EVEREST

Workshop Repair Manual



- Repair Manual
- Wiring Diagrams Supplement
- Automatic Transmission and Transfer RA4AX–EL
- Body Measurement Manual

2001 RANGER WL3 EVEREST W LT3 REPAIR MANUAL Supplement

FOREWORD

This Manual has been prepared to provide information covering normal service repairs and maintenance for the RANGER SERIES.

As all information in this manual was the best available at the time of printing, vehicle specification and other information will be updated in Service Information.

Ford Motor Company

APPLICATION:
This manual is applicable to vehicles which are equipped with Euro 3 Regulation Model (WL–3 and WLT–3 engines).
The applicable Vehicle Identification Numbers (VIN) and related materials are shown on the following page.

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There are explanations given only for the sections marked with shadow (■).

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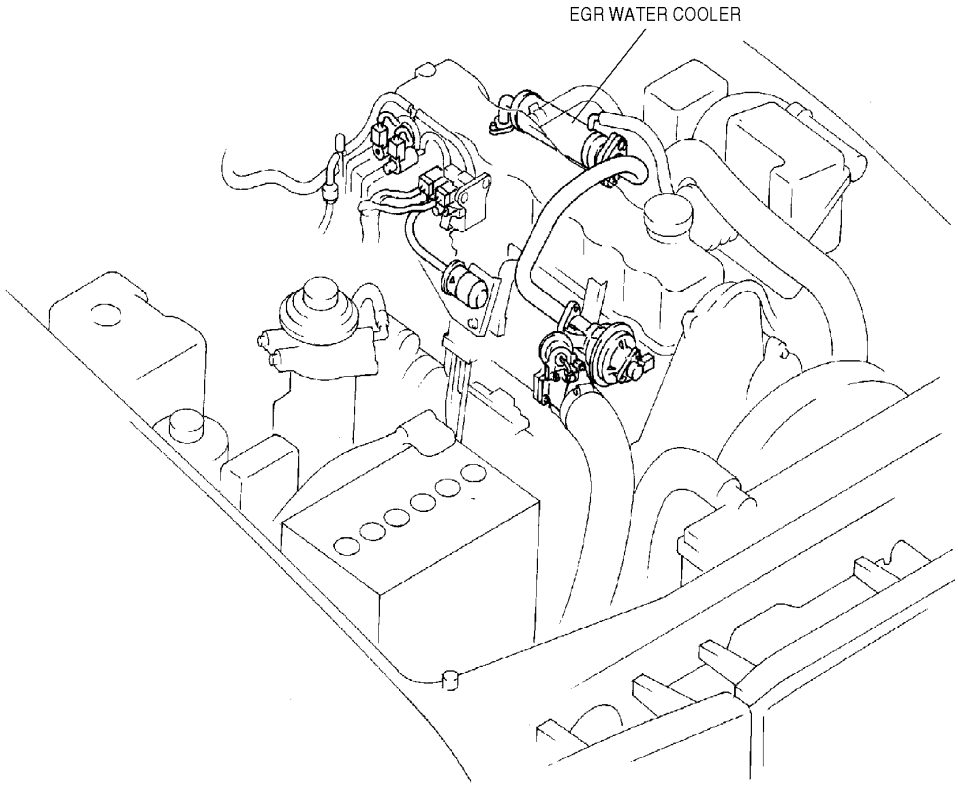
VEHICLE IDENTIFICATION NUMBERS (VIN)

WF0	LMBE40∗W	204506−
WF0	LMBD20∗W	204506−
WF0	LMDD20∗W	204506−
WF0	LMDE40∗W	204506−
WF0	LMFE40∗W	204506−
WF0	BMBD20∗W	204506−
WF0	LMAD20∗W	204506−
WF0	BMDE40∗W	204506−
WF0	BMDD20∗W	204506−

RELATED MATERIALS

RANGER Training Manual ..... F326−10−99A
RANGER Repair Manual ..... F161−10−99A
RANGER Overhaul Manual ..... F161−20−99A
RANGER Body Measurement Chart Manual ..... F330−10−99K
RANGER Wiring Diagrams (General L.H.D.) ..... F161−30−99A
RANGER Wiring Diagrams (General R.H.D.) ..... F161−40−99A
RANGER Wiring Diagrams Supplement (General L.H.D.) ..... F175−20−01I
RANGER Wiring Diagrams Supplement (General R.H.D.) ..... F175−30−01I

- Euro 3 and non Euro 3 regulation models are distinguished as follows:
  — Euro 3 Regulation models (WL−3, WLT−3) are equipped with an EGR water cooler in the engine room.
  — Non-Euro 3 Regulation models are not equipped with an EGR water cooler in the engine room.



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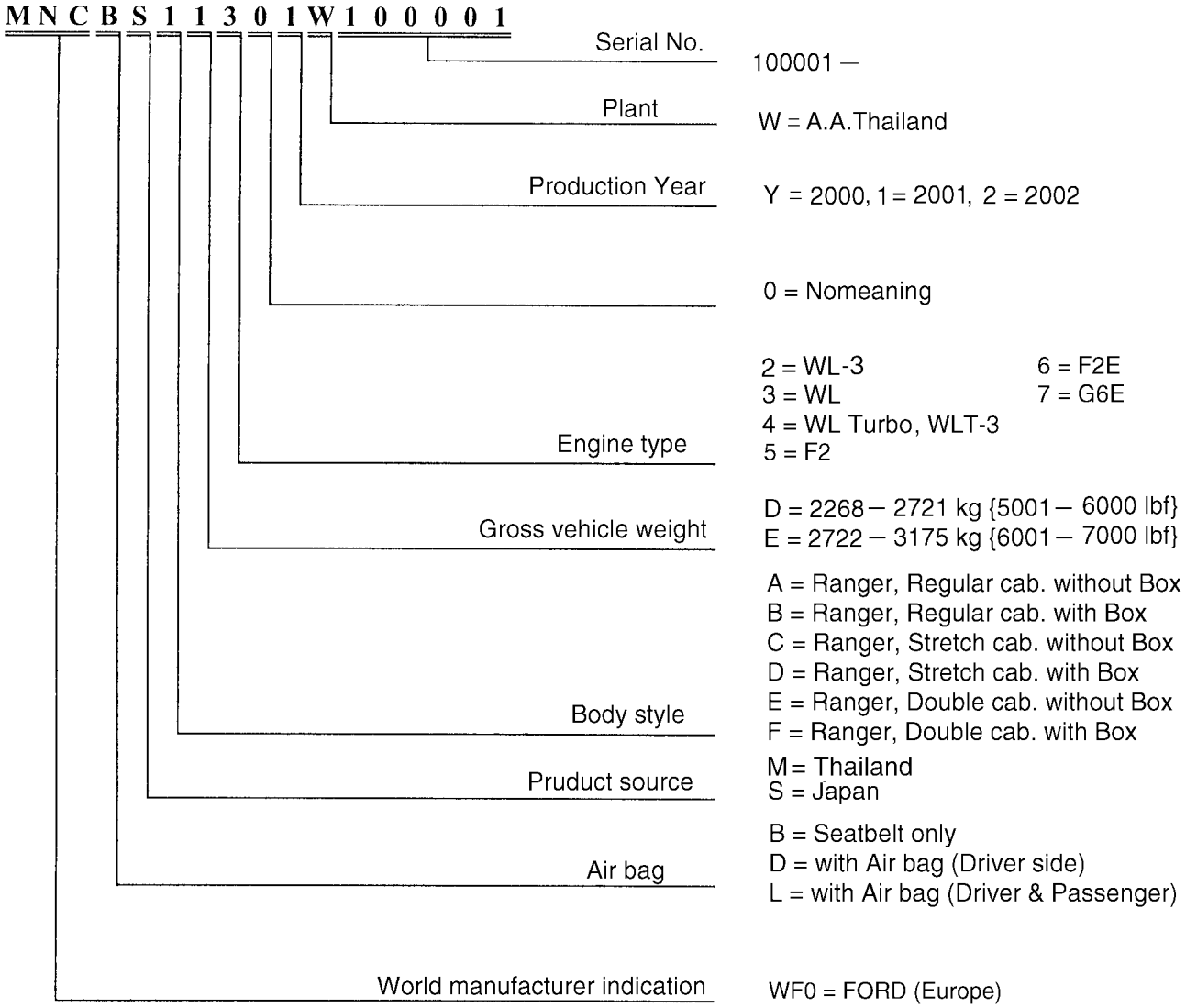
GENERAL INFORMATION

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VIN CODE **GI–2**
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VIN CODE

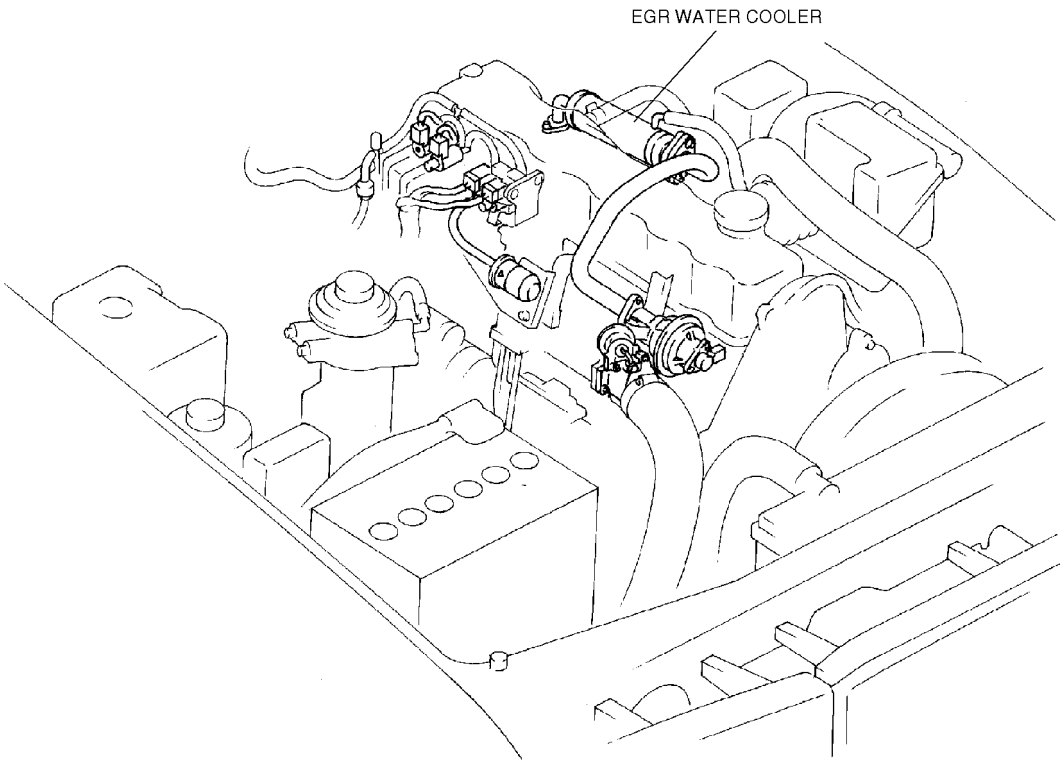
VIN CODE

ZCF200800021W02



YBR2010W002

- Euro 3 and non Euro 3 regulation models are distinguished as follows:
  —Euro 3 Regulation models (WL–3, WLT–3) are equipped with an EGR water cooler in the engine room.
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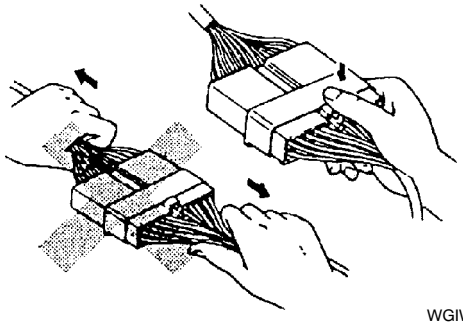
ELECTRICAL SYSTEM

CONNECTORS

ZCF201700006W02

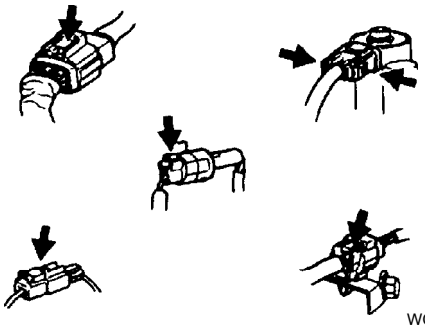
Disconnecting Connectors

- When disconnecting connector, grasp the connectors, not the wires.



WGIWXX0041E

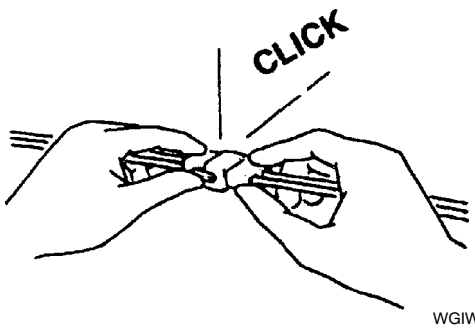
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking Connector

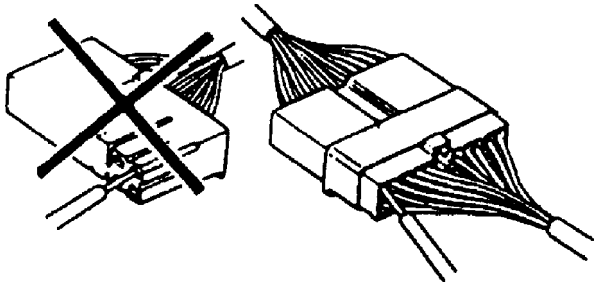
- When locking connectors, listen for a click indicating they are securely locked.



WGIWXX0043E

Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

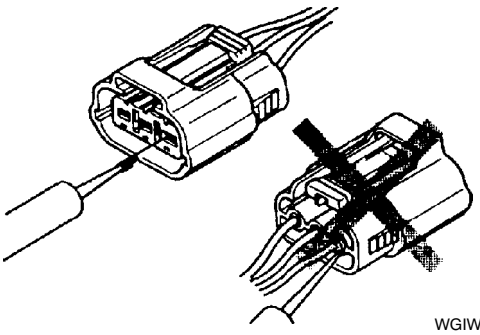


WGIWXX0044E

- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution

- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**

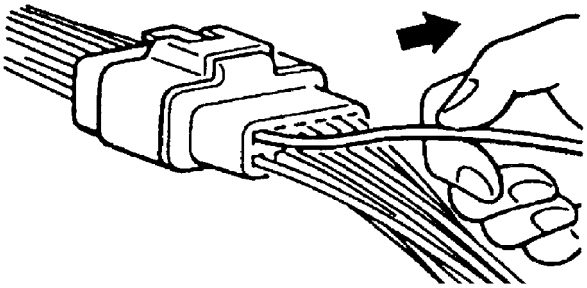


WGIWXX0045E

Terminals

Inspection

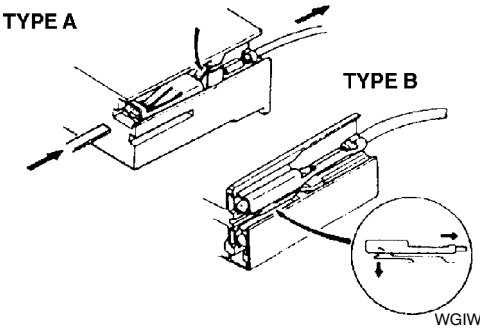
- Pull lightly on individual wires to verify that they are secured in the terminal.



WGIWXX0064E

Replacement

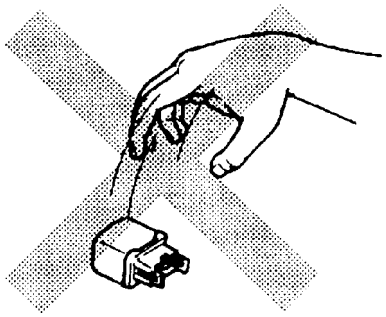
- Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



WGIWXX0046E

Sensors, Switches, and Relays

- Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.

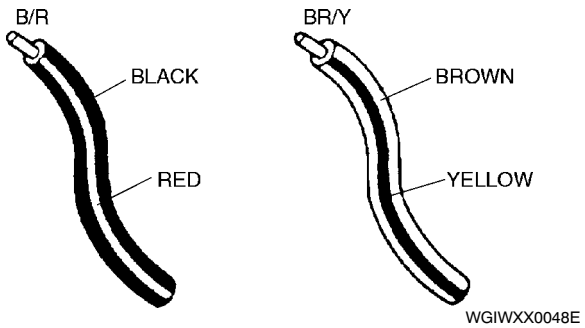


WGIWXX0047E

Wiring Harness
Wiring color codes

- Two-color wires are indicated by a two-color code symbol.
- The first letter indicates the base color of the wire and the second the color of the stripe.

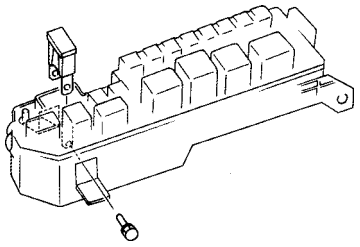
CODE	COLOR	CODE	COLOR
B	Black	O	Orange
BR	Brown	P	Pink
G	Green	R	Red
GY	Gray	V	Violet
L	Blue	W	White
LB	Light Blue	Y	Yellow
LG	Light Green		



WGIWXX0048E

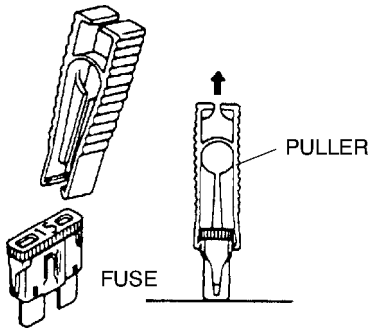
Fuse
Replacement

- When replacing a fuse, be sure to replace it with one of the same capacity. If a fuse fails again, the circuit probably has a short and the wiring should be inspected.
- Be sure that the negative battery cable is disconnected before replacing a main fuse.



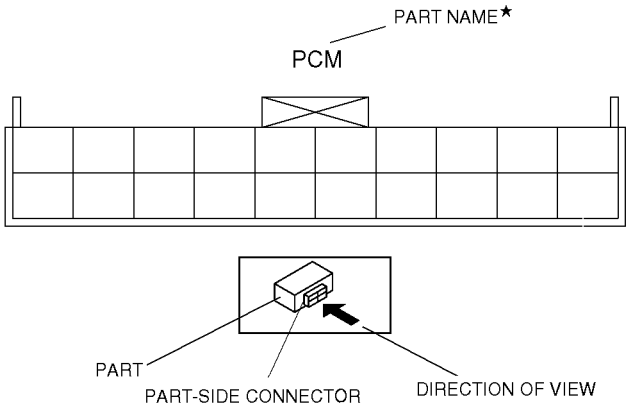
WGIWXX0049E

- When replacing a pullout fuse, use the fuse puller.



WGIWXX0050E

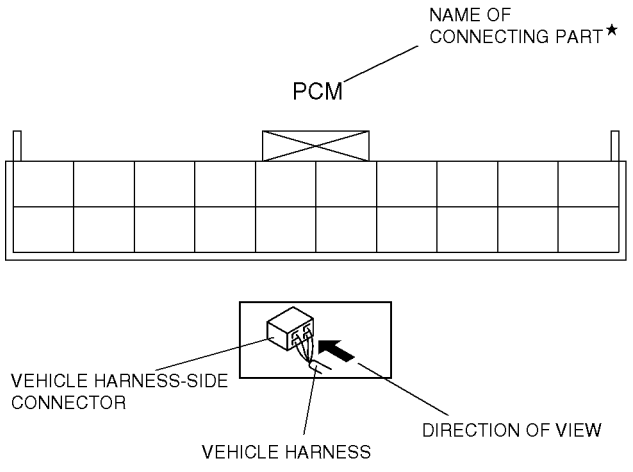
Direction of View for Connector
Part-side connector
Direction of view is from the terminal side.



WGIWXX0100E

* : Part names are shown only when there are multiple connector drawings.

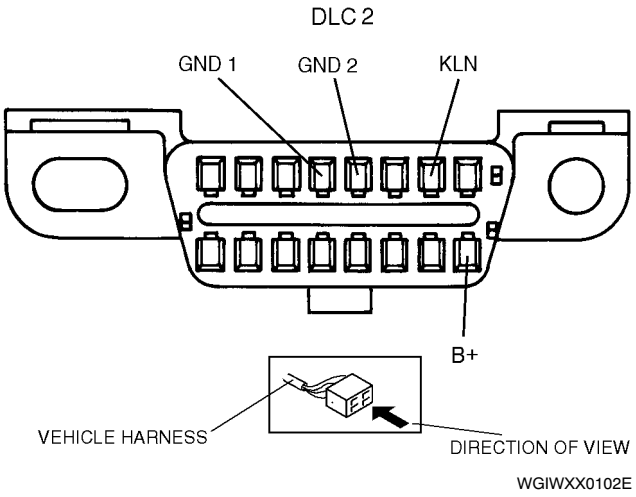
Vehicle harness side connector
Direction of view is from the harness side.



WGIWXX0101E

* : Part names are shown only when there are multiple connector drawings.

Other
Vehicle harness–side connectors, such as the DLC2, have to be viewed from the terminal side.



NEW STANDARDS

NEW STANDARDS TABLE

ZCF202800020W01

- The following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V_B	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
—	Closed Throttle Position Switch	—	Idle Switch	
CPP	Clutch Pedal Position	—	Clutch Position	
CIS	Continuous Fuel Injection System	EGI	Electronic Gasoline Injection System	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFI	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On Board Diagnostic	—	Diagnosis/Self Diagnosis	
OL	Open Loop	—	Open Loop	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multiport Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1–2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2–3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3–4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	EC–AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Airflow Meter	
WU–TWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1 : Diagnostic trouble codes depend on the diagnostic test mode.
#2 : Controlled by the PCM
#3 : In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4 : Device that controls engine and powertrain
#5 : Directly connected to exhaust manifold
#6 : Part name of diesel engine

ABBREVIATIONS

ABBREVIATIONS TABLE

ZCF203000011W01

A/C	Air conditioner
ABDC	After bottom dead center
ACC	Accessories
ATDC	After top dead center
BBDC	Before bottom dead center
BTDC	Before top dead center
EX	Exhaust
IN	Intake
L.H.D.	Left hand drive
OFF	Switch off
ON	Switch on
PCV	Positive crankcase ventilation
R.H.D.	Right hand drive
SST	Special service tool
TDC	Top dead center

SCHEDULED MAINTENANCE

SCHEDULED MAINTENANCE TABLE

ZCF203400013W01

Chart symbols:

I : Inspect and repair, clean, adjust, or replace if necessary. (Oil-permeated air cleaner elements cannot be cleaned using the air-blow method.)
R : Replace
T : Tighten
L : Lubricate
C : Clean

Remarks:

- To ensure efficient operation of the engine and all systems related to emission control, the ignition and fuel systems must be serviced regularly. It is strongly recommended that all servicing related to these systems be done by an authorized Ford Dealer.
- After the described period, continue to follow the described maintenance at the recommended intervals.
- Refer below for a description of items marked* in the maintenance chart.

*1: (WL–3) Replacement of the timing belt is required at every 90,000 km (54,000 miles). Failure to replace the timing belt may result in damage to the engine.
(WLT–3) Replacement of the timing belt is required at every 100,000 km (60,000 miles). Failure to replace the timing belt may result in damage to the engine.

*2: Also inspect and adjust the power steering and air conditioner drive belts, if installed.

*3: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter more often than recommended intervals.

a. Driving in dusty conditions.
b. Extended periods of idling or low speed operation.
c. Driving for long period in cold temperatures or driving regularly at short distance (iess than 8 km/5 miles) only.

*4: If the vehicle is operated in very dusty or sandy areas, inspect and if necessary, clean or replace the air cleaner element more often than the recommended intervals.

*5: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, change the brake fluid annually.

WL–3

Maintenance Item	Maintenance Interval (Number of months or km (miles), wichever comes first)											
Months	12	24	36	48	60	72	84	96	108	120	132	144
×1000 Km	15	30	45	60	75	90	105	120	135	150	165	180
(×1000 Miles)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	(81)	(90)	(99)	(108)
ENGINE												
Engine valve clearance		I		I		I		I		I		I
Engine timing belt *1	Replace every 90,000 km (54,000 miles)											
Drive belts *2	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil *3	R	R	R	R	R	R	R	R	R	R	R	R
Oil filter *3	R	R	R	R	R	R	R	R	R	R	R	R
COOLING SYSTEM												
Cooling system		I		I		I		I		I		I
Engine coolant (for Europe)	Replace at first 4 years or 90,000 km (54,000 miles) ; after that, every 2 years											
FUEL SYSTEM												
Air cleaner element *4	C	R	C	R	C	R	C	R	C	R	C	R
Fuel filter			R			R			R			R
Fuel lines & hoses	I	I	I	I	I	I	I	I	I	I	I	I
EMISSION CONTROL SYSTEM												
E.G.R. system (if installed)				I				I				I
ELECTRICAL SYSTEM												
Battery electrolyte level & specific gravity	I	I	I	I	I	I	I	I	I	I	I	I
CHASSIS & BODY												
Brake & clutch pedal	I	I	I	I	I	I	I	I	I	I	I	I
Clutch fluid	I	I	I	I	I	I	I	I	I	I	I	I

Maintenance Item	Maintenance Interval (Number of months or km (miles), wichever comes first)												
	Months	12	24	36	48	60	72	84	96	108	120	132	144
	×1000 Km	15	30	45	60	75	90	105	120	135	150	165	180
	(×1000 Miles)	(9)	(18)	(27)	(36)	(45)	(54)	(63)	(72)	(81)	(90)	(99)	(108)
Brake lines, hoses & connections		I	I	I	I	I	I	I	I	I	I	I	I
Brake fluid	*5	I	R	I	R	I	R	I	R	I	R	I	R
Parking brake		I	I	I	I	I	I	I	I	I	I	I	I
Power brake unit & hoses		I	I	I	I	I	I	I	I	I	I	I	I
Disc brakes		I	I	I	I	I	I	I	I	I	I	I	I
Drum brakes		I	I	I	I	I	I	I	I	I	I	I	I
Manual steering gear oil (if installed)			I		I		I		I		I		I
Power steering fluid & lines		I	I	I	I	I	I	I	I	I	I	I	I
Steering operations & gear housing			I		I		I		I		I		I
Steering linkages, tie rod ends & arms			I		I		I		I		I		I
Manual transaxle oil				R			R			R			R
Rear differential oil (2WD)				R			R			R			R
Front and rear differential oil (4WD)		R	I	R	I	R	I	R	I	R	I	R	I
Transfer oil		R	I	R	I	R	I	R	I	R	I	R	I
Propeller shaft joints (4WD)			L		L		L		L		L		L
Front wheel bearing grease					R				R				R
Front suspension & ball joints				I		I		I		I		I	
Driveshaft dust boots (4WD)				I			I			I			I
Bolts & nuts on chassis & body		T	T	T	T	T	T	T	T	T	T	T	T
Wheel nuts		T	T	T	T	T	T	T	T	T	T	T	T
Exhaust system heat shields			I		I		I		I		I		I

WLT–3

Maintenance Item	Maintenance Interval (Number of months or km (miles), wichever comes first)																
	Months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
	×1000 Km	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
	(×1000 Miles)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	(79)	(84)	(90)	(96)
ENGINE																	
Engine valve clearance (for Europe)				I			I			I			I			I	
Engine timing belt	*1	Replace every 100,000 km (60,000 miles)															
Drive belts	*2	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil	*3	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Oil filter	*3	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
COOLING SYSTEM																	
Cooling system			I		I		I		I		I		I		I		I
Engine coolant (for Europe)		Replace at first 4 years or 100,000 km (60,000 miles) ; after that, every 2 years															
FUEL SYSTEM																	
Air cleaner element	*4	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
Fuel filter					R				R				R				R
Fuel lines & hoses		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
EMISSION CONTROL SYSTEM																	
E.G.R. system (if installed)							I						I				
ELECTRICAL SYSTEM																	
Battery electrolyte level & specific gravity			I		I		I		I		I		I		I		I
CHASSIS & BODY																	
Brake & clutch pedal		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Maintenance Item	Maintenance Interval (Number of months or km (miles), wichever comes first)																
	Months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
	×1000 Km	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
	(×1000 Miles)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	(79)	(84)	(90)	(96)
Clutch fluid		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses & connections			I		I		I		I		I		I		I		I
Brake fluid	*5	I	I	I	R	I	I	I	R	I	I	I	R	I	I	I	R
Parking brake		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Power brake unit & hoses			I		I		I		I		I		I		I		I
Disc brakes		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Drum brakes			I		I		I		I		I		I		I		I
Manual steering gear oil (if installed)			I		I		I		I		I		I		I		I
Power steering fluid & lines		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Steering operations & gear housing			I		I		I		I		I		I		I		I
Steering linkages, tie rod ends & arms			I		I		I		I		I		I		I		I
Manual transaxle oil			I		R		I		R		I		R		I		R
Rear differential oil (2WD)			I		R		I		R		I		R		I		R
Front and rear differential oil (4WD)			R		I		R		I		R		I		R		I
Transfer oil			R		I		R		I		R		I		R		I
Propeller shaft joints (4WD)			L		L		L		L		L		L		L		L
Front wheel bearing grease					R				R				R				R
Front suspension & ball joints					I				I				I				I
Driveshaft dust boots (4WD)					I				I				I				I
Bolts & nuts on chassis & body			T		T		T		T		T		T		T		T
Wheel nuts			T		T		T		T		T		T		T		T
Exhaust system heat shields					I				I				I				I

ENGINE
(WL, WL Turbo, WL–3, WLT–3)

FEATURES

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OUTLINE OF CONSTRUCTION **B2–2**
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SPECIFICATIONS **B2–2**
ENGINE MECHANISM **B2–3**
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TIMING GEAR **B2–4**

SERVICE

OUTLINE **B2–5**
SUPPLEMENTAL SERVICE INFORMATION . **B2–5**
VALVE CLEARANCE **B2–5**
VALVE CLEARANCE
INSPECTION/ADJUSTMENT **B2–5**
ROCKER ARM **B2–7**
ROCKER ARM REMOVAL/INSTALLATION ... **B2–7**
FRONT OIL SEAL **B2–9**
FRONT OIL SEAL REPLACEMENT **B2–9**

OUTLINE

OUTLINE OF CONSTRUCTION

ZCF230201001W01

- The Euro 3 Regulation, WL−3 and WLT−3 models have been adopted .
- The construction and operation of the WL−3 and WLT−3 engines are the same as that of the previous RANGER (UN) WL,WL Turbo engine models, except for the following features. (See RANGER TRAINING MANUAL F326−10−99A.)

FEATURES

ZCF230201001W02

Reduced noise and vibration (WL−3, WLT−3 models)

- Torsional damper pulley (Crankhsaft pulley)
- Timing gear (Injection pump gear)

SPECIFICATIONS

ZCF230201001W03

Item				Specification			
				WL	WL Turbo	WL−3	WLT−3
Type				Diesel, 4-cycle			
Cylinder arrangement and number				In−line, 4-cylinder			
Combustion chamber				Swirl type			
Valve system				OHC, timing gear and belt driven,12 valves			
Displacement (ml {cc, cu in})				2,499 {2,499, 152.4}			
Bore × stroke (mm {in})				93.0 × 92.0 {3.66 × 3.62}			
Compression ratio				21.9, 21.6*1	20.1, 19.8*1	21.6	19.9
Compression pressure (kPa {kgf/cm^2, psi} [rpm])				2,942 {30, 427} [200]			
Valve timing	IN	Open	BTDC (°)	8	10	8	
		Close	ABDC (°)	28	24	23	
	EX	Open	BBDC (°)	61			
		Close	ATDC (°)	9			
Valve clearance (mm {in})		IN	Engine cold	0.05—0.15 {0.0020—0.0059} (0.10 ± 0.05 {0.0039 ± 0.0019})			
			Engine hot (Reference)	0.15 {0.0059}			
		EX	Engine cold	0.15—0.25 {0.0060—0.0098} (0.20 ± 0.05 {0.0078 ± 0.0019})			
			Engine hot (Reference)	0.25 {0.0098}			

*1 : General

Bold frames: New specifications

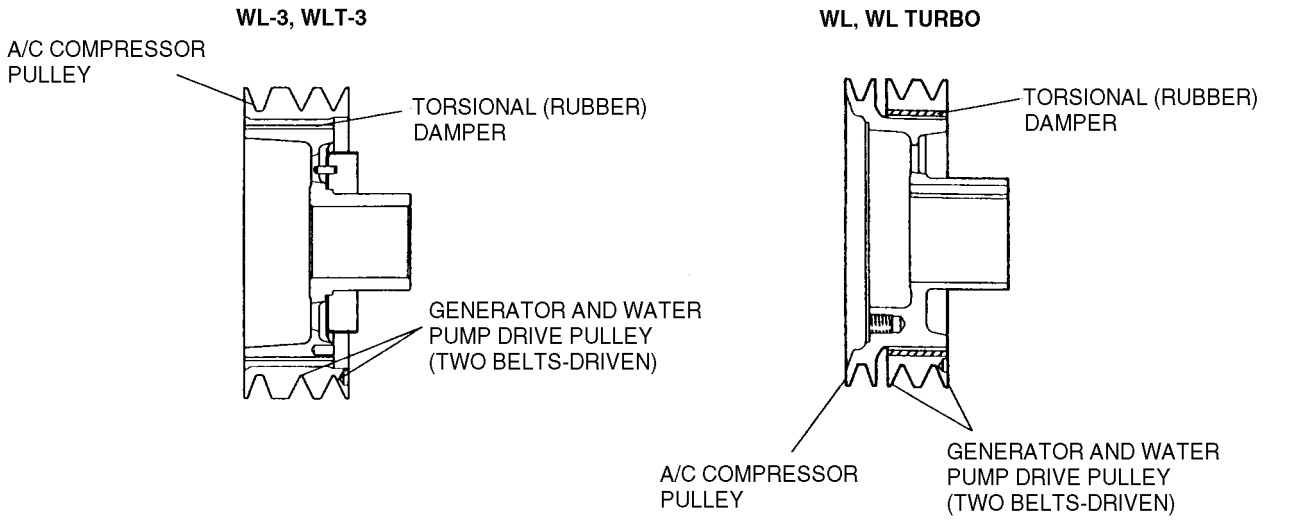
ENGINE MECHANISM

CRANKSHAFT PULLEY DESCRIPSION

ZCF232439000W01

Function/Structure (WL–3, WLT–3 models)

- The shape of the crankshaft pulley has been modified to reduce noise and torsional vibration during high speed rotation of the crankshaft.



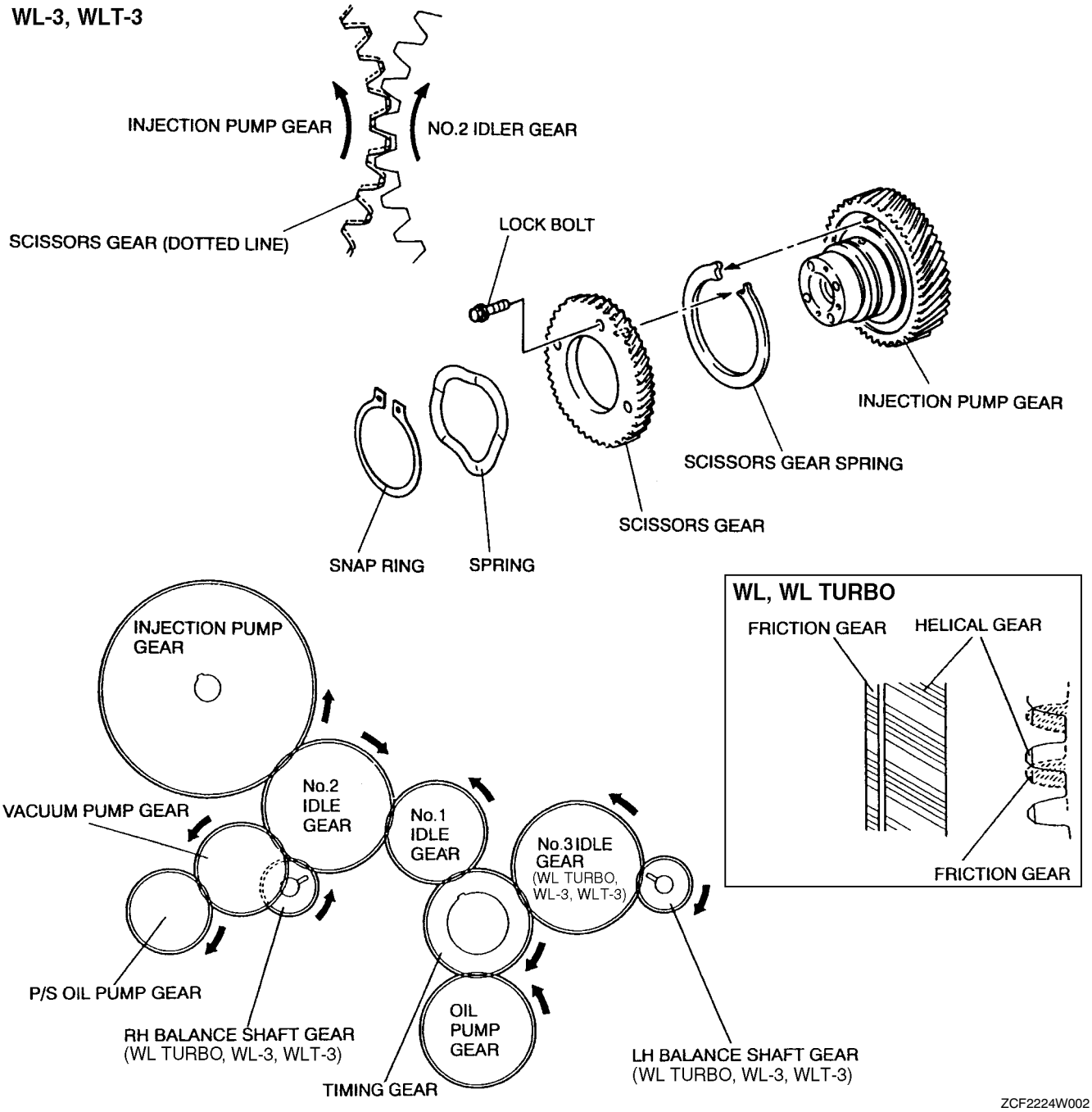
ZCF2224W001

TIMING GEAR

ZCF232439000W02

Injection Pump Gear (WL–3, WLT–3 models)

- The gears are helical. Injection pump gear is combined with a scissors gear.
- The scissors gear, through the force of the scissors gear spring, prevents the teeth of the injection pump gear from moving back and forth (backlash) between the teeth of the No.2 idler gear, with which the injection pump gear is meshed, and thus reduces gear noise.
- When removing the injection pump gear, fix the scissors gear to the injection pump gear using a lock bolt (M8 x 1.25, length under the bolt head is approximately 14 mm {0.55 in} to prevent the scissors gear from rotating under the spring force.



ZCF2224W002

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

ZCF230201001W06

- The following changes have been made since the publication of the RENGER REPAIR MANUAL (F161−10−99A).

Valve clearance

- Inspection/Adjustment procedure has been modified.

Rocker arm

- Removal/Installation procedure has been modified.

Front oil seal

- Replacement procedure has been modified.

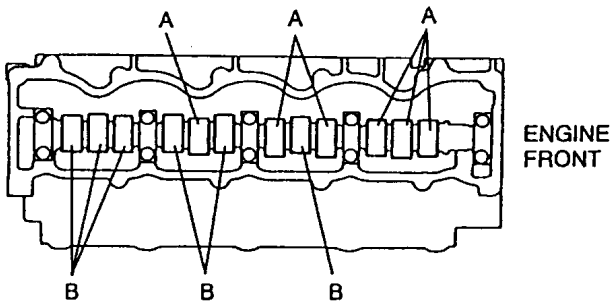
VALVE CLEARANCE

VALVE CLEARANCE INSPECTION/ADJUSTMENT

ZCF231112111W01

1. Remove the EGR pipe (WL−3,WLT−3). (See F2−55 EGR SYSTEM REMOVAL/INSTALLATION.)
2. Remove the cylinder head cover.
3. Turn the crankshaft and align the timing mark with the indicator pin so that the piston of the No. 1 or No. 4 cylinders is at TDC of the compression.
4. Measure the valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.

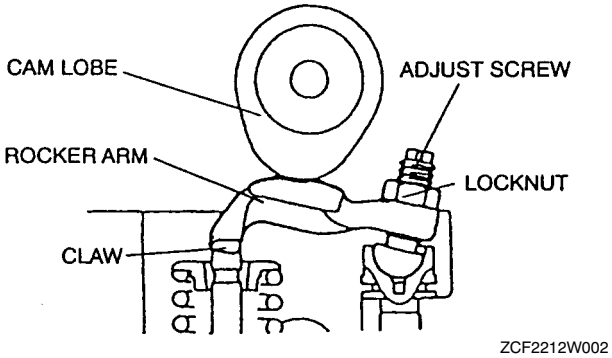
Valve clearance [Engine cold]
IN: 0.05 — 0.15 mm {0.0020 — 0.0059 in}
[Engine cold]
0.15 mm {0.0059 in}
[Engine hot (reference)]
EX: 0.15 —0.25 mm {0.0060 — 0.0098 in}
[Engine cold]
0.25 mm {0.0098 in}
[Engine hot (reference)]



ZCF2212W001

Caution

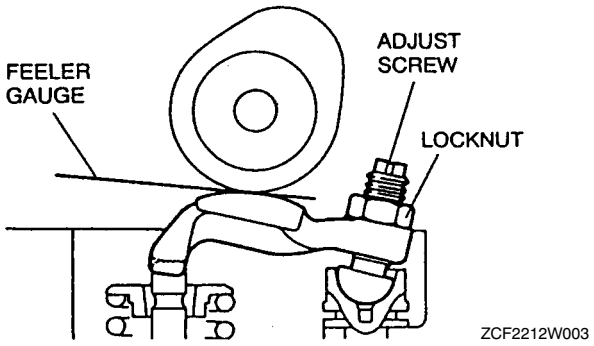
- **Loosening the locknut and the adjust screw while the cam lobe is not pressing down the rocker arm will damage the claw of the rocker arm. When loosening the locknut and the adjust screw, rotate the crankshaft clockwise and be sure that the cam lobe presses down the rocker arm firmly as shown in the figure.**



ZCF2212W002

5. If not within the specification, adjust and recheck the valve clearance.
6. Turn the crankshaft one full turn and measure the remaining valve clearances. Adjust if necessary.

Tightening torque
16—20 N·m {1.6—2.1 kgf·m, 12—15 ft·lbf}



7. Install the cylinder head cover.
8. Install the EGR pipe (WL–3,WLT–3). (See F2–55 EGR SYSTEM REMOVAL/INSTALLATION.)

ROCKER ARM

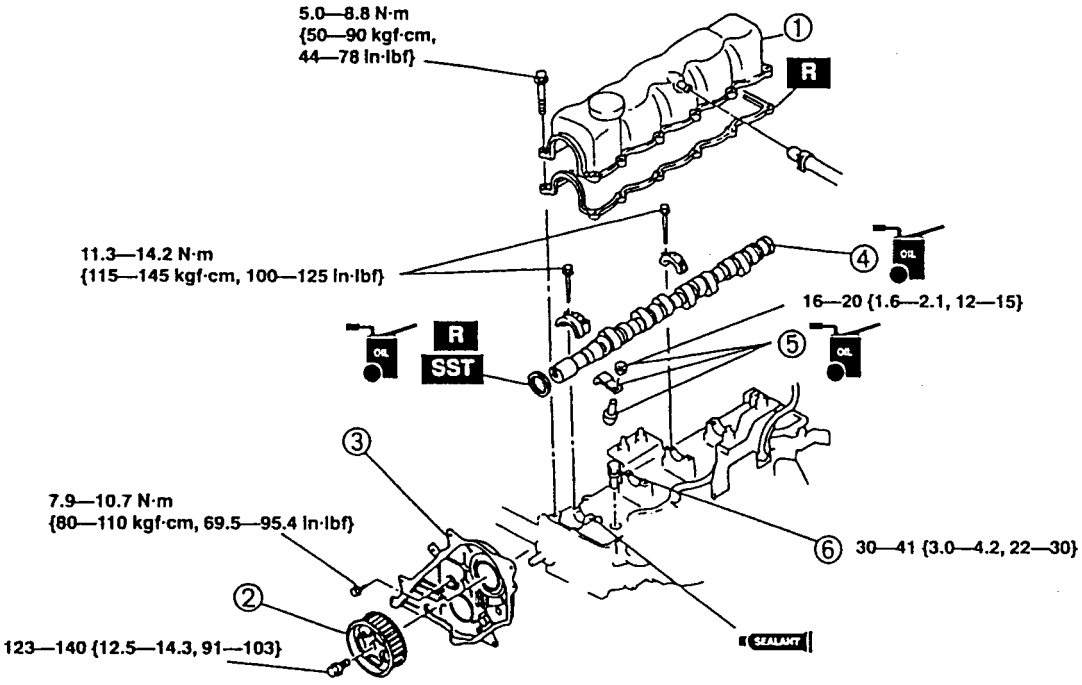
ROCKER ARM REMOVAL/INSTALLATION

ZCF232112010W01

Caution

- **Removing the camshaft under load can break the camshaft. When removing the camshaft, be sure to prevent the camshaft from pressing down the rocker arm. (See B2-5 VALVE CLEARANCE INSPECTION/ADJUSTMENT.)**

1. Disconnect the negative battery cable.
2. Remove the EGR pipe (WL-3,WLT-3). (See F2-55 EGR SYSTEM REMOVAL/INSTALLATION.)
3. Remove the air intake pipe and breather chamber.
4. Remove the timing belt.
5. Remove the order indicated.
6. Install in the reverse order of removal.



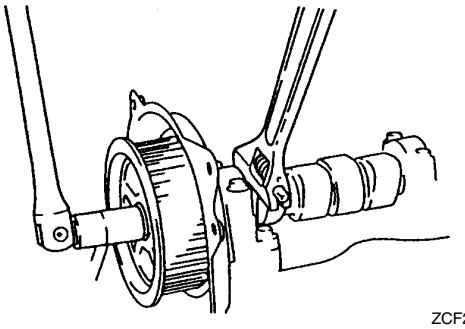
ZCF2221W001

1	Cylinder head cover
2	Camshaft pulley (See B2-8 Camshaft pulley Removal Note) (See B2-9 Camshaft Pulley Installation Note)
3	Seal plate (See B2-9 Seal plate Installation Note)

4	Camshaft (See B2-8 Camshaft Removal Note) (See B2-8 Camshaft Installation Note)
5	Rocker arm (See B2-8 Rocker Arm Installation Note)
6	Pivot

Camshaft pulley Removal Note

- Hold the camshaft using a wrench cast hexagon.



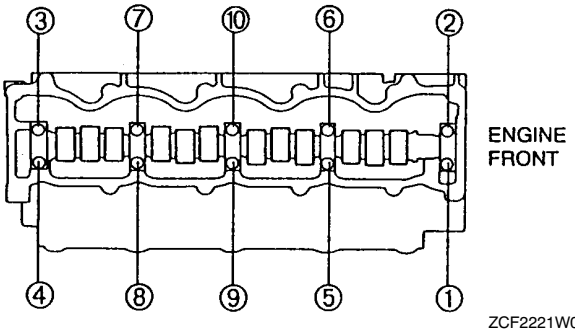
ZCF2221W002

Camshaft Removal Note

Note

- Mark the camshaft cap so that they can be reinstalled in the position from which they were removed.

- Loosen the camshaft cap bolts in three or four steps in the order shown.

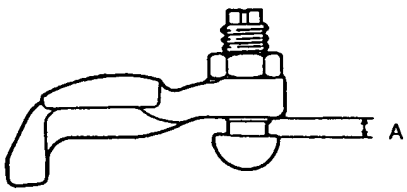


ZCF2221W003

Rocker Arm Installation Note

- If a new rocker arm is used, set dimension A as follows.

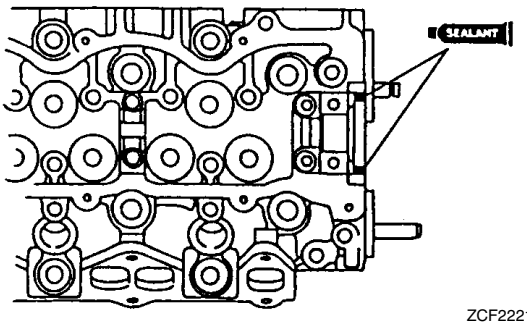
Dimension A
0—4 mm {0—0.1 in}



ZCF2221W004

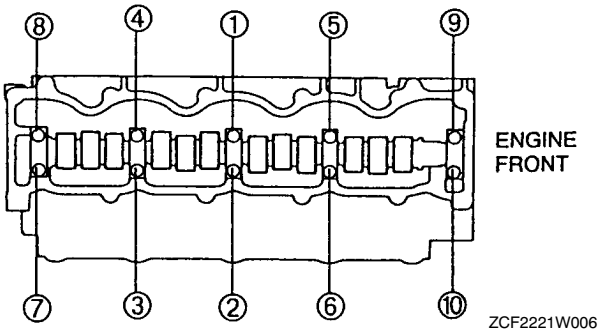
Camshaft Installation Note

1. Apply silicone sealant to the camshaft cap mounting surfaces as shown. Prevent sealant from getting onto the camshaft journal, oil seal surface, and camshaft thrust surface.



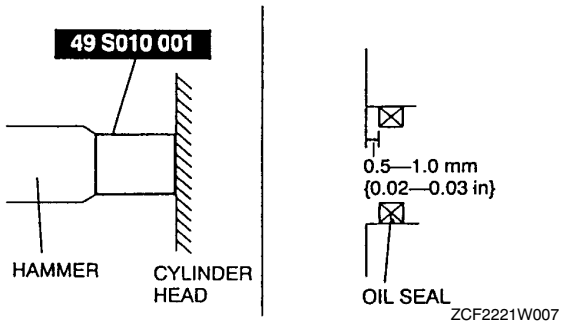
ZCF2221W005

2. Tighten the camshaft cap bolts gradually in three or four steps in the order shown.



ZCF2221W006

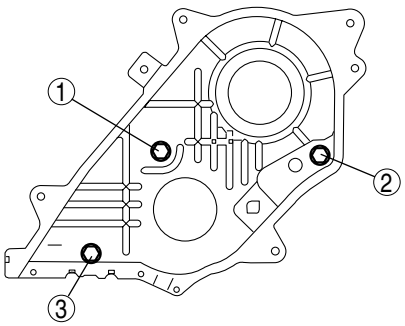
3. Apply clean engine oil to the new oil seal.
4. Push the oil seal slightly in by hand.
5. Tap the oil seal into the cylinder head using the **SST** and the a hammer.
6. To ensure that the oil seal is installed accurately, measure distance between the end of the cylinder head and the face of the oil seal.



ZCF2221W007

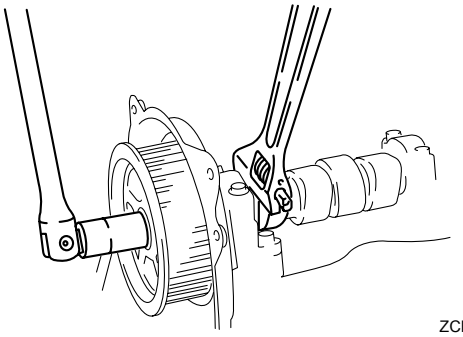
ROCKER ARM, FRONT OIL SEAL

Seal plate Installation Note
- Tighten the seal plate bolts in the order shown.



ZCF2221W008

Camshaft Pulley Installation Note
- Hold the camshaft by using a wrench on the cast hexagon and tighten the pulley lock bolt.


ZCF2221W002

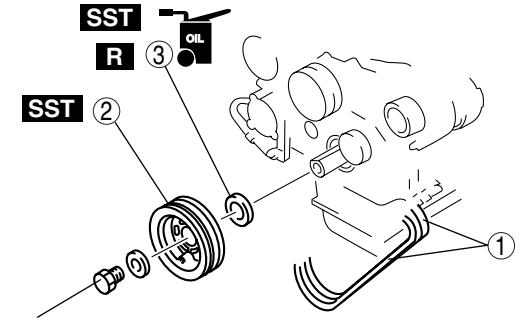
FRONT OIL SEAL

FRONT OIL SEAL REPLACEMENT

ZCF232010602W01

Caution
- **There are two types of crankshaft pulley lock bolts.**
- **When replacing the bolts, measure the stem length of the bolts and replace them with the same length of bolt.**
- **Otherwise, the bolts will contact the crankshaft pulley resulting in improper installation.**

1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove the radiator hose.
4. Remove the radiator cowling and cooling fan.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Inspect the engine oil level.
8. Adjust the drive belt deflection.



BOLT STEM LENGTH 30.5 mm {1.2 in} :
350—390 {35—40, 260—280}
BOLT STEM LENGTH 36.5 mm {1.4 in} :
392—441 {40—44, 290—325}

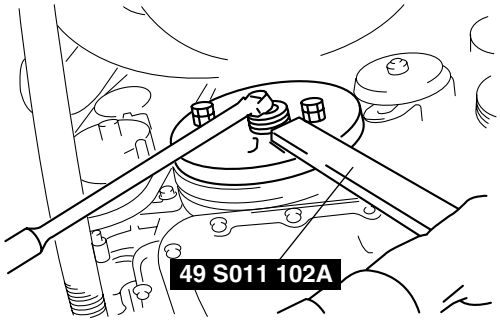
N·m {kgf·m, ft·lbf}

CE2220WR01

1	Drive belt
2	Crankshaft pulley (See B2-9 Crankshaft pulley Removal Note) (See B2-10 Crankshaft pulley Installation Note)
3	Front oil seal (See B2-10 Front Oil Seal Removal Note) (See B2-10 Front Oil Seal Installation Note)

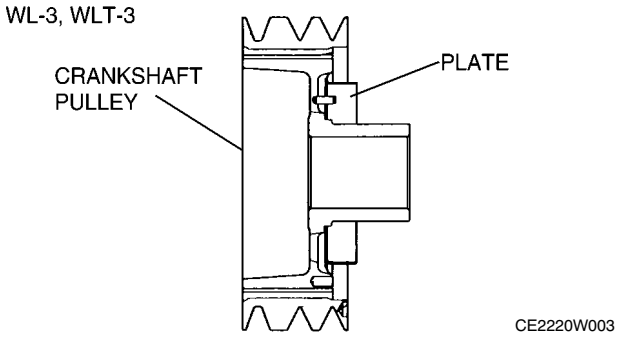
Crankshaft pulley Removal Note
- Hold the crankshaft by using the **SST**

Caution
- **Turning the crankshaft after the crankshaft pulley is removed can dislocate the timing gear.**
- **Removing the key can cause the key grooves to become misaligned.**

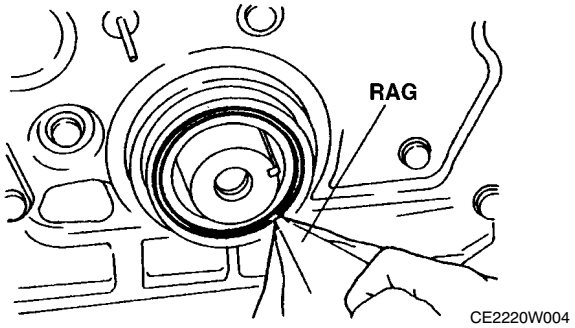


CE2220W002

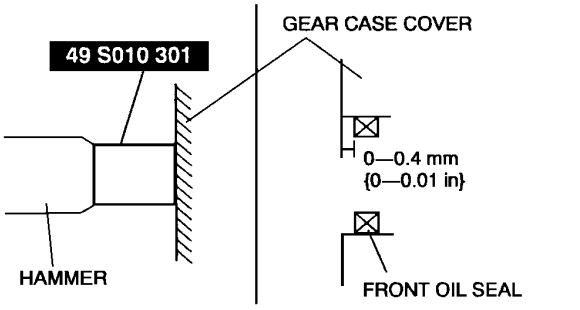
Caution
(WL–3, WLT–3)
- **The TDC sensor plate is a very important part for engine operation control; any deformation of the plate may disable the operation control.**
  When disassembling/assembling the crankshaft pulley, be very careful not to deform the plate by interference with other parts or improper handling.



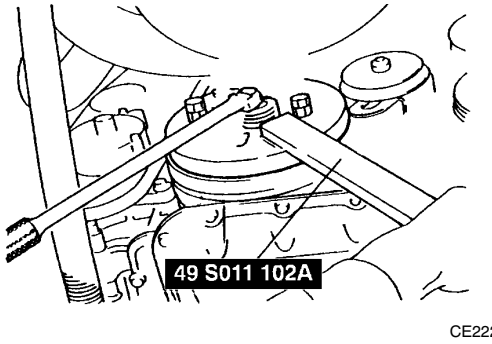
Front Oil Seal Removal Note
1. Cut the oil seal lip using a razor knife.
2. Remove the oil seal using a screwdriver protected with a rag.



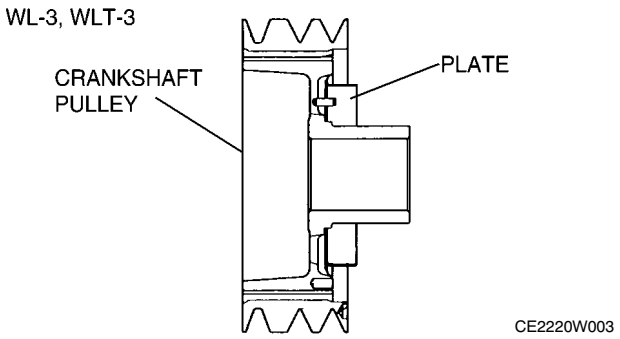
Front Oil Seal Installation Note
1. Apply clean engine oil to the new oil seal lip.
2. Push the oil seal slightly in by hand.
3. Tap the oil seal in evenly using the **SST** and a hammer.
4. To ensure that the oil seal is installed accurately, measure the distance between the end of the gear case cover and the face of the front oil seal.



Crankshaft pulley Installation Note
- Hold the crankshaft using the **SST**



Caution
(WL–3, WLT–3)
- **The TDC sensor plate is a very important part for engine operation control; any deformation of the plate may disable the operation control.**
  When disassembling/assembling the crankshaft pulley, be very careful not to deform the plate by interference with other parts or improper handling.



COOLING SYSTEM

FEATURES

OUTLINE **E–2**
OUTLINE OF CONSTRUCTION **E–2**
SPECIFICATIONS **E–2**
COOLANT FLOW DIAGRAM **E–3**

OUTLINE

OUTLINE OF CONSTRUCTION

ZCF360201004W01

- The construction and operation of the cooling systems of the Euro 3 Regulation models is essentially carried over from that of the current RANGER (UN)/RANGER WL, WL Turbo models (non−Euro 3 regulation models). (See RANGER Training Manual F326−10−99A.)
- Euro 3 and non Euro 3 regulation models are distinguished as follows:
  —Euro 3 Regulation models are equipped with an EGR water cooler in the coolant flow diagram.

SPECIFICATIONS

ZCF360201004W02

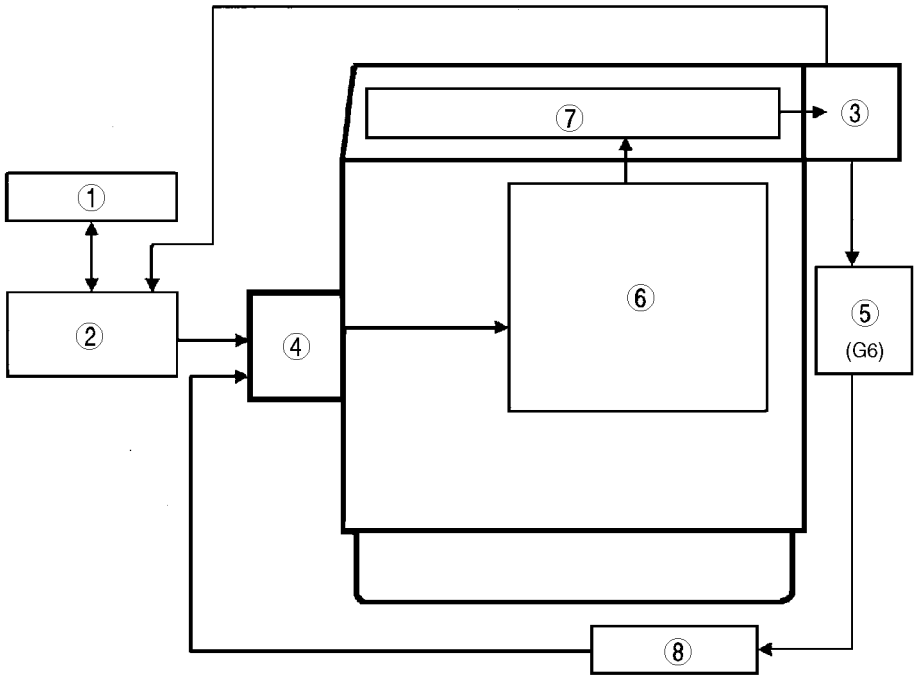
Item			Engine					
			F2	G6	WL	WL−3	WL turbo	WLT−3
Cooling system			Water-cooled, force circulation					
Coolant capacity (Approximate quantity) (L {US qt, Imp qt})		With heater	7.5 {7.9, 6.6}		9.4 {9.9,8.3}			
		Without heater	6.9 {7.3, 6.1}		8.8 {9.3, 7.7}			
Water pump	Type		Centrifugal, timing belt driven	Centrifugal, V−belt driven				
Thermo−stat	Type		Wax, flow−control	Wax, two−stage	Wax, bottom by−pass			
	Opening temperature (°C {°F})		83.5—89.5 {183—193}	Sub: 83.5—89.5 {183—193} Main: 86.5—89.5 {188—193}	80—84 {176—183}			
	Full-open temperature (°C {°F})		100 {212}		95 {203}			
	Full-open lift (mm {in})		8.5 {0.33} min	Sub: 1.5 {0.06} min Main: 8.0 {0.31} min	8.5 {0.33} min.			
Radiator	Type		Corrugated fin					
	Cap valve opening pressure (kPa {kgf/cm^2, psi})		74—102 {0.75—1.05, 10.7—14.9}		94—122 {0.95—1.25, 13.6—17.7}			
Cooling fan	Type		Thermo-modulation					
	Blade	Outer diameter (mm {in})	380 {15.0}	410 {16.1}	440 {17.3}			
		Number	7	8	10			

Bold frames : New specification

COOLANT FLOW DIAGRAM

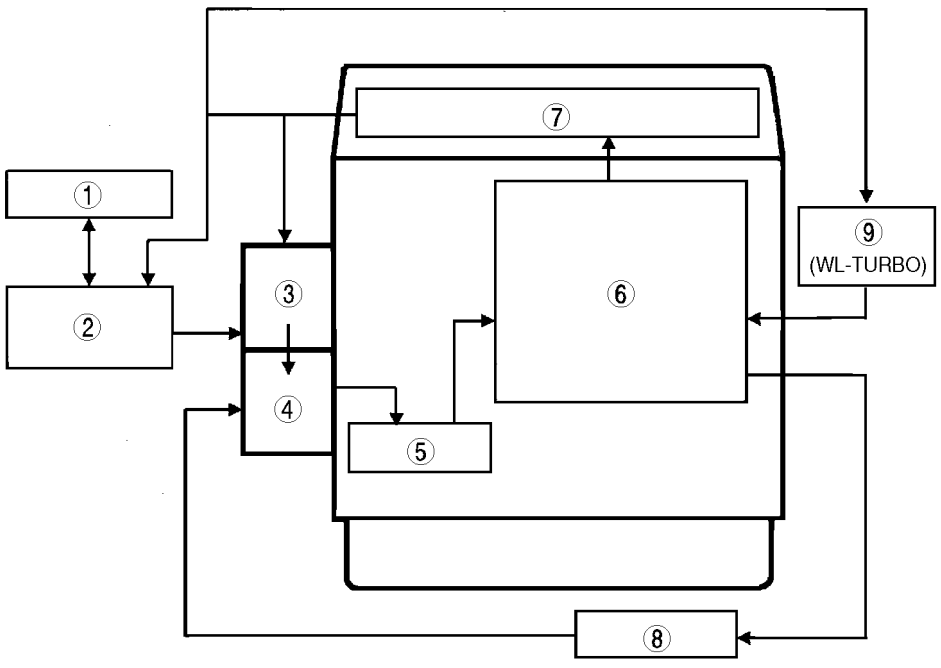
ZCF360201004W03

F2, G6



ZBE3602W001

WL, WL TURBO

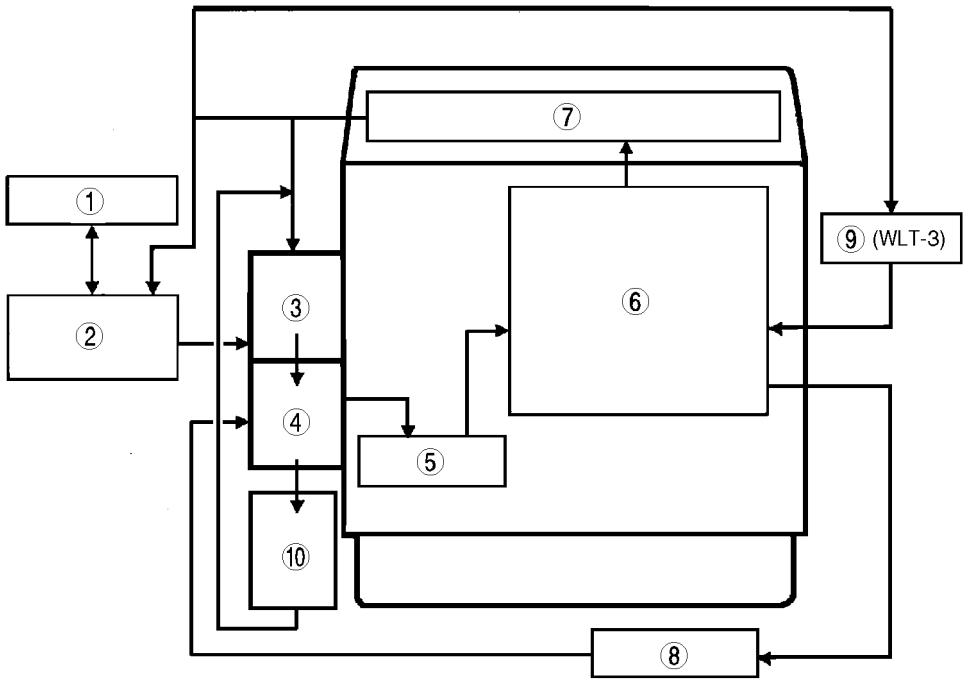


ZBE3602W003

1	Coolant reservoir
2	Radiator
3	Thermostat
4	Water pump
5	Oil cooler

6	Cylinder block
7	Cylinder head
8	Heater
9	Turbocharger

WL–3, WLT–3



ZBE3602W002

1	Coolant reservoir
2	Radiator
3	Thermostat
4	Water pump
5	Oil cooler

6	Cylinder block
7	Cylinder head
8	Heater
9	Turbocharger
10	EGR water cooler

FUEL AND EMISSION CONTROL SYSTEMS

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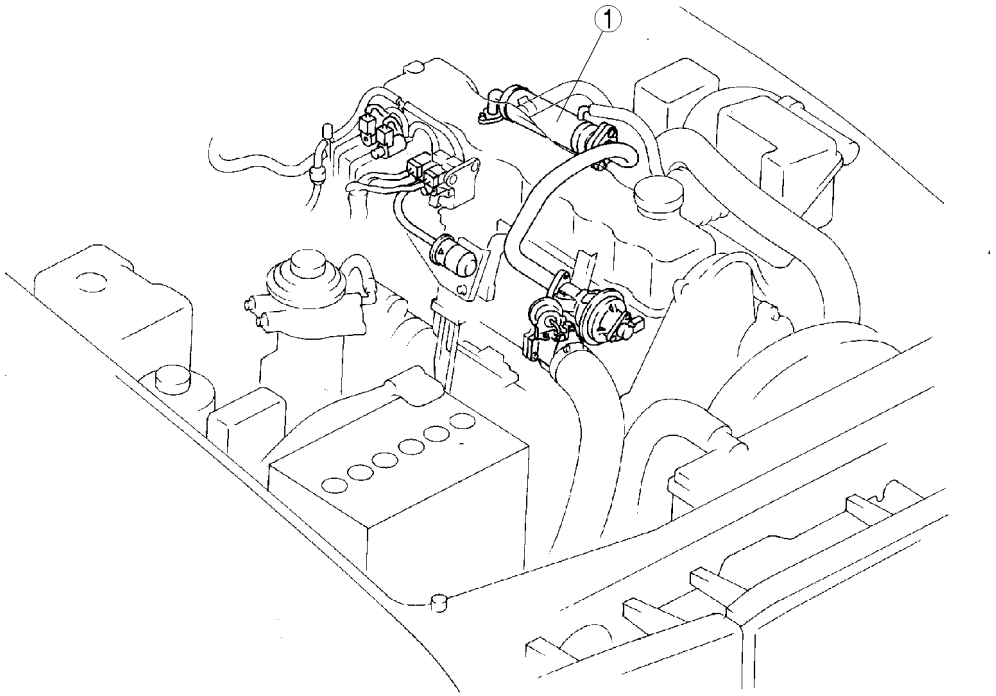
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OUTLINE

OUTLINE OF CONSTRUCTION

ZCF400202000W01

- To match the Euro 3 Regulation, WL−3 and WLT−3 models have been adopted which have electronic control type injection pump.
- The construction and operation of the fuel and emission control systems of the Euro 3 Regulation models is essentially carried over from that of the current RANGER (UN)/RANGER WL, WL Turbo models (non-Euro 3 regulation models.) (See RANGER TRAINING MANUAL F326−10−99A.) except for the following features.
- Euro 3 and non Euro 3 regulation models are distinguished as follows:
  — Euro 3 Regulation models are equipped with an EGR water cooler in the engine room.
  — Non-Euro 3 Regulation models are not equipped with an EGR water cooler in the engine room.



ZCF4002W004

1	EGR water cooler

FEATURES

ZCF400202000W02

Improved Emission Performance

- An electric controlled type injection pump has been adopted on the Euro 3 Regulation models.
- An EGR valve position sensor has been added to the Euro 3 Regulation model.
- An EGR water cooler has been added to the Euro 3 Regulation models.
- An intake shutter valve has been added to the Euro 3 Regulation WLT−3 engine models.
- A turbocharger that is smaller than the WL Turbo engine has been added on the Euro 3 Regulation WL−3 models.

Improved Drivability

- A turbocharger that is smaller than the WL Turbo engine has been adopted on the Euro 3 Regulation WL−3 models.

Improved Serviceability

- DTCs have been added to Euro 3 Regulation models.
- PID DATA MONITOR and SIMULATION functions have been added to the Euro 3 Regulation models, using WDS or equivalent.

SPECIFICATIONS

ZCF400202000W03

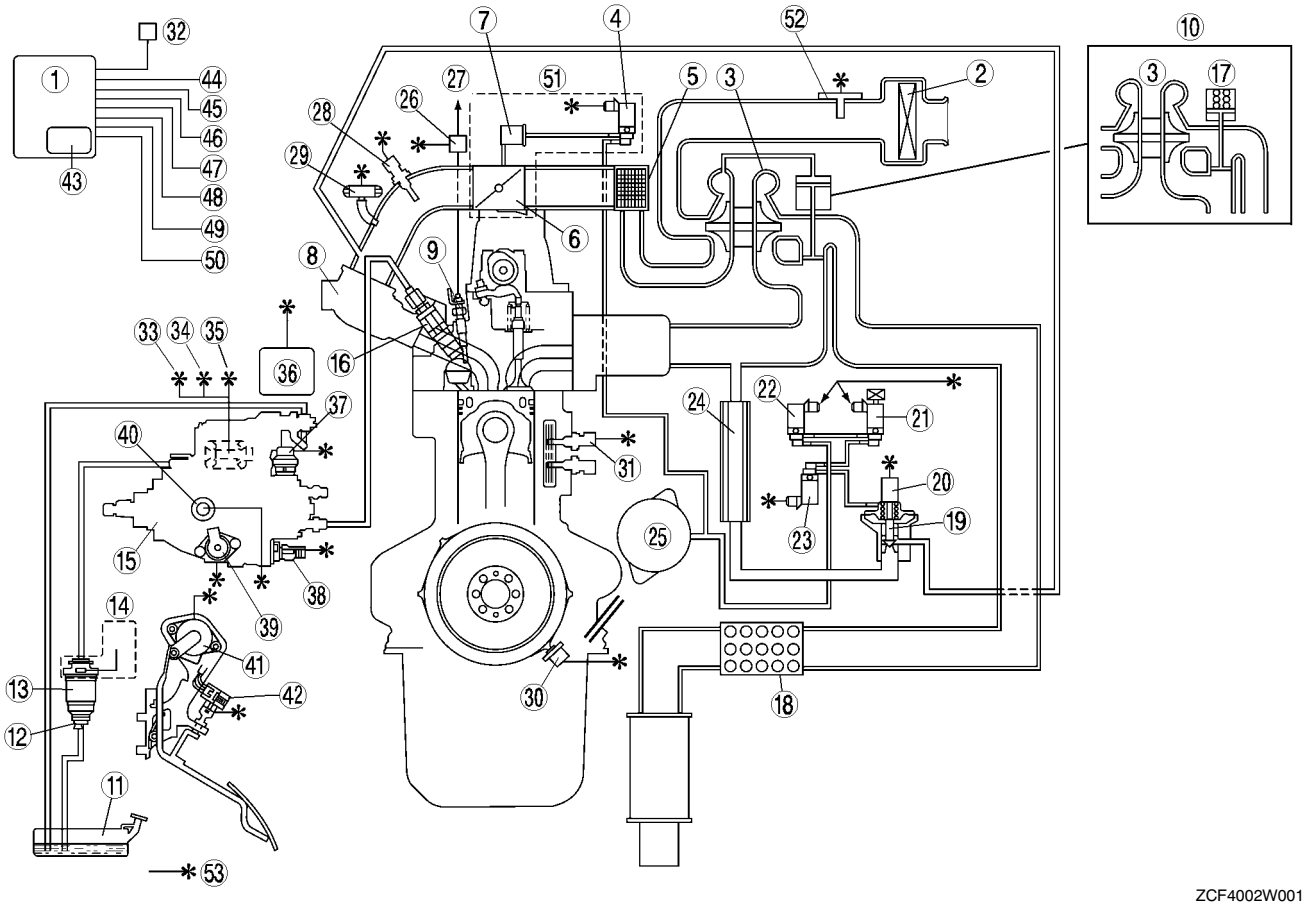
Item		Euro 3 Regulation models		Non Euro 3 Regulation models	
		WL-3	WLT-3	WL	WL Turbo
Air cleaner element	Type	Non woven fabric (dry)			
Supercharger type	Type	Turbocharger with charge air cooler		-	Turbocharger with charge air cooler
Glow plug	Type	Ceramic type		Self-temperature control type	
Injection pump	Type	Bosch VE distributor			
Fuel tank	Capacity (L {US gal, Imp gal})	63 {67, 55}*1,70 {74, 62}			
Catalyst	Type	Oxidation catalyst converter			
EGR control	Type	Duty control type		-	ON/OFF
PCV system	Type	Closed type			

*1 : Stretch cab 2WD
Bold frames : New specifications

CONTROL SYSTEM DIAGRAM

ZCF400202000W04

Euro 3 Regulation Models



ZCF4002W001

1	PCM
2	Air cleaner
3	Turbocharger
4	Intake shutter solenoid valve
5	Charge air cooler
6	Intake shutter valve

7	Intake shutter valve actuator
8	Intake manifold
9	Glow plug
10	WL-3
11	Fuel tank
12	Sedimentor switch

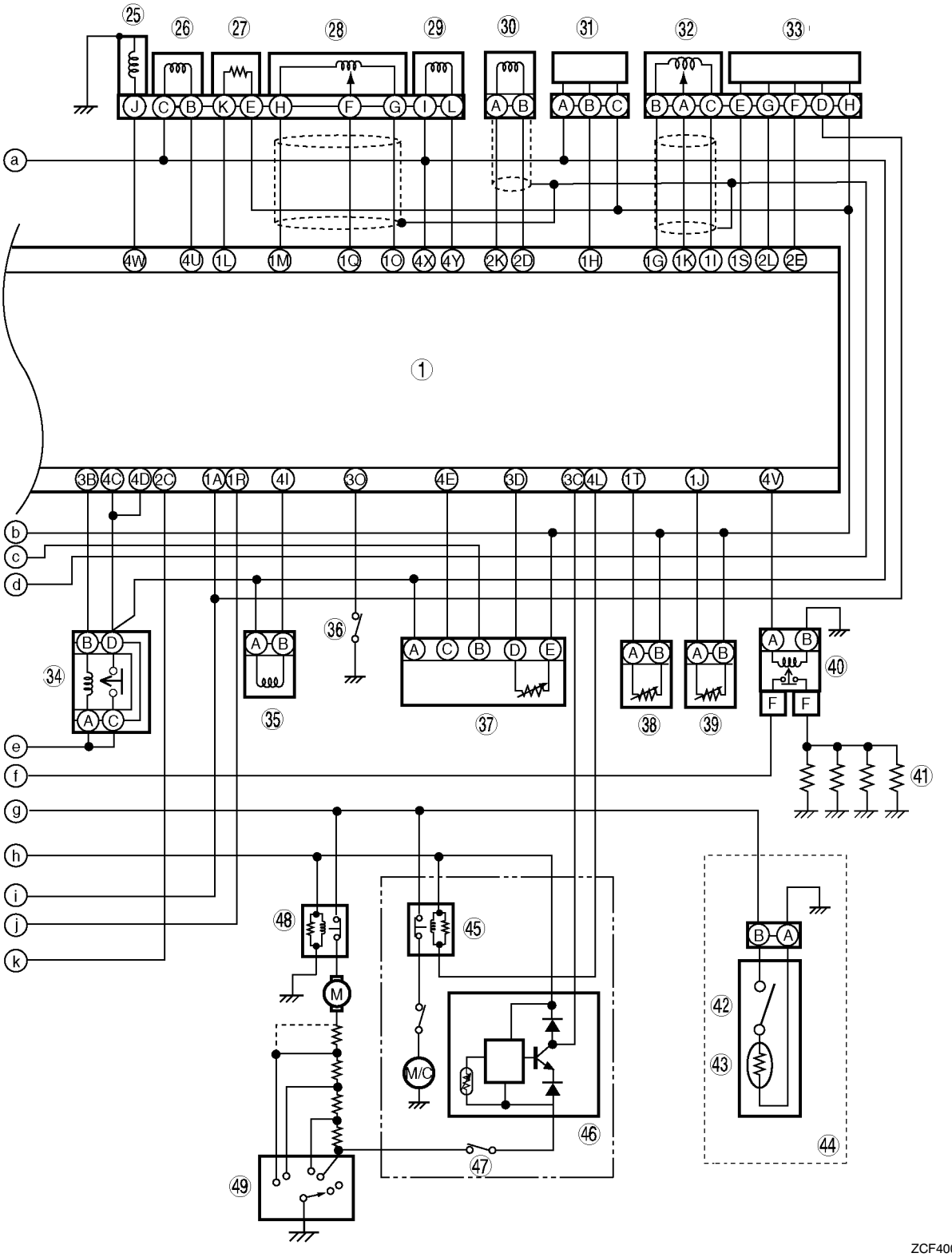
13	Fuel filter
14	Fuel warmer (if equipped)
15	Injection pump
16	Injection nozzle
17	Wastegate dumper
18	Oxidation catalytic converter
19	EGR valve
20	EGR valve position sensor
21	EGR solenoid valve (vent)
22	EGR solenoid valve (vacuum)
23	EGR control solenoid valve
24	EGR water cooler
25	Vacuum pump
26	Glow plug relay
27	To battery
28	IAT sensor No.2
29	Boost sensor
30	TDC sensor
31	ECT sensor
32	PCM control relay
33	Fuel temperature sensor

34	CS sensor
35	Electronic govenor
36	Injection pump EPROM
37	FSO solenoid
38	TCV
39	Timer position sensor
40	Pump speed sensor
41	Accelerator position sensor
42	Idle switch
43	Barometric pressure sensor
44	Engine switch
45	Starter (starter signal)
46	A/C switch
47	VSS
48	DLC (TEN)
49	Neutral switch
50	Clutch switch
51	WLT-3
52	MAF/IAT sensor
53	To PCM

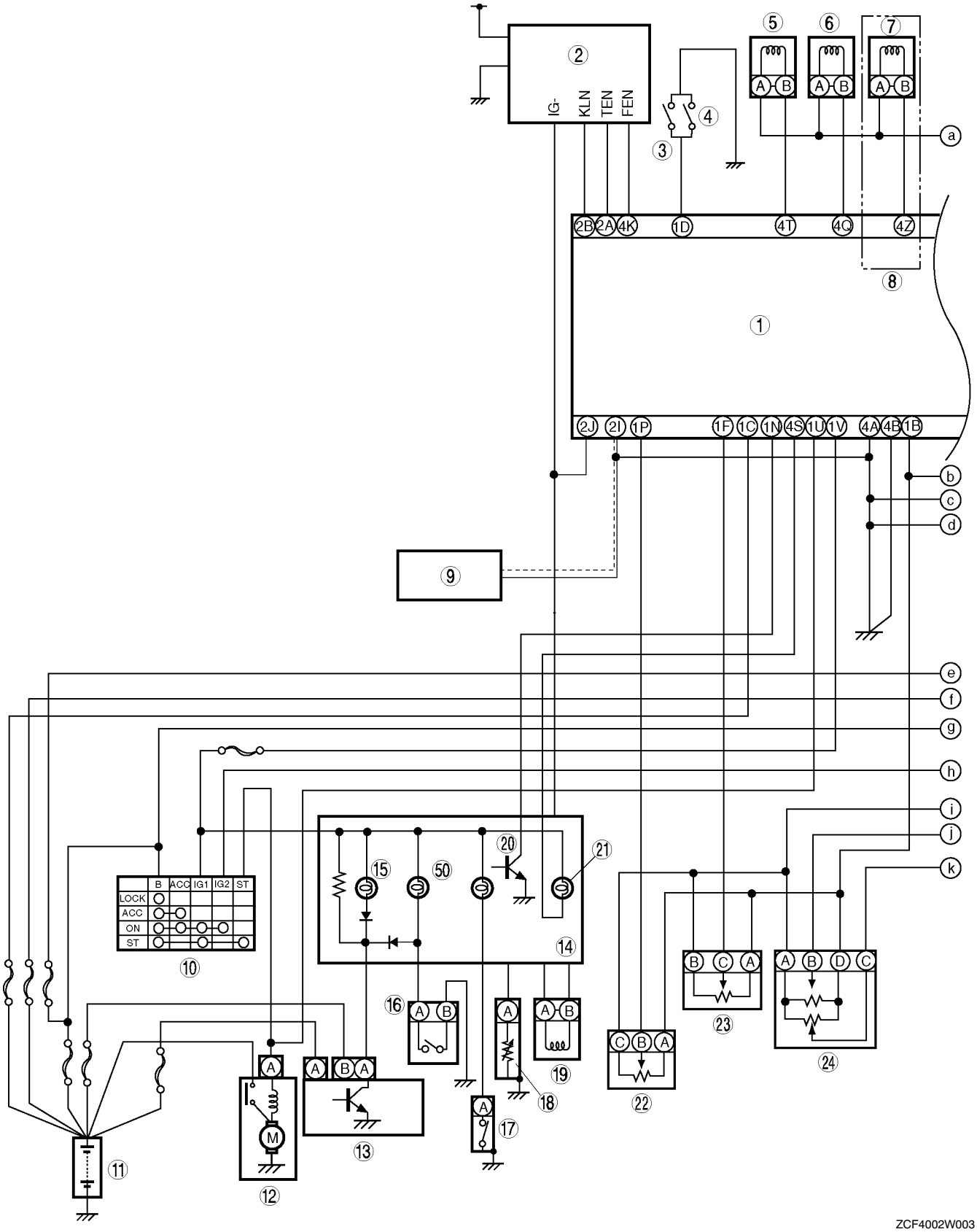
CONTROL SYSTEM WIRING DIAGRAM

ZCF400202000W05

Euro 3 Regulation Models



ZCF4002W002



1	PCM
2	DLC
3	Neutral switch
4	Clutch switch
5	EGR solenoid valve (vacuum)

6	EGR solenoid valve (vent)
7	Intake shutter solenoid valve
8	WLT–3 engine only
9	Immobilizer unit
10	Engine switch

11	Battery
12	Starter
13	Generator
14	Instrument cluster
15	Generator warning light
16	Sedimentor switch
17	Oil pressure switch
18	Heat gauge unit
19	Vehicle speedometer sensor
20	VSS
21	Glow indicator light
22	Boost sensor
23	EGR valve position sensor
24	Accelerator position sensor
25	FSO solenoid
26	TCV
27	Fuel temperature sensor
28	CS sensor
29	Electronic governor
30	Pump speed sensor

31	TDC sensor
32	Timer position sensor
33	Injection pump EPROM
34	PCM control relay
35	EGR control solenoid valve
36	Idle switch
37	MAF/IAT sensor
38	ECT sensor
39	IAT sensor No.2
40	Glow plug relay
41	Glow plug
42	Vacuum switch
43	Fuel warmer
44	With fuel warmer
45	A/C relay
46	A/C amplifier
47	A/C switch
48	Blower motor relay
49	Fan switch
50	Sedimentor warning light

INTAKE−AIR SYSTEM

OUTLINE

ZCF401001005W01

Euro 3 Regulation Models

- The construction and operation of the intake−air system of the Euro 3 Regulation models is essentially carried over from that of the current RANGER (UN)/RANGER WL, WL Turbo models, except for following. (See RANGER TRAINING MANUAL F326−10−99A.)
  - —A small size turbocharger comparable to the one on the previous WL Turbo model has been adopted on the WL−3 models to improve response and engine torque at low/middle speeds.
  - —An intake shutter valve has been installed on the intake manifold to improve emission performance. (WLT−3 models)
  - —A ceramic type glow plug has been adopted to improve emission performance when starting under cold conditions.

TURBOCHARGER DESCRIPTION

ZCF401013700W01

Euro 3 Regulation Models (WL−3)

Outline

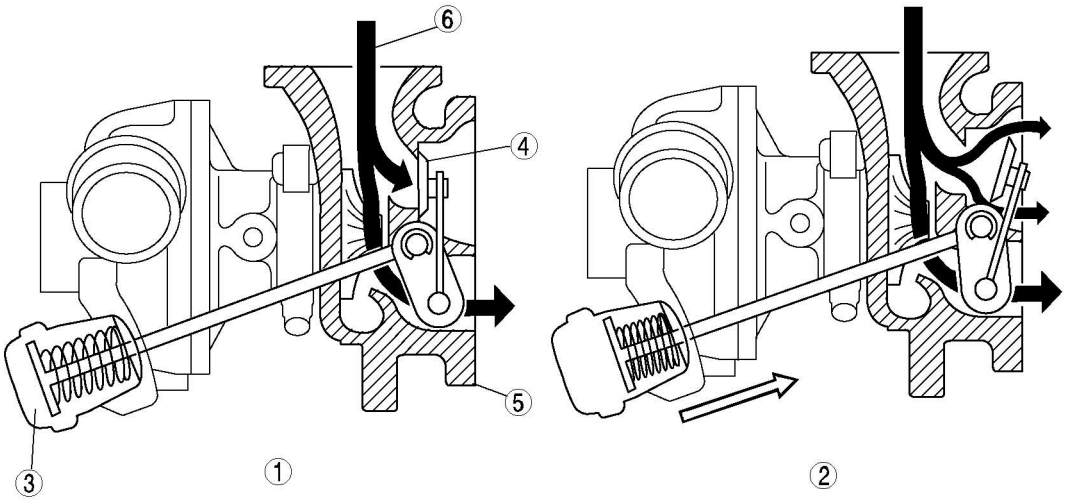
- To improve emission performance and engine power in conformance to the Euro 3 regulation, a turbocharger has been added to the existing WL engine type.
- Compared to the WLT−3 engine turbocharger, smaller turbine wheels have been adopted, improving response and engine torque at low/middle speeds.

Function

- The turbocharger uses exhaust gas pressure to compress the intake air.

Structure/operation

- A wastegate valve, an exhaust−pressure control type valve with a simple structure, has been adopted.
- When exhaust pressure is low, the wastegate valve is closed by spring resistance from the wastegate damper spring.
- When exhaust pressure from the exhaust manifold exceeds the set value, the wastegate valve overcomes spring resistance of the wastegate damper. As a result, the exhaust pressure is released to the turbine wheel downstream and the air charging pressure is controlled.



ZCF4010W101

1	Low exhaust−pressure
2	Exhaust−pressure exceeds set value
3	Wastegate dumper

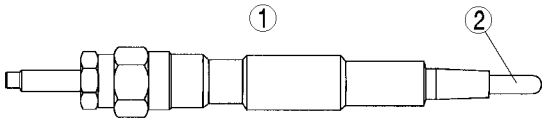
4	Wastegate valve
5	Turbocharger
6	Exhaust gas flow

GLOW PLUG DESCRIPTION

ZCF401018601W01

Euro 3 Regulation Models
Function
- Glow plug improves ignitability and combustibility of intake air by generating heat.

Structure/Operation
- Ceramic material is used on the glow area end for self-control of heat.



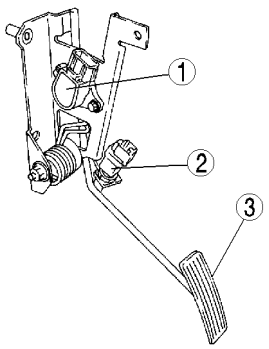
ZCF4010W011

1	Glow plug	2	Glow area end

ACCELERATOR PEDAL COMPONENT DESCRIPTION

ZCF401041600W01

Euro 3 Regulation Models
Structure
- Accelerator pedal components consist of an accelerator pedal, idle switch, and accelerator position sensor.



ZCF4010W012

1	Accelerator position sensor	3	Accelerator pedal
2	Idle switch		

FUEL SYSTEM

OUTLINE

ZCF401201006W01

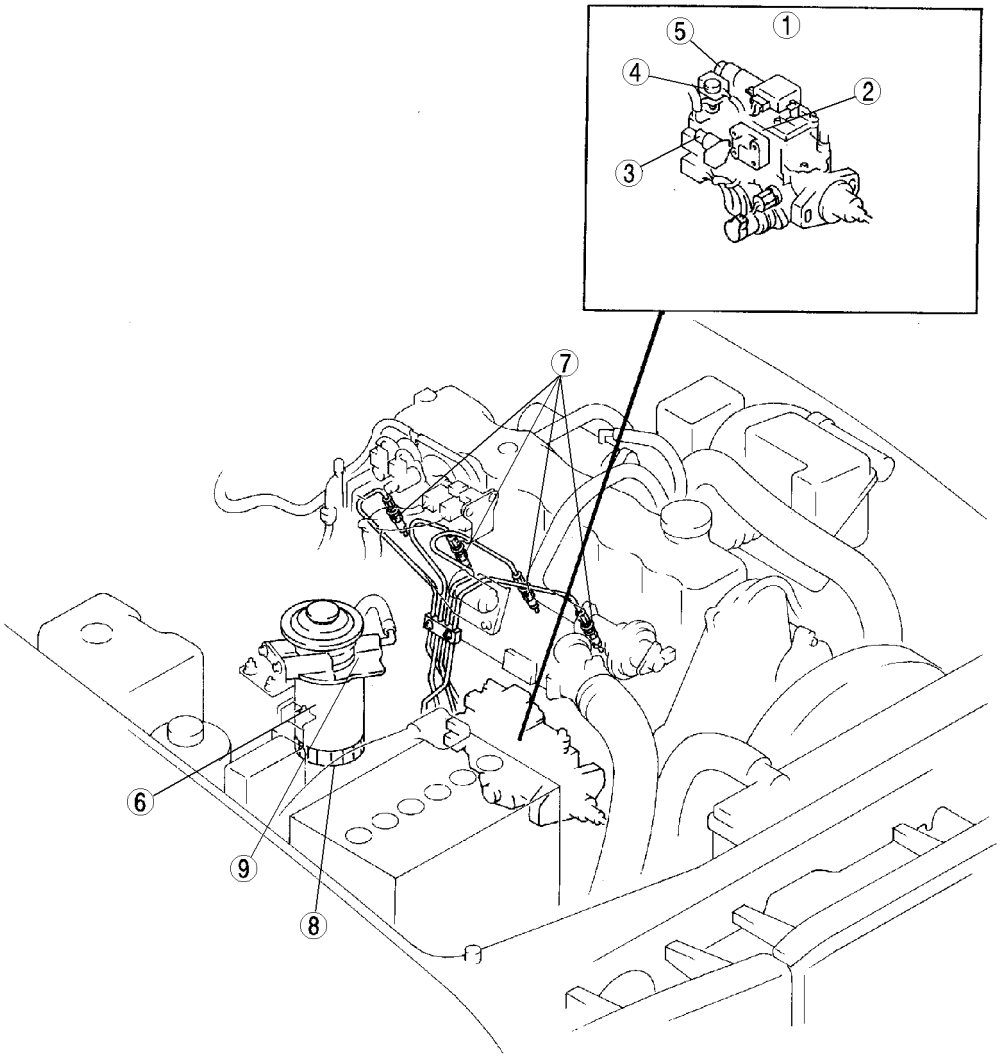
Euro 3 Regulation Models

- The construction and operation of the fuel system of the Euro 3 Regulation models is essentially carried over from that of the current RANGER (UN)/RANGER WL, WL Turbo models, except for following. (See RANGER TRAINING MANUAL F326−10−99A.)
  —An electronic control type injection pump has been adopted to improve the emission performance.

STRUCTUAL VIEW

ZCF401201006W02

Euro 3 Regulation Models



ZCF4012W020

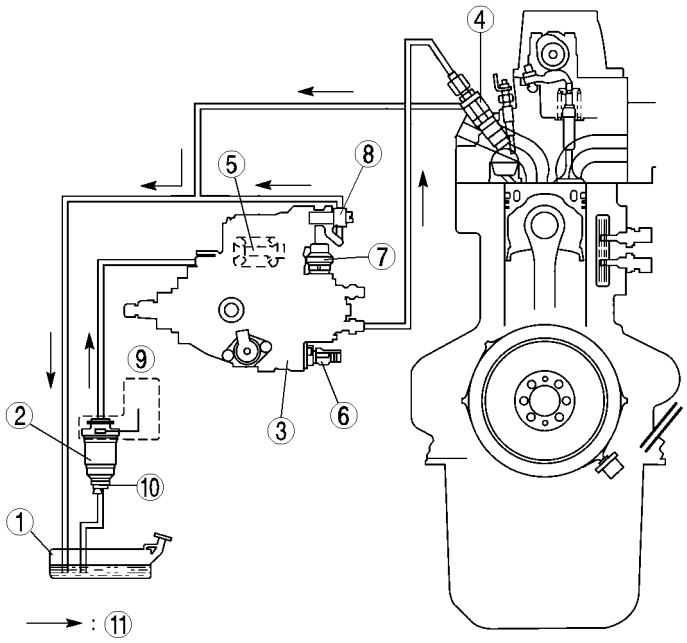
1	Injection pump
2	Electronic governor
3	TCV
4	FSO solenoid
5	Overflow valve

6	Fuel filter
7	Injection nozzle
8	Sedimentor switch
9	Fuel warmer (if equipped)

SYSTEM DIAGRAM

ZCF401201006W03

Euro 3 Regulation Models



ZCF4012W011

1	Fuel tank
2	Fuel filter
3	Injection pump
4	Injection nozzle
5	Electronic governor
6	TCV

7	FSO solenoid
8	Overflow valve
9	Fuel warmer (if equipped)
10	Sedimentor switch
11	Fuel flow

INJECTION PUMP DESCRIPTION

ZCF401213800W01

Euro 3 Regulation Models

Outline

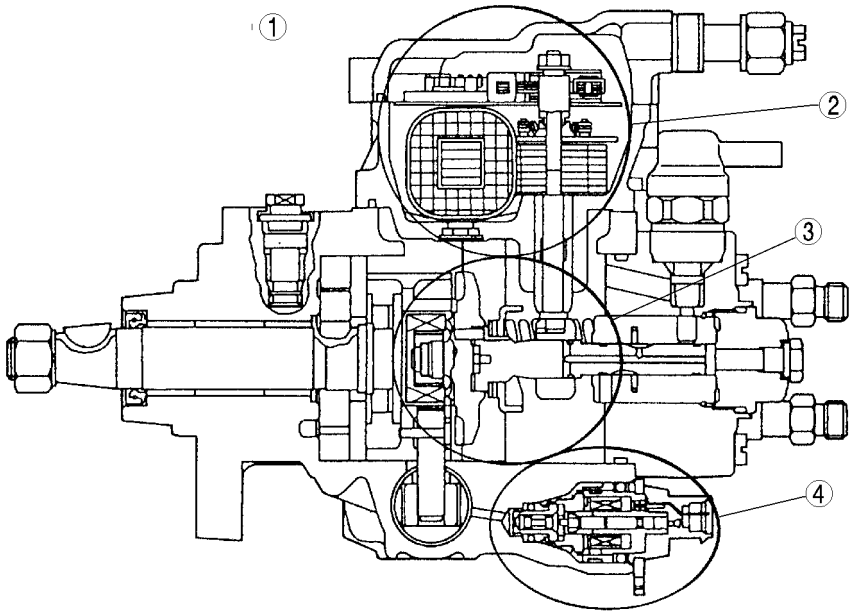
- Due to the adoption of the electronic control type injection pump, the PCM electrically controls the adjustment of the fuel injection amount and timing, which has been controlled mechanically in non- Euro 3 regulation models. The PCM detects the engine driving condition according to the input signals from the sensors, and determines the optimal fuel injection amount and timing.

Function

- The injection pump distributes and force feeds the fuel to the injection nozzle with the optimal injection amount and timing according to the engine condition.

Structure

- The electronic control type injection pump consists of a pump mechanism, which has the same construction as the conventional mechanical injection pump, and electronic control parts such as an electronic governor and a timer control valve.



ZCF4012W013

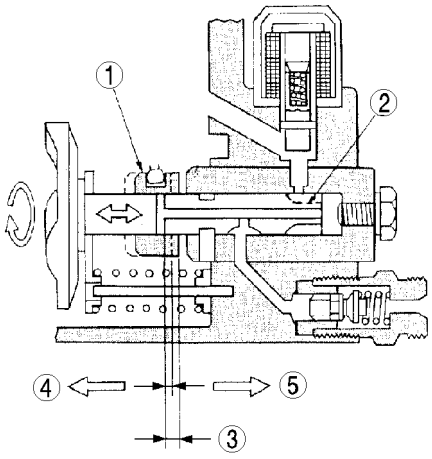
1	Injection pump cross-sectional view
2	Electronic governor

3	Pump mechanism
4	Timer control valve

Operation

Injection amount adjustment

- As with the conventional mechanical injection pump, the fuel is increased or decreased by moving the control sleeve and changing the injection end timing. When the control sleeve moves to the left, the effective stroke, which determines the injection amount, is reduced and the injection amount is also reduced. On the other hand, when the control sleeve moves to the right, the effective stroke increases and the injection amount also increases.
- In the electronic control type injection pump, the control sleeve position is moved by the electronic governor.



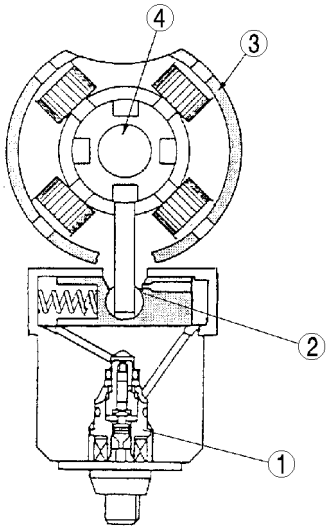
ZCF4012W014

1	Control sleeve
2	Plunger
3	Effective stroke

4	Fuel decrease
5	Fuel increase

Injection Timing Adjustment

- As with the conventional mechanical injection pump, the fuel injection timing is determined by moving the timer piston to change the relative position of the roller holder that contacts the cam plate.
- In the electronic control type injection pump, the fuel pressure that actuates the timer piston is controlled by the timer control valve.



ZCF4012W015

1	Timer control valve
2	Timer piston

3	Roller holder
4	Cam plate

OVERFLOW VALVE DESCRIPTION

ZCF401213800W02

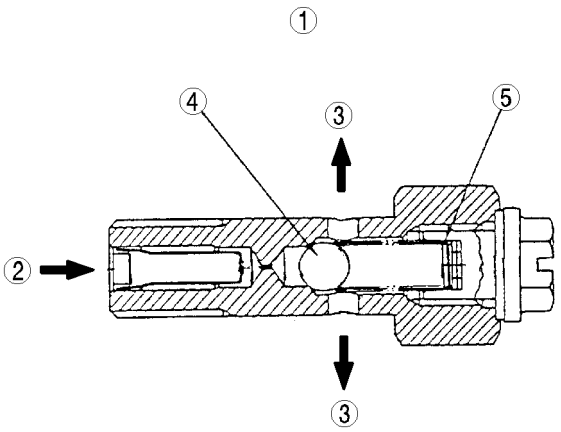
Euro 3 Regulation Models

Function

- The overflow valve maintains a constant fuel pressure in the pump chamber to stabilize the pressure when the fuel is drawn to the high pressure chamber and ensures the optimal fuel injection amount.

Structure/Operation

- The overflow valve is installed on the end face (injection side) of the electronic governor cover.The check valve contains a ball and spring which regulates the pressure in the pump chamber and prevents overflow from occuring through the set force of the spring.



