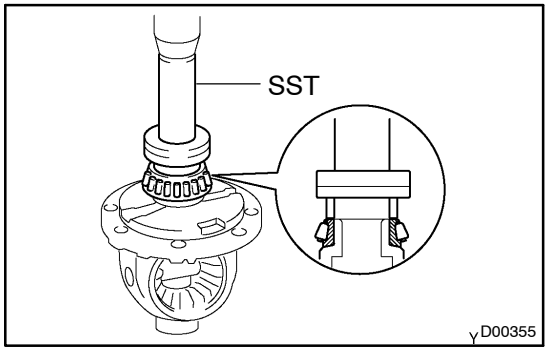


(d) Using a dial indicator, check the side gear backlash.
Measure the side gear backlash while holding one pinion toward the differential case.
Standard backlash:
0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specification, install a thrust washer of different thickness.

(e) Using a pin punch and hammer, drive in the straight pin through the differential case and hole in the pinion shaft.

(f) Using a chisel and hammer, caulk the pin holes around the circumference of the differential case.



2. Ring gear side: INSTALL TAPERED ROLLER BEARING

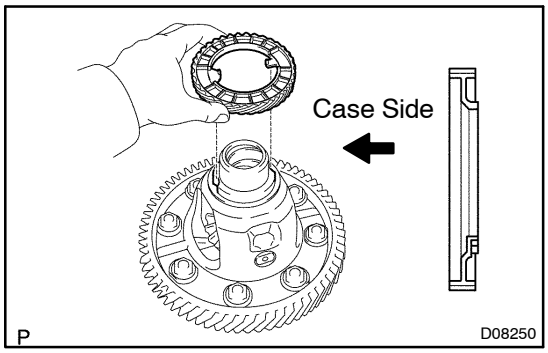
Using SST and a press, install the tapered roller bearing.
SST 09350–32014 (09351–32120, 09351–32140)

NOTICE:

When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.

HINT:

Set SST to the bearing inner race securely.

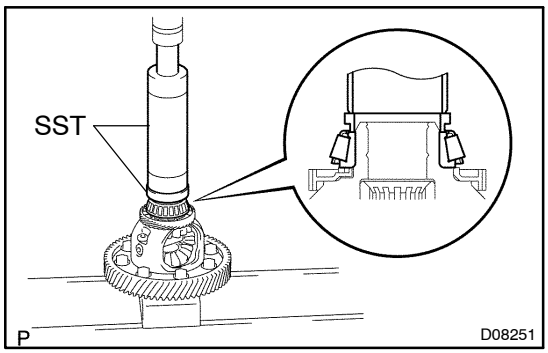


3. Vehicle speed sensor drive gear side: INSTALL TAPERED ROLLER BEARING

(a) Place the vehicle speed sensor drive gear in position to stop it turning, and install the vehicle speed sensor drive gear.

NOTICE:

Be sure to install the vehicle speed sensor drive gear in the correct direction, as shown in the illustration.



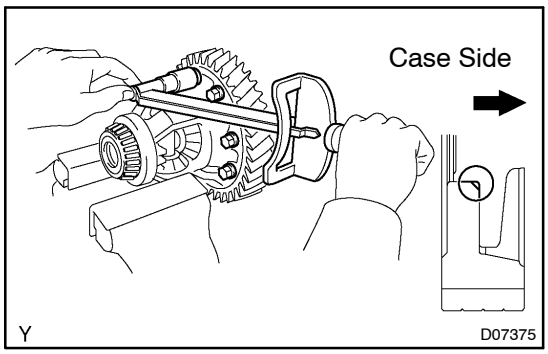
(b) Using SST and a press, install a new side bearing.
SST 09316–60011 (09316–00011), 09350–32014 (09351–32120)

NOTICE:

When replacing the tapered roller bearing outer race, replace the tapered roller bearing along with it.

HINT:

Set SST to the bearing inner race securely.



4. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case.
(b) Heat the ring gear in boiling water.
(c) Carefully take the ring gear out of the water.
(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

HINT:

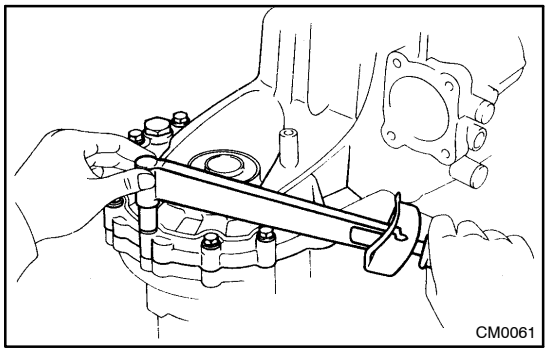
Align the matchmarks on the differential case and contact the ring gear.

(e) Temporarily install the 8 set bolts.

CAUTION:

The ring gear set bolts should not be tightened until the ring gear has cooled sufficiently.

(f) After the ring gear has cooled sufficiently, torque the ring gear set bolts uniformly at a time.
Torque: 77 N·m (790 kgf·cm, 57 ft·lbf)

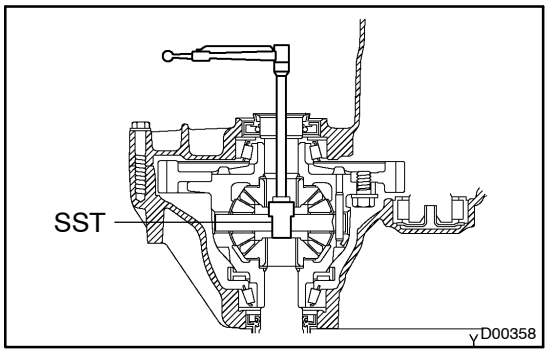


5. INSPECT DIFFERENTIAL TAPERED ROLLER BEARING PRELOAD

NOTICE:

Perform this only when replacing the tapered roller bearing and outer race of the differential case.

(a) Install the differential case assembly to the transaxle case.
(b) Install the transmission case to the transaxle case with the 16 bolts.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



(c) Using SST and a torque wrench, turn the differential case assembly right and left 2 or 3 times to allow the bearings to settle.
SST 09564–32011

(d) Using SST and a torque wrench, measure the preload.
SST 09564–32011
Preload (at starting):
New bearing
0.8 – 1.6 N·m (8 – 16 kgf·cm, 6.9 – 13.9 in.·lbf)
Reused bearing
0.5 – 1.0 N·m (5 – 10 kgf·cm, 4.3 – 8.7 in.·lbf)

If the preload is not within the specification, remove the transmission case side outer race of the tapered roller bearing with SST (See page MX–50). Select an appropriate shim.
HINT:
The preload will change by about 0.3 – 0.4 N·m (3 – 4 kgf·cm, 2.6 – 3.5 in.·lbf) corresponding to a change of 0.05 mm (0.0020 in.) in shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
AA	2.10 (0.0827)	LL	2.60 (0.1024)
BB	2.15 (0.0846)	MM	2.65 (0.1043)
CC	2.20 (0.0866)	NN	2.70 (0.1063)
DD	2.25 (0.0886)	PP	2.75 (0.1083)
EE	2.30 (0.0906)	QQ	2.80 (0.1102)
FF	2.35 (0.0925)	RR	2.85 (0.1122)
GG	2.40 (0.0945)	SS	2.90 (0.1142)
HH	2.45 (0.0965)	TT	2.95 (0.1161)
JJ	2.50 (0.0984)	UU	3.00 (0.1181)
KK	2.55 (0.1004)	–	–

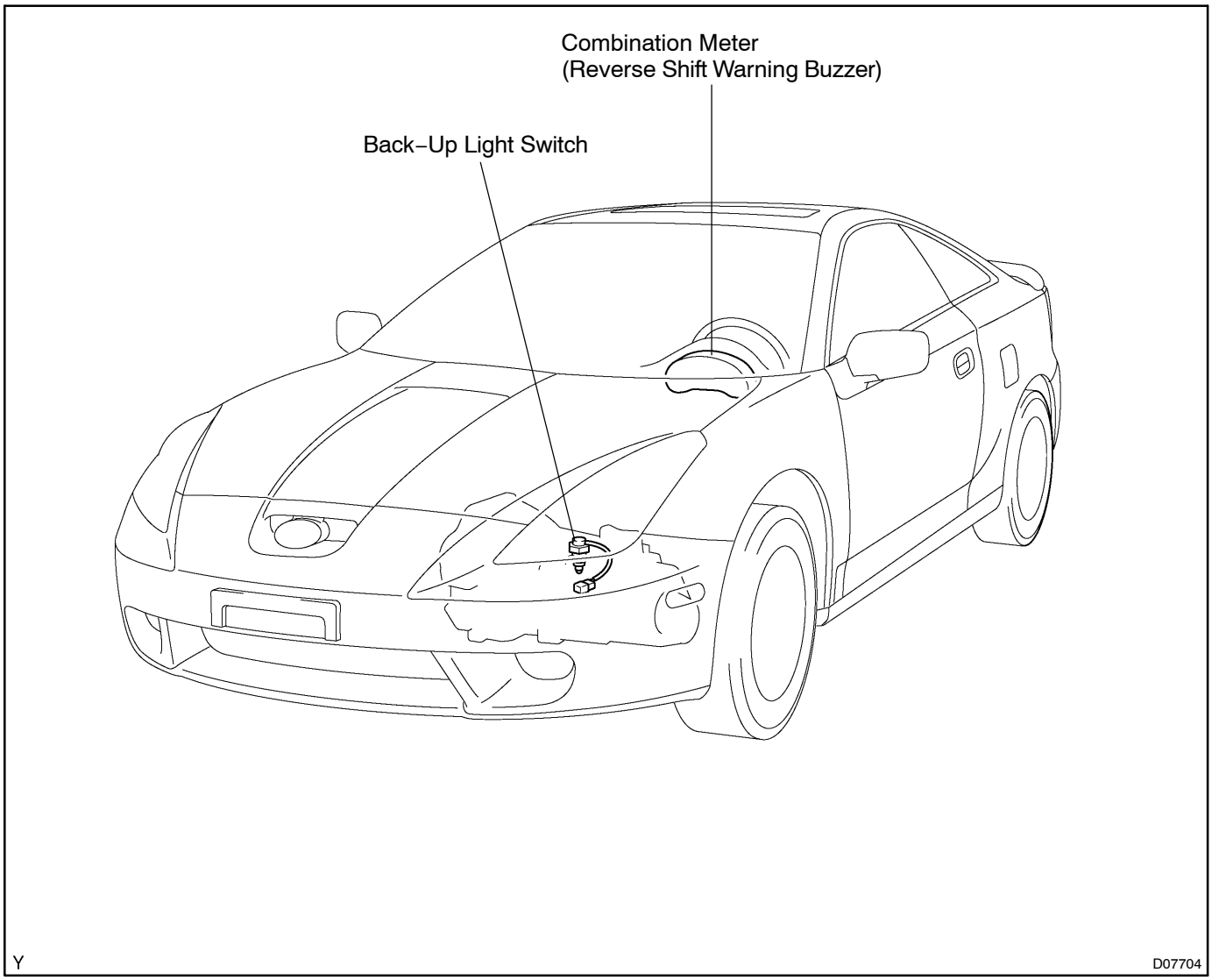
(e) Remove the 16 bolts and transmission case.

(f) Remove the differential case assembly.

REVERSE SHIFT WARNING BUZZER SYSTEM

LOCATION

MX01V–04



MX0A6–03

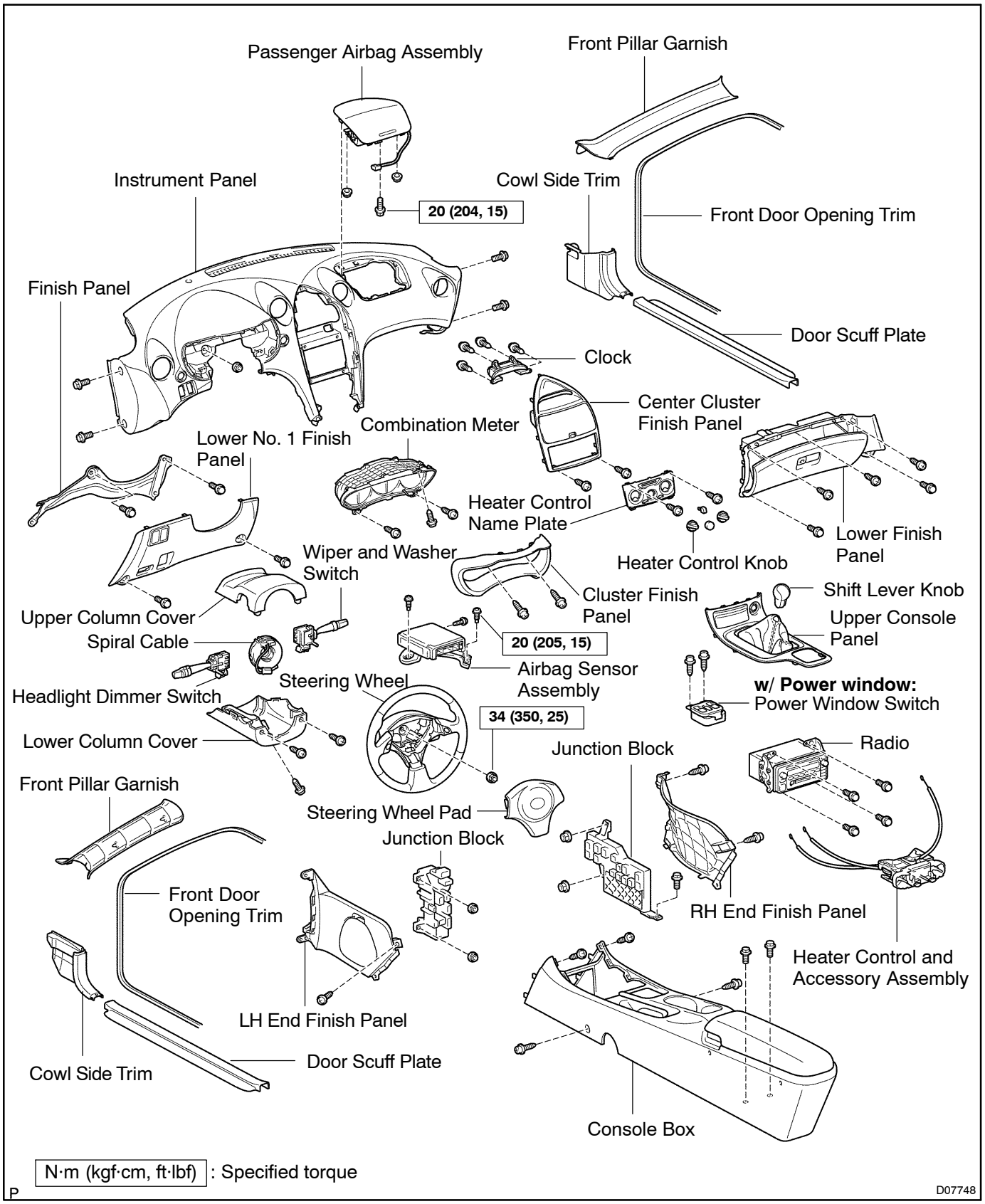
INSPECTION

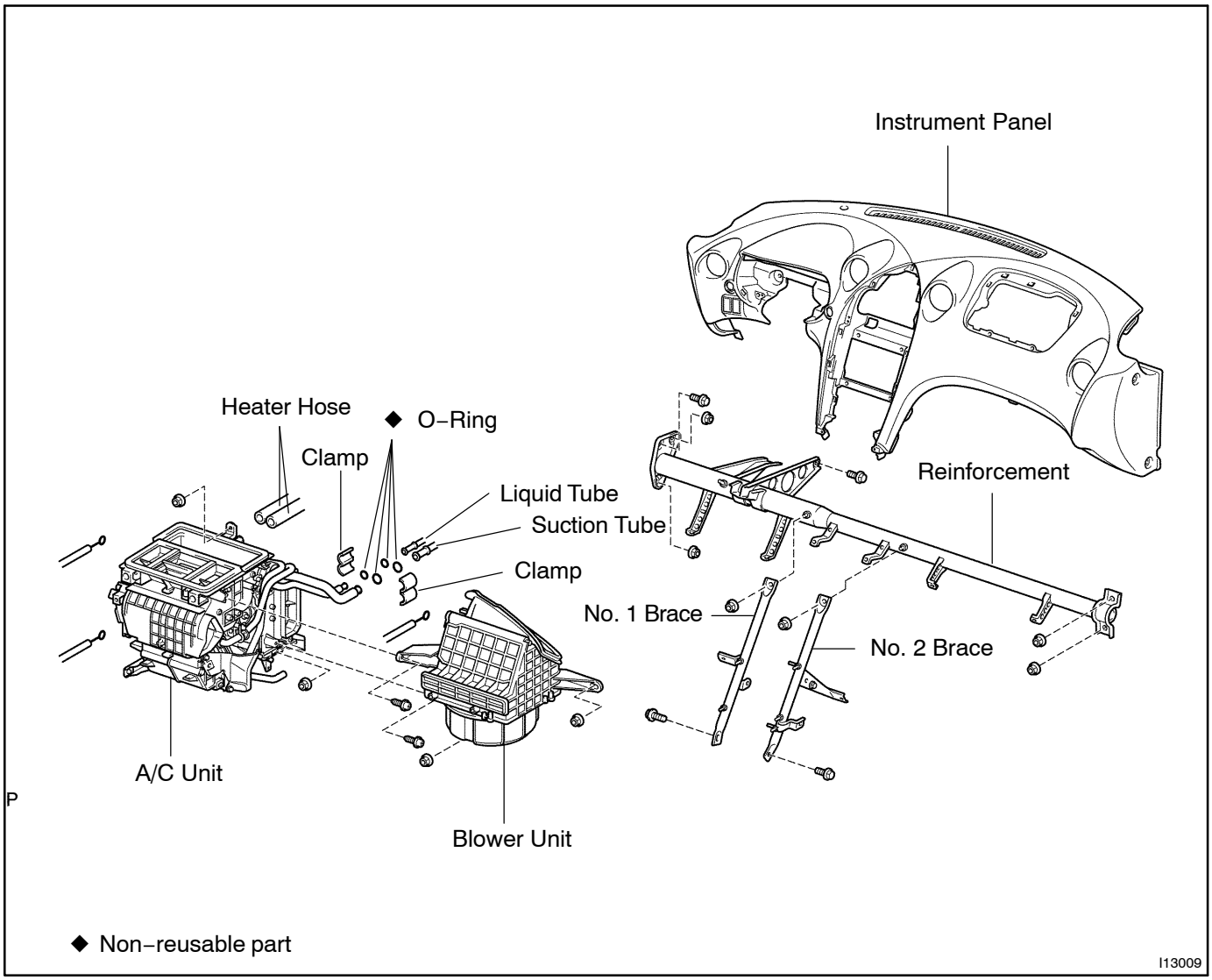
1. **INSPECT REVERSE SHIFT WARNING BUZZER SYSTEM (See page BE–50)**
2. **INSPECT BACK–UP LIGHT SWITCH CONTINUITY (See page BE–34)**

SHIFT LEVER AND CONTROL CABLE

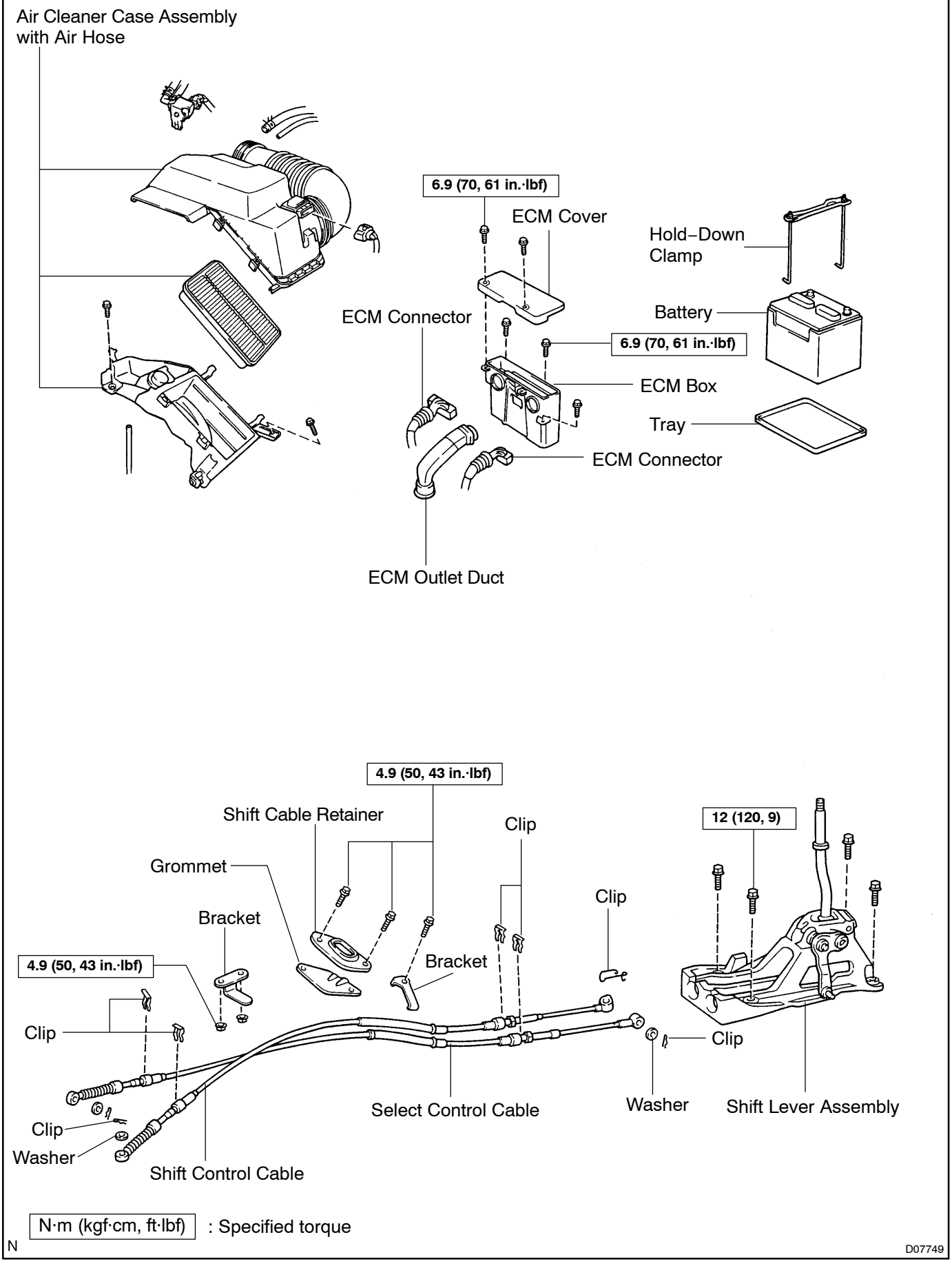
COMPONENTS

MX0A5–03




Instrument Panel
Heater Hose
◆ O–Ring
Clamp
Liquid Tube
Suction Tube
Clamp
Reinforcement
No. 1 Brace
No. 2 Brace
A/C Unit
Blower Unit
◆ Non–reusable part
I13009

P


Air Cleaner Case Assembly with Air Hose
6.9 (70, 61 in.·lbf)
ECM Cover
Hold–Down Clamp
ECM Connector
Battery
6.9 (70, 61 in.·lbf)
ECM Box
Tray
ECM Connector
ECM Outlet Duct
4.9 (50, 43 in.·lbf)
Shift Cable Retainer
Clip
12 (120, 9)
Grommet
Clip
Bracket
Bracket
4.9 (50, 43 in.·lbf)
Clip
Clip
Clip
Select Control Cable
Washer
Shift Lever Assembly
Clip
Washer
Shift Control Cable
N·m (kgf·cm, ft·lbf) : Specified torque
N
D07749

AUTOMATIC TRANSAXLE SYSTEM

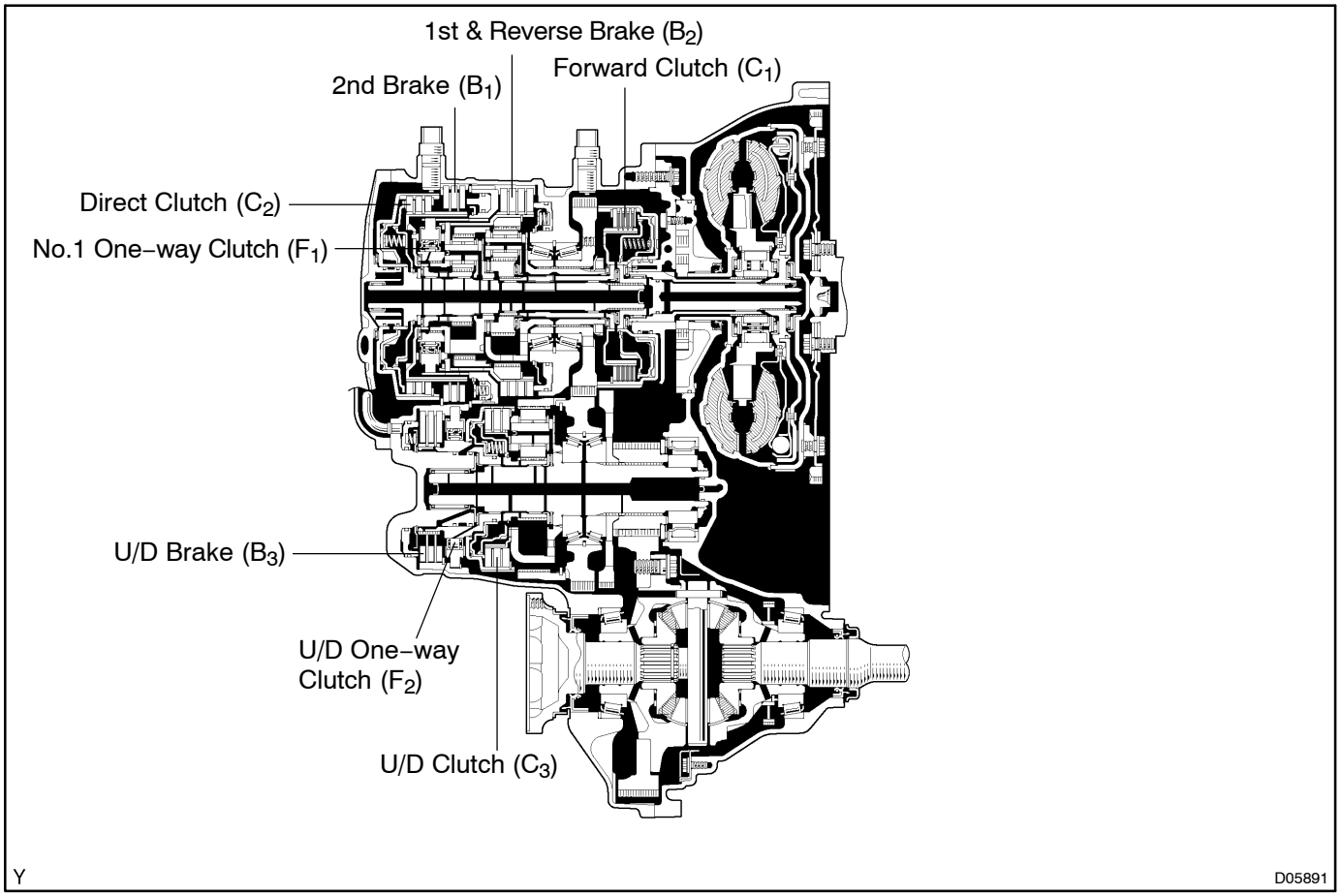
AX042–05

PRECAUTION

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

AX0CM–03

OPERATION



○ ... Operating

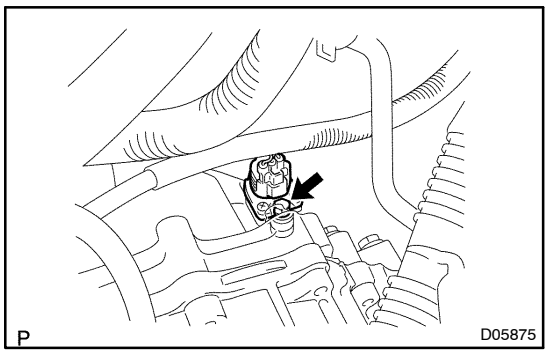
Shift lever position	Gear position	C_1	C_2	C_3	B_1	B_2	B_3	F_1	F_2
P	Parking						○		
R	Reverse		○			○	○		
N	Neutral						○		
D	1st	○					○	○	○
	2nd	○			○		○		○
	3rd	○	○				○		○
	O/D	○	○	○					
2	1st	○					○	○	○
	2nd	○			○		○		○
L	1st	○				○	○	○	○

VEHICLE SPEED SENSOR

AX08T–09

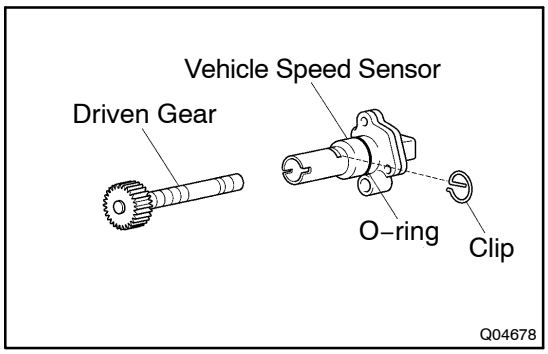
ON–VEHICLE REPAIR

1. **REMOVE BATTERY**
2. **REMOVE ECM AND ECM CASE**
3. **REMOVE ECM BRACKET**



4. **DISCONNECT VEHICLE SPEED SENSOR CONNECTOR**
5. **REMOVE VEHICLE SPEED SENSOR ASSEMBLY**

(a) Remove the bolt and vehicle speed sensor assembly.
(b) Remove the clip and speedometer driven gear from the vehicle speed sensor.
(c) Remove the O–ring from the vehicle speed sensor.



6. **INSTALL VEHICLE SPEED SENSOR ASSEMBLY**

(a) Coat a new O–ring with ATF and install it to the vehicle speed sensor.
(b) Install the speedometer driven gear to the vehicle speed sensor with clip.
(c) Install the vehicle speed sensor assembly with the bolt.
Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)

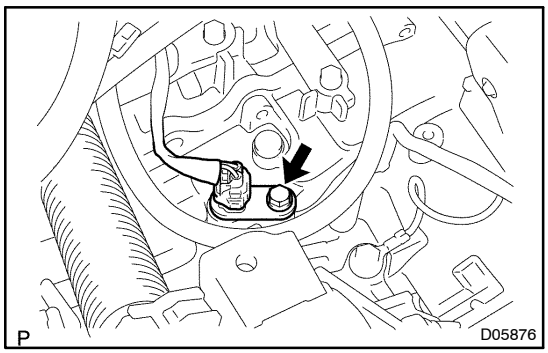
7. **CONNECT VEHICLE SPEED SENSOR CONNECTOR**
8. **INSTALL ECM BRACKET**
Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)
9. **INSTALL ECM AND ECM CASE**
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)
10. **INSTALL BATTERY**

SPEED SENSOR

AX09L–09

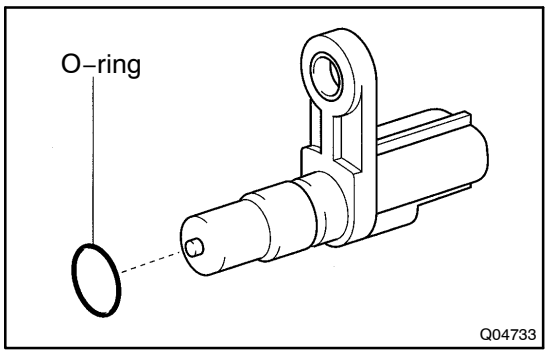
ON–VEHICLE REPAIR

1. **REMOVE BATTERY**
2. **REMOVE ECM AND ECM CASE**
3. **REMOVE ECM BRACKET**



4. **DISCONNECT INPUT TURBINE SPEED SENSOR CONNECTOR**
5. **REMOVE INPUT TURBINE SPEED SENSOR**

(a) Remove the bolt and input turbine speed sensor.



(b) Remove the O–ring from the input turbine speed sensor.

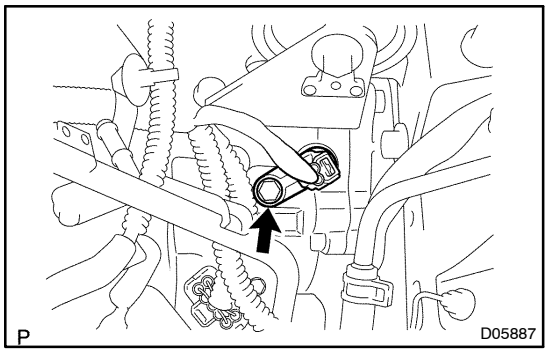
6. **INSTALL INPUT TURBINE SPEED SENSOR**

(a) Coat a new O–ring with ATF and install it to the input turbine speed sensor.

(b) Install the input turbine speed sensor with the bolt.

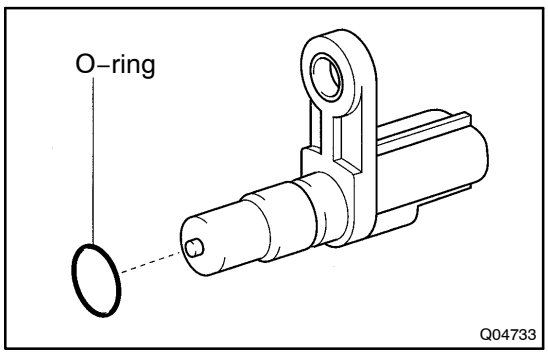
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

7. **CONNECT INPUT TURBINE SPEED SENSOR CONNECTOR**



8. **DISCONNECT COUNTER GEAR SPEED SENSOR CONNECTOR**
9. **REMOVE COUNTER GEAR SPEED SENSOR**

(a) Remove the bolt and counter gear speed sensor.



(b) Remove the O–ring from the counter gear speed sensor.

10. **INSTALL COUNTER GEAR SPEED SENSOR**

(a) Coat a new O–ring with ATF and install it to the counter gear speed sensor.

(b) Install the counter gear speed sensor with the bolt.

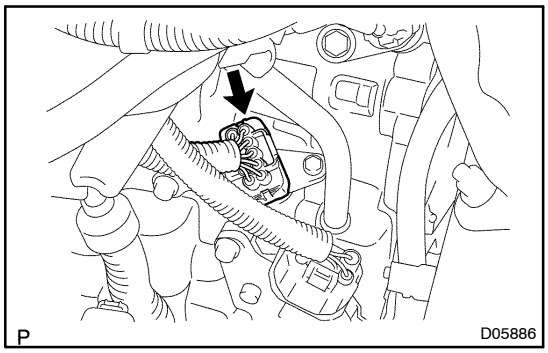
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

11. **CONNECT COUNTER GEAR SPEED SENSOR CONNECTOR**

12. INSTALL ECM BRACKET
Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)

13. INSTALL ECM AND ECM CASE
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

14. INSTALL BATTERY



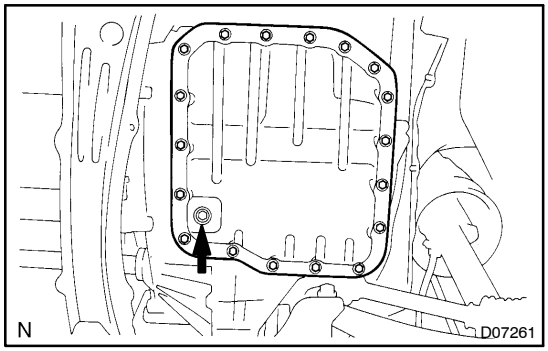
ATF TEMPERATURE SENSOR

AX0KI–02

ON–VEHICLE REPAIR

1. DISCONNECT SOLENOID CONNECTOR

2. REMOVE LH ENGINE UNDER COVER



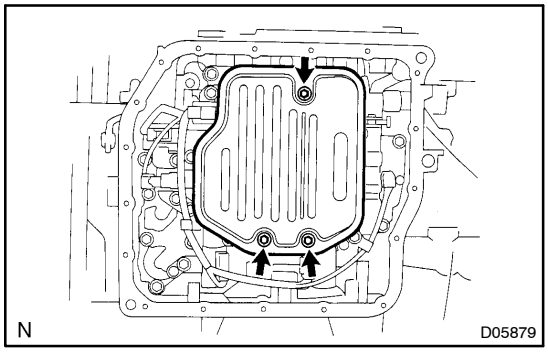
3. REMOVE DRAIN PLUG AND DRAIN ATF

4. REMOVE OIL PAN AND GASKET

NOTICE:

Some fluid will remain in the oil pan.

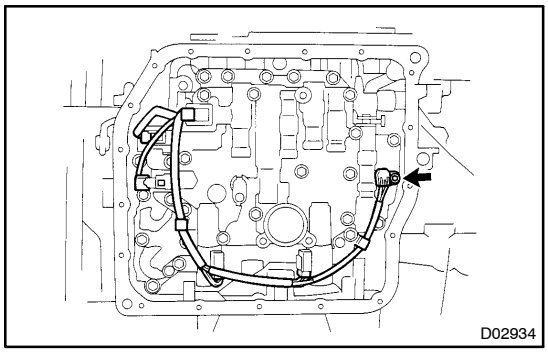
Remove the 18 bolts, and carefully remove the oil pan assembly. Discard the gasket.



5. REMOVE OIL STRAINER

(a) Remove the 3 bolts and oil strainer.

(b) Remove the O–ring.



6. DISCONNECT 5 SHIFT SOLENOID VALVE CONNECTORS

7. REMOVE ATF TEMPERATURE SENSOR

Remove the bolt and lock plate, and remove the ATF temperature sensor.

8. SEPARATE WIRE HARNESS FROM 2 CLAMPS

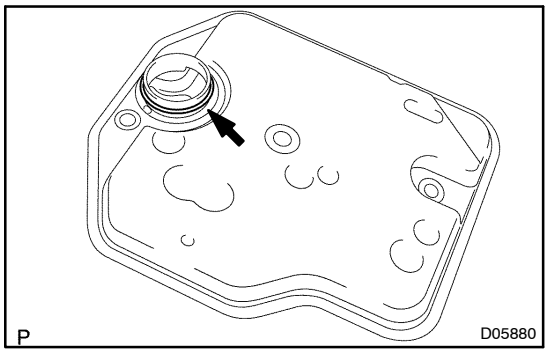
9. CLAMP WIRE HARNESS TO 2 CLAMPS

10. INSTALL ATF TEMPERATURE SENSOR

Install the ATF temperature sensor with the lock plate and bolt.

Torque: 6.6 N·m (67 kgf·cm, 58 in.·lbf)

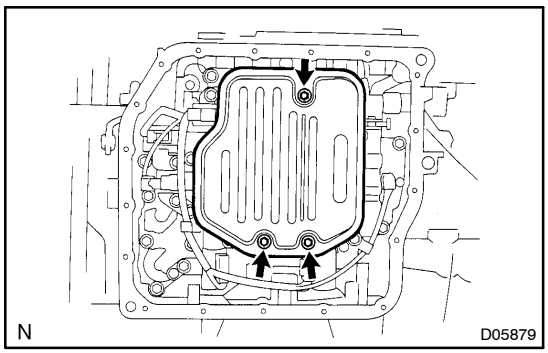
11. CONNECT 5 SHIFT SOLENOID VALVE CONNECTORS



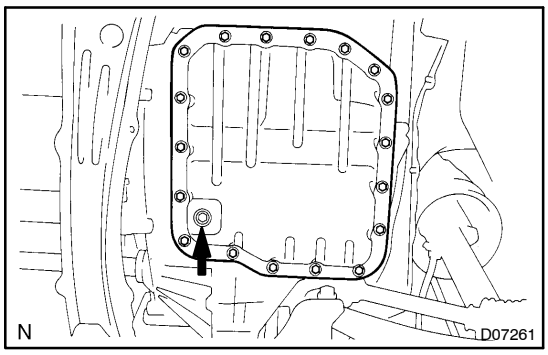
12. INSTALL OIL STRAINER

(a) Coat a new O–ring with ATF.

(b) Install the O–ring to the oil strainer.



(c) Install the oil strainer with the 3 bolts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

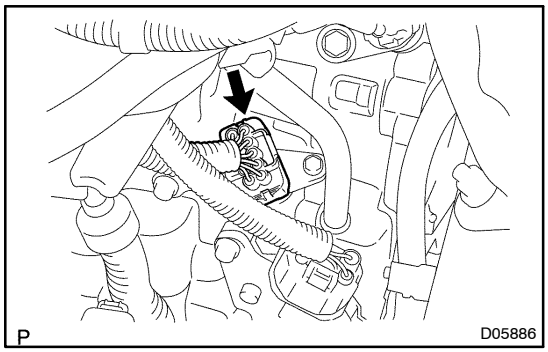


13. INSTALL OIL PAN

Install the oil pan and a new gasket with the 18 bolts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

14. INSTALL DRAIN PLUG

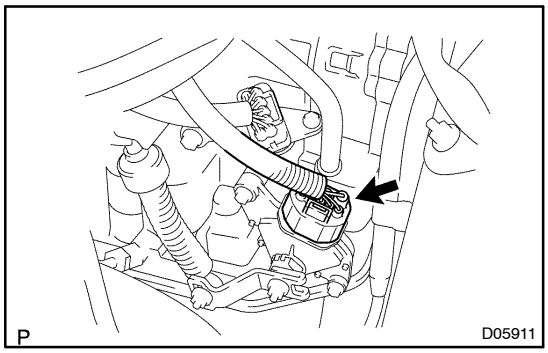
Install a new gasket and drain plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



15. CONNECT SOLENOID CONNECTOR

16. FILL ATF AND CHECK ATF LEVEL
(See page DI–669)

17. INSTALL LH ENGINE UNDER COVER



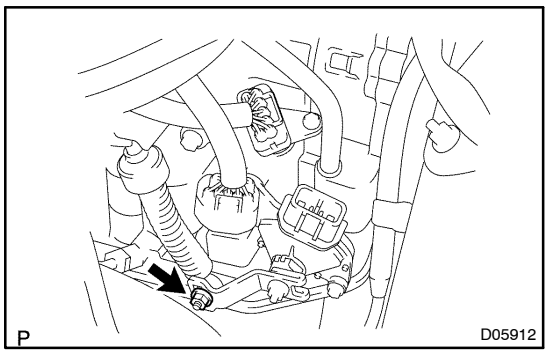
PARK/NEUTRAL POSITION (PNP) SWITCH

AX0KJ–06

ON–VEHICLE REPAIR

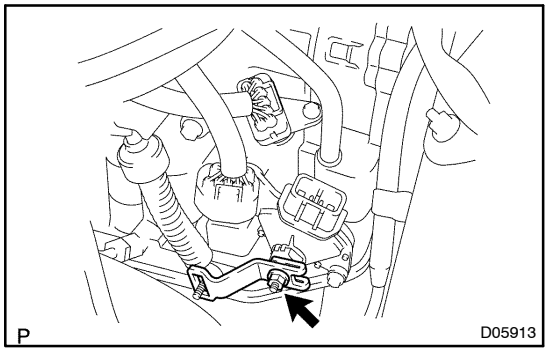
1. REMOVE AIR CLEANER ASSEMBLY

2. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

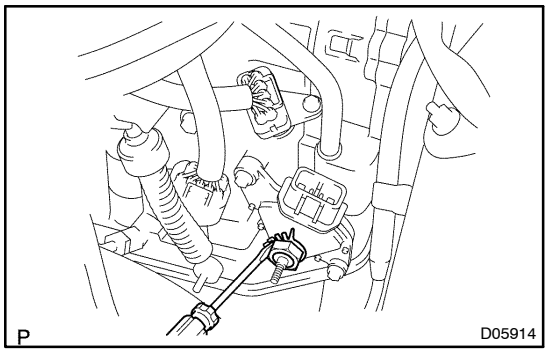


3. REMOVE PARK/NEUTRAL POSITION SWITCH

(a) Remove the nut.

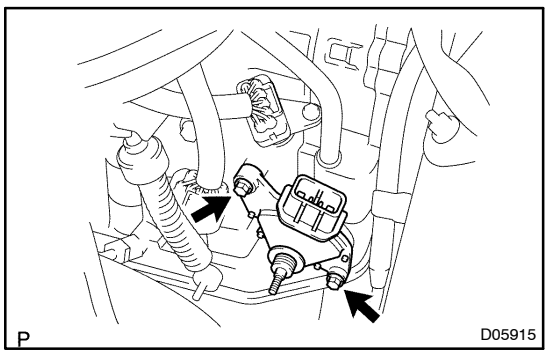


(b) Remove the nut, washer and control shift lever.



(c) Using a screwdriver, pry off the lock plate.

(d) Remove the nut and lock plate.



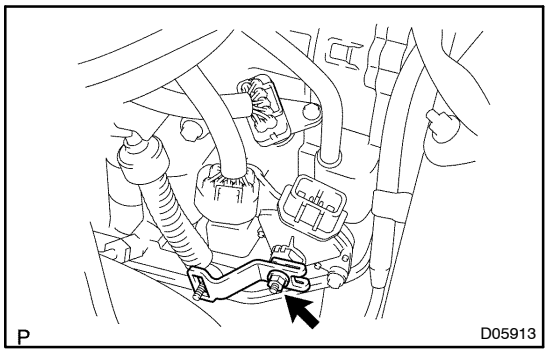
(e) Remove the 2 bolts and pull out the park/neutral position switch.

4. INSTALL AND ADJUST PARK/NEUTRAL POSITION SWITCH

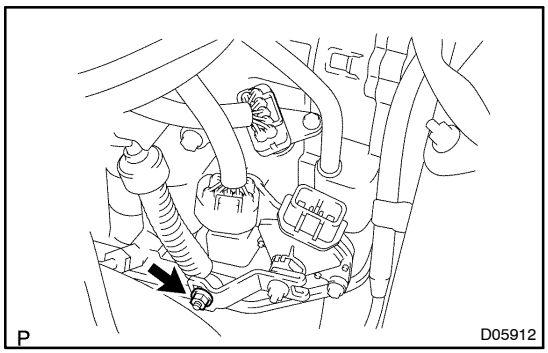
(a) Install the park/neutral position switch with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Install a new lock plate and nut.
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

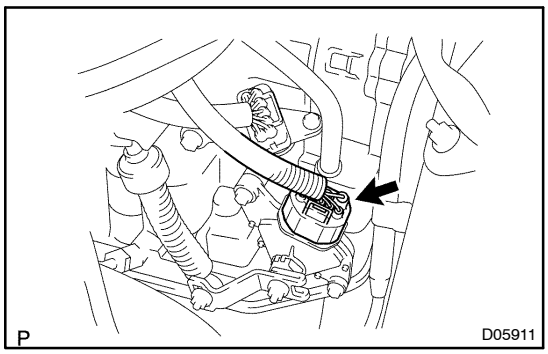
(c) Bend the claws on the lock plate to fix the nut.



(d) Install the control shift lever with the nut.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



(e) Connect the control cable to the control shaft.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



5. CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

6. CHECK PARK/NEUTRAL POSITION OPERATION

Check that the engine can be started with the shift lever only in the N or P position, but not in other position.

If the engine can not be stated not as started above, carry out the adjustment procedure (See page DI–669).

7. INSTALL AIR CLEANER ASSEMBLY

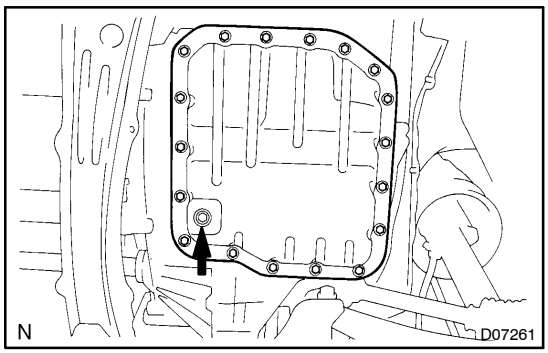
8. TEST DRIVE VEHICLE

VALVE BODY ASSEMBLY

AX0KN–02

ON–VEHICLE REPAIR

1. REMOVE LH ENGINE UNDER COVER



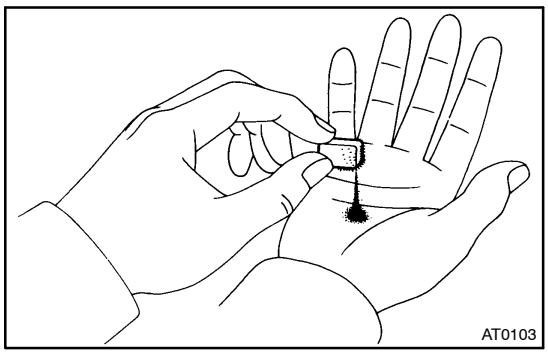
2. REMOVE DRAIN PLUG AND DRAIN ATF

3. REMOVE OIL PAN AND GASKET

NOTICE:

Some fluid will remain in the oil pan.

Remove the 18 bolts, and carefully remove the oil pan assembly. Discard the gasket.

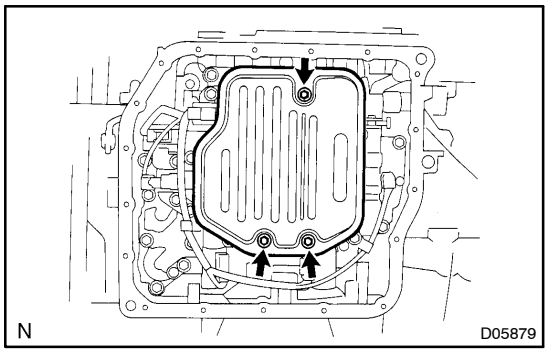


4. EXAMINE PARTICLES IN OIL PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic)...bearing, gear and plate wear

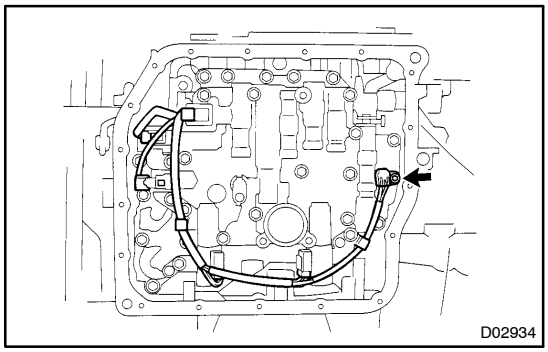
Brass (non–magnetic)... bushing wear



5. REMOVE OIL STRAINER

(a) Remove the 3 bolts and oil strainer.

(b) Remove the O–ring.

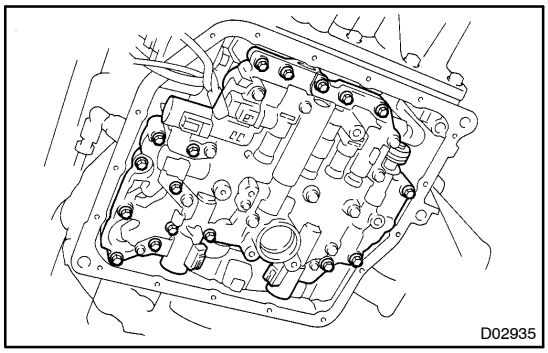


6. DISCONNECT 5 SHIFT SOLENOID VALVE CONNECTORS

7. REMOVE ATF TEMPERATURE SENSOR

Remove the bolt and lock plate, and remove the ATF temperature sensor.

8. SEPARATE WIRE HARNESS FROM 2 CLAMPS

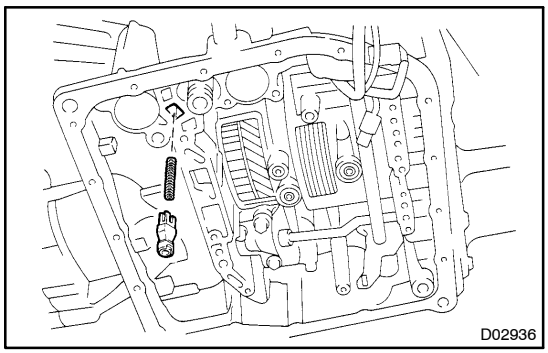


9. REMOVE VALVE BODY

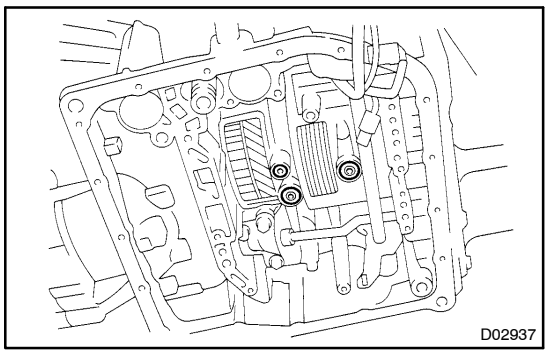
Remove the 17 bolts and valve body.

NOTICE:

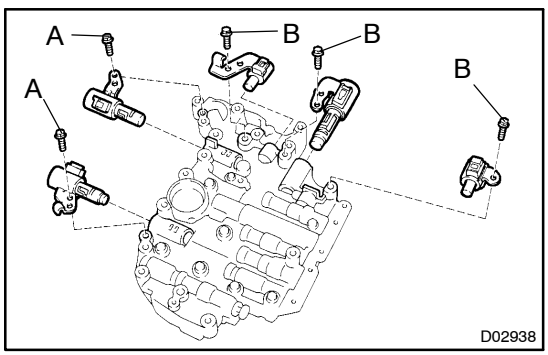
Be careful not to drop the check valve body, spring and accumulator piston.



10. REMOVE CHECK BALL BODY AND SPRING



11. REMOVE 3 APPLY GASKETS



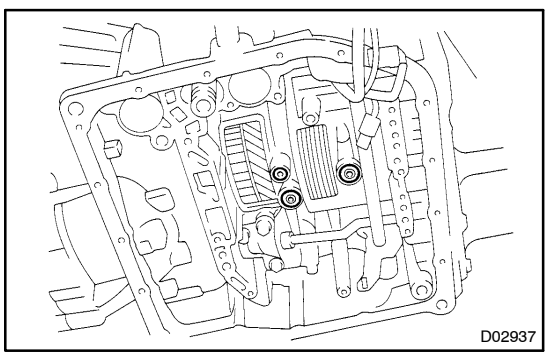
12. REMOVE SHIFT SOLENOID VALVE

Remove the 5 bolts and 5 shift solenoid valves.

13. INSTALL SHIFT SOLENOID VALVE

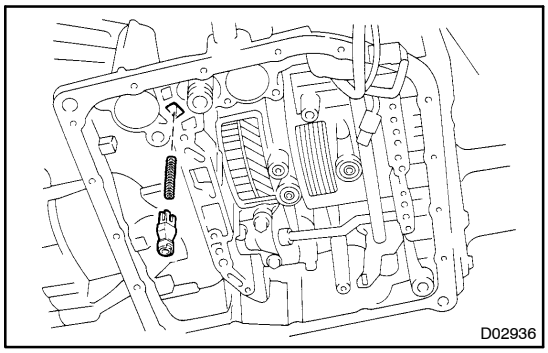
Install the 5 shift solenoid valves with the 5 bolts.

Torque:
Bolt A: 6.6 N·m (67 kgf·cm, 58 in.·lbf)
Bolt B: 11 N·m (110 kgf·cm, 8 ft·lbf)
Bolt length:
Bolt A: 12 mm (0.47 in.)
Bolt B: 45 mm (1.77 in.)

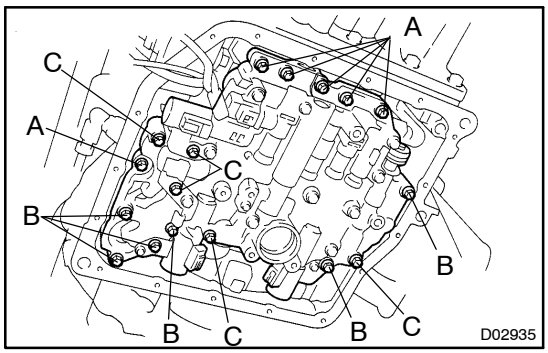


14. INSTALL APPLY GASKET

(a) Coat 3 new apply gaskets with ATF.
(b) Install the gaskets to the transaxle case.



15. INSTALL CHECK VALVE AND SPRING



16. INSTALL VALVE BODY

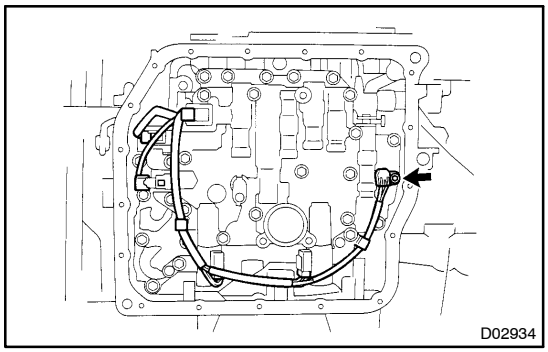
(a) Align the groove of the manual valve with the pin of the manual valve lever.

(b) Temporarily install the valve body with the 17 bolts.
Bolt length:
Bolt A: 25 mm (0.98 in.)
Bolt B: 41 mm (1.61 in.)
Bolt C: 45 mm (1.77 in.)

(c) Check that the manual valve lever contacts the center of the roller at the tip of the detent spring.

(d) Tighten the 17 bolts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

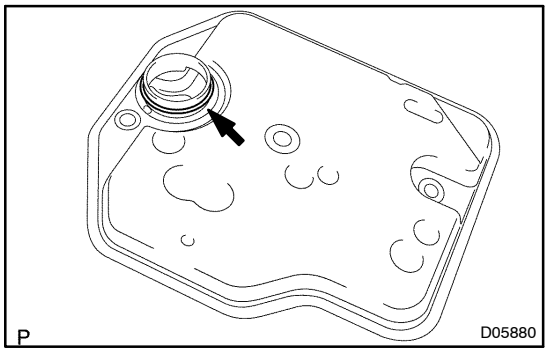
17. CLAMP WIRE HARNESS TO 2 CLAMPS



18. INSTALL ATF TEMPERATURE SENSOR

Install the ATF temperature sensor with the lock plate and bolt.
Torque: 6.6 N·m (67 kgf·cm, 58 in.·lbf)

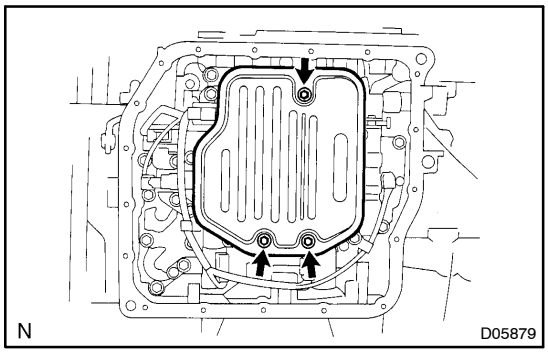
19. CONNECT 5 SHIFT SOLENOID VALVE CONNECTORS



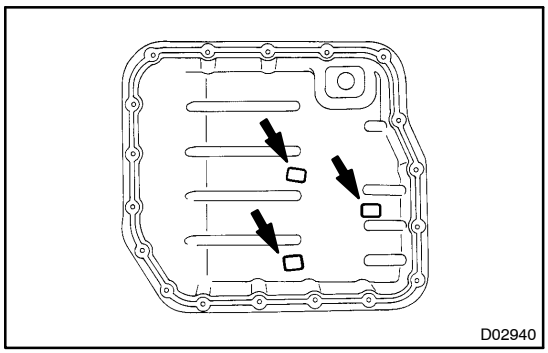
20. INSTALL OIL STRAINER

(a) Coat a new O–ring with ATF.

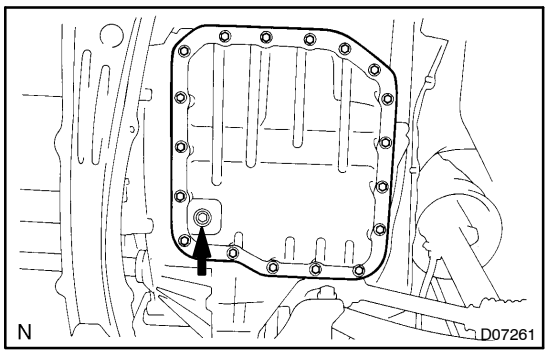
(b) Install the O–ring to the oil strainer.



(c) Install the oil strainer with the 3 bolts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)



21. INSTALL MAGNET IN OIL PAN
Install the 3 magnets in the oil pan, as shown in the illustration.

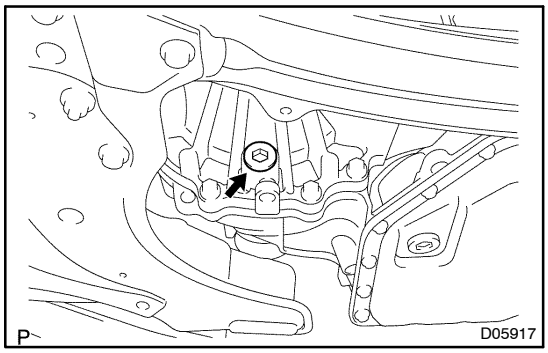


22. INSTALL OIL PAN
Install the oil pan and a new gasket with the 18 bolts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

23. INSTALL DRAIN PLUG
Install a new gasket and drain plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

24. FILL ATF AND CHECK ATF LEVEL
(See page DI–669)

25. INSTALL LH ENGINE UNDER COVER



DIFFERENTIAL OIL SEAL

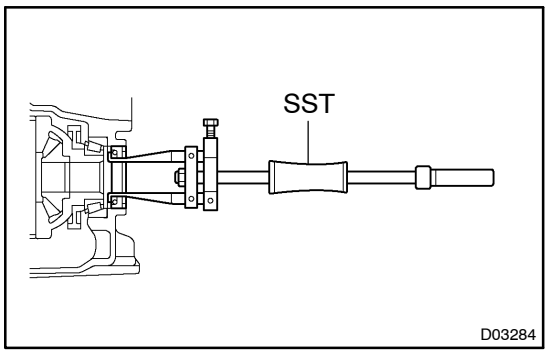
AX09M–06

ON–VEHICLE REPAIR

1. DRAIN ATF FROM FRONT DIFFERENTIAL CASE

2. REMOVE LH AND RH DRIVE SHAFTS

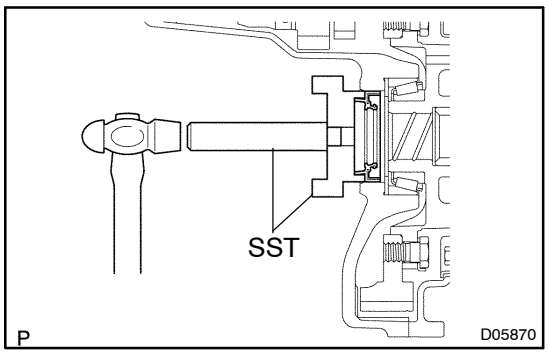
(See page SA–21)



3. REMOVE LH AND RH SIDE OIL SEAL

Using SST, drive out both the side oil seals.

SST 09308–10010



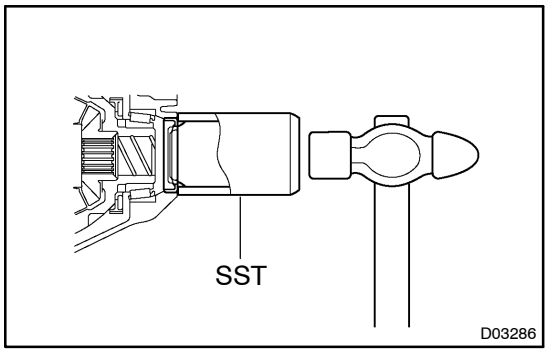
4. INSTALL LH SIDE OIL SEAL

(a) Using SST and a hammer, drive in a new oil seal.

SST 09350–32014 (09351–32150), 09950–70010 (09951–07150)

Oil seal drive in depth: 2.7 ± 0.5 mm (0.106 ± 0.020 in.)

(b) Coat the oil seal lip with MP grease.



5. INSTALL RH SIDE OIL SEAL

(a) Using SST and a hammer, drive in a new oil seal.

SST 09223–00010

Oil seal drive in depth: 0 ± 0.5 mm (0 ± 0.020 in.)

(b) Coat the oil seal lip with MP grease.

6. INSTALL LH AND RH DRIVE SHAFTS

(See page SA–33)

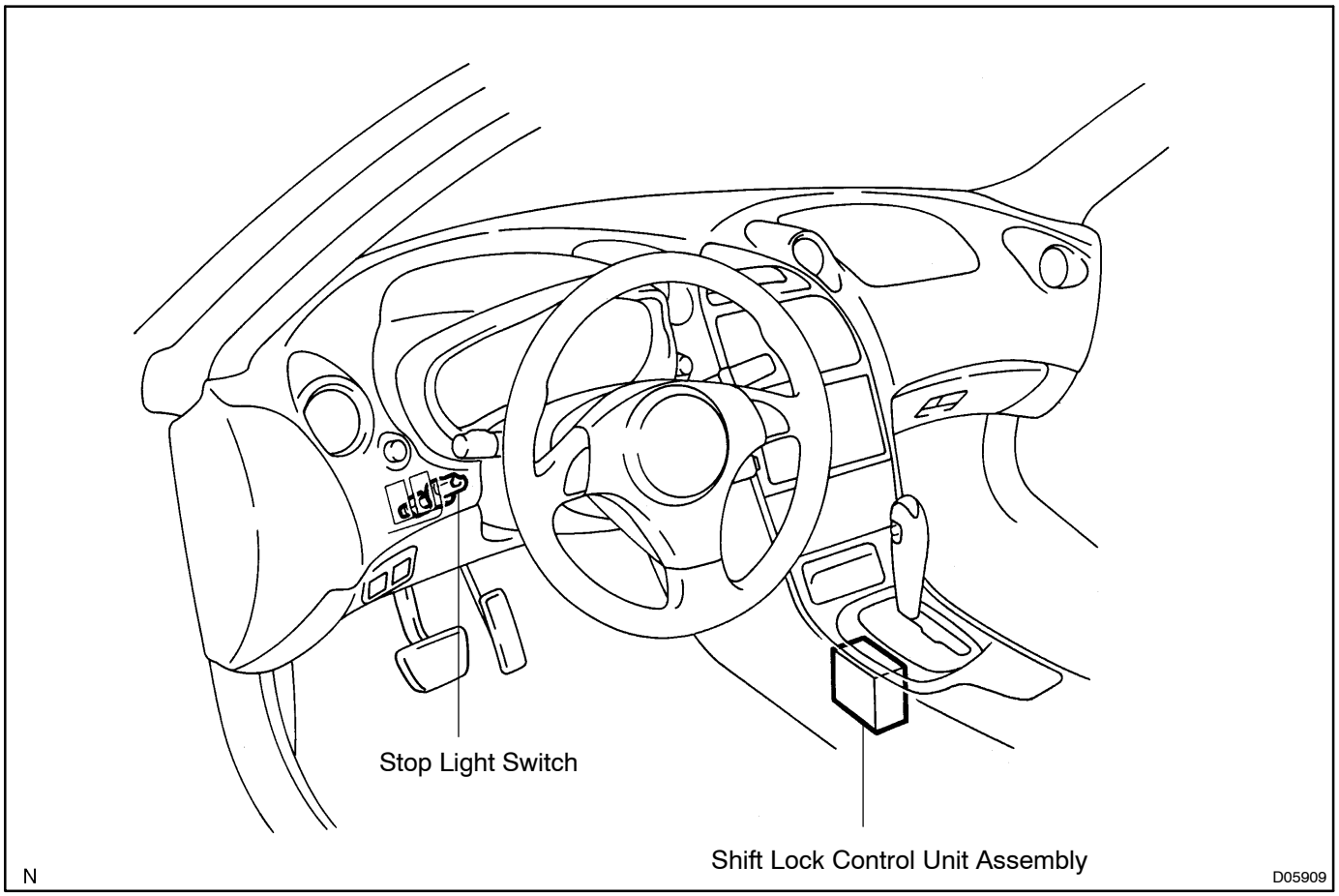
7. FILL ATF AND CHECK ATF LEVEL

(See page DI–669)

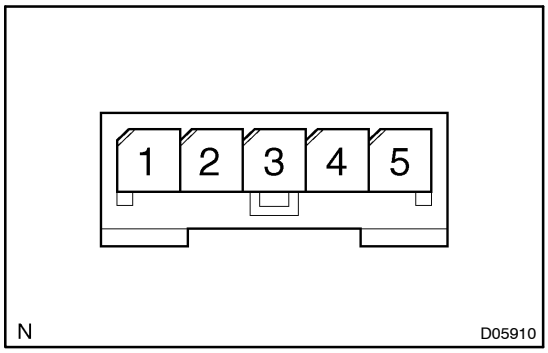
SHIFT LOCK SYSTEM

COMPONENTS

AX0KL–02



AX0KM–02



INSPECTION

INSPECT SHIFT LOCK CONTROL UNIT ASSEMBLY

Using a voltmeter, measure the voltage at each terminal.

HINT:

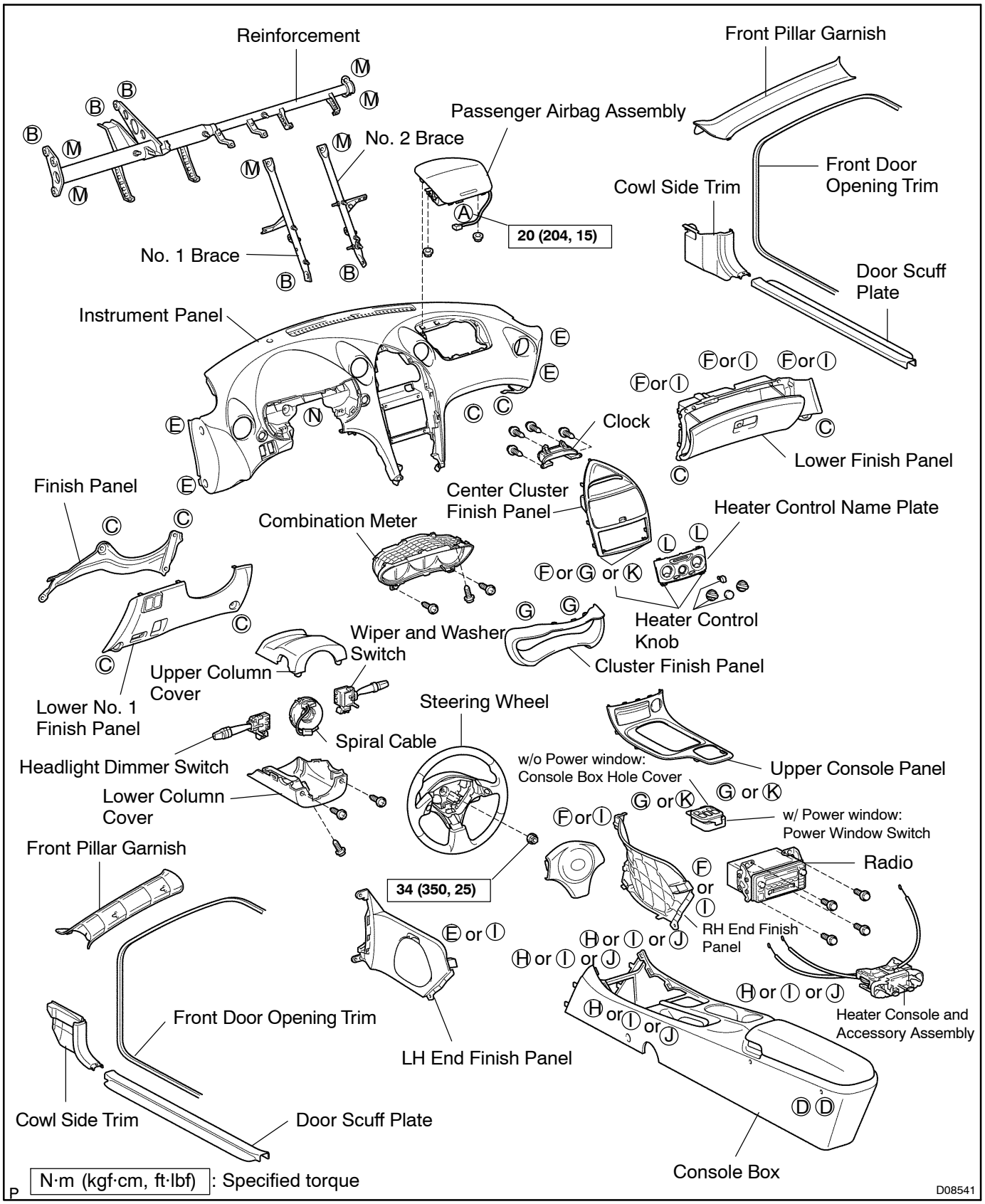
Do not disconnect the shift lock control unit assembly connector.

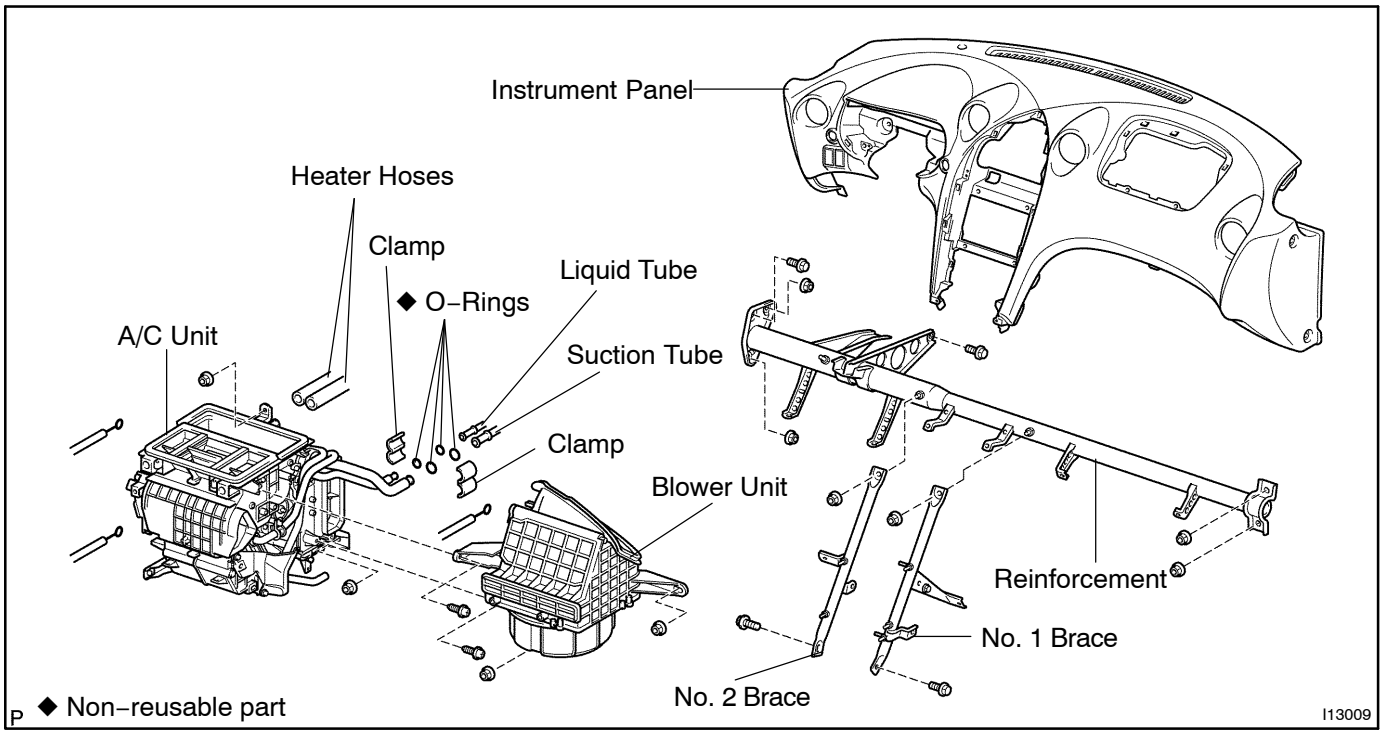
Terminal	Measuring Condition	Voltage (V)
5 – 1 (IG – E)	Ignition switch ON	10 – 14
3 – 1 (STP – E)	Depressing brake pedal	10 – 14

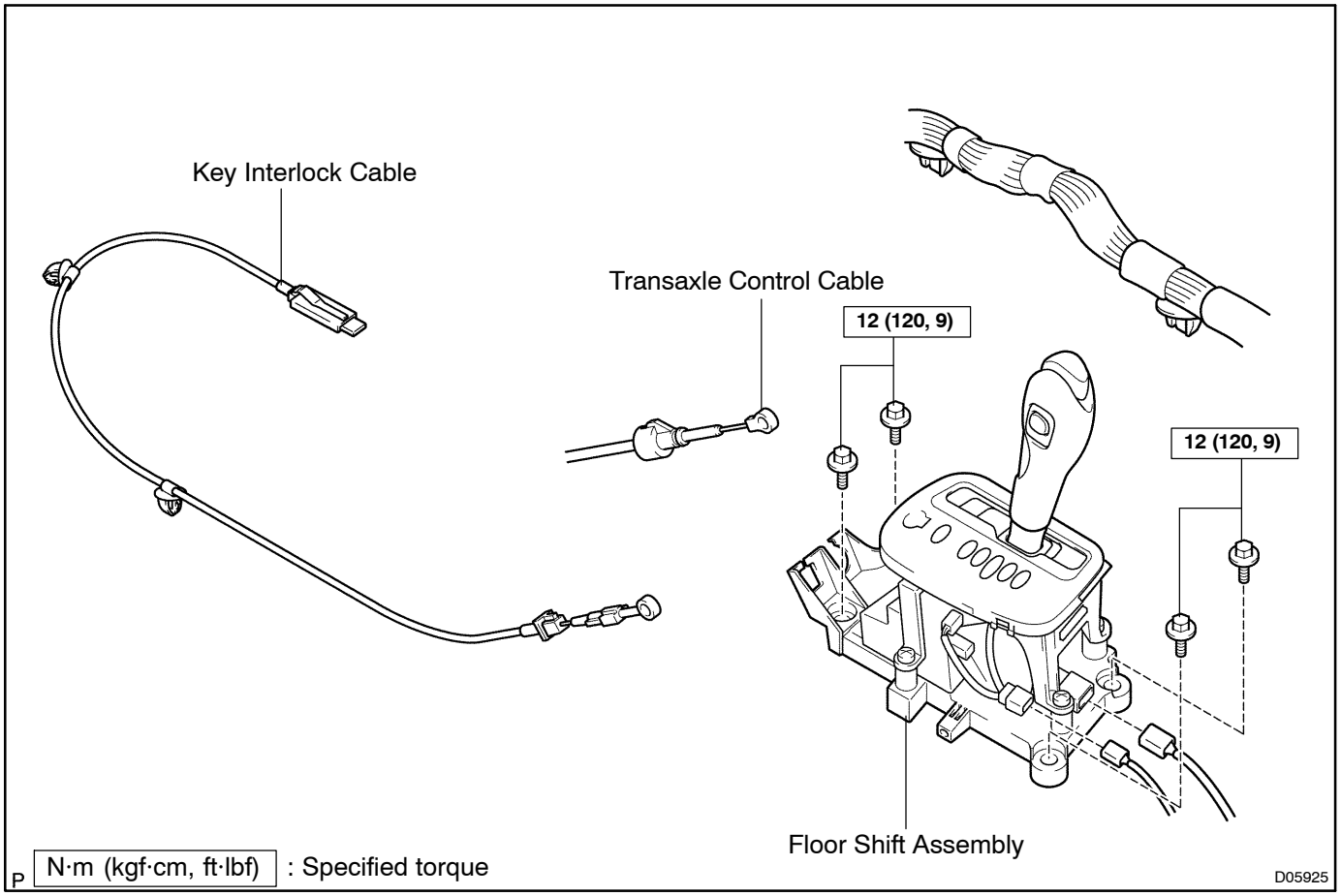
FLOOR SHIFT ASSEMBLY

COMPONENTS

AX0L5–03

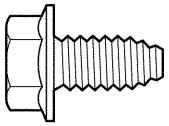
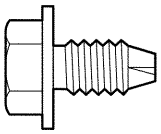
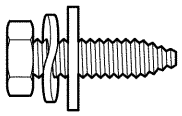
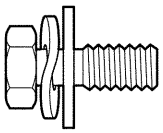
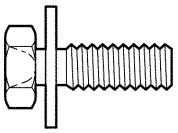
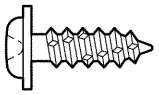
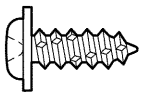
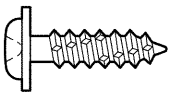
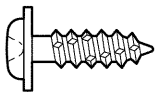
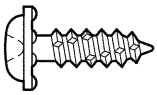
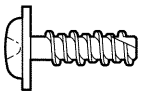
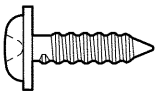
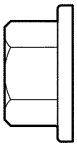
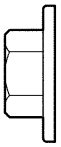



Instrument Panel
Heater Hoses
Clamp
◆ O–Rings
Liquid Tube
A/C Unit
Suction Tube
Clamp
Blower Unit
Reinforcement
No. 1 Brace
No. 2 Brace
P ◆ Non–reusable part
I13009


Key Interlock Cable
Transaxle Control Cable
12 (120, 9)
12 (120, 9)
Floor Shift Assembly
P N·m (kgf·cm, ft·lbf) : Specified torque
D05925

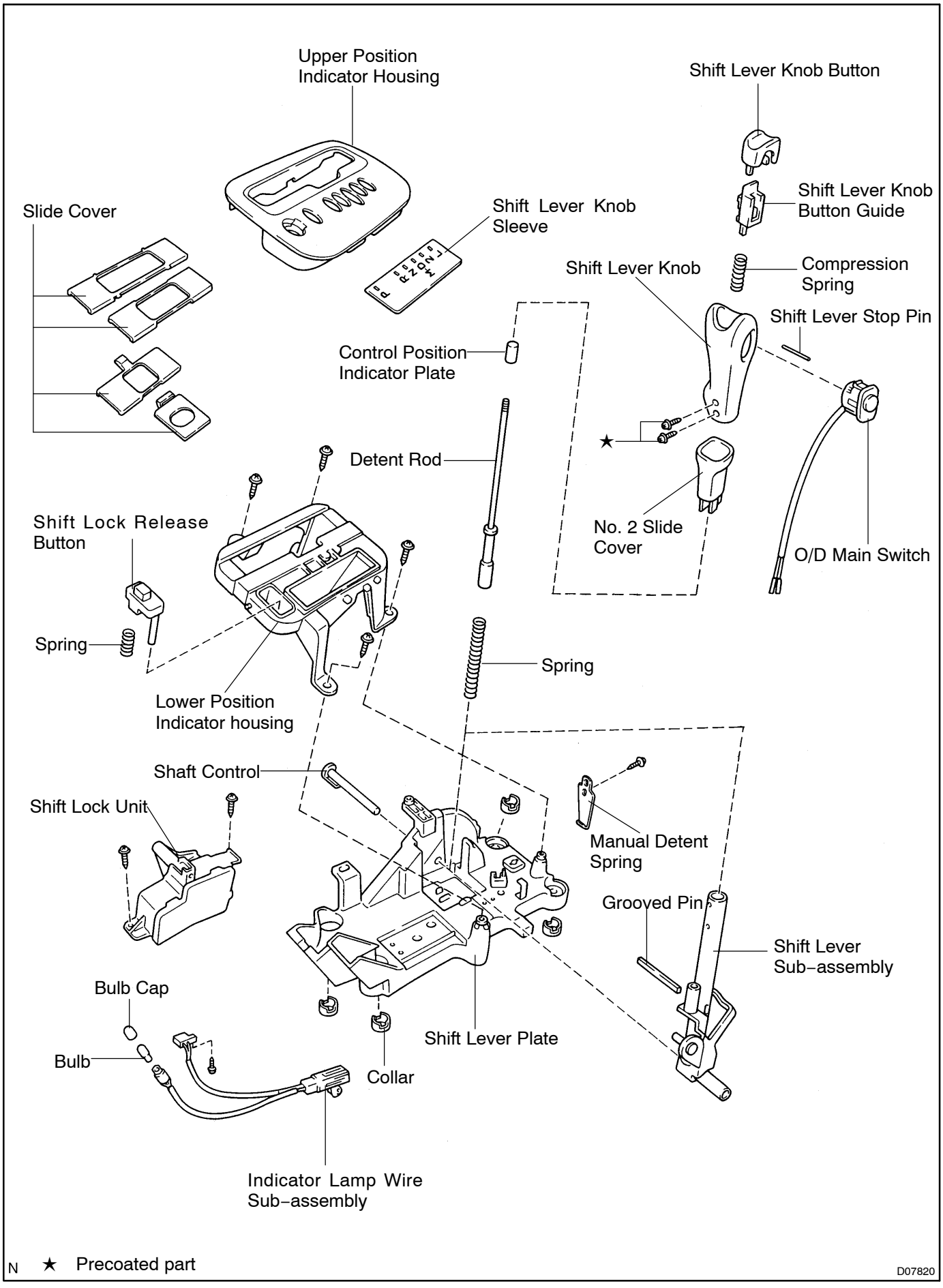
HINT:
Screw shapes and sizes are indicated in the table below. The codes (”A” – ”N”) correspond to those indicated on the previous page.

mm (in.)

	Shape	Size		Shape	Size		Shape	Size
Ⓐ		ø = 8 (0.32) L = 16 (0.63)	Ⓑ		ø = 8 (0.32) L = 15 (0.59)	Ⓒ		ø = 6 (0.24) L = 22 (0.87)
Ⓓ		ø = 6 (0.24) L = 16 (0.63)	Ⓔ		ø = 6 (0.24) L = 18 (0.71)	Ⓕ		ø = 5.22 (0.2055) L = 16 (0.63)
Ⓖ		ø =5.22 (0.2055) L = 16 (0.63)	Ⓗ		ø = 5 (0.20) L = 18 (0.71)	Ⓘ		ø = 5 (0.20) L = 16 (0.63)
Ⓙ		ø = 5 (0.20) L = 16 (0.63)	Ⓚ		ø = 5 (0.20) L = 14 (0.55)	Ⓛ		ø = 4 (0.16) L = 16 (0.63)
Ⓜ		ø = 8 (0.32)	Ⓝ		ø = 6 (0.24)			

P

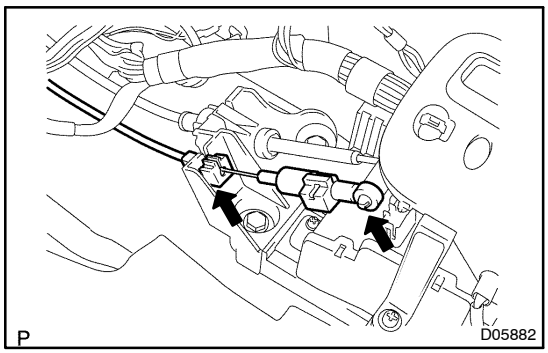
H12659


Upper Position Indicator Housing
Shift Lever Knob Button
Shift Lever Knob Button Guide
Slide Cover
Shift Lever Knob Sleeve
Shift Lever Knob
Compression Spring
Shift Lever Stop Pin
Control Position Indicator Plate
Detent Rod
No. 2 Slide Cover
O/D Main Switch
Shift Lock Release Button
Spring
Lower Position Indicator housing
Spring
Shaft Control
Shift Lock Unit
Manual Detent Spring
Grooved Pin
Shift Lever Sub–assembly
Bulb Cap
Bulb
Collar
Shift Lever Plate
Indicator Lamp Wire Sub–assembly
N ★ Precoated part
D07820

AX0L6–04

REMOVAL

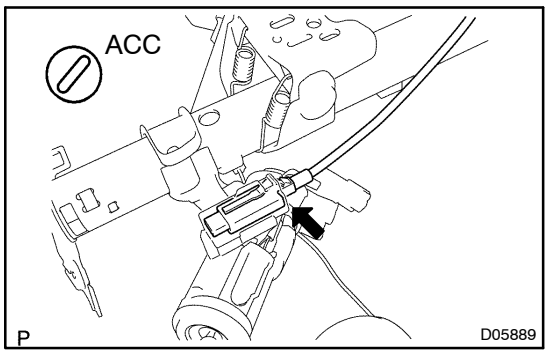
1. **REMOVE INSTRUMENT PANEL (See page BO–79)**
2. **REMOVE AIR CONDITIONING UNIT (See page AC–26)**



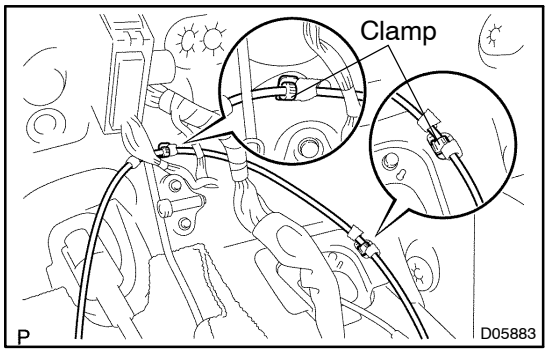
3. **REMOVE KEY INTERLOCK CABLE**

(a) Remove the cable end from the rod of the floor shift assembly.

(b) Pull out the cable while pressing the clip of the key interlock cable.



(c) With the key in ACC, remove the cable cap claw from the key interlock and pull it.

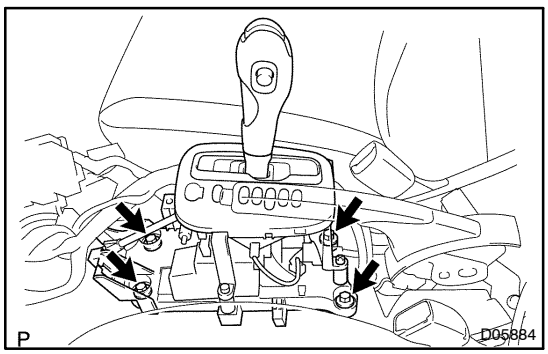


(d) Disconnect the 2 key interlock cable clamps.

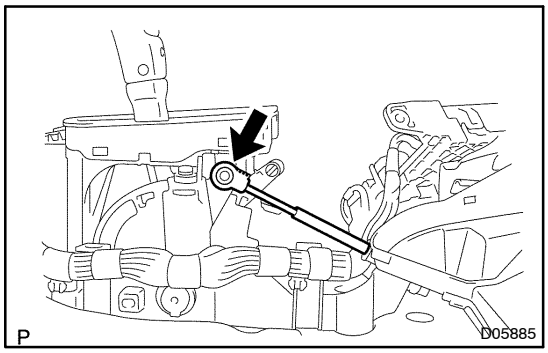
4. **REMOVE FLOOR SHIFT ASSEMBLY**

(a) Disconnect the 2 connectors.

(b) Disconnect the 2 wire harness clamps from the floor shift assembly.



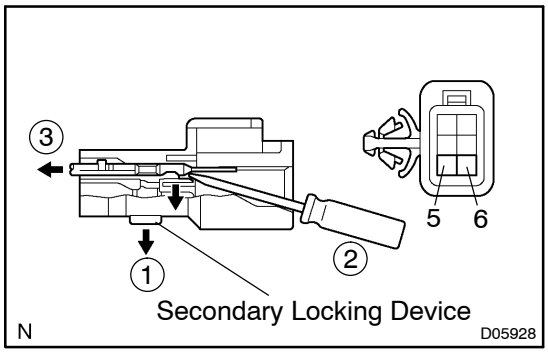
(c) Remove the 4 bolts from the floor shift assembly.



(d) Remove the cable end from the rod of the floor shift assembly.
(e) Pull out the cable while pressing the clip of the transaxle control cable.
(f) Remove the floor shift assembly.

AX0L8–02

DISASSEMBLY

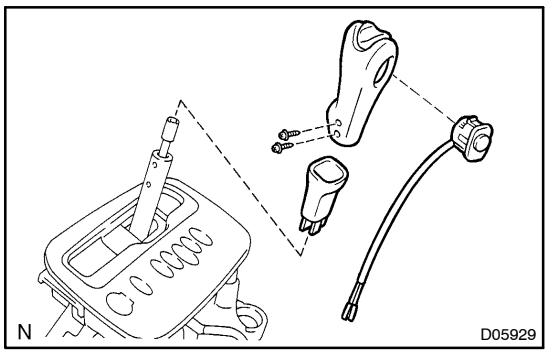


1. REMOVE O/D MAIN SWITCH TERMINAL

(a) Remove the O/D main switch connector from the shift lever plate.

(b) Disengage the secondary locking device.

(c) Release the locking log of the terminals 5 and 6, and pull the terminals out from the rearward.



2. REMOVE SHIFT LEVER KNOB SUB–ASSEMBLY

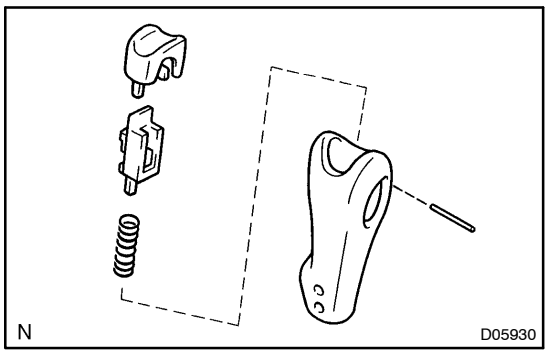
(a) Remove the 2 screws and shift lever knob sub–assembly.

NOTICE:

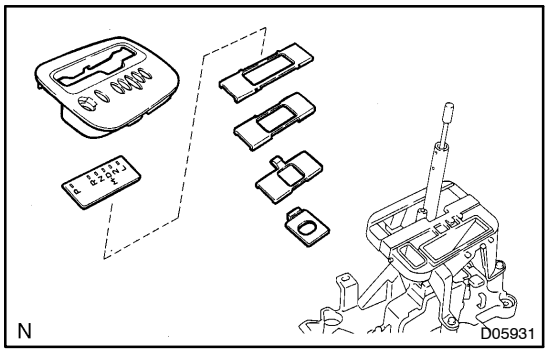
Pay attention not to apply unnatural load to O/D main switch wire harness.

(b) Remove the O/D main switch.

(c) Remove the No. 2 slide cover.



(d) Remove the shift lever stop pin, shift lever knob button, shift lever knob button guide and compression spring.

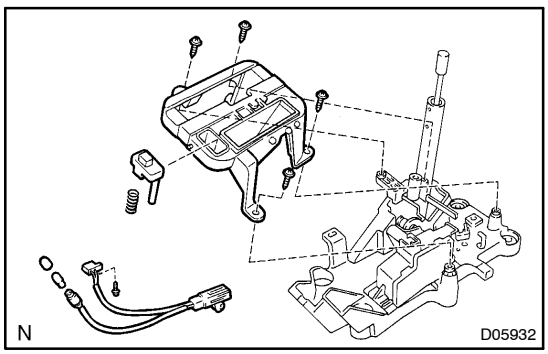


3. REMOVE UPPER POSITION INDICATOR HOUSING

(a) Remove the upper position indicator housing.

(b) Remove the control position indicator plate.

(c) Remove the 4 slide covers from the lower position indicator housing.



4. REMOVE LOWER POSITION INDICATOR HOUSING

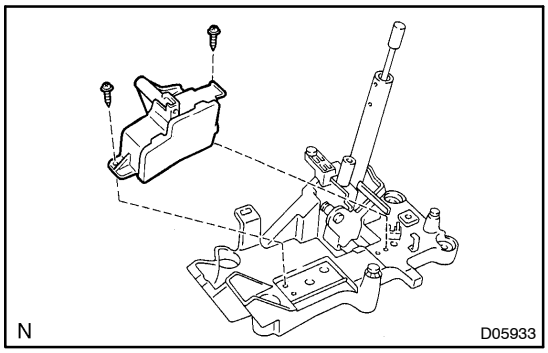
(a) Remove the indicator lamp wire sub–assembly.

(b) Remove the 4 screws and lower position indicator housing.

(c) Remove the bulb cap and bulb from the indicator lamp wire sub–assembly.

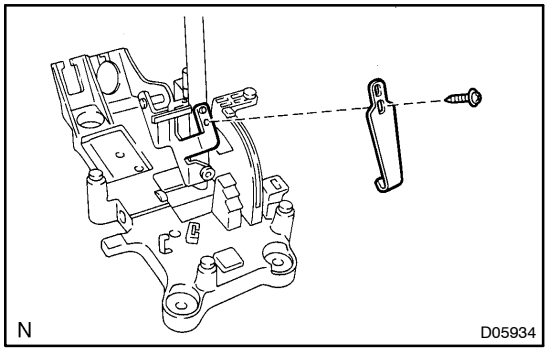
(d) Remove the screw and indicator lamp wire sub–assembly.

(e) Remove the shift lock release button and spring.

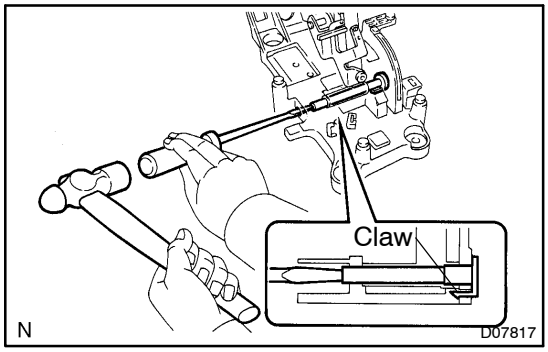


5. REMOVE SHIFT LOCK UNIT

Remove the 2 screws and shift lock unit.

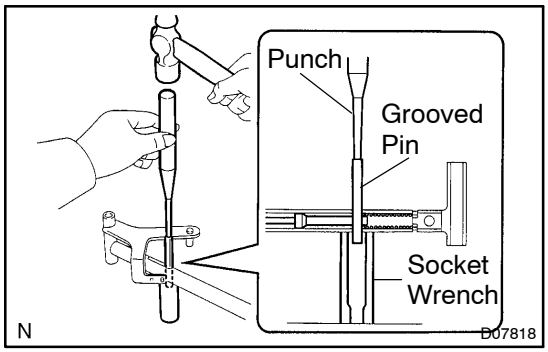


6. REMOVE SCREW AND MANUAL DETENT SPRING



7. REMOVE SHIFT LEVER SUB–ASSEMBLY

Using a screwdriver and hammer, drive off the shaft control while disengaging the claw of the shaft control and remove the shift lever sub–assembly.



8. REMOVE DETENT ROD

(a) Set a 14 mm deep socket wrench.
(b) Using a punch and hammer, remove the grooved pin.
(c) Remove the detent rod and spring.
(d) Remove the shift lever knob sleeve from the detent rod.

9. REMOVE COLLARS

Using a screwdriver and hammer, remove the 4 collars.

AX0L9–02

REASSEMBLY

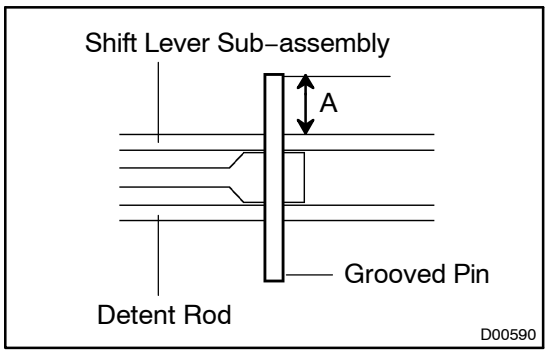
1. INSTALL COLLARS

2. INSTALL DETENT ROD

(a) Install the shift lever knob sleeve to the detent rod.

(b) Apply MP grease on the detent rod and spring.

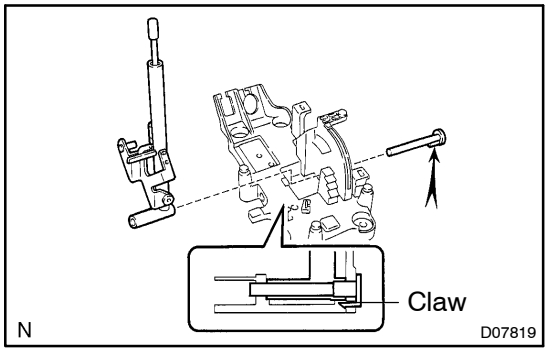
(c) Install the spring and detent rod.



(d) Using a punch and hammer, install the grooved pin to the detent rod pin hole.

A: 8.0 ± 0.2 mm (0.315 ± 0.008 in.)

(e) Check the detent rod operation.



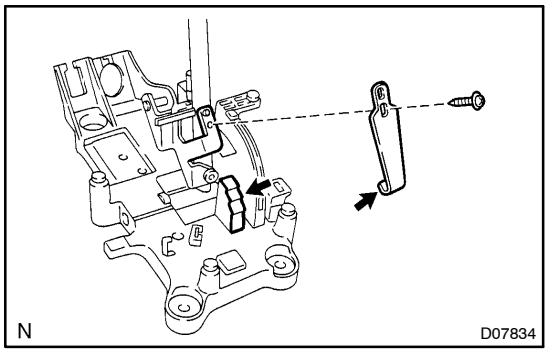
3. INSTALL SHIFT LEVER SUB–ASSEMBLY

(a) Apply MP grease on the spring.

(b) Install the shift lever sub–assembly and shaft control to shift lever plate.

HINT:

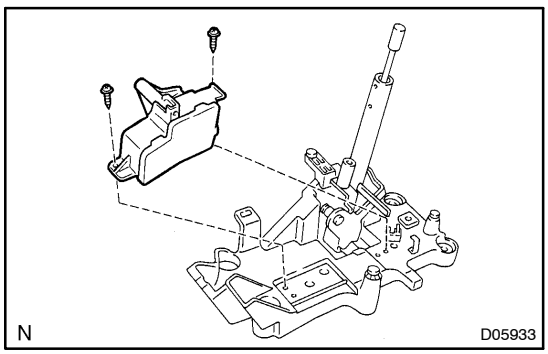
Check that the claw of the shaft control is fit onto the shift lever plate.



4. INSTALL MANUAL DETENT SPRING AND SCREW

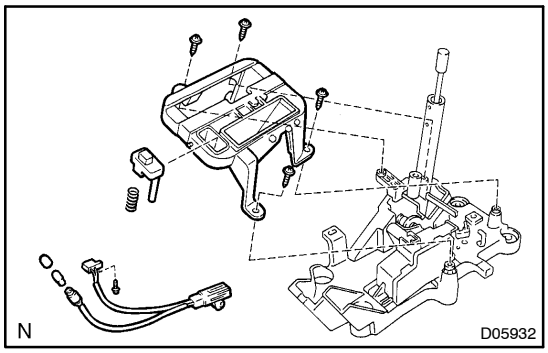
(a) Apply MP grease to the parts indicated by the arrows manual detent spring and shift lever plate in the illustration.

(b) Install the manual detent spring with the screw.



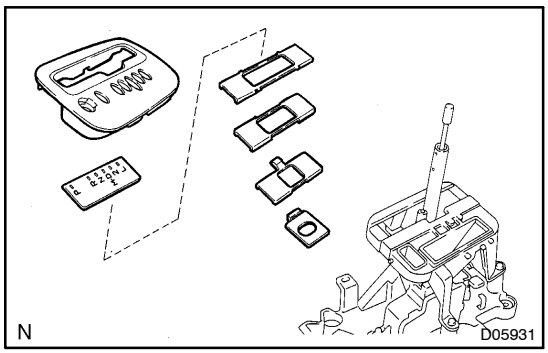
5. INSTALL SHIFT LOCK UNIT

Install the shift lock unit with the 2 screws.



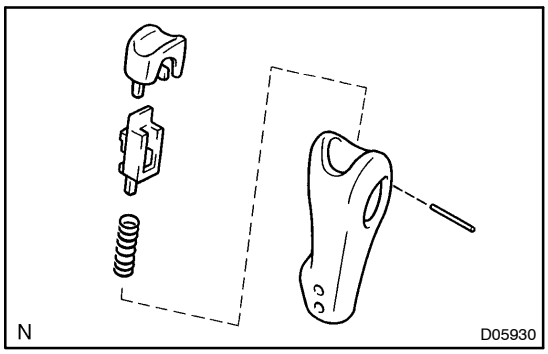
6. INSTALL LOWER POSITION INDICATOR HOUSING

(a) Apply MP grease on the spring.
(b) Install the spring and shift lock release button.
(c) Install the indicator lamp wire sub–assembly with the screw.
(d) Install the bulb and bulb cap to the indicator lamp wire sub–assembly.
(e) Install the lower position indicator housing with the 4 screws.
(f) Install the indicator lamp wire sub–assembly.



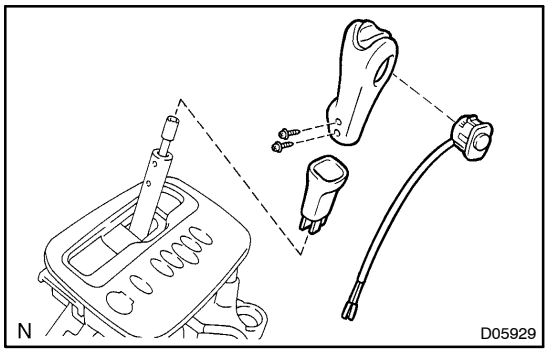
7. INSTALL UPPER POSITION INDICATOR HOUSING

(a) Install the 4 slide covers to the lower position indicator housing, as shown in the illustration.
(b) Install the control position indicator plate.
(c) Install the upper position indicator housing.



8. INSTALL SHIFT LEVER KNOB SUB–ASSEMBLY

(a) Apply MP grease on the compression spring.
(b) Install the compression spring, shift lever knob button guide, shift lever knob button and shift lever stop pin.



(c) Install the No. 2 slide cover.
(d) Install the O/D main switch.
(e) Install the shift lever knob sub–assembly with the 2 screws.

HINT:

Coat the threads of screws with sealant.

Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

NOTICE:

Make sure not to catch O/D main switch wire harness.

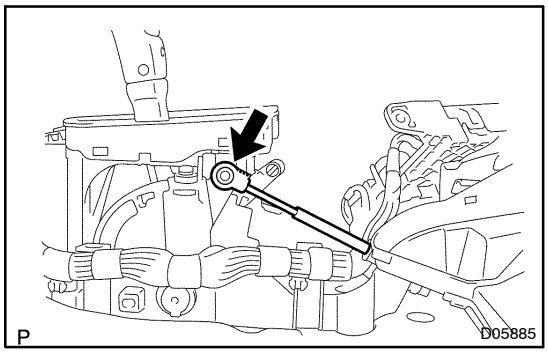
9. INSTALL O/D MAIN SWITCH TERMINAL

(a) Connect the 2 O/D main switch terminals to the connector.
(b) Connect the connector to the shift lever plate.

AX0L7–04

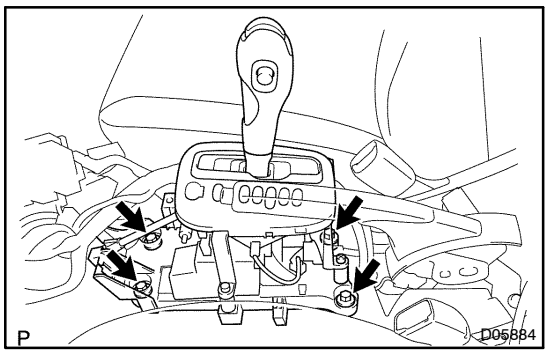
INSTALLATION

1. INSTALL FLOOR SHIFT ASSEMBLY



(a) Pull in the cable while pressing the clip of the transaxle control cable to the floor shift assembly.

(b) Install the cable end from the rod of the floor shift assembly.

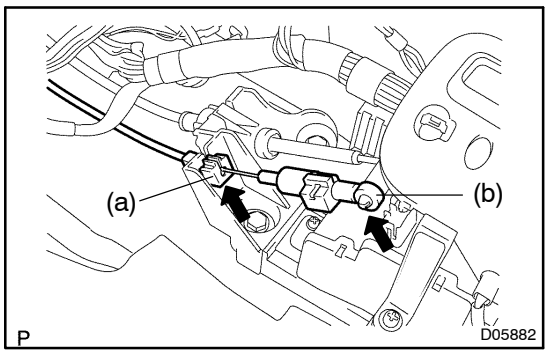


(c) Install the floor shift assembly with the 4 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

(d) Connect the 2 wire harness clamps from the floor shift assembly.

(e) Connect the 2 connector.

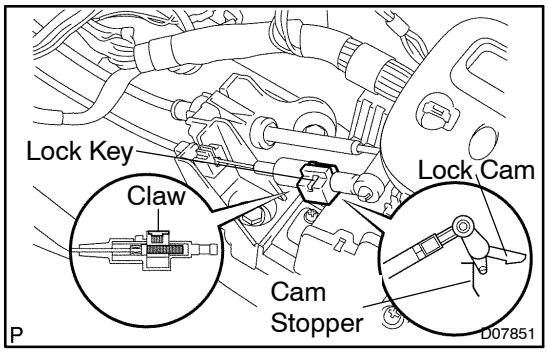
2. INSTALL KEY INTERLOCK CABLE



(a) Pass the key interlock cable end through the hole in the floor shift assembly.

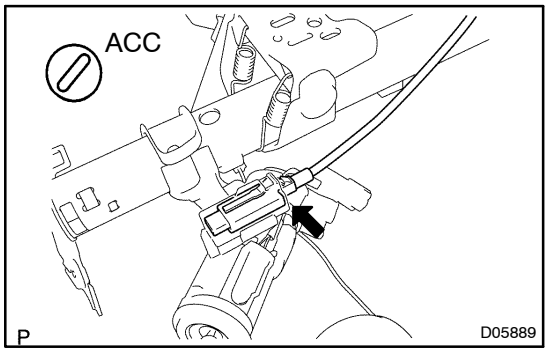
HINT:
Make sure that the claws shown by the arrow in the illustration are locked.

(b) With the shift lever in N position, set the hole of the cable end to the floor shift assembly to assemble them.

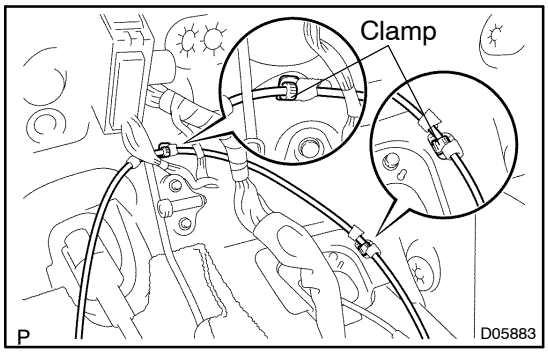


(c) At the time of reassembly:
With the key in ACC, push a claw into lock key.
At this time, be careful not to apply undue force on bending to the cable (Cable length adjustment is completed).

HINT:
Check that the key lock cam contacts the cam stopper.



(d) With the key in ACC, install the cable cap claw to the key interlock.



(e) Connect the 2 key interlock cable clamps.

(f) Pull in the cable while pressing the clip of the key interlock cable.

3. INSTALL AIR CONDITIONING UNIT (See page AC–29)

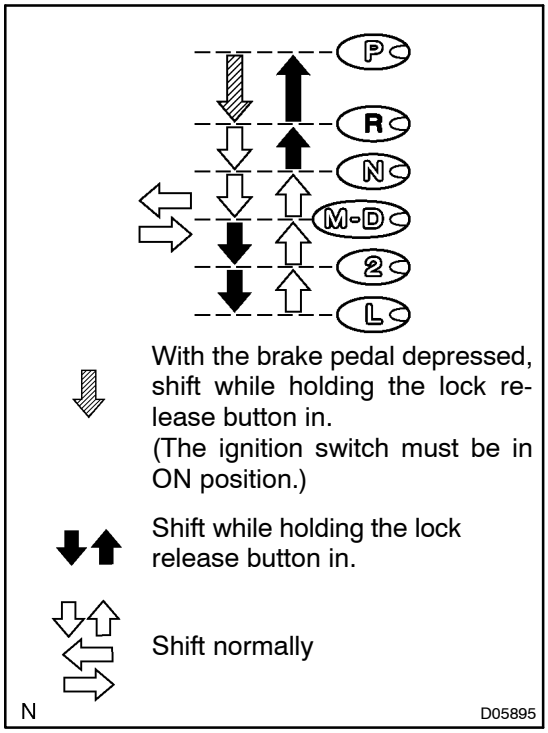
4. INSTALL INSTRUMENT PANEL (See page BO–85)

5. INSPECT KEY INTERLOCK AND SHIFT LOCK OPERATION

(a) Check that a key can be turned from ACC to LOCK only when the shift lever is in P position.

(b) Check that the key cannot be turned to LOCK when the shift lever is position in other than P position.

(c) When the ignition key is in LOCK, check that pressing the shift release button enables the shift lever to shift from P position to other positions.



(d) When shifting it to each position, make sure that the shifting lever moves smoothly, can be moderately operated and the position indicator displays correctly.

Positions which can be operated without pressing the shift lever knob button

R → N → D → M → D, L → 2 → D → N

Positions which can be operated only while pressing the shift lever knob button

D → 2 → L, N → R → P

Positions which can be operated only while pressing the shift lever knob button, ignition switch ON and brake pedal depressed

P → R

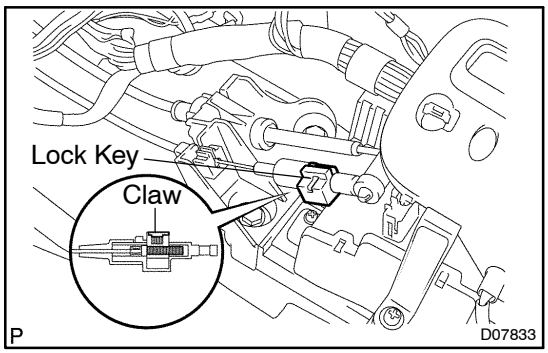
(e) When starting the engine, make sure that the vehicle moves forward when shifting form N to D position, and moves rearward when shifting to R position.

6. ADJUSTMENT IN CASE OF MALFUNCTION

(a) When the key can not be turned from ACC to LOCK even though the shift lever is in P position:

This is the condition where the cable end on the ignition key side is not returned to the position where it can be locked. The condition is caused by undue bending of the cable, rotative resistance of the pin on the shift lever side, or increased resistance due to any reason such as twisting of the cable. Reinstall and readjust the key interlock cable.

(b) When the key is turned from ACC to LOCK even though the shift lever is in other than P Position:
Since the cable is too long due to improper adjustment at the automatic adjustment part of the key can not be locked. Readjust the key interlock cable.

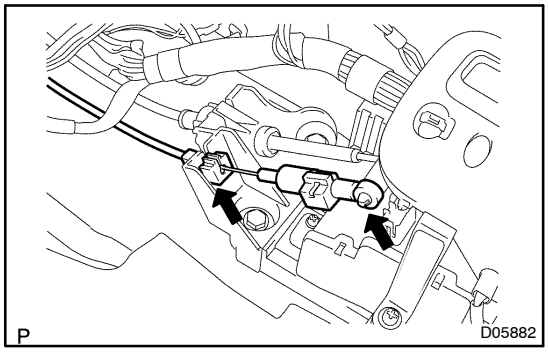


7. READJUSTMENT OF KEY INTERLOCK CABLE

HINT:

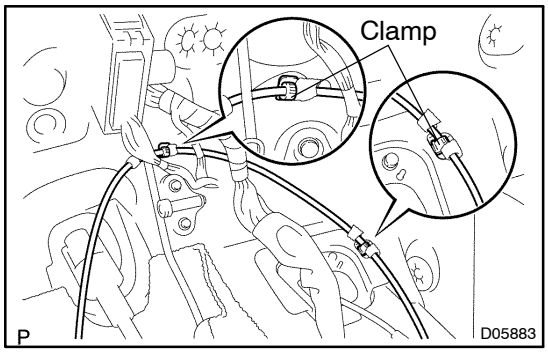
Assembly shall be undertaker in the same way as step 2.

(a) Using a screwdriver, unlock the claw of the lock key of the automatic adjustment part.

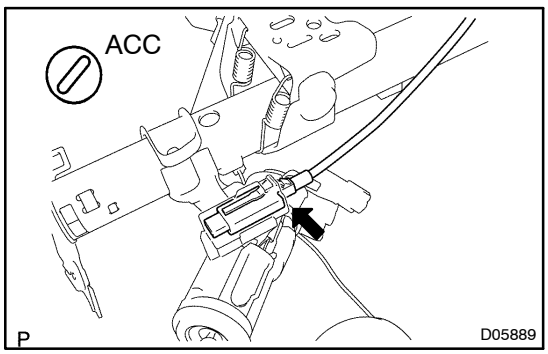


(b) Remove the key interlock cable end from the rod of the floor shift assembly.

(c) Pull out the cable while pressing the clip of the key interlock cable.



(d) Remove the cable clamp from the other.

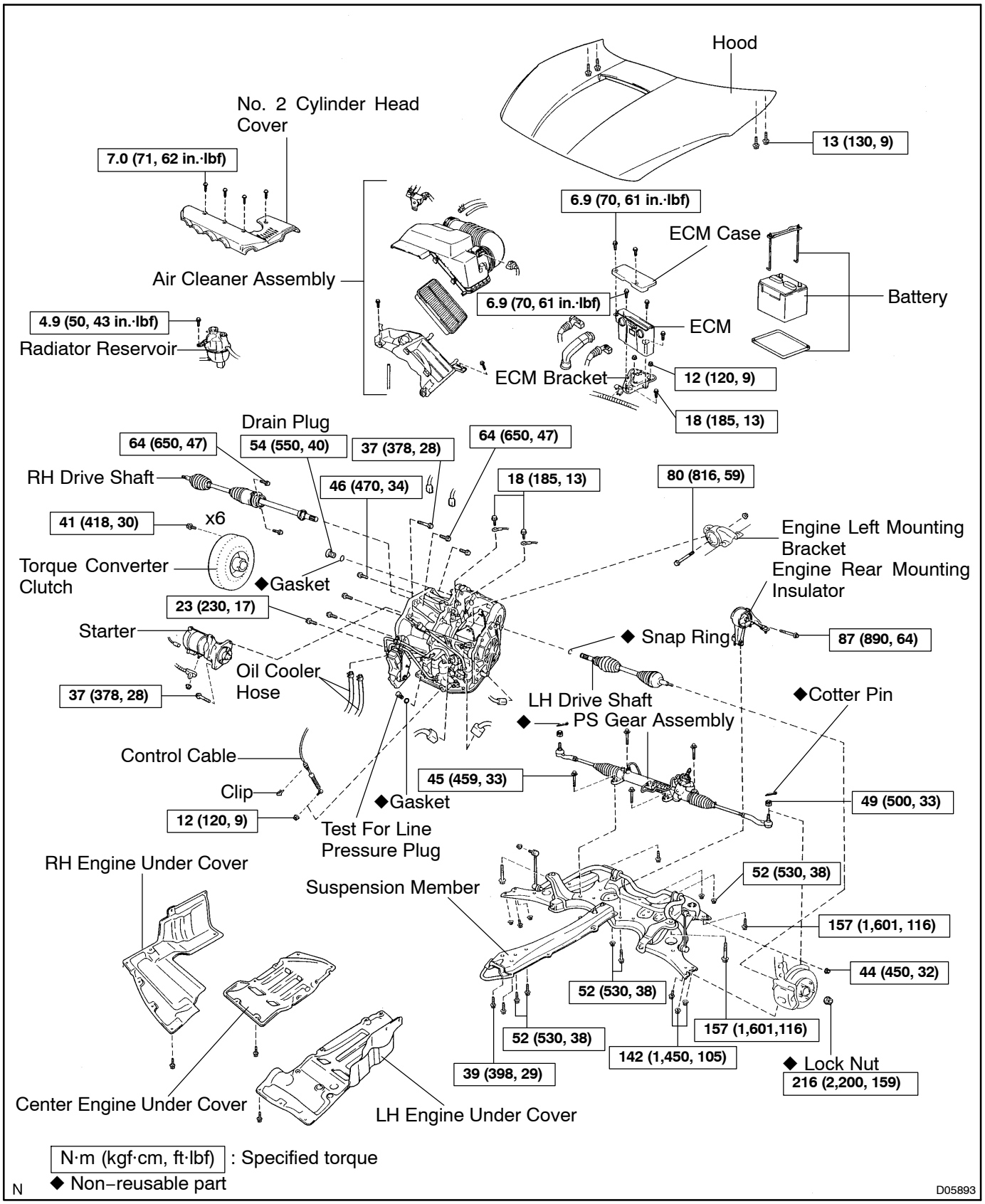


(e) With the key in ACC, install the cable cap claw to the key interlock.

AUTOMATIC TRANSAXLE UNIT

COMPONENTS

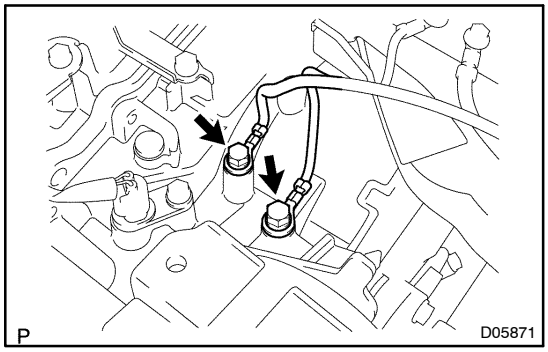
AX0KO–02



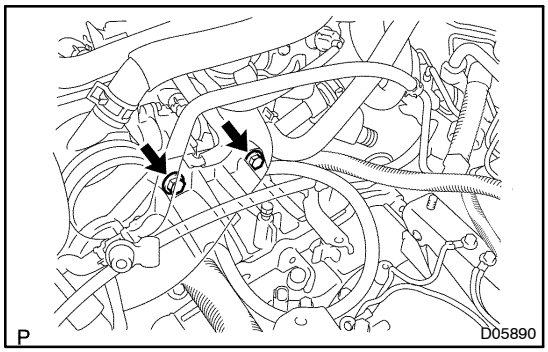
AX0KP–02

REMOVAL

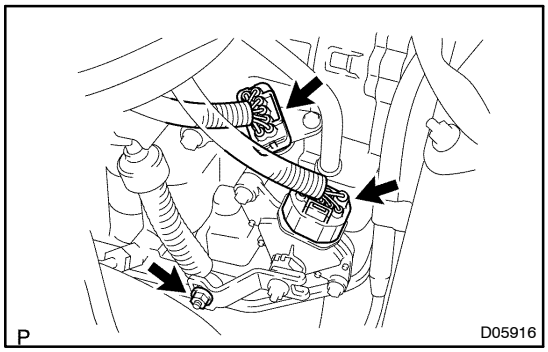
1. **REMOVE HOOD**
   Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
2. **REMOVE BATTERY**
3. **REMOVE ECM AND ECM CASE**
   Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)
4. **REMOVE ECM BRACKET**
   Torque:
   Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
   Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)
5. **REMOVE AIR CLEANER ASSEMBLY**
6. **REMOVE NO. 2 CYLINDER HEAD COVER**
   Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)



7. **REMOVE 2 GROUND CABLES**
   Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
8. **DISCONNECT CONTROL CABLE FROM CLAMP**
9. **DISCONNECT INPUT TURBINE SPEED SENSOR CONNECTOR**
10. **DISCONNECT COUNTER GEAR SPEED SENSOR CONNECTOR**
11. **REMOVE VEHICLE SPEED SENSOR CONNECTOR**



12. **REMOVE 2 UPPER SIDE TRANSAXLE MOUNTING BOLTS FROM TRANSAXLE**
    Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



13. **DISCONNECT SOLENOID CONNECTOR AND PARK/NEUTRAL POSITION SWITCH CONNECTOR**

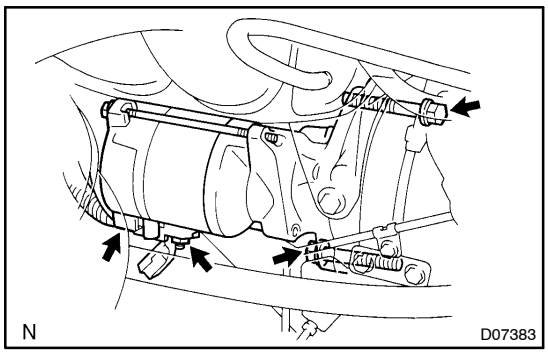
Disconnect the solenoid connector and park/neutral position switch connector.

14. **DISCONNECT CONTROL CABLE**

(a) Remove the nut from the control shift lever.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

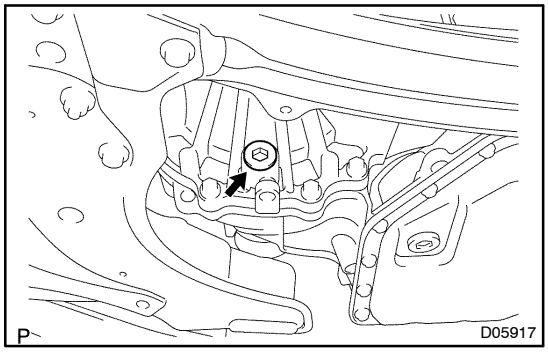
(b) Remove the clip and disconnect the control cable.

15. REMOVE BOLT AND DISCONNECT RADIATOR RESERVOIR
Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



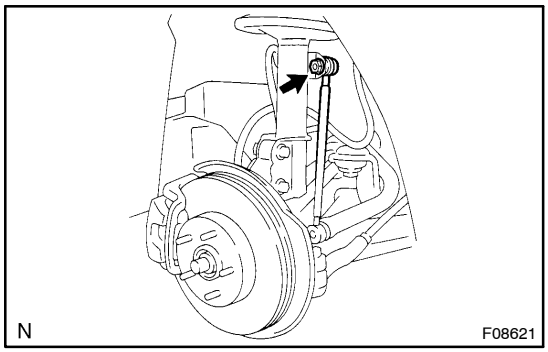
16. REMOVE STARTER
(a) Remove the nut and wire, and disconnect the connector.
(b) Remove the 2 bolts and starter.
Torque: 37 N·m (378 kgf·cm, 28 ft·lbf)

17. REMOVE LH, RH, CENTER ENGINE UNDER COVERS

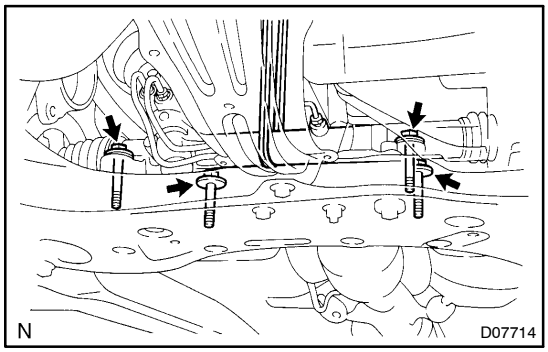


18. DRAIN ATF FROM FRONT DIFFERENTIAL CASE
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)

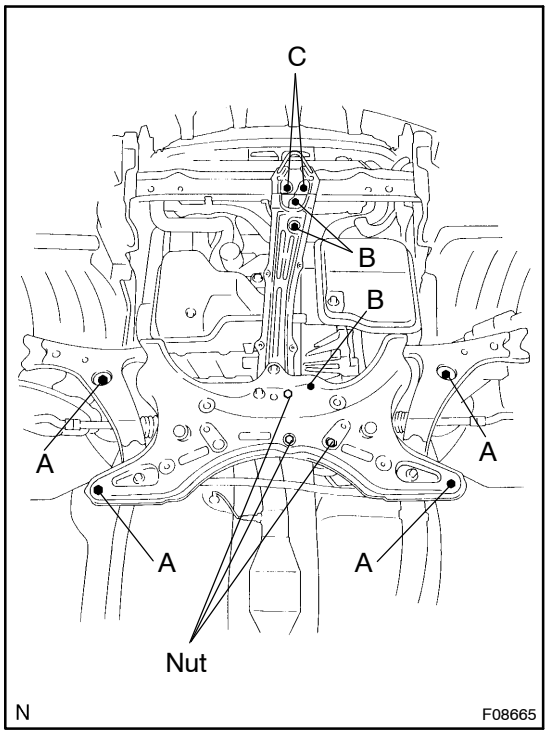
19. REMOVE LH AND RH DRIVE SHAFTS
(See page SA–21)



20. DISCONNECT LH AND RH STABILIZER BAR LINKS FROM SHOCK ABSORBER
Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)



21. REMOVE 4 BOLTS AND DISCONNECT PS GEAR ASSEMBLY
HINT:
Support the PS gear assembly securely.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

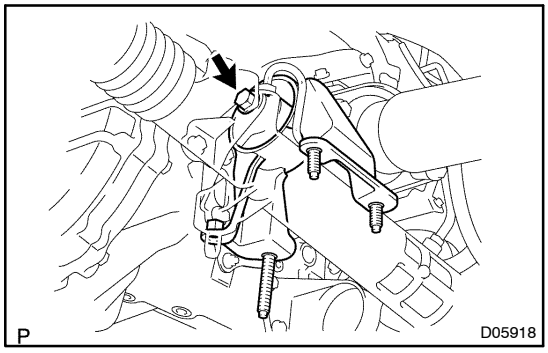


22. REMOVE SUSPENSION MEMBER

(a) Remove the 9 bolts and 3 nuts.

Torque:
Bolt A: 157 N·m (1,601 kgf·cm, 116 ft·lbf)
Bolt B: 52 N·m (530 kgf·cm, 38 ft·lbf)
Bolt C: 39 N·m (398 kgf·cm, 29 ft·lbf)
Nut: 52 N·m (530 kgf·cm, 38 ft·lbf)

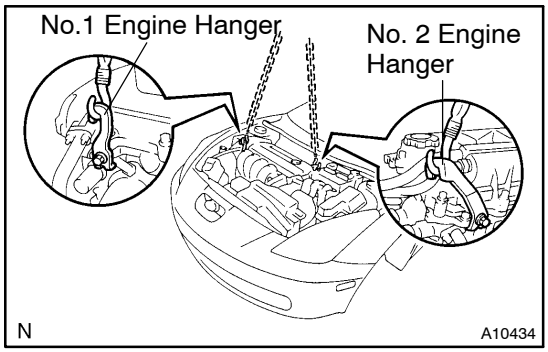
(b) Remove the suspension member.



23. REMOVE ENGINE REAR MOUNTING INSULATOR

Remove the bolt and engine rear mounting insulator.

Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)



24. ATTACH ENGINE SLING DEVICE TO ENGINE HANGERS

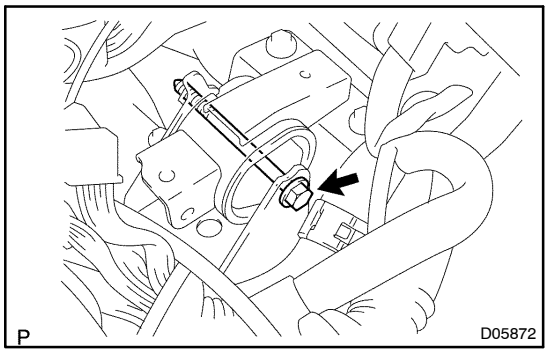
(a) Disconnect the 2 PCV hoses.

(b) Install the No. 1 and No. 2 engine hangers in the correct direction.

Parts No. :
No. 1 engine hanger: 12281–88600
No. 2 engine hanger: 12282–88600
Bolt: 91512–61020
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

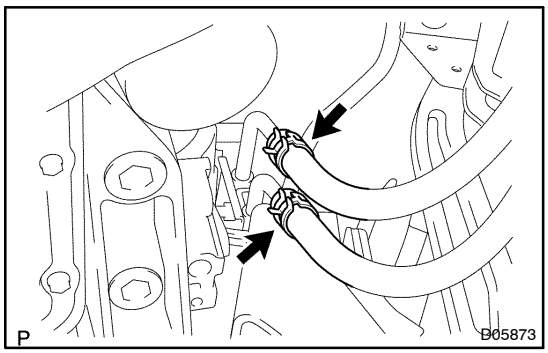
(c) Attach the engine chain hoist to the engine hangers.

CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.



25. REMOVE UPPER SIDE ENGINE LEFT MOUNTING, NUT AND BOLT

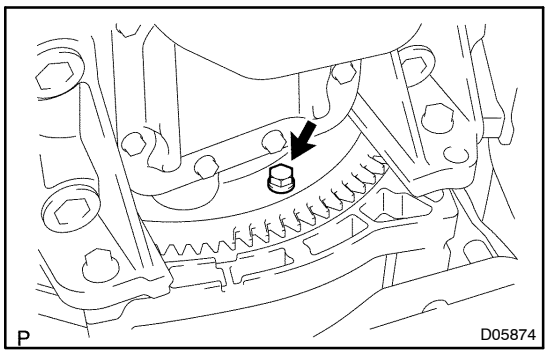
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)



26. REMOVE OIL COOLER HOSE

Loosen the 2 clips and disconnect the 2 oil cooler hoses.

27. SUPPORT TRANSAXLE WITH A JACK



28. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLT

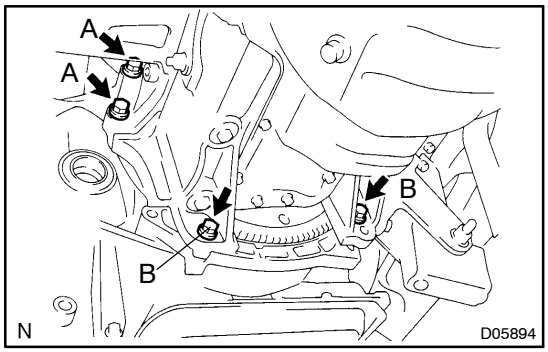
Turn the crankshaft to gain access and remove the 6 bolts holding the crankshaft pulley set bolt with a wrench.

Torque: 41 N·m (418 kgf·cm, 30 ft·lbf)

HINT:

At the time of installation, please refer to the following item.

First install black colored bolt and then 5 other bolts.



29. REMOVE TRANSAXLE ASSEMBLY

(a) Remove the 4 bolts.

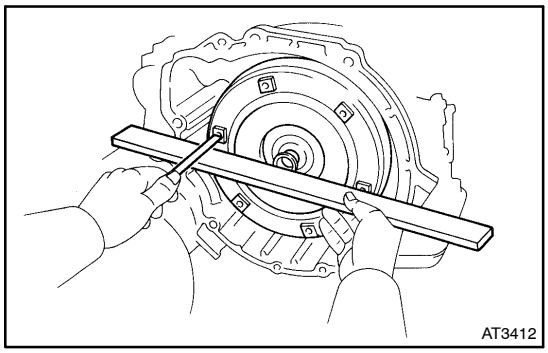
Torque:

A bolt: 46 N·m (470 kgf·cm, 34 ft·lbf)

B bolt: 23 N·m (230 kgf·cm, 17 ft·lbf)

(b) Separate the transaxle from engine, and lower the transaxle.

AX0KQ–05



INSTALLATION

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure the distance between the installed surface and the front surface of the transaxle housing.

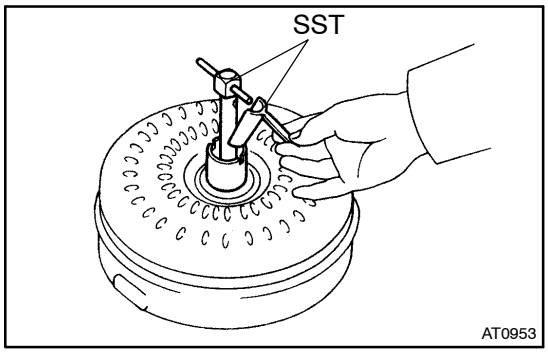
Correct distance: More than 13.3 mm (0.524 in.)

2. TRANSAXLE INSTALLATION

Installation is in the reverse order of removal (See page AX–31).

HINT:

- After installation, adjust the shift control cable and park/neutral position switch (See page DI–669).
- Fill ATF and check the fluid level (See page DI–669).
- Perform the test drive of the vehicle.
- Adjust the hood (See page BO–9).



TORQUE CONVERTER CLUTCH AND DRIVE PLATE

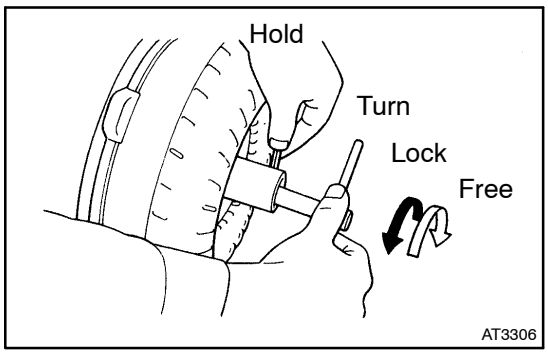
AX09X–11

INSPECTION

1. INSPECT ONE–WAY CLUTCH

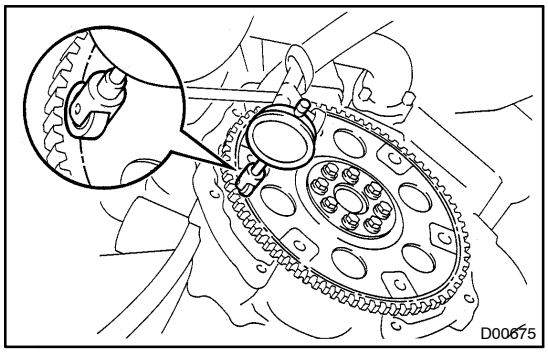
(a) Install SST into the inner race of the one–way clutch.
SST 09350–32014 (09351–32010)

(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



(c) With the torque converter clutch setting up on its side, check that the clutch locks when turned counterclockwise, and rotates smoothly clockwise.

If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

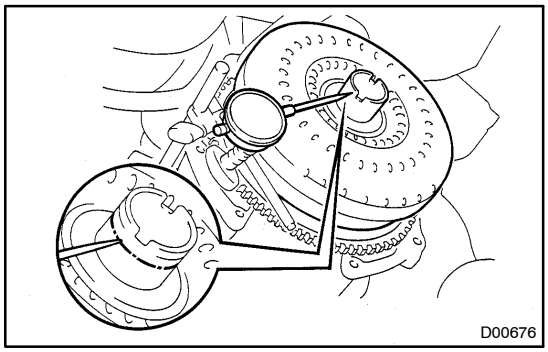
(a) Set up a dial indicator and measure the drive plate runout.

(b) Check the damage of the ring gear.

Maximum runout: 0.20 mm (0.0079 in.)

If the runout is not within the specification or ring gear is damaged, replace the drive plate.

Torque: 88 N·m (897 kgf·cm 65 ft·lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

Temporarily mount the torque converter clutch on the drive plate. Set a dial indicator and measure the torque converter clutch sleeve runout.

Maximum runout: 0.30 mm (0.0118 in.)

If the runout is not within the specification, try to correct by reorienting the installation of the converter.

HINT:
Mark the position of the converter clutch to ensure the installation is correctly performed.

AUTOMATIC TRANSAXLE SYSTEM

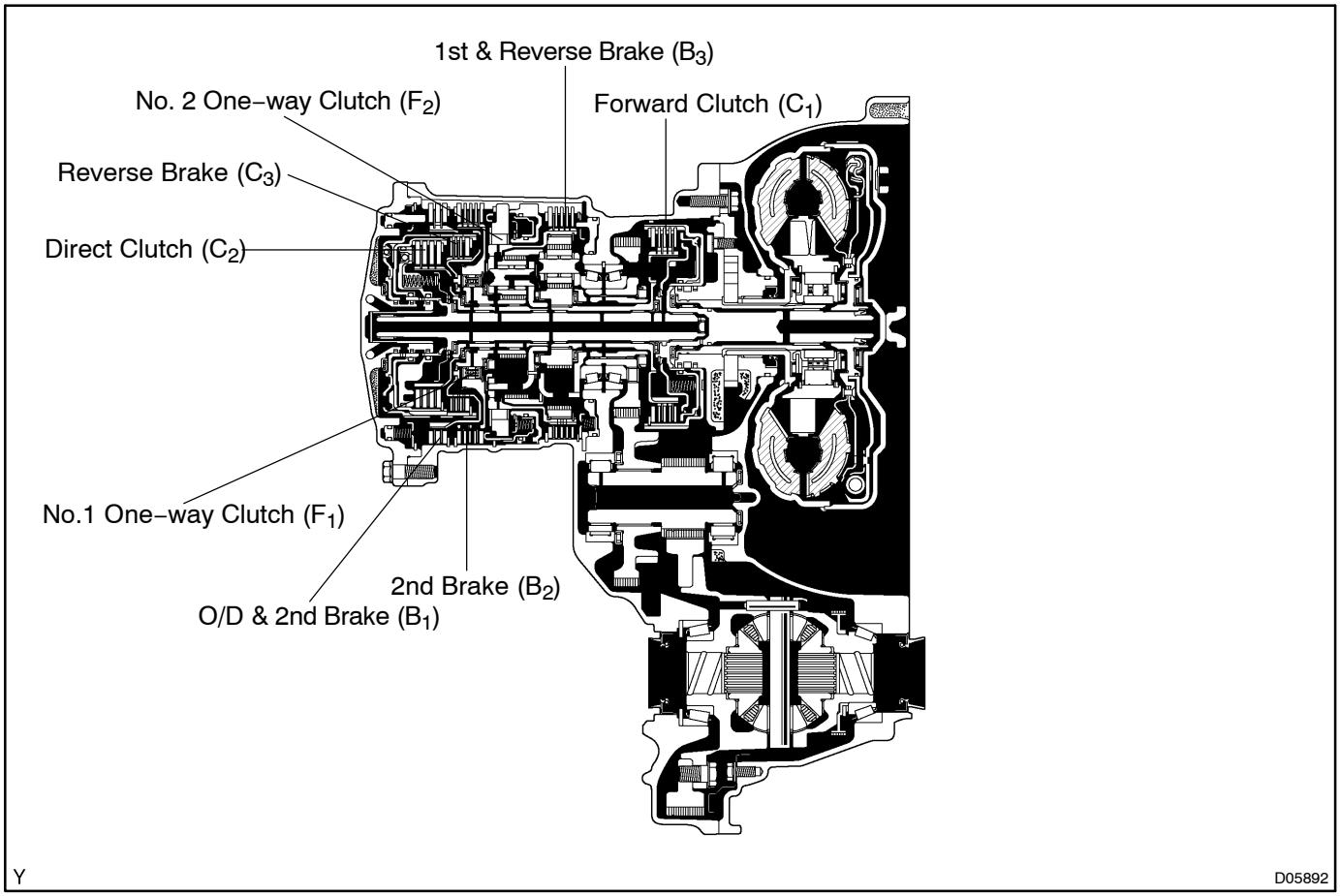
AX042–04

PRECAUTION

If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section.

AX09J–07

OPERATION



○ ... Operating

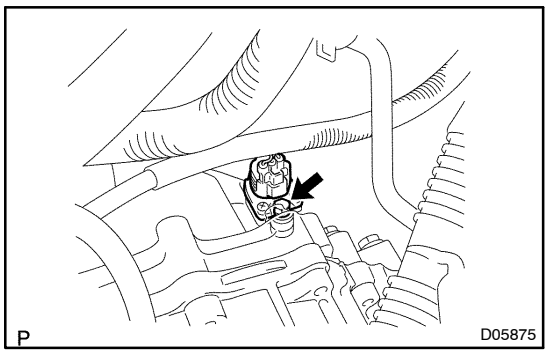
Shift lever position	Gear position	C_1	C_2	C_3	B_1	B_2	B_3	F_1	F_2
P	Parking								
R	Reverse			○			○		
N	Neutral								
D	1st	○							○
	2nd	○				○		○	
	3rd	○	○			○			
	O/D		○		○	○			
2	1st	○							○
	2nd	○			○	○		○	
L	1st	○					○		○

VEHICLE SPEED SENSOR

AX0KU–02

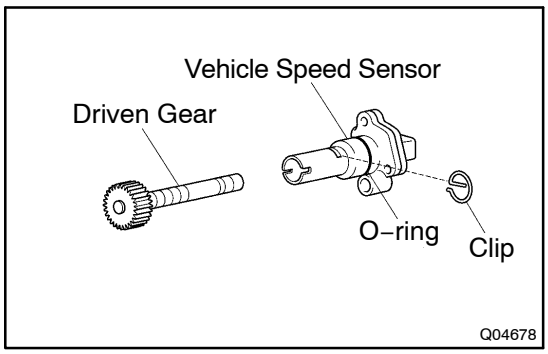
ON–VEHICLE REPAIR

1. **REMOVE BATTERY**
2. **REMOVE ECM AND ECM CASE**
3. **REMOVE ECM BRACKET**



4. **DISCONNECT VEHICLE SPEED SENSOR CONNECTOR**
5. **REMOVE VEHICLE SPEED SENSOR ASSEMBLY**

(a) Remove the bolt and vehicle speed sensor assembly.
(b) Remove the clip and speedometer driven gear from the vehicle speed sensor.
(c) Remove the O–ring from the vehicle speed sensor.



6. **INSTALL VEHICLE SPEED SENSOR ASSEMBLY**

(a) Coat a new O–ring with ATF and install it to the vehicle speed sensor.
(b) Install the speedometer driven gear to the vehicle speed sensor with clip.
(c) Install the vehicle speed sensor assembly with the bolt.
Torque: 5.5 N·m (56 kgf·cm, 49 in.·lbf)

7. **CONNECT VEHICLE SPEED SENSOR CONNECTOR**
8. **INSTALL ECM BRACKET**
Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)
9. **INSTALL ECM AND ECM CASE**
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)
10. **INSTALL BATTERY**

INPUT TURBIN SPEED SENSOR

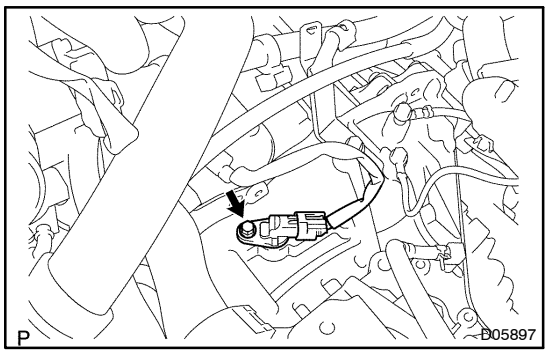
AX0PI–02

ON–VEHICLE REPAIR

1. REMOVE BATTERY

2. REMOVE ECM AND ECM CASE

3. REMOVE ECM BRACKET



4. REMOVE INPUT TURBIN SPEED SENSOR

(a) Disconnect the connector.

(b) Remove the bolt and input turbin speed sensor.

(c) Remove the O–ring from the input turbin speed sensor.

5. INSTALL INPUT TURBIN SPEED SENSOR

(a) Coat a new O–ring with ATF and install it to the input turbin speed sensor.

(b) Install the input turbin speed sensor with the bolt.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(c) Connect the connector.

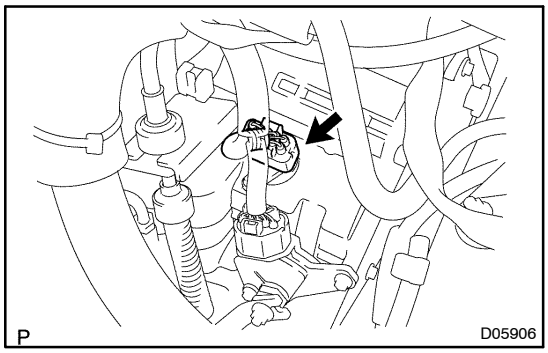
6. INSTALL ECM BRACKET

Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)

7. INSTALL ECM AND ECM CASE

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

8. INSTALL BATTERY



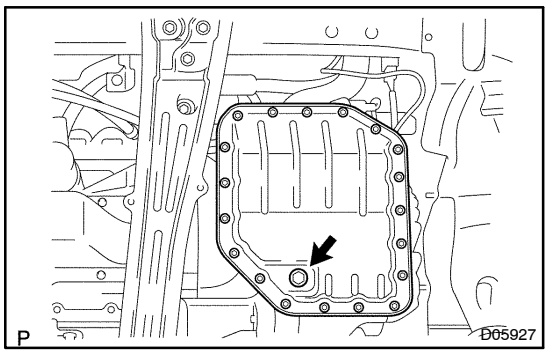
ATF TEMPERATURE SENSOR

AX0KW–02

ON–VEHICLE REPAIR

1. DISCONNECT SOLENOID CONNECTOR

2. REMOVE LH ENGINE UNDER COVER



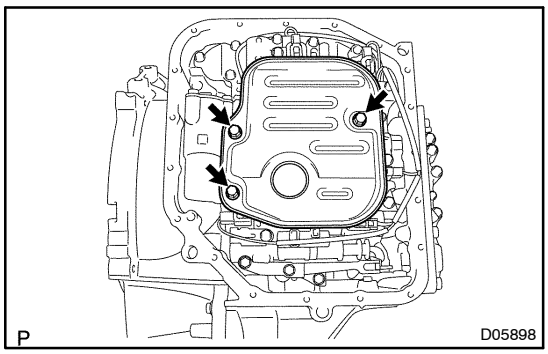
3. REMOVE DRAIN PLUG AND DRAIN ATF

4. REMOVE OIL PAN AND GASKET

NOTICE:

Some fluid will remain in the oil pan.

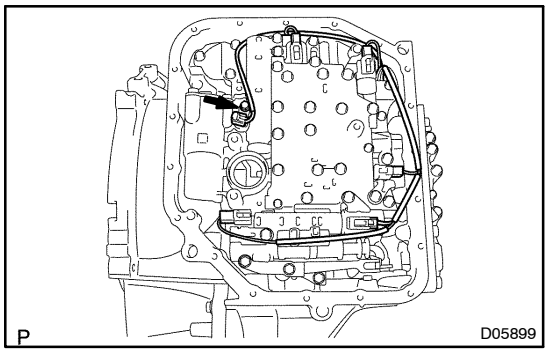
Remove the 19 bolts, and carefully remove the oil pan assembly. Discard the gasket.



5. REMOVE OIL STRAINER

(a) Remove the 3 bolts and oil strainer.

(b) Remove the O–ring.



6. DISCONNECT 5 SHIFT SOLENOID VALVE CONNECTORS

7. REMOVE ATF TEMPERATURE SENSOR

(a) Remove the bolt and lock plate, and remove the ATF temperature sensor.

(b) Remove the O–ring from the ATF temperature sensor.

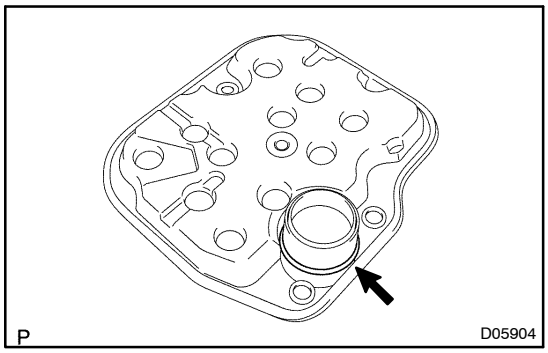
8. INSTALL ATF TEMPERATURE SENSOR

(a) Coat a new O–ring with ATF and it to the direct clutch speed sensor.

(b) Install the ATF temperature sensor with the lock plate and bolt.

Torque: 10 N·m (110 kgf·cm, 8 ft·lbf)

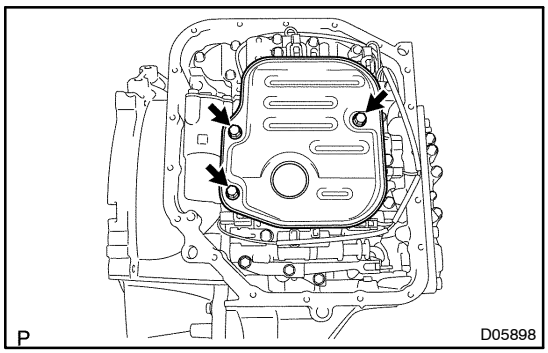
9. CONNECT 5 SHIFT SOLENOID VALVE CONNECTORS



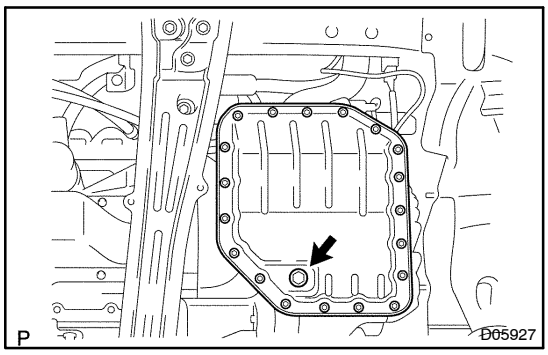
10. INSTALL OIL STRAINER

(a) Coat a new O–ring with ATF.

(b) Install the O–ring to the oil strainer.



(c) Install the oil strainer with the 3 bolts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)

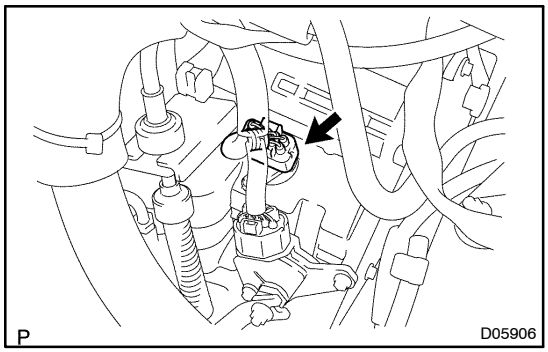


11. INSTALL OIL PAN

Install the oil pan and a new gasket with the 19 bolts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

12. INSTALL DRAIN PLUG

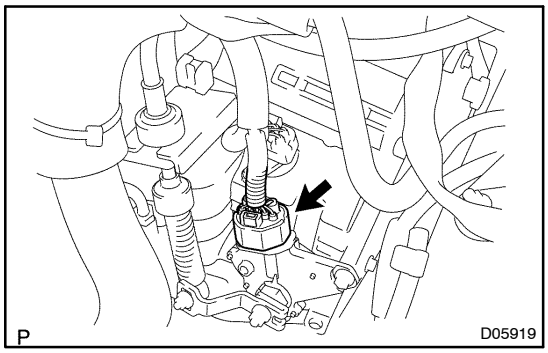
Install a new gasket and drain plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



13. CONNECT SOLENOID CONNECTOR

14. FILL ATF AND CHECK ATF LEVEL
(See page DI–758)

15. INSTALL LH ENGINE UNDER COVER



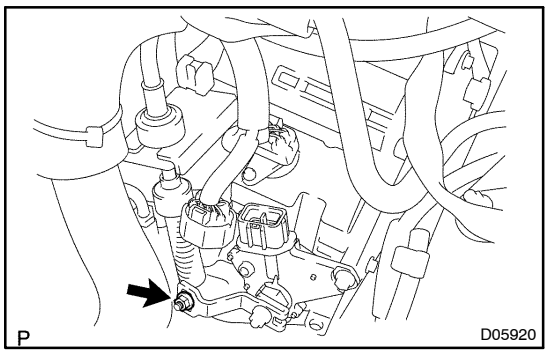
PARK/NEUTRAL POSITION (PNP) SWITCH

AX0KX–02

ON–VEHICLE REPAIR

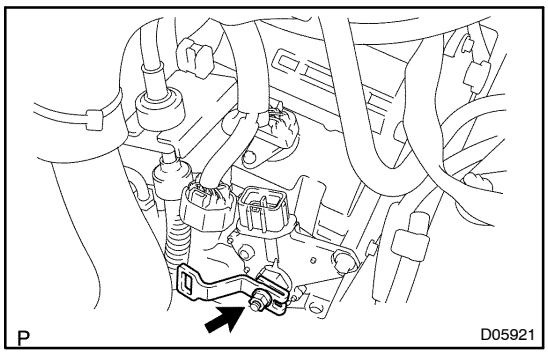
1. REMOVE AIR CLEANER ASSEMBLY

2. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

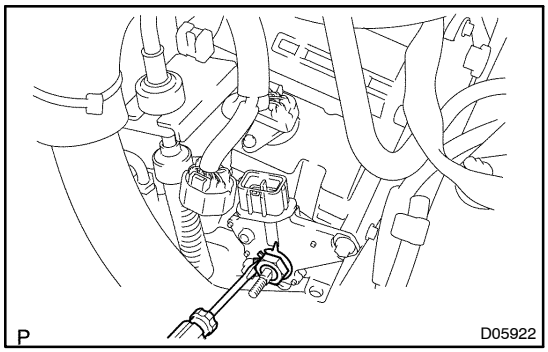


3. REMOVE PARK/NEUTRAL POSITION SWITCH

(a) Remove the nut.

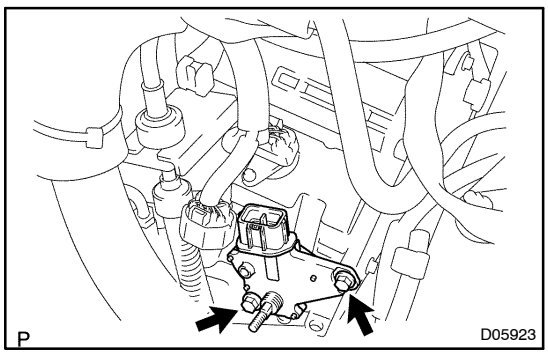


(b) Remove the nut, washer and control shift lever.



(c) Using a screwdriver, pry off the lock plate.

(d) Remove the nut and lock plate.



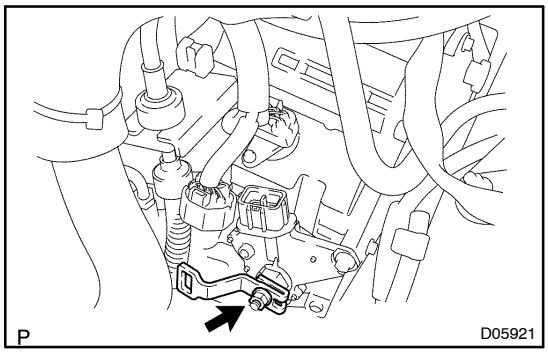
(e) Remove the 2 bolts and pull out the park/neutral position switch.

4. INSTALL AND ADJUST PARK/NEUTRAL POSITION SWITCH

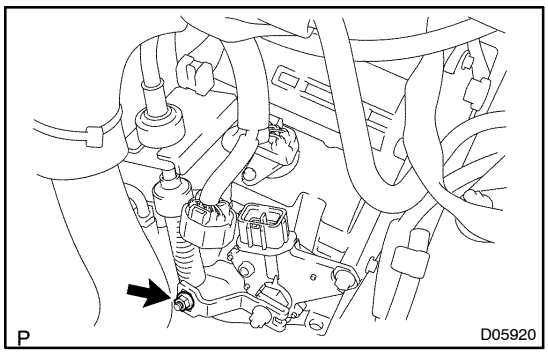
(a) Install the park/neutral position switch with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Install a new lock plate and nut.
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

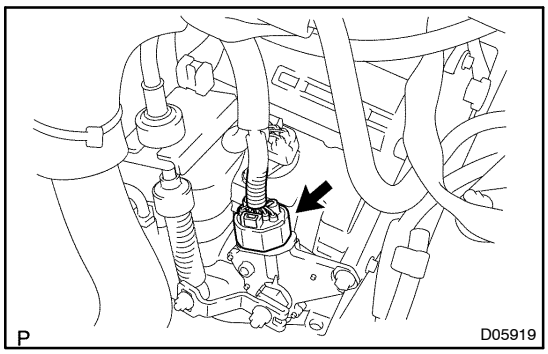
(c) Bend the claws on the lock plate to fix the nut.



(d) Install the control shift lever with the nut.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



(e) Connect the shift control cable to the control shaft.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



5. CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

6. CHECK PARK/NEUTRAL POSITION OPERATION

Check that the engine can be started with the shift lever only in the N or P position, but not in other position.

If the engine can not be stated not as started above, carry out the adjustment procedure (See page DI–758).

7. INSTALL AIR CLEANER ASSEMBLY

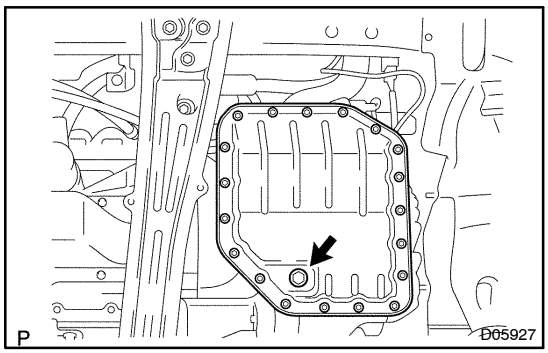
8. TEST DRIVE VEHICLE

VALVE BODY ASSEMBLY

AX0KK–03

ON–VEHICLE REPAIR

1. REMOVE LH ENGINE UNDER COVER



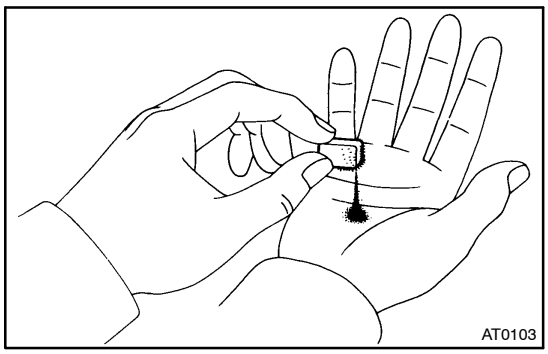
2. REMOVE DRAIN PLUG AND DRAIN ATF

3. REMOVE OIL PAN AND GASKET

NOTICE:

Some fluid will remain in the oil pan.

Remove the 19 bolts, and carefully remove the oil pan assembly. Discard the gasket.

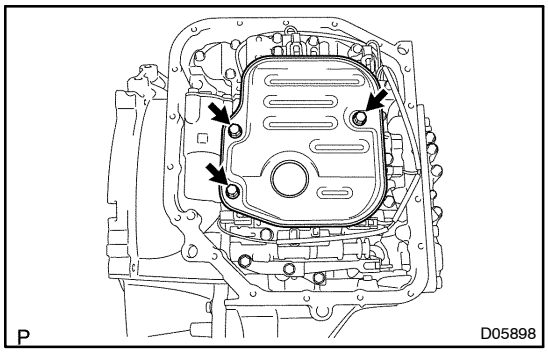


4. EXAMINE PARTICLES IN OIL PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic)...bearing, gear and plate wear

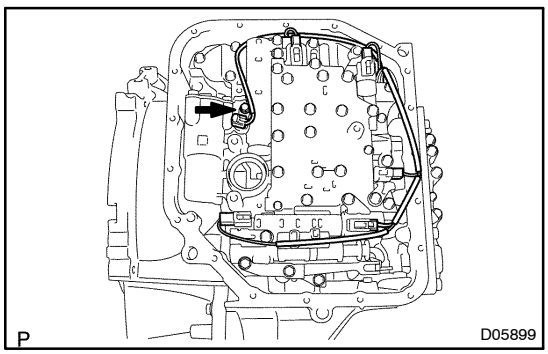
Brass (non–magnetic)... bushing wear



5. REMOVE OIL STRAINER

(a) Remove the 3 bolts and oil strainer.

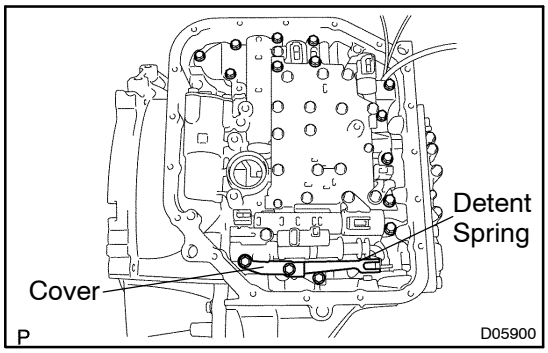
(b) Remove the O–ring.



6. DISCONNECT 5 SHIFT SOLENOID VALVE CONNECTORS

7. REMOVE ATF TEMPERATURE SENSOR

Remove the bolt and lock plate, and remove the ATF temperature sensor.



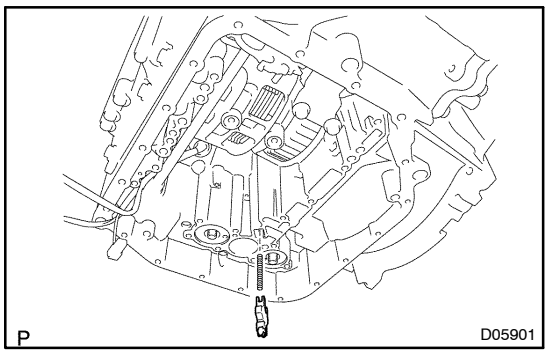
8. REMOVE VALVE BODY

(a) Remove the 3 bolts, cover and detent spring.

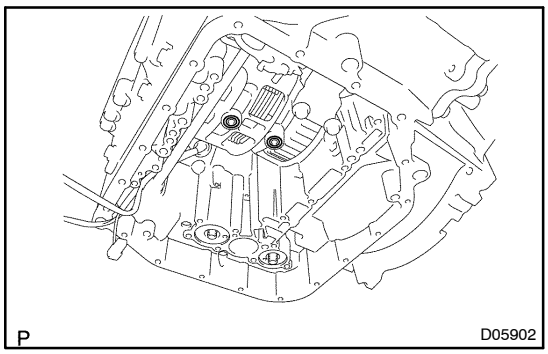
(b) Remove the 12 bolts and valve body.

NOTICE:

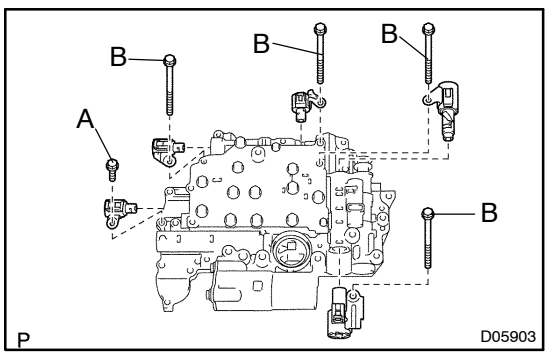
Be careful not to drop the check valve body, spring and accumulator piston.



9. REMOVE CHECK BALL BODY AND SPRING



10. REMOVE 2 APPLY GASKETS



11. REMOVE SHIFT SOLENOID VALVE

Remove the 5 bolts and 5 shift solenoid valves.

12. INSTALL SHIFT SOLENOID VALVE

Install the 5 shift solenoid valves with the 5 bolts.

Torque:

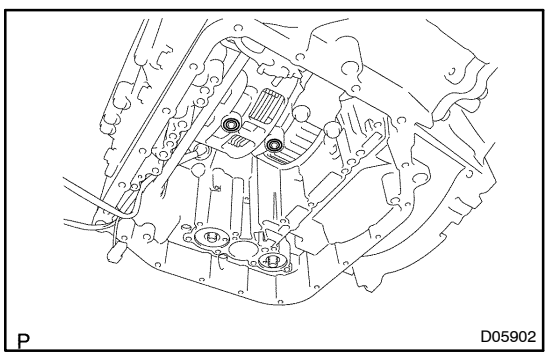
Bolt A: 6.6 N·m (67 kgf·cm, 58 in.·lbf)

Bolt B: 11 N·m (110 kgf·cm, 8 ft·lbf)

Bolt length:

Bolt A: 14 mm (0.55 in.)

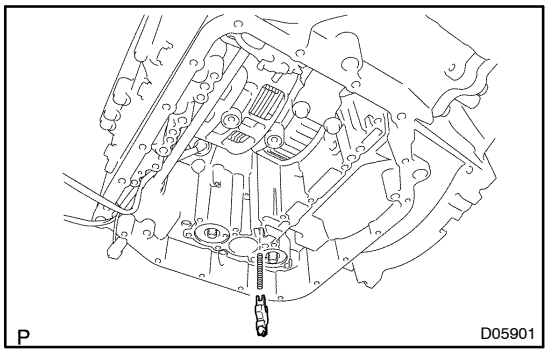
Bolt B: 55 mm (2.17 in.)



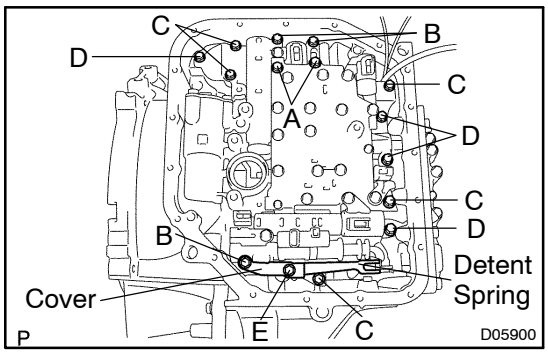
13. INSTALL APPLY GASKET

(a) Coat 2 new apply gaskets with ATF.

(b) Install the gaskets to the transaxle case.



14. INSTALL CHECK VALVE AND SPRING



15. INSTALL VALVE BODY

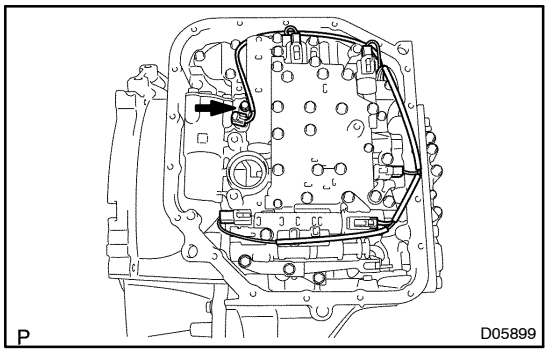
(a) Align the groove of the manual valve with the pin of the manual valve lever.

(b) Temporarily install the valve body with the 12 bolts.
Bolt length:
Bolt A: 55 mm (2.17 in.)
Bolt B: 45 mm (1.77 in.)
Bolt C: 32 mm (1.26 in.)
Bolt D: 22 mm (0.87 in.)

(c) Temporarily install the detent spring and cover with the 3 bolts.
Bolt length:
Bolt B: 45 mm (1.77 in.)
Bolt C: 32 mm (1.26 in.)
Bolt E: 14 mm (0.55 in.)

(d) Check that the manual valve lever contacts the center of the roller at the tip of the detent spring.

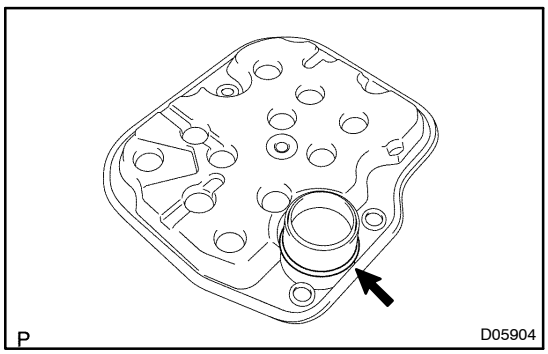
(e) Tighten the 15 bolts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)



16. INSTALL ATF TEMPERATURE SENSOR

Install the ATF temperature sensor with the lock plate and bolt.
Torque: 10 N·m (100 kgf·cm, 8 ft·lbf)

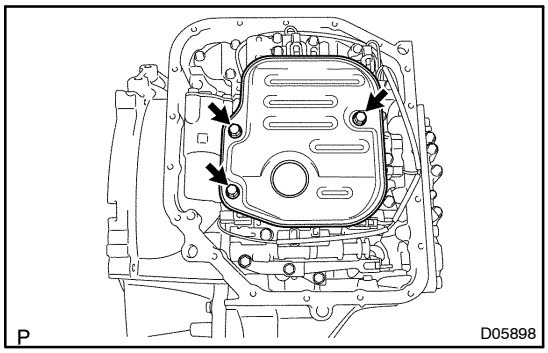
17. CONNECT 5 SHIFT SOLENOID VALVE CONNECTORS



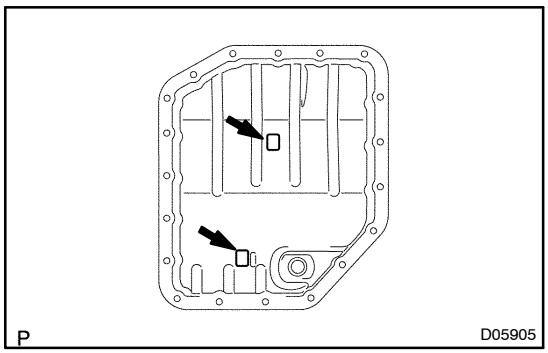
18. INSTALL OIL STRAINER

(a) Coat a new O–ring with ATF.

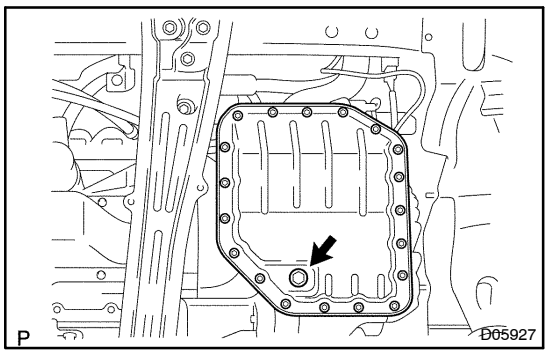
(b) Install the O–ring to the oil strainer.



(c) Install the oil strainer with the 3 bolts.
Torque: 11 N·m (110 kgf·cm, 8 ft·lbf)



19. INSTALL MAGNET IN OIL PAN
Install the 2 magnets in the oil pan, as shown in the illustration.



20. INSTALL OIL PAN
Install the oil pan and a new gasket with the 19 bolts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

21. INSTALL DRAIN PLUG
Install a new gasket and drain plug.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

22. FILL ATF AND CHECK ATF LEVEL
(See page DI–758)

23. INSTALL LH ENGINE UNDER COVER

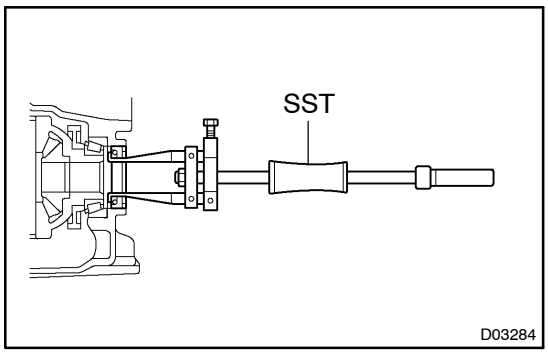
DIFFERENTIAL OIL SEAL

AX0KZ–02

ON–VEHICLE REPAIR

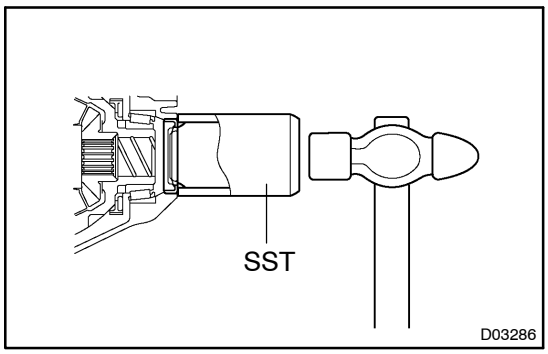
1. DRAIN ATF FROM FRONT DIFFERENTIAL CASE

2. REMOVE LH AND RH DRIVE SHAFTS
(See page SA–21)



3. REMOVE LH AND RH SIDE OIL SEAL

Using SST, drive out both the side oil seals.
SST 09308–10010



4. INSTALL LH AND RH SIDE OIL SEAL

(a) Using SST and a hammer, drive in a new oil seal.
SST 09223–00010
Oil seal drive in depth:
LH side: 2.7 ± 0.5 mm (0.106 ± 0.020 in.)
RH side: 0 ± 0.5 mm (0 ± 0.020 in.)

(b) Coat the oil seal lip with MP grease.

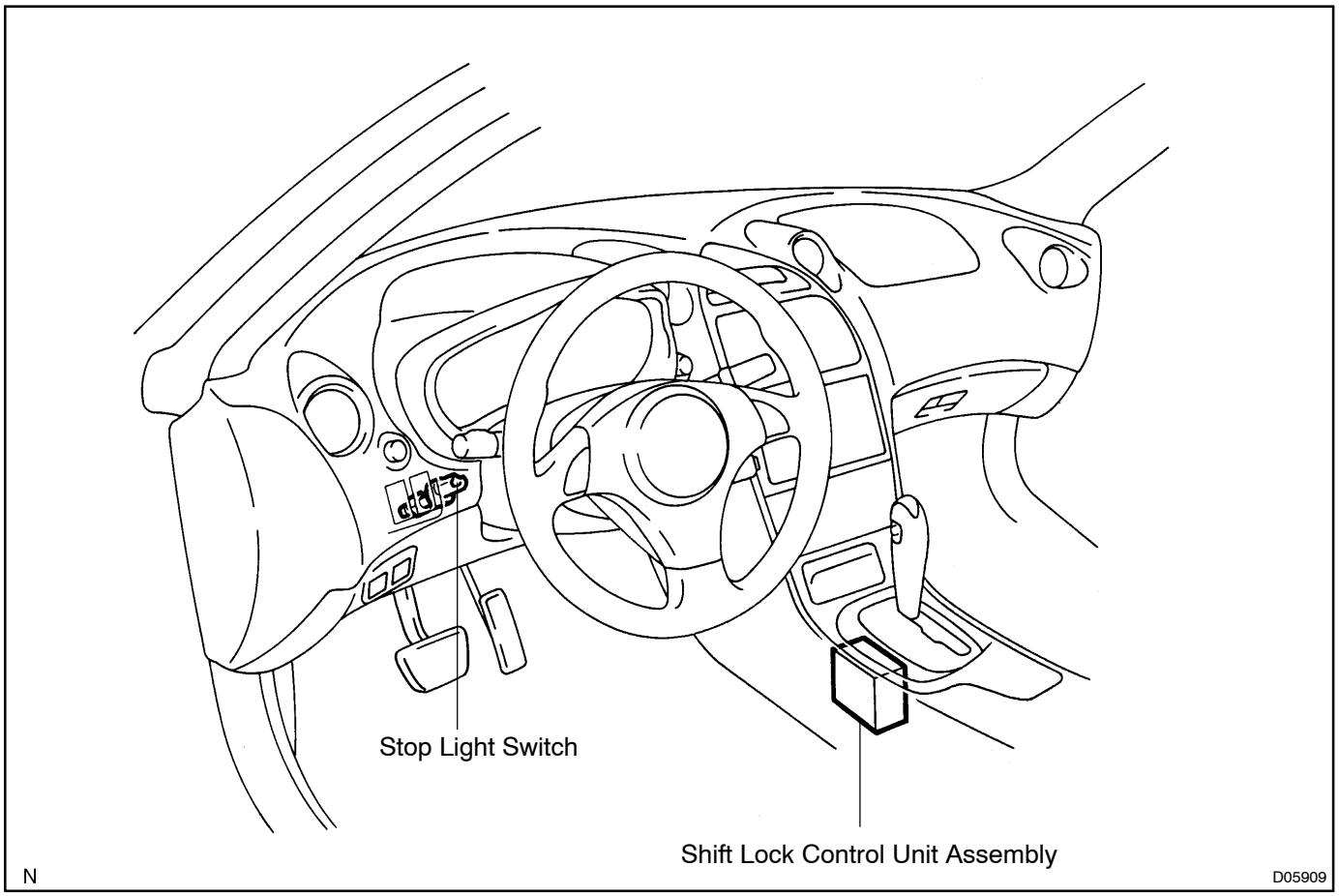
5. INSTALL LH AND RH DRIVE SHAFTS
(See page SA–33)

6. FILL ATF AND CHECK ATF LEVEL
(See page DI–758)

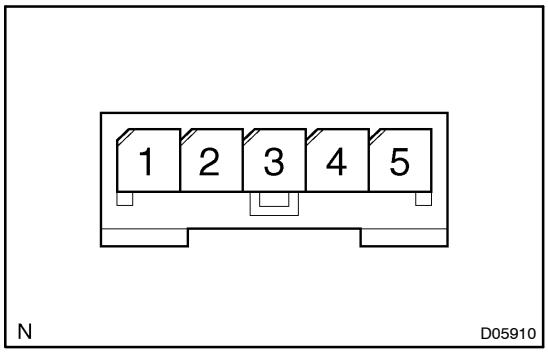
SHIFT LOCK SYSTEM

COMPONENTS

AX0L0–02



AX0L1–02



INSPECTION

INSPECT SHIFT LOCK CONTROL UNIT ASSEMBLY

Using a voltmeter, measure the voltage at each terminal.

HINT:

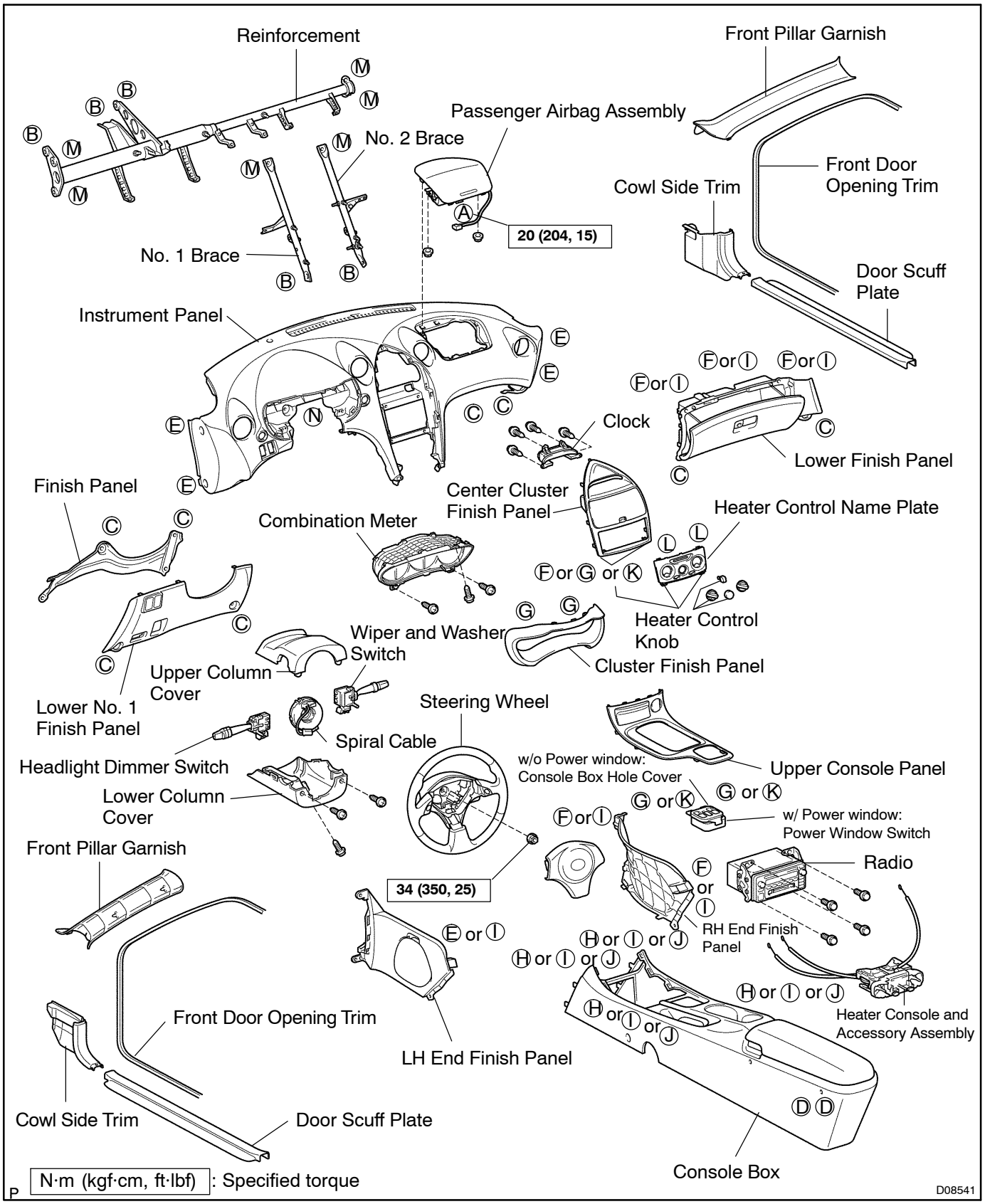
Do not disconnect the shift lock control unit assembly connector.

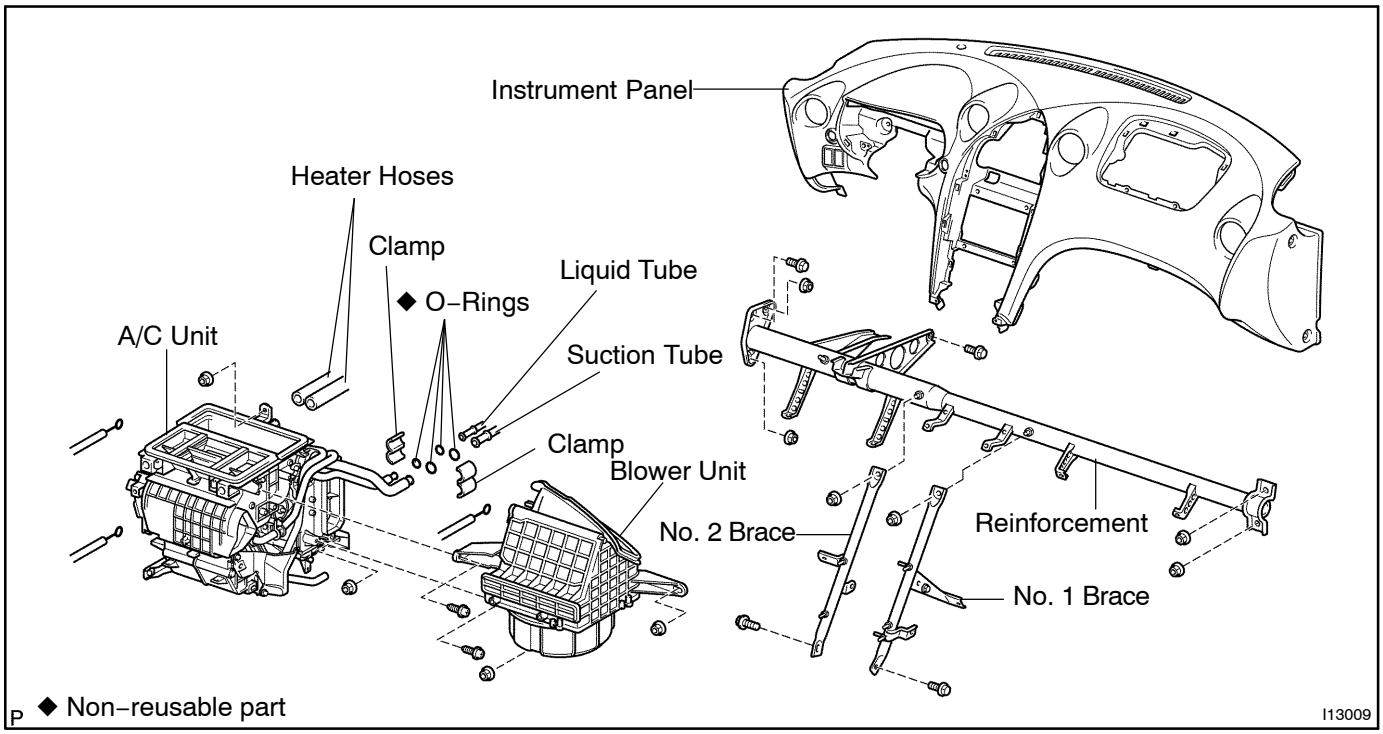
Terminal	Measuring Condition	Voltage (V)
5 – 1 (IG – E)	Ignition switch ON	10 – 14
3 – 1 (STP – E)	Depressing brake pedal	10 – 14

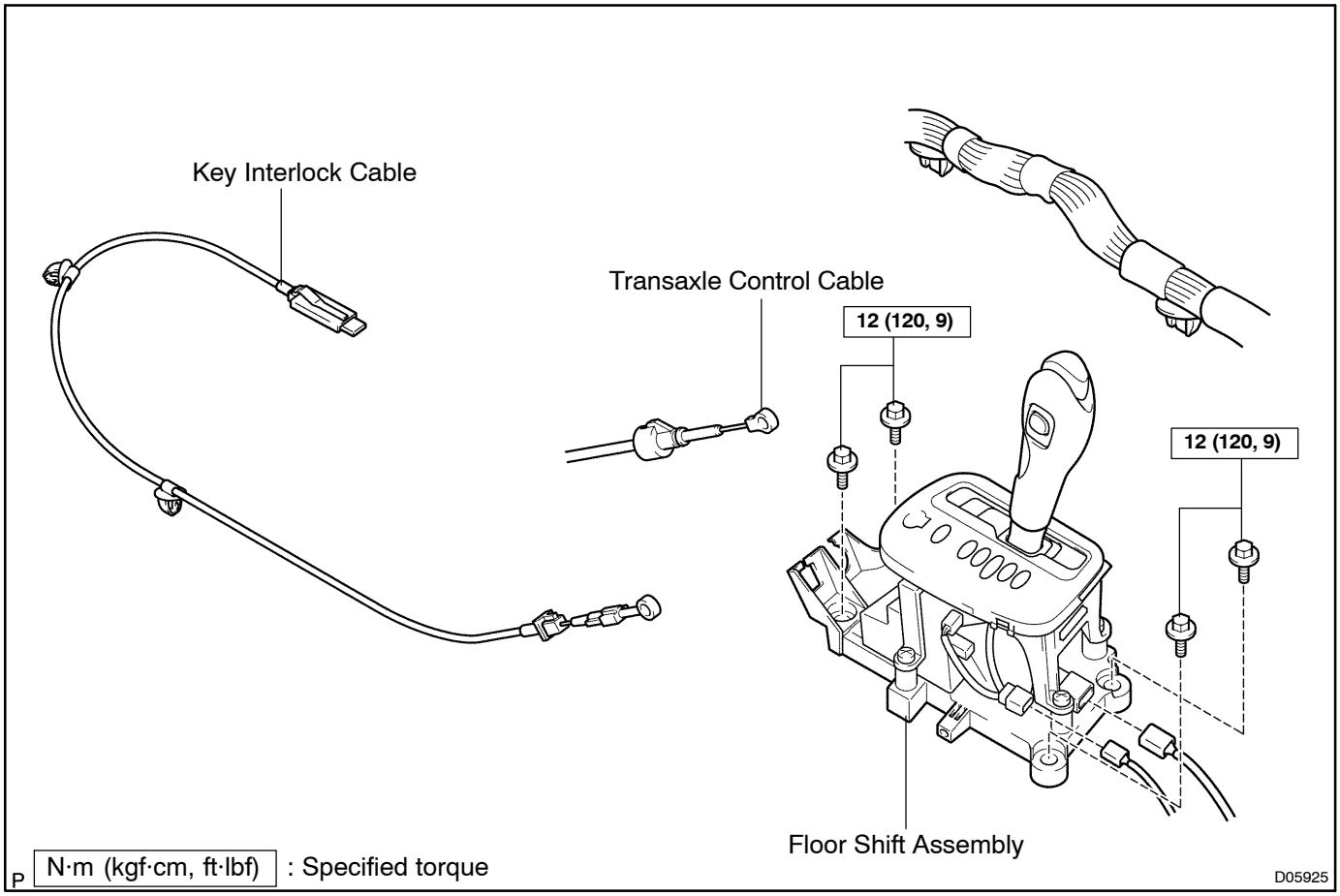
FLOOR SHIFT ASSEMBLY

COMPONENTS

AX0LB–03

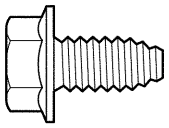
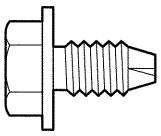
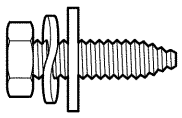
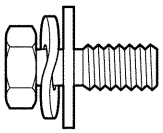
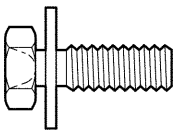
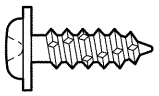
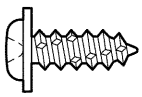
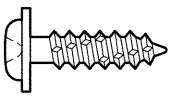
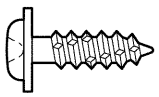
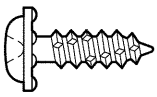
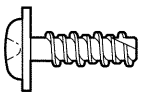
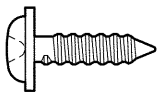
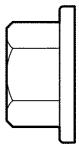
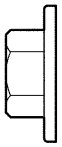



Instrument Panel
Heater Hoses
Clamp
◆ O–Rings
Liquid Tube
A/C Unit
Suction Tube
Clamp
Blower Unit
No. 2 Brace
Reinforcement
No. 1 Brace
P ◆ Non–reusable part
I13009


Key Interlock Cable
Transaxle Control Cable
12 (120, 9)
12 (120, 9)
Floor Shift Assembly
P N·m (kgf·cm, ft·lbf) : Specified torque
D05925

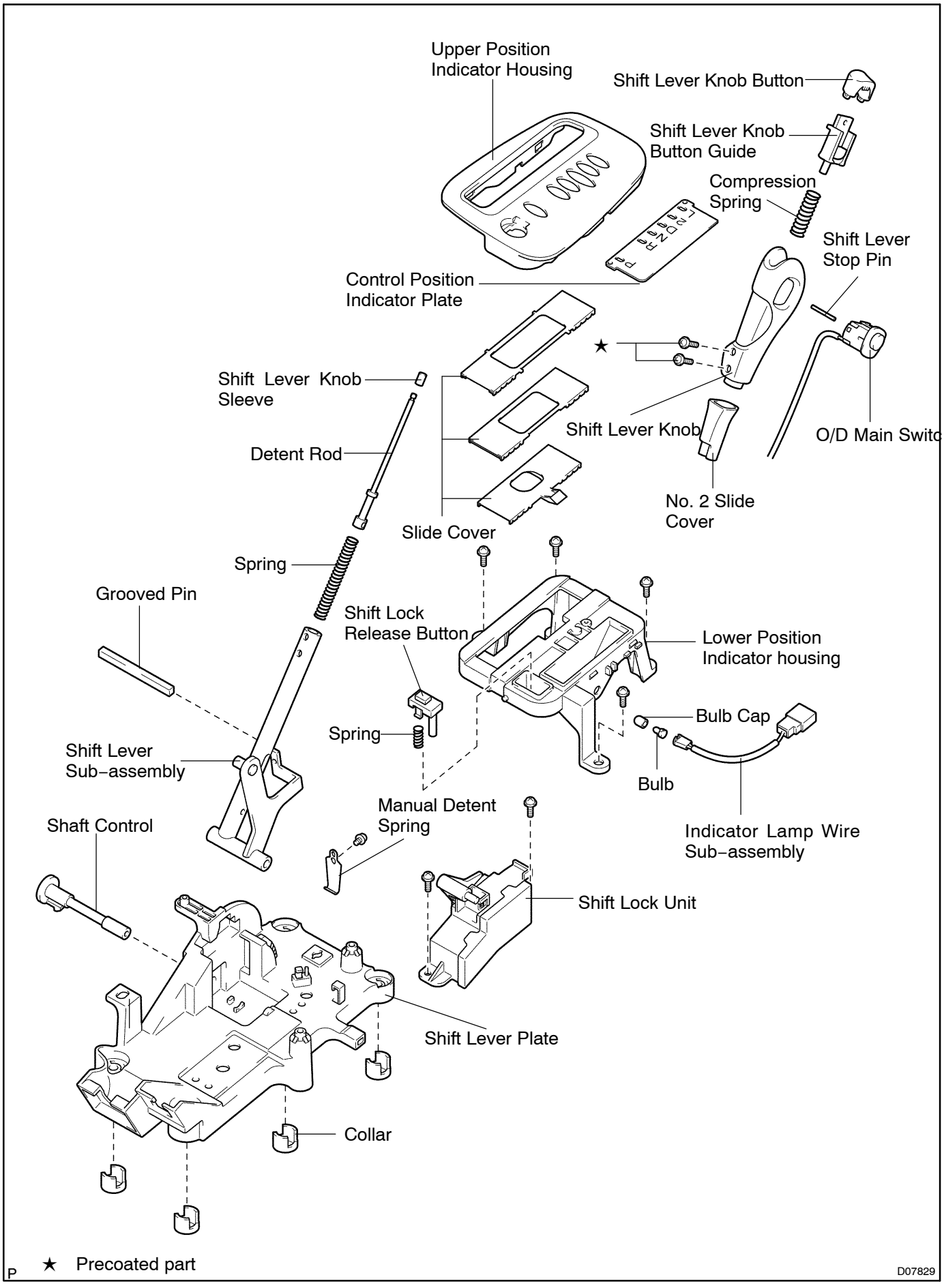
HINT:
Screw shapes and sizes are indicated in the table below. The codes (”A” – ”N”) correspond to those indicated on the previous page.

mm (in.)

	Shape	Size		Shape	Size		Shape	Size
Ⓐ		ø = 8 (0.32) L = 16 (0.63)	Ⓑ		ø = 8 (0.32) L = 15 (0.59)	Ⓒ		ø = 6 (0.24) L = 22 (0.87)
Ⓓ		ø = 6 (0.24) L = 16 (0.63)	Ⓔ		ø = 6 (0.24) L = 18 (0.71)	Ⓕ		ø = 5.22 (0.2055) L = 16 (0.63)
Ⓖ		ø =5.22 (0.2055) L = 16 (0.63)	Ⓗ		ø = 5 (0.20) L = 18 (0.71)	Ⓘ		ø = 5 (0.20) L = 16 (0.63)
Ⓙ		ø = 5 (0.20) L = 16 (0.63)	Ⓚ		ø = 5 (0.20) L = 14 (0.55)	Ⓛ		ø = 4 (0.16) L = 16 (0.63)
Ⓜ		ø = 8 (0.32)	Ⓝ		ø = 6 (0.24)			

P

H12659

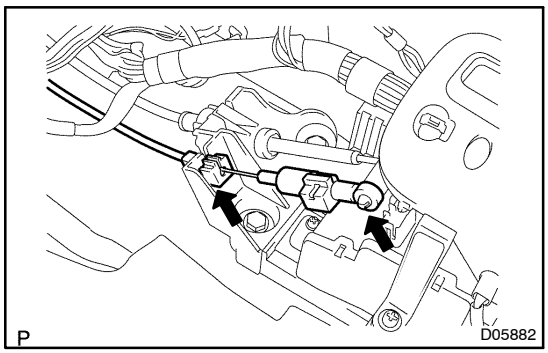

Upper Position Indicator Housing
Shift Lever Knob Button
Shift Lever Knob Button Guide
Compression Spring
Shift Lever Stop Pin
Control Position Indicator Plate
Shift Lever Knob Sleeve
Detent Rod
Shift Lever Knob
O/D Main Switc
No. 2 Slide Cover
Slide Cover
Spring
Grooved Pin
Shift Lock Release Button
Lower Position Indicator housing
Bulb Cap
Spring
Shift Lever Sub–assembly
Bulb
Manual Detent Spring
Indicator Lamp Wire Sub–assembly
Shaft Control
Shift Lock Unit
Shift Lever Plate
Collar
★ Precoated part
D07829

AX0L6–03

REMOVAL

1. REMOVE INSTRUMENT PANEL (See page BO–79)

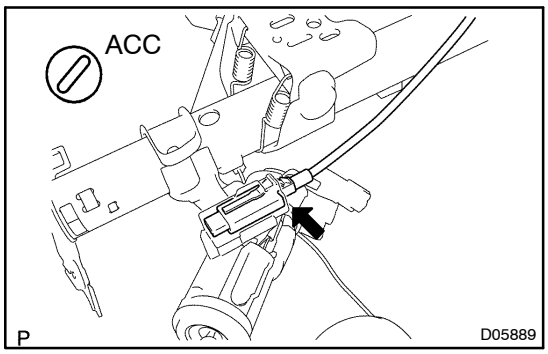
2. REMOVE AIR CONDITIONING UNIT (See page AC–26)



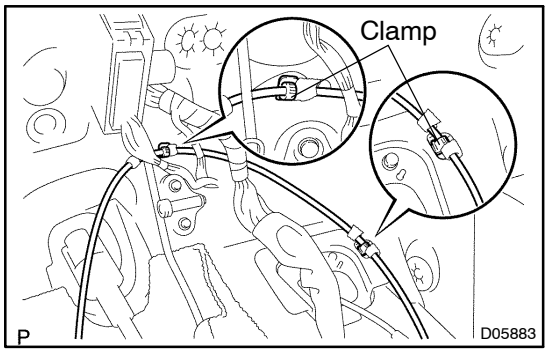
3. REMOVE KEY INTERLOCK CABLE

(a) Remove the cable end from the rod of the floor shift assembly.

(b) Pull out the cable while pressing the clip of the key interlock cable.



(c) With the key in ACC, remove the cable cap claw from the key interlock and pull it.

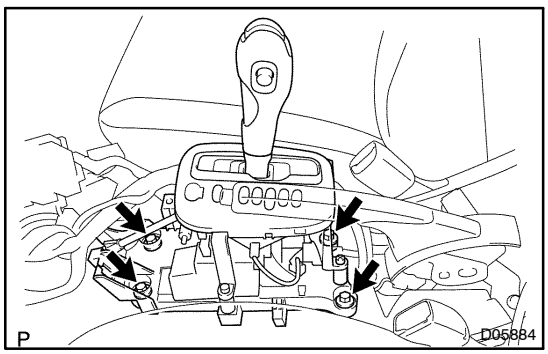


(d) Disconnect the 2 key interlock cable clamps.

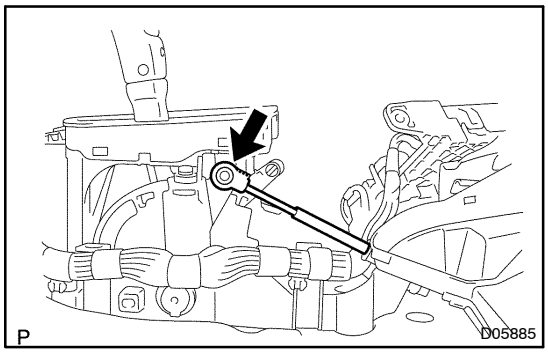
4. REMOVE FLOOR SHIFT ASSEMBLY

(a) Disconnect the 2 connectors.

(b) Disconnect the 2 wire harness clamps from the floor shift assembly.



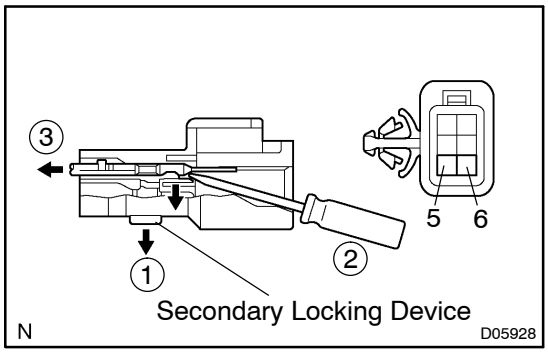
(c) Remove the 4 bolts from the floor shift assembly.



(d) Remove the cable end from the rod of the floor shift assembly.
(e) Pull out the cable while pressing the clip of the transaxle control cable.
(f) Remove the floor shift assembly.

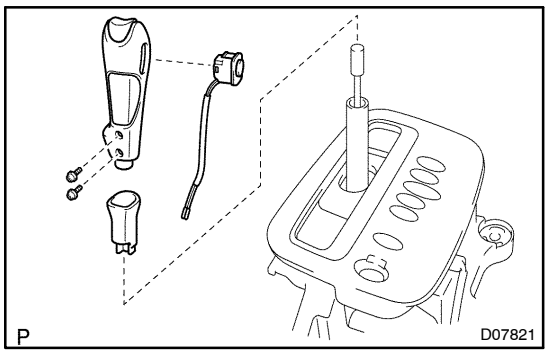
AX0LC–02

DISASSEMBLY



1. REMOVE O/D MAIN SWITCH TERMINAL

(a) Remove the O/D main switch connector from the shift lever plate.
(b) Disengage the secondary locking device.
(c) Release the locking log of the terminals 5 and 6, and pull the terminals out from the rearward.



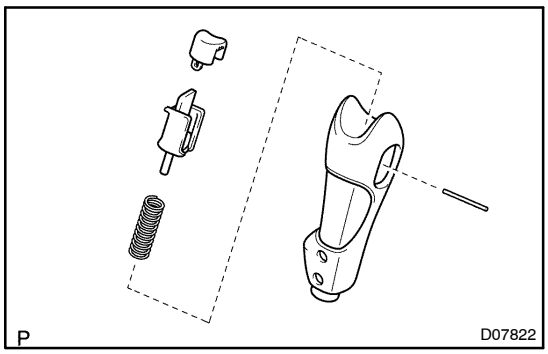
2. REMOVE SHIFT LEVER KNOB SUB–ASSEMBLY

(a) Remove the 2 screws and shift lever knob sub–assembly.

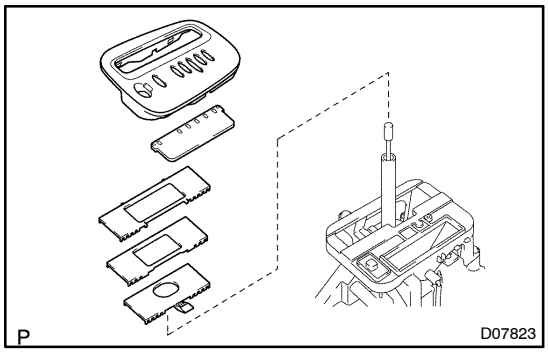
NOTICE:

Pay attention not to apply unnatural load to O/D main switch wire harness.

(b) Remove the O/D main switch.
(c) Remove the No. 2 slide cover.

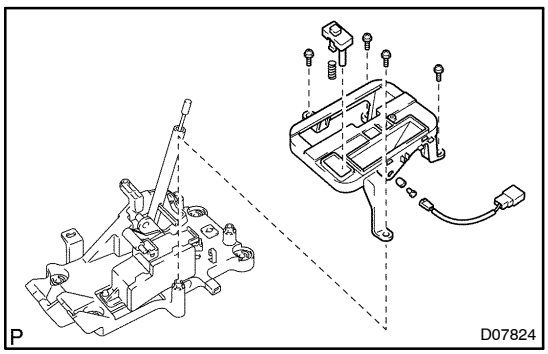


(d) Remove the shift lever stop pin, shift lever knob button, shift lever knob button guide and compression spring.



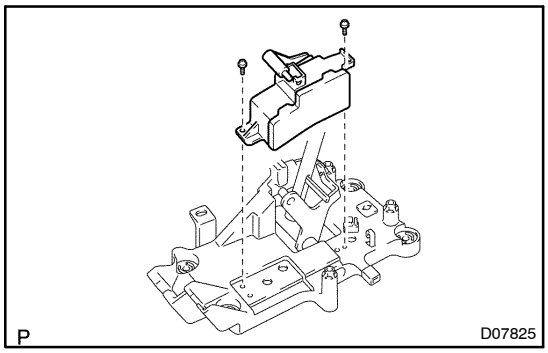
3. REMOVE UPPER POSITION INDICATOR HOUSING

(a) Remove the upper position indicator housing.
(b) Remove the control position indicator plate.
(c) Remove the 3 slide covers from the lower position indicator housing.



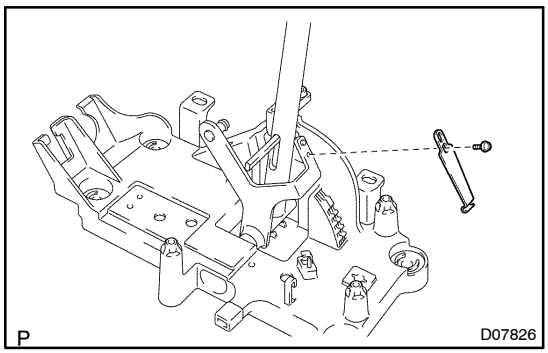
4. REMOVE LOWER POSITION INDICATOR HOUSING

(a) Remove the indicator lamp wire sub–assembly.
(b) Remove the 4 screws and lower position indicator housing.
(c) Remove the bulb cap and bulb from the indicator lamp wire sub–assembly.
(d) Remove the shift lock release button and spring.

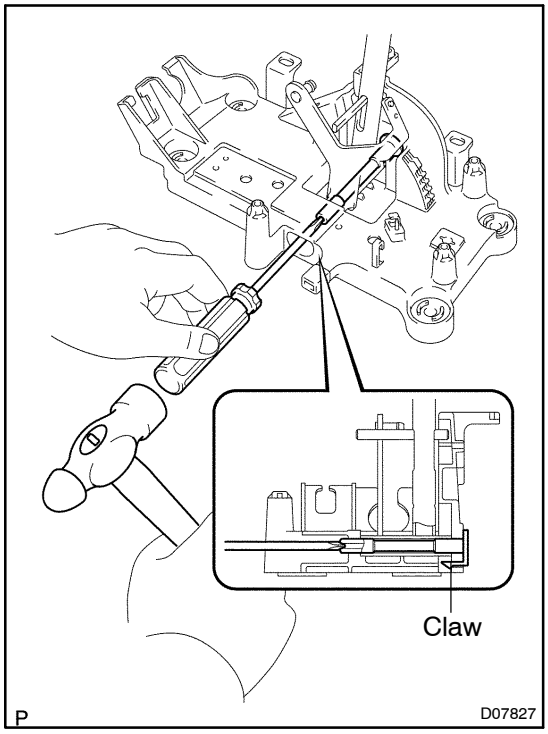


5. REMOVE SHIFT LOCK UNIT

Remove the 2 screws and shift lock unit.

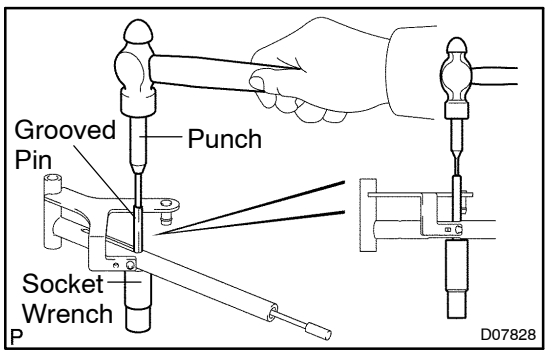


6. REMOVE SCREW AND MANUAL DETENT SPRING



7. REMOVE SHIFT LEVER SUB–ASSEMBLY

Using a screwdriver and hammer, drive off the shaft control while disengaging the claw of the shaft control and remove the shift lever sub–assembly.



8. REMOVE DETENT ROD

(a) Set a 14 mm deep socket wrench.
(b) Using a punch and hammer, remove the grooved pin.
(c) Remove the detent rod and spring.
(d) Remove the shift lever knob sleeve from the detent rod.

9. REMOVE COLLARS

Using a screwdriver and hammer, remove the 4 collars.

AX0LD–02

REASSEMBLY

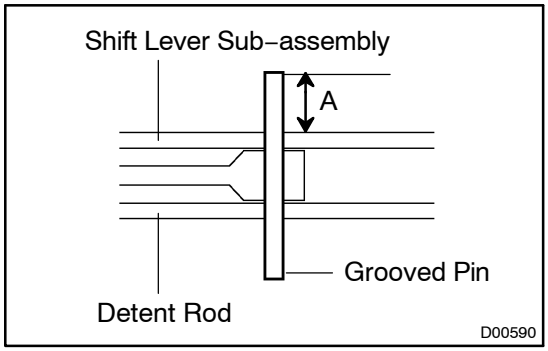
1. INSTALL 4 COLLARS

2. INSTALL DETENT ROD

(a) Install the shift lever knob sleeve to the detent rod.

(b) Apply MP grease on the detent rod and spring.

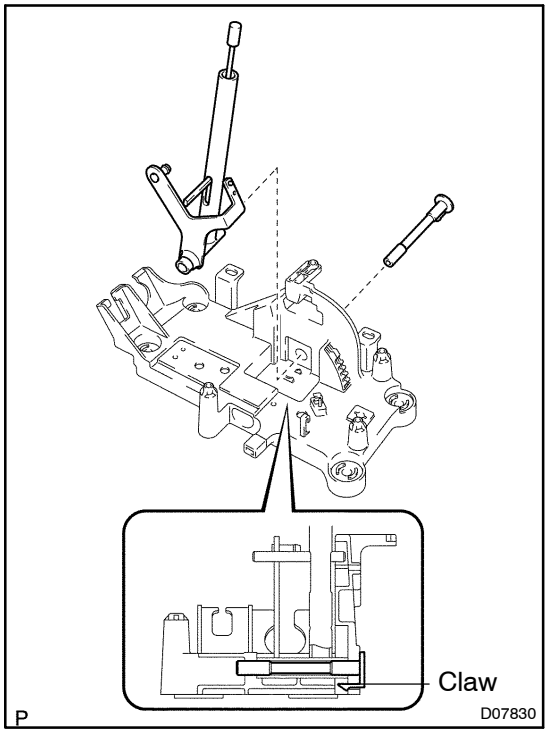
(c) Install the spring and detent rod.



(d) Using a punch and hammer, install the grooved pin to the detent rod pin hole.

A: 8.0 ± 0.2 mm (0.315± 0.008 in.)

(e) Check the detent rod operation.



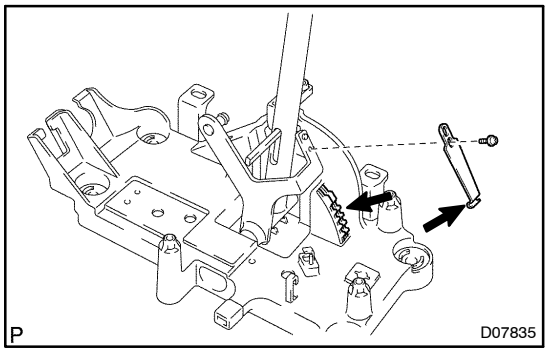
3. INSTALL SHIFT LEVER SUB–ASSEMBLY

(a) Apply MP grease on the spring.

(b) Install the shift lever sub–assembly and shaft control to shift lever plate.

HINT:

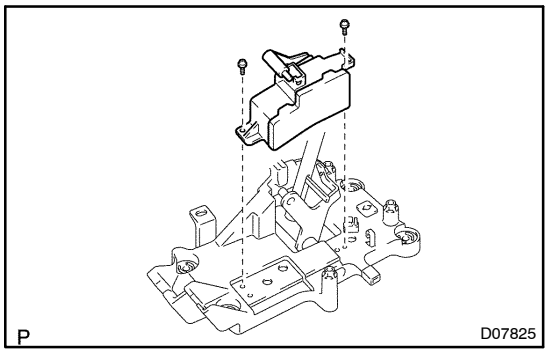
Check that the claw of the shaft control is fit onto the shift lever plate.



4. INSTALL MANUAL DETENT SPRING AND SCREW

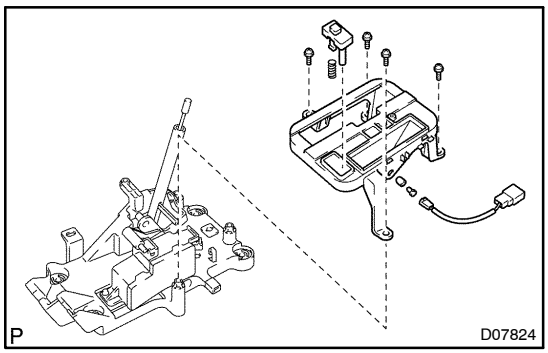
(a) Apply MP grease to the parts indicated by the arrows manual detent spring and shift lever plate in the illustration.

(b) Install the manual detent spring with the screw.



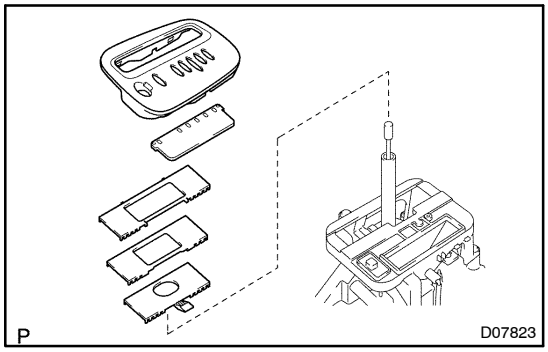
5. INSTALL SHIFT LOCK UNIT

Install the shift lock unit with the 2 screws.



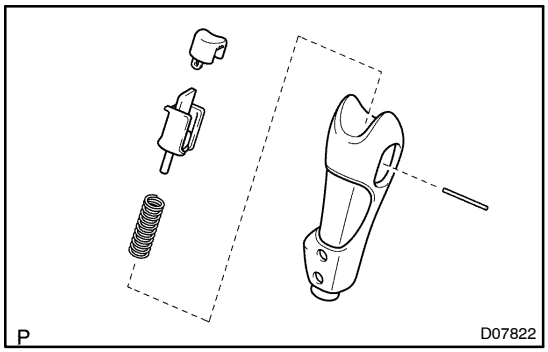
6. INSTALL LOWER POSITION INDICATOR HOUSING

(a) Apply MP grease on the spring.
(b) Install the spring and shift lock release button.
(c) Install the bulb and bulb cap to the indicator lamp wire sub–assembly.
(d) Install the lower position indicator housing with the 4 screws.
(e) Install the indicator lamp wire sub–assembly.



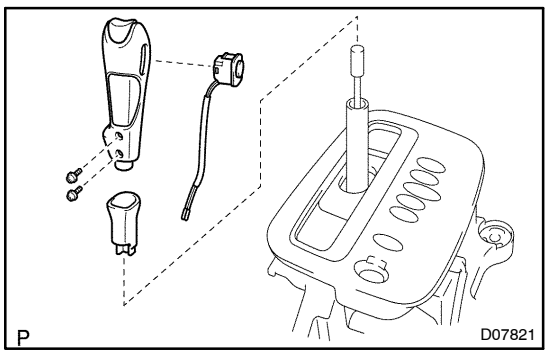
7. INSTALL UPPER POSITION INDICATOR HOUSING

(a) Install the 3 slide covers to the lower position indicator housing, as shown in the illustration.
(b) Install the control position indicator plate.
(c) Install the upper position indicator housing.



8. INSTALL SHIFT LEVER KNOB SUB–ASSEMBLY

(a) Apply MP grease on the compression spring.
(b) Install the compression spring, shift lever knob button guide, shift lever knob button and shift lever stop pin.



(c) Install the No. 2 slide cover.
(d) Install the O/D main switch
(e) Install the shift lever knob sub–assembly with the 2 screws.

HINT:

Coat the threads of screws with sealant.

Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

NOTICE:

Make sure not to catch O/D main switch wire harness.

9. INSTALL O/D MAIN SWITCH TERMINAL

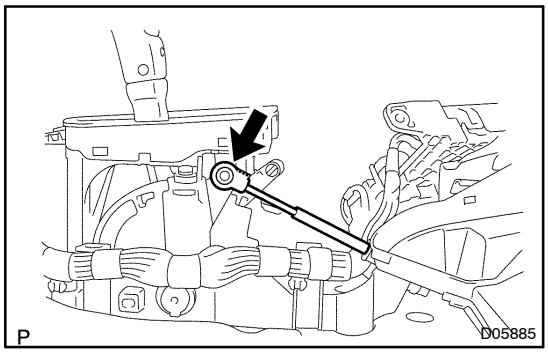
(a) Connect the 2 O/D main switch terminals to the connector.

(b) Connect the connector to the shift lever plate.

AX0L7–05

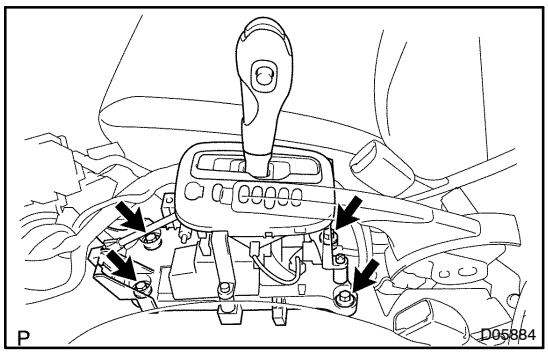
INSTALLATION

1. INSTALL FLOOR SHIFT ASSEMBLY



(a) Pull in the cable while pressing the clip of the transaxle control cable to the floor shift assembly.

(b) Install the cable end from the rod of the floor shift assembly.

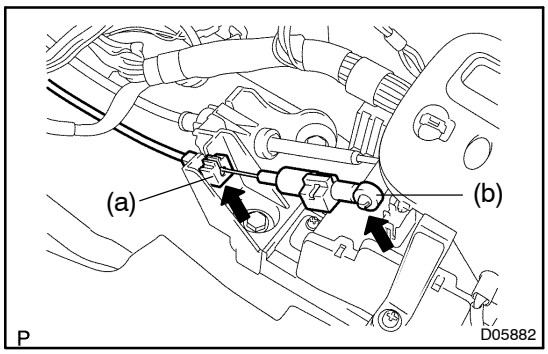


(c) Install the floor shift assembly with the 4 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

(d) Connect the 2 wire harness clamps from the floor shift assembly.

(e) Connect the 2 connectors.

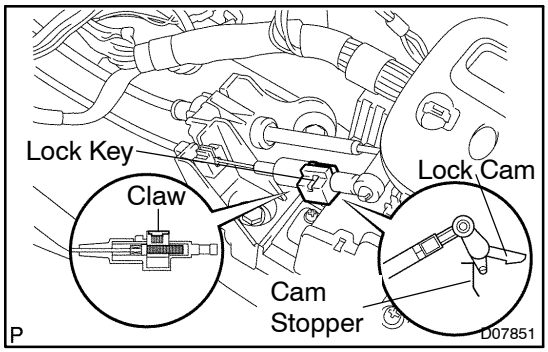
2. INSTALL KEY INTERLOCK CABLE



(a) Pass the key interlock cable end through the hole in the floor shift assembly.

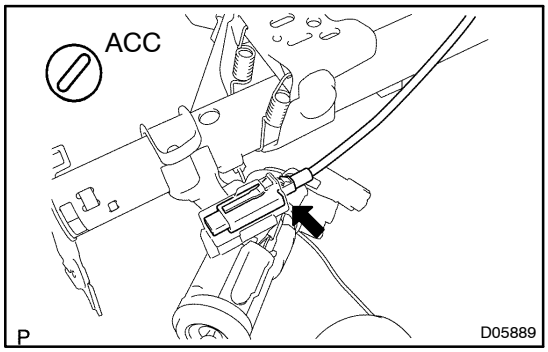
HINT:
Make sure that the claws shown by the arrow in the illustration are locked.

(b) With the shift lever in N position, set the hole of the cable end to the floor shift assembly to assemble them.

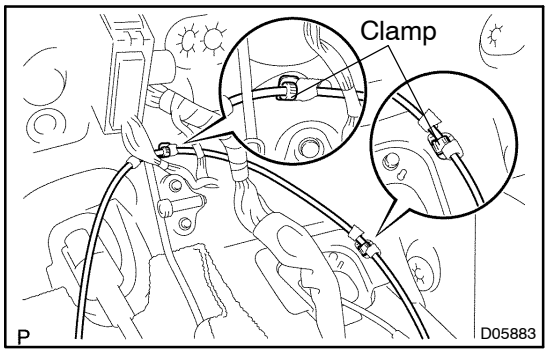


(c) At the time of reassembly:
With the key in ACC, push a claw into lock key.
At this time, be careful not to apply undue force on bending to the cable (Cable length adjustment is completed).

HINT:
Check that the key lock cam is contact with the cam stopper.



(d) With the key in ACC, install the cable cap claw to the key interlock.



(e) Connect the 2 key interlock cable clamps.

(f) Pull in the cable while pressing the clip of the key interlock cable.

3. INSTALL AIR CONDITIONING UNIT (See page AC–29)

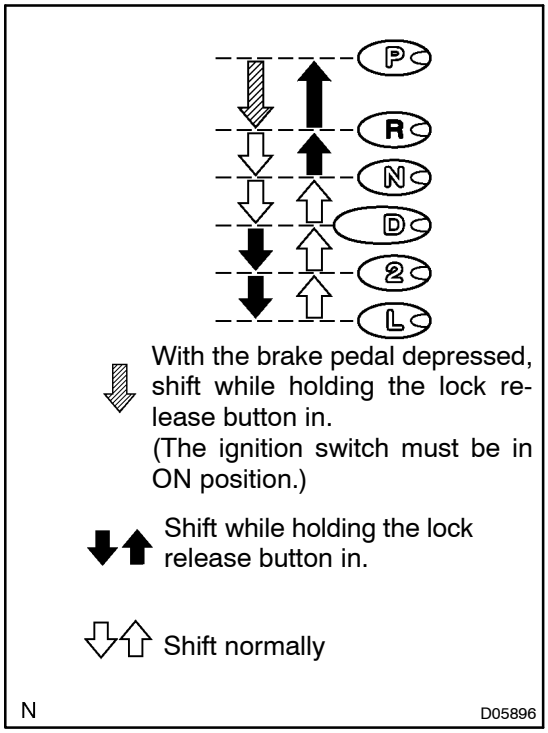
4. INSTALL INSTRUMENT PANEL (See page AC–29)

5. INSPECT KEY INTERLOCK AND SHIFT LOCK OPERATION

(a) Check that a key can be turned from ACC to LOCK only when the shift lever is in P position.

