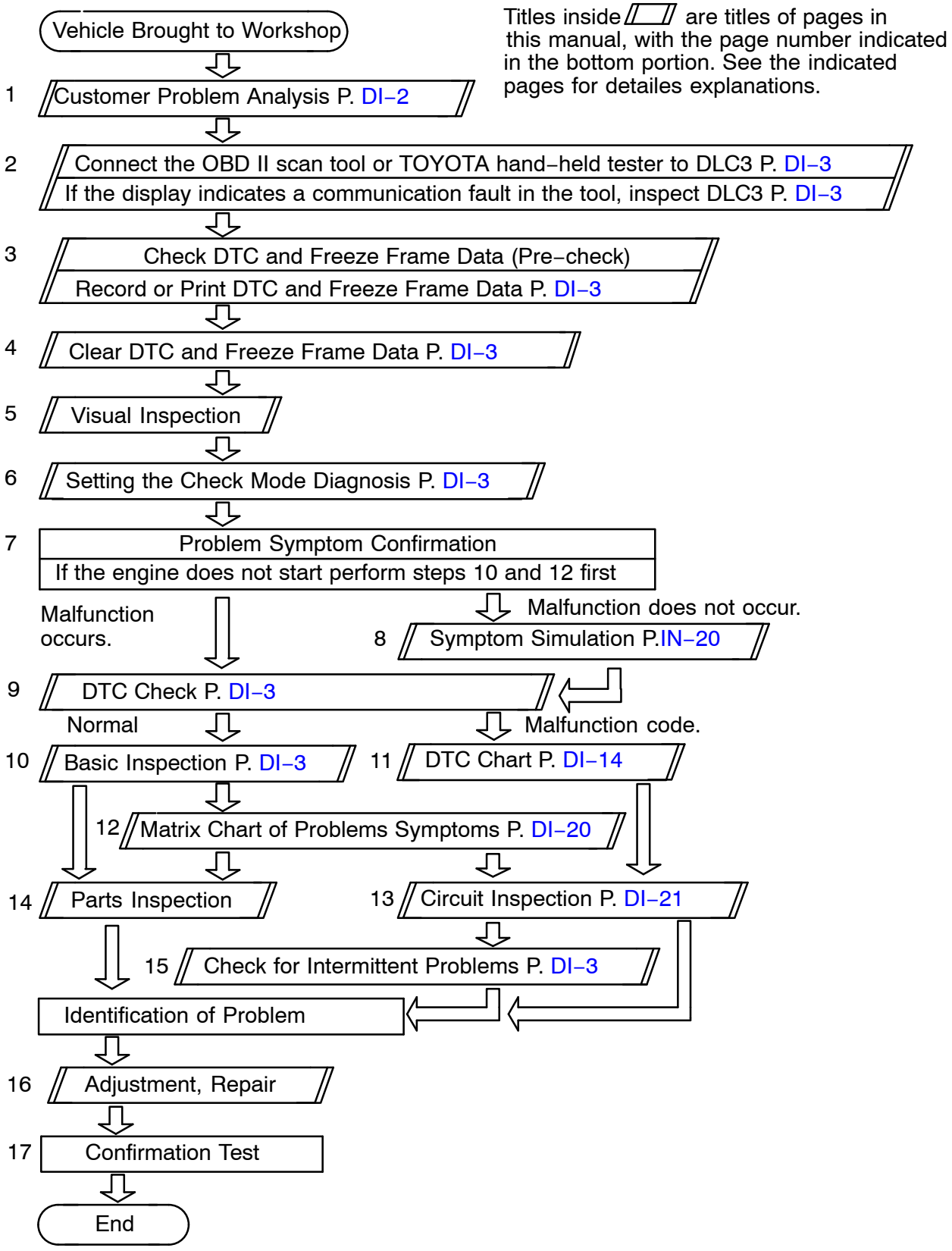
ENGINE

DI3Z5–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.



DI3Z6–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

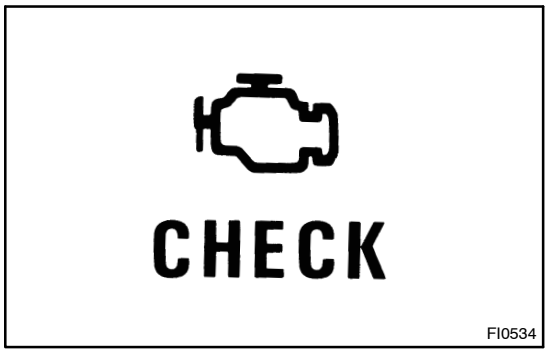
Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

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 Driveaability	☐ 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	

Datas 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. ____˚F/____˚C)
	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 MIL		☐ Remains on ☐ Sometimes light up ☐ Does not light up
DTC Inspection	Normal mode (Precheck)	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )
	Check Mode	☐ Normal ☐ Malfunction code(s) (code) ☐ Freeze frame data ( )

DI3Z7–01

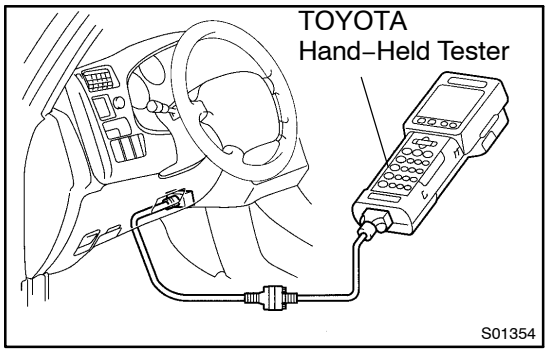


PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBDII vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBDII scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.
- OBDII regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Light (MIL) on the instrument panel when the computer detects a malfunction in the computer itself on in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Code (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–14).
- If the malfunction does not recur in 3 trips, the MIL goes off but the DTC remain recorded in the ECM memory.

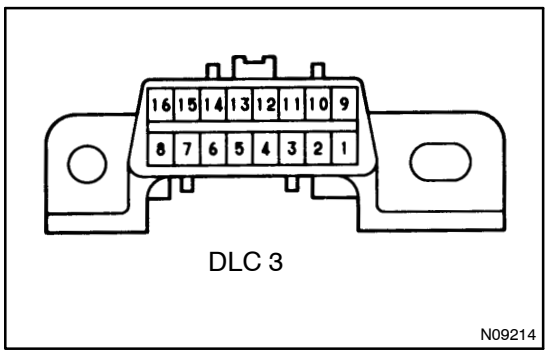


- To check the DTC, connect the OBDII scan tool or TOYOTA hand–held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBDII scan tool or TOYOTA hand–held tester also enables you to erase the DTC and check freezed frame data and various forms of engine data. (For operating instructions, see the OBDII scan tool's instruction book.)
- DTC include SAE controlled codes and Manufacture 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–14).
- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTC use 2 trip detection logic* to prevent erroneous detection and ensure thorough malfunction 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 (TOYOTA hand–held tester only) (See page DI–3).
- *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 second drive test, this second detection causes the MIL to light up.
- The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTC P0300 – P0304) or fuel trim malfunction (DTC P0171, P0172), or other malfunction (first malfunction only), is detected.
- Because freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
- Priorities for Troubleshooting:
  If troubleshooting priorities for multiple diagnostic codes are given in the applicable diagnostic chart, these should be followed.

If no instructions are given, troubleshoot DTC according to the following priorities.

(1) DTC other than fuel trim malfunction (DTC P0171, P0172), EGR (DTC P0401, P0402), and misfire (DTC P0300 – P0304).



DLC 3

(2) Fuel trim malfunction (DTC P0171, P0172) and EGR (DTC P0401, P0402).

(3) Misfire (DTC P0300 – P0304).

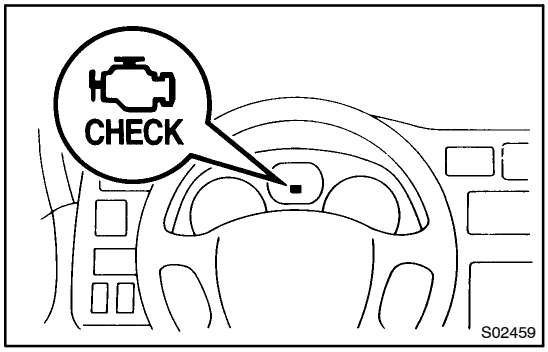
(b) Check the DLC3.

The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection / Voltage or Resistance	Condition
2	Bus ⊕ Line / Pulse generation	During transmission
4	Chassis Ground / ↔ Body Ground 1 Ω or less	Always
5	Signal Ground / ↔ Body Ground 1 Ω or less	Always
16	Battery Positive / ↔ Body Ground 9 ~ 14V	Always

HINT:
If your display shows ”UNABLE TO CONNECT TO VEHICLE” when you have connected the cable of the OBDII scan tool or TOYOTA 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.

(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:
TOYOTA hand–held tester only:
When the diagnosis system is switched from normal mode to check mode, it erases all DTC and freezed frame data recorded in normal mode. So before switching modes, always check the DTC and freezed frame data, and note them down.

(1) Prepare the OBDII scan tool (complying with SAE J1978) or TOYOTA hand–held tester.

(2) Connect the OBDII scan tool or TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn the OBDII scan tool or TOYOTA hand–held tester switch ON.

(4) Use the OBDII scan tool or TOYOTA hand–held tester to check the DTC and freezed frame data, note them down.

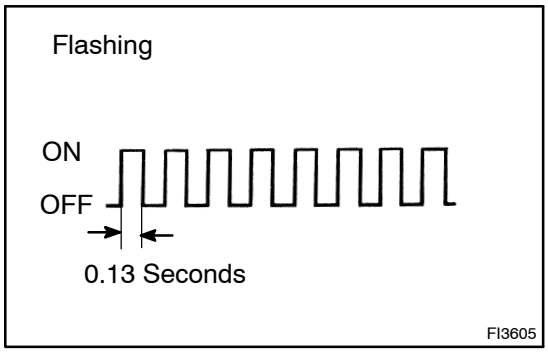
(5) See page DI–14 to confirm the details of the DTC.

NOTICE:
When simulating symptoms with an OBDII scan tool (Excluding TOYOTA hand–held tester) to check the DTC, use normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTC are recorded in the ECM.

3. INSPECT DIAGNOSIS (Check Mode)

HINT:
TOYOTA Hand–Held Tester only:
Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

(a) Check the DTC.
  (1) Initial conditions.
    - Battery positive voltage 11 V or more.
    - Throttle valve fully closed.
    - Transmission in park or neutral position.
    - Air conditioning switched OFF.
  (2) Turn ignition switch OFF.
  (3) Prepare the TOYOTA hand–held tester.



  (4) Connect the TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.
  (5) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
  (6) Switch the TOYOTA hand–held tester normal mode to check mode. (Check that the MIL flashes.)
  (7) Start the engine. (The 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 DTC, etc.

  (9) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTC and freezed frame data, etc.

HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode, so all diagnostic codes, etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

The following actions will erase the DTC and freezed frame data.

(1) Operating the OBDII scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes.
(See the OBDII scan tool's instruction book for operating instructions.)

(2) Disconnecting the battery terminals or EFI fuse.

NOTICE:

If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice–versa, or it the ignition switch is turned from ON to ACC or OFF during check mode, the DTC and freezed frame data will be erased.

4. FAIL–SAFE CHART

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

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0105	Ignition timing fixed at 5° BTDC	Returned to normal condition
P0110	Intake air temp. is fixed at 68°F (20°C)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 176°F (80°C)	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively When closed throttle position switch is ON: 0.1 V ≦ VTA ≦ 0.95 V
P0325	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 1 ignition

5. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand–held tester only:

By putting the vehicle's ECM in check mode, 1 trip detection logic possible instead of 2 trip detection logic and sensitivity to detect open circuit is increased. This makes it easier to detect intermittent problems.

(1) Clear the diagnostic trouble codes (See page DI–3)
(2) Set the check mode (See page DI–3)
(3) Perform a simulation test (See page IN–20)
(4) Check the connector and terminal inspection (See page IN–30)
(5) Visual check and contact pressure (See page IN–30)
(6) Handle the connector (See page IN–30)

6. BASIC INSPECTION

When the Malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems.

In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in 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 STARTING and continue to troubleshoot.**

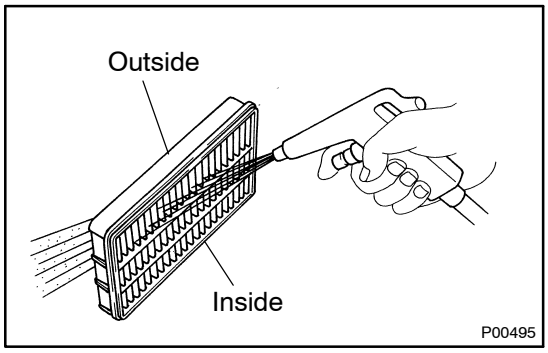
YES

3	**Does engine start?**

NO → **Go to step 7.**

YES

4	Check air filter.



PREPARATION:
Remove air filter.
CHECK:
Visually check that the air cleaner element is not excessively dirty or oily.
HINT:
If necessary, clean element with compressed air.
First blow from inside thoroughly,then blow from outside of element.

NG → **Repair or replace.**

OK ↓

5	Check idle speed.

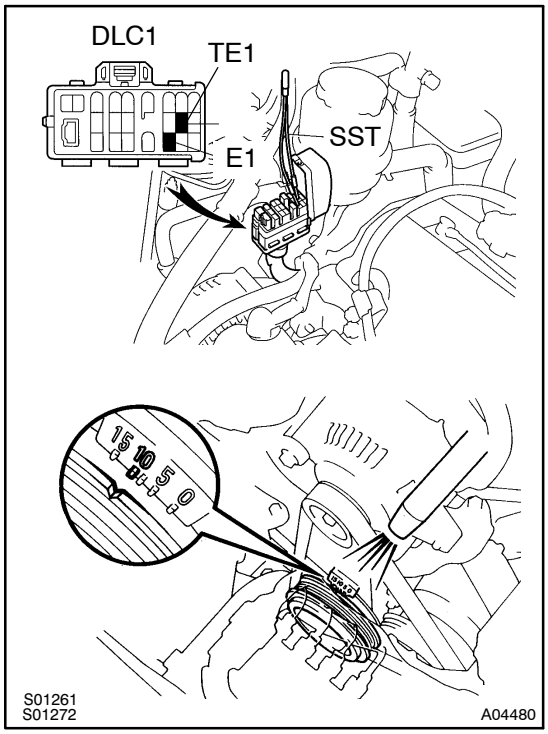
PREPARATION:
(a) Warm up engine to normal operating temperature.
(b) Switch off all accessories.
(c) Switch off air conditioning.
(d) Shift transmission into ”N” position.
(e) Connect the OBDII scan tool or TOYOTA hand–held tester to DLC3 on the vehicle.

CHECK:
Use CURRENT DATA to check the engine idle speed.
OK:
Idling speed: 650 – 750 rpm

NG → **Proceed to matrix chart of problem symptoms on page DI–20.**

OK ↓

6	Check ignition timing.



PREPARATION:

(a) Warm up engine to normal operating temperature.
(b) Shift transmission into ”N” position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of DLC1.
SST 09843–18020
(e) Using a timing light, connect the tester to No.1 high–tension cord.

CHECK:

Check ignition timing.

OK:

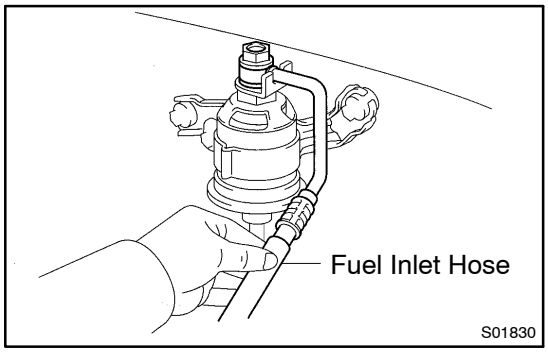
Ignition timing: 10° BTDC at idle

NG → **Proceed to IGNITION and continue to troubleshoot.**

OK

Proceed to matrix chart of problem symptoms on page DI–20.

7	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Turn ignition switch ON.
(c) Connect the TOYOTA hand–held tester to DLC3 on the vehicle.
(d) Use ACTIVE TEST mode to operate the fuel pump.
(e) 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–5).

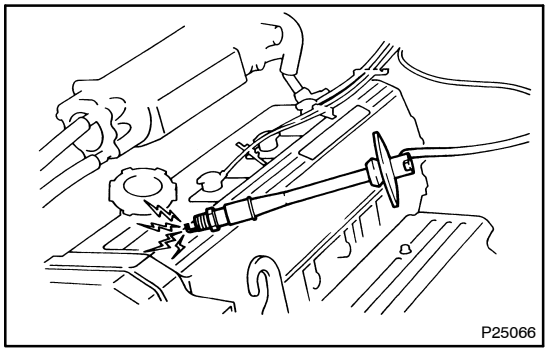
CHECK:

Check for fuel pressure in the inlet hose when it is pinched off.
HINT:
At this time, you will hear a fuel flowing noise.

NG → **Proceed to page SF–5 and continue to trouble-shoot.**

OK

8	Check for spark.



PREPARATION:

(a) Disconnect the high–tension cord from spark plug.
(b) Remove spark plug.
(c) Install spark plug to high–tension cord.
(d) Disconnect 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, do not crank the engine for more than 5 – 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to trouble-shoot.**

OK

Proceed to matrix chart of problem systems on page DI–20.

7. ENGINE OPERATING CONDITION

NOTICE:

The value given below for "Normal Condition" are representative values, so a vehicle may still be normal even it its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

(a) CARB Mandated Signals

TOYOTA hand–held tester display	Measurement Item	Normal Condition *
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warning up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 20.7 – 48.4 % Racing without load (2,500 rpm) : 17.7 – 45.3 %
COOLANT TEMP	Engine Coolant Temperature Sensor Value	After warning up: 80 – 95°C (176 – 203°F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 700 ± 50 rpm
VEHICLE SPD	Vehicle Speed	Vehicle Stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance Ignition Timing of Cylinder No.1	Idling: BTDC 0 – 10°
INTAKE AIR	Intake Air Temperature Sensor Value	Equivalent to Ambient Temp.
MAP	Absolute Pressure Inside Intake Manifold	Idling: 21 – 49 kPa Racing without load (2,500 rpm): 17 – 46 kPa
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a Percentage 0V → 0 %, 5V → 100 %	Throttle Fully Closed: 6 – 16 % Throttle Fully Open: 64 – 98 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bnak 1,Sensor 1	Idling : 0.1 – 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving 50 km/h (31 mph): 0.1 – 0.9 V

*: 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.

(b) TOYOTA Enhanced Signals

TOYOTA hand–held tester display	Measurement Item	Normal Condition *
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 RPM
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 9 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 1.9 – 3.3 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 25 – 60 %
STARTER SIG	Starter Signal	Cranking: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
PNP SW	Park / Neutral Position Switch Signal	P or N position: ON
ELCTRCL LOAD SIG	Electrical Load Signal	Defogger S/W ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL#1 CYL#2 CYL#3 CYL#4	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignitions for every 1,000 revolutions	0 – 2,000
EGR SYSTEM	EGR system operating condition	Idling: OFF
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operating: ON
VAPOR PRESS VSV	Vapor Pressure VSV Signal	VSV operating: ON
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich.	Idling after warned up: 0 – 1,000 msec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean.	Idling after warned up: 0 – 1,000 msec.

*: If 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.

DI3Z8–02

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 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.

SAE DEFINED

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0105 (DI–21)	Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction	• Open or short in Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM	○ *1	○
P0106 (DI–24)	Manifold Absolute Pressure / Barometric Pressure Circuit Ranger / Performance Problem	• Manifold absolute pressure sensor	○ *1	○
P0110 (DI–25)	Intake Air Temp. Circuit Malfunction	• Open or short in take air temp. sensor circuit • Intake air temp. sensor • ECM	○ *1	○
P0115 (DI–29)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○ *1	○
P0116 (DI–33)	Engine Coolant Temp. Circuit Range / Performance Problem	• Engine coolant temp. sensor • Cooling system	○ *1	○
P0120 (DI–34)	Throttle / Pedal Position Sensor / Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○ *1	○
P0121 (DI–38)	Throttle / Pedal Position Sensor / Switch "A" Circuit Range / Performance Problem	• Throttle position sensor	○ *1	○
P0125 (DI–39)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in oxygen sensor circuit • Oxygen sensor	○ *1	○
P0130 (DI–42)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Oxygen sensor • Fuel trim malfunction	○ *1	○
P0133 (DI–45)	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Oxygen sensor	○ *1	○
P0136 (DI–46)	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Oxygen sensor	○ *1	○
P0171 (DI–48)	System too Lean (Fuel Trim)	• Air Intake (hose loose) • Fuel line pressure • Injector blockage • Oxygen sensor malfunction • Manifold absolute pressure sensor • Engine coolant temp. sensor	○ *1	○

*1: MIL lights up

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0172 (DI–48)	System too Rich (Fuel Trim)	• Fuel line pressure • Injector blockage, leak • Oxygen sensor malfunction • Manifold absolute pressure sensor • Engine coolant temp. sensor	○ *1	○
P0300 (DI–51)	Random / Multiple Cylinder Misfire Detected	• Ignition system • Injector • Fuel line pressure • EGR • Compression pressure • Valve clearance not to specification • Valve timing • Manifold absolute pressure sensor • Engine coolant temp. sensor	○ *2	○
P0301 P0302 P0303 P0304 (DI–51)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4			
P0325 (DI–56)	Knock Sensor 1 Circuit Malfunction	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○ *1	○
P0335 (DI–59)	Crankshaft Position Sensor ”A” Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM	○ *1	○
P0336 (DI–62)	Camshaft Position Sensor Circuit Range / Performance	• Distributor • ECM malfunction (for back up)	○ *1	○
P0340 (DI–63)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • ECM	○ *1	○
P0401 (DI–65)	Exhaust Gas Recirculation Flow Insufficient Detected	• EGR valve stuck close • Open or short in VSV circuit for EGR • Vacuum or EGR hose disconnected • Manifold absolute pressure sensor • EGR VSV open or close malfunction • ECM	○ *1	○
P0402 (DI–71)	Exhaust Gas Recirculation Flow Excessive Detected	• EGR valve stuck open • Vacuum or EGR hose is connected to wrong post • Manifold absolute pressure sensor • ECM	○ *1	○
P0420 (DI–73)	Catalyst System Efficiency Below Threshold	• Three–way catalytic converter • Open or short in oxygen sensor circuit • Oxygen sensor	○ *1	○
P0440 (DI–76)	Evaporative Emission Control System Malfunction	• Vapor pressure sensor • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected • Hose or tube cracked, holed, damaged or loose • Fuel tank cracked, holed, or damaged • Charcoal canister cracked, holed or damaged	○ *1	○

*1: MIL lights up

*2: MIL lights up or blinking

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0441 (DI–82)	Evaporative Emission Control System Incorrect Purge Flow	• Open or short in VSV circuit for vapor pressure sensor • VSV for vapor pressure sensor • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Vacuum hose cracked, holed, blocked, damaged or disconnected • Charcoal canister cracked, holed or damaged	○ *1	○
P0446 (DI–82)	Evaporative Emission Control System Vent Control Malfunction			
P0450 (DI–92)	Evaporative Emission Control System Pressure Sensor Malfunction	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○ *1	○
P0500 (DI–94)	Vehicle Speed Sensor Malfunction	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • ECM	○ *1	○
P0505 (DI–97)	Idle Control System Malfunction	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Open or short AC1 single circuit • Air intake (hose loose)	○ *1	○

*1: MIL lights up

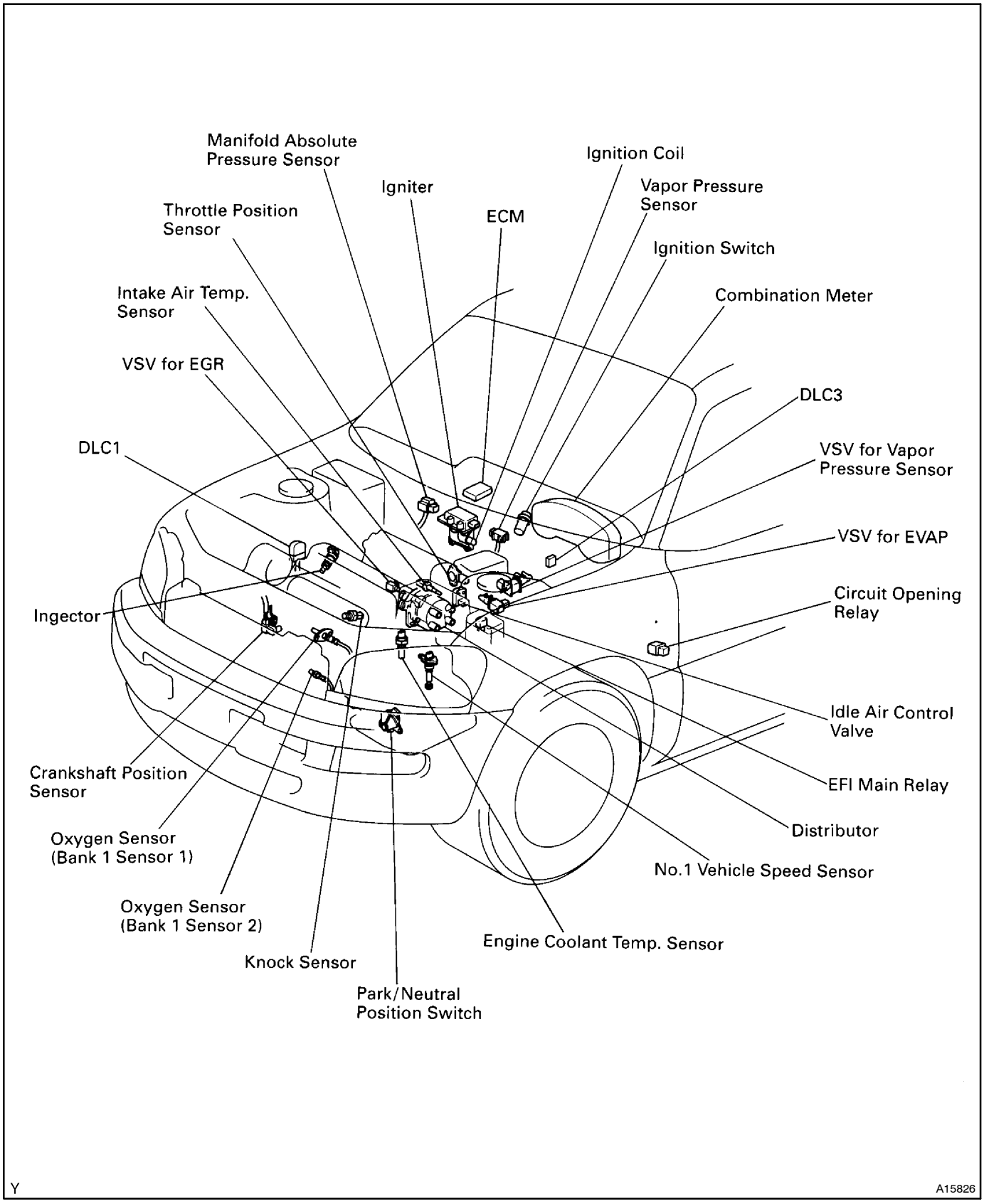
MANUFACTURER DEFINED

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P1300 (DI–100)	Ignition Circuit Malfunction	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○ *1	○
P1500 (DI–105)	Starter Signal Circuit Malfunction	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM	○ *1	○
P1600 (DI–108)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○ *1	○
P1780 (DI–110)	Park / Neutral Position Switch Malfunction	• Short in park / neutral position switch circuit • Park / neutral position switch • ECM	○ *1	○

*1: MIL lights up

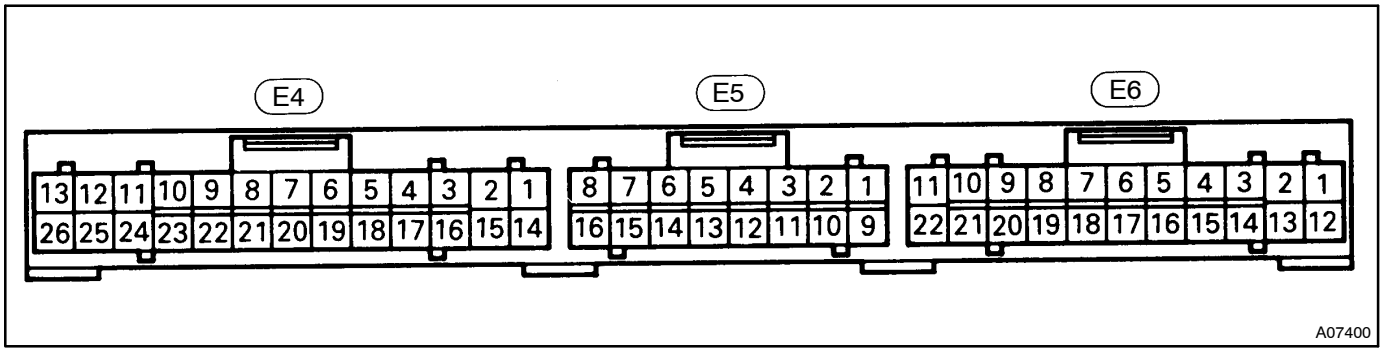
DI3Z9–02

PARTS LOCATION



DI3ZA–02

TERMINALS OF ECM



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E6–1) – E1 (E4–14)	R–W ↔ BR	Always	9 ~ 14
+B (E6–12) – E1 (E4–14)	B–R ↔ BR	IG switch ON	9 ~ 14
VC (E5–1) – E2 (E5–9)	Y ↔ BR	IG switch ON	4.5 ~ 5.5
VTA (E5–11) – E2 (E5–9)	L–R ↔ BR	IG switch ON Throttle valve fully closed.	0.3 ~ 0.8
		IG switch ON Throttle valve fully open.	3.2 ~ 4.9
PIM (E5–2) – E2 (E5–9)	LG–R ↔ BR	IG switch ON	3.3 ~ 3.9
		Apply vacuum 26.7 kpa (200 mmHg, 7.9 in. Hg)	2.5 ~ 3.1
THA (E5–3) – E2 (E5–9)	Y–B ↔ BR	Idling, Intake air temp. 20˚C (68˚F)	0.5 ~ 3.4
THW (E5–4) – E2 (E5–9)	W ↔ BR	Idling, Engine coolant temp. 80˚C (176˚F)	0.2 ~ 1.0
STA (E6–11) – E1 (E4–14)	B–W (M/T) ↔ BR	Cranking	6.0 or more
STA (E6–11) – E1 (E4–14)	B (A/T) ↔ BR	Cranking	6.0 or more
#10 (E4–12) – E01 (E4–13)	B–R ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–51)
#20 (E4–11) – E01 (E4–13)	B–Y ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–51)
#30 (E4–25) – E01 (E4–13)	B–R ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–51)
#40 (E4–24) – E01 (E4–13)	B–Y ↔ BR	IG switch ON	9 ~ 14
		Idling	Pulse generation (See page DI–51)
IGT (E4–20) – E1 (E4–14)	B ↔ BR	Idling	Pulse generation (See page DI–100)
IGF (E4–3) – E1 (E4–14)	L–Y ↔ BR	IG switch ON Disconnect igniter connector	4.5 ~ 5.5
		Idling	Pulse generation (See page DI–100)
G⊕ (E4–5) – NE⊖ (E4–14)	B ↔ G	Idling	Pulse generation (See page DI–59)
NE⊕ (E4–4) – NE⊖ (E4–17)	R ↔ G	Idling	Pulse generation (See page DI–59)

FC (E6–14) – E1 (E4–14)	G–R ↔ BR	IG switch ON	9 ~ 14
EGR (E4–23) – E1 (E4–14)	B–W ↔ BR	IG switch ON	0 ~ 3
ISCC (E4–9) – E1 (E4–14)	B–Y ↔ BR	IG switch ON Disconnect E4 of ECM connector	9 ~ 14
ISCO (E4–10) – E1 (E4–14)	B–L ↔ BR	IG switch ON Disconnect E4 of ECM connector	9 ~ 14
OX1 (E5–6) – E1 (E4–14)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 mins. after warning up.	Pulse generation
OX2 (E5–5) – E1 (E4–14)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 mins. after warning up.	Pulse generation
KNK (E5–10) – E1 (E4–14)	B ↔ BR	Idling	Pulse generation (See page DI–56)
* NSW (E6–22) – E1 (E4–14)	B–W ↔ BR	IG switch ON Other shift position in ”P” , ”N” position	9 ~ 14
		IG switch ON Shift position in ”P” , ”N” position	0 ~ 3.0
SPD (E6–9) – E1 (E4–14)	V–W ↔ BR	IG switch ON Rotate driver wheel slowly.	Pulse generation (See page DI–94)
TE1 (E5–15) – E1 (E4–14)	L–W ↔ BR	IG switch ON	9 ~ 14
W (E6–5) – E1 (E4–14)	G–R ↔ BR	Idling	9 ~ 14
		IG switch ON	Below 3.0
AC (E6–10) – E1 (E4–14)	Y–G ↔ BR	Idling, A/C switch ON	Below 2.0
		Idling, A/C switch OFF	9 ~ 14
ACT (E6–21) – E1 (E4–14)	R–Y ↔ BR	Idling, A/C switch ON	9 ~ 14
		Idling, A/C switch OFF	Below 2.0
* OD2 (E6–7) – E1 (E4–14)	LG ↔ BR	IG switch ON, O/D main switch pushed out	9 ~ 14
		IG switch ON, O/D main switch pushed in	0 ~ 3
* OD1 (E6–20) – E1 (E4–14)	Y–B ↔ BR	IG switch ON, Cruise control ECU no request O/D cut	9 ~ 14
		IG switch ON, Cruise control ECU request O/D cut	0 ~ 3
EVP (E4–22) – E1 (E4–14)	P ↔ BR	IG switch ON	9 ~ 14
TPC (E5–8) – E1 (E4–14)	R–W ↔ BR	IG switch ON	9 ~ 14
PTNK (E5–7) – E2 (E5–9)	L–Y ↔ BR	IG switch ON, Disconnect vacuum hose from vapor pressure sensor	2.9 ~ 3.7
		Apply vacuum (4.0 kPa, 30 mmHg, 1.18 in. Hg) (less than 66.7 kPa, 500 mmHg, 19.7 in. Hg)	Below 0.5
ELS (E6–17) – E1 (E4–14)	B ↔ BR	Defogger switch and taillight switch ON	7.5 ~ 14
		Defogger switch and taillight switch OFF	0 ~ 1.5
SDL (E6–16) – E1 (E4–14)	W ↔ BR	During transmission	Pules generation

*: A/T only

DI3ZB–02

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed the DTC check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

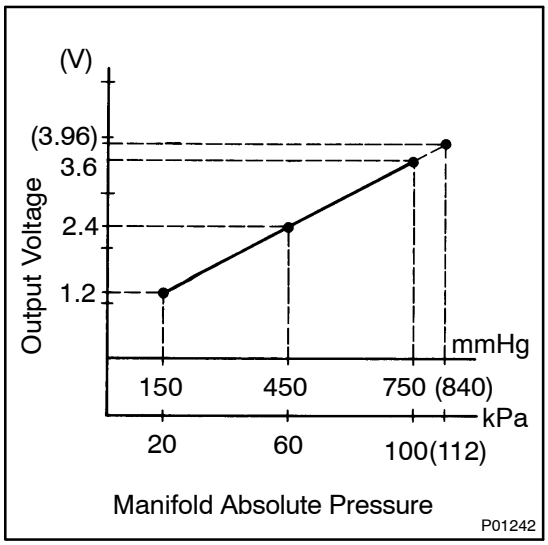
Symptom	Suspect Area	See page
Does not start (Engine does not crank	1. Starter and starter relay	ST Section
Does not start (No combustion)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–113 DI–116 IN–30
Does not start (No complete combustion)	1. Fuel pump control circuit	DI–116
Difficult to start (Engine cranks normally)	1. Fuel pump control circuit 2. Compression	DI–116 EM–3
Difficult to start (Cold engine)	1. Starter signal circuit 2. Fuel pump control circuit	DI–105 DI–116
Difficult to start (Hot engine)	1. Starter signal circuit 2. Fuel pump control circuit	DI–105 DI–116
Poor idling (High engine idle speed)	1. A/C signal circuit 2. ECM power source circuit	AC–64 DI–113
Poor idling (Low engine idle speed)	1. A/C signal circuit 2. Fuel pump control circuit	AC–64 DI–116
Poor idling (Rough idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–116
Poor idling (Hunting)	1. ECM power source circuit 2. Fuel pump control circuit	DI–113 DI–116
Poor Driveability (Hesitation / Poor acceleration)	1. Fuel pump control circuit 2. A/T faulty 3. A/C cut control circuit	DI–116 DI–141 DI–122
Poor Driveability (Surging)	1. Fuel pump control circuit	DI–116
Engine stall (Soon after starting)	1. Fuel pump control circuit	DI–116
Engine stall (During A/C operation)	1. A/C signal circuit 2. Engine control module (ECM)	AC–64 IN–30

DI3ZC–01

CIRCUIT INSPECTION

DTC	P0105	Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction

CIRCUIT DESCRIPTION



By a built–in sensor unit, the manifold absolute pressure sensor detects the intake manifold pressure as a voltage. The ECM then determines the basic injection duration and basic injection advance angle based on this voltage. Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the present absolute vacuum 0) , it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air–fuel ratio at the proper lever under all conditions.

DTC No.	DTC Detecting Condition	Trouble Area
P0105	Open or short manifold absolute pressure sensor circuit	• Open or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • ECM

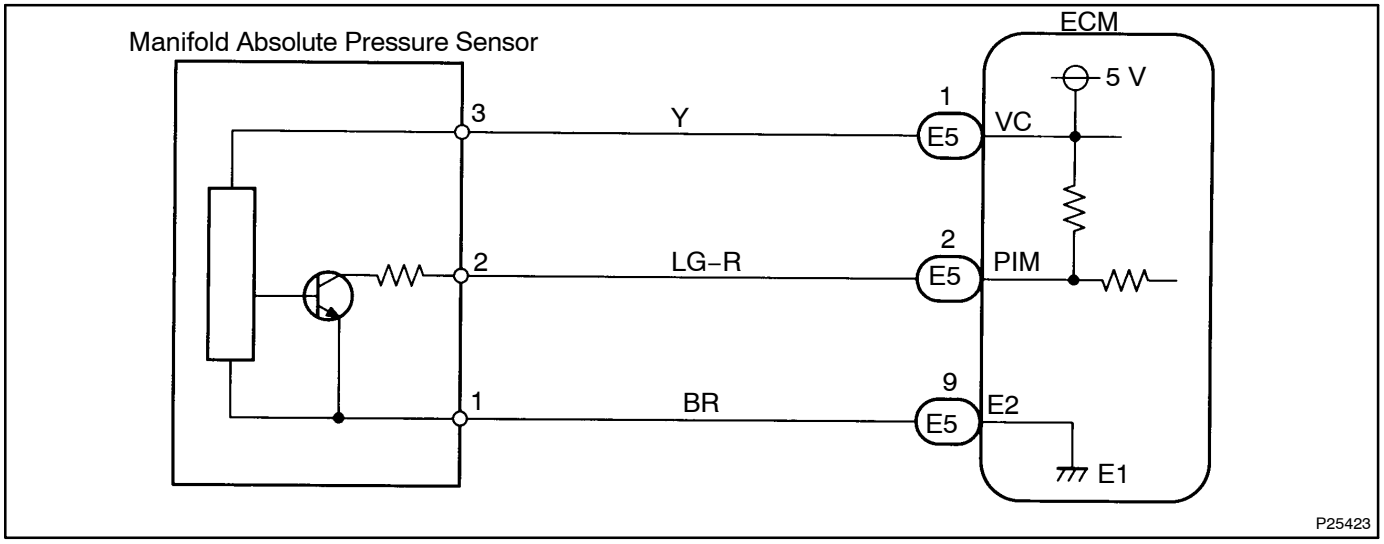
If the ECM detects DTC ”P0105” it operates the fail safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

HINT:

After confirming DTC P0105 use the OBDII scan tool or TOYOTA hand–held tester to confirm the manifold absolute pressure from ”CURRENT DATA”.

Manifold Absolute Pressure	Malfunction
0 kpa	PIM circuit short
130 kpa or more	VC circuit open or short PIM circuit open E2 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTC P0105, P0110, P0115, P0120 are output simultaneously, E2 (sensor ground) may be open.

1	**Connect OBDII scan tool or TOYOTA hand–held tester, and read value of manifold absolute pressure.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read value of manifold absolute pressure on the OBDII scan tool or TOYOTA hand–held tester.

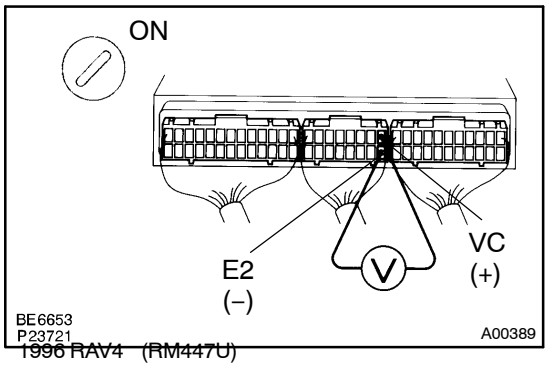
OK:

Same as atmospheric pressure.

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

NG

2	**Check voltage between terminals VC and E2 of ECM connector.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of ECM connector.

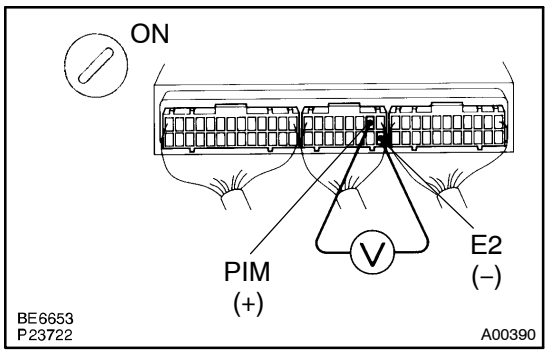
OK:

Voltage : 4.5 – 5.5V

NG → Check and replace ECM (See page IN–30).

OK

3	Check voltage between terminals PIM and E2 of ECM connector.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals PIM and E2 of ECM connector.

OK:

Voltage : 3.3 – 3.9 V

OK → Check and replace ECM (See page IN–30).

NG

4	Check for open and short in harness and connector between manifold absolute pressure sensor and ECM.

NG → Repair or replace harness or connector.

OK

Replace manifold absolute pressure sensor.

DI3ZD–01

DTC	P0106	Manifold Absolute Pressure Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction on page DI–21.

DTC No.	DTC Detecting Condition	Trouble Area
P0106	After the engine is warmed up, conditions (a) and (b) continue with engine speed 400 ~ 1,000 rpm (2 trip detection logic) (a) Throttle valve fully closed (b) Manifold absolute pressure sensor output > 3.0 V	• Manifold absolute pressure sensor.
	Condition (c) and (d) continue with engine speed 2,500 rpm or less (2 trip detection logic) (c) VTA > 1.8 (d) Manifold absolute pressure sensor output < 1.0 V	

WIRING DIAGRAM

Refer to Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction on page DI–21.

INSPECTION PROCEDURE

HINT:
If DTC ”P0105” (Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction) and ”P0106” (Manifold Absolute Pressure / Barometric Pressure Circuit Range / Performance Problem) are output simultaneously, manifold absolute pressure sensor circuit may be open.
Perform troubleshooting of DTC P0105 first.

1	**Are there any other codes (besides DTC P0106) being output?**

YES → **Go to relevant DTC chart.**

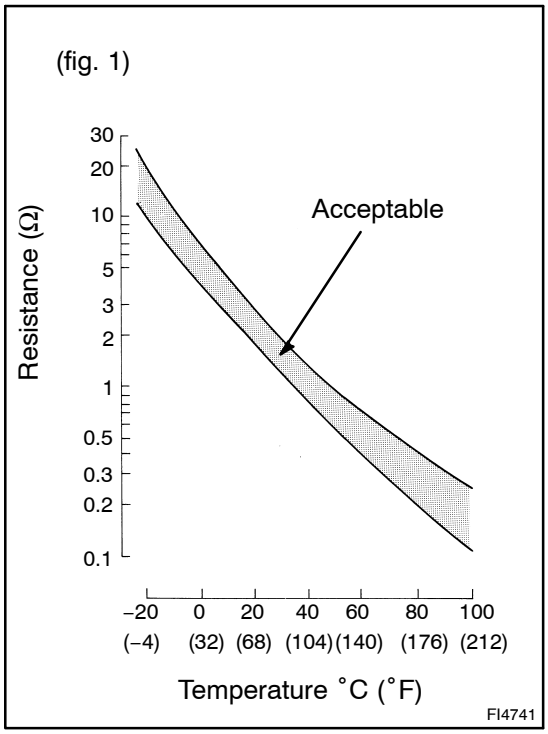
NO

Replace manifold absolute pressure sensor.

DI3ZE–01

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION



The intake air temp. sensor is built into the air cleaner cap and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See Fig. 1.).
The intake air temperature sensor is connected to the ECM (See next page). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via a 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 also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.
If the ECM detects the DTC ”P0110”, it operates the fail safe function in which the intake air temperature is assumed to be 20˚C (68˚F).

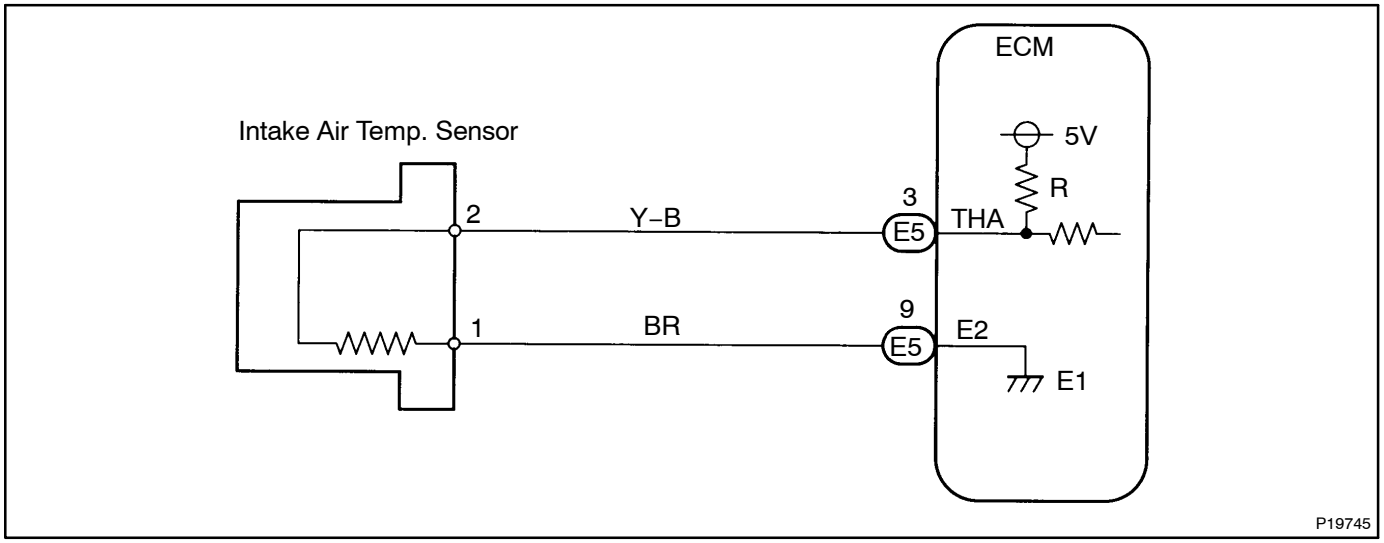
Intake Air Temp. ˚C (˚F)	Resistance (kΩ)	Voltage (V)
–20 (–4)	16.2	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.1	1.4
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.2	0.3

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM

HINT:
After confirming DTC P0110 use the OBDII scan tool or TOYOTA hand–held tester to confirm the intake air temperature from ”CURRENT DATA”.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTC ”P0105” (Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction), ”P0110” (Intake Air Temp. Circuit Malfunction), ”P0115” (Engine Coolant Temp. Circuit Malfunction), ”P0120” (Throttle / Pedal Position Sensor / Switch ”A” Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.

1	**Connect the OBDII scan tool or TOYOTA hand–held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK:

Same as actual intake air temperature.

HINT:

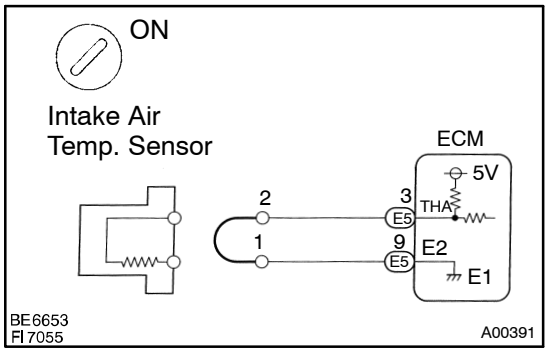
- If there is open circuit, OBDII scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, OBDII scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

NG → **– 40°C (– 40°F) .... Go to step 2.**
140°C (284°F) .... Go to step 4.

OK

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

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the intake air temp. sensor connector.
(b) Connect sensor wire harness terminals together.
(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

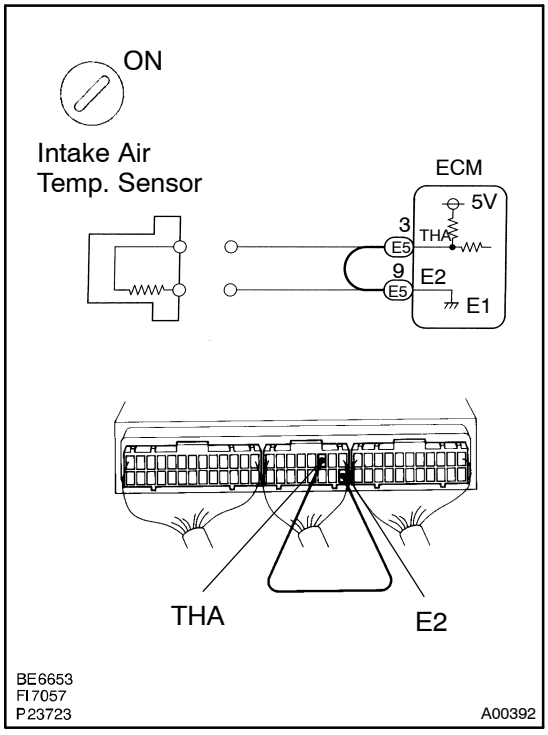
OK:

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

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

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove side trim cover (See page SF–61).
(b) Connect between terminals THA and E2 of ECM connector.

HINT:

Intake air temp. sensor connector is disconnected. Before checking do a visual and contact pressure check for the ECM connector (See page IN–30).

(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK:

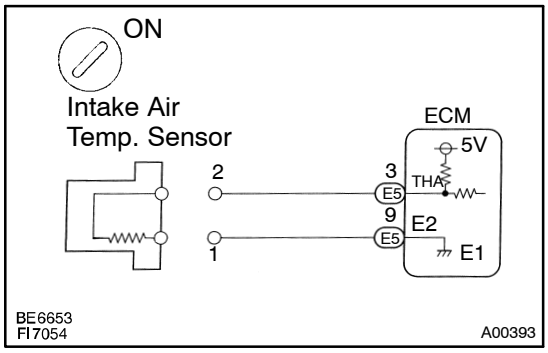
Temperature value : 140°C (294°F) or more

OK	Open in harness between terminals E2 or THA, repair or replace harness.

NG

Confirm good connection at ECM.
If OK, replace ECM.

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the intake air temp. sensor connector.

(b) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

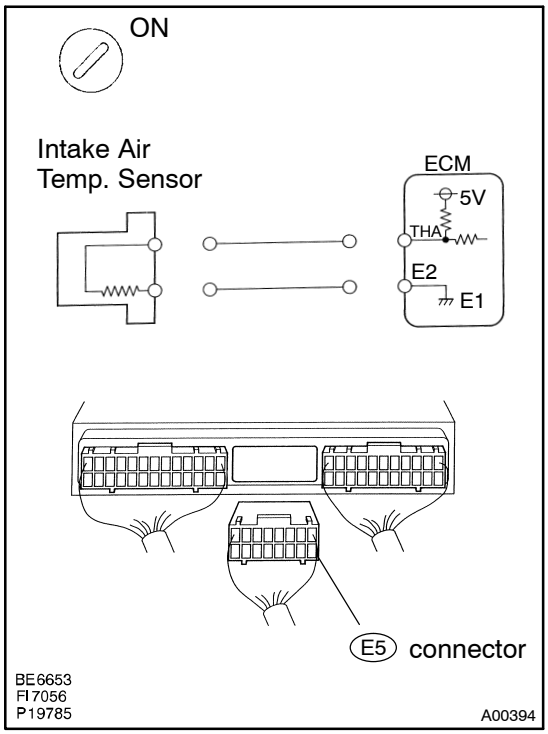
OK:

Temperature value : – 40˚C (– 40˚F).

OK	Replace intake air temp. sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Disconnect the E5 connector of ECM.

HINT:

Intake air temp. sensor connector is disconnected.

(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK:

Temperature value: – 40˚C (– 40˚F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–30).

DI3ZF–01

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temperature sensor changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page DI–25.

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80˚C (176˚F).

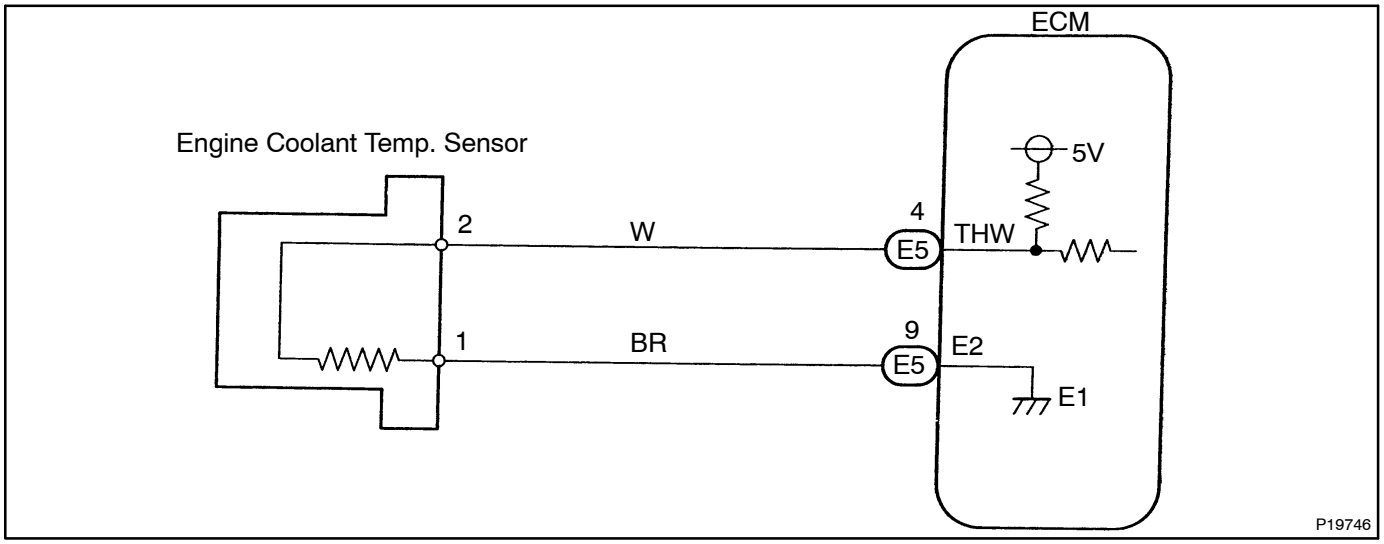
DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT:

After confirming DTC P0115 use the OBDII scan tool or TOYOTA hand–held tester to confirm the engine coolant temperature from ”CURRENT DATA”.

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

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTC ”P0105” (Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction), ”P0110” (Intake Air Temp. Circuit Malfunction), ”P0115” (Engine Coolant Temp. Circuit Malfunction), ”P0120” (Throttle / Pedal Position Sensor / Switch ”A” Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.

1	**Connect the OBDII scan tool or TOYOTA hand–held tester, and read value of engine coolant temperature.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK:

Same as actual engine coolant temperature.

HINT:

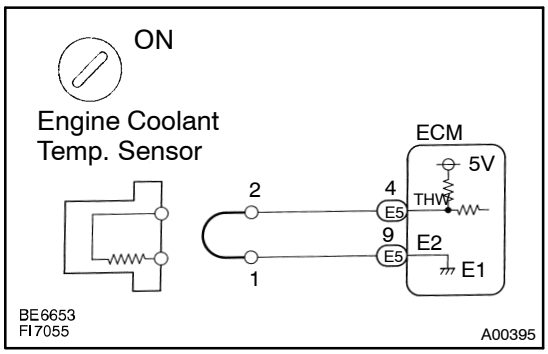
- If there is open circuit, OBDII scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, OBDII scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

NG	**– 40°C (– 40°F) .... Go to step 2.** **140°C (284°F) or more .... Go to step 4.**

OK

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

2	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.

(b) Connect sensor wire harness terminals together.

(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

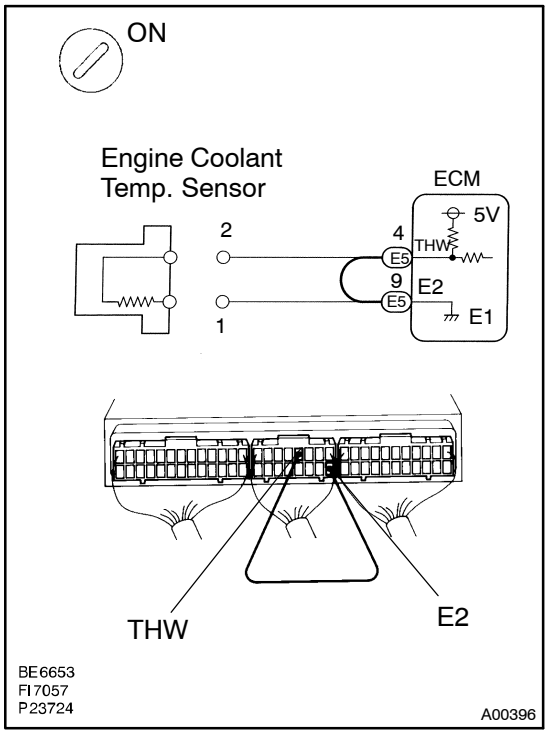
OK:

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

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

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove side trim cover. (See page SF–61).

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

HINT:

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

(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK:

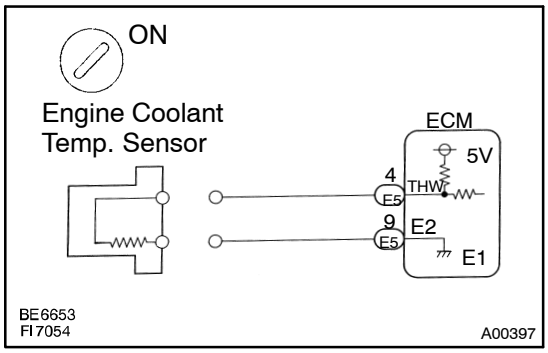
Temperature value: 140°C (284°F) or more

OK	Open in harness between terminals E2 or THW, repair or replace harness.

NG

Confirm good connection at ECM.
If OK, replace ECM.

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.

(b) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

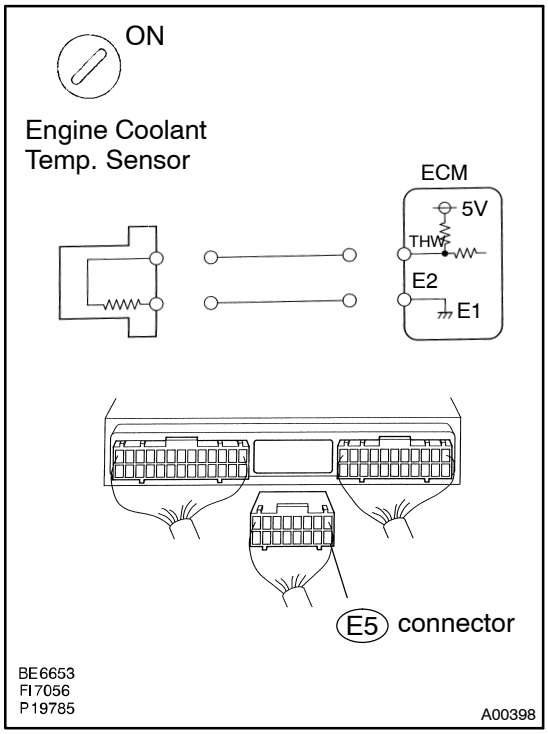
OK:

Temperature value : – 40°C (– 40°F)

OK	Replace engine coolant temp. sensor.

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove side trim cover. (See page SF–61).

(b) Disconnect the E5 connector of ECM.

HINT:

Engine coolant temp. sensor connector is disconnected.

(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK:

Temperature value : – 40˚C (– 40˚F)

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

NG

Check and replace ECM (See page IN–30).

DI3ZG–01

DTC	P0116	Engine Coolant Temp. Circuit Range / Performance Problem

CIRCUIT DESCRIPTION

Refer to Engine Coolant Temp. Circuit Malfunction on page DI–29.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	If THW < –7°C (19.4°F), 20 minutes or more after starting engine, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	• Engine coolant temp. sensor • Cooling system
	If THW ≧ –7°C (19.4°F), 5 minutes or more after starting engine, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

If DTC ”P0115” (Engine Coolant Temp. Circuit Malfunction) and ”P0116” (Engine Coolant Temp. Circuit Range / Performance Problem) are output simultaneously, engine coolant temp. sensor circuit may be open. Perform troubleshooting of DTC P0115 first.

1	Are there any other codes (besides DTC P0116) being output?

YES → Go to relevant DTC chart.

NO

2	Check thermostat (See page CO–11).

NG → Replace thermostat.

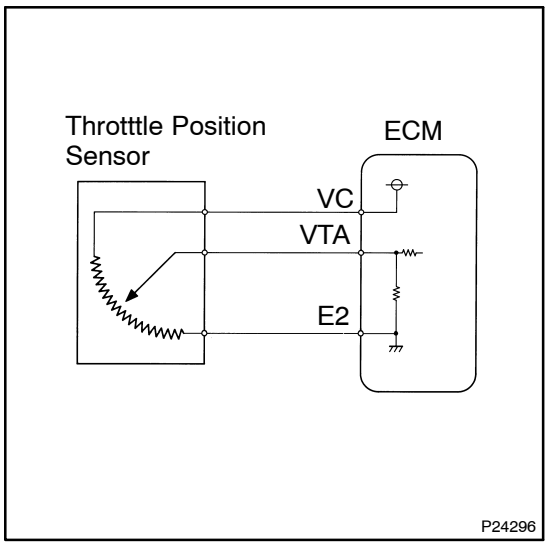
OK

Replace engine coolant temp. sensor (See page SF–49).

DI3ZH–01

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

CIRCUIT DESCRIPTION



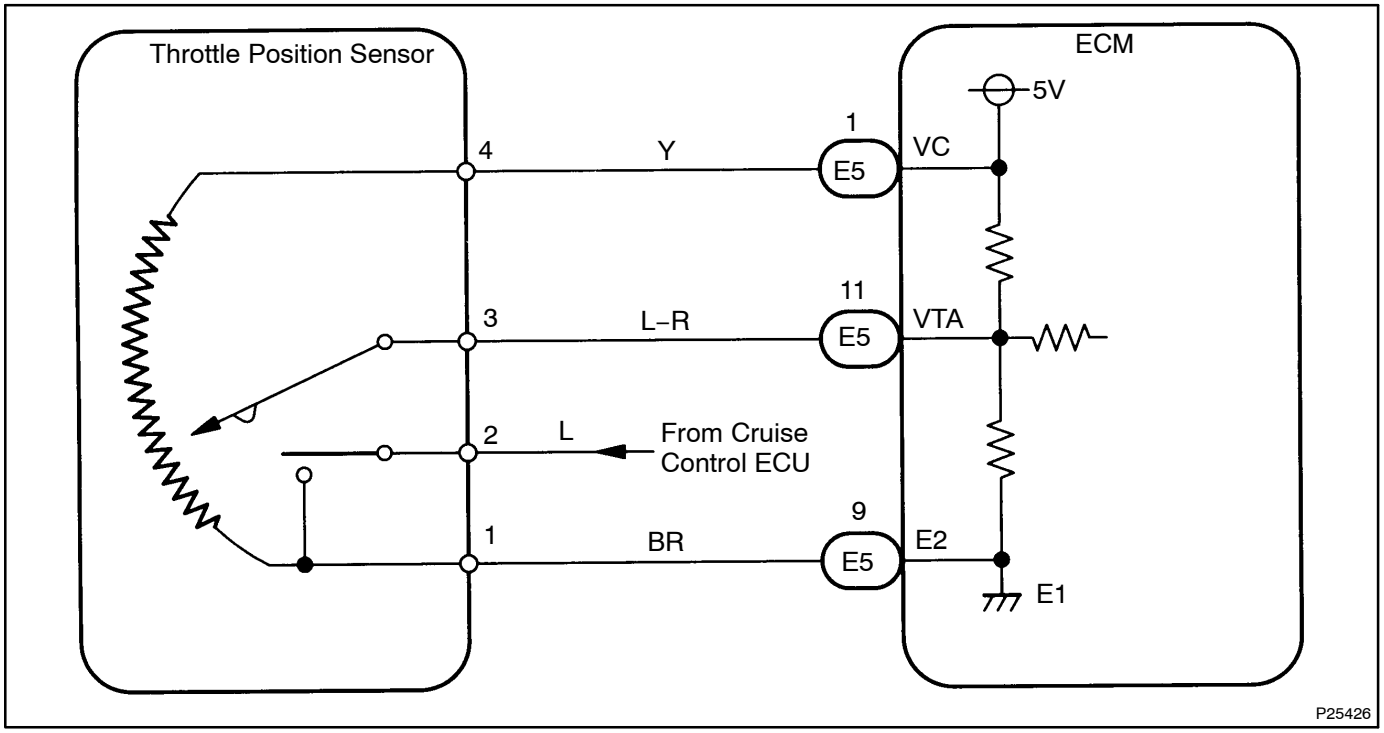
The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.3 V – 0.8 V is applied to terminal VTA of the ECM. The voltage applied to the terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from this signal input from terminal VTA, and uses them as one of the conditions for deciding the air–fuel ration correction, power increases correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues (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 use the OBDII scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage.

Throttle Valve opening position expressed as percentage		Trouble Area
Throttle Valve fully closed	Throttle Valve fully open	
0 %	0 %	VC line open VTA line open or short
100 %	100 %	E2 line open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTC P0105" (Manifold Absolute Pressure / Barometric Pressure Circuit Malfunction), "P0110" (Intake Air Temp. Circuit Malfunction), "P0115" (Engine Coolant Temp. Circuit Malfunction), "P0120" (Throttle / Pedal Position Sensor / Switch "A" Circuit Malfunction) are output simultaneously, E2 (sensor ground) may be open.

1	**Connect OBDII scan tool or TOYOTA hand–held tester and read the throttle valve opening percentage.**

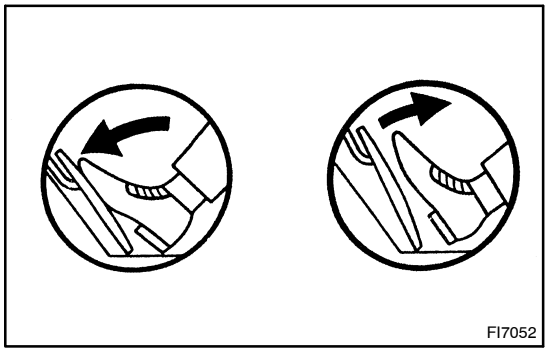
PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read the throttle valve opening percentage.



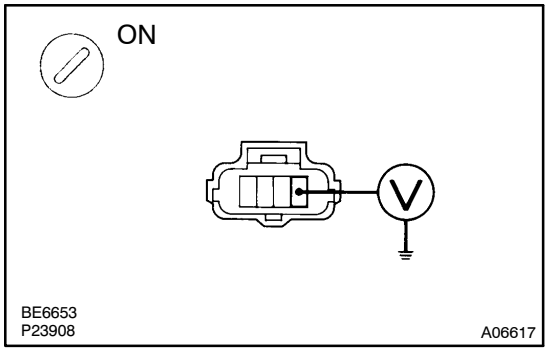
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 70 %
Fully closed	Approx. 10 %

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

NG

2	**Check voltage between terminal VC of wire harness side connector and body ground.**



PREPARATION:
(a) Disconnect the throttle position sensor connector.
(b) Turn ignition ON.

CHECK:
Measure voltage between terminal VC of wire harness side connector and body ground.

OK:
Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

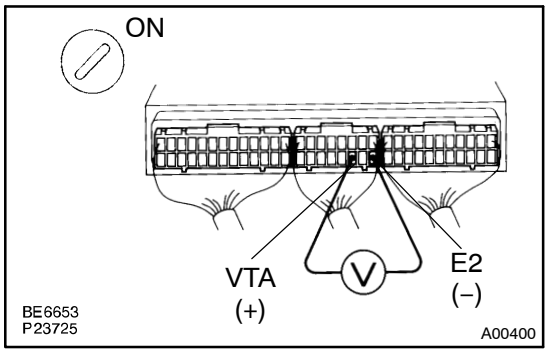
OK

3	**Check throttle position sensor (See page SF–31).**

NG → **Replace throttle position sensor.**

OK

4	**Check voltage between terminals VTA and E2 of ECM connector.**



PREPARATION:
(a) Remove side trim cover. (See page SF–62).
(b) Turn ignition switch ON.

CHECK:
Measure voltage between terminals VTA and E2 of ECM connector.

OK:

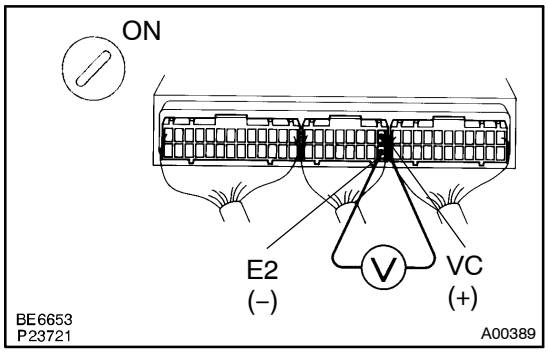
Throttle Valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	3.2 – 4.9 V

NG → **Check for open and short in harness and connector between ECM and throttle position sensor (VTA or E2 line) (See page IN–30).**

OK →

Check and replace ECM (See page IN–30).

5	**Check voltage between terminals VC and E2 of ECM connector.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of ECM connector.

OK:

Voltage 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–30).**

OK →

Check for open in harness and connector between ECM and sensor (VC line) (See page IN–30).

DI3ZI–01

DTC	P0121	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to Throttle / Pedal Position Sensor / Switch ”A” Circuit Malfunction on page DI–34.

DTC No.	DTC Detecting Condition	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 between 30 km/h (19 mph) and 0 km/h (0 mph) (2 trip detection logic)	• Throttle position sensor

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0121) being output?

YES → Go to relevant DTC chart.

NO →

Replace throttle position sensor.

DI3ZJ–01

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

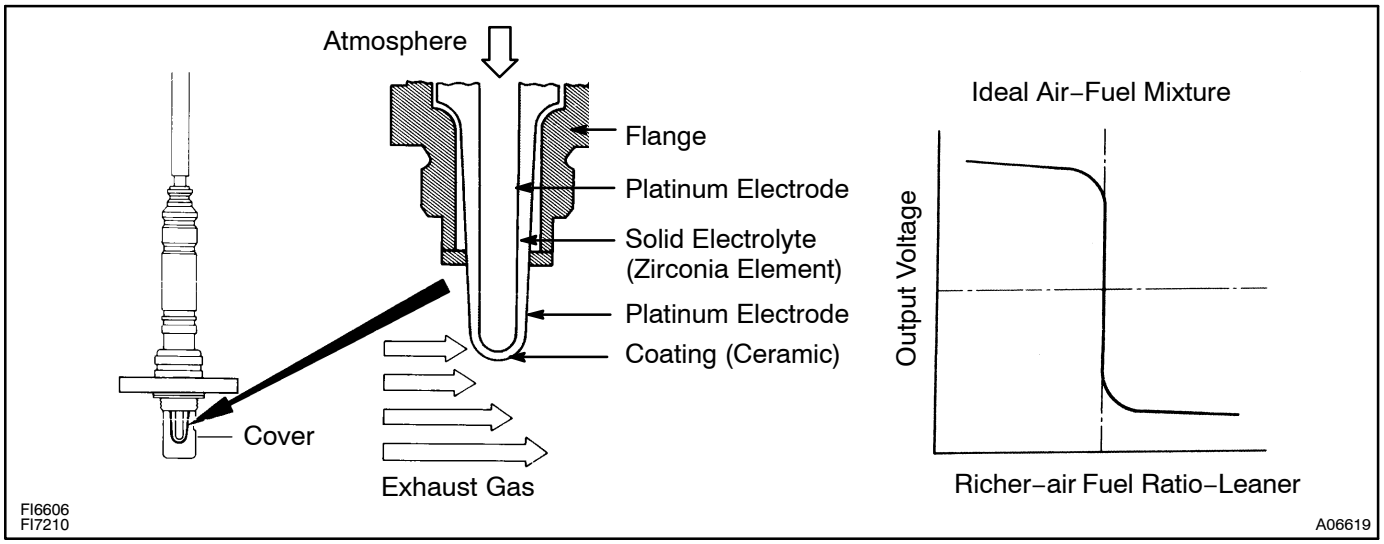
To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V).

The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.



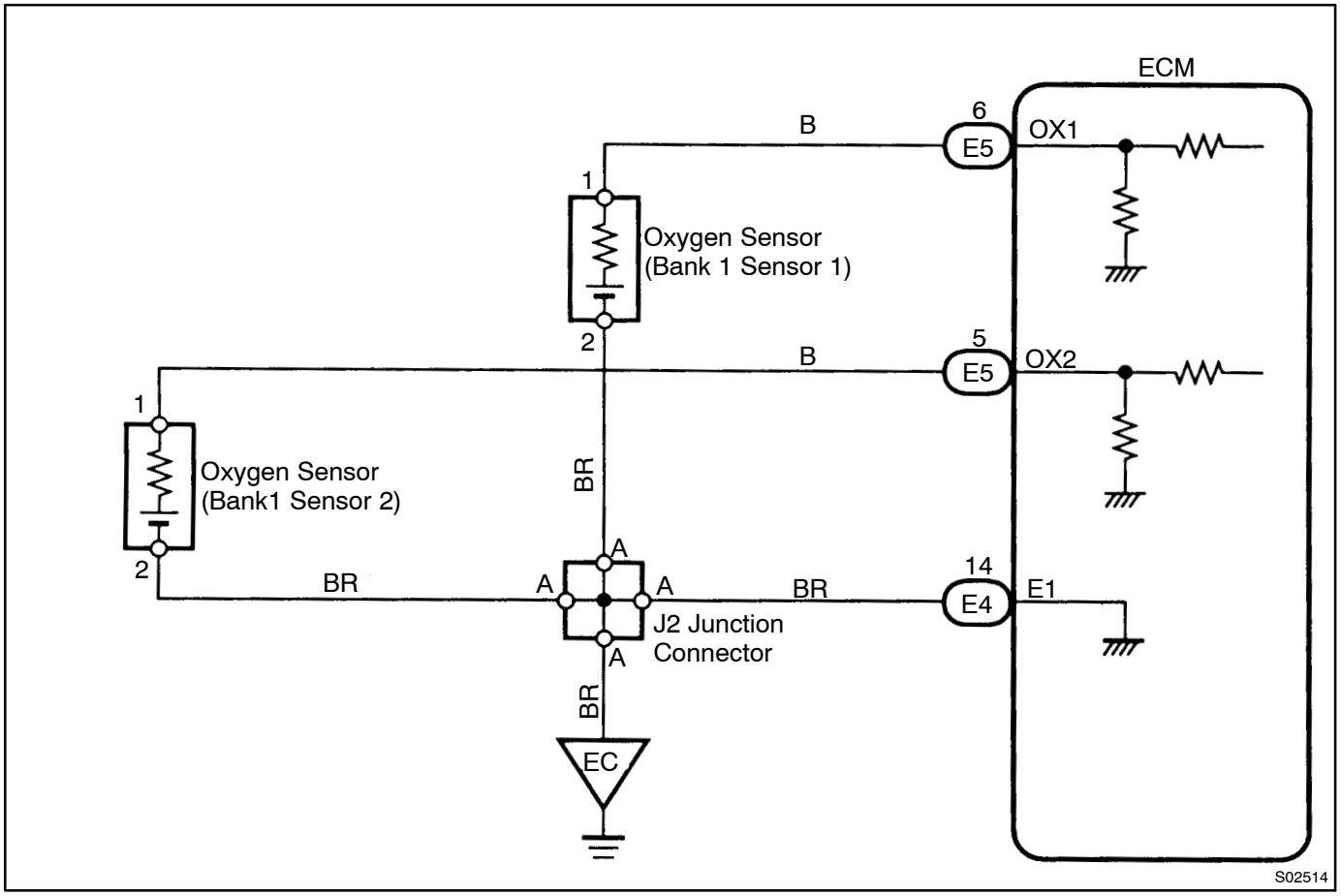
DTC No.	DTC Detecting Condition	Trouble Area
P0125	After the engine is warmed up, oxygen sensor output does not indicate RICH even once when conditions (a), (b), and (c) continue for at least 1.5 minutes (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 ~ 100 km/h (25 ~ 62 mph) (c) Throttle valve does not fully closed	• Open or short in oxygen sensor circuit • oxygen sensor

HINT:

After confirming DTC P0125 use the OBDII scan tool or TOYOTA hand–held tester to confirm voltage output of oxygen sensor from ”CURRENT DATA”.

If voltage output of oxygen sensor is 0 V, oxygen sensor circuit may be open or short.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect the OBDII scan tool or TOYOTA hand–held tester and read value for voltage output of oxygen sensor.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

(b) Warm up engine to normal operating temperature.

CHECK:

Read voltage output of oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 times using accelerator pedal.

OK:

Oxygen sensor output a RICH signal (0.45 V or more) at least once.

OK	**Check and replace ECM (See page IN–30).**

NG

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

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

OK

Replace oxygen sensor.

DI3ZK–01

DTC	P0130	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to ”Insufficient Coolant Temp. for Closed Loop Fuel Control” on page DI–39.

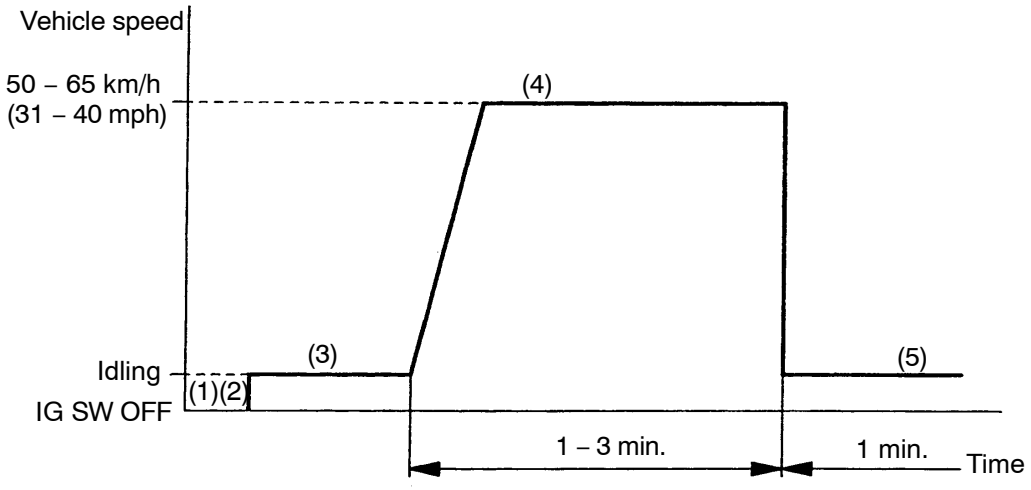
DTC No.	DTC Detecting Condition	Trouble Area
P0130	Voltage output of oxygen sensor remains at 0.35 V or more, 0.55 V or less, during idling after the engine is warmed up (2 trip detection logic)	• Oxygen sensor • Fuel trim malfunction

HINT:
Sensor 1 refers to the sensor closer to the engine body.
The oxygen sensor’s output voltage and the short–term fuel trim value can be read using the OBDII scan tool or TOYOTA hand–held tester.

WIRING DIAGRAM

Refer to page DI–39 for the WIRING DIAGRAM.

CONFIRMATION DRIVING PATTEN



A01666

(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Switch the TOYOTA hand–held tester from normal mode to check mode (See page DI–3).
(3) Start the engine and warm it up with all accessory switches OFF.
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 minutes to warm up the oxygen sensor.
(5) Idle the engine for 1 minute.
HINT:
If a malfunction exists, the MIL will light up during step (5).
NOTICE:
If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
If you do not hove a TOYOTA hand–held tester, turn the ignition switch OFF after performing steps (3) to (5), then perform steps (3) to (5) again.

INSPECTION PROCEDURE

1	**Check for open and short in harness and connector between ECM and oxygen sensor (See page IN–30).**

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

OK ↓

2	**Check for oxygen sensor date.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

(b) Warm up engine to normal operation temperature.

CHECK:

Read the oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	Oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about +20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about –20 %
3	Except 1 and 2	

1, 2 → **Check fuel trim system (See page DI–48).**

3 ↓

3	**Check the output voltage of oxygen sensor during idling.**

PREPARATION:

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

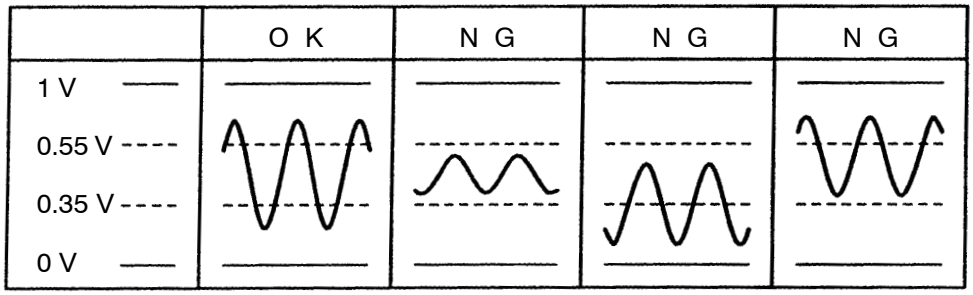
CHECK:

Use the OBDII scan tool or TOYOTA hand–held tester read the output voltage of the oxygen sensor during idling.