ZCF4012W016

1	Overflow valve cross-sectional view
2	From pump chamber
3	To fuel tank

4	Check ball
5	Spring

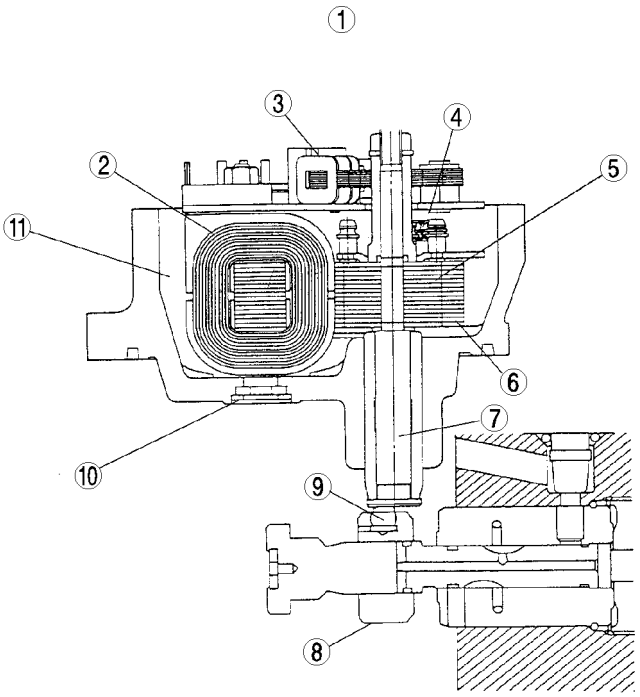
ELECTRONIC GOVERNOR DESCRIPTION

ZCF401213800W03

Euro 3 Regulation Models

Structure

- The electronic governor is installed on the upper part of the injection pump and consists of a coil, rotor, shaft, and control sleeve (CS) sensor.



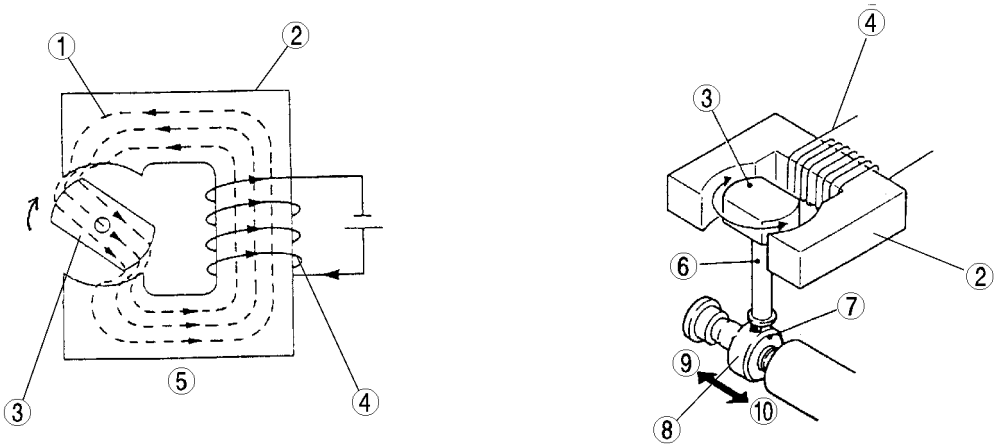
ZCF4012W018

1	Electronic governor cross-sectional view
2	Coil
3	Control sleeve (CS) sensor
4	Return spring
5	Rotor
6	Core

7	Shaft
8	Control sleeve
9	Ball pin
10	Magnet filter
11	Governor chamber

Operation

- In contrast to the current type of injection pump, this injection pump adjusts the injection amount electromagnetically. The control sleeve (CS) sensor detects the control sleeve position and sends feedback to the PCM.
- When electricity passes through the coil, the core becomes magnetized, and the rotor rotates within the regulated limit.
  The strength of the magnetization is determined by the input flow of electricity. The magnetic force which occurs in the core causes the rotor to rotate until it balances with the return spring's tension.
- The governor chamber and pump chamber are connected through the magnet filter, and the coil is cooled by the flow of fuel into the governor chamber.
  The magnet filter prevents the entry of steel chips into the electronic governor.
- On the tip of the shaft, which is pressed in the rotor, a ball pin is installed eccentrically against the shaft. The ball pin is inserted in the control sleeve hole and the control sleeve position is moved when the rotor is rotated.
- When the electric current output from the PCM as fuel injection amount is large, the electric current that flows in the coil also increases, widening the rotation angle of the rotor. As a result, the control sleeve position moves in the direction that fuel injection amount increases (right side).



ZCF4012W019

1	Magnetized
2	Core
3	Rotor
4	Coil
5	Electricity passes

6	Shaft
7	Ball pin
8	Control sleeve
9	Fuel decrease
10	Fuel increase

TIMER CONTROL VALVE DESCRIPTION

ZCF401213800W04

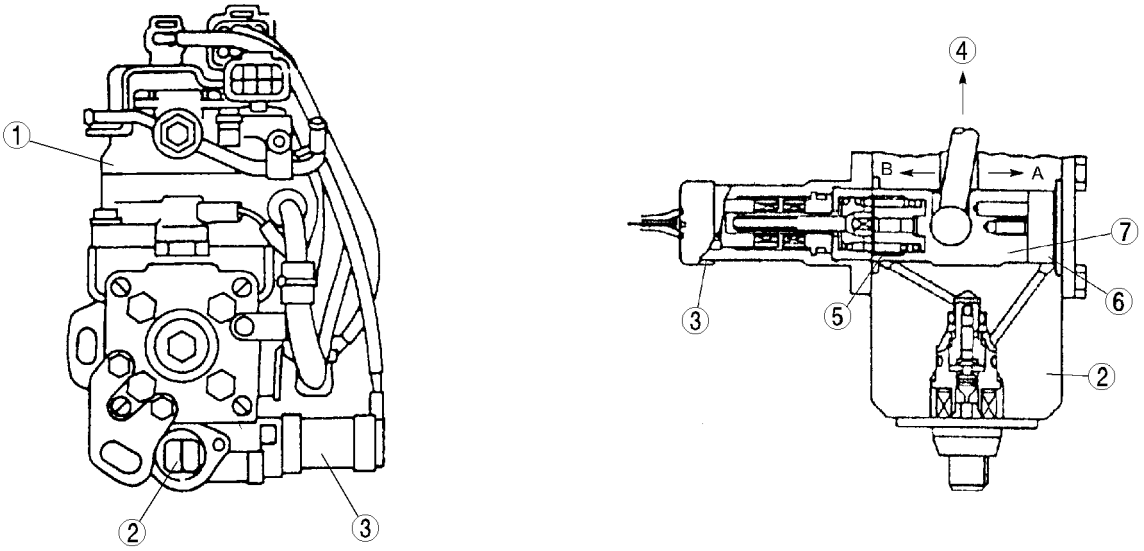
Euro 3 Regulation Models

Function

- The TCV is mounted to the bottom of the injection pump. The TCV is a solenoid valve that controls the position of the timer piston that modifies the fuel injection timing.

Structure/Operation

- The TCV is located between the oil passages that connect the high-and low-pressure chambers. The TCV opens and closes the sheet part of the end of the needle in the TCV with the control signal (duty signal) from the PCM, and adjusts the timer piston position by adjusting the fuel pressure of the high-pressure chamber. (Valve open: toward retard; valve closed: toward advance)



ZCF4012W017

1	Injection pump
2	TCV
3	Timer position sensor
4	Roller holder
5	Low-pressure chamber

6	High-pressure chamber
7	Timer piston ● A side: retard ● B side: advance

EMISSION SYSTEM

OUTLINE

ZCF401601007W01

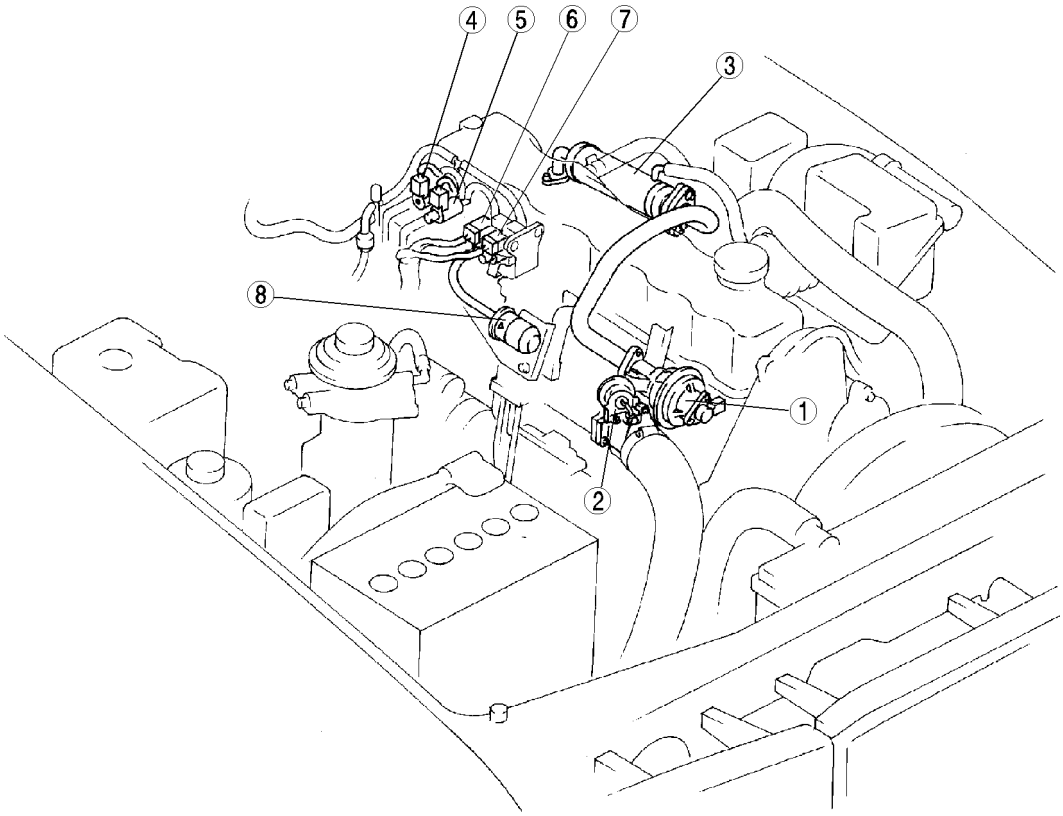
Euro 3 Regulation Models

- The construction and operation of the emission system of the Euro 3 Regulation models is essentially carried over from that of the current RANGER (UN)/RANGER WL, WL Turbo models, except for following. (See RANGER TRAINING MANUAL F326−10−99A.)
  - —The EGR system has been strengthened to comform to the Euro 3 Regulation.
    - An intake shutter valve has been adopted. (WLT−3)
    - An EGR water cooler has been adopted.
    - An EGR valve control type for WL−3 and WLT−3 has been changed from ON/OFF control type which is used for current WL and WL Turbo, to duty control using EGR solenoid valves. (vent and vacuum.)

STRUCTURAL VIEW

ZCF401601007W02

Euro 3 Regulation Models



ZCF4016W013

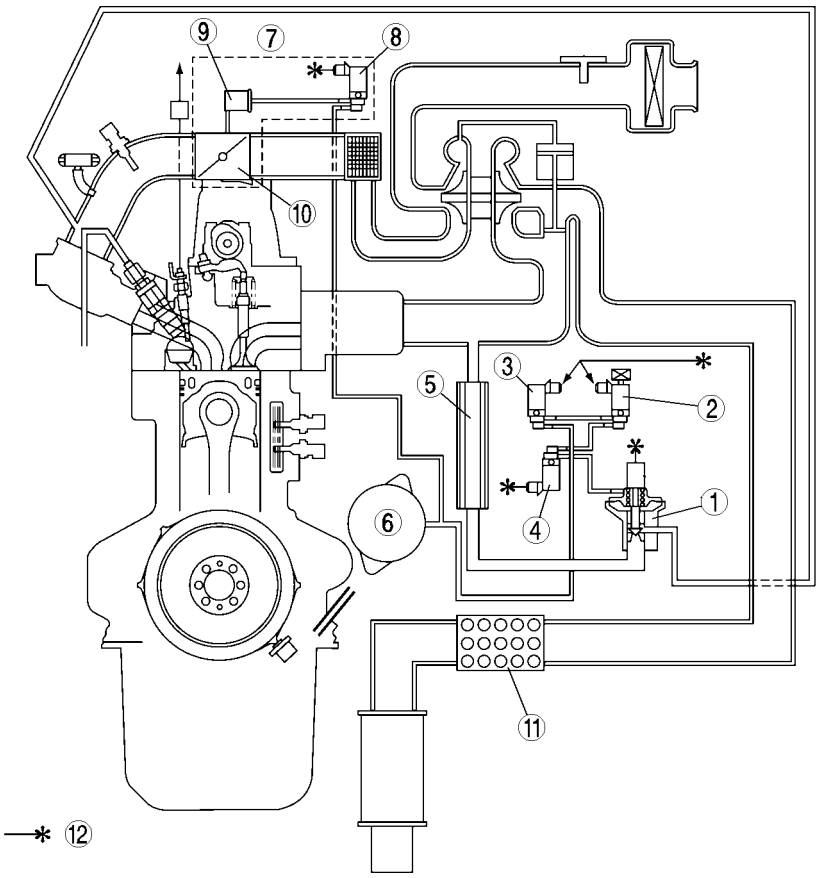
1	EGR valve
2	Intake shutter valve (WLT-3)
3	EGR water cooler
4	EGR solenoid valve (vacuum)

5	EGR solenoid valve (vent)
6	EGR control solenoid valve
7	Intake shutter solenoid valve (WLT-3)
8	Air filter

SYSTEM DIAGRAM

ZCF401601007W03

Euro 3 Regulation Models



ZCF4016W014

1	EGR valve
2	EGR solenoid valve (vent)
3	EGR solenoid valve (vacuum)
4	EGR control solenoid valve
5	EGR water cooler
6	Vacuum pump

7	WLT-3
8	Intake shutter solenoid valve
9	Intake shutter valve actuator
10	Intake shutter valve
11	Oxidation catalytic converter
12	To PCM

EGR SYSTEM

ZCF401601075W01

Euro 3 Regulation Models

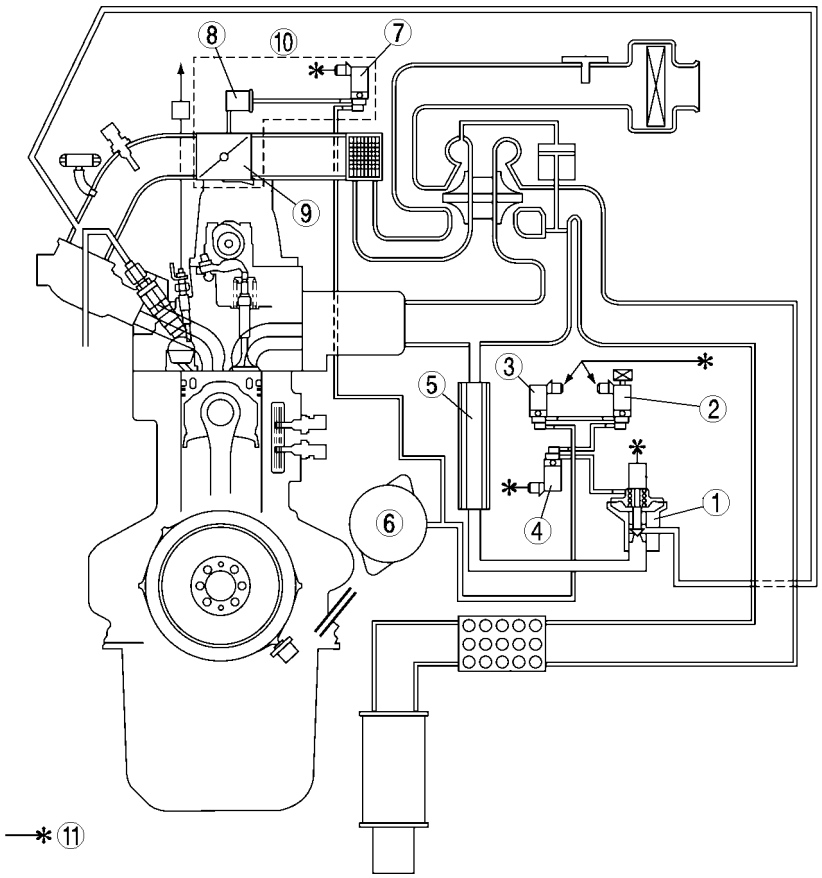
Outline

- An intake shutter valve has been adopted upstream of the intake manifold where the exhaust gas is introduced.
- By closing the intake shutter valve and generating vacuum in the intake manifold during exhaust gas introduction, the gas is led to the combustion chamber efficiently and the amount of NOx has been reduced.
- The newly adopted EGR water cooler cools EGR gas and improves the intake-air charging efficiency, reducing black smoke.

Operation

- To open the EGR valve and increase the EGR amount, increase the EGR solenoid valve (vacuum) control duty valve to increase the vacuum applied to the EGR valve. To close the EGR valve to decrease the EGR amount, increase the EGR solenoid valve (vent) control duty valve to decrease the vacuum applied to the EGR valve.
- When the PCM energizes the intake shutter solenoid valve during the exhaust gas introduction at low engine speed, the vacuum passage is opened and vacuum is applied to the intake shutter valve actuator. Due to this, the intake shutter valve is closed and vacuum is generated downstream of the intake manifold after the intake shutter valve, realizing easier introduction of the exhaust gas to the combustion chamber.

System diagram



ZCF4016W015

1	EGR valve
2	EGR solenoid valve (vent)
3	EGR solenoid valve (vacuum)
4	EGR control solenoid valve
5	EGR water cooler
6	Vacuum pump

7	Intake shutter solenoid valve
8	Intake shutter valve actuator
9	Intake shutter valve
10	WLT-3
11	To PCM

EGR SORENOID VALVE (VACUUM, VENT) DESCRIPTION

ZCF401618741W01

Euro 3 Regulation Models
Function

- EGR solenoid valve (vacuum) and EGR solenoid valve (vent) open/close the passage which brings vacuum generated in the vacuum pump to the diaphragm, and control the EGR valve opening.

Structure/Operation

- Vent side solenoid valve is connected to the EGR valve diaphragm through EGR control solenoid valve, and the vacuum side solenoid valve is connected to vacuum pump.
- Solenoid valve consists of a solenoid coil, spring, plunger and air filter.
- Vacuum side solenoid valve increases the angle of the valve opening by increasing vacuum on EGR valve via the EGR control signal (duty signal).
- Vent side solenoid valve decreases the angle of the valve opening by releasing vacuum on EGR valve via the EGR control signal (duty signal).
- Based on the combination of the vent side and vacuum side solenoid valves, the EGR valve opening angle is controlled.

EGR CONTROL SOLENOID VALVE DESCRIPTION

ZCF401618741W04

Euro 3 Regulation Models
Function
- EGR valve changes the pressure on the diaphragm of the EGR valve from vacuum to atmospheric pressure.

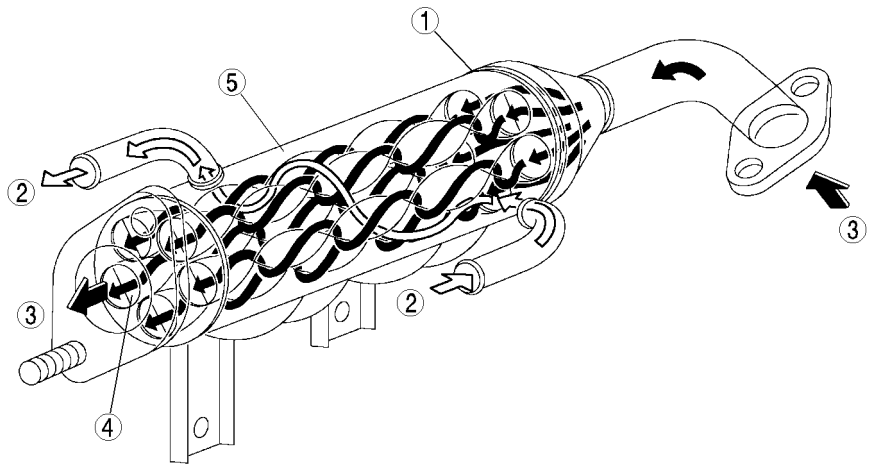
Structure/Operation
- EGR control solenoid valve consists of coil, spring, and plunger.
- When EGR valve is not energized, the passage between the diaphragm and atmospheric air side is open.
- When specified conditions are satisfied, the solenoid coils become energized and electromagnetic, and then pull the plunger. At this time, the passage between the diaphragm and atmospheric air side is closed and the passage between the diaphragm and vacuum pump side is opened.

EGR WATER COOLER DESCRIPTION

ZCF401620302W01

Euro 3 Regulation Models
Function
- EGR water cooler cools recircurated exhaust gas from the intake manifold.

Structure/Operation
- EGR water cooler has an EGR passage and coolant passage.



ZCF4016W012

1	EGR water cooler
2	Coolant flow
3	Exhaust gas flow

4	EGR passage
5	Coolant passage

INTAKE SHUTTER VALVE DESCRIPTION

ZCF401620100W01

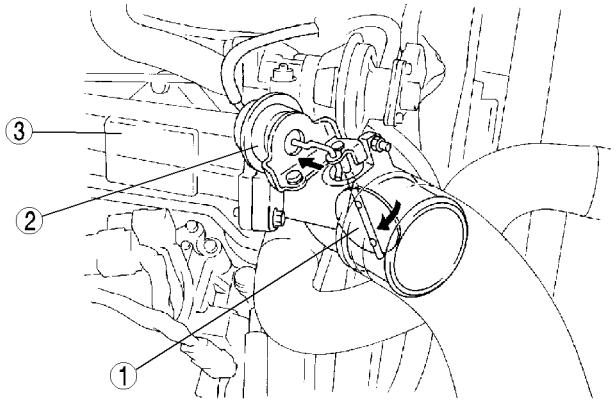
Euro 3 Regulation Models (WLT-3)

Function

- When the exhaust gas recirculation system is operated, the intake shutter valve closes, vacuum is generated in the intake manifold, and EGR gas is efficiently transported to the combustion chamber. As a result, NOx is reduced.
- When the engine is idling, the intake shutter valve closes and reduces air intake noise.

Structure/Operation

- When the exhaust gas recirculation system is operated and vacuum is applied to the diaphragm of the intake shutter valve actuator, the internal lever is pulled and the intake shutter valve closes.



ZCF4016W011

1	Intake shutter valve
2	Intake shutter valve actuator

3	Intake manifold

INTAKE SHUTTER SOLENOID VALVE DESCRIPTION

ZCF401613937W01

Euro 3 Regulation Models (WLT-3)

Function

- The intake shutter solenoid valve switches the opening/closing of the passage where the vacuum generated in the vacuum pump is led to the diaphragm of the intake shutter valve actuator.

Structure

- The intake shutter solenoid valve consists of a solenoid coil, a spring, a plunger, etc.

Operation

- The vacuum passage between the intake shutter valve actuator and the vacuum pump is opened or closed depending upon whether the intake shutter solenoid valve is energized or de-energized.

CONTROL SYSTEM

OUTLINE

ZCF404001070W01

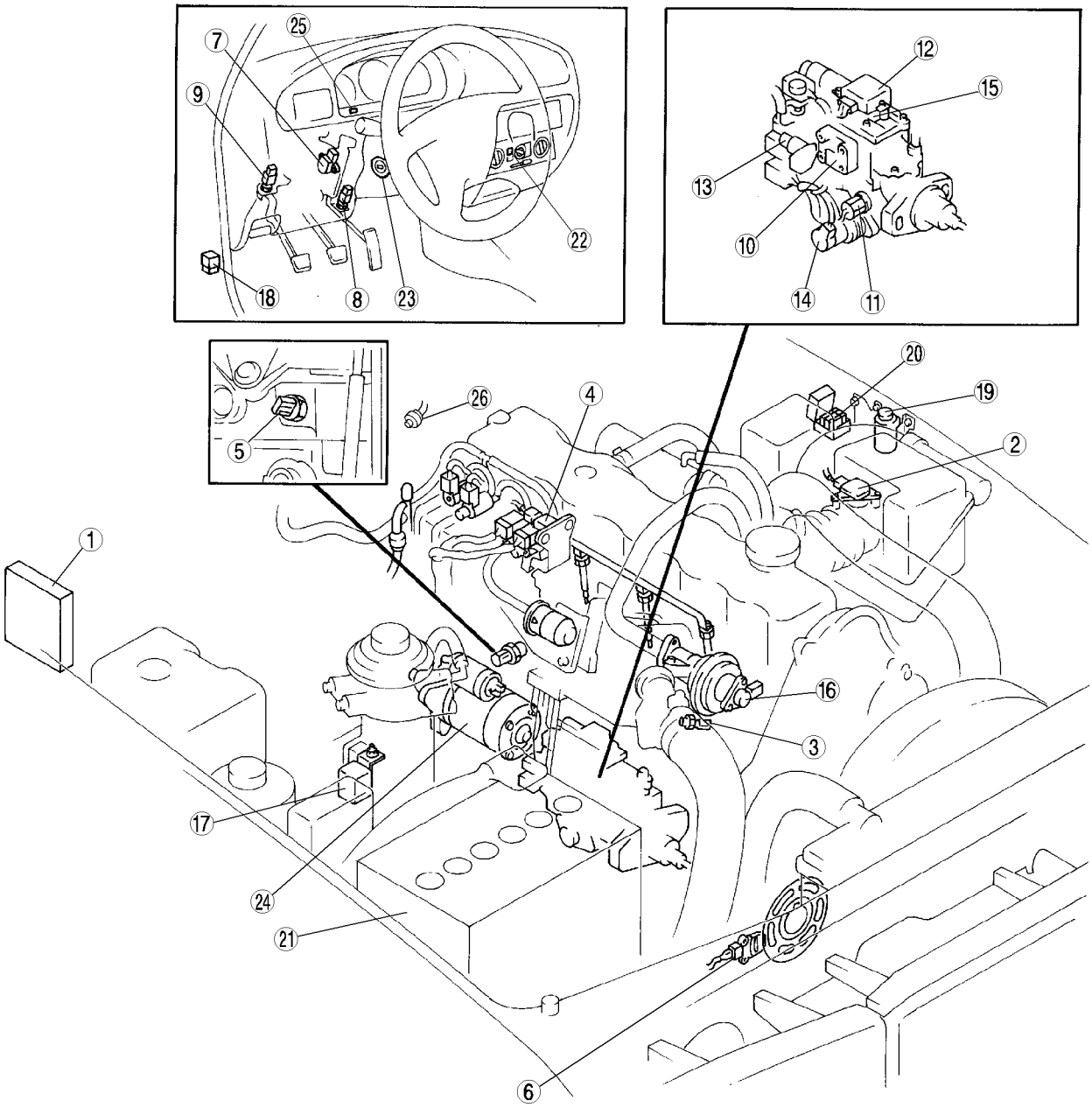
Euro 3 Regulation Models

- The construction and operation of the control system of the Euro 3 Regulation models is essentially carried over from that of the current RANGER (UN)/RANGER WL, WL Turbo models, except for following. (See RANGER TRAINING MANUAL F326−10−99A.)
  - —Fuel injection amount control has been adopted to improve emission performance.
  - —Fuel injection timing control has been adopted to improve emission performance.
  - —The EGR valve control type for Euro 3 Regulation models has been changed from previous ON/OFF control type to duty control using EGR solenoid valves (vent and vacuum).
  - —Due to the adoption of the electronic control type injection pump, the immobilizer control has been modified.

STRUCTURAL VIEW

ZCF404001070W02

Euro 3 Regulation Models



ZCF4040W045

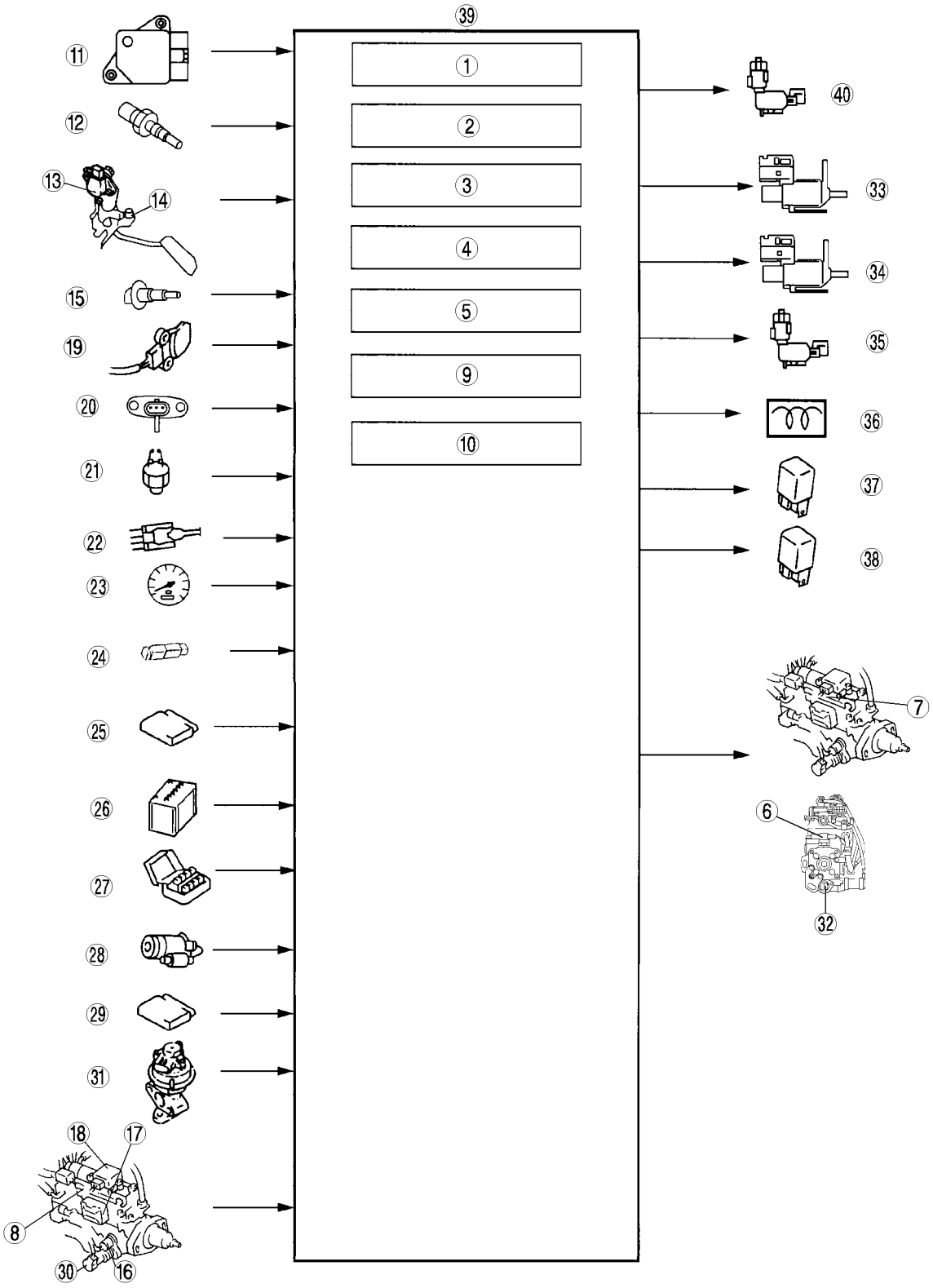
1	PCM (integrated with barometric pressure sensor)
2	MAF/IAT sensor
3	IAT sensor No.2
4	Boost sensor
5	ECT sensor
6	TDC sensor
7	Accelerator position sensor
8	Idle switch
9	Clutch switch
10	Fuel temperature sensor
11	Pump speed sensor
12	Injection pump EPROM
13	Timer control valve

14	Timer position sensor
15	Control sleeve (CS) sensor
16	EGR position sensor
17	Glow plug relay
18	PCM control relay
19	A/C relay
20	DLC
21	Battery
22	A/C switch
23	Engine switch
24	Starter
25	Glow indicator light
26	Neutral switch

BLOCK DIAGRAM

ZCF404001070W03

Euro 3 Regulation Models



ZCF4040W100

1	Fuel injection amount control
2	Fuel injection timing control
3	Idle speed control
4	Glow control
5	EGR control

6	FSO solenoid
7	Electronic governor
8	CS sensor
9	A/C cut−off control
10	Immobilizer system

11	MAF/IAT sensor
12	ECT sensor
13	Accelerator position sensor
14	Idle switch
15	IAT sensor No.2
16	Pump speed sensor
17	Fuel temperature sensor
18	Injection pump EPROM
19	TDC sensor
20	Boost sensor
21	Neutral switch
22	Clutch switch
23	VSS
24	A/C switch
25	Immobilizer unit (with immobilizer system)

26	Battery
27	DLC
28	Starter (starter signal)
29	Barometric pressure sensor (integrated in PCM)
30	Timer position sensor
31	EGR valve position sensor
32	Timer control valve
33	EGR solenoid valve (vacuum)
34	EGR solenoid valve (vent)
35	EGR control solenoid valve
36	Glow indicator light (instrument cluster)
37	Glow plug relay
38	A/C relay
39	PCM
40	Intake shutter solenoid valve (WLT-3)

CONTROL SYSTEM DEVICE AND CONTROL RELATIONSHIP CHART

ZCF404001070W04

Euro 3 Regulation Models

×: Applicable

	Device	Control item					
		Fuel injection amount control	Fuel injection timing control	Glow control	EGR control	A/C cut-off control	Immobilizer system
Input	ECT sensor	×	×	×	×	×	
	Accelerator position sensor	×	×		×	×	
	Idle switch	×			×		
	MAF/IAT sensor	×			×		
	IAT sensor No.2	×					
	Pump speed sensor	×	×		×	×	
	Fuel temperature sensor	×					
	Injection pump EPROM	×					
	TDC sensor	×	×		×		
	Boost sensor	×					
	Neutral switch	×	×		×	×	
	Clutch switch	×	×		×	×	
	VSS	×		×		×	
	Barometric pressure sensor (integrated in PCM)	×	×				
	Immobilizer unit (with immobilizer system)						×
	Battery (glow plug voltage)			×			
	Starter signal	×	×			×	
	Control sleeve (CS) sensor	×					
	Timer position sensor		×				
	A/C switch	×					
Output	Electronic governor	×					
	TCV		×				
	EGR solenoid valve (vacuum, vent)				×		
	EGR conrol solenoid valve				×		
	FSO solenoid valve	×					×
	Glow indicator light			×			
	Glow plug relay			×			
	A/C relay					×	
	Intake shutter solenoid valve (WLT-3)				×		

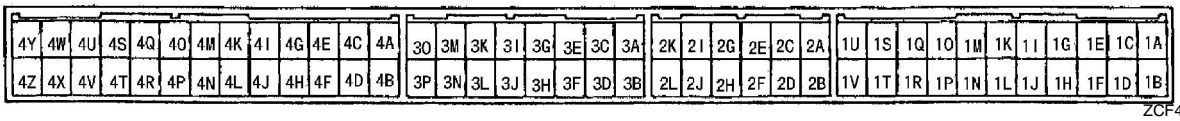
ZCF4040W046

PCM DESCRIPTION

ZCF404018880W01

Euro 3 Regulation Models
Function

- Based on the signal from each input sensor, the PCM outputs a drive (operation) signal to the drive parts (solenoid, etc.), which require an optimum control amount according to the engine condition (engine speed, engine coolant temperature, etc.).
- The PCM is located in the underfoot area of the right side seat.



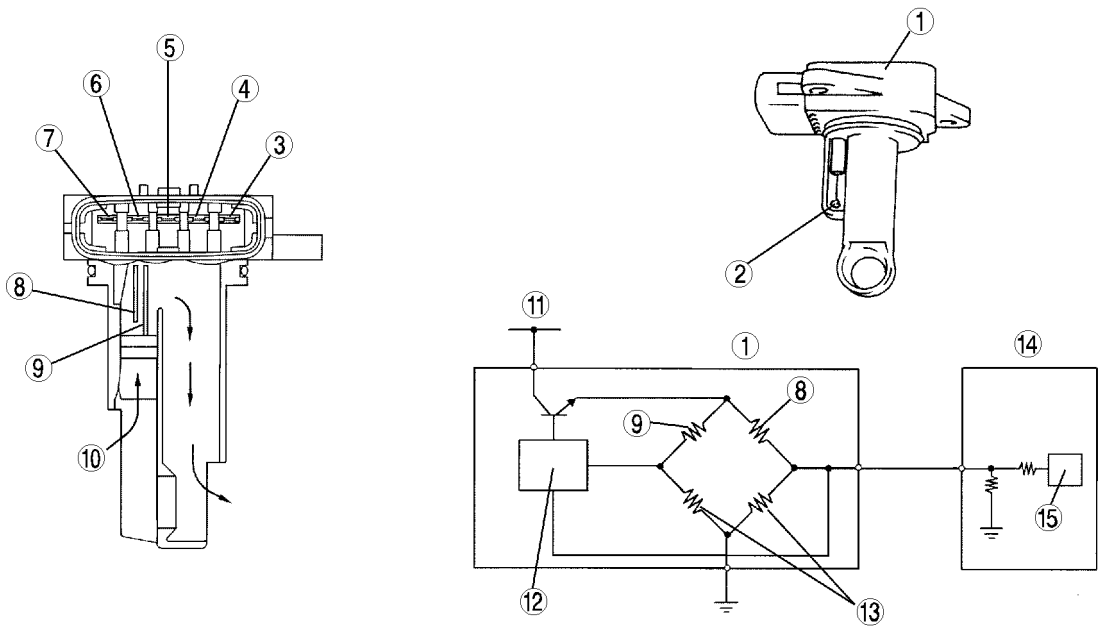
ZCF4040W035

MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR DESCRIPTION

ZCF404013210W01

Euro 3 Regulation Models
Structure

- A hot−wire type MAF sensor is used.
- IAT sensor No.1 has integrated into the MAF/IAT sensor.



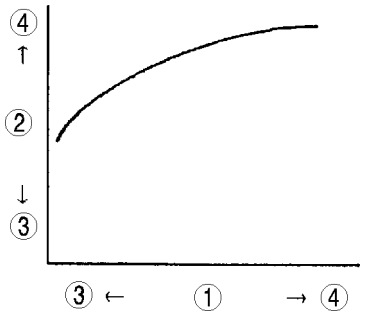
ZCF4040W037

1	MAF sensor
2	IAT sensor No.1
3	MAF sensor power supply
4	MAF sensor GND
5	MAF sensor output
6	IAT sensor No.1 output
7	IAT sensor No.1 GND
8	Hot wire

9	Cold wire
10	Intake airflow
11	From PCM control relay
12	Comparison circuit
13	Constant resistor
14	PCM
15	CPU

Operation

- The hot−wire (heat resistor) type MAF sensor detects the mass intake airflow that corresponds to the output current.
- The output current is controlled by the control circuit in the MAF sensor and heats the hot wire (heat resistor) so that the temperature difference between the heat resistor and the intake air is constant.
- The output current required to maintain the heat resistor temperature is proportional to the intake airflow volume. The output current characteristic against the mass intake airflow is as shown in the figure below.
- The cold wire (cold resistor) corrects the variation in resistance of the hot wire (heat resistor) which is caused by the intake air temperature.



Y6E4040W014

1	Mass intake airflow
2	Output current

3	Low
4	High

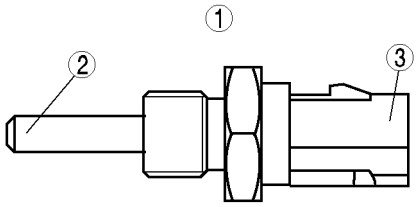
INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 DESCRIPTION

ZCF404018845W01

Euro 3 Regulation Models

Function

- The intake air sensor No.2 is installed in the air pipe between the charge air cooler and the intake manifold. By utilizing a thermistor of which resistance varies with supercharged air temperature, the sensor detects temperature in the intake manifold.
- The detected intake air temperature is used for correction of fuel injection amount control.



ZCF4040W036

1	IAT sensor No.2
2	Detecting part

3	Connector

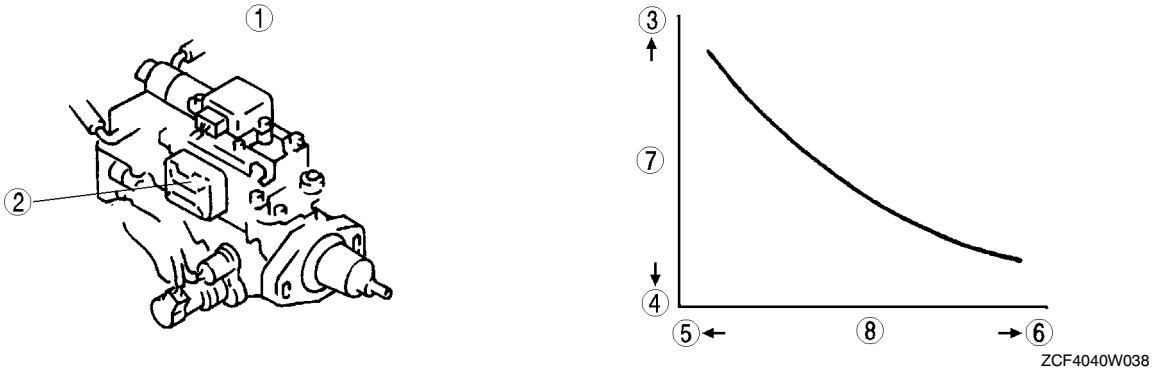
FUEL TEMPERATURE SENSOR DESCRIPTION

ZCF404013809W01

Euro 3 Regulation Models

Function

- The fuel temperature sensor is built into the electronic governor at the top of the injection pump. The fuel temperature sensor detects the fuel temperature required for correction of the fuel injection amount according to the change in the thermistor's resistance value and sends it to the PCM.
- The resistance characteristic of the fuel temperature sensor is as shown.



ZCF4040W038

1	Injection pump
2	Fuel temperature sensor
3	High
4	Low

5	Low
6	High
7	Resistance
8	Fuel temperature

PUMP SPEED SENSOR DESCRIPTION

ZCF404013801W01

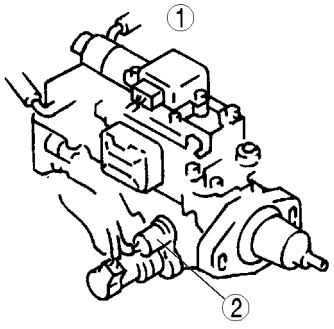
Euro 3 Regulation Models

Function

- The pump speed sensor is mounted to the side of the injection pump and detects the engine speed with the sensor ring press−fitted to the drive shaft in the injection pump.

Structure/Operation

- The pump speed sensor detects the alternating voltage produced by the change in the magnetic field of the projection on the sensor ring press−fitted to the drive shaft as an engine speed signal and as a cylinder discrimination signal.
- The TDC sensor also detects the engine speed signal, but in the event that the TDC sensor malfunctions, the pump speed sensor detects the engine speed signal and inputs it to the PCM.



ZCF4040W040

1	Injection pump

2	Pump speed sensor

CONTROL SLEEVE (CS) SENSOR DESCRIPTION

ZCF404013805W01

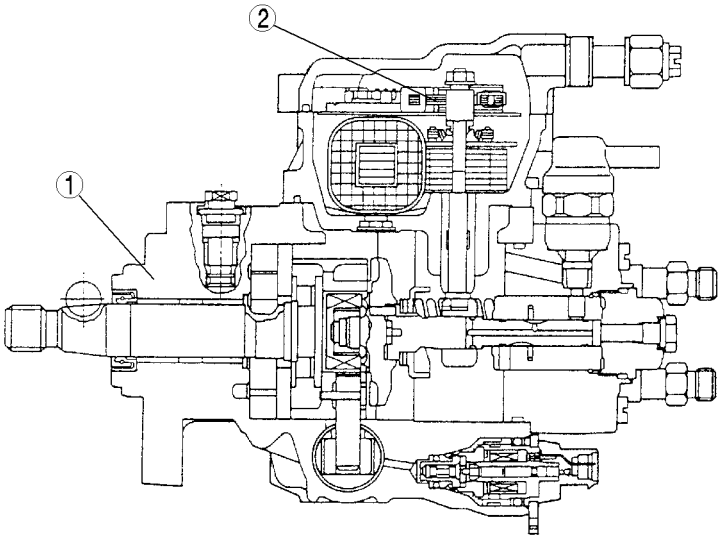
Euro 3 Regulation Models

Function

- The CS sensor detects the control sleeve position and is used as a fuel injection amount feedback signal in the PCM.

Structure/Operation

- The CS sensor is mounted to the top of the electronic governor.
- The CS sensor consists of a sleeve position detection part and a temperature correction part. The sleeve position detection part has a movable plate which rotates with the sensor coil and the governor shaft, and modifies the strength of the sensor coil's magnetic field according to the rotation of the movable plate (control sleeve position). The temperature correction part has a temperature correction coil and a fixed plate, and modifies the strength of the correction coil's magnetic field according to the temperature.
- Basically, the CS sensor detects the sleeve position depending on the change in strength of the sensor coil's magnetic field. However, the strength of the magnetic field will also change depending on the temperature of the coil. As a result, the CS sensor, by constantly comparing and correcting the opposing temperature correction coil's magnetic field, calculates an accurate rotation angle as a voltage and thereby detects the control sleeve position.



ZCF4040W041

1	Injection pump	2	CS sensor

TIMER POSITION SENSOR DESCRIPTION

ZCF404013807W01

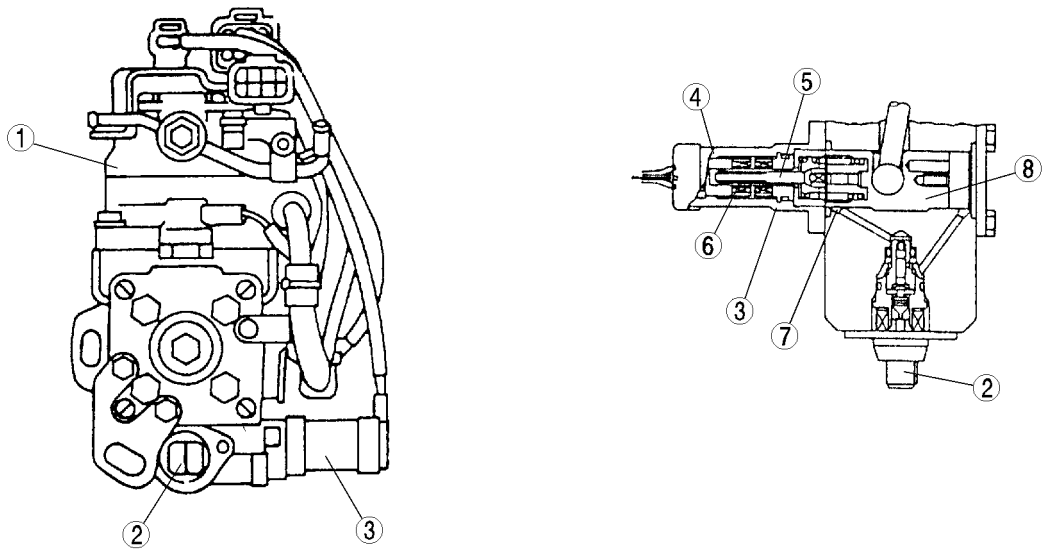
Euro 3 Regulation Models

Function

- The timer position sensor detects the timer piston position and is used as a fuel injection timing feedback signal in the PCM

Structure/Operation

- The timer position sensor is mounted to the low pressure chamber side and consists of a core rod, a coil, and a bobbin
- The core rod is mounted to the timer piston. The core rod moves the middle of the coil with the timer piston to change the strength of the coil's magnetic field and detects this voltage change as the timer piston position.



ZCF4040W044

1	Injection pump
2	Timer control valve
3	Timer position sensor
4	Bobbin

5	Core rod
6	Coil
7	Low-pressure chamber
8	Timer piston

INJECTION PUMP EPROM DESCRIPTION

ZCF404013802W01

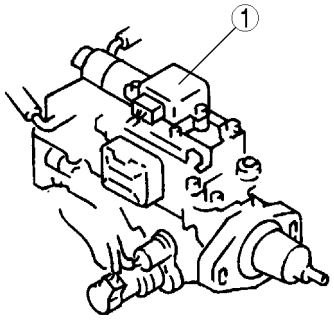
Euro 3 Regulation Models

Function

- For accurate fuel injection control, injection pump production variance/mechanical variance is added to injection pump EPROM as a correction value.

Structure/Operation

- Injection pump EPROM is installed on the top of injection pump.
- Injection pump EPROM varies in characteristics. When there is any malfunction, contact the injection pump supplier, Bosch Automotive Systems Corporation for repair.



ZCF4040W049

1	Injection pump EPROM

TDC SENSOR DESCRIPTION

ZCF404018230W01

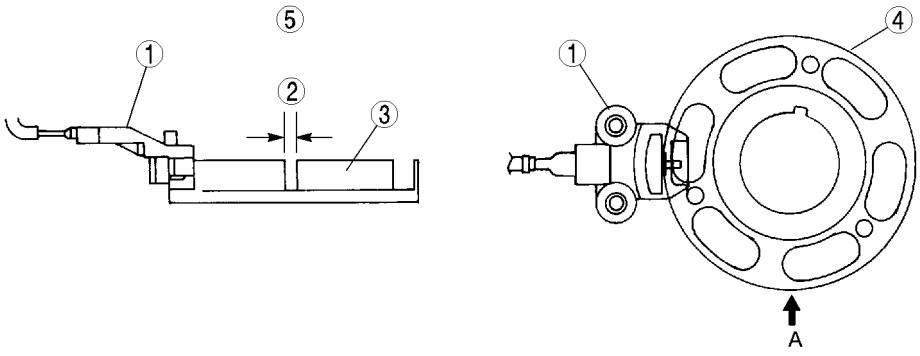
Euro 3 Regulation Models

Function

- TDC sensor detects crankshaft speed signal.

Structure/Operation

- TDC sensor is installed near crankshaft pulley.
- TDC sensor is a hall−element type and it detects hall voltage generated by the change in magnetic flux of the magnet inside the sensor and hall element as the crankshaft speed signal.
- Crankshaft speed signal is detected directly from the fin and window area on the plate.
- TDC sensor also detects the engine speed signal and inputs it to the PCM in case the pump speed sensor has a malfunction in detecting the engine speed signal.



ZCF4040W048

1	TDC sensor
2	Window area
3	Fin area

4	Plate
5	View A

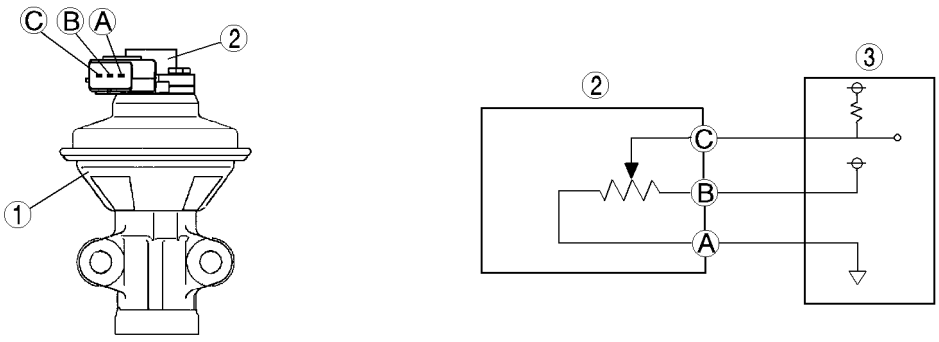
EGR VALVE POSITION SENSOR DESCRIPTION

ZCF404020300W01

Euro 3 Regulation Models

Function

- The EGR valve position sensor measures EGR valve lift amount and sends signal to the PCM, allowing the PCM to diagnose a EGR system malfunction when there is a discrepancy between target and actual opening angles of the EGR valve.



ZCF4040W058

1	EGR valve
2	EGR valve position sensor

3	PCM

BOOST SENSOR DESCRIPTION

ZCF404018660W01

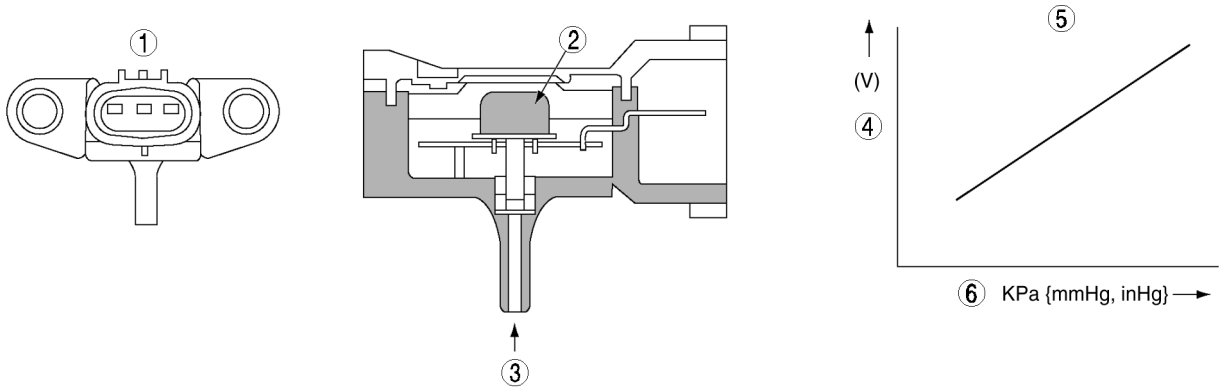
Euro 3 Regulation Models

Function

- The boost sensor detects the intake air pressure as an absolute pressure, and sends it to the PCM as an intake air pressure signal.
- The boost sensor is installed in the air pipe between the charge air cooler and the intake manifold.

Operation

- The boost sensor is filled with crystal (silicon) and it is the semi−conductor pressure sensor which utilizes the characteristic of the electrical resistance that changes when the crystal is pressurized.
  *Absolute pressure is the pressure when vacuum is set as **0 kPa {0 mmHg, 0 inHg}**.



ZCF4040W029

1	Boost sensor
2	Vacuum chamber (Integrated with a silicon chip)
3	Supercharged pressure

4	Output voltage
5	Sensor output characteristic
6	pressure

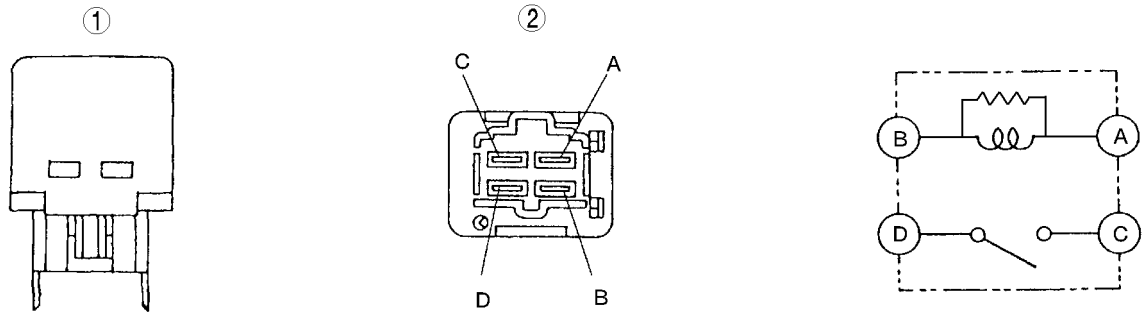
PCM CONTROL RELAY DESCRIPTION

ZCF404018880W04

Euro 3 Regulation Models

Operation

- The PCM control relay controls power to PCM and output part when the engine switch is turned ON/OFF.



ZCF4040W030

1	PCM control relay

2	PCM control relay connector

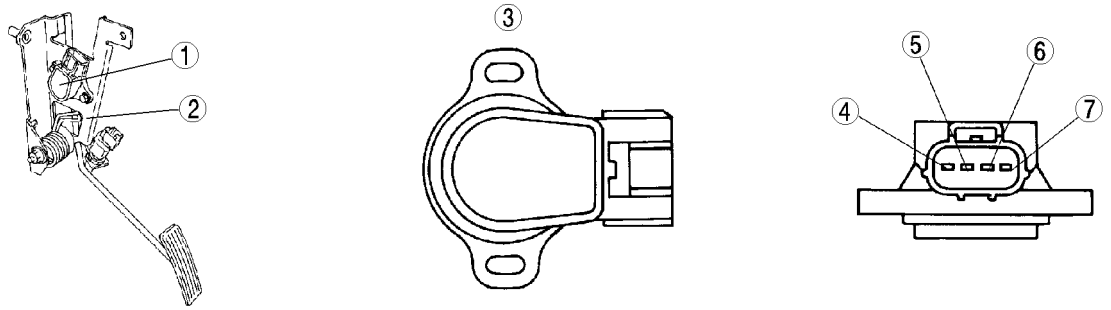
ACCELERATOR POSITION SENSOR DESCRIPTION

ZCF404041602W01

Euro 3 Regulation Models

Function

- The accelerator position sensor is installed on the accelerator pedal, and detects how much the accelerator pedal is being depressed from the change in the resistance value (variable resistance).



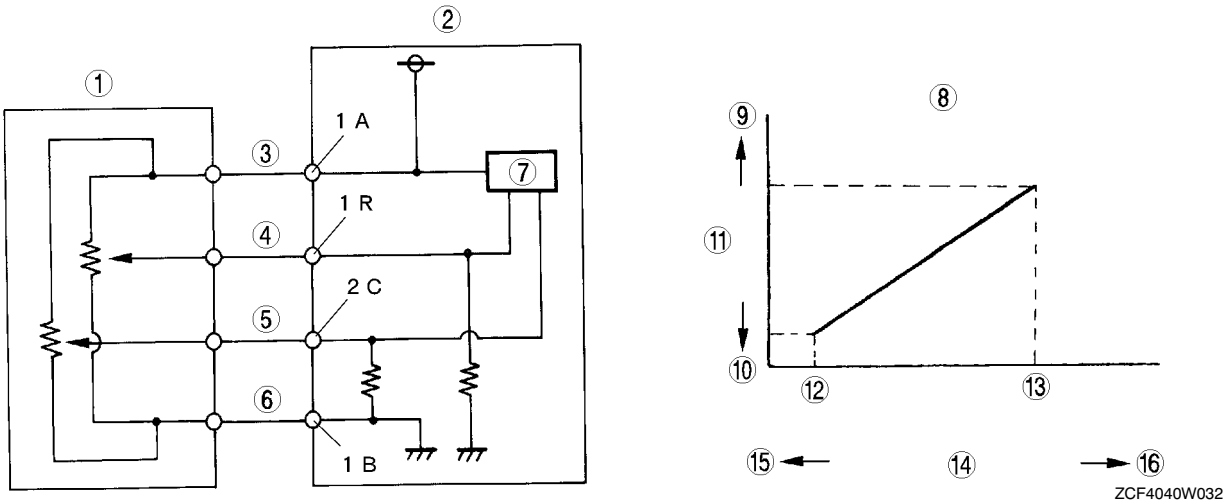
ZCF4040W031

1	Accelerator position sensor
2	Accelerator pedal component
3	External view
4	GND

5	Accelerator position signal (monitor)
6	Accelerator position signal (main)
7	Power supply

Structure/Operation

- The accelerator position sensor is a potentiometer type and works is the same way as the throttle position sensor.
- The accelerator position sensor contains two circuits for detecting accelerator position: main circuit and monitor circuit. The main circuit is used for the controls operated by the PCM (e.g. fuel injection amount control). The monitor circuit is used for detecting malfunctions in the accelerator position sensor.
- When voltage difference between the main and monitor circuits increases, the PCM determines that the accelerator position sensor is malfunctioning and stores DTC P0120. Thus, a detection condition item has been added to DTC P0120.
- The input voltage characteristic of the accelerator position sensor is as shown (figure 1.)



ZCF4040W032

1	Accelerator position sensor
2	PCM
3	Power supply
4	Main (input)
5	Monitor (input)
6	GND
7	CPU
8	Figure 1.

9	High
10	Low
11	Input voltage
12	Not accelerated
13	Fully accelerated
14	Accelerator pedal position
15	Close
16	Open

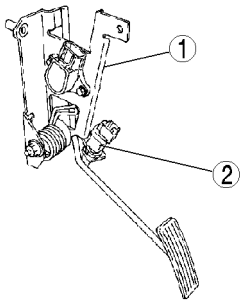
IDLE SWITCH DESCRIPTION

ZCF404066470W01

Euro 3 Regulation Models

Function

- The idle switch is mounted to the accelerator pedal and inputs to the PCM whether the accelerator pedal is depressed or released. The PCM detects the idle switch signal as an idle signal.
- The idle signal inputted to the PCM is compared with the accelerator opening signal detected from the accelerator position sensor, and on−board diagnostic of the idle switch and the accelerator position sensor is performed.

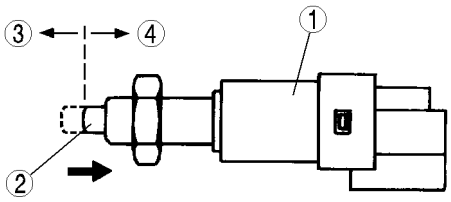


ZCF4040W033

1	Accelerator pedal component
2	Idle switch

Structure/Operation

- When the push rod is pushed in (the accelerator pedal is released) a preset amount, the contact of the idle switch closes, and the PCM determines that the engine is idling. When the contact of the idle switch is open (OFF), the PCM determines that the engine is not idling.



ZCF4040W056

1	Idle switch
2	Push rod
3	Off (accelerator pedal is depressed)
4	On (accelerator pedal is released)

CLUTCH SWITCH DESCRIPTION

ZCF404017640W01

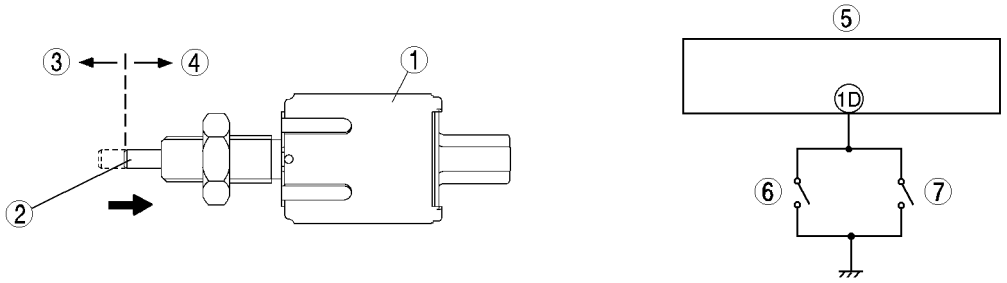
Euro 3 Regulation Models

Function

- The clutch switch detects the clutch connection condition.
- The clutch switch is connected parallel to the neutral switch, and both the switches are connected to the PCM.
- The clutch and neutral switch is a switch that detects whether the engine is under a loaded condition (engine output is transmitted to the road surface) or under an unloaded condition (engine output is not transmitted to the road surface).

Structure/Operation

- The clutch switch is mounted to the top of the clutch pedal. When the clutch pedal is depressed, the contact of the clutch switch closes (ON) and the PCM detects 0V. When the clutch pedal is released, the contact opens (OFF) and the PCM detects 12V.



ZCF4040W053

1	Clutch switch
2	Push rod
3	On (clutch pedal is depressed)
4	Off (clutch pedal is released)

5	PCM
6	Neutral switch
7	Clutch switch

NEUTRAL SWITCH DESCRIPTION

ZCF404017640W03

Euro 3 Regulation Models

Function

- The neutral switch detects the gear shift lever position (neutral).
- The neutral switch is connected parallel to the clutch switch, and both the switches are connected to the PCM.
- The neutral and clutch switch is a switch that detects whether the engine is under a loaded condition (engine output is transmitted to the road surface) or under an unloaded condition (engine output is not transmitted to the road surface).

Structure/Operation

- The neutral switch is mounted to the transmission. When the shift lever is in the neutral position, the contact of the switch closes (ON) and the PCM detects this as 0V. When in any gear, the contact opens (OFF) and the PCM detects this as 12V.



ZCF4040W034

1	Neutral switch
2	Push rod
3	Off
4	On

5	PCM
6	Neutral switch
7	Clutch switch

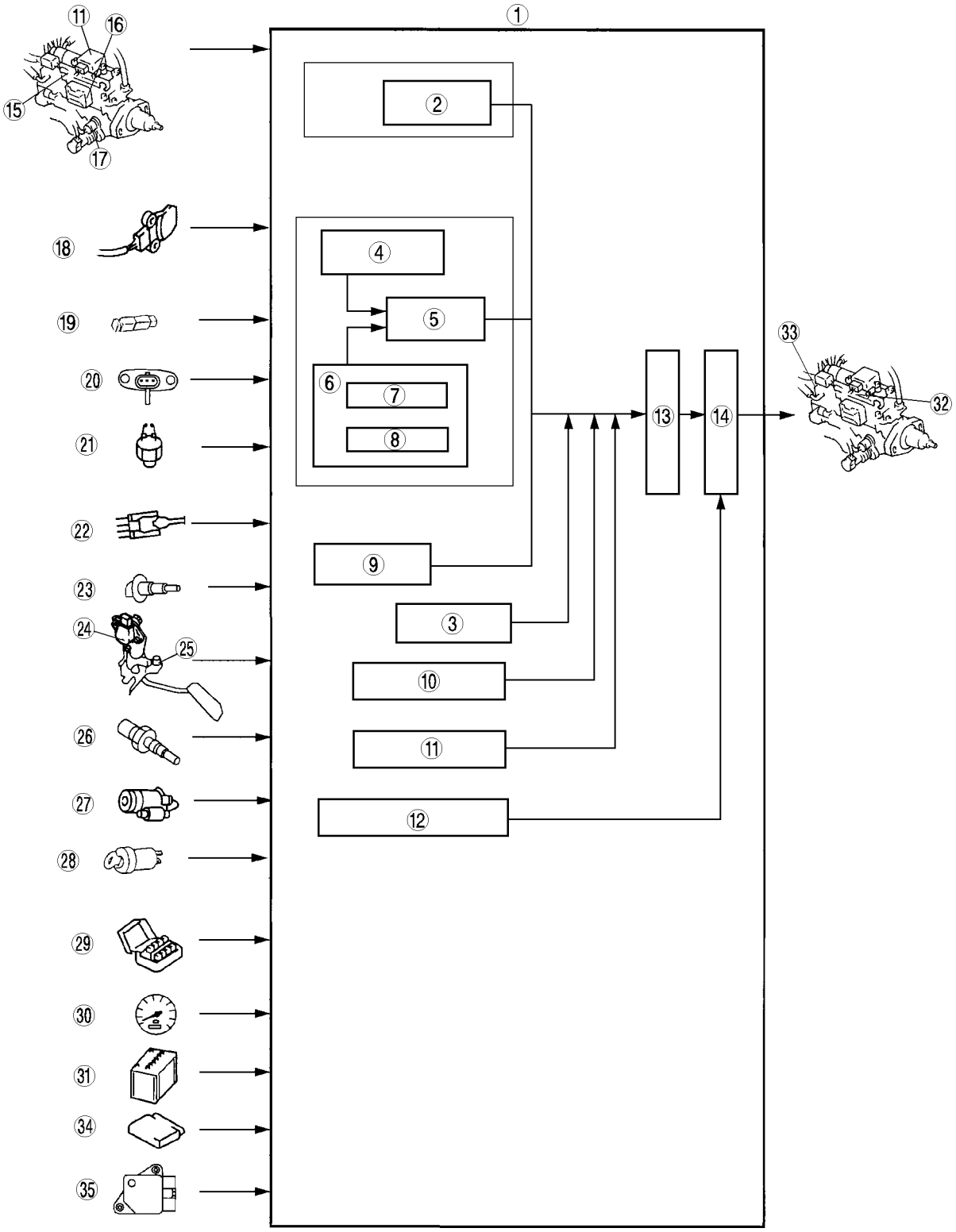
FUEL INJECTION AMOUNT CONTROL

ZCF404001070W06

Euro 3 Regulation Models

Outline

- Fuel injection amount control optimally controls the amount of fuel injected according to the engine operating condition. The PCM determines the engine operating condition based on the signals of the input sensors in the figure below and drives the governor with the control signal of the fuel injection amount calculated from this.



ZCF4040W101

1	PCM
2	Fuel injection amount at engine start
3	Maximum fuel injection amount
4	Idle speed feedback correction
5	Basic fuel injection amount at idle
6	Correction
7	Cylinder and differential learning
8	Idle load learning
9	Basic fuel injection amount at normal operation
10	Fuel temperature correction
11	Injection pump EPROM
12	Control sleeve position feedback correction
13	Target control sleeve position calculation
14	Electronic governor drive control
15	CS sensor
16	Fuel temperature sensor
17	Pump speed sensor
18	TDC sensor

19	A/C switch
20	Boost sensor
21	Neutral switch
22	Clutch switch
23	IAT sensor No.2
24	Accelerator position sensor
25	Idle switch
26	ECT sensor
27	Starter
28	Engine switch
29	DLC
30	VSS
31	Battery
32	Electronic governor
33	FSO solenoid
34	Barometric pressure sensor (integrated in PCM)
35	MAF/IAT sensor

Control outline
- The PCM controls fuel injection timing by moving the position of the control sleeve that drives the electronic governor mounted to the injection pump and determines the end of fuel injection.
- The PCM calculates the target fuel injection amount based on input signals, and determines the target control sleeve position according to this calculation.
- The PCM drives the electronic governor with the CS sensor so that the actual detected control sleeve position approaches the target control sleeve position.
- The relationship of each signal to fuel injection timing control is shown below. (Verify with block diagram.)

Basic fuel injection amount at normal operation
- The basic fuel injection amount is pre-programmed into the PCM and is determined by engine speed and the amount that the accelerator pedal is depressed.

Fuel injection amount at engine start
- The fuel injection amount at engine start is pre-programmed into the PCM and is determined by engine speed and engine coolant temperature.

Basic fuel injection amount at idle
- The basic fuel injection amount at idle is determined by performing feedback correction of the actual engine speed to approach the target idle speed programmed into the PCM for the injection amount required based on the basic fuel injection amount, cylinder and differential learning, and idle load learning.

Target idle speed

Engine condition	Target idle speed (rpm)
Unloaded, idling	720
A/C operating	750

Idle load learning
- By accounting for correction values of various loads, such as A/C operation at idle, idle load learning maintains idle speed stability that accompanies load modifies.

Cylinder and differential learning
- Because there is mechanical variation in the injection pump and the engine, with only a uniform injection amount programmed into the PCM, there will be differences in engine speed in each vehicle.
- Differential learning maintains stable idle speed by pre-learning corrected fuel amounts according to the variation of each vehicle and accounting for this in the basic fuel injection amount.
- Cylinder learning stabilizes idle speed by detecting the variation in fuel injection amount of each cylinder that results from combinations of injection pumps and injection nozzles from the change in gear speed of the crankshaft and correcting the injection amount suitable to each cylinder.

Maximum fuel injection amount

- Maximum fuel injection amount is the maximum value for the basic fuel injection amount at idle and the basic fuel injection amount at normal operation, and is determined by intake air temperature, atmospheric pressure, and engine speed.

Target control sleeve position calculation

- The target control sleeve position is calculated from the fuel injection amount calculated in the PCM.

Electronic governor drive control

- Performs feedback control of the duty signal so that the actual control sleeve position inputted from the CS sensor approaches the target control sleeve position.

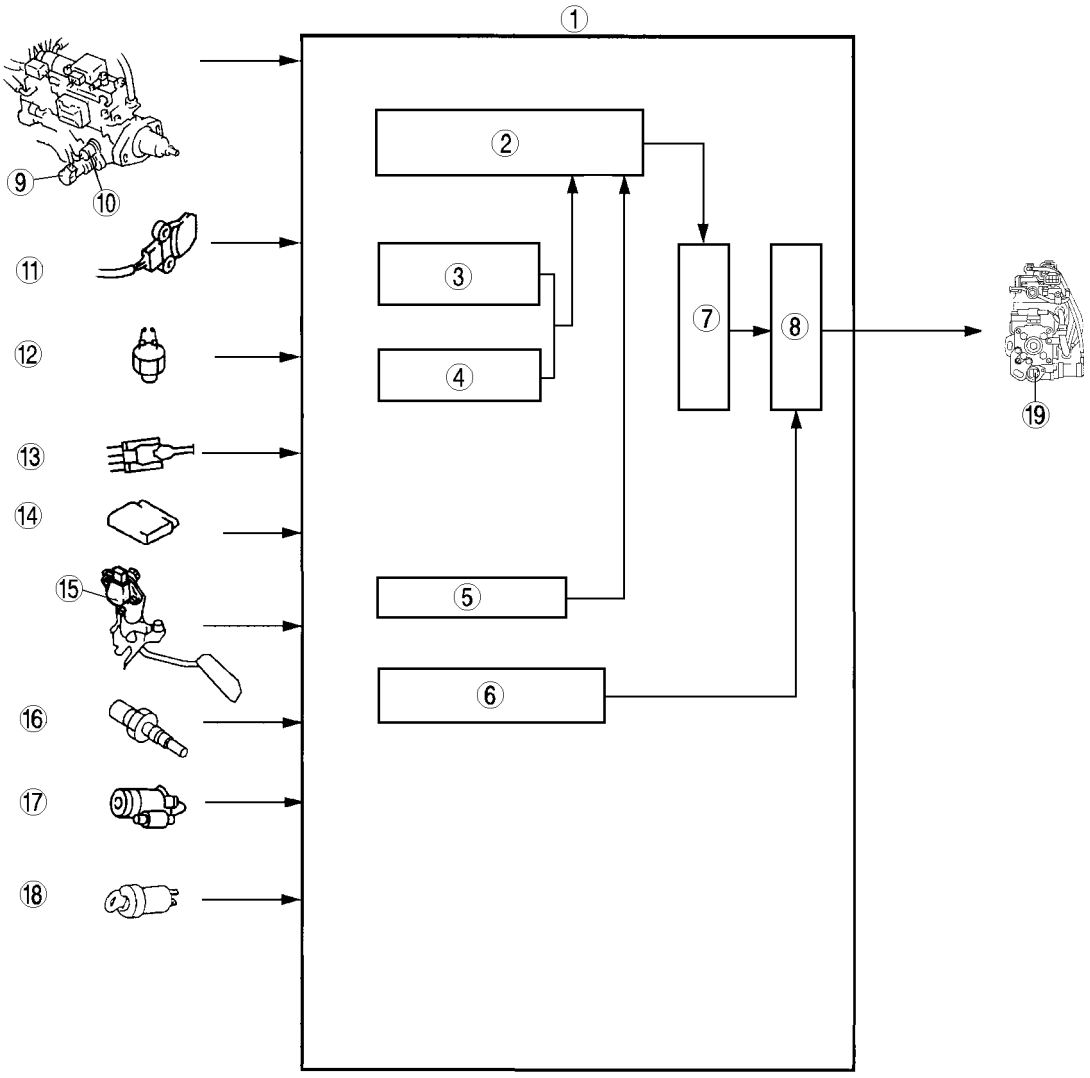
FUEL INJECTION TIMING CONTROL

ZCF404001070W07

Euro 3 Regulation Models

Outline

- Fuel injection timing is a control that determines optimal fuel injection timing according to engine operating condition. The PCM determines the engine operating condition based on the signals of the input sensors in the figure below. The timer control valve is driven by the control signal of the fuel injection timing calculated form this.



ZCF4040W102

1	PCM
2	Basic fuel injection timing
3	Basic fuel injection timing at engine start
4	Basic fuel injection timing at normal operation

5	Atmospheric pressure correction
6	Timer position feedback correction
7	Target timer position calculation
8	Timer control valve drive control

9	Timer position sensor
10	Pump speed sensor
11	TDC sensor
12	Neutral switch
13	Clutch switch
14	Barometric pressure sensor (integrated in PCM)

15	Accelerator position sensor
16	ECT sensor
17	Starter
18	Engine switch
19	Timer control valve

Control outline
- The PCM controls fuel injection timing by driving the timer control valve mounted to the injection pump by modifying the hydraulic pressure applied to the timer piston and by moving the position of the timer piston.
- The PCM calculates the target fuel injection amount based on input signals, and determines the opening angle of the timer control valve according to this calculation.
- The timer control valve is driven by the duty signal sent from the PCM. The longer the duty signal is ON, the more the valve opens, and injection timing also becomes faster.
- The relationship of each signal to fuel injection timing control is shown below.

Basic fuel injection timing
- Basic fuel injection timing is pre-programmed into the PCM and is determined by engine speed and fuel injection amount.

Correction at engine start
- A correction value suitable for starting is pre-programmed into the PCM and is determined by engine speed and engine coolant temperature.

Correction at driving
- A correction value suitable for driving is pre-programmed into the PCM and is determined by engine speed and engine coolant temperature.

Target timer position calculation
- The target timer piston position is calculated from fuel injection timing calculated in the PCM.

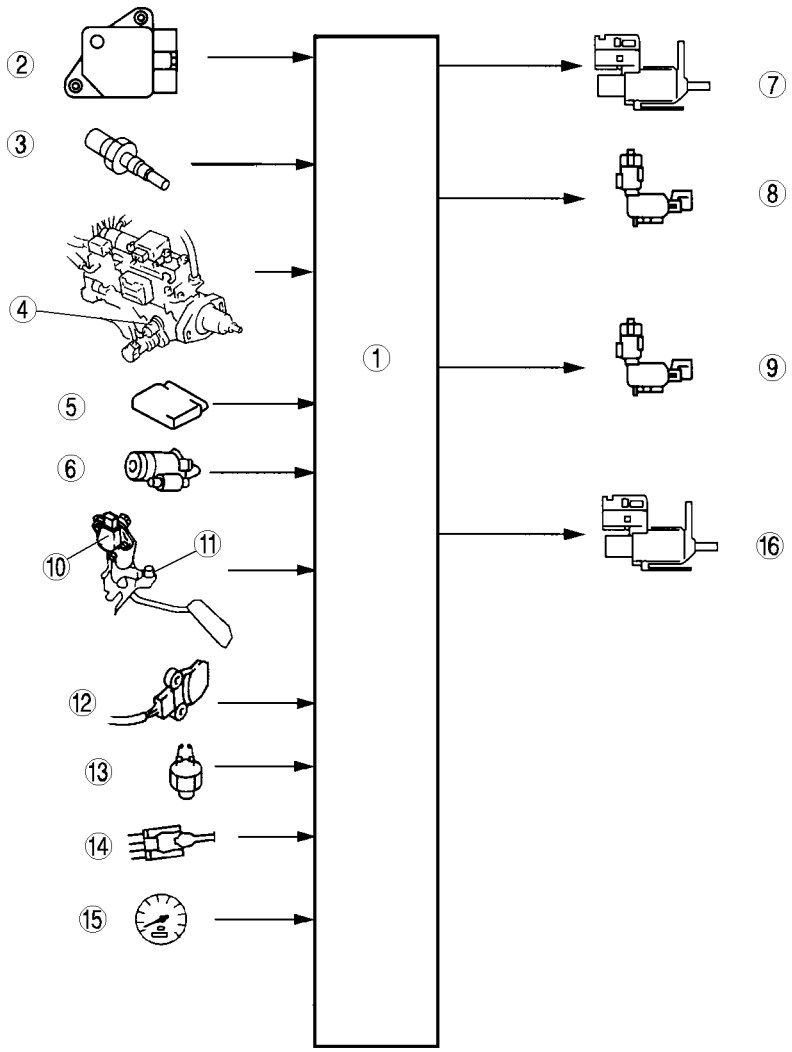
TCV drive control
- Timer control valve drive control performs feedback control by sending a duty signal to the timer control valve to make the actual timer position approach the target timer position.

EGR CONTROL

ZCF404001070W08

Euro 3 Regulation Models
Outline
- PCM controls two duty−solenoid valves to control the EGR valve to obtain the optimum EGR amount depend on engine operating condition. Due to this, emission performance and drivability has been improved.
- When introducing the exhaust gas during low engine speed, the PCM turns the intake shutter solenoid valve on to close the intake shutter valve. Thus the exhaust gas is led to the combustion chamber efficiently and less NOx is emitted.

Block diagram



ZCF4040W055

1	PCM
2	MAF/IAT sensor
3	ECT sensor
4	Pump speed sensor
5	Barometric pressure sensor (integrated in PCM)
6	Starter
7	EGR control solenoid valve
8	EGR solenoid valve (vacuum)

9	EGR solenoid valve (vent)
10	Accelerator position sensor
11	Idle switch
12	TDC sensor
13	Neutral switch
14	Clutch switch
15	VSS
16	Intake shutter solenoid valve (WLT-3)

Operation

- To improve emission performance, target EGR valve position has been decided based on intake air flow, engine speed and engine coolant temperature.
- The PCM controls the vacuum applied to EGR valve by opening and closeing two−duty solenoid valve.
- The flow amount of the EGR is calculated from the difference between the following amounts:
  —Target intake air amount that is mainly calculated from engine speed and fuel injection amount
  —Actual intake air amount that is mainly detected by MAF/IAT sensor
- The PCM turns the intake shutter solenoid valve on to close the intake shutter valve when the EGR operation at low engine speed.
- The PCM turns the intake shutter solenoid valve on when all of the following conditions are met.
  —Engine coolant temperature is above threshold level.
  —Intake air temperature is above threshold level.
  —Barometric pressure is above threshold level.
  —Engine speed is below threshold level.
  —Vehicle speed is below threshold level.

ON–BOARD DIAGNOSTIC

OUTLINE

ZCF407018881W01

Euro 3 Regulation Models

- DTCs for added parts, monitoring PIDs and simulation PIDs have been added to improve serviceability.

DTC

ZCF407018881W02

Euro 3 Regulation Models

- To match regulation the DTCs of Euro 3 Regulation model have been changed from 2 digits to 4 digits.
- Due to the electric controlled injection pump has been added, the DTCs for their sensors and actuators have been added to improve the serviceability.

×: Applicable

Diagnosed circuit/ system	DTC	Detection condition	Fail – safe	Memory function
MAF sensor	P0100	• PCM monitors input voltage from MAF/IAT sensor when engine is running. If PCM detects either of following conditions, PCM determines that MAF circuit has a malfunction. — Input voltage at PCM terminal 4E is **below 0.25 V**. — Input voltage at PCM terminal 4E is **above 4.90 V**.	• Inhibits EGR control. • Turns EGR solenoid valve (vacuum/vent) off.	×
Boost sensor	P0105	• PCM monitors input voltage from boost sensor when engine switch is turned ON. If PCM detects either of following conditions, PCM determines that boost sensor circuit has a malfunction. — Input voltage at PCM terminal 1P is **below 0.19 V**. — Input voltage at PCM terminal 1P is **above 4.90 V**.	• Sets boost pressure for control **approx. 101 kPa {760 mmHg, 30 inHg}**.	×
IAT sensor No.1	P0110	• PCM monitors IAT sensor No.1 signal at PCM terminal 1J. If voltage at PCM terminal 1J is **below 0.13 V** or **above 4.90 V**, PCM determines that IAT sensor No.1 circuit has a malfunction.	• Sets IAT sensor No.1 for control **25 °C {77 °F}**.	×
ECT sensor	P0115	• PCM monitors ECT sensor signal at PCM terminal 1T. If voltage at PCM terminal 1T is **below 0.19 V** or **above 4.90 V**, PCM determines that ECT sensor circuit has a malfunction.	• Sets ECT sensor for control at engine running **60 °C {140 °F}**. • Sets ECT sensor for control at engine starting **0 °C {32 °F}**	×
Accelerator position sensor	P0120	• PCM monitors accelerator position sensor signal at PCM terminal 1R. If PCM detects either of following conditions, PCM determines that accelerator position sensor circuit has a malfunction. — Input voltage at PCM terminal 1R is **below 0.29 V**. — Input voltage at PCM terminal 1R is **above 4.80 V**. — Input voltage at PCM terminal 1R is **above 1.35 V** with idle switch ON. • PCM monitors difference voltage between main circuit and monitor circuit of accelerator position sensor. If difference voltage between PCM terminal 1R and 2C is **above 0.90 V**, PCM determines that accelerator position sensor has a malfunction.	• Sets accelerator position when idle switch off. • Sets accelerator position **0 V** when idle switch on.	×
Fuel temperature sensor	P0180	• PCM monitors fuel temperature sensor signal at PCM terminal 1L. If voltage at PCM terminal 1L is **below 0.19 V** or **above 4.59 V**, PCM determines that fuel temperature sensor circuit has malfunction.	• Sets fuel temperature for control **55 °C {131 °F}**.	×

Diagnosed circuit/ system	DTC	Detection condition	Fail – safe	Memory function
Injection amount control system	P0251	● PCM monitors difference voltage between target injection amount and actual injection amount while engine running. If difference voltage is **above threshold for 0.5 s**, PCM determines that injection amount control system is malfunctioning.	● Turns FSO solenoid off. ● Turns electronic governor off.	×
TDC sensor	P0335	● If PCM does not receive input signal from TDC sensor when engine is running, PCM determines that TDC sensor circuit has a malfunction.	● Detects engine speed using pump speed sensor.	×
EGR system	P0400	● PCM monitors EGR valve position sensor signal at PCM terminal 1F. If voltage at PCM terminal 1F is **below 0.66 V** when engine is idle, PCM determines that EGR system has a malfunction.	● Turns EGR solenoid valve (vacuum/vent) off.	×
VSS	P0500	● PCM detects after following conditions, PCM determines that VSS sensor circuit has a malfunction: — Gear is in position other than neutral. — Engine speed is **above 4,000 rpm**. — Vehicle speed is **below 3.76 km/h {2.33 mph}**.	–	×
Idle switch	P0510	● PCM detects after following conditions, PCM determines that idle switch has a malfunction: — Output voltage from idle switch is **above 1.35 V** with idle switch ON. — Output voltage from idle switch is **below 0.86 V** with idle switch OFF.	–	×
PCM	P0606	● PCM detects internal malfunction.	–	×
IAT sensor No.2	P1110	● PCM monitors IAT sensor No.2 signal at PCM terminal 1J. If voltage at PCM terminal 1J is **below 0.14 V** or **above 4.90 V**, PCM determines that IAT sensor No.2 circuit has a malfunction.	● Sets IAT sensor No.2 for control **25 °C {77 °F}**.	×
FSO solenoid	P1182	● When the engine switch is turned off while the engine is running, if the decrease in engine speed is **200 rpm** or less **2 seconds** after the engine switch is turned off, PCM determines that FSO solenoid has malfunction.	● Turns FSO solenoid off.	×
Pump speed sensor	P1189	● PCM monitors pump speed sensor signal at PCM terminal 2D and 2K. If difference between engine speeds detected by the pump speed sensor and the TDC sensor is **500 rpm** or more for **1 second** continuously under the following conditions, PCM determines that pump speed sensor circuit has malfunction. — Engine speed detected by the pump speed sensor is lower than that detected by the TDC sensor — Engine is running	● Detects pump speed using TDC sensor.	×
BARO sensor	P1195	● PCM monitors input voltage from BARO sensor integrated in PCM. If input voltage from BARO sensor is **below 1.50 V** or **above 4.50 V**, PCM determines that BARO sensor circuit is malfunctioning.	● Sets BARO sensor for control **approx. 101 kPa {760 mmHg, 30 inHg}**.	×
Control sleeve(CS) sensor	P1226	● PCM monitors input voltage from CS sensor. If input voltage from CS sensor is **below 0.23 V** or **above 4.68 V**, PCM determines that CS sensor circuit is malfunctioning.	● Turns FSO solenoid off. ● Turns electronic governor off.	×
TCV	P1312	● PCM monitors difference voltage between target injection timing and actual injection timing while ECT is **above 80 °C {176 °F}** and engine running. If difference voltage is above threshold for 5 seconds, PCM determines that injection timing control system is malfunctioning.	● Sets TCV position specified value.	×

Diagnosed circuit/ system	DTC	Detection condition	Fail – safe	Memory function
Timer position sensor	P1318	● PCM monitors input voltage from timer position sensor. If input voltage from timer position sensor is **above 4.50 V**or **above 4.90 V**, PCM determines that timer position sensor circuit is malfunctioning.	● Sets TCV position specified value.	×
EGR system	P1402	● If PCM detects EGR valve position sensor voltage at PCM terminal 1F **below 0.10 V** or **above 4.90 V** after engine start, PCM determines that EGR position circuit has a malfunction.	● Turns EGR control solenoid valve (vacuum/vent) off.	×
Immobilizer system	P1602*	● Command transmission from the PCM to the immobilizer unit exceeds limit. ● No response from immobilizer unit	–	–
Immobilizer system	P1603*	● Code word is not registered in PCM.	–	–
Immobilizer system	P1604*	● Key ID numbers are not registered in PCM.	–	–
Immobilizer system	P1621*	● Code word stored in PCM and immobilizer unit does not match	–	–
Immobilizer system	P1622*	● ID number stored in immobilizer unit (IU) and PCM does not match. This DTC is indicated only after immobilizer unit is replaced and reprogramming system.	–	–
Immobilizer system	P1623*	● PCM internal EPROM damaged.	–	–
Immobilizer system	P1624*	● PCM detected immobilizer system communication malfunction more than three times	–	–
Injection pump EPROM	P1649	● If PCM cannot access to injection pump EPROM, PCM determines that the injection pump EPROM circuit has malfunction.	● Inhibits correction control using injection pump EPROM.	×

* : With immobilizer system

PID/DATA MONITOR AND RECORD

ZCF407018881W03

Euro 3 Regulation Models

- The PID/DATA monitor function has been added for the Euro 3 Regulation models.
- The PIDs can confirm using **SST** (WDS or equivalent).

PID Monitor table

Monitor item (Display on NGS tester)	Monitoring item	Condition/unit	PCM terminal
ACCS	A/C relay	ON/OFF	4L
ACSW	A/C switch	ON/OFF	3C
ARPMDES	Target engine speed	RPM	–
BARO	Barometric pressure in PCM	kPa/Bar/psi	–
	Barometric pressure sensor voltage in PCM	V	
CS P	Control sleeve signal voltage	V	1Q
ECT	Engine coolant temperature	˚C/˚F	1T
	Engine coolant temperature signal voltage	V	
EGRA	EGR solenoid valve (vent)	%	4Q
EGRV	EGR solenoid valve (vacuum)	%	4T
EGRVP	EGR valve position	V	1F
FLT	Fuel temperature	˚C/˚F	1L
FLT V	Fuel temperature signal voltage	V	1L
FSOV	FSO solenoid control	ON/OFF	4W

Monitor item (Display on NGS tester)	Monitoring item	Condition/unit	PCM terminal
GPC	Glow plug control	ON/OFF	4V
GPL	Glow indicator light	ON/OFF	4S
IASV	Intake shutter valve	ON/OFF	4Z
IAT	Intake air temperature (IAT sensor No.2)	°C/°F	1J
	Intake air temperature signal voltage (IAT sensor No.2)	V	
IATDC	Intake air temperature (IAT sensor No.1)	°C/°F	3D
	Intake air temperature (IAT sensor No.1)	V	
IDLE SW	Idle switch	ON/OFF	3O
MAF	MAF sensor signal voltage	V	4E
MAINRLY	PCM control relay	ON/OFF	3B
MAP	Boost pressure	kPa/Bar/psi	1P
	Boost sensor signal voltage	V	
PNP	Neutral/clutch position	ON/OFF	1D
RPM	Engine speed	RPM	1H
STARTER	Engine switch	ON/OFF	1U
TPS	Timer position sensor	%	1K
test	TEN terminal (in DLC)	ON/OFF	2A
TP	Accelerator position sensor No.1 signal voltage	V	1R
TP2 V	Accelerator position sensor No.2 signal voltage	V	2C
VPWR	Battery positive voltage	V	4C
VSS	Vehicle speed	KPH/MPH	1N

SIMULATION TEST

ZCF407018881W04

Euro 3 Regulation Models

- The simulation function has been added for the Euro 3 Regulation models.
- The following output devices can activate using **SST** (WDS or equivalent).

Simulation test item table

×: Applicable

Simulation item	Definition	Operation	Test condition		PCM terminal
			IG ON	Idle	
ACCS	A/C relay	ON or OFF	×	×	4L
GOVERNOR	Electronic governor	Actuate by any duty value (0.5 — 3.5 V)	–	×	4X, 4Y
EGRA	EGR solenoid valve (vent) control	Actuate by any duty value (0 — 100%)	×	×	4T
EGRV	EGR solenoid valve (vacuum) control	Actuate by any duty value (0 — 100%)	×	×	4Q
FSOV	FSO solenoid valve	ON or OFF	×	×	4W
GPL	Glow indicator light	ON or OFF	×	×	4S
GPC	Glow plug relay	ON or OFF	×	×	4V
IASV	Intake shutter valve solenoid valve	ON or OFF	×	×	4Z
TCV	Timer control valve	Actuate by any duty value (0 — 100%)	×	×	4U

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

ZCF400202000W06

- The following changes and/or additions have been made since publication of the RANGER REPAIR MANUAL (F161−10−99A).

Engine tune-up
- Engine tune up procedure has been modified.

Intake−air system
- Vacuum tube routing diagram has been modified.

Turbocharger (WL-3)
- Inspection procedure has been added.

Glow plug
- Removal/installation procedure has been modified.
- Inspection procedure has been modified.

Accelerator pedal component
- Removal/installation procedure has been modified.
- Disassembly/assembly procedure has been modified.

Injection pump
- Inspection procedure has been modified.

Fuel shut off (FSO) solenoid
- Inspection procedure has been added.

Electronic governor
- Inspection procedure has been added.

Timer control valve (TCV)
- Inspection procedure has been added.

EGR system
- Removal/installation procedure has been added.

EGR valve
- Inspection procedure has been modified.

EGR solenoid valve (vacuum)
- Inspection procedure has been added.

EGR solenoid valve (vent)
- Inspection procedure has been added.

EGR control solenoid valve
- Inspection procedure has been added.

Intake shutter valve actuator (WLT-3)
- Inspection procedure has been added.

Intake shutter solenoid valve (WLT-3)
- Inspection procedure has been added.

Control system
- Component parts has been modified.

PCM
- Removal/installation procedure has been modified.
- Inspection procedure has been modified.

Mass air flow (MAF)/Intake Air Temperature (IAT) sensor
- Inspection procedure has been added.

Intake air temperature (IAT) No.2 sensor
- Inspection procedure has been added.

Engine coolant temperature (ECT) sensor
- Inspection procedure has been modified.

Fuel temperature sensor
- Inspection procedure has been added.

Pump speed sensor
- Inspection procedure has been added.

Control sleeve (CS) sensor
- Inspection procedure has been added.

Timer position sensor
- Inspection procedure has been added.

Injection pump EPROM
- Inspection procedure has been added.

TDC sensor
- Removal/installation procedure has been modified.
- Inspection procedure has been added.

EGR valve position sensor
- Inspection procedure has been added.

Boost sensor
- Inspection procedure has been added.

PCM control relay
- Inspection procedure has been added.

Accelerator position senor
- Inspection procedure has been added.
- Adjustment procedure has been added.

Idle switch
- Inspection procedure has been added.
- Adjustment procedure has been added.

Clutch switch
- Inspection procedure has been added.

Neutral switch
- Inspection procedure has been added.

On−board diagnostic
- Inspection procedure has been modified.

Troubleshooting
- Inspection procedure has been modified.

ENGINE TUNE–UP

ENGINE TUNE-UP

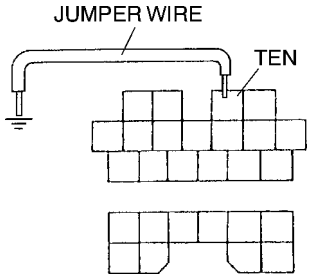
ZCF400802000W01

Euro 3 Regulation Models
Engine tune-up

1. Prepare for the engine tune-up.
   (1) Warm up the engine to normal operating temperature.
   (2) Shift the transmission into neutral (MT) or P range (AT).
   (3) Turn off all electrical loads.
2. Turn on the test mode.

   Caution
   - **Connecting to the wrong DLC terminal may cause a malfunction. Carefully connect only to the specified terminal.**

   (1) Connect DLC terminal TEN to the body ground using a jumper wire.



XME3908W005

3. Verify that the idle speed is within the specification.

   Specification
   695—745 (720 ± 25) rpm

   - If not as specified, inspect the following parts.
     — Accelerator position sensor
     — ECT sensor
     — TDC sensor
     — Pump speed sensor
   - If the parts are normal, replace the PCM.
4. Turn off the test mode.
   (1) Disconnect the jumper wire.
5. Inspect the idle-up speed.
   (1) Verify that the idle-up speed is within the specification under the following load condition. (Excludes temporary idle speed drop just after the electrical loads turn on.)
   - If not as specified, replace the PCM.

Specification

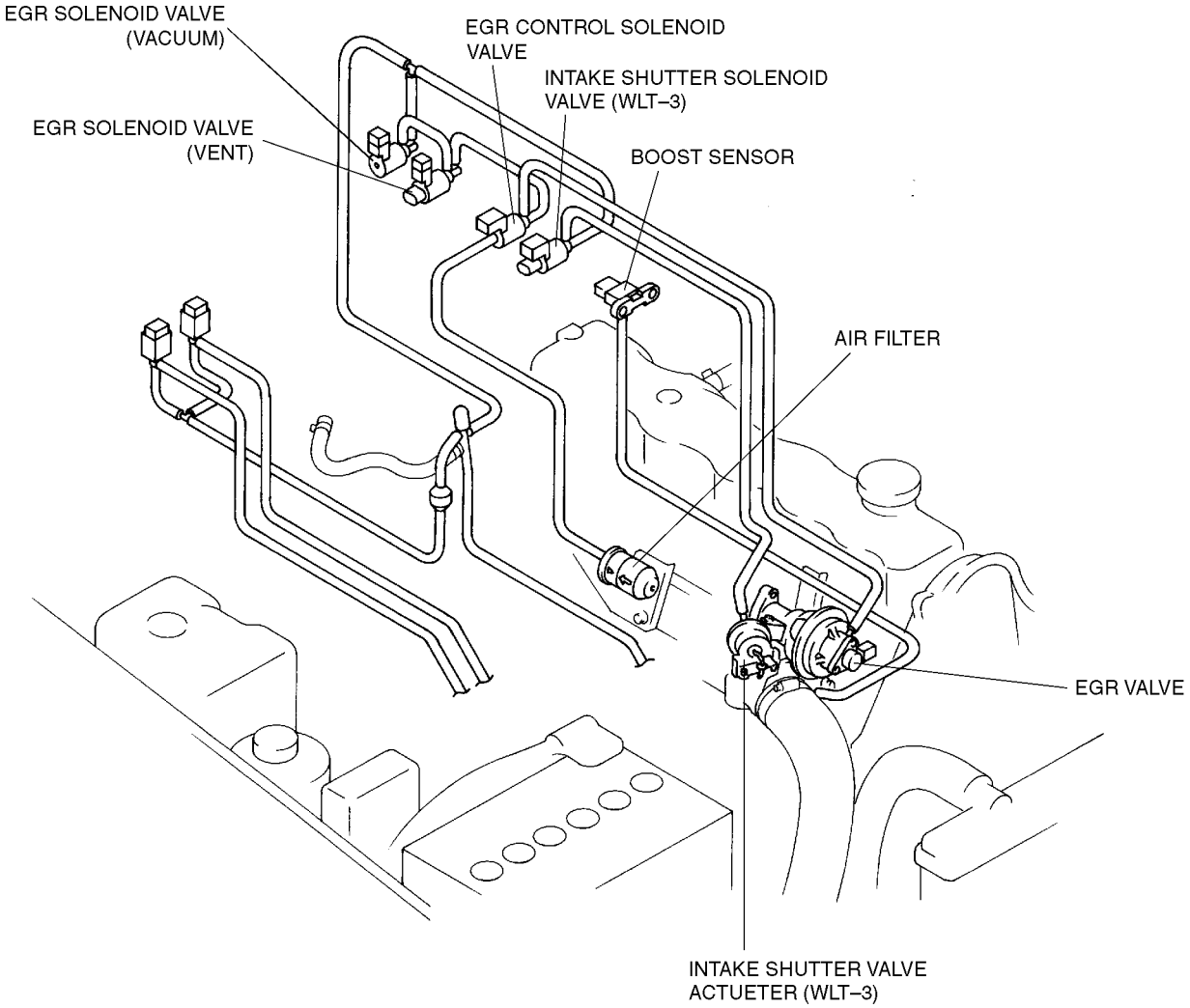
Load condition	Idle-up speed (rpm)
	Neutral (MT) P range (AT)
A/C ON	725—775 (750 ± 25)

INTAKE–AIR SYSTEM

VACUUM TUBE ROUTING DIAGRAM

ZCF401020030W01

Euro 3 Regulation Models



ZCF4010W004

TURBOCHARGER INSPECTION

ZCF401013700W02

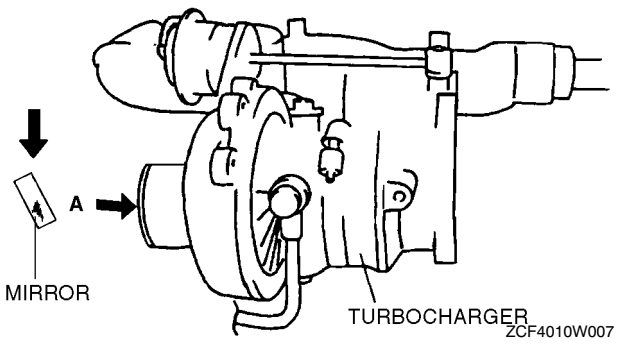
Euro 3 Regulation Models (WL– 3)

Compressor wheels inspection

1. Remove the air hose.
2. Remove the joint pipe.
3. Set the small mirror as shown and inspect the compressor wheel from view A.

Note

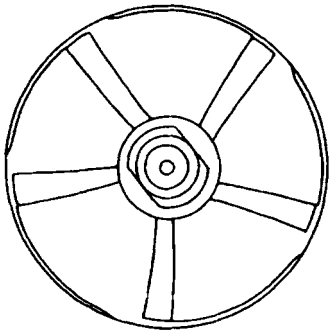
- To make work accurate, use a penlight to inspect.



ZCF4010W007

4. Inspect all fins of compressor wheel while rotating the compressor wheel by hand.
   - If the compressor wheel is interfering with the housing, it is likely that more than two fins are damaged, cracked or bent. Replace the turbocharger.

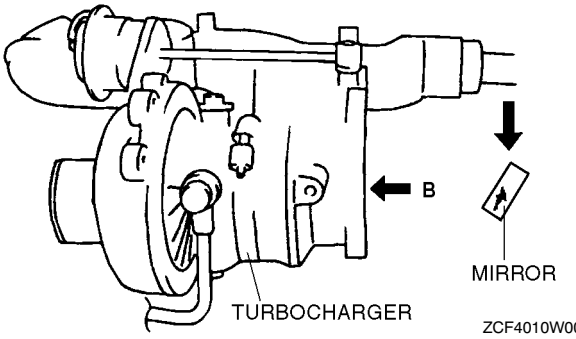
Note
- If scratches are found inside the housing but the fins are okay, the turbocharger is okay. Scratches are made in the turbocharger made by factory.