(b) Check that the key cannot be turned to LOCK when the shift lever is position in other than P position.

(c) When the ignition key is in LOCK, check that pressing the shift release button enables the shift lever to shift from P position to other positions.



(d) When shifting it to each position, make sure that the shifting lever moves smoothly, can be moderately operated and the position indicator displays correctly.

Positions which can be operated without pressing the shift lever knob button

R → N → D → D, L → 2 → D → N

Positions which can be operated only while pressing the shift lever knob button

D → 2 → L, N → R → P

Positions which can be operated only while pressing the shift lever knob button, ignition switch ON and brake pedal depressed

P → R

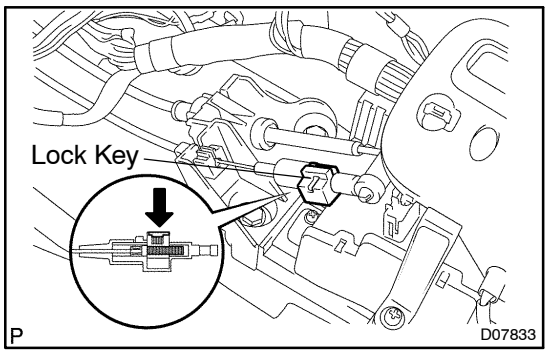
(e) When starting the engine make sure that the vehicle moves forward when shifting form N to D position, and moves rearward when shifting to R position.

6. ADJUSTMENT IN CASE OF MALFUNCTION

(a) When the key can not be turned from ACC to LOCK even though the shift lever is in P position:

This is the condition where the cable end on the ignition key side is not returned to the position where it can be locked. The condition is caused by undue bending of the cable, rotative resistance of the pin on the shift lever side, or increased resistance due to any reason such as twisting of the cable. Reinstall and readjust the key interlock cable.

(b) When the key is turned from ACC to LOCK even though the shift lever is in other than P position:
Since the cable is too long due to improper adjustment at the automatic adjustment part of the key can not be locked. Readjust the key interlock cable.

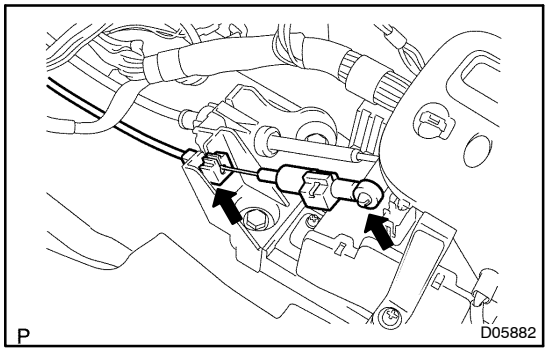


7. READJUSTMENT OF KEY INTERLOCK CABLE

HINT:

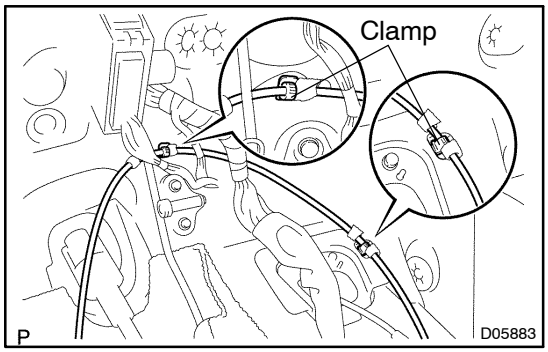
Assembly shall be undertaker in the same way as step 2.

(a) Using a screwdriver, unlock the claw of the lock key of the automatic adjustment part.

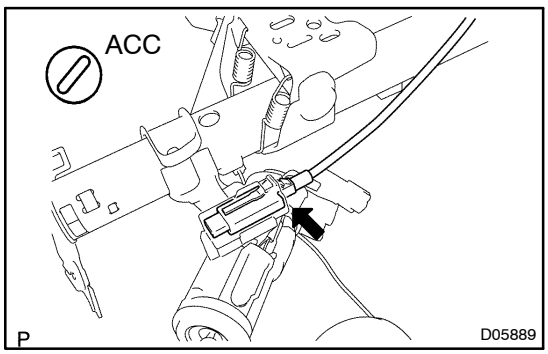


(b) Remove the key interlock cable end from the rod of the floor shift assembly.

(c) Pull out the cable while pressing the clip of the key interlock cable.



(d) Remove the cable clamp from the other.

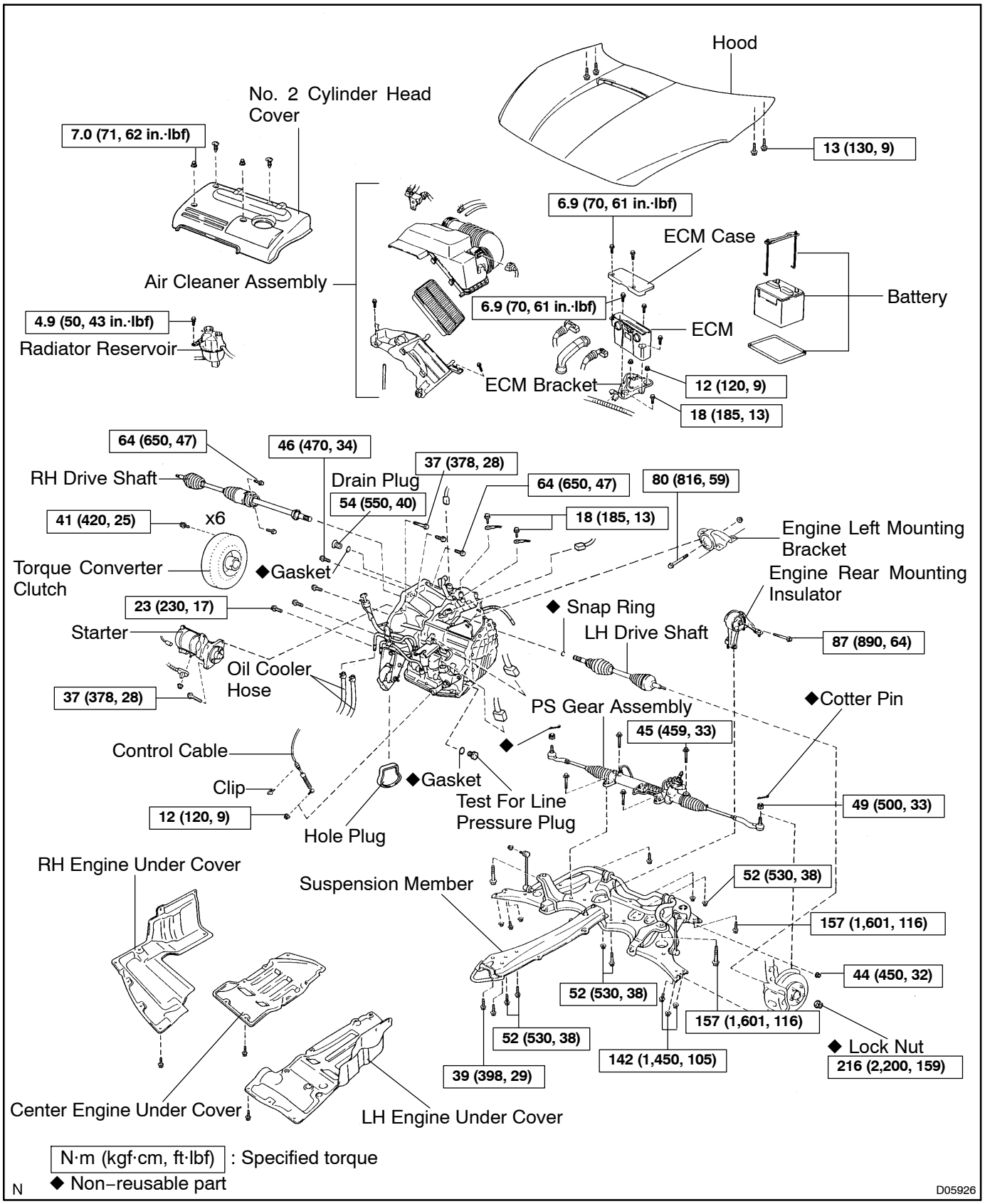


(e) With the key in ACC, install the cable cap claw to the key interlock.

AUTOMATIC TRANSAXLE UNIT

COMPONENTS

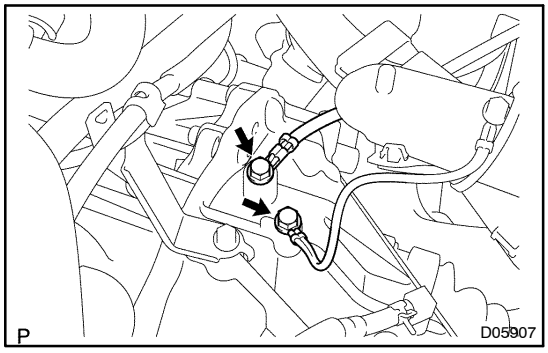
AX0L2–02



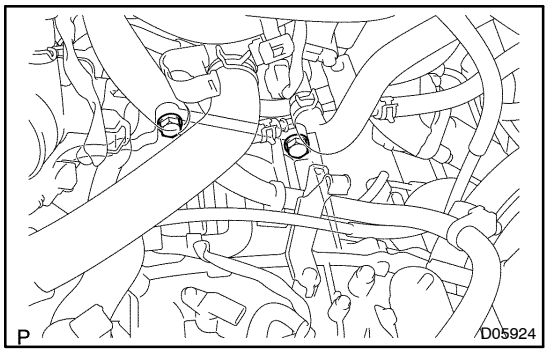
AX0L3–02

REMOVAL

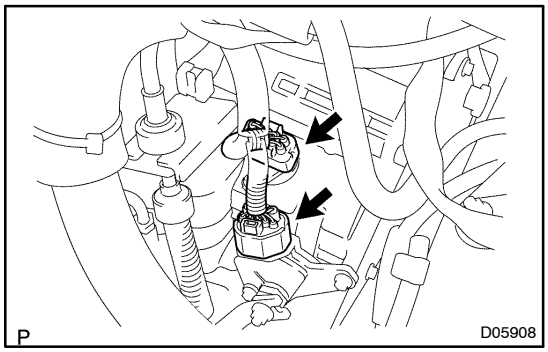
1. **REMOVE HOOD**
   Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
2. **REMOVE BATTERY**
3. **REMOVE ECM AND ECM CASE**
   Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)
4. **REMOVE ECM BRACKET**
   Torque:
   Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
   Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)
5. **REMOVE AIR CLEANER ASSEMBLY**
6. **REMOVE NO. 2 CYLINDER HEAD COVER**
   Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)



7. **REMOVE 2 GROUND CABLES**
   Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
8. **DISCONNECT CONTROL CABLE FROM CLAMP**
9. **DISCONNECT INPUT TURBINE SPEED SENSOR CONNECTOR**
10. **REMOVE VEHICLE SPEED SENSOR CONNECTOR**



11. **REMOVE 2 UPPER SIDE TRANSAXLE MOUNTING BOLTS FROM TRANSAXLE**
    Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



12. **DISCONNECT SOLENOID CONNECTOR AND PARK/NEUTRAL POSITION SWITCH CONNECTOR**

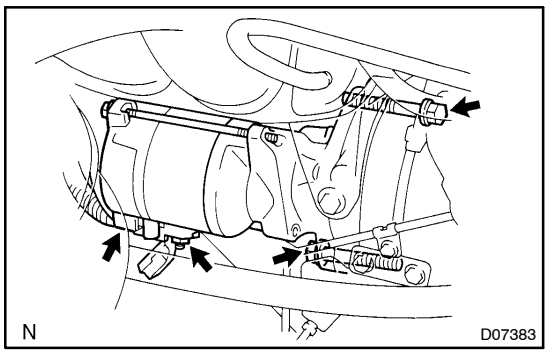
Disconnect the solenoid connector and park/neutral position switch connector.

13. **DISCONNECT CONTROL CABLE**

(a) Remove the nut from the control shift lever.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

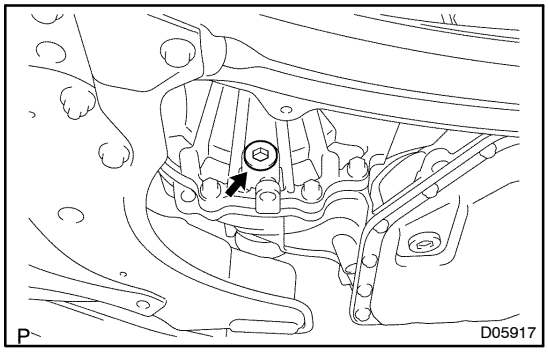
(b) Remove the clip and disconnect the control cable.

14. REMOVE BOLT AND DISCONNECT RADIATOR RESERVOIR
Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



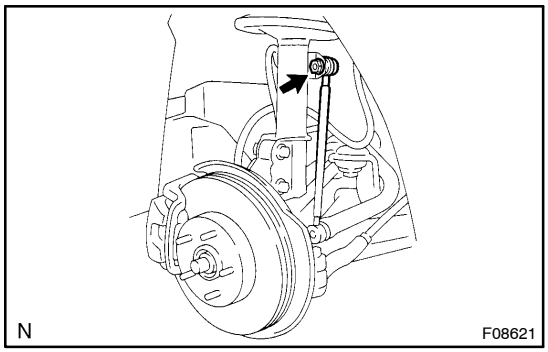
15. REMOVE STARTER
(a) Remove the nut and wire, and disconnect the connector.
(b) Remove the 2 bolts and starter.
Torque: 37 N·m (378 kgf·cm, 28 ft·lbf)

16. REMOVE LH, RH, CENTER ENGINE UNDER COVERS

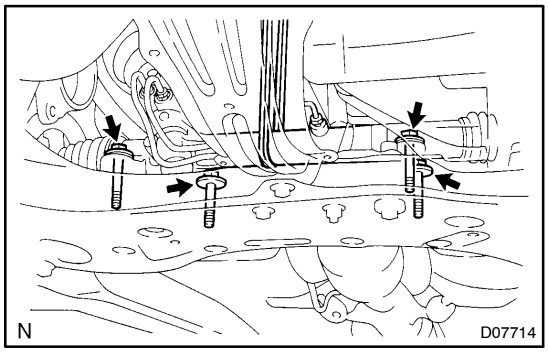


17. DRAIN ATF FROM FRONT DIFFERENTIAL CASE
Torque: 54 N·m (550 kgf·cm, 40 ft·lbf)

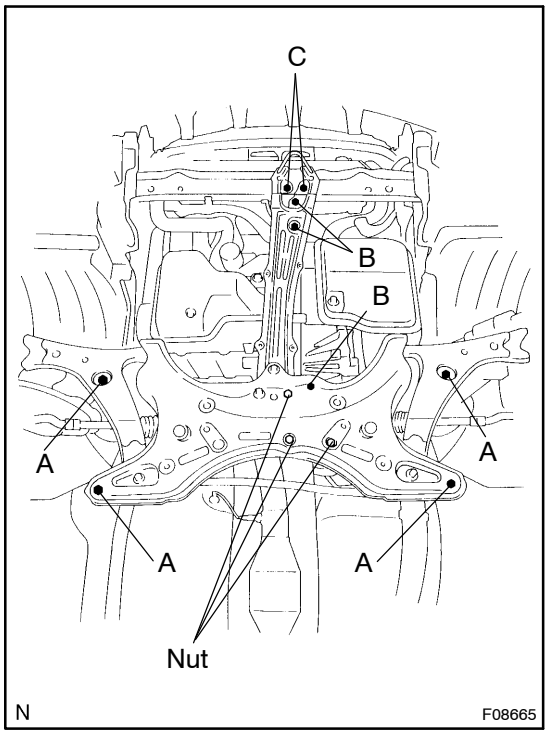
18. REMOVE LH AND RH DRIVE SHAFTS
(See page SA–21)



19. DISCONNECT LH AND RH STABILIZER BAR LINKS FROM SHOCK ABSORBER
Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)



20. REMOVE 4 BOLTS AND DISCONNECT PS GEAR ASSEMBLY
HINT:
Support the PS gear assembly securely.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

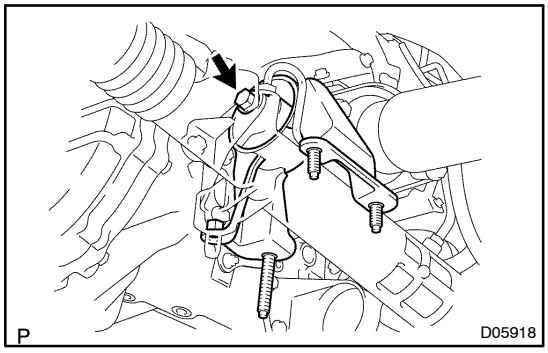


21. REMOVE SUSPENSION MEMBER

(a) Remove the 9 bolts and 3 nuts.

Torque:
Bolt A: 157 N·m (1,601 kgf·cm, 116 ft·lbf)
Bolt B: 52 N·m (530 kgf·cm, 38 ft·lbf)
Bolt C: 39 N·m (398 kgf·cm, 29 ft·lbf)
Nut: 52 N·m (530 kgf·cm, 38 ft·lbf)

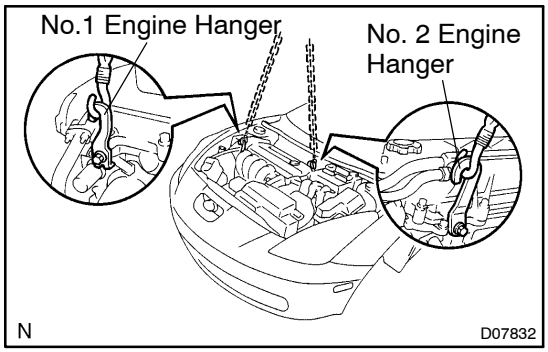
(b) Remove the suspension member.



22. REMOVE ENGINE REAR MOUNTING INSULATOR

Remove the bolt and engine rear mounting insulator.

Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)



23. ATTACH ENGINE SLING DEVICE TO ENGINE HANGERS

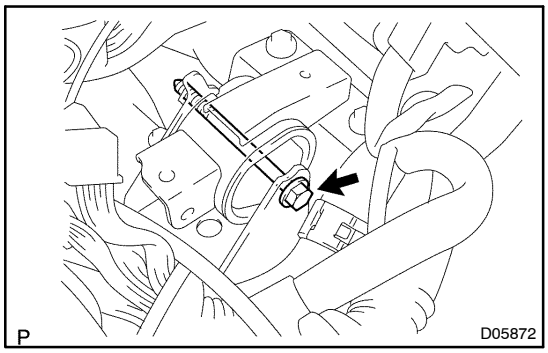
(a) Disconnect the 2 PCV hoses.

(b) Install the No. 1 and No. 2 engine hangers in the correct direction.

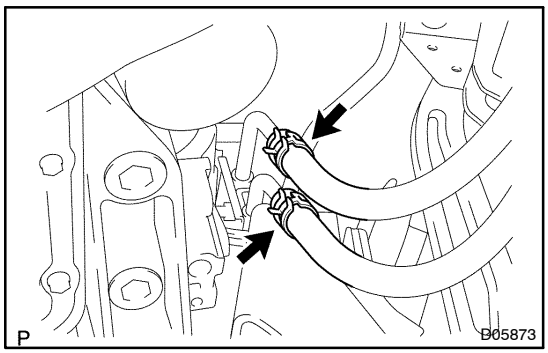
Parts No. :
No. 1 engine hanger: 12281–22021
No. 2 engine hanger: 12281–15040 or 12281–15050
Bolt: 91512–B1016
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

(c) Attach the engine chain hoist to the engine hangers.

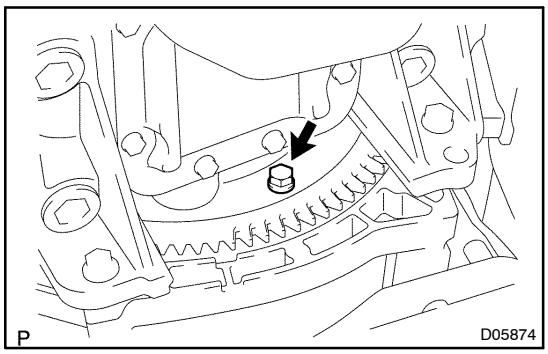
CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.



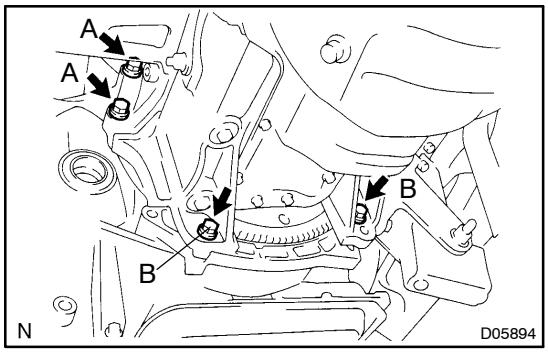
24. REMOVE UPPER SIDE ENGINE LEFT MOUNTING, NUT AND BOLT
Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)



25. REMOVE OIL COOLER HOSE
Loosen the 2 clips and disconnect the 2 oil cooler hoses.
26. SUPPORT TRANSAXLE WITH A JACK

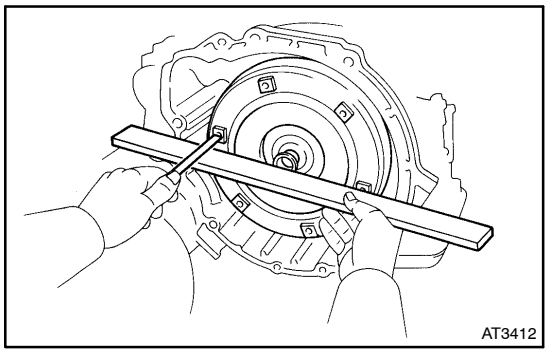


27. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLT
(a) Remove the hole plug.
(b) Turn the crankshaft to gain access and remove the 6 bolts holding the crankshaft pulley set bolt with a wrench.
Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)
HINT:
At the time of installation, please refer to the following item.
First install black colored bolt and then 5 other bolts.



28. REMOVE TRANSAXLE ASSEMBLY
(a) Remove the 4 bolts.
Torque:
A bolt: 46 N·m (470 kgf·cm, 34 ft·lbf)
B bolt: 23 N·m (230 kgf·cm, 17 ft·lbf)
(b) Separate the transaxle from engine, and lower the transaxle.

AX0L4–02



INSTALLATION

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure the distance between the installed surface and the front surface of the transaxle housing.

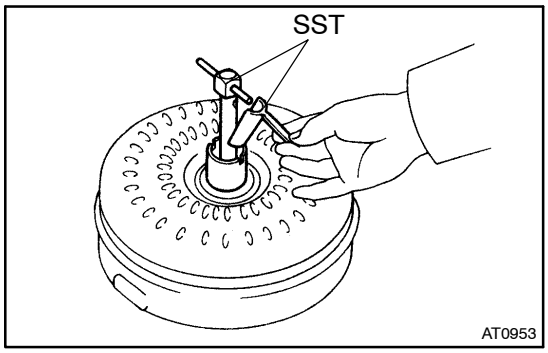
Correct distance: More than 13.3 mm (0.524 in.)

2. TRANSAXLE INSTALLATION

Installation is in the reverse order of removal (See page AX–31).

HINT:

- After installation, adjust the shift control cable and park/neutral position switch (See page DI–758).
- Fill ATF and check the fluid level (See page DI–758).
- Perform the test drive of the vehicle.
- Adjust the hood (See page BO–9).



TORQUE CONVERTER CLUTCH AND DRIVE PLATE

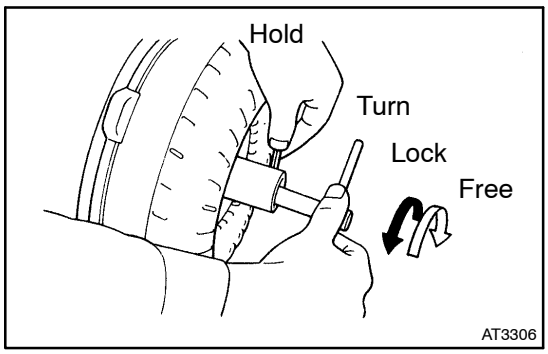
AX09X–10

INSPECTION

1. INSPECT ONE–WAY CLUTCH

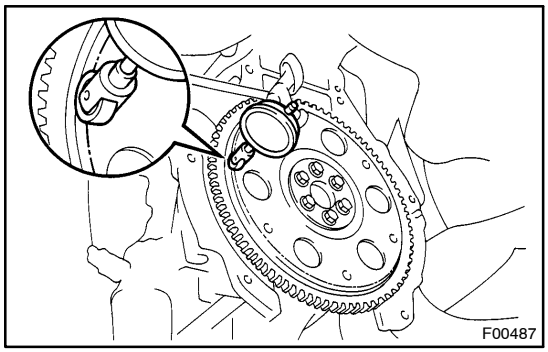
(a) Install SST into the inner race of the one–way clutch.
SST 09350–32014 (09351–32010)

(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



(c) With the torque converter clutch setting up on its side, check that the clutch locks when turned counterclockwise, and rotates smoothly clockwise.

If necessary, clean the converter and retest the clutch.
Replace the converter clutch if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

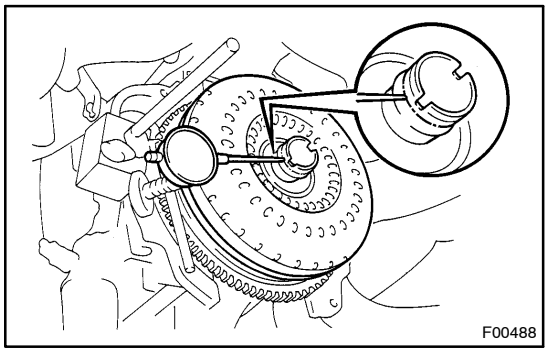
(a) Set up a dial indicator and measure the drive plate runout.

(b) Check the damage of the ring gear.

Maximum runout: 0.20 mm (0.0079 in.)

If the runout is not within the specification or ring gear is damaged, replace the drive plate.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

Temporarily mount the torque converter clutch on the drive plate. Set a dial indicator and measure the torque converter clutch sleeve runout.

Maximum runout: 0.30 mm (0.0118 in.)

If the runout is not within the specification, try to correct by reorienting the installation of the converter.

HINT:
Mark the position of the converter clutch to ensure the installation is correctly performed.

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

SA0CB–18

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

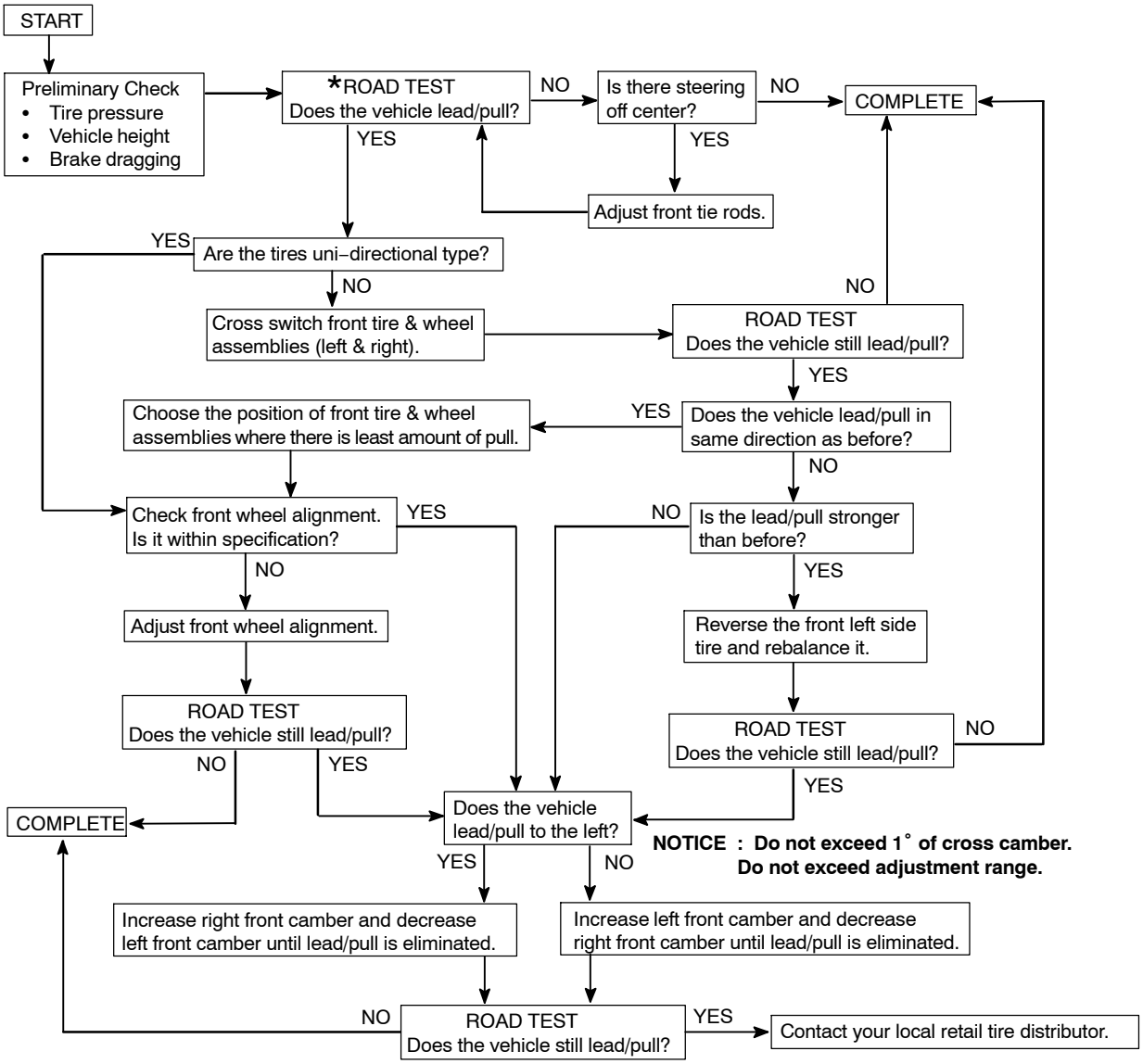
Symptom	Suspect Area	See page
Bottoming	1. Vehicle (Overloaded)	–
	2. Spring (Weak)	SA–34
		SA–62
	3. Shock absorber (Worn)	SA–37
		SA–65
Sways/pitches	1. Tire (Worn or improperly inflated)	SA–3
	2. Stabilizer bar (Bent or broken)	SA–51
		SA–76
	3. Shock absorber (Worn)	SA–37
		SA–65
Front wheel shimmy	1. Tire (Worn or improperly inflated)	SA–3
	2. Wheel (Out of balance)	SA–3
	3. Shock absorber (Worn)	SA–37
	4. Wheel alignment (Incorrect)	SA–5
	5. Ball joint (Worn)	SA–49
	6. Hub bearing (Worn)	SA–13
	7. Steering linkage (Loose or worn)	–
	8. Steering gear (Out of adjustment or broken)	SR–35
Abnormal tire wear	1. Tire (Worn or improperly inflated)	SA–3
	2. Wheel alignment (Incorrect)	SA–5
	3. Shock absorber (Worn)	SA–37
		SA–65
	4. Suspension parts (Worn)	–

SA28T–02

REPAIR PROCEDURES

HINT:

This is a flow chart for vehicle pull.



* Select a flat road where the vehicle can be driven in a straight line for 100 meters at a constant speed of 35mph. Please confirm safety and set the steering wheel to its straight position. Drive the vehicle in a straight line for 100 meters at a constant speed of 35mph without holding the steering wheel.

(1) The vehicle can keep straight but the steering wheel has some angle.
→ STEERING OFF CENTER (See page SR–9)

(2) The vehicle cannot keep straight.
→ STEERING PULL

TIRE AND WHEEL

SA1P0–03

INSPECTION

1. INSPECT TIRE

(a) Check the tires for wear and proper inflation pressure.

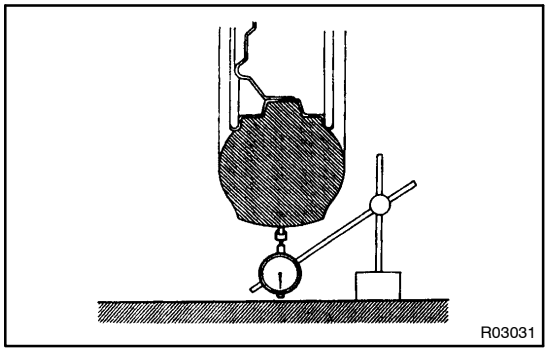
Cold tire inflation pressure

1ZZ–FE engine models:

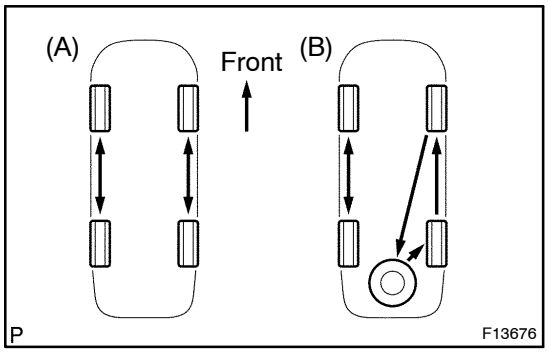
Tire size	Front kPa (kgf/cm^2, psi)	Rear kPa (kgf/cm^2, psi)
195/60R15 88H P195/60R15 87H	210 (2.1, 29)	210 (2.1, 29)

2ZZ–GE engine models:

Tire size	Front kPa (kgf/cm^2, psi)	Rear kPa (kgf/cm^2, psi)
205/55R15 87V P205/55R15 87V 205/50R16 87V	220 (2.2, 32)	220 (2.2, 32)



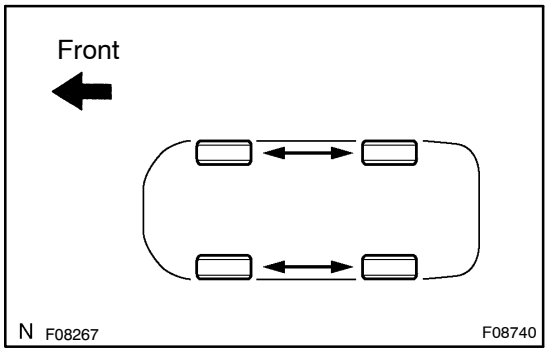
(b) Using a dial indicator, check the tire runout.
Tire runout: 1.0 mm (0.039 in.) or less



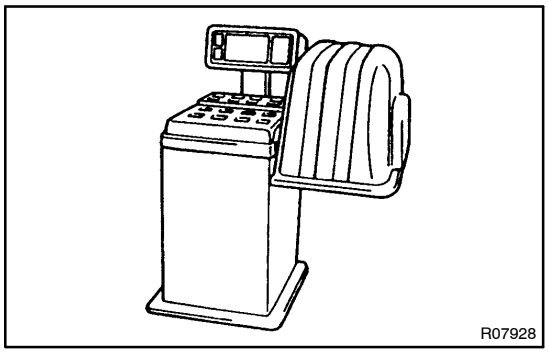
2. ROTATING TIRES

HINT:

- Rotate tires as shown in the illustration.
- Rotate as shown in (B) if the spare tire is included in the rotation.



If the rotating direction is specified, do not exchange the tires between the right and left.

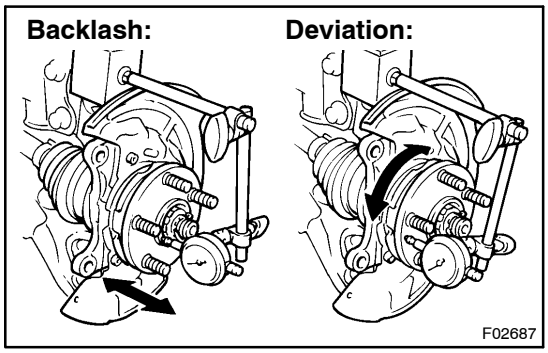


3. INSPECT WHEEL BALANCE

(a) Check and adjust the Off–the–car balance.

(b) If necessary, check and adjust the On–the–car balance.

Imbalance after adjustment: 8.0 g (0.018 lb) or less



4. CHECK WHEEL BEARING LOOSENESS

(a) Using a dial indicator, check the backlash near the center of the axle hub.

Maximum: 0.05 mm (0.0020 in.)

If the backlash exceeds the maximum, replace the bearing.

(b) Using a dial indicator, check the deviation at the surface of the axle hub outside the hub bolt.

Maximum: 0.07 mm (0.0028 in.)

If the deviation exceeds the maximum, replace the axle hub.

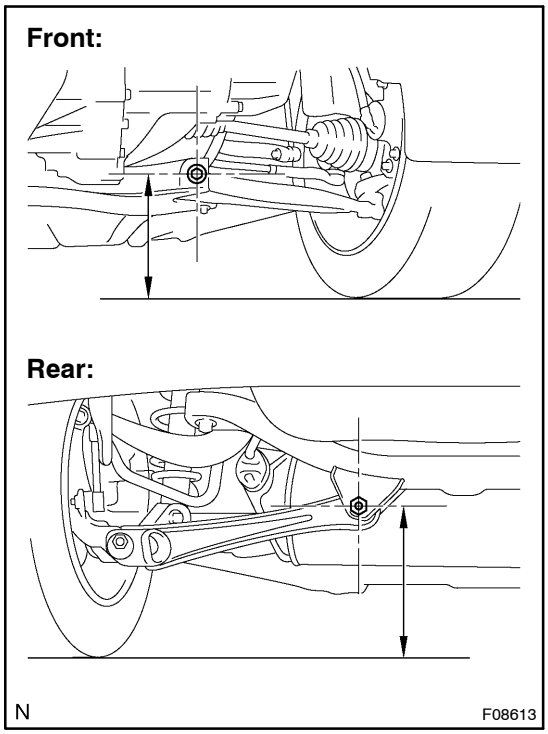
5. CHECK FRONT SUSPENSION FOR LOOSENESS

6. CHECK STEERING LINKAGE FOR LOOSENESS

7. CHECK BALL JOINT FOR LOOSENESS

8. CHECK SHOCK ABSORBER WORKS PROPERLY

- Check that oil leaks
- Check mounting bushings for wear
- Bounce front and rear of the vehicle



FRONT WHEEL ALIGNMENT

SA1CK–21

INSPECTION

1. MEASURE VEHICLE HEIGHT

Vehicle height:

Tire size	Front*1 mm (in.)	Rear*2 mm (in.)
195/60R15, P195/60R15	190 (7.48)	224 (8.82)
205/55R15, P205/55R15	190 (7.48)	226 (8.90)
205/50R16	193 (7.60)	225 (8.86)

*1: Front measuring point

Measure the distance from the ground to the center of the front side lower suspension arm mounting bolt.

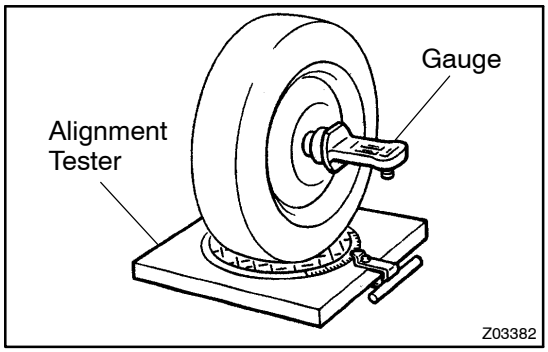
*2: Rear measuring point

Measure the distance from the ground to the center of the rear side lower suspension arm suspension member side set bolt.

NOTICE:

Before inspecting the wheel alignment, adjust the vehicle height to the specified value.

If the vehicle height is not the specified value, try to adjust it by pushing down on or lifting the body.



2. INSTALL CAMBER–CASTER–KINGPIN GAUGE OR POSITION VEHICLE ON WHEEL ALIGNMENT TESTER

Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION

Camber, caster and steering axis inclination:

195/60R15, P195/60R15 tire:

Camber	–0°28' ± 45' (–0.47° ± 0.75°)
Right–left error	45' (0.75°) or less
Caster	2°07' ± 45' (2.12° ± 0.75°)
Right–left error	45' (0.75°) or less
Steering axis inclination	13°09' ± 45' (13.15° ± 0.75°)
Right–left error	45' (0.75°) or less

205/55R15, P205/55R15 tire:

Camber	–0°25' ± 45' (–0.42° ± 0.75°)
Right–left error	45' (0.75°) or less
Caster	2°01' ± 45' (2.02° ± 0.75°)
Right–left error	45' (0.75°) or less
Steering axis inclination	13°04' ± 45' (13.07° ± 0.75°)
Right–left error	45' (0.75°) or less

205/50R16 tire:

Camber	–0°29' ± 45' (–0.48° ± 0.75°)
Right–left error	45' (0.75°) or less
Caster	2°02' ± 45' (2.03° ± 0.75°)
Right–left error	45' (0.75°) or less
Steering axis inclination	13°12' ± 45' (13.20° ± 0.75°)
Right–left error	45' (0.75°) or less

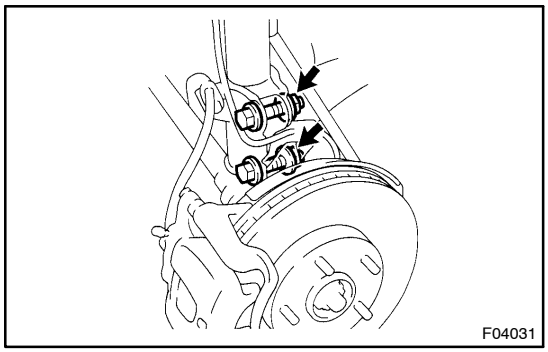
If the caster and steering axis inclination are not within the specified values, after the camber has been correctly adjusted, recheck the suspension parts for damaged and/or worn out parts.

4. ADJUST CAMBER

NOTICE:

After the camber has been adjusted, inspect the toe–in.

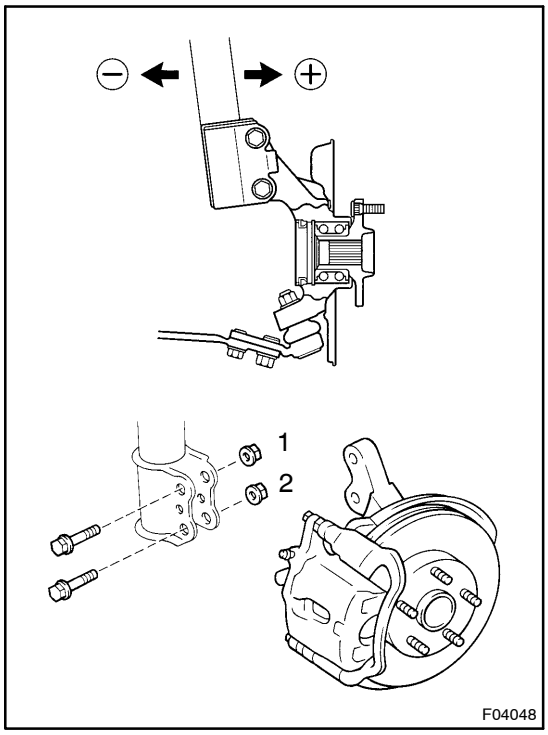
(a) Remove the front wheel.



(b) Remove the 2 nuts on the lower side of the shock absorber.

(c) Coat the threads of the nuts with engine oil.

(d) Temporarily install the 2 nuts.



(e) Adjust the camber by pushing or pulling the lower side of the shock absorber in the direction in which the camber adjustment is required.

(f) Tighten the nuts.
Torque: 153 N·m (1,560 kgf·cm, 113 ft·lbf)

(g) Install the front wheel.
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

(h) Check the camber.

HINT:

- Try to adjust the camber to the center of the specified value.
- Adjusting value for the set bolts is 6' – 30' (0.1° – 0.5°).

If the camber is not within the specified value, using the following table, estimate how much additional camber adjustment will be required, and select the camber adjusting bolt.

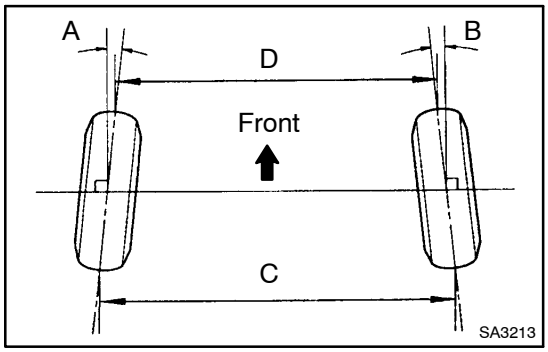
Bolt / Adjusting Value	Set Bolt		Adjusting Bolt					
	90105–15001		90105–15004		90105–15005		90105–15006	
			1 Dot		2 Dots		3 Dots	
	11		11		11		11	
	1	2	1	2	1	2	1	2
15'	●			●				
30'	●					●		
45'	●							●
1°00'			●					●
1°15'					●			●
1°30'							●	●

F01195

(i) Do the steps mentioned above again. Between step (b) and (c), replace 1 or 2 selected bolts.

HINT:

When replacing the 2 bolts, replace 1 bolt for each time.



5. INSPECT TOE–IN

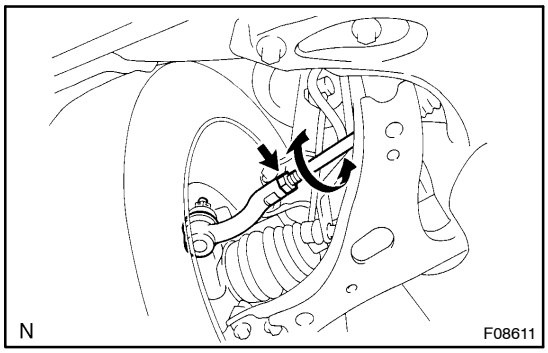
Toe–in:

Toe–in (total)	A + B: 0° ± 12' (0° ± 0.2°) C – D: 0 ± 2 mm (0 ± 0.08 in.)

If the toe–in is not within the specified value, adjust it at the rack ends.

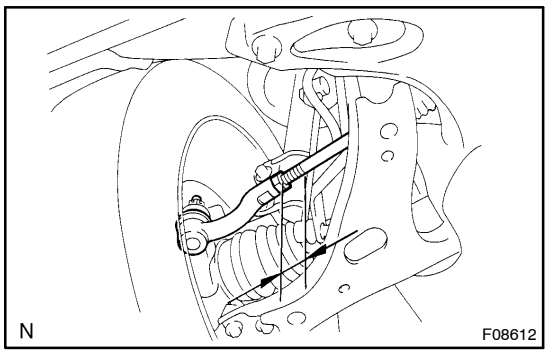
6. ADJUST TOE–IN

(a) Remove the rack boot set clips.



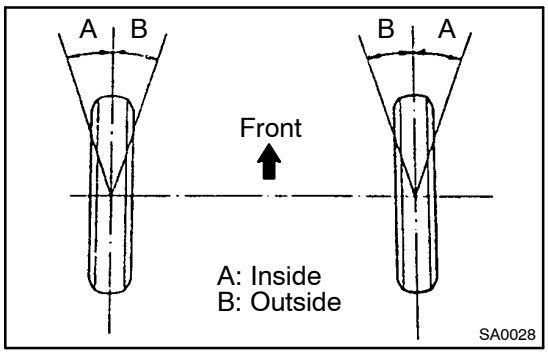
(b) Loosen the tie rod end lock nuts.
(c) Turn the right and left rack ends by an equal amount to adjust the toe–in.

HINT:
Try to adjust the toe–in to the center of the specified value.



(d) Make sure that the lengths of the right and left rack ends are the same.
Rack end length difference: 1.5 mm (0.059 in.) or less
(e) Torque the tie rod end lock nuts.
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)
(f) Place the boots on the seats and install the clips.

HINT:
Make sure that the boots are not twisted.



7. INSPECT WHEEL ANGLE

Turn the steering wheel fully, and measure the turning angle.

Wheel turning angle:

195/60R15, P195/60R15 tire:

Inside wheel	38°41' ± 2° (38.68° ± 2°)
Outside wheel: Reference	33°20' (33.33°)

205/55R15, P205/55R15 tire:

Inside wheel	38°46' ± 2° (38.77° ± 2°)
Outside wheel: Reference	33°25' (33.42°)

205/50R16 tire:

Inside wheel	38°38' ± 2° (38.63° ± 2°)
Outside wheel: Reference	33°19' (33.32°)

If the right and left inside wheel angles differ from the specified value, check the right and left rack end lengths.

REAR WHEEL ALIGNMENT

SA1OZ–02

INSPECTION

1. MEASURE VEHICLE HEIGHT (See page SA–5)

2. INSTALL CAMBER–CASTER–KINGPIN GAUGE OR POSITION VEHICLE ON WHEEL ALIGNMENT TESTER

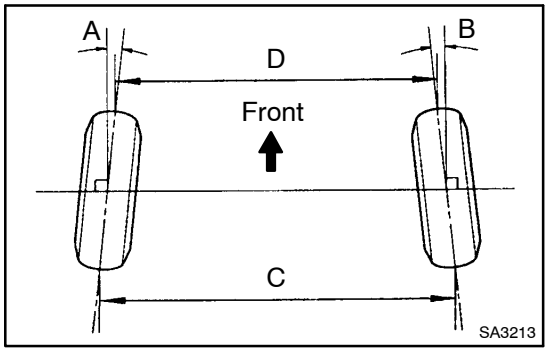
Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER

Camber:

Camber	–1°11' ± 45' (–1.18° ± 0.75°)
Right–left error	45' (0.75°) or less

If the camber is not within the specified value, after the toe–in is inspected, see step 5. to adjust.

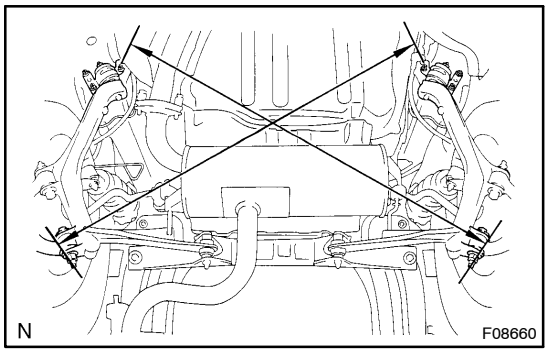


4. INSPECT TOE–IN

Toe–in:

Toe–in (total)	A + B: 0°18' ± 12' (0.3° ± 0.2°) C – D: 3 ± 2 mm (0.12 ± 0.08 in.)

If the toe–in is not within the specified value, see step 5. to adjust.



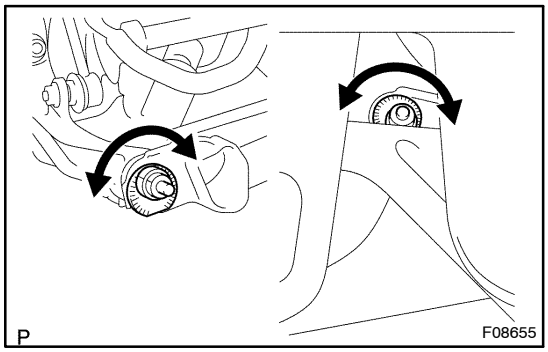
5. ADJUST CAMBER AND TOE–IN

(a) Measure the distance from the LH lower suspension arm bracket set bolt to the RH axle carrier rear side set bolt as shown in the illustration.

(b) Employ the same manner to the RH–LH.

Length difference: 6 mm or less

If it exceeds the specified value, adjust it by turning the adjusting cams.



(c) Loosen the upper and lower arm adjusting cam set nuts.

(d) Adjust the camber and toe–in by turning the adjusting cams.

HINT:

Try to adjust the camber and toe–in to the center of the specified values.

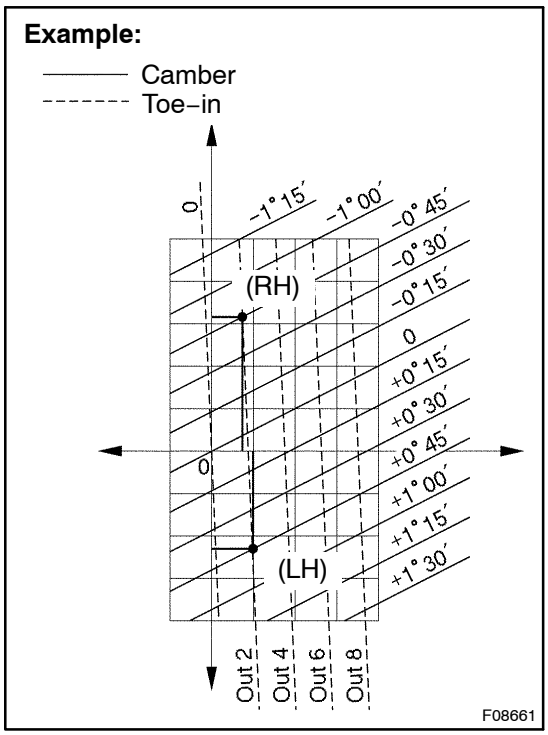
(e) Torque the upper and lower arm adjusting cam set nuts.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

6. HOW TO READ ADJUSTMENT CHART (EXAMPLE)

(a) Measure the present alignment.

Example:
Camber (RH): –0°26' (–0.43°)
Camber (LH): –1°56' (–1.93°)
Toe–in (total): IN 7 mm (0.28 in.)

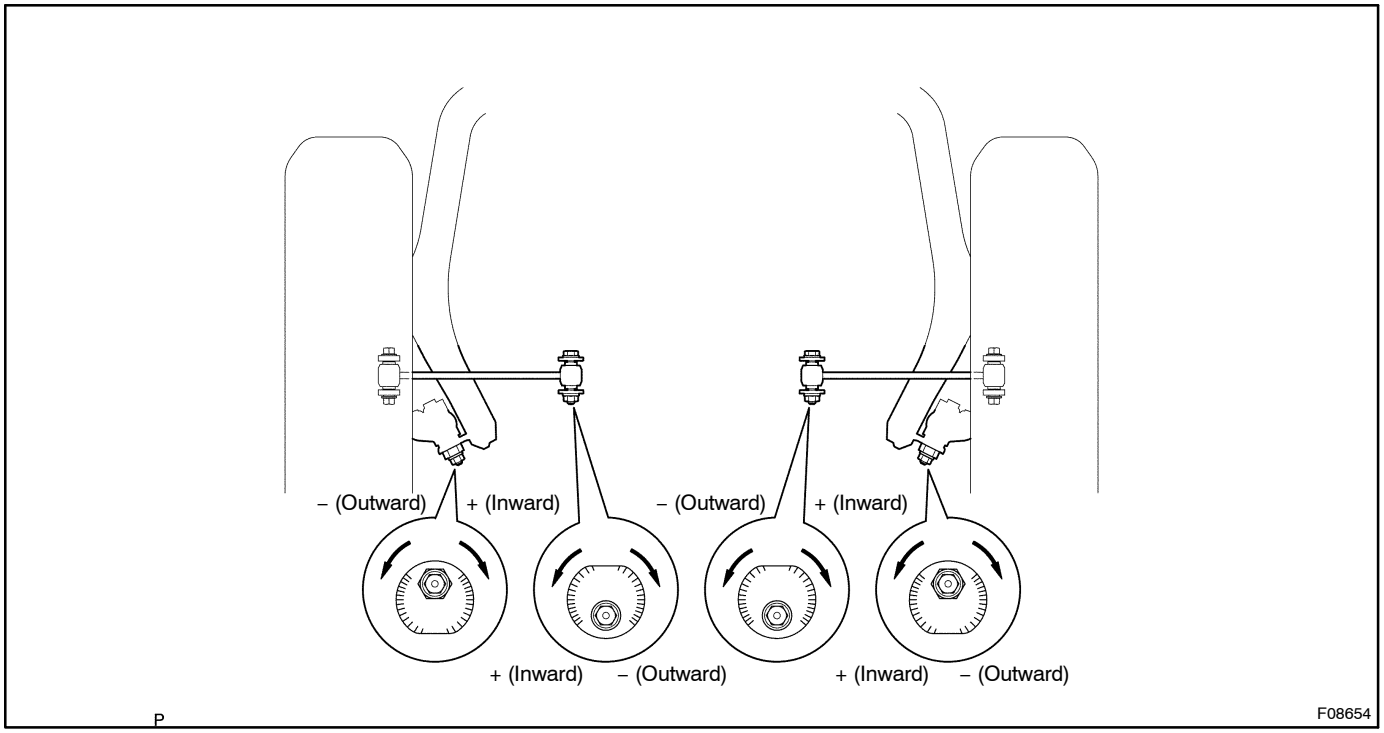


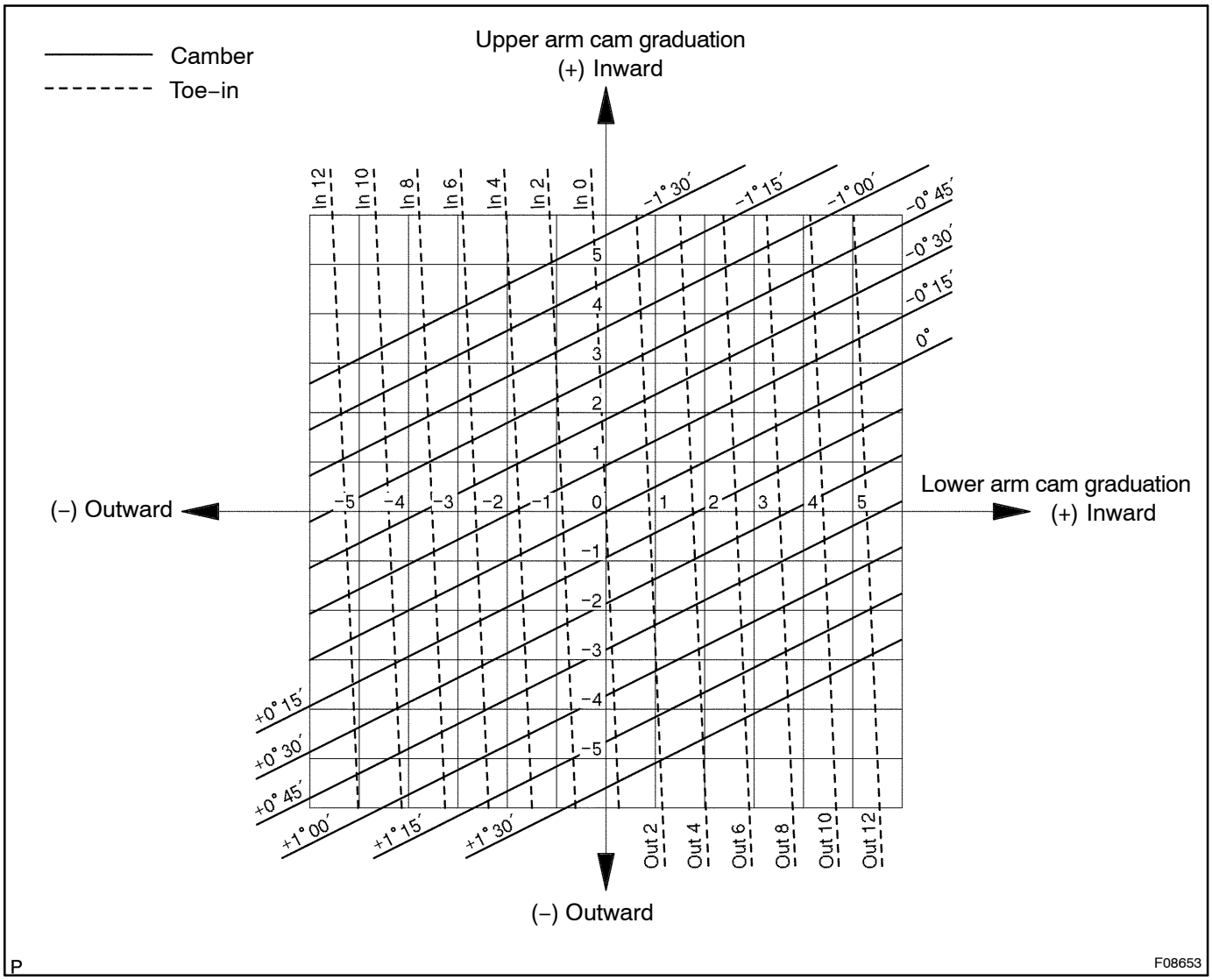
(b) Mark the difference between the standard value (A) and the measured value (B) on the adjustment chart.

Standard value:
Camber: –1°11' (–1.18°)
Toe–in (total): IN 3mm (0.12 in.)
Formula: A – B = C
Camber (RH): –1°11' – (–0°26') = –0°45'
Camber (LH): –1°11' – (–1°56') = 0°45'
Toe–in (total): IN3 – IN7 = OUT 4
Toe–in (each side): OUT 2

(c) As shown in the example chart, read the distance from the marked point to the origin of the chart, and adjust the upper and/or lower arm adjusting cams accordingly

Amount to turn adjusting cams (by graduation):
Upper arm cam (RH): + (Inward) 3.2
Lower arm cam (RH): + (Inward) 0.8
Upper arm cam (LH): – (Outward) 2.3
Lower arm cam (LH): + (Inward) 1.0

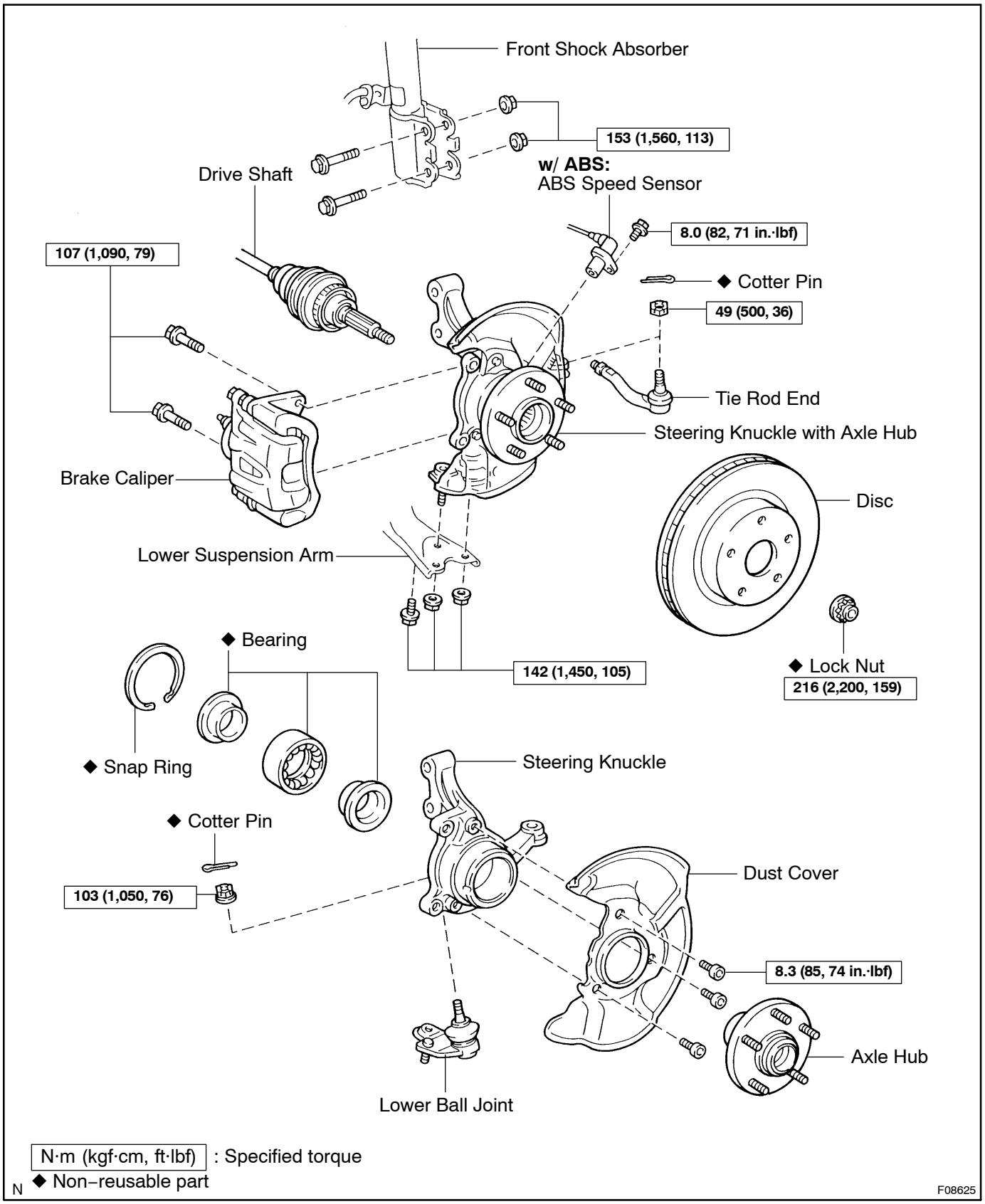



Camber
Toe–in
Upper arm cam graduation
(+) Inward
(–) Outward
Lower arm cam graduation
(+) Inward
(–) Outward
In 12
In 10
In 8
In 6
In 4
In 2
In 0
Out 2
Out 4
Out 6
Out 8
Out 10
Out 12
–1° 30′
–1° 15′
–1° 00′
–0° 45′
–0° 30′
–0° 15′
0°
+0° 15′
+0° 30′
+0° 45′
+1° 00′
+1° 15′
+1° 30′
P
F08653

FRONT AXLE HUB

COMPONENTS

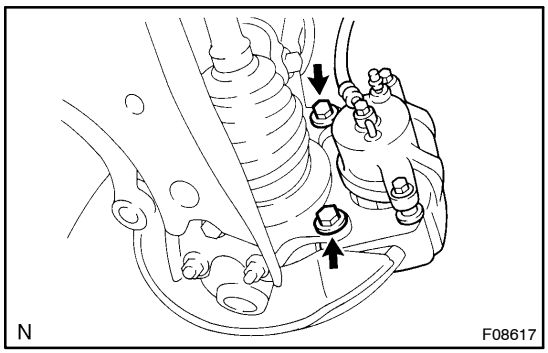
SA07B–14



SA1P1–02

REMOVAL

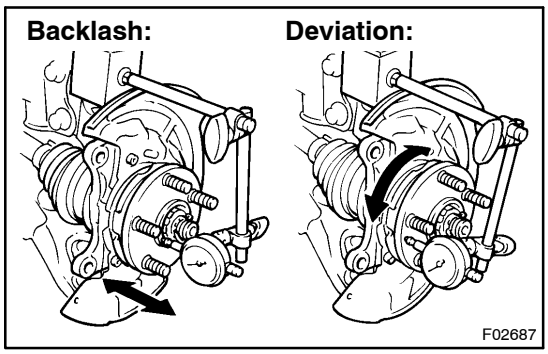
1. REMOVE FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



2. CHECK BEARING BACKLASH AND AXLE HUB DEVIATION

(a) Remove the 2 bolts, brake caliper and disc.

(b) Support the brake caliper securely.



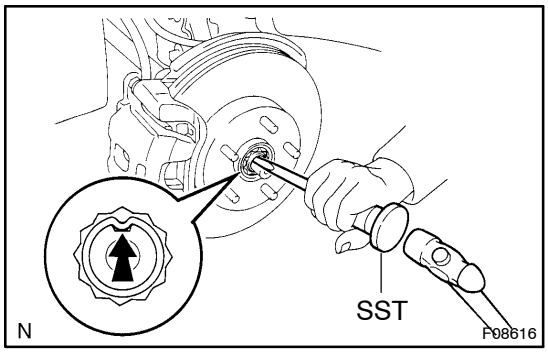
(c) Using a dial indicator, check the backlash near the center of the axle hub.
Maximum: 0.05 mm (0.0020 in.)

If the backlash exceeds the maximum, replace the bearing.

(d) Using a dial indicator, check the deviation at the surface of the axle hub outside the hub bolt.
Maximum: 0.07 mm (0.0028 in.)

If the deviation exceeds the maximum, replace the axle hub.

(e) Install the disc, 2 bolts and brake caliper.
Torque: 107 N·m (1,090 kgf·cm, 79 ft·lbf)



3. REMOVE DRIVE SHAFT LOCK NUT

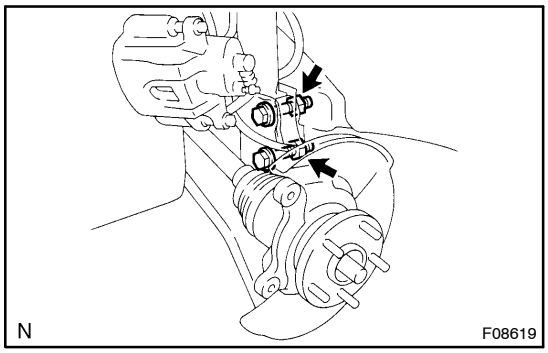
(a) Using SST and a hammer, unstake the staked part of the lock nut.
SST 09930–00010

(b) While applying the brakes, remove the nut.
Torque: 216 N·m (2,200 kgf·cm, 159 ft·lbf)

(c) Remove the brake caliper and disc.

(d) Support the brake caliper securely.

4. w/ ABS:
REMOVE ABS SPEED SENSOR
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



5. LOOSEN 2 NUTS ON LOWER SIDE OF SHOCK ABSORBER

Torque: 153 N·m (1,560 kgf·cm, 113 ft·lbf)

HINT:

Do not remove the 2 bolts and nuts.

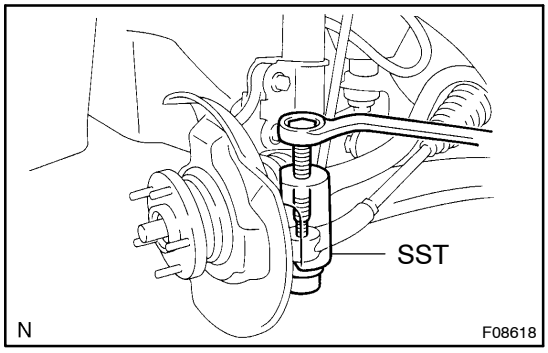
6. DISCONNECT TIE ROD END FROM STEERING KNUCKLE

(a) Remove the cotter pin and nut.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

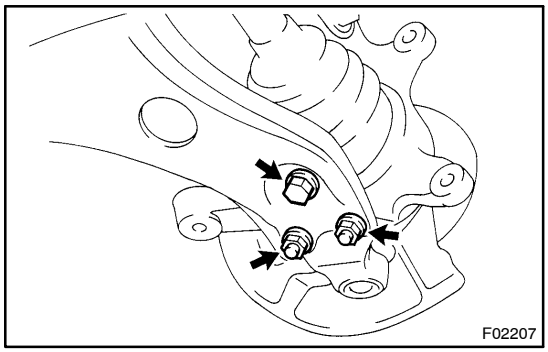
HINT:

At the time of installation, if the holes for a new cotter pin are not aligned, tighten the nut further up to 60°.



(b) Using SST, disconnect the tie rod end from the steering knuckle.

SST 09610–20012



7. DISCONNECT LOWER SUSPENSION ARM FROM LOWER BALL JOINT

Remove the 2 nuts and bolt.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

8. REMOVE STEERING KNUCKLE WITH AXLE HUB

(a) Remove the 2 bolts and nuts on the lower side of the shock absorber.

HINT:

At the time of installation, coat the nut's thread with engine oil.

(b) Remove the steering knuckle with the axle hub.

NOTICE:

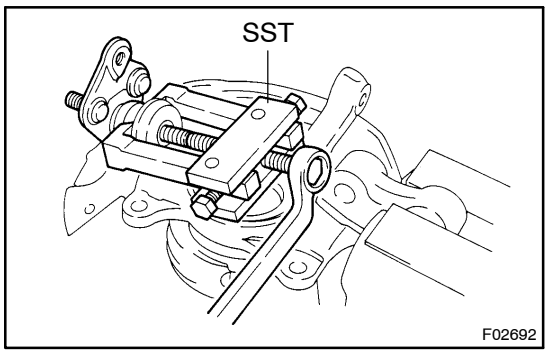
Be careful not to damage the boot and ABS speed sensor rotor.

SA07D–12

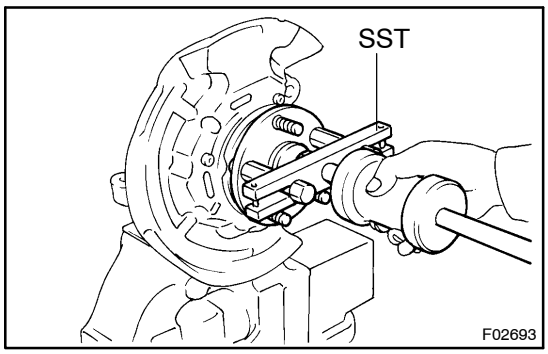
DISASSEMBLY

1. REMOVE LOWER BALL JOINT

(a) Remove the cotter pin and nut.

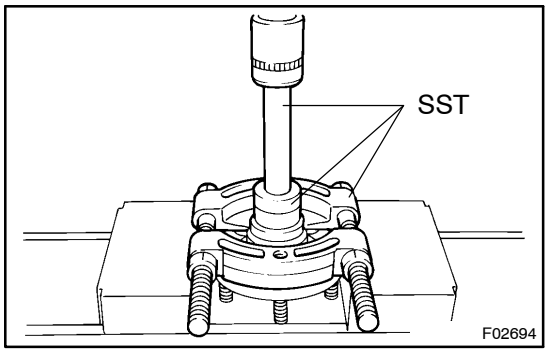


(b) Using SST, remove the lower ball joint.
SST 09628–62011



2. REMOVE AXLE HUB

(a) Using SST, remove the axle hub.
SST 09520–00031 (09520–00040, 09521–00010, 09521–00020)



(b) Using SST and a press, remove the inner race (outside) from the axle hub.
SST 09555–55010, 09950–60010 (09951–00380), 09950–70010 (09951–07150)

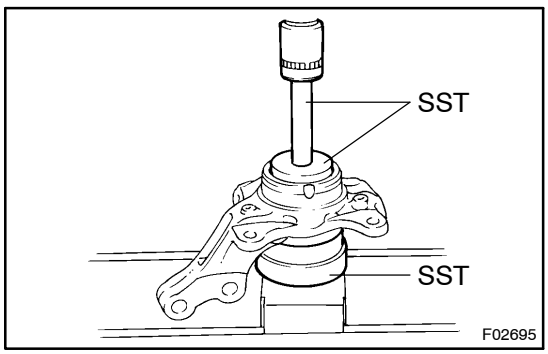
3. REMOVE DUST COVER

Using a torx® socket (T30), remove the 3 bolts and dust cover.

4. REMOVE BEARING FROM STEERING KNUCKLE

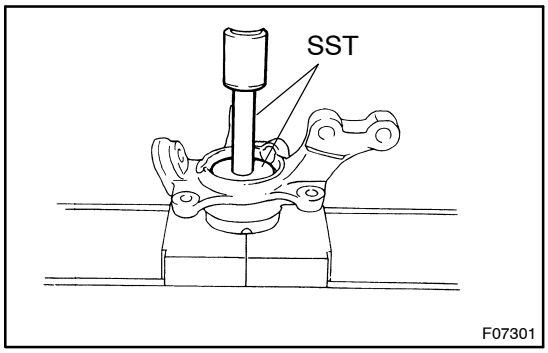
(a) Using snap ring pliers, remove the snap ring.

(b) Place the inner race on the outside of the bearing.



(c) Using SST and a press, remove the bearing.
SST 09527–17011, 09950–60010 (09951–00650), 09950–70010 (09951–07150)

SA108–06



REASSEMBLY

1. INSTALL BEARING

(a) Using SST and a press, install a new bearing to the steering knuckle.

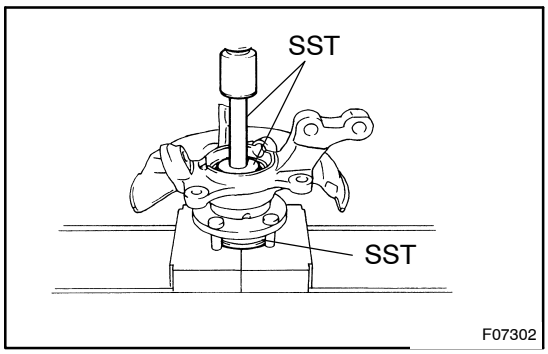
SST 09950–60020 (09951–00730),
09950–70010 (09951–07150)

(b) Using snap ring pliers, install a new snap ring.

2. INSTALL DUST COVER

Place the dust cover and using a torx® socket (T30), install the 3 bolts.

Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)



3. INSTALL FRONT AXLE HUB

Using SST and a press, install the axle hub.

SST 09608–32010, 09950–60010 (09951–00550)
09950–70010 (09951–07150)

4. INSTALL LOWER BALL JOINT

(a) Install the lower ball joint and tighten the nut.

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

(b) Install a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60°.

SA07F–13

INSTALLATION

Installation is in the reverse order of removal (See page SA–13).

HINT:

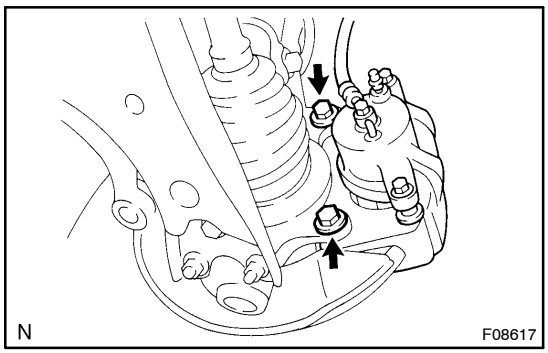
After installation, check the ABS speed sensor signal (See page DI–836) and front wheel alignment (See page SA–5).

FRONT WHEEL HUB BOLT

SA1CN–06

REPLACEMENT

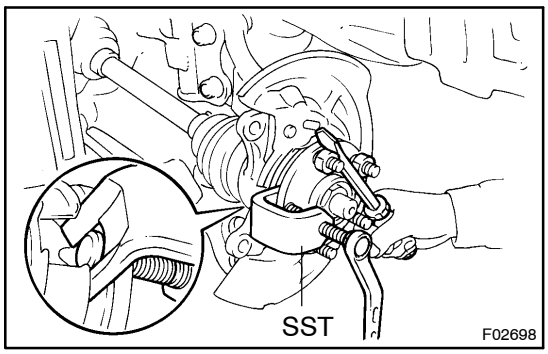
1. REMOVE FRONT WHEEL



2. REMOVE BRAKE CALIPER AND DISC

(a) Remove the 2 bolts, brake caliper and disc.

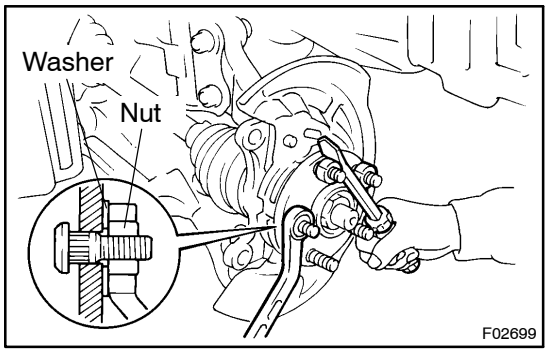
(b) Support the brake caliper securely.



3. REMOVE HUB BOLT

Using SST, 2 nuts and a screwdriver or an equivalent, remove the hub bolt.

SST 09628–10011



4. INSTALL HUB BOLT

(a) Install a washer and nut to a new hub bolt as shown in the illustration.

(b) Using a screwdriver or an equivalent to hold, install the hub bolt by torquing the nut.

(c) Remove the 3 nuts and washer.

5. INSTALL DISC AND BRAKE CALIPER

Install the disc, brake caliper and 2 bolts.

Torque: 107 N·m (1,090 kgf·cm, 79 ft·lbf)

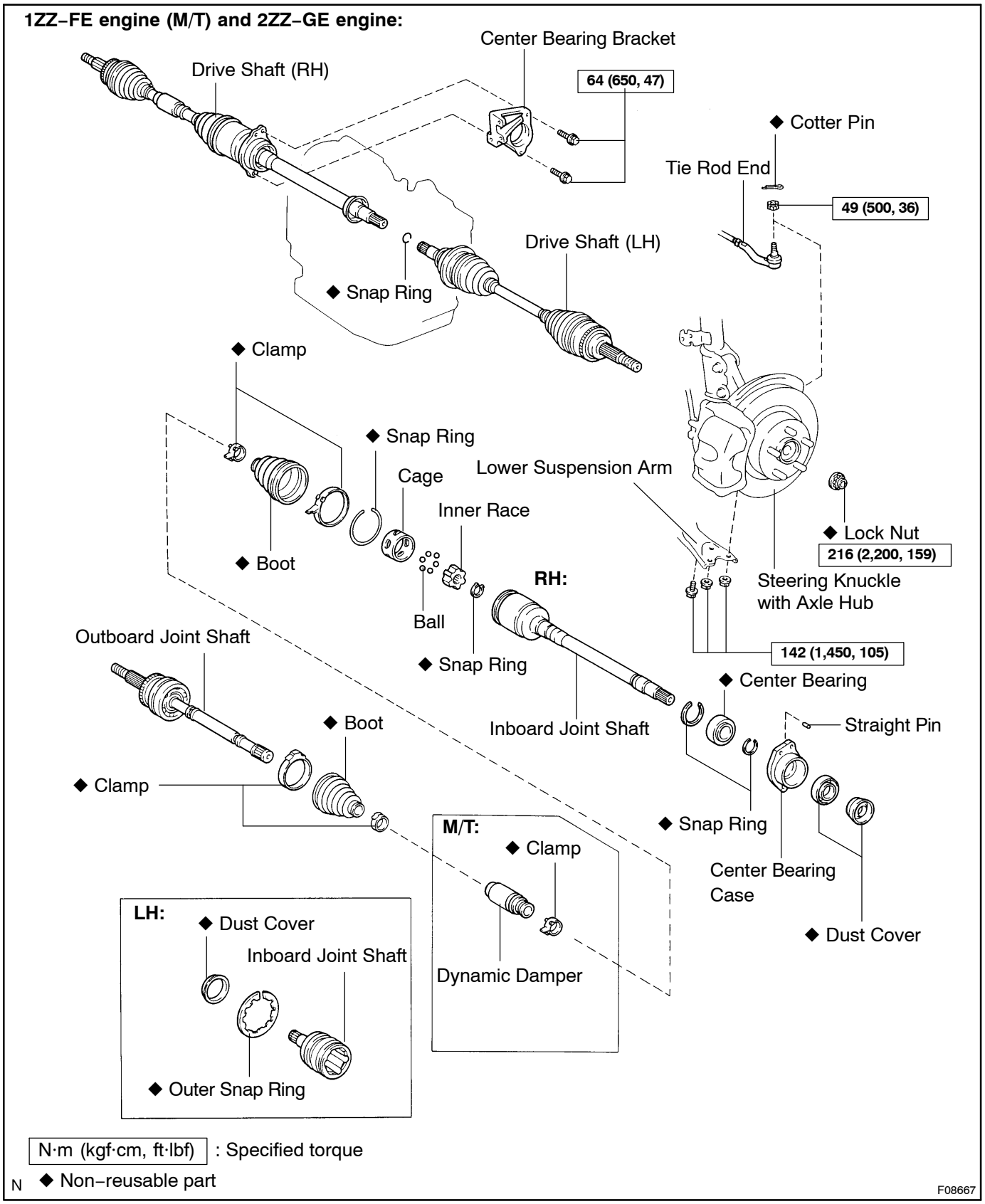
6. INSTALL FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

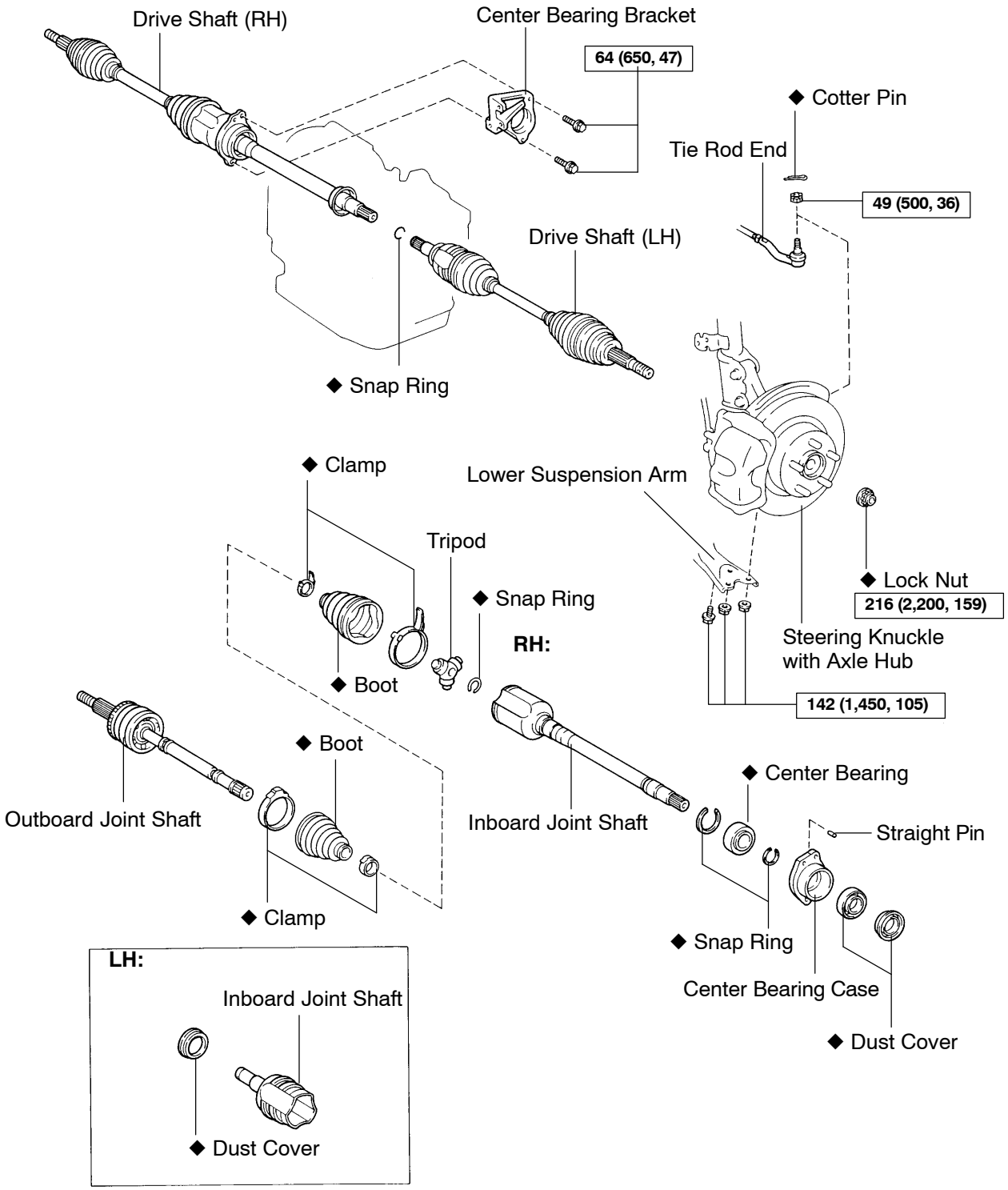
FRONT DRIVE SHAFT

COMPONENTS

SA0TF–07



1ZZ–FE engine (A/T):



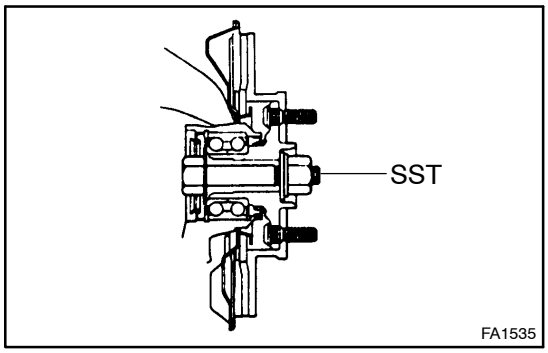
N

N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

F08666

SA1P2–03



REMOVAL

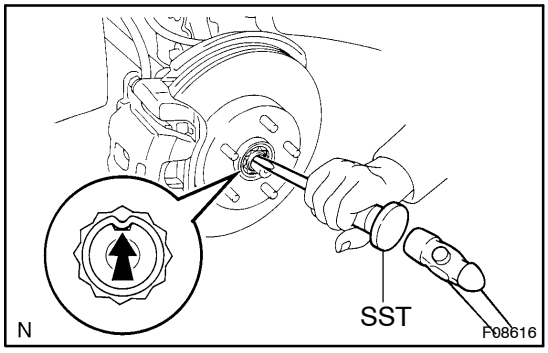
NOTICE:

- **The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed.**
  Therefore, if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with the SST.
  SST 09608–16042 (09608–02021, 09608–02041)
- **w/ ABS:**
  After disconnecting the drive shaft from the axle hub, work carefully so as not to damage the ABS speed sensor rotor serrations on the drive shaft.

1. REMOVE FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE ENGINE UNDER COVER

3. DRAIN GEAR OIL (M/T) OR ATF (A/T)



4. REMOVE DRIVE SHAFT LOCK NUT

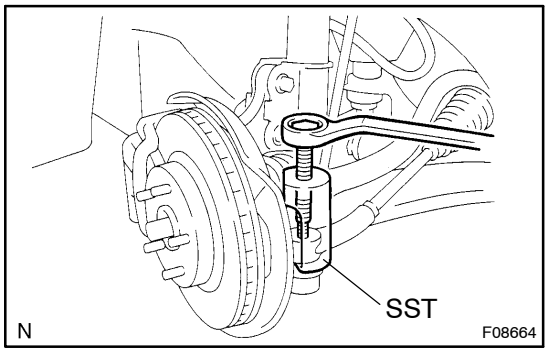
(a) Using SST and a hammer, unstake the staked part of the lock nut.
SST 09930–00010

(b) While applying the brakes, remove the nut.
Torque: 216 N·m (2,200 kgf·cm, 159 ft·lbf)

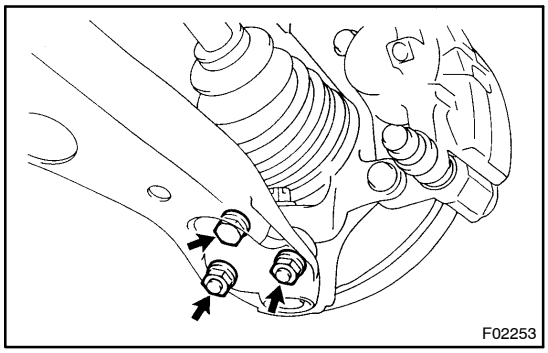
5. DISCONNECT TIE ROD END FROM STEERING KNUCKLE

(a) Remove the cotter pin and nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

HINT:
At the time of installation, if the holes for a new cotter pin are not aligned, tighten the nut further up to 60°.



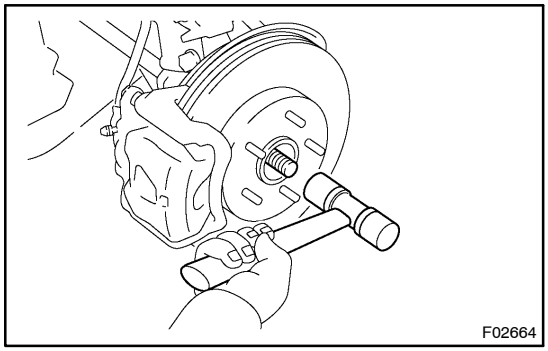
(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09610–20012



6. DISCONNECT LOWER BALL JOINT FROM LOWER SUSPENSION ARM

Remove the 2 nuts and bolt.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

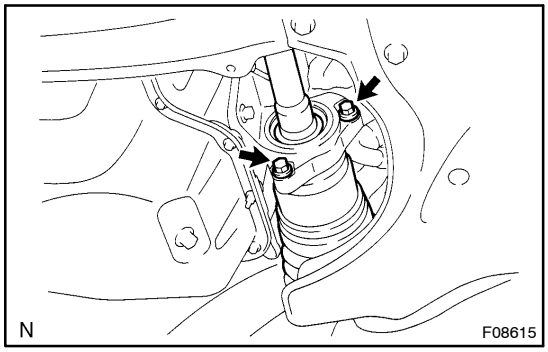


7. DISCONNECT DRIVE SHAFT FROM AXLE HUB

Using a plastic hammer, disconnect the drive shaft from the axle hub.

NOTICE:

Be careful not to damage the boot and ABS speed sensor rotor.



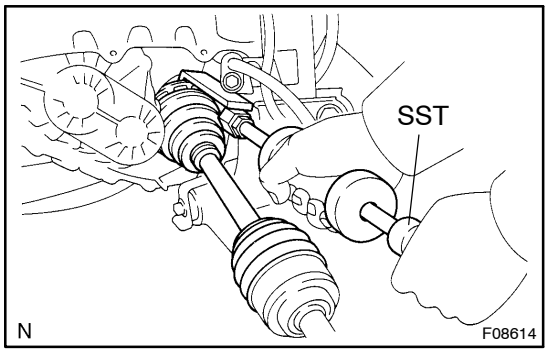
8. RH drive shaft:
REMOVE DRIVE SHAFT

Remove the 2 bolts on the center bearing bracket and pull out the drive shaft together with the center bearing case.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

NOTICE:

Be careful not to damage the oil seal and dust cover.



9. LH drive shaft:
REMOVE DRIVE SHAFT

(a) Using SST, remove the drive shaft.
SST 09520–01010, 09520–24010 (09520–32040)

NOTICE:

Be careful not to damage the oil seal and dust cover.

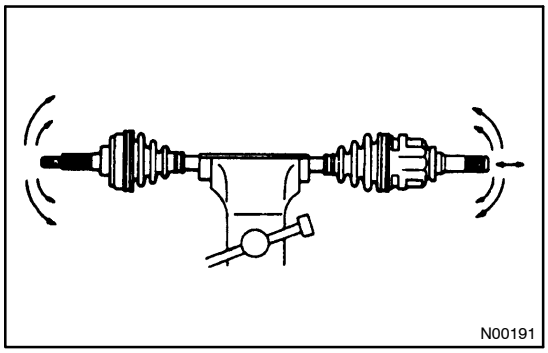
HINT:

At the time of installation, please refer to the following items.

- Apply gear oil to the inboard joint shaft and differential case sliding surfaces.
- Before installing the drive shaft, set the snap ring with its opening side facing downward.
- Whether inboard joint shaft is in contact with pinion shaft or not can be known from the sound or feeling.
- After installation, check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in the axial direction.
- After installation, check that the drive shaft cannot be removed by hand.

(b) Using a screwdriver, remove the snap ring from the inboard joint shaft.

SA1P3–02


N00191

DISASSEMBLY

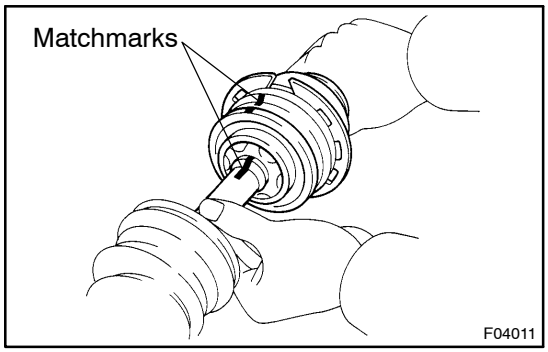
1. 1ZZ–FE engine (M/T) and 2ZZ–GE engine: DISASSEMBLE DRIVE SHAFT

(a) Check the drive shaft.
  (1) Check to see that there is no remarkable play in the outboard joint.
  (2) Check to see that the inboard joint slides smoothly in the thrust direction.
  (3) Check to see that there is no remarkable play in the radial direction of the inboard joint.
  (4) Check the boots for damage.

(b) Remove the inboard and outboard joint boot clamps.
  (1) Using a screwdriver, disclamp the 2 inboard joint boot clamps.
  (2) Using a side cutter, cut the 2 outboard joint boot clamps and remove them.

(c) M/T:
Remove the dynamic damper clamp.
Using a screwdriver, disclamp the dynamic damper clamp.

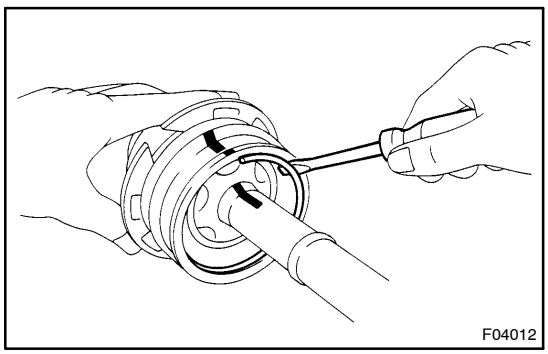
(d) Remove the inboard joint shaft.
  (1) Slide the inboard joint boot toward the outboard joint.



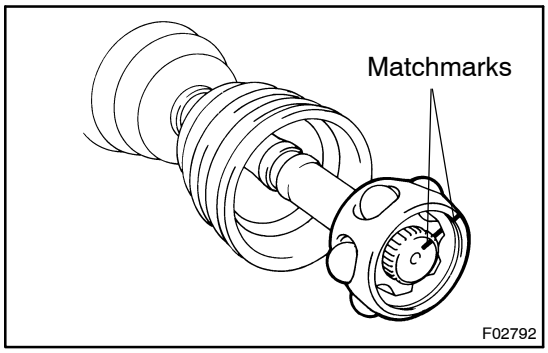
F04011

  (2) Place matchmarks on the outboard joint shaft and inboard joint shaft.

NOTICE:
Do not punch the marks.


F04012

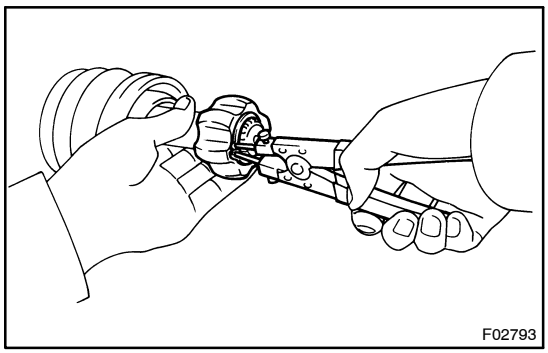
  (3) Using a screwdriver, remove the snap ring.
  (4) Remove the inboard joint shaft from the outboard joint shaft.



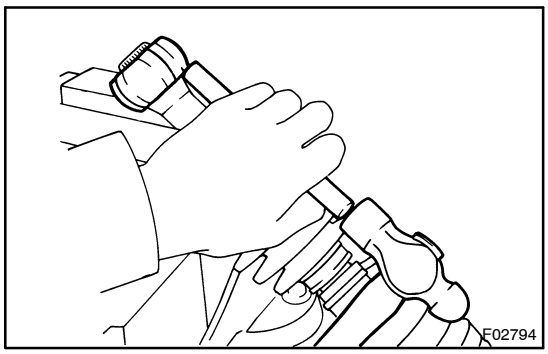
(e) Disassemble the outboard joint shaft.
(1) Place matchmarks on the outboard joint shaft, inner race and cage.

NOTICE:
Do not punch the marks.

(2) Remove the 6 balls.
(3) Slide the cage toward outboard joint.



(4) Using a snap ring expander, remove the snap ring.



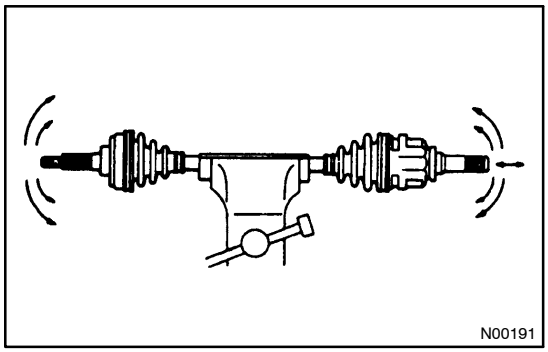
(5) Using a brass bar and hammer, remove the inner race.

NOTICE:
Be careful not to damage the inner race.

(6) Remove the cage.

(f) Remove the dynamic damper (M/T), damper clamp (M/T), inboard and outboard joint boots and inboard joint clamps.

NOTICE:
Do not disassemble the outboard joint.

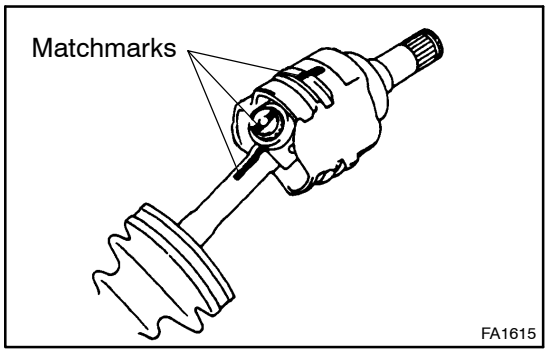


2. 1ZZ–FE engine (A/T):
DISASSEMBLE DRIVE SHAFT

(a) Check the drive shaft.
(1) Check to see that there is no remarkable play in the outboard joint.
(2) Check to see that the inboard joint slides smoothly in the thrust direction.
(3) Check to see that there is no remarkable play in the radial direction of the inboard joint.
(4) Check the boots for damage.

(b) Remove the inboard and outboard joint boot clamps.
(1) Using a screwdriver, disclamp the 2 inboard joint boot clamps.
(2) Using a side cutter, cut the 2 outboard joint boot clamps and remove them.

(c) Remove the inboard joint shaft.
(1) Slide the inboard joint boot toward the outboard joint.



(2) Place matchmarks on the inboard joint shaft, tripod and outboard joint shaft.

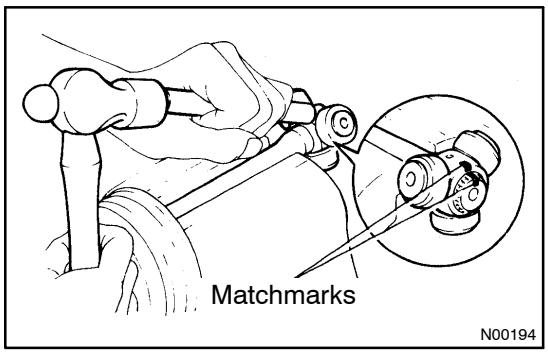
NOTICE:

Do not punch the marks.

(3) Remove the inboard joint shaft from the outboard joint shaft.

(d) Remove the tripod.

(1) Using a snap ring expander, remove the snap ring.



(2) Place matchmarks on the outboard joint shaft and tripod.

NOTICE:

Do not punch the marks.

(3) Using a brass bar and hammer, remove the tripod from the outboard joint shaft.

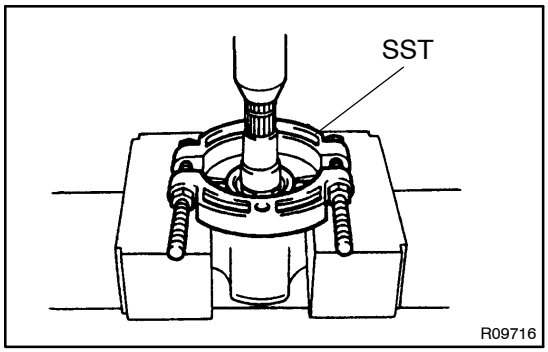
NOTICE:

Do not tap the roller.

(e) Remove the inboard and outboard joint boots and inboard joint clamps.

NOTICE:

Do not disassemble the out board joint.



3. DISASSEMBLE INBOARD JOINT SHAFT

(a) LH:

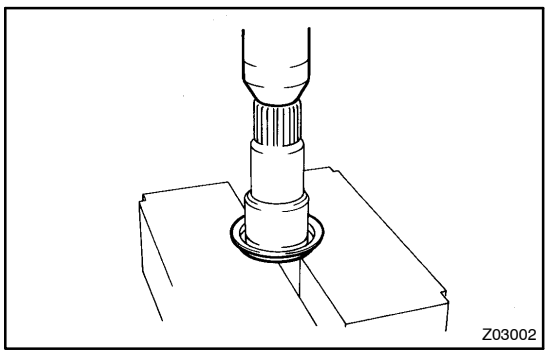
Remove the dust cover.

Using SST and a press, remove the dust cover.

SST 09950–00020

(b) LH shaft of 1ZZ–FE engine (M/T) and 2ZZ–GE engine:

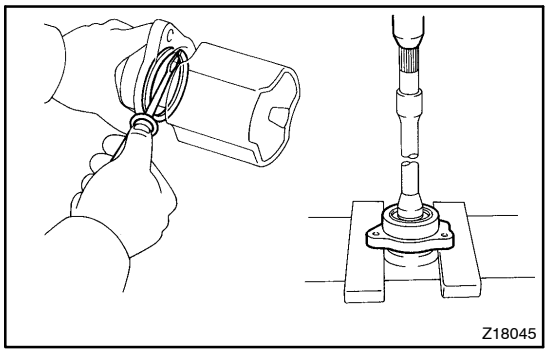
Using a snap ring expander, remove the outer snap ring.



(c) RH:

Remove the transaxle side dust cover.

Using a press, remove the transaxle side dust cover.



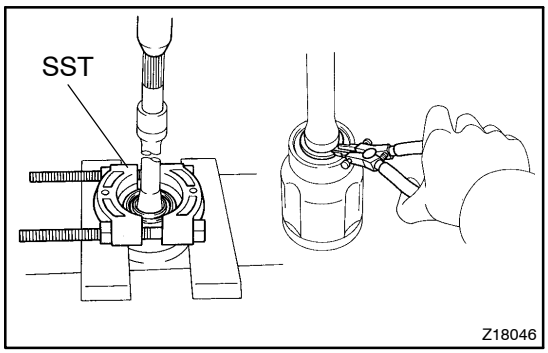
(d) RH:

Remove the center bearing.

(1) Using a screwdriver, remove the outside snap ring.

(2) Using a press, remove the center bearing case.

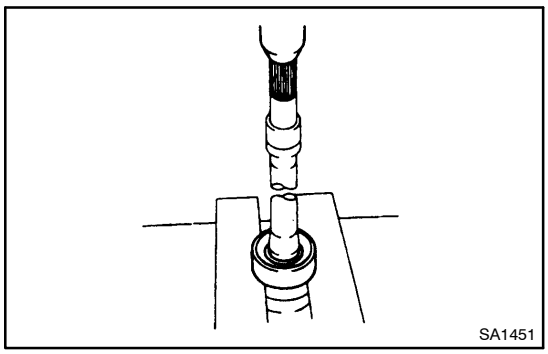
(3) Using a pin punch and hammer, remove the straight pin from the center bearing case.



(4) Using SST and a press, remove the dust cover.

SST 09950–00020

(5) Using a snap ring expander, remove the inside snap ring.



(6) Using a press, remove the center bearing.

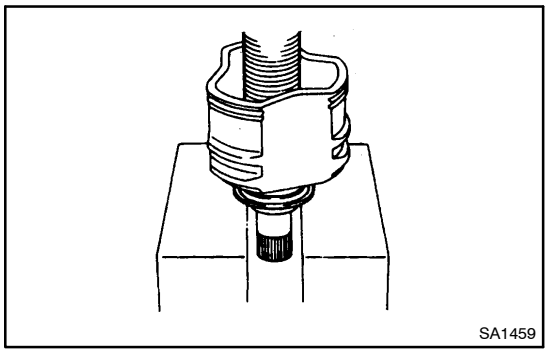
SA1P4–02

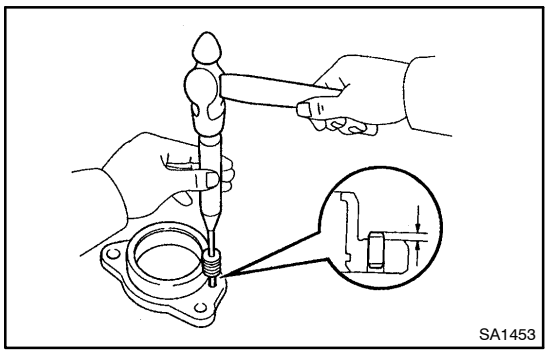
REASSEMBLY

1. REASSEMBLE INBOARD JOINT SHAFT

(a) LH:
Install dust cover.
Using a press, install a new dust cover.

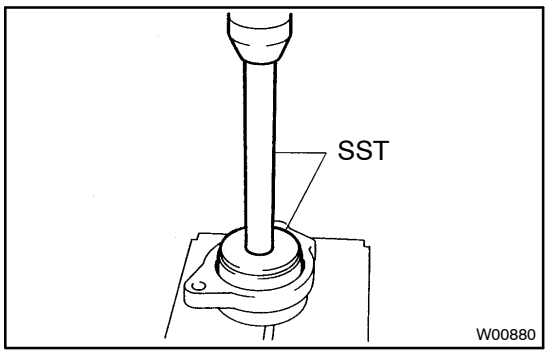
(b) LH shaft of 1ZZ–FE engine (M/T) and 2ZZ–GE engine:
Using a snap ring expander, install a new outer snap ring.


SA1459


SA1453

(c) RH:
Install center bearing.

(1) Using a pin punch and hammer, install the straight pin into the center bearing case.

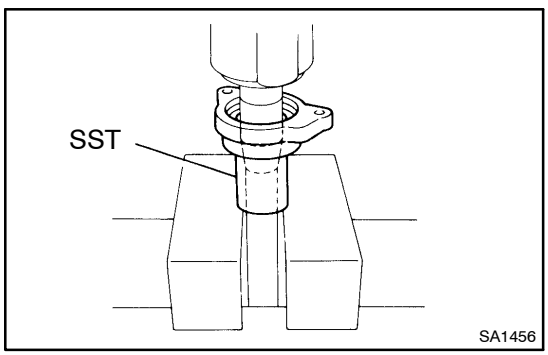


W00880

(2) Using SST and a press, install a new center bearing into the bearing case.

SST 09950–60010 (09951–00650),
09950–70010 (09951–07150)

(3) Using a screwdriver, install a new outside snap ring.

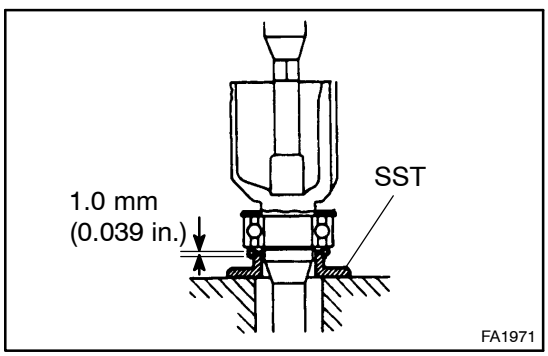


SA1456

(4) Using SST and a press, install the center bearing with the bearing case assembly to the inboard joint shaft.

SST 09710–30021 (09710–03141)

(5) Using a snap ring expander, install a new inside snap ring.

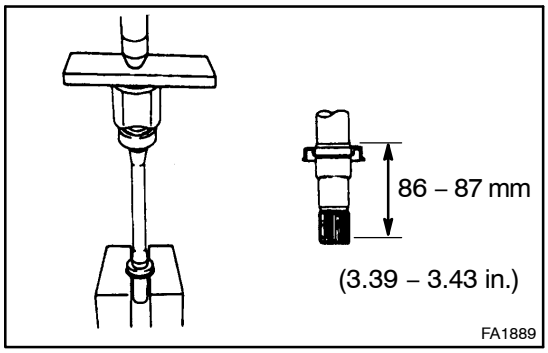


FA1971

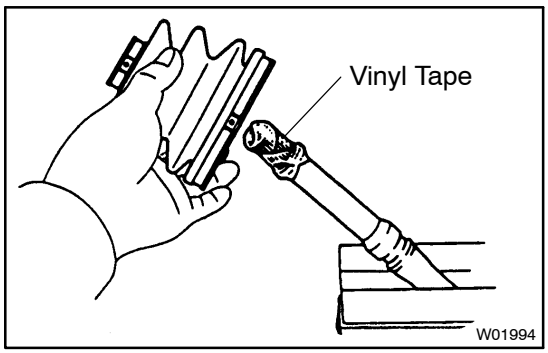
(6) Using SST, an extension bar and press, install a new dust cover.

SST 09506–35010

HINT:
The clearance between the dust cover and bearing should be kept in the ranges as shown in the illustration.



(d) RH:
Install the transaxle side dust cover.
Using a steel plate and press, install a new transaxle side dust cover until the distance from the tip of the inboard joint shaft to the dust cover reaches the specified value, as shown in the illustration.



2. 1ZZ–FE engine (A/T):
REASSEMBLE DRIVE SHAFT

(a) Temporarily install new outboard and inboard joint boots and new clamps.

HINT:
Before installing the boots, wrap the spline of the outboard joint shaft with vinyl tape to prevent them from being damaged.

(1) Place 2 new clamps on a new outboard joint boot and install them to the outboard joint shaft.
(2) Place 2 new clamps on a new inboard joint boot and install them to the outboard joint shaft.

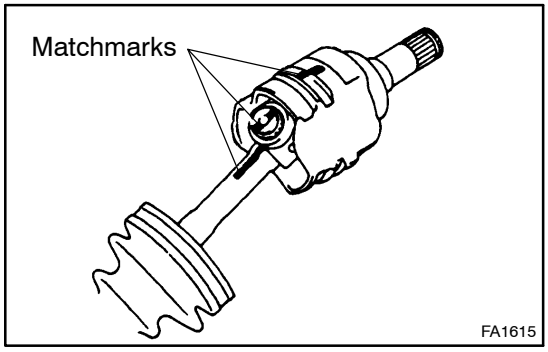
(b) Install the tripod.
(1) Place the beveled side of the tripod axial spline toward the outboard joint.
(2) Align the matchmarks placed before removal.
(3) Using a brass bar and hammer, tap in the tripod to the outboard joint shaft.

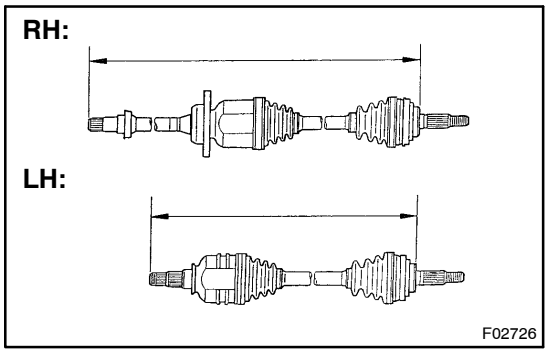
NOTICE:
Do not tap the roller.

(4) Using a snap ring expander, install a new snap ring.

(c) Install the boot to outboard joint.
Before assembling the boot, pack the outboard joint and boot with grease in the boot kit.
Grease capacity: (Color = Yellow ocher)
110 – 120 g (3.9 – 4.2 oz.)

(d) Install the inboard joint shaft to outboard joint shaft.
(1) Pack the inboard joint and boot with grease in the boot kit.
Grease capacity: (Color = Yellow ocher)
180 – 190 g (6.3 –6.7 oz.)
(2) Align the matchmarks placed before removal, and install the inboard joint shaft to the outboard joint shaft.
(3) Temporarily install the boot to the inboard joint.



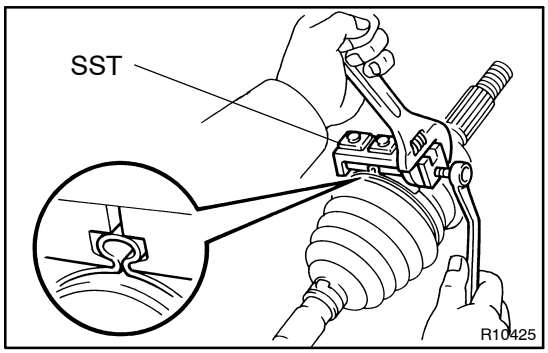


(e) Assemble the boot clamps to both boots.
(1) Make sure that the boots are on the shaft grooves.
(2) Make sure that the boots are not stretched or contracted when the drive shaft is at standard length.

Drive shaft standard length:

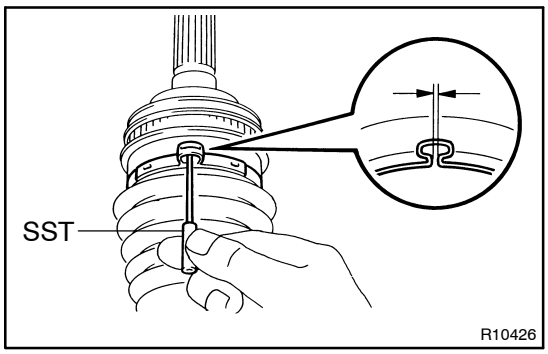
RH	851.0 ± 5.0 mm (33.504 ± 0.197 in.)
LH	565.9 ± 5.0 mm (22.279 ± 0.197 in.)

(3) Bend the band and lock the inboard joint boot clamps with a screwdriver.

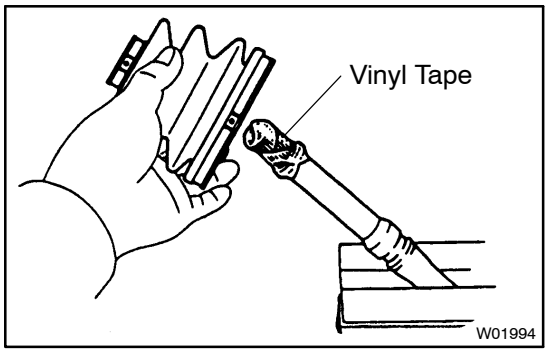


(4) Secure the 2 outboard joint boot clamps onto the boot.
(5) Place SST onto the outboard joint large boot clamp.
SST 09521–24010
(6) Tighten the SST so that the large clamp is pinched.

NOTICE:
Do not overtighten the SST.



(7) Using SST, adjust the clearance of the large clamp.
SST 09240–00020
Clearance: 0.8 mm (0.031 in.) or less
(8) Employ the same manner to the outboard joint small boot clamp.

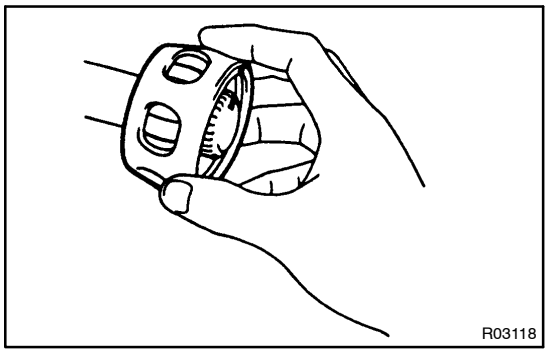


3. 1ZZ–FE engine (M/T) and 2ZZ–GE engine: REASSEMBLE DRIVE SHAFT

(a) Temporarily install dynamic damper (M/T), new outboard and inboard joint boots and new clamps.

HINT:
Before installing the boots, wrap the spline of the outboard joint shaft with vinyl tape to prevent them from being damaged.

(1) Place 2 new clamps on a new outboard joint boot and install them to the outboard joint shaft.
(2) M/T:
Place new clamp on the dynamic damper and install them to the outboard joint shaft.
(3) Place 2 new clamps on a new inboard joint boot and install them to the outboard joint shaft.



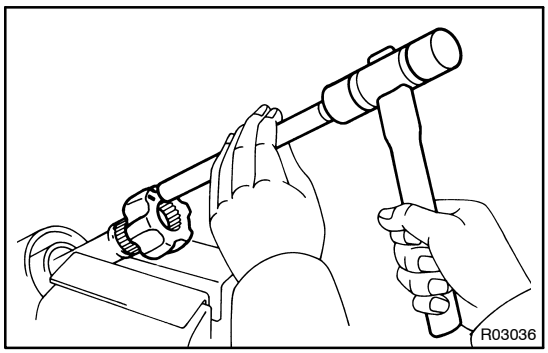
(b) Assemble the outboard joint shaft.

(1) Install the cage to the outboard joint shaft.

NOTICE:

The side with smaller diameter must face outboard joint.

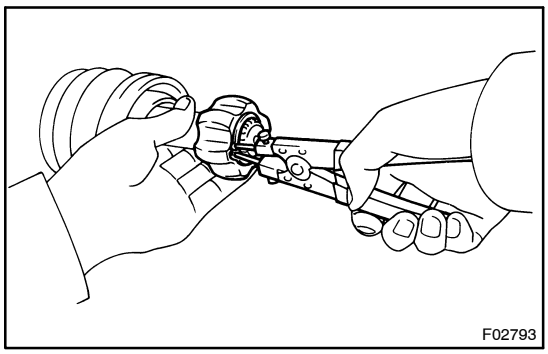
(2) Align the matchmarks on the inner race and outboard joint shaft.



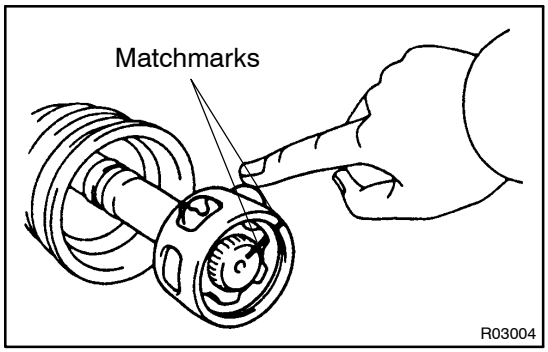
(3) Using a brass bar and hammer, tap in the inner race to the outboard joint shaft.

NOTICE:

Be careful not to damage the inner race.



(4) Using a snap ring expander, install a new snap ring.



(5) Align the matchmarks on the cage and inner race.

(6) Install the cage to the inner race.

(7) Install the 6 balls.

HINT:

Apply grease onto the balls to keep them from falling.

(c) Install the boot to outboard joint.

Before assembling the boot, pack the outboard joint and boot with grease in the boot kit.

Grease capacity: (Color = Black)

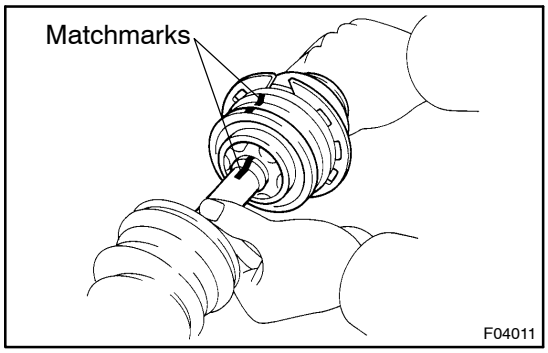
115 – 135 g (4.1 – 4.8 oz.)

(d) Install the inboard joint shaft to outboard joint shaft.

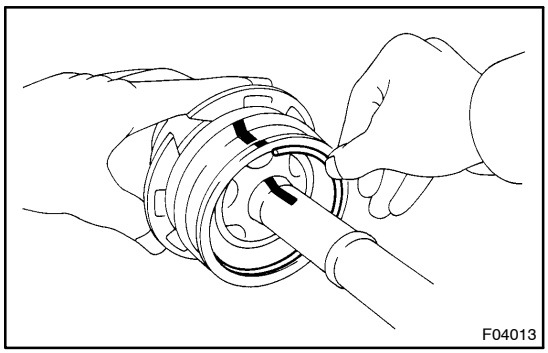
(1) Before assembling the boot, pack the inboard joint and boot with grease in the boot kit.

Grease capacity: (Color = Gray)

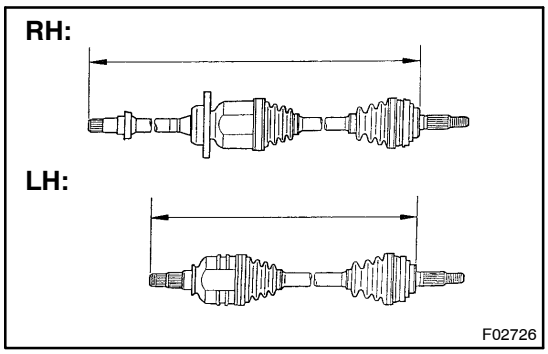
100 – 120 g (3.5 – 4.2 oz.)



(2) Align the matchmarks on the inboard joint shaft and outboard joint shaft.
(3) Install the inboard joint shaft to the outboard joint shaft.



(4) Install a new snap ring.
(5) Temporarily install the boot to the inboard joint shaft.

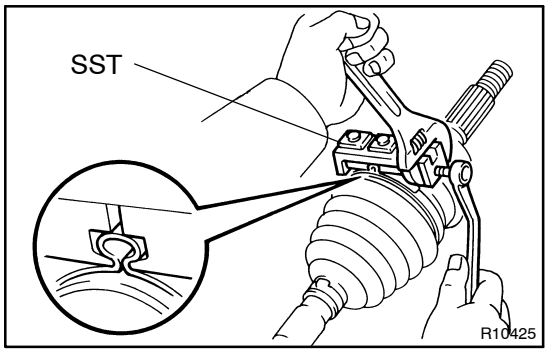


(e) Assemble the boot clamps to both boots.
(1) Make sure that the boots are on the shaft grooves.
(2) Make sure that the boots are not stretched or contracted when the drive shaft is at standard length.

Drive shaft standard length:

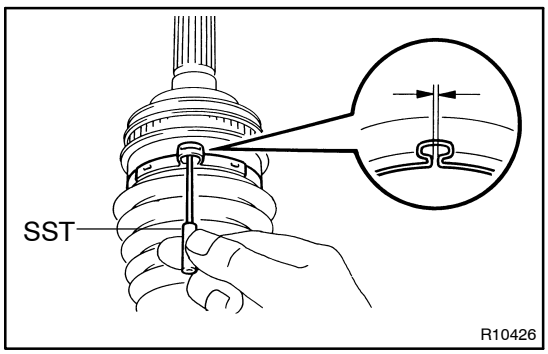
RH	845.5 ± 5.0 mm (33.287 ± 0.197 in.)
LH	563.7 ± 5.0 mm (22.193 ± 0.197 in.)

(3) Bend the band and lock the inboard joint boot clamps with a screwdriver.

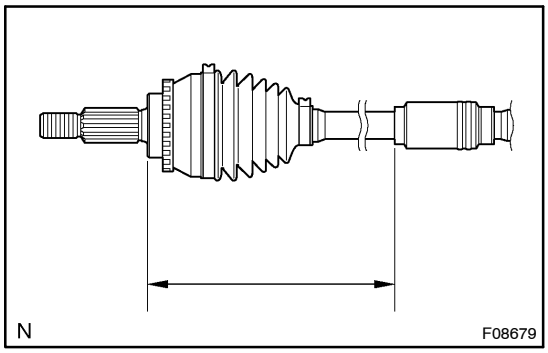


(4) Secure the 2 outboard joint boot clamps onto the boot.
(5) Place SST onto the outboard joint large boot clamp.
SST 09521–24010
(6) Tighten the SST so that the large clamp is pinched.

NOTICE:
Do not overtighten the SST.



(7) Using SST, adjust the clearance of the large clamp.
SST 09240–00020
Clearance: 1.2 – 4.0 mm (0.047 – 0.157 in.)
(8) Employ the same manner to the outboard joint small boot clamp.



(f) M/T:

Assemble the dynamic damper clamp.

(1) Set the dynamic damper distance, as described below.

Distance: 155.0 ± 2.0 mm (6.102 ± 0.079 in.)

(2) Bend the band and lock the dynamic damper clamp with a screwdriver.

4. CHECK DRIVE SHAFT (See page SA–23)

SA0TJ–08

INSTALLATION

Installation is in the reverse order removal (See page SA–21).

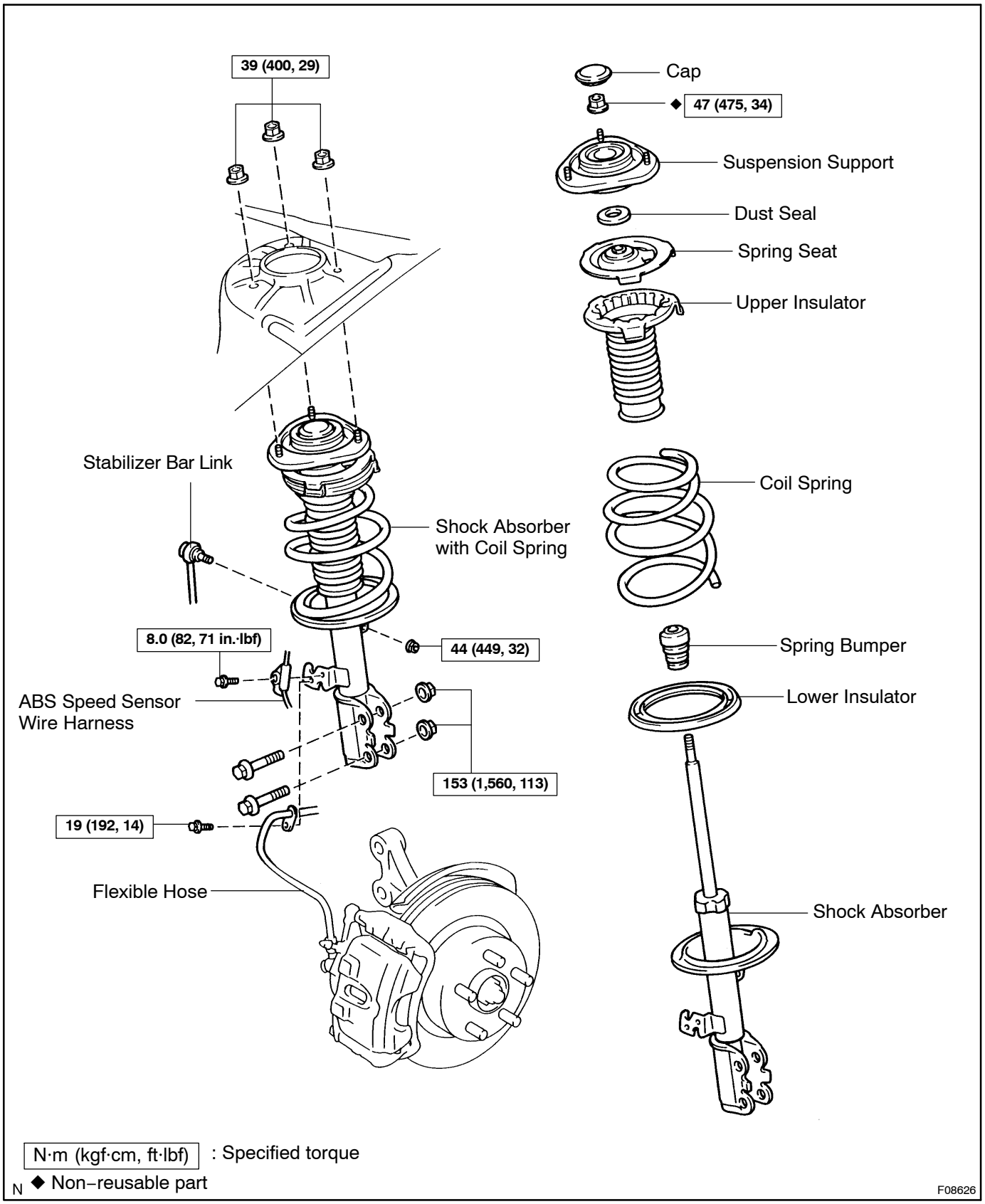
HINT:

After installation, check the ABS speed sensor signal (See page DI–836) and front wheel alignment (See page SA–5).

FRONT SHOCK ABSORBER

SA10J–09

COMPONENTS



SA1P5–03

REMOVAL

1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. DISCONNECT ABS SPEED SENSOR WIRE HARNESS CLAMPS FROM SHOCK ABSORBER

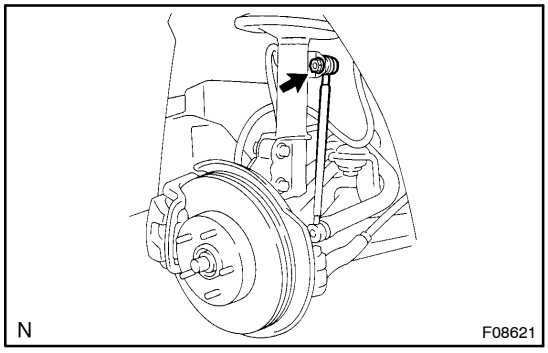
Remove the bolt and disconnect the ABS speed sensor wire harness clamp.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

3. DISCONNECT FLEXIBLE HOSE

Remove the bolt and disconnect the flexible hose from the shock absorber bracket.

Torque: 19 N·m (192 kgf·cm, 14 ft·lbf)



4. DISCONNECT STABILIZER BAR LINK

Remove the nut and disconnect the stabilizer bar link from the shock absorber.

Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

HINT:

If the ball joint turns together with the nut, use a hexagon (5 mm) wrench to hold the stud.

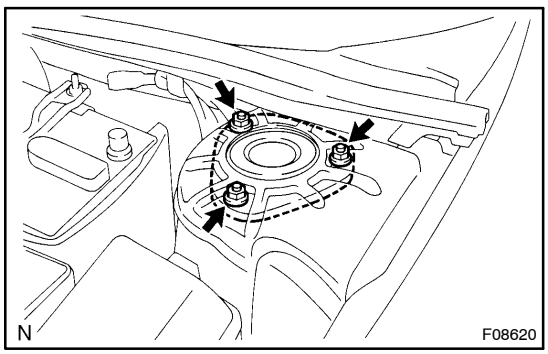
5. REMOVE SHOCK ABSORBER WITH COIL SPRING

(a) Loosen the 2 nuts on the lower side of shock absorber.

Torque: 153 N·m (1,560 kgf·cm, 113 ft·lbf)

HINT:

Do not remove the 2 bolts.



(b) Remove the 3 nuts on the upper side of the shock absorber.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

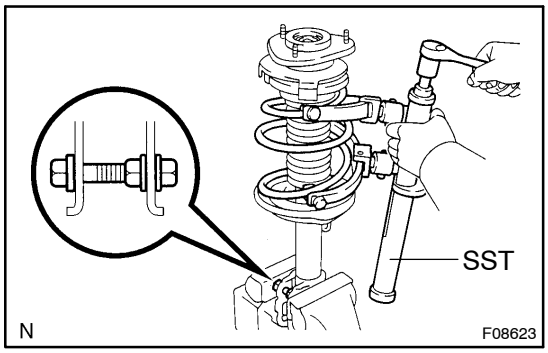
(c) Remove the 2 nuts and bolts on the lower side of shock absorber.

HINT:

At the time of installation, coat the nut's thread with engine oil.

(d) Remove the shock absorber with coil spring.

SA0CS–09



DISASSEMBLY

REMOVE COIL SPRING

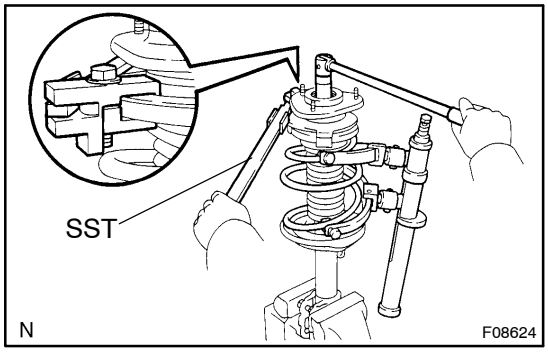
(a) Install 2 nuts and a bolt to the bracket at the lower side of the shock absorber and secure it in a vise.

(b) Using SST, compress the coil spring.
SST 09727–30021 (09727–00010, 09727–00021, 09727–00031)

NOTICE:

Do not use an impact wrench. It will damage the SST.

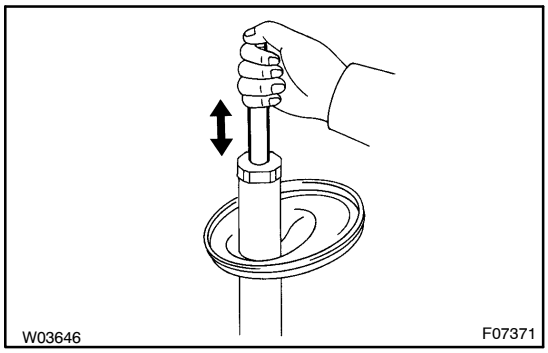
(c) Remove the cap from the suspension support.



(d) Using SST to hold the spring seat, remove the nut.
SST 09729–22031

(e) Remove the suspension support, dust seal, spring seat, upper insulator, coil spring, spring bumper and lower insulator.

SA0CT–09



INSPECTION

INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual sound during operation.

If there is any abnormality, replace the shock absorber with a new one.

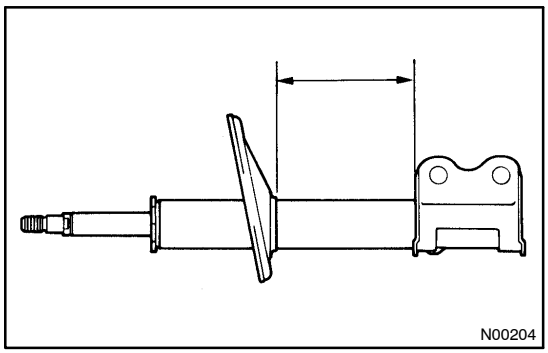
NOTICE:

When disposing of the shock absorber, see DISPOSAL on page SA–38.

SA0L8–09

DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD



2. DRILL HOLE TO DISCHARGE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder as shown in the illustration to discharge the gas inside.

CAUTION:

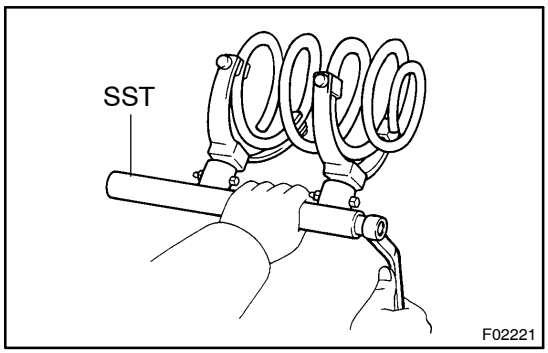
- **When drilling, chips may fly out, work carefully.**
- **The gas is colorless, odorless and non–poisonous.**

SA1P6–03

REASSEMBLY

1. INSTALL LOWER INSULATOR ONTO SHOCK ABSORBER

2. INSTALL SPRING BUMPER TO PISTON ROD



3. INSTALL COIL SPRING

(a) Using SST, compress the coil spring.

SST 09727–30021 (09727–00010, 09727–00021, 09727–00031)

NOTICE:

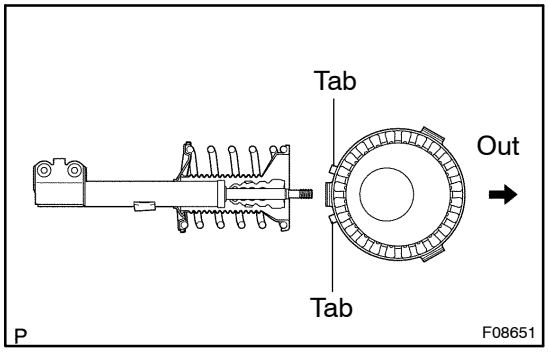
Do not use an impact wrench. It will damage the SST.

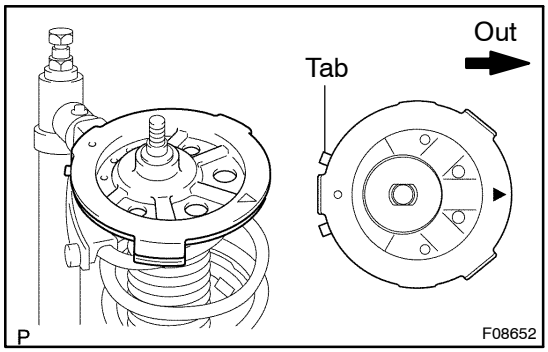
(b) Install the coil spring to the shock absorber.

HINT:

Fit the lower end of the coil spring into the gap of the spring lower seat.

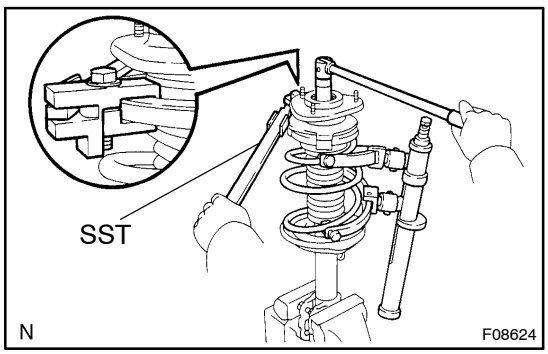
(c) Install the upper insulator as shown in the illustration.





(d) Install the spring seat to the shock absorber with the "▽" mark facing to the outside of the vehicle.

(e) Install the dust seal and suspension support.



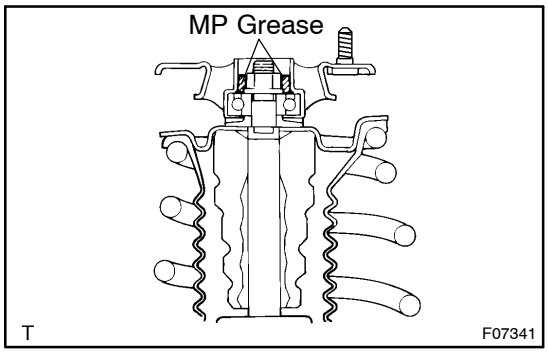
(f) Using SST to hold the suspension support, install a new nut.

SST 09729–22031

Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

(g) Remove the SST.

SST 09727–30021 (09727–00010, 09727–00021, 09727–00031)



(h) Apply MP grease into the suspension support.
(i) Install the cap.

SA10P–08

INSTALLATION

Installation is in the reverse order of removal (See page SA–35).

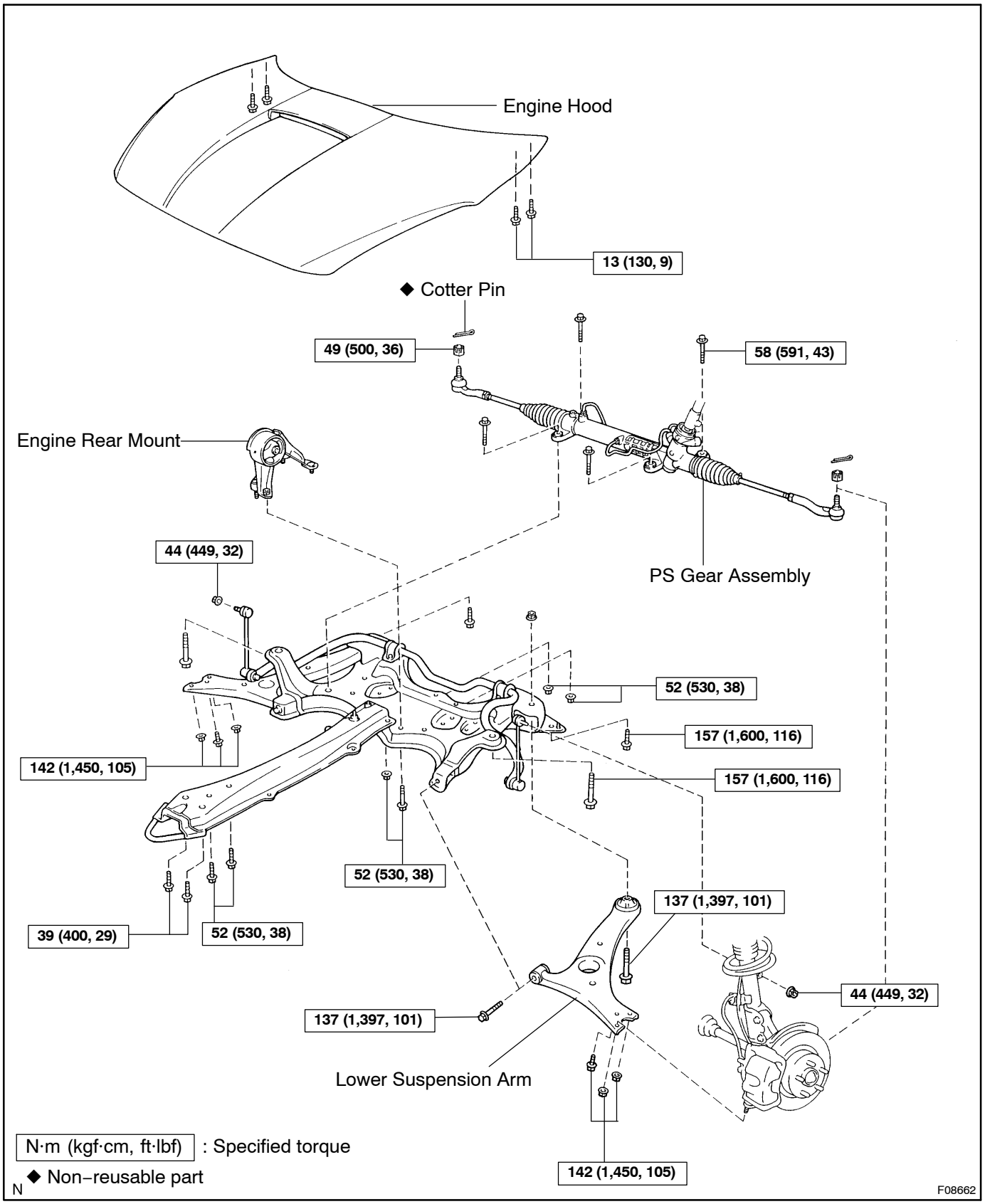
HINT:

After installation, check the front wheel alignment (See page SA–5).

FRONT LOWER SUSPENSION ARM

COMPONENTS

SA1OR–06



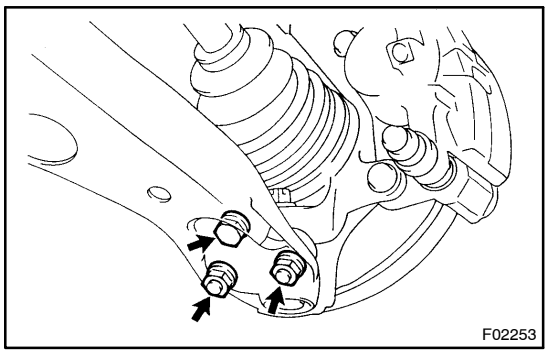
SA1OS–03

REMOVAL

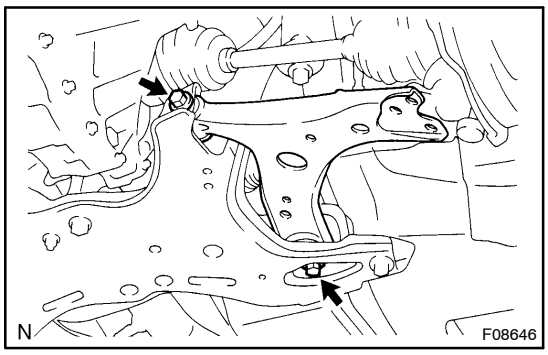
1. REMOVE FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. M/T or A/T RH side:
REMOVE LOWER SUSPENSION ARM

(a) Remove the engine under cover.



(b) Remove the bolt and 2 nuts, and disconnect the lower suspension arm from the lower ball joint.
Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)



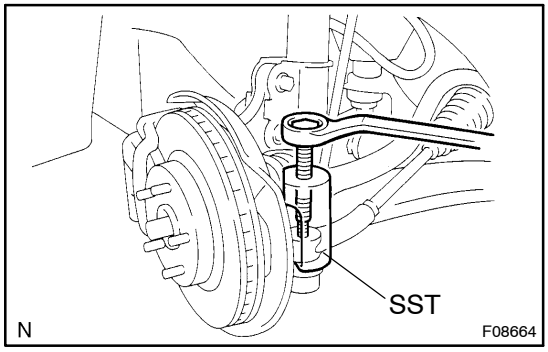
(c) Remove the 2 bolts, nut and lower suspension arm.
Torque: 137 N·m (1,397 kgf·cm, 101 ft·lbf)

HINT:
At the time of installation, after stabilizing the suspension, torque the bolts.

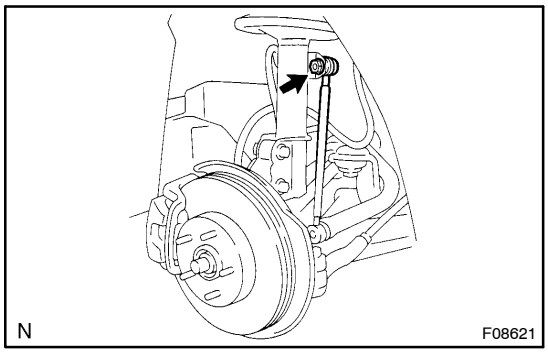
3. A/T LH side:
REMOVE LOWER SUSPENSION ARM

(a) Remove the engine under covers.
(b) Disconnect the RH and LH tie rod ends.
(1) Remove the cotter pin and nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

HINT:
At the time of installation, if the holes for a new cotter pin are not aligned, tighten the nut further up to 60°.



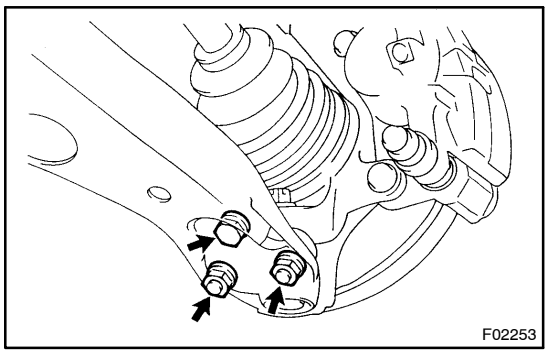
(2) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09610–20012
(3) Employ the same manner described above to the other side.



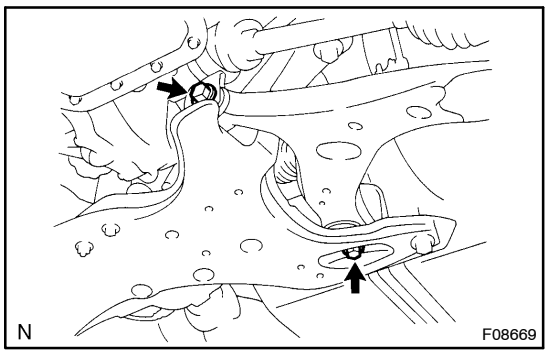
(c) Disconnect the RH and LH stabilizer bar links.
(1) Remove the nut and disconnect the stabilizer bar link from the shock absorber.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

HINT:
If the ball joint turns together with the nut, use a hexagon (5 mm) wrench to hold the stud.

(2) Employ the same manner described above to the other side.



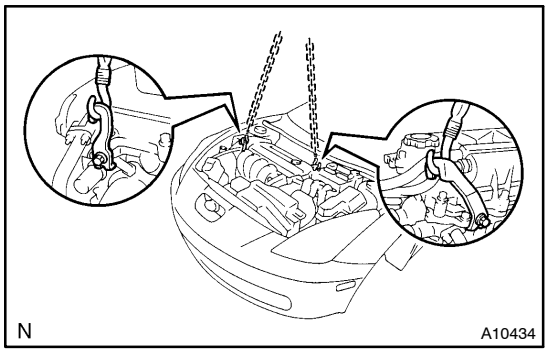
(d) Disconnect the RH and LH lower suspension arms from the lower ball joints.
(1) Remove the bolt and 2 nuts, and disconnect the lower suspension arm from the lower ball joint.
Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)
(2) Employ the same manner described above to the other side.



(e) Loosen the lower suspension arm set bolts.
Torque: 137 N·m (1,397 kgf·cm, 101 ft·lbf)

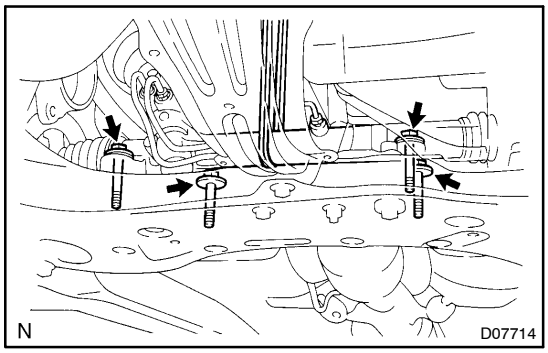
HINT:
At the time of installation, after stabilizing the suspension, torque the bolts.

(f) Remove the engine hood (See page BO–9).

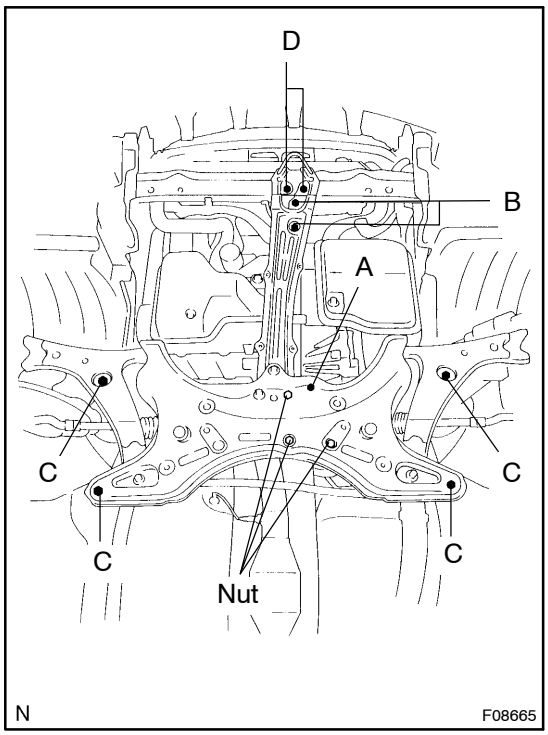


(g) Attach the engine sling device to the engine hangers.
(1) Disconnect the 2 PCV hoses.
(2) Install the No. 1 and No. 2 engine hangers in the correct direction.
Parts No. : (1ZZ–FE engine)
No. 1 engine hanger: 12281–22021
No. 2 engine hanger: 12281–15040 or 12281–15050
Bolt: 91512–B1016
Parts No. : (2ZZ–GE engine)
No. 1 engine hanger: 12281–88600
No. 2 engine hanger: 12282–88600
Bolt: 91512–61020
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)
(3) Attach the engine chain hoist to the engine hangers.

CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.



(h) Disconnect the PS gear assembly from the suspension member.
(1) Remove the 4 set bolts.
Torque: 58 N·m (591 kgf·cm, 43 ft·lbf)
(2) Tie the PS gear assembly to suspend it securely.



(i) Remove the bolt A and 3 nuts, and disconnect the engine rear mount.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)
(j) Remove the 2 bolts (B) and disconnect the engine front mount.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)
(k) Using a transmission jack, support the suspension member.
(l) Remove the 6 bolts (C and D) and lower the suspension member.
Torque:
Bolt C: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt D: 39 N·m (400 kgf·cm, 29 ft·lbf)
(m) Remove the 2 bolts, nut and lower suspension arm.

SA1OT–02

INSTALLATION

Installation is in the reverse order of removal (See page SA–43).

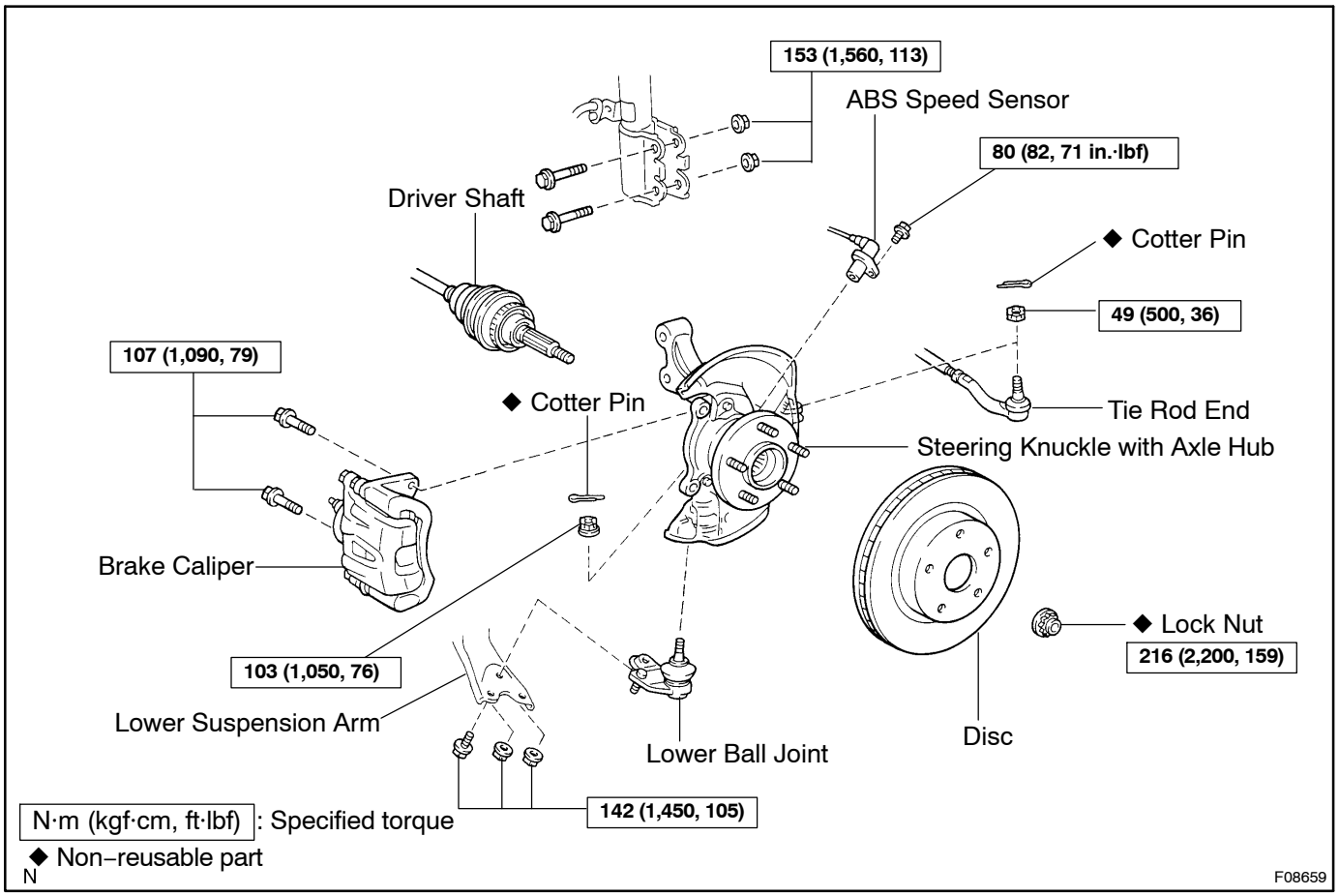
HINT:

After installation, check the front wheel alignment (See page SA–5).

FRONT LOWER BALL JOINT

COMPONENTS

SA07X–13



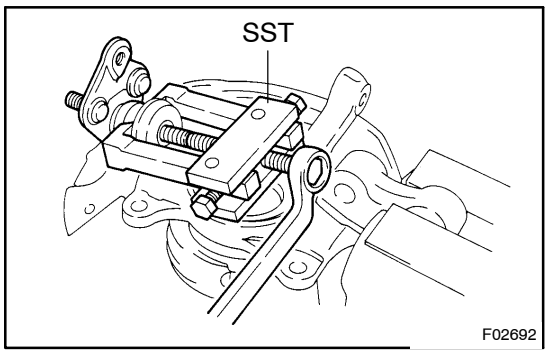
SA07Y–11

REMOVAL

1. REMOVE STEERING KNUCKLE WITH AXLE HUB
(See page SA–13)

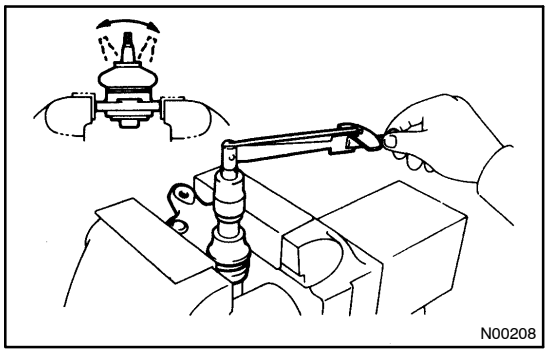
2. REMOVE LOWER BALL JOINT

(a) Remove the cotter pin and nut.



(b) Using SST, remove the lower ball joint.
SST 09628–62011

SA1EP–04



INSPECTION

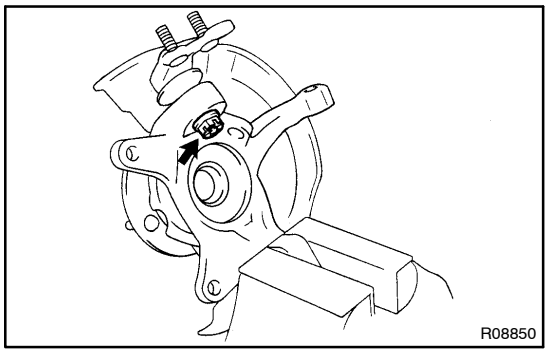
INSPECT LOWER BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously at a rate of 2 – 4 seconds per 1 turn and take the torque reading on the 5th turn.

Turning torque:
1.0 – 4.9 N·m (10 – 50 kgf·cm, 8.7 – 43 in.·lbf)

SA10F–04



INSTALLATION

1. INSTALL LOWER BALL JOINT

(a) Install the lower ball joint and tighten the nut.
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

(b) Install a new cotter pin.

If the holes for the cotter pin are not aligned, tighten the nut further up to 60 °.

2. INSTALL STEERING KNUCKLE WITH AXLE HUB
(See page SA–17)

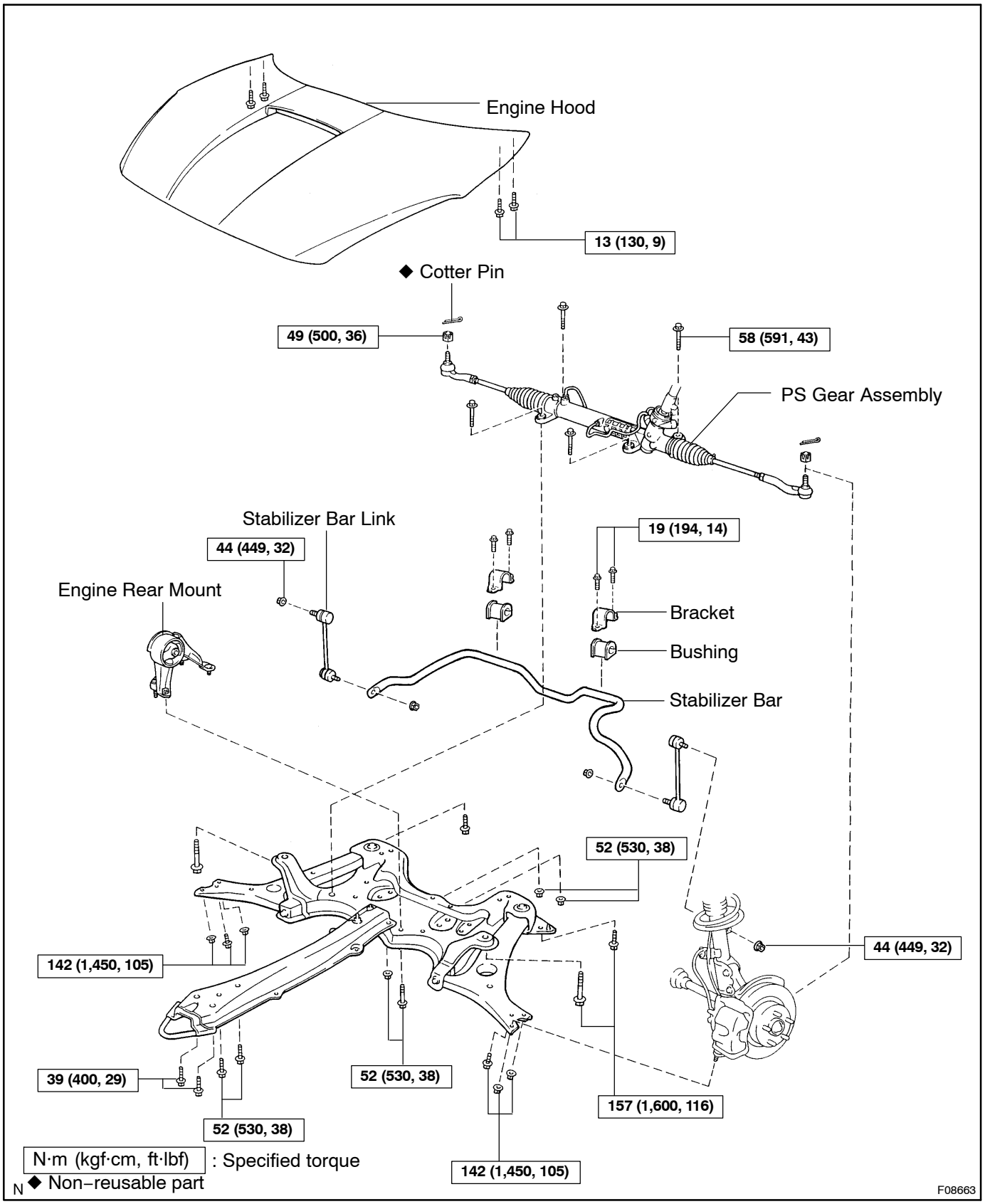
3. CHECK ABS SPEED SENSOR SIGNAL
(See page DI–836)

4. CHECK FRONT WHEEL ALIGNMENT
(See page SA–5)

FRONT STABILIZER BAR

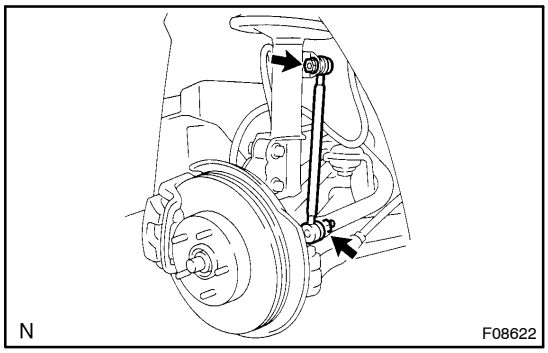
COMPONENTS

SA10H–07



SA10I–07

REMOVAL



1. REMOVE STABILIZER BAR LINKS

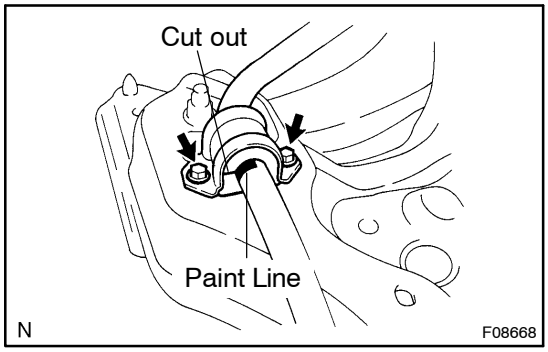
(a) Remove the 2 nuts and stabilizer bar link.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

HINT:

If the ball joint turns together with the nut, use a hexagon (5 mm) wrench to hold the stud.

(b) Employ the same manner described above to the other side.

2. REMOVE FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM (See page SA–43)



3. REMOVE STABILIZER BAR

(a) Remove the 2 bolts, bracket and bushing.
Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

HINT:

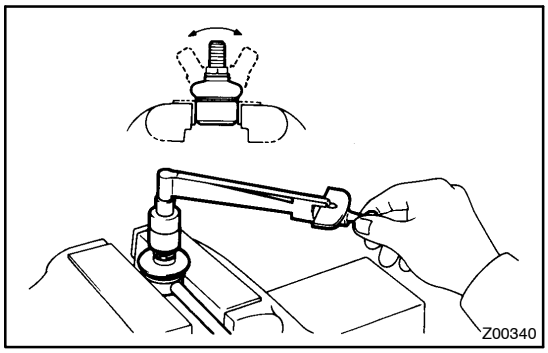
At the time of installation, please refer to the following items.

- Install the bushing so that the cutout will face to the rear.
- Install the bushing to the outside of the paint line on the stabilizer bar.

(b) Employ the same manner described above to the other side.

(c) Remove the stabilizer bar.

SA1ET–08



INSPECTION

INSPECT STABILIZER BAR LINK BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously at a rate of 2 – 4 seconds per 1 turn and take the torque reading on the 5th turn.

Turning torque:
0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)

SA04Q–06

INSTALLATION

Installation is in the reverse order of removal (See page SA–52).

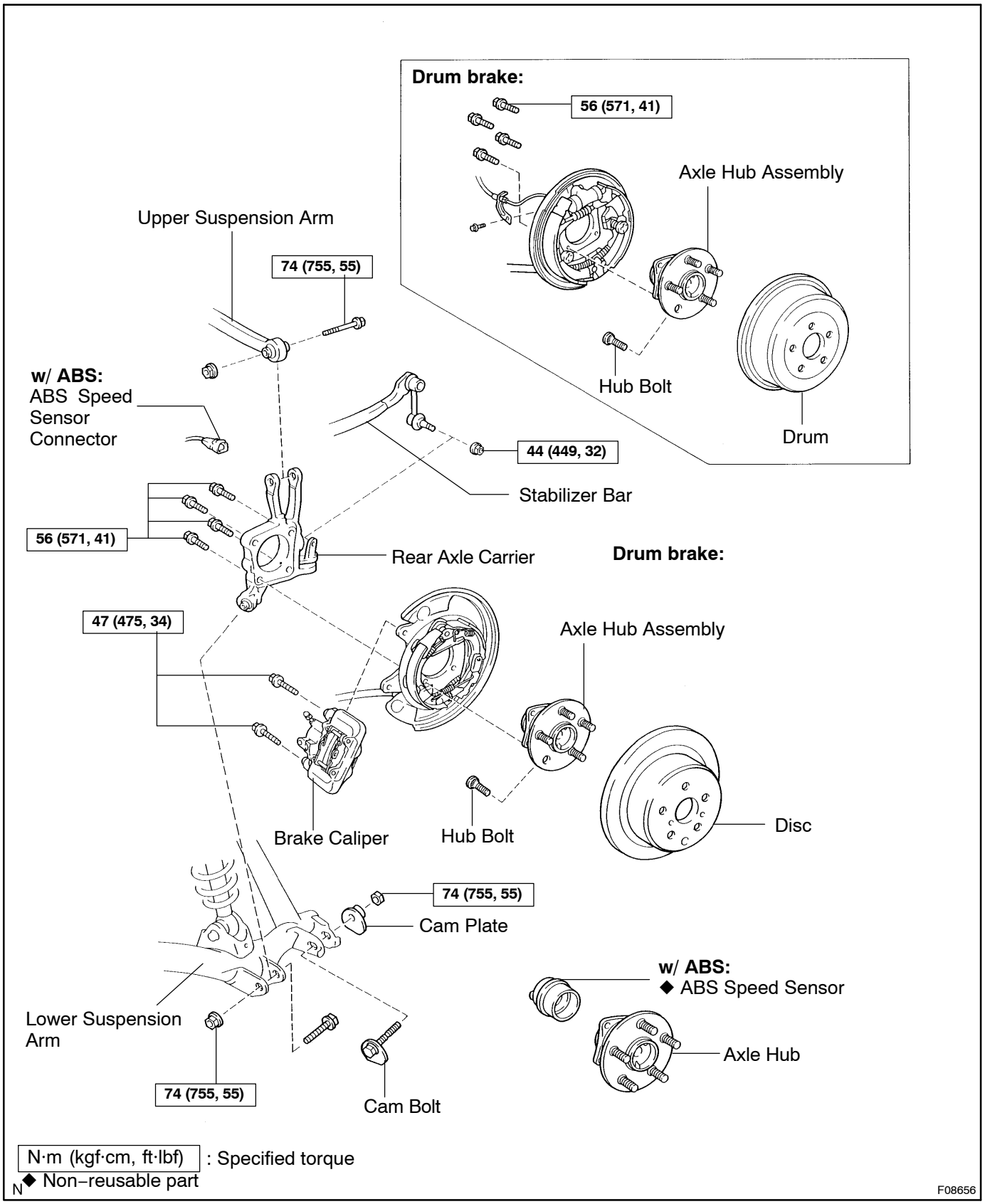
HINT:

After installation, check the front wheel alignment (See page SA–5).

REAR AXLE CARRIER

COMPONENTS

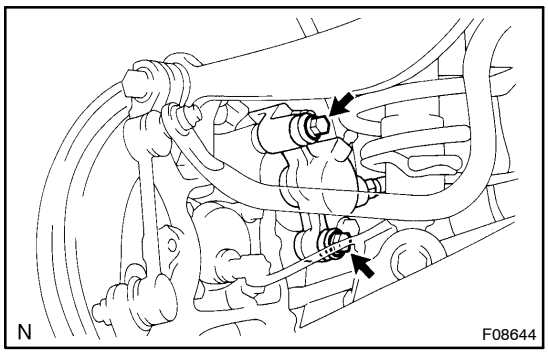
SA1P7–03



SA1P8–02

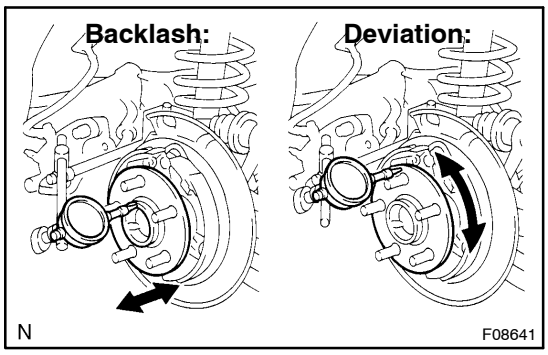
REMOVAL

1. REMOVE REAR WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



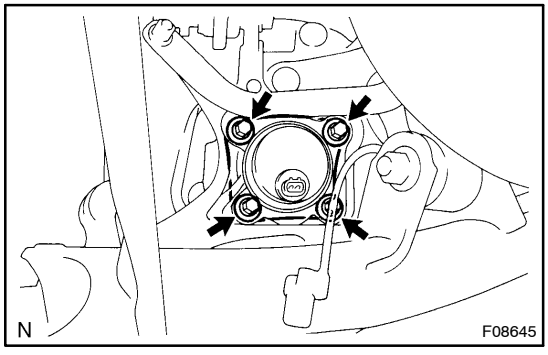
2. w/ Disc brake:
REMOVE BRAKE CALIPER AND DISC
(a) Remove the 2 bolts, brake caliper and disc.
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)
(b) Support the brake caliper securely.

3. w/ Drum brake:
REMOVE BRAKE DRUM



4. CHECK BEARING BACKLASH AND AXLE HUB DEVIATION
(a) Using a dial indicator, check the backlash near the center of the axle hub.
Maximum: 0.05 mm (0.0020 in.)
If the backlash exceeds the maximum, replace the axle hub.
(b) Using a dial indicator, check the deviation at the surface of the axle hub outside the hub bolt.
Maximum: 0.07 mm (0.0028 in.)
If the deviation exceeds the maximum, replace the axle hub.

5. w/ ABS:
DISCONNECT ABS SPEED SENSOR CONNECTOR



6. REMOVE REAR AXLE HUB
(a) Remove the 4 bolts and axle hub assembly.
Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)
(b) Support the backing plate securely.

7. DISCONNECT STABILIZER BAR LINK
Remove the nut and disconnect stabilizer bar link.
Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)
HINT:
If the ball joint turns together with the nut, use a hexagon (5 mm) wrench to hold the stud.

8. DISCONNECT UPPER SUPPORT SUSPENSION ARM

Remove the bolt and nut, and disconnect the upper suspension arm.

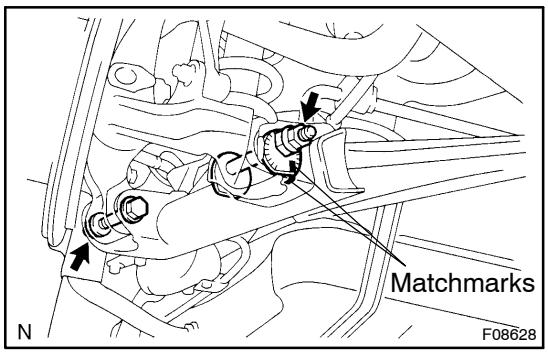
Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

NOTICE:

Do not turn the nut.

HINT:

At the time of installation, after stabilizing the suspension, torque the bolt.



9. REMOVE REAR AXLE CARRIER

(a) Remove the front side bolt and nut of the lower suspension arm.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

(b) Place matchmarks on both the cam plate and lower suspension arm.

(c) Remove the nut, cam plate and cam bolt.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

(d) Remove the rear axle carrier.

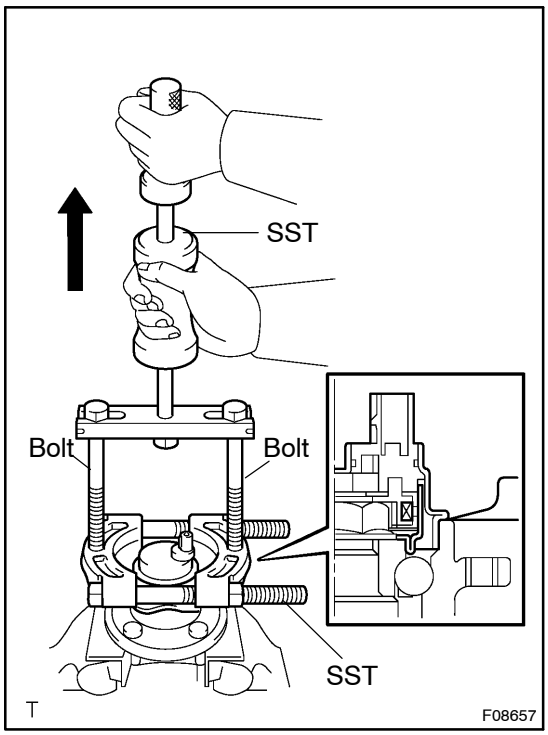
SA1L8–06

DISASSEMBLY

w/ ABS:

REMOVE ABS SPEED SENSOR

(a) Using a pin punch and hammer, drive out the 2 pins and remove the 2 attachments from SST.
SST 09520–00031 (09520–00040, 09521–00020)



(b) Mount the axle hub assembly in a soft jaw vise.

NOTICE:

Replace the axle hub assembly if it is dropped or a strong shock is given to it.

(c) Using SST and 2 bolts (Diameter: 12 mm, Pitch: 1.5 mm), remove the ABS speed sensor.
SST 09520–00031 (09520–00040, 09521–00020), 09950–00020

NOTICE:

- **Do not allow any foreign matter sticking to the sensor rotor.**
- **Pull out the ABS speed sensor straightly not to damage the sensor rotor.**
- **If damage has occurred to the sensor rotor, replace the axle hub assembly.**
- **Do not scratch the contacting surface of the axle hub and speed sensor.**

SA1P9–05

REASSEMBLY

w/ ABS:

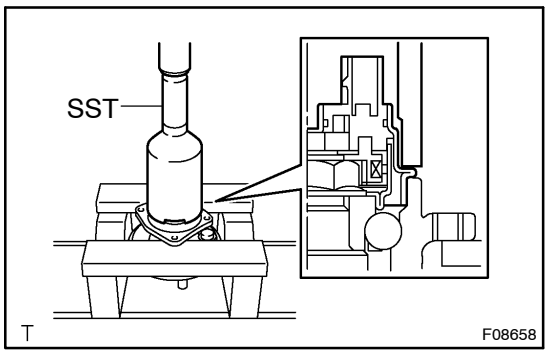
INSTALL NEW ABS SPEED SENSOR

(a) Clean the contacting surface of the axle hub and a new ABS speed sensor.

NOTICE:

Do not allow any foreign matter sticking to the sensor rotor.

(b) Place the ABS speed sensor on the axle hub so that the connector is set at the bottom under the on–vehicle condition.



(c) Using SST and a press, install a new ABS speed sensor to the axle hub.
SST 09214–76011

NOTICE:

- **Do not tap the speed sensor with a hammer directly.**
- **Check that there should be no foreign matter on the speed sensor detection portion.**
- **Press in the ABS speed sensor straightly and slowly.**

SA1PA–04

INSTALLATION

Installation is in the reverse order of removal (See page SA–56).

HINT:

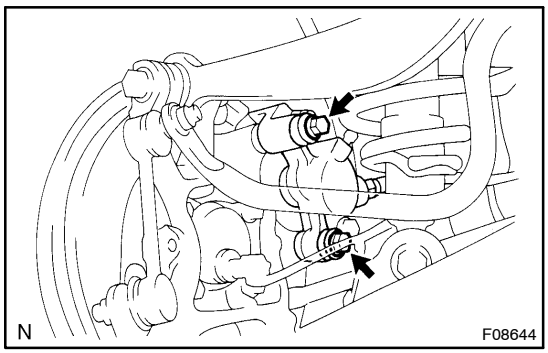
After installation, check the ABS speed sensor signal (See page DI–836) and rear wheel alignment (See page SA–9).

REAR WHEEL HUB BOLT

SA1PB–03

REPLACEMENT

1. REMOVE REAR WHEEL

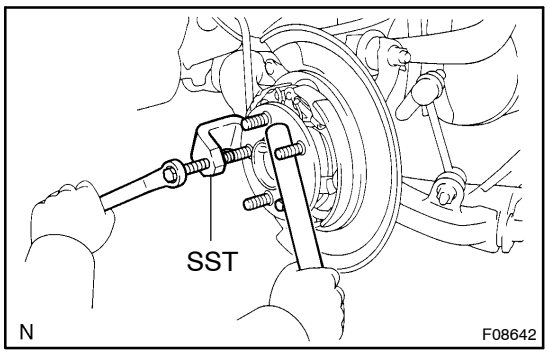


2. w/ Disc brake:
REMOVE BRAKE CALIPER AND DISC

(a) Remove the 2 bolts, brake caliper and disc.

(b) Support the brake caliper securely.

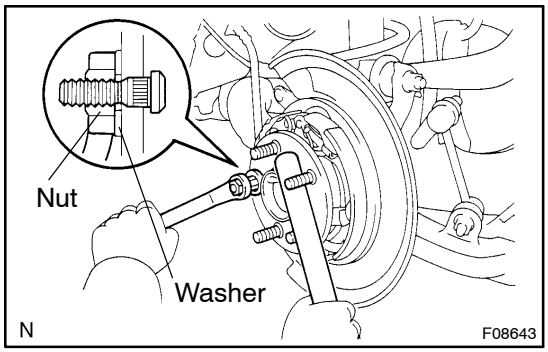
3. w/ Drum brake:
REMOVE BRAKE DRUM



4. REMOVE HUB BOLT

Using SST and a brass bar, remove the hub bolt.

SST 09628–10011



5. INSTALL HUB BOLT

(a) Install a washer and nut to a new hub bolt as shown in the illustration.

(b) Using a brass bar to hold, install the hub bolt by torquing the nut.

6. w/ Drum brake:
INSTALL BRAKE DRUM

7. w/ Disc brake:
INSTALL DISC AND BRAKE CALIPER

Install the disc and brake caliper and 2 bolts.

Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

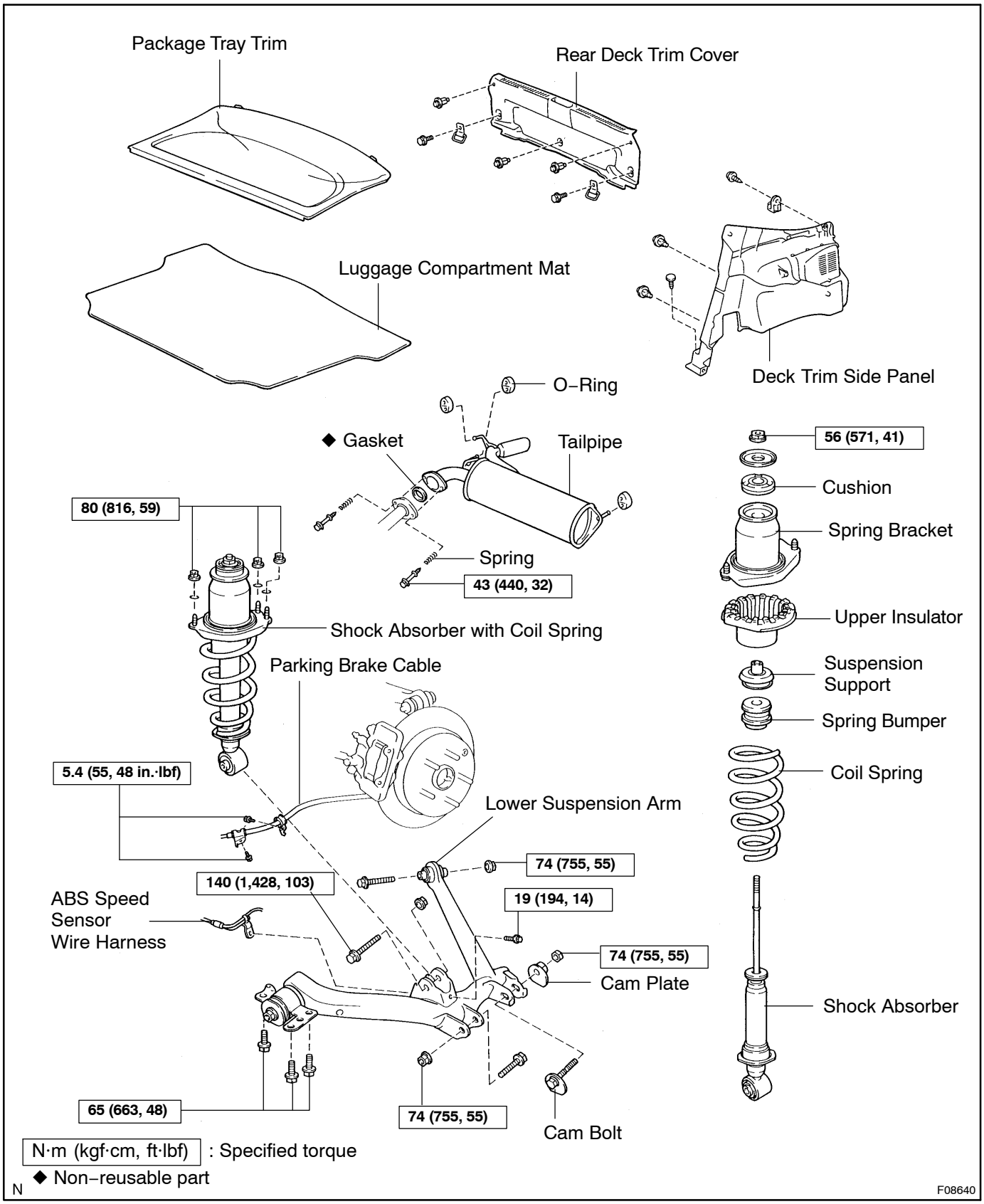
8. INSTALL REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

REAR SHOCK ABSORBER

SA1OU–04

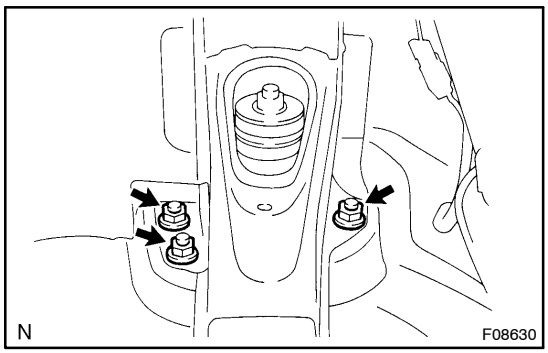
COMPONENTS



SA1OV-02

REMOVAL

1. **REMOVE REAR WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE PACKAGE TRAY TRIM**
3. **REMOVE LUGGAGE COMPARTMENT MAT**
4. **REMOVE REAR DECK TRIM COVER**
5. **REMOVE DECK TRIM SIDE PANEL**
6. **REMOVE REAR LOWER SUSPENSION ARM**
   (See page SA–73)



7. **REMOVE REAR SHOCK ABSORBER**

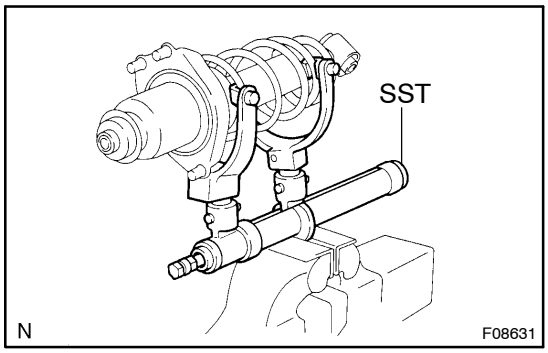
Remove the 3 nuts and rear shock absorber.

Torque: 80 N·m (816 kgf·cm, 59 ft·lbf)

SA1OW–04

DISASSEMBLY

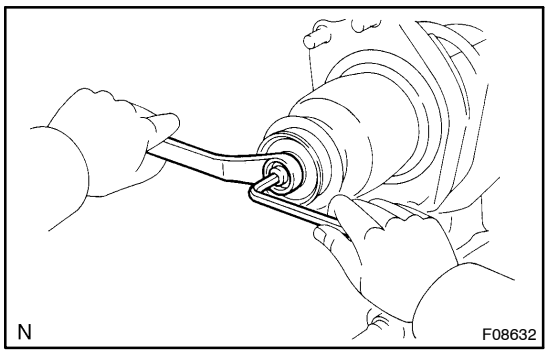
REMOVE COIL SPRING



(a) Using SST, compress the coil spring.
SST 09727–30021 (09727–00010, 09727–00021, 09727–00031)

NOTICE:

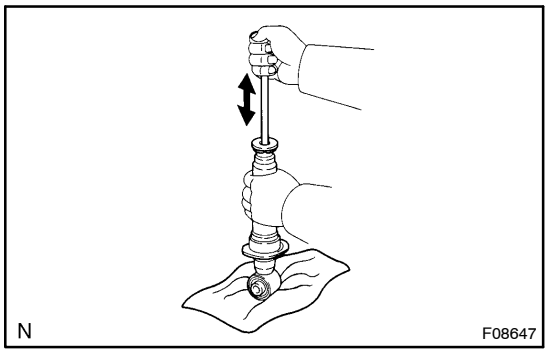
Do not use an impact wrench. It will damage the SST.



(b) Using a 6 mm hexagon wrench to hold the piston rod, remove the nut.

(c) Remove the washer, cushion, spring bracket, upper insulator, suspension support, spring bumper and coil spring.

SA08C–11



INSPECTION

INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual sound during operation.

If there is any abnormality, replace the shock absorber with a new one.

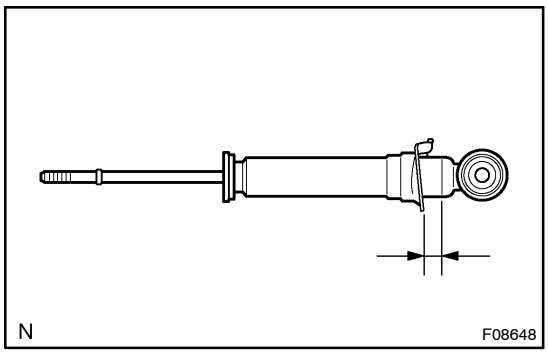
NOTICE:

When disposing of the shock absorber, see DISPOSAL on page SA–66.

SA08D–10

DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD



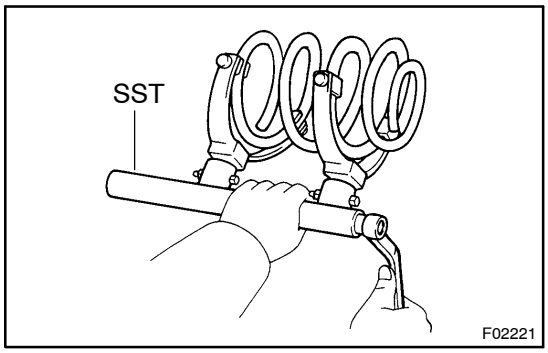
2. DRILL HOLE TO DISCHARGE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder as shown in the illustration to discharge the gas inside.

CAUTION:

- **When drilling, chips may fly out, work carefully.**
- **The gas is colorless, odorless and non–poisonous.**

SA1OX–03



REASSEMBLY

1. INSTALL COIL SPRING

(a) Using SST, compress the coil spring.
SST 09727–30021 (09727–00010, 09727–00021, 09727–00031)

NOTICE:

Do not use an impact wrench. It will damage the SST.

(b) Insert the coil spring to the shock absorber.

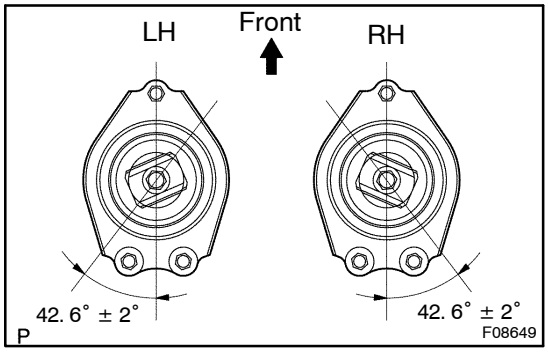
HINT:

Fit the lower end of the coil spring into the gap of the spring lower seat.

2. INSTALL SPRING BUMPER AND SUSPENSION SUPPORT

3. INSTALL SPRING BRACKET

(a) Set the upper insulator to the spring bracket.



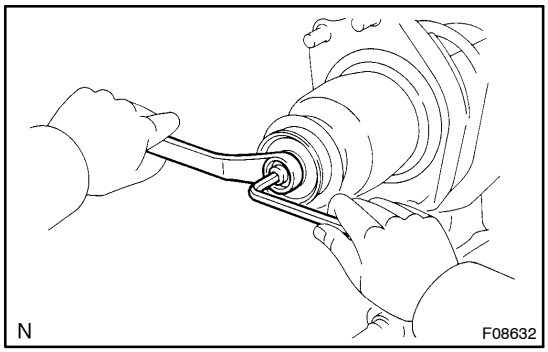
(b) Position the spring bracket with upper insulator as shown in the illustration.

(c) Install the cushion and washer.

(d) Temporarily tighten the center nut.

(e) Remove the SST.
SST 09727–30021 (09727–00010, 09727–00021, 09727–00031)

(f) Recheck the direction of the spring bracket.



(g) Using a 6 mm hexagon wrench to hold the piston rod, tighten the nut.
Torque: 56 N·m (571 kgf·cm, 41 ft·lbf)

SA1OY–04

INSTALLATION

Installation is in the reverse order of removal (See page SA–63).

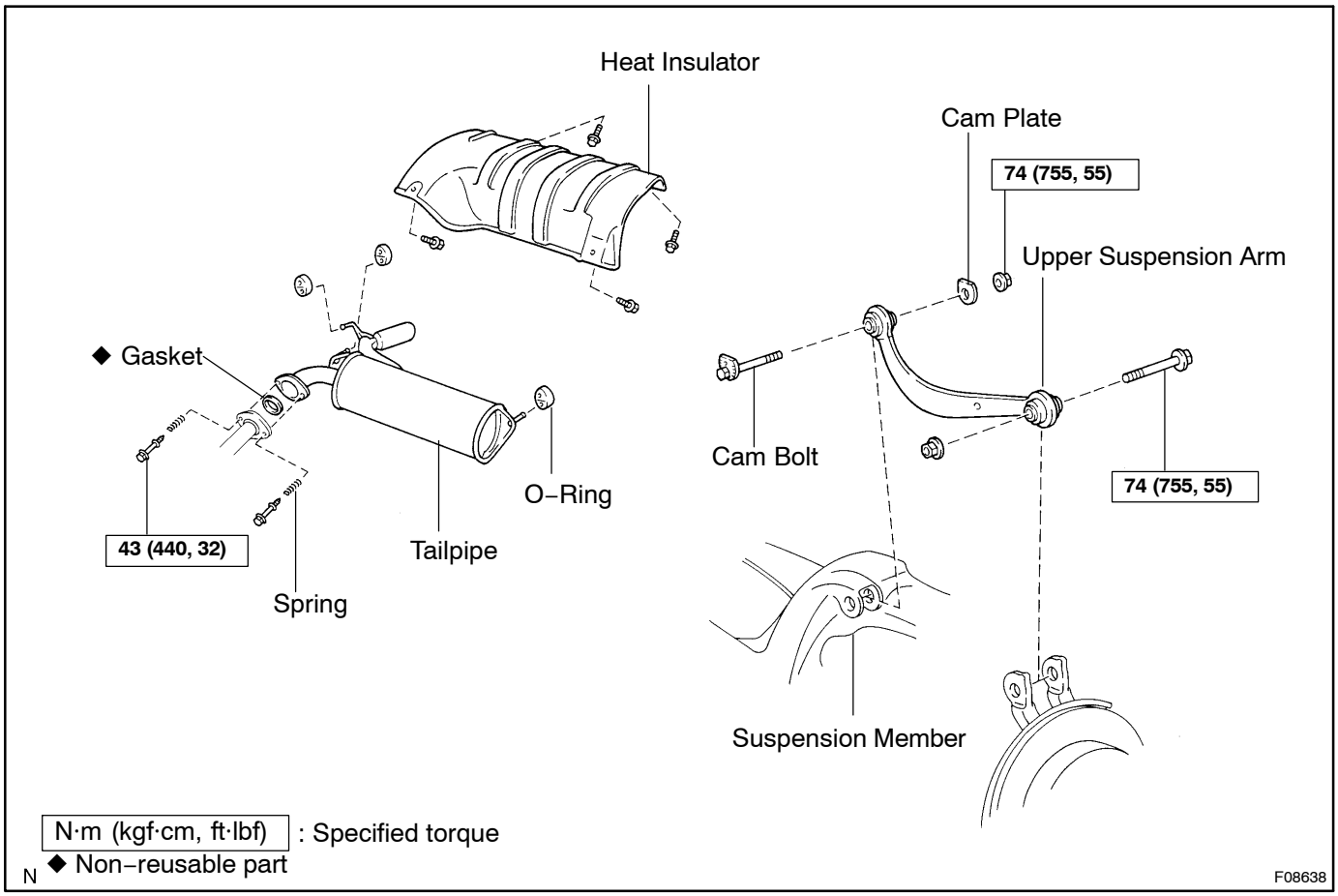
HINT:

After installation, check the rear wheel alignment (See page SA–9).

REAR UPPER SUSPENSION ARM

COMPONENTS

SA1PC–02



SA1PD–02

REMOVAL

1. REMOVE REAR WHEEL

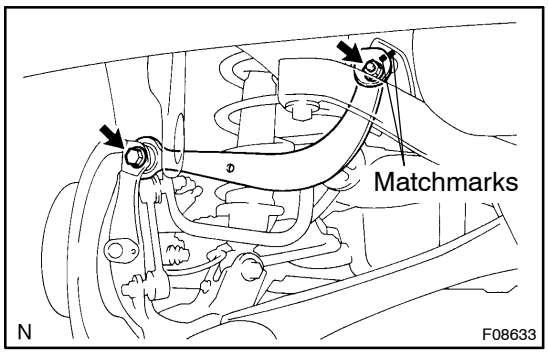
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE TAILPIPE AND HEAT INSULATOR

(a) Remove the 2 bolts, springs, gasket, 3 O–rings and tailpipe.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(b) Remove the 4 bolts and heat insulator.



3. REMOVE UPPER SUSPENSION ARM

(a) Place matchmarks on both the cam plate and suspension member.

(b) Remove the nut, cam plate and cam bolt.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

(c) Remove the bolt, nut and upper suspension arm.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

NOTICE:

Do not turn the nut.

HINT:

At the time of installation, after stabilizing the suspension, torque the bolt.

SA1PE–02

INSTALLATION

Installation is in the reverse order of removal (See page SA–70).

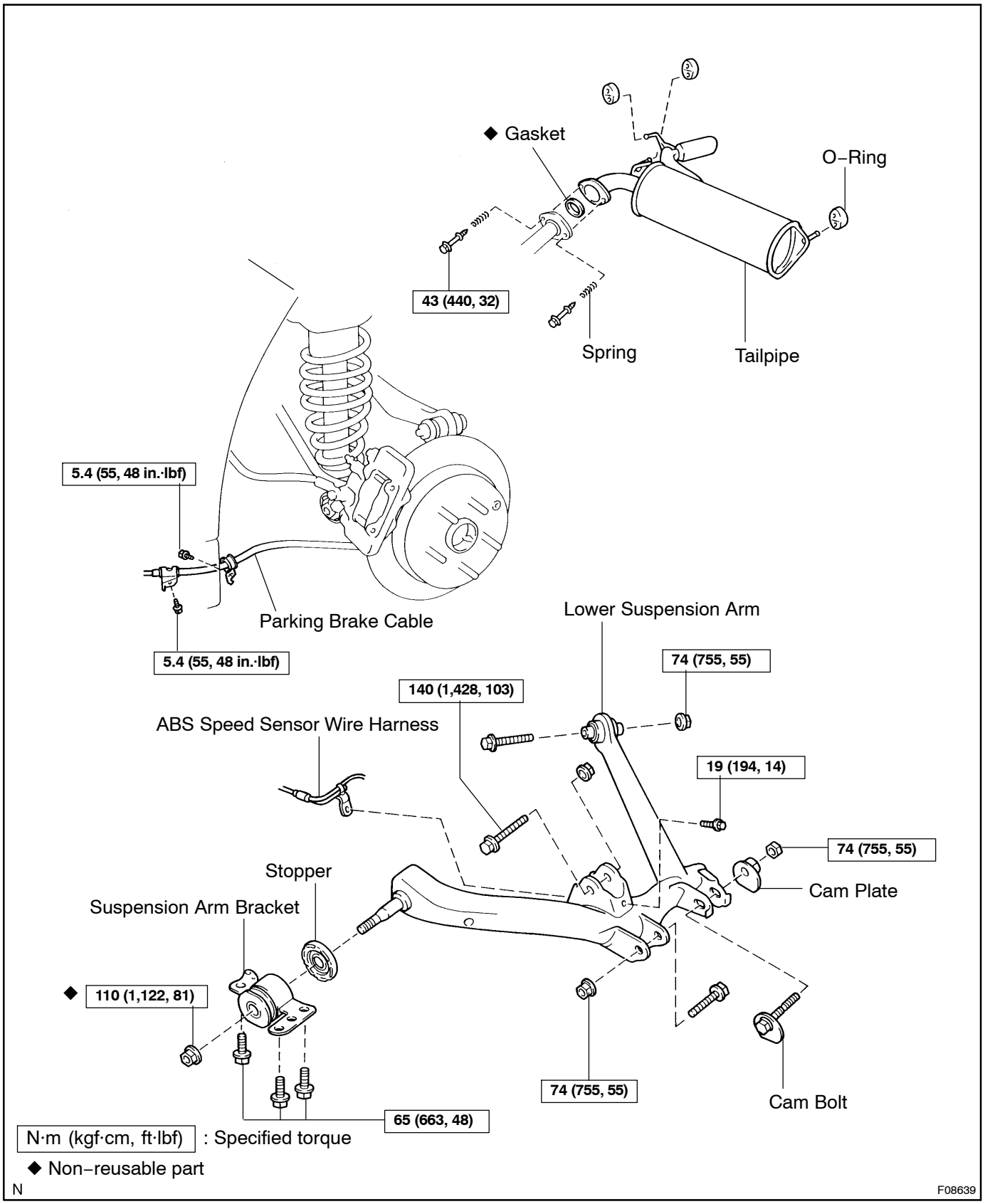
HINT:

After installation, check the rear wheel alignment (See page SA–9).

REAR LOWER SUSPENSION ARM

COMPONENTS

SA1PF–02



SA1PG–02

REMOVAL

1. REMOVE REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE ABS SPEED SENSOR WIRE HARNESS CLAMP

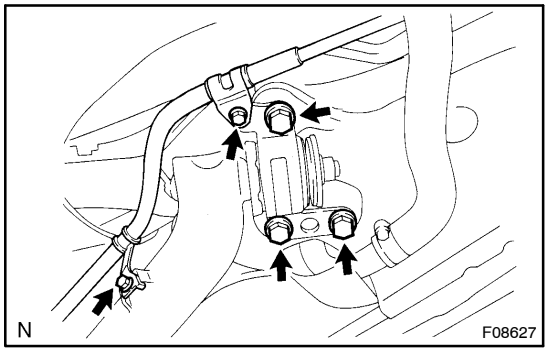
Remove the bolt and disconnect the ABS speed sensor wire harness clamp.

Torque: 19 N·m (194 kgf·cm, 14 ft·lbf)

3. REMOVE TAILPIPE

Remove the 2 bolts, springs, gasket, 3 O–rings and tailpipe.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



4. DISCONNECT PARKING BRAKE CABLE CLAMP

Remove the 2 bolts and disconnect the parking brake cable clamps.

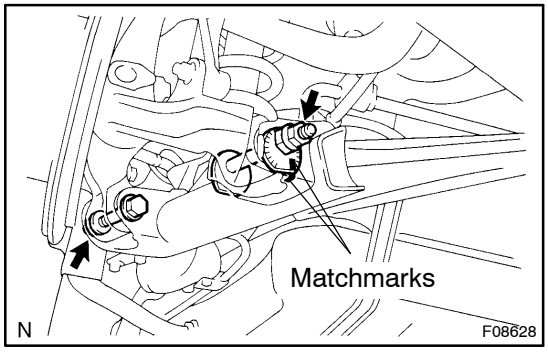
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

5. LOOSEN 3 BOLTS ON FRONT SIDE OF LOWER SUSPENSION ARM

Torque: 65 N·m (663 kgf·cm, 48 ft·lbf)

HINT:

- Do not remove the bolts.
- At the time of installation, after stabilizing the suspension, torque the bolts.



6. DISCONNECT REAR AXLE CARRIER FROM LOWER SUSPENSION ARM

(a) Remove the front side bolt and nut.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

(b) Place matchmarks on both the cam plate and lower suspension arm.

(c) Remove the nut, cam plate and cam bolt.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

(d) Disconnect the rear axle carrier from the lower suspension arm.

7. DISCONNECT REAR SHOCK ABSORBER

Remove the bolt and nut and disconnect the rear shock absorber.

Torque: 140 N·m (1,428 kgf·cm, 103 ft·lbf)

NOTICE:

Do not turn the nut.

HINT:

At the time of installation, after stabilizing the suspension, torque the bolt.

8. REMOVE LOWER SUSPENSION ARM

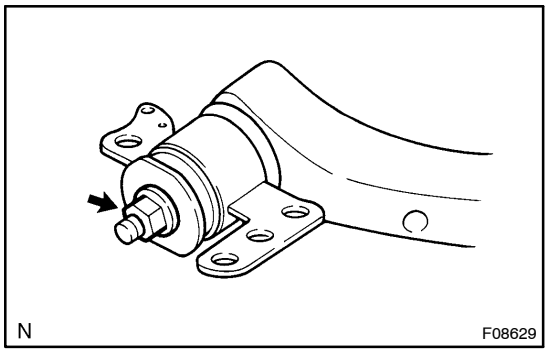
(a) Remove the bolt and nut on the rear side of lower suspension arm.

Torque: 74 N·m (755 kgf·cm, 55 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

(b) Remove the front side 3 bolts and lower suspension arm.



9. REMOVE SUSPENSION ARM BRACKET

Remove the nut, suspension arm bracket and stopper.

Torque: 110 N·m (1,122 kgf·cm, 81 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

SA1PH–02

INSTALLATION

Installation is in the reverse order of removal (See page SA–73).

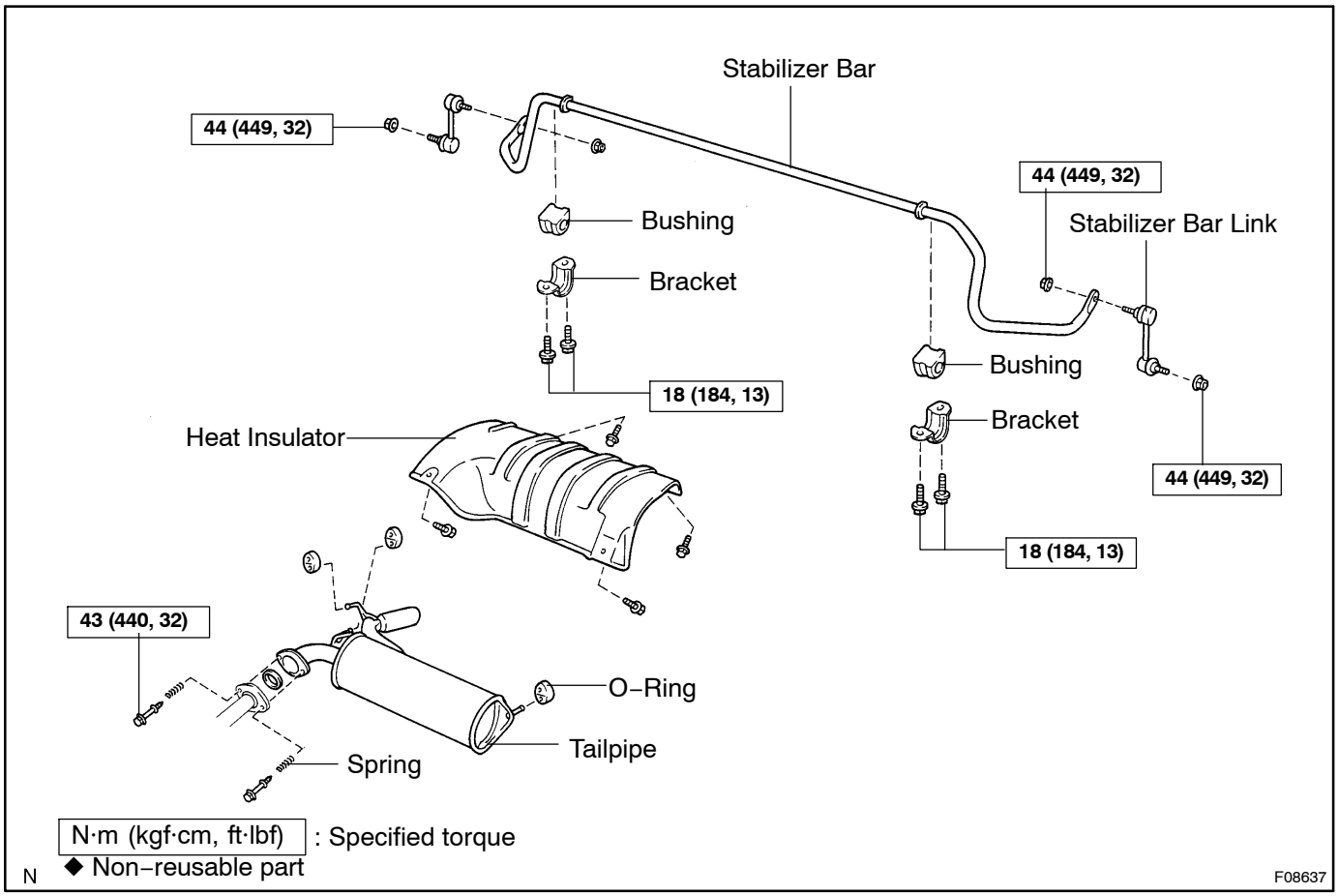
HINT:

After installation, check the rear wheel alignment (See page SA–9).

REAR STABILIZER BAR

COMPONENTS

SA1PI–05



SA1PJ–03

REMOVAL

1. REMOVE REAR WHEEL

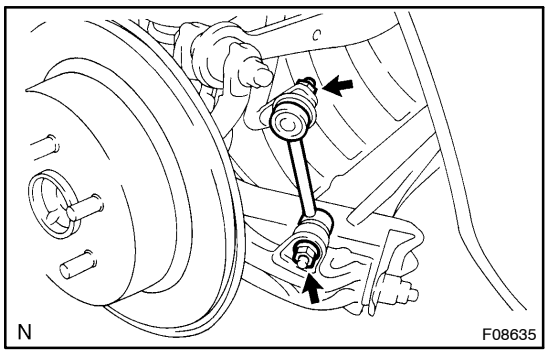
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE TAILPIPE AND HEAT INSULATOR

(a) Remove the 2 bolts, springs, gasket, 3 O–rings and tailpipe.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(b) Remove the 4 bolts and heat insulator.



3. REMOVE STABILIZER BAR LINKS

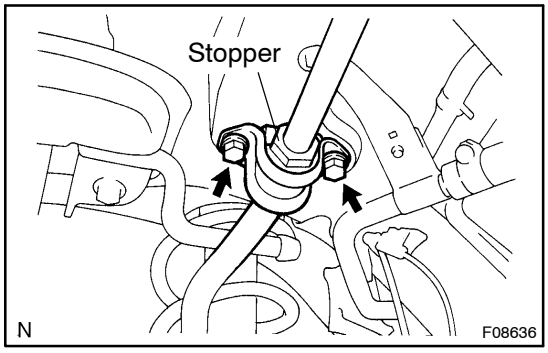
(a) Remove the 2 nuts and stabilizer bar link.

Torque: 44 N·m (449 kgf·cm, 32 ft·lbf)

HINT:

If the ball joint turns together with the nut, use a hexagon (5 mm) wrench to hold the stud.

(b) Employ the same manner described above to the other side.



4. REMOVE STABILIZER BAR BRACKETS AND BUSHINGS

(a) Remove the 2 bolts, bracket and bushing.

Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

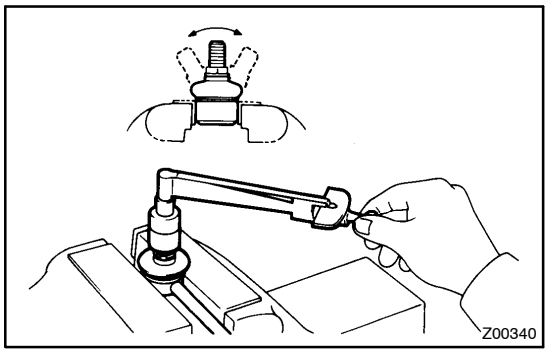
HINT:

At the time of installation, install the bushing to the outside of the stopper on the stabilizer bar.

(b) Employ the same manner described above to the other side.

5. REMOVE STABILIZER BAR

SA1FD–06



INSPECTION

INSPECT STABILIZER BAR LINK BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously at a rate of 2 – 4 seconds per 1 turn and take the torque reading on the 5th turn.

Turning torque:
0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)

SA1PK–04

INSTALLATION

Installation is in the reverse order of removal (See page SA–77).

BRAKE SYSTEM

BR0PW–03

PRECAUTION

- **Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.**
- **It is very important to keep parts and the area clean when repairing the brake system.**
- **If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.**

TROUBLESHOOTING

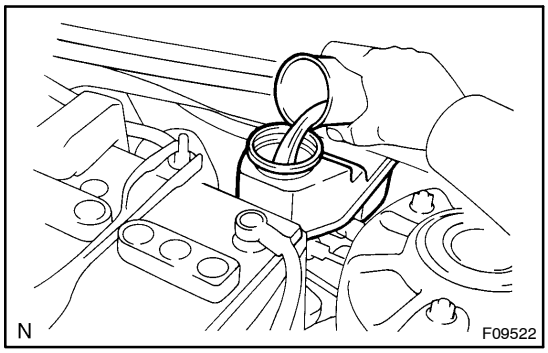
PROBLEM SYMPTOMS TABLE

BR0PX–09

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Low pedal or spongy pedal	5. Fluid leaks for brake system	DI–881
	6. Air in brake system	BR–4
	7. Piston seals (Worn or damaged)	BR–22 BR–36 BR–28
	8. Rear brake shoe clearance (Out of adjustment)	BR–32
	9. Master cylinder (Faulty)	BR–10
	10. Booster push rod (Out of adjustment)	BR–18
Brake drag	1. Brake pedal free play (Minimum)	BR–6
	2. Parking brake lever travel (Out of adjustment)	BR–9
	3. Parking brake wire (Sticking)	–
	4. Rear brake shoe clearance (Out of adjustment)	BR–32 BR–46
	5. Pad or lining (Cracked or distorted)	BR–19 BR–33 BR–28 BR–42
	6. Piston (Stuck)	BR–22 BR–36 BR–28
	7. Piston (Frozen)	BR–22 BR–36 BR–28
	8. Anchor, tension or return spring (Faulty)	BR–28 BR–42
	9. Booster push rod (Out of adjustment)	BR–18
	10. Vacuum leaks for booster system	BR–14
	11. Master cylinder (Faulty)	BR–10
Brake pull	1. Piston (Stuck)	BR–22 BR–36 BR–28
	2. Pad or lining (Oily)	BR–19 BR–33 BR–28 BR–42
	3. Piston (Frozen)	BR–22 BR–36 BR–28
	4. Disc (Scored)	BR–25 BR–39
	5. Pad or lining (Cracked or distorted)	BR–19 BR–33 BR–28 BR–42

Hard pedal but brake inefficient	1. Fluid leaks for brake system	DI–881
	2. Air in brake system	BR–4
	3. Pad or lining (Worn)	BR–19 BR–33 BR–28 BR–42
	4. Pad or lining (Cracked or distorted)	BR–19 BR–33 BR–28 BR–42
	5. Rear brake shoe clearance (Out of adjustment)	BR–32 BR–46
	6. Pad or lining (Oily)	BR–19 BR–33 BR–28 BR–42
	7. Pad or lining (Glazed)	BR–19 BR–33 BR–28 BR–42
	8. Disc (Scored)	BR–25 BR–39
	9. Booster push rod (Out of adjustment)	BR–18
	10.Vacuum leaks for booster system	BR–14
Noise from brakes	1. Pad or lining (Cracked or distorted)	BR–19 BR–33 BR–28 BR–42
	2. Installation bolt (Loose)	BR–22 BR–36
	3. Disc (Scored)	BR–25 BR–39
	4. Pad support plate (Loose)	BR–19
	5. Sliding pin (Worn)	BR–22
	6. Pad or lining (Dirty)	BR–19 BR–33 BR–28 BR–42
	7. Pad or lining (Glazed)	BR–19 BR–33 BR–28 BR–42
	8. Anchor, tension or return spring (Faulty)	BR–28 BR–42
	9. Anti–squeal shim (Damaged)	BR–19 BR–33
	10.Shoe hold–down spring (Damaged)	BR–28 BR–42



BRAKE FLUID

BLEEDING

BR0PY–05

HINT:

If any work is done on the brake system or if air in the brake lines is suspected, bleed the air from the brake system.

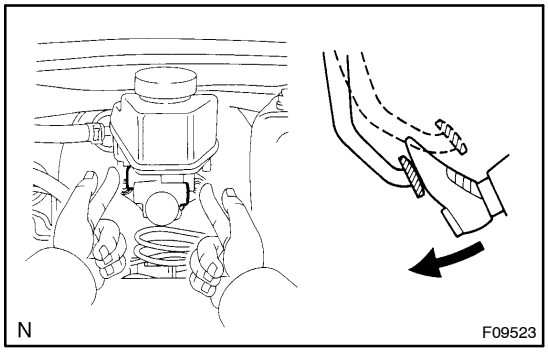
NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Fluid: SAE J1703 or FMVSS No. 116 DOT3

2. REMOVE BATTERY



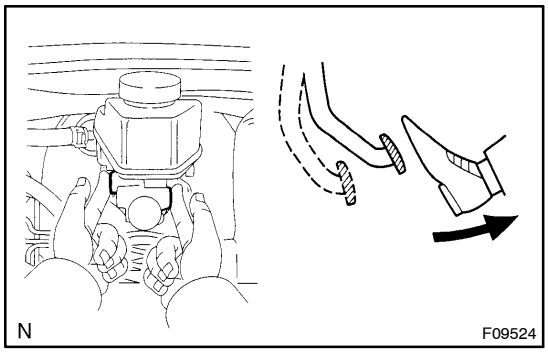
3. BLEED MASTER CYLINDER

HINT:

If the master cylinder has been disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

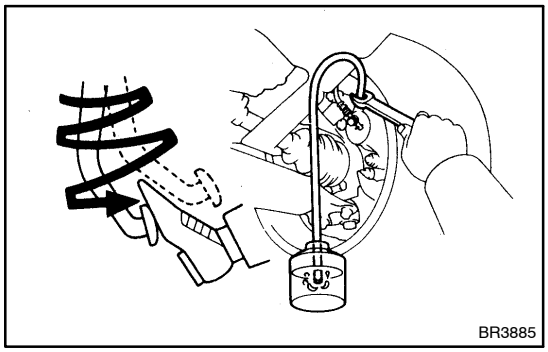
(a) Disconnect the brake lines from the master cylinder.
SST 09023–00101

(b) Slowly depress the brake pedal and hold it.



(c) Block off the outlet plug with your finger and release the brake pedal.

(d) Repeat (b) and (c) 3 or 4 times.



4. BLEED BRAKE LINE

(a) Connect the vinyl tube to the caliper.

(b) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down.

(c) At the point when fluid stops coming out, tighten the bleeder plug, then release the brake pedal.

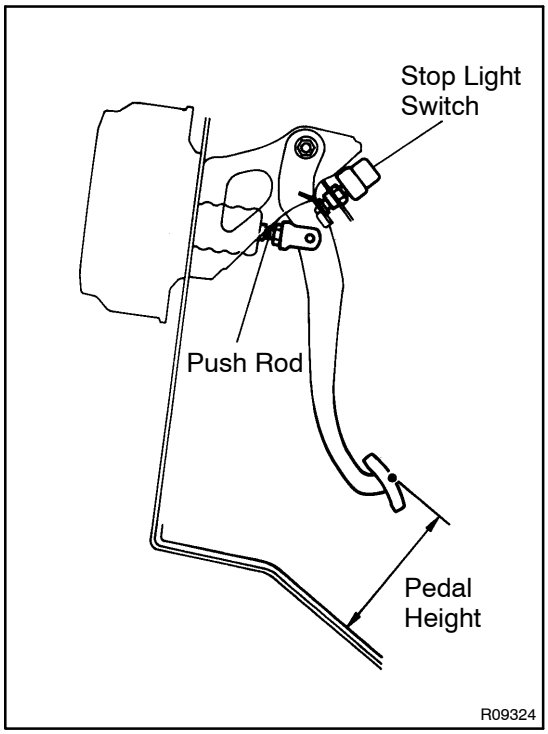
(d) Repeat (b) and (c) until all the air in the fluid has been bled out.

(e) Repeat the above procedure to bleed the air out of the brake line for each wheel.

5. CHECK FLUID LEVEL IN RESERVOIR

Check the fluid level and add fluid if necessary.

Fluid: SAE J1703 or FMVSS No. 116 DOT3



BRAKE PEDAL

BR0PZ–10

ON–VEHICLE INSPECTION

1. CHECK PEDAL HEIGHT

Pedal height from asphalt sheet:

Standard Pedal:

139.8 – 149.8 mm (5.504 – 5.898 in.)

Sport Pedal:

141.1 – 151.1 mm (5.555 – 5.949 in.)

If the pedal height is incorrect, adjust it.

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Remove the lower No. 1 panel and finish panel.

(b) Disconnect the connector from the stop light switch.

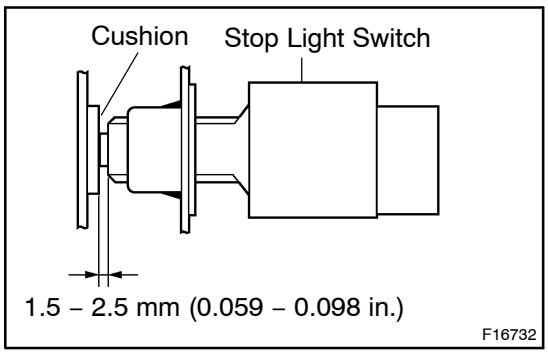
(c) Turn the stop light switch counterclockwise and remove the stop light switch.

(d) Loosen the clevis lock nut.

(e) Adjust the pedal height by turning the pedal push rod.

(f) Tighten the clevis lock nut.

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)



(g) Insert the stop light switch until the body hits the cushion.

NOTICE:

When inserting the stop light switch, support the pedal from behind so that the pedal is not pushed in.

(h) Make a quarter turn clockwise to install the stop light switch.

NOTICE:

The turning torque for installing the stop light switch should be 1.5 N·m (15 kgf·cm, 13 ft·lbf) or less.

HINT:

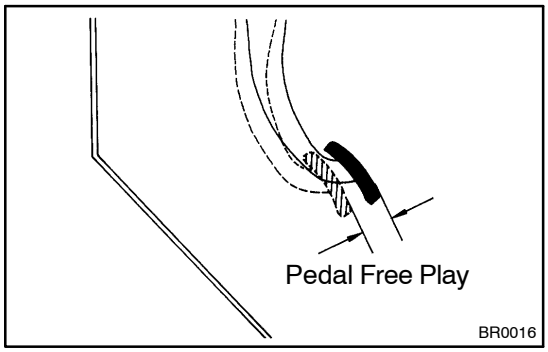
Due to the inverse screw structure, if the stop light switch is turned clockwise, the stop light switch moves in the direction to be pulled out.