OK:

Oxygen sensor output voltage:

Alternates repeatedly between approx. 0.35 V and approx. 0.55 V (See the following table.)



A00292

OK → **Perform confirmation driving pattern (See page DI–42).**

NG

Replace oxygen sensor.

DI3ZL–01

DTC	P0133	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to ”Insufficient Coolant Temp. for Closed Loop Fuel Control” on page DI–39.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	Response time for the oxygen sensor’s voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after the engine is warmed up (2 trip detection logic)	• Oxygen sensor

HINT:
Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0133) being output?**

YES → **Go to relevant DTC chart.**

NO

Replace oxygen sensor.

DI3ZM–01

DTC	P0136	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to ”Insufficient Coolant Temp. for Closed Loop Fuel Control” on page DI–39.

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of the oxygen sensor (bank 1 sensor 2) remains at 0.4 V or more or 0.5 V or less when the vehicle is driven at 40km/h (25 mph) or more after the engine is warmed up (2 trip detection logic)	• Oxygen sensor

HINT:
Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to page DI–39 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0136) being output?**

YES → **Go to relevant DTC chart.**

NO

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

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

OK

3	**Check the output voltage of oxygen sensor (bank 1 sensor 2).**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

(b) Warm up engine to normal operating temperature.

CHECK:

Read the output voltage of oxygen sensor (Bank 1 Sensor 2) when engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm for 3 mins using accelerator pedal.

OK:

Oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

OK → **Check that each connector is properly connected.**

NG

Replace oxygen sensor.

DI3ZN–01

DTC	P0171	System too Lean (Fuel Trim)

DTC	P0172	System too Rich (Fuel Trim)

CIRCUIT DESCRIPTION

”Fuel trim” refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.
”Short–term fuel trim” is the short–term fuel compensation used to maintain the air–fuel ration at its ideal theoretical value. The signal from the oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.
”Long–term fuel trim” is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.
If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When the air fuel ratio feedback is stable after engine warning up, the fuel trim is considerably in error on the RICH side (2 trip detection logic)	• Fuel line pressure • Injector blockage • Oxygen sensor malfunction • Manifold absolute pressure sensor • Engine coolant temp. sensor
P0172	When the air fuel ratio feedback is stable after engine warning up, the fuel trim is considerably in error on the LEAN side (2 trip detection logic)	• Fuel line pressure • Injector blockage, leak • Oxygen sensor malfunction • Manifold absolute pressure sensor • Engine coolant temp. sensor.

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 is detected. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ±25 %, the system is functioning normally.

INSPECTION PROCEDURE

1	Check air induction system (See page SF–1).

NG → Repair or replace.

OK

2	**Check for oxygen sensor data.**

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up engine to normal operating temperature.

CHECK:

Read the oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	Oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about +20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about –20 %
3	Except 1 and 2	

3 → **Check for oxygen sensor (See page DI–42).**

1, 2 ↓

3	**Check fuel pressure (See page SF–5).**

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–1).**

OK ↓

4	**Check injector injection (See page SF–21).**

NG → **Replace injector.**

OK ↓

5	**Check manifold absolute pressure sensor and engine coolant temp. sensor (See page DI–21, DI–29).**

NG → **Repair or replace.**

OK ↓

6	Check for spark and ignition (See page IG–1).

NG → Repair or replace.

OK

Check and replace ECM
(See page IN–30).

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

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. And when the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

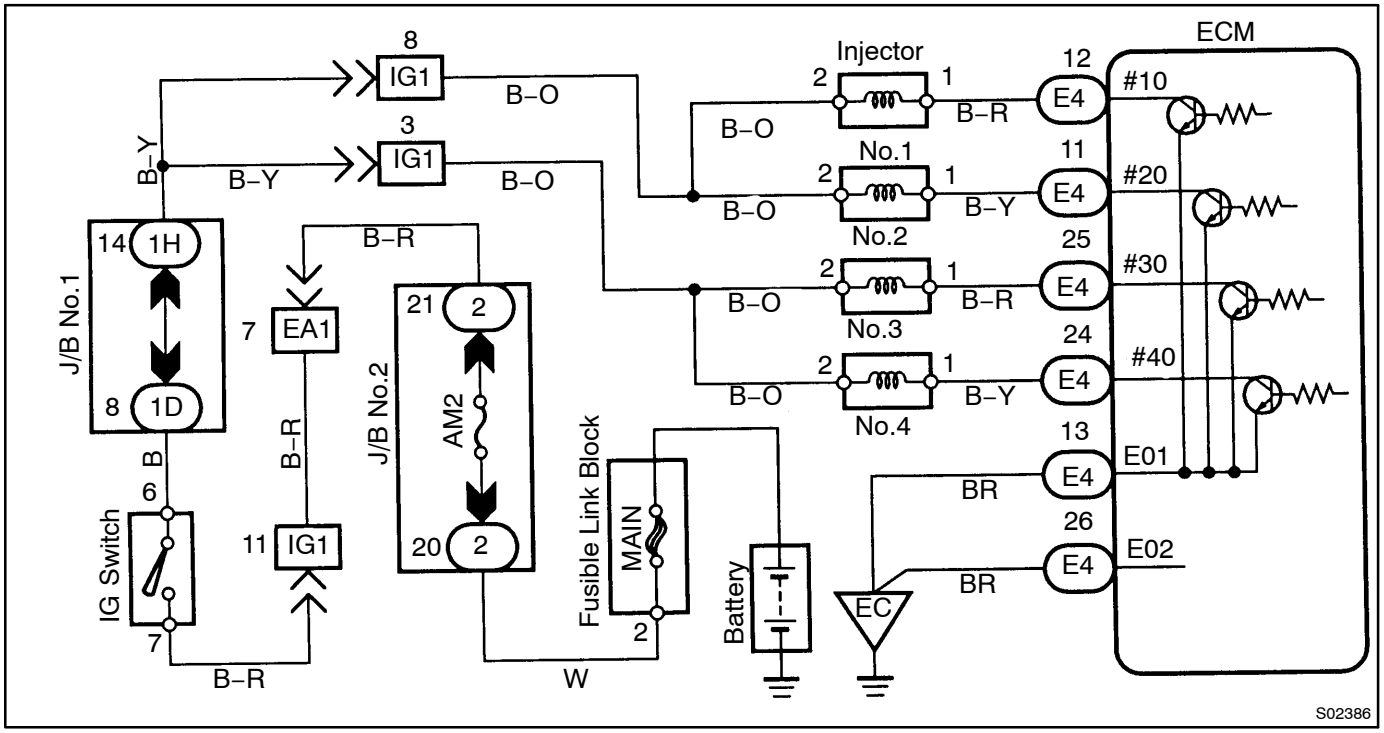
If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinder is detected during any particular 200 or 1,000 revolutions	• Ignition system • Injector • Fuel line pressure • EGR • Compression pressure • Valve clearance not to specification • Valve timing • Manifold absolute pressure sensor • Engine coolant temp. sensor
P0301 P0302 P0303 P0304	For any particular 200 revolutions of the engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of the engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	

HINT:

When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no Random Misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

WIRING DIAGRAM



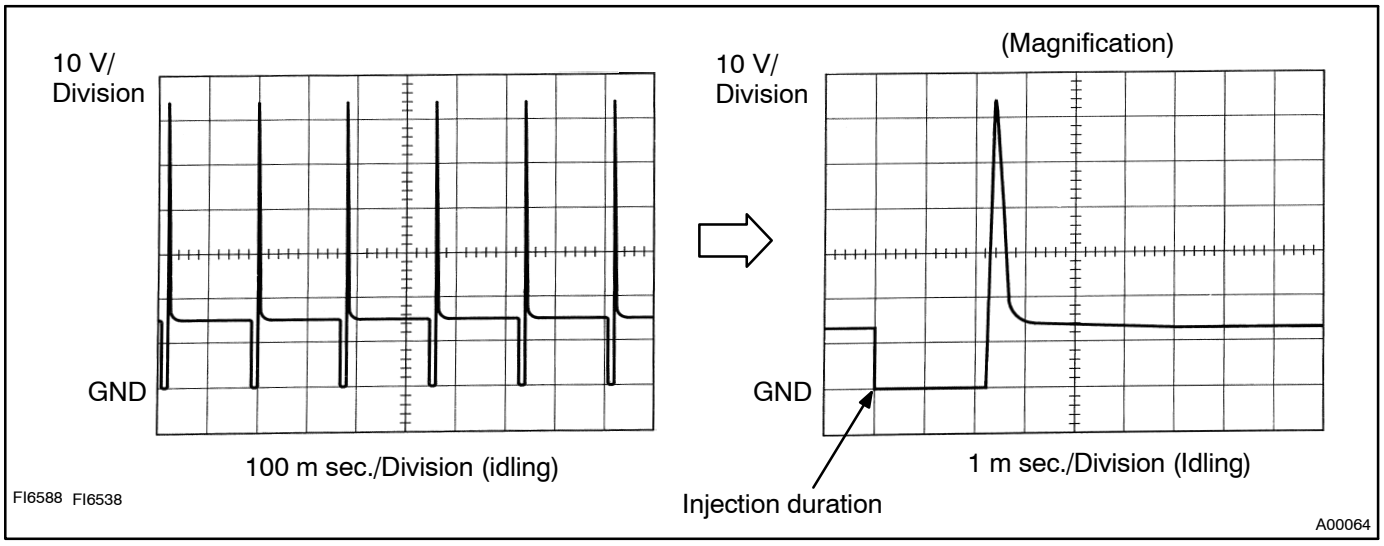
Reference INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

With the engine idling, measure between terminals #10, #20, #30, #40 and E01 of ECM.

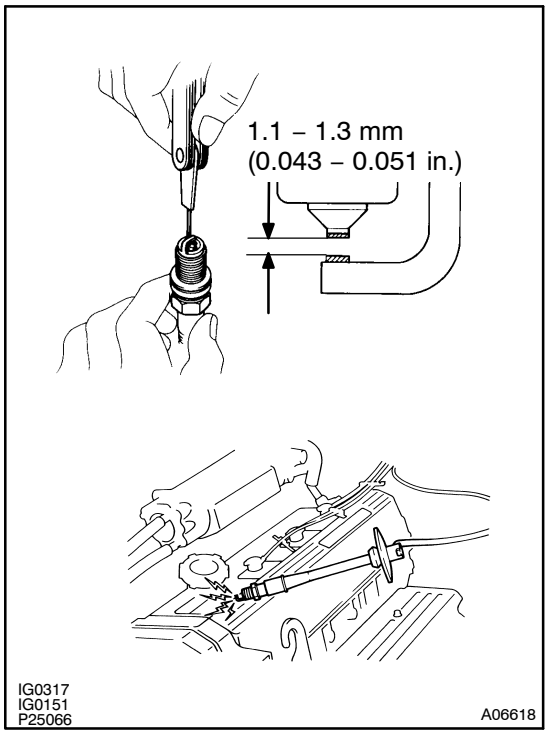
HINT:

The correct waveform is as shown.



INSPECTION PROCEDURE

1	Check spark plug and spark of misfiring cylinder.



PREPARATION:
(a) Disconnect the high–tension cord from spark plug.
(b) Remove spark plug.

CHECK:
(a) Check the carbon deposits on electrode.
(b) Check electrode gap.

OK:

(1) No large carbon deposit present.
Not wet with gasoline or oil.
(2) Electrode gap: 1.1 – 1.3 mm (0.043 – 0.051 in.)

PREPARATION:
(a) Install the spark plug to the high – tension cord.
(b) Disconnect injector connector.
(c) Ground 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, do not crank the engine for more than 5 – 10 seconds at a time.

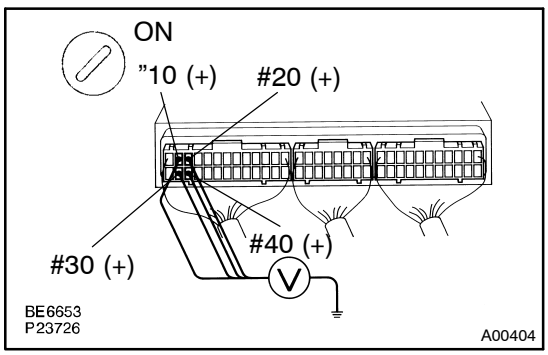
OK:

Spark jumps across electrode gap.

NG	Replace or check ignition system (See page IG–1).

OK

2	Check voltage of ECM terminal for injector of failed cylinder.



PREPARATION:
(a) Remove side trim cover (See page SF–61).
(b) Turn ignition switch ON.

CHECK:
Measure voltage between applicable terminal of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK	Go to step 4

NG

3	Check injector resistance of misfiring cylinder (See page SF–21).

NG → Replace injector.

OK →

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

4	Check fuel pressure (See page SF–5).

NG → Check and repair fuel pomp, pressure regulator, fuel pipe line and filter (See page SF–1).

OK →

5	Check injector injection (See page SF–21).

NG → Replace injector.

OK →

6	Check EGR system (See page SF–45).

NG → Repair EGR system.

OK →

7	Check manifold absolute pressure sensor and engine coolant temp. sensor (See page DI–21, DI–29).

NG → **Repair or replace.**

OK

Check the compression pressure (See page EM–3), valve clearance (See page EM–5) and valve timing (See page EM–19).

DI3ZP–01

DTC	P0325	Knock Sensor 1 Circuit Malfunction

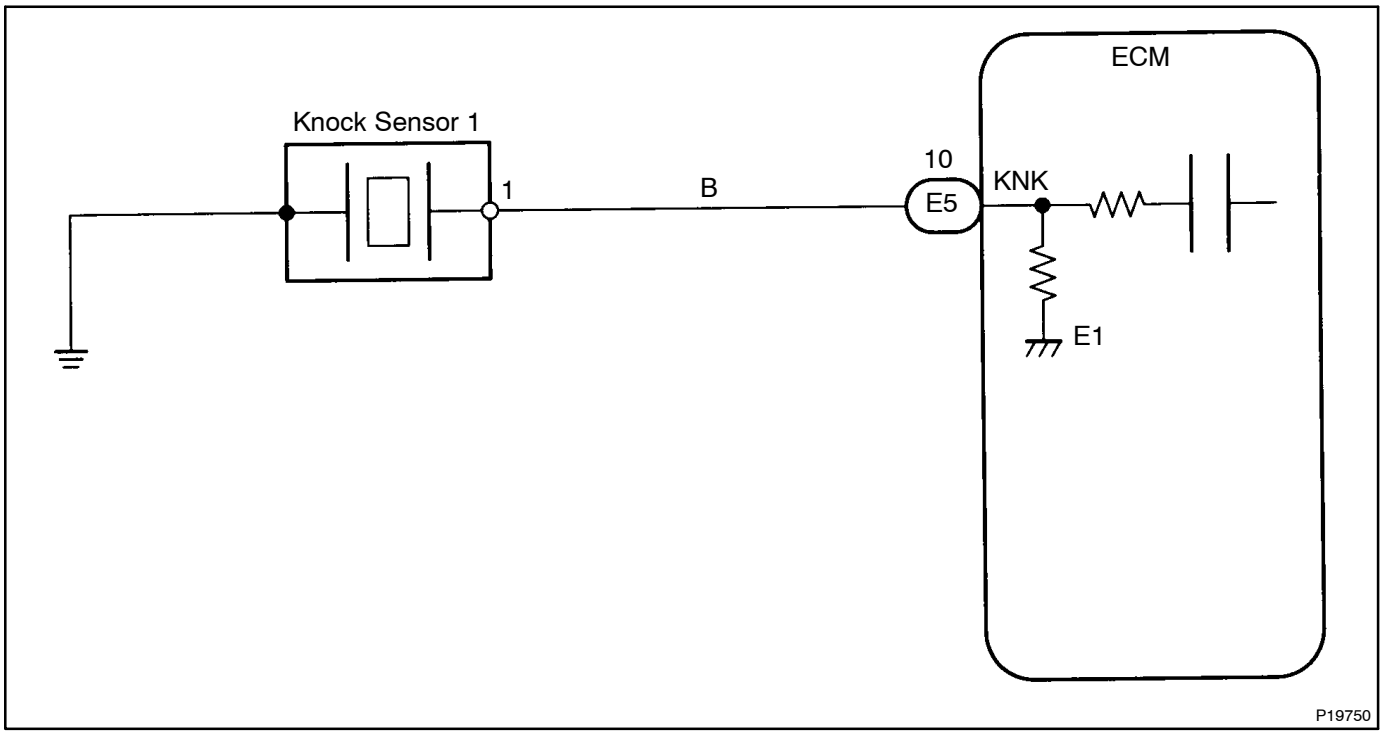
CIRCUIT DESCRIPTION

A 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 1,200 rpm or more (2 trip detection logic)	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM

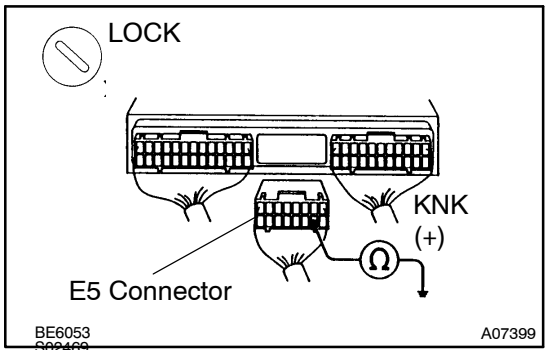
If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Disconnect the E5 connector of ECM.

CHECK:

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

OK:

Resistance: 1M Ω or higher

OK	**Go to step 3.**

NG

2	**Check knock sensor (See page SF–57).**

NG	**Repair knock sensor.**

OK

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

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

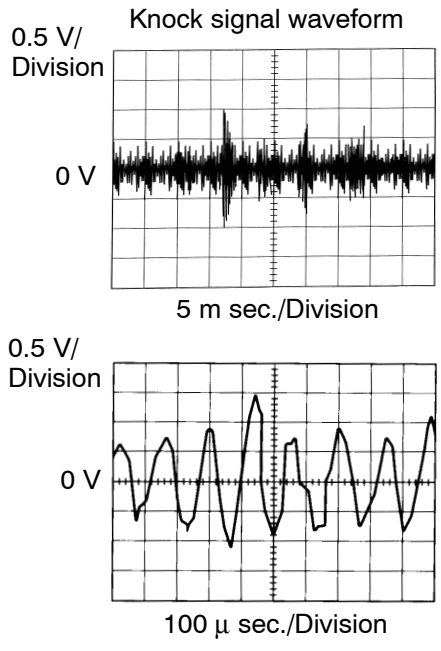
OK

4	**Does malfunction disappear when a good knock sensor is installed?**

YES	**Replace knock sensor.**

NO

Check and replace ECM (See page IN–30).



Reference INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm) measure between terminal KNK of ECM and body ground.

HINT:

The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 132 ¿ sec.
  (Normal mode vibration frequency of knock sensor: 7.6 KHz).

HINT:

If normal mode vibration frequency is not 7.6 KHz, the sensor is malfunctioning.

DI3ZQ–01

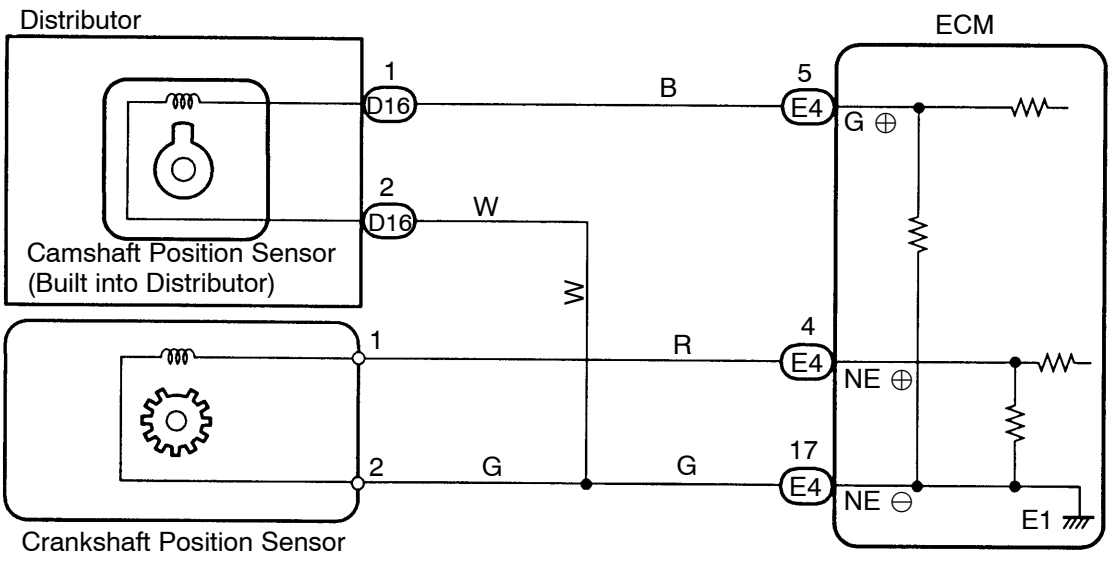
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consists of a signal plate and pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, and the actual crankshaft angle and the engine speed by the NE signals.

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 • Starter • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

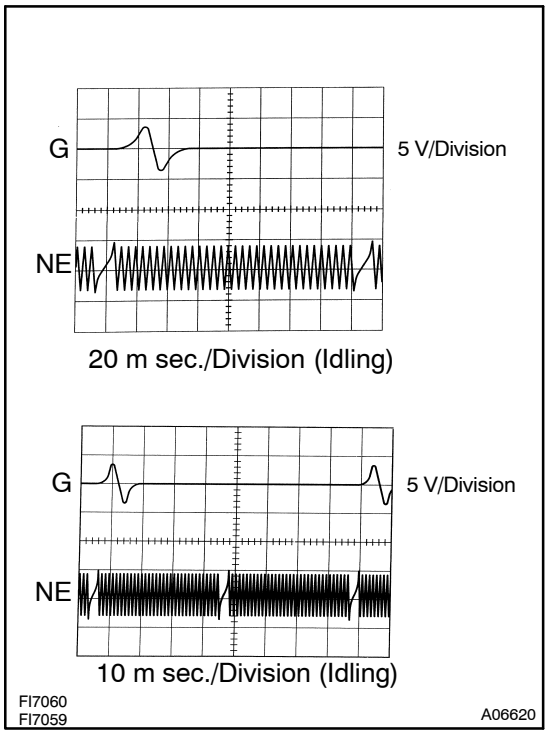
WIRING DIAGRAM



S02414

INSPECTION PROCEDURE

1	**Check resistance of crankshaft position sensor (See page IG–14).**



Reference:
INSPECTION USING OSCILLOSCOPE
During cranking or idling, check between terminals G ⊕ and NE ⊖, NE ⊕ and NE ⊖ of ECM.
HINT:
The correct waveforms are as shown.

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 and teeth of signal plate.**

NG → **Tighten the sensor.**
Replace signal plate.

OK

Check and replace ECM (See page IN–30).

DI3ZR–01

DTC	P0336	Crankshaft Position Sensor Circuit Range / Performance

CIRCUIT DESCRIPTION

Refer to Crankshaft Position Sensor ”A” Circuit Malfunction on page DI–59.

DTC No.	DTC Detecting Condition	Trouble Area
P0336	Engine control computer malfunction (for backup)	• Distributor • ECM

WIRING DIAGRAM

Refer to page DI–59.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0336) being output?**

YES → **Go to relevant DTC chart.**

NO

Check and replace ECM (See page IN–30).

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consist of a signal plate an pickup coil.
The G signal plate has one tooth on its outer circumference and is built into the distributor.
When the camshaft rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signal and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	Detection Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM with engine speed 600 rpm or more	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • ECM

WIRING DIAGRAM

Refer to page DI–59 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	**Check resistance of camshaft position sensor (signal generator) (See page IG–14).**

Reference:
INSPECTION USING OSCILLOSCOPE
Refer to page DI–59 for the OSCILLOSCOPE.

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.**

NG → **Tighten the sensor.**

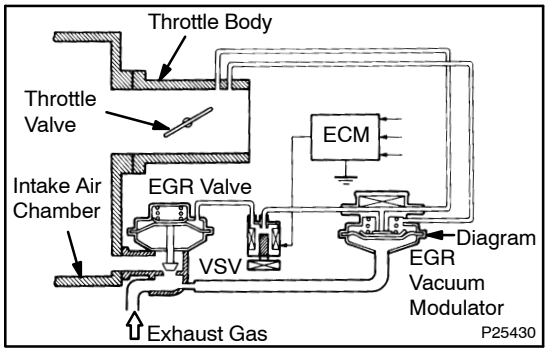
OK

Check and replace ECM (See page IN–30).

DTC	P0401	Exhaust Gas Recirculation Flow Insufficient Detected

CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temperature and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

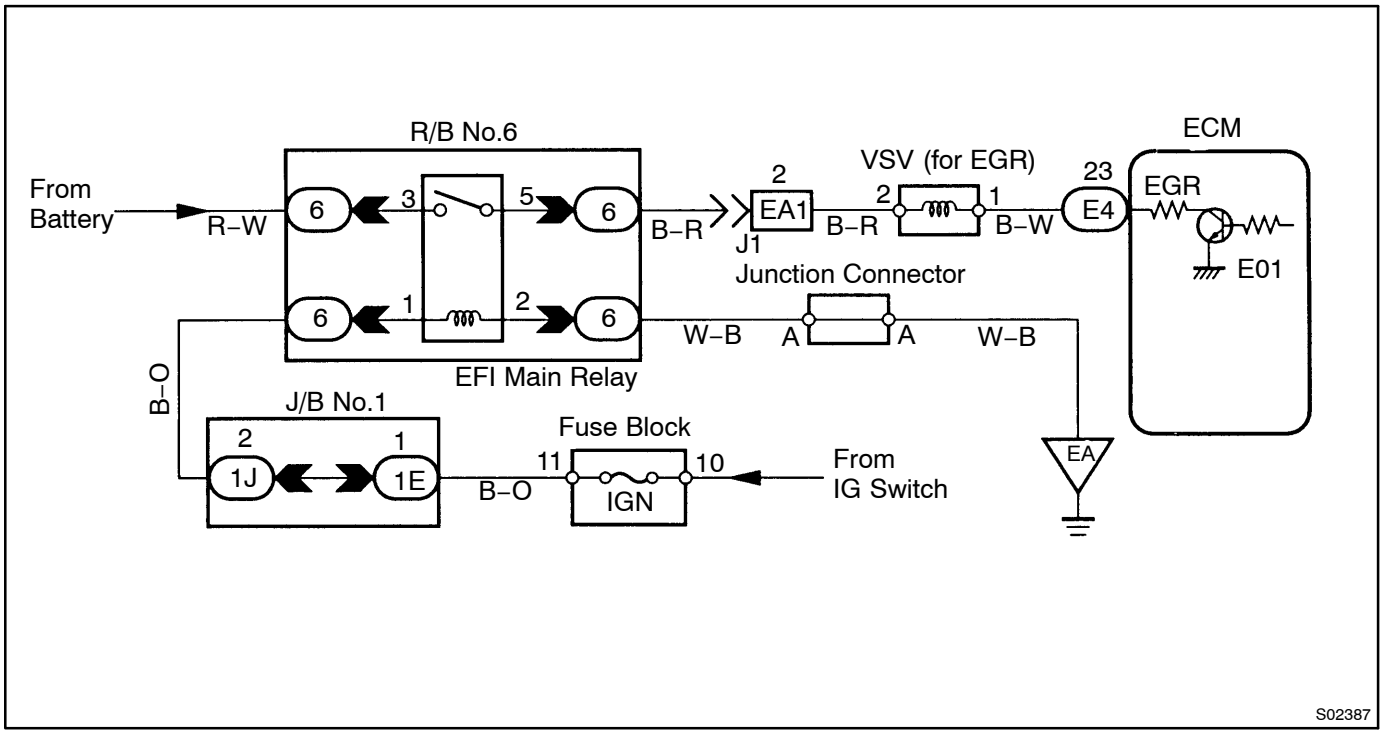


If even one the following conditions is fulfilled, the VSV is turned ON by a signal from ECM. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off).

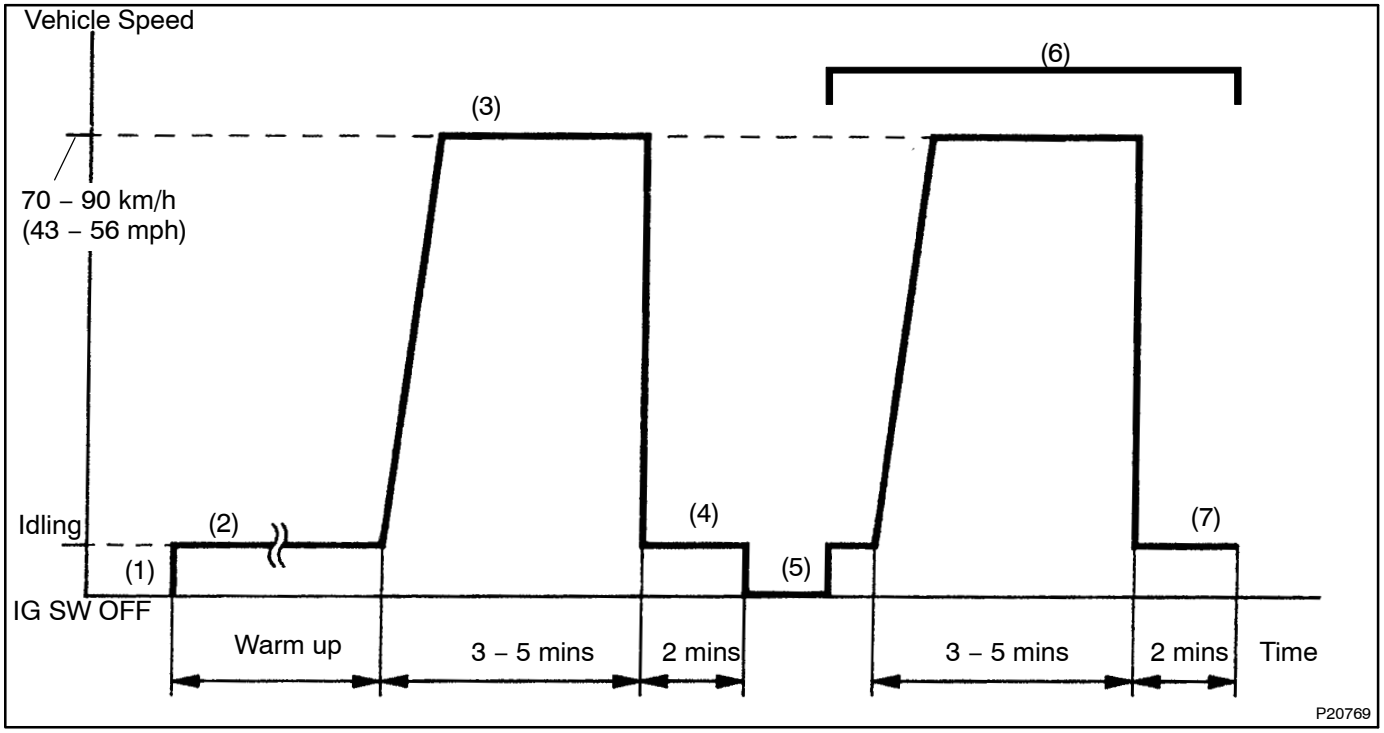
- Before the engine is warmed up
- During deceleration (throttle valve closed) .
- Light engine load (amount of intake air very small).
- Engine idling.
- Engine speed over 4,400 rpm.
- High engine load (amount of intake air very large) .

DTC No.	DTC Detecting Condition	Trouble Area
P0401	After the engine is warmed up, the intake manifold absolute pressure is lager than the valve calculated by the ECM while the EGR system is ON (2 trip detected logic)	• EGR valve stuck closed • Open or short in VSV circuit for EGR • Vacuum or EGR hose disconnected • Manifold absolute pressure sensor • EGR VSV open or close malfunction • ECM

WIRING DIAGRAM



SYSTEM CHECK DRIVING PATTERN



(1) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start and warm it up the engine with all accessories switched OFF.
(3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 minutes or more.
(4) Idle the engine for about 2 minutes.
(5) Stop at safe place and turn the ignition switch OFF.
(6) Start the engine and do steps (3) and (4) again.
(7) Check the ”READINESS TESTS” mode on the OBDII scan tool or TOYOTA hand–held tester. If ”COMPL” is displayed and the MIL does not light up, the system is normal. If ”INCMPL” is displayed and the MIL does not light up, run the vehicle again and check it.

HINT:

”INCMPL” is displayed when either condition (a) or (b) exists.

- The system check is incomplete.
- There is malfunction in the system.

If there is a malfunction in the system, the MIL will light up after step (2) to (6) above are done.

INSPECTION PROCEDURE

HINT:

- If DTC ”P0150” and / or ”P0106” and ”P0401” are output simultaneously, perform troubleshooting or DTC ”P0105” first.
- If DTC ”P0401” and ”P0402” are output simultaneously, perform troubleshooting of DTC ”P0402” first.

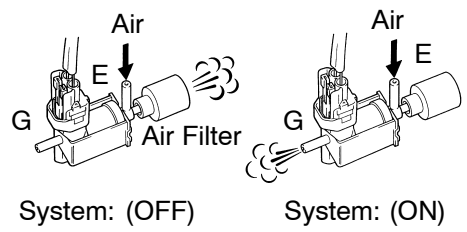
TOYOTA hand–held tester

1	Check the connection of the vacuum hose, EGR hose (See page EC–5).

NG → Repair or replace.

OK

2	Check the VSV for EGR.



PREPARATION:
Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:
Check operation of VSV, when it is operated by the TOYOTA hand–held tester.

OK:

EGR system is OFF:
Air from pipe E is flowing out through the air filter.
EGR system is ON:
Air from pipe E is flowing out pipe G.

OK → Go to step 4.

NG

3	Check operation of the VSV for EGR (See page SF–43).

NG → Replace VSV for EGR.

OK

Check for open and short in harness and connector between R/B No.6 and ECM (See page IN–30).

4	Check EGR vacuum modulator (See page EC–8).

NG → Repair or replace.

OK

5	Check EGR valve (See page EC–8).

NG → Repair or replace.

OK

6	Check manifold absolute pressure sensor (See page DI–21).

NG → Repair or replace.

OK

Check and replace ECM (Se page IN–30).

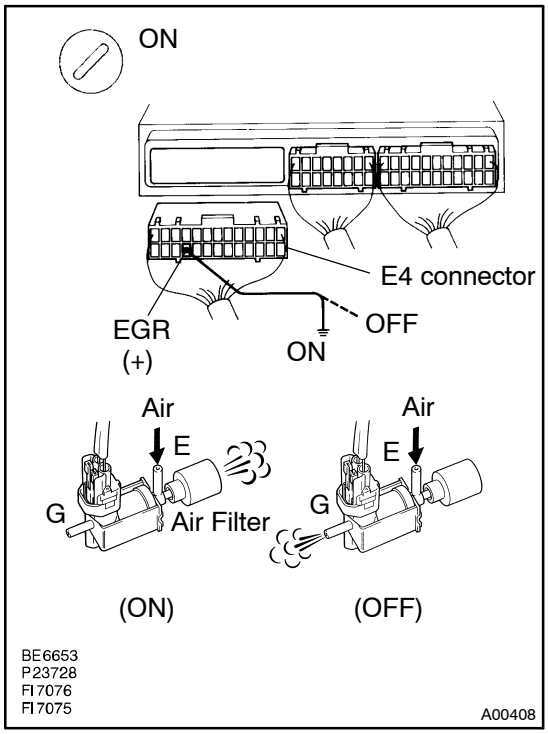
OBDII scan tool (excluding TOYOTA hand–held tester)

1	Check the connection of vacuum hose, EGR hose (See page EC–5).

NG → Repair or replace.

OK

2	Check the VSV for EGR.



PREPARATION:

(a) Remove side trim cover (See page SF–62).
(b) Disconnect the E4 connector of ECM.
(c) Turn ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EGR of ECM connector and body ground. (ON)
(2) Disconnect between terminal EGR of ECM connector and body ground. (OFF)

OK:

(1) VSV is ON:
Air from pipe E is Flowing out through the air filter.
(2) VSV is OFF:
Air from pipe E is flowing out pipe G.

OK	Go to step 4.

NG

3	Check operation of the VSV for EGR (See page SF–43).

NG	Replace VSV for EGR.

OK

Check for open and short in harness and connector between R/B No.6 and ECM (See page IN–30).

4	Check EGR vacuum modulator (See page EC–8).

NG → Repair or replace.

OK

5	Check EGR valve (See page EC–8).

NG → Repair or replace.

OK

6	Check manifold absolute pressure sensor (See page DI–21).

NG → Repair or replace.

OK

Check and replace ECM
(See page IN–30).

DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected

CIRCUIT DESCRIPTION

Refer to Exhaust Gas Recirculation Flow Insufficient Detected on page DI–65.

DTC No.	DTC Detecting Condition	Trouble Area
P0402	After the engine is warmed up, conditions (a) and (b) continue (a) The intake manifold absolute pressure is larger than the value calculated by the ECM while the EGR system is ON. (b) Misfiring is detected during idling (2 trip detection logic)	• EGR valve stuck open • Vacuum or EGR hose is connected to wrong post • Manifold absolute pressure sensor • ECM

See DTC P0140 for System Check Driving Pattern and Wiring Diagram.

INSPECTION PROCEDURE

HINT:

- If DTC ”P0105” and / or ”P0106” and ”P0402” are output simultaneously, perform troubleshooting of DTC ”P0105” first.
- If DTC ”P0401” and ”P0402” are output simultaneously, perform troubleshooting of DTC ”P0402” first.

1	**Check the connection of the vacuum hose, EGR hose (See page EC–5).**

NG → **Repair or replace.**

OK

2	**Check EGR valve (See page EC–8).**

NG → **Repair or replace.**

OK

3	**Check the VSV for EGR * .**

* If you have TOYOTA hand–held tester, see page DI–65, step 2.
  If you have no TOYOTA hand–held tester, see page DI–65, step 2.

OK → **Go to step 5.**

NG

4	Check operation of the VSV for EGR (See page SF–43).

NG → Replace VSV for EGR.

OK →

Check for open and short in harness and connector between R/B No.6 and ECM (See page IN–30).

5	Check EGR vacuum modulator (See page EC–8).

NG → Repair or replace.

OK →

6	Check manifold absolute pressure sensor (See page DI–21).

NG → Repair or replace.

OK →

Check and replace ECM (See page IN–30).

DI3ZV–01

DTC	P0420	Catalyst System Efficiency Below Threshold

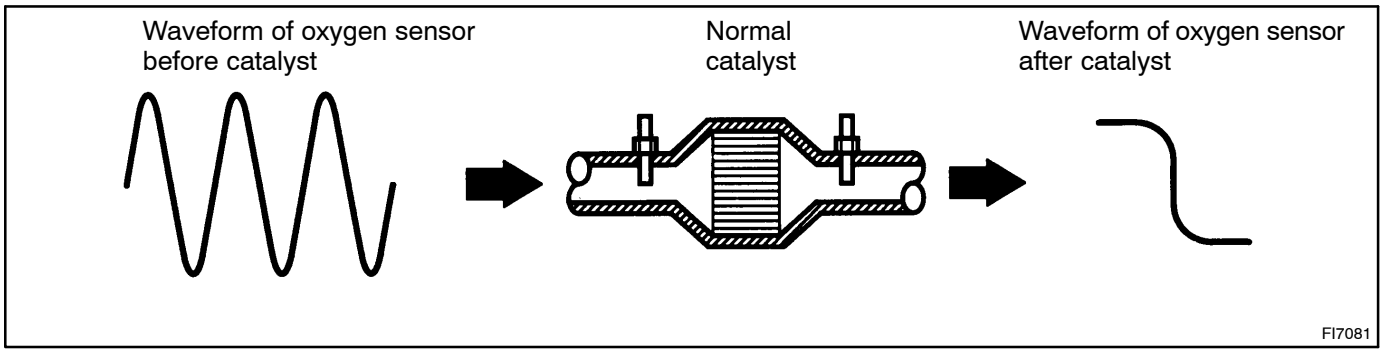
CIRCUIT DESCRIPTION

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

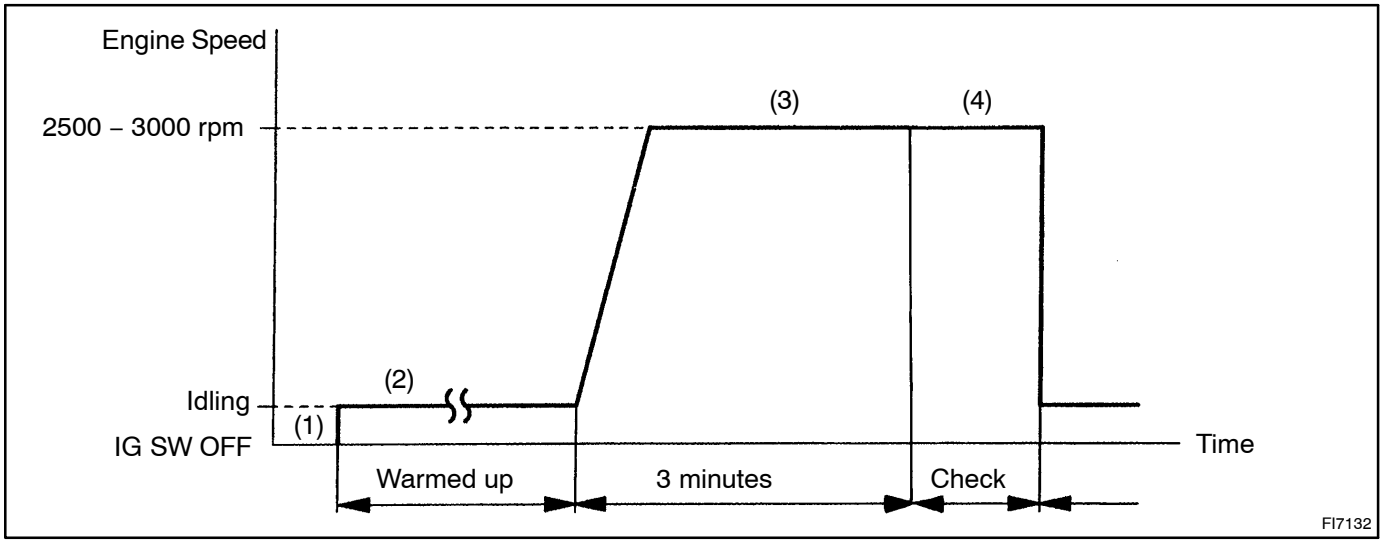
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

But when both wavaforms change at a similar rate, it indicates that catalyst performance has deteriorated.

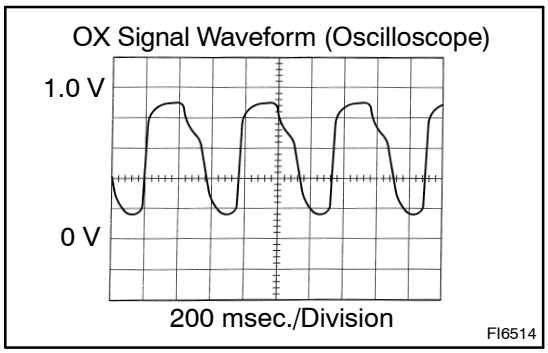


DTC No	DTC Detecting Condition	Trouble Area
P0420	After the engine and the catalyst are warmed up, and while the vehicle is driven within the set vehicle and engine speed range, the waveforms of the oxygen sensors (bank 1 sensor 1 and bank 1 sensor 2) have the same amplitude (2 trip detection logic)	• Front TWC (front catalyst) and TWC w/pipe (rear catalyst) • Oxygen sensor

CONFIRMATION ENGINE RACING PATTERN



(1) Connect the TOYOTA hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1, OX2 and E1 of ECM.
(2) Start engine and warm it up with all accessories switched OFF until water temperature is stable.
(3) Race the engine at 2500 – 3000 rpm for about 3 min.
(4) After confirming that the waveforms of the oxygen sensor, bank 1 sensor 1 (OX1), oscillate around 0.5 V during feedback to the ECM, check the waveform of the oxygen senor, bank 1 sensor 2 (OX2).



HINT:
If there is a malfunction in the system, the waveform of the oxygen senor, bank1 sensor 2 (OX2), is almost the same as that of the oxygen sensors, bank 1 senor 1 (OX1), on the left.
There are some cases where, even though a malfunction exists, the MIL may either light up or not light up.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0420) being output?

YES → Go to relevant DTC chart.

NO

2	Check oxygen senor (bank 1 sensor 1) (See page DI–42).

NG → Repair or replace.

OK

3	Check oxygen senor (bank 1 sensor 2) (See page DI–45).

NG → Repair or replace.

OK

Replace both of front TWC (front catalyst) and TWC w/ pipe (rear catalyst) (See page EC–11).

DI3ZW–01

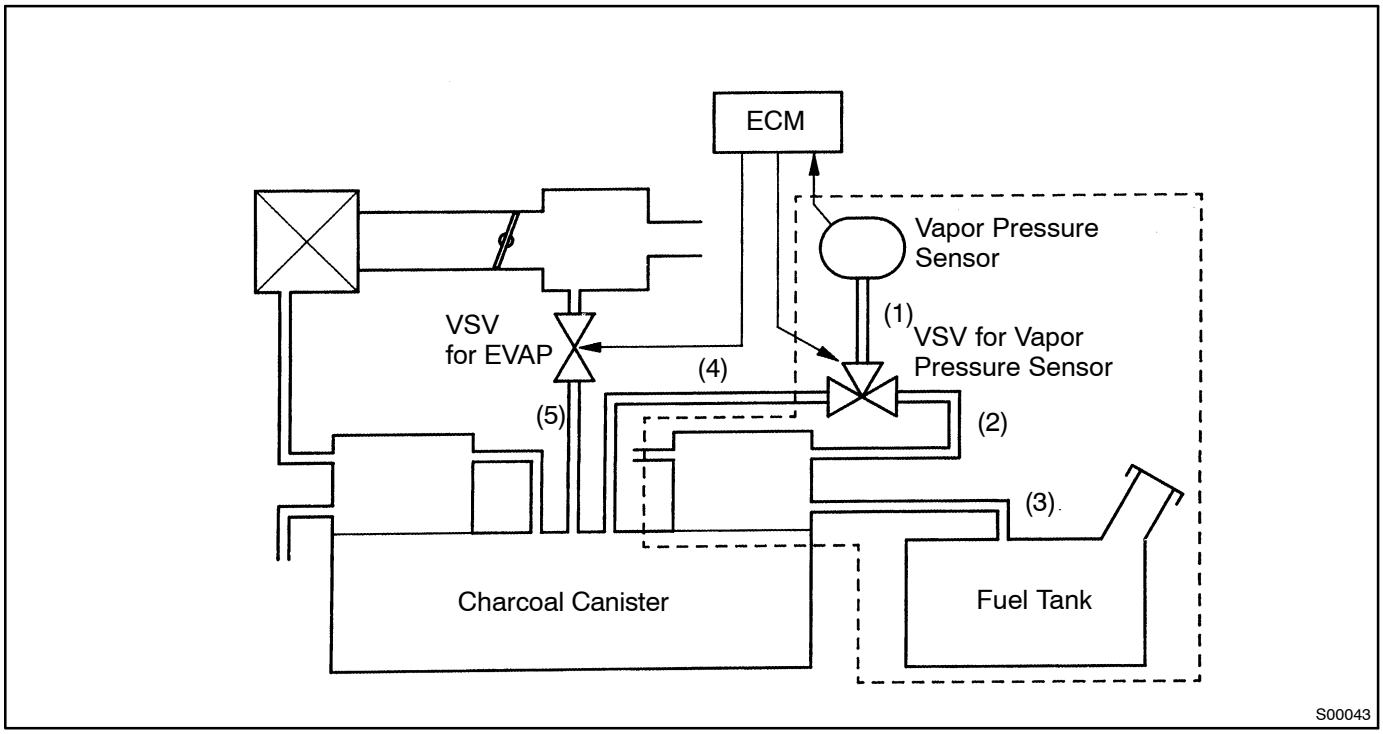
DTC	P0440	Evaporative Emission Control System Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor are used to detect abnormalities in the evaporative emission control system.

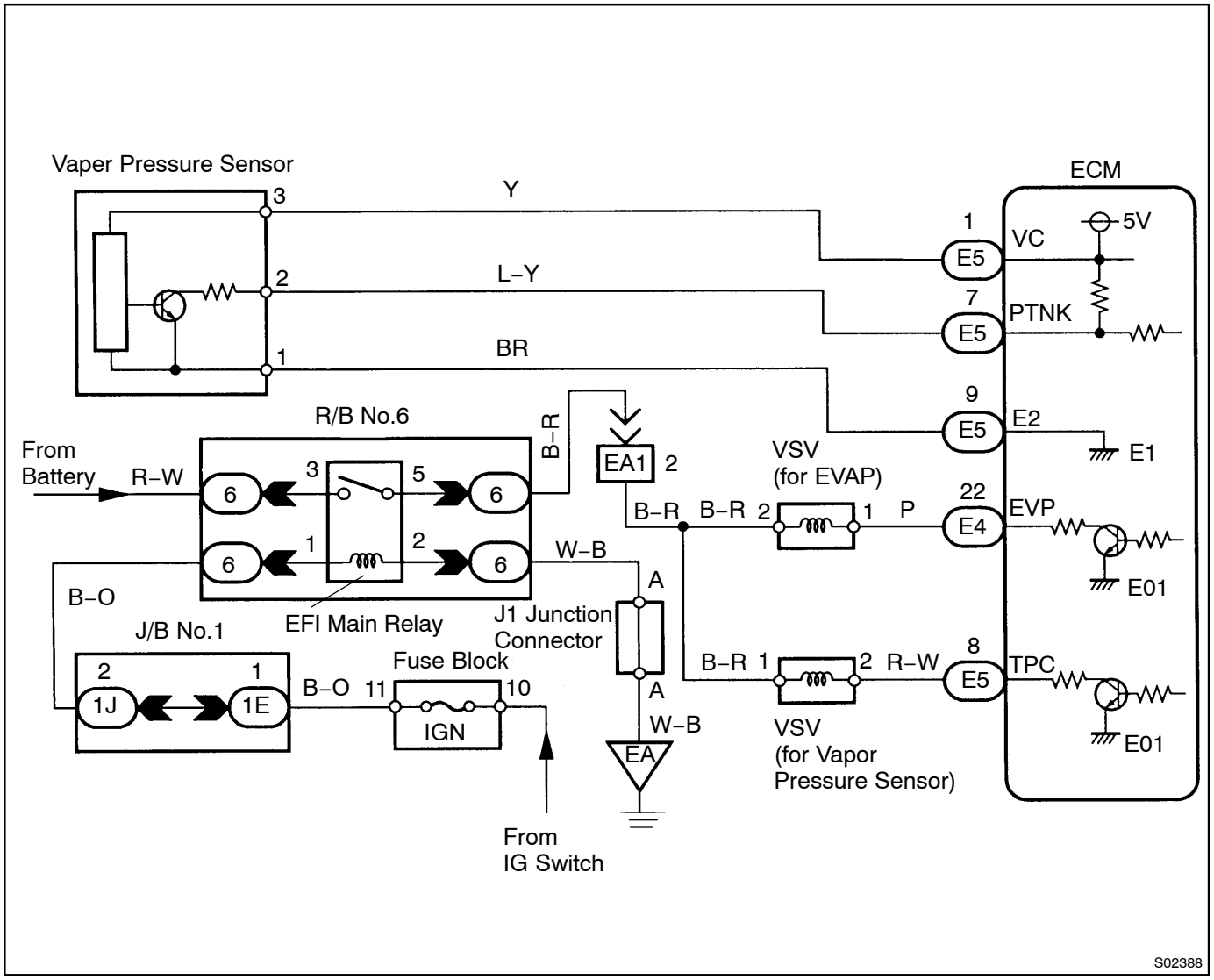
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTC P0440 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.



DTC No.	DTC Detecting Condition	Trouble Area
P0440	The fuel tank pressure is atmospheric pressure after the vehicle is driven for 20 min. (2 trip detection logic)	• Vapor pressure sensor • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1) or (2) in fig. 1) ((3) in fig. 1) • Fuel tank cranked, holed or damaged • Charcoal canister cracked, holed or damaged

WIRING DIAGRAM

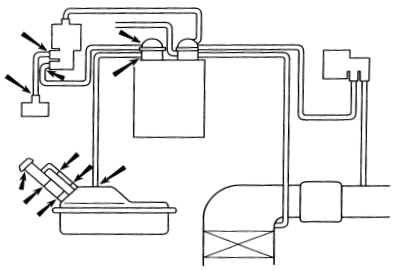


INSPECTION PROCEDURE

HINT:

- If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450. If no malfunction is detected, troubleshoot DTC P0440 next.
- Ask the customer whether, after the MIL came on, the customer found the fuel tank cap loose and tightened it. Also ask the customer whether the fuel tank cap was loose when refuelling.
  If the fuel tank cap was loose, it was the cause of the DTC. If the fuel tank cap was not loose or if the customer was not sure if it was loose, troubleshoot according to the following procedure.

1	**Check whether the hoses close to the fuel tank have been modified, and check whether there are signs of any accident near the 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 the fuel tank and charcoal canister

NG → **Repair or replace.**

OK

2	**Check that the fuel tank cap is TOYOTA genuine parts.**

NG → **Replace to TOYOTA genuine parts.**

OK

3	**Check that the fuel tank cap is correctly installed.**

NG → **Correctly install the fuel tank cap.**

OK

4	**Check the fuel tank cap (See page EC–5).**

NG → **Replace fuel tank cap.**

OK

5	**Check the filler neck for damage.**

PREPARATION:
Remove the fuel tank cap.
CHECK:
Visually inspect the filler neck for damage.

NG → **Replace the filler neck.**

OK

6	**Check the vacuum hoses between vapor pressure sensor and VSV for vapor pressure sensor, and VSV for vapor pressure sensor 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.**

OK

7	**Check the 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 SF–1), 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.**

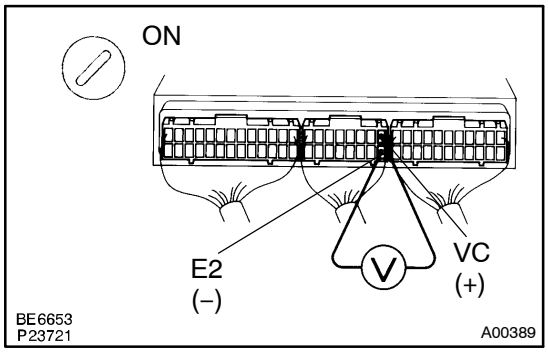
OK

8	**Check the charcoal canister for cracks, hole and damage (See page EC–5).**

NG → **Replace charcoal canister.**

OK

9	Check voltage between terminals VC and E2 of ECM connector.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of ECM connector.

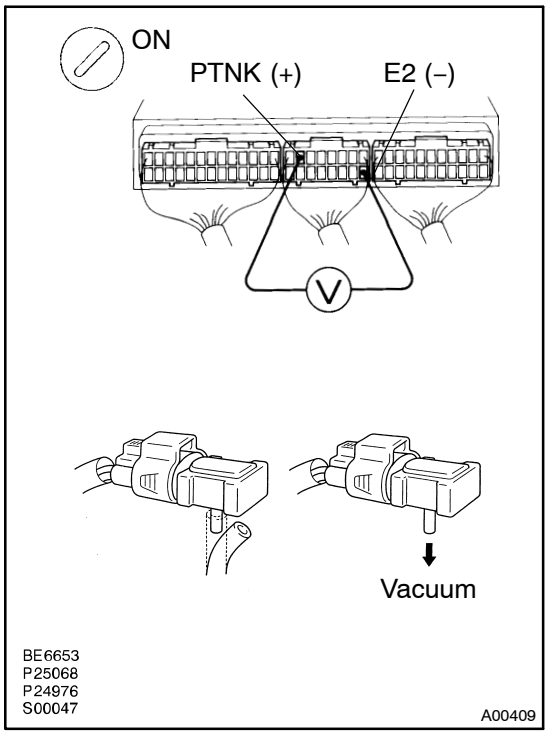
OK:

Voltage: 4.5 – 5.5 V

NG	Check and replace ECM (See page IN–30).

OK

10	Check voltage between terminals PTNK and E2 of ECM connector.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply vacuum (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).

OK:

(1) Voltage: 2.9 – 3.7 V

(2) Voltage: 0.5 V or less

OK	Go to step 12.

NG

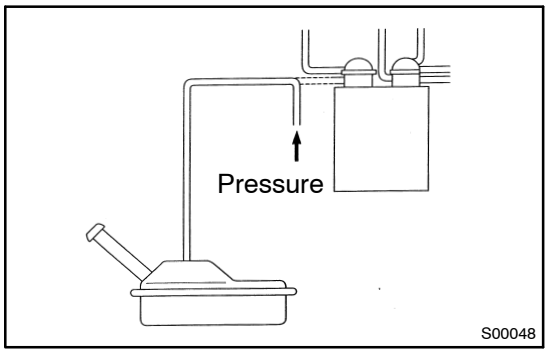
11	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

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

OK

Replace vapor pressure senor.

12	**Check the fuel tank for cracks and damage.**



PREPARATION:

(a) Disconnect the vacuum hose from charcoal canister.
(b) Correctly install the fuel tank cap.
(c) Apply a pressure of 5 kPa (0.05 kgf/cm^2, 0.71 psi) to the fuel tank.

CHECK:

Check whether the pressure is maintained after 1 minute.

OK:

Pressure applied to the fuel tank is maintained.

NG → **Replace fuel tank.**

OK

It is likely that the vehicle user did not properly close the fuel tank cap. Please explain to the customer how to properly install the fuel tank cap.

DI3ZX–01

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor 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 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 VSV for EVAP, the VSV for vapor pressure sensor, or in the vapor pressure sensor itself.

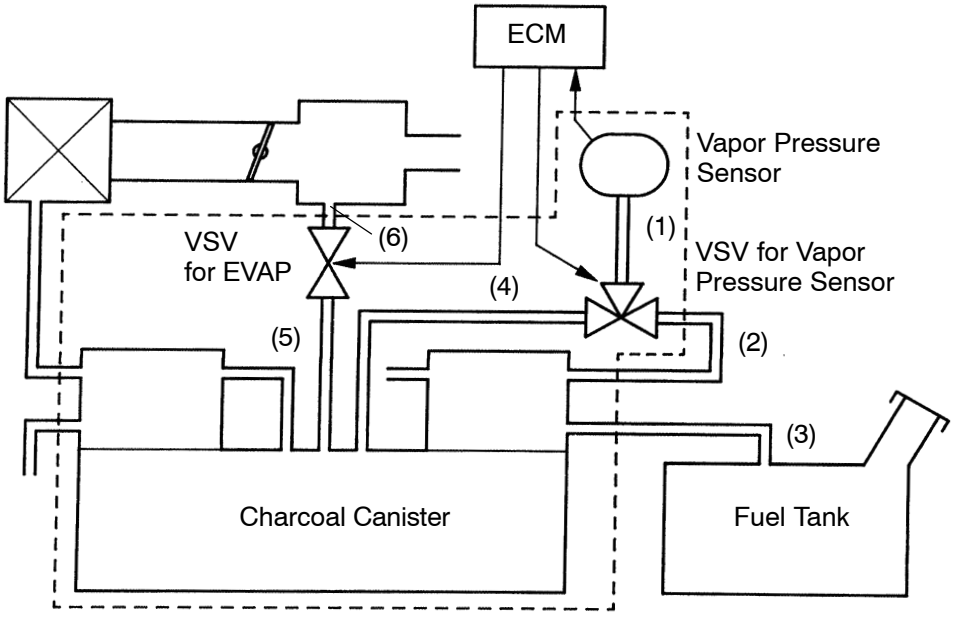


fig.1

S00044

DTC No..	DTC Detecting Condition	Trouble Area
P0441	The pressure in the charcoal canister does not drop during purge control (2 trip detection logic)	• Open or short in VSV circuit for vapor pressure sensor • VSV for vapor pressure sensor • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for EVAP • VSV for EVAP • Vacuum hose cracks, hole, blocked, damaged or disconnected ((1), (4), (5) and (6) in fig. 1) • Charcoal canister cracks, hole or damaged
	During purge cut–off, the pressure in the charcoal canister is very low compared with atmospheric pressure (2 trip detection logic)	
P0446	When VSV for vapor pressure sensor is OFF, ECM judges that there is no continuity between vapor pressure sensor and charcoal canister (2 trip detection logic)	
	When VSV for vapor pressure sensor is ON, ECM judges that there is no continuity between vapor pressure sensor and fuel tank (2 trip detection logic)	
	After the purge cut off operates, the pressure in the charcoal canister is maintained at atmospheric pressure (2 trip detection logic)	

WIRING DIAGRAM

Refer to Evaporative Emission Control System Malfunction on page DI–76.

INSPECTION PROCEDURE

HINT:
If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450.
If no malfunction is detected, troubleshoot DTC P0440 next.

TOYOTA hand–held tester

1	**Check the VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect the VSV or sensor connector.**

OK

2	**Check the vacuum hose between intake manifold and VSV for EVAP,VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, and VSV for vapor pressure sensor and vapor pressure sensor.**

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.**

OK

3	Check voltage between terminals VC and E2 of ECM connector (See page DI–76, step 9).

NG → Check and replace ECM (See page IN–30).

OK

4	Check voltage between terminals PTNK and E2 of ECM connector (See page DI–76, step 10).

OK → Go to step 6.

NG

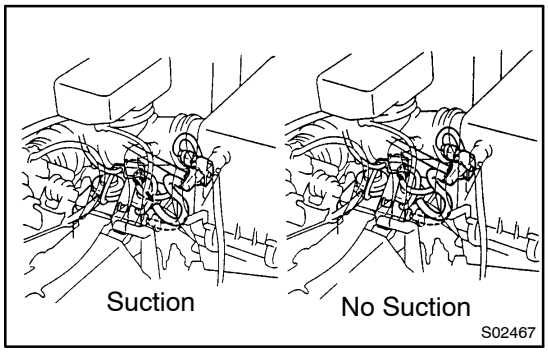
5	Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).

NG → Repair or replace harness or connector.

OK

Replace vapor pressure sensor.

6	Check the purge flow.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(c) Disconnect from the charcoal canister the vacuum hose to the VSV for EVAP.
(d) Start the engine.

CHECK:

When the VSV for EVAP is operated by the TOYOTA 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 10.

NG

7	Check the vacuum hose between intake manifold and VSV for EVAP, and VSV for EVAP 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.

OK

8	Check operation of the VSV for EVAP (See page SF–43).

NG	Replace VSV.

OK

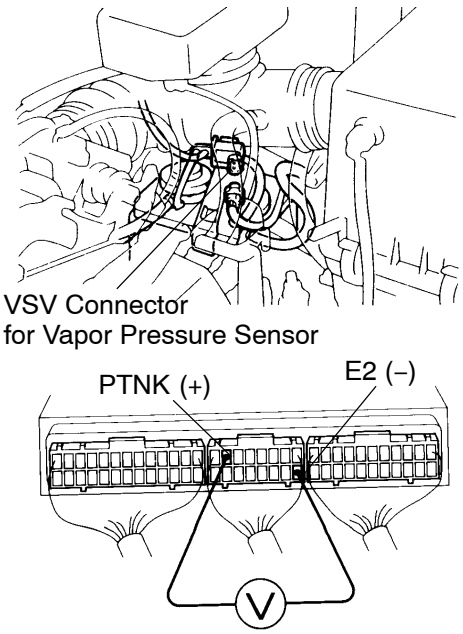
9	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and VSV for EVAP and ECM (See page IN–30).**

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

OK

Check and replace ECM (See page IN–30).

10	**Connect the TOYOTA hand–held tester, when VSV connector for vapor pressure sensor is disconnected and VSV for EVAP is ON, measure voltage between terminals PTNK and E2 of ECM connector.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the VSV connector for vapor pressure sensor.
(c) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(d) Remove side trim cover (See page SF–61).
(e) Start the engine.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector, when VSV for EVAP is ON, using the TOYOTA hand–held tester.

OK:

Voltage: 2.0 V or less

OK → **Go to step 12.**

NG

11	**Check the vacuum between charcoal canister and VSV for vapor pressure sensor, and vapor pressure sensor and VSV for vapor pressure sensor.**

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.**

OK

12	**Check operation of the VSV for vapor pressure sensor (See page SF–47).**

NG → **Replace VSV.**

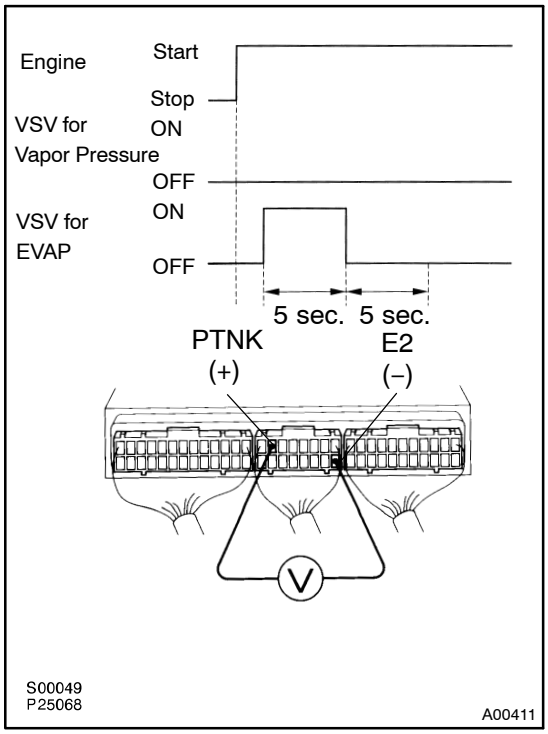
OK

13	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and VSV for vapor pressure sensor and ECM (See page IN–30).**

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

OK

14	Check the charcoal canister.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Remove the fuel rank cap.
(c) Disconnect the VSV connector for vapor pressure sensor.
(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.
(e) Remove side trim cover (See page SF–61).
(f) Start the engine.
(g) VSV for EVAP is ON by TOYOTA hand–held tester and remains on for 5 sec.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector 5 secs. after switching VSV for EVAP from ON to OFF.

OK:

Voltage: 2.5 V or less

NG → **Replace charcoal canister.**

OK

Check and replace ECM (See page IN–30).

OBDII scan tool (excluding TOYOTA hand–held tester)

1	Check the VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.

NG → **Repair or connect the VSV or sensor connector.**

OK

2	Check the vacuum hose between intake manifold and VSV for EVAP,VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, and VSV for vapor pressure sensor and vapor pressure sensor.

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.**

OK ↓

3	**Check voltage between terminals VC and E2 of ECM connector (See page DI–76, step 9).**

NG → **Check and replace ECM (See page IN–30).**

OK ↓

4	**Check voltage between terminals PTNK and E2 of ECM connector (See page DI–76, step 10).**

OK → **Go to step 6.**

NG ↓

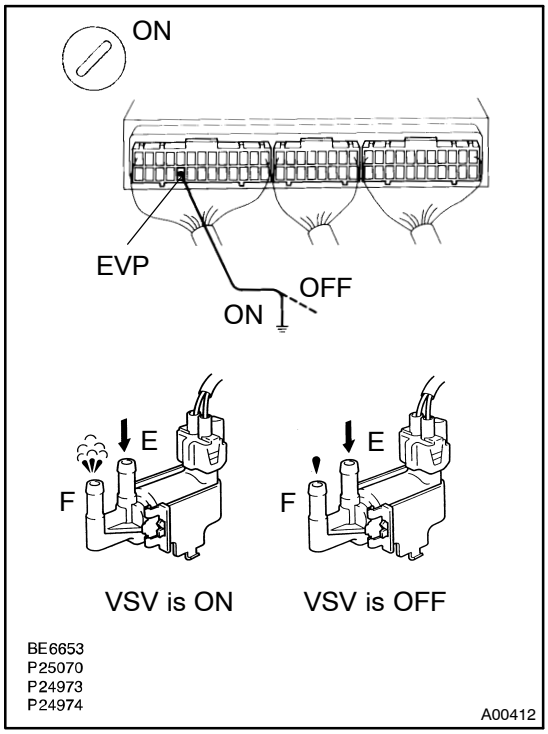
5	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–30).**

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

OK ↓

Replace vapor pressure sensor.

6	Check the VSV for EVAP.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP of ECM and body ground.

(2) Disconnect between terminal EVP of ECM and body ground.

OK:

(1) VSV is ON:
Air from pipe E is following out through pipe F.
(2) VSV is OFF:
Air does not flow from pipe E to pipe F.

OK → **Go to step 9.**

NG

7	Check operation of the VSV for EVAP (See page SF–43).

NG → **Replace VSV.**

OK

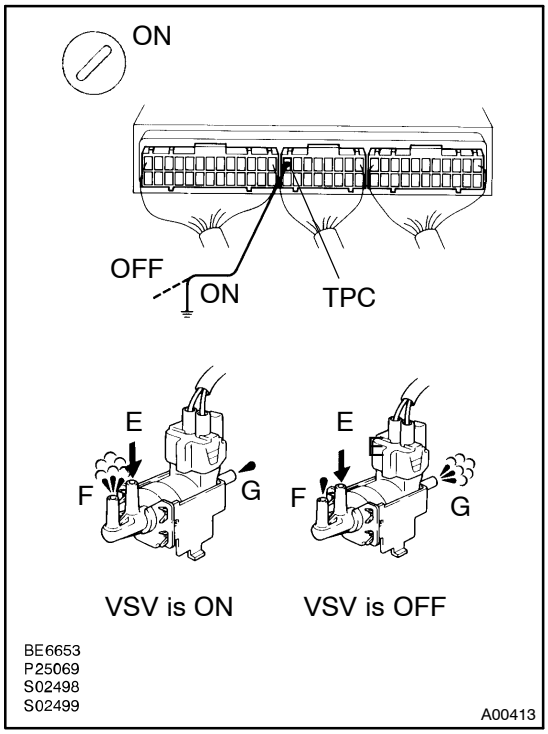
8	Check for open and short in harness and connector between EFI main relay (Marking: EFI MAIN) and VSV for EVAP and ECM (See page IN–30).

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

OK

Check and replace ECM (See page IN–30).

9	Check the VSV for vapor pressure sensor.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Check VSV function

(1) Connect between terminal TPC of ECM and body ground.

(2) Disconnect between terminal TPC of ECM and body ground.

OK:

VSV is ON:
Air from pipe E is flowing out through pipe F.
VSV is OFF:
Air from pipe E is flowing out through pipe G.

OK	Check and replace charcoal canister (See page EC–5).

NG

10	Check operation of the VSV for vapor pressure sensor (See page SF–47).

NG	Replace VSV.

OK

11	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and VSV for vapor pressure sensor and ECM (See page IN–30).

NG	Repair or replace harness or connector.

OK

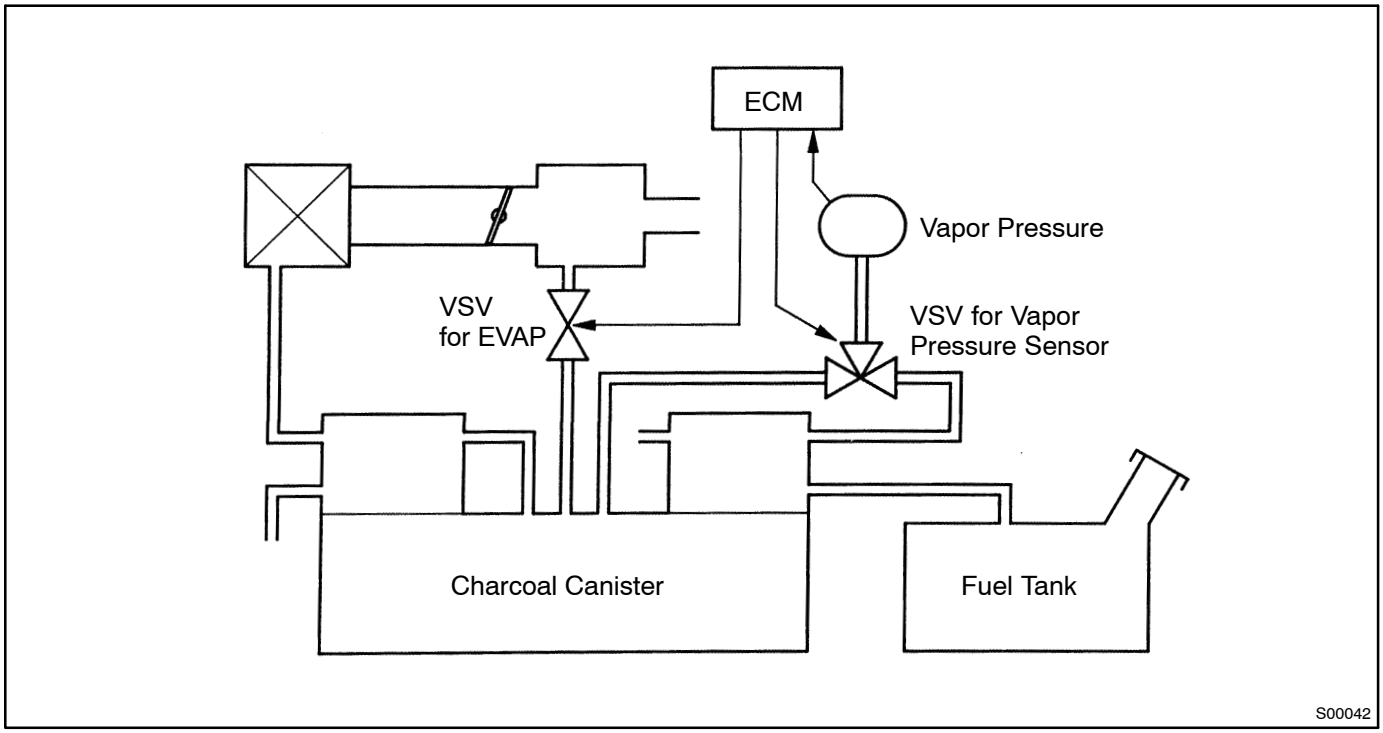
Check and replace ECM (See page IN–30).

DI3ZY–01

DTC	P0450	Evaporative Emission Control System Pressure Sensor Malfunction

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor 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 P0450 is recorded by the ECM when the vapor pressure sensor malfunction.



DTC No.	DTC Detecting Condition	Trouble Area
P0450	Condition (a) or (b) continues. (2 trip detection logic) (a) PTNK < 0.5 V (b) PTNK > 4.5 V	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM

WIRING DIAGRAM

Refer to Evaporative Emission Control System Malfunction on page DI–76.

INSPECTION PROCEDURE

HINT:
If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450.
If no malfunction is detected, troubleshoot DTC P0440 next.

1	**Check voltage between terminals VC and E2 of ECM connector (See page DI–76, step 9).**

NG → **Check and replace ECM (See page IN–30).**

OK

2	**Check voltage between terminals PTNK and E2 of ECM connector (See page DI–76, step 10).**

OK → **Check and replace ECM (See page IN–30).**

NG

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

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

OK

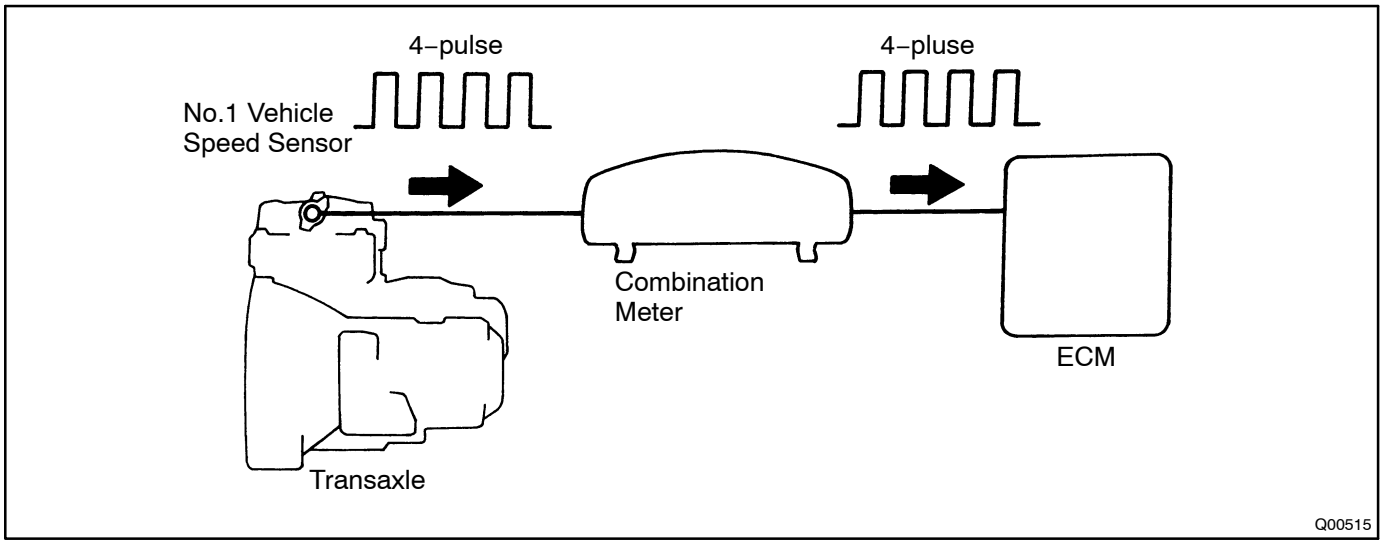
Replace the vapor pressure sensor.

DI3ZZ–01

DTC	P0500	Vehicle Speed Sensor Malfunction

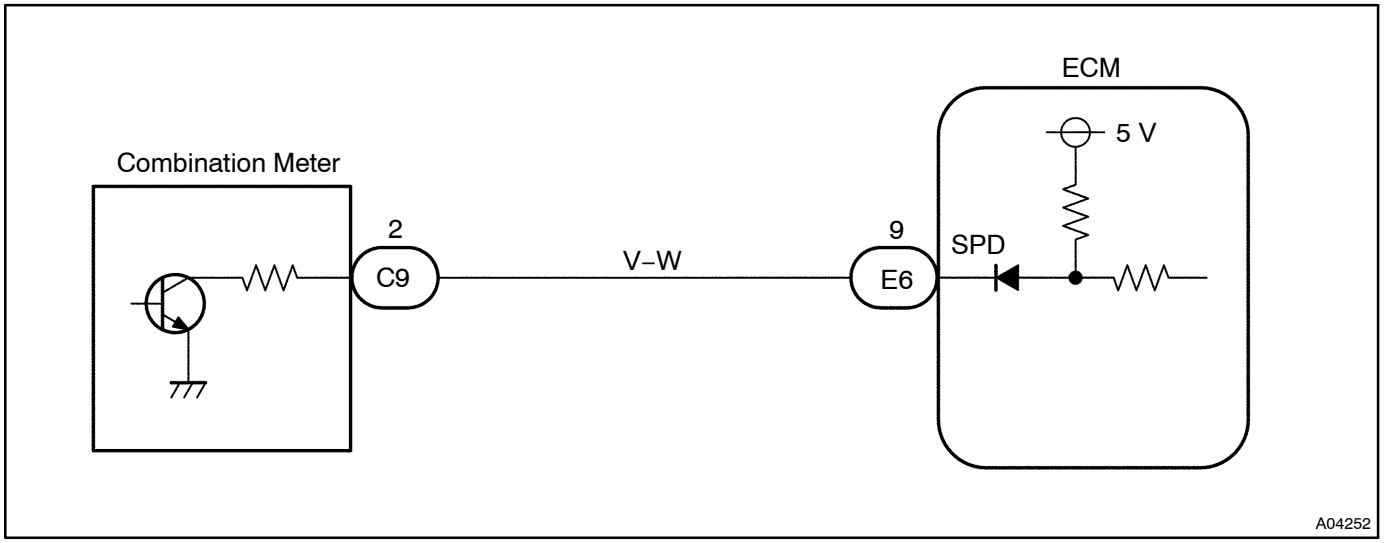
CIRCUIT DESCRIPTION

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 pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under the following conditions: (2 trip detection logic) For A/T: (a) Park / neutral position switch is OFF (b) Vehicle is being driven For M/T: (a) Engine speed is between 2,000 rpm and 5,000 rpm (b) Vehicle is being driven at 88 km/h (54 mph) or more	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of speedometer.**

CHECK:

Drive the vehicle and check it the operation of the speedometer in the combination meter is normal.

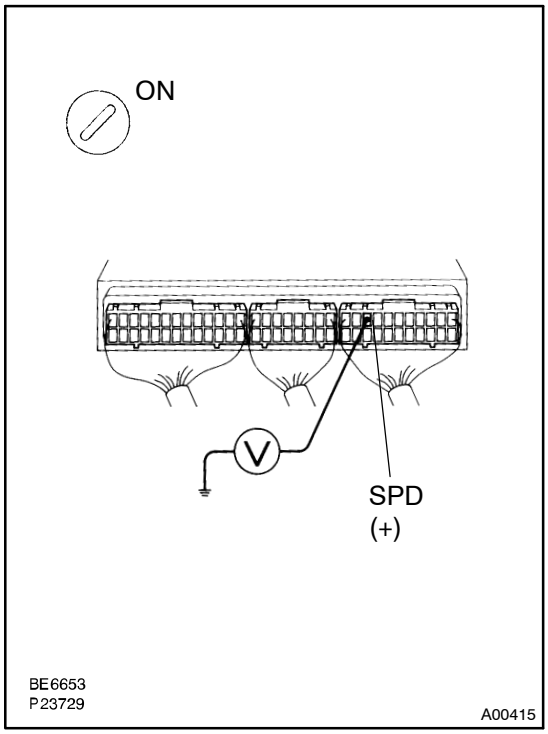
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → **Check speedometer circuit. See combination meter troubleshooting.**

OK

2	Check voltage between terminal SPD of ECM connector and body ground.



PREPARATION:

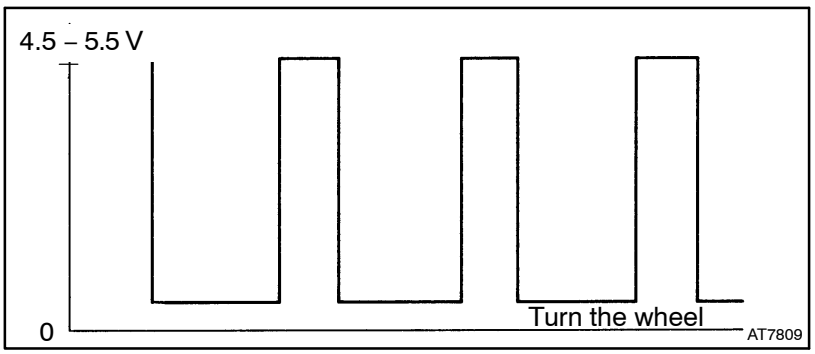
(a) Remove side trim cover (See page SF–62).
(b) Shift the shift lever to neutral.
(c) Jack up one of the front wheels
(d) Turn ignition switch ON.