ZCF4010W008

Turbine wheel inspection
1. Remove the air hose.
2. Remove the joint pipe.
3. Set the small mirror as shown and inspect the turbine wheel from view B.

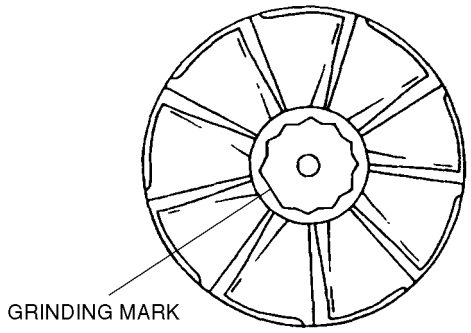
Note
- To make work accurate, use a penlight to inspect.



ZCF4010W009

4. Inspect all fins of turbine wheel while rotating the turbine wheel by hand.
   - If the turbine wheel is interfering with the housing, it is likely that one or more fins are damaged, cracked or bent. Replace the turbocharger.

Note
- Grinding marks on the shaft are normal. This mark is for adjusting the shaft balance at the factory.



ZCF4010W010

GLOW PLUG REMOVAL/INSTALLATION

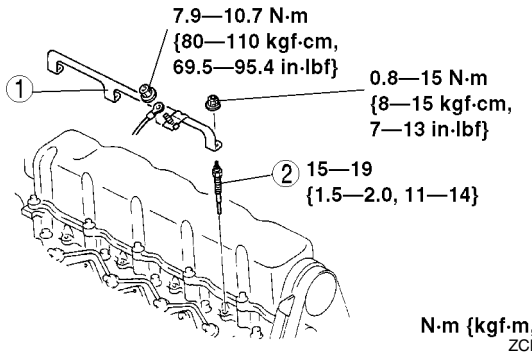
ZCF401018601W02

Euro 3 Regulation Models

Caution
- **Do not damage the heated section of the glow plug.**
- **Do not reuse a glow plug that has been dropped over a height of 10 cm, even when there are no scratches and resistance is normal (0.5 ohms at normal temperature).**
- **Do not remove the glow plug unless you are replacing it.**

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Glow plug cord
2	Glow plug (See F2-49 Glow plug removal note) (See F2-49 Glow plug installation note) (See F2-50 Glow plug cleaning before installation note)



ZCF4010W001

3. Install in the reverse order of removal.

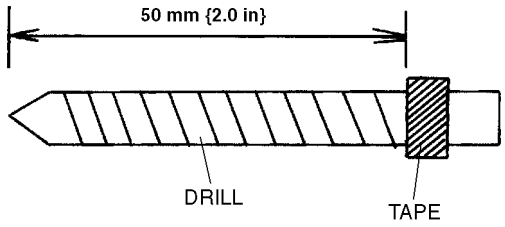
Glow plug removal note
1. When removing the glow plug, first loosen it at least one pitch using a tool, then loosen by hand.

Glow plug installation note
1. Tighten the glow plug it at least one pitch by hand, and continue tightening with a tool.

Glow plug cleaning before installation note

Caution
- **Carbon on the glow plug can damage the glow plug and engine. Remove carbon on the glow plug and fitting holes before installing the glow plug.**

1. Wrap tape on both a **5.5 mm and a 5.7 mm** drills, starting from the tip to a point **50 mm** from the tip.



ZCF4010W002

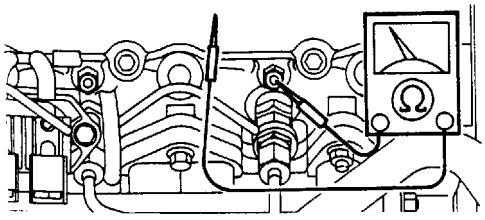
2. Push in the **5.5 mm** drill until the section covered with tape is fully inserted.
3. Turn the drill by hand to remove the carbon on the fitting holes.
4. Repeat steps 2. and 3. for the **5.7 mm** drill.

GLOW PLUG INSPECTION

ZCF401018601W03

Euro 3 Regulation Models

1. Remove the glow plug cord. (See F2-49 GLOW PLUG REMOVAL/INSTALLATION.)
2. Inspect for continuity between the glow plug terminal and the cylinder head using an ohmmeter.



YYJ4010W105

- If there is no continuity, replace the glow plug.

Glow plug resistance
Approx. 0.5 ohm [20˚C {68˚F}]

3. Install the glow plug cord.

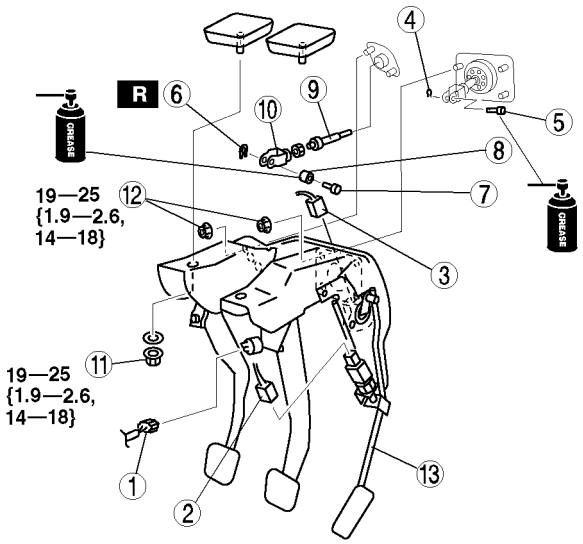
ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION

ZCF401041600W02

Euro 3 Regulation Models

1. Disconnect the negative battery cable.
2. Remove the column cover. (See Section N)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

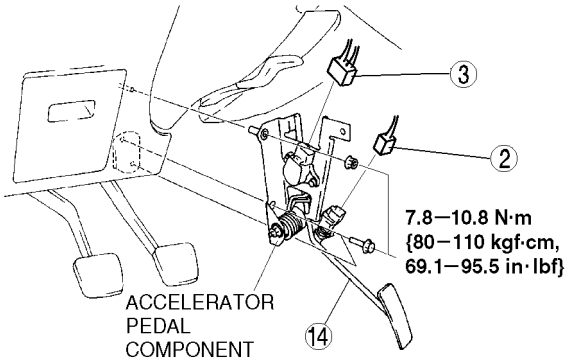
R.H.D.



N·m {kgf·m, ft·lbf}

ZCF4010W013

L.H.D.



ZCF4010W005

1	Brake switch connector
2	Idle switch connector
3	Accelerator position sensor connector
4	Spring pin
5	Clevis pin
6	E clip
7	Pin
8	Bushing
9	Push rod
10	Clevis
11	Nut
12	Nut
13	Pedal component (See F2-51 Pedal component installation note)
14	Accelerator pedal component

Pedal component installation note

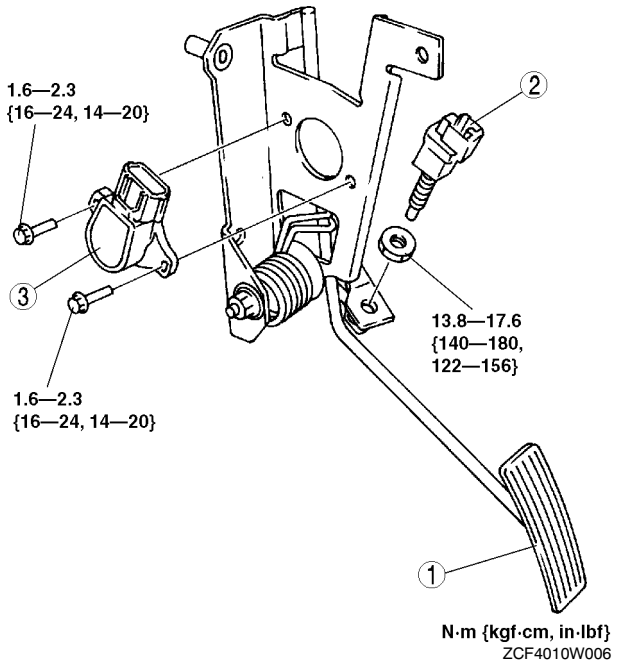
- Carry out the “BRAKE PEDAL HEIGHT INSPECTION” procedure after installing the pedal component. (See Section P)
- Carry out the “CLUTCH PEDAL INSPECTION” procedure after installing the pedal component. (See Section H)

ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY

ZCF401041600W03

Euro 3 Regulation Models

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



ZCF4010W006

1	Accelerator pedal
2	Idle switch (SeeF2−73 IDLE SWITCH ADJUSTMENT)
3	Accelerator position sensor (See F2−72 ACCELERATOR POSITION SENSOR ADJUSTMENT)

FUEL SYSTEM

INJECTION PUMP INSPECTION

ZCF401213800W05

Euro 3 Regulation Models
Injection pump inner parts inspection

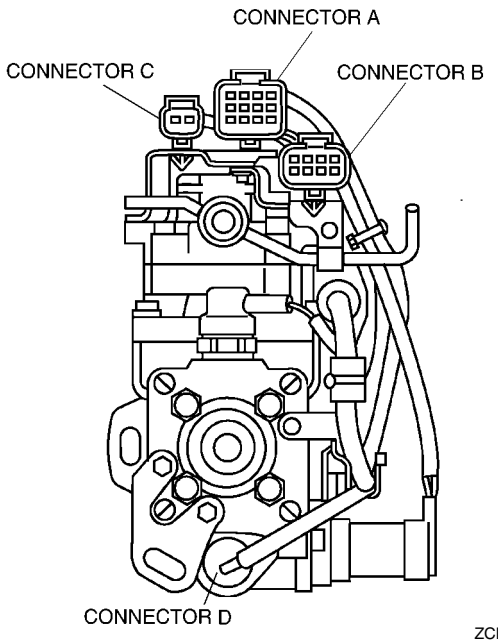
Caution
- **Injection pump is sealed to maintain proper function. Special tools and testers are required when disassembling the injection pump. Disassembling the injection pump without special tools and testers will cause a malfunction.**
- **Consult authorized BOSCH parts distributor for repair if any of the injection pump inner parts are possibly malfunctioning.**

Injection pump auxiliary parts inspection

Caution
- **Consult authorized BOSCH parts distributor for repair if any of the following injection pump auxiliary parts are possibly malfunctioning:**

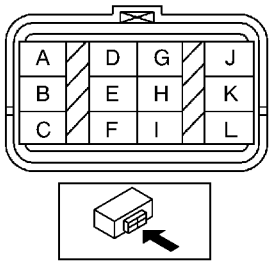
1. Electronic governor
2. Timer position sensor
3. Control sleeve (CS) sensor
4. Fuel temperature sensor
5. Timer control valve (TCV)

Location of the connectors on the injection pump



ZCF4012W003

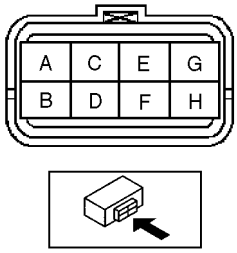
CONNECTOR A



ZCF4012W007

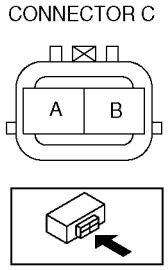
Terminal	Part name
A	-
B	TCV (–)
C	TCV (+)
D	-
E	Fuel temperature sensor (–)
F	CS sensor
G	CS sensor (+)
H	CS sensor (–)
I	Electronic governor (+)
J	FSO solenoid
K	Fuel temperature sensor (+)
L	Electronic governor (–)

CONNECTOR B



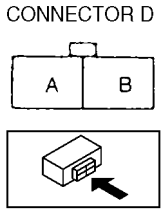
ZCF4012W006

Terminal	Part name
A	Timer position sensor
B	Timer position sensor (–)
C	Timer position sensor (+)
D	Injection pump EPROM (VCC)
E	Injection pump EPROM (DI/DO)
F	Injection pump EPROM (CLK)
G	Injection pump EPROM (CS)
H	Injection pump EPROM (GND)



ZCF4012W005

Terminal	Part name
A	Pump speed sensor (+)
B	Pump speed sensor (–)



ZCF4012W010

Terminal	Part name
A	TCV body (+)
B	TCV body (–)

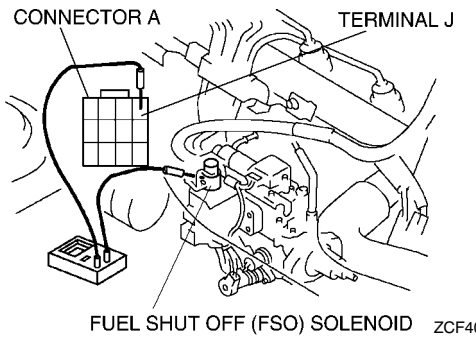
FUEL SHUT OFF (FSO) SOLENOID INSPECTION

ZCF401213800W06

Euro 3 Regulation models
On–vehicle inspection
Continuity inspection

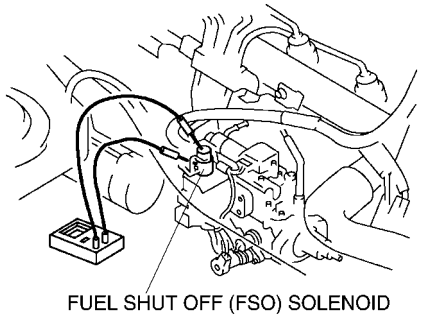
Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect for continuity between the terminals under the following conditions.



ZCF4012W008

4. Remove the terminal cover of the FSO solenoid.
5. Verify that the resistance between the FSO solenoid terminal and the FSOsolenoid body is within the specification.
   - If not as specified, replace the FSO solenoid.
   - If as specified, but the engine does not start, perform the following off–vehicle inspection.



ZCF4012W009

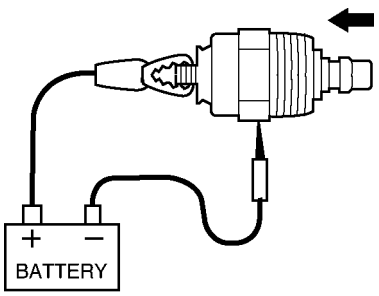
Specification

FSO temperature (˚C {˚F})	Resistance (ohm)
13—33 {55.4—91.4}	7.5—9.7

Off–vehicle inspection

Operation inspection

1. Remove the FSO solenoid.
2. Connect the battery positive voltage to the FSO solenoid terminal and ground the FSO solenoid body.
3. Verify that the valve stem is drawn into the valve.
   - If not as specified, replace the FSO solenoid.
   - If as specified, carry out the “Circuit Open/Short Inspection.”



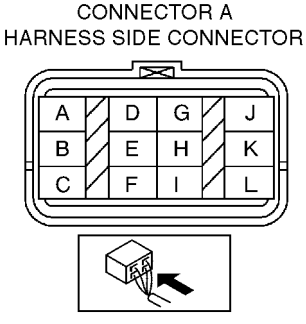
ZCF4012W002

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (injection pump connector A terminal J and PCM connector terminal 4W)



ZCF4012W001

Short circuit

- Injection pump connector A terminal J and PCM connector terminal 4W to GND.

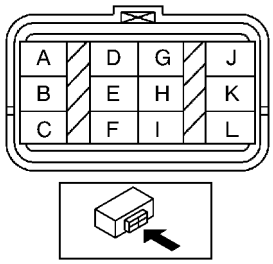
ELECTRONIC GOVERNOR INSPECTION

ZCF401213800W07

Euro 3 Regulation models
Resistance inspection

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect for resistance between the terminals under the following conditions.
   - Consult authorized BOSCH parts distributor for repair if the electronic governor is possibly malfunctioning.
   - If as specified, carry out the “Circuit Open/Short Inspection.”



ZCF4012W004

Specification

Terminal	Atmospheric temperature (˚C {˚F})	Resistance (ohm)
I—L	18—28 {64.4—82.4}	0.58—0.84

Circuit Open/Short Inspection
1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (Injection pump connector A terminal I and PCM connector terminal 4x)
- Signal circuit (Injection pump connector A terminal L and PCM connector terminal 4Y)

Short circuit
- Electronic governor connector terminal L and PCM connector terminal 4Y to GND.

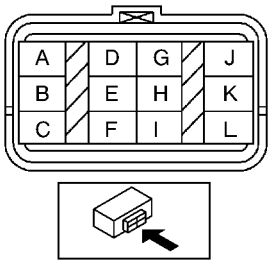
TIMER CONTROL VALVE (TCV) INSPECTION

ZCF401213800W08

Euro3 Regulation models
Continuity inspection

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect for continuity between the terminals B and C using an ohmmeter.
   - If no continuity is detected, perform resistance inspection.



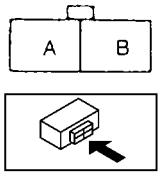
ZCF4012W004

Resistance inspection
1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector D.
   - Consult authorized BOSCH parts distributor for repair if the timer control valve (TCV) is possibly malfunctioning.
   - If as specified, carry out the “Circuit Open/Short Inspection.”

Specification

Terminal	Atmospheric temperature (˚C {˚F})	Resistance (ohm)
A—B	10—30 {50—86}	10.3—11.7

CONNECTOR D



ZCF4012W010

Circuit Open/Short Inspection
1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (Injection pump connector D terminal A and PCM control relay connector terminal D)
- Signal circuit (Injection pump connector D terminal B and PCM connector terminal 4U)

Short circuit
- Injection pump connector D terminal B and PCM connector terminal 4U to GND.

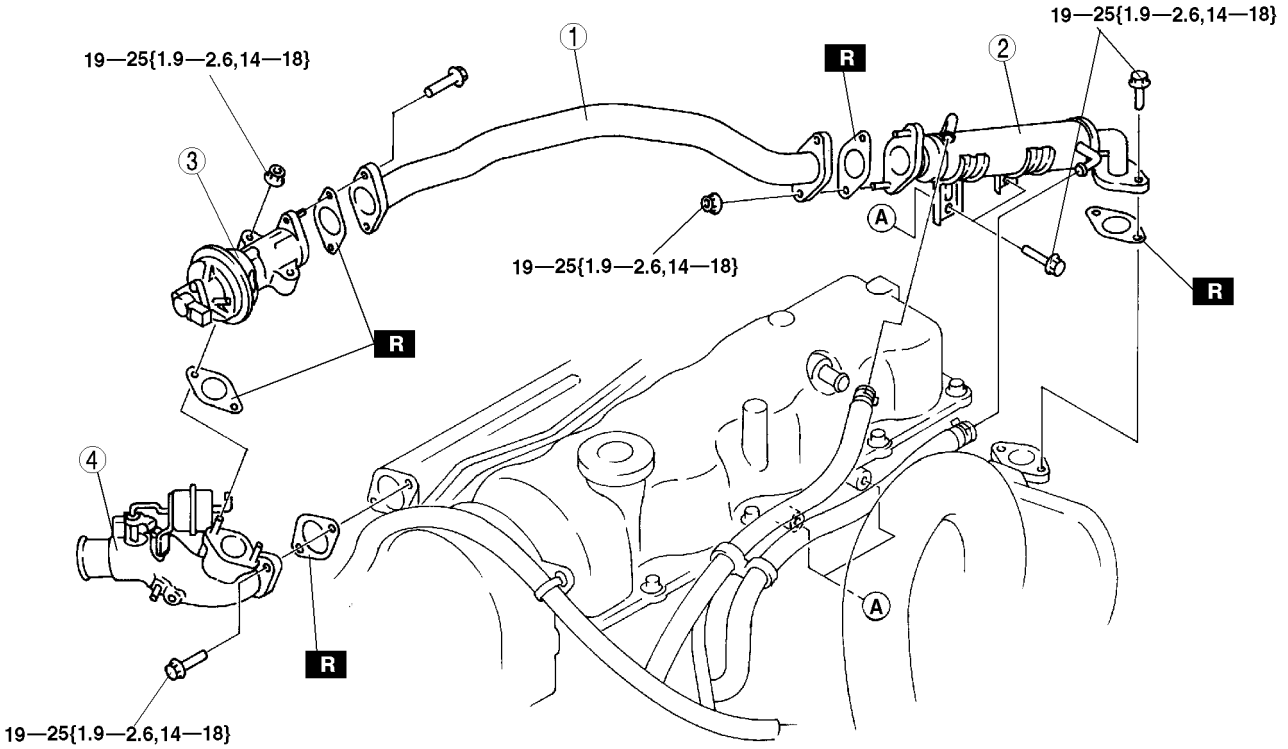
EMISSION SYSTEM

EGR SYSTEM REMOVAL/INSTALLATION

ZCF401601075W02

Euro 3 Regulation Models

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



N·m {kgf·m, ft·lbf}

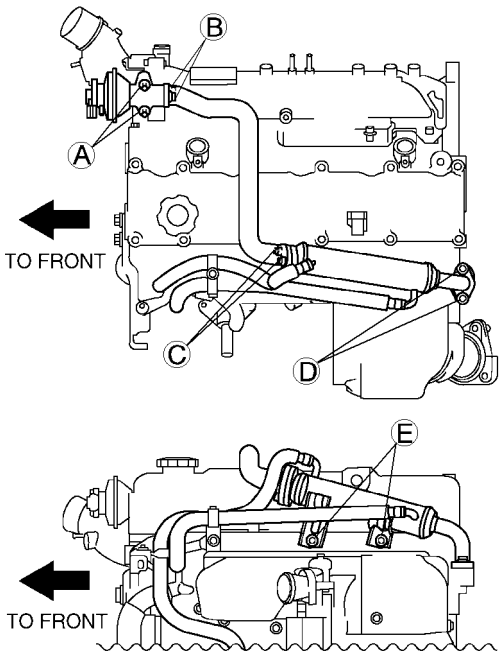
ZCF4016W009

1	EGR pipe
2	EGR water cooler

3	EGR valve
4	Intake shutter valve (WLT-3)

EGR system installation note

1. Temporarily tighten bolts and nuts in order of A to E.
2. Tighten the bolts and nuts in order of A to E.



ZCF4016W010

EGR VALVE INSPECTION

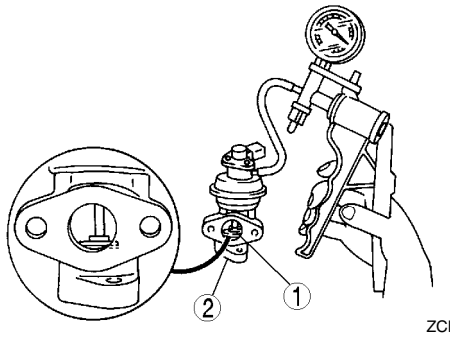
ZCF401620300W01

Euro 3 Regulation models

1. Inspect for airflow between 1 and 2 when vacuum is applied using a vacuum pump as shown in the figure.
   - If not as specified, replace the EGR valve.

Specification

Vacuum kPa {mmHg, inHg}	Airflow
Below –30.0— –36.6 {–225— –275,–8.9 — –10.8}	Yes
Except above	No



ZCF4016W008

EGR SOLENOID VALVE (VACUUM) INSPECTION

ZCF401618741W02

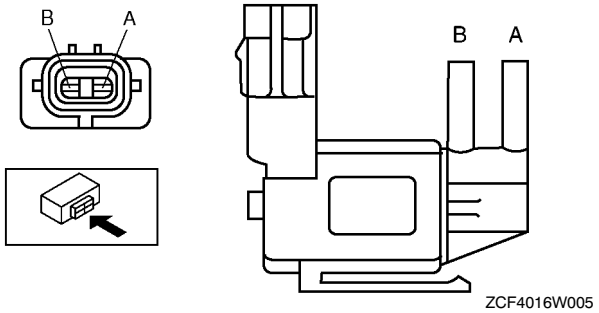
Euro 3 Regulation Models

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the EGR solenoid valve (vacuum).
   - If as specified, carry out the “Circuit Open/Short Inspection.”

: Airflow

Step	Terminal		Port	
	A	B	A	B
1				
2	B+	GND	○—○	

ZCF4016W004



ZCF4016W005

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR solenoid valve (vacuum) connector terminal A and PCM control relay connector terminal D)
- GND circuit (EGR solenoid valve (vacuum) connector terminal B and PCM connector terminal 4T)

Short circuit

- EGR solenoid valve (vacuum) connector terminal A and PCM control relay connector terminal D to GND

EGR SOLENOID VALVE (VENT) INSPECTION

ZCF401618741W03

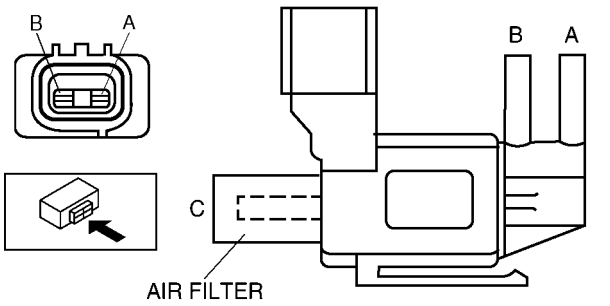
Euro 3 Regulation Models

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the EGR solenoid valve (vent).
   - If as specified, carry out the “Circuit Open/Short Inspection.”

: Airflow

Step	Terminal		Port		
	A	B	A	B	C
1			○—○	○—○	○—○
2	B+	GND	○—○	○—○	

ZCF4016W003



ZCF4016W006

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR solenoid valve (vent) connector terminal A and PCM control relay connector terminal D)
- GND circuit (EGR solenoid valve (vent) connector terminal B and PCM connector terminal 4Q)

Short circuit

- EGR solenoid valve (vent) connector terminal A and PCM control relay connector terminal D to GND

EGR CONTROL SOLENOID VALVE INSPECTION

ZCF401618741W05

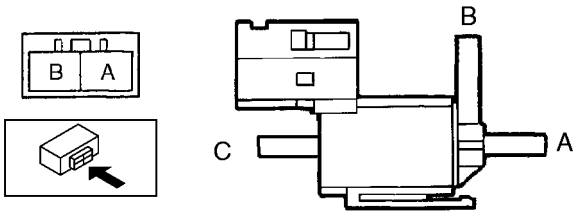
Euro 3 Regulation Models

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the EGR control solenoid valve.
   - If as specified, carry out the “Circuit Open/Short Inspection.”

: Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○—○	
2	B+	GND	○—○		

YTA4114W105



ZCF4016W001

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (EGR control solenoid valve connector terminal A and PCM control relay connector terminal D)
- GND circuit (EGR control solenoid valve connector terminal B and PCM connector terminal 4I)

Short circuit

- EGR control solenoid valve connector terminal A and PCM control relay connector terminal D to GND

INTAKE SHUTTER VALVE ACTUATOR INSPECTION

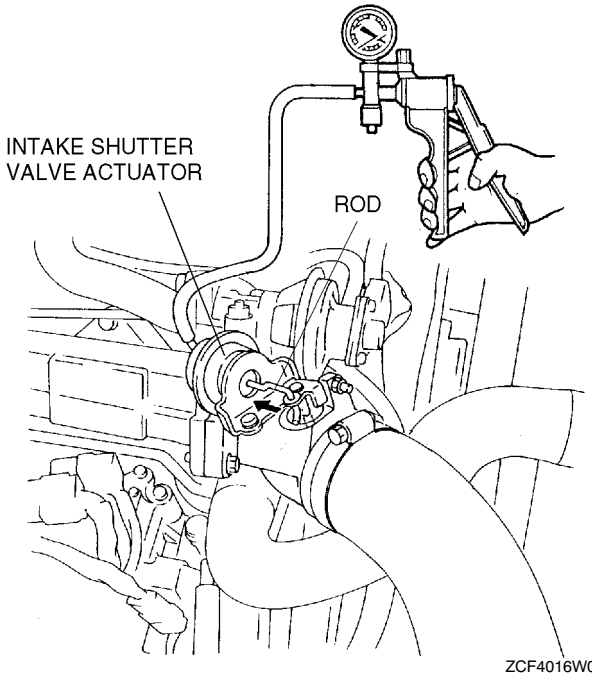
ZCF401620100W02

Euro 3 Regulation models (WLT-3)

1. Disconnect the vacuum hose from the intake shutter valve actuator.
2. Connect a vacuum pump to the intake shutter valve actuator.
3. Apply vacuum and verify that the rod moves.
   - If the rod does not move, replace the intake shutter valve.

Specification

Vacuum kPa {mmHg, inHg}	Rod movement
Below –5.3 {–40, –1.57}	Starts to move
Above –26.6 {–200, –7.9}	Fully pulled



ZCF4016W007

INTAKE SHUTTER SOLENOID VALVE INSPECTION

ZCF401613937W02

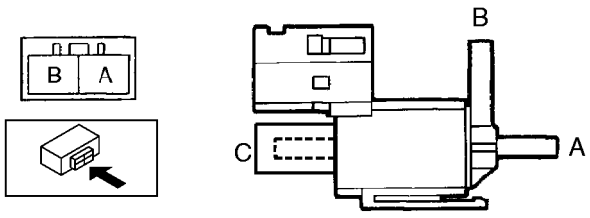
Euro 3 Regulation Models (WLT-3)

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the intake shutter solenoid valve.
   - If as specified, carry out the “Circuit Open/Short Inspection.”

: Airflow

Step	Terminal		Port		
	A	B	A	B	C
1				○—○	
2	B+	GND	○—○		

YTA4114W105



ZCF4016W002

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (intake shutter solenoid valve connector terminal A and PCM control relay connector terminal D)
- GND circuit (intake shutter solenoid valve connector terminal B and PCM connector terminal 4Z)

Short circuit

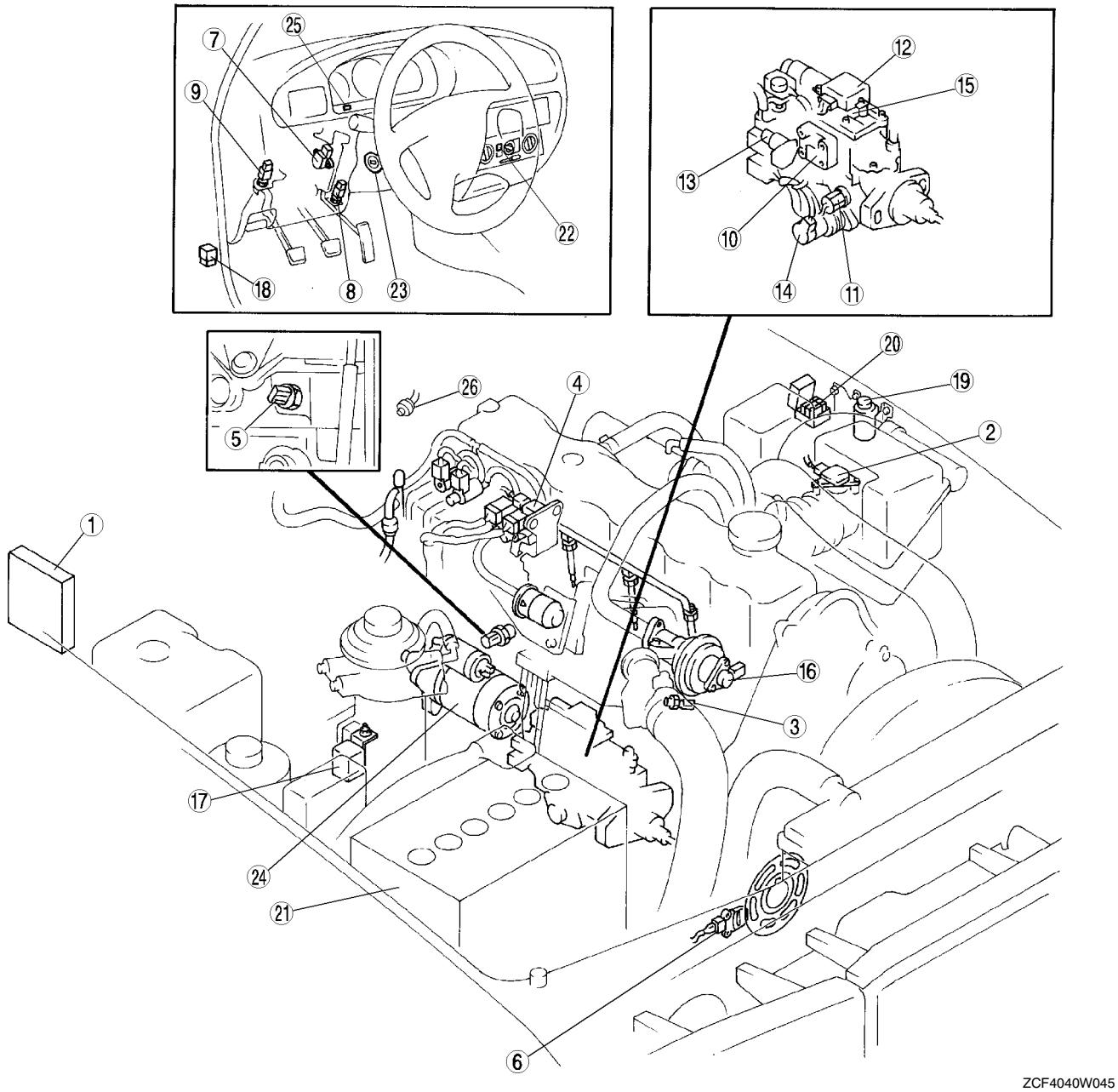
- Intake shutter solenoid valve connector terminal A and PCM control relay connector terminal D to GND

CONTROL SYSTEM

CONTROL SYSTEM COMPONENT

ZCF404001070W05

Euro 3 Regulation Models



ZCF4040W045

1	PCM
2	MAF/IAT sensor
3	IAT sensor No.2
4	Boost sensor
5	ECT sensor
6	TDC sensor
7	Accelerator position sensor
8	Idle switch
9	Clutch switch
10	Fuel temperature sensor
11	Pump speed sensor
12	Injection pump EPROM

13	TCV
14	Timer position sensor
15	Control sleeve (CS) sensor
16	EGR valve position sensor
17	Glow plug relay
18	PCM control relay
19	A/C relay
20	DLC
21	Battery
22	A/C switch
23	Engine switch
24	Starter

25	Glow indicator light
26	Neutral switch

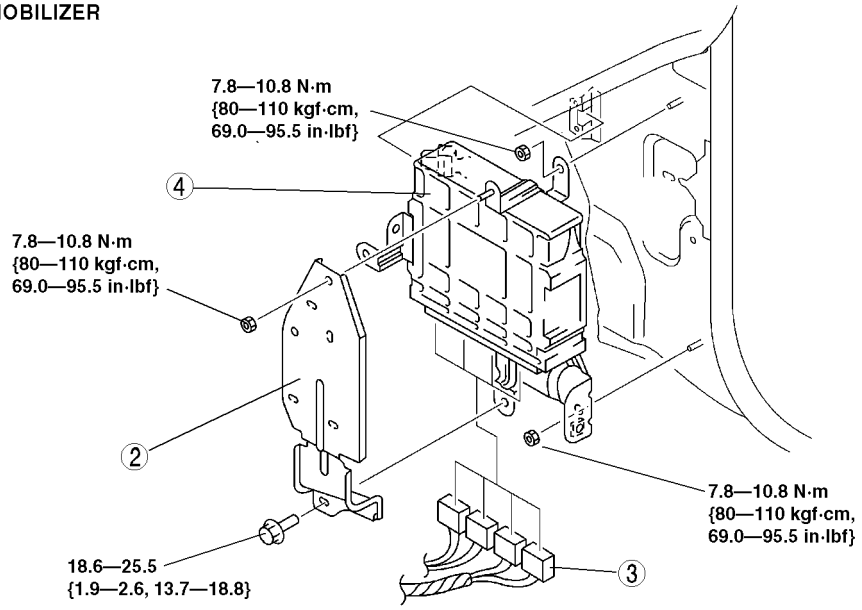
PCM REMOVAL/INSTALLATION

ZCF404018880W02

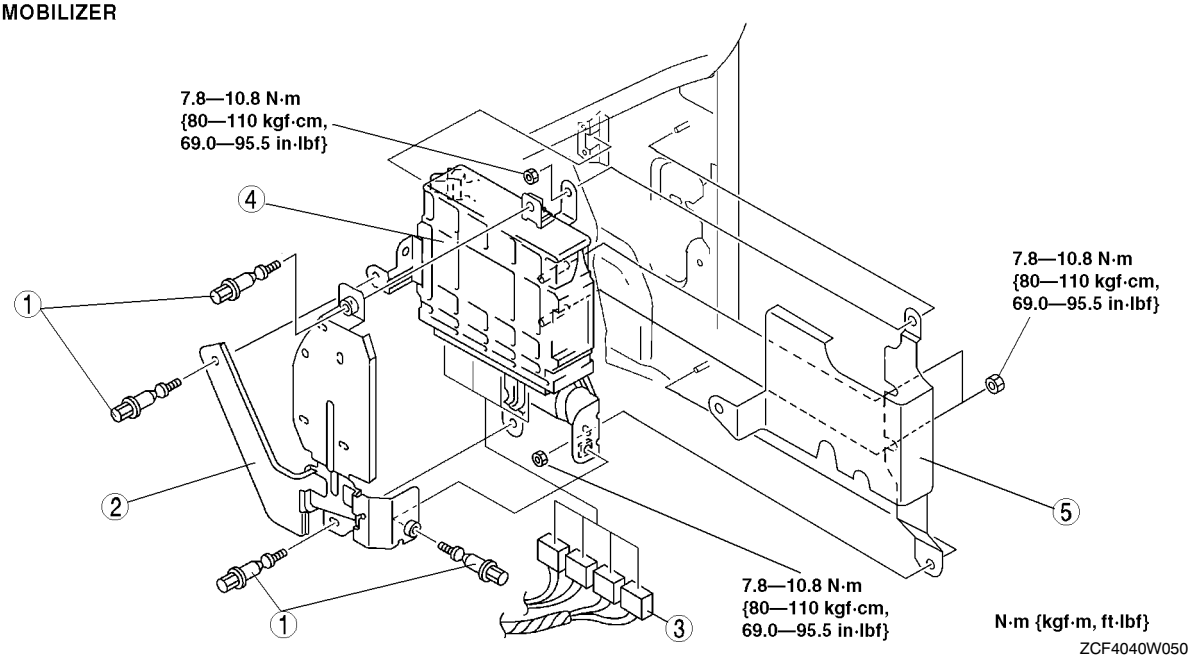
Euro 3 Regulation Models

1. Disconnect the battery negative cable.
2. Remove the passenger's side front side trim.
3. Remove in the order indicated in the table.

WITHOUT IMMOBILIZER



WITH IMMOBILIZER



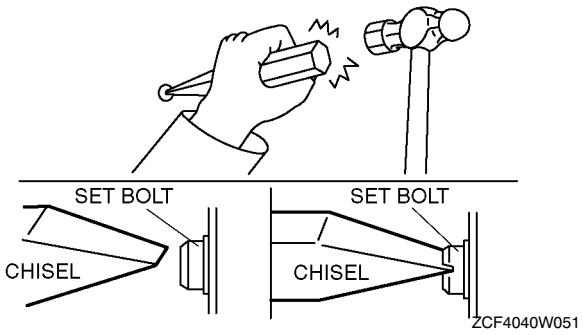
ZCF4040W050

1	Set bolt (with immobilizer) (See F2–61 Set bolt removal note) (See F2–61 Set bolt installation note)
2	PCM cover

3	PCM connector
4	PCM
5	Bracket

Set bolt removal note

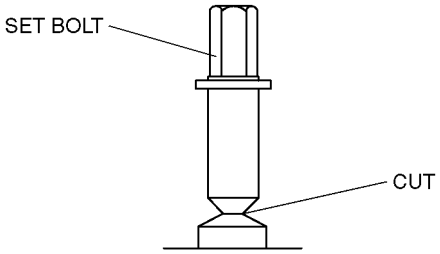
1. Using a chisel and a hammer, cut a groove on the head of the set bolt so that a screwdriver can be inserted.
2. Loose the set bolt by using an impact screwdriver or pliers.



ZCF4040W051

Set bolt installation note

1. Install new set bolt and tighten it until the neck of the bolt is cut.



ZCF4040W052

PCM INSPECTION

ZCF404018880W03

Euro 3 Regulation Models

Caution

- **The PCM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM to determine the cause of trouble. Otherwise, diagnosis will be incorrect.**

Note

- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
  - — Electronic governor
  - — Pump speed sensor
  - — Injection pump EPROM
  - — EGR control solenoid valve

1. Connect the WDS or equivalent to the DLC. (See F2−77 ON−BOARD DIAGNOSTIC TEST)
2. Turn the engine switch on.
3. Measure the value.
   - If value is not within the specification, follow the instructions in Action column.

PID Monitor Table

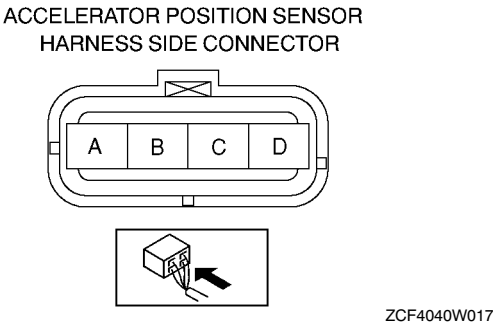
Monitor item (Definition)	Unit/ Condition			Condition/Specification	Action	PCM terminal
ACCS (A/C relay)	ON/OFF			Engine switch is on: OFF A/C switch is on and fan switch is on at idle: ON	Inspect following PIDs: TP, ECT, ACSW, PNP, VS, STARTER. Inspect A/C relay. (See Section U)	4L
ACSW (A/C switch)	ON/OFF			A/C switch and fan switch is on with engine switch on: ON A/C switch is off with engine switch on: OFF	Inspect refrigerant pressure switch. (See Section U)	3C
ARPMDES (Target engine speed)	rpm			A/C ON: 750 rpm Other: 720 rpm	Inspect A/C switch. (See Section U)	-
BARO (Barometric pressure in PCM)	kPa	Bar	psi	Elevation 0—400 m {0—1310 ft}: 100—103 kPa {1.00—1.03 Bar, 14.5—14.9 psi}	Replace PCM.	-
	V			Elevation 0—400 m {0—1310 ft}: approx. 4.0 V		
CS P (Control sleeve signal voltage)	V			Engine switch is off: below 1.0 V Engine switch is on or idle: approx. 2.5 V	Inspect control sleeve (CS) sensor. (See F2−68 CONTROL SLEEVE (CS) SENSOR INSPECTION)	1Q

Monitor item (Definition)	Unit/ Condition		Condition/Specification	Action	PCM terminal
ECT (Engine coolant temperature)	˚C	˚F	ECT is 20˚C {68˚F}: 20˚C {68˚F} ECT is 85˚C {185˚F}: 85˚C {185˚F}	Inspect ECT sensor. (See F2–66 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION)	1T
	V		ECT is 20˚C {68˚F}: 3.0—3.2 V ECT is 85˚C {185˚F}: 0.7—0.9 V		
EGRA (EGR solenoid valve (vent))	%		Engine switch is on: 0—100% Idle: 0—100%	Inspect following PIDs: ECT, TP, IDLE SW, MAF, IAT, RPM, EGRVP. Inspect EGR solenoid valve (vent). (See F2–56 EGR SOLENOID VALVE (VENT) INSPECTION)	4Q
EGRV (EGR solenoid valve (vacuum))	%		Engine switch is on: 0—100% Idle: 0—100%	Inspect following PIDs: ECT, TP, IDLE SW, MAF, IAT, RPM, EGRVP. Inspect EGR solenoid valve (vent). (See F2–56 EGR SOLENOID VALVE (VACUUM) INSPECTION)	4T
EGRVP (EGR valve position)	V		Engine switch is on: approx. 0.6 V Idle: above 3.0 V	Inspect EGR valve position sensor. (See F2–70 EGR VALVE POSITION SENSOR INSPECTION)	1F
FLT (Fuel temperature sensor)	˚C	˚F	Fuel temperature is 20˚C {68˚F}: 20˚C {68˚F}:	Inspect fuel temperature sensor. (See F2–67 FUEL TEMPERATURE SENSOR INSPECTION)	1L
FLT V (Fuel temperature signal voltage)	V		Fuel temperature is 20˚C {68˚F}: 2.4—2.6 V Fuel temperature is 70˚C {158˚F}: 0.7—0.9 V	Inspect fuel temperature sensor. (See F2–67 FUEL TEMPERATURE SENSOR INSPECTION)	1L
FSOV (FSO solenoid control)	ON/OFF		Idle: ON Engine switch is on: ON Engine speed is above 5,100 rpm: OFF DTC P1182, P0251, P0606, P1226 is detected: OFF	Follow appropriate DTC troubleshooting (See F2–77 DTC TABLE)	4W
GPC (Glow plug control)	ON/OFF		**ECT below 60˚C {140˚F}** ● For 15 s after engine switch on: ON ● After 6.5 s—10 min elapse from engine switch on: OFF ● For 6.5 s—10 min after engine started: ON ● After 15 s elapse from engine started: OFF **ECT above 60˚C {140˚F}** ● For 6.5 s after engine switch on: ON ● After 6.5 s elapse from engine switch on: OFF	Inspect following PIDs: ECT, VSS, VPWR. Inspect glow plug relay. (See T–6 RELAY INSPECTION)	4V
GPL (Glow indicator light)	ON/OFF		For 4 s after engine switch on (ECT is 20 °C {68 °F}): ON	Inspect instrument cluster. (See Section T)	4S
IASV (Intake shutter valve)	ON/OFF		Engine switch is on: OFF Idle: ON	Inspect following PIDs: RPM, BARO, ECT, IAT, VS Inspect intake shutter solenoid valve. (See F2–57 INTAKE SHUTTER SOLENOID VALVE INSPECTION	4Z*
IAT (IAT sensor No.2)	˚C	˚F	IAT is 20˚C {68˚F}: 20˚C {68˚F} IAT is 30˚C {86˚F}: 30˚C {86˚F}	Inspect IAT sensor No.2. (See F2–66 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION)	1J
	V		IAT is 20˚C {68˚F}: 2.3—2.5 V IAT is 30˚C {86˚F}: 1.8—2.0 V		

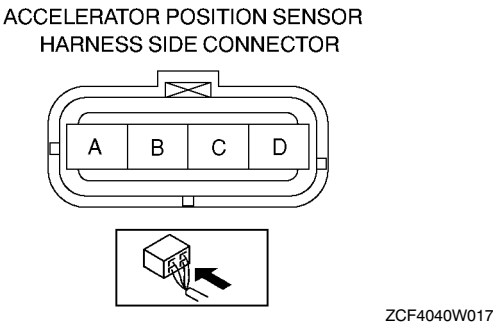
Monitor item (Definition)	Unit/ Condition			Condition/Specification	Action	PCM terminal
IATDC (IAT sensor No.1)	˚C	˚F		IAT is 20˚C {68˚F}: 20˚C {68˚F} IAT is 30˚C {86˚F}: 30˚C {86˚F}	Inspect MAF/IAT sensor. (See F2−65 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)	3D
	V			IAT is 20˚C {68˚F}: 2.3—2.5 V IAT is 30˚C {86˚F}: 1.8—2.0 V		
IDLE SW (Idle switch)	ON/OFF			Accelerator pedal is released: ON Other: OFF	Inspect idle switch. (See F2−73 IDLE SWITCH INSPECTION)	3O
MAF (MAF sensor input voltage)	V			Engine switch is on: below 1.0 V Idle: 1.6—2.0 V	Inspect MAF/IAT sensor. (See F2−65 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)	4E
MAINRLY (PCM control relay)	ON/OFF			Engine switch is on: ON Other: OFF	Inspect engine switch. (See Section T)	3B
MAP (Boost sensor)	kPa	Bar	psi	Idle: 101kPa {1.01 Bar, 14.7psi}	Inspect boost sensor. (See F2−71 BOOST SENSOR INSPECTION)	1P
	V			Idle: approx. 2.6V		
PNP (Neutral/clutch switch)	ON/OFF			Neutral position or clutch pedal is depressed: ON Others: OFF	Inspect neutral and clutch switch. (See F2−75 NEUTRAL SWITCH INSPECTION) (See F2−74 CLUTCH SWITCH INSPECTION)	1D
RPM (Engine speed)	rpm			A/C ON: 725—775rpm Other: 695—745rpm	Inspect following PIDs: TP V, MAP V, RPM	1H
STARTER (Engine switch)	ON/OFF			Engine switch at START: ON Other: OFF	Inspect engine switch. (See Section T)	1U
TPS (Timer position sensor signal)	%			Engine switch is ON: 0% Idle: 100%	Inspect timer position sensor. (See F2−69 TIMER POSITION SENSOR INSPECTION)	1K
TEST (TEN terminal (in DLC))	ON/OFF			Terminal TEN (DLC) is shorted to GND: ON Terminal TEN (DLC) is open: OFF	Inspect wiring from DLC terminal TEN to PCM terminal 2A.	2A
TP V (Accelerator position signal voltage)	V			Accelerator pedal is depressed: 3.4—3.8 V Accelerator pedal is released:0.5—0.7 V	Inspect accelerator position sensor. (See F2−71 ACCELERATOR POSITION SENSOR INSPECTION)	1R
TP2 V (Accelerator position signal voltage)	V			Accelerator pedal is depressed: 3.4—3.8 V Accelerator pedal is released: 0.5—0.7 V	Inspect accelerator position sensor. (See F2−71 ACCELERATOR POSITION SENSOR INSPECTION)	2C
VPWR (Battery positive voltage)	V			Engine switch is ON: B+ Other: below 1.0 V	Inspect PCM control relay. (See T−6 RELAY INSPECTION)	4C
VSS (Vehicle speed)	km/h		mph	Vehicle speed is 20 km/h {12.5 mph}: 20 km/h {12.5 mph} Vehicle speed is 40 km/h {25 mph}: 40 km/h {25 mph}	Inspect Instrument cluster. (See Section T)	1N

Not using SSTs (WDS or equivalent) at constant voltage terminal inspection

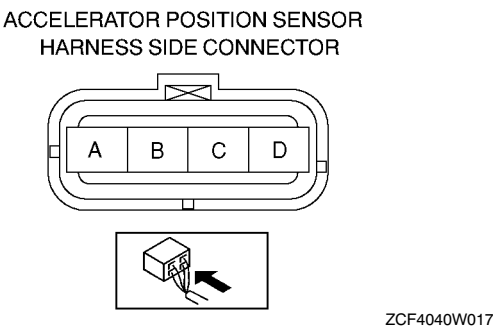
1. Turn the engine switch to ON.
2. Measure the voltage between the accelerator position sensor connector (vehicle side) terminal A and body GND using a voltmeter.



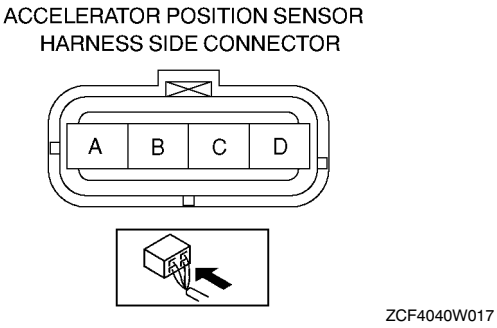
(1) Measurement voltage is **0 V**.
- ① Turn the engine switch to OFF.
- ② Disconnect the accelerator position sensor connector (applied constant voltage).
- ③ Verify there is no continuity between the accelerator position sensor connector (vehicle side) terminal A and body GND using an ohmmeter.
  - If there is continuity, repair the related harnesses.



- ④ Inspect for continuity between the PCM connector (vehicle side) terminal 1A and accelerator position sensor connector (vehicle side) terminal A (applied constant voltage) using an ohmmeter.
  - If there is no continuity, repair the related harnesses.



(2) Measurement voltage is **B+**.
- ① Turn the engine switch to OFF.
- ② Disconnect the battery positive harness and battery negative harness.
- ③ Verify there is no continuity between the accelerator position sensor connector (vehicle side) terminal A and battery positive harness using an ohmmeter.
  - If there is continuity, repair the related harnesses.



(3) Measurement voltage is **approx. 5 V**.
- Constant voltage terminal of PCM is okay.

Not using SSTs (WDS or equivalent) at GND terminal inspection

1. Turn the engine switch to OFF.
2. Disconnect the PCM connectors.
3. Inspect for continuity between the PCM GND terminals and body GND using an ohmmeter.
   - If there is no continuity, repair the related harnesses.

PCM GND terminal
1B
4A
4B

Not using SSTs (WDS or equivalent) at power supply terminal inspection

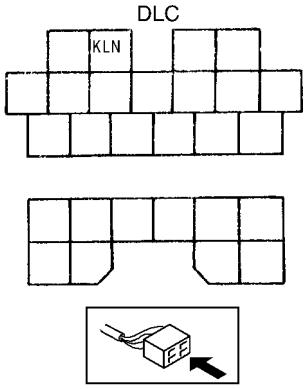
1. Turn the engine switch to ON.
2. Disconnect the PCM connectors.
3. Measure the voltage between the PCM battery power terminal connectors and body GND using an ohmmeter.
   - If not as specified, repair the related harnesses.

Power supply terminal voltage: B+

PCM power supply terminal
1C

Not using SSTs (WDS or equivalent) at serial communication terminal inspection

1. Turn the engine switch to OFF.
2. Disconnect the PCM connectors.
3. Verify there is continuity between the PCM connector terminal 2B and DLC KLN terminal.
   - If not as specified, repair the related harnesses.



ZCF4040W057

MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION

ZCF404013210W02

Euro 3 Regulation Models

Note
- Perform the following inspection only when directed.

MAF sensor voltage inspection

1. Turn the engine switch to ON.
2. Set the WDS or equivalent and monitor the MAF PID.
   - If not as specified, perform the “Circuit open/short inspection.”

   MAF PID
   below 1.0 V

3. Start the engine and warm up the engine completely.
4. Monitor the MAF PID at idle.
   - If not as specified, perform the “Circuit open/short inspection.”

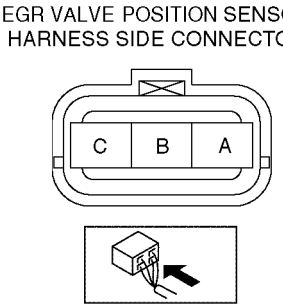
   MAF PID
   1.6—2.0 V

CIrcuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (MAF/IAT sensor connector terminal A and PCM control relay connector terminal D)
- Signal circuit (MAF/IAT sensor connector terminal C and PCM connector terminal 4E)
- GND circuit (MAF/IAT sensor connector terminal B and PCM connector terminal 4A)



ZCF4040W009

Short circuit

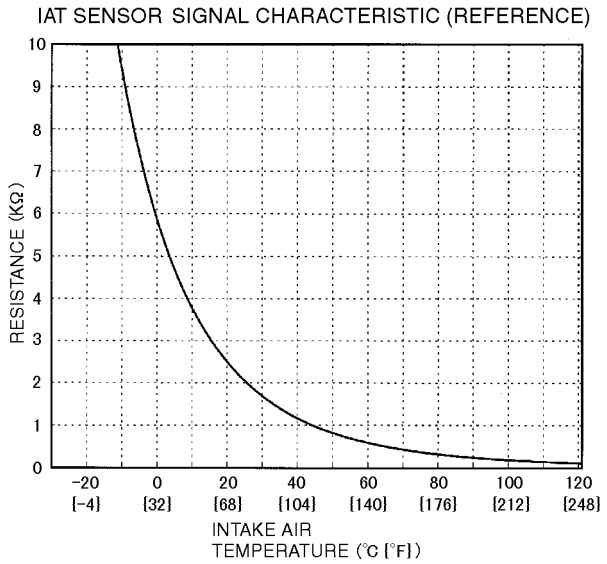
- MAF/IAT sensor connector terminal A and PCM control relay connector terminal D to GND
- MAF/IAT sensor connector terminal C and PCM connector terminal 4E to GND

IAT sensor No.1 resistance inspection

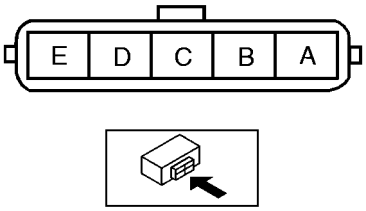
1. Disconnect the MAF/IAT sensor connector.
2. Measure the resistance between MAF/IAT sensor terminals D and E using an ohmmeter.
   - If not as specified, replace the MAF/IAT sensor.
   - If as specified, carry out the “Circuit open/short inspection.”

Specification

Ambient temperature (˚C {˚F})	Resistance (kilo ohm)
20 {68}	2.2—2.7
30 {86}	1.4—1.9



ZCF4040W022



ZCF4040W010

CIrcuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Signal circuit (MAF/IAT sensor connector terminal D and PCM connector terminal 3D)
- GND circuit (MAF/IAT sensor connector terminal E and PCM connector terminal 1B)

Short circuit

- MAF/IAT sensor connector terminal D and PCM connector terminal 3D

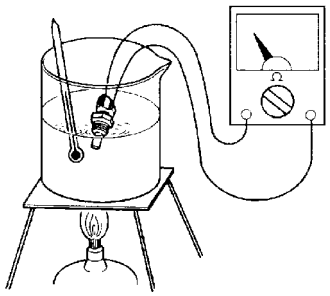
INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION

ZCF404018845W02

Euro 3 Regulation Models
Inspection of resistance

Note
- Perform the following test only when directed.

1. Place the IAT sensor No.2 in water with a thermometer, and heat the water gradually.



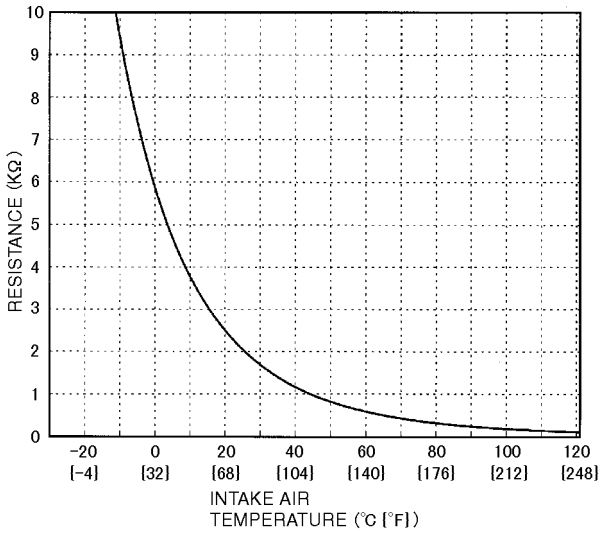
W5U140WZC

2. Measure the resistance of the IAT sensor No.2 using an ohmmeter.
   - If not as specified, replace the IAT sensor No.2.
   - If IAT sensor No.2 is okay, but PID value is out of specification, perform the “Circuit open/short inspection.”

Specification

Water temperature (˚C {˚F})	Resistance (kilohm)
20 {68}	2.21—2.69
80 {176}	0.29—0.354

IAT SENSOR No.2 SIGNAL CHARACTERISTIC (REFERENCE)



ZCF4040W023

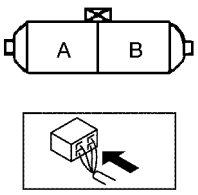
Circuit open/short inspection

1. Inspect for an open or short circuit in the following siring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Signal circuit (IAT sensor No.2 connector terminal A and PCM connector terminal J)
- GND circuit (IAT sensor No.2 connector terminal B and PCM connector terminal B)

IAT SENSOR No.2
HARNESS SIDE CONNECTOR



ZCF4040W015

Short circuit

- IAT sensor No.2 connector terminal A and PCM connector terminal J to GND.

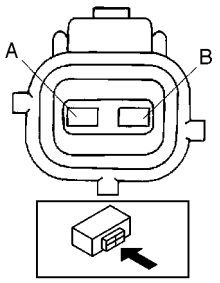
ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

ZCF404018840W01

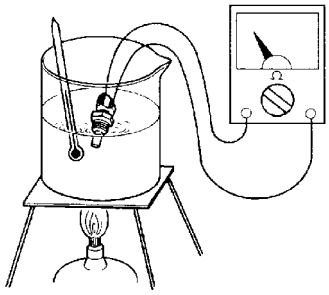
Euro 3 Regulation Models
Resistance inspection

Note
- Perform the following test only when directed.

1. Place the sensor in water with a thermometer, and heat the water gradually.



ZCF4040W006

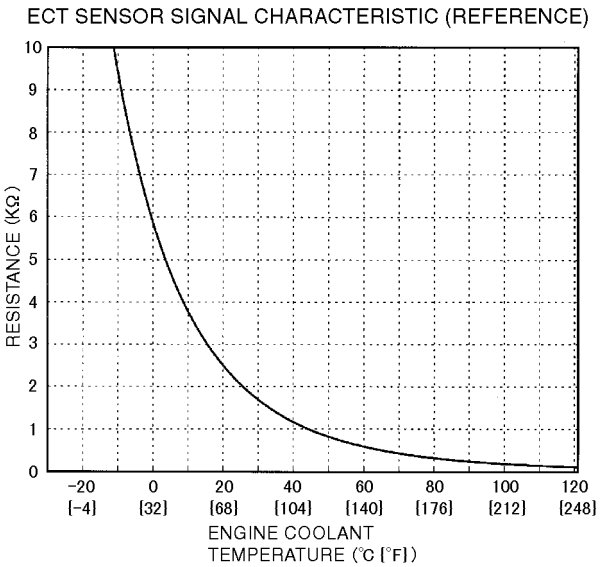


W5U140WZC

2. Measure the resistance between the ECT sensor terminals using an ohmmeter.
   - If not as specified, replace the ECT sensor.
   - If ECT sensor is okay, but PID value is out of specification, perform the “Circuit open/short inspection.”

Specification

Engine coolant temperature (˚C {˚F})	Resistance (kilohm)
20 {68}	2.27—2.73
80 {176}	0.29—0.34



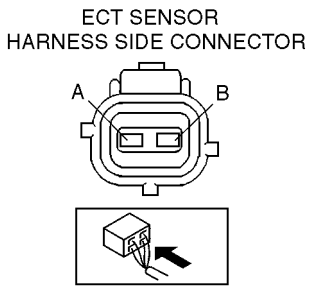
Z5U140WZ5

Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harness.

Open circuit

- Reference voltage circuit (ECT sensor connector terminal A and PCM connector terminal 1T)
- GND circuit (ECT sensor connector terminal B and PCM connector terminal 1B)



ZCF4040W016

Short circuit

- ECT sensor connector terminal A and PCM connector terminal 1T to GND.

FUEL TEMPERATURE SENSOR INSPECTION

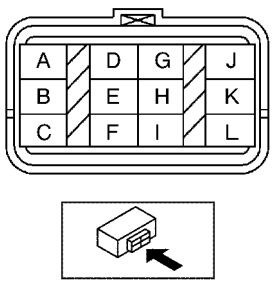
ZCF404013809W02

Euro 3 Regulation Models
Resistance Inspection

Note

- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect the resistance between the terminals under the following condition.
   - Consult authorized BOSCH parts distributor for repair if the fuel temperature sensor is possibly malfunctioning.
   - If fuel temperature sensor is okay, but PID value is out of specification, perform the “Circuit open/short inspection.”



ZCF4040W001

Specification

Terminal	Atmospheric temperature ˚C {˚F}	Resistance (ohm)
E—K	20—30 {68—86}	1.4—2.6

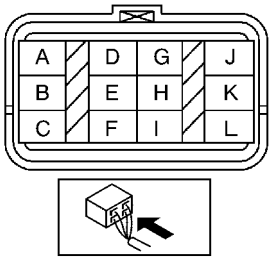
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power supply circuit (Injection pump connector A terminal K and PCM connector terminal 1L)
- Ground circuit (Injection pump connector A terminal E and PCM connector terminal 1B)

CONNECTOR A
HARNESS SIDE CONNECTOR



ZCF4012W001

Short circuit

- Injection pump connector A terminal K and PCM connector terminal 1L to GND

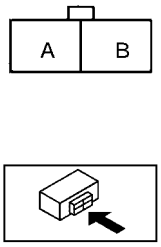
PUMP SPEED SENSOR INSPECTION

ZCF404013801W02

Euro 3 Regulation Models
Resistance Inspection

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the connector C of the injection pump auxiliary part. (See F2–52 Injection pump auxiliary parts inspection)
3. Inspect the resistance between the terminals A and B under the following condition.
   - Consult authorized BOSCH parts distributor for repair if the pump speed sensor is possibly malfunctioning:
   - If pump speed sensor is okay, but PID value is out of specification, perform the “Circuit open/short inspection.”



ZCF4040W002

Specification

Terminal	Atmospheric temperature ˚C {˚F}	Resistance (ohm)
A—B	20—30 {68—86}	1.46—1.78

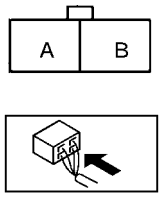
Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.

Open circuit

- Power circuit (Pump speed sensor connector terminal A and PCM connector terminal 2K)
- GND circuit (Pump speed sensor connector terminal B and PCM connector terminal 2D)

CONNECTOR C
HARNESS SIDE CONNECTOR



ZCF4040W003

Short circuit

- Pump speed sensor connector terminal A and PCM connector terminal 2K to GND

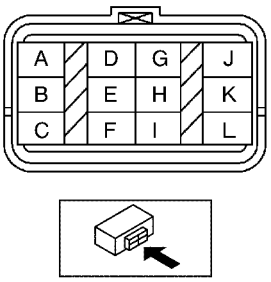
CONTROL SLEEVE (CS) SENSOR INSPECTION

ZCF404013805W02

Euro 3 regulation Models
Resistance inspection

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector A.
3. Inspect the resistance between the terminals under the following condition.
   - Consult authorized BOSCH parts distributor for repair if the CS sensor is possibly malfunctioning:
   - If the CS sensor is okay, but PID value is out of specified, perform the “CS sensor circuit open/short inspection.”



ZCF4040W001

Specification

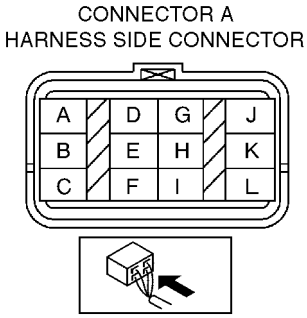
Terminal	Atmospheric temperature ˚C {˚F}	Resistance (ohm)
G—H	18—28 {66.4—82.4}	11.2—12.4
G—F	18—28 {66.4—82.4}	5.6—6.2
F—H	18—28 {66.4—82.4}	5.6—6.2

CS sensor circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - if there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Injection pump connector A terminal G and PCM connector terminal 1O)
- CS sensor signal circuit (CS sensor connector terminal F and PCM connector terminal 1Q)
- Ground circuit (Injection pump connector A terminal H and PCM connector terminal 1M)



ZCF4012W001

Short circuit

- Injection pump connector A terminal G and PCM connector terminal 1O to GND
- Injection pump connector A terminal F and PCM connector terminal 1Q to GND

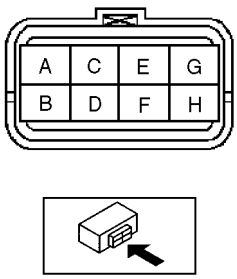
TIMER POSITION SENSOR INSPECTION

ZCF404013807W02

Euro 3 Regulation Models
Resistance inspection

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector B.
3. Inspect the resistance between the terminals under the following condition.
   - Consult authorized BOSCH parts distributor for repair if the timer position sensor is possibly malfunctioning:
   - If timer position sensor is okay, but PID value is out of specification, perform the “Circuit open/short inspection.”



ZCF4040W004

Specification

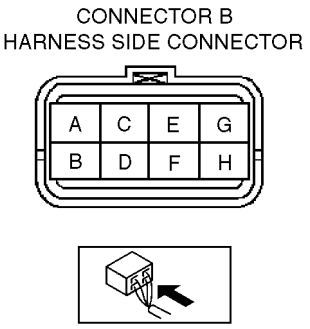
Terminal	Resistance (ohm)	Atmospheric temperature ˚C {˚F}
A—B	76.3—87.7	15—35 {59—95}
A—C	76.3—87.7	15—35 {59—95}

Circuit open/short inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Injection pump connector B terminal C and PCM connector terminal 1I)
- Timer position signal circuit (Injection pump connector B terminal A and PCM connector terminal 1K)
- Ground circuit (Injection pump connector B and PCM connector terminal 1G)



ZCF4040W005

Short circuit

- Injection pump connector B terminal C and PCM connector terminal 1I to GND
- Injection pump connector B terminal A and PCM connector terminal 1K to GND

INJECTION PUMP EPROM INSPECTION

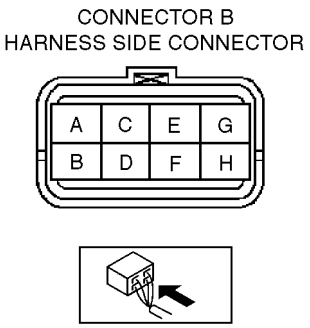
ZCF404013802W02

Euro 3 Regulation Models

Caution
- **Do not input voltage to B terminal in the injection pump EPROM.Doing so will cause a malfunction of the injection pump EPROM.**

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Disconnect the injection pump connector B.
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.
   - If the wiring harnesses are okay, but the injection pump EPROM is possibly malfunctioning, consult authorized BOSCH parts distributor for repair.



ZCF4040W005

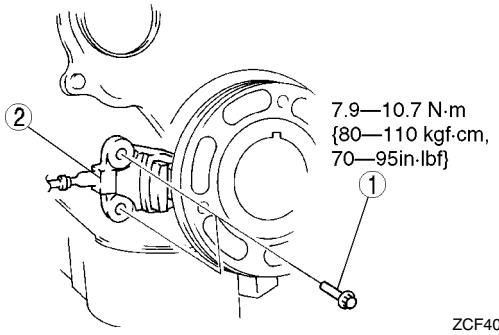
Circuit open/short inspection
Open circuit
- Power Circuit (Injection pump connector B terminal D and PCM connector terminal 1A)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal E and PCM connector terminal 1S)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal F and PCM connector terminal 2E)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal G and PCM connector terminal 2L)
- GND circuit (Injection pump connector B H and PCM connector terminal 1B)

Short circuit
- Power Circuit (Injection pump connector B terminal D and PCM connector terminal 1A to GND)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal E and PCM connector terminal 1S to GND)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal F and PCM connector terminal 2E to GND)
- Injection pump EPROM signal Circuit (Injection pump connector B terminal G and PCM connector terminal 2L to GND)

TDC SENSOR REMOVAL/INSTALLATION

ZCF404018230W02

Euro 3 Regulation Models
1. Disconnect the negative battery cable.
2. Remove the crankshaft pulley.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Verify that there is no interference between the TDC sensor and the plate.



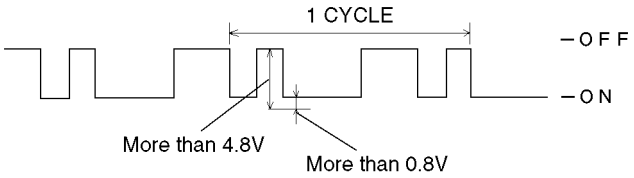
ZCF4040W024

1	TDC sensor installation bolt
2	TDC sensor

TDC SENSOR INSPECTION

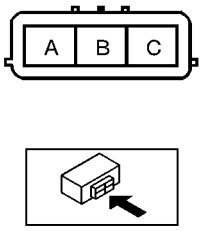
ZCF404018230W03

Euro 3 Regulation Models
Wave profile Inspection
1. Set oscilloscope.
   Measuring terminals
   PCM terminal: 1H(+)⇔1B(-)
2. Verify that output voltage when ON and OF and output pattern are within the specification.



ZCF4040W043

3. If not as specified, perform the following inspections and repair or replace the malfunctioning part.
   - When output voltage is approc.5.0V constant
     — Open circuit between PCM terminal 1H and TDC sensor terminal B
   - When output voltage is approx. 0V constant
     — Short circuit between PCM terminal 1H and TDC sensor terminal B
     — Open/Short circuit between power TDC sensor terminal A and PCM control relay terminal D
   - When NE signal is ON and OFF with low output voltage or no oscillation
     — TDC sensor plate read station has malfunction



ZCF4040W042

EGR VALVE POSITION SENSOR INSPECTION

ZCF404020300W02

Euro 3 Regulation Models

Note
- Perform the following inspection only when directed.

EGR valve position sensor voltage inspection
1. Turn the engine switch to ON.
2. Set the WDS or equivalent and monitor the EGRVP PID.
   - If not as specified, perform the “Circuit open/short inspection.”

EGRVP PID
approx. 0.6 V

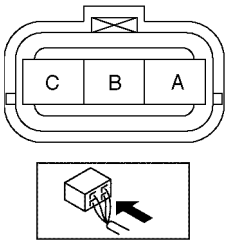
3. Start the engine and warm up the engine completely.
4. Monitor the EGRVP PID.
   - If not as specified, perform the “Circuit open/short inspection.”

EGRVP PID
above 3.0V

CIrcuit open/short inspection
1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (EGR valve position sensor connector terminal B and PCM connector terminal 1A)
- Signal circuit (EGR valve position sensor connector terminal C and PCM connector terminal 1F)
- GND circuit (EGR valve position sensor connector terminal A and PCM connector terminal 1B)

EGR VALVE POSITION SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W009

Short circuit
- EGR valve position sensor connector terminal B and PCM connector terminal 1A to GND
- EGR valve position sensor connector terminal C and PCM connector terminal 1F to GND

BOOST SENSOR INSPECTION

ZCF404018660W02

Euro 3 Regulation Models

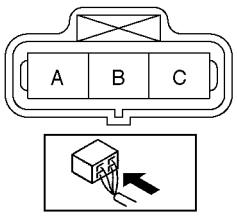
Note
- Perform the following test only when detected.

1. Inspect the boost sensor for damage and cracks.
2. Inspect vacuum hose for improper routing, kinks or leakage.
   - If the above are okay, perform the “Circuit open/short inspection.”
   - If the above open or short circuit are correct, replace the boost sensor.

Circuit open/short inspection
1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Boost circuit (Boost sensor connector terminal B and PCM connector terminal 1P)
- Constant voltage circuit (Boost sensor connector terminal A and PCM connector terminal 1A)
- Ground circuit (Boost sensor connector terminal C and PCM connector terminal 1B)

BOOST SENSOR
HARNESS SIDE CONNECTOR



ZCF4040W011

Short circuit
- Boost circuit (Boost sensor connector terminal B and PCM connector terminal 1P to GND)
- Constant voltage circuit (Boost sensor connector terminal A and PCM connector terminal 1A to GND)

PCM CONTROL RELAY INSPECTION

ZCF404018880W05

Euro 3 Regulation Models
1. Inspect the PCM control relay. (See T–6 RELAY INSPECTION.)

ACCELERATOR POSITION SENSOR INSPECTION

ZCF404041602W02

Euro3 Regulation models

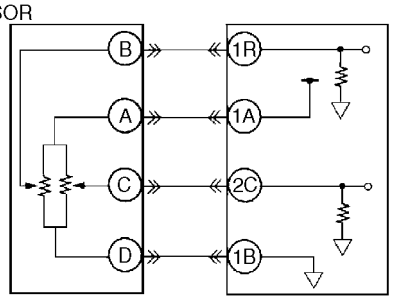
Note
- Perform the following test only when directed.

1. Visually inspect all accelerator pedal components for looseness.
2. Verify that the accelerator position sensor is installed to the accelerator pedal properly.
3. Check the power circuit voltage.
   (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

Note
- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.

ACCELERATOR POSITION SENSOR

PCM



ZCF4040W019

4. Verify that the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is as shown below according to the accelerator pedal conditions.
   - If not as specified, carry out the “Circuit Open/Short Inspection.”
   - If the circuit is OK, replace the accelerator position sensor.

Specification

Accelerator pedal condition	Output voltage (V)
Fully released	0.5—0.7(Target value: 0.6)
Gradually depressed	Increases linearly
Fully depressed	3.4—3.8(Target value: 3.6)

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit

- Power circuit (Accelerator position sensor connector terminal A and PCM connector terminal 1A)
- Signal circuit (Accelerator position sensor connector terminal B and PCM connector terminal 1R)
- Signal circuit (Accelerator position sensor connector terminal C and PCM connector terminal 2C)
- GND circuit (Accelerator position sensor connector terminal D and PCM connector terminal 1B)

Short circuit

- Accelerator position sensor connector terminal B and PCM connector terminal 1R to GND.
- Accelerator position sensor connector terminal C and PCM connector terminal 2C to GND.

ACCELERATOR POSITION SENSOR ADJUSTMENT

ZCF404041602W03

Euro3 Regulation models

Caution

- **Adjusting the accelerator position sensor unnecessarily may adversely affect engine control. Therefore, adjust accelerator position sensor only when it is replaced.**

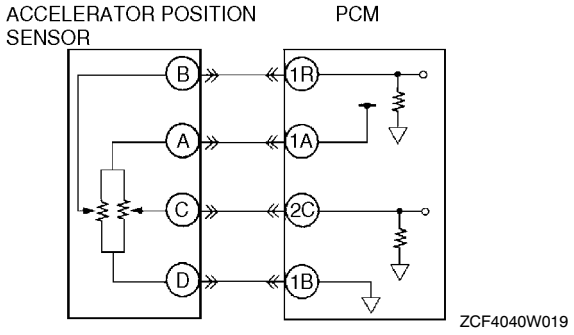
Note

- Perform the following test only when directed.
- Accelerator position sensor adjustment is based on the output voltage with the accelerator pedal fully released. Therefore, be sure to adjust according to the following procedure. (Begin adjustment with the accelerator pedal fully released.)

1. Visually inspect all accelerator pedal components for looseness.
2. Install the accelerator position sensor.
3. Check the power circuit voltage.
   (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

Note

- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.

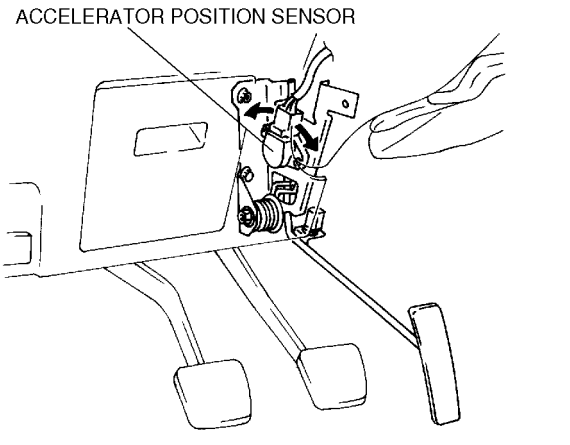


ZCF4040W019

4. Adjust the output voltage when the accelerator pedal is fully released.
   (1) Verify that the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is as shown below according to the accelerator pedal conditions.
   - If not as specified, move the accelerator position sensor to adjust the installation position of the accelerator position sensor so that the PCM terminal 1R voltage is within the specification.

Specification

Accelerator pedal condition	Output voltage (V)
Fully released	0.5—0.7(Target value: 0.6)
Gradually depressed	Increases linearly



ZCF4040W020

5. Verify that the output voltage when the accelerator pedal is fully depressed.
   (1) Depress the accelerator pedal fully and verify that the voltage at the PCM terminal 1R is within the specification.

Specification
3.4—3.8V (Target value: 3.6 V)

6. After completion of Steps 1. through 5, inspect the idle switch.

IDLE SWITCH INSPECTION

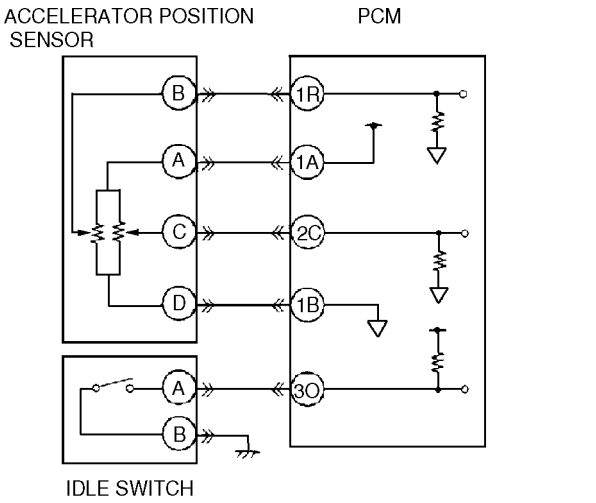
ZCF404066470W02

Euro3 Regulation models

Note
- Perform the following test only when directed.

1. Verify that the accelerator position sensor is normal.
2. Visually inspect all accelerator pedal components for looseness.
3. Verify that the idle switch is installed to the accelerator pedal properly.
4. Verify that the power circuit voltage.
   (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

Note
- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.



ZCF4040W025

5. Verify that the voltage at the PCM terminal 3O (idle signal) is 1 V or less with the accelerator pedal fully released.
6. Depress the accelerator pedal gradually and hold the pedal when the PCM terminal 3O voltage changes to approximately **10 V**.
7. Verify that the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is within the specification.
   - If not as specified, carry out the “Circuit Open/Short Inspection.”
   - If the circuit is OK, replace the idle switch.

Specification
1.0—1.2 V (Target value: 1.1 V)

Circuit Open/Short Inspection

1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Signal circuit (Idle switch connector terminal A and PCM connector terminal 3O)
- GND circuit (Idle switch connector terminal B and body GND)
- Power circuit (Accelerator position sensor connector terminal A and PCM connector terminal 1A)
- Signal circuit (Accelerator position sensor connector terminal B and PCM connector terminal 1R)
- Signal circuit (Accelerator position sensor connector terminal C and PCM connector terminal 2C)
- GND circuit (Accelerator position sensor connector terminal D and PCM connector terminal 1B)

Short circuit
- Idle switch connector terminal A and PCM connector terminal 3C to GND.
- Accelerator position sensor connector terminal B and PCM connector terminal 1R to GND.
- Accelerator position sensor connector terminal C and PCM connector terminal 2C to GND.

IDLE SWITCH ADJUSTMENT

ZCF404066470W03

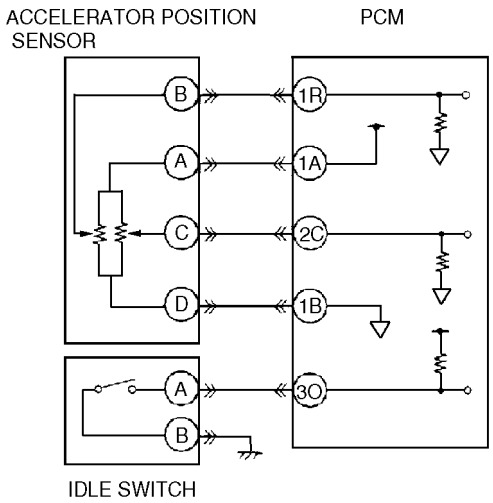
Euro3 Regulation models

Caution
- **Adjusting the idle switch unnecessarily may adversely affect engine control. Therefore, adjust the idle switch only when it is replaced.**

Note
- Perform the following test only when directed.

1. Verify that the accelerator position sensor is normal.
2. Visually inspect all accelerator pedal components for looseness.
3. Loosen the locknut that secures the idle switch.
4. Verify that the power circuit voltage.
   (1) Verify that the voltage between the PCM terminals 1A (power circuit) and 1B (ground circuit) is **4.75—5.25 V**.

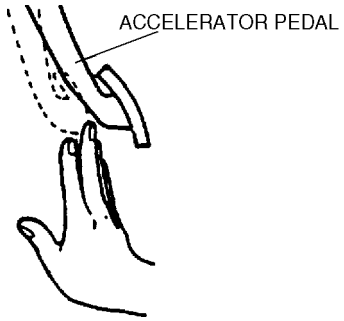
Note
- Voltage at the PCM terminal 1R may deviate when the power circuit voltage is abnormal.



ZCF4040W025

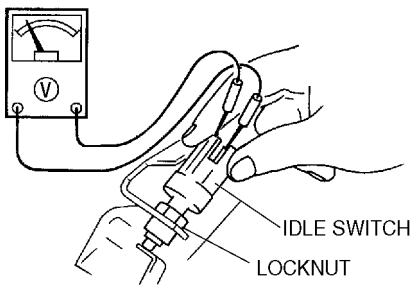
5. Depress the accelerator pedal by hand and secure it when the voltage between the PCM terminals 1R (accelerator position detection signal) and 1B is within the range specified below.

Voltage range
1.0—1.2V (Target value: 1.1 V)



ZCF4040W026

6. Turn the idle switch under the condition in Step 5. Secure the idle switch when the continuity turns from OFF to ON, and tighten the locknut.



ZCF4040W028

7. Release the accelerator pedal. Depress the accelerator pedal again and verify that the idle switch continuity changes from OFF to ON when the PCM terminal 1R voltage is within **1.0—1.2 V**.
   - If the continuity does not change, repeat Step 6.

CLUTCH SWITCH INSPECTION

ZCF404017640W02

Euro 3 Regulation Models
Inspection of Continuity

Note
- Perform the following test only when directed.

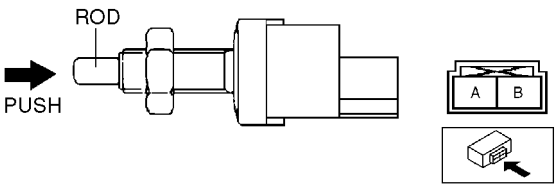
1. Inspect continuity between the clutch switch terminals using an ohmmeter.
   - If not as specified, replace the clutch switch.
   - If clutch switch is okay, but PID value is out of specification, perform the “Circuit open/short inspection.”

Specification

○—○ : Continuity

Condition	Clutch pedal	Terminal	
		A	B
Push the rod	Released		
Except above	Depressed	○	○

ZCF4040W054



ZCF4040W007

2. Reconnect the clutch switch connector.

Circuit open/short inspection
1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (Clutch switch connector terminal A and PCM connector terminal 1D)
- GND circuit (Clutch switch connector terminal B and GND.)

Short circuit
- Clutch switch connector terminal A and PCM connector terminal 1D to GND.

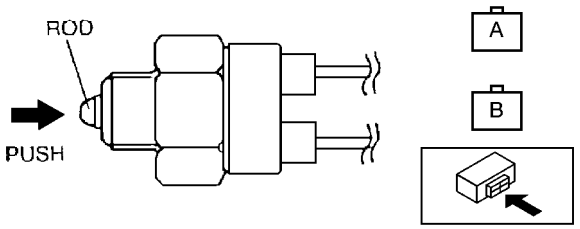
NEUTRAL SWITCH INSPECTION

ZCF404017640W04

Euro 3 Regulation Models

Note
- Perform the following inspection only when directed.

Continuity inspection
1. Inspect for continuity between the neutral switch terminals using an ohmmeter.



ZCF4040W018

- If the neutral switch is okay, but the PNP PID is out of specification, carry out of the “Circuit open/short inspection.”
- If not as specified, replace the neutral switch.

Specification

○—○ : Continuity

Condition	Transmission	Terminal	
		A	B
Rod pushed	In neutral	○	○
Except above	Others		

ZCF4040W047

Circuit open/short inspection
1. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.

Open circuit
- Power circuit (neutral switch terminal A and PCM terminal 1D)
- GND circuit (neutral switch terminal B and GND)

Short circuit
- Neutral switch terminal A and PCM connector terminal 1D to GND

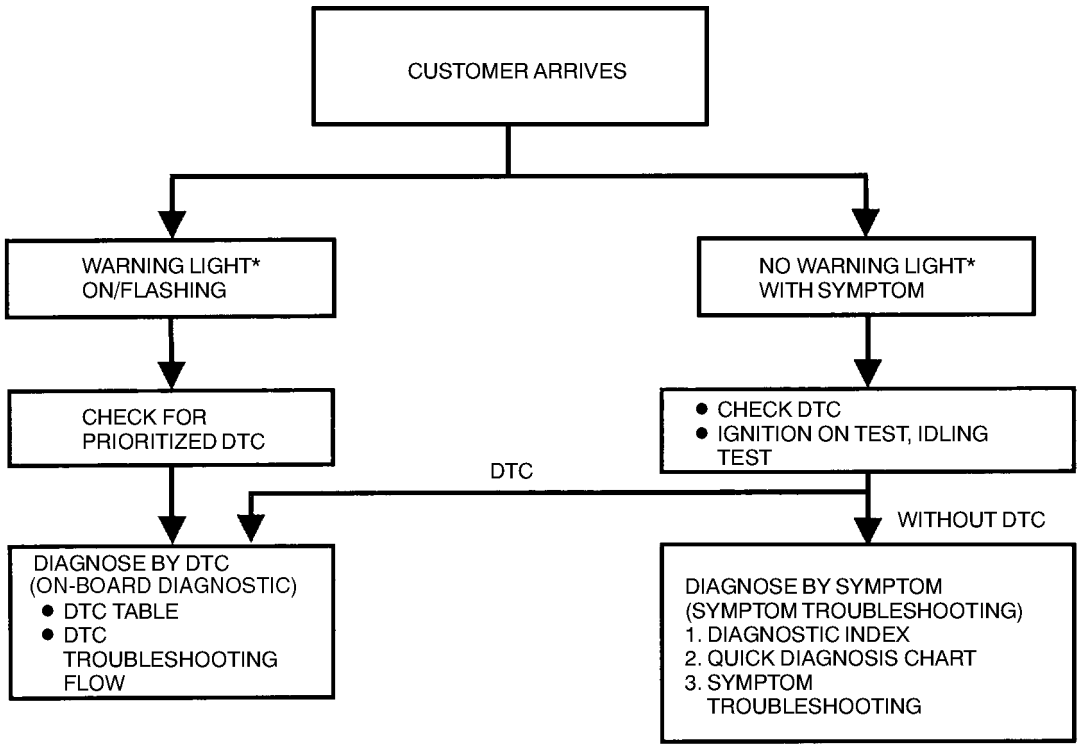
ON–BOARD DIAGNOSTIC

FOREWORD

ZCF407018881W05

Euro 3 Regulation Models

- When the customer reports a vehicle malfunction, check the warning light indication and diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
  - —If a DTC exists, diagnose the applicable DTC inspection. (See F2–77 DTC TABLE.)
  - —If no DTC exists and the warning light does not illuminate or flash, diagnose the applicable symptom troubleshooting. (See F2–129 TROUBLESHOOTING ITEM TABLE)



YMU102WBX

*: Generator Warning Light, Security Light and Glow Indicator Light Flashing

OBD READ/CLEAR DIAGNOSTIC TEST RESULTS

ZCF407018881W06

Euro 3 Regulation Models

- This retrieves all stored DTCs in PCM and clears the DTC.

OBD PARAMETER IDENTIFICATION (PID) ACCESS

ZCF407018881W07

Euro 3 regulation Models

- The PID mode allows access to certain data values, analog and digital inputs/outputs, calculated values and system status information. Since PID values for output devices are PCM internal data values, inspect each device to identify which output device has a malfunction.

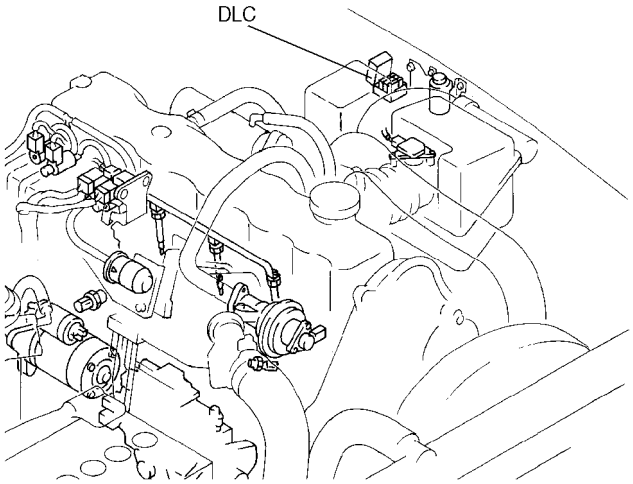
ON-BOARD DIAGNOSTIC TEST

ZCF407018881W08

Euro 3 Regulation Models

DTCs retrieving procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect WDS or equivalent to the vehicle DLC located the engine room.

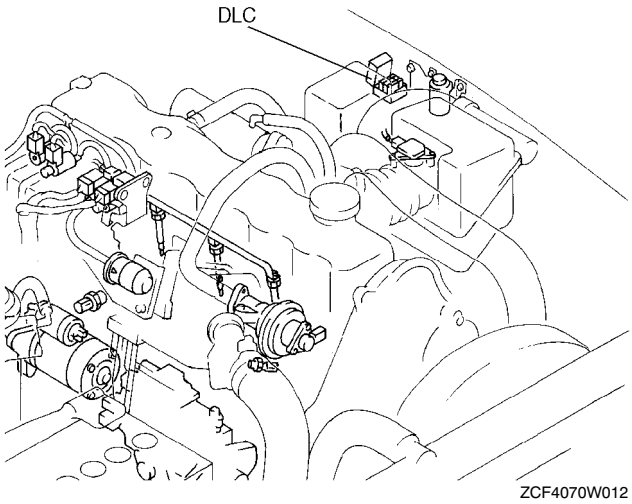


ZCF4070W012

3. Retrieve DTC by WDS or equivalent.

PID/DATA monitor and record procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect WDS or equivalent to the vehicle DLC located the engine room.



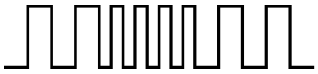
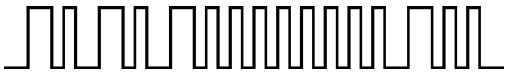
ZCF4070W012

3. Access and monitor PIDs by WDS or equivalent.

DTC TABLE

ZCF407018881W09

DTC	Output pattern	Possible cause	Page
P0100	 WALTPX0100	MAF circuit malfunction	(See F2–79 DTC P0100)
P0105	 WALTPX0105	Boost sensor circuit malfunction	(See F2–82 DTC P0105)
P0110	 WALTPX0110	IAT No.1circuit malfunction	(See F2–84 DTC P0110)
P0115	 WALTPX0115	ECT circuit malfunction	(See F2–87 DTC P0115)
P0120	 WALTPX0120	Accelerator position sensor circuit malfunction	(See F2–90 DTC P0120)
P0180	 WALTPX0180	Fuel temperature sensor malfunction	(See F2–93 DTC P0180)
P0251	 WALTPX0251	Injection amount control system malfunction	(See F2–96 DTC P0251)
P0335	 WALTPX0335	TDC sensor circuit malfunction	(See F2–98 DTC P0335)

DTC	Output pattern	Possible cause	Page
P0400	 WALTPX0400	EGR system malfunction	(See F2–99 DTC P0400)
P0500	 WALTPX0500	Vehicle speed sensor (VSS) circuit malfunction	(See F2–101 DTC P0500)
P0510	 WALTPX0510	Idle switch malfunction	(See F2–103 DTC P0510)
P0606	 WALTPX0606	PCM malfunction	(See F2–104 DTC P0606)
P1110	 WALTPX1110	IAT No.2 circuit malfunction	(See F2–105 DTC P1110)
P1182	 WALTPX1182	Fuel shut off (FSO) solenoid malfunction	(See F2–108 DTC P1182)
P1189	 WALTPX1189	Pump speed sensor circuit malfunction	(See F2–109 DTC P1189)
P1195	 WALTPX1195	BARO circuit malfunction	(See F2–110 DTC P1195)
P1226	 WALTPX1226	Control sleeve (CS) sensor circuit malfunction	(See F2–111 DTC P1226)
P1312	 WALTPX1312	Timer control valve circuit malfunction	(See F2–113 DTC P1312)
P1318	 WALTPX1318	Timer position sensor circuit malfunction	(See F2–115 DTC P1318)
P1402	 WALTPX1402TIF	EGR valve position sensor circuit malfunction	(See F2–117 DTC P1402)
P1602 *	 WALTPX1602	Immobilizer unit–PCM communication error	(See F2–120 DTC P1602)
P1603 *	 WALTPX1603	Code word is not registered in PCM	(See F2–122 DTC P1603)
P1604 *	 WALTPX1604	Key ID numbers are not registered in PCM	(See F2–123 DTC P1604)

DTC	Output pattern	Possible cause	Page
P1621 *	 WALTPX1621	Code word does not match after engine cranking	(See F2–123 DTC P1621)
P1622 *	 WALTPX1622	Key ID number does not match	(See F2–124 DTC P1622)
P1623 *	 WALTPX1623	Code word or key ID number read/write error in PCM	(See F2–124 DTC P1623)
P1624 *	 WALTPX1624	Immobilizer system communication counter = 0	(See F2–125 DTC P1624)
P1649	 WALTPX1649	Injection pump EPROM circuit malfunction	(See F2–125 DTC P1649)

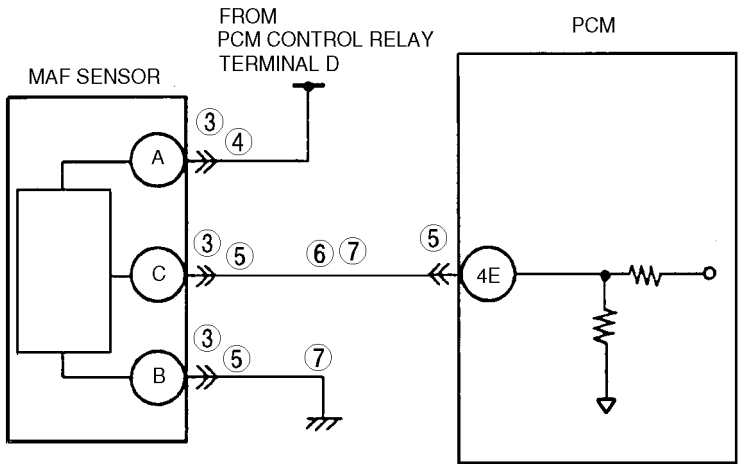
* : With immobilizer system

DTC P0100

ZCF407018881W10

DTC P0100	MAF circuit malfunction
DETECTION CONDITION	● PCM monitors input voltage from MAF/IAT sensor when engine is running. If PCM detects either of following conditions, PCM determines that MAF circuit has a malfunction. — Input voltage at PCM terminal 4E is **below 0.25 V**. — Input voltage at PCM terminal 4E is **above 4.90 V**.
POSSIBLE CAUSE	● MAF/IAT sensor malfunction ● Connector or terminal malfunction ● Short to GND in wiring between MAF/IAT sensor terminal C and PCM terminal 4E ● Open circuit in wiring between MAF/IAT sensor terminal C and PCM terminal 4E ● Open circuit in wiring between MAF/IAT sensor terminal B and PCM terminal body GND ● PCM malfunction ● Open circuit in wiring between MAF/IAT sensor terminal A and PCM control relay terminal D

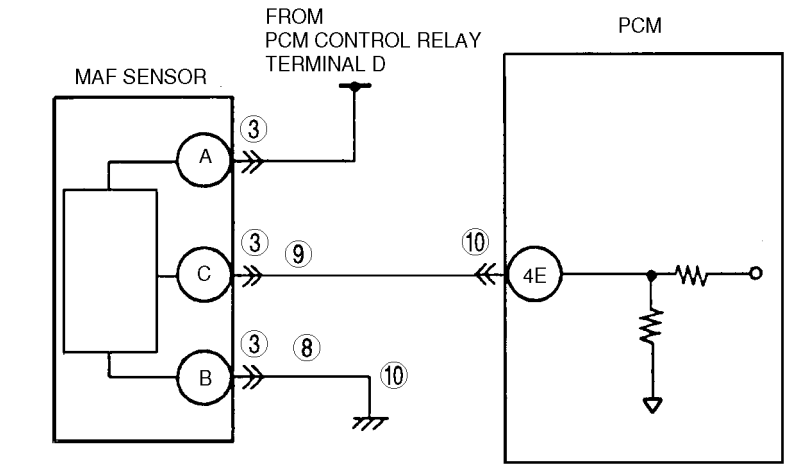
LOW INPUT



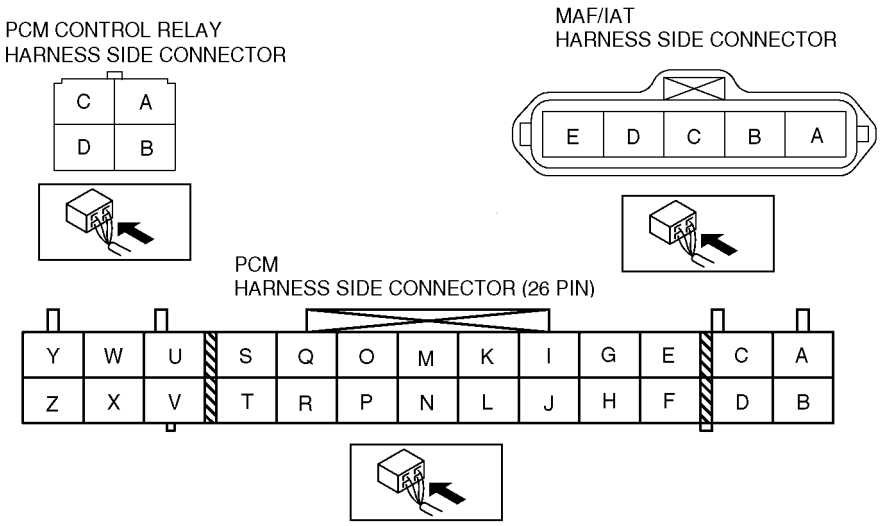
ZCF4070W001

DTC P0100	MAF circuit malfunction

HIGH INPUT



ZCF4070W002



ZCF4070W003

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY CURRENT INPUT SIGNAL STATUS** ● Turn engine switch (engine OFF). ● Connect WDS or equivalent. ● Start engine. ● Access MAF PID using WDS or equivalent. ● Is MAF PID **within 0.25— 4.90 V**?	Yes	Go to Step 11.
		No	Go to next step.
3	**INSPECT MAF/IAT SENSOR CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect MAF/IAT sensor connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminals, then go to Step 9.
		No	If MAF PID is **below 0.25 V** in previous step, go to next step. If MAF PID is **above 4.90 V** in previous step, go to Step 8.