(i) Connect the connector to the stop light switch.

(j) Check the protrusion of the rod.

Protrusion of the rod: 1.5 – 2.5 mm (0.059 – 0.098 in.)

(k) After adjusting the pedal height, check the pedal free play.



3. CHECK PEDAL FREE PLAY

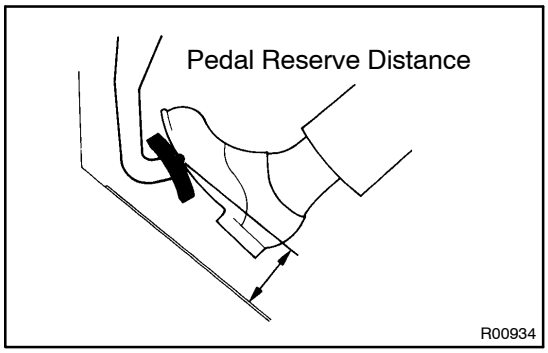
(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal until the beginning of the resistance is felt. Measure the distance, as shown.

Pedal free play: 1 – 6 mm (0.04 – 0.24 in.)

If incorrect, check the stop light switch clearance.

If the clearance is OK, then troubleshoot the brake system.



4. CHECK PEDAL RESERVE DISTANCE

Release the parking brake lever.

With engine running, depress the pedal and measure the pedal reserve distance, as shown.

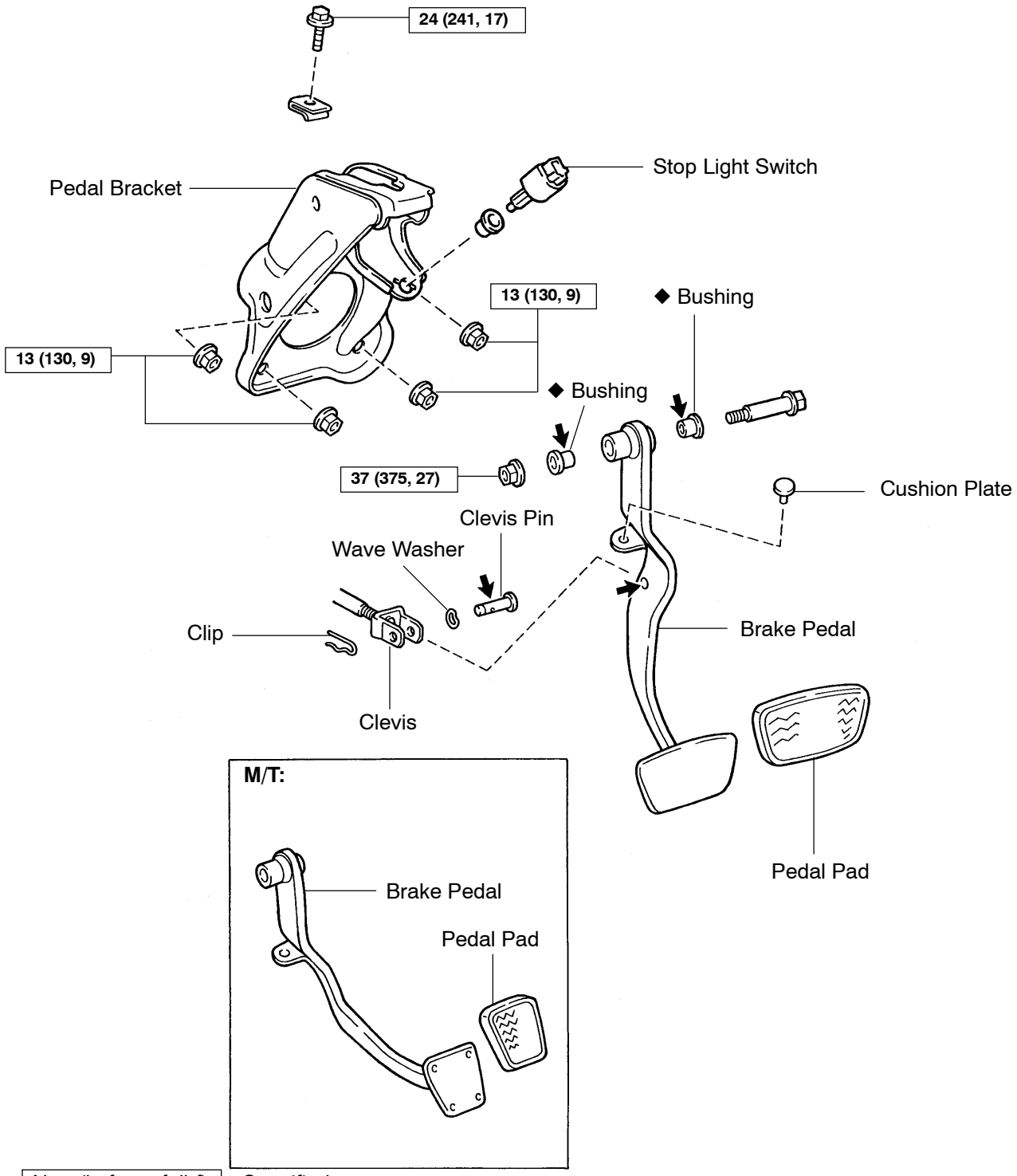
Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf): More than 85 mm (3.35 in.)

If incorrect, troubleshoot the brake system.

BR145–05

COMPONENTS

A/T:

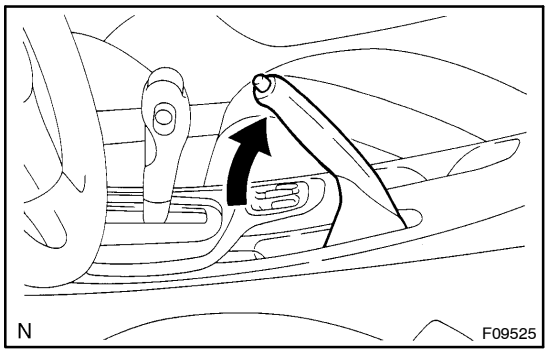


N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

N ⬅ Lithium soap base glycol grease

F15923



PARKING BRAKE LEVER

BR0Q0–06

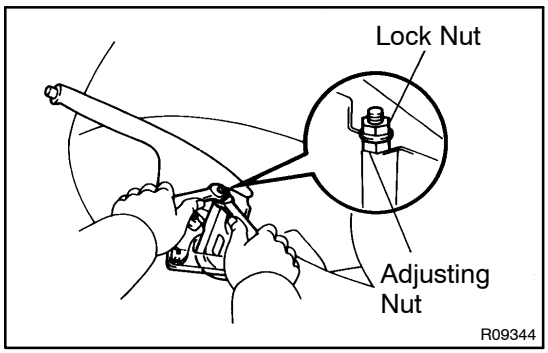
ON–VEHICLE INSPECTION

1. CHECK PARKING BRAKE LEVER TRAVEL

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake lever travel at 196 N (20 kgf, 44.1 lbf): 7 – 8 clicks

If incorrect, adjust the parking brake.



2. IF NECESSARY, ADJUST PARKING BRAKE

HINT:

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted. For shoe clearance adjustment, see step 1 on page BR–45 or see step 2 on page BR–32.

(a) Remove the console box.

(b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct.

(c) Tighten the lock nut.

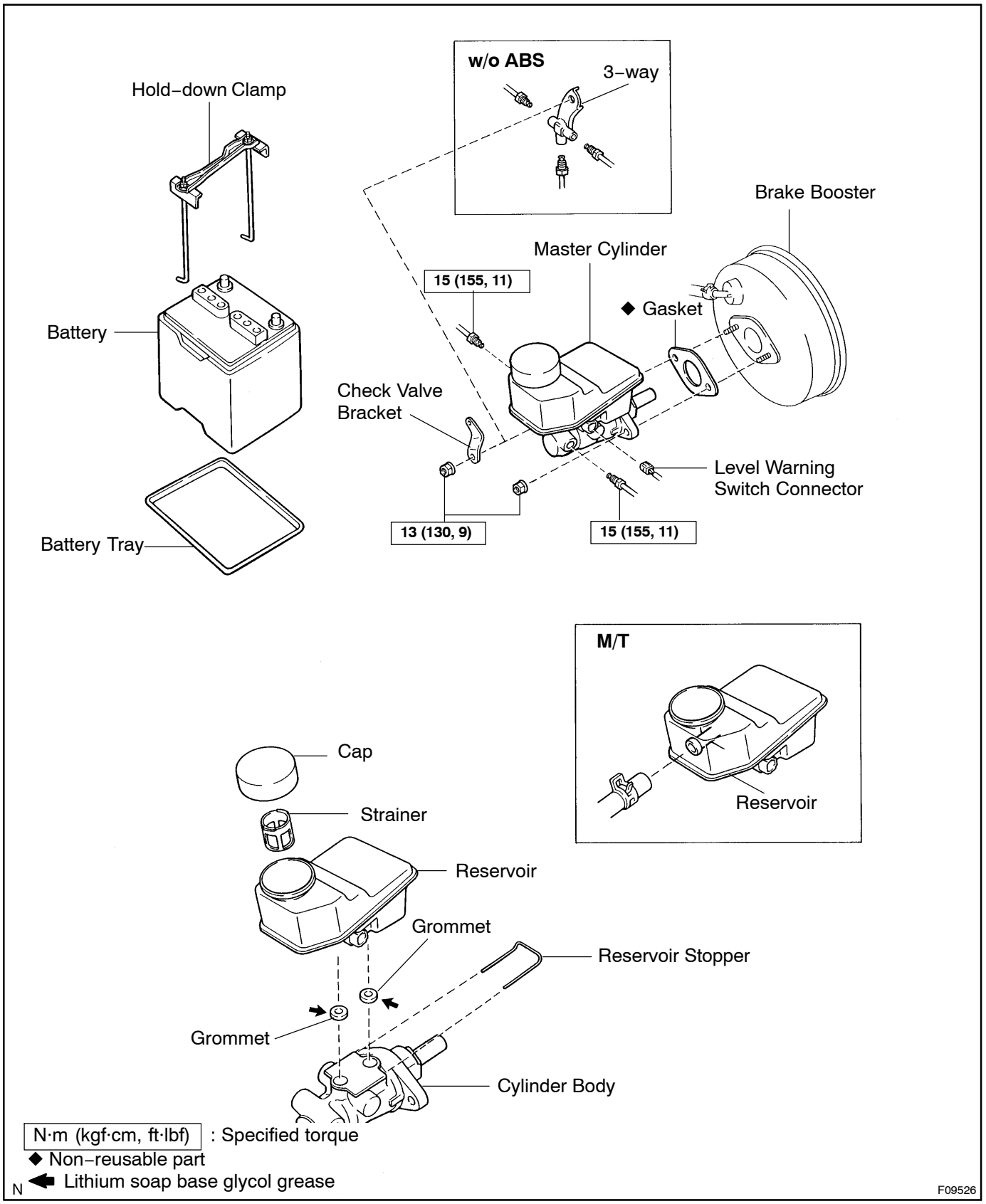
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(d) Install the console box.

BRAKE MASTER CYLINDER

COMPONENTS

BR0Q1–07



F09526

BR0Q2–03

REMOVAL

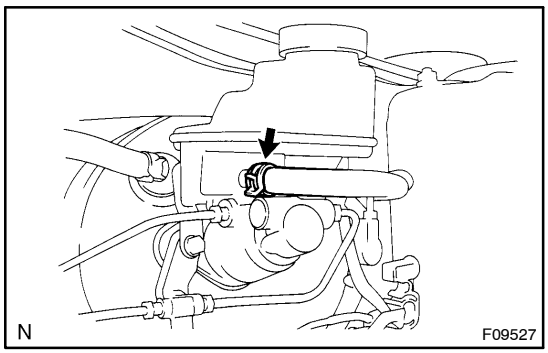
1. REMOVE BATTERY

2. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

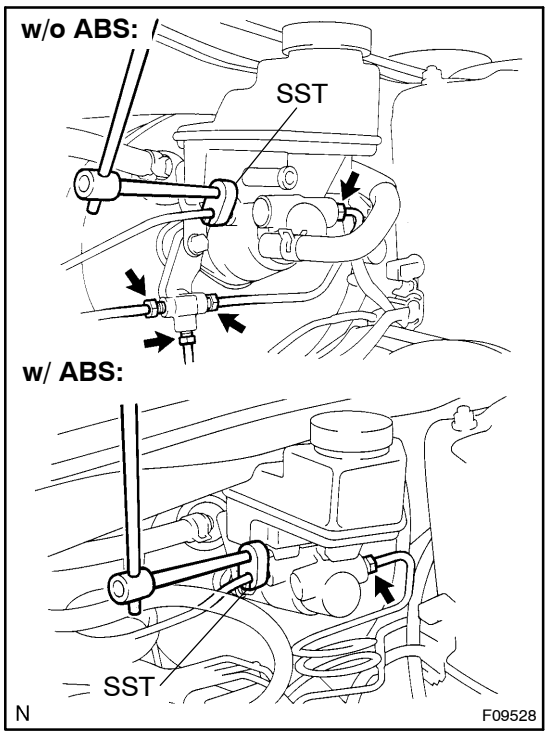
3. DRAW OUT FLUID WITH SYRINGE

NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.



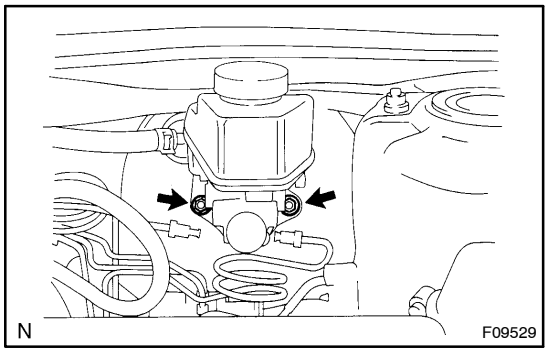
4. M/T:
DISCONNECT RESERVOIR HOSE



5. DISCONNECT BRAKE LINE

(a) w/o ABS:
Using SST, disconnect the 5 brake lines from the master cylinder and 3–way union.
SST 09023–00101
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

(b) w/ ABS:
Using SST, disconnect the 2 brake lines from the master cylinder.
SST 09023–00101
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)



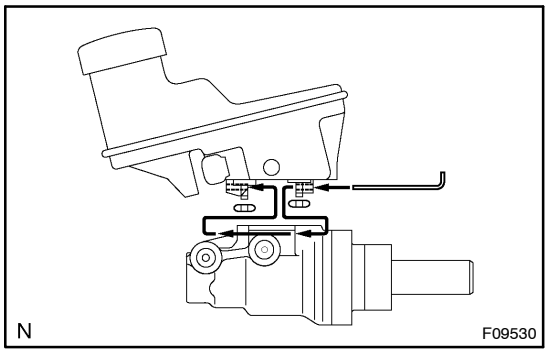
6. REMOVE MASTER CYLINDER

(a) Remove the 2 mounding nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) w/o ABS:
Pull out the check valve bracket, 3–way and master cylinder.

(c) w/ ABS:
Pull out the check valve bracket and master cylinder.

(d) Remove the gasket from the master cylinder.



7. REMOVE RESERVOIR

(a) Pull out the reservoir stopper.

HINT:

At the time of installation, make sure to insert the reservoir stopper through holes of the reservoir and the master cylinder groove.

(b) Remove the reservoir and 2 grommets.

(c) Remove the cap and strainer from the reservoir.

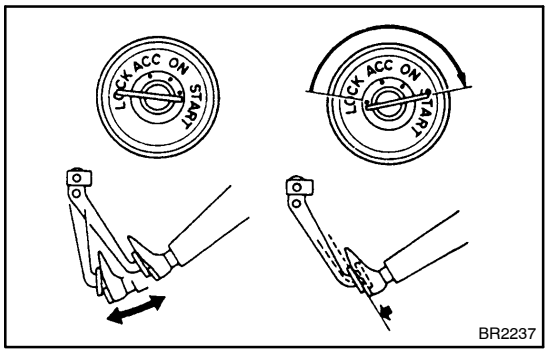
BR0AJ–04

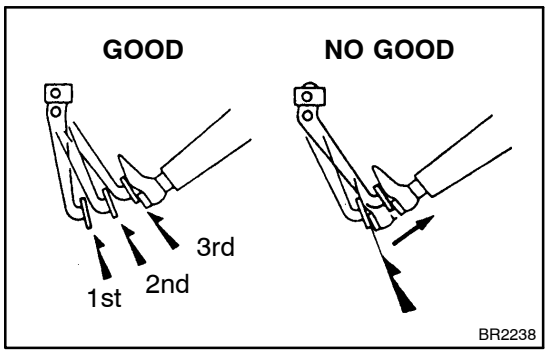
INSTALLATION

Installation is in the reverse order of removal (See page BR–11).

HINT:

- Before installation, adjust length of brake booster push rod (See page BR–18).
- After installation, fill the brake reservoir with brake fluid, bleed the brake system (See page BR–4), and check for leaks.
- Check and adjust brake pedal (See page BR–6).





BRAKE BOOSTER ASSEMBLY

BR0Q7–05

ON–VEHICLE INSPECTION

1. OPERATING CHECK

(a) Depress the brake pedal several times with the engine off and check that there is no change in the pedal reserve distance.

(b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.

2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly.

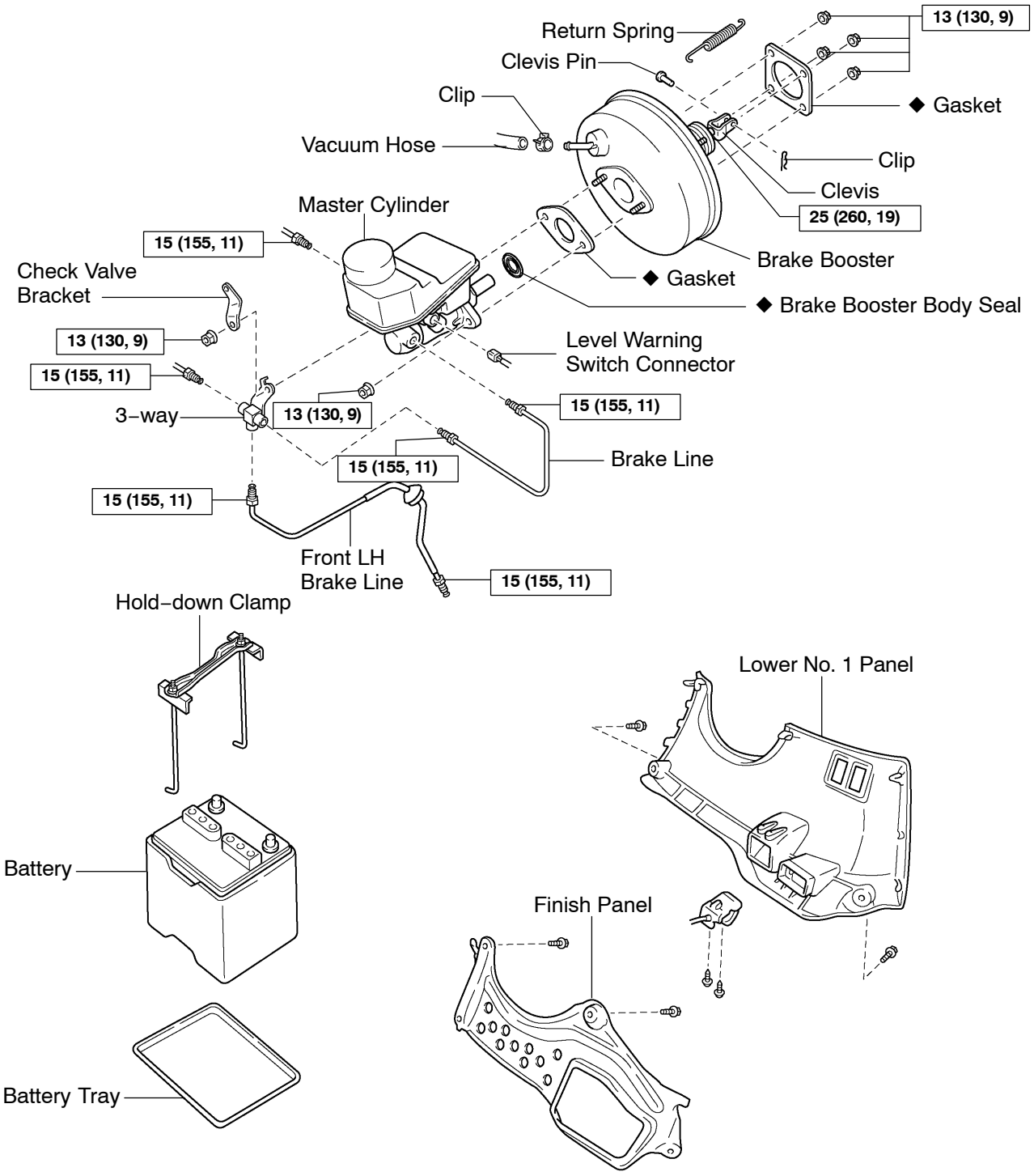
If the pedal goes down farthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed. If there is no change in the pedal reserve travel after holding the pedal for 30 seconds, the booster is air tight.

BR1TZ–02

COMPONENTS

w/o ABS:



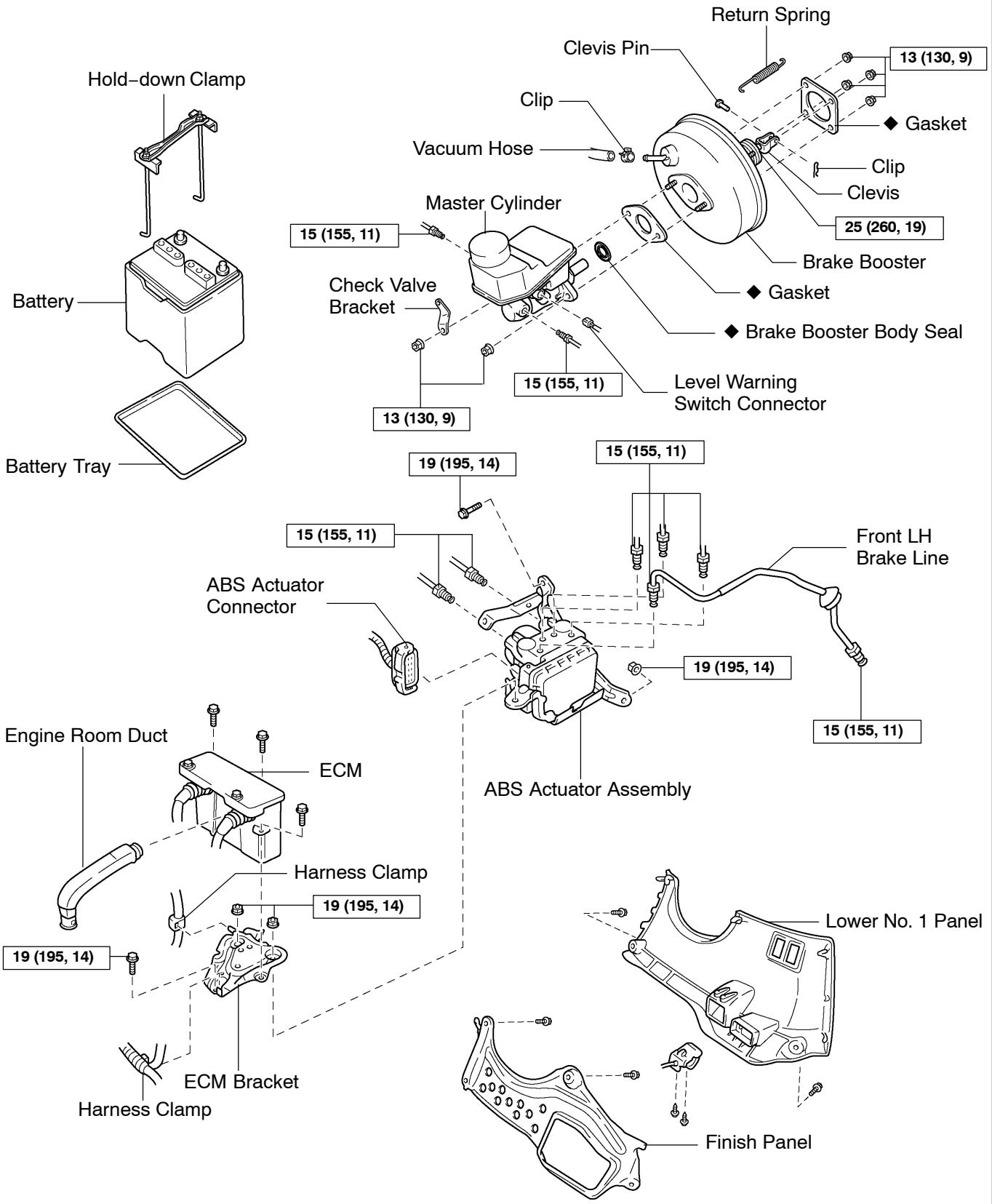
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

N

cmc0939

w/ ABS:



N·m (kgf·cm, ft·lbf) : Specified torque

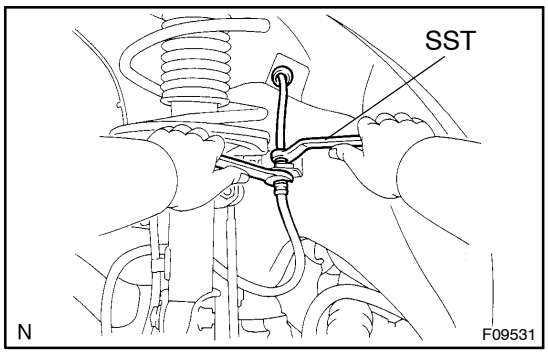
N ◆ Non–reusable part

cmc0943

BR146–06

REMOVAL

1. **REMOVE FRONT LH WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE MASTER CYLINDER (See page BR–11)**
3. **DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER**
4. **w/ ABS:**
   REMOVE ABS ACTUATOR ASSEMBLY
   (See page BR–51)



5. **REMOVE FRONT LH BRAKE LINE**

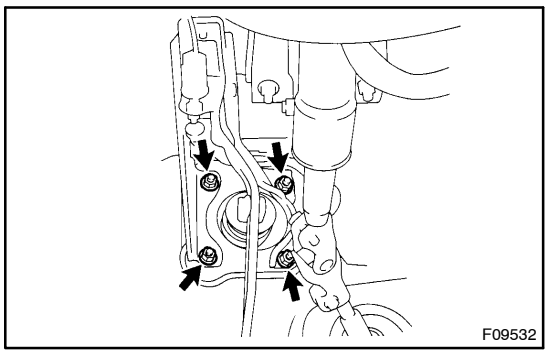
(a) Using SST and spanner, disconnect the brake line from the flexible hose of front LH brake.
SST 09751–36011

(b) Pull out the brake line with the grommet from the body.

6. **REMOVE BRAKE BOOSTER**

(a) Remove the lower No. 1 panel and finish panel.

(b) Remove the return spring, clip and clevis pin.



(c) Remove the clevis and 4 nuts.

(d) Pull out the brake booster and gasket.

7. **REMOVE BRAKE BOOSTER BODY SEAL**

Pry out the brake booster body seal.

BR147–02

INSTALLATION

1. INSTALL BRAKE BOOSTER

(a) Install a new gasket and brake booster with 4 nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Install the clevis, and torque the lock nut.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

(c) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.

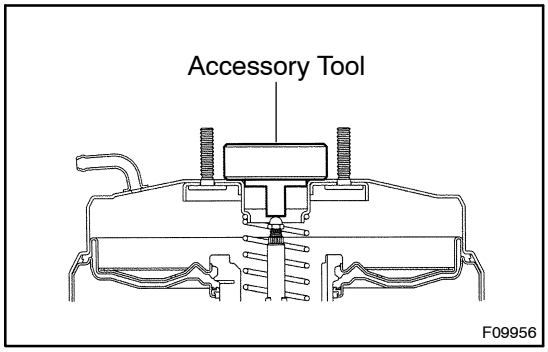
(d) Install the pedal return spring.

2. INSTALL FRONT LH BRAKE LINE

(a) Insert the brake line with the grommet into the body, and install the grommet to the body.

(b) Using SST and spanner, connect the brake line to the flexible hose of front LH brake.
SST 09751–36011
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

3. w/ ABS:
INSTALL ABS ACTUATOR ASSEMBLY (See page BR–52)



4. When replacing the brake master cylinder only:
ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD

(a) Apply chalk to the tip of an accessory tool.

(b) Place the accessory tool to the brake booster.

(c) Measure the clearance between the brake booster push rod and accessory tool.
Clearance: 0 mm (0 in.)

HINT:

Adjust the clearance in following cases:

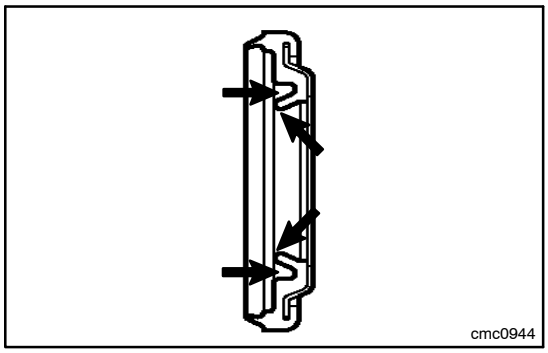
- If there is a clearance between the accessory tool and the shell of the booster (floating accessory tool), the clearance is small.
- If the chalk does not stick on the tip of the push rod, the clearance is large.

(d) If the clearance is outside of the specified range, depress the brake pedal and adjust the length of the protruding push rod of the brake booster.

NOTICE:

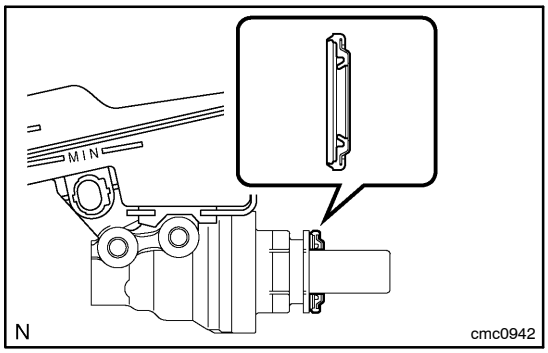
Make an adjustment with the booster having no vacuum. (Depress the brake pedal several times with the engine stopped.)

5. CONNECT VACUUM HOSE TO BRAKE BOOSTER



6. INSTALL BRAKE BOOSTER BODY SEAL

(a) Apply silicone grease to a new brake booster body seal, as shown in the illustration.



(b) Install the brake booster body seal to the master cylinder piston.

NOTICE:

Be sure to install the brake booster body seal in the correct direction.

7. INSTALL MASTER CYLINDER (See page BR–13)

8. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR–4)

9. CHECK FOR FLUID LEAKAGE

10. CHECK AND ADJUST BRAKE PEDAL

(a) Check and adjust the brake pedal (See page BR–6).

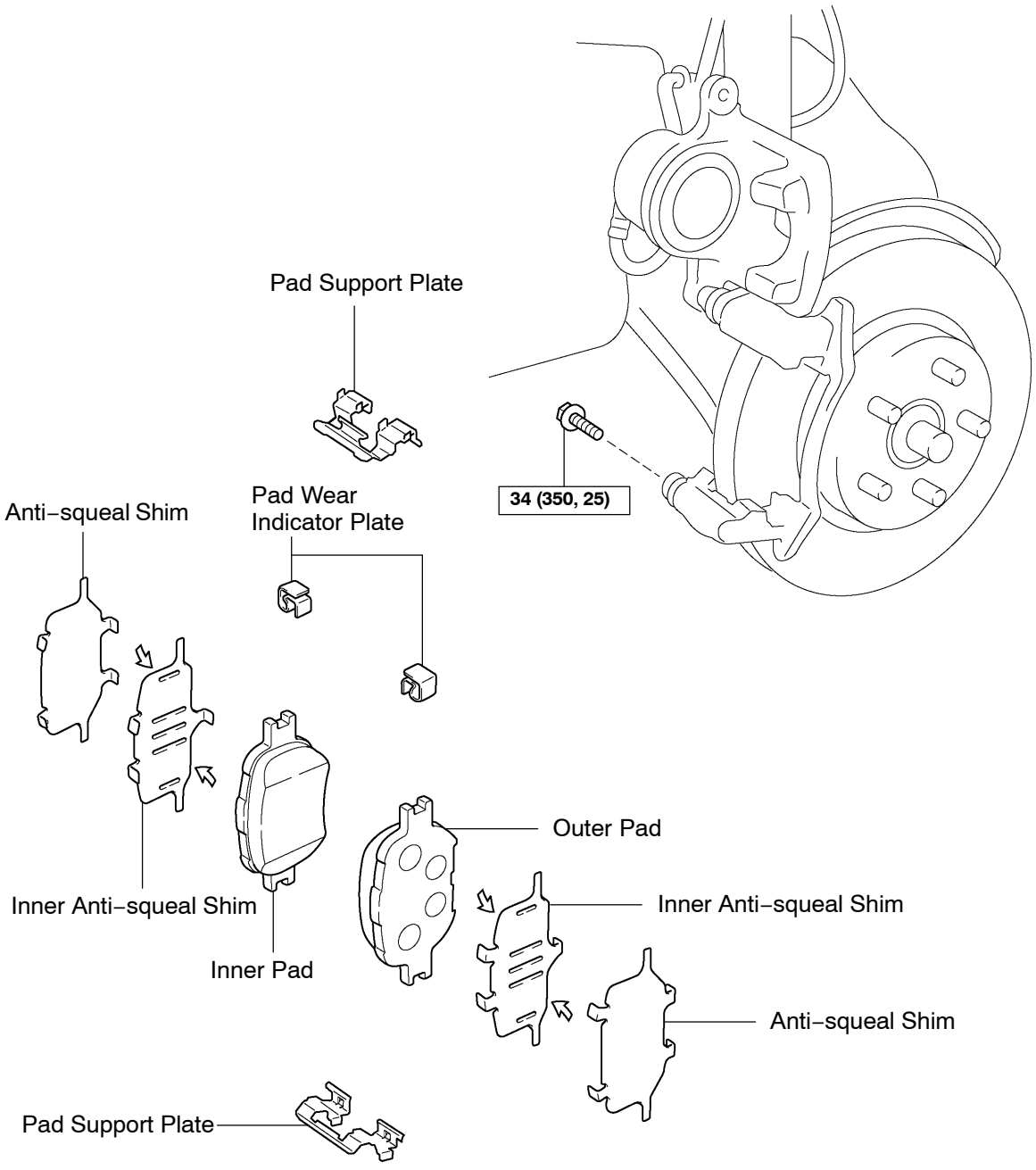
(b) Install the finish panel and lower No. 1 panel.

11. DO OPERATIONAL CHECK (See page BR–14)

FRONT BRAKE PAD

COMPONENTS

BR0QB–06



N·m (kgf·cm, ft·lbf) : Specified torque

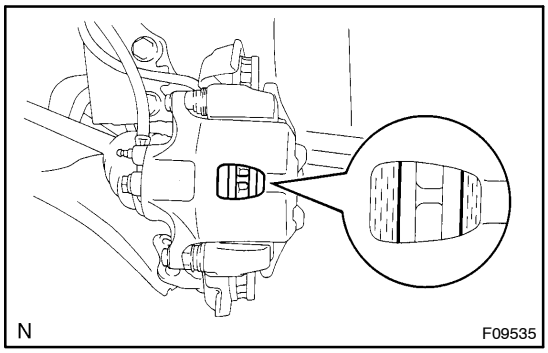
⇦ Disc brake grease

N

F16321

BR148–03

REPLACEMENT

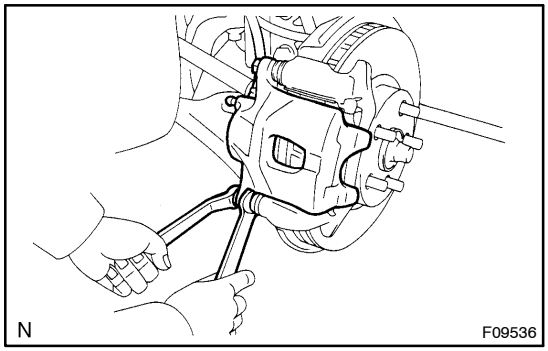


1. REMOVE FRONT WHEEL

2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspection hole and replace the pads if they are not within the specification.

Minimum thickness: 1.0 mm (0.039 in.)



3. LIFT UP CALIPER

(a) Hold the sliding pin and remove the bottom side installation bolt.

HINT:

Do not disconnect the flexible hose from the brake caliper.

(b) Lift up the caliper and suspend it securely.

4. REMOVE 2 PADS WITH 4 ANTI–SQUEAL SHIMS AND PAD 2 WEAR INDICATOR PLATES

5. REMOVE 2 PAD SUPPORT PLATES

NOTICE:

The support plates can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

6. CHECK DISC THICKNESS AND RUNOUT

(See page BR–25)

7. INSTALL PAD SUPPORT PLATES

Install the 2 pad support plates.

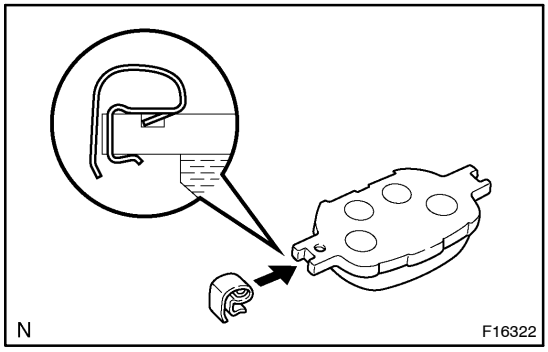
NOTICE:

Do not assemble the upper and lower pad support plates in reverse.

8. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti–squeal shims and wear indicator plate must be replaced together with the pads.



(a) Install a pad wear indicator plate on the each pad.

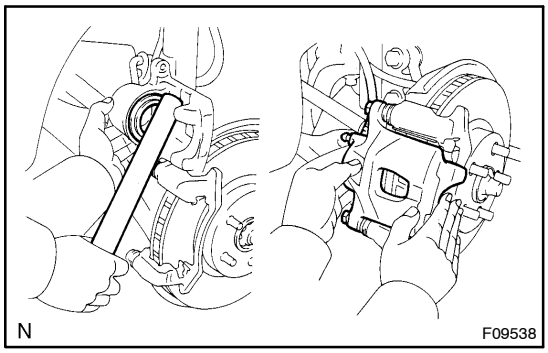
(b) Apply disc brake grease to both sides of each inner anti–squeal shim (See page BR–19).

(c) Install the 2 anti–squeal shims on each pad.

(d) Install the pads with the pad wear indicator plate facing upward.

NOTICE:

There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



9. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in the piston with a hammer handle or similar implement.

HINT:

If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

(c) Install the caliper.

(d) Hold the sliding pin and torque the installation bolts.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

10. INSTALL FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

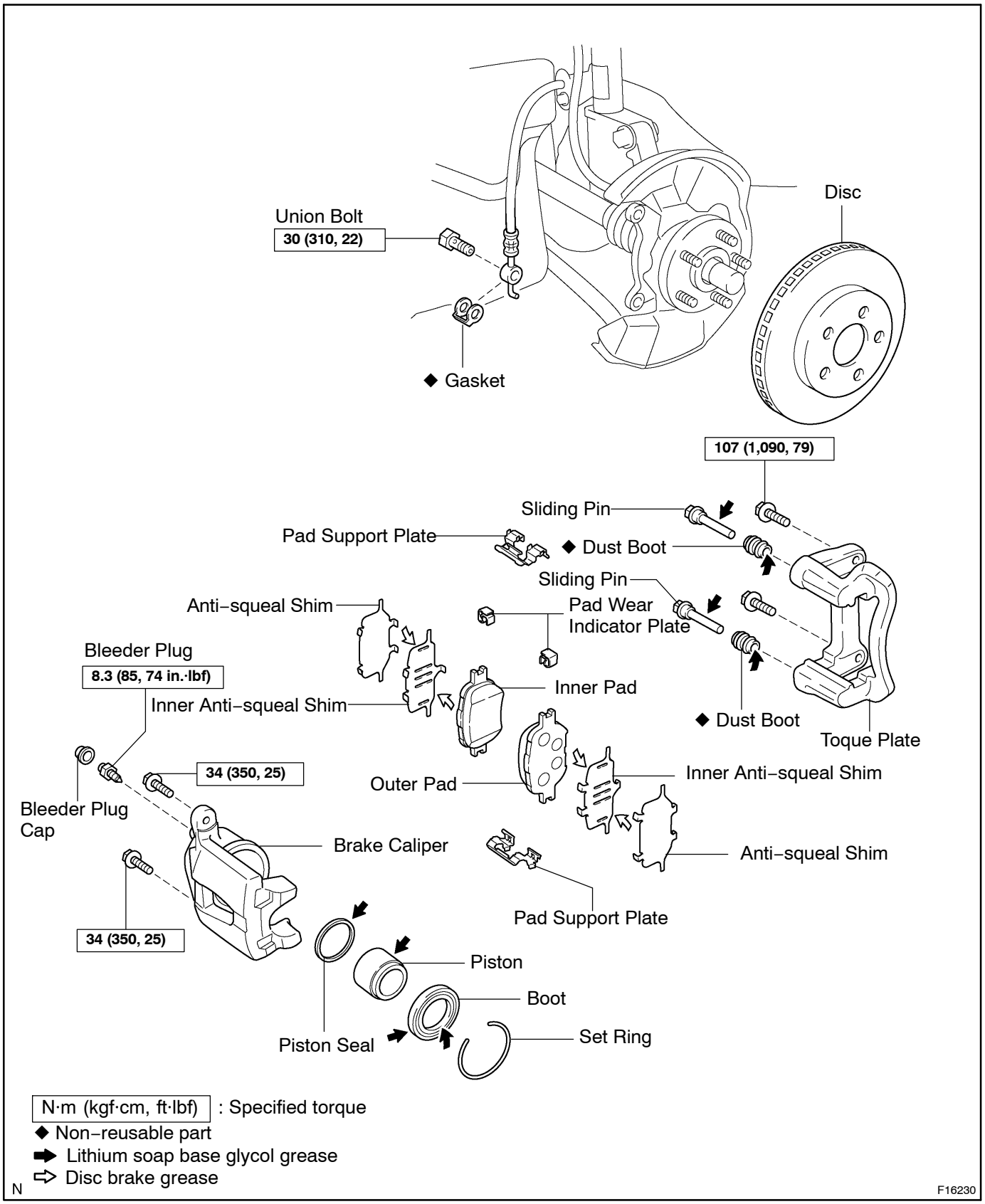
11. DEPRESS BRAKE PEDAL SEVERAL TIMES

12. CHECK THAT FLUID LEVEL IS AT MAX LINE

FRONT BRAKE CALIPER

COMPONENTS

BR1U0–02



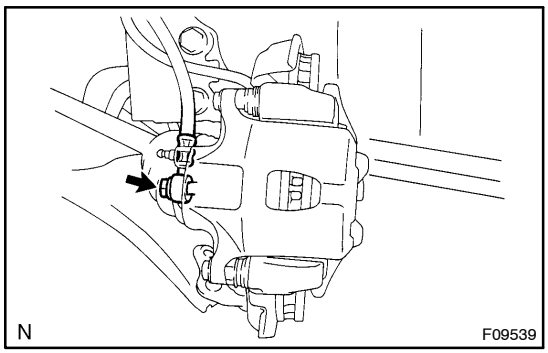
BR0QE–08

REMOVAL

1. REMOVE FRONT WHEEL

Remove the wheel and temporarily fasten the disc with hub nuts.

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



2. DISCONNECT FLEXIBLE HOSE

(a) Remove the union bolt and gasket from the caliper, then disconnect the flexible hose from the caliper.

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

HINT:

At the time of installation, install the flexible hose lock securely in the lock hole in the caliper.

(b) Use a container to catch the brake fluid as it drains out.

3. REMOVE CALIPER

(a) Hold the sliding pin and remove the 2 installation bolts.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

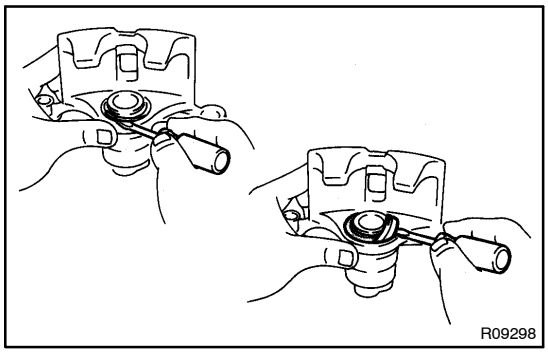
(b) Remove the caliper from the torque plate.

4. REMOVE 2 PADS WITH ANTI–SQUEAL SHIMS

5. REMOVE 2 PAD SUPPORT PLATES

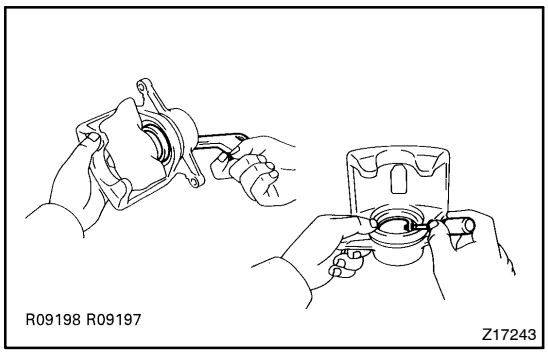
BR0QF–05

DISASSEMBLY



1. REMOVE SET RING AND CYLINDER BOOT

Using a screwdriver, remove the set ring and cylinder boot from the caliper.



2. REMOVE PISTON

(a) Place a piece of cloth or similar, between the piston and the caliper.

(b) Use compressed air to remove the piston from the cylinder.

CAUTION:

Do not place your fingers in front of the piston when using compressed air.

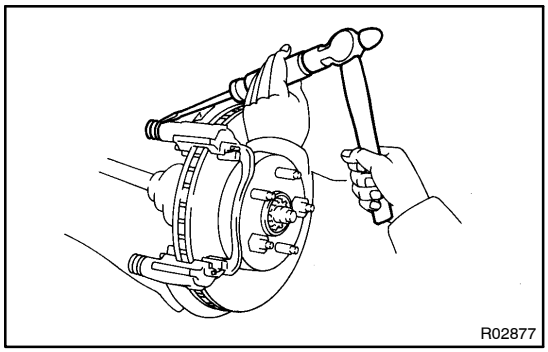
3. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder.

4. REMOVE BLEEDER PLUG CAP AND BLEEDER PLUG

5. REMOVE SLIDING PINS AND DUST BOOTS

(a) Remove the 2 sliding pins from the torque plate.



(b) Using a screwdriver and hammer, tap out the 2 dust boots.

HINT:

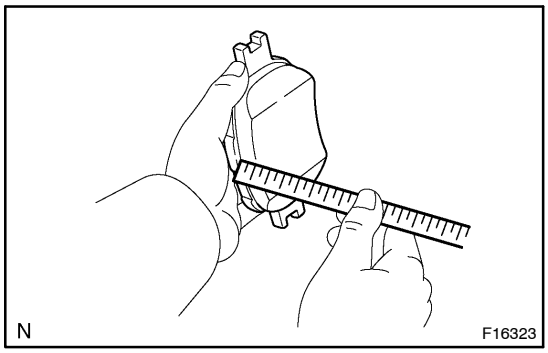
At the time of reassembly, use a 19 mm socket wrench and tap in 2 new dust boots into the torque plate.

NOTICE:

At the time of reassembly, check that the metal plate portion of the dust boot fits snugly in the torque plate.

BR0QG–09

INSPECTION



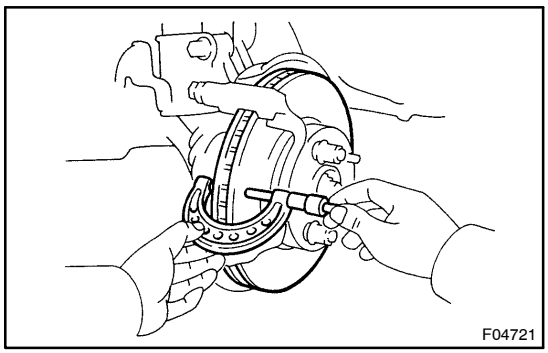
1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness: 11.5 mm (0.453 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the minimum thickness or less, or if the pad has severe, uneven wear.



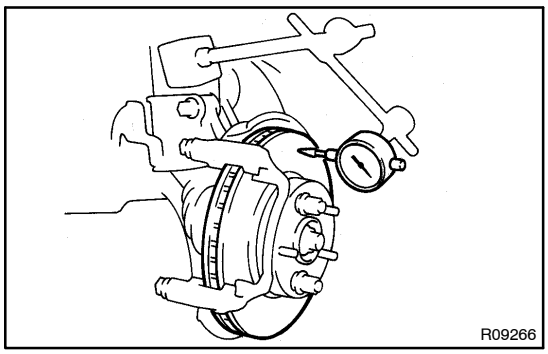
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness: 25.0 mm (0.984 in.)

Minimum thickness: 23.0 mm (0.906 in.)

Replace the disc if the disc's thickness is at the minimum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.

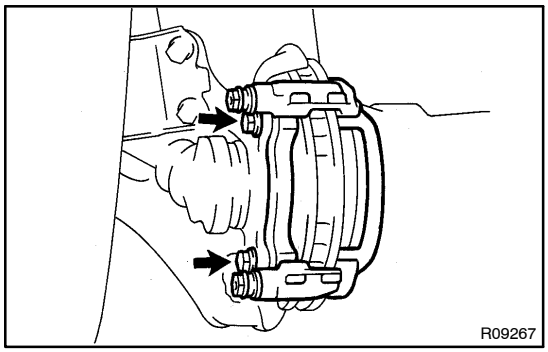


3. MEASURE DISC RUNOUT

Using a dial indicator, measure the disc runout 10 mm (0.39 in.) away from the outer edge of the disc.

Maximum disc runout: 0.05 mm (0.0020 in.)

If the disc's runout is maximum value or greater, check the bearing play in the axial direction and check the axle hub runout (See page SA–13). If the bearing play and axle hub runout are not abnormal, adjust the disc runout or grind it on a "On–car" brake lathe.



4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the 2 bolts and torque plate from the knuckle.

(b) Remove the hub nuts and the disc. Reinstall the disc in the position turned 1/5 from its original position on the hub. Install and torque the hub nuts.

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

Remeasure the disc runout. Make a note of the runout and the disc's position on the hub.

(c) Repeat (b) until the disc has been installed on the 3 remaining hub positions.

(d) If the minimum runout recorded in (b) and (c) is less than 0.05 mm (0.0020 in.), install the disc in that position.

(e) If the minimum runout recorded in (b) and (c) is greater than 0.05 mm (0.0020 in.), replace the disc and repeat step 3.

(f) Install the torque plate and torque the mounting bolts.

Torque: 107 N·m (1,090 kgf·cm, 79 ft·lbf)

BR0QH–03

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–24).

NOTICE:

Apply lithium soap base glycol grease to the parts indicated by arrows (See page BR–22).

BR0QI–04

INSTALLATION

Installation is in the reverse order of removal (See page BR–23).

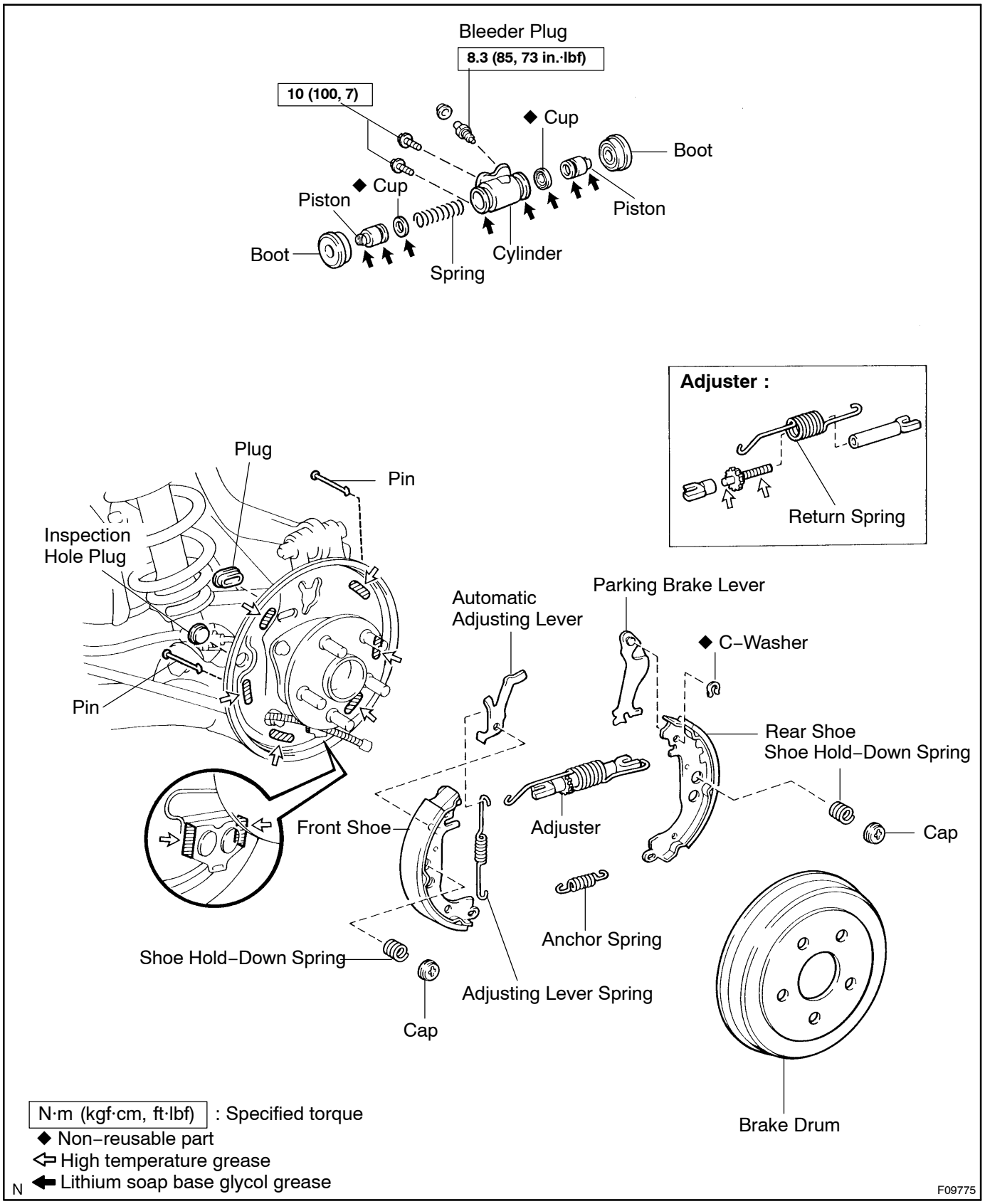
HINT:

- After installation, fill the brake reservoir with brake fluid and bleed brake system (See page BR–4).
- Check for leaks.

REAR DRUM BRAKE

COMPONENTS

BR14A–03



BR14B–03

REMOVAL

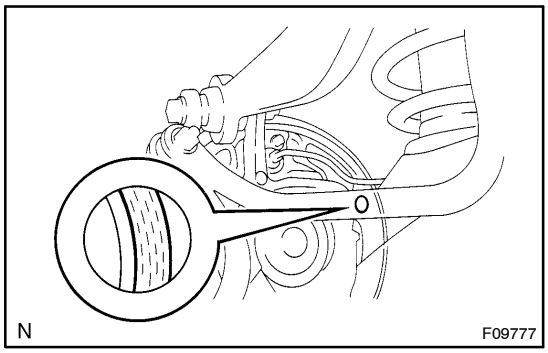
1. INSPECT SHOE LINING THICKNESS

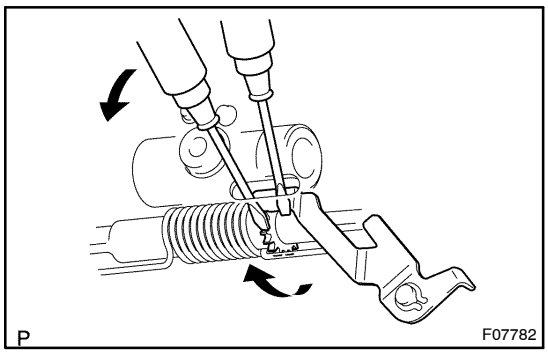
Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL





3. REMOVE BRAKE DRUM

(a) Release the parking brake lever, and remove the brake drum.

HINT:

If the brake drum cannot be removed easily, do the following steps.

(b) Remove the plug and insert a screwdriver through the hole in the backing plate.

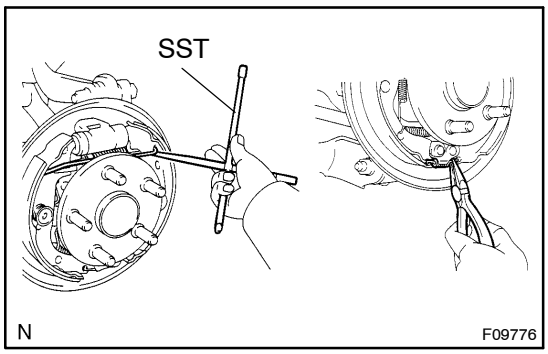
(c) Using another screwdriver, reduce the brake shoe adjuster by turning the adjusting wheel.

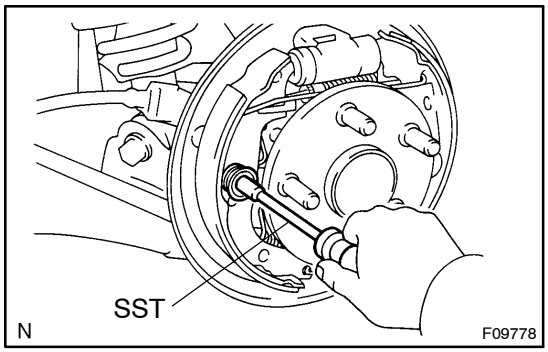
4. REMOVE FRONT SHOE

(a) Using SST, disconnect the adjuster spring from the rear shoe.

SST 09703–30010

(b) Using needle–nose pliers, remove the anchor spring.





(c) Using SST, remove the cap, shoe hold–down spring and pin from the front shoe.

SST 09718–00010

(d) Remove the adjuster and adjuster spring together with the front shoe.

(e) Remove the adjuster together with the adjuster spring from the front shoe.

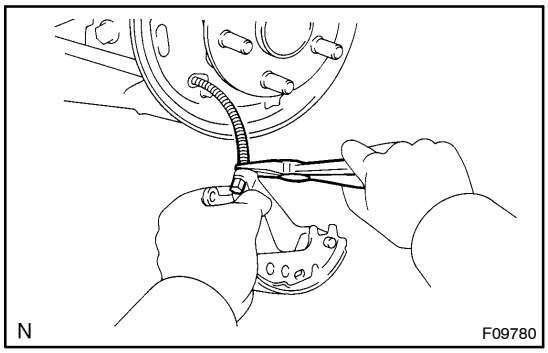
(f) Using needle–nose pliers, remove the adjusting lever spring.

(g) Remove the automatic adjusting lever from the front shoe.

5. REMOVE REAR SHOE

(a) Using SST, remove the cap, shoe hole–down spring and pin.

SST 09718–00010

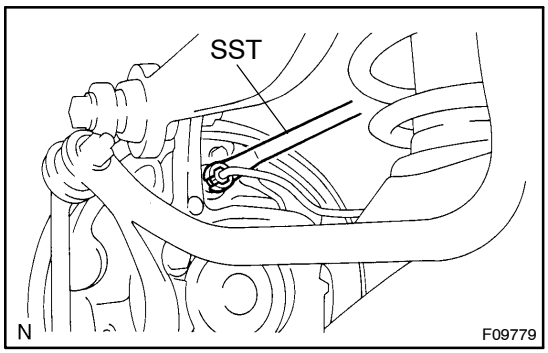


(b) Using needle–nose pliers, disconnect the parking brake cable from the parking brake lever, and remove the rear shoe.

6. REMOVE PARKING BRAKE LEVER

(a) Remove the C–washer.

(b) Remove the parking lever from the rear shoe.



7. REMOVE WHEEL CYLINDER

(a) Using SST, disconnect the brake line. Use container to catch the brake fluid.

SST 09751–36011

Torque:15 N·m (155 kgf·cm, 11 ft·lbf)

(b) Remove the 2 bolts and the wheel cylinder.

Torque:10 N·m (100 kgf·cm, 7 ft·lbf)

8. DISASSEMBLE WHEEL CYLINDER

(a) Remove the 2 boots from the wheel cylinder.

(b) Remove the 2 pistons from the wheel cylinder.

(c) Remove the spring from the wheel cylinder.

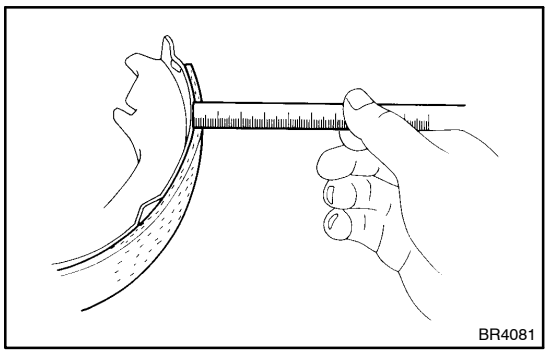
(d) Remove the 2 piston cups from each piston.

BR0RX–11

INSPECTION

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.



2. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the shoe lining thickness.

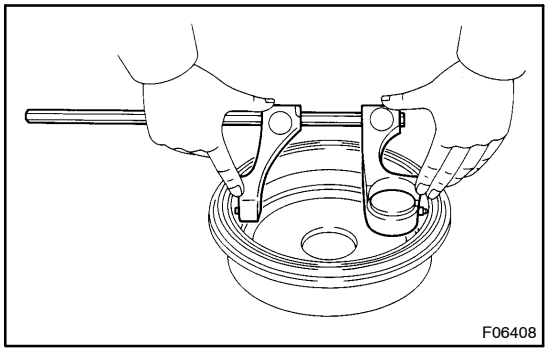
Standard thickness: 4.0 mm (0.157 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the thickness is less than the minimum or shoe lining shows signs of uneven wear, replace the brake shoes.

HINT:

If brake shoes need to be replaced, they must be replaced as a set.



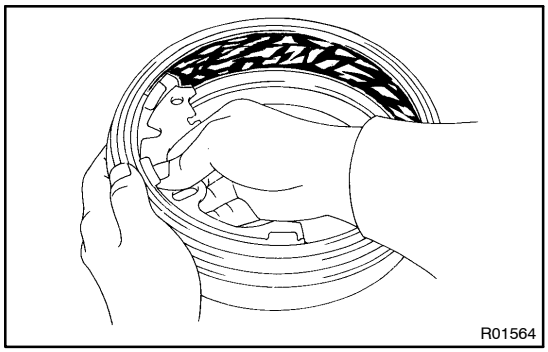
3. MEASURE BRAKE DRUM INSIDE DIAMETER

Using a brake drum gauge or equivalent, measure the inside diameter of the drum.

Standard inside diameter: 200.0 mm (7.874 in.)

Maximum inside diameter: 201.0 mm (7.913 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



4. INSPECT REAR BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

BR11H–07

INSTALLATION

Installation is in the reverse order of removal (See page BR–29).

NOTICE:

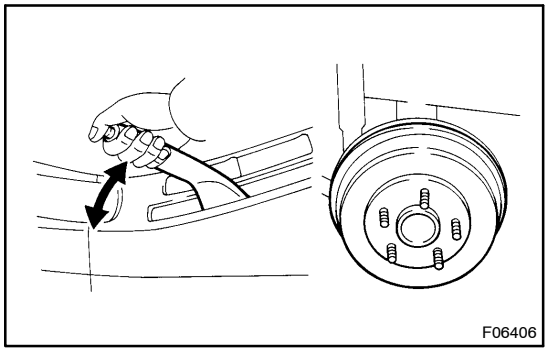
Apply lithium soap base glycol grease and high temperature grease to the parts indicated by the arrows (See page BR–28).

1. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

(a) Move the parking brake lever of the rear shoe back and forth. Check that the adjuster turns.

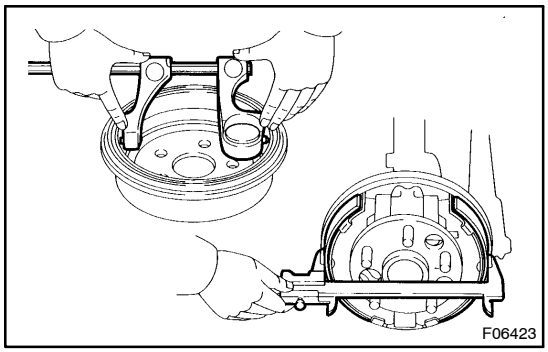
If the adjuster does not turn, check for incorrect installation of the rear brake.

(b) Adjust the adjuster length to the as short as possible.



(c) Install the brake drum.

(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.



2. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the brake drum.

(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.

(c) Install the brake drum.

3. FILL BRAKE RESERVOIR WITH BRAKE FLUID

4. BLEED BRAKE SYSTEM (See page BR–4)

5. CHECK FOR LEAKS

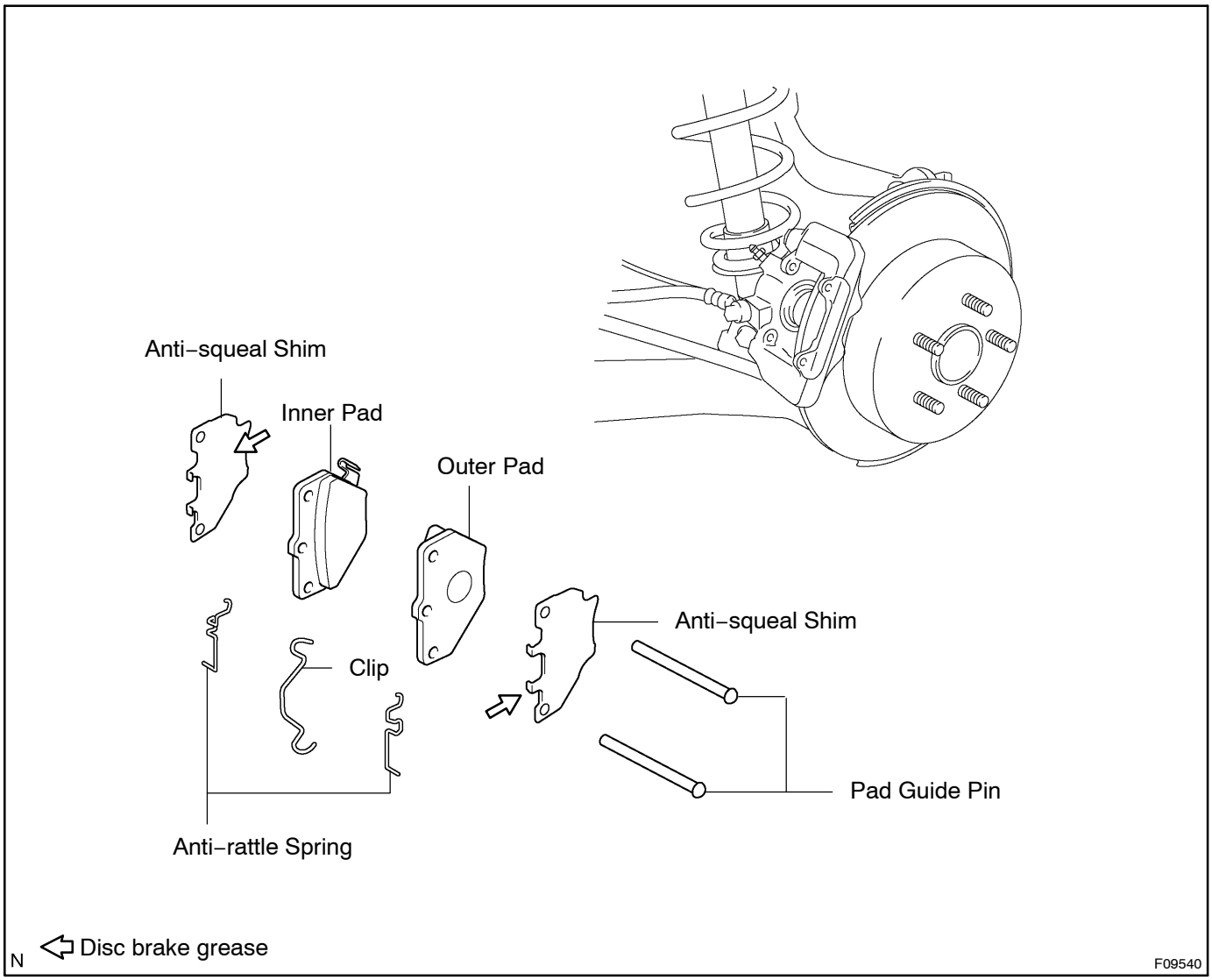
6. INSTALL REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

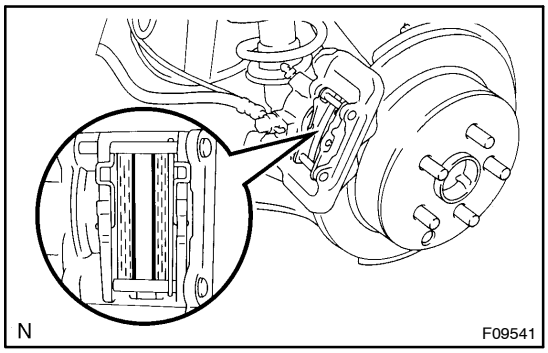
REAR BRAKE PAD

COMPONENTS

BR0QJ–09



BR14C–03



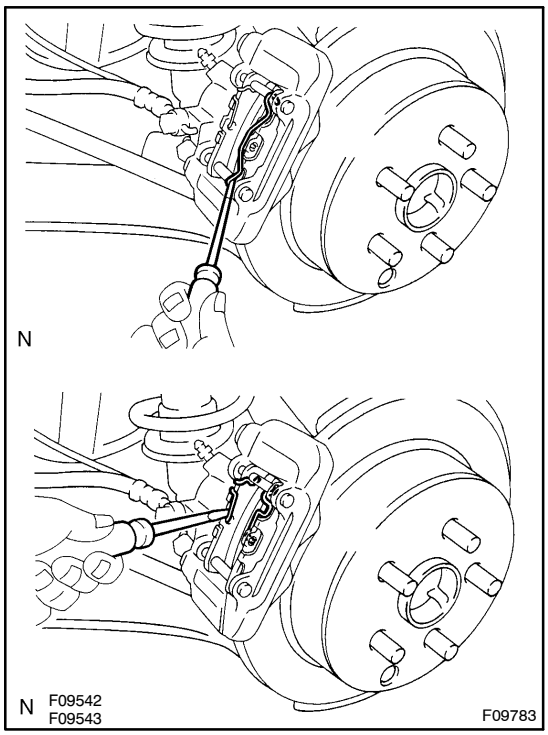
REPLACEMENT

1. REMOVE REAR WHEEL

2. INSPECT PAD LINING THICKNESS

Check the pad thickness.

Minimum thickness: 1.0 mm (0.039 in.)



3. REMOVE CLIP, 2 ANTI–RATTLE SPRINGS AND 2 PAD GUIDE PINS

(a) Using a screwdriver, remove the clip and 2 anti–rattle springs.

NOTICE:

- **Do not deform the clip and anti–rattle spring.**
- **The clip and anti–rattle spring can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.**

(b) Remove the 2 pad guide pins.

4. REMOVE PADS AND ANTI–SQUEAL SHIMS

(a) Remove the 2 pads.

(b) Remove the anti–squeal shim from each pad.

5. CHECK DISC THICKNESS AND RUNOUT (See page BR–39)

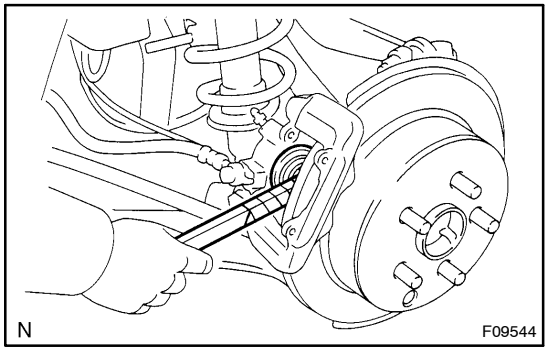
6. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti–squeal shims must be replaced together with the pads.

(a) Apply disc brake grease to inside of anti–squeal shims (See page BR–33).

(b) Install the anti–squeal shim on each pad.



(c) Draw out a small amount of brake fluid from the reservoir.

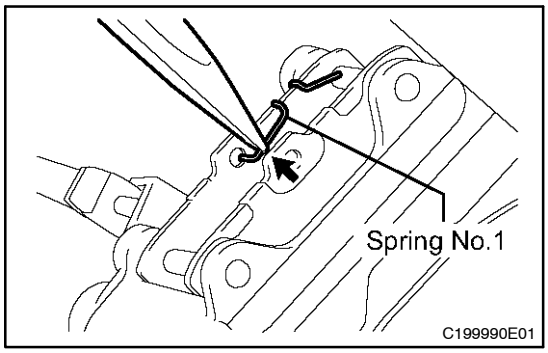
(d) Press in the piston with a hammer handle or equivalent.

HINT:

- Tape the hammer handle before use.
- If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

(e) Install the two brake pads with the anti–squeal shims to the brake caliper.

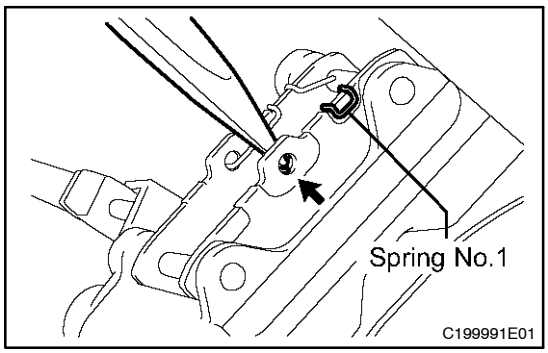
(f) Install the two guide pins to fix the brake pads.



7. INSTALL SPRING NO.1

(a) Hook the spring upper portion to the guide pin No.1.

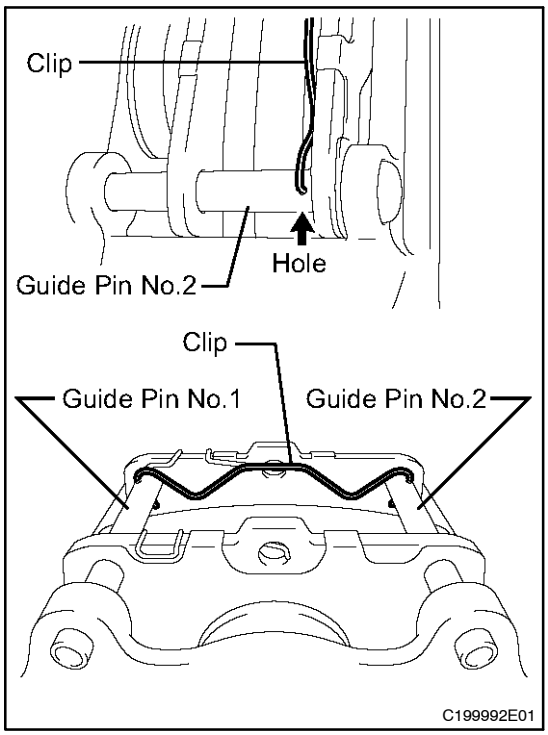
(b) Hook the spring lower portion to the center hole of the brake pad.



8. INSTALL SPRING NO.2

(a) Hook the spring upper portion to the guide pin No.1.

(b) Hook the spring lower portion to the center hole of the brake pad.



9. FIX GUIDE PINS WITH CLIP

(a) Insert the clip end into the hole of the guide pin No.1.

(b) Insert the other clip end into the hole of the guide pin No.2.

NOTICE:

The clip should be fully inserted into the guide pin No.1 and No.2. If not, the guide pins will come off and the brake caliper will be broken.

10. INSTALL REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

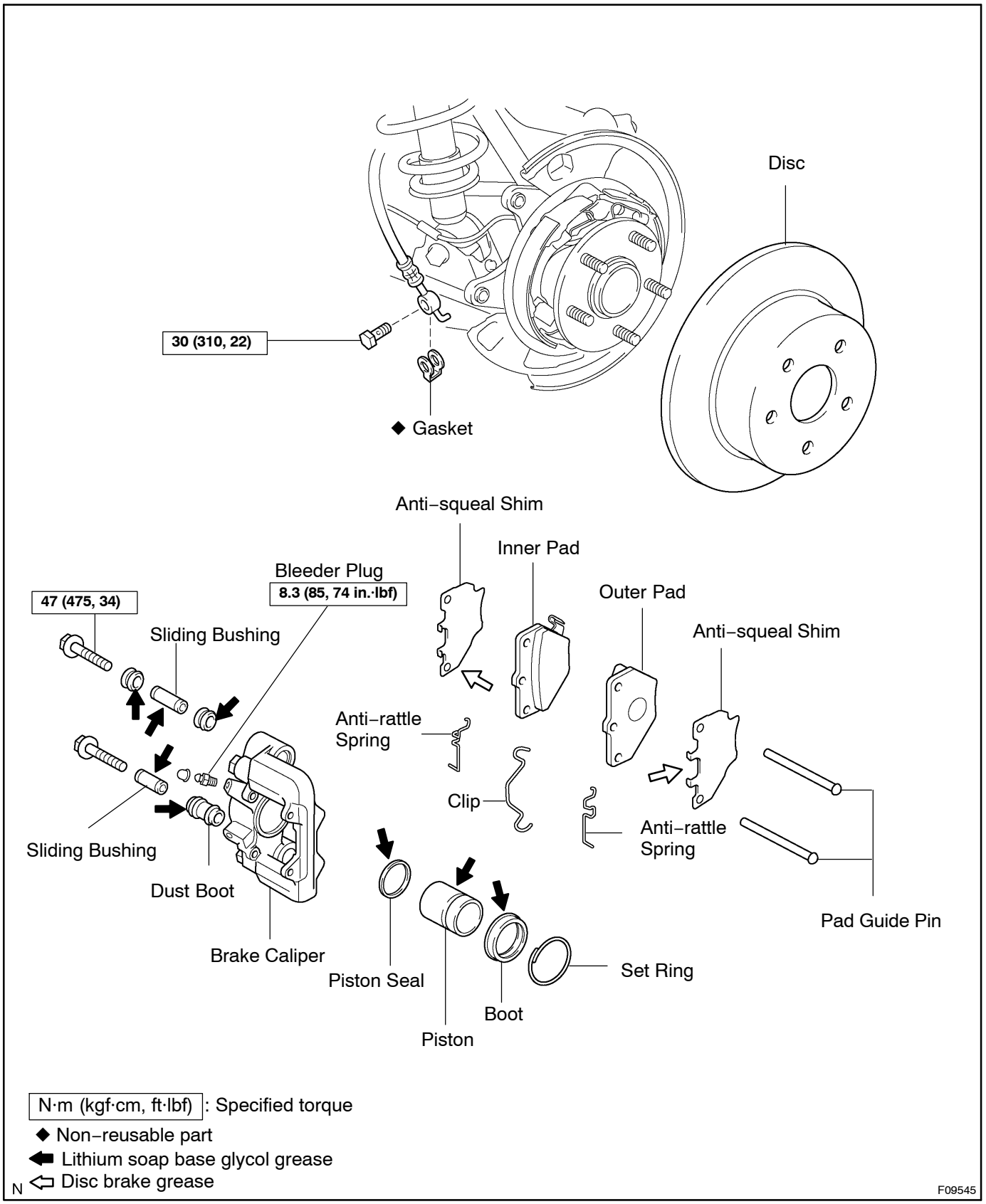
11. DEPRESS BRAKE PEDAL SEVERAL TIMES

12. CHECK THAT FLUID LEVEL IS AT MAX LINE

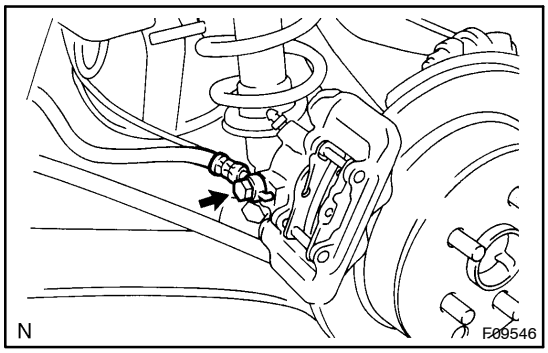
REAR BRAKE CALIPER

COMPONENTS

BR0QL–09



BR14D–04



REMOVAL

1. REMOVE REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. DISCONNECT FLEXIBLE HOSE

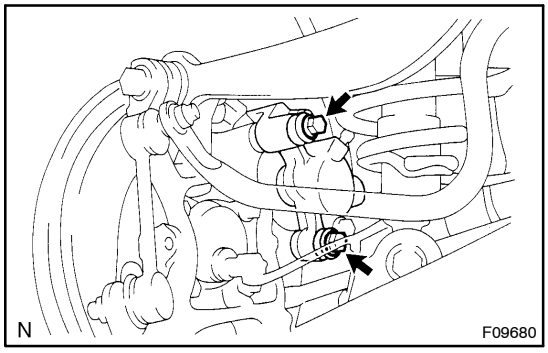
(a) Remove the union bolt and gasket from the caliper, then disconnect the flexible hose from the caliper.

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

HINT:

At the time of installation, insert the flexible hose lock securely in the lock hole in the caliper.

(b) Use a container to catch the brake fluid as it drains out.



3. REMOVE CALIPER

(a) Remove the 2 installation bolts and caliper.

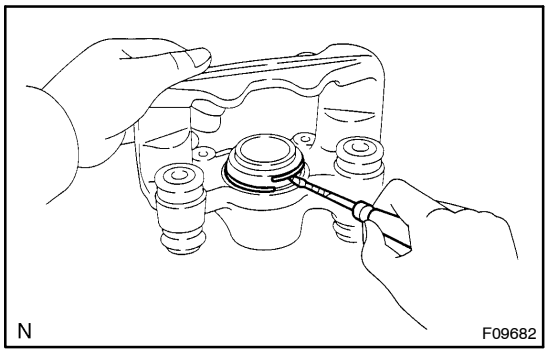
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

(b) Remove the caliper from the torque plate.

4. REMOVE 2 PADS WITH ANTI–SQUEAL SHIMS

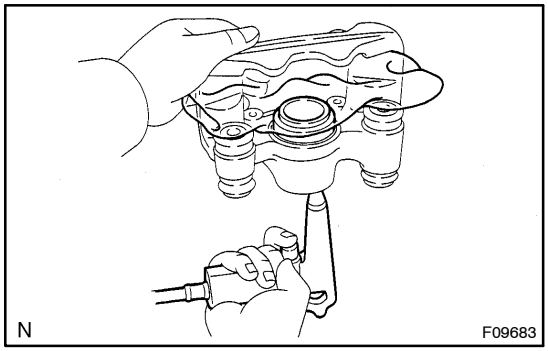
BR14E–04

DISASSEMBLY



1. REMOVE SET RING AND CYLINDER BOOT

Using a screwdriver, remove the set ring and cylinder boot.



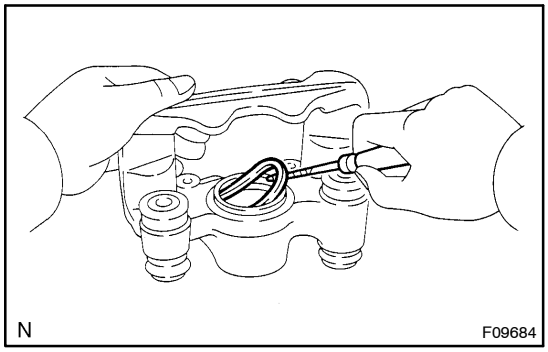
2. REMOVE PISTON

(a) Put a piece of cloth or an equivalent between the piston and caliper.

(b) Use compressed air to remove the piston from the cylinder.

CAUTION:

Do not place your fingers in front of the piston when using compressed air.



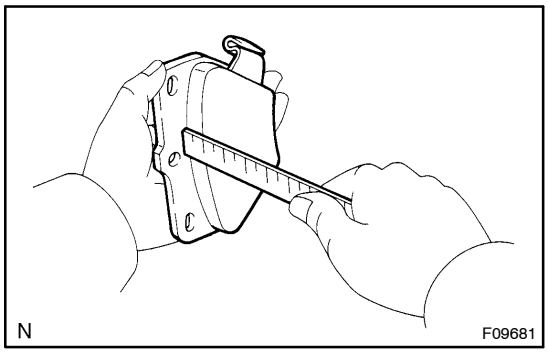
3. REMOVE PISTON SEAL FROM CYLINDER

Using a screwdriver, remove the piston seal.

4. REMOVE 2 SLIDING BUSHINGS AND 3 DUST BOOTS

BR14F–05

INSPECTION



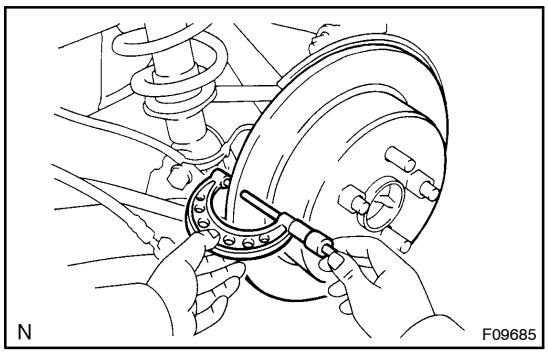
1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the minimum thickness or less, or if the pad has severe, uneven wear.



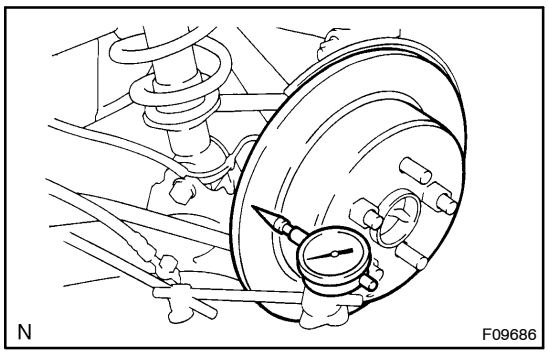
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness: 9.0 mm (0.354 in.)

Minimum thickness: 7.5 mm (0.295 in.)

Replace the disc if the disc's thickness is at the minimum thickness or less. Replace the disc or grind it on a lathe if it is scored or worn unevenly.



3. MEASURE DISC RUNOUT

Using a dial indicator, measure disc runout at a position 10 mm (0.39 in.) from the outside edge.

Maximum disc runout: 0.15 mm (0.0059 in.)

If the disc's runout is at the maximum value or greater, check the bearing play is in the axial direction and check the axle hub runout (See page SA–56). If the bearing play and axle hub runout are not abnormal, adjust the disc runout or grind it on a "On–car" brake lathe.

4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the hub nuts and the disc. Reinstall the disc in the position turned 1/5 from its original position on the hub. Install and torque the hub nuts.

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

Remeasure the disc runout. Make a note of the runout and the disc's position on the hub.

(b) Repeat (a) until the disc has been installed on the 3 remaining hub positions.

(c) If the minimum runout recorded in (a) and (b) is less than 0.15 mm (0.0059 in.), install the disc in that position.

(d) If the minimum runout recorded in (a) and (b) is greater than 0.15 mm (0.0059 in.), replace the disc and repeat step 3.

BR0QP–03

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–38).

NOTICE:

Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR–36).

BR0B7–09

INSTALLATION

Installation is in the reverse order of removal (See page BR–37).

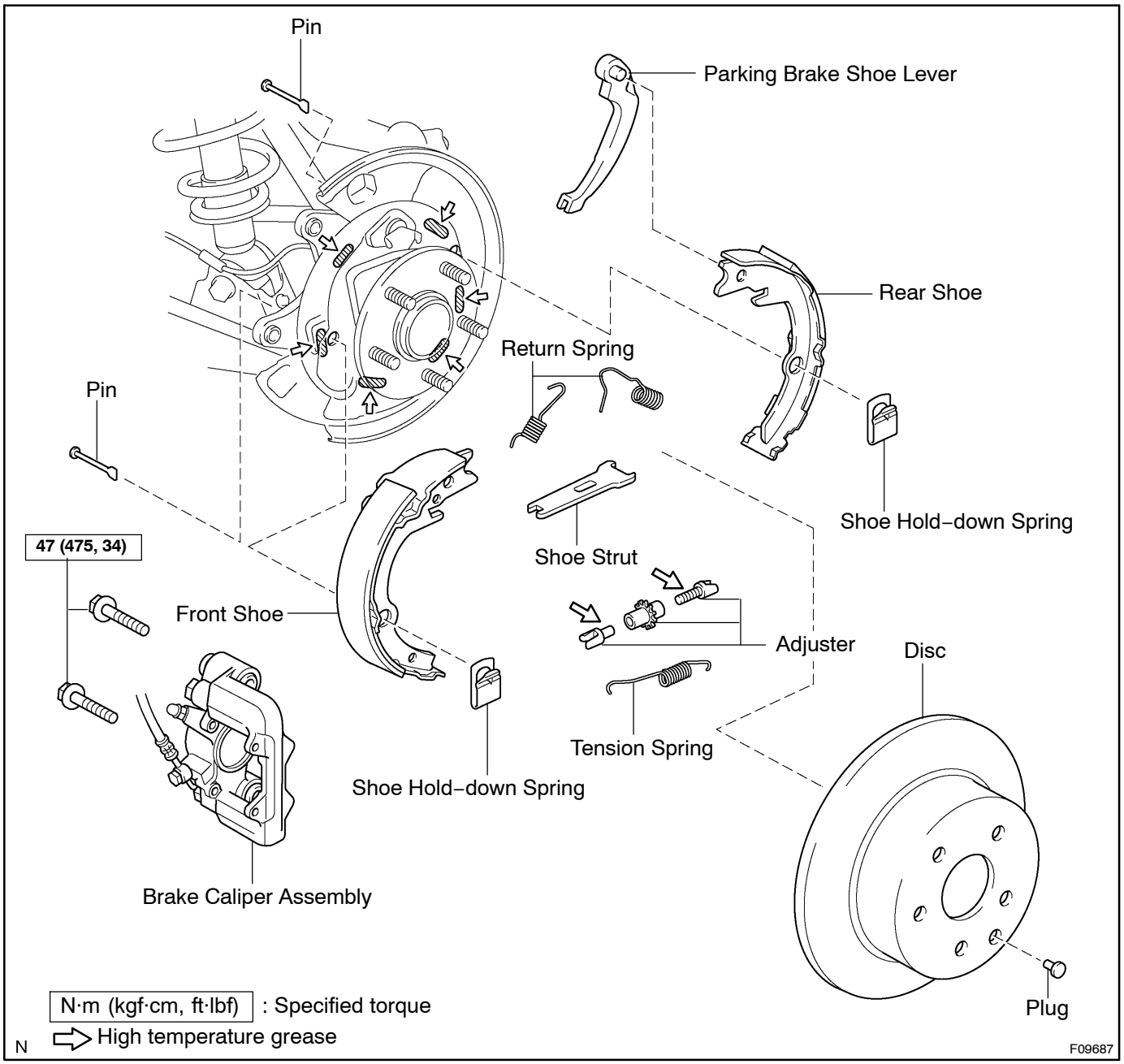
HINT:

- After installation, fill the brake reservoir with brake fluid and bleed the brake system (See page BR–4).
- Check for leaks.

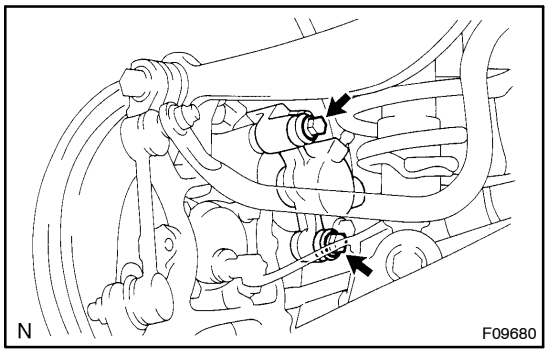
PARKING BRAKE

COMPONENTS

BR0QR–07



BR0QS–04



DISASSEMBLY

1. REMOVE REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE REAR DISC BRAKE ASSEMBLY

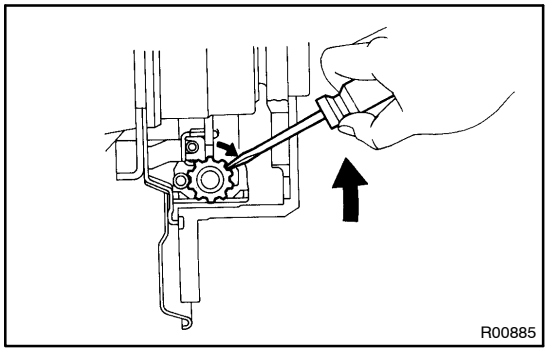
(a) Remove the 2 installation bolts and rear brake caliper.

Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

HINT:

Do not disconnect the flexible hose from the brake caliper.

(b) Suspend the disc brake securely. Ensure that the hose is not stretched.

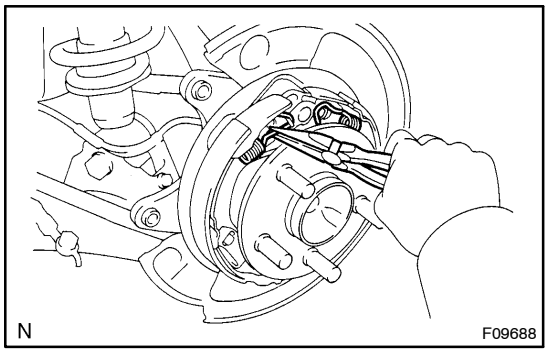


3. REMOVE DISC

Release the parking brake lever, and remove the disc.

HINT:

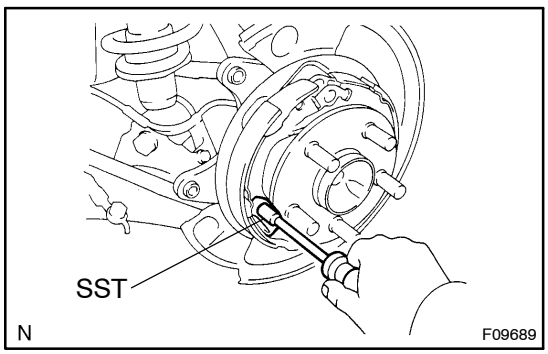
If the disc cannot be removed easily, turn the shoe adjuster until the wheel turns freely.



4. REMOVE SHOE RETURN SPRINGS AND TENSION SPRING

Using needle–nose pliers, remove the 2 shoe return springs and tension spring.

5. REMOVE SHOE STRUT



6. REMOVE FRONT SHOE AND ADJUSTER

(a) Using SST, remove the shoe hold–down spring and pin from the front shoe.

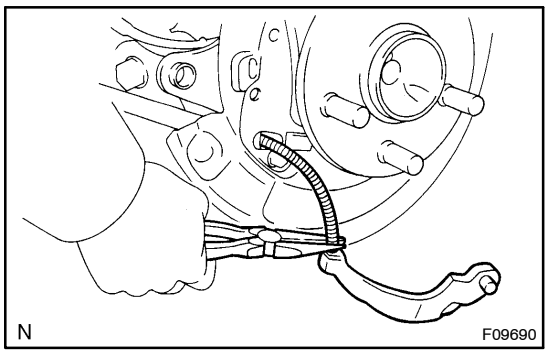
SST 09718–00010

(b) Remove the front shoe and adjuster.

7. REMOVE REAR SHOE

(a) Using SST, remove the shoe hold–down spring and pin from the rear shoe.
SST 09718–00010

(b) Disconnect the rear shoe from the parking brake shoe lever, and remove rear shoe.



8. REMOVE PARKING BRAKE SHOE LEVER

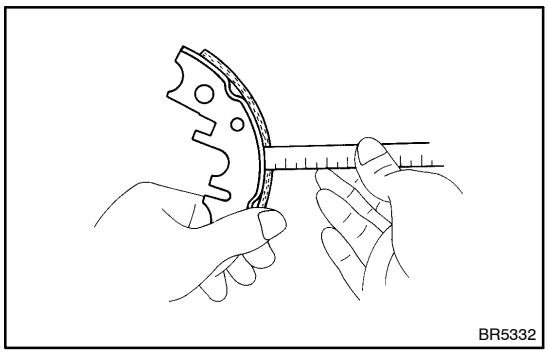
Using needle–nose pliers, disconnect the parking brake cable from the parking brake shoe lever.

BR14G–02

INSPECTION

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.



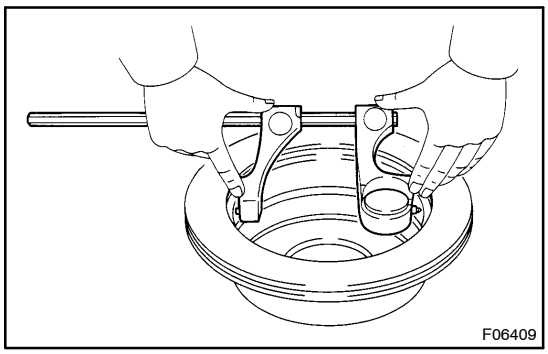
2. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the thickness of the shoe lining.

Standard thickness: 2.0 mm (0.079 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the lining thickness is at the minimum thickness or less, or if there is severe, uneven wear, replace the brake shoe.



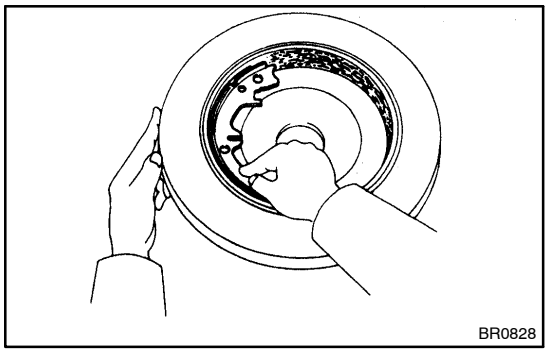
3. MEASURE DISC INSIDE DIAMETER

Using a brake drum gauge or equivalent, measure the inside diameter of the disc.

Standard inside diameter: 173.0 mm (6.811 in.)

Maximum inside diameter: 174.0 mm (6.850 in.)

Replace the disc if the inside diameter is at the maximum value or more. Replace the disc or grind it with a lathe if the disc is scored or is worn unevenly.



4. INSPECT PARKING BRAKE LINING AND DISC FOR PROPER CONTACT

Apply chalk to the inside surface of the disc, then grind down the brake shoe lining to fit. If the contact between the disc and the brake shoe lining is improper, repair it using a brake shoe grinder or replace the brake shoe assembly.

BR0QU–05

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–43).

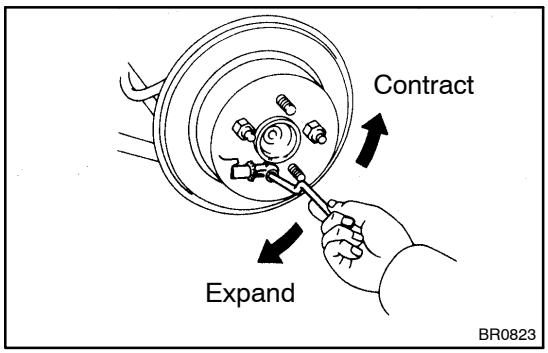
NOTICE:

Apply high temperature grease to the parts indicated by the arrows (See page BR–42).

1. ADJUST PARKING BRAKE SHOE CLEARANCE

(a) Temporarily install the hub nuts.

(b) Remove the hole plug.



(c) Turn the adjuster and expand the shoes until the disc locks.

(d) Return the adjuster 8 notches.

(e) Install the hole plug.

2. SETTLING PARKING BRAKE SHOES AND DISC

(a) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road.

(b) With the parking brake release button pushed in, pull on the lever with 98 N (10 kgf, 19.8 lbf) of force.

(c) Drive the vehicle for about 400 meters (0.25 mile) in this condition.

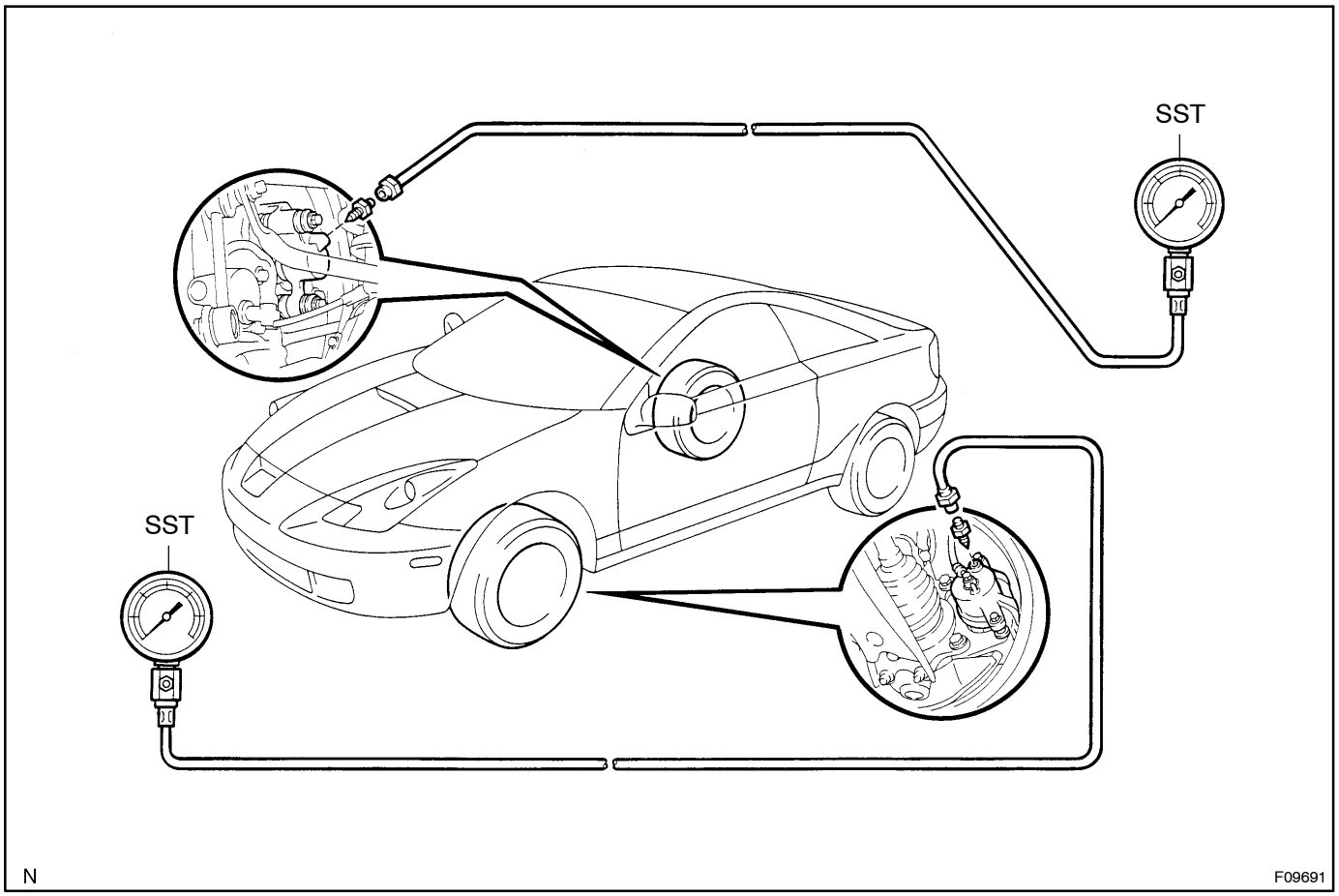
(d) Repeat this procedure 2 or 3 times.

3. CHECK AND ADJUST PARKING BRAKE LEVER TRAVEL (See page BR–9)

PROPORTIONING VALVE (P VALVE)

ON–VEHICLE INSPECTION

BR0QV–07



1. **INSTALL LSPV GAUGE (SST) AND BLEED AIR**
   SST 09709–29018
2. **BLEED AIR FROM FLUID PRESSURE GAUGE**
3. **RAISE MASTER CYLINDER PRESSURE AND CHECK REAR WHEEL CYLINDER OR REAR BRAKE CALIPER PRESSURE**

1ZZ–FE engine:

Master cylinder fluid pressure	Rear wheel cylinder fluid pressure
2,450 kPa (25.0 kgf/cm^2, 355 psi)	2,450 kPa (25.0 kgf/cm^2, 355 psi)
7,850 kPa (80.0 kgf/cm^2, 1,139 psi)	3,800 kPa (38.8 kgf/cm^2, 551 psi)

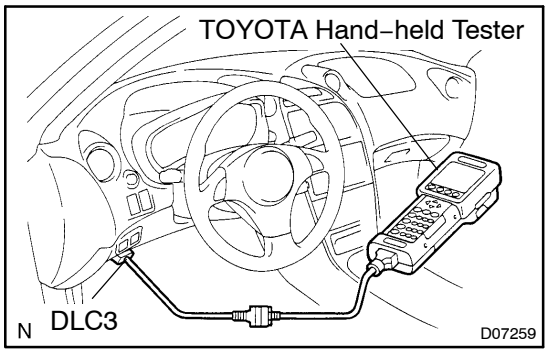
2ZZ–GE engine:

Master cylinder fluid pressure	Rear brake caliper fluid pressure
2,450 kPa (25.0 kgf/cm^2, 355 psi)	2,450 kPa (25.0 kgf/cm^2, 355 psi)
7,850 kPa (80.0 kgf/cm^2, 1,139 psi)	4,450 kPa (45.4 kgf/cm^2, 646 psi)

When inspecting the fluid pressure, inspect the left font and right rear together, and the right front and left rear together.

If the rear fluid pressure is incorrect, replace the P valve assembly.

4. **BLEED BRAKE SYSTEM (See page BR–4)**
5. **CHECK FOR LEAKS**



ABS ACTUATOR

BR1U1–02

ON–VEHICLE INSPECTION

1. CONNECT TOYOTA HAND–HELD TESTER:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Start the engine and run it at idle.

(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

HINT:

Please refer to the TOYOTA hand–held tester operator's manual for further details.

2. INSPECT ACTUATOR MOTOR OPERATION

(a) With the motor relay ON, check the actuator motor operation noise.

(b) Turn the motor relay OFF.

(c) Depress the brake pedal and hold it for about 15 seconds. Check that the brake pedal cannot be depressed.

(d) With the motor relay ON, check that the pedal does not pulsate.

NOTICE:

Do not keep motor relay ON for more than 5 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

(e) Turn the motor relay OFF and release the brake pedal.

3. INSPECT RIGHT FRONT WHEEL OPERATION

NOTICE:

Never turn ON the solenoid which is not described below.

(a) With the brake pedal depressed, perform the following operations.

(b) Turn the SFRH and SFRR solenoid ON simultaneously, and check that the pedal cannot be depressed.

NOTICE:

Do not keep solenoid ON for more than 10 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

(c) Turn the SFRH and SFRR solenoid OFF simultaneously, and check that the pedal can be depressed.

(d) Turn the motor relay ON, and check that the pedal returns.

NOTICE:

Do not keep motor relay ON for more than 5 seconds continuously. When operating it continuously, set the interval of more than 20 seconds.

(e) Turn the motor relay OFF and release the brake pedal.

4. INSPECT OTHER WHEEL OPERATION

As in the same procedure, check the solenoids of other wheels.

HINT:

Left front wheel: SFLH, SFLR

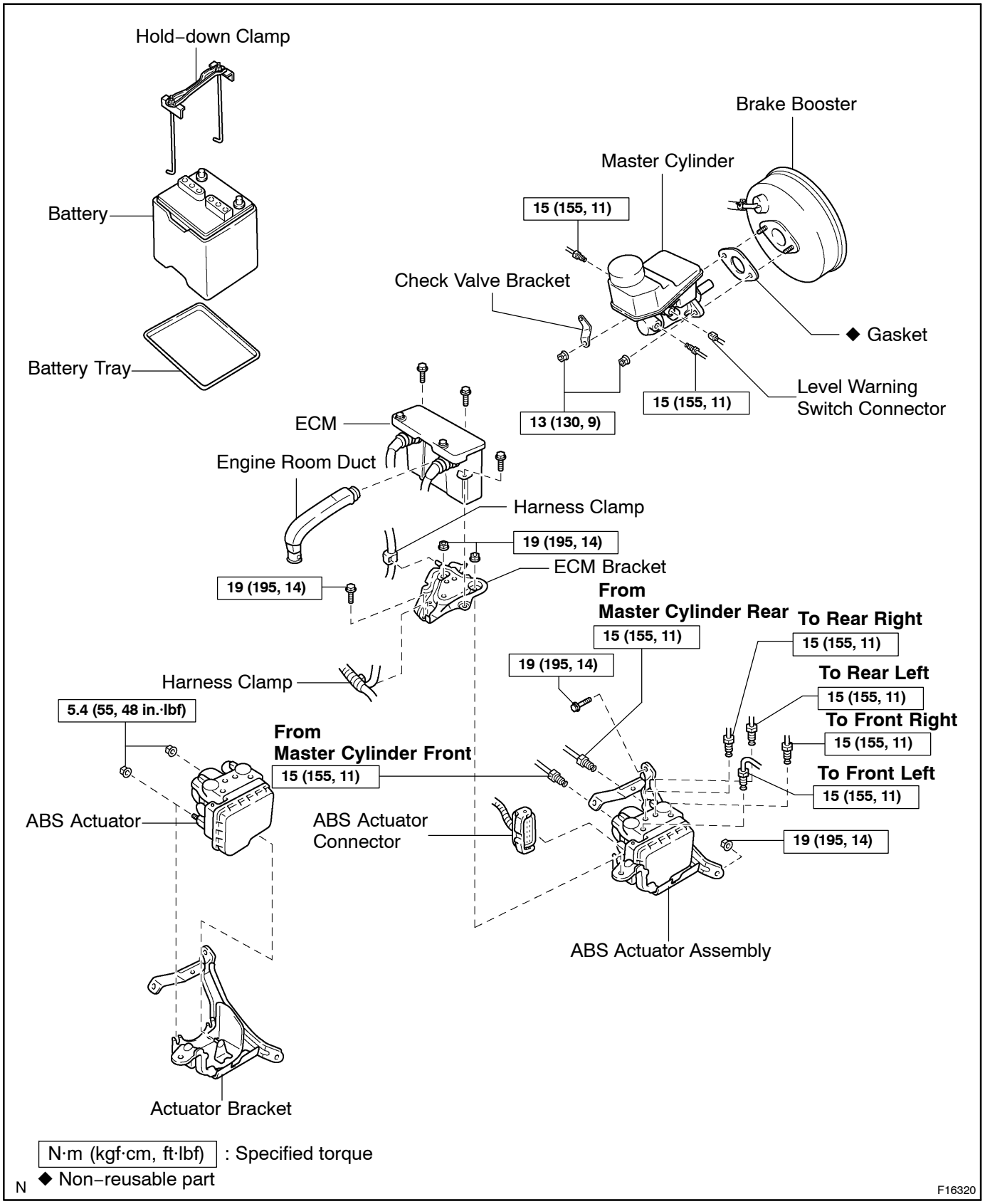
Right rear wheel: SRRH, SRRR

Left rear wheel: SRLH, SRLR

5. CLEAR DTC (See page DI–836)

BR0QX–09

COMPONENTS



BR1U2–03

REMOVAL

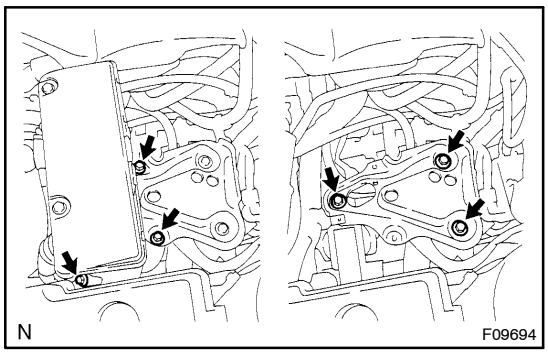
1. REMOVE BATTERY

Remove the hold–down clamp, battery and battery tray.

2. REMOVE MASTER CYLINDER (See page BR–11)

3. REMOVE ECM AND ECM BRACKET

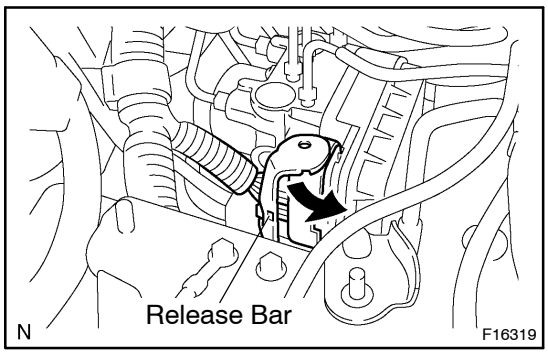
(a) Remove the engine room duct.



(b) Remove the 3 bolts, and move the ECM aside.

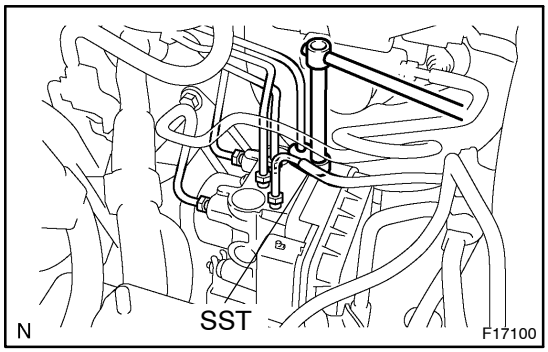
(c) Disconnect the 2 harness clamps, and remove the bolt, 2 nuts and ECM bracket.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



4. DISCONNECT ABS ACTUATOR CONNECTOR

Pull the release bar and disconnect the ABS actuator connector.



5. DISCONNECT BRAKE LINES

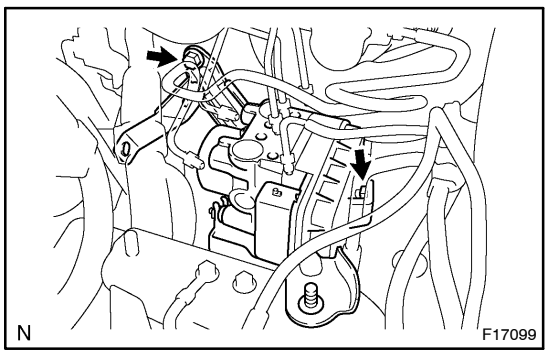
Using SST, disconnect the 6 brake lines.

SST 09023–00101

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

HINT:

- When disconnecting the brake lines, Use tags or make a memo to identify the place to reconnect (See page BR–50).
- At the time of installation, connect each brake line to the correct position (See page BR–50).



6. REMOVE ABS ACTUATOR

(a) Remove the bolt, nut and ABS actuator assembly.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

(b) Remove the 2 nuts and ABS actuator from the actuator bracket.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

BR0QZ–04

INSTALLATION

Installation is in the reverse order of removal (See page BR–51).

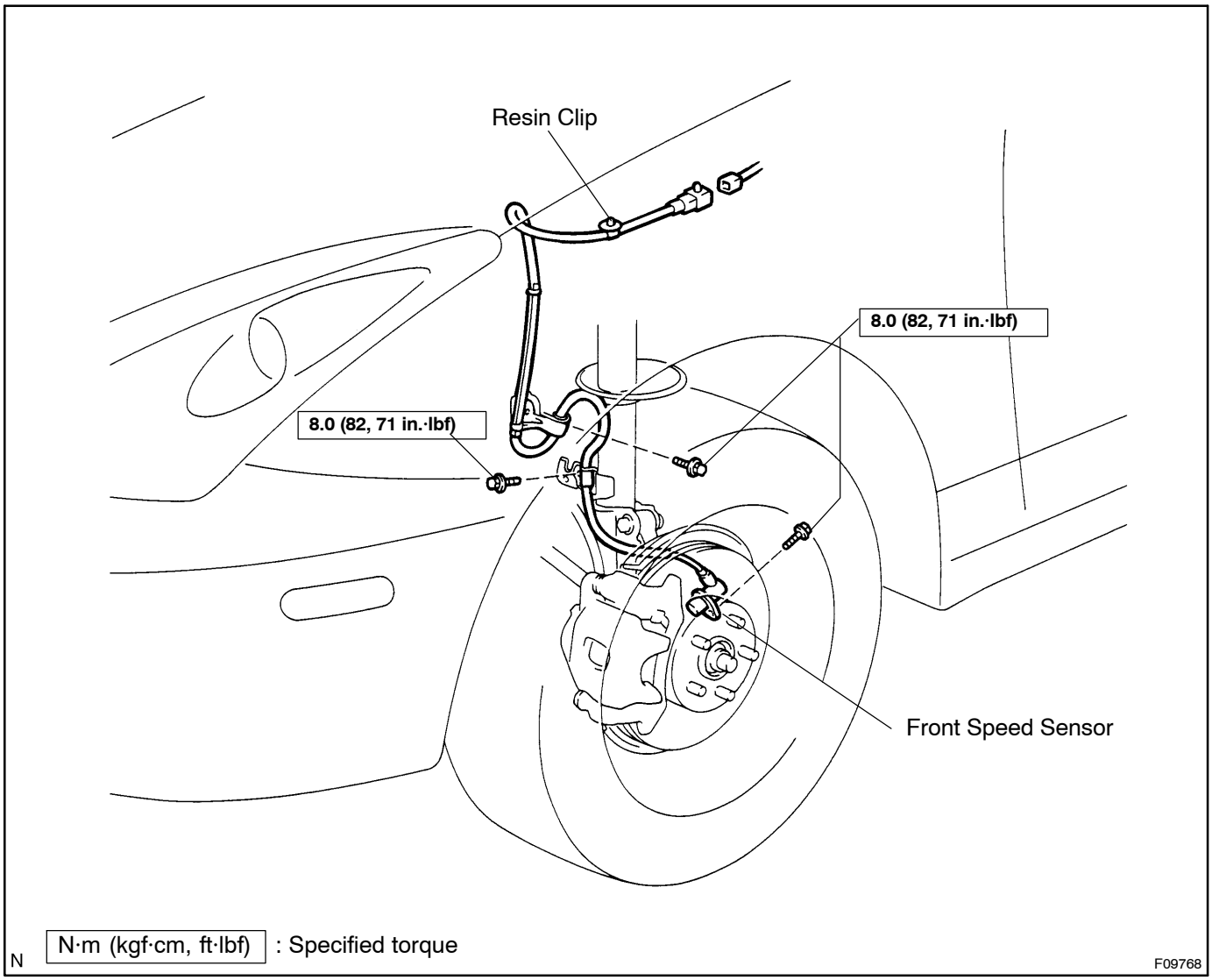
HINT:

- After installation, fill the brake reservoir with brake fluid and bleed brake system (See page BR–4).
- Check for leaks.

FRONT SPEED SENSOR

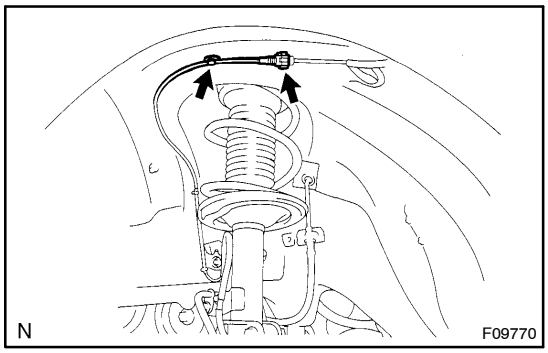
COMPONENTS

BR0R0-08



BR0R1–05

REMOVAL

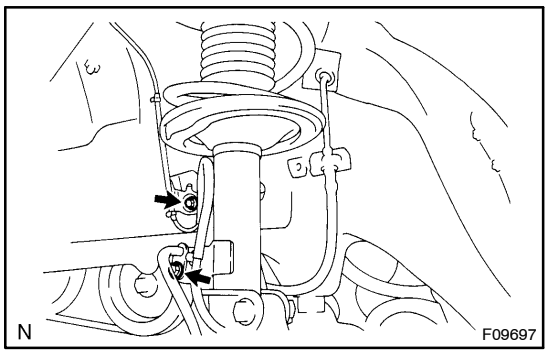


1. DISCONNECT SPEED SENSOR CONNECTOR

(a) Remove the front wheel.
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

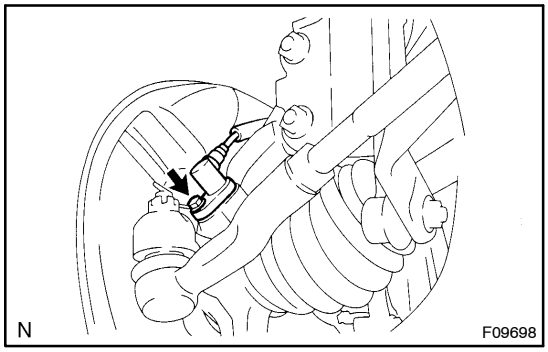
(b) Remove the fender liner.

(c) Disconnect the speed sensor connector and resin clip.



2. REMOVE SPEED SENSOR

(a) Remove the 2 clamp bolts holding the sensor harness from the body and shock absorber.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



(b) Remove the speed sensor installation bolt from the steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NOTICE:

At the time of installation, please refer to the following item.

- **There are no foreign objects on the sensor or the part of the knuckle to which the sensor is to be installed.**
- **The sensor is installed flat against the knuckle when you tighten the bolt.**

BR0R2–04

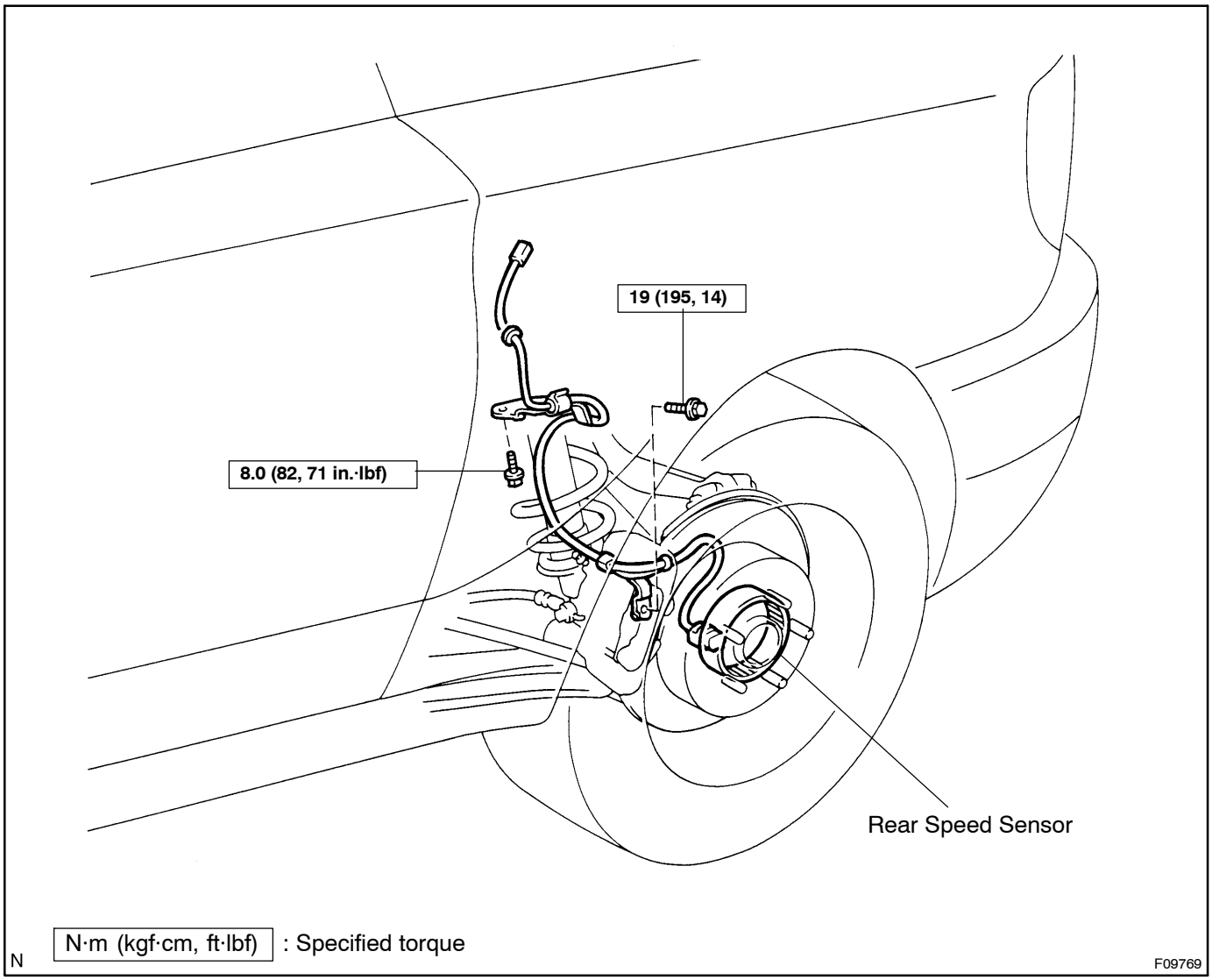
INSTALLATION

Installation is in the reverse order of removal (See page BR–54).
AFTER INSTALLATION, CHECK SPEED SENSOR SIGNAL (See page DI–836)

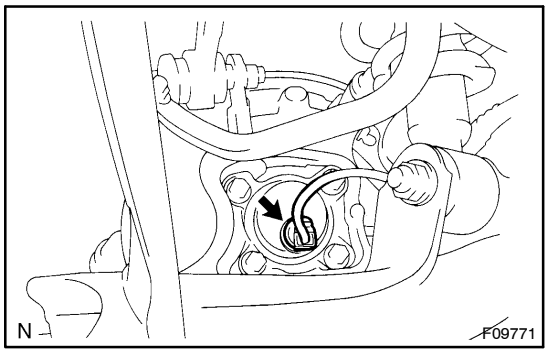
REAR SPEED SENSOR

COMPONENTS

BR0R3–08



BR14I–03



REMOVAL

1. REMOVE REAR WHEEL

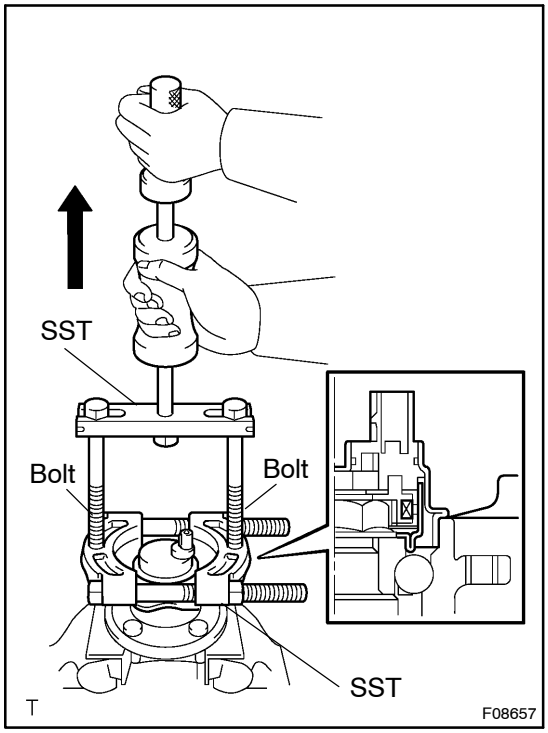
2. DISCONNECT SPEED SENSOR CONNECTOR

Disconnect the connector from the speed sensor.

3. REMOVE SPEED SENSOR WITH REAR AXLE HUB (See Page SA–56)

4. REMOVE SPEED SENSOR

(a) Using a pin punch and hammer, drive out the 2 pins and remove the 2 attachments from SST.
SST 09520–00031



(b) Mount the rear axle hub in a soft jaw vise.

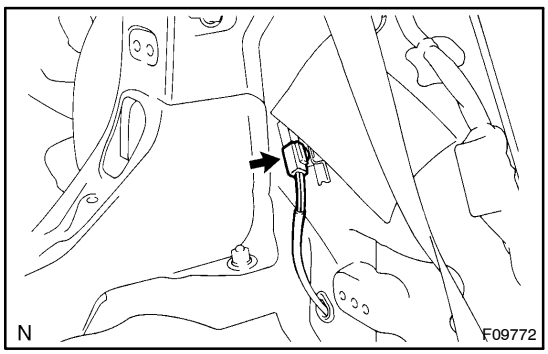
NOTICE:

Replace the axle hub assembly if it is dropped or a strong shock is given to it.

(c) Using SST and 2 bolts (Diameter: 12 mm, Pitch: 1.5 mm), remove the speed sensor.
SST 09520–00031 (09520–00040, 09521–00020), 09950–00020

NOTICE:

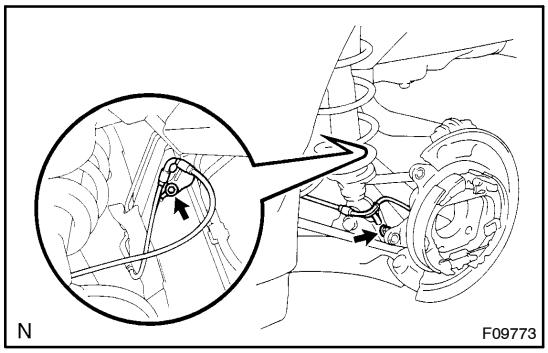
- **If a damage is inflicted to the sensor rotor, replace the axle hub assembly.**
- **Do not scratch the contacting surface of axle hub and speed sensor.**



5. IF NECESSARY, REPLACE SPEED SENSOR WIRE HARNESS

(a) Remove the seat cushion, seatback and quarter trim (See page BO–88).

(b) Disconnect the speed sensor wire harness connector.



(c) Remove the 2 clamp bolts holding the sensor harness from the lower arm and body.
Torque:
Lower arm side: 19 N·m (195 kgf·cm, 14 ft·lbf)
Body side: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

(d) Replace the sensor wire harness with the grommet.

BR14J–04

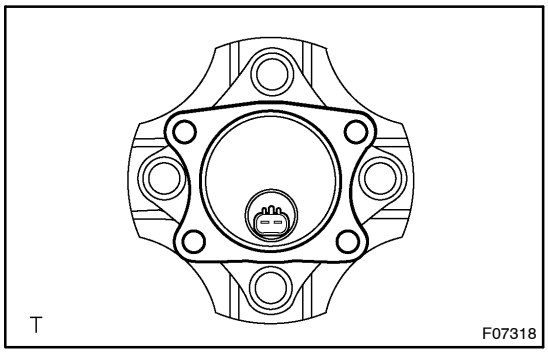
INSTALLATION

1. INSTALL NEW SPEED SENSOR

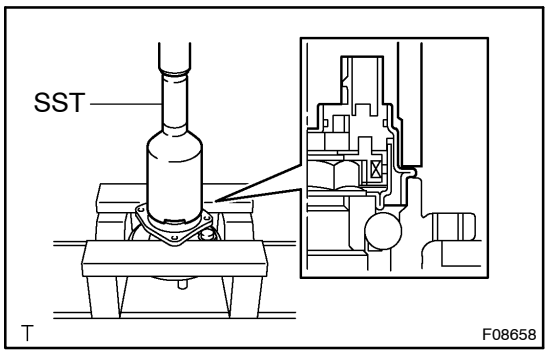
(a) Clean the contacting surface of the axle hub and a new speed sensor.

NOTICE:

Do not stick any foreign objects to the sensor rotor.



(b) Place the speed sensor on the axle hub so that the connector makes the most downward position under the on–vehicle condition.



(c) Using SST and a press, install a new speed sensor to the axle hub.

SST 09214–76011

NOTICE:

- **Do not tap the speed sensor with a hammer directly.**
- **Check that there should be no foreign objects on the speed sensor detection portion.**
- **Press in the speed sensor straight and slowly.**

2. INSTALL SPEED SENSOR WITH REAR AXLE (See page SA–60)

3. CONNECT SPEED SENSOR CONNECTOR

4. INSTALL REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

5. CHECK SPEED SENSOR SIGNAL (See page DI–836)

STEERING SYSTEM

SR08F–10

PRECAUTION

- **Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.**
- **The CELICA is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.**

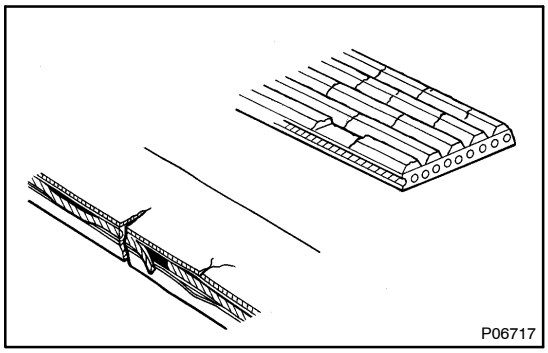
TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

SR08G–10

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in the order shown. If necessary, repair or replace these parts.

Symptom	Suspect Area	See page
Hard steering	1. Tires (Improperly inflated)	SA–3
	2. Power steering fluid level (Low)	SR–5
	3. Drive belt (Loose)	SR–3
	4. Front wheel alignment (Incorrect)	SA–5
	5. Steering system joints (Worn)	–
	6. Suspension arm ball joints (Worn)	SA–49
	7. Steering column (Binding)	–
	8. Power steering vane pump	SR–24
	9. Power steering gear	SR–35
Poor return	1. Tires (Improperly inflated)	SA–3
	2. Front wheel alignment (Incorrect)	SA–5
	3. Steering column (Binding)	–
	4. Power steering gear	SR–35
Excessive play	1. Steering system joints (Worn)	–
	2. Suspension arm ball joints (Worn)	SA–49
	3. Intermediate shaft, Sliding yoke (Worn)	–
	4. Front wheel bearing (Worn)	SA–13
	5. Power steering gear	SR–35
Abnormal noise	1. Power steering fluid level (Low)	SR–5
	2. Steering system joints (Worn)	–
	3. Power steering vane pump	SR–24
	4. Power steering gear	SR–35



DRIVE BELT

SR08H–08

INSPECTION

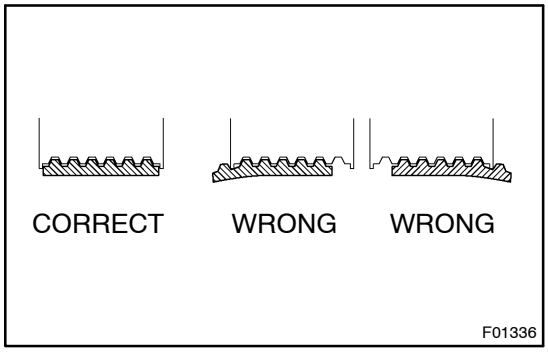
INSPECT DRIVE BELT

Visually check the drive belt for excessive wear, frayed cords, etc.

If any defect has been found, replace the drive belt.

HINT:

- Cracks on the rib side of a belt are considered acceptable. If the missing chunks from the ribs are found on the drive belt, it should be replaced.



- After installing a drive belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the drive belt has not slipped out of the groove on the bottom of the pulley.

POWER STEERING FLUID

SR08I–09

BLEEDING

1. CHECK FLUID LEVEL (See page SR–5)

2. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS

3. TURN STEERING WHEEL

With the engine stopped, turn the steering wheel slowly from lock to lock several times.

4. LOWER VEHICLE

5. START ENGINE

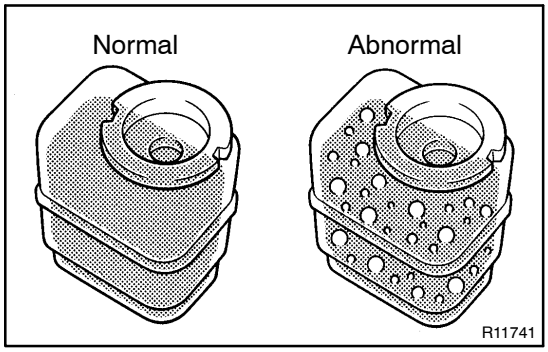
Run the engine at idle for a few minutes.

6. TURN STEERING WHEEL

(a) With the engine idling, turn the steering wheel to left or right full lock position and keep it there for 2–3 seconds, then turn the steering wheel to the opposite full lock position and keep it there for 2–3 seconds.

(b) Repeat (a) several times.

7. STOP ENGINE

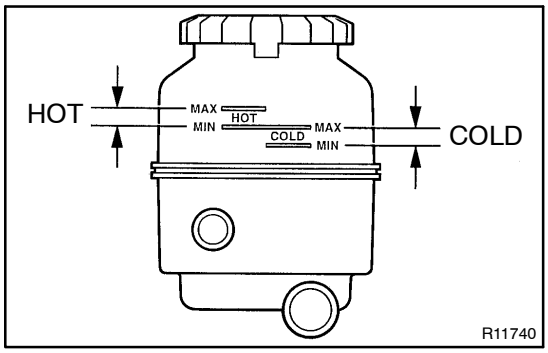


8. CHECK FOR FOAMING OR EMULSIFICATION

If the system has to be bled twice specifically because of foaming or emulsification, check for fluid leaks in the system.

9. CHECK FLUID LEVEL (See page SR–5)

SR08J–08



INSPECTION

1. CHECK FLUID LEVEL

(a) Keep the vehicle level.

(b) With the engine stopped, check the fluid level in the oil reservoir.

If necessary, add fluid.

Fluid: ATF DEXRON® II or III

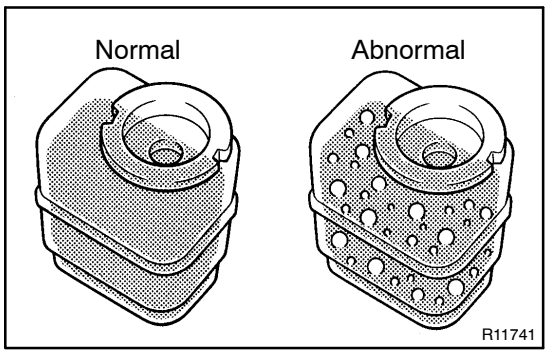
HINT:

Check that the fluid level is within the HOT LEVEL range on the reservoir. If the fluid is cold, check that it is within the COLD LEVEL range.

(c) Start the engine and run it at idle.

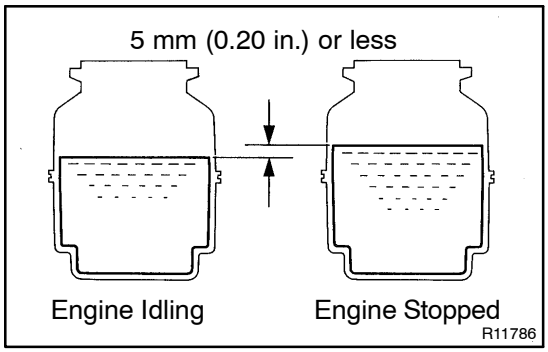
(d) Turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80˚C (176˚F)



(e) Check for foaming or emulsification.

If there is foaming or emulsification, bleed power steering system (See page SR–4).



(f) With the engine idling, measure the fluid level in the oil reservoir.

(g) Stop the engine.

(h) Wait a few minutes and remeasure the fluid level in the oil reservoir.

Maximum fluid level rise: 5 mm (0.20 in.)

If a problem is found, bleed power steering system (See page SR–4).

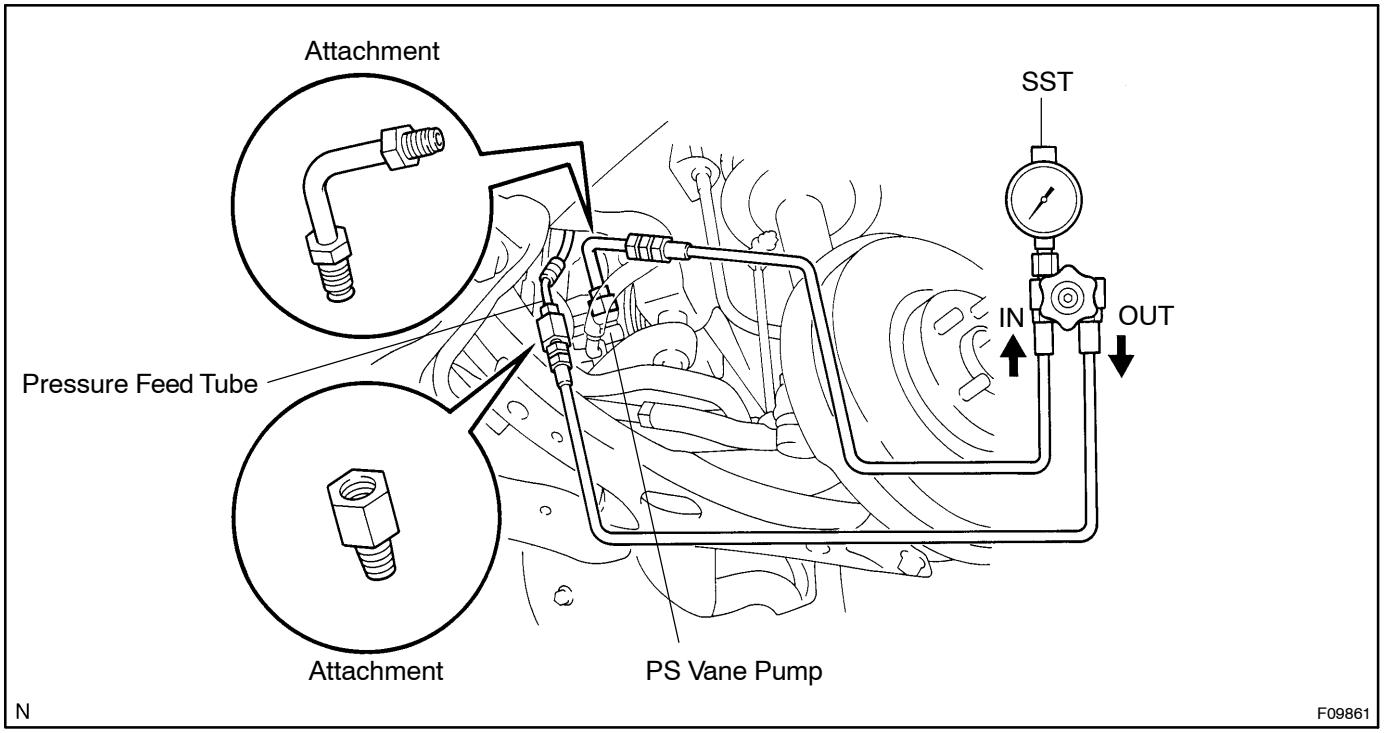
(i) Check the fluid level.

2. CHECK STEERING FLUID PRESSURE

(a) Disconnect the pressure feed tube from the PS vane pump (See page SR–26).

(b) Connect SST, as shown in the illustration below.
SST 09640–10010 (09641–01010, 09641–01030, 09641–01060)

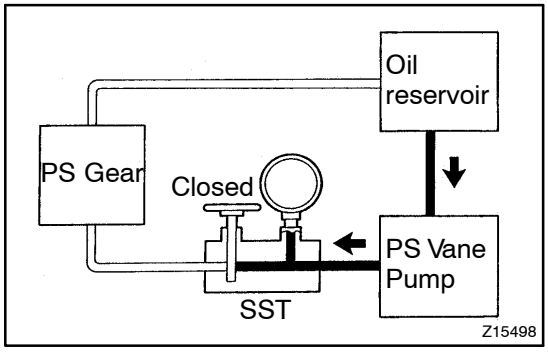
NOTICE:
Check that the valve of the SST is in the open position.



(c) Bleed the power steering system (See page SR–4).

(d) Start the engine and run it at idle.

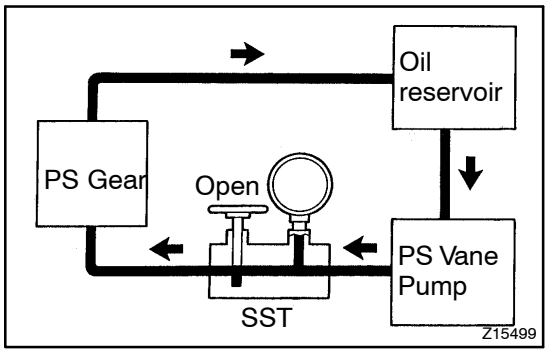
(e) Turn the steering wheel from lock to lock several times to boost fluid temperature.
Fluid temperature: 80°C (176°F)



(f) With the engine idling, close the valve of the SST and observe the reading on the SST.
Minimum fluid pressure:
7,355 kPa (75 kgf/cm^2, 1,067 psi)

NOTICE:

- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

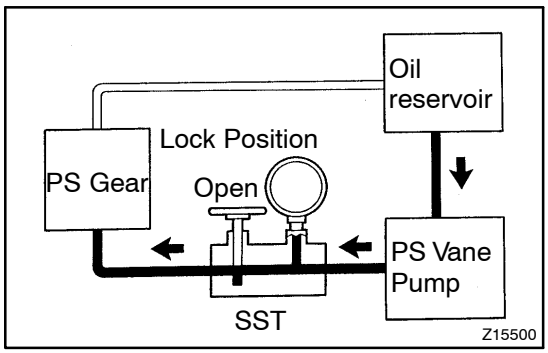


(g) With the engine idling, open the valve fully.

(h) Measure the fluid pressure at engine speeds of 1,000 rpm and 3,000 rpm.

Difference fluid pressure:
490 kPa (5 kgf/cm^2, 71 psi) or less

NOTICE:
Do not turn the steering wheel.



(i) With the engine idling and valve fully opened, turn the steering wheel to full lock.

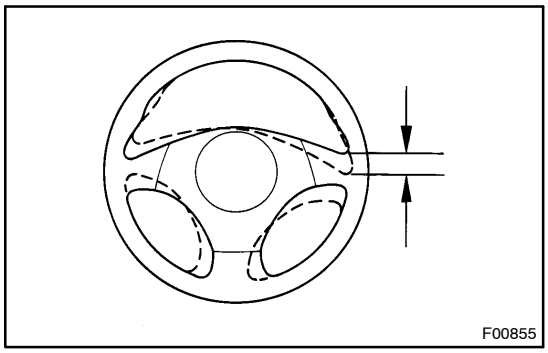
Minimum fluid pressure:
7,355 kPa (75 kgf/cm^2, 1,067 psi)

NOTICE:
- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

(j) Disconnect the SST.
SST 09640–10010 (09641–01010, 09641–01030, 09641–01060)

(k) Connect the pressure feed tube to the PS vane pump (See page SR–34).

(l) Bleed the power steering system (See page SR–4).



STEERING WHEEL

SR08K–15

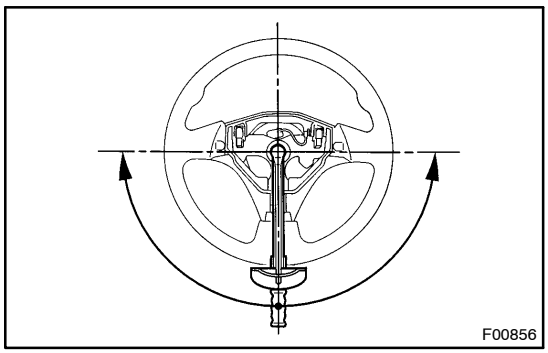
INSPECTION

1. CHECK STEERING WHEEL FREEPLAY

(a) Stop the vehicle and face the tires straight ahead.

(b) Rock the steering wheel gently up and down with a finger lightly, check the steering wheel freeplay.

Maximum freeplay: 30 mm (1.18 in.)



2. CHECK STEERING EFFORT

(a) Center the steering wheel.

(b) Remove the steering wheel pad (See page SR–13).

(c) Start the engine and run it at idle.

(d) Measure the steering effort in both directions.

Steering effort (Reference):

6.5 N·m (65 kgf·cm, 58 in.·lbf)

HINT:

Take the tire type, pressure and contact surface into consideration before making your diagnosis.

(e) Install the steering wheel set nut.

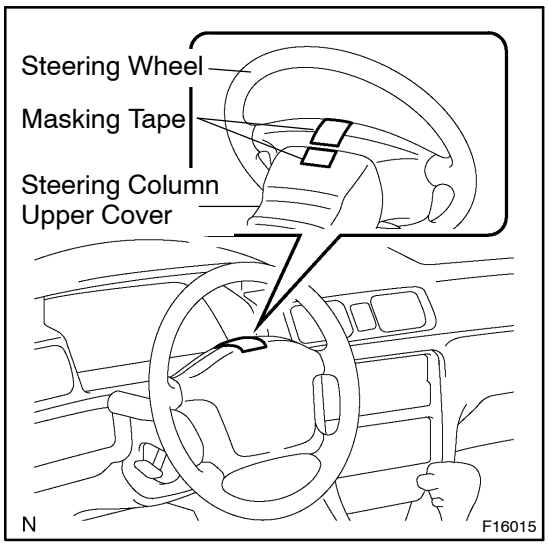
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

(f) Install the steering wheel pad (See page SR–21).

SR1HO–21

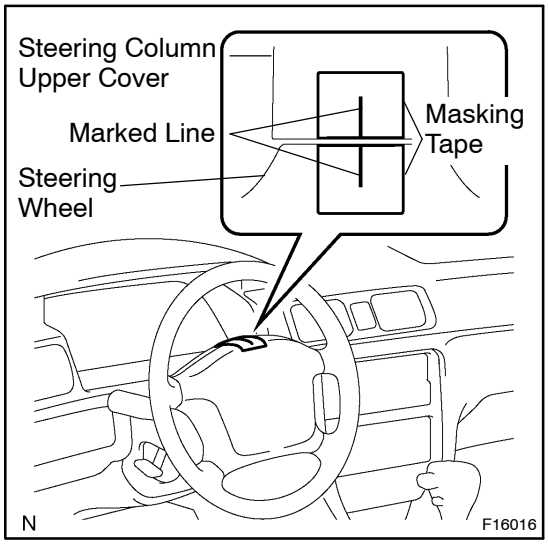
REPAIR PROCEDURES

HINT:
This is the repair procedure for steering off center.



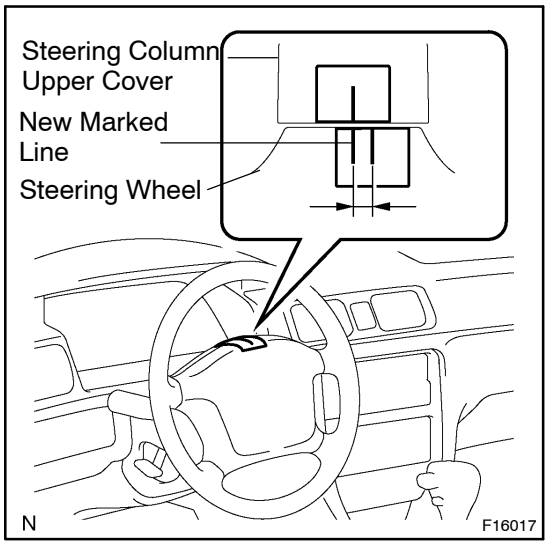
1. INSPECT STEERING WHEEL OFF CENTER

(a) Apply masking tape on the top center of the steering wheel and steering column upper cover.



(b) Drive the vehicle in a straight line for 100 meters at a constant speed of 35 mph (56 km/h), and hold the steering wheel to maintain the course.

(c) Draw a line on the masking tape as shown in the illustration.



(d) Turn the steering wheel to its straight position.

HINT:

Refer to the upper surface of the steering wheel, steering spoke and SRS airbag line for the straight position.

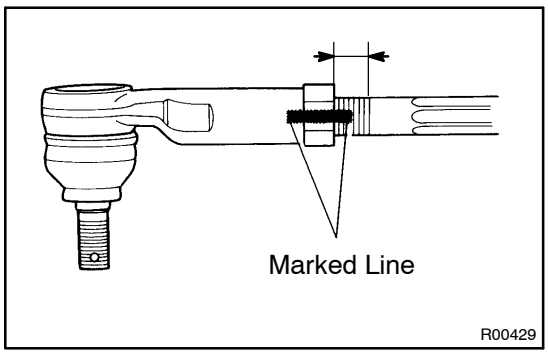
(e) Draw a new line on the masking tape of the steering wheel as shown in the illustration.

(f) Measure the distance between the 2 lines on the masking tape of the steering wheel.

(g) Convert the measured distance to steering angle.
Measured distance 1 mm (0.04 in.) = Steering angle approximately 1 deg.

HINT:

Make a note of the steering angle.



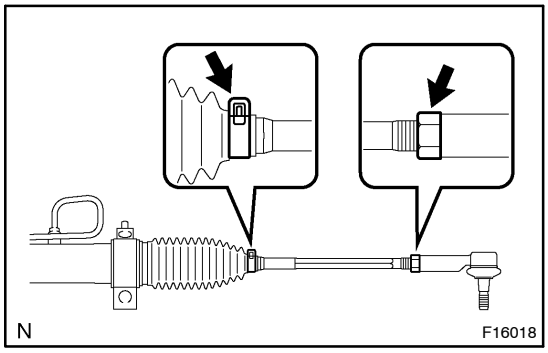
2. ADJUST STEERING ANGLE

(a) Draw a line on the RH and LH tie rod and rack ends where it can easily be seen.

(b) Using a paper gauge, measure the distance from RH and LH tie rod ends to the rack end screws.

HINT:

- Measure the RH side and LH side.
- Make a note of the measured values.



(c) Remove the RH and LH boot clips from the rack boots.

(d) Loosen the RH and LH lock nuts.

(e) Turn the RH and LH rack end by the same amount (but in different directions) according to the steering angle.
1 turn 360 deg. of rack end (1.5 mm (0.059 in.) horizontal movement) = 12 deg. of steering angle

(f) Tighten the RH and LH lock nuts.
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

NOTICE:

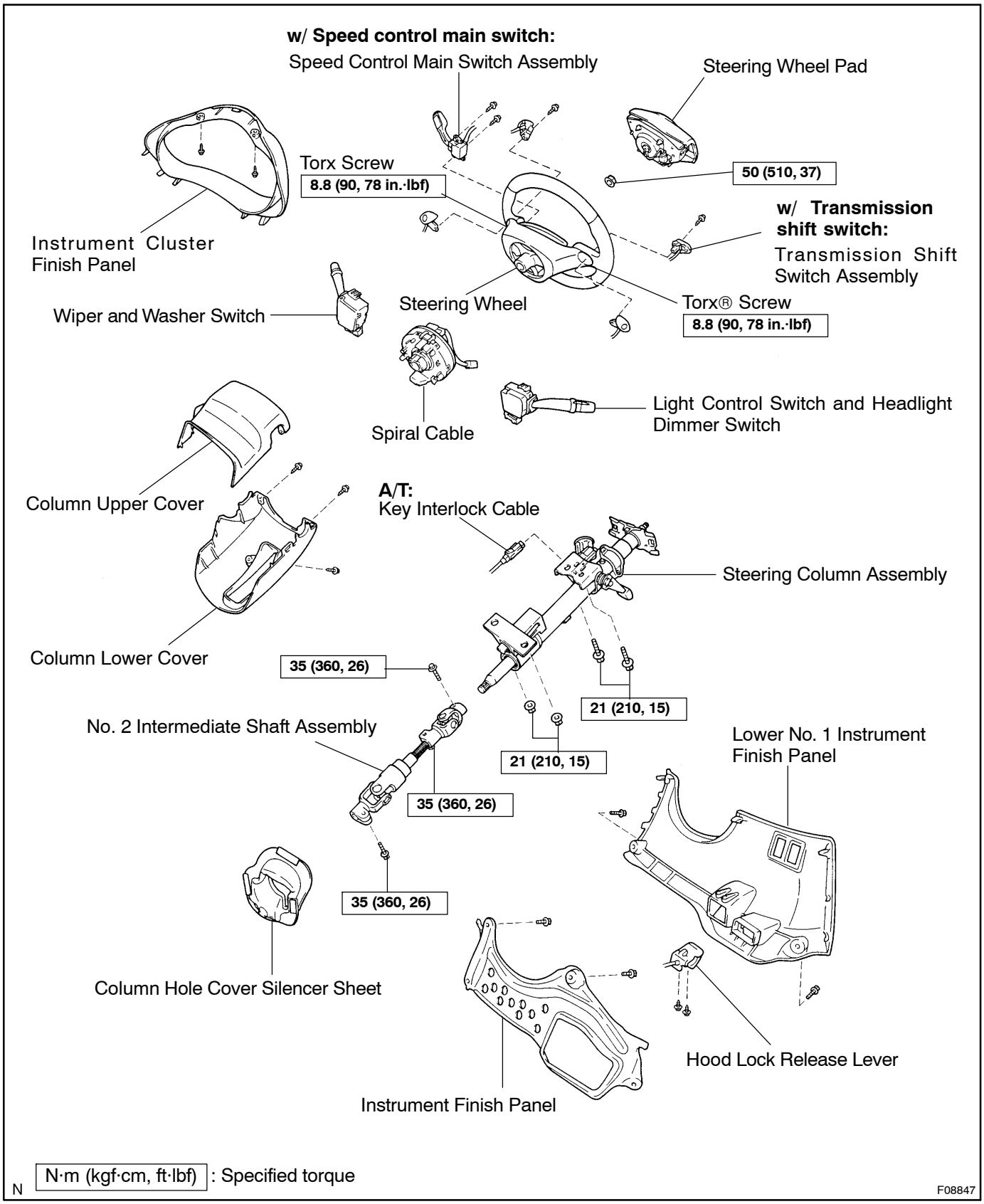
Make sure that the difference in length between RH and LH tie rod ends and rack end screws are within 1.5 mm (0.059 in.).

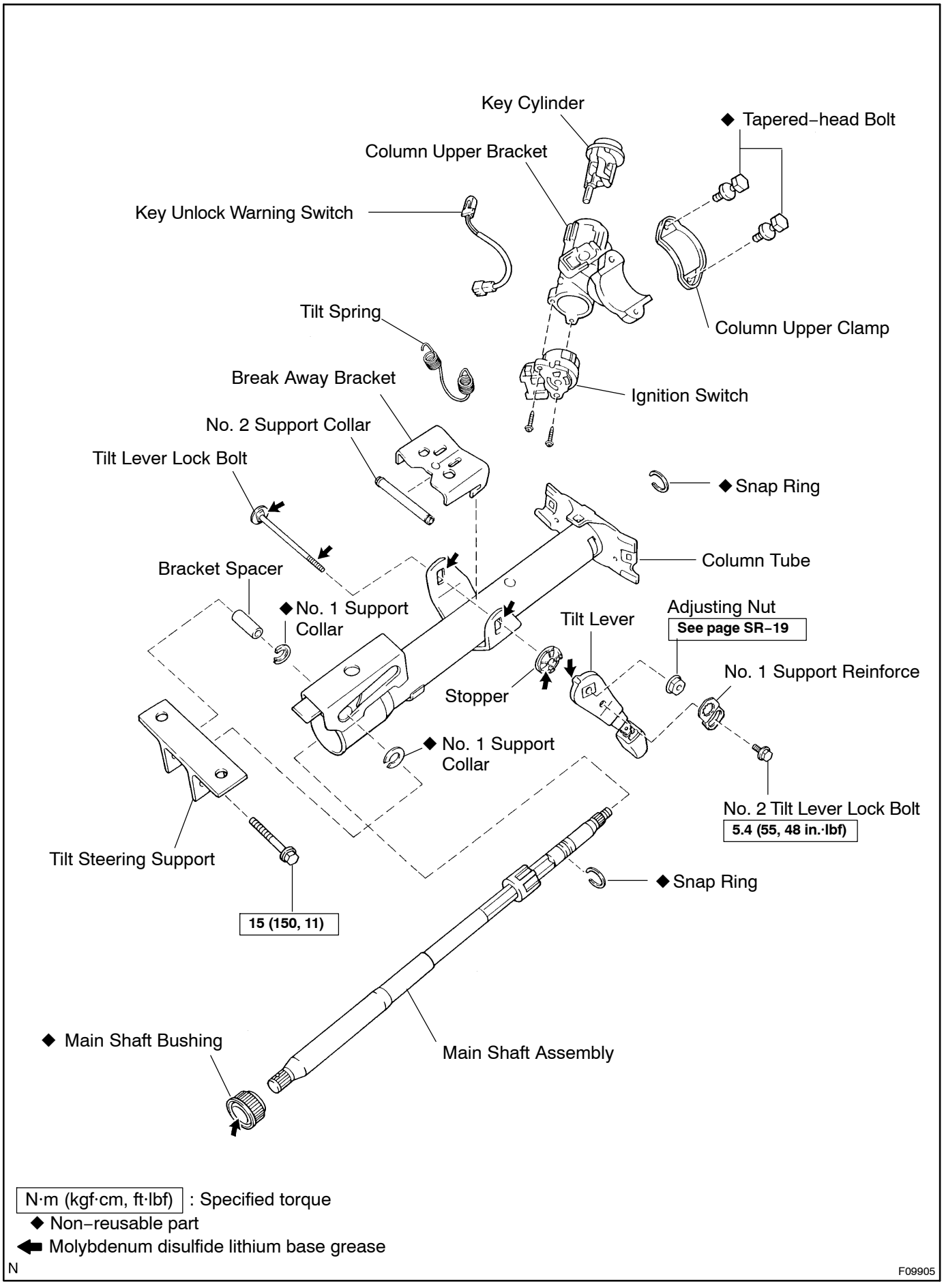
(g) Install the RH and LH boot clips.

TILT STEERING COLUMN

COMPONENTS

SR0YK–10





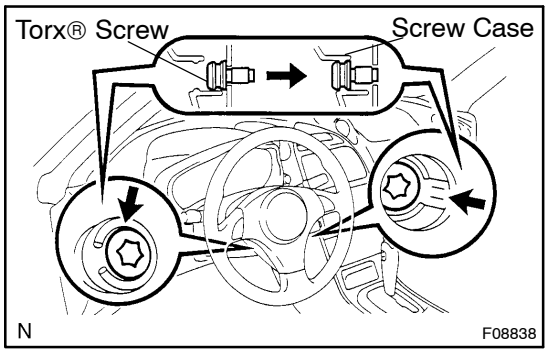
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
⬅ Molybdenum disulfide lithium base grease

N

F09905

SR0YL–07

REMOVAL



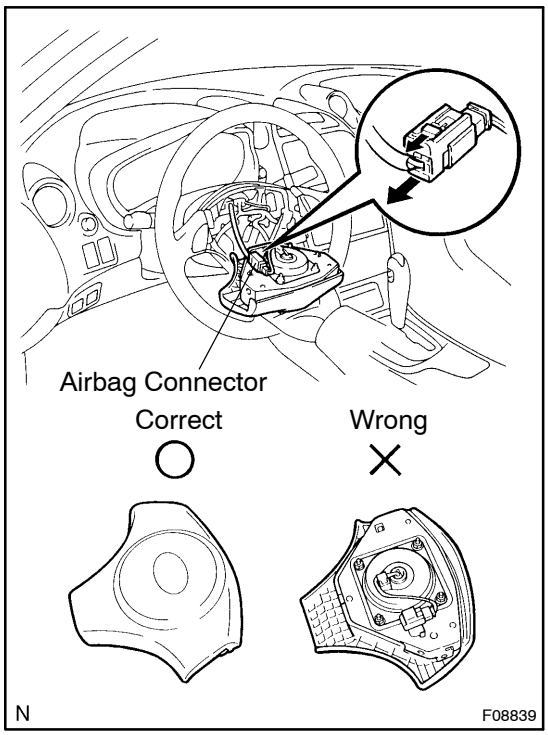
1. REMOVE STEERING WHEEL PAD

NOTICE:

If the airbag connector is disconnected with the ignition switch at ON, DTCs will be recorded.

(a) Place the front wheels facing straight ahead.

(b) Using a torx® socket wrench, loosen the 2 torx® screws until the groove along the screw circumference catches on the screw case.



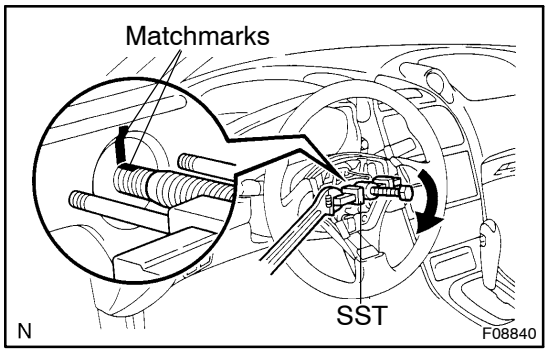
(c) Pull out the wheel pad from the steering wheel and disconnect the airbag connector.

CAUTION:

- **When storing the wheel pad, keep the upper surface of the pad facing upward.**
- **Never disassemble the wheel pad.**

NOTICE:

When removing the wheel pad, take care not to pull the airbag wire harness.



2. REMOVE STEERING WHEEL

(a) Disconnect the connector.

(b) Remove the steering wheel set nut.

(c) Place matchmarks on the steering wheel and main shaft assembly.

(d) Using SST, remove the steering wheel.

SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05021)

3. REMOVE LOWER NO. 1 INSTRUMENT FINISH PANEL

(a) Remove the 2 screws and disconnect the hood lock release lever.

(b) Remove the 2 bolts and lower No. 1 instrument finish panel.

(c) Disconnect the connector.

4. REMOVE INSTRUMENT FINISH PANEL

Remove the 2 bolts and instrument finish panel.

5. REMOVE INSTRUMENT CLUSTER FINISH PANEL

Remove the 2 screws and instrument cluster finish panel.

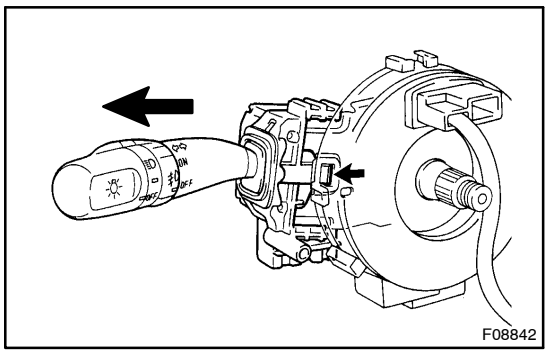
6. REMOVE COLUMN UPPER AND LOWER COVERS

Remove the 3 screws, column upper and lower covers.

7. REMOVE SPIRAL CABLE, LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH AND WIPER AND WASHER SWITCH

(a) Disconnect the 3 connectors from the spiral cable, light control switch and headlight dimmer switch and wiper and washer switch.

(b) Disconnect the airbag connector from the spiral cable.



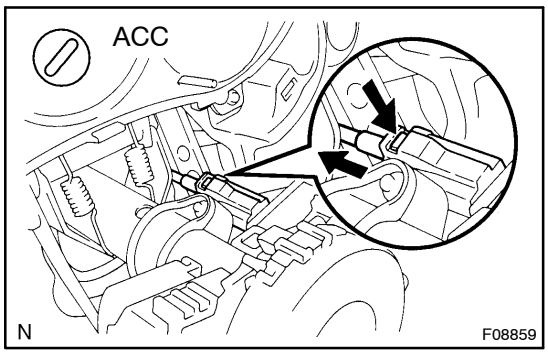
(c) Push the claw and pull out the light control switch and headlight dimmer switch.

(d) Employ the same manner described above to the wiper and washer switch.

(e) Remove the spiral cable.

NOTICE:

Do not disassemble the spiral cable or apply oil to it.

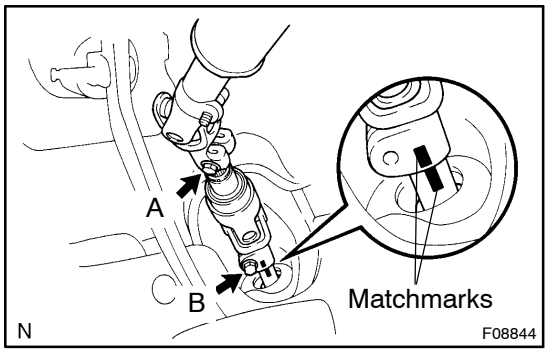


8. A/T:

REMOVE KEY INTERLOCK CABLE

With the key in ACC, push the claw and pull out the key interlock cable.

9. REMOVE COLUMN HOLE COVER SILENCER SHEET



10. DISCONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY

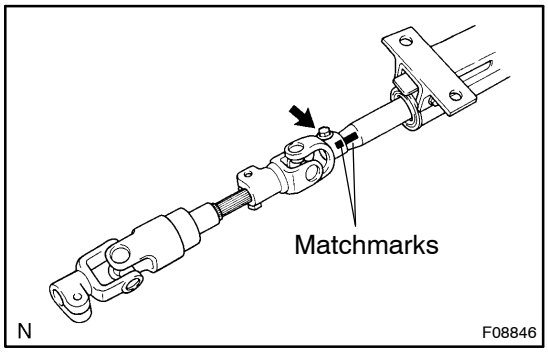
(a) Place matchmarks on the No. 2 intermediate shaft assembly and intermediate extension.

(b) Loosen the bolt A and remove the bolt B, then disconnect the No. 2 intermediate shaft assembly.

11. REMOVE STEERING COLUMN ASSEMBLY

(a) Disconnect the connectors.

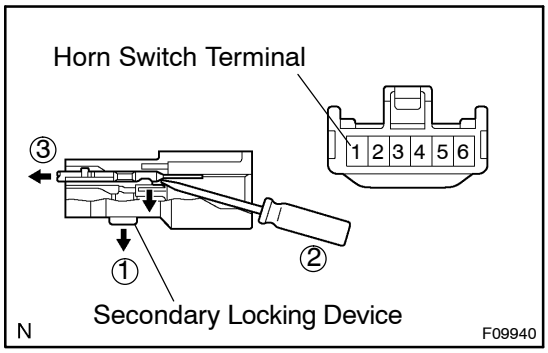
(b) Remove the 2 bolts, nuts and steering column assembly.



12. REMOVE NO. 2 INTERMEDIATE SHAFT ASSEMBLY

(a) Place matchmarks on the No. 2 intermediate shaft assembly and main shaft assembly.

(b) Remove the bolt and No. 2 intermediate shaft assembly.



13. w/ Transmission shift switch:

REMOVE TRANSMISSION SHIFT SWITCH ASSEMBLY FROM STEERING WHEEL

(a) Remove the 2 screws.

(b) Disengage the secondary locking device of the connector.

(c) Release the locking lug of the terminal 1 (horn switch terminal), and pull the terminal out of the rear.

(d) Remove the transmission shift switch assembly.

14. w/ Speed control main switch:

REMOVE SPEED CONTROL MAIN SWITCH ASSEMBLY FROM STEERING WHEEL

(a) Remove the 2 screws.

(b) Disengage the secondary locking device of the connector.

(c) Release the locking lug of the terminal 1 (horn switch terminal), and pull the terminal out of the rear.

(d) Remove the speed control main switch assembly.

15. w/ Transmission shift switch and speed control main switch:

REMOVE TRANSMISSION SHIFT SWITCH ASSEMBLY AND SPEED CONTROL MAIN SWITCH ASSEMBLY FROM STEERING WHEEL

(a) Remove the 2 screws from the transmission shift switch assembly.

(b) Remove the 2 screws from the speed control main switch assembly.

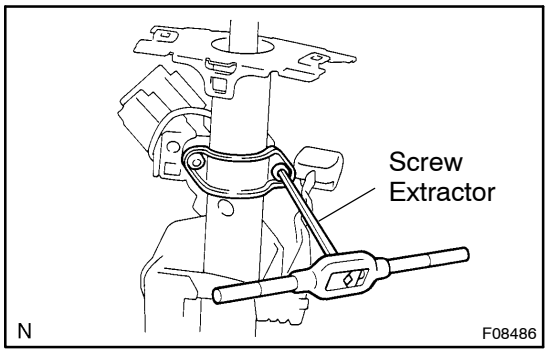
(c) Disengage the secondary locking device of the connector.

(d) Release the locking lug of the terminal 1 (horn switch terminal), and pull the terminal out of the rear.

(e) Remove the transmission shift switch assembly and speed control main switch assembly.

SR0YM–02

DISASSEMBLY



1. REMOVE COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

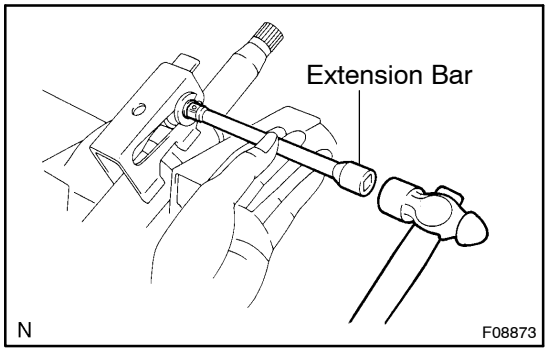
(a) Using a centering punch, mark the center of the 2 tapered–head bolts.

(b) Using a 3 – 4 mm (0.12 – 0.16 in.) drill, drill into the 2 bolts.

(c) Using a screw extractor, remove the 2 bolts, column upper bracket and column upper clamp.

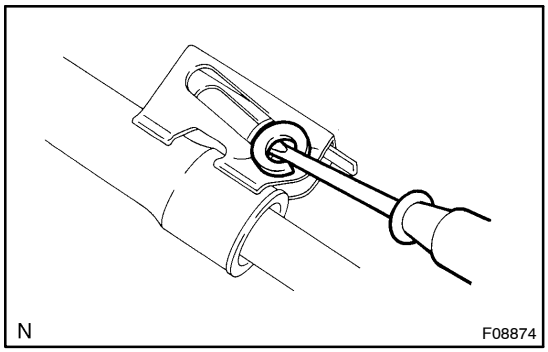
2. REMOVE TILT STEERING SUPPORT

Remove the bolt and tilt steering support.



3. REMOVE BRACKET SPACER AND 2 NO. 1 SUPPORT COLLARS

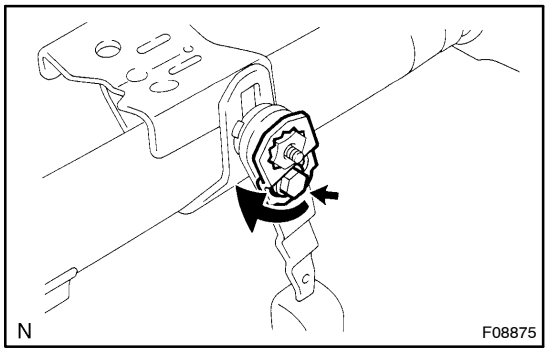
(a) Using an extension bar and a hammer, tap out the bracket spacer.



(b) Using a screwdriver, remove the 2 No. 1 support collars.

4. REMOVE TILT LEVER AND BREAK AWAY BRACKET

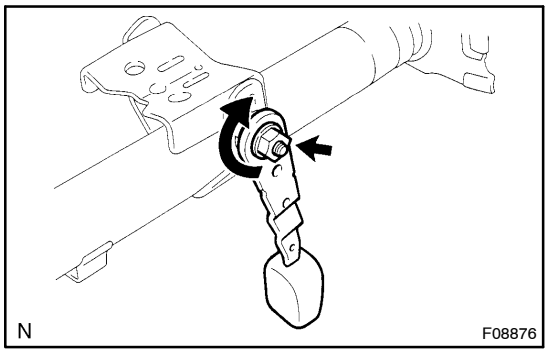
(a) Remove the tilt spring.



(b) Remove the No. 2 tilt lever lock bolt and No. 1 support reinforce.

HINT:

This bolt is left–handed one.

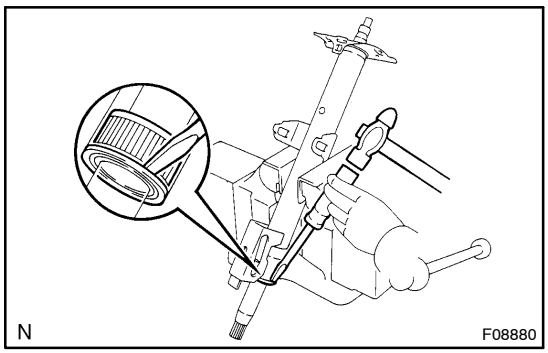


(c) Remove the adjusting nut, tilt lever, stopper, tilt lever lock bolt and break away bracket.

HINT:

This nut is left–handed one.

(d) Remove the No. 2 support collar from the break away bracket.



5. REMOVE MAIN SHAFT BUSHING

Using a screwdriver and hammer, tap out the main shaft bushing.

6. REMOVE MAIN SHAFT ASSEMBLY

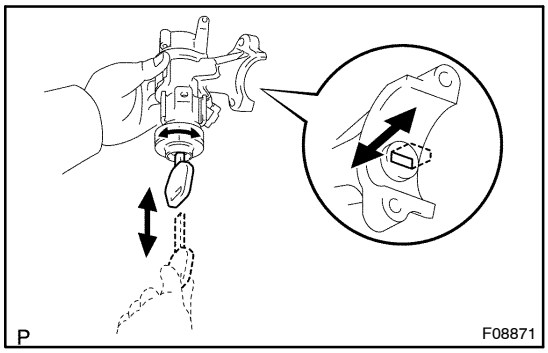
(a) Using a snap ring expander, remove the snap ring on the upper side.

(b) Remove the main shaft assembly.

(c) Using a snap ring expander, remove the snap ring on the lower side.

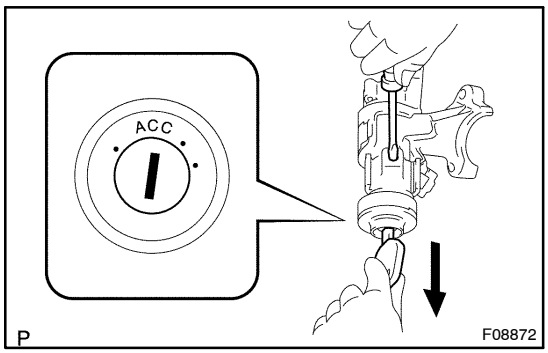
SR0VN–09

INSPECTION



1. INSPECT STEERING LOCK OPERATION

Check that the steering lock mechanism operates properly.



2. IF NECESSARY, REPLACE KEY CYLINDER

(a) Place the ignition key at the ACC position.

(b) Push down the stop pin with a screwdriver, and pull out the cylinder.

(c) Install a new cylinder.

HINT:

Make sure the key is at the ACC position.

3. INSPECT IGNITION SWITCH (See page BE–15)

4. IF NECESSARY, REPLACE IGNITION SWITCH

(a) Remove the 2 screws and ignition switch from the column upper bracket.

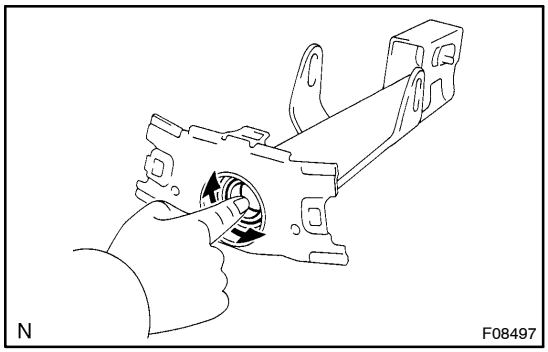
(b) Install a new ignition switch with the 2 screws.

5. INSPECT KEY UNLOCK WARNING SWITCH (See page BE–15)

6. IF NECESSARY, REPLACE KEY UNLOCK WARNING SWITCH

(a) Slide the key unlock warning switch out of the column upper bracket.

(b) Slide a new key unlock warning switch in the column upper bracket.



7. INSPECT BEARING

Check the bearing rotation condition and check for abnormal noise.

If the bearing is worn or damaged, replace the column tube.

SR0VO–04

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

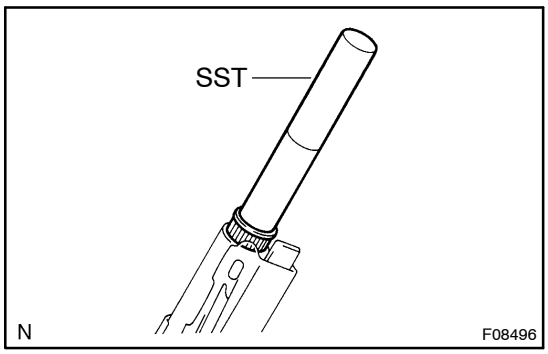
1. COAT PARTS INDICATED BY ARROWS WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE
(See page SR–11)

2. INSTALL MAIN SHAFT ASSEMBLY

(a) Using a snap ring expander, install a new snap ring on the lower side.

(b) Install the main shaft assembly.

(c) Using a snap ring expander, install a new snap ring on the upper side.



3. INSTALL MAIN SHAFT BUSHING

(a) Coat a new bushing with molybdenum disulfide lithium base grease.

(b) Using SST and a hammer, tap in the main shaft bushing.
SST 09608–04031

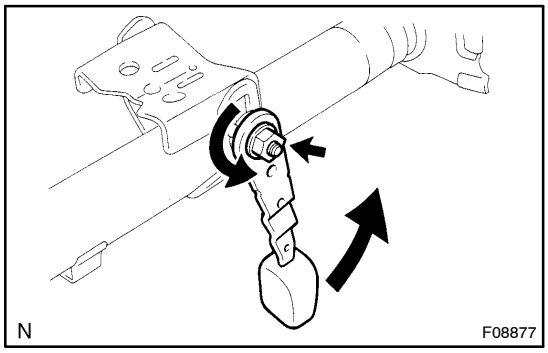
4. INSTALL BREAK AWAY BRACKET AND TILT LEVER

(a) Install the No. 2 support collar to the break away bracket.

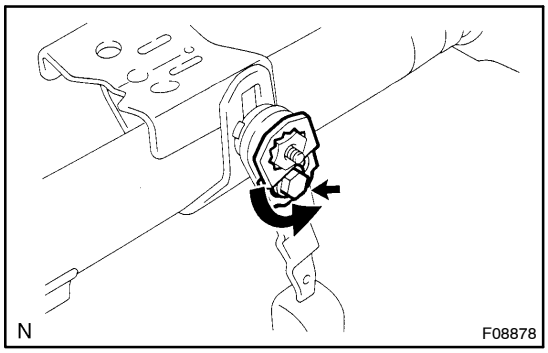
(b) Install the break away bracket, tilt lever lock bolt, stopper and tilt lever.

HINT:

Align the holes in the column tube with the projections of the tilt lever lock bolt and stopper.



(c) Install the adjusting nut by rotating it counterclockwise in the specified torque so that the locking load (load applied to when a knob is operated) of the tilt lever will be 38 – 82 N (3.9 – 8.4 kgf, 8.5 – 18.4 lbf).
Torque: 9 N·m – 14 N·m (90 kgf·cm – 145 kgf·cm, 80 in.·lbf – 10 ft·lbf)

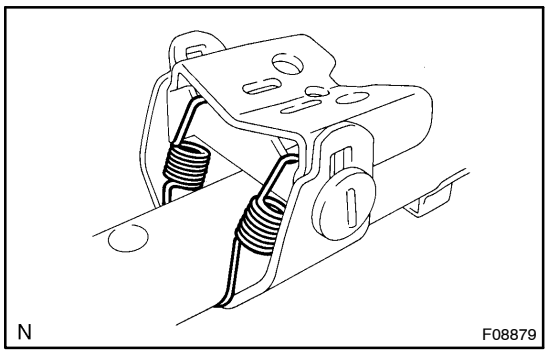


(d) Install the No. 1 support reinforce with the No. 2 tilt lever lock bolt by turning it counterclockwise.

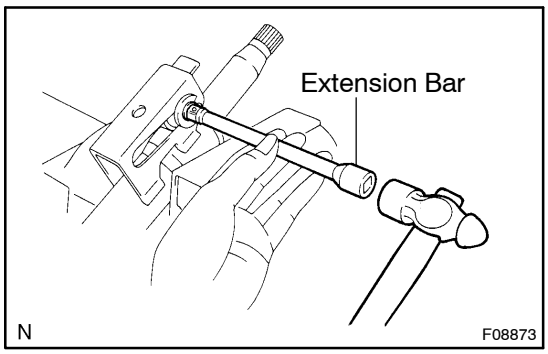
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

HINT:

Align the No. 1 support reinforce with the nut to eliminate looseness by turning the No. 1 support reinforce counterclockwise a little, then torque the No. 2 tilt lever lock bolt.



(e) Install the tilt spring.



5. INSTALL 2 NO. 1 SUPPORT COLLARS AND BRACKET SPACER

(a) Install 2 new No. 1 support collars.

HINT:

Install the white support collar to the RH side, black support collar to the LH side.

(b) Using an extension bar and a hammer, drive in the bracket spacer.

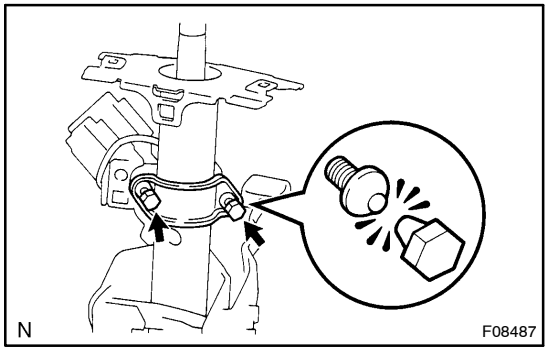
6. INSTALL TILT STEERING SUPPORT

Install the tilt steering support with the bolt.

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

NOTICE:

Make sure that the tilt steering support is installed facing in the correct direction.

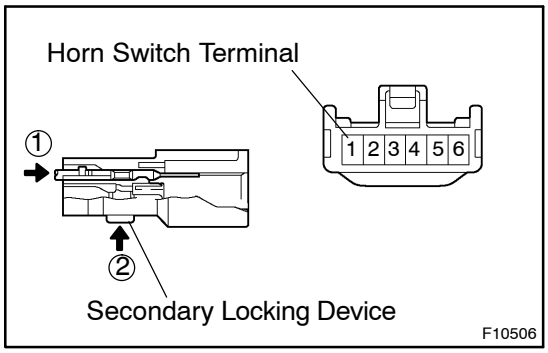


7. INSTALL COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

(a) Install the column upper bracket and column upper clamp with 2 new tapered–head bolts.

(b) Tighten the 2 tapered–head bolts until the bolt heads break off.

SR0YN-08



INSTALLATION

1. w/ Transmission shift switch:
INSTALL TRANSMISSION SHIFT SWITCH ASSEMBLY TO STEERING WHEEL

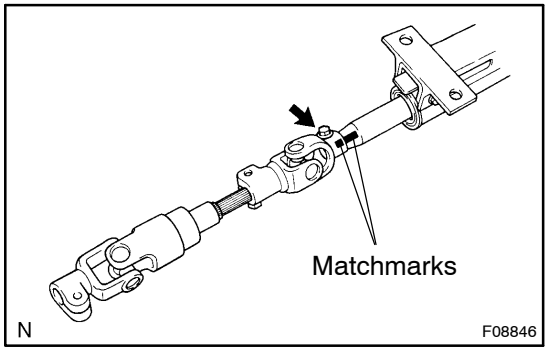
(a) Install the transmission shift switch assembly.
(b) Push the terminal 1 (horn switch terminal) into the connector.
(c) Engage the secondary locking device of the connector.
(d) Install the 2 screws.

2. w/ Speed control main switch:
INSTALL SPEED CONTROL MAIN SWITCH ASSEMBLY TO STEERING WHEEL

(a) Install the speed control main switch assembly.
(b) Push the terminal 1 (horn switch terminal) into the connector.
(c) Engage the secondary locking device of the connector.
(d) Install the 2 screws.

3. w/ Transmission shift switch and speed control main switch:
INSTALL TRANSMISSION SHIFT SWITCH ASSEMBLY AND SPEED CONTROL MAIN SWITCH ASSEMBLY TO STEERING WHEEL

(a) Install the transmission shift switch assembly and speed control main switch assembly.
(b) Push the terminal 1 (horn switch terminal) into the connector.
(c) Engage the secondary locking device of the connector.
(d) Install the 2 screws to the transmission shift switch assembly.
(e) Install the 2 screws to the speed control main switch assembly.

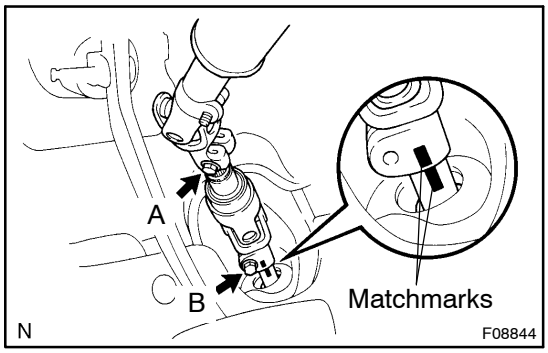


4. INSTALL NO. 2 INTERMEDIATE SHAFT ASSEMBLY

(a) Align the matchmarks on the No. 2 intermediate shaft assembly and main shaft assembly.
(b) Install the No. 2 intermediate shaft assembly with the bolt.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

5. INSTALL STEERING COLUMN ASSEMBLY

(a) Install the steering column assembly with the 2 bolts and nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
(b) Connect the connectors.



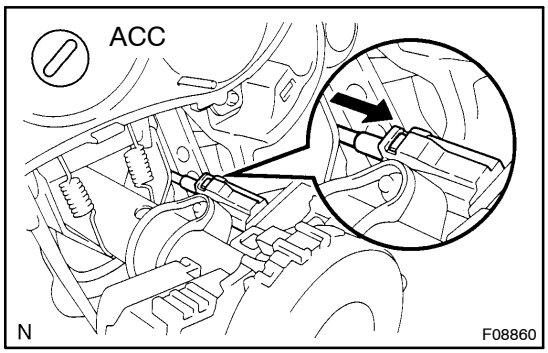
6. CONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY

(a) Align the matchmarks on the No. 2 intermediate shaft assembly and intermediate extension.

(b) Install the bolt B.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

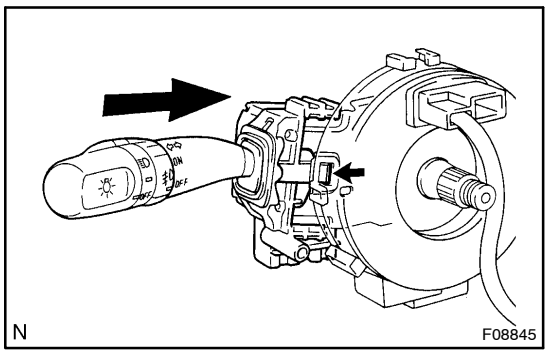
(c) Torque the bolt A.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

7. INSTALL COLUMN HOLE COVER SILENCER SHEET



8. A/T:
INSTALL KEY INTERLOCK CABLE

With the key in ACC, push into the key interlock cable and install it.



9. INSTALL LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH, WIPER AND WASHER SWITCH AND SPIRAL CABLE

(a) Install the spiral cable.

(b) Push into the light control switch and headlight dimmer switch until the claw is latched.

(c) Employ the same manner described above to the wiper and washer switch.

(d) Connect the airbag connector to the spiral cable.

(e) Connect the 3 connectors to the spiral cable, light control switch and headlight dimmer switch and wiper and washer switch.

10. INSTALL COLUMN UPPER AND LOWER COVERS

Install the column upper and lower covers with the 3 screws.

11. INSTALL INSTRUMENT CLUSTER FINISH PANEL

Install the instrument cluster finish panel with the 2 screws.

12. INSTALL INSTRUMENT FINISH PANEL

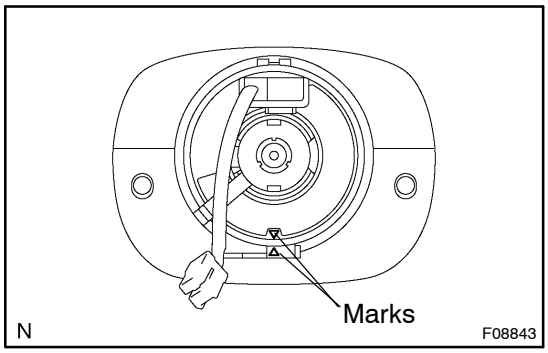
Install the instrument finish panel with the 2 bolts.

13. INSTALL LOWER NO. 1 INSTRUMENT FINISH PANEL

(a) Connect the connector .

(b) Install the lower No. 1 instrument finish panel with the 2 bolts.

(c) Connect the hood lock release lever and install the 2 screws.



14. CENTER SPIRAL CABLE

(a) Check that the front wheels are facing straight ahead.

(b) Turn the cable counterclockwise by hand until it becomes harder to turn.

(c) Then rotate the cable clockwise about 2.5 turns to align the marks.

HINT:

The cable will rotate about 2.5 turns to either left or right of the center.

15. INSTALL STEERING WHEEL

(a) Align the matchmarks on the steering wheel and main shaft assembly.

(b) Install the steering wheel set nut.

Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

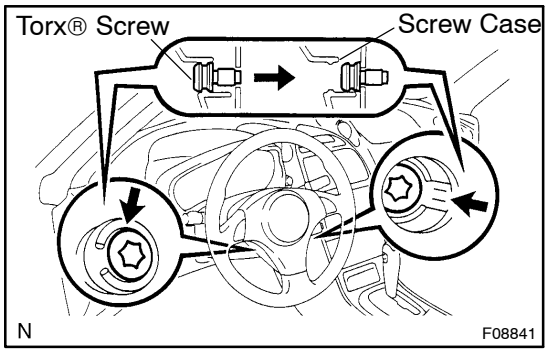
(c) Connect the connector.

16. INSTALL STEERING WHEEL PAD

NOTICE:

- **Never use airbag parts from another vehicle. When replacing parts, replace with new ones.**
- **Make sure the wheel pad is installed with the specified torque.**
- **If the wheel pad has been dropped, or there are cracks, dents or other defects in the case or connector, replace the wheel pad with a new one.**
- **When installing the wheel pad, take care that the wirings do not interfere with other parts and that they are not pinched between other parts.**

(a) Connect the airbag connector.



(b) Install the steering wheel pad after confirming that the circumference groove of the torx® screws is caught on the screw case.

(c) Using a torx® socket wrench, torque the 2 screws.

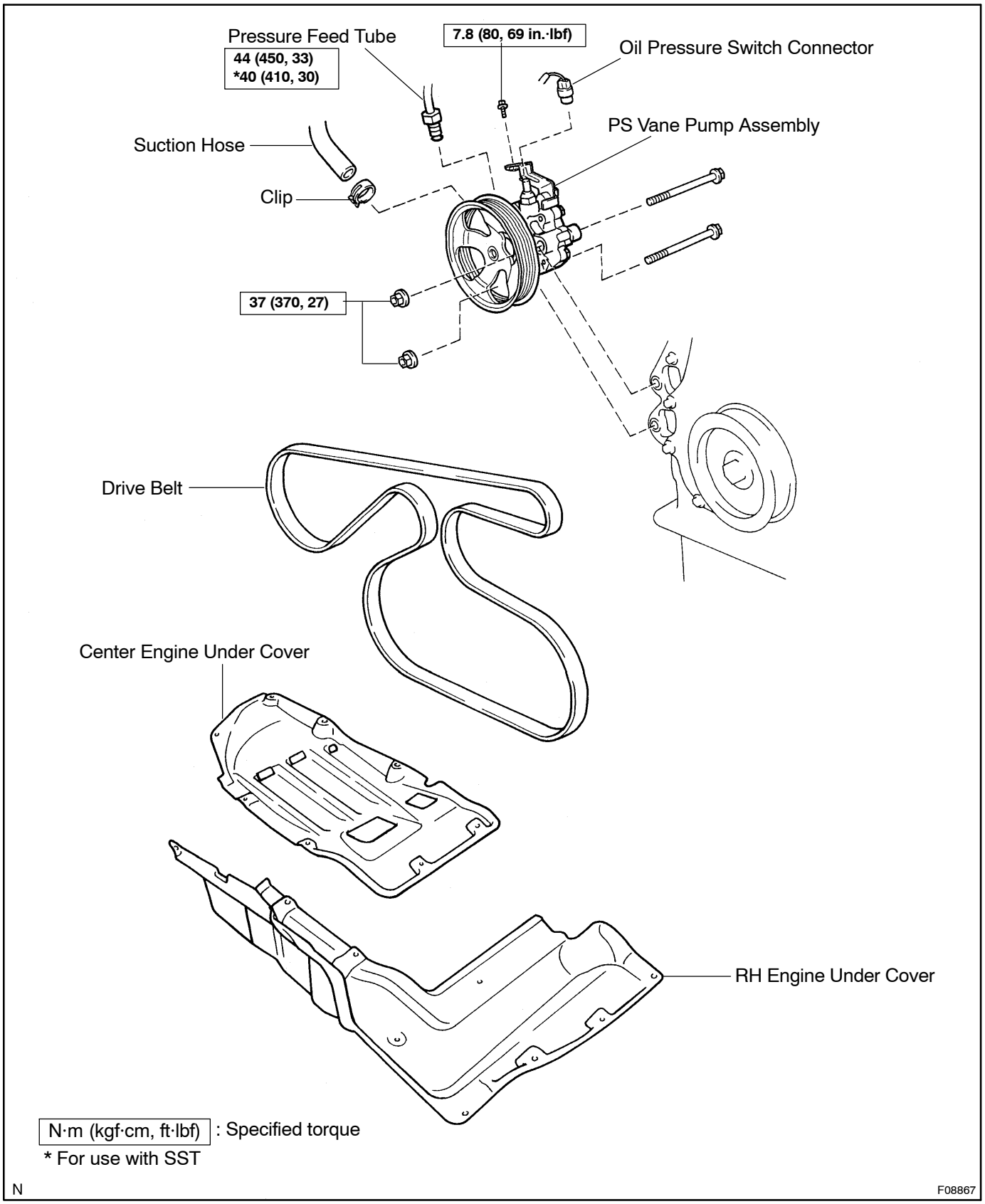
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

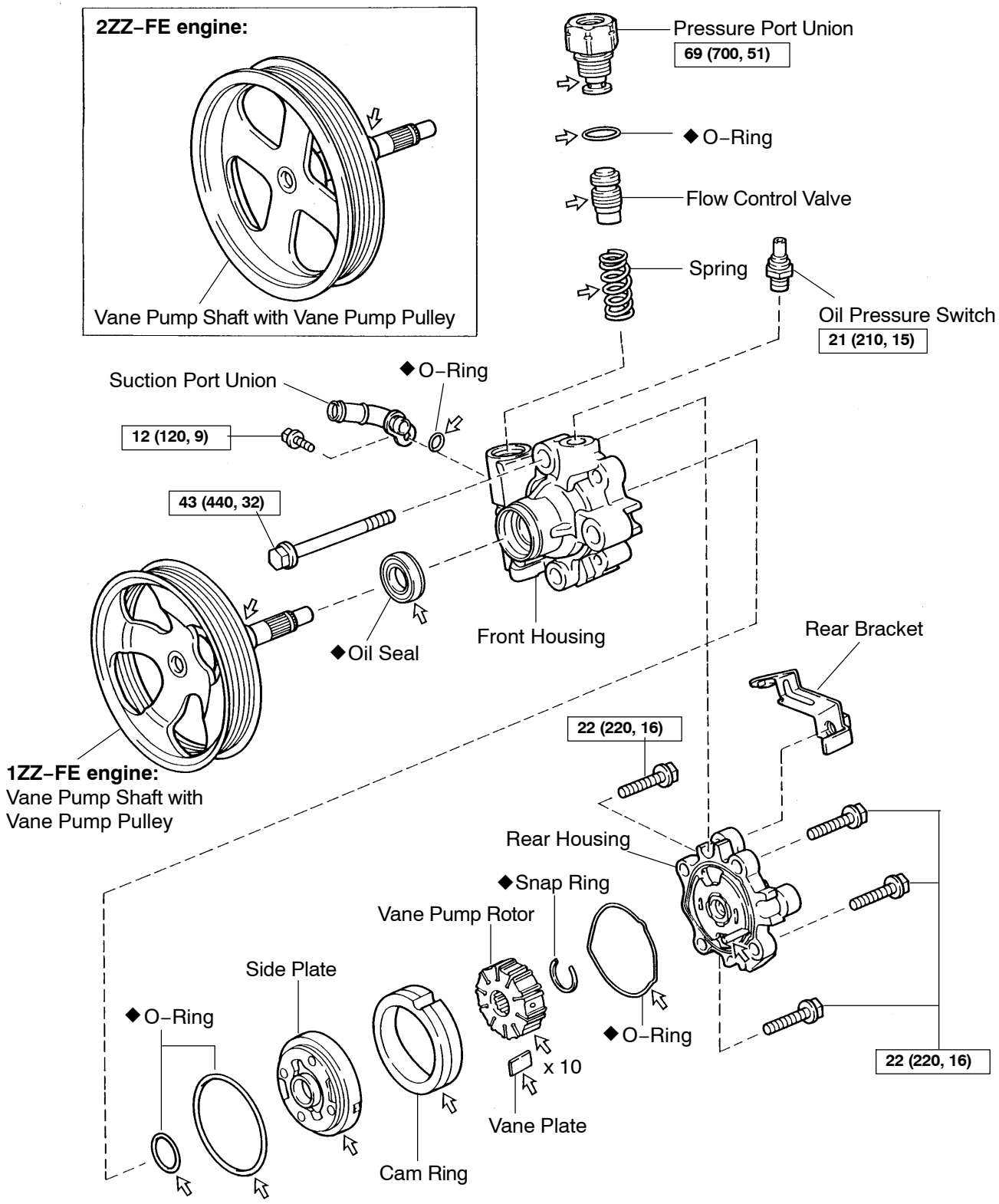
17. CHECK STEERING WHEEL CENTER POINT

POWER STEERING VANE PUMP

COMPONENTS

SR0YO–08





N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
⇦ Power steering fluid

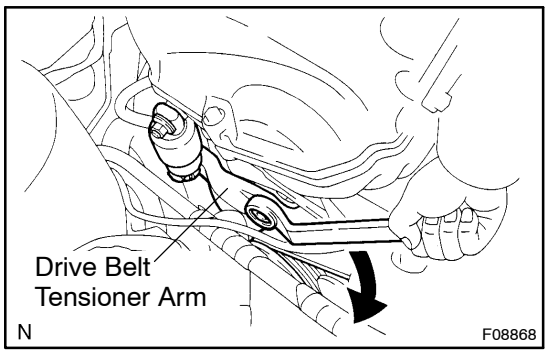
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SR0YP–05

REMOVAL

1. REMOVE RH AND CENTER ENGINE UNDER COVERS



2. REMOVE DRIVE BELT

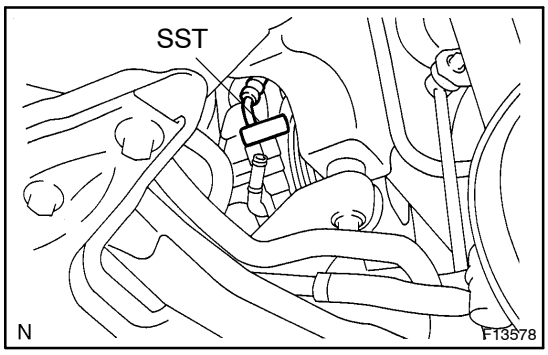
Loosen the drive belt tension by turning the drive belt tensioner arm clockwise, and remove the drive belt.

3. DISCONNECT SUCTION HOSE

Remove the clip and disconnect the suction hose.

NOTICE:

Take care not to spill fluid on the drive belt.



4. DISCONNECT PRESSURE FEED TUBE

(a) Using SST, disconnect the pressure feed tube.
SST 09023–38401

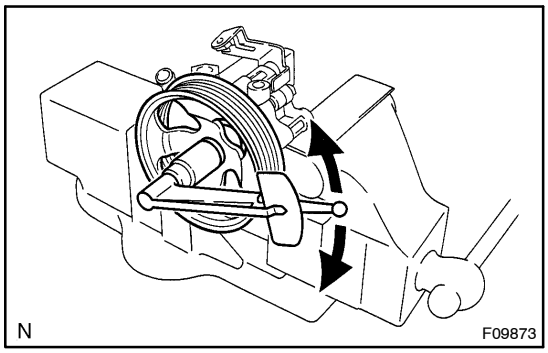
(b) Remove the bolt and disconnect the pressure feed tube clamp.

5. DISCONNECT OIL PRESSURE SWITCH CONNECTOR

6. REMOVE PS VANE PUMP ASSEMBLY

Remove the 2 pump assembly set bolts, nuts and PS vane pump assembly.

SR0VS–14



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. MEASURE PS VANE PUMP ROTATING TORQUE

(a) Check that the pump rotates smoothly without abnormal noise.

(b) Using a torque wrench, check the pump rotating torque.

Rotating torque:

0.27 N·m (2.8 kgf·cm, 2.4 in.·lbf) or less

2. REMOVE SUCTION PORT UNION

(a) Remove the bolt and suction port union.

(b) Remove the O–ring from the suction port union.

3. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING

(a) Remove the pressure port union, flow control valve and spring.

(b) Remove the O–ring from the pressure port union.

4. REMOVE OIL PRESSURE SWITCH

NOTICE:

Be careful not to drop the oil pressure switch.

If the oil pressure switch is dropped or strongly damaged, replace it with a new one.

5. REMOVE REAR HOUSING

(a) Remove the bolt and rear bracket.

(b) Remove the 4 bolts and rear housing.

(c) Remove the O–ring from the rear housing.

6. REMOVE CAM RING, 10 VANE PLATES, VANE PUMP ROTOR AND SIDE PLATE

(a) Remove the cam ring and 10 vane plates.

NOTICE:

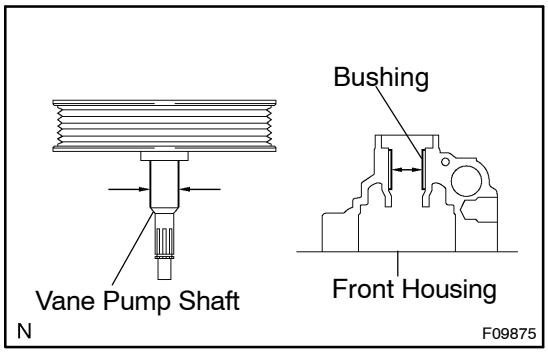
Take care not to drop the vane plate.

(b) Using a screwdriver, remove the snap ring, vane pump rotor and side plate.

(c) Remove the 2 O–rings from the side plate.

7. REMOVE VANE PUMP SHAFT WITH VANE PUMP PULLEY

SR0VT–14



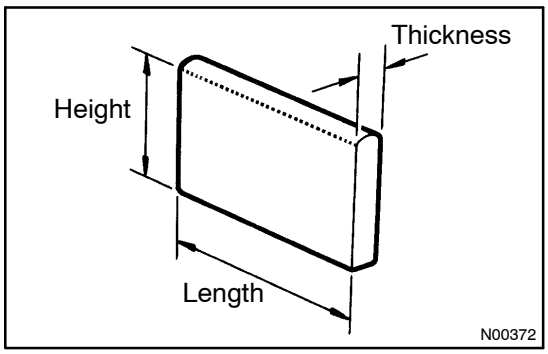
INSPECTION

1. MEASURE OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

Using a micrometer and a caliper gauge, measure the oil clearance.

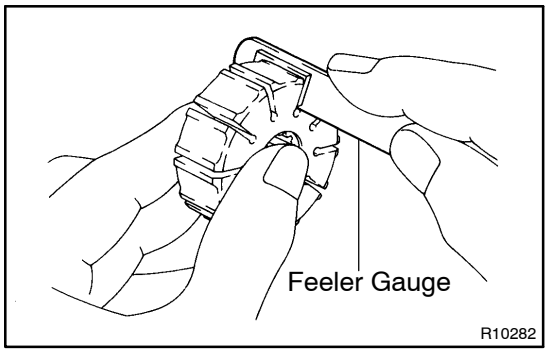
Standard clearance:
0.021 – 0.043 mm (0.0008 – 0.0017 in.)
Maximum clearance: 0.07 mm (0.0028 in.)

If it is more than the maximum, replace the front housing and vane pump shaft.

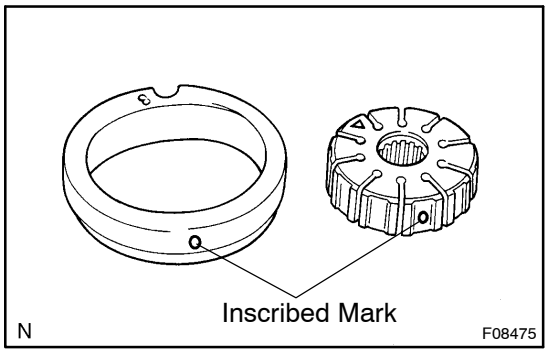


2. INSPECT VANE PUMP ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the 10 vane plates.
Minimum height: 7.6 mm (0.299 in.)
Minimum thickness: 1.405 mm (0.0553 in.)
Minimum length: 11.993 mm (0.4722 in.)



(b) Using a feeler gauge, measure the clearance between the vane pump rotor groove and vane plate.
Maximum clearance: 0.03 mm (0.0012 in.)



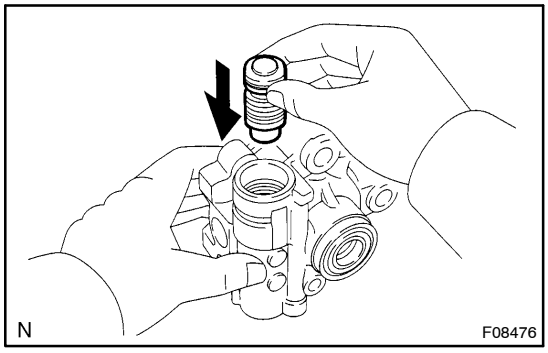
If it is more than the maximum, replace the vane plate and/or vane pump rotor with the one having the same mark stamped on the cam ring.

Inscribed mark: 0, 1, 2, 3, or 4

HINT:

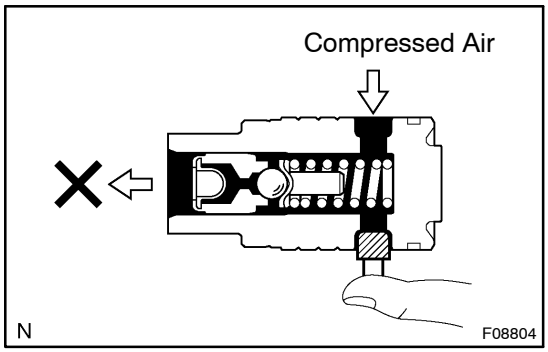
There are 5 vane plate lengths corresponding to the following vane pump rotor and cam ring marks:

Vane pump rotor and cam ring mark	Vane plate part number	Vane plate length mm (in.)
0	44345 – 32100	12.001 – 12.003 (0.47248 – 0.47256)
1	44345 – 32110	11.999 – 12.001 (0.47240 – 0.47248)
2	44345 – 32120	11.997 – 11.999 (0.47232 – 0.47240)
3	44345 – 32130	11.995 – 11.997 (0.47224 – 0.47232)
4	44345 – 32140	11.993 – 11.995 (0.47216 – 0.47224)

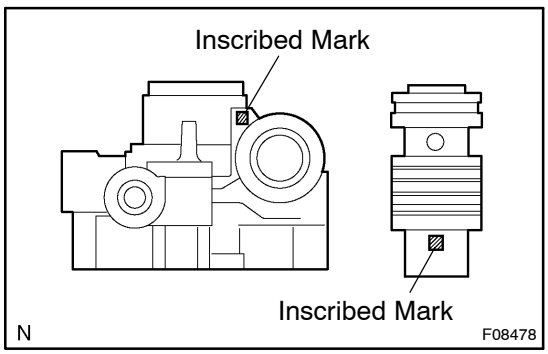


3. INSPECT FLOW CONTROL VALVE

(a) Coat the flow control valve with power steering fluid and check that it falls smoothly into the valve hole of the front housing by its own weight.

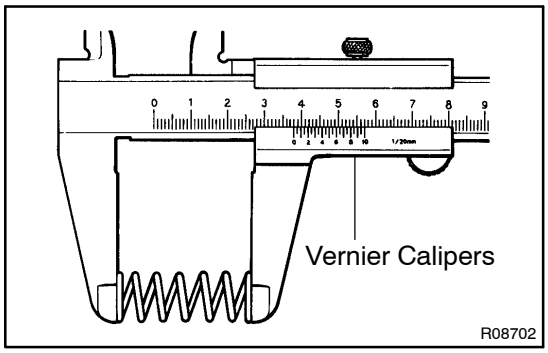


(b) Check the flow control valve for leakage. Close one of the holes and apply compressed air of 392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi) into the opposite side hole, and confirm that air does not come out from the end hole.



If necessary, replace the flow control valve with the one having the same letter as inscribed on the front housing.

Inscribed mark: A, B, C, D, E or F



4. INSPECT SPRING

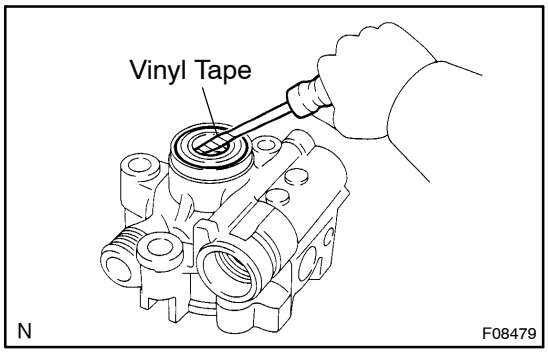
Using vernier calipers, measure the free length of the spring.

Minimum free length: 35.8 mm (1.409 in.)

If it is not within the specification, replace the spring.

SR0VU–14

REPLACEMENT



NOTICE:

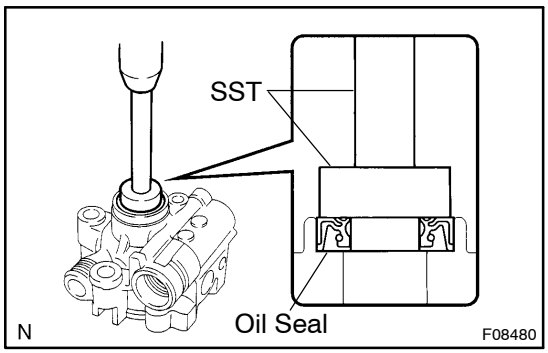
When using a vise, do not overtighten it.

IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver with vinyl tape wound around its tip, remove the oil seal.

NOTICE:

Be careful not to damage the bushing of the front housing.



(b) Coat a new oil seal lip with power steering fluid.

(c) Using SST, press in the oil seal.

SST 09950–60010 (09951–00280),
09950–70010 (09951–07100)

NOTICE:

Make sure that the oil seal is installed facing in the correct direction.

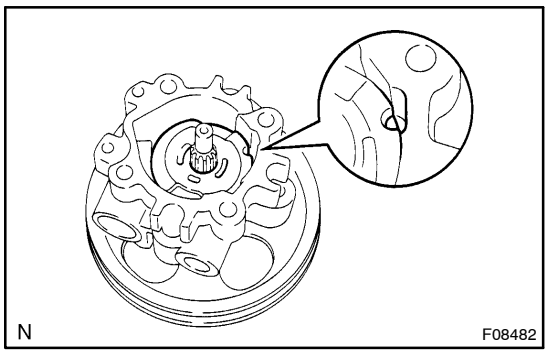
SR0VV–14

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. **COAT PARTS INDICATED BY ARROWS WITH POWER STEERING FLUID (See page SR–24)**
2. **INSTALL VANE PUMP SHAFT WITH VANE PUMP PULLEY**



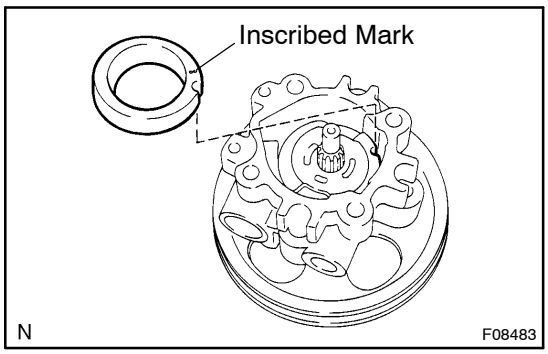
3. **INSTALL SIDE PLATE**

(a) Coat 2 new O–rings with power steering fluid, and install them to the side plate.

(b) Align the dent of the side plate with the dent of the front housing, and install the side plate.

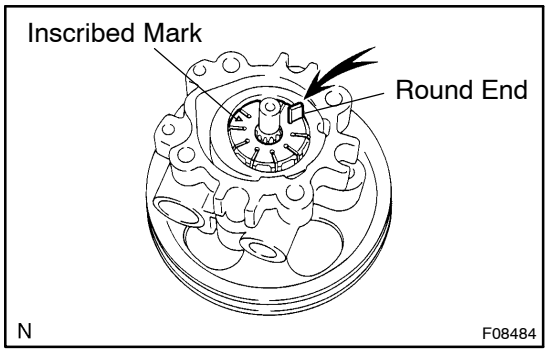
NOTICE:

Make sure that the side plate is installed facing in the correct direction.



4. **INSTALL CAM RING**

Align the dent of the cam ring with the dent of the side plate, and install the cam ring with the inscribed mark facing outward.



5. **INSTALL VANE PUMP ROTOR**

(a) Install the vane pump rotor with the inscribed mark facing outward.

(b) Install a new snap ring to the vane pump shaft.

6. **INSTALL 10 VANE PLATES**

Install the 10 vane plates with the round end facing outward.

7. **INSTALL REAR HOUSING**

(a) Coat a new O–ring with power steering fluid, and install it to the rear housing.

(b) Align the straight pin of the rear housing with the dents of the cam ring, side plate and front housing, and install the rear housing with the 4 bolts.

Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

(c) Install the rear bracket with the bolt.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

8. **INSTALL OIL PRESSURE SWITCH**

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

9. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

(a) Install the spring.

(b) Install the flow control valve facing in the correct direction (See page SR–24).

(c) Coat a new O–ring with power steering fluid, and install it to the pressure port union.

(d) Install the pressure port union.

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

10. INSTALL SUCTION PORT UNION

(a) Coat a new O–ring with power steering fluid, and install it to the suction port union.

(b) Install the suction port union with the bolt.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

11. MEASURE PS VANE PUMP ROTATING TORQUE (See page SR–27)

SR0YQ–05

INSTALLATION

1. INSTALL PS VANE PUMP ASSEMBLY

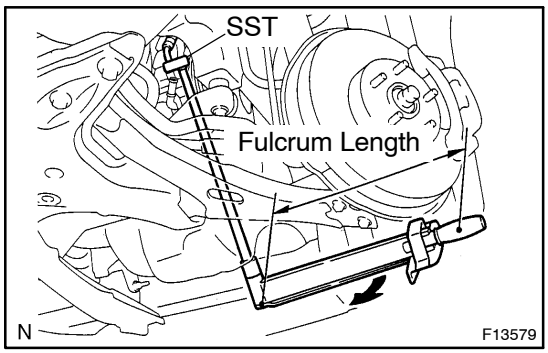
Install the PS vane pump assembly with the 2 pump assembly set bolts and nuts.

Torque: 37 N·m (370 kgf·cm, 27 ft·lbf)

2. CONNECT OIL PRESSURE SWITCH CONNECTOR

NOTICE:

Be careful to prevent oil from being attached to the connector.



3. CONNECT PRESSURE FEED TUBE

(a) Connect the pressure feed tube clamp with the bolt.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

(b) Using SST, connect the pressure feed tube.

SST 09023–38401

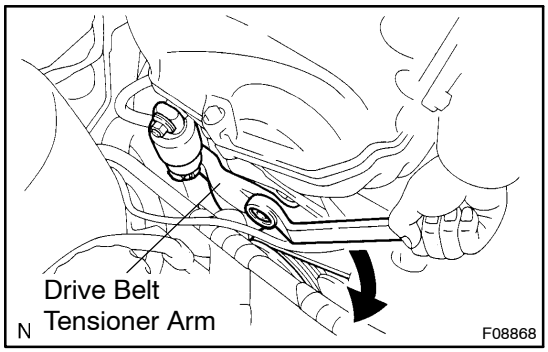
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

HINT:

- Use a torque wrench with a fulcrum length of 345 mm (11.81 in).
- This torque value is effective in case that SST is parallel to a torque wrench.

4. CONNECT SUCTION HOSE

Connect the suction hose with the clip.