CHECK:

Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.



NG → **Check and repair harness and connector between combination meter and ECM.**

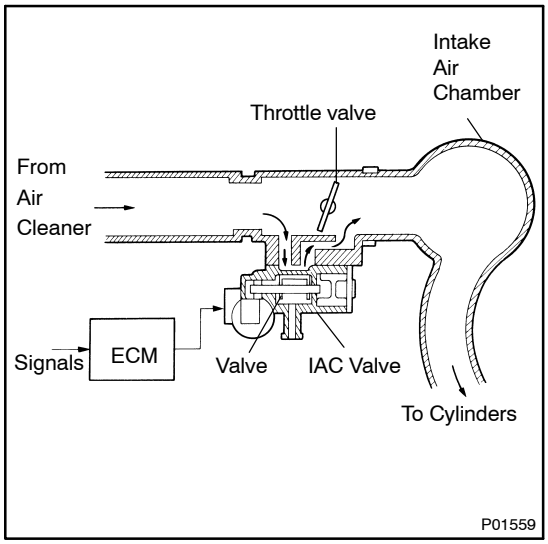
OK

Check and replace ECM (See page IN–30).

DI400–01

DTC	P0505	Idle Control System Malfunction

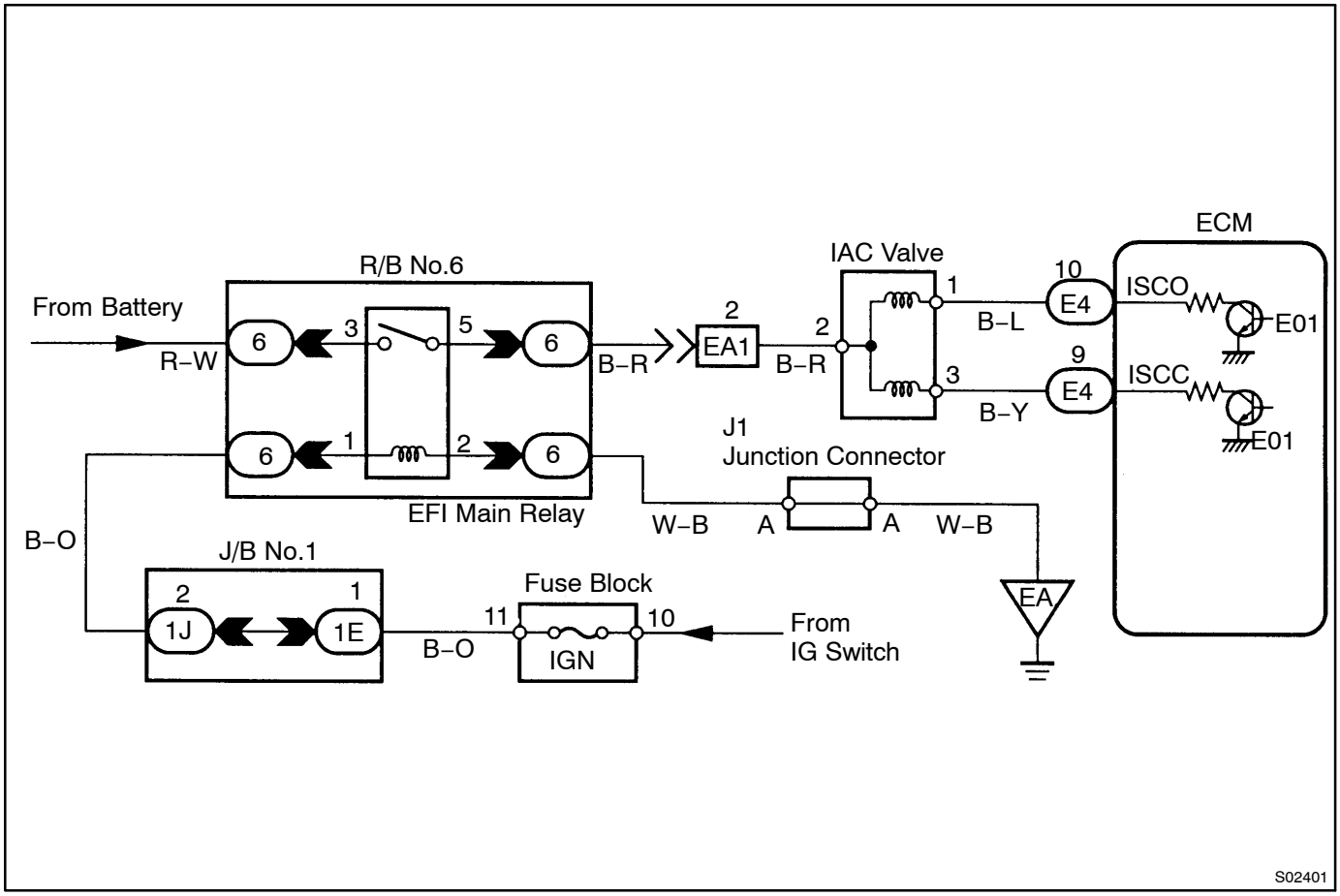
CIRCUIT DESCRIPTION



The rotary solenoid type IAC valve is located on the throttle body and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates only the IAC valve to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from the target speed (2 trip detection logic)	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Open or short IAC signal circuit • Air intake (hose loose)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check air induction system (See page EC–5).**

NG → **Repair or replace.**

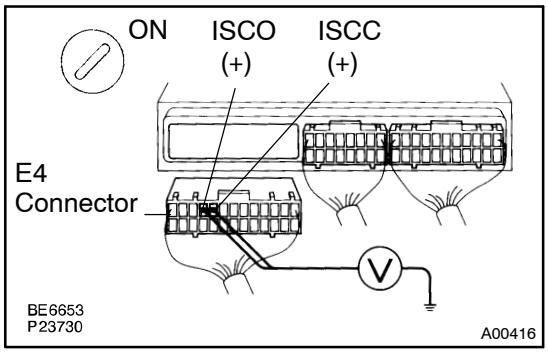
OK

2	**Check A/C signal circuit (See page AC–64).**

NG → **Repair or replace.**

OK

3	**Check voltage between terminals ISCO, ISCC of ECM connector and body ground.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).
(b) Disconnect the E4 connector of ECM.
(c) Turn ignition switch ON.

CHECK:

Measure voltage between terminals ISCO, ISCC of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK	**Go to step 5.**

NG

4	**Check IAC valve (See page SF–34).**

NG	**Replace IAC valve.**

OK

Check for open and short in harness and connector between R/B No.6 and IAC valve, IAC valve and ECM (See page IN–30).

5	**Check operation of the IAC valve (See page SF–34).**

NG	**Repair or replace IAC valve.**

OK

Check and replace ECM (See page IN–30).

DI401-01

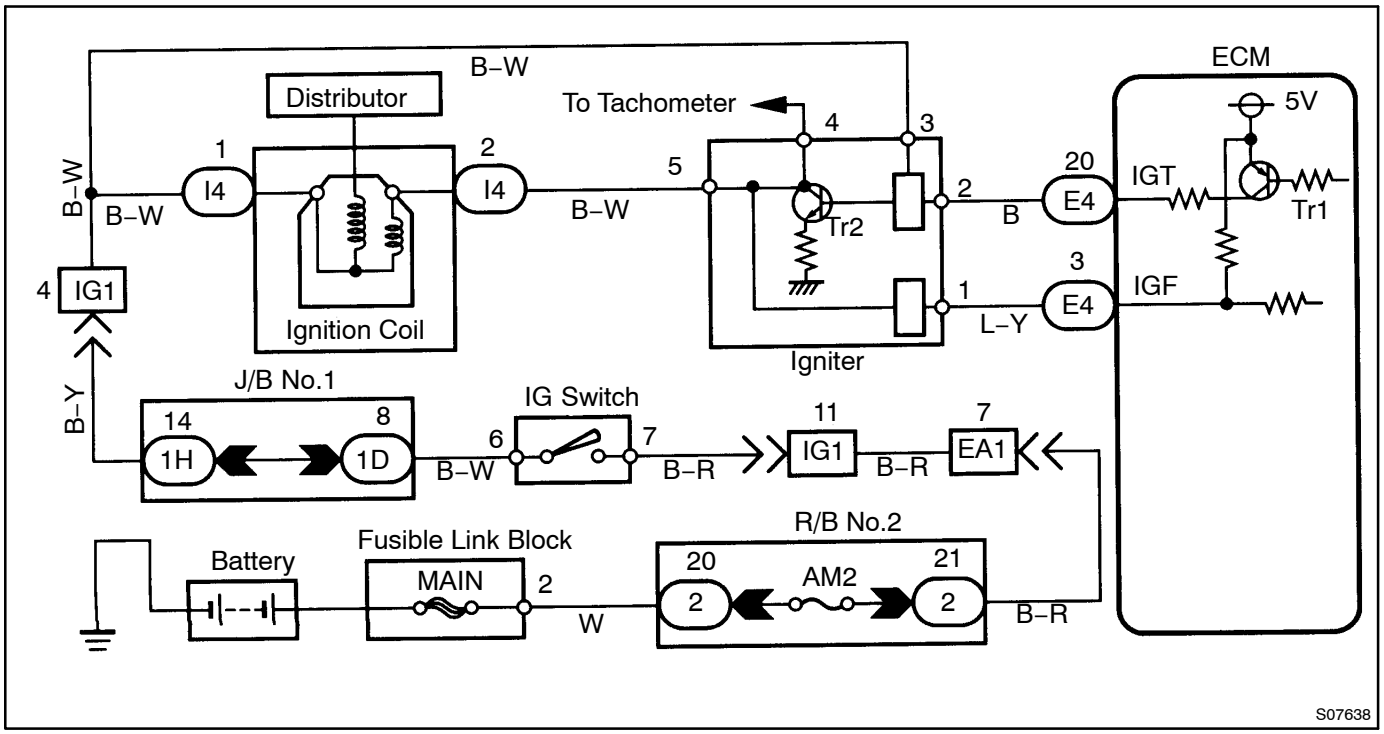
DTC	P1300	Igniter Circuit Malfunction

CIRCUIT DESCRIPTION

This ECM determines the ignition timing, turns on Tr_1 at a predetermined angle (˚CA) before the desired ignition timing and outputs an ignition signal (IGT) ”1” to the igniter.
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.
When it reaches the ignition timing, the ECM turns Tr_1 off and outputs the IGT signal ”O”.
This turns Tr_2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM.
The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 8 consecutive IGT signals during engine running.	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check spark plug and spark (See page IG–1).

NG → Go to step 4.

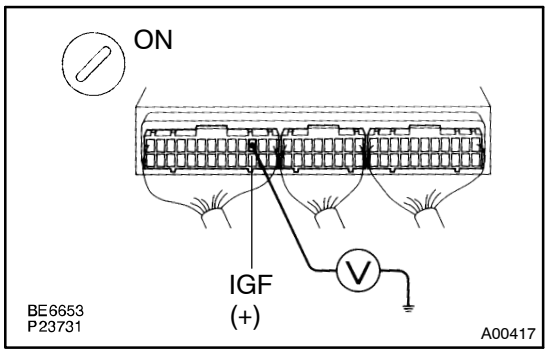
OK

2	Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–30).

NG → Repair or replace harness or connector.

OK

3	Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.



PREPARATION:

(a) Disconnect igniter connector.
(b) Remove side trim cover (See page SF–61).
(c) Turn ignition switch ON.

CHECK:

Measure voltage between terminal IGF of ECM connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK → Replace igniter.

NG

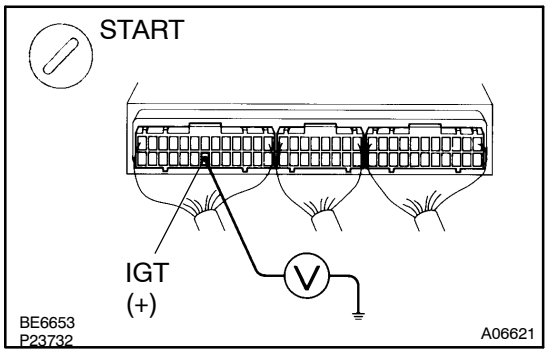
Check and replace ECM (See page IN–30).

4	**Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN–30).**

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

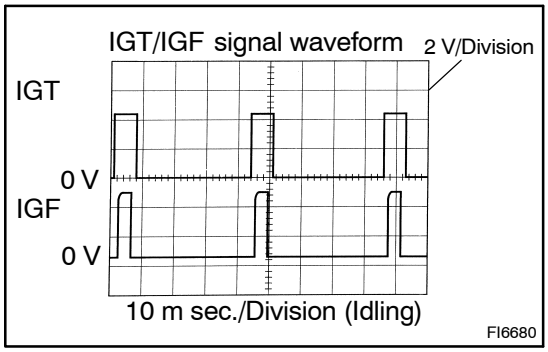
OK

5	**Check voltage between terminal IGT of ECM connector and body ground.**



PREPARATION:
Remove side trim cover (See page SF–61).
CHECK:
Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

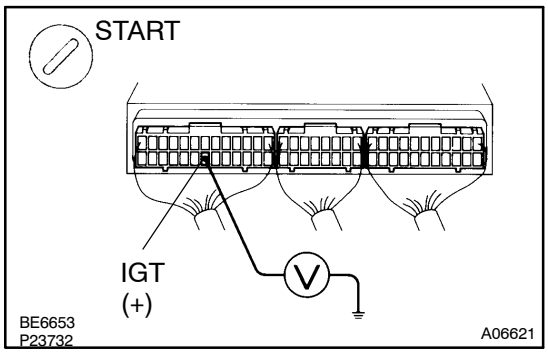


Reference:
INSPECTION USING OSCILLOSCOPE
During idling, check waveform between terminal IGT and E1 of ECM.
HINT:
The correct waveforms are as shown.

NG → **Check and replace ECM (See page IN–30).**

OK

6	Disconnect igniter connector and check voltage between terminal IGT of ECM connector and body ground.



PREPARATION:
(a) Disconnect the igniter connector.
(b) Remove side trim cover (See page SF–61).

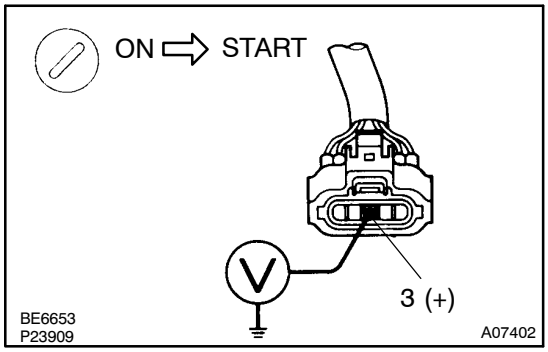
CHECK:
Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

OK:
Voltage: More than 0.1 V and less than 4.5 V

OK	Replace igniter.

NG

7	Check voltage between terminal 3 of igniter connector and body ground.



PREPARATION:
Disconnect the igniter connector.

CHECK:
Measure voltage between terminal 3 of igniter connector and body ground, when ignition switch is turned to ”ON” and ”START” position.

OK:
Voltage: 9 – 14 V

NG	Check and repair igniter power source circuit.

OK

8	Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–30).

NG	Repair or replace harness or connector.

OK

9	Check ignition coil (See page IG–1).

NG → Replace ignition coil.

OK →

Replace igniter.

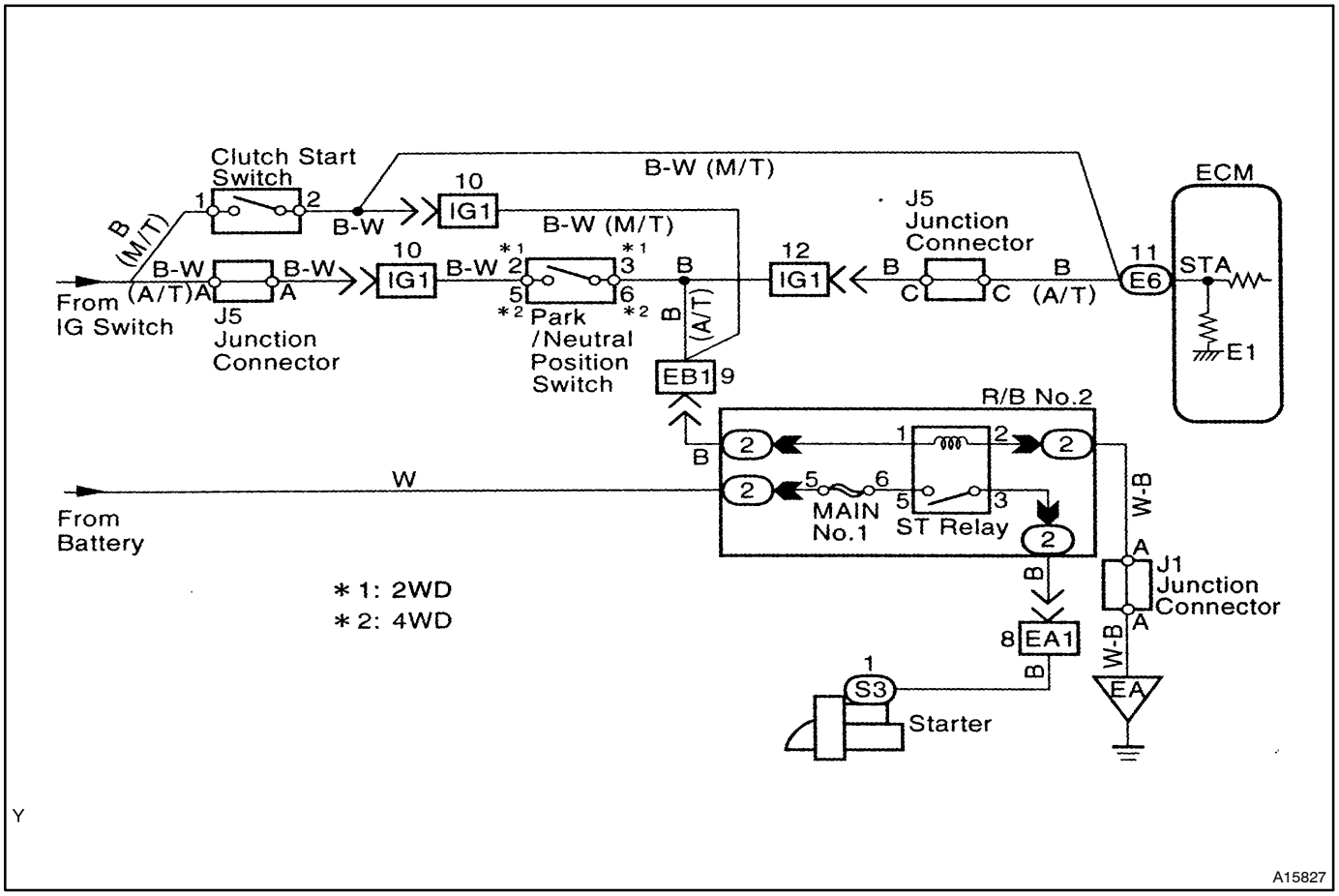
DI965-01

DTC	P1500	Starter Signal Circuit Malfunction

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page DI–20.

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check STA signal.**

PREPARATION:

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

(b) Turn ignition switch ON and push TOYOTA hand–held tester main switch ON.

CHECK:

Read STA signal on the TOYOTA hand–held tester while starter operates.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–20).**

NG

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

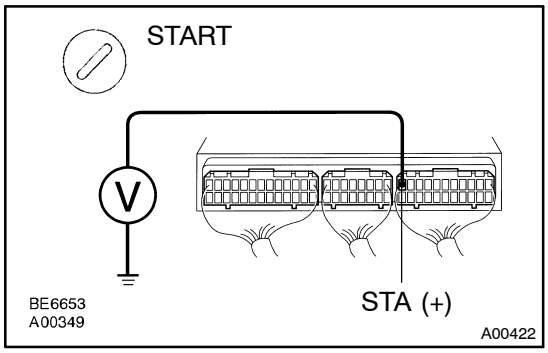
NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–30).

OBDII scan tool (excluding TOYOTA hand–held tester):

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:

(a) Turn up the floor mat on the passenger side.

(b) Remove the 2 bolts for ECM.

CHECK:

Measure the voltage between terminal STA of ECM connector and the body ground during engine is cranking.

OK:

Voltage: 6.0 V or more.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–20).**

NG

2	**Check for open in harness and connector between ECM and starter relay (Marking: ST) (See page IN–30).**

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

OK

Check and replace ECM (See page IN–30).

DI403–01

DTC	P1600	ECM BATT Malfunction

CIRCUIT DESCRIPTION

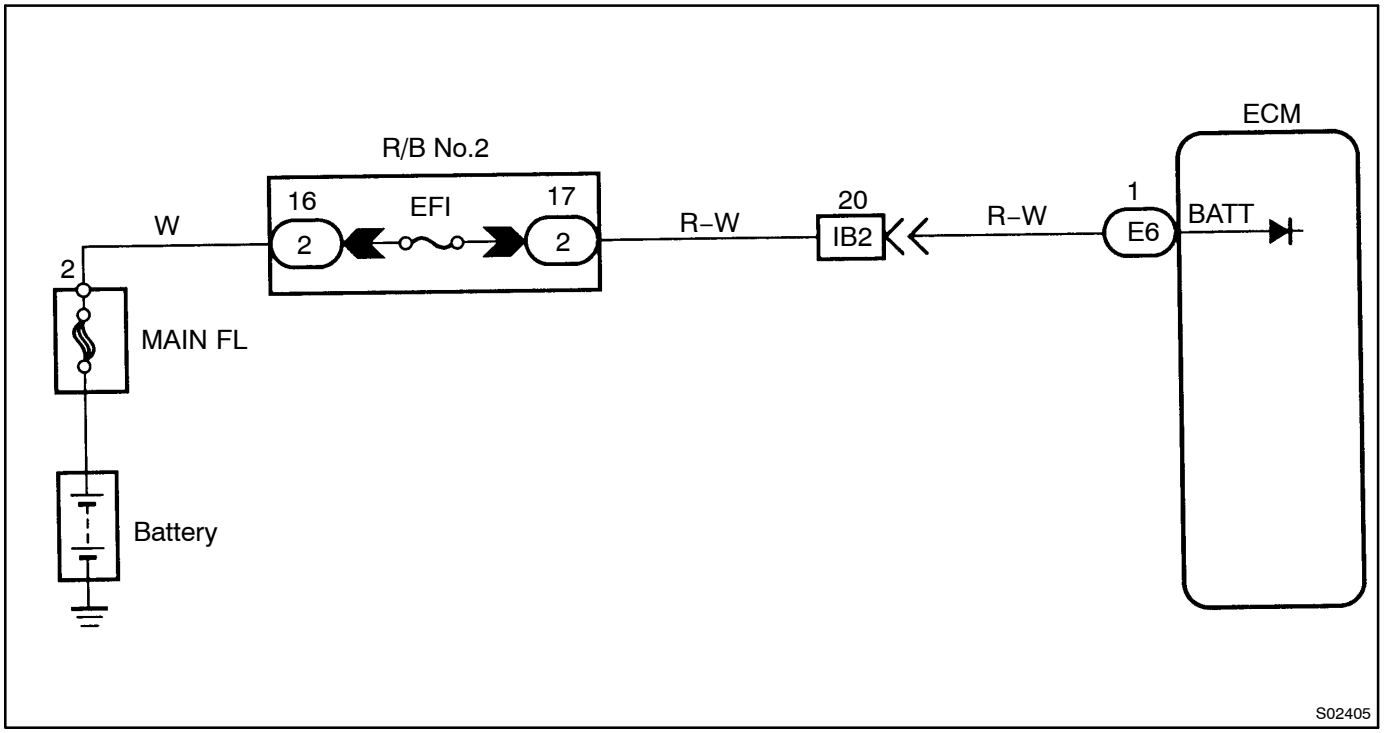
Battery positive voltage is supplied to terminal BATT of the ECM even the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:

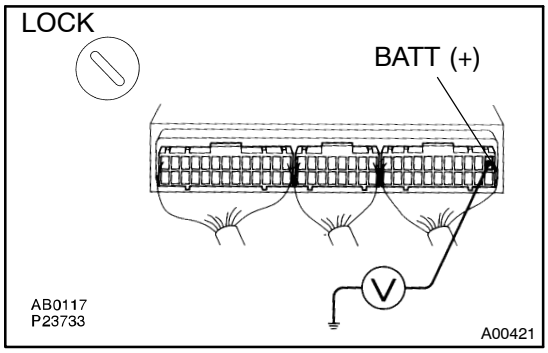
If DTC P1600 appear, the ECM does not store another DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal BATT of ECM connector and body ground.**

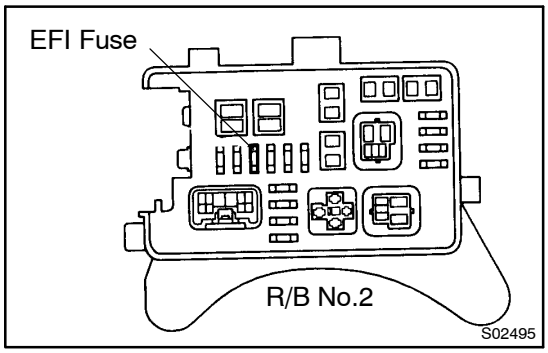


PREPARATION:
Remove side trim cover (See page SF–61).
CHECK:
Measure voltage between terminal BATT of ECM connector and body ground.
OK:
Voltage: 9 – 14 V

OK	**Check and replace ECM (See page IN–30).**

NG

2	**Check EFI fuse.**



PREPARATION:
Remove EFI fuse from R/B No.2.
CHECK:
Check continuity of EFI fuse.
OK:
Continuity

NG	**Check for short in all the harness and components connected to EFI fuse.**

OK

Check and repair harness or connector between battery and EFI fuse, EFI fuse and ECM.

DI404–01

DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park / neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L or R position, the park / neutral position switch goes off, so the voltage of ECM terminal NSW becomes battery positive voltage, the voltage of the ECM internal power source.

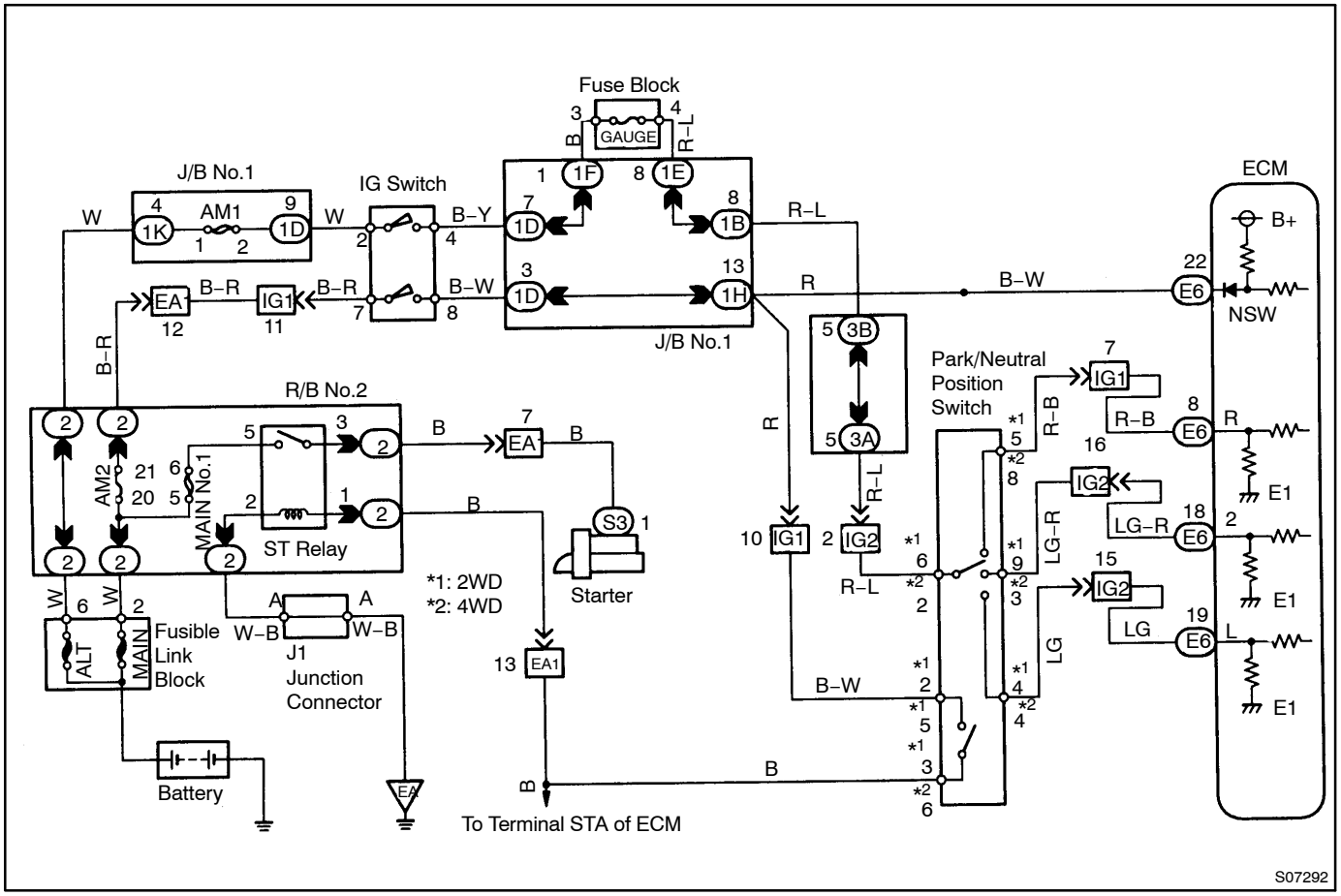
If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1780	Two or more switches are ON simultaneously for "N", "2", "L" and "R" position (2 trip detection logic)	• Short in park / neutral position switch circuit • Park / neutral position switch • ECM
	When driving under conditions (a) and (b) for 30 sec. or more the park / neutral position switch is ON (N position): (2 trip detection logic) (a) Vehicle speed: 80 km/h (50 mph) or more (b) Engine speed: 1,500 ~ 3,000 rpm	

HINT:

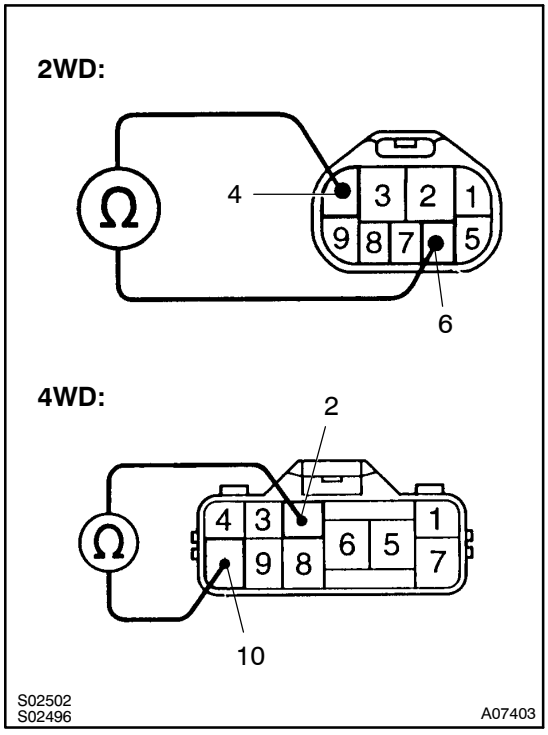
After confirming DTC P1780 use the TOYOTA hand–held tester to confirm the PNP switch signal from "CURRENT DATA".

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check park / neutral position switch.**



PREPARATION:

Disconnect park / neutral position switch connector.

CHECK:

Check continuity between each terminal shown below when the shift lever is positioned to each range.

OK:

Shift Position	Terminal No. to continuity	
P	6 – 1 *1 : 2 – 7 *2	2 – 3 *1 : 5 – 6 *2
R	6 – 5 *1 : 2 – 8 *2	
N	6 – 7 *1 : 2 – 9 *2	2 – 3 *1 : 5 – 6 *2
D	6 – 8 *1 : 2 – 10 *2	
2	6 – 9 *1 : 2 – 3 *2	
L	6 – 4 *1 : 2 – 4 *2	

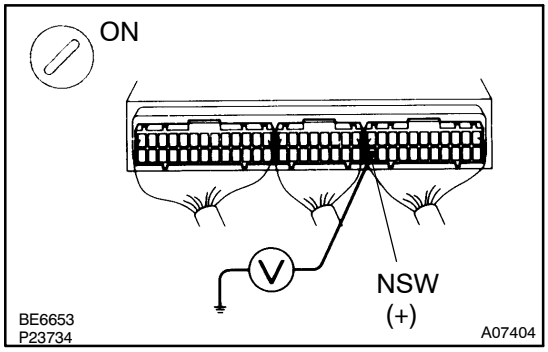
*1: 2WD

*2: 4WD

NG	**Replace park / neutral position switch.**

OK

2	**Check voltage between terminal NSW of ECM connector and body ground.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal NSW of ECM connector and body ground after the shift lever is moved to the following positions.

OK:

Shift lever position	P or N	L, 2, D or R
Voltage	0 – 3 V	9 – 14 V

OK → **Check and replace ECM (See page IN–30).**

NG

Check for open and short in harness and connector between ECM and park / neutral position switch (See page IN–30).

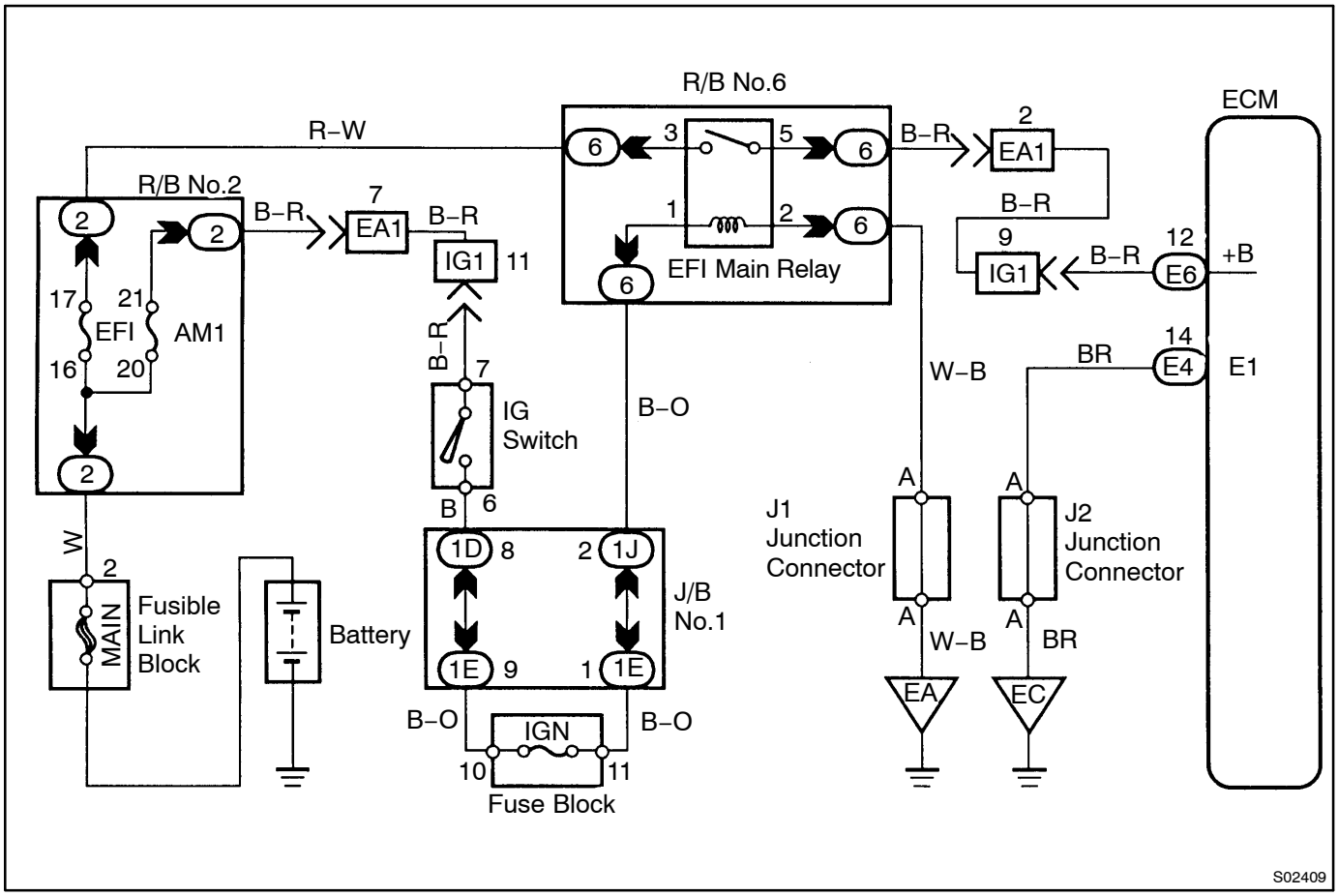
DI406-01

ECM Power Source Circuit

CIRCUIT DESCRIPTION

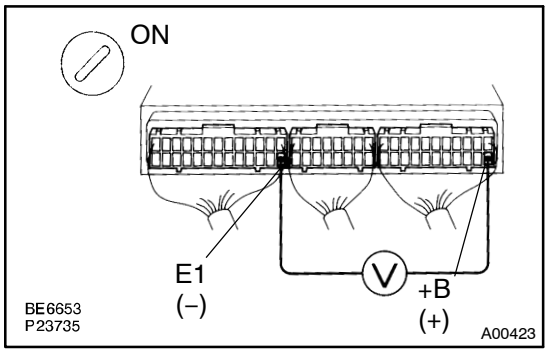
When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI relay and supplying power to the terminals +B of the ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals +B and E1 of ECM connector.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals +B and E1 of ECM connector.

OK:

Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–20).**

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 EFI main relay (Making: EFI) (See page SF–39).**

NG → **Replace EFI main relay (Making: EFI)**

OK

4	**Check EFI fuse (See page DI–110, step 2).**

NG → **Check for short in all the harness and components connected of EFI fuse.**

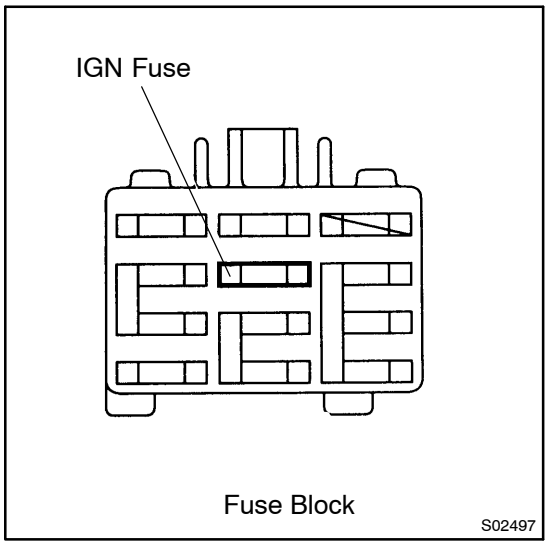
OK

5	**Check for open in harness and connector between EFI main relay (Marking: EFI) and battery, EFI main relay (Marking: EFI) and ECM (See page IN–30).**

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

OK

6	**Check IGN fuse.**



PREPARATION:
Remove IGN fuse from fuse block.
CHECK:
Check continuity of IGN fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to IGN fuse.**

OK

7	**Check ignition switch (See page BE–11).**

NG → **Replace ignition switch.**

OK

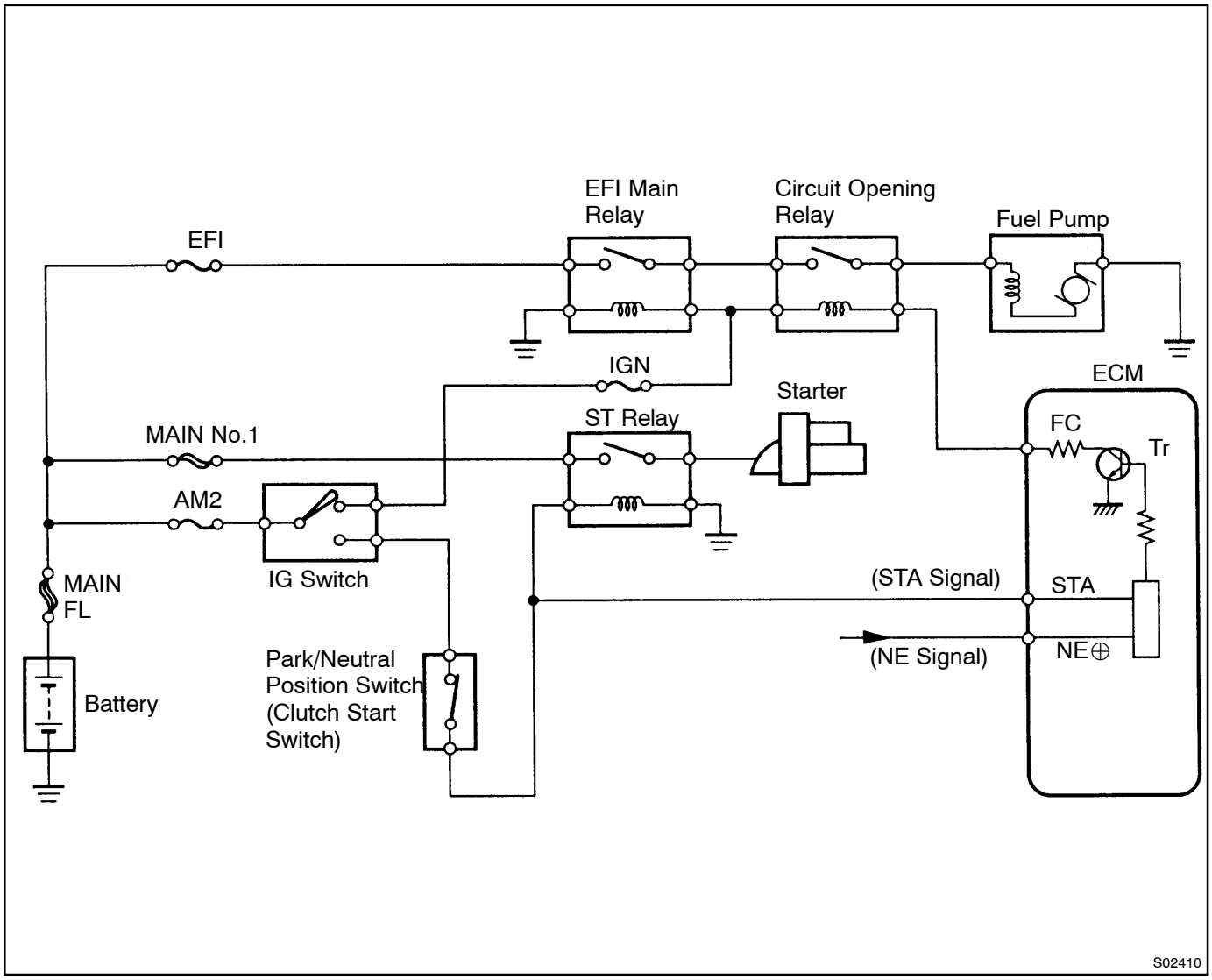
Check for open in harness and connector between IG switch and EFI main relay (Marking: EFI), EFI main relay (Marking: EFI) and body ground (See page IN–30).

DI407-02

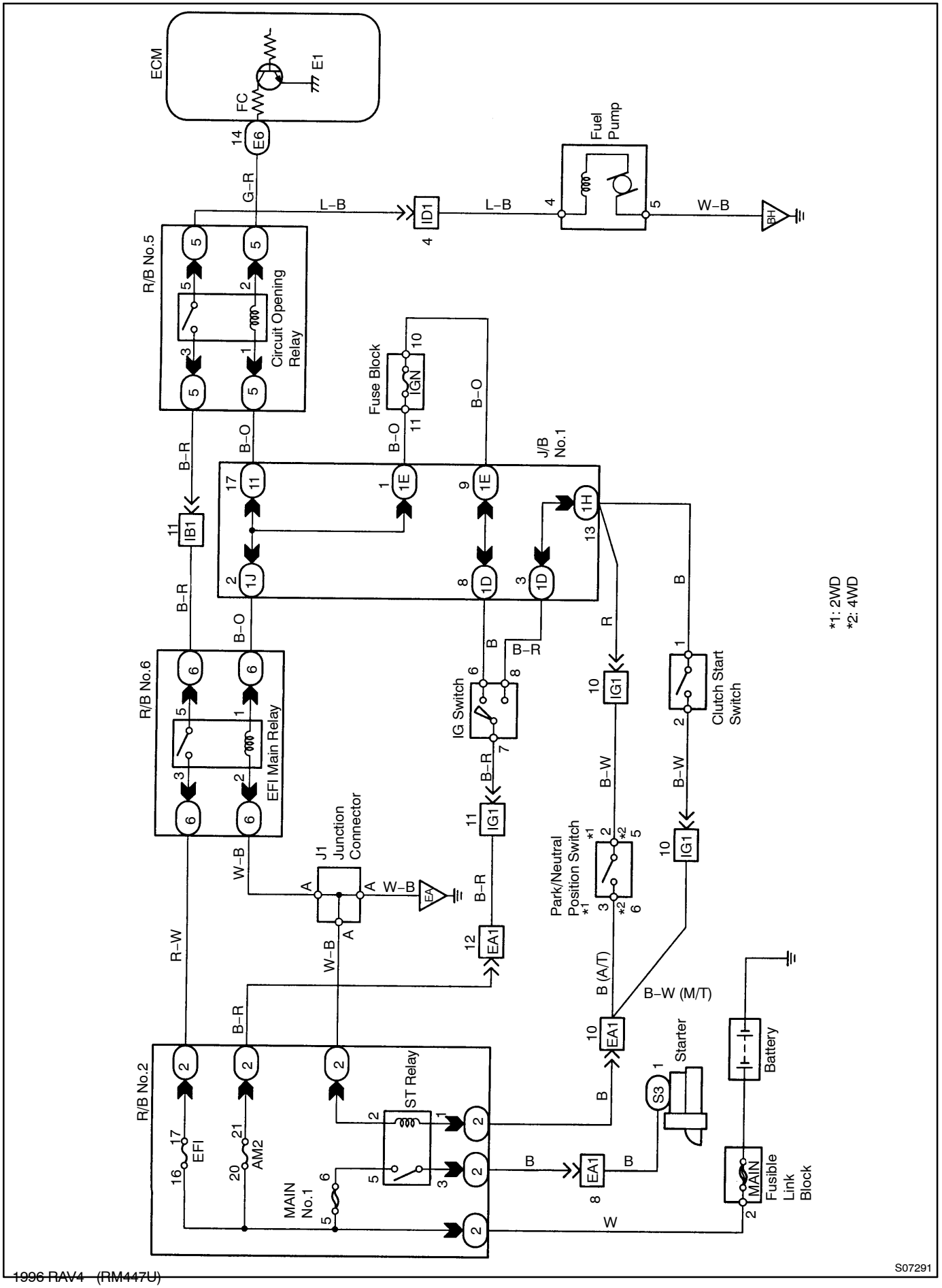
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil and also current flows to terminal STA of ECM (STA signal).
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to 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
TOYOTA hand–held tester

1	Connect the TOYOTA hand–held tester and check operation of fuel pump (See page SF–5).

OK → Check for starter signal circuit (See page DI–105).

NG

2	Check for ECM power source circuit (See page DI–113).

NG → Repair or replace.

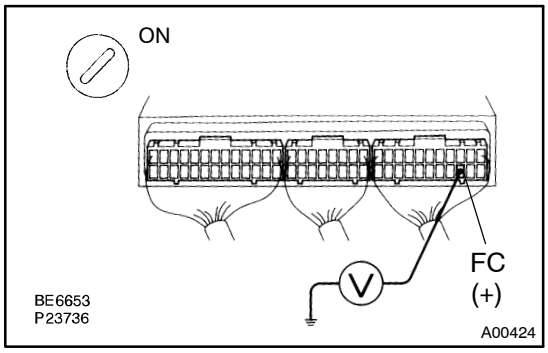
OK

3	Check circuit opening relay (See page SF–41).

NG → Replace circuit opening relay.

OK

4	Check voltage between terminal FC of ECM and body ground.



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal FC of ECM and body ground.

OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay, circuit opening relay and ECM.**

OK ↓

5	Check fuel pump (See page SF–5).

NG → **Repair or replace fuel pump.**

OK ↓

6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–30).

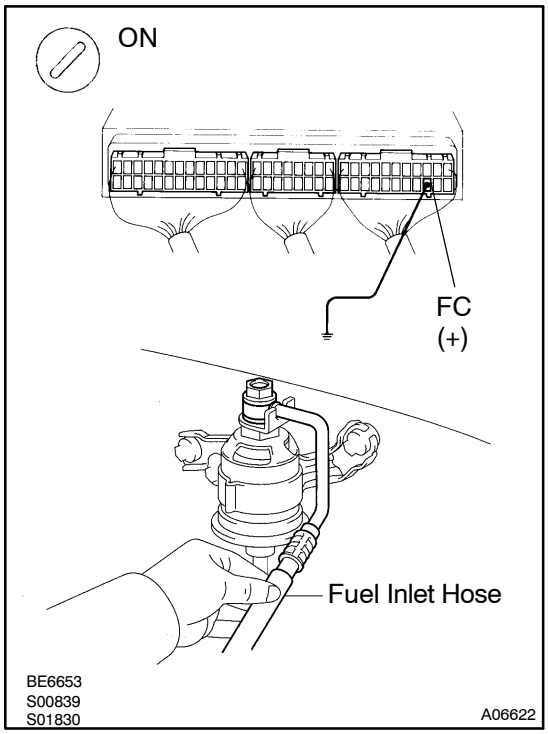
NG → **Repair or replace harness or connector.**

OK ↓

Check and replace ECM (See page IN–30).

OBDII scan tool (exculding TOYOTA hand–held tester)

1	**Check fuel pump operation.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

(a) Connect between terminal FC of ECM and body ground.

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

OK:

There is pressure in the inlet hose.

HINT:

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

OK	**Check for starter signal circuit (See page DI–105).**

NG

2	**Check for ECM power source circuit (See page DI–113).**

NG	**Repair or replace.**

OK

3	**Check circuit opening relay (See page SF–40).**

NG	**Replace circuit opening relay.**

OK

4	Check voltage between terminal FC of ECM and body ground (See page DI–116, step 4).

NG → Check for open in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay, circuit opening relay and ECM.

OK ↓

5	Check fuel pump (See page SF–5).

NG → Repair or replace fuel pump.

OK ↓

6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–30).

NG → Repair or replace harness or connector.

OK ↓

Check and replace ECM (See page IN–30).

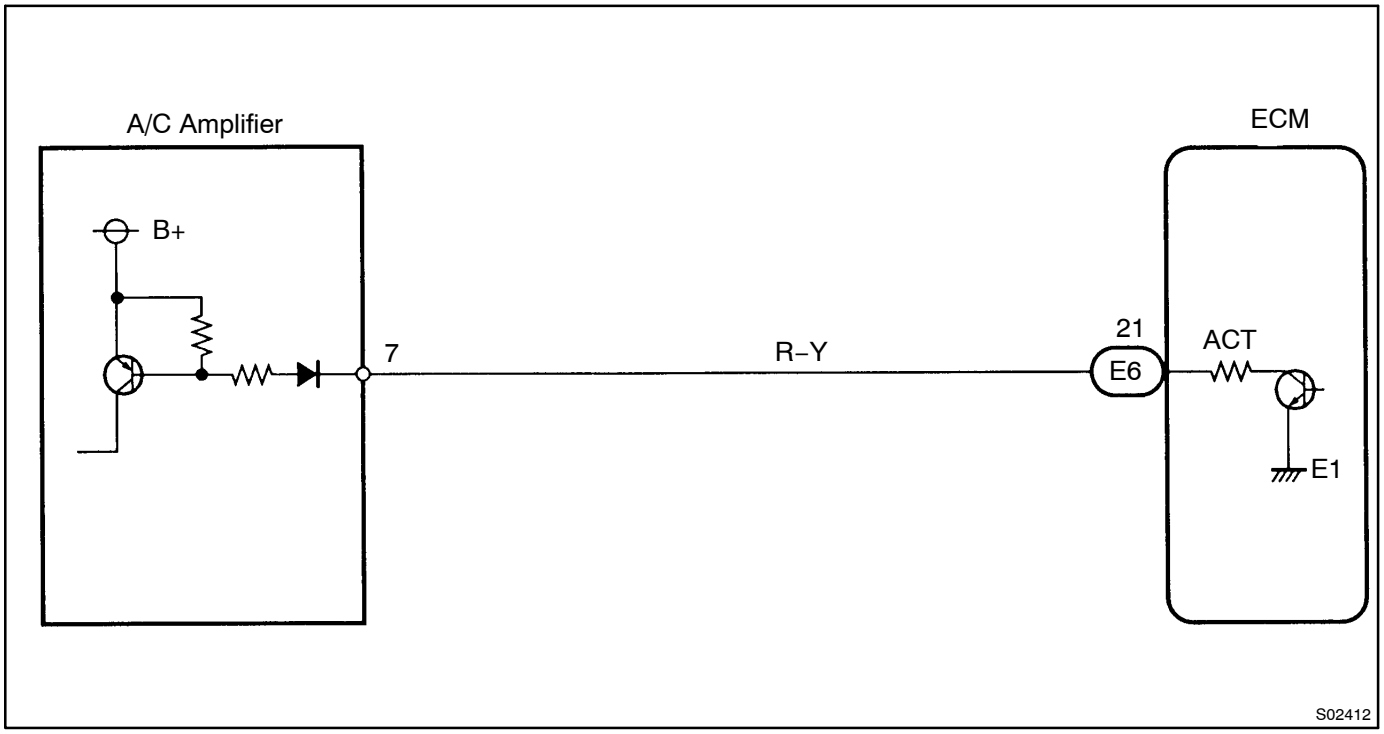
DI408–01

A/C Cut Control Circuit

CIRCUIT DESCRIPTION

This circuit cuts air conditioning operation during vehicle acceleration in order to increase acceleration performance. During acceleration with the vehicle speed at 25 km/h (16 mph) or less, engine speed at 1,200 rpm or less and throttle valve opening angle at 60° or more, the A/C magnet switch is turned OFF for several seconds.

WIRING DIAGRAM



INSPECTION PROCEDURE
TOYOTA hand–held tester:

1	**Connect the TOYOTA hand–held tester and check operation of air conditioning cut control.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(c) Starter the engine and air conditioning switch ON.

HINT:

A/C magnet clutch is turned ON.

(d) Select the ACTIVE TEST mode on the TOYOTA hand–held tester.

CHECK:

Check operation of A/C magnet clutch cut when air conditioning cut control is operated by the TOYOTA hand–held tester.

OK:

A/C magnet clutch is turned OFF.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–20).**

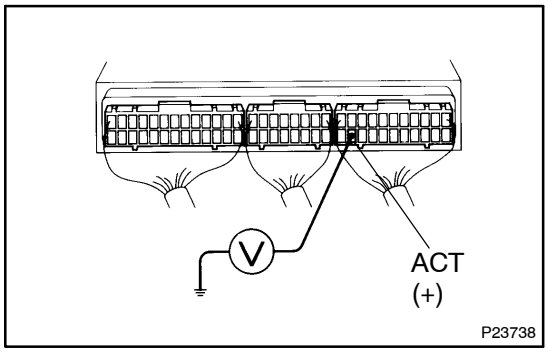
NG

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

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

OK

3	**Check voltage between terminal ACT of ECM and body ground.**



PREPARATION:

(a) Remove side trim cover (See page SF–61).

(b) Start the engine.

CHECK:

Measure voltage between terminal ACT of ECM connector and body ground when A/C switch is turned to ON and OFF.

OK:

A/C switch condition	Voltage
ON	9 – 14 V
OFF	Below 2.0 V

NG → **Check and replace A/C amplifier.**

OK →

Check and replace ECM (See page IN–30).

OBDII scan tool (excluding TOYOTA hand–held tester)

1	**Check voltage between terminal ACT of ECM and body ground (See same page, step 3).**

OK → **Check and replace ECM (See page IN–30).**

NG →

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

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

OK →

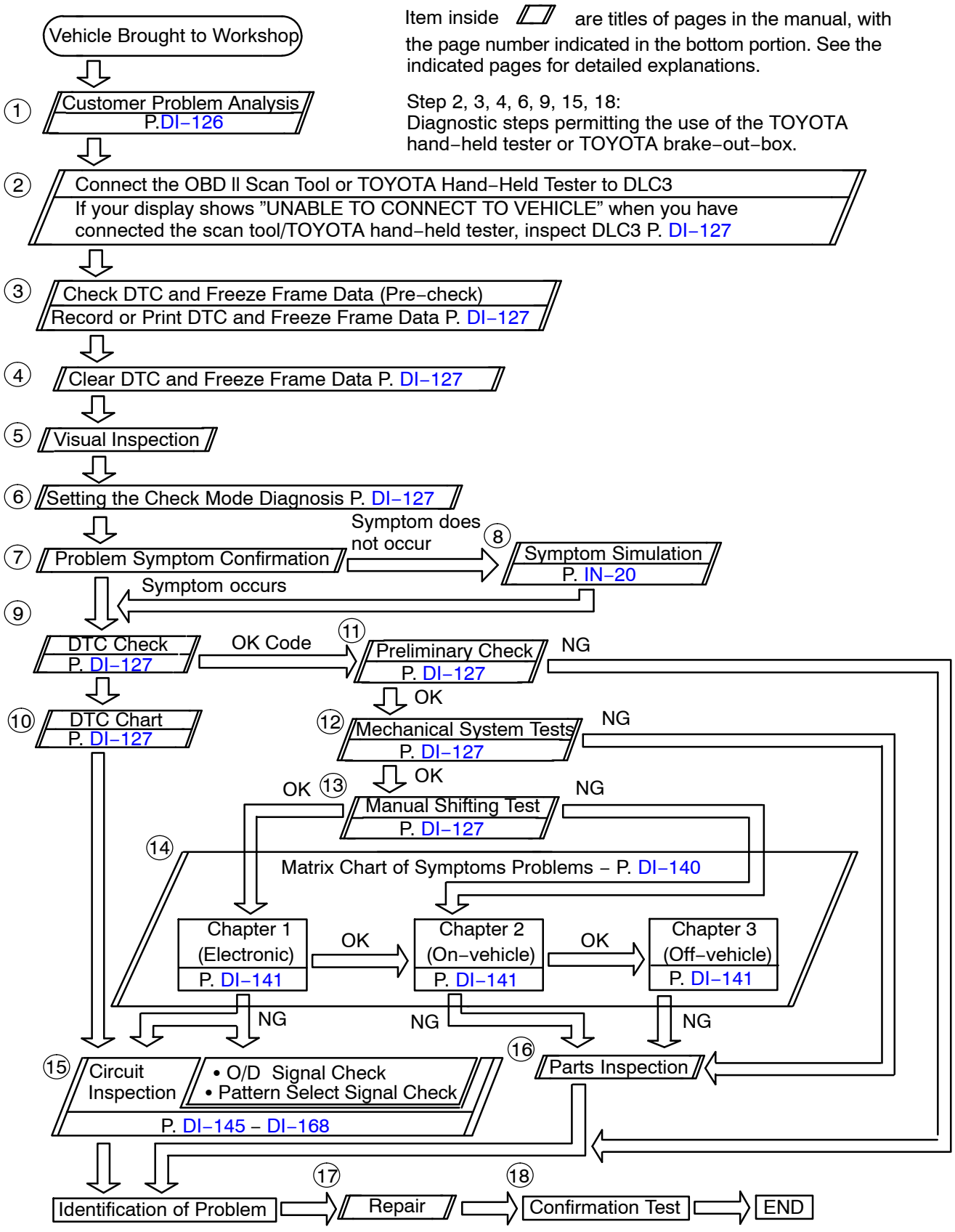
Check and replace A/C amplifier.

AUTOMATIC TRANSAXLE (A241E)

DI409–02

HOW TO PROCEED WITH TROUBLESHOOTING

Trobleshoot in accordance with the procedure on the follwoing pages.



DI40A–01

CUSTOMER PROBLEM ANALYSIS CHECK

Transaxle Control System Check Sheet

Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
Frequency Problem Occurs	☐ 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	☐ Malfunction code (Code)
	2nd Time	☐ Normal	☐ Malfunction code (Code)

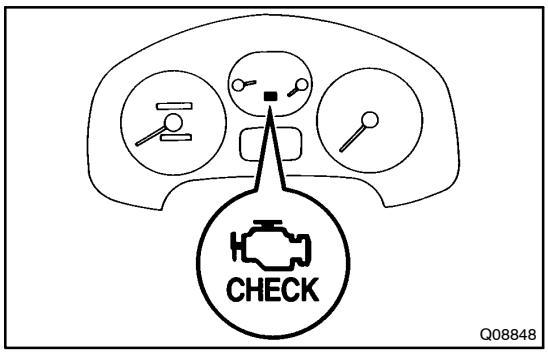
DI40B–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

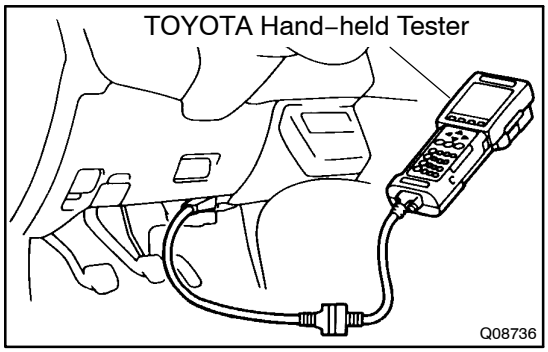
(a) Description

- When troubleshooting OBDII vehicles, the only difference from the usual troubleshooting procedure is that you connect the OBDII scan tool complying with SAE J1978 or TOYOTA 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 the 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–14).

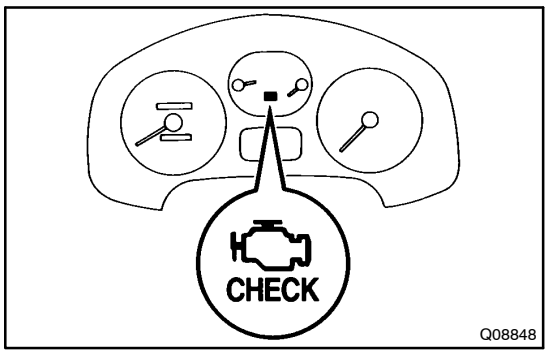
If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle. The OBDII scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD II scan tool's 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 page DI–138).

- 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 (TOYOTA hand–held tester) (See page DI–127).
- *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 second test drive, this second detection causes the MIL to light up.



2. Normal Mode:
INSPECT DIAGNOSIS

(a) Check the MIL.
  (1) The MIL lights up 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 starts, 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:
TOYOTA hand–held tester only:
When the diagnostic system is switched from the normal mode to the check mode, it erases all DTCs and freezed frame data recorded in the normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

  (1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.
  (2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
  (3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand–held tester switch ON.
  (4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data. Note them down (For operating instructions, see the OBDII scan tool's instruction book.).

(5) See page DI–138 to confirm the details of the DTCs.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use the normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated for the first time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

3. Check Mode:

INSPECT DIAGNOSIS

HINT:

TOYOTA 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 the normal mode can also be detected in the check mode.

(a) Check the DTC.

(1) Initial conditions.

- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transaxle in the PARK position
- Air conditioning switched off

(2) Prepare the TOYOTA hand–held tester.

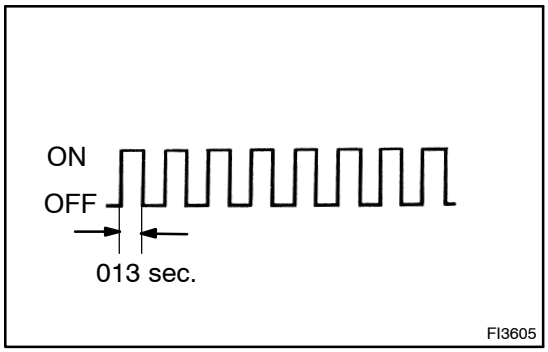
(3) Connect the TOYOTA hand–held tester to the DLC3.

(4) Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.

(5) Switch the TOYOTA hand–held tester from the normal mode to the check mode (Check that the MIL flashes.).

(6) Start the engine (The MIL goes off after the engine start.).

(7) Simulate the conditions of the malfunction described by the customer.



NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(8) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc.

HINT:

Take care not to turn the ignition switch OFF.

Turning the ignition switch off switches the diagnosis system from check mode to normal mode, so all DTCs, etc. are erased.

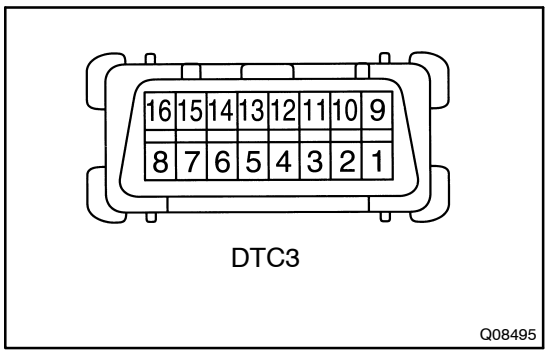
(9) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

- The following actions will erase the DTCs and freezed frame data.
- Operating the OBDII scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (See the TOYOTA hand–held tester or OBD II scan tool's instruction book for operating instructions.).

NOTICE:

If the TOYOTA hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.



(c) Inspect the DLC3.

The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection/Voltage or Resistance	Condition
2	Bus ⊕ Line/Pulse generation	During communication
4	Chassis Ground – Body/1 Ω or less	Always
5	Signal Ground – Body/1 Ω or less	Always
16	Battery Positive – Body/9 – 14 V or 1 Ω or less	Always

HINT:

If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA 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.

4. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand–held tester only:

By putting the vehicle's ECM in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(1) Clear the DTCs (See step 3).
(2) Set the check mode (See step 3).
(3) Do simulation test (See page IN–20).
(4) Check the connector connection and terminal (See page IN–30).
(5) Visual check and contact pressure (See page IN–20).
(6) Handle the connector (See page IN–20).

5. 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.

6. ROAD TEST

NOTICE:

Do the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).

(a) D position test.

Shift into the D position, keep the accelerator pedal constant at the full throttle valve opening position and check the following points:

(1) Check up– shift operation.

Check that 1 → 2, 2 → 3 and 3 → O/D up–shift takes place, at the shift point shown in the automatic shift schedule (See page SS–32).

HINT:

- O/D Gear Up–shift Prohibition Control:
  Engine coolant temperature is 50°C (122°F) or less.
  If there is a 10km/h (6 mph) difference between the set cruise control speed and vehicle speed.
  O/D main switch is pushed ON (During the O/D OFF indicator light lights up.).
- O/D Gear Lock–up Prohibition Control:
  Brake pedal is depressed.
  Engine coolant temperature is 50°C (122°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 noise and vibration.

Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

HINT:

The check for the cause of abnormal noise and vibration must be performed very thoroughly as it could also be due to loss of balance in the torque converter clutch, etc.

(4) Check kick–down operation.

While running 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–32).

(5) Check abnormal shock and slip at kick–down.
(6) Check the lock–up mechanism.
  - Drive in the D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).
  - Lightly depress the accelerator pedal and check that the RPM does not change abruptly.

If there is a big jump in RPM, there is no lock–up.

(b) 2 position test.
Shift into the 2 position and, while drive with the accelerator pedal held constantly at the full throttle valve opening position, check on 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–32).

HINT:
There is no O/D up–shift and lock–up in the 2 position.

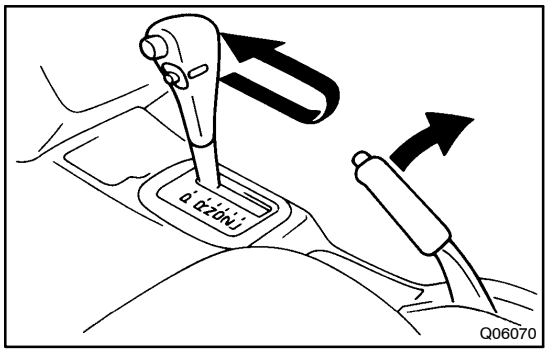
(2) Check engine braking.
While running in the 2nd gear of the 2 position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

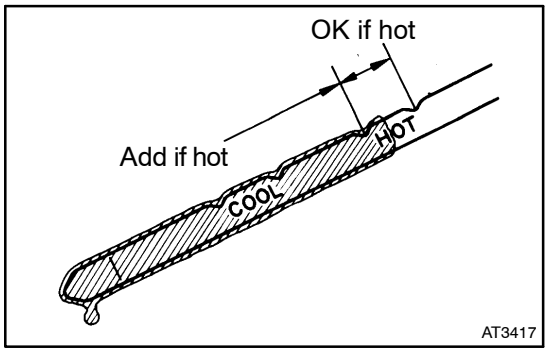
(c) L position test.
Shift into the L position and while driving with the accelerator pedal held constantly at the full throttle valve opening position, check the following points:
(1) Check no up–shift.
While running in the L position, check that there in no up–shift to 2nd gear.
(2) Check engine braking.
While running 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 and while starting at full throttle, check for slipping.

CAUTION:
Before conducting this test ensure that the test area is free from personnel and obstructions.

(e) P position test.
Stop the vehicle on a gradient (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.





7. BASIC INSPECTION

(a) Check the fluid level.

HINT:
- Drive the vehicle so that the engine and transaxle are at normal operating temperature.
Fluid temperature: 70 – 80°C (158 – 176°F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced 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 the P to L position and return to the P position.
(3) Pull out the oil level gauge 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.

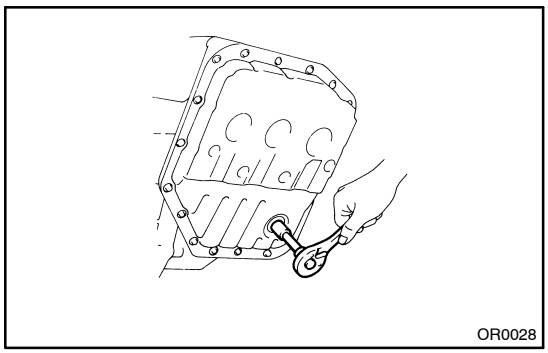
Fluid type: ATF DEXRON ®II

NOTICE:

Do not overfill.

(b) Check the fluid condition.

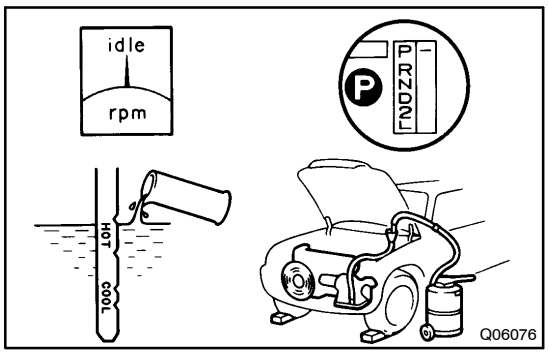
If the fluid smells burnt or is black, replace it.



(c) Replace the fluid.

(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 DEXRON ®II

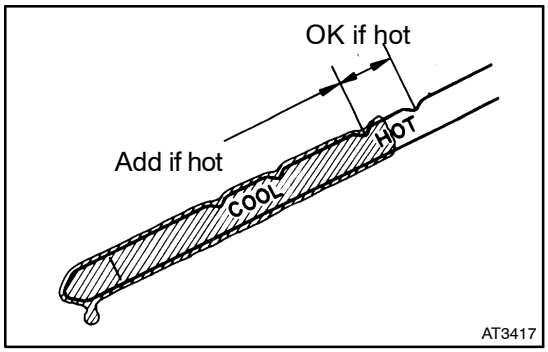
Capacity:

Drain and refill: 3.3 liters (3.5 US qts, 2.9 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 – 80°C (158 – 176°F) and add as necessary.



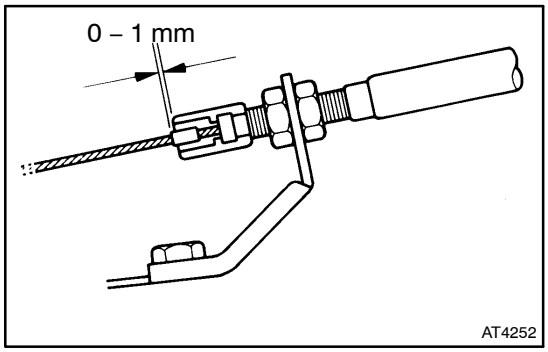
NOTICE:

Do not overfill.

(d) Check the fluid leaks.

Check for leaks in the transaxle.

If there are leaks, it is necessary to replace O–rings, gaskets, oil seals, plugs or other parts.



(e) Inspect and adjust throttle cable.

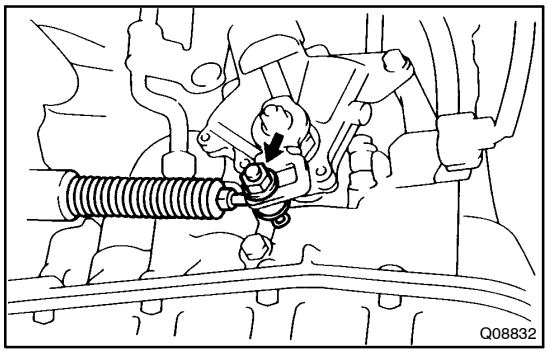
(1) Check that the throttle valve is fully closed.

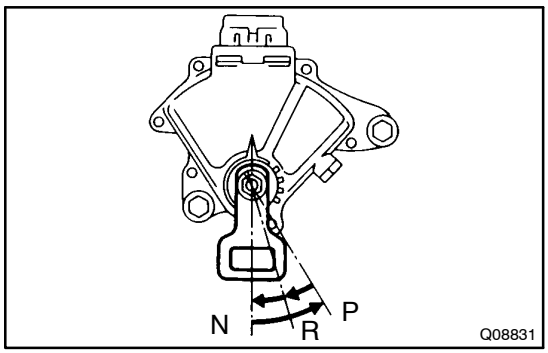
(2) Check that the inner cable is not slack.

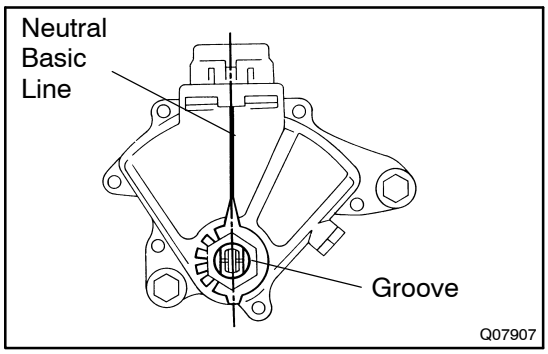
(3) Measure the distance between the outer cable end and stopper on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

If the distance is not within the standard, adjust the cable by the adjusting nuts.







(f) Inspect and adjust 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 correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures:

(1) Loosen the nut on the control shaft lever.
(2) Push the control shaft lever fully downward.
(3) Return the control shaft lever 2 notches to the N position.
(4) Set the shift lever to the N position.
(5) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.

Torque: 6.9 N·m (70 kgf·cm, 61 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.

(g) Inspect and adjust park/neutral position switch.
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the following adjustment procedure:

(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)

HINT:
For continuity inspection of the park/neutral position switch, see page DI–156.

(h) Inspect the idle speed.
Idle speed: 700 ± 50 rpm (In N position and A/C OFF)

8. MECHANICAL SYSTEM TESTS

(a) Measure the stall test
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 operation ATF temperature 50 – 80°C (122 – 176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should be always 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) Fully apply the parking brake.
(3) Connect OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(4) Start the engine and check idle speed.
(5) Keep your left foot pressed firmly on the brake pedal.
(6) Shift into the D position. Fully depress the accelerator pedal. Quickly read the stall speed at this time.

Stall speed: 2,370 ± 150 rpm

(7) Do the same test in R position.

Stall speed: 2,370 ± 150 rpm

Evaluation:

Problem	Possible cause
Stall speed low in D and R positions	• Engine output may be insufficient • Stator one–way clutch is operating properly HINT: If more than 600 rpm below the specified value, the torque converter clutch could be faulty
Stall speed high in D position	• Line pressure too low • Forward clutch slipping • No. 2 one–way clutch not operating properly • U/D one–way clutch not operating properly
Stall speed high in R position	• Line pressure too low • Direct clutch slipping • 1st and reverse brake slipping • U/D brake slipping
Stall speed high in D and R positions	• Line pressure too low • Improper fluid level • U/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 U/D direct clutch, forward clutch, direct clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).**
- **Make sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake
(2) Start the engine and check idle speed.

Idle speed: 700 ± 50 rpm (In N position and A/C OFF)

(3) Shift the shift lever from the N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: N → D Less than 1.2 seconds

In the same way, measure the time lag for N → R.

Time lag: N → R Less than 1.5 seconds

Evaluation:

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • U/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • U/D brake worn

9. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operating ATF temperature 50 – 80˚C (122 – 176˚F).**
- **The line pressure test should always 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 teat plug on the transaxle case left side and connect SST (See page AX–14. for the location to connect SST).
SST SST 09992–00094 (09992–00230, 09992–00270)
(3) Chock the 4 wheels.
(4) Fully apply the parking brake.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressed firmly on the brake pedal and shift into the D position.
(7) Measure the line pressure when the engine is idling.
(8) Fully depress the accelerator pedal. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE:

Release the accelerator pedal and stop test if the wheels being to rotate before the engine speed reaches specified stall speed.

(9) In the same way, do the teat in R position.

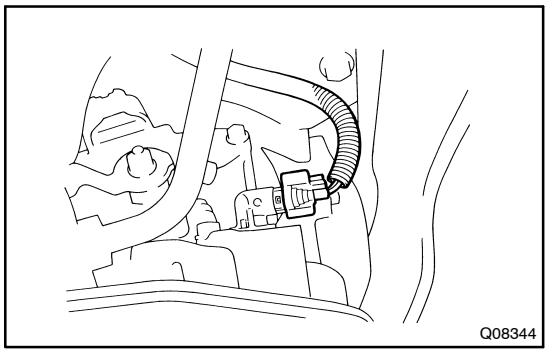
Specified line pressure:

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	353 – 422 (3.6 – 4.3, 51 – 61)	598 – 804 (6.1 – 8.2, 87 – 117)
Stall	824 – 971 (8.4 – 9.9, 119 – 141)	1,530 – 1,780 (15.6 – 18.1, 222 – 257)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and do a retest.

Evaluation:

Problem	Possible cause
If the measured value in all positions are higher.	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured values in all positions are lower.	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective • Oil pump defective • U/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 and reverse brake defective



10. MANUAL SHIFTING TEST

HINT:

With this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the solenoid wire.

(b) Inspect the manual driving operation

Check that the shift and gear positions correspond with the table below.

Shift Position	Gear Position
D	O/D
2	3rd
L	1st
R	Reverse
P	Pawl Lock

HINT:

If the L, 2 and D position gear position are difficult to distinguish, do the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
- If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the solenoid wire.

(d) Cancel out the DTC (See step 3).