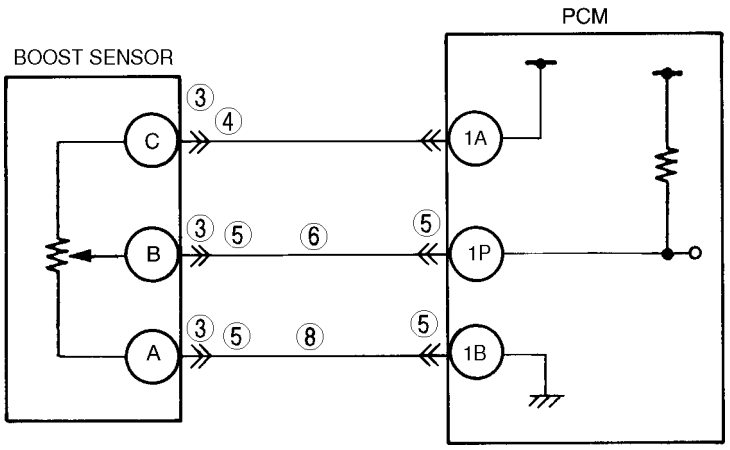
STEP	INSPECTION		ACTION
4	**CHECK POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Check voltage at MAF/IAT sensor terminal A (harness−side). ● Is voltage **B+**?	Yes	Go to next step.
		No	Inspect for open circuit in wiring harness between MAF/IAT sensor terminal A (harness−side) and PCM control relay terminal D (harness−side). Repair or replace harness, then go to Step 11.
5	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled−out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair terminal, then go to Step 11.
		No	Go to next step.
6	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between MAF/IAT sensor terminal C (harness−side) and PCM connector terminal 4E (harness−side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
7	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORTS** ● Check for continuity between following circuits: — MAF/IAT sensor terminal C (harness−side) and body GND — MAF/IAT sensor connector terminals B and C (harness−side) ● Is there continuity?	Yes	Repair or replace suspected harness, then go to Step 11.
		No	Inspect MAF/IAT sensor, then go to Step 11. (See F2−65 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)
8	**INSPECT MAF SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between MAF/IAT sensor terminal B (harness−side) and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
9	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between MAF/IAT sensor terminal C (harness−side) and body GND. ● Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
11	**INSPECT POOR CONNECTION OF PCM CONNECTOR** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection at terminals 4E and 4A (damaged, pulled−out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair terminal, then go to next step.
		No	Inspect MAF/IAT sensor, then go to next step. (See F2−65 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)
12	**VERIFY TROUBLESHOOTING OF DTC P0100 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2−77 DTC TABLE)
		No	Troubleshooting completed.

DTC P0105

ZCF407018881W11

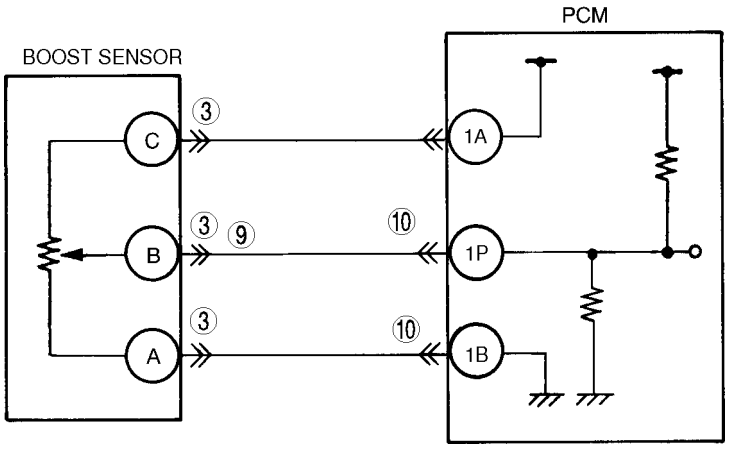
DTC P0105	Boost sensor circuit malfunction
DETECTION CONDITION	● PCM monitors input voltage from boost sensor when engine switch is turned ON. If PCM detects either of following conditions, PCM determines that boost sensor circuit has a malfunction. — Input voltage at PCM terminal 1P is **below 0.19 V**. — Input voltage at PCM terminal 1P is **above 4.90 V**.
POSSIBLE CAUSE	● Boost sensor malfunction ● Connector or terminal malfunction ● Short to GND in wiring between boost sensor terminal B and PCM terminal 1P ● Open circuit in wiring between boost sensor terminal B and PCM terminal 1P ● Open circuit in wiring between boost sensor terminal A and PCM terminal 1B ● Open circuit in wiring between boost sensor terminal C and PCM terminal 1A ● PCM malfunction

LOW INPUT

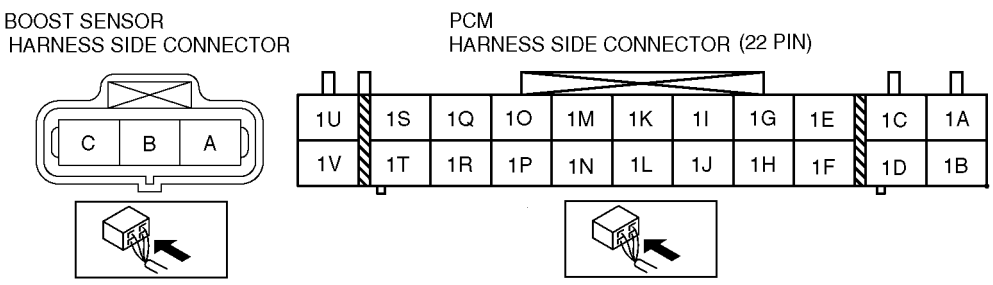


ZCF4070W004

HIGH INPUT



ZCF4070W005



ZCF4070W006

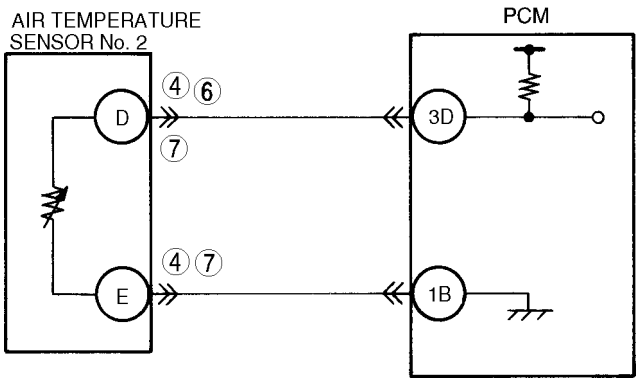
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY CURRENT INPUT SIGNAL STATUS** ● Turn engine switch to ON (engine OFF). ● Connect WDS or equivalent. ● Start engine. ● Access MAP PID using WDS or equivalent. ● Is MAP PID **within 0.19— 4.90 V**?	Yes	Go to Step 11.
		No	Go to next step.
3	**INSPECT POOR CONNECTION OF BOOST SENSOR CONNECTOR** ● Turn engine switch to OFF. ● Disconnect boost sensor connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminals, then go to Step 9.
		No	If MAP PID is **below 0.19 V** in previous step, go to next step. If MAP PID is **above 4.90 V** in previous step, go to Step 8.
4	**CHECK POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Check voltage at boost sensor terminal C (harness–side). ● Is voltage **B+**?	Yes	Go to next step.
		No	Inspect for open circuit in wiring harness between boost sensor terminal C (harness–side) and PCM terminal 1A (harness–side). Repair or replace harness, then go to Step 11.
5	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair terminal, then go to Step 11.
		No	Go to next step.
6	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between boost sensor terminal B (harness–side) and PCM connector terminal 1P (harness–side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.
7	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORTS** ● Check for continuity between following circuits: — Boost sensor terminal B (harness–side) and body GND — Boost sensor connector terminals A and B (harness–side) ● Is there continuity?	Yes	Repair or replace suspected harness, then go to Step 11.
		No	Inspect boost sensor, then go to Step 11. (See F2–71 BOOST SENSOR INSPECTION)
8	**INSPECT BOOST SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between boost sensor terminal A (harness–side) and PCM connector terminal 1B (harness–side). ● Is there continuity?	Yes	Replace boost sensor, then go to Step 11.
		No	Repair or replace suspected harness, then go to Step 11.
9	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between boost sensor terminal B (harness–side) and body GND. ● Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 11.

STEP	INSPECTION		ACTION
10	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection at terminals 1A, 1B and 1P (damaged, pulled–out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair terminal, then go to next step.
		No	Inspect boost sensor, then go to next step. (See F2–71 BOOST SENSOR INSPECTION)
11	**VERIFY TROUBLESHOOTING OF DTC P0105 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
12	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

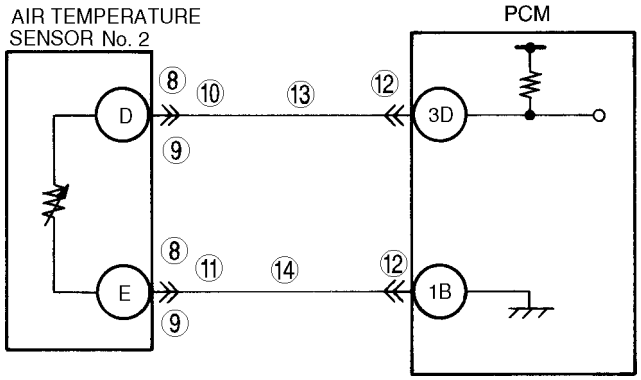
DTC P0110

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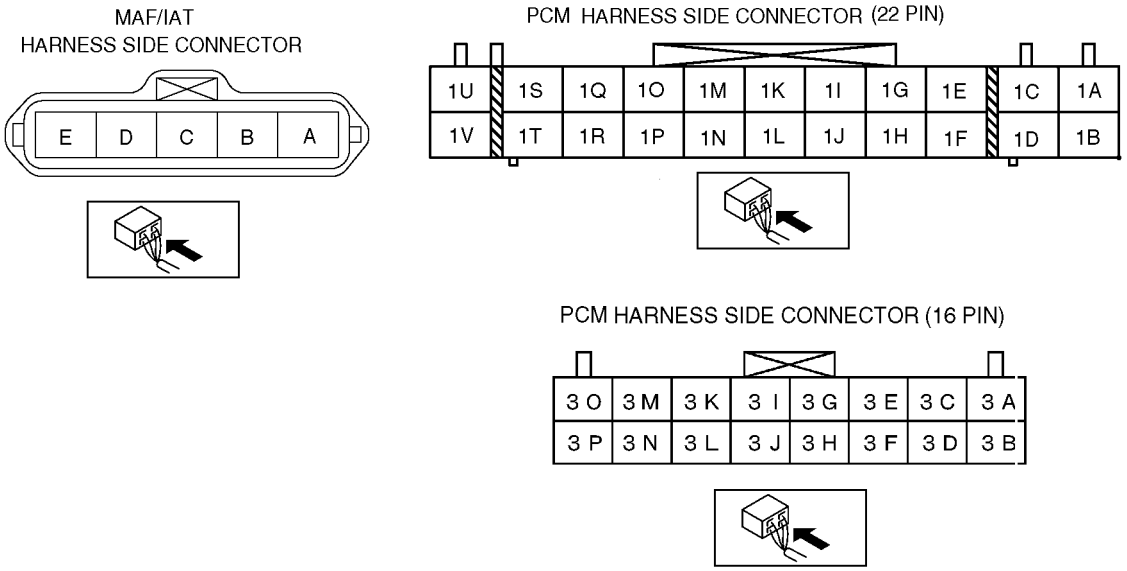
DTC P0110	IAT No. 1 circuit malfunction
DETECTION CONDITION	● PCM monitors IAT sensor No. 1 signal at PCM terminal 1J. If voltage at PCM terminal 1J is **below 0.13 V** or **above 4.90 V**, PCM determines that IAT sensor No. 1 circuit has a malfunction.
POSSIBLE CAUSE	● IAT sensor No. 1 malfunction ● Short to GND circuit between IAT sensor No. 1 terminal D and PCM terminal 3D ● IAT No. 1 signal and IAT GND circuit are shorted each other. ● Poor connection at IAT sensor No. 1 or PCM connector ● PCM malfunction ● Open circuit between IAT sensor No. 1 terminal D and PCM terminal 3D ● Short to power circuit between IAT sensor No. 1 terminal D and PCM terminal 3D ● Open circuit between IAT sensor No. 1 terminal E and PCM terminal 1B ● Short to power circuit between IAT sensor No. 1 terminal E and PCM terminal 1B
LOW INPUT	 ZCF4070W052

DTC P0110	IAT No. 1 circuit malfunction

HIGH INPUT



ZCF4070W053



ZCF4070W060

Diagnostic procedure

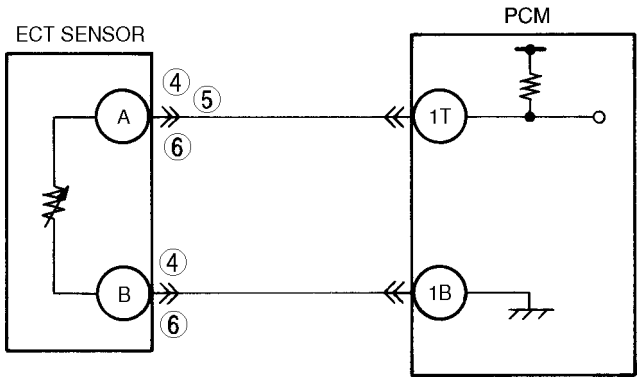
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**VERIFY CURRENT INPUT SIGNAL STATUS-HIGH OR LOW INPUT** ● Start engine. ● Access IATDC PID using WDS or equivalent. ● Is IATDC PID **within 0.13—4.90 V**?	Yes	Go to Step 16.
		No	● IF IATDC PID is **below 0.13 V**, go to next step. ● IF IATDC PID is **above 4.90 V**, go to Step 9.
4	**INSPECT IAT SENSOR No. 1 TERMINAL** ● Turn engine switch to OFF. ● Disconnect IAT sensor No. 1 connector. ● Check for bent terminal of IAT sensor No. 1 terminals D and E (part–side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 16.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**CLASSIFY IF IAT SENSOR No. 1 MALFUNCTION OR HARNESS MALFUNCTION** ● Turn engine switch to ON (Engine OFF). ● Access IATDC PID using WDS or equivalent. ● Is IATDC PID **below 0.13 V**?	Yes	Go to next step.
		No	Go to Step 10.
6	**INSPECT IAT SENSOR No. 1 SIGNAL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for continuity between IAT sensor No. 1 terminal D (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to next step.
7	**INSPECT IAT SENSOR No. 1 CIRCUITS FOR SHORT** ● Check for continuity between IAT sensor No. 1 terminals D and E (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to Step 16.
8	**INSPECT IAT SENSOR No. 1 CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect IAT sensor No. 1 connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 16.
		No	Go to next step.
9	**INSPECT IAT SENSOR No. 1** ● Inspect IAT sensor No. 1. (See F2–65 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION) ● Is it okay ?	Yes	Go to next step.
		No	Replace IAT sensor No. 1, then go to Step 16.
10	**INSPECT IAT SENSOR No. 1 SIGNAL CIRCUIT FOR SHORT TO POWER** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between IAT sensor No. 1 terminal D (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to next step.
11	**INSPECT IAT SENSOR No. 1 GND CIRCUIT FOR SHORT TO POWER** ● Measure voltage between IAT sensor No. 1 terminal E (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 16.
		No	Go to next step.
12	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Inspect PCM terminals 3D and 1B (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 16.
		No	Go to next step.
13	**INSPECT IAT SENSOR No. 1 SIGNAL CIRCUIT FOR OPEN** ● Check for continuity between IAT sensor No. 1 terminal D (harness–side) and PCM terminal 3D. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 16.
14	**INSPECT IAT SENSOR No. 1 GND CIRCUIT FOR OPEN** ● Check for continuity between IAT sensor No. 1 terminal E (harness–side) and PCM terminal 1B (harness-side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.

STEP	INSPECTION		ACTION
15	**VERIFY TROUBLESHOOTING OF DTC P1110 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Clear DTC from PCM memory. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
16	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

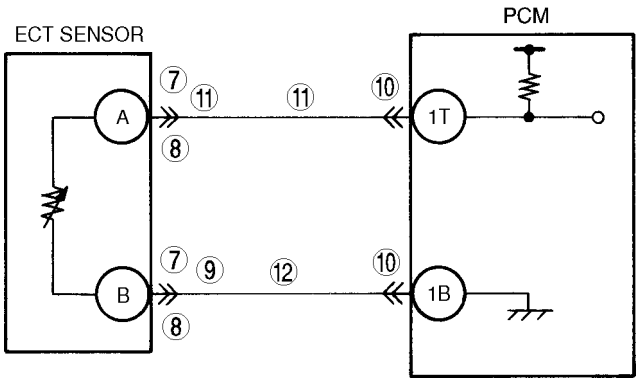
DTC P0115

ZCF407018881W13

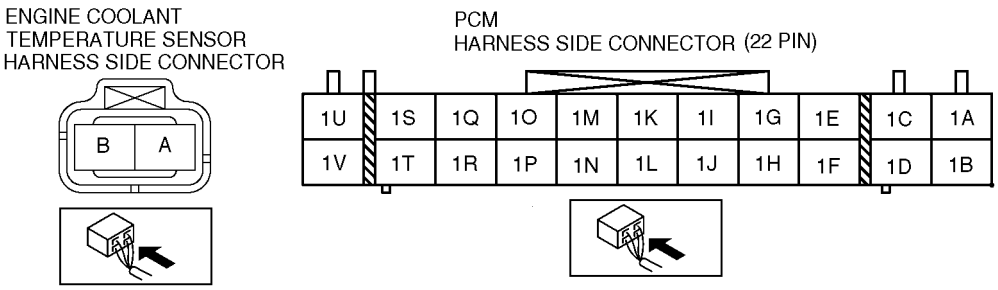
DTC P0115	ECT circuit malfunction
DETECTION CONDITION	● PCM monitors ECT sensor signal at PCM terminal 1T. If voltage at PCM terminal 1Tis **below 0.19 V** or **above 4.90 V**, PCM determines that ECT sensor circuit has a malfunction.
POSSIBLE CAUSE	● ECT sensor malfunction ● Short to GND circuit between ECT sensor terminal A and PCM terminal 1T ● ECT signal and ECT GND circuit are shorted each other. ● Poor connection at ECT sensor or PCM connector ● PCM malfunction ● Open circuit between ECT sensor terminal A and PCM terminal 1T ● Short to power circuit between ECT sensor terminal A and PCM terminal 1T ● Open circuit between ECT sensor terminal B and PCM terminal 1B ● Short to power circuit between ECT sensor terminal B and PCM terminal 1B
LOW INPUT	 ZCF4070W016

DTC P0115	ECT circuit malfunction

HIGH INPUT



ZCF4070W007



ZCF4070W017

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service information available?	Yes	Perform repair or diagnosis according to available Service information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Turn engine switch ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern is existing. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**VERIFY CURRENT INPUT SIGNAL STATUS–CIRCUIT MALFUNCTION** ● Start engine. ● Access ECT PID using WDS or equivalent. ● Is ECT PID **within 0.19—4.90 V**?	Yes	Go to Step 13.
		No	● If ECT PID is **below 0.19 V**, go to next step. ● If ECT PID is **above 4.90 V,** go to Step 7.
4	**INSPECT TERMINAL FOR BENDING** ● Turn engine switch to OFF. ● Disconnect ECT sensor connector. ● Check for bent of ECT sensor terminals A and B (part–side). ● Is there any concerns?	Yes	Repair or replace terminal, then go to Step 13.
		No	Go to next step.
5	**INSPECT ECT SIGNAL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check continuity between ECT sensor terminal A (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 13.
		No	Go to next step.
6	**INSPECT ECT CIRCUIT FOR SHORT** ● Check continuity between ECT sensor terminals A and B (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to step 13.
		No	Go to Step 13.

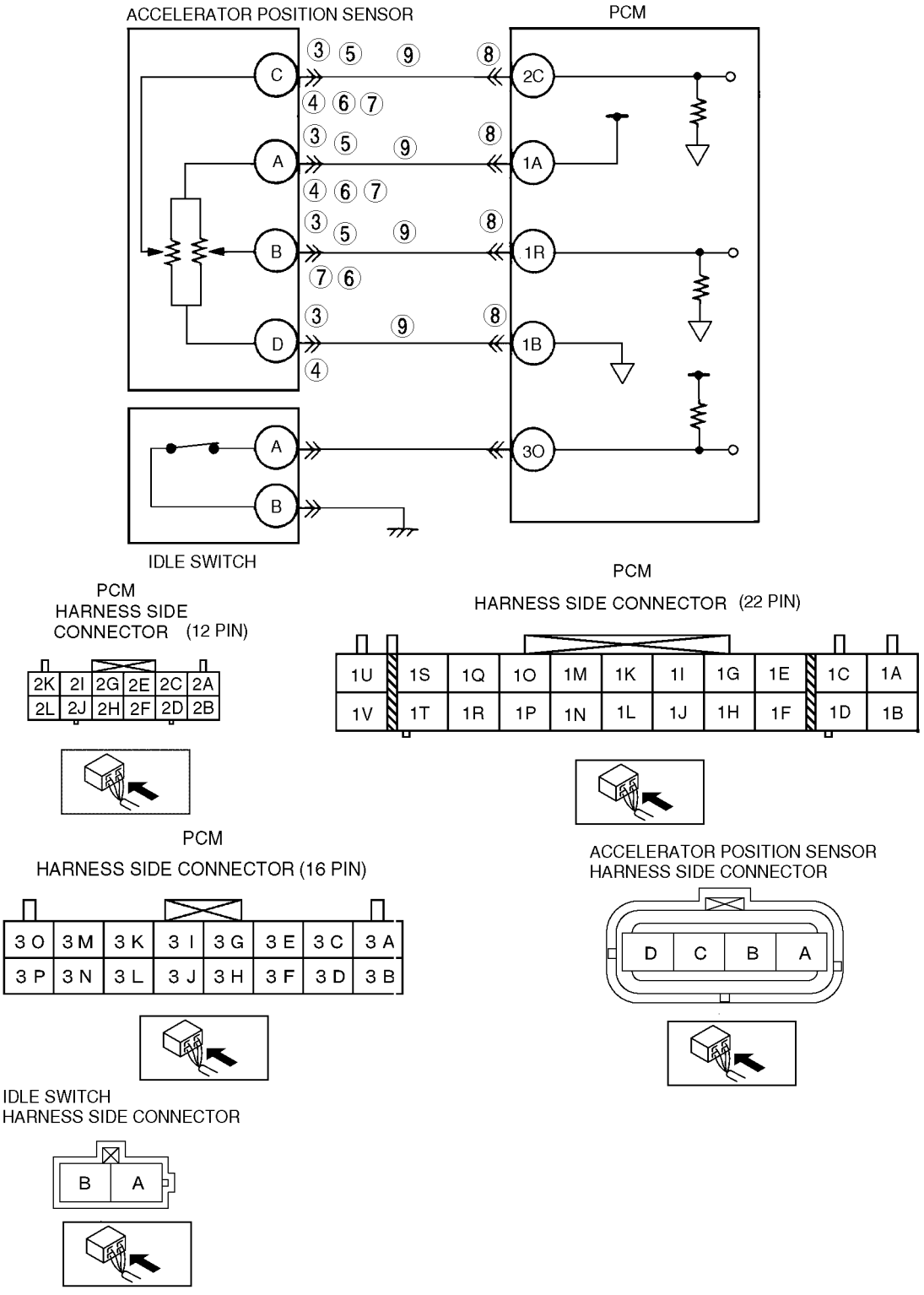
STEP	INSPECTION		ACTION
7	**INSPECT ECT SENSOR CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect ECT sensor connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 13.
		No	Go to next step.
8	**CLASSIFY ECT SENSOR OR HARNESS MALFUCNTION** ● Connect jumper wire between terminals A and B (harness–side). ● Access ECT PID using WDS or equivalent. ● Is ECT PID **approx. 0 V**?	Yes	Replace ECT sensor, then go to Step 13.
		No	Go to next step.
9	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between ECT sensor terminal A (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 13.
		No	Go to next step.
10	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Disconnect PCM connector. ● Check for poor connection at terminals 1T and 1B (damaged, pulled–out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 13.
		No	Go to next step.
11	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Check continuity between ECT sensor terminal A (harness–side) and PCM terminal 1T. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 13.
12	**INSPECT ECT SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** ● Check continuity between ECT sensor terminal B (harness–side) and PCM terminal 1B. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.
13	**VERIFY TROUBLESHOOTING OF DTC P0115 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
14	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P0120

ZCF407018881W14

DTC P0120	Accelerator position sensor circuit malfunction
DETECTION CONDITION	● PCM monitors accelerator position sensor signal at PCM terminal 1R. If PCM detects either of following conditions, PCM determines that accelerator position sensor circuit has a malfunction. — Input voltage at PCM terminal 1R is **below 0.29 V**. — Input voltage at PCM terminal 1R is **above 4.80 V**. — Input voltage at PCM terminal 1R is **above 1.35 V** with idle switch ON. ● PCM monitors difference voltage between main circuit and monitor circuit of accelerator position sensor. If difference voltage between PCM terminal 1R and 2C is **above 0.90 V**, PCM determines that accelerator position sensor has a malfunction.
POSSIBLE CAUSE	● Accelerator position sensor malfunction ● Poor connection at accelerator position sensor or PCM connector ● Open circuit between accelerator position sensor terminal B and PCM terminal 1R ● Short to GND circuit between accelerator position sensor terminal B and PCM terminal 1R ● Open circuit between accelerator position sensor terminal A and PCM terminal 1A ● Short to GND circuit between accelerator position sensor terminal A and PCM terminal 1A ● Open circuit between accelerator position sensor terminal C and PCM terminal 2C ● Short to GND circuit between accelerator position sensor terminal C and PCM terminal 2C ● PCM malfunction ● Open circuit between accelerator position sensor terminal D and PCM terminal 1B ● Short to reference voltage (Vref) supply circuit between accelerator position sensor terminal B and PCM terminal 1R ● Short to reference voltage (Vref) supply circuit between accelerator position sensor terminal C and PCM terminal 2C ● Electrical corrosion in accelerator position signal circuit ● Voltage drops in reference voltage (Vref) supply circuit ● Idle switch malfunction

DTC P0120	Accelerator position sensor circuit malfunction



ZCF4070W18

Diagnostic procedure

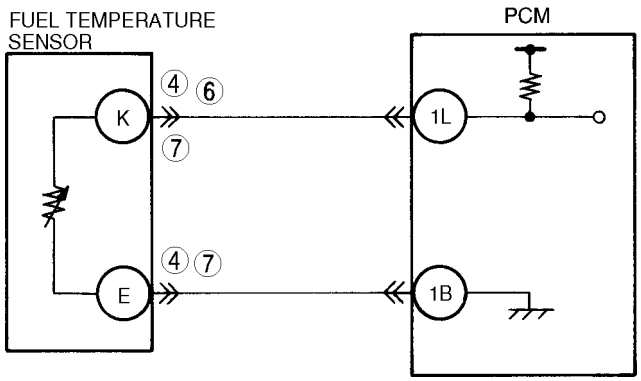
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Turn engine switch ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT ACCELERATOR POSITION SENSOR CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect accelerator position sensor connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace connector, then go to next step.
		No	Go to next step.
4	**INSPECT ACCELERATOR POSITION SENSOR TERMINAL** ● Check for bent terminal of accelerator position sensor terminals (part–side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 11.
		No	Go to next step.
5	**CHECK TERMINAL VOLTAGE AT ACCELERATOR POSITION SENSOR** ● Check voltage at accelerator position sensor terminals A, B and C (part–side). ● Is voltage **approx. 5 V**?	Yes	Go to next step.
		No	● If voltage is **approx. B+**, repair or replace appropriate harnesses. Then, go to Step 11. ● If voltage is **approx. 0V**, go to Step 8
6	**VERIFY ACCELERATOR POSITION SENSOR CIRCUIT FOR SHORT TO REFERENCE VOLTAGE (VREF) SUPPLY CIRCUIT** ● Check continuity between following terminals: — Accelerator position sensor terminals A and B (part–side) — Accelerator position sensor terminals A and C (part–side) ● Is there continuity?	Yes	Repair or replace appropriate harnesses, then go to Step 11.
		No	Go to next step.
7	**VERIFY ACCELERATOR POSITION SENSOR CIRCUIT FOR SHORT TO GND** ● Check continuity between following terminals: — Accelerator position sensor terminal A (part–side) and body GND — Accelerator position sensor terminal B (part–side) and body GND — Accelerator position sensor terminal C (part–side) and body GND ● Is there continuity?	Yes	Repair or replace appropriate harnesses, then go to Step 11.
		No	Go to next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Disconnect PCM connector. ● Inspect PCM terminals 1A, 1R, 1B and 2C (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 11.
		No	Go to next step.
9	**VERIFY ACCELERATOR POSITION SENSOR MAIN CIRCUIT,MONITOR CIRCUIT AND GND CIRCUIT FOR OPEN CIRCUIT** ● Check continuity between following terminals: — Accelerator position sensor terminal A (harness–side) and PCM terminal 1A — Accelerator position sensor terminal B (harness–side) and PCM terminal 1R — Accelerator position sensor terminal C (harness–side) and PCM terminal 2C — Accelerator position sensor terminal D (harness–side) and PCM terminal 1B ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace appropriate harnesses, then go to Step 11.

STEP	INSPECTION		ACTION
10	**INSPECT ACCELERATOR POSITION SENSOR** ● Make sure to reconnect all disconnected connectors. ● Inspect accelerator position sensor. (See F2–71 ACCELERATOR POSITION SENSOR INSPECTION) ● Is it okay?	Yes	Go to next step.
		No	Replace accelerator position sensor, then go to Step 11.
11	**VERIFY TROUBLESHOOTING OF DTC P0120 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
12	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

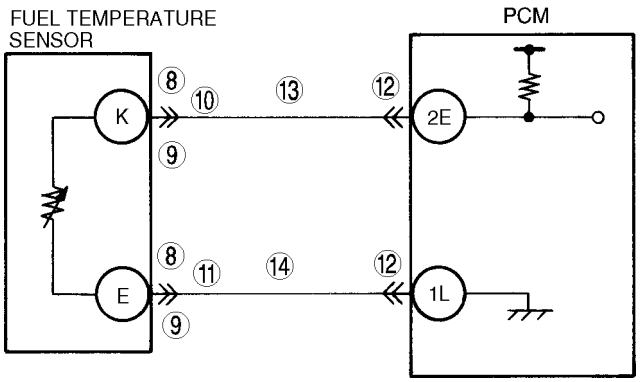
DTC P0180

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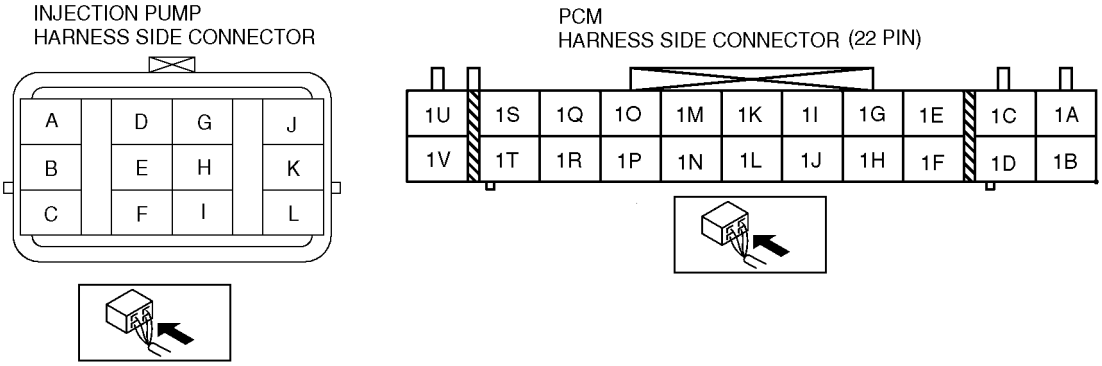
DTC P0180	Fuel temperature sensor malfunction
DETECTION CONDITION	● PCM monitors fuel temperature sensor signal at PCM terminal 1L. If voltage at PCM terminal 1L is **below 0.19 V** or **above 4.59 V**, PCM determines that fuel temperature sensor circuit has malfunction.
POSSIBLE CAUSE	● Fuel temperature sensor malfunction ● Short to GND circuit between fuel temperature sensor terminal K and PCM terminal 1L ● Fuel temperature signal and fuel temperature GND circuit are shorted each other. ● Poor connection at fuel temperature sensor or PCM connector ● PCM malfunction ● Open circuit between fuel temperature sensor terminal K and PCM terminal 1L ● Short to power circuit between fuel temperature sensor terminal K and PCM terminal 1L ● Open circuit between fuel temperature sensor terminal E and PCM terminal 1B ● Short to power circuit between fuel temperature sensor terminal E and PCM terminal 1B
LOW INPUT	 ZCF4070W008

DTC P0180	Fuel temperature sensor malfunction

HIGH INPUT



ZCF4070W009



ZCF4070W019

Diagnostic procedure

STEP	INSPECTION		ACTION
	VERIFY RELATED SERVICE INFORMATION AVAILABILITY ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Turn engine switch to ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**VERIFY CURRENT INPUT SIGNAL STATUS-HIGH OR LOW INPUT** ● Start engine. ● Access FLT V PID using WDS or equivalent. ● Is FLT V PID **within 0.19—4.59 V**?	Yes	Go to Step 15.
		No	● IF FLT V PID is **below 0.19 V**, go to next step. ● IF FLT V PID is **above 4.59 V**, go to Step 8.
4	**INSPECT FUEL TEMPERATURE SENSOR TERMINAL** ● Turn engine switch to OFF. ● Disconnect fuel temperature sensor connector. ● Check for bent terminal of fuel temperature sensor terminals K and E (part–side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
5	**CLASSIFY FUEL TEMPERATURE SENSOR MALFUNCTION OR HARNESS MALFUNCTION** ● Turn engine switch to ON (Engine OFF). ● Access FLT V PID using WDS or equivalent. ● Is FLT V PID **below 0.19 V**?	Yes	Go to next step.
		No	Inspect fuel temperature sensor, then go to Step 15. (See F2–67 FUEL TEMPERATURE SENSOR INSPECTION)

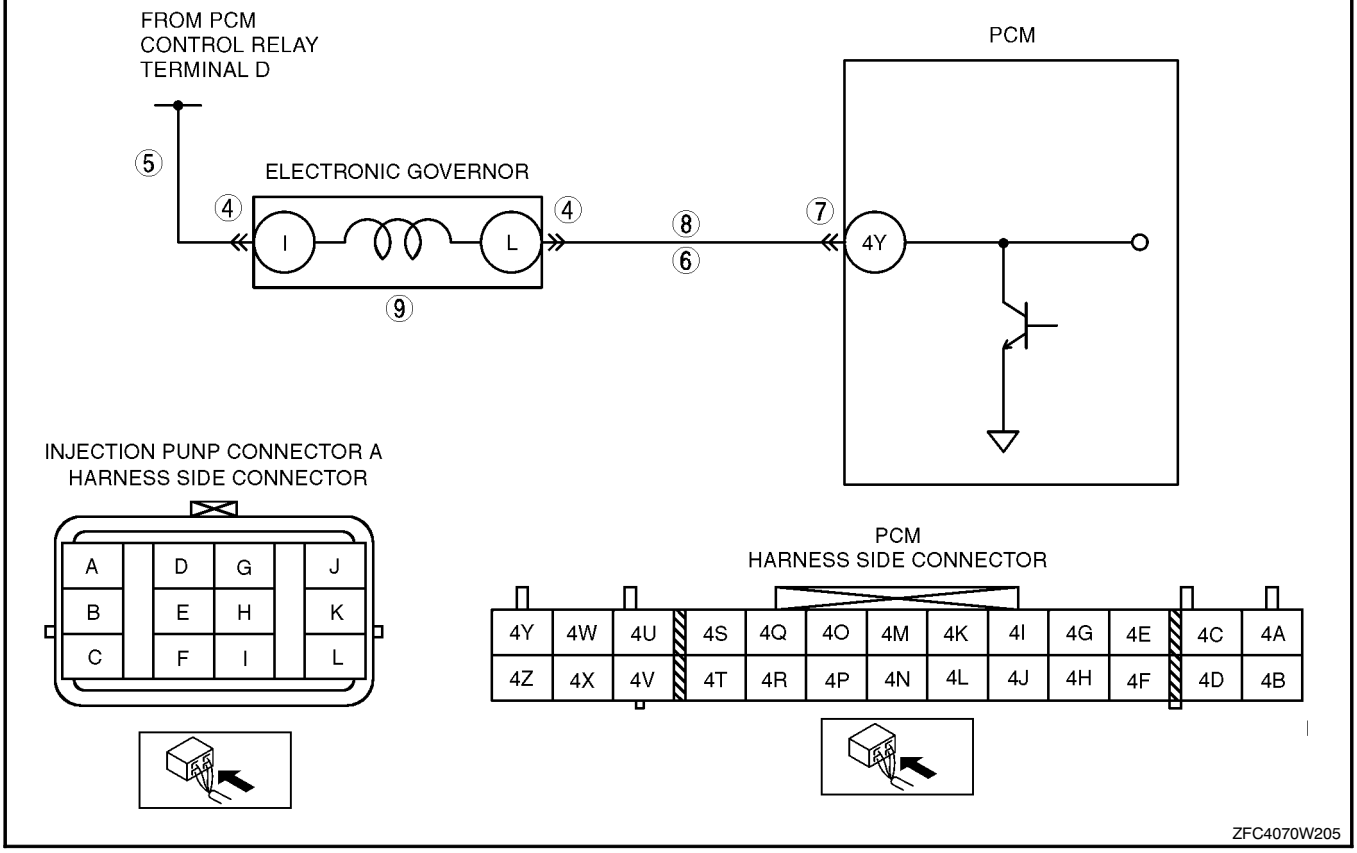
STEP	INSPECTION		ACTION
6	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for continuity between fuel temperature sensor terminal K (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
7	**INSPECT FUEL TEMPERATURE SENSOR CIRCUITS FOR SHORT** ● Check for continuity between fuel temperature sensor terminals K and E (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to Step 16.
8	**INSPECT FUEL TEMPERATURE SENSOR CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect fuel temperature sensor connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
9	**INSPECT FUEL TEMPERATURE SENSOR** ● Inspect fuel temperature sensor. (See F2–67 FUEL TEMPERATURE SENSOR INSPECTION) ● Is it okay ?	Yes	Go to next step.
		No	Replace fuel temperature sensor, then go to Step 15.
10	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between fuel temperature sensor terminal K (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
11	**INSPECT FUEL TEMPERATURE SENSOR GND CIRCUIT FOR SHORT TO POWER** ● Measure voltage between fuel temperature sensor terminal E (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
12	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Inspect PCM terminals 1L and 2E(damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
13	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between fuel temperature sensor terminal K (harness–side) and PCM terminal 2E. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 15.
14	**INSPECT FUEL TEMPERATURE SENSOR GND CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between fuel temperature sensor terminal E (harness–side) and PCM terminal 1L (harness-side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.

STEP	INSPECTION		ACTION
15	**VERIFY TROUBLESHOOTING OF DTC P0180 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
16	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P0251

ZCF407018881W16

DTC P0251	Injection amount control system malfunction
DETECTION CONDITION	● PCM monitors difference voltage between target injection amount and actual injection amount while engine running. If difference voltage is **above threshold** for **0.5 s**, PCM determines that injection amount control system is malfunctioning.
POSSIBLE CAUSE	● Connector or terminal malfunction ● Open circuit in wiring between injection pump connector A terminal I and PCM control relay terminal D ● Open circuit in wiring between injection pump connector A terminal I and PCM terminal 4X ● Open or Short to GND in wiring between injection pump connector A terminal L and PCM terminal 4Y ● Electronic governor malfunction ● Injection pump (injection amount control) malfunction ● PCM malfunction



ZFC4070W205

Diagnostic procedure

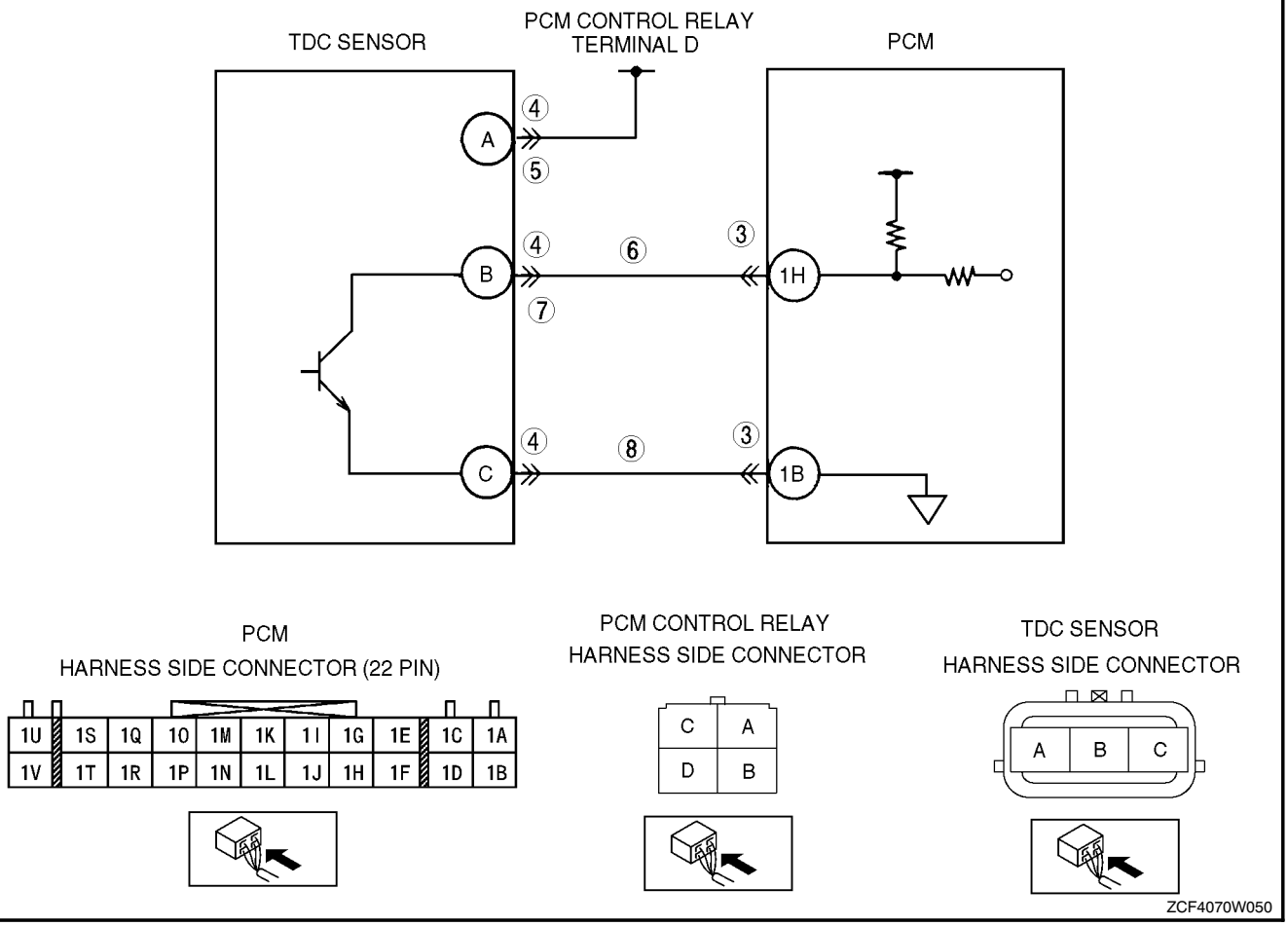
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**VERIFY CURRENT INPUT SIGNAL STATUS–IS CONCERN INTERMITTENT OR CONSTANT?** ● Turn engine switch to ON (Engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING Procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**VERIFY OTHER DTC IS PRESENT** ● Is other DTC present?	Yes	Perform appropriate DTC troubleshooting procedure. (See F2–77 DTC TABLE) then go to Step 8.
		No	Go to next step.
4	**INSPECT INJECTION PUMP CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect injection pump connector A. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
5	**INSPECT ELECTRONIC GOVERNOR POWER CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between injection pump connector A terminal I (harness–side) and body GND. ● Is voltage **B+**?	Yes	Go to next step.
		No	Repair or replace electronic governor power circuit for open, then go to Step 9.
6	**INSPECT ELECTRONIC GOVERNOR CONTROL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Check for continuity between injection pump connector A terminal L (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace electronic governor control circuit for short to GND, then go to Step 9.
		No	Go to next step.
7	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
8	**INSPECT ELECTRONIC GOVERNOR CONTROL CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between injection pump connector A terminal L (harness–side) and PCM terminal 4Y (harness–side). ● Is there continuity?	Yes	Injection pump may have malfunction. Consult your distributor for inspection of injection pump. Go to next step.
		No	Repair or replace electronic governor control circuit for open, then go to next step.
9	**INSPECT ELECTRONIC GOVERNOR** ● Perform electronic governor Inspection. (SeeF2–54 ELECTRONIC GOVERNOR INSPECTION) ● Is electronic governor okay?	Yes	Injection pump may have mechanical malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributer for replacement of electronic governor. Then go to next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0251 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (Engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
11	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P0335

ZCF407018881W17

DTC P0335	TDC sensor circuit malfunction
DETECTION CONDITION	● If PCM does not receive input signal from TDC sensor when engine is running, PCM determines that TDC sensor circuit has a malfunction.
POSSIBLE CAUSE	● TDC sensor malfunction ● Poor connection at TDC sensor or PCM connector ● PCM malfunction ● Short to GND circuit between TDC sensor terminal B and PCM terminal 1H ● Open circuit between TDC sensor terminal B and PCM terminal 1H ● Open circuit between TDC sensor terminal A and PCM control relay terminal D ● Open circuit between TDC sensor terminal C and PCM terminal 1B ● TDC sensor pulse wheel malfunction



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT TDC SENSOR** ● Inspect TDC sensor. (See F2–70 TDC SENSOR INSPECTION) ● Is it okay?	Yes	Check for poor connection (damage/pulled–out terminals, corrosion, etc), bent terminals of TDC sensor connector or plate. ● Repair if necessary, then go to Step 9
		No	Replace TDC sensor, then go to Step 9.

STEP	INSPECTION		ACTION
3	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection at terminals 1B and 1H (damaged, pulled–out terminals, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
4	**INSPECT TDC SENSOR TERMINAL** ● Turn engine switch OFF. ● Disconnect TDC sensor connector. ● Check bent terminal of TDC sensor terminals A, B and C (part–side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Inspect for open circuit in wiring harness between TDC sensor terminal A (harness–side) and PCM control relay terminal D (harness–side). Repair or replace harness, then go to Step 9.
5	**CHECK POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Check voltage at TDC sensor terminal A (harness–side). ● Is voltage **B+**?	Yes	Go to next step.
		No	Inspect for open circuit in wiring harness between TDC sensor terminal A (harness–side) and PCM control relay terminal D (harness–side). Repair or replace harness, then go to Step 9.
6	**INSPECT TDC CIRCUIT FOR OPEN CURCUIT** ● Check for continuity between TDC sensor terminal B (harness–side) and PCM connector terminal 1H (harness–side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 9.
7	**INSPECT TDC CIRCUIT FOR SHORT TO GND** ● Check for continuity between TDC sensor terminal B (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace suspected harness, then go to Step 9.
		No	Go to next step.
8	**INSPECT TDC SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between TDC sensor terminal C (harness–side) and PCM connector terminal 1B (harness–side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 9.
9	**VERIFY TROUBLESHOOTING OF DTC P0335 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P0400

ZCF407018881W18

DTC P0400	EGR system malfunction
DETECTION CONDITION	● PCM monitors EGR valve position sensor signal at PCM terminal 1F. If voltage at PCM terminal 1F is **below 0.66 V** when engine is idle, PCM determines that EGR system has a malfunction.
POSSIBLE CAUSE	● EGR valve malfunction ● EGR solenoid valve (vacuum) malfunction ● EGR solenoid valve (vent) malfunction ● EGR control solenoid valve malfunction ● PCM malfunction

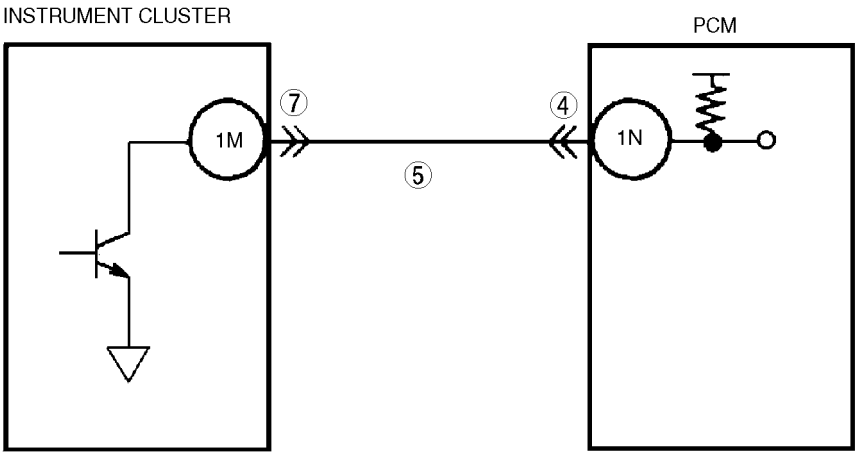
Diagnostic procedure

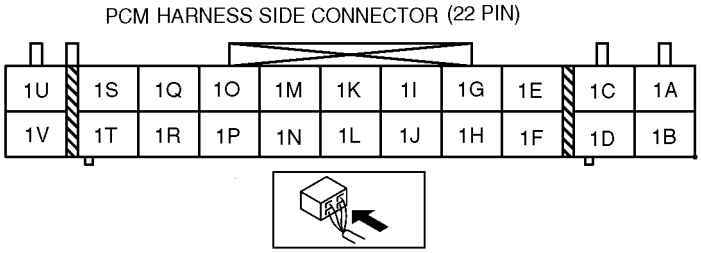
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Bulletins and/or on–line repair information availability. ● Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT FOR APPROPRIATE SOLENOID VALVES** ● Inspect for following solenoid valves. — EGR solenoid valve (vacuum) (See F2–56 EGR SOLENOID VALVE (VACUUM) INSPECTION) — EGR solenoid valve (vent) (See F2–56 EGR SOLENOID VALVE (VENT) INSPECTION) — EGR control solenoid valve (See F2–57 EGR CONTROL SOLENOID VALVE INSPECTION) ● Are solenoid valves okay?	Yes	Go to next step.
		No	Replace appropriate solenoid valves, then go to next step.
3	**INSPECT VACUUM HOSE CONDITION** ● Inspect vacuum hoses for clogging, any damages, freeze, or vacuum leakage. ● Is there any concern?	Yes	Replace vacuum hoses, then go to Step 5.
		No	Go to next step.
4	**INSPECT EGR VALVE MALFUNCTION** ● Turn ignition key to OFF. ● Remove EGR valve. ● Inspect EGR valve. (See F2–56 EGR VALVE INSPECTION) ● Is EGR valve okay?	Yes	Go to next step.
		No	Replace EGR valve, then go to Step 5.
5	**VERIFY TROUBLESHOOTING OF DTC P0400 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch ON (engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start the engine. ● Warm–up engine until ECT PID is **above 70 °C {158 °F}**. ● Is same DTC present?	Yes	Go to next step.
		No	Replace PCM, then go to next step.
5	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE” (See section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

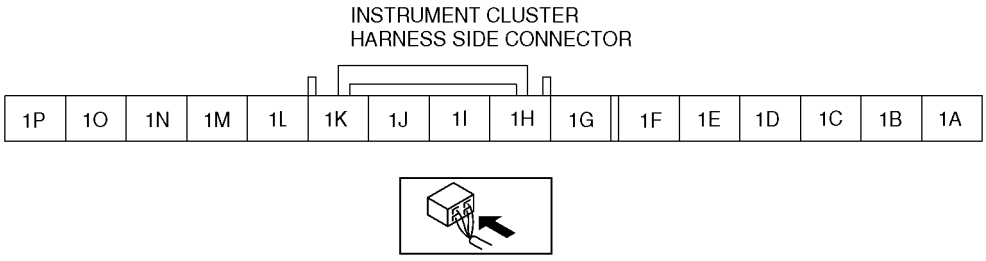
DTC P0500

ZCF407018881W19

DTC P0500	Vehicle speed sensor (VSS) circuit malfunction
DETECTION CONDITION	● PCM detects after following conditions, PCM determines that VSS sensor circuit has a malfunction: — Gear is in position other than neutral. — Engine speed is **avobe 4,000 rpm**. — Vehicle speed is **below 3.76 km/h {2.33 mph}**.
POSSIBLE CAUSE	● PCM malfunction ● Instrument cluster (vehicle speedometer sensor) malfunction ● Open circuit between PCM terminal 1N and instrument cluster terminal 1M ● Short to ground between PCM terminal 1N and instrument cluster terminal 1M ● VSS malfunction ● Open circuit between vehicle speed sensor terminal A and instrument cluster terminal 1L ● Short to ground between vehicle speed sensor terminal A and instrument cluster terminal 1L ● Open circuit between vehicle speed sensor terminal B and instrument cluster terminal 1M ● Short to ground between vehicle speed sensor terminal B and instrument cluster terminal 1M







ZCF4070W059

Diagnostic procedure

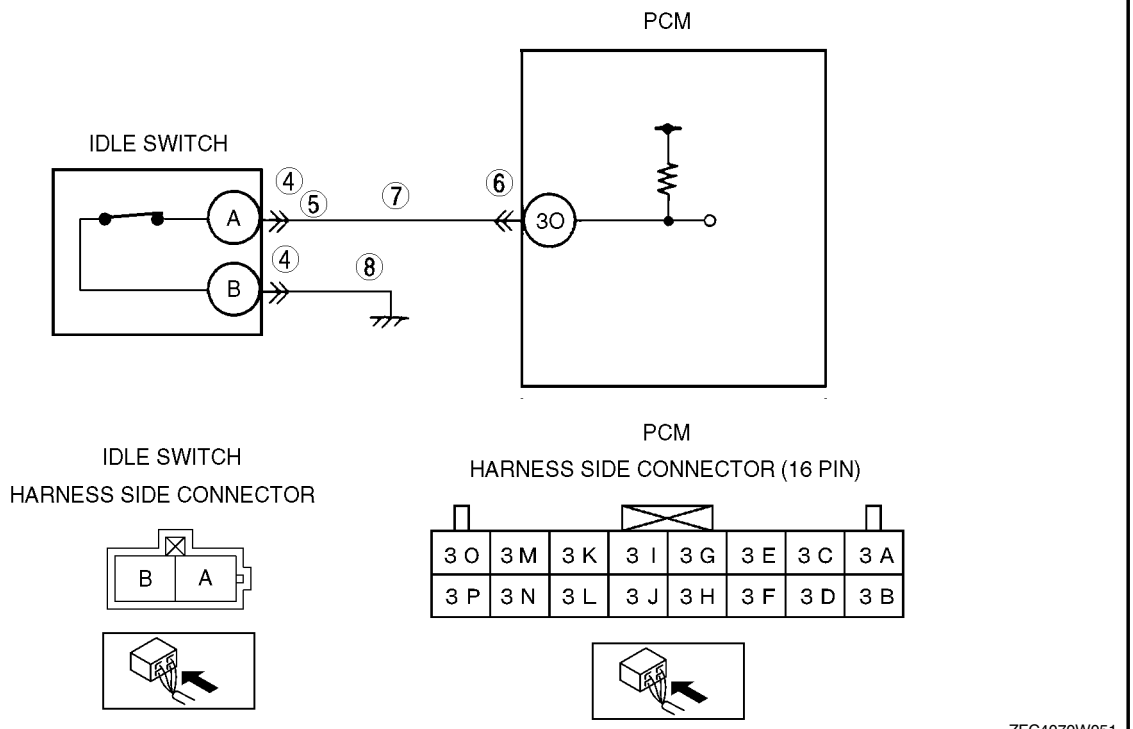
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service information available?	Yes	Perform repair or diagnosis according to available Service information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**CHECK SPEEDOMETER** ● Check speedometer. ● Does vehicle speedometer needle move?	Yes	Go to next step.
		No	Inspect speedometer, then go to next step. (See Section T.)
3	**CLASSIFY INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Turn engine switch ON (engine OFF). ● Clear DTC from PCM using WDS or equivalent. ● Turn engine switch to OFF then ON (engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (SeeF2–128 INTERMITTENT CONCERN TROUBLESHOOTING.)
4	**INSPECT POOR CONNECTION OF PCM CONNECTOR** ● Disconnect PCM connector. ● Check for poor connection at terminal 1N (damaged/pulled–out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	**INSPECT INSTRUMENT CLUSTER CIRCUIT FOR OPEN CIRCUIT** ● Check continuity between PCM terminal 1N and instrument cluster 1M (harness–side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 8.
6	**INSPECT INSTRUMENT CLUSTER CIRCUIT FOR SHORT TO GROUND** ● Check for continuity between PCM terminal 1N (harness–side) and body ground. ● Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
7	**INSPECT INSTRUMENT CLUSTER CONNECTOR FOR POOR CONNECTION** ● Disconnect instrument cluster connector. ● Check for poor connection at terminal 1M (damaged/pulled–out terminals, corrosion, etc.). ● Are there any concerns?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0500 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch ON (engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Warm up engine. ● Drive vehicle under following conditions for 10 seconds or more. — Engine speed: **4,000 rpm or above** — Gear: other than neutral. — Vehicle speed: **3.76 km/h {2.33 mph} or above** ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure”. (See Section F2.) ● Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0510

ZCF407018881W20

DTC P0510	Idle switch malfunction
DETECTION CONDITION	● PCM detects after following conditions, PCM determines that idle switch has a malfunction: — Output voltage from accelerator position sensor is **avobe 1.35 V** with idle switch ON. — Output voltage from accelerator position sensor is **below 0.86 V** with idle switch OFF.
POSSIBLE CAUSE	● Idle switch malfunction ● Short to GND circuit between idle switch terminal A and PCM terminal 3O ● Poor connection at idle switch or PCM connector ● PCM malfunction ● Open circuit between idle switch terminal A and PCM terminal 3O ● Open circuit between idle switch terminal B and body GND



ZFC4070W051

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**CHECK IDLE SWITCH** ● Inspect idle switch. (See F2–73 IDLE SWITCH INSPECTION) ● Is it okay?	Yes	Go to next step.
		No	Replace idle switch, then go to Step 9
4	**INSPECT IDLE SWITCH TERMINAL** ● Turn engine switch to OFF. ● Disconnect idle switch connector. ● Check for bent terminal of idle switch terminals A and B (part–side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT IDLE SWITCH SIGNAL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for continuity between idle switch terminal A (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 9.
		No	Go to next step.
6	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Inspect PCM terminals 3O (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
7	**INSPECT IDLE SWITCH SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between idle switch terminal A (harness–side) and PCM terminal 3O. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 9.
8	**INSPECT IDLE SWITCH GND CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between idle switch terminal B (harness–side) and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0510 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P0606

ZCF407018881W21

DTC P0606	PCM malfunction
DETECTION CONDITION	● PCM detects internal malfunction.
POSSIBLE CAUSE	● PCM malfunction

Diagnostic procedure

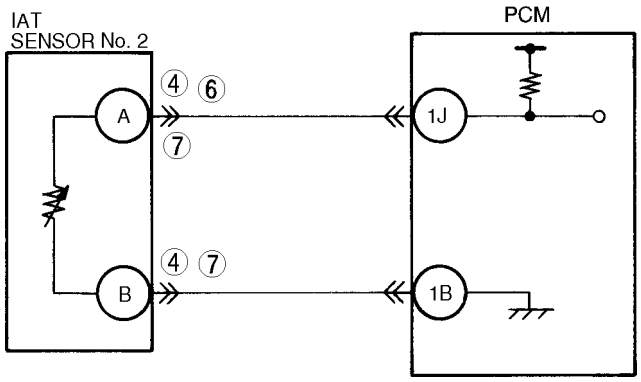
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P0606 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn engine switch to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1110

ZCF407018881W22

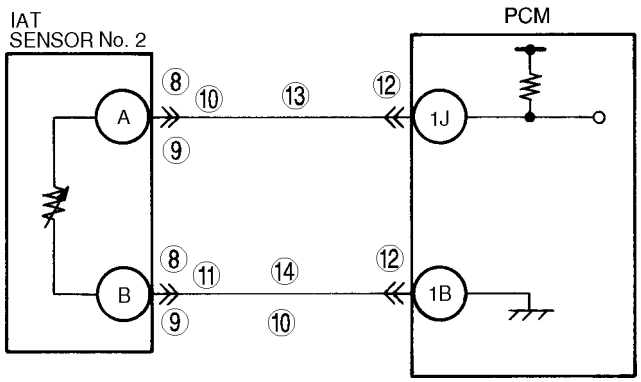
DTC P1110	IAT sensor No.2 circuit malfunction
DETECTION CONDITION	● PCM monitors IAT sensor No.2 signal at PCM terminal 1J. If voltage at PCM terminal 1J is **below 0.14 V** or **above 4.90 V**, PCM determines that IAT sensor No.2 circuit has a malfunction.
POSSIBLE CAUSE	● IAT sensor No.2 malfunction ● Short to GND circuit between IAT sensor No.2 terminal A and PCM terminal 1J ● IAT No.2 signal and IAT GND circuit are shorted each other ● Poor connection at IAT sensor No.2 or PCM connector ● PCM malfunction ● Open circuit between IAT sensor No.2 terminal A and PCM terminal 1J ● Short to power circuit between IAT sensor No.2 terminal A and PCM terminal 1J ● Open circuit between IAT sensor No.2 terminal B and PCM terminal 1B ● Short to power circuit between IAT sensor No.2 terminal B and PCM terminal 1B

LOW INPUT

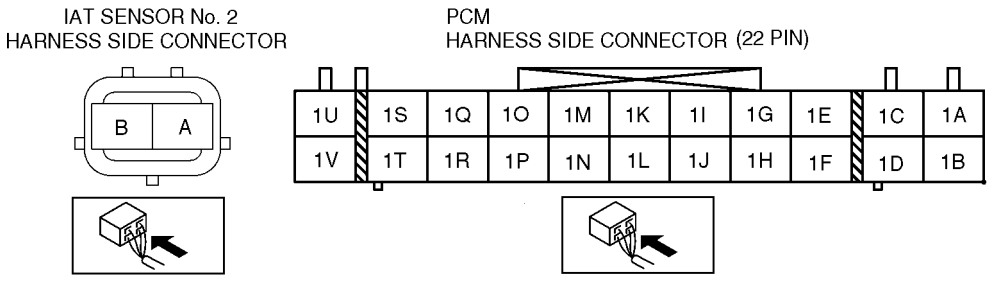


ZCF4070W013

HIGH INPUT



ZCF4070W014



ZCF4070W015

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.

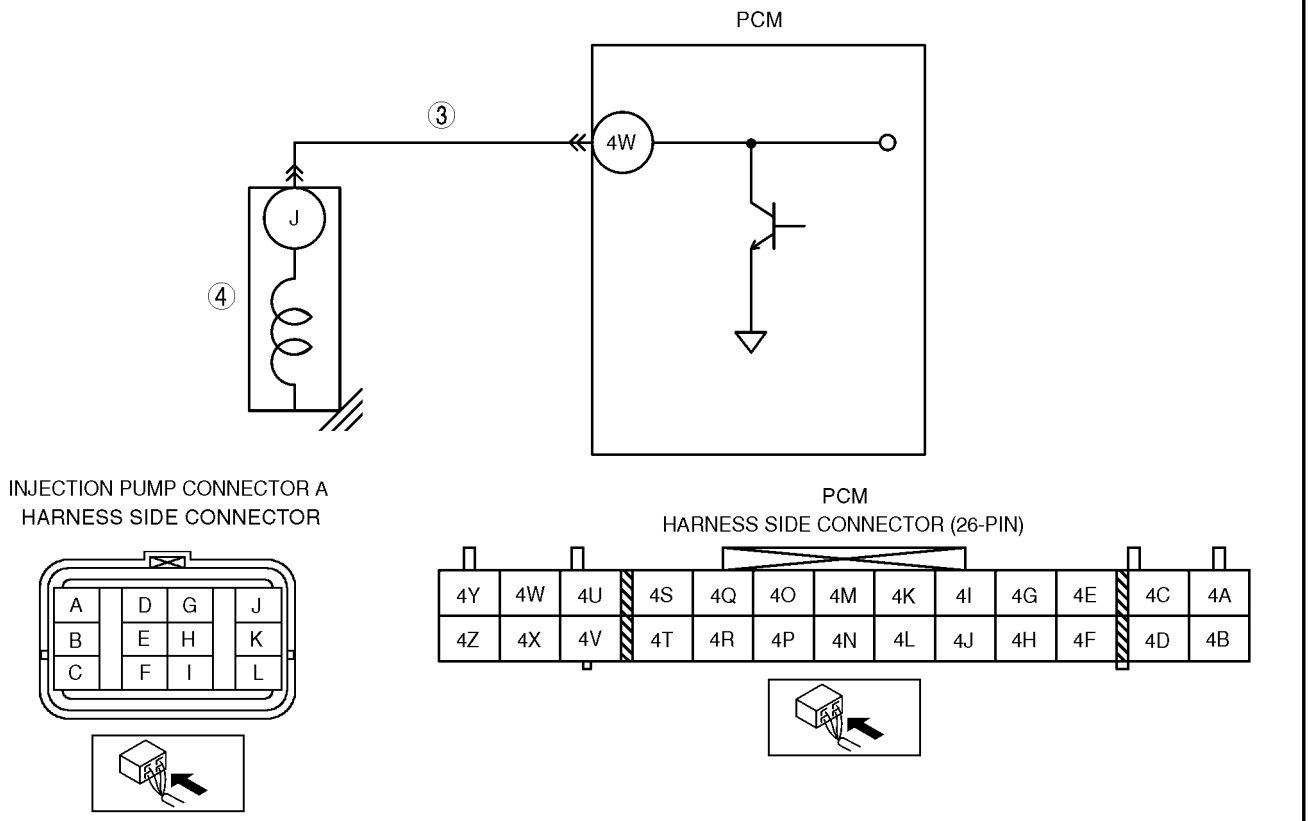
STEP	INSPECTION		ACTION
2	**CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Turn engine switch ON (engine OFF). ● Connect the WDS or equivalent. ● Clear DTC from PCM memory. ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**VERIFY CURRENT INPUT SIGNAL STATUS-HIGH OR LOW INPUT** ● Start engine. ● Access IAT PID using WDS or equivalent. ● Is IAT PID **within 0.14—4.90 V**?	Yes	Go to Step 15.
		No	● If IAT PID is **below 0.14 V**, go to next step. ● If IAT PID is **above 4.90 V**, go to Step 8.
4	**INSPECT IAT SENSOR No.2 TERMINAL** ● Turn engine switch to OFF. ● Disconnect IAT sensor No.2 connector. ● Check for bent terminal of IAT sensor No.2 terminals A and B (part–side). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 17.
		No	Go to next step.
5	**CLASSIFY IAT SENSOR No.2 MALFUNCTION OR HARNESS MALFUNCTION** ● Turn engine switch to ON (Engine OFF). ● Access IAT PID using WDS or equivalent. ● Is IAT PID **below 0.14 V**?	Yes	Go to next step.
		No	Go to Step 9.
6	**INSPECT IAT SENSOR No.2 SIGNAL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for continuity between IAT sensor No.2 terminal A (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
7	**INSPECT IAT SENSOR No.2 CIRCUITS FOR SHORT** ● Check for continuity between IAT sensor No.2 terminals A and B (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to Step 15.
8	**INSPECT IAT SENSOR No.2 CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect IAT sensor No.2 connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
9	**INSPECT IAT SENSOR No.2** ● Inspect IAT sensor No.2. (See F2–65 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION) ● Is it okay ?	Yes	Go to next step.
		No	Replace IAT sensor No.2, then go to Step 15.
10	**INSPECT IAT SENSOR No.2 SIGNAL CIRCUIT FOR SHORT TO POWER** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between IAT sensor No.2 terminal A (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.
11	**INSPECT IAT SENSOR No.2 GND CIRCUIT FOR SHORT TO POWER** ● Measure voltage between IAT sensor No.2 terminal B (harness–side) and body GND. ● Is voltage **B+**?	Yes	Repair or replace shorted harness, then go to Step 15.
		No	Go to next step.

STEP	INSPECTION		ACTION
12	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Inspect PCM terminals 1J and 1B (damaged, pulled-out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 15.
		No	Go to next step.
13	**INSPECT IAT SENSOR No.2 SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between IAT sensor No.2 terminal A (harness–side) and PCM terminal 1J. ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 15.
14	**INSPECT IAT SENSOR No.2 GND CIRCUIT FOR OPEN CIRCUIT** ● Check for continuity between IAT sensor No.2 terminal B (harness–side) and PCM terminal 1B (harness-side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to next step.
15	**VERIFY TROUBLESHOOTING OF DTC P0110 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
16	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1182

ZCF407018881W23

DTC P1182	Fuel shut off (FSO) solenoid malfunction
DETECTION CONDITION	● When the engine switch is turned off while the engine is running, if the decrease in engine speed is **200 rpm or less 2 seconds** after the engine switch is turned off, PCM determines that FSO solenoid has malfunction.
POSSIBLE CAUSE	● FSO solenoid malfunction ● Short to power circuit between injection pump connector A terminal J and PCM terminal 4W ● PCM malfunction



Diagnostic procedure

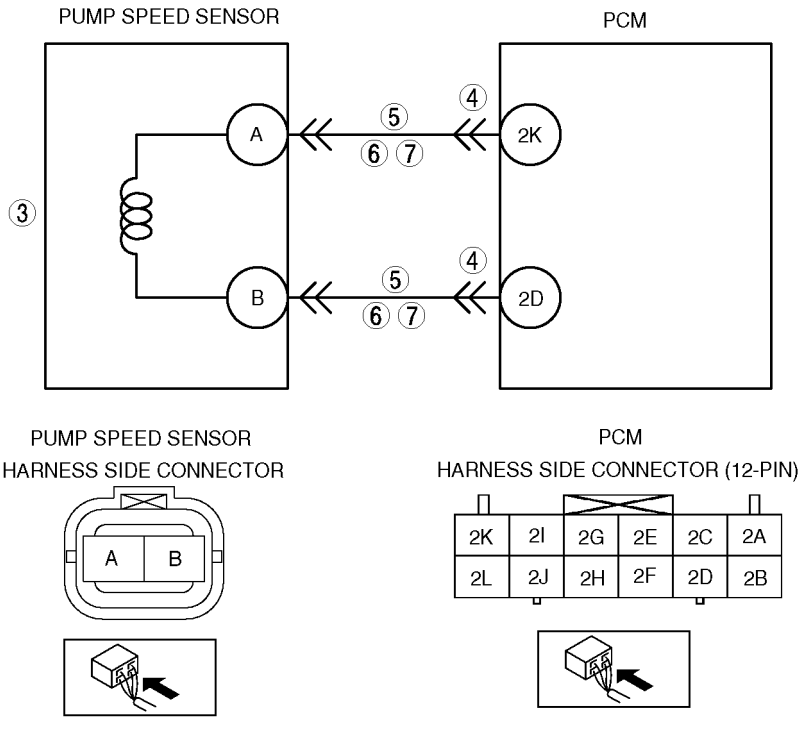
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Clear DTC from PCM memory. ● Start engine. ● Turn engine switch to OFF and wait for **2 seconds or more**, then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2-128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT FSO SOLENOID CIRCUIT FOR SHORT TO POWER** ● Inspect the voltage between injection pump connector A terminal J and body ground. ● Is voltage **B+**?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
4	**INSPECT FSO SOLENOID** ● Perform FSO solenoid inspection. (See F2-53 FUEL SHUT OFF (FSO) SOLENOID INSPECTION) ● Is FSO solenoid okay?	Yes	Go to next step.
		No	Replace FSO solenoid, then go to next step.

STEP	INSPECTION		ACTION
5	**VERIFY TROUBLESHOOTING OF DTC P0110 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Clear DTC from PCM memory. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1189

ZCF407018881W24

DTC P1189	Pump speed sensor circuit malfunction
DETECTION CONDITION	● PCM monitors pump speed sensor signal at PCM terminal 2D and 2K. If difference between engine speeds detected by the pump speed sensor and the TDC sensor is **500 rpm or more** for **1 second** continuously under the following conditions, PCM determines that pump speed sensor circuit has malfunction. — Engine speed detected by the pump speed sensor is lower than that detected by the TDC sensor — Engine is running
POSSIBLE CAUSE	● Pump speed sensor malfunction ● Poor connection at pump speed sensor or PCM connector ● Pump speed sensor circuits are shorted each other. ● Short to GND circuit between pump speed sensor terminal A and PCM terminal 2K ● Short to GND circuit between pump speed sensor terminal B and PCM terminal 2D ● Open circuit between pump speed sensor terminal A and PCM terminal 2K ● Open circuit between pump speed sensor terminal B and PCM terminal 2D ● PCM malfunction



ZCF4070W100

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to available Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**VERIFY PUMP SPEED SENSOR VOLTAGE** ● Disconnect pump speed sensor connector. ● Connect voltmeter pump speed sensor terminals A and B (part–side). ● Check voltage in AC range while cranking engine. ● Is any voltage reading?	Yes	Go to Step 4.
		No	Go to next step.
3	**VERIFY PUMP SPEED SENSOR** ● Perform pump speed sensor inspection. (See F2–68 PUMP SPEED SENSOR INSPECTION) ● Is pump speed sensor okay?	Yes	Check for poor connection (damaged, pulled–out terminals, corrosion, etc.) or bent terminal of pump speed sensor. ● Repair or replace if necessary, then go to Step 8.
		No	Go to next step.
4	**INSPECT PCM CONNECTOR POOR CONNECTION** ● Turn engine switch OFF. ● Disconnect PCM connector. ● Check for poor connection at terminals 2K and 2D (damaged, pulled–out terminals, corrosion, etc.). ● Is there any malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	**INSPECT PUMP SPEED SENSOR CIRCUIT FOR OPEN CIRCUIT** ● Inspect the following terminals for continuity: — Between pump speed sensor terminal A and PCM terminal 2K — Between pump speed sensor terminal B and PCM terminal 2D ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 8.
6	**INSPECT PUMP SPEED SENSOR CIRCUIT FOR SHORT TO GROUND** ● Inspect the following terminals for continuity: — Between pump speed sensor terminal A and body ground — Between pump speed sensor terminal B and body ground ● Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
7	**INSPECT PUMP SPEED SENSOR CIRCUIT FOR SHORT TO EACH OTHER** ● Check continuity between pump speed sensor terminals A and B (harness–side). ● Is there continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P1189 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Clear DTC from PCM memory. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1195

ZCF407018881W25

DTC P1195	BARO circuit malfunction
DETECTION CONDITION	● PCM monitors input voltage from BARO sensor integrated in PCM. If input voltage from BARO sensor is **below 1.50 V** or **above 4.50 V**, PCM determines that BARO sensor circuit is malfunctioning.
POSSIBLE CAUSE	● BARO sensor malfunction (integrated in PCM) ● PCM malfunction

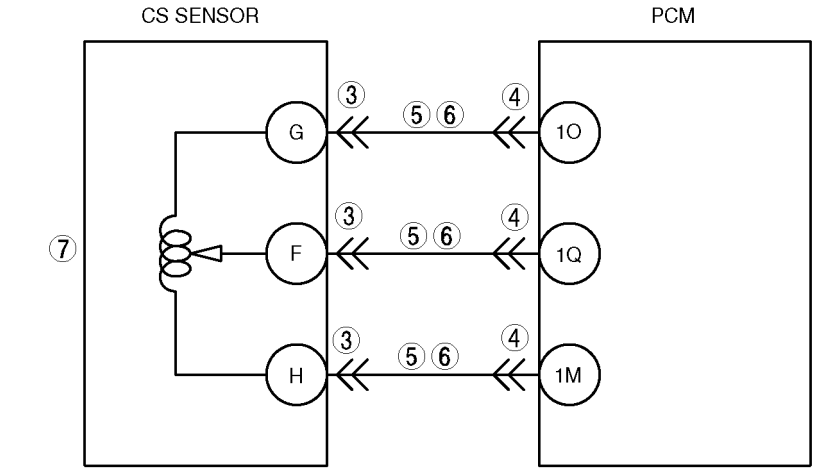
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1195 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn engine switch to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

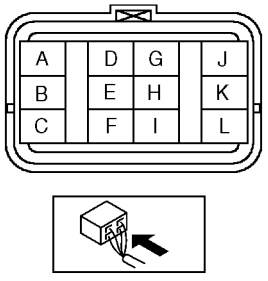
DTC P1226

ZCF407018881W26

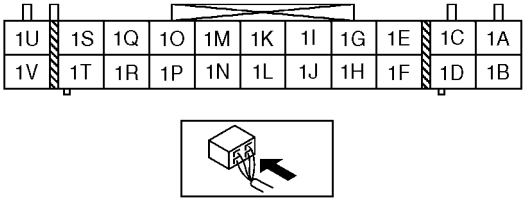
DTC P1226	Control sleeve (CS) sensor circuit malfunction
DETECTION CONDITION	● PCM monitors input voltage from CS sensor. If input voltage from CS sensor is **below 0.23 V** or **above 4.68 V**, PCM determines that CS sensor circuit is malfunctioning.
POSSIBLE CAUSE	● CS sensor malfunction ● PCM malfunction ● Connector or terminal malfunction ● Open or short to ground circuit between CS sensor terminal (injection pump connector A) F and PCM terminal 1Q ● Open or short to ground circuit between CS sensor terminal (injection pump connector A) G and PCM terminal 1O ● Open circuit between CS sensor terminal (injection pump connector A) H and PCM terminal 1M



INJECTION PUMP CONNECTOR A
HARNESS SIDE CONNECTOR



PCM
HARNESS SIDE CONNECTOR (22-PIN)



ZCF4070W101

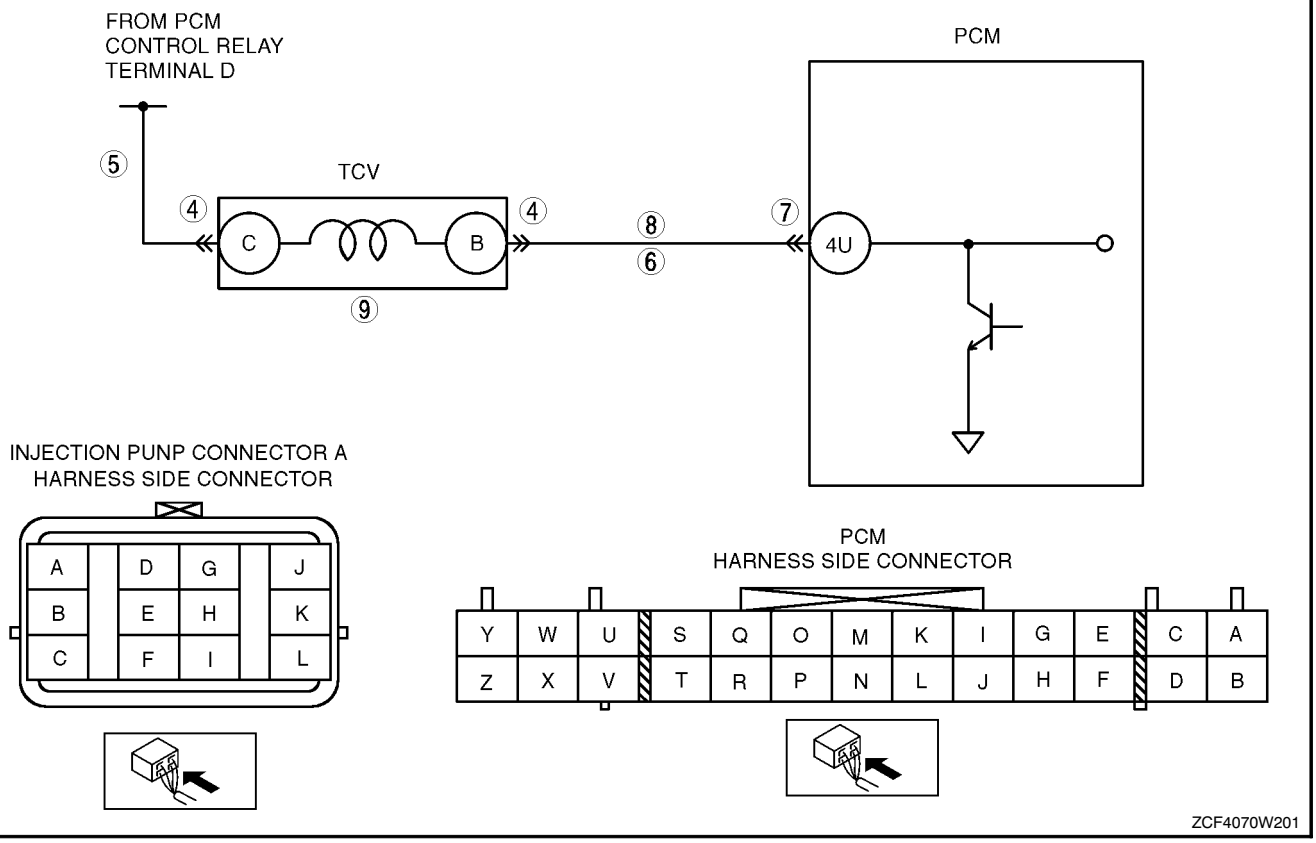
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1226 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn engine switch to OFF, then start engine. ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT CS SENSOR CONNECTOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect CS sensor connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
4	**INSPECT PCM CONNECTOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	**INSPECT CS SENSOR CIRCUIT FOR SHORT TO GROUND** ● Inspect the following terminals for continuity: — Between injection pump connector A terminal F and body ground — Between injection pump connector A terminal G and body ground ● Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
6	**INSPECT CS SENSOR CIRCUIT FOR OPEN CIRCUIT** ● Inspect the following terminals for continuity: — Between injection pump connector A terminal F and PCM terminal 1Q — Between injection pump connector A terminal G and PCM terminal 1O — Between injection pump connector A terminal H and PCM terminal 1M ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 8.
7	**INSPECT CS SENSOR** ● Perform CS sensor inspection. (See F2–68 CONTROL SLEEVE (CS) SENSOR INSPECTION) ● Is CS sensor okay?	Yes	Injection pump may have a malfunction. Consult your distributer for inspection of injection pump. Then go to next step.
		No	Consult your distributer for replace of CS sensor. Then go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P1226 COMPLETED** ● Turn engine switch to OFF and ON (Engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1312

ZCF407018881W27

DTC P1312	Timer control valve circuit malfunction
DETECTION CONDITION	● PCM monitors difference voltage between target injection timing and actual injection timing while ECT is **above 80°C {176°F}** and engine running. If difference voltage is **above threshold** for **5 s**, PCM determines that injection timing control system is malfunctioning.
POSSIBLE CAUSE	● Connector or terminal malfunction ● Open circuit in wiring between injection pump connector A terminal C and PCM control relay terminal D ● Short to GND in wiring between injection pump connector A terminal B and PCM terminal 4U ● Open circuit in wiring between injection pump connector A terminal B and PCM terminal 4U ● TCV malfunction ● Injection pump (injection timing control) malfunction ● PCM malfunction



ZCF4070W201

Diagnostic procedure

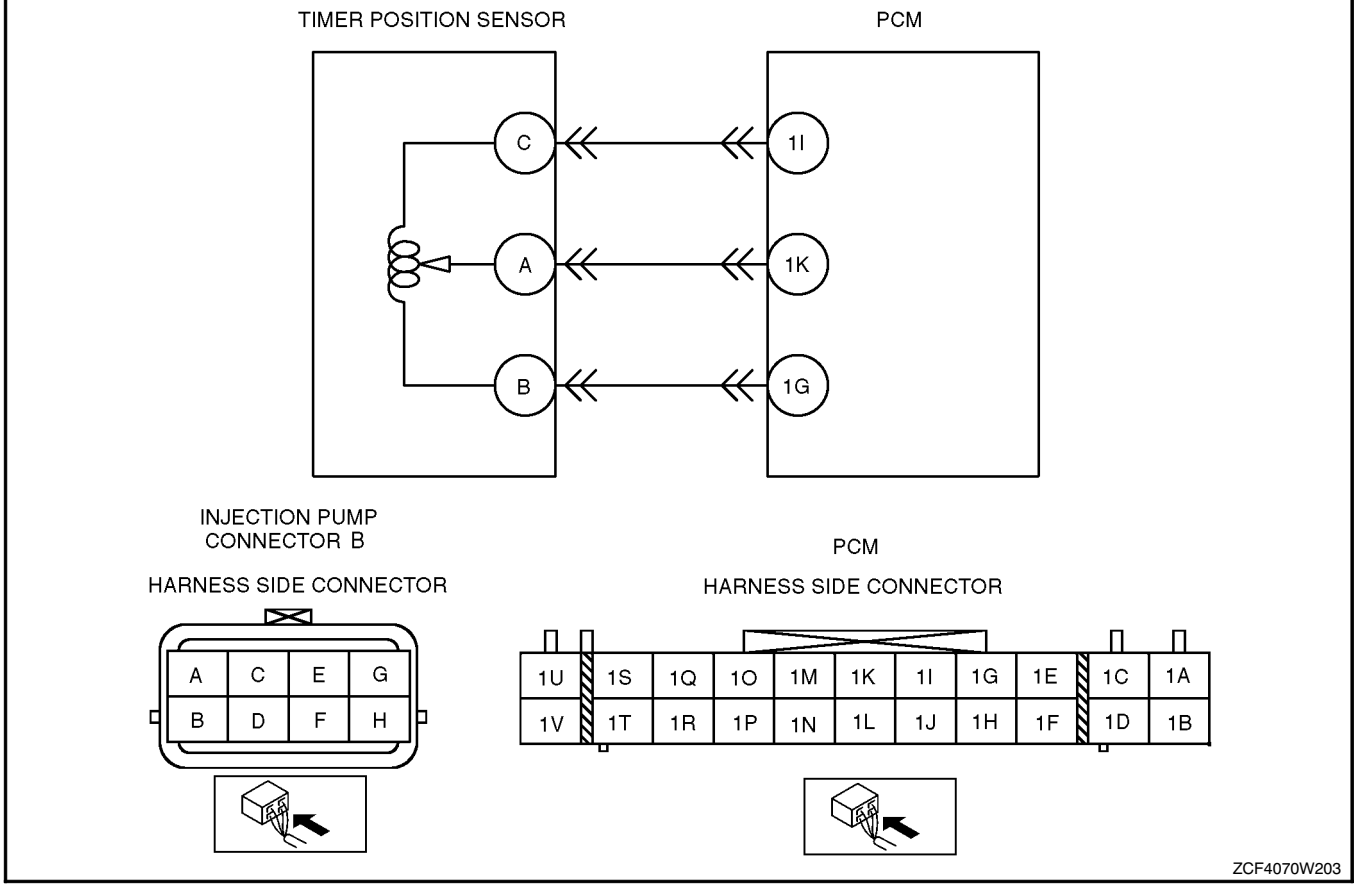
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY IF CURRENT INPUT SIGNAL STATUS–IS CONCERN INTERMITTENT OR CONSTANT?** ● Turn engine switch to ON (Engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Access ECT PID using WDS or equivalent. ● Wait until ECT PID is **above 80°C {176°F}**. ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING Procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**VERIFY OTHER DTC IS PRESENT** ● Is other DTC present?	Yes	Perform appropriate DTC troubleshooting procedure. (See F2–77 DTC TABLE) then go to Step 8.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT INJECTION PUMP CONNECTOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect injection pump connector A. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
5	**INSPECT TCV POWER CIRCUIT** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between injection pump connector A terminal C (harness–side) and body GND. ● Is voltage **B+**?	Yes	Go to next step.
		No	Repair or replace TCV power circuit for open, then go to Step 9.
6	**INSPECT TCV CONTROL CIRCUIT FOR SHORT TO GND** ● Turn engine switch to OFF. ● Check for continuity between injection pump connector A terminal C (harness–side) and body GND. ● Is there continuity?	Yes	Repair or replace TCV control circuit for short to GND, then go to Step 9.
		No	Go to next step.
7	**INSPECT PCM CONNECTOR POOR CONNECTION** ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
8	**INSPECT TCV CONTROL CIRCUIT FOR OPEN** ● Check for continuity between injection pump connector A terminal C (harness–side) and PCM terminal 4U (harness–side). ● Is there continuity?	Yes	Injection pump may have malfunction. Consult your distributor for inspection of injection pump. Go to next step.
		No	Repair or replace TCV control circuit for open, then go to next step.
9	**INSPECT TCV** ● Perform TCV Inspection. (SeeF2–54 TIMER CONTROL VALVE (TCV) INSPECTION) ● Is TCV okay?	Yes	Injection pump may have mechanical malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replacement of TCV. Then go to next step.
10	**VERIFY TROUBLESHOOTING OF DTC P1312 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Turn engine switch to ON (Engine OFF). ● Clear DTC from PCM memory using WDS or equivalent. ● Start engine. ● Access ECT PID using WDS or equivalent. ● Wait until ECT PID is **above 80˚C {176˚F}**. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
11	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1318

ZCF407018881W28

DTC P1318	Timer position sensor circuit malfunction
DETECTION CONDITION	● PCM monitors input voltage from timer position sensor. If input voltage from timer position sensor is **below 0.25 V** or **above 4.90 V**, PCM determines that timer position sensor circuit is malfunctioning.
POSSIBLE CAUSE	● Timer position sensor malfunction ● PCM malfunction ● Connector or terminal malfunction ● Open or short to ground circuit between timer position sensor terminal (injection pump connector B) A and PCM terminal 1K ● Open or short to ground circuit between timer position sensor terminal (injection pump connector B) C and PCM terminal 1I ● Open circuit between timer position sensor terminal (injection pump connector B) B and PCM terminal 1G



Diagnostic procedure

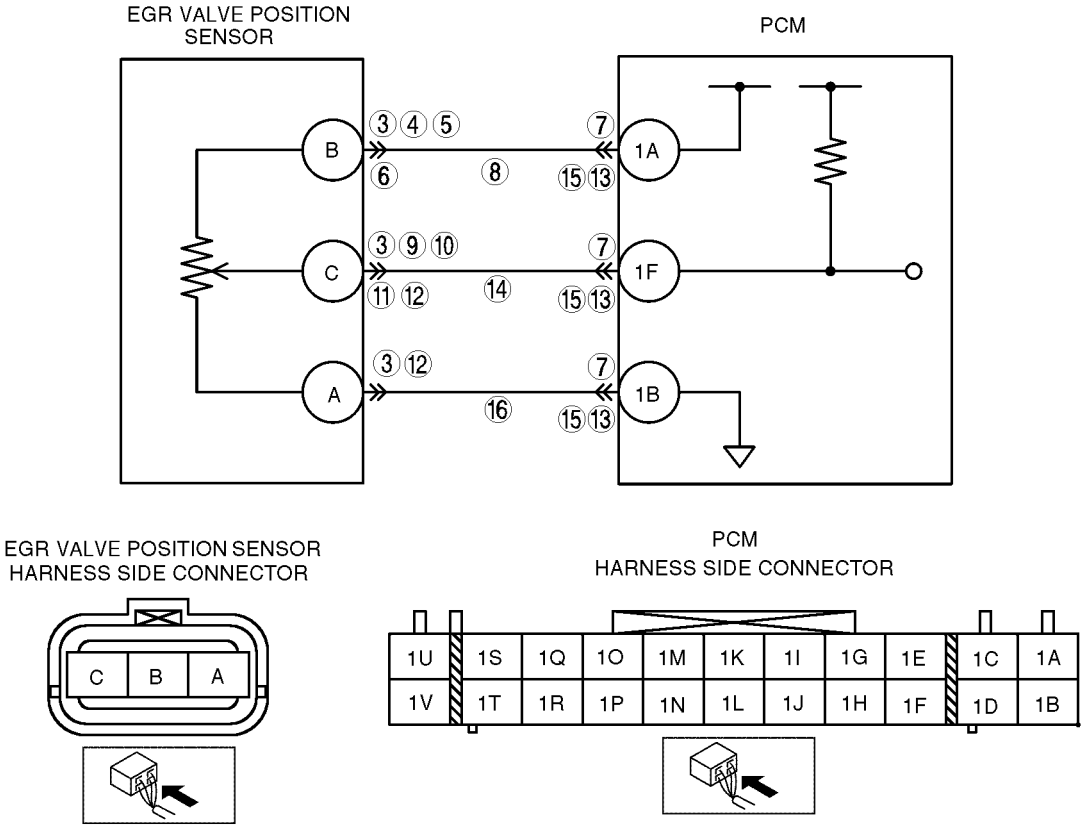
STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1318 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn engine switch to OFF, then start engine. ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT TIMER POSITION SENSOR CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect timer position sensor connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 8.
		No	Go to next step.
5	**INSPECT TIMER POSITION SENSOR CIRCUIT FOR SHORT TO GROUND** ● Inspect the following terminals for continuity: — Between injection pump connector B terminal A and body ground — Between injection pump connector B terminal C and body ground ● Is there continuity?	Yes	Repair or replace harness, then go to Step 8.
		No	Go to next step.
6	**INSPECT TIMER POSITION SENSOR CIRCUIT FOR OPEN** ● Inspect the following terminals for continuity: — Between injection pump connector B terminal A and PCM terminal 1K — Between injection pump connector B terminal C and PCM terminal 1I — Between injection pump connector B terminal B and PCM terminal 1G ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 8.
7	**INSPECT TIMER POSITION SENSOR** ● Perform timer position sensor inspection. (See F2–69 TIMER POSITION SENSOR INSPECTION) ● Is timer position sensor okay?	Yes	Injection pump may have a malfunction. Consult your distributor for inspection of injection pump. Then go to next step.
		No	Consult your distributor for replace of timer position sensor. Then go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P1318 COMPLETED** ● Turn engine switch to OFF and ON (Engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1402

ZCF407018881W29

DTC P1402	EGR valve position sensor circuit malfunction
DETECTION CONDITION	● If PCM detects EGR valve position sensor voltage at PCM terminal 1F **below 0.10 V** or **above 4.90 V** after engine start, PCM determines that EGR valve position circuit has a malfunction.
POSSIBLE CAUSE	● EGR valve position sensor malfunction ● Connector or terminal malfunction ● Open circuit between EGR valve position sensor terminal C and PCM terminal 1F. ● Short to ground circuit between EGR valve position sensor terminal C and PCM terminal 1F. ● Open circuit between EGR valve position sensor terminal B and PCM terminal 1A. ● Short to ground circuit between EGR valve position sensor terminal B and PCM terminal 1A. ● Open circuit between EGR valve position sensor terminal A and PCM terminal 1B ● Short to reference voltage (Vref) supply circuit between EGR valve position sensor terminal C and PCM terminal 1F ● PCM malfunction ● MAF sensor malfunction ● Electrical corrosion in EGR valve position signal circuit ● Voltage drops in ground circuit or reference voltage (Vref) supply circuit



ZCF4070W202

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY IF INTERMITTENT CONCERN OR CONTINUOUS CONCERN** ● Turn engine switch to OFF then ON (Engine OFF). ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern is existing. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)

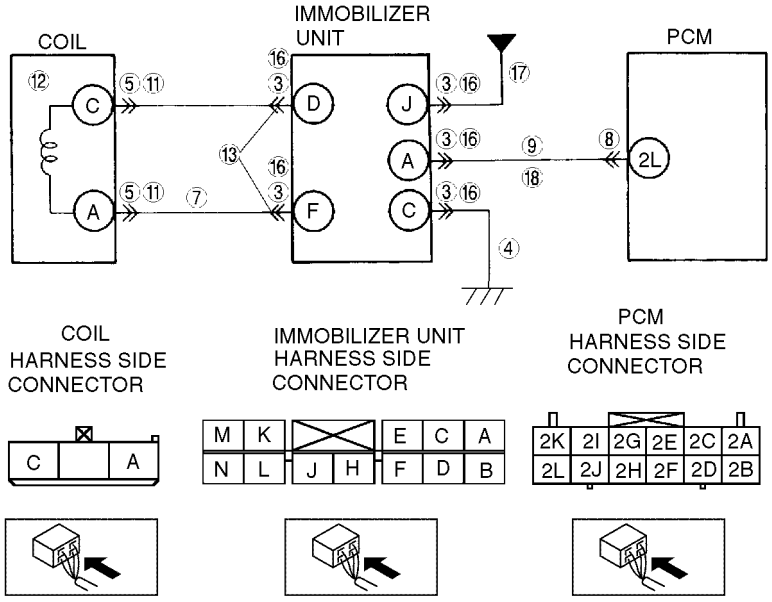
STEP	INSPECTION		ACTION
3	**INSPECT EGR VALVE POSITION SENSOR CONNECTOR** ● Turn engine switch to OFF. ● Disconnect EGR valve position sensor connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Are there any concerns?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
4	**CHECK POWER SUPPLY CIRCUIT VOLTAGE AT EGR VALVE POSITION SENSOR CONNECTOR** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between EGR valve position sensor terminal B (harness–side) and body ground. ● Is voltage **within 4.5— 5.5 V?**	Yes	Go to Step 9.
		No	● If voltage is **B+**, repair or replace shorted harness, then go to Step 18. ● If voltage is **approx. 0 V**, go to next step.
5	**INSPECT EGR VALVE POSITION SENSOR POWER SUPPLY CIRCUIT FOR SHORT TO GROUND** ● Check continuity between EGR valve position sensor terminal B (harness–side) and body ground. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
6	**INSPECT EGR VALVE POSITION SENSOR POWER SUPPLY AND GROUND CIRCUIT FOR SHORT TO EACH OTHER** ● Check continuity between EGR valve position sensor terminals B (harness–side) and A (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
7	**CHECK PCM CONNECTOR** ● Disconnect PCM connector. ● Check for poor connection at terminal 1A (damaged, pulled–out pins, corrosion, etc.). ● Is there any concern?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
8	**VERIFY EGR VALVE POSITION SENSOR POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** ● Check continuity between EGR valve position sensor terminal B (harness–side) and PCM terminal 1A (harness–side). ● Is there continuity?	Yes	Go to Step 18.
		No	Repair or replace suspected harness, then go to Step 18.
9	**CHECK SIGNAL CIRCUIT VOLTAGE AT EGR VALVE POSITION SENSOR CONNECTOR** ● Turn engine switch to ON (Engine OFF). ● Measure voltage between EGR valve position sensor terminal C (harness–side) and body ground. ● Is voltage **within 4.5— 5.5 V?**	Yes	Go to Step 15.
		No	● If voltage is **B+**, repair or replace shorted harness, then go to Step 18. ● If voltage is **approx. 0 V**, go to Step 11.
10	**INSPECT EGR VALVE POSITION SENSOR POWER SUPPLY AND SIGNAL CIRCUIT FOR SHORT TO EACH OTHER** ● Check continuity between EGR valve position sensor terminals B (harness–side) and C (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
11	**INSPECT EGR VALVE POSITION SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** ● Check continuity between EGR valve position sensor terminal C (harness–side) and body ground. ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.

STEP	INSPECTION		ACTION
12	**INSPECT EGR VALVE POSITION SENSOR SIGNAL AND GROUND CIRCUIT FOR SHORT EACH OTHER** ● Check continuity between EGR valve position sensor terminals C (harness–side) and A (harness–side). ● Is there continuity?	Yes	Repair or replace shorted harness, then go to Step 18.
		No	Go to next step.
13	**CHECK PCM CONNECTOR** ● Disconnect PCM connector. ● Check for poor connection at terminal 1F (damaged, pulled–out pins, corrosion, etc.). ● Is there any concern?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
14	**VERIFY EGR VALVE POSITION SENSOR SIGNAL CIRCUIT FOR OPEN CIRCUIT** ● Disconnect PCM connector. ● Check continuity between EGR valve position sensor terminal C (harness–side) and PCM terminal 1F (harness–side). ● Is there continuity?	Yes	Go to Step 18.
		No	Repair or replace suspected harness, then go to Step 18.
15	**CHECK PCM CONNECTOR** ● Disconnect PCM connector. ● Check for poor connection at terminal 1B (damaged, pulled–out pins, corrosion, etc.). ● Is there any concern?	Yes	Repair terminal, then go to Step 18.
		No	Go to next step.
16	**VERIFY EGR VALVE POSITION SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** ● Check continuity between EGR valve position sensor terminal A (harness–side) and PCM terminal 1B (harness–side). ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace suspected harness, then go to Step 18.
17	**INSPECT EGR VALVE POSITION SENSOR** ● Perform EGR valve position sensor inspection. (See section F2) ● Is EGR position sensor okay?	Yes	Go to next step.
		No	Replace EGR valve position sensor, then go to next step.
18	**VERIFY TROUBLESHOOTING OF DTC P1402 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Start engine. ● Clear DTC from PCM memory using WDS or equivalent. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
19	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

DTC P1602

ZCF407018881W30

DTC P1602	Immobilizer unit-PCM communication error
DETECTION CONDITION	● Command transmission from the PCM to the immobilizer unit exceeds limit. ● No response from immobilizer unit
POSSIBLE CAUSE	● Immobilizer unit malfunction ● Coil (immobilizer system) malfunction ● Key (transponder) malfunction ● PCM malfunction ● Open circuit in wiring between immobilizer unit terminal A and PCM terminal 2L ● Open circuit in wiring between immobilizer unit terminal C and body ground ● Open circuit in wiring between immobilizer unit terminal F and coil terminal A ● Open circuit in wiring between immobilizer unit terminal D and coil terminal C ● Short to ground circuit in wiring between immobilizer unit terminal A and PCM terminal 2L ● Short to ground circuit in wiring between immobilizer unit terminal F and coil terminal A ● Short to ground circuit in wiring between immobilizer unit terminal D and coil terminal C



ZCF4070W301

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY IF NO DTC DETECTED OR SOME DTC DETECTED** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF and ON (Engine OFF). ● Has DTC P1624 been detected?	Yes	Go to step 10.
		No	Go to next step.
3	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** ● Turn ignition key to OFF. ● Disconnect immobilizer unit connector. ● Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). ● Is there any malfunction?	Yes	Repair or replace terminals, then go to Step 19.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT GROUND CIRCUIT OF IMMOBILIZER UNIT FOR OPEN CIRCUIT** ● Measure resistance between immobilizer unit terminal C (harness–side) and body ground. ● Is there any continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, then go to Step 19.
5	**INSPECT COIL TERMINAL** ● Disconnect coil connector. ● Check for bent terminals. ● Is there any malfunction?	Yes	Repair or replace terminals, then go to Step 19.
		No	Go to next step.
6	**INSPECT COIL FOR SHORT CIRCUIT** ● Check continuity between coil terminal A (part–side) and body ground. ● Is there any continuity?	Yes	Replace coil, then go to Step 19.
		No	Go to next step.
7	**INSPECT COIL CIRCUIT FOR SHORT** ● Connect coil connector. ● Check continuity between immobilizer unit terminal F (harness–side) and body ground. ● Is there any continuity?	Yes	Repair or replace harness for short circuit, then go to Step 19.
		No	Go to next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Is there any malfunction?	Yes	Repair or replace harness, then go to Step 19.
		No	Go to next step.
9	**INSPECT COMMUNICATION LINE FOR OPEN CIRCUIT** ● Connect break out box with PCM disconnected. ● Measure continuity between immobilizer unit terminal A (harness–side) and PCM terminal 2L. ● Is there any continuity?	Yes	Go to step 19.
		No	Repair or replace harness for open circuit, then go to Step 19.
10	**CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTCS** ● Has DTC P1602 detected?	Yes	Go to Step 14.
		No	Go to next step.
11	**INSPECT COIL CONNECTOR FOR POOR CONNECTION** ● Disconnect coil connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Are there any malfunctions?	Yes	Repair or replace harness, then go to Step 19.
		No	Go to next step.
12	**INSPECT COIL FOR OPEN CIRCUIT** ● Disconnect coil connector. ● Measure resistance between coil terminals (part–side). ● Is there any continuity?	Yes	Go to next step.
		No	Replace coil, then go to Step 19.
13	**INSPECT COIL CIRCUIT FOR OPEN CIRCUIT** ● Connect coil connector. ● Measure the resistance between immobilizer connector F and D (harness–side). ● Is there any continuity?	Yes	Go to Step 19.
		No	Repair or replace harness for open circuit, then go to Step 19.
14	**CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTCS.** ● Has immobilizer unit DTC 03 detected?	Yes	Key has not transponder, change to registered key. Then go to Step 19.
		No	Go to next step.
15	**CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTCS.** ● Has immobilizer unit DTC 01 detected?	Yes	Key that using for ignition is not registered. Reprogram key or using another registered key, then go to next step. (See T–8 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No	Go to next step.