5. INSTALL DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner arm clockwise, and install the drive belt.

6. INSTALL RH AND CENTER ENGINE UNDER COVERS

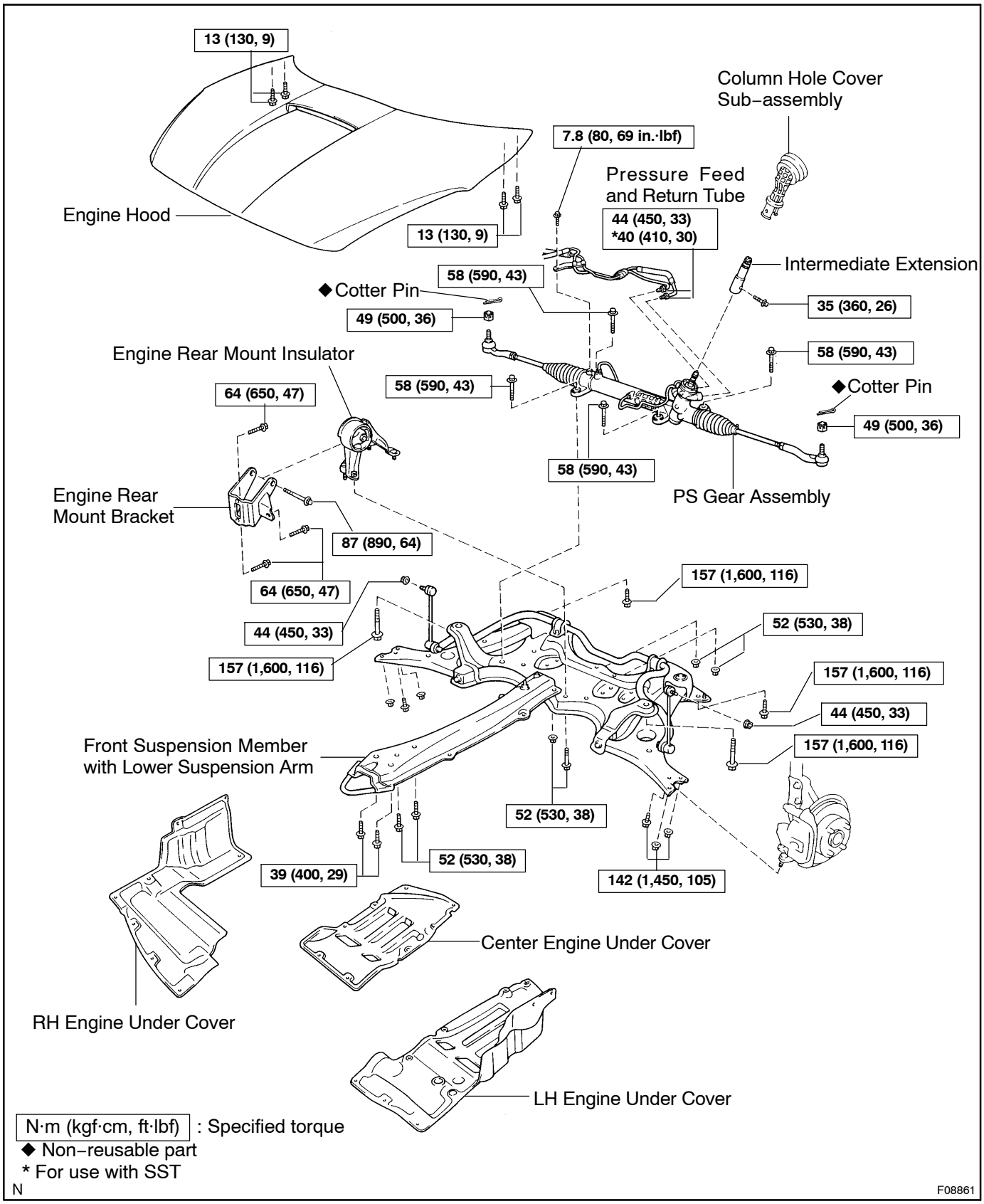
7. BLEED POWER STEERING SYSTEM

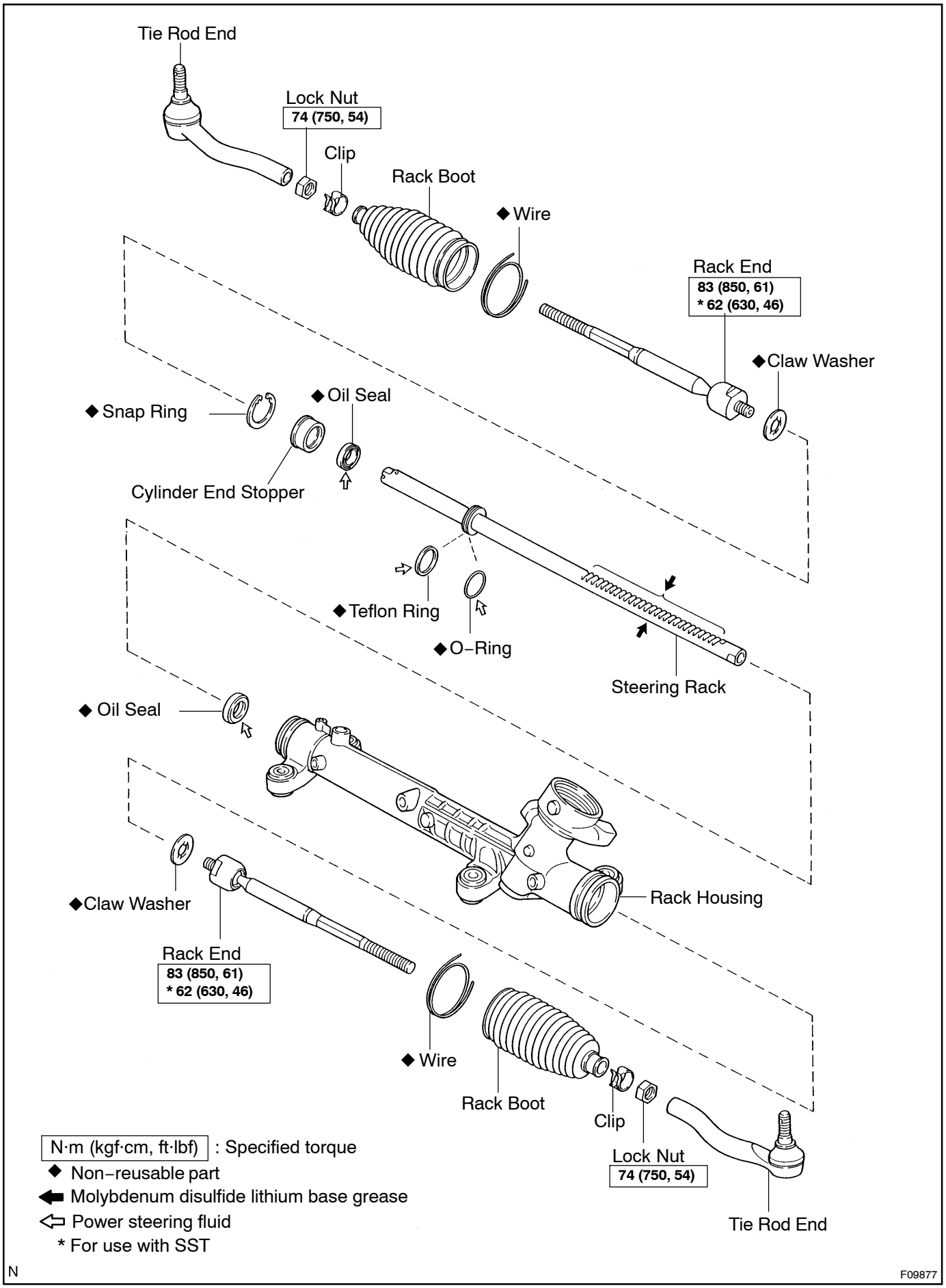
(See page SR–4)

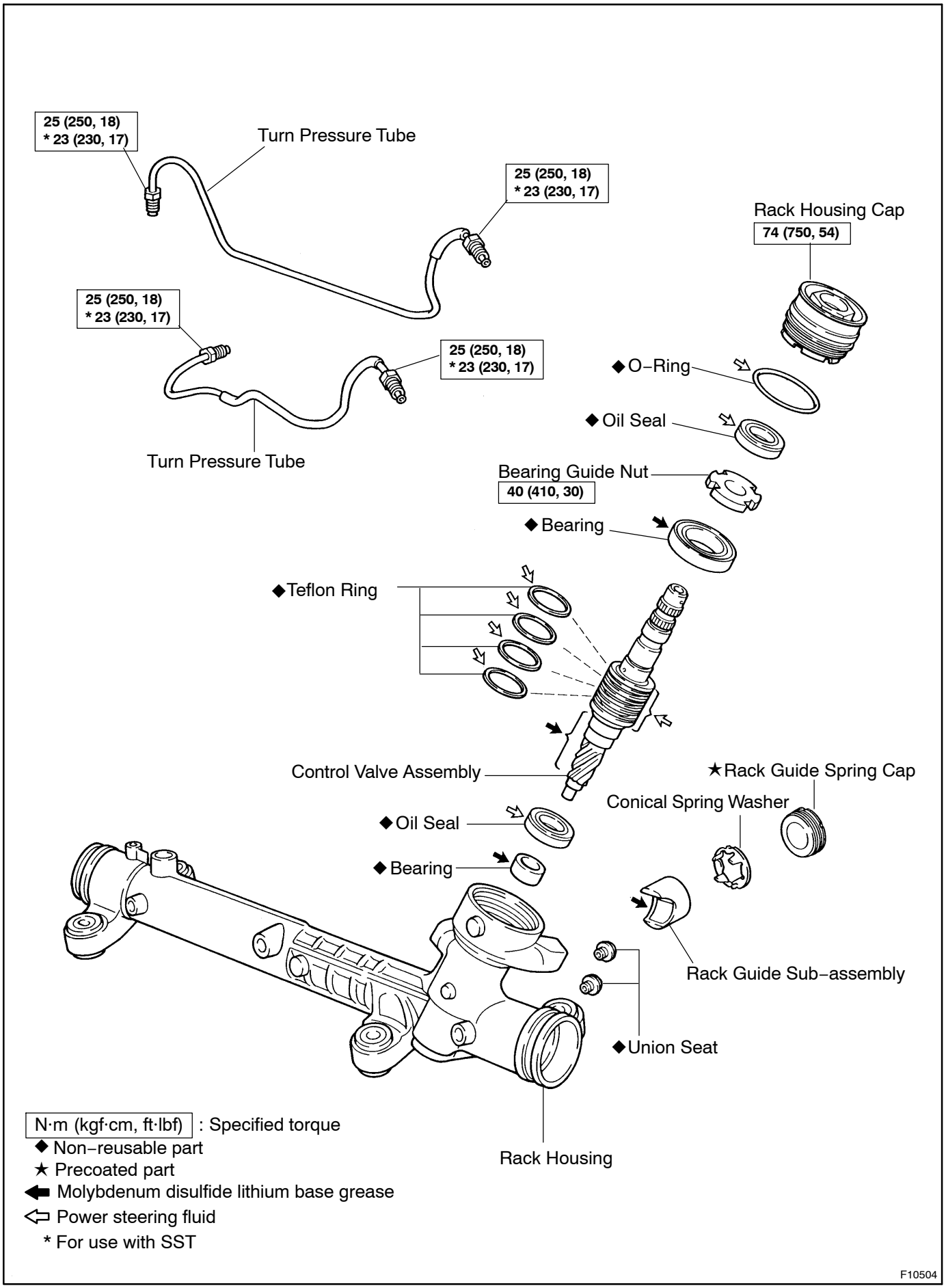
POWER STEERING GEAR

COMPONENTS

SR0YX–04




Tie Rod End
Lock Nut
74 (750, 54)
Clip
Rack Boot
◆Wire
Rack End
83 (850, 61)
* 62 (630, 46)
◆Claw Washer
◆Snap Ring
◆Oil Seal
Cylinder End Stopper
◆Teflon Ring
◆O–Ring
Steering Rack
◆Oil Seal
Rack Housing
◆Claw Washer
Rack End
83 (850, 61)
* 62 (630, 46)
◆Wire
Rack Boot
Clip
Lock Nut
74 (750, 54)
Tie Rod End
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
Molybdenum disulfide lithium base grease
Power steering fluid
* For use with SST
N
F09877


25 (250, 18)
* 23 (230, 17)
Turn Pressure Tube
25 (250, 18)
* 23 (230, 17)
Rack Housing Cap
74 (750, 54)
25 (250, 18)
* 23 (230, 17)
25 (250, 18)
* 23 (230, 17)
◆O–Ring
◆Oil Seal
Turn Pressure Tube
Bearing Guide Nut
40 (410, 30)
◆Bearing
◆Teflon Ring
Control Valve Assembly
★Rack Guide Spring Cap
Conical Spring Washer
◆Oil Seal
◆Bearing
Rack Guide Sub–assembly
◆Union Seat
Rack Housing
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part
★ Precoated part
Molybdenum disulfide lithium base grease
Power steering fluid
* For use with SST
F10504

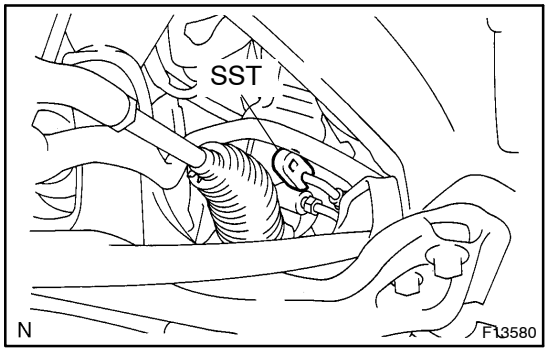
SR0YR–04

REMOVAL

NOTICE:

Remove the steering wheel assembly before the steering gear removal, because there is possibility of breaking of the spiral cable.

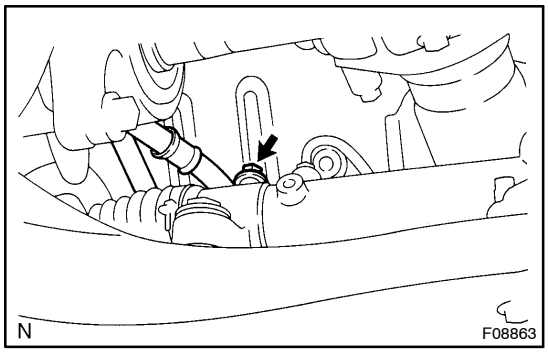
1. **PLACE FRONT WHEELS FACING STRAIGHT AHEAD**
2. **REMOVE STEERING WHEEL PAD (See page SR–13)**
3. **REMOVE STEERING WHEEL (See page SR–13)**
4. **REMOVE RH, CENTER AND LH ENGINE UNDER COVERS**
5. **DISCONNECT RH AND LH TIE ROD ENDS (See page SA–13)**
6. **DISCONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY (See page SR–13)**



7. **DISCONNECT PRESSURE FEED AND RETURN TUBES**

Using SST, disconnect the pressure feed and return tubes.

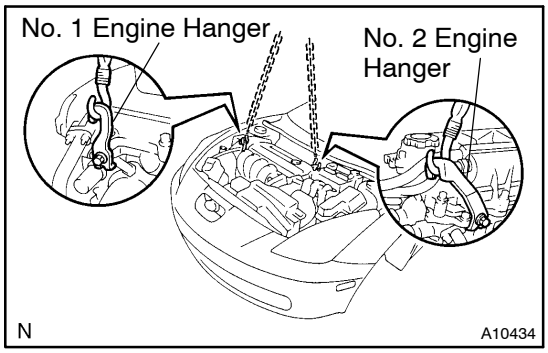
SST 09023–38401



8. **DISCONNECT TUBE CLAMP**

Remove the bolt and disconnect the tube clamp.

9. **DISCONNECT COLUMN HOLE COVER SUB–ASSEMBLY**
10. **REMOVE ENGINE HOOD (See page BO–9)**



11. ATTACH ENGINE SLING DEVICE TO ENGINE HANGERS

(a) Remove the 4 bolts and No. 2 cylinder head cover.

(b) Disconnect the PCV hoses from the cylinder head cover.

(c) Install the No. 1 and No. 2 engine hangers in the correct direction.

1ZZ–FE Engine:
Part No.:
No. 1 engine hanger: 12281–22021
No. 2 engine hanger: 12281–15040 or 12281–15050
Bolt: 91512–B1016
Torque: 38 N·m (388 kgf·cm, 28 ft·lbf)
2ZZ–FE Engine:
Part No.:
No. 1 engine hanger: 12281–88600
No. 2 engine hanger: 12282–88600
Bolt: 91512–61020
Torque: 38 N·m (388 kgf·cm, 28 ft·lbf)

(d) Attach the engine sling device to the engine hangers.

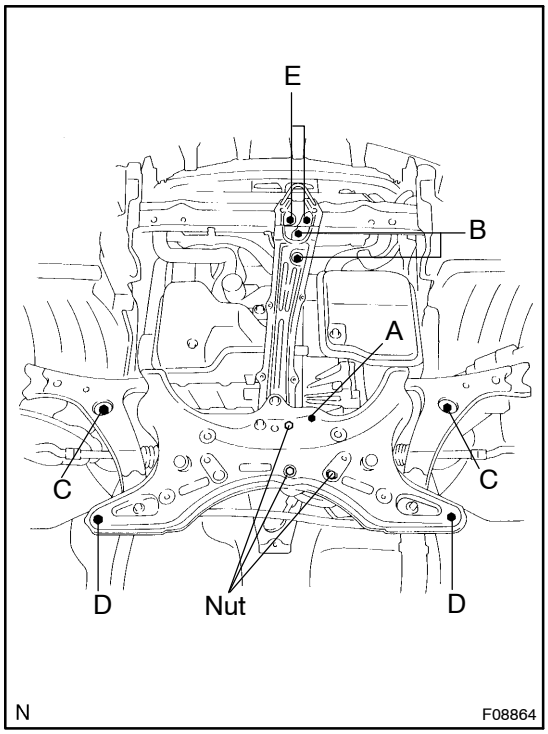
CAUTION:
Do not attempt to hang the engine by hooking the chain to any other part.

12. DISCONNECT LOWER BALL JOINT FROM LOWER SUSPENSION ARM (See page SA–43)

13. DISCONNECT STABILIZER BAR

(a) Remove the nut and disconnect the stabilizer bar.

(b) Employ the same manner described above to the other side.



14. DISCONNECT ENGINE REAR MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Remove the bolt (bolt A) and 3 nuts, and disconnect the engine rear mount insulator and front suspension member.

15. DISCONNECT ENGINE FRONT MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Remove the 2 bolts (bolt B) and disconnect the engine front mount insulator and front suspension member.

16. SUPPORT FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM

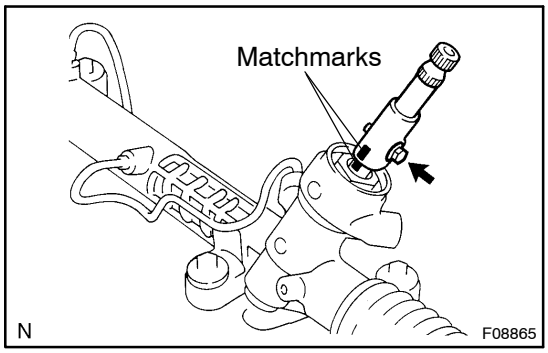
Using a transmission jack, support the front suspension member with lower suspension arm.

17. REMOVE FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM AND PS GEAR ASSEMBLY

Remove the 6 bolts (bolt C, D and E) and front suspension member with lower suspension arm and PS gear assembly.

18. REMOVE PS GEAR ASSEMBLY

(a) Remove the 4 bolts and PS gear assembly from the front suspension member.



(b) Place matchmarks on the intermediate extension and control valve shaft.

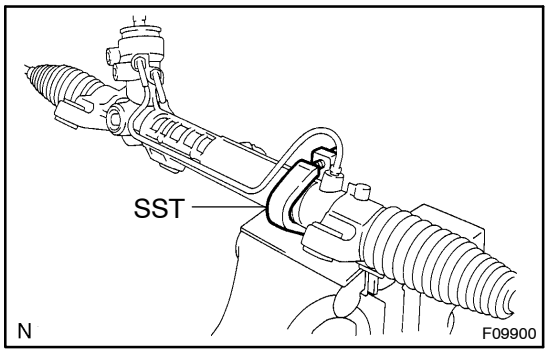
(c) Remove the bolt and intermediate extension.

19. REMOVE ENGINE REAR MOUNT INSULATOR AND ENGINE REAR MOUNT BRACKET

(a) Remove the through bolt and engine rear mount insulator.

(b) Remove the 3 bolts and engine rear mount bracket.

SR0YS–03



DISASSEMBLY

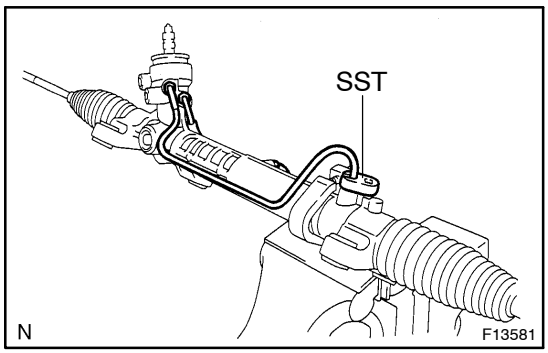
NOTICE:

When using a vise, do not overtighten it.

1. SECURE PS GEAR ASSEMBLY IN VISE

Using SST, secure the PS gear assembly in a vise.

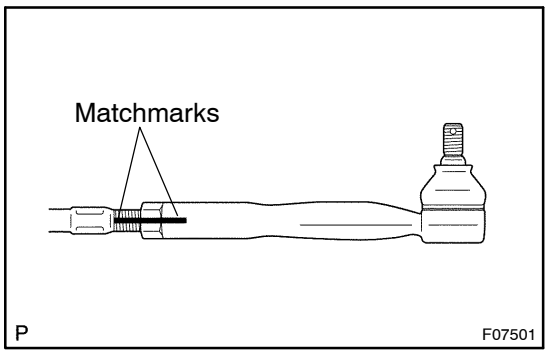
SST 09612–00012



2. REMOVE 2 TURN PRESSURE TUBES

Using SST, remove the 2 turn pressure tubes.

SST 09023–38201



3. REMOVE RH AND LH TIE ROD ENDS AND LOCK NUTS

(a) Place matchmarks on the tie rod end and rack end.

(b) Loosen the lock nut, and remove the tie rod end and lock nut.

(c) Employ the same manner described above to the other side.

4. REMOVE RH AND LH CLIPS, WIRES AND RACK BOOTS

(a) Using needle nose pliers, loosen the wire.

(b) Remove the clip, wire and rack boot.

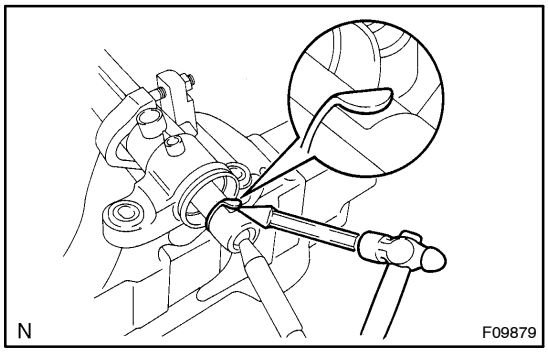
NOTICE:

Be careful not to damage the boot.

HINT:

Mark the RH and LH rack boots.

(c) Employ the same manner described above to the other side.

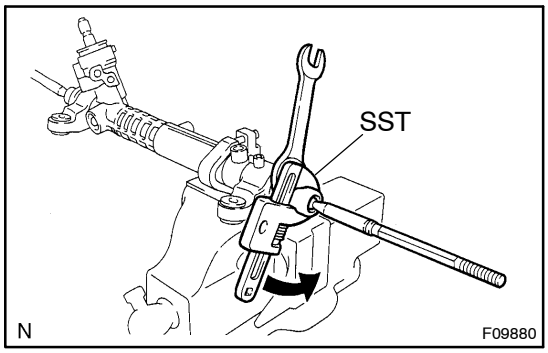


5. REMOVE RH AND LH RACK ENDS AND CLAW WASHERS

(a) Using a chisel and a hammer, unstake the washer.

NOTICE:

Avoid any impact on the steering rack.



(b) Using a spanner, hold the steering rack steadily and using SST, remove the rack end.
SST 09922–10010

NOTICE:

Use SST 09922–10010 in the direction shown in the illustration.

HINT:

Mark the RH and LH rack ends.

(c) Remove the claw washer.

(d) Employ the same manner described above to the other side.

6. REMOVE RACK GUIDE SPRING CAP, CONICAL SPRING WASHER AND RACK GUIDE SUB–ASSEMBLY

7. REMOVE RACK HOUSING CAP

(a) Remove the rack housing cap.

(b) Remove the O–ring from the rack housing cap.

8. REMOVE CONTROL VALVE ASSEMBLY

Pull out the control valve assembly.

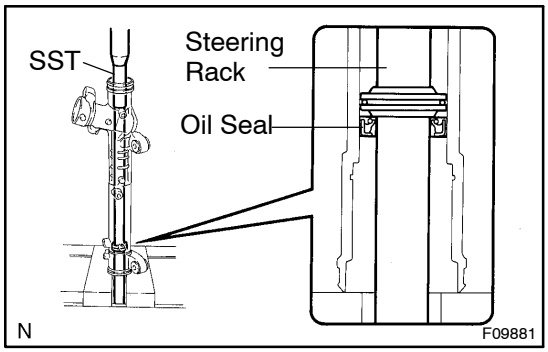
NOTICE:

Be careful not to damage the oil seal lip.

9. REMOVE CYLINDER END STOPPER

(a) Using snap ring pliers, remove the snap ring.

(b) Pull out the cylinder end stopper.

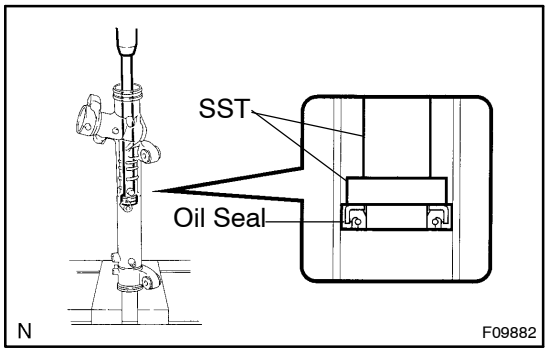


10. REMOVE STEERING RACK AND OIL SEAL

Using SST, press out the steering rack and oil seal.
SST 09950–70010 (09951–07200)

NOTICE:

Take care not to drop the steering rack.



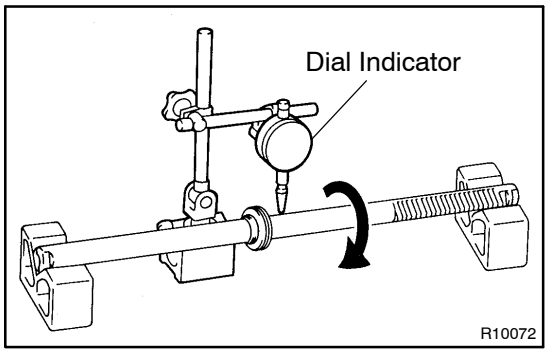
11. REMOVE OIL SEAL

Using SST, press out the oil seal.
SST 09950–60010 (09951–00280),
09950–70010 (09951–07360)

NOTICE:

Do not damage the rack housing.

SR0YT–03



INSPECTION

NOTICE:

When using a vise, do not overtighten it.

INSPECT STEERING RACK

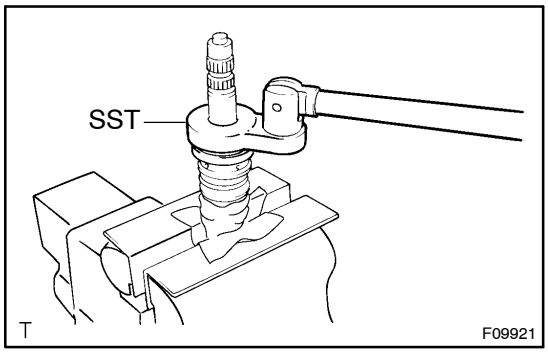
(a) Using a dial indicator, check the rack for runout, teeth wear and damage.

Maximum runout: 0.1 mm (0.004 in.)

(b) Check the back surface for wear and damage.

SR0YU–03

REPLACEMENT



NOTICE:

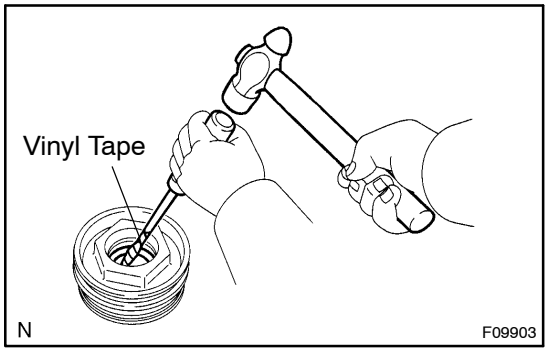
When using a vise, do not overtighten it.

1. IF NECESSARY, REPLACE BEARING

(a) Using SST, remove the bearing guide nut and bearing.
SST 09617–35020

(b) Coat a new bearing with molybdenum disulfide lithium base grease.

(c) Install the bearing and using SST, install the bearing guide nut.
SST 09617–35020
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

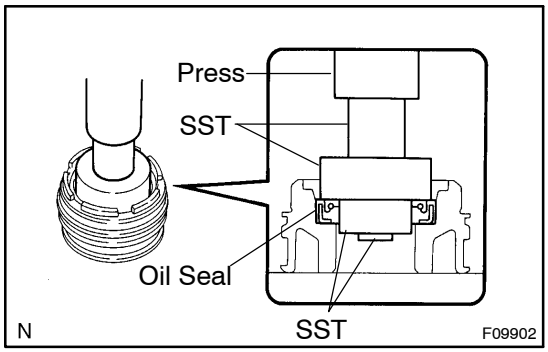


2. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver with vinyl tape wound around its tip, remove the oil seal.

NOTICE:

Be careful not to damage the rack housing cap.

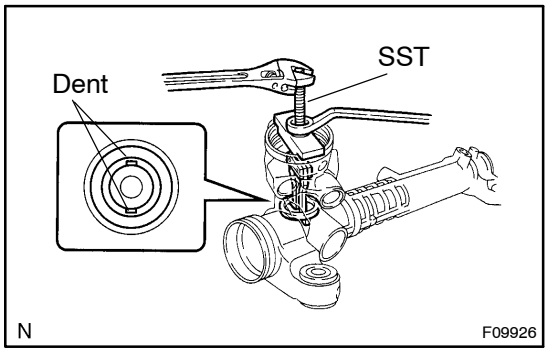


(b) Coat a new oil seal lip with power steering fluid.

(c) Using SST, press in the oil seal.
SST 09950–60010 (09951–00210, 09951–00340, 09952–06010), 09950–70010 (09951–07100)

NOTICE:

Make sure that the oil seal is installed facing in the correct direction.



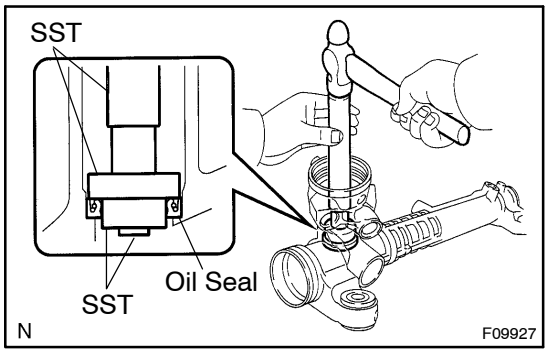
3. IF NECESSARY, REPLACE OIL SEAL

(a) Using SST, remove the oil seal.
SST 09612–20010

NOTICE:

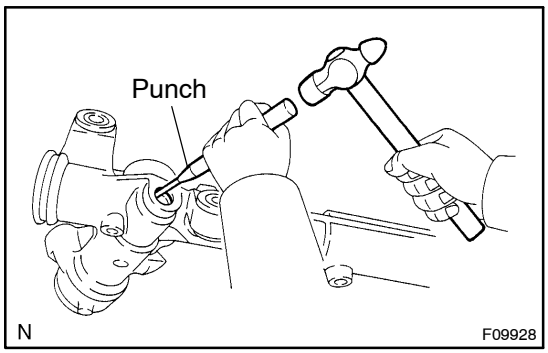
Be careful not to damage the rack housing.

(b) Coat a new oil seal lip with power steering fluid.



(c) Using SST and a hammer, tap in the oil seal.
SST 09950–60010 (09951–00240, 09951–00350, 09952–06010), 09950–70010 (09951–07150)

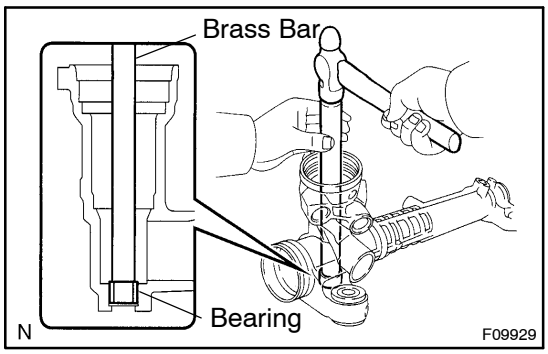
NOTICE:
Make sure that the oil seal is installed facing in the correct direction.



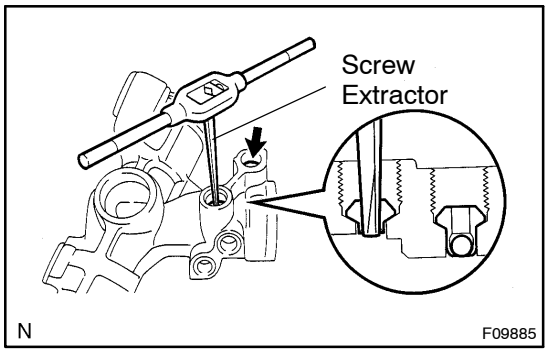
4. IF NECESSARY, REPLACE BEARING

(a) Using a punch and a hammer, tap out the bearing.

(b) Coat a new bearing with molybdenum disulfide lithium base grease.

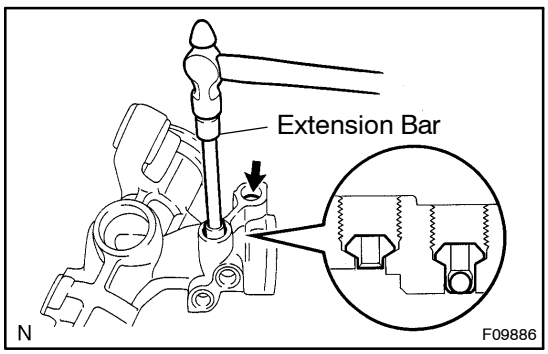


(c) Using a brass bar and a hammer, tap in the bearing.



5. IF NECESSARY, REPLACE 2 UNION SEATS

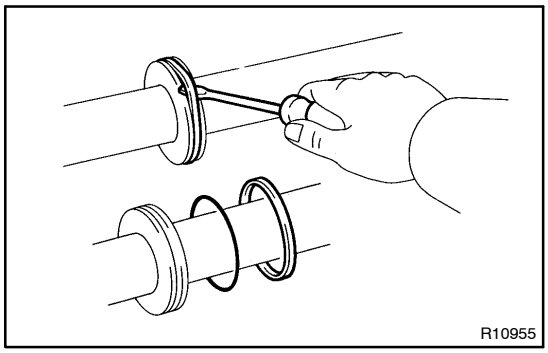
(a) Using a screw extractor, remove the union seat from the rack housing.



(b) Using a hammer and an extension bar, lightly tap in a new union seat.

NOTICE:
Before installing the union seat, remove the dust sticking to the rack housing.

(c) Employ the same manner described above to the other side.



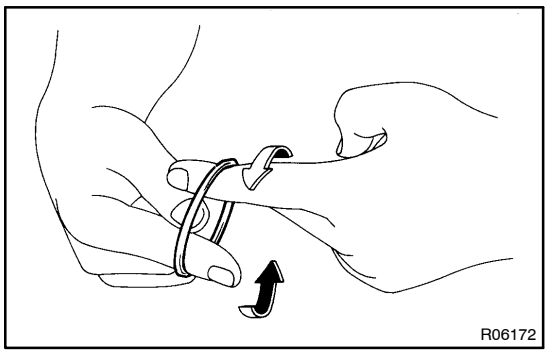
6. IF NECESSARY, REPLACE TEFLON RING AND O–RING

(a) Using a screwdriver, remove the teflon ring and O–ring from the steering rack.

NOTICE:

Be careful not to damage the groove for the teflon ring.

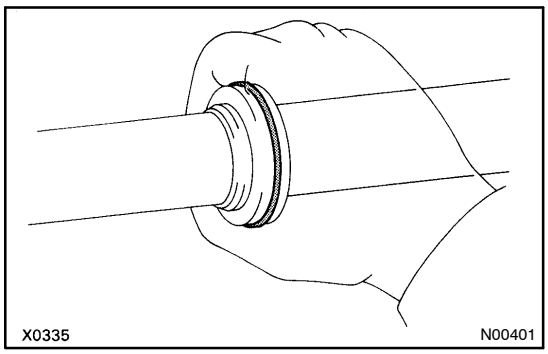
(b) Coat a new O–ring with power steering fluid and install it to the steering rack.



(c) Expand a new teflon ring with your fingers.

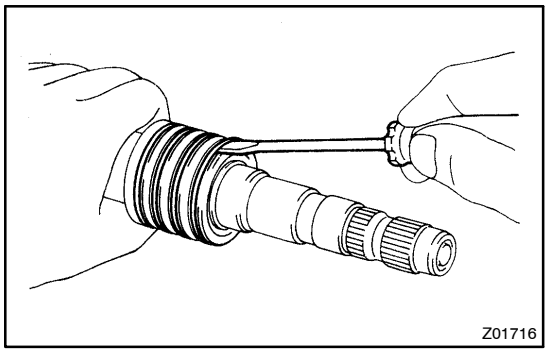
NOTICE:

Be careful not to overexpand the teflon ring.



(d) Coat the teflon ring with power steering fluid.

(e) Install the teflon ring to the steering rack and settle it down with your fingers.



7. IF NECESSARY, REPLACE 4 TEFLON RINGS

(a) Using a screwdriver, remove the 4 teflon rings from the control valve assembly.

NOTICE:

Be careful not to damage the grooves for the teflon rings.

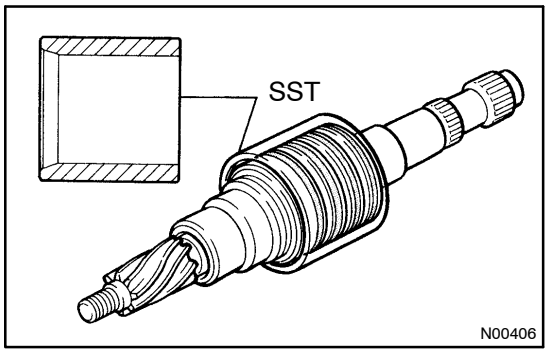
(b) Expand 4 new teflon rings with your fingers.

NOTICE:

Be careful not to overexpand the teflon ring.

(c) Coat the teflon rings with power steering fluid.

(d) Install the teflon rings to the control valve assembly and settle them down with your fingers.



(e) Carefully slide the tapered end of SST over the teflon rings until they fit to the control valve assembly.
SST 09631–20081

NOTICE:
Be careful not to damage the teflon rings.

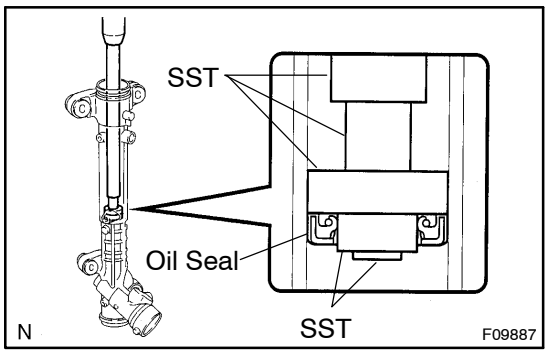
SR0YV–03

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT PARTS INDICATED BY ARROWS WITH POWER STEERING FLUID OR MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR–35)



2. INSTALL OIL SEAL

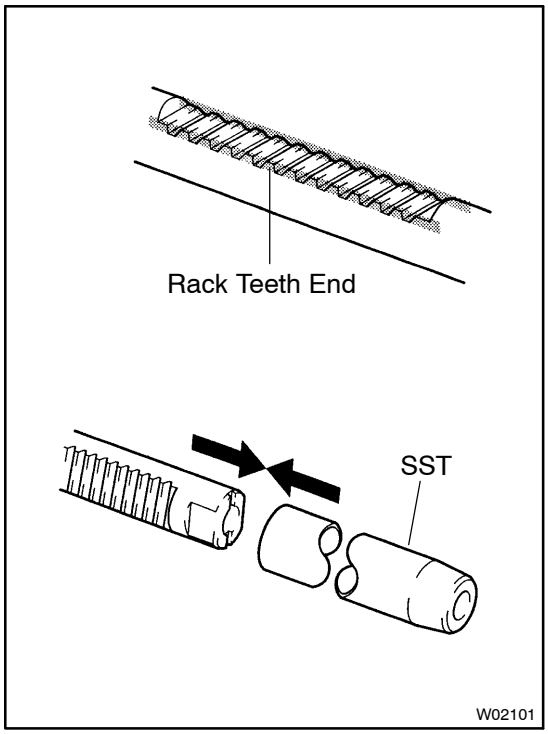
(a) Coat a new oil seal lip with power steering fluid.

(b) Install the oil seal to SST, and press them into the rack housing.

SST 09950–60010 (09951–00240, 09951–00400, 09952–06010), 09950–70010 (09951–07360)

NOTICE:

- **Make sure that the oil seal is installed facing in the correct direction.**
- **Take care that the oil seal does not get reversed as you install it.**



3. INSTALL STEERING RACK

(a) Install SST to the rack.

SST 09631–20051

HINT:

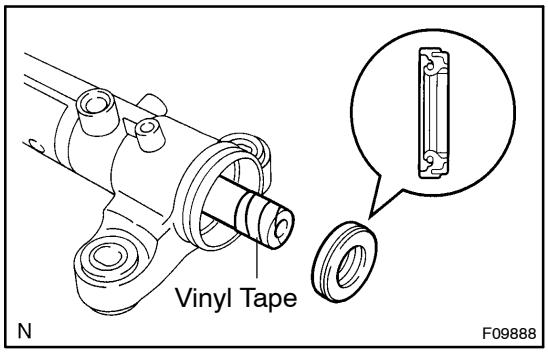
If necessary, scrape the burrs off the rack teeth end and burnish.

(b) Coat SST with power steering fluid.

(c) Install the steering rack into the rack housing.

(d) Remove the SST.

SST 09631–20051



4. INSTALL OIL SEAL

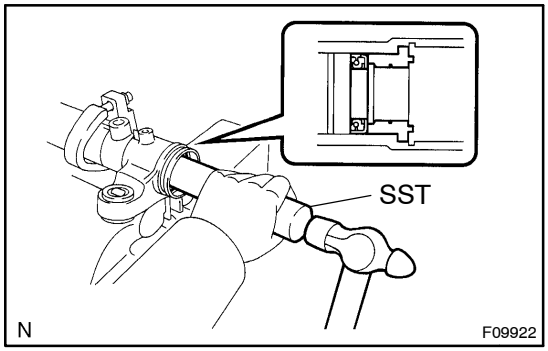
(a) Coat a new oil seal lip with power steering fluid.

(b) To prevent oil seal lip damage, wind vinyl tape on the steering rack end, and apply power steering fluid.

(c) Install the oil seal by pushing it into the rack housing without tilting.

NOTICE:

- **Make sure that the oil seal is installed facing in the correct direction.**
- **Be careful not to damage the oil seal lip.**

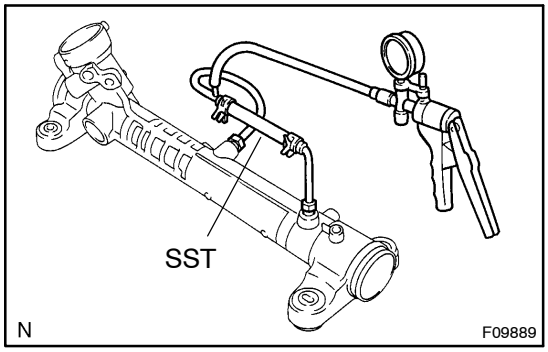


5. INSTALL CYLINDER END STOPPER

(a) Using SST and a hammer, drive in the cylinder end stopper.

SST 09612–22011

(b) Using snap ring pliers, install a new snap ring to the rack housing.



6. AIR TIGHTNESS TEST

(a) Install SST to the rack housing.

SST 09631–12071

(b) Apply 53 kPa (400 mmHg, 15.75 in.Hg) of vacuum for about 30 seconds.

(c) Check that there is no change in the vacuum.

If there is a change in the vacuum, check the installation of the oil seals.

7. INSTALL CONTROL VALVE ASSEMBLY

NOTICE:

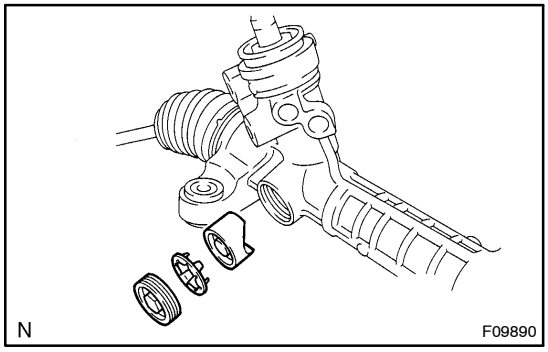
Be careful not to damage the teflon rings and oil seal lips.

8. INSTALL RACK HOUSING CAP

(a) Coat a new O–ring with power steering fluid, and install it to the rack housing cap.

(b) Install the rack housing cap.

Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

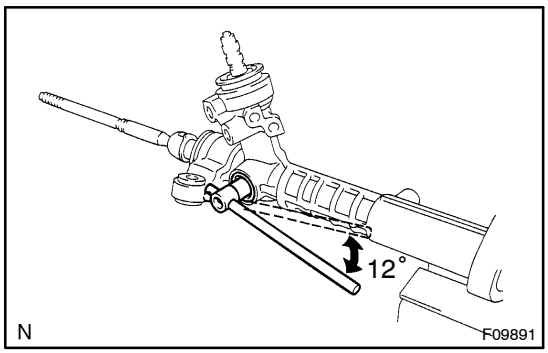


9. INSTALL RACK GUIDE SUB–ASSEMBLY, CONICAL SPRING WASHER AND RACK GUIDE SPRING CAP

(a) Install the rack guide sub–assembly and conical spring washer.

(b) Apply sealant to 2 or 3 threads of the rack guide spring cap.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Temporarily install the rack guide spring cap.

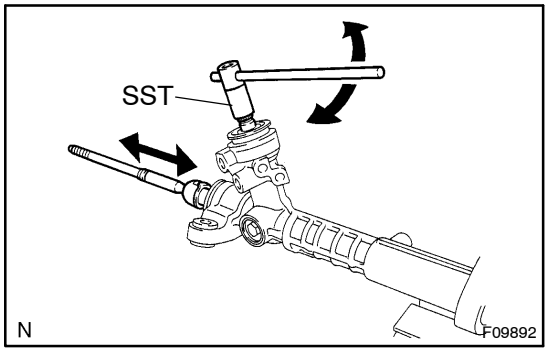


10. ADJUST TOTAL PRELOAD

(a) To prevent the steering rack teeth from damaging the oil seal lip, temporarily install the RH and LH rack ends.

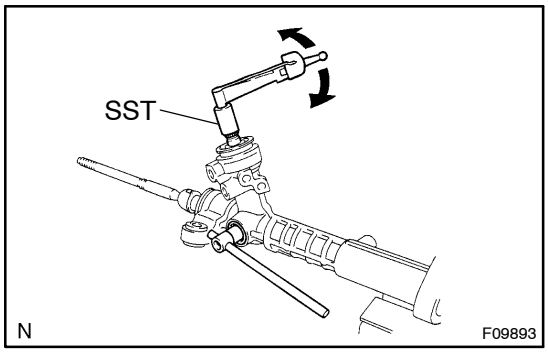
(b) Torque the rack guide spring cap.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Return the rack guide spring cap 12°.

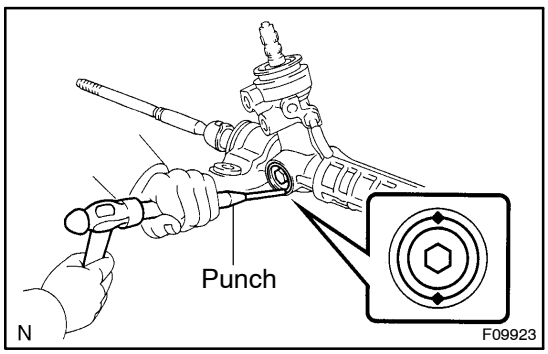


(d) Using SST, turn the control valve shaft right and left 1 or 2 times.
SST 09616–00011

(e) Loosen the rack guide spring cap until the rack guide spring is not functioning.



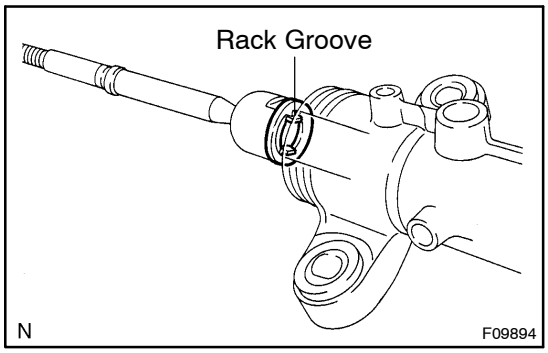
(f) Using SST and torque wrench, tighten the rack guide spring cap until the preload is within the specification.
SST 09616–00011
Preload (turning):
0.9 – 1.3 N·m (9 – 13 kgf·cm, 8.0 – 11.5 in.·lbf)



(g) Using a punch and a hammer, stake 2 parts in opposing positions on the rack guide spring cap.

(h) Recheck the total preload.
Preload (turning):
0.9 – 1.3 N·m (9 – 13 kgf·cm, 8.0 – 11.5 in.·lbf)

(i) Remove the RH and LH rack ends.

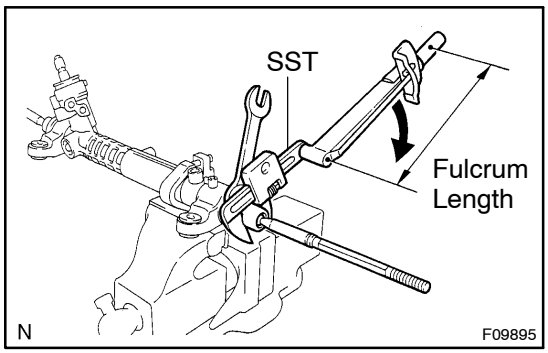


11. INSTALL RH AND LH CLAW WASHERS AND RACK ENDS

(a) Install a new claw washer, and temporarily install the rack end.

HINT:

Align the claws of the claw washer with the steering rack grooves.



(b) Using a spanner, hold the steering rack steadily and using SST, torque the rack end.

SST 09922–10010

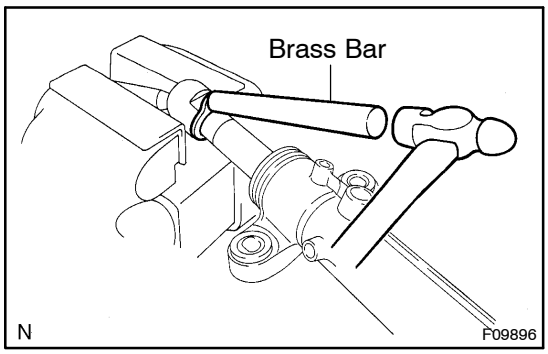
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

NOTICE:

Use SST 09922–10010 in the direction shown in the illustration.

HINT:

Use a torque wrench with a fulcrum length of 380 mm (14.96 in.).

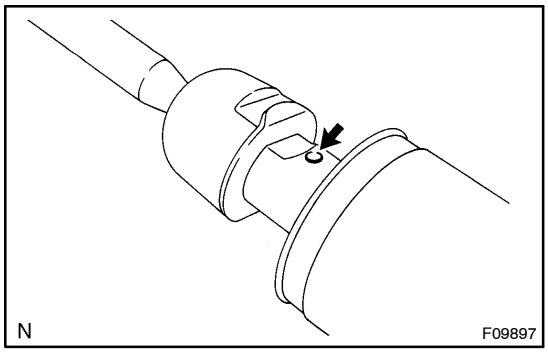


(c) Using a brass bar and a hammer, stake the washer.

NOTICE:

Avoid any impact on the steering rack.

(d) Employ the same manner described above to the other side.



12. INSTALL RH AND LH RACK BOOTS, WIRES AND CLIPS

(a) Ensure that the steering rack hole is not clogged with grease.

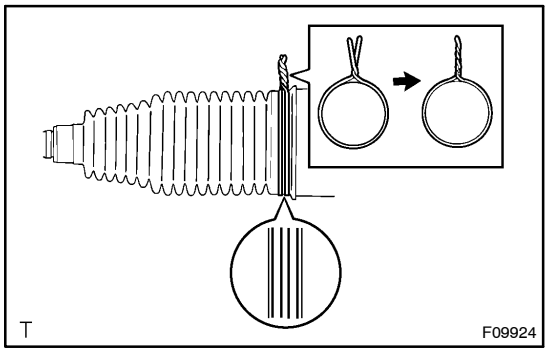
HINT:

If the hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel is turned.

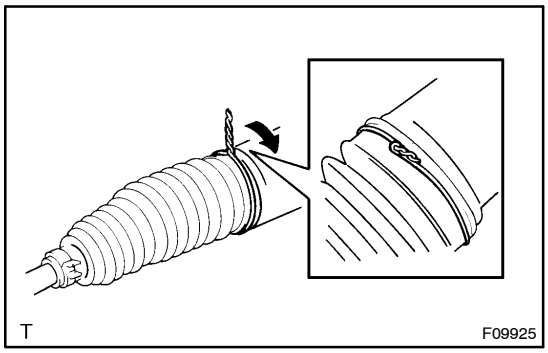
(b) Install the boot, clip and a new wire.

NOTICE:

Be careful not to damage or twist the boot.

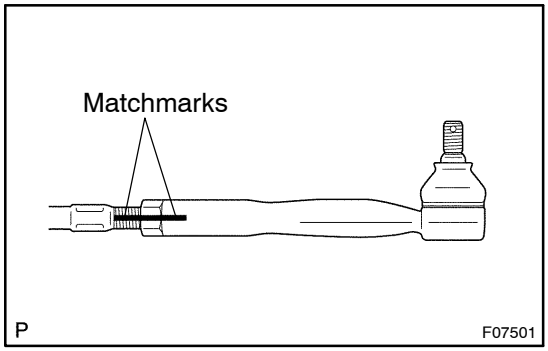


(c) After winding and tightening the wire around the circumference of the boot twice, twist it several times, and install it.



(d) As shown in the illustration, bend the wire to the circular direction to prevent damage to the boot.

(e) Employ the same manner described above to the other side.



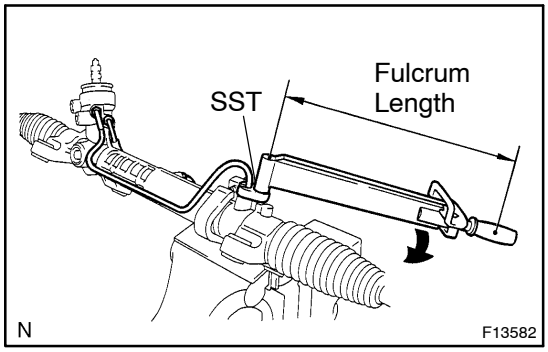
13. INSTALL RH AND LH TIE ROD ENDS AND LOCK NUTS

(a) Screw the lock nut and tie rod end onto the rack end until the matchmarks are aligned.

(b) After adjusting toe–in, torque the nut (See page SA–5).

Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

(c) Employ the same manner described above to the other side.



14. INSTALL 2 TURN PRESSURE TUBES

Using SST, install the 2 turn pressure tubes.

SST 09023–38201

Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)

HINT:

- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.

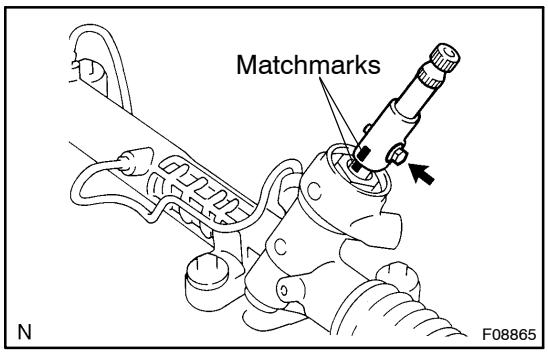
SR0YW–04

INSTALLATION

1. INSTALL ENGINE REAR MOUNT INSULATOR AND ENGINE REAR MOUNT BRACKET

(a) Install the engine rear mount bracket with the 3 bolts.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

(b) Install the engine rear mount insulator with the through bolt.
Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

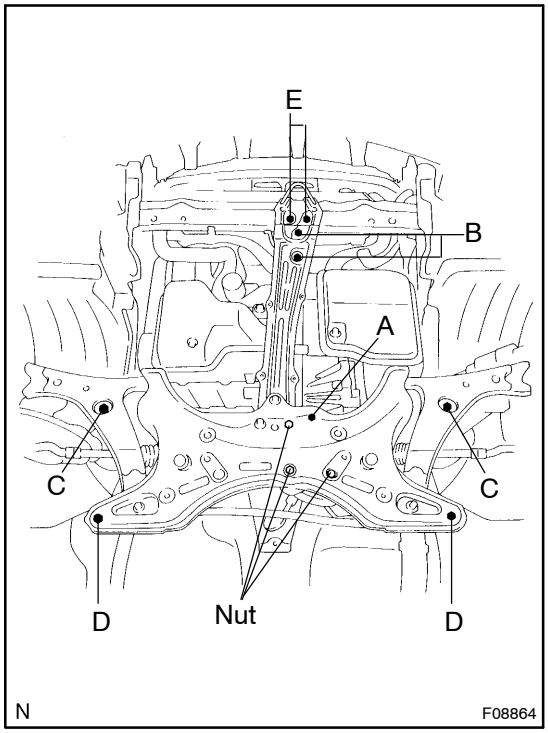


2. INSTALL PS GEAR ASSEMBLY

(a) Align the matchmarks on the intermediate extension and control valve shaft.

(b) Install the bolt.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(c) Install the PS gear assembly with the 4 bolts to the front suspension member.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)



3. INSTALL FRONT SUSPENSION MEMBER WITH LOWER SUSPENSION ARM AND PS GEAR ASSEMBLY

Install the front suspension member with lower suspension arm and PS gear assembly with the 6 bolts (bolt C, D and E).
Torque:
Bolt C: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt D: 157 N·m (1,600 kgf·cm, 116 ft·lbf)
Bolt E: 39 N·m (400 kgf·cm, 29 ft·lbf)

4. CONNECT ENGINE FRONT MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

Connect the engine front mount insulator and front suspension member with the 2 bolts (bolt B).
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

5. CONNECT ENGINE REAR MOUNT INSULATOR AND FRONT SUSPENSION MEMBER

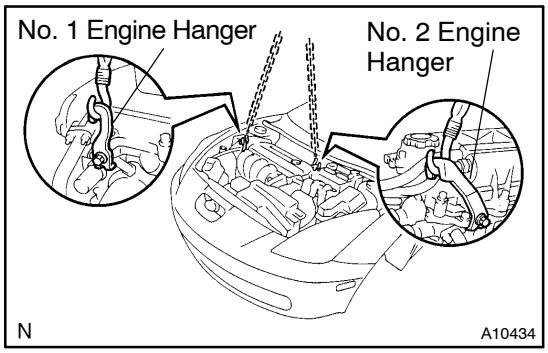
Connect the engine rear mount insulator and front suspension member with the bolt (bolt A) and 3 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

6. CONNECT STABILIZER BAR

(a) Connect the stabilizer bar with the nut.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Employ the same manner described above to the other side.

7. CONNECT LOWER BALL JOINT TO LOWER SUSPENSION ARM (See page SA–46)



8. DISENGAGE ENGINE SLING DEVICE FROM ENGINE HANGERS

(a) Disengage the engine sling device from the engine hangers.

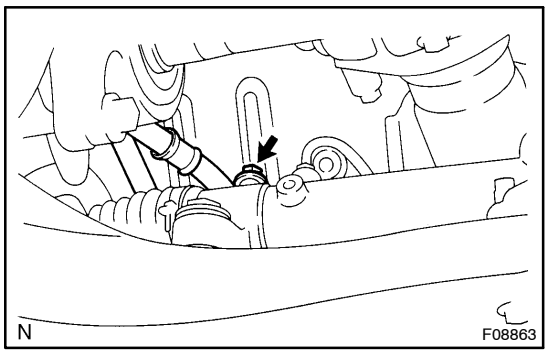
(b) Remove the No. 1 and No. 2 engine hangers.

(c) Connect the PCV hoses to the cylinder head cover.

(d) Install the No. 2 cylinder head cover with the 4 bolts.

9. INSTALL ENGINE HOOD (See page BO–9)

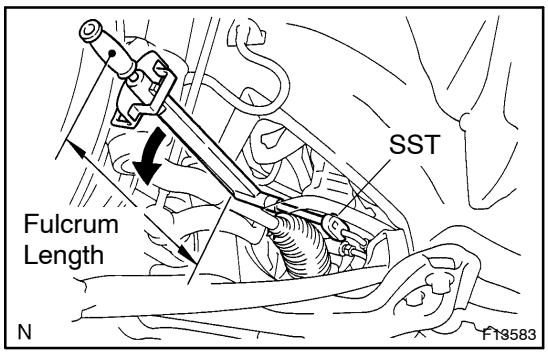
10. CONNECT COLUMN HOLE COVER SUB–ASSEMBLY



11. CONNECT TUBE CLAMP

Connect the tube clamp with the bolt.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)



12. CONNECT PRESSURE FEED AND RETURN TUBES

Using SST, connect the pressure feed and return tubes.

SST 09023–38400

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

HINT:

- Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.

13. CONNECT NO. 2 INTERMEDIATE SHAFT ASSEMBLY (See page SR–21)

14. CONNECT RH AND LH TIE ROD ENDS (See page SA–17)

15. INSTALL RH, CENTER AND LH ENGINE UNDER COVERS

16. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

HINT:

Do it with the front of the vehicle jacked up.

17. CENTER SPIRAL CABLE (See page SR–21)

18. INSTALL STEERING WHEEL

(a) Align the matchmarks on the steering wheel and steering column main shaft.

(b) Temporarily tighten the steering wheel set nut.

19. BLEED POWER STEERING SYSTEM (See page SR–4)

20. CHECK STEERING WHEEL CENTER POINT

21. TORQUE STEERING WHEEL SET NUT
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

22. INSTALL STEERING WHEEL PAD (See page SR–21)

23. CHECK FRONT WHEEL ALIGNMENT
(See page SA–5)

SRS AIRBAG

RS0JO–12

PRECAUTION

CAUTION:

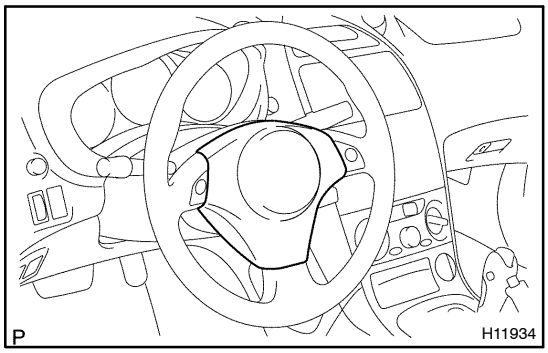
- **The CELICA is equipped with SRS, which comprises a driver airbag, front passenger airbag and side airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the SRS, it is possible that the SRS may fail to operate when required. Before performing servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedures described in the repair manual.**
- **Work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.**
  (The SRS is equipped with a back–up power source so that if work is started within 90 seconds from disconnecting the negative (–) terminal cable of the battery, the SRS may be deployed.)
- **Do not expose the steering wheel pad, front passenger airbag assembly, side airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly or door side airbag sensor directly to hot air or flames.**

NOTICE:

- **Malfunction symptoms of the SRS are difficult to confirm, so the DTCs become the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect the DTCs before disconnecting the battery.**
- **Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad, front passenger airbag assembly, side airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly and door side airbag sensor should be inspected.**
  (See page RS–14, RS–28, RS–42, RS–54, RS–59, RS–64 and RS–69)
- **Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.**
- **Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.**
- **Never disassemble and repair the steering wheel pad, front passenger airbag assembly, side airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly or door side airbag sensor in order to reuse it.**
- **If the steering wheel pad, front passenger airbag assembly, side airbag assembly, airbag sensor assembly, front airbag sensor, side airbag sensor assembly or door side airbag sensor has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace it with new one.**
- **Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting the system's electrical circuits.**
- **Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.**
- **After work on the SRS is completed, perform the SRS warning light check (See page DI–884).**
- **When the negative (–) terminal cable is disconnected from the battery, the memory of the clock and audio system will be canceled. So before starting work, make a record of the contents memorized in the audio memory system. When work is finished, reset the audio systems as they were before and adjust the clock. To avoid erasing the memory in each memory system, never use a back– up power supply from outside the vehicle.**
- **If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.**

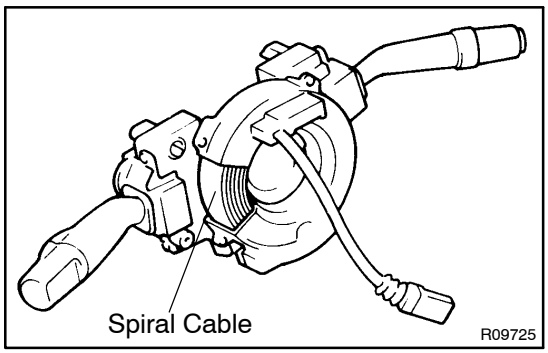
RS0JP–03

OPERATION



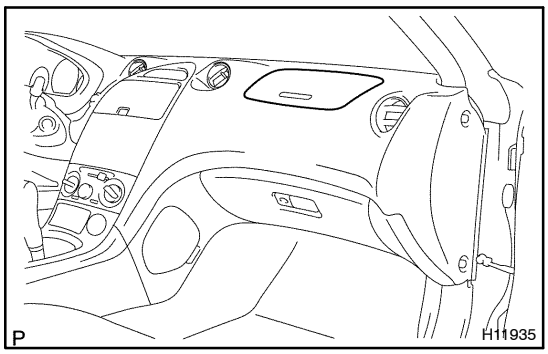
1. STEERING WHEEL PAD (with AIRBAG)

The inflater and bag of the SRS are stored in the steering wheel pad and cannot be disassembled. The inflater contains a squib, igniter charge, gas generator, etc., and inflates the bag when instructed by the airbag sensor assembly.



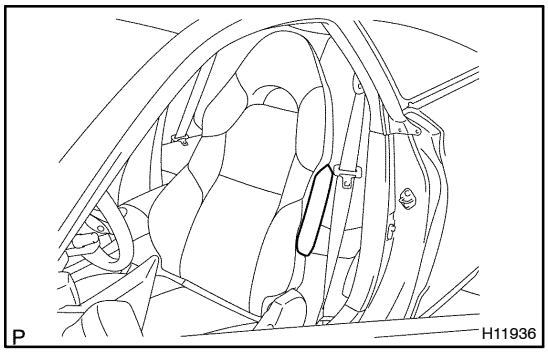
2. SPIRAL CABLE (in COMBINATION SWITCH)

A spiral cable is used as an electrical joint from the vehicle body side to the steering wheel.



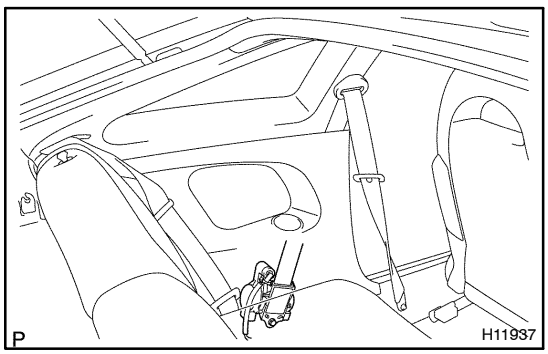
3. FRONT PASSENGER AIRBAG ASSEMBLY

The inflater and bag of the SRS are stored in the front passenger airbag assembly and cannot be disassembled. The inflater contains a squib, igniter charge, gas generator, etc., and inflates the bag when instructed by the airbag sensor assembly.



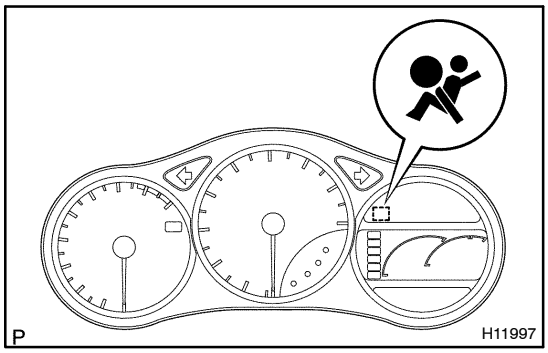
4. SIDE AIRBAG ASSEMBLY

The inflater and bag of the SRS side airbag are stored in the side airbag assembly and cannot be disassembled. The inflater contains a squib, igniter charge, gas generator, etc., and inflates the bag when instructed by the side airbag sensor assembly.



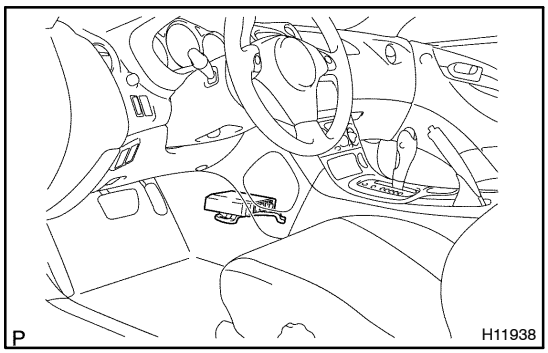
5. SEAT BELT PRETENSIONER

The seat belt pretensioner system is a component of the front seat outer belt. The pretensioner contains a squib, gas generator, wire, piston, etc., and operates in the event of a frontal collision. The seat belt pretensioner cannot be disassembled.



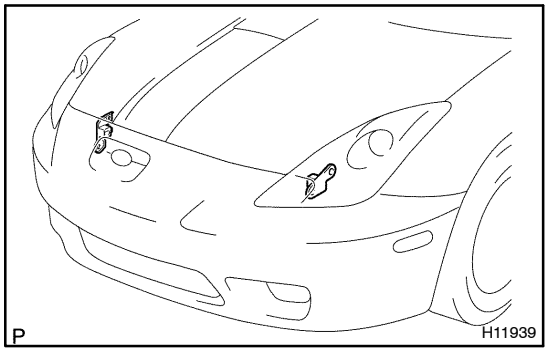
6. SRS WARNING LIGHT

The SRS warning light is located on the combination meter. It goes on to alert the driver of trouble in the system when a malfunction is detected in the airbag sensor assembly self–diagnosis. In normal operation conditions when the ignition switch is turned to the ON position, the light goes on for about 6 seconds and then goes off.



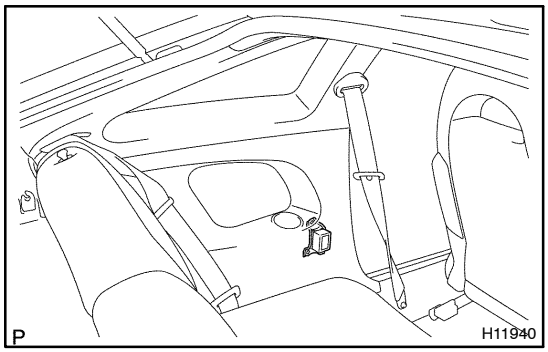
7. AIRBAG SENSOR ASSEMBLY

The airbag sensor assembly is mounted on the floor inside the lower center finish panel. The airbag sensor assembly consists of an airbag sensor, safing sensor, diagnosis circuit, ignition control, drive circuit, etc. It receives signals from the airbag sensor, front airbag sensor, side airbag sensor assembly and door side airbag assembly and judges whether the SRS must be activated or not. The airbag sensor assembly cannot be disassembled.



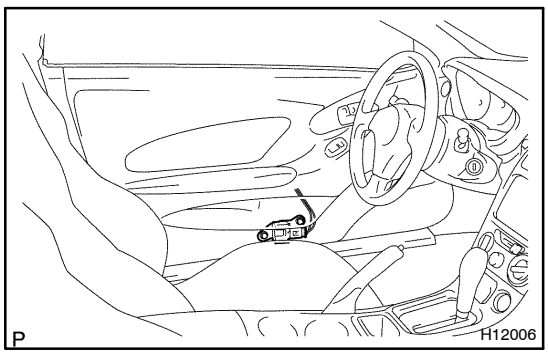
8. FRONT AIRBAG SENSOR

The front airbag sensor is mounted inside each of the side members. The sensor unit is a mechanical type. When the sensor detects deceleration force above a predetermined limit, contact is made in the sensor, sending a signal to the airbag sensor assembly. The front airbag sensor cannot be disassembled.



9. SIDE AIRBAG SENSOR ASSEMBLY

The side airbag sensor assembly is mounted in the LH and RH center pillars. The side airbag sensor assembly consists of a lateral deceleration sensor, safing sensor, diagnosis circuit, etc. It sends signals to the airbag sensor assembly to judge whether the SRS side airbag must be activated or not. The side airbag sensor assembly cannot be disassembled.



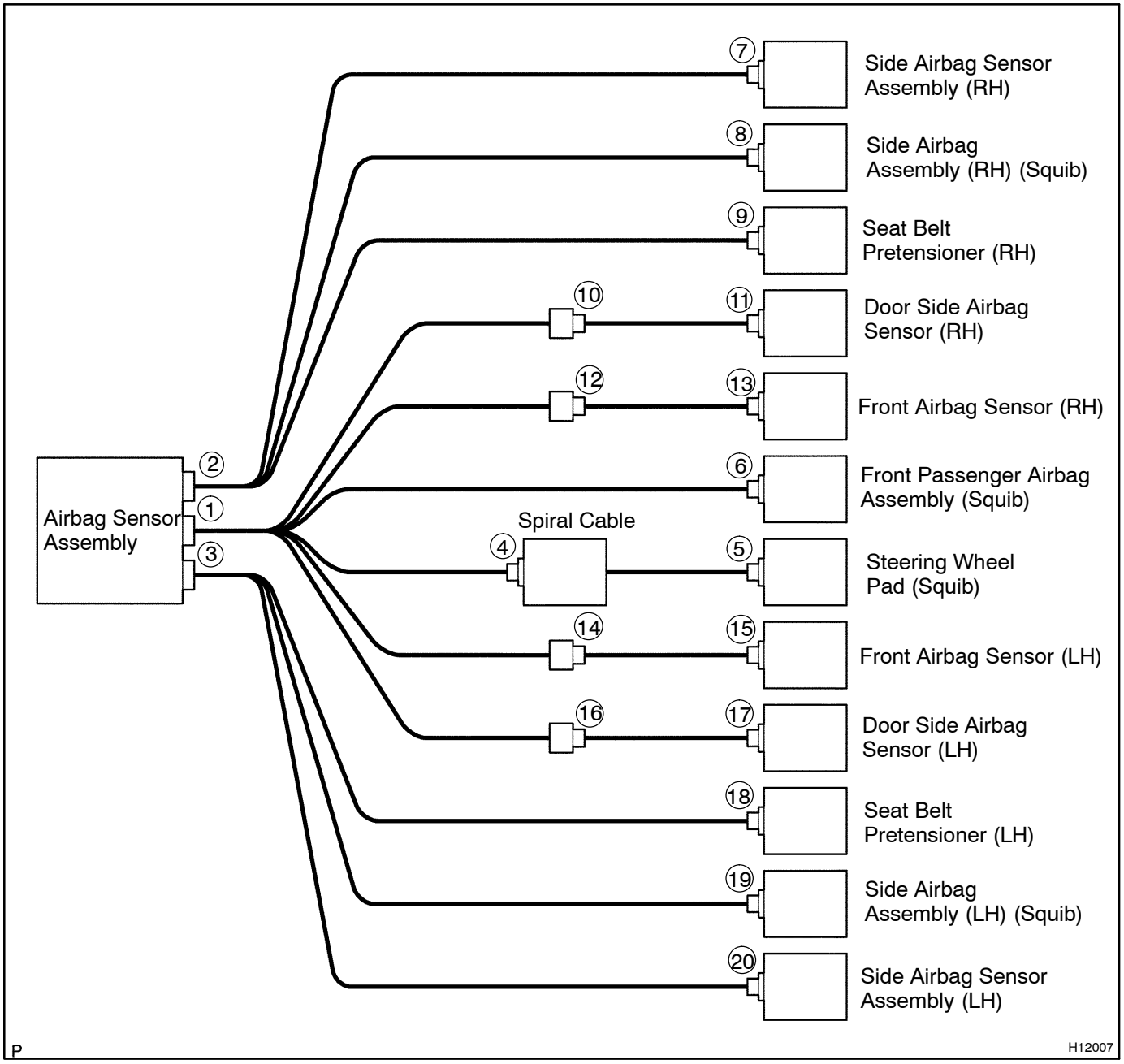
10. DOOR SIDE AIRBAG SENSOR

The door side airbag sensor is mounted on each of the door inside panel. The sensor unit is a mechanical type. When the sensor detects deceleration force above a predetermined limit, contact is made in the sensor, sending a signal to the airbag sensor assembly. The door side airbag sensor cannot be disassembled.

11. SRS CONNECTORS

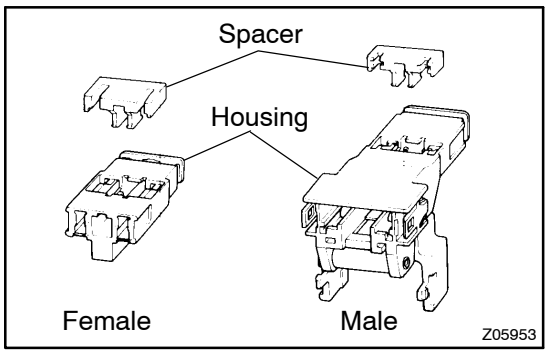
HINT:

SRS connectors are located as shown in the following illustration.



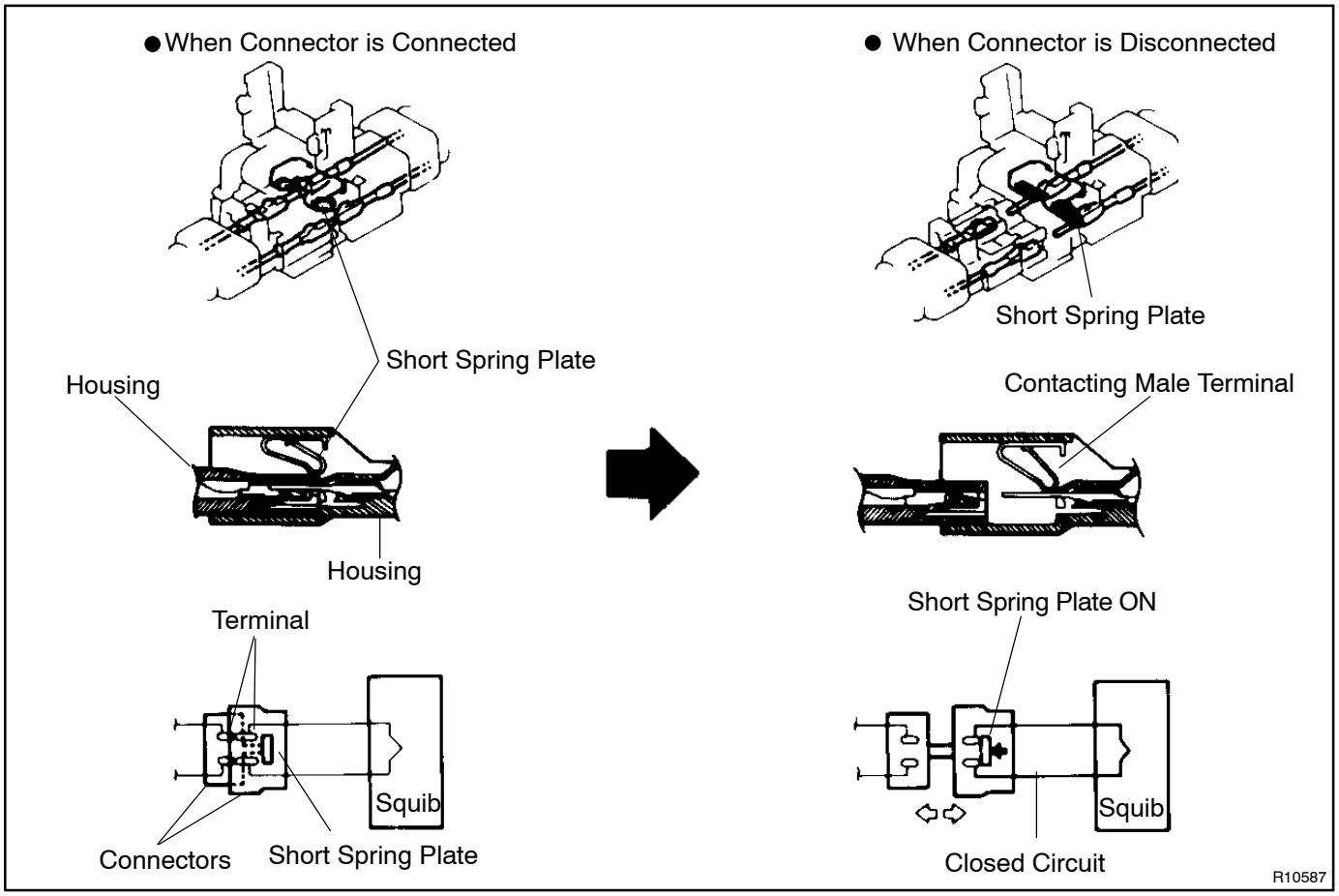
No.	Item	Application
(1)	Terminal Twin–Lock Mechanism	Connectors 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
(2)	Airbag Activation Prevention Mechanism	Connectors 1, 2, 3, 4, 5, 6, 8, 19
(3)	Electrical Connection Check Mechanism	Connectors 1, 2, 3

(a) All connectors in the SRS are colored in yellow to distinguish them from other connectors. Connectors having special functions and specifically designed for the SRS are used in the locations shown on the previous page to ensure high reliability. These connectors use durable gold–plated terminals.

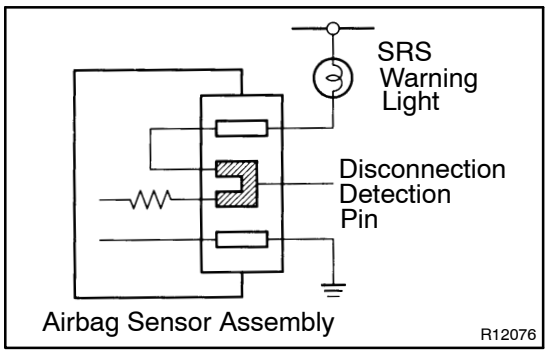


(1) Terminal Twin–Lock Mechanism
Each connector has a two–piece component consisting of a housing and a spacer. This design enables the terminal to be locked securely by two locking devices (the retainer and the lance) to prevent terminals from coming out.

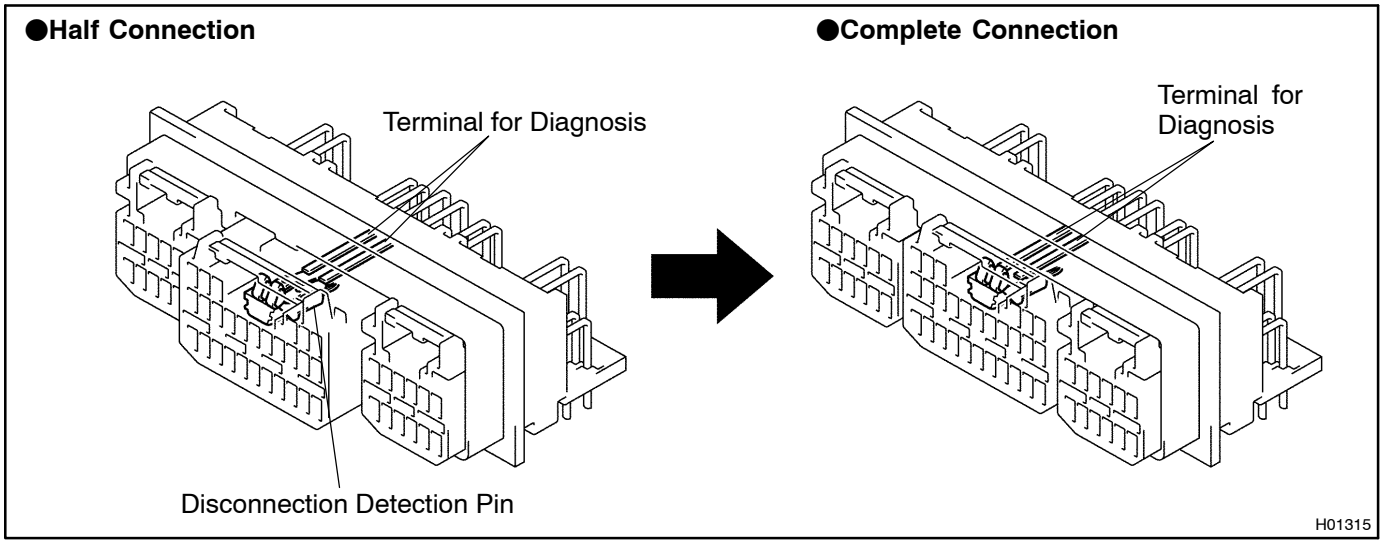
(2) Airbag Activation Prevention Mechanism
Each connector contains a short spring plate. When the connector is disconnected, the short spring plate automatically connects positive (+) terminal and negative (–) terminal of the squib.



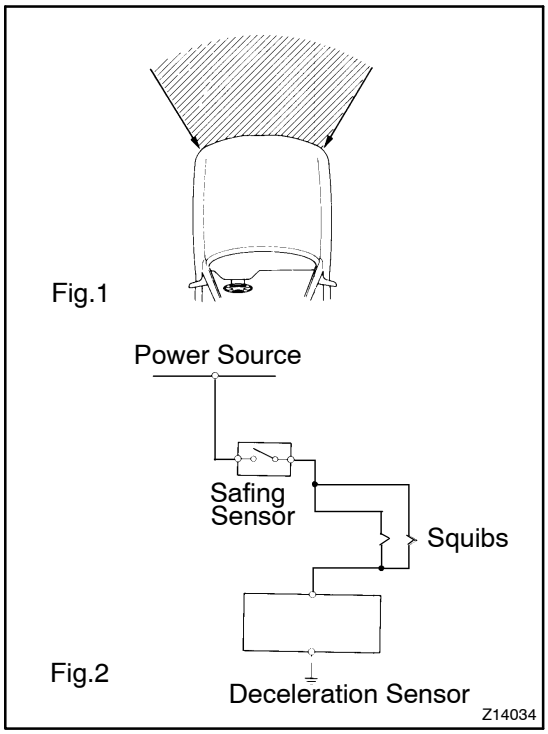
HINT:
The type of connector is shown in the diagram on the previous page.



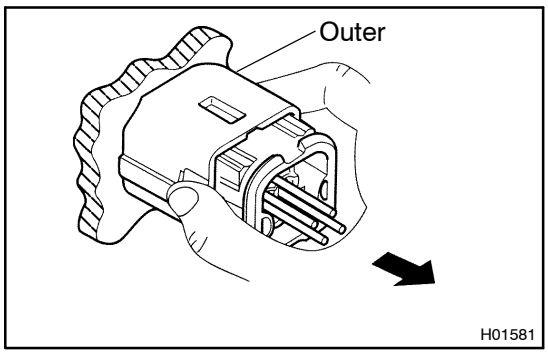
(3) Electrical Connection Check Mechanism
This mechanism electrically checks that connectors are connected correctly and completely. The electrical connection check mechanism is designed so that the disconnection detection pin connects with the diagnosis terminals when the connector housing lock is locked.



HINT:
The illustration shows connectors ”1”, ”2” and ”3” in step 11.



(b) When the vehicle is involved in a frontal collision in the hatched area (Fig. 1) and the shock is larger than the predetermined level, the SRS is activated automatically. A safing sensor is designed to go on at a smaller deceleration rate than the airbag sensor. As illustrated in Fig. 2, ignition is caused when current flows to the squib, which happens when a safing sensor and the deceleration sensor go on simultaneously. When a deceleration force acts on the sensors, 2 squibs in the driver airbag and front passenger airbag ignite and generate gas. The gas discharging into the driver airbag and front passenger airbag rapidly increases the pressure inside the bags, breaking open the steering wheel pad and instrument panel.
Bag inflation then ends, and the bags deflate as the gas is discharged through discharge holes at the bag's rear or side.



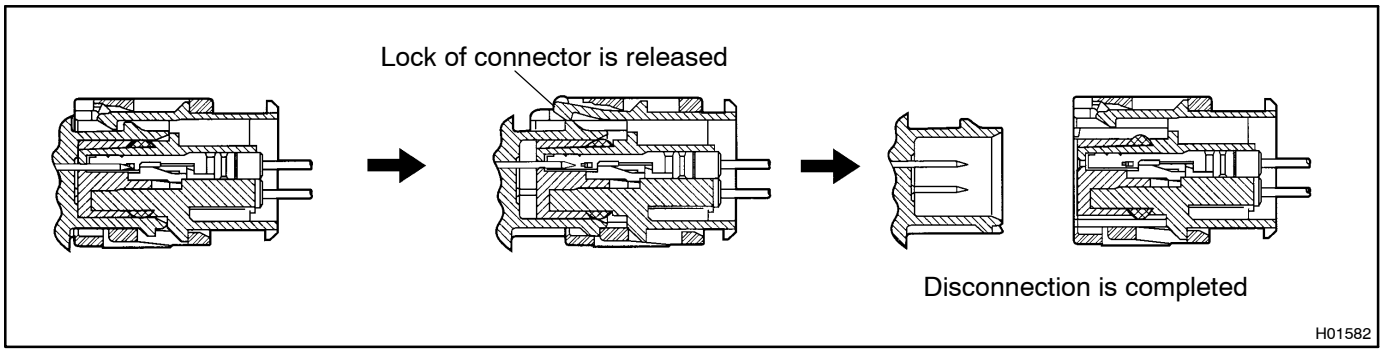
12. DISCONNECTION OF CONNECTORS FOR FRONT AIRBAG SENSOR, SIDE AIRBAG SENSOR AND DOOR SIDE AIRBAG SENSOR

(a) While holding both flank sides of the outer, slide the outer to the direction shown by an arrow.

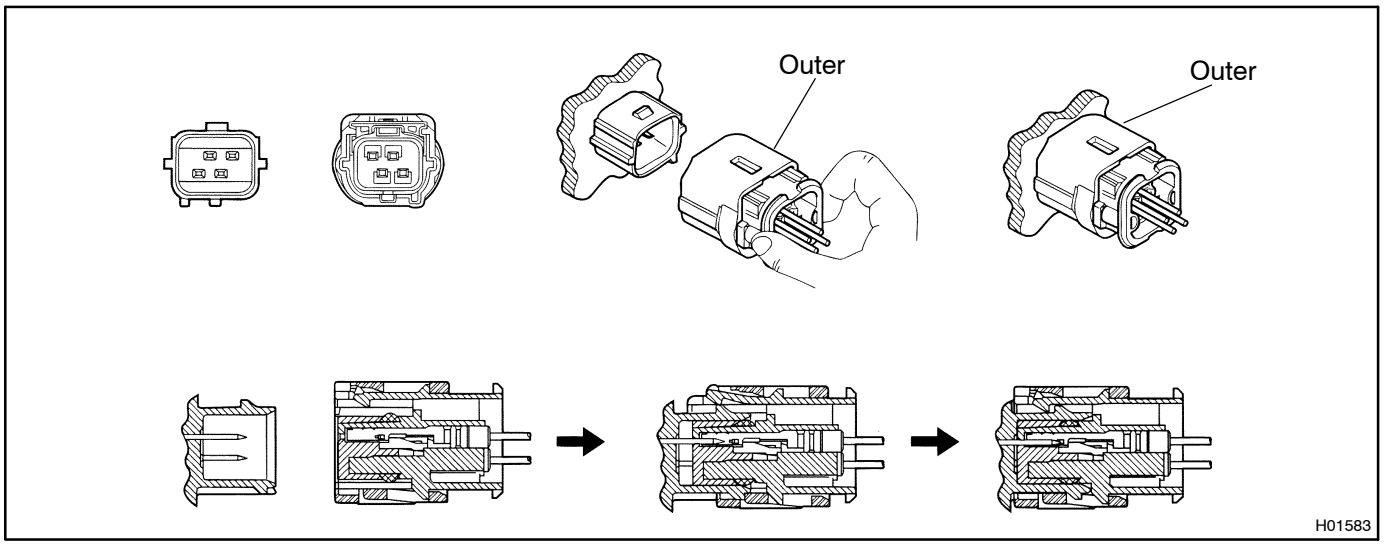
(b) Lock of the connectors is released, then disconnect the connectors.

HINT:

Be sure to hold both flank sides of the outer. If holding the top and bottom sides, it will obstruct disconnection.



13. CONNECTION OF CONNECTORS FOR FRONT AIRBAG SENSOR, SIDE AIRBAG SENSOR AND DOOR SIDE AIRBAG SENSOR



(a) Align the male connector (of the side of sensor) and female connector in the same direction as shown in the illustration and fit in them without rubbing.

(b) As they are fitted in, the outer slides rearward. Press it until the outer returns to its original position again.

If fitting stops half way, connectors will separate.

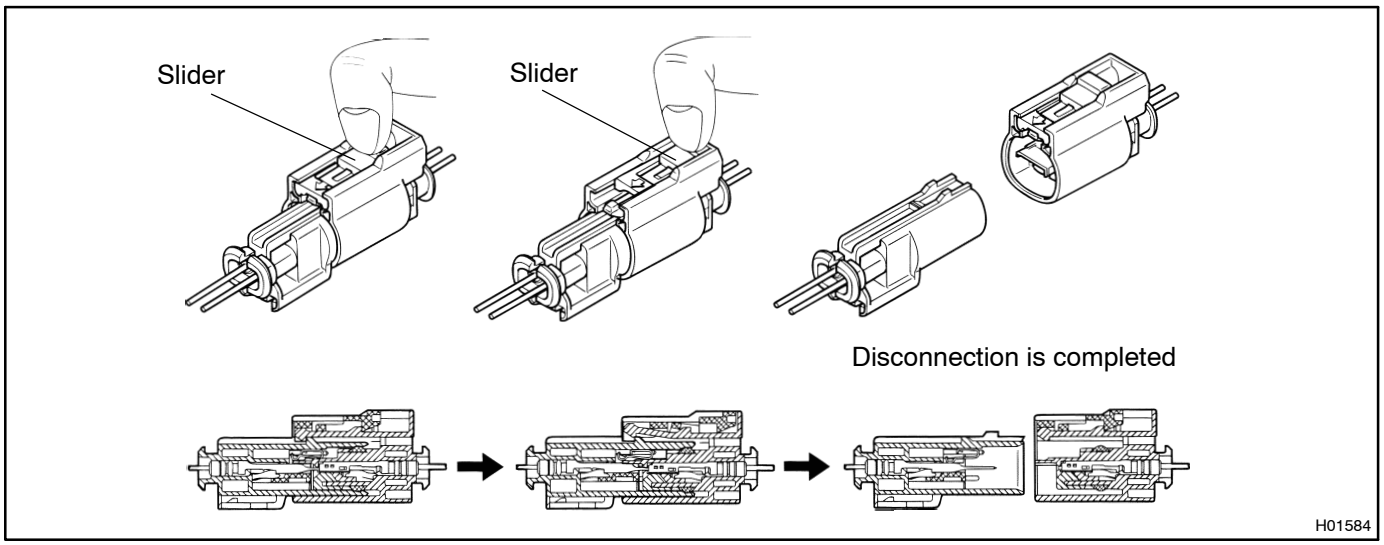
(c) Be sure to insert until they are locked. After fitting in, pull them slightly to check that they are locked. (When locked, make sure that the outer returns to its original position and sound at the time of fitting in can be heard.)

HINT:

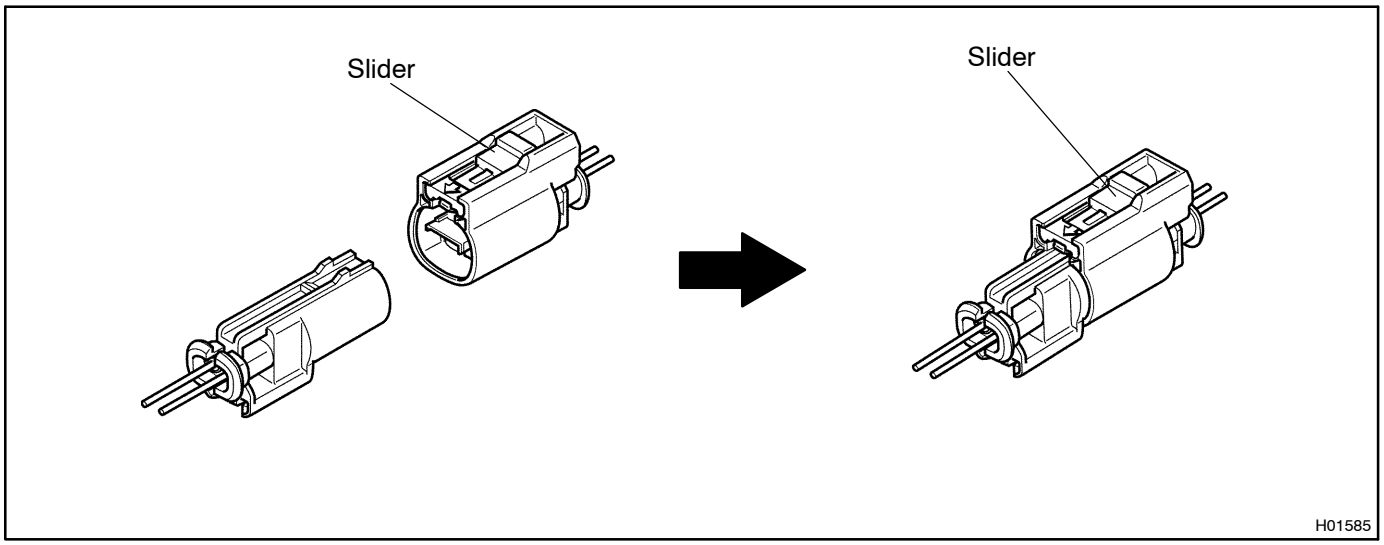
- Do not fit in while holding the outer.
- When fitting in, the outer slides. Do not touch it.

14. DISCONNECTION OF SIDE AIRBAG CONNECTOR

(a) Place a finger on the slider.
(b) Slide the slider to release lock.
(c) Disconnect the connector.



15. CONNECTION OF SIDE AIRBAG CONNECTOR



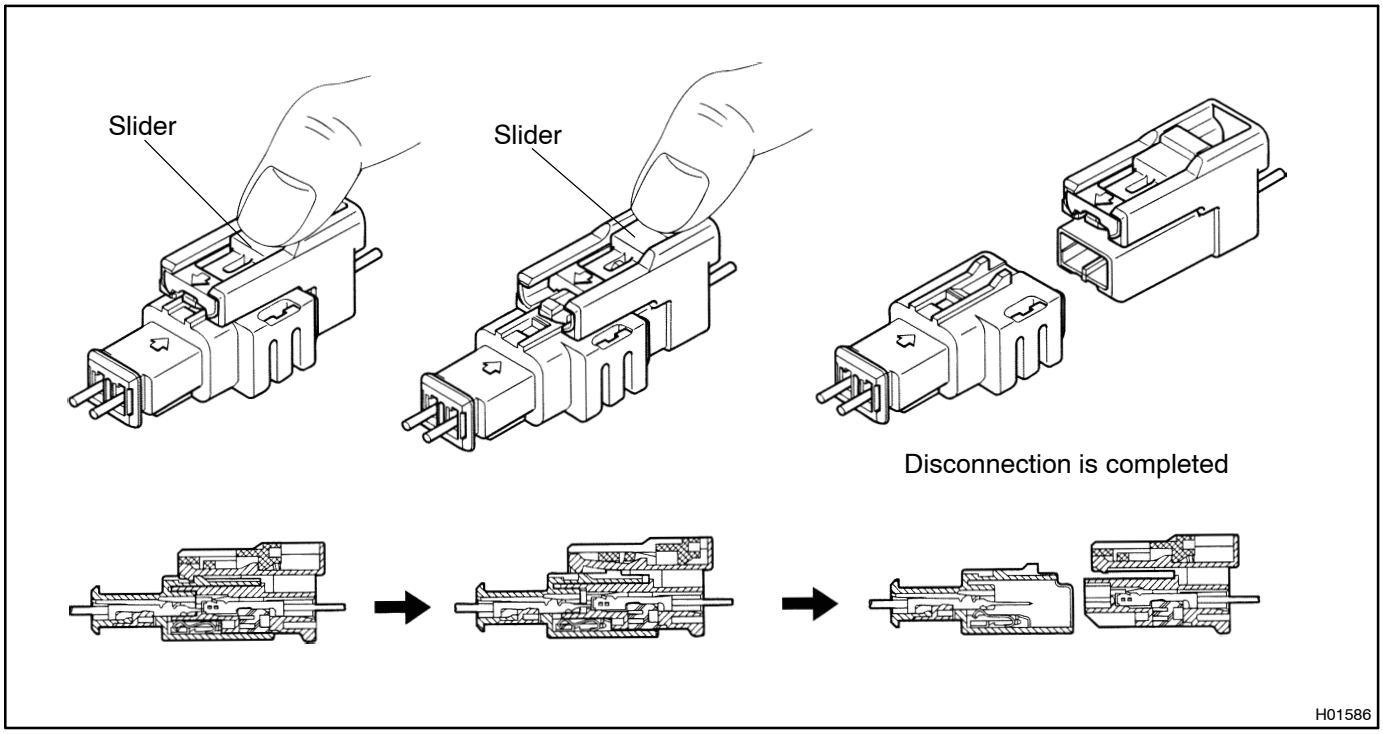
(a) Align a lock part of male connector and a slider of female connector in the same direction as shown in the illustration, fit in them without rubbing.
(b) Be sure to insert until they are locked. After fitting in pull them slightly to check that they are locked. (When locked, make sure that the outer returns to its original position and sound at the time of fitting in can be heard.)

HINT:

- As the slider slides, do not touch it.
- Be careful not to deform the release board. If the release board is deformed, replace it with a new one.

16. DISCONNECTION OF CONNECTORS FOR STEERING WHEEL PAD (with AIRBAG) AND FRONT PASSENGER AIRBAG ASSEMBLY

(a) Place a finger on the slider.
(b) Slide the slider to release lock.
(c) Disconnect the connector.



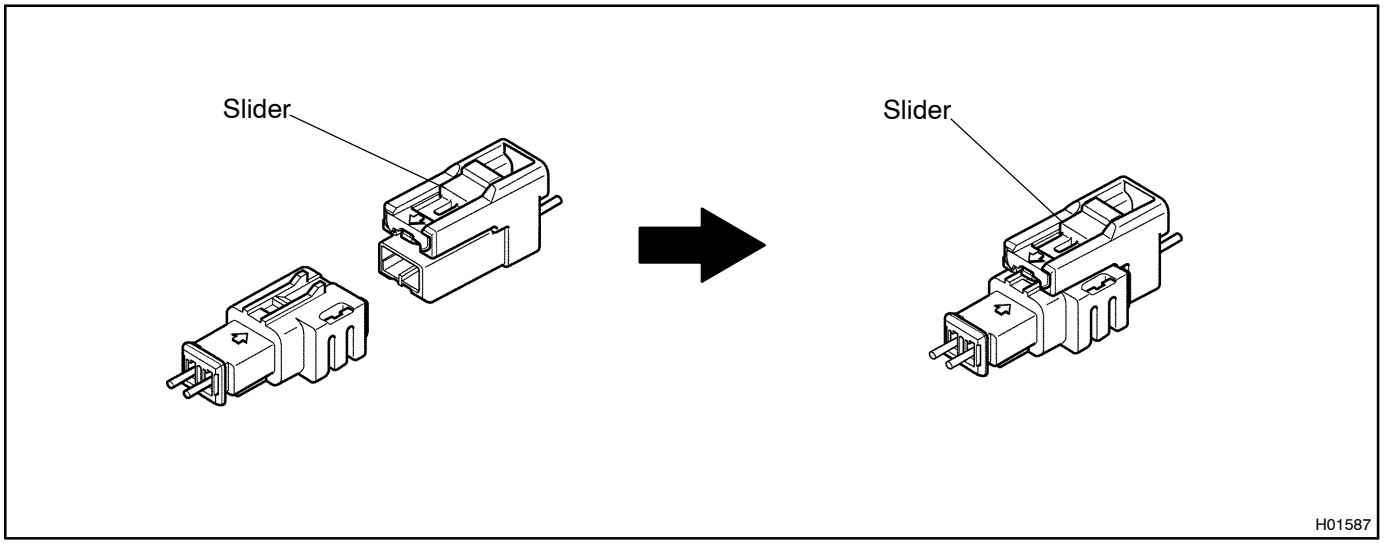
17. CONNECTION OF CONNECTORS FOR STEERING WHEEL PAD (with AIRBAG) AND FRONT PASSENGER AIRBAG ASSEMBLY

(a) Align a lock part of male connector and a slider of female connector in the same direction as shown in the illustration, fit in them without rubbing.

(b) Be sure to insert until they are locked. After fitting in pull them slightly to check that they are locked. (When locked, make sure that the outer returns to its original position and sound at the time of fitting in can be heard.)

HINT:

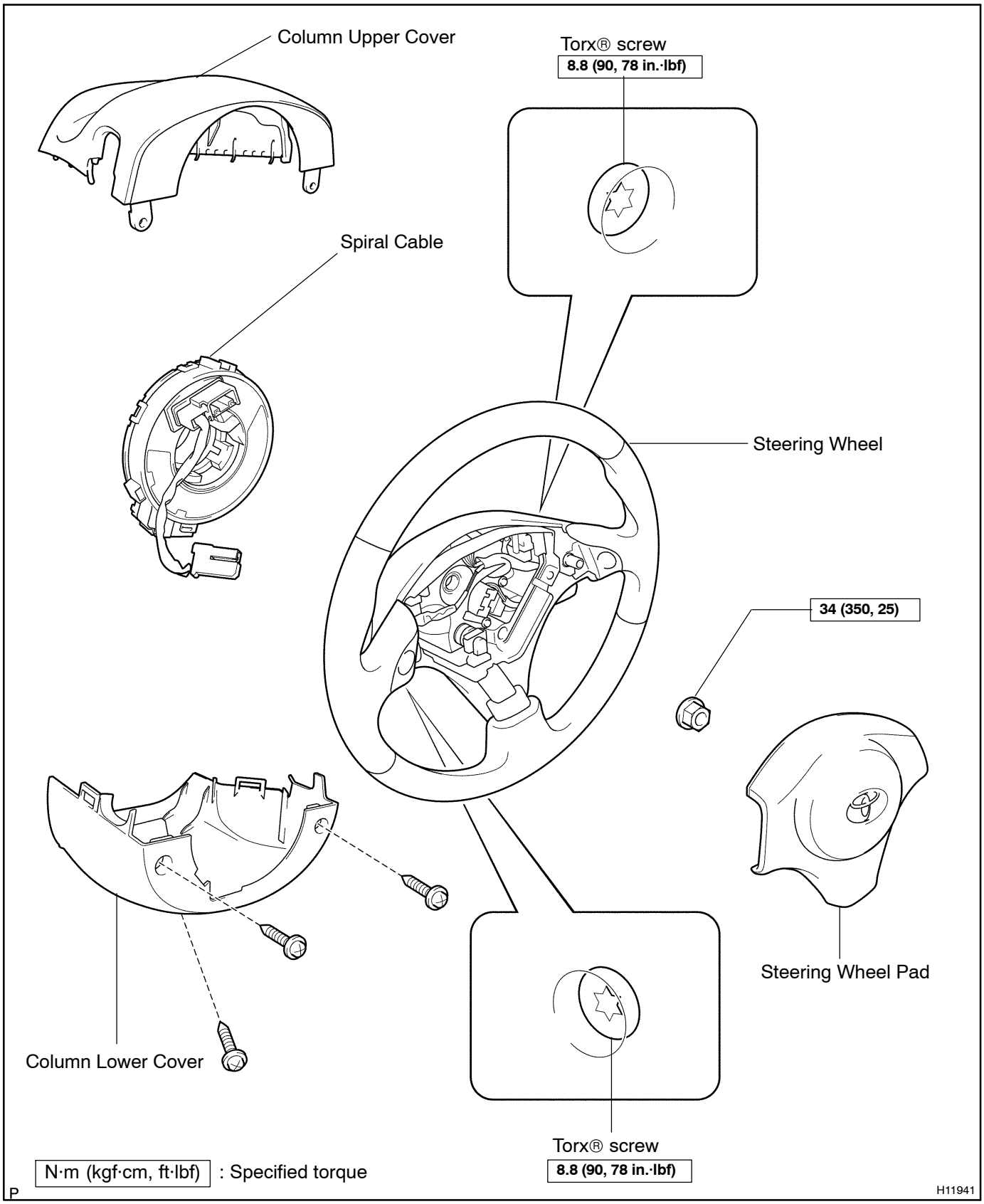
- As the slider slides, do not touch it.
- Be careful not to deform the release board. If the release board is deformed, replace it with a new one.



STEERING WHEEL PAD AND SPIRAL CABLE

COMPONENTS

RS0JQ–14



RS0JR–06

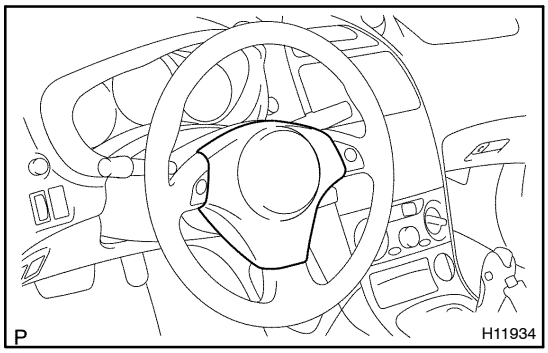
REMOVAL

HINT:

For step 1 to 4, refer to page SR–13.

1. **REMOVE STEERING WHEEL PAD**
2. **REMOVE STEERING WHEEL**
3. **REMOVE UPPER AND LOWER COLUMN COVERS**
4. **REMOVE SPIRAL CABLE**

RS0JS–11



INSPECTION

1. Vehicle not involved in collision:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

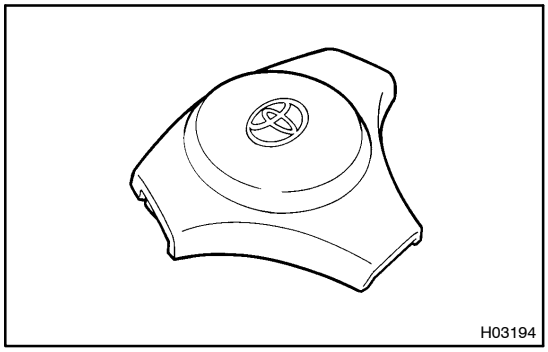
(a) Do a diagnostic system check (See page DI–884).

(b) Do a visual check which includes the following item with the steering wheel pad (with airbag) installed in the vehicle.

Check cuts, minute cracks or marked discoloration on the steering wheel pad top surface and in the grooved portion.

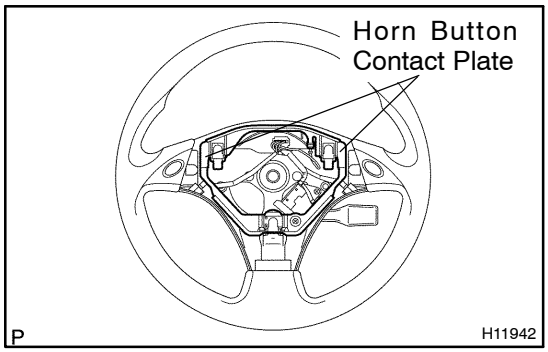
2. Vehicle involved in collision and airbag is not deployed:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).



(b) Do a visual check which includes the following items with the steering wheel pad (with airbag) removed from the vehicle.

- Check cuts, minute cracks or marked discoloration on the steering wheel pad top surface and in the grooved portion.
- Check cuts and cracks in wire harness, and chipping in connectors.

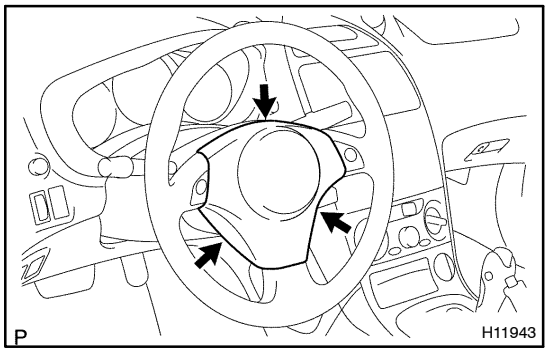


- Check the deformation of the horn button contact plate of the steering wheel.

CAUTION:
For removal and installation of the steering wheel pad, see page SR–13 and SR–21, be sure to follow the correct procedure.

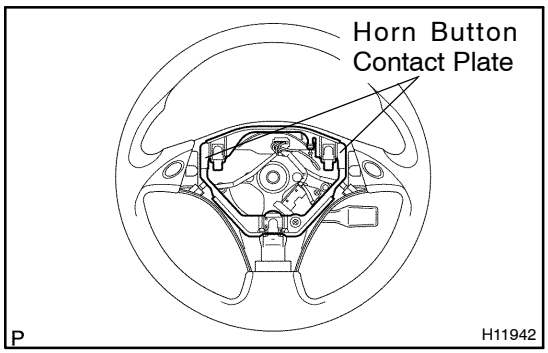
HINT:

- If the horn button contact plate of the steering wheel is deformed, never repair it. Always replace the steering wheel assembly with a new one.
- There should be no interference between the steering wheel pad and steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel.



3. Vehicle involved in collision and airbag is deployed: INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).



(b) Do a visual check which includes the following items with the steering wheel pad (with airbag) removed from the vehicle.

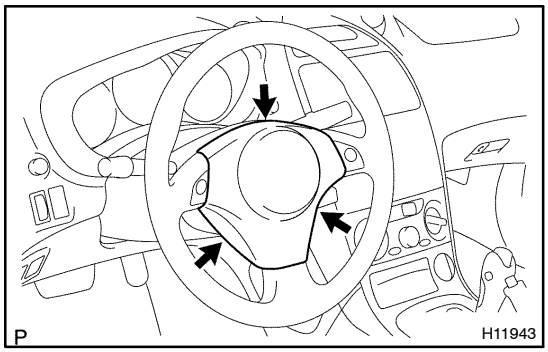
- Check the deformation on the horn button contact plate of the steering wheel.
- Check the damage on the spiral cable connector and wire harness.

CAUTION:

For removal and installation of the steering wheel pad, see page SR–13 and SR–21, and be sure to follow the correct procedure.

HINT:

- If the horn button contact plate of the steering wheel is deformed, never repair it. Always replace the steering wheel assembly with a new one.



- There should be no interference between the steering wheel pad and steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel.

RS0JT–10

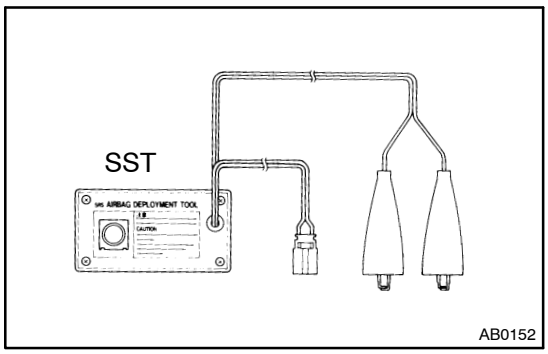
DISPOSAL

HINT:

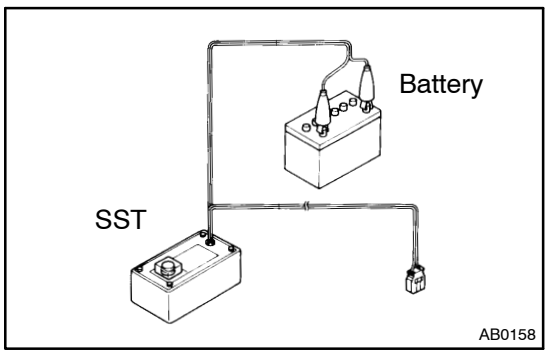
When scrapping vehicle equipped with an SRS or disposing of a steering wheel pad (with airbag), always first deploy the airbag in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION:

- **Never dispose of a steering wheel pad of which airbag has not deployed.**
- **The airbag produces a sizeable exploding sound when it deploys, so perform the operation out–of–doors and where it will not create a nuisance to nearby residents.**



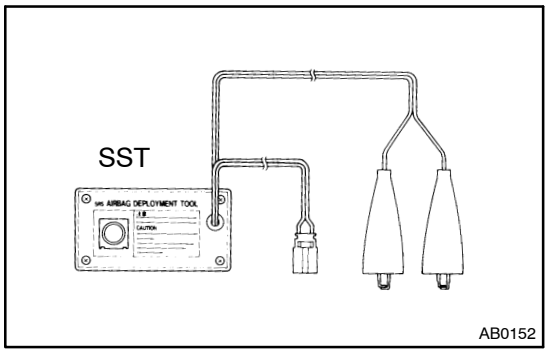
- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
  SST 09082–00700
- **When deploying an airbag, perform the operation at least 10 m (33 ft) away from the steering wheel pad.**
- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with the deployed airbag.**



1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT:

Have a battery ready as the power source to deploy the airbag.

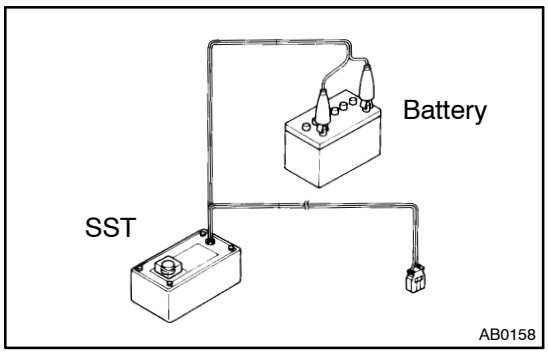


(a) Check functioning of the SST.

CAUTION:

When deploying the airbag, always use the specified SST: SRS Airbag Deployment Tool.

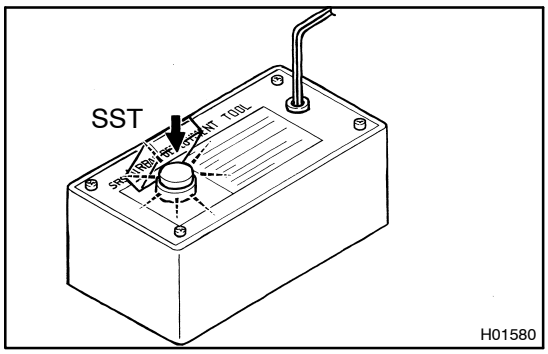
SST 09082–00700



(1) Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.

HINT:

Do not connect the yellow connector which will be connected with the supplemental restraint system.

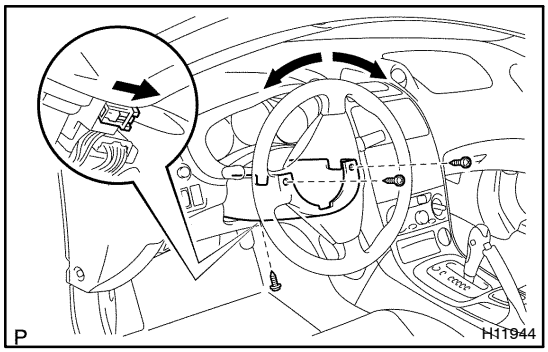


(2) Press the SST activation switch, and check that the LED of the SST activation switch lights up.

CAUTION:

If the LED lights up when the activation switch is not being pressed, SST malfunction is probable, so definitely do not use the SST.

(3) Disconnect the SST from the battery.



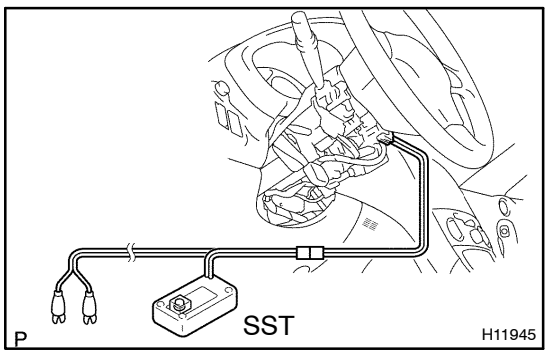
(b) Install the SST.

CAUTION:

Check that there is no looseness in the steering wheel and steering wheel pad.

(1) While turning the steering wheel right / left, remove the 3 screws and column lower cover.

(2) Disconnect the airbag connector of the spiral cable.

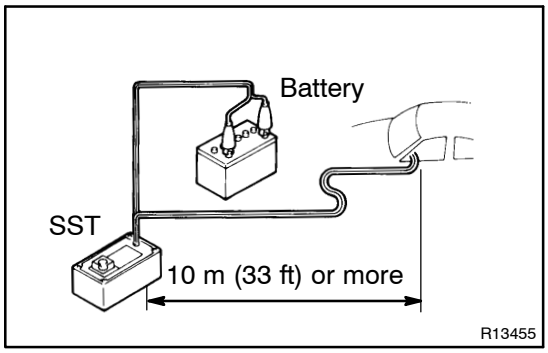


(3) Connect the connectors of the 2 SST to the airbag connector of the spiral cable.

SST 09082–00700, 09082–00760

NOTICE:

To avoid damaging the connector of the SST and wire harness, do not lock the secondary lock of the twin lock.



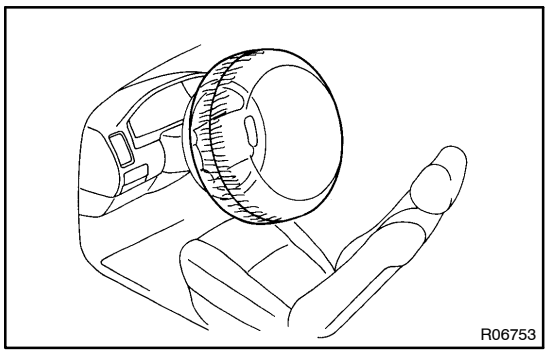
(4) Move the SST at least 10 m (33 ft) away from the front of the vehicle.

(5) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

(6) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (–) terminal.



(c) Deploy the airbag.

(1) Check that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.

(2) Press the SST activation switch and deploy the airbag.

CAUTION:

- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with the deployed airbag.**
- **When scrapping a vehicle, deploy the airbag and scrap the vehicle with the steering wheel pad still installed.**
- **When moving a vehicle for scrapping which has a steering wheel pad with deployed airbag, use gloves and safety glasses.**

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.

2. DEPLOYMENT WHEN DISPOSING OF STEERING WHEEL PAD ONLY

NOTICE:

- **When disposing of the steering wheel pad (with airbag) only, never use the customers vehicle to deploy the airbag.**
- **Be sure to follow the procedure given below when deploying the airbag.**

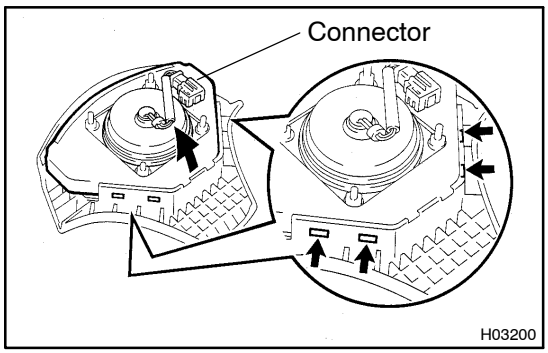
HINT:

Have a battery ready as the power source to deploy the airbag.

(a) Remove the steering wheel pad (See page SR–13).

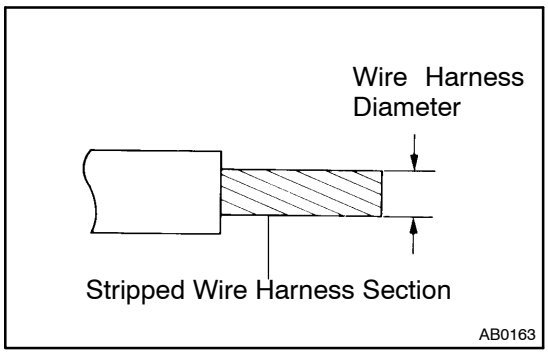
CAUTION:

- **When removing the steering wheel pad, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.**
- **When storing the steering wheel pad, keep the upper surface of the pad facing upward.**



(b) Remove the connector on the steering wheel pad rear surface.

(c) Remove the steering wheel pad cover.



(d) Using a service–purpose wire harness tie down the steering wheel pad to the disc wheel.

Wire harness: Stripped wire harness section 1.25 mm^2 or more (0.0019 in^2. or more)

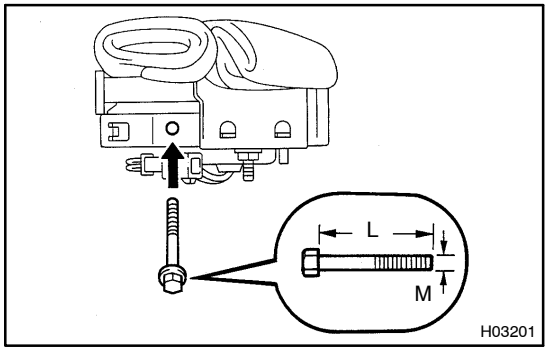
CAUTION:

If a wire harness which is too thin or some other thing is used to tie down the steering wheel pad, it may be snapped by the shock when the airbag is deployed. This is highly dangerous. Always use a wire harness for vehicle use which is at least 1.25 mm^2 (0.0019 in^2.).

HINT:

To calculate the square of the stripped wire harness section:

Square = 3.14 x (Diameter)^2 divided by 4



(1) Install the 2 bolts with washers in the 2 bolt holes in the steering wheel pad.

Bolt:

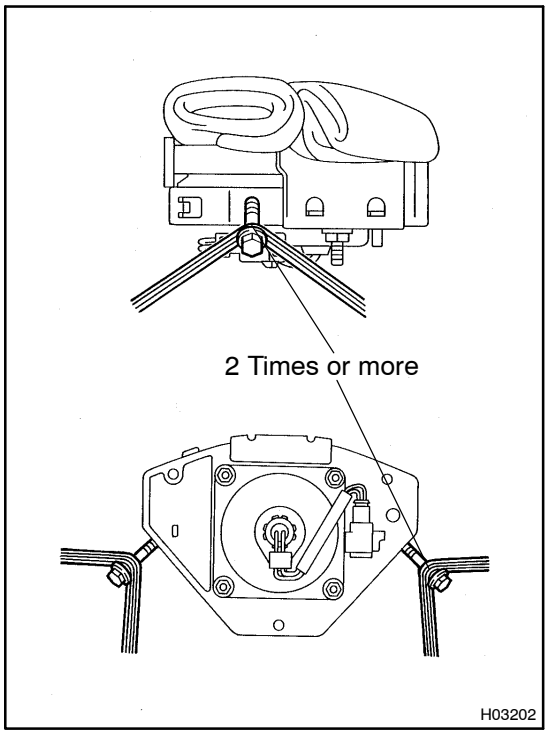
L: 35. mm (1.387 in.)

M: 6.0 mm (0.236 in.)

Pitch: 1.0 mm (0.039 in.)

NOTICE:

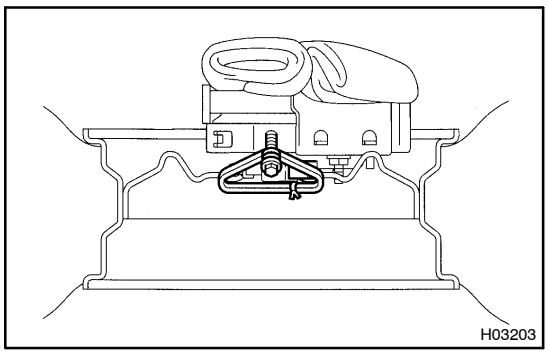
- **Tighten the bolts by hand until the bolts become difficult to turn.**
- **Do not tighten the bolts too much.**



(2) Using 3 wire harnesses, wind the wire harness at least 2 times each around the bolts installed on the left and right sides of the steering wheel pad.

CAUTION:

- **Tightly wind the wire harness around the bolts so that there is no slack.**
- **If there is slackness in the wire harness, the steering wheel pad may come loose due to the shock when the airbag is deployed. This is highly dangerous.**



(3) Face the upper surface of the steering wheel pad upward. Separately tie the left and right sides of the steering wheel pad to the disc wheel through the hub nut holes. Position the steering wheel pad connector so that it hangs downward through a hub hole in the disc wheel.

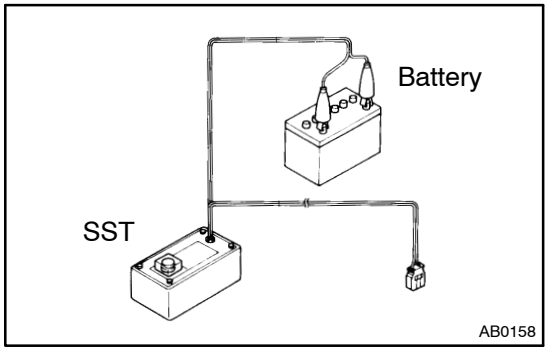
CAUTION:

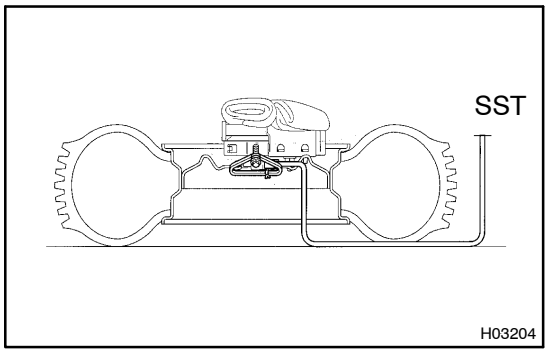
- **Make sure that the wire harness is tight. It is very dangerous when looseness in the wire harness results in the steering wheel pad coming free due to the shock from the airbag deploying.**
- **Always tie down the steering wheel pad with the pad side facing upward. It is very dangerous if the steering wheel pad is tied down with the metal surface facing upward as the wire harness will be cut by the shock from the airbag deploying and the steering wheel pad will be thrown into the air.**

NOTICE:

The disc wheel will be marked by airbag deployment, so when disposing of the airbag use a redundant disc wheel.

(e) Check functioning of the SST (See step 1–(a)).
SST 09082–00700





(f) Install the SST.

CAUTION:

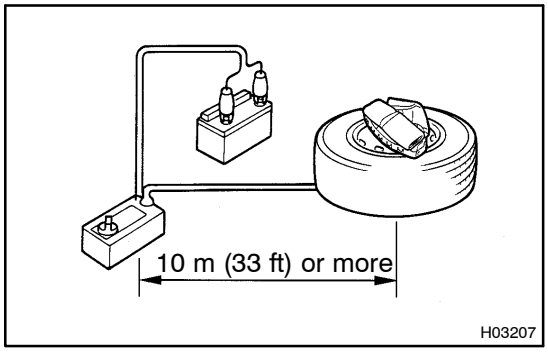
Place the disc wheel on the level ground.

(1) Connect the connectors of the 2 SST to the steering wheel pad connector.

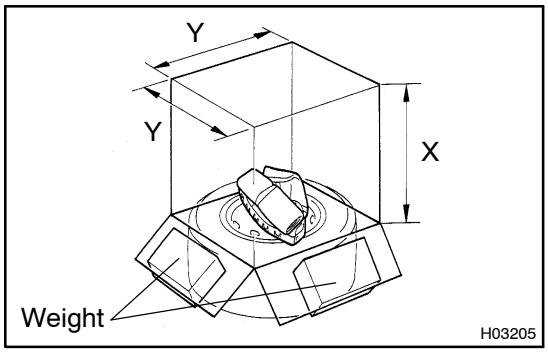
SST 09082–00700, 09082–00760

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the disc wheel.



(2) Move the SST to at least 10 m (33 ft) away from the steering wheel pad tied down on the disc wheel.



(g) Cover the steering wheel pad with a cardboard box or tires.

- Covering method using a cardboard box:
  Cover the steering wheel pad with the cardboard box and weight the cardboard box down in 4 places with at least 190 N (20 kg, 44 lb).

Size of cardboard box:

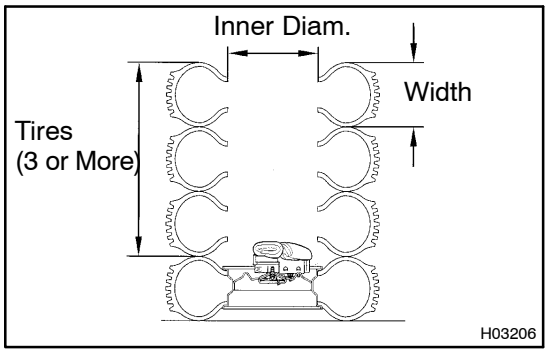
Must exceed the following dimensions:

X = 460 mm (18.11 in.)

Y = 650 mm (25.59 in.)

NOTICE:

- **When dimension Y of the cardboard box exceeds the diameter of the disc wheel with tire to which the steering wheel pad is tied, X should be the following size.**
  X = 460 mm (18.11 in.) + width of tire
- **If a cardboard box smaller than the specified size is used, the cardboard box will be broken by the shock from the airbag deployment.**



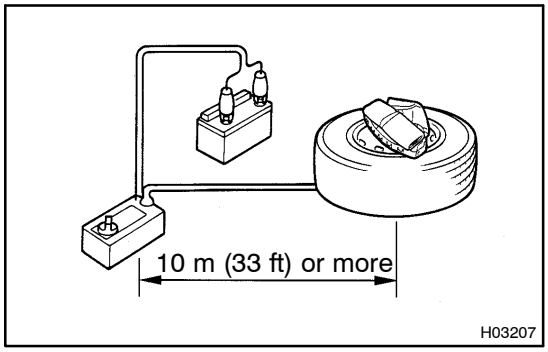
- Covering method using tires:
  Place at least 3 tires without disc wheel on top of the disc wheel with tire to which the steering wheel pad is tied.

Tire size: Must exceed the following dimensions–
Width: 185 mm (7.87 in.)
Inner diameter: 360 mm (14.17 in.)

CAUTION:
Do not use tires with disc wheels.

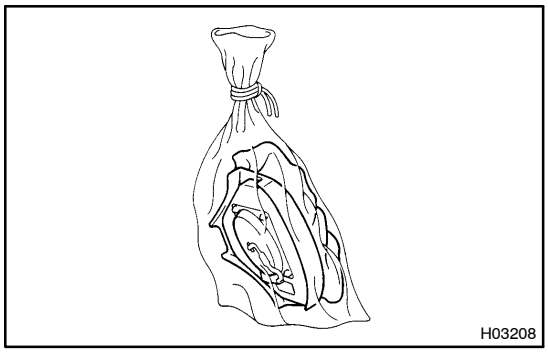
NOTICE:
The tires may be marked by the airbag deployment, so use the redundant tires.

(h) Deploy the airbag.
  (1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.



  (2) Check that no one is within 10 m (33 ft) area around the disc wheel which the steering wheel pad is tied to.
  (3) Press the SST activation switch and deploy the airbag.

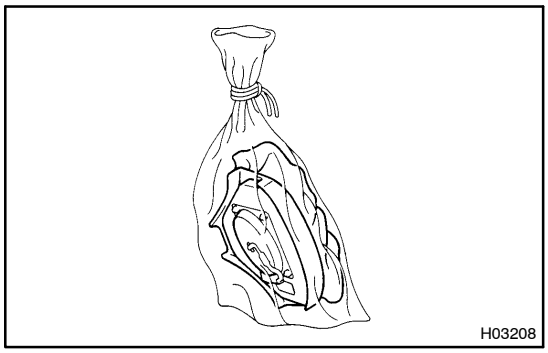
HINT:
The airbag deploys simultaneously as the LED of the SST activation switch lights up.



(i) Dispose of the steering wheel pad (with airbag).

CAUTION:
- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with the deployed airbag.**

  (1) Remove the steering wheel pad from the disc wheel.
  (2) Place the steering wheel pad in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.



3. DEPLOYMENT WHEN DISPOSING OF STEERING WHEEL PAD WITH AIRBAG DEPLOYED IN COLLISION

Dispose of the steering wheel pad (with airbag).

CAUTION:

- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **When moving a vehicle for scrapping which has a steering wheel pad with the deployed airbag, use gloves and safety glasses.**
- **Use gloves and safety glasses when handling a steering wheel pad with deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with deployed airbag.**

(1) Remove the steering wheel pad from the steering wheel (See page SR–13).

(2) Place the steering wheel pad in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.

RS0JU–08

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the steering wheel pad, steering wheel or spiral cable.

Case	Replacing part
If the airbag has been deployed.	Steering wheel pad
If the steering wheel pad has been found to be faulty in troubleshooting.	Steering wheel pad
If the spiral cable has been found to be faulty in troubleshooting.	Spiral cable
If the steering wheel pad has been found to be faulty during checking items (See page RS–14).	Steering wheel pad
If the steering wheel has been found to be faulty during checking items (See page RS–14).	Steering wheel
If the spiral cable has been found to be faulty during checking items (See page RS–14).	Spiral cable
If the steering wheel pad has been dropped.	Steering wheel pad

CAUTION:

For removal and installation of the steering wheel pad, see page SR–13 and SR–21. Be sure to follow the correct procedure.

RS0JV–06

INSTALLATION

HINT:

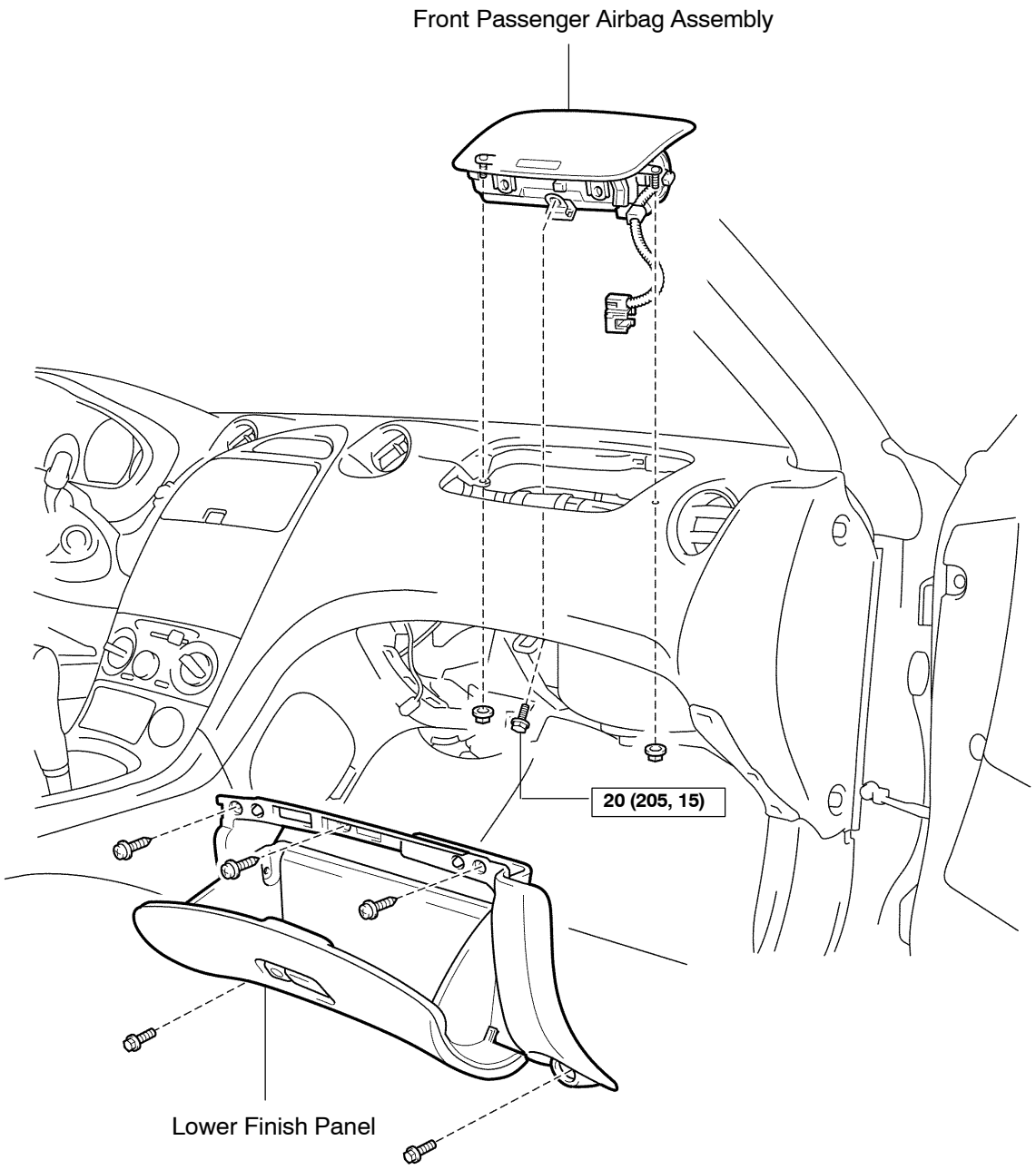
For step 1 to 4, refer to page SR–21.

1. **INSTALL SPIRAL CABLE**
2. **INSTALL UPPER AND LOWER COLUMN COVERS**
3. **INSTALL STEERING WHEEL**
4. **INSTALL STEERING WHEEL PAD**

FRONT PASSENGER AIRBAG ASSEMBLY

COMPONENTS

RS0JW–10



N·m (kgf·cm, ft·lbf) : Specified torque

P

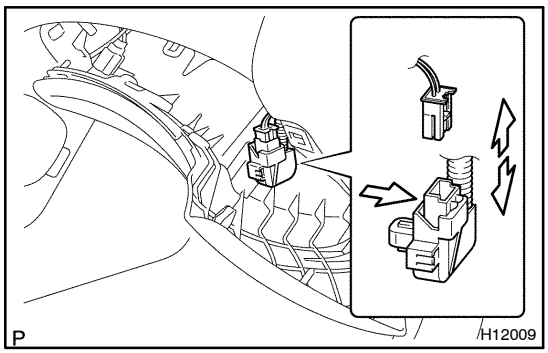
H11957

RS0JX–04

REMOVAL

NOTICE:

- **If the wiring connector of the SRS is disconnected and the ignition switch is in ON position, DTCs will be recorded.**
- **Never use the airbag parts from another vehicle. When replacing parts, replace them with new parts.**



1. DISCONNECT AIRBAG CONNECTOR

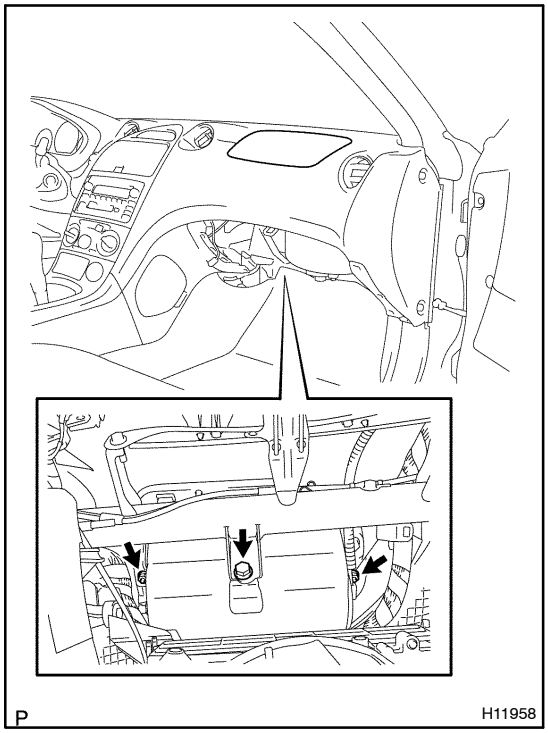
(a) Remove the 3 screws, 2 bolts and lower finish panel.

(b) Remove the connector cover from the lower finish panel.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

(c) Disconnect the airbag connector.



2. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY

Remove the bolt and 2 nuts.

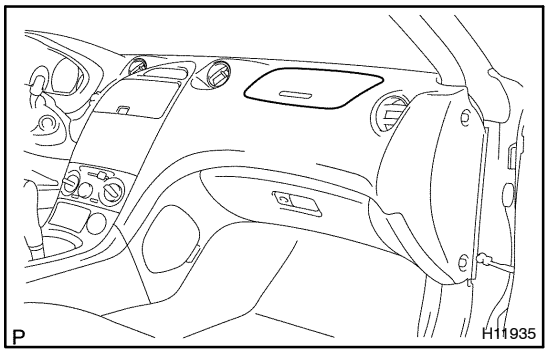
CAUTION:

- **Do not store the front passenger airbag assembly with the airbag deployment side facing downward.**
- **Never disassemble the front passenger airbag assembly.**

NOTICE:

When removing the front passenger airbag assembly, take care not to damage the wire harness.

RS0JY–07



INSPECTION

1. Vehicles not involved in collision:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

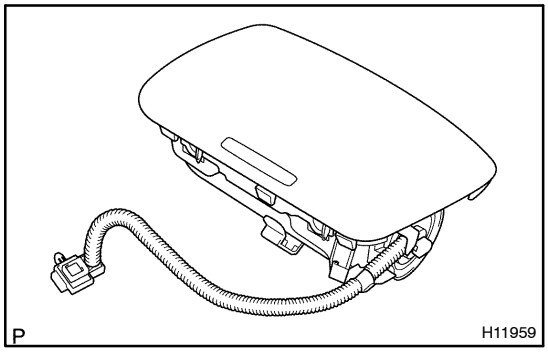
(a) Do a diagnostic system check (See page DI–884).

(b) Do a visual check which includes the following item with the front passenger airbag assembly installed in the vehicle.

Check cuts, minute cracks or marked discoloration on the front passenger airbag assembly and instrument panel.

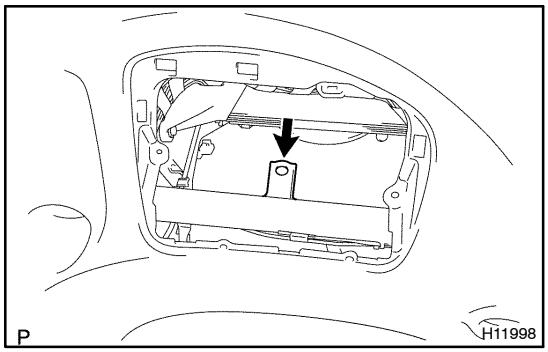
2. Vehicle involved in a collision and airbag is not deployed:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).



(b) Do a visual check which includes the following items with the front passenger airbag assembly removed from the vehicle.

- Check cuts, minute cracks or marked discoloration on the front passenger airbag assembly.
- Check cuts and cracks in wire harness, and for chipping in connectors.



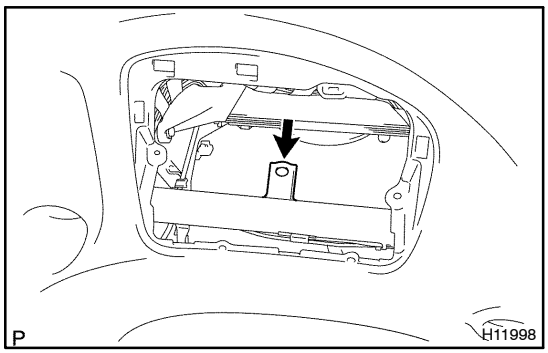
- Check the deformation or cracks on the instrument panel and instrument panel reinforcement.

CAUTION:
For removal and installation of the front passenger airbag assembly, see page RS–27 and RS–38, and be sure to follow the correct procedure.

HINT:
If the instrument panel or instrument panel reinforcement is deformed or cracked, never repair it. Always replace it with a new one.

3. Vehicle involved in a collision and airbag is deployed: INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).



(b) Do a visual check which includes the following items with the front passenger airbag assembly removed from the vehicle.

- Check the deformation or cracks on the instrument panel and instrument panel reinforcement.
- Check the damage on the connector and wire harness.

CAUTION:

For removal and installation of the front passenger airbag assembly, see page SR–13 and SR–21, and be sure to follow the correct procedure.

HINT:

If the instrument panel or instrument panel reinforcement is deformed or cracked, never repair it. Always replace it with a new one.

RS0JZ–09

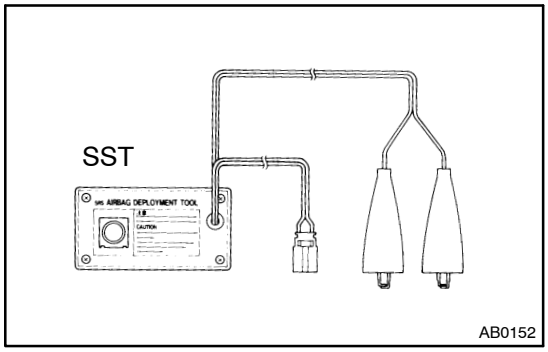
DISPOSAL

HINT:

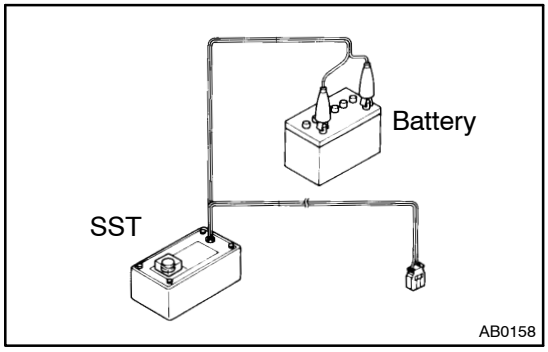
When scrapping vehicle equipped with an SRS or disposing of a front passenger airbag assembly, always first deploy the airbag in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION:

- **Never dispose of a front passenger airbag assembly which has an undeployed airbag.**
- **The airbag produces a sizeable exploding sound when it deploys, so perform the operation out–of–doors and where it will not create a nuisance to nearby residents.**



- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
  SST 09082–00700
- **When deploying an airbag, perform the operation at least 10 m (33 ft) away from the front passenger airbag assembly.**
- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front passenger airbag assembly with the deployed airbag.**

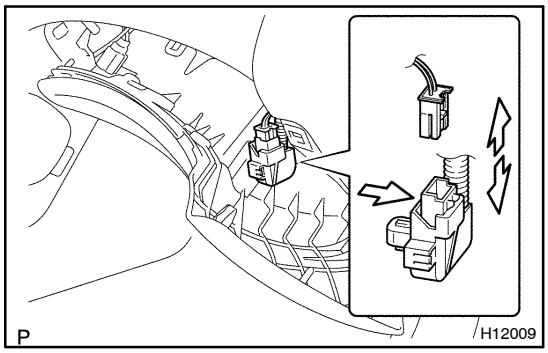


1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT:

Have a battery ready as the power source to deploy the airbag.

(a) Check functioning of the SST (See step 1–(a) on page RS–16).
SST 09082–00700



(b) Disconnect the airbag connector.

(1) Using a screwdriver, pry out the glove compartment door finish plate inside the lower panel.

HINT:

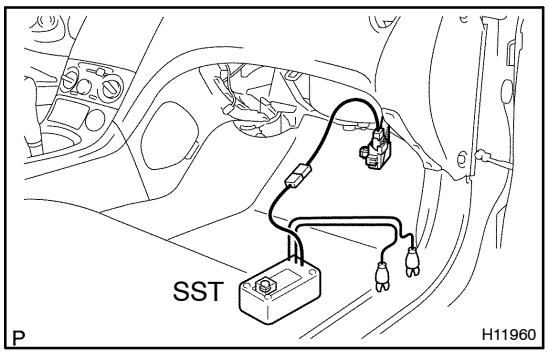
Tape the screwdriver tip before use.

(2) Remove the connector from the glove compartment door finish plate.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

(3) Disconnect the airbag connector.



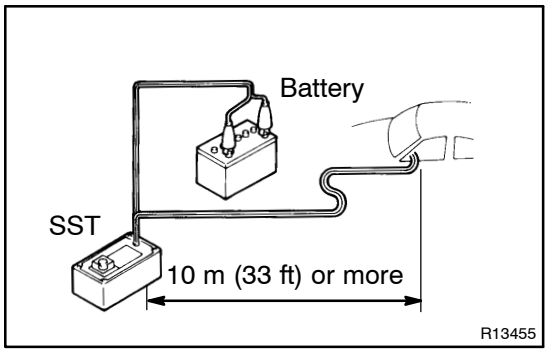
(c) Install the SST.

(1) Connect the connectors of the 2 SST to the front passenger airbag assembly connector.

SST 09082–00700, 09082–00760

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



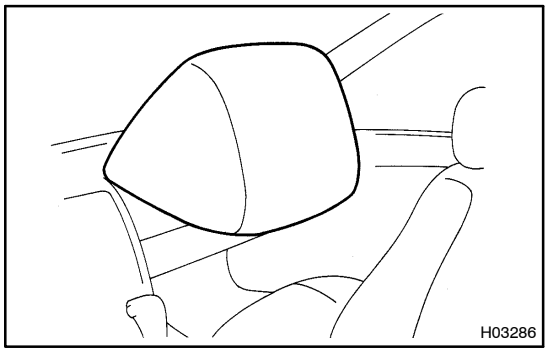
(2) Move the SST to at least 10 m (33 ft) away from the front of the vehicle.

(3) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

(4) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (–) terminal.



(d) Deploy the airbag.

(1) Check that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.

(2) Press the SST activation switch and deploy the airbag.

CAUTION:

- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling the front passenger airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to the front passenger airbag assembly with the deployed airbag.**
- **When scrapping a vehicle, deploy the airbag and scrap the vehicle with the front passenger airbag assembly still installed.**
- **When moving a vehicle for scrapping which has the front passenger airbag assembly with the deployed airbag, use gloves and safety glasses.**

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.

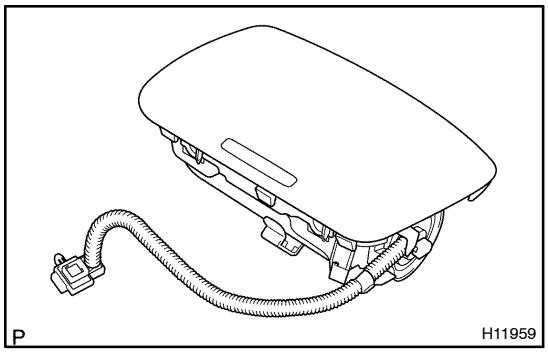
2. DEPLOYMENT WHEN DISPOSING OF FRONT PASSENGER AIRBAG ASSEMBLY ONLY

NOTICE:

- **When disposing of the front passenger airbag assembly only, never use the customer's vehicle to deploy the airbag.**
- **Be sure to follow the procedure given below when deploying the airbag.**

HINT:

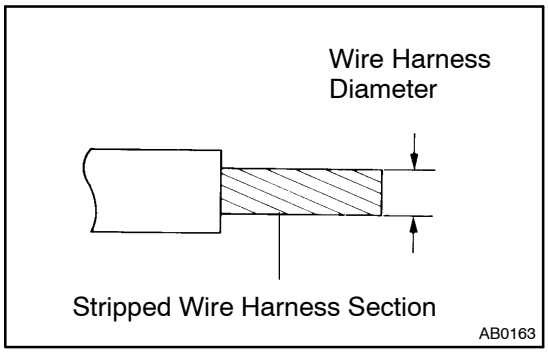
Have a battery ready as the power source to deploy the airbag.



(a) Remove the front passenger airbag assembly (See page RS–27).

CAUTION:

- **When removing the front passenger airbag assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.**
- **When storing the front passenger airbag assembly, keep the upper surface of the airbag deployment side facing upward.**



(b) Using a service–purpose wire harness, tie down the front passenger airbag assembly to the tire.

Wire harness: Stripped wire harness section 1.25 mm^2 or more (0.0019 $in.^2$ or more)

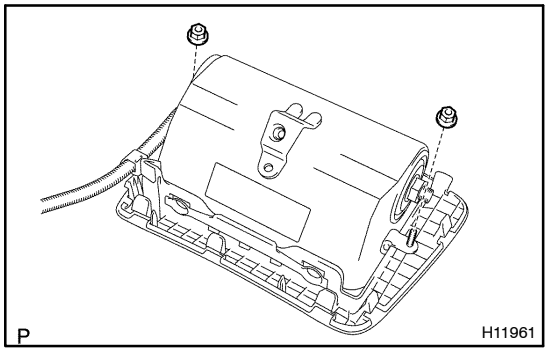
CAUTION:

If the front passenger airbag assembly is tied down with too thin wire harness, it may snap. This is highly dangerous. Always use a wire harness which is at least 1.25 mm^2 (0.0019 in^2.).

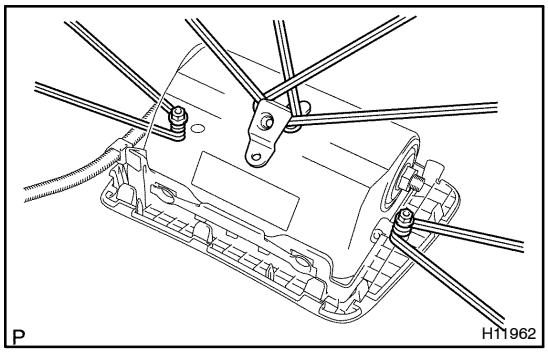
HINT:

To calculate the square of the stripped wire harness section:

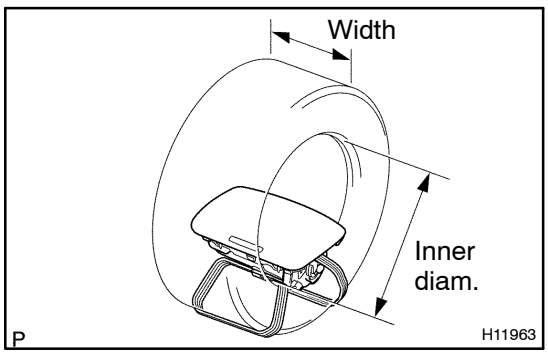
Square = 3.14 X (Diameter)^2 divided by 4



(1) Install the 2 nuts on the front passenger airbag assembly.



(2) Wind the wire harness around the bolts, and pass the wire harness though the installation holes.



(3) Position the front passenger airbag assembly inside the tire with the airbag deployment side facing inside.

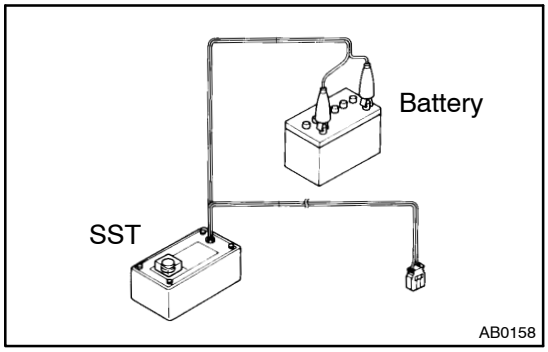
Tire size: Must exceed the following dimensions–
Width: 185 mm (7.28 in.)
Inner diameter: 360 mm (14.17 in.)

CAUTION:

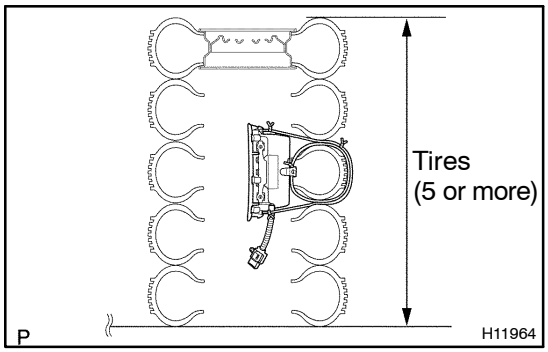
- **Make sure that the wire harness is tight. It is very dangerous if looseness in the wire harness results in the front passenger airbag assembly coming free due to the shock from the airbag deploying.**
- **Always tie down the front passenger airbag assembly with the airbag deployment side facing inside.**

NOTICE:

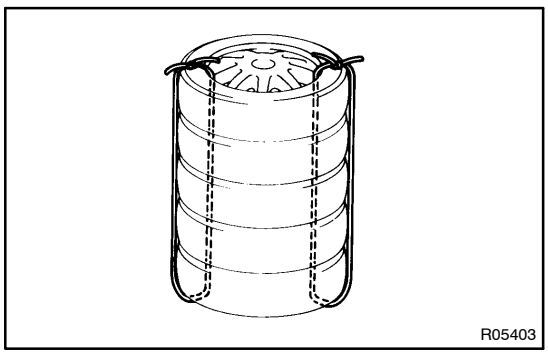
The tire will be marked by the airbag deployment, so when disposing of the airbag use a redundant tire.



(c) Check functioning of the SST (See step 1–(a) on page RS–16).
SST 09082–00700



(d) Place the tires.
(1) Place at least 2 tires under the tire to which the front passenger airbag assembly is tied.
(2) Place at least 2 tires over the tire to which the front passenger airbag assembly is tied. The top tire should have the wheel installed.



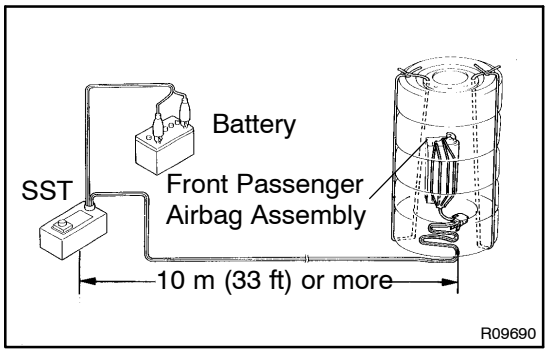
(3) Tie the tires together with 2 wire harnesses.

CAUTION:

Make sure that the wire harnesses are tight. It is very dangerous if loose wire harnesses result in the tires coming free due to the shock from the airbag deploying.

HINT:

Place the SST connector and wire harnesses inside tires. Provide at least 1 m (3 ft) of slack for the wire harness.



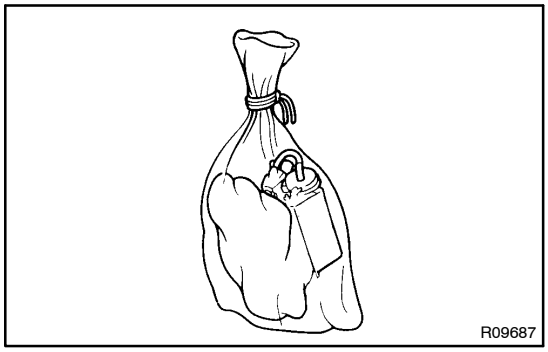
(e) Install the SST.
Connect the connectors of the 2 SST to the front passenger airbag assembly connector.
SST 09082–00700, 09082–00760

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the tires.

(f) Deploy the airbag.
(1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.
(2) Check that no one is within 10 m (33 ft) area around the tire which the front passenger airbag assembly is tied to.
(3) Press the SST activation switch and deploy the airbag.

HINT:
The airbag deploys simultaneously as the LED of the SST activation switch lights up.

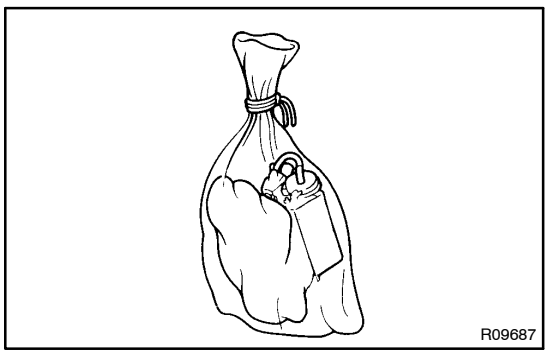


(g) Dispose of the front passenger airbag assembly.

CAUTION:

- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front passenger airbag assembly with the deployed airbag.**

(1) Remove the front passenger airbag assembly from the tire.
(2) Place the front passenger airbag assembly in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.



3. DEPLOYMENT WHEN DISPOSING OF FRONT PASSENGER AIRBAG ASSEMBLY WITH AIRBAG DEPLOYED IN COLLISION

Dispose of the front passenger airbag assembly.

CAUTION:

- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front passenger airbag assembly with the deployed airbag.**

(1) Remove the front passenger airbag assembly from the instrument panel (See page RS–27).

(2) Place the front passenger airbag assembly in a vinyl bag, tie the end tightly and dispose of it in the same way so as other general parts disposal.

RS0K0–06

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the front passenger airbag assembly, instrument panel or instrument panel reinforcement.

Case	Replacing part
If the airbag has been deployed.	Front passenger airbag assembly
If the front passenger airbag assembly has been found to be faulty in trouble-shooting.	Front passenger airbag assembly
If the front passenger airbag assembly has been found to be faulty during checking items (See page RS–28).	Front passenger airbag assembly
If the instrument panel has been found to be faulty during checking items (See page RS–28).	Instrument panel
If the instrument panel reinforcement has been found to be faulty during checking items (See page RS–28).	Instrument panel reinforcement
If the front passenger airbag assembly has been dropped.	Front passenger airbag assembly

CAUTION:

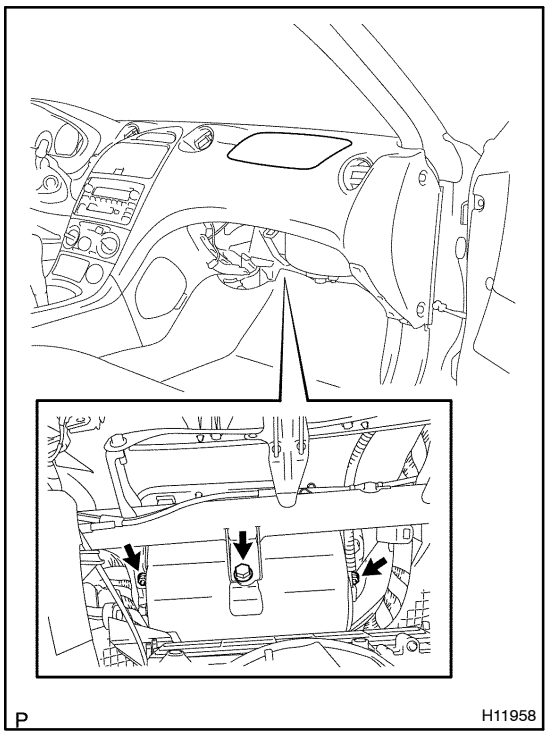
For replacement of the front passenger airbag assembly, see page RS–27 and RS–38. Be sure to follow the correct procedure.

RS0K1–04

INSTALLATION

NOTICE:

Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.



1. INSTALL FRONT PASSENGER AIRBAG ASSEMBLY

(a) Install the front passenger airbag assembly with the 2 nuts.

(b) Install the bolt.

Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

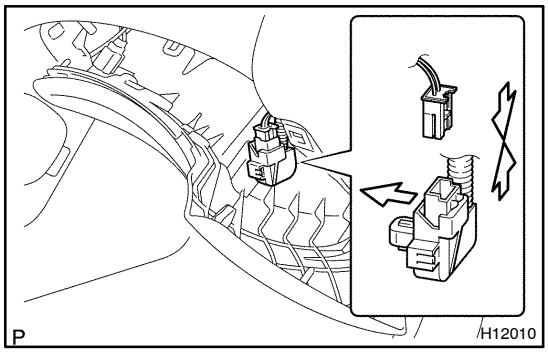
CAUTION:

- **When installing the front passenger airbag assembly, take care that the wiring does not interfere with other parts and is not pinched between other parts.**
- **Make sure that no foreign objects are trapped between the airbag bag and within the module.**

NOTICE:

If the front passenger airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the front passenger airbag assembly with a new one.

(c) Install the airbag wire harness clamp.



2. CONNECT AIRBAG CONNECTOR

(a) Connect the airbag connector.

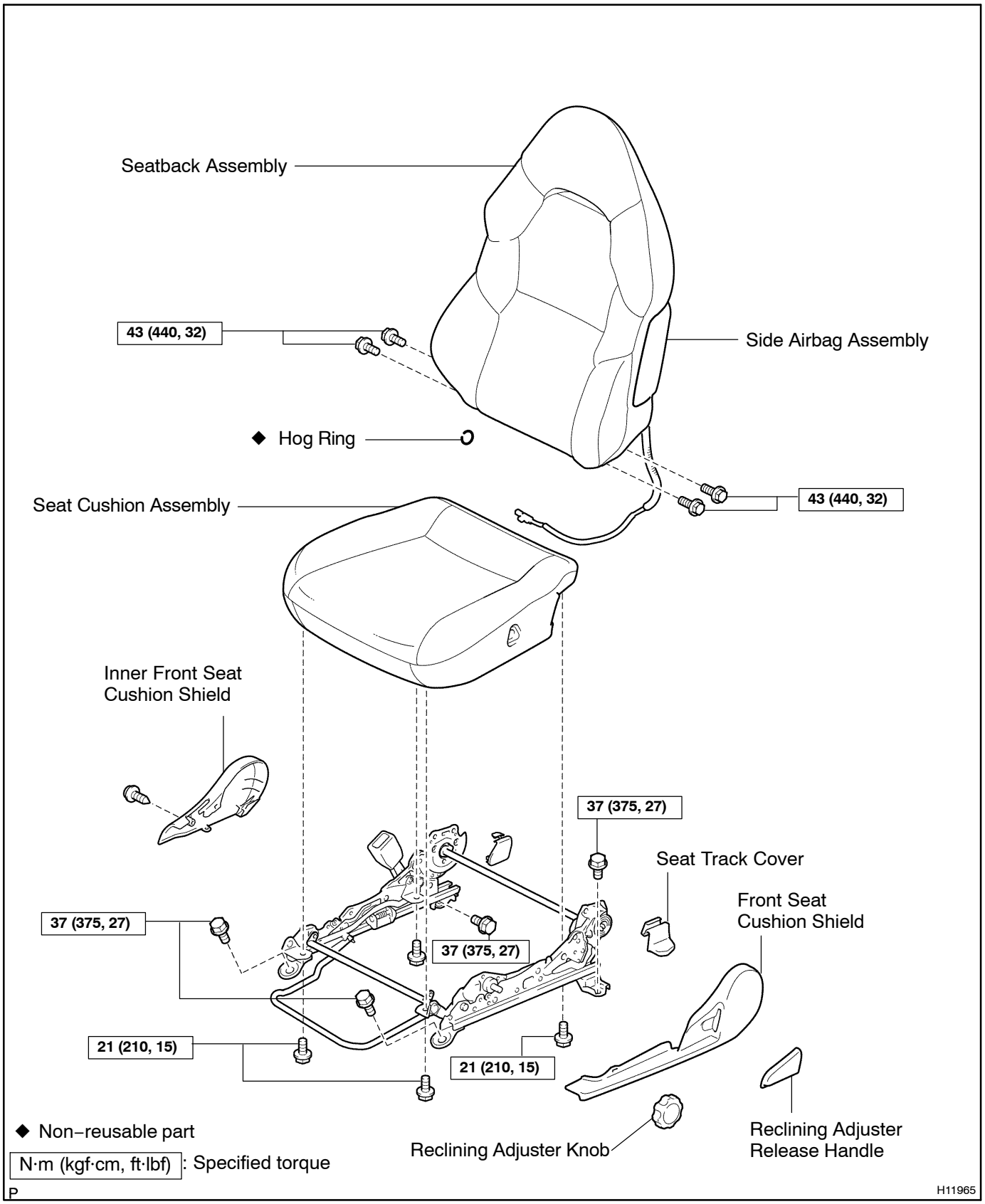
(b) Install the connector cover to the lower finish panel.

(c) Install the lower finish panel with the 3 screws and 2 bolts.

SIDE AIRBAG ASSEMBLY

COMPONENTS

RS0K2–06

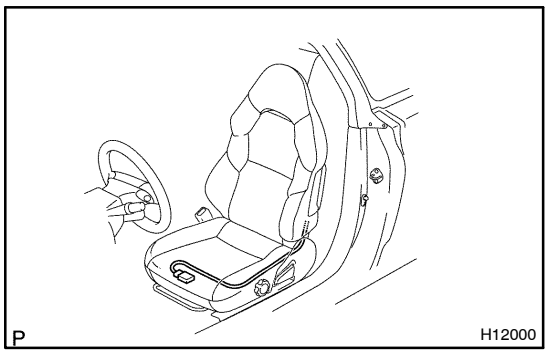


RS0K3–02

REMOVAL

NOTICE:

- **If the wiring connector of the SRS is disconnected and the ignition switch is at ON position, DTCs will be recorded.**
- **Never use the airbag parts from another vehicle. When replacing parts, replace them with new parts.**



1. REMOVE FRONT SEAT

(a) Remove the 2 seat track covers and 4 bolts.

(b) Disconnect the side airbag connector.

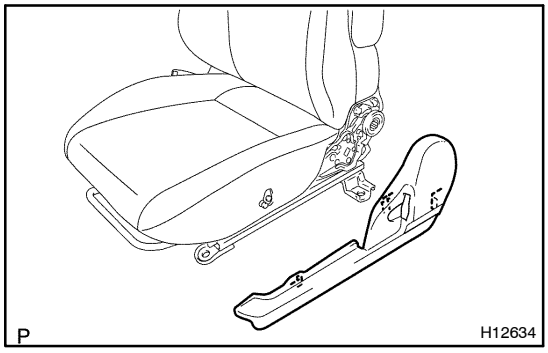
NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

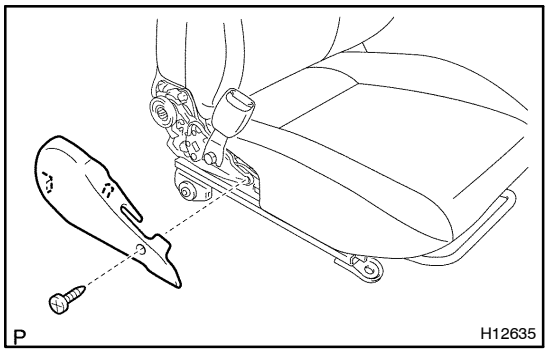
(c) Remove the front seat.

2. REMOVE RECLINING ADJUSTER RELEASE HANDLE

3. REMOVE RECLINING ADJUSTER KNOB



4. REMOVE FRONT SEAT CUSHION SHIELD



5. REMOVE INNER FRONT SEAT CUSHION SHIELD

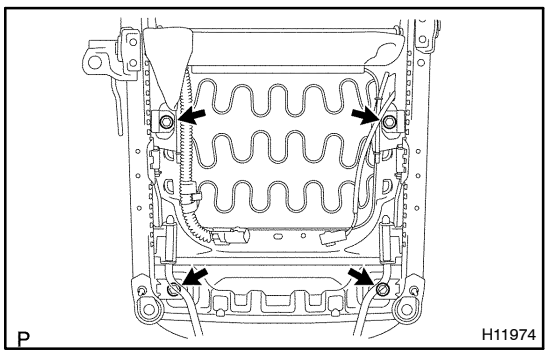
Remove the screw and inner front seat cushion shield

6. REMOVE SEAT CUSHION ASSEMBLY

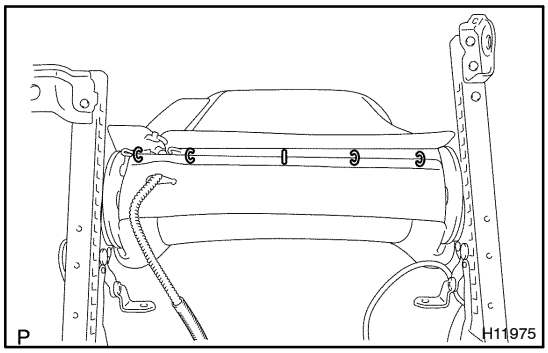
(a) Remove the wire harness from the seat cushion assembly.

NOTICE:

When handling the airbag wire harness, take care not to damage the airbag wire harness.

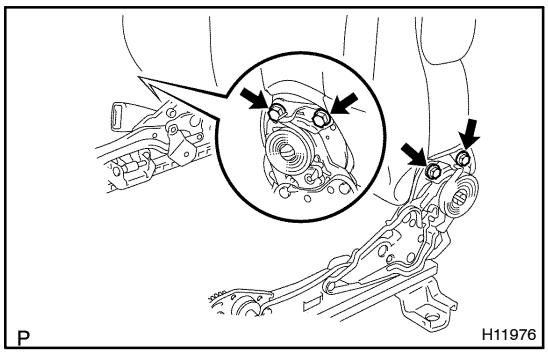


(b) Remove the 4 bolts and seat cushion assembly.



7. REMOVE SEATBACK ASSEMBLY

(a) Remove the hog rings of the seatback frame, as shown in the illustration.

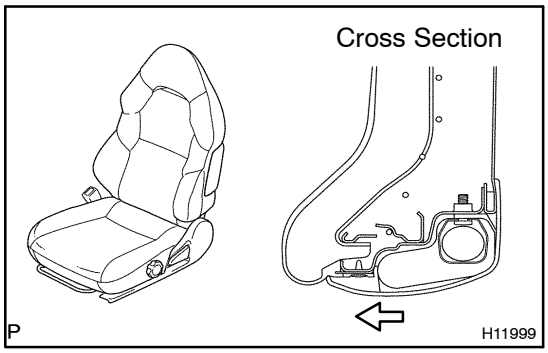


(b) Remove the 4 bolts and seatback assembly.

CAUTION:

Do not store the seatback assembly with the airbag deployment side facing downward.

RS0K4–06



INSPECTION

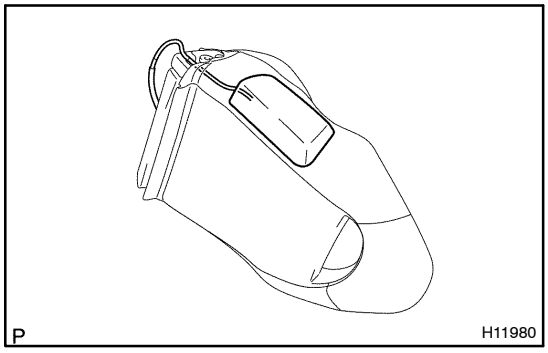
1. Vehicles not involved in collision:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).

(b) Do a visual check which includes the following item with the seatback assembly installed in the vehicle.
Check that there are no cuts and cracks of the outside of side airbag assembly.

2. Vehicle involved in a collision and airbag is not deployed:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).



(b) Do a visual check which includes the following items with the seatback assembly removed from the vehicle.
- Check cuts and cracks of the side airbag assembly.
- Check cuts and cracks in wire harness, and chipping in connectors.

CAUTION:
For removal and installation of the seatback assembly, see page RS–40 and RS–50. Be sure to follow the correct procedure.

3. Vehicle involved in a collision and airbag is deployed:
INSPECT SUPPLEMENTAL RESTRAINT SYSTEM

(a) Do a diagnostic system check (See page DI–884).

(b) Do a visual check which includes the following items with the seatback assembly removed from the vehicle.
- Check the seatback installation part of the seat adjuster.
- Check the damage to the connector and wire harness.

CAUTION:
For removal and installation of the seatback assembly, see page RS–40 and RS–50. Be sure to follow the correct procedure.

HINT:
If the seat adjuster is deformed, never repair it. Always replace it with new one.

RS0K5–06

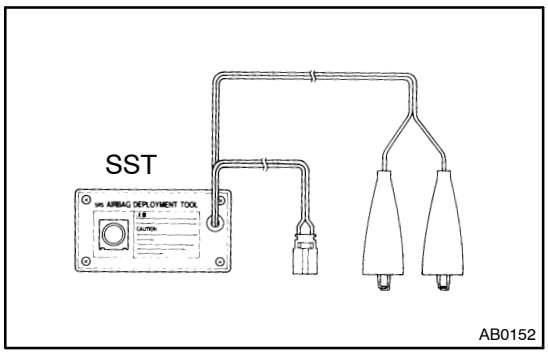
DISPOSAL

HINT:

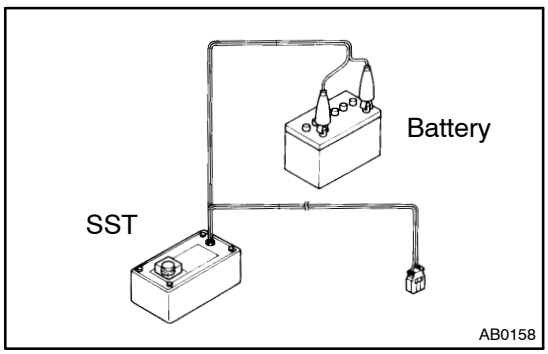
When scrapping vehicles equipped with a SRS or disposing of the side airbag assembly always first deploy the airbag in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC.

CAUTION:

- **Never dispose of a steering wheel pad of which airbag has not deployed.**
- **The airbag produces a sizeable exploding sound when it deploys, so perform the operation out–of–doors and where it will not create a nuisance to nearby residents.**



- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool), perform the operation in a place away from electrical noise.**
  SST 09082–00700
- **When deploying an airbag, perform the operation at least 10 m (33 ft) away from the airbag assembly.**
- **The side airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling side airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a side airbag assembly with the deployed airbag.**

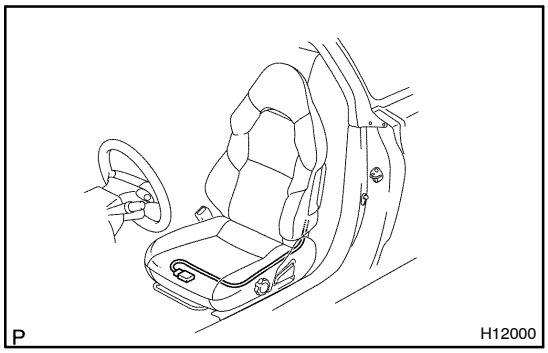


1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT:

Have a battery ready as the power source to deploy the airbag.

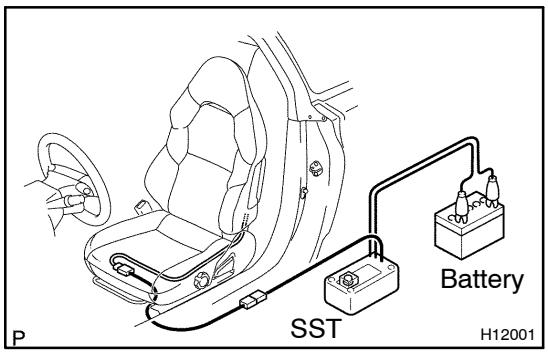
(a) Check functioning of the SST (See step 1–(a) on page RS–16).
SST 09082–00700



(b) Disconnect the side airbag connector.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.



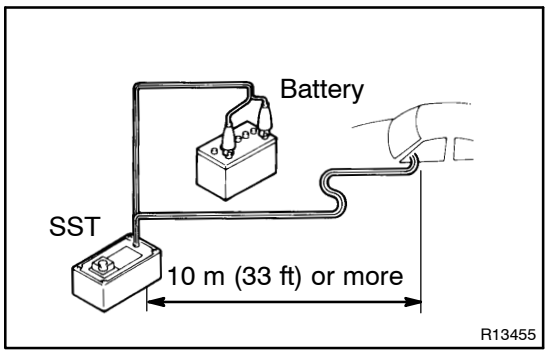
(c) Install the SST.

(1) Connect the connectors of the 2 SST to the airbag connector.

SST 09082–00700, 09082–00750

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



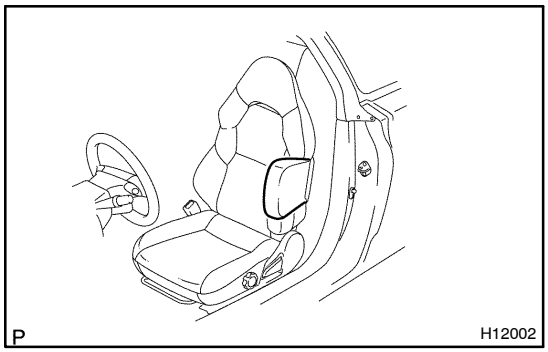
(2) Move the SST at least 10 m (33 ft) away from the front of the vehicle.

(3) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

(4) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.



(d) Deploy the airbag.

(1) Check that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.

(2) Press the SST activation switch and deploy the airbag.

CAUTION:

- **The side airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling the side airbag assembly with the deployed airbag.**
- **Do not apply water, etc. to the side airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **When scrapping a vehicle, deploy the airbag and scrap the vehicle with the side airbag assembly still installed.**

HINT:
The airbag deploys simultaneously as the LED of SST activation switch lights up.

2. DEPLOYMENT WHEN DISPOSING OF SIDE AIRBAG ASSEMBLY

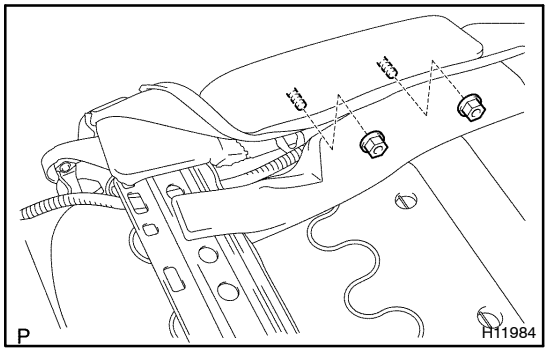
NOTICE:

- **When disposing of the side airbag assembly only, never use the customer's vehicle to deploy the airbag.**
- **Be sure to follow the procedure given below when deploying the airbag.**

HINT:
Have a battery ready as the power source to deploy the airbag.

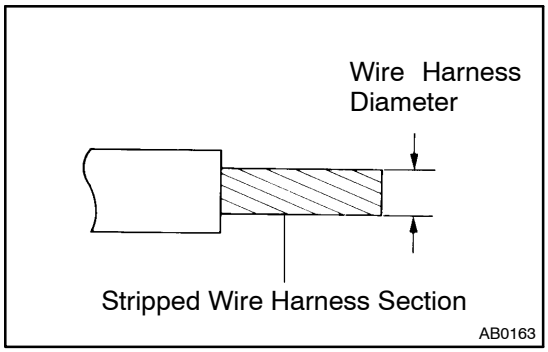
(a) Remove the seatback assembly (See page RS–40).

(b) Open the fastener of the seatback cover.



(c) Remove the side airbag assembly from the seatback assembly.

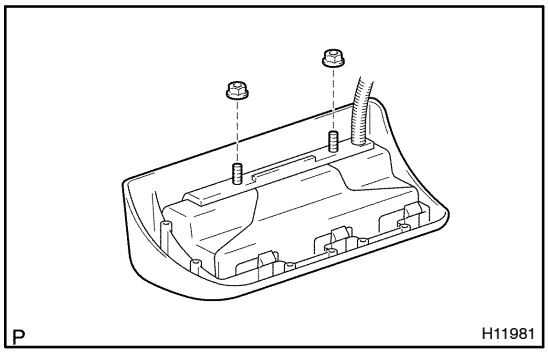
CAUTION:
When storing the side airbag assembly, keep the upper surface of the airbag deployment side facing upward.



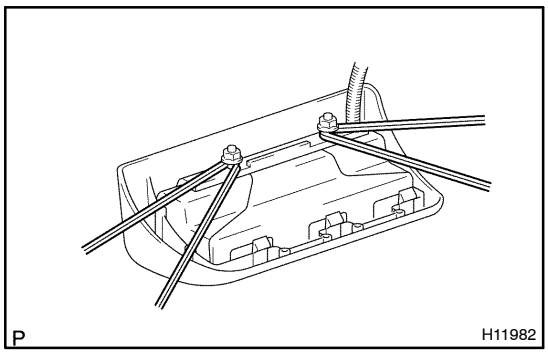
(d) Using a service–purpose wire harness, tie down the side airbag assembly to the tire.
Wire harness: Stripped wire harness section 1.25 mm^2 or more (0.0019 in^2. or more)

CAUTION:
If a wire harness which is too thin or some other thing is used to tie down the side airbag assembly, it may be snapped by the shock when the airbag is deployed. This is highly dangerous. Always use a wire harness for vehicle use which is at least 1.25 mm^2 (0.0019 in^2.).

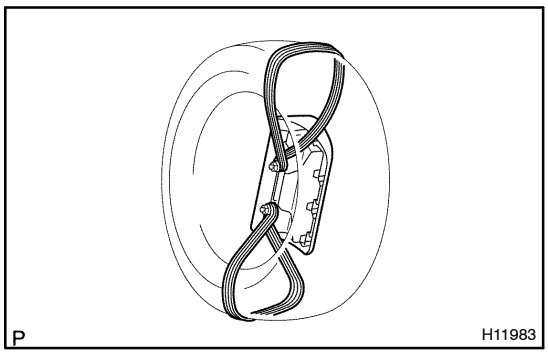
HINT:
To calculate the square of the stripped wire harness section–
Square = 3.14 x $(Diameter)^2$ divided by 4



(1) Install the 2 nuts to the side airbag assembly.



(2) Wind the wire harness around the stud bolts of the side airbag assembly as shown in the illustration.



(3) Position the side airbag assembly inside the tire with the airbag deployment direction facing inside.

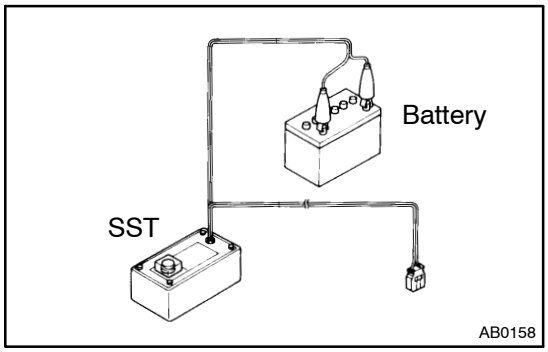
Tire size: Must exceed the following dimensions–
Width: 185 mm (7.28 in.)
Inner diameter: 360 mm (14.17 in.)

CAUTION:

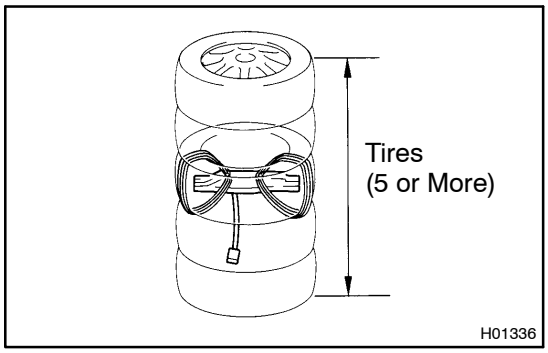
- **Make sure the wire harness is tight. It is very dangerous when a loose wire harness results in the side airbag assembly coming free due to the shock from the airbag deploying.**
- **Always tie down the side airbag assembly with the airbag deployment side facing inside.**

NOTICE:

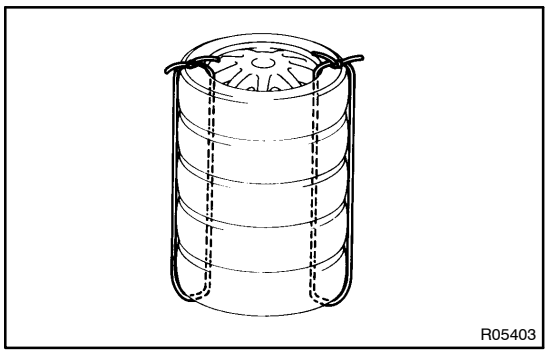
The tire will be marked by the airbag deployment, so when disposing of the airbag use a redundant tire.



(e) Check functioning of the SST (See step 1–(a) on page RS–16).
SST 09082–00700



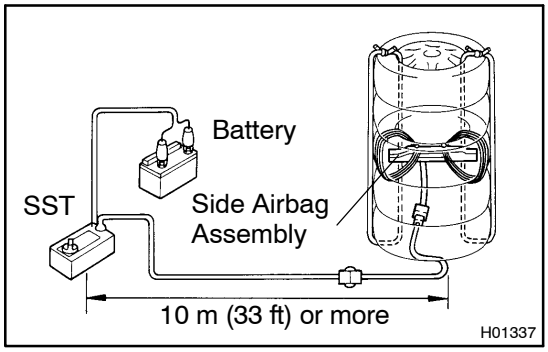
(f) Place the tires.
(1) Place at least 2 tires under the tire to which the side airbag assembly is tied.
(2) Place at least 2 tires over the tire to which the side airbag assembly is tied. The top tire should have the wheel installed.



(3) Tie the tires together with 2 wire harnesses.

CAUTION:
Make sure that the wire harnesses are tight. It is very dangerous when loose wire harnesses result in the tires coming free due to the shock from the airbag deploying.

HINT:
Place the SST connector and wire harnesses inside tires. Secure at least 1 m (3 ft) of slack for the wire harness.

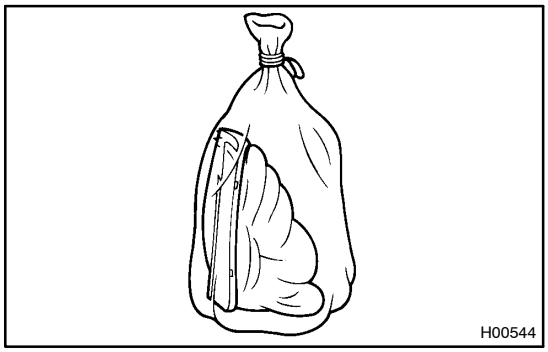


(g) Install the SST.
Connect the connectors of the 2 SST to the side airbag assembly connector.
SST 09082–00700, 09082–00750

NOTICE:
To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the tire.

(h) Deploy the airbag.
(1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.
(2) Check that no one is within 10 m (33 ft) area around the tire which the side airbag assembly is tied to.
(3) Press the SST activation switch and deploy the airbag.

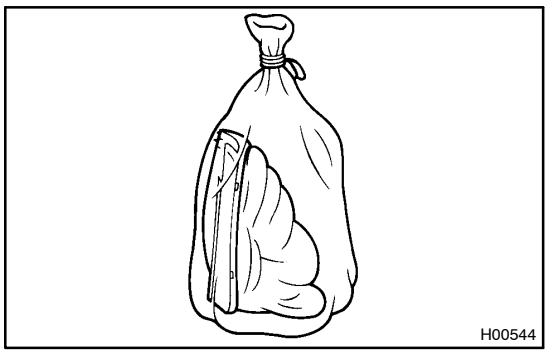
HINT:
The airbag deploys simultaneously as the LED of the SST activation switch lights up.



(i) Dispose of the side airbag assembly.

CAUTION:
- **The side airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a side airbag assembly with the deployed airbag.**
- **Do not apply water etc. to a side airbag assembly with the deployed airbag.**

- **Always wash your hands with water after completing the operation.**
  (1) Remove the side airbag assembly from the tire.
  (2) Place the side airbag assembly in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.



3. DEPLOYMENT WHEN DISPOSING OF SIDE AIRBAG ASSEMBLY WITH AIRBAG DEPLOYED IN COLLISION

Dispose of the side airbag assembly.

CAUTION:

- **The side airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a side airbag assembly with the deployed airbag.**
- **Do not apply water etc. to a side airbag assembly with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
  (1) Remove the side airbag assembly from the seat (See page RS–40 and see step 2).
  (2) Place the side airbag assembly in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.

RS0K6–02

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the seatback assembly.

Case	Replacing part
If the side airbag has been deployed.	Seatback assembly
If the side airbag assembly has been found to be faulty in troubleshooting.	Seatback assembly
If the side airbag assembly has cuts during checking items (See page RS–42).	Seatback assembly
If the side airbag assembly has been found to be faulty during checking items (See page RS–42).	Seatback assembly
If the seatback assembly has been dropped.	Seatback assembly

CAUTION:

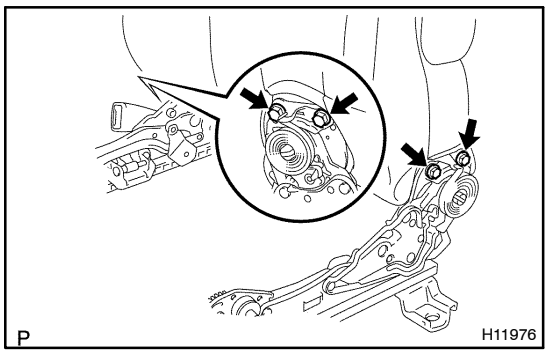
For removal and installation of the seatback assembly, see page RS–40 and RS–50. Be sure to follow the correct procedure.

RS0K7–02

INSTALLATION

NOTICE:

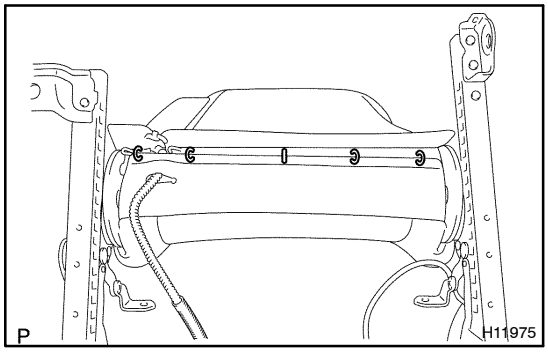
Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.



1. INSTALL SEATBACK ASSEMBLY

(a) Install the seatback assembly to the seat adjuster with the 4 bolts.

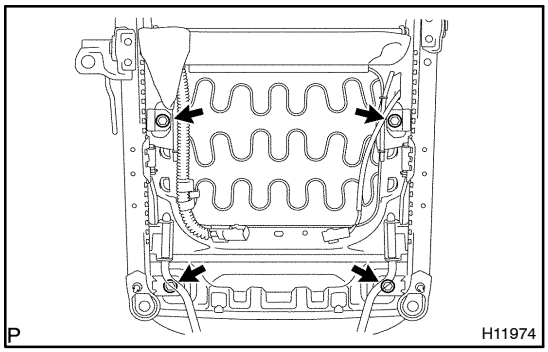
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



(b) Install 5 new hog rings.

HINT:

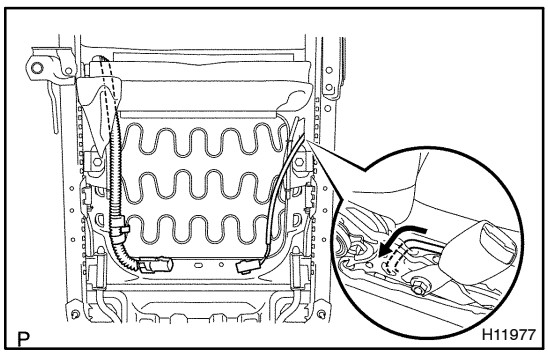
When installing the hog rings, take care to prevent wrinkles as little as possible.



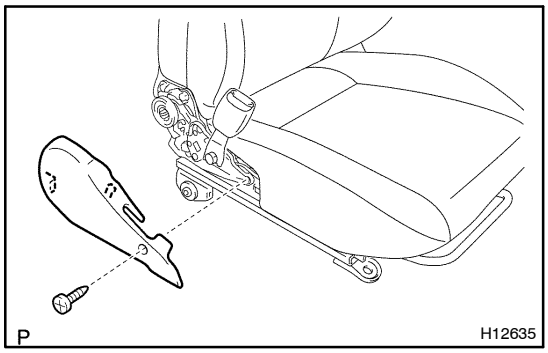
2. INSTALL SEAT CUSHION ASSEMBLY

(a) Install the seat cushion assembly with the 4 bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

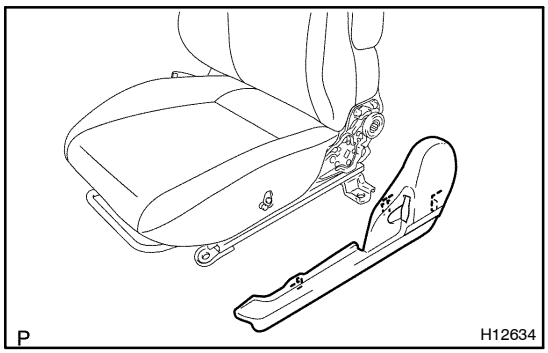


(b) Install the wire harness to the seat cushion assembly.



3. INSTALL INNER FRONT SEAT CUSHION SHIELD

Install the inner front seat cushion shield with the screw.



4. INSTALL FRONT SEAT CUSHION SHIELD

5. INSTALL RECLINING ADJUSTER KNOB

6. INSTALL RECLINING ADJUSTER RELEASE HANDLE

7. INSTALL FRONT SEAT

NOTICE:

When mounting the seat to the vehicle, take care not to damage the airbag wire harness.

(a) Connect the side airbag connector.

(b) Slide the front seat to the most front position.

NOTICE:

Make sure that seat adjuster locks.

(c) Without holding the seat track handle, mount the seat to the vehicle.

HINT:

If holding the seat track handle, the adjusted rearmost position slip off.

(d) Tighten the bolts on the front side temporarily, from the bolt on the inner side tighten them completely.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

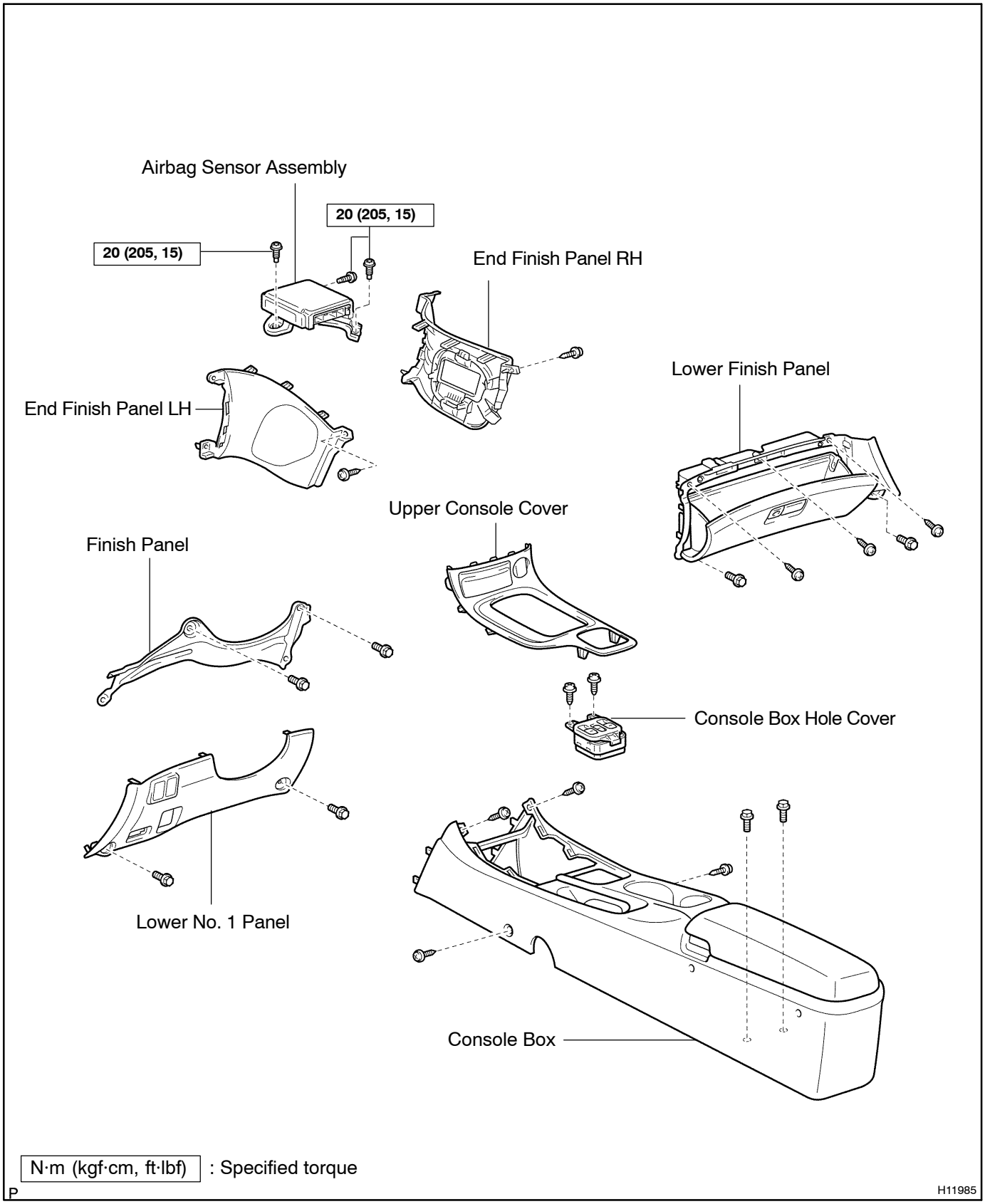
(e) Slide the seat to the most front position to install the bolts on the rear side.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

(f) Install the 2 seat track covers.

AIRBAG SENSOR ASSEMBLY

COMPONENTS

RS0K8–13



RS0K9–13

REMOVAL

NOTICE:

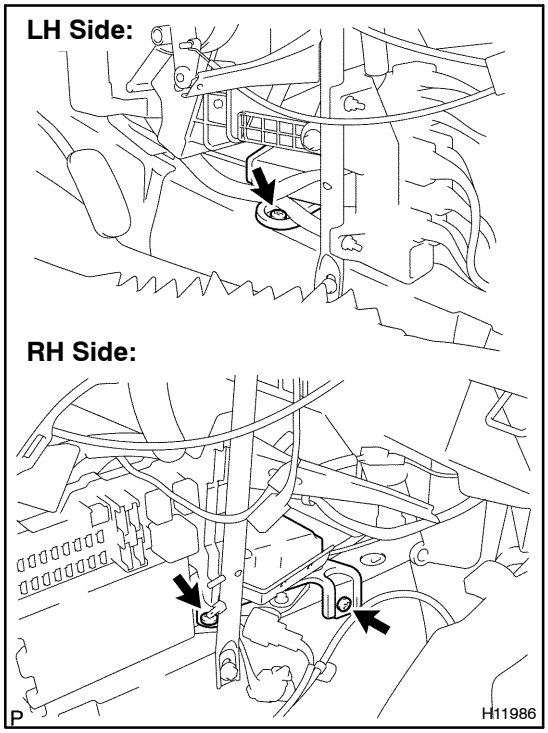
Do not open the cover or the case of the ECU and various electrical devices unless absolutely necessary.

(If the IC terminals are touched, the IC may be destroyed by static electricity.)

HINT:

For step 1 to 8, refer to page BO–79.

1. **REMOVE LOWER FINISH PANEL**
2. **REMOVE LOWER NO. 1 PANEL**
3. **REMOVE FINISH PANEL**
4. **REMOVE UPPER CONSOLE COVER**
5. **REMOVE CONSOLE BOX HOLE COVER**
6. **REMOVE CONSOLE BOX**
7. **REMOVE END FINISH PANEL LH**
8. **REMOVE END FINISH PANEL RH**



9. **REMOVE AIRBAG SENSOR ASSEMBLY**

(a) Disconnect the airbag sensor connectors.

NOTICE:

Disconnect the connectors with the airbag sensor assembly installed.

(b) Using a torx® wrench, remove the 3 screws and airbag sensor assembly.

Torx® wrench: T40 (Part No.09042–00020 or locally manufactured tool)

RS0KA–08

INSPECTION

1. VEHICLE NOT INVOLVED IN COLLISION

Do a diagnostic system check (See page DI–884).

2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED

Do a diagnostic system check (See page DI–884).

3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

Replace the airbag sensor assembly (See page DI–884).

RS0KB–06

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the airbag sensor assembly.

- If the SRS has been deployed in a collision.
- If the airbag sensor assembly has been found to be faulty in troubleshooting.
- If the airbag sensor assembly has been dropped.

CAUTION:

For removal and installation of the airbag sensor assembly, see page RS–53 and RS–56. Be sure to follow the correct procedure.

RS0KC–13

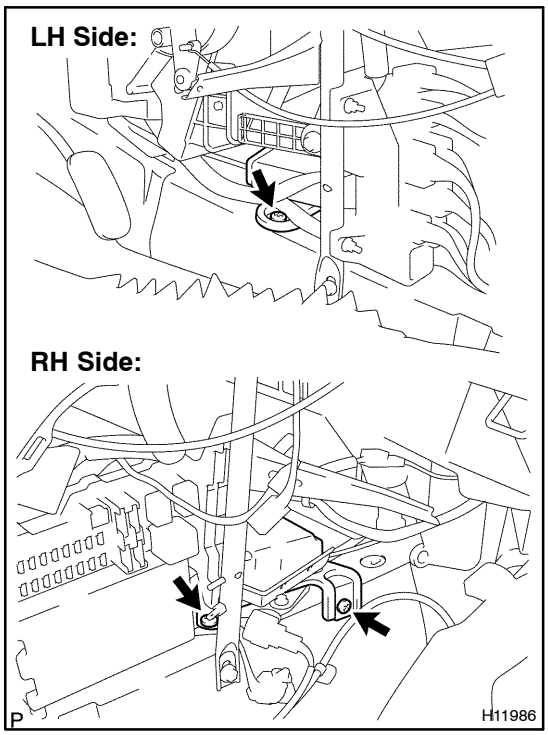
INSTALLATION

NOTICE:

- **Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.**
- **Never reuse the airbag sensor assembly involved in a collision when the airbag has deployed.**
- **Never repair a sensor in order to reuse it.**

HINT:

For step 2 to 9, refer to page BO–85.



1. INSTALL AIRBAG SENSOR ASSEMBLY

(a) Using a torx® wrench, install the airbag sensor assembly with the 3 screws.

Torx® wrench: T40 (Part No.09042–00020 or locally manufactured tool)

Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

(b) Connect the airbag sensor connectors.

NOTICE:

- **Connection of the connector is done after the sensor assembly has been installed.**
- **Make sure the sensor assembly is installed with the specified torque.**
- **If the sensor assembly has been dropped, or there are cracks, dents or other defects in the case, bracket or connector, replace the sensor assembly with a new one.**
- **When installing the senor assembly, take care that the SRS wiring does not interfere with other parts and is not pinched between other parts.**
- **After installing, shake the sensor assembly to check that there is no looseness.**

2. INSTALL END FINISH PANEL RH

3. INSTALL END FINISH PANEL LH

4. INSTALL CONSOLE BOX

5. INSTALL CONSOLE BOX HOLE COVER

6. INSTALL UPPER CONSOLE COVER

7. INSTALL FINISH PANEL

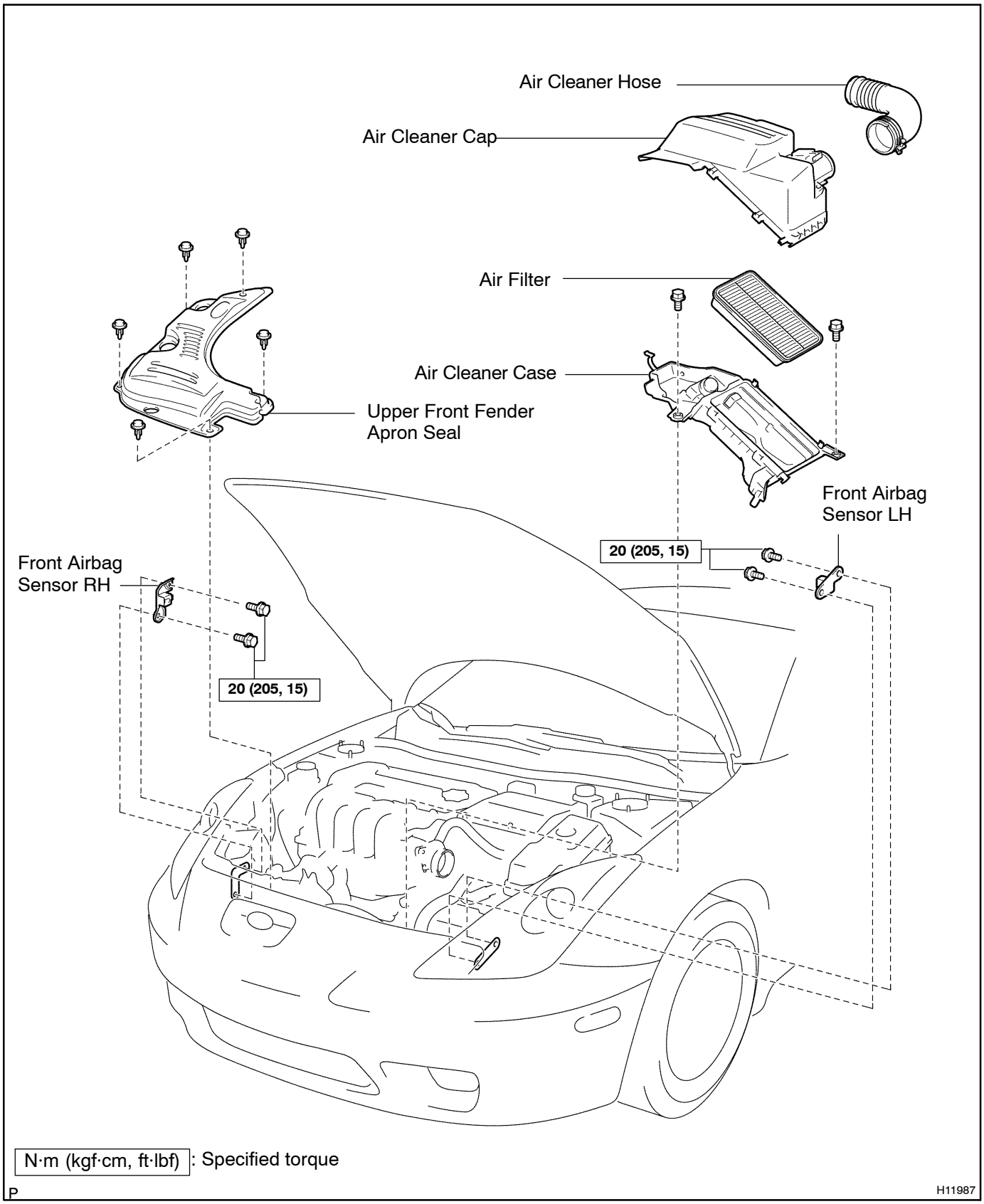
8. INSTALL LOWER NO. 1 PANEL

9. INSTALL LOWER FINISH PANEL

FRONT AIRBAG SENSOR

COMPONENTS

RS0KD–11

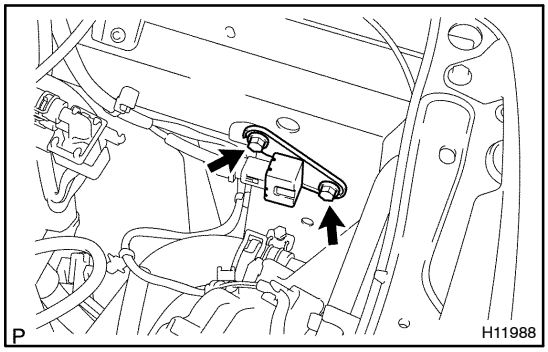


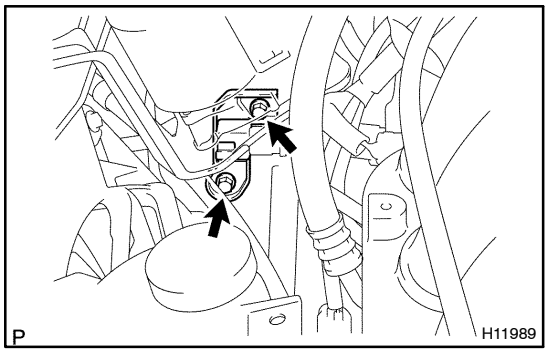
RS0KE–06

REMOVAL

NOTICE:

- **If the wiring connector of the SRS is disconnected with the ignition switch at ON position, DTCs will be recorded.**
- **Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.**
- **Never reuse the sensor involved in a collision when the SRS has deployed.**
- **Never repair a sensor in order to reuse it.**





1. LH:

REMOVE FRONT AIRBAG SENSOR

(a) Remove the air cleaner hose.
(b) Remove the air cleaner cap.
(c) Remove the air filter.
(d) Remove the 2 bolts and air cleaner case.
(e) Disconnect the connector.

NOTICE:

Disconnect the connector with sensor assembly installed.

(f) Remove the 2 bolts and front airbag sensor LH.

2. RH:

REMOVE FRONT AIRBAG SENSOR

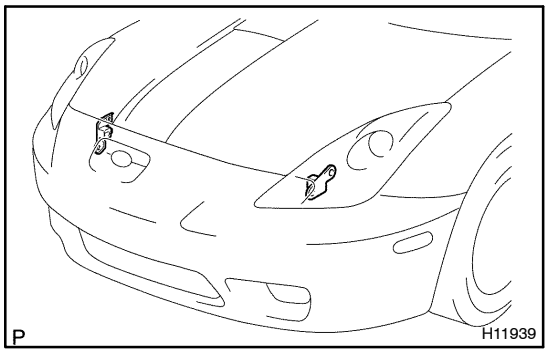
(a) Remove the 5 clips and upper front fender apron seal.
(b) Disconnect the connector.

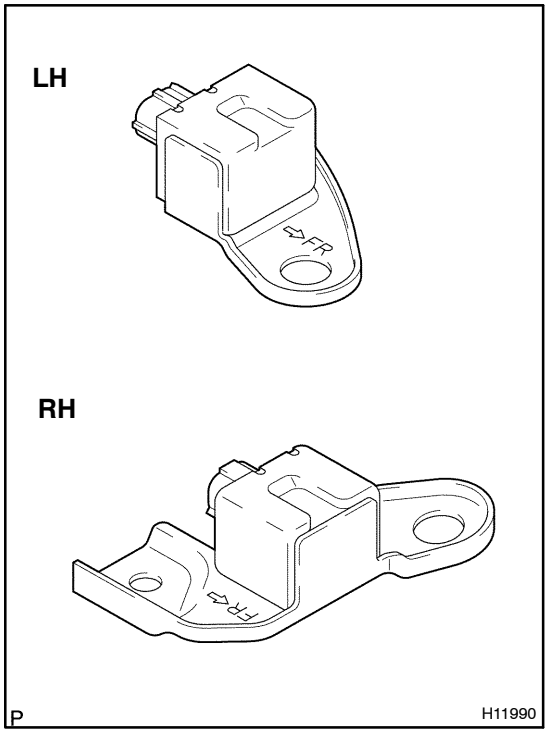
NOTICE:

Disconnect the connector with sensor assembly installed.

(c) Remove the 2 bolts and front airbag sensor RH.

RS0KF–09





INSPECTION

1. VEHICLES NOT INVOLVED IN COLLISION

Do a diagnostic system check (See page DI–884).

2. VEHICLES INVOLVED IN COLLISION

(a) Do a diagnostic system check (See page DI–884).

(b) If the front fender of the car or its periphery is damaged, do a visual check for damage to the front airbag sensor, which includes the following items even if the airbag was not deployed:

- Check the bracket deformation.
- Check the paint peeling off the bracket.
- Check the cracks, dents or chips in the case.
- Check the cracks, dents, chipping and scratches in the connector.
- Check the peeling off of the label or damage to the serial number.

RS01O–27

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the front airbag sensor.

- If the SRS has been deployed in a collision. (Replace both the left and right airbag sensors.)
- If the front airbag sensor has been found to be faulty in troubleshooting.
- If the front airbag sensor has been found to be faulty during checking items (See page RS–59).
- If the front airbag sensor has been dropped.

CAUTION:

For removal and installation of the front airbag sensor, see page RS–58 and RS–61. Be sure to follow the correct procedure.

RS0KH–08

INSTALLATION

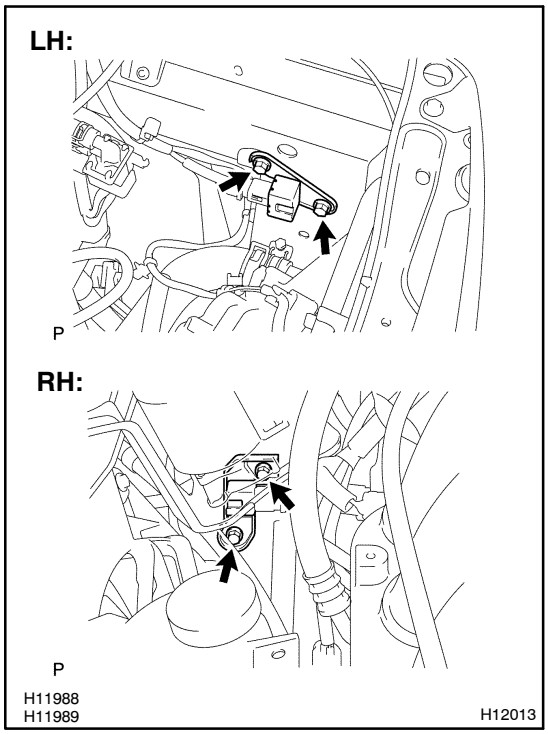
1. INSTALL FRONT AIRBAG SENSOR LH AND RH

(a) Install the front airbag sensors with the 4 bolts.
Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

(b) Connect the front airbag sensor connector.

NOTICE:

- **Connection of the connector is done after the sensor assembly has been installed.**
- **Make sure the sensor is installed with the specified torque.**
- **If the sensor has been dropped, or there are cracks, dents or other defects in the case, brackets or connector, replace the removed sensor with a new one.**
- **The front sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector. If the connector is not securely locked, a malfunction code will be detected by the diagnostic system.**



HINT:
Install the front airbag sensor with the arrow on the sensor facing toward the front of the vehicle.

2. INSTALL HEAD LIGHT

Install head lights with the 4 bolts and 2 screws (See page BE–22).

3. INSTALL AIR CLEANER CASE

Install the air cleaner case with the 2 bolts.

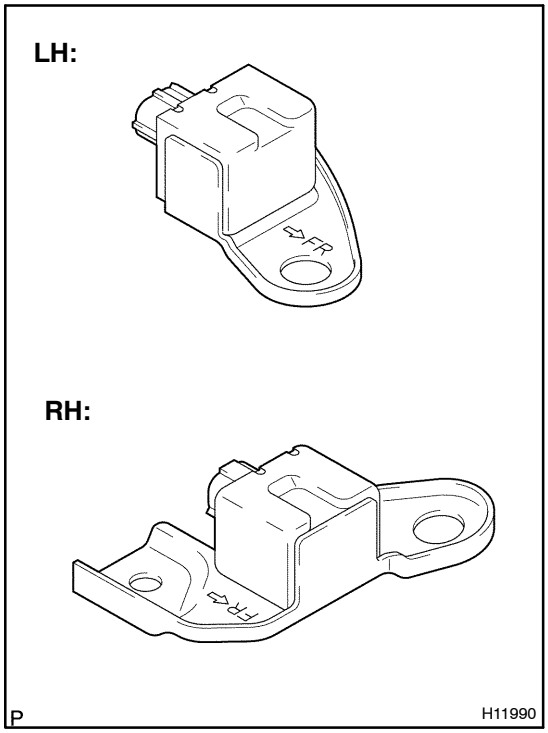
4. INSTALL AIR FILTER

5. INSTALL AIR CLEANER CAP

6. INSTALL AIR CLEANER HOSE

7. INSTALL UPPER FRONT FENDER APRON SEAL

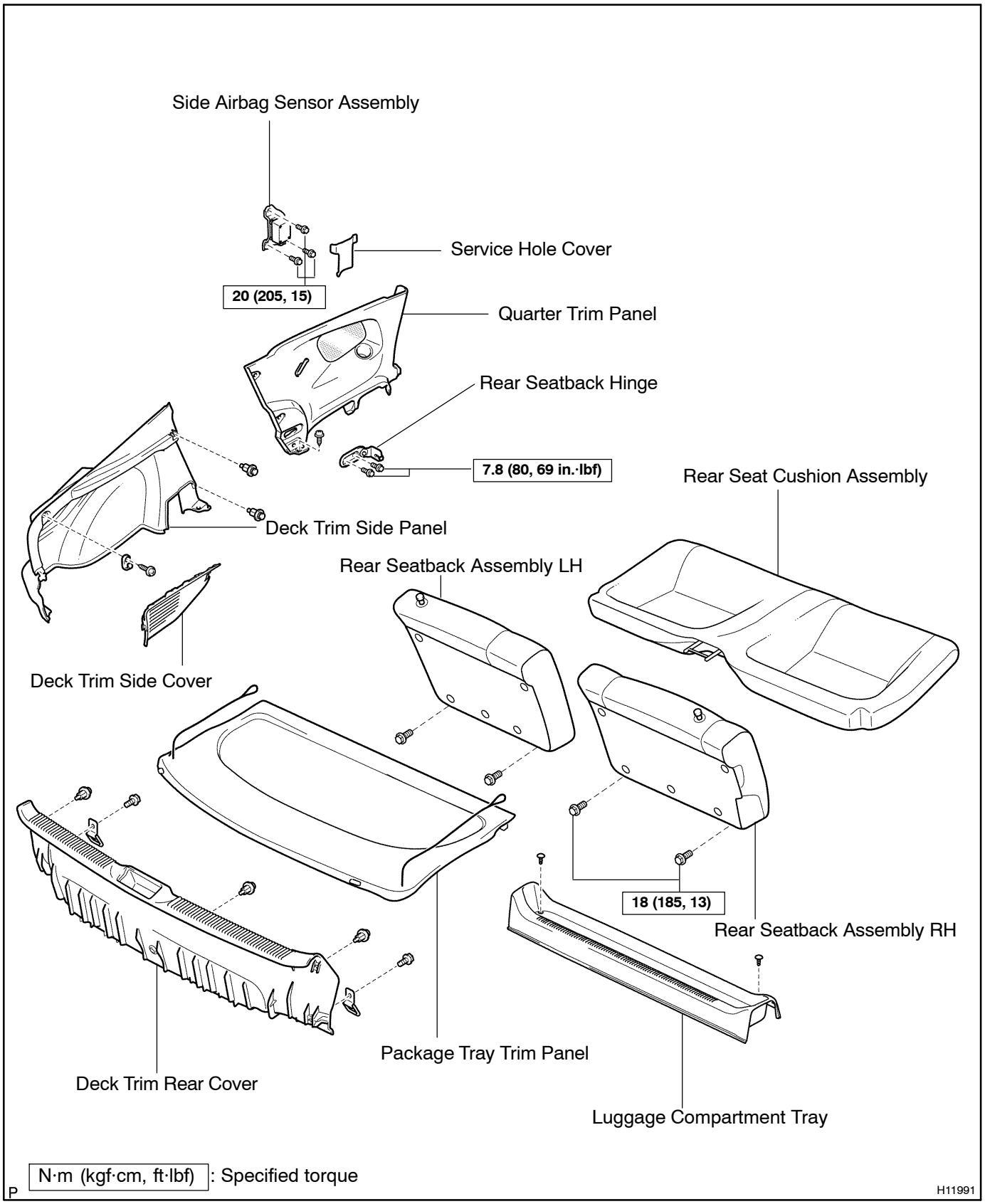
Install the upper front fender apron seal with the 5 clips.



SIDE AIRBAG SENSOR ASSEMBLY

RS0KI–06

COMPONENTS



RS0KJ–06

REMOVAL

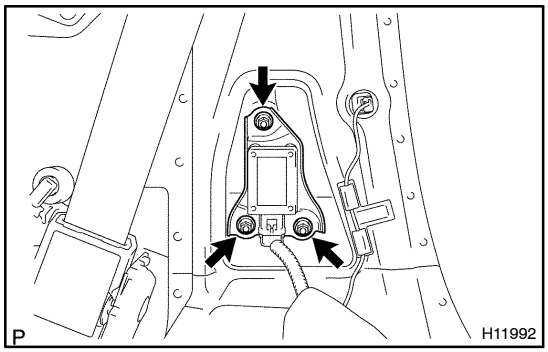
NOTICE:

- **If the wiring connector of the SRS is disconnected with the ignition switch at ON position, DTCs will be recorded.**
- **Do not open the cover or the case of the ECU and various electrical devices unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)**

HINT:

For step 1 to 9, refer to page BO–88.