DI40C–02

DIAGNOSTIC TROUBLE CODE CHART

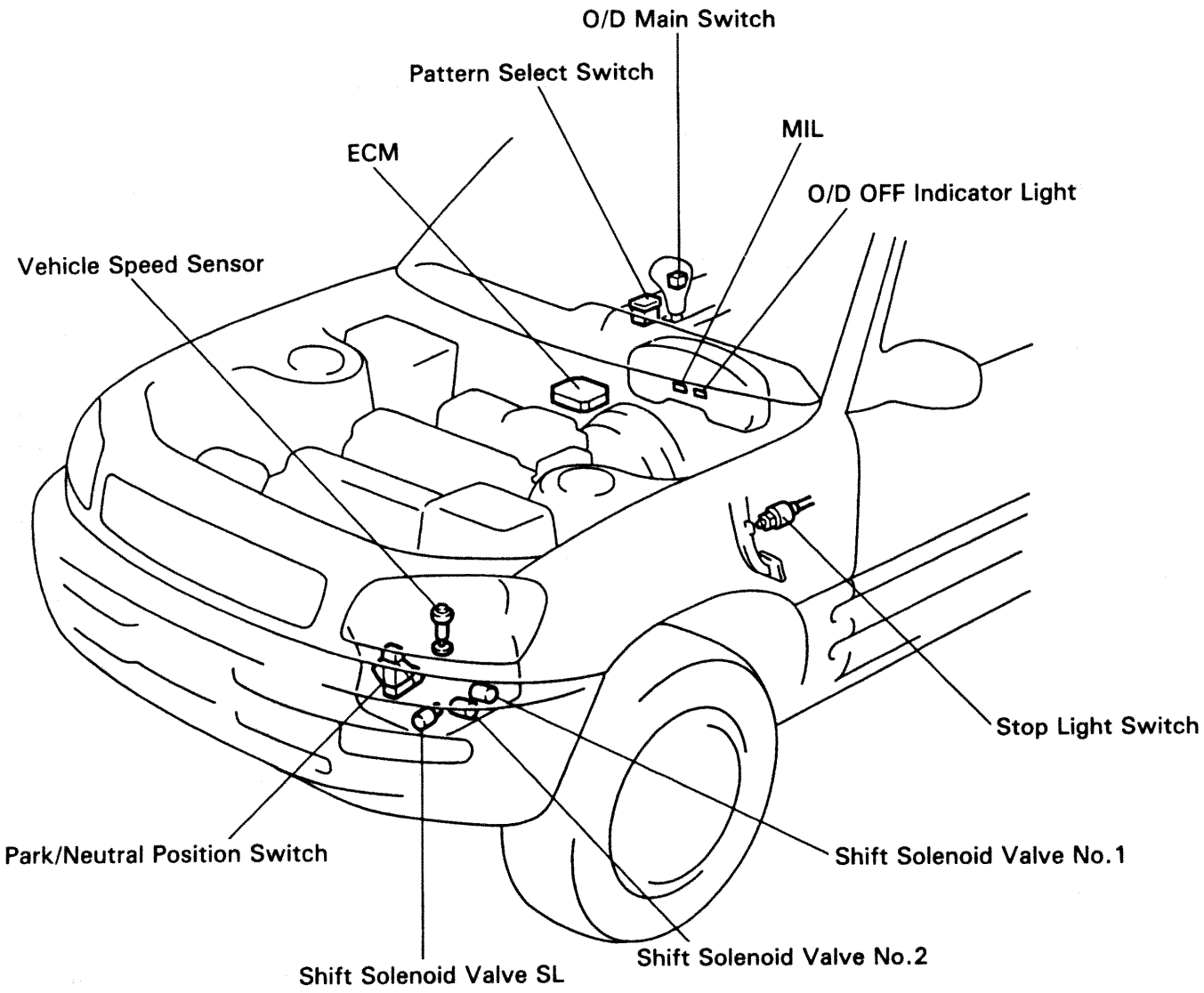
If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0500 (DI–94)	Vehicle Speed Sensor Malfunction	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • ECM	●	○
P0750 (DI–146)	Shift Solenoid A Malfunction (Shift Solenoid Valve No. 1)	• Shift solenoid valve No. 1 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0753 (DI–147)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No. 1)	• Open or short in shift solenoid valve No. 1 circuit • Shift solenoid valve No. 1 • ECM	●	○
P0755 (DI–146)	Shift Solenoid B Malfunction (Shift Solenoid Valve No. 2)	• Shift solenoid valve No. 2 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0758 (DI–147)	Shift Solenoid ”B” Electrical Malfunction (Shift Solenoid Valve No. 2)	• Open or short in shift solenoid valve No. 2 circuit • Shift solenoid valve No. 2 • ECM	●	○
P0770 (DI–151)	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	• Shift solenoid valve SL is stuck open or closed • Valve body is blocked up or stuck • Lock–up clutch	●	○
P0773 (DI–153)	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P1780 (DI–156)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○

*: ● ..... MIL lights up

DI40D–02

PARTS LOCATION

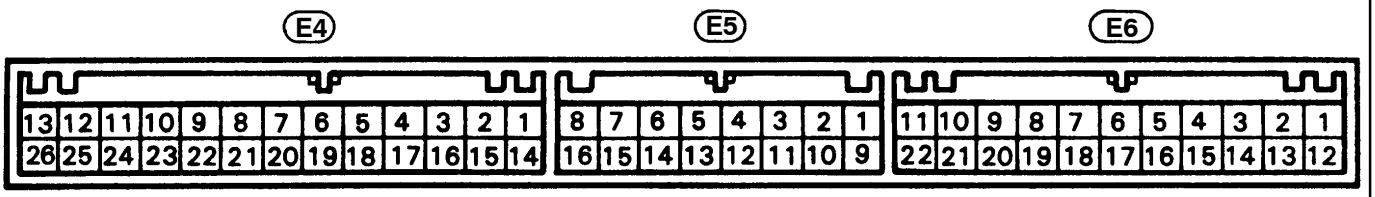


Q08862

DI40E–02

TERMINALS OF ECM

ECM Terminals



Z16062

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
SPD (E6–9) – E1 (E4–14)	V–W – BR	Disconnect cruise control connector and IG ON Turn one front wheel slowly	Pulse signal is output Below 1 ↔ 4 – 6
S1 (E4–2) – E1 (E4–14)	P–B – BR	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	10 – 14
		1st or 2nd gear	10 – 14
		3rd or O/D gear	Below 1
S2 (E4–15) – E1 (E4–14)	P – BR	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	Below 1
		2nd or 3rd gear	10 – 14
		1st or O/D gear	Below 1
SL (E4–1) – E1 (E4– 4)	Y–B – BR	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	Below 1
		Vehicle driving under look–up position	10 – 14
OD1 (E6–20) – E1 (E4–14)	Y–B – BR	IG ON	4 – 6
OD2 (E6–7) – E1 (E4–14)	LG – BR	O/D main switch ON (O/D ON)	10 – 14
		O/D main switch OFF (O/D OFF)	Below 1
L (E6–19) – E1 (E4–14)	LG – BR	IG ON Shift lever L position	10 – 14
		IG ON Shift lever other than L position	Below 1
R (E6–8) – E1 (E4–14)	R–B – BR	IG ON Shift lever R position	10 – 14
		IG ON Shift lever other than R position	Below 1
2 (E–18)– E1 (E4–14)	LG–R – BR	IG ON Shift lever 2 position	10 – 14
		IG ON Shift lever other than R position	Below 1
NSW (E6–22) – E1 (E4–14)	B–W – BR	IG ON Shift lever P or N position	Below 1
		IG ON Shift lever other than P or N position	10 – 14
B/K (E6–4) – E1 (E4–14)	G–W – BR	IG ON Brake papel is depressed	7.5 – 14
		IG ON Brake papel is released	Below 1
P (E6–15) – E1 (E4–14)	R–G – BR	PWR pattern	7.5 – 14
		NORM pattern	Below 1

DI40F–02

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

When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to chapter 2 or 3, proceed as instructed.

(1) 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.

(2) If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	7. ECM	DI–140
No up–shift (3rd → O/D)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–161 DI–166 DI–140
No down–shift (O/D → 3rd)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–161 DI–166 DI–140
No down–shift (A particular gear, from 1st to 3rd gear, is not down–shifted)	1. ECM	DI–140
No lock–up	1. Stop light switch circuit 2. ECM	DI–159 DI–140
No lock–up off	1. Pattern select switch circuit 2. ECM	DI–168 DI–140
Shift point too high or too low	1. ECM	DI–140
Up–shift to O/D from 3rd while O/D main switch is OFF	1. O/D main switch & O/D OFF indicator light circuit 2. ECM	DI–161 DI–140
Up–shift to O/D from 3rd while engine is cold	1. ECM	DI–140
No kick–down	1. ECM	DI–140
Engine stalls when starting off or stopping	1. ECM	DI–140

Chapter 2: On–Vehicle Repair

(★: A241E, A244E, A245E, A246E Automatic Transaxle Repair Manual Pub. No. RM390U)

Symptom	Suspect Area	See page
Does not move in any forward position	1. Off–vehicle matrix chart	–
Does not move in reverse position	1. Off–vehicle matrix chart	–
Does not move in any position	1. Primary regulator valve 2. Manual valve 3. Throttle valve 4. Off–vehicle matrix chart	★ ★ ★ –
No up–shift (1st → 2nd)	1. 1–2 shift valve 2. Off–vehicle matrix chart	★ –

No up–shift (2nd → 3rd)	1. 2–3 shift valve 2. Off–vehicle matrix chart	★ –
No up–shift (3rd → O/D)	1. 3–4 shift valve 2. Off–vehicle matrix chart	★ –
No down–shift (O/D → 3rd)	1. 3–4 shift valve 2. Off–vehicle matrix chart	★ –
No down–shift (3rd → 2nd)	1. 2–3 shift valve 2. Off–vehicle matrix chart	★ –
No down–shift (2nd → 1st)	1. 1–2 shift valve 2. Off–vehicle matrix chart	★ –
Harsh engagement (N → R)	1. C_2 accumulator 2. Off–vehicle matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle matrix chart	★ –
Harsh engagement (N → L)	1. 1. C_1 accumulator 2. Low coast modulator valve 3. Off–vehicle matrix chart	★ ★ –
Harsh engagement (1st → 2nd (D position))	1. Accumulator control valve 2. B_2 Accumulator 3. Off–vehicle matrix chart	★ ★ –
Harsh engagement (1st → 2nd (2 position))	1. B_2 accumulator 2. Accumulator control valve 3. 2nd coast modulator valve 4. Off–vehicle matrix chart	★ ★ ★ –
Harsh engagement (1st → 2nd → 3rd → O/D)	1. Throttle valve 2. Primary regulator valve	★ ★
Harsh engagement (2nd → 3rd)	1. C_2 accumulator 2. Accumulator control valve 3. Off–vehicle matrix chart	★ ★ –
Harsh engagement (3rd → O/D)	1. B_2 accumulator 2. C_3 accumulator 3. Off–vehicle matrix chart	★ ★ –
Harsh engagement (O/D → 3rd)	1. B_4 accumulator 2. Off–vehicle matrix chart	★ –
Harsh engagement (3rd → 2nd)	1. C_2 Accumulator 2. Off–vehicle matrix chart	★ –
Slip (Forward & Reverse)	1. Primary regulator valve 2. Off–vehicle matrix chart	★ –
Slip (R position)	1. Off–vehicle matrix chart	–
Slip (1st)	1. Off–vehicle matrix chart	–
Slip (2nd)	1. Off–vehicle matrix chart	–
Slip (3rd)	1. Off–vehicle matrix chart	–
Slip (O/D)	1. Off–vehicle matrix chart	–
No engine braking (1st (L position))	1. Low coast modulator valve 2. Off–vehicle matrix chart	★ –
No engine braking (2nd (2 position))	1. 2nd coast modulator valve 2. Off–vehicle matrix chart	★ –
No kick–down	1. 1–2 shift valve 2. 2–3 shift valve 3. 3–4 shift valve	★ ★ ★

Poor acceleration	1. Primary regulator valve 2. Off–vehicle matrix chart	★ –
No lock–up	1. Look–up relay valve 2. Off–vehicle matrix chart	★ –

Chapter 3: Off–Vehicle Repair
(★: A241E, A244E, A245E, A246E Automatic Transaxle Repair Manual Pub. No. RM390U)

Symptom	Suspect Area	See page
Does not move in any forward position	1. Forward clutch (C_1)	★
Does not move in reverse position	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3) 3. U/D brake (B_4)	★ ★ ★
Does not move in any position	1. Torque converter clutch 2. Oil pump 3. U/D one–way clutch (F_3) 4. Front planetary gear 5. Rear planetary gear 6. On–vehicle matrix chart	AX–20 ★ ★ ★ ★ –
No up–shift (1st → 2nd)	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1) 3. On–vehicle matrix chart	★ ★ –
No up–shift (2nd → 3rd)	1. Direct clutch (C_2) 2. On–vehicle matrix chart	★ –
No up–shift (3rd → O/D)	1. U/D brake (C_3) 2. On–vehicle matrix chart	★ –
No down–shift (O/D → 3rd)	1. U/D brake (B_4) 2. U/D one–way clutch (F_3) 3. On–vehicle matrix chart	★ ★ –
No down–shift (3rd → 2nd)	1. No. 1 one–way clutch (F_1) 2. On–vehicle matrix chart	★ –
No down–shift (2nd → 1st)	1. No. 2 one–way clutch (F_2) 2. On–vehicle matrix chart	★ –
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3) 3. On–vehicle matrix chart	★ ★ –
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. On–vehicle matrix chart	★ –
Harsh engagement (N → L)	1. Forward clutch (C_1) 2. 1st and reverse brake (B_3) 3. On–vehicle matrix chart	★ ★ –
Harsh engagement (1st → 2nd (D position))	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1) 3. On–vehicle matrix chart	★ ★ –
Harsh engagement (1st → 2nd (2 position))	1. 2nd coast brake (B_1) 2. 2nd brake (B_2) 3. No. 1 one–way clutch (F_1) 4. On–vehicle matrix chart	★ ★ ★ –
Harsh engagement (1st → 2nd → 3rd → O/D)	1. On–vehicle matrix chart	–
Harsh engagement (2nd → 3rd)	1. Direct clutch (C_2) 2. On–vehicle matrix chart	★ –
Harsh engagement (3rd → O/D)	1. U/D clutch (C_3) 2. On–vehicle matrix chart	★ –

Harsh engagement (O/D → 3rd)	1. U/D brake (B_4) 2. On–vehicle matrix chart	★ –
Harsh engagement (3rd → 2nd)	1. Direct clutch (C_2) 2. On–vehicle matrix chart	★ –
Harsh engagement (Lock–up)	1. Torque converter clutch	AX–20
Slip (Forward & reverse)	1. Torque converter clutch 2. Oil pump 3. On–vehicle matrix chart	AX–20 ★ –
Slip (R position)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3)	★ ★
Slip (1st)	1. Forward clutch (C_1) 2. No. 2 one–way clutch (F_2) 3. U/D one–way clutch (F_3)	★ ★ ★
Slip (2nd)	1. Forward clutch (C_1) 2. 2nd brake (B_2) 3. No. 1 one–way clutch (F_1) 4. U/D one–way clutch (F_3)	★
Slip (3rd)	1. Forward clutch (C_1) 2. Direct clutch (C_2) 3. U/D one–way clutch (F_3)	★ ★ ★
Slip (O/D)	1. Forward clutch (C_1) 2. Direct clutch (C_2) 3. U/D clutch (C_3)	★ ★ ★
No engine braking (1st (L position))	1. 1st and reverse brake (B_3) 2. On–vehicle matrix chart	★ –
No engine braking (2nd (2 position))	1. 2nd coast brake (B_1) 2. On–vehicle matrix chart	★ –
No kick–down	1. On–vehicle matrix chart	–
Poor acceleration	1. Torque converter clutch 2. Forward clutch (C_1) 3. On–vehicle matrix chart	AX–20 ★ –
No lock–up	1. Torque converter clutch 2. On–vehicle matrix chart	AX–20 –
Engine stalls when staring off or stopping	1. Torque converter clutch	AX–20

DI40G–01

CIRCUIT INSPECTION

DTC	P0500	Vehicle Speed Sensor Malfunction

See page DI–94.

DTC	P0750, P0755	Shift Solenoid A/B Malfunction (Shift Solenoid Valve No. 1 / No. 2)

SYSTEM DESCRIPTION

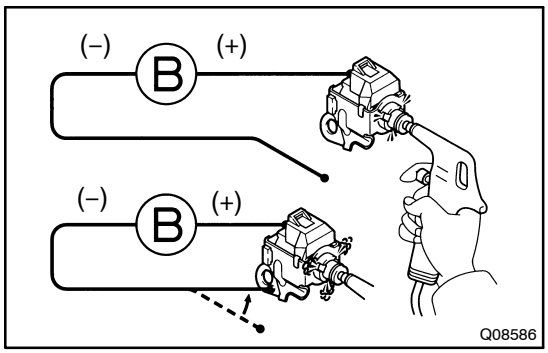
The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear). The ECM then compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0750 P0755	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

HINT:
Check the shift solenoid valve No. 1 when DTC P0750 is output and check shift solenoid valve No. 2 when DTC P0755 is output.

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) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the shift solenoid valves do not leak air.
(b) When battery positive voltage is supplied to the shift solenoid valves, check they open.

NG → **Replace shift solenoid valve No. 1 or No. 2.**

OK

2	Check valve body (See page DI–141).

NG → **Repair or replace valve body.**

OK

Repair transaxle (See page AX–15).

DTC	P0753, P0758	Shift Solenoid A/B Electrical Malfunction (Shift Solenoid Valve No. 1/No. 2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is done in combination with ON and OFF of the shift solenoid valves No. 1 and No. 2 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 safely (Fail safe function).
Fail Safe Function:
If either of the shift solenoid valve circuits develops an open or a 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 SL OFF at the same time. If both solenoids are malfunction, hydraulic control cannot be done electronically so it 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).

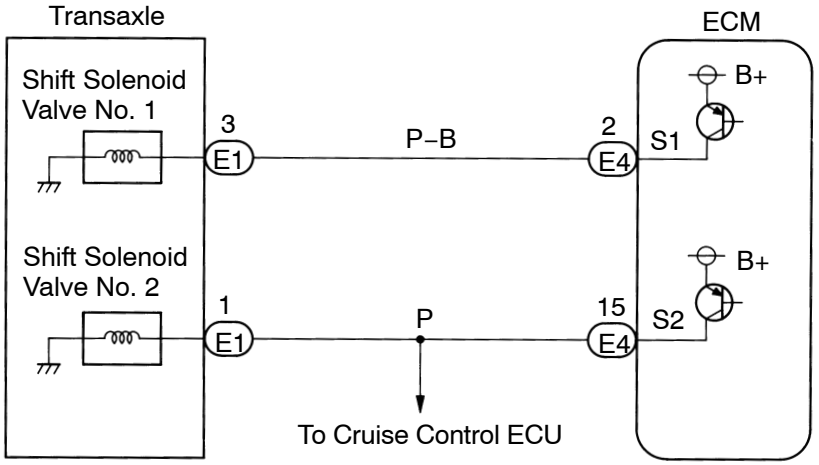
Position	NORMAL			SHIFT SOLENOID NO.1 MALFUNCTIONING			SHIFT SOLENOID NO.2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		
D	ON	OFF	1st	X	ON	3rd	ON	X	1st	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	O/D
2	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	1st

X: Malfunctions

HINT:
Check the shift solenoid valve No. 1 when DTC P0753 is output and check the shift solenoid valve No. 2 when DTC P0758 is output.

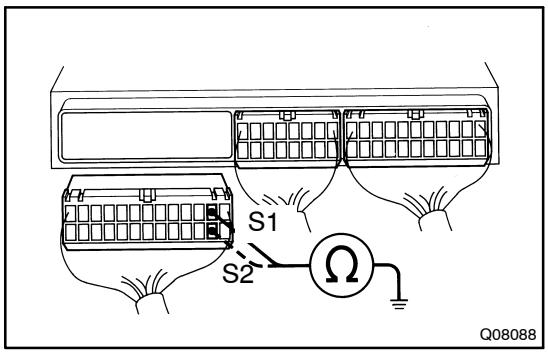
DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	The ECM checks for an open or short circuit in the shift solenoid valves No. 1 and No. 2 circuit when it changes The ECM records DTC P0753 or P0758 if condition a) or b) is detected once, but it does not light up the MIL After ECM detects condition a) or b) continuously 2 times or more in one–trip, it causes the MIL light up until condition a) or b) disappears After that, if the ECM detects condition (a) or (b) once, it starts lighting up the MIL again (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 No. 1/No. 2 circuit • Shift solenoid valve No. 1/No. 2 • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Measure resistance between terminal S1 or S2 of ECM and body ground.**

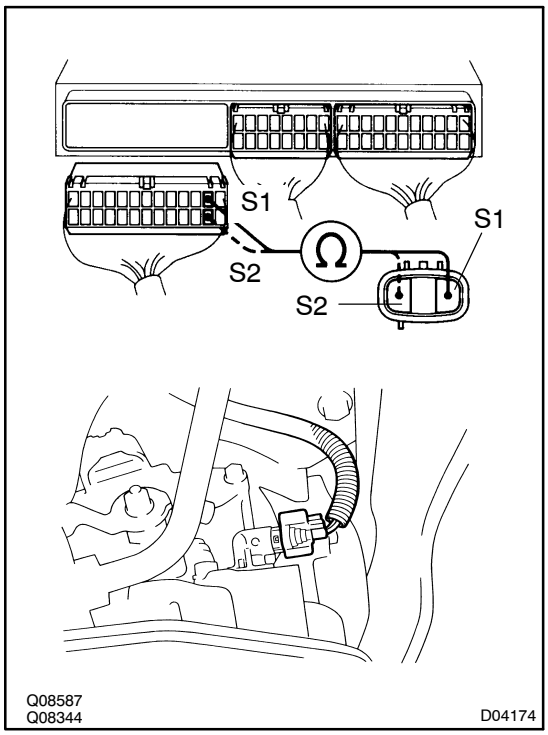


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure the resistance between terminal S1 or S2 of the ECM and body ground.
OK:
Resistance: 11 – 15 Ω

OK → **Check and replace ECM.**

NG

2	**Check harness and connector between ECM and automatic transaxle solenoid connector.**



PREPARATION:

(a) Disconnect the connector from the ECM.

(b) Disconnect the solenoid connector from the automatic transaxle.

CHECK:

Check the harness and connector between terminal S1 or S2 of the ECM and terminal S1 or S2 of the solenoid connector.

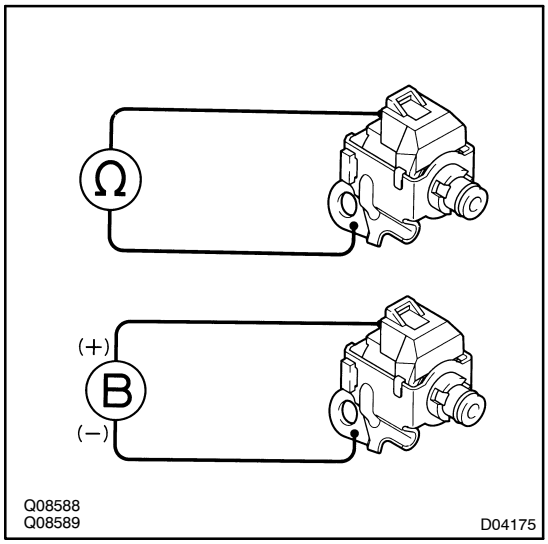
OK:

There is no open and no short circuit.

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

OK

3	Check shift solenoid valve No. 1 or No. 2.



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

Measure the resistance between the solenoid connector and solenoid body.

OK:

Resistance: 11 – 15 Ω

CHECK:

Connect positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body.

OK:

The solenoid makes on operating noise.

NG → **Replace shift solenoid valve No. 1 or No. 2.**

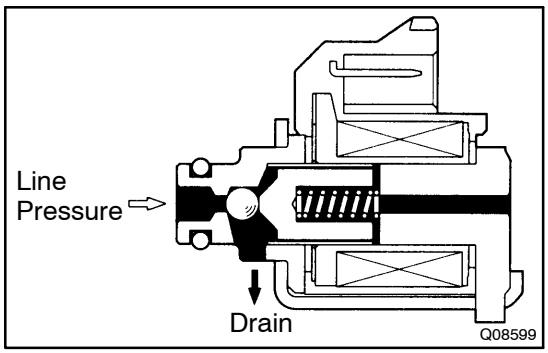
OK

Repair or replace solenoid wire.

DI40J–01

DTC	P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)

SYSTEM DESCRIPTION

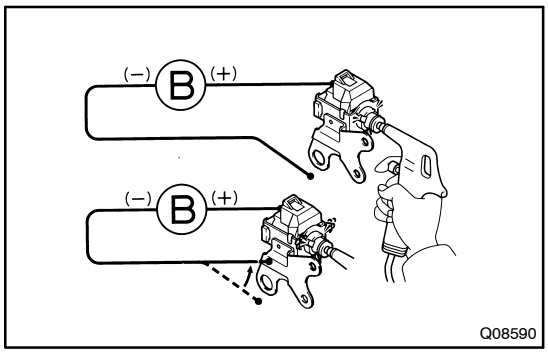


The ECM uses signals from the throttle position sensor, air–flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P0770	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h (50 mph)) lock–up remains ON in the lock–up OFF range (2 trip detection logic)	• Shift solenoid valve SL is stuck open or closed • Valve body is blocked up or stuck • Lock–up clutch

INSPECTION PROCEDURE

1	Check shift solenoid valve SL operation.



PREPARATION:
(a) Remove the oil pan.
(b) Remove the shift solenoid valve SL.

CHECK:
(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve leak air.
(b) When battery positive voltage is supplied to the solenoid valve, check it close.

NG → **Replace shift solenoid valve SL.**

OK

2	**Check valve body (See page DI–141).**

NG → **Repair or replace valve body.**

OK

Replace torque converter clutch (See page AX–14).

DI40K–01

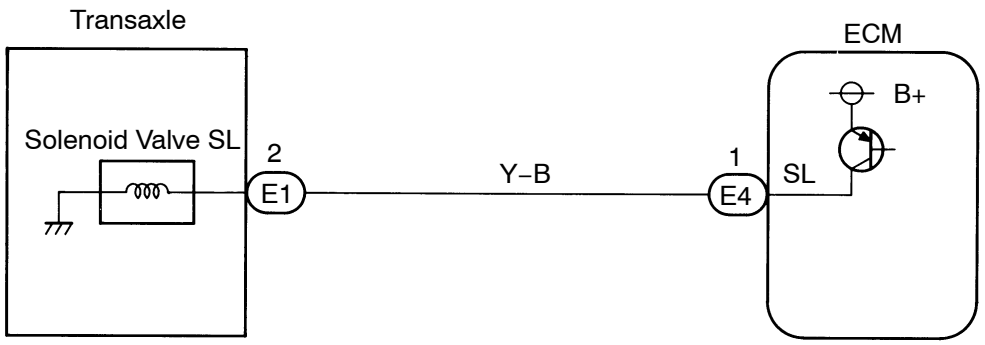
DTC	P0773	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)

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
P0773	Either a) or b) is 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 SL circuit. • Shift solenoid valve SL • ECM

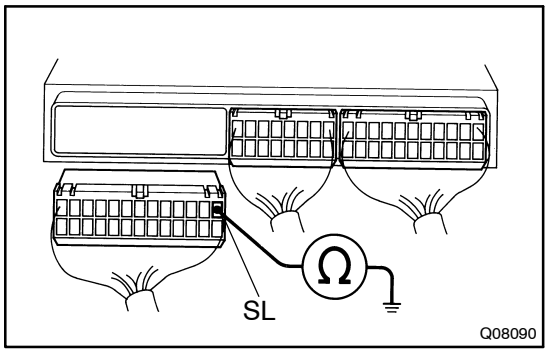
WIRING DIAGRAM



Q06971

INSPECTION PROCEDURE

1	**Measure resistance between terminal SL of ECM and body ground.**

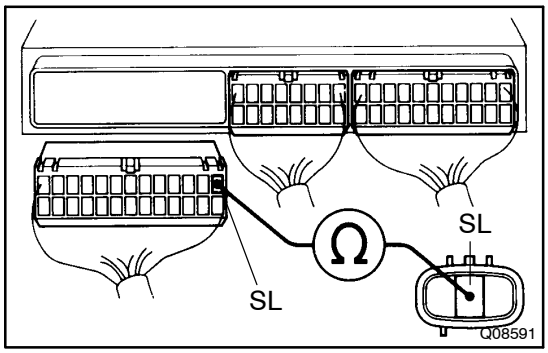


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure the resistance between terminal SL of the ECM and body ground.
OK:
Resistance: 11 – 15 Ω

OK	**Check and replace ECM.**

NG

2	**Check harness and connector between ECM and automatic transaxle solenoid connector.**

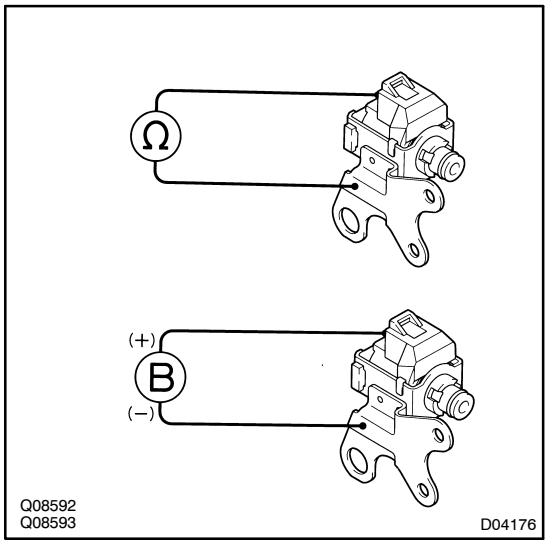


PREPARATION:
(a) Disconnect the connector from the ECM.
(b) Disconnect the solenoid connector from the automatic transaxle.
CHECK:
Check the harness between terminal SL of the ECM and terminal SL of the solenoid connector.
OK:
There is no open or short circuit.

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

OK

3	Check shift solenoid valve SL.



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve SL.

CHECK:

Measure the resistance between the solenoid connector and solenoid body.

OK:

Resistance: 11 – 15 Ω

CHECK:

Connect or positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body.

OK:

The shift solenoid valve SL makes operation noise.

NG → **Replace shift solenoid valve SL.**

OK

Check and replace or repair solenoid wire.

DI40M–02

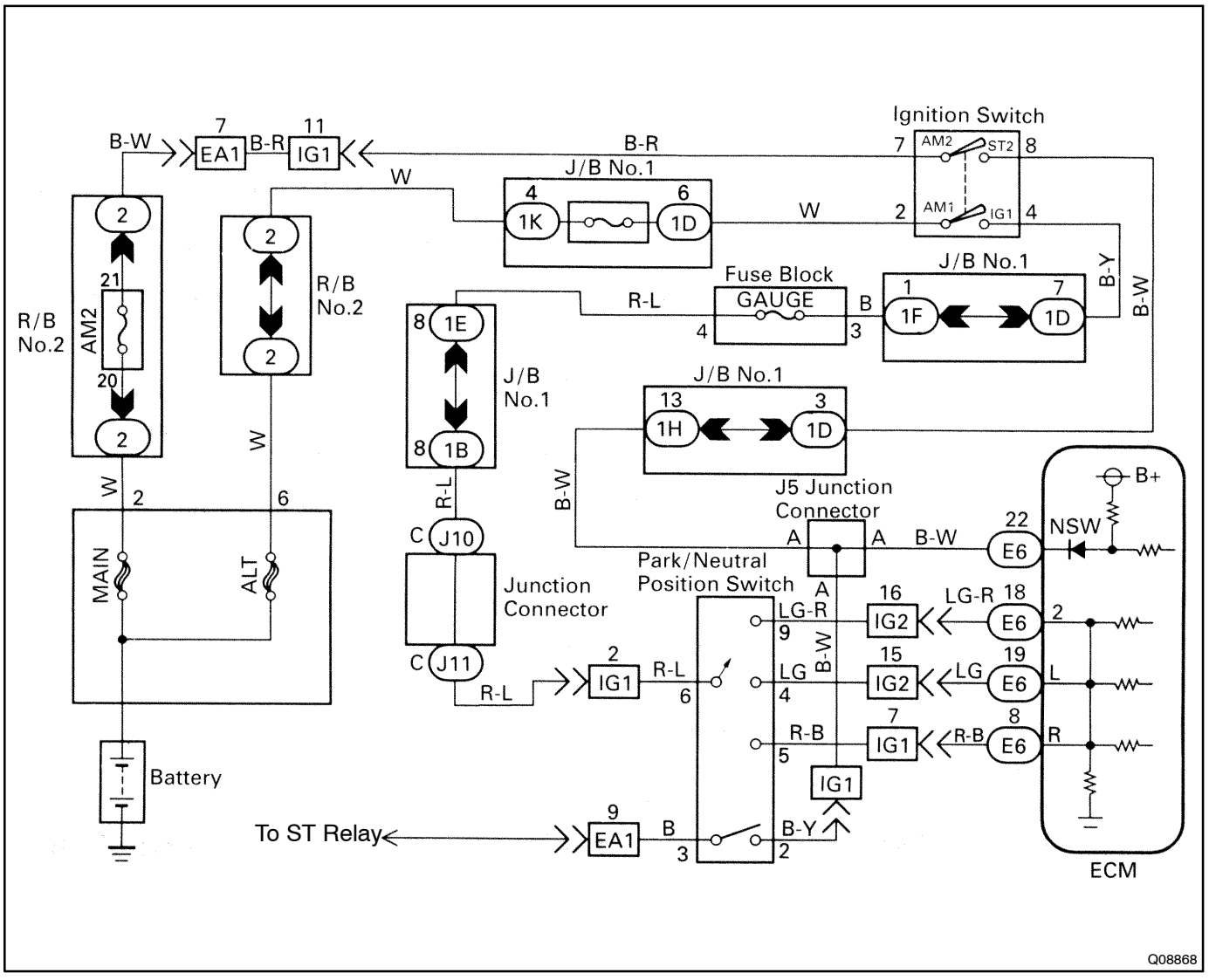
DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (NSW, R, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in the D position.

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for N, R, 2 or L position (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a), (b) and (c) for 30 sec. or more, the park / neutral position switch is ON (N position) (2 trip detection logic) (a) Vehicle speed: 80 km/h (50 mph) or more (b) Engine speed: 1,500 – 3,000 rpm (c) Manifold absolute pressure: 450 mmHg or more	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check PNP SW, REVERSE, 2ND and LOW signal.**

When using TOYOTA hand–held tester:

PREPARATION:

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

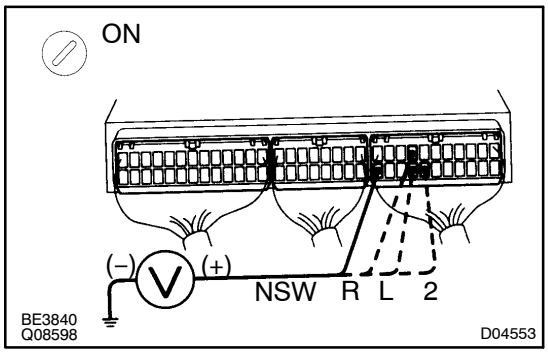
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Shift the shift lever to the P, R, N, 2 or L positions, and read the PNPSW, REVERSE, 2ND and LOW signals on the TOYOTA hand–held tester.

OK:

Shift position	Signal
P, N	PNP SW OFF → ON
R	REVERSE OFF → ON
2	2ND OFF → ON
L	LOW OFF → ON



When using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals NSW, R, 2, L of the ECM and body ground when the shift lever is shifted to the following positions.

OK:

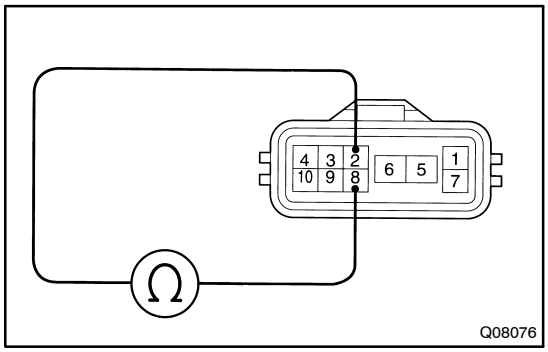
Position	NSW – Body ground	R – Body ground	2 – Body ground	L – Body ground
P, N	Below 0 V	Below 0 V	Below 0 V	Below 0 V
R	10 – 14 V*	10 – 14 V*	Below 0 V	Below 0 V
D	10 – 14 V	Below 0 V	Below 0 V	Below 0 V
2	10 – 14 V	Below 0 V	10 – 14 V	Below 0 V
L	10 – 14 V	Below 0 V	Below 0 V	10 – 14 V

*: The voltage will drop slightly due to lighting up of the back up light.

OK → **Check an replace the ECM.**

NG

2	Check park/neutral position switch.



PREPARATION:

Disconnect the park/neutral position switch connector.

CHECK:

Check the continuity between each terminal shown below when the shift lever is moved to each position.

Shift position	Terminal NO. to continuity	
P	2 – 7	5 – 6
R	2 – 8	
N	2 – 9	5 – 6
D	2 – 10	
2	2 – 3	
L	2 – 4	

NG → **Replace park/neutral position switch.**

OK ↓

3	Check harness and connector between battery and park/neutral position switch, and ECM and park/neutral position switch (See page IN–30).

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

OK ↓

Check and replace ECM.

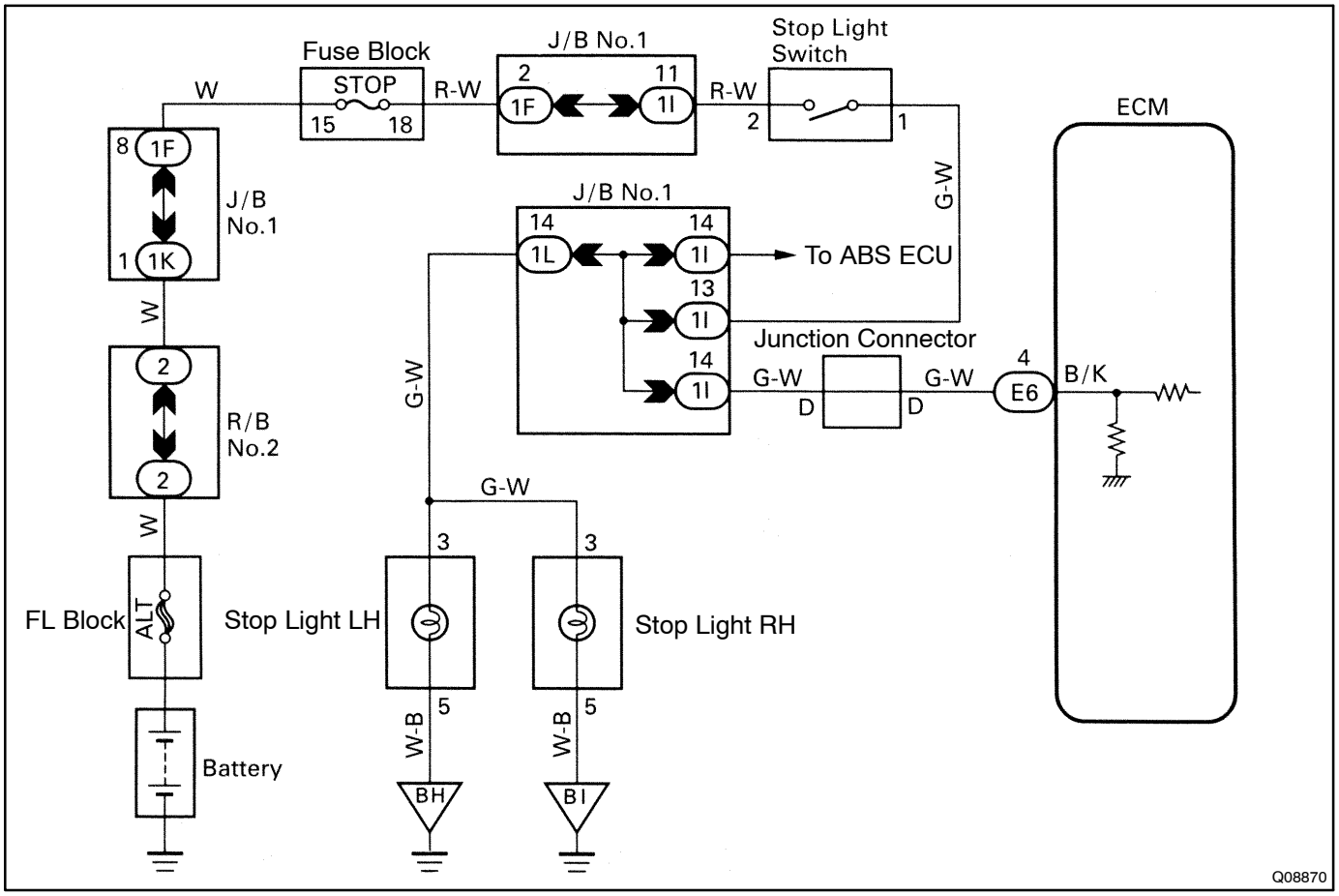
DI98Q–03

Stop Light Switch Circuit

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 signal to ECM. Then the ECM cancels of the lock–up clutch while braking is in progress.

WIRING DIAGRAM



INSPECTION PROCEDURE

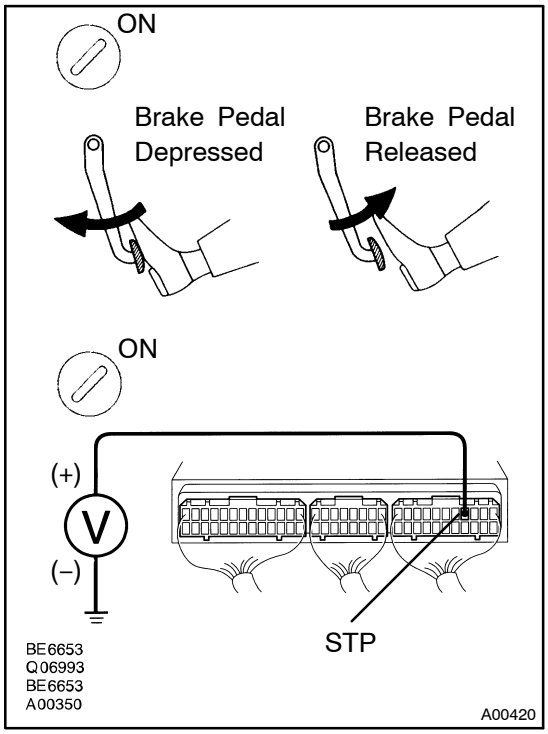
1	**Check operation of stop light.**

CHECK:
Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit.**

OK

2	Check STP signal.



When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the STP signal on the TOYOTA hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

When not using OBD II scan tool or TOYOTA hand–held tester:

CHECK:

(a) Turn the ignition switch ON.

(b) Check the voltage between B/K of the ECM and body ground.

OK:

Brake Pedal	Voltage
Depressed	7.5 – 14 V
Released	Below 1.5 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–141).**

NG

3	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 ECM.

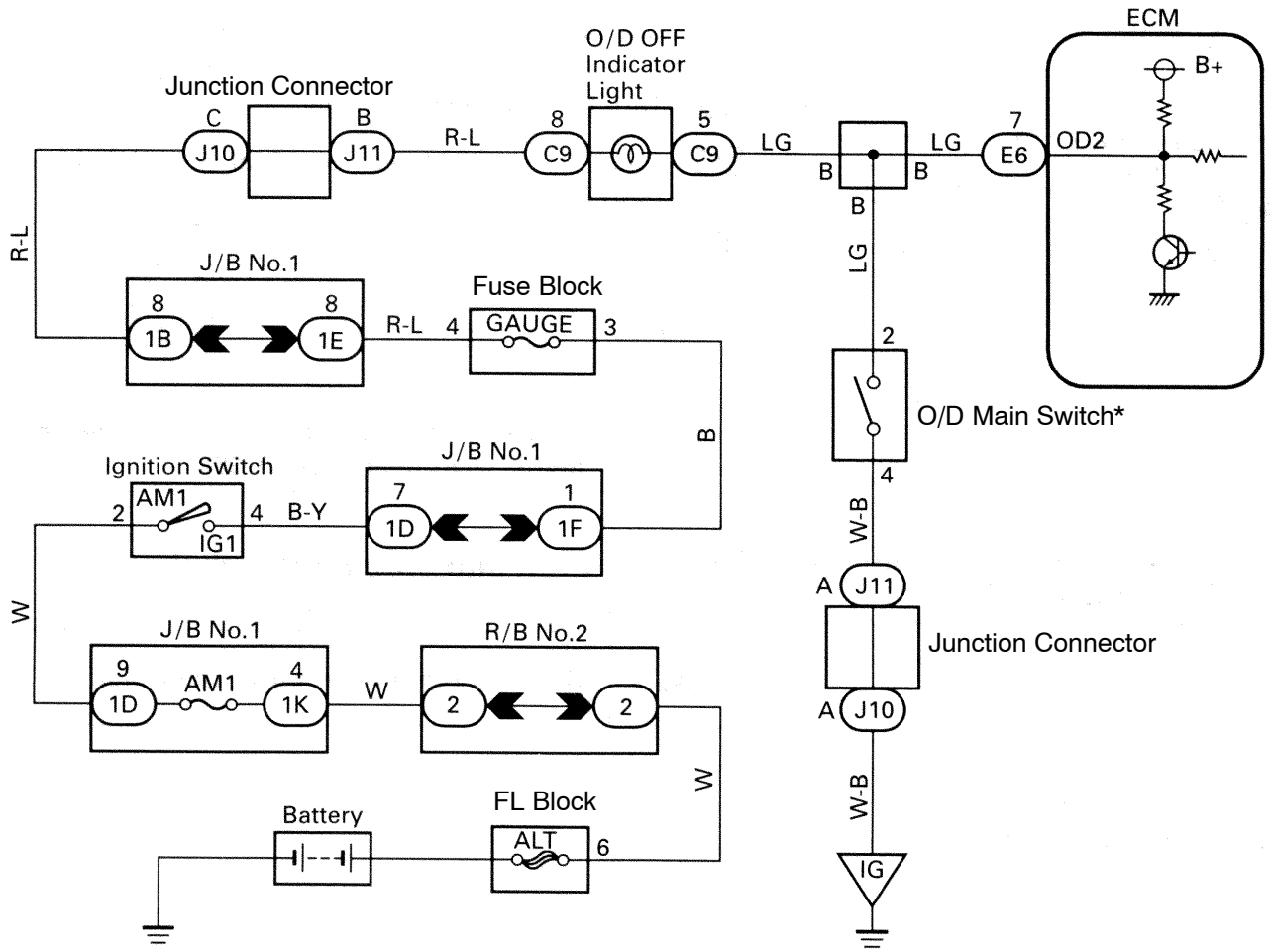
DI40N–02

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go open when the switch is pushed in and go closed when it is pushed once again. In O/D main switch OFF position, the O/D OFF indicator lights up, and the ECM prohibits shifting to O/D.

WIRING DIAGRAM

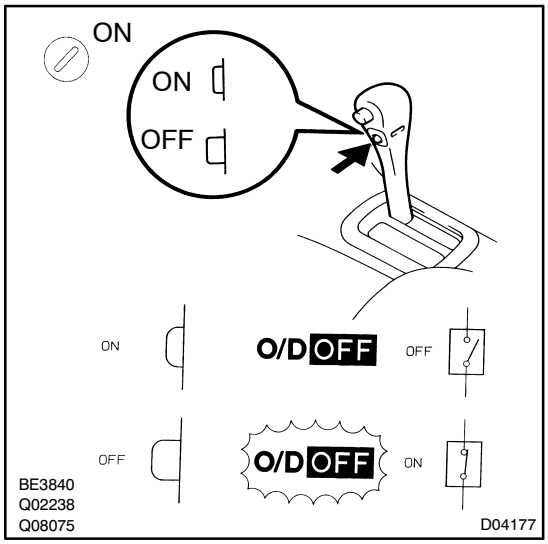


*: O/D Main switch
Contacts go open with switch pushed in.
Contacts go closed with switch pushed once again.

Q08869

INSPECTION PROCEDURE
O/D OFF indicator light does not light up.

1	**Check operation of O/D Main Switch.**



CHECK:

(a) Turn the ignition switch ON.

(b) Check the "O/D OFF" indicator light when the O/D main switch is pushed in to ON.

OK:

"O/D OFF" indicator light goes off.

(c) Check the "O/D OFF" indicator light when the O/D main switch is pushed again, to OFF.

OK:

"O/D OFF" indicator light lights up.

NG → **Go to step 4.**

OK

2	Check OVERDRIVE CUT SW2 signal.

When using TOYOTA hand–held tester:

PREPARATION:

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

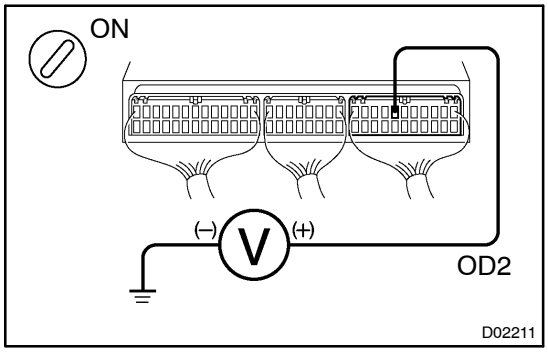
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the OD2 signal on the TOYOTA hand–held tester.

OK:

O/D main switch pushed in:
OVERDRIVE CUT SW2 ..... ON
O/D main switch pushed once again:
OVERDRIVE CUT SW2 ..... OFF



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the voltage between terminal OD2 of the ECM and body ground.

OK:

O/D Main Switch	Voltage
OFF	Below 1 V
ON	10 ~ 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–141).**

NG

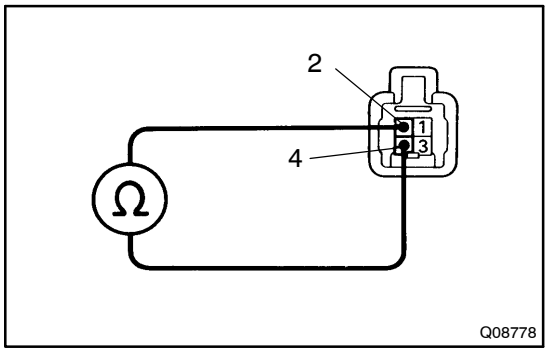
3	Check harness and connector between O/D OFF indicator light and ECM (See page IN–30).

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

OK

Check and replace ECM.

4	Check O/D main switch.



PREPARATION:

(a) Disconnect the O/D main switch connector.

(b) Check the continuity between terminals 2 and 4 of the O/D main switch connector.

OK:

O/D Main Switch	Resistance
ON	∞ Ω (open)
OFF	0 Ω (continuity)

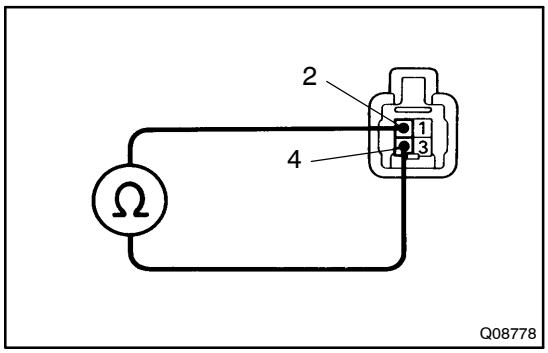
NG → **Replace O/D main switch.**

OK →

Check and replace combination meter (See page BE–37).

O/D OFF indicator light remains ON.

1	Check O/D main switch.



CHECK:

(a) Disconnect the O/D main switch connector.

(b) Check the continuity between terminals 2 and 4 of the O/D main switch connector.

OK:

O/D Main Switch	Resistance
ON	∞ Ω (open)
OFF	0 Ω (continuity)

NG → **Replace O/D main switch.**

OK →

2	**Check harness and connector between O/D OFF indicator light and O/D main switch, and O/D OFF indicator light and ECM (See page IN–30).**

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

OK

Check and replace ECM.

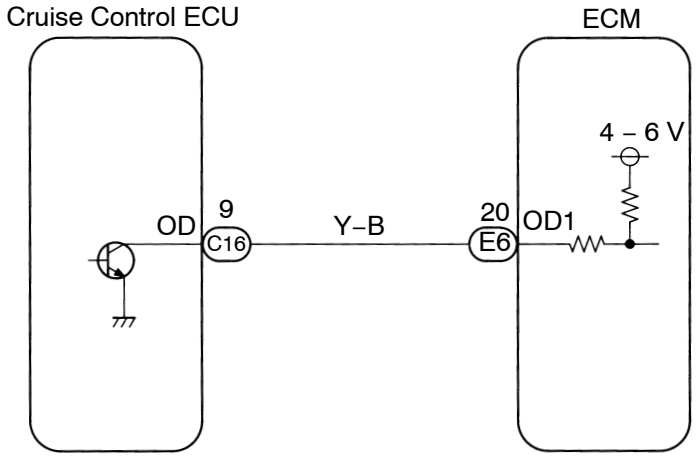
DI40O–01

O/D Cancel Signal Circuit

CIRCUIT DESCRIPTION

While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruising, O/D may be prohibited temporarily under some conditions.
The cruise control ECU sends O/D cur signals to the ECM as necessary and the ECM cancels O/D shifting until these signals are discontinued.

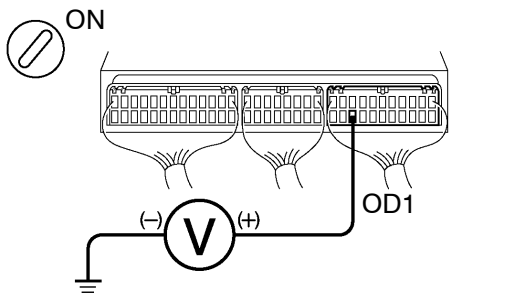
WIRING DIAGRAM



Q05352

INSPECTION PROCEDURE

1	**Check voltage between terminal OD1 of ECM and body ground.**



D02210

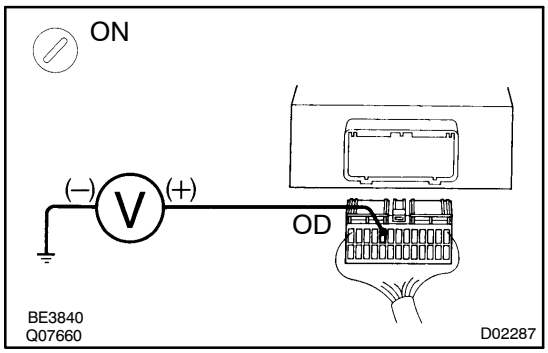
PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal OD1 of the ECM and body ground.
OK:

Voltage: 4 – 6 V

OK	**Proceed next circuit inspection shown on problem symptoms table (See page DI–141).**

NG

2	**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 the voltage between terminal OD of the cruise control ECU harness side connector and body ground.

OK:

Voltage: 9 – 14 V

OK → **Check and replace cruise control ECU (See page IN–30).**

NG

3	**Check harness and connector between cruise control ECU and ECM (See page IN–30).**

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

OK

Check and replace ECM.

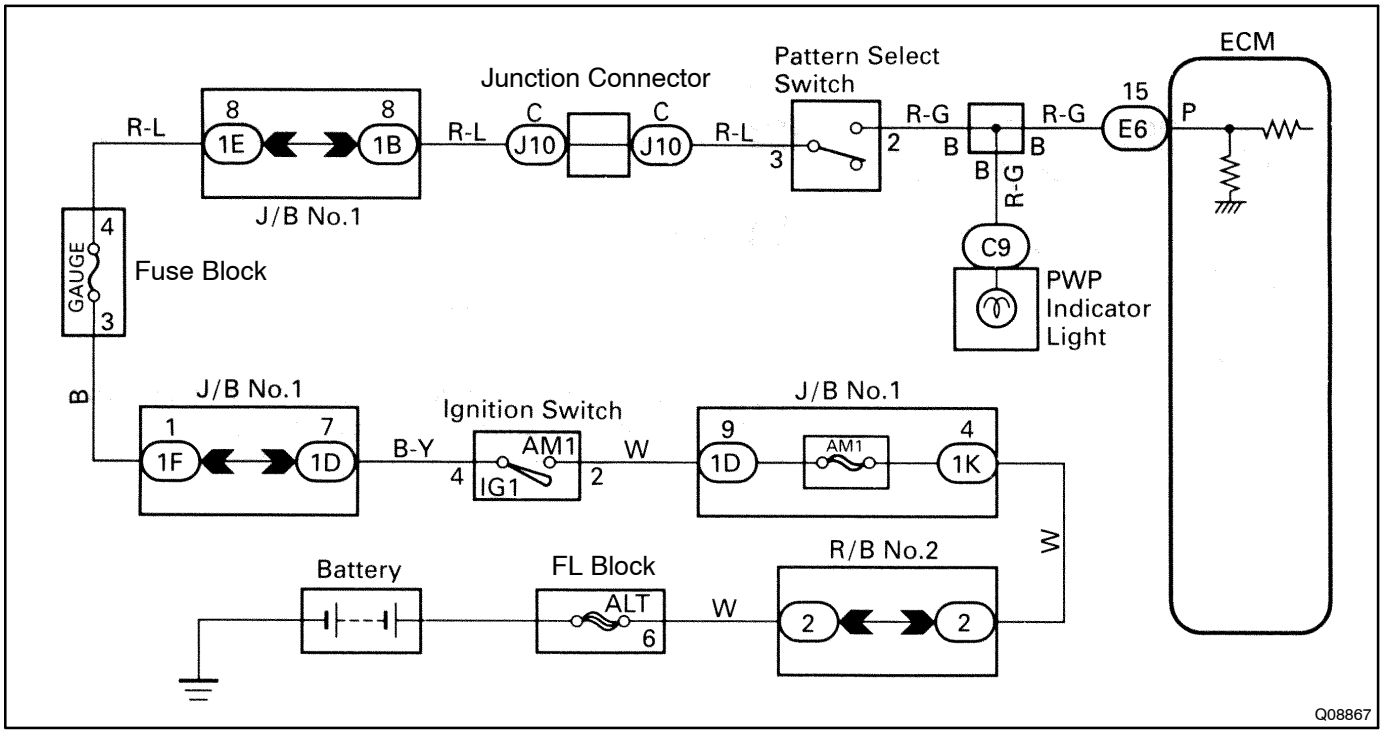
DI40P–02

Pattern Select Switch Circuit

CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and POWER patterns, 2 position, and L position and the lock–up patterns. Following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the solenoid valves ON and OFF, and control the transmission gear change and the lock–up clutch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of PWR indicator light.**

CHECK:

Check if the PWR indicator light normally when the pattern select switch is set to NORM and PWR position.

OK:

Pattern select switch	PWR indicator light
PWR	Light up
NORM	Goes off

NG → **Check and repair PWR indicator light (See page BE–2).**

OK

2	Check PATTERN SEL SW2.

When using TOYOTA hand–held tester:

PREPARATION:

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

(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the PATTERN SEL SW2 signal on the TOYOTA hand–held tester.

OK:

Pattern select switch pushed in:
PATTERN SEL SW2 ..... ON
Pattern select switch pushed once again:
PATTERN SEL SW2 ..... OFF

When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

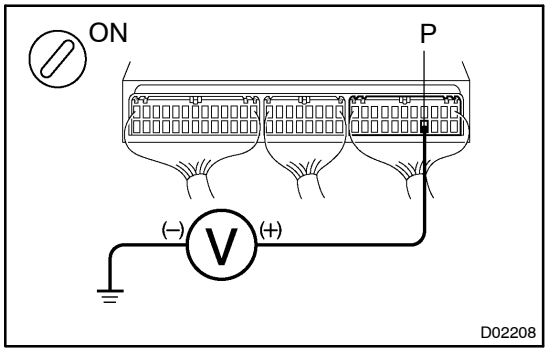
Measure the voltage between terminal P of the ECM and body ground when the pattern select switch is set to the PWR (POWER) position and NORM (NORMAL) position.

OK:

Pattern Select Switch	Voltage
PWR	7.5 – 14 V
NORM	Below 1 V

HINT:

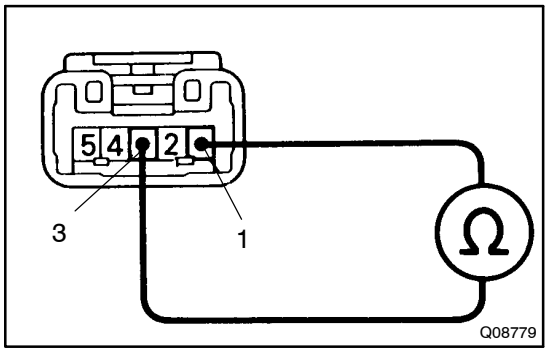
The ECM uses the normal pattern signal if the power signal is not input.



OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–141).**

NG

3	Check pattern select switch.



PREPARATION:
Remove the pattern select switch.
CHECK:
Check the resistance between terminals 1 and 3 of the pattern select switch connector when the select switch is set to PWR and NORM positions.
OK:

Pattern	Resistance
PWR	0 Ω (continuity)
NORM	∞ Ω (open)

NG → **Replace pattern select switch.**

OK

4	Check harness and connector between battery and pattern select switch, and pattern select switch and ECM (See page IN–30).

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

OK

Check and replace ECM.

AUTOMATIC TRANSAXLE (A540H)

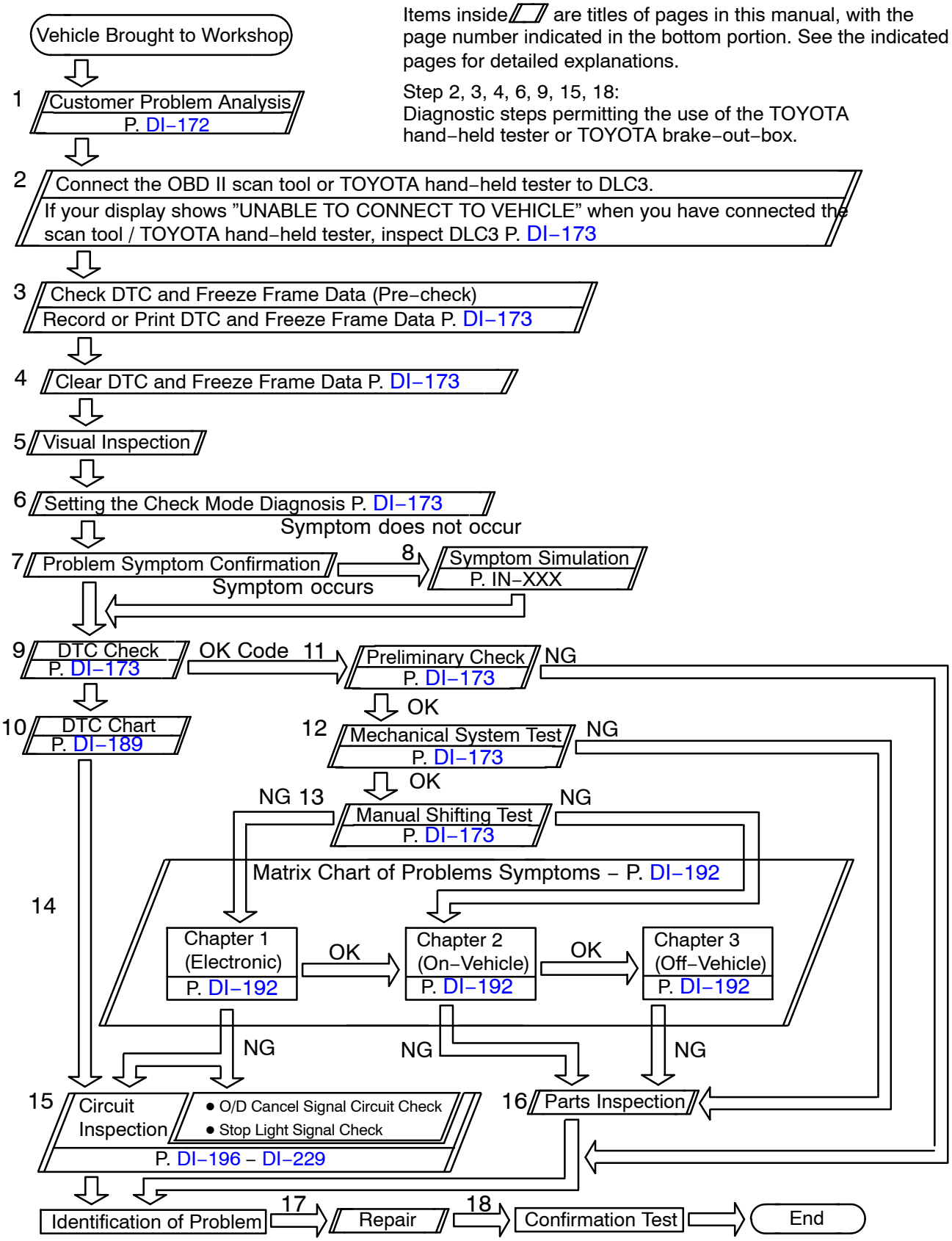
DI40R–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

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.

Step 2, 3, 4, 6, 9, 15, 18:
Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA brake–out–box.



DI40S–01

CUSTOMER PROBLEM ANALYSIS CHECK

Transaxle Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km mile

Date Problem Occurred	/ /
Frequency Problem Occurs?	☐ 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 (Code)
	2nd Time	☐ Normal code	☐ Malfunction code (Code)

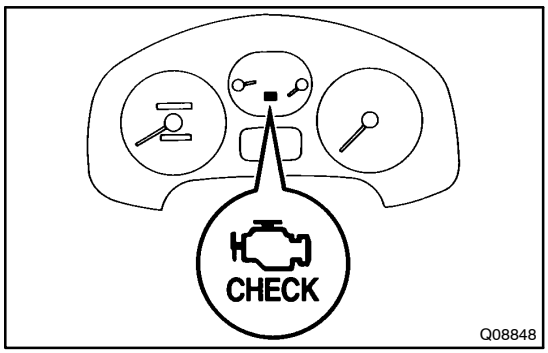
DI40T–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

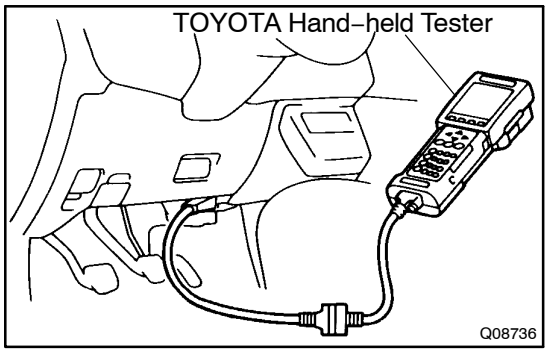
(a) Description.

- When troubleshooting OBDII vehicles, the only difference from the usual troubleshooting procedure is that you connect the OBDII scan tool complying with SAE J1978 or TOYOTA 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 the 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–14).

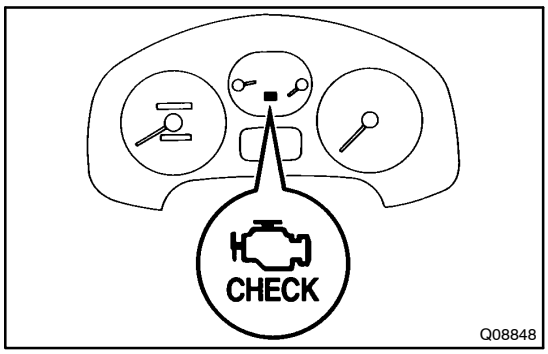
If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle. The OBDII scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data. (For operating instructions, see the OBDII scan tool's 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 page DI–189).

- 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 (TOYOTA hand–held tester) (See step 3).
- *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 second test drive, this second detection causes the MIL to light up.



2. Normal Mode:
INSPECT DIAGNOSIS

(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 starts, the MIL should go off. If the lamp remains on, the diagnosis system has a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:
TOYOTA hand–held tester only:
When the diagnostic system is switched from the normal mode to the check mode, it erases all DTCs and freezed frame data recorded in the normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

  (1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.
  (2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
  (3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand–held tester switch ON.
  (4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data. Note them down (For operating instructions, see the OBDII scan tool's instruction book.).

(5) See page DI–189 to confirm the details of the DTCs.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use the normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated for the first time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

3. Check Mode:

INSPECT DIAGNOSIS

HINT:

TOYOTA 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 the normal mode can also be detected in the check mode.

(a) Check the DTC.

(1) Initial conditions.

- Battery positive voltage 11 V or more.
- Throttle valve fully closed
- Transaxle in the PARK position
- Air conditioning switched off

(2) Prepare the TOYOTA hand–held tester.

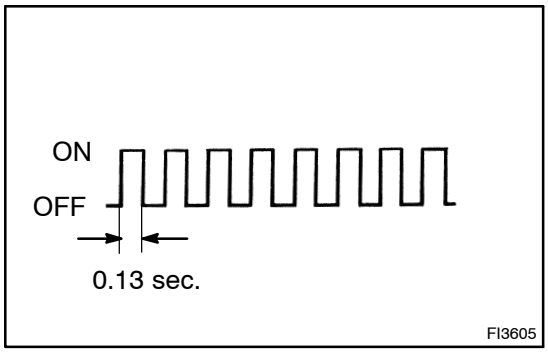
(3) Connect the TOYOTA hand–held tester to the DLC3.

(4) Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.

(5) Switch the TOYOTA hand–held tester from the normal mode to the check mode (Check that the MIL flashes.).

(6) Start the engine (The MIL goes off after the engine start.).

(7) Simulate the conditions of the malfunction described by the customer.



NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(8) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc.

HINT:

Take care not to turn the ignition switch OFF. Turning the ignition switch off switches the diagnosis system from check mode to normal mode, so all DTCs, etc. are erased.

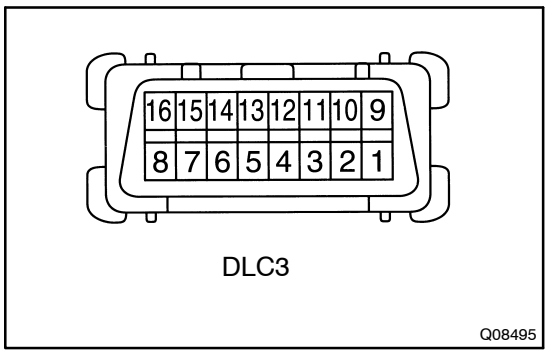
(9) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

- The following actions will erase the DTCs and freezed frame data.
- Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (See the OBD II scan tool's instruction book for operating instructions.).

NOTICE:

If the TOYOTA hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.



DLC3

(c) Inspect the DLC3.

The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection/Voltage or Resistance	Condition
2	Bus ⊕ Line/Pulse generation	During communication
4	Chassis Ground – Body/1 Ω or less	Always
5	Signal Ground – Body/1 Ω or less	Always
16	Battery Positive – Body/9 – 14 V or 1 Ω or less	Always

HINT:

If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA 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.

4. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand–held tester only:

By putting the vehicle's ECM in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(1) Clear the DTCs (See step 3).
(2) Set the check mode (See step 3).
(3) Do a simulation test (See page IN–30).
(4) Check the connector connection and terminal (See page IN–30).
(5) Visual check and contact pressure (See page IN–30).
(6) Handle the connector (See page IN–30).

5. 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, does 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.

6. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).

(a) D position test in NORM and PWR pattern ranges.
Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position and check the following:
(1) 1 → 2, 2 → 3 and 3 → O/D up–shift should take place, and shift points should conform to those shown in the automatic shift schedule (See page SS–34).

HINT:

- There is not O/D up–shift and lock–up when the engine coolant temperature is below 60°C (140°F).
- There is not lock–up when the vehicle speed is 10 km/h (6 mph) less than the set cruise control speed.

Problem	Possible cause
If there is no 1 → 2 up–shift	• Shift solenoid valve No. 2 stuck • 1–2 shift valve is stuck
If there is no 2 → 3 up–shift	• Shift solenoid valve No. 1 is stuck • 2–3 shift valve is stuck
If there is no 3 → O/D up–shift	• 3–4 shift valve is stuck
If the shift point is defective	• Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective
If the lock–up is defective	• Shift solenoid valve SL is stuck • Lock–up relay valve is stuck

(2) In the same way, check the shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shifts.

Evaluation:

Problem	Possible cause
If the shock is excessive	• Line pressure is too high • Accumulator is defective • Check ball is defective

(3) Run at the D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT:

The check for the cause of any abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter clutch, etc.

(4) While running the D position, 2nd, 3rd and O/D gears, check to see 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–34).
(5) Check for abnormal shock and slip at kick–down.

(6) Check for the lock–up mechanism.
- Drive in the D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 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, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.
(1) Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to that shown on the automatic shift schedule (See page SS–35).
(2) While running in the 2 points and 2nd gear, release the accelerator pedal and check the engine braking effect.

Evaluation:

Problem	Possible cause
If these is no engine braking effect	• 2nd coast brake is defective

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(c) L position test.
(1) While running in the L position, check to see that there in no up–shift to 2nd gear.
(2) While running in the L position, release the accelerator pedal and check the engine braking effect.

Evaluation:

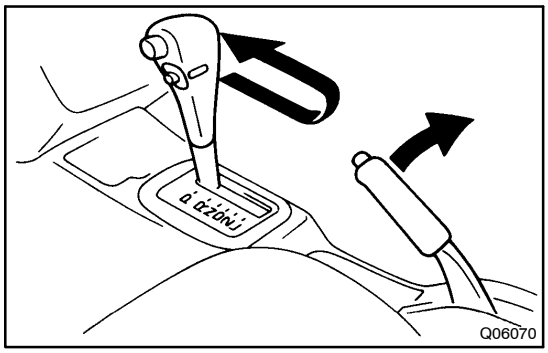
Problem	Possible cause
If these is no engine braking effect	• 1st and reverse brake defective

(3) Check for abnormal noises during acceleration and deceleration.

(d) R position test.
Shift into the R position and, while starting at full throttle, check for slipping.

CAUTION:
Before conducting this test ensure that the test area is free from personnel an obstructions.

(e) P position test.
Stop the vehicle on a gradient (more than 5°) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.



7. BASIC INSPECTION

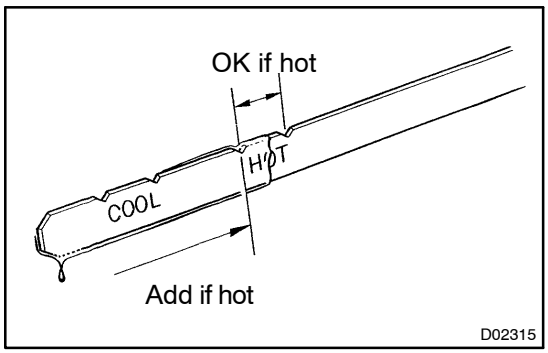
(a) Check the ATF level.

HINT:

The vehicle must have been driven so that the engine and transaxle are at normal operating temperature.

ATF temperature: 70 – 80˚C (158 – 176˚F)

(1) Park the vehicle on a level surface, set the parking brake.



(2) With the engine idling and the brake pedal depressed, shift the shift lever into each gear from the P position to L position smoothly and return to the P position.

(3) Pull out the transaxle dipstick and wipe it clean.

(4) Push it back fully into the pipe.

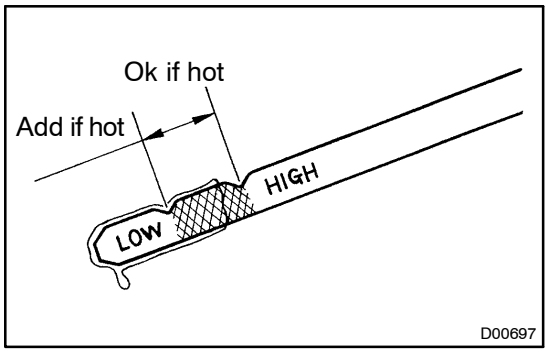
(5) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side of the hot range, add fluid.

Fluid type: ATF type T or equivalent

NOTICE:

Do not overfill.



(b) Check the transfer oil level.

(1) Park the vehicle on a level surface, set the parking brake.

(2) Pull out the transfer dipstick and wipe it clean.

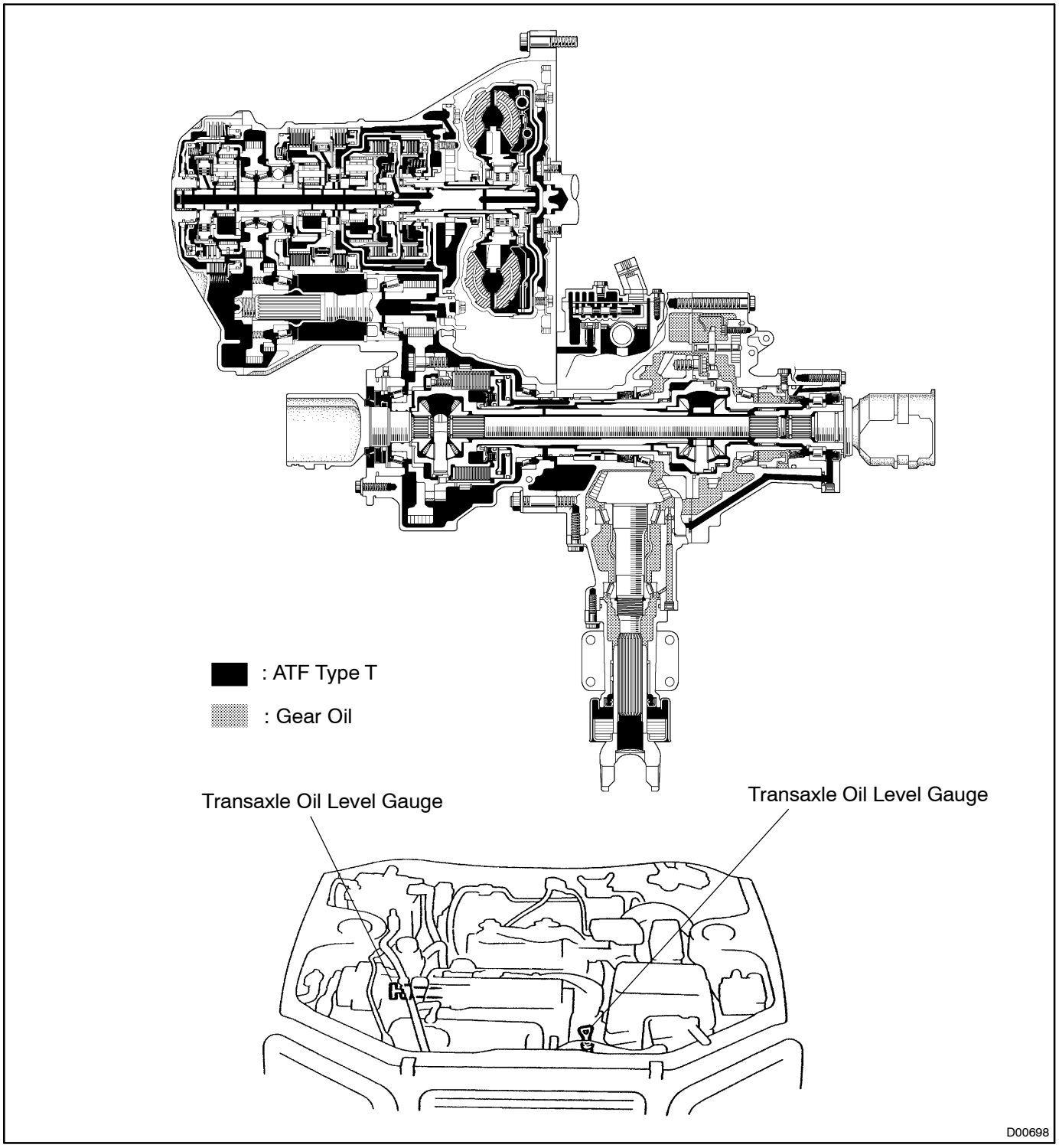
(3) Push it back fully into the pipe.

(4) Pull it out and check the oil level, as shown in the illustration.

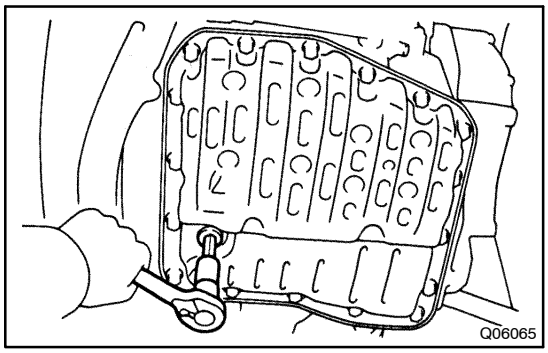
Oil grade: API GL–5

Oil viscosity: SAE 75W–90

NOTICE:
Do not overfill.



(c) Check the fluid condition.
If the fluid smells burnt or is black, replace it.



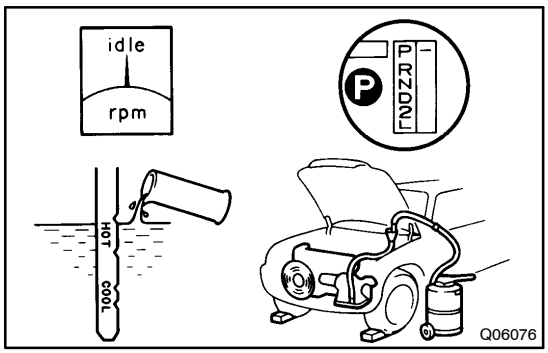
(d) Replace the ATF.

NOTICE:

Do not overfill.

(1) Using a 10 mm hexagon wrench, remove the drain plug, gasket and drain the fluid.

(2) Install a new gasket and the drain plug securely.

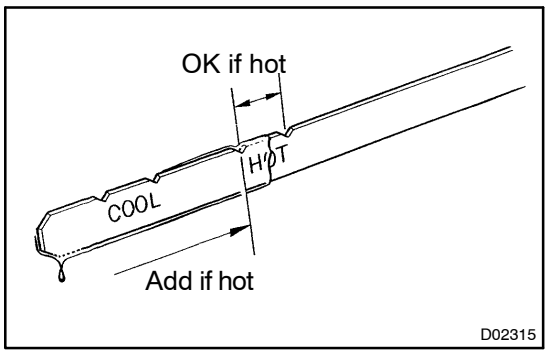


(3) Add new fluid through the filler pipe.

Fluid type: ATF type T or equivalent

Drain and refill: 3.3 liters (3.5 US qts, 2.9 Imp. qts)

(4) Start the engine and shift the selector into all the positions from P through L and then shift into the P position.

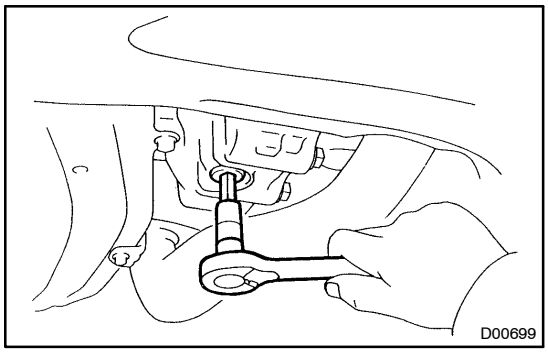


(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(6) Check the fluid level with the normal fluid temperature 70 – 80°C (158 – 176°F) and add as necessary.

NOTICE:

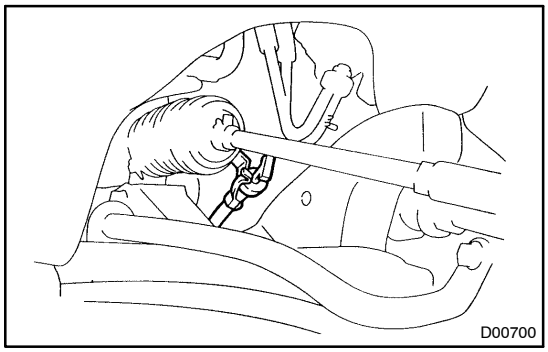
Do not overfill.



(e) Replace the transfer oil.

(1) Using a 10 mm hexagon wrench, remove the drain plug and drain the oil.

(2) Install the drain plug.



(3) Add new oil through the filler pipe.

Recommended oil:

Oil grade API GL–5

Viscosity SAE 75W–90

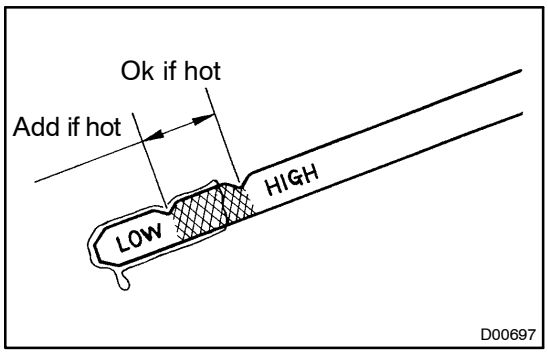
Capacity: 0.7 liters (0.7 US qts, 0.6 Imp. qts)

(4) Check the oil level and add as necessary.