STEP	INSPECTION		ACTION
16	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** ● Turn ignition key to OFF. ● Disconnect immobilizer unit connector. ● Check for poor connection (damaged, pulled–out terminals, corrosion, etc.). ● Are there any malfunctions?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
17	**INSPECT IMMOBILIZER UNIT POWER CIRCUIT FOR OPEN CIRCUIT** ● Turn ignition key to ON (Engine OFF). ● Measure voltage between immobilizer connector J (harness–side) and body ground. ● Is there voltage **B+**?	Yes	Go to next step.
		No	Repair or replace harness for open circuit, then go to Step 19.
18	**INSPECT COMMUNICATION LINE FOR SHORT HARNESS** ● Measure resistance between immobilizer unit terminal A (harness–side) and body ground. ● Is there any continuity?	Yes	Repair or replace harness for short, then go to next step.
		No	Go to next step.
19	**VERIFY TROUBLESHOOTING OF DTC P1602 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
20	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1603

ZCF407018881W31

DTC P1603	Code word is not registered in PCM
DETECTION CONDITION	● Code word is not registered in PCM.
POSSIBLE CAUSE	● Immobilizer system reprogram procedure (code word) was not performed after replacing PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1603 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Perform code word reprogram procedure. (See T–8 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No	Go to next step.
3	**VERIFY TROUBLESHOOTING OF DTC P1603 COMPLETED** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
4	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1604

ZCF407018881W32

DTC P1604	Key ID numbers are not registered in PCM
DETECTION CONDITION	● Key ID numbers are not registered in PCM.
POSSIBLE CAUSE	● Immobilizer system reprogram procedure (key IDs) was not performed after replacing PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1604 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Perform key ID number reprogram procedure. (See T–8 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No	Go to next step.
3	**VERIFY TROUBLESHOOTING OF DTC P1604 COMPLETED** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
4	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1621

ZCF407018881W33

DTC P1621	Code word does not match after engine cranking
DETECTION CONDITION	● Code word stored in PCM and immobilizer unit does not match
POSSIBLE CAUSE	● Immobilizer system reprogram procedure (code word) was not performed correctly after replacing immobilizer unit or PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1621 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Perform code word reprogram procedure. (See T–8 IMMOBILIZER SYSTEM REPROGRAM PROCEDURE)
		No	Go to next step.
3	**VERIFY TROUBLESHOOTING OF DTC P1621 COMPLETED** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
4	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1622

ZCF407018881W34

DTC P1622	Key ID number does not match
DETECTION CONDITION	● ID number stored in immobilizer unit (IU) and PCM does not match. This DTC is indicated only after immobilizer unit is replaced and reprogramming system.
POSSIBLE CAUSE	● Transformation of key ID number stored in PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1622 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Go to next step.
		No	Go to Step 4.
3	**CHECK IF ENGINE STARTS NORMALLY USING ANOTHER REGISTERED KEY** ● Does engine start with another registered key?	Yes	Previous key is defective. Discard it.
		No	Go to next step.
4	**VERIFY TROUBLESHOOTING OF DTC P1622 COMPLETED** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
5	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1623

ZCF407018881W35

DTC P1623	Code word or key ID number read/write error in PCM
DETECTION CONDITION	● PCM internal EEPROM damaged.
POSSIBLE CAUSE	● PCM internal EEPROM damaged.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1623 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1624

ZCF407018881W36

DTC P1624	Immobilizer system communication counter = 0
DETECTION CONDITION	● PCM detected immobilizer system communication malfunction three times or more
POSSIBLE CAUSE	● Attempted to start engine three times or more under malfunction. ● Code word mismatch

Diagnostic procedure

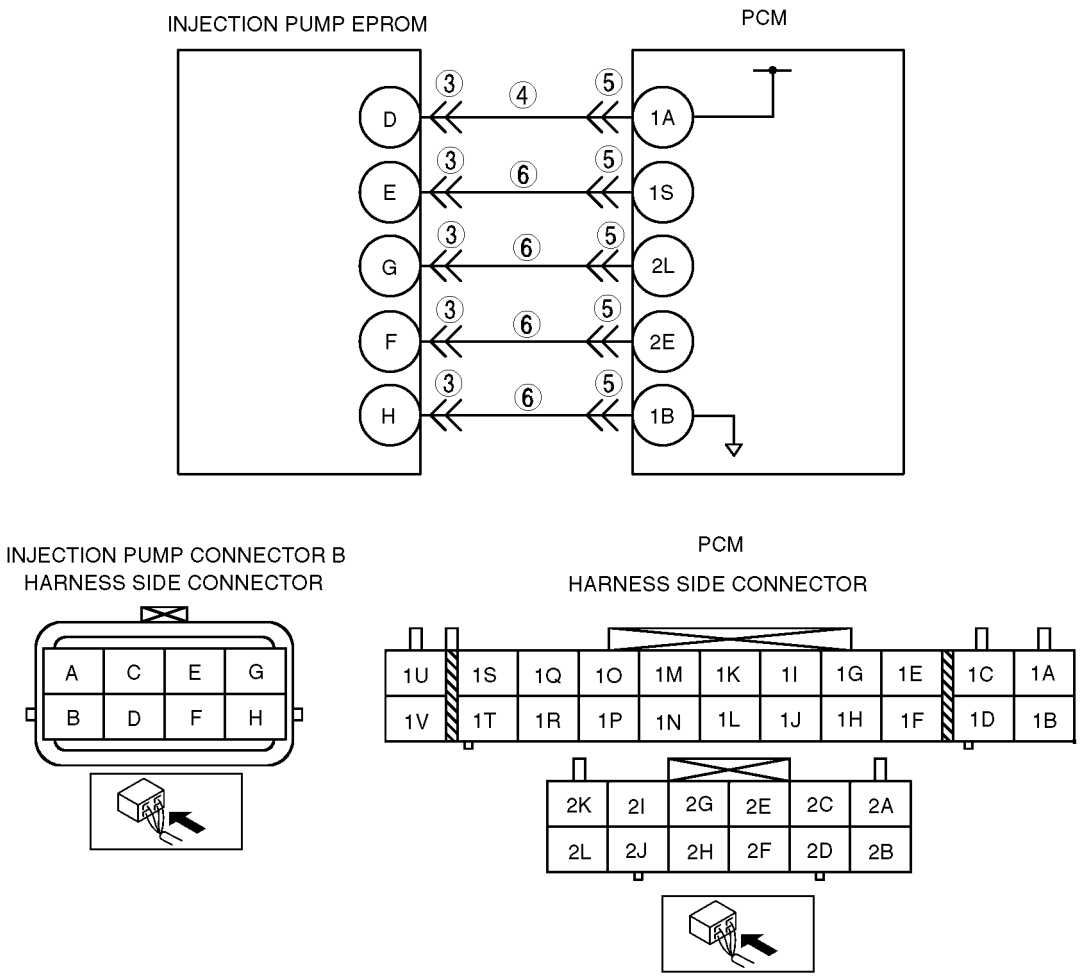
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any repair information available?	Yes	Perform repair or diagnosis according to available repair information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** ● Turn ignition key to OFF and to START. ● Has P1602 been detected?	Yes	Go to DTC P1602 inspection. (See F2–120 DTC P1602.)
		No	Go to next step.
3	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** ● Has P1621 been detected?	Yes	Go to DTC P1621 inspection. (See F2–123 DTC P1621.)
		No	Go to next step.
4	**VERIFY TROUBLESHOOTING OF DTC P1624 COMPLETED** ● Make sure to reconnect all disconnected connectors. ● Clear DTC from memory using WDS or equivalent. ● Turn ignition key to OFF, then start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
5	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “After Repair Procedure” (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE.)
		No	Troubleshooting completed.

DTC P1649

ZCF407018881W37

DTC P1649	Injection pump EPROM circuit malfunction
DETECTION CONDITION	● If PCM cannot access to injection pump EPROM, PCM determines that the injection pump EPROM circuit has malfunction.
POSSIBLE CAUSE	● Injection pump EPROM malfunction ● PCM malfunction ● Connector or terminal malfunction ● Open circuit between injection pump EPROM terminal (injection pump connector B) D and PCM terminal 1A ● Open or short to ground circuit between injection pump EPROM terminal (injection pump connector B) F and PCM terminal 2E ● Open or short to ground circuit between injection pump EPROM terminal (injection pump connector B) G and PCM terminal 2L ● Open or short to ground circuit between injection pump EPROM terminal (injection pump connector B) E and PCM terminal 1S ● Open circuit between injection pump EPROM terminal (injection pump connector B) H and PCM terminal 1B

DTC P1649	Injection pump EPROM circuit malfunction



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** ● Check for related Service Information availability. ● Is any related Service Information available?	Yes	Perform repair or diagnosis according to Service Information. ● If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P1649 DETECTED AGAIN** ● Clear DTC from memory using WDS or equivalent. ● Turn engine switch to OFF, then start engine. ● Is same DTC present?	Yes	Go to next step.
		No	Intermittent concern exists. Go to INTERMITTENT CONCERN TROUBLESHOOTING procedure. (See F2–128 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT INJECTION PUMP EPROM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect injection pump EPROM connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
4	**INSPECT INJECTION PUMP EPROM POWER CIRCUIT FOR OPEN CIRCUIT** ● Measure voltage between injection pump connector B terminal D (harness–side) and body GND. ● Is voltage **approx. 5V**?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 9.

STEP	INSPECTION		ACTION
5	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** ● Turn engine switch to OFF. ● Disconnect PCM connector. ● Check for poor connection (damaged, pulled–out pins, corrosion, etc.). ● Is there a malfunction?	Yes	Repair or replace terminal, then go to Step 9.
		No	Go to next step.
6	**INSPECT INJECTION PUMP EPROM CIRCUIT FOR SHORT TO GND** ● Inspect the following terminals for continuity: — Between injection pump connector B terminal F and body ground — Between injection pump connector B terminal G and body ground — Between injection pump connector B terminal E and body ground ● Is there continuity?	Yes	Repair or replace harness, then go to Step 9.
		No	Go to next step.
7	**INSPECT INJECTION PUMP EPROM CIRCUIT FOR OPEN CIRCUIT** ● Inspect the following terminals for continuity: — Between injection pump connector B terminal F and PCM terminal 2E — Between injection pump connector B terminal G and PCM terminal 2L — Between injection pump connector B terminal E and PCM terminal 1S — Between injection pump connector B terminal H and PCM terminal 1B ● Is there continuity?	Yes	Go to next step.
		No	Repair or replace open harness, then go to Step 9.
8	**INSPECT INJECTION PUMP EPROM** ● Perform injection pump EPROM inspection. (See F2–69 INJECTION PUMP EPROM INSPECTION) ● Is injection pump EPROM okay?	Yes	Injection pump may have a malfunction. Consult your distributer for inspection of injection pump. Then go to next step.
		No	Consult your distributer for replace of injection pump EPROM. Then go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P1649 COMPLETED** ● Turn engine switch to OFF and ON (Engine OFF). ● Clear DTC from memory using WDS or equivalent. ● Start engine. ● Is same DTC present?	Yes	Replace PCM, then go to next step.
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** ● Perform “AFTER REPAIR PROCEDURE”. (See Section F2) ● Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–77 DTC TABLE)
		No	Troubleshooting completed.

TROUBLESHOOTING

FORWORD

ZCF408018881W01

- Before proceeding with the following troubleshooting:
  - —See Section GI to understand the basic troubleshooting procedure.
  - —Perform the DTC inspection.
  - —If a DTC is displayed, proceed with inspection steps for the code.
  - —When the engine can be started, perform "ENGINE TUNE–UP." (See F2–47 ENGINE TUNE–UP.)

INTERMITTENT CONCERN TROUBLESHOOTING

ZCF408018881W02

Vibration Method

- If malfunction occurs or becomes worse while driving on a rough road or when engine is vibrating, perform the steps below.

Note

- There are several reasons vehicle or engine vibration could cause an electrical malfunction. Some of the things to check for are:
  - — Connectors not fully seated.
  - — Wire harnesses not having full play.
  - — Wires laying across brackets or moving parts.
  - — Wires routed too close to hot parts.
- An improperly routed, improperly clamped, or loose harness can cause wiring to become pinched between parts.
- The connector joints, points of vibration, and places where wire harnesses pass through the fire wall, body panels, etc. are the major areas to be checked.

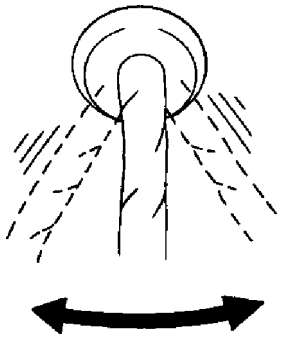
Inspection Method for Switch Connectors or Wires

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Turn switch on manually.
5. Shake each connector or wire harness a bit vertically and horizontally while monitoring the PID.
   - If PID value is unstable, check for poor connection.



Y3U103WN3

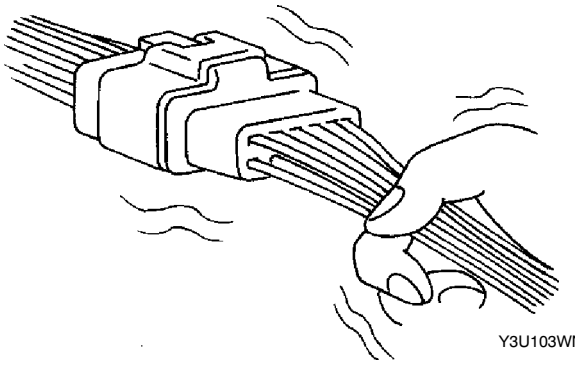
Inspection Method for Sensor Connectors or Wires

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Shake each connector or wire harness a bit vertically and horizontally while monitoring the PID.
   - If PID value is unstable, check for poor connection.



Y3U103WN4

Inspection Method for Sensors

1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for the switch you are inspecting.
4. Vibrate the sensor slightly with your finger.
   - If PID value is unstable or malfunction occurs, check for poor connection and/or poorly mounted sensor.

Inspection Method for Actuators or Relays

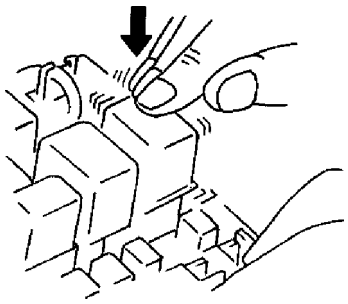
1. Connect **SSTs** (WDS or equivalent) to DLC.
2. Turn engine switch to ON (Engine OFF).

Note

- If engine starts and runs, perform the following steps at idle.

3. Prepare the SIMULATION TEST for actuators or relays that you are inspecting.

4. Vibrate the actuator or relay with your finger for **3 s** after SIMULATION TEST is activated.
   - If variable click sound is heard, check for poor connection and/or poorly mounted actuator or relay.



Y3U103WN5

Note
- Vibrating relays too strongly may result in open relays.

Water Sprinkling Method
If malfunction occurs only during high humidity or rainy/snowy weather, perform the following steps.

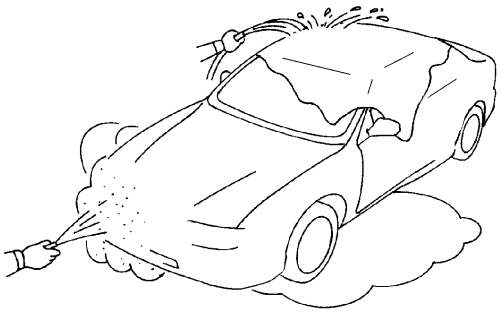
Caution
- **Indirectly change the temperature and humidity by spraying water onto the front of the radiator.**
- **If a vehicle is subject to water leakage, the leakage may damage the control module.**

When testing a vehicle with a water leakage problem, special caution must be used.

1. Connect **SSTs** (WDS or equivalent) to DLC if you are inspecting sensors or switches.
2. Turn engine switch to ON (Engine OFF).

Note
- If engine starts and runs, perform the following steps at idle.

3. Access PIDs for sensor or switch if you are inspecting sensors or switches.
4. If you are inspecting the switch, turn it on manually.
5. Spray water onto the vehicle or run it through a car wash.
   - If PID value is unstable or malfunction occurs, repair or replace part as necessary.



Y3U103WTJ

TROUBLESHOOTING ITEM TABLE

ZCF408018881W03

- Confirm trouble symptom using the following diagnostic index, then go to appropriate troubleshooting chart.

No.	TROUBLESHOOTING ITEM		DESCRIPTION
1	Melting of main or other fuses		Starter does not work.
2	Will not crank		Starter does not work.
3	Hard to start/long crank/erratic start/erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking time before starting.
4	Engine stalls.	After start/at idle	Engine stops unexpectedly at idle and/or after start.
5	Cranks normally but will not start		Starter cranks engine at normal speed but engine will not run.
6	Slow return to idle/fast idle		Engine takes more time than normal to return to idle speed. Engine speed continues at fast idle after warm−up.
7	Engine runs rough/rolling idle		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively. Idle speed is too slow and engine shakes excessively.
8	Runs on		Engine runs after engine switch is turned off.
9	Engine stalls/quits.	Acceleration/cruise	Engine stops unexpectedly at beginning of acceleration, during acceleration or while cruising.
	Engine runs rough.	Acceleration/cruise	Engine speed fluctuates during acceleration or cruising.
	Misses	Acceleration/cruise	Engine misses during acceleration or cruising.
	Buck/jerk	Acceleration/cruise/ deceleration	Vehicle bucks/jerks during acceleration, cruising, or deceleration.
	Hesitation/stumble	Acceleration	Momentary pause at beginning of acceleration or during acceleration
	Surges	Acceleration/cruise	Momentary minor irregularity in engine output
10	Lack/loss of power	Acceleration/cruise	Performance is poor under load (e.g., power down when climbing hills).

No.	TROUBLESHOOTING ITEM		DESCRIPTION
11	Poor fuel economy		Fuel economy is unsatisfactory.
12	High oil consumption/leakage		Oil consumption is excessive.
13	Cooling system concerns	Overheating	Engine runs at higher than normal temperature/overheats.
14	Cooling system concerns	Runs cold	Engine does not reach normal operating temperature.
15	Excessive black smoke		Excessive black smoke is observed in exhaust gas.
16	Engine noise		Engine noise from under hood
17	Vibration concerns (engine)		Vibration from under hood or drive line
18	A/C does not work sufficiently.		A/C does not work sufficiently.
19	A/C is always on or A/C compressor runs continuously.		A/C compressor magnetic clutch does not disengage.
20	Intermittent concerns		Intermittent concerns
21	Constant voltage		Incorrect constant voltage

QUICK DIAGNOSIS CHART

ZCF408018881W04

×: Applicable

Troubleshooting item \ Possible factor			Starter motor malfunction (Mechanical or electrical)	Starter circuit including engine switch open	Improper engine oil level	Low or dead battery	Charging system malfunction	Improper engine compression	Improper valve timing	Hydrolocked engine	Improper engine oil viscosity	Improper dipstick	Base engine malfunction	Flywheel is seized.	Turbocharger malfunction	Improper tension or damaged drive belts	Improper engine coolant level	Water and anti-freeze mixture is improper.	Cooling system malfunction (including thermostat)	Cooling fan system malfunction	Engine or transmission mounts are improperly installed.	Condenser fan or cooling fan malfunction	Fuel quality
1	Melting of main or other fuses																						
2	Will not crank		×	×		×	×			×			×	×										
3	Hard to start/long crank/erratic start/ erratic crank		×	×				×	×				×											×
4	Engine stalls.	After start/at idle						×	×				×											×
5	Cranks normally but will not start							×	×				×											×
6	Slow return to idle/fast idle																		×					
7	Engine runs rough/rolling idle							×	×				×											×
8	Runs on																							
9	Engine stalls/quits.	Acceleration/ cruise						×	×				×		×									
	Engine runs rough.	Acceleration/ cruise						×	×				×		×									
	Misses	Acceleration/ cruise						×	×				×		×									
	Buck/jerk	Acceleration/ cruise/ deceleration						×	×				×		×									
	Hesitation/stumble	Acceleration						×	×				×		×									
	Surges	Acceleration/ cruise						×	×				×		×									
10	Lack/loss of power	Acceleration/ cruise						×	×				×		×									
11	Poor fuel economy							×	×				×		×		×		×					×
12	High oil consumption/leakage				×			×			×	×	×		×									
13	Cooling system concerns	Overheating											×			×	×	×	×	×		×		
14	Cooling system concerns	Runs cold																	×	×		×		
15	Excessive black smoke							×	×				×											
16	Engine noise								×				×		×	×								
17	Vibration concerns (engine)															×					×	×		
18	A/C does not work.																							
19	A/C is always on or A/C compressor runs continuously.																							
20	Intermittent concerns																			×				
21	Constant voltage																							

Y6E4080W002

×: Applicable

	Troubleshooting item / Possible factor		Engine overheating	Air cleaner element clogging or restriction	intake-air system restriction	Air leakage from intake-air system (Loose tubes, cracks, gaskets breakage)	Incorrect idle speed	Incorrect injection timing	Injection pump malfunction	Fuel filter restriction or clogging	Fuel system restriction	Injection nozzle and/or gasket malfunction	Fuel leakage from fuel system	Restriction in exhaust system	EGR system malfunction	Intake shutter valve malfunction	PCM control relay malfunction	Pump speed sensor	Boost sensor malfunction	MAF/IAT sensor malfunction	Idle switch malfunction	Accelerator position sensor malfunction	ECT sensor malfunction
1	Melting of main or other fuses																						
2	Will not crank																						
3	Hard to start/long crank/erratic start/ erratic crank				×		×	×	×	×	×	×	×	×	×								×
4	Engine stalls.	After start/at idle	×		×		×	×	×	×	×	×	×		×		×	×		×	×	×	×
5	Cranks normally but will not start				×			×	×	×	×	×	×		×		×	×		×			×
6	Slow return to idle/fast idle						×	×															
7	Engine runs rough/rolling idle		×		×		×	×	×	×	×	×	×		×					×	×	×	×
8	Runs on																						
9	Engine stalls/quits.	Acceleration/ cruise	×	×	×	×	×	×	×	×	×	×		×	×			×	×	×	×	×	×
	Engine runs rough.	Acceleration/ cruise	×	×	×	×	×	×	×	×	×	×		×	×			×	×	×	×	×	×
	Misses	Acceleration/ cruise	×	×	×	×	×	×	×	×	×	×		×	×			×	×	×	×	×	×
	Buck/jerk	Acceleration/ cruise/ deceleration	×	×	×	×	×	×	×	×	×	×		×	×			×	×	×	×	×	×
	Hesitation/stumble	Acceleration	×	×	×	×	×	×	×	×	×	×		×	×			×	×	×	×	×	×
	Surges	Acceleration/ cruise	×	×	×	×	×	×	×	×	×	×		×	×			×	×	×	×	×	×
10	Lack/loss of power	Acceleration/ cruise	×	×	×	×	×	×	×	×	×	×		×	×	×			×	×	×	×	×
11	Poor fuel economy			×			×	×	×			×	×	×	×				×				×
12	High oil consumption/leakage																						
13	Cooling system concerns	Overheating	×												×								×
14	Cooling system concerns	Runs cold																					
15	Excessive black smoke			×				×	×			×			×	×			×	×			×
16	Engine noise							×	×			×			×								×
17	Vibration concerns (engine)																						
18	A/C does not work.																						
19	A/C is always on or A/C compressor runs continuously.																						
20	Intermittent concerns							×							×		×	×	×	×		×	×
21	Constant voltage																						

ZCF4080W001

×: Applicable

	Troubleshooting item / Possible factor		IAT sensor No.2 malfunction	VSS malfunction	Improper starting signal	TDC sensor malfunction	A/C switch malfunction	Glow system malfunction	Injection pump EPROM malfunction	Fuel temperature sensor malfunction	TCV malfunction	FSO solenoid and/or relay malfunction	Neutral switch malfunction	Immobilizer system activation	A/C system malfunction (including improper refrigerant amount)	Clutch slippage	Brake dragging	Loose parts	Improper balance of wheels & tires	Drive line malfunction	Suspension malfunction
1	Melting of main or other fuses																				
2	Will not crank																				
3	Hard to start/long crank/erratic start/ erratic crank				×	×		×	×		×										
4	Engine stalls.	After start/at idle	×	×	×	×		×		×	×	×		×	×						
5	Cranks normally but will not start				×			×			×	×		×							
6	Slow return to idle/fast idle										×										
7	Engine runs rough/rolling idle		×	×		×		×		×	×		×		×						
8	Runs on											×									
9	Engine stalls/quits.	Acceleration/ cruise	×			×	×	×		×	×				×	×					
	Engine runs rough.	Acceleration/ cruise	×			×	×	×		×	×				×	×					
	Misses	Acceleration/ cruise	×			×	×	×		×	×				×	×					
	Buck/jerk	Acceleration/ cruise/ deceleration	×			×	×	×		×	×				×	×					
	Hesitation/stumble	Acceleration	×			×	×	×		×	×				×	×					
	Surges	Acceleration/ cruise	×			×	×	×		×	×				×	×					
10	Lack/loss of power	Acceleration/ cruise				×	×		×	×	×	×			×	×	×				
11	Poor fuel economy					×				×							×				
12	High oil consumption/leakage																				
13	Cooling system concerns	Overheating					×								×						
14	Cooling system concerns	Runs cold																			
15	Excessive black smoke		×			×	×		×	×	×										
16	Engine noise		×							×								×			
17	Vibration concerns (engine)																	×	×	×	×
18	A/C does not work.						×								×						
19	A/C is always on or A/C compressor runs continuously.						×								×						
20	Intermittent concerns		×	×		×	×	×	×	×	×	×	×								
21	Constant voltage																				

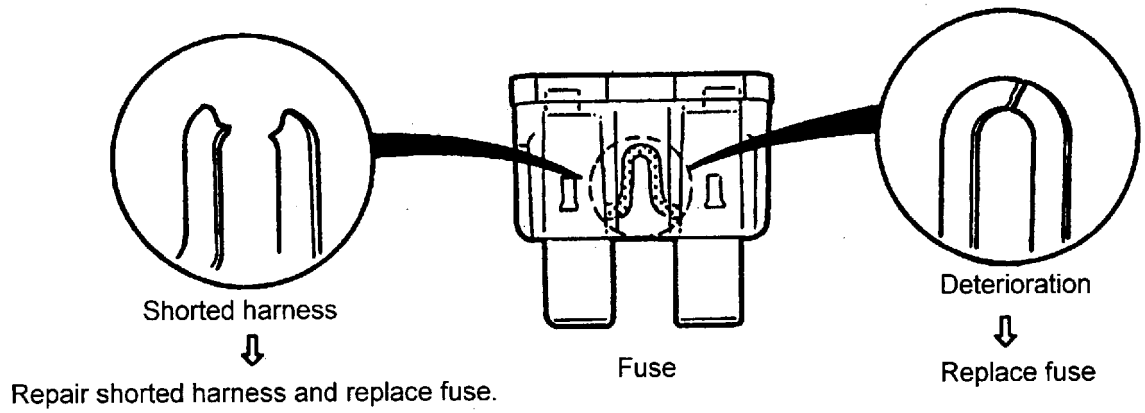
ZCF4080W002

NO.1 MELTING OF MAIN OR OTHER FUSES

ZCF408018881W05

1	Melting of main or other fuses

[TROUBLESHOOTING HINTS]
Inspect condition of fuse.



Y6E4080W001

Damaged fuse	Related wiring harness
MAIN (80 A)	**MAIN fuse** ● Generator ● Engine switch — ENG fuse ● Blower relay — Blower fan motor ● A/C relay — Refrigerant pressure switch ● FIP fuse
BTN (30 A)	**BTN fuse** ● ROOM fuse
GLOW (60 A)	**GLOW fuse** ● Glow plug relay — Glow plug
ENG (15 A)	**ENG fuse** ● PCM
FIP (15 A)	**FIP fuse** ● PCM control relay — PCM
ROOM (10 A)	**ROOM fuse** ● PCM

NO.2 WILL NOT CRANK

ZCF408018881W06

2	Will not crank
DESCRIPTION	● Starter does not work.
POSSIBLE CAUSE	● Open starter circuit between battery and starter through engine switch ● Starter malfunction ● Seized/hydrolocked engine or flywheel

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Verify following: — Battery connection — Battery condition — Fuses ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.

STEP	INSPECTION		ACTION
2	● Is clicking sound heard from starter when engine switch is turned to START?	Yes	Go to next step.
		No	Go to Step 6.
3	● Do any other electrical accessories work?	Yes	Go to next step.
		No	Inspect charging system. (See Section G)
4	● Disconnect battery negative cable. ● Disconnect engine switch and starter connectors. ● Inspect for electrical connections, loose wire, bent or corroded terminals. ● Inspect for continuity on following circuits — Engine switch and starter — Battery cable and starter magnetic switch ● Are all circuits okay?	Yes	Go to next step.
		No	Repair or replace open circuits.
5	● Inspect engine switch. (See Section T) ● Are all circuits okay?	Yes	Go to next step.
		No	Replace engine switch.
6	● Inspect starting system. (See section G) ● Is starting system okay?	Yes	Inspect for seized/hydrolocked engine, flywheel or drive plate. (See Section H)
		No	Repair or replace components as required.
7	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.3 HARD TO START/LONG CRANK/ERRATIC START/ERRATIC CRANK

ZCF408018881W07

3	Hard to start/long crank/erratic start/erratic crank
DESCRIPTION	● Starter cranks engine at normal speed but engine requires excessive cranking time before start. ● Battery is in normal condition.
POSSIBLE CAUSE	● Poor fuel quality ● Starting system malfunction ● Intake−air system restriction ● Incorrect idle speed ● Engine overheating ● Glow system malfunction ● Fuel filter clogging ● Fuel line restriction ● Fuel leakage ● Exhaust system restriction ● Incorrect fuel injection timing ● Injection pump malfunction ● Injection nozzle malfunction ● Low engine compression ● Injection pump EPROM malfunction ● EGR system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Inspect for following: — Fuel quality including water contamination — Fuel line/fuel filter clogging — Intake−air system restriction ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	● Is engine overheating?	Yes	Go to symptom troubleshooting “NO.13 COOLING SYSTEM CONCERNS−OVERHEATING.”
		No	Go to next step.
3	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON position. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.

STEP	INSPECTION		ACTION
4	● Does engine start normally after warm−up?	Yes	Inspect glow plug and glow plug relay. (SeeF2−50 GLOW PLUG INSPECTION) (See Section F2) Replace any malfunctioning part as necessary. If glow system is okay, go to next step.
		No	Go to next step.
5	● Is idle speed correct?	Yes	Go to next step.
		No	Adjust idle speed. (See F2−47 ENGINE TUNE−UP)
6	● Is there any restriction in exhaust system?	Yes	Repair or replace as necessary.
		No	Go to next step.
7	● Inspect for fuel leakage from fuel pipe. ● Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
8	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 10.
		No	Go to next step.
9	● Inspect timing belt for following: — Chipping of gear teeth — Breakage, damage or cracks — Low tension ● Is timing belt okay?	Yes	Inspect for following: ● Burnt valve ● Worn piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve stem or valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing If timing belt is not okay, replace timing belt.
10	● Inspect injection timing. ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2−54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
11	● Remove and injection nozzle for following: — Clogged nozzle — Faulty nozzle gasket — Incorrect valve opening pressure ● Is injection nozzle okay?	Yes	Inspect following: ● Starting signal (PCM terminal 1U) If okay, remove and inspect injection pump.
		No	Repair or replace injection nozzle.
12	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.4 ENGINE STALLS-AFTER START/AT IDLE

ZCF408018881W08

4	Engine stalls—after start/at idle
DESCRIPTION	● Engine stops unexpectedly at idle and/or after start.
POSSIBLE CAUSE	● Poor fuel quality ● Intake−air system restriction ● Incorrect idle speed ● Engine overheating ● A/C system improper operation ● Immobilizer system activation or malfunction ● FSO solenoid malfunction ● PCM control relay malfunction ● Glow system malfunction ● Fuel leakage ● Fuel line restriction ● Fuel filter clogging ● Incorrect fuel injection timing ● Injection pump malfunction ● Injection nozzle malfunction ● Low engine compression ● EGR system malfunction ● MAF/IAT sensor malfunction ● IAT sensor N0.2 malfunction ● VSS malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**Note** ● Following test should be performed on vehicles with immobilizer system. ● Go to Step 12 for vehicles without immobilizer system. ● Connect WDS or equivalent to DLC. ● Do following conditions appear? — Engine is not completely started — DTC P1624 is displayed	Yes	**Both conditions appear:** ● Go to Step 4.
		No	**Either or other condition appear:** ● Go to next step.
2	● Does engine stall **approx. 2 s** after engine is started?	Yes	Go to next step.
		No	Immobilizer system is okay. Go to Step 12.
3	● Is immobilizer unit connector securely connected to immobilizer unit?	Yes	Go to next step.
		No	Connect immobilizer unit connector securely. Return to Step 2.
4	● Does immobilizer indicator light flash and indicate any of following immobilizer system DTCs? — **DTC: 01, 02, 03, 11, 21**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See T–16 DTC TABLE)
		No	Go to next step.
5	● Does immobilizer indicator light illuminate?	Yes	Go to Step 8.
		No	Go to next step.
6	● Does immobilizer indicator light flash and indicate following immobilizer system DTC **more than 135 s** after engine switch is turned to ON? — **DTC: 24, 30**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See T–16 DTC TABLE)
		No	Go to next step.
7	● Turn engine switch to OFF. ● Disconnect immobilizer unit connector. ● Connect jumper wire between immobilizer unit connector terminal M and GND. ● Turn engine switch to ON. ● Does immobilizer indicator light illuminate?	Yes	Reconnect immobilizer unit connector. Go to next step.
		No	Inspect for open circuit between immobilizer unit connector terminal M and instrument cluster. If okay, inspect immobilizer indicator light bulb. Repair or replace if necessary. Reconnect immobilizer unit connector, then return to Step 4.
8	● Connect WDS or equivalent to DLC and retrieve DTC. ● Is any of following DTC displayed? — **DTC: P1602, P1603, P1604, P1621, P1622, P1624**	Yes	Go to appropriate DTC test.
		No	Go to next step.
9	● Disconnect accelerator position sensor connector. ● Inspect continuity between GND terminal at accelerator position sensor vehicle harness connector and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Access PCM connector. Inspect for continuity between PCM connector 4A and 4B terminals and body GND. Repair or replace as necessary.
10	● Turn engine switch to ON. ● Access B+ PID. ● Is B+ PID okay? **B+ PID** **Battery positive voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
11	● Disconnect immobilizer unit connector. ● Turn engine switch to ON. ● Is there battery voltage at immobilizer unit connector terminal J?	Yes	Inspect for open circuit between PCM connector terminal 2I and immobilizer unit connector terminal A.
		No	Repair or replace wiring harness between immobilizer unit connector terminal J and fuse panel.

STEP	INSPECTION		ACTION
12	● Inspect for following: — Fuel quality including water contamination — Fuel line restriction — Loose bands on intake−air system — Cracks on intake−air system parts — Intake−air system restriction ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 12.
13	● Is engine overheating?	Yes	Go to symptom troubleshooting “NO.13 COOLING SYSTEM CONCERNS−OVERHEATING.”
		No	Go to next step.
14	**Note** ● Ignore DTC P0120 while performing this test. ● Disconnect accelerator position sensor connector. ● Measure voltage at accelerator position sensor connector VREF terminal with engine switch ON. **Specification** **4.5—5.5 V** ● Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting “NO.21 CONSTANT VOLTAGE.”
15	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test. **Communication error message is displayed:** ● Inspect for following: — Open circuit between PCM control relay and PCM terminal 4C — Open PCM control relay GND circuit — PCM control relay is stuck open — Open PCM GND circuit (terminal 4A or 4B) — Poor connection of vehicle body GND
		No	**No DTC is displayed:** ● Go to next step.
16	● Does engine run normal after warm−up?	Yes	Go to next step.
		No	Go to Step 18.
17	● Inspect for glow plug and glow plug relay. (See F2−50 GLOW PLUG INSPECTION) (See Section F2) ● Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any malfunctioning parts according to glow system operation results.
18	● Access RPM PID. ● Is RPM PID indicating engine speed during cranking engine?	Yes	Go to next step.
		No	Inspect for following: ● Open or short circuit in pump speed sensor ● Open or short circuit in pump speed sensor harnesses ● Open or short circuit between pump speed sensor and PCM terminals 2K and 2D
19	**Note** ● The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalls, go to next step. ● Go to next step for the vehicles without A/C system. ● Connect pressure gauge to A/C lines. ● Turn blower switch on. ● Is pressure within specifications? (See Section U)	Yes	Go to next step.
		No	**A/C is always on:** ● Go to symptom troubleshooting ”NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY.” **Other symptoms:** ● Inspect following: — Refrigerant charging amount — Cooling fan and/or condenser fan operation

STEP	INSPECTION		ACTION
20	● Depress accelerator pedal slightly. ● Crank engine. ● Does engine start now?	Yes	Inspect and adjust idle speed. (See F2−47 ENGINE TUNE−UP) If symptom still appears, go to next step.
		No	Go to next step.
21	● Perform FSO solenoid inspection. (See F2−53 FUEL SHUT OFF (FSO) SOLENOID INSPECTION) ● Is FSO solenoid okay?	Yes	Go to next step.
		No	Inspect for following: ● Stuck FSO solenoid ● Open circuit in FSO solenoid ● Poor GND of FSO solenoid ● Open circuit between FSO solenoid and PCM connector terminal 4W Repair or replace any malfunctioning parts.
22	● Inspect fuel leakage from fuel pipe. ● Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
23	● Access EGR PID. ● Read EGR PID during cranking engine. (See F2−61 PCM INSPECTION) ● Is EGR PID okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid valve (vent) ● EGR solenoid valve (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harness between EGR solenoid valve (vacuum) and PCM terminal 4T Repair or replace as necessary.
24	● Inspect injection timing. ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2−54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
25	● Inspect fuel filter for clogging. ● Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
26	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
27	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 29.
		No	Go to next step.
28	● Inspect timing belt for following: — Chipping of gear teeth — Low tension — Breakage, damage or cracks ● Is timing belt okay?	Yes	Inspect for following: ● Burnt valve ● Worn piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve seat or valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
29	● Is valve clearance correct?	Yes	Inspect following: ● Idle switch ● Neutral switch ● Start signal (PCM terminal 1U) ● MAF/IAT sensor ● IAT sensor No.2 ● VSS ● Pump speed sensor If okay, remove and inspect injection pump.
		No	Adjust valve clearance.
30	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.5 CRANKS NORMALLY BUT WILL NOT START

ZCF408018881W09

5	Cranks normally but will not start
DESCRIPTION	● Starter cranks engine at normal speed but engine will not run. ● Refer to “No.4 ENGINE STALLS” if this symptom appears after engine stall. ● Fuel is in tank. ● Battery is in normal condition.
POSSIBLE CAUSE	● Poor fuel quality ● Intake−air system restriction ● Fuel line restriction ● EGR system malfunction ● FSO solenoid malfunction ● Glow system malfunction ● Fuel leakage ● Fuel filter clogging ● Incorrect fuel injection timing ● Injection pump malfunction ● Injection nozzle malfunction ● Immobilizer system activation or malfunction ● Low engine compression ● PCM control relay malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**Note** ● The following test should be performed on the vehicles with immobilizer system. ● Go to Step 12 for vehicles without immobilizer system. ● Connect WDS or equivalent to DLC. ● Do following conditions appear? — Engine is not completely started. — DTC P1624 is displayed.	Yes	**Both conditions appear:** ● Go to Step 4.
		No	**Either of other condition appears:** ● Go to next step.
2	● Does engine stall after **approx. 2 s** since engine is started?	Yes	Go to next step.
		No	Immobilizer system is okay. Go to Step 12.
3	● Is immobilizer unit connector securely connected to immobilizer unit?	Yes	Go to next step.
		No	Connect immobilizer unit connector securely. Return to Step 2.
4	● Does immobilizer indicator light flash and indicate any of following immobilizer system DTC? — **DTC: 01, 02, 03, 11, 21**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See T−16 DTC TABLE)
		No	Go to next step.
5	● Does immobilizer indicator light illuminate?	Yes	Go to Step 8.
		No	Go to next step.
6	● Does immobilizer indicator light flash and indicate any of following immobilizer system DTCs after **more than 135 s** after engine switch is turned to ON? — **DTC: 24, 30**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See T−16 DTC TABLE)
		No	Go to next step.
7	● Turn engine switch to OFF. ● Disconnect immobilizer unit connector. ● Connect jumper wire between immobilizer unit connector terminal M and GND. ● Turn engine switch to ON. ● Does immobilizer indicator light illuminate?	Yes	Reconnect immobilizer unit connector. Go to next step.
		No	Inspect for open circuit between immobilizer unit connector terminal M and instrument cluster. If okay, inspect immobilizer indicator light bulb. Repair or replace if necessary. Reconnect immobilizer unit connector, then return to Step 4.
8	● Connect WDS or equivalent to DLC and retrieve DTC. ● Is any of following DTC displayed? — **DTC: P1602, P1603, P1604, P1621, P1622, P1624**	Yes	Go to appropriate DTC test.
		No	Go to next step.

STEP	INSPECTION		ACTION
9	● Disconnect accelerator position sensor connector. ● Inspect for continuity between GND terminal at accelerator position sensor vehicle harness connector and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Access PCM connector. Inspect for continuity between PCM connector 4A/4B terminals and body GND. Repair or replace as necessary.
10	● Turn engine switch to ON. ● Access B+ PID. ● Is B+ PID okay? **B+ PID** **Battery positive voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
11	● Disconnect immobilizer unit connector. ● Turn engine switch to ON. ● Is there battery voltage at immobilizer unit connector terminal J?	Yes	Inspect for open circuit between PCM connector terminal 2I and immobilizer unit connector terminal A.
		No	Repair or replace wiring harness between immobilizer unit connector terminal J and fuse panel.
12	● Inspector for following: — Fuel quality including water contamination — Fuel line restriction — Loose bands on intake–air system — Cracks on intake–air system parts — Intake–air system restriction ● Inspect fuses. ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 12.
13	**Note** ● Ignore DTC P0120 while performing this test. ● Turn engine switch to ON. ● Disconnect accelerator position sensor connector. ● Measure voltage at accelerator position sensor connector VREF terminal. **Specification** **4.5—5.5 V** ● Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting ”NO.21 CONSTANT VOLTAGE.”
14	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON position. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.
15	● Turn engine switch to ON. ● Is FSO solenoid operation sound heard?	Yes	Go to Step.
		No	Inspect for following: ● Stuck FSO solenoid ● Open circuit in FSO solenoid ● Poor GND of FSO solenoid ● Open circuit between FSO solenoid and PCM connector terminal 4W Repair or replace any malfunctioning parts.
16	● Inspect glow plug and glow plug relay. (See F2–50 GLOW PLUG INSPECTION) (See Section F2) ● Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any malfunctioning part according to glow system operation results.
17	● Inspect for fuel leakage from fuel pipe. ● Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
18	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 20.
		No	Go to next step.

STEP	INSPECTION		ACTION
19	● Inspect timing belt for following — Chipping of gear teeth — Low tension — Breakage, damage or cracks ● Is timing belt okay?	Yes	Inspector for following: ● Burnt valve ● Worn piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve system or valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
20	● Inspect injection timing ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2−54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
21	● Inspect fuel filter for clogging. ● Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
22	● Access EGR PID. ● Read EGR PID during cranking engine. (See F2−61 PCM INSPECTION) ● Is PID value okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid valve (vent) ● EGR solenoid valve (vacuum) ● EGR valve ● Vacuum hose between EGR solenoid valve ● Wiring harness between EGR solenoid valve (vacuum) and PCM terminal 4T Repair or replace as necessary.
23	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve operating pressure — Faulty nozzle okay? ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
24	● Is valve clearance correct?	Yes	Inspect following: ● Pump speed sensor If okay, remove and inspect injection pump.
		No	Adjust valve clearance.
25	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.6 SLOW RETURN TO IDLE/FAST IDLE

ZCF408018881W10

6	Slow return to idle/fast idle
DESCRIPTION	● Engine takes more time than normal to return to idle speed. ● Engine speed continues at fast idle after warm−up
POSSIBLE CAUSE	● Malfunction of ECT sensor ● Thermostat is stuck open. ● Air leakage from intake−air system ● Fuel injection timing is incorrect. ● Incorrect adjustment of accelerator cable free play ● Incorrect adjustment of idle speed

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	No	**No DTC is displayed:** ● Go to next step.
		Yes	**DTC is displayed:** ● Go to appropriate DTC test.
2	● Inspect injection timing. ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2−54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.

STEP	INSPECTION		ACTION
3	● Inspect for air leakage from intake−air system components while racing engine to higher speed. ● Is there any air leakage?	Yes	Repair or replace as necessary.
		No	Go to next step.
4	● Remove thermostat and inspect operation. (See Section E) ● Is thermostat okay?	Yes	Inspect and adjust idle speed. (See F2−47 ENGINE TUNE−UP)
		No	Replace thermostat.
5	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.7 ENGINE RUNS ROUGH/ROLLING IDLE

ZCF408018881W11

7	Engine runs rough/rolling idle
DESCRIPTION	● Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively. ● Idle speed is too slow and engine shakes excessively.
POSSIBLE CAUSE	● Poor fuel quality ● Air leakage from intake−air system ● Intake−air system restriction ● Incorrect idle speed ● Engine overheating ● A/C system improper operation ● EGR system improper operation ● Glow system malfunction ● Fuel leakage ● Fuel filter clogging ● Fuel line restriction ● Incorrect fuel injection timing ● Injection pump malfunction ● Injection nozzle malfunction ● Low engine compression

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Inspect for following: — Proper fuel quality including water contamination — Loose bands on intake−air system — Cracks on intake−air system parts — Intake−air system restriction ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	● Is engine overheating?	Yes	Go to symptom troubleshooting ”NO.13 COOLING SYSTEM CONCERNS−OVERHEATING.”
		No	Go to next step.
3	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**No DTC is displayed:** ● Go to next step.
		No	**DTC is displayed:** ● Go to appropriate DTC test.
4	● Does engine run normal after warm−up?	Yes	Go to next step.
		No	Go to step 6.
5	● Inspect glow plug and glow plug relay. (SeeF2−50 GLOW PLUG INSPECTION) (See Section F2) ● Is glow system operation normal?	Yes	Go to step 7.
		No	Repair or replace any malfunctioning part according to glow system operation results.

STEP	INSPECTION		ACTION
6	**Note** ● The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalls, go to next step. ● Go to next step for the vehicle without A/C system. ● Connect pressure gauge to A/C lines. ● Turn blower switch on. ● Is pressure within specifications? (See Section U)	Yes	Go to next step.
		No	**A/C is always on:** ● Go to symptom troubleshooting "NO 19. A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY." **For other symptoms:** ● Inspect following: — Refrigerant charging amount — Cooling fan and/or condenser fan operation
7	● Depress accelerator pedal slightly. ● Crank engine. ● Does engine start now?	Yes	Inspect and adjust idle speed. (See F2–47 ENGINE TUNE–UP) If symptom still appears, go to next step.
		No	Go to next step.
8	● Inspect fuel leakage from fuel pipe. ● Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
9	● Perform EGR system inspection. ● Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid valve (vent) ● EGR solenoid valve (vacuum) ● EGR valve ● Vacuum hose connection ● Wiring harness between EGR solenoid valve (vacuum) and PCM terminal 4T Repair or replace as necessary.
10	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 12.
		No	Go to next step.
11	● Inspect timing belt for following: — Chipping of gear teeth — Low tension — Breakage, damage or cracks ● Is timing belt okay?	Yes	Inspect for following: ● Burnt valve ● Worm piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve stem or valve guide Repair or replace as necessary
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
12	● Inspect injection timing. ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2–54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
13	● Inspect fuel filter for clogging. ● Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
14	● Inspect fuel line for restriction. ● Is any restriction found in fuel line?	Yes	Repair or replace as necessary.
		No	Go to next step.
15	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
16	● Is valve clearance correct?	Yes	Inspect following: ● VSS ● Pump speed sensor If okay, remove and inspect injection pump.
		No	Adjust valve clearance.
17	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.8 RUNS ON

ZCF408018881W12

8	Runs on
DESCRIPTION	● Engine runs after engine switch is turned to OFF.
POSSIBLE CAUSE	● FSO solenoid malfunction.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Run engine at idle speed. ● Disconnect FSO solenoid connector. ● Make sure engine stops. ● Does engine stop?	Yes	Inspect for following: ● Short to power line between engine switch and FSO solenoid Inspect circuit between FSO solenoid and PCM terminal 4W. Repair or replace wiring harness.
		No	Inspect FSO solenoid for being stuck open.
2	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.9 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES

ZCF408018881W13

9	**Engine stalls/quits—acceleration/cruise** **Engine runs rough—acceleration/cruise** **Misses—acceleration/cruise** **Buck/jerk—acceleration/cruise/deceleration** **Hesitation/stumble—acceleration** **Surges—acceleration/cruise**
DESCRIPTION	● Engine stops unexpectedly at beginning of acceleration or during acceleration or while cruising. ● Engine speed fluctuates during acceleration or cruising. ● Engine misses during acceleration or cruising. ● Vehicle bucks/jerks during acceleration, cruising or deceleration. ● Momentary pause at beginning of acceleration or during acceleration ● Momentary minor irregularity in engine output
POSSIBLE CAUSE	● Poor fuel quality ● Glow system malfunction ● Air leakage from intake−air system ● Purge solenoid valve malfunction ● Intake−air system restriction ● Air cleaner restriction ● Engine overheating ● A/C system improper operation ● Turbocharger malfunction ● EGR system malfunction ● Fuel line restriction ● Fuel filter clogging ● Incorrect fuel injection timing ● Incorrect idle speed ● Injection pump malfunction ● Injection nozzle malfunction ● Low engine compression ● Exhaust system restriction ● Clutch slippage

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Is idle speed stable?	Yes	Go to next step.
		No	Go to symptom troubleshooting ”NO.7 ENGINE RUNS ROUGH/ROLLING IDLE.”
2	● Is engine overheating?	Yes	Go to symptom troubleshooting ”NO.13 COOLING SYSTEM OVERHEATING.”
		No	Go to next step.
3	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.

STEP	INSPECTION		ACTION
4	● Does symptom disappear after warm−up?	Yes	Go to next step.
		No	Go to Step 6.
5	● Inspect glow plug and glow plug relay. (See F2−50 GLOW PLUG INSPECTION) (See Section F2) ● Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any malfunctioning part according to glow system operation results.
6	**Note** ● The following test should be performed on the vehicles with A/C system. ● Go to next step for the vehicles without A/C system. ● Connect pressure gauge to A/C lines. ● Turn blower switch on. ● Is pressure within specifications? (See Section U)	Yes	Go to next step
		No	**A/C is always on:** ● Go to symptom troubleshooting "NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY." **For other symptoms:** ● Inspect following: — Refrigerant charging amount — Cooling fan and condenser fan operation
7	● Inspect air cleaner and/or intake−air system for clogging or restriction. ● Are air cleaner and intake−air system okay?	Yes	Go to next step.
		No	Clean or replace as necessary.
8	**Note** ● The following test should be performed on the vehicles with turbocharger system. ● Inspect hose bands between following parts: — Turbocharger compressor housing and air cleaner — Turbocharger compressor housing and charge air cooler ● Are hose bands loose?	Yes	Retighten hose bands. If concern is resolved, complete inspection. If concern still exists, go to next step.
		No	Turbocharger is okay. Go to next step.
9	● Perform EGR system inspection. ● Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid (vent) ● EGR solenoid (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harnesses between EGR solenoids and PCM terminals Repair or replace as necessary.
10	● Is there any restriction in exhaust system?	Yes	Repair or replace as necessary.
		No	Go to next step.
11	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
12	● Inspect fuel line for restriction. ● Is any restriction found in fuel line?	Yes	Repair or replace as necessary.
		No	Go to next step.
13	● Inspect fuel filter for clogging. ● Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
14	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 16.
		No	Go to next step.

STEP	INSPECTION		ACTION
15	● Inspect timing belt for following: — Chipping of gear teeth — Low tension — Breakage damage or cracks ● Is timing belt okay?	Yes	Inspect for following: ● Burnt valve ● Worn piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve stem and valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
16	● Inspect injection timing. ● Is injection timing okay?	Yes	Inspect following: ● Clutch for slippage ● Pump speed sensor If okay, remove and inspect injection pump.
		No	Inspect TCV. (See F2−54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
17	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.10 LACK/LOSS OF POWER

ZCF408018881W14

10	Lack/loss of power—acceleration/cruise
DESCRIPTION	● Performance is poor under load (e.g., power down when climbing hills).
POSSIBLE CAUSE	● Poor fuel quality ● Air leakage from intake−air system ● Intake−air system restriction ● Air cleaner restriction ● Engine overheating ● A/C system improper operation ● EGR system malfunction ● Clutch slippage ● Exhaust system restriction ● Fuel line restriction ● Fuel filter clogging ● Incorrect fuel injection timing ● Incorrect idle speed ● Injection pump malfunction ● Injection nozzle malfunction ● Low engine compression pressure ● Turbocharger malfunction ● Brake system dragging ● Intake shutter valve malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Is idle speed stable?	Yes	Go to next step.
		No	Go to symptom troubleshooting ”NO.7 ENGINE RUNS ROUGH/ROLLING IDLE.”
2	● Is engine overheating?	Yes	Go to symptom troubleshooting ”NO.13 COOLING CONCERNS−OVERHEATING.”
		No	Go to next step.
3	● Is engine overheating?	Yes	Go to symptom troubleshooting ”No.16 COOLING SYSTEM CONCERNS−OVERHEATING.”
		No	Go to next step.
4	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	Go to next step.
		No	**A/C is always on:** ● Go to symptom troubleshooting ”NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY.” **For other symptoms:** ● Inspect following: — Refrigerant charging amount — Cooling fan and condenser fan operation

STEP	INSPECTION		ACTION
5	● Inspect A/C cut−off operation. ● Does A/C cut−off work properly?	Yes	Go to next step.
		No	Inspect A/C cut−off system components.
6	● Inspect air cleaner and/or intake−air system for clogging or restriction. ● Are air cleaner and intake−air system okay?	Yes	Go to next step.
		No	Clean or replace as necessary.
7	**Note** ● The following test should be performed on the vehicles with turbocharger system. ● Go to Step 16 for the vehicles without turbocharger system.	Yes	Retighten hose bands. If concern is resolved, complete inspection. If concern still exists, go to next step.
	● Inspect hose bands between following parts: — Turbocharger compressor housing and air cleaner — Turbocharger compressor housing and charge air cooler ● Are hose bands loose?	No	Turbocharger is okay. Go to next step.
8	● Remove parts necessary to inspect turbocharger. Do not remove turbocharger. ● Inspect if turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. (See F2−48 TURBOCHARGER INSPECTION) ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
9	● Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
10	● Turn turbocharger compressor wheel by hand. ● Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
11	● Inspect if turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. **Note** ● Inspect all fins on each turbine wheel. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
12	● Is any engine oil found inside turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** ● Replace turbocharger. **Small amount of oil is found:** ● Wipe oil out of vehicle, then go to next step.
		No	Go to next step.
13	● Is any engine oil found inside turbocharger compressor housing?	Yes	Wipe oil out of vehicle and install all removed parts in Step 8. Then, go to next step.
		No	Turbocharger is okay. Install all removed parts in Step 8. Then, go to next step.
14	● Perform EGR system inspection. ● Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid (vent) ● EGR solenoid (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harnesses between EGR solenoids and PCM terminals Repair or replace as necessary.

STEP	INSPECTION		ACTION
15	● Is there any restriction in exhaust system?	Yes	Repair or replace as necessary.
		No	Go to next step.
16	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
17	● Inspect fuel filter for clogging. ● Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
18	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 20.
		No	Go to next step.
19	● Inspect timing belt for following: — Chipping of gear teeth — Low tension — Breakage, damage or cracks ● Is timing belt okay?	Yes	Inspect following: ● Burnt valve ● Worn piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve stem and valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
20	● Inspect injection timing. ● Is injection timing okay?	Yes	Inspect following: ● Boost sensor ● Brake system for dragging ● Clutch for slippage If okay, remove and inspect injection pump.
		No	Inspect TCV. (See F2–54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
21	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.11 POOR FUEL ECONOMY

ZCF408018881W15

11	Poor fuel economy
DESCRIPTION	● Fuel economy is unsatisfactory.
POSSIBLE CAUSE	● Incorrect adjustment of idle speed ● Accelerator pedal misadjustment ● Air cleaner restriction ● Engine cooling system malfunction ● Poor fuel quality ● Improper coolant level ● Turbocharger malfunction ● Improper engine compression ● Exhaust system clogging ● Injection timing is incorrect ● Injection nozzle malfunction ● Injection pump malfunction ● Fuel leakage ● Brake dragging ● EGR system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Inspect for following: — Fuel quality including water contamination — Air cleaner element restriction ● Inspect coolant level ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.

STEP	INSPECTION		ACTION
2	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** Go to appropriate DTC test.
		No	**No DTC is displayed:** Go to next step.
3	● Access ECT PID. ● Drive vehicle while monitoring PID. (See F2−61 PCM INSPECTION) ● Is PID within specification?	Yes	Go to next step.
		No	Inspect for coolant leakage, cooling fan and condenser fan operations or thermostat operation.
4	● Inspect idle speed. (See F2−47 ENGINE TUNE−UP) ● Is idle speed okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting ”NO.6 SLOW RETURN TO IDLE/FAST IDLE.”
5	● Perform EGR system inspection. ● Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid (vent) ● EGR solenoid (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harness between EGR solenoids and PCM terminals Repair or replace as necessary.
6	● Inspect fuel leakage from fuel pipe. ● Is any fuel leakage found on fuel pipe?	Yes	Repair or replace as necessary.
		No	Go to next step.
7	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
8	**Note** ● The following test should be performed on the vehicles with turbocharger system. ● Perform turbocharger inspection. (See F2−48 TURBOCHARGER INSPECTION) ● Is turbocharger okay?	Yes	Go to next step.
		No	Replace turbocharger.
9	● Is there restriction in exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
10	● Is brake system functioning properly?	Yes	Go to next step.
		No	Inspect for cause.
11	● Measure engine compression. ● Is compression okay?	Yes	Go to Step 13.
		No	Go to next step.
12	● Inspect timing belt for following: — Chipping or gear teeth — Low tension — Breakage, damage or cracks ● Is timing belt okay?	Yes	Inspect for following: ● Burnt valve ● Worn piston, piston ring or cylinder ● Damaged cylinder head gasket ● Damaged valve seat ● Worn valve stem and valve guide Repair or replace as necessary.
		No	If timing is incorrect, adjust timing. If timing belt is not okay, replace timing belt.
13	● Inspect injection timing. ● Is injection timing okay?	Yes	Inspect following: ● Boost sensor ● Injection pump
		No	Adjust injection timing.
14	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.12 HIGH OIL CONSUMPTION/LEAKAGE

ZCF408018881W16

12	High oil consumption/leakage
DESCRIPTION	● Oil consumption is excessive.
POSSIBLE CAUSE	● Improper engine oil level ● Improper dipstick ● Improper engine oil viscosity ● Engine internal parts malfunction ● Oil leakage ● Turbocharger malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Verify following: — Proper dipstick — Proper engine viscosity — Engine oil level ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	**Note** ● The following test should be performed on the vehicles with turbocharger system. ● Remove parts necessary to inspect turbocharger. ● Do not remove turbocharger. ● Inspect if turbocharger compressor wheel is bent, damaged, or interfering with housing on vehicle. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
3	● Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
4	● Turn turbocharger compressor wheel by hand. ● Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
5	● Inspect if turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. **Note** ● Inspect all fins on each turbine wheel. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
6	● Is any engine oil found inside turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** ● Replace turbocharger. **Small amount of oil is found:** ● Wipe oil of vehicle, then go to next step.
		No	Go to next step.
7	● Is any engine oil found inside turbocharger compressor housing?	Yes	Wipe oil out of vehicle, then go to next step.
		No	Go to next step.
8	● Is any engine oil found around oil pipes attached on turbocharger centre housing?	Yes	If oil leaks from damaged pipe, replace oil pipe. Then, go to next step.
		No	Go to next step.
9	● Is any engine oil found inside air intake pipes or hoses?	Yes	Wipe engine oil out.
		No	Turbocharger is okay. Install all removed parts in Step 2. Then go to next step.

STEP	INSPECTION		ACTION
10	● Measure engine compression. ● Is compression okay?	Yes	Inspect oil leakage from outside of engine.
		No	Inspect for following: ● Damaged valve seat ● Worn valve stem and valve guide ● Worn or stuck piston ring ● Worn piston, piston ring or cylinder Service as necessary.
11	● Verify test results. If okay, return to diagnostic index to service any advice additional symptoms.		

NO.13 COOLING SYSTEM CONCERNS-OVERHEATING

ZCF408018881W17

13	Cooling system concerns–overheating
DESCRIPTION	● Engine runs at higher than normal temperature/overheats.
POSSIBLE CAUSE	● Cooling fan malfunction ● Condenser fan malfunction ● Low drive belt tension ● Drive belt damage ● Improper coolant level ● Thermostat malfunction ● Radiator clogging ● Improper water/anti–freeze mixture ● Improper or damaged radiator cap ● Radiator hose damage ● Coolant leakage (engine internal, turbocharger, external) ● A/C system malfunction ● EGR system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Inspect following: — Engine coolant level — Coolant leakage — Water and anti–freeze mixture — Radiator condition — Collapsed or restricted radiator hoses — Radiator pressure cap — Drive belt tension — Drive belt — Fan rotational direction — Cooling fan ● Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTCs. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.
3	**Note** ● The following test should be performed on the vehicles with A/C system. Go to Step 5 for vehicles without A/C system. ● Start engine and run it at idle speed. ● Turn A/C switch off. ● Does A/C compressor disengage?	Yes	Go to next step.
		No	Go to symptom troubleshooting ”NO.19 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY.”
4	● Start engine and run it at idle speed. ● Turn A/C switch on if equipped. ● Do condenser fan and/or cooling fan operate?	Yes	Go to next step.
		No	**Condenser fan does not operate:** ● Inspect for following: — Condenser fan relay is stuck open. — Condenser fan motor malfunction — Condenser fan motor GND open — Open circuit between condenser fan motor and relay — Open circuit between condenser fan relay and PCM terminal 3C — Open battery power circuit of condenser fan relay

STEP	INSPECTION		ACTION
5	● Is drive belt okay?	Yes	Go to next step.
		No	Replace drive belt.
6	● Is there any leakage around heater unit in passenger compartment?	Yes	Inspect and service heater for leakage.
		No	Go to next step.
7	● Is there any leakage at coolant hoses and/or radiator?	Yes	Replace malfunctioning parts.
		No	Go to next step.
8	● Perform EGR system inspection. ● Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid (vent) ● EGR solenoid (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harness between EGR solenoid and PCM terminals Repair or replace as necessary.
9	● Cool down engine. ● Remove thermostat and inspect operation. ● Is thermostat okay?	Yes	Thermostat is okay. Inspect cylinder block for leakage or blockage.
		No	Replace thermostat.
10	● Verify test results. If okay, return to diagnostic index to service any additional symptoms		

NO.14 COOLING SYSTEM CONCERNS-RUNS COLD

ZCF408018881W18

14	Cooling system concerns—runs cold
DESCRIPTION	● Engine normal operating temperature.
POSSIBLE CAUSE	● Thermostat malfunction ● Condenser fan system malfunction ● Cooling fan system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Is customer complaint “Lack of passenger compartment heat” only?	Yes	Inspect A/C and heater system.
		No	Go to next step.
2	● Does engine speed continue at fast idle?	Yes	Go to symptom troubleshooting ”NO.6 SLOW RETURN TO IDLE/FAST IDLE.”
		No	Go to next step.
3	● Remove thermostat and inspect operation. (See Section E) ● Is thermostat okay?	Yes	Inspect cooling fan and condenser fan operation. If both or either fan operate abnormally, inspect for following: ● Condenser fan relay is stuck closed ● Short to GND between condenser fan relay and PCM terminal 3C ● Circuit between condenser fan relay and fan motor shorts to battery supply line
		No	Replace thermostat.
4	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.15 EXCESSIVE BLACK SMOKE

ZCF408018881W19

15	Excessive black smoke
DESCRIPTION	● Excessive black smoke is observed in exhaust gas.
POSSIBLE CAUSE	● Air cleaner element restriction ● Incorrect fuel injection timing ● Injection nozzle malfunction ● Injection pump malfunction ● Low engine compression ● EGR System Malfunction ● Intake shutter valve malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Connect WDS or equivalent to DTC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.
2	● Does any other symptom exist?	Yes	Go to appropriate flow chart.
		No	Go to next step.
3	● Inspect air cleaner element for clogging. ● Is air cleaner element okay?	Yes	Go to next step.
		No	Repair or replace air cleaner element.
4	● Inspect injection timing. ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2–54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
5	● Remove injection nozzle. ● Inspect injection nozzle for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket ● Is injection nozzle okay?	Yes	Go to next step.
		No	Repair or replace injection nozzle.
6	● Perform EGR system inspection. ● Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid (vent) ● EGR solenoid (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harness between EGR solenoids and PCM terminals Repair or replace as necessary.
7	● Measure engine compression. ● Is compression okay?	Yes	Inspect following: ● Boost sensor ● Injection pump
		No	Inspect following: ● Damaged valve seat ● Worn valve stem and valve guide ● Worn or stuck piston ring ● Worn piston, piston ring or cylinder Service as necessary.
8	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.16 ENGINE NOISE

ZCF408018881W20

16	Engine noise
DESCRIPTION	● Engine noise from under hood
POSSIBLE CAUSE	● Engine internal damage ● Timing belt displacement ● Injection nozzle malfunction ● Loose attaching bolts or worn parts ● Improper drive belt tension ● Air leakage from intake–air system ● Turbocharger operating noise ● Improper injection timing ● ECT sensor malfunction ● EGR system malfunction ● IAT sensor No.2 malfunction ● Injection pump malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Is squeal, click or chirp sound present?	Yes	Inspect engine oil level or drive belts.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	● Is rumble or grind sound present?	Yes	Inspect drive belt.
		No	Go to next step.
3	● Is rattle sound present?	Yes	Inspect location of rattle for loose parts.
		No	Go to next step.
4	● Is hiss sound present?	Yes	Inspect for vacuum leakage.
		No	Go to next step.
5	● Is rap or roar sound present?	Yes	Inspect exhaust system for loose parts.
		No	Go to next step.
6	● Connect WDS or equivalent to DTC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.
7	● Access ECT PID. ● Inspect ECT PID while warming up engine. ● Is PID value correct?	Yes	Go to next step.
		No	Inspect ECT sensor and related wiring harnesses.
8	● Access IAT PID. ● Inspect IAT PID while running engine. ● Is PID value correct?	Yes	Go to next step.
		No	Inspect IAT sensor and related wiring harnesses.
9	● Inspect injection timing. ● Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. (See F2−54 TIMER CONTROL VALVE (TCV) INSPECTION) If TCV is okay, adjust injection timing.
10	● Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Inspect following: ● EGR solenoid (vent) ● EGR solenoid (vacuum) ● EGR valve ● Vacuum hose connections ● Wiring harnesses between EGR solenoids and PCM terminals Repair or replace as necessary.
11	**Note** ● The following test should be performed on the vehicles with turbocharger system. ● Remove parts necessary to inspect turbocharger. ● Inspect if turbocharger compressor wheel is bent, damaged, or interfering with casing on vehicle. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
12	● Inspect if turbocharger compressor wheel locknut is loose or has fallen down inside turbocharger. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
13	● Turn turbocharger compressor wheel by hand. ● Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
14	● Inspect if turbocharger turbine wheel is damaged, cracked or interfering with housing on vehicle. ● Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
15	● Is any engine oil found inside turbocharger turbine housing?	Yes	**Excessive amount of oil is found:** ● Replace turbocharger. **Small amount of oil is found:** ● Wipe oil out of vehicle, then, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
16	● Is any engine oil found inside turbocharger compressor housing?	Yes	Wipe oil out of vehicle. Then, go to next step.
		No	Go to next step.
17	● Is any exhaust gas leakage found around location where turbocharger is attached to exhaust manifold?	Yes	Remove turbocharger. Inspect for cracks on centre housing inlet surface. If cracks are found, replace turbocharger.
		No	Go to next step.
18	● Are any centre housing and turbine housing attaching bolts loose?	Yes	Retighten loose bolts. If a bolt is found to be missing, attach appropriate new bolt.
		No	Turbocharger is okay. Install all removed parts in Step 11. Go to next step.
19	● Remove injection nozzle. ● Inspect for following: — Clogged nozzle — Seized needle valve — Incorrect valve opening pressure — Faulty nozzle gasket — After−dripping ● Is injection nozzle okay?	Yes	Inspect for following: ● Metal flow ● Bent connecting rod ● Damaged valve seat
		No	Replace injection nozzle or gasket.
20	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.17 VIBRATION CONCERNS (ENGINE)

ZCF408018881W21

17	**Vibration concerns (engine)**
DESCRIPTION	● Vibration from under hood or driveline
POSSIBLE CAUSE	● Loose attaching bolts or worn parts ● Components malfunction such as worn parts

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Inspect following components for loose attaching bolts or worn parts: — Cooling fan — Drive belt and pulley — Engine mounts — Exhaust system ● All items okay?	Yes	Inspect following systems: ● Wheels ● Transmission and amounts ● Driveline ● Suspension Service as necessary.
		No	Readjust or retighten engine mount installation position. Service as necessary for other parts.
2	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.18 A/C DOES NOT WORK SUFFICIENTLY

ZCF408018881W22

18	**A/C does not work sufficiently**.
DESCRIPTION	● A/C compressor magnetic clutch does not engage when A/C switch is turned on.
POSSIBLE CAUSE	● Improper refrigerant charging amount ● Open A/C magnetic clutch ● Open circuit in related wire harnesses ● Poor GND of A/C magnetic clutch ● A/C low/high pressure switch is stuck open. ● A/C relay is stuck open. ● Seized A/C compressor ● ECT sensor malfunction ● Improper magnetic clutch clearance ● Accelerator position sensor malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.
2	● Turn engine switch on. ● Set the fan switch to 1st, 2nd, 3rd, or 4th position. ● Verify the blower motor is operating. ● Is blower motor okay?	Yes	Go to next step.
		No	Inspect for following: ● Poor ground of fan switch ● Open circuit in blower resistor ● Poor contact of fan switch ● Blower relay is stuck open ● Open circuit in blower relay coil ● Seized blower motor ● Open circuit in blower motor coil ● Open circuit between blower motor and resistor ● Open circuit between fan switch and resistor Repair or replace as necessary.
3	● Connect WDS or equivalent to DTC. ● Access ACSW PID. ● Turn engine switch on. ● Set the fan switch to 1st, 2nd, 3rd, or 4th position. ● Turn A/C switch on. ● Dose ACSW PID read ON?	Yes	Go to next step.
		No	Inspect for following: ● Frost switch is stuck open. ● Poor contact of microswitch in heater control unit ● Open circuit between PCM connector terminal 3C and frost switch connector terminal ● Open circuit between frost switch connector terminal and fan switch connector terminal Repair or replace as necessary.
4	● Start the engine and run it at idle speed. ● Set the fan switch to 1st position. ● Measure the voltage at terminal of A/C relay connector terminal C. **Specification** **More than 10.5 V** ● Is voltage correct?	Yes	Go to next step.
		No	Inspect for following: ● Open circuit A/C relay coil ● Poor connect in A/C relay ● A/C relay stuck open ● Open circuit between PCM connector terminal 4L and A/C relay connector terminal ● Open circuit in battery supply line ● Open circuit between engine switch and A/C relay connecter terminal ● Engine coolant temperature sensor malfunction Repair or replace as necessary.
5	● Disconnect the A/C magnetic clutch connector. ● Measure the A/C magnetic clutch connector terminal voltage. **Specification** **More than 10.5 V** ● Is voltage correct?	Yes	Inspect for following: ● Poor ground of A/C magnetic clutch ● Open circuit in magnetic clutch coil ● Refrigerant charging amount Repair or replace as necessary.
		No	Inspect for following: ● Open circuit between pressure switch connector terminal and A/C magnetic clutch connector terminal ● Refrigerant changing amount ● A/C pressure switch is stuck open. ● Magnetic clutch clearance ● A/C compressor is seized Repair or replace as necessary.
6	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.19 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY

ZCF408018881W23

19	A/C always ON or A/C compressor runs continuously
DESCRIPTION	● A/C compressor magnetic clutch does not disengage.
POSSIBLE CAUSE	● Improper magnetic clutch clearance ● Short to GND circuit between PCM and A/C relay ● Short to GND circuit between PCM and A/C switch ● Short to power line between A/C relay and pressure switch ● A/C low/high pressure switch is stuck closed. ● A/C relay is stuck closed.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Connect WDS or equivalent to DLC. ● Turn engine switch to ON. ● Retrieve any DTC. ● Is DTC displayed?	Yes	**DTC is displayed:** ● Go to appropriate DTC test.
		No	**No DTC is displayed:** ● Go to next step.
2	● Connect WDS or equivalent to DLC. ● Access ACSW PID. ● Turn engine switch on. ● Turn blower switch off. ● Dose ACSW PID read ON?	Yes	Go to next step.
		No	Inspect for following: ● Short to ground circuit between PCM connector terminal 3C and frost switch ● Short to ground circuit between frost switch and blower switch connector terminal Repair or replace as necessary.
3	● Start engine and run it at idle speed. ● Turn blower switch off. ● Measure the voltage at terminal of A/C relay connector terminal C. **Specification** **0 V** ● Is voltage correct?	Yes	Inspect for magnetic clutch clearance. Adjust it as necessary.
		No	Inspect for following: ● Short to ground circuit between PCM connector terminal 4L and A/C relay terminal C ● A/C relay is stuck to close. ● Short to power line between A/C relay connector terminal C and A/C pressure switch ● Short to power line between pressure switch and A/C compressor magnetic clutch connector Repair or replace as necessary.
4	● Verify test results. If okay, return to diagnostic index to service any additional symptoms.		

NO.20 INTERMITTENT CONCERNS

ZCF408018881W24

20	Intermittent concerns
DESCRIPTION	● Symptom occurs randomly and is difficult diagnose.
POSSIBLE CAUSE	–

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Talk to customer. ● Retrieve vehicle service history. ● Does vehicle have a number of previous repairs and components replaced for a certain symptom?	Yes	Go to appropriate flow chart.
		No	Go to next step.
2	● Connect WDS or equivalent to DLC. ● If input is switch−type component, turn on manually. ● Turn engine switch to ON. ● Access PIDs for suspect component. ● Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. ● Are any PID values out of range, or do they suddenly change and go back into range?	Yes	Inspect each wire for corrosion, bent or loose terminal crimps.
		No	Go to Symptom Index.
3	● Start engine. ● Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. ● Are any PID values out of range, or do they suddenly change and go back into range?	Yes	Inspect each wire for corrosion, bent or loose terminals and poor wire terminal crimps.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	● Accurately spray water on suspect component wire, component or vacuum line related to possible fault area. ● Are any PID values out of range, or suddenly change and go back into range, or was there a noticeable engine misfire/stumble?	Yes	**Fault occurred while spraying on component:** ● Replace part and verify repair. **Fault occurred while spraying wiring:** ● Inspect each wire for corrosion, bent or loose terminals and poor wire terminal crimps. **Fault occurred while spraying vacuum line:** ● Repair vacuum hoses.
		No	Inspect wire and connector at suspect component for corrosion, bent or loose terminals, poor wire terminal crimps and high tension of wire. Repair as necessary.

NO.21 CONSTANT VOLTAGE

ZCF408018881W25

21	Constant voltage
DESCRIPTION	● Incorrect constant voltage
POSSIBLE CAUSE	● Constant voltage circuit malfunction **Note** ● Accelerator position sensor and boost sensor use constant voltage.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Disconnect accelerator position sensor connector. ● Turn engine switch to ON position. ● Measure voltage between following accelerator position sensor connector terminals: — Constant voltage terminal and GND terminal ● Is constant voltage **above 6.0 V**?	Yes	Repair constant voltage circuit short to power in harness.
		No	Go to next step.
2	● Is voltage across battery terminals **above 10.5 V**?	Yes	Go to next step.
		No	Inspect charging system.
3	● Turn engine switch to OFF. ● Disconnect sensor where constant voltage inspection failed. ● Measure voltage between battery positive post and GND circuit at appropriate sensor vehicle harness connector. ● Is voltage **above 10.5 V** and **within 1.0 V** of battery voltage?	Yes	Go to next step.
		No	Go to Step 9.
4	● Turn engine switch to ON. ● Connect WDS or equivalent to DTC. ● Attempt to access ECT PID. ● Can ECT PID be accessed?	Yes	Inspect for open constant voltage supply circuit between PCM connector terminal 1A and suspect sensor connector.
		No	Go to next step.
5	● Turn engine switch to OFF. ● Disconnect accelerator position sensor connector. ● Disconnect EGR solenoid valve (vacuum) connector. ● Turn engine switch to ON. ● Measure voltage between power supply circuit at EGR solenoid valve (vacuum) connector and battery negative post. ● Is voltage **above 10.5 V**?	Yes	Reconnect EGR solenoid valve (vacuum). Go to next step.
		No	Battery power is not present. Inspect following: ● MAIN fuse and/or PCM fuse ● PCM control relay ● Open circuit between MAIN fuel and PCM control relay ● Open circuit between PCM control relay and EGR solenoid valve (vacuum) ● Open circuit between PCM control relay and PCM terminal 3B ● Open circuit between PCM control relay and PCM terminal 4C/4D

STEP	INSPECTION		ACTION
6	● Turn engine switch to OFF. ● Leave accelerator position sensor disconnected. ● Disconnect MAF/IAT sensor connector. ● Turn engine switch to ON. ● Measure voltage between following accelerator position sensor connector terminals: — Constant voltage terminal and GND terminal ● Is voltage **4.0—6.0 V**?	Yes	Replace MAF/IAT sensor.
		No	Go to next step.
7	● Turn engine switch to OFF. ● Leave accelerator position sensor and MAF/IAT sensor connectors disconnected. ● Disconnect boost sensor connector. ● Turn engine switch to ON. ● Measure voltage between constant voltage and GND terminals at accelerator position sensor connector. ● Is voltage **4.0—6.0 V**?	Yes	Replace boost sensor.
		No	Go to next step.
8	● Turn engine switch to OFF. ● Leave accelerator position sensor disconnected. ● Disconnect MAF/IAT sensor and boost sensor connectors. ● Turn engine switch to ON. ● Connect WDS or equivalent to DLC. ● Access B+ PID. ● Is B+ PID **above 10.5 V**?	Yes	Inspect constant voltage circuit for shorting to GND.
		No	Inspect for open battery power supply circuit between PCM control relay and PCM terminal 4C/4D.
9	● Turn engine switch to ON. ● Connect WDS or equivalent to DLC. ● Attempt to access ECT PID. ● Can ECT PID be accessed?	Yes	Go to next step.
		No	Go to Step 11.
10	● Are DTCs present for two or more following sensors connected to PCM 1B terminal? ● Boost sensor ● MAF/IAT sensor ● Accelerator position sensor ● ECT sensor ● IAT sensor No.2 ● Fuel temperature sensor ● EGR position sensor	Yes	Go to next step.
		No	Inspect for poor GND circuit of sensor where constant voltage inspection failed.
11	● Turn engine switch to OFF. ● Disconnect WDS or equivalent from DLC. ● Disconnect sensor where constant voltage inspection failed. ● Inspect for continuity between GND circuit at appropriate sensor connector and body GND. ● Is there continuity?	Yes	Go to next step.
		No	Inspect for open GND circuit between following terminals: ● PCM connector 4A/4B terminals and GND ● PCM connector 4A/4B and 1B terminals

MANUAL TRANSMISSION (R15M–D, R15MX–D)

FEATURES

OUTLINE **J2–2**
OUTLINE OF CONSTRUCTION **J2–2**
FEATURES **J2–2**

SERVICE

OUTLINE **J2–3**
SUPPLEMENTAL SERVICE INFORMATION . **J2–3**
MANUAL TRANSMISSION **J2–3**
MANUAL TRANSMISSION
REMOVAL/INSTALLATION **J2–3**

OUTLINE

OUTLINE OF CONSTRUCTION

ZCF520201029W01

- The construction and operation of the manual transmission is essentially carried over from that of the current RANGER, except for the following specifications. (See RANGER Training Manual F326-1*-99A.)

FEATURES

ZCF520201029W02

Improved Emission Performance

- The neutral switch has been added to the transmission of WL−3 and WLT−3 engine models.

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

ZCF520201029W03

- The following changes and/or additions have been made since publication of the RANGER Repair Manual (F161-1*-99A).

Manual transmission

- Removal/installation procedure has been modified.

MANUAL TRANSMISSION

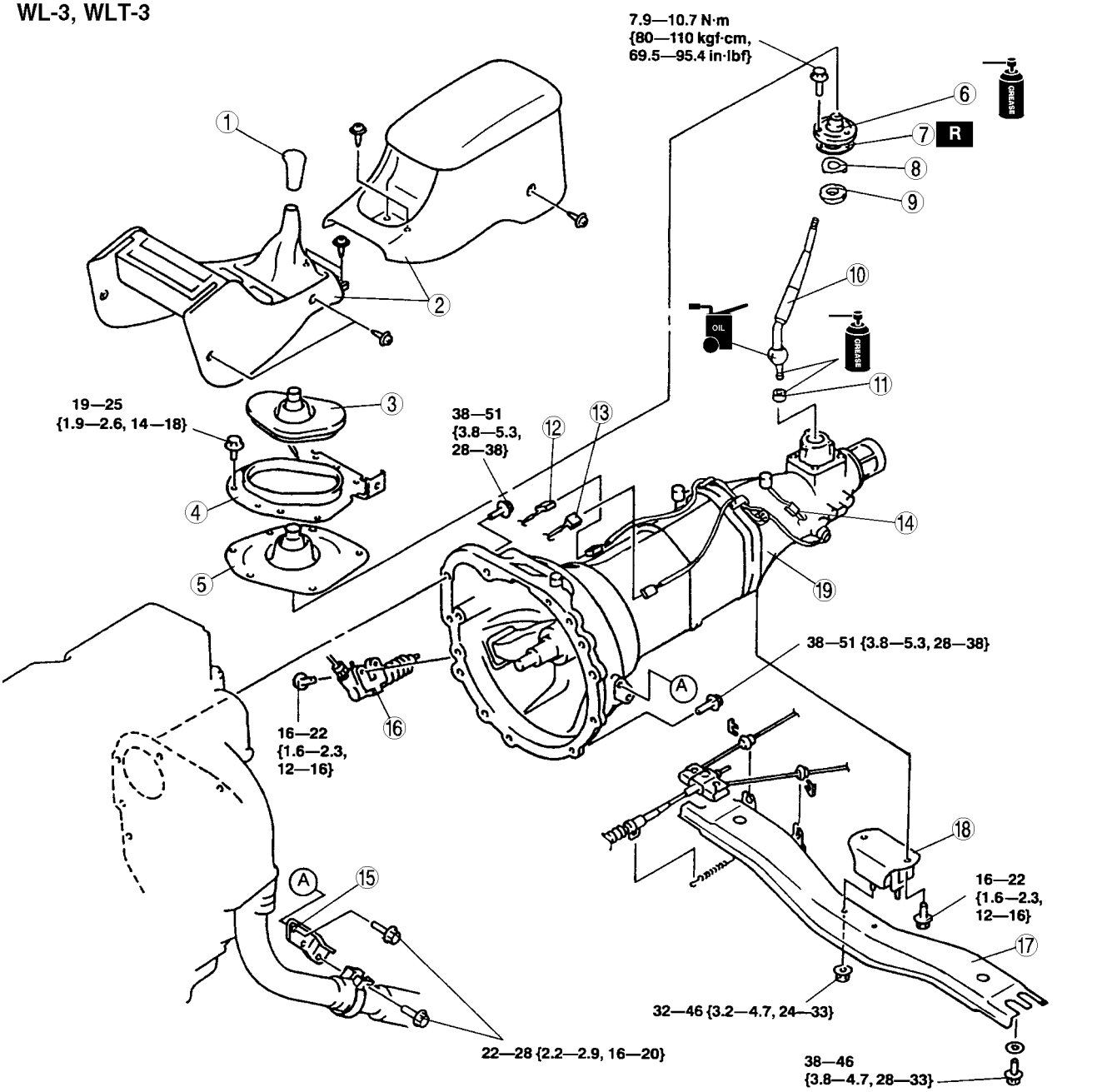
MANUAL TRANSMISSION REMOVAL/INSTALLATION

ZCF521001029W01

4x2 (R15M–D)

1. Disconnect the negative battery cable.
2. Drain the transmission oil into a container.
3. Remove the propeller shaft.
4. Remove the starter.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Add the specified amount and type transmission oil.
8. Warm up the engine and transmission, inspect for oil leakage, and verify the transmission operation.

WL-3, WLT-3



ZCF5210W001

1	Shift lever knob
2	Console
3	Dust boot
4	Change boot upper plate
5	Boot
6	Dust boot
7	Gasket
8	Wave washer
9	Change bush
10	Change lever
11	Change seat

12	Vehicle speedometer sensor connector
13	Back−up light switch connector
14	Neutral switch connector
15	Front pipe bracket
16	Clutch release cylinder
17	Crossmember See J2−5 Crossmember removal note
18	Transmission lower mount
19	Transmission See J2−5 Transmission removal note See J2−5 Transmission installation note

Crossmember removal note

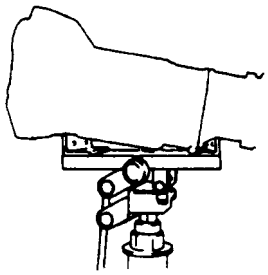
- Securely support the transmission on a transmission jack, then remove the crossmember.

Transmission removal note

Warning

- **Do not allow the transmission to fall from the transmission jack.**

- Maintain the stability of the transmission while removing it.



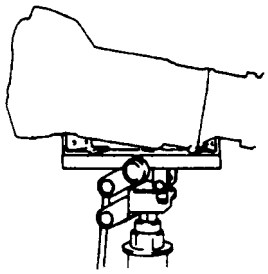
ZCF5210W002

Transmission installation note

Warning

- **A transmission that is not securely supported on a transmission jack is dangerous. It can slip or fall, causing serious injury. Never work without the transmission jack until crossmember installation is finished.**

1. Place the transmission on a transmission jack.
2. Maintain the stability of the transmission while installing the jacks.

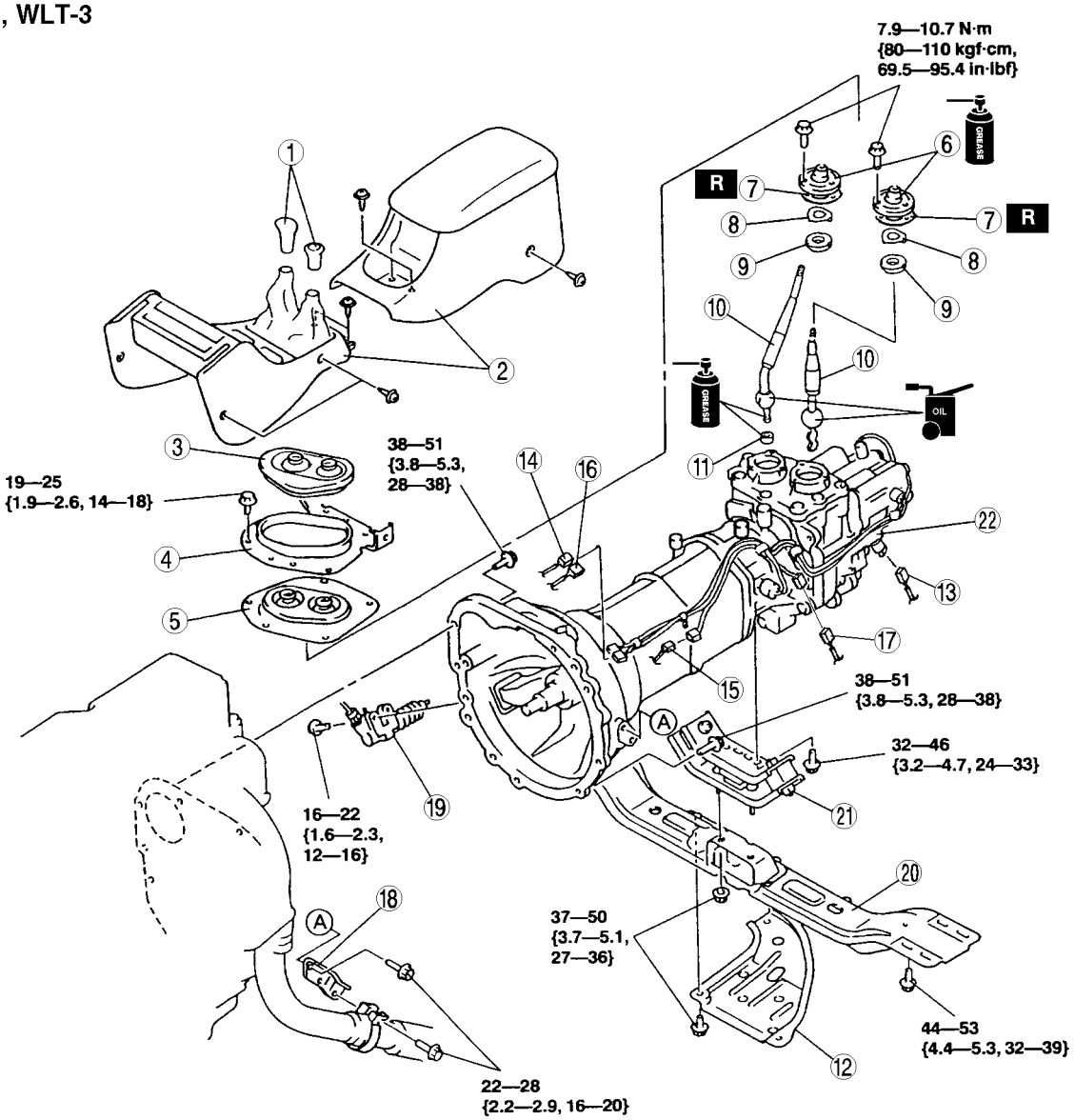


ZCF5210W002

4x4 (R15MX–D)

1. Disconnect the negative battery cable.
2. Drain the transmission and transfer oil into a container.
3. Remove the front and rear propeller shaft.
4. Remove the starter.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Add the specified amount and type transmission and transfer oil.
8. Warm up the engine and transmission, inspect for oil leakage, and verify the transmission operation.

WL-3, WLT-3



N·m {kgf·m, ft·lbf}

ZCF5210W003

1	Shift lever knob
2	Console
3	Dust boot
4	Change boot upper plate
5	Boot
6	Dust boot
7	Gasket
8	Wave washer

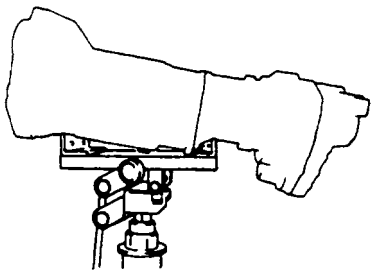
9	Change bush
10	Change lever
11	Change seat
12	Transfer under cover
13	Vehicle speedometer sensor connector
14	Back–up light switch connector
15	Transfer neutral switch connector (RFW model)
16	4x4 indicator switch connector

17	Neutral switch connector
18	Front pipe bracket
19	Clutch release cylinder
20	Crossmember
21	Transmission lower mount
22	Transmission and transfer See J2−7 Transmission and transfer removal note See J2−7 Transmission and transfer installation note

Transmission and transfer removal note

Warning
- **Do not allow the transmission to fall from the transmission jack.**

- Maintain the stability of the transmission and transfer while removing the jacks.

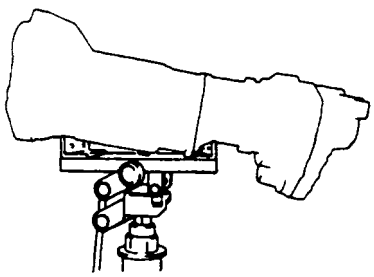


ZCF5210W004

Transmission and transfer installation note

Warning
- **A transmission and transfer that are not securely supported on a transmission jack are dangerous. They can slip or fall, causing serious injury. Never work without the transmission jack until crossmember installation is finished.**

1. Place the transmission and transfer on a transmission jack.
2. Maintain the stability of the transmission and transfer while installing the jacks.



ZCF5210W004

FRONT AND REAR AXLES

FEATURES

OUTLINE **M–2**
OUTLINE OF CONSTRUCTION **M–2**
FEATURES **M–2**
SPECIFICATION **M–2**

M

OUTLINE

OUTLINE OF CONSTRUCTION

ZCF630201018W01

- The construction and operation of the front and rear axles for the WL–3 engine model is essentially carried over from that of the current RANGER WL engine model, except the following features. (See RANGER Training Manual F326-10-99A.)
- The construction and operation of the front and rear axles for the WLT–3 engine model is the same as that of the current RANGER WL Turbo engine model. (See RANGER Training Manual F326-10-99A.)

FEATURES

ZCF630201018W02

Optimised engine characteristic

- The final gear ratio for the WL–3 engine model has been changed from that of the current WL engine model.

SPECIFICATION

ZCF630201018W03

Item				Specification			
				New Ranger (UN)		Current Ranger (UN)	
				2WD	4WD	2WD	4WD
				WL–3	WLT–3		
Front axle	Wheel bearing type			Taper roller bearing		←	
Rear axle	Wheel bearing type			Taper roller bearing		←	
	Support type			Semi-floating		←	
	Casing			Banjo type		←	
	Length		(mm {in})	739.5 {29.1}		←	
	Diameter		(mm {in})	33.0 {1.3}		←	
Rear differential	Reduction gear			Hypoid gear		←	
	Differential gear			Straight bevel gear		←	
	Ring gear size		(mm {in})	203.2 {8.00}		←	
	Final gear ratio			3.909	4.444	3.909 (F2 CIS), 4.444 (F2 CARB), 4.100 (WL)	4.444 (WL Turbo, G6), 4.777 (WL)
	Oil	Standard	Grade	API service GL-5		←	
			Viscosity	SAE 90		←	
			Capacity (Approximate quantity) (L {US qt, Imp qt})	1.40 {1.48, 1.23}	1.85 {1.96, 1.63}	←	
		LSD	Grade	API service GL-6		←	
			Viscosity	SAE 90		←	
			Capacity (Approximate quantity) (L {US qt, Imp qt})	1.40 {1.48, 1.23}	1.85 {1.96, 1.63}	←	

Item				Specification			
				New Ranger (UN)		Current Ranger (UN)	
				2WD	4WD	2WD	4WD
				WL–3	WLT–3		
Front differential	Reduction gear			—	Hypoid gear	←	
	Differential gear			—	Straight bevel gear	←	
	Ring gear size (mm {in})			—	184 {7.25}	←	
	Final gear ratio			—	4.444	—	4.444 (WL Turbo, G6), 4.777 (WL)
	Oil	Grade		—	API service GL-5	←	
		Viscosity		—	Above –18 ˚C {0 ˚F}: SAE90 Below –18 ˚C {0 ˚F}: SAE80	←	
		Capacity (Approximate quantity) (L {US qt, Imp qt})		—	1.5 {1.6, 1.3}	—	1.5 {1.6, 1.3} (RFW) 1.2 {1.3, 1.1} (MFW)
Drive shaft	Joint type		Wheel side	—	Bell joint	←	
			Differential side	—	Double offset joint	←	
	Shaft diameter (mm {in})			—	28 {1.1}	←	

Bold frames : New specifications

M

BODY ELECTRICAL SYSTEM

FEATURES

OUTLINE **T–2**
OUTLINE OF CONSTRUCTION **T–2**
FEATURES **T–2**
IMMOBILIZER SYSTEM **T–2**
OUTLINE **T–2**
STRUCTURAL VIEW **T–3**
SYSTEM WIRING DIAGRAM **T–4**

SERVICE

OUTLINE **T–5**
SUPPLEMENTAL SERVICE INFORMATION .. **T–5**
POWER SYSTEM **T–5**
RELAY LOCATION **T–5**
RELAY INSPECTION **T–6**
IMMOBILIZER SYSTEM **T–7**
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DTC 02 ..... **T–17**
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DTC 11 ..... **T–18**
DTC 21 ..... **T–19**
DTC 24 ..... **T–19**
DTC 30 ..... **T–20**

T

OUTLINE

OUTLINE OF CONSTRUCTION

ZCF810201088W01

- The construction and operation of the body electrical system is essentially carried over from that of the current RANGER model, except the following features. (See RANGER Training Manual F326−10−99A.)

FEATURES

ZCF810201088W02

Improved Security

- The immobilizer system has been modified.

IMMOBILIZER SYSTEM

OUTLINE

ZCF812267000W01

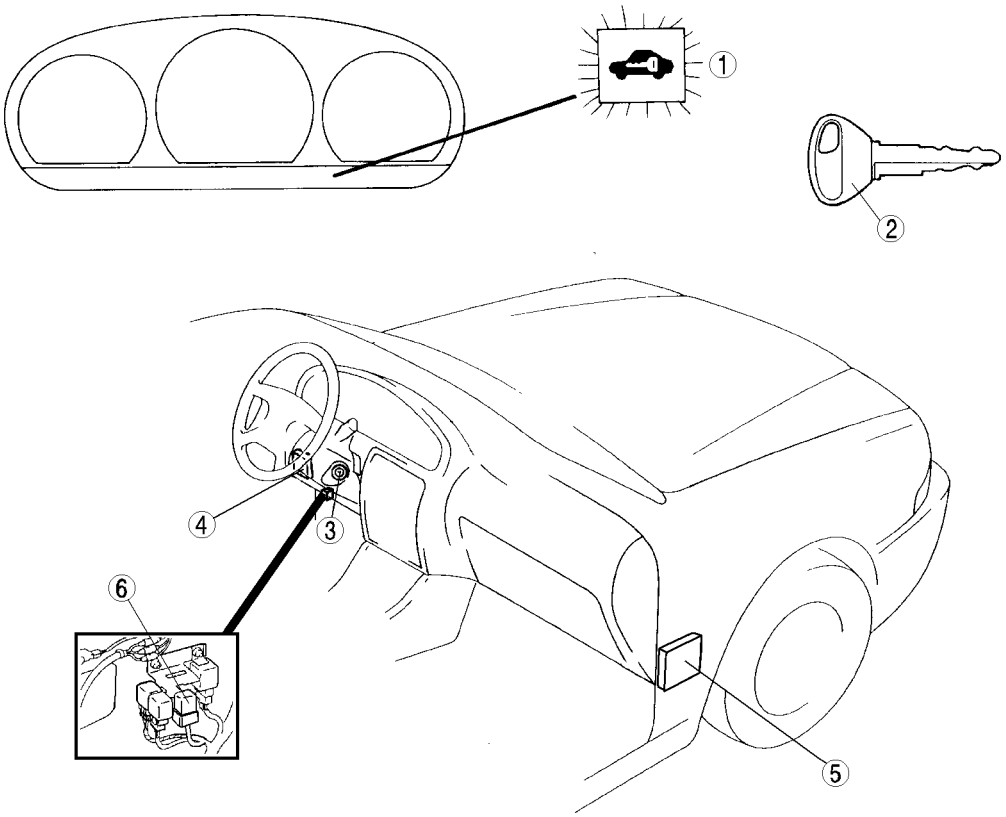
- The immobilizer system is essentially carried over from that of the current RANGER model. However, some items have been changed and/or added to improve security. Refer to the following table.