1. **REMOVE PACKAGE TRAY TRIM PANEL**
2. **REMOVE REAR SEATBACK ASSEMBLY LH AND RH**
3. **REMOVE REAR SEAT CUSHION ASSEMBLY**
4. **REMOVE DECK TRIM REAR COVER**
5. **REMOVE DECK TRIM SIDE COVER**
6. **REMOVE DECK TRIM SIDE PANEL**
7. **REMOVE LUGGAGE COMPARTMENT TRAY**
8. **REMOVE REAR SEATBACK HINGE**
9. **REMOVE QUARTER TRIM PANEL**



10. **REMOVE SIDE AIRBAG SENSOR ASSEMBLY**

(a) Remove the cover.

(b) Disconnect the connector.

NOTICE:

Remove the connector with the sensor assembly installed.

(c) Remove the 3 nuts and side airbag sensor assembly.

RS0KK–05

INSPECTION

1. VEHICLES NOT INVOLVED IN COLLISION

Do a diagnostic system check (See page DI–884).

2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED

Do a diagnostic system check (See page DI–884).

3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

Replace the side airbag sensor assembly (See page DI–884).

RS0KL–02

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the side airbag sensor assembly.

- If the side airbag assembly has been deployed in a collision.
- If the side airbag sensor assembly has been found to be faulty in troubleshooting.
- If the side airbag sensor assembly has been dropped.

CAUTION:

For removal and installation of the side airbag sensor assembly, see page RS–63 and RS–66. Be sure to follow the correct procedure.

RS0KM–06

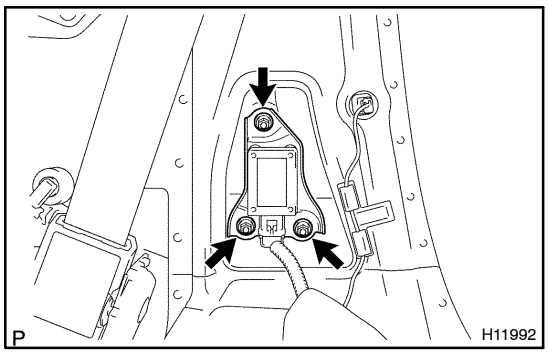
INSTALLATION

NOTICE:

- **Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.**
- **Never reuse the side airbag sensor assembly involved in a collision when the airbag has deployed.**
- **Never repair a sensor in order to reuse it.**

HINT:

For step 2 to 10, refer to page BO–91.



1. INSTALL SIDE AIRBAG SENSOR

(a) Install the side airbag assembly with 3 screws.
Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

(b) Connect the connector.

NOTICE:

- **Connection of the connector is done after the sensor assembly has been installed.**
- **Make sure the sensor assembly is installed with the specified torque.**
- **If the sensor assembly has been dropped, or there are cracks, dents or other defects in the case, bracket or connector, replace the sensor assembly with a new one.**
- **When installing the sensor assembly, take care that the SRS wiring does not interfere with other parts and is not pinched between other parts.**
- **After installation, shake the sensor assembly to check that there is no looseness.**

(c) Install the cover.

2. INSTALL QUATER TRIM PANEL

3. INSTALL REAR SEAT BACK HINGE
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

4. INSTALL LUGGAGE COMPARTMENT TRAY

5. INSTALL DECK TRIM SIDE PANEL

6. INSTALL DECK TRIM SIDE COVER

7. INSTALL DECK TRIM REAR COVER

8. INSTALL REAR SEAT CUSHION ASSEMBLY

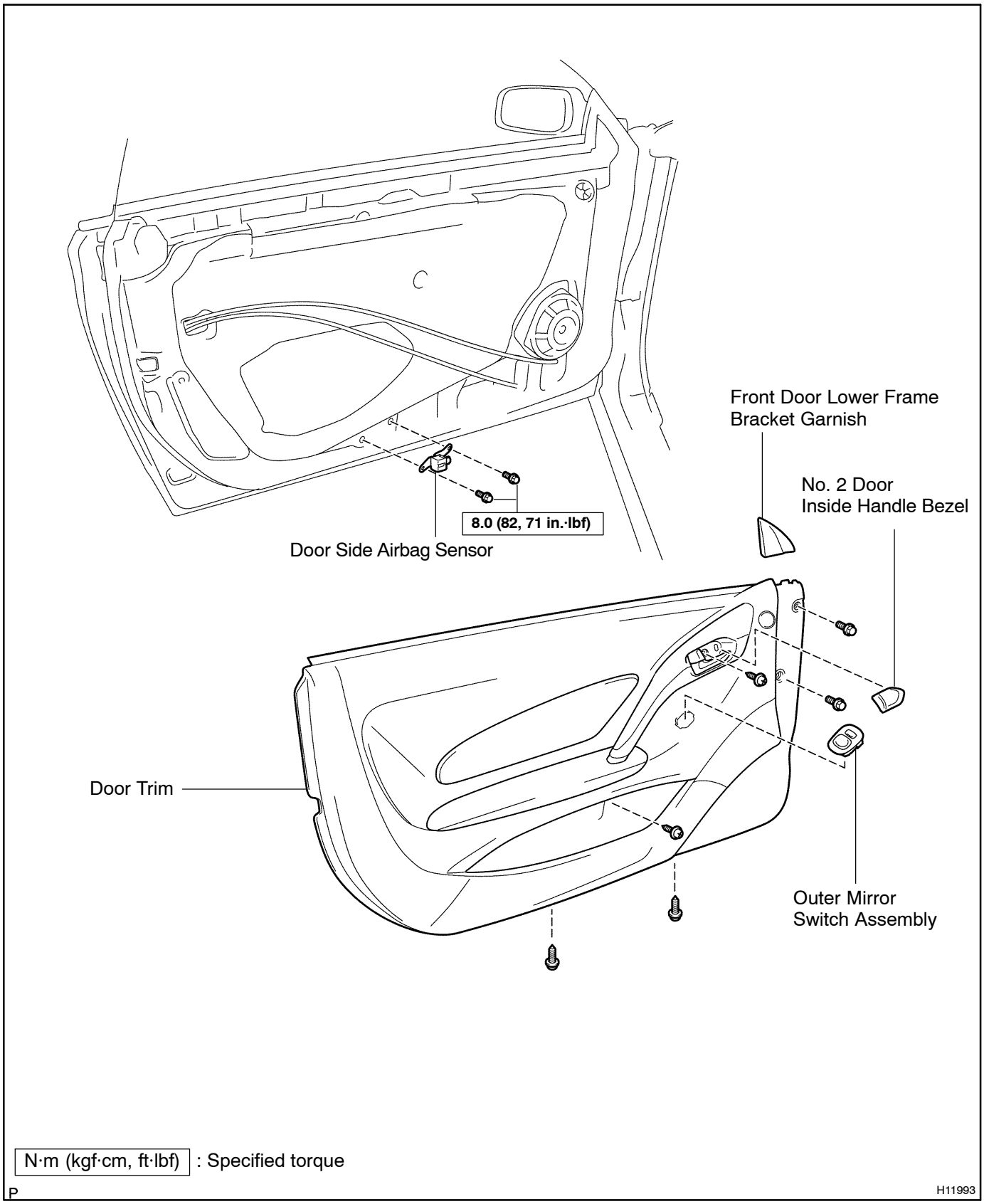
9. INSTALL REAR SEATBACK ASSEMBLY LH AND RH
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

10. INSTALL PACKAGE TRAY TRIM PANEL

DOOR SIDE AIRBAG SENSOR

COMPONENTS

RS0KN–03



RS0KO–03

REMOVAL

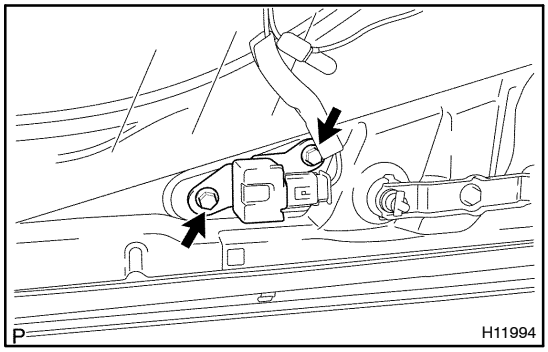
NOTICE:

- **If the wiring connector of the SRS is disconnected with the ignition switch at ON position, DTCs will be recorded.**
- **Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.**
- **Never reuse the sensor involved in a collision when the SRS has deployed.**
- **Never repair a sensor in order to reuse it.**

HINT:

For step 1 to 4, refer to page BO–11.

1. **REMOVE NO. 2 DOOR INSIDE HANDLE BEZEL**
2. **REMOVE OUTER MIRROR SWITCH ASSEMBLY**
3. **REMOVE FRONT DOOR LOWER FRAME BRACKET GARNISH**
4. **REMOVE DOOR TRIM**



5. **REMOVE DOOR SIDE AIRBAG SENSOR**

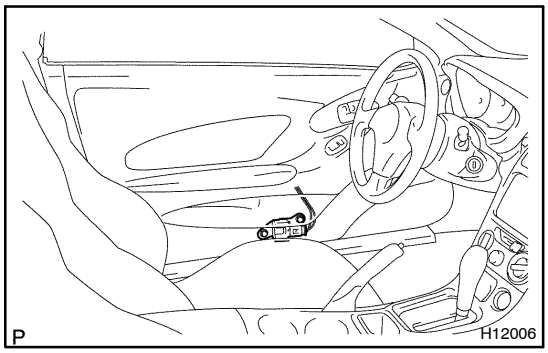
(a) Disconnect the door side airbag sensor connector.

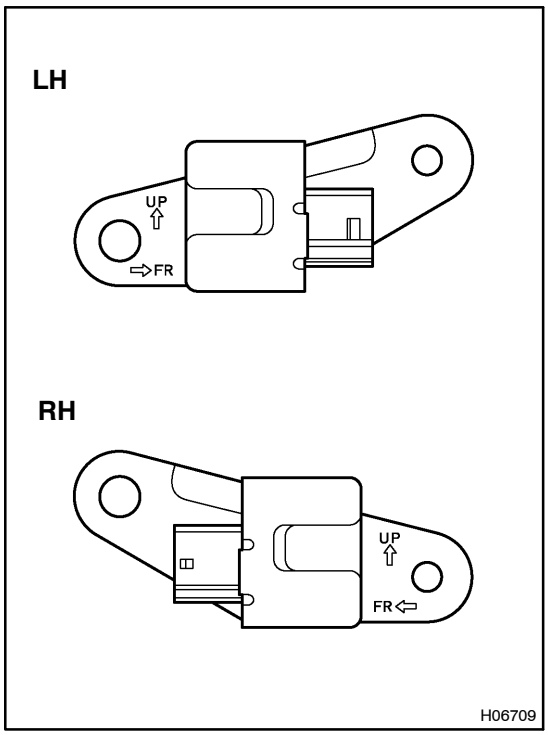
NOTICE:

Disconnect the connector with sensor assembly installed.

(b) Remove the 2 bolts and door side airbag sensor.

RS0KP–02





INSPECTION

1. VEHICLES NOT INVOLVED IN COLLISION

Do a diagnostic system check (See page DI–884).

2. VEHICLES INVOLVED IN COLLISION

(a) Do a diagnostic system check (See page DI–884).

(b) If the front door or its periphery is damaged, do a visual check for damage to the door side airbag sensor, which includes the following items even if the airbag was not deployed:

- Check the bracket deformation.
- Check the paint peeling off the bracket.
- Check the cracks, dents or chips in the case.
- Check the cracks, dents, chipping and scratches in the connector.
- Check the peeling off of the label or damage to the serial number.

RS0KQ–02

REPLACEMENT

REPLACEMENT REQUIREMENTS

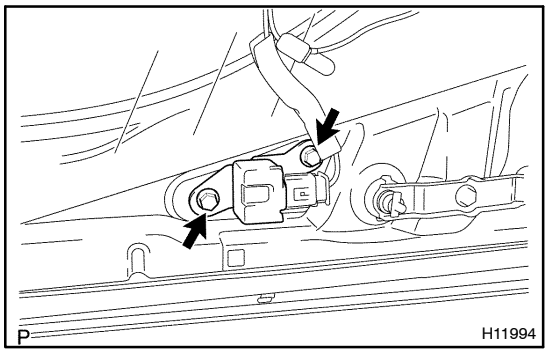
In the following cases, replace the front airbag sensor.

- If the side airbag assembly has been deployed in a collision.
- If the door side airbag sensor has been found to be faulty in troubleshooting.
- If the door side airbag sensor has been found to be faulty during checking items (See page RS–59).
- If the door side airbag sensor has been dropped.

CAUTION:

For removal and installation of the door side airbag sensor, see page RS–68 and RS–71. Be sure to follow the correct procedure.

RS0KR–02



INSTALLATION

HINT:

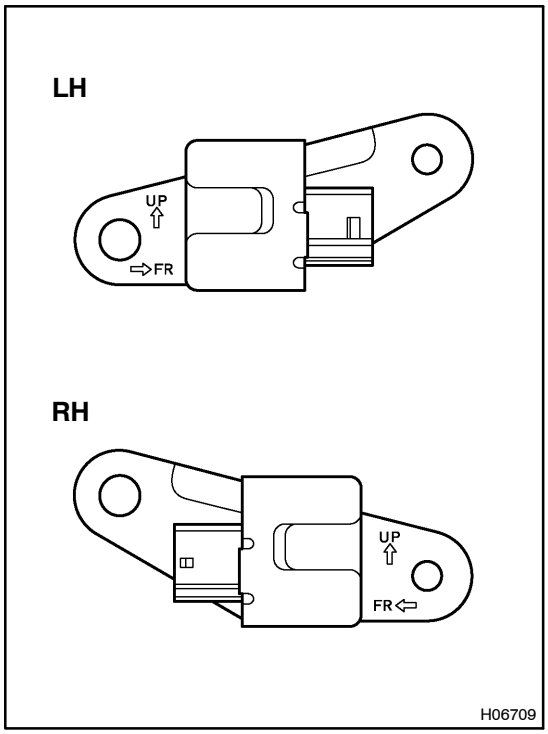
For step 2 to 5, refer to page BO–21.

1. INSTALL DOOR SIDE AIRBAG SENSOR

(a) Install the door side airbag sensor with the 2 bolts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NOTICE:

- **Connection of the connector is done after the sensor has been installed.**
- **Make sure the sensor is installed with the specified torque.**
- **If the sensor has been dropped, or there are cracks, dents or other defects in the case, brackets or connector, replace the removed sensor with new one.**
- **The door side airbag sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector. If the connector is not securely locked, a malfunction code will be detected by the diagnostic system.**



HINT:

Install the door side airbag sensor with the arrow on the sensor facing toward the front of the vehicle.

(b) Connect the front airbag sensor connector.

2. INSTALL DOOR TRIM

3. INSTALL FRONT DOOR LOWER FRAME BRACKET GARNISH

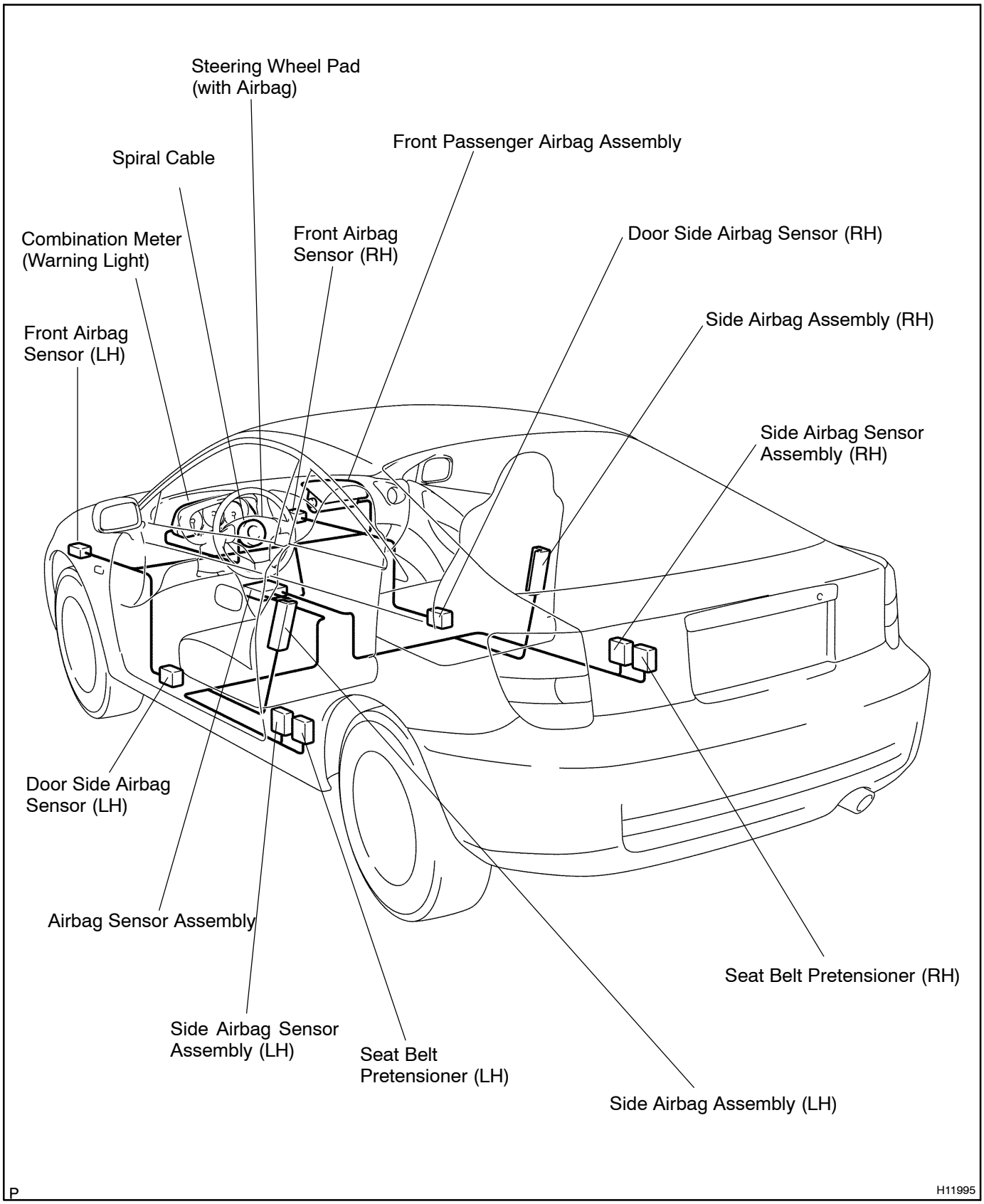
4. INSTALL OUTER MIRROR SWITCH ASSEMBLY

5. INSTALL NO. 2 DOOR INSIDE HANDLE BEZEL

WIRE HARNESS AND CONNECTOR

RS0KS–12

LOCATION



RS0KT–08

INSPECTION

HINT:

The SRS wire harness is integrated with the instrument panel wire harness assembly. All the connectors in the system are a standard yellow color.

1. VEHICLES NOT INVOLVED IN COLLISION

Do a diagnostic system check (See page DI–884).

2. VEHICLES INVOLVED IN COLLISION

(a) Do a diagnostic system check (See page DI–884).

(b) Check breaks in all wires of the SRS wire harness, and exposed conductors.

(c) Check to see if the SRS wire harness connectors are cracked or chipped.

RS0KU–07

REPLACEMENT

In the following cases,replace the wire harness or connector.

- If any part of the SRS wire harness or any connector has been found to be faulty in troubleshooting.
- If any part of the SRS wire harness or any connector has been found to be faulty during checking items (See page RS–73).

CAUTION:

If the wire harness used in the SRS is damaged, replace the whole wire harness assembly.

BODY ELECTRICAL SYSTEM

BE0OM–17

PRECAUTION

HINT:

Take care to observe the following precautions when performing inspections or removal and replacement of body electrical related parts.

1. PRECAUTION OF DISCHARGE HEADLIGHT SYSTEM

(a) Disconnect the connector of the light control computer after disconnecting the battery negative terminal or turn off the light control switch off.

(b) When any defects such as deformation, crack, dent, chipping, etc. are identified on the discharge headlight (especially on the light control ECU) and headlight is damaged by collision, replace the discharge headlight with a new one.

(c) Even if the discharging operation seems to be normal, the fail–safe function may be defective.

(d) Touching the high voltage socket of the discharge headlight with the headlight dimmer switch ON could generate momentary high voltage of 20, 000 V and lead to a serious accident.

(e) Never connect a tester to the high voltage socket of the discharge headlight for measurement, as this leads to a serious accident because of high voltage.

(f) When performing operation related to the discharge headlight, keep it away from water such as rain, turn off the light control switch, and disconnect the battery terminal and connector of the light control ECU in advance to avoid electric shock.

(g) When performing operation related to the discharge headlight, start operation after assembling is completely over and never turn on the light without a bulb installed.

(h) Do not turn on the discharge headlight using another power source except vehicle's.

2. HEADLIGHT BULB REPLACEMENT

(a) If the adhered oil is left on the halogen lamp surface, the lamp service life is shortened as it becomes hot when it is turned on.

(b) Since the internal pressure of a discharge headlight and halogen bulbs is high, dropping, hitting or damaging the bulb may cause the glass to scatter. Therefore, handle the headlight bulb with great care.

(c) When replacing bulb, prepare a new bulb before starting operation.

(d) A bulb of the same watt must be used for bulb replacement.

(e) Firmly reinstall the socket in bulb replacement. Otherwise, cloudy lens or invasion by water will be caused.

Halogen bulbs have pressurized gas inside and require special handling. They can burst if scratched or dropped. Hold a bulb only by its plastic or metal case.

Don't touch the glass part of a bulb with bare hands.

3. SRS (SUPPLEMENTAL RESTRAINT SYSTEM)

The CELICA is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag and side airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

4. AUDIO SYSTEM

If the negative (–) terminal cable is disconnected from the battery, the preset AM, FM 1 and FM 2 stations stored in memory are erased, so be sure to note the stations and reset them after the battery terminal is reconnected.

5. MOBILE COMMUNICATION SYSTEM

If the vehicle is equipped with a mobile communication system, refer to precautions in the IN section.

TROUBLESHOOTING

BE0ON–24

PROBLEM SYMPTOMS TABLE

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

Symptom	Suspect Area	See page
Ignition switch is not set to each position.	11. Ignition Switch	BE–10
”Key unlock warning system” does not operate.	1. Key Unlock Warning Switch 2. Door Courtesy Switch 3. Body Control System 4. Combination Meter 5. Wire Harness	BE–10 BE–32 DI–1117 – –

HEADLIGHT (HALOGEN) AND TAILLIGHT SYSTEM

Symptom	Suspect Area	See page
”Lo–Beam” and ”Hi–Beam” of both sides do not come on. (Taillights do come on.)	1. Light Control Switch 2. Body Control System	BE–18 DI–1117
”Lo–Beam” and ”Hi–Beam” of both sides do not come on. (Taillights do not come on neither.)	1. Light Control Switch 2. Body Control System 3. Headlight Bulb	BE–18 DI–1117 –
”Lo–Beams” do not come on. (Both sides)	1. HEAD Relay 2. Headlight Dimmer Switch 3. Body Control System 4. Wire Harness	BE–18 BE–18 DI–1117 –
”Lo–Beam” does not come on. (One side)	1. HEAD LH LWR Fuse 2. HEAD RH LWR Fuse 3. Headlight Bulb 4. Wire Harness	BE–10 BE–10 – –
”Hi–Beams” do not come on. (Both sides)	1. DRL NO. 2 DIMMER Relay 2. MAIN Fuse 3. HEAD LVL DRL NO. 1 Fuse 4. Headlight Dimmer Switch 5. Body Control System 6. Wire Harness	BE–18 BE–10 BE–24 BE–18 DI–1117 –
”Hi–Beam” does not come on. (ONE SIDE)	1. HEAD LH UPR Fuse 2. HEAD RH UPR Fuse 3. DRL NO. 3 Relay 4. DRL NO. 4 Relay 5. Headlight Bulb 6. Wire Harness	BE–10 BE–10 BE–18 BE–18 – –
”Flash” does not operate.	1. Headlight Dimmer Switch 2. Body Control System 3. Wire Harness	BE–18 DI–1117 –
”Light–on warning System” does not operate.	1. Door courtesy Switch (Driver’s) 2. Body Control System 3. Combination Meter 4. Wire Harness	BE–32 DI–1117 – –
”Automatic light control system” does not operate.	1. Automatic Light Control Sensor 2. Light Control Switch 3. Door Courtesy Switch 4. Body Control System 5. Wire Harness	BE–18 BE–18 BE–18 DI–1117 –
Headlight does not come on with light control SW in HEAD.	1. Light Control Switch 2. Body Control System 3. Wire Harness	BE–18 DI–1117 –

Headlight does not go off with light control SW in OFF.	1. Headlight Relay 2. Body Control System 3. Wire Harness	BE–18 DI–1117 –
Taillight does not come on with light control SW in TAIL.	1. Taillight Relay 2. Light Control Switch 3. Body Control System	BE–18 BE–18 DI–1117
Taillight does not go off with light up control SW in OFF.	1. Taillight Relay 2. Light Control Switch 3. Body Control System 4. Wire Harness	BE–18 BE–18 DI–1117 –
Headlight does not come on with engine running and light control SW in OFF.	1. Generator L Terminal 2. Parking Brake Switch 3. Body Control System 4. Wire Harness	CH–10 BE–50 DI–1117 –

DISCHARGE HEADLIGHT

Symptom	Suspect Area	See page
”Lo–Beam” and ”Hi–Beam” of both sides do not come on. (Taillights do not come on.)	1. HEAD Relay 2. DRL NO. 2 DIMMER Relay 3. Headlight Dimmer Switch 4. Light Control Switch 5. Body Control System 6. Headlight Bulb 7. HEAD RH UPR or HEAD LH UPR Fuse 8. Wire Harness	BE–18 BE–18 BE–18 BE–18 DI–1117 – BE–10 –
”Lo–Beam” and ”Hi–Beam” of both sides do not come on. (Taillights do come on neither.)	1. Light Control Switch 2. Body Control System 3. Wire Harness	BE–18 DI–1117 –
”Lo–Beam” and ”Hi–Beam” of only one side do not come on.	1. HEAD RH LWR and HEAD RH UPR Fuse (Both) or HEAD LH LWR and HEAD LH UPR Fuse (Both) 2. Headlight Bulb 3. Wire Harness	BE–10 – –
”Lo–Beams” do not come on. (Both sides)	1. Head Relay 2. Headlight Dimmer Switch 3. Body Control System 4. Wire Harness	BE–18 BE–18 DI–1117 –
”Lo–Beam” does not come on. (ONE SIDE)	1. HEAD LH LWR Fuse 2. HEAD RH LWR Fuse 3. Headlight Bulb 4. Wire Harness	BE–10 BE–10 – –
”Hi–Beams” do not come on. (Both sides)	1. DRL NO. 2 DIMMER Relay 2. HEAD RH UPR Fuse (Engine Room J/B) 3. Headlight Dimmer Switch 4. Body Control System 5. Wire Harness	BE–18 BE–10 BE–18 DI–1117 –
”Hi–Beam” does not come on. (ONE SIDE)	1. HEAD LH UPR Fuse 2. HEAD RH UPR Fuse 3. Headlight Bulb 4. Wire Harness	BE–10 BE–10 – –

FOG LIGHT SYSTEM

Symptom	Suspect Area	See page
Front fog light does not come on with light control switch at HEAD. (Headlights do come on.)	1. FR FOG Fuse 2. Front Fog Light Relay 3. Front Fog Light Switch 4. Wire Harness	BE–10 BE–27 BE–27 –
Front fog light does not come on with light control switch at HEAD. (Headlights do not come on neither.)	1. Headlight and Taillight System 2. Wire Harness	BE–2 –
Only one light does not come on.	1. Bulb 2. Wire Harness	– –

TURN SIGNAL AND HAZARD WARNING SYSTEM

Symptom	Suspect Area	See page
”Hazard” and ”Turn” do not come on.	1. Hazard Warning Switch 2. Turn Signal Flasher 3. Wire Harness	BE–30 BE–30 –
The flashing frequency is abnormal.	1. Bulb 2. Turn Signal Flasher 3. Wire Harness	– BE–30 –
Hazard warning light does not come on. (Turn is normal.)	1. HAZ Fuse 2. Wire Harness	BE–10 –
Hazard warning light does not come on in one direction.	1. Hazard Warning Switch 2. Wire Harness	BE–30 –
Turn signal does not come on. (Combination meter, wiper and washer do not operate.)	1. Ignition Switch 2. TURN Fuse 3. Turn Signal Switch 4. Wire Harness	BE–15 BE–10 BE–30 –
Turn signal does not come on. (Combination meter, wiper and washer are normal.)	1. TURN Fuse 2. Turn Signal Switch 3. Wire Harness	BE–10 BE–30 –
Turn signal does not come on in one direction.	1. Turn Signal Switch 2. Wire Harness	BE–30 –
Only one bulb does not come on.	1. Bulb 2. Wire Harness	– –

INTERIOR LIGHT SYSTEM

Symptom	Suspect Area	See page
Only one light does not come on.	1. Bulb 2. Wire Harness	– –
Front interior light does not come on.	1. Bulb 2. Map Light Assembly 3. Wire Harness	– BE–32 –
Rear interior light does not come on.	1. Bulb 2. DOME Fuse 3. Luggage compartment courtesy switch 4. Wire Harness	– BE–10 BE–32 –
The illumination does not fade out when all the doors are closed.	1. Courtesy Switch 2. Body Control System 3. Wire Harness	BE–32 DI–1117 –

The illumination does not fade out immediately when the ignition switch is turned to ACC or ON within 15 seconds after all the doors are closed.	1. Ignition Switch 2. RADIO NO. 2 Fuse 3. BK/UP LP Fuse 4. Body Control System 5. Wire Harness	BE–15 BE–10 BE–10 DI–1117 –
The illumination does not fade out immediately when all the doors are locked within 15 seconds after they are closed.	1. Door Unlock Detection Switch 2. Body Control System 3. Wire Harness	BE–66 DI–1117 –

BACK–UP LIGHT SYSTEM

Symptom	Suspect Area	See page
Back–up lights do not come on.	1. BK/UP LP Fuse 2. Back–up Light Switch (M/T) 3. Park/Neutral Position Switch (A/T) 4. Bulb 5. Wire Harness	BE–10 BE–35 DI–701 DI–789 – –
Back–up lights remain ON.	1. Wire Harness	–
Only one light does not come on.	1. Bulb 2. Wire Harness	– –

STOP LIGHT SYSTEM

Symptom	Suspect Area	See page
Stop lights do not come on.	1. STOP Fuse 2. Stop Light Switch 3. Bulb 4. Wire Harness	BE–10 BE–37 – –
Stop lights remain ON.	1. Stop Light Switch 2. Wire Harness	BE–37 –
Only one light does not come on.	1. Bulb 2. Wire Harness	– –

WIPER AND WASHER SYSTEM

Symptom	Suspect Area	See page
Wipers and washers do not operate.	1. WIPER Fuse and WASHER Fuse 2. Ignition Switch 3. Wiper and Washer Switch 4. Wire Harness	BE–10 BE–15 BE–39 –
Front wiper does not operate.	1. Front Wiper and Washer Switch 2. Front Wiper Motor 3. WIPER Fuse 4. Wire Harness	BE–39 BE–39 BE–10 –
Rear wiper does not operate.	1. Rear wiper and Washer Switch 2. Rear Wiper Motor and Relay 3. RR WIPER Fuse 4. Wire Harness	BE–39 BE–39 BE–10 –
Front washer does not operate.	1. Front Wiper and Washer Switch 2. Washer Motor 3. WASHER Fuse 4. Wire Harness	BE–39 BE–39 BE–10 –
Rear washer does not operate.	1. Rear Wiper and Washer Switch 2. Washer Motor 3. WASHER Fuse 4. Wire Harness	BE–39 BE–39 –

Meter, Gauges and Illumination:
COMBINATION METER

Symptom	Suspect Area	See page
Tachometer, fuel gauge and engine coolant temperature gauge do not operate.	1. Meter Circuit 2. Wire Harness	BE–46 –
Speedometer does not operate.	1. Vehicle Speed Sensor 2. Meter Circuit 3. Wire Harness	BE–50 BE–46 –
Tachometer does not operate.	1. Igniter 2. ECM 3. Meter Circuit 4. Wire Harness	 DI–1 BE–46 –
Fuel gauge does not operate or operates abnormally.	1. Fuel Receiver Gauge 2. Fuel Sender Gauge 3. Meter Circuit 4. Wire Harness	BE–50 BE–50 BE–46 –
Engine coolant temperature gauge does not operate or operates abnormally.	1. Engine Coolant Temperature Receiver Gauge 2. Engine Coolant Temperature Sender Gauge 3. Meter Circuit 4. Wire Harness	BE–50 BE–50 BE–46 –
All illumination lights do not come on.	1. TAIL Fuse (I/P J/B) 2. Light Control Rheostat 3. Meter Circuit 4. Wire Harness	BE–10 BE–50 BE–46 –
Only one illumination light does not come on.	1. LED 2. Meter Circuit	– BE–46

Warning Lights:
COMBINATION METER

Symptom	Suspect Area	See page
Warning lights do not come on. (Except discharge and door open.)	1. Bulb or LED 2. ECU–B Fuse 3. Ignition Switch 4. Meter Circuit 5. Generator 6. Wire Harness	– BE–10 BE–15 BE–46 BE–10 –
Brake warning Light does not come on.	1. LED 2. Brake Fluid Level Warning Switch 3. Parking Brake Switch 4. Meter Circuit 5. Wire Harness	– BE–50 BE–50 BE–46 –
Seat belt warning light does not come on.	1. LED 2. Seat Belt Buckle Switch 3. Body Control System 4. Meter Circuit 5. Wire Harness	– BE–50 DI–1117 BE–46 –

Low oil pressure warning light does not come on.	1. LED 2. Low Oil Pressure Warning Switch 3. Meter Circuit 4. Wire Harness	– BE–50 BE–46 –
Door open warning light does not come on.	1. LED 2. DOME Fuse 3. Door Courtesy Switch 4. Luggage Room Light Switch 5. Body Control System 6. Meter Circuit 7. Wire Harness	– BE–10 BE–32 BE–32 DI–1117 BE–46 –

Indicator Lights:
COMBINATION METER

Symptom	Suspect Area	See page
SRS indicator light does not come on.	1. LED 2. Airbag Sensor Assembly 3. Wire Harness	– DI–980 –
ABS indicator light does not come on.	1. LED 2. Wire Harness	– –
Malfunction indicator light does not come on.	1. LED 2. ECM 3. Wire Harness	– DI–1 –
A/T shift position indicator light does not come on.	1. LED or LCD 2. Park/Neutral Position Switch 3. Light Control Rheostat 4. Meter Circuit 5. Wire Harness	– DI–701 DI–789 BE–50 BE–46 –
O/D OFF indicator light does not come on.	1. LED or LCD 2. O/D Main Switch 3. ECM 4. Meter Circuit 5. Wire Harness	– DI–746 DI–829 DI–1 BE–46 –
Turn indicator light does not come on.	1. Bulb 2. Turn Signal and Hazard Warning System 3. Meter Circuit 4. Wire Harness	– BE–2 BE–46 –
High beam indicator light does not come on.	1. Bulb 2. Headlight and Taillight System 3. Meter Circuit 4. Wire Harness	– BE–2 BE–46 –
CRUISE indicator light does not come on.	1. LED 2. Cruise Control ECU (1ZZ–FE) 3. Cruise Control ECU (2ZZ–GE) 4. Meter Circuit 5. Wire Harness	– DI–1083 BE–46 DI–1109 –

DEFOGGER SYSTEM

Symptom	Suspect Area	See page
All defogger systems do not operate.	1. HTR Fuse (I/P J/B) 2. DEF Fuse (I/P J/B) 3. DEF Relay (I/P J/B) 4. Defogger Switch 5. Wire Harness	BE–10 BE–10 BE–58 BE–58 –
Rear window defogger does not operate.	1. Defogger Wires 2. Wire Harness	BE–58 –

ELECTRIC TENSION REDUCER SYSTEM

Symptom	Suspect Area	See page
Tension reducer does not operate. (Driver's and Passenger's.)	1. TENS RDC Fuse 2. Wire Harness	BE–10 –
Tension reducer does not operate. (Only one side.)	1. Buckle Switch 2. Tension Reducer Solenoid 3. Wire Harness	BE–56 BE–56 –

POWER WINDOW CONTROL SYSTEM

Symptom	Suspect Area	See page
Power window does not operate.	1. FR P/W Fuse 2. FR P/W Fuse 3. Ignition Switch 4. Power Window Master Switch 5. Wire Harness	BE–10 BE–10 BE–15 BE–62 –
"One touch power window system" does not operate.	1. Power Window Master Switch	BE–62
Only one window glass does not move.	1. Power Window Master Switch 2. Power Window Motor 3. Wire Harness	BE–62 BE–62 –
"Window lock system" does not operate.	1. Power Window Master Switch	BE–62
Illumination does not come on.	1. Power Window Master Switch	BE–62

POWER DOOR LOCK CONTROL SYSTEM

Symptom	Suspect Area	See page
"Door lock control system" does not operate.(ALL)	1. Body Control System 2. DOOR Fuse 3. Wire Harness 4. Other Parts	DI–1117 BE–10 – –
Malfunction in Door Lock / Unlock. (Using door manual switch.)	1. Door Lock Control Switch 2. Body Control System 3. Wire Harness 4. Other Parts	BE–66 DI–1117 – –
Malfunction in Door Lock / Unlock. (Using door manual switch and key.)	1. Wire Harness 2. Other Parts	– –
Malfunction in Door Lock / Unlock. (Using key.)	1. Door Unlock Detection Switch 2. Body Control System 3. Wire Harness 4. Other Parts	BE–66 DI–1117 – –
Fault in 2 – Operation unlock function of driver's side door key lock and unlock switch.	1. Door Unlock Detection Switch 2. Body Control System 3. Wire Harness 4. Other Parts	BE–66 DI–1117 – –

Fault in key confine prevention operation.	1. Door Unlock Detection Switch 2. Door Courtesy Switch 3. Door Lock Control Switch 4. Body Control System 5. Wire Harness 6. Other Parts	BE–66 BE–32 BE–66 DI–1117 – –
Only one door lock does not operate.	1. Door Lock Motor 2. Wire Harness	BE–66 –

WIRELESS DOOR LOCK CONTROL SYSTEM

HINT:

- Troubleshooting of the wireless door lock control system is based on the premise that the door lock control system operates normally. Accordingly, before troubleshooting the wireless door lock control system, first make certain that the door lock control system operates normally.
- If the trouble still reappears even though there are no abnormalities in any of the other circuits, check and replace the Wireless Door Lock Receiver as the last step.

Symptom	Suspect Area	See page
All functions of wireless door lock control system do not operate.	1. Transmitter 2. Wireless Door Lock Receiver 3. Body ECU 4. Wire Harness	BE–66 BE–66 DI–1117 –
Wireless door lock operates, but the buzzer does not sound. (The buzzer does not sound when the customize function prohibits.)	1. Wireless Door Lock Buzzer 2. Wireless Door Lock Receiver 3. Wire Harness	– BE–66 –

SLIDING ROOF SYSTEM

Symptom	Suspect Area	See page
Sliding roof system does not operate.	1. S/ROOF Fuse (I/P J/B) 2. TENS RDC Fuse (I/P J/B) 3. Sliding Roof Control Assembly 4. Sliding Roof Switch 5. Wire Harness	BE–10 BE–10 BE–86 BE–86 –
Sliding roof system operates abnormally.	1. Sliding Roof Control Assembly 2. Sliding Roof Switch 3. Wire Harness	BE–86 BE–86 –
Sliding roof system stops operation halfway.	1. Sliding Roof Control Assembly 2. Sliding Roof Switch	BE–86 BE–86
”Key–off Sliding Roof” operation does not operate.	1. S/ROOF Fuse 2. TENS RDC Fuse 3. Ignition Switch 4. Door Courtesy Switch 5. Body Control System 6. Wire Harness	BE–10 BE–10 BE–15 BE–32 DI–1117 –

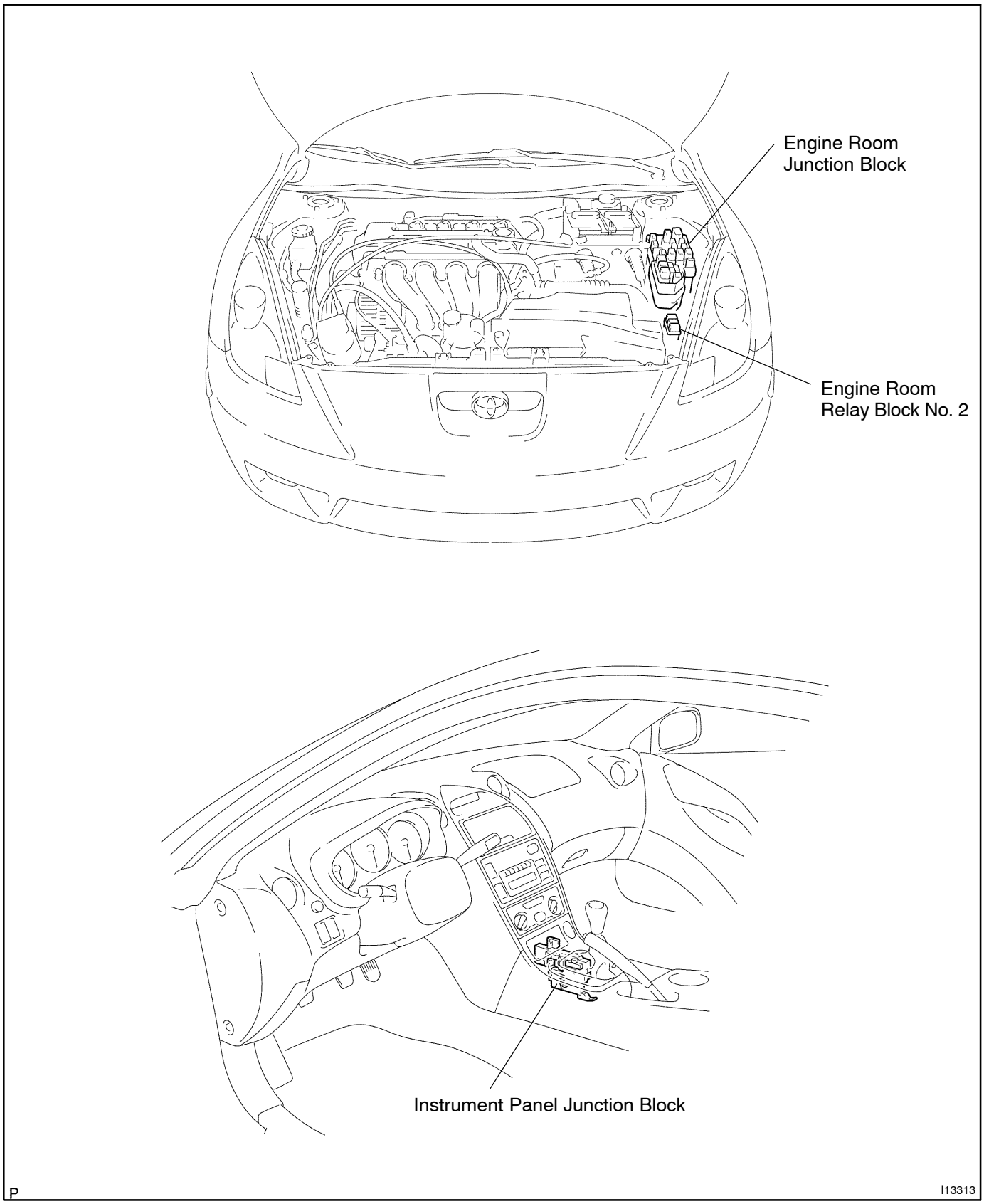
POWER MIRROR CONTROL SYSTEM

Symptom	Suspect Area	See page
Mirror does not operate.	1. ECU–ACC Fuse 2. Mirror Switch 3. Mirror Motor	BE–10 BE–88 BE–88
Mirror operates abnormally.	1. Mirror Switch 2. Mirror Motor 3. Wire Harness	BE–88 BE–88 –

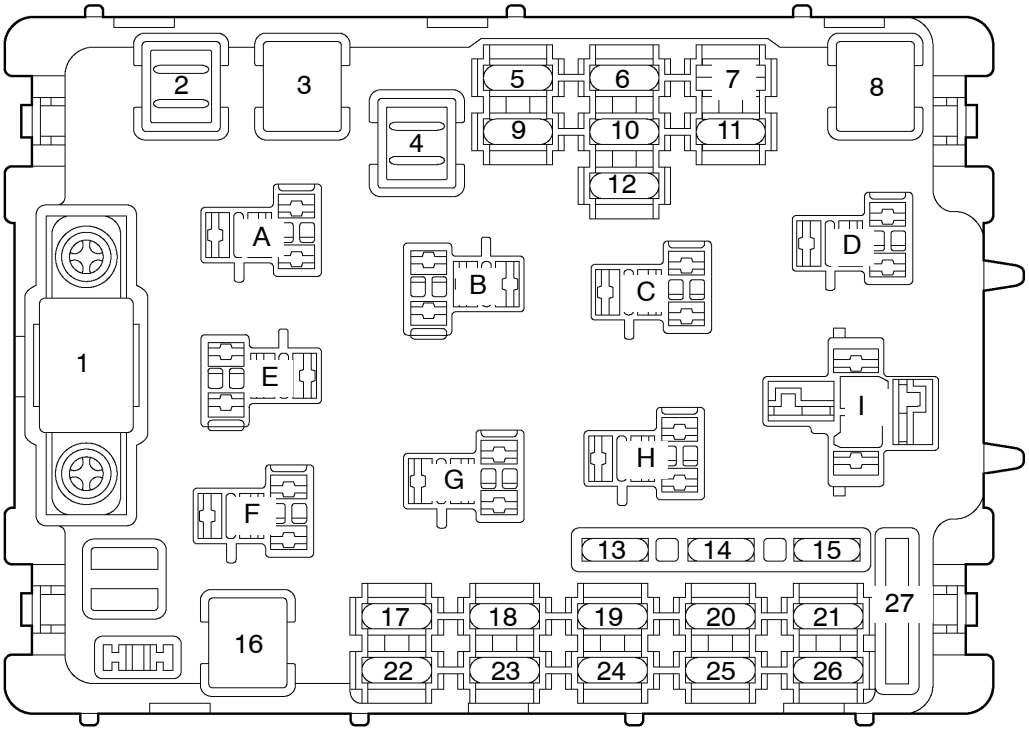
POWER SOURCE

LOCATION

BE2FH–03



ENGINE ROOM JUNCTION BLOCK



FUSES

1. FL ALT	120 A
2. CDS	30 A
3. ABS NO. 1	50 A
4. RDI	30 A
5. HEAD LH LWR	15 A
6. HEAD RH UPR	20 A
7. AUTO ANTENNA	15 A
8. HTR	50 A
9. ABS NO. 2	25 A
10. LVL DRL NO.1	7.5 A
11. HEAD LH LWR	10 A
12. HEAD RH LWR	15 A
13. SPARE	10 A
14. SPARE	15 A
15. SPARE	30 A
16. MAIN	40 A
17. IG2	15 A
18. ST	7.5 A
19. EFI NO. 2	10 A
20. EFI NO. 1	10 A
21. HORN	10 A
22. HAZ	10 A
23. AM2	7.5 A
24. EFI	20 A
25. DCC	25 A
26. ALT–S	7.5 A
27. SPARE	7.5 A

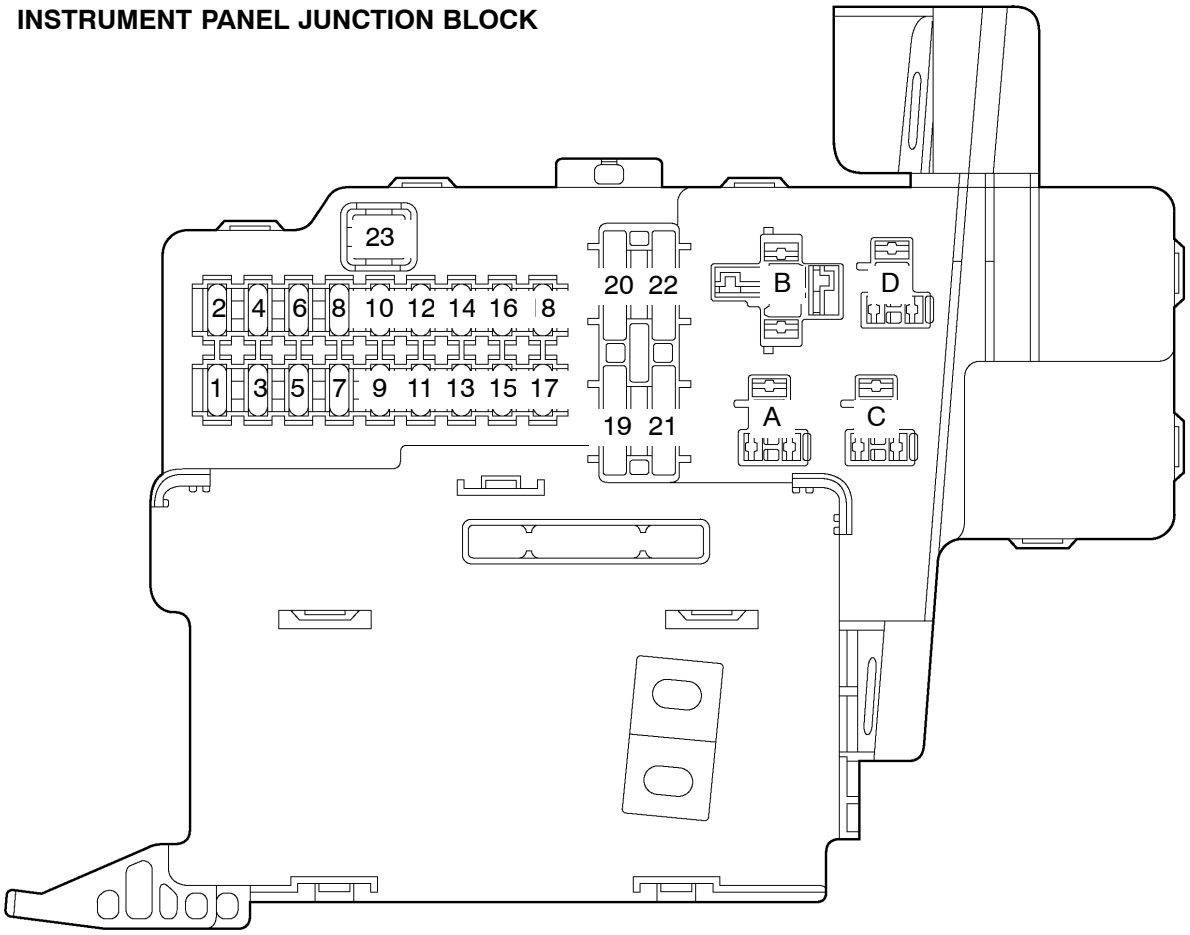
RELAYS

A. FAN NO. 2 Relay
B. FAN NO. 1 Relay
C. Circuit Opening Relay
D. Horn Relay
E. FAN NO. 3 Relay
F. Magnetic Clutch Relay
G. IG2 Relay
H. EFI Relay
I. Headlight Control Relay

N

I11732

INSTRUMENT PANEL JUNCTION BLOCK



FUSES

1. CIG	15 A
2. S/ROOF	15 A
3. AM1	25 A
4. FL P/W	20 A
5. DOOR	20 A
6. STOP	10 A
7. FR FOG	15 A
8. SRS–IG	7.5 A
9. OBD	7.5 A
10. WASHER	15 A
11. WIPER	25 A
12. RADIO	15 A
13. –	–
14. TURN	7.5 A
15. RR WIPER	10 A
16. HTR	10 A
17. FR R/W	20 A
18. TAIL	10 A
19. MULTI–FUSE	5 A (ABS–IG, WARNING, FAN RLY, ECU–IG)
20. MULTI–FUSE	7.5 A (DOME, MPX–B, ECU–B)
21. MULTI–FUSE	5 A (BODY ECU–IG, BK/UP LP, TENS RDC, DEF RLY)
22. MULTI–FUSE	7.5 A (ECU – ACC, PANEL2, PANEL1)
23.DEF	30 A

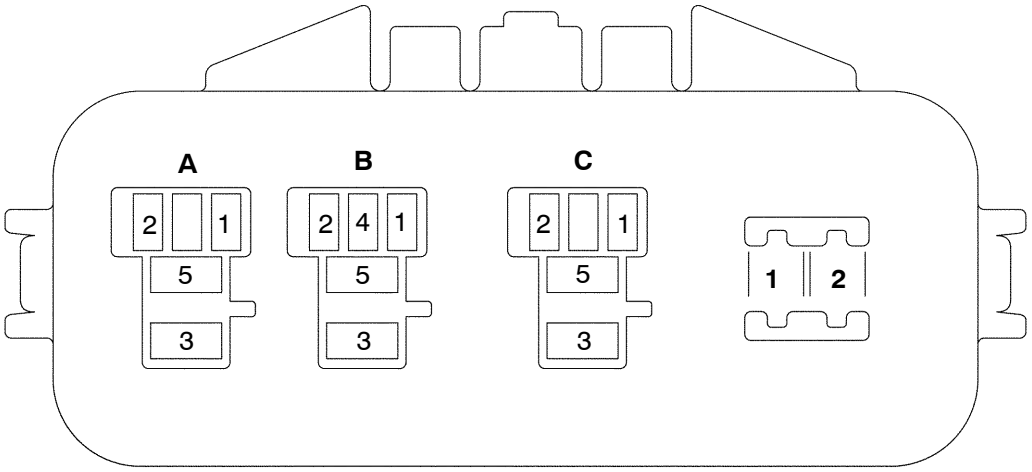
RELAYS

A. –
B. IG1 Relay
C. Defogger Relay
D. Taillight Control Relay

N

I11731

ENGINE ROOM RELAY BLOCK NO. 2



FUSES

1. HEAD LH UPR 10A
2. HEAD RH UPR 10A

RELAYS

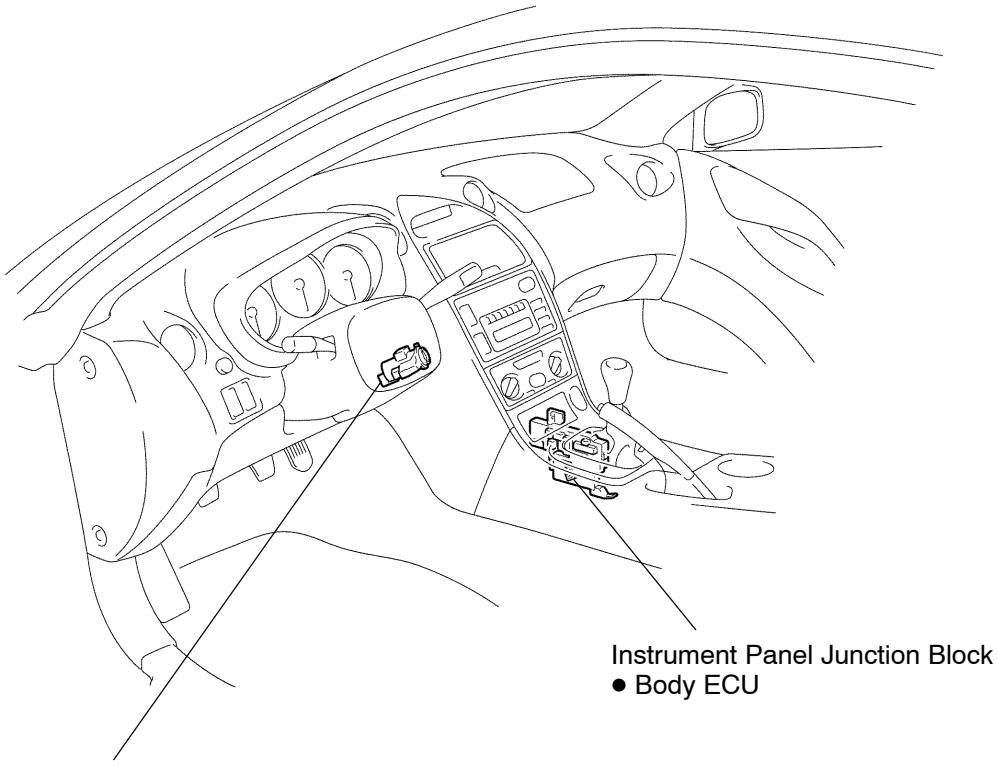
A. DRL No. 4 Relay
B. DRL No. 3 Relay
C. DRL No. 2 Relay

P I25675

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

BE0OP–19

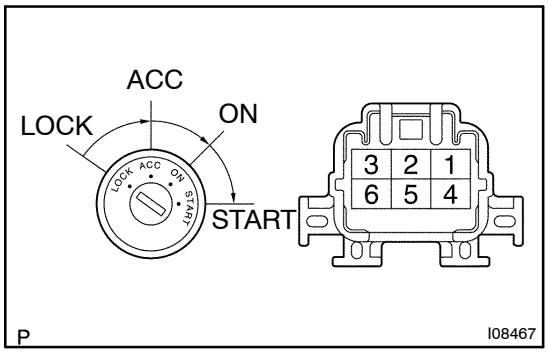
LOCATION



P

I13314

BE0OQ–09

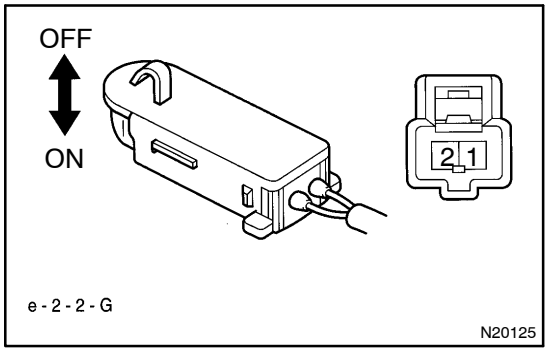


INSPECTION

1. INSPECT IGNITION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	–	No continuity
ACC	1 – 3	Continuity
ON	1 – 2 – 3 5 – 6	Continuity
START	1 – 2 4 – 5 – 6	Continuity

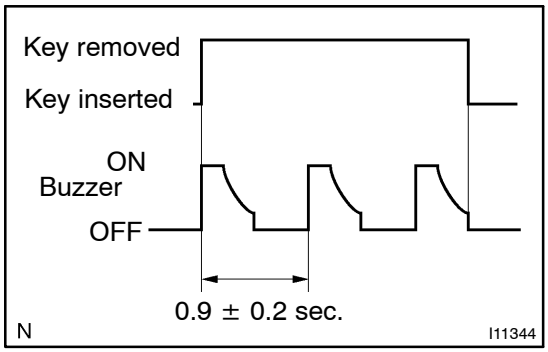
If continuity is not as specified, replace the switch.



2. INSPECT KEY UNLOCK WARNING SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF (Key removed)	–	No continuity
ON (Key set)	1 – 2	Continuity

If continuity is not as specified, replace the switch.



3. INSPECT KEY UNLOCK WARNING BUZZER

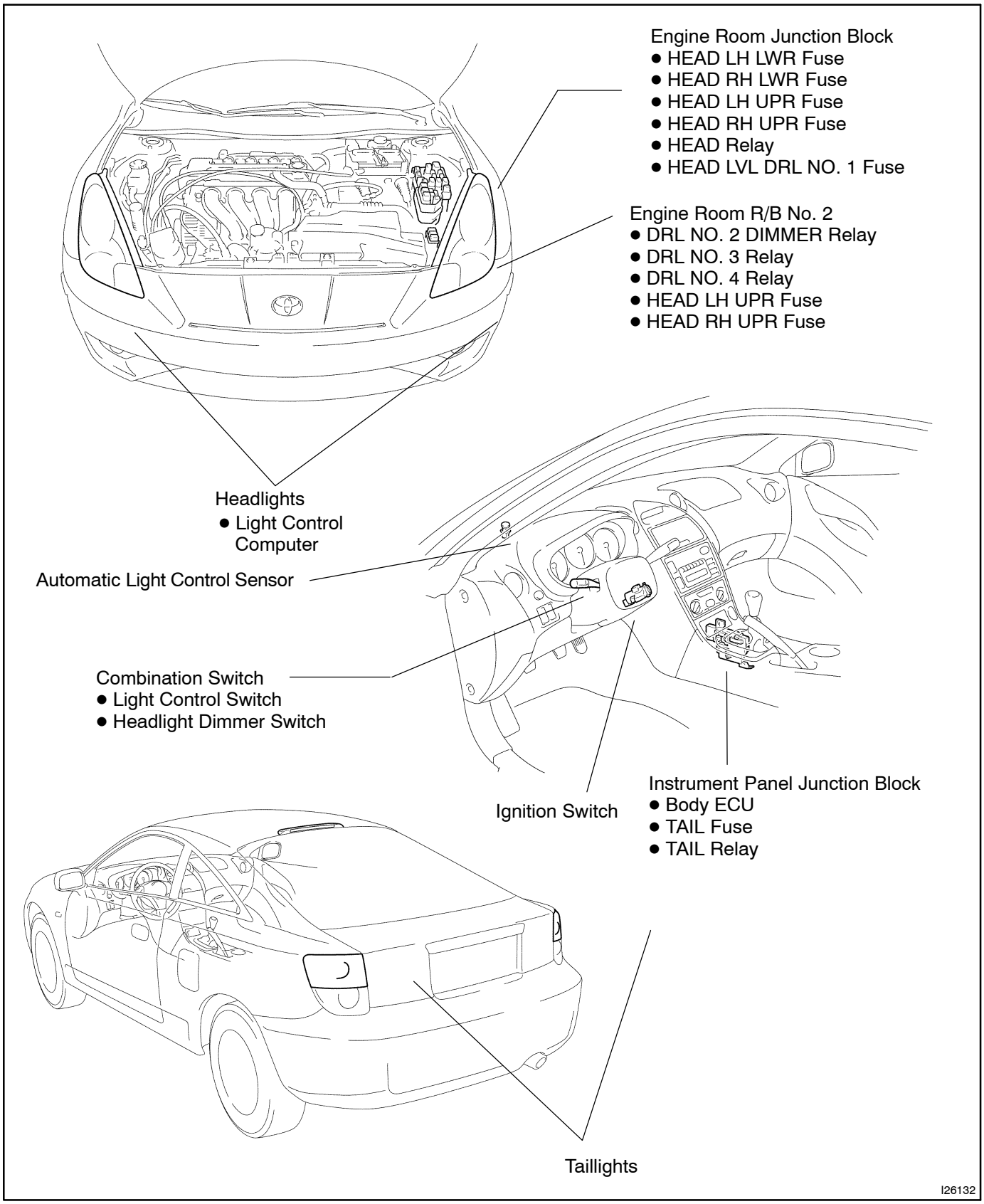
Check that the buzzer sounds when driver's door is opened and the key is inserted.

If operation is not as specified, replace the combination meter. (See page BE–46)

HEADLIGHT AND TAILLIGHT SYSTEM

BE0OR–18

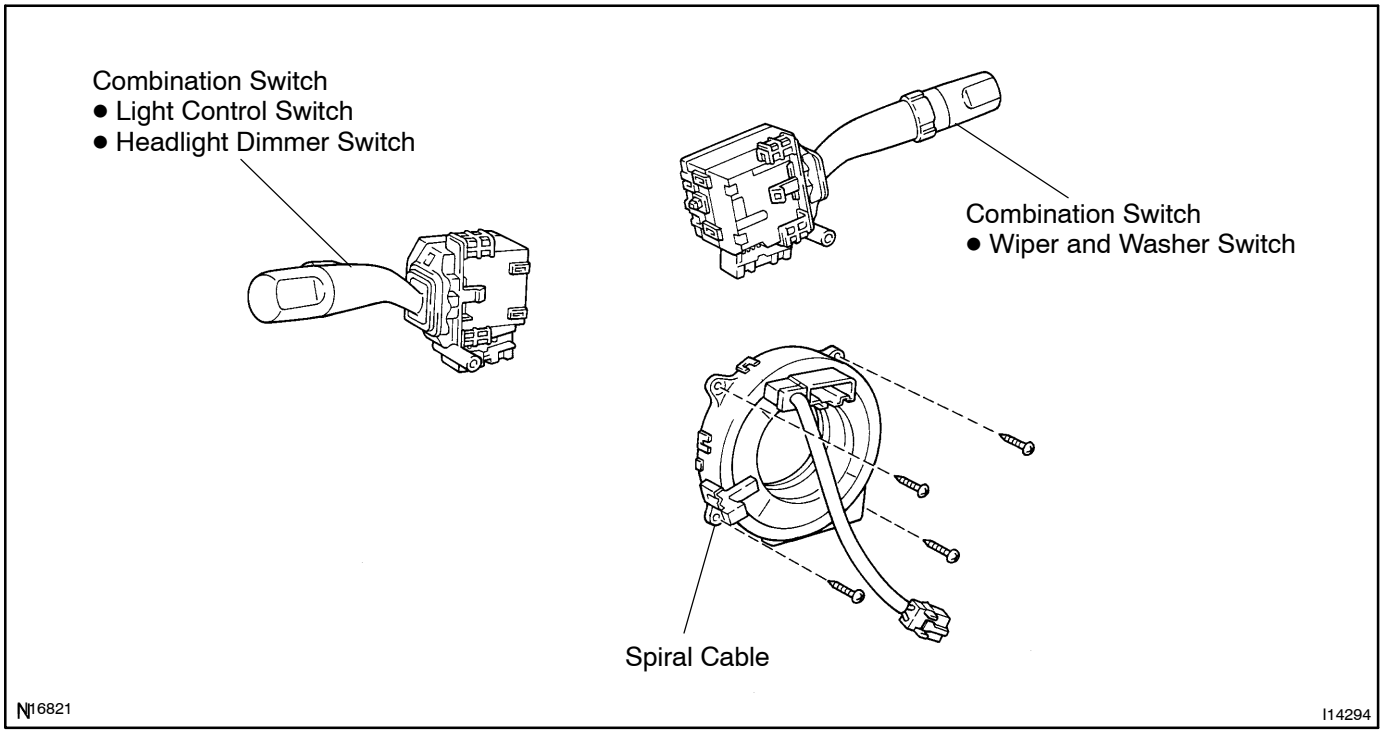
LOCATION



I26132

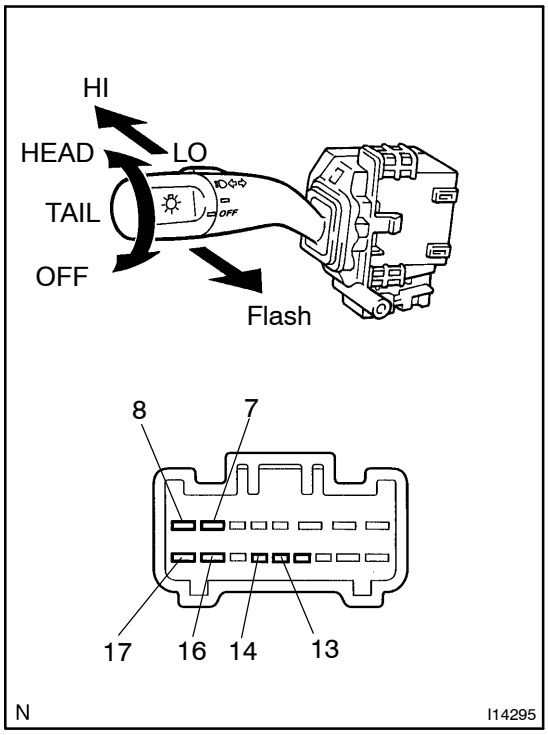
BE0OS–07

COMPONENTS



BE2FG–02

INSPECTION



1. INSPECT LIGHT CONTROL SWITCH CONTINUITY

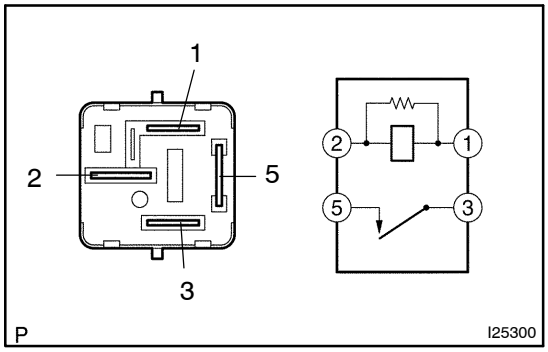
Switch position	Tester connection	Specified condition
OFF	–	No continuity
TAIL	14 – 16	Continuity
HEAD	13 – 14 – 16	Continuity

If continuity is not as specified, replace the switch.

2. INSPECT HEADLIGHT DIMMER SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Low beam	16 – 17	Continuity
High beam	7 – 16	Continuity
Flash	7 – 8 – 16	Continuity

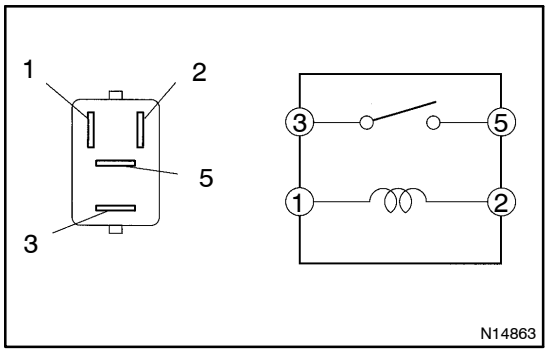
If continuity is not as specified, replace the switch.



3. INSPECT HEAD RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

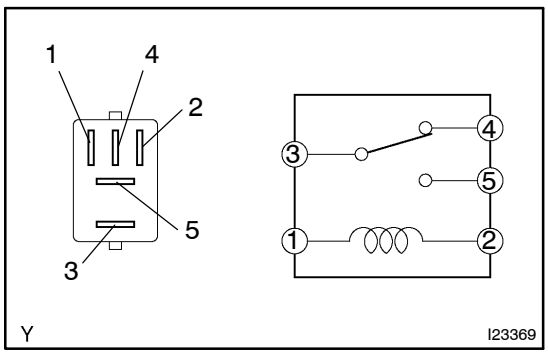
If continuity is not as specified, replace the relay.



4. INSPECT DAYTIME RUNNING LIGHT NO. 2 DIMMER RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

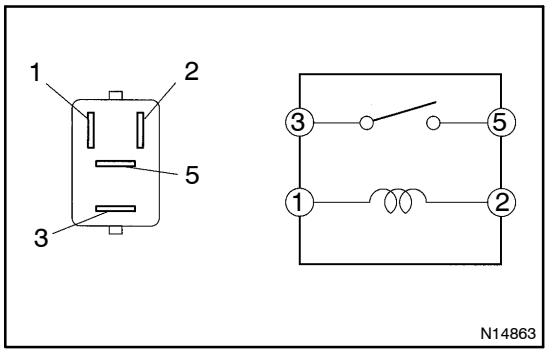
If continuity is not as specified, replace the relay.



5. INSPECT DAYTIME RUNNING LIGHT NO. 3 RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2, 3 – 4	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

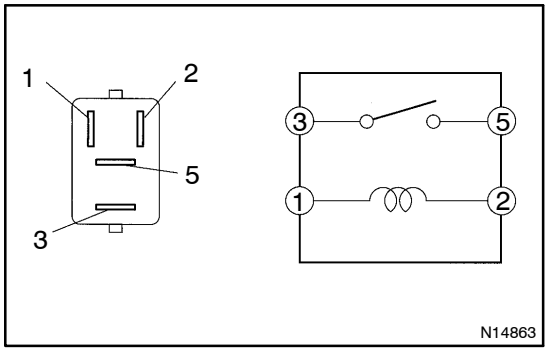
If continuity is not as specified, replace the relay.



6. INSPECT DAYTIME RUNNING LIGHT NO. 4 RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

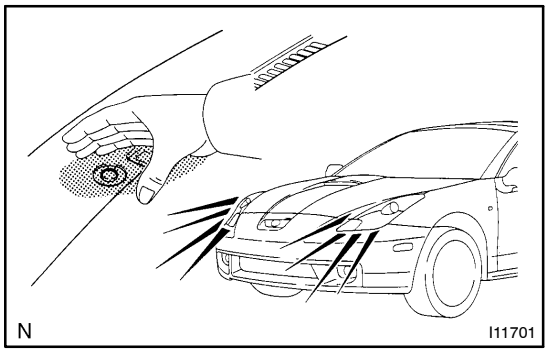
If continuity is not as specified, replace the relay.



7. INSPECT TAIL RELAY CONTINUITY

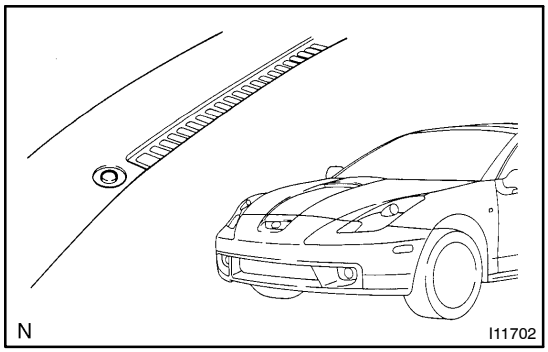
Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.



8. w/ Automatic light control system: INSPECT AUTOMATIC LIGHT CONTROL

(a) Turn the ignition switch to ON.
(b) Turn the light control switch to AUTO.
(c) Gradually cover the top of the sensor.
(d) Verify that the accessory lights and the headlights comes on. (Daytime running light ON)



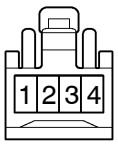
9. w/ Automatic light control system: INSPECT AUTOMATIC LIGHT CONTROL

(a) Gradually expose the sensor.
(b) Verify that the headlights and the accessory lights go off.

10. w/ Automatic light control system: INSPECT LIGHT–OFF CONDITION

(a) Turn the ignition switch to ON.
(b) Turn the light control switch to AUTO.
(c) Gradually cover the top of the sensor to turn on the light.
(d) Verify that the lights will go off when light control switch position is OFF or the area surrounding the sensor gets light.

Wire Harness Side:



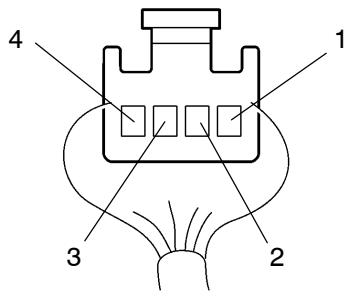
I01254

11. w/ Automatic light control system:
INSPECT AUTOMATIC LIGHT CONTROL SENSOR CIRCUIT

(a) Disconnect the connector from the automatic light control sensor and inspect the connector on the wire harness side.

Tester connection	Condition	Specified condition
3 – Ground	Constant	Continuity
1 – Ground	Ignition switch LOCK or ACC	No voltage
1 – Ground	Ignition switch ON	Battery positive voltage
4 – Ground	Ignition switch LOCK or ACC	No voltage
4 – Ground	Ignition switch ON	5.2 – 9.0 V

If circuit is as specified, perform the inspection on the following page.
If the circuit is not as specified, inspect the circuit connected to other parts.



I01255

(b) Connect the wire harness side connector to the sensor and inspect wire harness side connector from the back side.

HINT:
- Ignition switch ON.
- Light control switch OFF.
- Vehicle's surroundings are bright.

Tester connection	Condition	Specified condition
3 – Ground	Constant	Continuity
1 – Ground	Ignition switch LOCK or ACC	No voltage
1 – Ground	Ignition switch ON	9.5 V or more
Vehicle is under the direct sun light. (Sensor is not covered)		Taillight and Headlight are ON.

If circuit is as specified, replace the sensor with a new one.
If the circuit is not as specified, inspect the circuit connected to other parts.

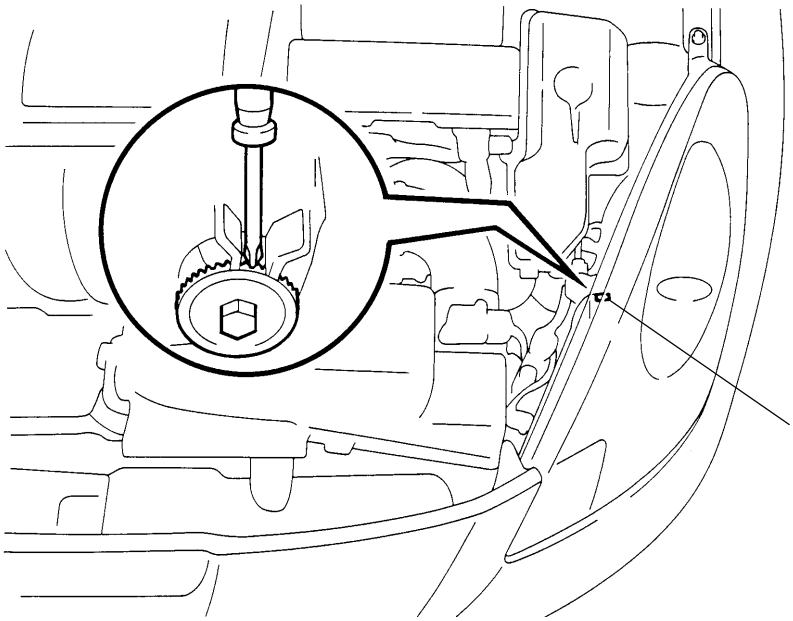
12. FAIL–SAFE FUNCTION

Light Control Computer

Condition	Content
Output open	Lighting of the headlight stops, and the condition is maintained until power is turned ON again (headlight dimmer switch OFF → ON).
Short between output terminals	Lighting of the headlight stops within 1 second and the condition is maintained until power is turned ON again (headlight dimmer switch OFF → ON).
Leakage between output terminal and body ground	Lighting of the headlight stops, and the condition is maintained until power is turned ON again (headlight dimmer switch OFF → ON).
Low lamp voltage	Lighting of the headlight stops, and the condition is maintained until power is turned ON again (headlight dimmer switch OFF → ON).
High lamp voltage	Lighting of the headlight stops, and the condition is maintained until power is turned ON again (headlight dimmer switch OFF → ON).
Bulb flushing	• The condition is maintained more than 60 seconds. • Lighting of the headlight stops, and the condition is maintained until power is turned ON again (headlight dimmer switch OFF → ON).
High input voltage	As soon as the voltage comes within the range of operation voltage (9 – 16 V), it come on again.
Low input voltage	When voltage become 9.5 V → 7.5 V, lighting condition is maintained until possible voltage (Below 6 V) to keep lighting and lighting of the headlight stops. As soon as the voltage becomes within the range of operation voltage (more than 9 V), it comes on again.

BE1CY–16

ADJUSTMENT



N

I13678

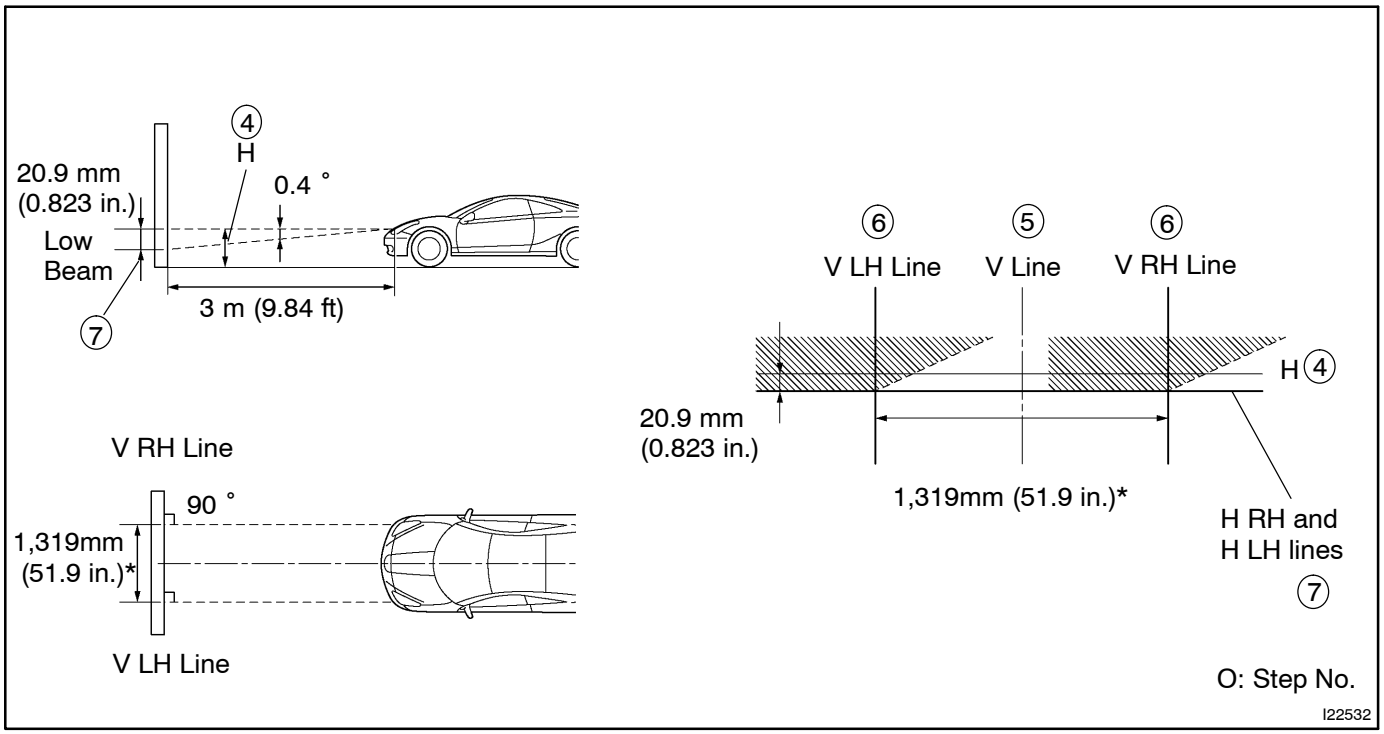
ADJUSTING HEADLIGHT AIM

(a) Place the vehicle in the following conditions.
- The body around the headlight is not deformed.
- The vehicle is parked on a level surface.
- Tire inflation pressure is the specified value.
- A driver is in the driver's seat and the vehicle is ready for driving anytime (with a tank full).
- The vehicle is bounced for several times.

(b) Check the headlight aiming.
(1) Prepare a thick white paper.
(2) Stand the paper perpendicularly to the ground at the position 9.84 ft away from the headlights.
(3) Ensure that the center line of the vehicle and the paper face forms a 90–degree angle as shown in the illustration.
(4) Draw a horizontal line (H line) on the paper, showing where the headlights should strike.
(5) Draw a vertical line (V line) to where the center line of the vehicle is to be.
(6) Draw 2 vertical lines to where the both headlights should strike (V RH and V LH lines).
(7) Draw a horizontal line by connecting the both low beam center marks to where the headlights should strike (H RH and H LH lines).

HINT:
The H RH and H LH line is 0.4° below the horizontal line (H line) of the light axis.

(8) Start the engine.
(9) Turn the headlights to ON.
(10) Check that the headlights properly strike the position shown in the illustration.
(11) If not, adjust the lights in the vertical or the horizontal direction.



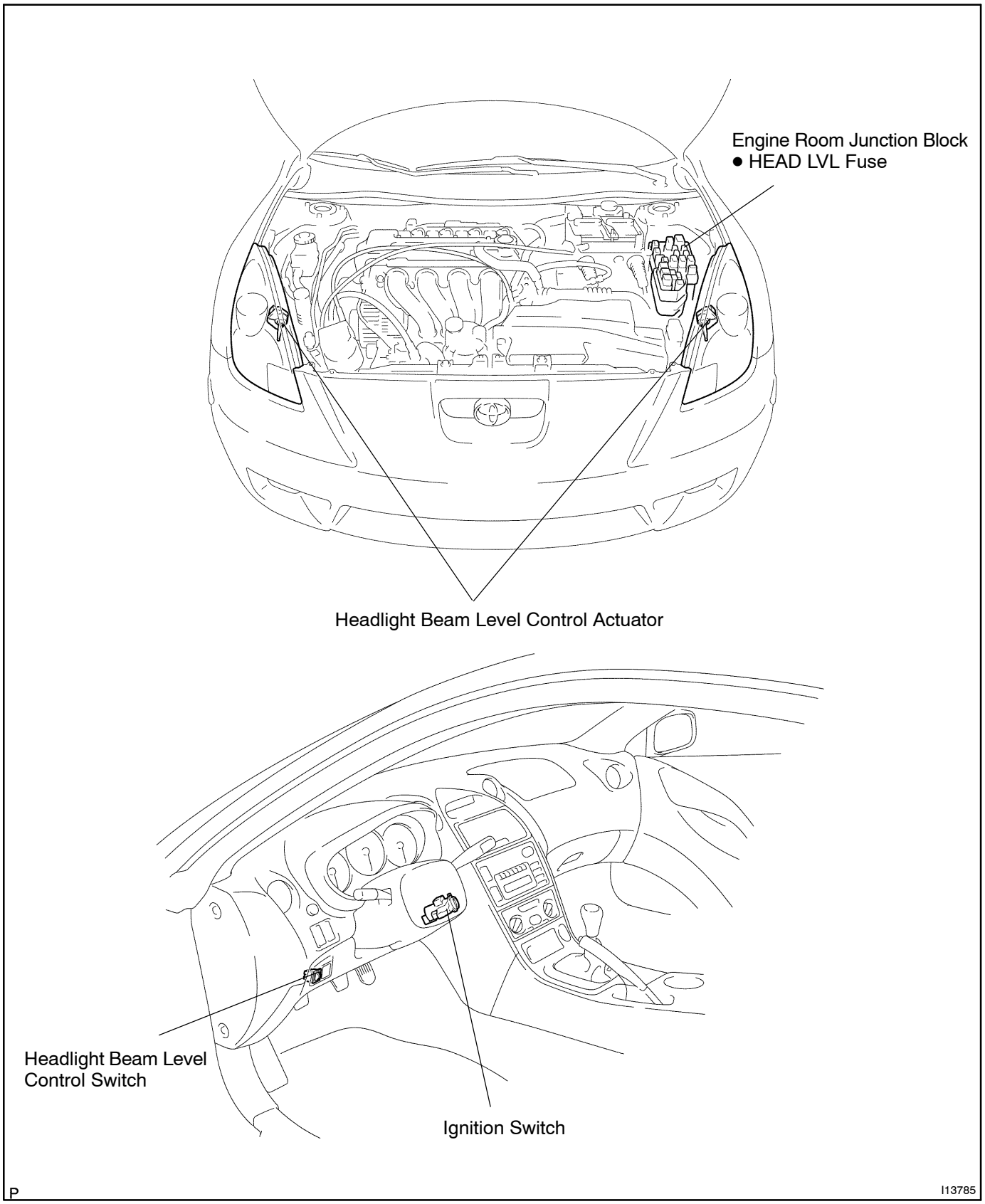
HINT:
- As shown in the illustration, adjust each aim of the RH and LH lights.
- Since the horizontal direction is impossible to adjust, the value * of the "Low Beam" aim is merely a reference.

(c) When adjusting the headlight aim in the vertical direction:
Use an adjusting bolt to adjust the headlight aim to within the specified range.

HEADLIGHT BEAM LEVEL CONTROL SYSTEM

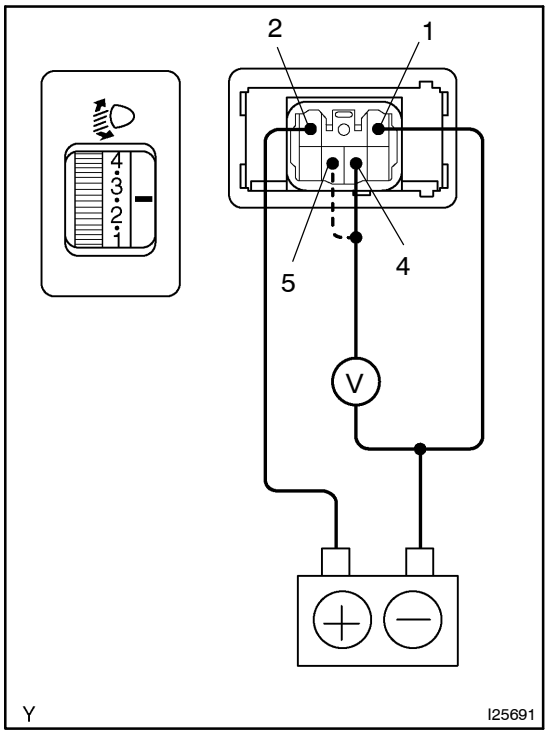
BE1EM–04

LOCATION



BE1EN–06

INSPECTION



1. INSPECT HEADLIGHT BEAM LEVEL CONTROL SWITCH CURRENT

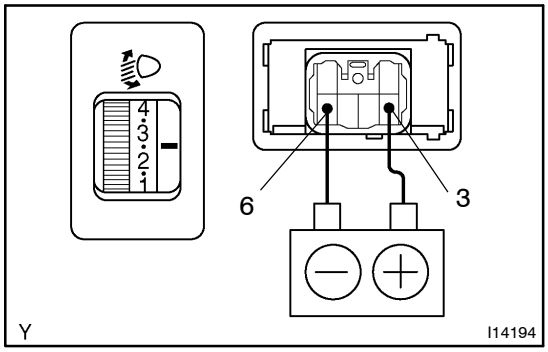
NOTICE:

If a resister is not placed, switch may be damaged.

Measure the voltage between terminals 4 and 5.

Switch position	voltage
0	Approx. 10.8 V
1	Approx. 9.5 V
2	Approx. 8.2 V
3	Approx. 7.0 V
4	Approx. 5.7 V
5	Approx. 4.4 V

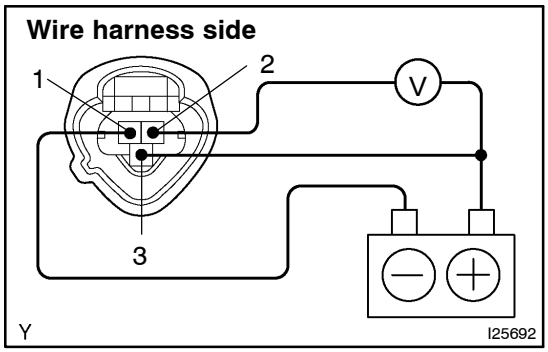
If current value is not as specified, replace the switch.



2. INSPECT HEADLIGHT BEAM LEVEL CONTROL SWITCH ILLUMINATION

Connect the battery positive (+) lead to terminal 3 and the battery negative (–) lead to terminal 6, and check that the illumination light comes on.

If operation is not as specified, replace the switch.



3. INSPECT HEADLIGHT BEAM LEVEL CONTROL ACTUATOR OPERATION

NOTICE:

If a resister is not placed, switch may be damaged.

Disconnect the connector and inspect the connector on the wire harness as shown in the chart.

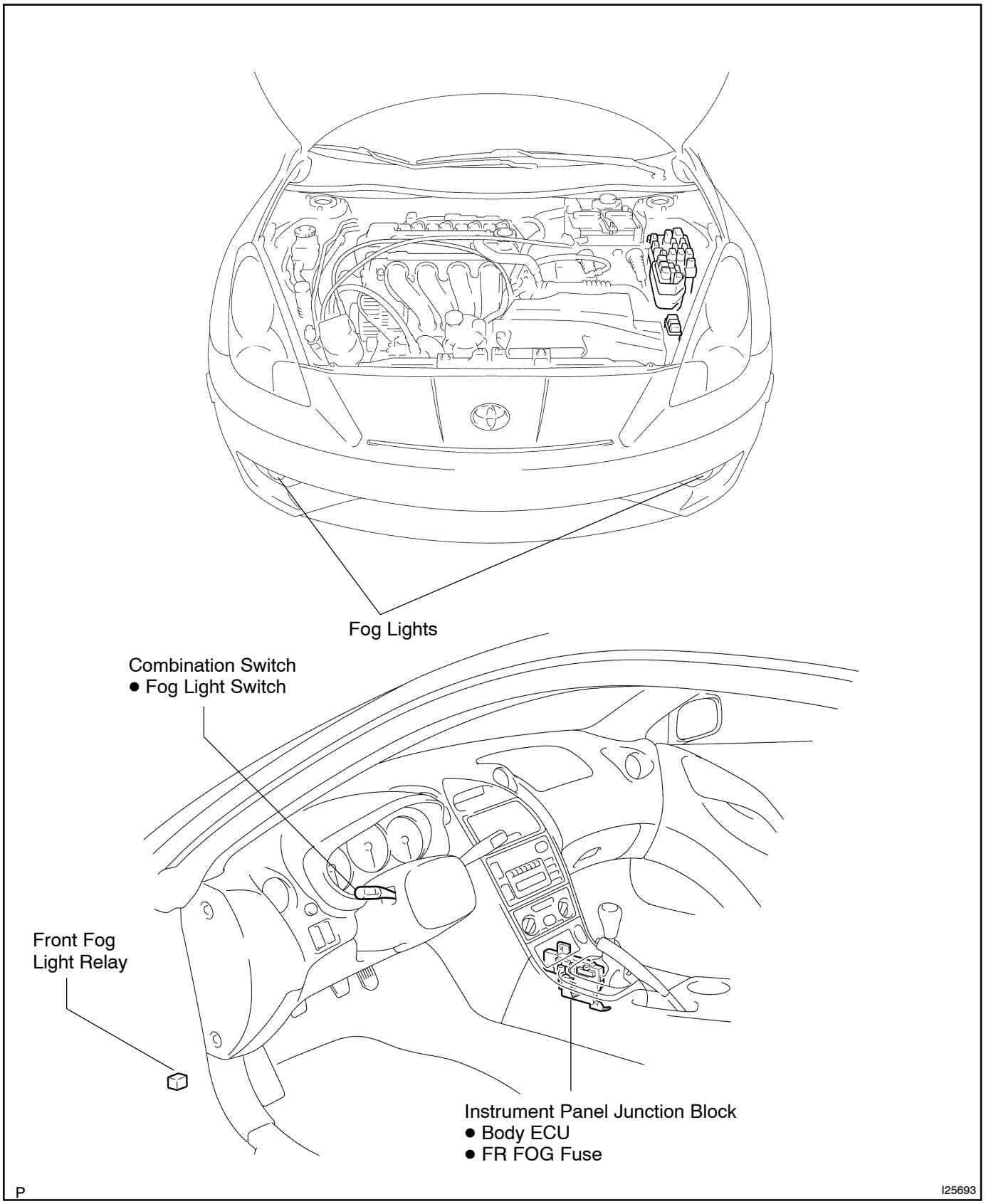
Switch position	voltage
0	Approx. 10.8 V
1	Approx. 9.5 V
2	Approx. 8.2 V
3	Approx. 7.0 V
4	Approx. 5.7 V
5	Approx. 4.4 V

If current value is not as specified, replace the actuator.

FOG LIGHT SYSTEM

LOCATION

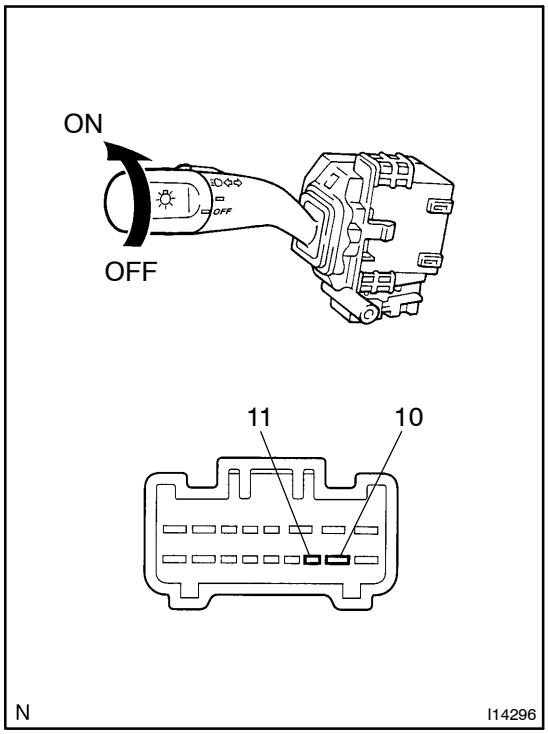
BE0OV–03



BE0OW–04

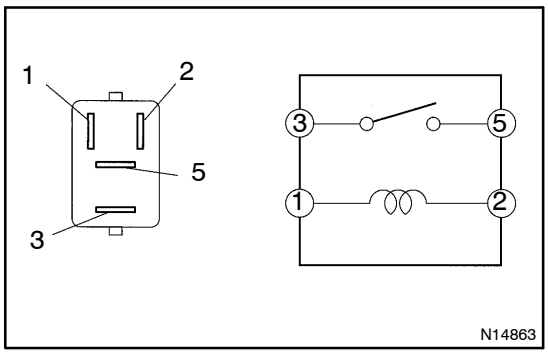
INSPECTION

1. INSPECT FRONT FOG LIGHT SWITCH CONTINUITY



Switch position	Tester connection	Specified condition
OFF	–	No continuity
ON	10 – 11	Continuity

If continuity is not as specified, replace the switch.

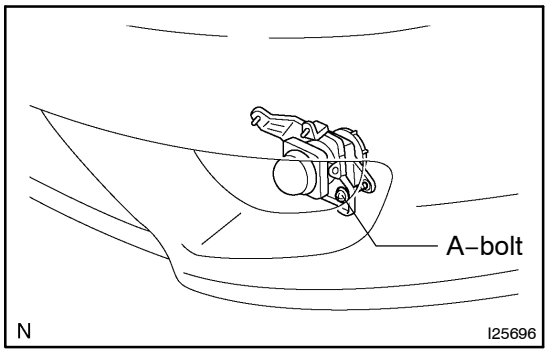


2. INSPECT FRONT FOG LIGHT RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.

BE0OX–04



ADJUSTMENT

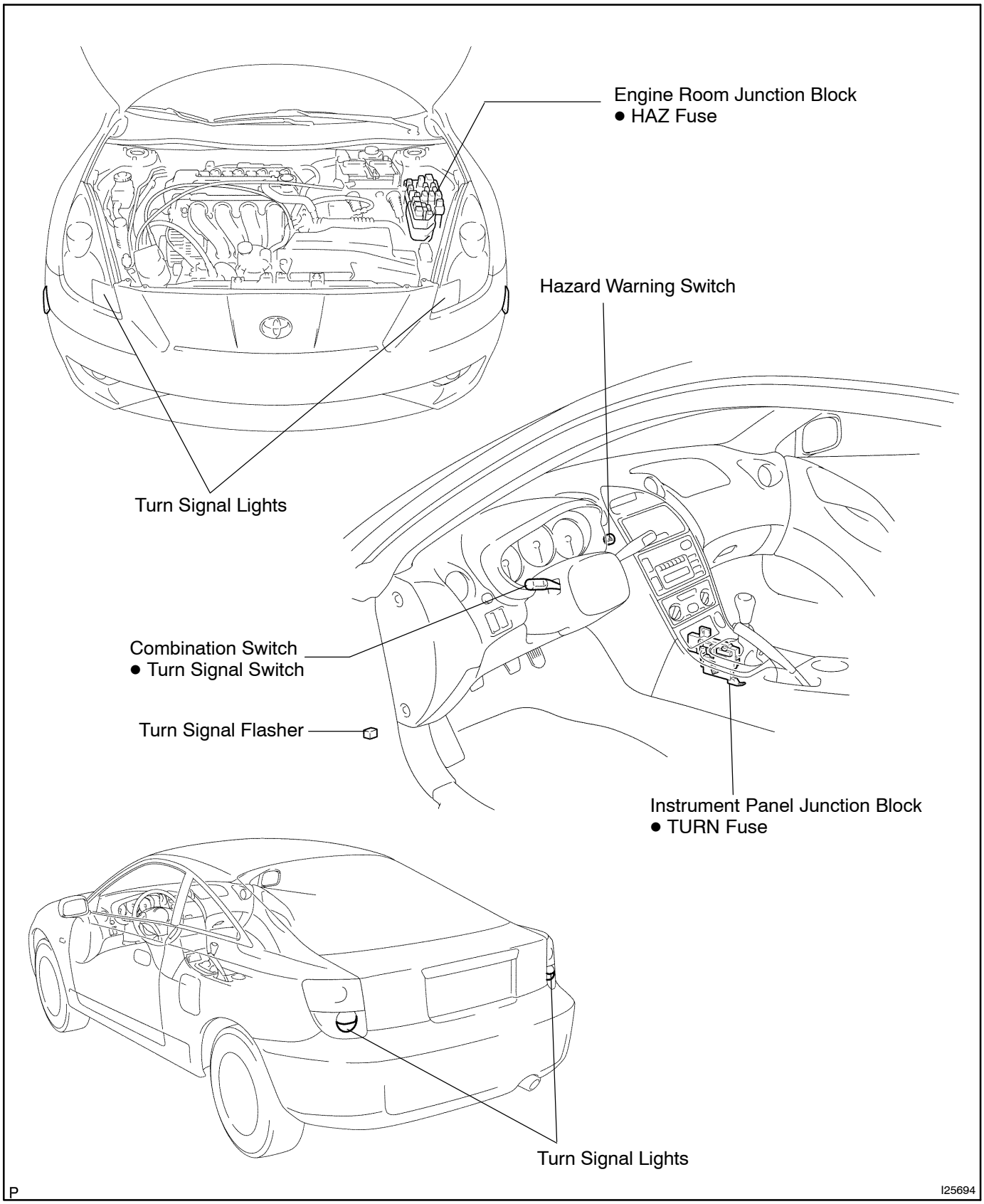
ADJUST FOG LIGHT AIM

A–bolt: Vertical Direction

TURN SIGNAL AND HAZARD WARNING SYSTEM

BE0OY–14

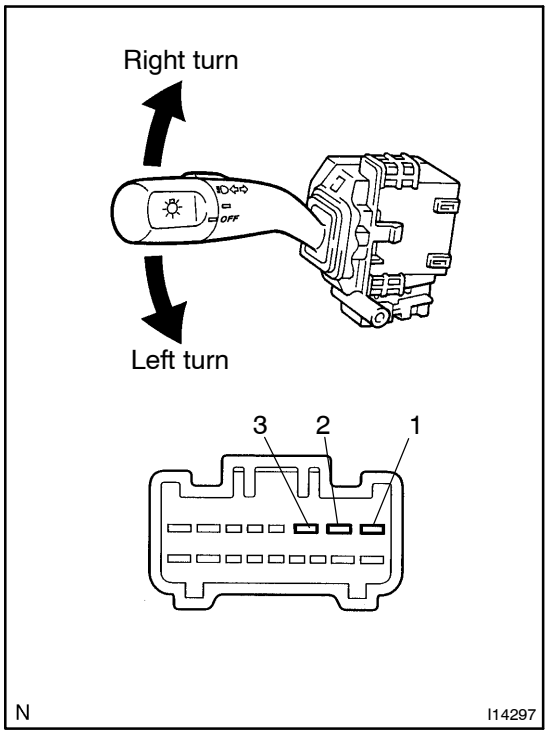
LOCATION



BE0OZ–11

INSPECTION

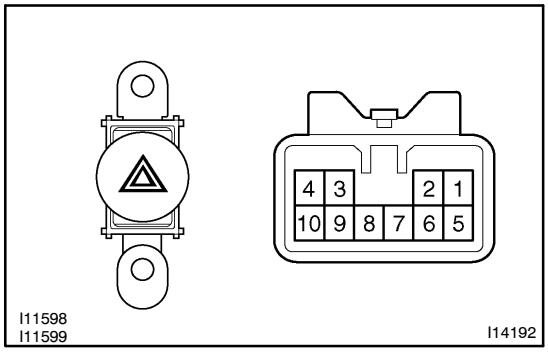
1. INSPECT TURN SIGNAL SWITCH CONTINUITY



Switch position	Tester connection	Specified condition
Left turn	1 – 2	Continuity
Neutral	–	No continuity
Right turn	2 – 3	Continuity

If continuity is not as specified, replace the switch.

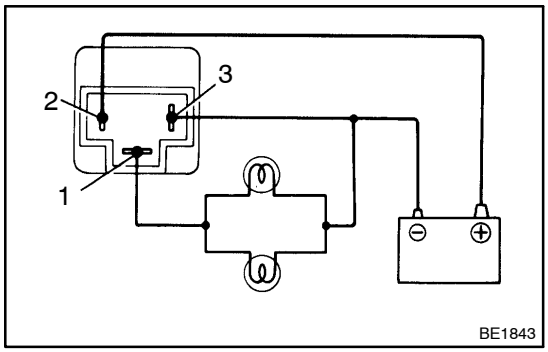
2. INSPECT HAZARD WARNING SWITCH CONTINUITY



Condition	Tester connection	Specified condition
OFF	5 – 7	Continuity
ON	5 – 6, 1 – 2 – 4	Continuity
Illumination circuit	8 – 9	Continuity

If continuity is not as specified, replace the switch.

3. INSPECT TURN SIGNAL FLASHER OPERATION



(a) Connect the battery positive (+) lead to terminal 2 and the battery negative (–) lead to terminal 3.

(b) Connect the 2 turn signal light bulbs parallel to each other to terminals 1 and 3, then check that the bulbs flash.

HINT:

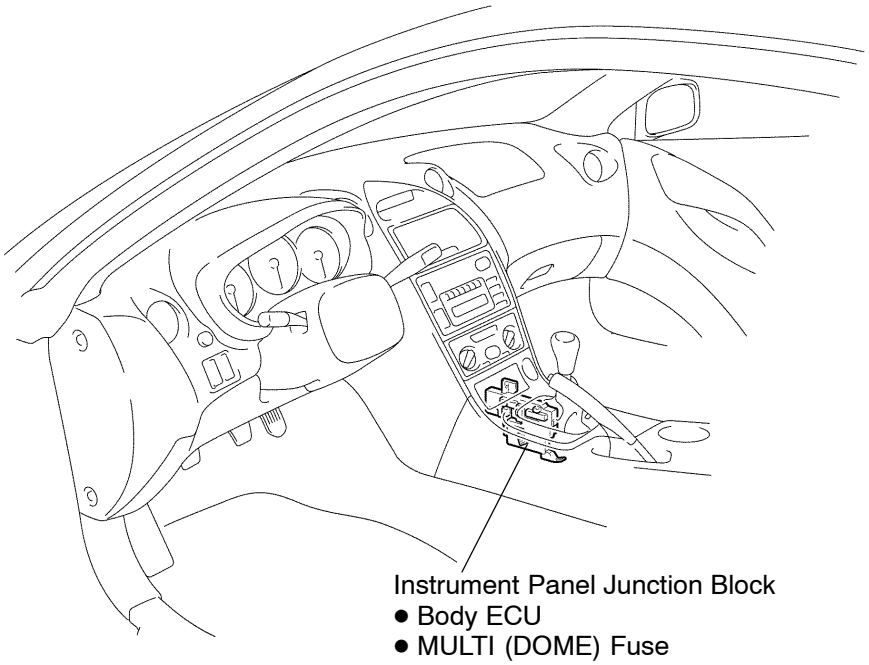
- The turn signal lights should flash 60 or 120 times per minute.
- If one of the front or rear turn signal lights has an open circuit, the number of flashers will be more than 140 per minute.

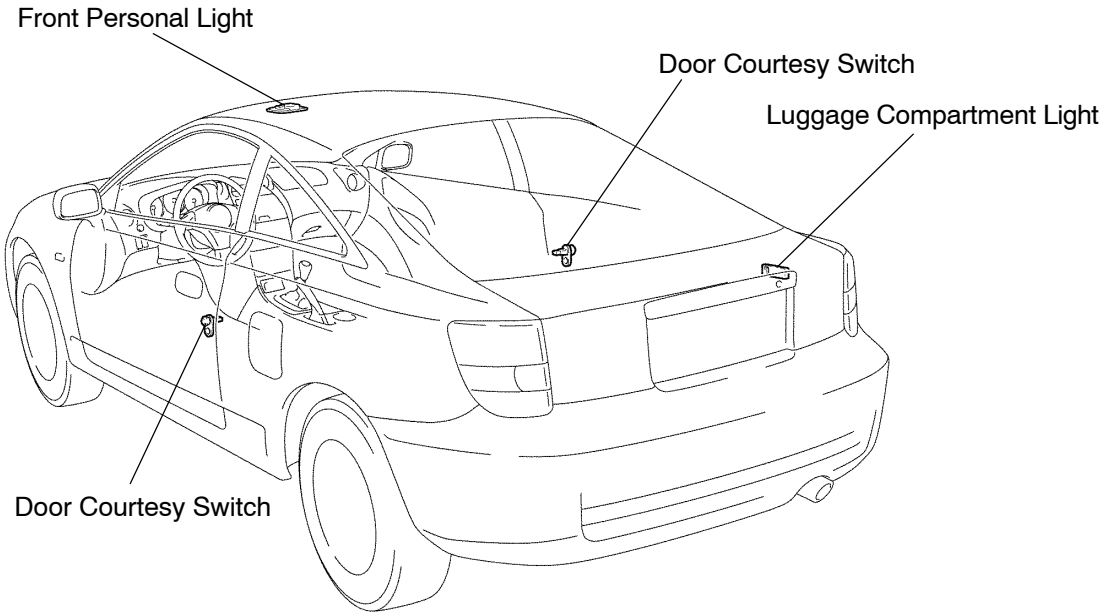
If operation is not as specified, replace the flasher.

INTERIOR LIGHT SYSTEM

BE0P0-14

LOCATION

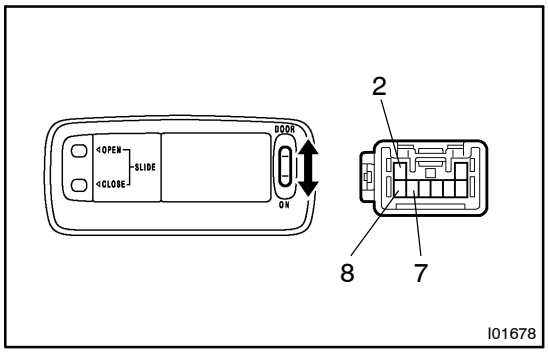




I13603

BE1CZ–04

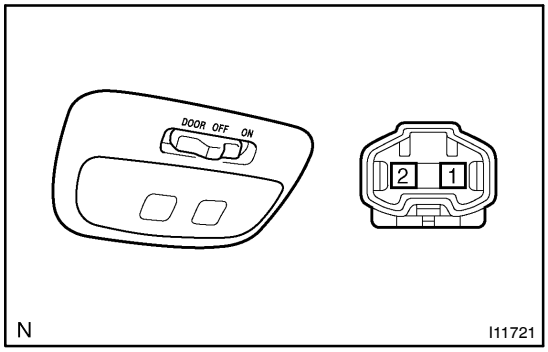
INSPECTION



1. w/ Sliding roof:
INSPECT FRONT PERSONAL LIGHT SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF	–	No continuity
DOOR	2 – 7	Continuity
ON	2 – 8	Continuity

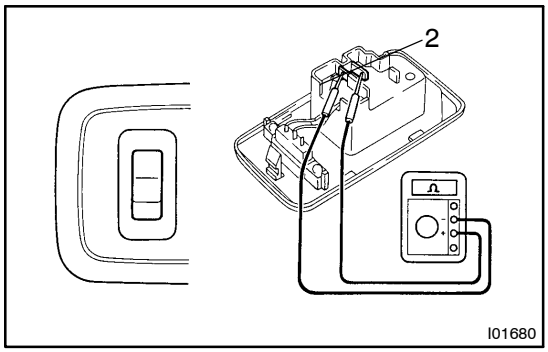
If continuity is not as specified, replace the light assembly or the bulb.



2. w/o Sliding roof:
INSPECT FRONT PERSONAL LIGHT CONTINUITY

Using an ohmmeter, check that there is a continuity between terminals.

If continuity is not as specified, replace the front personal light assembly or the bulb.

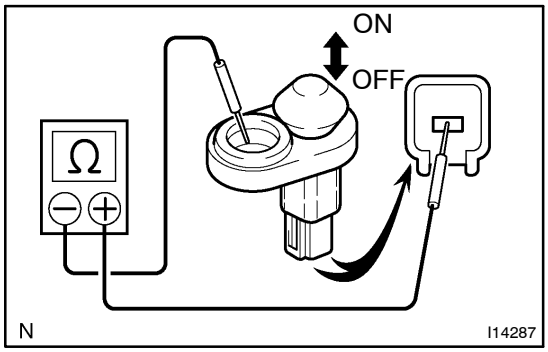


3. INSPECT REAR ROOM LIGHT CONTINUITY

(a) Disconnect the connector from the room light.

(b) Turn the room light switch to ON, check that there is a continuity between terminal 1 and 2.

If continuity is not as specified, replace the light assembly or the bulb.

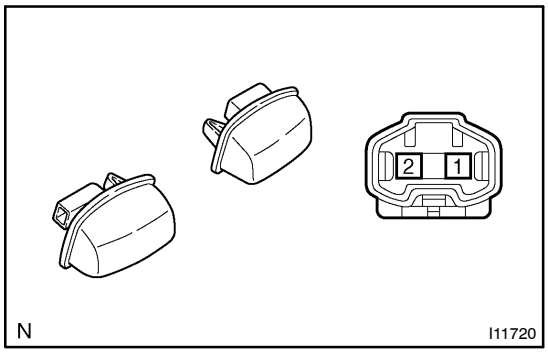


4. INSPECT DOOR COURTESY SWITCH CONTINUITY

(a) Check that there is a continuity between terminals and the switch body with the switch ON (Switch pin released: opened door).

(b) Check that there is no continuity between terminals and the switch body with the switch OFF (Switch pin pushed in: closed door).

If operation is not as specified, replace the switch.



5. INSPECT LICENCE PLATE LIGHT CONTINUITY

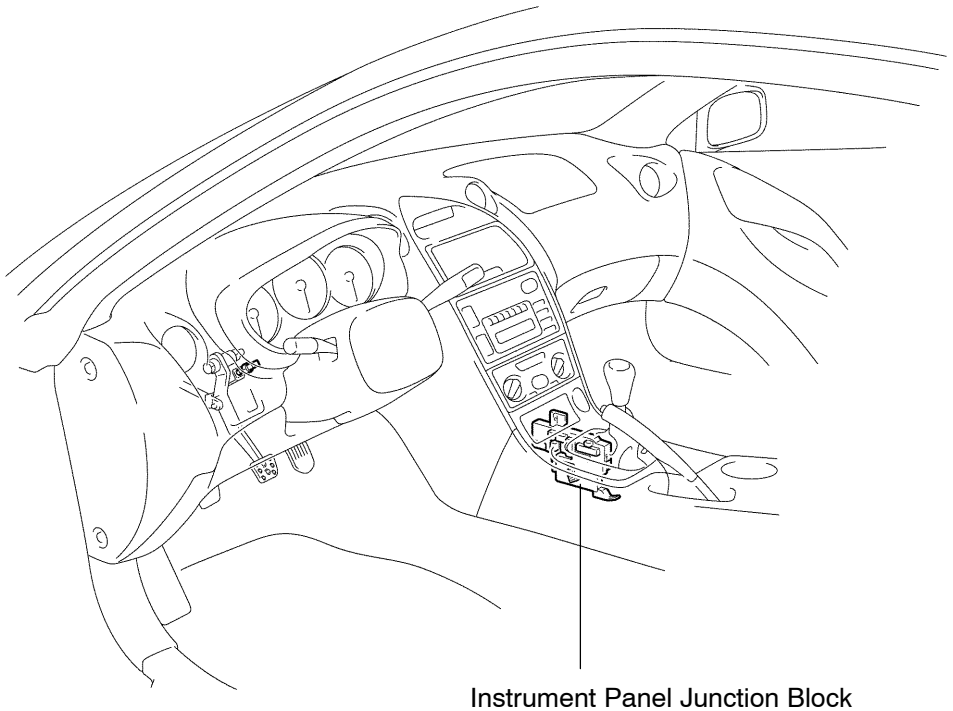
Using an ohmmeter, check that there is a continuity between terminals.

If continuity is not as specified, replace the light assembly or the bulb.

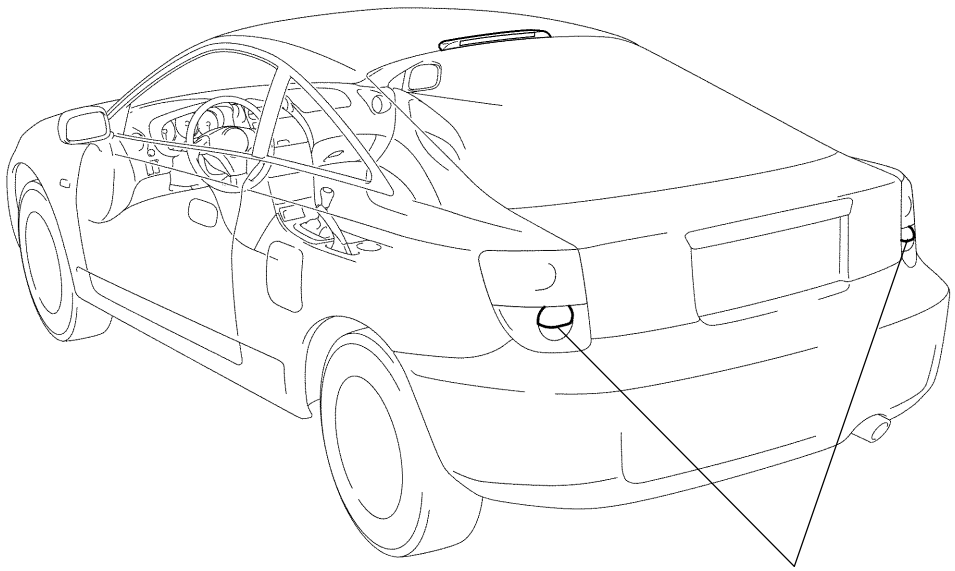
BACK–UP LIGHT SYSTEM

LOCATION

BE0P2–17



Instrument Panel Junction Block
● MULTI (BK/UP LP) Fuse

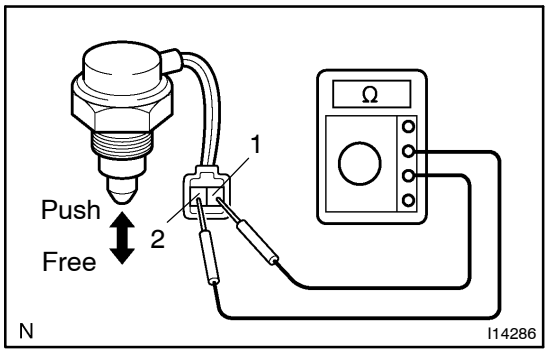


Back–Up Lights

P

I25690

BE0P3–14



INSPECTION

1. M/X:

INSPECT BACK–UP LIGHT SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Free	1 – 2	No continuity
Push	1 – 2	Continuity

If continuity is not as specified, replace the switch.

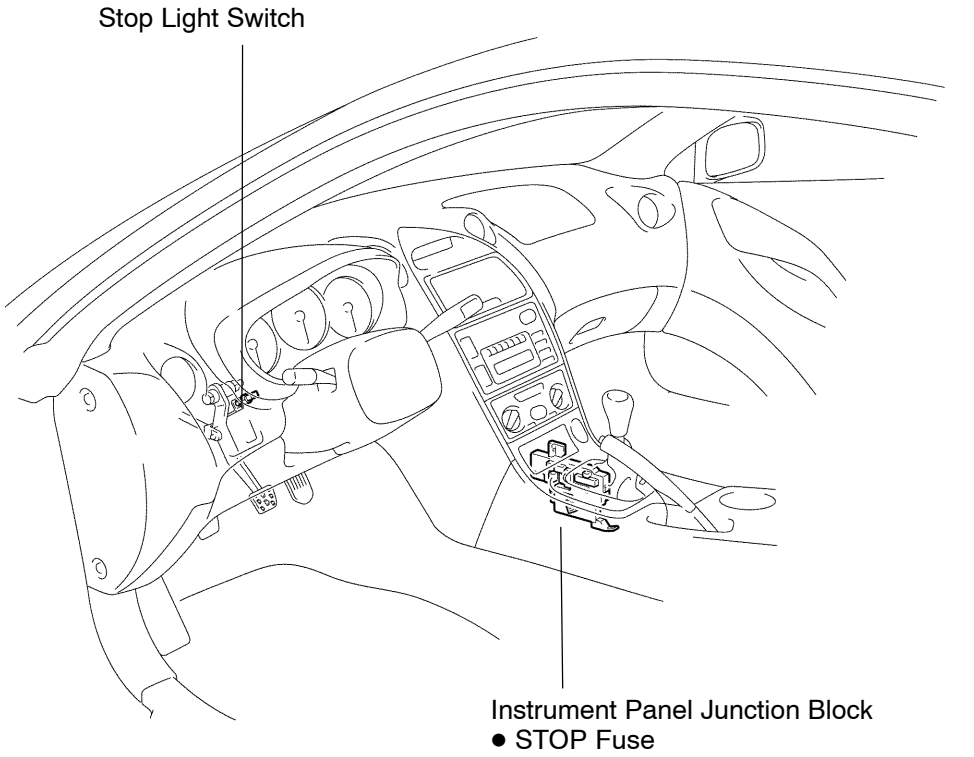
2. A/X:

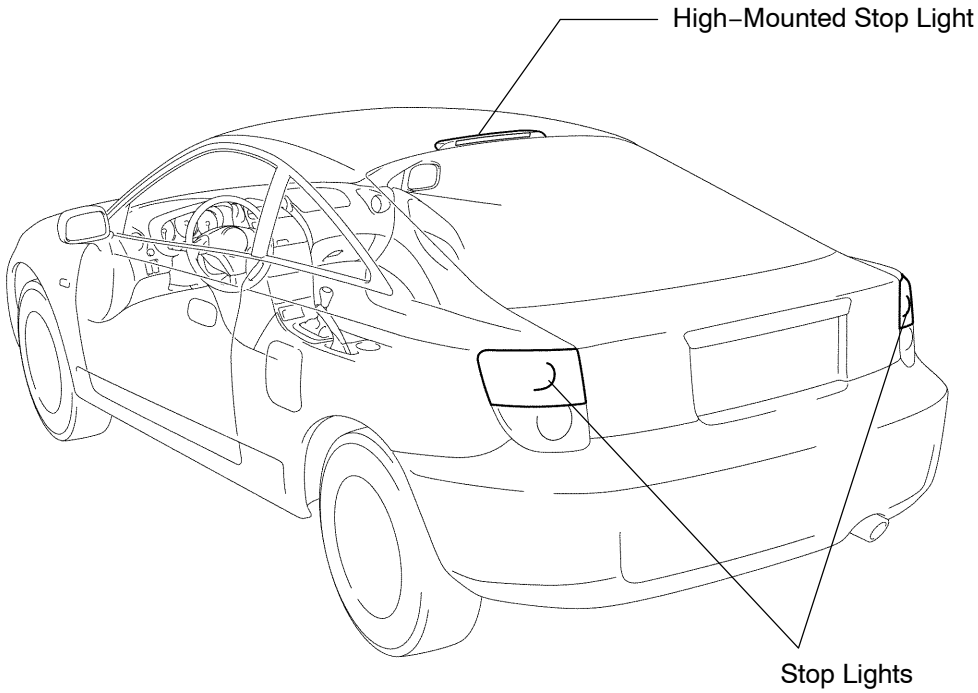
INSPECT PARK/NEUTRAL POSITION SWITCH CONTINUITY (See page DI–701 or DI–789)

STOP LIGHT SYSTEM

LOCATION

BE0P4–14

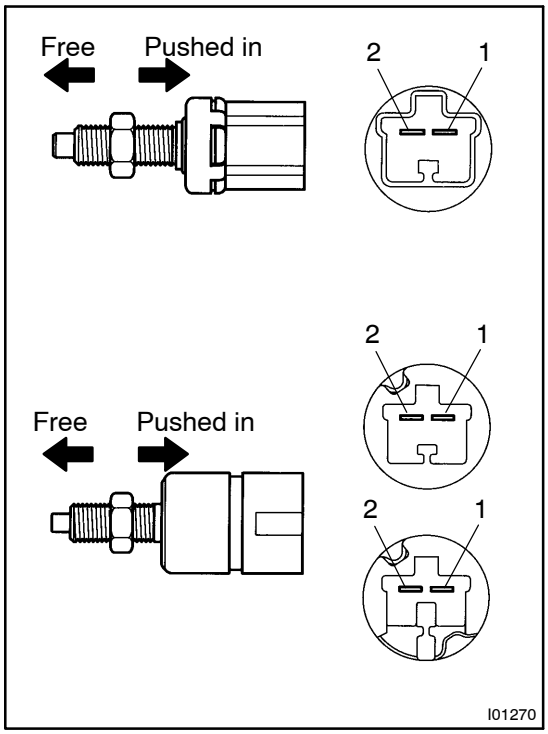




P

I25689

BE1D0–06



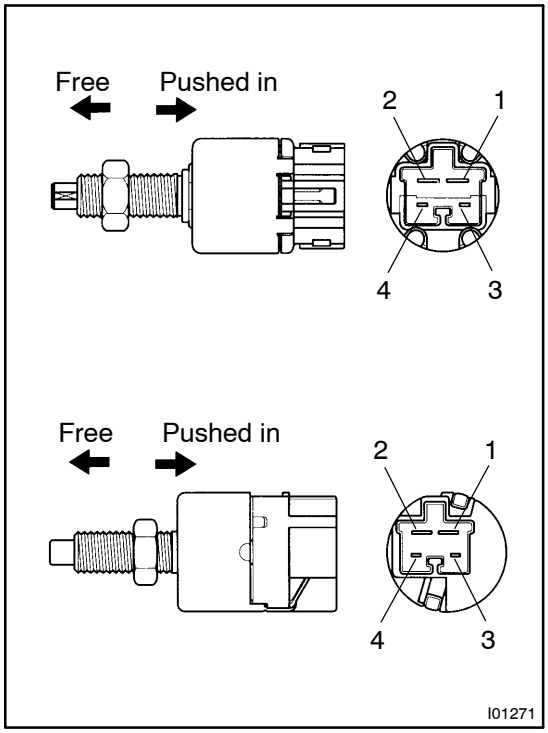
INSPECTION

INSPECT STOP LIGHT SWITCH CONTINUITY

w/o cruise control system:

Switch position	Tester connection	Specified condition
Switch pin pushed in (Pedal released)	–	No continuity
Switch pin free (Pedal depressed)	1 – 2	Continuity

If continuity is not as specified, replace the switch.



w/ cruise control system:

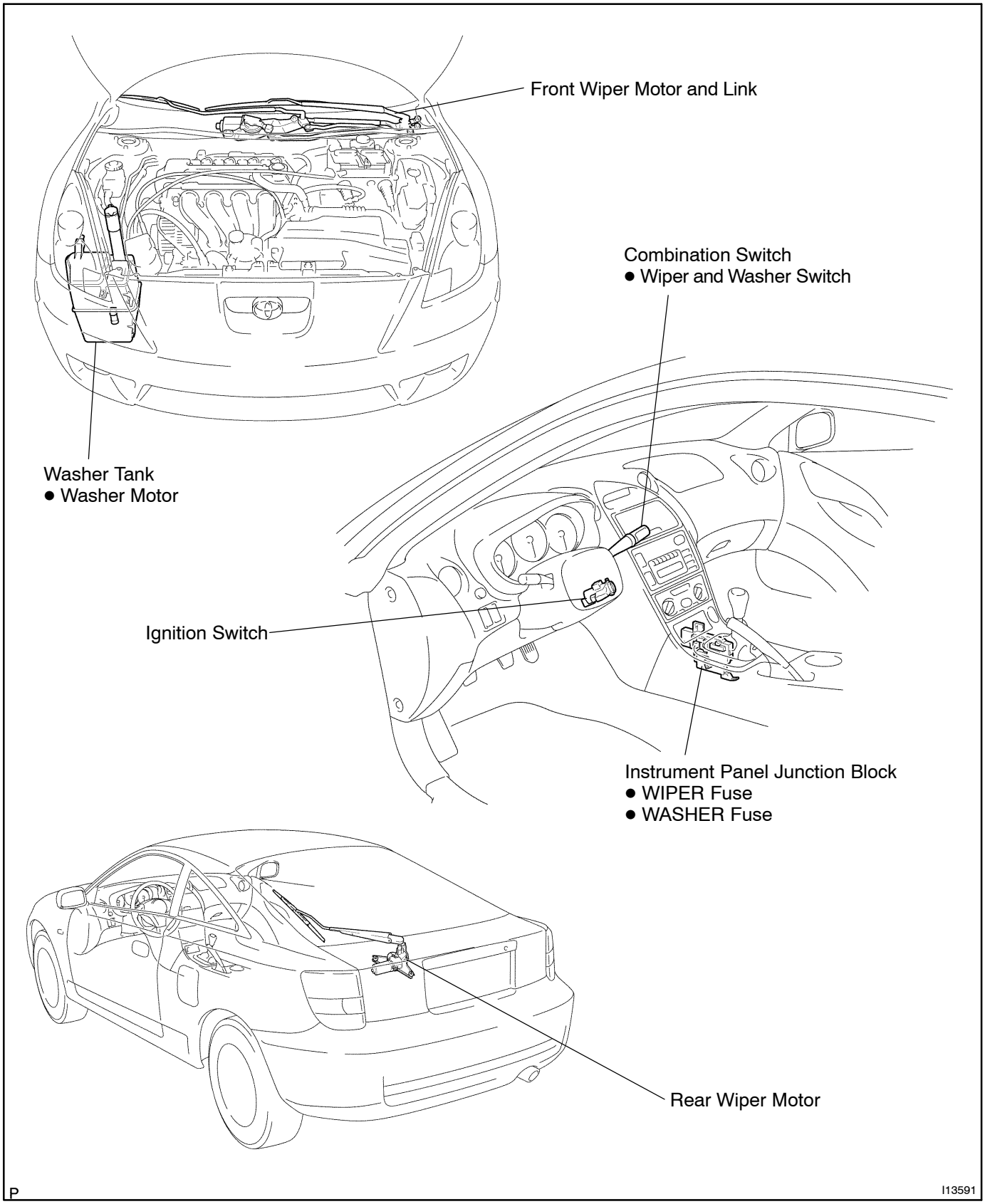
Switch position	Tester connection	Specified condition
Switch pin pushed in (Pedal released)	–	No continuity
Switch pin free (Pedal depressed)	1 – 2	Continuity

If continuity is not as specified, replace the switch.

WIPER AND WASHER SYSTEM

BE0P6–14

LOCATION



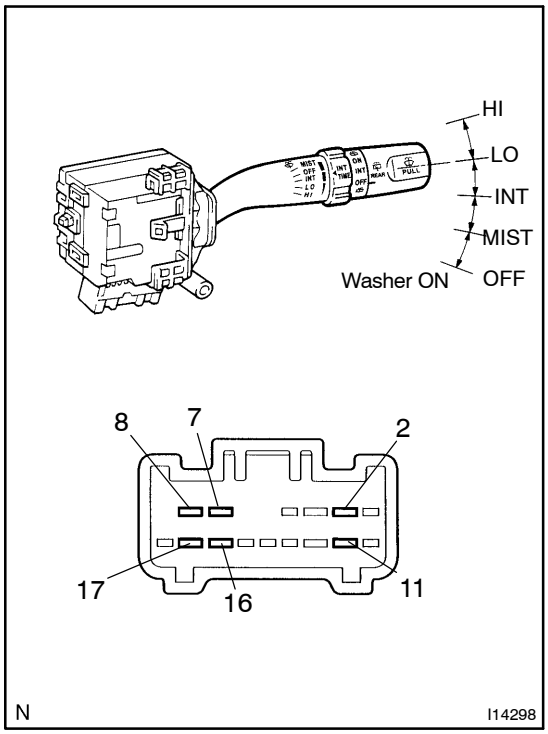
BE2FF–02

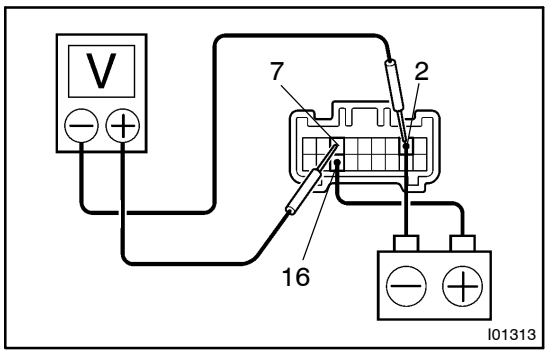
INSPECTION

1. INSPECT FRONT WIPER AND WASHER SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF	7 – 16	Continuity
MIST (w/ Mist wiper)	7 – 17	Continuity
INT (w/ Intermittent wiper)	7 – 16	Continuity
LO	7 – 17	Continuity
HI	8 – 17	Continuity
Washer ON	2 – 11	Continuity

If continuity is not as specified, replace the switch.





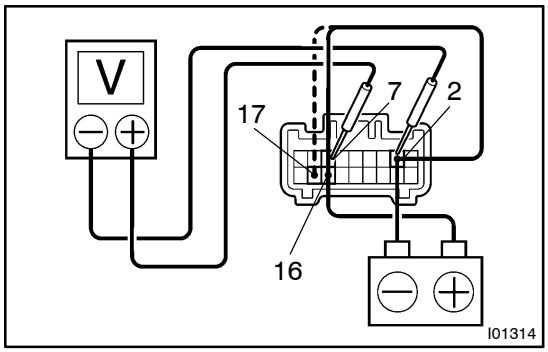
2. INSPECT FRONT WIPER INTERMITTENT OPERATION

(a) Turn the wiper switch to the INT position.

(b) Turn the intermittent time control switch to FAST position.

(c) Connect the battery positive (+) lead to terminal 16 and the battery negative (–) lead to terminal 2.

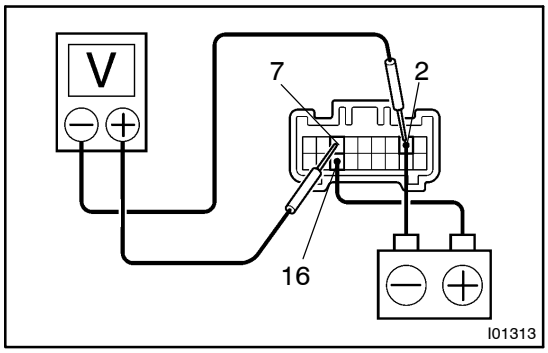
(d) Connect the voltmeter positive (+) lead to terminal 7 and the voltmeter negative (–) lead to terminal 2, then check that the meter needle indicates the battery voltage.



(e) After connecting terminal 16 to terminal 17, connect to terminal 2 to terminal 17, check the voltage rises from 0 volts to the battery voltage within the times as shown in the table.

INT time control switch position	Voltage
FAST	Approx. 0.6 – 2.6 secs. ←Battery voltage ←0 Volt
SLOW	Approx. 5.2 – 15.7 secs. ←Battery voltage ←0 Volt

If operation is not as specified, replace the wiper and washer switch.

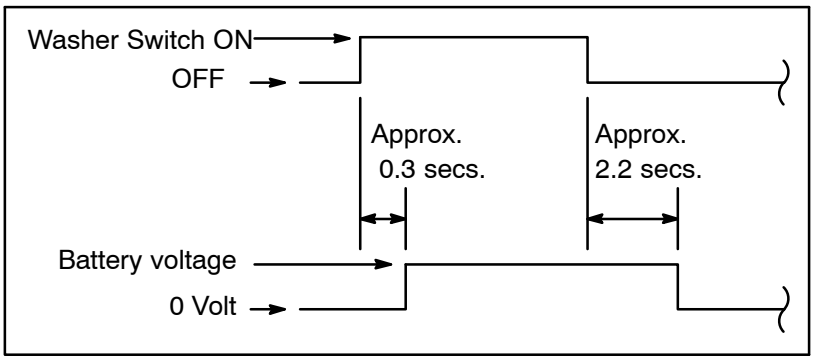


3. INSPECT FRONT WASHER LINKED OPERATION

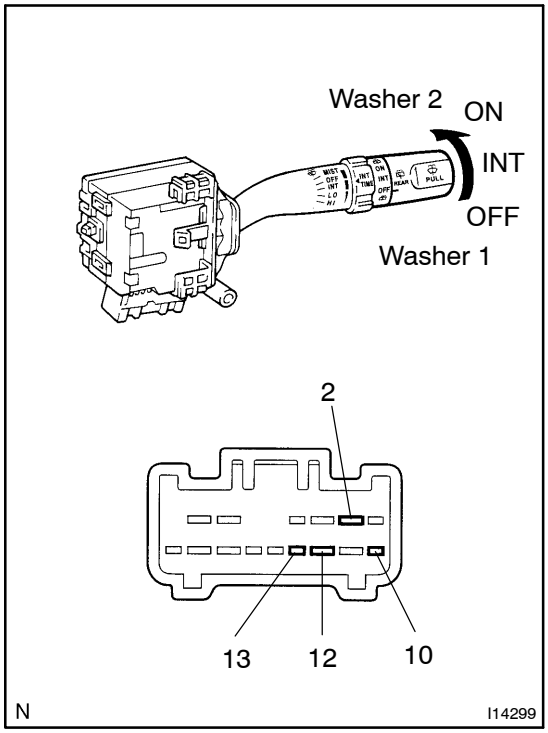
(a) Connect the battery positive (+) lead to terminal 16 and the battery negative (–) lead to terminal 2.

(b) Connect the voltmeter positive (+) lead to terminal 7 and the voltmeter negative (–) lead to terminal 2.

(c) Push in the washer switch, and check that the voltage changes as shown in the table.



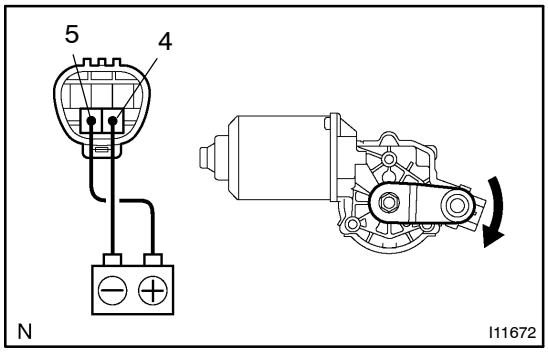
If operation is not as specified, replace the wiper and washer switch.



4. INSPECT REAR WIPER AND WASHER SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Washer 1	2 – 12	Continuity
OFF	–	No continuity
INT	2 – 13	Continuity
ON	2 – 10	Continuity
Washer 2	2 – 10 – 12	Continuity

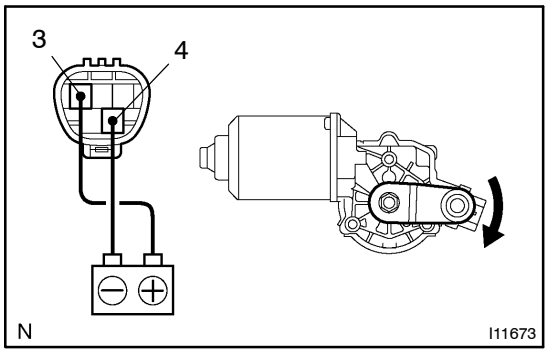
If continuity is not as specified, replace the switch.



5. Low Speed: INSPECT FRONT WIPER MOTOR OPERATION

Connect the battery positive (+) lead from the battery to terminal 5 and the battery negative (–) lead to terminal 4, then check that the motor operates at low speed.

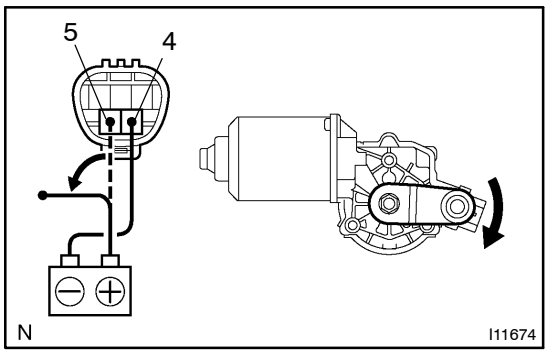
If operation is not as specified, replace the motor with a new one.



6. High Speed:
INSPECT FRONT WIPER MOTOR OPERATION

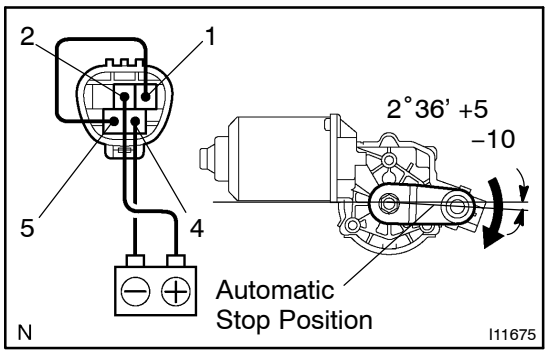
Connect the battery positive (+) lead to terminal 3 and the battery negative (–) lead to terminal 4, then check that the motor operates at high speed.

If operation is not as specified, replace the motor with a new one.



7. Stopping at Stop Position:
INSPECT FRONT WIPER MOTOR OPERATION

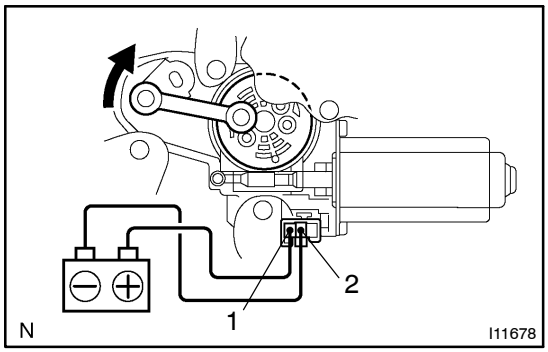
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting the positive (+) lead from terminal 5.



(b) Connect terminal 1 and 5.

(c) Connect the battery positive (+) lead to terminal 2 and battery negative (–) lead to terminal 4, then check that the motor stops running at the stop position after the motor operates again.

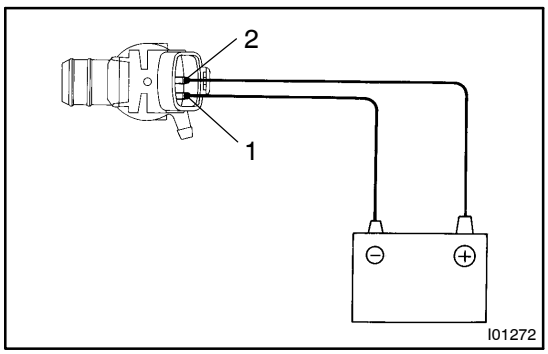
If operation is not as specified, replace the motor.



8. Intermittent:
INSPECT REAR WIPER MOTOR AND RELAY OPERATION

Connect the battery positive (+) lead to terminal 1, and the battery negative (–) lead to terminal 2 and the motor body, then check that the motor operates intermittently for 9 – 15 seconds.

If operation is not as specified, replace the motor and relay with new ones.



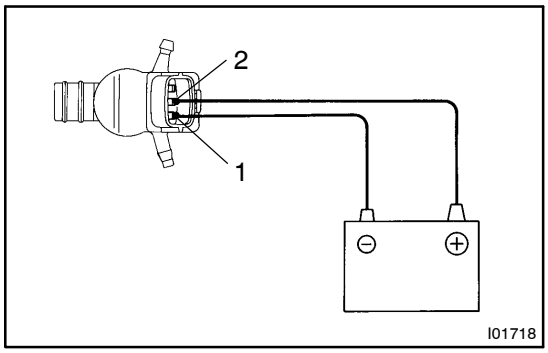
9. w/o Rear wiper:
INSPECT WASHER MOTOR OPERATION

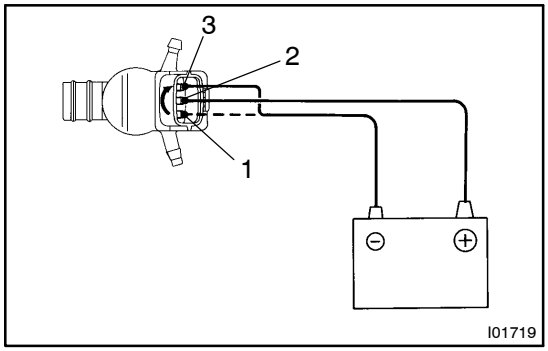
Connect the battery positive (+) lead to terminal 2 and the battery negative (–) lead to terminal 1, then check that the motor operates.

NOTICE:

These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor with a new one.





10. w/ Rear wiper:
INSPECT FRONT WASHER MOTOR OPERATION

Connect the battery positive (+) lead to terminal 2 and the battery negative (–) lead to terminal 1, then check that the motor operates.

NOTICE:

These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor with a new one.

11. w/ Rear wiper:
INSPECT REAR WASHER MOTOR OPERATION

Connect the battery positive (+) lead to terminal 2 and the battery negative (–) lead to terminal 3, then check that the motor operates.

NOTICE:

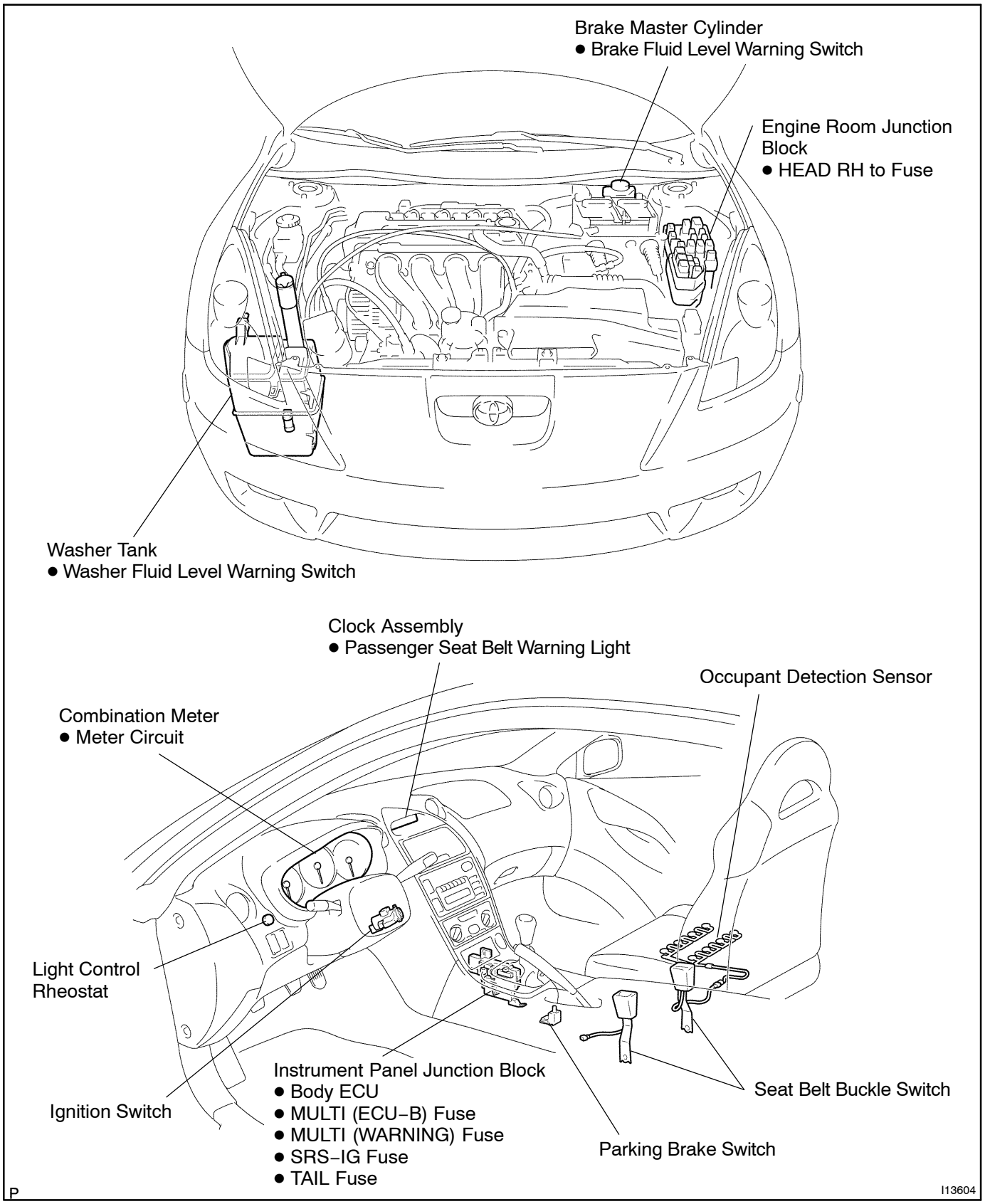
These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

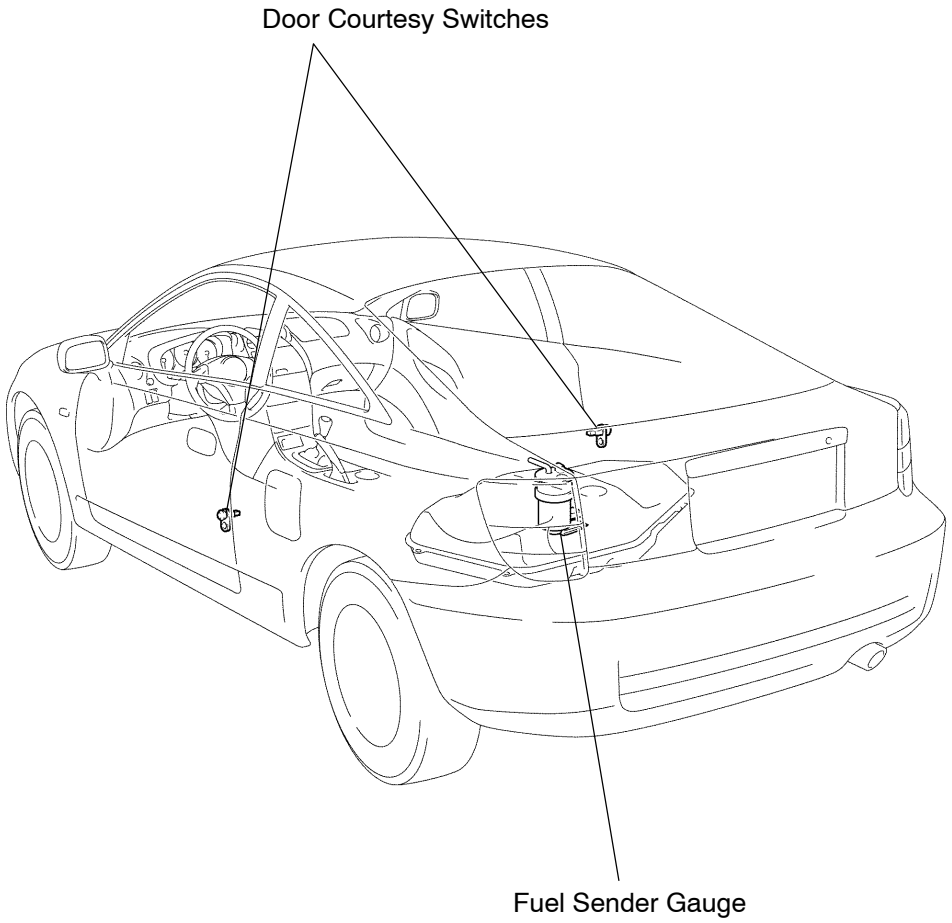
If operation is not as specified, replace the motor with a new one.

COMBINATION METER

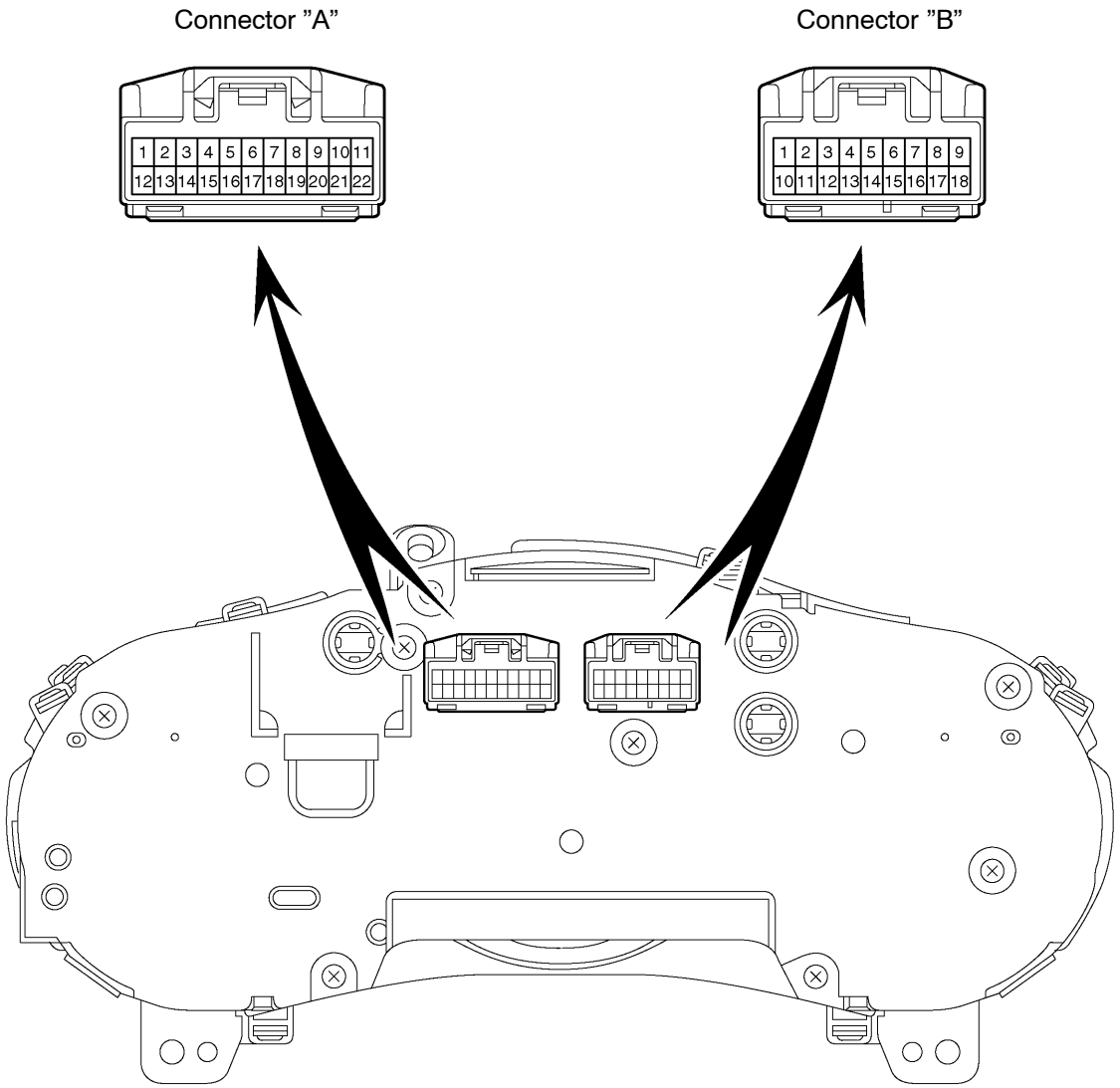
LOCATION

BE1D1–11





P
I13605

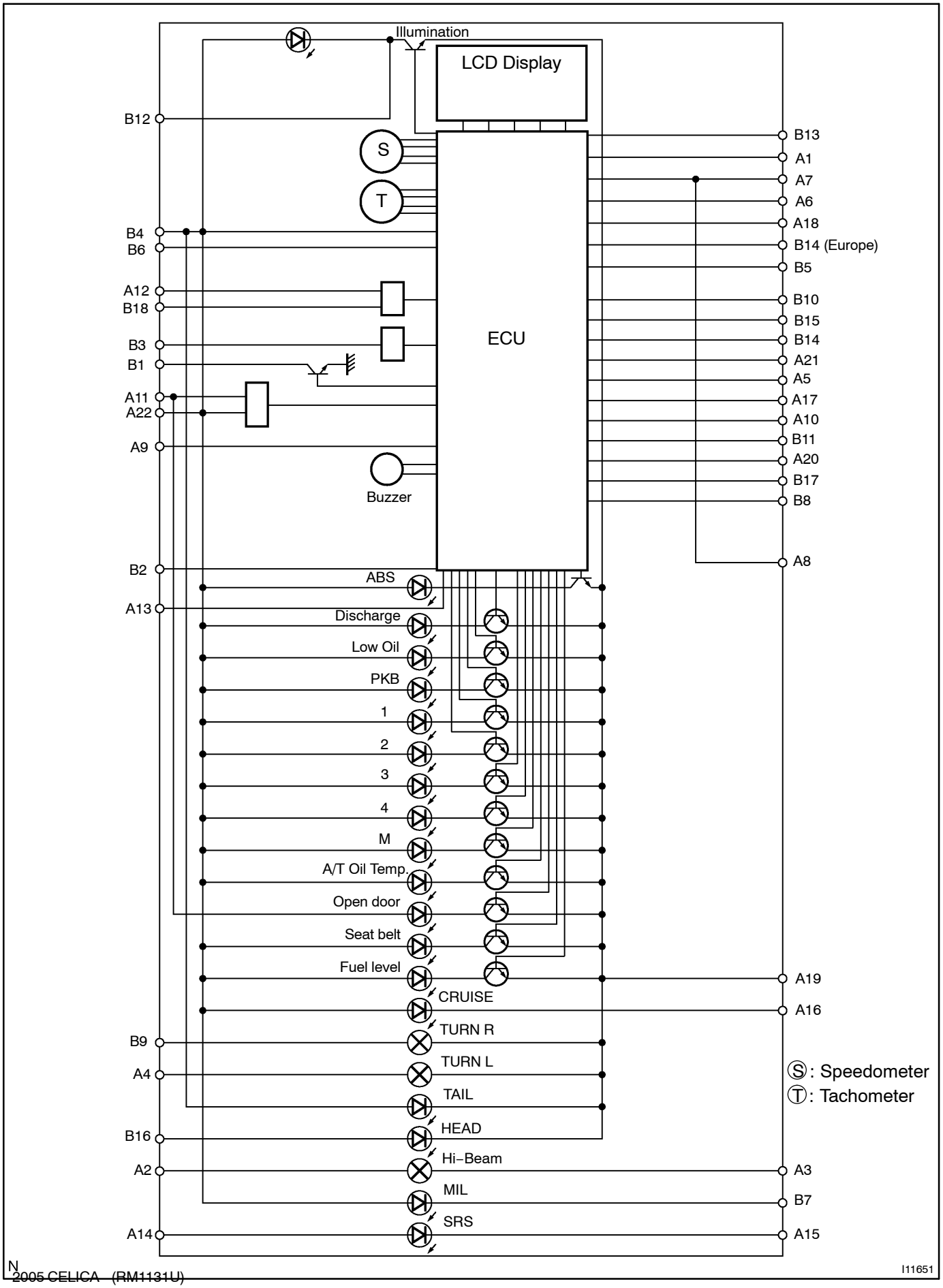

Connector ”A”
Connector ”B”
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18

N

I11735

BE0P9–10

CIRCUIT



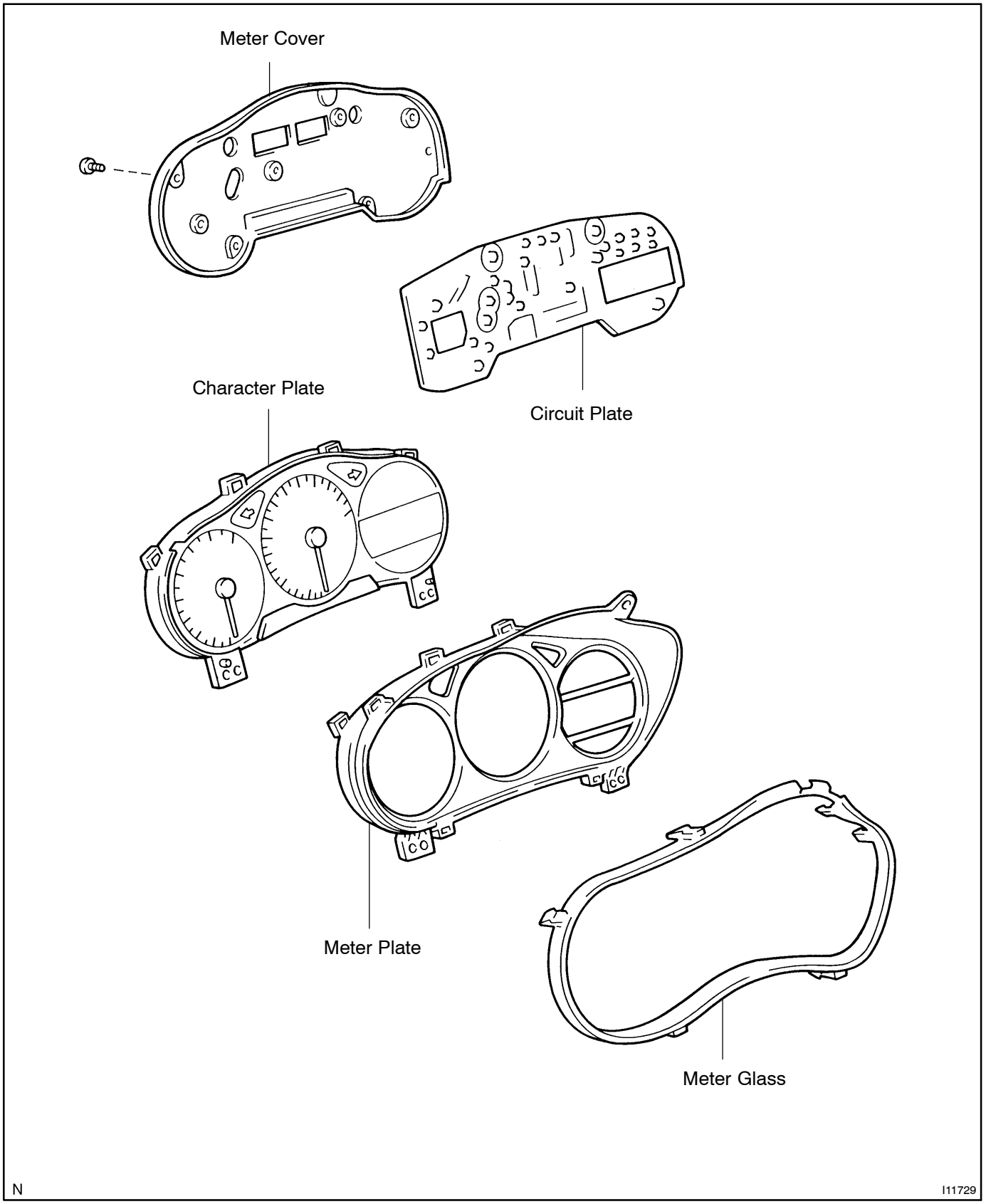
I11651

No.		Wiring connector side
A	1	Sport mode switch
	2	Headlight dimmer switch
	3	Headlight
	4	Turn signal switch (Left side)
	5	Light control rheostat
	6	Evaporator temp. sensor
	7	Ground
	8	Ground
	9	Speed control unit
	10	Ground
	11	ECU–B Fuse
	12	ECM (MPX circuit)
	13	Heater main relay
	14	SRS Fuse
	15	Airbag sensor assembly
	16	Cruise control ECU
	17	Light control rheostat
	18	Evaporator temp. sensor
	19	Ground
	20	Speed sensor (SI terminal)
	21	Back–up light switch
	22	WARNING Fuse
B	1	Generator
	2	Clock (Passenger seat belt warning)
	3	Body ECU
	4	TAIL Fuse
	5	A/C ECU
	6	ECM (Tacho signal)
	7	ECM
	8	ABS ECU (Parking brake switch signal)
	9	Turn signal switch (Right side)
	10	A/C control panel (A/C switch indicator)
	11	ABS ECU
	12	Automatic light control sensor
	13	O/D off switch
	14	Front defogger switch
	15	A/C switch
	16	HEAD RH–LO Fuse
	17	ABS ECU
	18	ECM (MPX circuit)

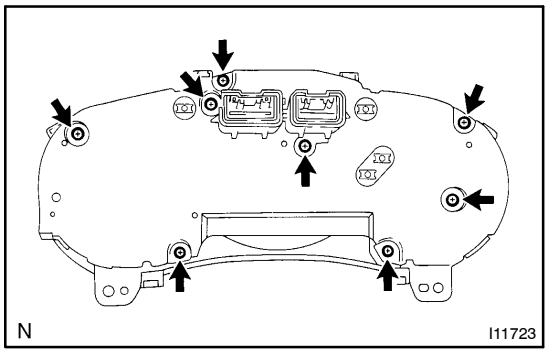
MPX: Multiplex communication
Temp. : Temperature

BE1D2–04

COMPONENTS



BE1D3–04

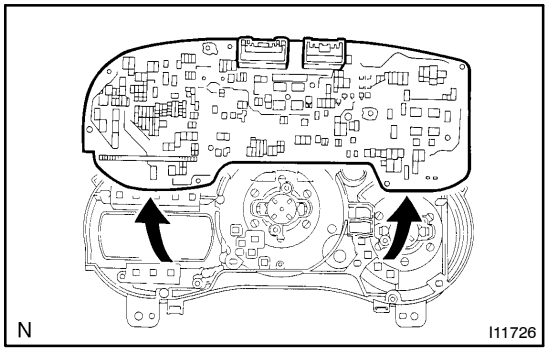


DISASSEMBLY

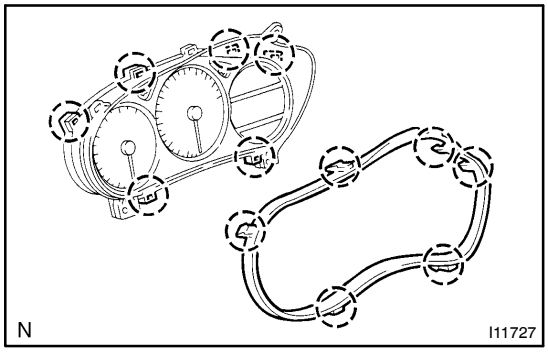
COMBINATION METER COVER:

(a) Remove the 8 screws.

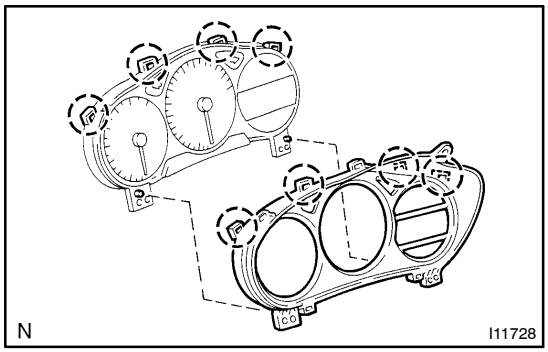
(b) Remove the combination meter cover.



(c) Remove the meter circuit plate.



(d) Remove the 6 clips and the meter glass.



(e) Remove the 4 clips and the meter plate.

BE1D4–04

INSPECTION

1. INSPECT SPEEDOMETER ON–VEHICLE

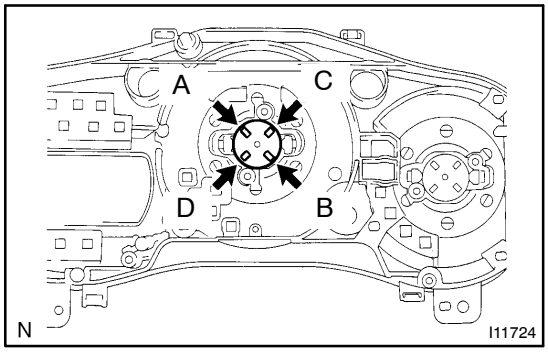
Using a speedometer tester, inspect the speedometer and check the operation of the odometer.

HINT:

Tire wear and tire over or under inflation will increase the indication error.

If error is excessive, replace the speedometer.

USA (mph)		CANADA (km/h)	
Standard indication	Allowable range	Standard indication	Allowable range
20	19– 22	20	18 – 23
40	39 – 42.5	40	40 – 44
60	59.5 – 63.5	60	60 – 64.5
80	80 – 85	80	80 – 85
100	100 – 105.5	100	100 – 105
120	120 – 125.5	120	120 – 125.5
		140	140 – 146
		160	160 – 167

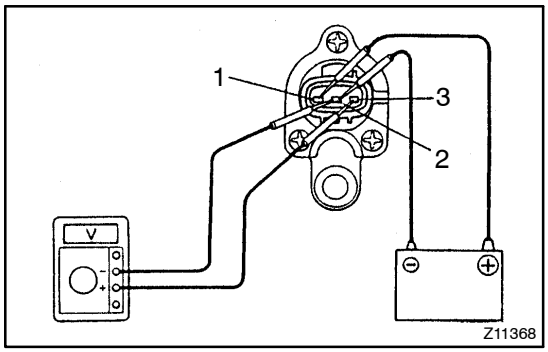


2. INSPECT SPEEDOMETER RESISTANCE

Measure the resistance between terminals with fixing pointer to the stopper.

Tester connection	Resistance (Ω)
A – B	250
C – D	250

If resistance value is not as specified, replace the meter.



3. INSPECT VEHICLE SPEED SENSOR OPERATION

(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2.

(b) Connect the tester positive (+) lead to terminal 3 and the tester negative (–) lead to terminal 2.

(c) Rotate the shaft.

(d) Check that there is voltage change from approx. 0 V to 11 V between terminals 2 and 3.

HINT:

The voltage change should be 4 times for every revolution of the speed sensor shaft.

If operation is not as specified, replace the sensor.

4. INSPECT TACHOMETER ON–VEHICLE

(a) Connect a tune–up test tachometer, and start the engine.

NOTICE:

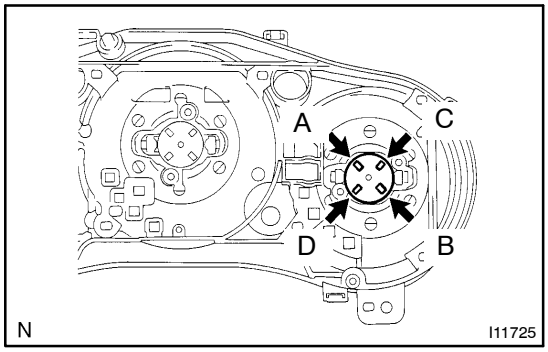
Reversing the connection of the tachometer will damage the transistors and the diodes inside.

(b) Compare the tester indications with the tachometer indications.

RPM (DC 13.5 V, 25 °C (77 °F))

Standard indication	Allowable range
700	700 – 770
1,000	900 – 1,100
2,000	1,850 – 2,150
3,000	2,800 – 3,200
4,000	3,800 – 4,200
5,000	4,800 – 5,200
6,000	5,800 – 6,200
7,000	6,800 – 7,200

If error is excessive, replace the tachometer.

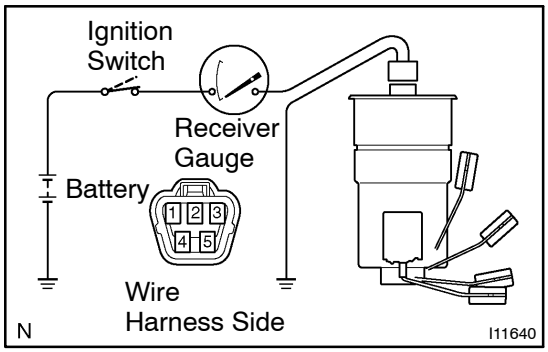


5. INSPECT TACHOMETER RESISTANCE

Measure the resistance between terminals with fixing the pointer to the stopper.

Tester connection	Resistance (Ω)
A – B	250
C – D	250

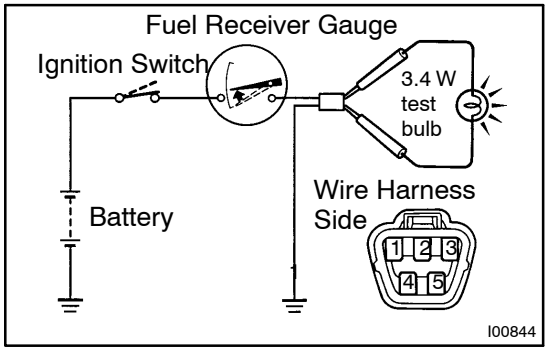
If resistance value is not as specified, replace the meter.



6. INSPECT FUEL RECEIVER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge assembly.

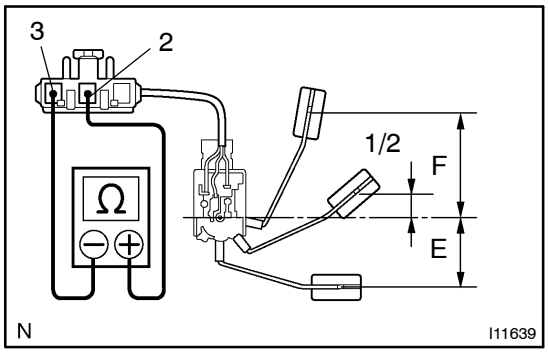
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY.



(c) Connect terminal 2 and 3 of the wire harness side connector through a 3.4 W test bulb.

(d) Turn the ignition switch ON, check that the bulb lights up and receiver gauge needle moves upper side.

If operation is not as specified, inspect the fuel receiver gauge resistance.

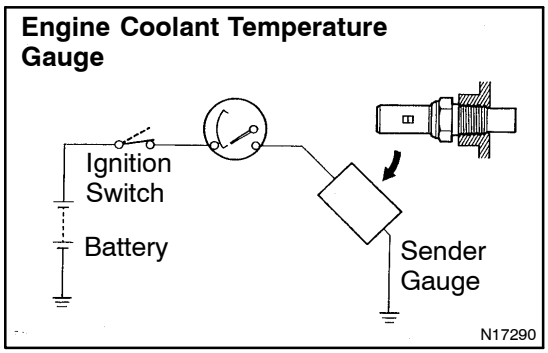


7. INSPECT FUEL SENDER GAUGE RESISTANCE

Measure the resistance between terminals 2 and 3 for each float position.

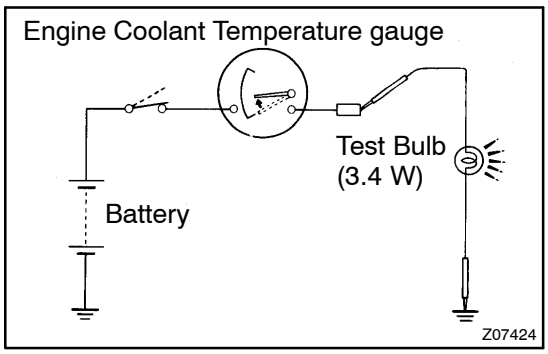
Float position: mm (in.)	Resistance (Ω)
F: Approx. 75.9 (2.99)	Approx. 3.0
1/2: Approx. 17.2 (0.68)	Approx. 31.6
E: Approx. 50.8 (2.00)	Approx. 110.0

If resistance value is not as specified, replace the sender gauge.



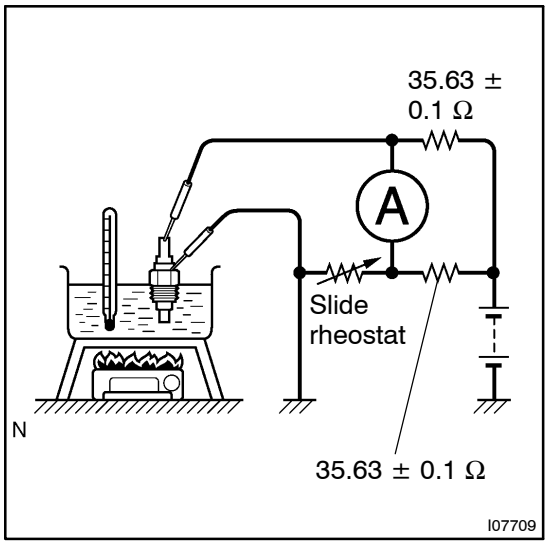
8. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.
(b) Turn the ignition switch ON, then check that the receiver gauge needle indicates COOL.



(c) Ground the terminal of the wire harness side connector through a 3.4 W test bulb.
(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves toward the hot side.

If operation is not as specified, inspect the sender gauge.
Then recheck the system.

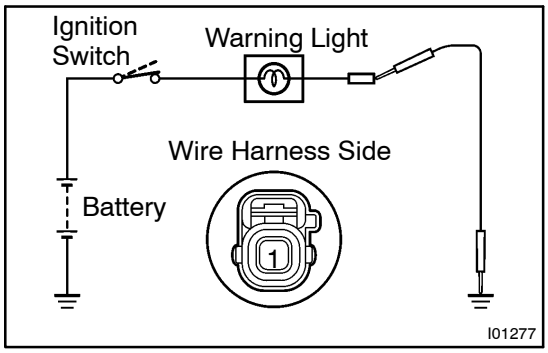


9. INSPECT ENGINE COOLANT TEMPERATURE SENDER GAUGE RESISTANCE

Connect the wire harness as shown in the illustration, and adjust the ammeter pointer to indicate ”0” using the slide rheostat, then read the rheostat indication.

Temperature °C (°F)	Resistance (Ω)
50 (122.0)	160 – 240
120 (248.0)	17.1 – 21.2

If resistance value is not as specified, replace the engine coolant temperature sender gauge.

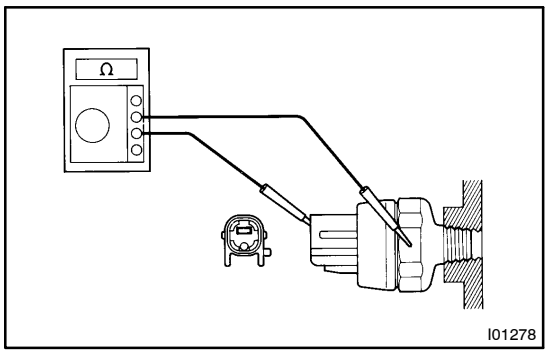


10. INSPECT LOW OIL PRESSURE WARNING LIGHT

(a) Disconnect the connector from the warning switch and the ground terminal of the wire harness side connector.

(b) Turn the ignition switch ON, check that the warning light comes on.

If the warning light does not come on, test the bulb or inspect the wire harness.



11. INSPECT LOW OIL PRESSURE SWITCH CONTINUITY

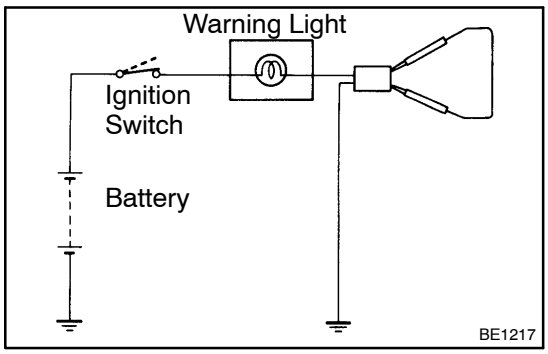
(a) Check that there is a continuity between terminal and ground with the engine stopped.

(b) Check that there is no continuity between terminal and ground with the engine running.

HINT:

Oil pressure should be over 24.5 kPa (0.25 kgf/cm^2, 3.55 psi).

If operation is not as specified, replace the switch.



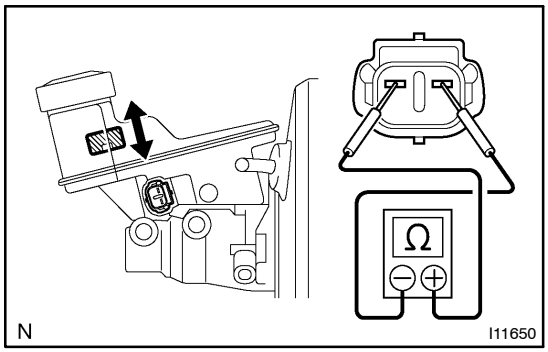
12. INSPECT BRAKE WARNING SYSTEM LIGHT

(a) Disconnect the connector from the brake fluid level warning switch.

(b) Connect terminals on the wire harness side of the level warning switch connector.

(c) Start the engine, then check that the brake warning light comes on.

If the warning light does not come on, test the bulb or wire harness.



13. INSPECT BRAKE FLUID LEVEL WARNING SWITCH CONTINUITY

(a) Remove the reservoir tank cap and the strainer.

(b) Disconnect the connector.

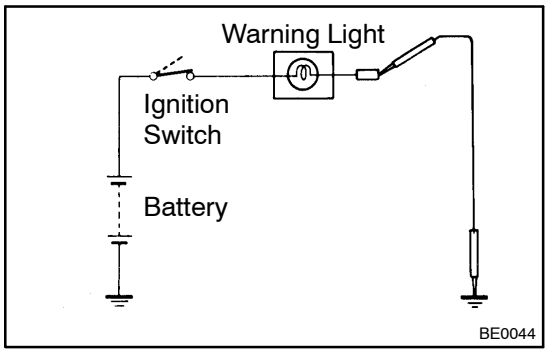
(c) Check that there is no continuity between terminals with the switch OFF (float up).

(d) Use a syphon, etc. to take fluid out of the reservoir tank.

(e) Check that there is a continuity between terminals with the switch ON (float down).

(f) Pour the fluid back in the reservoir tank.

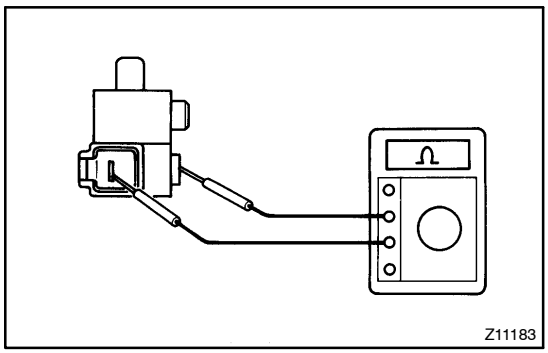
If operation is not as specified, replace the switch.



14. INSPECT PARKING BRAKE WARNING LIGHT

(a) Disconnect the connector from the parking brake switch.
(b) Ground terminal of the wire harness side connector.
(c) Start the engine and check that the warning light comes on.

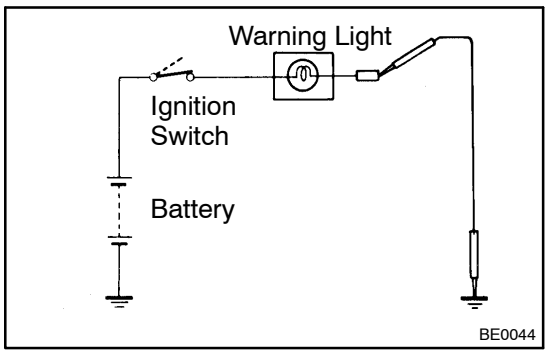
If the warning light does not come on, test the bulb or inspect the wire harness.



15. INSPECT PARKING BRAKE SWITCH CONTINUITY

(a) Check that there is a continuity between terminal and switch body with the switch ON (switch pin released).
(b) Check that there is no continuity between terminal and switch body with the switch OFF (switch pin pushed in).

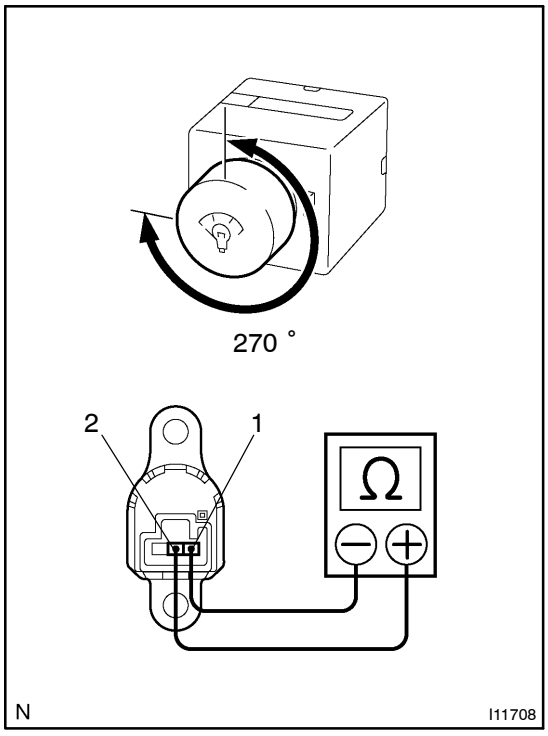
If operation is not as specified, replace the switch or inspect ground point.



16. INSPECT OPEN DOOR WARNING LIGHT

Disconnect the connector from the door courtesy switch and the ground terminal 1 of the wire harness side connector, and check that the warning light comes on.

If the warning light does not comes on, inspect the bulb or wire harness.



17. INSPECT LIGHT CONTROL RHEOSTAT OPERATION

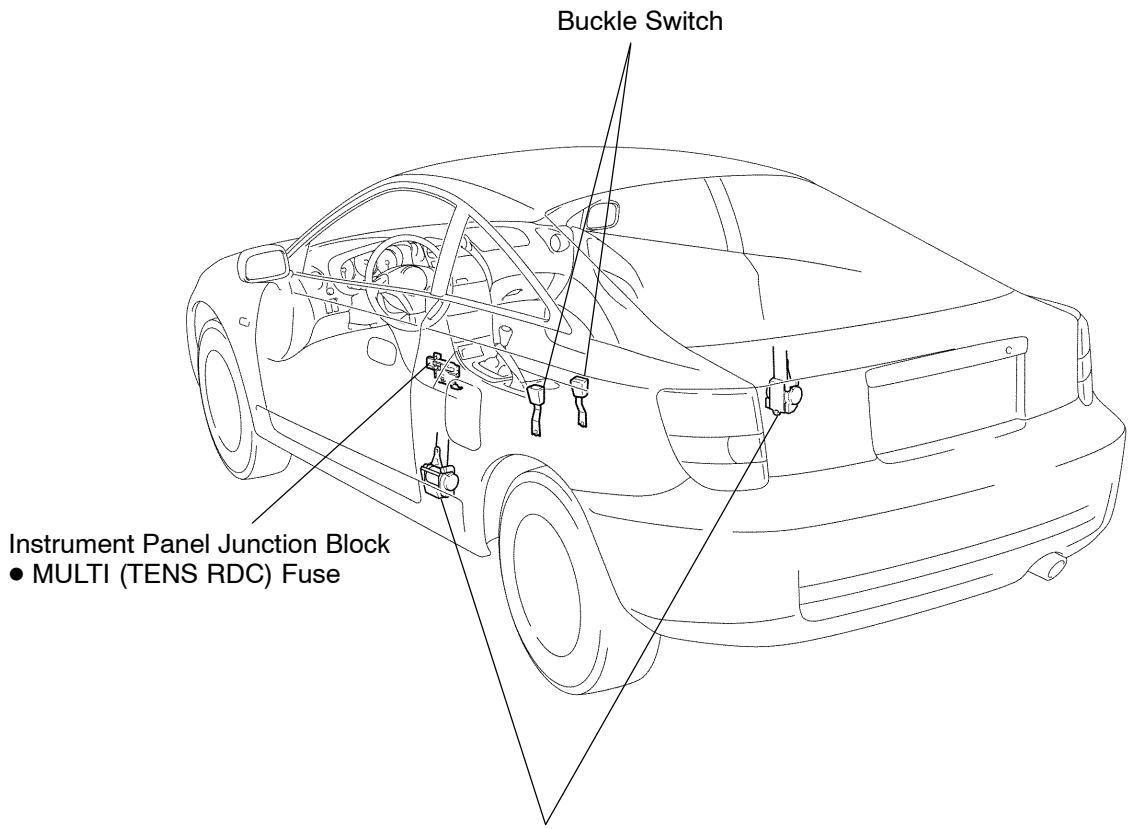
Gradually turn the rheostat knob from the bright side to dark side and check that the resistance decreases from 10 kΩ to 0 Ω between terminals 2 and 1. (Turn the rheostat knob clockwise)

If operation is not as specified, replace the rheostat light control.

ELECTRIC TENSION REDUCER SYSTEM

BE0PB–04

LOCATION

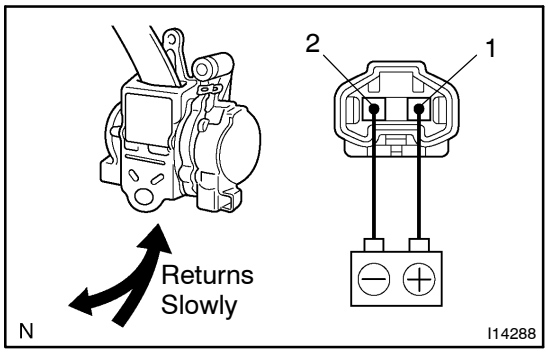


P

I13594

BE0PC–04

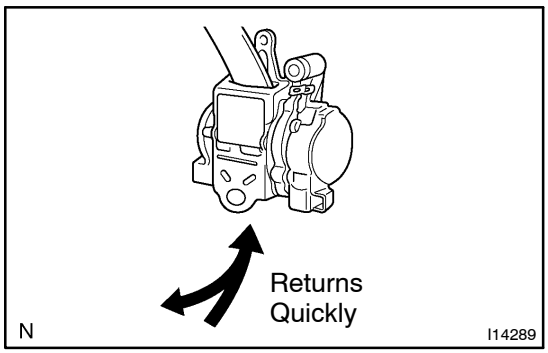
INSPECTION



1. INSPECT TENSION REDUCER SOLENOID OPERATION

(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2.

(b) Pull the belt upward and check that the belt is slowly retracted when released.



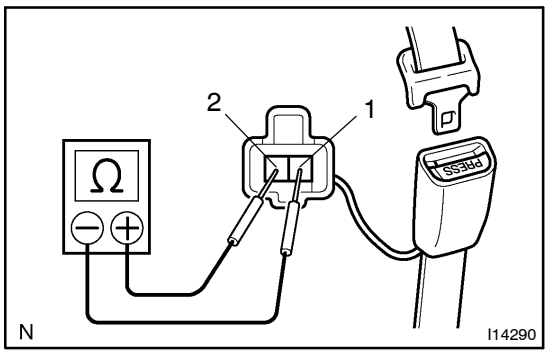
(c) Disconnect the lead from the battery.

(d) Pull the belt upward and check that the belt is retracted quicker than in (b) when released.

HINT:

Do not tilt the retractor.

If the operation is not as specified, replace the front seat outer belt assembly.



2. INSPECT BUCKLE SWITCH CONTINUITY

(a) Check that there is a continuity between terminals of the switch side connector with the switch ON (belt fastened).

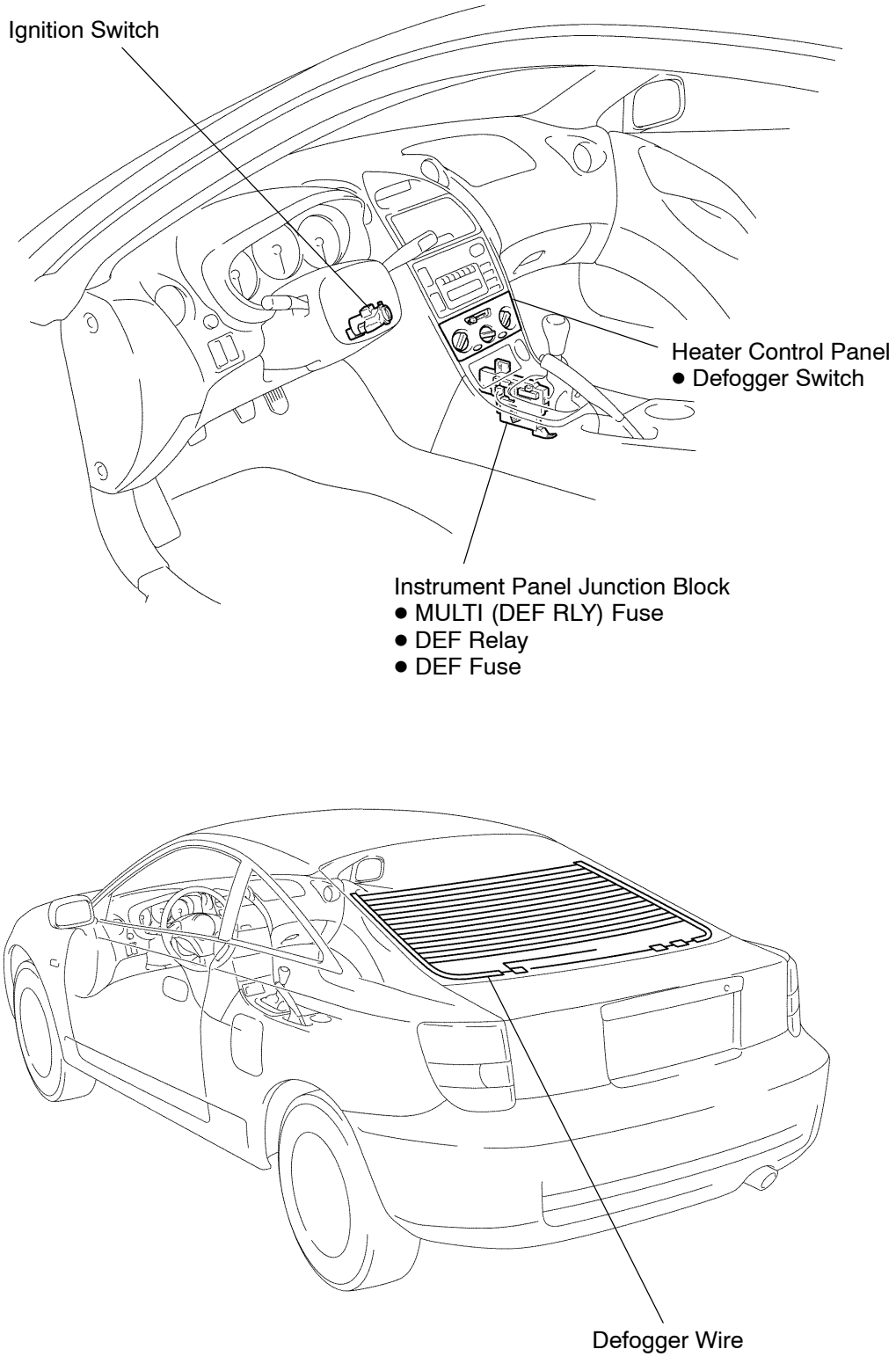
(b) Check that there is no continuity between terminals of the switch side connector with the switch OFF (belt unfastened).

If operation is not as specified, replace the seat belt inner.

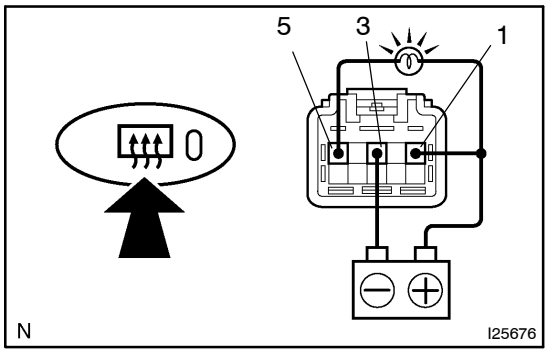
DEFOGGER SYSTEM

LOCATION

BE0PD–14



BE1D5–06



INSPECTION

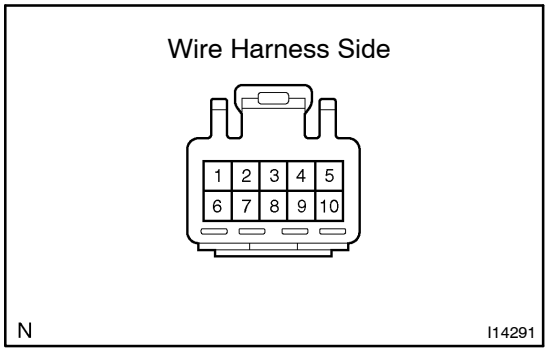
1. INSPECT DEFOGGER TIMER OPERATION

(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 3.

(b) Connect the battery positive (+) lead to terminal 5 through a 3.4 W test bulb.

(c) Turn the defogger switch ON and check that the indicator light and the test bulb light for 12 to 18 minutes, and go off afterward.

If operation is not as specified, replace the switch.



2. Connector disconnected:
INSPECT DEFOGGER SWITCH CIRCUIT

Disconnect the connector from the switch and inspect the connector on wire harness side as shown in the chart.

Tester connection	Condition	Specified condition
3 – Ground	Constant	Continuity
5 – Ground	Ignition switch LOCK or ACC	No voltage
5 – Ground	Ignition switch ON	Battery positive voltage

If the circuit is not as specified, replace the switch.

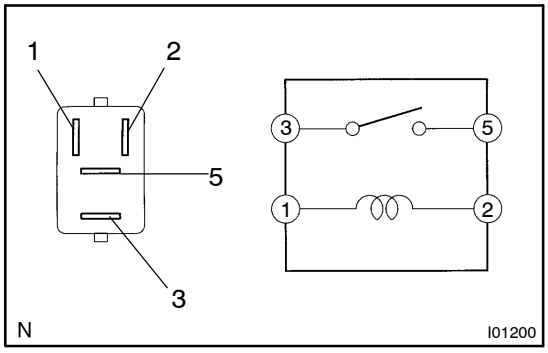
3. Connector connected:
INSPECT DEFOGGER SWITCH CIRCUIT

Connect the connector from the switch and inspect the wire harness side connector from the back side as shown in the chart.

Tester connection	Condition	Specified condition
5 – Ground	Ignition switch ON and defogger switch OFF	Battery positive voltage
5 – Ground	Ignition switch ON and defogger switch ON	No voltage

If the circuit is not as specified, try replace the switch with a new one.

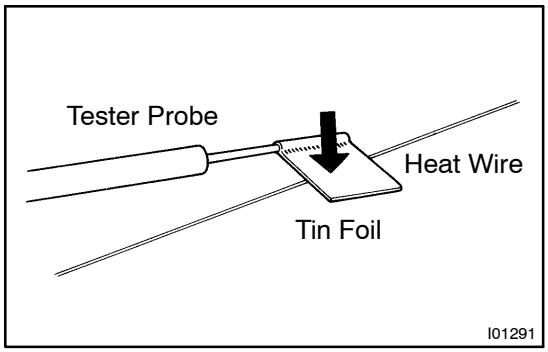
If the circuit is not as specified, inspect the circuit connected to other parts.



4. INSPECT DEFOGGER RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.



5. INSPECT DEFOGGER WIRE

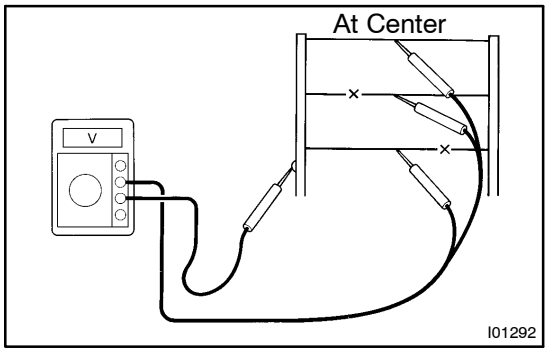
NOTICE:

- **When cleaning the glass, use a soft, dry cloth, and wipe the glass between the wires. Take care not to damage the wires.**
- **Do not use detergents or glass cleaners with abrasive ingredients.**
- **When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger, as shown.**

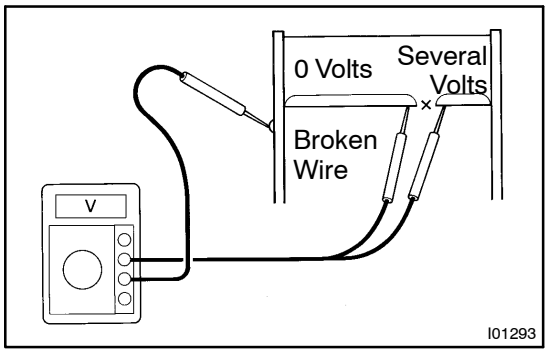
(a) Turn the ignition switch ON.

(b) Turn the defogger switch ON.

(c) Inspect the voltage at the center of each heat wire, as shown.



Voltage	Criteria
Approx. 5V	Okay (No break in wire)
Approx. 10V or 0V	Broken wire



HINT:

If there is approximately 10 V, the wire is broken somewhere between the center of the wire and the positive (+) end. If there is no voltage, the wire is broken somewhere between the center of the wire and ground.

(d) Place the voltmeter positive (+) lead against the defogger positive (+) terminal.

(e) Place the voltmeter negative (–) lead with the foil strip against the heat wire at the positive (+) terminal end, and slide it toward the negative (–) terminal end.

(f) The point where the voltmeter deflects from zero to several V is the place where the heat wire is broken.

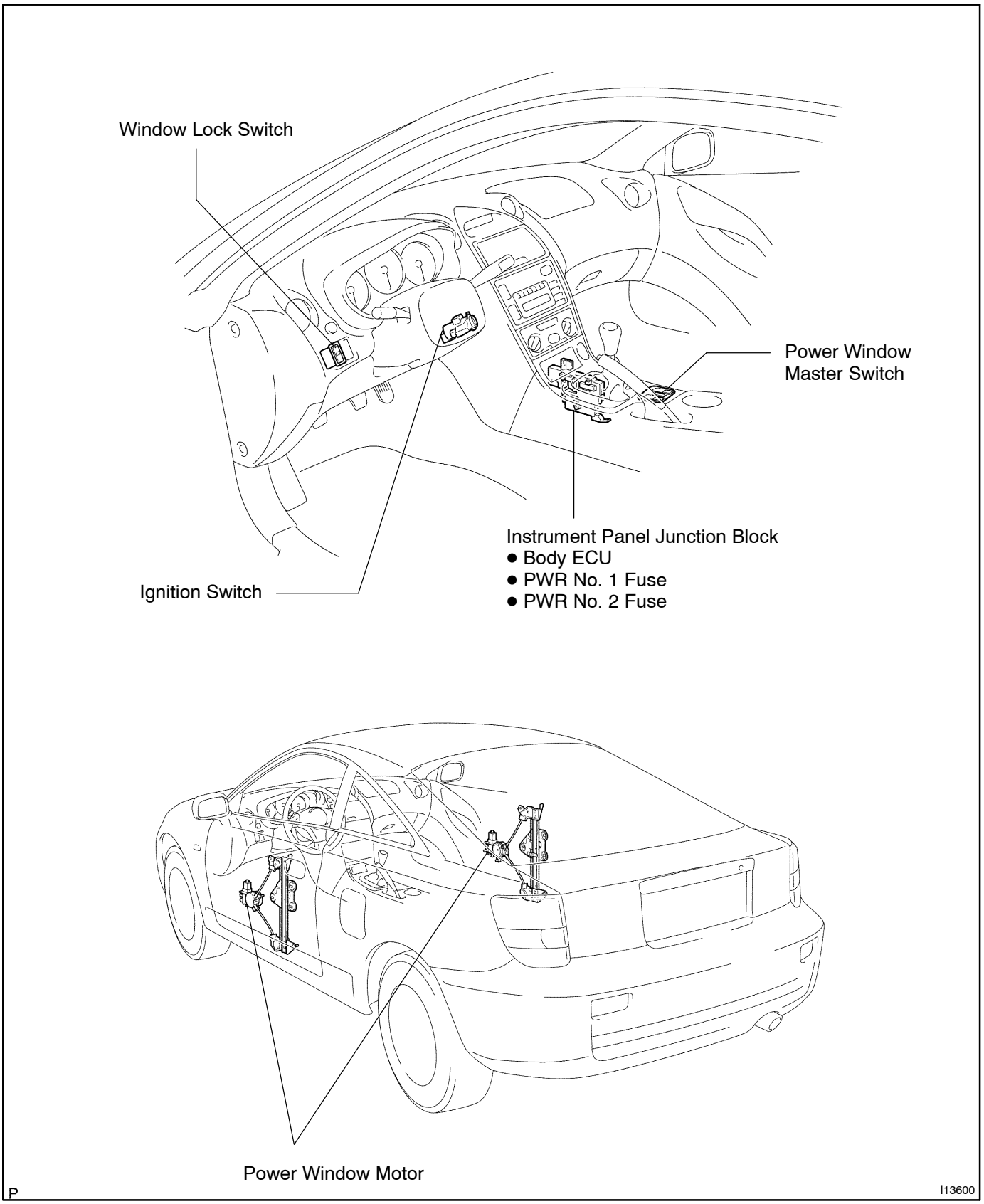
HINT:

If the heat wire is not broken, the voltmeter indicates 0 V at the positive (+) end of the heat wire but gradually increases to about 12 V as the meter probe is moved to the other end.

POWER WINDOW CONTROL SYSTEM

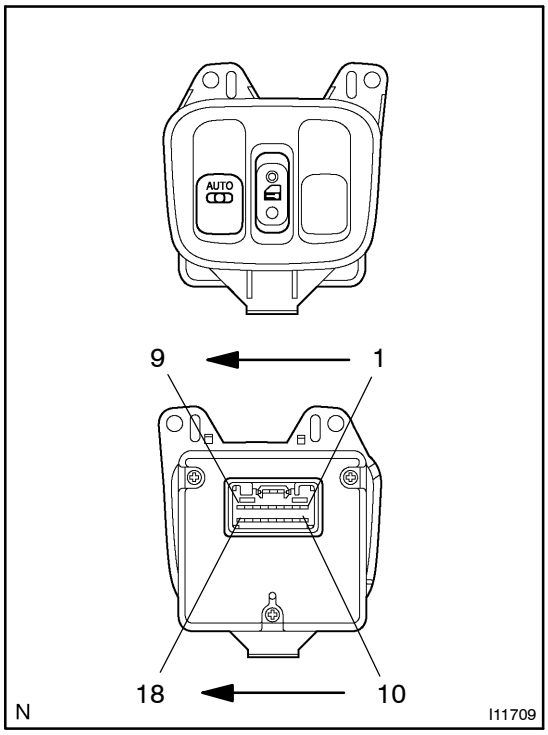
LOCATION

BE0PF–12



BE1D6–03

INSPECTION



1. INSPECT POWER WINDOW MASTER SWITCH CONTINUITY

Driver's switch:

Switch position	Tester connection	Specified condition
UP	2 – 9, 17 – 18	Continuity
OFF	9 – 17, 17 – 18	Continuity
DOWN	2 – 18, 9 – 17	Continuity
DOWN AUTO	2 – 18, 9 – 17	Continuity

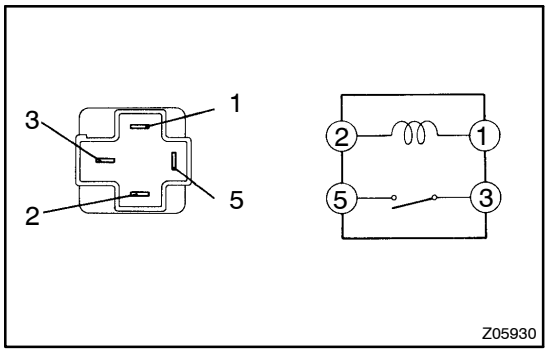
Passenger's switch (Window unlock):

Switch position	Tester connection	Specified condition
UP	1 – 11, 10 – 17	Continuity
OFF	1 – 17, 10 – 17	Continuity
DOWN	10 – 11, 1 – 17	Continuity

Passenger's switch (Window lock):

Switch position	Tester connection	Specified condition
UP	1 – 11	Continuity
OFF	1 – 10	Continuity
DOWN	10 – 11	Continuity

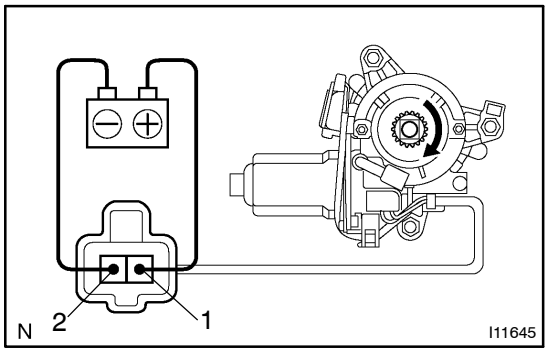
If continuity is not as specified, replace the switch.



2. INSPECT POWER MAIN RELAY CONTINUITY

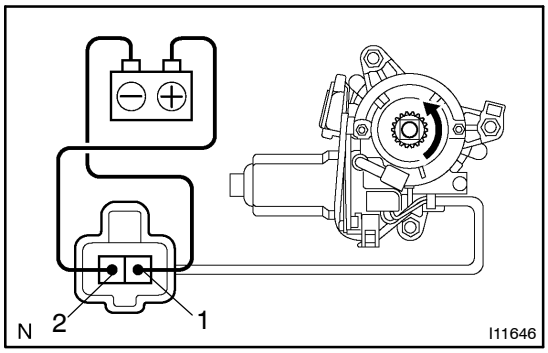
Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.



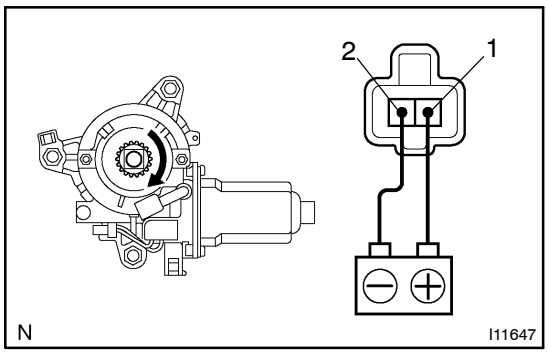
3. Driver's door: INSPECT POWER WINDOW MOTOR OPERATION

(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2, then check that the motor turns clockwise.



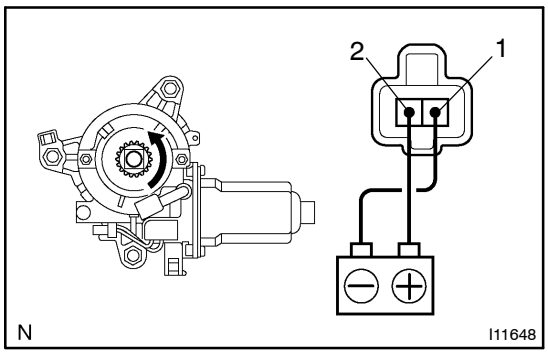
(b) Reverse the polarity, check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.



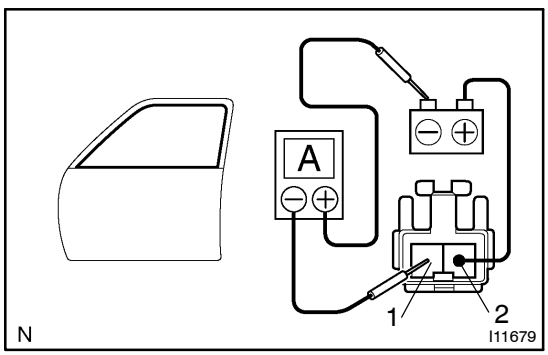
4. Passenger's door:
INSPECT POWER WINDOW MOTOR OPERATION

(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2, check that the motor turns clockwise.



(b) Reverse the polarity, and check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.



5. Driver's door:
INSPECT PTC OPERATION

(a) Disconnect the connector from the window motor.

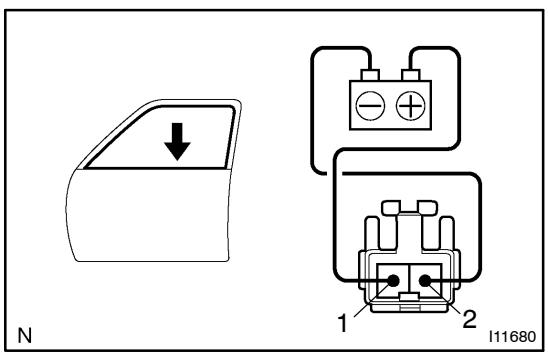
(b) Connect the ammeter positive (+) lead to terminal 1 of the wire harness side connector and the negative (–) lead to ammeter negative terminal of the battery.

(c) Connect the battery positive (+) lead to terminal 2 of the wire harness side connector, and raise the window to the fully closed position.

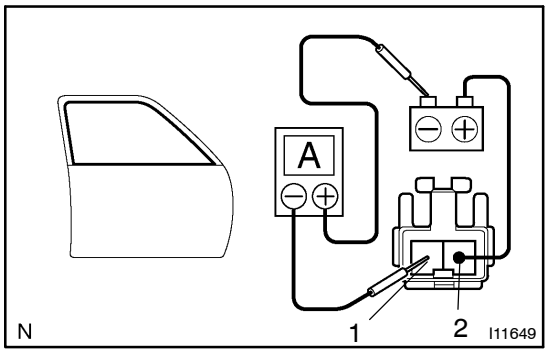
(d) Continue to apply voltage, and check that the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.

(e) Disconnect the leads from terminals.

(f) Approximately 90 seconds later, connect the battery positive (+) lead to terminal 1 and battery negative (–) lead to terminal 2, then check that the window begins to descend.

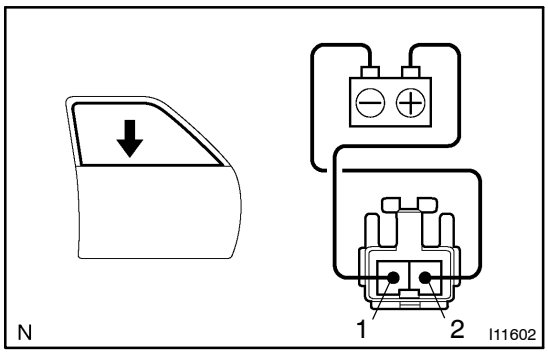


If operation is not as specified, replace the motor.



6. Passenger's door:
INSPECT PTC OPERATION

(a) Disconnect the connector from the power window switch.
(b) Connect the ammeter positive (+) lead to terminal 1 of the wire harness side connector and the ammeter negative (–) lead to negative terminal of the battery.
(c) Connect the positive (+) lead from the battery to terminal 2 of the wire harness side connector, and raise the window to the fully closed position.



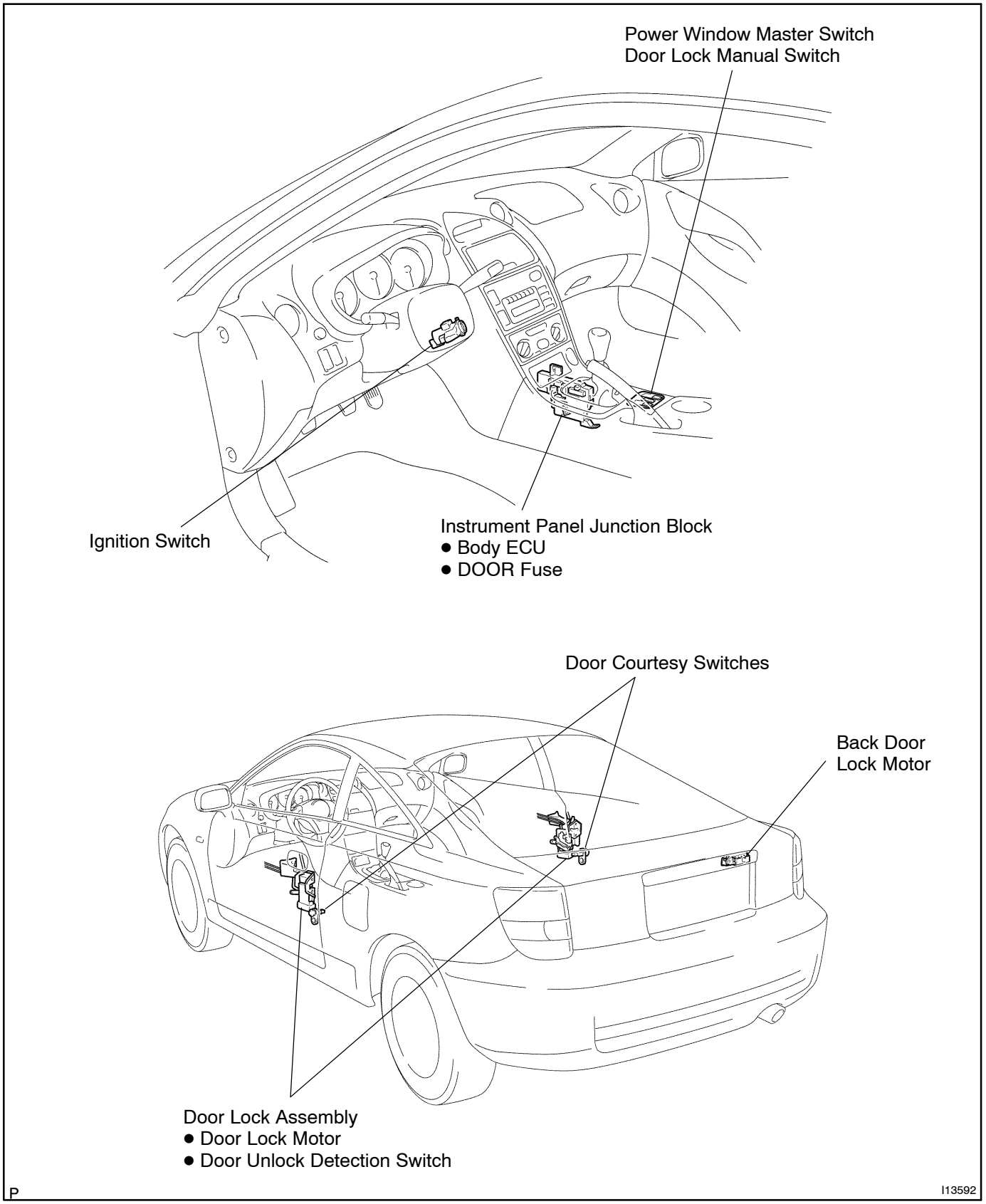
(d) Continue to apply voltage, and check that the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.
(e) Disconnect the leads from terminals.
(f) Approximately 90 seconds later, connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2, then check that the window begins to descend.

If operation is not as specified, replace the motor.

POWER DOOR LOCK CONTROL SYSTEM

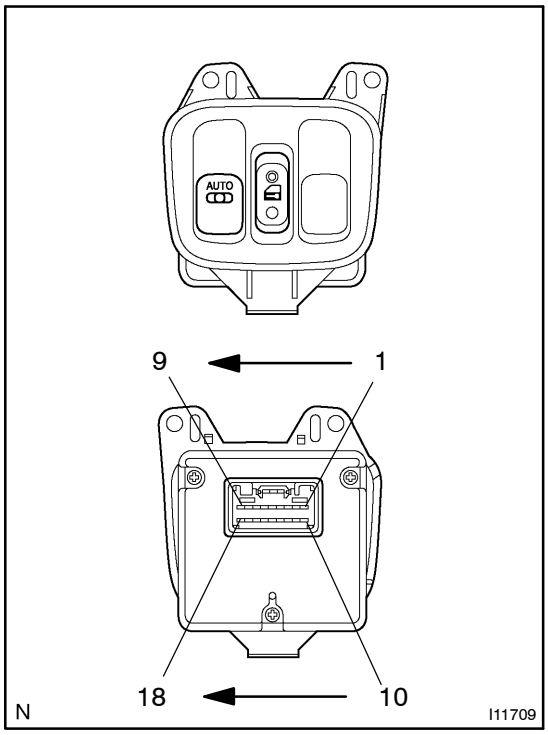
BE0PH–14

LOCATION



BE1D7–03

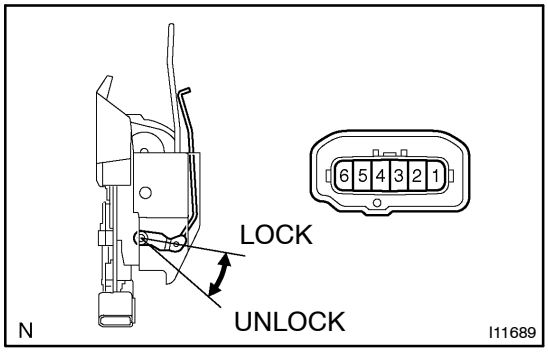
INSPECTION



1. Master switch:
INSPECT DRIVER'S DOOR LOCK CONTROL SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	5 – 17	Continuity
OFF	–	No continuity
UNLOCK	6 – 17	Continuity

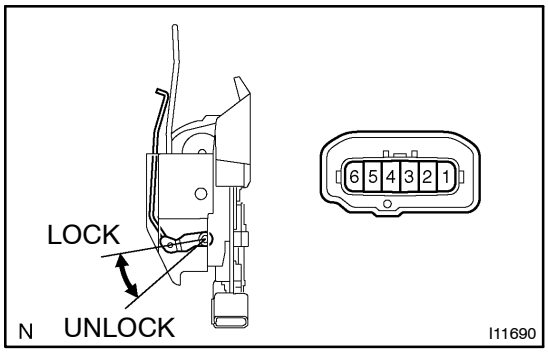
If continuity is not as specified, replace the switch.



2. Driver's door:
INSPECT DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	3 – 5	Continuity
OFF	–	No continuity
UNLOCK	3 – 6	Continuity

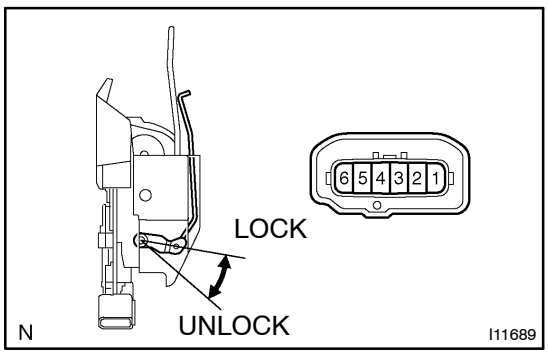
If continuity is not as specified, replace the switch.



3. Passenger's door:
INSPECT DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	2 – 4	Continuity
OFF	–	No continuity
UNLOCK	1 – 4	Continuity

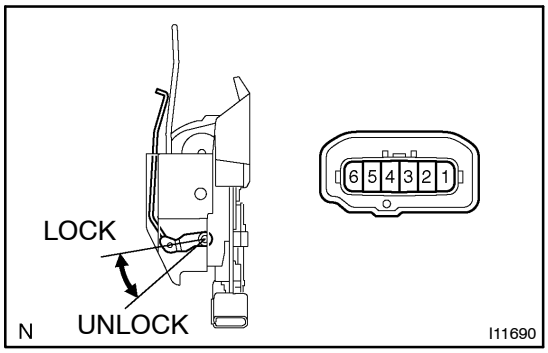
If continuity is not as specified, replace the switch.



4. Driver's door:
INSPECT DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF (Door Lock set to LOCK)	–	No continuity
ON (Door Lock set to UNLOCK)	3 – 4	Continuity

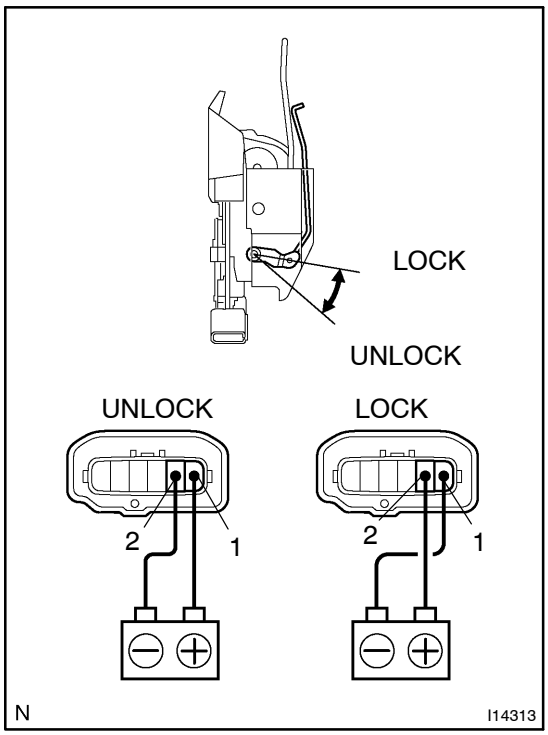
If continuity is not as specified, replace the switch.



5. Passenger's door:
INSPECT DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF (Door Lock set to LOCK)	–	No continuity
ON (Door Lock set to UNLOCK)	3 – 4	Continuity

If continuity is not as specified, replace the switch.