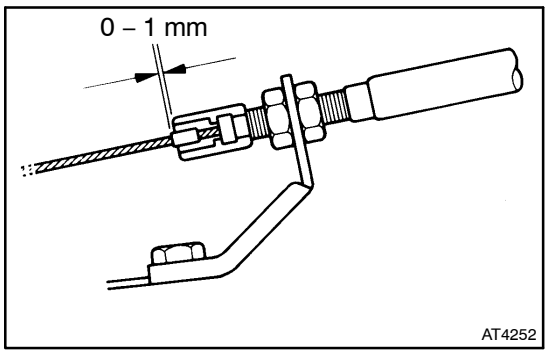
NOTICE:

Do not overfill.

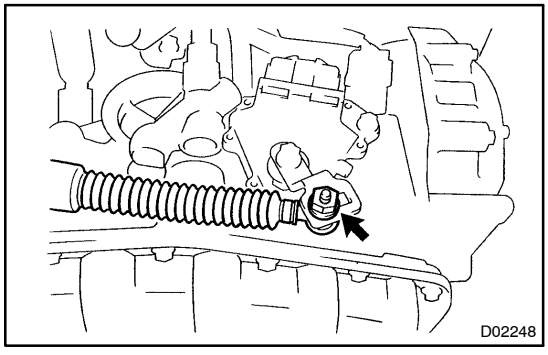
(f) Check the fluid leaks.
Check for leaks in the transmission and transfer.



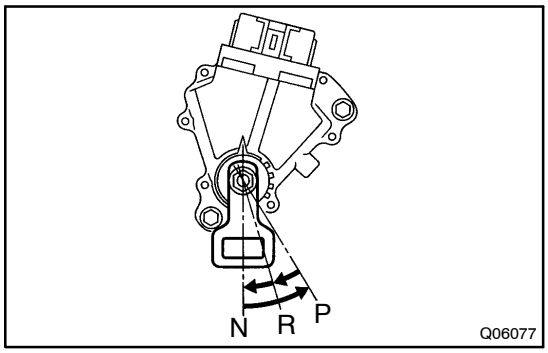
If there are leaks, it is necessary to repair or replace O – rings, FIPG's, oil seals or other parts.



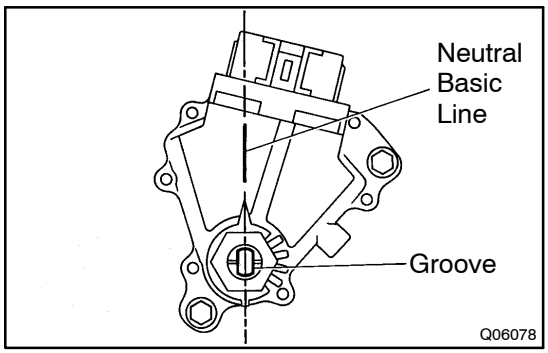
(g) Inspect and adjust the throttle cable.
(1) Check that the throttle valve is fully closed.
(2) Check that the inner cable is not slack.
(3) Loosen the adjustment nuts.
(4) Adjust the outer cable so that the distance between the end of the boot and stopper on the cable is as standard.
Standard boot and cable stopper distance:
0 – 1 mm (0 – 0.04 in.)
(5) Tighten the adjusting nuts.
(6) Recheck the adjustments.



(h) Adjust the shift control cable.
(1) Loosen the nut on the lever.
(2) Push the manual lever fully toward the right side of the vehicle.



(3) Return the lever 2 notches to the NEUTRAL position.
(4) Set the shift lever in the N position.
(5) While holding the lever lightly toward the ”R” position side, tighten the shift lever nut.



(i) Adjust the park/neutral position switch.

If the engine will start with the shift selector in any position other than the N or P position, adjustment is required.

(1) Loosen the park/neutral position switch bolts and set the shift selector to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolts.

Torque: 5.4 N·m(55 kgf·cm,48 in·lbf)

(j) Inspect the idle speed.

Idle speed: 750 ± 50 rpm (In N position and A/C OFF)

8. 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 ATF temperature 50 – 80˚C (122 – 176˚F).**
- **Do not continuously run this test longer than 5 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 OBD II scan tool or TOYOTA hand–held tester to the 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: 2,400 ± 150 rpm

(7) Do the same test in R position.

Stall speed: 2,400 ± 150 rpm

Evaluation:

Problem	Possible cause
Stall speed low in D and R positions	• Engine output may be insufficient • Stator one–way clutch is operating properly HINT: If more than 600 rpm below the specified value, the torque converter clutch could be faulty

Stall speed high in D position	• Line pressure too low • Forward clutch slipping • No. 2 one–way clutch not operating properly • O/D one–way clutch not operating properly
Stall speed high in R position	• Line pressure too low • Direct clutch slipping • 1st and reverse brake slipping • O/D clutch slipping
Stall speed 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, direct clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.
(2) Start the engine and check idle speed.
Idle speed: 750 ± 50 rpm (In N position and A/C OFF)
(3) Shift the shift lever from the N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: N → D Less than 1.2 seconds
In the same way, measure the time lag for N → R.
Time lag: N → R Less than 1.5 seconds

If N → D or N → R time lag is longer than specified:

Evaluation:

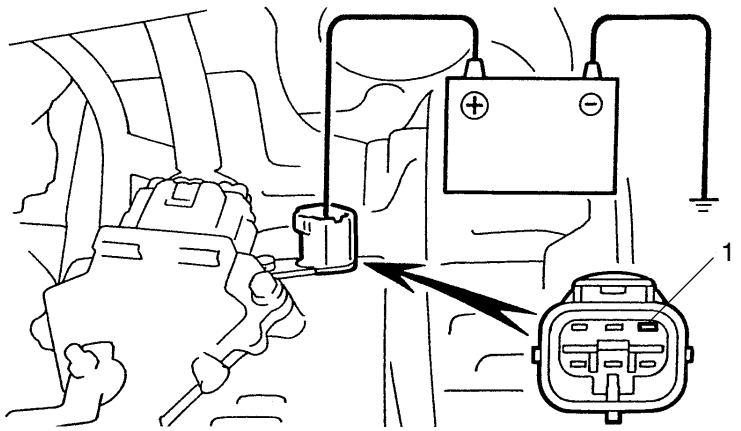
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • O/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • O/D one–way clutch not operating properly

9. Line Pressure:
HYDRAULIC TEST

(a) Preparation.
(1) Warm up the ATF.
(2) Remove the test plug on the transaxle case and connect SST (See page AX–18 for the location to connect SST).
SST 09992–00094 (09992–00230)

CAUTION:

- **Perform the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).**
- **The line pressure test should always be carried out in parts. One should observe the conditions of wheels or wheel stopper outside the vehicle while the other is performing the test.**



(b) Measure the line pressure.

(1) Fully apply the parking brake and chock the 4 wheels.
(2) Start the engine and check idling speed.
(3) Step down strongly on the brake pedal with your left foot and shift into the D position.
(4) Measure the line pressure when the engine is idling speed.
(5) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(6) Only when the shift solenoid valve ST is opened:
Apply battery positive voltage between terminal of the solenoid connector and body ground.
(7) In the same way, perform the test in the R position.

Automatic Transaxle	Idling kPa (kgf/cm^2, psi)	Stall kPa (kgf/cm^2, psi)
* D position (Shift solenoid valve ST open)	530 – 706 (5.4 – 7.2, 76 – 102)	1,324 – 1,549 (13.5 – 15.8, 192 – 225)
D position (Shift solenoid valve ST close)	363 – 442 (3.7 – 4.3, 53 – 61)	736 – 863 (7.5 – 8.8, 106 – 125)
R position	530 – 706 (5.4 – 7.2, 76 – 102)	1,324 – 1,549 (13.5 – 15.8, 192 – 225)

*: When battery voltage is supplied to terminal 4 of the solenoid connector and body ground, the shift solenoid valve ST valve is open.

If the measured pressures are not with in the specification, recheck the throttle cable adjustment and perform a retest.

(8) Clear the DTC's after the test.

Evaluation:

Problem	Possible cause
If the measured values at all positions are higher than specified	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured value in all positions are lower than specified	• Throttle cable out of adjustment • 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 and reverse brake defective

10. Center Differential Control Clutch: HYDRAULIC TEST

(a) Preparation.
  (1) Warm up the ATF.
  (2) Remove the test plug and connect SST (See page AX–18 for the location to connect SST).
  SST SST 09992–00094 (09992–00111)

CAUTION:
- **Perform the test at normal operating ATF temperature 50 – 80˚C (122 – 176˚F)**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

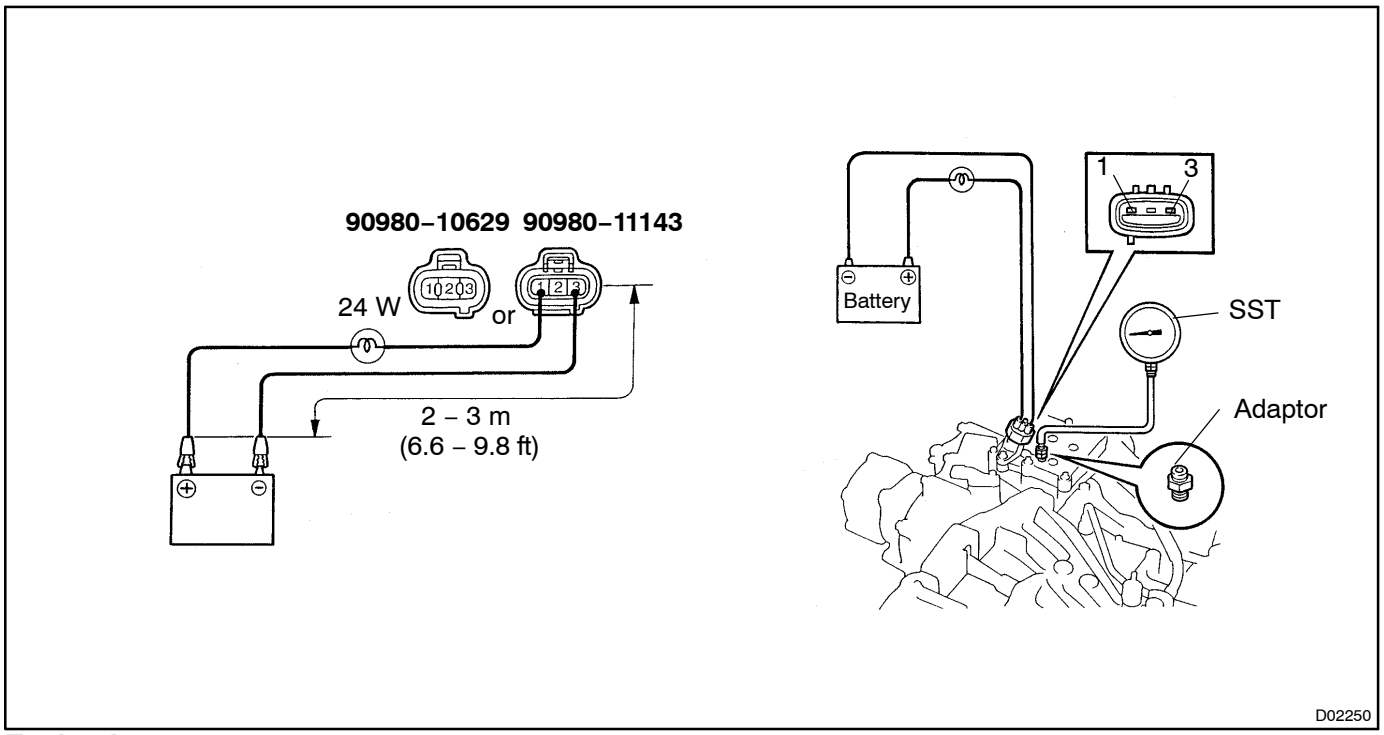
(b) Measure the center differential clutch control pressure.
  (1) Start the vehicle and open the accelerator open 50 % or more and check that the center differential clutch control pressure is in the range from more than 294 kPa (3.0 kgf/cm^2, 42 psi).
  (2) Fully close the accelerator and check that the SST registers 9.8 kPa (0.1 kgf/cm^2, 1.4 psi) or less.

CAUTION:
- **Confirm safety of the road before checking.**
- **Take care to avoid slip when you start the vehicle on a paved road.**
- **Check the pressure at normal driving ATF temperature 50 – 80˚C (122 – 176˚F).**

Reference:
To measure center differential control pressure to be measured with the solenoid opened by applying voltage to it, refer to the following:
- Prepare a sub–assembly for checking as follows:
  Prepare a supply connector (Part No. 90980–10629, or 90980–11143)
  Connect a harness of 2 – 3 m (6.6 – 9.8 ft) to terminal 1 of the connector.
  Place a bulb of 24W in between the harness.
  Connect a harness of 2 – 3 m (6.6 – 9.8 ft) to terminal 3 of the connector.
- Connect the inspection's sub–harness assembly to the solenoid connector of the transfer.
  Connect terminal 1 of the sub–harness to the battery's positive (+) terminal, and terminal 3 of the sub–harness to the battery's negative (–) terminal.
- Measure the center differential control pressure at idling and when performing the stall test (When 1st gear).

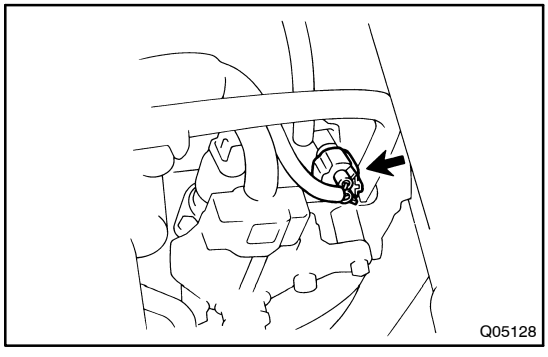
Engine speed	Sub–harness	Line pressure kPa (kgf/cm^2, psi)
Idling	Connected	363 – 422 (3.7 – 4.3, 53 – 61)
Stall (Shift solenoid valve SLD OFF)	Connected	735 – 863 (7.5 – 8.8, 107 – 125)
Stall (Shift solenoid valve SLD ON)	Connected	1,324 – 1,549 (13.5 – 15.8, 192 – 225)
All rpm	Not connected	9.8 (0.1, 1.4) or less

- Clear the DTC's after the test.



Evaluation:

Problem	Possible cause
If the measured values at all conditions are higher than the specification	• Differential control valve defective • Solenoid modulator valve defective
If the measured values at all conditions are lower than the specification	• Oil pump defective • Differential control valve defective • Solenoid modulator valve defective
If the pressure is low in the stall test (Shift solenoid valve SLD ON only)	• Shift solenoid valve SLD defective
If the measured values are lower than the specification, when sub–harness is connected	• Solenoid modulator valve defective • Differential control valve defective
If the measured values are higher than the specification, when sub–harness is connected	• Solenoid modulator valve defective • Differential control valve defective



11. MANUAL SHIFTING TEST

HINT:

With this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transaxle.

(a) Disconnect the solenoid wire.

(b) Inspect the manual driving operation.
Check that the shift and gear positions correspond with the table below.

Shift Position	Gear Position
D	O/D
2	O/D
L	1st
R	Reverse
P	Pawl Lock

HINT:
If the position (L, 2 and D positions) are difficult to distinguish, do the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
- If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the solenoid wire.
(d) Cancel out the DTC (See step 3).

DI40U–02

DIAGNOSTIC TROUBLE CODE CHART

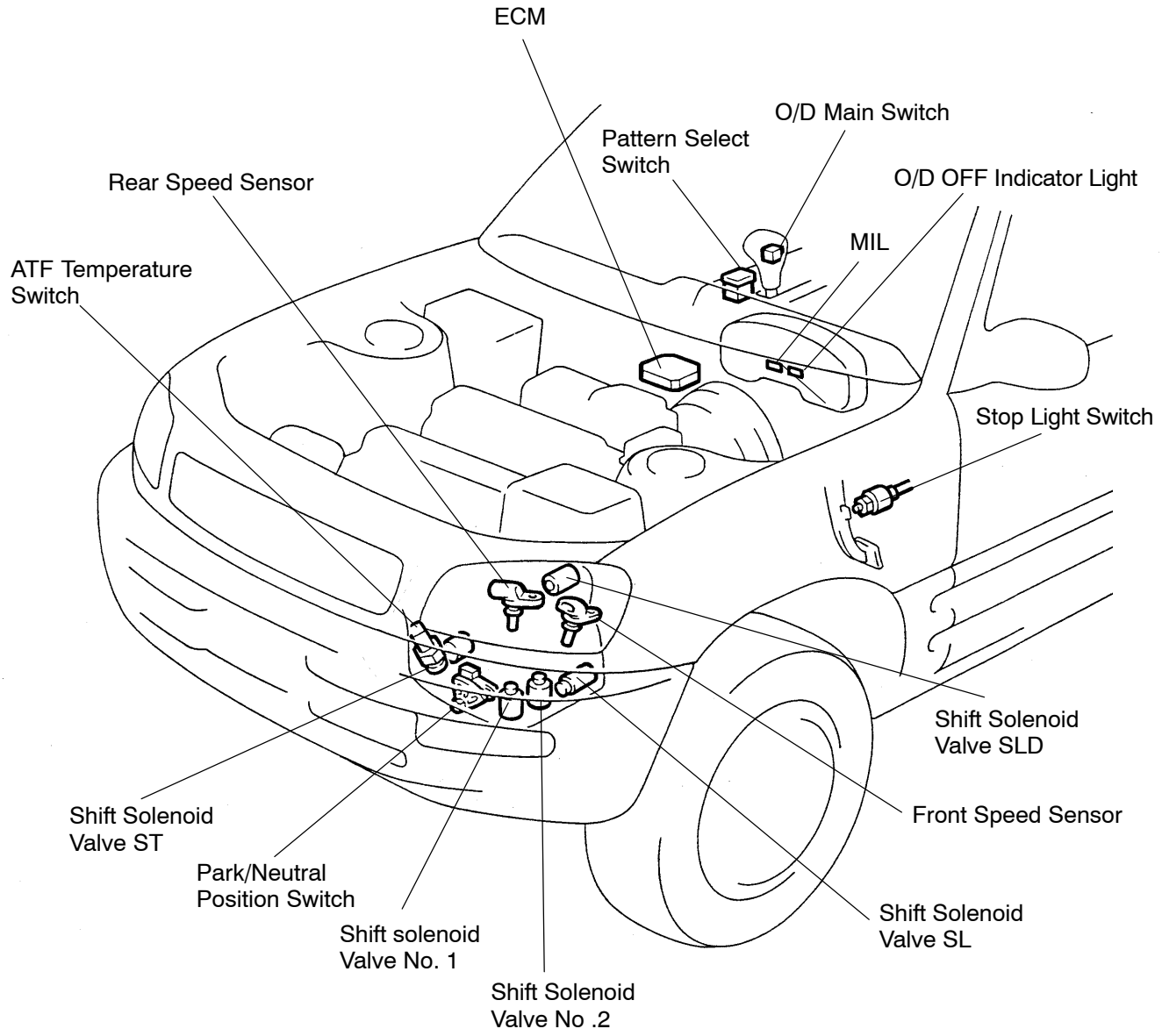
If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0500 (DI–94)	Vehicle Speed Sensor Malfunction	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • ECM	●	○
P0750 (DI–197)	Shift Solenoid A Malfunction (Shift Solenoid Valve No. 1)	• Shift solenoid valve No. 1 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0753 (DI–198)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No.1)	• Open or short in shift solenoid valve No. 1 circuit • Shift solenoid valve No. 1 • ECM	●	○
P0755 (DI–197)	Shift Solenoid B Malfunction (Shift Solenoid Valve No. 2)	• Shift solenoid valve No. 2 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0758 (DI–198)	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No. 2)	• Open or short in shift solenoid valve No. 2 circuit • Shift solenoid valve No. 2 • ECM	●	○
P0770 (DI–201)	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	• Shift solenoid valve SL is stuck open or closed • Valve body is blocked up or stuck • Lock–up clutch	●	○
P0773 (DI–203)	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P1700 (DI–206)	Speed sensor No. 2 Circuit Malfunction (Front Speed Sensor)	• Open or short in front speed sensor circuit • Front speed sensor • ECM	●	○
P1715 (DI–209)	Rear Wheel Sensor Circuit Malfunction (Rear Speed Sensor)	• Open or short in rear speed sensor circuit • Rear speed sensor • ECM	●	○
P1760 (DI–212)	Linear Solenoid for Line Pressure Control Circuit Malfunction (Shift Solenoid Valve ST)	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM	●	○
P1770 (DI–215)	Differential Lock Solenoid No. 1 Circuit Malfunction (Shift Solenoid Valve SLD)	• Open or short in shift solenoid valve SLD circuit • Shift solenoid valve SLD • ECM	●	○
P1780 (DI–218)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○

*: ● ..... MIL lights up

DI40V–01

PARTS LOCATION

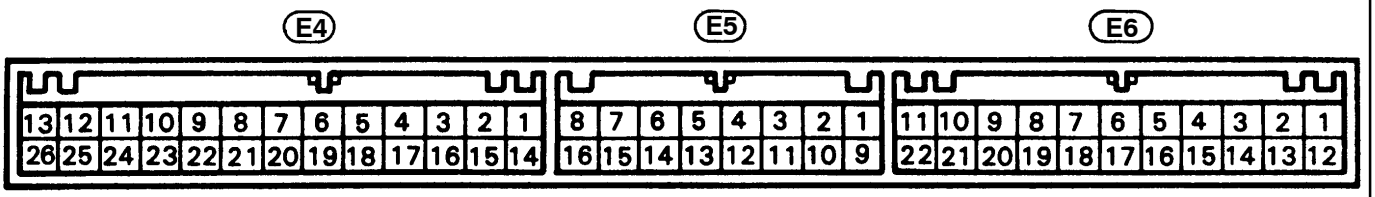


D02251

DI40W–02

TERMINALS OF ECM

ECM Terminals



Z16062

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
SPD (E6–9) – E1 (E4–14)	V–W – BR	Disconnect cruise control connector and IG ON Turn one front wheel slowly	Pulse signal is output Below 1.5 ↔ 4 – 6
S1 (E4–2) – E1 (E4–14)	P–B – BR	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	10 – 14
		1st or 2nd gear	10 – 14
		3rd or O/D gear	Below 1
S2 (E4–15) – E1 (E4–14)	P – BR	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	Below 1
		2nd or 3rd gear	10 – 14
		1st or O/D gear	Below 1
SL (E4–1) – E1 (E4– 4)	Y–B – BR	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	Below 1
		Vehicle driving under look–up position	10 – 14
OD1 (E6–20) – E1 (E4–14)	Y–B – BR	IG ON	4 – 6
OD2 (E6–7) – E1 (E4–14)	LG – BR	O/D main switch ON (O/D ON)	10 – 14
		O/D main switch OFF (O/D OFF)	Below 1
L (E6–19) – E1 (E4–14)	LG – BR	IG ON Shift lever L position	10 – 14
		IG ON Shift lever other than L position	Below 1
R (E6–8) – E1 (E4–14)	R–B – BR	IG ON Shift lever R position	10 – 14
		IG ON Shift lever other than R position	Below 1
2 (E–18)– E1 (E4–14)	LG–R – BR	IG ON Shift lever 2 position	10 – 14
		IG ON Shift lever other than R position	Below 1
NSW (E6–22) – E1 (E4–14)	B–W – BR	IG ON Shift lever P or N position	Below 1
		IG ON Shift lever other than P or N position	10 – 14
B/K (E6–4) – E1 (E4–14)	G–W – BR	IG ON Brake papel is depressed	7.5 – 14
		IG ON Brake papel is released	Below 1
ST (E6–13) – E1 (E4–14)	LG – BR	IG ON	Below 1
SLD^+ (E6–3) – SLD^- (E6–2)	L–B – BR–B	IG ON	Pulse generation
FR^+ (E4–8) – FR^- (E4–7)	Y–R – W–R	IG ON Standing still	1 or less
		IG ON Vehicle moving (more than 20 km/h)	Pulse generation
RR^+ (E5–14)– RR^- (E5–13)	L–Y – R–L	IG ON Standing still	1 or less
		IG ON Vehicle moving (more than 20 km/h)	Pulse generation
P (E6–15) – E1 (E4–14)	R–G – BR	PWR pattern	7.5 – 14
		NORM pattern	Below 1

DI40X–02

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

When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to chapter 2 or 3, proceed as instructed.

(1) 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.

(2) If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	2. ECM	DI–191
No up–shift (3rd → O/D)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–223 DI–221 DI–191
No down–shift (O/D → 3rd)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–223 DI–221 DI–191
No down–shift (A particular gear, from 1st to 3rd gear, is not down–shifted)	1. ECM	DI–191
No lock–up	1. Stop light switch circuit 2. ECM	DI–227 DI–191
No lock–up off	1. ECM	DI–191
Shift point too high or too low	1. Pattern select switch circuit 2. ECM	DI–229 DI–191
Up–shifts to O/D from 3rd while O/D main switch is OFF	1. O/D main switch & O/D OFF indicator light circuit 2. ECM	DI–223 DI–191
Up–shifts to O/D from 3rd while engine is cold	1. ECM	DI–191
No kick–down	1. ECM	DI–191
Engine stalls when starting off or stopping	1. ECM	DI–191
"A/T OIL" indicator light does not light up or does not goes off	1. A/T temperature switch	DI–191

Chapter 2: On–Vehicle Repair
(★: A540H Automatic Transaxle Repair Manual Pub. No. RM488U)

Symptom	Suspect Area	See page
Vehicle does not move in R position	1. 1–2 shift valve 2. 2–3 shift valve 3. Throttle valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Vehicle does not move in any forward position or reverse position	1. Manual valve 2. Primary regulator valve 3. Secondary regulator valve 4. Off–vehicle repair matrix chart	★ ★ ★ –

No lock–up	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
No lock– up OFF	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ –
No kick–down	1. Throttle cable 2. 1–2 shift valve 3. 2–3 shift valve 4. 3–4 shift valve 5. Down shift plug	★ ★ ★ ★ ★
No engine braking (1st (L position))	1. Low coast modulator valve 2. Low coast modulator valve 3. Off–vehicle repair matrix chart	★ ★ –
No engine braking (2nd (2 position))	1. 2nd coast modulator valve 2. 2nd lock valve 3. 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)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	★ –
No down shift (3rd → 2nd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	★ –
No down shift (2nd → 1st)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → R)	1. No. 1 and No. 2 accumulator control valve 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. C_1 accumulator 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (N → L)	1. Low coast modulator valve	★
Harsh engagement (1st → 2nd (D position))	1. B_2 accumulator 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (1st → 2nd (2 position))	1. 2nd coast modulator valve	★
Harsh engagement (1st → 2nd → 3rd)	1. Throttle modulator valve 2. No. 1 and No. 2 accumulator control valve	★ ★
Harsh engagement (1st → 2nd → 3rd → O/D)	1. No. 1 and No. 2 accumulator control valve	★
Harsh engagement (2nd → 3rd)	1. C_2 accumulator	★
Harsh engagement (3rd → O/D)	1. B_0 accumulator 2. Off–vehicle repair matrix chart	★ –
Harsh engagement (O/D → 3rd)	1. C_0 accumulator 2. B_0 accumulator	★ ★
Harsh engagement (3rd → 2nd)	1. B_2 accumulator 2. C_0 accumulator 3. B_0 accumulator 4. 2nd coast modulator valve 5. Off–vehicle repair matrix chart	★ ★ ★ ★ –
Sliper shudder in forward and reverse (Directry after E/G start)	1. Pressure relief valve 2. Oil starter 3. Off–vehicle repair matrix chart	★ AX–8 –

Front or rear wheel is slipping	1. Shift restrict reverse ball 2. Solenoid modulator valve 3. Differential control valve 4. Off–vehicle repair matrix chart	★ ★ ★ –
Shift point too high or too low	1. Secondary regulator valve	★

Chapter 3: Off–Vehicle Repair
(★: A540H Automatic Transaxle Repair Manual Pub. No. RM488U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position	1. Forward clutch (C_1) 2. No. 2 one–way clutch (F_2) 3. 1st and reverse brake (B_3) 4. 2nd coast brake (B_1) 5. 2nd brake (B_2) 6. Direct clutch (C_2)	★ ★ ★ ★ ★ ★
Vehicle does not move in reverse position	1. 2nd coast brake (B_1) 2. Front planetary gear 3. Rear planetary gear 4. Direct clutch (C_2) 5. O/D direct clutch (C_0) 6. 1st and reverse brake (B_3)	★ ★ ★ ★ ★ ★
Vehicle does not move in any forward position and reverse position	1. Parking lock pawl 2. Oil pump 3. O/D one–way clutch (F_0) 4. O/D direct clutch (C_0) 5. O/D brake (B_0) 6. Front planetary gear 7. Rear planetary gear 8. O/D planetary gear	★ ★ ★ ★ ★ ★ ★ ★
No lock–up	1. Torque converter clutch	AX–22
No lock–up OFF	1. Torque converter clutch	AX–22
Large shock during lock–up	1. Torque converter clutch	AX–22
E/G stalls when starting off and stopping	1. Torque converter clutch	AX–22
No up–shift (1st → 2nd)	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1)	★ ★
No up–shift (2nd → 3rd)	1. Direct clutch (C_2)	★
No up–shift (3rd → O/D)	1. O/D brake (B_0)	★
No down–shift (2nd → 1st)	1. 2nd coast brake (B_1)	★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3)	★ ★
Harsh engagement (N → D)	1. Forward clutch (C_1)	★
Harsh engagement (1st → 2nd (D position))	1. 1st and reverse brake (B_3)	★
Harsh engagement (2nd → 3rd)	1. 2nd coast brake (B_1)	★
Harsh engagement (3rd → O/D)	1. O/D direct clutch (C_0) 2. O/D brake (B_0) 3. O/D planetary gear	★ ★ ★
Slip on shudder (Forward and reverse (After warm–up))	1. Torque converter clutch 2. Oil pump 3. No. 1 one–way clutch (F_1) 4. O/D direct clutch (C_0)	AX–22 ★ ★ ★
Slip on shudder (Forward and reverse (Direct after E/G start))	1. Torque converter clutch	AX–22

Slip on shudder (R range)	1. Direct clutch (C_2) 2. O/D direct clutch (C_0) 3. O/D one–way clutch (F_0)	★ ★ ★
Slip on shudder (1st)	1. Forward Clutch (C_1) 2. No. 2 one–way Clutch (F_2)	★ ★
Slip on shudder (2nd)	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1)	★ ★
Slip on shudder (2nd → 3rd (Up–shift))	1. Direct clutch (C_2)	★
Slip on shudder (3rd)	1. Direct clutch (C_2)	★
Slip on shudder (O/D)	1. O/D brake (B_0)	★
No engine braking (1st – 3rd)	1. O/D direct clutch (C_0)	★
No engine braking (1st (L position))	1. 1st and reverse brake (B_3)	★
No engine braking (2nd (2 position))	2. 2nd coast brake (B_1)	★
Poor acceleration (All positions)	1. Torque converter clutch 2. Oil pump	AX–22 ★
Poor acceleration (O/D)	1. O/D direct clutch (C_0) 2. O/D planetary gear	★ ★
Poor acceleration (Other than O/D)	1. O/D brake (B_0) 2. O/D planetary gear	★ ★
Poor acceleration (Other than 2nd)	1. 2nd coast brake (B_1) 2. 2nd brake (B_2)	★ ★
Poor acceleration (1st and 2nd)	1. O/D brake (B_0)	★
Poor acceleration (1st and R position)	1. 1st and reverse brake (B_3)	★
Poor acceleration (R position)	1. Forward clutch (C_1)	★
Front or rear wheel is slipping	1. Center differential clutch	★

DI40Y–01

CIRCUIT INSPECTION

DTC	P0500	Vehicle Speed Sensor Malfunction

See page DI–94.

DI40Z–01

DTC	P0750, P0755	Shift Solenoid A/B Malfunction (Shift Solenoid Valve No. 1 / No. 2)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear). The ECM then compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

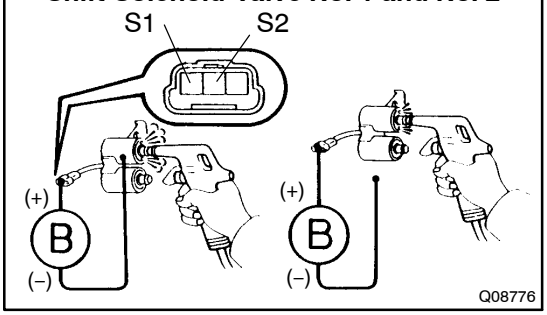
DTC No.	DTC Detecting Condition	Trouble Area
P0750 P0755	During normal driving, gear required by the ECM does not match actual gear (2 trip detection logic)	• Shift solenoid valve No. 1 / No. 2 is stuck open or closed • Valve body is blocked up or stuck

HINT:
Check the shift solenoid valve No. 1 when DTC P0750 is output and check shift solenoid valve No. 2 when DTC P0755 is output.

INSPECTION PROCEDURE

1	Check solenoid valve No. 1 or No. 2 operation.

Shift Solenoid Valve No. 1 and No. 2



PREPARATION:

(a) Remove the oil pan.
(b) Remove the shift solenoid valve No. 1 or No. 2.

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 positive voltage is supplied to the solenoid valves, check that solenoid valve open.

NG → **Replace shift solenoid valve No. 1 or No. 2.**

OK

2	Check valve body (See page DI–192).

NG → **Repair or replace valve body.**

OK

Repair or replace transaxle (See page AX–19).

DTC	P0753, P0758	Shift Solenoid A/B Electrical Malfunction (Shift Solenoid Valve No. 1/No. 2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is done in combination with ON and OFF of the shift solenoid valves No. 1 and No. 2 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).
Fail Safe Function:
If either of the shift solenoid valve circuits develops an open or a 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 SL OFF at the same time. If both solenoids are malfunction, hydraulic control cannot be done electronically so it 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).

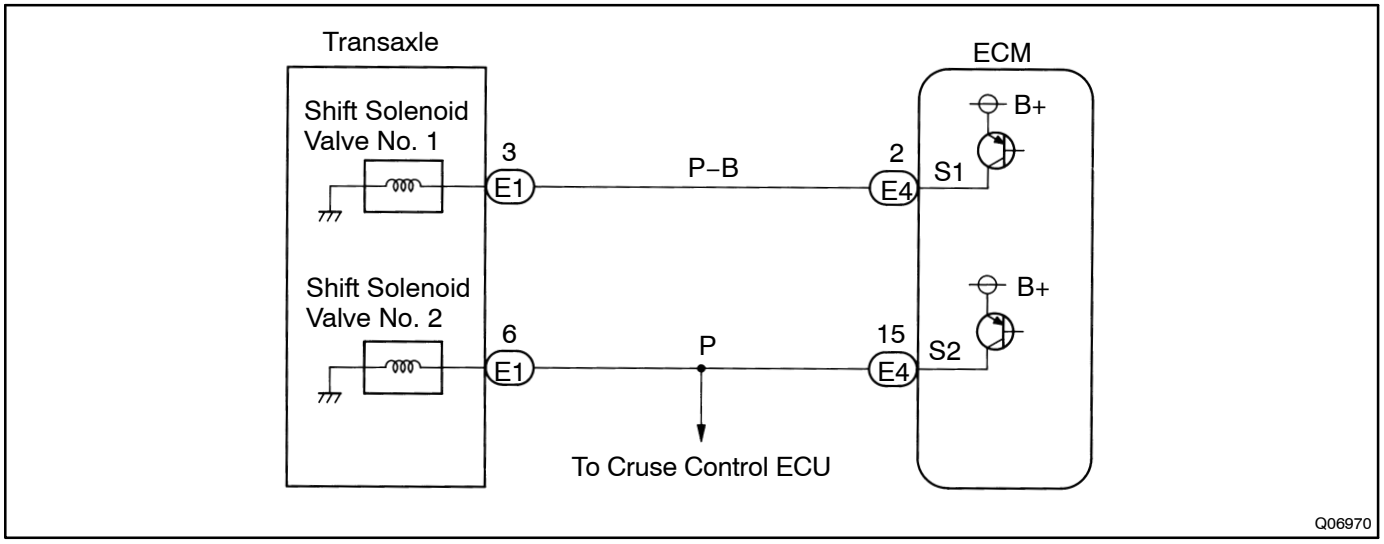
Position	NORMAL			SHIFT SOLENOID NO. 1 MALFUNCTIONING			SHIFT SOLENOID NO. 2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		
D	ON	OFF	1st	X	ON	3rd	ON	X	1st	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	O/D
2	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	1st

X: Malfunctions

HINT:
Check the shift solenoid valve No. 1 when DTC P0753 is output and check the shift solenoid valve No. 2 when DTC P0758 is output.

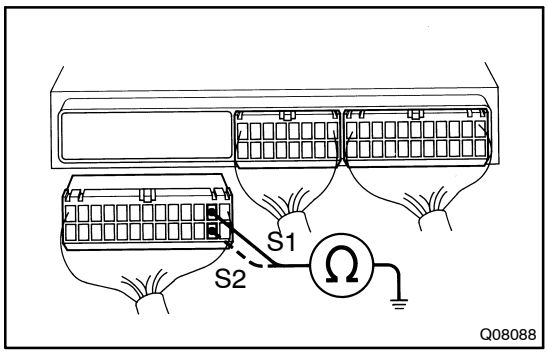
DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	The ECM checks for an open or short circuit in the shift solenoid valves No.1 and No.2 circuit when it changes The ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once, but it does not light up the MIL After ECM detects condition (a) or (b) continuously 2 times or more in one–trip, it causes the MIL light up until condition (a) or (b) disappears After that, if the ECM detects condition (a) or (b) once, it starts lighting up the MIL (d) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized (e) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized	• Open or short in shift solenoid valve No. 1/No. 2 circuit • Shift solenoid valve No. 1/No. 2 • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Measure resistance between terminal S1 or S2 of ECM and body ground.**

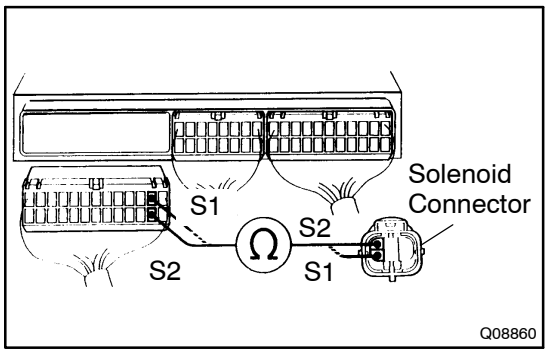


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure the resistance between terminal S1 or S2 of the ECM and body ground.
OK:
Resistance: 11 – 15 Ω

OK → **Check and replace ECM.**

NG

2	Check harness and connector between ECM and automatic transaxle solenoid connector.



PREPARATION:

(a) Disconnect the connector from the ECM.
(b) Disconnect the solenoid connector from the automatic transaxle.

CHECK:

Check the harness and connector between terminal S1 or S2 of the ECM and terminal S1 or S2 of the solenoid connector.

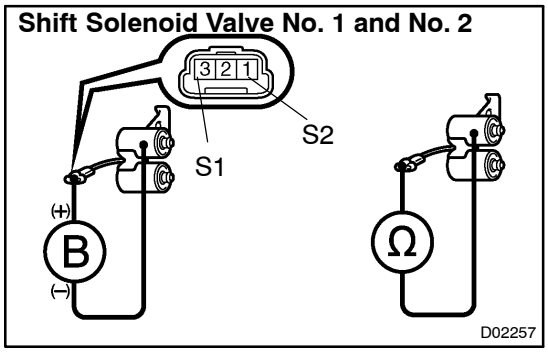
OK:

There is no open and no short circuit.

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

OK

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 solenoid body.

OK:

Resistance: 11 – 15 Ω

CHECK:

Connect positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body.

OK:

The solenoid makes an operating noise.

NG → **Replace shift solenoid valve No. 1 or No. 2.**

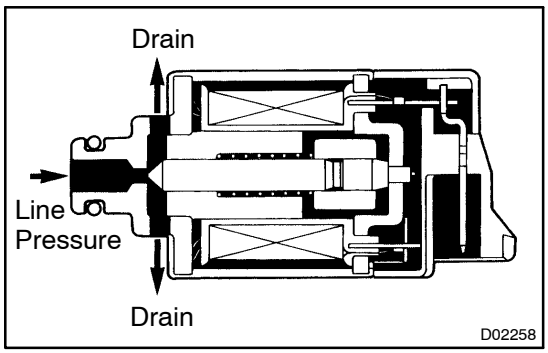
OK

Repair or replace solenoid wire.

DI411–01

DTC	P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)

SYSTEM DESCRIPTION

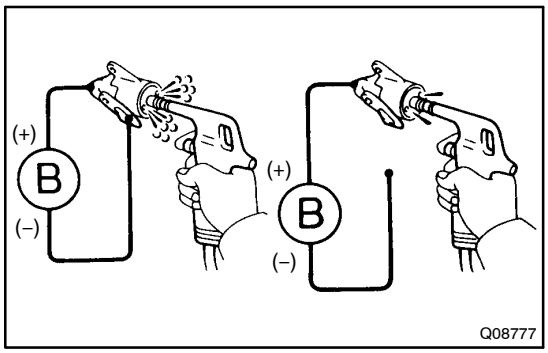


The ECM uses the signals from the throttle position sensor and air flow meter to monitor the engagement condition of the lock–up clutch
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P0770	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 SL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch

INSPECTION PROCEDURE

1	Check shift solenoid valve SL operation.



PREPARATION:
Remove the shift solenoid valve SL from the valve body.
CHECK:
(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve open.
(b) When battery positive voltage is supplied to the solenoid valve, check that solenoid valve does not leak air.

NG → **Replace shift solenoid valve SL.**

OK

2	**Check valve body (See page DI–192).**

NG → **Repair or replace valve body.**

OK

Repair torque converter clutch (See page AX–22).

DI412-01

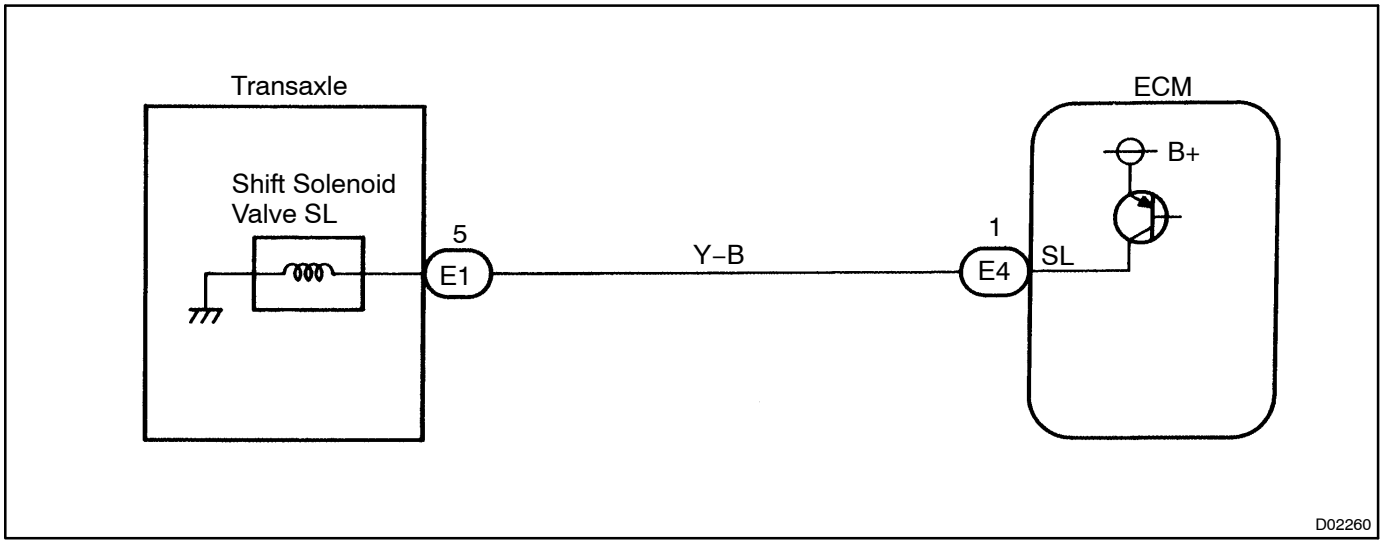
DTC	P0773	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)

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.

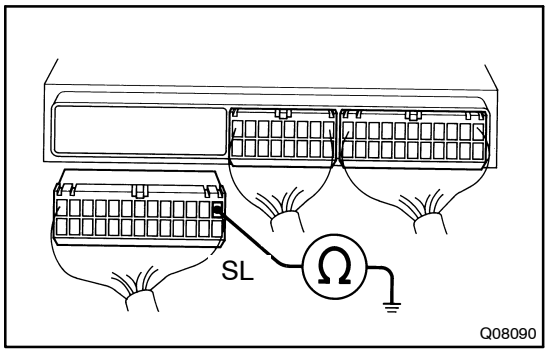
DTC No.	DTC Detecting Condition	Trouble Area
P0773	Either (a) or (b) is detected for 1 time (2 trip detection logic) (a) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized. (b) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Measure resistance between terminal SL of ECM and body ground.**

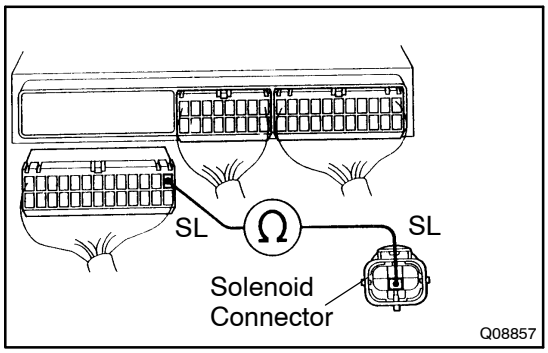


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure the resistance between terminal SL of the ECM and body ground.
OK:
Resistance: 11 – 15 Ω

OK	**Check and replace ECM.**

NG

2	**Check harness and connector between ECM and automatic transaxle solenoid connector.**

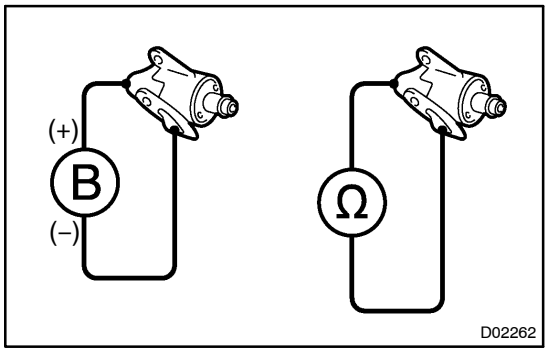


PREPARATION:
(a) Disconnect the connector from the ECM.
(b) Disconnect the solenoid connector from the automatic transaxle.
CHECK:
Check the harness between terminal SL of the ECM and terminal SL of solenoid connector.
OK:
There is no open or short circuit.

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

OK

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 the resistance between the solenoid connector and solenoid body.

OK:

Resistance: 11 – 15 Ω

CHECK:

Connect positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body.

OK:

The shift solenoid valve SL makes operations noise.

NG → **Replace shift solenoid valve SL.**

OK

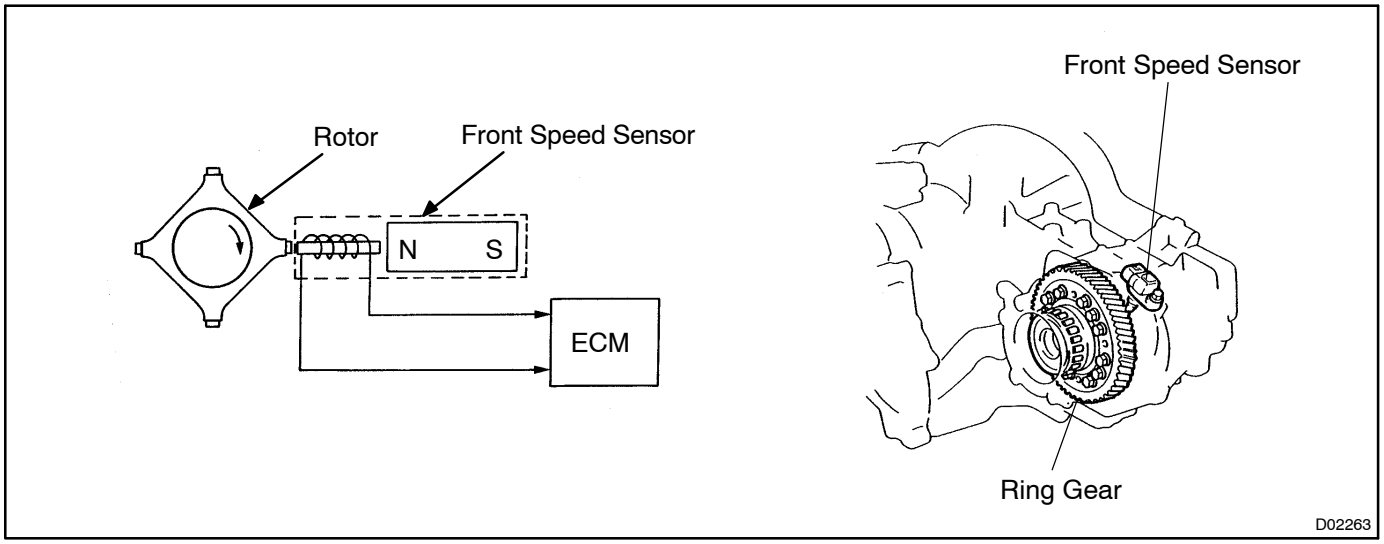
Check and replace or repair solenoid wire.

DI414–01

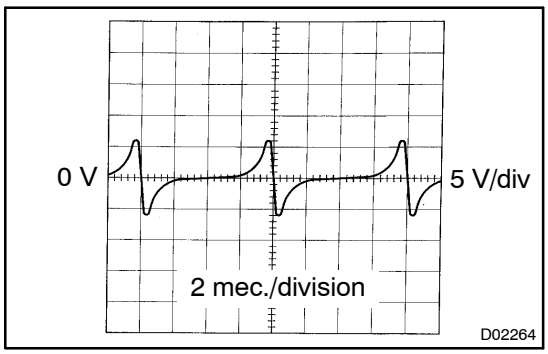
DTC	P1700	Speed sensor No. 2 Circuit Malfunction (Front Speed Sensor)

CIRCUIT DESCRIPTION

The front speed sensor detects the vehicle speed based on revolution of the ring gear and sends signals to the ECM. An AC voltage is generated in the front speed sensor coil as the ring rear mounted on the ring gear rotates, and this voltage is sent to the ECM.
The center differential clutch is controlled by the ECM based on the signals from the front speed sensor and rear speed sensor signals.

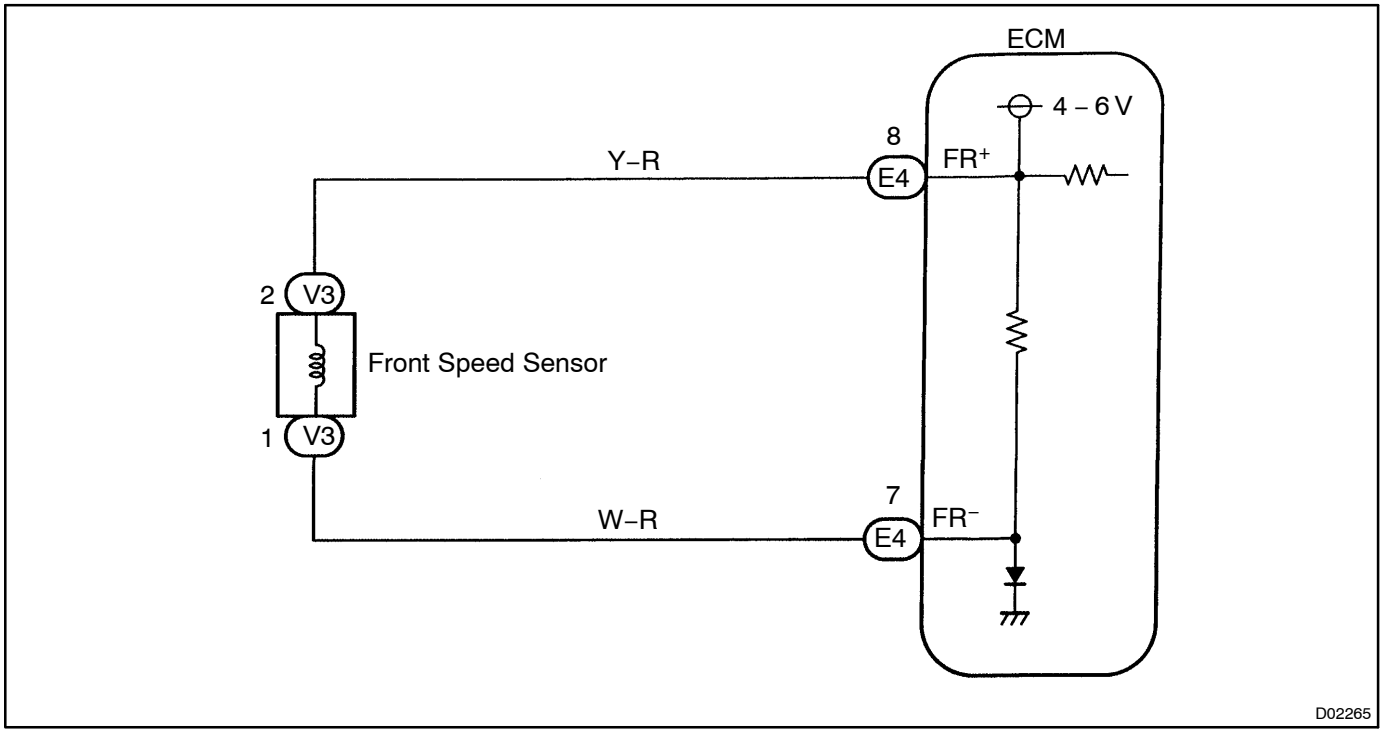


DTC No.	DTC Detecting Condition	Trouble Area
P1700	All condition below are detects 5,400 times or more continuously (a) No signal from front speed sensor is input to ECM while 4 pulses of rear speed sensor is sent (b) Vehicle speed: 18 km/h (11 mph) or more for at 4 sec. (c) Park / neutral position switch: OFF (Other than P or N position)	• Open or short in front speed sensor circuit • Front speed sensor • ECM



Reference:
Wavefrom between terminals FR^+ and FR^- when vehicle speed is approx. 20 km/h (13 mph).

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check vehicle speed value or resistance between terminals FR+ and FR– of ECM.**

When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Remove the DLC3 cover.

(b) Connect an OBDII scan tool or TOYOTA hand–held tester to the DLC3.

(c) Turn the ignition switch ON and OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Drive the vehicle and read vehicle speed value.

OK:

Vehicle speed matches tester speed value.

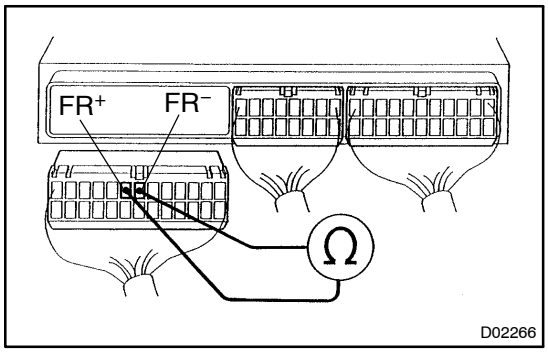
When not using OBD II scan tool or TOYOTA hand–held tester:

CHECK:

Check the resistance between terminals FR+ and FR– of the ECM.

OK:

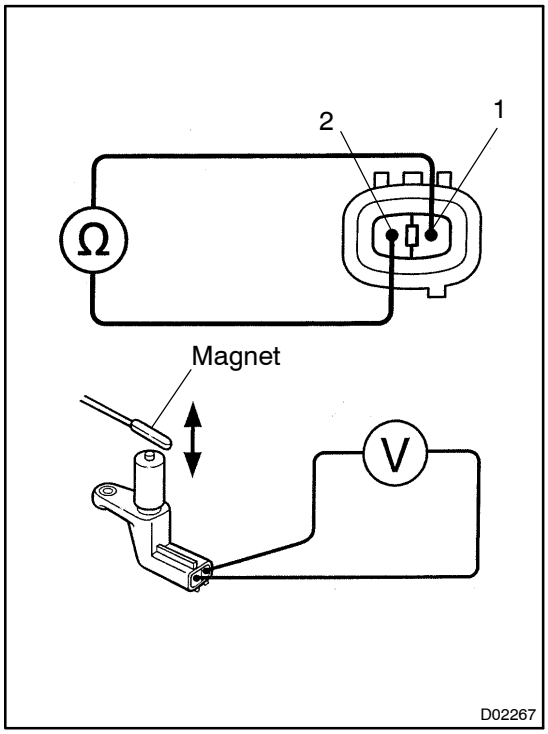
Resistance: 560 – 680 Ω



OK → **Check and replace ECM.**

NG → 1996 RAV4 (RM447U)

2	Check front speed sensor.



PREPARATION:

Remove the front speed sensor from the transaxle.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor.

OK:

Resistance: 560 – 680 Ω

Reference:

Check the front transaxle revolution sensor's function

CHECK:

Check the voltage between terminals 1 and 2 of the speed sensor when a magnet is put close to the front end of the front speed sensor then taken away quickly.

OK:

Voltage is generated intermittently.

HINT:

The generated voltage is extremely low.

NG → **Replace front speed sensor.**

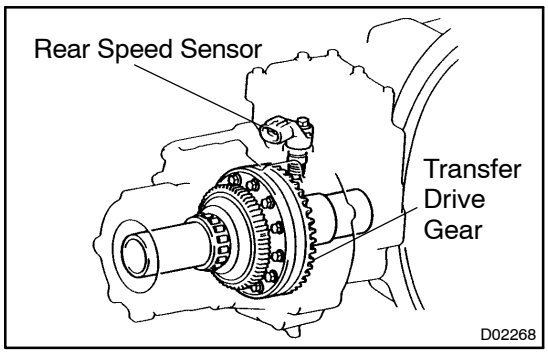
OK →

Check and repair harness and connector between ECM and front speed sensor.

DI415–01

DTC	P1715	Rear Wheel Sensor Circuit Malfunction (Rear Speed Sensor)

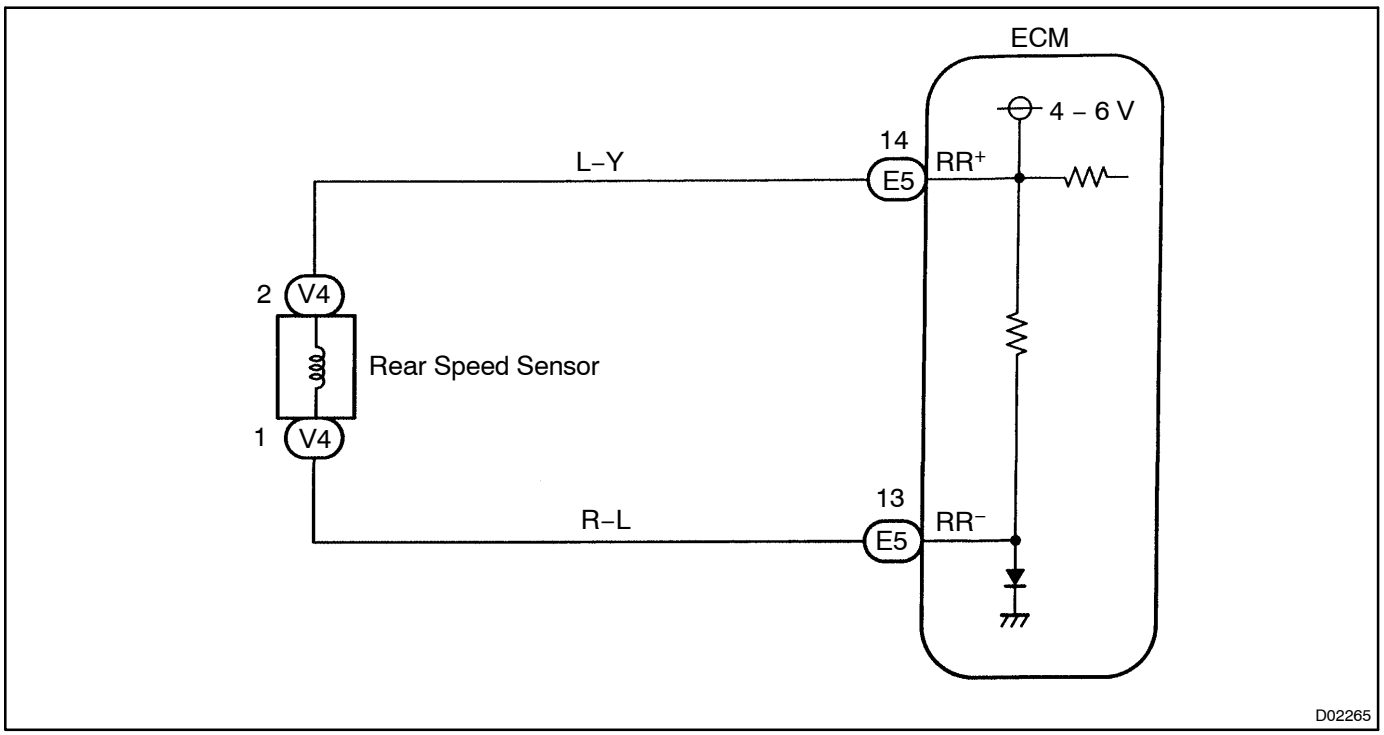
CIRCUIT DESCRIPTION



The rear speed sensor detects the rear wheel speed based on revolution of the transfer drive gear.
Its construction is the same as that of the front speed sensor (See page DI–206).
The center differential clutch is controlled by the ECM based on the signals from the front speed sensor and rear speed sensor signals.

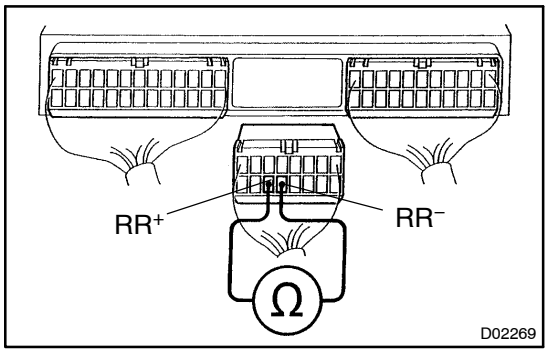
DTC No.	DTC Detecting Condition	Trouble Area
P1715	All conditions below are detected 10 sec. or more (2 trip detection logic) (a) No signal rear speed sensor is input to ECM (b) Vehicle speed: 30 km/h (19 mph) or more (c) Park / neutral position switch: OFF (Other than P or N position)	• Open or short in rear speed sensor circuit • Rear speed sensor • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check resistance between terminals RR+ and RR– of ECM.

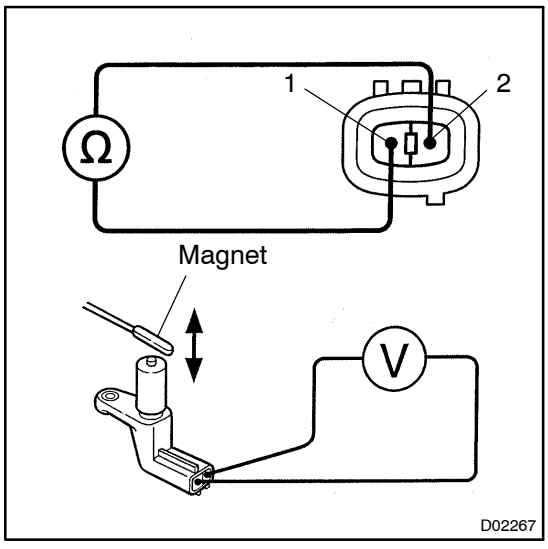


CHECK:
Check the resistance between terminals RR+ and RR– of the ECM.
OK:
Resistance: 560 – 680 Ω

OK	Check and replace ECM.

NG

2	Check rear speed sensor.



PREPARATION:
Remove the rear speed sensor from transaxle.
CHECK:
Measure the resistance between terminals 1 and 2 of the revolution sensor.
OK:
Resistance: 560 – 680 Ω
Reference:
Check the vehicle speed sensor's function
CHECK:
Check the voltage between terminals 1 and 2 of the speed sensor when a magnet is put close to the front end of the rear speed sensor then taken away quickly.
OK:
Voltage is generated intermittently.
HINT:
The generated voltage is extremely low.

NG	Replace rear speed sensor.

OK

Check and repair harness and connector between ECM and rear speed sensor.

DI416–01

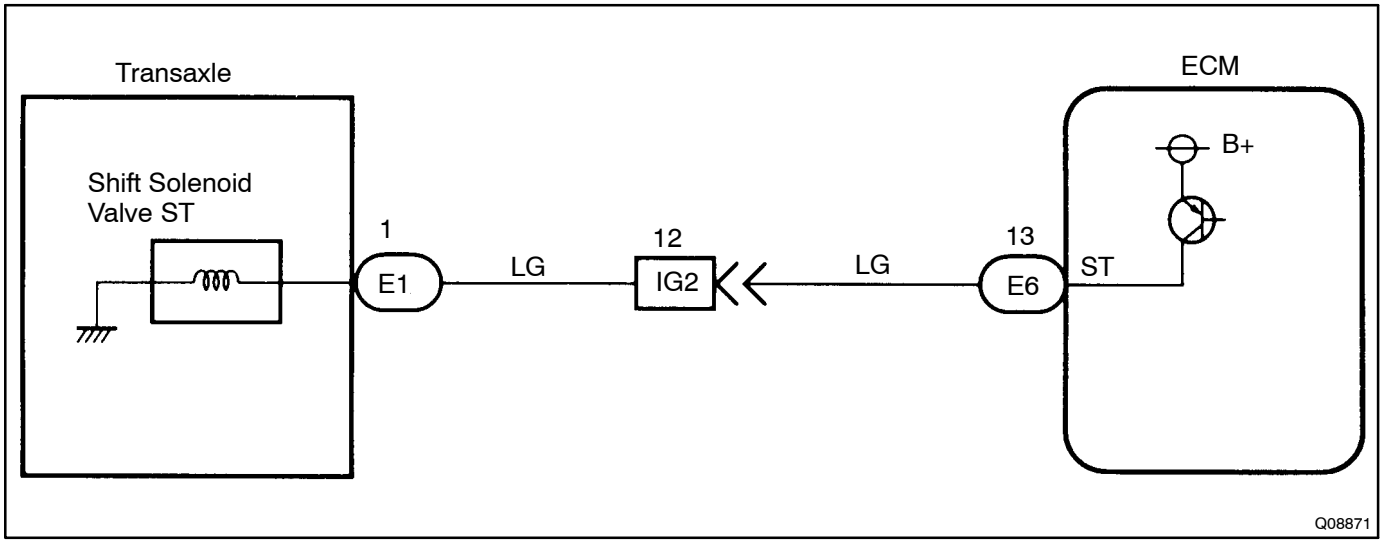
DTC	P1760	Linear Solenoid for Line Pressure Control Circuit Malfunction (Shift Solenoid Valve ST)

CIRCUIT DESCRIPTION

When the difference in speed between the front wheels and rear wheels is large, and this takes place during an extreme low–speed operation in the D, 2, or L position, shift solenoid valve ST is turned ON by the signal from the ECM.

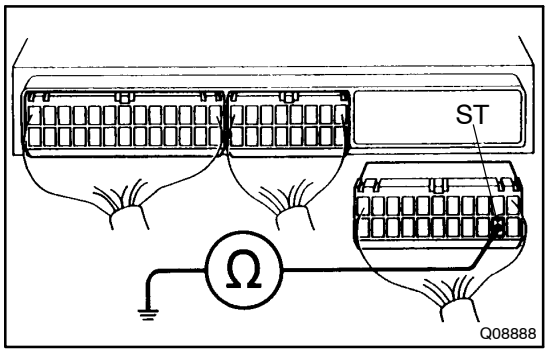
DTC No.	DTC Detecting Condition	Trouble Area
P1760	Either (a) or (b) are detected for 1 time (2 trip detection logic) (a) Solenoid resistance is 8 Ω or less short circuit when solenoid is energized (b) Solenoid resistance is 100 kΩ or more open circuit when solenoid is not energized	• Open or short in shift solenoid valve ST circuit • Shift solenoid valve ST • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Measure resistance between terminal ST of ECM and body ground.**

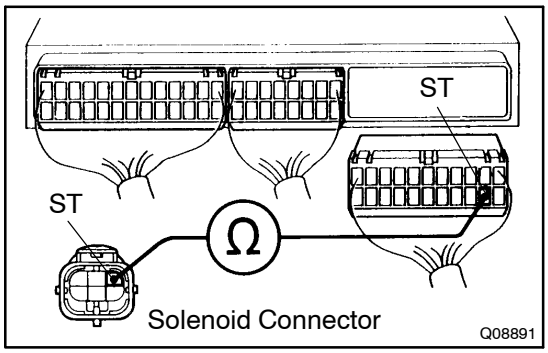


PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure the resistance between terminal ST of the ECM and body ground.
OK:
Resistance: 11 – 15 Ω

OK → **Check and replace ECM.**

NG

2	**Check harness and connector between ECM and automatic transaxle solenoid connector.**

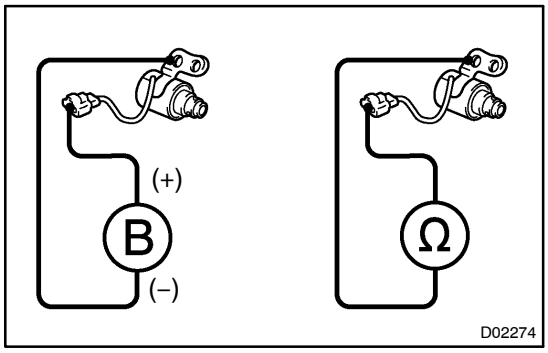


PREPARATION:
(a) Disconnect the connector from the ECM.
(b) Disconnect the solenoid connector from the automatic transaxle.
CHECK:
Check the harness between terminal ST of the ECM and terminal of the ST solenoid connector.
OK:
There is no open or short circuit.

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

OK

3	Check shift solenoid valve ST.



PREPARATION:

(a) Jack–up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the shift solenoid valve ST connector.
(d) Remove the shift solenoid valve ST.

CHECK:

Measure the resistance between solenoid connector and solenoid body.

OK:

Resistance: 11 – 15 Ω

CHECK:

Connect positive ⊕ lead to terminal of the solenoid connector, negative ⊖ lead to the solenoid body.

OK:

The shift solenoid valve ST makes operations noise.

NG → **Replace shift solenoid valve ST.**

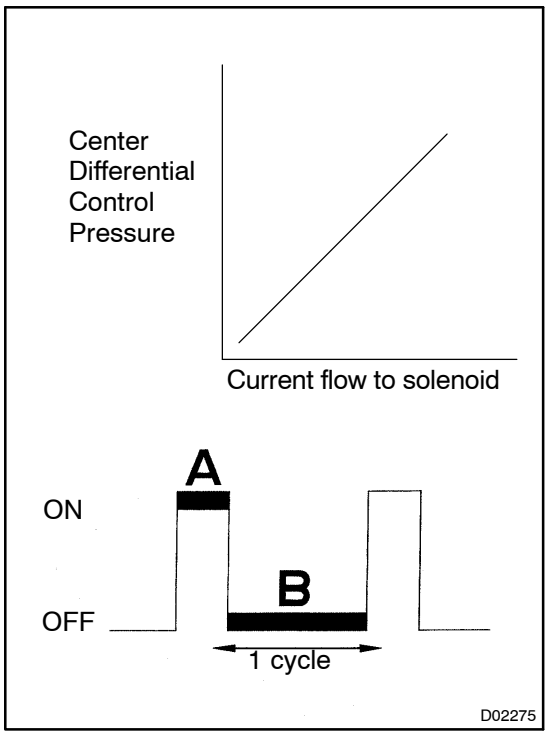
OK

Check and replace or repair solenoid wire.

DI417–01

DTC	P1770	Differential Lock Solenoid No. 1 Circuit Malfunction (Shift Solenoid Valve SLD)

CIRCUIT DESCRIPTION



Shift solenoid valve SLD controls the oil pressure applied to the center differential clutch and maintains the limited slip differential effects at most appropriate level.

The ECM determines optimum control pressure according to the signals from the throttle position sensor, front and rear transaxle revolution sensor and control volume of current flow to the shift solenoid valve.

The amount of current flow to the solenoid valve is controlled by the duty ratio* of the ECM output signal. The higher the duty ratio becomes, the higher the center differential control pressure becomes during the center differential control operation.

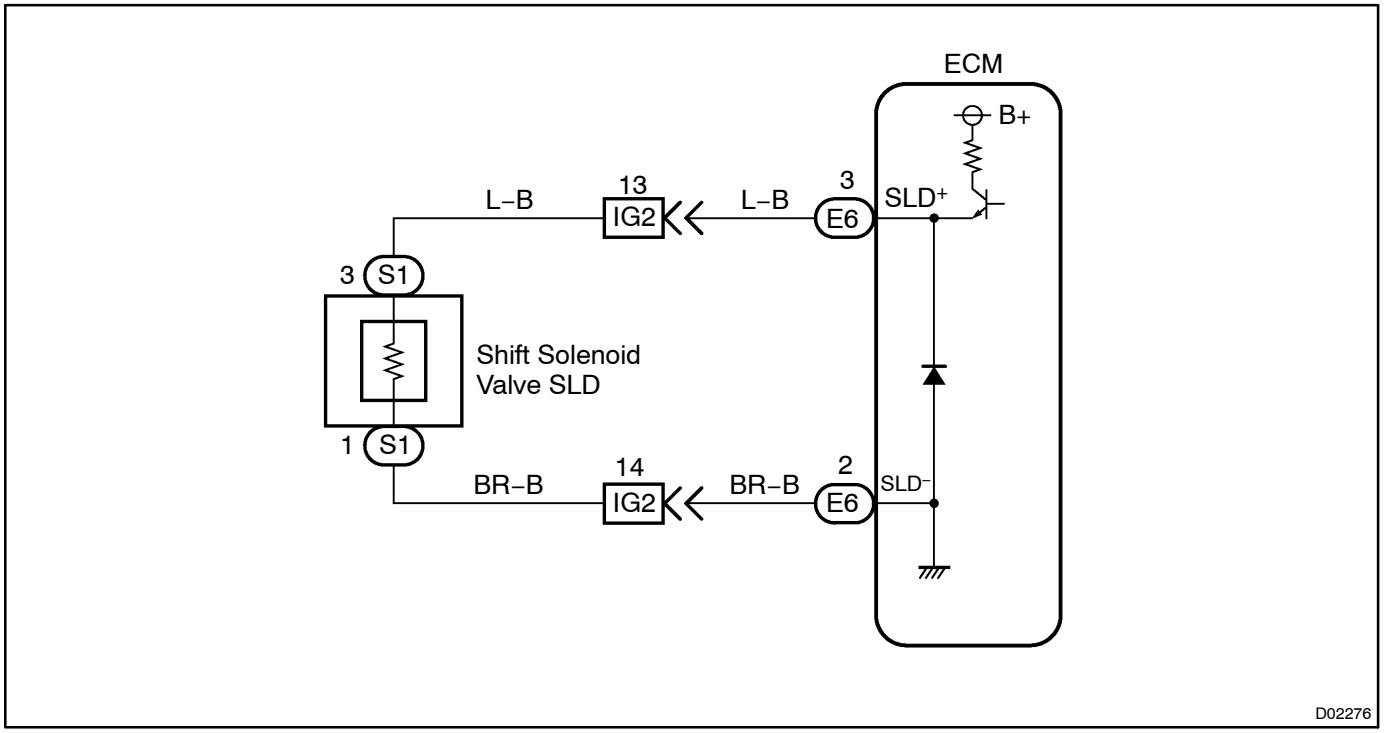
*: Duty Ratio

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

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$

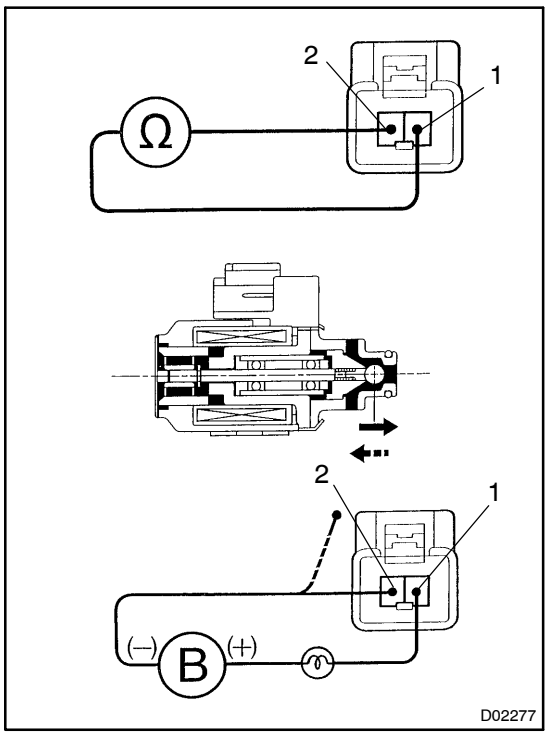
DTC No.	DTC Detection Condition	Trouble Area
P1770	All conditions below are detected 1 sec. or more (2 trip detection logic) (a) SLD output signal's duty ON of 3.3 msecs. or more with duty ratio of at least 5 % lasts (b) B^+ voltage: 11 V or more	• Open or short in shift solenoid valve SLD circuit • Shift solenoid valve SLD • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check shift solenoid valve SLD.**



Check solenoid resistance:

PREPARATION:

(a) Jack up the vehicle.
(b) Remove the oil pan.
(c) Disconnect the connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the solenoid connector.

OK:

Resistance: 5.1 – 5.5 Ω

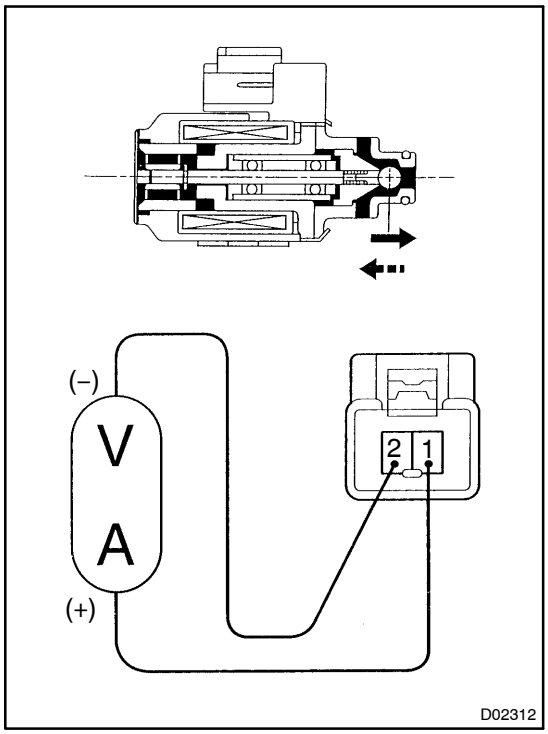
Check solenoid operation:

CHECK:

Connect positive ⊕ lead with an 8 – 10 W bulb to terminal 1 of the solenoid connector and nagative ⊖ lead to terminal 2, then check the movement of the valve.

OK:

When battery positive voltage is applied	Valve moves in → direction in illumination (on the left)
When battery positive voltage is cut off	Valve moves in ← direction in illumination (on the right)



Reference

Check the solenoid's operation:

CHECK:

(a) Prepare a variable power supply.

(b) Connect positive ⊕ lead of the variable power supply to terminal 1 of the solenoid connector and negative ⊖ lead to terminal 2.

(c) Check the movement of the valve when the voltage is gradually increased (A current greater than 1A should not be supplied.).

OK:

As the voltage is increased, the valve should move slowly in the → direction

(d) Check the movement of the valve when the voltage is cut off.

OK:

The valve should return in the ← direction.

NG → **Replace solenoid valve SLD.**

OK

2	**Check harness and connector between shift solenoid valve SLD and ECM (See page IN–30).**

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

OK

Check and replace ECM.

DI418-02

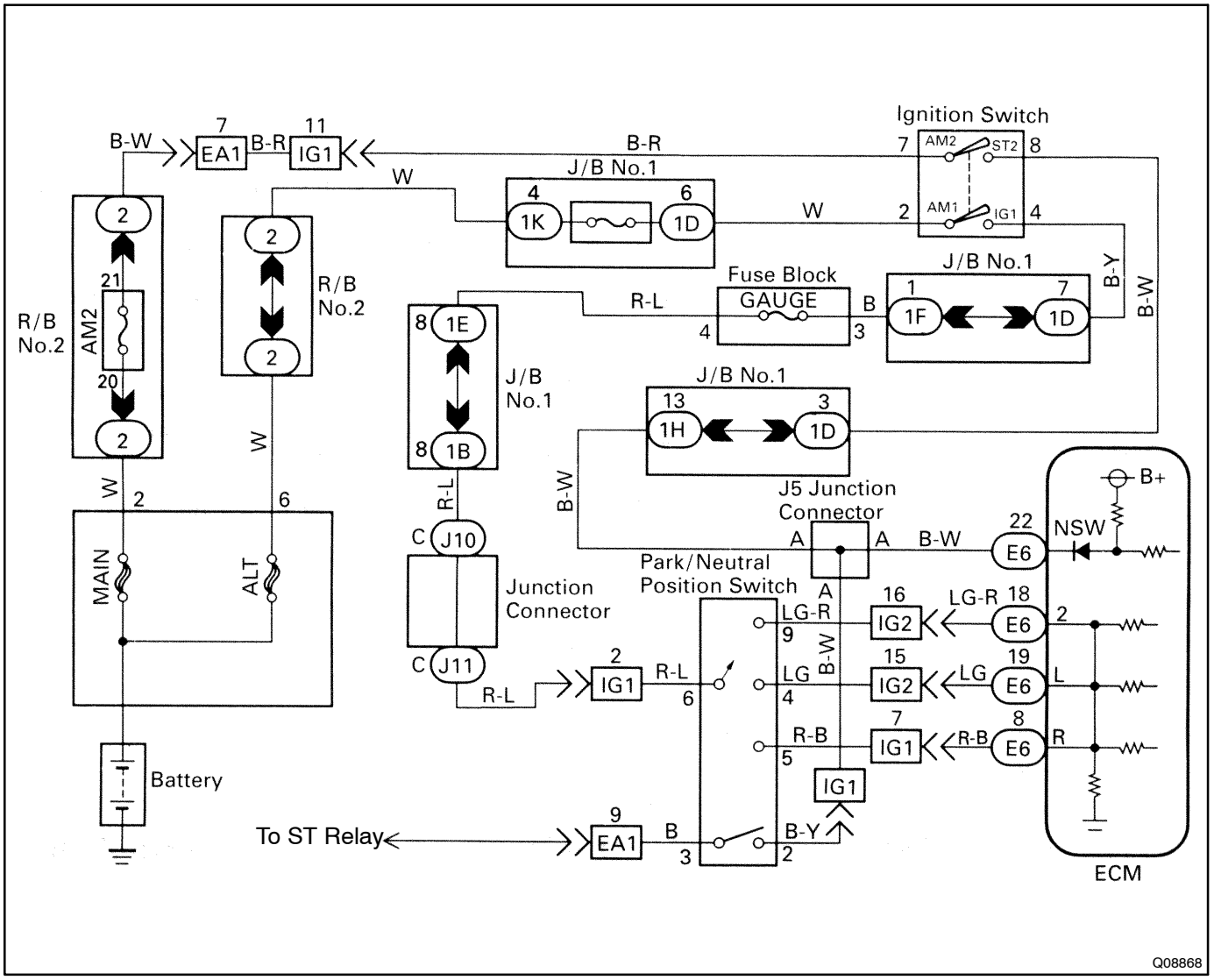
DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (NSW, R, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in the D position.