Comparison with current LASER model

Item	Comparison
Immobilizer unit	• Key reminder switch ON/OFF signal detection function is added. • Starter relay control function is added. • System operation is changed. • The operation is the same as that of current LASER model.
Key (transponder)	Same as the current LASER model
Coil	
On−board diagnostic function	
ID number input procedure	Procedure is changed.
Code word input procedure	

STRUCTURAL VIEW

ZCF812267000W02



ZCF8122W108

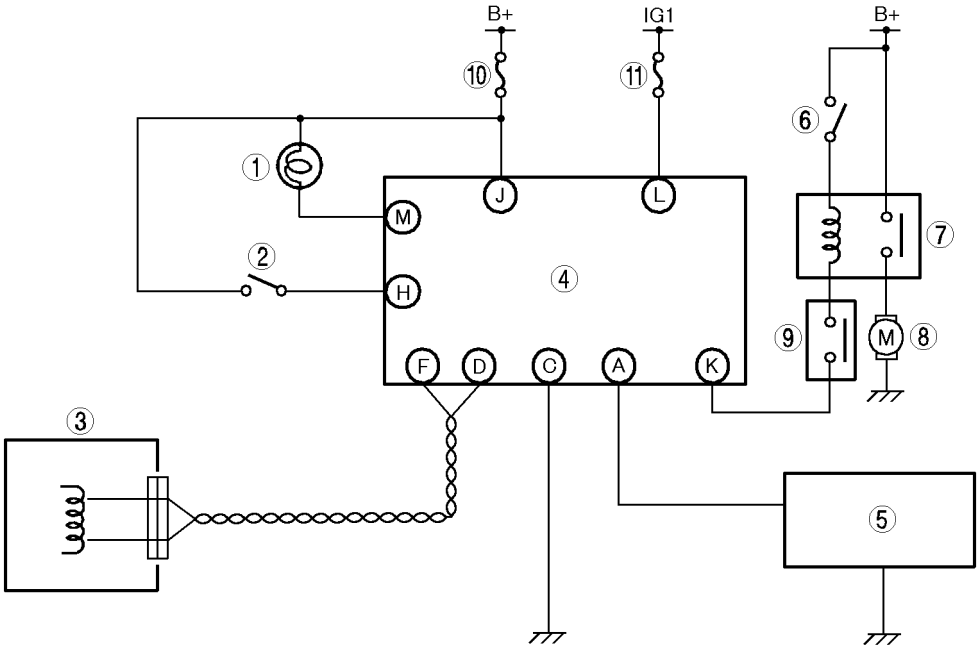
1	Security light
2	Key (transponder)
3	Coil

4	Immobilizer unit
5	PCM
6	Starter relay

T

SYSTEM WIRING DIAGRAM

ZCF812267000W05



YLE8122W002

1	Security light
2	Key reminder switch
3	Coil
4	Immobilizer unit
5	PCM

6	Engine switch (Start position)
7	Starter relay
8	Starter
9	ROOM 10 A fuse
10	ENGINE 15 A fuse

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

ZCF810201088W03

- The additions and modifications have been made since publication of the below manuals, as follows.
  —Ford RANGER Repair Manual (F161−10−99A)

Relay
- Inspection procedure has been added.

Immobilizer unit
- Inspection procedure has been modified.

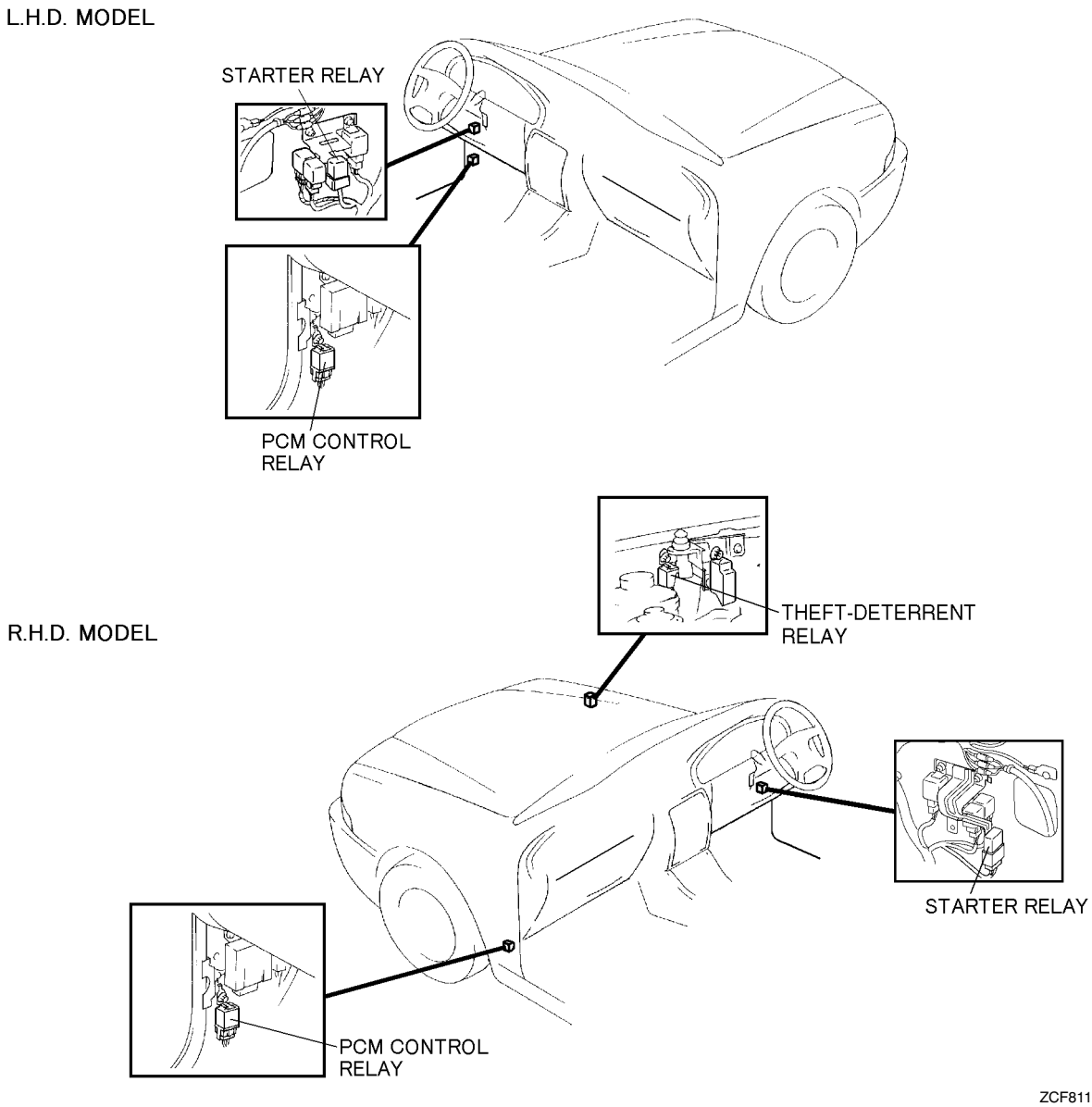
Immobilizer system
- Reprogram procedure has been modified.
- Code word input procedure has been modified.

On-board diagnostic
- Immobilizer system procedure has been modified.

POWER SYSTEM

RELAY LOCATION

ZCF811066191W01



ZCF8110W101

T

RELAY INSPECTION

ZCF811066191W02

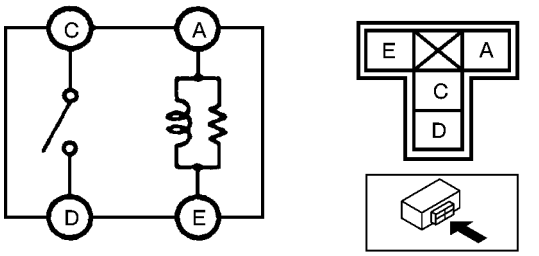
Relay Type

Terminal type		Parts name
Four−terminal	Type A	Starter relay
	Type B	PCM control relay

Note
- The inspection of theft−deterrent relay has not been changed.

Four−terminal
Type A

1. Remove the relay.
2. Inspect for continuity between the relay terminals using an ohmmeter.



ZCF8110W102

- If not as specified, replace the relay.

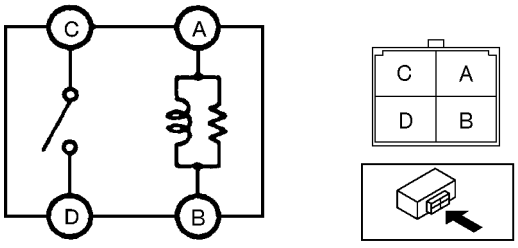
○—○ : Continuity

Step	Terminal			
	A	E	C	D
1	○—○			
2	B+	GND	○—○	

Z5U914WAK

Type B

1. Remove the relay.
2. Inspect for continuity between the relay terminals using an ohmmeter.



ZCF8110W103

- If not as specified, replace the relay.

○—○ : Continuity

Step	Terminal			
	A	B	C	D
1	○—○			
2	B+	GND	○—○	

Y5A8110W151

IMMOBILIZER SYSTEM

IMMOBILIZER UNIT INSPECTION

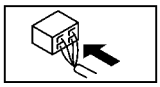
ZCF812267003W01

1. Measure the voltage at the immobilizer unit terminals as indicated below.
2. Disconnect the immobilizer unit connector before inspecting for continuity at terminal C.
   - If not as specified, inspect the parts listed under “Action.”
   - If the parts and wiring harnesses are okay but the system still does not work properly, replace the immobilizer unit.

Terminal Voltage Table (Reference)

IMMOBILIZER UNIT
HARNESS SIDE CONNECTOR

M	K			E	C	A
N	L	J	H	F	D	B



ZCF8170W103

Terminal	Signal	Connected to	Test condition	Voltage (V)/continuity	Action
A	Communication with PCM	PCM	Engine switch at ON position	B+	● Inspect PCM ● Inspect related harness
			Engine switch at LOCK position	Below 1.0	
B	—	—	—	—	—
C	GND	GND	Under any condition: inspect for continuity to ground	Yes	● Inspect GND
D	Power supply to coil	Coil	Key removed from key cylinder	Below 1.0	● Inspect coil ● Inspect related harness
			Key inserted into key cylinder	Cannot be measured	
E	—	—	—	—	—
F	Key ID number input	Coil	Key removed from key cylinder	Below 1.0	● Inspect coil ● Inspect related harness
			Key inserted into key cylinder	Cannot be measured	
H	Key reminder switch input	Key reminder switch	Key removed from key cylinder	Below 1.0	● Inspect key reminder switch ● Inspect related harness
			Key inserted into key cylinder	B+	
J	Back-up power supply	Battery	Under any condition	B+	● Inspect ROOM 10 A fuse ● Inspect related harness
K	Starter relay output	Starter relay	Engine switch at ON position	Below 1.0	● Inspect starter relay ● Inspect related harness
			Engine switch at LOCK position	0	
L	Power supply	Engine switch	Engine switch at ON position	B+	● Inspect ENGINE 15 A fuse ● Inspect related harness
			Engine switch at OFF position	Below 1.0	
M	Security light output	Security light	Security light neither illuminates nor blinks	B+	● Inspect security light ● Inspect related harness
N	—	—	—	—	—

T

IMMOBILIZER SYSTEM REPROGRAM PROCEDURE

ZCF812267000W03

Note
- When an error occurs during the reprogram procedures, except when both the immobilizer unit and PCM are replaced, repeat the procedure from Step 1. If you still cannot reprogram, confirm how many keys can start the engine. Then, perform the key replacement or additional reprogram procedure according to the valid key number.
- To make a copy of the key or replace the immobilizer system component parts (the key(s), steering lock, immobilizer unit, and/or PCM), the customer should bring all keys to the dealer. This is because the previously programmed key IDs are erased when reprogramming the key IDs into the immobilizer unit and PCM.
- If the customer has only one valid key when replacing the immobilizer system component parts, the dealer should contact a distributor to obtain the code word.
- To replace the immobilizer unit or PCM, there should be at least one valid key. Otherwise, both the immobilizer unit and PCM should be replaced.
- The immobilizer unit and PCM cannot be changed from one car to another. If an immobilizer unit or PCM is replaced with one from another car, the engine will not start. Reprogramming of the IDs and code word of an immobilizer unit that has already been programmed is not possible.
- The immobilizer unit and PCM should not be newly replaced as a trial during troubleshooting. If this is done, the ID and code word will be programmed into the new unit and it cannot be used for other cars even if you find that the old unit was normal.
- The immobilizer system cannot be deactivated.
- Confirm that all keys registered can start the engine after the reprogram procedure. When confirming, wait for **more than 5 seconds** before inserting the next key.
- When the customer does not need to register more than two keys, the following procedures can be stopped after registering two keys.
- If the key cannot be registered in spite of the fact that the immobilizer system operates normally, there may be a malfunction with the key reminder switch or wiring harness.

Key Replacement or Addition
When the customer has two or more valid keys

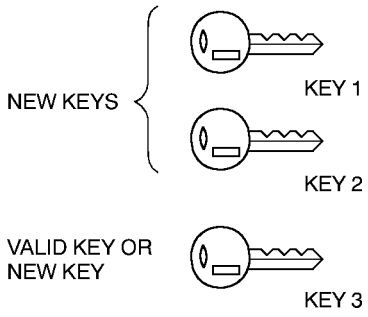


Y5A8122W102

Note
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Cut new transponder−equipped key(s).
2. Insert key 1 into the steering lock and hold for **1 second or more**.
3. Remove and insert key 1 **five times** at **no more than 1−second intervals**.
   (1) After the final key insertion, verify that the security light illuminates.
   (2) Remove the key from the steering lock and verify that the security light goes off.
4. Insert key 2 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
5. Insert key 3 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
6. If there are 4—8 keys (valid and/or new keys), repeat Step 5 with each key.
7. Wait for **30 seconds**.

When the customer has only one or no valid key (code word is required)

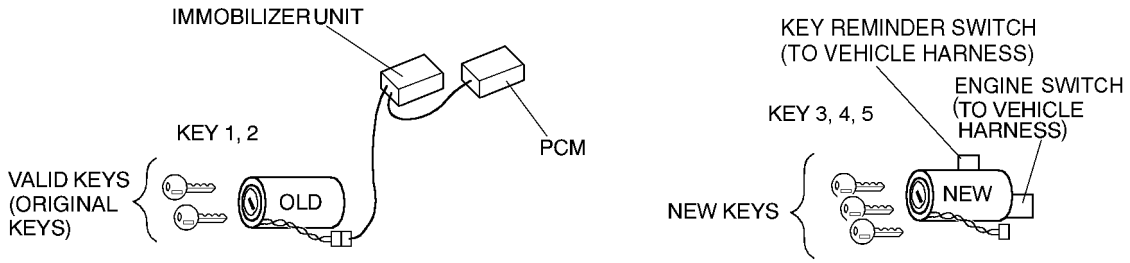


Y5A8122W103

Note
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Cut new transponder−equipped key(s).
2. Insert key 1 into the steering lock and hold for **1 second or more**.
3. Remove and insert key 1 **five times** at no more than 1−second intervals.
   (1) After the final key insertion, verify that the security light flashes. (**300 ms** ON—**300 ms** OFF)
   (2) Wait for **5 minutes** until the security light flashes at **1.2−second intervals**.
   (3) Input the code word. (See T−14 CODE WORD INPUT PROCEDURE.)
   (4) After verifying that the security light has switched from flashing to straight illumination, turn the key to the ON position.
   (5) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
4. Insert key 2 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
5. Insert key 3 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
6. If there are 4—8 keys (valid and/or new keys), repeat Step 5 with each key.
7. Wait for **30 seconds**.
8. After reprogramming, clear DTCs stored in the PCM.

Steering Lock Replacement
When the customer has two or more valid keys from the old steering lock



ZCF8122W101

Note
- When replacing the steering lock, the coil and keys should be replaced as a set.
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Remove the steering lock.
2. Connect the engine switch connector and key reminder switch connector to a new steering lock.
3. Connect the coil connector to the removed steering lock as shown in the figure.
4. Insert key 1 into the removed steering lock.

5. Insert key 3 into the new steering lock and hold for **1 second or more**.
6. Remove and insert key 3 five times at **no more than 1−second intervals**.
   (1) After the final key insertion, verify that the security light illuminates.
   (2) Remove the key from the steering lock and verify that the security light goes off.

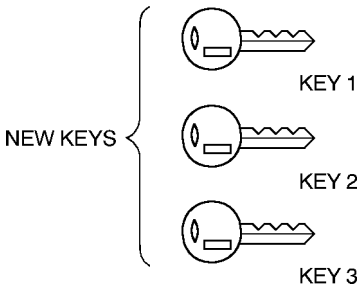
Note
- Perform Steps 7, 8 and 9 **within 30 seconds** after Step 6—(2).

7. Remove key 1 from the steering lock.
8. Insert key 2 into the removed steering lock.
9. Insert key 3 into the new steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates.
10. After verifying that the security light goes off, turn the key to the LOCK position.

Note
- Perform Steps 11 and 12 **within 30 seconds** after Step 10.

11. Disconnect the coil connector from the removed steering lock and connect to the new steering lock.
12. Turn key 3 to the ON position and verify that the security light illuminates.
13. After verifying that the security light goes off, turn key 3 to the LOCK position and remove from the steering lock.
14. Insert key 4 into the new steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates.
   (2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
15. Insert key 5 into the new steering lock and turn the key to the ON position.
   (1) After verifying that the security light goes off, turn the key to the LOCK position.
16. Wait for **30 seconds**.
17. Install the new steering lock to the vehicle.

When the customer has only one or no valid key (code word is required)



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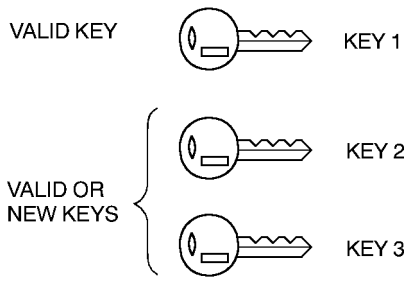
Note
- When replacing the steering lock, the coil and keys should be replaced as a set.
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Replace the steering lock.
2. Insert key 1 into the steering lock and hold for **1 second or more**.
3. Remove and insert key 1 **five times** at **no more than 1−second intervals**.
   (1) After the final key insertion, verify that the security light flashes. (**300 ms** ON—**300 ms** OFF)
   (2) Wait for **5 minutes** until the security light flashes at **1.2−second intervals**.
   (3) Input the code word. (See T−14 CODE WORD INPUT PROCEDURE.)
   (4) After verifying that the security light has switched from flashing to straight illumination, turn the key to the ON position.
   (5) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
4. Insert key 2 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.

(2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
5. Insert key 3 into the steering lock and turn the key to the ON position.
(1) Verify that the security light illuminates for **1—2 seconds**.
(2) After verifying that the security light goes off, turn the key to the LOCK position.
6. If there are 4—8 keys (valid and/or new keys), repeat Step 5 with each key.
7. Wait for **30 seconds**.
8. After reprogramming, clear DTCs stored in the PCM.

Immobilizer Unit Replacement
When the customer does not have valid key
- PCM needs to be replaced with immobilizer unit. Perform “Both Immobilizer unit and PCM Replacement” of the IMMOBILIZER SYSTEM REPROGRAM PROCEDURE. (See T−13 Both Immobilizer Unit and PCM Replacement.)

When the customer has at least one valid key (code word is required)



Y5A8122W106

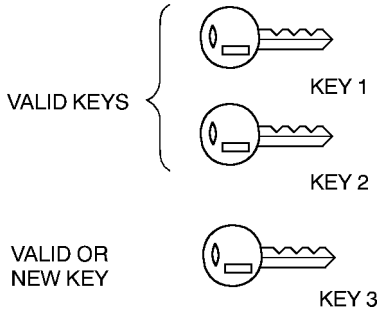
Note
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Cut new transponder−equipped key(s) if necessary.
2. Replace immobilizer unit.
3. Insert key 1 into the steering lock and turn the key to the ON position.
(1) Verify that the security light illuminates.
4. After the security light goes off, turn key 1 to the LOCK position.
(1) Remove the key from the steering lock and wait for **2 seconds or more**.
5. Insert key 2 into the steering lock and hold **1 second or more**.
6. Remove and insert key 2 **five times** at **no more than 1−second intervals**.
(1) After the final key insertion, verify that the security light flashes. (**300 ms** ON—**300 ms** OFF)
(2) Wait for **5 minutes** until the security light flashes at **1.2−second intervals**.
(3) Input the code word. (See T−14 CODE WORD INPUT PROCEDURE.)
(4) After verifying that the security light has switched from flashing to straight illumination, turn the key to the ON position.
(5) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
7. Insert key 1 into the steering lock and turn the key to the ON position.
(1) Verify that the security light illuminates for **1—2 seconds**.
(2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
8. Insert key 3 into the steering lock and turn the key to the ON position.
(1) Verify that the security light illuminates for **1—2 seconds**.
(2) After the security light goes off, turn the key to the LOCK position.
9. If there are 4—8 keys (valid and/or new keys), repeat Step 8 with each key.
10. Wait for **30 seconds**.
11. After reprogramming, clear DTCs stored in the PCM.

PCM Replacement
When the customer does not have valid key

- Immobilizer unit needs to be replaced with PCM. Perform “Both Immobilizer Unit and PCM Replacement” of the IMMOBILIZER SYSTEM REPROGRAM PROCEDURE. (See T−13 Both Immobilizer Unit and PCM Replacement.)

When the customer has two or more valid keys



Y5A8122W107

Note

- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Cut new transponder−equipped key(s) if necessary.
2. Replace the PCM.
3. Insert key 1 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
4. Remove and insert key 1 **five times** at **no more than 1−second intervals**.
   (1) After the final key insertion, verify that the security light illuminates.
   (2) Remove the key from the steering lock and verify that the security light goes off.
5. Insert key 2 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
6. Repeat Step 5 with key 1.
7. Insert key 3 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
8. If there are 4—8 keys (valid and/or new keys), repeat Step 7 with each key.
9. Wait for **30 seconds**.

When the customer has only one valid key (code word is required)



Y5A8122W108

Note

- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Cut new transponder−equipped key(s) if necessary.
2. Replace the PCM.
3. Insert key 1 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates.

4. After verifying that the security light goes off, turn key 1 to the LOCK position.
   (1) Remove the key from the steering lock and wait for **2 seconds or more**.
5. Insert key 2 into the steering lock and wait for **1 second or more**.
6. Remove and insert key 2 **five times** at **no more than 1−second intervals**.
   (1) After the final key insertion, verify that the security light flashes. (**300 ms** ON—**300 ms** OFF)
   (2) Wait for **5 minutes** until the security light flashes at **1.2−second intervals**.
   (3) Input the code word. (See T−14 CODE WORD INPUT PROCEDURE.)
   (4) After verifying that the security light has switched from flashing to straight illumination, turn the key to the ON position.
   (5) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
7. Insert key 3 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
8. If there are 4—8 keys (valid and/or new keys), repeat Step 8 with each key.
9. Wait for **30 seconds**.
10. After reprogramming, clear DTCs stored in the PCM.

Both Immobilizer Unit and PCM Replacement
When the customer has two or more valid keys

Note
- Keys may be valid or new.
- When an error occurs in Steps 1 to 3, repeat the procedure from Step 1.
- When an error occurs in Step 4, perform the “Reprogram error recovery procedure for both immobilizer unit and PCM replacement.”
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

1. Cut new transponder equipped key(s) if necessary.
2. Replace immobilizer unit and PCM.
3. Using key 1, turn engine switch to ON position. Observe security light illuminates and then goes out.
   (1) Turn key 1 to LOCK position. Observe security light blinks once repeatedly.
4. Using key 2, turn engine switch to ON position. Observe security light illuminates and then goes out.
   (1) Turn key 2 to LOCK position. Observe security light blinks twice repeatedly.
5. Using key 3, turn engine switch to ON position. Observe security light illuminates and then goes out.
   (1) Turn key 3 to LOCK position. Observe security light blinks three times repeatedly.
6. If there are 4—8 keys (valid and/or new keys), repeat Step 4.
7. Wait for **30 seconds** to quit reprogram mode.

Reprogram error recovery procedure for both immobilizer unit and PCM replacement

Note
- If no specific time interval is given, each step should be performed **within 30 seconds** of the previous step.

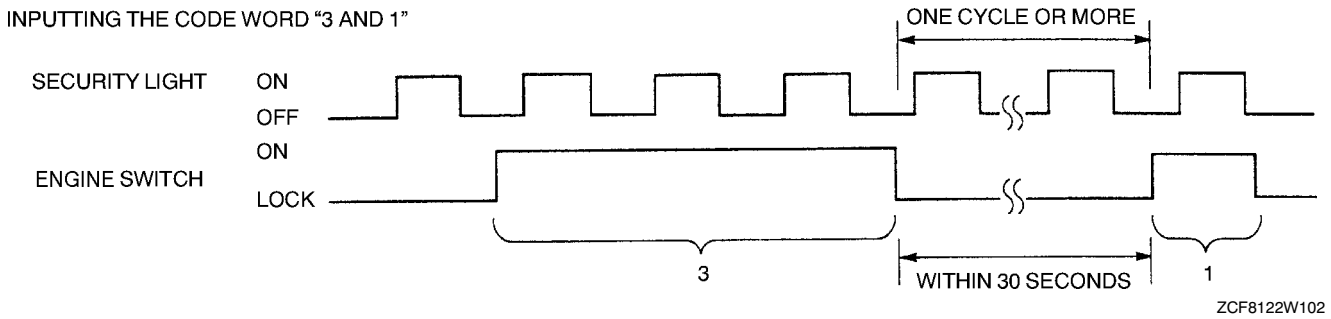
1. Insert key 1 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
2. Remove and insert key 1 **five times** at **no more than 1−second intervals**.
   (1) After the final key insertion, verify that the security light illuminates.
   (2) Remove the key from the steering lock and verify that the security light goes off.
3. Insert key 2 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position and remove from the steering lock.
4. Insert key 3 into the steering lock and turn the key to the ON position.
   (1) Verify that the security light illuminates for **1—2 seconds**.
   (2) After verifying that the security light goes off, turn the key to the LOCK position.
5. Wait for **30 seconds**.

CODE WORD INPUT PROCEDURE

ZCF812267000W04

Note
- A code word is composed of eight digits from 1—9 and is part of the immobilizer unit from the manufacturer. Each unit has its own code word. To obtain the code word, you need to have the immobilizer serial number, then ask the distributor.
- To input the code word into the PCM, turn the engine key and count the number of flashes of the security light. The calculation of the number of flashes of the security light comes with the timing of the turning of the key.

1. Wait for **5 minutes** until security light flashes slowly. (**300 ms** ON—**300 ms** OFF → **1.2 s** ON—**1.2 s** OFF)
2. Input the code word as shown in the example below.



ZCF8122W102

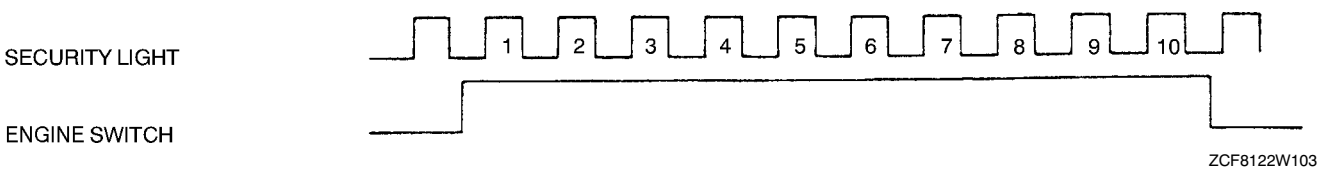
   (1) Turn engine switch to ON position while security light is off and count three illumination cycles. As the light goes out after the third illumination, turn key to LOCK position.
   (2) Wait at least one illumination cycle and **within 30 seconds** of going to LOCK position, turn engine switch to ON position while security light is off and count one illumination cycle. As the light goes out after the first illumination, turn key to LOCK position.
   (3) Repeat Step (2) for rest of six digits.
3. When code word is registered correctly in the PCM, the security light stops flashing and illuminates.
4. As soon as the security light stops flashing and illuminates, the following immobilizer system reprogram procedure should be started.

Note
- If the code word is not input correctly, the security light goes out after all eight digits are input. In this case, perform the "Code Word Input Error Recovery Procedure."

Examples of Incorrect Input of Code Word

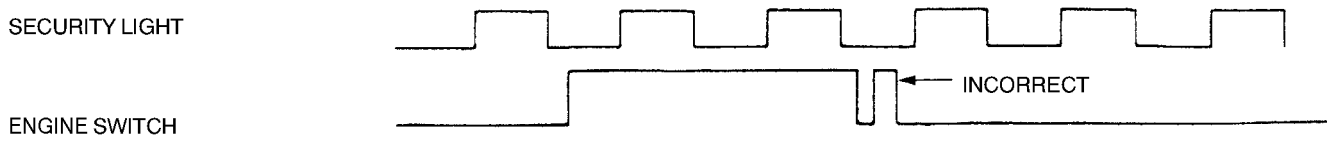
Note
- The security light must flash one or more times between the digits of the code word.
- If the code word is input incorrectly, the security light goes out. Remove and insert key **five times** and repeat the procedure to input all eight figures for the code word.
- When an error occurs during the reprogram procedures except when both the immobilizer unit and PCM are replaced, repeat the procedure from Step 1. If you still cannot reprogram, confirm how many keys can start the engine. Then, perform the key replacement or addition reprogram procedure according to the valid key number.

- The security light flashes ten or more times while the engine switch is at ON position.



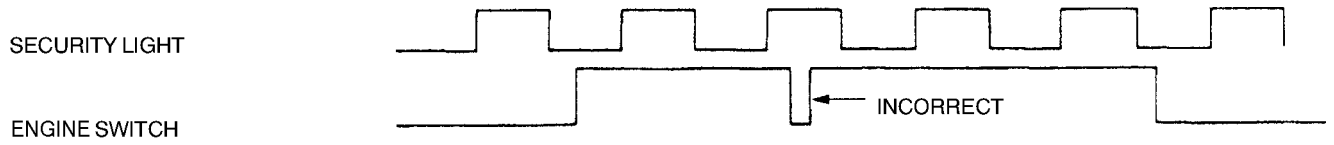
ZCF8122W103

- The engine switch is turned to ON position and LOCK position while the security light is off.



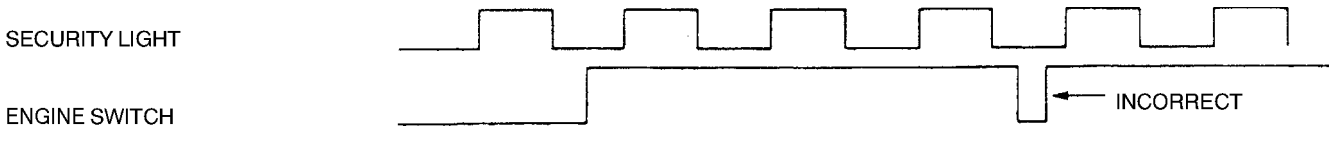
ZCF8122W104

- The engine switch is turned to LOCK position and ON position while the security light is on.



ZCF8122W105

- The engine switch is turned to LOCK position and ON position while the security light is off.



ZCF8122W106

- An unmatched code word is input to the immobilizer unit.

Code Word Input Error Recovery Procedure

1. Remove and insert key **five times** at **no more than 1-second intervals**.
2. Repeat the “CODE WORD INPUT PROCEDURE.”

ON−BOARD DIAGNOSTIC [IMMOBILIZER SYSTEM]

FOREWORD

ZCF817067000W01

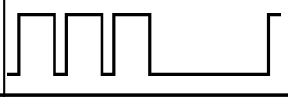
Caution
- **When the engine does not start or stalls and the following DTCs are not indicated, go to engine symptom troubleshooting.**

Note
- If engine condition is normal but light stays on, inspect for short circuit between security light and immobilizer unit connector terminal M. Repair or replace the wiring harness if necessary.

1. Turn the engine switch to START position **for 2 seconds**, then back to ON position.
2. Wait for **2 minutes**.
3. Verify the security light condition and read the DTC if indicated.
4. Verify the DTC with WDS or equivalent.
5. If the DTC is indicated, go to troubleshooting referring to the DTC table.

DTC TABLE

ZCF817067000W02

DTC	Output pattern	Description	Page
01	 WALTPX0001	ID number unregistered in immobilizer unit is input after engine switch is turned to ON position or engine cranking.	(See T−17 DTC 01)
02	 WALTPX0002	ID number format error (voltage range, frequency)	(See T−17 DTC 02)
03	 WALTPX0003	ID number is not input into immobilizer unit after engine switch is turned to ON position or cranking engine.	(See T−17 DTC 03)
11	 WALTPX0011	Coil or wiring harness between immobilizer unit and coil is open circuit.	(See T−18 DTC 11)
21	 WALTPX0021	Code word/ID number stored in immobilizer unit EEPROM cannot be read.	(See T−19 DTC 21)
24	 WALTPX0024	Open or short circuit in wiring harness between immobilizer unit and PCM.	(See T−19 DTC 24)
30	 WALTPX0030	Immobilizer unit—PCM communication error	(See T−20 DTC 30)

Note
- Perform the following if the security light stays on:
  - — If engine stalls, go to symptom troubleshooting “NO.7 ENGINE RUNS ROUGH/ROLLING IDLE.” (See F2−143 NO.7 ENGINE RUNS ROUGH/ROLLING IDLE.)
  - — If engine will not start, go to symptom troubleshooting “NO.5 CRANKS NORMALLY BUT WILL NOT START.” (See F2−140 NO.5 CRANKS NORMALLY BUT WILL NOT START)
  - — If engine condition is normal but light stays on, inspect for continuity between the following wiring harness and body ground: security light and immobilizer unit connector terminal M. Repair or replace the wiring harness.

DTC 01

ZCF817067000W03

DTC 01	ID number unregistered in immobilizer unit is input after engine switch is turned to ON position or engine cranking.
POSSIBLE CAUSE	● ID number is unregistered in immobilizer unit.

Diagnostic procedure

STEP	INSPECTION		ACTION
—	—	—	Go to ID number input procedure. (See T−8 Key Replacement or Addition)

DTC 02

ZCF817067000W04

DTC 02	ID number format error (voltage range, frequency)
POSSIBLE CAUSE	● Defective transponder in the key

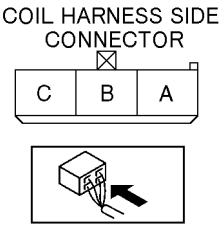
Diagnostic procedure

STEP	INSPECTION		ACTION
—	—	—	Dispose of defective key. Duplicate key if necessary. (See T−8 Key Replacement or Addition)

DTC 03

ZCF817067000W05

DTC 03	ID number is not input into immobilizer unit after engine switch is turned to ON position or cranking engine.
POSSIBLE CAUSE	● No transponder in the key ● Defective transponder in the key (ID number is not output.) ● Defective coil at steering lock ● Defective wiring harness between coil and immobilizer unit



ZCF8170W102

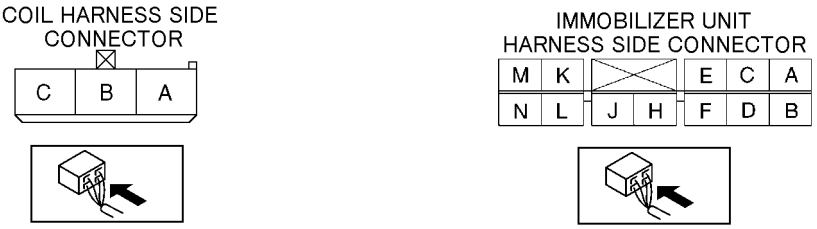
Diagnostic procedure

STEP	INSPECTION		ACTION
1	● Does security light indicate DTC 11?	Yes	Go to DTC 11.
		No	Go to next step.
2	● Does security light indicate DTC 30?	Yes	Go to DTC 30.
		No	Go to next step.
3	**INSPECT FOR OTHER PROPER KEYS** ● Does engine start with other proper keys?	Yes	Dispose of defective key. Duplicate key if necessary. (See T−8 Key Replacement or Addition .)
		No	Go to next step.
4	**INSPECT COIL CIRCUIT FOR SHORT TO GND OR COIL CIRCUIT FOR CONTINUITY** ● Disconnect the coil connector. ● Inspect for short circuits between coil connector terminals A and C and ground, and also between coil connector terminals A and C. ● Is there a short?	Yes	Repair the wiring harness connected to terminals A and/or C.
		No	Troubleshooting is completed.

DTC 11

ZCF817067000W06

DTC 11	Coil or wiring harness between immobilizer unit and coil is open circuit.
POSSIBLE CAUSE	● Open circuit in coil ● Poor connection of coil connector ● Poor connection of immobilizer unit ● Defective wiring harness between immobilizer unit and coil



ZCF8170W101

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CONNECTOR CONNECTION** ● Is connector of coil or immobilizer unit connected securely?	Yes	Go to next step.
		No	Connect connector securely.
2	**INSPECT COIL CIRCUIT FOR CONTINUITY** ● Is there continuity between coil terminals A and C?	Yes	Go to next step.
		No	Replace coil.
3	**INSPECT COIL CIRCUIT FOR OPEN CIRCUIT** ● Disconnect coil connector and immobilizer unit connector. ● Inspect for open circuit in wiring harness: — Immobilizer unit D to coil C, and immobilizer unit F to coil A — Immobilizer unit D to coil A, and immobilizer unit F to coil C ● Is there an open? **Note** ● Vehicle harness which is connected to immobilizer unit terminals D and F, uses a twisted pair wire. Because twisted pair wire does not have polarity, immobilizer unit connector terminal D may be connected to coil connector terminal A or C. Likewise, immobilizer unit connector terminal F may be connected to coil connector terminal A or C.	Yes	Replace immobilizer unit and reprogram immobilizer system. (See T−11 Immobilizer Unit Replacement)
		No	Repair wiring harness between coil and immobilizer unit.

DTC 21

ZCF817067000W07

DTC 21	Code word/ID number stored in immobilizer unit EEPROM cannot be read.
POSSIBLE CAUSE	● Defective immobilizer unit

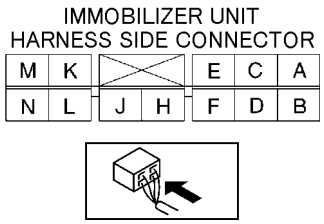
Diagnostic procedure

STEP	INSPECTION		ACTION
—	**INSPECT IMMOBILIZER UNIT** ● Turn engine switch from LOCK position to START position **for 2 seconds**. ● Does security light indicate DTC 21 again?	Yes	Replace immobilizer unit and reprogram immobilizer system. (See T−11 Immobilizer Unit Replacement)
		No	Immobilizer system is okay.

DTC 24

ZCF817067000W08

DTC 24	Open or short circuit in wiring harness between immobilizer unit and PCM
POSSIBLE CAUSE	● Defective immobilizer unit ● Defective PCM ● Poor connection of connector ● Defective wiring harness



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Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CONNECTOR CONNECTION** ● Are both immobilizer unit and PCM connectors connected properly?	Yes	Go to next step.
		No	Connect connectors properly.
2	**INSPECT COMMUNICATION CIRCUIT FOR CONTINUITY** ● Disconnect immobilizer unit and PCM connectors. ● Is there continuity between immobilizer unit connector terminal A and following PCM connector terminal? — Terminal 3S	Yes	Go to next step.
		No	Repair wiring harness between PCM and immobilizer unit.
3	**INSPECT IMMOBILIZER UNIT FOR SHORT TO GND** ● Is there continuity between immobilizer unit connector terminal A and ground?	Yes	Repair short circuit in wiring harness between PCM and immobilizer unit.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT COMMUNICATION CIRCUIT** ● Connect PCM connector. ● Turn engine switch to ON position. ● Measure voltage at immobilizer unit connector terminal A. ● Is voltage **more than 10 V**?	Yes	Replace immobilizer unit and reprogram immobilizer system. (See T−11 Immobilizer Unit Replacement) **Note** ● Confirm that voltage at immobilizer unit connector terminal L is **more than 10 V** when turning engine switch to ON position after repairing malfunction of DTC 24. If not as specified, repair wiring harness between ENGINE 15 A fuse and immobilizer unit.
		No	Replace PCM and reprogram immobilizer system. (See T−12 PCM Replacement) **Note** ● Confirm that voltage at immobilizer unit connector terminal L is **more than 10 V** when turning engine switch to ON position after repairing malfunction of DTC 24. If not as specified, repair wiring harness between ENGINE 15 A fuse and immobilizer unit.

DTC 30

ZCF817067000W09

DTC 30	Immobilizer unit—PCM communication error
POSSIBLE CAUSE	● Defective immobilizer unit ● Defective PCM

Diagnostic procedure

STEP	INSPECTION		ACTION
—	**INSPECT INNER CIRCUIT OF IMMOBILIZER UNIT** ● Replace immobilizer unit and reprogram immobilizer system. (See T−11 Immobilizer Unit Replacement) ● Does engine start?	Yes	Immobilizer unit was defective.
		No	Replace PCM and reprogram immobilizer system. (See T−12 PCM Replacement)

TECHNICAL DATA

TECHNICAL DATA **TD–2**
ENGINE **TD–2**
FUEL AND EMISSION CONTROL SYSTEMS **TD–2**

TECHNICAL DATA

ENGINE

ZCF931001001W01

Item			Engine
			WL, WL Turbo, WL-3, WLT-3
Valve clearance [Engine cold] (mm {in})		IN	0.05—0.15 {0.0020—0.0059} (0.10 ± 0.05 {0.0039 ± 0.0020}) 0.15 {0.0059} [Engine hot (Reference)]
		EX	0.15—0.25 {0.0060—0.0098} (0.20 ± 0.05 {0.0079 ± 0.0020}) 0.25 {0.0098} [Engine hot (Reference)]
Camshaft oil seal tapping amount		(mm {in})	0.5—1.0 {0.02—0.03}
Front oil seal tapping amount		(mm {in})	0—0.4 {0—0.015}

FUEL AND EMISSION CONTROL SYSTEMS

ZCF931001087W01

Item		Engine	
		WL–3	WLT–3
Idle speed (rpm)		695—745(720 ± 25)	
Idle up speed (rpm)	When A/C is operated	725—775 (750 ± 25)	
	When P/S is operated	–	
	When engine is cold	–	

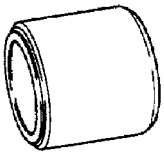
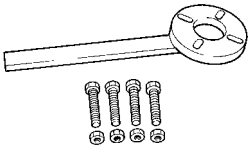
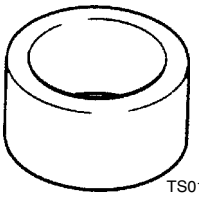
SPECIAL TOOLS

SPECIAL TOOLS **ST–2**
ENGINE **ST–2**
FUEL AND EMISSION CONTROL SYSTEMS **ST–2**

SPECIAL TOOLS

ENGINE

ZCF941001001W01

49 S010 001 Oil seal installer  TB014001X	49 S011 102A Crankshaft lock tool  TS011102A	49 S010 301 Oil seal installer  TS010301X

FUEL AND EMISSION CONTROL SYSTEMS

ZCF941001087W01

WDS  TWDS00000	—	—

EVEREST Repair Manual

FOREWORD

This Manual has been prepared to provide information covering normal service repairs and maintenance for the Everest Series.

As all information in this manual was the best available at the time of printing, all alternations related to modifications will be noticed by Service Information.

Ford Motor Company

APPLICATION:
This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN), shown on the following page.

CONTENTS

Title		Section
General Information		GI
Engine	G6	B1
	WL Turbo	B2
Lubrication System		D
Cooling System		E
Fuel and Emission Control Systems	G6	F1
	WL Turbo	F2
Engine Electrical System		G
Clutch		H
Manual Transmission	M15M–D M15MX–D	J1
	R15M–D R15M–D	J2
	Transfer	J3
Propeller Shaft		L
Front and Rear Axles		M
Steering System		N
Braking System		P
Suspension		R
Body		S
Body Electrical System		T
Heater and Air Conditioner Systems		U
Technical Data		TD
Special Tools		ST

There are explanations given only for the sections marked with shadow (■).

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F183–10–03A

VEHICLE IDENTIFICATION NUMBERS (VIN)

MNB	BS4D40*W	100001—
MNB	LS4D40*W	100001—
MNB	BS4D70*W	100001—
MNB	LS4D70*W	100001—
MNB	BSYD40*W	100001—
MNB	LSYD40*W	100001—
MNC	BS4D40*W	100001—
MNC	LS4D40*W	100001—
MNC	BS4D70*W	100001—
MNC	LS4D70*W	100001—
MND	BS417**W	100001—
MND	LS417**W	100001—

RELATED MATERIALS

RANGER Repair Manual
RANGER Training Manual
RANGER Repair Manual Supplement F165–10–99J
RANGER Repair Manual Supplement F166–10–00G
RANGER Repair Manual Supplement F172–10–00J
RANGER Repair Manual Supplement F176–10–01H
RANGER Repair Manual
(European, General specs.) F161–10–99A
RANGER Training Manual
(European, General specs.) F326–10–99A
RANGER Overhaul Manual
(European, General specs.) F161–20–99A
RANGER Repair Manual Supplement
(Australian, General (L.H.D. R.H.D.) specs.) F182–10–02I
Manual Transmission Workshop Manual
M15M–D M15MX–D
Manual Transmission Workshop Manual
R15M–D R15MX–D
EVEREST Bodyshop Manual F337–10–03A
EVEREST Wiring Diagram
(General (L.H.D.) specs.) F183–20–03A
EVEREST Wiring Diagram
(General (R.H.D.) specs.) F183–30–03A

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NEW STANDARDS TABLE GI-3
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HOW TO USE THIS MANUAL

RANGE OF TOPICS

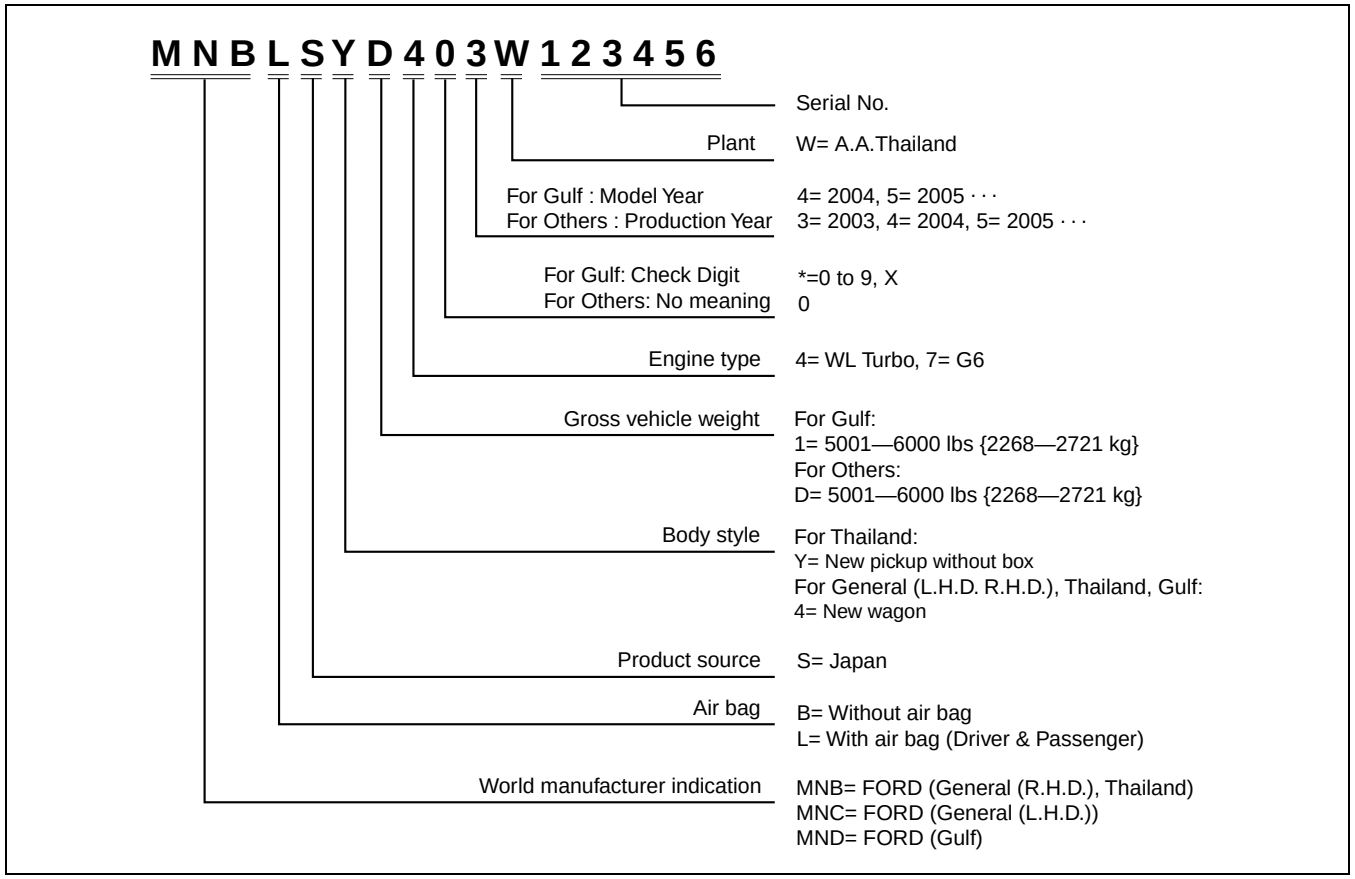
AVF201000001W01

- This manual indicates only changes/additions, as it is supplemental to the related materials. Therefore it may not contain the necessary reference service procedures to perform the service indicated in this manual.

VIN CODE

VIN CODE

AVF200800021W01



AVF2008W001

NEW STANDARDS

NEW STANDARDS TABLE

AVF202800020W01

- The following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V_B	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
—	Closed Throttle Position Switch	—	Idle Switch	
CPP	Clutch Pedal Position	—	Clutch Position	
CIS	Continuous Fuel Injection System	EGI	Electronic Gasoline Injection System	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFI	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On Board Diagnostic	—	Diagnosis/Self Diagnosis	

NEW STANDARDS

New Standard		Previous Standard		Remark
Abbrevi-ation	Name	Abbrevi-ation	Name	
OL	Open Loop	—	Open Loop	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multiport Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1–2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2–3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3–4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	EC-AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Airflow Meter	
WU-TWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1 : Diagnostic trouble codes depend on the diagnostic test mode.
#2 : Controlled by the PCM
#3 : In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4 : Device that controls engine and powertrain
#5 : Directly connected to exhaust manifold
#6 : Part name of diesel engine

ABBREVIATIONS

ABBREVIATIONS

AVF203000011W01

ABS	Antilock brake system
E/L	Electric load
ELR	Emergency locking retractor
ESA	Electronic spark advance
HI	High
LH	Left hand
L.H.D.	Left hand drive
LO	Low
LSD	Limited slip differential
LSPV	Load sensing proportioning valve
M	Motor
PCM	Powertrain control module
PID	Parameter identification
PRC	Pressure regulator control
P/S	Power steering
RFW	Remote freewheel
R.H.D.	Right hand drive
SST	Special service tool
TP	Throttle position
WDS	Worldwide diagnostic system
4×2	4 wheel-2 drive
4×4	4 wheel-4 drive

SCHEDULED MAINTENANCE

SCHEDULED MAINTENANCE TABLE

AVF203400013W01

For General (L.H.D. R.H.D.)

Maintenance Item	Maintenance Interval (Number of months or kilometers (miles), whichever comes first)																
	Months	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**	**66**	**72**	**78**	**84**	**90**	**96**
	×1000 km	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**	**160**
	×1000 miles	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**	**66**	**72**	**78**	**84**	**90**	**96**
GASOLINE ENGINE																	
Idle speed			I		I		I		I		I		I		I		I
Air cleaner element *1		C	C	C	R	C	C	C	R	C	C	C	R	C	C	C	R
Fuel lines and hoses			I		I		I		I		I		I		I		I
Initial ignition timing			I		I		I		I		I		I		I		I
Spark plugs					R				R				R				R
Evaporative system (if equipped)			I		I		I		I		I		I		I		I
DIESEL ENGINE																	
Engine timing belt *2		Replace every 100,000 km (60,000 miles)															
Engine valve clearance			I		I		I		I		I		I		I		I
Air cleaner element *1		C	C	R	C	C	R	C	C	R	C	C	R	C	C	R	C
Fuel lines and hoses		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
GASOLINE and DIESEL ENGINE																	
Drive belts *3		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil *4		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Oil filter *4		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Cooling system			I		I		I		I		I		I		I		I
Engine coolant		Replace every 2 years															
Fuel filter					R				R				R				R
Battery electrolyte level and specific gravity			I		I		I		I		I		I		I		I
Brake and clutch pedals		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Clutch fluid		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses and connections			I		I		I		I		I		I		I		I
Brake fluid *5		I	I	I	R	I	I	I	R	I	I	I	R	I	I	I	R
Parking brake		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Power brake unit and hoses			I		I		I		I		I		I		I		I
Disc brakes		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Drum brakes			I		I		I		I		I		I		I		I
Power steering fluid and lines		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Steering operation and gear housing			I		I		I		I		I		I		I		I
Steering linkages tie rod ends and arms			I		I		I		I		I		I		I		I
Manual transmission oil		I	I		R		I		R		I		R		I		R
Rear differential oil (2WD)			I		R		I		R		I		R		I		R
Front and rear differential oil (4WD)			R		I		R		I		R		I		R		I
Transfer oil (4WD)			R		I		R		I		R		I		R		I
Drive shaft dust boots (4WD)					I				I				I				I
Propeller shaft joints (4WD)			L		L		L		L		L		L		L		L
Front suspension ball joints					I				I				I				I
Wheel nuts			T		T		T		T		T		T		T		T
Exhaust system heat shields					I				I				I				I
Bolts and nuts on chassis and body			T		T		T		T		T		T		T		T

SCHEDULED MAINTENANCE

Chart symbols:

I : Inspect: Inspect and clean, repair, adjust or replace if necessary.
R : Replace
T : Tighten
L : Lubricate
C : Clean

Remarks:

- To ensure efficient operation of the engine and all systems related to emission control, the ignition and fuel systems must be serviced regularly. It is strongly recommended that all servicing related to these systems be done by an authorized Ford Dealer.
- After the prescribed period, continue to follow the described maintenance at the recommended intervals.
- Refer below for a description of items marked* in the maintenance chart.

*1: If the vehicle is operated in very dusty or sandy areas, inspect and if necessary, clean or replace the air cleaner element more often than the recommended intervals.

*2: Replacement of the timing belt is required at every 100,000 km {60,000 miles}.
Failure to replace the timing belt may result in damage to the engine.

*3: Also adjust and inspect the power steering and air conditioner drive belts, if equipped.

*4: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter more often than recommended intervals.
a. Driving in dusty conditions.
b. Extended periods of idling or low speed operation.
c. Driving for long period in cold temperatures or driving regularly at short distance (less than 8 km/5 miles) only.

*5: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, change the brake fluid annually.

For Thailand

Maintenance Item	Maintenance Interval (Number of months or kilometers (miles), whichever comes first)											
	Months	**-**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
	×1000 km	**1.5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
	×1000 miles	**0.9**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
ENGINE												
Engine valve clearance				I		I		I		I		I
Engine timing belt *1	Replace every 100,000 km											
Drive belts *2	A	I	I	I	I	I	I	I	I	I	I	I
Engine oil *3		R	R	R	R	R	R	R	R	R	R	R
Engine oil filter *3		R	R	R	R	R	R	R	R	R	R	R
COOLING SYSTEM												
Cooling system				I		I		I		I		I
Engine coolant	Replace every 2 years											
FUEL SYSTEM												
Air cleaner element *4		C	C	R	C	C	R	C	C	R	C	
Fuel filter					R				R			
Fuel lines and hoses		I	I	I	I	I	I	I	I	I	I	I
ELECTRICAL SYSTEM												
Battery electrolyte level and specific gravity	I	I	I	I	I	I	I	I	I	I	I	I
CHASSIS & BODY												
Brake and clutch pedals		I	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses and connections			I		I		I		I		I	
Brake fluid *5		I	I	I	R	I	I	I	R	I	I	
Clutch fluid		I	I	I	I	I	I	I	I	I	I	
Parking brake		I	I	I	I	I	I	I	I	I	I	
Power brake unit and hoses			I		I		I		I		I	
Disc brakes (front)		I	I	I	I	I	I	I	I	I	I	
Drum brakes (rear)			I		I		I		I		I	
Power steering fluid and lines		I	I	I	I	I	I	I	I	I	I	
Steering operation and gear housing			I		I		I		I		I	
Steering linkages, tie rod ends and arms			I		I		I		I		I	

Maintenance Item	Maintenance Interval (Number of months or kilometers (miles), whichever comes first)											
	Months	**-**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
	×1000 km	**1.5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
	×1000 miles	**0.9**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
Manual transmission oil			I	I	I	R	I	I	I	R	I	I
Front differential oil (4WD)						R				R		
Rear differential oil						R				R		
Transfer oil (4WD)						R				R		
Propeller shaft joints (4WD)				L		L		L		L		L
Wheel nuts		T		T		T		T		T		T
Driveshaft dust boots (4WD)				I		I		I		I		I
Front suspension ball joints						I				I		
Bolts and nuts on chassis and body		T		T		T		T		T		T
Exhaust system heat shields						I				I		

Chart symbols:

I : Inspect: Inspect and clean, repair, adjust or replace if necessary.
A : Adjust: Examination resulting in adjustment or replacement
R : Replace
T : Tighten
L : Lubricate
C : Clean (by air blow)

Remarks:

- To ensure efficient operation of the engine and all systems related to emission control, the ignition and fuel systems must be serviced regularly. It is strongly recommended that all servicing related to these systems be done by an authorized Ford Dealer.
- After 100,000 km or 60 months, continue to follow the described maintenance at the recommended intervals.
- Refer below for a description of items marked* in the maintenance chart.

*1: Replacement of the timing belt is required at every 100,000 km.
Failure to replace the timing belt may result in damage to the engine.

*2: Also adjust and inspect the power steering and air conditioner drive belts, if equipped.

*3: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter more often than recommended intervals.
a. Driving in dusty conditions.
b. Extended periods of idling or low speed operation.
c. Driving for long period in cold temperatures or driving regularly at short distance (less than 8 km) only.

*4: If the vehicle is operated in very dusty or sandy areas;
- Inspect the air cleaner element at every 5,000 km or 3 months. Clean or replace if necessary.
- Replace the air cleaner element at every 20,000 km or 12 months.

*5: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, change the brake fluid annually.

FUEL AND EMISSION CONTROL SYSTEMS (G6)

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OUTLINE

OUTLINE OF CONSTRUCTION

AVF390218881W01

- The fuel and emission control system is essentially carried over those of the current RANGER G6 engine models except for the following features. (See RANGER Training Manual F326-10-99A.)

FEATURES

AVF390218881W02

Improved Serviceability

- Due to the introduction of the WDS, PID names have been changed and some PIDs have been added to provide more detailed information.
- Due to the adoption of the immobilizer system, DTCs have been added (Vehicle with immobilizer system).

Improved Security

- The immobilizer system has been adopted. Therefore, DTCs have been added. The construction and operation of the immobilizer system is the same as that of LASER FP engine model with immobilizer system.

Improved idle stability

- With the adoption of the rear A/C, the idle-up speed for the condition when the A/C is on has been increased.

Modifications to match the vehicle characteristics

- Fuel tank has been changed.

SPECIFICATIONS

AVF390218881W03

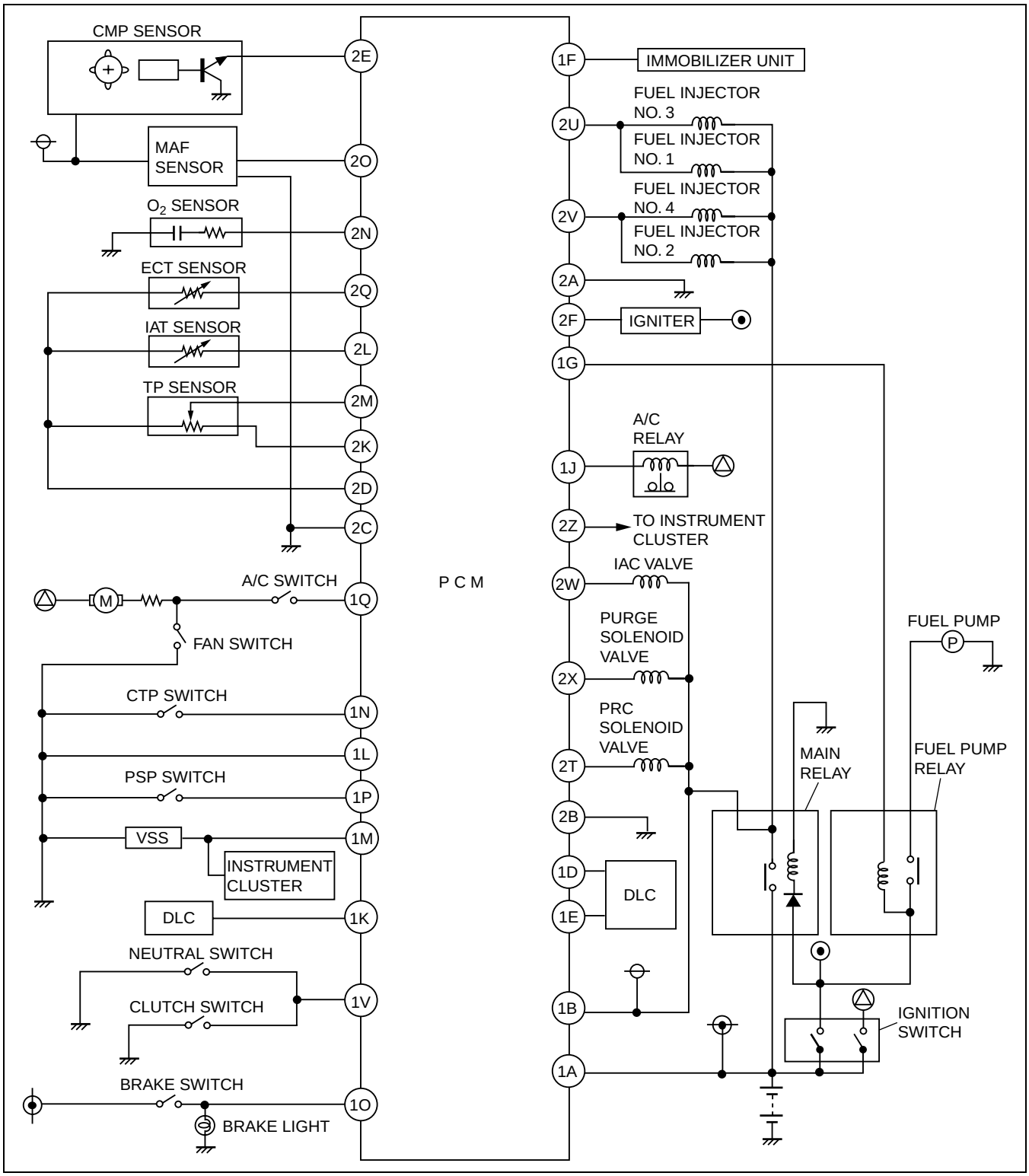
Item		Specification	
		EVEREST	**Current RANGER**
Air cleaner element	Type	Paper element (dry type)	
Idle air control (IAC) valve	Type	Duty control	
Fuel injector	Type	Hi-ohmic	
	Fuel delivery type	Top-feed	
	Drive type	Voltage	
Pressure regulator	Regulating pressure (kPa {kgf/cm^2, psi})	280 {2.9, 41}	
Fuel pump	Type	Impeller (in-tank)	
Fuel tank	Capacity (L {US gal, lmp gal})	71.0 {18.8, 15.6}	63.0 {16.6, 13.9}*1 70.0 {18.5, 15.4}*2
Fuel	Specification	Unleaded (RON 90 or higher)	
Catalyst	Type	TWC (monolithic)	
Evaporative emission control system	Type	Canister	
PCV system	Type	Closed	

*1 : Double cab 2WD, stretch cab 2WD
*2 : Double cab 4WD, stretch cab 4WD, regular cab
Bold frames: New specification

CONTROL SYSTEM WIRING DIAGRAM

AVF390218881W04

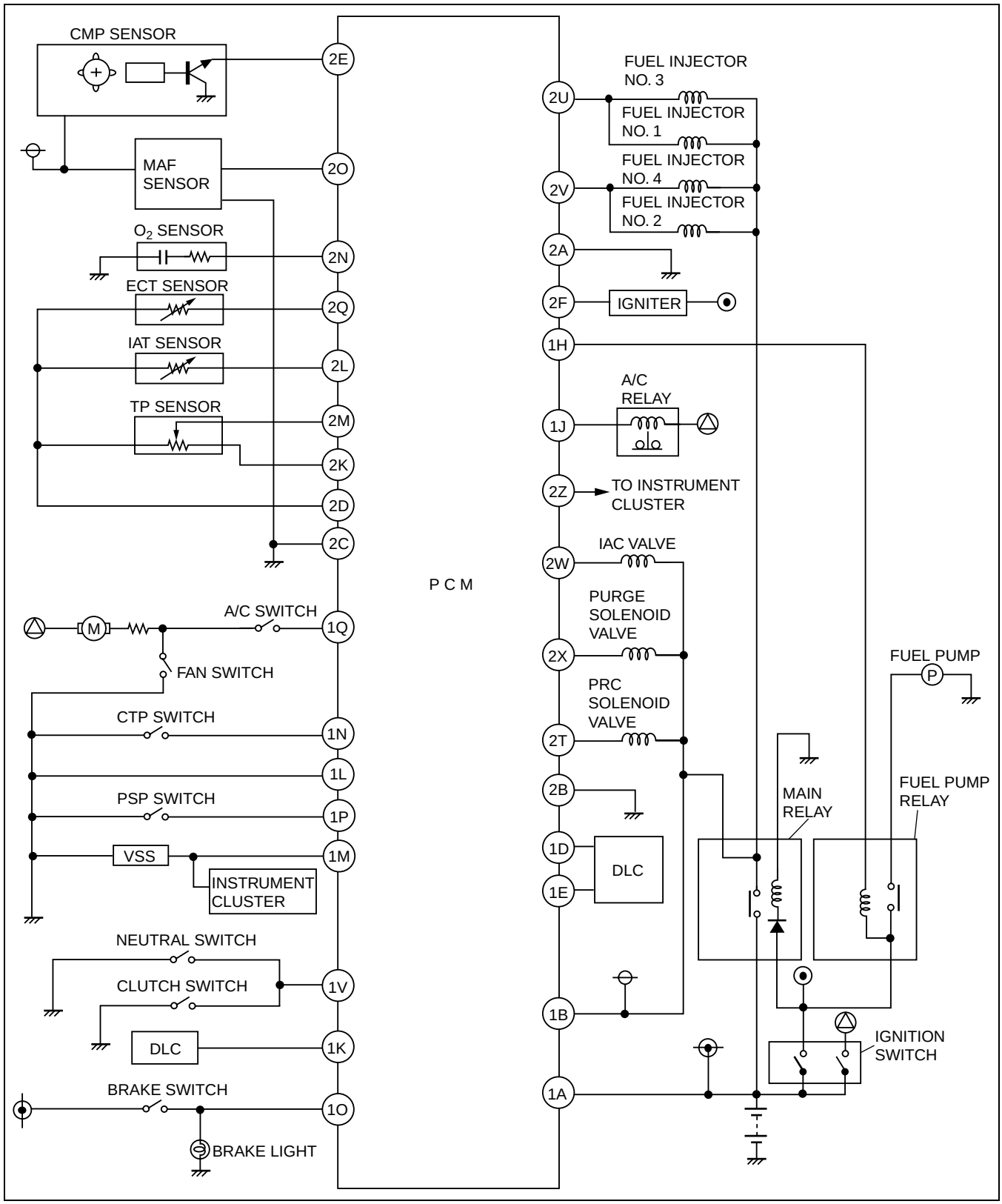
With Immobilizer System



AVF3940W009

F1

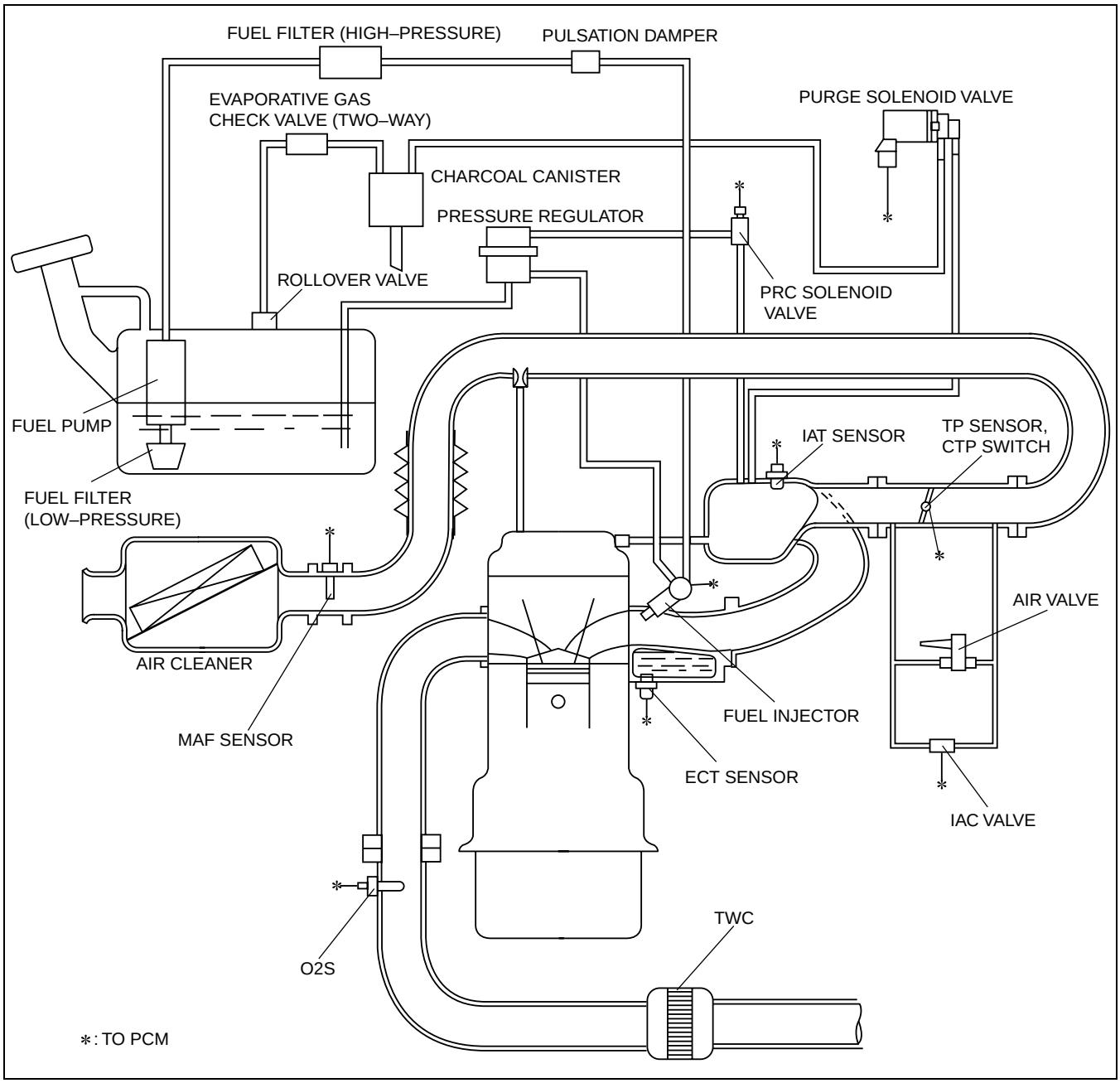
Without Immobilizer System



AVF3940W008

CONTROL SYSTEM DIAGRAM

AVF390218881W05



AVF3940W007

F1

FUEL SYSTEM

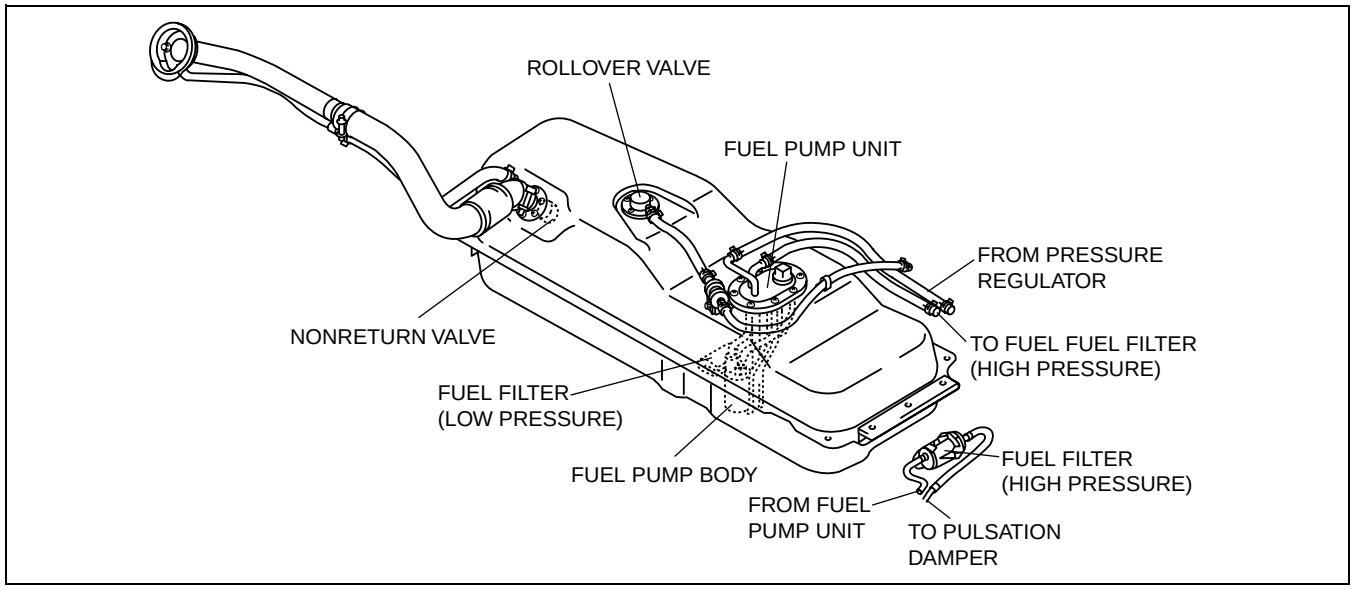
FUEL SYSTEM OUTLINE

AVF391201006W01

- The fuel system is essentially carried over from that of the current RANGER G6 engine models. (See RANGER Training Manual F161-10-99A.)
  — The shape of the fuel tank has been changed, accordingly the number of rollover valves has been reduced from 2 to 1.

FUEL SYSTEM STRUCTURAL VIEW

AVF391201006W02



AVF3912W007

CONTROL SYSTEM

CONTROL SYSTEM OUTLINE

AVF394018881W01

- The construction and operation of the EVEREST is essentially carried over from that of the current RANGER, except for the following.
  — The idle-up speed has been changed.
  — A PCM compliant with the immobilizer system has been added.

CONTROL DEVICES AND CONTROL RELATIONSHIP CHART

AVF394018881W02

Engine Control System
Input devices

x: Applicable

Component	IAC	Fuel injection control	Fuel pump control	PRC	ESA control	Purge control	A/C cut-off control	Immobilizer system*1
MAF sensor	x				x	x		
TP sensor	x	x			x	x	x	
IAT sensor	x	x		x	x			
CMP sensor (in distributor)	x	x	x	x	x		x	
ECT sensor	x	x		x	x	x		
BARO sensor (in PCM)	x	x						
O2S		x				x		
CTP sensor	x	x		x	x			
PSP switch	x							
Neutral/clutch switch	x	x			x	x	x	
Brake switch		x						
A/C switch	x					x		
Battery	x	x			x			
DTC (Terminal TEN)	x				x			
Immobilizer unit (with immobilizer system)*1			x		x			x

AVF3940W005

*1 : With immobilizer unit
Bold frames: New specification

Output devices

x: Applicable

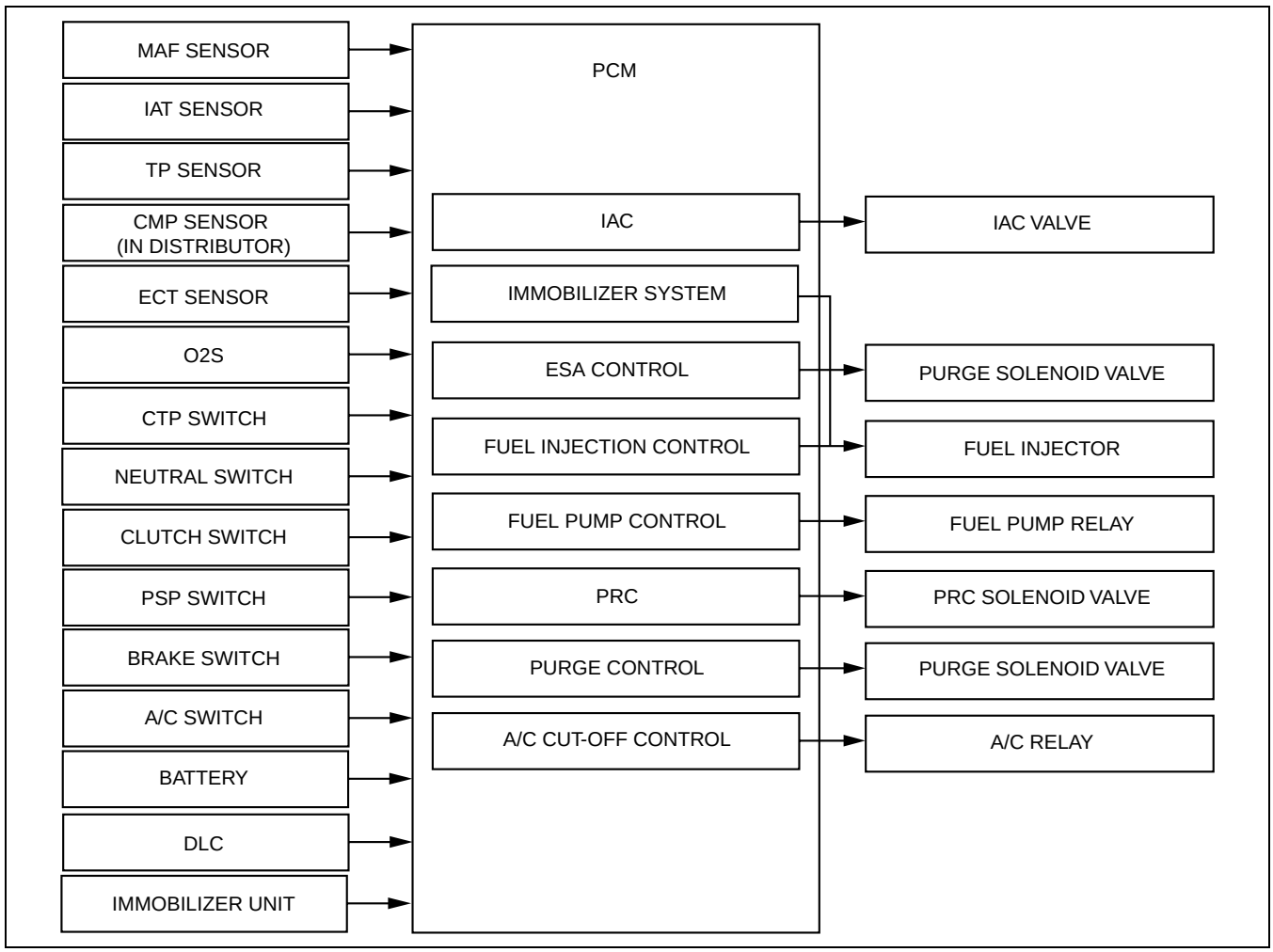
Component	IAC	Fuel injection control	Fuel pump control	PRC	ESA control	Purge control	A/C cut-off control	Immobilizer system*1
IAC	x							
Fuel injector		x						
PRC solenoid valve				x	x			
Igniter				x	x			x
Purge solenoid valve						x		
A/C relay							x	
Fuel pump relay								x

AVF3940W006

*1 : With immobilizer unit
Bold frames: New specification

BLOCK DIAGRAM

AVF394018881W03



AVF3940W003

IDLE AIR CONTROL (IAC)

AVF394018881W04

Idle Speed

- A comparison of the idle speeds for EVEREST G6 engine model and current RANGER G6 engine model is as shown in the following table.

Condition	Idle speed (rpm)	
	EVEREST	Current RANGER
No load	730—770	
A/C is operating	780—880	700—800
Electrical load is on	700—800	
P/S is operating	700—800	

Bold frames: New specification

IMMOBILIZER SYSTEM

AVF394018881W05

- Immediately after the engine is started, the immobilizer unit judges if the ignition key is valid or not. When the key is valid, the PCM continues to run the engine. When the key is invalid, the immobilizer unit actuates the PCM to carry out the fuel cut-off and the ignition cut-off operations, and as result, the engine stops in a few seconds.

ON-BOARD DIAGNOSTIC

ON-BOARD DIAGNOSTIC OUTLINE

AVF397018881W01

- The construction and operation of the on-board diagnostic system is essentially carried over from that of the current RANGER G6 engine models, except for the following. (See Ford RANGER Training Manual F326-10-99A.) (See Ford RANGER Repair Manual F161-10-99A.)
  - — Some DTC have been added.
  - — The OBD tester has been changed from the NGS tester to WDS. Therefore, the PID names have been changed.

DTC

AVF397018881W02

- The DTCs shown below have been added for the detection logic or condition.

Immobilizer System

Immobilizer unit-PCM communication error (P1602)
- Command transmission from the PCM to the immobilizer unit exceeds the limit.
- No response from the immobilizer unit.

Code word unregistered in PCM (P1603)
- Code word unregistered.

Key ID numbers are not registered in PCM (P1604)
- Key ID numbers are not registered in the PCM.

Code words do not match after engine cranking (P1621)
- Code words stored in the PCM and immobilizer unit do not match.

Key ID number mismatch (P1622)
- ID numbers stored in the immobilizer unit (IU) and the PCM do not match. This DTC is indicated only after the immobilizer unit is replaced and system is reprogrammed.

Code word or key ID number read/write error in PCM (P1623)
- PCM internal EEPROM damaged.

Immobilizer system communication counter = 0 (P1624)
- PCM detected immobilizer system communication malfunction more than three times.

PID/DATA MONITOR AND RECORD

AVF397018881W03

- The PID/DATA monitoring items for the fuel and emission control system is as shown in the table below.

Monitor item table

—: Not applicable

PID item	Definition	Unit/Condition	PCM terminal
ACCS	A/C relay	ON/OFF	1J
ACSW	A/C switch	ON/OFF	1Q
ARPMDES	Target engine speed	rpm	—
BARO	Barometric pressure	kPa or inHg	—
	Barometric pressure signal voltage	V	—
BOO	Brake switch	ON/OFF	1O
CPP/PNP	Clutch pedal position switch/neutral switch circuit	Drive/Neutral	1V
ECT	Engine coolant temperature	°C or °F	2Q
	Engine coolant temperature signal voltage	V	2Q
EVAPCP	Purge solenoid valve duty value	%	2X
FP	Fuel pump relay	ON/OFF	1G[*1], 1H[*2]
FPRC	PRC solenoid valve	ON/OFF	2T
FUELPW1	Fuel injection duration	ms	2U,2V
IAC	IAC valve control	ms	2W
IAT	Intake-air temperature	°C or °F	2L
	Intake-air temperature signal voltage	V	2L
IDLE SW	Idle switch (TP sensor)	ON/OFF	1N
LOAD	Engine load	%	—
LONGFT1	Long term fuel trim	%	—
MAF	Mass air flow amount	g/s or lb/m	2O
	Mass air flow signal voltage	V	2O
MIL	Malfunction indicator light	ON/OFF	1E
O2S11	O2S signal voltage	V	2N
PSP	PSP switch	High/Low	1P
RPM	Engine speed	rpm	2E
SHRTFT1	Short term fuel trim	%	—
SPARKADV	Ignition timing	°(BTDC)	2F
Test	TEN terminal condition	ON/OFF	1K
TP	TP sensor signal voltage	V	2M
VPWR	Battery positive voltage	V	1A,1B
VSS	Vehicle speed	km/h or mph	1M

*1 : With immobilizer system
*2 : Without immobilizer system

SIMULATION TEST

AVF397018881W04

- The simulation test items for the fuel and emission control systems are as shown in the table below.

Simulation item table

×: Applicable
—: Not applicable

Simulation item	Applicable component	Operation	Test condition		PCM terminal
			IG ON	Idle	
ACCS	A/C relay	ON or OFF	×	×	1J
EVAPCP	Purge solenoid valve	Actuated by any duty value	×	×	2X
FP	Fuel pump relay	ON or OFF	×	×	1G[*1], 1H[*2]
FPRC	PRC solenoid valve	ON or OFF	×	×	2T
FUELPW1	Fuel injection duration	Actuated fuel injection time	—	×	2U, 2V
IAC	Idle air control	Actuated IAC valve opening time	×	×	2W
INJ 1	Fuel injector No.1 and No.3	OFF	—	×	2U
INJ 2	Fuel injector No.2 and No.4	OFF	—	×	2V

*1 : With immobilizer system
*2 : Without immobilizer system

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF390218881W06

- The following changes and/or additions have been made since publication of the Ford RANGER Repair Manual (F161-10-99A).

Idle-up speed
- Inspection procedure has been modified.

Fuel tank
- Removal/installation procedure has been modified.

PCM
- Inspection procedure has been modified.

On-board diagnostic
- Inspection procedure has been modified.

TROUBLESHOOTING
- Diagnostic procedure has been modified.

ENGINE TUNE-UP

IDLE-UP SPEED INSPECTION

AVF390802000W01

Using the SSTs (WDS or equivalent)

1. Turn off the electrical loads.
2. Warm up the engine as follows.
   (1) Start the engine.
   (2) Maintain the engine speed at **approx. 3,000 rpm** until the cooling fans start to operate.
   (3) Release the accelerator pedal.
   (4) Wait until the cooling fans stop.
3. Verify that the idle speed is normal.
4. Verify that the idle-up speed (WDS: RPM PID) is within the specification using WDS or equivalent.
   - If not as specified with all load conditions, inspect the IAC valve.
   - If not as specified with some load conditions, inspect the CMP sensor, harnesses, and connectors.

Idle speed

Condition	Engine speed (rpm)*1
E/L ON *2	700—800
P/S ON *3	700—800
A/C ON *4	780—880

*1 : Excludes temporary idle speed drop just after the electrical loads (E/L) are turned on.
*2 : Headlight is on, fan switch is above 1st, cooling fan is operating, rear window defroster is on.
*3 : Steering wheel is fully turned.
*4 : A/C switch and fan switch are on.

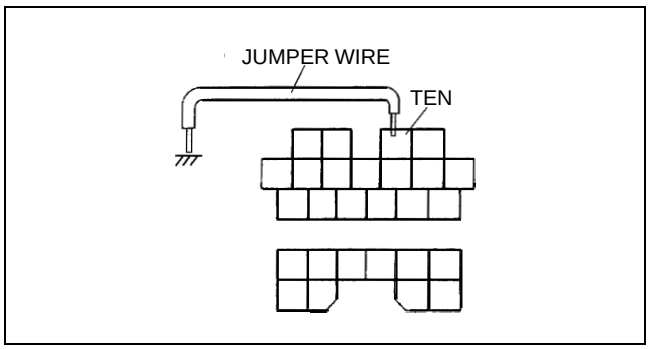
Not Using the SSTs (WDS or equivalent)

1. Turn off the electrical loads.
2. Warm up the engine as follows.
   (1) Start the engine.
   (2) Maintain the engine speed at **approx. 3,000 rpm** until the cooling fan starts to operate.
   (3) Release the accelerator pedal.
   (4) Wait until the cooling fan stops.
3. Turn on the test mode.

Caution

- **Connecting to the wrong DLC terminal may cause a malfunction. Carefully connect only to the specified terminal.**

4. Connect DLC terminal TEN to the body GND using a jumper wire.
5. Verify that the idle-up speed is within the specification.
   - If not as specified with all load conditions, inspect the IAC valve.
   - If not as specified with some load conditions, inspect the related input switches, harnesses, and connectors.



AVF3908W001

Idle speed

Condition	Engine speed (rpm)*1
E/L ON *2	700—800
P/S ON *3	700—800
A/C ON *4	780—880

*1 : Excludes temporary idle speed drop just after the electrical loads (E/L) are turned on.
*2 : Headlight is on, fan switch is above 1st, cooling fan is operating, rear window defroster is on.
*3 : Steering wheel is fully turned.
*4 : A/C switch and fan switch are on.

FUEL SYSTEM

FUEL TANK REMOVAL/INSTALLATION

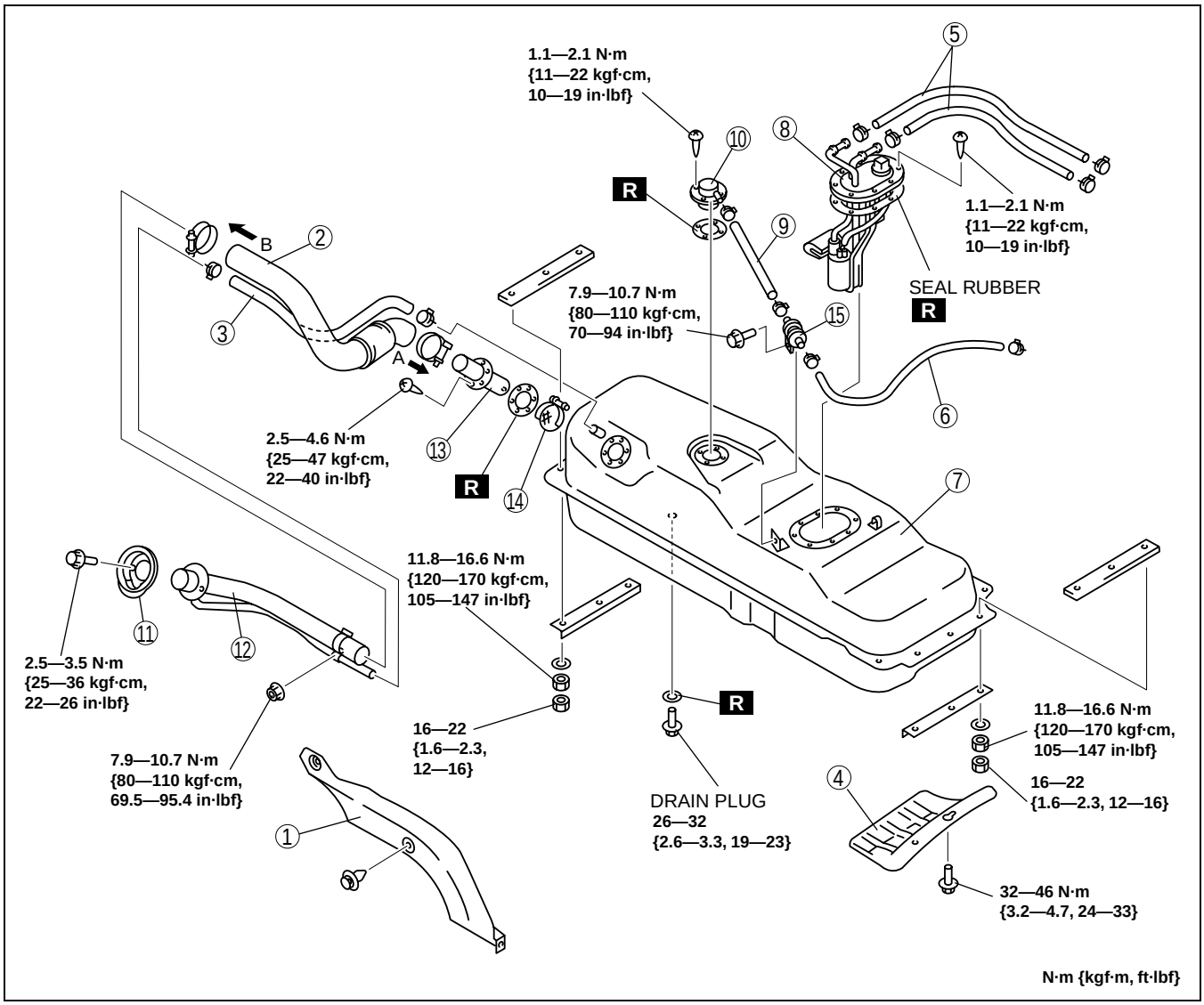
AVF391242110W01

Warning

- **Repairing a fuel tank that has not been properly steam cleaned can be dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, do not damage the sealing surface of the fuel pump unit when removing or installing.**

1. Level the vehicle.
2. Complete the “BEFORE REPAIR PROCEDURE”.
3. Disconnect the negative battery cable.
4. Drain the fuel from the drain plug.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.

7. Complete the “AFTER REPAIR PROCEDURE”.



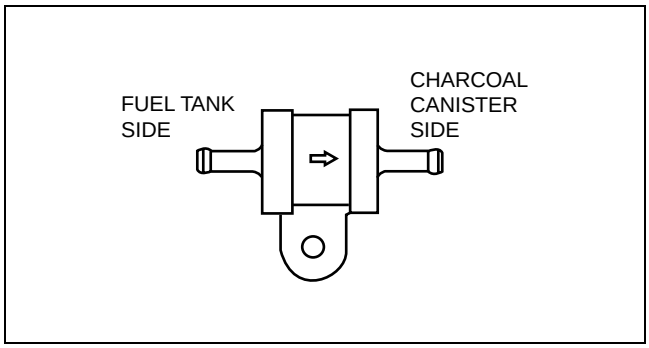
AVF3912W006

1	Fuel-filler pipe protector
2	Joint hose (See F1–14 Joint Hose Installation Note)
3	Breather hose (See F1–14 Evaporative Hose, Breather Hose Installation Note)
4	Under guard
5	Fuel hose
6	Evaporative hose (to charcoal canister) (See F1–14 Evaporative Hose, Breather Hose Installation Note)
7	Fuel tank

8	Fuel pump unit
9	Evaporative hose (See F1–14 Evaporative Hose, Breather Hose Installation Note)
10	Rollover valve
11	Dust cover
12	Fuel-filler pipe
13	Fuel inlet pipe
14	Nonreturn valve
15	Evaporative gas check valve (two-way) (See F1–14 Evaporative Gas Check valve (Two-way) Installation Note)

Evaporative Gas Check valve (Two-way) Installation Note

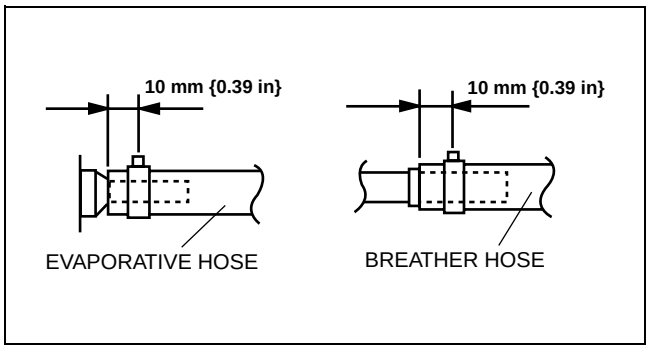
1. Install the arrow mark of the evaporative gas check valve (two-way) facing the charcoal canister.



AVF3912W001

Evaporative Hose, Breather Hose Installation Note

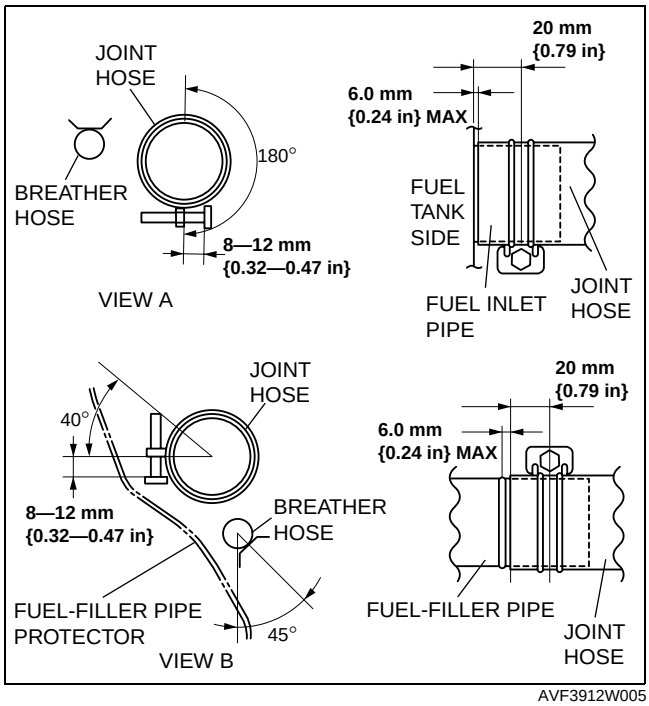
1. Fit the breather hose onto the respective fittings, and install clamps as shown.



AVF3912W002

Joint Hose Installation Note

1. Fit the joint hose onto the respective fittings, and install clamps as shown.



AVF3912W005

CONTROL SYSTEM

PCM INSPECTION

AVF394018880W01

Caution
- **The PCM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM determine the cause of trouble. Otherwise, diagnosis will be incorrect.**

Using SST (WDS or Equivalent)

Note
- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
  — Water temperature sender unit (Integrated with ECT sensor)
  — CMP sensor
  — Main relay

1. Connect the SSTs (WDS or equivalent) to the DLC.
2. Turn the ignition switch to the ON position.
3. Measure the PID value.
   - If PID value is not within the specification, inspect the parts listed under “Inspection item(s)”.

Note
- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the PCM. Therefore, an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device. If a monitored value of an output device is out of specification, inspect the monitored value of the input device related to the output control.
- Perform the simulation test for the output device after PID/DATA measurement is completed.

PID/DATA monitor table (reference)

Monitor item (definition)	Unit/ Condition	Condition/Specification (Reference)	Inspection item(s)	PCM terminal
ACCS (A/C relay)	ON/OFF	Ignition switch ON: OFF A/C switch ON and fan switch ON at idle: ON	Inspect the following monitor items: — RPM, TP, ECT, ACSW A/C relay	1J
ACSW (A/C switch)	ON/OFF	A/C switch and fan switch ON at ignition switch ON: ON A/C switch OFF at ignition switch ON: OFF	A/C switch	1Q
ARPMDES (Target engine speed)	RPM	No load: 750 rpm E/L operating: 750 rpm P/S operating: 750 rpm A/C ON: 830 rpm	Inspect the following monitor items: — IAT, RPM, ECT, MAF, TP, ACSW, PSP IAC valve CMP sensor	—
BARO	kPa or inHg	Below 400 m {0.25 mile} above sea level: 100—103 kPa {1.02—1.05 kgf/cm^2}	DTC inspection	—
	V	Below 400 m {0.25 mile} above sea level: 3.9—4.0 V		
BOO (Brake switch)	ON/OFF	Brake pedal depressed: ON Brake pedal released: OFF	Brake switch	1O
CPP/PNP (Shift lever position)	Drive /Neutral	Neutral position and clutch pedal depressed: Drive Others: Neutral	Neutral switch Clutch switch	1V
ECT (Engine coolant temperature)	°C / °F	ECT 20 °C {68 °F}: 20 °C {68 °F} ECT 60 °C {140 °F}: 60 °C {140 °F}	ECT sensor	2Q
	V	ECT 20 °C {68 °F}: 2.2—2.4 V After warms up: Below 1.0 V		
EVAPCP (Purge solenoid valve duty value)	%	Ignition switch ON: 0% Idle: 0%	Inspect the following monitor items: — IAT, RPM, ECT, MAF, O2S11,BARO, TP, VPWR Purge solenoid valve	2X

Monitor item (definition)	Unit/ Condition	Condition/Specification (Reference)	Inspection item(s)	PCM terminal
FP (Fuel pump relay)	ON/OFF	Ignition switch ON: OFF Idle: ON Cranking: ON	Inspect the following monitor items: — RPM — CMP sensor Fuel pump relay	1G*1 1H*2
FPRC (PRC solenoid valve)	ON/OFF	Ignition switch on: OFF Idle: OFF Engine start at hot condition: ON	Inspect the following monitor items: — ECT, IAT, RPM, VPWR PRC solenoid valve	2T
FUELPW1(Fuel injector duration)	ms	Ignition switch ON: 0 ms Idle (after warm up): 3.0—5.0 ms	Inspect the following monitor items: — IAT, MAF, TP, ECT, RPM, O2S11, TR, PSP, ACSW, VPWR Fuel injector	2U, 2V
IAC (IAC valve)	ms	Idle: Approx. 2.4—2.7 ms	Inspect the following monitor items: — IAT, RPM, ECT, MAF, TP, PSP, ACSW IAC valve	2W
IAT (Intake air temperature)	°C / °F	IAT 20 °C {68 °F}: 20 °C {68 °F} IAT 30 °C {86 °F}: 30 °C {86 °F}	IAT sensor	2L
	V	IAT 20 °C {68 °F}: 2.5—2.6 V IAT 30 °C {86 °F}: 1.7—1.9 V		
IDLE SW (CTP switch)	ON/OFF	Accelerator depressed: OFF Accelerator released: ON	CTP switch	1N
LOAD (Engine load)	%	Ignition switch ON: 0% Idle (after warm up): approx.19%	MAF sensor	—
LONGFT1 (long term fuel trim)	%	Idle (after warm up): approx.–14—14%	DTC inspection (See F1–20 DTC TABLE)	—
MAF (Mass airflow)	g/s or lb/m	Ignition switch ON: approx. 0 g/s Idle (after warm up): 1.5 g/s	MAF sensor	2O
	V	Ignition switch ON: 1.0—2.0 V Idle (after warm up): 1.9—2.8 V		
MIL (Malfunction indicator lamp)	ON/OFF	Ignition switch ON: ON Idle: OFF	DTC inspection (See F1–20 DTC TABLE)	1E
O2S11 (Front oxygen sensor)	V	Ignition switch ON: 0.1—1.0 V Idle (after warm up): 0.1—1.0 V Acceleration (after warm up): 0.5—1.0 V Deceleration (after warm up): 0—0.5 V	O2S	2N
PSP (Power steering pressure switch)	High/Low	Steering wheel fully turned: High Steering wheel in straight ahead position: Low	PSP switch	1P
RPM (Engine speed)	rpm	No load: 730—770 rpm E/L operating: 700—800 rpm P/S operating: 700—800 rpm A/C ON: 780—880 rpm	CMP sensor	2E
SHRTFT1 (Short term fuel trim)	%	Idle (after warm up): approx.–30—25%	DTC inspection (See F1–20 DTC TABLE)	—
SPARKADV (Ignition timing)	° (BTDC)	Terminal TEN (DLC) short to GND: 4°—6° BTDC Idle: –1°—30° BTDC	Inspect the following monitor items: — MAF, TP, ECT, RPM, PSP, ACSW, VPWR, TEST, CPP/PNP CMP sensor Idle speed and ignition timing	2F
Test (TEN terminal (DLC))	ON/OFF	Terminal TEN (DLC) short to GND: ON Terminal TEN (DLC) open: OFF	Wiring from DLC terminal TEN to PCM terminal 1K	1K
TP (TP sensor signal voltage)	V	CTP: 0.4—0.6 V WOT: 3.4—4.7 V	TP sensor	2M
VPWR (Battery positive voltage)	V	Constant: B+	Main relay Battery	1A, 1B
VSS (Vehicle speed)	km/h / mph	Vehicle speed 20 km/h {12 mph}: 20 km/h {12 mph} Vehicle speed 40 km/h {25 mph}: 40 km/h {25 mph}	Vehicle speedometer sensor Vehicle speed sensor	1M

*1 : With immobilizer system
*2 : Without immobilizer system

Using Voltmeter (Not Using SSTs (WDS or equivalent))

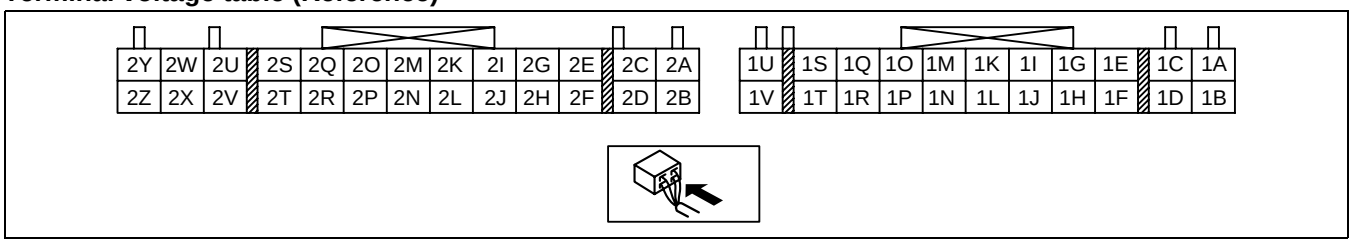
1. Remove the PCM.
2. Reconnect the PCM connector and battery negative terminal.