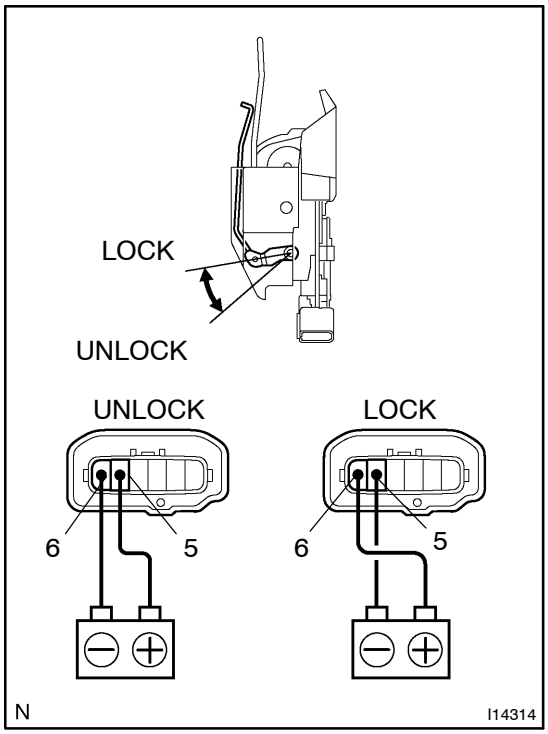


6. Driver's door:
INSPECT DOOR LOCK MOTOR OPERATION

(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2, and check that the door lock link moves to UNLOCK position.

(b) Reverse the polarity and check that the door lock link moves to LOCK position.

If operation is not as specified, replace the door lock assembly.

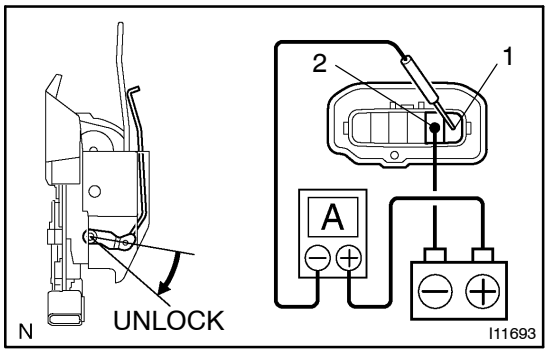


7. Passenger's door:
INSPECT DOOR LOCK MOTOR OPERATION

(a) Connect the battery positive (+) lead to terminal 5 and the battery negative (–) lead to terminal 6, and check that the door lock link moves to UNLOCK position.

(b) Reverse the polarity and check that the door lock link moves to LOCK position.

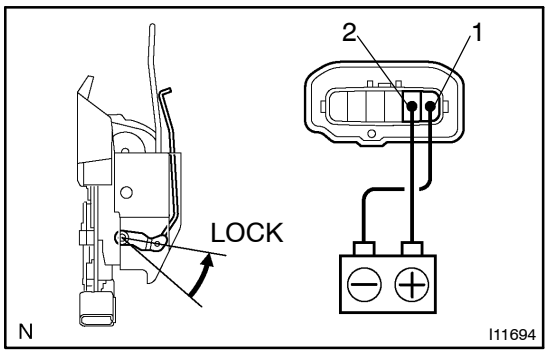
If operation is not as specified, replace the door lock assembly.



8. INSPECT DRIVER'S DOOR PTC THERMISTOR OPERATION

(a) Connect the battery negative (–) lead to terminal 2.

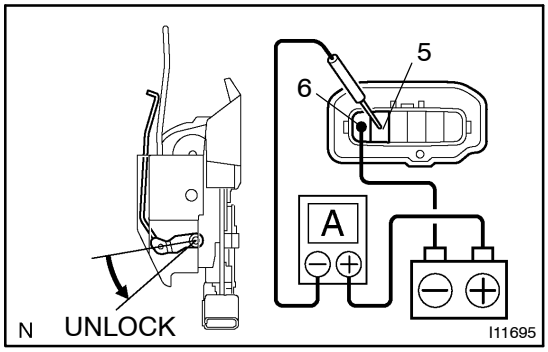
(b) Connect the ammeter positive (+) lead to terminal 1 and the ammeter negative (–) lead to battery negative (–) terminal, and check that the current changes from approximately 3.2 A to less than 0.5 A within 20 to 70 seconds.



(c) Disconnect the leads from terminals.

(d) Approximately 60 seconds later, connect the battery positive (+) lead to terminal 2 and the battery negative (–) lead to terminal 1, and check that the door lock moves to the LOCK position.

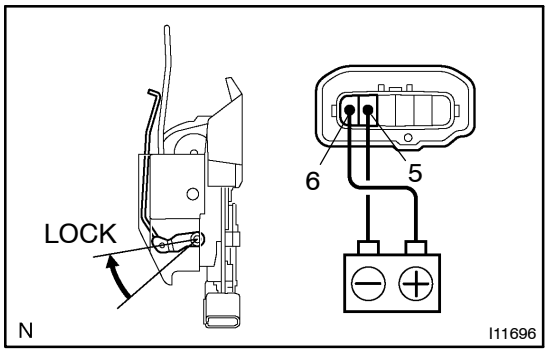
If operation is not as specified, replace the door lock assembly.



9. INSPECT PASSENGER'S DOOR PTC THERMISTOR OPERATION

(a) Connect the battery negative (–) lead to terminal 6.

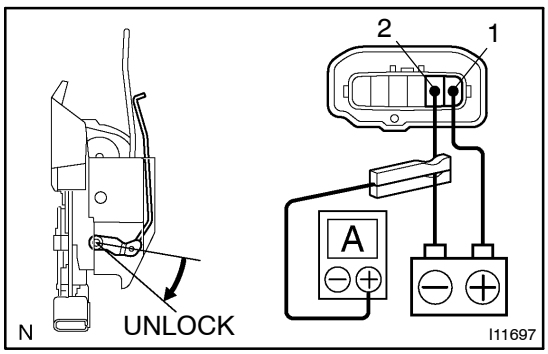
(b) Connect the ammeter positive (+) lead to terminal 5 and the ammeter negative (–) lead to the battery negative (–) terminal, and check that the current changes from approximately 3.2 A to less than 0.5 A within 20 to 70 seconds.



(c) Disconnect the leads from terminals.

(d) Approximately 60 seconds later, connect the battery positive (+) lead to terminal 6 and the battery negative (–) lead to terminal 5, and check that the door lock moves to the LOCK position.

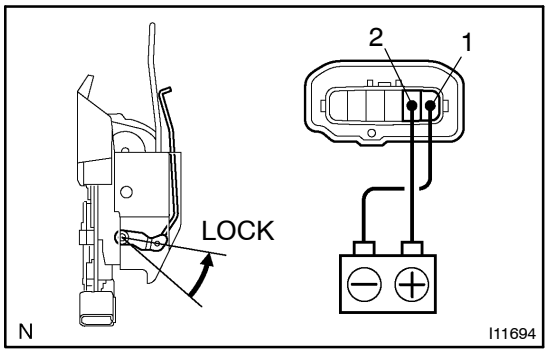
If operation is not as specified, replace the door lock assembly.



10. INSPECT DRIVER'S DOOR PTC THERMISTOR OPERATION

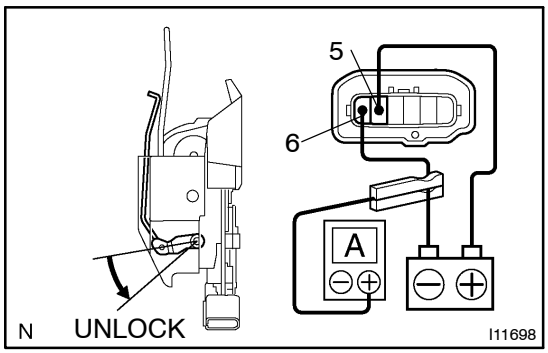
(a) Connect the battery positive (+) lead to terminal 1 and the battery negative (–) lead to terminal 2.

(b) Attach a current–measuring probe to either the positive (+) lead or the negative (–) lead, and check that the current changes from approximately 3.2 A to less than 0.5 A within 20 to 70 seconds.



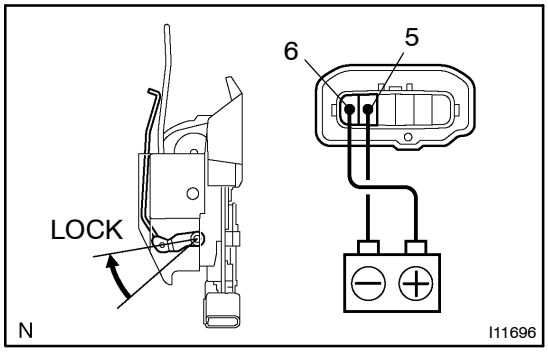
(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, reverse the polarity, and check that the door lock moves to the LOCK position.

If operation is not as specified, replace the door lock assembly.



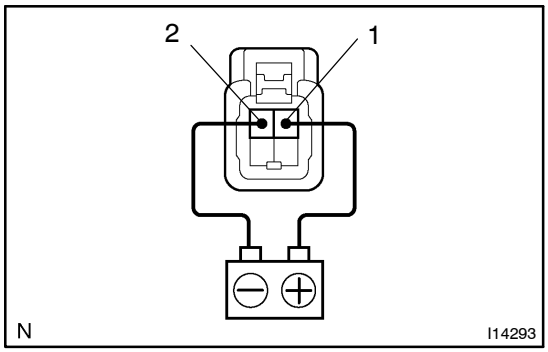
11. INSPECT PASSENGER'S DOOR PTC THERMISTOR OPERATION

(a) Connect the battery positive (+) lead to terminal 5 and the battery negative (–) lead to terminal 6.
(b) Attach a current–measuring probe to either the positive (+) lead or the negative (–) lead, and check that the current changes from approximately 3.2 A to less than 0.5 A within 20 to 70 seconds.



(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, reverse the polarity, and check that the door lock moves to the LOCK position.

If operation is not as specified, replace the door lock assembly.



12. INSPECT BACK DOOR LOCK MOTOR OPERATION

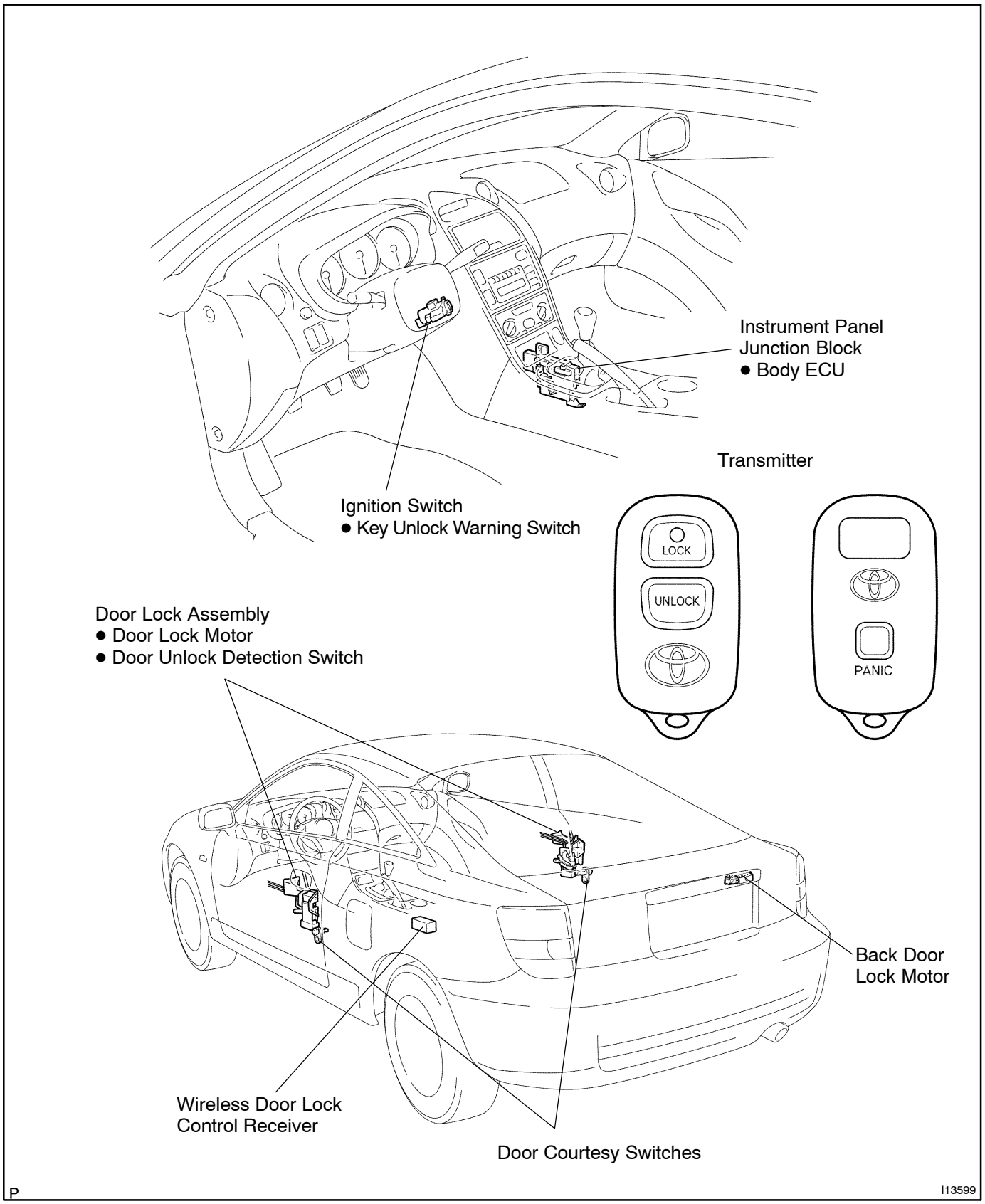
Connect the battery positive (+) lead to terminal 1 and the negative (–) lead to terminal 2, and check that the door lock link moves to UNLOCK position.

If operation is not as specified, replace the door lock assembly.

WIRELESS DOOR LOCK CONTROL SYSTEM

BE1D8–05

LOCATION



BE0IM–21

PRE–CHECK

Only wireless function (Remote control) does not operate.
(If a new transmitter or a transmitter of the same type that works properly with the vehicle is not available.)

Set the vehicle in the initialized condition:
The initialized condition is satisfied when the following conditions are met.
(1) The key plate is not inserted in the ignition key cylinder.
(2) All the doors are closed. (Door warning light is off.)
(3) All the doors are locked.

Basic function check:

Under the standard operation, check the UNLOCK–LOCK operation as operating the UNLOCK and LOCK switch 3 times or more alternately, check the UNLOCK–LOCK operation from 3rd time onward.
● Follow the procedure below to perform the standard operation.
(1) Keep about 1 M away from the outside handle of a driver's seat in the right direction.
(2) Face the transmitter toward the vehicle and press one of transmitter switches for about 1 sec.

Yes

Normal
<Reference>
● Operative distance may differ depending on the operator, the way of holding the transmitter or its position.
● As the transmitter uses weak wave, its operating range becomes narrowed when the weak wave is interrupted by noise.

No

Transmitter battery check:

Replace the transmitter battery with a new or normal one and check UNLOCK–LOCK function works under the standard operation.
<Reference>
● The battery should be replaced by only the shops with sufficient skill when new normal battery is necessary.
● Battery quality can be judged by checking the remnant volume of the battery.

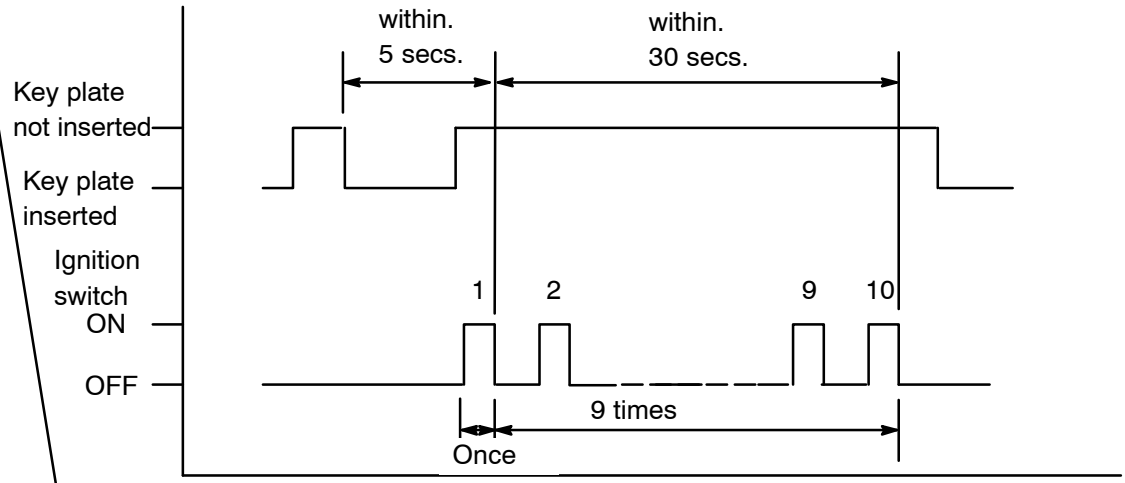
Yes → Battery faulty.

No

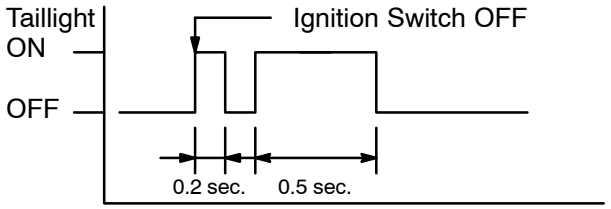
Set the vehicle in the initialized condition.

Inspection start by using self diagnostic mode:

Enter into the self diagnostic mode.
If operating door control receiver in the order of 1 to 2, the mode turns to diagnostic mode.
(1) Insert the key plate in the ignition key cylinder and then pull it out, then insert it again and turn the ignition switch
OFF → ON → OFF once within 5 seconds after pulling out.
(2) After completing the procedure within 30 seconds, turn the ignition switch OFF → ON → OFF 9 times.
HINT:
In the case that either of (1) and (2) conditions is not satisfied, transfer to normal mode.
<Reference>
When completing self diagnostic mode, turn the ignition switch ON.
LOCK and UNLOCK operation cannot be performed under the self diagnostic mode.



Diagnostic mode operation confirmation:
Check the taillight comes on soon after the input operation of self diagnostic mode.



No

Is the method to input the diagnostic mode correct?

No

Yes

(Not enter in diagnostic mode)

Is the function of operation confirmation taillight normal?

No

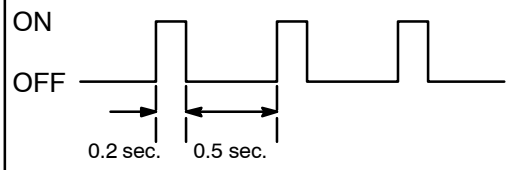
Yes

Taillight faulty.

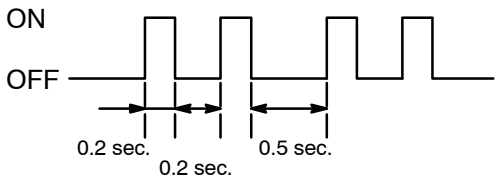
Yes

Confirmation of diagnostic mode:
Check the taillight comes on when pressing on each switch of the transmitter.

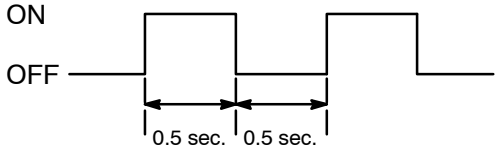
(1) Received normal wave of LOCK switch.



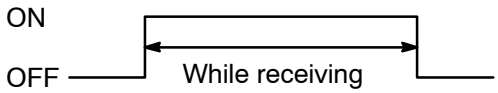
(2) Received normal wave of UNLOCK switch.



(3) Received normal wave of PANIC switch.



(4) Compatibility of the recognition code or out from synchronization of rolling code.*.

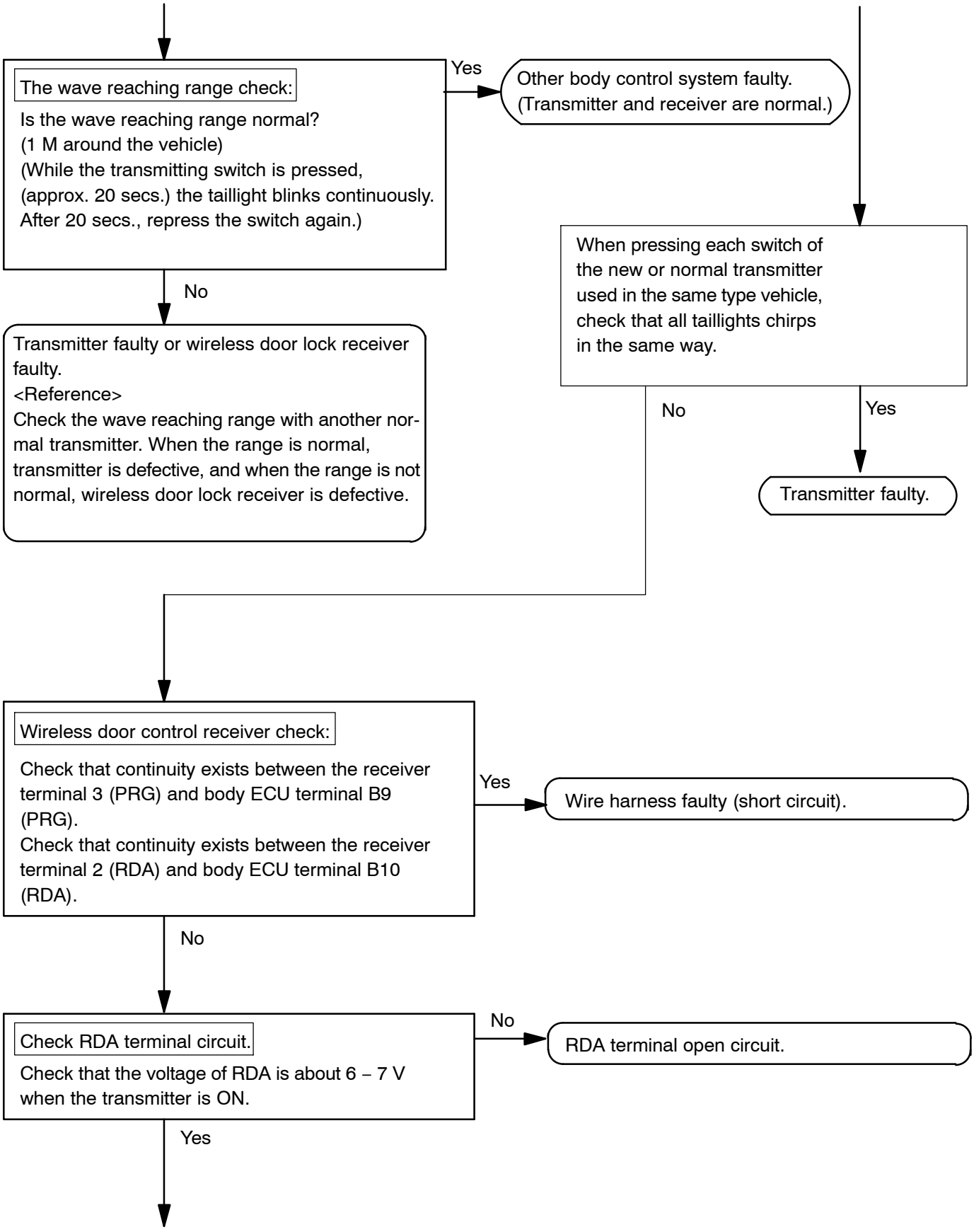


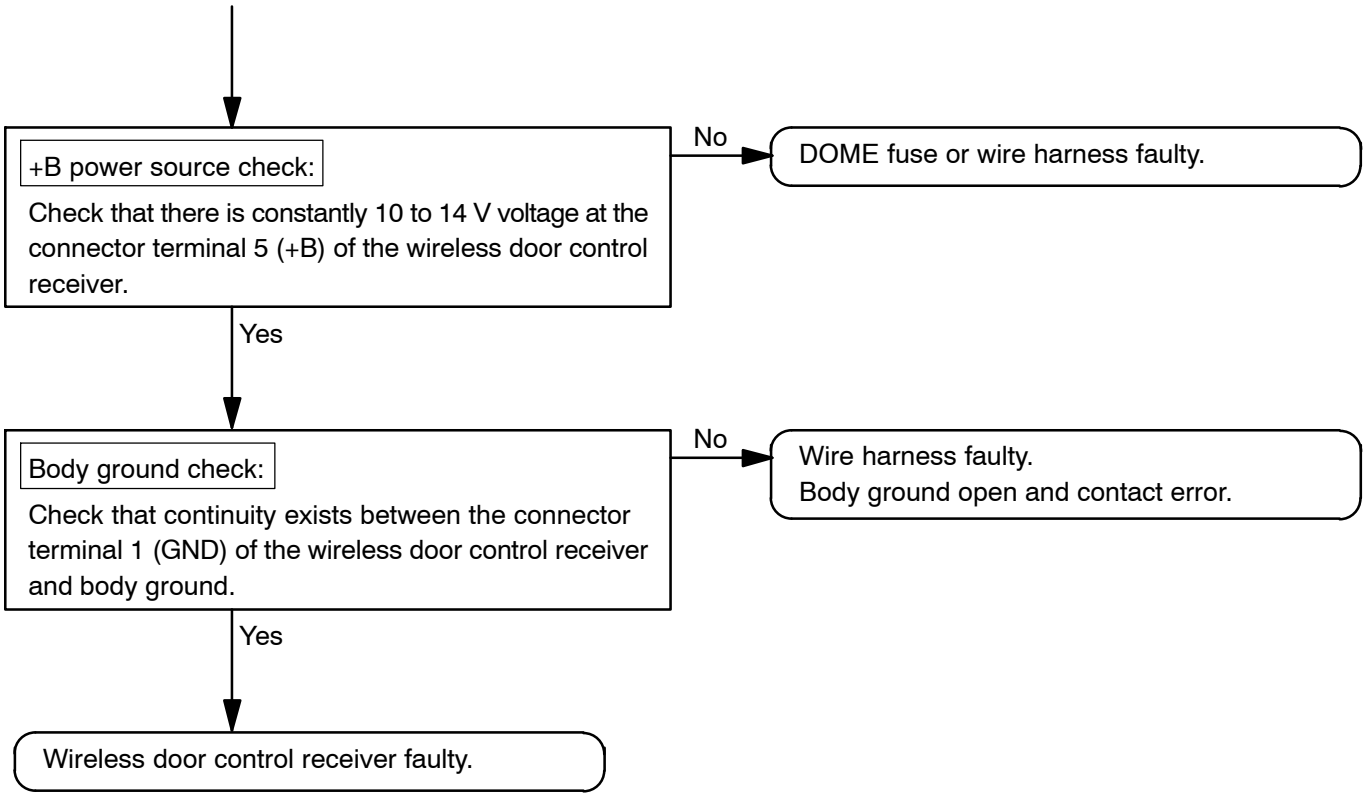
No response

Transmitter faulty or wireless door lock receiver faulty.
<Reference>
- Use another (normal) transmitter and check with the diagnostic mode, and if the check result shows the transmitter faulty, the wireless door lock receiver can be judged normal.

In the case of taillight outputs from (1) – (3)

In the case of taillight outputs of (4)


The wave reaching range check:
Is the wave reaching range normal?
(1 M around the vehicle)
(While the transmitting switch is pressed,
(approx. 20 secs.) the taillight blinks continuously.
After 20 secs., repress the switch again.)
Yes
Other body control system faulty.
(Transmitter and receiver are normal.)
No
Transmitter faulty or wireless door lock receiver faulty.
<Reference>
Check the wave reaching range with another normal transmitter. When the range is normal, transmitter is defective, and when the range is not normal, wireless door lock receiver is defective.
When pressing each switch of the new or normal transmitter used in the same type vehicle, check that all taillights chirps in the same way.
No
Yes
Transmitter faulty.
Wireless door control receiver check:
Check that continuity exists between the receiver terminal 3 (PRG) and body ECU terminal B9 (PRG).
Check that continuity exists between the receiver terminal 2 (RDA) and body ECU terminal B10 (RDA).
Yes
Wire harness faulty (short circuit).
No
Check RDA terminal circuit.
Check that the voltage of RDA is about 6 – 7 V when the transmitter is ON.
No
RDA terminal open circuit.
Yes


+B power source check:
Check that there is constantly 10 to 14 V voltage at the connector terminal 5 (+B) of the wireless door control receiver.
No
DOME fuse or wire harness faulty.
Yes
Body ground check:
Check that continuity exists between the connector terminal 1 (GND) of the wireless door control receiver and body ground.
No
Wire harness faulty.
Body ground open and contact error.
Yes
Wireless door control receiver faulty.

BE0OJ–15

INSPECTION

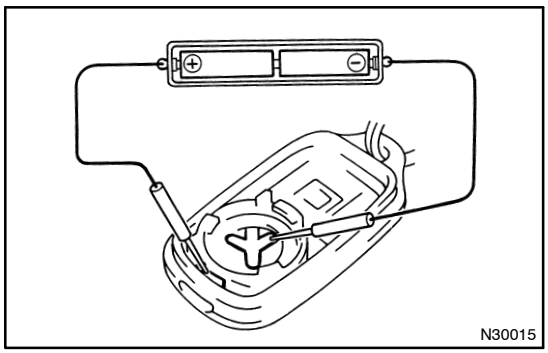
1. INSPECT WIRELESS DOOR LOCK TRANSMITTER OPERATION

HINT:

Refer to ”Wireless door lock control receiver and transmitter replacement” on page BE–79.

(a) Using a screwdriver, remove the screw and the cover.

(b) Remove the battery (lithium battery).



(c) Install a new or normal battery (lithium battery).

HINT:

When a new or normal battery can not be obtained, connect 2 new 1.5 V batteries in series, and connect the battery (+) to the battery receptacle side terminal and battery (–) to the bottom terminal, then apply 3 V voltage to the transmitter.

(d) In the location approx. 1 M away from driver’s outside handle in the right direction, check the transmitter operation as pressing transmission switch on the surface of the transmitter body.

Standard:

Remote control of the vehicle door lock can be operated.

HINT:

- The minimum operation distance differs depending on the operator, the way of holding the transmitter, and location.
- As the transmitter uses weak wave, its operating range becomes narrowed when the weak wave is interrupted by noise.

(e) Install the battery (lithium battery).

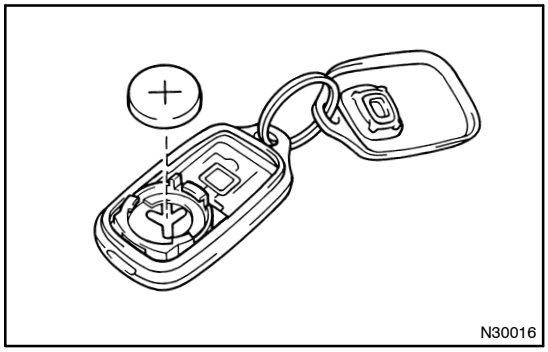
(f) Install the cover so that O–ring is not distorted or slipped off.

(g) Using a screwdriver, tighten the screw.

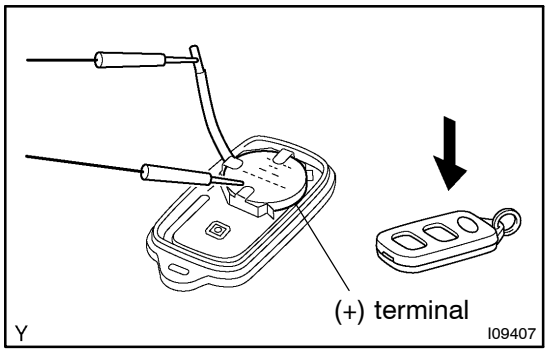
2. CHECK BATTERY CAPACITY

HINT:

- Make sure to use the TOYOTA electrical tester.
- Without loading the battery, judge can not be made whether the battery is available or not on the test.
- When the transmitter is faulty, the energy amount left in the battery might not be checked correctly.
- On the lithium battery used for the transmitter, the voltage more than 2.5 V with the battery unloaded is shown on the tester until the energy is completely consumed.
  Accordingly, when inspecting the energy amount left in the battery, it is necessary to measure the voltage when the battery is loaded. (1.2 kΩ).



(a) Remove the screw and the cover using a (–) driver.
(b) Remove the battery (lithium battery) from the transmitter.
(c) Connect the lead to the (–) terminal of the transmitter and install the battery.

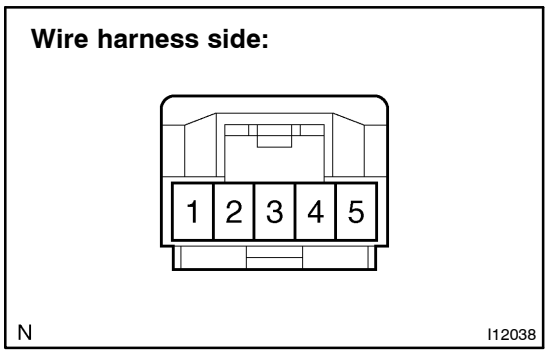


(d) Connect (+) tester to the (+) battery (lithium battery), and (–) tester to the lead respectively.
(e) Press one of the transmitting switches on the transmitter for approx. 1 second.
(f) Press the transmitting switch on the transmitter again to check the voltage.
Standard: 2.1 V or more

HINT:

- When the temperature of the battery is low, the judgement can not be made correctly.
  When the outcome of the test is less than 2.1 V, conduct the test again after leaving the battery in the place at 18 °C for more than 30 minutes.
- By the auto power off function, the voltage becomes no load voltage (more than 2.5 V) condition after 20 seconds from the switch was pressed.
  Make sure to read the voltage beforehand.
- High voltage might be shown 1 to 2 times after leaving the battery, and the judgement should be made with the voltage shown at the 3rd time or later.

(g) Disconnect the lead.
(h) Set the battery (lithium battery) in the transmitter.
(i) Install the cover, so that the O–ring is not distorted or slipped off.
(j) Using a screwdriver, tighten the screw.

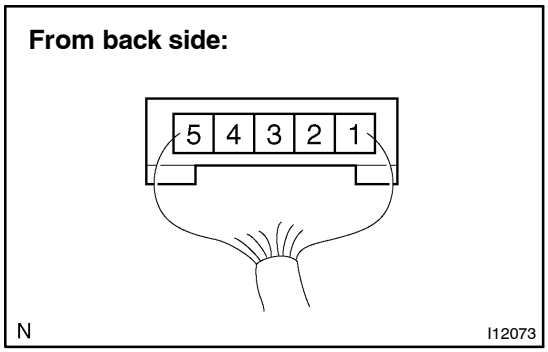


3. INSPECT WIRELESS DOOR LOCK CONTROL RECEIVER CIRCUIT

(a) Disconnect the connector from the receiver and inspect the connector on the wire harness side as shown below.

Tester connection	Condition	Specified condition
1 – Ground	Always	Continuity
5 – Ground	Always	Battery voltage

If the circuit is not as specified, inspect the circuit connected to other parts.



(b) Connect the wire harness side connector to the receiver and inspect the wire harness side connector from the back side as shown below.

Tester connection	Condition	Specified condition
3 – Ground	Normal mode	10 – 14 V
2 – Ground	Ignition switch position OFF Key removed Transmitter ON	About 6 – 7 V

If circuit is as specified, replace the receiver.
If the circuit is not as specified, inspect the circuit connected to other parts.

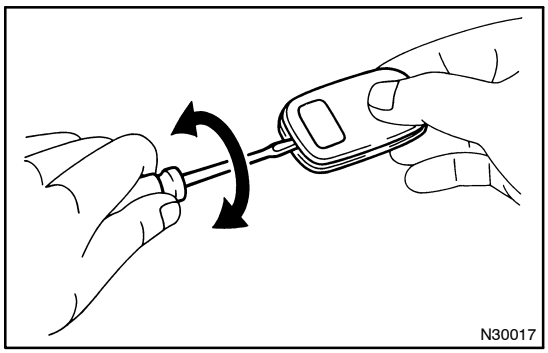
BE1D9–04

REPLACEMENT

1. REPLACE TRANSMITTER (LITHIUM) BATTERY

NOTICE:

Special caution should be taken for handling each component as they are precision electronic components.



(a) Using a screwdriver, remove the cover.

NOTICE:

Do not pry out the cover forcibly.

HINT:

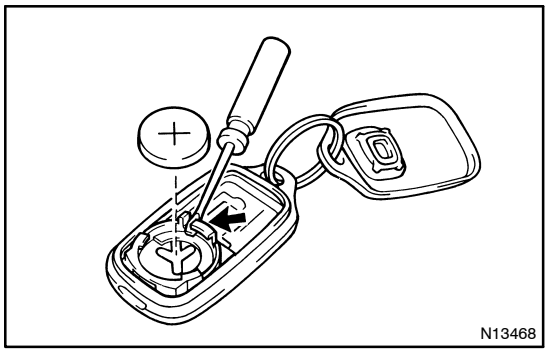
Push the cover with fingers as shown in the illustration, to make a chink, and then pry out the cover from that chink using a screwdriver.

(b) Remove the transmitter.

(c) Remove the battery (lithium battery).

NOTICE:

- **Do not push the terminals with fingers.**
- **If prying up the battery (lithium battery) forcibly to remove, the terminals are deformed.**



(d) Install a battery (lithium battery) as shown in the illustration.

NOTICE:

Face the battery upward. Take care not to deform the terminals.

(e) Assemble the transmitter to the key plate and the cover.

2. REPLACE DOOR CONTROL RECEIVER AND TRANSMITTER

NOTICE:

When replacing the door control receiver and the transmitter, registration of the recognition code is necessary because they are provided as a single components.

(a) Select which operation mode should be performed from the following modes.
- Add mode
- Rewrite mode
- Prohibition mode
- Confirmation mode

HINT:
- The add mode is used to retain codes already registered while you register new recognition codes. This mode is used when adding a transmitter. However, if the number of registered codes exceeds 4 codes, previously registered codes are erased in order, starting from the first registered code.
- The rewrite mode is used to erase all previously registered codes and register only new recognition codes.
- The prohibition mode is used to erase all registered codes and cancels the wireless door lock function. Use this mode when the transmitter is lost.
- The confirmation mode is for confirming how many recognition codes are already registered before you register additional recognition codes.

(b) Follow the chart on the following pages to register the transmitter recognition code at the wireless door lock control receiver.

HINT:
- When procedure is out of the specified, the operation returns to normal operation.
- Maximum of 4 recognition codes can be registered.

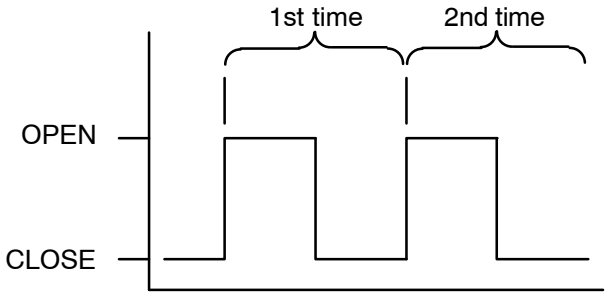
Start registration of recognition code

The vehicle should be in the following conditions.
- The key is not inserted in the ignition key cylinder.
- Driver's door is OPEN. (Other doors are CLOSED)
- Driver's door is UNLOCKED.

Insert the key into the ignition key cylinder, then pull it out. (Repeat this twice within 5 seconds)

Within 40 secs.

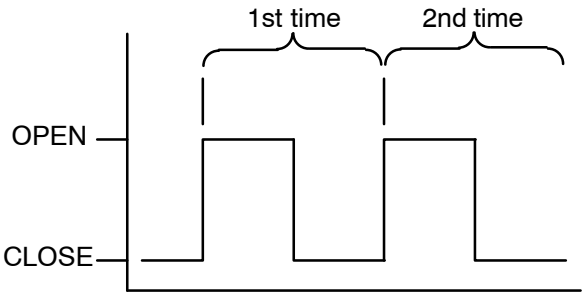
Open and close the door (manual operation) 2 times.



Insert the key into the ignition key cylinder, then pull it out.

Within 40 secs.

Again open and close the door (manual operation) 2 times.

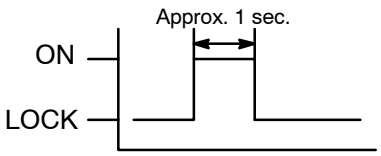


Close the all door and insert the key into the ignition key cylinder.

Turn the ignition switch from ON to LOCK at approx. 1 sec. interval 1 to 5 times to select the mode.

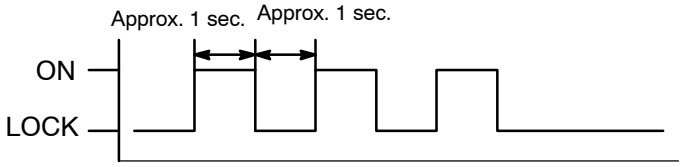
Add mode

ON – LOCK change occurs 1 time



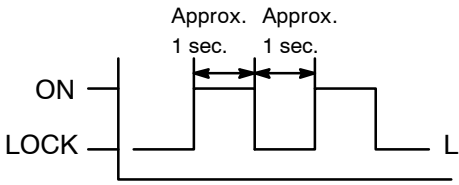
Confirmation mode

ON – LOCK change occurs 3 times



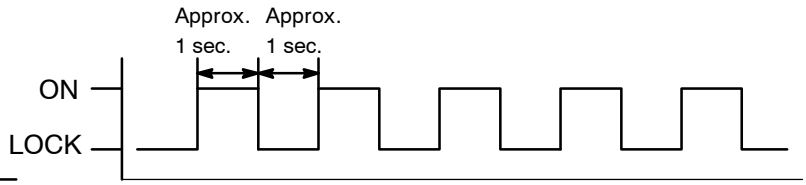
Rewrite mode

ON – LOCK change occurs 2 times



Prohibition mode

ON – LOCK change occurs 5 times



Pull out the key from the ignition key cylinder.

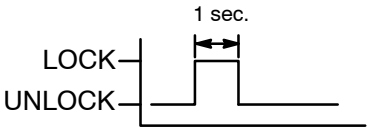
Within 3 secs.

When add mode or rewrite mode is selected.

Door control relay automatically performs the LOCK–UNLOCK operation once or twice at 1 sec. interval to inform the operator that either the add mode or rewrite mode has been selected.

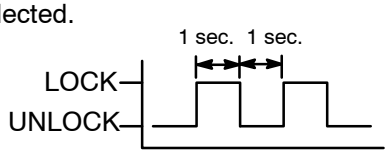
LOCK–UNLOCK occurs once

Indicates that add mode has been selected.



LOCK–UNLOCK occurs twice

Indicates that rewrite mode has been selected.

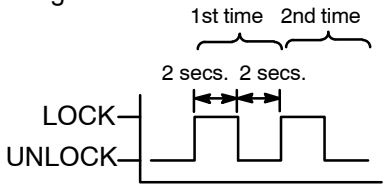


When prohibition mode is selected.

When confirmation mode is selected.

Door control relay automatically performs the LOCK–UNLOCK operation 1 to 4 times at 2 sec. interval to inform the operator of the number of the registered codes.
HINT:
When the number of the registered code is 0, the operation is automatically performed 5 times.

Example:
When the operation is performed twice, it indicates that 2 types of recognition codes are registered.

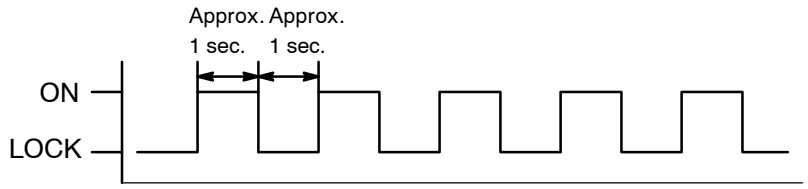


Registration of recognition code (Confirmation mode and prohibition mode) is completed.

When prohibition mode is selected.

Within 40 secs.

Door control relay performs LOCK–UNLOCK operation 5 times at a 1 sec. interval to inform the operator that prohibition mode has been selected.



Press the lock and unlock switches on the transmitter switch simultaneously for less than 1.5 sec.

Within 3 secs.

Press either one of 2 switches on the transmitter.

Within 3 secs.

Door control relay automatically performs LOCK–UNLOCK operation once or twice at a 1 sec. interval to inform the operator that the receiver has received the signal from the transmitter.

LOCK–UNLOCK occurs once

Registration of recognition code is completed

LOCK–UNLOCK occurs twice

Registration of recognition code has not been completed.

- Recognition code received first time and second time did not match.
- When selecting add mode, an already registered recognition code was received.

If LOCK–UNLOCK operation cannot be performed at all, the mode returns to the normal mode, then start with ”Start registration of recognition code”.

Proceed to finish registration

Proceed to continue registration

Within 40 secs.

If even one of the following conditions is satisfied, registration of recognition codes is completed.

- 40 secs. elapses since the door control relay response.
- The driver’s door is opened.
- The key plate is inserted in the ignition key cylinder.
- 4 type recognition codes are registration at one time.

Registration of recognition codes (add mode or rewrite mode) is completed.

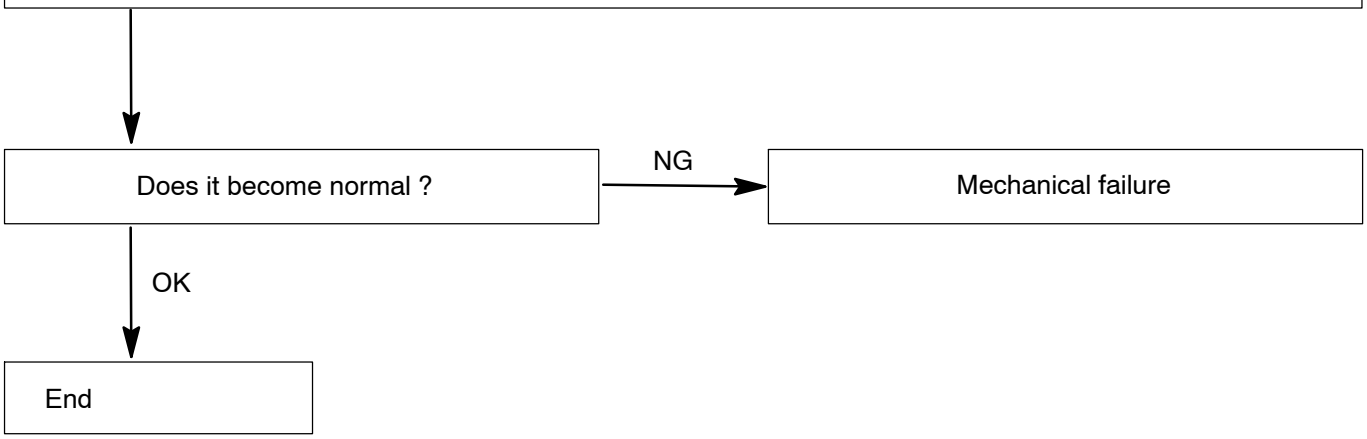
SLIDING ROOF SYSTEM

TROUBLESHOOTING

BE0O9–10

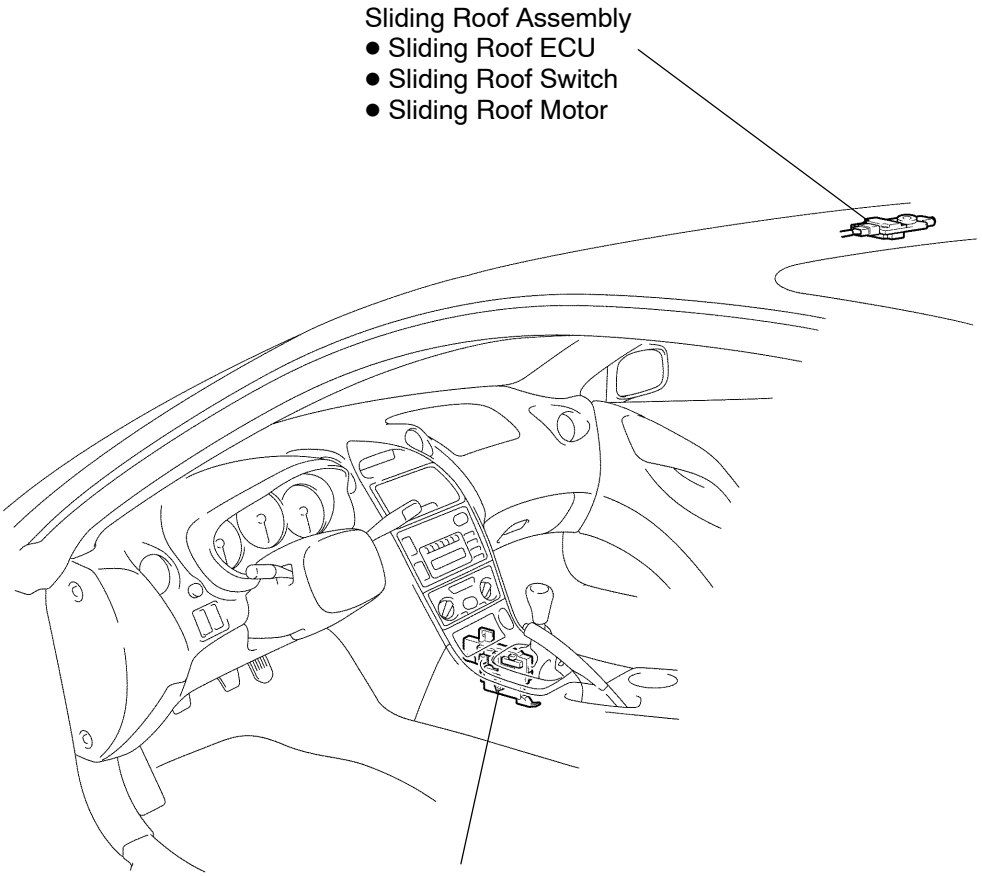
Sliding roof cannot be closed and reverses in error for some reason.

1. Operate the corresponding switch continuously for 10 sec, or more from the starting point of the reverse motion.
2. This shifts it to the manual operation in which the jam protection system is prohibited. (with the ignition ON)
3. In the manual operation, close the sliding roof completely and stop the motion.
4. The fully closed position will be detected by ECU.(Initialization)



BE0PJ–05

LOCATION

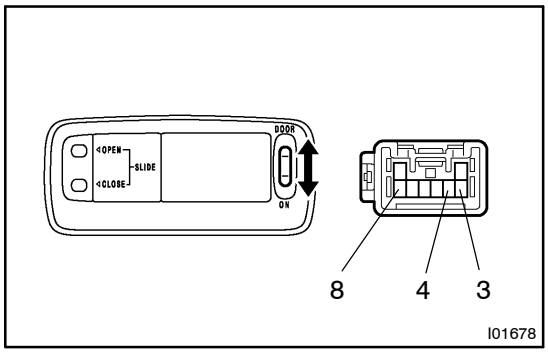


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I13593

BE1DA–05

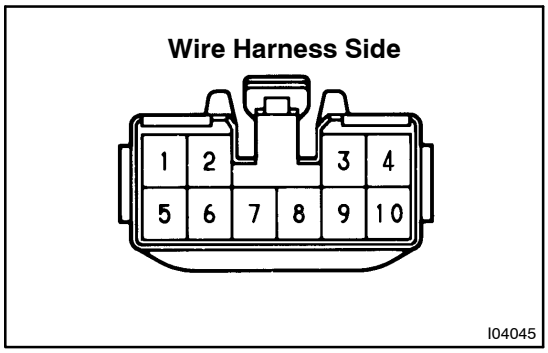
INSPECTION



1. INSPECT SLIDING ROOF SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OPEN	3 – 8	Continuity
OFF	–	No continuity
CLOSE	4 – 8	Continuity

If continuity is not as specified, replace the switch.



2. INSPECT SLIDING ROOF CONTROL ASSEMBLY CIRCUIT

Disconnect the connector from the ECU and inspect the connector on the wire harness side, as shown in the chart.

Tester connection	Condition	Specified condition
1 – Ground	Constant	Continuity
2 – Ground	Ignition switch LOCK or ACC	No voltage*
2 – Ground	Ignition switch ON	Battery positive voltage
5 – Ground	Constant	Battery positive voltage
7 – Ground	Constant	Continuity
6 – Ground	Constant	No continuity
8 – Ground	Ignition switch LOCK or ACC	No voltage
8 – Ground	Ignition switch ON	Battery positive voltage
9 – Ground	Sliding roof control switch CLOSE/DOWN	No continuity
9 – Ground	Sliding roof control switch OPEN/UP	Continuity
10 – Ground	Sliding roof control switch OPEN/UP	No continuity
10 – Ground	Sliding roof control switch CLOSE/DOWN	Continuity

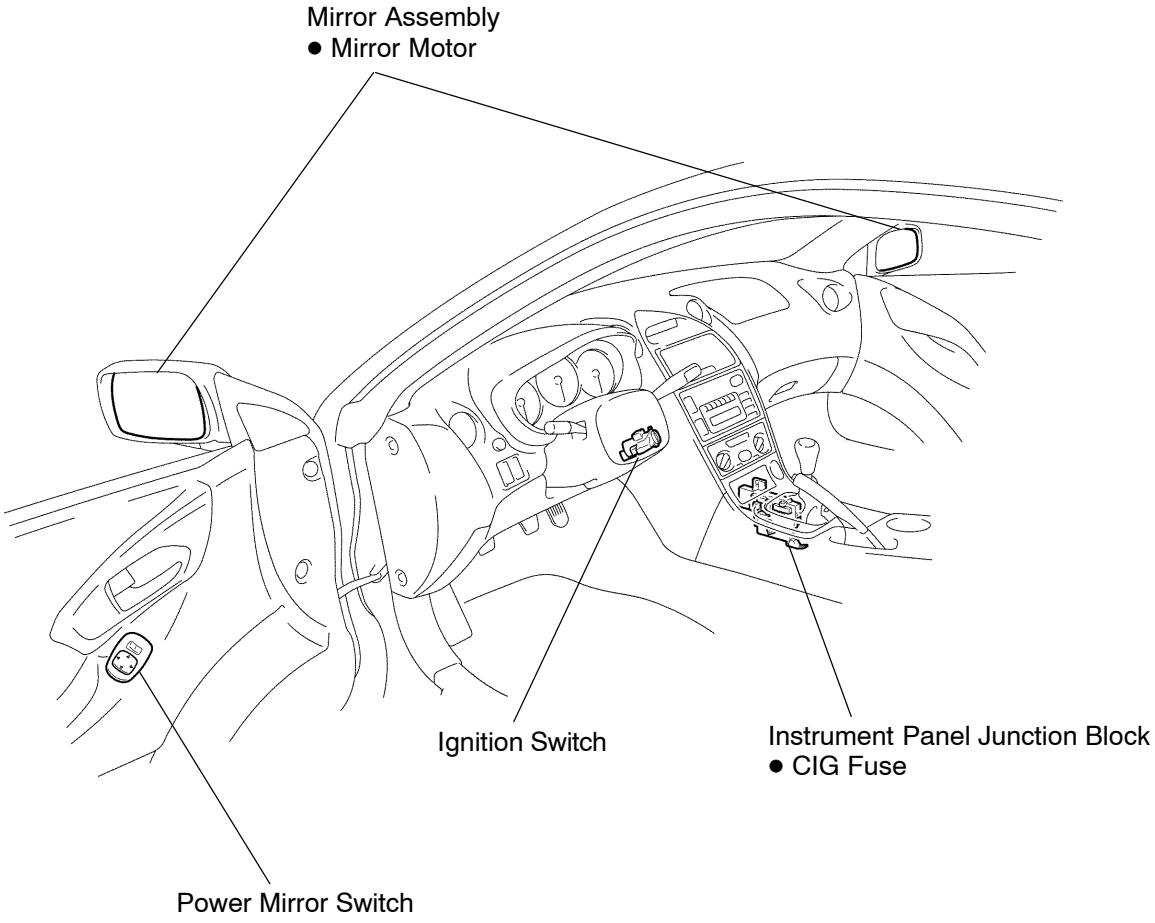
*: Exceptions: Within 43 seconds after the ignition switch ON → OFF (ACC) or until driver or passenger door is opened after the ignition switch ON → OFF (ACC).

If the circuit is not as specified, replace the assembly.

POWER MIRROR CONTROL SYSTEM

BE0PL–14

LOCATION

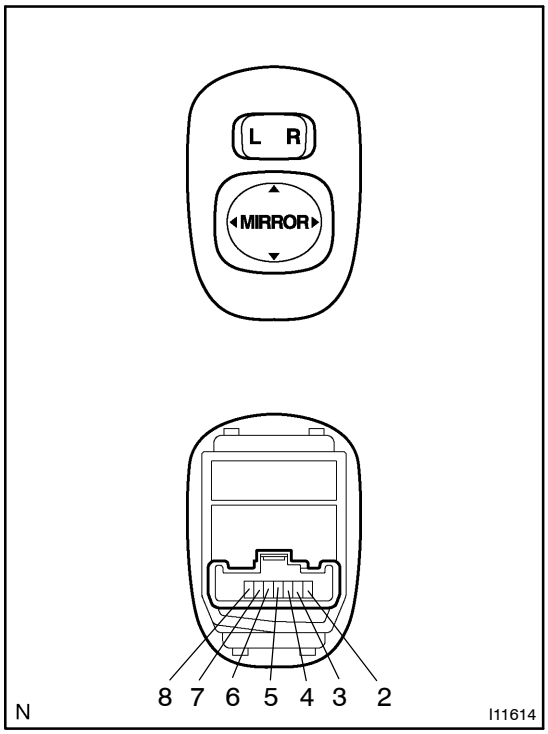


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BE1DB–13

INSPECTION



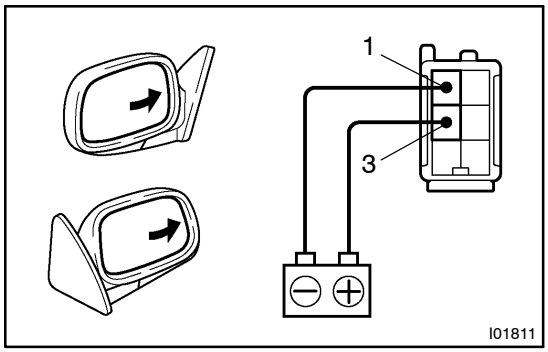
1. INSPECT LEFT SIDE MIRROR SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF	–	No continuity
UP	4 – 8 6 – 7	Continuity
DOWN	4 – 7 6 – 8	Continuity
LEFT	5 – 8 6 – 7	Continuity
RIGHT	5 – 7 6 – 8	Continuity

2. INSPECT RIGHT SIDE MIRROR SWITCH CONTINUITY

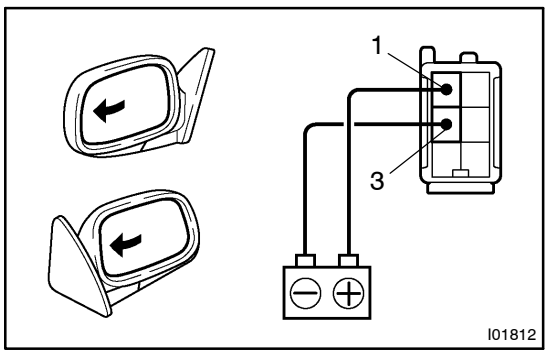
Switch position	Tester connection	Specified condition
OFF	–	No continuity
UP	3 – 8 6 – 7	Continuity
DOWN	3 – 7 6 – 8	Continuity
LEFT	2 – 8 6 – 7	Continuity
RIGHT	2 – 7 6 – 8	Continuity

If continuity is not as specified, replace the switch.
If continuity is as specified, inspect the switch circuit.

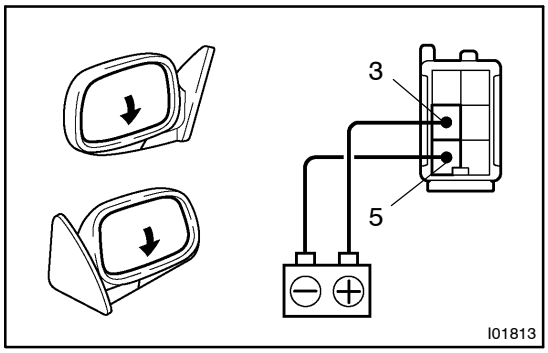


3. INSPECT MIRROR MOTOR OPERATION

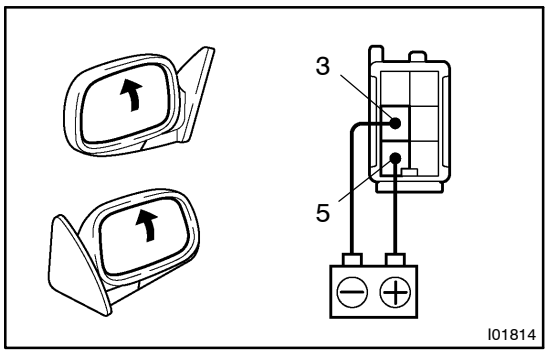
(a) Connect the battery positive (+) lead from the battery to terminal 3 and the battery negative (–) lead to terminal 1, and check that the mirror turns right side.



(b) Reverse the polarity, and check that the mirror turns left side.



(c) Connect the battery positive (+) lead to terminal 3 and the battery negative (–) lead to terminal 5, and check that the mirror turns downward.



(d) Reverse the polarity, and check that the mirror turns to the upward.

If operation is not as specified, replace the mirror assembly.

AUDIO SYSTEM

DESCRIPTION

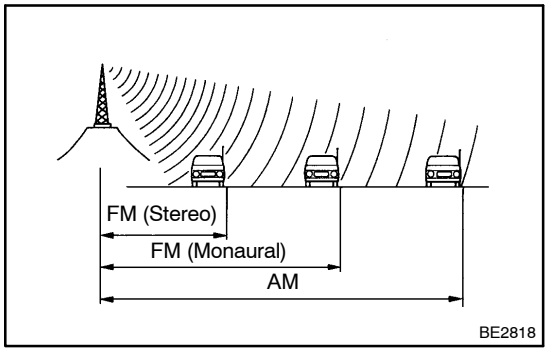
BE2FE–03

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM ⟷		FM ⟷	
Modulation method	Amplitude modulation			Frequency modulation	

LF: Low frequency MF: Medium Frequency HF: High Frequency VHF: Very High Frequency

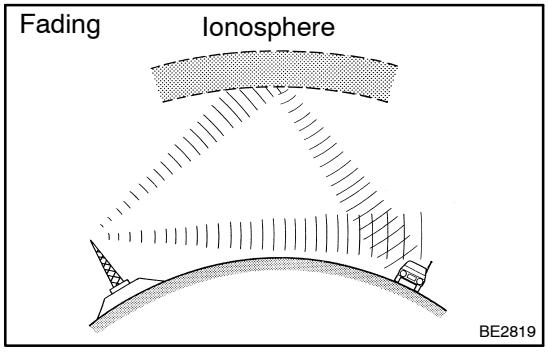


2. SERVICE AREA

There are great differences in the size of the service area for AM and FM monaural. Sometimes FM stereo broadcasts cannot be received even through AM comes in very clearly.
Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference (”noise”) easily.

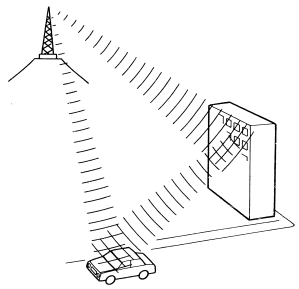
3. RECEPTION PROBLEMS

Besides the problem of static, there are also the problems called ”fading”, ”multipath” and ”fade out”. These problems are caused not by electrical noise but by the nature of the radio waves themselves.



- Fading
  Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals from the same transmitter that reach the vehicle’s antenna directly. This type of interference is called ”fading”.

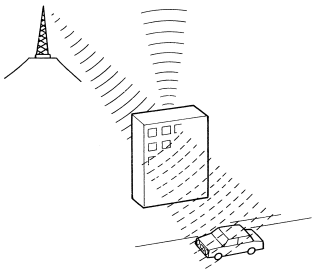
Multipath



BE2820

- Multipath
  One type of interference caused by bouncing of radio waves off obstructions is called ”multipath”. Multipath occurs when a signal from the broadcast transmitter antenna bounces off buildings and mountains and interferes with the signal that is received directly.

Fade Out



BE2821

- Fade Out
  Because FM radio waves are higher frequencies than AM radio waves, they bounce off buildings, mountains, and other obstructions. For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstructions. This is called ”fade out”.

4. NOISE PROBLEMS

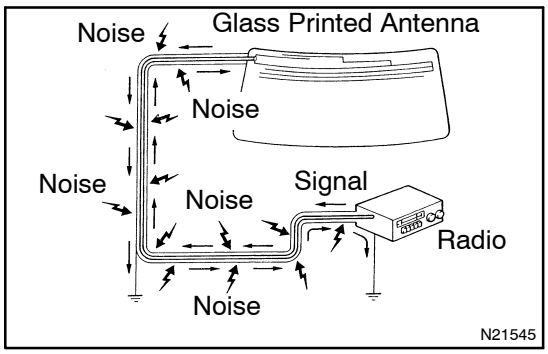
(a) Questionnaire for noise:
It is very important for noise troubleshooting to have good understanding of the claims from the customers, so make the best use of following questionnaire and diagnose the problem accurately.

AM	Noise occurs at a specific place.	Strong possibility of foreign noise.
	Noise occurs when listening to faint broadcasting.	There is a case that the same program is broadcasted from different local stations, and you are listening to different station even if the program is the same.
	Noise occurs only at night.	Strong possibility of the beat from a distant broadcasting.
FM	Noise occurs at a specific place while driving.	Strong possibility of multipath noise and fading noise caused by the changes of FM waves.

HINT:
If the condition when the noise occurs does not meet any of the above, find out the cause based on ”Reception Problems”. Refer to the description about Multipath and Fading mentioned previously.

(b) Matters that require attention when checking:

- Noise coming into the radio usually has no harm for practical use as the noise protection is taken which prevent an extremely loud noise to come in. When extremely loud noise comes into the radio, check if the grounding is normal where the antenna is installed.
- Check if all the regular noise prevention parts are properly installed and if there is any installation of non–authorized parts and non–authorized wiring.
- If you leave the radio out of tune (not tuning), it is easy to diagnose the phenomenon as noise occurs frequently.



(c) Antenna and noise:

Electronic signal received by the antenna will reach to the radio transmitted through the core wire of the coaxial cable. Any noise wave other than radio wave is mixed into this core wire, that causes noise in the radio and poor sound quality. In order to prevent these noises from mixing into the radio, the core wire inside the coaxial cable is covered with a mesh wire called shield wire. This shield wire shelters the noise and transmits it to the ground and thus preventing noise from mixing in. If this shield wire has grounding failure, that causes noise.

5. COMPACT DISC PLAYER

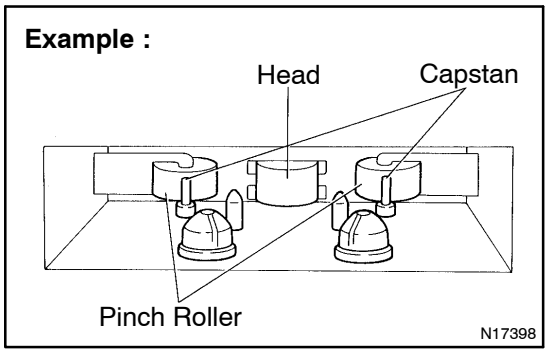
Compact Disc Players use a laser beam pick–up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc.

HINT:

Never attempt to disassemble or oil any part of the player unit. Do not insert any object other than a disc into the magazine.

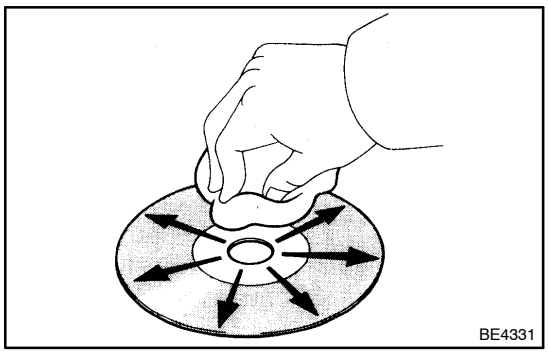
NOTICE:

CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.



6. Tape Player/Head Cleaning:
MAINTENANCE

(a) Raise the cassette door with your finger.
(b) Using a pencil or similar object, push in the guide.
(c) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, the pinch rollers and the capstans.



7. CD Player/Disc Cleaning:
MAINTENANCE

If disc gets dirty, clean the disc by wiping the surface from the center to outside radially with a soft cloth.

NOTICE:

Do not use a conventional record cleaner or anti–static preservative.

8. OUTLINE OF AVC–LAN

(a) What is AVC–LAN?

AVC–LAN is the abbreviation, which stands for Audio Visual Communication–Local Area Network. This is an unified standard co–developed by 6 audio manufactures associated with Toyota Motor Corporation.

The Unified standard covers signals, such as audio signal, visual signal, signal for switch indication and communication signal.

(b) Objectives

Recently the car audio system has been rapidly developed, and functions have been changed drastically. The conventional system has been switched to the multi–media type such as a navigation system. At the same time the level of customers needs to audio system has been upgraded. This lies behind this standardization.

The concrete objectives are explained below.

(1) When products by different manufactures were combined together, there used to be a case that malfunction occurred such as sound failure. This problem is resolved by standardization of signals.

(2) Various types of after market products can be add or replace freely.

(3) Because of the above (2), each manufacture has been concentrated on developing products in their strongest field. That enable manufactures to provide many types of products inexpensively.

(4) Generally, a new product developed by a manufacture could not be used with other manufactures products due to a lack of compatibility. Because of this new standard, users can enjoy compatible products provided for them timely.

(c) The above descriptions are the objectives to introduce AVC–LAN. By this standardization, development of new products will no longer cause systematic errors, and thus it is very effective for the future.

HINT:

- When +B short or GND short is detected in AVC–LAN circuit, communication stops. Accordingly the audio system does not function normally.
- When audio system is not equipped with a navigation system, audio head unit is the master unit. (When audio system is equipped with a navigation system, navigation ECU is the master unit.)
- The car audio system using AVC–LAN circuit has a diagnosis function.
- Each product has its own specified numbers called physical address. Numbers are also allotted to each function in one product, which are called logical address.

9. DIAGNOSIS FUNCTION

(a) Diagnosis start–up

For shifting to diagnosis mode, turn the ignition switch ON and push the ”DISC” switch 3 times while pressing ”ch1” and ”ch6” switches.

HINT:

To exit the diagnosis mode, push the ”DISC” switch for 1.7 sec. or turn the ignition switch to ACC or OFF.

(b) Element check mode

After the diagnosis start–up, the system enters the element check mode. Check that the all elements come on.

HINT:

By pressing the ”SEEK UP” switch, the system enters the ”Service Check Mode”.

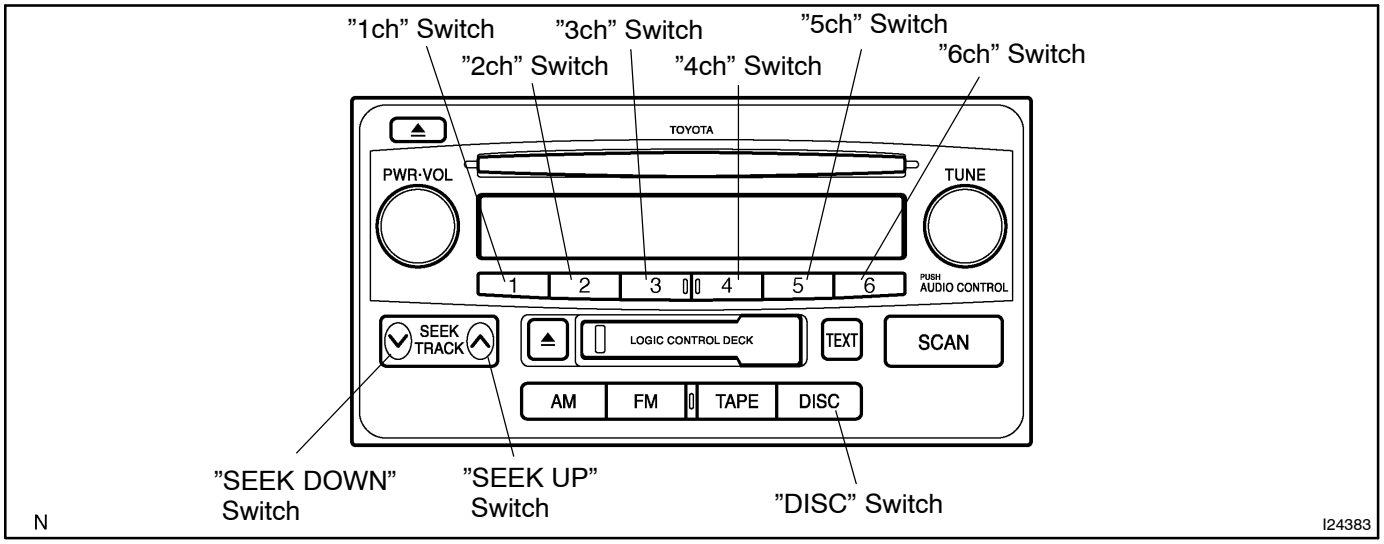
(c) Switch check mode

(1) Element check mode is started at the same time with the switch check mode.

(2) Check that there is a beep sound when any switch is pressed.

HINT:

By pressing ”SEEK UP” switch, the system enters the ”Service Check Mode”.



(d) Service check mode

(1) After the element check and switch check is completed, the system enters service check mode when ”SEEK UP” switch is pressed.

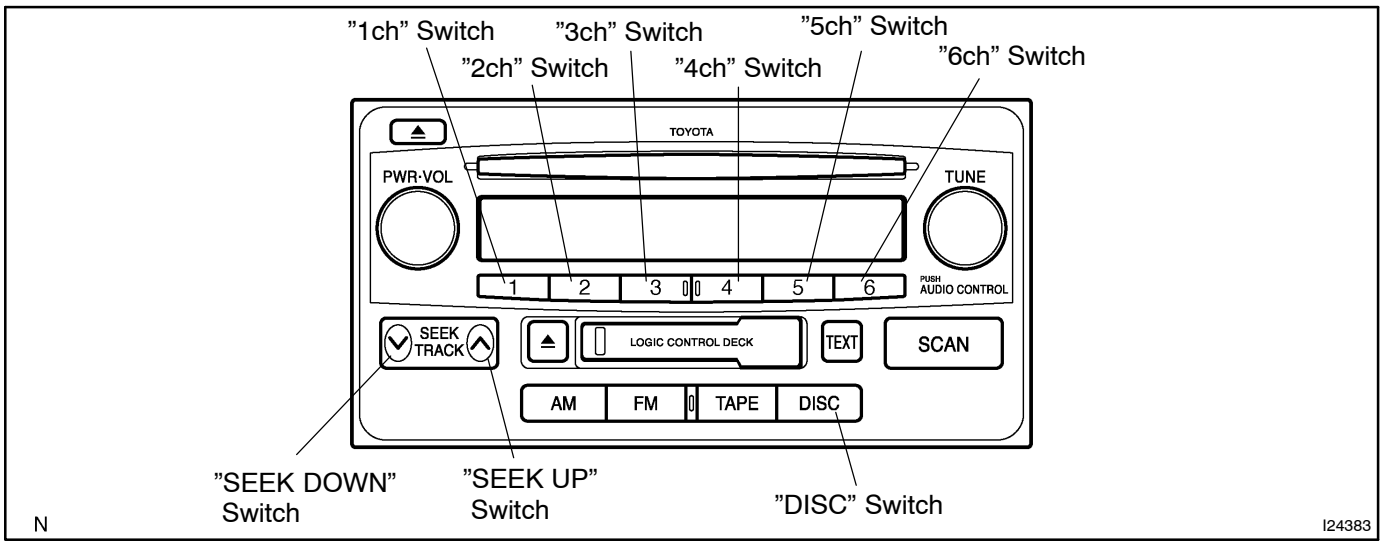
(2) Error codes over the tuner and connected equipments are displayed on the screen of the tuner. Results for each check are displayed as follows:

- good:
  No DTC is detected for both ”System Check Confirmation” and ”Diagnosis Memory Response”.
- nCon:
  The component does not respond to the ”Diagnosis On Instruction” command.
  Applicable only to AVC – LAN.
- ECHn:
  Application of new version is confirmed by the ”Diagnosis On Check”, and there is one or more DTC which indicates ”Replacement” in the ”System Check Result Response” or ”Diagnosis Memory Response”.
- CHEC:
  Application of new version is confirmed by the ”Diagnosis On Check”, and there is no DTC which indicates ”Replacement” in the ”System Check Result Response” or ”Diagnosis Memory Response”, but one or more DTC which indicates ”Check” is identified.

- Old:
  Application of old version is confirmed by the ”Diagnosis On Check”, and DTC is identified in the ”System Check Result Response” or ”Diagnosis Memory Response”.
- nrES:
  No response is identified in the ”System Check Start Instruction” and ”Request for System Check Result” commands.

HINT:

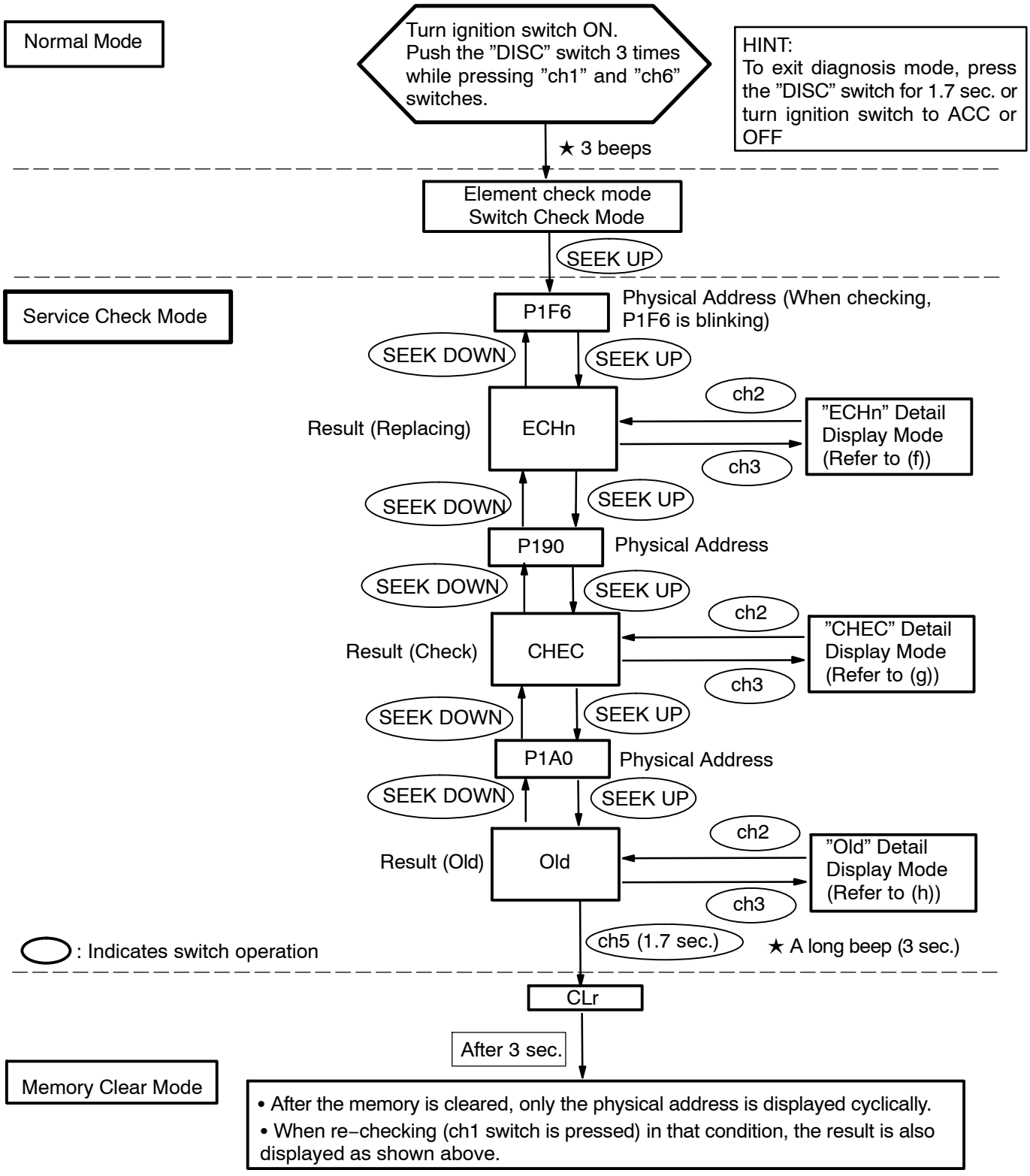
- Check the present and past condition of components by performing the System Check and collecting stored DTC memories.
- Check results are displayed as one of the following six indications: ”good”, ”ECHn”, ”CHEC”,”nCon”, ”Old” or ”nrES”.



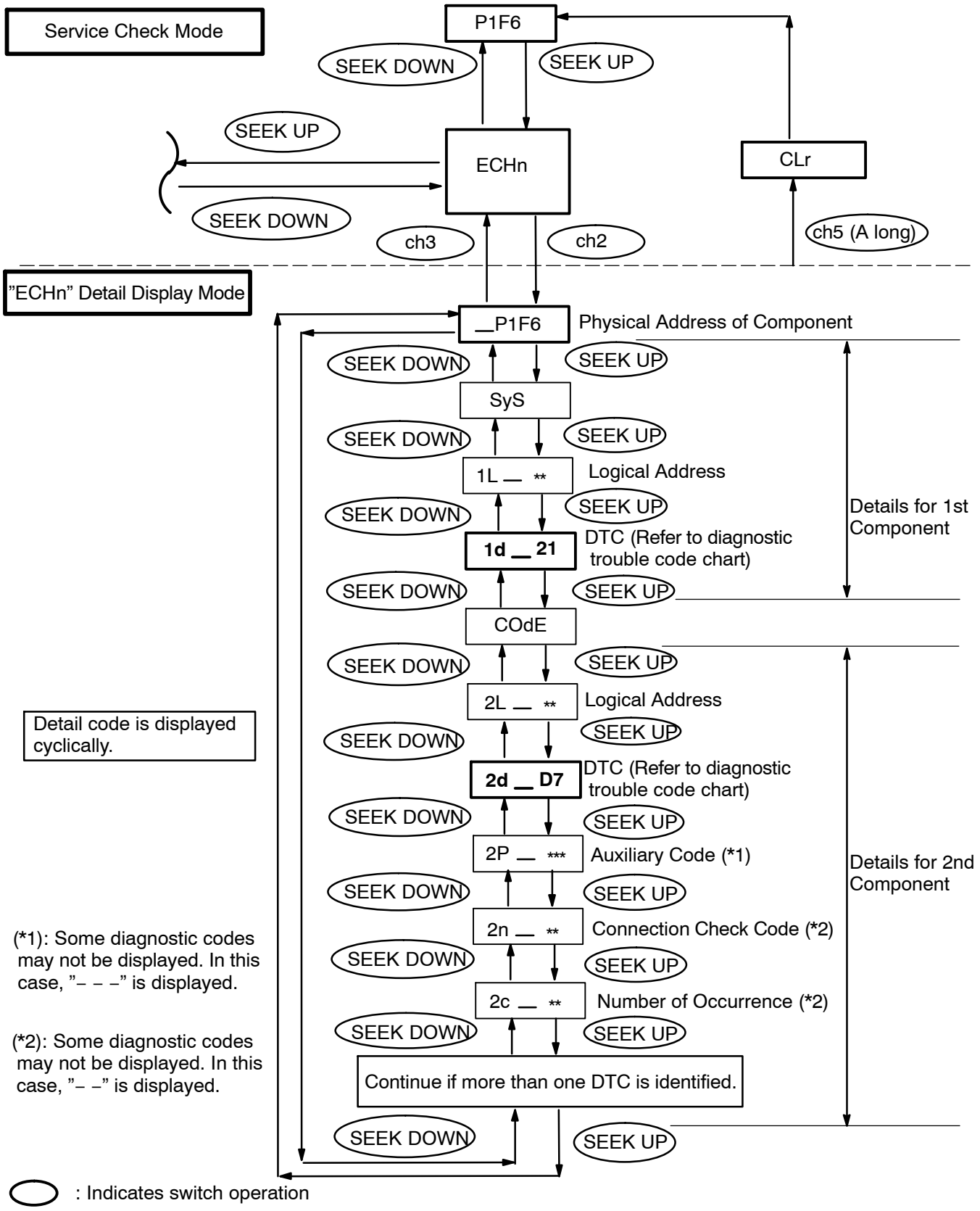
(e) Display Screen for Service Check.

Example:

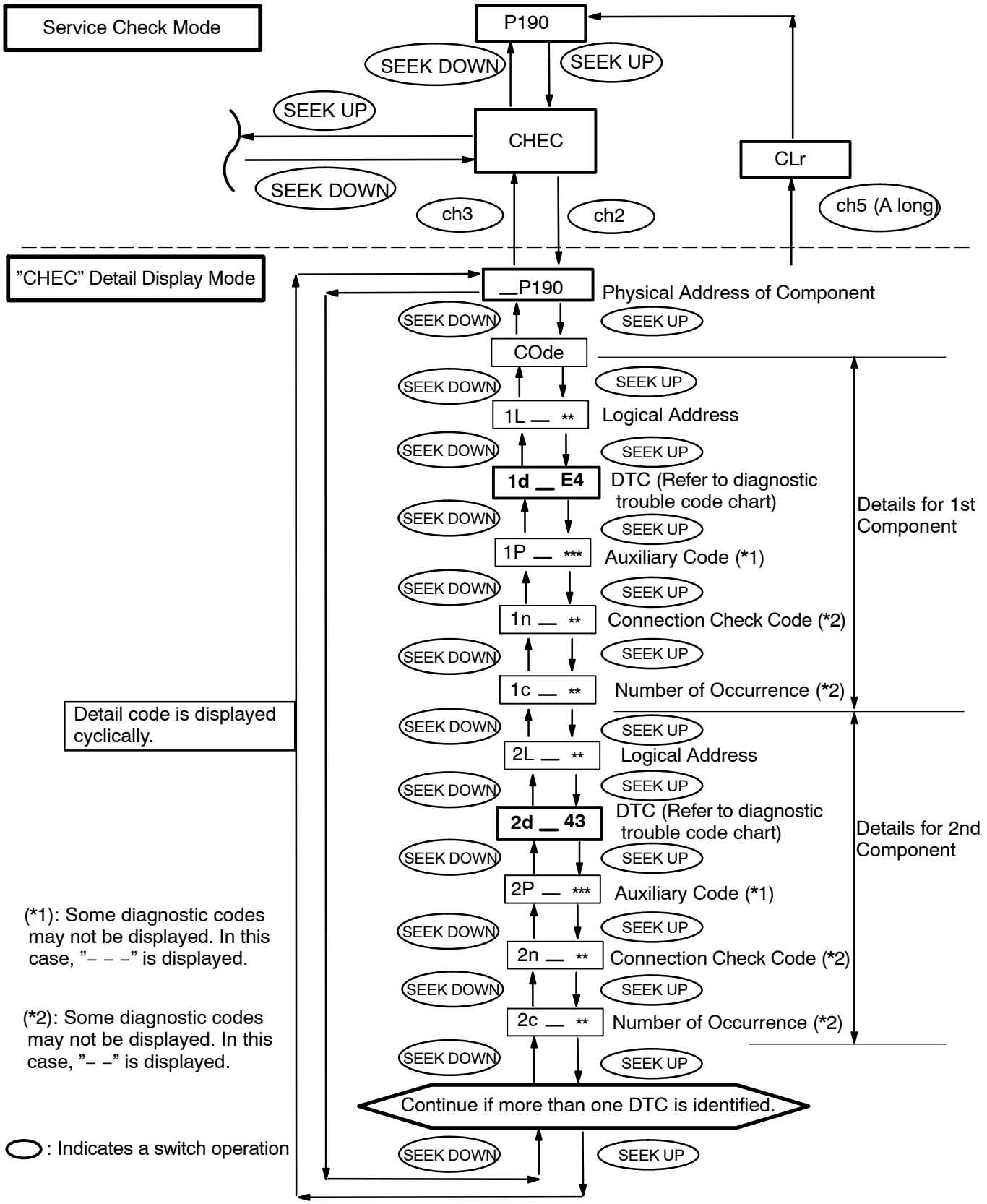
Connection parts (physical address): Radio receiver (P190), RSE ECU (P1F6), DVD player (P1A0)



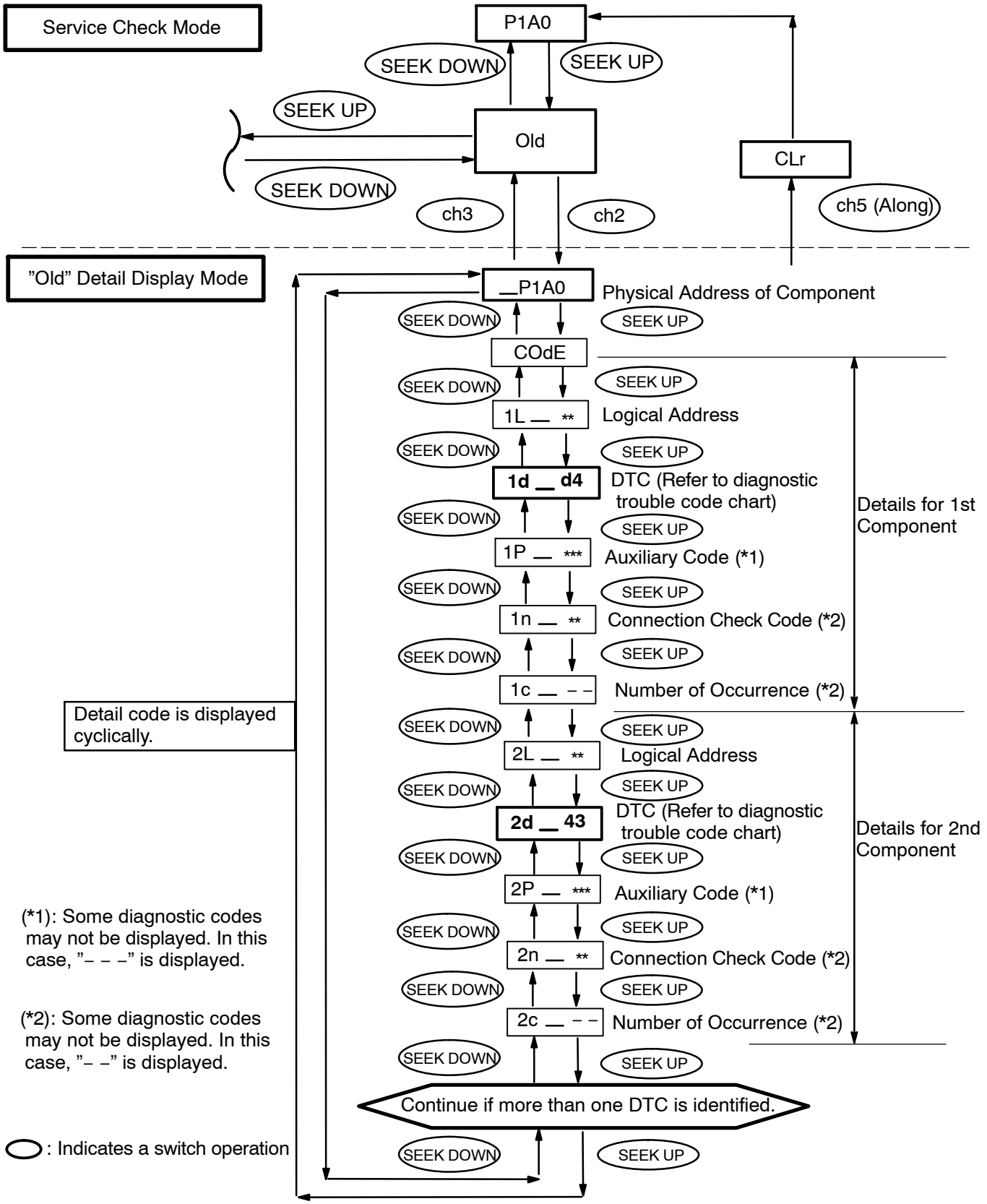
(f) ”ECHn” Detail Display Mode Screen



(g) ”CHEC” Detail Display Mode Screen



(h) ”Old” Detail Display Mode Screen



10. DIAGNOSIS CODE LIST

- If there is ”O” in the system check column, an error can be detected when the mode is switched to the system check mode.
- If there is ”O” in the diagnosis memory column, each unit is monitoring whether or not it has failure. In the case of detecting failure, it memorizes DTC.

Parts Name	DTC	Diagnosis item	Diagnosis content	Countermeasure and inspected parts	System Check	Diagnosis memory
Head Unit (190)	42	FM tuner error	There is an error in FM tuner	Radio receiver check	X	○
	50	Cassette error	There is an error in cassette deck		X	○
	51	Cassette eject error	Cassette can not be ejected from Head Unit		X	○
	D1	Transmitter error	Communication with the equipment that is communicating has failed successively	Radio receiver check Wire harness and connecter check	○	○
	D2	Periodic communication no response	Error in periodic communication	Wire harness and connector	X	○
	FF	Diagnosis no response	Result of diagnosis is not issued from start to finish	Radio receiver check	○	X
AMP (440)	D1	Transmitter error	Communication with the equipment that is communicating has failed successively	Stereo component amplifier check	○	○
	D4	Periodic communication error	Connection confirmation has not come from the equipment that is communicating	● Radio receiver check ● Wire harness check	X	○

BE1DD–07

TROUBLESHOOTING

NOTICE:

When replacing the internal mechanism (computer part) of the audio system, be careful not to bring your body or clothing into contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).

HINT:

This is a simple troubleshooting which should be carried out on the vehicle during system operation. This inspection procedure was prepared for the assumption of system component troubles (except for the wires and connectors, etc.).

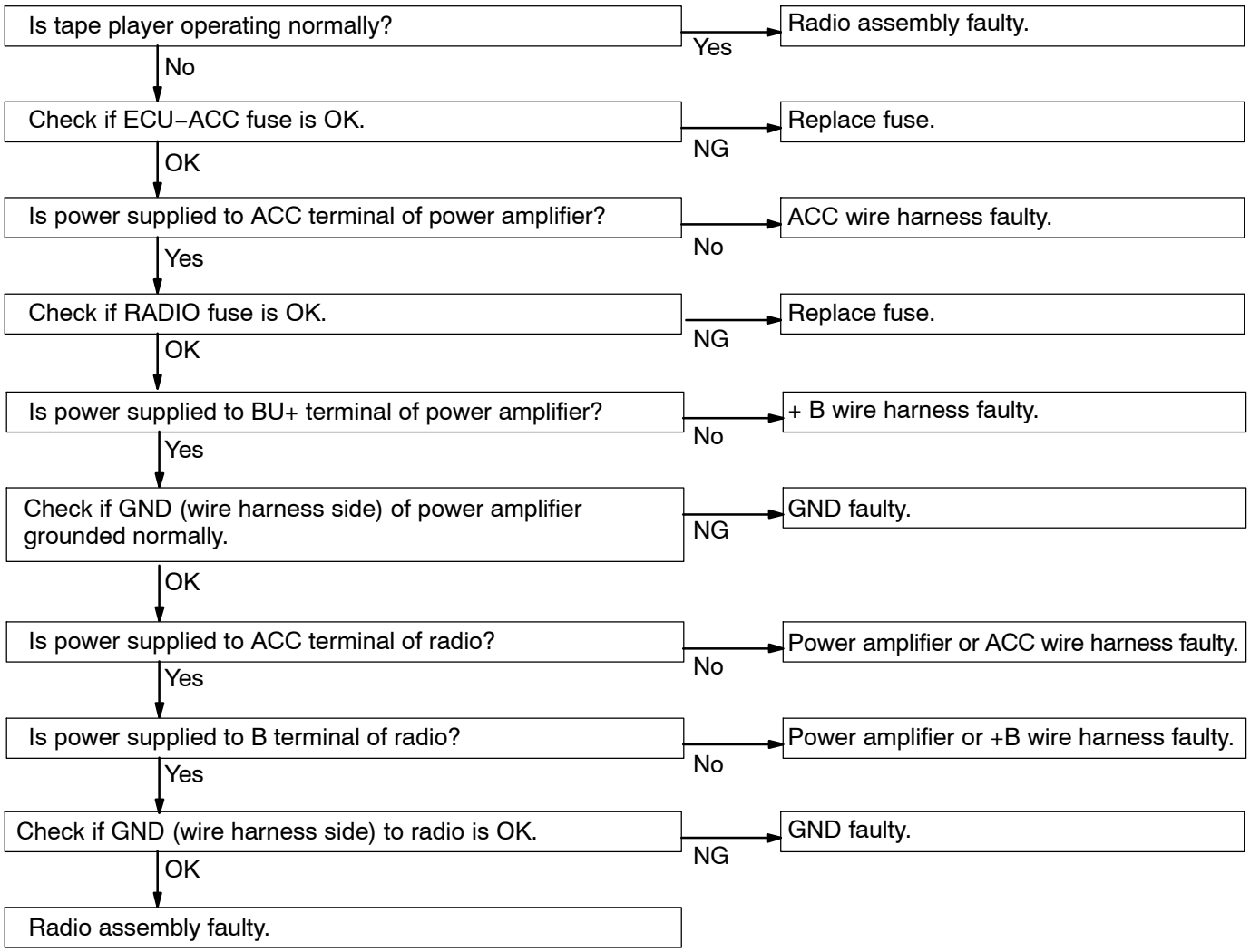
Always inspect the trouble taking the following items into consideration.

- Open or short circuit of the wire harness
- Connector or terminal connection fault

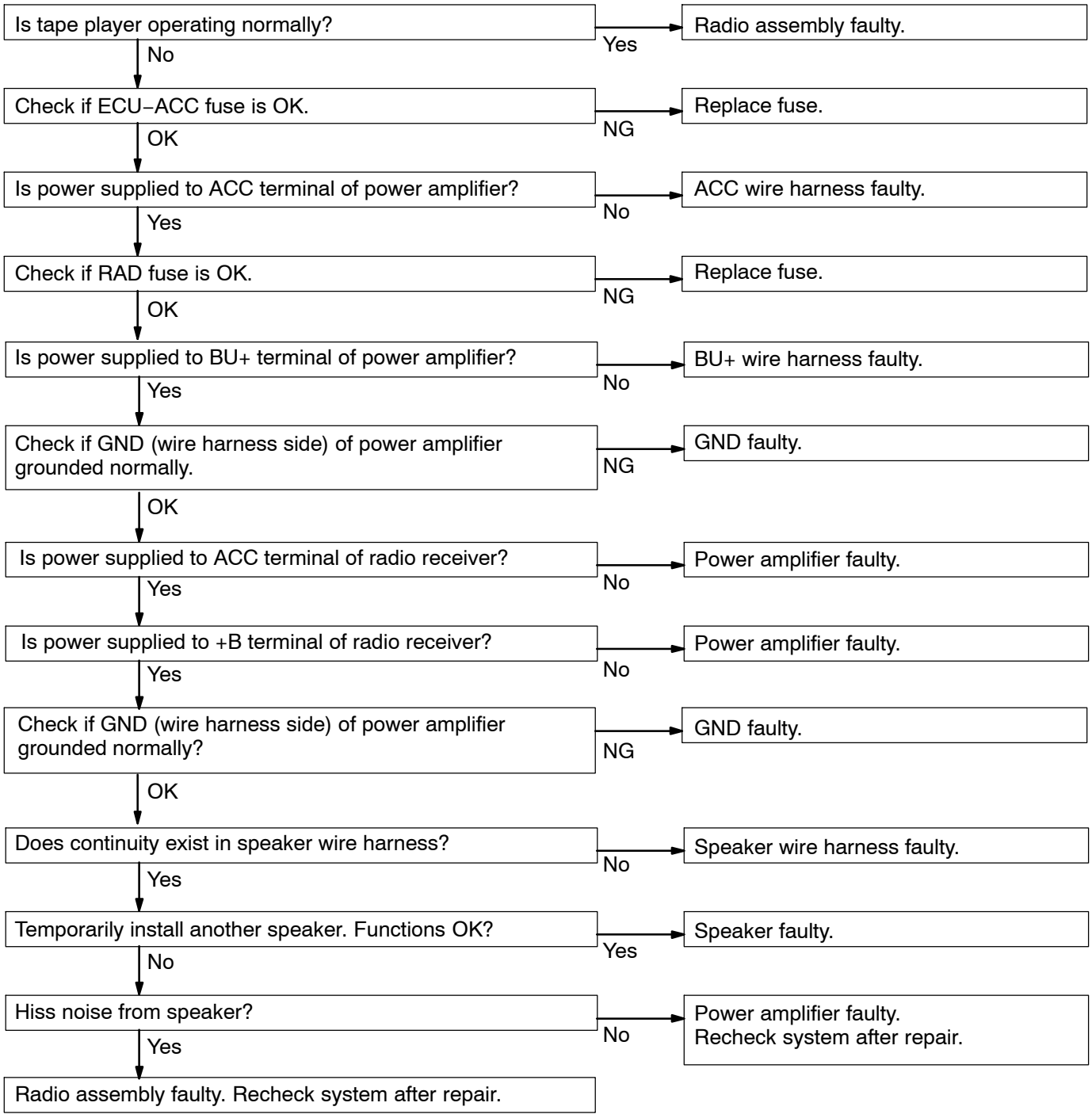
	Problem	No.
Radio	Radio does not operate when power switch turned to 'ON'.	1
	Display indicates when power switch is turned to 'ON', but no sound (including 'noise') is produced.	2
	Noise present, but AM – FM are not operating.	3
	Any speaker does not work.	4
	Any AM or FM does not work.	5
	Few preset turning bands.	5
	Reception is poor.	6
	Sound quality is poor.	7
	Preset memory disappears.	8
Tape Player	Cassette tape cannot be inserted.	9
	Cassette tape inserted, but no power.	10
	Power coming in, but tape player does not operate.	11
	Any speaker does not work.	12
	Sound quality is poor.	13
	Tape jammed, malfunction with tape speed or auto–reverse.	14
	Cassette tape cannot be ejected.	15
CD Player	CD cannot be inserted.	16
	CD inserted, but no power.	17
	Power coming in, but CD player does not operate.	18
	Sound jumps.	19
	Sound quality is poor (Volume faint).	20
	Any speaker does not work.	21
	CD cannot be ejected.	22
Power Amplifier	No power coming in.	23
	Power coming in, but power amplifier does not operate.	24
	Any speaker does not work.	25
Noise	Noise occurs	26
	Noise is produced by vibration or shock while driving.	27
	Noise is produced when engine starts.	28

The term "AM" includes LW, MW and SW, and the term "FW" includes UKW.

1	Radio	RADIO NOT OPERATING WHEN POWER SWITCH TURNED TO ”ON”



2	Radio	DISPLAY INDICATES WHEN POWER SWITCH TURNED TO "ON", BUT NO SOUND (INCLUDING "NOISE") IS PRODUCED



3	Radio	NOISE PRESENT, BUT AM–FM NOT OPERATING

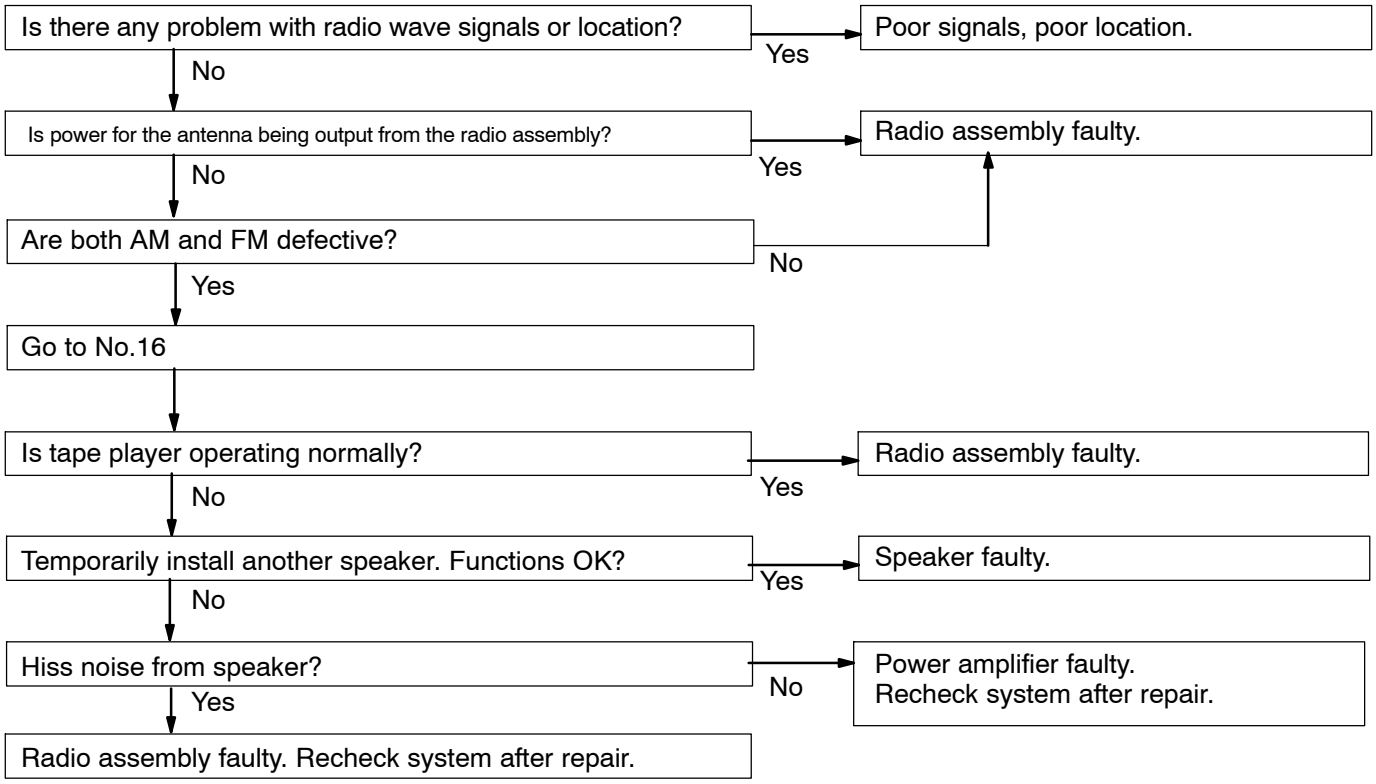
Go to No.25

If radio side faulty. → Radio faulty.

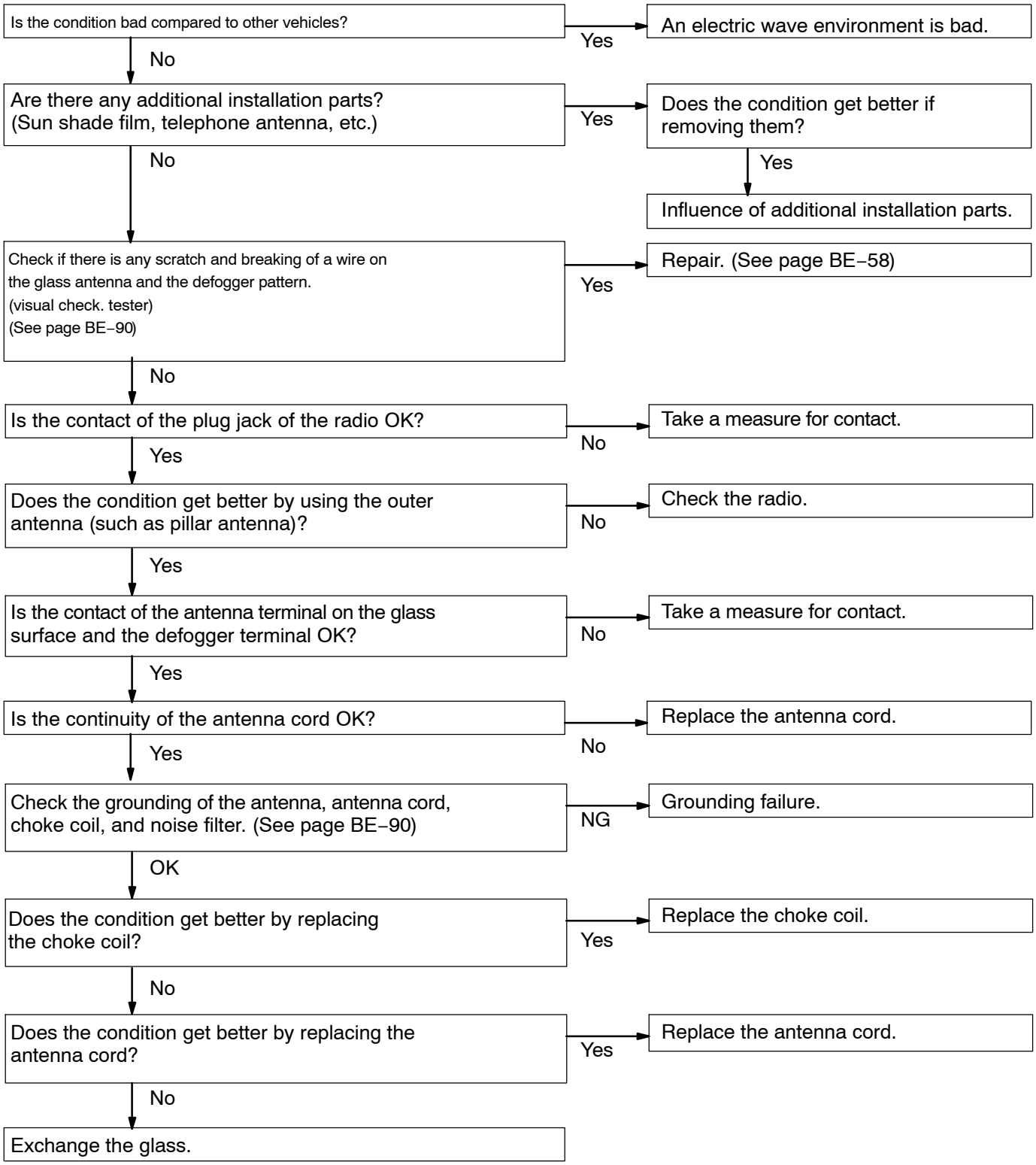
4	Radio	ANY SPEAKER DOES NOT WORK

Is tape player operating normally?
- Yes → Radio assembly faulty.
- No → Is hiss noise produced by non–functioning speaker?
  - Yes → Radio assembly faulty. Recheck system after repair.
  - No → Does continuity exist in speaker wire harness?
    - No → Speaker wire harness faulty.
    - Yes → Temporarily install another speaker. Functions OK?
      - Yes → Speaker faulty.
      - No → Power amplifier faulty. Recheck system after repair.

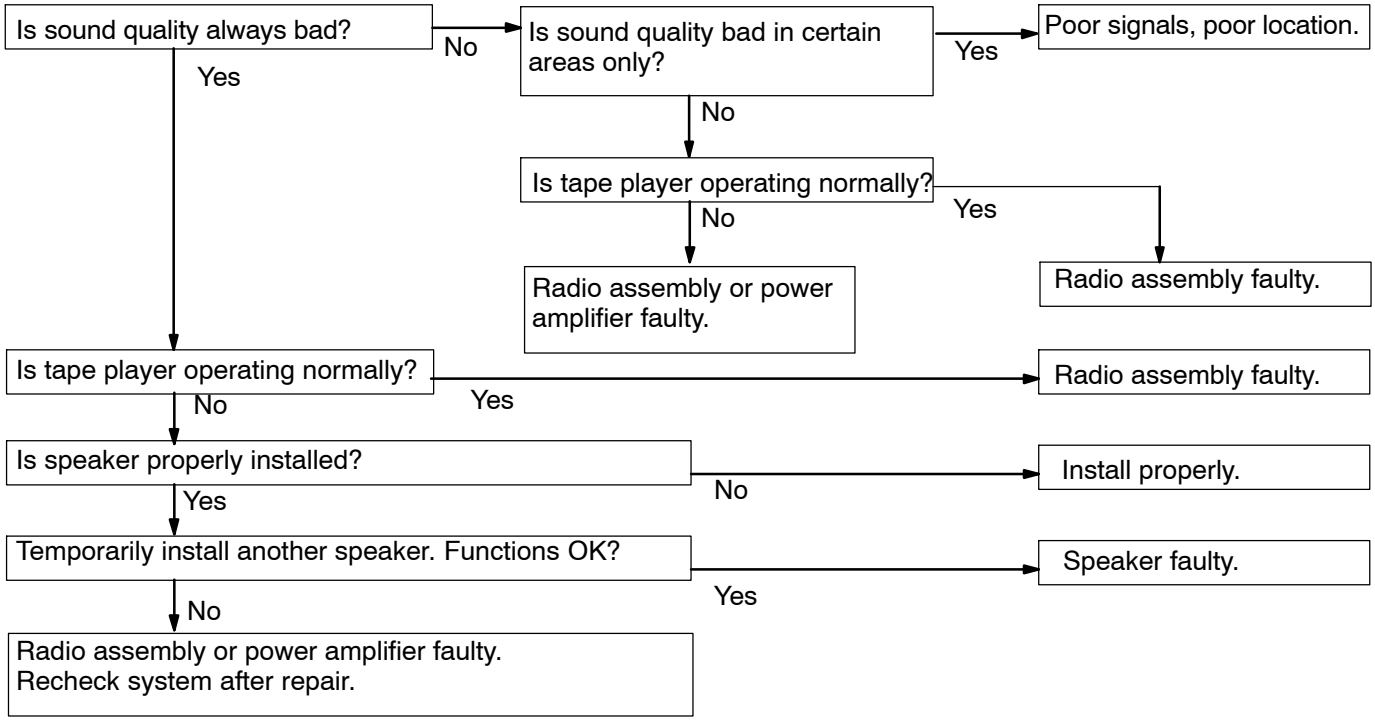
5	Radio	ANY AM OR FM DOES NOT WORK FEW PRESET TUNING BANDS



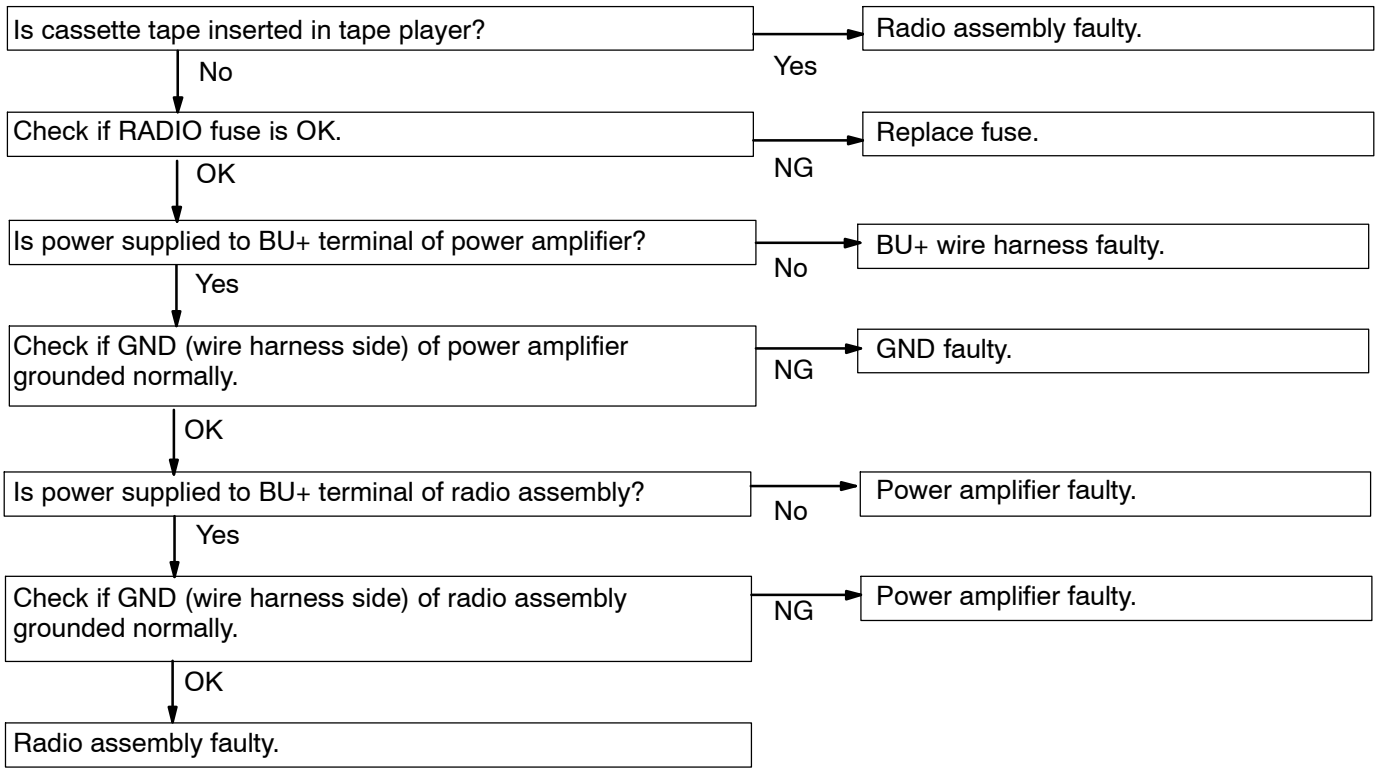
6	Radio	POOR RECEPTION



7	Radio	SOUND QUALITY POOR



8	Radio	PRESET MEMORY DISAPPEARS



9	Tape Player	CASSETTE TAPE CANNOT BE INSERTED

Is there any foreign objects inside tape player?
- Yes → Remove foreign objects.
- No ↓

Is auto search button of radio operating normally?
- Yes → Radio assembly faulty.
- No ↓

Check if RADIO fuse is OK.
- NG → Replace fuse.
- OK ↓

Is power supplied to BU+ terminal of power amplifier?
- No → BU+ wire harness faulty.
- Yes ↓

Check if GND (wire harness side) of power amplifier grounded normally.
- NG → GND faulty.
- OK ↓

Is power supplied to BU+ terminal of radio assembly?
- No → Power amplifier faulty.
- Yes ↓

Check if GND (wire harness side) of radio assembly grounded normally.
- NG → Power amplifier faulty.
- OK ↓

Radio assembly faulty.

10	Tape Player	CASSETTE TAPE INSERTED, BUT NO POWER

Is radio operating normal?
- Yes → Radio assembly faulty.
- No ↓

Check if ECU–ACC fuse is OK.
- NG → Replace fuse.
- OK ↓

Is power supplied to ACC terminal of power amplifier?
- No → ACC wire harness faulty.
- Yes ↓

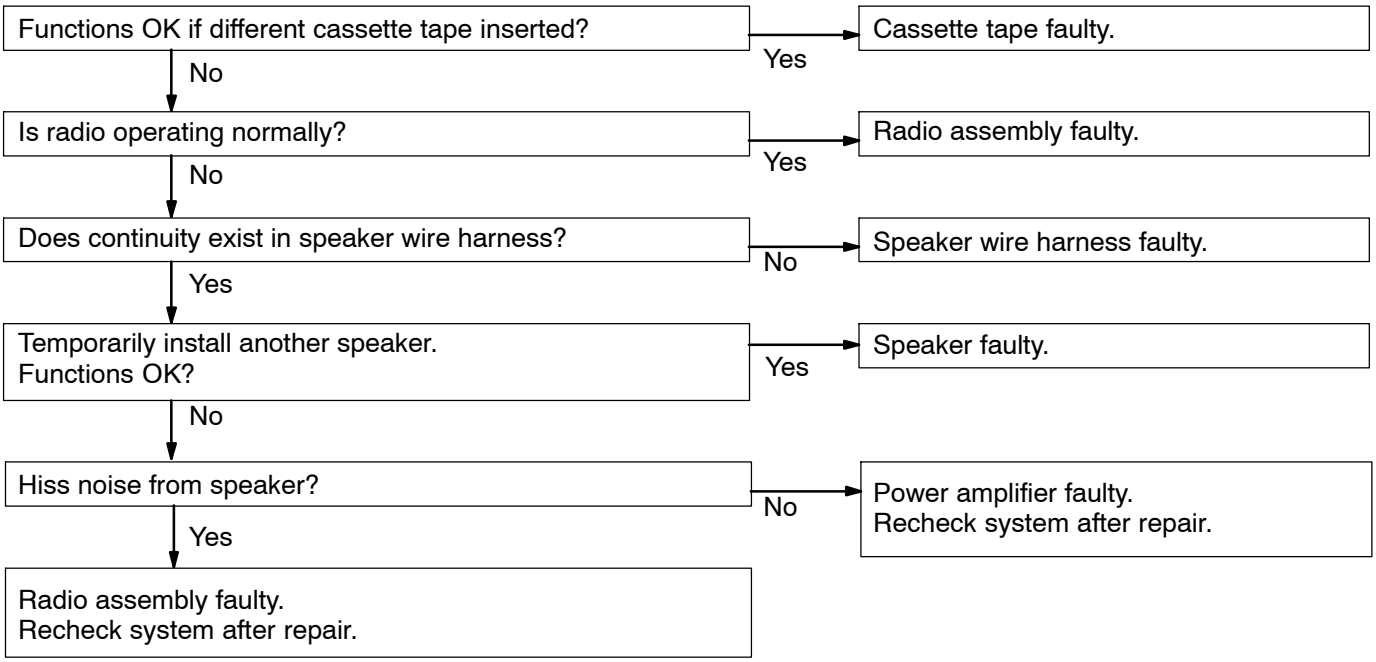
Check if RAD fuse is OK.
- NG → Replace fuse.
- OK ↓

Is power supplied to +B terminal of radio assembly?
- No → +B wire harness faulty.
- Yes ↓

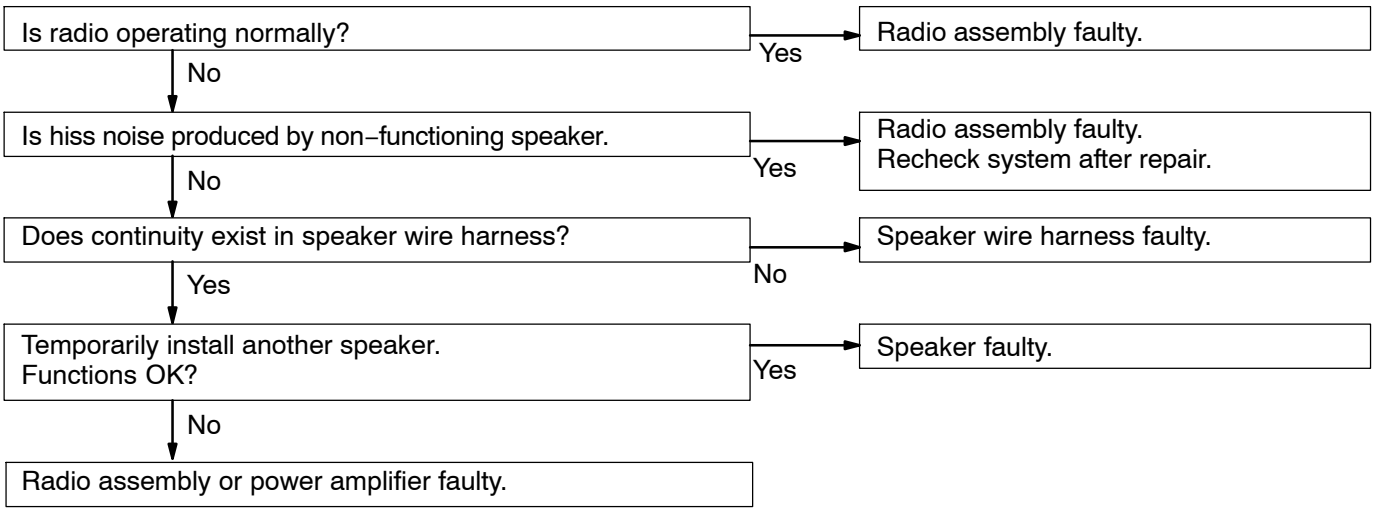
Is power supplied to ACC terminal of radio assembly?
- No → Power amplifier faulty.
- Yes ↓

Radio assembly faulty.

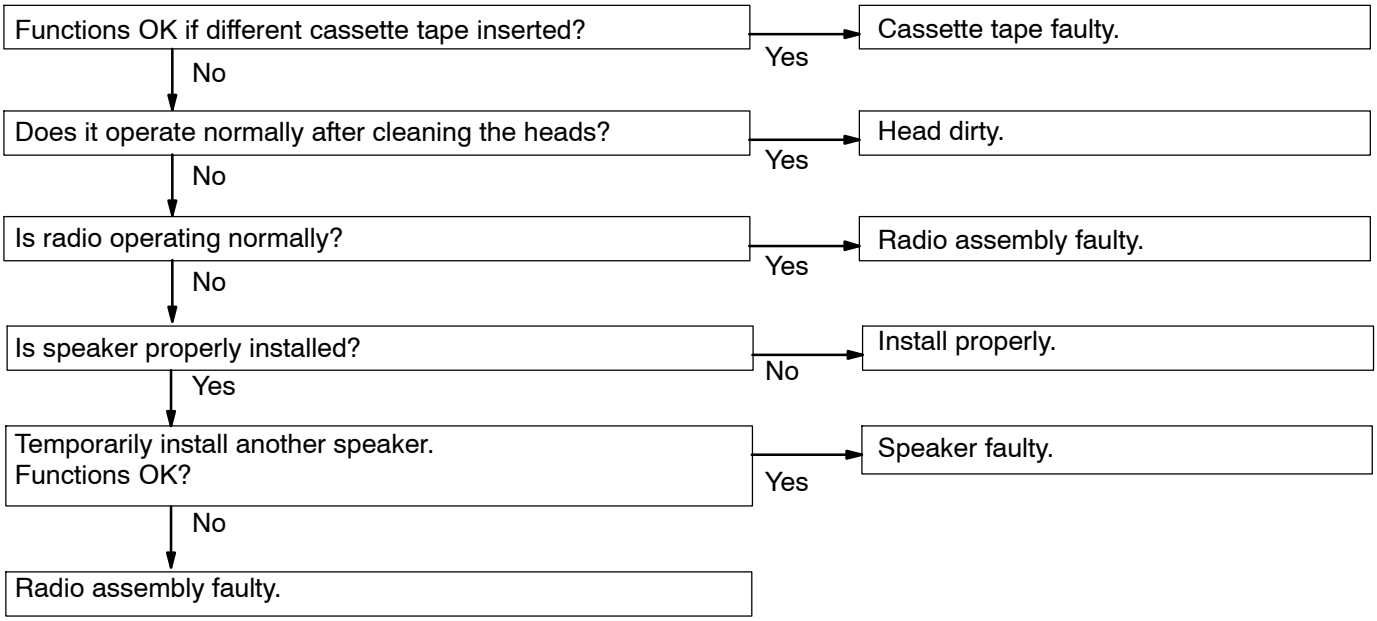
11	Tape Player	POWER COMING IN, BUT TAPE PLAYER NOT OPERATING



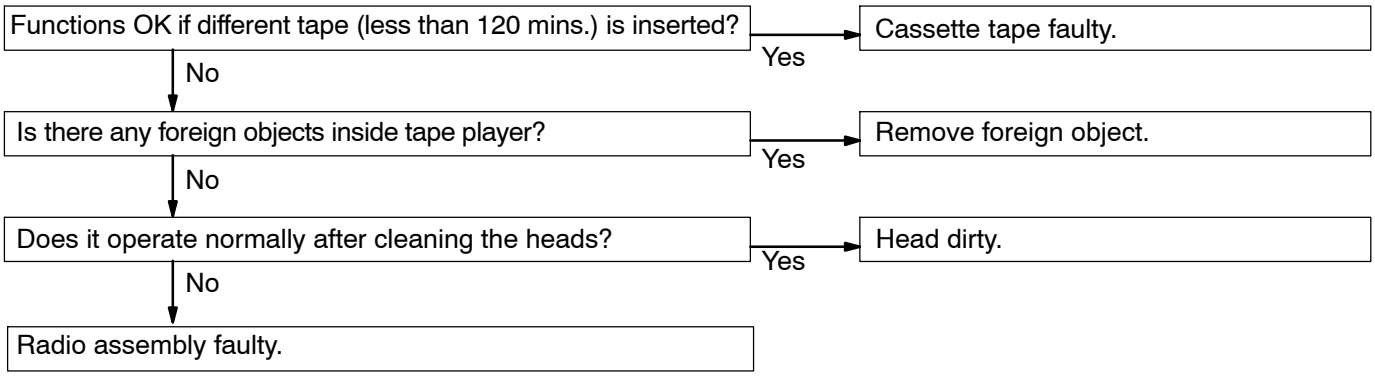
12	Tape Player	ANY SPEAKER DOES NOT WORK



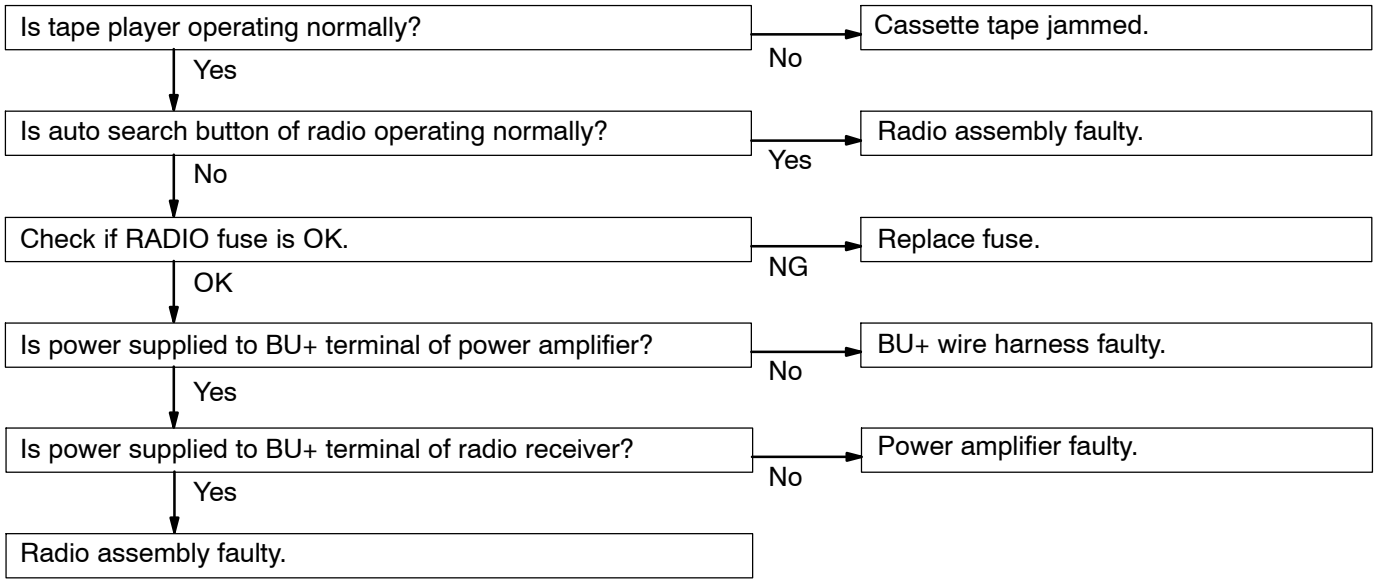
13	Tape Player	SOUND QUALITY POOR (VOLUME FAINT)



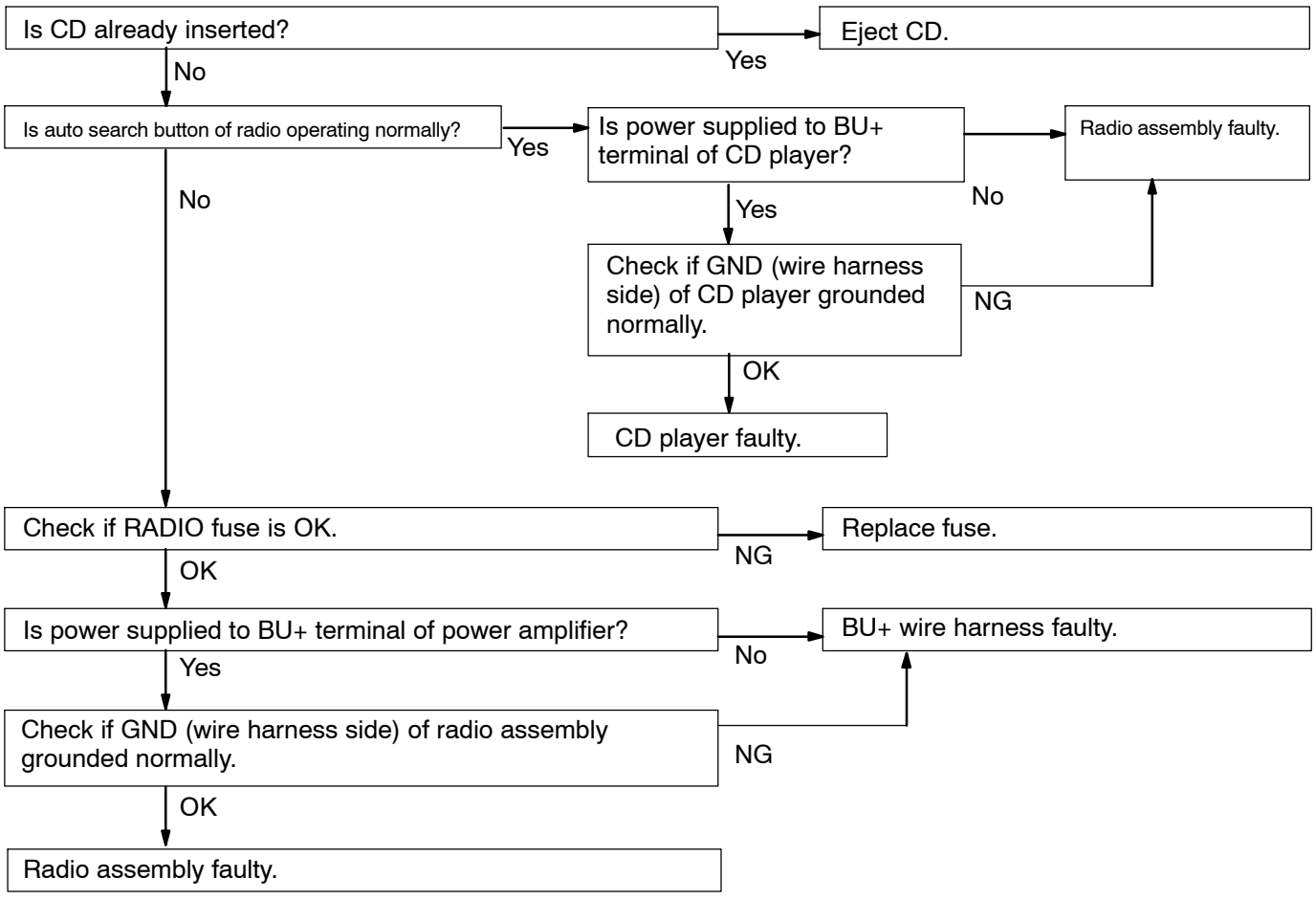
14	Tape Player	TAPE JAMMED MALFUNCTION WITH TAPE SPEED OR AUTO–REVERSE



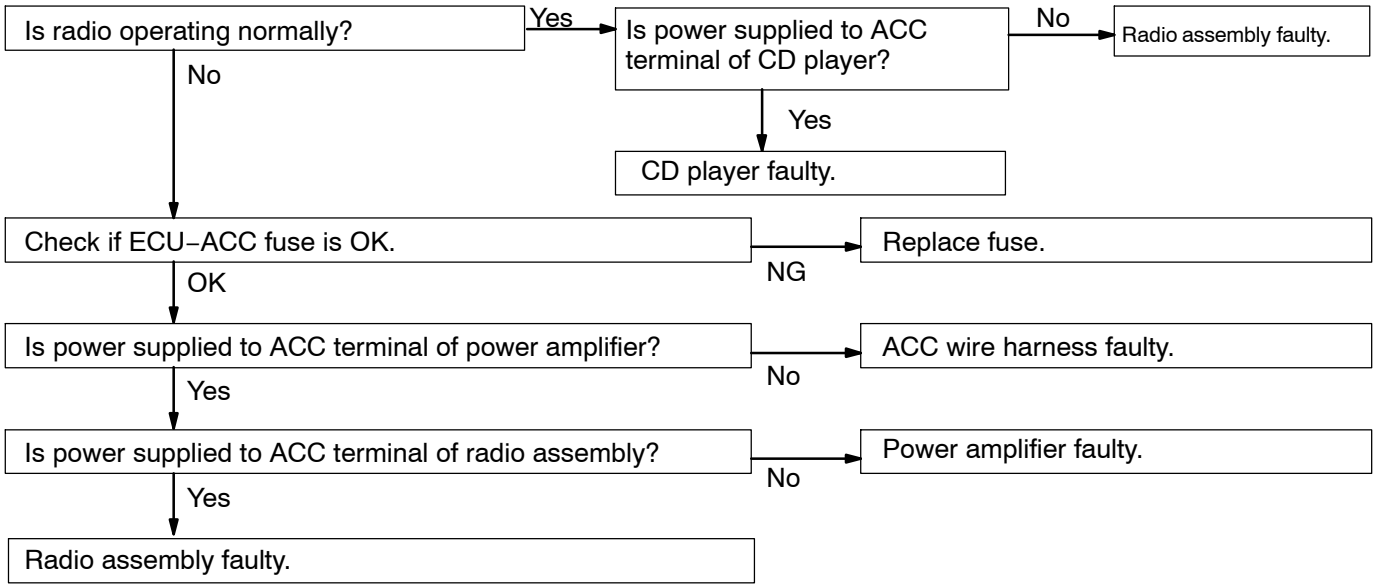
15	Tape Player	CASSETTE TAPE WILL NOT BE EJECTED



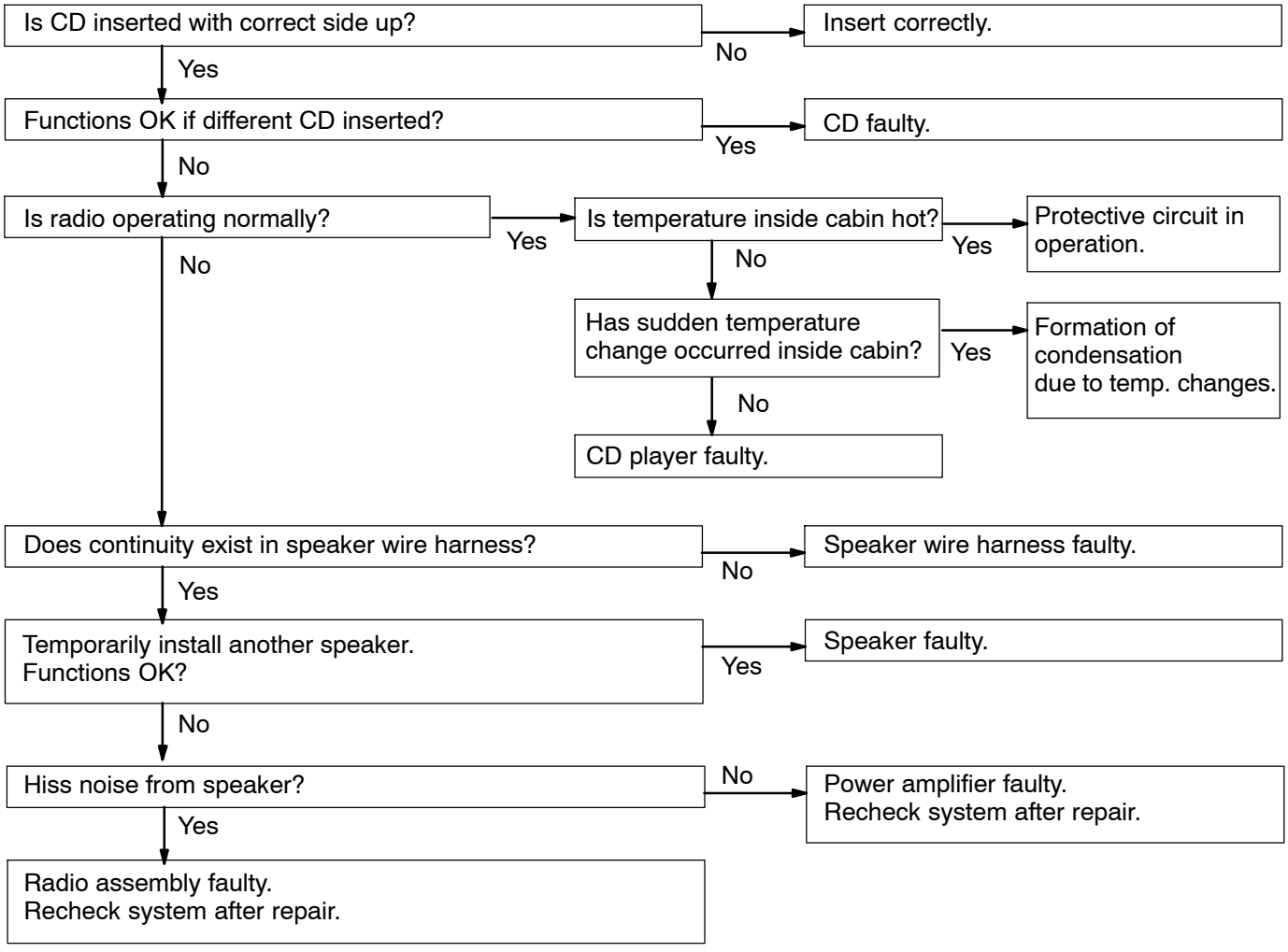
16	CD Player	CD CANNOT BE INSERTED



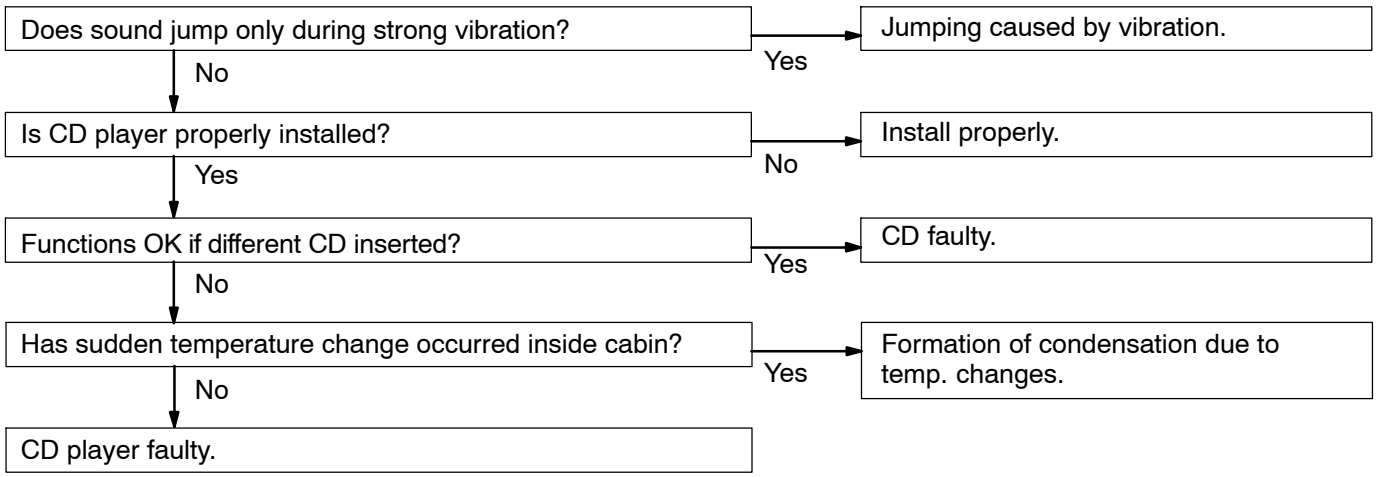
17	CD Player	CD INSERTED, BUT NO POWER



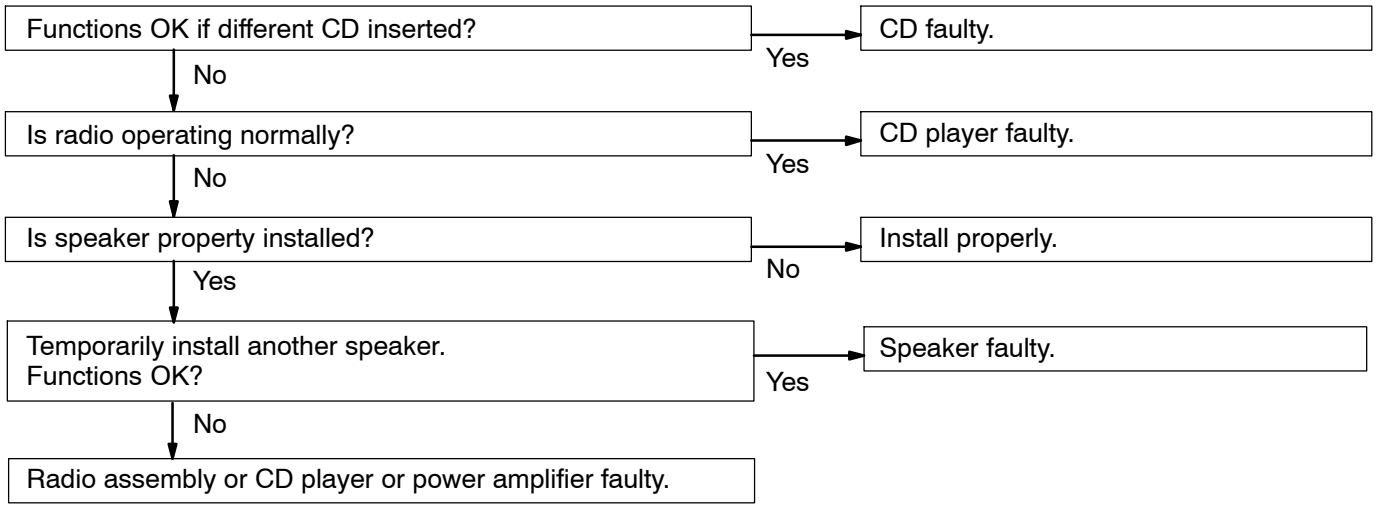
18	CD Player	POWER COMING IN, BUT CD PLAYER NOT OPERATING



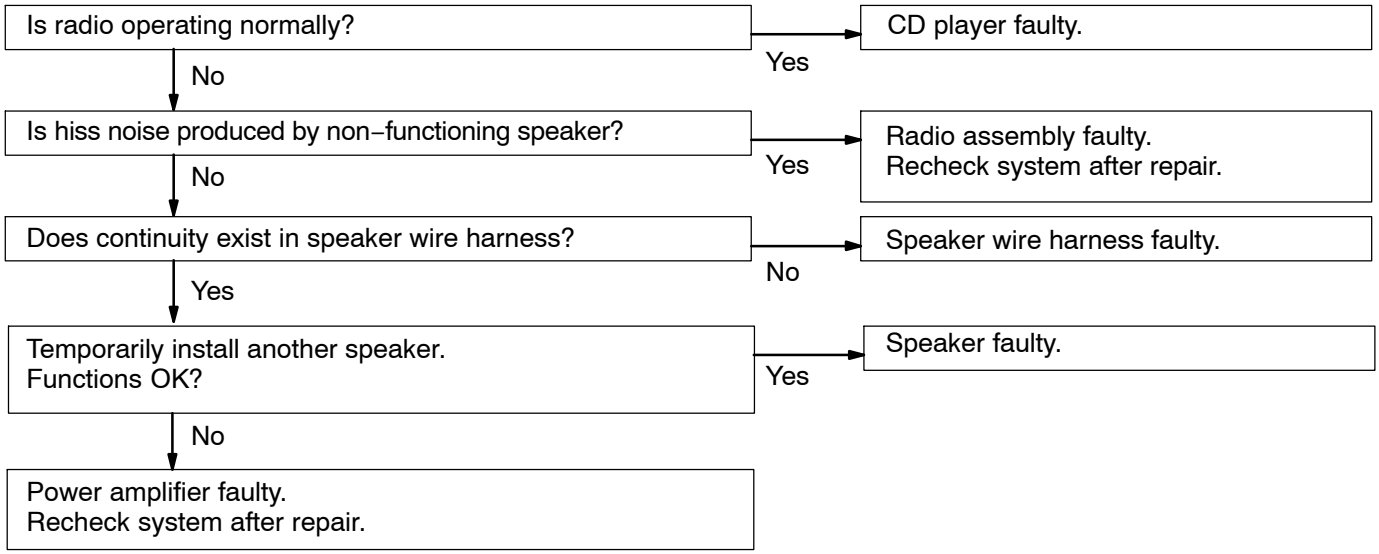
19	CD Player	SOUND JUMPS



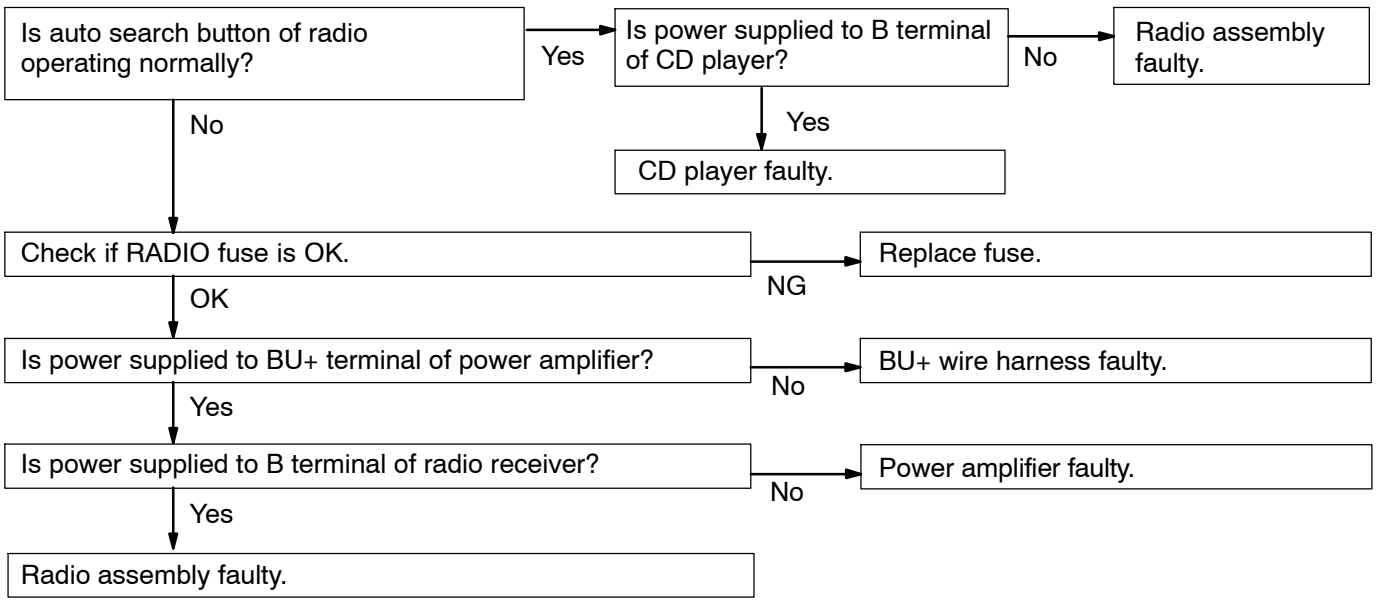
20	CD Player	SOUND QUALITY POOR (VOLUME FAINT)



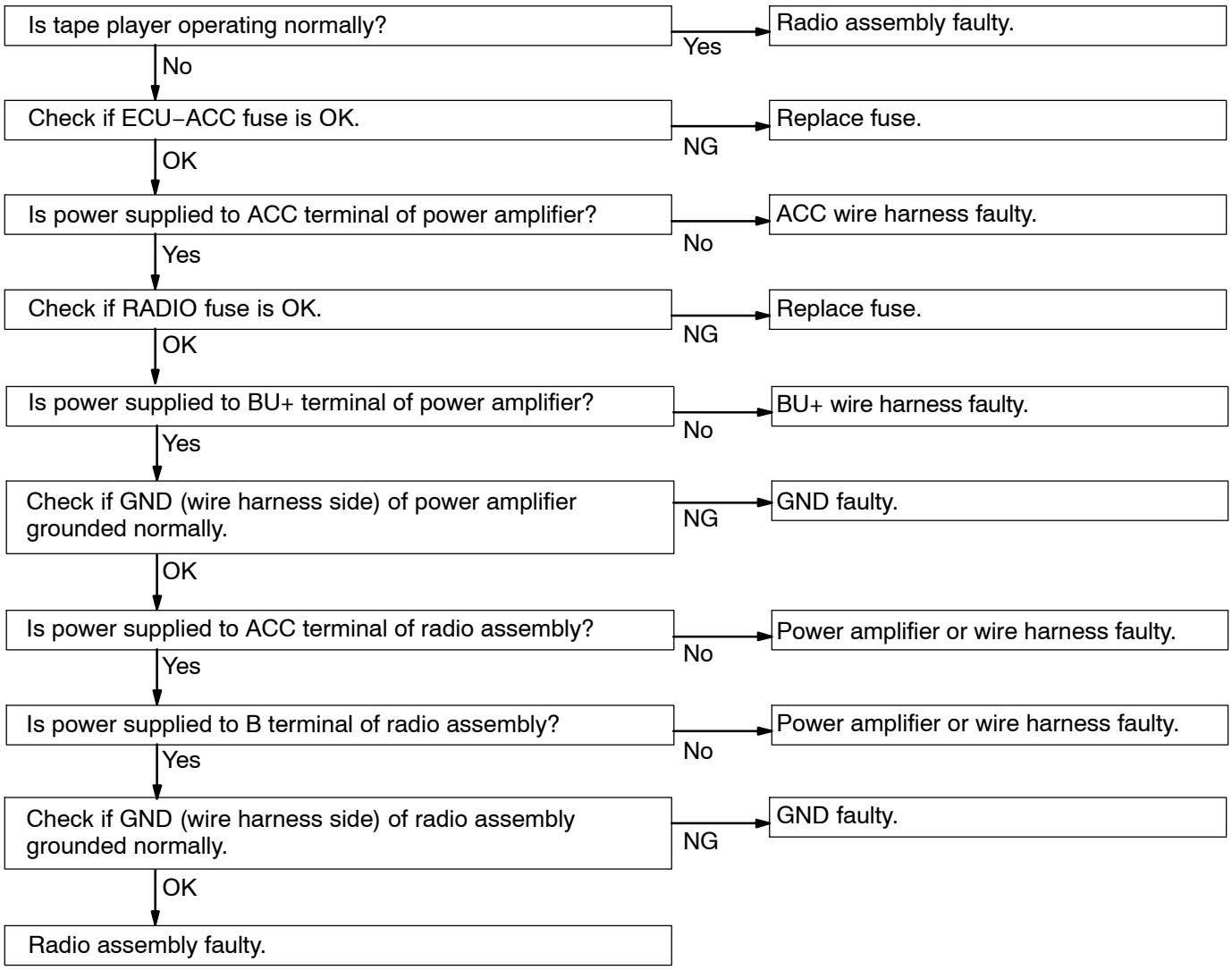
21	CD Player	ANY SPEAKER DOES NOT WORK



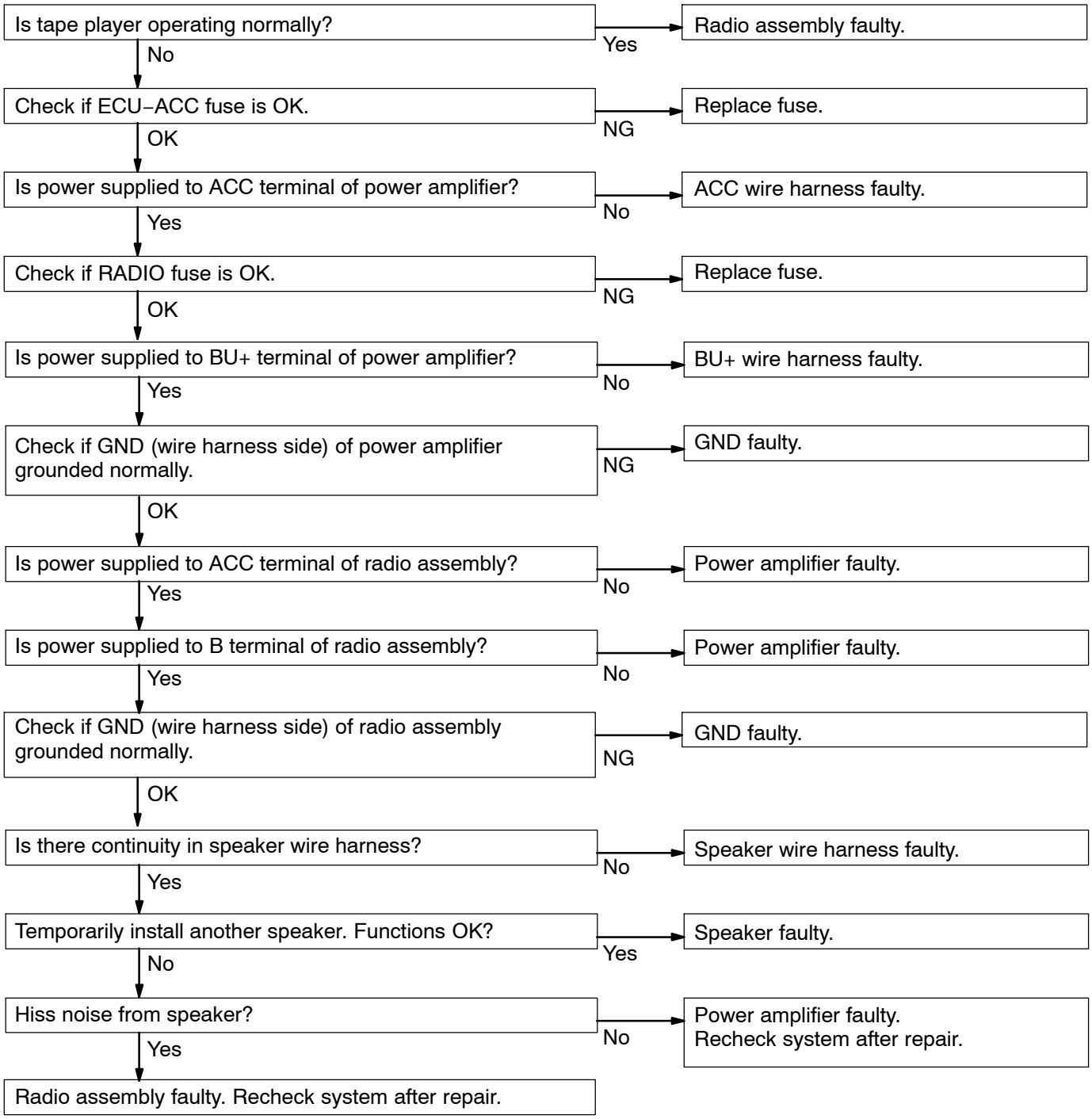
22	CD Player	CD WILL NOT BE EJECTED



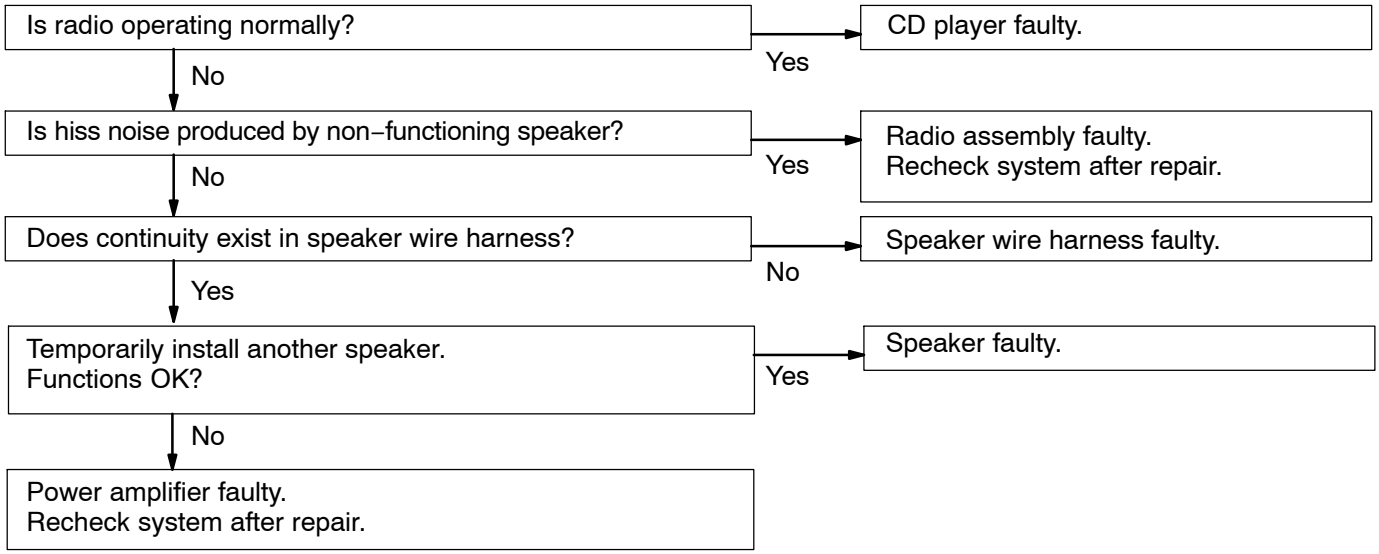
23	Power Amplifier	NO POWER COMING IN



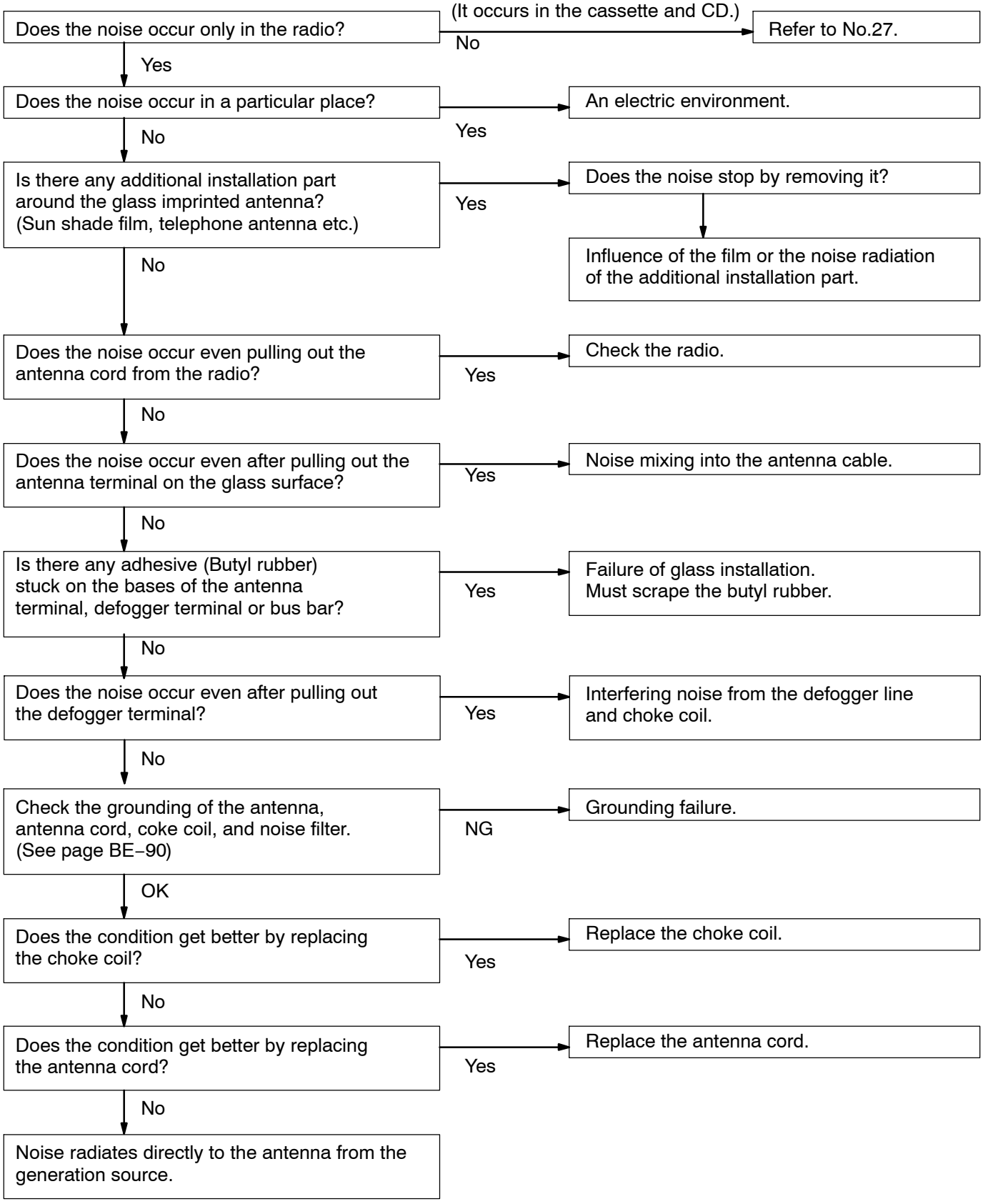
24	Power Amplifier	POWER COMMIG IN, BUT WOOFER (POWER) AMPLIFIER NOT OPERATING



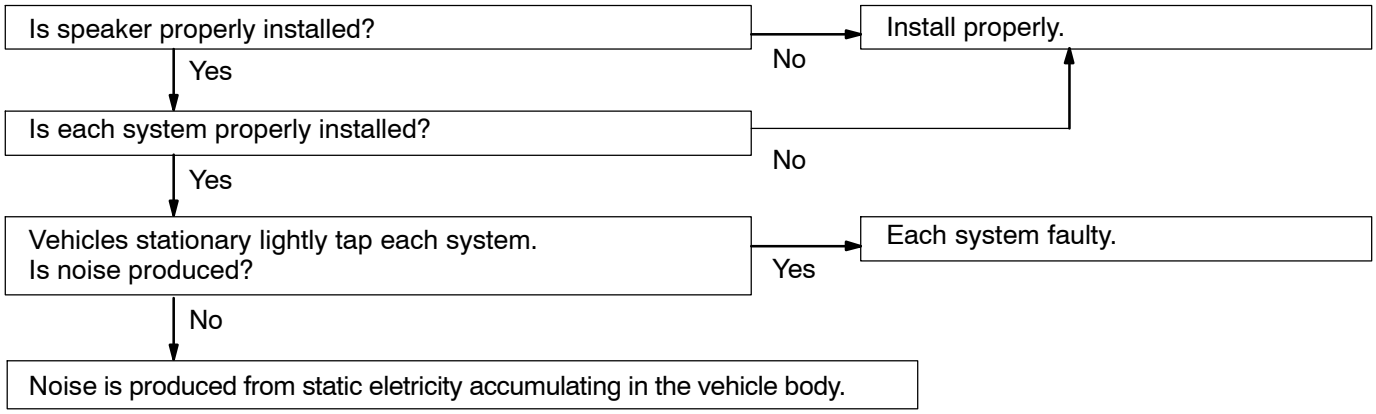
25	Power Amplifier	ANY SPEAKER DOES NOT WORK



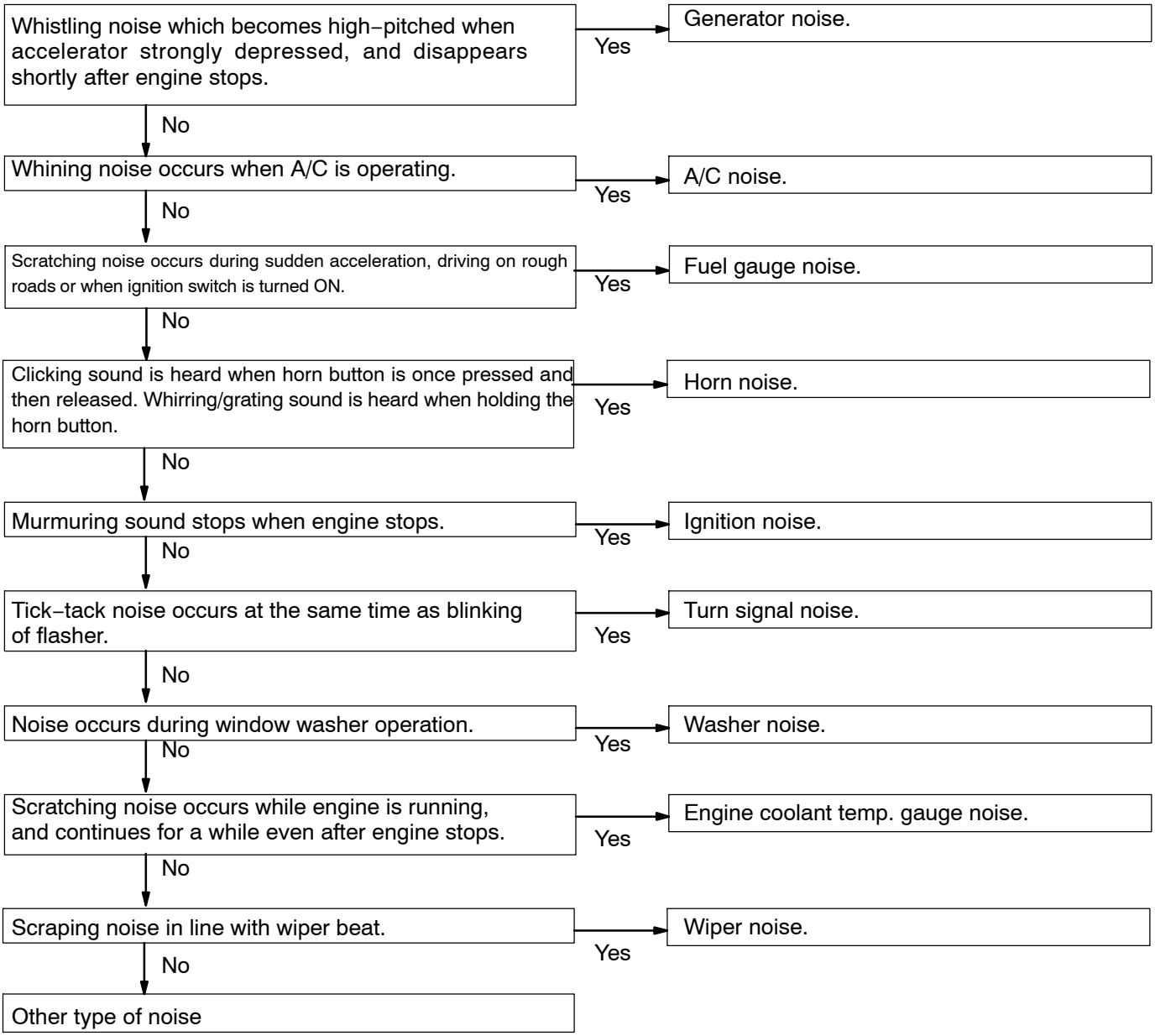
26	Noise	NOISE OCCURS



27	Noise	NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING

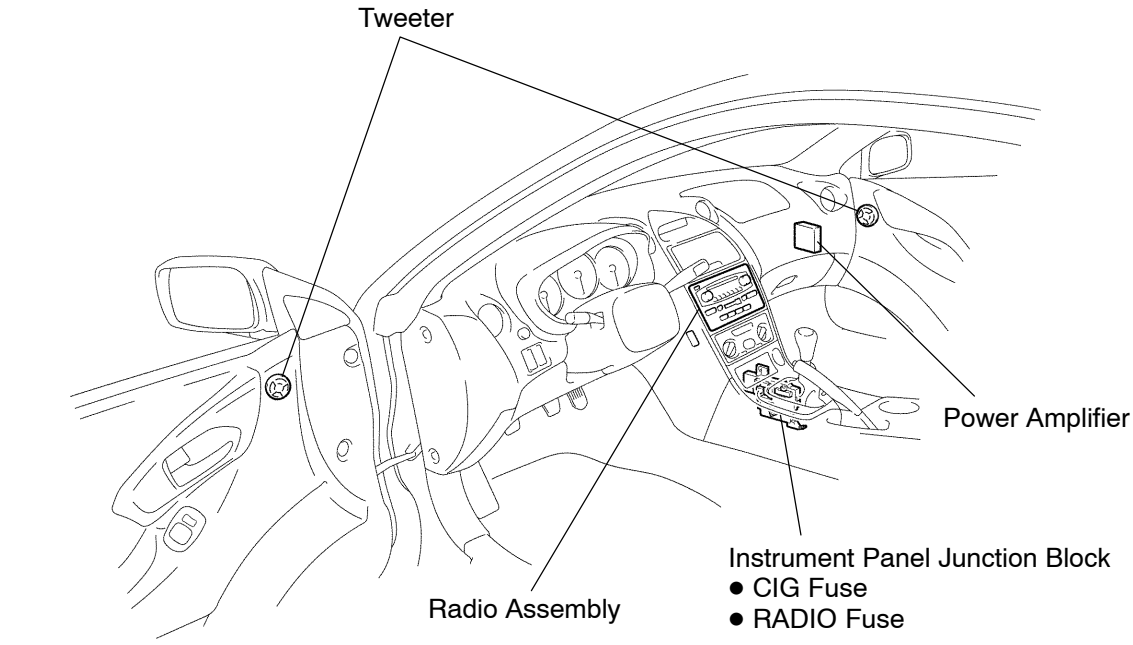


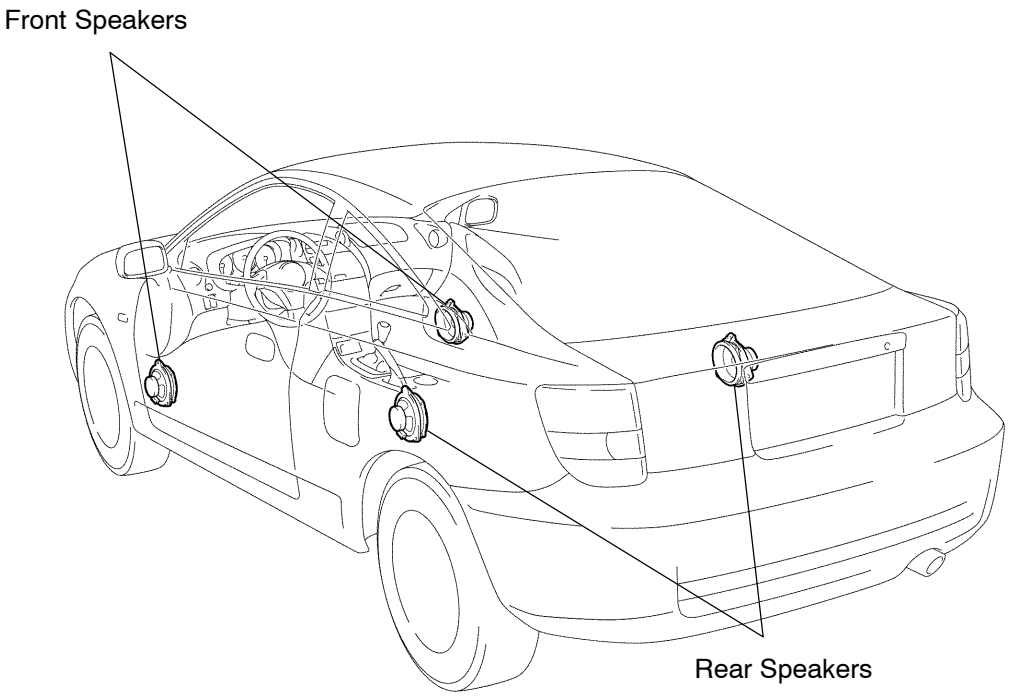
28	Noise	NOISE PRODUCED WHEN ENGINE STARTS



BE0PP–13

LOCATION

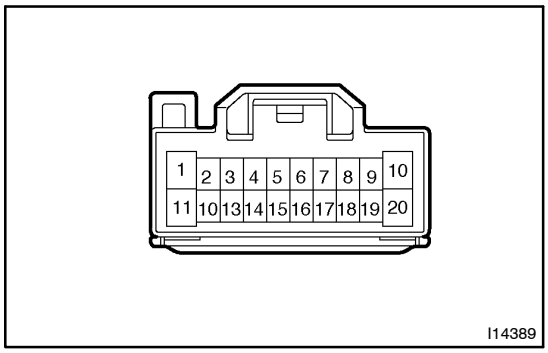




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I25301

BE16M–10



INSPECTION

1. 8 speaker type:
INSPECT RADIO RECEIVER ASSEMBLY CIRCUIT

Inspect the connector on the wire harness side with the connector of radio receiver assembly still connected.

Tester connection	Condition	Specified condition
1 – Ground (B)	Always	Battery positive voltage
2 – Ground (ILL+)	Light control switch TAIL or HEAD	Battery positive voltage
3 – Ground (AMP)	Radio power switch ON	Battery positive voltage
7 – Ground (MUTE)	Audio sounding	1 V or below
8 – Ground (FR)	Audio sounding	5 – 7 V
9 – Ground (FL)	Audio sounding	5 – 7 V
10 – Ground (GND3)	Always	Continuity
11 – Ground (ACC)	Ignition switch ACC	Battery positive voltage
16 – Ground (SGND)	Always	Continuity
17 – Ground (BEEP)	Audio sounding	–
18 – Ground (RR)	Audio sounding	5 – 7 V
19 – Ground (RL)	Audio sounding	5 – 7 V
20 – Ground (GND)	Always	Continuity

If the circuit is not as specified, inspect the circuits connected to other parts.

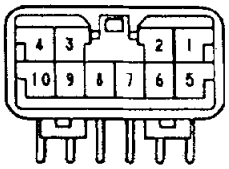
2. 6 speaker type:

INSPECT RADIO RECEIVER ASSEMBLY CIRCUIT

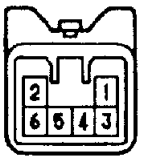
Inspect the connector on the wire harness side with the connector of radio receiver assembly still connected.

Radio Receiver Side

Connector ”A”



Connector ”B”



I12416

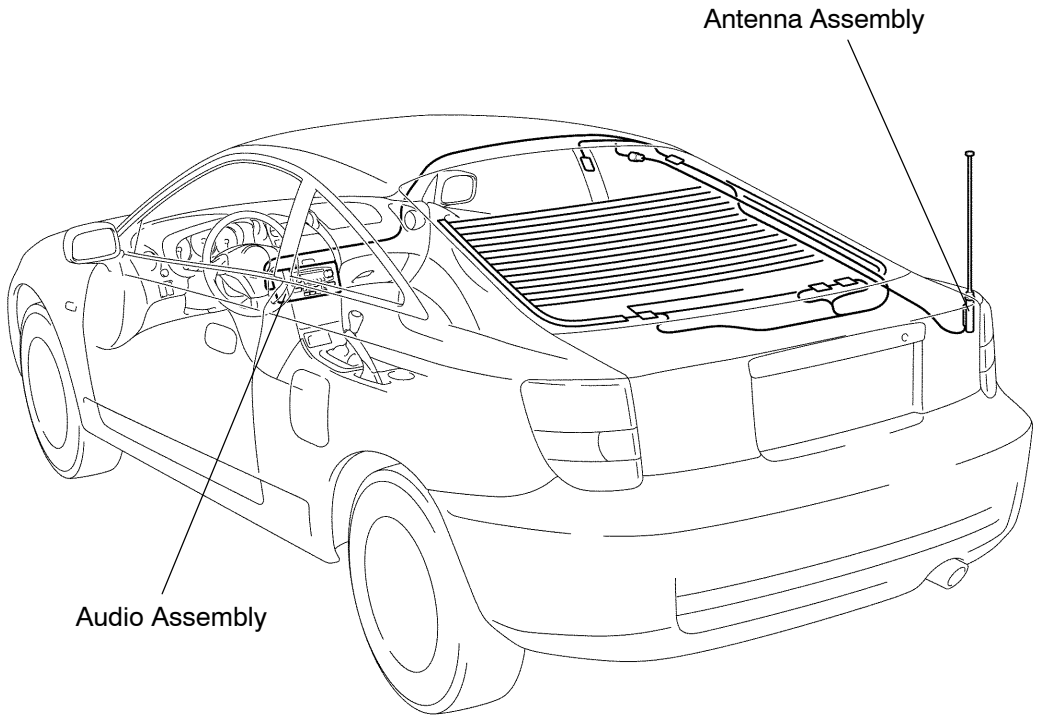
Tester connection	Condition	Specified condition
A1 – Ground (FR+)	Audio sounding	5 – 7 V
A2 – Ground (FL+)	Audio sounding	5 – 7 V
A3 – Ground (ACC)	Ignition switch ACC	Battery positive voltage
A4 – Ground (+B)	Always	Battery positive voltage
A5 – Ground (FR–)	Audio sounding	5 – 7 V
A6 – Ground (FL–)	Audio sounding	5 – 7 V
A7 – Ground (GND)	Always	Continuity
A10 – Ground (ILL+)	Light control switch TAIL or HEAD	Battery positive voltage
B1 – Ground (RR+)	Audio sounding	5 – 7 V
B2 – Ground (RL+)	Audio sounding	5 – 7 V
B3 – Ground (RR–)	Audio sounding	5 – 7 V
B6 – Ground (RL–)	Audio sounding	5 – 7 V

If the circuit is not as specified, inspect the circuits connected to other parts.

ANTENNA

LOCATION

BE1DE–09



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I25302

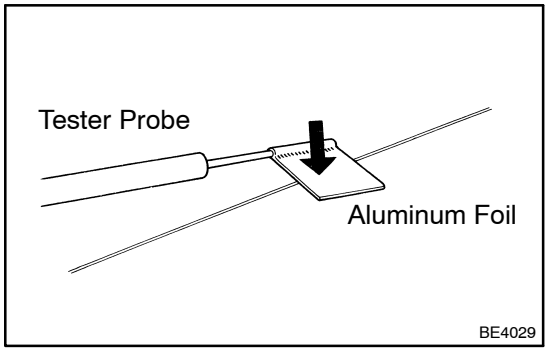
BE0B0–12

INSPECTION

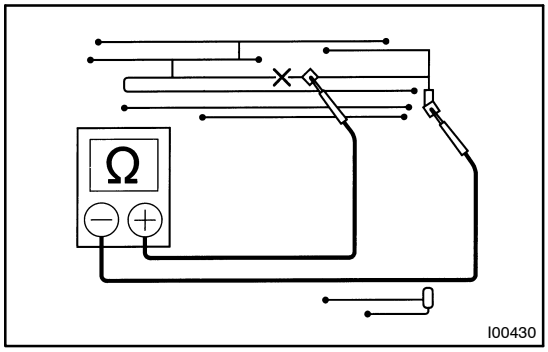
1. GLASS PRINTED ANTENNA INSPECTION PROCEDURE

NOTICE:

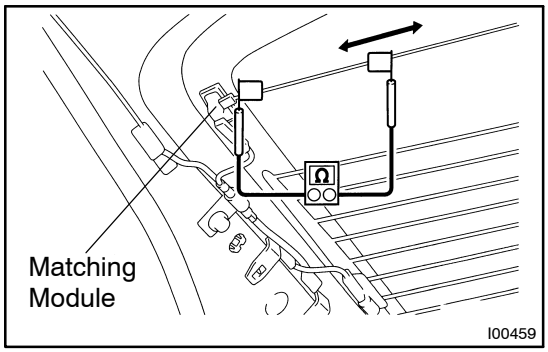
- **When cleaning the glass, use soft dry cloth, and wipe the glass between the wire.**
  Take care not to damage the wires.
- **Do not use detergents or glass cleaners with abrasive ingredients.**



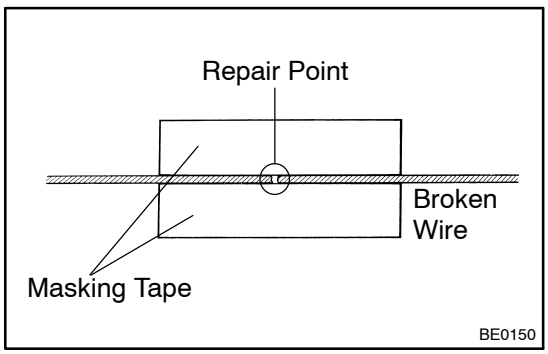
NOTICE:
In order not to damage the glass printed antenna, wrap up the tip of the tester stick with aluminum foil as shown in the illustration and check by holding the aluminum foil with a finger.



By placing and moving the tester stick along the glass printed antenna, check if continuity exists.

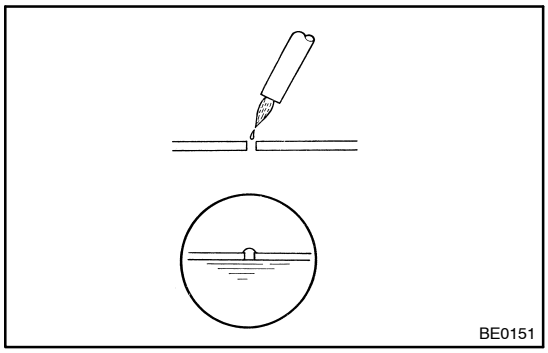


HINT:
Matching module is built in the bus bar of the glass printed antenna (main terminal side) of CELICA and no continuity exists between the terminal and the antenna. Therefore, for the continuity checking of the glass printed antenna on the main antenna side of CELICA, place one probe of the tester on the position beside the bus bar (position shown in the illustration) and check by moving the other probe of the tester along.



2. GLASS PRINTED ANTENNA REPAIR PROCEDURE

(a) Clean the broken wire tips with grease, wax and silicone remover.
(b) Place the masking tape along both sides of the wire for repair.
(c) Thoroughly mix the repair agent (Dupont paste No. 4817).



(d) Using a fine tip brush, apply a small amount of the agent to the wire.

(e) After a few minutes, remove the masking tape.

CLOCK

TROUBLESHOOTING

BE0G0–15

HINT:

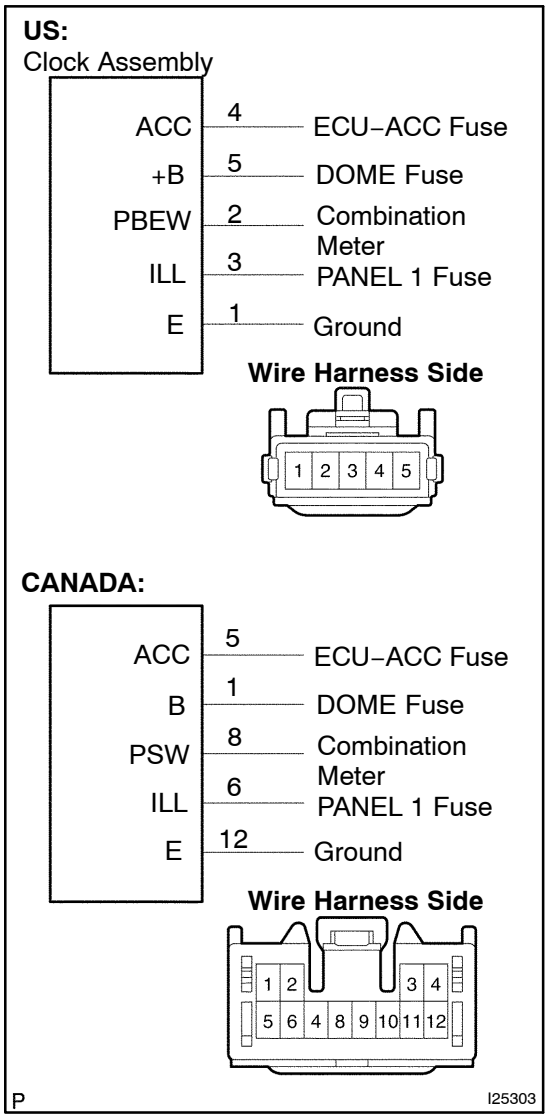
Troubleshoot the clock according to the table below.

Troubleshooting	No.
Passenger seat belt warning light does not come on.	1
Clock does not operate.	1
Clock loses or gains time (± 1.5 seconds/day)	2

1. INSPECT CLOCK CIRCUIT

2. TROUBLESHOOTING NO.1

1	**PASSENGER SEAT BELT WARNING LIGHT DOES NOT OPERATE**
	CLOCK DOES NOT OPERATE



(a) Turn ignition switch ON.

(b) Check that the battery positive voltage is 10 – 16 V.

If voltage is not as specified, replace the battery.

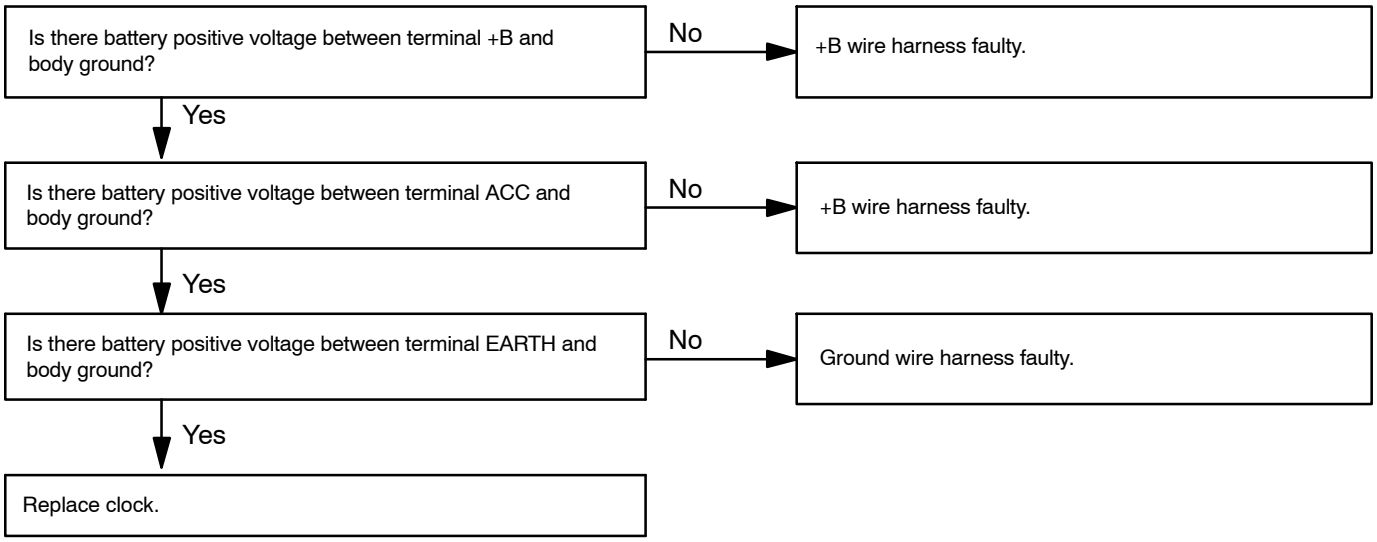
(c) Check that the DOME and ECU–ACC fuses are not blown.

If the fuse is blown, replace the fuse and check for short.

(d) Troubleshoot the clock as follows.

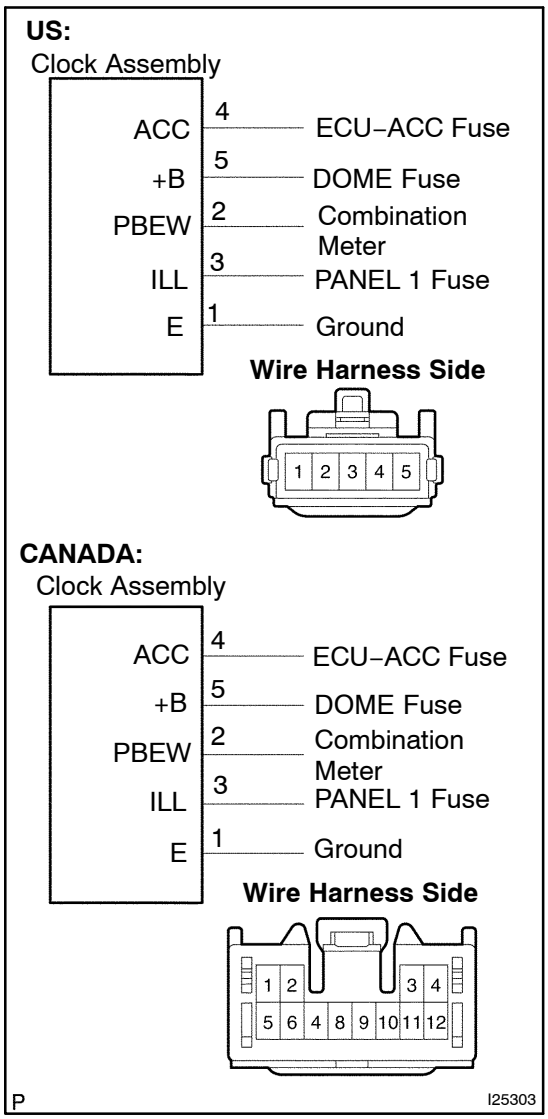
HINT:

Inspect the connector on the wire harness side.



3. TROUBLESHOOTING NO.2

2	**CLOCK LOSES OR GAINS TIME**



(a) Turn ignition switch ON.

(b) Check that the battery positive voltage is 10 – 16 V.

If voltage is not as specified, replace the battery.

(c) Inspect the error of the clock.

Allowable error (per day): ± 1.5 seconds

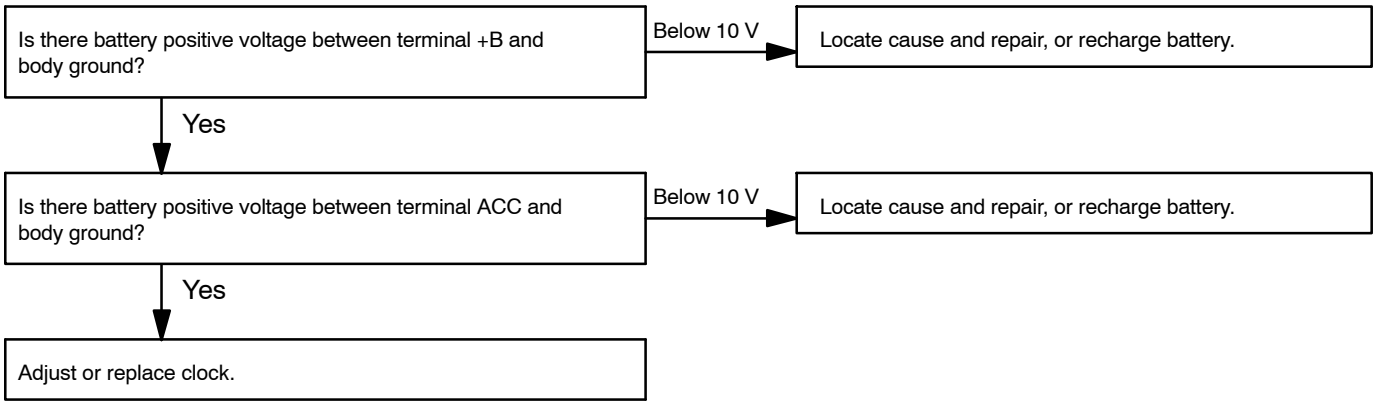
If the error exceeds the allowable error, replace the clock.

(d) Check if the clock adjusting button is sticking in position and has failed to return.

(e) Troubleshoot the clock as follows.

HINT:

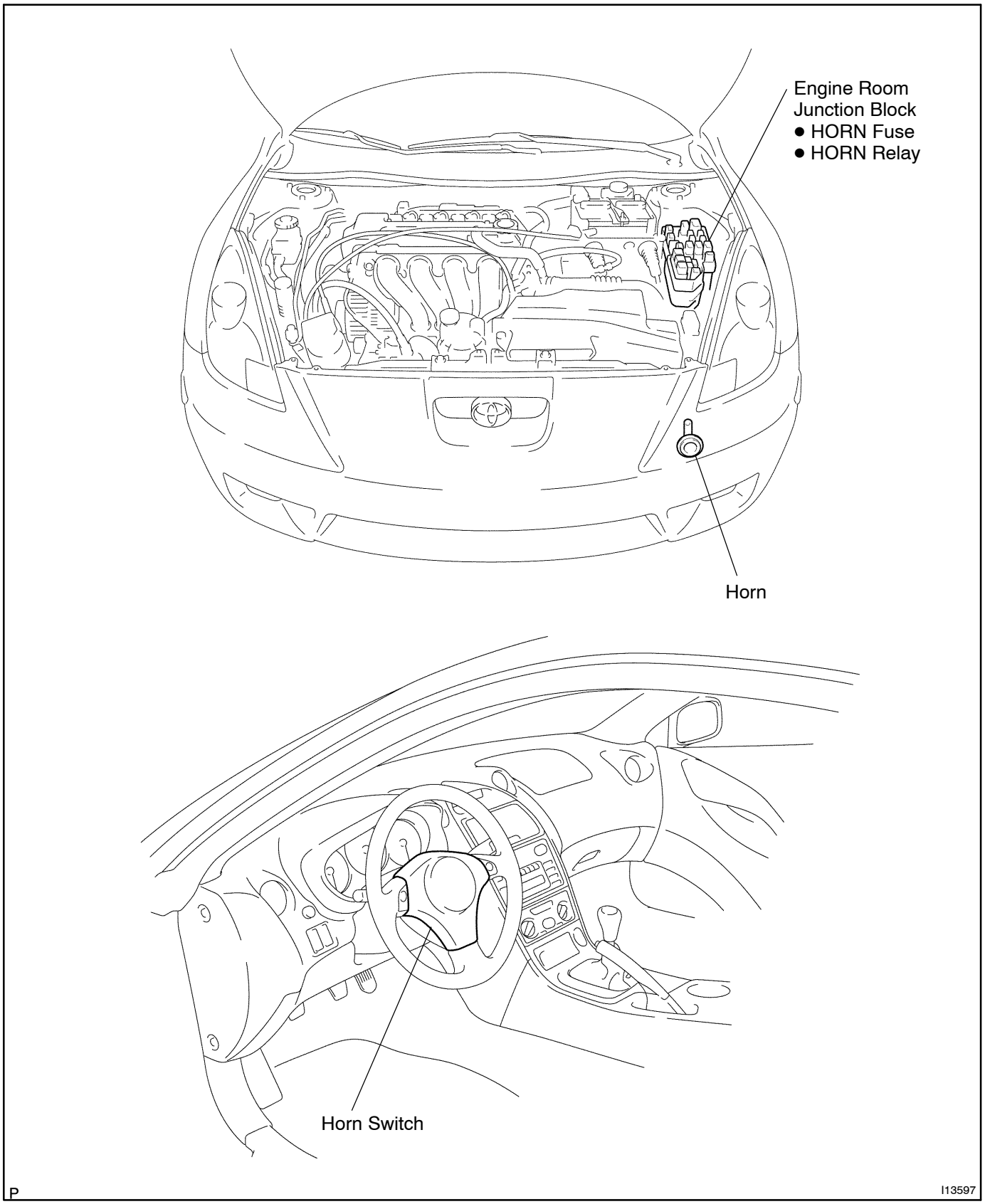
Inspect the connector on the wire harness side.


Is there battery positive voltage between terminal +B and body ground?
Below 10 V
Locate cause and repair, or recharge battery.
Yes
Is there battery positive voltage between terminal ACC and body ground?
Below 10 V
Locate cause and repair, or recharge battery.
Yes
Adjust or replace clock.

HORN SYSTEM

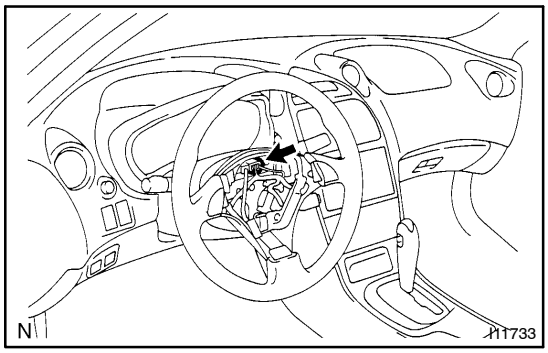
LOCATION

BE0FY–33



BE0FZ–27

INSPECTION

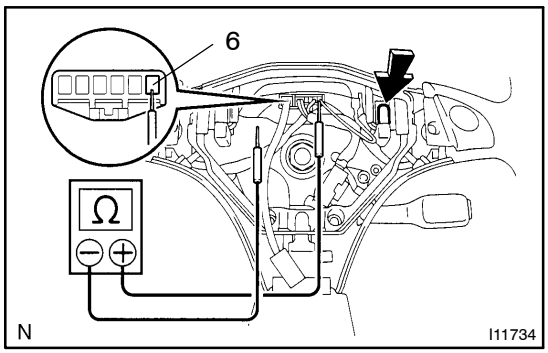


1. INSPECT HORN SWITCH

(a) Disconnect the negative (–) terminal from the battery.
(b) Remove the left and right covers from the steering wheel.
(c) Using a torx® socket wrench, loosen the 2 bolts.
(d) Pull up the horn pad and place it on the steering column.

HINT:
Do not disconnect the connector from the horn pad.

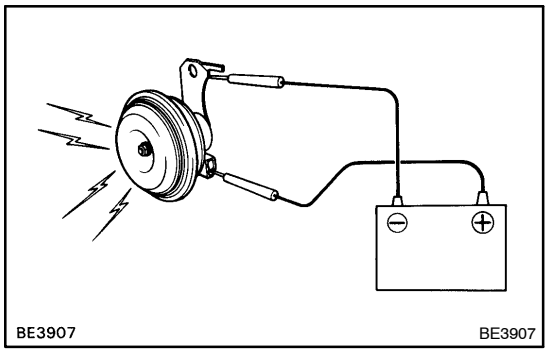
(e) Disconnect the connector from the slip ring.



(f) Check that no continuity exists between terminal 6 of the connector and body ground.
(g) Check that continuity exists between terminal 6 of the connector and body ground when the horn contact plate is pressed against the steering spoke assembly.

If continuity is not as specified, repair or replace the steering wheel or wire harness as necessary.

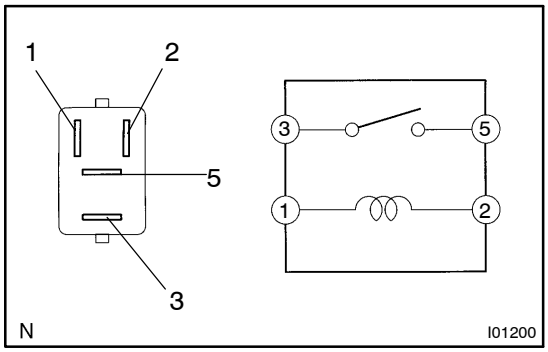
(h) Install the horn pad in place, and using a torx® socket wrench, torque the 2 bolts.
Torque: 7.1 N·m (72 kgf·cm, 62 in.·lbf)
(i) Install the left and right covers.
(j) Connect the negative (–) terminal to the battery.



2. INSPECT HORN OPERATION

Connect the battery positive (+) lead from the battery to the terminal and battery negative (–) lead to the horn body and check that the horn blows.

If operation is not as specified, replace the horn.



3. INSPECT HORN RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

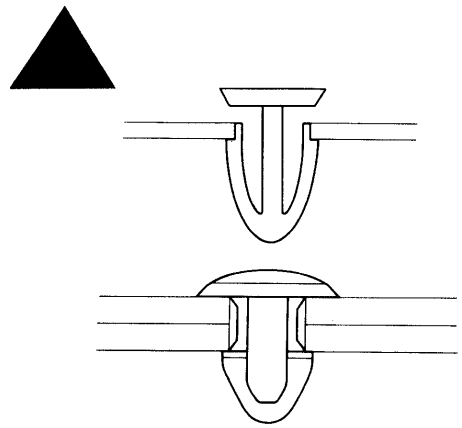
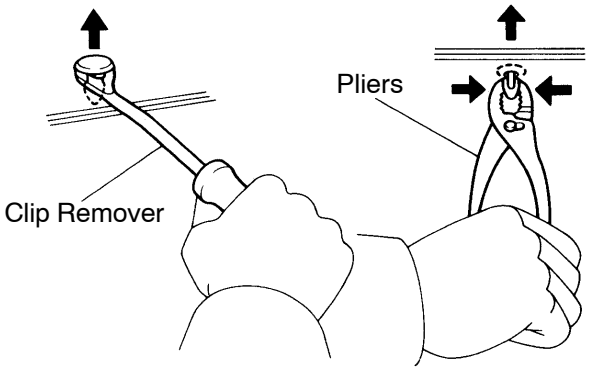
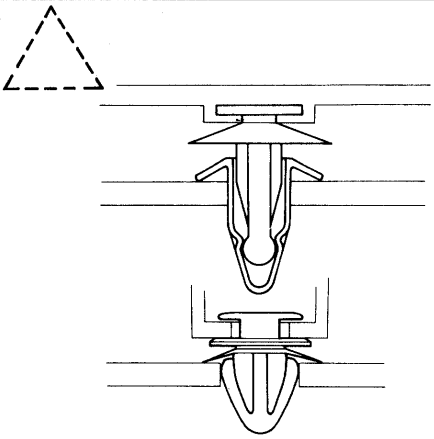
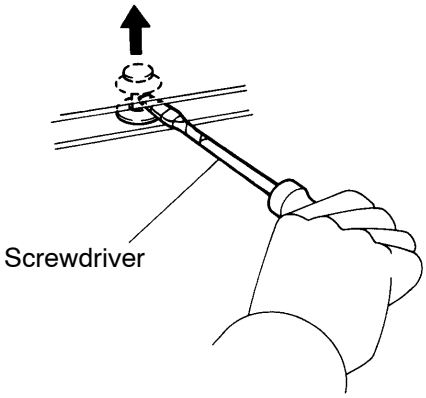
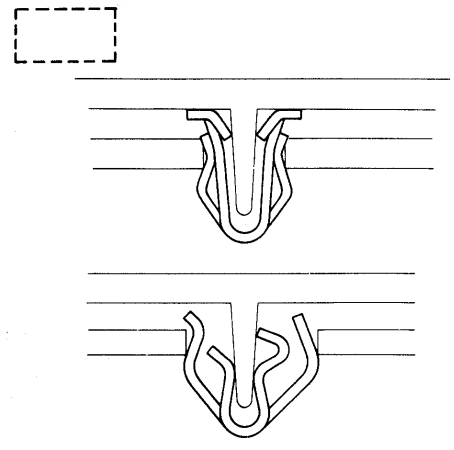
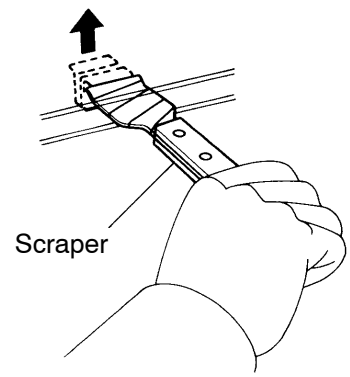
If continuity is not as specified, replace the relay.

CLIP

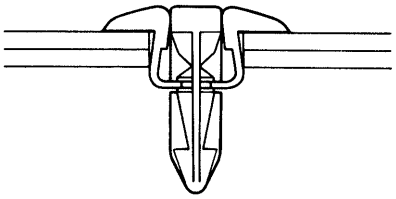
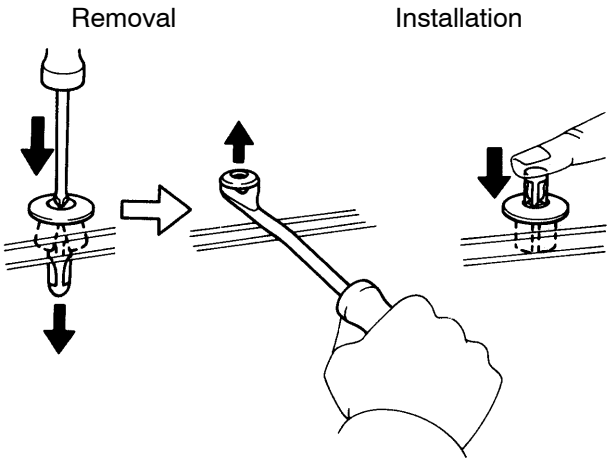
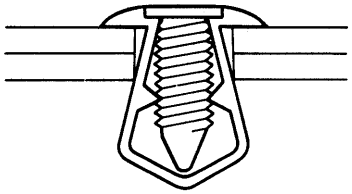
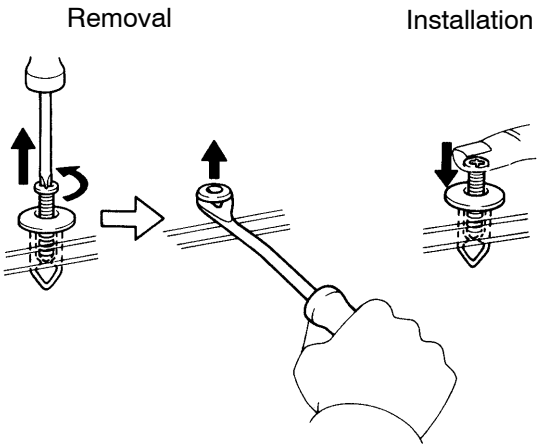
BO0ZO–14

REPLACEMENT

The removal and installation methods of typical clips used in body parts are shown in the table below.
HINT:
If the clip is damaged during the operation, always replace it with a new clip.

Shape (Example)	Removal/Installation
	
	
	

V00005

Shape (Example)	Removal/Installation
	
	

V00012

SRS AIRBAG

BO0ZP–08

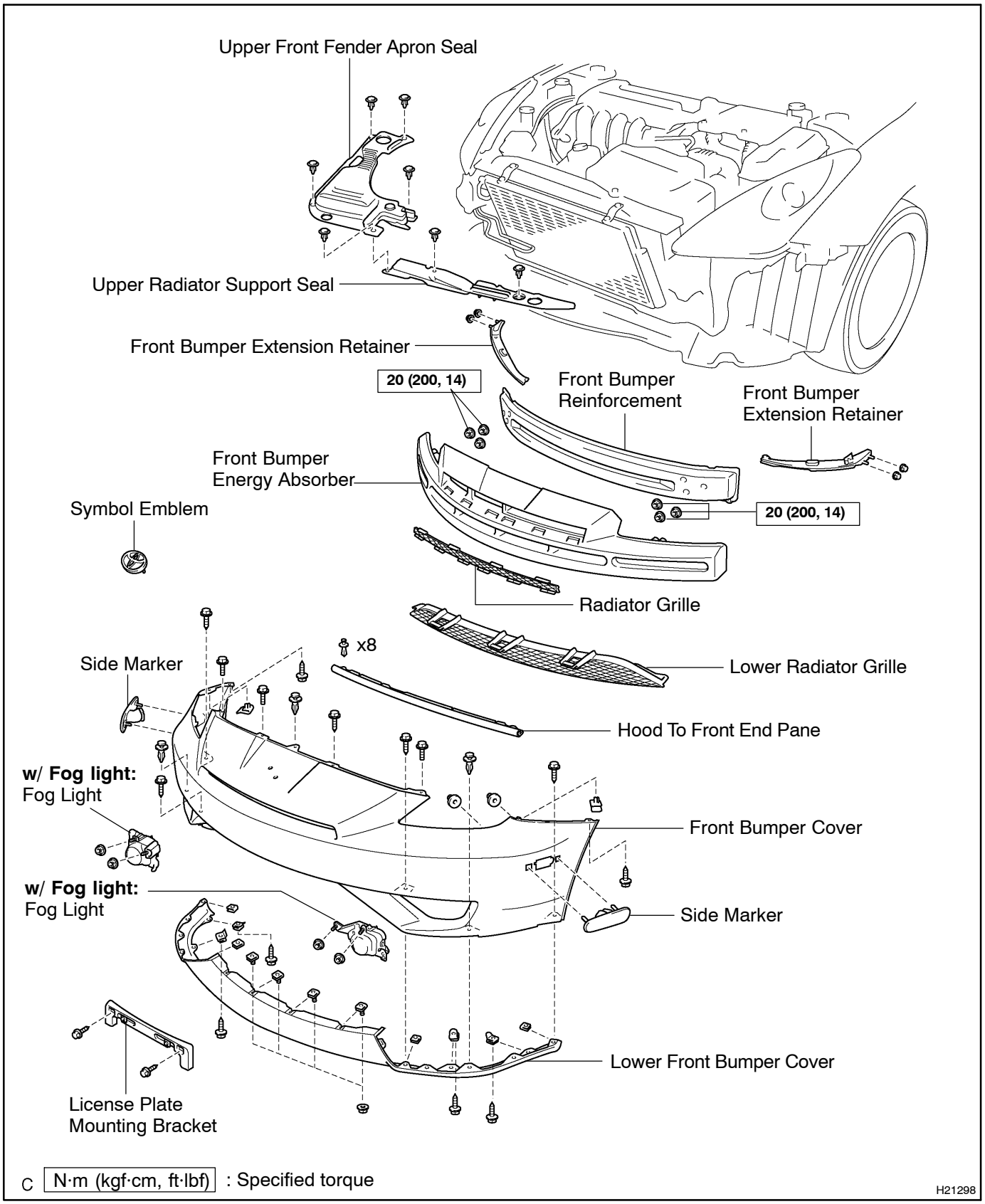
PRECAUTION

The CELICA is equipped with an SRS (Supplemental Restraint System) such as the driver airbag, front passenger airbag, side airbag and seat belt pretensioner. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

FRONT BUMPER

COMPONENTS

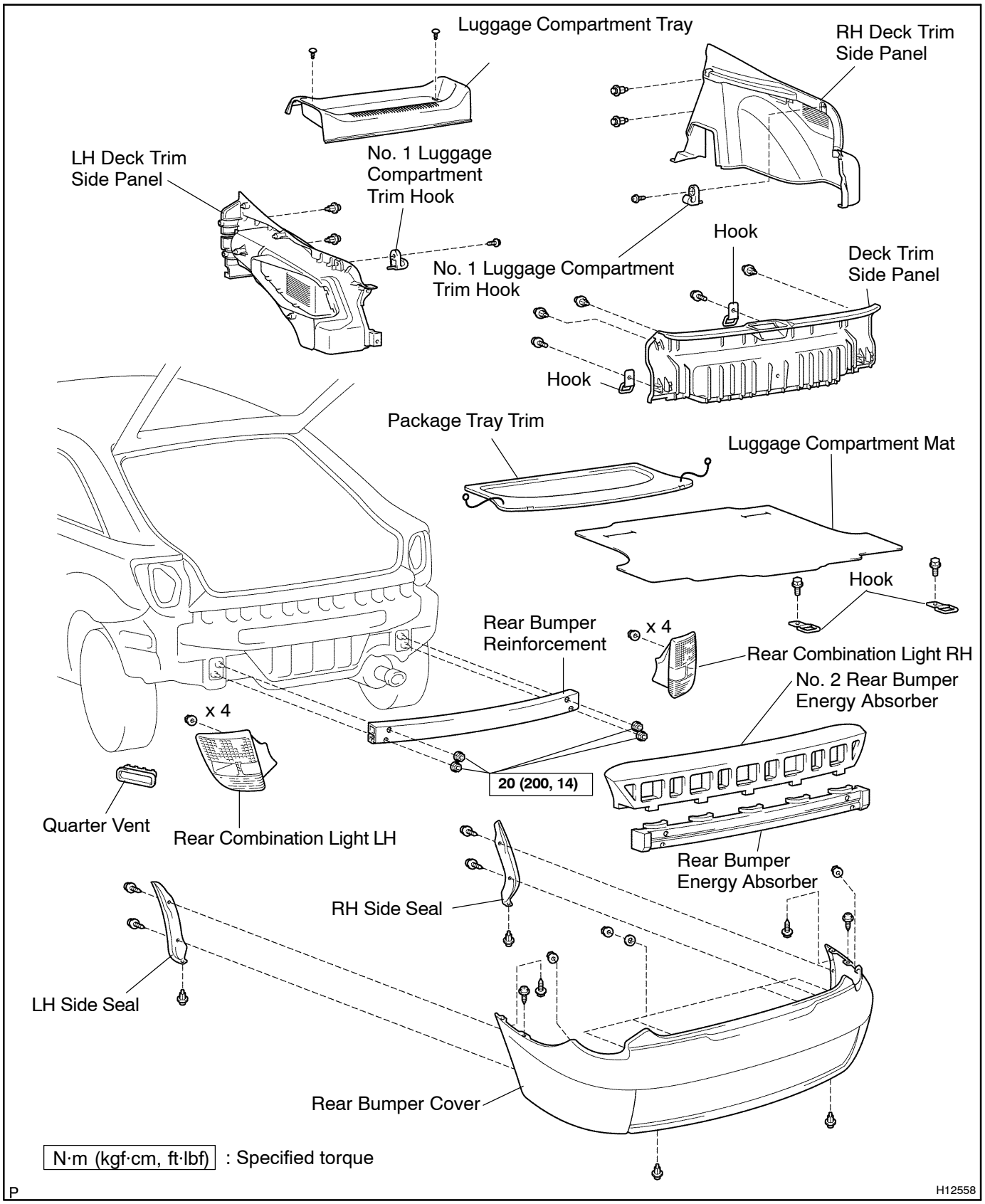
BO4J4–02



REAR BUMPER

COMPONENTS

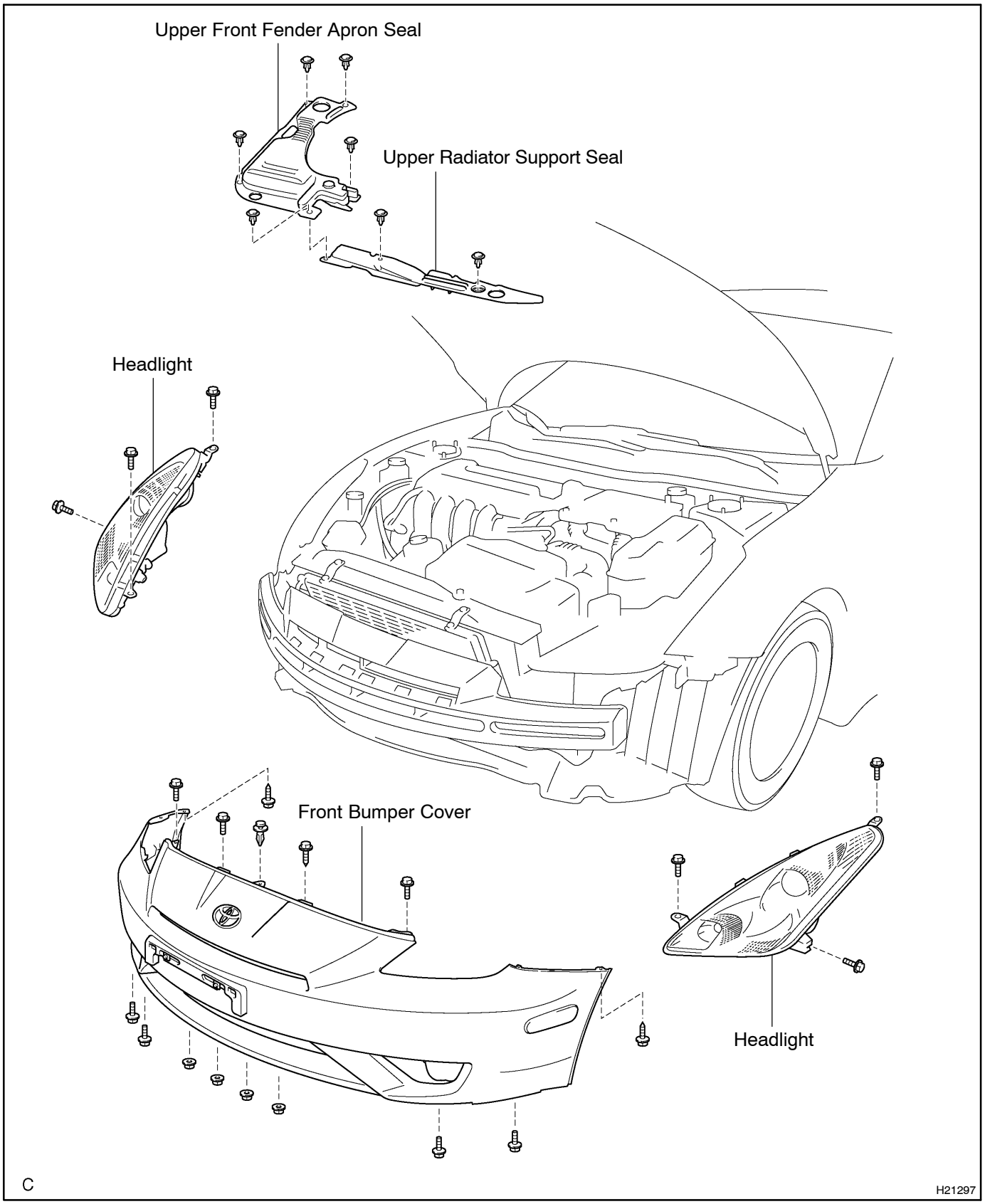
BO1DH–09



HEADLIGHT

COMPONENTS

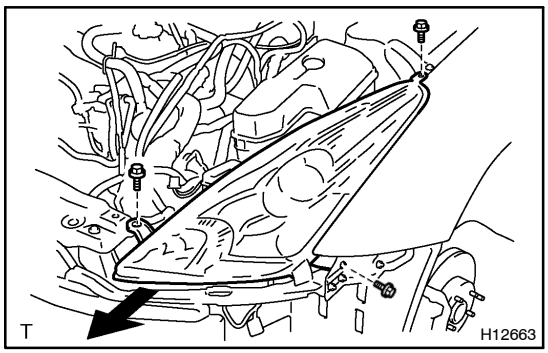
BO2NB–09



BO2NC–07

REMOVAL

1. **REMOVE UPPER FRONT FENDER APRON SEAL**
2. **REMOVE UPPER RADIATOR SUPPORT SEAL**
3. **REMOVE FRONT BUMPER COVER**
   (See page BO–4)

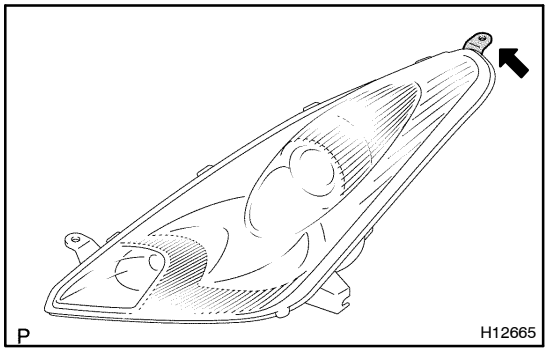


4. **REMOVE HEADLIGHT**

(a) Remove the 3 bolts.

(b) Disconnect the connectors, then remove the headlight as shown in the illustration.

(c) The procedure for the other side is same as above.



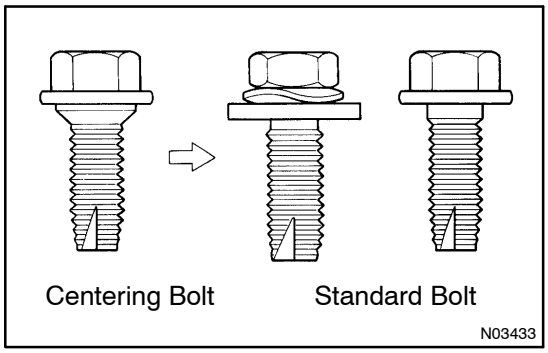
HINT:

At the time of installation, if the bracket in the illustration is damaged, replace it to a new one to install the headlight to the body. If the shown part of the headlight is damaged, the headlight can be reinstalled to the body by installing a bracket to it.

BO2ND–07

INSTALLATION

Installation is in the reverse order of removal (See page BO–6).



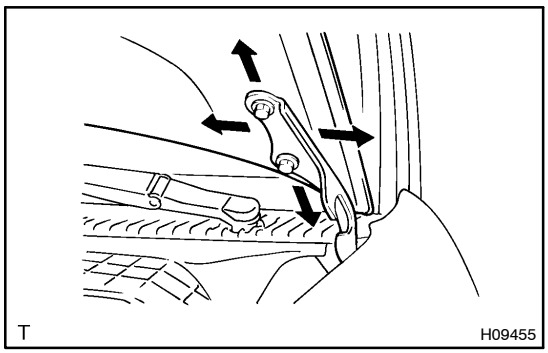
HOOD

ADJUSTMENT

BO2NE–06

HINT:

Since the centering bolt is used as the hood hinge and lock set bolt, the hood cannot be adjusted with it on. Substitute the standard bolt for the centering bolt.