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for the N, R, 2 and L positions (2 trip detection logic) When driving under conditions (a), (b) and (c) for 30 sec. or more, the park/neutral position switch is ON (N position). (2 trip detection logic) (a) Vehicle speed: 80 km/h (50 mph) or more (b) Engine speed: 1,500 ~ 3,000 rpm (c) Manifold absolute pressure: 450 mmHg or more	• Short in park/neutral position switch circuit. • Park/neutral position switch • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check PNP SW, REVERSE, 2ND and LOW signals.**

When using TOYOTA hand–held tester:

PREPARATION:

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

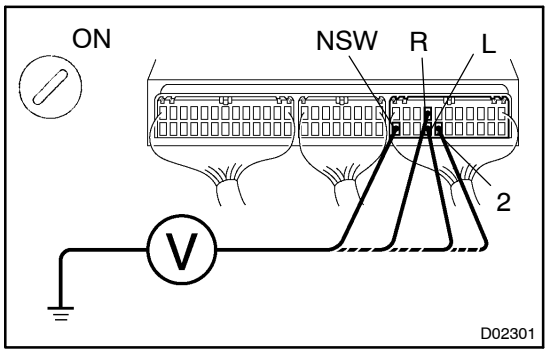
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Shift the shift lever to the P, R, N, 2 or L, and read the PNP SW, REVERSE, 2ND and LOW signals on the TOYOTA hand–held tester.

OK:

Shift position	Signal
P, N	PNP SW OFF → ON
R	REVERSE OFF → ON
2	2ND OFF → ON
L	LOW OFF → ON



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals NSW, R, 2, and L of ECM and body ground when the shift lever is shifted to the following positions.

OK:

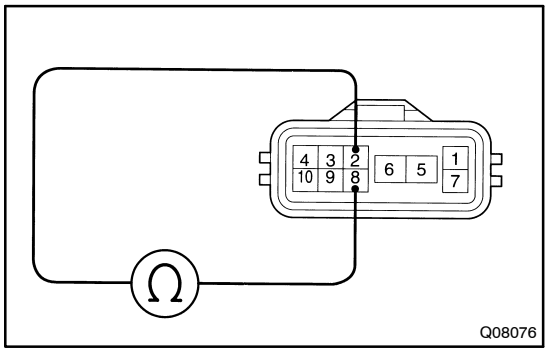
Position	NSW – Body ground	R – Body ground	2 – Body ground	L – Body ground
P, N	Below 1 V	Below 1 V	Below 1 V	Below 1 V
R	10 – 14 V*	10 – 14 V*	Below 1 V	Below 1 V
D	10 – 14 V	Below 1 V	Below 1 V	Below 1 V
2	10 – 14 V	Below 1 V	10 – 14 V	Below 1 V
L	10 – 14 V	Below 1 V	Below 1 V	10 – 14 V

*: Voltage will drop slightly due to lighting up of the back up light.

OK → **Check an replace ECM.**

NG

2	Check park/neutral position switch.



PREPARATION:

Disconnect the park/neutral position switch connector.

CHECK:

Check the continuity between each terminal shown below when the shift lever is moved to each position.

Shift position	Terminal No. to continuity	
P	2 – 7	5 – 6
R	2 – 8	
N	2 – 9	5 – 6
D	2 – 10	
2	2 – 3	
L	2 – 4	

NG → **Replace park/neutral position switch.**

OK

Repair or replace harness and connector between battery and park/neutral position switch, and park/neutral position switch and ECM.

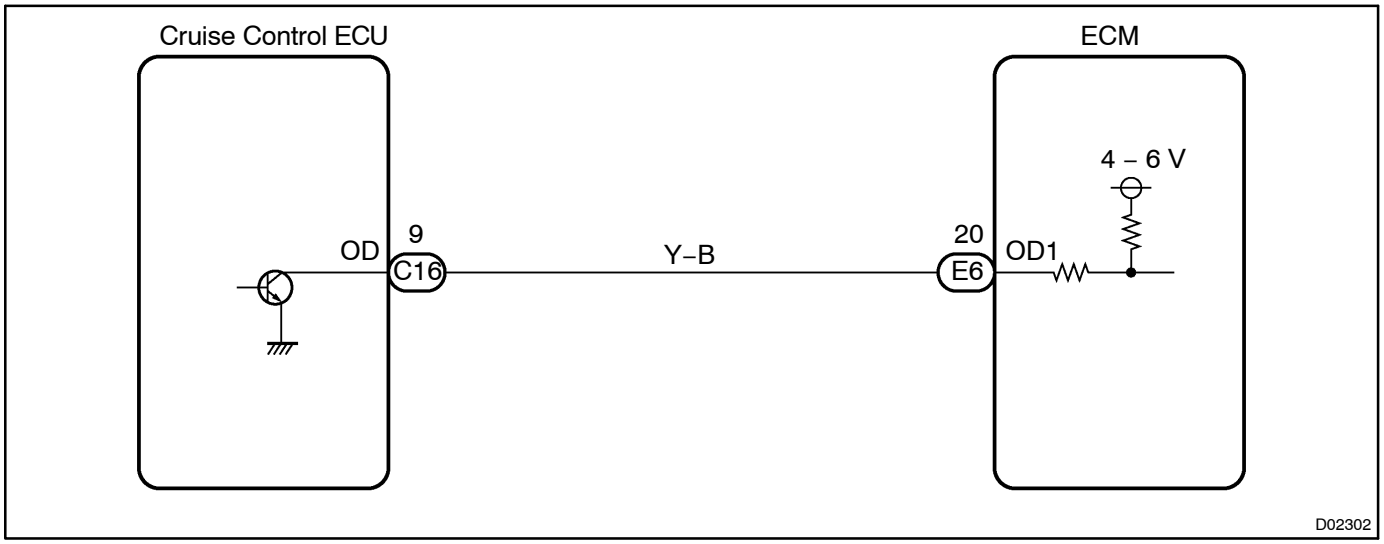
DI419-01

O/D Cancel Signal Circuit

CIRCUIT DESCRIPTION

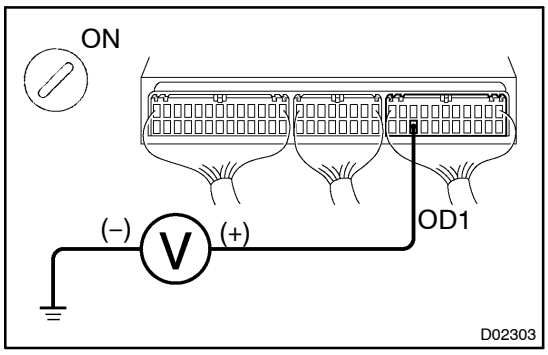
While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruising, O/D may be prohibited temporarily in some conditions.
The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels O/D shifting until these signals are discontinued.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal OD1 of ECM and body ground.**



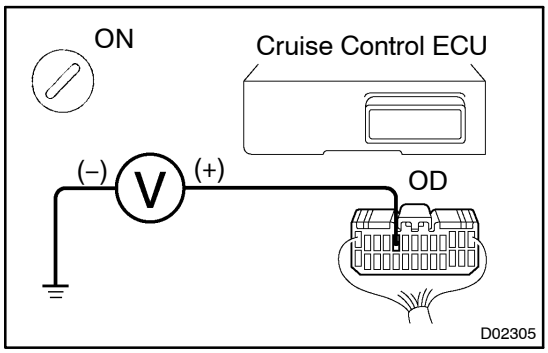
PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure the voltage between terminal OD1 of the ECM and body ground.
OK:

Voltage: 4 – 6 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–192).**

NG

2	**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 the voltage between terminal OD of the cruise control ECU harness side connector and body ground.

OK:

Voltage: 4 – 6 V

OK	**Check and replace cruise control ECU (See page IN–30).**

NG

3	**Check harness and connector between cruise control ECU and ECM (See page IN–30).**

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

OK

Check and replace ECM.

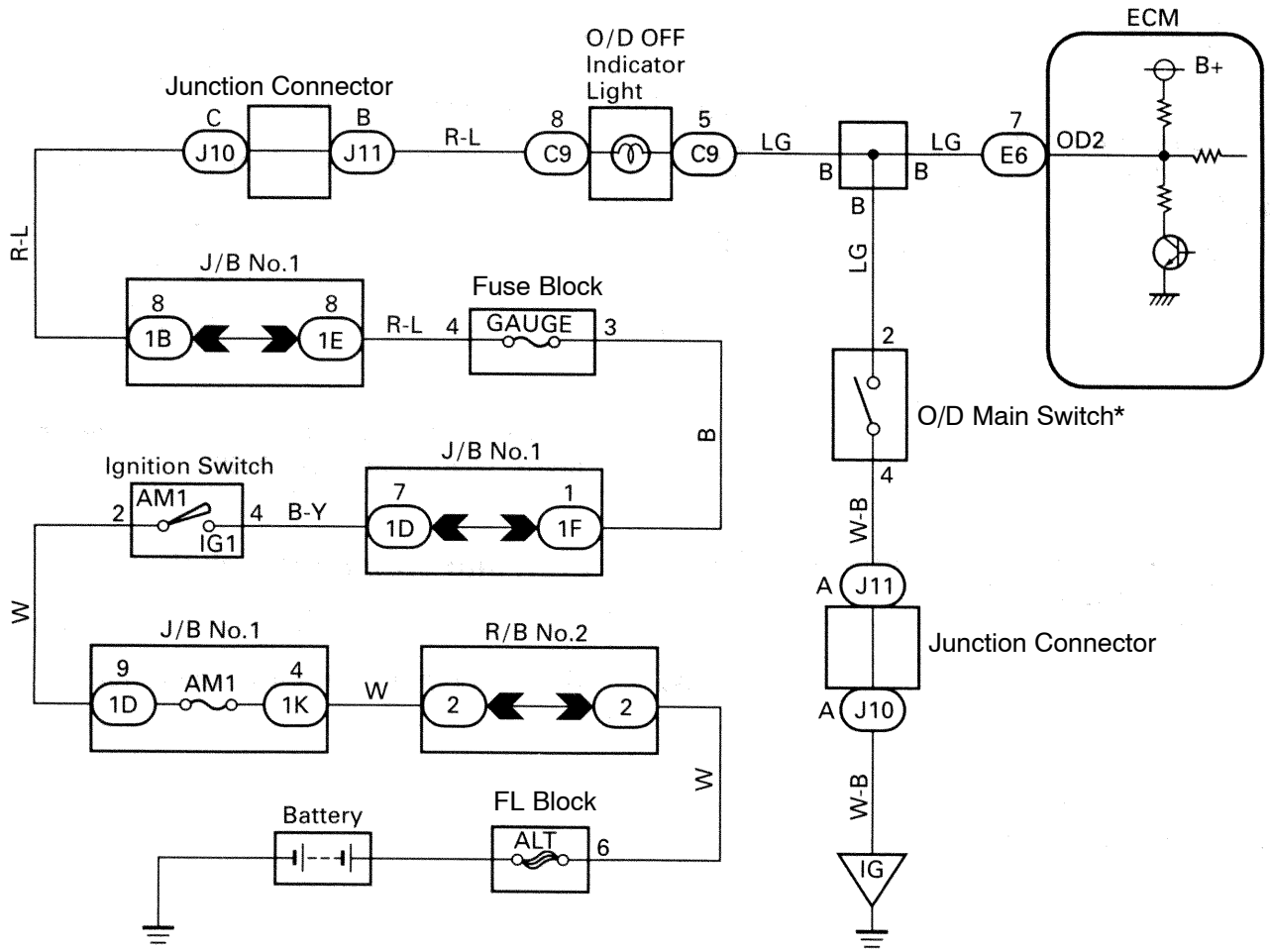
DI41A–02

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go open when the switch is pushed in and go close when it is pushed once again. In O/D main switch at the OFF position, the O/D OFF indicator light lights up, and the ECM prohibits shifting to O/D.

WIRING DIAGRAM



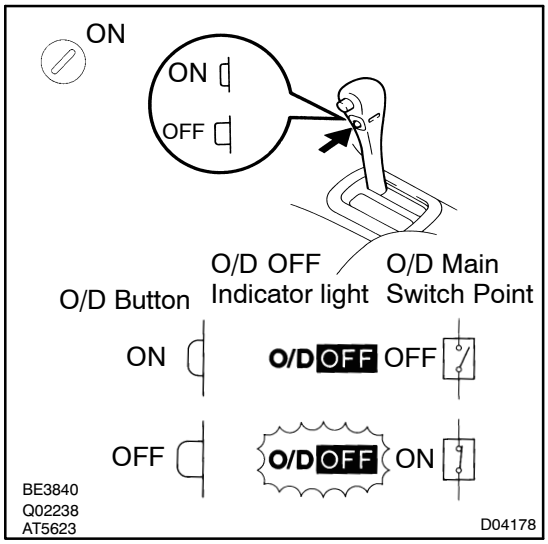
*: O/D Main switch
Contacts go open with switch pushed in.
Contacts go closed with switch pushed once again.

Q08869

INSPECTION PROCEDURE

O/D OFF indicator light does not light up:

1	**Check operation of O/D main switch.**



CHECK:

(a) Turn the ignition switch ON.

(b) Check the "O/D OFF" indicator light when the O/D button is pushed to ON.

OK:

"O/D OFF" indicator light goes off.

(c) Check the "O/D OFF" indicator light when the O/D button is pushed again, to OFF.

OK:

"O/D OFF" indicator light lights up.

NG → **Go to step 4.**

OK

2	Check OVERDRIVE CUT SW2 signal.

When using TOYOTA hand–held tester:

PREPARATION:

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

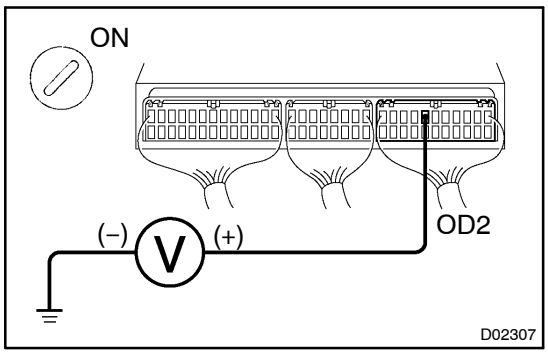
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the OVERDRIVE CUT SW2 signal on the TOYOTA hand–held tester.

OK:

O/D main switch pushed in:
OVERDRIVE CUT SW2 ..... ON
O/D main switch pushed once again:
OVERDRIVE CUT SW2 ..... OFF



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the voltage between terminal OD2 of the ECM and body ground.

OK:

O/D Main Switch	Voltage
OFF	Below 1 V
ON	10 – 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–192).**

NG

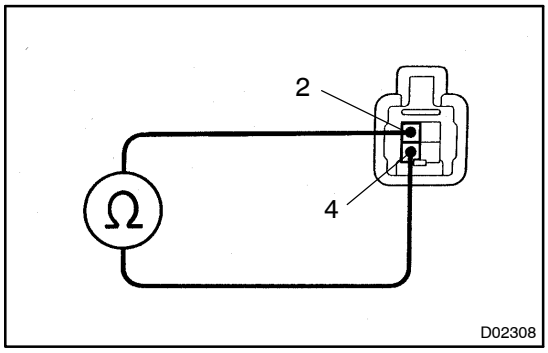
3	Check harness and connector between O/D OFF indicator light and ECM (See page IN–30).

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

OK

Check and replace ECM.

4	**Check O/D main switch.**



PREPARATION:

(a) Disconnect the O/D main switch connector.

(b) Measure the resistance between terminals 2 and 4 of the O/D main switch connector.

OK:

O/D Main Switch	Resistance
ON	∞ Ω (open)
OFF	0 Ω (continuity)

NG → **Replace O/D main switch.**

OK →

Check and replace combination meter (See page BE–37).

O/D OFF indicator light remains ON:

1	**Check O/D main switch.**

NG → **Replace O/D main switch.**

OK →

2	**Check harness and connector between O/D OFF indicator light and O/D main switch, and O/D OFF indicator light and ECM (See page IN–30).**

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

OK →

Check and replace ECM.

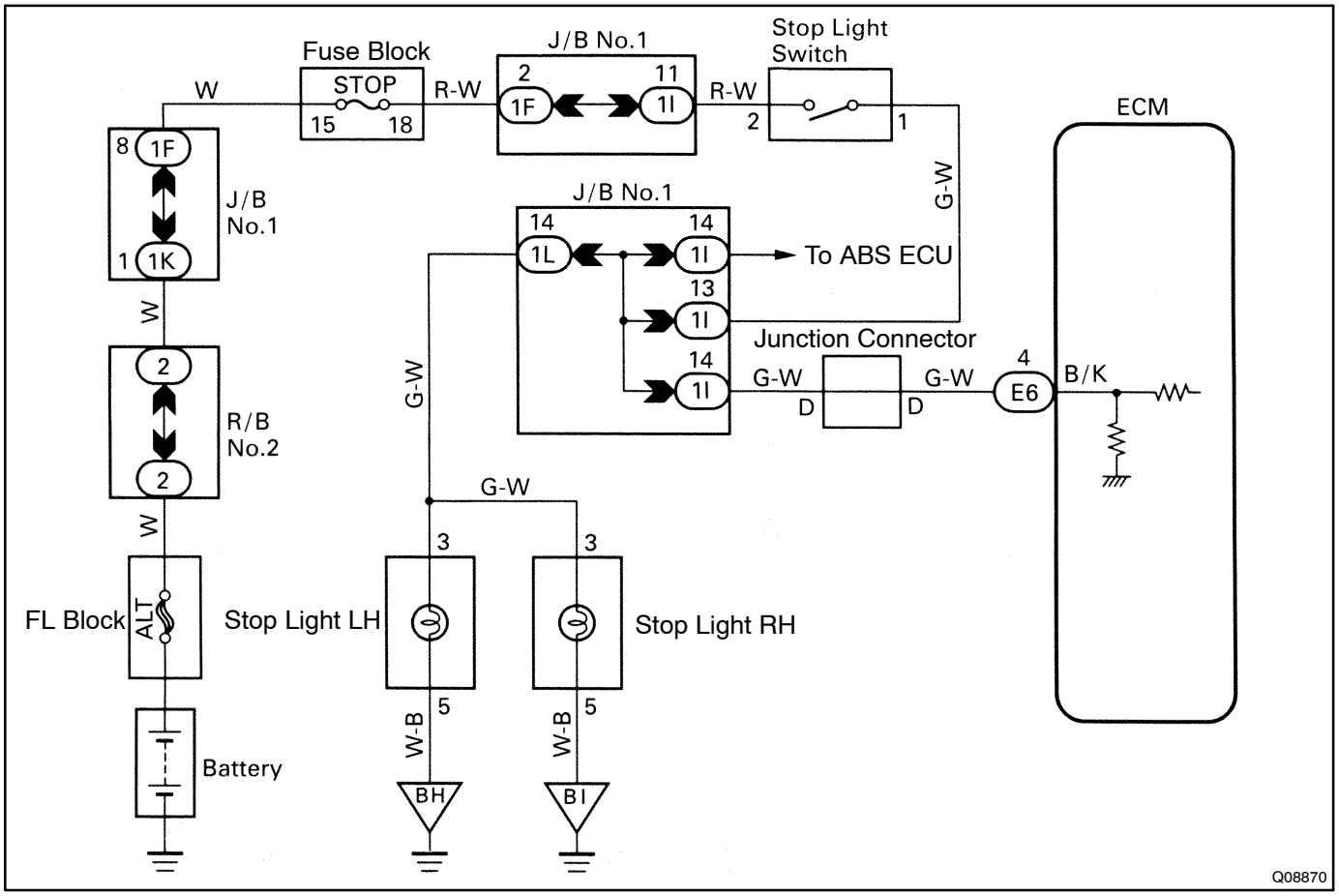
DI994–01

Stop Light Switch Circuit

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 signal to ECM. Then the ECM cancels of the lock–up clutch while braking is in progress.

WIRING DIAGRAM



INSPECTION PROCEDURE

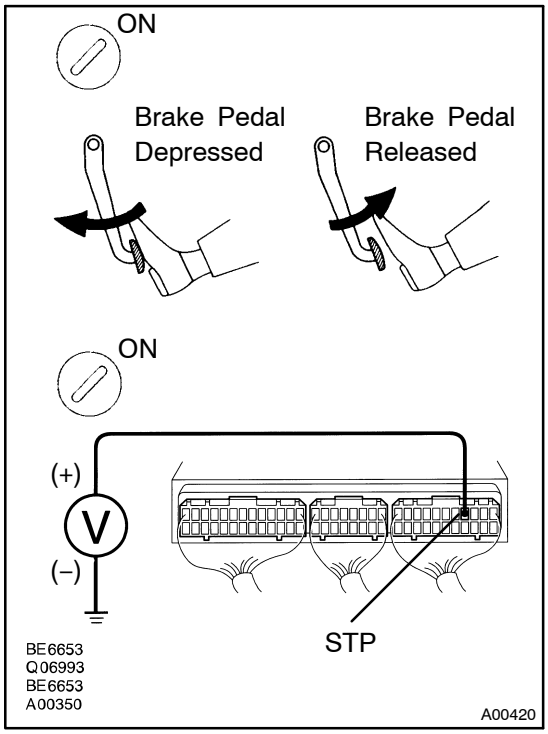
1	**Check operation of stop light.**

CHECK:
Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit.**

OK

2	Check STP signal.



When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3

(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the STP signal on the TOYOTA hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Released	OFF

When not using OBD II scan tool or TOYOTA hand–held tester:

CHECK:

(a) Turn the ignition switch ON.

(b) Check the voltage between B/K of the ECM and body ground.

OK:

Brake Pedal	Voltage
Depressed	7.5 – 14 V
Released	Below 1.5 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–192).**

NG

3	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 ECM.

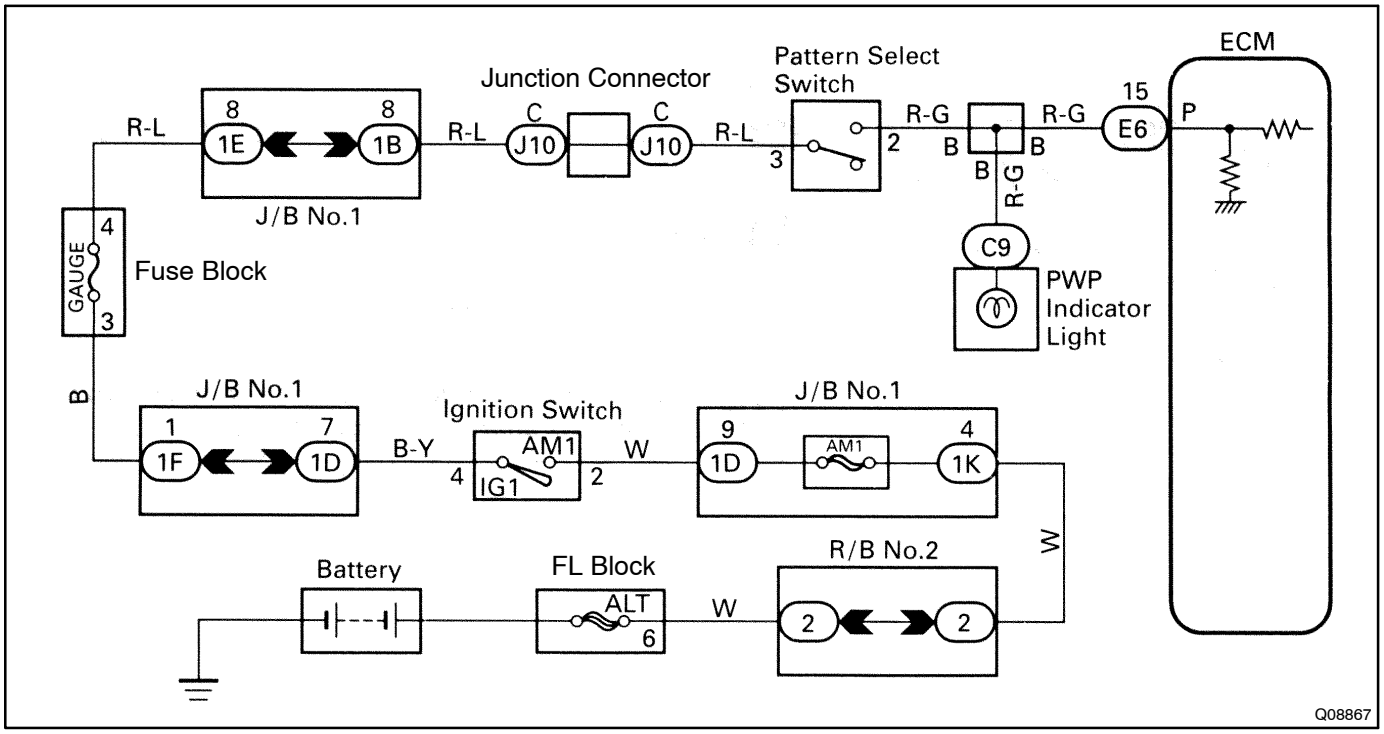
DI41B–02

Pattern Select Switch Circuit

CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and POWER patterns, 2 and L position and the lock–up patterns. Following the programs corresponding to the signals from the pattern select switch, the park / neutral position switch and other various sensors, the ECM switches the solenoid valves ON and OFF, and control the transmission gear change and the lock–up clutch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of PWR indicator light.**

CHECK:

Check if the PWR indicator light normally when the pattern select switch is set to NORM and PWR position.

OK:

Pattern select switch	PWR indicator light
PWR	Light up
NORM	Goes off

NG → **Check and repair PWR indicator light (See page BE–37).**

OK

2	Check PATTERN SEL SW2

When using TOYOTA hand–held tester:

PREPARATION:

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

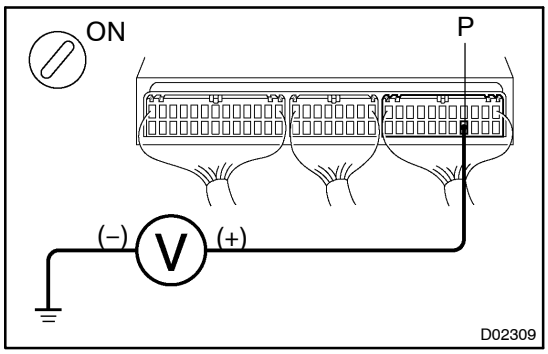
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the PATTERN SEL SW2 signal on the TOYOTA hand–held tester.

OK:

Pattern select switch pushed in:
PATTERN SEL SW2 .....ON
Pattern select switch pushed once again:
PATTERN SEL SW2 .....OFF



When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure voltage between terminal P of ECM and body ground when the pattern select switch is set to the PWR (POWER) position and NORM (NORMAL) position.

OK:

Pattern Select Switch	Voltage
PWR	7.5 – 14 V
NORM	Below 1 V

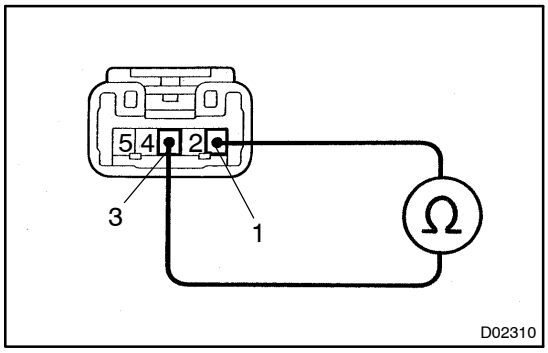
HINT:

The ECM uses the normal pattern signal if the power signal is not input.

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–192).**

NG

3	Check pattern select switch.



PREPARATION:
Remove the pattern select switch.
CHECK:
Measure the resistance between terminals 1 and 3 of the pattern select switch connector when the select switch is set to PWR and NORM positions.
OK:

Pattern	Resistance
PWR	0 Ω (continuity)
NORM	∞ Ω (open)

NG → **Replace pattern select switch.**

OK

4	Check harness and connector between battery and pattern select switch, and pattern select switch and ECM (See page IN–30).

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

OK

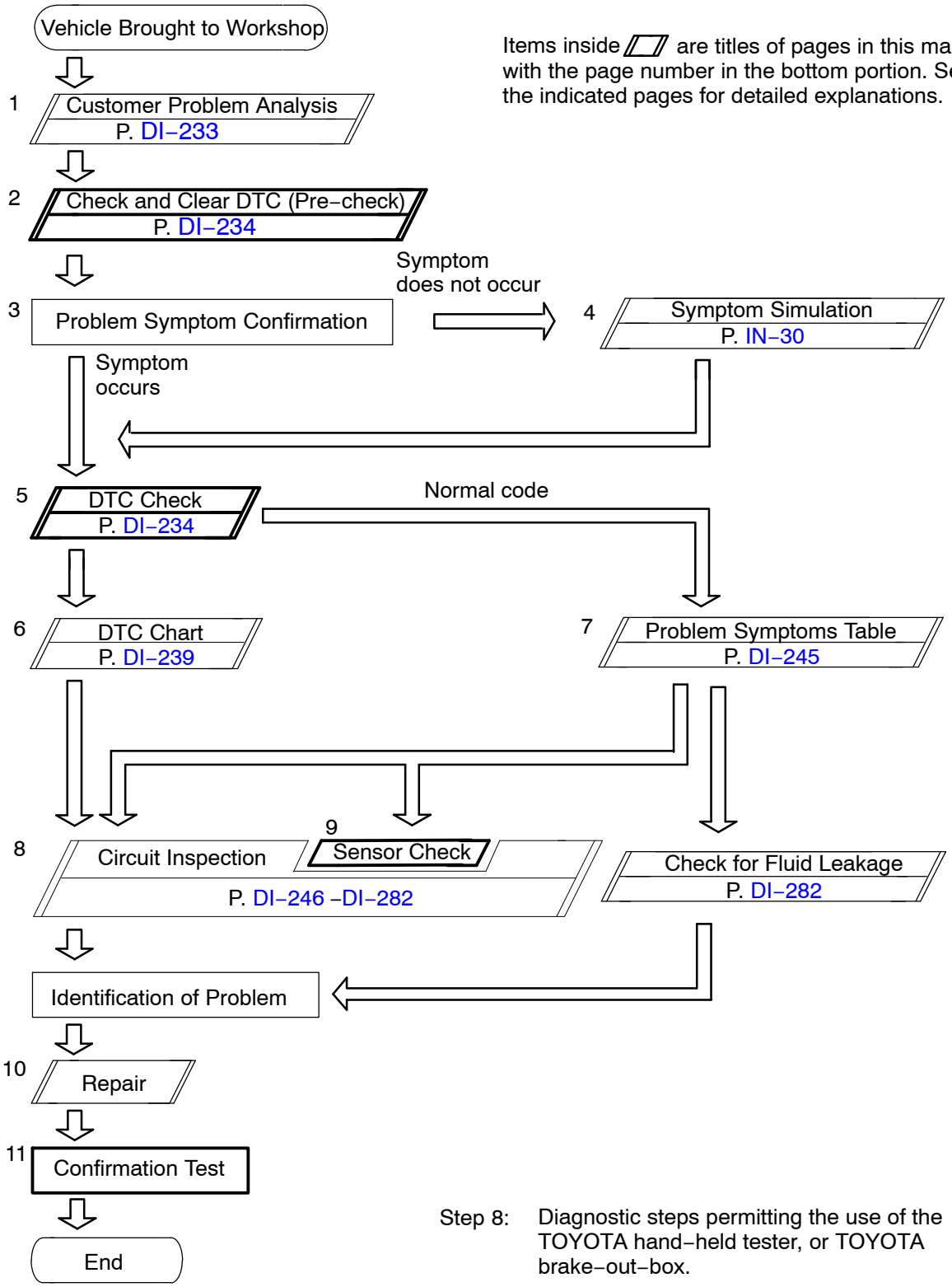
Check and replace ECM.

ANTI–LOCK BRAKE SYSTEM

DI41C–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshooting in accordance with the procedure on the following pages.



Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the indicated pages for detailed explanations.

Step 8: Diagnostic steps permitting the use of the TOYOTA hand–held tester, or TOYOTA brake–out–box.

DI41D–01

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

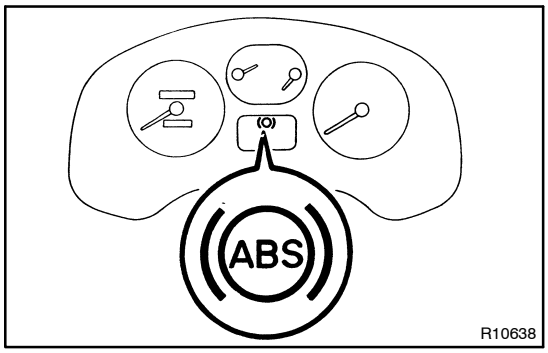
Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI98E–01

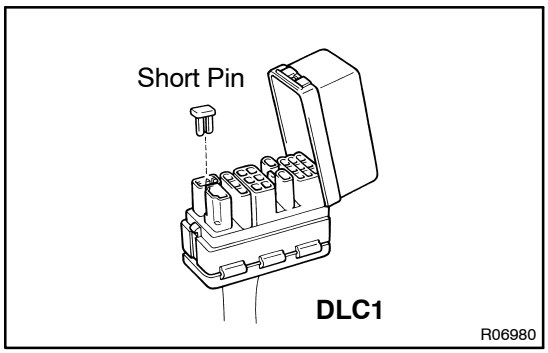
PRE–CHECK

1. DIAGNOSIS SYSTEM

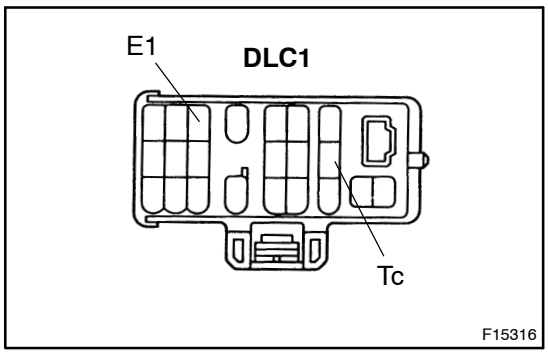


(a) Check the indicator.
When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

HINT:
If the indicator check result is not normal, proceed to trouble-shooting for the ABS warning light circuit (See page DI–275).

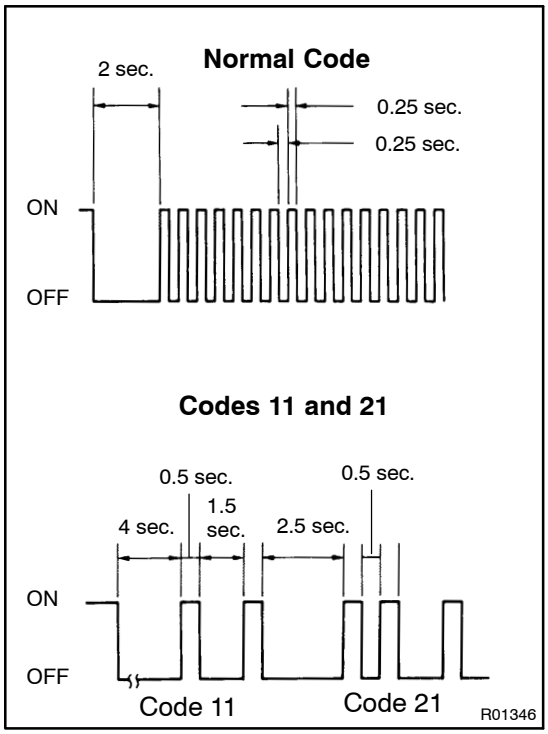


(b) Check the DTC.
(1) Turn the ignition switch ON.
(2) Disconnect the short pin from the DLC1.



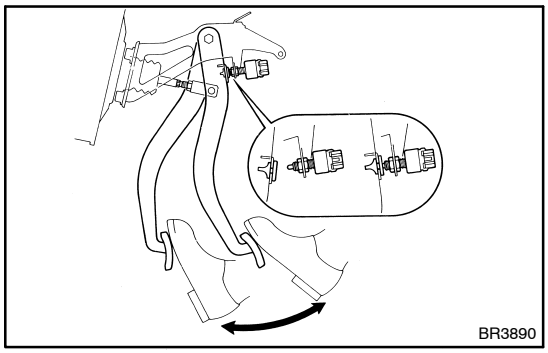
(3) Using SST, connect terminals Tc and E1 of the DLC1.
SST 09843–18020
(4) Read the DTC from the ABS warning light on the combination meter.

HINT:
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–278 or DI–275).

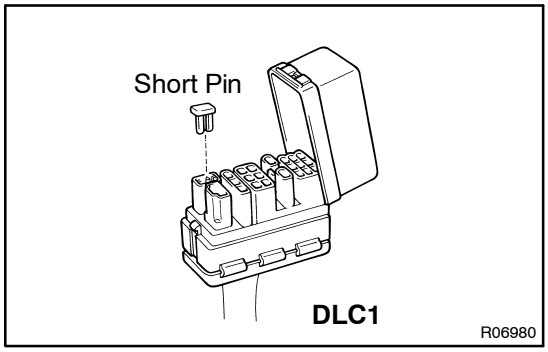


- As an example, the blinking patterns for normal code and codes 11 and 21 are shown in the illustration.
(5) Codes are explained in the code table on page DI–242.
(6) After completing the check, disconnect terminals Tc and E1, and turn off the display.

If 2 or more malfunctions are indicated at the same time, the lowest numbered DTC will be displayed 1st.

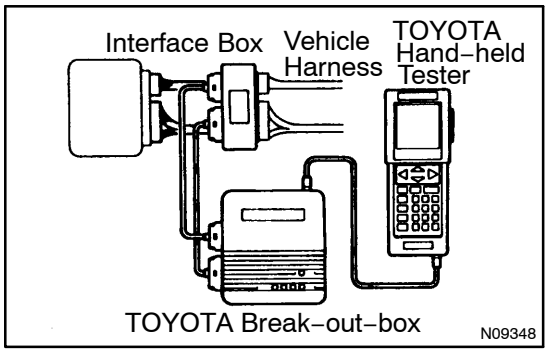


(c) Clear the DTC.
(1) Using SST, connect terminals Tc and E1 of the DLC1.
SST 09843–18020
(2) Disconnect the short pin from the DLC1.
(3) Turn the ignition switch ON.
(4) Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 3 seconds (4WD models) or 5 seconds (2WD models).
(5) Check that the warning light shows the normal code.
(6) Remove the SST from the terminals of the DLC1.
SST 09843–18020



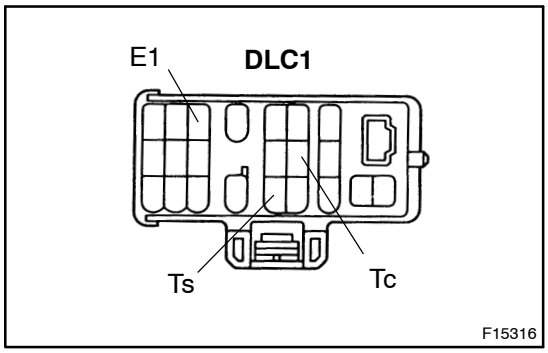
(7) Connect the short pin to the DLC1.

HINT:
4WD vehicles:
Cancellation can also be done by removing the ECU–B fuse, but in this case, other memory systems will also canlelled out.



(d) Using TOYOTA break–out–box and TOYOTA hand–held tester, measure the ECU terminal values.
(1) Turn the ignition switch OFF.
(2) Hook up the TOYOTA hand–held tester and TOYOTA break–out–box to the vehicle.
(3) Turn the ignition switch ON.
(4) Read the ECU input / output values by following the prompts on the tester screen.

HINT:
TOYOTA hand–held tester has a ”Snapshot” function. This records the measured values and is effective in the diagnosis of intermittent problems. Please refer to the TOYOTA hand–held tester / TOYOTA break–out–box operators manual for further details.



2. SPEED SENSOR SIGNAL CHECK

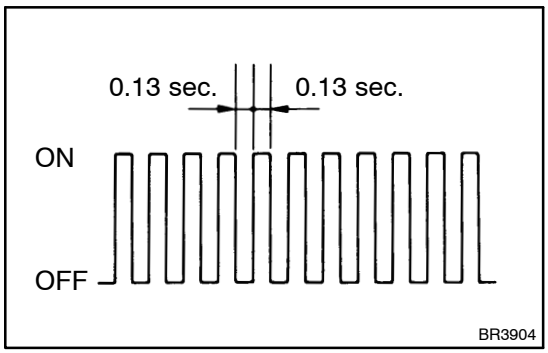
(a) Check the speed sensor signal.

(1) Turn the ignition switch OFF.

(2) Using SST, connect terminals Ts and E1 of the DLC1.

SST 09843–18020

(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 (See page DI–275).

(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 terminals Tc and E1 of the DLC1.

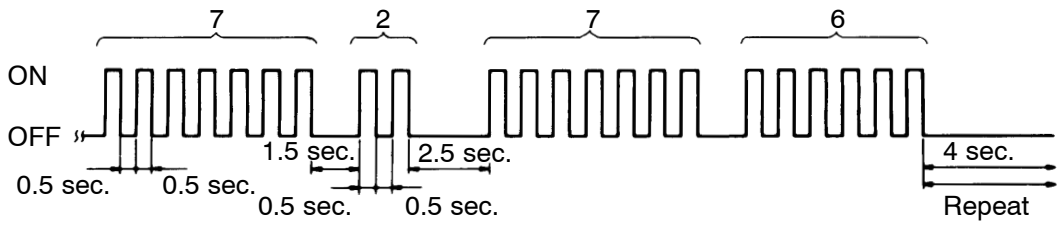
SST 09843–18020

(8) Read the number of blinks of the ABS warning light.

HINT:

- See the list of DTC shown on the next page.
- 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 1st.

Malfunction Code (Example Code 72, 76)



(9) After doing the check, disconnect terminals Ts and E1, and Tc and E1 of the DLC1, and turn the ignition switch OFF.

(b) Check the DTC of the sensor function.

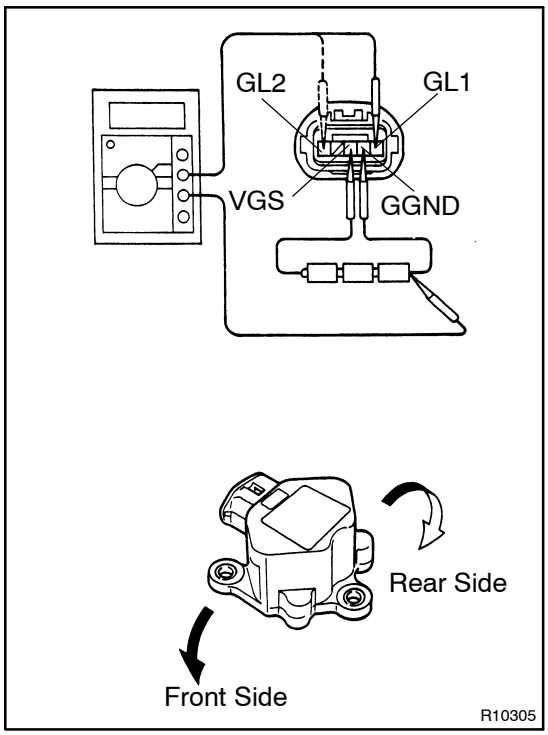
Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor
*79	Deceleration sensor is faulty	• Deceleration sensor • Sensor installation

*: 4WD models

3. DECELERATION SENSOR OPERATION DIAGNOSIS SYSTEM

CAUTION:

While checking the deceleration sensor operating diagnosis system, the Anti–lock Brake System does not work and brake system works as a conventional brake system.



Check the deceleration sensor output.

(1) Connect 3 dry batteries of 1.5 V in series.

(2) Connect VGS terminal to the batteries' positive (+) terminal, and GGND terminal to the batteries' negative (–) terminal, apply about 4.5 V between VGS–GGND terminals.

NOTICE:

Do not apply voltage of 6 V or more to terminals VGS and GGND.

(3) Check the output of GL1 and GL2 terminals.

Symbols	Condition	Standard Value
GL1	Horizontal	about 2.3 V
GL1	Lean forward	0 – about 2.3 V
GL1	Lean rearward	about 2.3 V – 4.5 V
GL2	Horizontal	about 2.3 V
GL2	Lean forward	about 2.3 V – 4.5 V
GL2	Lean rearward	0 – about 2.3 V

HINT:

- If the senor is tilted too much it may show the wrong value.
- If dropped, the sensor should be replaced with a new one.
- The sensor removed from the vehicle should not be placed upside down.

DI41F–02

DIAGNOSTIC TROUBLE CODE CHART

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

- Using SST 09843–18020, connect the terminals Tc and E1, and remove the short pin.
- If any abnormality is not found when inspect each inspection parts, inspect the ECU.

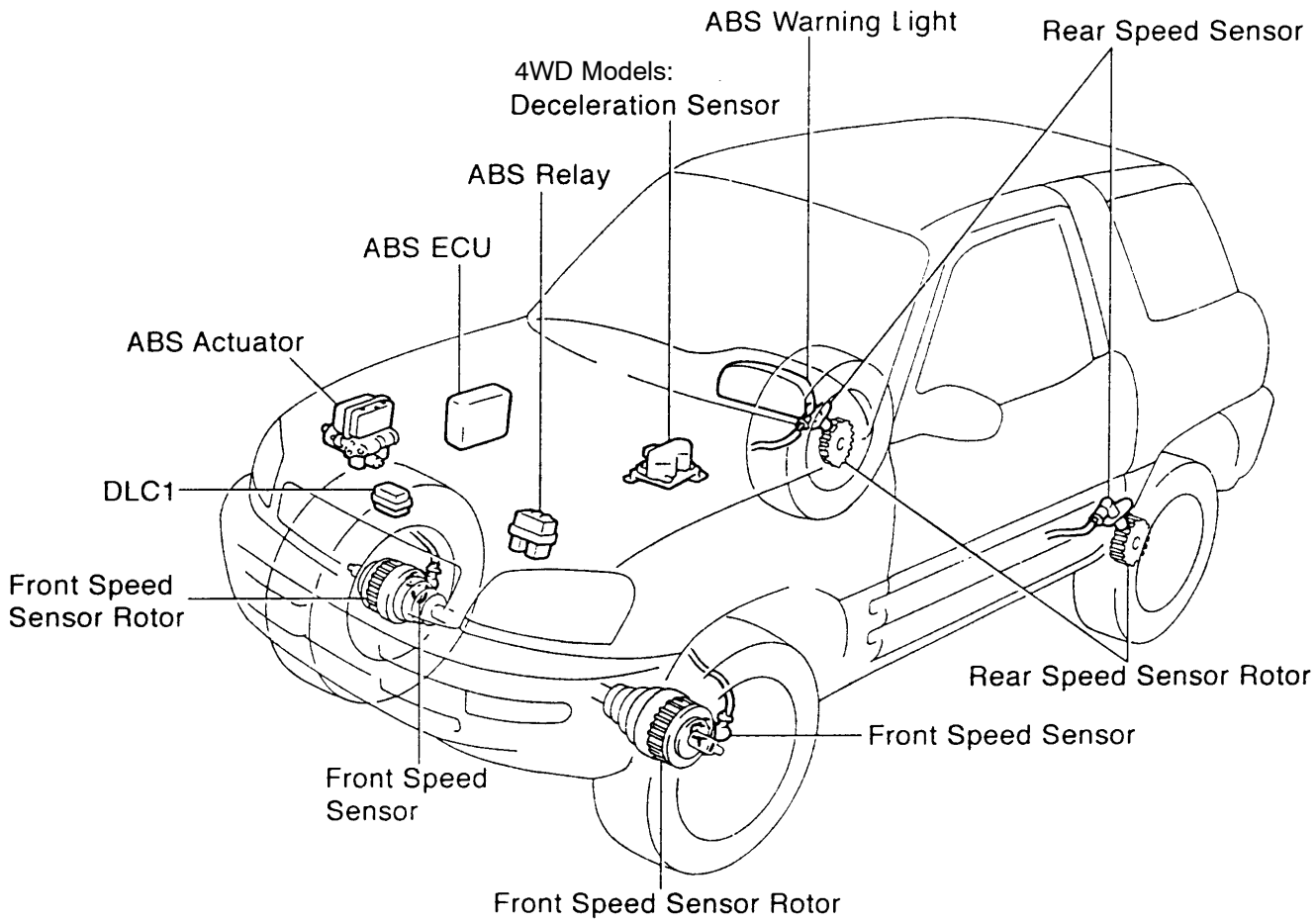
DTC No. (See page)	Detection Item	Trouble Area
11 (DI–246)	Open circuit in ABS control (solenoid) relay circuit	• ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit • ECU
12 (DI–246)	Short circuit in ABS control (solenoid) relay circuit	• ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit • ECU
*3 13 (DI–250)	Open circuit in ABS control (motor) relay circuit	• ABS control (motor) relay • Open or short in ABS control (motor) relay circuit • ECU
14 (DI–250)	Short circuit in ABS control (motor) relay circuit	• ABS control (motor) relay • B+ short in ABS control (motor) relay circuit • ECU
21 (DI–254)	Open or short circuit in 2–position solenoid circuit for right front wheel	• ABS actuator • Open or short in SFRR or SFRH circuit • ECU
22 (DI–254)	Open or short circuit in 2–position solenoid circuit for left front wheel	• ABS actuator • Open or short in SFLR or SFLH circuit • ECU
23 (DI–254)	Open or short circuit in 2–position solenoid circuit for right rear wheel	• ABS actuator • Open or short in SRRR or SRRH circuit • ECU
24 (DI–254)	Open or short circuit in 2–position solenoid circuit for left rear wheel	• ABS actuator • Open or short in SRLR or SRLH circuit • ECU
*3 31 (DI–257)	Right front wheel speed sensor signal malfunction	• Right front, left front, right rear or left rear speed sensor • Open or short in each speed sensor circuit • Speed rotor • ECU
*3 32 (DI–257)	Left front wheel speed sensor signal malfunction	
*3 33 (DI–257)	Right rear wheel speed sensor signal malfunction	
*3 34 (DI–257)	Left rear wheel speed sensor signal malfunction	
*2 35 (DI–257)	Open circuit in speed sensor circuit	• Open in speed sensor circuit
*1 37 (DI–261)	Some tire is different size from other tires	• Tire size • ECU
41 (DI–262)	Low battery positive voltage Abnormal high battery positive voltage (2WD Vehicles)	• Battery • IC regulator • Open or short in power source circuit • ECU
*2 43 (DI–266)	Malfunction in deceleration sensor (constant output)	• Deceleration sensor • Wire harness for deceleration sensor system • ECU

*2 44 (DI–267)	Open or short in deceleration sensor circuit	• Deceleration sensor • Open or short in deceleration sensor circuit • ECU
*2 45 (DI–266)	Malfunction in deceleration sensor	• Deceleration sensor • Wire harness for deceleration sensor system
51 (DI–269)	Pump motor is locked Open in pump motor ground	• ABS pump motor
Always ON (DI–270)	Malfunction in ECU Abnormal high battery positive voltage (2WD Vehicles)	• Battery *1 • IC regulator *1 • Open or short in pwer source circuit *1 • ECU

*1: 2WD models
*2: 4WD models
*3: As the DTC cannot be erased by replacing parts alone, do either of the following operations.
1. Clear DTC (See page DI–234).
2. At the vehicle speed of 20 km/h (12 mph), drive the vehicle for 30 sec. or more.

DI41G–02

PARTS LOCATION

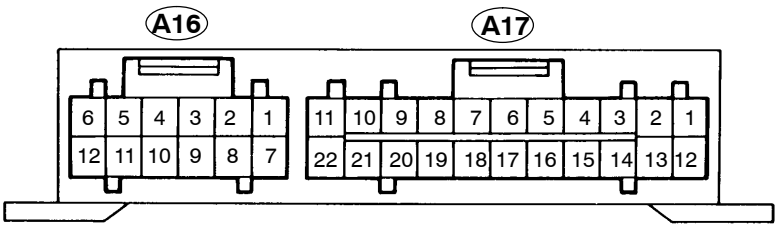


W01414

DI7HG–02

TERMINALS OF ECU

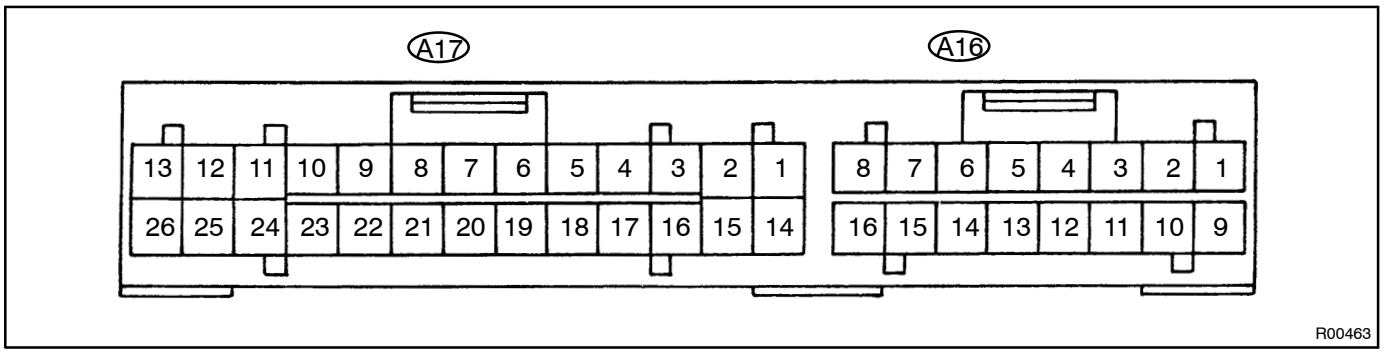
2WD Models:



W01411

Symbols (Terminal No.)	Wiring Color	Condition		STD Voltage (V)
IG1 (A16–2) – GND (A17–2, 13)	B–Y – W–B	IG switch ON		10 – 14
SR (A17–18) – R+ (A17–8)	R–L – R–W	IG switch ON	ABS warning light OFF	Below 1.5
MR (A17–7) – R+ (A17–8)	R–B – R–W	IG switch ON		10 – 14
SFRH (A17–4) – GND (A17–2, 13)	R–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
SFRR (A17–1) – GND (A17–2, 13)	R–G – W–B	IG switch ON	ABS warning light OFF	10 – 14
SFLH (A17–10) – GND (A17–2, 13)	L–R – W–B	IG switch ON	ABS warning light OFF	10 – 14
SFLR (A17–11) – GND (A17–2, 13)	L–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRRR (A17–22) – GND (A17–2, 13)	G–Y – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRRH (A17–21) – GND (A17–2, 13)	G–B – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRLR (A17–12) – GND (A17–2, 13)	BR–R – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRLH (A17–5) – GND (A17–2, 13)	BR–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
AST (A17–16) – GND (A17–2, 13)	G–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
MT (A17–9) – GND (A17–2, 13)	L–O ↔ W–B	IG switch ON		Below 1.5
WA (A16–4) – GND (A17–2, 13)	R–Y – W–B	IG switch ON	ABS warning light ON	Below 2.0
		IG switch ON	ABS warning light OFF	10 – 14
STP (A16–12) – GND (A17–2, 13)	G–W – W–B	Stop light switch OFF		Below 1.5
		Stop light switch ON		8 – 14
Tc (A16–9) – GND (A17–2, 13)	W–L – W–B	IG switch ON		10 – 14
Ts (A16–8) – GND (A17–2, 13)	L – W–B	IG switch ON		10 – 14
FR+ (A17–3) – FR– (A17–14)	B – W	IG switch ON	Slowly turn right front wheel	AC generation
FL+ (A17–19) – FL– (A17–20)	R – G	IG switch ON	Slowly turn left front wheel	AC generation
RR+ (A16–1) – RR– (A16–7)	Y –BR	IG switch ON	Slowly turn right rear wheel	AC generation
RL+ (A16–3) – RL– (A16–10)	G – R	IG switch ON	Slowly turn left rear wheel	AC generation

4WD Models:



Symbols (Terminal No.)	Wiring Color	Condition		STD Voltage (V)
BAT (A17–22) – GND (A17–11, 24)	L–Y – W–B	Always		10 – 14
IG1 (A17–10) – GND (A17–11, 24)	B–Y – W–B	IG switch ON		10 – 14
SR (A16–5) – R– (A16–15)	R–L – R–W	IG switch ON	ABS warning light OFF	10 – 14
MR (A16–4) – R– (A16–15)	R–B – R–W	IG switch ON		Below 1.0
SFRH (A16–1) – GND (A17–11, 24)	R–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
SFRR (A16–2) – GND (A17–11, 24)	R–G – W–B	IG switch ON	ABS warning light OFF	10 – 14
SFLH (A17–13) – GND (A17–11, 24)	L–R – W–B	IG switch ON	ABS warning light OFF	10 – 14
SFLR (A17–12) – GND (A17–11, 24)	L–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRRR (A17–25) – GND (A17–11, 24)	G–Y – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRRH (A17–26) – GND (A17–11, 24)	G–B – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRLR (A16–10) – GND (A17–11, 24)	BR–R – W–B	IG switch ON	ABS warning light OFF	10 – 14
SRLH (A16–9) – GND (A17–11, 24)	BR–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
AST (A16–11) – GND (A17–11, 24)	G–W – W–B	IG switch ON	ABS warning light OFF	10 – 14
MT (A16–8) – GND (A17–11, 24)	L–O ↔ W–B	IG switch ON		Below 1.5
WA (A16–12) – GND (A17–11, 24)	R–Y – W–B	IG switch ON	ABS warning light ON	Below 2.0
		IG switch ON	ABS warning light OFF	10 – 14
PKB (A17–9) – GND (A17–11, 24)	R–B – W–B	IG switch ON	PKB switch ON	Below 1.5
		IG switch ON	PKB switch OFF	10 – 14
STP (A17–21) – GND (A17–11, 24)	G–W – W–B	Stop light switch OFF		Below 1.5
		Stop light switch ON		8 – 14
Tc (A17–20) – GND (A17–11, 24)	W–L – W–B	IG switch ON		10 – 14
Ts (A17–6) – GND (A17–11, 24)	L – W–B	IG switch ON		10 – 14
FR+ (A16–7) – FR– (A16–6)	B – W	IG switch ON	Slowly turn right front wheel	AC generation
FL+ (A16–14) – FL– (A16–13)	R – G	IG switch ON	Slowly turn left front wheel	AC generation

RR+ (A17–15) – RR– (A17–16)	Y –BR	IG switch ON	Slowly turn right rear wheel	AC generation
RL+ (A17–1) – RL– (A17–2)	G – R	IG switch ON	Slowly turn left rear wheel	AC generation
GL1 (A17–19) – GND (A17–11, 24)	B – W–B	IG switch ON		0.5 – 4.5 V
GL2 (A17–7) – GND (A17–11, 24)	W – W–B	IG switch ON		0.5 – 4.5 V
VGS (A17–5) – GND (A17–11, 24)	R – W–B	IG switch ON		4.5 – 5.5 V

DI411–02

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.

Symptoms	Suspected Area	See page
ABS does not operate	Only when 1 – 4 are all normal and the problem is still occuring, replace the ABS ECU 2. Check the DTC, reconfirming that the normal code is output 3. IG power source circuit 4. Speed sensor circuit 5. Check the ABS actuator with a checker If abnormal, check the hydraulic circuit for leakage (See page DI–282)	 DI–234 DI–262 DI–257 BR–35
ABS does not operate efficiently	Only when 1 – 4 are all normal and the problem is still occuring, replace the ABS 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 checker If abnormal, check the hydraulic circuit for leakage (See page DI–282)	 DI–234 DI–257 DI–273 BR–35
ABS warning light abnormal	1. ABS warning light circuit 2. ABS ECU	DI–275 –
DTC check cannot be done	Only when 1 and 2 are all normal and the problem is still occuring, replace the ABS ECU 1. ABS warning light circuit 2. Tc terminal circuit	 DI–275 DI–278
Speed sensor signal check cannot be done	1. Ts terminal circuit 2. ABS ECU	DI–280 –

DI41J–02

CIRCUIT INSPECTION

DTC	11, 12	ABS Control (Solenoid) Relay Circuit

CIRCUIT DESCRIPTION

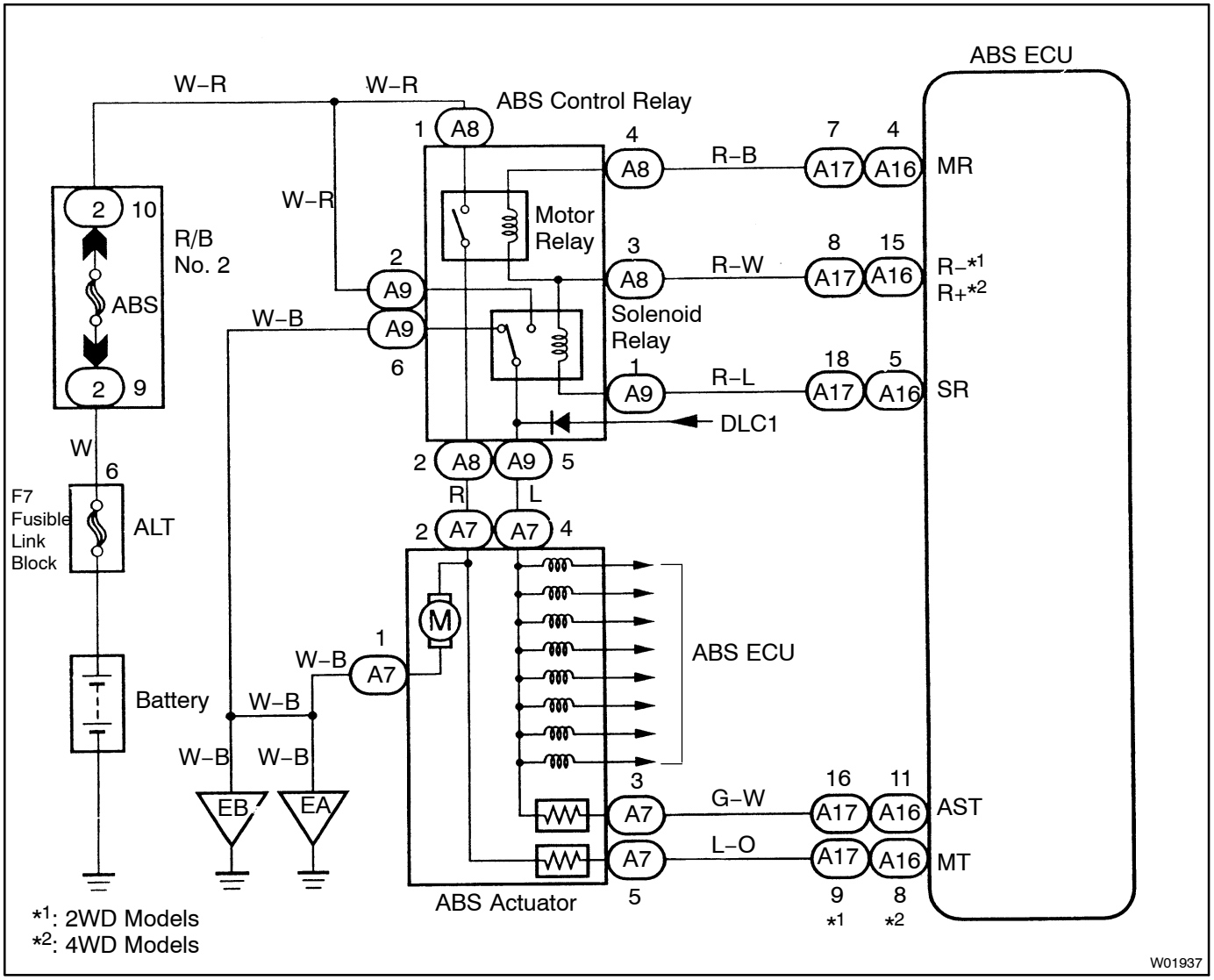
This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detecting Condition	Trouble Area
11	Conditions 1 and 2 continue for 0.2 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 2WD models: 10 – 14 V 4WD models: Below 1.5 V 2. ABS control (solenoid) relay monitor terminal (AST) voltage: 0 V	• ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit • ECU
12	Conditions 1 and 2 continue for 0.2 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 2WD models: 0 V 4WD models: 10 – 14 V 2. ABS control (solenoid) relay monitor terminal (AST) voltage: 10 – 14 V	• ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit • ECU

Fail safe function:

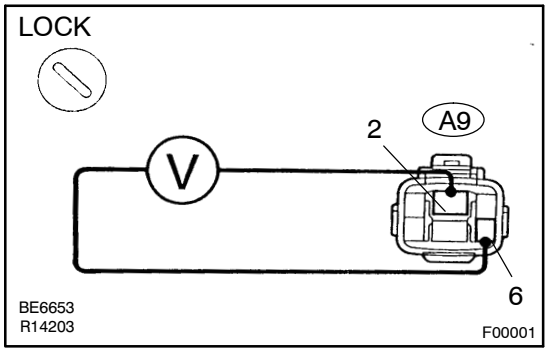
If trouble occurs in the ABS control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals A9–2 and A9–6 of ABS control (solenoid) relay connector.**



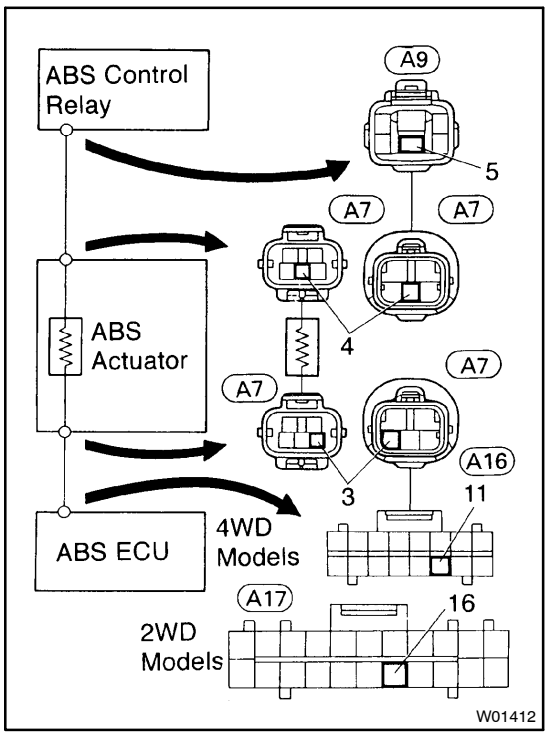
PREPARATION:
Disconnect the ABS control relay connector.
CHECK:
Measure the voltage between terminals A9–2 and A9–6 of the ABS control relay harness side connector.
OK:

Voltage: 10 – 14 V

NG	**Check and repair harness or connector.**

OK

2	**Check continuity between terminals A9–5 and A7–4, A7–4 and A7 –3, and A7–3 and A16–11/A17–16.**



PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check the continuity between terminal A9–5 and A7–4, A7–4 and A7–3, A7–3 and A16–11/A17–16.
OK:

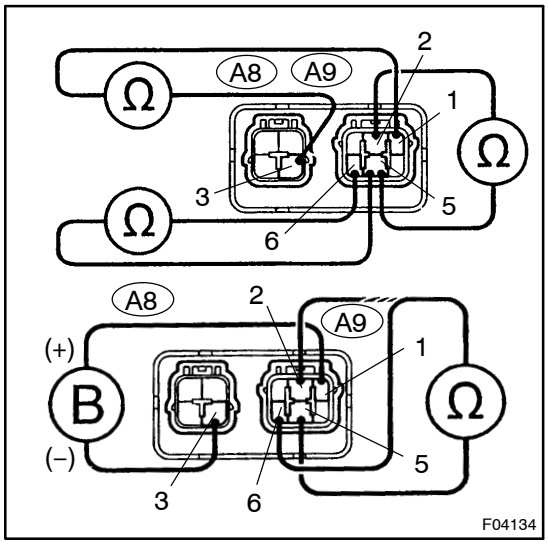
Continuity

HINT:
There is a resistance of 26 – 40 Ω between terminals A7–4 and A7–3.

NG	**Repair or replace harness or ABS actuator.**

OK

3	Check ABS control (solenoid) relay.



CHECK:

Check the continuity between each terminal of the ABS control (solenoid) relay.

OK:

Terminals A9–1 and A8–3	Continuity (Reference value 80 Ω)
Terminals A9–5 and A9–6	Continuity
Terminals A9–2 and A9–5	Open

CHECK:

(a) Apply battery voltage between terminals A9–1 and A8–3.

(b) Check the continuity between each terminal of the ABS control (solenoid) relay.

OK:

Terminals A9–5 and A9–6	Open
Terminals A9–2 and A9–5	Continuity

NG → **Replace ABS control relay.**

OK

4	Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–30).

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

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

DI41K–02

DTC	13, 14	ABS Control (Motor) Relay Circuit

CIRCUIT DESCRIPTION

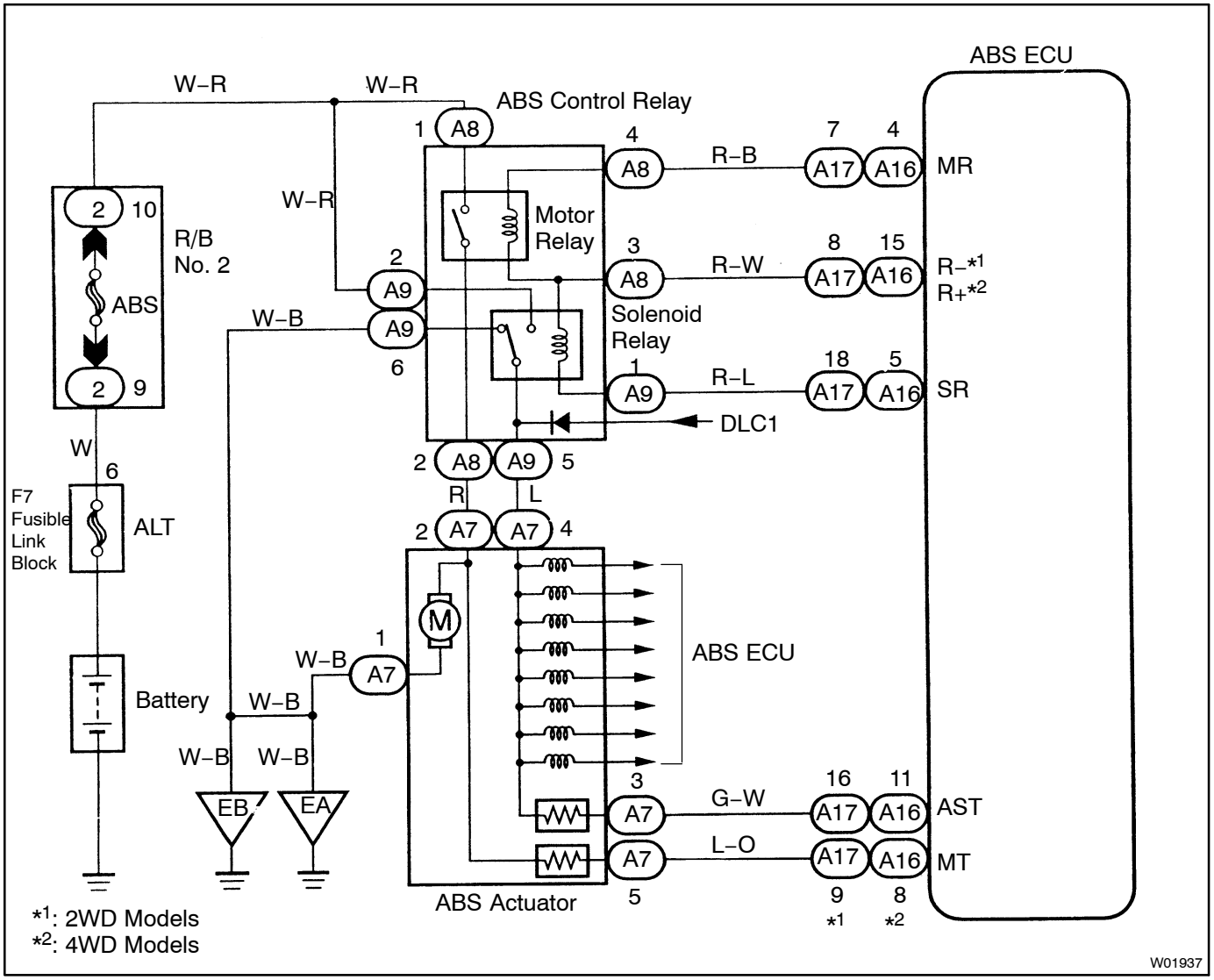
This ABS control (motor) relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the control (motor) relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
13	Conditions 1 and 2 continued for 0.2 sec. or more: 1. ABS control (motor) relay terminal (MR) voltage: 2WD models: 10 – 14 V 4WD models: Below 1.5 V 2. ABS control (motor) relay monitor terminal (MT) voltage: 0 V	• ABS control (motor) relay • Open or short in ABS control (motor) relay circuit • ECU
14	Conditions 1 and 2 continued for 4 sec. or more: 1. ABS control (motor) relay terminal (MR) 2WD models: 0 V 4WD models: 10 – 14 V 2. ABS control (motor) relay monitor terminal (MT) voltage: Battery positive voltage	• ABS control (motor) relay • B+ short in ABS control (motor) relay circuit • ECU

Fail safe function:

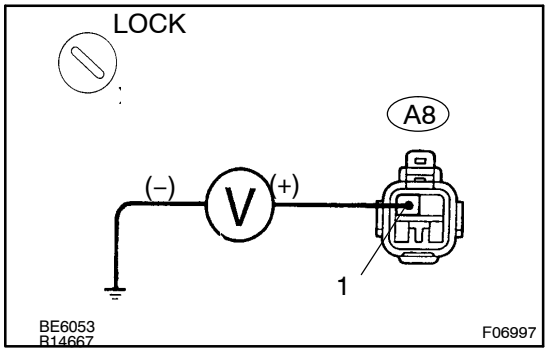
If trouble occurs in the ABS control (motor) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal A8–1 of ABS control (motor) relay and body ground.**

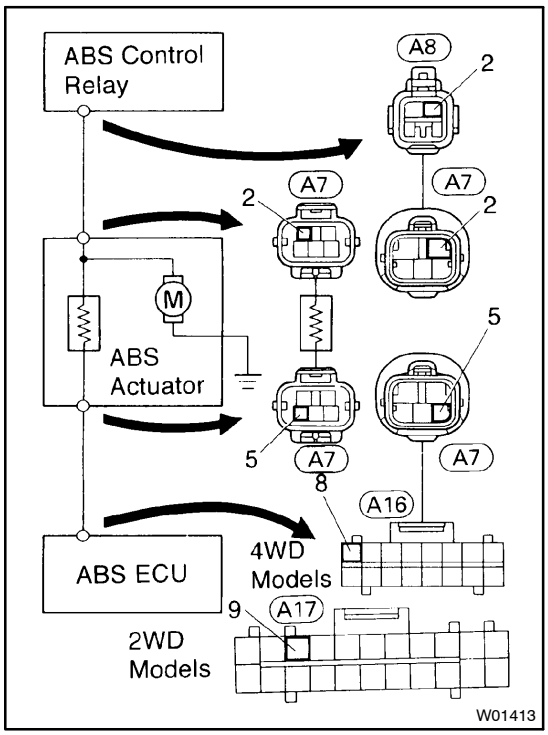


PREPARATION:
Disconnect the ABS control relay connector.
CHECK:
Measure the voltage between terminal A8–1 of the ABS control relay harness side connector and body ground.
OK:
Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

2	**Check continuity between terminals A8–2 and A7–2, A7–2 and A7–5, and A7–5 and A16–8/A17–9.**

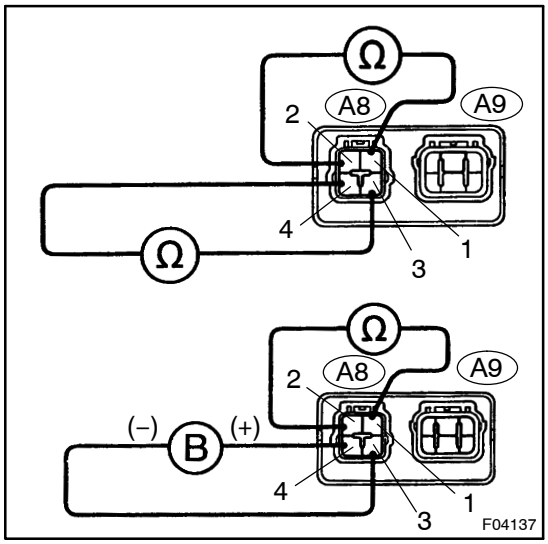


PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check continuity between terminal A8–2 and A7 – 2, A7 – 2 and A7–5, and A7–5 and A16–8/A17–9.
OK:
Continuity
HINT:
There is a resistance of 26 – 40 Ω between terminals A7–2 and A7–5.

NG → **Repair or replace harness or ABS actuator.**

OK

3	Check ABS control (motor) relay.



CHECK:

Check the continuity between each terminal of the ABS control relay.

OK:

Terminals A8–3 and A8–4	Continuity (Reference value 68 Ω)
Terminals A8–1 and A8–2	Open

CHECK:

(a) Apply battery voltage between terminals A8–3 and A8–4.

(b) Check the continuity between terminal of the ABS control relay.

OK:

Terminals A8–1 and A8–2	Continuity

NG → **Replace ABS control relay.**

OK

4	Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–30).

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

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

DI41L–02

DTC	21, 22, 23, 24	ABS Actuator Solenoid Circuit

CIRCUIT DESCRIPTION

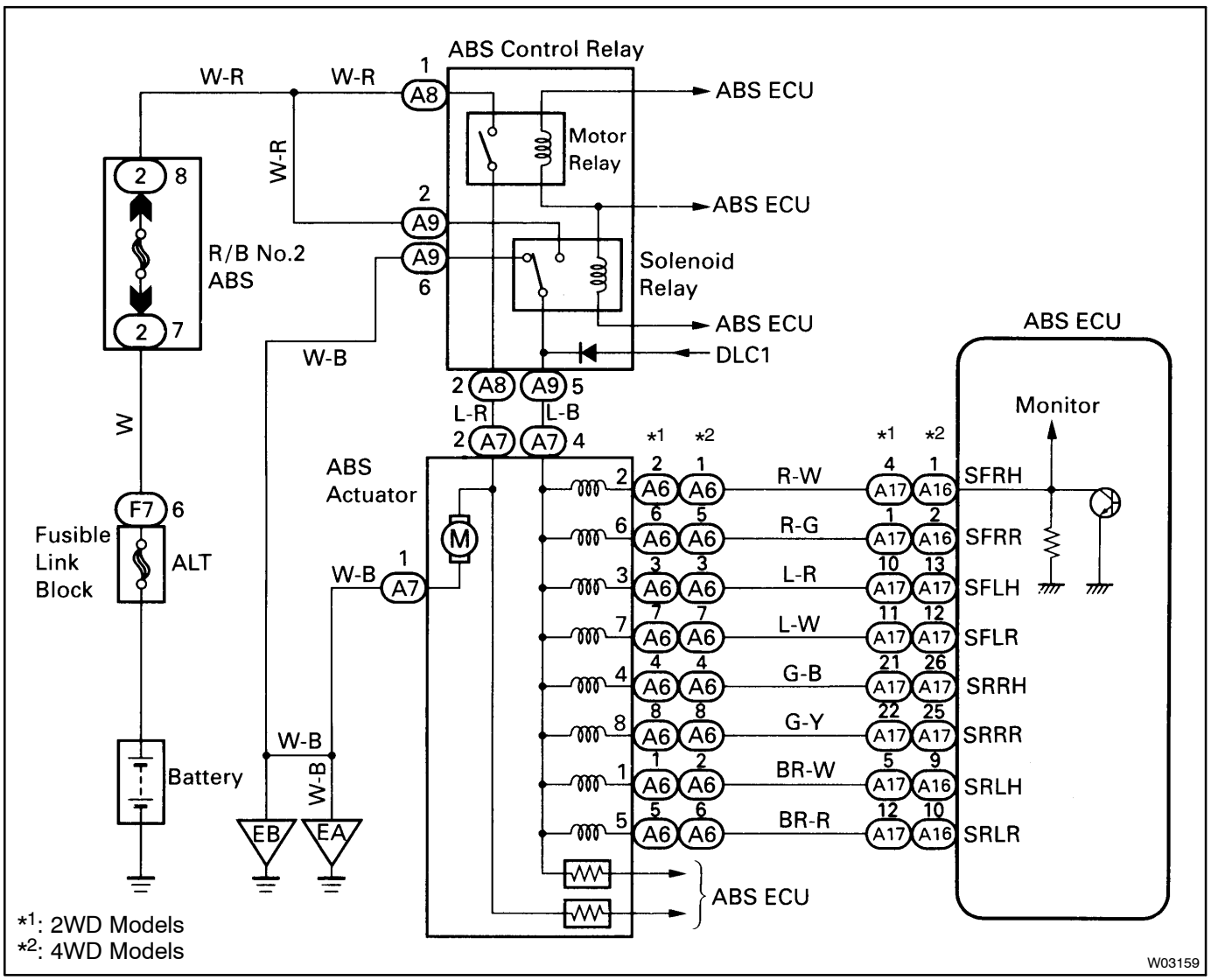
This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders, thus controlling the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
21	Conditions 1 through 3 continue for 0.05 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 2WD models: 10 – 14 V 4WD models: Below 1.5 V 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SFRR or SFRH is 0 V or battery positive voltage	• ABS actuator • Open or short in SFRR or SFRH circuit • ECU
22	Conditions 1 through 3 continue for 0.05 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 2WD models: 10 – 14 V 4WD models: Below 1.5 V 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SFLR or SFLH is 0 V or battery positive voltage	• ABS actuator • Open or short in SFLR or SFLH circuit • ECU
23	Conditions 1 through 3 continue for 0.05 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 2WD models: 10 – 14 V 4WD models: Below 1.5 V 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SRRR or SRRH is 0 V or battery positive voltage	• ABS actuator • Open or short in SRRR or SRRH circuit • ECU
24	Conditions 1 through 3 continue for 0.05 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 2WD models: 10 – 14 V 4WD models: Below 1.5 V 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SRLR or SRLH is 0 V or battery positive voltage	• ABS actuator • Open or short in SRLR or SRLH circuit • ECU

Fail safe function:

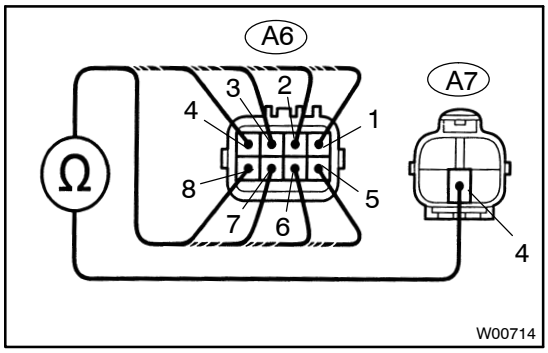
If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS actuator solenoid.**



PREPARATION:

Disconnect the 2 connectors from the ABS actuator.