Note

- With the PCM connector connected, GND the voltmeter negative (–) lead and measure voltage at each PCM terminal by inserting the voltmeter positive (+) lead.

3. Measure the voltage at PCM terminal using a voltmeter.
4. If any incorrect voltage is detected, inspect related systems, wiring harnesses and connectors referring to the action column in the terminal voltage list.

Terminal voltage table (Reference)



AVF3940W002

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item(s)
1A	Back-up power supply	Battery	Constant		B+	• ROOM fuse • Related harness
1B	Power supply	Main relay	Ignition switch OFF		Below 1.0	• Related harness
			Ignition switch ON		B+	
1C	—	—	—		—	—
1D	Serial communication	DLC (Terminal KLN)	Carry out inspection according to DTC. DTC output is a part of serial communication. Judgement by terminal voltage is not possible.		—	• Related harness
1E	DTC output	DLC (Terminal FEN)	Ignition switch on and terminal TEN (in DLC) short to chassis GND	No DTC stored	Below 1.0	• Related harness
				DTC stored	Below 1.0—B+	
1F*1	Immobilizer communication	Immobilizer unit	Because this terminal is for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to diagnostic trouble codes.			• Immobilizer unit • Related harness
1G*1	Fuel pump control	Fuel pump relay	Ignition switch ON		B+	• Fuel pump relay • Related harness
			Cranking		Below 1.0	
			Idle		Below 1.0	
1H*2	Fuel pump control	Fuel pump relay	Ignition switch ON		B+	• Fuel pump relay • Related harness
			Cranking		Below 1.0	
			Idle		Below 1.0	
1I	—	—	—		—	—
1J	A/C control	A/C relay	Ignition switch ON	A/C switch ON	B+	• A/C relay • Related harness
				A/C switch OFF	B+	
			Ignition switch OFF	A/C switch ON	Below 1.0	
				A/C switch OFF	Below 1.0	
1K	Diagnostic test mode	DLC (Terminal TEN)	Ignition switch ON	Terminal TEN (DLC) open	B+	• Related harness
				Terminal TEN (DLC) short to GND	Below 1.0	
1L	Transmission distinction	GND	Constant		Below 1.0	• Related harness

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item(s)
1M	Vehicle speed	VSS	Vehicle stopped		Below 1.0 or Approx. 5.0	• VSS • Related harness
			Vehicle running		Approx. 5.0	
1N	CTP	CTP switch	Ignition switch ON	Accelerator pedal depressed	B+	• CTP switch • Related harness
				Accelerator pedal released	Below 1.0	
1O	Brake	Brake switch	Brake pedal depressed		B+	• Brake switch • Related harness
			Brake pedal released		Below 1.0	
1P	Power steering pressure	PSP switch	Idle	Steering wheel straight ahead position	B+	• PSP switch • Related harness
				Steering wheel fully turned	Below 1.0	
1Q	A/C	A/C switch	Ignition switch ON	A/C switch and fan switch ON	Below 1.0	• A/C switch • Related harness
				A/C switch OFF	B+	
1R	—	—	—		—	—
1S	—	—	—		—	—
1T	—	—	—		—	—
1U	—	—	—		—	—
1V	Load/no load distinction	Neutral/clutch switch	Ignition switch ON	Transmission neutral position or clutch pedal depressed	Below 1.0	• Neutral switch • Clutch switch • Related harness
				Other than transmission neutral or clutch pedal released	B+	
2A	GND	GND	Constant		Below 1.0	• Related harness
2B	GND	GND	Constant		Below 1.0	• Related harness
2C	GND	GND	Constant		Below 1.0	• Related harness
2D	Analog GND	MAF sensor, IAT sensor, ECT sensor, O2S, TP sensor	Constant		Below 1.0	• Related harness
2E	SGT	CMP sensor (integrated into distributor)	Ignition switch ON		5.0	• CMP sensor • Related harness
			Idle		1.8—2.3	
2F	IGT control	Ignition control module	Ignition switch ON		Below 1.0	• Ignition control module • Related harness
			Idle		0.35—0.5	
2G	—	—	—		—	—
2H	—	—	—		—	—
2I	—	—	—		—	—
2J	—	—	—		—	—
2K	Constant voltage (Vref)	TP sensor	Ignition switch ON		4.5—5.5	• Related harness
2L	IAT	IAT sensor	Ignition switch ON	IAT 20°C {68°F}	2.15	• IAT sensor • Related harness
2M	TP	TP sensor	Ignition switch ON	Accelerator pedal released	0.4—0.6	• TP sensor • Related harness
				Accelerator pedal depressed	3.4—4.7	

Terminal	Signal	Connected to	Test condition		Voltage (V)	Inspection item(s)
2N	O2S	O2S	Ignition switch ON		0.55	• O2S • Related harness
			Idle	Engine cold	0.0—1.0	
				After warm up	0.0—1.0	
			Acceleration		0.5—1.0	
			Deceleration		0.0—0.5	
2O	Mass airflow	MAF sensor	Ignition switch ON		1.45	• MAF sensor • Related harness
			Idle (after warm up)		2.15	
			Engine speed 3,000rpm (after warm up)		2.73	
2P	—	—	—		—	—
2Q	ECT	ECT sensor	Ignition switch ON	IAT 20°C {68°F}	1.02	• ECT sensor • Related harness
				After warm up	0.58	
2R	—	—	—		—	—
2S	—	—	—		—	—
2T	Pressure regulator control	PRC solenoid valve	ECT above 90°C {194°F} (Hot condition)	For 120 s. after ignition switch ON	Below 1.0	• PRC solenoid valve • Related harness
				For 120 s. after engine start	Below 1.0	
			Others	Ignition switch ON	B+	
2U	Fuel injector control	Fuel injector No.1, No.3	Ignition switch ON		B+	• Fuel injector • Related harness
			Idle		B+	
2V		Fuel injector No.2, No.4	Ignition switch ON		B+	• Fuel injector • Related harness
			Idle		B+	
2W	IAC	IAC valve	Ignition switch ON		Below 1.0	• IAC valve • Related harness
			Idle (after warm up)		Approx. 1.0	
2X	Purge control	Purge solenoid valve	Ignition switch ON		Below 1.0	• IAC valve • Related harness
			Idle		Approx. 1.0	
			Driving in gear		—	—
2Y	—	—	—		—	—
2Z	Engine speed output	Tachometer (integrated into instrument cluster)	Ignition switch ON		B+	• Instrument cluster • Related harness
			Idle		4.9—7.0	

*1 : With immobilizer system
*2 : Without immobilizer system

F1

ON-BOARD DIAGNOSTIC

DTC TABLE

AVF397018881W05

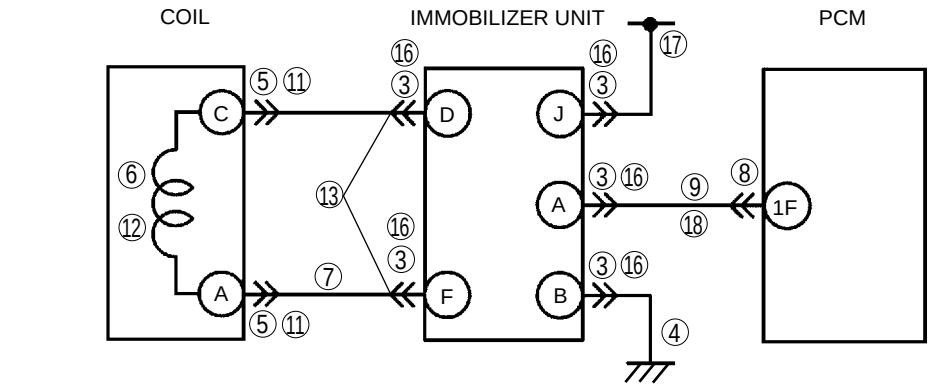
DTC No.	Condition	Page
P0100	MAF circuit malfunction	–
P0115	ECT circuit malfunction	–
P0120	TP sensor circuit malfunction	–
P0134	HO2S circuit no activity detected	–
P0340	CMP sensor circuit malfunction	–
P0443	Evaporative emission solenoid system purge control valve circuit malfunction	–
P0550	PSP switch circuit malfunction	–
P1110	IAT sensor circuit malfunction	–
P1170	HO2S no inversion	–
P1195	BARO circuit malfunction	–
P1250	Pressure regulator control (PRC) valve circuit malfunction	–
P1602*1	Immobilizer unit-PCM communication error	(See F1–21 DTC P1602)
P1603*1	Key ID numbers are not registered in PCM	(See F1–23 DTC P1603)
P1604*1	Code word is not registered in PCM	(See F1–24 DTC P1604)
P1608	PCM internal circuit malfunction	–
P1621*1	Code word does not match after engine cranking	(See F1–24 DTC P1621)
P1622*1	Key ID number does not match	(See F1–25 DTC P1622)
P1623*1	Code word or key ID number read/write error in PCM	(See F1–25 DTC P1623)
P1624*1	Immobilizer system communication counter = 0	(See F1–26 DTC P1624)

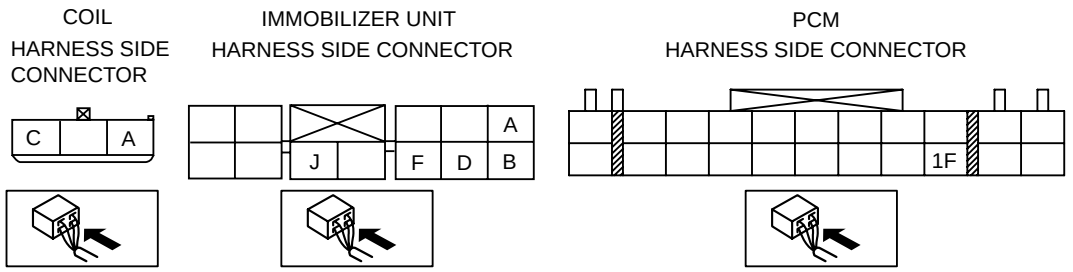
*1 : With immobilizer system

DTC P1602

AVF397001083W01

DTC P1602	Immobilizer unit-PCM communication error
DETECTION CONDITION	• Command transmission from the PCM to the immobilizer unit exceed the limit. • No response from the immobilizer unit
POSSIBLE CAUSE	• Immobilizer unit malfunction • Coil (immobilizer system) malfunction • Key (transponder) malfunction • PCM malfunction • Open circuit in wiring between immobilizer unit terminal A and PCM terminal 1F • Open circuit in wiring between immobilizer unit terminal B and body ground • Open circuit in wiring between immobilizer unit terminal F and coil terminal A • Open circuit in wiring between immobilizer unit terminal D and coil terminal C • Short to ground circuit in wiring between immobilizer unit terminal A and PCM terminal 1F • Short to ground circuit in wiring between immobilizer unit terminal F and coil terminal A • Short to ground circuit in wiring between immobilizer unit terminal D and coil terminal C





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, then go to the next step.
		No	Go to the next step.
2	**CLASSIFY NO DTC DETECTED OR SOME DTC DETECTED** • Clear the DTC from the memory using WDS or equivalent. • Turn the ignition switch to the OFF and ON position (Engine off). • Has DTC P1624 been detected?	Yes	Go to Step 10.
		No	Go to the next step.
3	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** • Turn the ignition switch to the OFF position. • Disconnect the immobilizer unit connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace the terminals, then go to Step 19.
		No	Go to the next step.

F1

STEP	INSPECTION		ACTION
4	**INSPECT GND CIRCUIT OF IMMOBILIZER UNIT FOR OPEN CIRCUIT** • Measure the resistance between the immobilizer unit terminal B (wiring harness-side) and body GND. • Is there any continuity?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 19.
5	**INSPECT COIL TERMINAL** • Disconnect the coil connector. • Check for bent terminals. • Is there any malfunction?	Yes	Repair or replace the terminals, then go to Step 19.
		No	Go to the next step.
6	**INSPECT COIL FOR SHORT CIRCUIT** • Check the continuity between coil terminal A (part-side) and body GND. • Is there any continuity?	Yes	Replace the coil, then go to Step 19.
		No	Go to the next step.
7	**INSPECT COIL CIRCUIT FOR SHORT** • Connect the coil connector. • Check the continuity between immobilizer unit terminal F (wiring harness-side) and body GND. • Is there any continuity?	Yes	Repair or replace the wiring harness, then go to Step 19.
		No	Go to the next step.
8	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Disconnect the PCM connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace the wiring harness, then go to Step 19.
		No	Go to the next step.
9	**INSPECT COMMUNICATION LINE FOR OPEN CIRCUIT** • Measure the continuity between immobilizer unit terminal A (wiring harness-side) and PCM terminal 1F. • Is there any continuity?	Yes	Go to step 19.
		No	Repair or replace the wiring harness, then go to Step 19.
10	**CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTC** • Has DTC P1602 been detected?	Yes	Go to Step 14.
		No	Go to the next step.
11	**INSPECT COIL CONNECTOR FOR POOR CONNECTION** • Disconnect the coil connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are there any malfunctions?	Yes	Repair or replace the wiring harness, then go to Step 19.
		No	Go to the next step.
12	**INSPECT COIL FOR OPEN CIRCUIT** • Disconnect the coil connector. • Measure the resistance between the coil terminals (part-side). • Is there any continuity?	Yes	Go to the next step.
		No	Replace the coil, then go to Step 19.
13	**INSPECT COIL CIRCUIT FOR OPEN CIRCUIT** • Connect the coil connector. • Measure the resistance between immobilizer connector F and D (wiring harness-side). • Is there any continuity?	Yes	Go to Step 19.
		No	Repair or replace the wiring harness, then go to Step 19.
14	**CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTC** • Has immobilizer unit DTC 03 been detected?	Yes	The key has not transponder, change to registered key. Then go to Step 19.
		No	Go to the next step.
15	**CLASSIFY MALFUNCTION BY ANOTHER DETECTED DTC** • Has immobilizer unit DTC 01 been detected?	Yes	The ignition switch is not registered. Reprogram key or using another registered key, then go to the next step.
		No	Go to the next step.

STEP	INSPECTION		ACTION
16	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** • Turn the ignition switch to the OFF position. • Disconnect the immobilizer unit connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are there any malfunctions?	Yes	Repair or replace the wiring harness, then go to the next step.
		No	Go to the next step.
17	**INSPECT IMMOBILIZER UNIT POWER CIRCUIT FOR OPEN CIRCUIT** • Turn the ignition switch to the ON position (Engine off). • Measure the voltage between immobilizer connector J (wiring harness-side) and body GND. • Is voltage **B+**?	Yes	Go to the next step.
		No	Repair or replace the wiring harness, then go to Step 19.
18	**INSPECT COMMUNICATION LINE FOR SHORT HARNESS** • Measure the resistance between immobilizer unit terminal A (wiring harness-side) and body GND. • Is there any continuity?	Yes	Repair or replace the wiring harness, then go to the next step.
		No	Go to the next step.
19	**VERIFY TROUBLESHOOTING OF DTC P1602 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
20	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

DTC P1603

AVF397001083W02

DTC P1603	Key ID numbers are not registered in PCM
DETECTION CONDITION	• The key ID numbers are not registered in PCM.
POSSIBLE CAUSE	• The immobilizer system reprogram procedure (key ID) was not performed after replacing the PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTC P1603 DETECTED AGAIN** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Perform the code word reprogram procedure.
		No	Go to the next step.
3	**VERIFY TROUBLESHOOTING OF DTC P1603 COMPLETED** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

DTC P1604

AVF397001083W03

DTC P1604	Code word unregistered in PCM
DETECTION CONDITION	• The code word unregistered in PCM.
POSSIBLE CAUSE	• The immobilizer system reprogram procedure (code word) was not performed after replacing the PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTC P1604 DETECTED AGAIN** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Perform the code word reprogram procedure.
		No	Go to the next step.
3	**VERIFY TROUBLESHOOTING OF DTC P1604 COMPLETED** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

DTC P1621

AVF397001083W04

DTC P1621	Code words do not match after engine cranking
DETECTION CONDITION	• The code words stored in PCM and Immobilizer unit do not match
POSSIBLE CAUSE	• The immobilizer system reprogram procedure (code word) was not performed correctly after replacing the immobilizer unit or PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTC P1621 DETECTED AGAIN** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Perform the code word reprogram procedure.
		No	Go to the next step.
3	**VERIFY TROUBLESHOOTING OF DTC P1621 COMPLETED** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

DTC P1622

AVF397001083W05

DTC P1622	Key ID number mismatch
DETECTION CONDITION	• The ID numbers stored in the immobilizer unit (IU) and the PCM do not match. This DTC is indicated only after the immobilizer unit is replaced and the system is reprogrammed.
POSSIBLE CAUSE	• The transformation of key ID number stored in the PCM.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTC P1622 DETECTED AGAIN** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Go to the next step.
		No	Go to Step 4.
3	**CHECK ENGINE IS STARTING NORMALLY USING ANOTHER REGISTERED KEY** • Does the engine start with another registered key?	Yes	The previous key is defective. Discard it.
		No	Go to the next step.
4	**VERIFY TROUBLESHOOTING OF DTC P1622 COMPLETED** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

DTC P1623

AVF397001083W06

DTC P1623	Code word or key ID number read/write error in PCM
DETECTION CONDITION	• The PCM internal EEPROM damaged.
POSSIBLE CAUSE	• The PCM internal EEPROM damaged.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**VERIFY DTC P1623 DETECTED AGAIN** • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

DTC P1624

AVF397001083W07

DTC P1624	Immobilizer system communication counter = 0
DETECTION CONDITION	• The PCM detected immobilizer system communication malfunction more than three times
POSSIBLE CAUSE	• Try to start the engine more than three times under the malfunction condition. • Code word mismatch

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY RELATED SERVICE INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related Service Information available?	Yes	Perform repair or diagnosis according to the available Service Information. • If the vehicle is not repaired, go to the next step.
		No	Go to the next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** • Turn the ignition switch to the OFF and START position. • Has P1602 been detected?	Yes	Go to DTC P1602 inspection. (See F1–21 DTC P1602)
		No	Go to the next step.
3	**INSPECT IMMOBILIZER UNIT CONNECTOR FOR POOR CONNECTION** • Has P1621 been detected?	Yes	Go to DTC P1621 inspection. (See F1–24 DTC P1621)
		No	Go to the next step.
4	**VERIFY TROUBLESHOOTING OF DTC P1624 COMPLETED** • Make sure to reconnect all connectors. • Clear the DTC from memory using WDS or equivalent. • Turn the ignition switch to the OFF position, then start the engine. • Is the same DTC present?	Yes	Replace the PCM, then go to the next step.
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure” • Is there any DTC present?	Yes	Go to the applicable DTC inspection. (See F1–20 DTC TABLE)
		No	Troubleshooting completed.

TROUBLESHOOTING

SYMPTOM QUICK DIAGNOSIS CHART

AVF398018881W01

X : Applicable

	Troubleshooting item		Possible factor: ECT sensor malfunction	Main relay malfunction (Mechanical or electrical)	V-reference supply circuit malfunction	PCV valve malfunction	Evaporative emission control system malfunction	Catalytic converter malfunction	Exhaust system restricted or clogged	Improper air/fuel mixture ratio control	PRC solenoid valve inproper operation	Fuel filters restricted or clogged	Fuelleakage from fuel system (Including insulator, injector O-ring)	Injectors malfunction (Leakage or clogging, inoperative)	Fuel hoses restricted or clogged	Pressure regulator malfunction	Fuel pump boky malfunction (Mechanical or electrical)
1	Melting of main or other fuses																
2	Will not crank																
3	Hard to start/long crank/erratic start/erratic crank					x	x		x	x	x	x			x	x	x
4	Engine stalls.	After start/at idle		x	x	x	x		x	x			x	x	x	x	x
5	Cranks normally but will not start			x		x	x		x	x			x	x	x	x	x
6	Slow return to idle		x														
7	Engine runs rough/rolling idle					x	x		x	x		x		x	x	x	x
8	Fast idle/runs on		x														
9	Low idle/stalls during deceleration						x			x							
10	Engine stalls/quits.	Acceleration/cruise		x	x	x	x		x	x		x		x	x	x	x
	Engine runs rough.	Acceleration/cruise		x	x	x	x		x	x		x		x	x	x	x
	Misses	Acceleration/cruise		x	x	x	x		x	x		x		x	x	x	x
	Buck/jerk	Acceleration/cruise/ deceleration		x	x	x	x		x	x		x		x	x	x	x
	Hesitation/stumble	Acceleration		x	x	x	x		x	x		x		x	x	x	x
	Surges	Acceleration/cruise		x	x	x	x		x	x		x		x	x	x	x
11	Lack/loss of power	Acceleration/cruise				x	x		x					x	x	x	x
12	knocking/pinging	Acceleration/cruise														x	x
13	Poor fuel economy					x			x		x	x			x	x	x
14	Emissions compliance					x	x	x	x	x		x			x	x	x
15	High oil consumption/leakage					x											
16	Cooling system concerns	Overheating															
17	Cooling system concerns	Runs cold															
18	Exhaust smoke					x					x			x	x	x	x
19	Fuel odor (in engine compartment)						x						x			x	
20	Engine noise																
21	Vibration concerns (engine)																
22	A/C does not work sufficiently.																
23	A/C is always on or A/C compressor runs continuously.																
24	A/C is not cut off under WOT conditions.																
25	Exhaust sulphur smell						x										
26	Intermittent concerns		x	x			x	x			x			x		x	x
27	Constant voltage																

AVF3980W001

F1

NO.4 ENGINE STALLS-AFTER START/AT IDLE

AVF398018881W02

4	ENGINE STALLS-AFTER START/AT IDLE
DESCRIPTION	• Engine stops unexpectedly at idle and/or after start.
POSSIBLE CAUSE	• A/C system operation is improper • Air leakage from intake-air system parts • Purge solenoid valve malfunction • Improper operation of IAC valve • No signal from CMP sensor due to sensor related wire or wrong installation • Vacuum leakage • Low engine compression • Spark leakage from high-tension leads • Poor fuel quality • PCV valve malfunction • Air cleaner restriction • Restriction in exhaust system • Electrical connector disconnection • Open or short circuit in fuel pump body and related harness • No battery power supply to PCM or poor GND • Inadequate fuel pressure • Fuel pump body mechanical malfunction • Fuel leakage from fuel injector • Pressure regulator control (PRC) system malfunction • Immobilizer system malfunction (if equipped) **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	**Note** • Following test should be performed on vehicles with immobilizer system. Connect WDS or equivalent to DLC. Do following conditions appear? • Engine is not completely started • DTC P1624 is displayed	Yes	**Both conditions appear:** Go to step 4.
		No	**Either or other condition appear:** Go to next step.
2	Does engine stall **approx. 2 s** after engine is started?	Yes	Go to next step.
		No	Immobilizer system is okay. Go to step 12.
3	Is immobilizer unit connector securely connected to immobilizer unit?	Yes	Go to next step.
		No	Go to step 2.
4	Does immobilizer indicator light flash and indicate any of following immobilizer system DTCs? • **DTC: 01, 02, 03, 11, 21**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See F1–20 DTC TABLE)
		No	Go to next step.
5	Does immobilizer indicator light illuminate?	Yes	Go to step 8.
		No	Go to next step.
6	Does immobilizer indicator light flash and indicate following immobilizer system DTC **more than 135 s** after engine switch is turned to ON?. • **DTC: 24, 30**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See F1–20 DTC TABLE)
		No	Go to next step.
7	Turn ignition switch to OFF. Disconnect immobilizer unit connector. Connect jumper wire between immobilizer unit connector terminal M and GND. Turn ignition switch to ON. Does immobilizer indicator light illuminate?	Yes	Reconnect immobilizer unit connector. Go to next step.
		No	Inspect for open circuit between immobilizer unit connector terminal M and instrument cluster. If okay, inspect immobilizer indicator light bulb. Repair or replace if necessary. Reconnect immobilizer unit connector, then return to Step 4.

STEP	INSPECTION	RESULTS	ACTION
8	Connect WDS or equivalent to DLC and retrieve DTC. Is any of following DTC displayed? • **DTC: P1602, P1603, P1604, P1621, P1622, P1624**	Yes	Go to appropriate DTC test.
		No	Go to next step.
9	Disconnect throttle position sensor connector. Inspect continuity between GND terminal at throttle position sensor vehicle harness connector and body GND. Is there continuity?	Yes	Go to next step.
		No	Access PCM connector. Inspect for continuity between PCM connector 2A, 2B, 2C terminals and body GND. Repair or replace as necessary.
10	Turn ignition switch to ON. Access VPWR PID. Is VPWR PID okay? **VPWR PID** **Battery positive voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
11	Disconnect immobilizer unit connector. Turn engine switch to ON. Is there battery voltage at immobilizer unit connector terminal J?	Yes	Inspect for open circuit between PCM connector terminal F and immobilizer unit connector terminal A.
		No	Repair or replace wiring harness between immobilizer unit connector terminal J and fuse panel.
12	Verify following: • Vacuum connection • Air cleaner element • No air leakage from intake-air system • No restriction of intake-air system • Proper sealing of intake manifold (e.g. IAC valve) • Ignition wiring • Fuel quality (e.g. proper octane, contamination, winter/summer blend) • Electrical connections • Smooth operation of throttle valve Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 12.
13	Turn ignition switch ON. Disconnect TP sensor connector. Measure voltage at TP sensor connector VREF terminal with ignition switch ON. **Voltage** **4.5—5.5 V** Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.27 “Constant voltage”.
14	Connect WDS or equivalent to DLC. Turn ignition switch ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test. **Communication error message is displayed:** Inspect for following: • Open circuit between main relay and PCM terminal 1B • Open main relay GND circuit • Main relay stuck open • Open PCM GND circuit (PCM terminal 2A, 2B or 2C) • Poor connection of vehicle body GND
		No	**No DTC displayed:** Go to next step.
15	Attempt to start engine at part throttle. Does engine run smoothly at part throttle?	Yes	Inspect IAC valve and wiring harness.
		No	Go to next step.
16	Connect WDS or equivalent to DLC. Access RPM PID. Is RPM PID indicating engine speed during cranking of engine?	Yes	Go to next step.
		No	Inspect for following: • Open or short circuit in CMP sensor • Open or short circuit between CMP sensor and PCM terminal 2E • Open or short circuit in CMP sensor harnesses If CMP sensor and harness okay, go to next step.
17	Visually inspect CMP sensor. Is CMP sensor okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
18	Inspect for cracks on high-tension leads. Are there any cracks on high-tension leads?	Yes	Repair suspected high-tension lead.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
19	Is strong blue spark visible at each disconnected high-tension lead while cranking engine?	Yes	Go to next step. If symptom occurs with A/C ON, go to Step 25.
		No	Inspect for following: • Open or short circuit in ignition coil • Open circuit in high-tension leads • Open circuit between igniter connector GND terminal and body GND • Open circuit between ignition switch and ignition coil • Open circuit between ignition coil and condenser • Open circuit between condenser and igniter • Open circuit between igniter and PCM terminal 2F
20	Inspect spark plug condition. Is spark plug wet, covered with carbon, or grayish white?	Yes	**Spark plug is wet or covered with carbon:** Inspect for fuel leakage from injector. **Spark plug is grayish white:** Inspect for clogged fuel injector.
		No	Go to next step.
21	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
22	Is there any restriction in the exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
23	Install fuel pressure gauge between fuel main pipe and fuel distributor. Connect jumper wire between F/P terminal at DLC and GND. Turn ignition switch ON. Is fuel line pressure correct with ignition switch ON? **Fuel line pressure** **270—310 kPa** **{2.7—3.2 dgf/cm^2, 39—45 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. Inspect PRC solenoid valve, related vacuum hose and related harnesses. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
24	Visually inspect for fuel leakage at fuel injector, O-ring, and fuel line. Service as necessary. Does fuel line pressure hold after ignition switch is turned OFF? **Fuel line pressure** **More than 150 kPa** **{1.5 dgf/cm^2, 21 psi} for 5min.**	Yes	Go to next step.
		No	Inspect pressure regulator diaphragm condition. If condition is okay, inspect fuel injector. If condition is not okay, replace pressure regulator.
25	**Note** • The following test is for stall concerns with A/C ON. If other symptoms exist, go to next step. Connect pressure gauges to A/C low and high pressure side lines. Turn A/C ON and measure low side and high side pressure. Is pressure within specifications?	Yes	Go to next step.
		No	If A/C is always ON, go to symptom troubleshooting No.23 “A/C is always ON/A/C compressor runs continuously”. For other symptoms, inspect following: • Refrigerant charging amount
26	Disconnect vacuum hose between purge solenoid valve and dynamic chamber from purge solenoid side. Plug opening end of vacuum hose. Start engine. Is engine stall now eliminated?	Yes	Inspect if purge solenoid valve sticks to open. Inspect evaporative emission control system.
		No	Go to next step.
27	Is air leakage felt of heard at intake-air system components while racing engine to higher speed?	Yes	Repair or replace.
		No	Go to next step.
28	Is engine compression correct?	Yes	Inspect valve timing.
		No	Inspect for cause.
29	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.5 CRANDS NORMALLY BUT WILL NOT START

AVF398018881W03

5	CRANKS NORMALLY BUT WILL NOT START
DESCRIPTION	• Starter cranks engine at normal speed but engine will not run. • Refer to “Engine stalls” if this symptom appears after engine stall. • Fuel in tank. • Battery is in normal condition.
POSSIBLE CAUSE	• No battery power supply to PCM • Air leakage from intake-air system • Open PCM GND or vehicle body GND • Improper operation of IAC valve • No signal from CMP sensor due to sensor related wire or incorrect installation • Low engine compression • Vacuum leadage • Spark leakage from high-tension leads • Poor fuel quality • PCV valve malfunction • Air cleaner restriction • Restriction in exhaust system • Disconnected electrical connector • Open or short circuit in fuel pump body and related harness • Inadequate fuel pressure • Fuel pump body mechanical malfunction • fuel leadage from injector • Fuel injector is clogged • Purge solenoid valve malfunction • Pressure regulator control (PRC) system malfunction **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	**Note** • Following test should be performed on vehicles with immobilizer system. Connect WDS or equivalent to DLC. Do following conditions appear? • Engine is not completely started • DTC P1624 is displayed	Yes	**Both conditions appear:** Go to step 4.
		No	**Either or other condition appear:** Go to next step.
2	Does engine stall **approx. 2 s** after engine is started?	Yes	Go to next step.
		No	Immobilizer system is okay. Go to step 12.
3	Is immobilizer unit connector securely connected to immobilizer unit?	Yes	Go to next step.
		No	Go to step 2.
4	Does immobilizer indicator light flash and indicate any of following immobilizer system DTCs? • **DTC: 01, 02, 03, 11, 21**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See F1–20 DTC TABLE)
		No	Go to next step.
5	Does immobilizer indicator light illuminate?	Yes	Go to step 8.
		No	Go to next step.
6	Does immobilizer indicator light flash and indicate following immobilizer system DTC **more than 135 s** after engine switch is turned to ON?. • **DTC: 24, 30**	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system. (See F1–20 DTC TABLE)
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
7	Turn ignition switch to OFF. Disconnect immobilizer unit connector. Connect jumper wire between immobilizer unit connector terminal M and GND. Turn ignition switch to ON. Does immobilizer indicator light illuminate?	Yes	Reconnect immobilizer unit connector. Go to next step.
		No	Inspect for open circuit between immobilizer unit connector terminal M and instrument cluster. If okay, inspect immobilizer indicator light bulb. Repair or replace if necessary. Reconnect immobilizer unit connector, then return to Step 4.
8	Connect WDS or equivalent to DLC and retrieve DTC. Is any of following DTC displayed? • **DTC: P1602, P1603, P1604, P1621, P1622, P1624**	Yes	Go to appropriate DTC test.
		No	Go to next step.
9	Disconnect throttle position sensor connector. Inspect continuity between GND terminal at throttle position sensor vehicle harness connector and body GND. Is there continuity?	Yes	Go to next step.
		No	Access PCM connector. Inspect for continuity between PCM connector 2A, 2B, 2C terminals and body GND. Repair or replace as necessary.
10	Turn ignition switch to ON. Access VPWR PID. Is VPWR PID okay? **VPWR PID** **Battery positive voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
11	Disconnect immobilizer unit connector. Turn engine switch to ON. Is there battery voltage at immobilizer unit connector terminal?	Yes	Inspect for open circuit between PCM connector terminal F and immobilizer unit connector terminal A.
		No	Repair or replace wiring harness between immobilizer unit connector terminal J and fuse panel.
12	Verify following: • Vacuum connection • External fuel shut off or accessory (dill switch, alarm etc.) • Fuel quality (e.g.proper octane, contamination, winter/summer blend) • No air leakage from intake-air system • Proper sealing of intake manifold and components attached to intake manifold (e.g.IAC valve) • Ignition wiring • Electrical connections • Fuses • Smooth operation of throttle valve Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 12.
13	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test. **Communication error message is displayed:** Inspect for following: • Open circuit between main relay and PCM terminal 1B • Open main relay GND circuit • Main relay stuck open • Open PCM GND circuit (PCM terminal 2A, 2B, or 2C) • Poor connection of vehicle body GND
		No	**No DTC displayed:** Go to next step.
14	Turn ignition switch ON. Disconnect TP sensor connector. Measure voltage at TP sensor connector VREF terminal with ignition switch ON. **Voltage** **4.5—5.5 V**	Yes	Go to next step.
		No	Go to symptom troubleshooting No.27 “Constant voltage”.
15	Does engine start with throttle closed?	Yes	Go to step 29.
		No	Go to next step.
16	Will engine start and rum smoothly at part throttle?	Yes	Inspect IAC valve and wiring harness.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
17	Connect WDS or equivalent to DLC Access RPM PID. Is RPM PID indicating engine speed when cranking engine?	Yes	Go to next step.
		No	Inspect for following: • Open or short circuit in CMP sensor • Open or short circuit between CMP sensor and PCM terminal 2E • Open or short circuit in CMP sensor harnesses If CMP sensor and harness are okay, go to next step.
18	Visually inspect CMP sensor. Is CMP sensor okay?	Yes	Go to next step.
		No	Repair suspected high-tension leads.
19	Inspect for cracks on high-tension leads. Is there any cracks on high-tension leads?	Yes	Go to next step.
		No	Replace PCV valve.
20	Is strong blue spark visible at each disconnected high-tension lead while cranking engine?	Yes	Go to next step.
		No	Inspect for following: • Open or short circuit in ignition coil • Open circuit in high-tension leads • Open circuit between igniter connector GND terminal and body GND • Open circuit between ignition switch and ignition coil • Open circuit between ignition coil and condenser • Open circuit between condenser and igniter • Open circuit between ignition coil and igniter • Ope circuit between igniter and PCM terminal 2F
21	Inspect spark plug conditions. Is spark Plug wet, covered with carbon, or grayish white?	Yes	If spark plug is wet or covered with carbon, inspect for fuel leakage from injector. If spark plug is grayish white, inspect for clogged fuel injector.
		No	Install spark plugs on original cylinders. Go to next step.
22	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV vale.
23	Is there any restriction in exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
24	Install fuel pressure gauge between fuel main pipe and fuel distributor. connect jumper wire between F/P terminal at DLC in engine compartment and GND. Turn ignition switch ON. Is fuel line pressure correct when ignition switch is cycled ON/OFF five times? **Fuel line Pressure** **270—310 kPa** **{2.7—3.2 kgf/cm^2, 39—45 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. Inspect PRC solenoid, related vacuum hose, and harnesses. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
25	Visually inspect for fuel leakage at fuel injector O-ring and fuel line. Service as necessary. Is fuel line pressure held after ignition switch is turned OFF? **Fuel line Pressure** **More than 150 kPa** **{1.5 kgf/cm^2, 21 psi}** **for 5 min.**	Yes	Go to next step.
		No	Inspect pressure regulator diaphragm condition. If condition is okay, inspect fuel injector. If condition is not okay, replace pressure regulator.
26	Disconnect vacuum hose between purge solenoid valve and dynamic chamber from purge solenoid valve side. Plug opening end of vacuum hose. Start engine. Is starting condition improved?	Yes	Inspect if purge solenoid valve sticks to open mechanically. Inspect evaporative emission control system.
		No	Go to next step.
27	Is air leakage felt or heard at intake-air system components while racing engine to higher speed?	Yes	Repair or replace.
		No	Go to next step.
28	Is engine compression correct?	Yes	Inspect valve timing.
		No	Inspect for causes.
29	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.9 LOW IDLE/STALLS DURING DECELERATION

AVF398018881W04

9	LOW IDLE/STALLS DURING DECELERATION
DESCRIPTION	• Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.
POSSIBLE CAUSE	• Vacuum leakage • IAC valve malfunction • Air leakage from intake-air system • MAF sensor or related circuit malfunction • TP sensor or related circuit malfunction • Brake switch or related circuit malfunction • Neutral/clutch switch or related circuit malfunction

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Does engine idle roughly?	Yes	Go to symptom troubleshooting No.7 for “Engine runs rough/Rolling idle”.
		No	Go to next step.
2	Verify following: • Proper routing and no damage of vacuum lines • IAC valve is connected properly • No air leakage from intake-air system Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 2.
3	Connect WDS or equivalent to DLC. Turn ignition switch ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**NO DTC displayed:** Go to next step.
4	Does idle speed drop or stall when disconnecting IAC valve?	Yes	Go to next step.
		No	Inspect following: • Circuit from IAC valve to PCM connector terminal 2W for open and short • IAC valve for sticking If okay, go to next step.
5	Disconnect vacuum hose between purge solenoid valve and dynamic chamber from purge solenoid valve side. Plug opening end of vacuum hose. Drive vehicle. Does engine condition improve?	Yes	Inspect evaporative emission control system.
		No	Go to next step.
6	Connect WDS or equivalent to DLC. Access TP, MAF, VSS, BOO and PNP PIDs. Monitor each PID while driving vehicle. • TP PID • MAF PID • VSS PID • BOO PID • PNP PID Are PIDs okay? (See F1–15 PCM INSPECTION)	Yes	Go to symptom troubleshooting No.26 for “Intermittent concerns”.
		No	**TPTP PID:** Inspect TP sensor. **MAF PID:** Inspect MAF sensor. **VSS PID:** Inspect VSS. **BOO PID:** Inspect brake switch. **PNP PID:** Inspect neutral switch and clutch switch.
7	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.10 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES

AVF398018881W05

10	**ENGINE STALLS/QUITS-ACCELERATION/CRUISE** **ENGINE RUNS ROUGH-ACCELERATION/CRUISE** **MISSES-ACCELERATION/CRUISE** **BUCK/JERK-ACCELERATION/CRUISE/DECELERATION** **HESITATION/STUMBLE-ACCELERATION** **SURGES-ACCELERATION/CRUISE**
DESCRIPTION	• Engine stops unexpectedly at beginning of acceleration or during acceleration. • Engine stops unexpectedly while cruising. • Engine speed fluctuates during acceleration or cruising. • Engine misses during acceleration or cruising. • Vehicle bucks/jerks during acceleration, cruising or deceleration. • Momentary pause at beginning of acceleration or during acceleration. • Momentary minor irregularity in engine output.
POSSIBLE CAUSE	• A/C system operation is improper • Air leakage from intake-air system parts • Purge solenoid valve malfunction • Improper operation of IAC valve • Erratic signal from CMP sensor • Low engine compression • Vacuum leakage • Poor fuel quality • Spark leakage from high-tension leads • Air cleaner restriction • PCV valve malfunction • Improper valve timing due to jumping out of timing • Restriction in exhaust system • Intermittent open or short in fuel pump circuit • Inadequate fuel pressure • Fuel pump mechanical malfunction • Fuel leakage from fuel injector • Fuel injector clogging • Intermittent open or short of MAF sensor, TP sensor and VSS • Clutch slippage **Warning** **Following troubleshooting flowchart contains fuel system diagnosis and repair procedures. read following warnings before performing fuel system service:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Verify following: • Vacuum connection • Air cleaner element • No air leakage from intake-air system • No restriction of intake-air system • Proper sealing of intake manifold and components attached to intake manifold (e.g. IAC valve) • Ignition wiring • Fuel quality (e.g. proper octane, contamination, winter/summer blend) • Electrical connections • Smooth operation of throttle valve Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.

STEP	INSPECTION	RESULTS	ACTION
2	Connect WDS or equivalent WDS or equivalent to DLC. Turn ignition switch ON. Retrieve any DTC. Is DTC displayed? • Proper routing and no damage of vacuum lines • IAC valve is connected properly. • No air leakage from intake-air system Are all items okay?	Yes	**No DTC displayed:** Go to next step.
		No	**DTC displayed:** Go to appropriate DTC test.
3	Is engine overheating?	Yes	Go to symptom troubleshooting No.16 “Cooling system concerns-Overheating”.
		No	Go to next step.
4	Connect WDS or equivalent to DLC. Access RPM PID, VPWR PID, TP PID, MAF PID, and VSS PID. • RPM PID • VPWR PID • TP PID • MAF PID • VSS PID Drive vehicle while monitoring PIDs. Are PIDs within specification? (See F1–15 PCM INSPECTION)	Yes	Go to next step.
		No	**RPM PID:** Inspect CMP sensor and related harness for vibration, intermittent open/short circuit. **VPWR PID:** Inspect for open circuit intermittently. **MAF PID:** Inspect for open circuit of MAF sensor and related wire harness intermittently. **TP PID:** Inspect if output signal from TP sensor changes smoothly. **VSS PID:** Inspect for open circuit of VSS and related wire harness intermittently.
5	Visually inspect CMP sensor. Is CMP sensor okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
6	Inspect spark plug condition. Is spark plug wet, covered with carbon, or grayish white?	Yes	**Spark plug is wet or covered with carbon:** Inspect for fuel leakage from fuel injector. **Spark Plug is grayish white:** Inspect for clogged fuel injector.
		No	Install spark plugs on original cylinders. Go to next step.
7	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
8	Verify that throttle lever is resting on throttle valve stop screw and/of throttle valve orifice plug. Is lever in correct position?	Yes	Go to next step.
		No	Adjust as necessary.
9	Are there restrictions in the exhaust system. Is spark plug wet, covered with carbon, or grayish white?	Yes	Inspect exhaust system.
		No	Go to next step.
10	Install fuel pressure gauge between fuel main pipe and fuel distributor. Connect jumper wire between F/P terminal at DLC in engine compartment and GND. Turn ignition switch ON. Is fuel line pressure correct with ignition switch ON? **Fuel line pressure** **270—310 kPa** **{2.7—3.2 kgf/cm^2, 39—45 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
11	Visually inspect for fuel leakage at fuel injector, O-ring, and fuel line. Service as necessary. Does fuel line pressure hold after ignition switch is turned OFF? **Fuel line pressure** **More than 150 kPa** **{1.5 kgf/cm^2, 21 psi} for 5 min.**	Yes	Go to next step.
		No	Inspect pressure regulator diaphragm condition. If condition is okay, inspect fuel injector. If condition is not okay, replace pressure regulator.

STEP	INSPECTION	RESULTS	ACTION
12	Install vacuum gauge to intake manifold. Start engine. Does fuel pressure gauge reading increase as vacuum gauge reading decreases and/or does fuel pressure gauge reading decrease as vacuum reading increases?	Yes	Go to next step.
		No	Connect vacuum hose to pressure regulator. Start engine. Verify that fuel pressure gauge reading changes as vacuum changes. If it changes, inspect vacuum line. If it does not change, replace pressure regulator.
13	**Note** • The following test is for engine stalling with A/C ON. If other symptoms exist, go to next step. Connect a pressure gauge to A/C low and high pressure side lines. Turn A/C ON and measure low side and high side pressure. Is pressure within specifications? Is spark plug wet, covered with carbon, or grayish white?	Yes	Go to next step.
		No	If A/C is always ON, go to symptom troubleshooting No.23 “A/C is always ON/A/C compressor runs continuously” For other symptoms, inspect following: • Refrigerant charging amount Go to next step.
14	Disconnect vacuum hose between purge solenoid valve and dynamic chamber from purge solenoid valve side. Plug opening end of vacuum hose. drive vehicle. Does engine condition improve?	Yes	Inspect if purge solenoid valve sticks open mechanically. Inspect evaporative emission control system.
		No	Go to next step.
15	Is engine compression correct?	Yes	Inspect following: • Valve timing • Clutch
		No	Inspect for cause.
16	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.11 LACK/LOSS OF POWER-ACCELERATION/CRUISE

AVF398018881W06

11	LACK/LOSS OF POWER — ACCELERATION/CRUISE
DESCRIPTION	Performance is poor under load (e.g., power down when climbing hills).
POSSIBLE CAUSE	• Improper A/C system operation • Air leakage from intake-air system parts • Purge control solenoid malfunction • Brake dragging • Erratic signal or no signal from CMP sensor • Low engine compression • Vacuum leakage • Poor fuel quality • Spark leakage from high-tension leads • Air cleaner restriction • PCV valve malfunction • Improper valve timing due to jumping out of timing belt • Restriction in exhaust system • Intermittent open or short in fuel pump body circuit • Inadequate fuel pressure • Fuel pump mechanical malfunction • Fuel leakage from fuel injector • Fuel injector clogging • Intermittent open or short of MAF sensor, TP sensor and VSS • Clutch slippage **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Verify following: • Vacuum connection • Air cleaner element • No air leakage from intake-air system • No restriction of intake-air system • Proper sealing of intake manifold and components attached to intake manifold (e.g. IAC valve) • Fuel quality (e.g. proper octane, contamination, winter/summer blend) Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 1.
2	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
3	Is engine overheating?	Yes	Go to symptom troubleshooting "No.16 Cooling system concerns - Overheating".
		No	Go to next step.
4	Connect WDS or equivalent to DLC. Access RPM, MAF, TP and VSS PIDs. Drive vehicle while monitoring PIDs. Are PIDs within specification? (See F1–15 PCM INSPECTION)	Yes	Go to next step.
		No	**RPM PID:** Inspect CKP sensor and related wiring harness for vibration and/or intermittent open/short circuit. **MAF PID:** Inspect for intermittent open circuit of MAF sensor and related wiring harness. **TP PID:** Inspect if TP sensor output increases smoothly. **VSS PID:** Inspect for intermittent open circuit of VSS and related wiring harness.
5	Visually inspect CMP sensor. Is CKP sensor okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
6	Inspect spark plug conditions. Is spark plug wet, covered with carbon or grayish white?	Yes	**Spark plug is wet or covered with carbon:** Inspect for fuel leakage from fuel injector. **Spark plug is grayish white:** Inspect for clogged fuel injector.
		No	Install spark plugs on original cylinders. Go to next step.
7	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
8	Is there restriction in exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
9	Install fuel pressure gauge between fuel main pipe and fuel distributor. Connect jumper wire between F/P terminal at DLC in engine compartment and GND. Turn ignition switch to ON. Is fuel line pressure correct with ignition switch ON? **Fuel line pressure** **270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
10	Install vacuum gauge to intake manifold. Start engine. Does fuel pressure gauge reading increase as vacuum gauge reading decreases and/or does fuel pressure gauge reading decrease as vacuum reading increases?	Yes	Go to next step.
		No	Connect vacuum hose to pressure regulator. Start engine. Verify that fuel pressure gauge reading changes as vacuum changes. If it changes, inspect vacuum line. If it does not change, replace pressure regulator.

STEP	INSPECTION	RESULTS	ACTION
11	**Note** • Following test is for engine stalling with A/C ON concern. If other symptoms exist, go to next step. Connect pressure gauge to A/C low and high side pressure lines. Turn A/C ON and measure low side and high side pressures. Are the pressures within specifications?	Yes	Go to next step.
		No	If A/C is always ON, go to symptom troubleshooting "No.23 A/C is always ON or A/C compressor runs continuously". For other symptoms, inspect following: • Refrigerant charging amount • Condenser fan operation
12	Inspect for A/C cut-off operation. Does A/C cut off work properly?	Yes	Go to next step.
		No	Inspect A/C cut-off system components.
13	Disconnect vacuum hose between purge solenoid valve and dynamic chamber from purge solenoid valve side. Plug opening end of vacuum hose. Drive vehicle. Is engine condition improved?	Yes	Inspect if purge solenoid valve is sticks open mechanically. Inspect evaporative emission control system.
		No	Go to next step.
14	Is engine compression correct?	Yes	Inspect following: • Valve timing • Clutch • Brake system for dragging
		No	Inspect for cause.
15	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

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NO.12 KNOCKING/PINGING-ACCELERATION/CRUISE

AVF398018881W07

12	KNOCKING/PINGING - ACCELERATION/CRUISE
DESCRIPTION	Sound is produced when air/fuel mixture is ignited by something other than spark plug (e.g., hot spot in combustion chamber).
POSSIBLE CAUSE	• Engine overheating due to cooling system malfunction • Inadequate engine compression • Inadequate fuel pressure **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect WDS or equivalent to DLC. Access ECT PID. Verify ECT PID is **less than 116 °C {241 °F}** while driving. Is ECT PID less than specification?	Yes	Go to next step.
		No	Inspect cooling system for cause of overheating.
2	Connect WDS or equivalent to DLC. Turn ignition switch ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
3	Is engine compression correct?	Yes	Go to next step.
		No	Inspect for cause.

STEP	INSPECTION	RESULTS	ACTION
4	Install fuel pressure gauge between fuel main pipe and fuel distributor. Start engine and run it at idle. Measure fuel line pressure at idle. Is fuel line pressure correct at idle? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
5	Install vacuum gauge to intake manifold. Start engine. does fuel pressure gauge reading increase as vacuum gauge reading decreases and/of does fuel pressure gauge reading decrease as vacuum reading increases?	Yes	Inspect ignition timing.
		No	Connect vacuum hose to pressure regulator. Start engine. Verify that fuel pressure gauge reading changes as vacuum changes. If it changes, inspect vacuum line, If it does not change, replace pressure regulator.
6	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.13 POOR FUEL ECONOMY

AVF398018881W08

13	POOR FUEL ECONOMY
DESCRIPTION	Fuel economy is unsatisfactory.
POSSIBLE CAUSE	• Contaminated air cleaner element • Engine cooling system malfunction • Improper automatic transmission fluid level • Weak spark • Poor fuel quality • Improper coolant level • Inadequate fuel pressure • Spark plug malfunction • PCV valve malfunction • Brake dragging • Improper valve timing due to jumping out of timing belt • Contaminated MAF sensor • Improper engine compression • Exhaust system clogging **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect for following: • Air cleaner element for contamination • ATF level • Fuel quality • Coolant level Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 1.
2	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
3	Connect WDS or equivalent to DLC. Access ECT PID. Drive vehicle while monitoring PID. (See F1–15 PCM INSPECTION) Is PID within specification?	Yes	Go to next step.
		No	Inspect for coolant leakage, cooling fan and condenser fan operations or thermostat operation.

STEP	INSPECTION	RESULTS	ACTION
4	Is strong blue spark visible at each disconnected high-tension lead while cranking engine?	Yes	Inspect for following: • Spark plugs malfunction Repair or replace malfunctioning parts. If okay, go to next step.
		No	Inspect following: • High-tension leads • Ignition coil and connector
5	Install fuel pressure gauge between fuel main pipe and fuel distributor. Start engine and run it at idle. Measure fuel line pressure at idle. Is fuel line pressure correct at idle? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
6	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
7	Is there any restriction?	Yes	Inspect exhaust system.
		No	Go to next step.
8	Is brake system functioning properly?	Yes	Go to next step.
		No	Inspect for cause.
9	Inspect for contaminated MAF sensor. Is there any contamination?	Yes	Replace MAF sensor.
		No	Go to next step.
10	Is engine compression correct?	Yes	Inspect valve timing.
		No	Inspect for cause.
11	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.14 EMISSION COMPLIANCE

AVF398018881W09

14	EMISSION COMPLIANCE
DESCRIPTION	Emission compliance test is failed.
POSSIBLE CAUSE	• Vacuum lines leakage or blockage • Cooling system malfunction • Spark plug malfunction • Leakage from intake manifold • Inadequate fuel pressure • PCV valve malfunction or incorrect valve installation • Exhaust system clogging • Fuel tank ventilation system malfunction • Charcoal canister damage • Excessive carbon is built up in combustion chamber. • Improper engine compression • Improper valve timing **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect for following: • Vacuum lines for leakage or blockage • Electrical connections • Proper maintenance schedule followed • Intake-air system and air cleaner element concerns: obstructions, leakage or dirtiness Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 1.
2	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
3	Is any other drivability concern present?	Yes	Go to appropriate symptom troubleshooting.
		No	Go to next step.
4	Connect WDS or equivalent to DLC. Access ECT PID. Warm up engine and run it at idle. Is ECT PID correct?	Yes	Go to next step.
		No	Inspect for coolant leakage, cooling fan and condenser fan operation or thermostat operation.
5	Is strong blue spark visible at each disconnected high-tension lead while cranking engine?	Yes	Inspect for following: • Spark plugs malfunction Repair or replace malfunctioning parts. If okay, go to next step.
		No	Inspect following: • High-tension leads • Ignition coil and connector
6	Install fuel pressure gauge between fuel main pipe and fuel distributor. Start engine and run it at idle. Measure fuel line pressure at idle. Is fuel line pressure correct at idle? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
7	Does fuel line pressure remain at specification for **60 seconds** when ignition switch is turned ON? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	Inspect pressure regulator for high pressure cause.
8	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
9	Is there restriction in exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
10	Inspect for fuel saturation inside charcoal canister. Is excess amount of liquid fuel present in canister?	Yes	Replace charcoal canister.
		No	Inspect fuel tank vent system.
11	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.15 HIGH OIL CONSUMPTION/LEAKAGE

AVF398018881W10

15	HIGH OIL CONSUMPTION/LEAKAGE
DESCRIPTION	Oil consumption is excessive.
POSSIBLE CAUSE	• PCV valve malfunction • Improper dipstick • Improper engine oil viscosity • Engine internal parts malfunction

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
2	Inspect for following: • External leakage • Proper dipstick • Proper engine oil viscosity Are all items okay?	Yes	Inspect internal engine parts such as valves, valve guides, valve stem seals, cylinder head drain passage, and piston rings.
		No	Service if necessary. Repeat Step 2.
3	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

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NO.16 COOLING SYSTEM CONCERNS-OVERHEATING

AVF398018881W11

16	COOLING SYSTEM CONCERNS -OVERHEATING
DESCRIPTION	Engine runs at higher than normal temperature/overheats.
POSSIBLE CAUSE	• Improper coolant level • Blown fuses • Coolant leakage • Excessive A/C system pressure • Improper water/anti-freeze mixture • Fans reverse rotation • Poor radiator condition • Thermostat malfunction • Radiator hoses damage • Improper or damaged radiator cap • Main cooling fan is inoperative • Coolant overflow system malfunction • Improper tension of drive belt • Drive belt damage

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect for following: • Engine coolant level • Coolant leakage • Water and anti-freeze mixture • Radiator condition • Collapsed or restricted radiator hoses • Radiator pressure cap • Overflow system • Fan rotational direction • Fuses Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 1.
2	Connect WDS or equivalent to DLC. Turn ignition key to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
3	Start engine and run it at idle speed. Turn A/C switch ON. Does A/C compressor engage?	Yes	Go to Step 5.
		No	Inspect for following and repair or replace if necessary: • Refrigerant charging amount • Open circuit between A/C relay and PCM terminal 1J • Seized A/C magnetic clutch • A/C magnetic clutch malfunction If all items are okay, go to next step.

STEP	INSPECTION	RESULTS	ACTION
4	Connect WDS or equivalent to DLC. Access ACSW PID ON WDS or equivalent. Start engine and run it at idle speed. Turn A/C switch ON. Does ACSW PID read ON?	Yes	Go to next step.
		No	Inspect following: • Refrigerant pressure switch operation • A/C switch is stuck open. • Open or short circuit between refrigerant pressure switch and PCM terminal 1Q • Open circuit of blower motor fan switch and resistor (if blower motor does not operate) • Evaporator temperature sensor and A/C amplifier
5	Is drive belt okay?	Yes	Go to next step.
		No	Replace drive belt.
6	Is there any leakage around heater unit in passenger compartment?	Yes	Inspect and service heater for leakage.
		No	Go to next step.
7	Is there any leakage at coolant hoses and/or radiator?	Yes	Replace malfunctioning part.
		No	Go to next step.
8	Cool down the engine. Remove thermostat and inspect operation. Is thermostat okay?	Yes	Engine coolant temperature and thermostat are okay, inspect engine block for leakage or blockage.
		No	Access ECT V PID ON WDS or equivalent. Inspect for both ECT V and temperature gauge readings. If temperature gauge ON instrument cluster indicates normal range but ECT V is not same as temperature gauge reading, inspect ECT sensor. If temperature gauge on instrument cluster indicates overheating but ECT V is normal, inspect temperature gauge and heat gauge unit.
9	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.17 COOLING SYSTEM CONCERNS-RUNS COLD

AVF398018881W12

17	COOLING SYSTEM CONCERNS -RUNS COLD
DESCRIPTION	Engine takes excessive period for reaching normal operating temperature.
POSSIBLE CAUSE	• Thermostat malfunction • Cooling fan system malfunction

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is customer complaint "Lack of passenger compartment heat" only?	Yes	Inspect A/C and heater system.
		No	Go to next step.
2	Does engine speed continue at fast idle?	Yes	Go to symptom troubleshooting "No.8 Fast idle/runs on".
		No	Go to next step.
3	Remove thermostat and inspect operation. Is thermostat okay?	Yes	Access ECT V PID ON WDS or equivalent. Inspect for both ECT V PID and temperature gauge on instrument cluster readings. If temperature gauge on instrument cluster indicates normal range but ECT V PID is not same as temperature gauge reading, inspect ECT sensor. If temperature gauge on instrument cluster indicates cold range but ECT voltage is normal, inspect temperature gauge and heat gauge unit.
		No	Replace thermostat.
4	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.18 EXHAUST SMOKE

AVF398018881W13

18	EXHAUST SMOKE
DESCRIPTION	Blue, black, or white smoke from exhaust system
POSSIBLE CAUSE	**Blue smoke (Burning oil):** • PCV valve malfunction • Engine internal oil leakage **White smoke (Water in combustion):** • Cooling system (coolant loss) malfunction • Engine internal coolant leakage **Black smoke (Rich fuel mixture):** • Air cleaner restriction • Intake-air system is collapsed or restricted. • Fuel return line is restricted. • Excessive fuel pressure • Improper engine compression • Injector fuel leakage • Ignition system malfunction **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

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Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	What color is smoke coming from exhaust system?	Blue	Burning oil is indicated. Go to next step.
		White	Water in combustion is indicated. Go to Step 3.
		Black	Rich fuel mixture is indicated. Go to Step 4.
2	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Inspect for following: • Damaged valve guide, stems or valve seals • Blocked oil drain passage in cylinder head • Piston ring is not seated, seized or worn. • Damaged cylinder bore If other drivability symptoms are present, return to diagnostic index to service any additional symptoms.
		No	Replace PCV valve.
3	Does cooling system hold pressure?	Yes	Inspect for following: • Cylinder head gasket leakage • Intake manifold gasket leakage • Cracked or porous engine block If other drivability symptoms are present, return to diagnostic index to service any additional symptoms.
		No	Inspect for cause.
4	Inspect for following: • Air cleaner restriction • Collapsed or restricted intake-air system • Restricted fuel return line Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 4.
5	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.

STEP	INSPECTION	RESULTS	ACTION
6	Install fuel pressure gauge between fuel main pipe and fuel distributor. Start engine and run it at idle. Measure fuel line pressure at idle. Is fuel line pressure correct at idle? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	**Zero or low:** • Inspect fuel pump circuit. • Inspect for open fuel pump relief valve. • Inspect for fuel leakage inside pressure regulator. • Inspect for clogged main fuel line. **High:** • Inspect pressure regulator for high pressure cause. • Inspect for clogged fuel return line.
7	Is strong blue spark visible at each disconnected high-tension lead while cranking engine?	Yes	Inspect spark plugs and CMP sensor.
		No	Inspect following: • High-tension leads • Ignition coil and connector
8	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.19 FUEL ODOR (IN ENGINE COMPARTMENT)

AVF398018881W14

19	FUEL ODOR (IN ENGINE COMPARTMENT)
DESCRIPTION	Gasoline fuel smell or visible leakage
POSSIBLE CAUSE	• Excessive fuel pressure • Purge solenoid valve malfunction • Fuel tank vent system blockage • Charcoal canister malfunction **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Visually inspect for fuel leakage at fuel injector O-ring and fuel line. Service as necessary. Install fuel pressure gauge between fuel main pipe and fuel distributor. Start engine and run it at idle. Then stop engine. Does fuel line pressure remain at specification for **60 seconds** when ignition switch is turned ON and OFF? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	Inspect pressure regulator for high pressure cause.
2	Inspect for blockage/restriction or open between engine vacuum port and charcoal canister. Inspect for blockage in fuel tank vent system. Is fault indicated?	Yes	Replace vacuum hose.
		No	Go to next step.
3	Inspect purge solenoid valve. Is solenoid operating properly?	Yes	Go to next step.
		No	Replace purge solenoid valve.
4	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Inspect charcoal canister for fuel saturation. If excess amount of liquid fuel is present, replace charcoal canister.
5	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.20 ENGINE NOISE

AVF398018881W15

20	ENGINE NOISE
DESCRIPTION	Engine noise from under hood
POSSIBLE CAUSE	**Squeal, click or chirp noise:** • Improper engine oil level • Improper drive belt tension **Rattle sound noise:** • Loose parts **Hiss sound noise:** • Vacuum leakage • Loose spark plug • Air leakage from intake-air system **Rumble or grind noise:** • Improper drive belt tension **Rap or roar sound noise:** • Exhaust system looseness **Other noise:** • Camshaft friction gear noise or HLA noise

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Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is squeal, click or chirp sound present?	Yes	Inspect engine oil level or drive belts.
		No	Go to next step.
2	Is rumble or grind sound present?	Yes	Inspect drive belts.
		No	Go to next step.
3	Is rattle sound present?	Yes	Inspect location of rattle for loose parts.
		No	Go to next step.
4	Is hiss sound present?	Yes	Inspect for following: • Vacuum leakage • Spark plug looseness • Intake-air system leakage
		No	Go to next step.
5	Is rapping or roaring sound present?	Yes	Inspect exhaust system for loose parts.
		No	Go to next step.
6	Is knock sound present?	Yes	Go to symptom troubleshooting "No.12 Knocking/ pinging".
		No	If noise comes from engine internal, inspect for friction gear noise.
7	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.21 VIBRATION CONCERNS (ENGINE)

AVF398018881W16

21	VIBRATION CONCERNS (ENGINE)
DESCRIPTION	• Vibration from under hood or driveline
POSSIBLE CAUSE	• Loose attaching bolts or worn parts • Components malfunction such as worn parts

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect following components for loose attaching bolts or worn parts: • Cooling fan • Drive belt and pulleys • Engine mounts All items okay?	Yes	Inspect following systems: • Wheels • Driveline • Suspension
		No	Readjust or retighten engine mount installation position. Service if necessary for other parts.
2	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.22 A/C DOES NOT WORK SUFFICIENTLY

AVF398018881W17

22	A/C DOES NOT WORK SUFFICIENTLY.
DESCRIPTION	A/C compressor magnetic clutch does not engage when A/C switch is turned ON.
POSSIBLE CAUSE	• Improper refrigerant charging amount • Open A/C magnetic clutch • Open circuit between A/C relay and A/C magnetic clutch • Poor GND of A/C magnetic clutch • Refrigerant pressure switch is stuck open. • A/C relay is stuck open. • Seized A/C compressor • Open circuit between A/C switch and PCM through both refrigerant pressure switch and A/C amplifier

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect WDS or equivalent to DLC. Turn ignition switch ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
2	Disconnect A/C compressor connector. Start engine and turn A/C switch to ON. Is there correct voltage at terminal of A/C compressor magnetic clutch connector? **Specification** **More than 10.5 V**	Yes	Inspect for GND condition of magnetic clutch ON A/C compressor. If GND condition is okay, inspect magnetic clutch coil for open circuit.
		No	Go to next step.
3	Connect WDS or equivalent to DLC. Access ACSW PID ON WDS or equivalent. Turn ignition switch to ON. Turn A/C switch ON and set blower fan at any speed. Does ACSW PID read ON?	Yes	Inspect for stuck open A/C relay. Replace as necessary.
		No	Go to next step.
4	Disconnect refrigerant pressure switch connector. Connect a jumper wire between terminals of refrigerant pressure switch connector. Start engine and turn A/C switch ON. Does A/C work?	Yes	Inspect for following: • Refrigerant charging amount • Refrigerant pressure switch operation
		No	Inspect following: • A/C switch is stuck open • open circuit between refrigerant pressure switch and PCM 1Q • Open circuit of blower motor fan switch and resistor (if blower motor does not operate) • Evaporator temperature sensor and A/C amplifier • Open circuit between A/C amplifier and refrigerant pressure switch
5	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.23 A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY

AVF398018881W18

23	A/C IS ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY.
DESCRIPTION	A/C compressor magnetic clutch does not disengage.
POSSIBLE CAUSE	• Stuck engagement • A/C relay is stuck closed. • Short to GND between A/C switch and PCM • Short to GND circuit between A/C relay and PCM • A/C relay to magnetic clutch circuit shorts to battery power

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.

STEP	INSPECTION	RESULTS	ACTION
2	Start engine and run it at idle. Turn A/C switch ON. Remove A/C relay. Does A/C magnetic clutch disengage?	Yes	Inspect for following: • A/C relay is stuck closed. • Short to GND circuit between A/C relay and PCM terminal 1J If both items are okay, go to next step.
		No	Inspect if circuit between A/C relay and magnetic clutch shorts to battery power circuit. If circuit is okay, inspect magnetic clutch stuck engagement or clearance.
3	Connect WDS or equivalent to DLC. Access ACSW PID ON WDS or equivalent. Start engine and turn A/C switch ON. Read ACSW PID while disconnecting refrigerant pressure switch connector. **Note** • ACSW PID should read OFF when disconnecting connector. If ACSW PID reading remains ON, short to GND circuit may be present. Does ACSW PID reading remain ON?	Yes	Inspect for short to GND circuit between refrigerant pressure switch and PCM terminal 1Q.
		No	Go to next step.
4	Reconnect refrigerant pressure switch connector. Read ACSW PID while turning OFF A/C switch. **Note** • ACSW PID should read OFF when turning A/C switch OFF. If ACSW PID reading remains ON, short to GND circuit may be present. Does ACSW PID reading remain ON?	Yes	Inspect following: • Short to GND circuit between A/C switch and A/C amplifier • Short to GND circuit between A/C amplifier and refrigerant pressure switch
		No	Inspect for stuck closed A/C switch.
5	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

F1

NO.24 A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE (WOT) CONDITIONS

AVF398018881W19

24	A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE (WOT) CONDITIONS.
DESCRIPTION	A/C compressor magnetic clutch does not disengage under WOT.
POSSIBLE CAUSE	• TP sensor malfunction • TP sensor misadjustment • TP sensor is loosely installed

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Does A/C compressor disengage when A/C switch is turned OFF?	Yes	Go to next step.
		No	Go to symptom troubleshooting "No.23 A/C is always ONON or A/C compressor runs continuously".
2	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Inspect TP sensor for proper adjustment.
3	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.25 EXHAUST SULPHUR SMELL

AVF398018881W20

25	EXHAUST SULPHUR SMELL
DESCRIPTION	Rotten egg smell (sulphur) from exhaust
POSSIBLE CAUSE	• Electrical connectors are disconnected or connected poorly • Charcoal canister malfunction • Vacuum lines are disconnected or connected improperly. • Improper fuel pressure **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Are any drivability or exhaust smoke concerns present?	Yes	Go to appropriate flow chart.
		No	Go to next step.
2	Inspect following: • Electrical connections • Vacuum lines Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 2.
3	Connect WDS or equivalent to DLC. Turn ignition switch to ON. Retrieve any DTC. Is DTC displayed?	Yes	**DTC displayed:** Go to appropriate DTC test.
		No	**No DTC displayed:** Go to next step.
4	Install fuel pressure gauge between fuel main pipe and fuel distributor. Start engine and run it at idle. Is fuel line pressure correct at idle? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for open fuel pump relief valve. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
5	Inspect charcoal canister for fuel saturation. Is excess amount of liquid fuel present in canister?	Yes	Replace charcoal canister.
		No	Inspect fuel tank vent system. If fuel tank vent system is okay, since sulfur content can vary in different fuels, suggest trying a different brand. If fuel tank vent system is not okay, repair or replace malfunctioning parts.
6	Verify test results. • If okay, return to diagnostic index to service any additional symptoms.		

NO.26 INTERMITTENT CONCERNS

AVF398018881W21

26	INTERMITTENT CONCERNS
DESCRIPTION	Symptom occurs randomly and is difficult to diagnose.

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Talk to customer. Retrieve vehicle service history. does vehicle have a number of previous repairs and components replaced for a certain symptom?	Yes	Go to next step.
		No	Go to Symptom index.

STEP	INSPECTION	RESULTS	ACTION
2	Connect WDS or equivalent to DLC. If input is switch-type component, turn ON manually. Turn ignition switch ON. Access PIDs for suspect component. Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. Are any PID values out of range, of do they suddenly change and go back into range?	Yes	Inspect each wire for corrosion, bent or loose terminal crimps.
		No	Go to next step.
3	Start engine. Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. Are any PID values out of range, or do they suddenly change and go back into range?	Yes	Inspect each wire for corrosion, bent or loose terminal crimps.
		No	Go to next step.
4	Start engine. Accurately spray water on suspect component wire, component or vacuum line related to possible fault area. Are any PIC values out of range, or do they suddenly change and go back into range, or was there a noticeable engine misfire/stumble?	Yes	**Fault occurred while spraying component:** Replace part and verify repair. **Fault occurred while spraying wiring:** Inspect each wire for corrosion, bent or loose terminals and poor wire terminal crimps. **Fault occurred while spraying vacuum line:** Repair vacuum hoses.
		No	Inspect wire and connector at suspect component for corrosion, bent or loose terminals, poor wire terminal crimps and high tension of wire. Repair as necessary.

F1

NO.27 CONSTANT VOLTAGE

AVF398018881W22

27	CONSTANT VOLTAGE
DESCRIPTION	Incorrect constant voltage
POSSIBLE CAUSE	• Constant voltage circuit malfunction **Note** • TP sensor and variable resistor uses constant voltage.

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Disconnect TP sensor connector. Turn ignition switch to ON. Measure voltage between following TP sensor and variable resistor connector terminals: • Constant voltage terminal - GND terminal Is constant voltage **greater than 6.0 V**?	Yes	Repair constant voltage circuit short to power in harness.
		No	Go to next step.
2	Is voltage across battery terminals **greater than 10.5 V**?	Yes	Go to next step.
		No	Inspect charging system.
3	Turn ignition switch to OFF. Leave TP sensor and variable resistor connector disconnected. Measure voltage between battery positive terminal and GND circuit at TP sensor connector. Is voltage **greater than 10.5 V** and **within 1.0 V** of battery voltage?	Yes	Go to next step.
		No	Go to Step 8.
4	**Note** • Purpose of this step is to determine if WDS or equivalent is communicating with PCM. Turn ignition switch to ON. Attempt to access ECT PID. Can ECT PID be accessed?	Yes	Go to Step 7.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
5	Turn ignition switch to OFF. Disconnect TP sensor and variable resistor connector disconnected Disconnect PCM connector. Turn ignition switch to ON. Measure voltage between PCM connector terminals 1B and 2B. Is resistance **greater than 10,000 ohms**?	Yes	Go to next step.
		No	Repair open circuit between PCM terminal 1B and main relay.
6	Leave TP sensor, variable resistor and PCM connectors disconnected. Measure resistance between PCM connector terminals 2K and 2B. Is resistance **greater than 10,000 ohms**?	Yes	Inspect for constant voltage at TP sensor and variable resistor connector again. If constant voltage is still out of range, replace PCM.
		No	Repair constant voltage circuit short to GND.
7	Turn ignition switch to OFF. Leave TP sensor and variable resistor disconnected. Disconnect PCM connector. Measure resistance between PCM connector terminal 2K and constant voltage circuit at appropriate sensor connector. Is resistance **less than 5.0 ohms**?	Yes	Inspect for constant voltage at TP sensor and variable resistor connector again. If constant voltage is still out of range, replace PCM.
		No	Repair open constant voltage circuit.
8	**Note** • Purpose of this step is to determine if WDS or equivalent is communicating with PCM. Reconnect TP sensor and variable resistor connector. Turn ignition switch to ON. Attempt to access ECT PID. Can ECT PID be accessed?	Yes	Go to next step.
		No	Go to Step 10.
9	Turn ignition switch OFF. Disconnect WDS or equivalent from DLC. Disconnect PCM connector. Measure resistance between GND circuit at appropriate sensor connector and PCM connector terminal 2D. Is resistance **less than 5.0 ohms**?	Yes	Reconnect sensor connector. Go to appropriate DTC test.
		No	Repair open GND circuit.
10	Turn ignition switch to OFF. Disconnect PCM connector. Measure resistance between battery negative terminal and PCM terminals 2A, 2B, and 2C. Is each resistance **less than 5.0 ohms**?	Yes	Go to next step.
		No	Repair open GND circuit.
11	Turn ignition switch to OFF. Measure resistance between GND circuit at following sensor connector and GND: • TP sensor • ECT sensor • IAT sensor • HO2S • MAF sensor • Variable resistor	Yes	GND circuits are okay. Inspect for constant voltage at TP sensor and variable resistor connector again.
		No	Inspect for open GND circuit.

DIAGNOSTIC INSPECTION

AVF398018881W23

Spark Plug Condition Inspection Purpose

1. Inspecting spark plugs condition can determine whether problem is related to a specific cylinder or to all cylinders.

Procedure

1. Remove the spark plug.
2. Inspect spark plug condition.
3. Go to appropriate troubleshooting chart for further information.

Spark plug condition	Troubleshooting chart	
Specific plug is wet or covered with carbon.	Symptom 1	Wet/carbon stuck on specific plug
Specific plug looks grayish white.	Symptom 2	Grayish white with specific plug
All plugs are wet or covered with carbon.	Symptom 3	Wet/carbon stuck on all plugs
All plugs look grayish whit.	Symptom 4	Grayish white with all plugs

NO.1 WET/CARBON STUCK ON SPECIFIC PLUG

AVF398018881W24

1	Wet/carbon stuck on specific plug
POSSIBLE CAUSE	• Spark–No spark visible or spark weak • Air/fuel mixture–Excessive fuel injection volume • Compression–No compression, low compression • Faulry spark plug **Warning** **The following troubleshooting flow chart contains the fuel system diagnosis and repair procedures. Read the following warnings before performing the fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is spark plug wet/covered with carbon by engine oil?	Yes	Working up and down inspect all areas related to oil.
		No	Go to next step.
2	Inspect spark plug for following:? • Cracked insulator • Heating value • Air gap • Worn electrode Is spark plug okay?	Yes	Go to next step.
		No	Replace spark plug.
3	Inspect compression pressure at suspected faulty cylinder, Is compression pressure correct?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
4	Install all spark plugs. Carry out spark test at suspected faulty cylinder. Is strong blue spark visible? (Compare with normal sylinder)	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
5	Carry out fuel line pressure inspection. Is fuel line pressure correct? **Fuel line pressure** **270—310 kPa {2.7—3.2 dgf/cm^2, 39—45 psi}**	Yes	Inspect fuel injector for following: • Open or short in injector • Leakage • Injection volume
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for fuel pump relief valve open. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.

NO.2 GRAYISH WHITE WHTH SPECIFIC PLUG

AVF398018881W25

2	Grayish white with specific plug
POSSIBLE CAUSE	• Air /fuel mixture—Insufficient fuel injection volume • Faulty spark plug

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect spark plug for following: • Heating value • Air gap Is spark plug okay?	Yes	Go to next step.
		No	Replace spark plug.
2	Remove suspected fuel injector. Inspect for following: • Resistance • Fuel injection volume Are all aboveitems okay?	Yes	Inspect for open circuit between suspected fuel injector terminal and PCM connector terminal.
		No	Go to next step.

NO.3 WET/CATRBON STUCK ON ALL PLUGS

AVF398018881W26

3	Wet/carbon stuck on all plugs
POSSIBLE CAUSE	• Spark—Spark weak • Air/fuel mixture—Too rich • Compression—Low compression • Clogging in intake/exhaust system **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is air cleaner element free of restriction?	Yes	Go to next step.
		No	Replace air cleaner element.
2	Carry out spark test. Is strong blue spark visible at each cylinder?	Yes	Go to next step.
		No	Repair wo replace malfunctioning parts. Repeat Step 2.
3	Carry out fuel line pressure inspection. Is fuel line pressure correct? **Fuel line pressure** **270—310 kPa {2.7—3.2 kgf/cm^2, 37—45 psi}**	Yes	Go to next step.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for fuel pump relief valve open. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.
4	Inspect following PIDs: • MAF • ECT • O2S11 Are PIDs okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
5	Carry out purge control inspection. (When engine can be started) Is purge control correct?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
6	Carry out compression inspection. Is compression correct?	Yes	inspect for clogging in exhaust system.
		No	Repair or replace malfunctioning parts.

NO.4 GRAYISH WHITE WITH ALL PLUGS

AVF398018881W27

4	Grayish white with all plugs
POSSIBLE CAUSE	• Air/fuel mixture—Too lean **Warning** **The following troubleshooting flow chart contains fuel system diagnosis and repair procedures. Read following warnings before performing fuel system services:** • **Fuel vapor is hazardous. It can easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.** • **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete "BEFORE REPAIR PROCEDURE" and "AFTER REPAIR PROCEDURE" described in this manual.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	When engine cannot be started, inspect intake-air system for air leakage. When engine can be started, carry out intake manifold vacuum inspection. Is air sucked in from intake-air system?	Yes	Repair or replace malfunctioning parts.
		No	Go to next step.
2	Carry out fuel line pressure inspection. Is fuel line pressure correct? **Fuel line pressure** **210—250 kPa {2.1—2.6 kgf/cm^2, 30—36 psi}**	Yes	Inspect following PIDs: • MAF • ECT • O2S11 Inspect for PCM GND condition.
		No	**Zero or low:** Inspect fuel pump circuit. Inspect for fuel pump relief valve open. Inspect for fuel leakage inside pressure regulator. Inspect for clogged main fuel line. **High:** Inspect pressure regulator for high pressure cause. Inspect for clogged fuel return line.

FUEL AND EMISSION CONTROL SYSTEMS (WL)

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OUTLINE

OUTLINE OF CONSTRUCTION

AVF400218881W01

- The fuel and emission control system is essentially carried over those of the current RANGER WL Turbo models, except for the following features. (See RANGER Training Manual F326-10-99A, RANGER Repair Manual Supplement F172-10-00J, RANGER Repair Manual Supplement F176-10-01H.)

FEATURES

AVF400218881W02

Improved Emission Performance

- The oxidation catalytic converter capacity has been increased from 1,440 ml {1,440 cc, 88 cu in} to 2,010 ml {2,010 cc, 123 cu in}.

Reduced Noise

- A resonance chamber has been built onto the fresh-air duct.
- An after silencer has been adopted.

Modifications to match the vehicle characteristics

- The fuel tank has been changed.

SPECIFICATIONS

AVF400218881W03

Item		EVEREST	Current RANGER
		WL Turbo	
Air cleaner element	Type	Non-woven fabric (dry type)	
Supercharger	Type	Turbocharger with charge air cooler	
Injection pump	Type	Bosch VE distributor	
Fuel tank	Capacity (L {US gal, Imp gal})	71.0 {18.8, 15.6}	63 {16.6, 13.9}*1, 70 {18.5, 15.4}*2
Glow plug	Type	Self-temperature control type	

*1 : Double cab 2WD, stretch cab 2WD
*2 : Double cab 4WD, stretch cab 4WD, regular cab
Bold frames: New specification

INTAKE-AIR SYSTEM

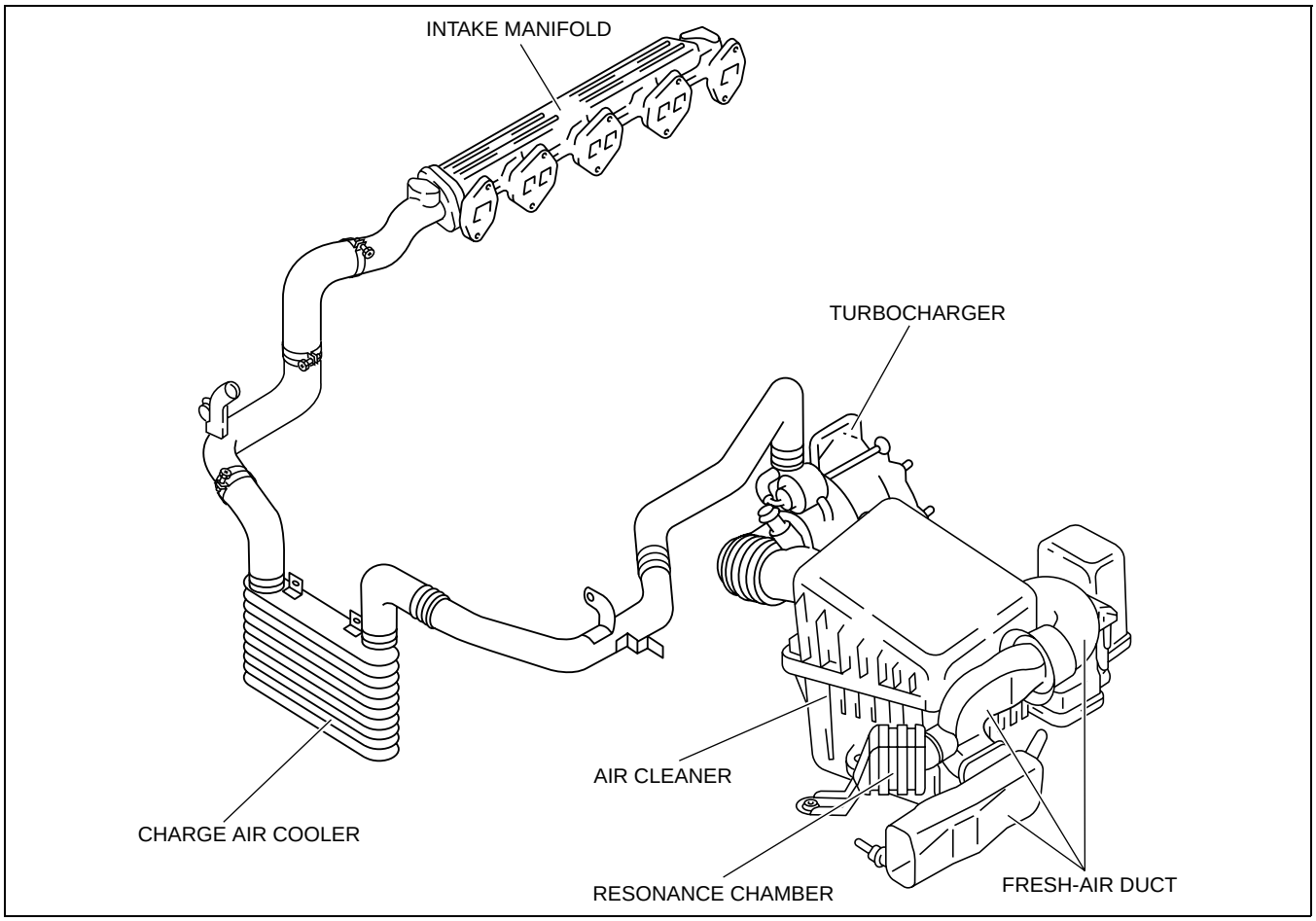
OUTLINE

AVF401001005W01

- The construction and operation of the intake-air system of the EVEREST models is essentially carried over from that of the current RANGER WL Turbo models, except for following. (See RANGER Training Manual F326-10-99A.)
  — A resonance chamber has been built onto the fresh-air duct.

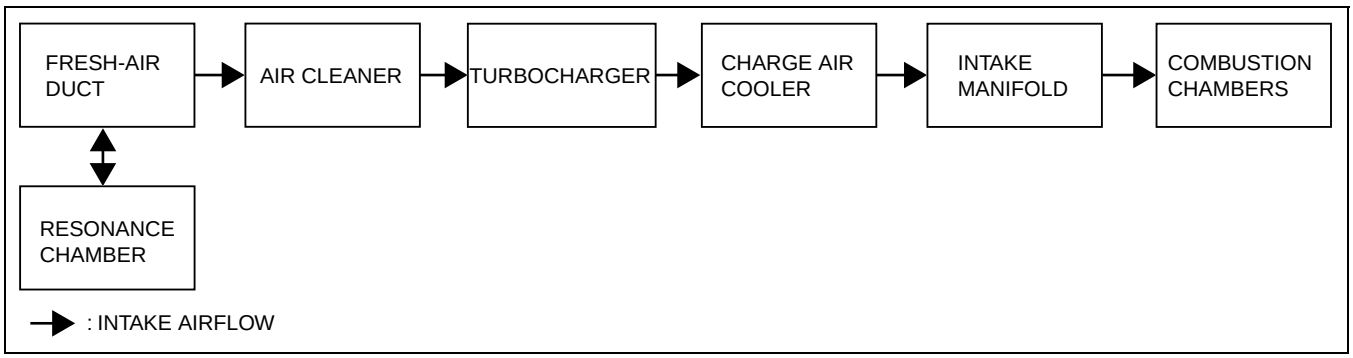
STRUCTURAL VIEW

AVF401001005W02



AVF4010W004

Intake airflow



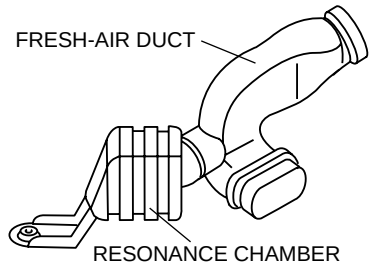
AVF4010W001

FRESH-AIR DUCT

AVF401001005W03

Function

- A resonance chamber has been adopted to reduce air intake noise at low engine speeds.



AVF4010W005

FUEL SYSTEM

OUTLINE

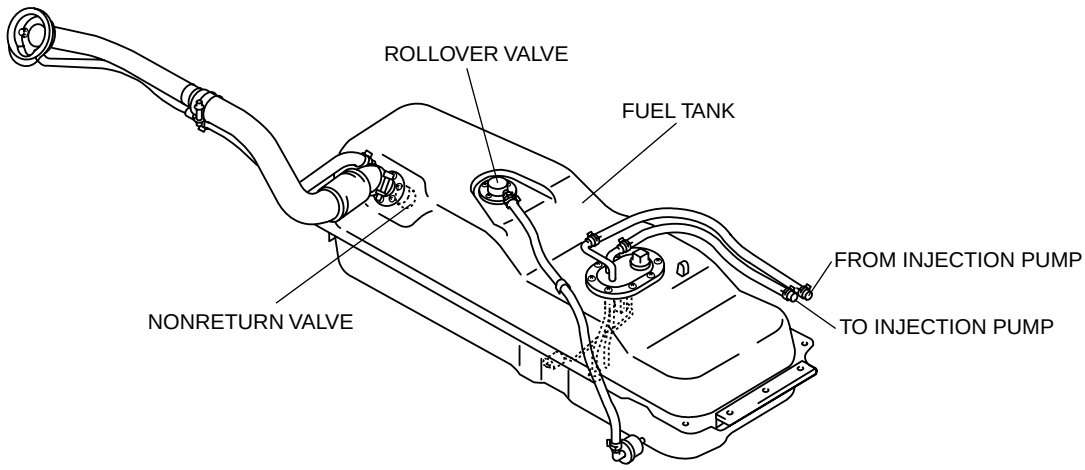
AVF401201006W01

- The fuel system is essentially carried over from that of the current RANGER WL Turbo models, except for following. (See RANGER Training Manual F326-10-99A, RANGER Repair Manual Supplement F172-10-00J, RANGER Repair Manual Supplement F176-10-01H.)
  - — The shape of the fuel tank has been changed, accordingly the number of rollover valves has been reduced from 2 to 1.

STRUCTURAL VIEW

AVF401201006W02

Fuel Tank Side



AVF4012W002

EXHAUST SYSTEM

OUTLINE

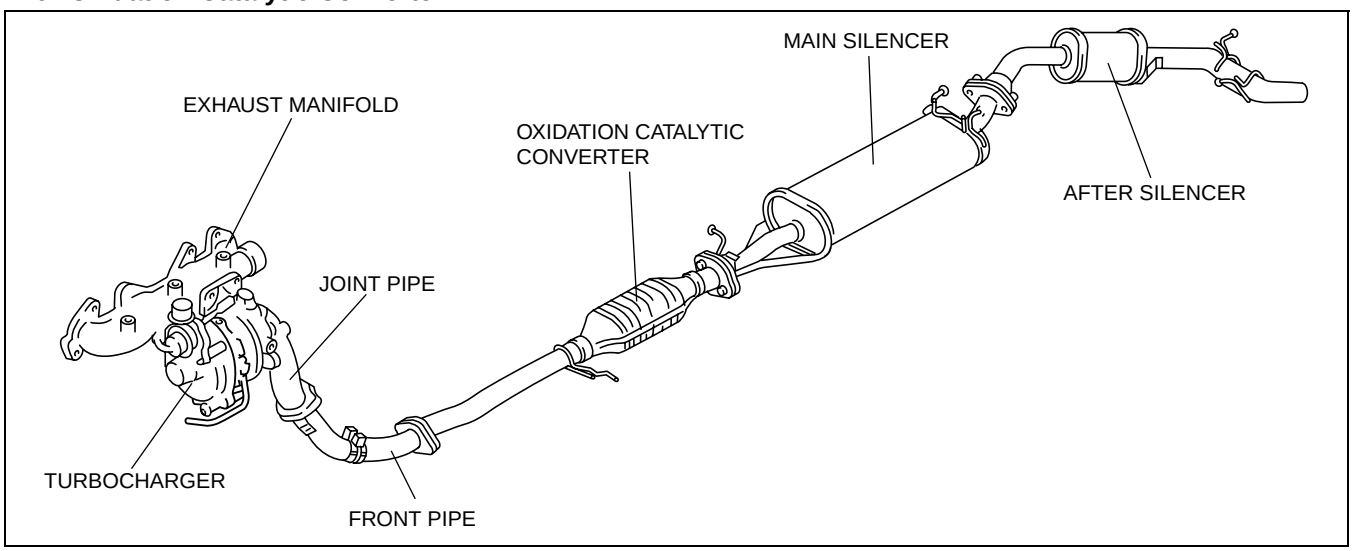
AVF401440000W01

- The exhaust system is essentially carried over from that of the current RANGER WL Turbo models, except for following. (See RANGER Training Manual F326-10-99A, RANGER Repair Manual Supplement F172-10-00J.)
  — An after silencer has been adopted to reduce noise.

STRUCTURAL VIEW

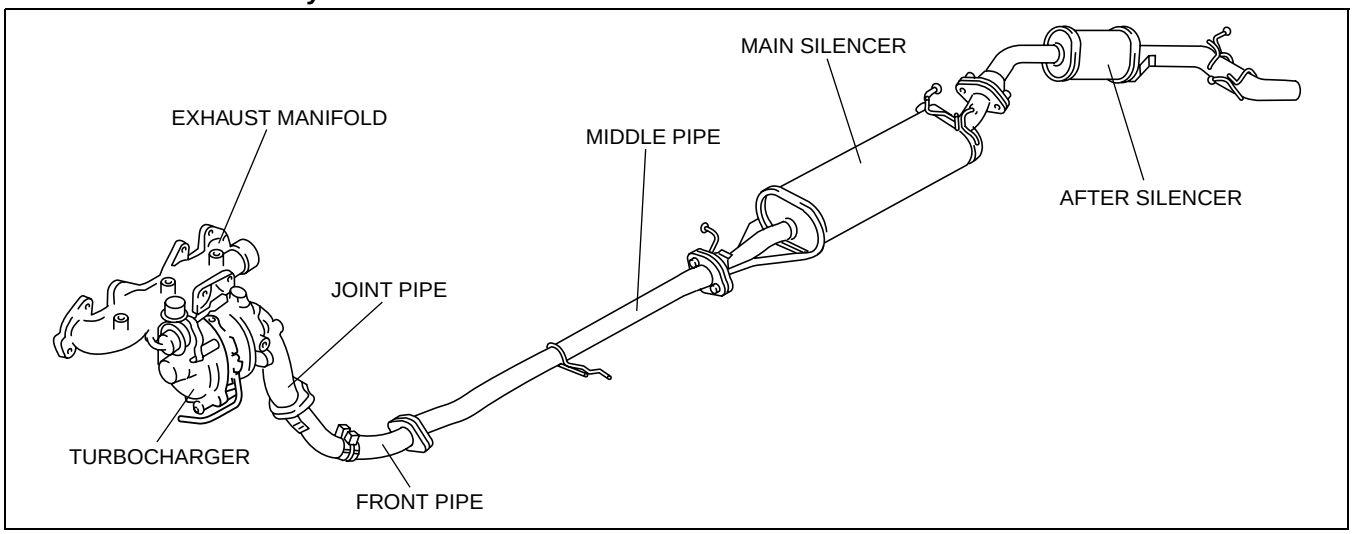
AVF401440000W02

With Oxidation Catalytic Converter



AVF4014W003

Without Oxidation Catalytic Converter



AVF4014W002

F2

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF400218881W04

- The following changes and/or additions have been made since publication of the RANGER Repair Manual (F161-10-99A), RANGER Repair Manual Supplement (F172-10-00J), and RANGER Repair Manual Supplement (F176-10-01H).

Idle-up speed
- Adjustment procedure has been modified.

Intake-air system
- Removal/installation procedure has been modified.

Fuel tank
- Removal/installation procedure has been modified.

Exhaust system
- Removal/installation procedure has been modified.

Troubleshooting
- Inspection procedure has been modified.

ENGINE TUNE-UP

IDLE-UP SPEED ADJUSTMENT

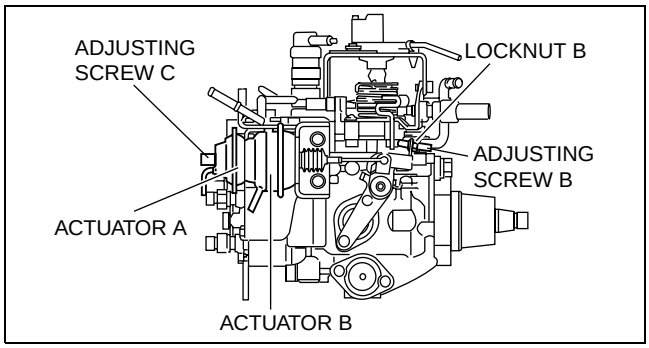
AVF400802000W01

1. Perform “ENGINE TUNE-UP PREPARATION”.
2. Turn all electrical loads off when in the neutral position.
3. Apply vacuum of **–53.3 kPa {–400 mmHg, –15.8 inHg}** or over to actuator B, and measure the idle-up speed.

   Specification
   1,200—1,500 (1,350±150) rpm

4. If not within the specification, perform the following;
   (1) Loosen locknut B.
   (2) Adjust the idle-up speed by turning adjusting screw B.
   (3) Tighten locknut B.

   Tightening torque
   5.9—8.8 N·m {60—90 kgf·cm, 53—78 in·lbf}



AVF4008W001

5. Release actuator B to atmosphere and apply vacuum of **–53.3 kPa {–400 mmHg, –15.8 inHg}** or over to actuator A, and measure the idle-up speed.

   Specification
   925—975 (950±25) rpm

6. If not as specified, adjust the idle-up speed by turning adjusting screw C.

INTAKE-AIR SYSTEM

INTAKE-AIR SYSTEM REMOVAL/INSTALLATION

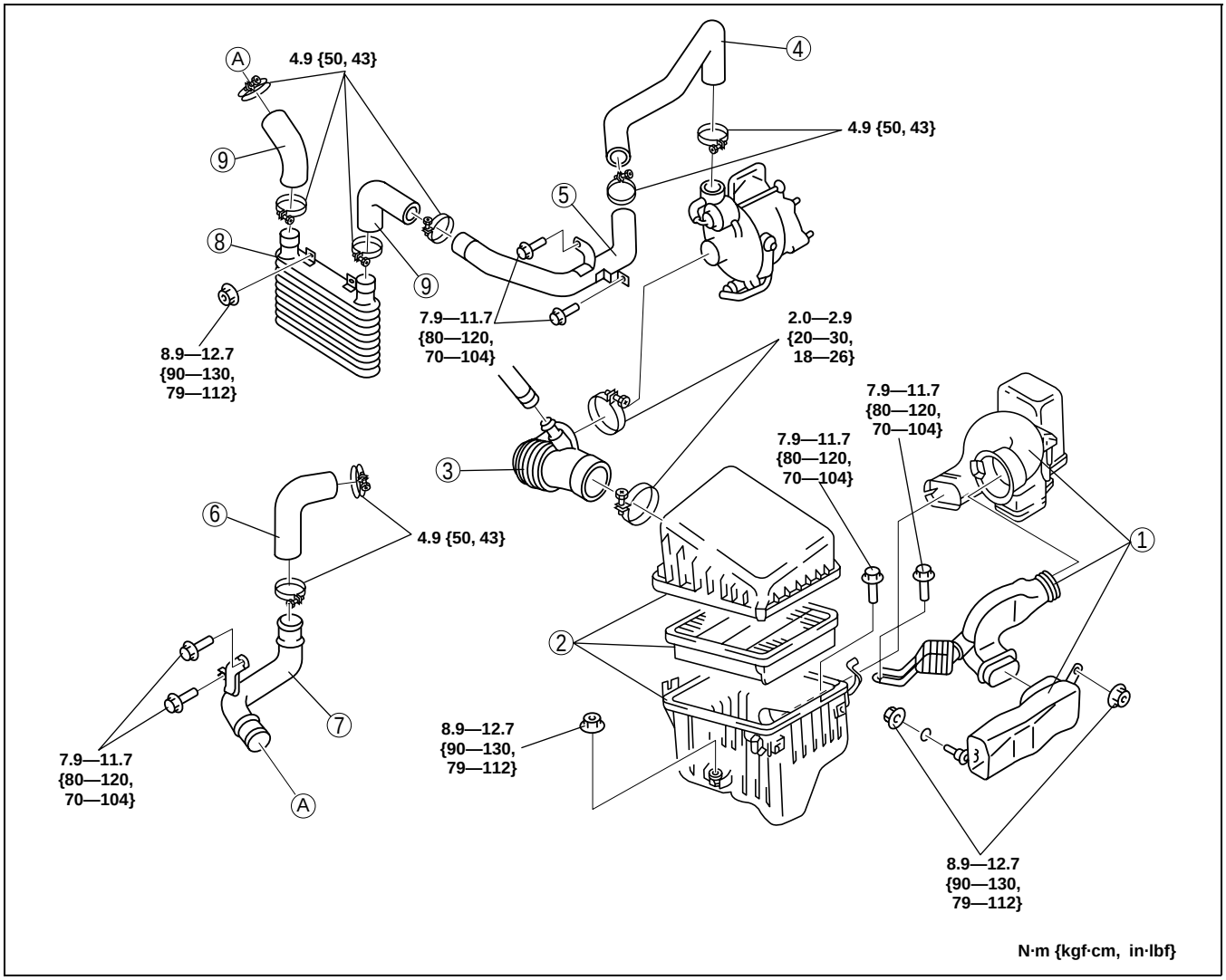
AVF401013000W01

Warning

- **Hot engines and intake-air system can cause severe burns. Turn off the engine and wait until it and the intake-air system have cooled before removing or installing the intake-air system.**

1. Disconnect the negative battery cable.
2. Drain the engine coolant from radiator.
3. Remove the front mud guard.
4. Remove the injection pipe.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Refill the engine coolant to radiator.