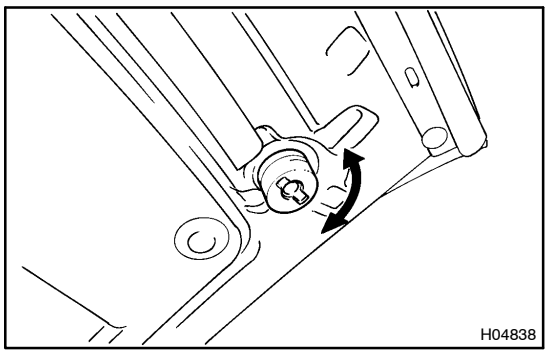


1. ADJUST HOOD IN FORWARD/REARWARD AND LEFT/LIGHT DIRECTIONS

(a) Adjust the hood by loosening the hood side hinge bolts.

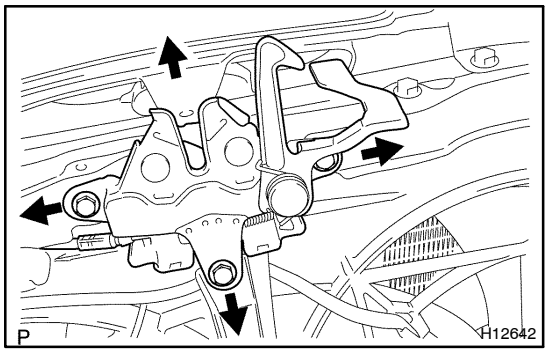
(b) Tighten the loosened bolts again.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by turning the cushions.



3. ADJUST HOOD LOCK

(a) Remove the upper front fender opron seal.

(b) Remove the upper radiator support seal.

(c) Remove the radiator reservoir.

(d) Adjust the hood lock by loosening the bolts.

(e) Tighten the loosened bolts again.

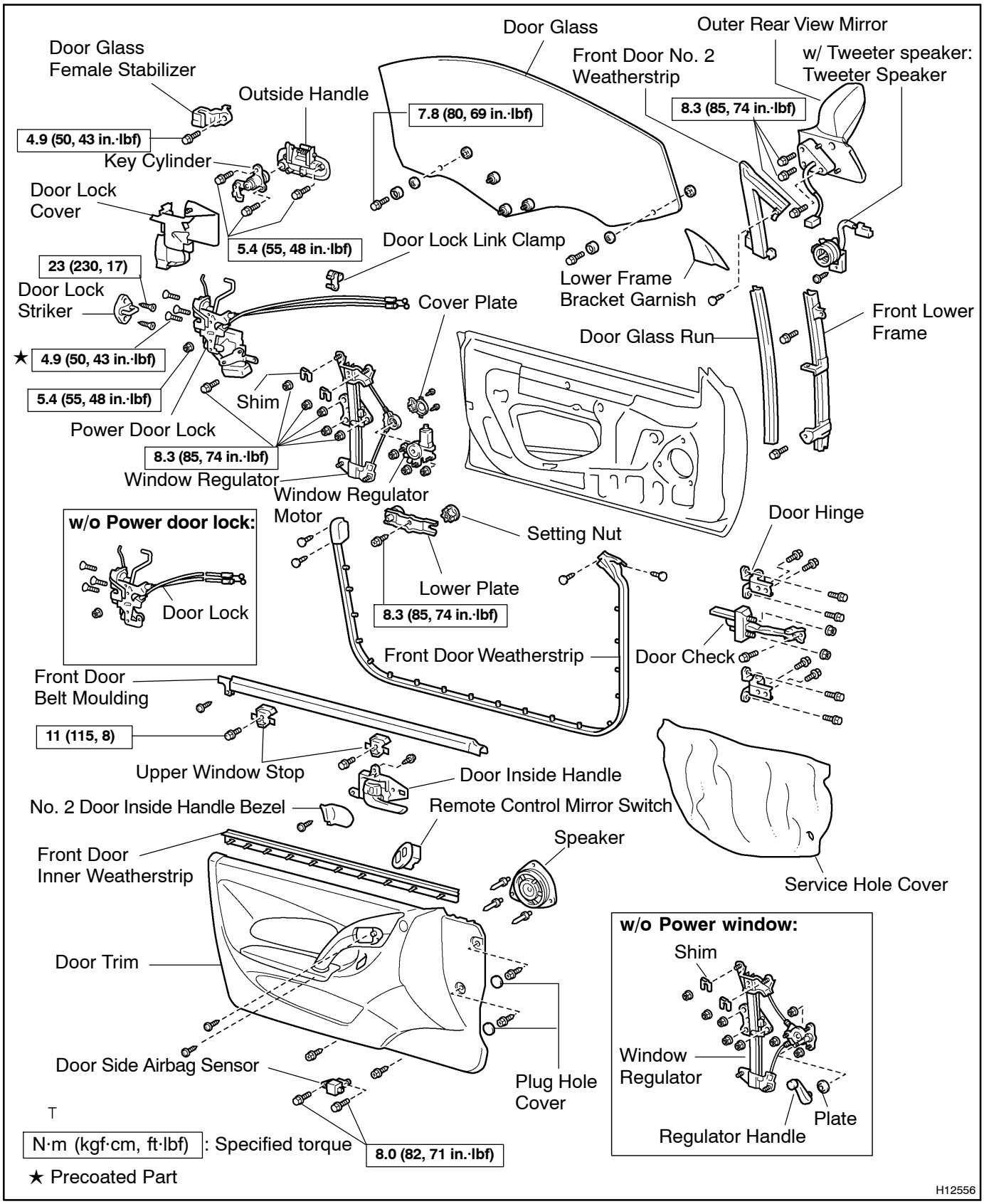
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)

(f) Reinstall the removed parts.

FRONT DOOR

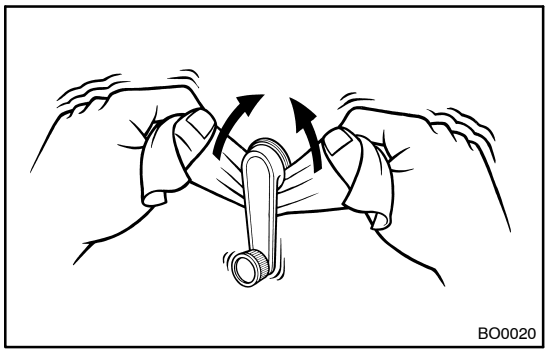
COMPONENTS

BO1DJ–08



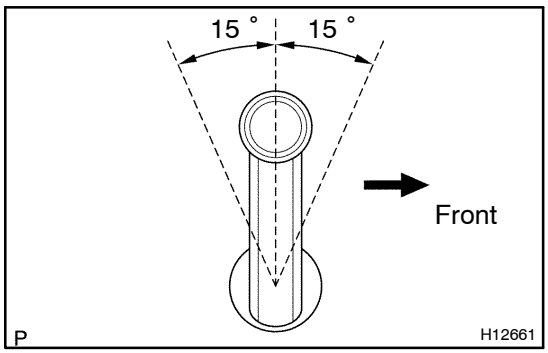
BO2OJ–02

DISASSEMBLY



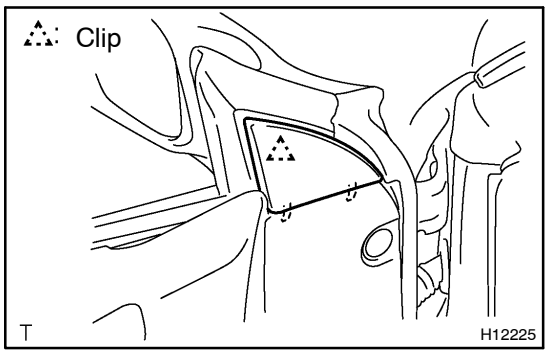
1. w/o Power window:
REMOVE REGULATOR HANDLE

Pull off the snap ring with a shop rag and remove the regulator handle and plate.



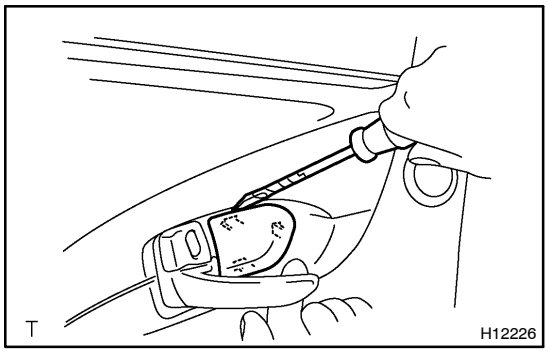
HINT:

- At the time of reassembly, please refer to the following item.
- With door window fully closed, install the plate and regulator handle with the snap ring in the position within ± 15° as shown in the illustration.



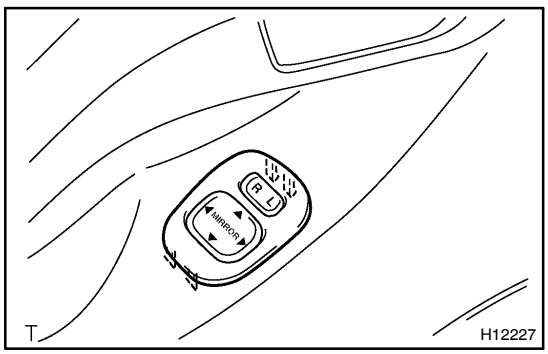
2. REMOVE LOWER FRAME BRACKET GARNISH

Using a screwdriver, remove the lower frame bracket garnish.
HINT:
Tape the screwdriver tip before use.



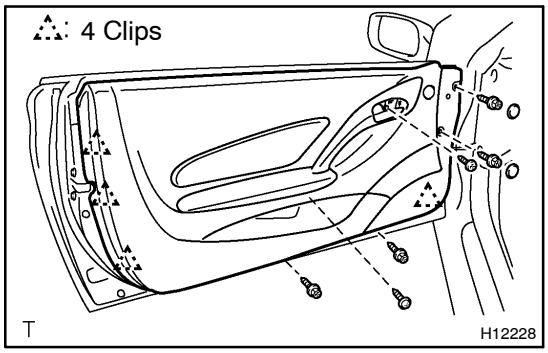
3. REMOVE NO. 2 DOOR INSIDE HANDLE BEZEL

Using a screwdriver, remove the No. 2 door inside handle bezel.
HINT:
Tape the screwdriver tip before use.



4. REMOVE REMOTE CONTROL MIRROR SWITCH

Using a screwdriver, remove the remote control mirror switch, then disconnect the connector.
HINT:
Tape the screwdriver tip before use.



5. REMOVE DOOR TRIM

(a) Using a screwdriver, remove the 2 plug hole covers.

HINT:

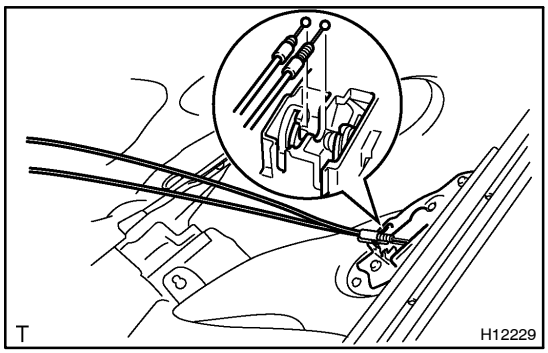
Tape the screwdriver tip before use.

(b) Remove the 6 screws.

(c) Insert a screwdriver between the door panel and door trim to pry the trim out.

HINT:

Tape the screwdriver tip before use.



(d) Pull the trim upward to remove it, then disconnect the locking cable and open cable from the door inside handle.

HINT:

- At the time of reassembly, please refer to the following items.
- Check that a ball at the end of the locking cable is pressed. (The cable should be locked.)
- Turn the locking knob of the inside handle fully to the lock side and install the locking cable.

(e) Remove the screw and door inside handle from the door trim.

(f) Using a screwdriver, remove the front door inner weatherstrip from the door trim.

6. REMOVE DOOR SIDE AIRBAG SENSOR

NOTICE:

- **If the wiring connector of the SRS is disconnected with the ignition switch in ON or ACC position, DTCs will be recorded.**
- **Never use SRS parts removed from another vehicle. When replacing parts, replace them with new ones.**
- **Never reuse the sensor involved in a collision where the SRS has deployed.**
- **Never repair a sensor in order to reuse it.**

Disconnect the connector, then remove the 2 bolts and door side airbag sensor.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

NOTICE:

- **At the time of reassembly, please refer to the following items.**
- **Make sure the sensor is installed in the specified torque.**
- **If the sensor has been dropped, or there are cracks, dents or any other defects are identified in the case, brackets or connector, replace the sensor. Always replace the set bolts with new ones.**
- **The sensor set bolts have been anti–rust treated. When the sensor is removed, always replace the set bolts with new ones.**
- **After installation, shake the sensor to check that there is no looseness.**

- **The sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector. If not, a malfunction code may be detected by the diagnostic system.**

7. REMOVE OUTSIDE REAR VIEW MIRROR
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)

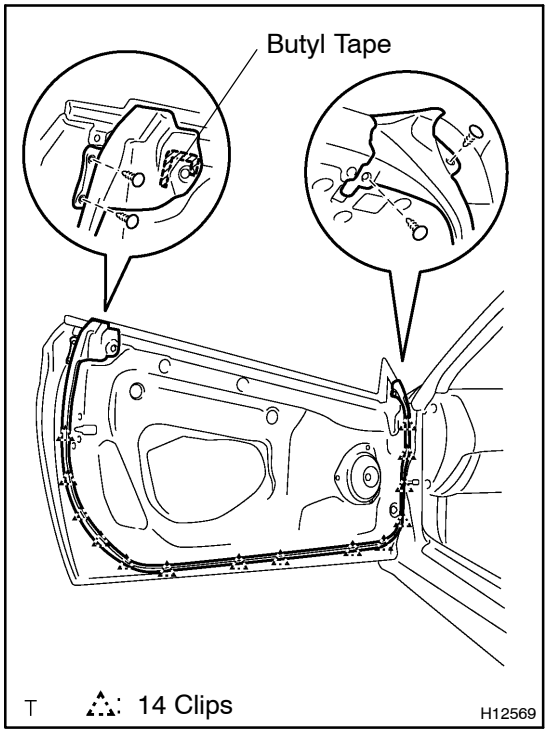
8. w/ Tweeter speaker:
REMOVE TWEETER SPEAKER

9. REMOVE SERVICE HOLE COVER

NOTICE:
Do not tear the cover.

HINT:

- At the time of reassembly, please refer to the following item.
- Bring out the 2 cables and wire harness through the slits of service hole cover.



10. REMOVE FRONT DOOR WEATHERSTRIP

(a) Using a clip remover, remove the 4 clips.

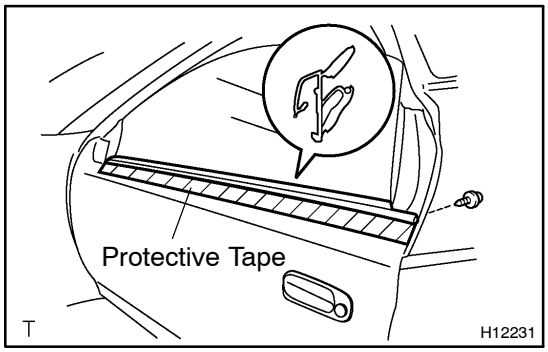
HINT:

Tape the screwdriver tip before use.

(b) Using a clip remover, remove the front door weatherstrip.

HINT:

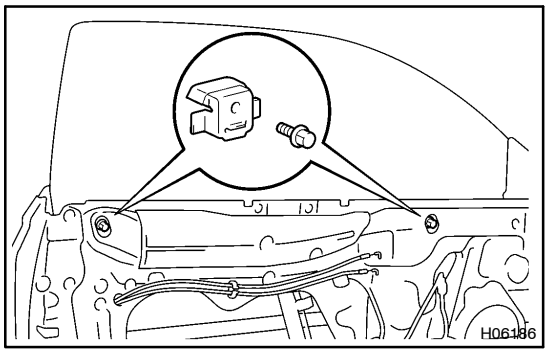
Tape the screwdriver tip before use.



11. REMOVE FRONT DOOR BELT MOULDING

(a) Remove the screw.

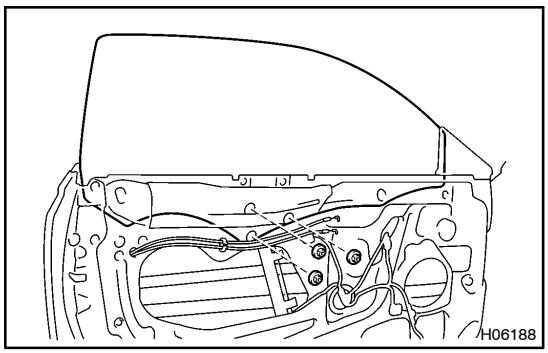
(b) Using a moulding remover, remove the front door belt moulding.



12. REMOVE UPPER WINDOW STOPS

Remove the 2 bolts and 2 upper window stops.

Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)



13. REMOVE DOOR GLASS

(a) Close the door glass until the nuts appear in the service hole.

(b) Remove the 3 nuts.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

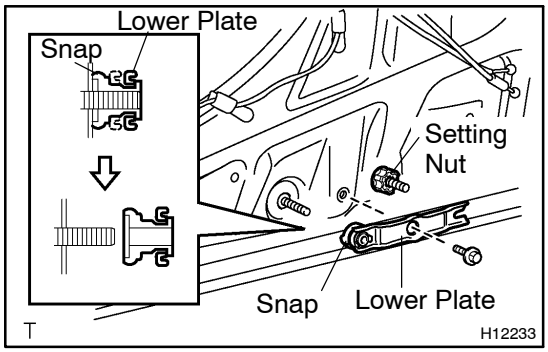
(c) Take the door glass out of the panel carefully.

NOTICE:

Be careful not to drop the door glass.

HINT:

- At the time of reassembly, please refer to the following item.
- Insert a shop rag inside the panel to prevent the glass from being scratched.



14. REMOVE WINDOW REGULATOR

(a) Remove the bolt of lower plate.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

(b) Unlock the snap by pulling the lower plate.

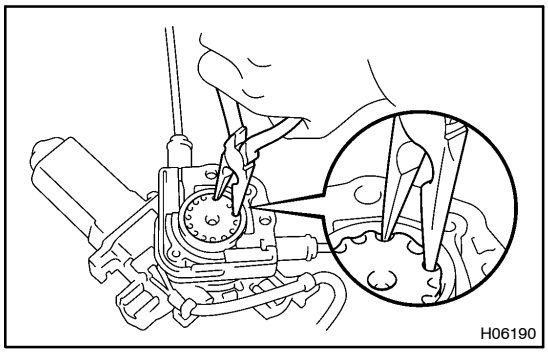
(c) Remove the snap and lower plate from the stud bolt of lower bracket.

(d) Remove the setting nut.

(e) w/ Power window:
Disconnect the connector.

(f) Remove the 5 nuts and window regulator.

Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)



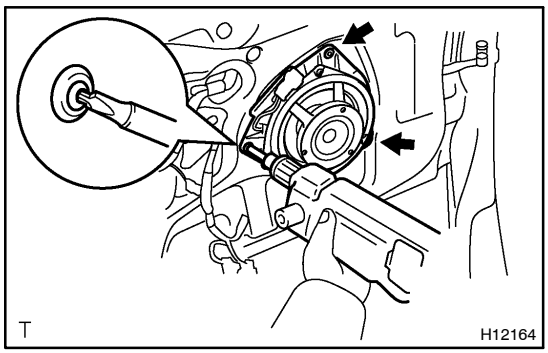
15. w/ Power window:
If replacing the window regulator:
REMOVE WINDOW REGULATOR FROM MOTOR

(a) Remove the 2 screws and cover plate.

(b) Using needle nose pliers, remove the drum and wire guide from the motor.

NOTICE:

Do not use a screwdriver etc. to remove them.



16. REMOVE SPEAKER

(a) Using a rivet cutter and drill, drill out the rivets and remove the speaker.

HINT:

Even if flanges are taken off, continue drilling and push out remaining flangments with the drill.

(b) Disconnect the connector.

(c) Using a vacuum cleaner, remove the drilled rivets and the associated metallic dust from the inside of the door panel.

CAUTION:

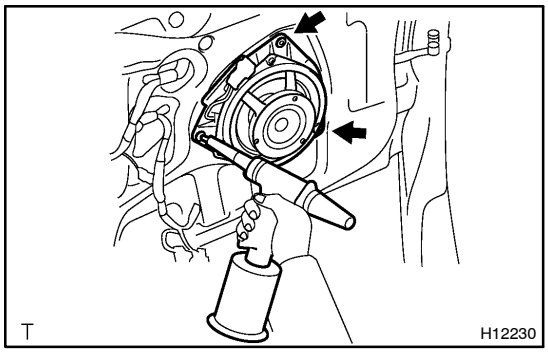
Do not touch the cut rivets and rivet cutter as they will be not.

NOTICE:

- **Do not jiggle the rivet cutter while cutting.**
- **Otherwise you may enlarge the rivet hole or damage the rivet cutter.**

HINT:

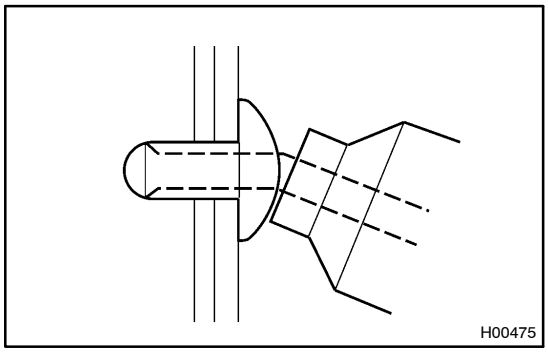
Do not drill the door inner hole.



HINT:

At the time of reassembly, please refer to the following item.

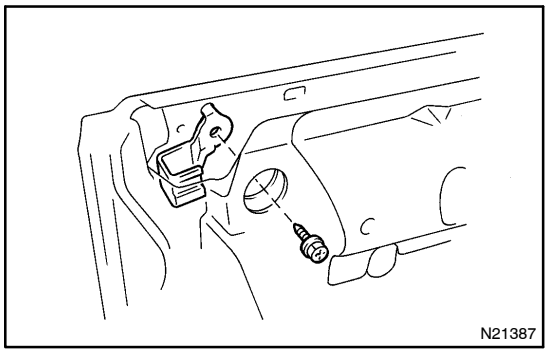
Using an air riveter, strike rivets into the door panel to install the speaker to the door panel.



NOTICE:

At the time of reassembly, please refer to the following item.

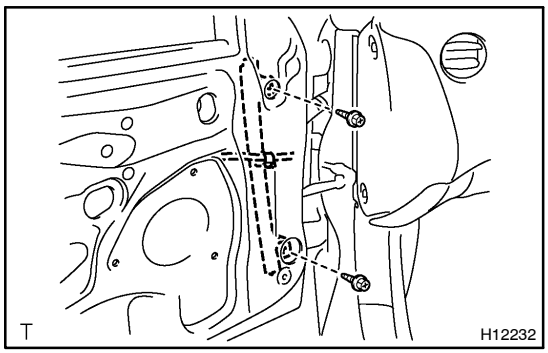
If the rivets are not positioned perpendicular to the assembled surface the mandrel will be bent. If the trigger is pulled in this condition, the air riveter may be also damaged.



17. REMOVE DOOR GLASS FEMALE STABILIZER

Remove the screw and door glass female stabilizer.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



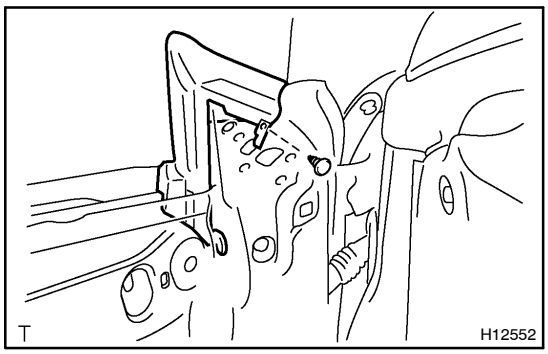
18. REMOVE FRONT LOWER FRAME

(a) Remove the 2 screws.

(b) Disengage the clamp of door wire harness from the front lower frame.

(c) Remove the front lower frame through the service hole.

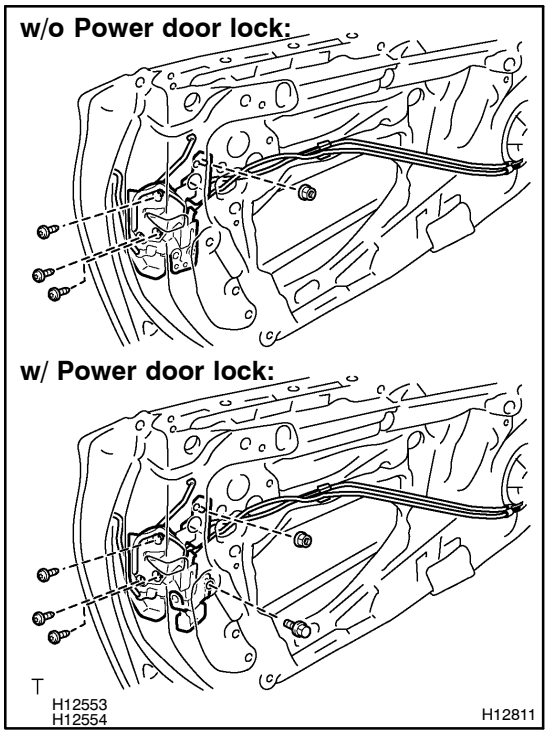
(d) Remove the door glass run from the lower frame.



19. REMOVE FRONT DOOR NO. 2 WEATHERSTRIP

(a) Using a clip remover, remove the clip.

(b) Remove the front door No. 2 weatherstrip.



20. REMOVE DOOR LOCK

(a) Disconnect the 2 links from the outside handle and key cylinder.

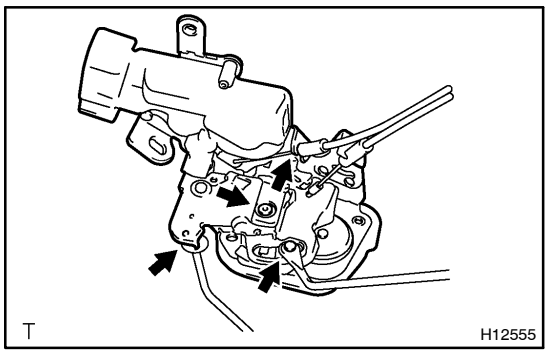
(b) w/o Power door lock:
Remove the nut and 3 screws.
Torque:
Nut: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
Screw: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

(c) w/ Power door lock:
Disconnect the connector and remove the bolt, nut and 3 screws.
Torque:
Nut: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
Bolt, Screw: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

HINT:

- At the time of reassembly, please refer to the following item.
- Apply adhesive to 3 screws.
  Part No. 08833–00070, THREE BOND 1324 or equivalent

(d) Remove the door lock through the service hole.
(e) Remove the door lock link clamp.



HINT:

- At the time of reassembly, please refer to the following item.
- Apply MP grease to the sliding and rotating parts of the door lock.

21. REMOVE OUTSIDE HANDLE

(a) Remove the 2 bolts and outside handle with key cylinder.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
(b) Remove the bolt and key cylinder from the outside handle.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

BO1DL–07

INSPECTION

INSPECT FRONT DOOR GLASS

Check the following. If the conditions are not met, readjust the glass.

(1) When you close the door with the glass fully closed, the a–a, b–b, c–c sections are in the same condition as shown in the illustration.

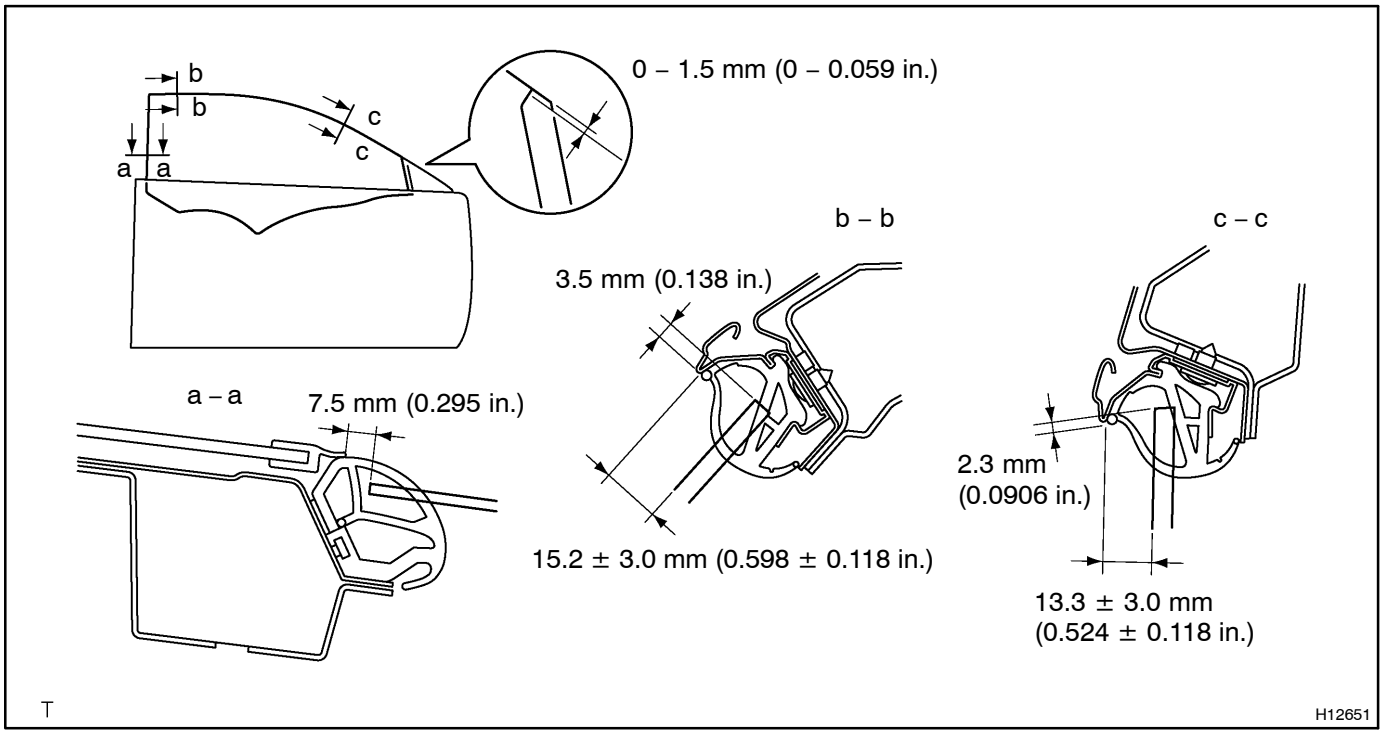
(2) When you close the door with the glass fully closed, check that the weatherstrip is not pinched and that the door glass is not in contact with the roof drip moulding.

(3) When the door glass is fully closed, check that the outside edge of the door glass is in contact with the weatherstrip at the front pillar and roof side and that the edge of the glass cannot be seen.

(4) Check that the door glass is not loose when it is half open.

(5) When the door glass is rising up, check that the door glass and roof side weatherstrip are parallel and that the door glass contacts the 2 upper stops.

(6) Check that the door glass moves up and down smoothly over all areas.



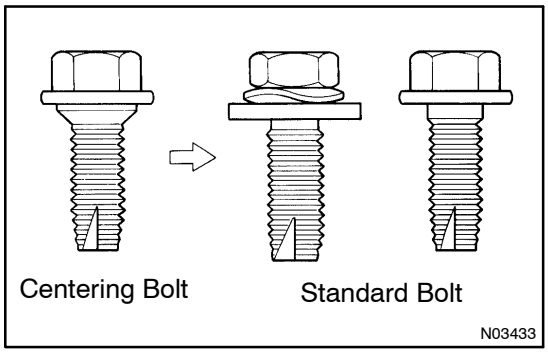
BO1DM–06

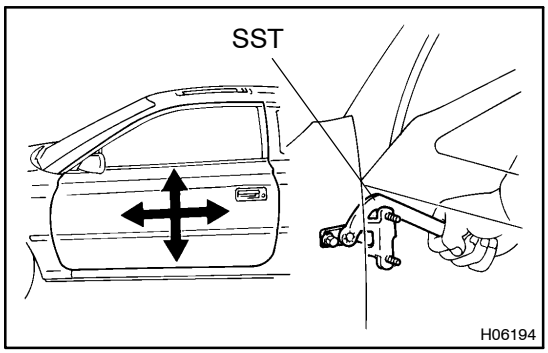
ADJUSTMENT

1. FRONT DOOR ADJUSTMENT

HINT:

Since the centering bolt is used as the door side hinge bolt, the door hinge cannot be adjusted with it on. Substitute the bolt with washer for the centering bolt.



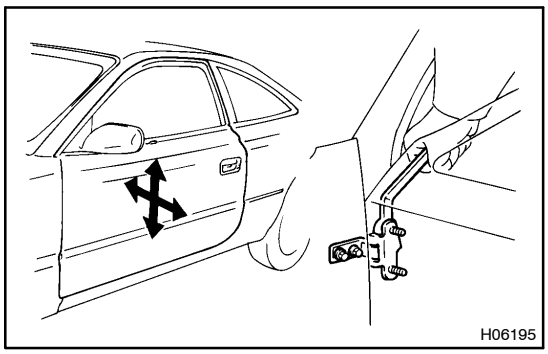


(a) Adjust the front door in forward/rearward and vertical directions.

Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812–00010

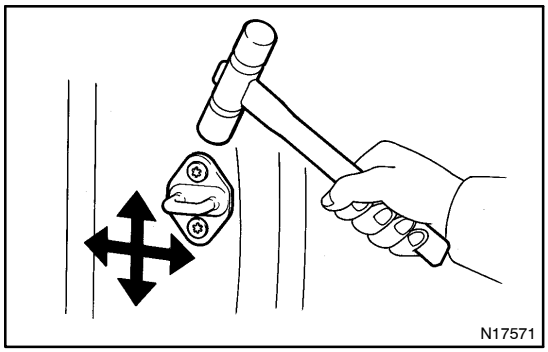
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)



(b) Adjust the front door in left/right and vertical directions.

Adjust the door by loosening the door side hinge bolts.

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)



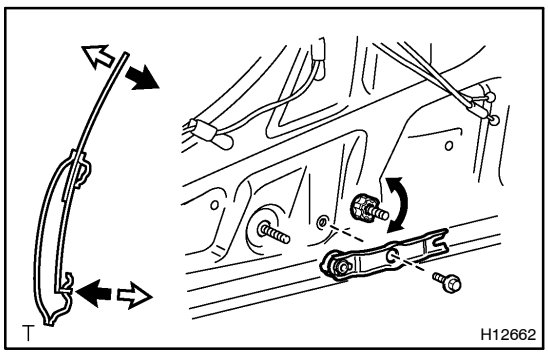
(c) Adjust front door lock striker.

(1) Check that the door fit and door lock linkages are adjusted correctly.

(2) Adjust the striker position by slightly loosening the striker mounting screws and hitting the striker with a hammer.

(3) Tighten the striker mounting screws again.

Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)



2. ADJUST FRONT DOOR GLASS

(a) Adjust the upper part of the glass inward/outward.

(1) Remove the bolt and lower plate.

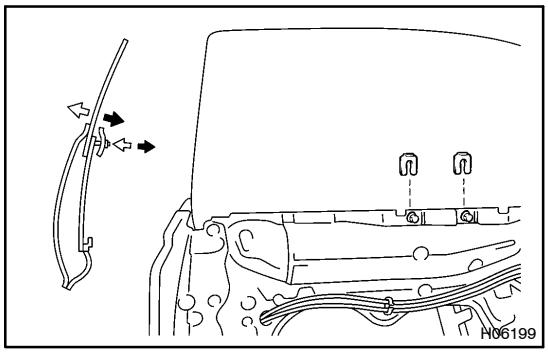
(2) Pull the lower plate so that the snap is unlocked.

(3) Remove the snap and lower plate.

(4) Adjust the glass by turning the setting nut.

(5) Reinstall the lower plate, snap and bolt.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

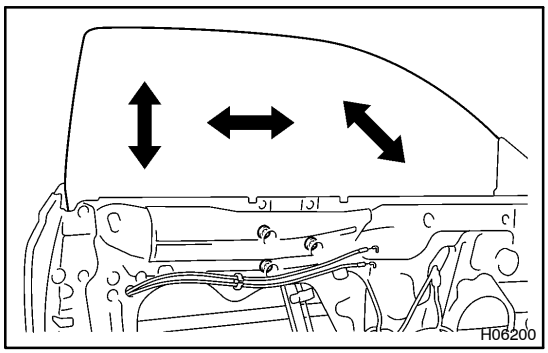


(b) Adjust the lower part of the glass inward/outward.
(1) Loosen the 2 nuts on the top of the window regulator.
(2) Insert the shim to adjust the glass position (inside/outside).

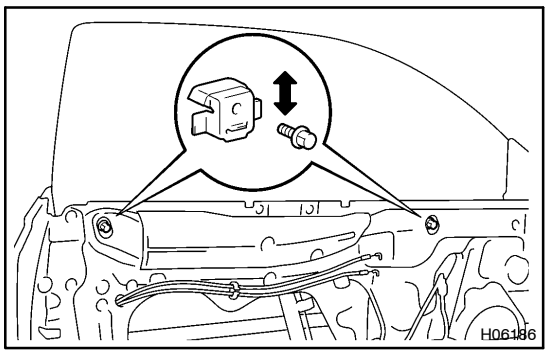
Shim thickness:
1.0 mm (0.039 in.)
2.0 mm (0.079 in.)

(3) Tighten the nuts.

Torque: 8.3 N·m (85 kgf·cm, 69 in.·lbf)



(c) Adjust the glass to the proper position (forward/rearward).
Loosen the 3 nuts of the carrier plate for adjustment.



(d) Adjust the glass to the proper position vertically.(With the glass fully closed).
Adjust the door window upper stops.

Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

BO2OK–04

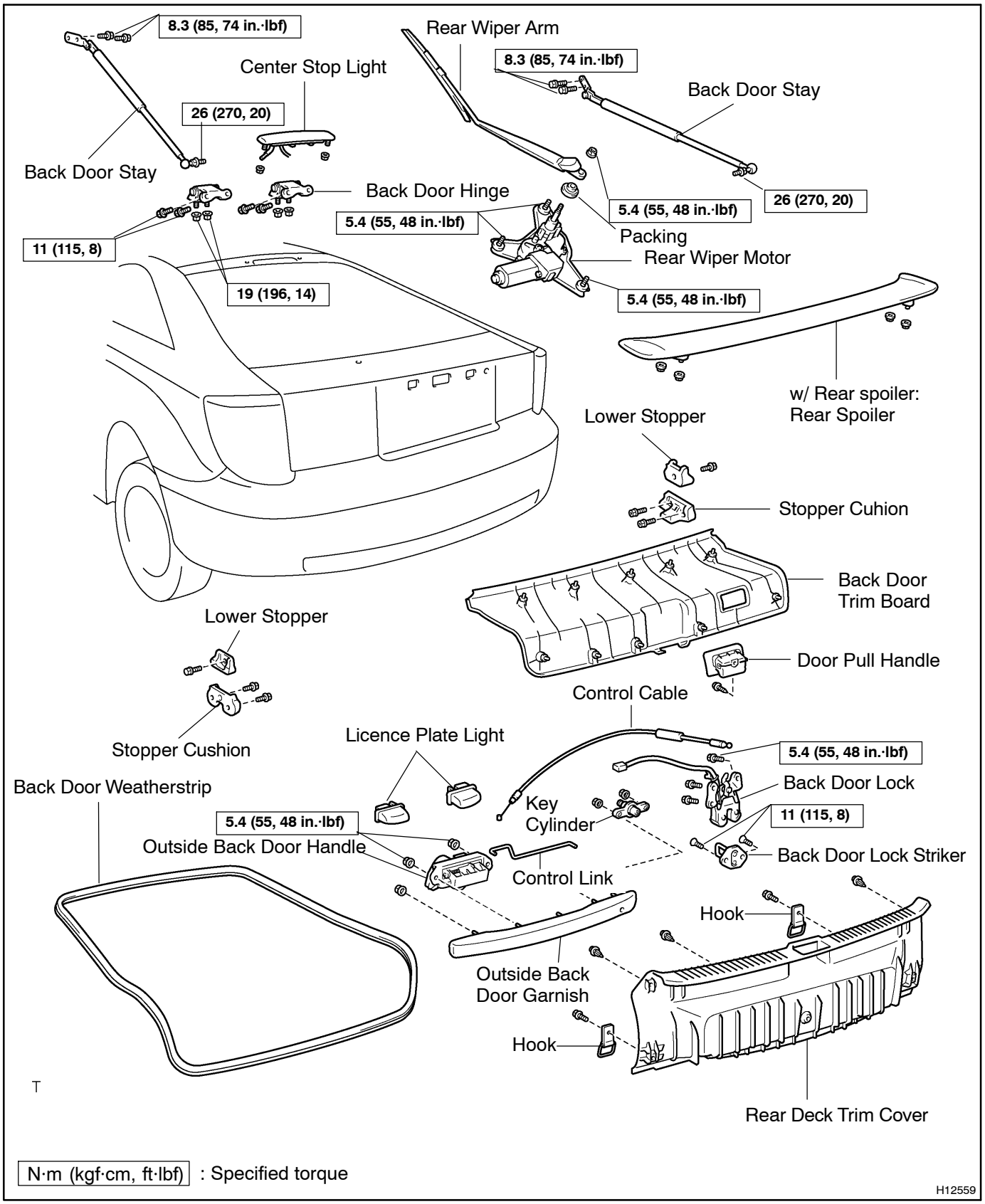
REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BO–11).

BACK DOOR

COMPONENTS

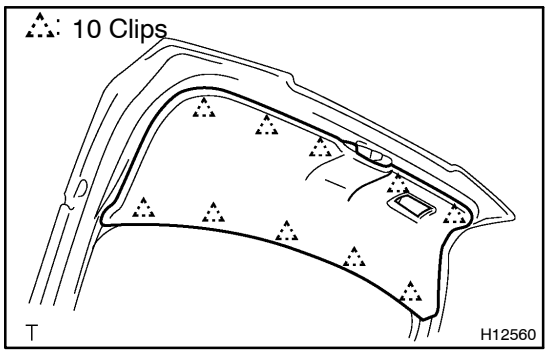
BO1DO–05



BO2OL–02

DISASSEMBLY

1. **w/ Rear spoiler:**
   REMOVE REAR SPOILER
2. **REMOVE DOOR PULL HANDLE**



3. **REMOVE BACK DOOR TRIM BOARD**

Using a screwdriver, remove the back door trim board.

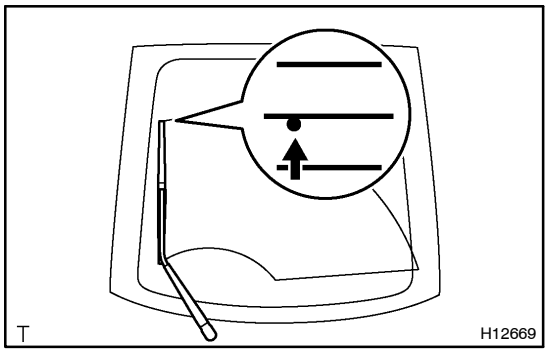
HINT:

Tape the screwdriver tip before use.

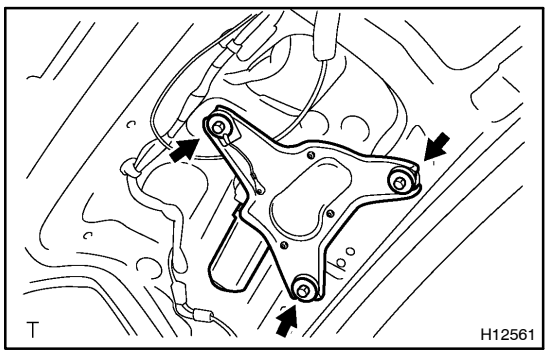
4. **REMOVE REAR WIPER ARM**

HINT:

- At the time of reassembly, please refer to the following items
- Operate the wiper motor once and turn the wiper switch OFF.
- Install the rear wiper arm and tighten the nut by hand.



- Adjust the installation position fo the wiper arm at a point in defogger pattern.
- Tighten the nut.
  Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

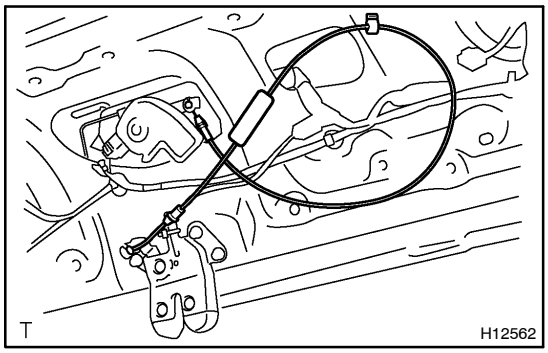


5. **REMOVE REAR WIPER MOTOR**

(a) Disconnect the connector.

(b) Unfasten the 3 bolts and remove the rear wiper motor.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(c) Remove the packing.



6. REMOVE CONTROL CABLE

(a) Disconnect the cable from the back door lock.

(b) Disconnect the cable from the outside back door handle.

(c) Remove the clamp and control cable.

7. REMOVE BACK DOOR LOCK

(a) Remove the wire harness clamp from the door lock.

(b) Remove the 3 bolts and back door lock.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(c) Disconnect the connector.

8. REMOVE KEY CYLINDER

(a) Disconnect the control link.

(b) Remove the 2 nuts and key cylinder.

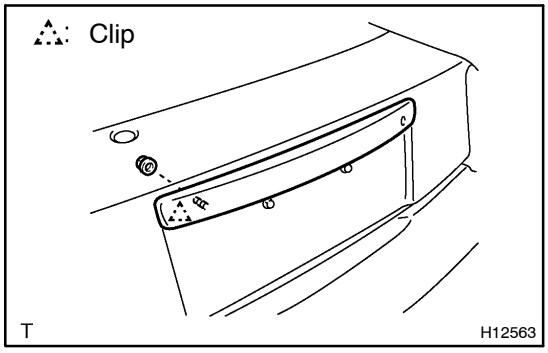
9. REMOVE OUTSIDE BACK DOOR HANDLE

(a) w/ Power door lock:
Disconnect the connector.

(b) Remove the 2 nuts and outside back door handle.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

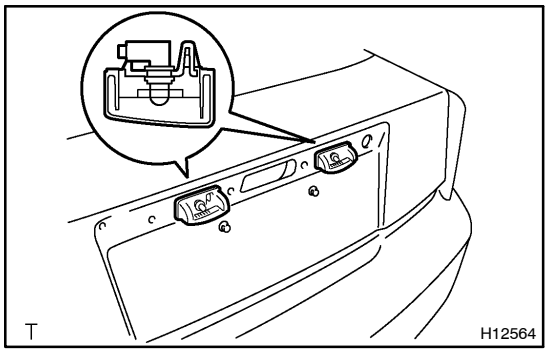
(c) Remove the control link from the outside back door handle.



10. REMOVE OUTSIDE BACK DOOR GARNISH

(a) Remove the nut.

(b) Remove the outside back door garnish by compressing clip from the inside to disengage them.



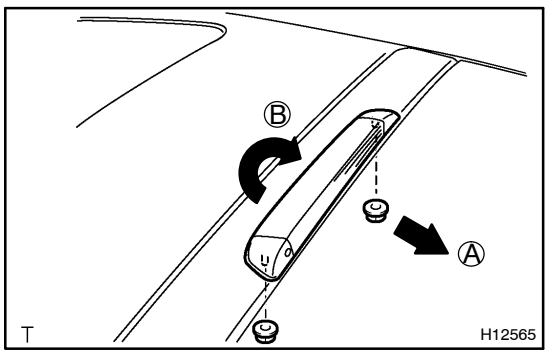
11. REMOVE LICENSE PLATE LIGHTS

(a) Disconnect the connectors.

(b) Using a screwdriver, remove the license plate lights.

HINT:

Tape the screwdriver tip before use.



12. REMOVE CENTER STOP LIGHT

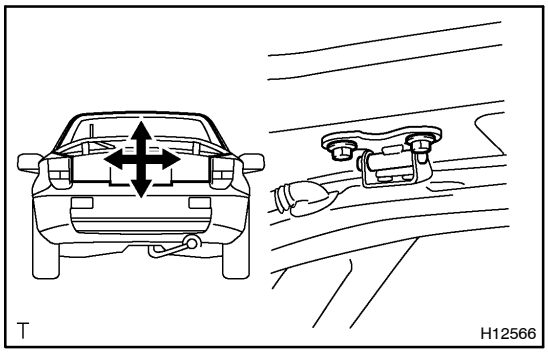
(a) Remove the 2 nuts.

(b) Disconnect the connector and washer hose, then remove the center stop light in order A, B as shown in the illustration..

13. REMOVE BACK DOOR WEATHERSTRIP

BO2OM–02

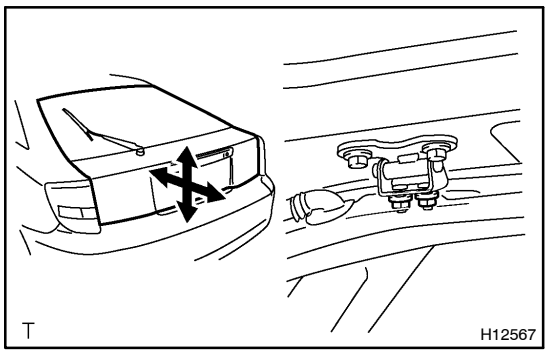
ADJUSTMENT



1. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.

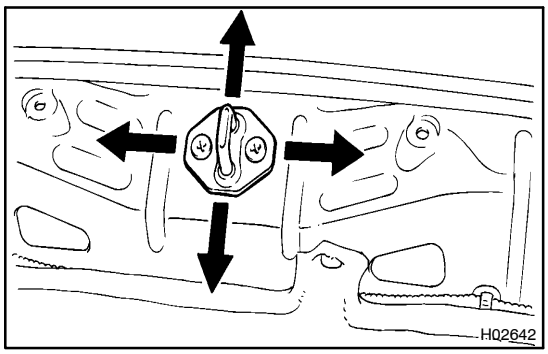
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)



2. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

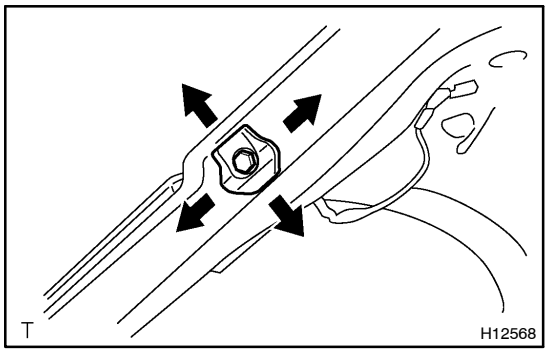
Loosen the body side hinge bolts and nuts to adjust.

Torque: 19 N·m (196 kgf·cm, 14 ft·lbf)



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door linkages are adjusted correctly.
(b) Remove the luggage compartment mat.
(c) Remove the 2 hooks and rear deck trim cover.
(d) Loosen the striker mounting screws.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)
(e) Using a plastic hammer, tap the striker to adjust.
(f) Reinstall the rear deck trim cover and 2 hooks.



4. ADJUST LOWER STOPPER

Loosen the stopper mounting bolts to adjust.

BO2ON–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BO–23).

BACK DOOR STAY

BO2NF–02

REPLACEMENT

1. REMOVE BACK DOOR STAY

(a) Remove the bolt and back door stay from the back door panel.

HINT:

While supporting the back door with your hand, remove the back door stay.

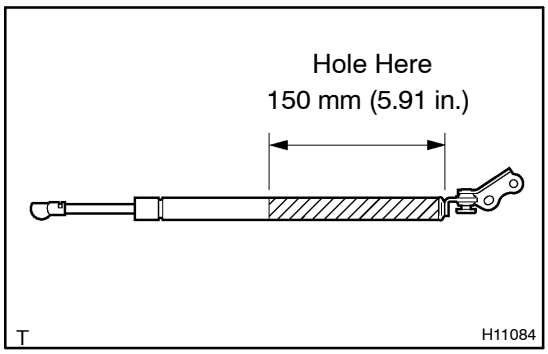
(b) Remove the 2 bolts and back door stay from the body.

2. IF NECESSARY, REPLACE BACK DOOR STAY

NOTICE:

When handling the back door stay

- **Do not disassemble the back door stay because the cylinder is filled with pressurized gas.**



- **If the back door stay is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole in the bottom of the back door stay as shown in the illustration to completely release the high–pressure gas before disposing of it.**
- **When drilling, chips may fly out so work carefully.**
- **The gas is colorless, odorless and non–toxic.**
- **When working, handle the back door stay carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.**
- **Do not turn the piston rod and cylinder with the back door stay fully extended.**

3. INSTALL BACK DOOR STAY

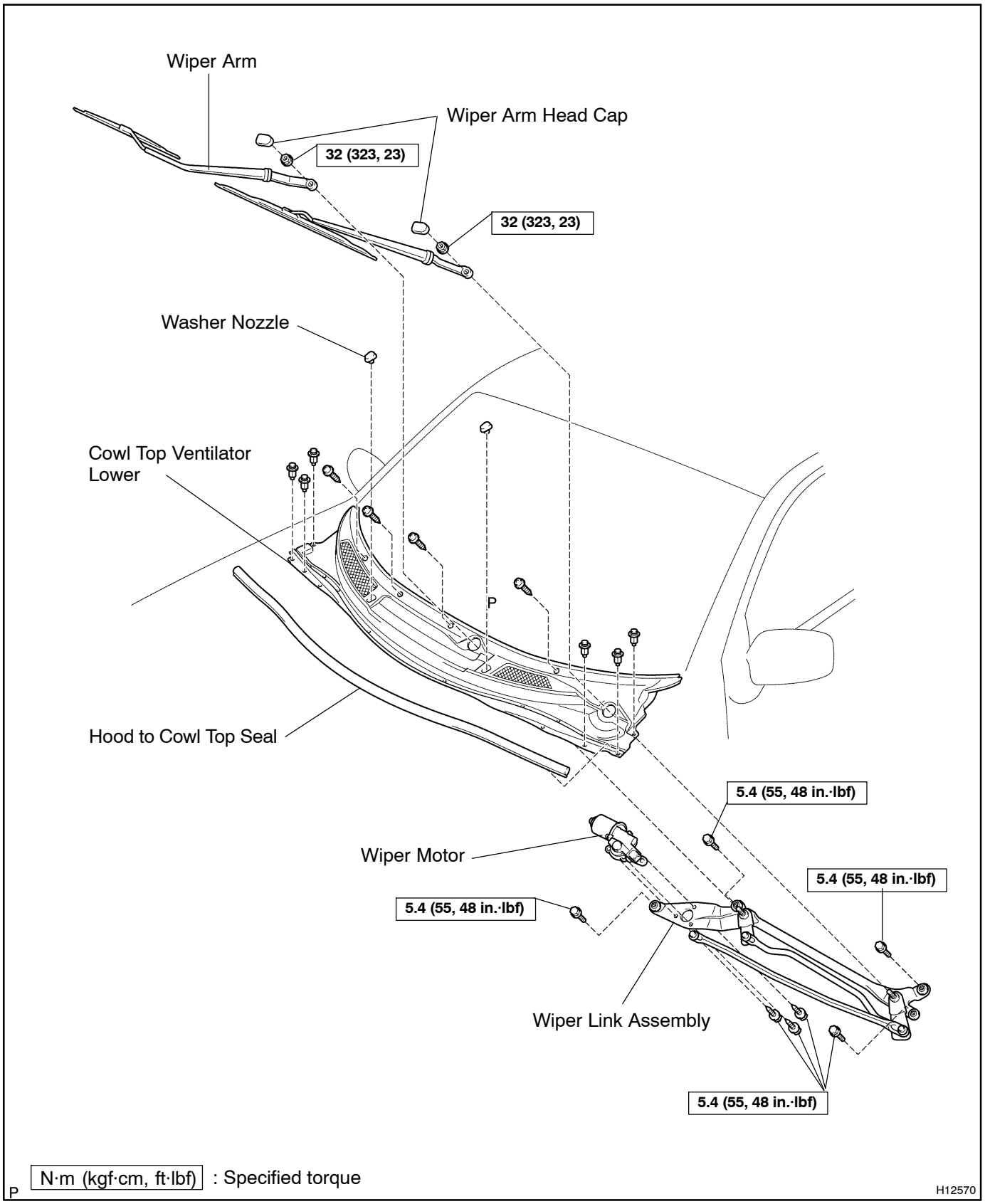
(a) Install the 2 bolts and back door stay to the body.
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)

(b) Install the bolt and back door stay to the back door panel.
Torque: 26 N·m (270 kgf·cm, 20 ft·lbf)

FRONT WIPER AND WASHER

COMPONENTS

BO1DT–07



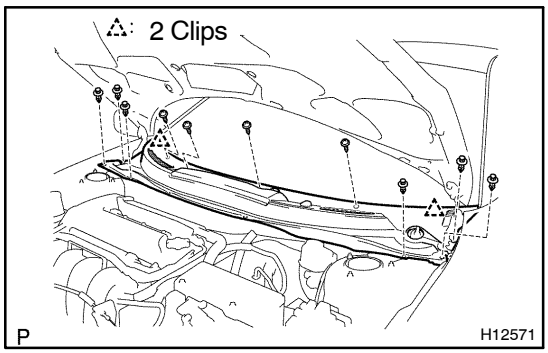
BO2NG–03

REMOVAL

1. REMOVE WIPER ARMS

Remove the 2 wiper arm head caps, 2 nuts and 2 wiper arms.

2. REMOVE HOOD TO COWL TOP SEAL



3. REMOVE COWL TOP VENTILATOR LOUVER

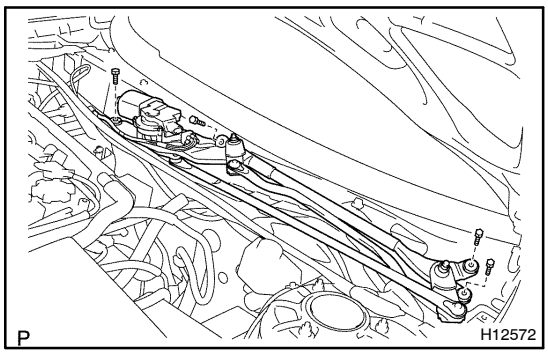
(a) Remove the 4 screws and 6 clips.

(b) Using a screwdriver, remove the cowl top ventilator louver, then disconnect the washer hoses.

HINT:

Tape the screwdriver tip before use.

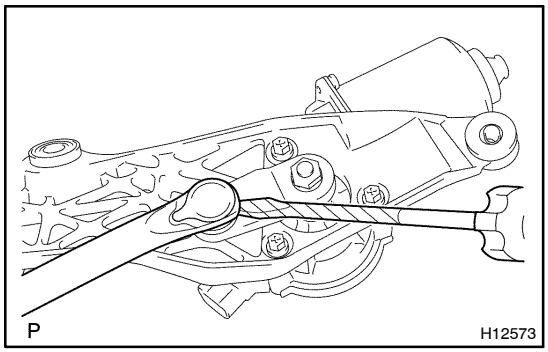
(c) Remove the 2 washer nozzles from the cowl top ventilator louver.



4. REMOVE WIPER MOTOR AND LINK ASSEMBLY

(a) Disconnect the connector.

(b) Remove the 4 bolts and wiper motor and link assembly.

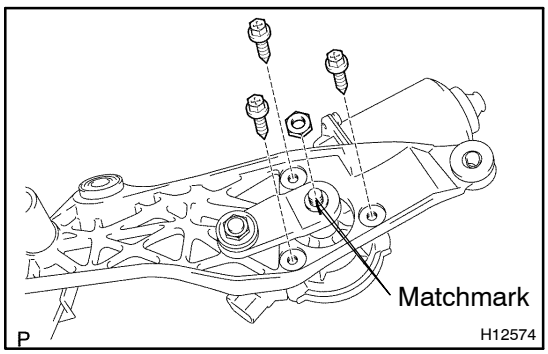


5. REMOVE WIPER MOTOR

(a) Using a screwdriver, disconnect the wiper link from the motor.

HINT:

Tape the screwdriver tip before use.



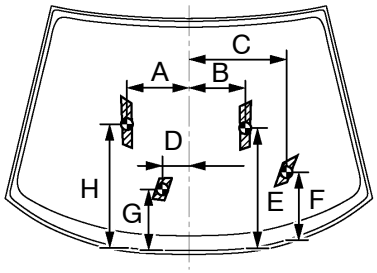
(b) Remove the nut.

(c) Place the matchmarks on the wiper link and motor.

(d) Remove the 3 screws and wiper motor from the wiper link.

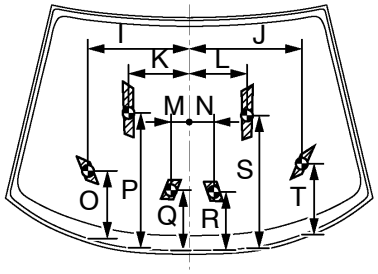
BO2NH–04

2 Jet nozzle:



T

3 Jet nozzle:



T H12667
H12668

H13146

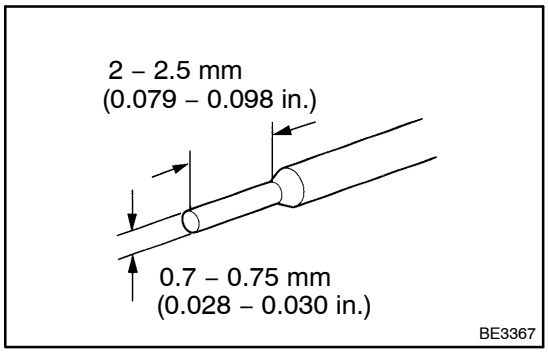
INSPECTION

INSPECT WASHER NOZZLE

While operating the washer check whether the point where the washer fluid hits the windshield and the surge area are within the range indicated by the hatched line.

A: 241.9 mm (9.524 in.)
B: 219.6 mm (8.646 in.)
C: 381.2 mm (15.008 in.)
D: 102.8 mm (4.047 in.)
E: 467.9 mm (18.421 in.)
F: 265.6 mm (10.457 in.)
G: 236.3 mm (9.303 in.)
H: 475.0 mm (18.701 in.)
I: 39 mm (15.524 in.)
J: 439.6 mm (17.307 in.)
K: 237.3 mm (9.343 in.)
L: 225.2 mm (8.866 in.)
M: 69.8 mm (2.748 in.)
N: 94.4 mm (3.717 in.)
O: 258.2 mm (10.165 in.)
P: 517.5 mm (20.374 in.)
Q: 234.2 mm (9.220 in.)
R: 228.3 mm (8.988 in.)
S: 513.3 mm (20.209 in.)
T: 276.6 mm (10.890 in.)

BO1DW–07



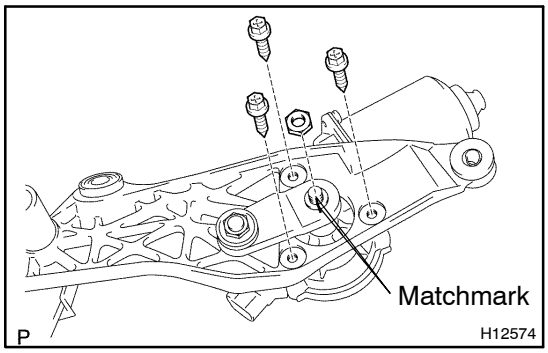
ADJUSTMENT

ADJUST FRONT WASHER NOZZLE

Using a tool like the one shown in the illustration, change the direction of the nozzle hole to adjust the point where washer fluid hits the windshield.

BO2NI–02

INSTALLATION

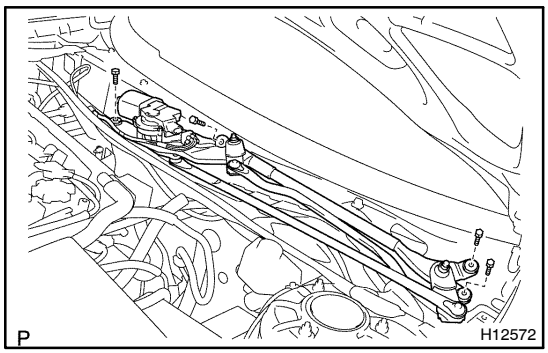


1. INSTALL WIPER MOTOR

(a) Install the wiper motor with the 3 screws to the wiper link.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Align the matchmarks on the wiper link and wiper motor, then install the nut.

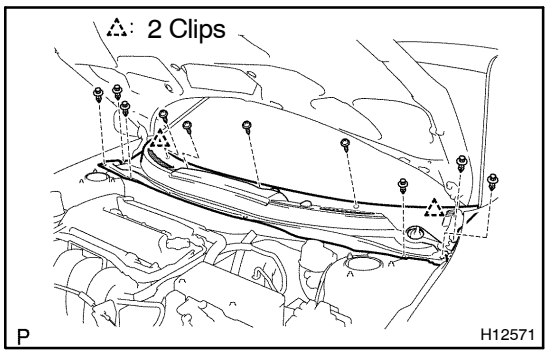
(c) Connect the wiper link to the wiper motor.



2. INSTALL WIPER MOTOR AND LINK ASSEMBLY

(a) Install the wiper motor and link assembly with the 4 screws.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Connect the connector.



3. INSTALL COWL TOP VENTILATOR LOUVER

(a) Install the 2 washer nozzle to the cowl top ventilator louver.

(b) Connect the washer hose, then install the cowl top ventilator louver with the 4 screws and 6 clips.

HINT:

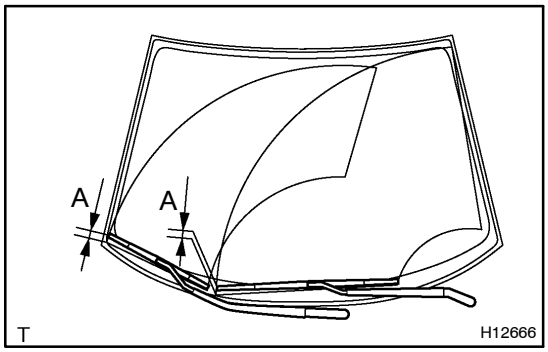
Check that the 2 clips on the back side of the cowl top ventilator louver are surely fixed to the body.

4. INSTALL HOOD TO COWL TOP SEAL

5. INSTALL WIPER ARMS

(a) Operate the wipers once and turn the wiper switch OFF.

(b) Install the wiper arms and tighten the nuts by hand.



(c) Adjust the installation positions of the wiper arms to the positions as shown in the illustration.
A:30 ± 7.5 mm (1.18 ± 0.295 in.)

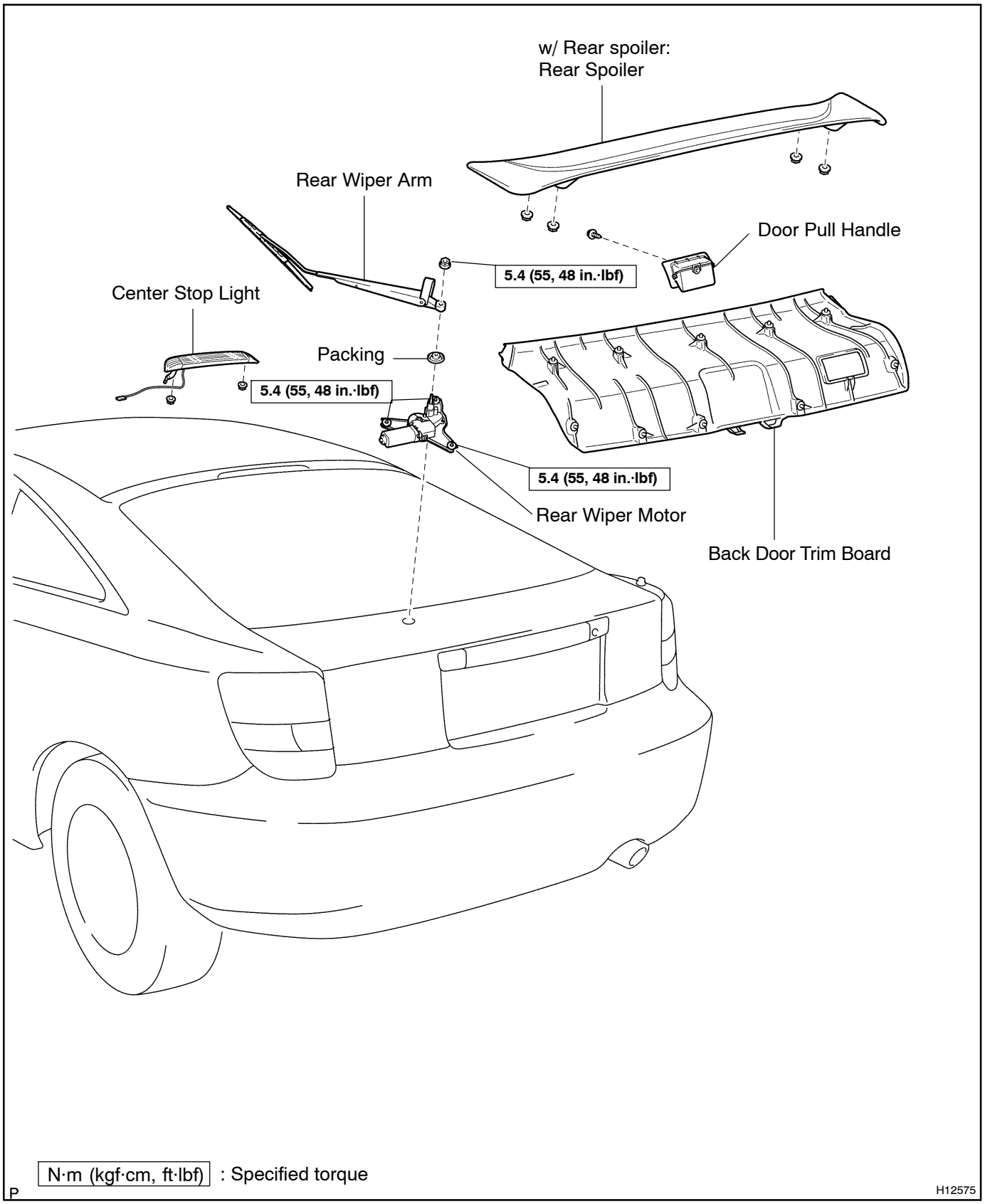
(d) Torque the nuts.
Torque: 32 N·m (323 kgf·cm, 23 ft·lbf)

(e) Install the 2 wiper and head caps.

REAR WIPER AND WASHER

COMPONENTS

BO1DY–05

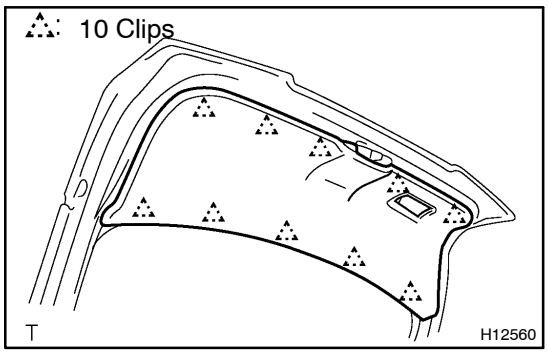


BO2NJ–02

REMOVAL

1. w/ Rear spoiler:
REMOVE REAR SPOILER

2. REMOVE DOOR PULL HANDLE



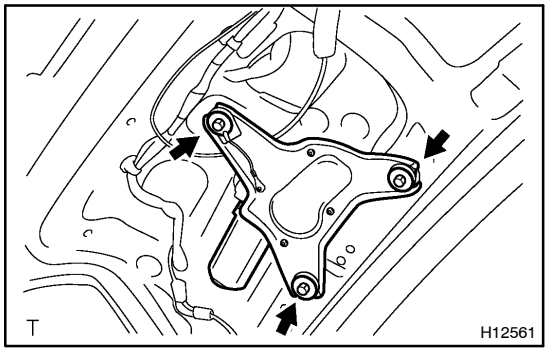
3. REMOVE BACK DOOR TRIM BOARD

Using a screwdriver, remove the back door trim board.

HINT:

Tape the screwdriver tip before use.

4. REMOVE REAR WIPER ARM

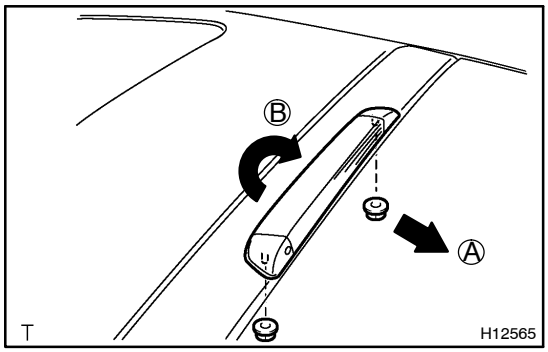


5. REMOVE REAR WIPER MOTOR

(a) Disconnect the connector.

(b) Unfasten the 3 bolts and remove the rear wiper motor.

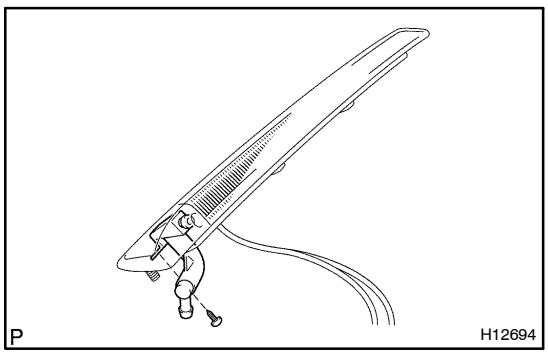
(c) Remove the packing.



6. REMOVE REAR WASHER NOZZLE

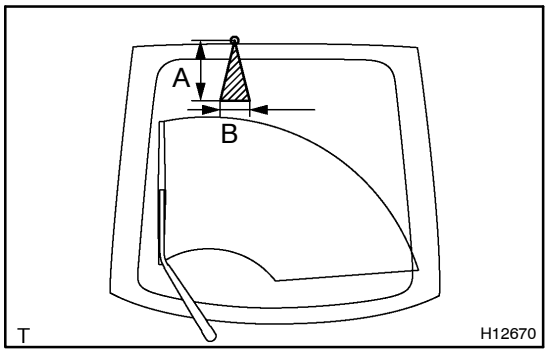
(a) Remove the 2 nuts.

(b) Disconnect the connector and washer hose, then remove the center stop light in order A, B as shown in the illustration.



(c) Remove the screw and rear washer nozzle from the center stop light.

BO1E0–05



INSPECTION

INSPECT WASHER NOZZLE

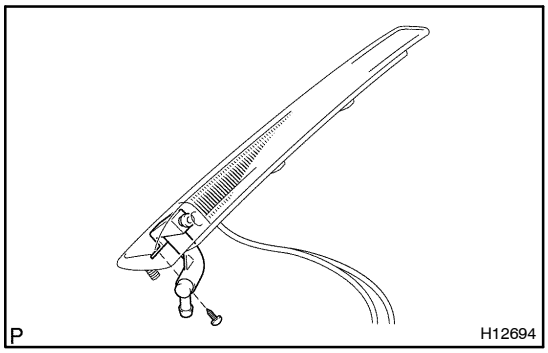
While operating the washer, check if the upper point where the washer fluid hits the back door glass and surge area are within range indicated by the hatched line.

A: 205 mm (8.07 in.)

B: 105 mm (4.13 in.)

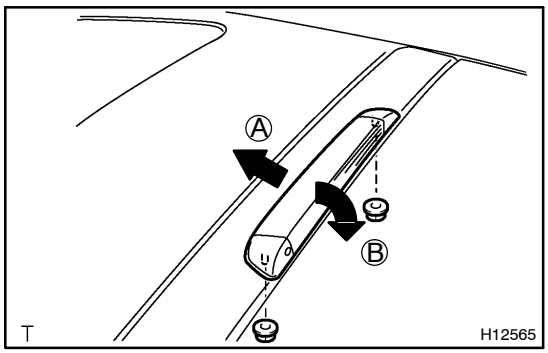
BO2NK–02

INSTALLATION

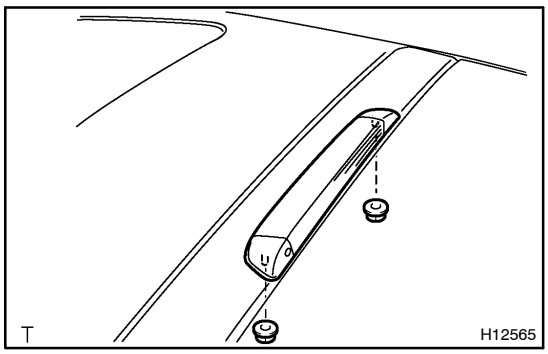


1. INSTALL REAR WASHER NOZZLE

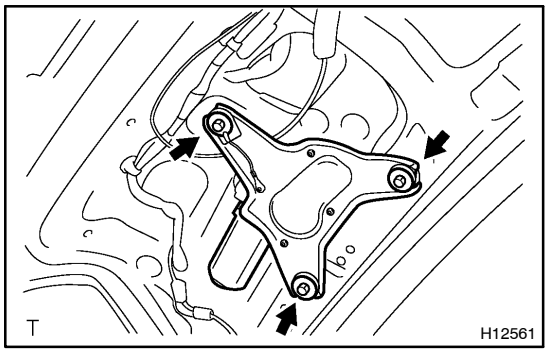
(a) Install the rear wiper nozzle to the center step light with the screw.



(b) Connect hte connector and wsher hose, then install the center stop light with the 2 nuts in order A, B as shown in the illustration.



(c) Connect the connector and washer hose, then install the center stop light with the 2 nuts.



2. INSTALL REAR WIPER MOTOR

(a) Install the packing.

(b) Install the rear wiper motor and fasten the 3 bolts.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(c) Connect the connector.

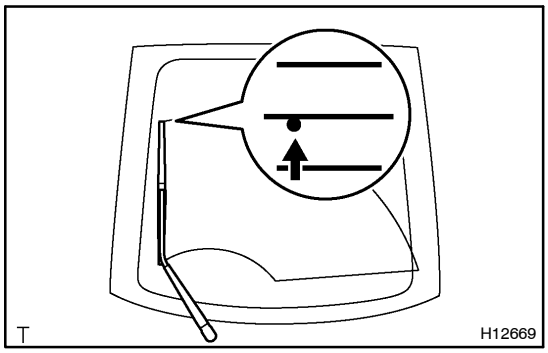
3. INSTALL BACK DOOR TRIM BOARD

4. INSTALL DOOR PULL HANDLE

5. INSTALL REAR WIPER ARM

(a) Operate the wiper motor once and turn the wiper switch OFF.

(b) Install the rear wiper arm and tighten the nut by hand.



(c) Adjust the installation position of the wiper arm at a point in defogger pattern.

(d) Tighten the nut.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

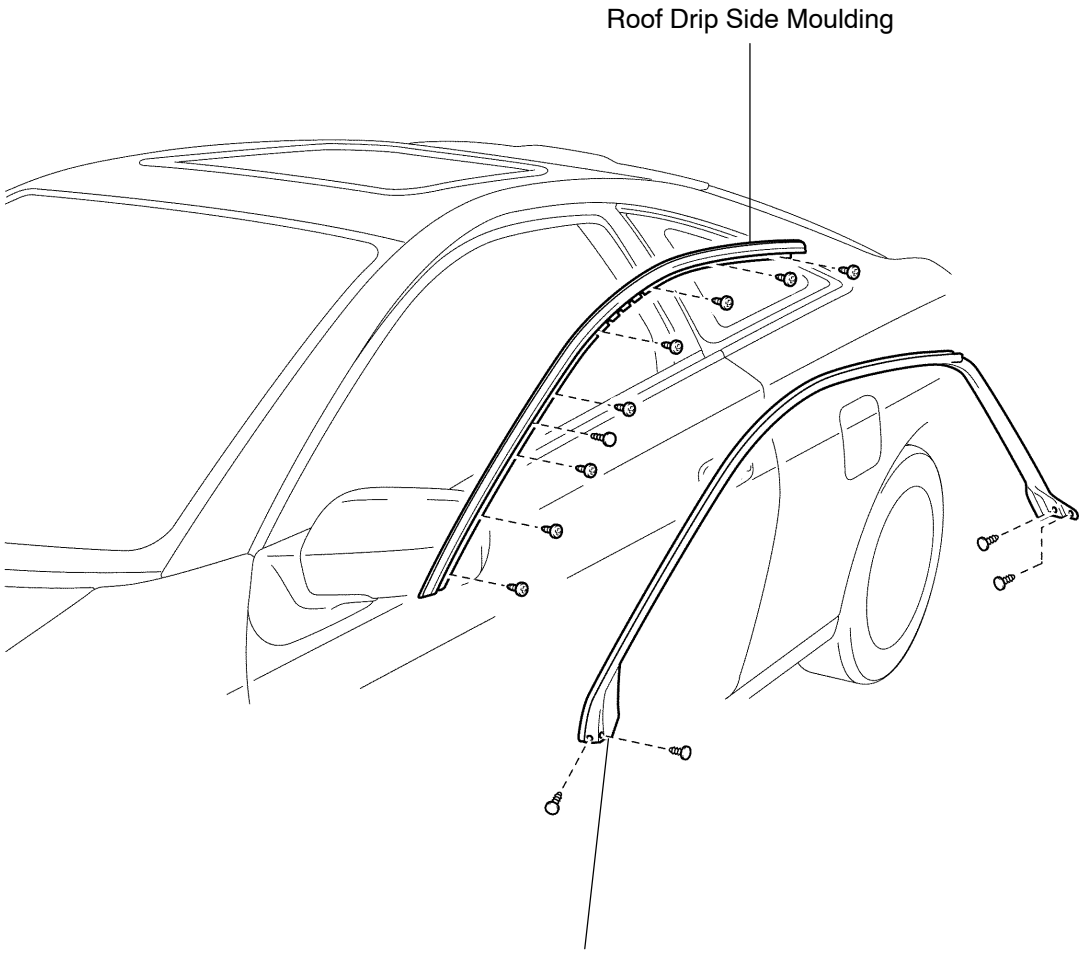
6. w/ Rear spoiler:

REMOVE REAR SPOILER

ROOF DRIP SIDE MOULDING

BO2NL–03

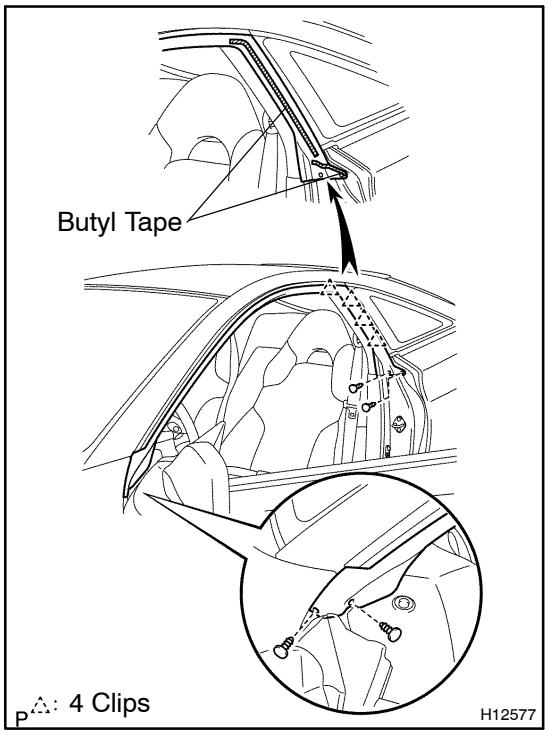
COMPONENTS



P

H12576

BO2NM–03

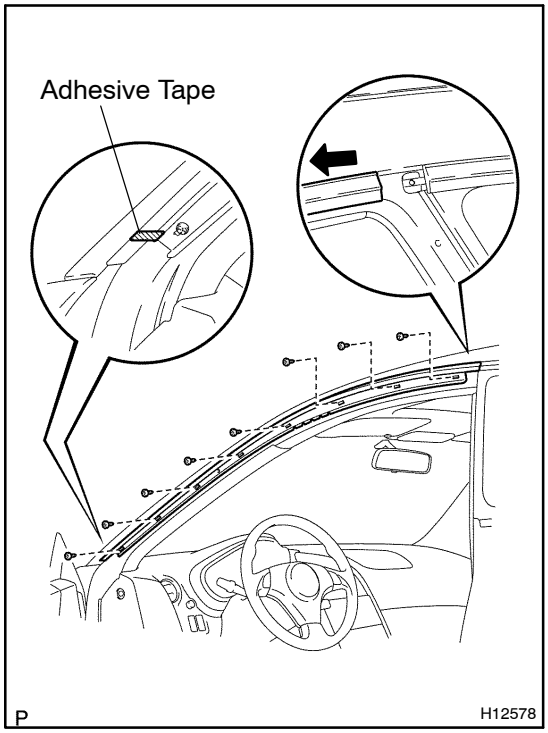


REMOVAL

1. REMOVE ROOF SIDE RAIL WEATHERSTRIP

(a) Using a clip remover, remove the 4 clips.

(b) Remove the roof side rail weatherstrip.



2. REMOVE ROOF DRIP SIDE MOULDING

Remove the 8 screws and roof drip side moulding.

BO2NN–02

INSTALLATION

1. CLEAN BODY MOUNTING SURFACE

(a) Using a heat light, heat the body mounting surface to 40 – 60˚C (104 – 140˚F).

NOTICE:

Do not heat the body excessively.

(b) Remove the adhesive tape from the body.

(c) Wipe off stains with cleaner.

2. If reusing the moulding:
CLEAN MOULDING

(a) Using a heat light, heat the moulding to 20 – 30 ˚C (68 – 86 ˚F).

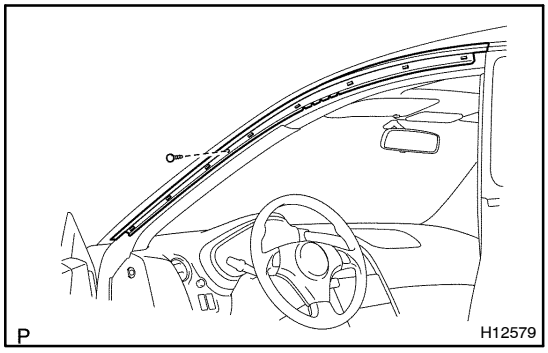
NOTICE:

Do not heat the moulding excessively.

(b) Remove the adhesive tape from the moulding.

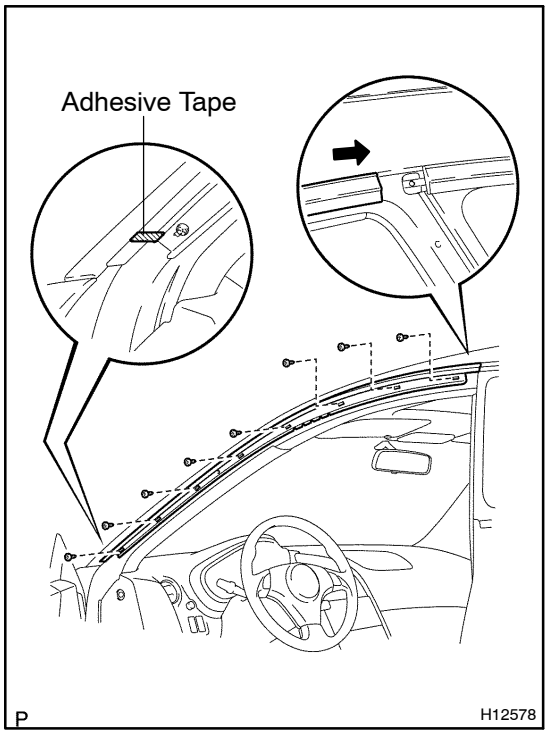
(c) Wipe off stains with cleaner.

(d) Apply a new adhesive tape to the moulding.



3. INSTALL ROOF DRIP SIDE MOULDING

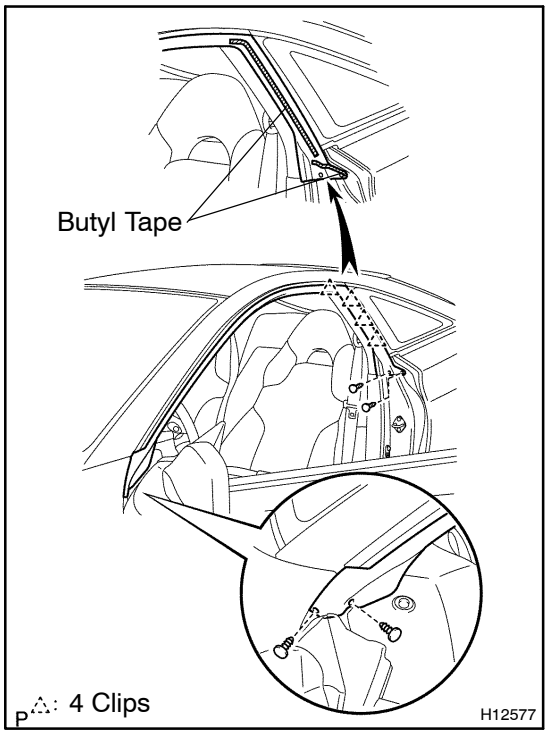
(a) If using a new moulding:
Secure the roof drip side moulding with the clip for temporary attachment.



(b) Install the roof drip side moulding with the 8 screws.

HINT:

When installing the moulding, tighten the screws from the rear side to the front side of the moulding.



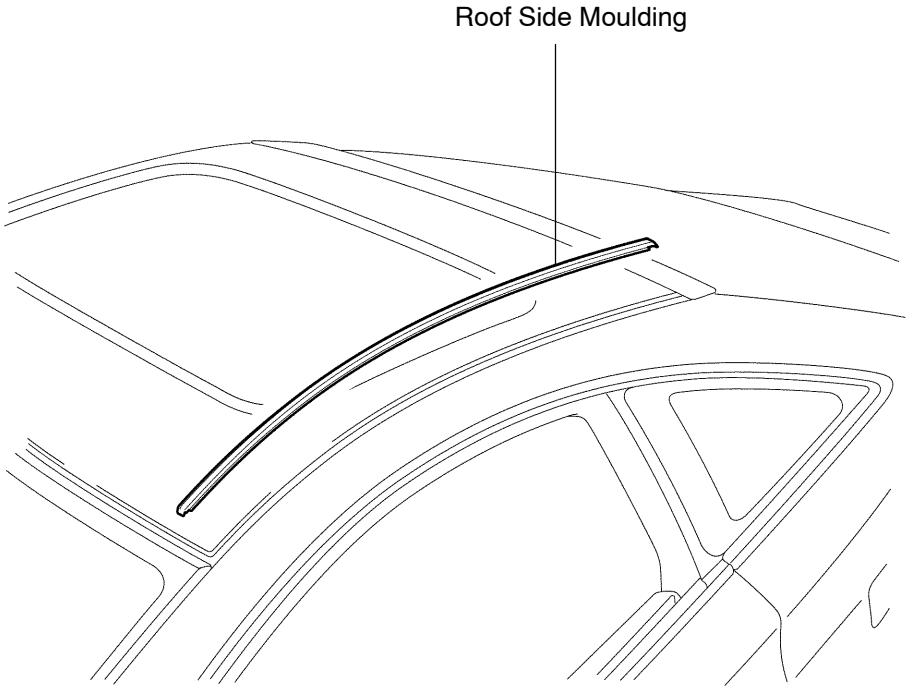
4. INSTALL ROOF SIDE RAIL WEATHERSTRIP

Install the roof side rail weatherstrip with the 4 clips as shown in the illustration.

ROOF SIDE MOULDING

COMPONENTS

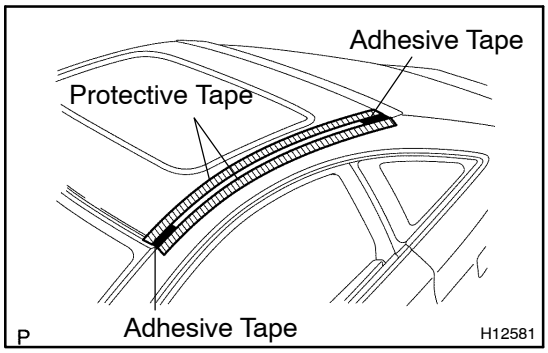
BO2NO–02



P

H12580

BO2NP–02



REMOVAL

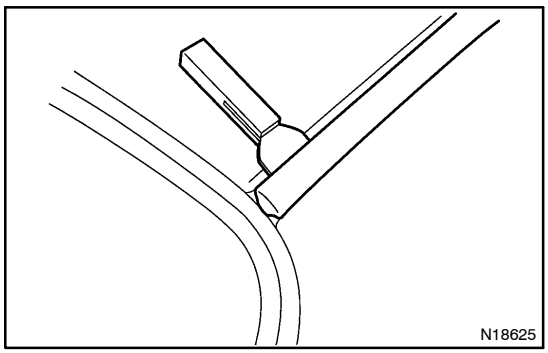
1. REMOVE ENDS OF MOULDING

(a) Apply protective tape to the outer surface as shown in the illustration to keep the surface from being scratched.

(b) Using a heat light, heat the moulding to 20 – 30°C (68 – 86°F).

NOTICE:

Do not heat the moulding excessively.



(c) Using a scraper, pull off the roof side moulding from the front end and rear end.

HINT:

Tape the screwdriver tip before use.

2. REMOVE MOULDING AND ADHESIVE

(a) Pull off the moulding by cutting the adhesive with a knife at the front and rear ends.

(b) Remove the moulding.

NOTICE:

Do not damage the body with the knife.

BO2NQ–03

INSTALLATION

1. CLEAN CONTRACT SURFACE OF BODY

(a) Using a heat light, heat the moulding surface to 40 – 60 °C (104 – 140°F).

NOTICE:

Do not heat the body excessively.

(b) Using a knife, cut away any rough areas on the body.

NOTICE:

Be careful not to damage the body.

(c) Wipe off stains with cleaner.

2. If reusing the moulding:
CLEAN MOULDING

(a) Using a heat light, heat the moulding surface to 20 – 30 °C (68 – 86°F).

NOTICE:

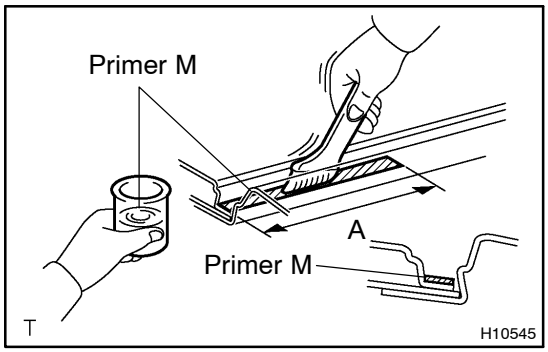
Do not heat the moulding excessively.

(b) Using a knife, cut the remaining adhesive from the moulding.

NOTICE:

Be careful not to damage the moulding.

(c) Wipe off stains with cleaner.



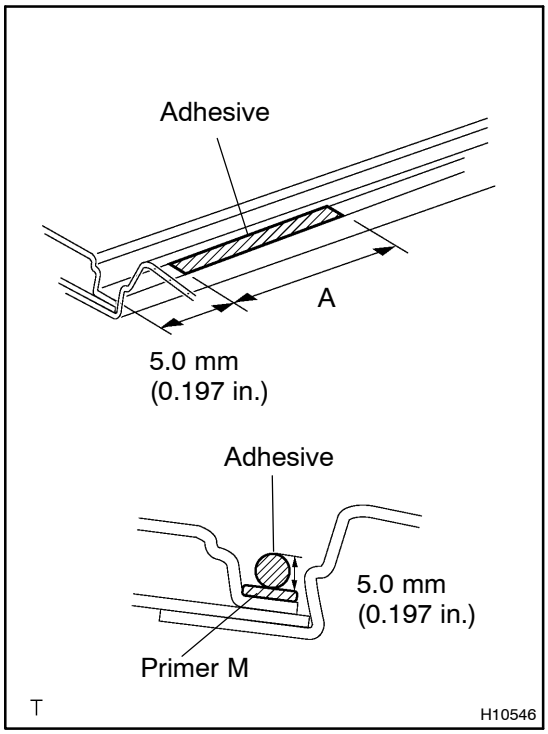
3. COAT CONTRACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M as shown in the illustration.

Front and rear end:
A: 66 mm (2.60 in.)

NOTICE:

- **Let the primer coating dry for 3 minutes or more.**
- **Do not coat the adhesive.**
- **Do not keep any of the opened Primer M for later use.**



4. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle.

Part No. 08850–00801 or equivalent

HINT:

After cutting off the tip, use all adhesive within the time described in the table below.

Temperature	Tackfree time
35˚C (95˚F)	15 minutes
20˚C (68˚F)	100 minutes
5˚C (41˚F)	8 hours

(b) Load the cartridge into the sealer gun.

(c) Apply adhesive to the hatched area in the illustration for both front and rear of the vehicle.

Front and rear end:

A: 50 mm (1.97 in.)

HINT:

When removing the moulding, apply adhesive well to the part where the body sealer is removed.

5. INSTALL MOULDING

Push the moulding to the body.

NOTICE:

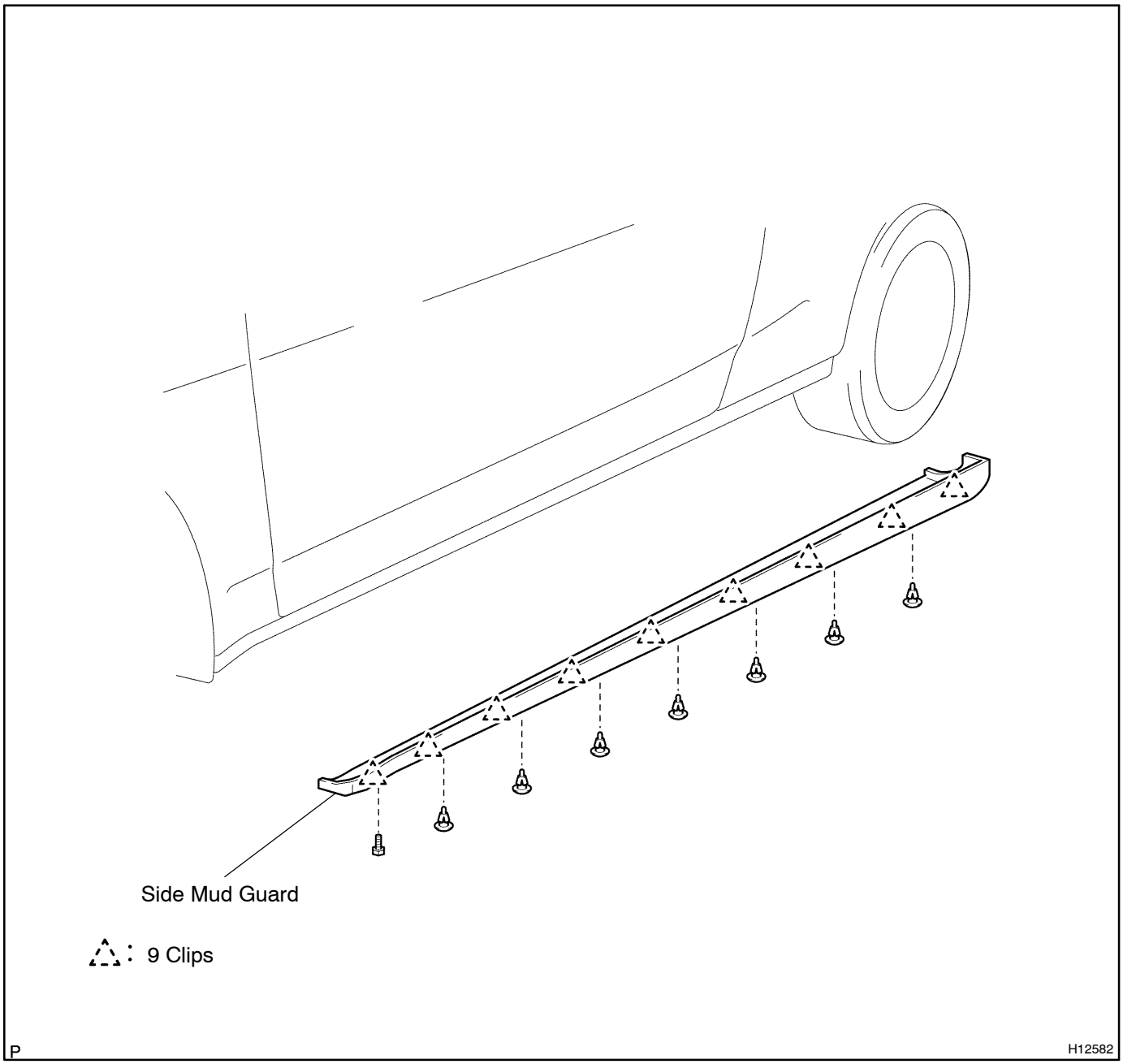
- **Make sure that the body and moulding are heated to the proper temperature.**
- **Do not depress the adhesive coated parts excessively but just hold them down with your thumb.**
- **Scrape off any overflowing adhesive with a plastic spatula and clean the surface with a dry rag.**
- **Take care not to drive the vehicle during the time described in the table below.**

Temperature	Minimum time prior to driving the vehicle
35˚C (95˚F)	1.5 hours
20˚C (68˚F)	5 hours
5˚C (41˚F)	24 hours

SIDE MUD GUARD

COMPONENTS

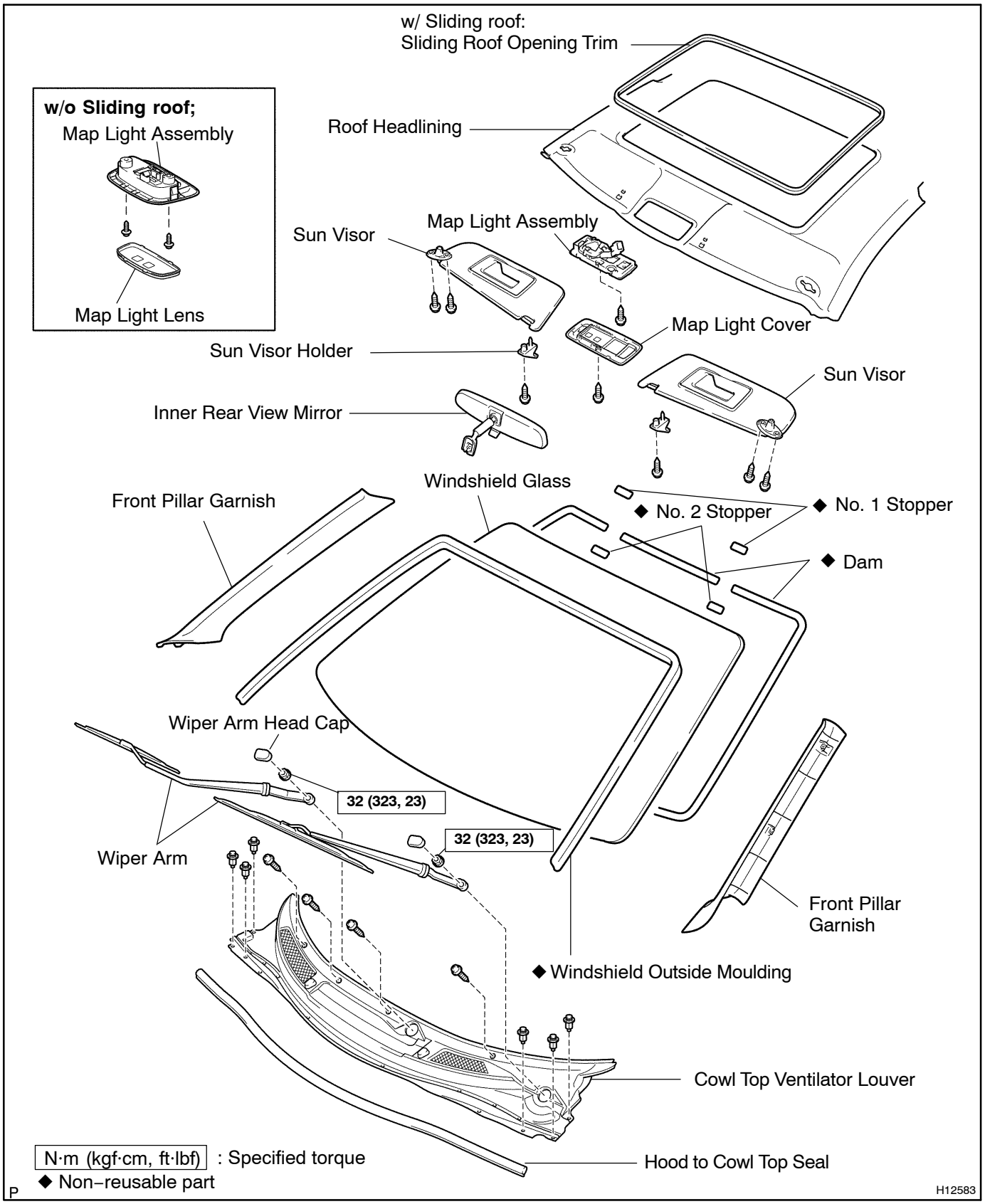
BO1E6–06



WINDSHIELD

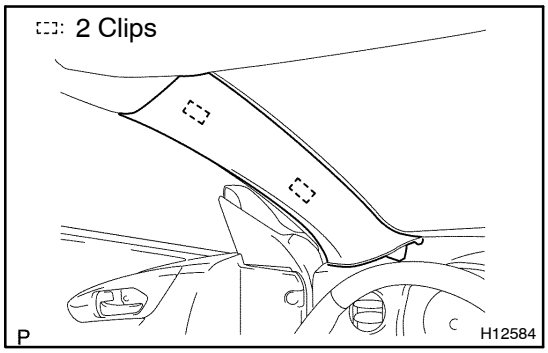
COMPONENTS

BO1E9–09



BO2NR–02

REMOVAL



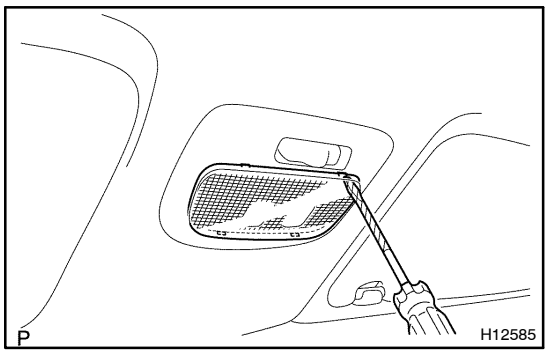
1. REMOVE FRONT PILLAR GARNISH

(a) Using a screwdriver, remove the front pillar garnish.

HINT:

Tape the screwdriver tip before use.

(b) Employ the same manner described above to the other side.



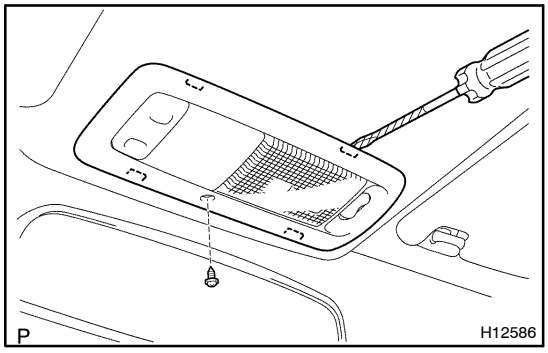
2. w/o Sliding roof:
REMOVE MAP LIGHT ASSEMBLY

(a) Using a screwdriver, remove the lens.

HINT:

Tape the screwdriver tip before use.

(b) Remove the 2 screws and map light assembly, then disconnect the connector.



3. w/ Sliding roof:
REMOVE MAP LIGHT ASSEMBLY

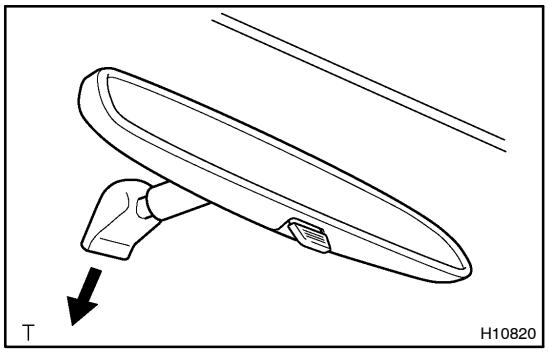
(a) Remove the screw.

(b) Using a moulding remover, remove the cover.

(c) Remove the screw and map light assembly, then disconnect the connector.

4. REMOVE SUN VISORS

5. REMOVE SUN VISOR HOLDERS



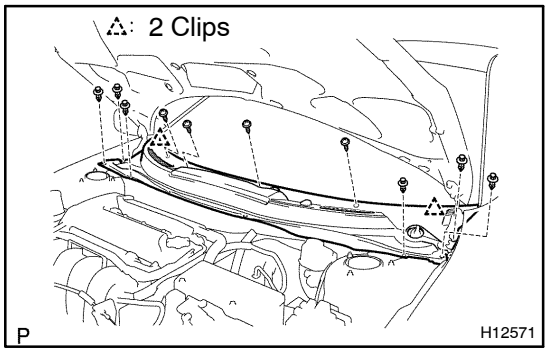
6. REMOVE INNER REAR VIEW MIRROR

Remove the inner rear view mirror as shown in the illustration.

7. REMOVE WIPER ARMS

Remove the 2 wiper arm head caps, 2 nuts and 2 wiper arms.

8. REMOVE HOOD TO COWL TOP SEAL



9. REMOVE COWL TOP VENTILATOR LOUVER

(a) Remove the 4 screws and 6 clips.

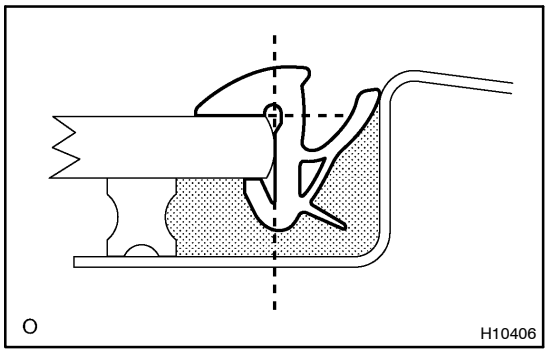
(b) Using a screwdriver, remove the cowl top ventilator louver, then disconnect the washer hoses.

HINT:

Tape the screwdriver tip before use.

10. w/ Sliding roof:
REMOVE SLIDING ROOF OPENING TRIM

11. PULL DOWN FRONT PART OF ROOF HEADLINING



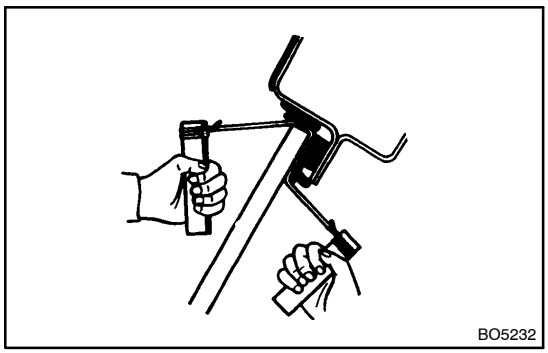
12. REMOVE WINDSHIELD OUTSIDE MOULDING

(a) Using a knife, cut off the moulding as shown in the illustration.

NOTICE:

Do not damage the body with the knife.

(b) Remove the remaining moulding.



13. REMOVE WINDSHIELD GLASS

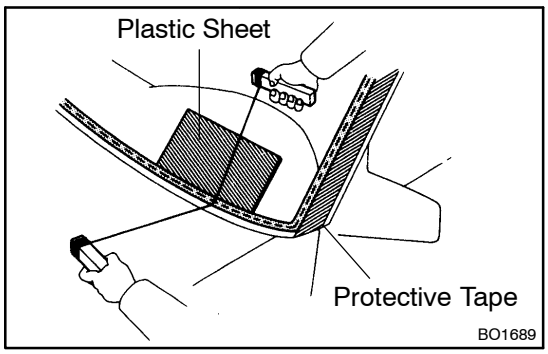
(a) Insert a piano wire between body and glass and let it pass through.

(b) Tie both wire ends to wooden blocks or similar objects.

(c) w/ Front window defogger:
Disconnect the connector.

NOTICE:

Be careful not to damage the wire harness.



(d) Cut the adhesive by pulling the piano wire around it.

NOTICE:

When separating the glass, take care not to damage the paint and exterior ornaments. To prevent the safety pad from being scratched when removing the windshield, place a plastic sheet between the piano wire and safety pad.

HINT:

Apply protective tape to the outer surface to keep the surface from being scratched.

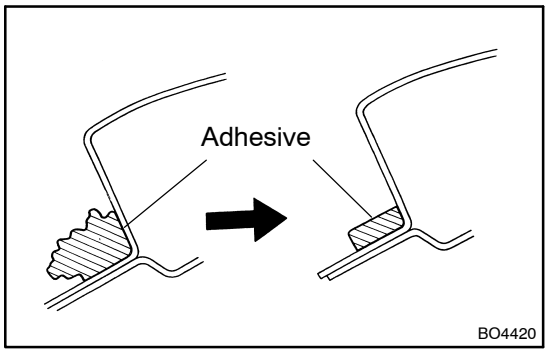
(e) Remove the glass.

NOTICE:

Leave the adhesive on the body as much as possible when cutting off the glass.

BO2NS–02

INSTALLATION



1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Using a knife, cut away any rough areas on the body.

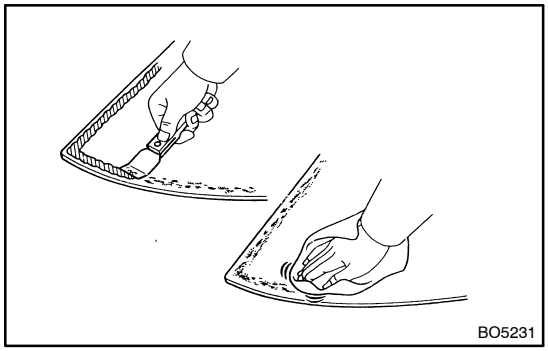
HINT:

Leave the adhesive on the body as much as possible.

(b) Clean the cut surface of the adhesive with a shop rag saturated in cleaner.

HINT:

Even if all the adhesive has been removed, clean the body.



2. CLEAN REMOVED GLASS

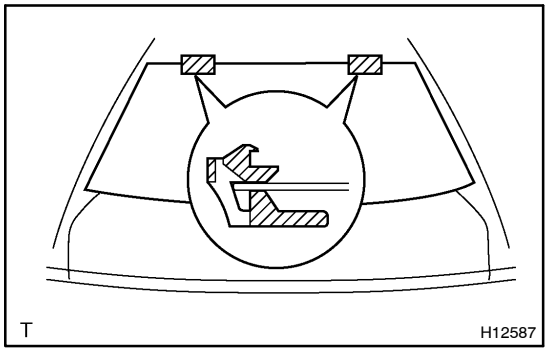
(a) Remove the damaged No.2 stoppers and dams.

(b) Using a scraper, remove the adhesive sticking to the glass.

(c) Clean the glass with cleaner.

NOTICE:

- **Be careful not to damage the glass.**
- **Do not touch the glass face after cleaning it.**



3. w/ No. 1 Stopper:
REPLACE NO. 1 STOPPERS

(a) Remove the damaged stoppers.

(b) Cut off the old adhesive around the stopper installation area.

NOTICE:

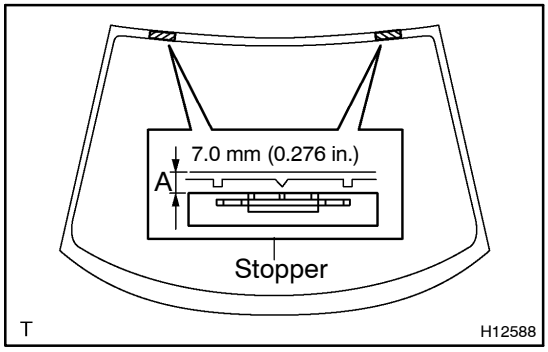
Be careful not to damage the body.

(c) Clean the installation area.

(d) Attach new stoppers to the body so that the notches on the body will align with the stoppers as shown in the illustration.

HINT:

Make sure that the stoppers are installed facing the correct direction.



4. INSTALL NEW NO. 2 STOPPERS

Attach new stoppers to the glass so that the ceramic notches on the glass will align with the stoppers as shown in the illustration.

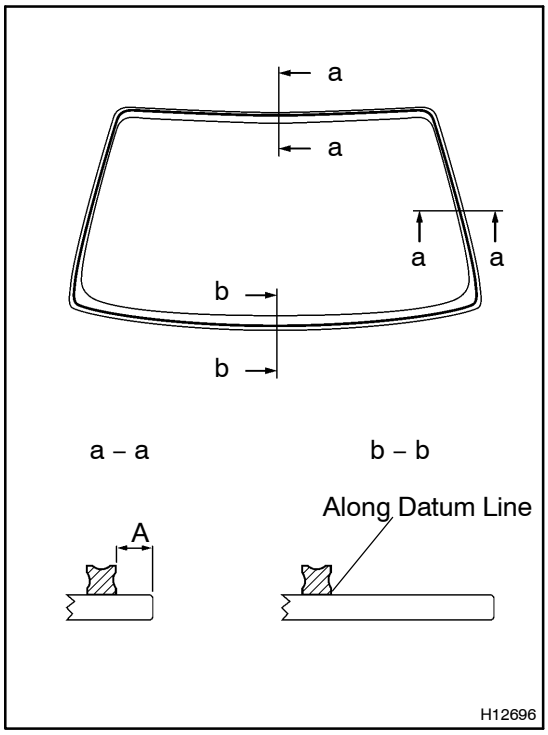
HINT:

Make sure that the stoppers are installed facing the correct direction.

A:

w/ No. 1 stopper: 7.7 ± 0.5 (0.303 ± 0.020 in.)

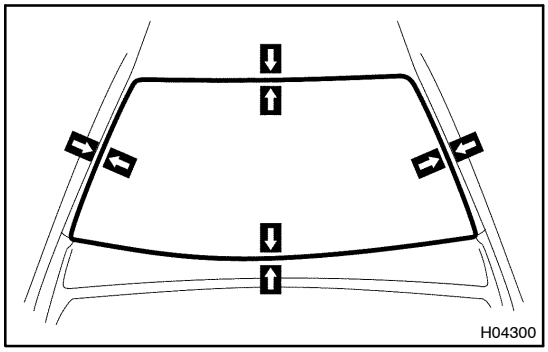
w/o No. 1 stopper: 9.0 ± 0.5 (0.354 ± 0.020 in.)



5. INSTALL NEW DAMS

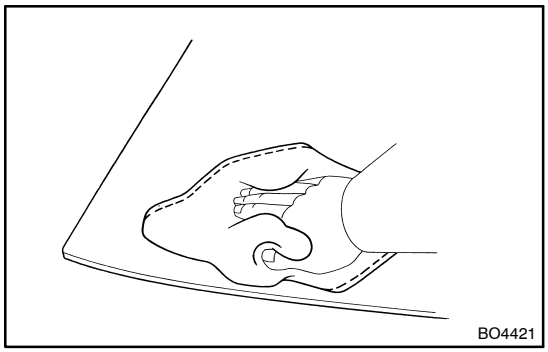
Install new dams with double–stick tape as shown in the illustration.

A: 7.0 mm (0.276 in.)



6. POSITION GLASS

(a) Place the glass in the correct position.
(b) Check that all contacting parts of the glass rim are set perfectly even.
(c) Place reference marks on the glass and body.
(d) Remove the glass.

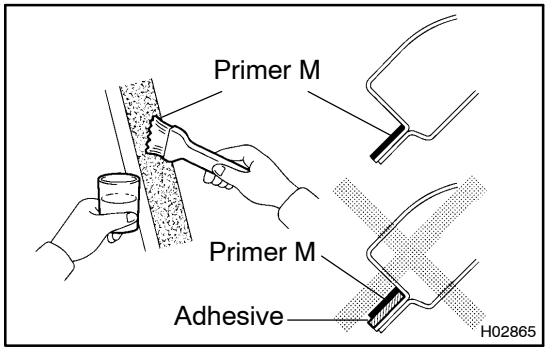


7. CLEAN CONTACT SURFACE OF GLASS

Using a cleaner, clean the contact surface which is black–colored area around the entire glass rim.

NOTICE:

Do not touch the glass face after cleaning it.

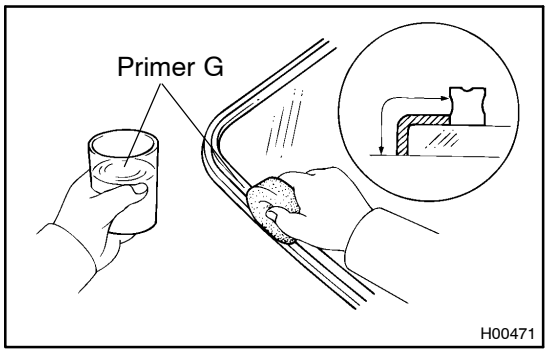


8. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat Primer M to the exposed part of body on the vehicle side.

NOTICE:

- **Allow 3 minutes or more to dry the primer coated surface.**
- **Do not coat Primer M to the adhesive.**
- **Do not keep any of the opened Primer M for later use.**



9. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G as shown in the illustration.

(b) When the primer is coated wrongly to the area other than the specified, wipe it off with a clean shop rag before the primer dries.

NOTICE:

- **Allow 3 minutes or more to dry the primer coated surface.**
- **Do not keep any of the opened Primer G for later use.**

10. APPLY ADHESIVE

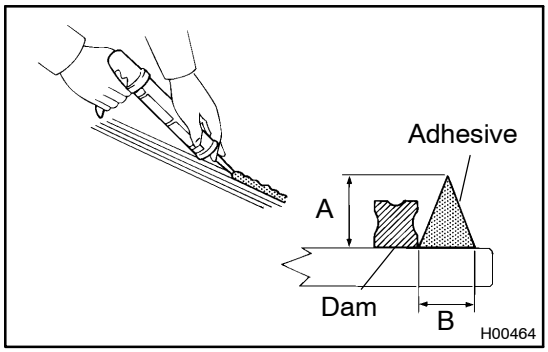
(a) Cut off the tip of the cartridge nozzle.
Part No. 08850–00801 or equivalent

HINT:

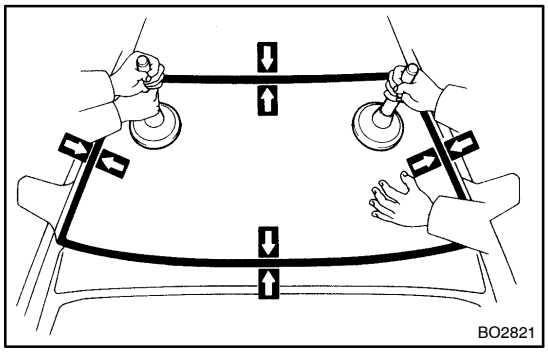
After cutting off the tip, use all adhesive within the time described in the table below.

Temperature	Tackfree time
35˚C (95˚F)	15 minutes
20˚C (68˚F)	100 minutes
5˚C (41˚F)	8 hours

(b) Load the cartridge into the sealer gun.



(c) Coat the glass with adhesive as shown in the illustration.
A: 12.5 mm (0.492 in.)
B: 8.0 mm (0.315 in.)



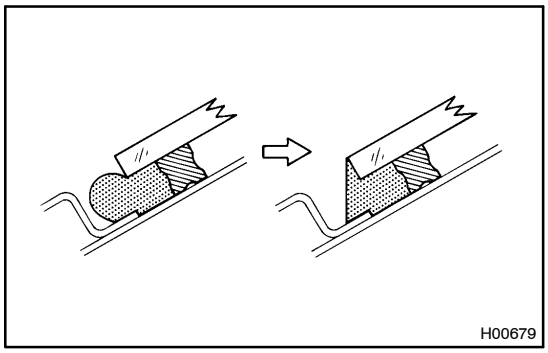
11. INSTALL WINDSHIELD GLASS AND MOULDING

(a) Install the glass, aligning the reference marks using a suction rubber.

HINT:

Check to see that the stoppers are attached to the body correctly.

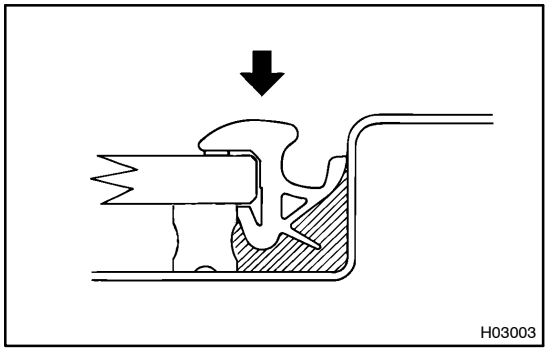
(b) Lightly press the glass front surface for close contact.



(c) Correct insufficient or protruded adhesive agent using a spatula.

HINT:

Apply the adhesive agent up to the windshield glass edge.



(d) Install a new windshield moulding to the windshield glass before the adhesive agent hardens.

HINT:

Install the moulding, aligning the center of moulding with the center of body.

(e) Remove any excessive adhesive agent before it hardens.

(f) Hold the glass and moulding in place securely with a protective tape or equivalent until the adhesive hardens.

NOTICE:

Take care not to drive the vehicle during the time described in the table below.

Temperature	Minimum time prior to driving the vehicle
35 °C (95 °F)	1.5 hours
20 °C (68 °F)	5 hours
5 °C (41 °F)	24 hours

12. INSPECT FOR LEAK AND REPAIR

NOTICE:

Conduct a leak test after the hardening time has elapsed.

13. INSTALL FRONT SIDE OF ROOF HEADLINING

14. INSTALL COWL TOP VENTILATOR LOUVER

HINT:

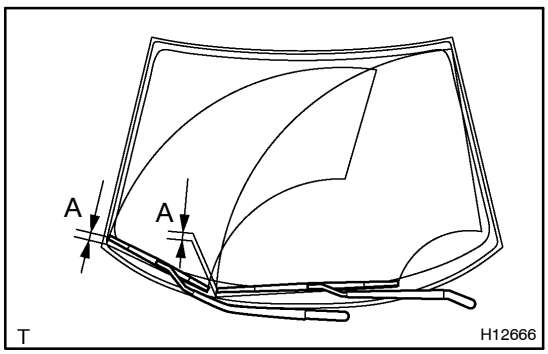
Check that the 2 clips on the back side of the cowl louver are surely fixed to the body.

15. INSTALL HOOD TO COWL TOP SEAL

16. INSTALL WIPER ARMS

(a) Operate the wiper motor once and turn the wiper switch OFF.

(b) Install the wiper arms and tighten the nuts by hand.



(c) Adjust the installation positions of the wiper arms to the positions as shown in the illustration.

A: 30 ± 7.5 mm (1.8 ± 0.295 in.)

(d) Torque the nuts.

Torque: 32 N·m (323 kgf·cm, 23 ft·lbf)

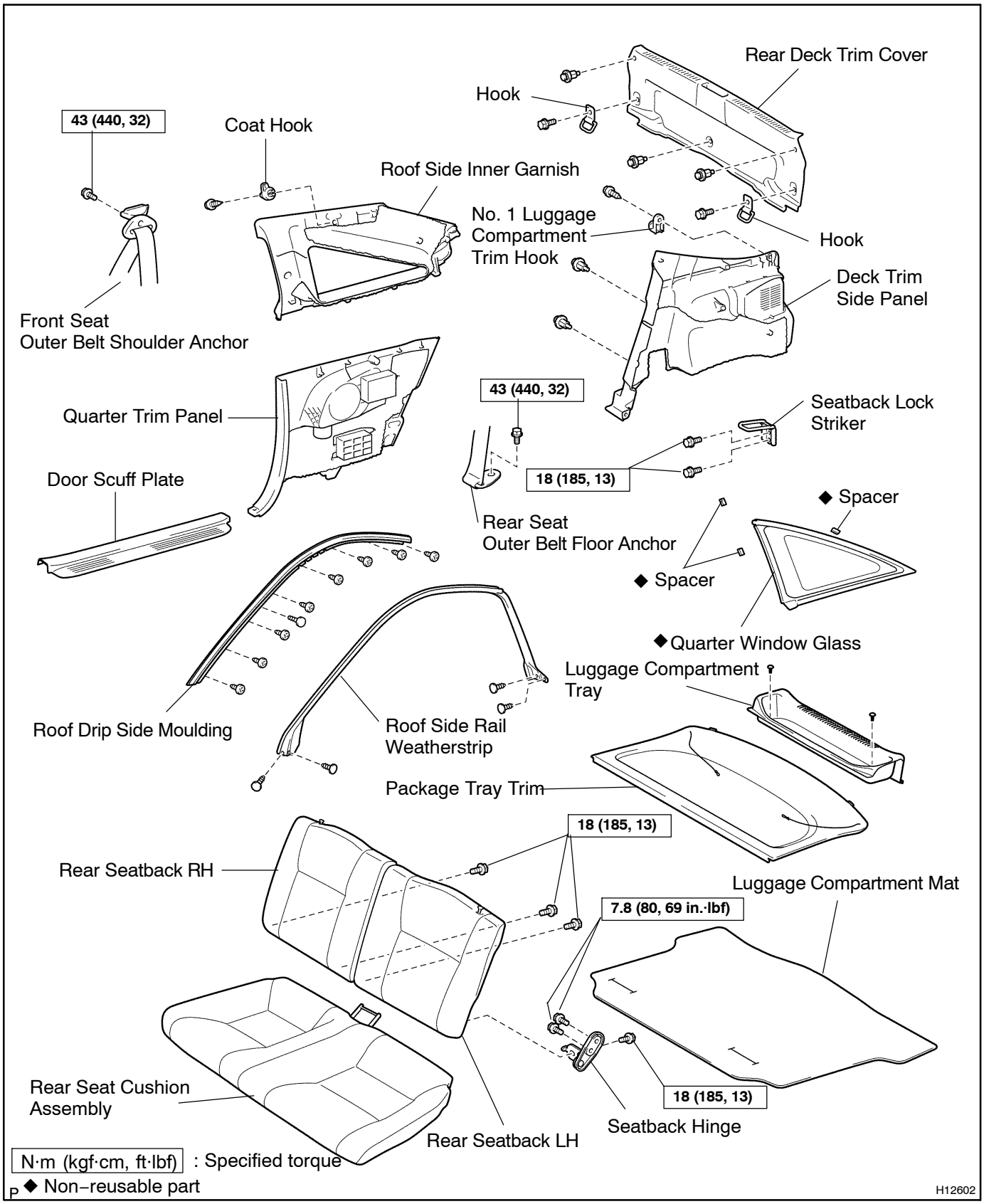
(e) Install the 2 wiper arm head caps.

17. INSTALL INNER REAR VIEW MIRROR
18. INSTALL SUN VISOR HOLDERS
19. INSTALL SUN VISOR
20. INSTALL MAP LIGHT ASSEMBLY
21. INSTALL FRONT PILLAR GARNISH

QUARTER WINDOW GLASS

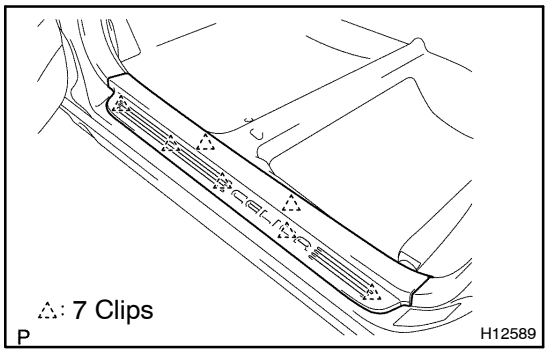
COMPONENTS

BO2NT–03



BO2NU–02

REMOVAL



1. REMOVE DOOR SCUFF PLATE

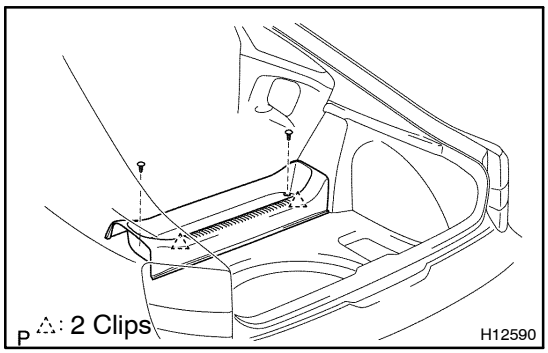
Using a screwdriver, remove the door scuff plate.

HINT:

Tape the screwdriver tip before use.

2. REMOVE PACKAGE TRAY TRIM

3. REMOVE REAR SEAT (See page BO–102)



4. REMOVE LUGGAGE COMPARTMENT TRAY

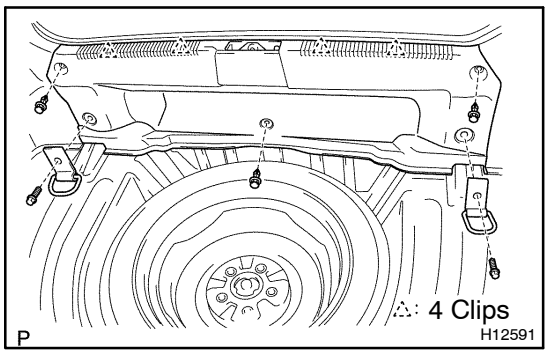
(a) Using a clip remover, remove the 2 clips.

(b) Using a screwdriver, remove the luggage compartment tray.

HINT:

Tape the screwdriver tip before use.

5. REMOVE LUGGAGE COMPARTMENT MAT



6. REMOVE REAR DECK TRIM COVER

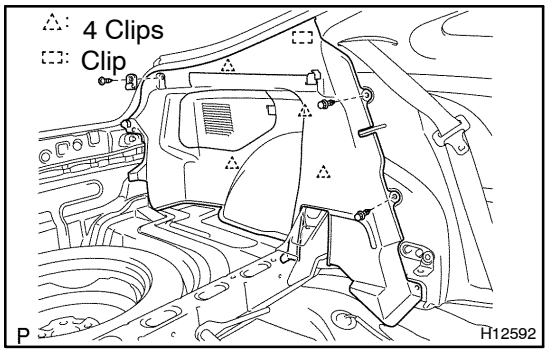
(a) Remove the 2 bolts and 2 hooks.

(b) Remove the 3 clips.

(c) Using a screwdriver, remove the rear deck trim cover.

HINT:

Tape the screwdriver tip before use.



7. REMOVE DECK TRIM SIDE PANEL

(a) Remove the screw and No. 1 luggage compartment trim hook.

(b) RH side:

Using a screwdriver, remove the rear room light, then disconnect the connector.

HINT:

Tape the screwdriver tip before use.

(c) Remove the 2 clips.

(d) Using a screwdriver, remove the deck trim side panel.

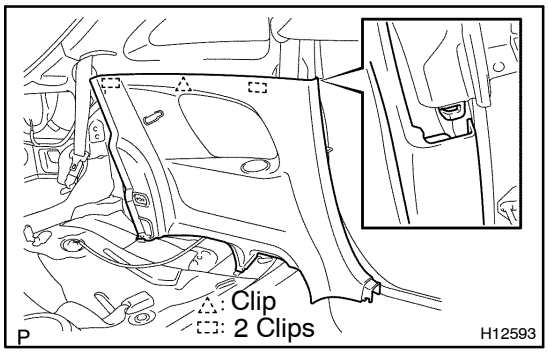
HINT:

Tape the screwdriver tip before use.

8. REMOVE REAR SEATBACK HINGE

9. REMOVE REAR SEATBACK LOCK STRIKER

10. REMOVE REAR SEAT OUTER BELT FLOOR ANCHOR



11. REMOVE QUARTER TRIM PANEL

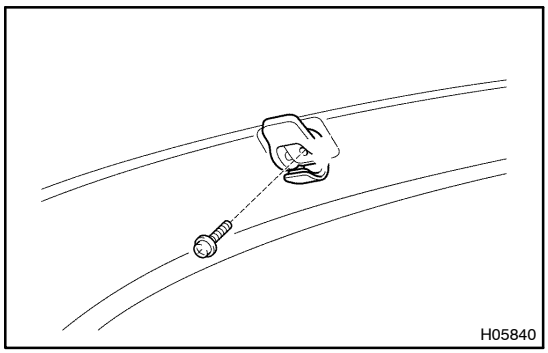
Using a screwdriver, remove the quarter trim panel.

HINT:

Tape the screwdriver tip before use.

12. REMOVE FRONT SEAT OUTER BELT SHOULDER ANCHOR

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



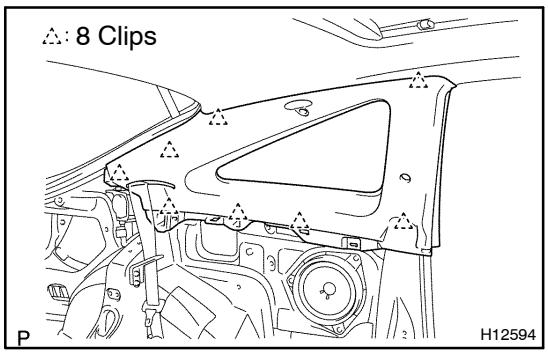
13. REMOVE ROOF SIDE INNER GARNISH

(a) Using a screwdriver, open the cap of coat hook.

HINT:

Tape the screwdriver tip before use.

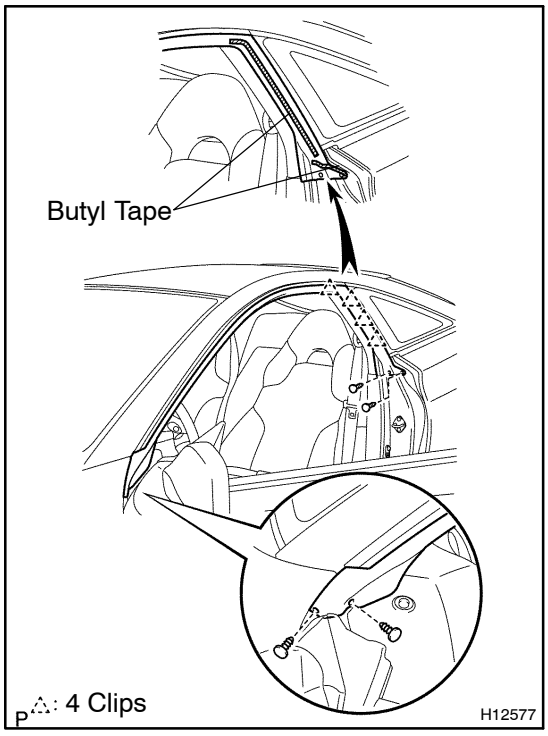
(b) Remove the screw and coat hook.



(c) Using a screwdriver, remove the roof side inner garnish.

HINT:

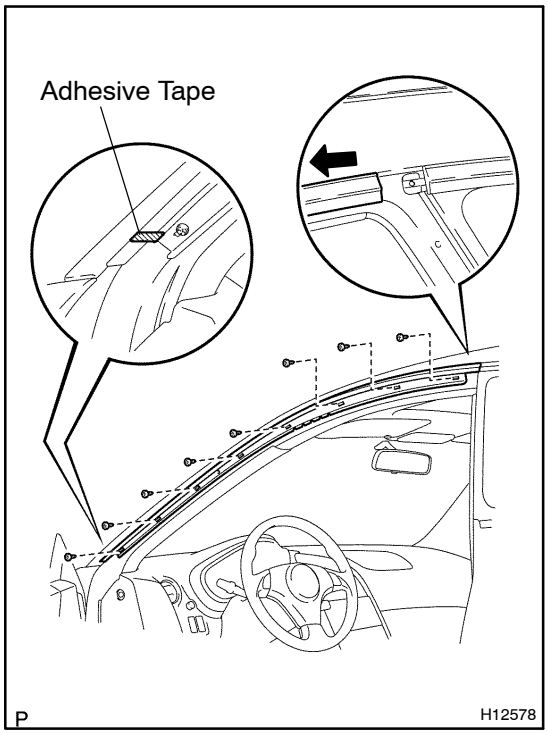
Tape the screwdriver tip before use.



14. REMOVE ROOF SIDE RAIL WEATHERSTRIP

(a) Using a clip remover, remove the 4 clips.

(b) Remove the roof side rail weatherstrip.



15. REMOVE ROOF DRIP SIDE MOULDING

Remove the 8 screws and roof drip side moulding.

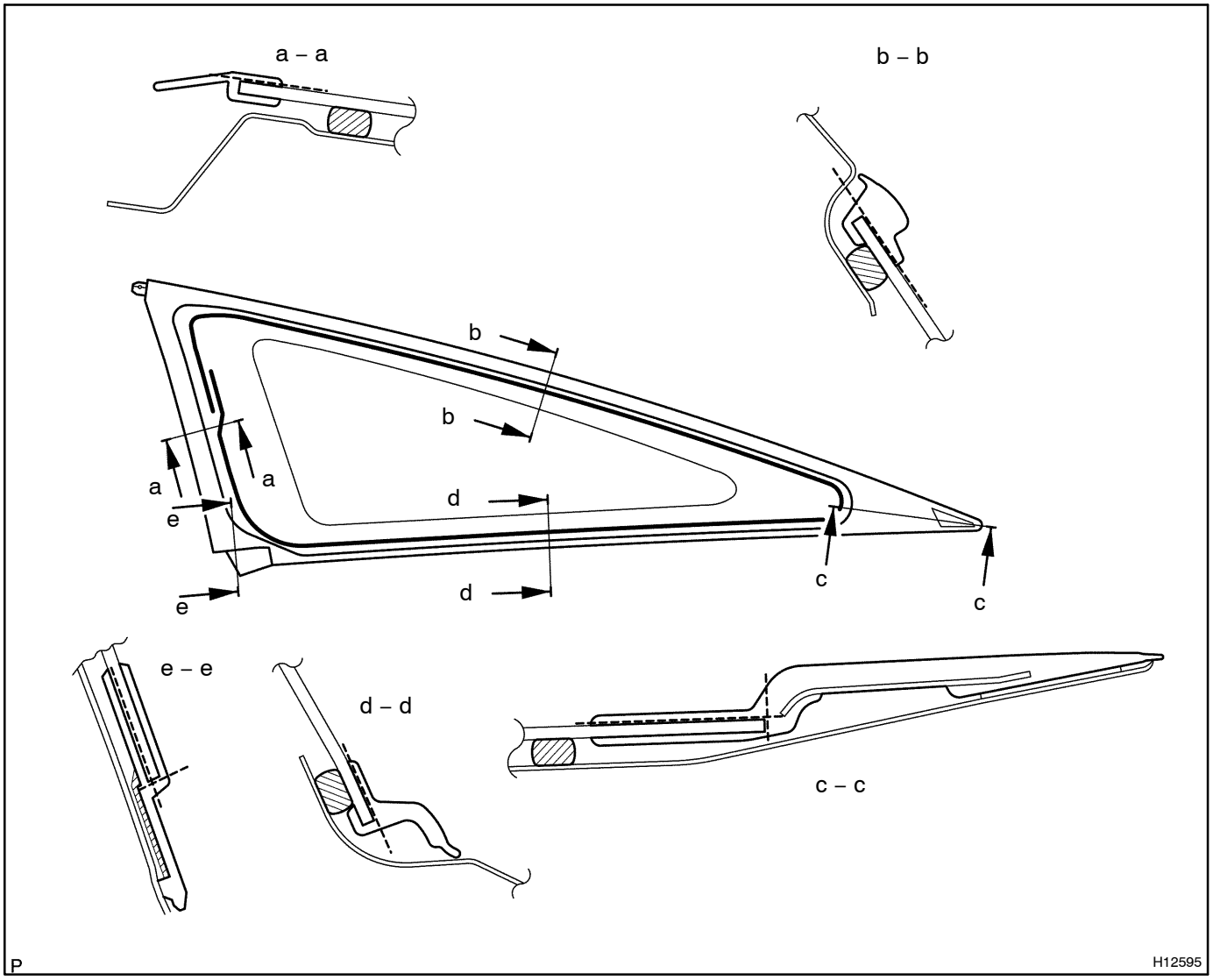
16. REMOVE QUARTER WINDOW GLASS

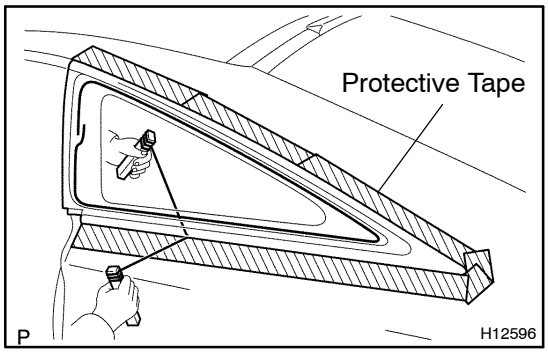
(a) Using a knife, cut off the moulding as shown in the below illustration.

NOTICE:

Do not damage the body with the knife.

(b) Remove the remaining moulding.





(c) Insert a piano wire between body and glass and let it pass through.

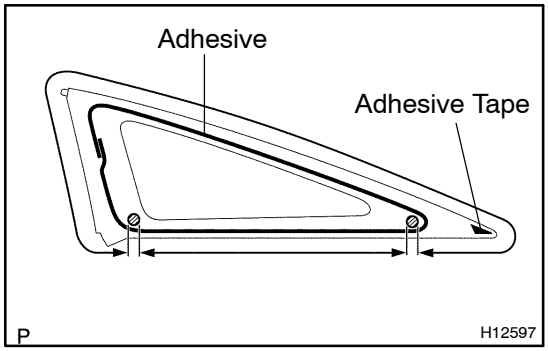
(d) Tie both wire ends to wooden blocks or similar objects.

HINT:

Apply protective tape to the outer surface to keep the surface from being scratched.

NOTICE:

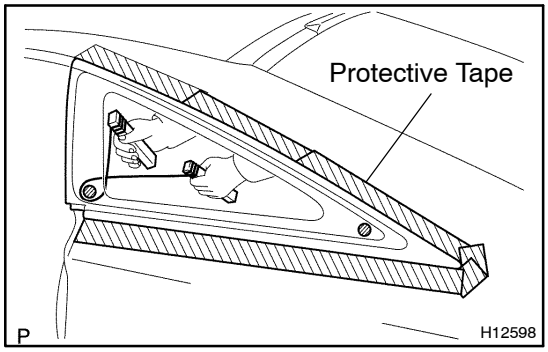
When separating the glass, take care not to damage the paint and exterior.



(e) Cut the adhesive by pulling the piano wire around it.

HINT:

Cut the adhesive areas as shown in the illustration, leaving the adhesive where the clips are.



(f) Push the piano wire through as shown in the illustration, cut off the adhered part to the clips.

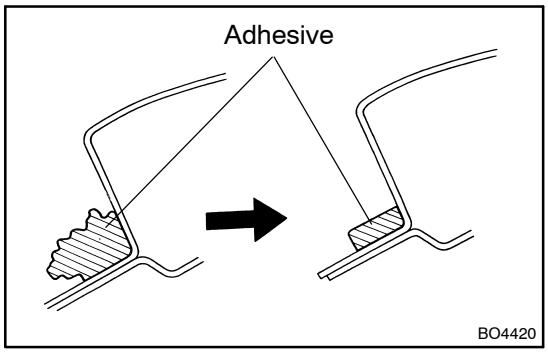
(g) Remove the glass.

NOTICE:

Leave the adhesive on the body as much as possible when cutting off the glass.

BO2NV–02

INSTALLATION



1. CLEAN AND SHAPE CONTACT SURFACE OF BODY PANEL

(a) Using a knife, cut away any rough areas on the body.

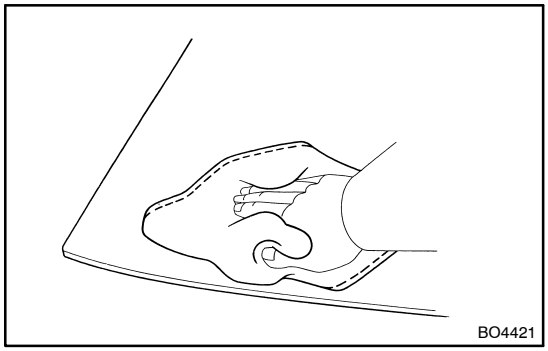
HINT:

Leave the adhesive on the body as much as possible.

(b) Clean the cut surface of the adhesive with a shop rag saturated in cleaner.

HINT:

Even if all the adhesive has been removed, clean the body.

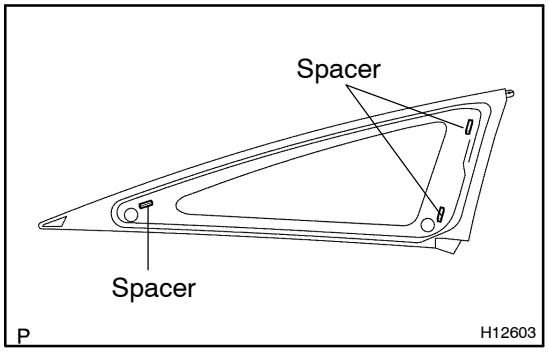


2. CLEAN CONTACT SURFACE OF NEW GLASS

Using a cleaner, clean the contact surface which is black–colored area around the entire glass rim.

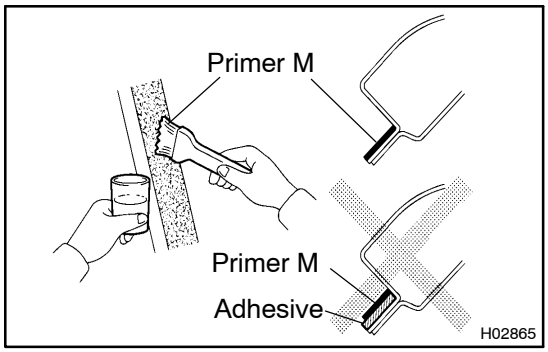
NOTICE:

Do not touch the glass face after cleaning it.



3. INSTALL NEW SPACERS

Install the new spacers to the quarter window glass as shown in the illustration.



4. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat Primer M to the exposed part of body on the vehicle side.

NOTICE:

- **Allow 3 minutes or more to dry the primer coated surface.**
- **Do not coat Primer M to the adhesive.**
- **Do not keep any of the opened Primer M for later use.**

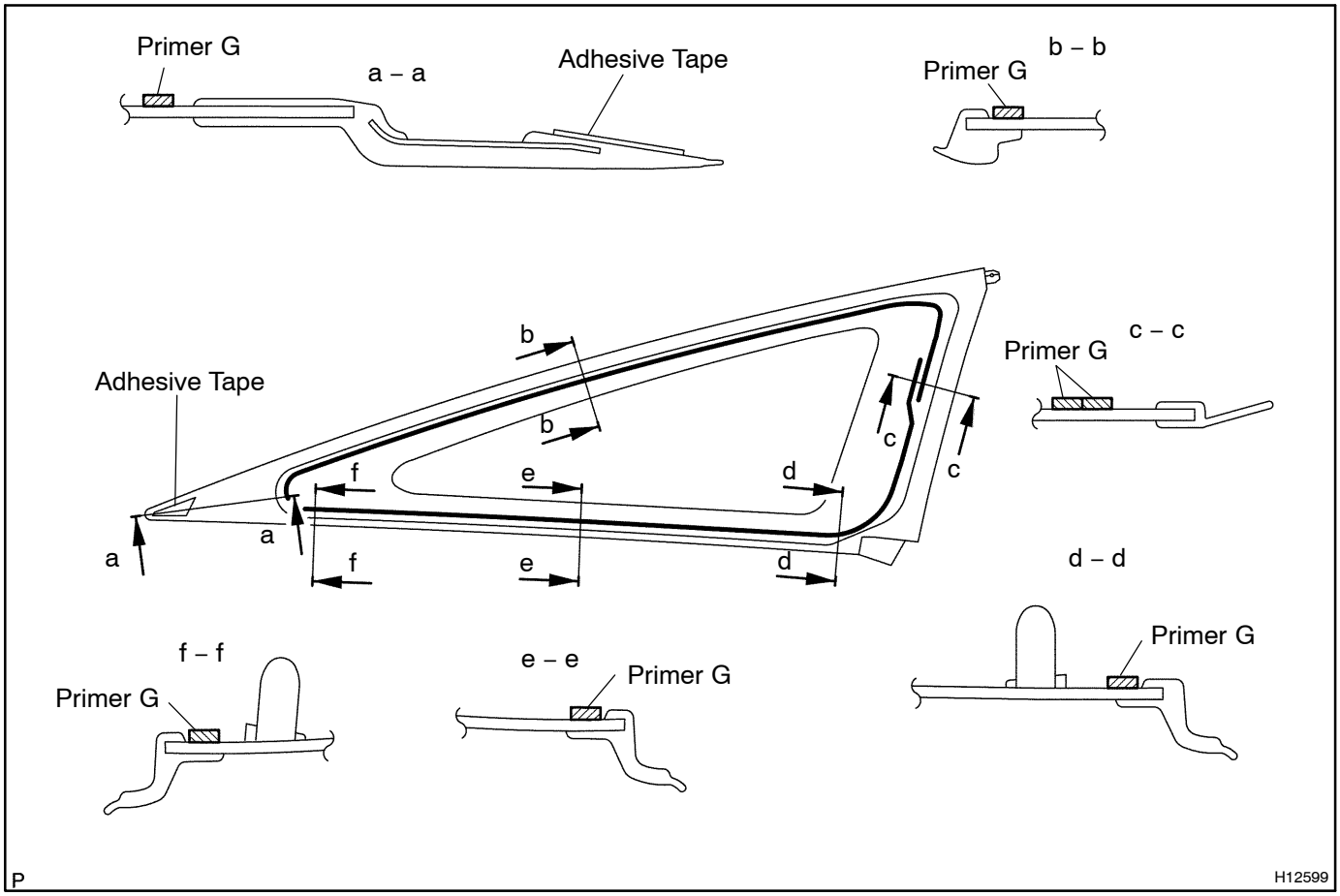
5. COAT CONTACT SURFACE OF NEW GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G as shown in the illustration.

(b) When the primer is coated wrongly to the area other than the specified, wipe it off with a clean shop rag before the primer dries.

NOTICE:

- **Allow 3 minutes or more to dry the primer coated surface.**
- **Do not keep any of the opened Primer G for later use.**



6. APPLY ADHESIVE

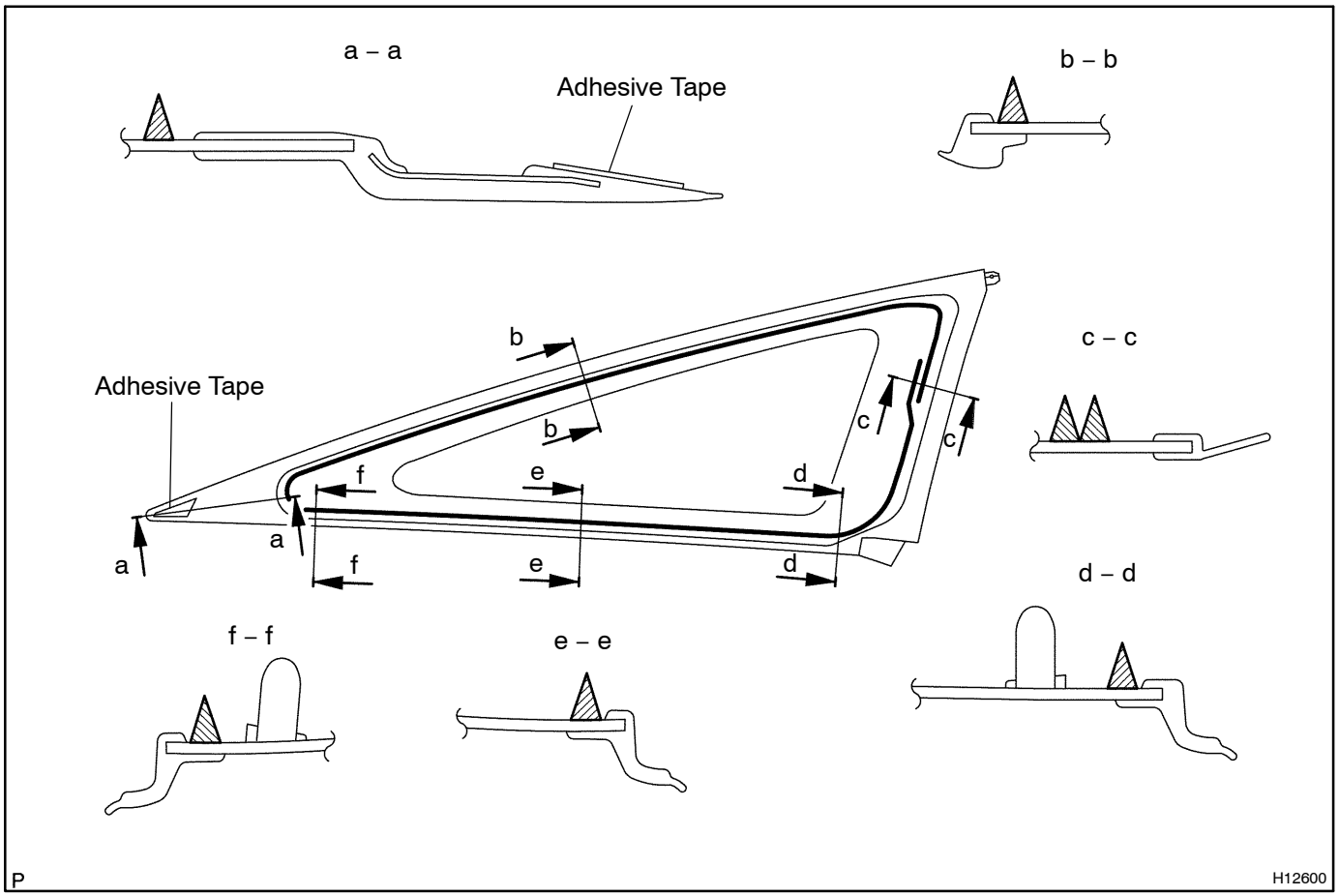
(a) Cut off the tip of the cartridge nozzle.
Part No. 08850–00801 or equivalent.

HINT:
After cutting off the tip, use all adhesive within the time described in the table below.

Temperature	Tackfree time
35˚C (95˚F)	15 minutes
20˚C (68˚F)	100 minutes
5˚C (41˚F)	8 hours

(b) Load the cartridge into the sealer gun.

(c) Coat the new glass with adhesive as shown in the illustration.
Adhesive height: 12.0 mm (0.472 in.)
Adhesive width: 8.0 mm (0.315 in.)



7. INSTALL NEW GLASS

(a) Install new glass to the body.

(b) Hold the glass in place securely with a protective tape or equivalent until the adhesive hardens.

NOTICE:

Take care not to drive the vehicle during the time described in the table below.

Temperature	Minimum time prior to driving the vehicle
35˚C (95˚F)	1.5 hours
20˚C (68˚F)	5 hours
5˚C (41˚F)	24 hours

8. INSPECT FOR LEAK AND REPAIR

(a) Conduct a leak test after the hardening time has elapsed.

(b) Seal any leak with sealant.

Part No. 08833–00030 or equivalent.

9. INSTALL ROOF DRIP SIDE MOULDING (See page BO–40)

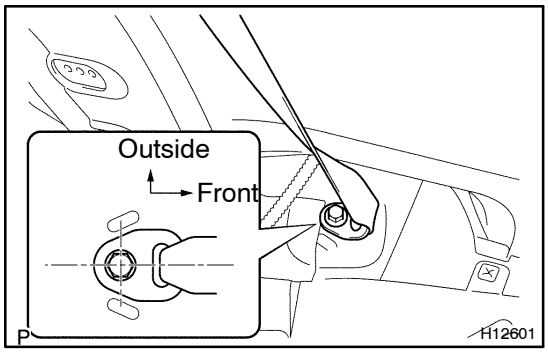
10. INSTALL ROOF SIDE RAIL WEATHERSTRIP (See page BO–40)

11. INSTALL ROOF SIDE INNER GARNISH

12. INSTALL FRONT SEAT OUTER BELT SHOULDER ANCHOR

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

13. INSTALL QUARTER TRIM PANEL



14. INSTALL REAR SEAT OUTER BELT FLOOR ANCHOR

Install the rear seat outer belt floor anchor with the bolts as shown in the illustration.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

15. INSTALL REAR SEATBACK LOCK STRIKER

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

16. INSTALL REAR SEATBACK HINGE

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

17. INSTALL DECK TRIM SIDE PANEL

18. INSTALL REAR DECK TRIM COVER

19. INSTALL LUGGAGE COMPARTMENT MAT

20. INSTALL PACKAGE TRAY TRIM

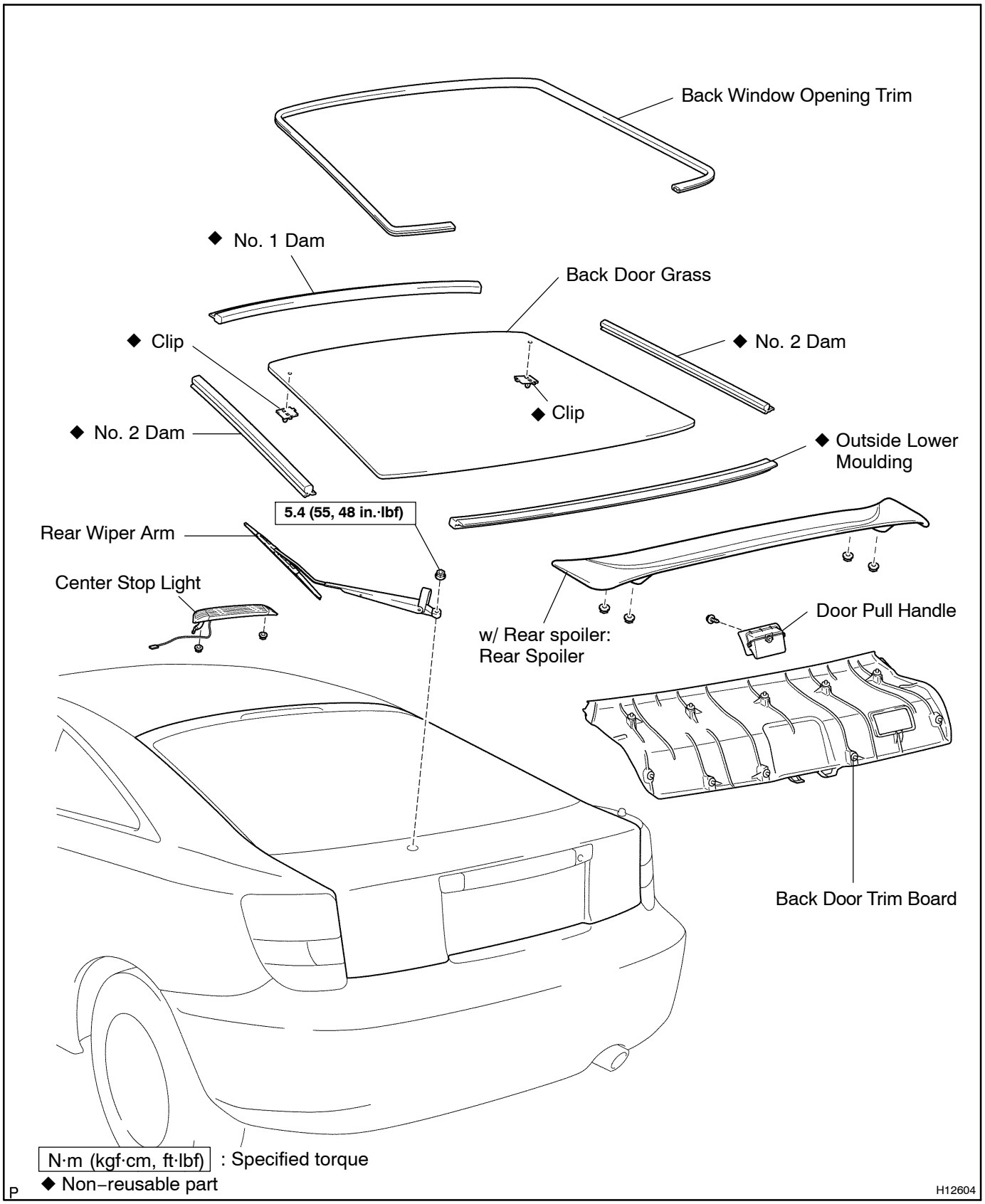
21. INSTALL REAR SEAT (See page BO–105)

22. INSTALL DOOR SCUFF PLATE

BACK DOOR GLASS

COMPONENTS

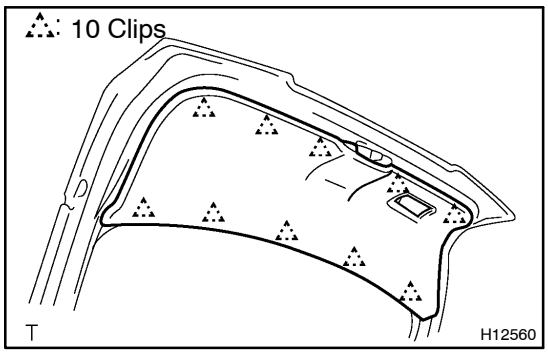
BO1EL–05



BO2NW–02

REMOVAL

1. **w/ Rear spoiler:**
   REMOVE REAR SPOILER
2. **REMOVE REAR WIPER ARM**
3. **REMOVE DOOR PULL HANDLE**

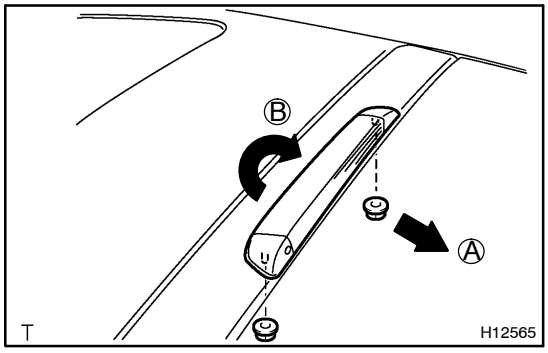


4. REMOVE BACK DOOR TRIM BOARD

Using a screwdriver, remove the back door trim board.

HINT:

Tape the screwdriver tip before use.

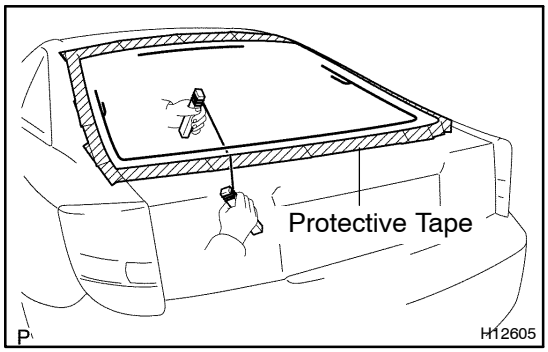


5. REMOVE CENTER STOP LIGHT

(a) Remove the 2 nuts.

(b) Disconnect the connector and washer hose, then remove the center stop light in order A, B as shown in the illustration..

6. REMOVE BACK WINDOW OPENING TRIM



7. REMOVE BACK DOOR GLASS

(a) Insert a piano wire between body and glass and let it pass through.

(b) Tie both wire ends to wooden blocks or similar object.

HINT:

Apply protective tape to the outer surface to keep the surface from being scratched.

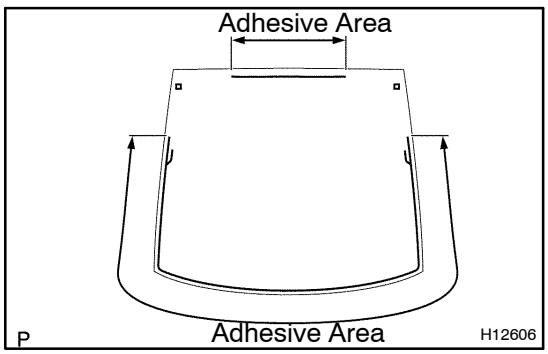
NOTICE:

When separating the glass, take care not to damage the paint and exterior.

(c) Cut the adhesive by pulling the piano wire around it.

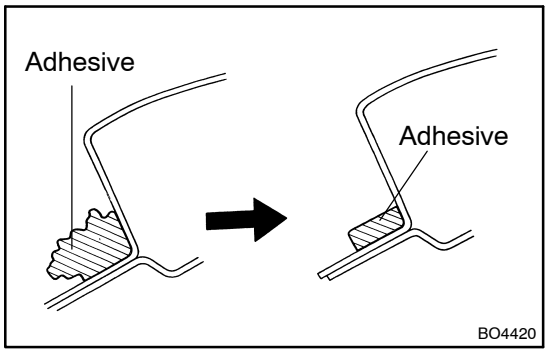
HINT:

Cut the adhesive areas as shown in the illustration.



BO2NX–02

INSTALLATION



1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Using a knife, cut away any rough areas on the body.

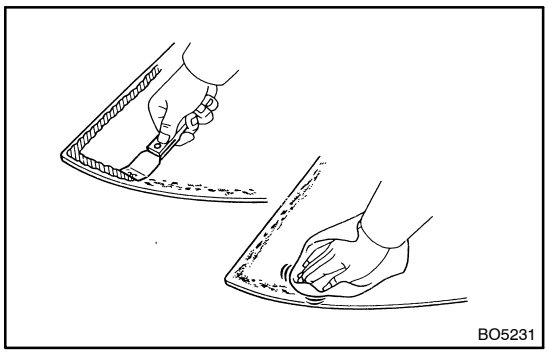
HINT:

Leave the adhesive on the body as much as possible.

(b) Clean the cutting surface of the adhesive with a shop rag saturated in cleaner.

HINT:

Even if all the adhesive has been removed, clean the body.



2. CLEAN REMOVED GLASS

(a) Place marks for installing new clips to the glass.

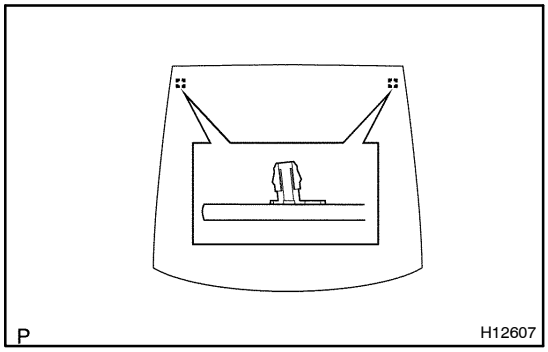
(b) Remove the damaged clips and dams.

(c) Using a scraper, remove the adhesive sticking to the glass.

(d) Clean the glass with cleaner.

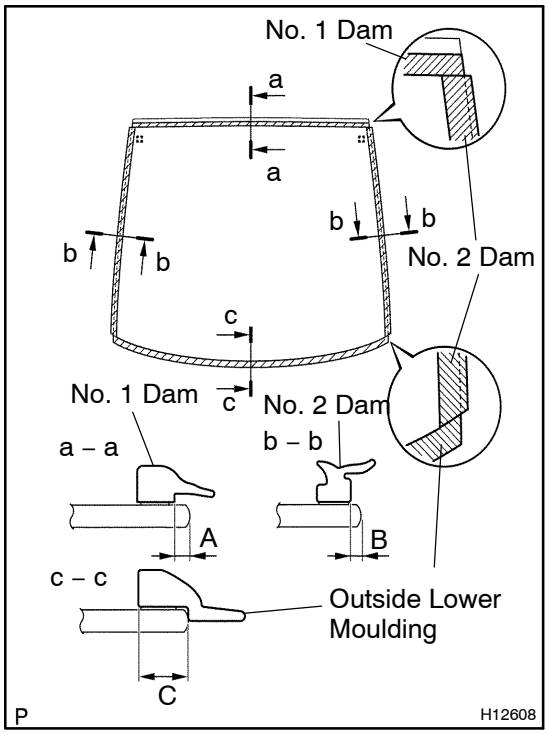
NOTICE:

- **Do not touch the glass after cleaning it.**
- **Be careful not to damage the glass.**



3. If reusing the glass: INSTALL NEW CLIPS

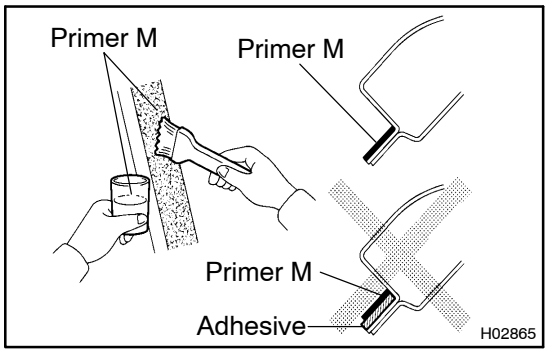
Install new clips onto the glass.



4. INSTALL NEW DAMS AND OUTSIDE LOWER MOULDING

Install new dams and outside lower moulding with adhesive tape as shown in the illustration.

A: 2.5 mm (0.098 in.)
B: 1.7 mm (0.067 in.)
C: 7.5 mm (0.295 in.)

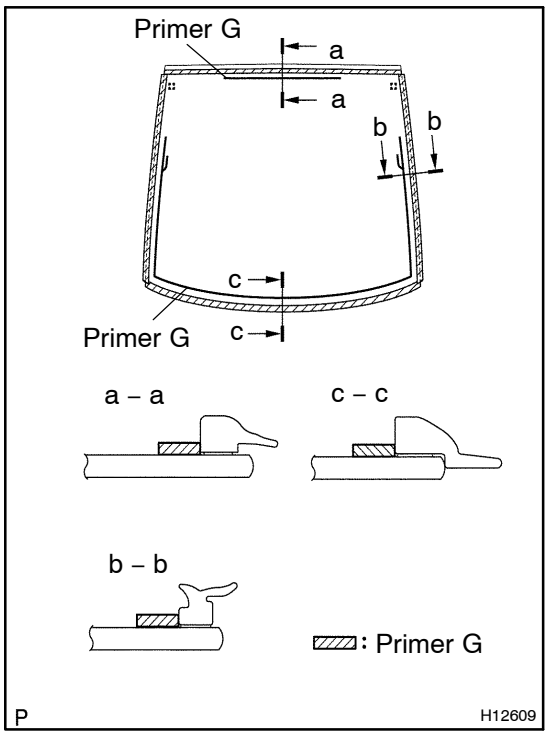


5. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat Primer M to the exposed part of body on the vehicle side.

NOTICE:

- **Allow 3 minutes or more to dry the primer coated surface.**
- **Do not coat Primer M to the adhesive.**
- **Do not keep any of the opened Primer M for later use.**



6. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G as shown in the illustration.

(b) When the primer is coated wrongly to the area other than the specified, wipe it off with a clean shop rag before the primer dries.

NOTICE:

- **Allow 3 minutes or more to dry the primer coated surface.**
- **Do not keep any of the opened Primer G for later use.**

7. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle.

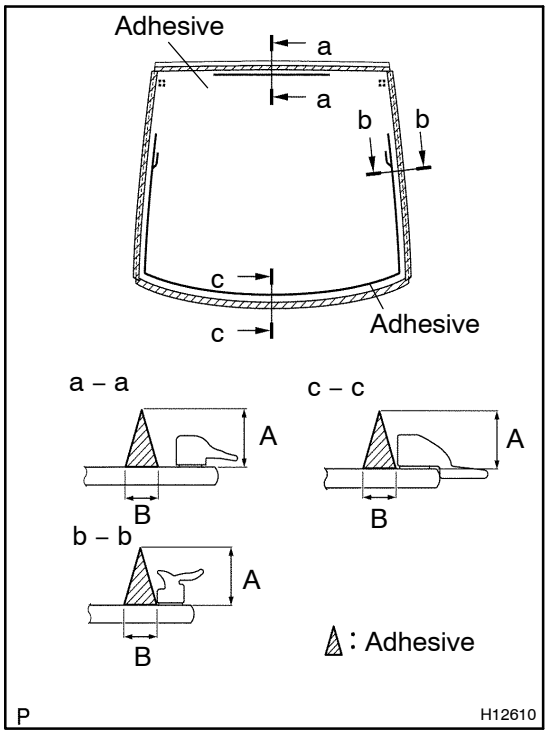
Part No. 08850–00801 or equivalent

HINT:

After cutting off the tip, use all adhesive within the time described in the table below.

Temperature	Tackfree time
35˚C (95˚F)	15 minutes
20˚C (68˚F)	100 minutes
5˚C (41˚F)	8 hours

(b) Load the cartridge into the sealer gun.



(c) Coat the glass with adhesive as shown in the illustration.
A: 12.0 mm (0.472 in.)
B: 8.0 mm (0.315 in.)

8. INSTALL BACK DOOR GLASS

(a) Install the back door glass to the back door.

HINT:

Confirm that the dams is attached to the back door panel.

(b) Hold the back door glass in place securely with a protective tape or equivalent until the adhesive hardenes.

NOTICE:

Take care not to drive the vehicle during the time described in the table below.

Temperature	Minimum time prior to driving the vehicle
35˚C (95˚F)	1.5 hours
20˚C (68˚F)	5 hours
5˚C (41˚F)	24 hours

9. INSPECT FOR LEAKS AND REPAIR

NOTICE:

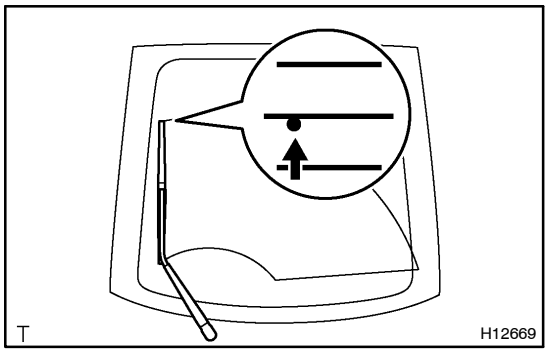
Conduct a leak test after the hardening time has elapsed.

10. INSTALL BACK WINDOW OPENING TRIM

11. INSTALL CENTER STOP LIGHT

12. INSTALL BACK DOOR TRIM BOARD

13. INSTALL DOOR PULL HANDLE



14. INSTALL REAR WIPER ARM

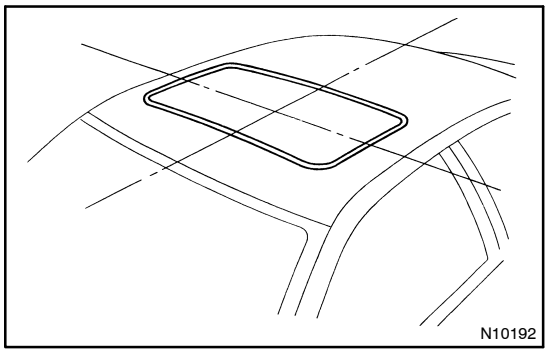
(a) Operate the wiper motor once and turn the wiper switch OFF.

(b) Install the rear wiper arm and tighten the nut by hand.

(c) Adjust the installation position of the wiper arm at a point in defogger pattern.

(d) Tighten the nut.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

15. w/ Rear spoiler:
REMOVE REAR SPOILER



SLIDING ROOF

BO2NY–02

ON–VEHICLE INSPECTION

INSPECT SLIDING ROOF GLASS ALIGNMENT

(a) Start the engine and check the operation time of the sliding roof.
Operation time:
Approx. 6 secs.

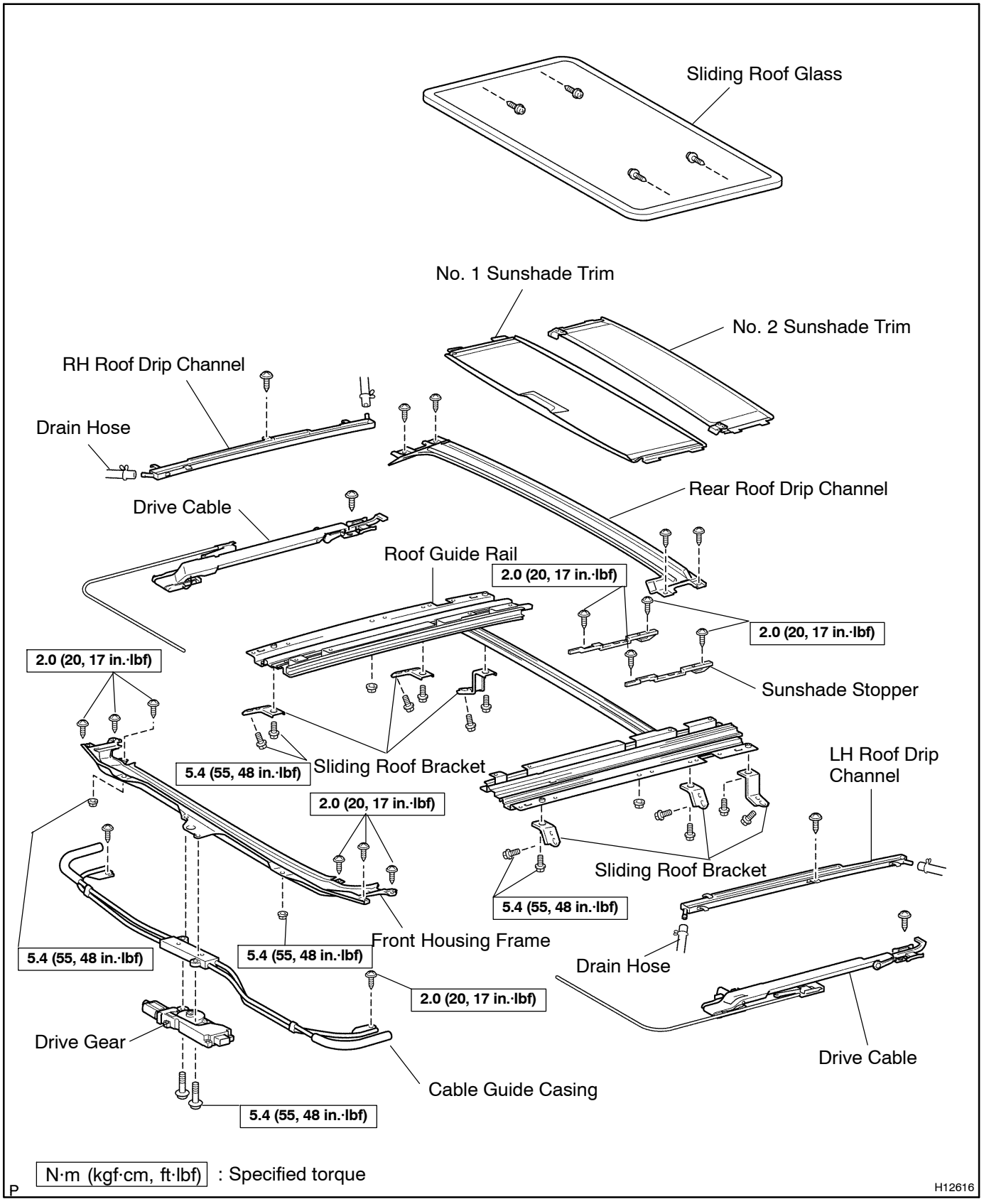
(b) Check for abnormal noise or binding during operation.

(c) With the sliding roof fully closed, check for water leakage.

(d) Check for a difference in level between the sliding roof weatherstrip and roof panel.
Except rear end:
0 ± 1.5 mm (0 ± 0.059 in.)
Rear end:
0 + 1.5 mm (0 + 0.059 in.)
0 – 1.0 mm (0 – 0.039 in.)

BO2NZ–02

COMPONENTS



BO2O0-02

REMOVAL

1. REMOVE ROOF HEADLINING
(See page BO–88)

2. REMOVE SLIDING ROOF GLASS

(a) Remove the 4 screws.

(b) Pull the glass upward to remove it.

3. REMOVE DRIVE GEAR

NOTICE:

Remove the drive gear with the sliding roof fully closed.

(a) Remove the 2 screws and room light bracket.

(b) Disconnect the connector.

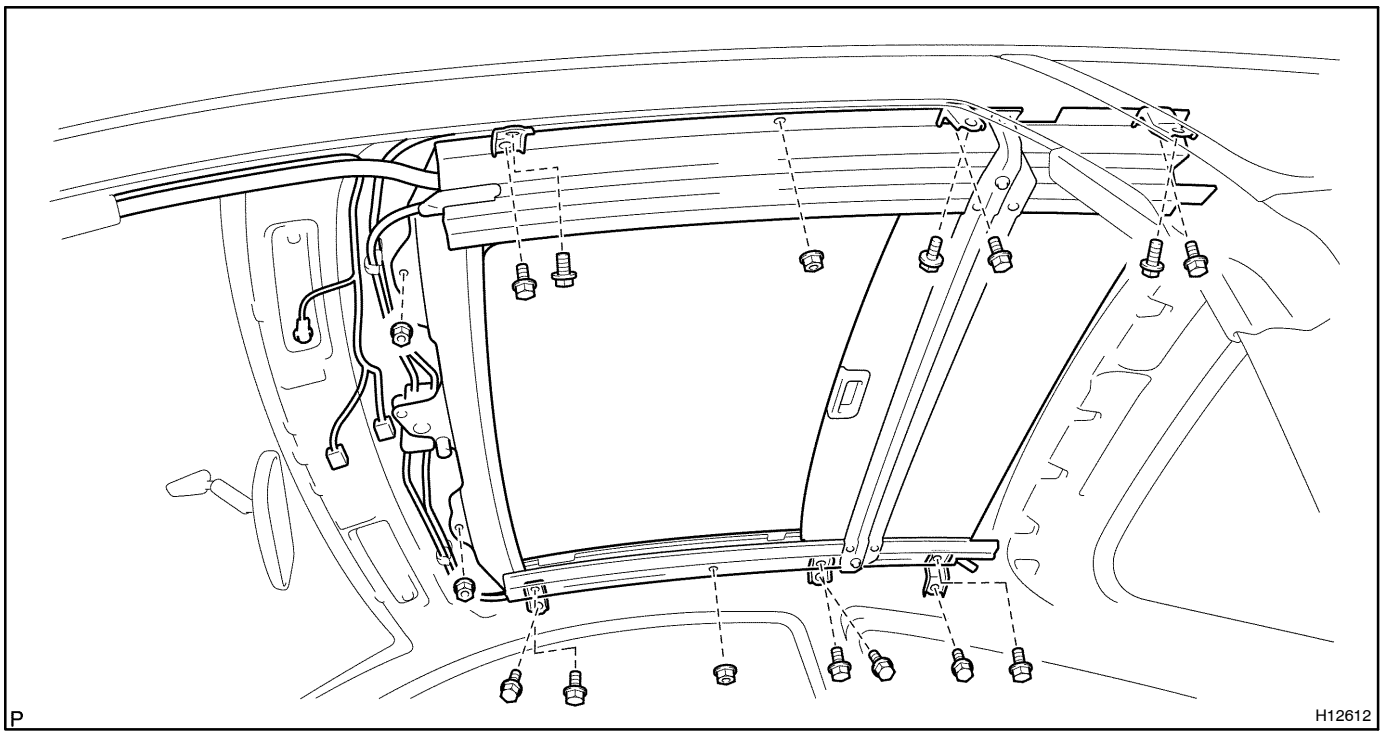
(c) Remove the 2 bolts and drive gear.
Torque: 5.4 N·m (55 kgf·cm, 48 ft·lbf)

4. REMOVE SLIDING ROOF HOUSING

(a) Disconnect the 4 drain hoses from the housing.

(b) Remove the 12 bolts and 6 brackets.
Torque: 5.4 N·m (55 kgf·cm, 48 ft·lbf)

(c) Remove the 4 nuts, then remove the housing.
Torque: 5.4 N·m (55 kgf·cm, 48 ft·lbf)

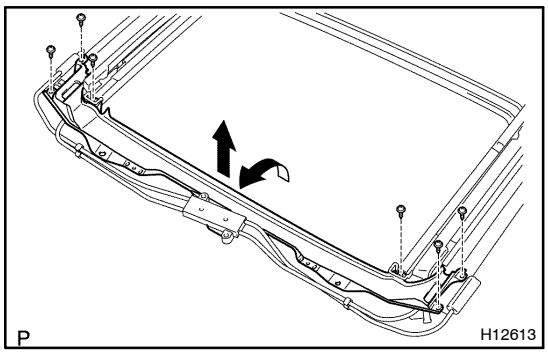


BO2O1-02

DISASSEMBLY

1. REMOVE SUNSHADE STOPPERS
Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)

2. REMOVE NO. 1 AND NO. 2 SUNSHADE TRIMS

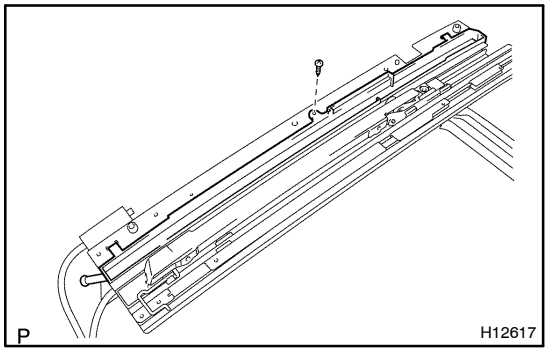


3. REMOVE FRONT HOUSING FRAME

Remove the 6 screws and front housing frame as shown in the illustration.

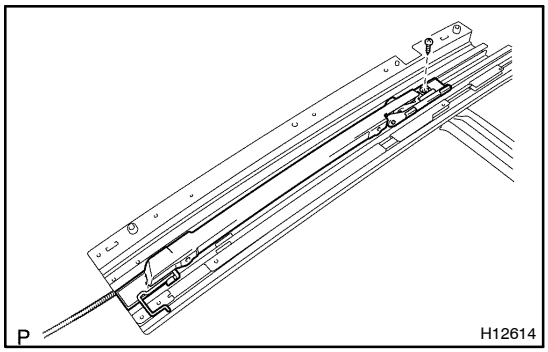
Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)

4. REMOVE REAR ROOF DRIP CANNEL



5. REMOVE LH AND RH ROOF DRIP CHANNEL

6. REMOVE CABLE GUIDE CASING
Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)



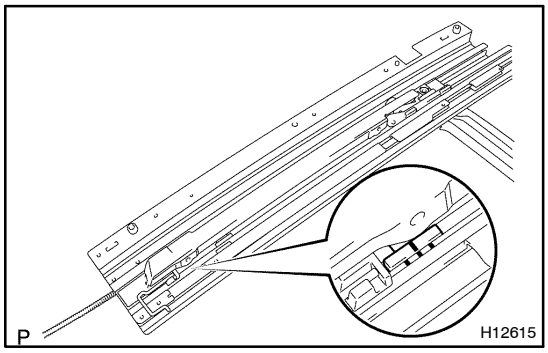
7. REMOVE DRIVE CABLE

(a) Remove the screw.
(b) Slide the drive cable rearward, then remove it.
(c) Employ the same manner described above to the other side.

HINT:

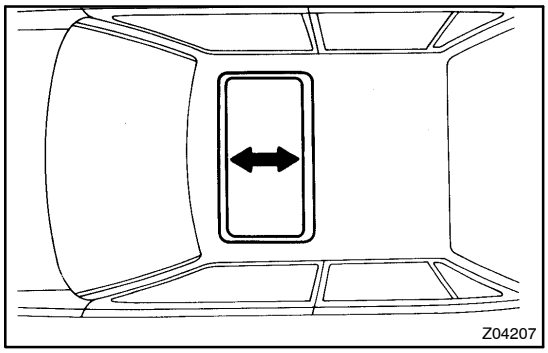
At the time of reassembly, please refer to the following items.

- Adjust the drive cable to a closed and tilted down position.



- Slide the cable forward or backward to align the 2 marks as shown in the illustration.

BO2O2-02



ADJUSTMENT

1. ADJUST SLIDING ROOF GLASS FORWARD OR REARWARD

(a) Loosen the sliding roof glass installation bolts.

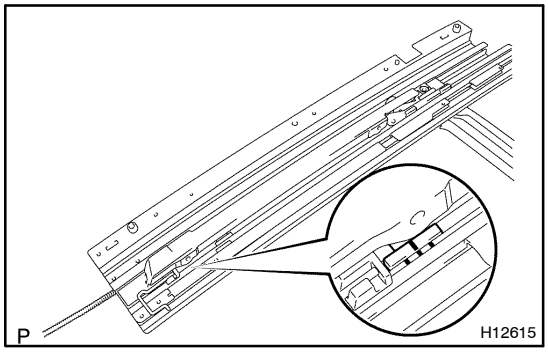
(b) Adjust the slide roof glass forward or rearward.

2. ADJUST SLIDING ROOF GLASS IN CLEARANCE (Difference in left and right clearance)

(a) When the front or rear alignment is not correct, remove the drive gear and sliding roof glass, then adjust the drive cables.

NOTICE:

Remove the drive gear with the sliding roof fully closed.



(b) Adjust by sliding the cables forward or rearward to align the 2 marks as shown in the illustration.

(c) Install the drive gear and sliding roof glass.

BO2O3–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BO–72).

BO2O4–02

INSTALLATION

Installation is in the reverse order of removal (See page BO–88).

HINT:

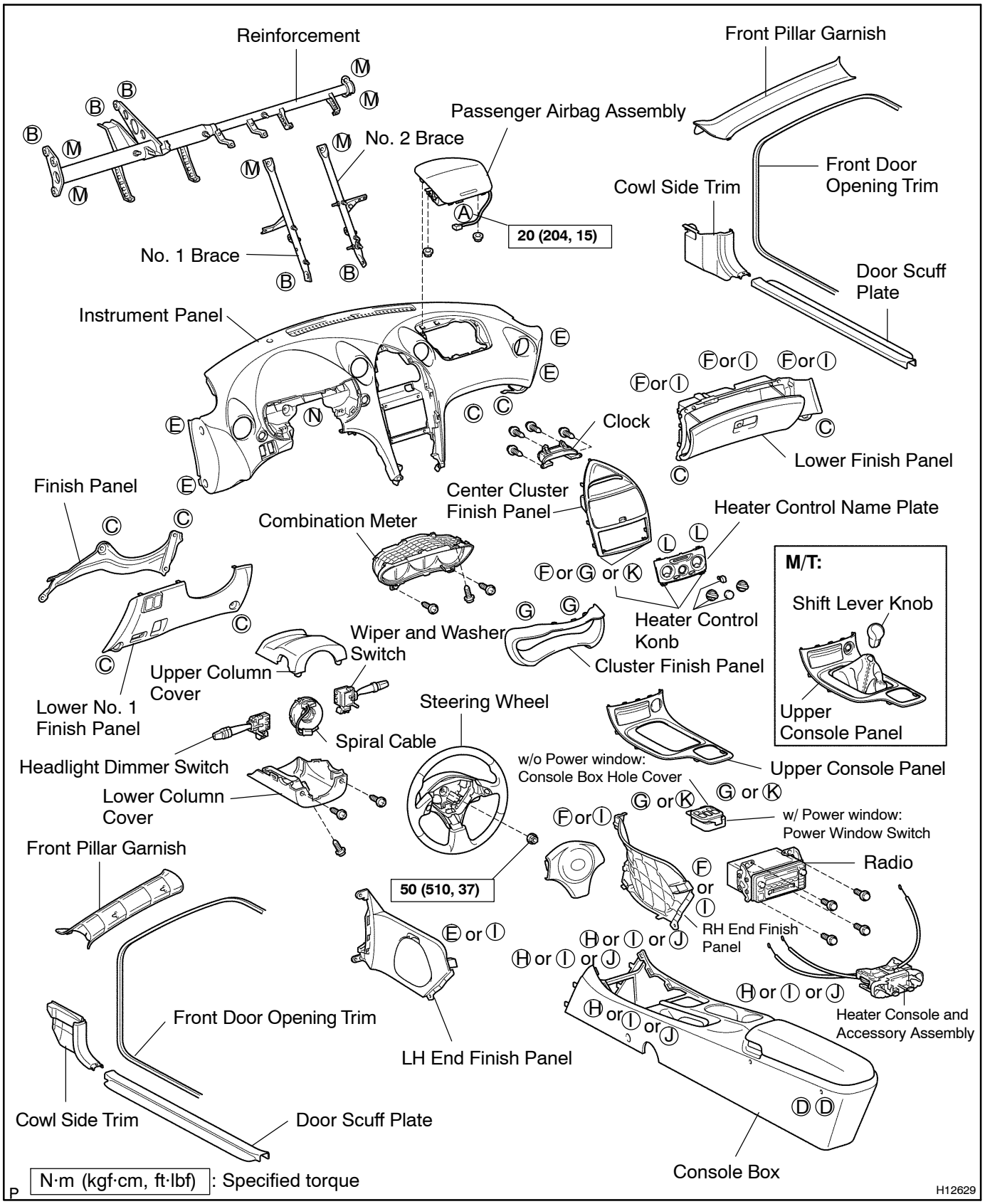
After installing the sliding roof, sliding roof need to be re–initialized.

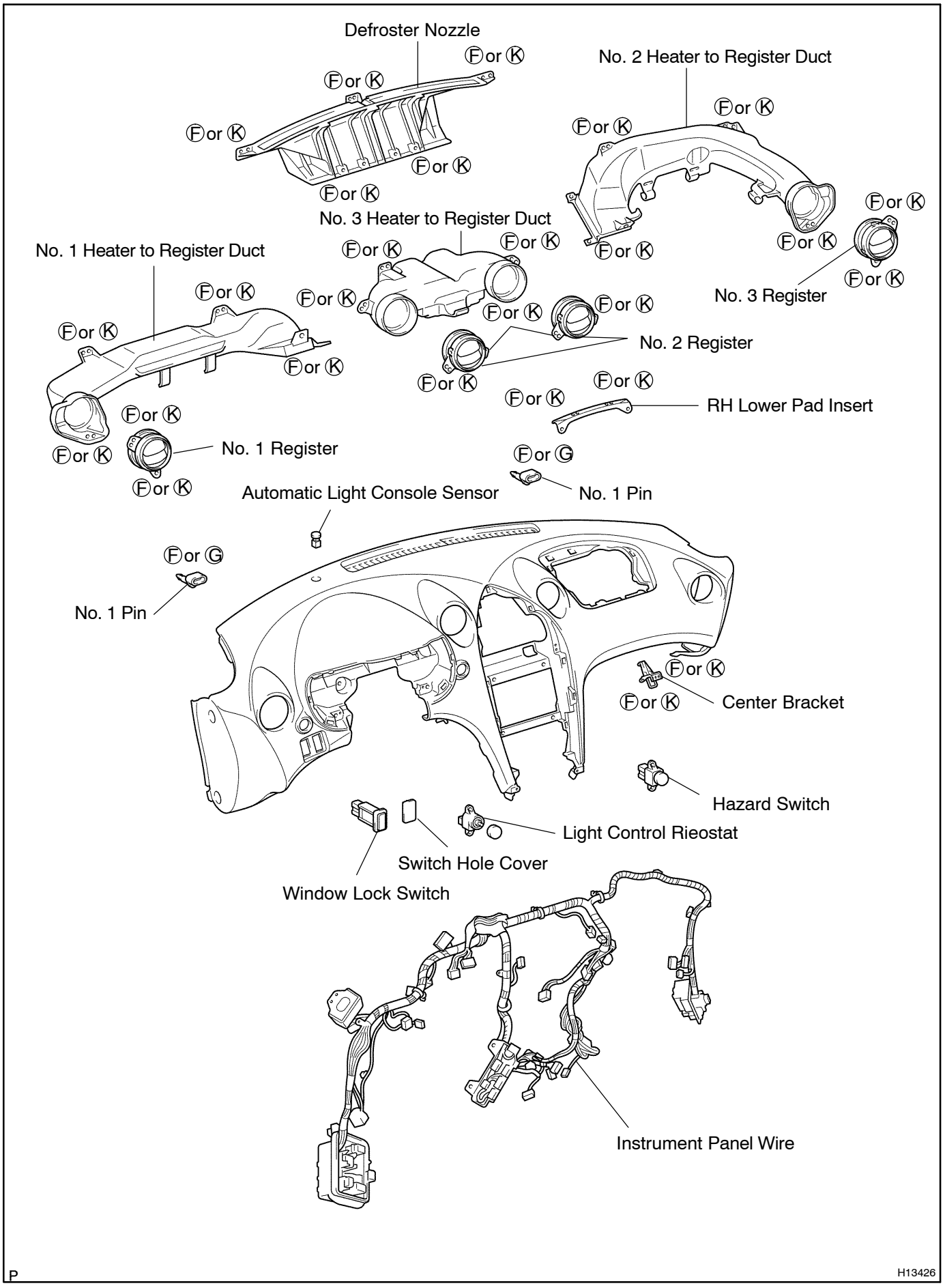
Refer to BE–86.

INSTRUMENT PANEL

COMPONENTS

BO1EV–06

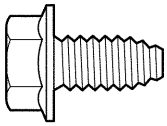
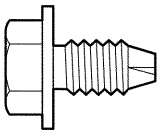
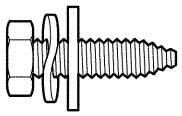
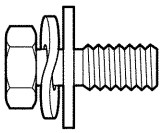
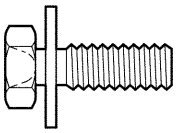
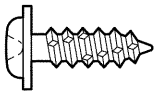
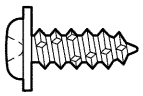
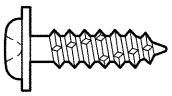
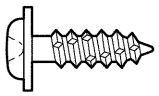
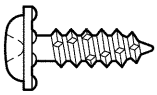
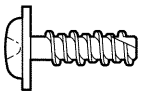
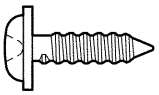
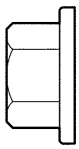
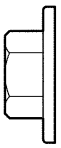



Defroster Nozzle
Ⓕor Ⓚ
No. 2 Heater to Register Duct
No. 3 Heater to Register Duct
No. 1 Heater to Register Duct
No. 3 Register
No. 2 Register
RH Lower Pad Insert
No. 1 Register
Ⓕor Ⓖ
No. 1 Pin
Automatic Light Console Sensor
Center Bracket
Hazard Switch
Light Control Rieostat
Switch Hole Cover
Window Lock Switch
Instrument Panel Wire
P
H13426

HINT:

Screw shapes and sizes are indicated in the table below. The codes (”A” – ”N”) correspond to those indicated on the previous page.

mm (in.)

	Shape	Size		Shape	Size		Shape	Size
Ⓐ		ø = 8 (0.32) L = 16 (0.63)	Ⓑ		ø = 8 (0.32) L = 15 (0.59)	Ⓒ		ø = 6 (0.24) L = 22 (0.87)
Ⓓ		ø = 6 (0.24) L = 16 (0.63)	Ⓔ		ø = 6 (0.24) L = 18 (0.71)	Ⓕ		ø = 5.22 (0.2055) L = 16 (0.63)
Ⓖ		ø =5.22 (0.2055) L = 16 (0.63)	Ⓗ		ø = 5 (0.20) L = 18 (0.71)	Ⓘ		ø = 5 (0.20) L = 16 (0.63)
Ⓙ		ø = 5 (0.20) L = 16 (0.63)	Ⓚ		ø = 5 (0.20) L = 14 (0.55)	Ⓛ		ø = 4 (0.16) L = 16 (0.63)
Ⓜ		ø = 8 (0.32)	Ⓝ		ø = 6 (0.24)			

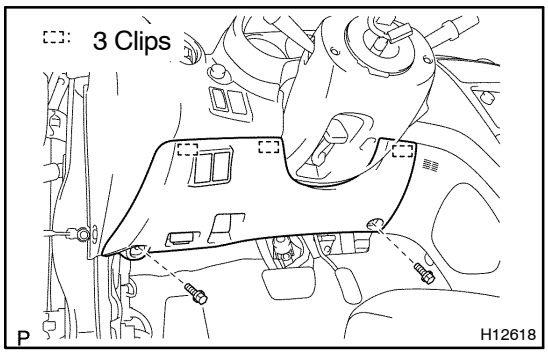
P

H12659

BO2O5–02

REMOVAL

1. **REMOVE STEERING WHEEL PAD AND STEERING WHEEL (See page SR–13)**
2. **REMOVE DOOR SCUFF PLATE**
3. **REMOVE COWL SIDE TRIM**



4. **REMOVE LOWER NO. 1 FINISH PANEL**

(a) Remove the 2 screws and hood lock release lever.

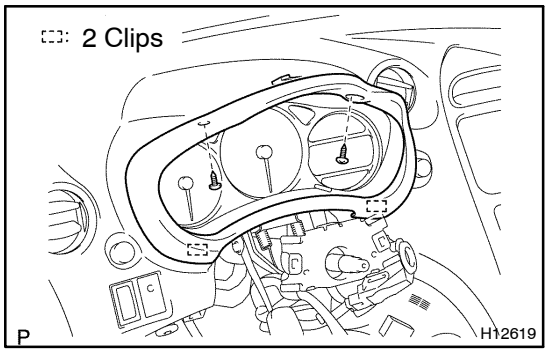
(b) Remove the 2 bolts.

(c) Using a screwdriver, remove the lower No. 1 finish panel.

HINT:

Tape the screwdriver tip before use.

5. **REMOVE FINISH PANEL**
6. **REMOVE COLUMN COVERS (See page SR–13)**
7. **REMOVE SPIRAL CABLE (See page SR–13)**
8. **REMOVE WIPER AND WASHER SWITCH AND LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH (See page SR–13)**



9. **REMOVE CLUSTER FINISH PANEL**

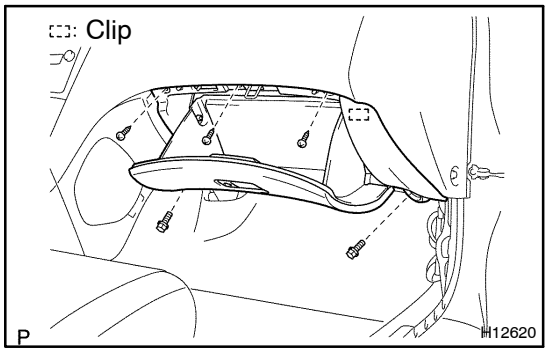
(a) Remove the 2 screws.

(b) Using a screwdriver, remove the cluster finish panel.

HINT:

Tape the screwdriver tip before use.

10. **REMOVE COMBINATION METER**



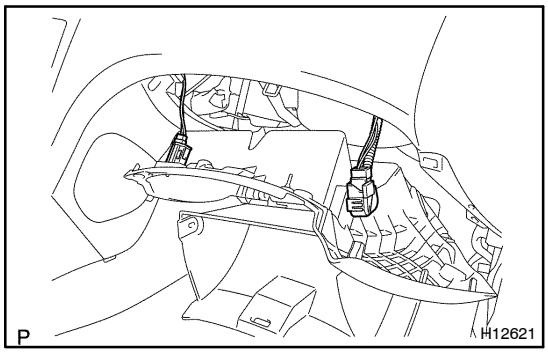
11. **REMOVE LOWER FINISH PANEL**

(a) Remove the 2 bolts and 3 screws.

(b) Using a screwdriver, disconnect the lower finish panel.

HINT:

Tape the screwdriver tip before use.



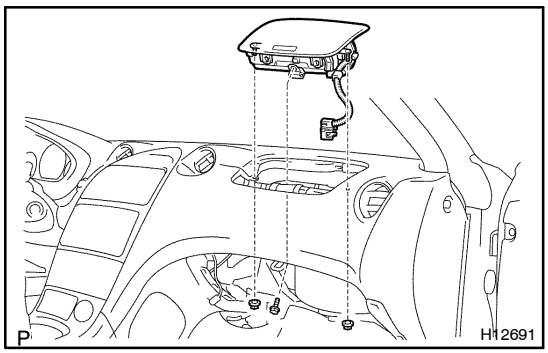
(c) Using a clip remover, disengage the airbag connector clamp.
(d) Disconnect the connector, then remove the lower finish panel.

12. DISCONNECT PASSENGER AIRBAG CONNECTOR

Disconnect the passenger airbag connector.

NOTICE:

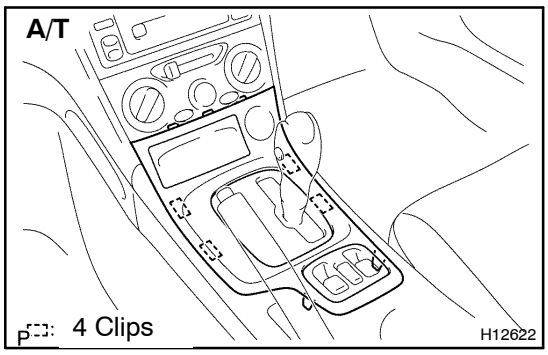
When disconnecting the airbag connector, take care not to damage the airbag wire harness.



13. REMOVE PASSENGER AIRBAG ASSEMBLY

Remove the bolt, 2 nuts, and passenger airbag assembly.

Torque:
Bolt: 20 N·m (204 kgf·cm, 15 ft·lbf)



14. REMOVE UPPER CONSOLE PANEL

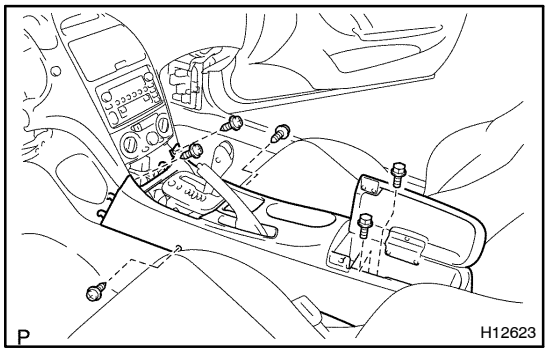
(a) M/T:
Remove the shift lever knob.
(b) Using a screwdriver, remove the upper console panel, the disconnect the connector.

HINT:

Tape the screwdriver tip before use.

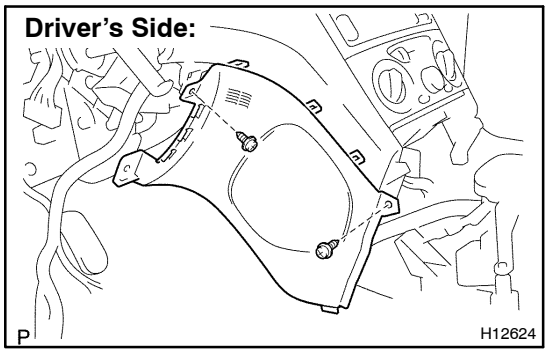
15. w/ Power window:
REMOVE POWER WINDOW CONTROL SWITCH

16. w/o Power window:
REMOVE CONSOLE BOX HOLE COVER



17. REMOVE CONSOLE BOX

(a) Remove the box bottom mat.
(b) Remove the 2 bolts, 4 screws and console box.



18. REMOVE END FINISH PANELS

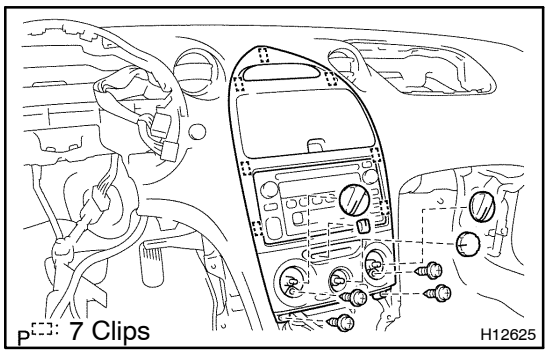
(a) Driver's side:
Remove the 2 screws.

(b) Passenger's side:
Remove the screws.

(c) Using a screwdriver, remove the end finish panels.

HINT:

Tape the screwdriver tip before use.



19. REMOVE CENTER CLUSTER FINISH PANEL WITH HEATER CONTROL NAME PLATE

(a) Remove the heater control knobs.

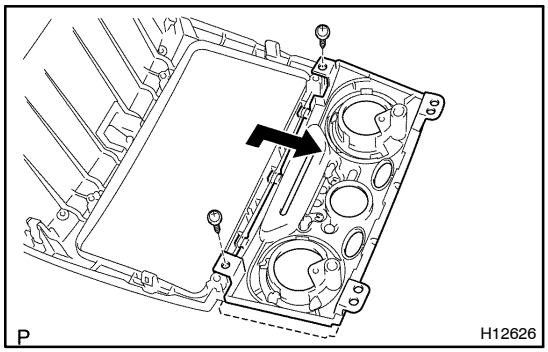
(b) Remove the 4 screws.

(c) Using a screwdriver, remove the center cluster finish panel with heater control name plate, then disconnect the connector.

HINT:

Tape the screwdriver tip before use.

(d) Remove the 4 screws and clock from the center cluster finish panel.



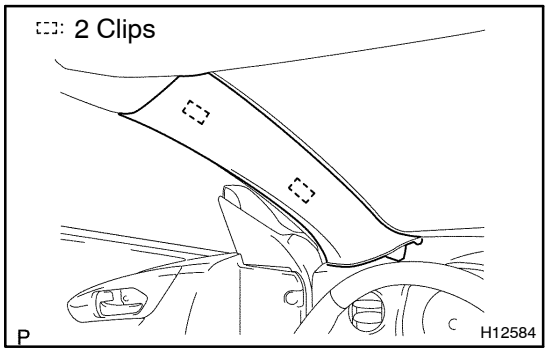
(e) Remove the 2 screws and heater control name plate from the center cluster finish panel as shown in the illustration.

20. w/ Radio:
REMOVE RADIO

21. w/o Radio:
REMOVE STEREO OPENING COVER ASSEMBLY

22. REMOVE HEATER CONTROL AND ACCESSORY ASSEMBLY (See page AC–66)

23. REMOVE STEERING COLUMN (See page SR–13)



24. REMOVE FRONT PILLAR GARNISH

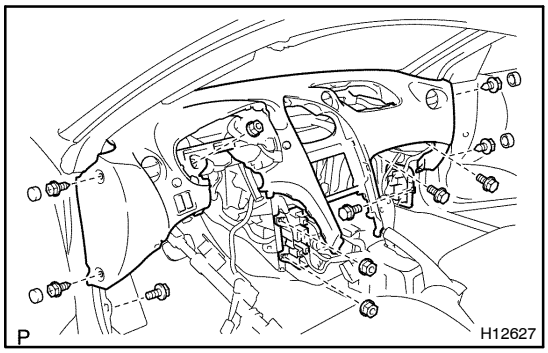
(a) Using a screwdriver, remove the front pillar garnish.

HINT:

Tape the screwdriver tip before use.

(b) Employ the same manner described above to the other side.

25. REMOVE FRONT DOOR OPENING TRIM



26. REMOVE INSTRUMENT PANEL

(a) Disconnect the connectors.

(b) Disengage the wire harness clamps.

(c) Remove the J/B set bolts and nuts.

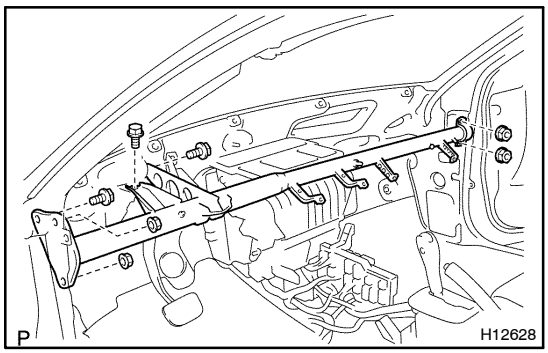
(d) Using a screwdriver, remove the 4 caps.

HINT:

Tape the screwdriver tip before use.

(e) Remove the 2 bolts, nut, 4 screws and instrument panel.

27. REMOVE NO. 1 AND NO. 2 BRACE



28. REMOVE REINFORCEMENT

(a) w/ ABS:

Remove the 2 nuts and ABS ECU.

(b) Remove the 3 bolts, 4 nuts and reinforcement.

BO2O6–06

DISASSEMBLY

1. REMOVE NO. 1 PINS
2. REMOVE INSTRUMENT PANEL WIRE
3. REMOVE DEFROSTER NOZZLE
4. REMOVE NO. 1 HEATER TO REGISTER DUCT
5. REMOVE NO. 2 HEATER TO REGISTER DUCT
6. REMOVE NO. 3 HEATER TO REGISTER DUCT
7. REMOVE AUTOMATIC LIGHT CONTROL SENSOR
8. REMOVE LIGHT CONTROL RHEOSTAT
9. REMOVE HAZARD SWITCH
10. REMOVE WINDOW LOCK SWITCH
11. REMOVE SWITCH HOLE COVER
12. REMOVE NO. 1 REGISTER
13. REMOVE NO. 2 REGISTERS
14. REMOVE NO. 3 REGISTER
15. REMOVE RH LOWER PAD INSERT
16. REMOVE CENTER BRACKET

BO2O7–04

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BO–83).

BO2O8–07

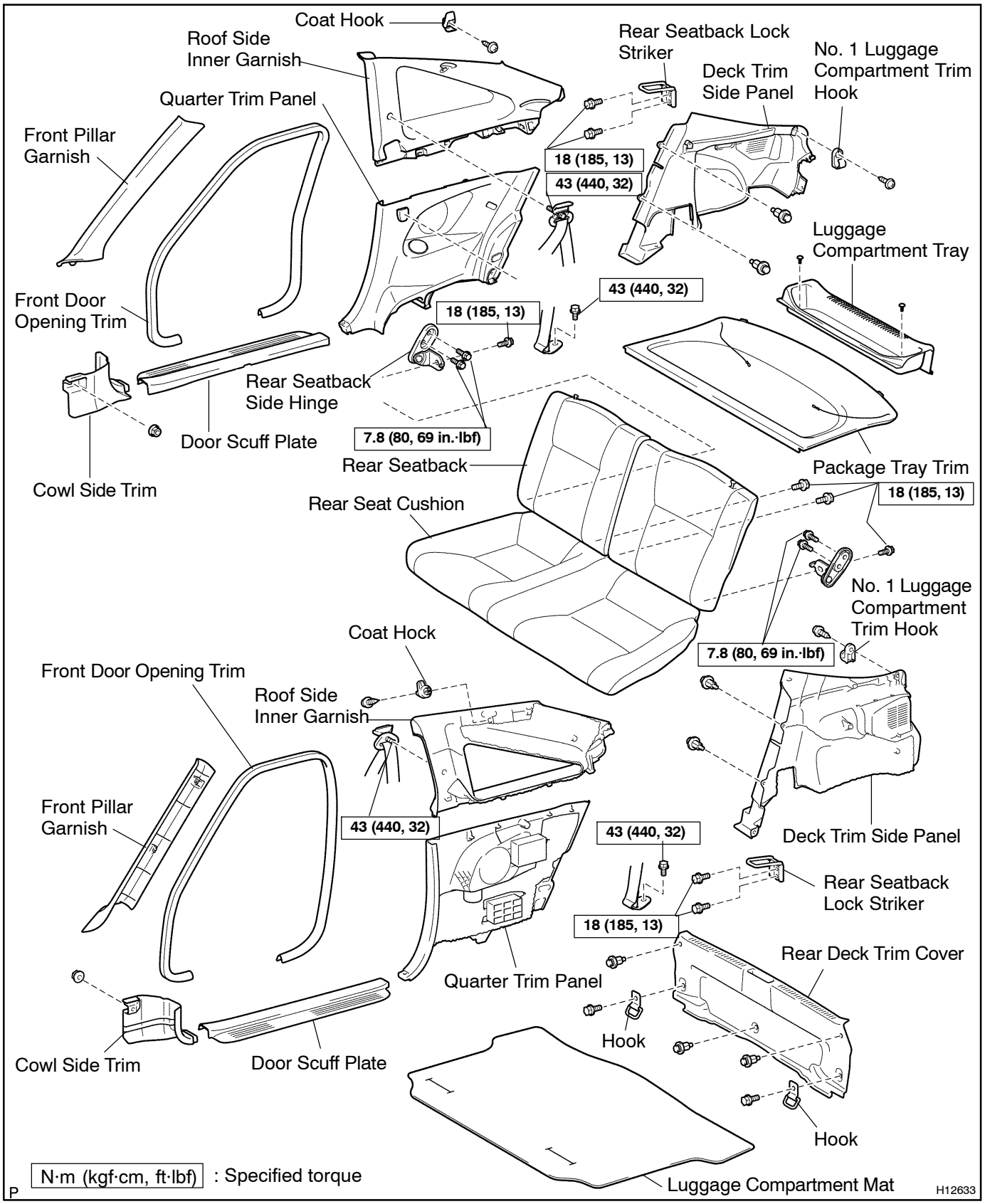
INSTALLATION

Installation is in the reverse order of removal (See page BO–79).

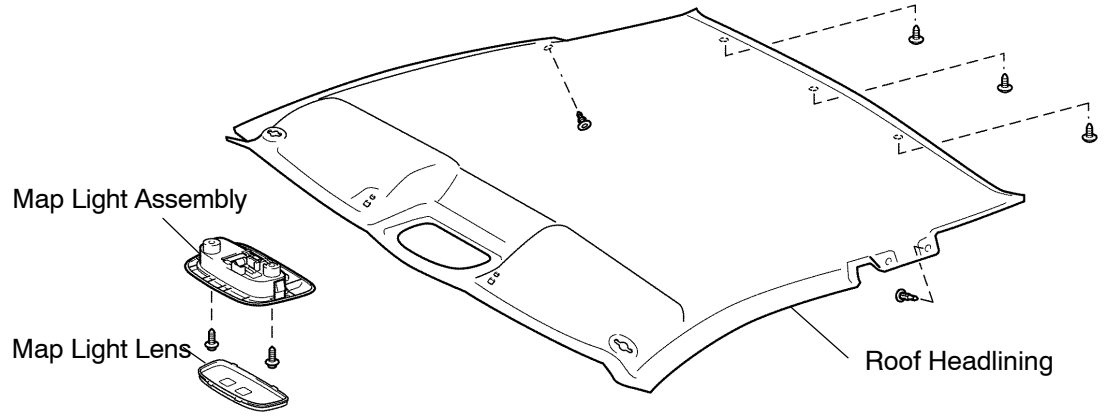
ROOF HEADLINING

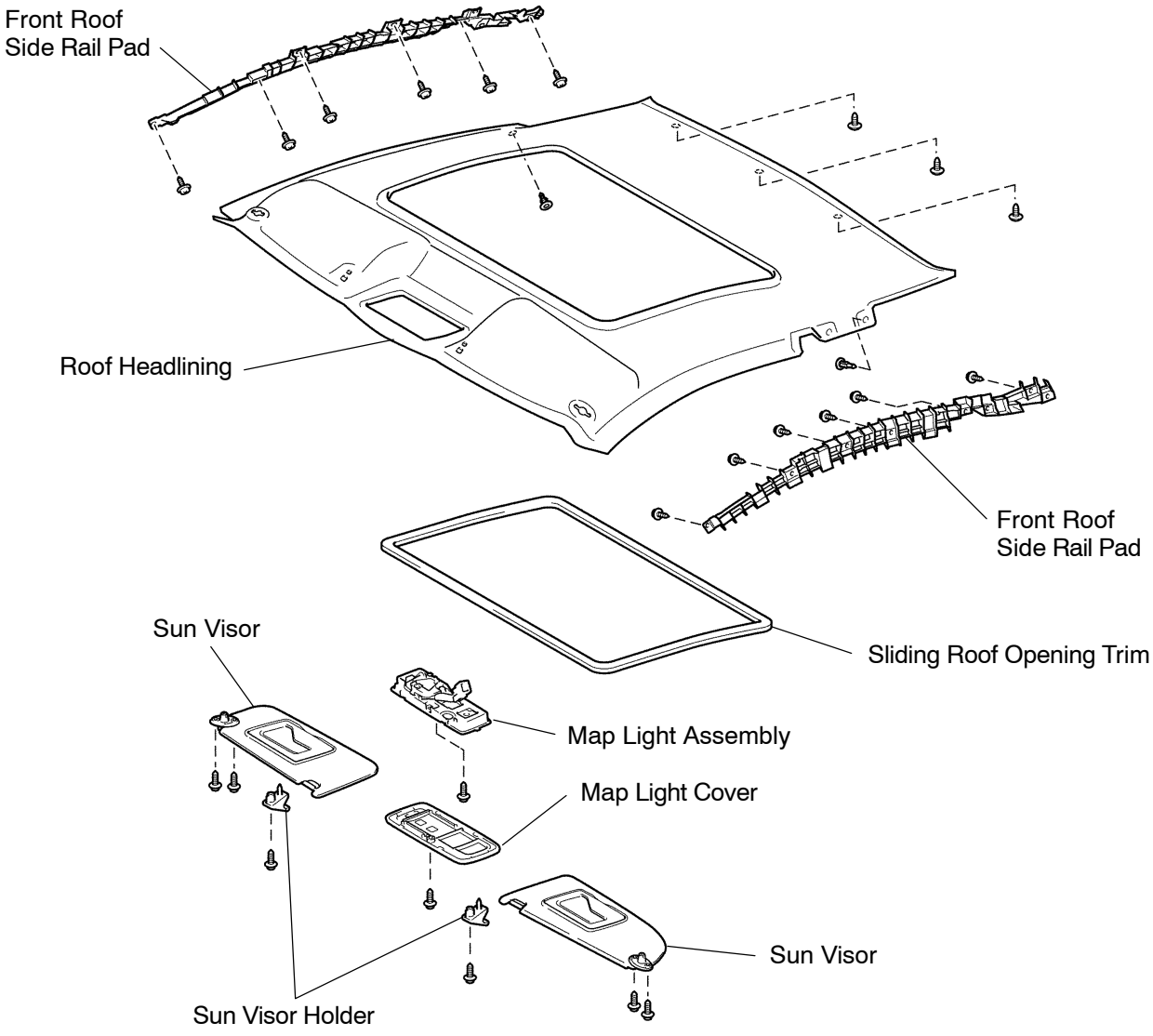
COMPONENTS

BO2O9–02



w/o Sliding roof:



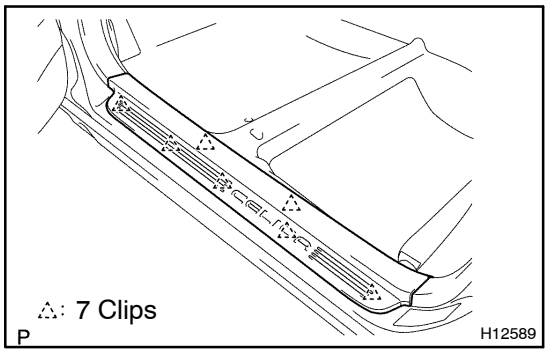


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H12652

BO2OA–02

REMOVAL



1. REMOVE DOOR SCUFF PLATE

(a) Using a screwdriver, remove the door scuff plate.