CHECK:

Check the continuity between terminals A7–4 and A6–1, 2, 3, 4, 5, 6, 7, 8 of the ABS actuator connector.

OK:

Continuity

HINT:

- Resistance of each of the solenoids SFRH, SFLH, SRRH and SRLH is 5.0 Ω (4WD models) or 8.8 Ω (2WD models).
- Resistance of each of the solenoids SFRR, SFLR, SRRR and SRLR is 2.2 Ω (4WD models) or 4.3 Ω (2WD models).

NG → **Replace ABS actuator.**

OK

2	**Check for open and short in harness and connector between ABS ECU and actuator (See page IN–30).**

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

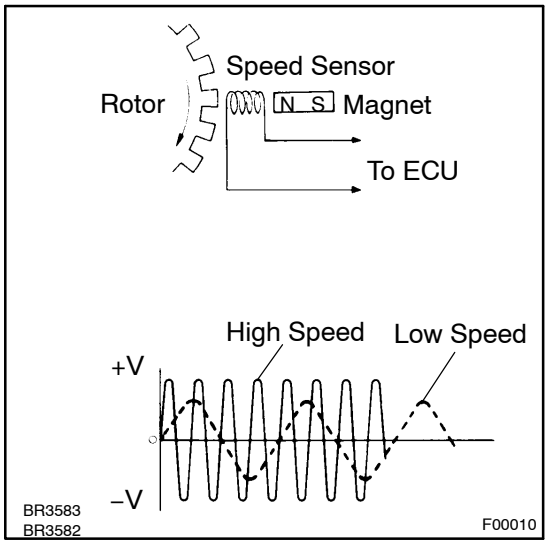
OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

DI98Z–01

DTC	31, 32, 33, 34, 35	Speed Sensor Circuit

CIRCUIT DESCRIPTION



The speed sensor detects the wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.

When the rotor 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
31, 32, 33, 34	Detection of any of conditions 1 through 3: 1. At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 5 sec. 2. Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF 3. Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km/h (12 mph) or more	• Right front, left front, right rear or left rear speed sensor • Open or short in each speed sensor circuit • Sensor rotor • ECU
*35	Speed sensor signal is not input for about 1 sec. while the speed sensor signals are being checked at vehicle speed of 0 km/h	• Open in speed sensor circuit • ECU

*: 4WD models

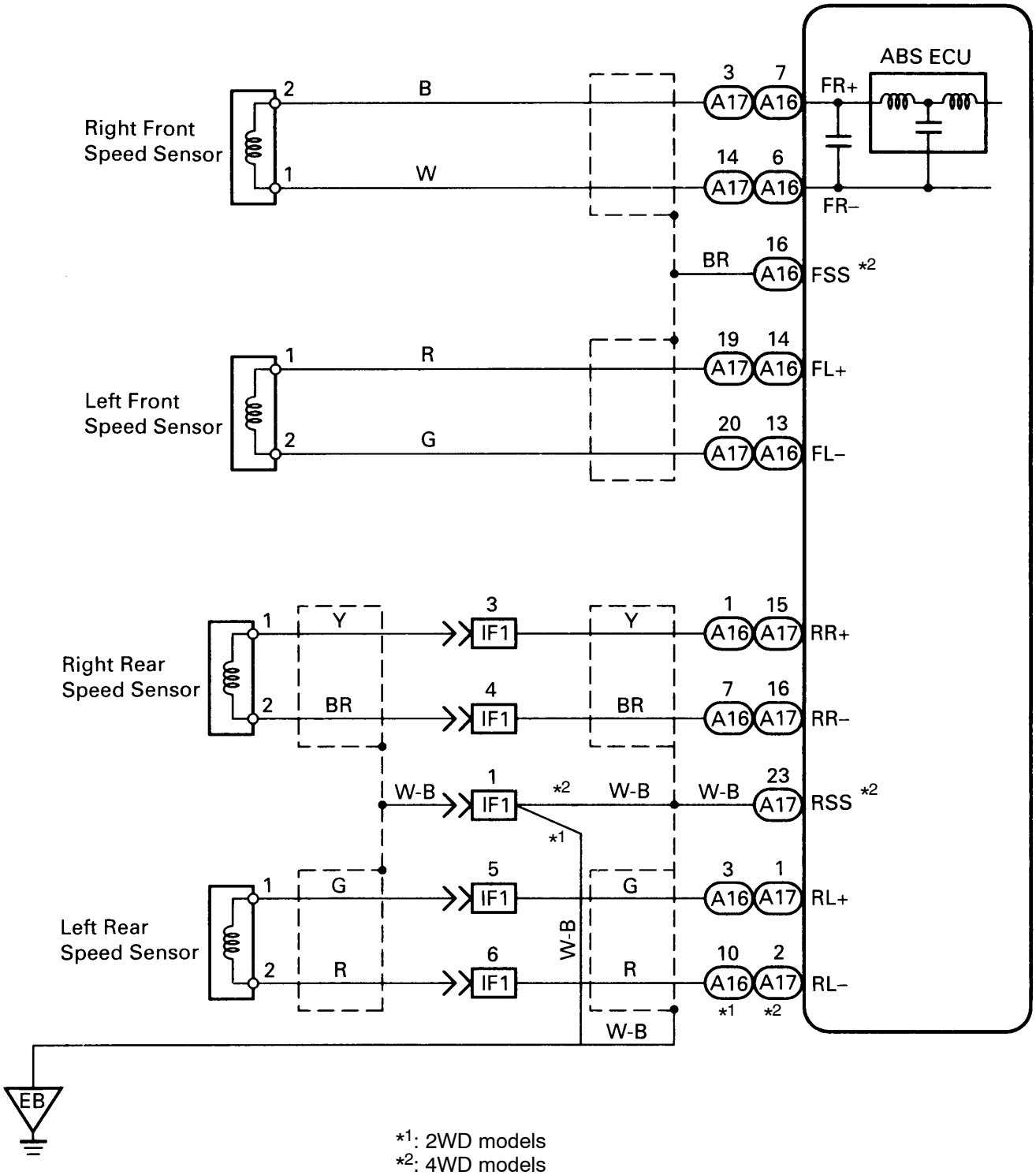
HINT:

- DTC No. 31 is for the right front speed sensor.
- DTC No. 32 is for the left front speed sensor.
- DTC No. 33 is for the right rear speed sensor.
- DTC No. 34 is for the left rear speed sensor.

Fail safe function:

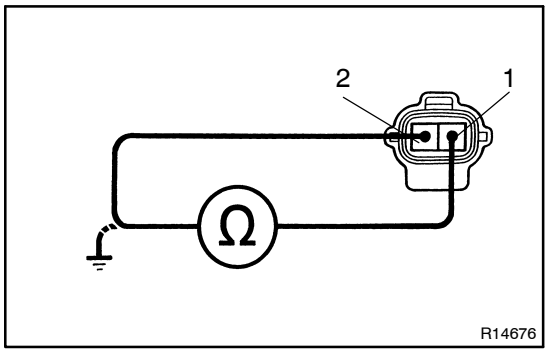
If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor.**



Front

PREPARATION:

Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

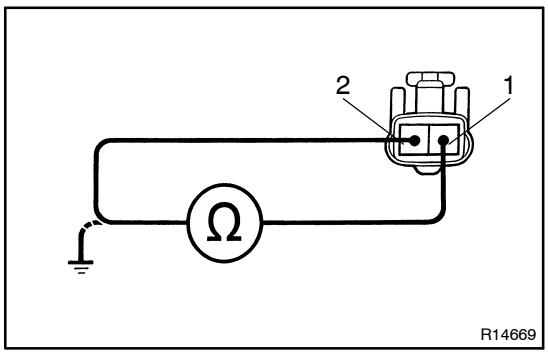
Resistance: 0.6 – 1.8 kΩ

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher



Rear:

PREPARATION:

Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

Resistance: 0.6 – 2.05 kΩ

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG	**Replace speed sensor.**

NOTICE:

Check the speed sensor signal last (See page DI–234).

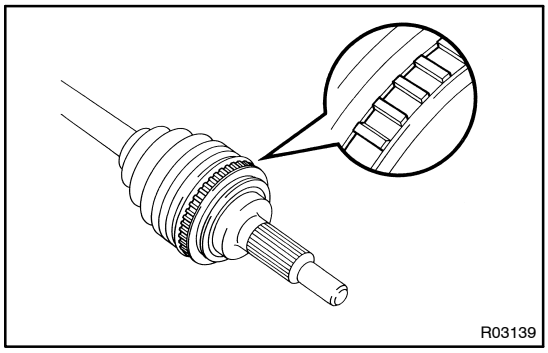
OK

2	**Check for open and short in harness and connector between each speed sensor and ECU (See page IN–30).**

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

OK

3	Check sensor rotor and sensor installation



Front:

PREPARATION:

Remove the brake disc (See page SA–20).

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or foreign objects.

CHECK:

Check the sensor tip.

OK:

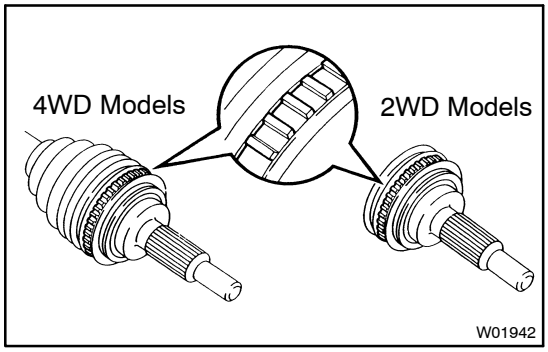
No scratches or foreign objects on the sensor tip.

CHECK:

Check the front speed sensor installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle.



Rear:

PREPARATION:

Remove the axle shaft (See page SA–52) or drive shaft (See page SA–62).

CHECK:

Check the sensor rotor serrations.

OK:

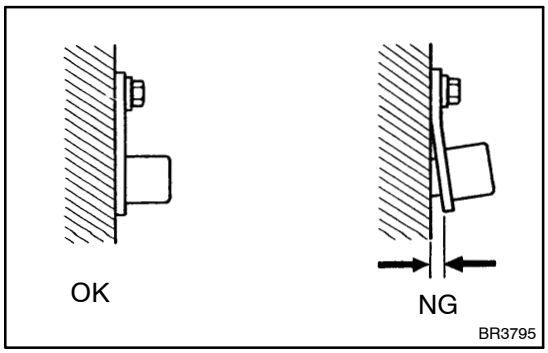
No scratches or missing teeth or foreign objects.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



CHECK:

Check the speed sensor installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and rear axle carrier.

NG	Replace speed sensor or rotor.

NOTICE:

Check the speed sensor signal last (See page DI–234).

OK

Check and replace ABS ECU.

DI41N–02

DTC	37	Tires of Different Size (2WD Modules)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
37	Driving at more than 20 km/h (12 mph) for more than 20 sec. with 1 or 2 tires of different size for 3 times continuously	• Tire size • ECU

INSPECTION PROCEDURE

1	**Check tire size.**

NG → **Replace tires so that all 4 tires are of same size.**

OK

Check and replace ABS ECU.

DI41O–02

DTC	41	IG Power Source Circuit

CIRCUIT DESCRIPTION

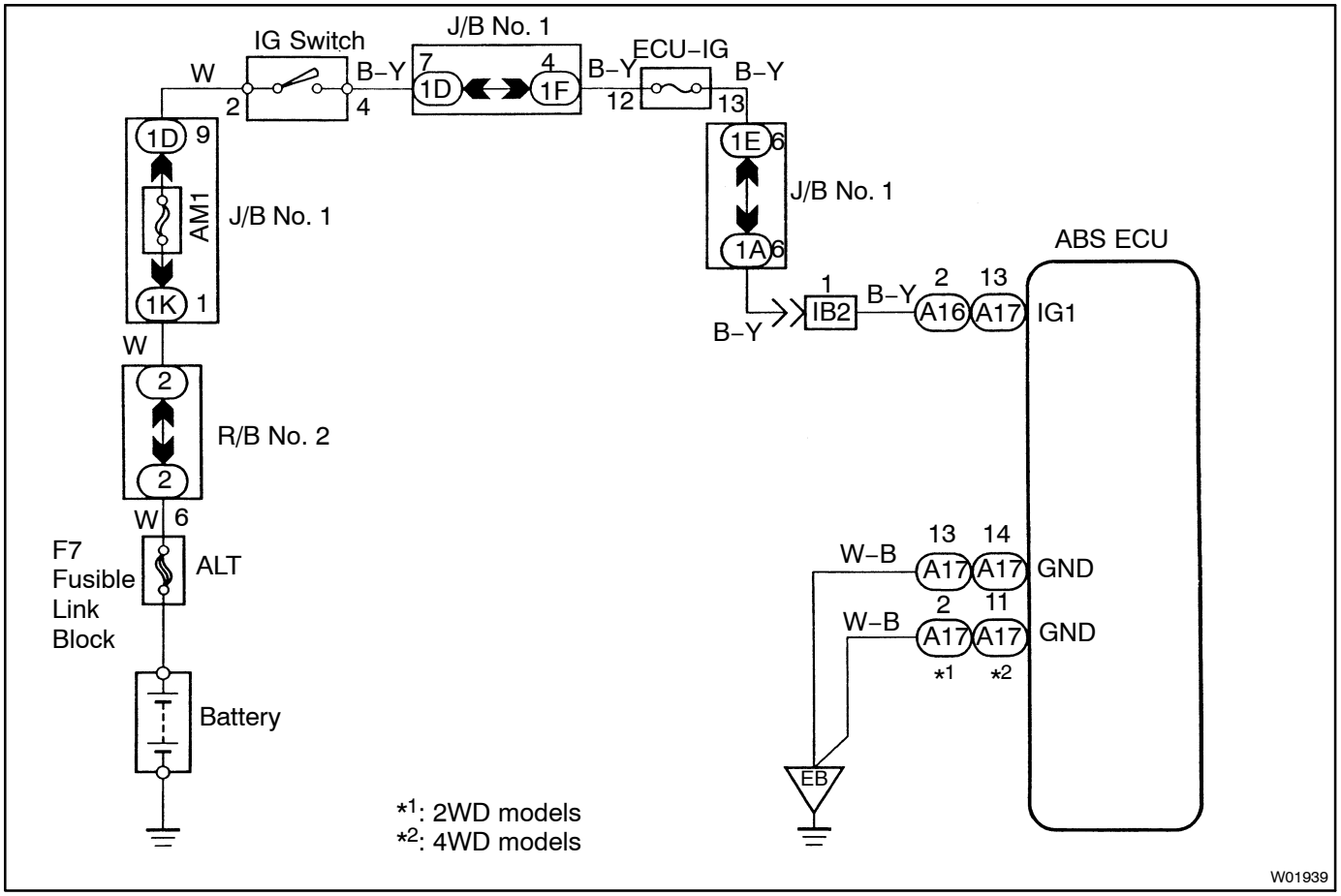
This is the power source for the ECU, hence the CPU, and the actuators.

DTC No.	DTC Detecting Condition	Trouble Area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at below 9.5 V for more than 10 sec. 4WD models: Voltage of ECU terminal IG1 remains at more than 17 V for 1 sec. or more	• Battery • IC regulator • Open or short in power source circuit • ECU

Fail safe function:

If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check battery positive voltage.**

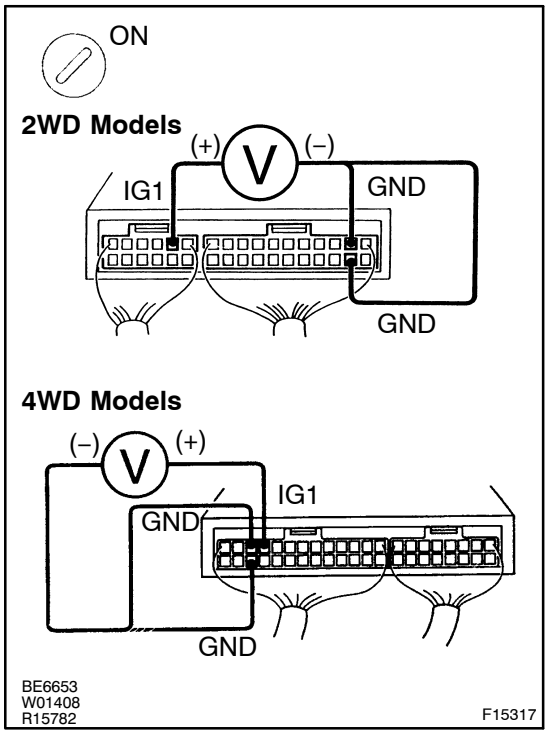
OK:

Voltage: 10 – 14 V

NG → **Check and repair charging system.**

OK

2	**Check voltage between terminals IG1 and GND of ABS ECU connector.**



PREPARATION:

Remove the ABS ECU with connectors still connected.

CHECK:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals IG1 and GND of the ABS ECU connector.

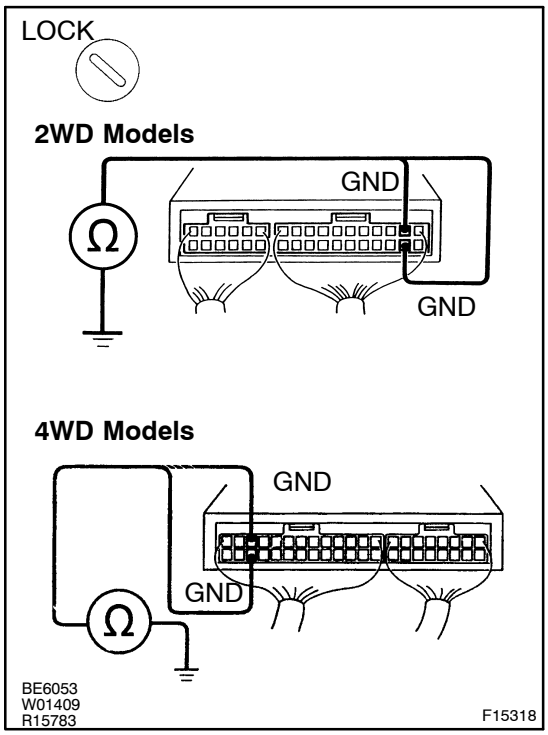
OK:

Voltage: 10 – 14 V

OK → **Check and replace ABS ECU.**

NG

3	**Check continuity between terminals GND of ABS ECU connector and body ground.**



CHECK:

Measure the resistance between terminals GND of the ABS ECU connector and body ground.

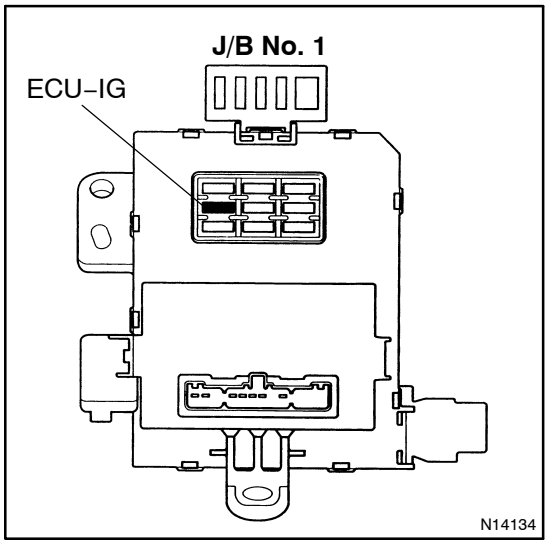
OK:

Resistance: 1 Ω or less

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

OK

4	Check ECU–IG fuse.



PREPARATION:
Remove the ECU–IG fuse from the J/B No. 1.
CHECK:
Check the continuity of the ECU–IG fuse.
OK:
Continuity

NG → **Check for short in all harness and components connected to ECU–IG fuse.**

OK

Check for open in harness and connector between ABS ECU and battery (See page IN–30).

DTC	43, 45	Malfunction is Deceleration Sensor (4WD Models)

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
43	Either of the following 1 or 2 is detected: 1. After the battery terminal is connected, input from the deceleration sensor does not charge at one cycle (0 km/h → more than 30 km/h → 0 km/h) for 16 times continuously 2. When the brake pedal is not depressed at vehicle speed of 5 km/h or more, forward and backward G (more than 0.4 G) is detected for 30 sec. or more	• Deceleration sensor • Wire harness for deceleration sensor system • ECU
*45	At vehicle speed of 30 km/h or more, the deceleration sensor output and vehicle acceleration from wheel speed remain abnormally different for 60 sec. or more	• Deceleration sensor • Wire harness for deceleration sensor system

INSPECTION PROCEDURE

1	**Check deceleration sensor (See page DI–234).**

NG → **Replace deceleration sensor.**

OK

2	**Check for open or short in harness and connector between sensor and ECU (See page IN–30).**

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

OK

Check and replace ABS ECU.

DI98Y–01

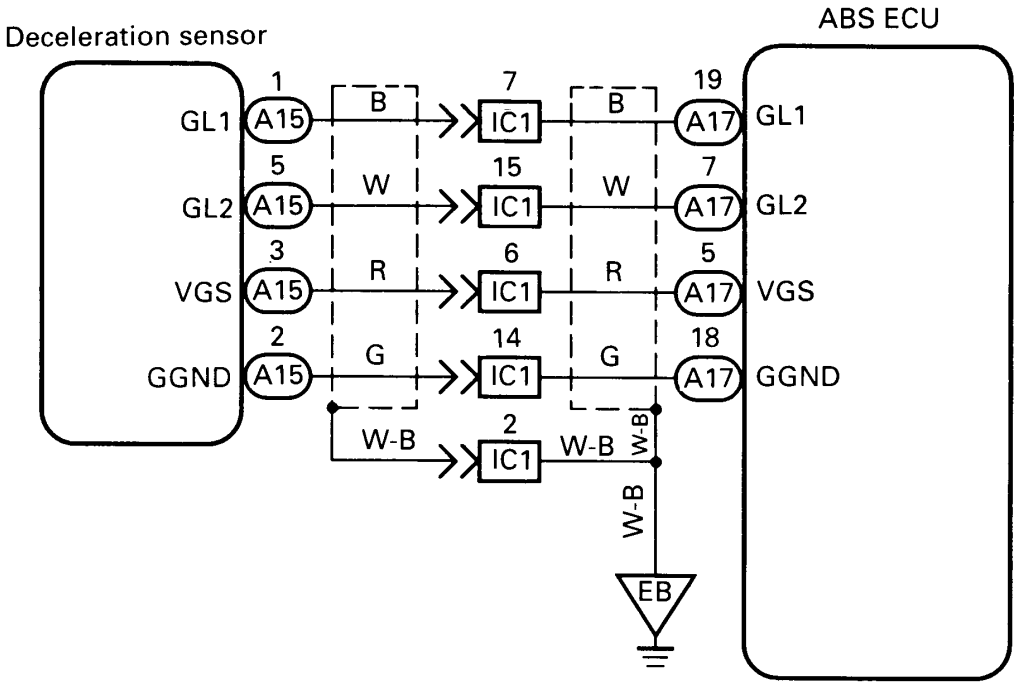
DTC	44	Deceleration Sensor Circuit (4WD Models)

CIRCUIT DESCRIPTION

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS control. If the sensor functions abnormally, the ABS warning light comes on but the ABS still operates.

DTC No.	TC Detecting Condition	Trouble Area
44	Either of the following 1 or 2 is detected: 1. G switch ON and output voltage of GL1 or GL2 remains 0.5 V or less or 4.5 V or more for more than 1.2 sec. 2. At vehicle speed of 0 km/h, outputs of GL1 and of GL2 remains abnormally different for 60 sec. or more 3. IG switch ON and VGS ≦ 4.4 V, VGS ≧ 5.5 V continues for 1.2 sec. or more	• Deceleration sensor • Open or short in deceleration sensor circuit • ECU

WIRING DIAGRAM



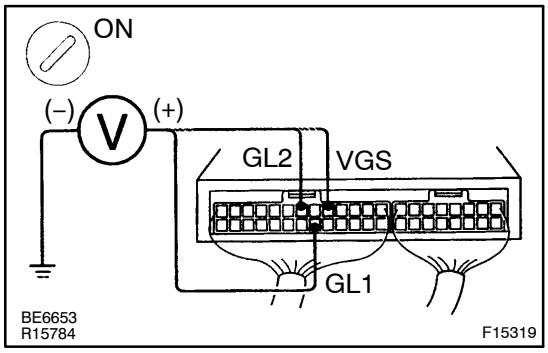
INSPECTION PROCEDURE

1	**Check for open and short in harness and connector between sensor and ECU (See page IN–30).**

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

OK

2	Check voltage between terminals GL1, GL2, VGS of ECU and body ground.



PREPARATION:

(a) Remove the ABS ECU with connectors still connected.
(b) Disconnect the sensor connector.
(c) Turn the ignition switch ON.

4 Door Models:

CHECK:

Measure the voltage between terminals GS1, GS2, VGS of the ECU and body ground.

OK:

Voltage:
GS1, GL2: 0.5 – 4.5 V
VGS: 4.5 – 5.5 V

NG → **Check and replace ABS ECU.**

OK

Check and replace deceleration sensor.

DI41S–03

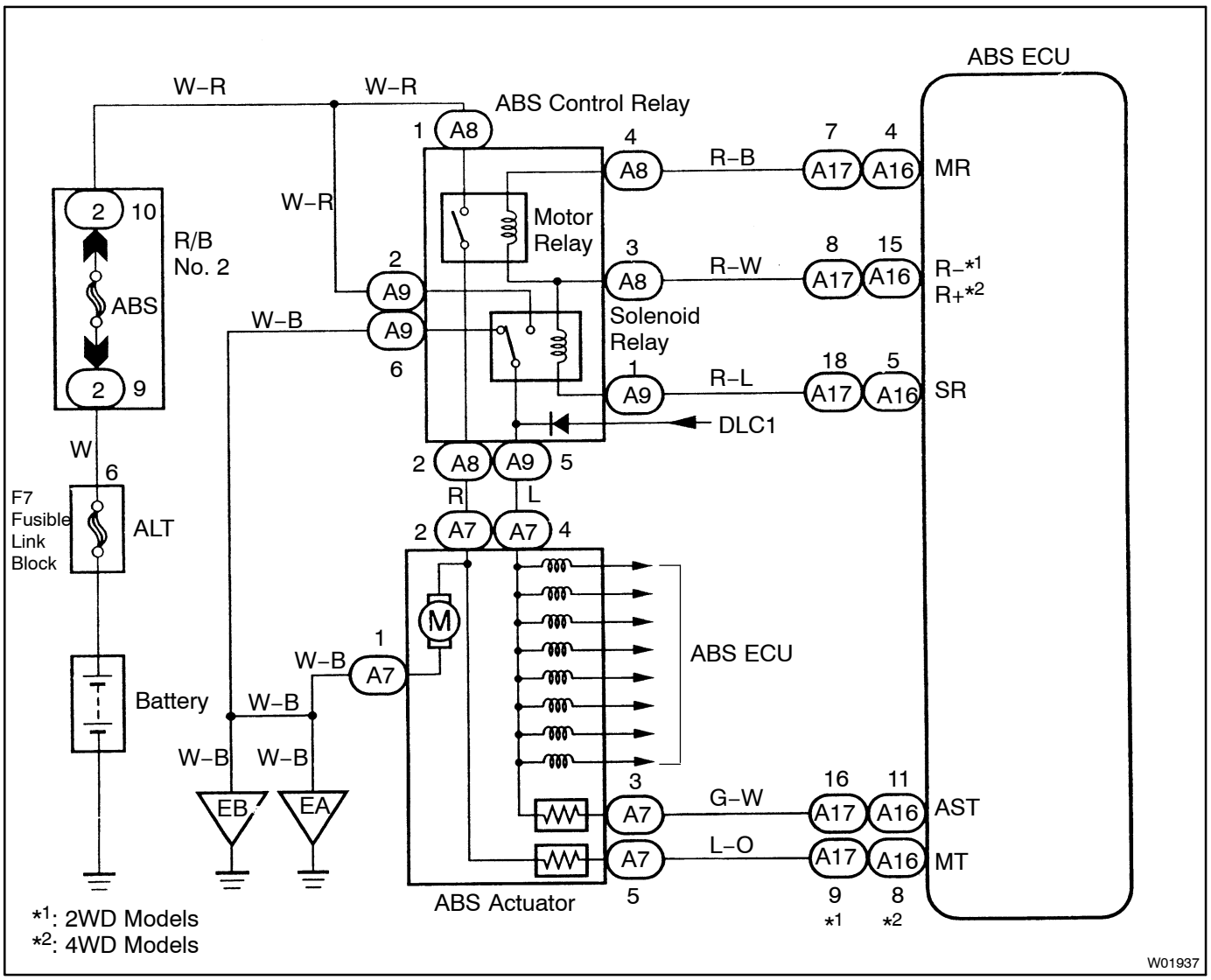
DTC	51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
51	Pump motor is not operating normally during initial check	• ABS pump motor

Fail safe function:
If trouble occurs in the ABS pump motor, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



DI41T–02

DTC	Always ON	Malfunction in ECU IG Power Source Circuit (2WD Models)

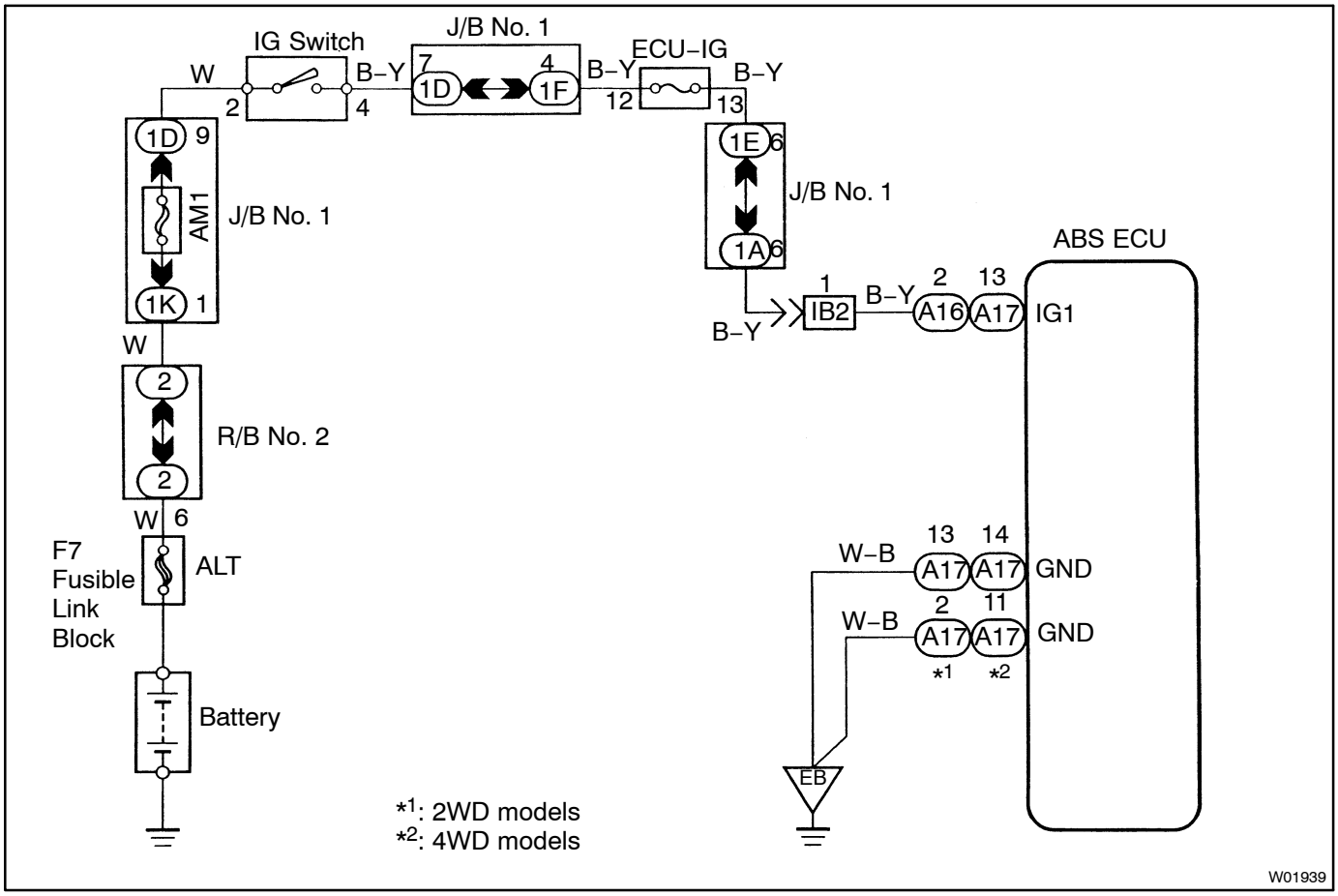
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the CPU, and the actuators.

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Voltage of ECU terminal IG1 remains at more than 17 V	• Battery • IC regulator • Open or short in power source circuit • ECU

Fail safe function:
If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Is DTC output?**

Check DTC on page DI–234.

YES → **Repair circuit indicated by code output.**

NO

2	**Is normal code displayed?**

YES → **Check ABS solenoid relay. Check for short in harness and connector between ABS solenoid relay and DLC1 (See page IN–30).**

NO

3	**Is ABS warning light go off?**

YES → **Check for open or short in harness and connector between ECU–IG Fuse and ECU (See page IN–30).**

NO

4	**Check battery positive voltage.**

PREPARATION:
Start the engine.
CHECK:
Check the battery positive voltage.
OK:

Voltage: 10 – 16 V

NG → **Check and repair charging system.**

OK

5	**Check ABS warning light.**

PREPARATION:

(a) Turn the ignition switch OFF.
(b) Disconnect the connector from the ABS ECU.
(c) Turn the ignition switch ON.

CHECK:

Check the ABS warning light goes off.

OK → **Check and replace ABS ECU.**

NG

Check for short in harness and connector between combination meter and ABS ECU, and combination meter and DLC1 (See page IN–30).

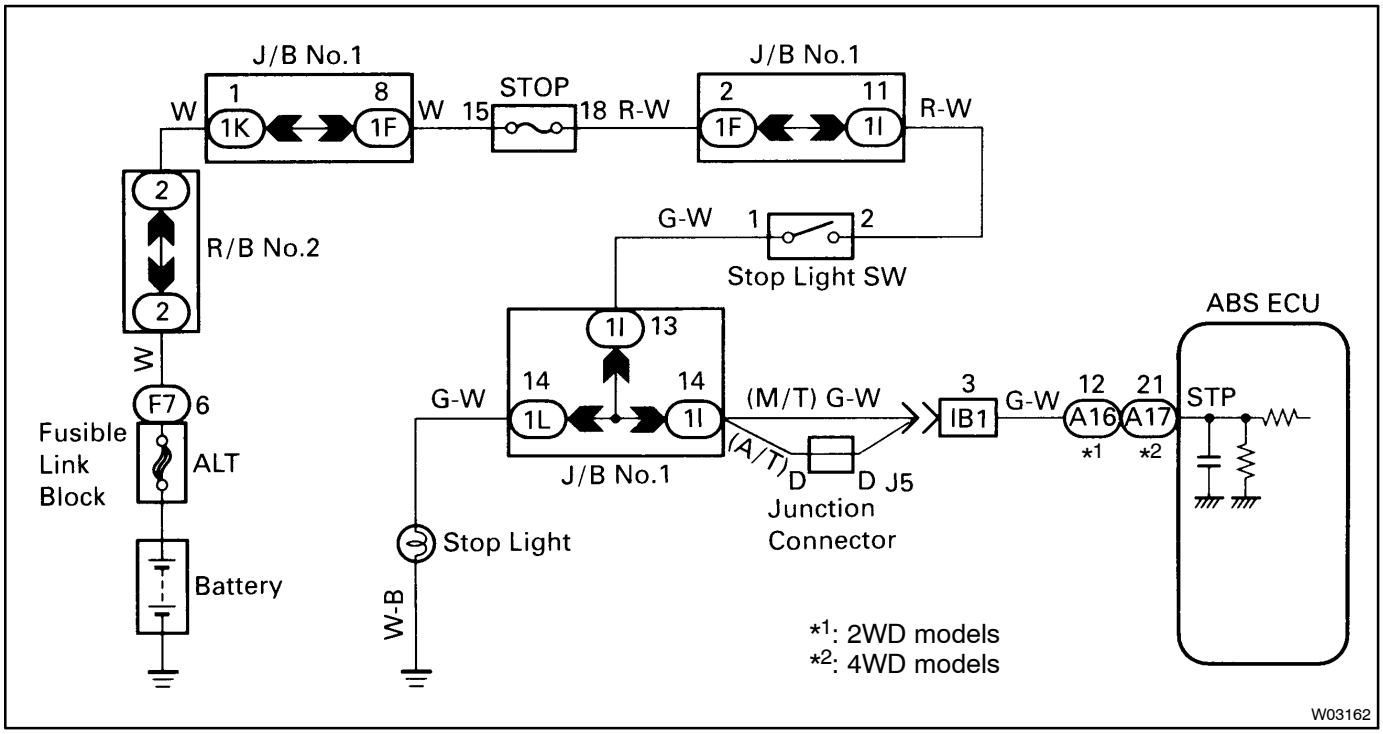
DI41R–02

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends a signal to the ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

CHECK:

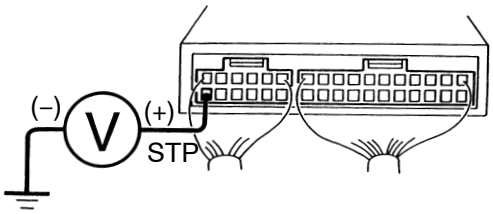
Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

NG → **Repair stop light circuit (See page BE–2).**

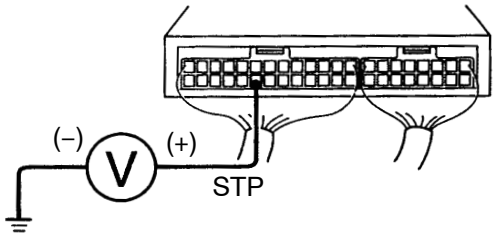
OK

2	Check voltage between terminal STP of ABS ECU and body ground.

2WD Models



4WD Models



W01410
R15785
F15320

PREPARATION:

Remove the ABS ECU with connectors still connected.

CHECK:

Measure the voltage between terminal STP of the ABS ECU and body ground when the brake pedal is depressed.

OK:

Voltage: 8 – 14 V

OK → **Proceed to next circuit inspection shown on Problem symptoms table (See page DI–245).**

NG

3	Check for open in harness and connector between ABS ECU stop light switch (See page IN–30).

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

OK

Check and replace ABS ECU.

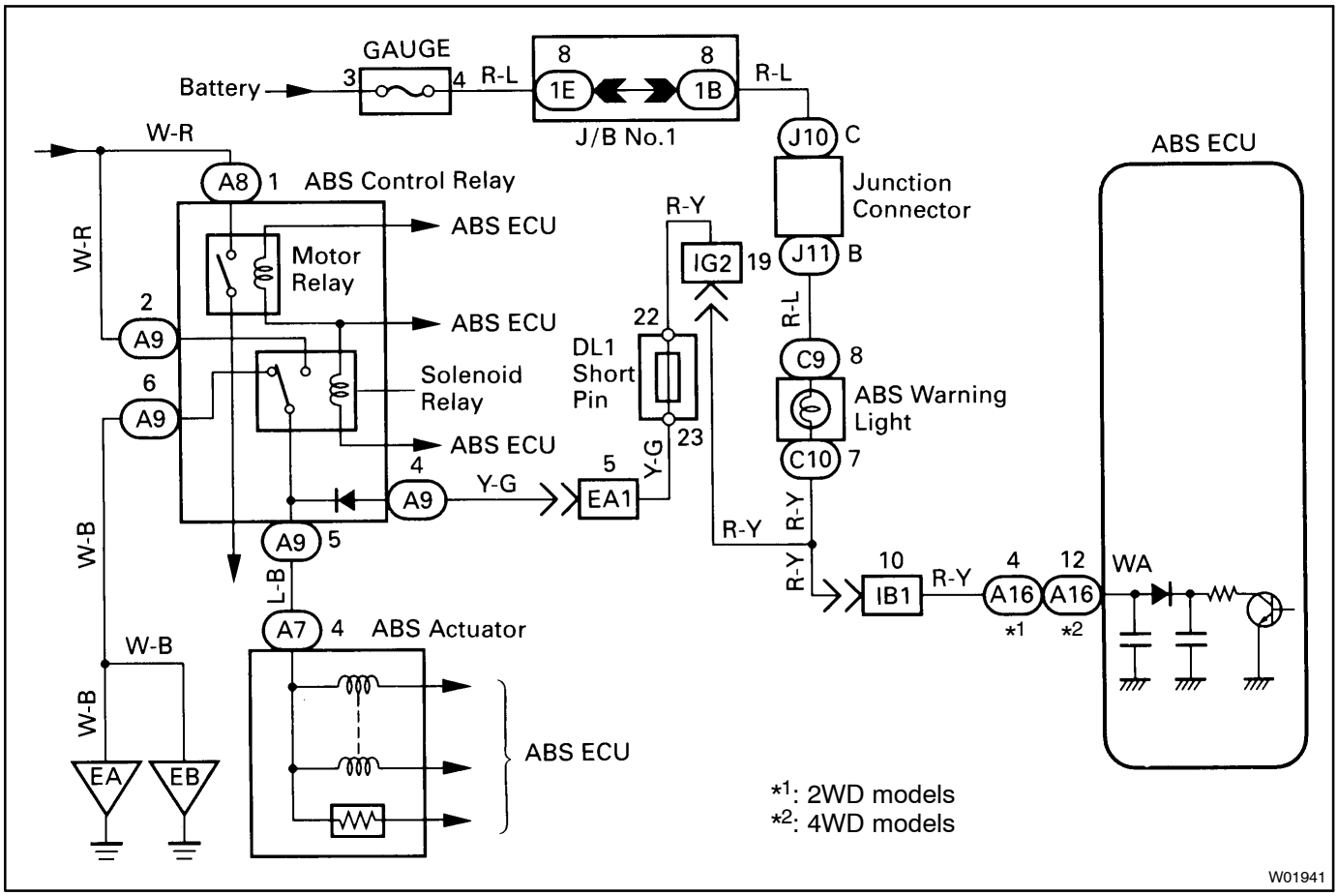
DI98X–01

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory. After removing the short pin of the DLC1, connect terminals Tc and E1 of the DLC1 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

Troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 3

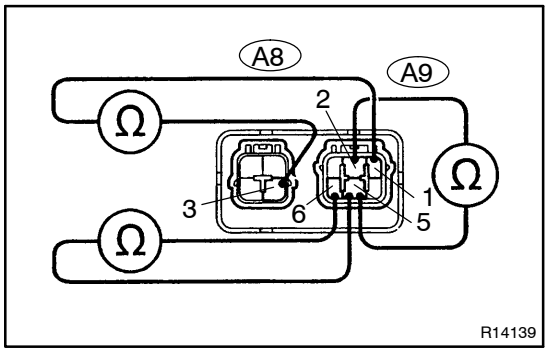
1	**Check ABS warning light.**

See combination meter troubleshooting on page BE–2.

NG → **Replace bulb or combination meter assembly.**

OK

2	Check ABS control relay.



PREPARATION:

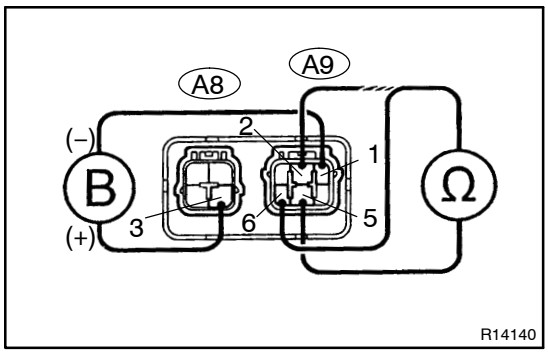
Disconnect the connectors from the control relay.

CHECK:

Check the continuity between each terminal of the ABS control relay.

OK:

Terminals A9–1 and A8–3	Continuity (Reference value 80 Ω)
Terminals A9–5 and A9–6	Continuity
Terminals A9–2 and A9–5	Open



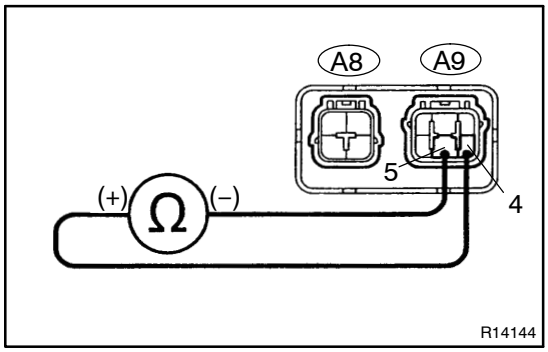
CHECK:

(a) Apply battery voltage between terminals A9–1 and A8–3.

(b) Check the continuity between each terminal of the ABS control relay.

OK:

Terminals A9–5 and A9–6	Open
Terminals A9–2 and A9–5	Continuity



CHECK:

Connect the ⊕ test lead to terminal A9–4 and the ⊖ lead to terminal A9–5. Check the continuity between the terminals.

OK:

Continuity

If there is no continuity, connect the ⊖ test lead to terminal A9–4 and the ⊕ lead to terminal A9–5. Recheck the continuity between the terminals.

NG → **Replace ABS control relay.**

OK

Check for open in harness and connector between DLC1 and ABS control relay and body ground (See page IN–30).

3	**Is DTC output?**

Check DTC on page DI–234.

YES → **Repair circuit indicated by code output.**

NO

4	**Does ABS warning light go off if short pin is removed?**

NO → **Check for short in harness and connector between warning light and DLC1 and ECU (See page IN–30).**

YES

5	**Check ABS control relay (See step No. 2).**

NG → **Replace ABS control relay.**

OK

Check for short in harness and connect between DLC1 and ABS control relay (See page IN–30).

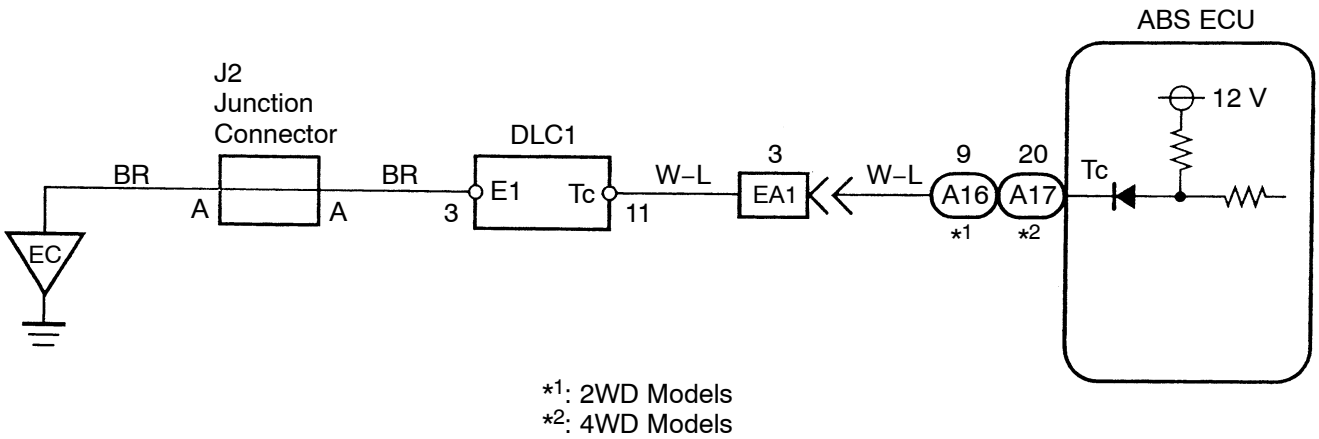
DI41V–02

Tc Terminal Circuit

CIRCUIT DESCRIPTION

Connecting terminals Tc and E1 of the DLC1 causes the ECU to display the DTC by flashing the ABS warning light.

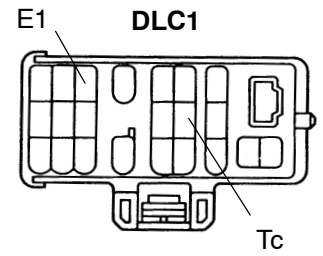
WIRING DIAGRAM



W01418 F15322

INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E1 of DLC1.**



F15316

CHECK:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals Tc and E1 of the DLC1.

OK:

Voltage: 10 – 14 V

OK → **If ABS warning light does not blink even after Tc and E1 are connected, ECU may be defective.**

NG

2	**Check for open and short in harness and connector between ABS ECU and DLC1, and DLC1 and body ground (See page IN–30).**

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

OK

Check and replace ABS ECU.

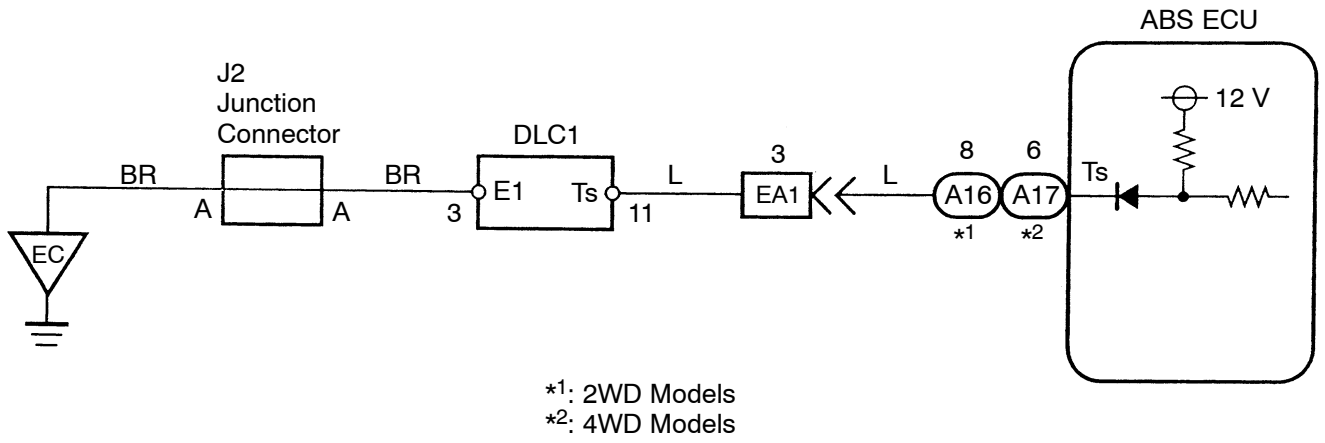
DI41W–02

Ts Terminal Circuit

CIRCUIT DESCRIPTION

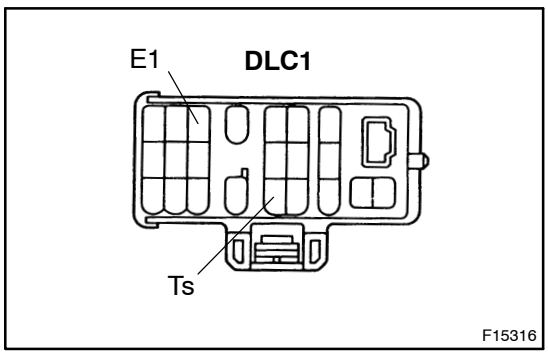
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check. Connecting terminals Ts and E1 of the DLC1 in the engine compartment starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Ts and E1 of DLC1.**



PREPARATION:

(a) Turn the ignition switch ON.

(b) Measure the voltage between terminals Ts and E1 of the DLC1.

OK:

Voltage: 10 – 14 V

OK

If ABS warning light does not blink even after Ts and E1 are connected, ECU may be defective.

NG

2	**Check for open and short in harness and connector between ABS ECU and DLC1, and DLC1 and body ground (See page IN–30).**

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

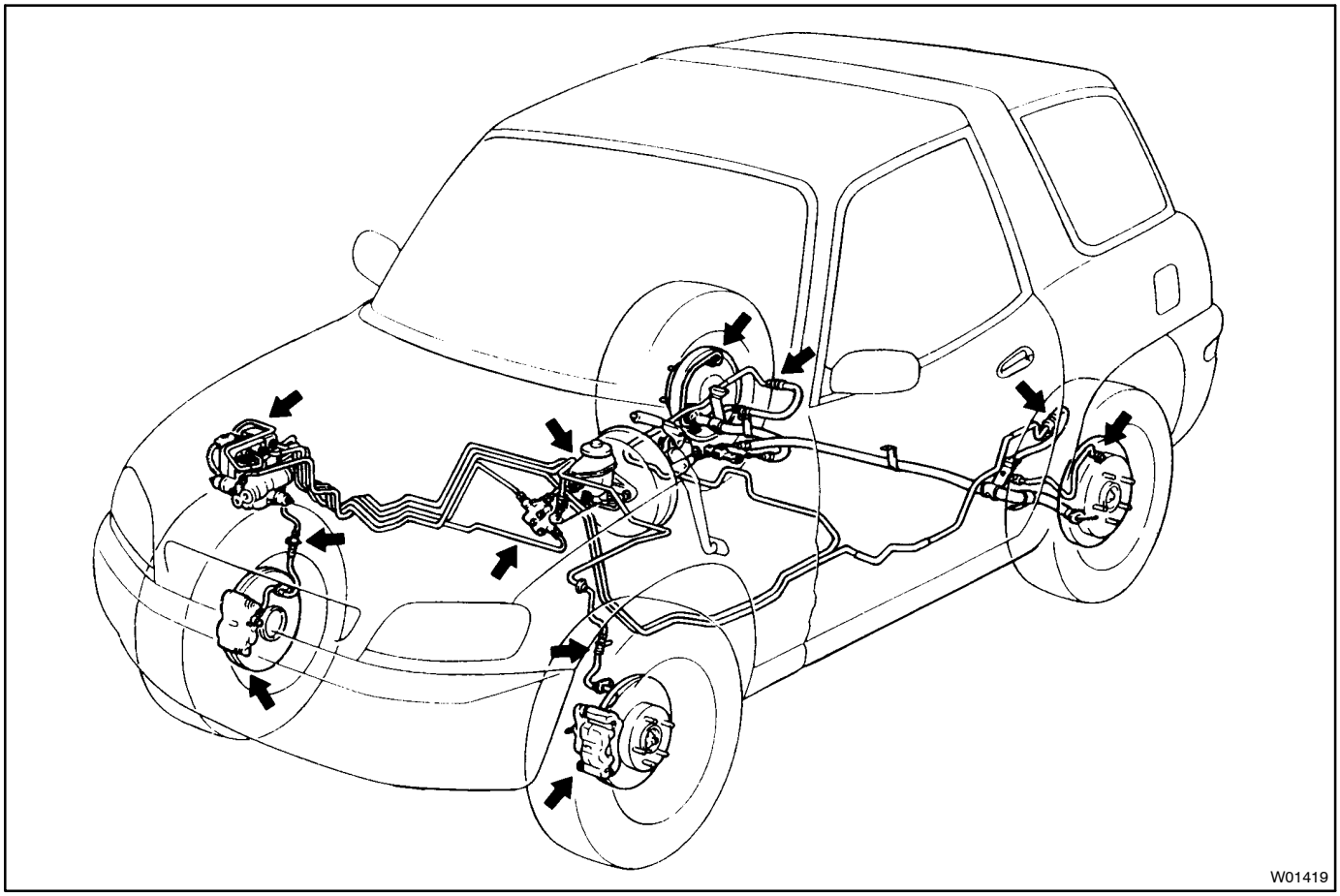
OK

Check and replace ABS ECU.

DI41X–02

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.

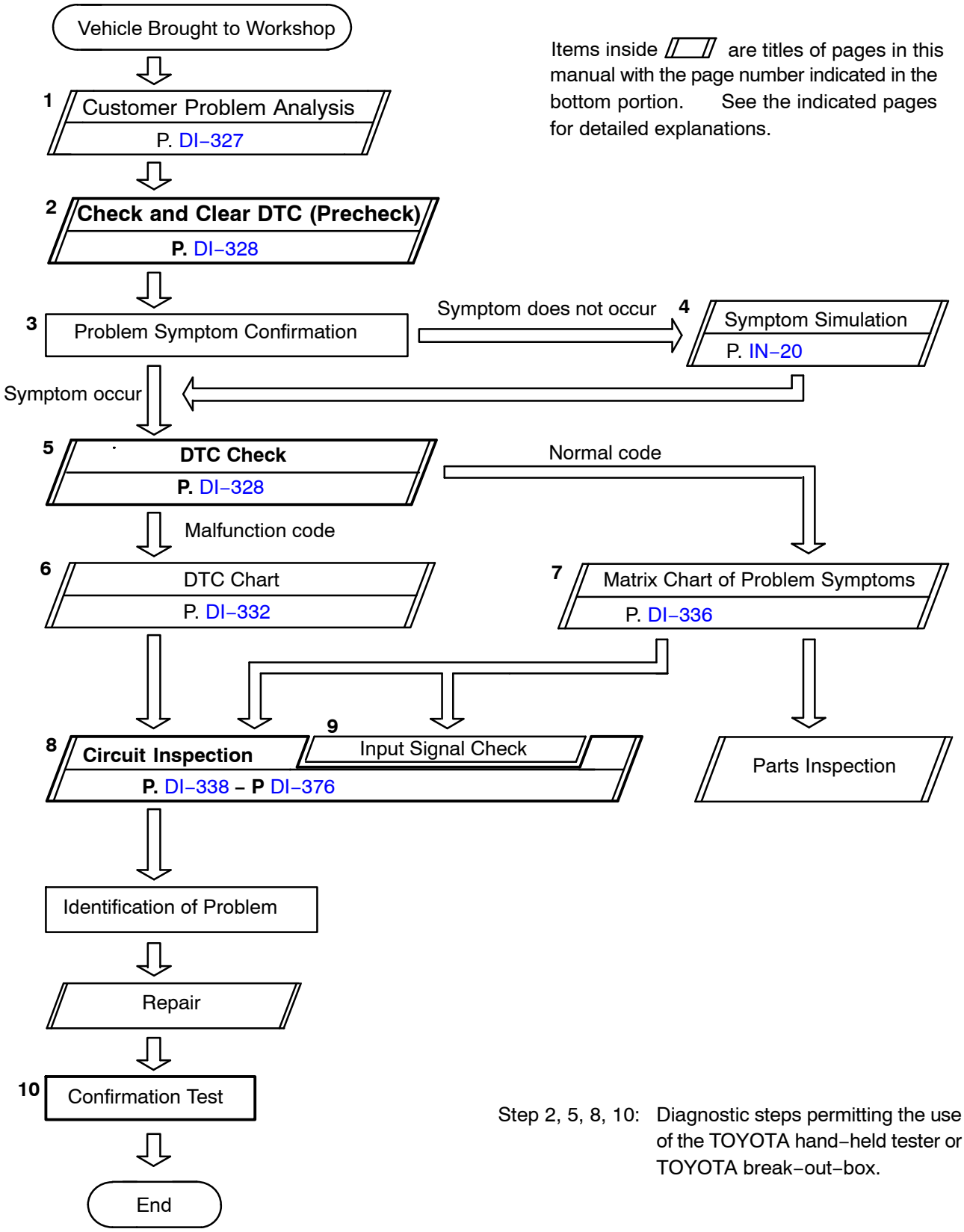


CRUISE CONTROL SYSTEM

DI42G–01

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting in accordance with the procedure on the following page.



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.

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

DI42H–01

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

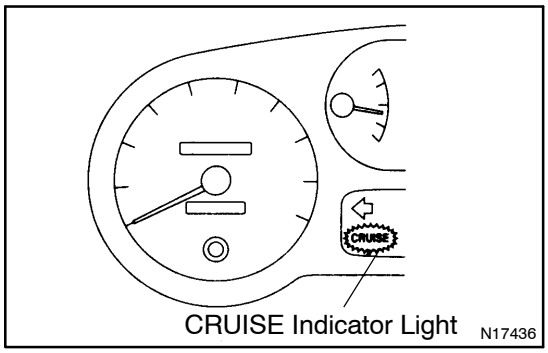
Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

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 ☐ 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
	☐ Faulty CRUISE MAIN indicator light	☐ Remains ON ☐ Does not light up ☐ Blinking

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

DI42I–02



PRE–CHECK

1. DIAGNOSIS SYSTEM

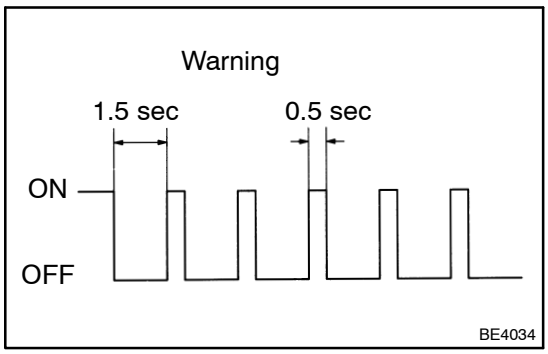
(a) Check the indicator.

(1) Turn the ignition switch to ON.

(2) Check that the CRUISE MAIN indicator light comes on when the cruise control main switch is pushed ON, and that the indicator light goes off when the main switch is pushed OFF.

HINT:

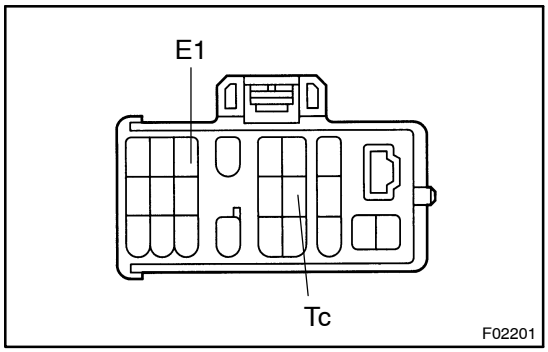
If the indicator check result is not normal, proceed to trouble-shooting (See page BE–2) for the combination meter section.



(b) Check the DTC.

HINT:

If a malfunction occurs in the vehicle speed sensors or actuator, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and blinks the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stored in memory as a DTC.



(c) Output of DTC using diagnosis check wire.

(1) Turn the ignition switch to ON.

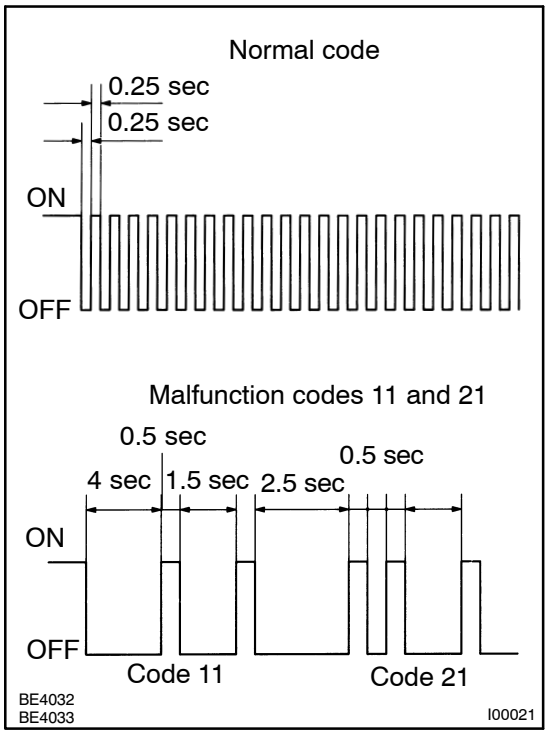
(2) Using SST, connect terminals Tc and E_1 of DLC1.

SST 09843–18020

(3) Read the DTC on the CRUISE MAIN indicator light.

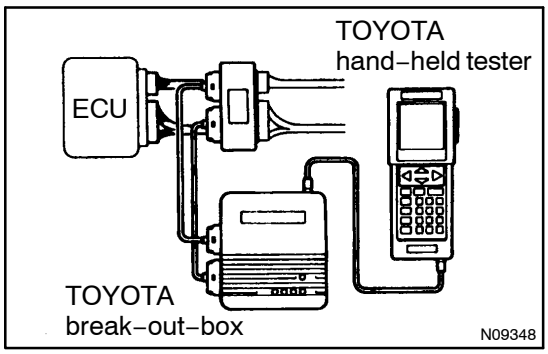
HINT:

- If the DTC is not output, inspect the diagnosis circuit (See page DI–374).
- As an example, the blinking patterns for codes; normal, 11 and 21 are shown in the illustration.



(4) Check for the problem, use the DTC table on the next page.

(5) After completing the check, disconnect terminals Tc and E_1, and turn off the display.



2. ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BRAKE–OUT–BOX AND TOYOTA HAND–HELD TESTER

(a) Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.

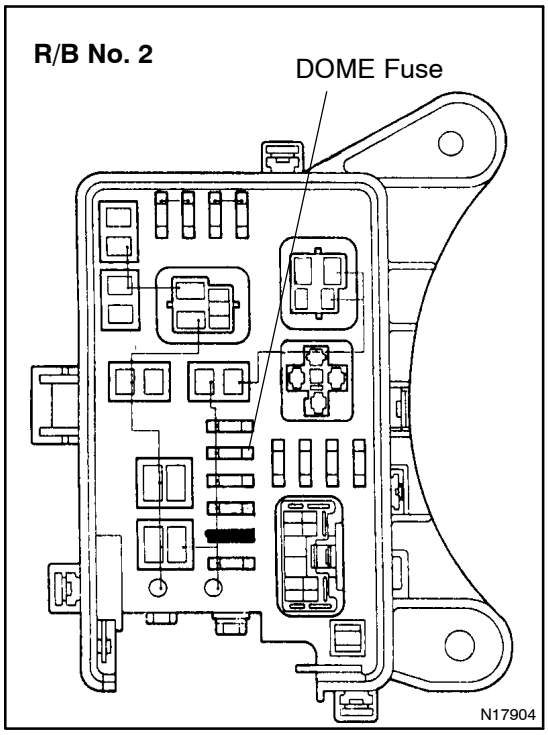
(b) Read the ECU input/output values by following the prompts on the scan tool screen.

HINT:

TOYOTA hand–held tester has a "Snapshot" function.

This records the measured values and is effective in the diagnosis of intermittent problems.

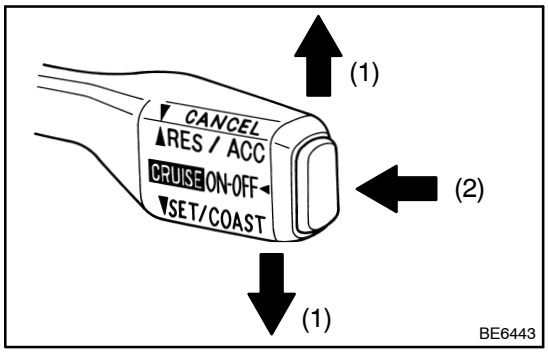
Please refer to the TOYOTA hand–held tester/TOYOTA break–out–box operator's manual for further details.



3. DTC CLEARANCE

(a) After completing repairs, the DTC retained in memory can be cleared by removing the ECU–IG fuse for 10 seconds or more, with the ignition switch off.

(b) Check that the normal code is displayed after connecting the fuse.



4. INPUT SIGNAL CHECK

HINT:

(1) For check No.1 – No.2.
- Turn the ignition switch ON.

(2) For check No.3.
- Turn ignition switch ON.
- Shift to D position. (A/T Vehicle)

(3) For check No.4.
- Jack up the vehicle.
- Start the engine.
- Shift to D position. (A/T Vehicle)

(a) Press the control switch to the SET/COAST or RES/ACC position and hold it down or hold it 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.

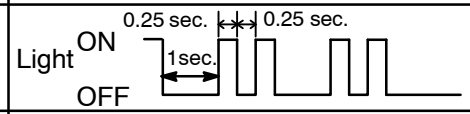
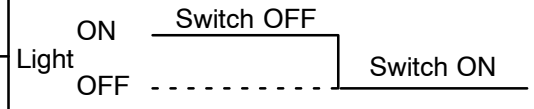
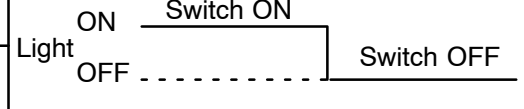
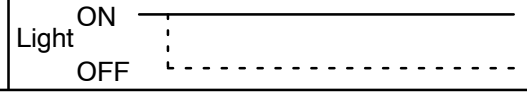
(e) Operate each switch as listed in the table below.

(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 lowest 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		

DI42J–02

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)	Detection Item	Trouble Area
–	• Normal	–
11 (DI–338)	• Actuator Motor Circuit	• Cruise control actuator motor • Harness or connector between actuator motor and ECU • ECU
12 (DI–340)	• Actuator Magnetic Clutch Circuit	• Cruise control actuator magnetic clutch • Harness or connector between ECU and magnetic clutch, magnetic clutch and body ground • ECU • STOP Fuse
13 (DI–343)	• Actuator Position Senor Circuit	• Cruise control actuator position sensor • Harness or connector between actuator position sensor and ECU • ECU
14 (DI–338)	• Actuator Motor Circuit • Actuator Position Sensor Circuit	• Cruise control actuator motor • Cruise control actuator position sensor • Harness or connector between actuator position sensor and body ground • Harness or connector between actuator motor and ECU • ECU
*21 (DI–346)	• Vehicle Speed Sensor Circuit	• Vehicle speed sensor • Combination meter • Harness or connector between vehicle speed sensor and combination meter, combination meter and ECU • ECU
32 (DI–348)	• Control Switch Circuit (Cruise Control Switch)	• Cruise control switch • Harness and connector between control switch and ECU • ECU
41	• Cruise Control ECU	• ECU
42	• Source Voltage Drop	• Battery

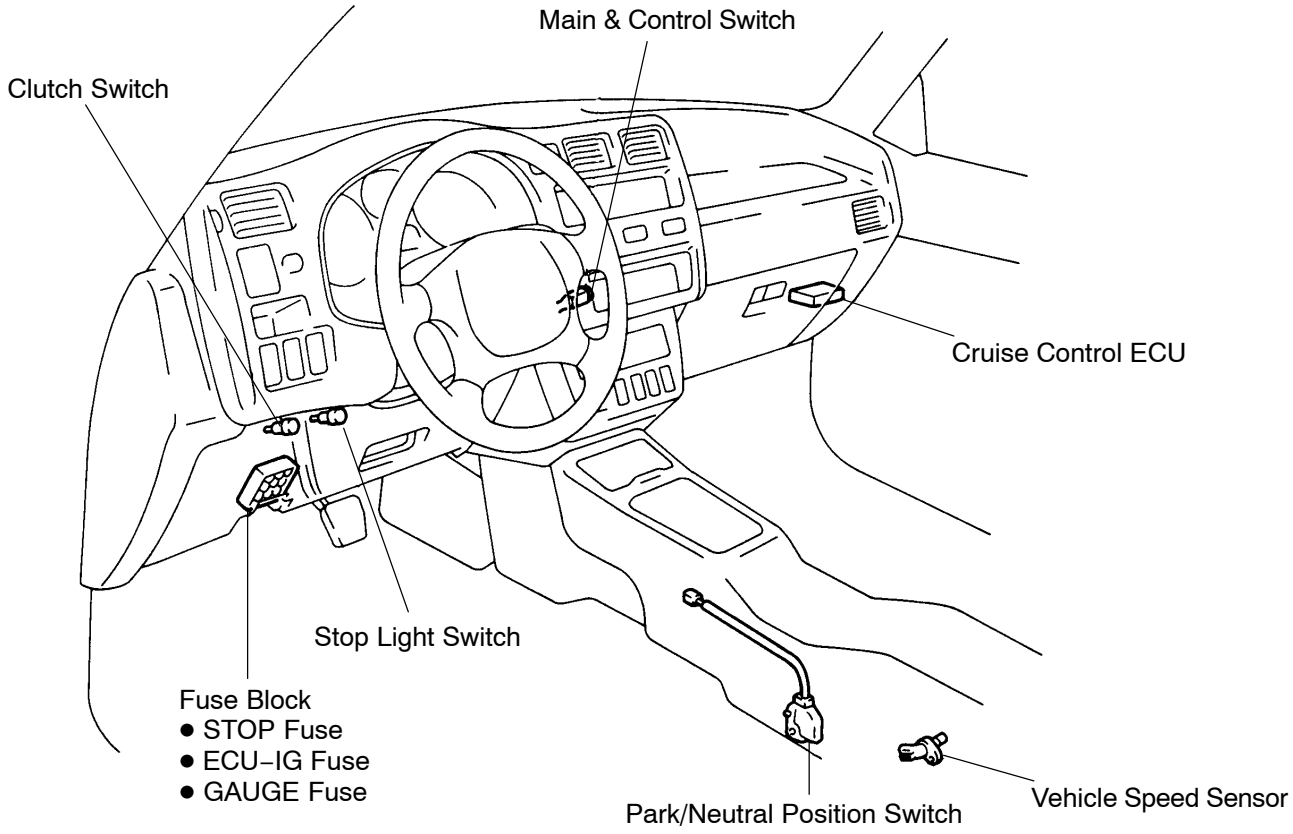
HINT:

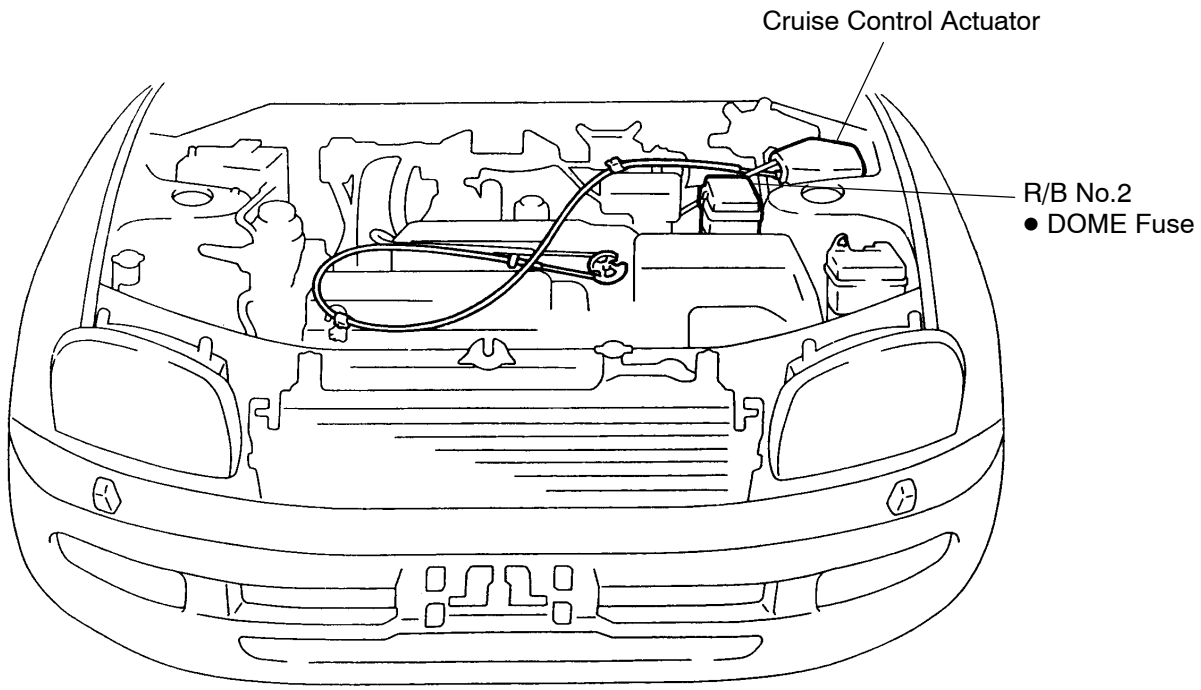
- When 2 or more codes are indicated, the lowest numbered code will be displayed first.
- If the inspection ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue check.
- If the trouble still reappears even though there are no abnormalities in any of the other circuits, then check or replace the cruise control ECU as the last step.

(*) When the vehicle speed decrease on uphill roads, the speed can be set again and driving continued. (This is not a malfunction.)

DI42K–01

PARTS LOCATION

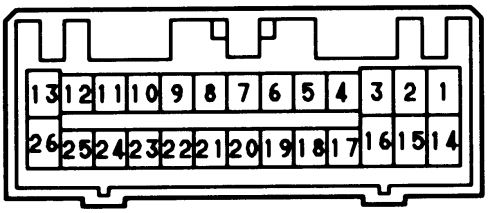




I10025

DI7HO–01

TERMINALS OF ECU



CRUISE Control ECU

I10026

Symbols	Terminals	Condition	Standard Value
D ↔ GND	2 – 13	M/T: Depress clutch pedal. A/T: Shift to except D position.	Below 1 V
		M/T: Release clutch pedal. A/T: Shift to D position.	10 – 16 V
Pi ↔ GND	7 – 13	IG ON. Main switch ON. Main indicator light ON.	Below 1.2 V
		IG ON. Main switch OFF. Main indicator light OFF.	10 – 16 V
Tc ↔ GND	8 – 13	Ignition switch ON.	10 – 16 V
O/D ↔ GND	9 – 13	Except during cruise control driving.	10 – 16 V
		O/D Switch ON. During cruise control driving . (Driving on flat road).	10 – 16 V
		O/D Switch OFF. During cruise control driving . (3rd driving).	Below 1 V
L ↔ GND	10 – 13	During cruise control driving.	9 – 15 V
		Except during cruise control driving.	Below 1 V
MC ↔ GND	11 – 13	During cruise control driving . COAST switch hold ON.	9 – 16 V
		During cruise control driving . ACCEL switch hold ON.	Below 1 V
MO ↔ GND	12 – 13	During cruise control driving. ACCEL switch hold ON.	9 – 15 V
		During cruise control driving. COAST switch hold ON.	Below 1 V
GND ↔ Body Ground	13 – Body Ground	Always.	Below 1 V
B ↔ GND	14 – 13	Ignition switch ON.	10 – 16 V
BATT ↔ GND	15 – 13	Always.	10 – 16 V
STP– ↔ GND	16 – 13	Depress brake pedal.	10 – 16 V
		Release brake pedal.	Below 1 V

CCS ↔ GND	18 – 13	IG ON. Main switch ON. Switch neutral position.	10 – 16 V
		IG ON. Main switch ON. CANCEL switch hold ON.	5.1 – 8.3 V
		IG ON. Main switch ON. SET/COAST switch hold ON.	2.4 – 4.0 V
		IG ON. Main switch ON. RESUME/ACCEL switch hold ON.	0.8 – 1.4 V
CMS ↔ GND	19 – 13	IG ON. Main switch hold ON. (Indicator light ON)	Below 1 V
		IG ON. Main switch hold OFF. (Indicator light OFF)	10 – 16 V
SPD ↔ GND	20 – 13	Engine start. Car stationary.	4.7 – 5.2 V
		During driving. (Pulse generated)	3 – 7 V
IDL ↔ GND	21 – 13	IG ON. Throttle valve fully opened.	Below 1 V
		IG ON. Throttle valve fully closed.	10 – 16 V
ECT ↔ GND	22 – 13	During cruise control driving. O/D switch ON.	Below 1 V
		During cruise control driving. O/D switch OFF (3rd driving).	10 – 16 V
VR1 ↔ GND	23 – 13	Ignition switch ON.	4.7 – 5.2 V
VR2 ↔ VR3	24 – 25	During cruise control driving.	1.0 – 4.7 V
		IG ON. Control plate fully opened.	4.2 – 4.7 V
		IG ON. Control plate fully closed.	1.0 – 1.2 V
VR3 ↔ GND	25 – 13	Always.	Below 1 V
L– ↔ GND	26 – 13	Always.	Below 1 V

DI42M–01

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the trouble still occurs (reappears), troubleshoot for each problem symptom, checking the circuits for each symptom in the order given in the table below. Proceed to the page indicated for each circuit.

HINT:

- 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 reappears even through there are no abnormalities in any of the other circuits, then check or replace the cruise control ECU as the last step.