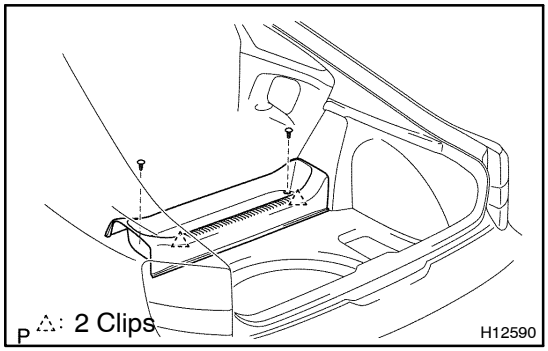
HINT:

Tape the screwdriver tip before use.

(b) Employ the same manner described above to the other side.

2. REMOVE PACKAGE TRAY TRIM

3. REMOVE REAR SEAT (See page BO–102)



4. REMOVE LUGGAGE COMPARTMENT TRAY

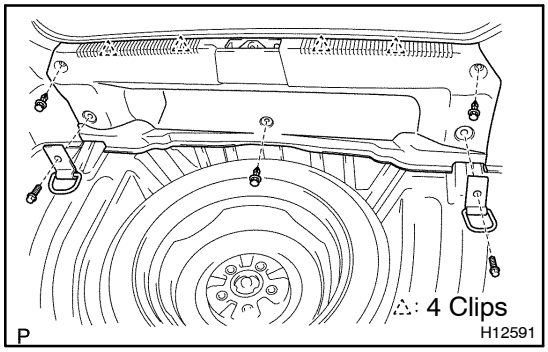
(a) Using a clip remover, remove the 2 clips.

(b) Using a screwdriver, remove the luggage compartment tray.

HINT:

Tape the screwdriver tip before use.

5. REMOVE LUGGAGE COMPARTMENT MAT



6. REMOVE REAR DECK TRIM COVER

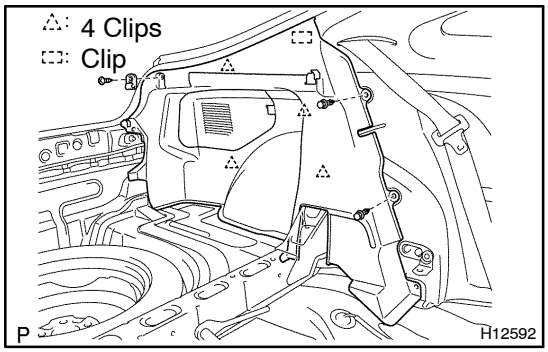
(a) Remove the 2 bolts and 2 hooks.

(b) Remove the 3 clips.

(c) Using a screwdriver, remove the rear deck trim cover.

HINT:

Tape the screwdriver tip before use.



7. REMOVE DECK TRIM SIDE PANEL

(a) Remove the screw and No. 1 luggage compartment trim hook.

(b) RH side:

Using a screwdriver, remove the rear room light, then disconnect the connector.

HINT:

Tape the screwdriver tip before use.

(c) Remove the 2 clips.

(d) Using a screwdriver, remove the deck trim side panel.

HINT:

Tape the screwdriver tip before use.

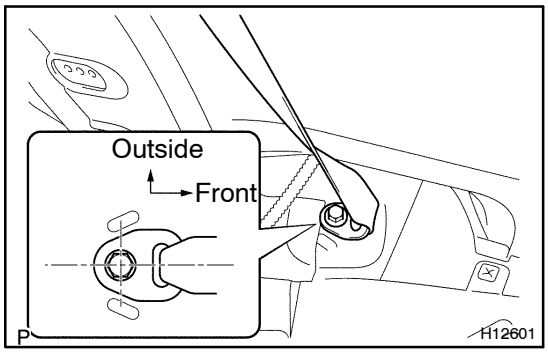
(e) Employ the same manner described above to the other side.

8. REMOVE REAR SEATBACK HINGES

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

9. REMOVE REAR SEATBACK LOCK STRIKERS

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



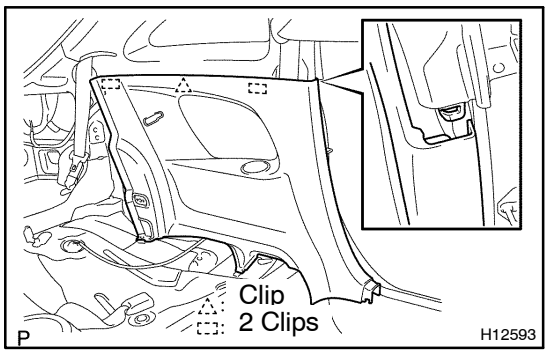
10. REMOVE REAR SEAT OUTER BELT FLOOR ANCHORS

HINT:

At the time of installation, please refer to the following item.

Install the rear seat outer belt floor anchor as shown in the illustration.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



11. REMOVE QUARTER TRIM PANEL

(a) Using a screwdriver, remove the quarter trim panel.

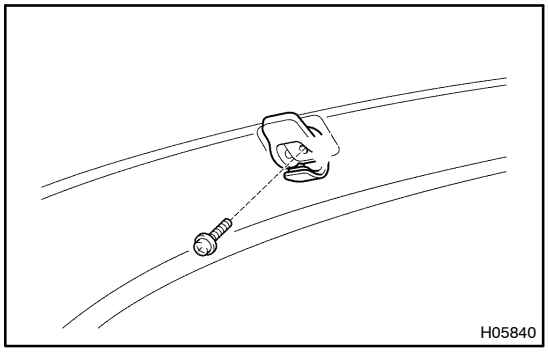
HINT:

Tape the screwdriver tip before use.

(b) Employ the same manner described above to the other side.

12. REMOVE FRONT SEAT OUTER BELT SHOULDER ANCHOR

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



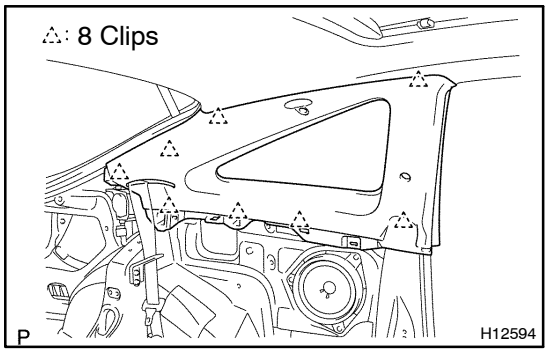
13. REMOVE ROOF SIDE INNER GARNISH

(a) Using a screwdriver, open the cap of coat hook.

HINT:

Tape the screwdriver tip before use.

(b) Remove the screw and coat hook.

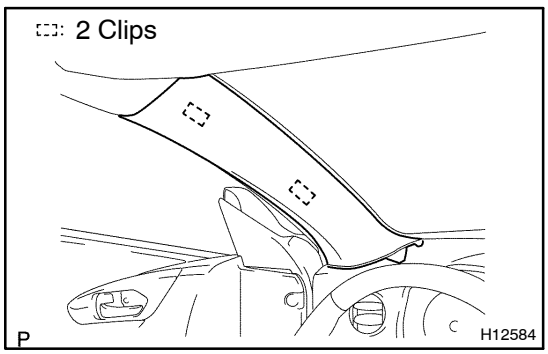


(c) Using a screwdriver, remove the roof side inner quarter.

HINT:

Tape the screwdriver tip before use.

(d) Employ the same manner described above to the other side.



14. REMOVE FRONT PILLAR GARNISH

(a) Using a screwdriver, remove the front pillar garnish.

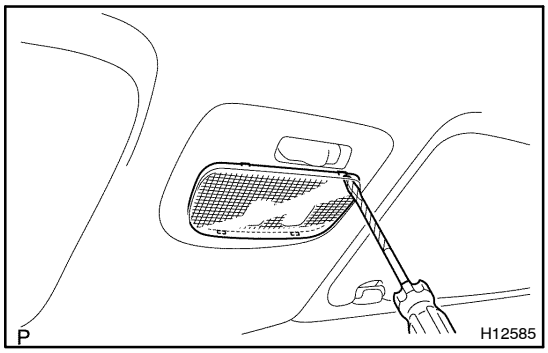
HINT:

Tape the screwdriver tip before use.

(b) Employ the same manner described above to the other side.

15. REMOVE COWL SIDE TRIMS

16. REMOVE FRONT DOOR OPENING TRIMS



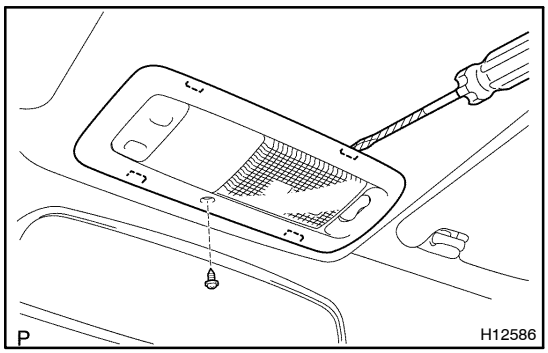
17. w/o Sliding roof:
REMOVE MAP LIGHT ASSEMBLY

(a) Using a screwdriver, remove the lens.

HINT:

Tape the screwdriver tip before use.

(b) Remove the 2 screws and map light assembly, then disconnect the connector.



18. w/ Sliding roof:
REMOVE MAP LIGHT ASSEMBLY

(a) Remove the screw.

(b) Using a moulding remover, remove the cover.

(c) Remove the screw and map light assembly, then disconnect the connector.

19. w/ Sliding roof:
REMOVE SUN ROOF OPENING TRIM MOULDING

20. REMOVE SUN VISORS

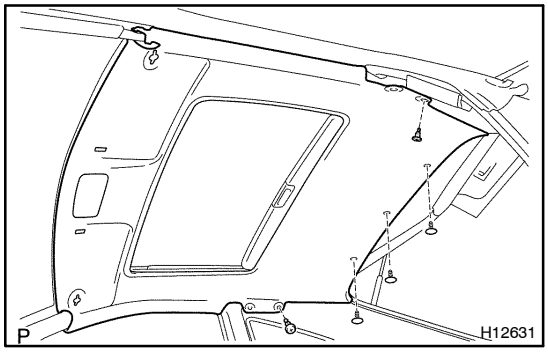
21. REMOVE SUN VISOR HOLDERS

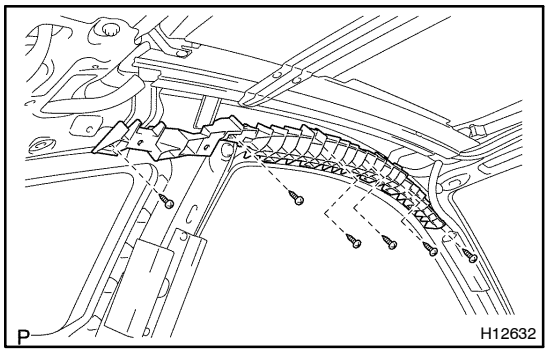
22. REMOVE ROOF HEADLINING

(a) Using a clip remover, remove the 5 clips.

(b) Remove the roof headlining.

23. REMOVE CLIP STOPPERS





24. REMOVE FRONT ROOF SIDE RAIL PAD

(a) Remove the 6 screws and front roof side rail pad.

(b) Employ the same manner described above to the other side.

BO2OB–02

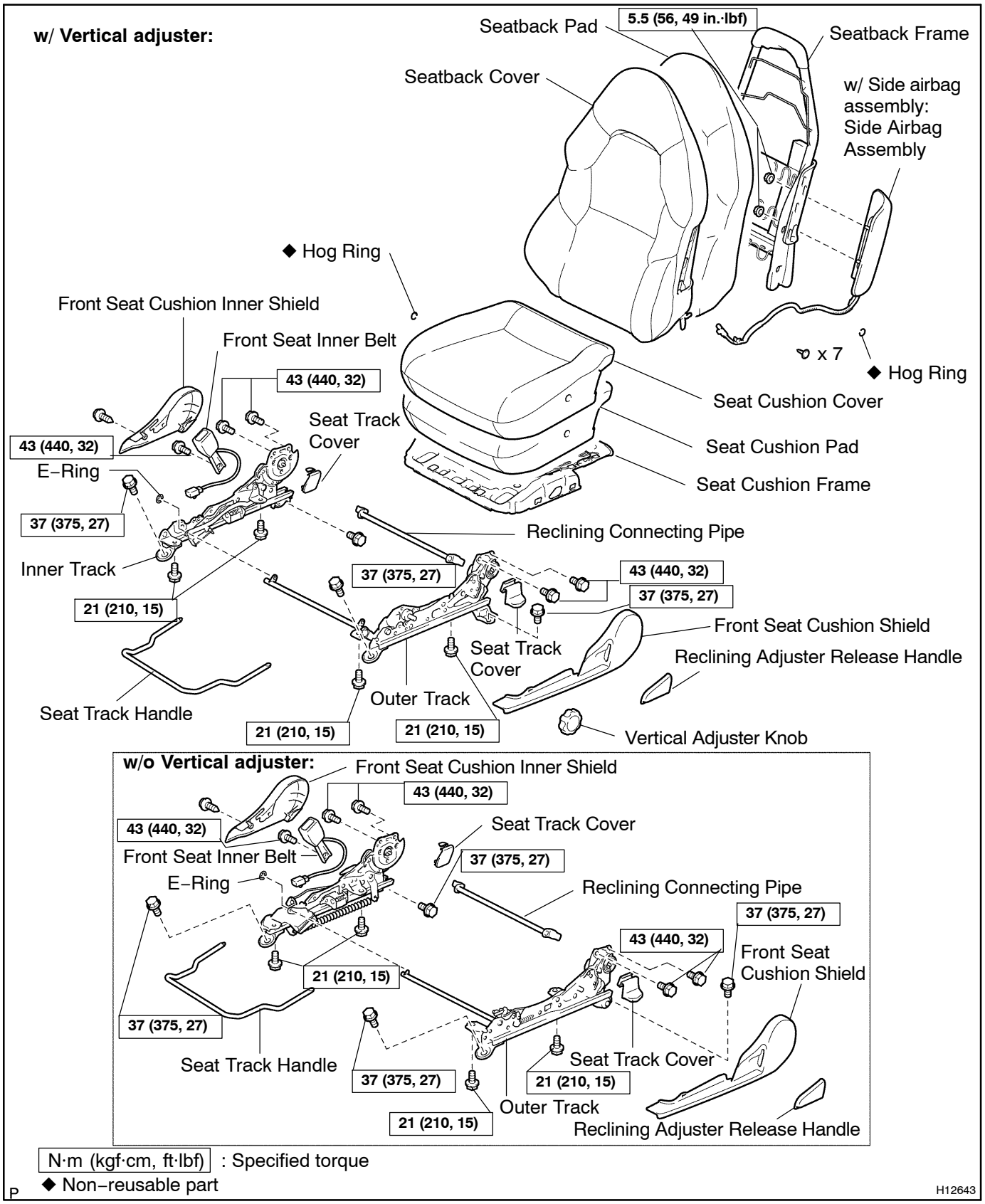
INSTALLATION

Installation is in the reverse order of removal (See page BO–88).

FRONT SEAT

COMPONENTS

BO1F6–08



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

P

H12643

BO1F7–06

REMOVAL

1. REMOVE SEAT TRACK COVERS

Using a screwdriver, remove the seat track covers.

HINT:

Tape the screwdriver tip before use.

2. REMOVE FRONT SEAT

(a) Remove the 4 bolts.

(b) Disconnect the connectors.

(c) Remove the front seat.

NOTICE:

Be careful not to damage the body.

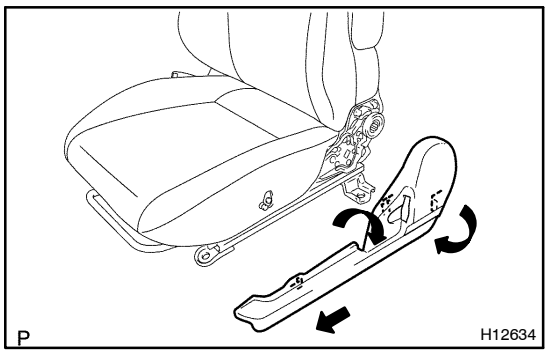
BO2OC–02

DISASSEMBLY

1. w/ Vertical adjuster:
REMOVE VERTICAL ADJUSTER KNOB

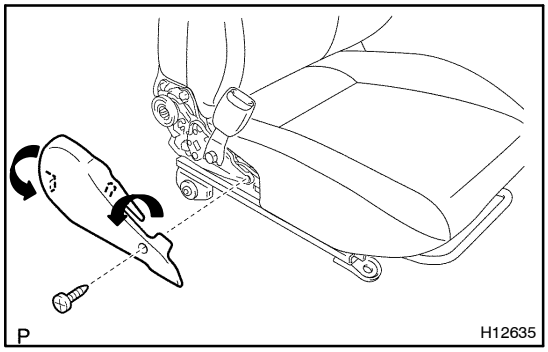
Using a screwdriver, remove the clip and vertical adjuster knob.
HINT:
Tape the screwdriver tip before use.

2. REMOVE RECLINING ADJUSTER RELEASE HANDLE



3. REMOVE FRONT SEAT CUSHION SHIELD

Remove the front seat cushion shield as shown in the illustration.

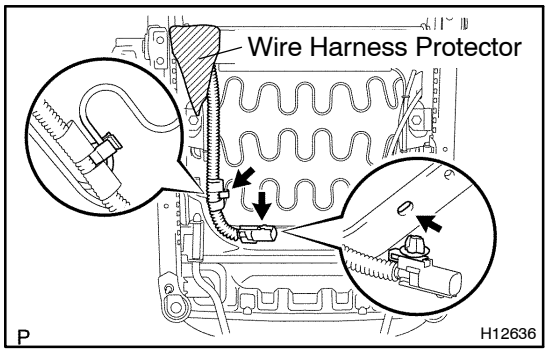


4. REMOVE FRONT SEAT CUSHION INNER SHIELD

Remove the screw and front seat cushion inner shield as shown in the illustration.

5. REMOVE SEATBACK ASSEMBLY

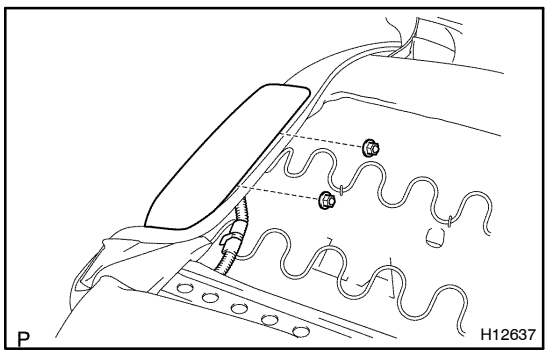
(a) Remove the hog rings.
(b) Zip the seatback cover open.

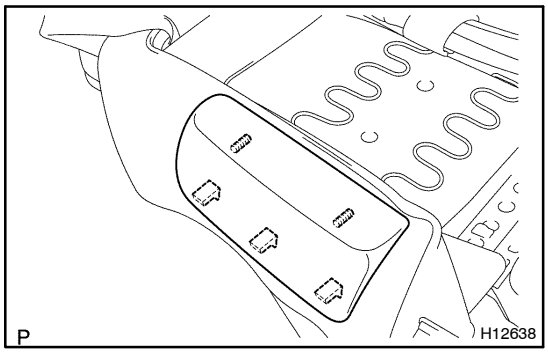


(c) w/ Side airbag assembly:
Turn over the wire harness protector as shown in the illustration.
(d) w/ Side airbag assembly:
Disengage the side airbag wire harness from the seat cushion frame.
(e) w/ Side airbag assembly:
Pull out the side airbag wire harness from the slit of seatback cover.
(f) Remove the 4 bolts and seatback assembly.

6. REMOVE SEATBACK COVER

(a) w/ Side airbag assembly:
Disengage the clamp of side airbag wire harness, then remove the 2 nuts.

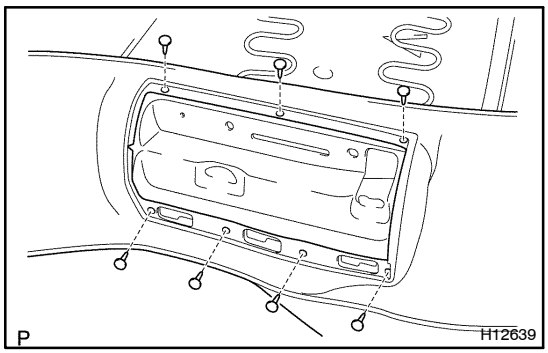




(b) w/ Side airbag assembly:
Remove the side airbag assembly as shown in the illustration.

CAUTION:

- **Do not store the side airbag assembly with the airbag deployment side facing down.**
- **Never disassemble the side airbag assembly.**



(c) w/ Side airbag assembly:
Using a clip remover, remove the 7 clips.
(d) Remove the seatback frame.
(e) Remove the seatback cover from the seatback cushion.

7. REMOVE FRONT SEAT INNER BELT

8. REMOVE SEAT CUSHION ASSEMBLY

(a) Remove the 4 bolts and seat cushion assembly.
(b) Remove the hog rings.
(c) Disengage the seat cushion cover hooks and remove the seat cushion frame.
(d) Remove the seat cushion cover from the seat cushion pad.

9. REMOVE SEAT TRACK HANDLE

Using a screwdriver, remove the seat track handle.
HINT:
Tape the screwdriver tip before use.

10. REMOVE RECLINING CONNECTING PIPE

11. DISASSEMBLE OUTER AND INNER TRACK

(a) Using a screwdriver, remove the E–ring.
(b) Disassemble the outer track and inner track.

BO1F9–06

INSPECTION

INSPECT RECLINING LOCK POSITION AND SLIDING LOCK POSITION SLIPPING OFF

(a) When reclining the seat, inspect that the outer and inner recliners are released at the same time.

HINT:

When the reclining lock position slips off, disassemble the seat to adjust the position.

(b) When sliding the seat, inspect that the outer and inner tracks are locked at the same time.

HINT:

When sliding lock positions slip off, loosen the bolts to adjust the position.

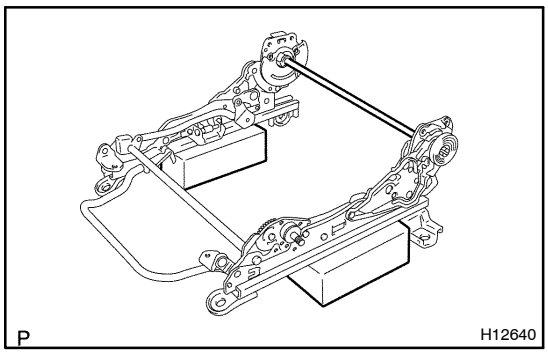
BO2OD–02

REASSEMBLY

1. ASSEMBLE OUTER TRACK AND INNER TRACK

Assemble the outer track and inner track with a new E–ring.

2. INSTALL SEAT TRACK HANDLE



3. INSTALL RECLINING CONNECTING PIPE

(a) Adjust the reclining lock positions of the seat adjusters.

(b) Slide the seat adjusters to the most front position.

(c) Place the adjusters on a spacer to adjust the seat rail in parallel and install the connecting pipe.

HINT:

When installing the connecting pipe while raising up the adjusters, the lock position adjusted in 3–(a) may become detached. When this happens, a lock error will occur.

4. INSTALL SEAT CUSHION ASSEMBLY

(a) Install the seat cushion cover to the seat cushion pad with new hog rings.

HINT:

When installing the hog rings, take care to prevent wrinkles as much as possible.

(b) Install the seat cushion frame to the seat cushion cover with pad.

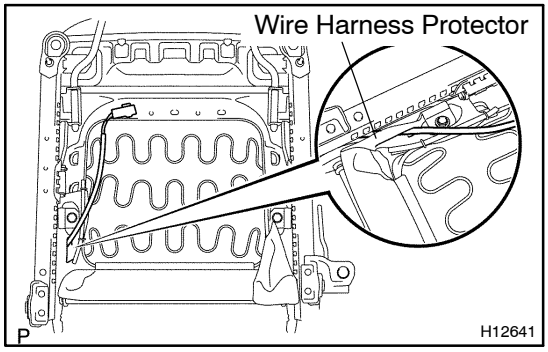
(c) Engage the seat cushion hooks and install new hog rings.

HINT:

When installing the hog rings, take care to prevent wrinkles as much as possible.

(d) Install the seat cushion assembly with the 4 bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



5. INSTALL FRONT SEAT INNER BELT

(a) Pass the wire harness of front seat inner belt through the wire harness protector of seat cushion assembly and install the front seat inner belt.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(b) Install the front seat inner belt wire harness to the seat cushion frame.

6. INSTALL SEATBACK COVER

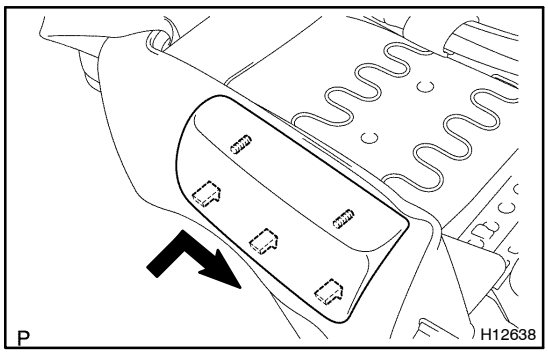
(a) Install the seatback cover to the seat cushion pad with new hog rings.

HINT:

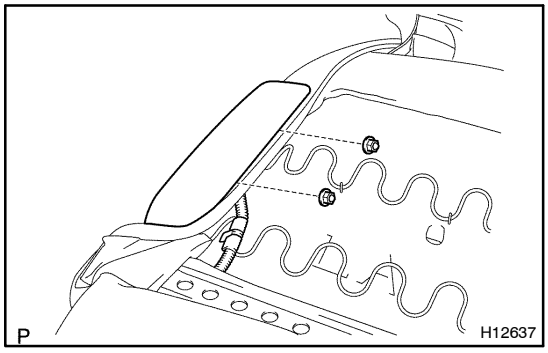
When installing the hog rings, take care to prevent wrinkles as much as possible.

(b) Install the seatback frame to the seatback cover with pad.

(c) w/ Side airbag assembly:
Install the 7 clips.



(d) w/ Side airbag assembly:
Install the side airbag assembly as shown in the illustration.



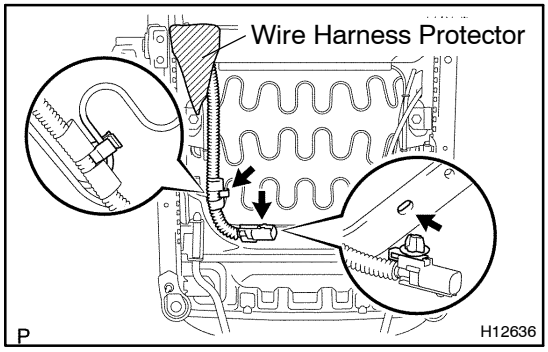
(e) w/ Side airbag assembly:
Install the 2 nuts, then engage the clamp of side airbag wire harness.
Torque:5.5 N·m (56 kgf·cm, 49 in.·lbf)

7. INSTALL SEATBACK ASSEMBLY

(a) Install the seatback assembly with the 4 bolts.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(b) w/ Side airbag assembly:
Insert the side airbag wire harness into the slit of seatback cover.

(c) w/ Side airbag assembly:
Engage the side airbag wire harness to the seat cushion frame.



(d) w/ Side airbag assembly:
Replace the wire harness protector as shown in the illustration.

(e) Zip the seatback cover closed.

(f) Install new hog rings.

HINT:

When installing the hog rings, take care to prevent wrinkles as much as possible.

8. INSTALL FRONT SEAT INNER SHIELD
9. INSTALL FRONT SEAT CUSHION SHIELD
10. INSTALL RECLINING ADJUSTER RELEASE HANDLE
11. w/ Vertical adjuster:
    INSTALL VERTICAL ADJUSTER KNOB

BO1FB–06

INSTALLATION

INSTALL FRONT SEAT

(a) Mount the front seat to the vehicle.

NOTICE:

Be careful not to damage the body.

(b) Connect the connectors.

(c) Slide the front seat to the most front position.

(d) Tighten the bolts on the rear side temporarily, starting from the bolt on the inner side tighten them completely.

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

(e) Slide the seat to the most rear position to install the bolts on the front side.

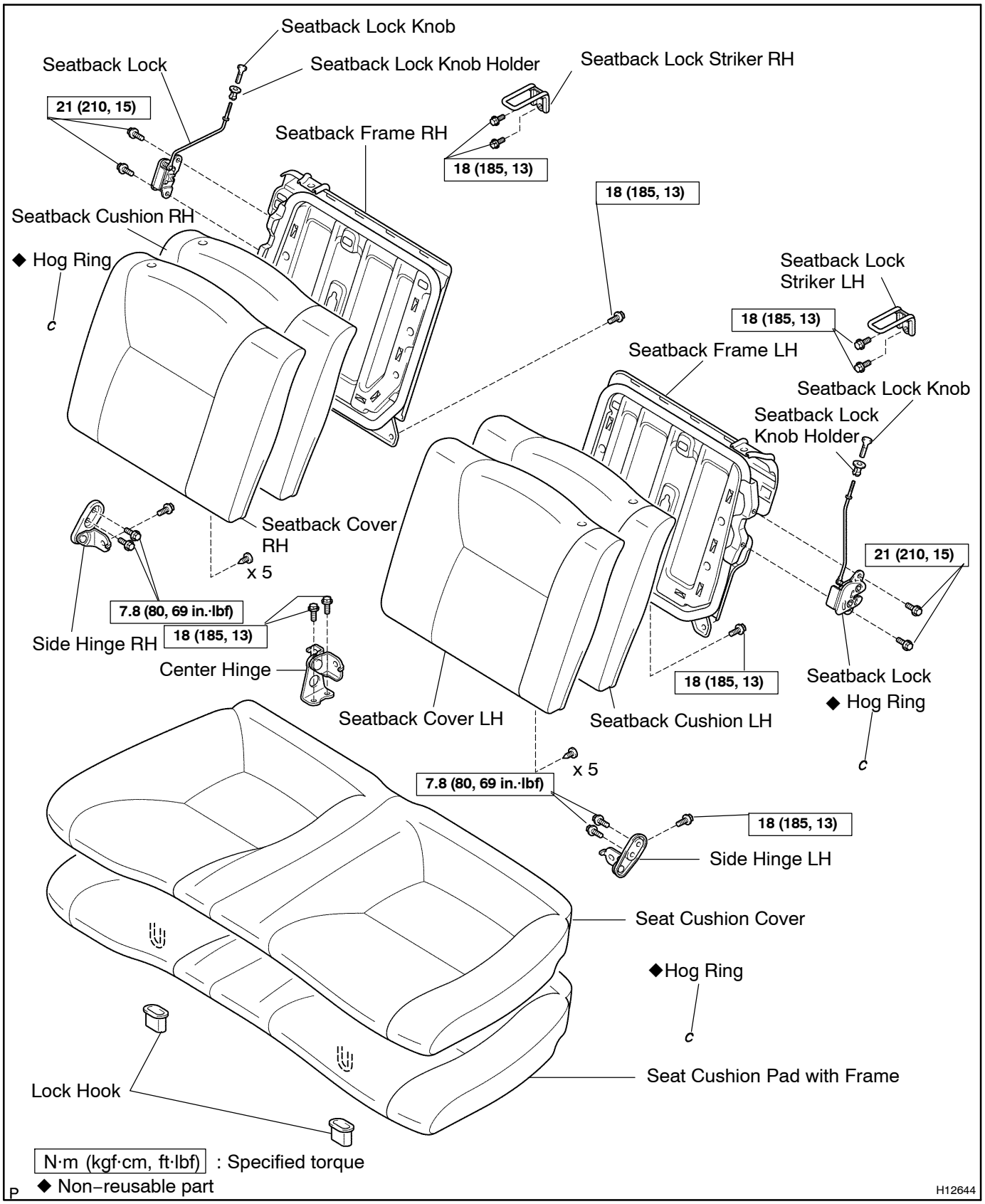
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

(f) Install the seat track covers.

REAR SEAT

COMPONENTS

BO1FC–05



BO1FD–04

REMOVAL

1. REMOVE SEATBACK ASSEMBLY LH AND RH

(a) Release the seatback assembly LH and RH.

(b) Remove the 4 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(c) Remove the seatback assembly LH and RH.

2. REMOVE SEAT CUSHION ASSEMBLY

3. REMOVE SIDE HINGE LH AND RH

Torque: 7.8 N·m (80 kgf·cm, 69 ft·lbf)

4. REMOVE CENTER HINGE

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

5. REMOVE SEATBACK LOCK STRIKER (See page BO–88)

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

BO1FE–03

DISASSEMBLY

1. REMOVE SEATBACK LOCK KNOBS

2. REMOVE SEATBACK LOCK KNOB HOLDERS

3. REMOVE SEATBACK FRAME

(a) Using a clip remover, remove the 5 clips.

(b) Turn over the seatback cover, then remove the hog rings.

(c) Remove the seatback frame from the seatback cover with pad.

(d) Employ the same manner described above to the other side.

4. REMOVE SEATBACK LOCK

(a) Remove the 2 bolts and seatback lock.

(b) Employ the same manner described above to the other side.

5. REMOVE SEATBACK COVER

(a) Remove the hog rings and seatback cover from the seatback pad.

(b) Employ the same manner described above to the other side.

6. REMOVE SEATBACK CUSHION COVER

Remove the hog rings and seat cushion cover from the seat cushion frame with pad.

BO1FF–03

REASSEMBLY

1. INSTALL SEAT CUSHION COVER

Install the seat cushion cover with new hog ring to the seat cushion frame with pad.

HINT:

When installing hog rings, take care to prevent wrinkles as little as possible.

2. INSTALL SEATBACK COVER

(a) Install the seatback cover with new hog ring to the seatback pad.

HINT:

When installing hog rings, take care to prevent wrinkles as little as possible.

(b) Employ the same manner described above to the other side.

3. INSTALL SEATBACK LOCKS

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

4. INSTALL SEATBACK FRAME

(a) Install the seatback frame to the seatback cover with pad.

(b) Install new hog rings.

HINT:

When installing hog rings, take care to prevent wrinkles as little as possible.

(c) Install the 5 clips.

(d) Employ the same manner described above to the other side.

5. INSTALL SEATBACK LOCK KNOB HOLDERS

6. INSTALL SEATBACK LOCK KNOB

BO1FG–04

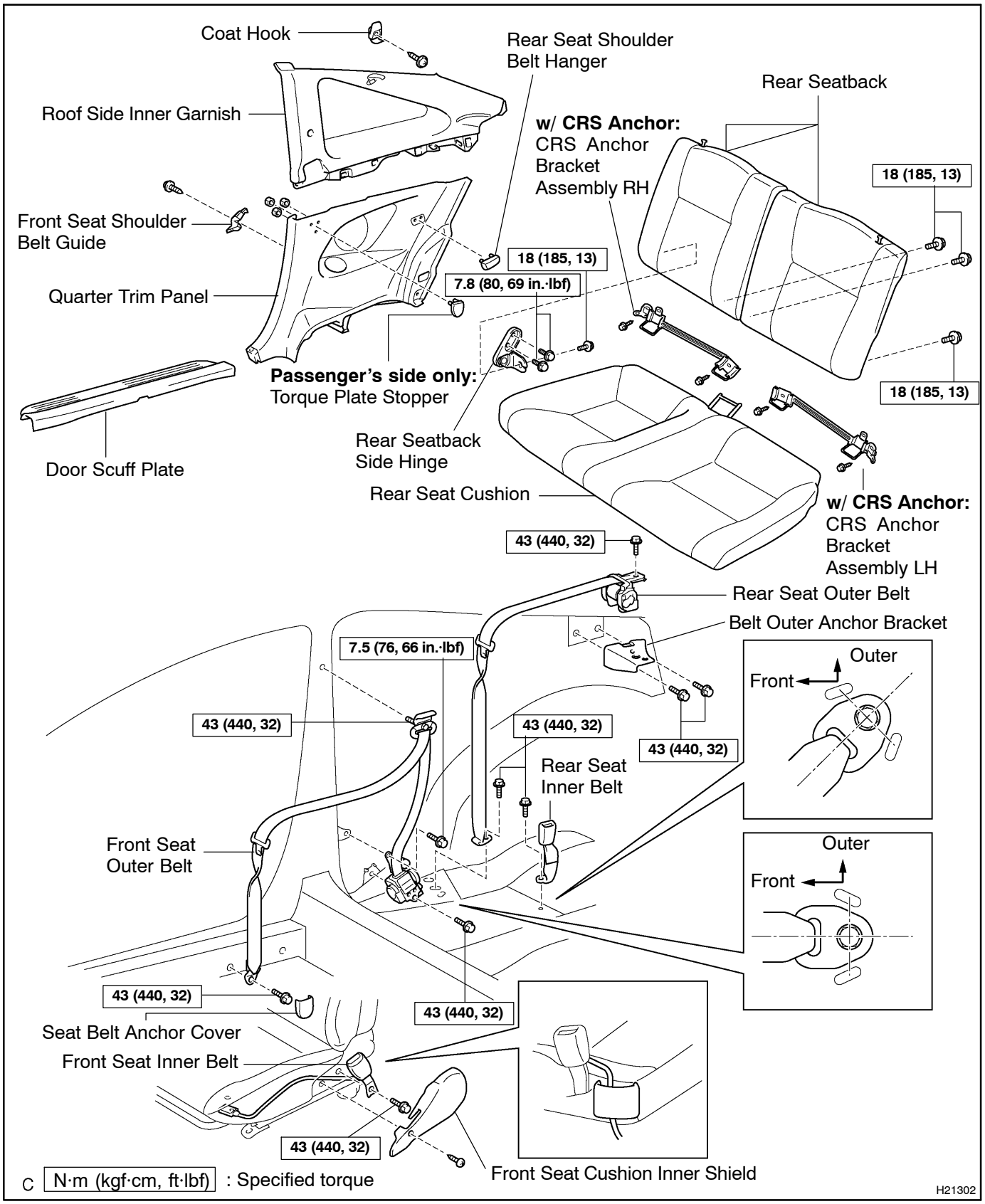
INSTALLATION

Installation is in the reverse order of removal (See page BO–102).

SEAT BELT

COMPONENTS

BO1FH–09



BO1FI–08

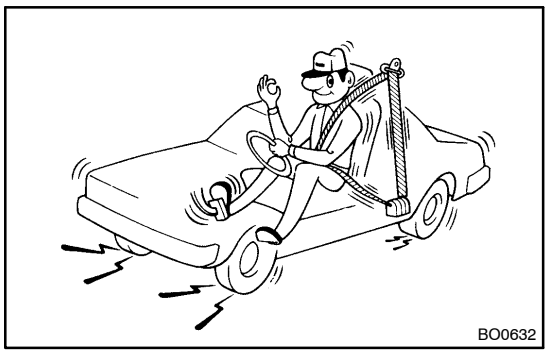
INSPECTION

CAUTION:

Replace the seat belt assembly (outer belt, inner belt, bolts, nuts or sill–bar) if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.

1. RUNNING TEST (IN SAFE AREA)

(a) Fasten the front seat belts.


BO0632

(b) Drive the car at 10 mph (16 km/h) and slam on the brakes. Check that the belt locks and cannot be extended.

HINT:

Conduct this test in a safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.

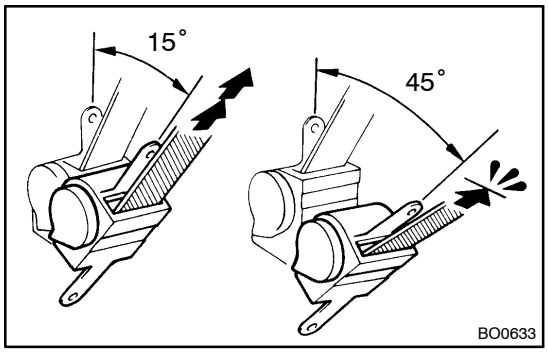
2. Driver's Seat Belt (ELR):

STATIC TEST

(a) Make sure that the belt locks when pulled out quickly.

(b) Remove the locking retractor assembly.

(c) Tilt the retractor slowly.



BO0633

(d) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out over 45 degrees of tilt.

If a problem is found, replace the assembly.

3. Except Driver's Seat Belt (ELR/ALR):

STATIC TEST

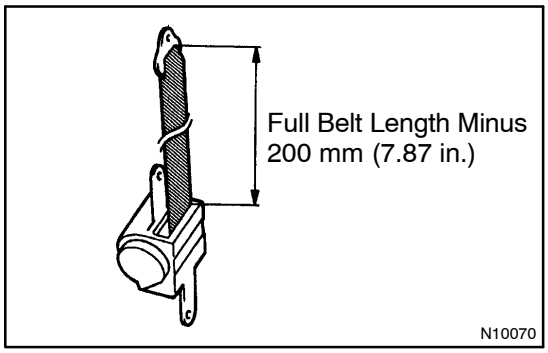
(a) Make sure that the belt locks when pulled out quickly.

(b) Remove the locking retractor assembly.

(c) Pull out the whole belt and measure the length of the whole belt. Then retract the belt slightly and pull it out again.

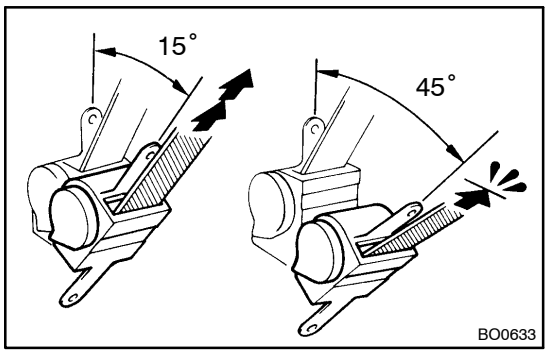
(d) Make sure that the belt cannot be extended further.

If a problem is found, replace the assembly.



(e) Retract the whole belt, then pull out the belt until 200 mm (7.87 in.)of the belt remains in the retractor.

(f) Tilt the retractor slowly.



(g) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.

If a problem is found, replace the assembly.

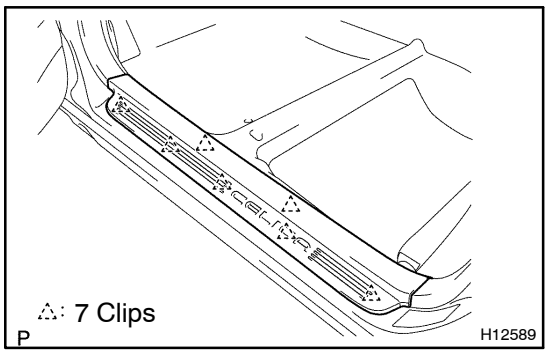
SEAT BELT PRETENSIONER

BO2OE–03

REMOVAL

NOTICE:

- **If the wiring connector of the seat belt pretensioner is disconnected with the ignition switch at ON diagnostic trouble codes will be recorded.**
- **Never use seat belt pretensioner from another vehicle. When replacing parts, replace them with new parts.**



1. REMOVE DOOR SCUFF PLATE

Using a screwdriver, remove the door scuff plate.

HINT:

Tape the screwdriver tip before use.

2. REMOVE PACKAGE TRAY TRIM

3. REMOVE REAR SEAT (See page BO–102)

4. REMOVE LUGGAGE COMPARTMENT TRAY

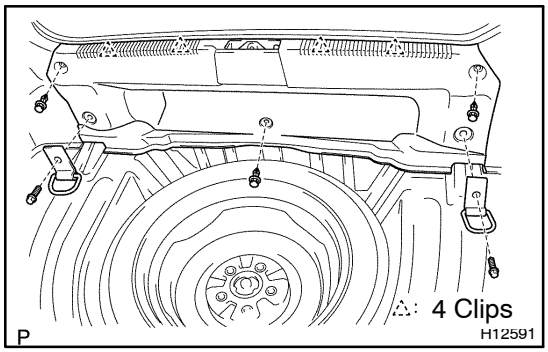
(a) Using a clip remover, remove the 2 clips.

(b) Using a screwdriver, remove the luggage compartment tray.

HINT:

Tape the screwdriver tip before use.

5. REMOVE LUGGAGE COMPARTMENT MAT



6. REMOVE REAR DECK TRIM COVER

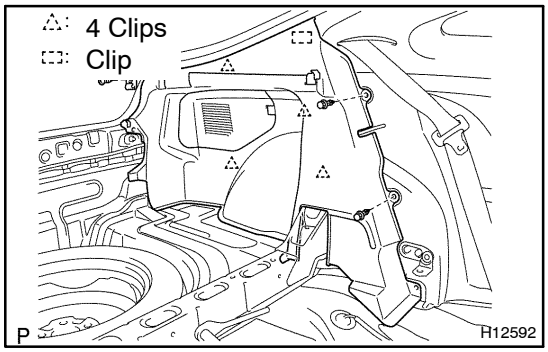
(a) Remove the 2 bolts and 2 hooks.

(b) Remove the 3 clips.

(c) Using a screwdriver, remove the rear deck trim cover.

HINT:

Tape the screwdriver tip before use.



7. REMOVE DECK TRIM SIDE PANEL

(a) Remove the screw and No. 1 luggage compartment trim hook.

(b) RH side:
Using a screwdriver, remove the rear room light, then disconnect the connector.

HINT:

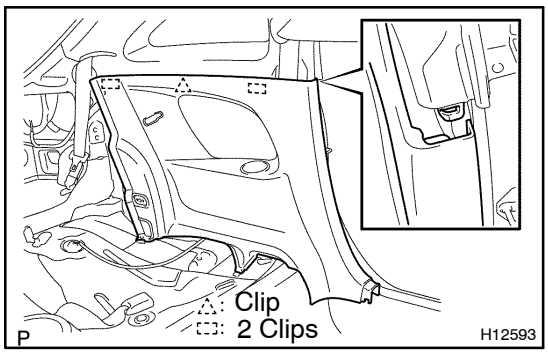
Tape the screwdriver tip before use.

(c) Remove the 2 clips.
(d) Using a screwdriver, remove the deck trim side panel.
HINT:
Tape the screwdriver tip before use.

8. REMOVE REAR SEATBACK HINGE

9. REMOVE REAR SEATBACK LOCK STRIKER

10. REMOVE REAR SEAT OUTER BELT FLOOR ANCHORS



11. REMOVE QUARTER TRIM PANEL

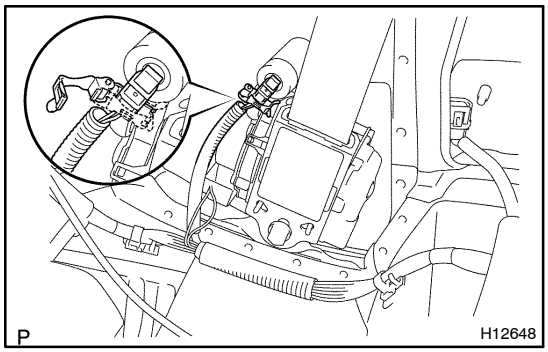
Using a screwdriver, remove the quarter trim panel.
HINT:
Tape the screwdriver tip before use.

12. REMOVE FRONT SEAT OUTER BELT SHOULDER ANCHOR

13. REMOVE FRONT SEAT OUTER BELT FLOOR ANCHOR

14. REMOVE RETRACTOR OF FRONT SEAT OUTER BELT

CAUTION:
Never disassemble the front seat outer belt.
NOTICE:
When removing the retractor of front seat outer belt, take care not to pull the seat belt pretensioner wire harness.

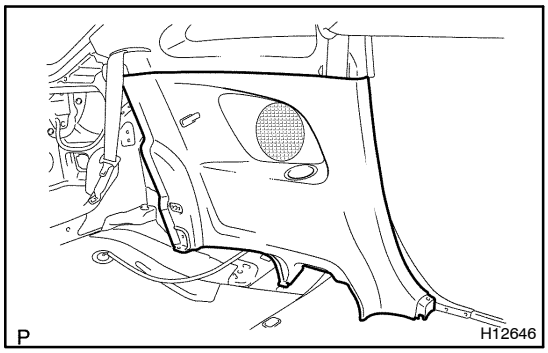


(a) Disconnect the pretensioner connector as shown in the illustration.

CAUTION:
When removing the seat belt pretensioner, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

(b) Disconnect the connector.
(c) Remove the 2 bolts and retractor of front seat outer belt.

BO2OF–03



INSPECTION

1. PRETENSIONER IS NOT ACTIVATED

(a) Perform a diagnostic system check (See page DI–884).

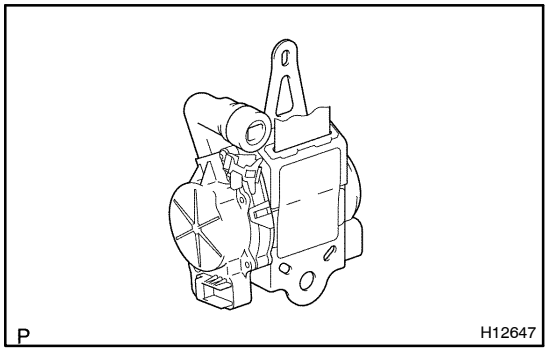
(b) Perform a visual check which includes the following items with the front seat outer belt removed from the vehicle.
- Check for cuts and cracks in, or marked discoloration on the quarter trim panel.
- Check for cuts and cracks in wire harness, and for chipping in connectors.
- Check for deformation of the quarter panel.

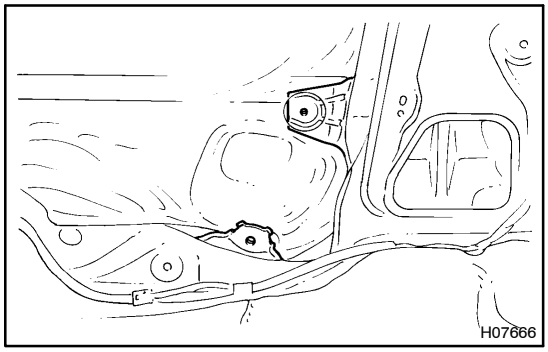
CAUTION:

For removal and installation of the front seat outer belt, see page BO–109 and BO–118.

2. PRETENSIONER IS ACTIVATED

(a) Perform a diagnostic system check (See page DI–884).





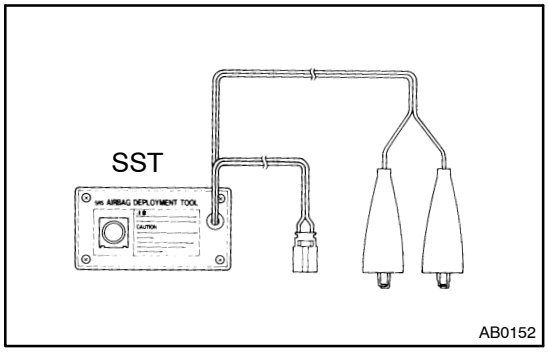
(b) Perform a visual check which includes the following items with the front seat outer belt removed from the vehicle.
- Check for deformation of the quarter panel.
- Check for damage on the connector and wire harness.

BO2OG–05

DISPOSAL

HINT:

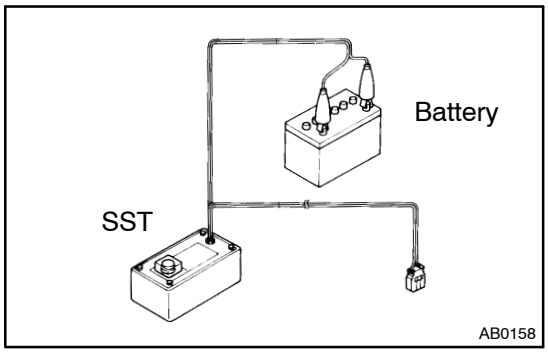
When scrapping vehicles equipped with a seat belt pretensioner or disposing of a front seat outer belt (with seat belt pretensioner) always first activate the seat belt pretensioner in accordance with the procedure described below. If any abnormality occurs in the seat belt pretensioner operation, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC. When disposing of a front seat outer belt (with seat belt pretensioner) activated in a collision, follow the same procedure given in step 1–(e) in "DISPOSAL".



CAUTION:

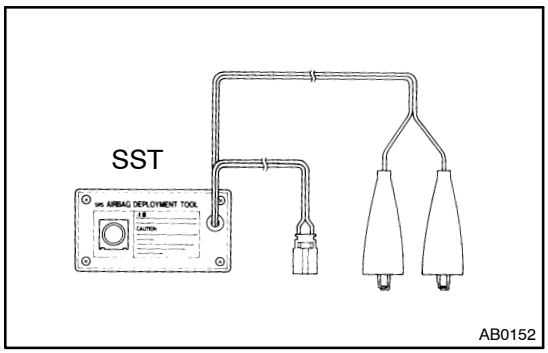
- **Never dispose of front seat outer belt which has an inactivated pretensioner.**
- **The seat belt pretensioner produces a sizeable exploding sound when it activates, so perform the operation out–of–door and where it will not create a nuisance to nearby residents.**
- **When activating the seat belt pretensioner, always use the specified SST. (SRS Airbag Deployment Tool) Perform the operation in a place away from electrical noise.**

  SST 09082–00700, 09082–00740
- **When activating a front seat outer belt (with seat belt pretensioner), perform the operation at least 10 m (33 ft) away from the front seat outer belt.**
- **Use gloves and safety glasses when handling a front seat outer belt with activated pretensioner.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front seat outer belt with activated pretensioner.**



1. SEAT BELT PRETENSIONER ACTIVATION WHEN SCRAPPING VEHICLE

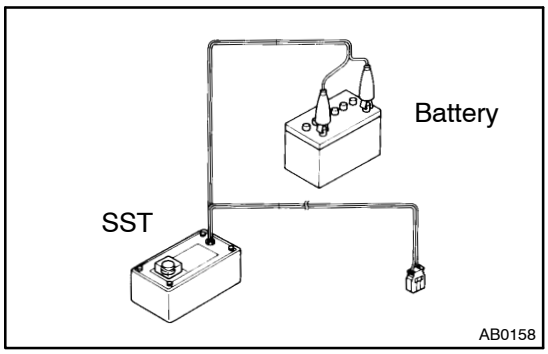
HINT:
Have a battery ready as the power source to activate the seat belt pretensioner.



(a) Check functioning of SST.

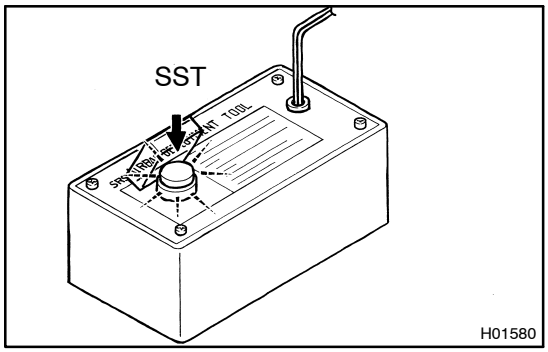
CAUTION:
When activating the seat belt pretensioner, always use the specified SST: SRS Airbag Deployment Tool.

SST 09082–00700, 09082–00740



(1) Connect the SST to the battery.
Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.

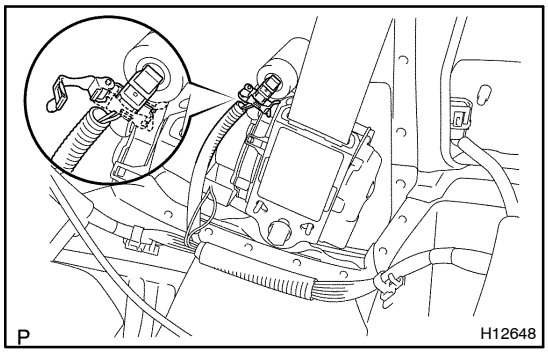
HINT:
Do not connect the yellow connector which will be connected with the seat belt pretensioner.



(2) Check functioning of SST.
Press the SST activation switch, and check the LED of the SST activation switch lights up.

CAUTION:
If the LED lights up when the activation switch is not being pressed, SST malfunction is probable, so definitely do not use the SST.

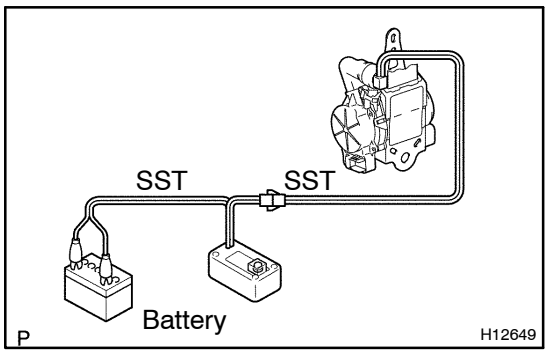
(b) Disconnect the pretensioner connector.
(1) Remove the door scuff plate.
(2) Remove the package tray trim.
(3) Remove the rear seat (See page BO–102).
(4) Remove the luggage compartment trim.
(5) Remove the luggage compartment mat.
(6) Remove the rear deck trim cover.
(7) Remove the deck trim side panel.
(8) Remove the seatback hinge.
(9) Remove the seatback lock striker.
(10) Remove the rear seat outer belt floor anchor.
(11) Remove the quarter trim panel.



(12) Disconnect the pretensioner connector as shown in the illustration.

(c) Install the SST.

(1) Buckle the front seat belt and check that there is no looseness and slack in the front seat inner belt and front seat outer belt.

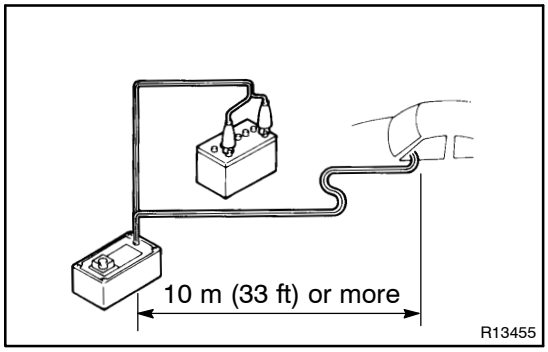


(2) Connect the 2 SST, then connect them to the seat belt pretensioner.

SST 09082–00700, 09082–00740

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



(3) Move the SST to at least 10 m (33 ft) away from the front of the vehicle.

(4) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

(5) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (–) terminal.

(d) Activate the seat belt pretensioner.

(1) Confirm that no one is inside the vehicle or within 10 m (33 ft) area around of the vehicle.

(2) Press the SST activation switch and activate the seat belt pretensioner.

HINT:

The seat belt pretensioner operates simultaneously as the LED of the SST activation switch lights up.

(e) Dispose of front seat outer belt (with seat belt pretensioner).

CAUTION:

- **The front seat outer belt is very hot when the seat belt pretensioner is activated, so leave it alone for at least 30 minutes after activation.**
- **Use gloves and safety glasses when handling a front seat outer belt with activated seat belt pretensioner.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front seat outer belt with activated seat belt pretensioner.**

HINT:
When scrapping a vehicle, activate the seat belt pretensioner and scrap the vehicle with activated front seat outer belt still installed.

2. ACTIVATION WHEN DISPOSING OF FRONT SEAT OUTER BELT ONLY

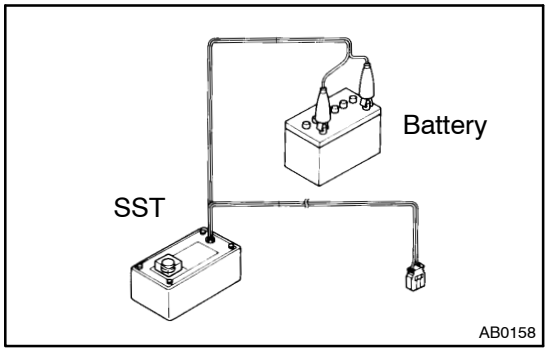
NOTICE:

- **When disposing of the front seat outer belt (with seat belt pretensioner) only, never use the customer's vehicle to activate the seat belt pretensioner.**
- **Be sure to follow the procedure given on the next page when activating the seat belt pretensioner.**

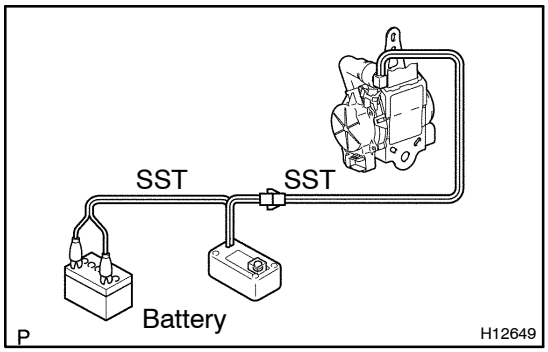
HINT:
Have a battery ready as the power source when activating the seat belt pretensioner.

(a) Remove the front seat outer belt (See page BO–109).

HINT:
Cut the belt near the seat belt retractor.

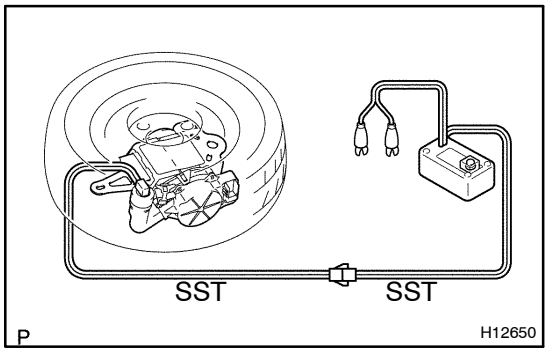


(b) Check functioning of SST (See step 1–(a)).
SST 09082–00700, 09082–00740



(c) Install the SST.
(1) Connect the 2 SST, then connect them to the seat belt pretensioner.
SST 09082–00700, 09082–00740

NOTICE:
To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.



(2) Place the front seat outer belt on the ground and cover it with the disc wheel with tire.

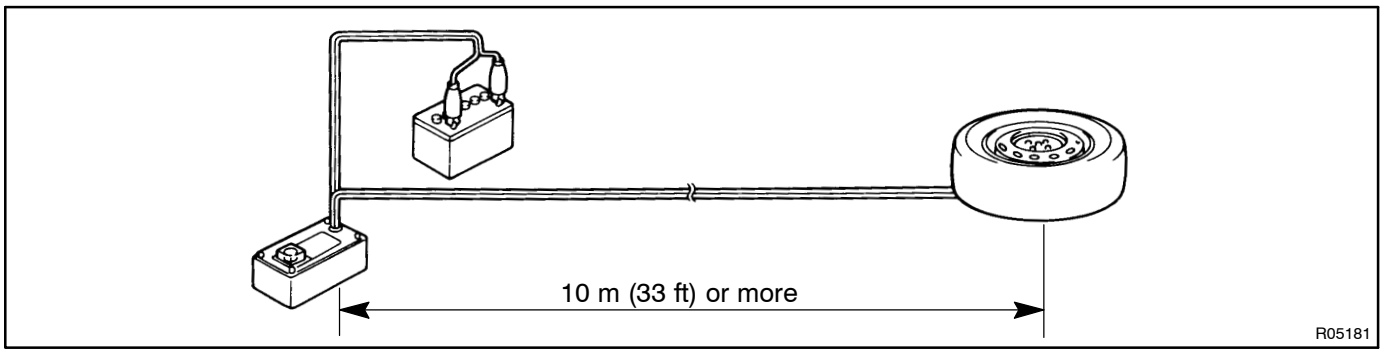
NOTICE:
Place the front seat outer belt as shown in the illustration.

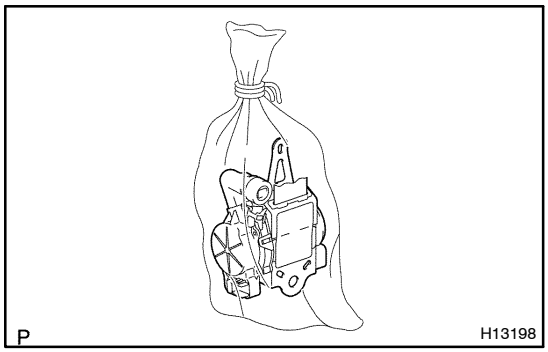
(3) Move the SST as least 10 m (33 ft) away from the disc wheel.

NOTICE:
Take care not to damage the SST wire harness.

(d) Activate the seat belt pretensioner.
  (1) Connect the SST red clip to the battery positive (+) terminal and black clip to the battery negative (–) terminal.
  (2) Check that no one is within 10 m (33 ft) area around the disc wheel.
  (3) Press the SST activation switch and activate the seat belt pretensioner.

HINT:
The seat belt pretensioner operates simultaneously as the LED of the SST activation switch lights up.





(e) Dispose of front seat outer belt (with seat belt pretensioner).

CAUTION:
- **The front seat outer belt is very hot when the seat belt pretensioner is activated, so leave it alone for at least 30 minutes after activation.**
- **Use gloves and safety glasses when handling a front seat outer belt with activated seat belt pretensioner.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a front seat outer belt with activated seat belt pretensioner.**

  (1) Remove the disc wheel and SST.
  (2) Place the front seat outer belt in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts.

BO2OH–04

REPLACEMENT

REPLACE REQUIREMENTS

In the following cases, replace the seat belt pretensioner.

- If the seat belt pretensioner has been activated.
- If the seat belt pretensioner has been found to be faulty in troubleshooting.
- If the front seat outer belt has been found to be faulty during checking in items 1–(b) or 2–(b).
- If the front seat outer belt has been dropped.

CAUTION:

For removal and installation of the seat belt pretensioner, see page BO–109 and BO–118.
Be sure to follow the correct procedure.

BO2OI–04

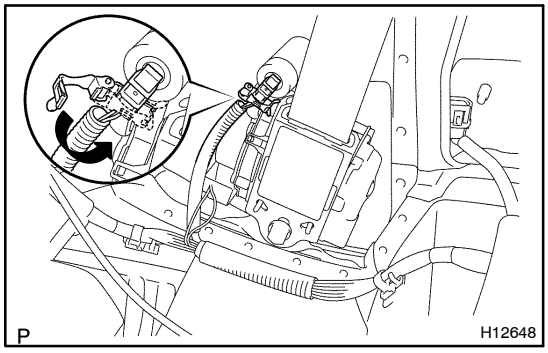
INSTALLATION

NOTICE:

- **Never use seat belt pretensioner from another vehicle. When replacing parts, replace them with new parts.**
- **Make sure that the front seat outer belt is installed with the specified torque.**
- **If the front seat outer belt has been dropped, or there are cracks, dents or other defects in the case or connector, replace the front seat outer belt with a new one.**
- **When installing the front seat outer belt, take care that the wiring does not interfere with other parts and is not pinched between other parts.**

1. INSTALL RETRACTOR OF FRONT SEAT OUTER BELT

(a) Install the retractor of front seat outer belt with the 2 bolts.
Torque:
Upper bolt: 7.5 N·m (76 kgf·cm, 66 in.·lbf)
Lower bolt: 43 N·m (440 kgf·cm, 32 ft·lbf)



(b) Connect the pretensioner connector as shown in the illustration.

(c) Connect the retractor switch connector.

2. INSTALL FRONT SEAT OUTER BELT SHOULDER ANCHOR
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

3. INSTALL FRONT SEAT OUTER BELT FLOOR ANCHOR
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

4. INSTALL QUARTER TRIM PANEL

5. INSTALL REAR SEAT OUTER BELT FLOOR ANCHOR
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

6. INSTALL REAR SEATBACK LOCK STRIKER

7. INSTALL REAR SEATBACK HINGE

8. INSTALL DECK TRIM SIDE PANEL

9. INSTALL REAR DECK TRIM COVER

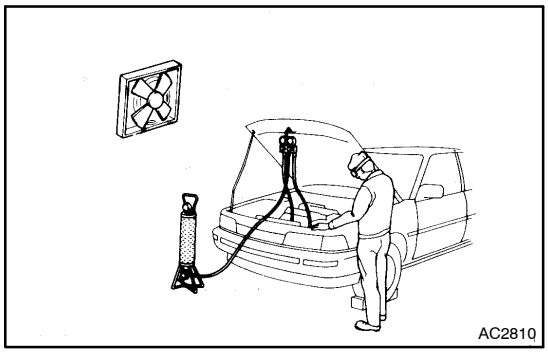
10. INSTALL LUGGAGE COMPARTMENT MAT

11. INSTALL LUGGAGE COMPARTMENT TRAY

12. INSTALL REAR SEAT (See page BO–105)

13. INSTALL PACKAGE TRAY TRIM

14. INSTALL DOOR SCUFF PLATE



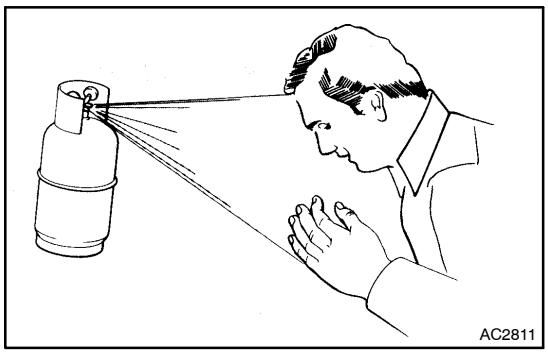
AIR CONDITIONING SYSTEM

AC0C1–13

PRECAUTION

1. DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR WEAR A NAKED FLAME

2. ALWAYS WEAR EYE PROTECTION



3. BE CAREFUL NOT TO GET LIQUID REFRIGERANT IN YOUR EYES OR ON YOUR SKIN

If liquid refrigerant gets in your eyes or on your skin.

(a) Wash the area with lots of cool water.

CAUTION:

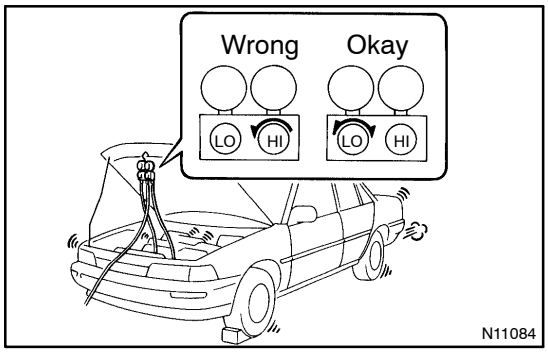
Do not rub your eyes or skin.

(b) Apply clean petroleum jelly to the skin.

(c) Go immediately to a physician or hospital for professional treatment.

4. NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME

5. BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT



6. DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERATION SYSTEM

If there is not enough refrigerant in the refrigerant system oil lubrication will be insufficient and compressor burnout may occur, so that care to avoid this, necessary care should be taken.

7. DO NOT OPEN PRESSURE MANIFOLD VALVE WHILE COMPRESSOR IS OPERATE

If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylinder to rupture, so open and close the only low pressure valve.

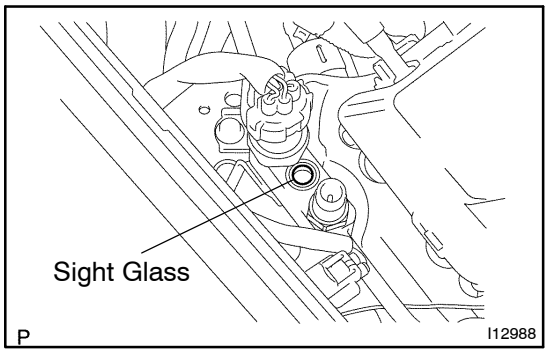
8. BE CAREFUL NOT TO OVERCHARGE SYSTEM WITH REFRIGERANT

If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating etc.

9. SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

The CELICA is equipped with an SRS (Supplemental Restraint System) such as the driver and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

AC2GT–05



ON–VEHICLE INSPECTION

1. INSPECT REFRIGERANT VOLUME

Observe the sight glass on the liquid tube.

Test conditions:

- Running engine at 1,500 rpm
- Blower speed control switch at ”HI” position
- A/C switch ON
- Temperature control dial at ”COOL” position
- Fully open the doors

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient*	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
2	No bubbles present in sight glass	None, sufficient or too much	Refer item 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
4	Temperature between compressor inlet and outlet is noticeably different	Correct or too much	Refer to items 5 and 6
5	Immediately after air conditioning is turned off, refrigerant in sight glass stays clear	Too much	(1) Discharge refrigerant (2) Evacuate air and charge proper amount or purified refrigerant
6	When air conditioning is turned off, refrigerant foams and then stays clear	Correct	–

*: Bubbles in the sight glass with ambient temperatures higher than usual can be considered normal if cooling is sufficient.

2. INSPECT REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

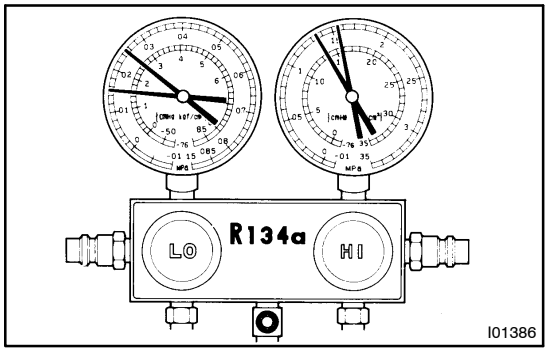
This is a method in witch the trouble is located by using a manifold gauge set. Read the manifold gauge pressure when the these conditions are established.

Test conditions:

- Temperature at the air inlet with the switch set at RECIRC is 30 – 35˚C (86 – 95˚F)
- Engine running at 1500 rpm
- Blower speed control switch at ”HI” position
- Temperature control dial at ”COOL” position

HINT:

It should be noted that the gauge indications may vary slightly due to ambient temperature conditions.



(1) Normally functioning refrigeration system.

Gauge reading:

Low pressure side:

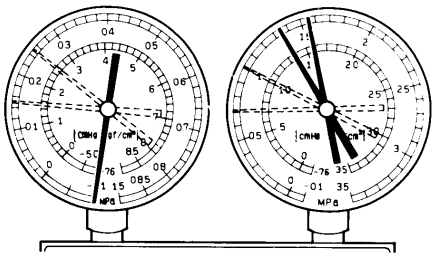
0.15 – 0.25 MPa (1.5 – 2.5 kgf/cm^2)

High pressure side:

1.37 – 1.57 MPa (14 – 16 kgf/cm^2)

(2) Moisture present in refrigeration system.

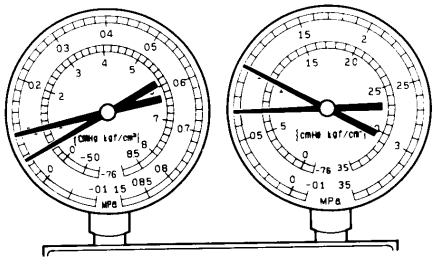
Condition: Periodically cools and then fails to cool



Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
During operation, pressure on low pressure side sometimes become a vacuum and sometime normal	Moisture entered in refrigeration system freezes at expansion valve orifice and temporarily stops cycle, but normal state is restored after a time when the ice melts	• Drier in over–saturated state • Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant	(1) Replace condenser (2) Remove moisture in cycle through repeatedly evacuating air (3) Charge proper amount of new refrigerant

(3) Insufficient cooling

Condition: Insufficient cooling

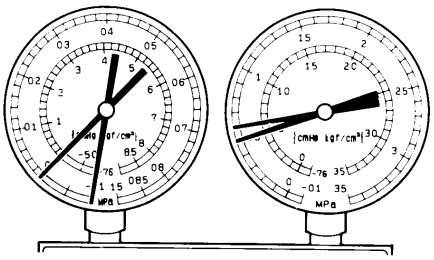


I01388

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low on both low and high pressure sides • Bubbles seen in sight glass continuously • Insufficient cooling performance	Gas leakage at some place in refrigeration system	• Insufficient refrigerant in system • Refrigerant leaking	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Charge proper amount of refrigerant (3) If indicated pressure value is near 0 when connected to gauge, create the vacuum after inspecting and repairing the location of the leak

(4) Poor circulation of refrigerant

Condition: Insufficient cooling

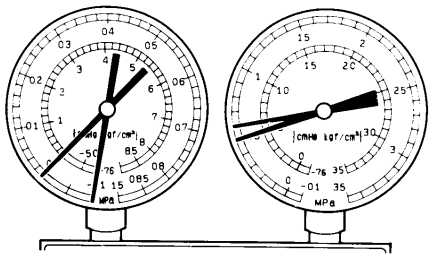


I01389

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low in both low and high pressure sides • Frost on tube from condenser to unit	Refrigerant flow obstructed by dirt in receiver	Receiver clogged	Replace condenser

(5) Refrigerant does not circulate

Condition: Does not cool (Cools from time to time in some cases)

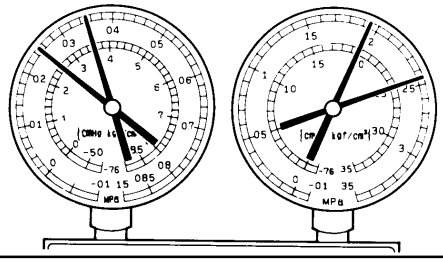


I01449

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Vacuum indicated on low pressure side, very low pressure indicated on high pressure side • Frost or dew seen on piping before and after receiver/ drier or expansion valve	• Refrigerant flow obstructed by moisture or dirt in refrigeration system • Refrigerant flow obstructed by gas leakage from expansion valve	Refrigerant does not circulate	(1) Check expansion valve (2) Clean out dirt in expansion valve by blowing with air (3) Replace condenser (4) Evacuate air and charge new refrigerant to proper amount (5) For gas leakage from expansion valve, replace expansion valve

(6) Refrigerant overcharged or insufficient cooling of condenser

Condition: Insufficient cooling

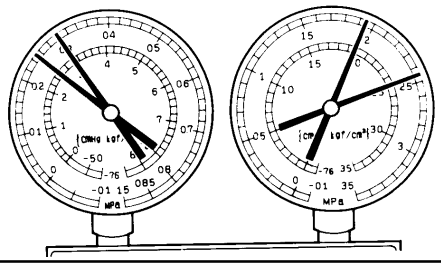


I01390

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • No sir bubbles seen through the sight glass even when the engine rpm is lowered	• Unable to develop sufficient performance due to excessive • Insufficient cooling of condenser	• Excessive refrigerant in cycle→refrigerant overcharged • Condenser cooling insufficient→condenser fins clogged of cooling fan faulty	(1) Clean condenser (2) Check cooling fan with fluid coupling operation (3) If (1) and (2) are in normal state, check amount of refrigerant Charge proper amount of refrigerant

(7) Air present in refrigeration system

Condition: Insufficient cooling



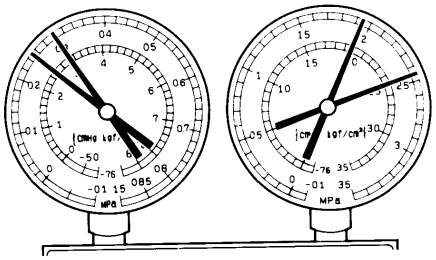
NOTE : These gauge indications are shown when the refrigeration system has been opens and the refrigerant charged without vacuum purging.

I01392

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • The low pressure piping hot to the touch • Bubbles seen in sight glass	Air entered in refrigeration system	• Air present in refrigeration system • Insufficient vacuum purging	(1) Check compressor oil to see if it is dirty or insufficient (2) Evacuate air and charge new refrigerant

(8) Expansion valve improperly

Condition: Insufficient cooling

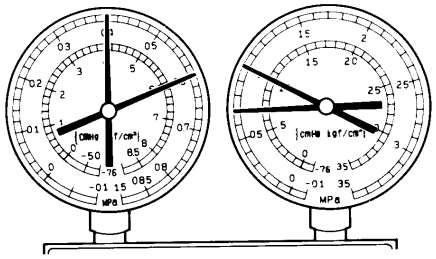


I01450

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • Frost or large amount of dew on piping on low pressure side	Trouble in expansion valve	• Excessive refrigerant in low pressure piping • Expansion valve opened too wide	Check expansion valve Replace if defective

(9) Defective compression compressor

Condition : Does not cool



I01393

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on low high pressure sides • Pressure too low to on high pressure side	Internal leak in compressor	• Compression defective • Valve leaking or broken sliding parts	Repair or replace compressor

3. INSPECT IDLE–UP SPEED

(a) Warm up engine.

(b) Inspect idle–up speed when the these conditions are established.

- Warm up engine
- Blower speed control switch at ”HI” position
- A/C switch ON
- Temperature control dial at ”COOL” position

1ZZ–FE engine models (M/T):

Magnetic clutch condition	Idle–up speed
Magnetic clutch not engaged	700 ± 50 rpm
Magnetic clutch engaged	900 ± 50 rpm

If idle speed is not as specified, check Idle control system.

1ZZ–FE engine models (A/T):

Magnetic clutch condition	Idle–up speed
Magnetic clutch not engaged	750 ± 50 rpm
Magnetic clutch engaged	900 ± 50 rpm

If idle speed is not as specified, check Idle control system.

2ZZ–GE engine models (M/T):

Magnetic clutch condition	Idle–up speed
Magnetic clutch not engaged	750 ± 50 rpm
Magnetic clutch engaged	850 ± 50 rpm

If idle speed is not as specified, check Idle control system.

2ZZ–GE engine models (A/T):

Magnetic clutch condition	Idle–up speed
Magnetic clutch not engaged	650 ± 50 rpm
Magnetic clutch engaged	850 ± 50 rpm

If idle speed is not as specified, check Idle control system.

4. INSPECT FOR LEAKAGE OF REFRIGERANT

(a) Perform in these conditions:
- Stop engine.
- Secure good ventilation (If not the gas leak detector may react to volatile gases witch are not refrigerant, such as evaporated gasoline and exhaust gas.)
- Repeat the test 2 or 3 times.
- Make sure that there is some refrigerant remaining in the refrigeration system.
  When compressor is OFF: approx. 392 – 588 kPa (4 – 6 kgf/ cm^2, 57 – 85 psi)

(b) Bring the gas leak detector close to the drain hose before performing the test.

HINT:
- After the blower motor stopped, leave the cooling unit for more than 15 minutes.
- Expose the gas leak detector sensor the under the drain hose.
- When bring the gas leak detector close to the drain hose, make sure that the gas leak detector does not react to the volatile gases.

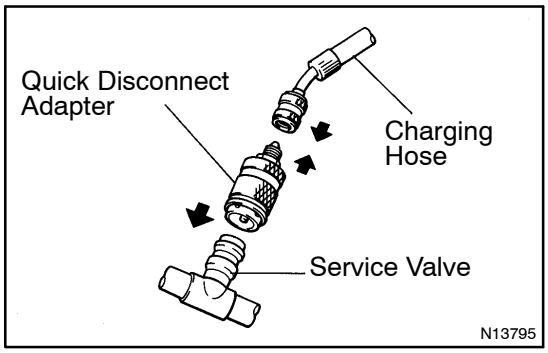
If such reaction is unavoidable, the vehicle must be lifted up.

(c) If gas leak is not detected on the drain hose, remove the blower resistor from the cooling unit. Then insert the gas leak detector sensor into the unit and perform the test.

(d) Disconnect the connector and leave the pressure switch for approx. 20 minutes. Then bring the gas leak detector close to the pressure switch and perform the test.

(e) Bring the gas leak detector close to the refrigerant lines and perform the test.

AC0C4–11



EVACUATING

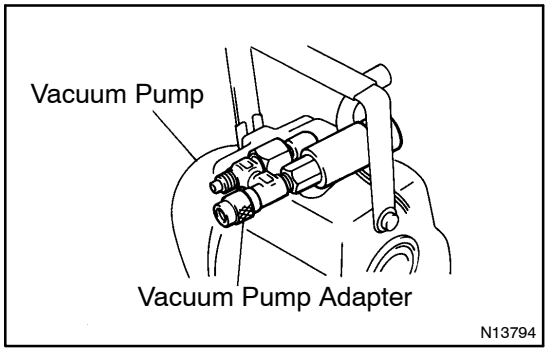
1. CONNECT QUICK DISCONNECT ADAPTER TO CHARGING HOSES

2. REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINES

3. SET ON MANIFOLD GAUGE SET

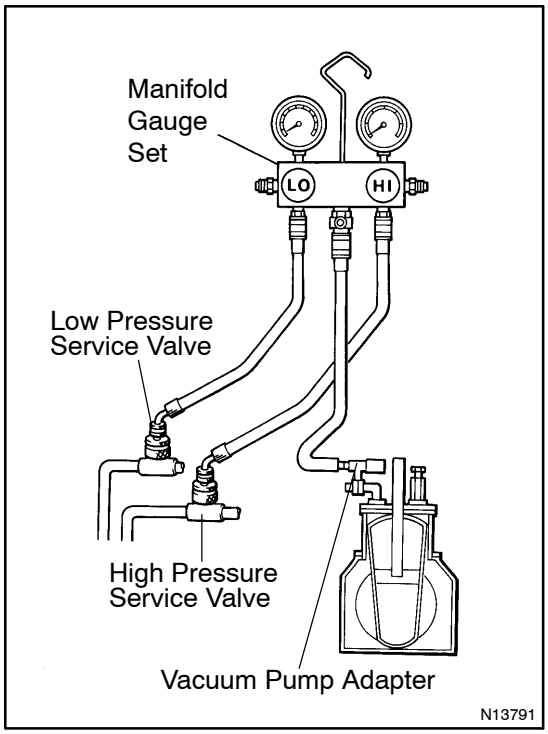
(a) Close both hand valves of manifold gauge set.

(b) Connect the quick disconnect adapters to the service valves.



4. EVACUATE AIR FROM REFRIGERATION SYSTEM

(a) Connect the vacuum pump adapter to the vacuum pump.



(b) Connect the center hose of the manifold gauge set to the vacuum pump adapter.

(c) Open both the high and low hand valves and run the vacuum pump.

(d) After 10 minutes or more, check that the low pressure gauge indicates 750 mmHg (30 in. Hg) or more.

HINT:

If the reading 750 mmHg (30 in. Hg) or more, close both hand valves of manifold gauge set and stop the vacuum pump.

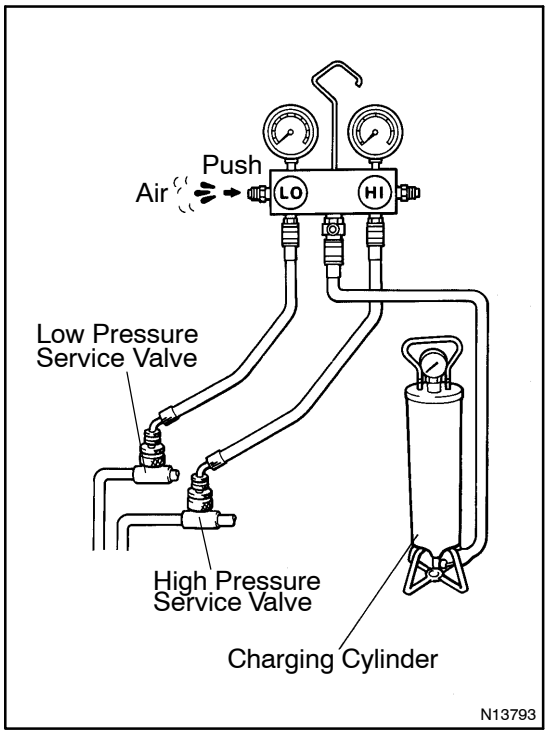
Check the system for leaks and repair necessary.

(e) Close both the high and low hand valves and stop the vacuum pump.

(f) Leave the system in this condition for 5 minutes or more and check that there is no gauge indicator.

AC2GU–04

CHARGING



1. INSTALL CHARGING CYLINDER

HINT:

When handling the charging cylinder, always follow the directions given in the instruction manual.

(a) Charge the proper amount of refrigerant into the charging cylinder.

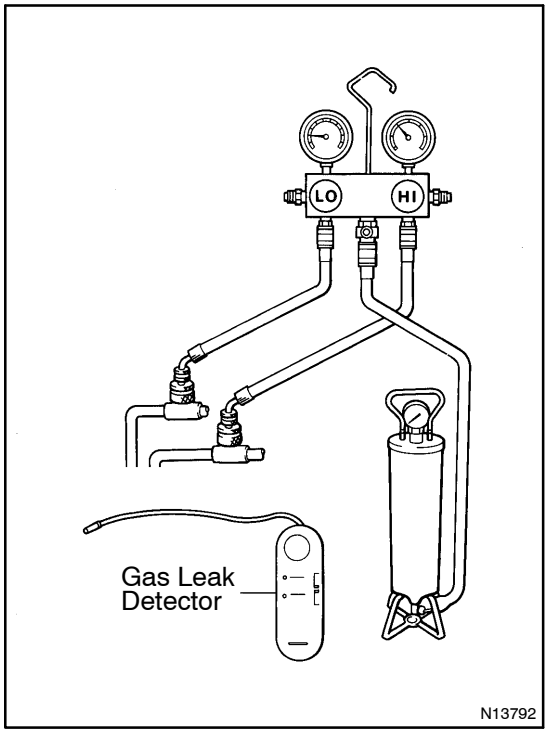
(b) Connect the center hose to the charging cylinder.

CAUTION:

Do not open both high and low hand valves of manifold gauge set.

(c) Open the valve of charging cylinder.

(d) Press the valve core on the side of manifold gauge and expel the air inside of the center hose.



2. INSPECT REFRIGERATION SYSTEM FOR LEAKS

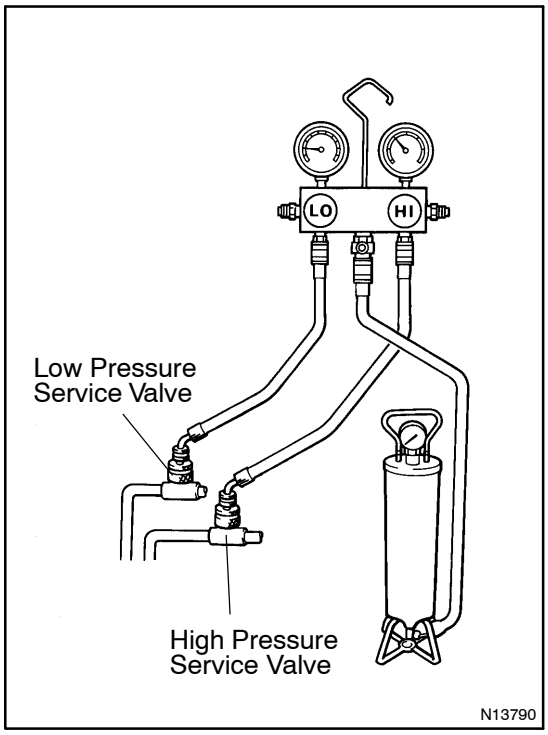
(a) Open the high pressure hand valve and charge refrigerant.

(b) When the low pressure gauge indicates 98 kPa (1 kgf/cm^2, 14 psi) close the high pressure hand valve.

(c) Using a gas leak detector, check the system for leakage.

CAUTION:

Use the refrigerant recovery/ recycling machine to recover the refrigerant whenever replacing parts.



3. CHARGE REFRIGERANT INTO REFRIGERANT SYSTEM

If there is no leak after refrigerant leak check, charge the proper amount of refrigerant into refrigeration system.

CAUTION:

- **Never run the engine when charging the system through the high pressure side.**
- **Do not open the low pressure hand valve when the system is being charged with liquid refrigerant.**

(a) Open the high pressure hand valve fully.

(b) Charge specified amount of refrigerant, then close the high pressure hand valve.

HINT:

A fully charged system is indicated by the sight glass being free of any bubbles.

(c) Charge partially refrigeration system with refrigerant.

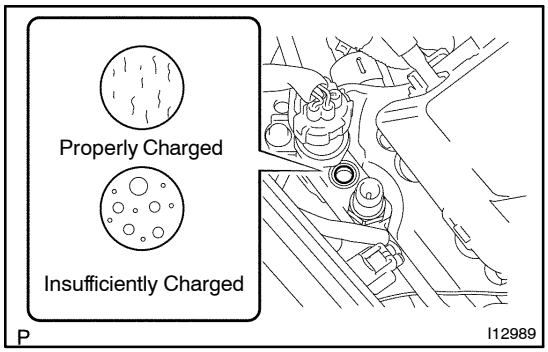
(1) Set vehicle in these condition:

- Running engine at 1,500 rpm
- Blower speed control switch: ”HI”
- Temperature control selector: ”MAX. COOL”
- Air inlet control selector: ”RECIRC”
- Fully open doors (Sliding roof: closed)

(2) Open the low pressure hand valve.

CAUTION:

Do not open the high pressure hand valve.

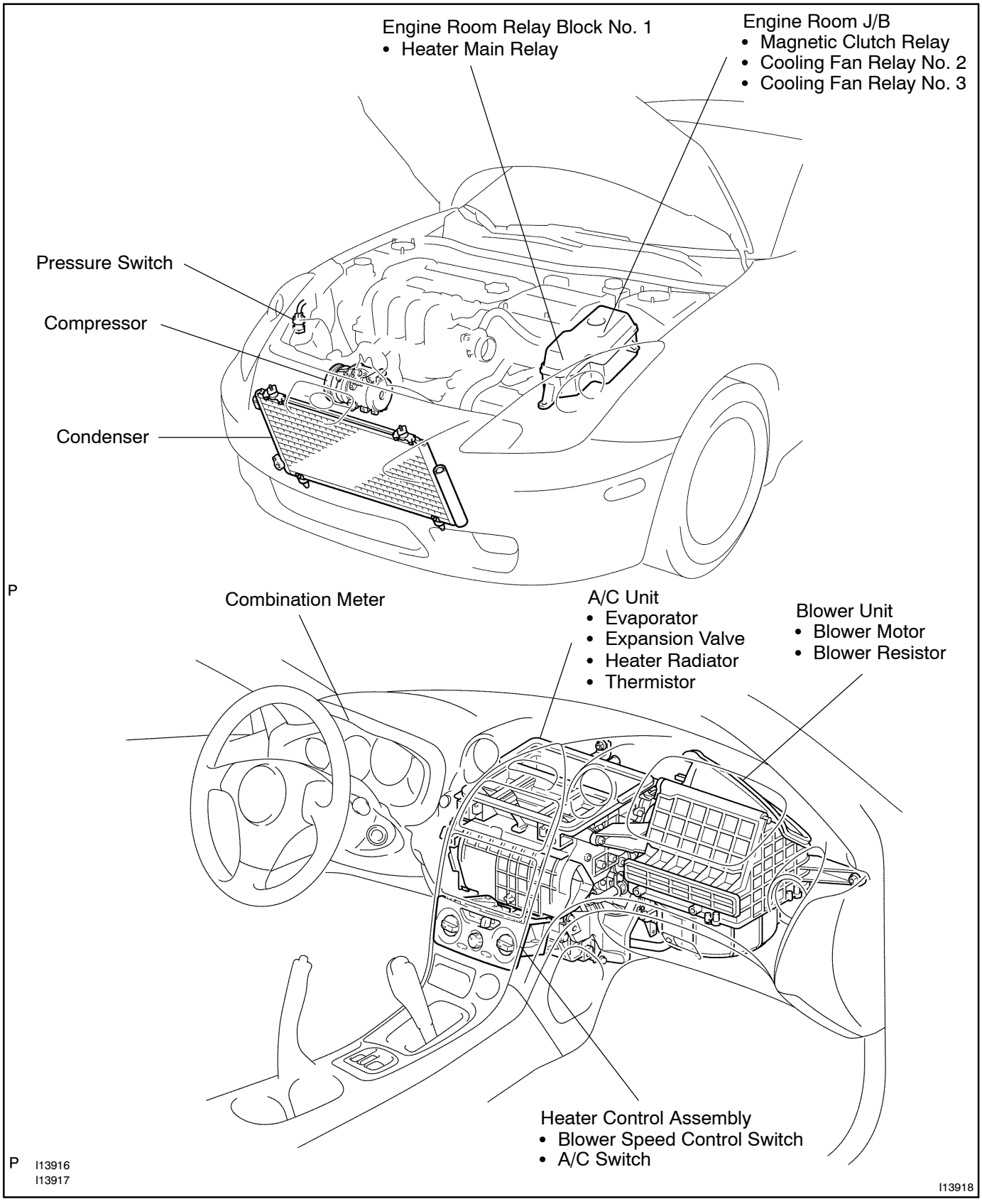


(d) Charge refrigerant until bubbles disappear and check the pressure on the gauge through the sight glass.

(e) Replenishment to be 100 ± 50 g after bubbles disappear.

AC0C6–15

LOCATION



TROUBLESHOOTING

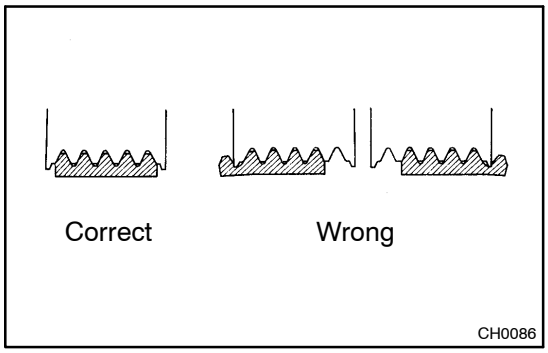
PROBLEM SYMPTOMS TABLE

AC1FO–12

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
No blower operation	1. HTR Fuse	–
	2. Heater main relay	AC–54
	3. Blower motor	AC–48
	4. Blower resistor	AC–49
	5. Blower speed control switch	AC–68
	6. Wire harness	–
No blower control	1. Blower motor	AC–48
	2. Blower resistor	AC–49
	3. Blower speed control switch	AC–68
	4. Wire harness	–
No air temperature	1. Engine coolant volume	–
	2. Heater control assembly	AC–65
No compressor operation	1. Refrigerant volume	AC–3
	2. A.C Fuse	–
	3. Magnetic clutch	AC–35
	4. Compressor lock sensor	AC–35
	5. Compressor	AC–35
	6. Pressure switch	AC–51
	7. Heater main relay	AC–54
	8. Blower speed control switch	AC–68
	9. Heater control assembly	AC–65
	10. Thermistor	AC–50
	11. Wire harness	–
No cool air comes out	1. Refrigerant volume	AC–3
	2. Refrigerant pressure	AC–3
	3. Drive belt	AC–16
	4. Magnetic clutch	AC–35
	5. Compressor lock sensor	AC–35
	6. Pressure switch	AC–51
	7. Thermistor	AC–50
	8. Heater control assembly	AC–65
	9. Wire harness	–
Insufficient cooling	1. Refrigerant volume	AC–3
	2. Drive belt	AC–16
	3. Magnetic clutch	AC–35
	4. Compressor	AC–35
	5. Condenser	AC–43
	6. Expansion Valve	AC–24
	7. Evaporator	AC–28
	8. Refrigerant lines	AC–21
	9 Pressure switch	AC–51
	10. A/C amplifier	AC–68
	11. Heater control assembly	AC–65
No engine idle–up when A/C switch ON	1. Heater control assembly	AC–65
	2. Engine (and ECT) ECU	–
	3. Idle control system	–
	4. Wire harness	–
No air inlet control	1. Heater control assembly	AC–65
	2. Wire harness	–

No mode control	1. Heater control assembly 2. Wire harness	AC–65 –
Blinking of A/C indicator	1. Compressor 2. Drive belt 3. Compressor lock sensor 4. Heater control assembly	AC–35 AC–16 AC–35 AC–65
Brightness does not change when light control switch is turned	1. Headlight and taillight system 2. Heater control assembly	BE–18 AC–65



DRIVE BELT

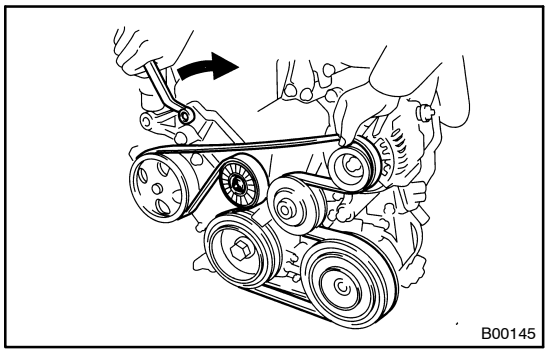
AC2GV–07

ON–VEHICLE INSPECTION

INSPECT DRIVE BELT'S INSTALLATION CONDITION

Check that the drive belt fits properly in the ribbed grooves.

AC1FP–03

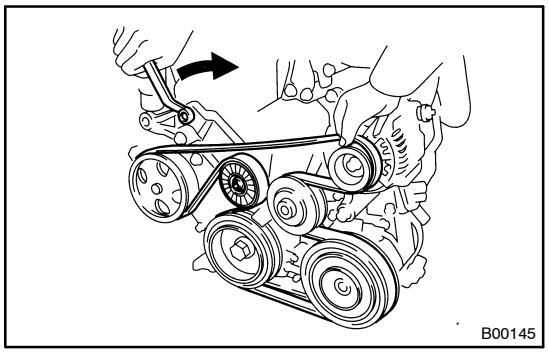


REMOVAL

REMOVE DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner arm clockwise, and remove the drive belt.

AC1FQ–03

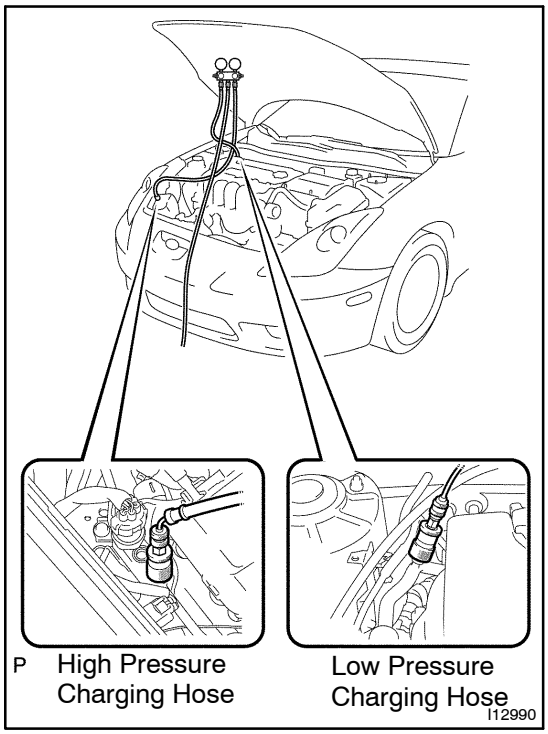


INSTALLATION

1. INSTALL DRIVE BELT

Turning the drive belt tensioner arm clockwise, and install the drive belt.

2. CHECK DRIVE BELT INSTALLING CONDITION



MANIFOLD GAUGE SET

AC0CA–07

SET ON

1. CONNECT CHARGE HOSE TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

CAUTION:

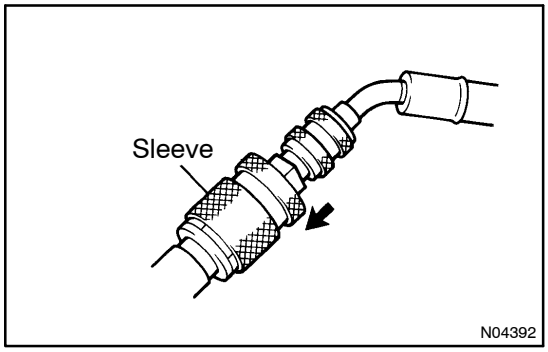
Do not connect the wrong hoses.

2. CONNECT QUICK DISCONNECT ADAPTER TO CHARGING HOSES

Tighten the nuts by hand.

3. CLOSE BOTH HAND VALVE OF MANIFOLD GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVE ON REFRIGERANT LINE

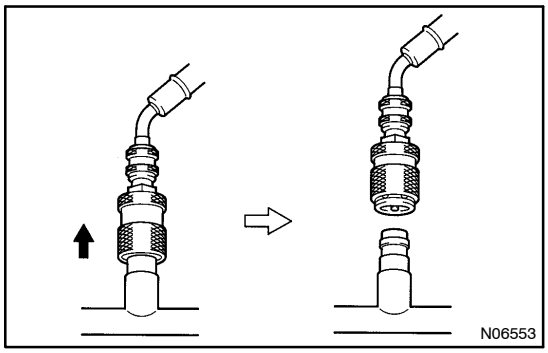


5. CONNECT QUICK DISCONNECT ADAPTER TO SERVICE VALVES

HINT:

Push the quick disconnect adapter onto the service valve, then slide, then slide the sleeve of the quick disconnect adapter downward to lock it.

AC0CB–11



SET OFF

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK DISCONNECT ADAPTERS FROM SERVICE VALVES ON REFRIGERANT LINE**

HINT:

Slide the sleeve of the quick disconnect adapter upward to unlock the adapter and remove it from the service valve.

3. **INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINE**

REFRIGERANT LINE

AC0CC–02

ON–VEHICLE INSPECTION

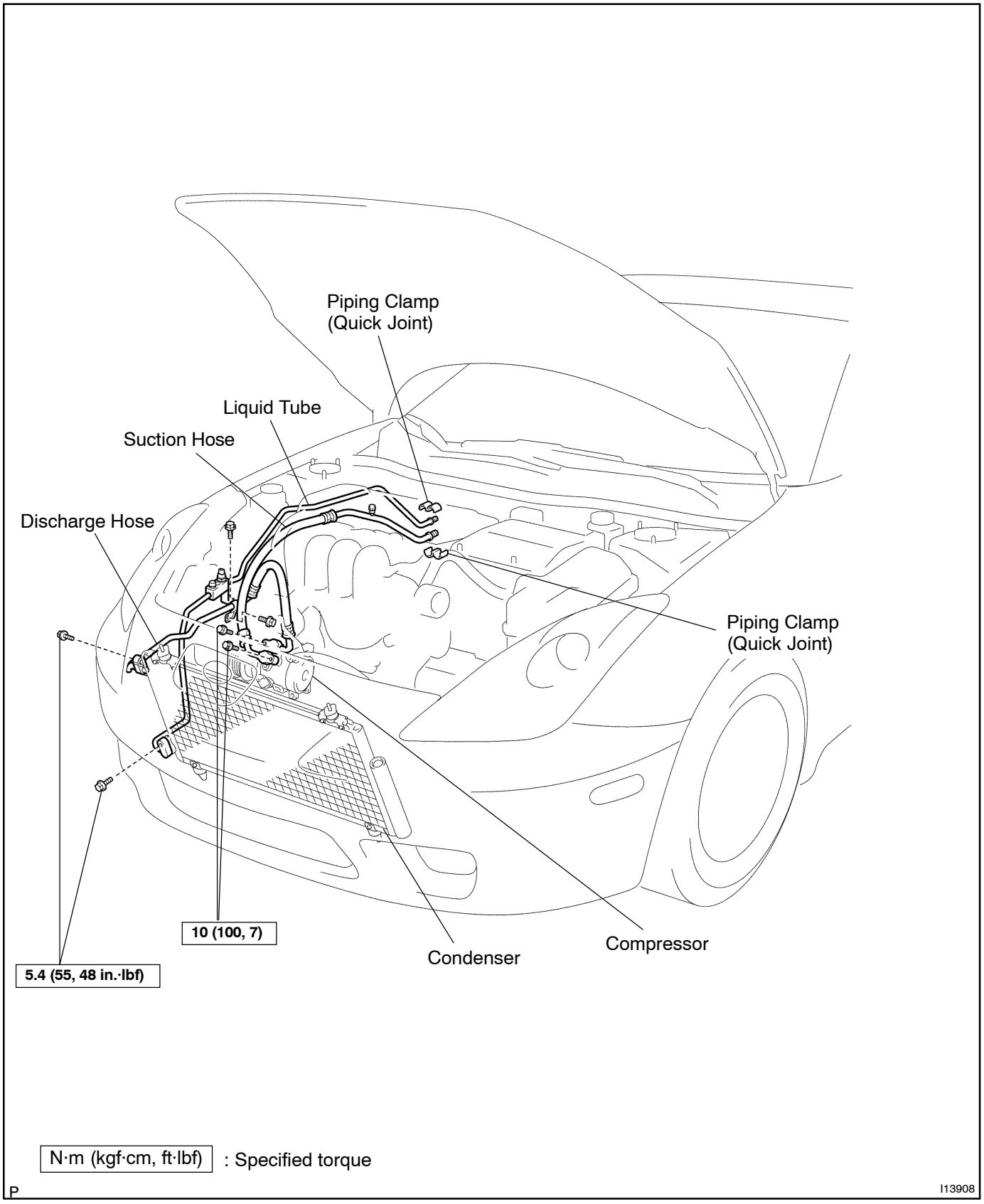
1. INSPECTION HOSE AND TUBE CONNECTIONS FOR LOOSENESS

2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

AC1FR–06

LOCATION



AC1FS–06

REPLACEMENT

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

3. TORQUE CONNECTIONS TO SPECIFIED TORQUE

NOTICE:

Connections should not be torqued tighter than the specified torqued.

Part tightened	N·m	kgf·cm	ft·lbf
Condenser x Discharge tube	5.4	55	48 in.·lbf
Condenser x Liquid tube	5.4	55	48 in.·lbf
Compressor x Discharge tube	10	100	7
Compressor x Suction tube	10	100	7
Expansion valve x Evaporator	5.4	55	48 in.·lbf

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT

Specified amount: 430 ± 30 g (15.17 ± 1.06 oz.)

5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant.

6. INSPECT AIR CONDITIONING OPERATION

AIR CONDITIONING UNIT

AC2GW–02

ON–VEHICLE INSPECTION

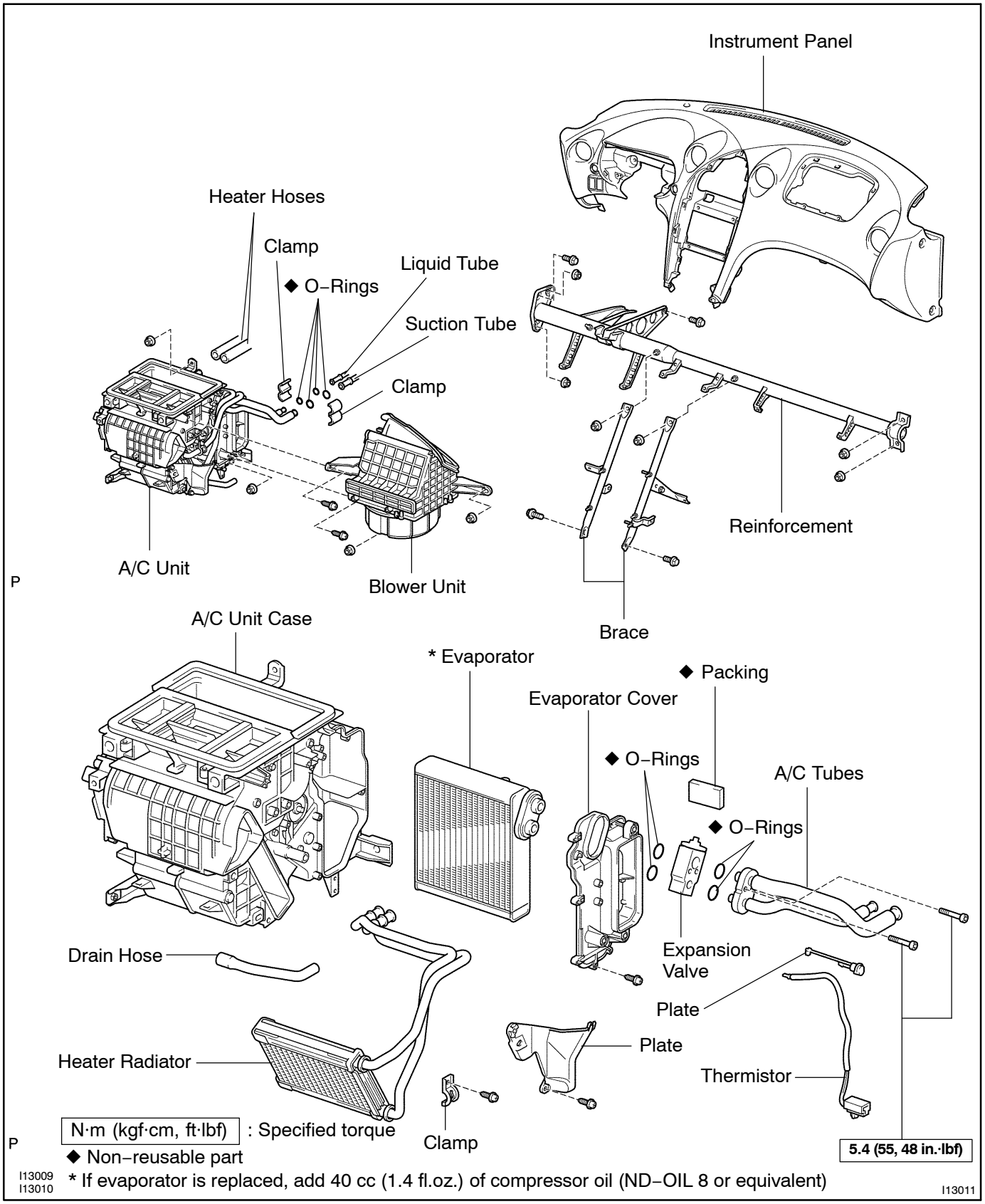
INSPECT FOR LEAKAGE OF REFRIGERANT

(a) Remove the glove compartment door (See page BO–79).
(b) Remove the blower unit.
(c) Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints or check the evaporator, expansion valve, A/C tube and O–rings.

AC2GX–02

COMPONENTS



AC2GY–02

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, please refer to the following item.

Evacuate air from refrigeration system.

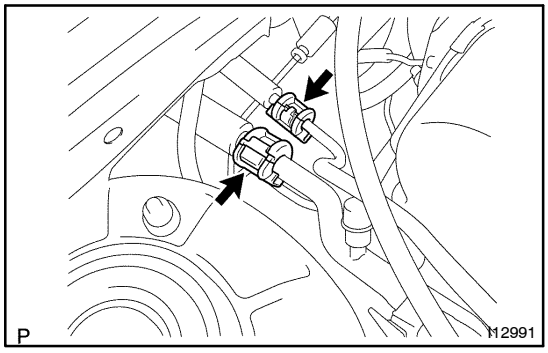
Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount: 430 ± 30 g (15.17 ± 1.06 oz.)

2. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

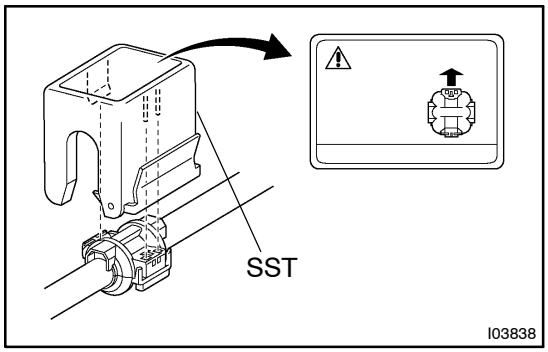
It is not necessary to drain out all coolant.



3. DISCONNECT LIQUID TUBE AND SUCTION HOSE

(a) Using SST, remove the 2 piping clamps.

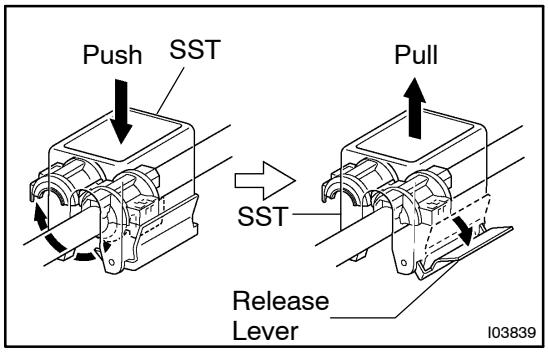
SST 09870–00015 (Suction tube)
09870–00025 (Liquid tube)



(1) Insert SST to piping clamp.

HINT:

Confirm the direction of the piping clamp claw and SST using the illustration showing on the caution label.



(2) Push down SST and release the clamp lock.

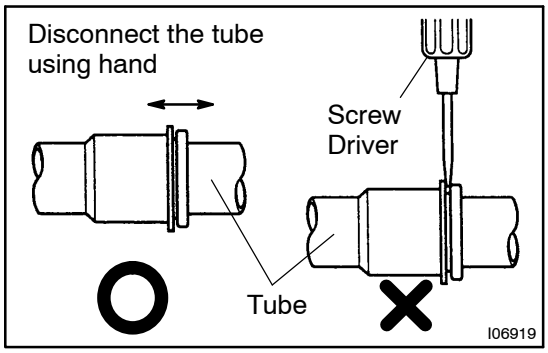
NOTICE:

Be careful not to deform the tubes, when pushing SST.

(3) Pull SST slightly and push the release lever, then remove the piping clamp with SST.

(4) Remove the piping clamp from SST.

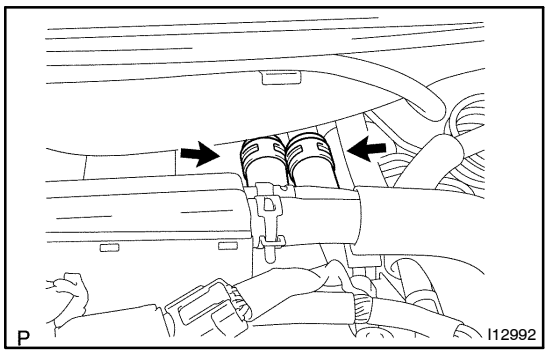
(b) Disconnect the both tubes.



NOTICE:

- **Do not use tools like screwdriver to remove the tube.**
- **Cap the open fittings immediately to keep moisture or dirt out of the system.**

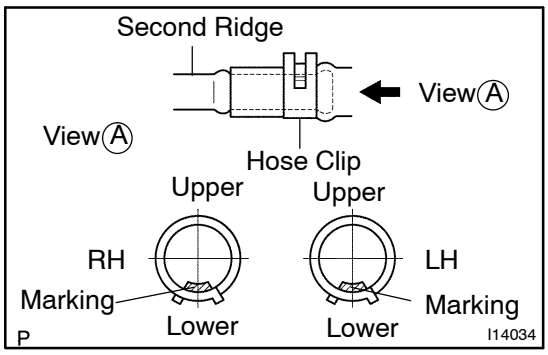
4. REMOVE INSTRUMENT PANEL AND REINFORCEMENT (See page BO–79)



5. DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPES

(a) Using pliers, grip the claw of the hose clip and slide the hose clip along the hose.

(b) Disconnect the heater hoses.

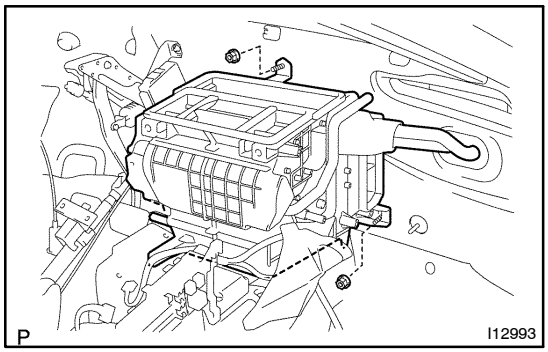


HINT:

At the time of installation, please refer to the following item.

Push the water hose onto the heater radiator pipe as far as second ridge on the pipe and install the hose clip.

6. REMOVE BLOWER UNIT (See page AC–31)



7. REMOVE A/C UNIT

(a) Disconnect the connectors.

(b) Remove the 2 nuts and A/C unit.

AC2GZ–02

INSPECTION

1. INSPECT EVAPORATOR

(a) Check evaporator fins for blockage.

If the fins are clogged, clean them with compressed air.

NOTICE:

Never use water to clean the evaporator.

(b) Check fitting for cracks or scratches.

If necessary, repair or replace.

2. INSPECT HEATER RADIATOR

Inspect fins for blockage.

If the fins are clogged, clean them with compressed air.

AC2H0–02

INSTALLATION

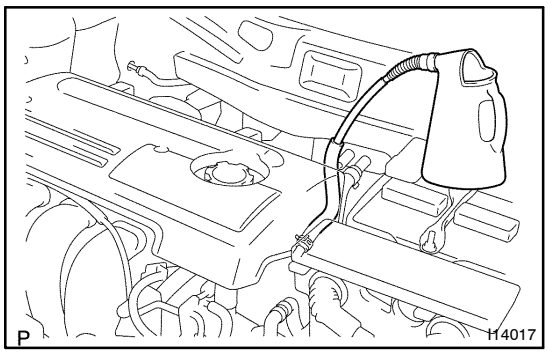
Installation is in the reverse order of removal (See page AC–26).

HOWEVER, NOTE THAT THE FOLLOWING PROCEDURES SHOULD BE SURELY CONDUCTED

(a) Remove the joint of the heater outlet hose from the heater pipe.

HINT:

Do not detach the other joint on the engine side.



(b) Hold the removed heater hose with the end facing up, pour LLC into the hose.

(c) Pour LLC until it flows into the reverse tank from the hose at the bottom.

(d) When this happens, stop pouring and reinstall the heater hose to the heater pipe.

(e) Perform air bleeding in the same manner when LLC is replaced (See page CO–2).

HINT:

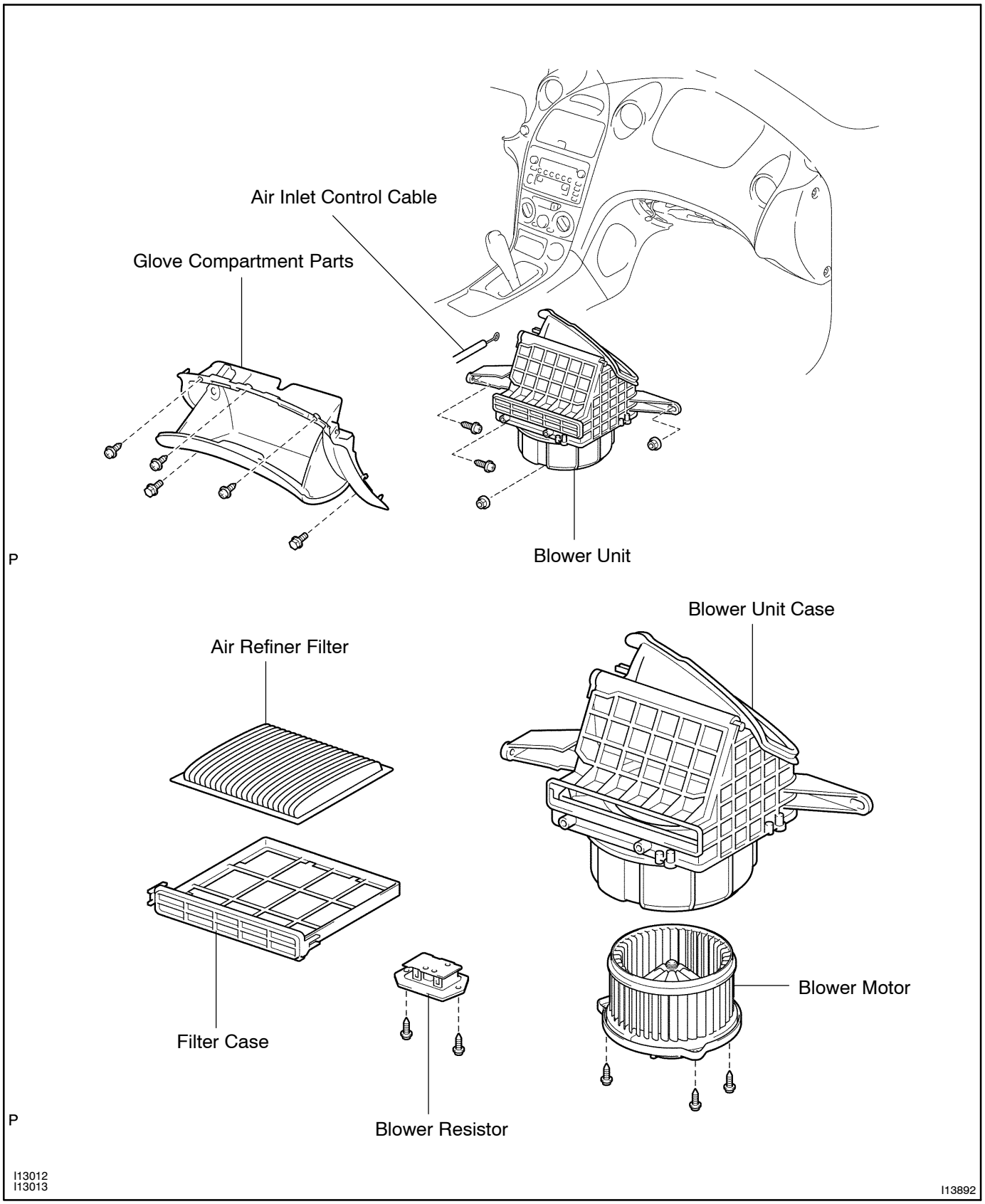
Note that the amount of LLC removed from the heater parts should be added.

Additional amount (example):
Heater core: approx. 350 cc
Heater pipe: approx. 200 cc
Heater hose: approx. 70 cc

BLOWER UNIT

COMPONENTS

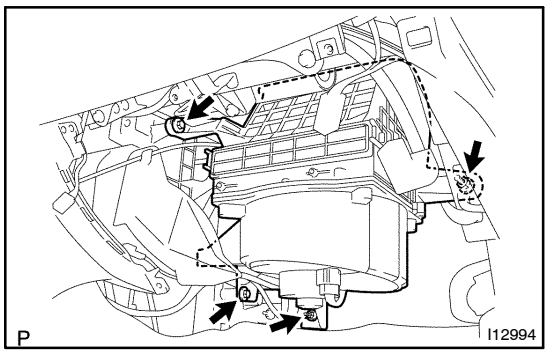
AC1G5–03



AC1G6–07

REMOVAL

1. REMOVE GLOVE COMPARTMENT PARTS
(See page BO–79)



2. REMOVE BLOWER UNIT

(a) Disconnect the connector and air inlet control cable.
(b) Remove wire harness clamp.
(c) Remove the 2 screws, 2 nuts and the blower unit.

AC2H1–03

DISASSEMBLY

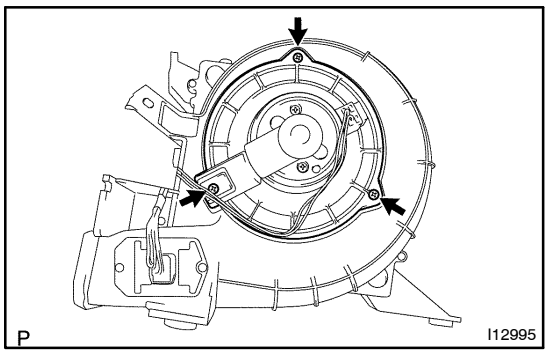
1. REMOVE BLOWER RESISTOR

Remove the 2 screws and blower resistor.

2. REMOVE AIR REFINER FILTER

(a) Pull out the filter cover.

(b) Remove the filter from the frame.



3. REMOVE BLOWER MOTOR

(a) Remove the screw and wire harness clamp.

(b) Remove the 3 screws and the blower motor.

AC1G8–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page AC–32).

AC1G9–02

INSTALLATION

Installation is in the reverse order of removal (See page AC–31).

COMPRESSOR AND MAGNETIC CLUTCH

AC1GA–10

ON–VEHICLE INSPECTION

1. INSPECT COMPRESSOR FOR METALLIC SOUND

Check if there is abnormal metallic sound from the compressor after starting the engine and turning the A/C switch on.

If abnormal metallic sound is heard, replace the compressor assembly.

2. INSPECT REFRIGERANT PRESSURE

(See page AC–3)

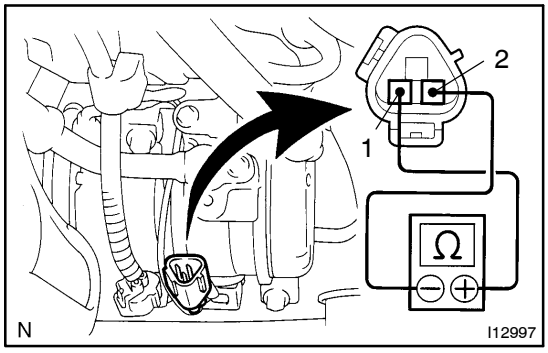
3. INSPECT FOR LEAKAGE OF REFRIGERANT

(a) Visually inspect the refrigerant for any leakage.

If there is any leakage, replace the compressor assembly.

(b) Using a gas leak detector, check for leakage of refrigerant.

If there is any leakage, replace the compressor assembly.



4. INSPECT COMPRESSOR LOCK SENSOR RESISTANCE

(a) Disconnect the compressor connector.

(b) Measure resistance between terminals 1 and 2.

Standard resistance:

165 – 205 Ω at 20°C (68°F)

If resistance is not as specified, replace the sensor.

5. CHECK FOR LEAKAGE OF GREASE FROM CLUTCH BEARING

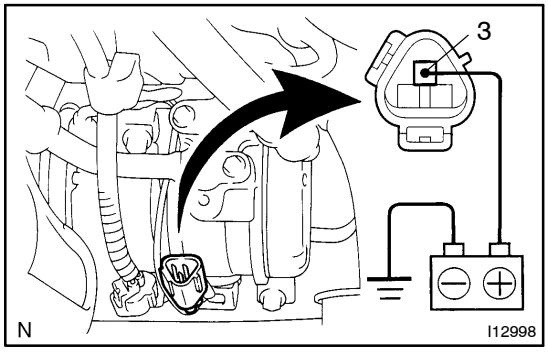
6. CHECK FOR SIGNS OF OIL ON PRESSURE PLATE OR ROTOR

7. INSPECT MAGNETIC CLUTCH BEARING FOR NOISE

(a) Start engine.

(b) Check for abnormal noise from the compressor when the A/C switch is OFF.

If abnormal noise is being emitted, replace the magnetic clutch.



8. INSPECT MAGNETIC CLUTCH OPERATION

(a) Disconnect the compressor connector.

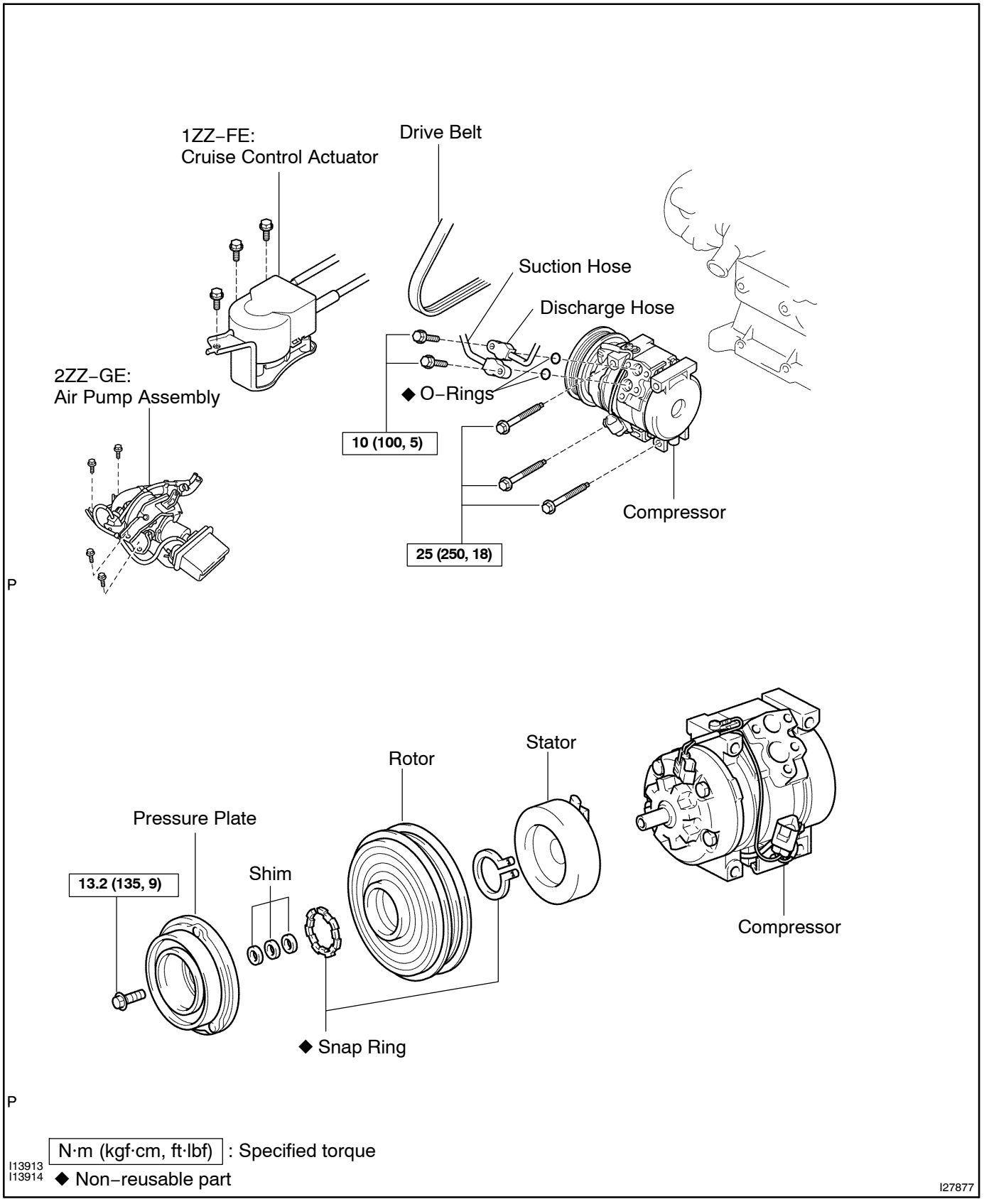
(b) Connect the positive (+) lead form the battery to terminal 3 and the negative (–) lead to the body ground.

(c) Check that the magnetic clutch operates.

If operation is not as specified, replace the magnetic clutch.

AC1GB–05

COMPONENTS



AC2H2–07

REMOVAL

1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX. 10 MINUTES

2. STOP ENGINE

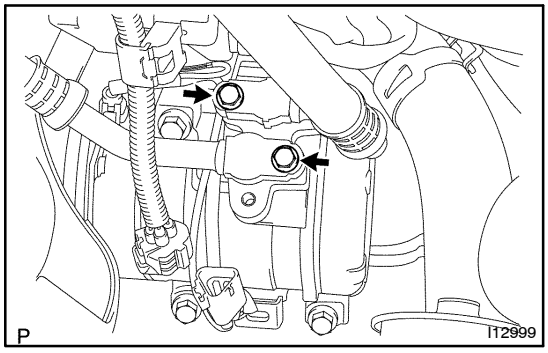
3. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

5. REMOVE DRIVE BELT (See page AC–17)

6. 1ZZ–FE:
REMOVE CRUISE CONTROL ACTUATOR (See page CO–27)

7. 2ZZ–GE:
REMOVE AIR PUMP ASSEMBLY (See page CO–27)

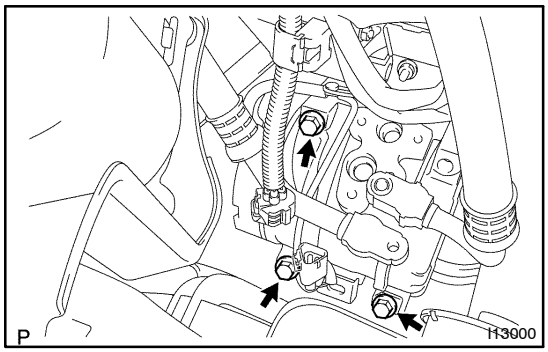


8. DISCONNECT DISCHARGE AND SUCTION HOSES

Remove the 2 bolts and disconnect the both hoses.

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.



9. REMOVE COMPRESSOR

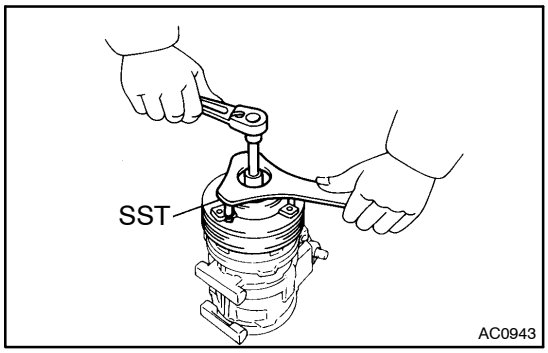
(a) Disconnect the connector.

(b) Disconnect the wire harness clamp.

(c) Remove the 3 bolts and compressor.

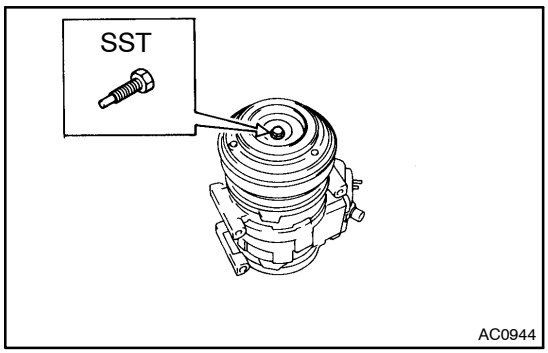
AC2H3–04

DISASSEMBLY

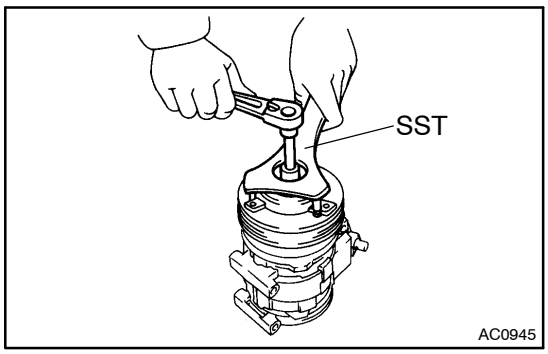


1. REMOVE PRESSURE PLATE

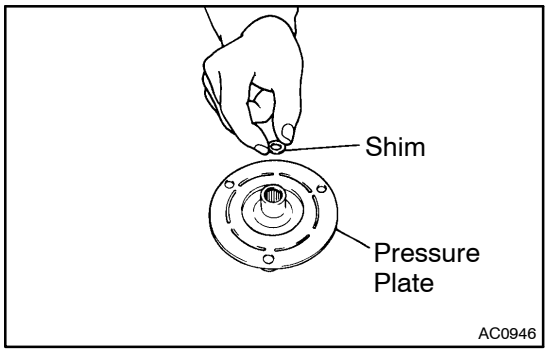
(a) Using SST and a socket wrench, remove the shaft bolt.
SST 07112–76060
Torque: 13.2 N·m (135 kgf·cm, 9 ft·lbf)



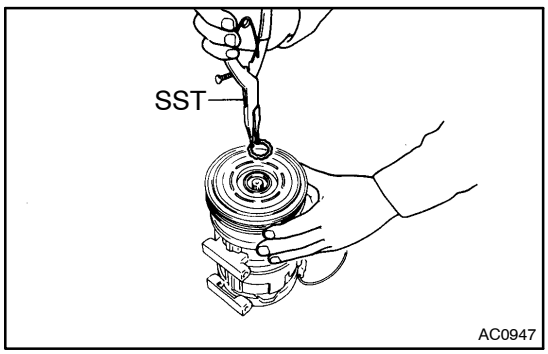
(b) Install SST on the pressure plate.
SST 07112–66040



(c) Using SST and socket wrench, remove the pressure plate.
SST 07112–66040, 07112–76060

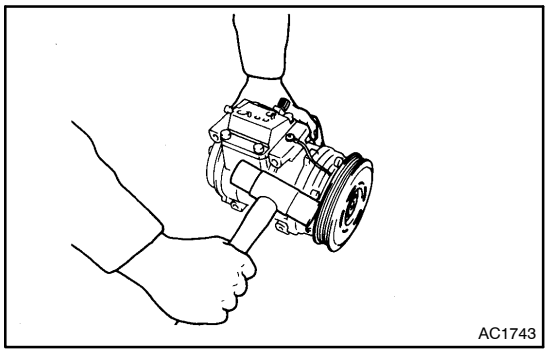


(d) Remove the shims from the pressure plate.



2. REMOVE ROTOR

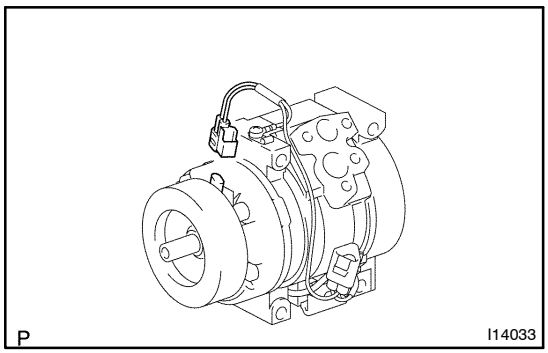
(a) Using SST, remove the snap ring.
SST 95994–10020



(b) Using a plastic hammer, tap the rotor off the shaft.

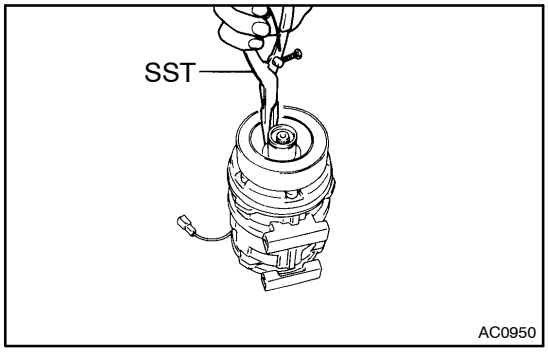
NOTICE:

Be careful not to damage the pulley when tapping on the rotor.

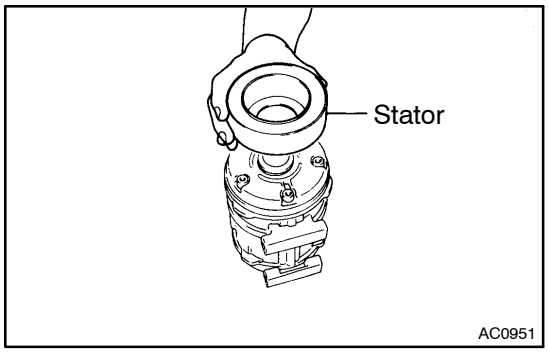


3. REMOVE STATOR

(a) Disconnect the connector from the stator.



(b) Using SST, remove the snap ring.
SST 95994–10020



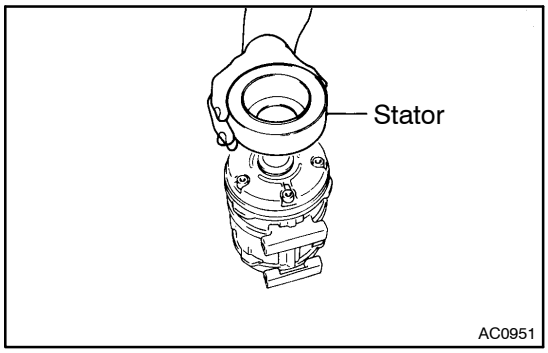
(c) Remove the stator.

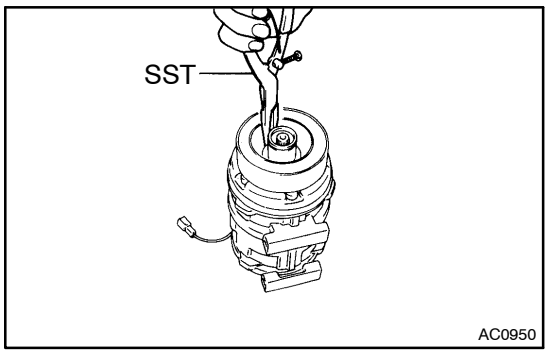
AC2H4–04

REASSEMBLY

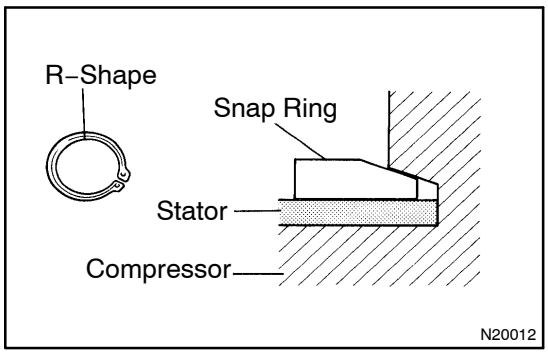
1. INSTALL STATOR

(a) Install the stator.

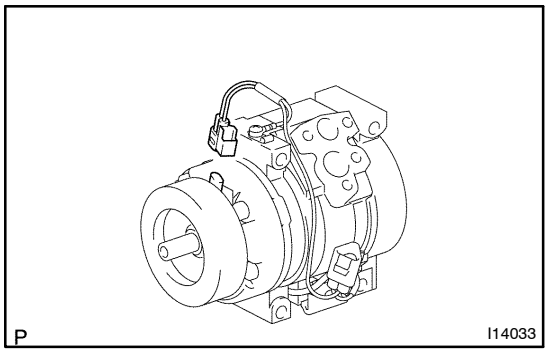




(b) Using SST, install the snap ring.
SST 95994–10020

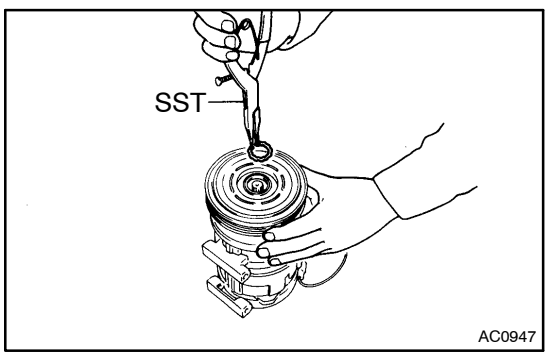


NOTICE:
The snap ring should be installed so that its beveled side faces up.

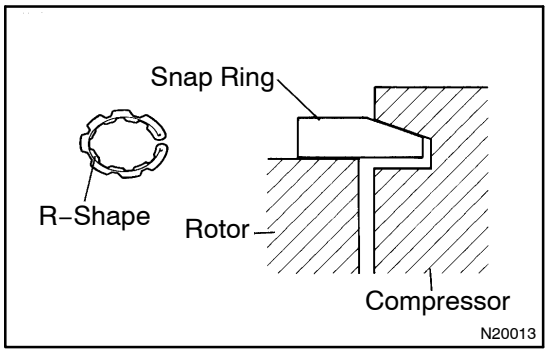


(c) Connect the connector to the stator.

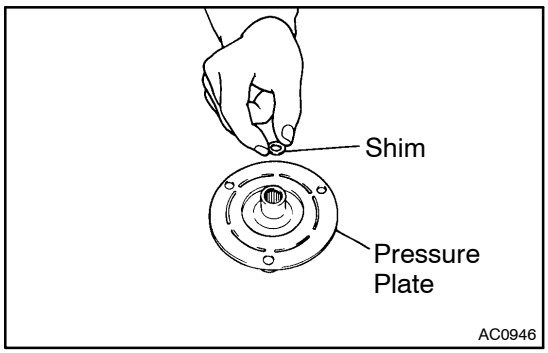
2. INSTALL ROTOR



(a) Install the rotor.
(b) Using SST, install the snap ring.
SST 95994–10020

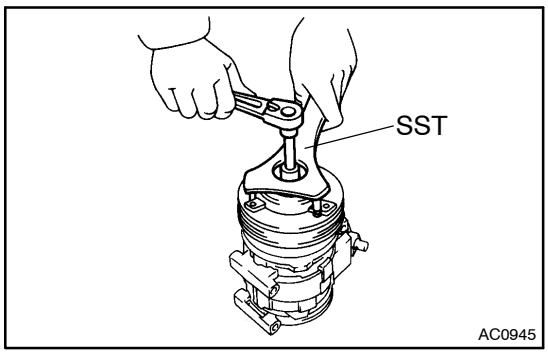


NOTICE:
The snap ring should be installed so that beveled side faces up.

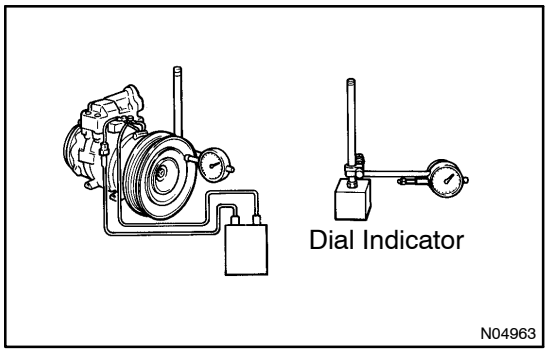


3. INSTALL PRESSURE PLATE

(a) Install the shims to the pressure plate and install the pressure plate on the rotor.



(b) Using SST and a torque wrench, install the shaft bolt.
SST 07112–66040, 07112–76060
Torque: 13.2 N·m (135 kgf·cm, 9 ft·lbf)



4. INSPECT MAGNETIC CLUTCH CLEARANCE

(a) Set the dial indicator to the pressure plate of the magnetic clutch.

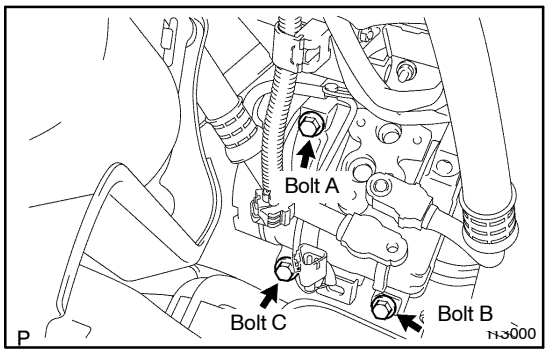
(b) Connect the magnetic clutch lead wire to the positive (+) terminal of the battery.

(c) Check the clearance between the pressure plate and rotor when connecting the negative (–) terminal to the battery.
Standard clearance:
0.45 ± 0.10 mm (0.018 ± 0.004 in.)

If the clearance is not within the standard clearance, adjust the clearance using shims to obtain the standard clearance.
Shim thickness:
0.1 mm (0.004 in.)
0.3 mm (0.012 in.)
0.5 mm (0.020 in.)

AC3SA–01

INSTALLATION



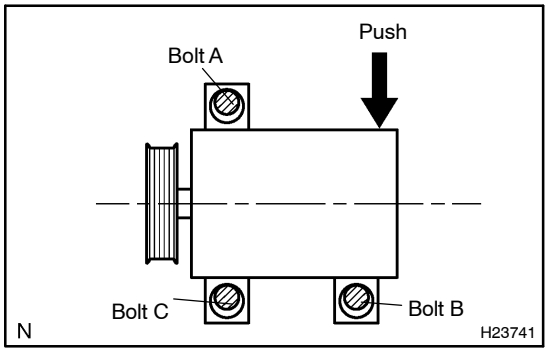
1. INSTALL COMPRESSOR

(a) Install the compressor with 3 bolts.

(b) Temporarily tighten bolt A.

HINT:

Do not over tighten the bolt until the compressor no longer moves.



(c) Push down on the rear side of the compressor and fully tighten bolt B, bolt C and bolt A in order.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(d) Connect the compressor connector.

2. CONNECT DISCHARGE AND SUCTION HOSES

(a) Lubricate 2 new O–rings with compressor oil and install them to the hoses.

(b) Connect the both hoses with 2 bolts.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

NOTICE:

Hose should be connected immediately after the caps have been removed.

3. 1ZZ–FE:

INSTALL CRUISE CONTROL ACTUATOR (See page CO–30)

4. 2ZZ–GE:

INSTALL AIR PUMP ASSEMBLY (See page CO–30)

5. INSTALL AND CHECK DRIVE BELT

(See page AC–18, AC–16)

6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

7. EVACUATE AIR FROM REFRIGERATION SYSTEM AND CHARGE SYSTEM WITH REFRIGERANT

Specified amount: 430 ± 30 g (15.17 ± 1.06 oz.)

8. INSPECT FOR LEAKAGE OF REFRIGERANT

(a) Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.

9. INSPECT A/C OPERATION

CONDENSER

AC1GJ–03

ON–VEHICLE INSPECTION

1. INSPECT CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, wash them with water and dry with compressed air.

NOTICE:

Be careful not to damage the fins.

If the fins are bent, straighten them with a screwdriver or pliers.

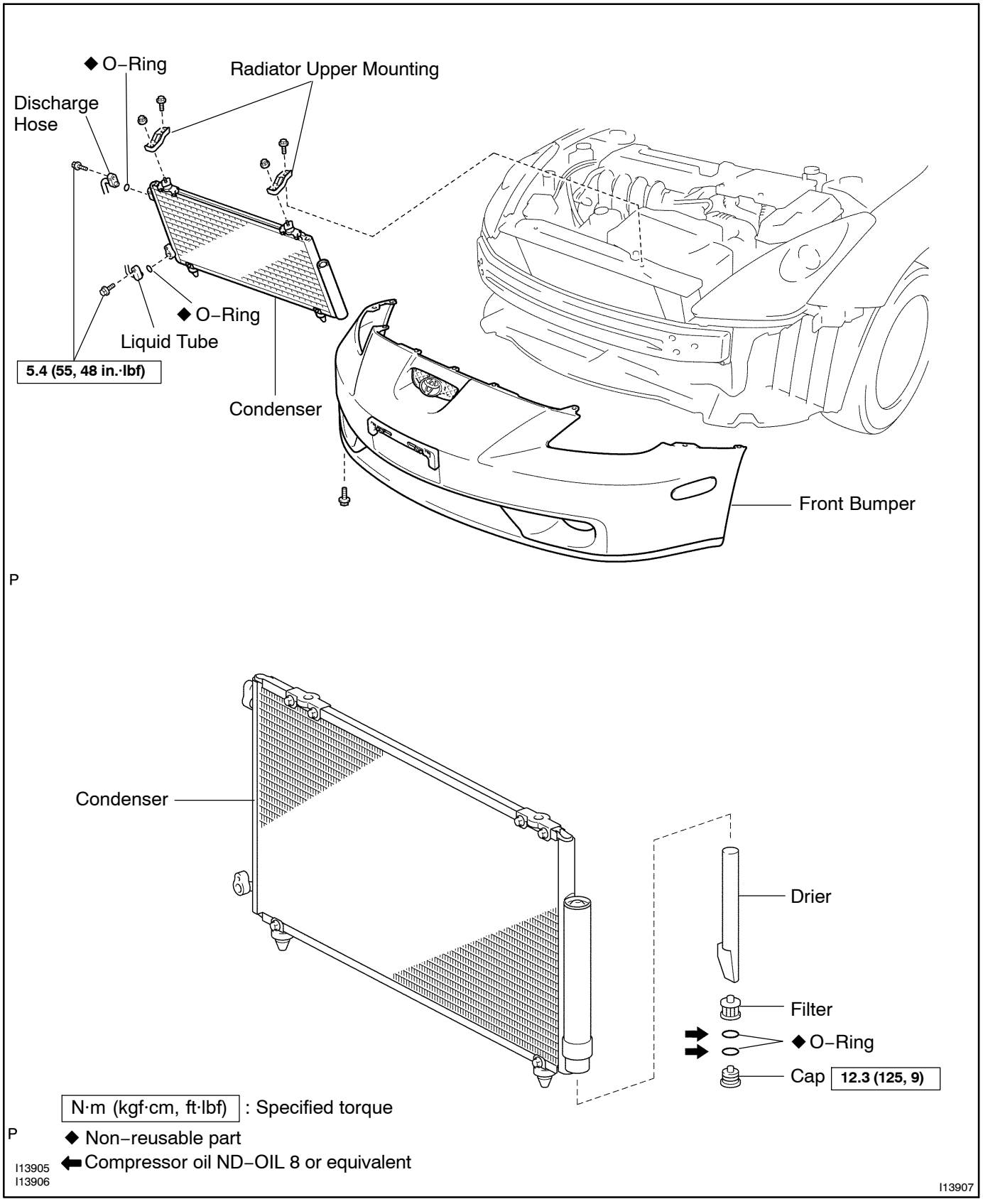
2. INSPECT CONDENSER AND FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.

AC2H5–02

COMPONENTS



AC2H6–02

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

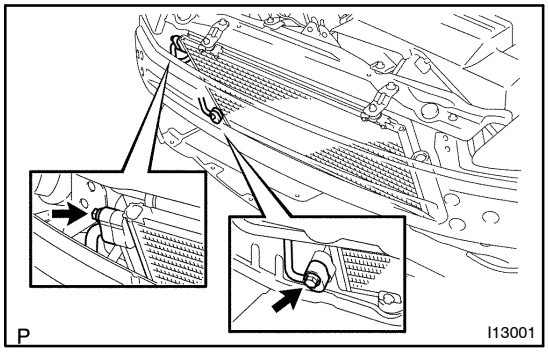
At the time of installation, please refer to the following item.

Evacuate air from refrigeration system.

Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount: 430 ± 30 g (15.17 ± 1.06 oz.)

2. REMOVE FRONT BUMPER (See page BO–4)



3. REMOVE LIQUID TUBE AND DISCHARGE HOSE

Remove 2 bolts and both tubes.

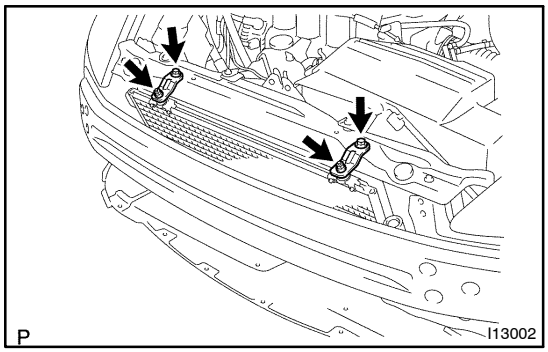
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture out of the system.

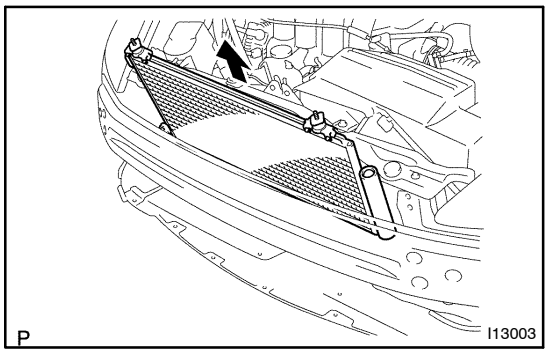
HINT:

Lubricate 2 new O–rings with compressor oil and install them to the tubes.



4. REMOVE RADIATOR UPPER MOUNTINGS

Remove the 2 bolts, 2 nuts and the 2 upper mountings.



5. REMOVE CONDENSER

Pull out the condenser.

HINT:

At the time of installation, please refer to the following item.

If condenser was replaced, add compressor oil to the compressor.

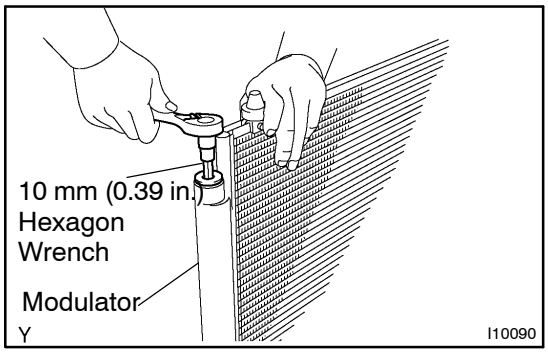
Add: 40 cc (1.4 fl. oz.)

Compressor oil: ND–OIL 8 or equivalent

AC22C–10

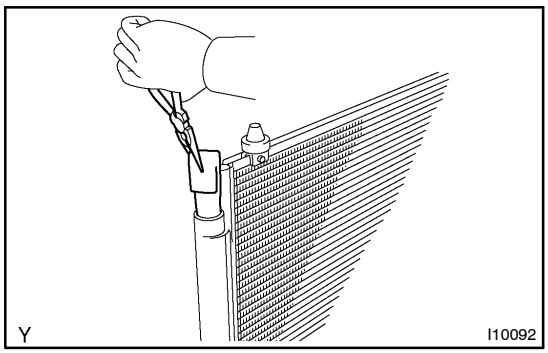
REPLACEMENT

REPLACE DRYER FROM MODULATOR

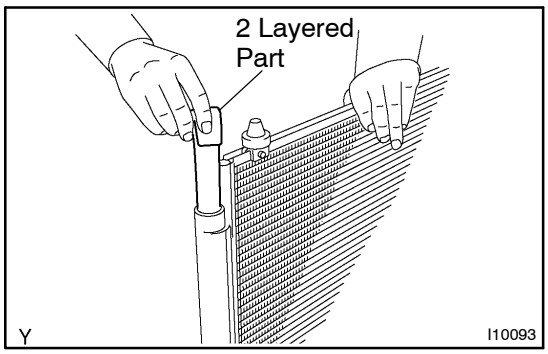


(a) Using a hexagon wrench (10 mm, 0.39 in.), remove the cap from the modulator.

(b) Remove the filter from the modulator.



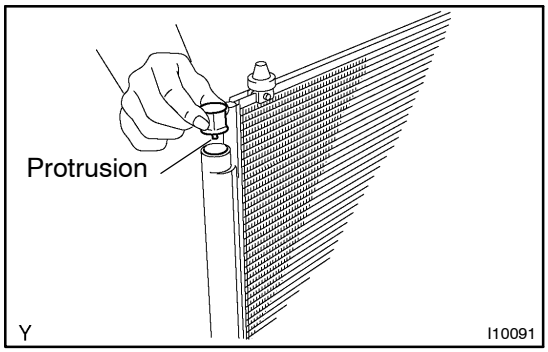
(c) Using pliers, remove the dryer.



(d) Insert a new dryer into the modulator.

NOTICE:

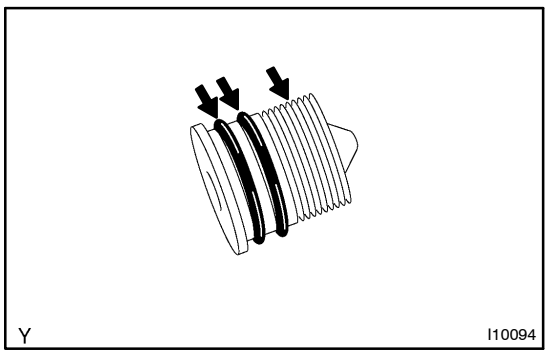
- **Do not remove the dryer from a vinyl bag until inserting it into the modulator.**
- **Install the dryer with its 2 layered part faced upward to the modulator.**



(e) Insert the filter into the modulator.

NOTICE:

Install the filter with its protrusion faced downward to the modulator.



(f) Install the cap to the modulator.

(1) Apply compressor oil to the o–rings and screw part of the cap.

Compressor oil: ND–OIL 8 or equivalent

(2) Using a hexagon wrench (10 mm, 0.39 in.), install the caps.

Torque: 12.3 N·m (125 kgf·cm, 9 ft·lbf)

AC1GL–02

INSTALLATION

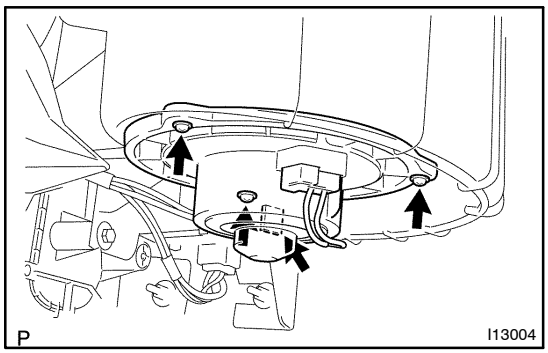
Installation is in the reverse order of removal (See page AC–45).

BLOWER MOTOR

AC1GP–07

INSPECTION

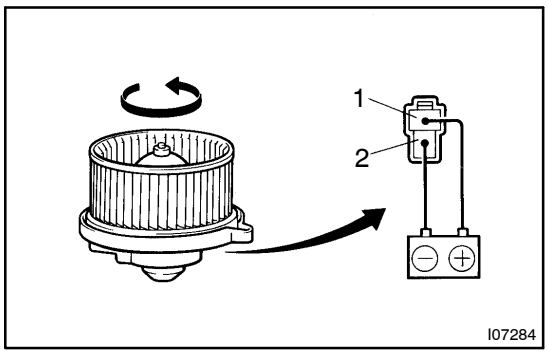
1. REMOVE GLOVE COMPARTMENT PARTS
(See page BO–79)



2. REMOVE BLOWER MOTOR

(a) Remove the wire harness clamp and disconnect the connector.

(b) Remove the 3 screws and motor.



3. INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, then check that the motor operations smoothly.

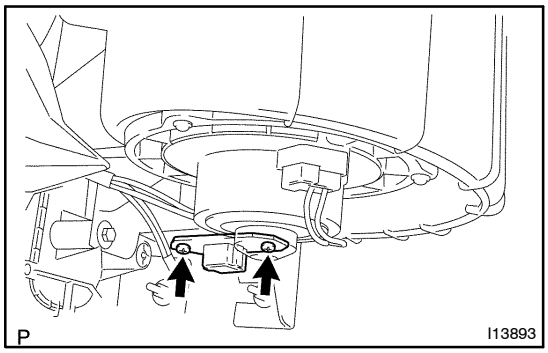
If operation is not as specified, replace the blower motor.

4. INSTALL BLOWER MOTOR

(a) Install the motor and 3 screws.

(b) Connect the connector and wire harness clamp.

5. INSTALL GLOVE COMPARTMENT PARTS
(See page BO–85)



BLOWER RESISTOR

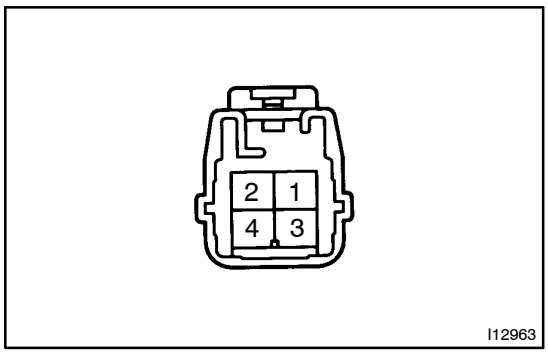
AC1GQ–04

INSPECTION

1. REMOVE BLOWER RESISTOR

(a) Disconnect the connector.

(b) Remove the 2 screws and the blower resistor.



2. INSPECT BLOWER RESISTOR CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2 – 3 – 4	Continuity

If continuity is not as specified, replace the blower resistor.

3. INSTALL BLOWER RESISTOR

(a) Install the blower resistor and 2 screws.

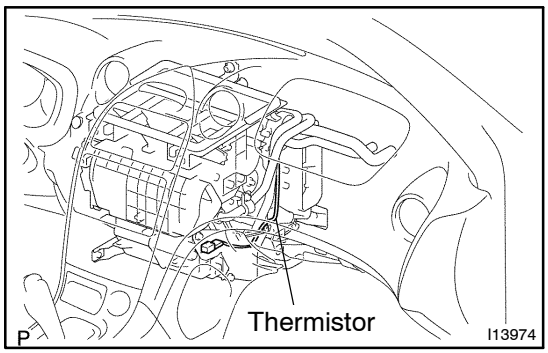
(b) Connect the connector.

THERMISTOR

AC2H7–02

INSPECTION

1. REMOVE BLOWER UNIT (See page AC–31)



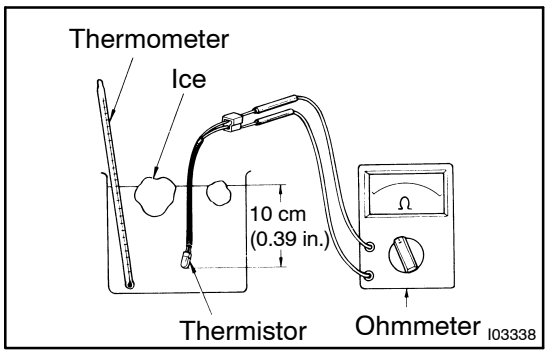
2. REMOVE THERMISTOR

(a) Disconnect the connector.

(b) Using a screwdriver, pull out the thermistor.

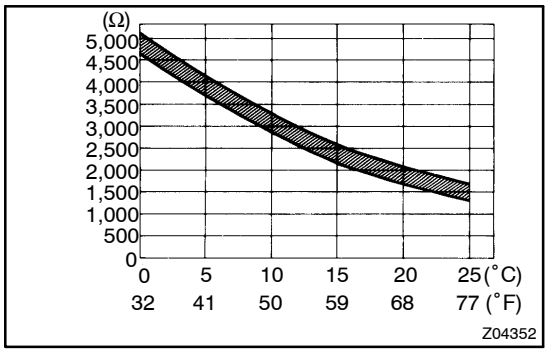
HINT:

Tape the screwdriver tip before use.



3. INSPECT THERMISTOR

(a) Place the thermistor in cold water, and while changing the temperature of water, measure resistance at the connector and at the same time, measure temperature of water with a thermometer.



(b) Compare the 2 readings on the chart.

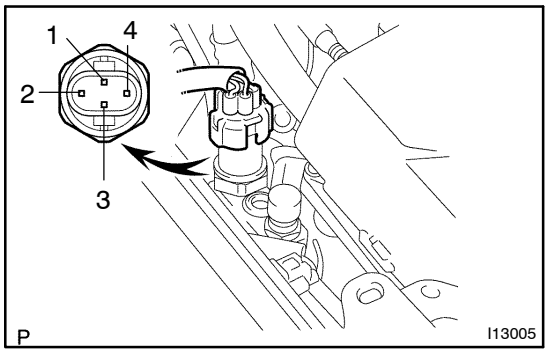
If resistance is not as specified, replace the thermistor.

4. INSTALL THERMISTOR

(a) Install the thermistor to A/C unit.

(b) Connect the connector.

5. INSTALL BLOWER UNIT (See page AC–34)

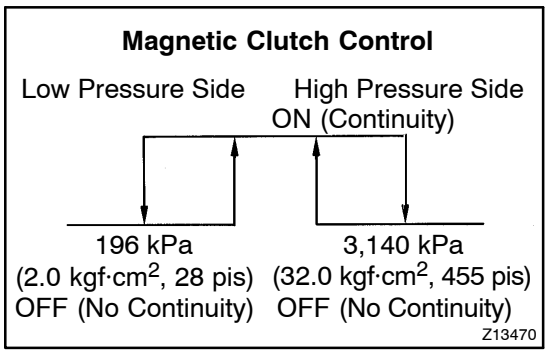


PRESSURE SWITCH

AC1GU–10

ON–VEHICLE INSPECTION

1. **SET ON MANIFOLD GAUGE SET (See page AC–19)**
2. **DISCONNECT CONNECTOR FROM PRESSURE SWITCH**
3. **RUN ENGINE AT APPROX. 1,500 RPM**

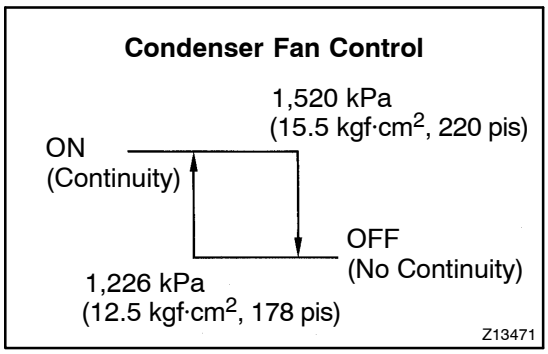


4. **Magnetic clutch control: INSPECT PRESSURE SWITCH OPERATION:**

(a) Connect the positive (+) lead from the ohmmeter to terminal 4 and the negative (–) lead to terminal 1.

(b) Check continuity between terminals when refrigerant pressure is charged, as shown in the illustration.

If operation is not as specified, replace the pressure switch.



5. **Condenser fan control: INSPECT PRESSURE SWITCH OPERATION**

(a) Connect the positive (–) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 3.

(b) Check continuity between terminals when refrigerant pressure is changed, as shown in the illustration.

If operation is not as specified, replace the pressure switch.

6. **STOP ENGINE AND SET OFF MANIFOLD GAUGE SET**
7. **CONNECT CONNECTOR TO PRESSURE SWITCH**

AC1GV–08

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERANT SYSTEM

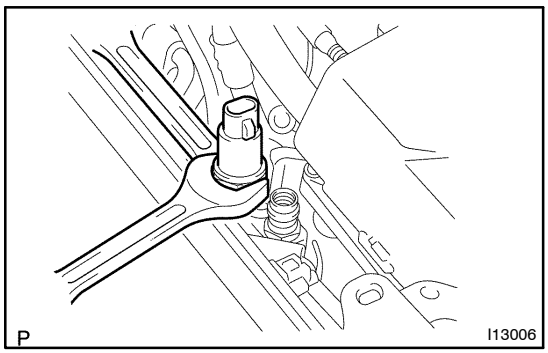
HINT:

At the time of installation, please refer to the following item.

Evacuate air from refrigeration system.

Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount: 430 ± 30 g (15.17 ± 1.06 oz.)



2. REMOVE PRESSURE SWITCH

(a) Disconnect the connector.

(b) Remove the pressure switch from the liquid tube.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

HINT:

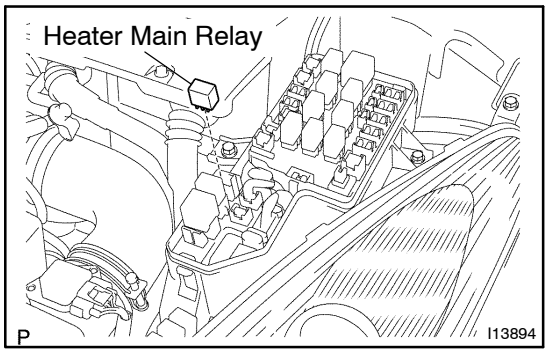
- Lock the switch mount on the tube with an open end wrench, being careful not to deform the tube, and remove the switch.
- At the time of installation, please refer to the following item.

  Lubricate a new O–ring with compressor oil and install them to the switch.

AC1GW–03

INSTALLATION

Installation is in the reverse order of removal (See page AC–52).

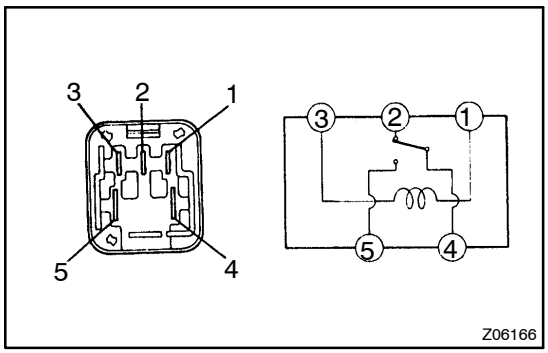


HEATER MAIN RELAY

AC1GX–03

INSPECTION

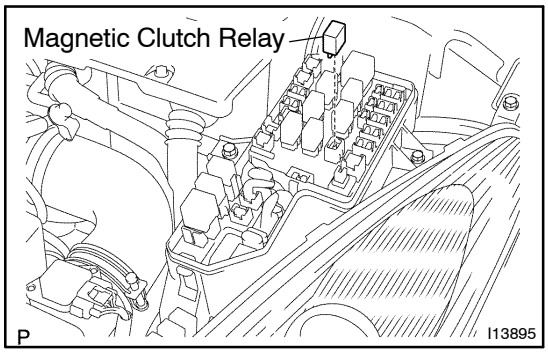
1. REMOVE HEATER MAIN RELAY FROM ENGINE ROOM RELAY BLOCK NO. 1



2. INSPECT HEATER MAIN RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 3 2 – 4	Continuity
Apply B+ between terminals 1 and 3.	4 – 5	Continuity

If continuity is not as specified, replace the relay.

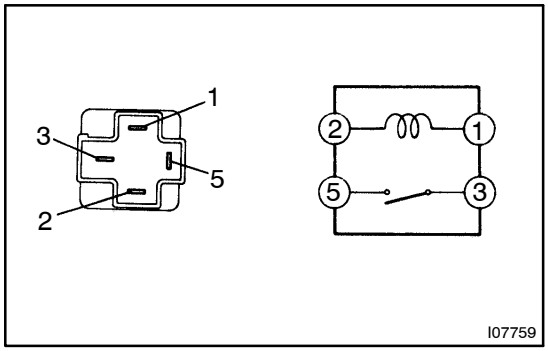


MAGNETIC CLUTCH RELAY

AC1GY–03

INSPECTION

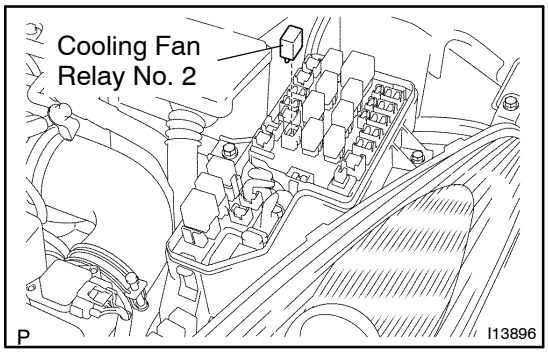
1. REMOVE MAGNETIC CLUTCH RELAY FROM ENGINE ROOM J/B



2. INSPECT MAGNETIC CLUTCH RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.

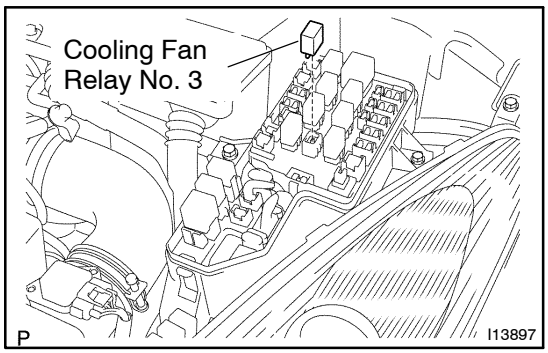


COOLING FAN RELAY

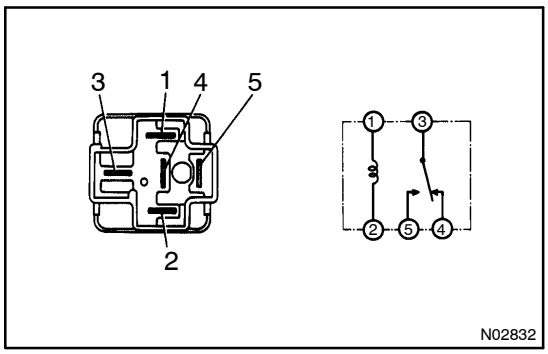
AC2H8–03

INSPECTION

1. REMOVE COOLING FAN RELAY NO. 2 FROM ENGINE ROOM J/B



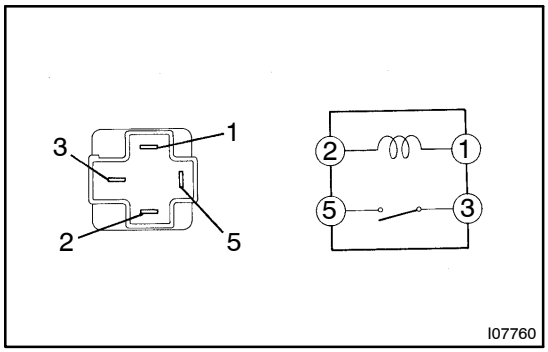
2. REMOVE COOLING FAN RELAY NO. 3 FROM ENGINE ROOM J/B



3. INSPECT COOLING FAN RELAY NO. 2 CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2 4 – 5	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.



4. INSPECT COOLING FAN RELAY NO. 3 CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

If continuity is not as specified, replace the relay.

CONDENSER FAN

AC1H0–09

ON–VEHICLE INSPECTION

1. INSPECT CONDENSER FAN OPERATION

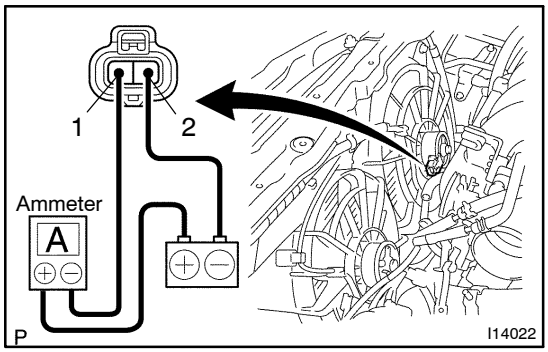
Inspect the fan operation at these conditions, as shown in the chart.

Test conditions:

- Start engine
- Blower speed control switch position ”HI”
- Temperature control dial at ”COOL” position
- Set on manifold gauge set
- A/C switch ON

Condition	Fan operation (Fan speed)
Engine coolant temperature 88 °C (190 °F) or below	Rotate (Low speed)
Engine coolant temperature 98 °C (208 °F) or above	Rotate (High speed)
Refrigerant pressure is less than 1,520 kPa (15.5 kgf/cm^2, 220 psi)	Rotate (Low speed)
Refrigerant pressure is 1,520 kPa (15.5 kgf/cm^2, 220 psi) or above	Rotate (High speed)

If operation is not as specified, proceed to the next inspection.



2. INSPECT CONDENSER FAN MOTOR OPERATION

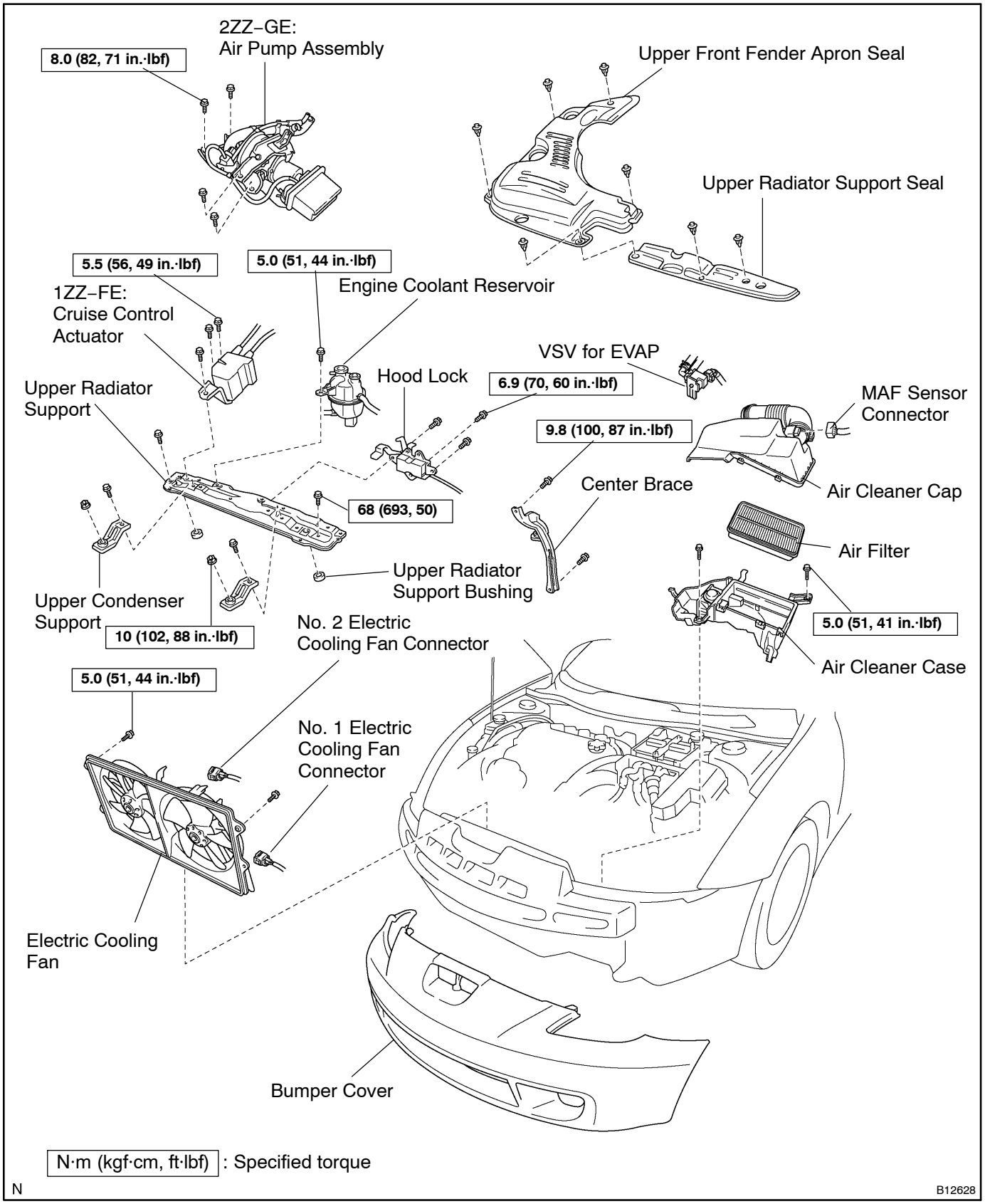
(a) Disconnect the condenser fan motor connector.
(b) Connect battery and ammeter.
(c) Check that the fan rotates smoothly, and then check the reading on the ammeter.

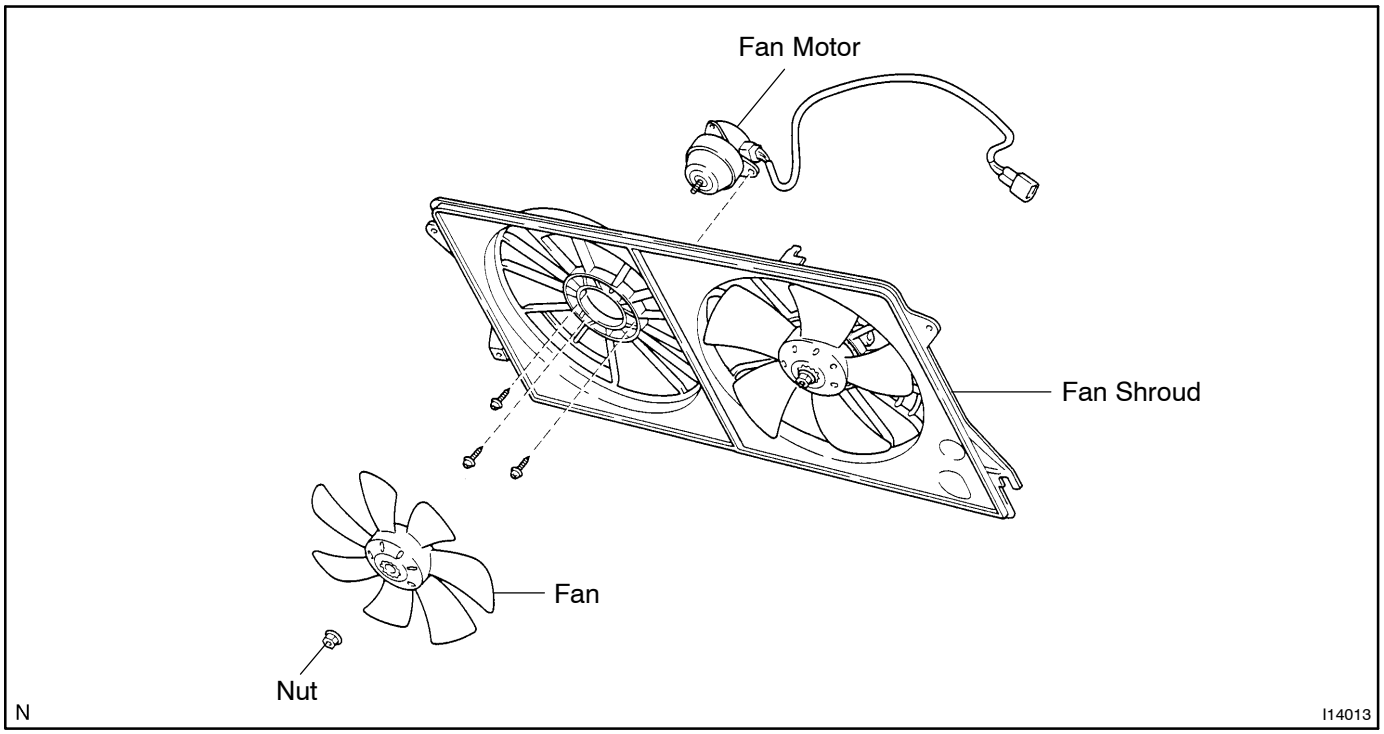
Specified amperage: 9.2 – 11.0 A at 20°C (68°F)

If operation is not as specified, replace the fan motor.
If operation is as specified, check the pressure switch, cooling fan relays and engine coolant temp. switch.

AC2H9–09

COMPONENTS




Fan Motor
Fan Shroud
Fan
Nut
N
I14013

AIR CONDITIONING AMPLIFIER

AC2HA–02

ON–VEHICLE INSPECTION

1. REMOVE COMBINATION MATER
(See page BE–48)

2. REMOVE ECM

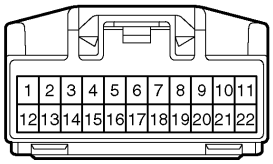
3. INSPECT A/C AMPLIFIER CIRCUIT

(a) Disconnect the connector from the combination mater and inspect the connector on the wire harness side, as shown in the chart below.

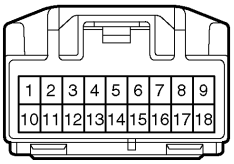
Test condition:

Turn ignition switch to ON

Wire harness side:



Connector ”A”



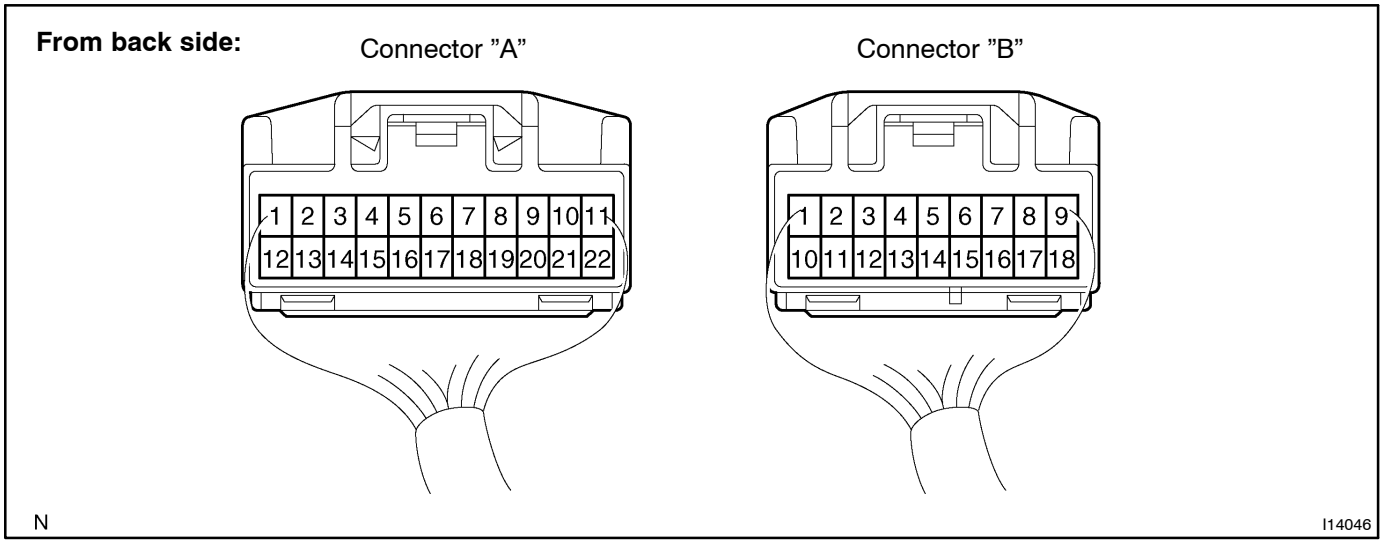
Connector ”B”

I14994

Tester connection	Condition	Specified condition
A7 – Ground	Constant	Continuity
A6 – A18	Evaporator temperature at 25°C (77°F)	1.5 kΩ

If circuit is as specified, try replacing the amplifier with a new one. If the circuit is not as specified, inspect the circuits connected to other parts.

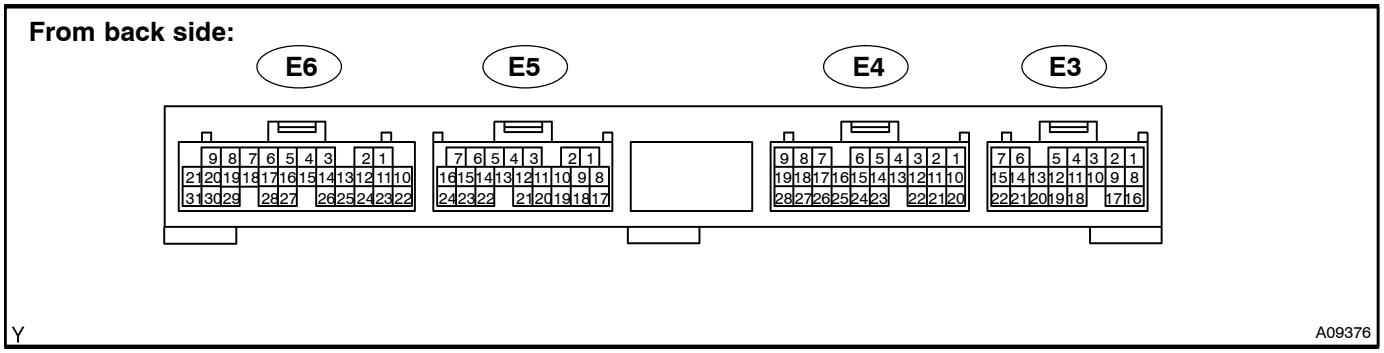
(b) Connect the connector to combination mater and inspect wire harness side from the back side, as shown in the chart below.
Test condition:
- Run engine at idle speed
- Set on manifold gauge set



Tester connection	Condition	Specified condition
B10 – Ground	A/C switch ON & Blower motor: operate	Below 1.0 V
	A/C switch OFF	Battery positive voltage
B14 – Ground	Mode selector: DEF.	Below 1.0 V
	Mode Selector: Except DEF.	Battery positive voltage
B15 – Ground	A/C switch ON	Below 1.0 V
	A/C switch OFF	Battery positive voltage
A13 – Ground	Blower motor: Operate	Below 2.0 V
	Blower motor: No operate	Battery positive voltage

If circuit is as specified, try replacing the amplifier with a new one. If the circuit is not as specified, inspect the circuits connected to other parts.

(c) Inspect the wire harness side connector of ECM from the back side, as shown in the chart below.



Tester connection	Condition	Specified condition
E3–12 ↔ Ground	Start engine. Magnetic clutch: ON	Below 1.0 V
	Start engine. Magnetic clutch: OFF	Battery positive voltage
E4–28 ↔ Ground	Start engine. A/C switch ON	Battery positive voltage
	Start engine. A/C switch OFF	No voltage
E4–18 ↔ Ground	Refrigerant pressure: 196 – 1,340 kPa	Battery positive voltage
	Refrigerant pressure: less than 196 or more than 1,340 kPa	No voltage

If circuit is as specified, try replacing the amplifier with a new one. If the circuit is not as specified, inspect the circuits connected to other parts.

AC2HB–02

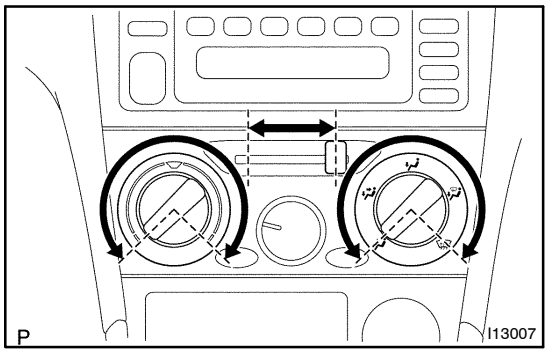
REMOVAL

1. REMOVE COMBINATION METER (See page BE–48)
2. REMOVE ECM

AC2HC–02

INSTALLATION

Installation is in the reverse order of removal (See page AC–63).



HEATER CONTROL ASSEMBLY

AC2HD–06

ON–VEHICLE INSPECTION

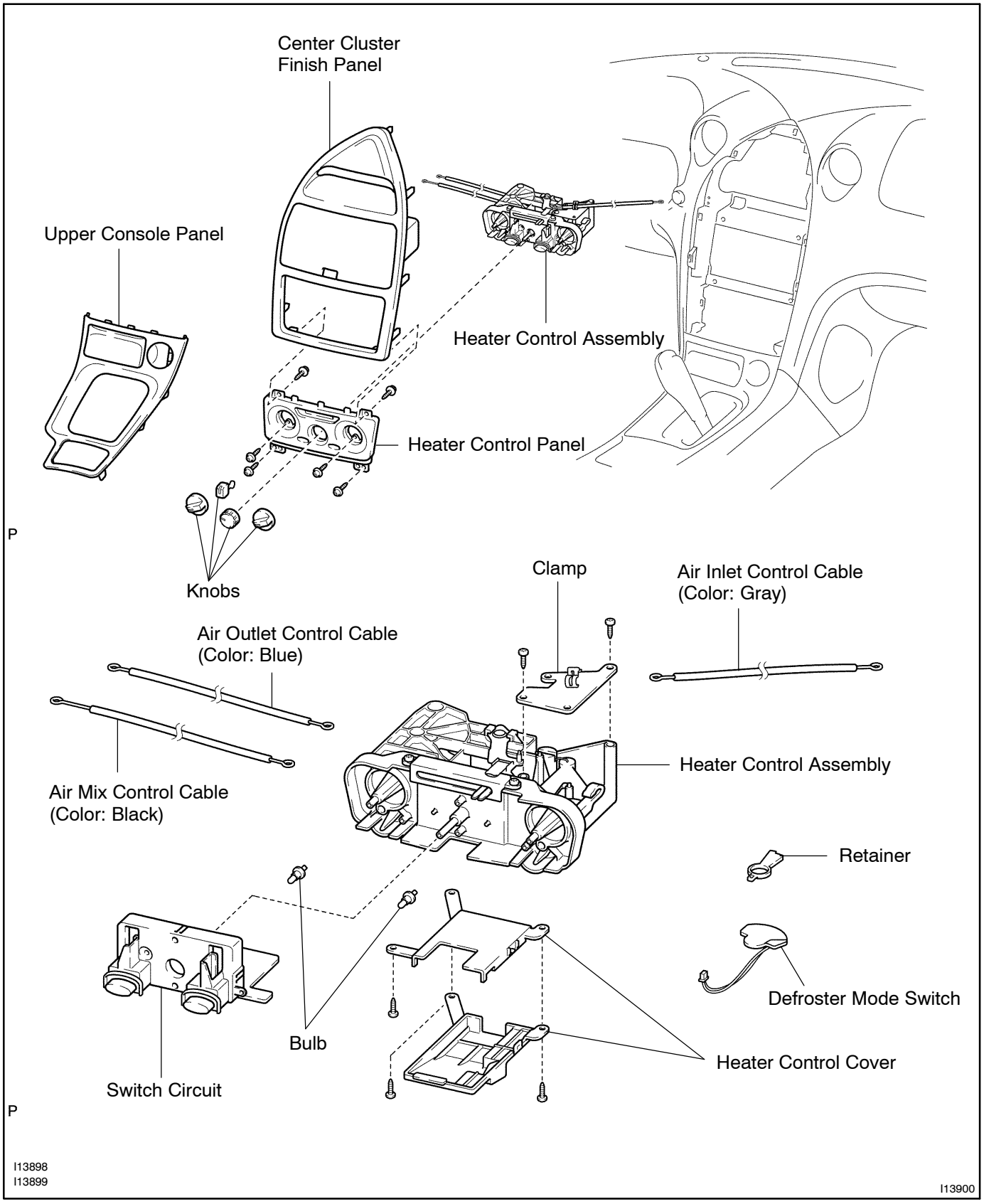
INSPECT HEATER CONTROL DIALS OPERATION

Turn the control lever and 2 control dials left and right then check that click sound can be heard and recoil is felt.

If click sound can not be heard or recoil is felt, adjust the control cable or check control cable and heater control assembly.

AC2HE–02

COMPONENTS



AC2HF–03

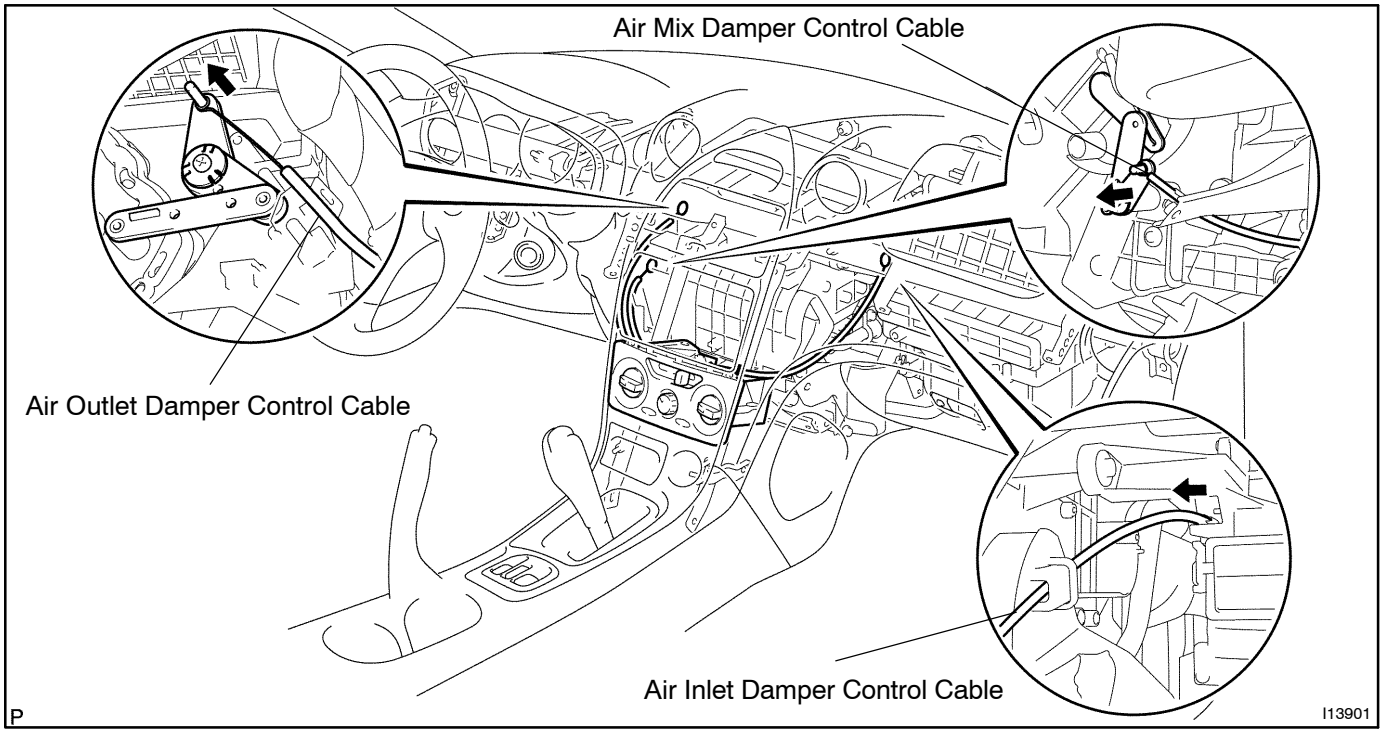
REMOVAL

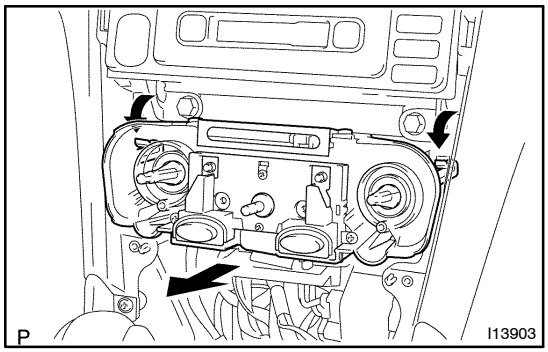
1. REMOVE CENTER CLUSTER FINISH PANEL
(See page BO–79)

2. DISCONNECT HEATER CONTROL CABLES

NOTICE:

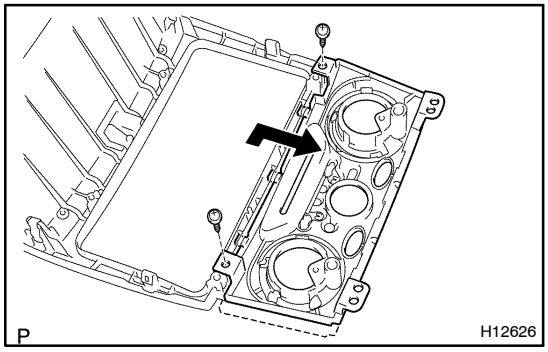
When the air mix damper control cables is disconnected, should not bend the cable.





3. REMOVE HEATER CONTROL ASSEMBLY

Release the 2 claws and pull out the A/C control assembly, then disconnect the connector.



4. REMOVE HEATER CONTROL PANEL

(a) Remove the 2 screws.

(b) Slide and remove the A/C control assembly.

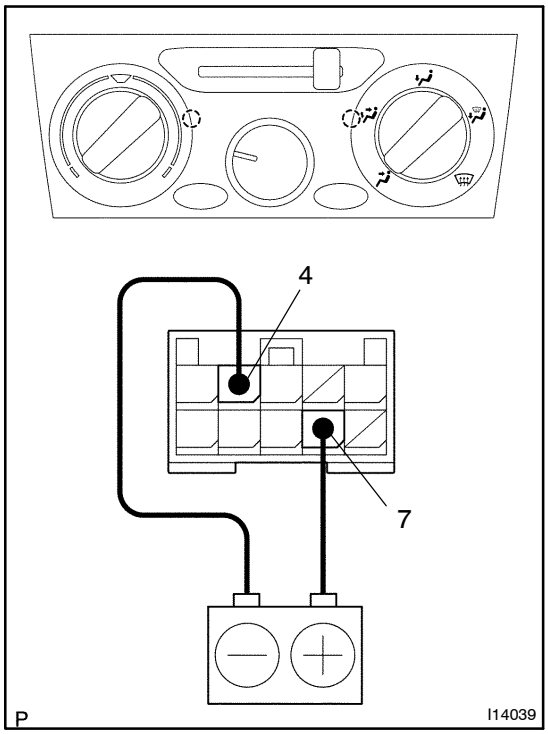
AC2HS–03

INSPECTION

1. INSPECT ILLUMINATION OPERATION

Connect the positive (+) lead from the battery to terminal 7 and negative (–) lead to terminal 4 then check that the illuminations lights up.

If operation is not as specified, check the faulty bulb.

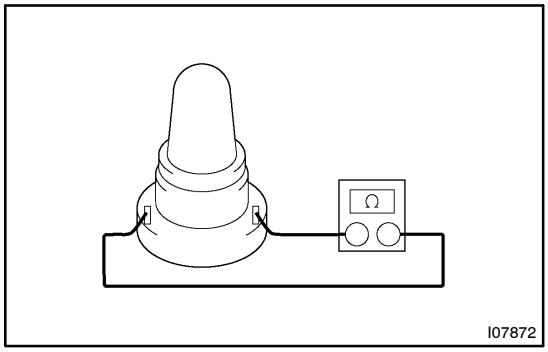


2. INSPECT BULB

Apply the tester as shown in the illustration to the test for continuity.

If continuity exists, replace the heater control.

If no continuity exists, replace the bulb.

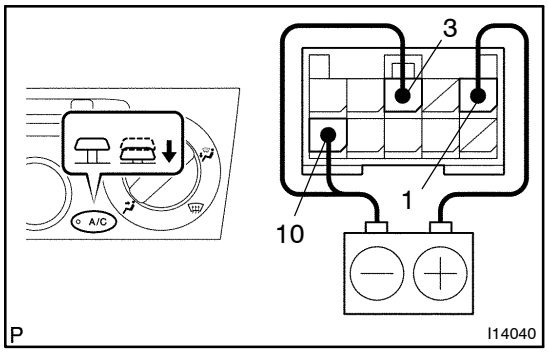


3. INSPECT A/C INDICATOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3 and 10.

(b) Push the A/C button in and then check that the indicator lights up.

If operation is not as specified, replace the switch.

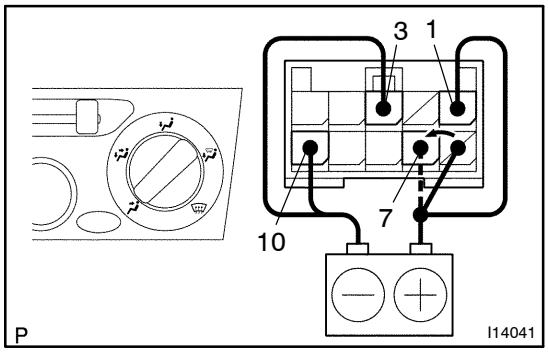


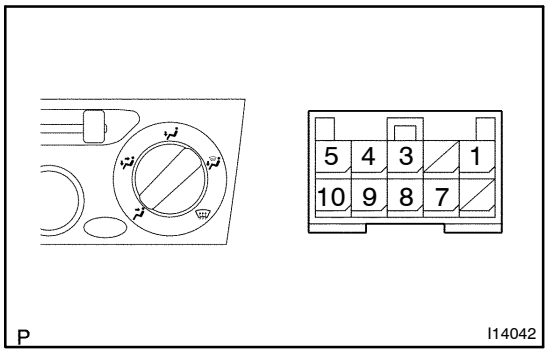
4. INSPECT DIMMING OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3 and 10 while press the switch.

(b) Connect the positive (+) lead from battery to terminal 7 and then check that the indicator dims.

If operation is not as specified, replace the switch.

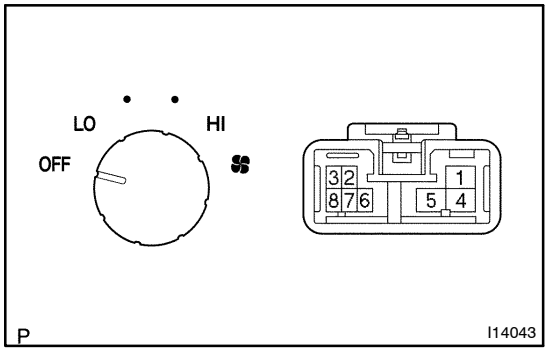




5. INSPECT A/C SWITCH CONTINUITY

Condition/ Circuit	Tester connection	Specified condition
OFF	–	No continuity
ON	9 – 3	Continuity

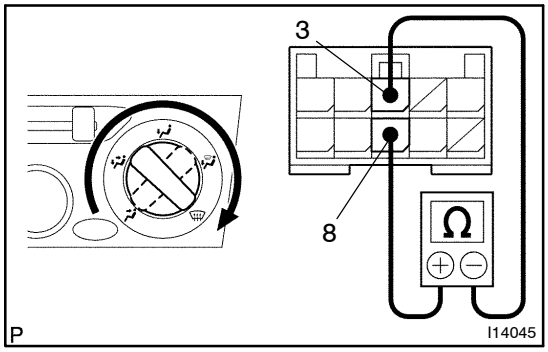
Switch continuity:
If continuity is not as specified, replace the switch.
Illumination circuit:
If continuity is not as specified, replace the bulb.



6. INSPECT BLOWER SPEED CONTROL SWITCH CONTINUITY

Position/ Circuit	Tester connection	Specified condition
OFF	–	No continuity
LO	1 – 8	Continuity
M1	1 – 6 – 8	Continuity
M2	1 – 5 – 8	Continuity
HI	1 – 4 – 8	Continuity

If continuity is not as specified, replace the switch.



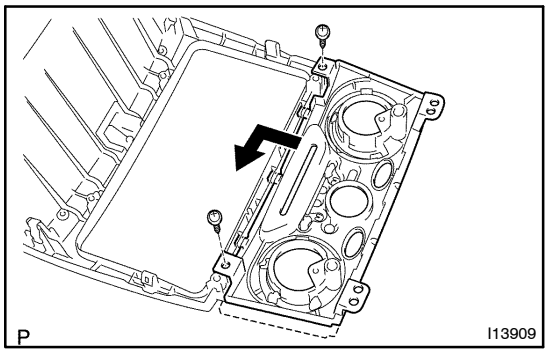
7. INSPECT DEFROSTER MODE SWITCH OPERATION

Position/ Circuit	Tester connection	Specified condition
OFF	–	No continuity
ON	3 – 8	Continuity

If no continuity exists, replace the switch.

8. INSPECT REAR DEFOGGER SWITCH OPERATION (See page BE–58)

AC2HG–06



INSTALLATION

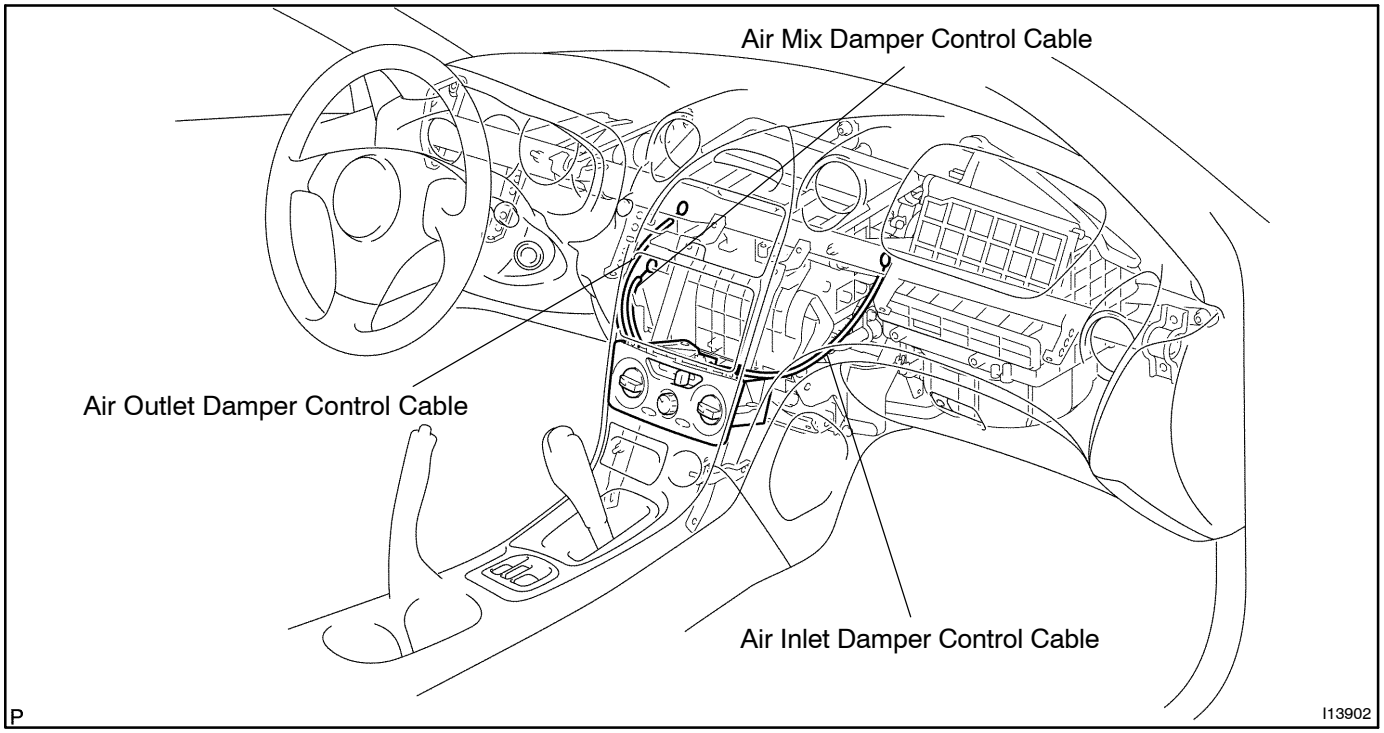
1. INSTALL A/C CONTROL PANEL

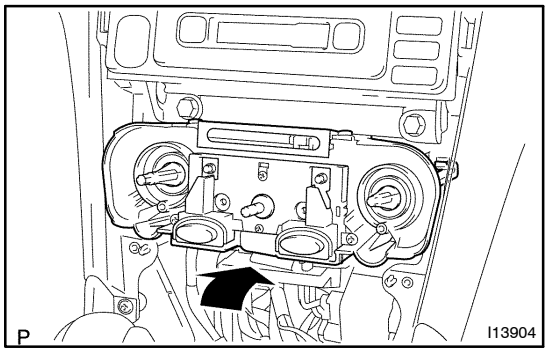
Install the A/C control panel and 2 screws.

2. INSTALL A/C CONTROL ASSEMBLY

(a) Install the A/C control assembly temporarily.

(b) Pass through the A/C control cables as shown in the illustration.





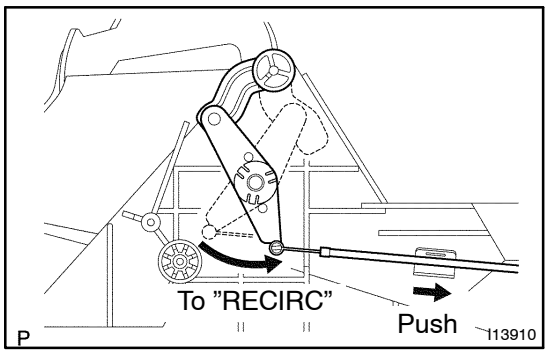
(c) Fit the 2 claws of heater control assembly in the instrument panel hole.

3. CONNECT A/C CONTROL CABLES

(a) Set air inlet control lever to ”RECIRC” position.

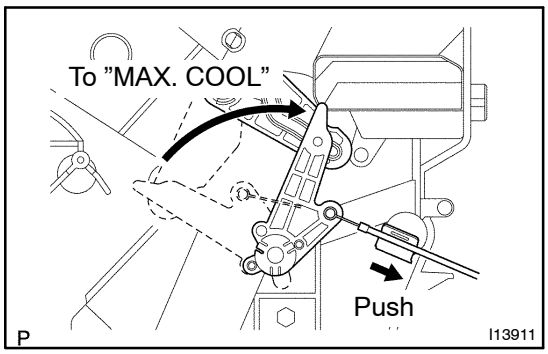
(b) Set temperature control dial to ”MAX. COOL” position.

(c) Set mode control dial to ”DEF” position.



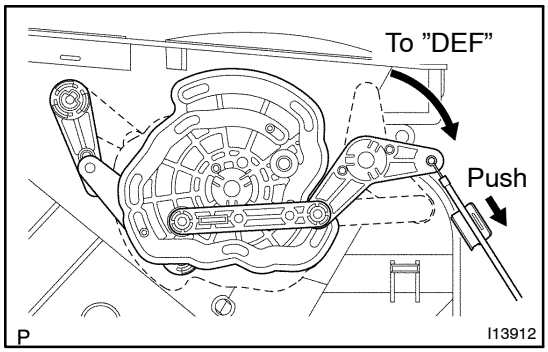
(d) Adjust air inlet damper control cable.
Set air inlet damper control lever to ”RECIRC” position and connect the inner cable to lever pin and clamp the outer cable.

HINT:
Lock the clamp while lightly pushing the outer cable to the direction shown by arrow in the illustration.



(e) Adjust air mix damper control cable.
Set air mix damper control lever to ”MAX. COOL” position and connect the inner cable to lever pin and clamp the outer cable.

HINT:
Lock the clamp while lightly pushing the outer cable to the direction shown by arrow in the illustration.



(f) Adjust air outlet damper control cable.
Pull the air outlet damper control link to ”DEF” position, connect the control cable and lock the clamp.

HINT:
Lock the clamp while lightly pushing the outer cable to the direction shown by arrow in the illustration.

ENGINE COOLANT TEMPERATURE (ECT) SWITCH

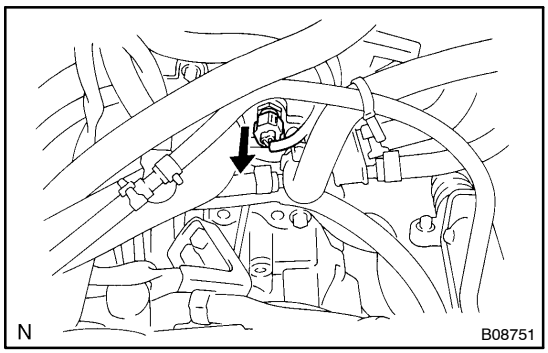
AC1HE–04

INSPECTION

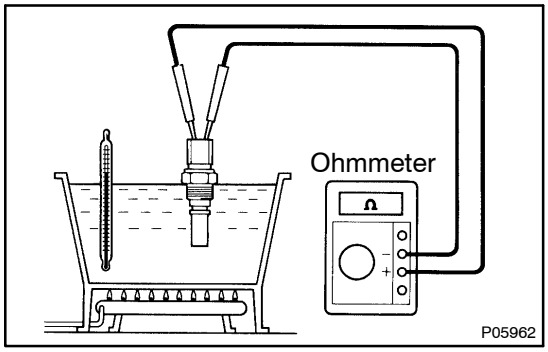
1. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

It is not necessary to drain out all the coolant.



2. REMOVE ECT SWITCH



3. INSPECT SWITCH CONTINUITY

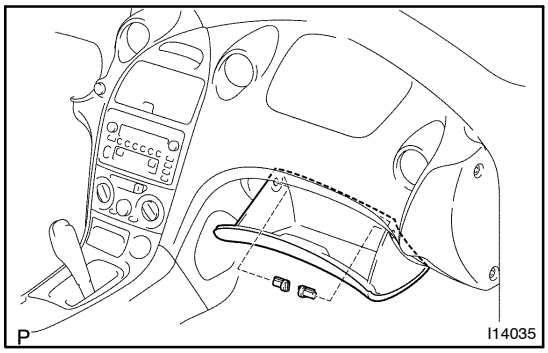
(a) Using an ohmmeter, check that no continuity exists between the terminals when the coolant temperature is above 90°C (194°F).

(b) Using an ohmmeter, check that continuity exists between the terminals when the coolant temperature is below 83 °C (181°F).

If no continuity exists, replace the switch.

4. INSTALL ECT SWITCH

5. REFILL ENGINE COOLANT



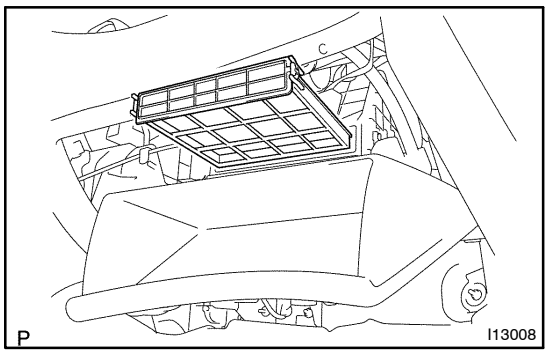
AIR REFINER FILTER

AC2HH–05

REPLACEMENT

1. REMOVE AIR REFINER FILTER

(a) Remove the 2 pins in the glove box and open the glove box widely by pulling it down.



(b) Pull out the filter case.
(c) Remove the air refiner filter from the filter case.

2. INSTALL AIR REFINER FILTER

(a) Install the air refiner filter to filter case.
(b) Install the filter case.
(c) Close the glove box and install the 2 pins to it.