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 Circuit 3. Control Switch Circuit (Cruise Control Switch) 4. Stop Light Switch Circuit 5. Park/Neutral Position Switch Circuit 6. Clutch Switch Circuit 7. Actuator 8. Cruise Control ECU	DI–371 DI–346 DI–348 DI–351 DI–360 DI–363 DI–338 IN–30
SET not occurring or CANCEL occurring. (DTC does not output)	1. ECU Power Source Circuit 2. Cruise Control ECU	DI–366 IN–30
Actual vehicle speed deviates above or below the set speed.	1. Actuator Control Cable 2. Vehicle Speed Sensor Circuit 3. Actuator 4. Cruise Control ECU	DI–376 DI–346 DI–338 IN–XXX
Gear shifting is frequent between 3rd and OD when driving on uphill road. (Hunting)	1. Electronically Controlled Transaxle Communication Circuit 2. Cruise Control ECU	DI–357 IN–30
Cruise control not cancelled, even when brake pedal is depressed.	1. Actuator Control Cable 2. Stop Light Switch Circuit 3. Actuator 4. Cruise Control ECU	DI–376 DI–351 DI–338 IN–30
Cruise control not cancelled, even when transmission is shifted to except D position. (A/T)	1. Actuator Control Cable 2. Park/Neutral Position Switch Circuit 3. Actuator 4. Cruise Control ECU	DI–376 DI–360 DI–338 IN–30
Cruise control not cancelled, even when clutch pedal depressed. (M/T)	1. Actuator Control Cable 2. Clutch Switch Circuit 3. Actuator 4. Cruise Control ECU	DI–376 DI–363 DI–338 IN–30
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	1. Actuator Control Cable 2. Control Switch Circuit (Cruise Control Switch) 3. Actuator 4. Cruise Control ECU	DI–376 DI–363 DI–338 IN–30
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Actuator Control Cable 2. Vehicle Speed Sensor Circuit 3. Actuator 4. Cruise Control ECU	DI–376 DI–346 DI–338 IN–30
Poor response in ACCEL and RESUME modes.	1. Actuator Control Cable 2. Electronically Controlled Transaxle Communication Circuit 3. Control Switch Circuit (Cruise Control Switch) 4. Actuator 5. Cruise Control ECU	DI–3764 DI–357 DI–363 DI–338 IN–30

O/D does not Resume, even through the road is not uphill.	1. Electronically Controlled Transaxle Communication Circuit 2. Cruise Control ECU	DI–357 IN–30
DTC memory is erased.	1. Back–up Power Source Circuit 2. Cruise Control ECU	DI–369 IN–30
DTC is not output, or is output when is should not be.	1. Cruise Control ECU	IN–30
Cruise MAIN indicator light remains ON or fails to light up.	Combination meter troubleshooting on page BE–2	

DI42N–02

CIRCUIT INSPECTION

DTC	11, 14	Actuator Motor Circuit

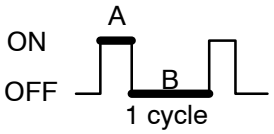
CIRCUIT DESCRIPTION

The actuator motor is operated by signals from the ECU. Acceleration and deceleration signals are transmitted by changes in the Duty Ratio (See note below).

Duty Ratio:

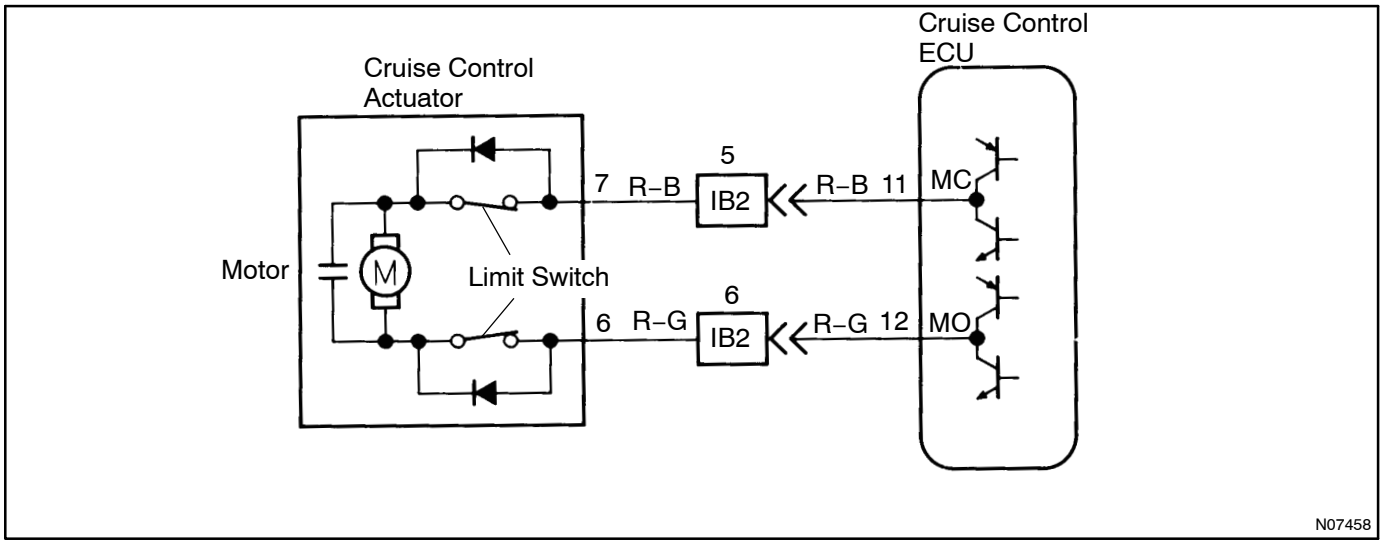
The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then.

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$



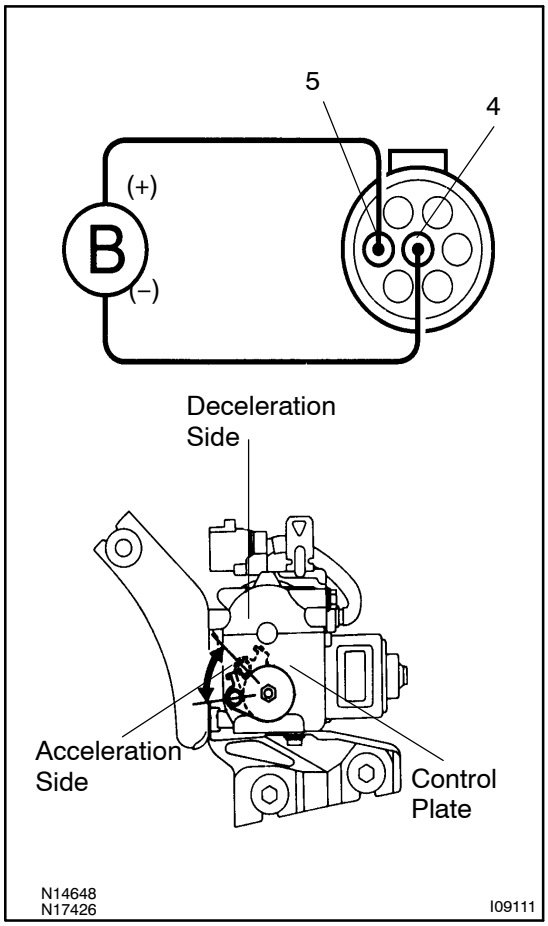
DTC No.	Detection Item	Trouble Area
11	• Short in motor circuit	• Cruise control actuator motor • Harness or connector between actuator motor and ECU • ECU
14	• Open in actuator motor circuit	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check actuator motor.**



PREPARATION:

(a) Remove cruise control actuator.

(b) Disconnect actuator connector.

CHECK:

(a) Connect positive + lead to terminal 5 and negative – lead to terminal 4 of actuator connector (Magnetic clutch ON).

NOTICE:

Do not connect the high tension cables to the wrong battery terminal.

You will damage the cruise control actuator.

(b) When battery positive voltage is applied to each terminal of actuator connector, check that the control plate moves smoothly without hesitating.

Moving direction	Terminal No. to connect	
Acceleration side	Positive + – 6	Negative – – 7
Deceleration side	Positive + – 7	Negative – – 6

(c) With the motor rotating as in 2., check that the motor is stopped by limit switches when the control plate moves to fully opened or fully closed position.

NG → **Replace actuator assembly.**

OK

2	**Check harness and connector between cruise control ECU and actuator motor (See page IN–30).**

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

OK

Proceed to next circuit inspection shown on matrix chart (See page DI–336).
However, when DTC 11, 14 is displayed, check and replace cruise control ECU.

DI42O–02

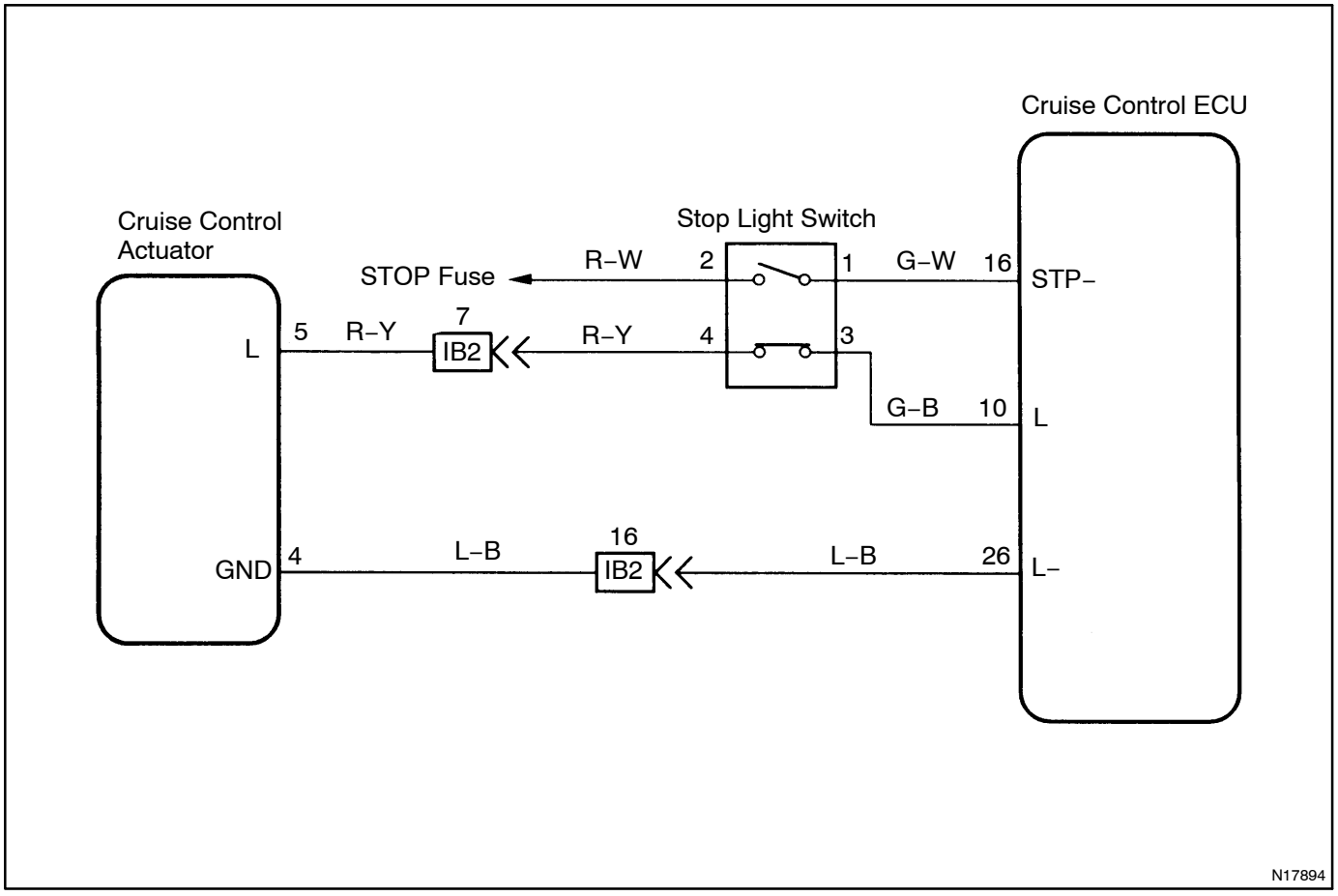
DTC	12	Actuator Magnetic Clutch Circuit

CIRCUIT DESCRIPTION

This circuit turns on the magnetic clutch inside the actuator during cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or vehicle speed sensor, etc. during cruise control, the rotor shaft between the motor and control plate is released.
When the brake pedal is depressed, the stop light switch turns on, supplying electrical power to the stop light. Power supply to the magnetic clutch is mechanically cut and 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 magnetic clutch OFF. If the vehicle speed later drops to within 10 km/h (6 mph) above the set speed, then cruise control at the set speed is resumed.

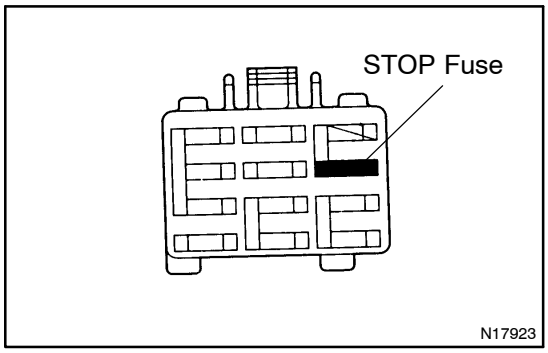
DTC No.	Detection Item	Trouble Area
12	• Short in magnetic clutch circuit • Open (0.8 sec.) in magnetic clutch circuit	• Cruise contorl actuator magnetic clutch • Harness or connector between ECU and magnetic clutch, magnetic clutch and body ground • ECU • STOP Fuse

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check STOP fuse.



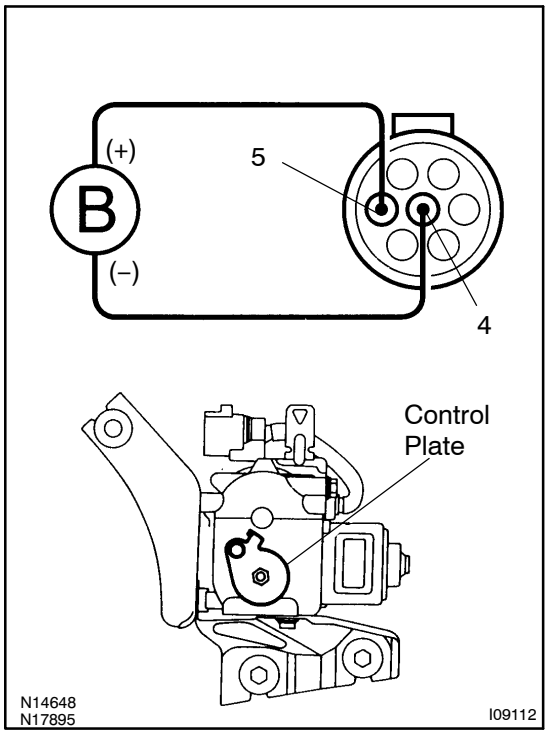
PREPARATION:
Remove STOP fuse from fuse block.
CHECK:
Check continuity of STOP fuse.
OK:

Continuity

NG	Check for short in all the harness and components connected to the STOP fuse (See attached wiring diagram).

OK

2	Check actuator magnetic clutch.



PREPARATION:
(a) Remove cruise control actuator.
(b) Disconnect actuator connector.
CHECK:
Move the control plate by hand.
OK:

Control plate moves. (Magnetic clutch off)

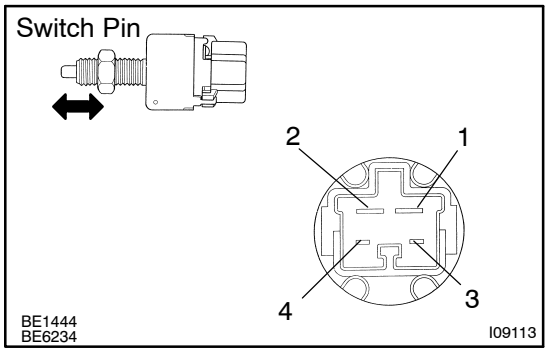
CHECK:
(a) Connect positive + lead to terminal 5 and negative – lead to terminal 4 of actuator connector.
(b) Move the control plate by hand.
NOTICE:
Do not connect the high tension cables to the wrong battery terminal.
You will damage the cruise control actuator.
OK:

Control plate does not move. (Magnetic clutch on)

NG	Replace actuator assembly.

OK

3	**Check stop light switch.**



PREPARATION:

Disconnect stop light switch connector.

CHECK:

Check continuity between terminals.

OK:

Switch position	Terminal No. to continuity
Switch pin free (Brake pedal depressed)	1 – 2
Switch pin pushed in (Brake pedal released)	3 – 4

NG → **Replace stop light switch.**

OK

4	**Check for open and short in harness and connectors between ECU and stop light switch, stop light switch and magnetic clutch, magnetic clutch and body ground (See page IN–30).**

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

OK

Proceed to next circuit inspection shown on matrix chart (See page DI–336).
However, when DTC 12 is displayed, check harness and connector for loose connection.
If connection is normal, check and replace ECU.

DI42P–02

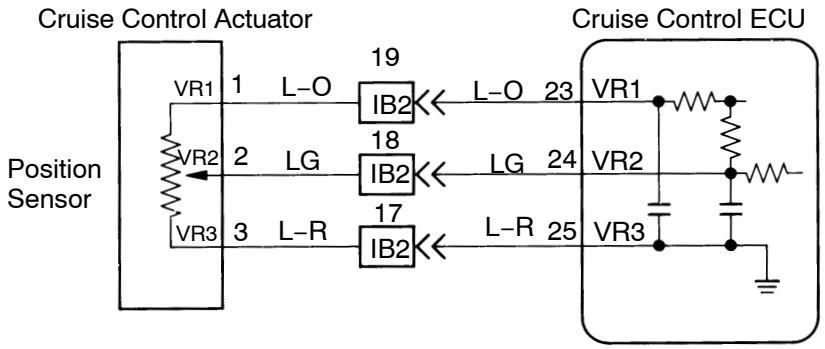
DTC	13, 14	Actuator Position Sensor Circuit

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
13	• Position sensor detects abnormal voltage	• Cruise control actuator motor • Cruise control actuator position sensor • Harness or connector between actuator position sensor and body ground • Harness or connector between actuator motor and ECU • ECU
14	• Open in actuator motor circuit • Position sensor signal value does not change when the motor operates	

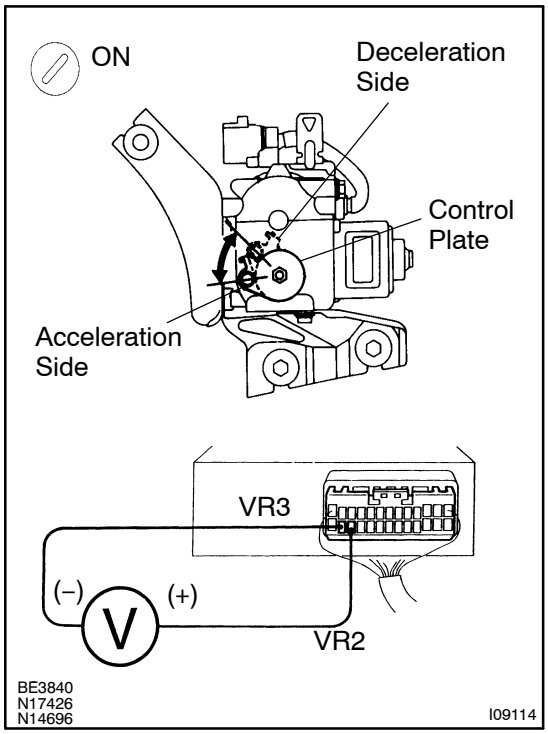
WIRING DIAGRAM



N07460

INSPECTION PROCEDURE

1	**Check voltage between terminals VR2 and VR3 of ECU connector.**



PREPARATION:

Remove ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminals VR2 and VR3 of ECU connector while turning control plate slowly by hand from the deceleration side to the acceleration side.

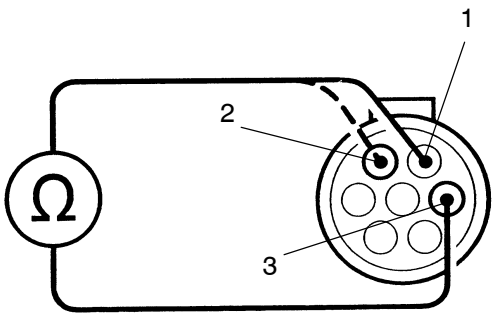
OK:

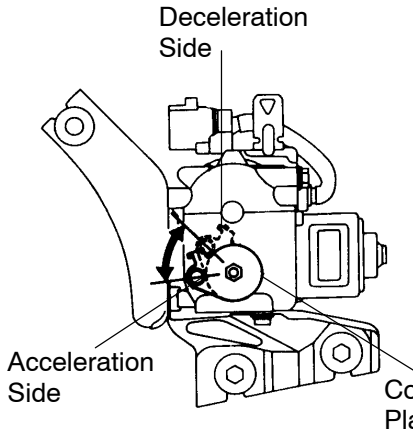
Voltage:
Fully closed: approx. 1.3 V
Fully opened: approx. 4.0 V
Note: As the control plate is turned, the voltage should increase gradually without interruption.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

2	Check actuator position sensor.





N14650
N17426 I22688

PREPARATION:

(a) Remove cruise control actuator.

(b) Disconnect the actuator connector.

CHECK:

Measure resistance between actuator terminals 1 and 3 of actuator connector.

OK:

Resistance: Approx. 2.2 kΩ

CHECK:

Measure resistance between terminals 2 and 3 of actuator connector, while turning the control plate slowly by hand from the deceleration side to the acceleration side.

OK:

Resistance:
Fully closed: Approx. 530 kΩ
Fully opened: Approx. 2.0 kΩ
Note: As the control plate turns, the resistance should increase gradually without interruption.

NG → **Replace actuator assembly.**

OK

3	Check for open and short in harness and connector between ECU and actuator position sensor (See page IN–30).

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

OK

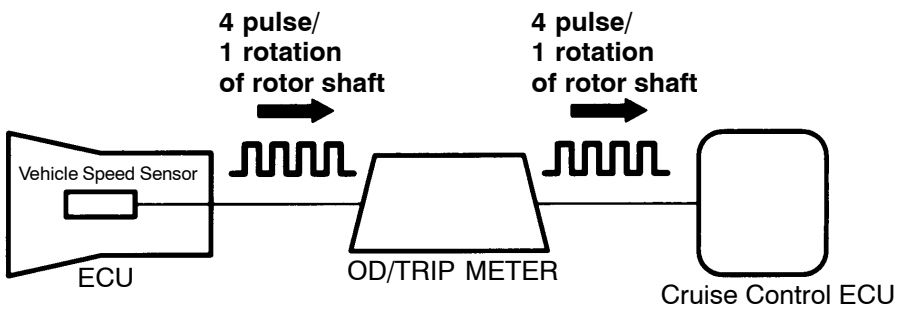
Check harness and connector for loose connection. If connection is normal check and replace ECU.

DI42Q–02

DTC	21	Vehicle Speed Sensor Circuit

CIRCUIT DESCRIPTION

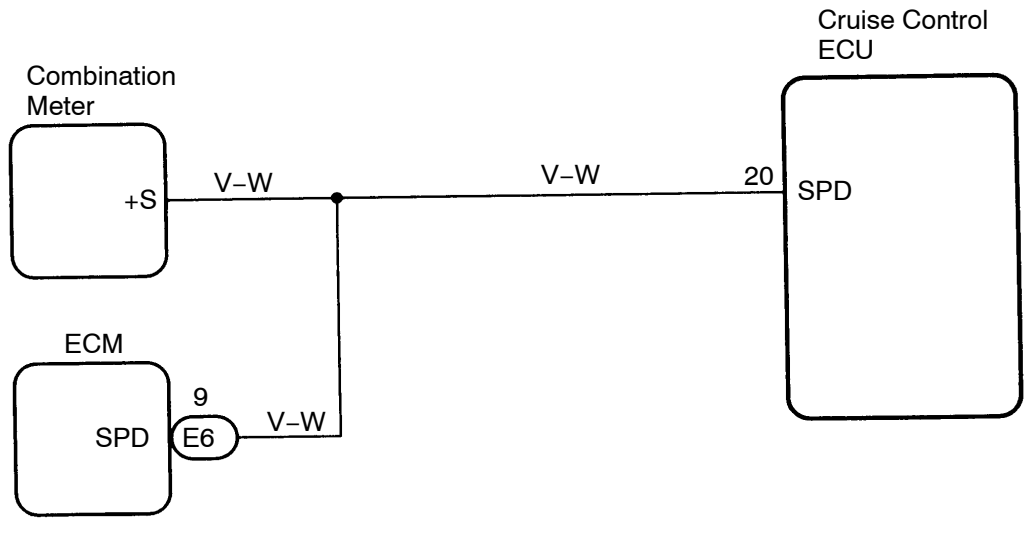
The vehicle speed sensor signal is sent to the cruise control ECU as the vehicle speed signal.
The rotor shaft in driven by the gear of the transaxle.
For each rotation of the shaft, the speed sensor sends a 4–pulse signal to the combination meter.
This signal is converted inside the combination meter and sent as a 4–pulse signal to the cruise control ECU.
The ECU calculates the vehicle speed from this pulse frequency.



I00292

DTC No.	Detection Item	Trouble Area
21	Speed signal is not input to the ECU while cruise control is set	• Vehicle speed sensor • Combination meter • Harness or connector between speed sensor and combination meter, combination meter and ECU • ECU
23	Vehicle speed sensor pluse is abnormal	• Vehicle speed sensor • Harness or connector (SPD) • ECU

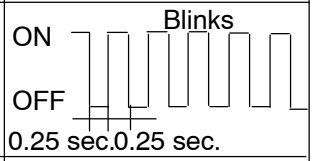
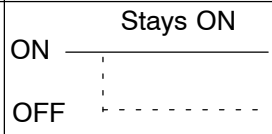
WIRING DIAGRAM



N17896

INSPECTION PROCEDURE

1	**Input signal check.**

Vehicle speed	Indicator light blinking pattern
Above 40 km/h (25 mph)	
Below 40 km/h (25 mph)	

CHECK:

(a) See input signal check on page DI–328.

(b) Check indicator light operation when driving with vehicle speed above 40 km/h (25 mph), and with vehicle speed below 40 km/h (25 mph).

OK:

Vehicle speed above 40 km/h (25 mph):
Indicator light blinks
Vehicle speed below 40 km/h (25 mph):
Indicator light stays on

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

2	**Check speedometer circuit (See combination meter troubleshooting on page BE–37).**

NG → **Repair or replace vehicle speed sensor, harness, connector or combination meter assembly.**

OK

Check harness and connector for loose connection. If connection is normal, check and replace ECU.

DI42R–02

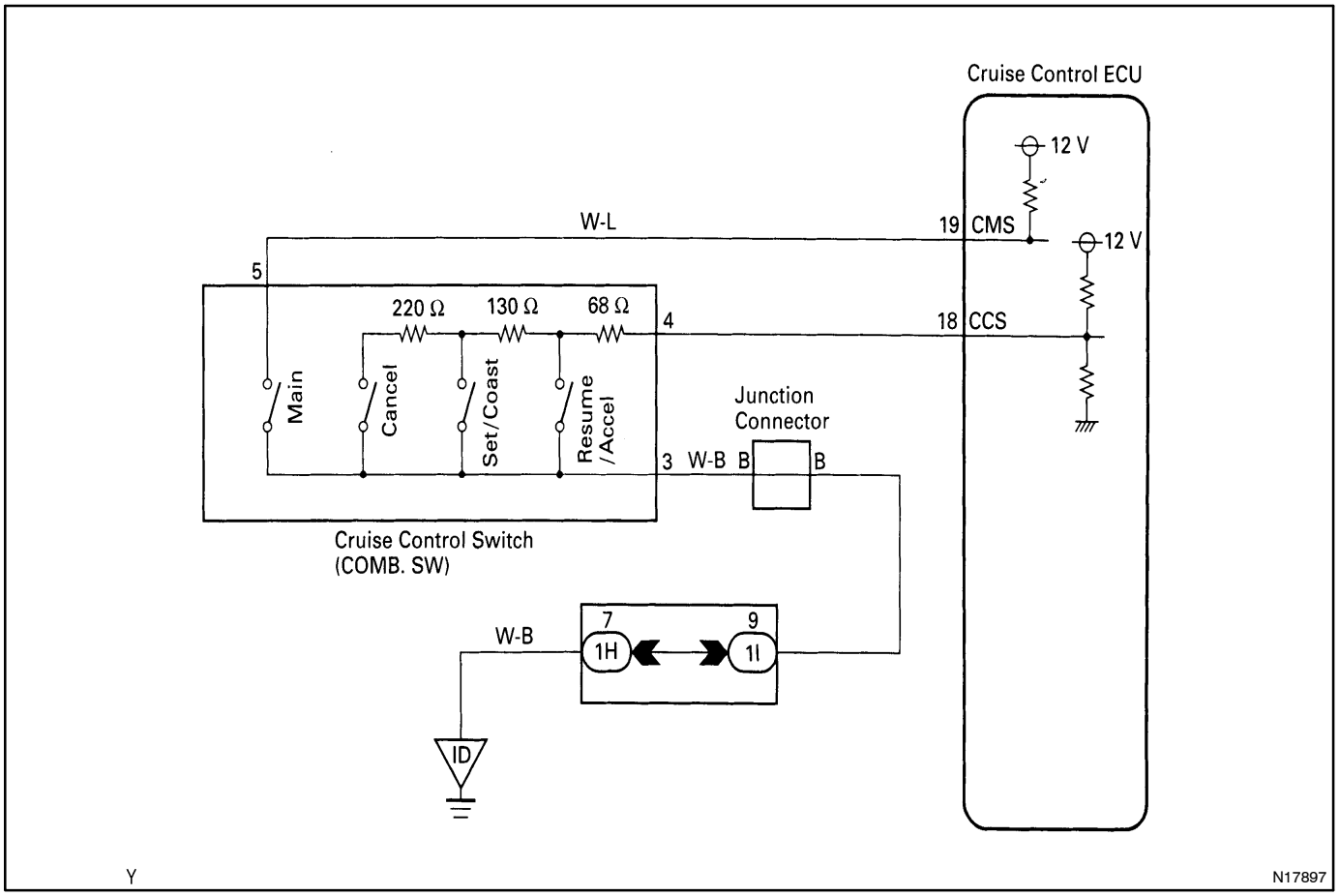
DTC	32	Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RESUME/ACCEL and CANCEl signals (each voltage) to the ECU.

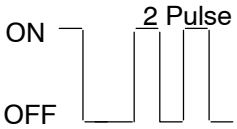
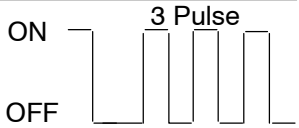
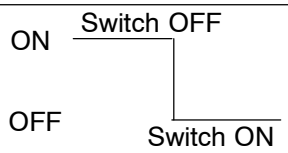
DTC No.	Detection Item	Trouble Area
32	• Short in, control switch circuit • Voltage abnormality in control switch	• Cruise control switch • Harness or connector between control switch and ECU • ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Input signal check.

Input Signal	Indicator light blinking pattern
SET/COAST SWITCH	
RESUME/ACCEL SWITCH	
CANCEL SWITCH	

PREPARATION:

(a) See input signal check on page DI–328.

(b) Check the indicator light operation when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

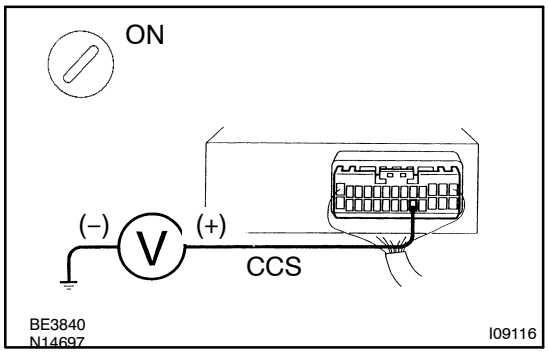
OK:

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 goes off when the cancel switch is turned on.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

2	Check voltage between terminal CCS of ECU connector and body ground.



PREPARATION:

Remove ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal CCS of ECU connector and body ground, when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

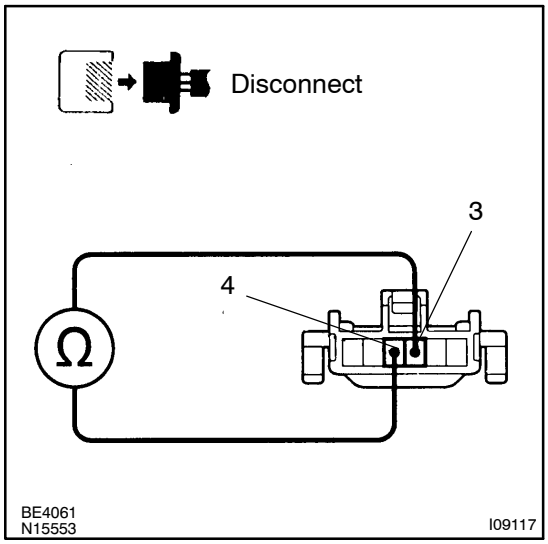
OK:

Switch position	Voltage
Neutral	10 – 16 V
RES/ACC	0.8 – 1.4 V
SET/COAST	2.4 – 4.0 V
CANCEL	5.1 – 8.3 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

3	Check control switch.



PREPARATION:

(a) Remove steering wheel center pad (See page SR–12).

(b) Disconnect control switch connector.

CHECK:

Measure resistance between terminals 3 and 4 of control switch connector when control switch is operated.

OK:

Switch position	Resistance
Neutral	1 MΩ or higher
RES/ACC	50 – 80 Ω
SET/COAST	180 – 220 Ω
CANCEL	400 – 440 Ω

HINT:

When DTC 34 is displayed, carefully check that resistance is always ∞ in neutral position, particularly when switching between RES/ACC and SET/COAST.

NG → **Replace cruise control switch.**

OK

4	Check for open and short in harness and connector between ECU and control switch (See page IN–30).

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

OK

Check and replace ECU.

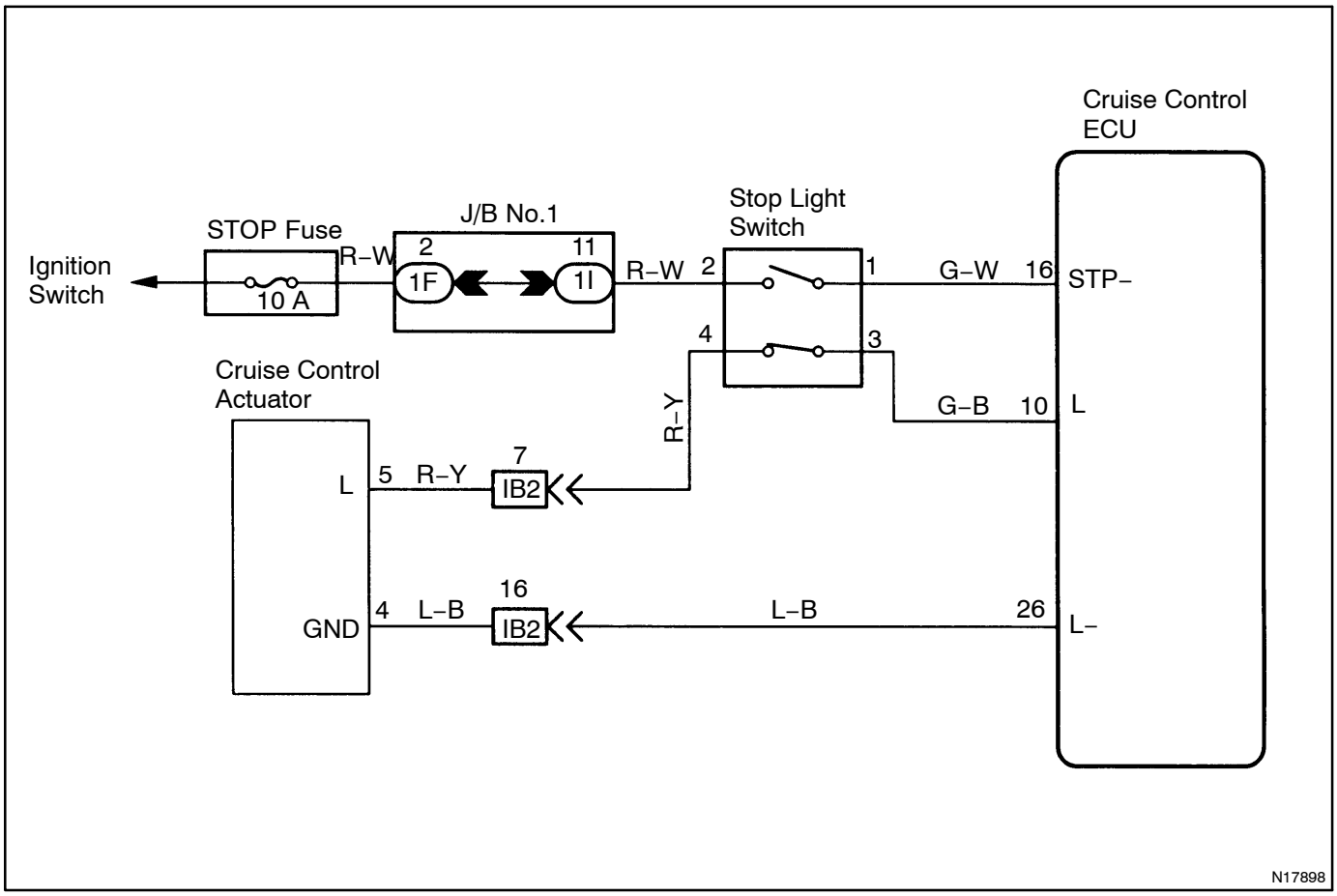
DI42S–02

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

When the brake is on, battery positive voltage normally applies through the stop fuse and stop light switch to terminal STP– of the ECU, and the ECU turns the cruise control off.
A fail–safe function is provided so that cancel functions normally, even if there is a malfunction in the stop light signal circuit.
If the harness connected to terminal STP– has an open, terminal STP– will have battery positive voltage and the cruise control will be turned off, also SET not occurring.
Also, when the brake is on, the magnetic clutch is cut electrically by the stop light switch, turning the cruise control off. (See page DI–338 for operation of the magnetic clutch)

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of stop light.**

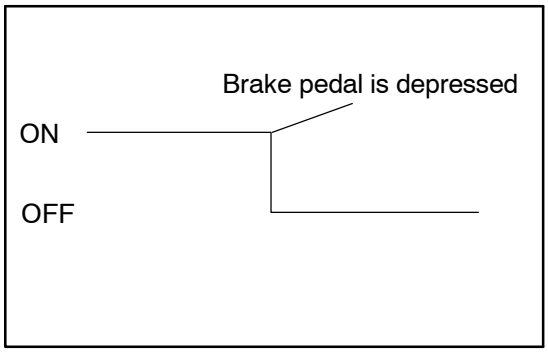
CHECK:

Check that stop light comes on when brake pedal is depressed, and turns off when brake pedal is released.

NG → **Check stop light circuit.**

OK

2	**Input signal check.**



CHECK:

(a) See input signal check on page DI–328.

(b) Check the indicator light when the brake pedal is depressed.

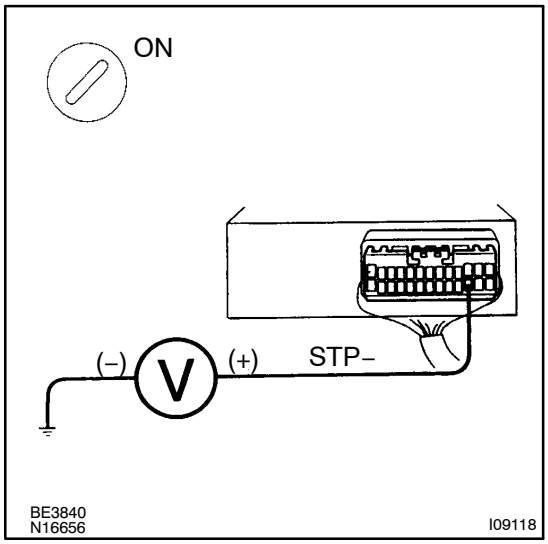
OK:

The indicator light goes off when the brake pedal is depressed.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

3	Check voltage between terminal, STP– of ECU connector and body ground.



PREPARATION:

Remove ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal STP–of ECU connector and body ground, when the brake pedal is depressed and released.

OK:

Pedal position	Voltage
Depressed	10 – 16 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

4	Check for open in harness and connectors between terminal STP– of ECU and stop light switch (See page IN–30).

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

OK

Check and replace ECU.

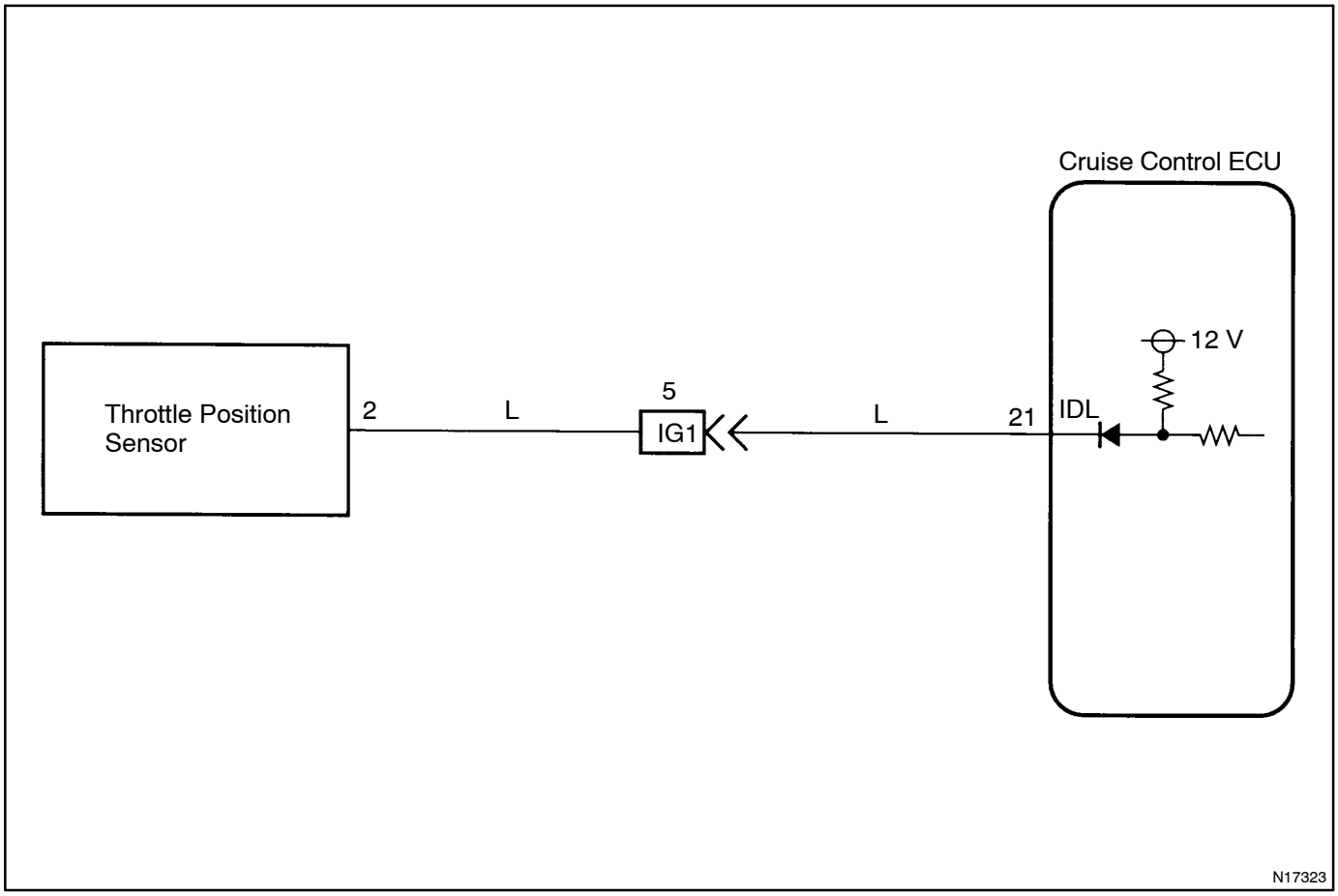
DI42T–02

Idle Switch Circuit

CIRCUIT DESCRIPTION

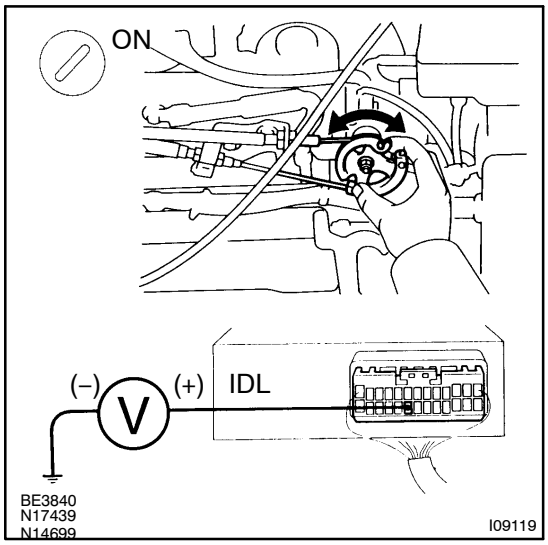
When the idle switch is turned ON, a signal is sent to the ECU. The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor value to enable accurate cruise control at the set speed. If the idle switch is malfunctioning, problem symptoms also occur in the engine, so also inspect the engine.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminal IDL of ECU connector and body ground.



PREPARATION:

(a) Remove cruise control ECU with connectors still connected.

(b) Disconnect ECM and ABS & TRAC ECU connector.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal IDL of ECU connector and body ground, when the throttle valve is fully closed and fully opened.

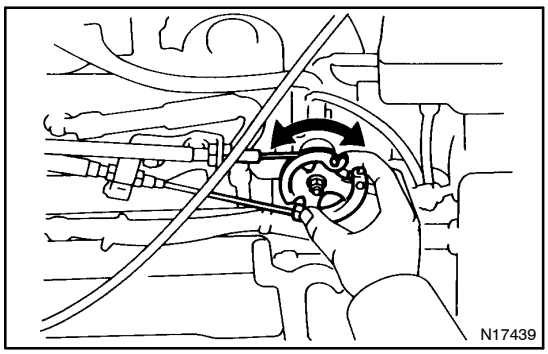
OK:

Throttle valve position	Voltage
Fully opened	10 – 16 V
Fully closed	Below 1 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

2	Check throttle position sensor.



PREPARATION:

Disconnect throttle position sensor connector.

CHECK:

Measure resistance between terminals 1 and 2 of throttle position sensor connector, when the throttle valve is fully closed and fully opened.

OK:

Throttle valve position	Resistance
Fully opened	1 MΩ or higher
Fully closed	Below 500 Ω

NG → **Replace throttle position sensor.**

OK

3	**Check for open and short in harness and connector between ECU and throttle position sensor, throttle position sensor and body ground (See page IN–30).**

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

OK

Check and replace ECU.

DI42U–02

Electronically Controlled Transaxle Communication Circuit

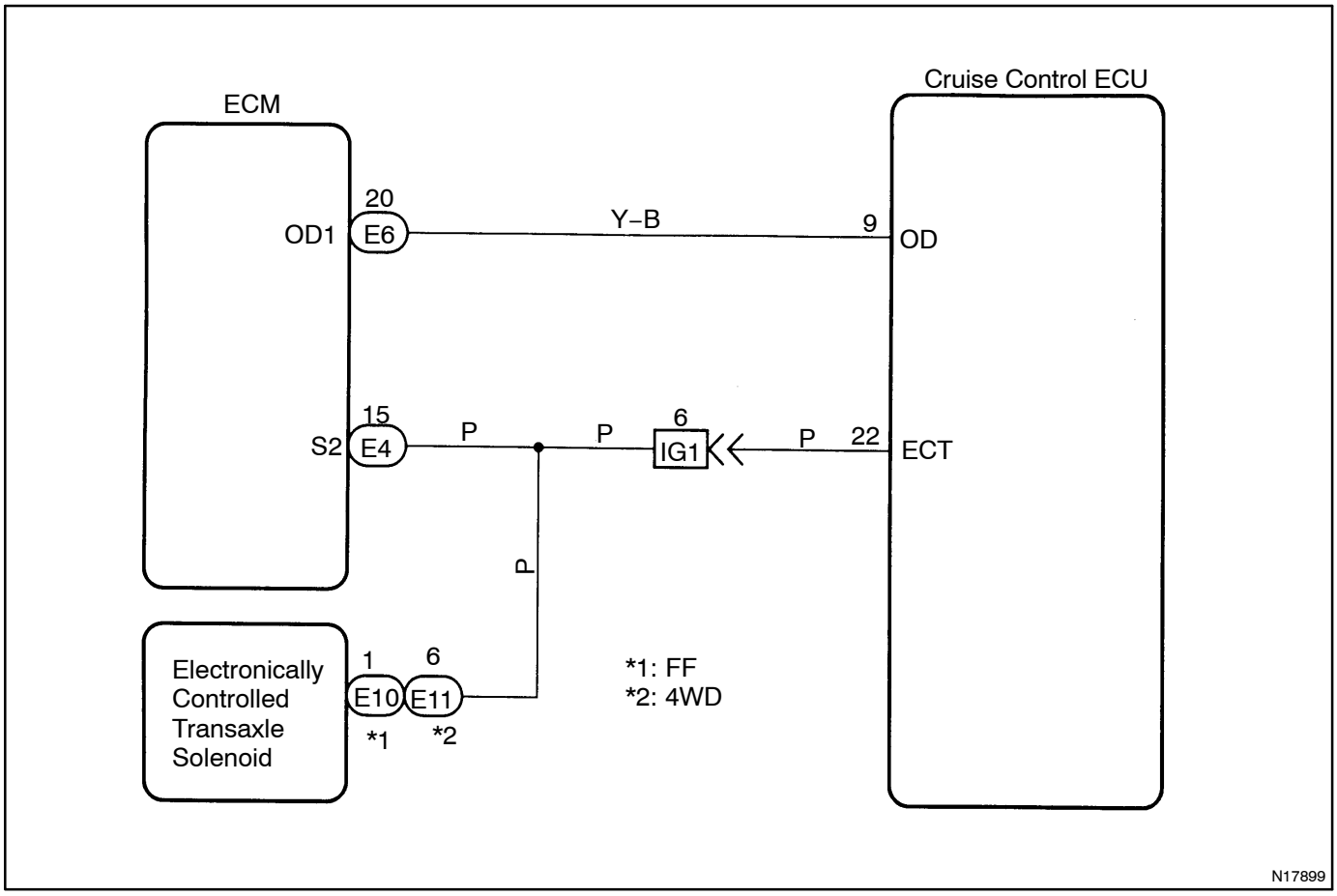
CIRCUIT DESCRIPTION

When driving uphill under cruise control, in order to reduce shifting due to ON–OFF overdrive operation and to provide smooth driving, when down shifting in the electronically controlled transaxle occurs, a signal to prevent upshift until the end of the uphill slope is sent from the cruise control ECU to the electronically controlled transaxle.

Terminal ECM of the cruise control ECU detects the shift change signal (output to electronically controlled transaxle No.2 solenoid) from the electronically controlled transaxle.

If vehicle speed down, also when terminal electronically controlled transaxle of the cruise control ECU receive down shifting signal, it sends a signal from terminal OD to OD1 to cut overdrive until the end of the uphill slope, and the gear shifts are reduced and gear shift points in the electronically controlled transaxle are changed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of overdrive.**

PREPARATION:

Test drive after engine warm up.

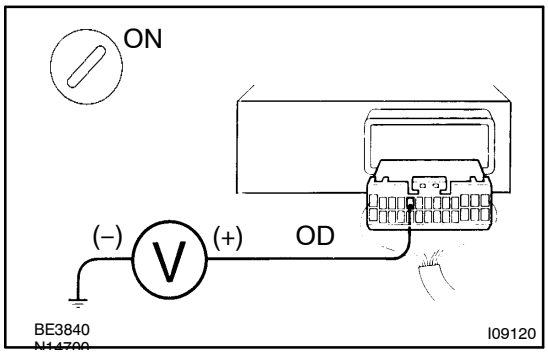
CHECK:

Check that overdrive ON ↔ OFF occurs with operation of OD switch ON – OFF.

NG → **Check and repair electronically controlled transaxle (See page DI–141 or DI–192).**

OK

2	**Check voltage between terminal OD of harness side connector of ECU and body ground.**



PREPARATION:

Remove ECU with connector still connected.

CHECK:

(a) Disconnect ECU connector.

(b) Turn ignition switch ON.

(c) Measure voltage between terminal OD of harness side connector of ECU and body ground.

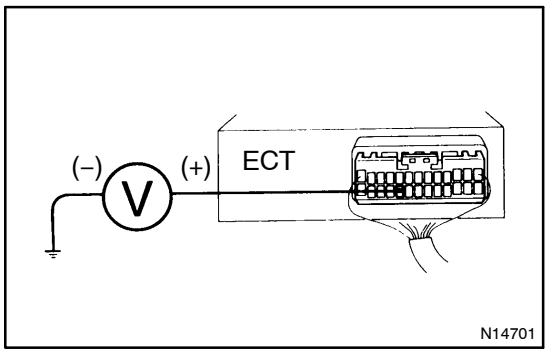
OK:

Voltage: 10 – 16 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 ECU connector.

(b) Test drive after engine warm up.

CHECK:

Check voltage between terminal ECT of cruise control ECU connector and body ground when OD switch is on and off.

OK:

Gear Position	Voltage
O/D	Below 1 V
3rd	10 – 16 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

4	Check for open and short in harness and connector between terminal ECT of cruise control ECU and electronically controlled transaxle solenoid (See page IN–30).

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

OK

Check and repair ECU.

5	Check for open and short in harness and connector between terminal OD of ECU and terminal OD1 of ECM (See page IN–30).

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

OK

Check and replace ECU.

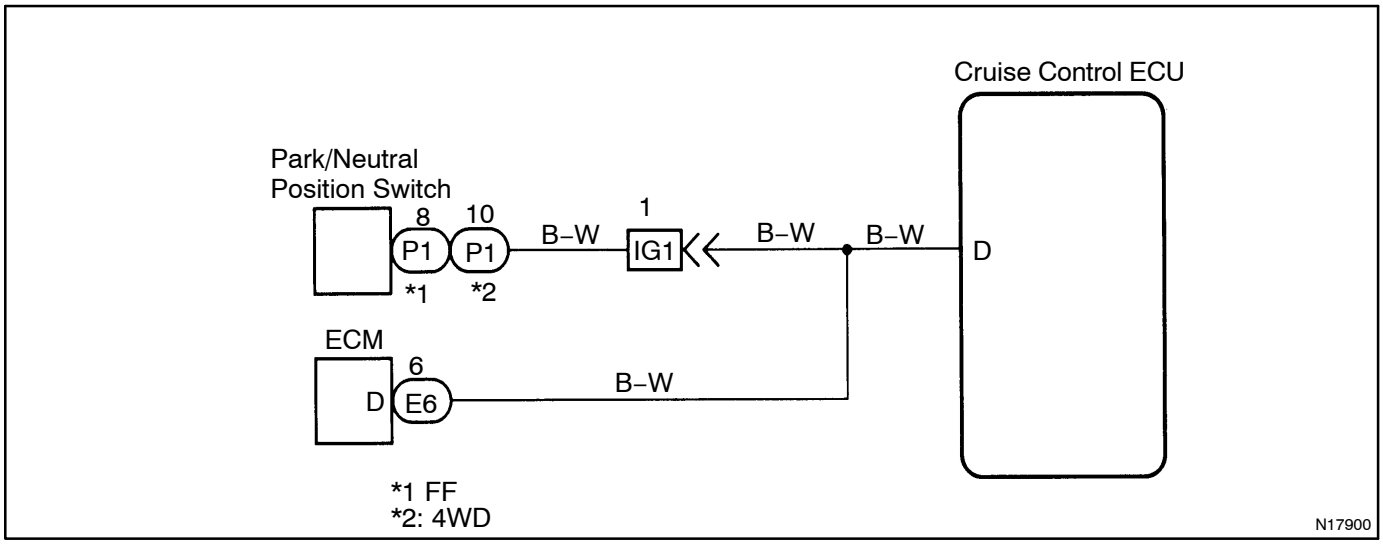
DI42V–02

Park/Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

When the shift position is put in except D position, a signal is sent from the park/neutral position switch to the ECU. When this signal is input during cruise control driving, the ECU cancels the cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of starter.**

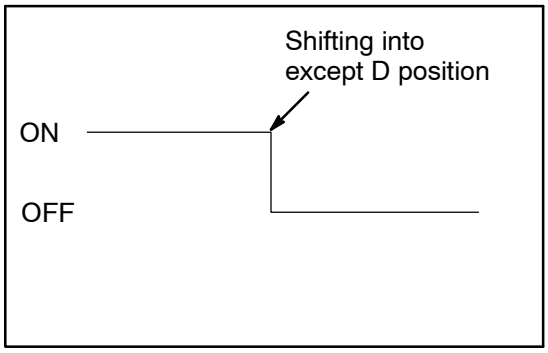
CHECK:

Check that the starter operates normally and that the engine starts.

NG → **Proceed to engine troubleshooting (See page DI–1).**

OK

2	Input signal check.



PREPARATION:

(a) See input signal check on page DI–328.

(b) Check the indicator light when shifting into except D position.

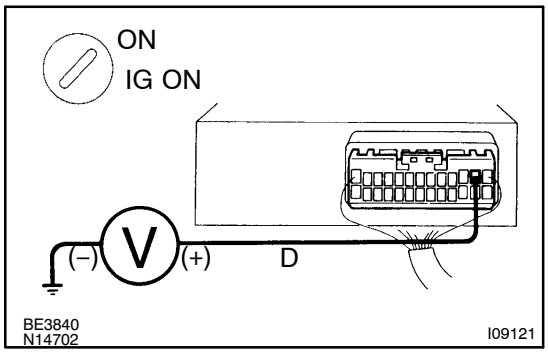
OK:

The indicator light goes off when shifting into except D position.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

3	Check voltage between terminal D of ECU connector and body ground.



PREPARATION:

Remove ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal D of ECU connector and body ground, when shifting into D position and other positions.

OK:

Shift Position	Voltage
D position	10 – 16 V
Other positions	Below 1 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

4	**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 ECU.

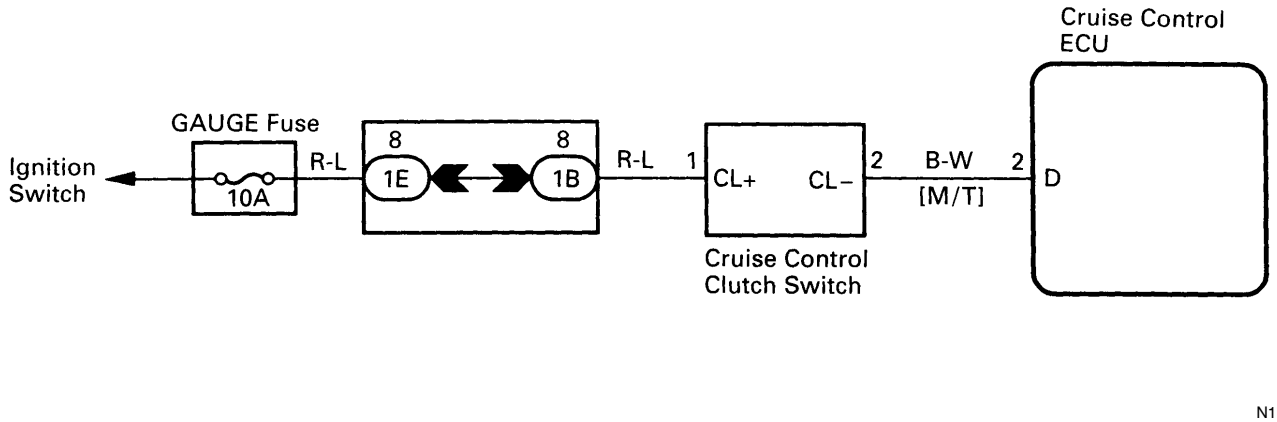
DI42W–02

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the cruise control ECU, when this signal is input to the cruise control ECU during cruise control driving, the cruise control ECU cancels cruise control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check operation of starter.**

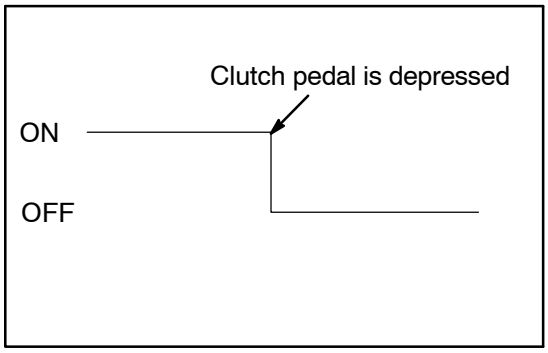
CHECK:

Check that the starter operates normally and that the engine starts.

NG → **Proceed to engine troubleshooting (See page DI–1).**

OK

2	Input signal check.



CHECK:

(a) See input signal check on page DI–328.

(b) Check the indicator light when the clutch pedal is depressed.

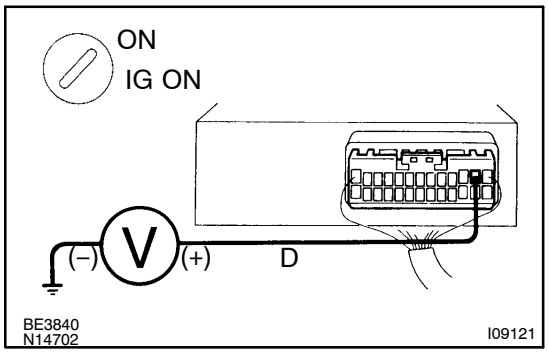
OK:

The indicator light goes off when the clutch pedal is depressed.

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

3	Check voltage between terminal D of ECU connector and body ground.



PREPARATION:

Remove ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal D of ECU connector and body ground, when the clutch pedal is depressed.

OK:

Shift Position	Voltage
ON (pedal depressed)	Below 1 V
OFF	10 – 16 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

4	**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 ECU.

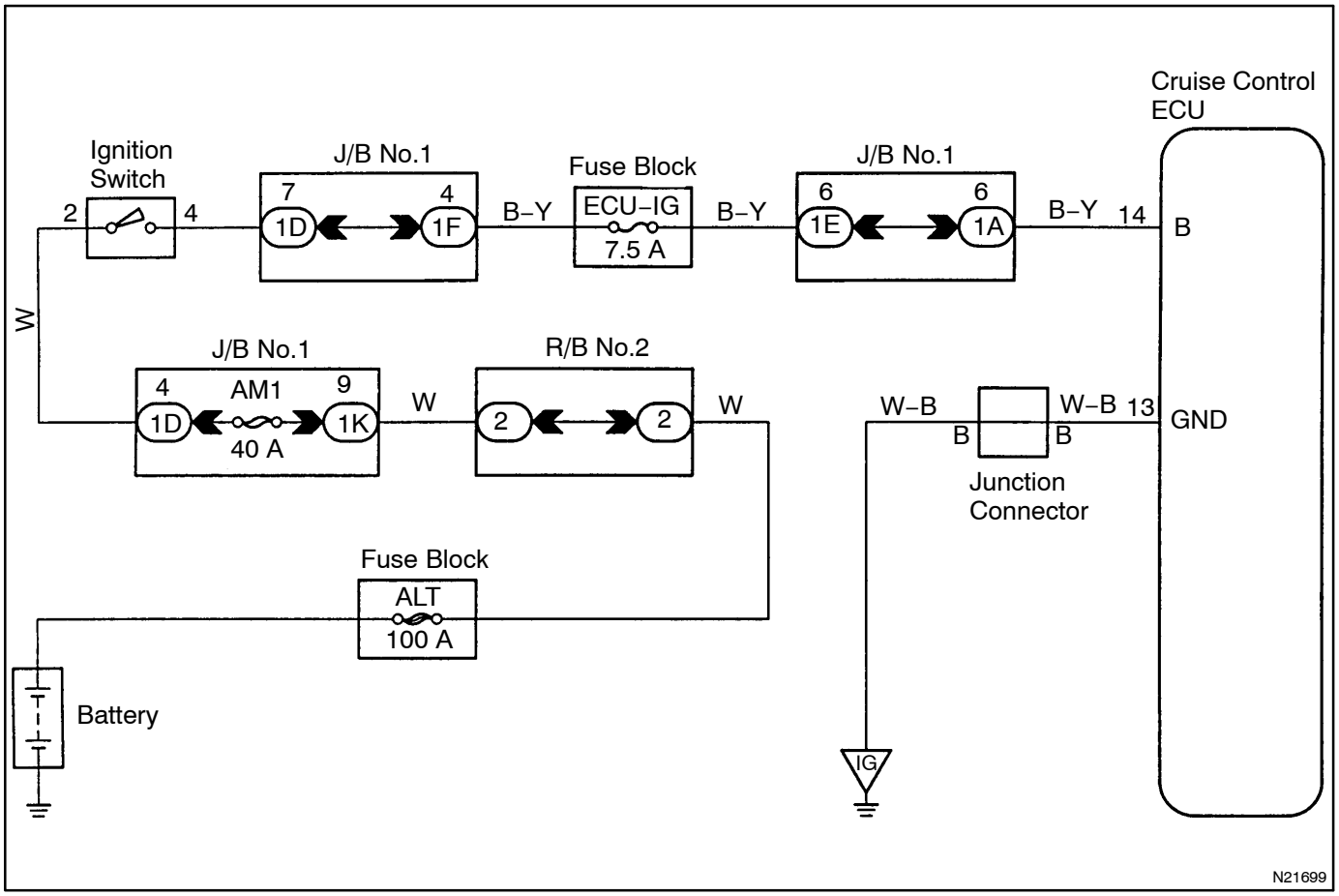
DI42X–02

ECU Power Source Circuit

CIRCUIT DESCRIPTION

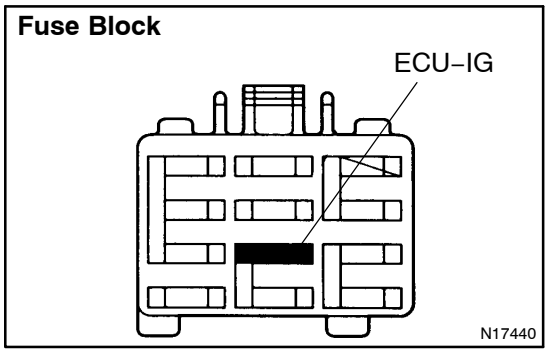
The ECU power source supplies power to the actuator and sensors, etc., Terminal GND and the cruise control ECU case are grounded.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ECU–IG fuse.**

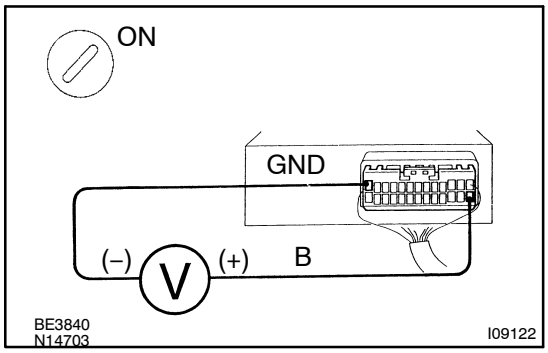


PREPARATION:
Remove ECU–IG fuse from fuse block.
CHECK:
Check continuity of ECU–IG fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to the ECU–IG fuse (See attached wiring diagram).**

OK

2	**Check voltage between terminals B and GND of ECU connector.**

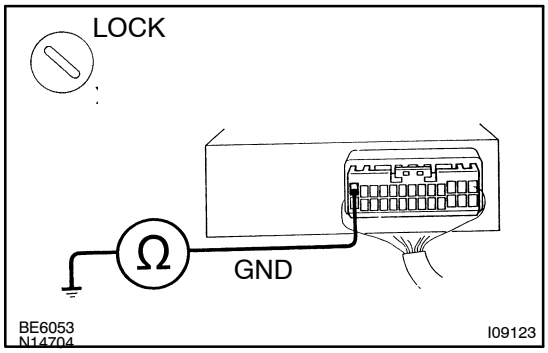


PREPARATION:
Remove ECU with connectors still connected.
CHECK:
(a) Turn ignition switch ON.
(b) Measure voltage between terminals B and GND of ECU connector.
OK:
Voltage: 10 – 16 V

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

NG

3	**Check continuity between terminal GND of ECU connector and body ground .**



CHECK:

Measure resistance between terminal GND of cruise control ECU connector and body ground.

OK:

Resistance: 1 Ω or less

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

OK

Check and repair harness and connector between battery and ECU.

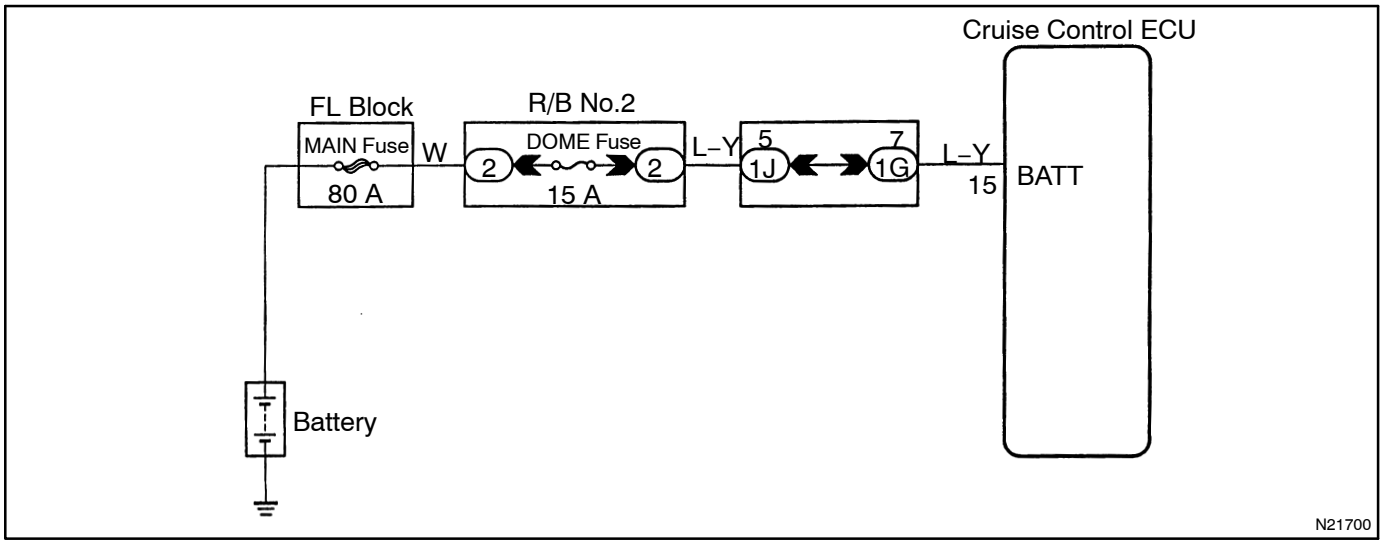
DI42Y–02

Back–up Power Source Circuit

CIRCUIT DESCRIPTION

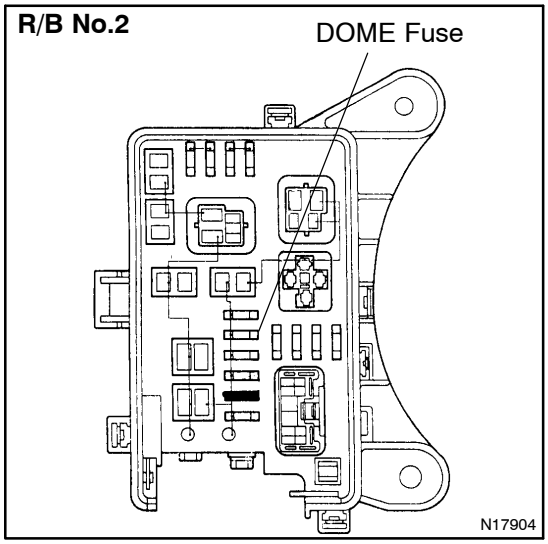
The ECU back–up power source provides power even when the ignition switch is off and is used for DTC memory, etc.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check DOME fuse.**



PREPARATION:

Remove DOME fuse from R/B No.2.

CHECK:

Check continuity of DOME fuse.

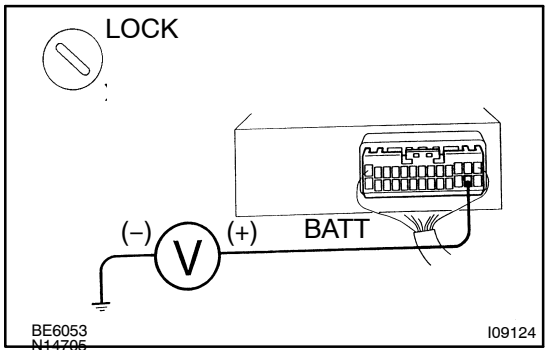
OK:

Continuity

NG → **Check for short in all the harness and components connected to the DOME fuse (See attached wiring diagram).**

OK

2	Check voltage between terminal BATT of ECU connector and body ground.



PREPARATION:

Remove ECU with connectors still connected.

CHECK:

Measure voltage between terminal BATT of ECU connector and body ground.

OK:

Voltage: 10 – 16 V

OK

Proceed to next circuit inspection shown on matrix chart (See page DI–336).

NG

Check and repair harness and connector between battery and ECU.

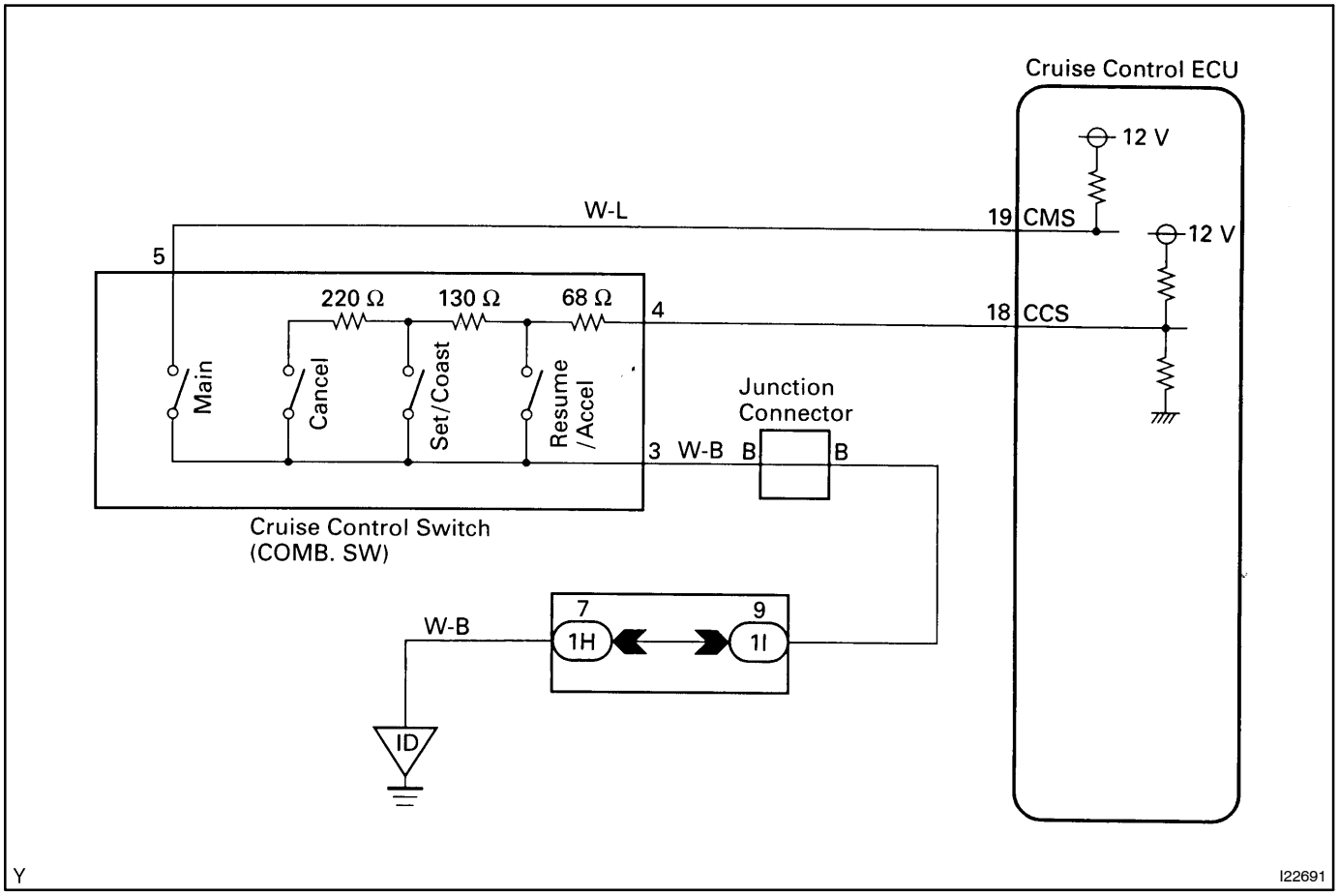
DI42Z-02

Main Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

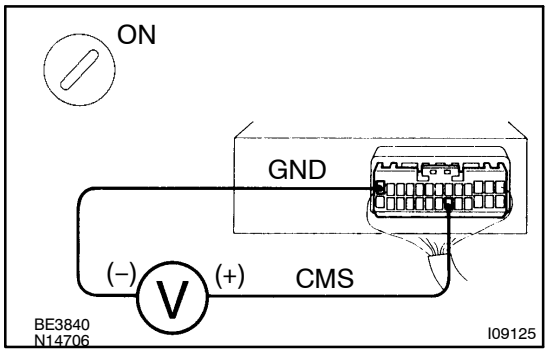
When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check voltage between terminal CMS and GND of cruise control ECU connector.



PREPARATION:

Remove cruise control ECU with connectors still connected.

CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminal CMS and GND of cruise control ECU connector when main switch is held ON and OFF.

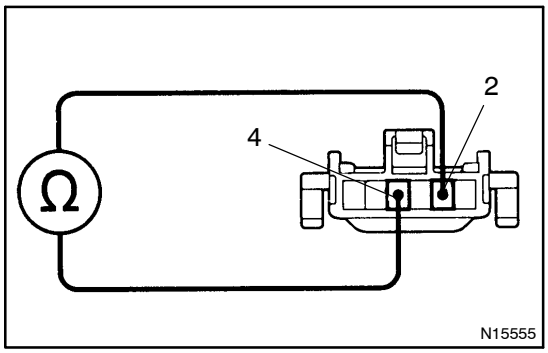
OK:

Main switch	Voltage
OFF	10 – 16 V
ON	Below 1 V

OK	Proceed to next circuit inspection shown on matrix chart (See page DI–336).

NG

2	Check main switch.



PREPARATION:

(a) Remove steering wheel center pad (See page SR–12).

(b) Disconnect cruise control switch connector.

CHECK:

Check continuity between terminals 2 and 4 of cruise control switch connector when main switch is held ON and OFF.

OK:

Main switch	Terminal No. to continuity
OFF	
ON	2 – 4

NG	Replace control switch.

OK

3	**Check harness and connector between cruise control ECU and main switch, main switch and body ground (See page IN–30).**

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

OK

Check and replace cruise control ECU.

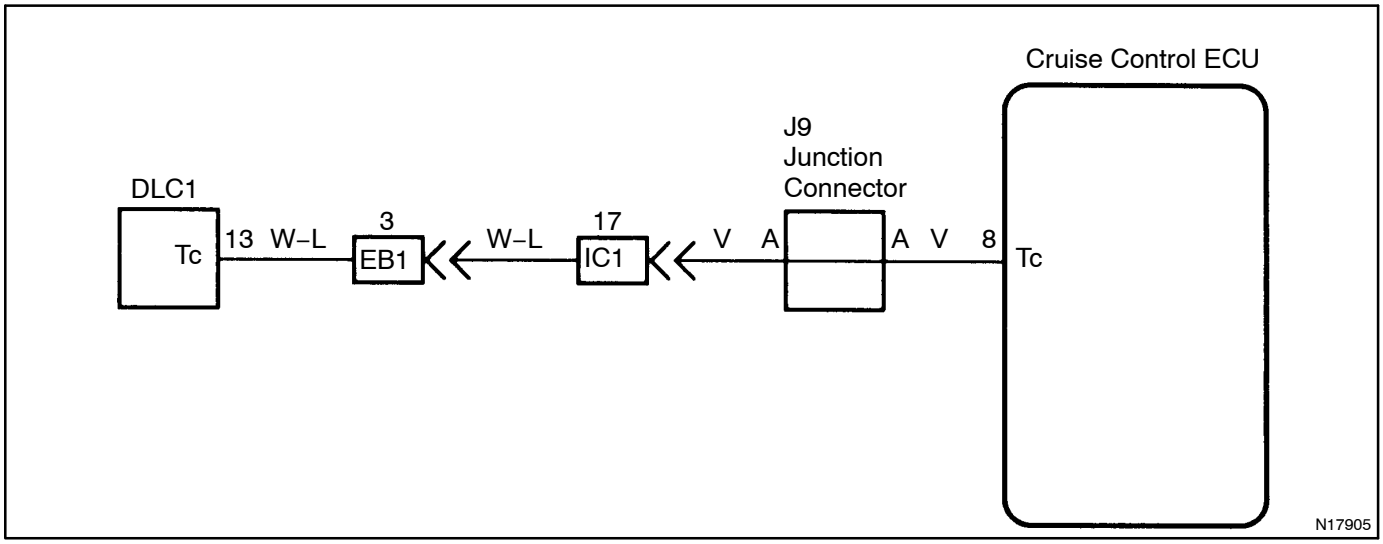
DI430–02

Tc Circuit

CIRCUIT DESCRIPTION

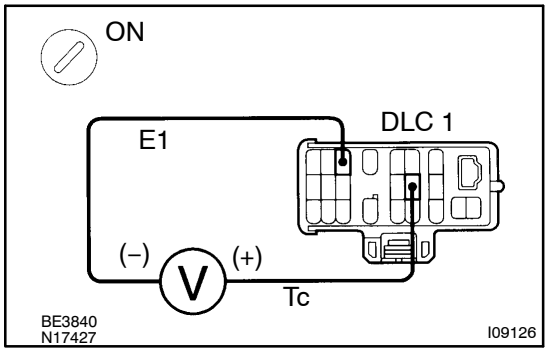
This circuit sends a signal to the ECU that DTC output is required.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E1 of DLC1.**



CHECK:

(a) Turn ignition switch ON.

(b) Measure voltage between terminals Tc and E1 of DLC1.

OK:

Voltage: 10 – 16 V

NG → **Proceed to next circuit inspection shown on matrix chart (See page DI–336).**

OK

2	**Check for open and short in harness and connector between ECU and DLC1, DLC1 and body ground (See page IN–30).**

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

OK

Check and replace ECU.

DI431–01

Actuator Control Cable Inspection

CHECK:

(a) Check that the actuator, control cable and throttle link are properly installed and that the cable and link are connected correctly.
(b) Check that the actuator and bell crank are operating smoothly.
(c) Check that the cable is not loose or too tight.

HINT:

- If the control cable is very 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.