Step 1

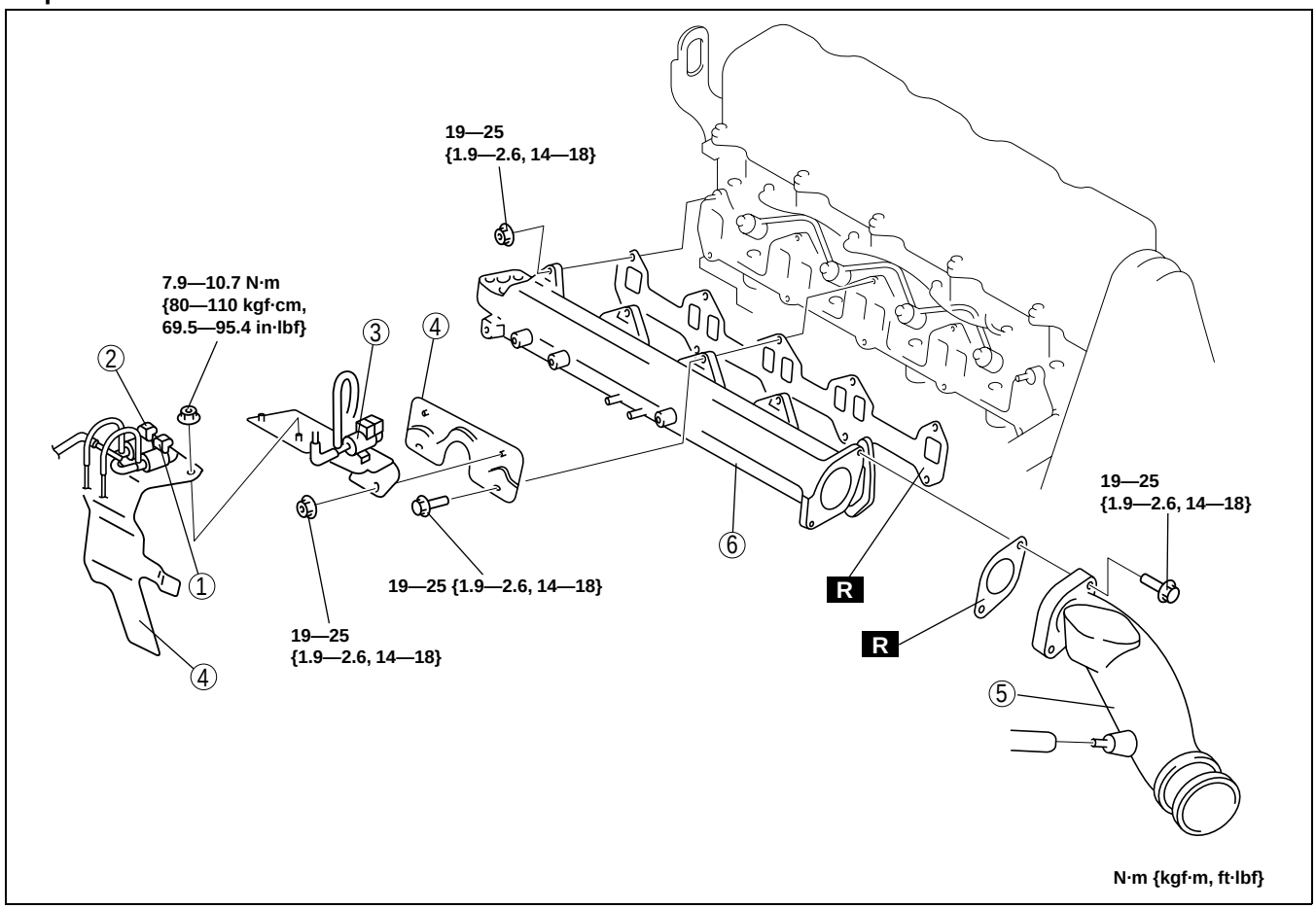


AVF4010W002

1	Fresh-air duct
2	Air cleaner
3	Air intake hose
4	Air hose
5	Air intake pipe

6	Air hose
7	Air intake pipe
8	Charge air cooler
9	Air hose

Step 2



AVF4010W003

1	FICD solenoid valve No.1
2	FICD solenoid valve No.2
3	EGR solenoid valve

4	FICD solenoid valve bracket
5	Air intake pipe
6	Intake manifold

FUEL SYSTEM

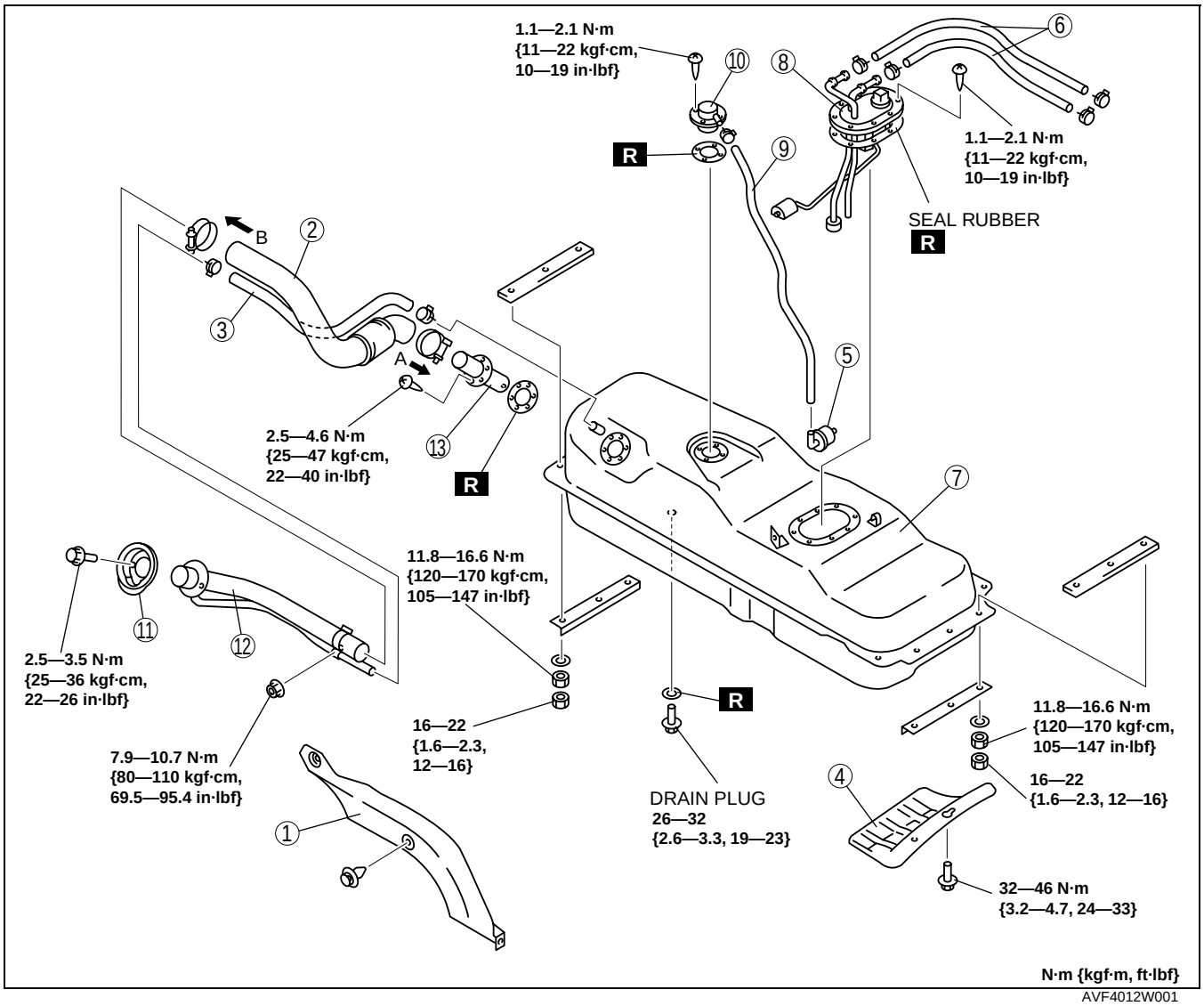
FUEL TANK REMOVAL/INSTALLATION

AVF401242110W01

Warning

- **Repairing a fuel tank that has not been properly steam cleaned can be dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.**

1. Level the vehicle.
2. Complete the “BEFORE REPAIR PROCEDURE”.
3. Disconnect the negative battery cable.
4. Remove the drain plug and drain the fuel from the fuel tank.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Complete the “AFTER REPAIR PROCEDURE”.



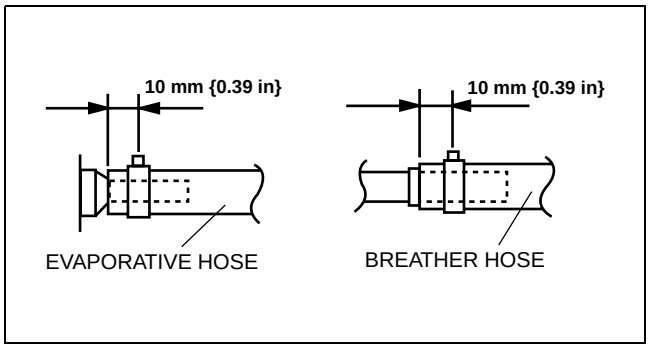
AVF4012W001

1	Fuel-filler pipe protector
2	Joint hose (See F2–10 Joint Hose Installation Note)
3	Breather hose (See F2–10 Evaporative Hose, Breather Hose Installation Note)
4	Under guard
5	Drain hose plug
6	Fuel hose

7	Fuel tank
8	Fuel gauge sender unit
9	Evaporative hose (See F2–10 Evaporative Hose, Breather Hose Installation Note)
10	Rollover valve
11	Dust cover
12	Fuel-filler pipe
13	Fuel inlet pipe

Evaporative Hose, Breather Hose Installation Note

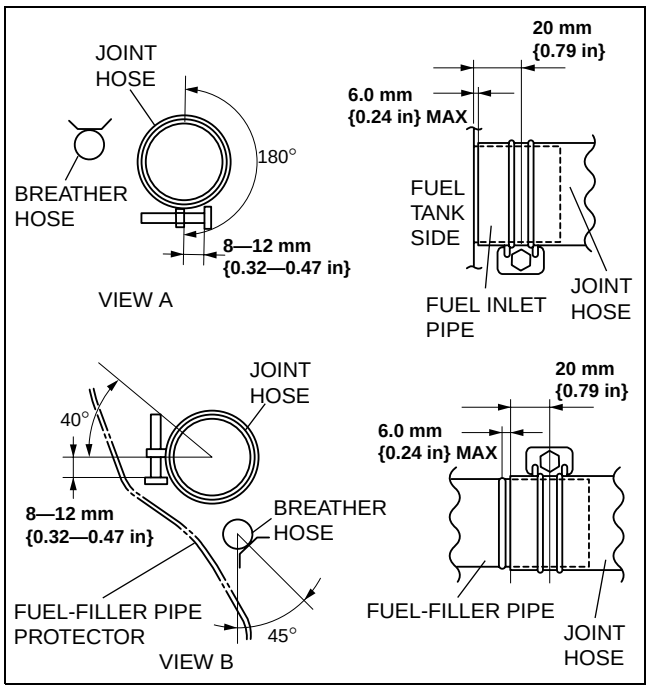
1. Fit the breather hose onto the respective fittings, and install clamps as shown.



AVF3912W002

Joint Hose Installation Note

1. Fit the joint hose onto the respective fittings, and install clamps as shown.



AVF3912W005

EXHAUST SYSTEM

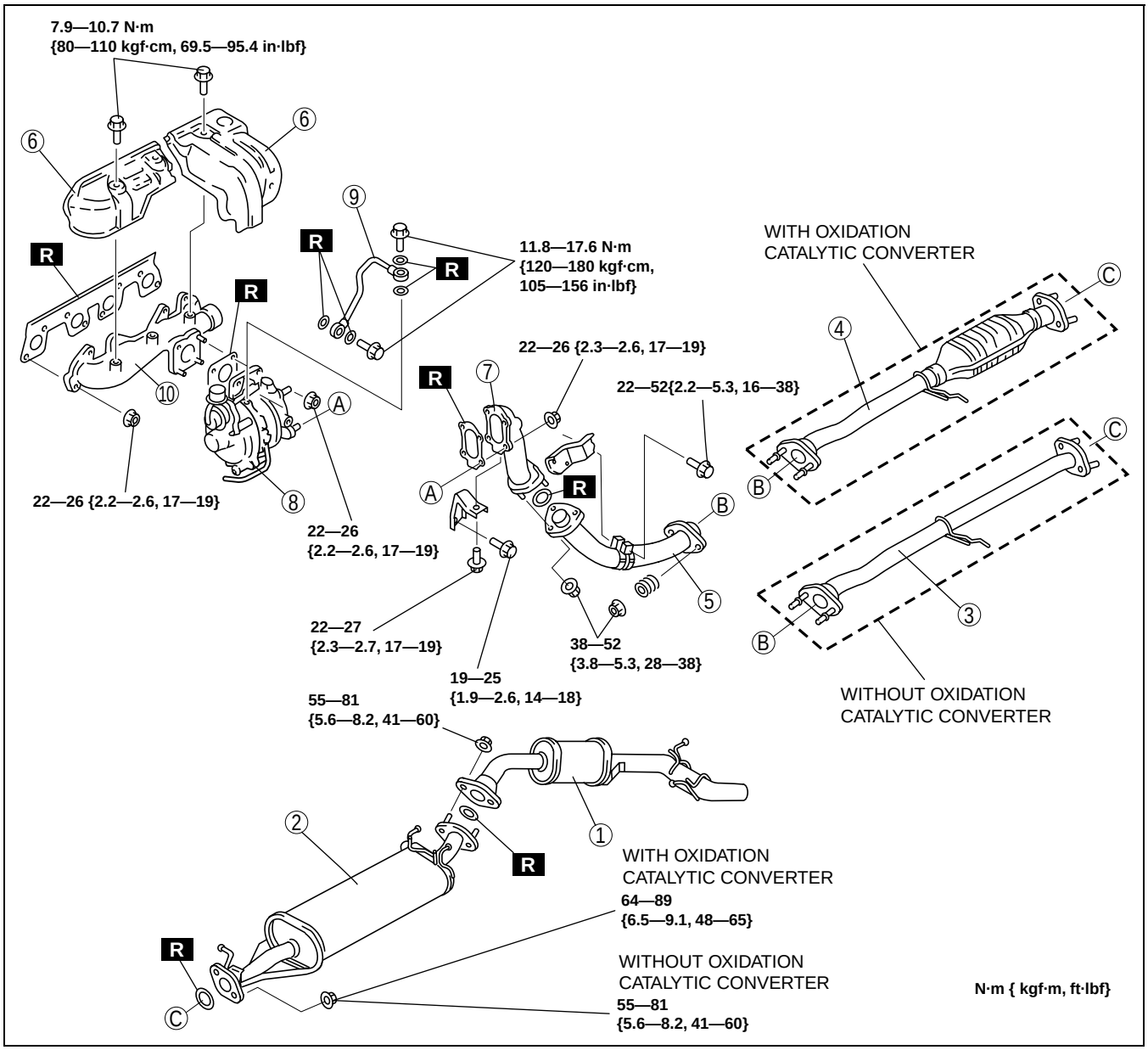
EXHAUST SYSTEM REMOVAL/INSTALLATION

AVF401440000W03

Warning

- **When the engine and exhaust system are hot, they can badly burn. Turn off the engine and wait until they are cool before removing the exhaust system.**

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



AVF4014W001

1	After silencer
2	Main silencer
3	Middle pipe
4	Oxidation catalytic converter
5	Front pipe
6	Exhaust manifold insulator

7	Joint pipe
8	Turbocharger (See F2–12 Turbocharger Removal Note) (See F2–12 Water Pipe Installation Note)
9	Oil pipe (See F2–12 Oil Pipe Installation Note)
10	Exhaust manifold

Turbocharger Removal Note

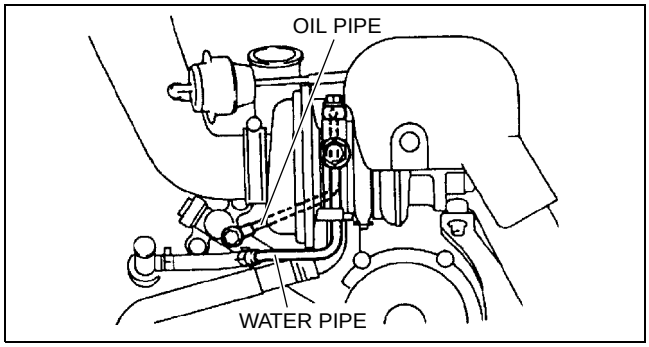
Caution
- **Do not drop the turbocharger.**
- **Do not bend the wastegate actuator mounting or rod.**

1. Cover the intake, exhaust, and oil passages to prevent dirt other objects from entering.

Oil Pipe Installation Note
1. Be sure that turbocharger is installed correctly, then install the oil pipe.

Water Pipe Installation Note
1. Install the water pipe and tighten to the specified torque.

Tightening torque
24—35 N·m {2.4—3.6 kgf·m, 18—26 ft·lbf}



AVF4014W004

TROUBLESHOOTING

FOREWORD

AVF408018881W01

Before processing with the following troubleshooting, refer to Section GI to understand the basic troubleshooting procedure.

SYMPTOM TROUBLESHOOTING

AVF408018881W02

- Confirm trouble symptom using the following diagnostic index, then go to appropriate troubleshooting chart.
- If a DTC is displayed, proceed with inspection steps for the code.

Diagnostic Index

No.	TROUBLESHOOTING ITEM		DESCRIPTION
1	Melts main or other fuse		—
2	Will not crank		Starter does not work.
3	Hard start/long crank/erratic start/erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking. Battery is in normal condition.
4	Engine stalls.	After start	Engine stops unexpectedly at idle and/or after start.
		At idle	
5	Cranks normally but will not start		Starter cranks engine at normal speed but engine will not run. Refer to “ENGINE STALLS” if this symptom appears after engine stall. Fuel is in tank. Battery is in normal condition.
6	Slow return to idle/fast idle		Engine takes more time than normal to return to idle speed. Engine speed continues at fast idle after warm-up.
7	Engine runs rough/rolling idle		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively. Idle speed is too slow and engine shakes excessively.
8	Runs on		Engine runs after engine switch is turned off.
9	Engine stalls/quits	Acceleration/cruise	Engine stops unexpectedly at beginning of acceleration during acceleration or cruising.
	Engine runs rough	Acceleration/cruise	Engine speed fluctuates during acceleration or cruising.
	Misses	Acceleration/cruise	Engine misses during acceleration or cruising.
	Buck/jerk	Acceleration/cruise/ deceleration	Vehicle bucks/jerks during acceleration, cruising, or deceleration.
	Hesitation/stumble	Acceleration	Momentary pause at beginning of acceleration or during acceleration.
	Surges	Acceleration/cruise	Momentary minor irregularity in engine output.
10	Lack/loss of power	Acceleration/cruise	Performance is poor under load (i.e. power down when climbing hills).
11	Poor fuel economy		Fuel economy is unsatisfactory.
12	High oil consumption/leaks		Oil consumption is excessive.
13	Cooling system concerns	Overheating	Engine runs at higher than normal temperature/overheats.
14	Cooling system concerns	Runs cold	Engine does not reach normal operating temperature.
15	Excessive black smoke		Excessive black smoke is observed in exhaust gas.
16	Engine noise		Engine noise from under hood.
17	Vibration concerns (engine)		Vibration from under hood or driveline.
18	A/C does not work.		A/C compressor magnetic clutch does not engage when A/C is turned on.
19	A/C always on / A/C compressor runs continuously.		A/C compressor magnetic clutch does not disengage.
20	Intermittent concerns		Symptom occurs randomly and is difficult to diagnose.

SYMPTOM QUICK DIAGNOSIS CHART

AVF408018881W03

X : Applicable

	Troubleshooting item		Possible factor: Starter motor malfunction (Mechanical or electrical)	Starter circuit including engine switch open	Improper engine oil level	Low or dead battery	Charging system malfunction	Improper engine compression	Improper valve timing	Hydrolocked engine	Improper ingine oil viscosity	Improper dipstick	Base engine malfunction	Flywheel is seized.	Improper tension or damaged drive belts	Improper engine coolant level	Water and anti-freeae mixture is improper.	Cooling system malfunctio (including thermostat)	Cooling fan system malfunction	Engine or transmission mounts are improperly installed.	Cooling fan malfunction	Fuel quality
1	Melting of main or other fuses																					
2	Will not crank		x	x		x	x			x			x	x								
3	Hard to start/long crank/erratic start/erratic crank		x	x				x	x			x	x									x
4	Engine stalls.	After start/at idle						x	x				x									x
5	Cranks normally but will not start							x	x				x									x
6	Slow return to idle																	x				
7	Engine runs rough/rolling idle							x	x				x									x
8	Runs on																					
9	Engine stalls/quits.	Acceleration/cruise						x	x				x									
	Engine runs rough.	Acceleration/cruise						x	x				x									
	Misses	Acceleration/cruise						x	x				x									
	Buck/jerk	Acceleration/cruise/ deceleration						x	x				x									
	Hesitation/stumble	Acceleration						x	x				x									
	Surges	Acceleration/cruise						x	x				x									
10	Lack/loss of power	Acceleration/cruise						x	x				x									
11	Poor fuel economy							x	x				x		x	x		x				x
12	High oil consumption/leakage				x	x		x			x	x	x									
13	Cooling system concerns	Overheating											x		x	x	x	x	x		x	
14	Cooling system concerns	Runs cold																x	x		x	
15	Exhaust black smoke							x	x													
16	Engine noise								x				x		x							
17	Vibration concerns (engine)														x					x	x	
18	A/C does not work.																					
19	A/C is always on or A/C compressor runs continuously.																					
20	Intermittent concerns																		x			

AVF4080W001

X : Applicable

	Troubleshooting item		Possible factor: Engine overheating	Air cleaner element clogging or restriction	intake-air system restriction	Air leakage from intake-air system (Loose tubes, cracks, gaskets breakage)	Incorrect idle speed	Incorrect injection timing	Injection pump malfunction	Fuel filter restriction or clogging	Fuel system restriction	Injection nozzle and/or gasket malfunction	Fuel leakage from fuel system	Restriction in exhaust system	EGR system malfunction	Intake shutter valve malfunction	PCM control relay malfunction	Pump speed sensor	FICD malfunction	Idle switch malfunction	Accelerator position sensor malfunction	ECT sensor malfunction
1	Melting of main or other fuses																					
2	Will not crank																					
3	Hard to start/long crank/erratic start/erratic crank				x		x	x	x	x	x	x	x	x	x							x
4	Engine stalls.	After start/at idle	x		x		x	x	x	x	x	x	x		x		x	x		x	x	x
5	Cranks normally but will not start				x			x	x	x	x	x	x		x		x	x				x
6	Slow return to idle						x	x											x			
7	Engine runs rough/rolling idle		x		x		x	x	x	x	x	x	x		x				x	x	x	x
8	Runs on																					
9	Engine stalls/quits.	Acceleration/cruise	x	x	x	x	x	x	x	x	x	x		x	x			x		x	x	x
	Engine runs rough.	Acceleration/cruise	x	x	x	x	x	x	x	x	x	x		x	x			x		x	x	x
	Misses	Acceleration/cruise	x	x	x	x	x	x	x	x	x	x		x	x			x		x	x	x
	Buck/jerk	Acceleration/cruise/ deceleration	x	x	x	x	x	x	x	x	x	x		x	x			x		x	x	x
	Hesitation/stumble	Acceleration	x	x	x	x	x	x	x	x	x	x		x	x			x		x	x	x
	Surges	Acceleration/cruise	x	x	x	x	x	x	x	x	x	x		x	x			x		x	x	x
10	Lack/loss of power	Acceleration/cruise	x	x	x	x	x	x	x	x	x	x		x	x	x				x	x	x
11	Poor fuel economy			x			x	x	x			x	x	x	x				x			x
12	High oil consumption/leakage																					
13	Cooling system concerns	Overheating	x												x							x
14	Cooling system concerns	Runs cold																				
15	Exhaust black smoke			x				x	x			x			x	x						x
16	Engine noise							x	x			x			x							x
17	Vibration concerns (engine)																					
18	A/C does not work.																					
19	A/C is always on or A/C compressor runs continuously.																					
20	Intermittent concerns							x							x		x	x			x	x

AVF4080W002

F2

X : Applicable

	Troubleshooting item		Possible factor															
			Improper starting signal	A/C switch malfunction	Glow system malfunction	Injection pump EPROM malfunction	TCV malfunction	FSO solenoid and/or relay malfunction	Neutral switch malfunction	Immobilizer system activation	A/C system malfunctio (including improper effrigerant amount)	Coutch slippage	Btake dragging	Loose parts	Improper balance of wheels & tires	Drive line malfunction	Suspension malfunction
1	Melting of main or other fuses																
2	Will not crank																
3	Hard to start/long crank/erratic start/erratic crank		x		x	x	x										
4	Engine stalls.	After start/at idle	x		x		x	x		x	x						
5	Cranks normally but will not start		x		x		x	x		x							
6	Slow return to idle						x										
7	Engine runs rough/rolling idle				x		x		x		x						
8	Runs on							x									
9	Engine stalls/quits.	Acceleration/cruise		x	x		x				x	x					
	Engine runs rough.	Acceleration/cruise		x	x		x				x	x					
	Misses	Acceleration/cruise		x	x		x				x	x					
	Buck/jerk	Acceleration/cruise/ deceleration		x	x		x				x	x					
	Hesitation/stumble	Acceleration		x	x		x				x	x					
	Surges	Acceleration/cruise		x	x		x				x	x					
10	Lack/loss of power	Acceleration/cruise		x		x	x	x			x	x	x				
11	Poor fuel economy												x				
12	High oil consumption/leakage																
13	Cooling system concerns	Overheating		x							x						
14	Cooling system concerns	Runs cold															
15	Exhaust black smoke			x		x	x										
16	Engine noise													x			
17	Vibration concerns (engine)													x	x	x	x
18	A/C does not work.			x							x						
19	A/C is always on or A/C compressor runs continuously.			x							x						
20	Intermittent concerns			x	x	x	x	x	x								

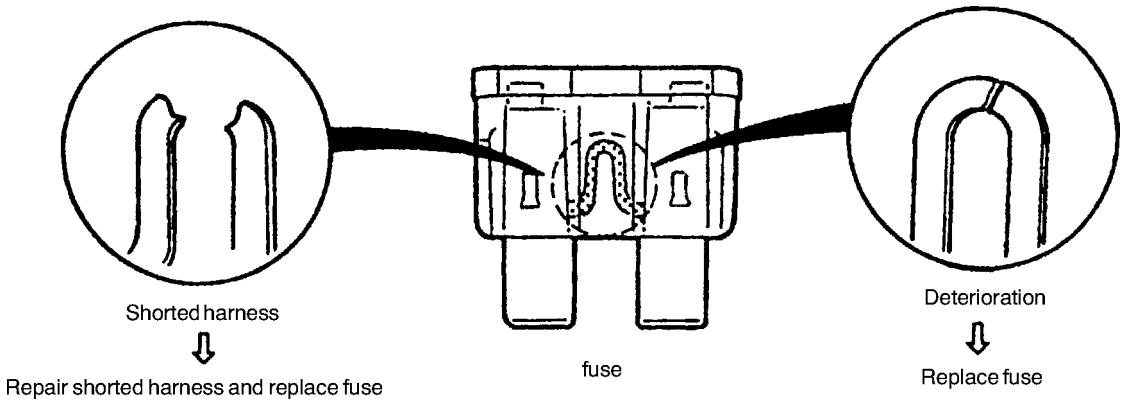
AVF4080W003

NO.1 MELTS MAIN OR OTHER FUSE

AVF408018881W04

1	MELTS MAIN OR OTHER FUSE

[TROUBLESHOOTING HINTS]
Inspect condition of fuse.



Damaged Fuse	Related Wiring Harness
MAIN	**Main fuse** • Engine switch • Generator • PCM **Blower relay** • Blower fan motor **A/C relay** • Refrigerant pressure switch
HEAD	**HEAD fuse** • Generator
GLOW	**Glow plug relay** • Glow plugs
ENGINE	**Engine fuse** • PCM • FICD solenoid valve No.1 • FICD solenoid valve No.2 • Fuel cut valve (FCV)

F2

NO.2 WILL NOT CRANK

AVF408018881W05

2	WILL NOT CRANK
DESCRIPTION	• Starter does not work.
POSSIBLE CAUSE	• Open starter circuit between battery and starter through engine switch • Starter malfunction • Seized/hydrolocked engine, flywheel

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Verify the following: • Battery condition • Battery connection • Fuses Are all items okay?	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
2	Turn engine switch to START. Is clicking sound heard from starter?	Yes	Go to next step.
		No	Go to Step 6.
3	Do any other electrical accessories work?	Yes	Go to next step.
		No	Inspect the charging system.
4	Disconnect negative battery cable. Disconnect engine switch and starter connectors. Inspect for electrical connections, loose wire, bent or corroded terminals. Inspect for continuity on following circuits: • Engine switch connector terminal ST and starter terminal S • Positive battery cable and starter magnet switch terminal B. Are all circuits okay?	Yes	Go to next step.
		No	Repair or replace open circuit.
5	Inspect engine switch. Is engine switch okay?	Yes	Go to next step.
		No	Replace engine switch.
6	Inspect starting system. Is starting system okay?	Yes	Inspect for seized/hydrolocked engine, flywheel.
		No	Service if required.

NO.3 HARD START/LONG CRANK/ERRATIC START/ERRATIC CRANK

AVF408018881W06

3	HARD START/LONG CRANK/ERRATIC START/ERRATIC CRANK
DESCRIPTION	• Starter cranks engine at normal speed but engine requires excessive cranking. • Battery is in normal condition.
POSSIBLE CAUSE	• Poor fuel quality • Starting system malfunction • Air cleaner restriction • Engine overheating • Glow system malfunction • Fuel leakage • Incorrect fuel injection timing • Injection pump malfunction • Injection nozzle malfunction • Low engine compression pressure • Fuel line clogging

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect for the following: • Fuel quality including water contamination • Loose bands on intake-air system • Cracks on intake-air system parts • Air cleaner element restriction Are all items okay?	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
2	Is engine overheating?	Yes	Go to flowchart No.13 for “COOLING SYSTEM CONCERNS - OVERHEATING”.
		No	Go to next step.
3	Does engine start normally after warm-up?	Yes	Inspect glow system operation. Replace any defective parts if necessary. If grow system is okay, go to next step.
		No	Go to next step.
4	Is there any restriction in exhaust system?	Yes	Repair or replace if necessary.
		No	Go to next step.
5	Inspect fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to next step.
6	Measure engine compression. Is compression okay?	Yes	Go to Step 8.
		No	Go to next step.
7	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for the following: • Burnt valve • Worn piston, piston ring, or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve stem or valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing belt. If timing belt is broken, damaged or cracked, replace the timing belt.
8	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. If TCV is okay, adjust injection timing.
9	Remove and inspect injection nozzle for the following: • Clogged nozzle • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Remove injection pump. Inspect injection pump. If injection pump is okay, inspect fuel line for clogging.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the injection nozzle. **Incorrect valve opening pressure:** Adjust injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.

NO.4 ENGINE STALLS - AFTER START/AT IDLE

AVF408018881W07

4	ENGINE STALLS - AFTER START/AT IDLE
DESCRIPTION	• Engine stops unexpectedly at idle and/or after start.
POSSIBLE CAUSE	• Poor fuel quality • Starting system malfunction • Air cleaner restriction • Incorrect idle speed • Engine overheating • A/C system improper operation • Glow system malfunction • Fuel leakage • Fuel filter clogging • Incorrect injection timing • Injection pump malfunction • Injection nozzle malfunction • Low engine compression • FICD malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**Note** • The following test should be performed on vehicles with immobilizer system. To to next step for vehicles without immobilizer system. Does security light flash?	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system.
		No	Go to next step.
2	Inspect for the following: • Fuel quality including water contamination • Loose bands on intake-air system • Cracks on intake-air system parts • Air cleaner element restriction Are all items okay?	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
3	Is engine overheating?	Yes	Go to flowchart No.13 for “COOLING SYSTEM CONCERNS - OVERHEATING”.
		No	Go to next step.
4	Does engine run normally after warm-up?	Yes	Go to next step.
		No	Go to Step 5.
5	Inspect glow system operation, Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any defective part according to glow system operation results.
6	**Note** • If the following test cannot be performed due to engine stalls, go to next step. Connect the pressure gauge to A/C lines. Turn the fan switch on. Is pressure within specification?	Yes	Go to next step.
		No	If A/C is always on, go to symptom troubleshooting No.19 “A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY”. For other symptoms, inspect following: • Refrigerant charging amount. • Cooling fan operation.
7	Inspect for FICD system operation. Is FICD operation normal?	Yes	Go to next step.
		No	Inspect the following: • ECT sensor • Vacuum pump • Vacuum leakage around vacuum pump or fittings • FICD solenoid valves • FICD actuator • PCM terminal voltage (B, E, C, P, and J) • Open circuit between FICD solenoid No.1 connector terminal B and PCM connector terminal C • Open circuit between FICD solenoid No.2 connector terminal B and PCM connector terminal P Repair or replace any defective part if necessary. If FICD system is okay, go to next step.

STEP	INSPECTION		ACTION
8	Depress accelerator pedal slightly. Crank the engine. Does engine start now?	Yes	Inspect and adjust idle speed. If symptom still appears, go to next step.
		No	Go to next step.
9	Inspect fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to next step.
10	Measure engine compression. Is compression okay?	Yes	Go to Step 11.
		No	Go to next step.
11	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for the following: • Burnt valve • Worn piston, piston ring, or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve seat or valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing. If timing belt is broken, damaged or cracked, replace timing belt.
12	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Adjust injection timing.
13	Inspect fuel filter for clogging. Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
14	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the injection nozzle. **Incorrect valve opening pressure:** Adjust injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
15	Is valve clearance correct?	Yes	Remove injection pump. Inspect injection pump.
		No	Adjust valve clearance.

NO.5 CRANKS NORMALLY BUT WILL NOT START

AVF408018881W08

5	CRANKS NORMALLY BUT WILL NOT START
DESCRIPTION	• Starter cranks engine at normal speed but engine will not run • Refer to “ENGINE STALLS” if this symptom appears after engine stall • Fuel is in tank • Battery is in normal condition
POSSIBLE CAUSE	• Poor fuel quality • Air cleaner restriction • Fuel cut valve (FCV) malfunction • Low engine compression • Fuel leakage • Fuel filter clogged • Incorrect injection timing • Injection pump malfunction • Injection nozzle malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**Note** • The following test should be performed on vehicles with immobilizer system. Go to next step for vehicles without immobilizer system. Does security light flash?	Yes	Go to “ON-BOARD DIAGNOSTIC FUNCTION” of immobilizer system.
		No	Go to next step.
2	Inspect for the following: • Fuel quality including water contamination • Loose bands on intake air system • Cracks on intake-air system parts • Air cleaner element restriction • Fuses Are all items okay?	Yes	Go to next step.
		No	Service if necessary. Repeat Step 2.
3	Turn engine switch to ON. Is FCV operation sound heard?	Yes	Go to next step.
		No	Inspect for the following: • Stuck FCV • Open circuit in FCV • Open wiring harness between engine switch and FCV • Poor ground of FCV.
4	Measure engine compression. Is compression okay?	Yes	Go to step 6.
		No	Go to next step.
5	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for the following: • Burnt valve • Worn piston, piston ring or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve stem or valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing. If timing belt is broken, damage or cracked, replace timing belt.
6	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Adjust injection timing.
7	Inspect fuel filter for clogging. Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
8	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the fuel injection nozzle. **Incorrect valve opening pressure:** Adjust fuel injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
9	Is valve clearance correct?	Yes	Remove injection pump. Inspect injection pump.
		No	Adjust valve clearance.

NO.6 SLOW RETURN TO IDLE/FAST IDLE

AVF408018881W09

6	SLOW RETURN TO IDLE/FAST IDLE
DESCRIPTION	• Engine takes more time than normal to return to idle speed • Engine speed continues at fast idle after warm-up
POSSIBLE CAUSE	• Malfunction of ECT sensor • Thermostat stuck open • FICD malfunction • Injection timing is incorrect. • Accelerator cable free play incorrect adjustment

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect FICD system operation. Is FICD operation normal?	Yes	Go to next step.
		No	Inspect the following: • ECT sensor • FICD solenoid valves • FICD actuators • PCM terminal voltage (B, E, C, P, J) • Short to ground circuit between FICD solenoid valve No.1 connector terminal B and PCM connector terminal C • Short to ground circuit between FICD solenoid valve No.2 connector terminal B and PCM connector terminal P Repair or replace any defective part if necessary. If FICD system is okay, go to next step.
2	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Adjust injection timing.
3	Remove thermostat and inspect operation. Is thermostat okay?	Yes	Inspect for free play of accelerator cable. Adjust free play if necessary. If free play is okay, inspect and adjust idle and/or idle-up speed. (See F2–6 IDLE-UP SPEED ADJUSTMENT)
		No	Replace thermostat.

NO.7 ENGINE RUNS ROUGH/ROLLING IDLE

AVF408018881W10

7	ENGINE RUNS ROUGH/ROLLING IDLE
DESCRIPTION	• Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively • Idle speed is too slow and engine shakes excessively
POSSIBLE CAUSE	• Poor fuel quality • Starting system malfunction • Air cleaner restriction • Incorrect idle speed • Engine overheating • A/C system improper operation • Glow system malfunction • Fuel leakage • Fuel filter clogged • Incorrect fuel injection timing • Injection pump malfunction • Injection nozzle malfunction • Low engine compression • FICD malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Verify the following: • Fuel quality including water contamination • Loose bands on intake-air system • Cracks on intake-air system parts • Air cleaner element restriction	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
2	Is engine overheating?	Yes	Go to flowchart No.13 for “COOLING SYSTEM CONCERNS - OVERHEATING”.
		No	Go to next step.

STEP	INSPECTION		ACTION
3	Does engine run normally after warm-up?	Yes	Go to next step.
		No	Go to Step 5.
4	Inspect glow system operation. Is glow system operation normal?	Yes	Go to Step 6.
		No	Repair or replace any defective part according to glow system operation results.
5	**Note** • If the following test cannot be performed due to engine stalls, go to next step. Connect the pressure gauge to A/C (if equipped) lines. Turn the blower switch on. Is the pressure within specification?	Yes	Go to next step.
		No	If A/C is always on, go to symptom troubleshooting No.19 “A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY”. For other symptoms, inspect following: • Refrigerant charging amount. • Cooling fan operation.
6	Inspect for FICD system operation. Is FICD operation normal?	Yes	Go to next step.
		No	Inspect following: • ECT sensor • Vacuum pump • Vacuum leaks around vacuum pump or fittings • FICD solenoid valves • FICD actuators • PCM terminal voltage (B, E, C, P, J) • Open circuit between FICD solenoid valve No.1 connector terminal B and PCM connector terminal C • Open circuit between FICD solenoid valve No.2 connector terminal B and PCM connector terminal P Repair or replace any defective part if necessary. If FICD system is okay, go to next step.
7	Depress accelerator pedal slightly. Crank the engine. Does engine start now?	Yes	Inspect and adjust idle speed. If symptom still appears, go to next step.
		No	Go to next step.
8	Inspect fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to next step.
9	Measure engine compression. Is compression okay?	Yes	Go to Step 11.
		No	Go to next step.
10	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for following: • Burnt valve • Worn piston, piston ring, or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve stem or valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing belt. If timing belt is broken, damaged or cracked, replace timing belt.
11	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. If TCV is okay, adjustment injection timing.
12	Inspect fuel filter for clogging. Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
13	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the fuel injection nozzle. **Incorrect valve opening pressure:** Adjust fuel injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
14	Is valve clearance correct?	Yes	Remove fuel injection pump. Inspect fuel injection pump.
		No	Adjust valve clearance.

NO.8 RUNS ON

AVF408018881W11

8	RUNS ON
DESCRIPTION	• Engine runs after engine switch is turned off
POSSIBLE CAUSE	• Fuel cut valve (FCV) malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Run the engine at idle speed. Disconnect the FCV connector. Verify that the engine stops. Does the engine stop?	Yes	Inspect for the following: • Short to power line between engine switch and FCV Repair or replace wire harness.
		No	Inspect FCV for stuck open.

NO.9 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES

AVF408018881W12

9	ENGINE STALLS/QUITS - ACCELERATION/CRUISE ENGINE RUNS ROUGH - ACCERATION/CRUISE MISSES - ACCELERATION/CRUISE BUCK/JERK - ACCELERATION/CRUISE/DECELERATION HESITATION/STUMBLE - ACCELERATION SURGES - ACCELERATION/CRUISE
DESCRIPTION	• Engine stops unexpectedly at beginning of acceleration, during acceleration or while cruising • Engine speed fluctuates during acceleration or cruising • Engine misses during acceleration or cruising • Vehicle bucks/jerks during acceleration, cruising, or deceleration • Momentary pause at beginning of acceleration or during acceleration • Momentary minor irregularity in engine output
POSSIBLE CAUSE	• Poor fuel quality • Starting system malfunction • Air leaks from intake-air system • Air cleaner restriction • Engine overheating • A/C system improper operation • Fuel leakage • Glow system malfunction • Fuel filter clogged • Incorrect fuel injection timing • Injection pump malfunction • Injection nozzle malfunction • Low engine compression • Clutch slippage

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is idle speed stable?	Yes	Go to next step.
		No	Go to flowchart No.7 “ENGINE RUNS ROUGH/ ROLLING IDLE”.
2	Is engine overheating?	Yes	Go to flowchart No.13 for “COOLING SYSTEM CONCERNS OVERHEATING”.
		No	Go to next step.
3	Does symptom disappear after warm-up?	Yes	Go to next step.
		No	Go to Step 5.
4	Inspect glow system operation. Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace any defective part according to glow system operation results.
5	Connect the pressure gauge to A/C lines. Turn the fan switch on. Is the pressure within specification?	Yes	Go to next step.
		No	If A/C is always on, go to symptom troubleshooting No.19 “A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY”. For other symptoms, inspect following: • Refrigerant charging amount • Cooling fan operation

STEP	INSPECTION		ACTION
6	Inspect air cleaner for clogging. Is air cleaner okay?	Yes	Go to next step.
		No	Clean or replace air cleaner element.
7	**Note** • The following test should be performed on turbocharger equipped model. For other model, go to Step 9. Inspect the hose band between the following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Is air cleaner okay?	Yes	Retighten the hose band. If the concern is resolved, complete the inspection. If the concern still exits, go to next step.
		No	Go to next step.
8	Inspect for improper operation, kinks, clogging, or disconnection on the wastegate control actuator. Is actuator okay?	Yes	Turbocharger is okay. Go to next step.
		No	Repair or replace if necessary. If the concern is resolved, complete the inspection. If the concern still exits, turbocharger is okay. Go to next step.
9	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the fuel injection nozzle. **Incorrect valve opening pressure:** Adjust fuel injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
10	Is there any restriction in exhaust system?	Yes	Repair or replace if necessary.
		No	Go to next step.
11	Inspect for fuel leakage from pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to next step.
12	Inspect fuel filter for clogging. Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
13	Measure engine compression. Is compression okay?	Yes	Go to Step 15.
		No	Go to next step.
14	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for the following: • Burnt valve • Worn piston, piston ring, or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve stem or valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing belt. If timing belt is broken, damaged or cracked, replace the timing belt.
15	Inspect injection timing. Is injection timing okay?	Yes	Inspect following: • Clutch slippage • Injection pump
		No	Adjust injection timing.

NO.10 LACK/LOSS OF POWER - ACCELERATION/CRUISE

AVF408018881W13

10	LACK/LOSS OF POWER - ACCELERATION/CRUISE
DESCRIPTION	• Performance is poor under load (i.e. power down when climbing hills)
POSSIBLE CAUSE	• Poor fuel quality • Starting system malfunction • Air leaks from intake-air system • Air cleaner restriction • Engine overheating • A/C system improper operation • Clutch slippage • Fuel leakage • Fuel filter clogged • Incorrect fuel injection timing • Injection pump malfunction • Injection nozzle malfunction • Low engine compression pressure • Brake system drags • EGR system malfunction (WL Turbo)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is idle speed stable?	Yes	Go to next step.
		No	Go to flowchart No.7 “ENGINE RUNS ROUGH/ ROLLING IDLE”.
2	Is engine overheating?	Yes	Go to flowchart No.13 for “COOLING SYSTEM CONCERNS - OVERHEATING”.
		No	Go to next step.
3	Connect the pressure gauge to A/C lines. Turn the fan switch on. Is the pressure within specification?	Yes	Go to next step.
		No	If A/C is always on, go to symptom troubleshooting No.19 “A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY”. For other symptoms, inspect the following: • Refrigerant charging amount • Cooling fan operation
4	Inspect air cleaner for clogging. Is air cleaner okay?	Yes	Go to next step.
		No	Clean or replace air cleaner element.
5	**Note** • The following test should be performed on turbocharger equipped model. For other model, go to Step 13. Inspect the hose band between the following parts: • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Is air cleaner okay?	Yes	Retighten the hose band. If the concern is resolved, complete the inspection. If the concern still exits, go to next step.
		No	Go to next step.
6	Inspect for improper operation, kinks, clogging, or disconnection on the wastegate control actuator. Is actuator okay?	Yes	Go to next step.
		No	Repair or replace if necessary. If the concern is resolved, complete the inspection. If the concern still exits, go to next step.
7	Remove the parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger primary compressor wheel is bent, damaged, or interfering with the housing on the vehicle. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
8	Inspect if the turbocharger compressor wheel locknut is loose or have fallen down inside turbocharger. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
9	Turn the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace the turbocharger.

STEP	INSPECTION		ACTION
10	Inspect if the turbocharger turbine wheel is damaged, cracked, or interfering with the housing on the vehicles. **Note** • Inspect all fins on each turbine wheel. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
11	Is any engine oil found inside the turbocharger turbine housing?	Yes	If an excessive engine oil is found on the vehicle, replace the turbocharger. If small amount of oil is found, wipe the oil out of the vehicle. Then, go to next step.
		No	Go to next step.
12	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe the oil out of the vehicle and install all parts removed in Step 7. Then, go to next step.
		No	Turbocharger is okay. Install all parts removed in Step 7. Then, go to next step.
13	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the injection nozzle. **Incorrect valve opening pressure:** Adjust injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
14	Is there any restriction in exhaust system?	Yes	Repair or replace if necessary.
		No	Go to next step.
15	Inspect fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to next step.
16	Inspect fuel filter for clogging. Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter cartridge.
17	**Note** • The following test should be performed on vehicles with EGR system. Go to next step for vehicles without EGR system. Carry out EGR system inspection. • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Is air cleaner okay?	Yes	Go to next step.
		No	Repair or replace if necessary.
18	Measure engine compression. Is compression okay?	Yes	Go to Step 20.
		No	Go to next step.
19	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for the following: • Burnt valve • Worn piston, piston ring, or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve stem and valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing. If timing belt is broken, damaged or cracked, replace timing belt.
20	Inspect injection timing. Is injection timing okay?	Yes	Inspect following: • Brake system dragging • Clutch slippage • Injection pump
		No	Inspect TCV. If TCV is okay, adjust injection timing.

NO.11 POOR FUEL ECONOMY

AVF408018881W14

11	POOR FUEL ECONOMY
DESCRIPTION	• Fuel economy is unsatisfactory
POSSIBLE CAUSE	• Idle speed or idle-up speed incorrect adjustment • Accelerator cable free play incorrect adjustment • Air cleaner restriction • Engine cooling system malfunction • Improper transmission fluid level • Poor fuel quality • Improper coolant level • Improper engine compression • Exhaust system clogged • Injection timing incorrect • Injection nozzle malfunction • Injection pump malfunction • High idle speed • High idle-up speed • FICD malfunction • Fuel leakage • Brake dragging • EGR system malfunction (WL Turbo)

F2

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect the following: • Fuel quality including water contamination • Air cleaner element restriction • Transmission fluid level • Coolant level Are all items okay?	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
2	Inspect idle speed and idle up speed. Is idle-up speed within specification?	Yes	Go to next step.
		No	Go to flowchart No.6 “SLOW RETURN TO IDLE/FAST IDLE”.
3	Inspect fuel leakage from fuel pipe. Is any fuel leakage found on fuel pipe?	Yes	Repair or replace if necessary.
		No	Go to next step.
4	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the injection nozzle. **Incorrect valve opening pressure:** Adjust injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
5	Is there restriction in exhaust system?	Yes	Inspect exhaust system.
		No	Go to next step.
6	Is brake system functioning properly?	Yes	Go to next step.
		No	Inspect for cause.
7	**Note** • The following test should be performed on vehicles with EGR system. Go to next step for vehicles without EGR system. Carry out EGR system inspection. • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Is air cleaner okay?	Yes	Go to next step.
		No	Repair or replace if necessary.
8	Measure engine compression. Is compression okay?	Yes	Go to Step 10.
		No	Go to next step.

STEP	INSPECTION		ACTION
9	Inspect timing belt for the following: • Chipping of gear teeth • Low tension • Breakage, damage, or cracks Is timing belt okay?	Yes	Inspect for the following: • Burnt valve • Worn piston, piston ring, or cylinder • Damaged cylinder head gasket • Damaged valve seat • Worn valve stem and valve guide Repair or replace if necessary.
		No	If tension or timing of timing belt is incorrect, adjust timing belt. If timing belt is broken, damaged or cracked, replace timing belt.
10	Inspect injection timing. Is injection timing okay?	Yes	Inspect injection pump.
		No	Adjust injection timing.

NO.12 HIGH OIL CONSUMPTION/LEAKS

AVF408018881W15

12	HIGH OIL CONSUMPTION/LEAKS
DESCRIPTION	• Oil consumption is excessive
POSSIBLE CAUSE	• Improper engine oil level • Improper dipstick • Improper engine oil viscosity • Engine internal part malfunction • Oil leak • Turbocharger malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Verify the following: • Proper dipstick • Proper engine viscosity • Engine oil level Are all items okay?	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
2	**Note** • The following test should be performed on turbocharger equipped model. For other models, go to Step 10. Remove the parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger primary compressor wheel is bent, damaged, or interfering with the housing on the vehicle. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
3	Inspect if the turbocharger compressor wheel locknut is loose or have fallen down inside turbocharger. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
4	Turn the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace the turbocharger.
5	Inspect if the turbocharger turbine wheel is damaged, cracked, or interfering with the housing on the vehicles. **Note** • Inspect all fins on each turbine wheel. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
6	Is any engine oil found inside the turbocharger turbine housing?	Yes	If an excessive engine oil is found on the vehicle, replace the turbocharger. If small amount of oil is found, wipe the oil out of the vehicle. Then, go to next step.
		No	Go to next step.
7	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe the oil out of the vehicle. Then, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
8	Is any engine oil found around oil pipes attached on the turbocharger center housing?	Yes	If the oil leaked from the damaged pipe, replace the oil pipe. Then, go to next step.
		No	Go to next step.
9	Is any engine oil found inside the air intake pipes or hoses?	Yes	Wipe the engine oil out.
		No	Turbocharger is okay. Install all parts removed in Step 2. Then, go to next step.
10	Measure engine compression. Is compression okay?	Yes	Inspect oil leakage from outside of engine.
		No	Inspect for the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring, or cylinder Service if necessary.

NO.13 COOLING SYSTEM CONCERNS - OVERHEATING

AVF408018881W16

13	COOLING SYSTEM CONCERNS - OVERHEATING
DESCRIPTION	• Engine runs at higher than normal temperature/overheats
POSSIBLE CAUSE	• Cooling fan malfunction • Low drive belt tension • Drive belt damage • Improper coolant level • Thermostat malfunction • Radiator clogging • A/C system malfunction • Water temperature gauge or sender unit malfunction • Improper or damaged radiator cap • Radiator hose damage • Coolant leakage (engine internal, external)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect the following: • Engine coolant level • Coolant leakage • Radiator condition • Collapsed or restricted radiator hoses • Radiator pressure cap • Drive belt tension • Drive belt Are all items okay?	Yes	Go to next step.
		No	Service if necessary and repeat Step 1.
2	Connect the pressure gauge to A/C lines. Turn the fan switch on. Is the pressure within specification?	Yes	Go to next step.
		No	If A/C is always on, go to symptom troubleshooting No.19 “A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY”. For other symptoms, inspect the following: • Refrigerant charging amount • Cooling fan operation
3	Inspect water temperature sender unit. Is water temperature sender unit okay?	Yes	Inspect thermostat.
		No	Replace water temperature sender unit.

NO.14 COOLING SYSTEM CONCERNS - RUNS COLD

AVF408018881W17

14	COOLING SYSTEM CONCERNS - RUNS COLD
DESCRIPTION	• Engine does not reach normal operating temperature
POSSIBLE CAUSE	• Thermostat malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Remove the thermostat from vehicle. Inspect thermostat. Is thermostat okay?	Yes	Inspect water temperature sender unit operation.
		No	Replace thermostat.

NO.15 EXCESSIVE BLACK SMOKE

AVF408018881W18

15	EXCESSIVE BLACK SMOKE
DESCRIPTION	• Excessive black smoke is observed in exhaust gas
POSSIBLE CAUSE	• Air cleaner element restriction • Incorrect fuel injection timing • Injection nozzle malfunction • Injection pump malfunction • Low engine compression • EGR system malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Does any other symptom exist?	Yes	Go to appropriate flow chart.
		No	Go to next step.
2	Inspect air cleaner element for clogging. Is air cleaner element okay?	Yes	Go to next step.
		No	Repair or replace air cleaner element.
3	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. If TCV is okay, adjust injection timing.
4	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket Is injection nozzle okay?	Yes	Go to next step.
		No	**Clogged nozzle or seized needle valve:** Disassemble and clean or replace the injection nozzle. **Incorrect valve opening pressure:** Adjust injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.
5	**Note** • The following test should be performed on vehicles with EGR system. Go to next step for vehicles without EGR system. Carry out EGR system inspection. • Turbocharger compressor housing and air cleaner • Turbocharger compressor housing and charge air cooler Is air cleaner okay?	Yes	Go to next step.
		No	Repair or replace if necessary.
6	Measure engine compression. Is compression okay?	Yes	Inspect injection pump.
		No	Inspect for the following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring, or cylinder Service if necessary.

NO.16 ENGINE NOISE

AVF408018881W19

16	ENGINE NOISE
DESCRIPTION	• Engine noise from under hood
POSSIBLE CAUSE	• Engine internal damage • Timing belt displacement • Injection nozzle malfunction • Loose attaching bolts or worn parts • Improper drive belt tension • Air leaks from intake-air system • Turbocharger operation noise (WL Turbo) • EGR system malfunction (WL Turbo)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**Note** • The following test should be performed on turbocharger equipped model. For other models, go to Step 9. Remove the parts necessary to inspect the turbocharger. Do not remove the turbocharger. Inspect if the turbocharger primary compressor wheel is bent, damaged, or interfering with the housing on the vehicle. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
2	Inspect if the turbocharger compressor wheel locknut is loose or have fallen down inside turbocharger. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
3	Turn the turbocharger compressor wheel by hand. Does the wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace the turbocharger.
4	Inspect if the turbocharger turbine wheel is damaged, cracked, or interfering with the housing on the vehicles. **Note** • Inspect all fins on each turbine wheel. Is there any problem?	Yes	Replace the turbocharger.
		No	Go to next step.
5	Is any engine oil found inside the turbocharger turbine housing?	Yes	If an excessive engine oil is found on the vehicle, replace the turbocharger. If small amount of oil is found, wipe the oil out of the vehicle. Then, go to next step.
		No	Go to next step.
6	Is any engine oil found inside the turbocharger compressor housing?	Yes	Wipe the oil out of the vehicle. Then, go to next step.
		No	Go to next step.
7	Is any engine oil found around the location where the turbocharger is attached to the exhaust manifold?	Yes	Remove the turbocharger. Inspect for cracks on the center housing inlet surface. If the cracks exceed specifications or no cracks are found, **DO NOT** replace the turbocharger. Replace the gaskets, bolts, and nuts only. Then, go to next step.
		No	Go to next step.
8	Are any of attaching bolts of center housing and turbine housing loose?	Yes	Retighten the loose bolts. If any bolt is missing, attach the appropriate new bolt.
		No	Turbocharger is okay. Install all parts removed in Step 1. Then, go to next step.
9	Is squeal, click, or chirp sound present?	Yes	Inspect engine oil level or drive belt.
		No	Go to next step.
10	Is rumble or grind sound present?	Yes	Inspect drive belt.
		No	Go to next step.
11	Is rattle sound present?	Yes	Inspect location of rattle for loose parts.
		No	Go to next step.
12	Is hiss sound present?	Yes	Inspect for the following: • Vacuum leaks • Intake-air system leaks
		No	Go to next step.
13	Is rap or roar sound present?	Yes	Inspect exhaust system for loose parts.
		No	Go to next step.
14	Inspect injection timing. Is injection timing okay?	Yes	Go to next step.
		No	Inspect TCV. If TCV is okay, adjust injection timing.

STEP	INSPECTION		ACTION
15	**Note** • The following test should be performed on vehicles with EGR system. Go to next step for vehicles without EGR system. Carry out the EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace if necessary.
16	Remove injection nozzle. Inspect injection nozzle for the following: • Clogged nozzle • Seized needle valve • Incorrect valve opening pressure • Faulty nozzle gasket • Fuel dripping (fuel leakage) Is injection nozzle okay?	Yes	Inspect for the following: • Metal flow • Bent connecting rod • Damaged valve seat
		No	**After-leakage, clogged nozzle or seized needle valve:** Disassemble and clean or replace the injection nozzle. **Incorrect valve opening pressure:** Adjust injection nozzle opening pressure. **Faulty nozzle gasket:** Replace nozzle gasket.

NO.17 VIBRATION COCNERNS (ENGINE)

AVF408018881W20

17	VIBRATION COCNERNS (ENGINE)
DESCRIPTION	• Vibration from under hood or driveline
POSSIBLE CAUSE	• Loose attaching bolts or worn parts • Components malfunctions such as worn parts

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Inspect the following components for loose attaching bolts or worn parts: • Cooling fan • Drive belt and pulley • Engine mounts • Exhaust system Are all items okay?	Yes	Inspect the following: • Wheels • Transmission and mounts • Driveline • Suspension Service if necessary.
		No	Readjust or retighten engine mount installation position. Service if necessary for other parts.

NO.18 A/C DOES NOT WORK

AVF408018881W21

18	A/C DOES NOT WORK
DESCRIPTION	• A/C compressor magnetic clutch does not engage when A/C is turned on
POSSIBLE CAUSE	• Improper refrigerant charging amount • Open A/C magnetic clutch • Open circuit in related wire harnesses • Poor ground of A/C magnetic clutch • A/C low/high pressure switch is stuck open • A/C relay is stuck open • Seized A/C compressor • Thermostat is stuck open • Open circuit in blower resistor • Poor fan switch ground • ECT sensor malfunction • Improper magnetic clutch clearance

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Turn engine switch on. Set the fan switch to 1st, 2nd, 3rd, or 4th position. Verify the blower motor is operating. Is blower motor okay?	Yes	Go to next step.
		No	Inspect for the following: • Poor ground of fan switch • Open circuit in blower resistor • Poor contact of fan switch • Blower relay is stuck open • Open circuit in blower relay coil • Seized blower motor • Open circuit in blower motor coil • Open circuit between blower motor and resistor • Open circuit between fan switch and resistor Repair or replace if necessary.
2	Turn the engine switch on. Set the fan switch to 1st, 2nd, 3rd, or 4th position. Measure the voltage at PCM connector terminal G. **Specification:** **Less than 2.7 V** Is voltage correct?	Yes	Go to next step.
		No	Inspect for the following: • Thermostat is stuck open • Open circuit between PCM connector terminal G and thermostat connector terminal • Open circuit between thermostat connector terminal and fan switch connector terminal Repair or replace if necessary.
3	Start the engine and run it at idle speed. Set the fan switch to 1st position. Measure the voltage at terminal of A/C relay connector terminal C. **Specification:** **More than 10.5 V** Is voltage correct?	Yes	Go to next step.
		No	Inspect for the following: • Open circuit in A/C relay coil • Poor contact in A/C relay • A/C relay stuck open • Open circuit between PCM connector terminal N and A/C relay connector terminal • Open circuit in battery supply line • Open circuit between engine switch and A/C relay connector terminal • ECT sensor malfunction Repair or replace if necessary.
4	Disconnect the A/C magnetic clutch connector. Measure the A/C magnetic clutch connector terminal voltage. **Specification:** **More than 10.5 V** Is voltage okay?	Yes	Inspect for the following: • Poor ground of A/C magnetic clutch • Open circuit in magnetic clutch coil • Refrigerant charging amount Repair or replace if necessary.
		No	Inspect for the following: • Open circuit between pressure switch connector terminal and A/C magnetic clutch connector terminal • Refrigerant charging amount • Refrigerant pressure switch is stuck open • Magnetic clutch clearance • A/C compressor is seized Repair or replace if necessary.

NO.19 A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY

AVF408018881W22

19	A/C ALWAYS ON / A/C COMPRESSOR RUNS CONTINUOUSLY
DESCRIPTION	• A/C compressor magnetic clutch does not disengage
POSSIBLE CAUSE	• Improper magnetic clutch clearance • Short to ground circuit between PCM and thermostat • Short to ground circuit between PCM and A/C relay • Short to power line between A/C relay and pressure switch • A/C low/high pressure switch is stuck closed • A/C relay is stuck closed • Thermostat is stuck open

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Turn the engine switch on. Turn the fan switch off. Measure the voltage at PCM connector terminal G. **Specification:** **More than 2.7 V** Is voltage correct?	Yes	Go to next step.
		No	Inspect for the following: • Short to ground circuit between PCM connector terminal G and thermostat • Short to ground circuit between thermostat and fan switch connector terminal Repair or replace if necessary.
2	Start the engine and run it at idle speed. Turn the fan switch off. Measure the voltage at terminal of A/C relay connector terminal C. **Specification:** **0 V** Is voltage correct?	Yes	Inspect magnetic clutch clearance. Adjust it if necessary.
		No	Inspect for the following: • Short to ground circuit between PCM connector terminal N and A/C relay terminal C • A/C relay is stuck closed • Short to power line between A/C relay connector terminal C and refrigerant pressure switch • Short to power line between pressure switch and magnetic clutch connector Repair or replace if necessary.

NO.20 INTERMITTENT CONCERNS

AVF408018881W23

20	INTERMITTENT CONCERNS
DESCRIPTION	• Symptom occurs randomly and is difficult to diagnose

Diagnostic procedure

STEP	INSPECTION		ACTION
1	Talk to customer. Retrieve vehicle service history. Does vehicle have a number of previous repairs and components replaced for a certain symptom?	Yes	Go to next step.
		No	Go to symptom index.
2	Key off. If input is switch-type component, turn on manually. Turn engine switch off. Connect the voltmeter to the PCM terminals. Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. Is any voltage out of range, or do they suddenly change and go back into range?	Yes	Inspect each wire for corrosion, bent or loose terminal clamps.
		No	Go to next step.
3	Start the engine and run it at idle speed. Lightly tap on suspect component, wiggle and pull each wire/connector at suspect component or PCM. Are any voltages out of range, or do they suddenly change and go back into range?	Yes	Inspect each wire for corrosion, bent or loose terminal clamps.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	Accurately spray water on suspect component wire, component, or vacuum line related to possible fault area. Is any voltage out of range, or suddenly change and go back into range, or was there a noticeable engine stumble?	Yes	Fault area is identified. If fault occurred while spraying on component: Replace part and verify repair. If fault occurred while spraying water: Inspect each wire for corrosion, bent, loose terminals, or poor wire terminal clamps. If fault occurred while spraying vacuum line: Repair vacuum hoses.
		No	Inspect wire and connector at suspect component for corrosion, bent, loose terminals, or poor wire terminal clamps and high tension wire. Repair if necessary.

PROPELLER SHAFT

FEATURES

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OUTLINE OF CONSTRUCTION..... L-2
SPECIFICATIONS L-2

SERVICE

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PROPELLER SHAFT (4X2)
REMOVAL/INSTALLATION..... L-3
REAR PROPELLER SHAFT (4X4)
REMOVAL/INSTALLATION..... L-4

OUTLINE

OUTLINE OF CONSTRUCTION

AVF610225002W01

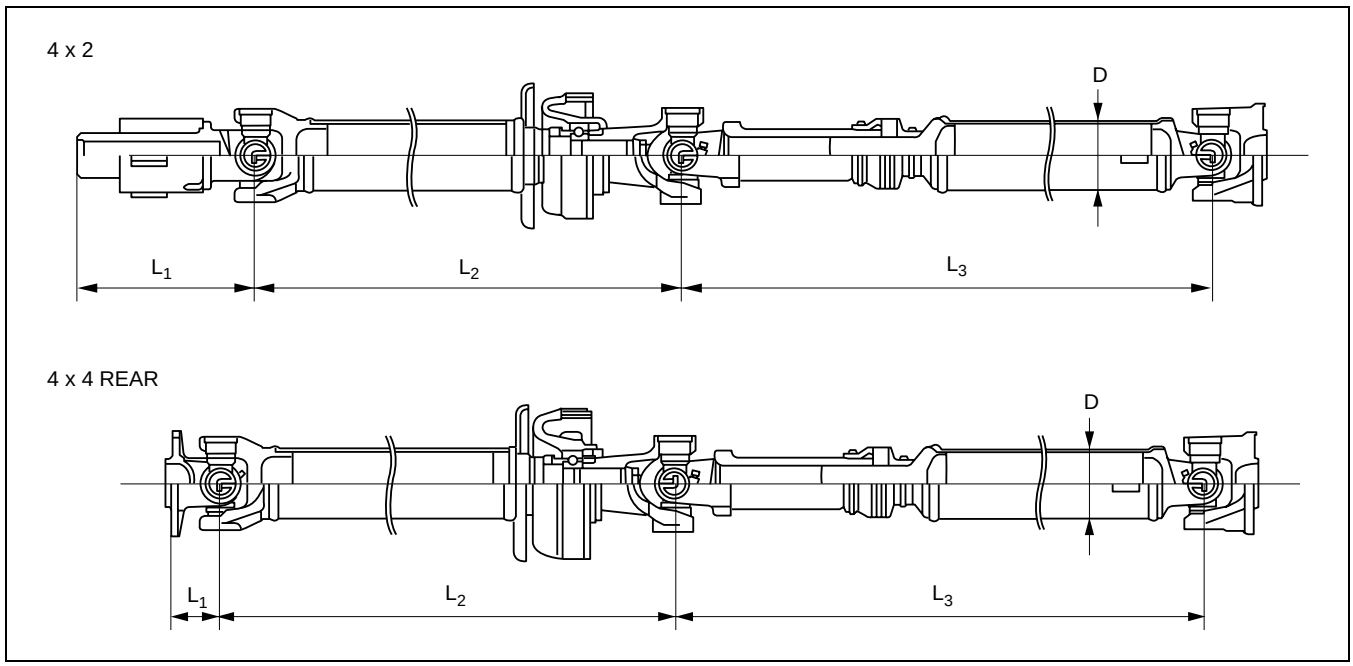
- With the adoption of a dynamic damper for WL (4x2), WL (4x4), G6 (4x2) and G6 (4x4) models, vibration and noise have been reduced.
- The construction and service procedures are essentially carried over from the current RANGER model (See RANGER Repair Manual F161-10-99A, RANGER Training Manual F326-10-99A.), but some specifications are revised.

SPECIFICATIONS

AVF610225002W02

Item		EVEREST			Current RANGER		
		4 x 2	4 x 4		4 x 2	4 x 4	
		Propeller shaft	Front propeller shaft	Rear propeller shaft	Propeller shaft	Front propeller shaft	Rear propeller shaft
Length (mm {in})	L1	159.0 {6.26}	40.0 {1.57}	45.3 {1.78}	159.0 {6.26}	40.0 {1.57}	45.3 {1.78}
	L2	657.6 {25.89}	470.0 {18.50}	545.8 {21.49}	666.1 {26.22}	470.0 {18.50}	545.8 {21.49}
	L3	808.2 {31.82}	245.0 {9.65}	799.7 {31.48}	956.1 {37.64}	245.0 {9.65}	936.4 {36.87}
Outer diameter (mm {in})	D	63.5 {2.50}	57.0 {2.24}	63.5 {2.50}	63.5 {2.50}	57.0 {2.24}	63.5 {2.50}
Joint type		3–cross joint	2–cross joint	3–cross joint	3–cross joint	2–cross joint	3–cross joint

Bold frames: New specification



AVG6110T001

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF610225002W03

- The following changes have been made since publication of the RANGER Repair Manual (F161-10-99A).

Propeller shaft (4x2)

- Removal/installation procedure has been modified.

Rear propeller shaft (4x4)

- Removal/installation procedure has been modified.

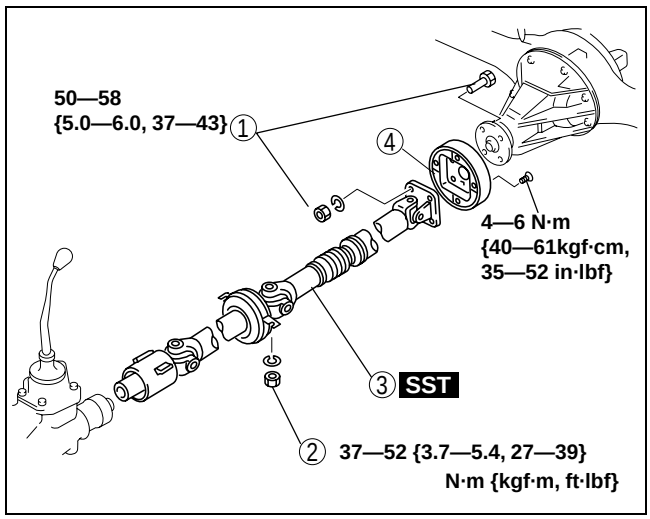
PROPELLER SHAFT

PROPELLER SHAFT (4X2) REMOVAL/INSTALLATION

AVF611025002W05

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.

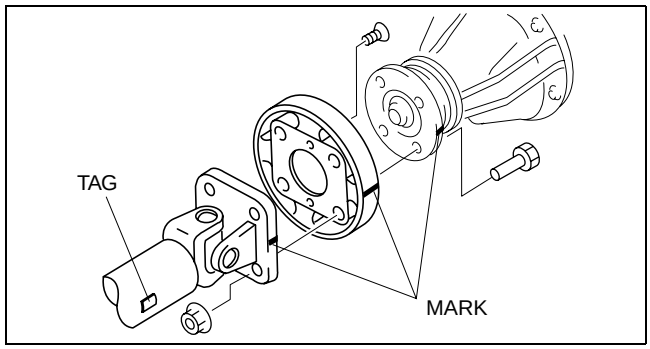
1	Bolt, nut
2	Nut (See L–4 Nut Installation Note)
3	Propeller shaft (See L–3 Propeller Shaft Removal Note) (See L–3 Propeller Shaft Installation Note)
4	Dynamic damper



AVG6110W001

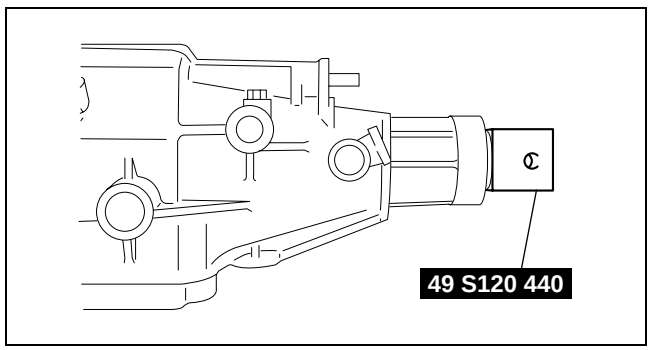
Propeller Shaft Removal Note

1. Before removing the propeller shaft, put marks on the yoke, dynamic damper and the companion flange on the propeller shaft tag side for proper reinstallation.



AVG6110W002

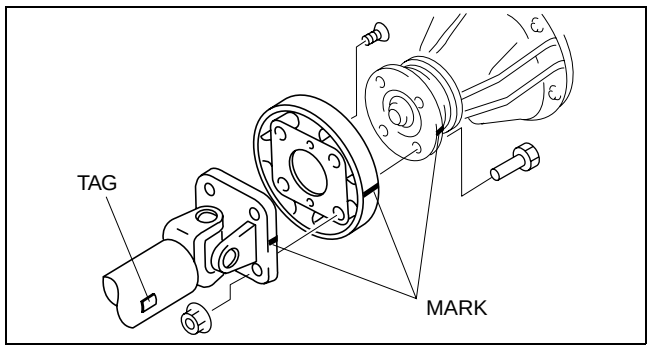
2. Remove the propeller shaft from the extension housing and immediately install the **SST** to prevent oil leakage.



AVG6110W003

Propeller Shaft Installation Note

1. Align the marks made during removal, and install the propeller shaft. If Installing a new propeller shaft, align the differential companion flange precast marking with the tag on the propeller shaft.



AVG6110W002

Nut Installation Note

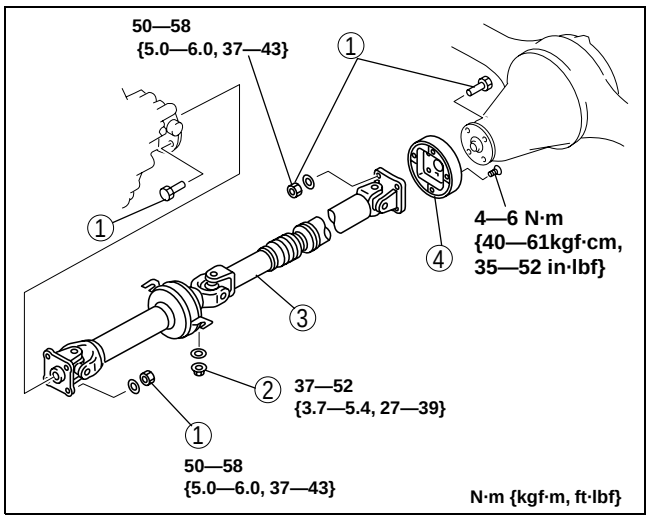
1. Tighten the center bearing installation nuts with the vehicle *unloaded.
   *unloaded:
   - Fuel tank is full.
   - Engine coolant and engine oil are at specified levels.
   - Jack and tools are in designated position.

REAR PROPELLER SHAFT (4X4) REMOVAL/INSTALLATION

AVF611025002W06

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.

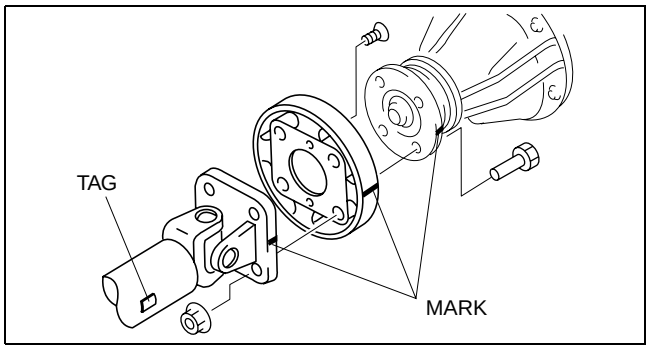
1	Bolt, nut
2	Nut (See L–4 Nut Installation Note)
3	Rear propeller shaft (See L–4 Rear Propeller Shaft Removal Note) (See L–4 Rear Propeller Shaft Installation Note)
4	Dynamic damper



AVG6110W004

Rear Propeller Shaft Removal Note

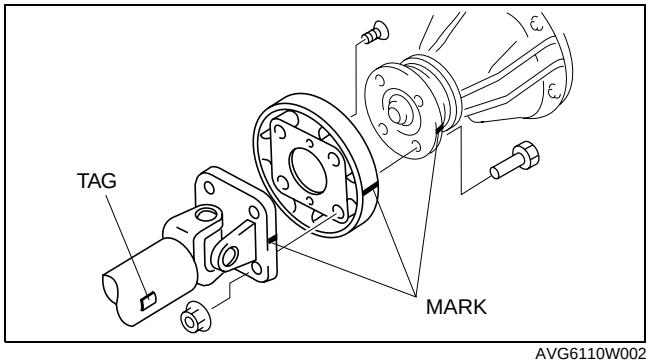
1. Before removing the rear propeller shaft, put marks on the yoke, dynamic damper and the companion flange on the rear propeller shaft tag side for proper reinstallation.



AVG6110W002

Rear Propeller Shaft Installation Note

1. Align the marks made during removal, and install the rear propeller shaft. If Installing a new propeller shaft, align the differential companion flange precast marking with the tag on the rear propeller shaft.



AVG6110W002

Nut Installation Note

1. Tighten the center bearing installation nuts with the vehicle *unloaded.
   *unloaded:
   - Fuel tank is full.
   - Engine coolant and engine oil are at specified levels.
   - Jack and tools are in designated position.

FRONT AND REAR AXLES

FEATURES

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SERVICE

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WHEEL HUB, STEERING KNUCKLE (4×2)
PRE-INSPECTION..... M-4
WHEEL HUB, STEERING KNUCKLE (4×2)
REMOVAL/INSTALLATION M-4
WHEEL HUB BOLT (4×2) REPLACEMENT M-10

OUTLINE

OUTLINE OF CONSTRUCTION

AVF630201018W01

- The construction and operation of the front and rear axles is essentially carried over from that of the current RANGER, except for the following features. (See RANGER Training Manual.) (See RANGER Repair Manual Supplement F165-10-99J.) (See RANGER Repair Manual Supplement F166-10-00G.) (See RANGER Repair Manual Supplement F172-10-00J.) (See RANGER Training Manual F326-10-99A.) (See RANGER Repair Manual Supplement F179-10-02D.) (See RANGER Repair Manual Supplement F182-10-02I.)

FEATURES

AVF630201018W02

Improved Serviceability

- The front wheel bearing in the 4x2 model has been changed from a conventional taper roller bearing (separate-type) to a unit-type taper roller bearing.
- The front wheel hub and disc plate in the 4x2 model have been changed from unseparatable disc plate type to separatable disc plate type.

Modifications to match vehicle characteristics

- The wheel hub locknut for the 4x2 model is fixed from the inner side of the wheel hub.
- The shapes of the front wheel hub and steering knuckle have been modified to fit a unit-type wheel bearing. (4x2 model)
- The final gear ratio of rear differential has been optimized to improve drivability.

SPECIFICATIONS

AVF630201018W03

Item				Specification			
				EVEREST		Current RANGER	
				4x2	4x4	4x2	4x4
Freewheel type				**—**	**RFW**	**—**	**RFW**
Front axle	Wheel bearing type			Taper roller bearing (unit-type)	Taper roller bearing (unit-type)	Taper roller bearing (separate-type)	Taper roller bearing (unit-type)
Rear axle	Wheel bearing type			Taper roller bearing			
	Support type			Semi-floating			
	Casing			Banjo type			
	Length		(mm {in})	739.5 {29.1}			
	Diameter		(mm {in})	33.0 {1.3}			
Rear differential	Reduction gear			Hypoid gear			
	Differential gear			Straight bevel gear			
	Ring gear size		(mm {in})	203 {8.00}			
	Final gear ratio			4.444	4.444	WL (Except GCC specs.): 4.444 WL (Others): 4.100 G6: 3.727	4.444
	Oil	Standard	Grade	API service GL-5			
			Viscosity	SAE 90			
			Capacity (Approximate quantity) (L {US qt, lmp qt})	1.40 {1.48, 1.23}	1.85 {1.96, 1.63}	1.40 {1.48, 1.23}	1.85 {1.96, 1.63}
		LSD	Grade	—	API service GL-6		
			Viscosity		SAE 90		
			Capacity (Approximate quantity) (L {US qt, lmp qt})		1.85 {1.96, 1.63}	1.40 {1.48, 1.23}	1.85 {1.96, 1.63}

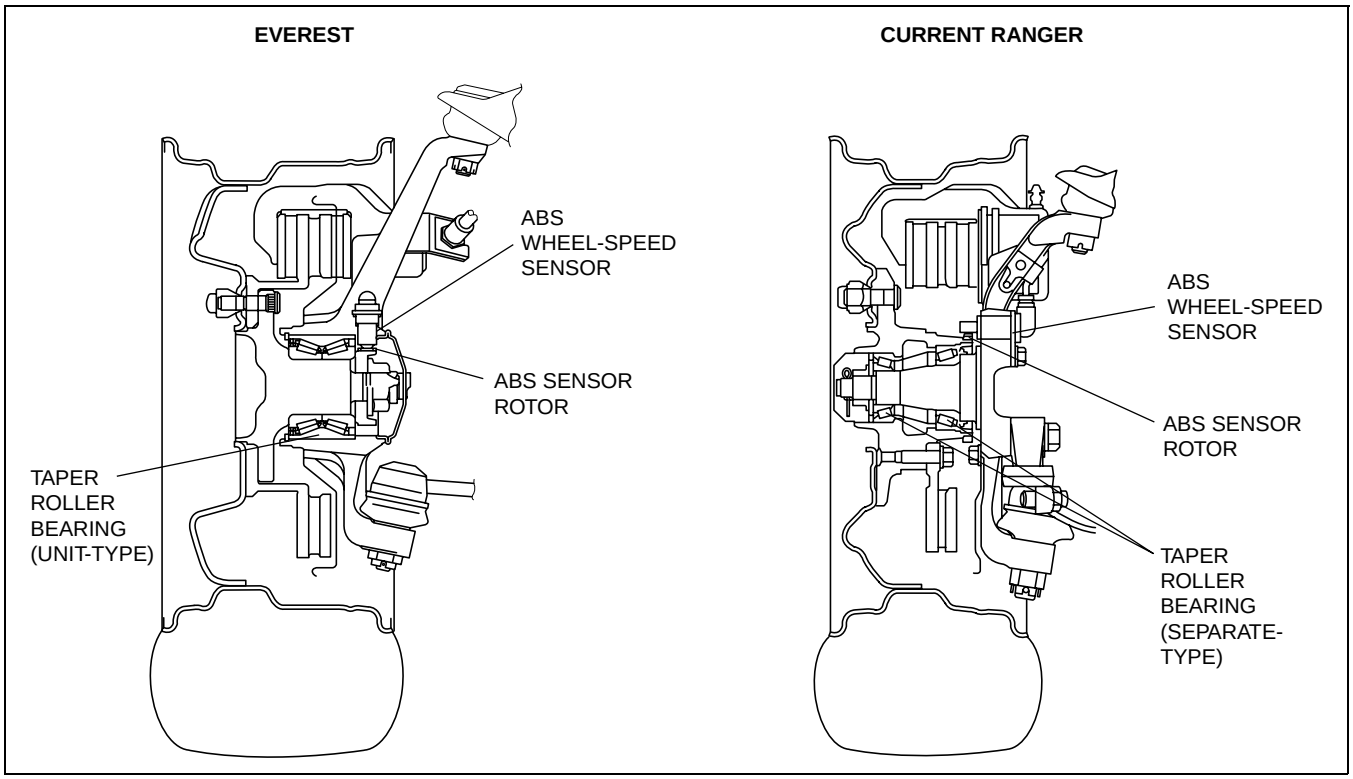
Item				Specification			
				EVEREST		Current RANGER	
				4x2	4x4	4x2	4x4
Freewheel type				**—**	**RFW**	**—**	**RFW**
Front differential	Reduction gear			—	Hypoid gear	—	Hypoid gear
	Differential gear				Straight bevel gear		Straight bevel gear
	Ring gear size (mm {in})				184 {7.25}		184 {7.25}
	Final gear ratio				4.444		4.444
	Oil	Grade			API service GL-5		API service GL-5
		Viscosity			Above –18 °C {0 °F}: SAE90 Below –18 °C {0 °F}: SAE80		Above –18 °C {0 °F}: SAE90 Below –18 °C {0 °F}: SAE80
		Capacity (Approximate quantity) (L {US qt, Imp qt})			1.5 {1.6, 1.3}		1.5 {1.6, 1.3}
Drive shaft	Joint type		Wheel side	—	Bell joint	—	Bell joint
			Differential side		Double offset joint		Double offset joint
	Shaft diameter (mm {in})				28 {1.1}		28 {1.1}

Bold frames: New specifications

CROSS SECTIONAL VIEW

AVF630201018W04

Front Axle (4x2)



AVF6302W001

M

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF630201018W05

- The following changes and/or additions have been made since publication of the below manuals.
  - — RANGER Repair Manual
  - — RANGER Repair Manual (F161-10-99A)
  - — RANGER Repair Manual Supplement (F179-10-02D)
  - — RANGER Repair Manual Supplement (F182-10-02I)

Wheel hub, steering knuckle (4x2)

- Inspection procedure has been modified.
- Removal/installation procedure has been modified.

Wheel hub bolt (4x2)

- Replacement procedure has been added.

FRONT AXLE

WHEEL HUB, STEERING KNUCKLE (4×2) PRE-INSPECTION

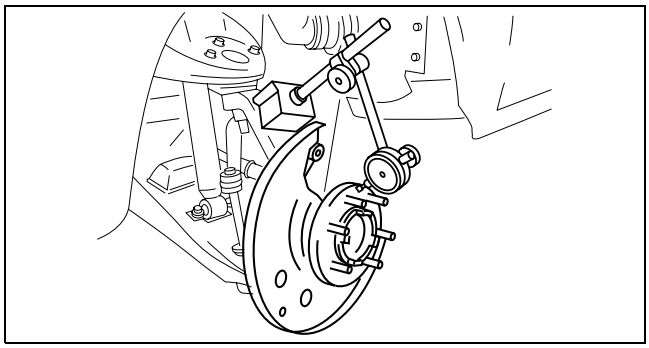
AVF631204000W04

Wheel Bearing Play Inspection

1. Position a dial indicator against the wheel hub.
2. Push and pull the wheel hub by hand in the axial direction and measure the wheel bearing play.

   Maximum wheel bearing play
   0.05 mm {0.002 in}

3. If the bearing play exceeds the specification, replace and tighten the locknut to the specified torque and retest.
   - Replace the wheel bearing as necessary.



AVF6312W009

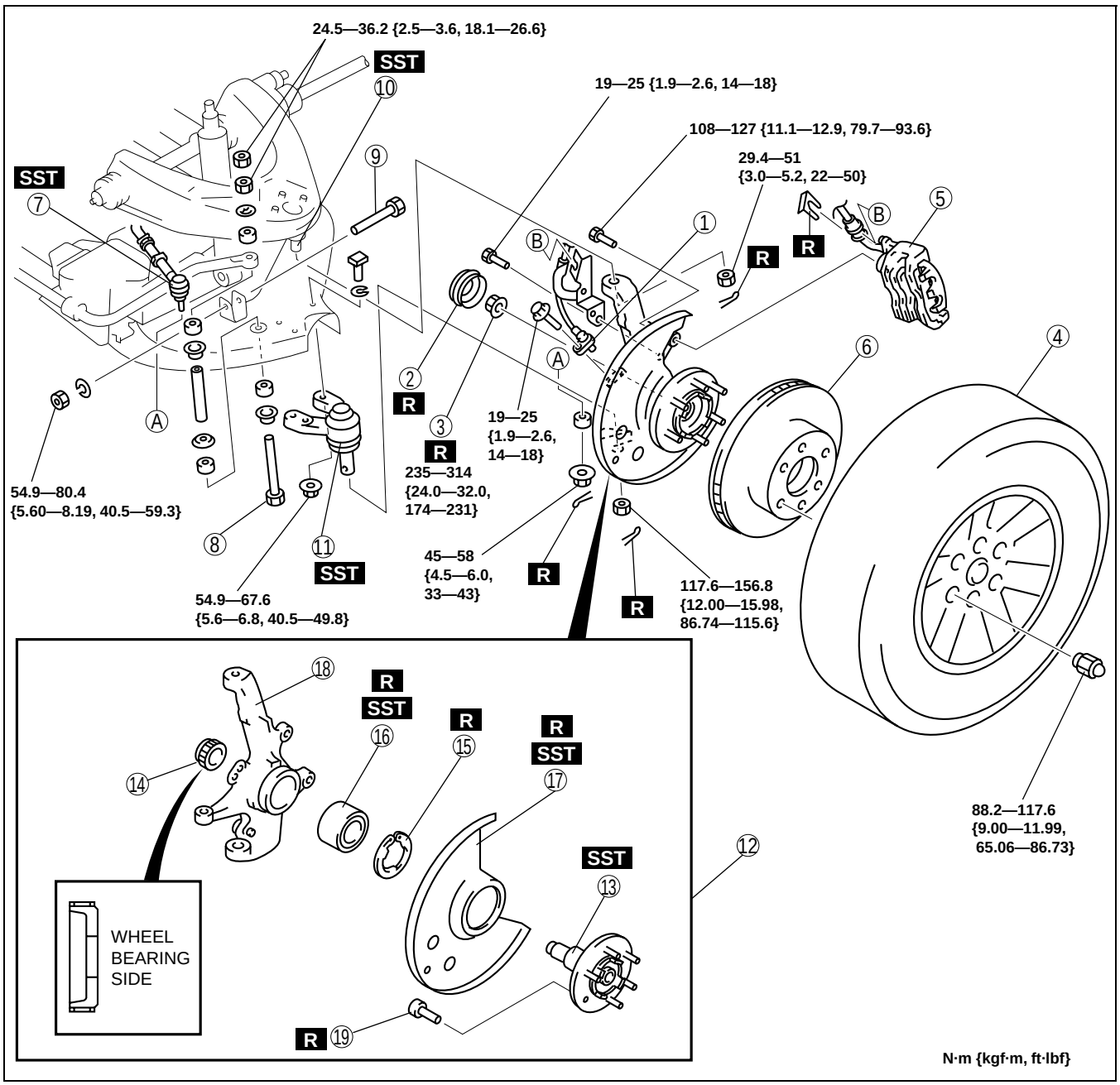
WHEEL HUB, STEERING KNUCKLE (4×2) REMOVAL/INSTALLATION

AVF631204000W05

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while the vehicle is being serviced.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



AVF6312W011

1	ABS wheel-speed sensor
2	Hub cap
3	Locknut (See M–6 Locknut Removal Note) (See M–9 Locknut Installation Note)
4	Wheel and tire
5	Brake caliper component (See M–6 Brake Caliper Component Removal Note)
6	Disc plate
7	Tie-rod end ball joint (See M–6 Tie-rod End Ball Joint Removal Note)
8	Bolt (stabilizer)
9	Bolt (shock absorber)
10	Upper arm ball joint
11	Lower arm ball joint

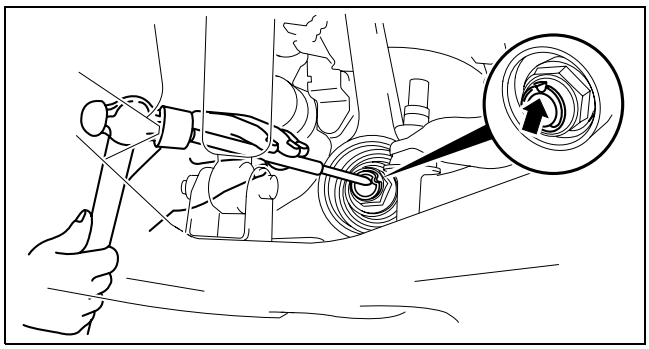
12	Wheel hub, steering knuckle, dust cover
13	Wheel hub component (See M–7 Wheel Hub Component Removal Note) (See M–9 Wheel Hub Component Installation Note)
14	ABS sensor rotor
15	Retaining ring
16	Wheel bearing (See M–7 Wheel Bearing Removal Note) (See M–9 Wheel Bearing Installation Note)
17	Dust cover (See M–7 Dust Cover Removal Note) (See M–8 Dust Cover Installation Note)
18	Steering knuckle
19	Hub bolt (See M–8 Hub Bolt Removal Note) (See M–8 Hub Bolt Installation Note)

M

Locknut Removal Note

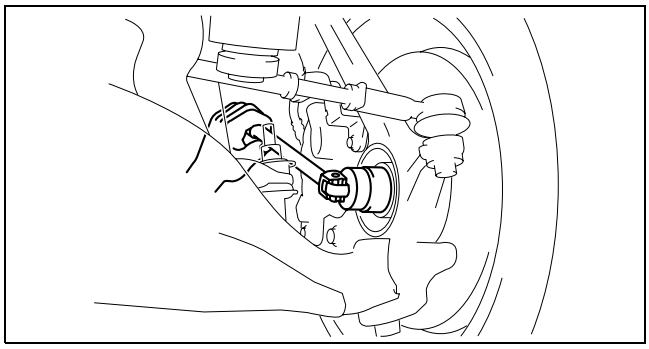
Note
- Remove the locknut with the vehicle on level ground.

1. Knock the crimped portion of the locknut outward using a small chisel and a hammer.



AVF6312W051

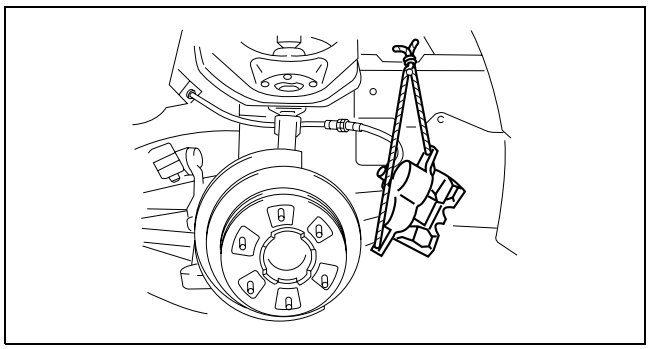
2. Remove the locknut.



AVF6312W052

Brake Caliper Component Removal Note

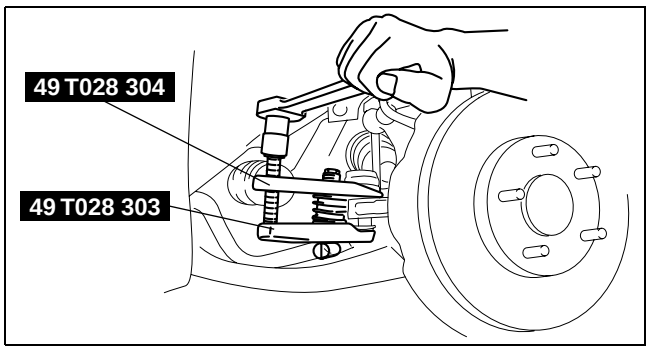
1. Remove the brake caliper component, and suspend it with rope.



AVF6312W002

Tie-rod End Ball Joint Removal Note

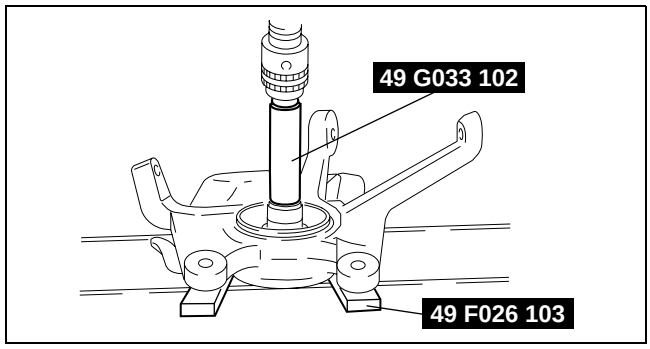
1. Remove the tie rod-nut.
2. Separate the tie-rod end from the steering knuckle using the **SSTs**.



AVF6312W003

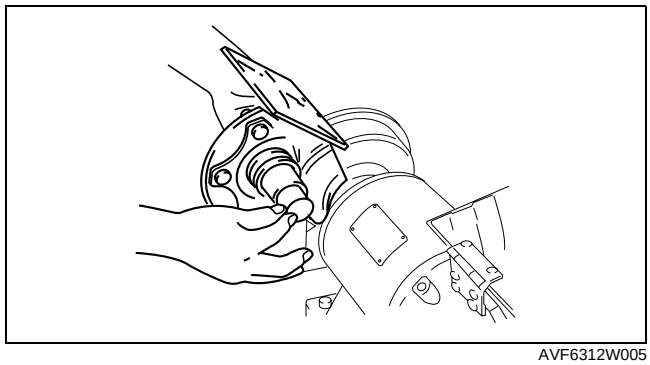
Wheel Hub Component Removal Note

1. Remove the wheel hub component using the **SSTs** and a press.



AVF6312W004

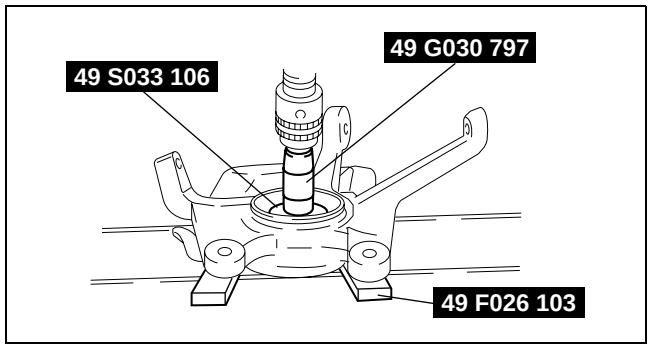
2. If the bearing inner race remains on the front wheel hub component, grind a section of the bearing inner race until **approx. 0.5 mm {0.02 in}** remains. Then remove it using a chisel.



AVF6312W005

Wheel Bearing Removal Note

1. Remove the wheel bearing using the **SSTs** and a press.



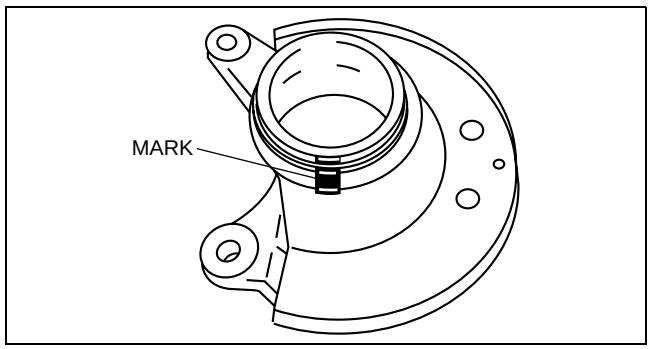
ABR6312W007

Dust Cover Removal Note

Note

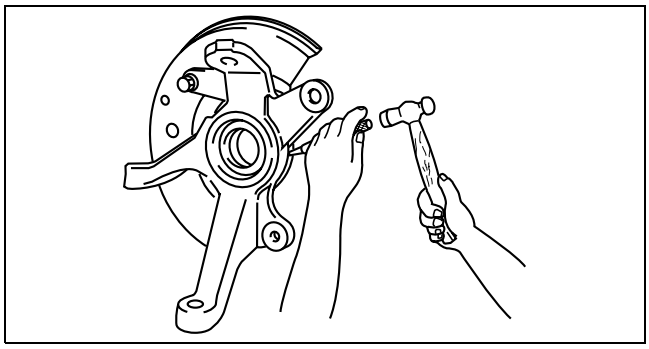
- The dust cover does not need to be removed unless it is being replaced.

1. Mark the dust cover and steering knuckle for proper installation.



ABR6312W008

2. Remove the dust cover using a chisel.

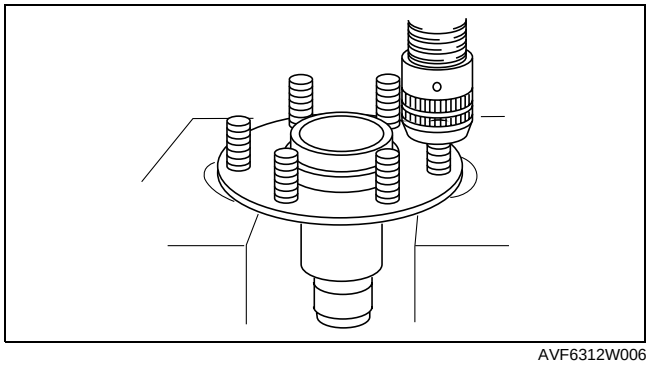


ABR6312W009

Hub Bolt Removal Note

Note
- The hub bolts do not need to be removed unless they are being replaced.

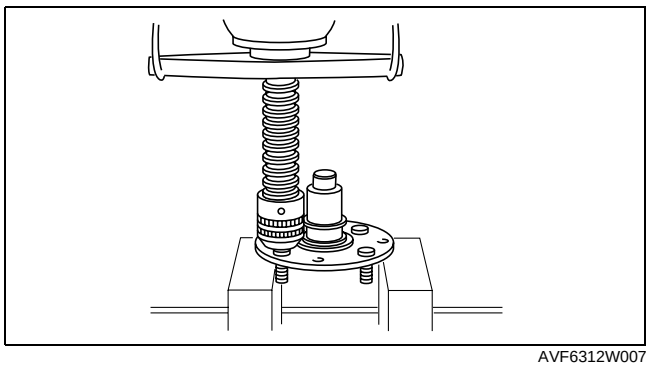
1. Remove the hub bolts using a press.



AVF6312W006

Hub Bolt Installation Note

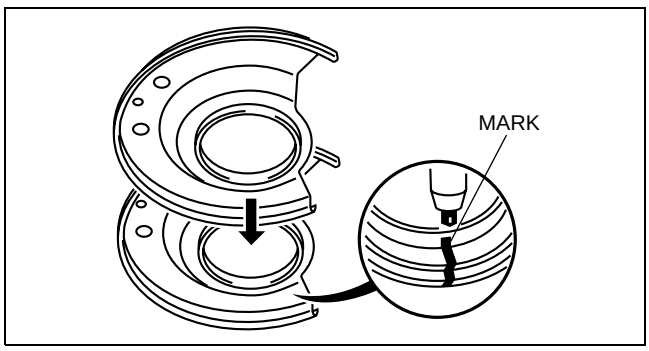
1. Install the new hub bolts using a press.



AVF6312W007

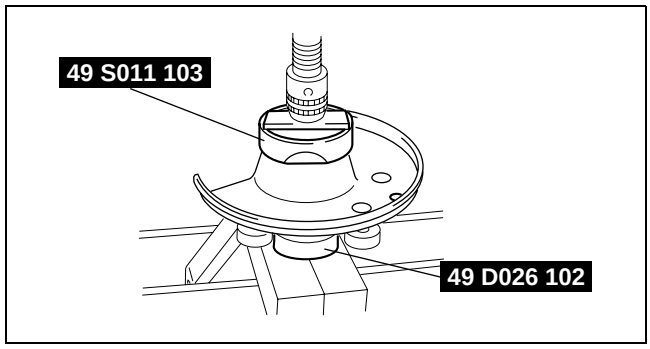
Dust Cover Installation Note

1. Mark the new dust cover in the same way as the removed one.
2. Align the marks of the new dust cover and the knuckle.



ABR6312W010

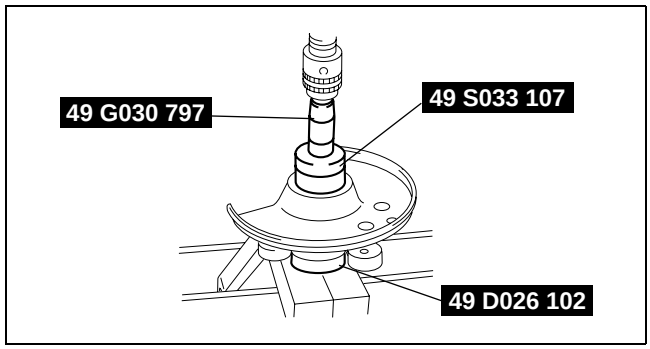
3. Install the new dust cover using the **SSTs** and a press.



ABR6312W011

Wheel Bearing Installation Note

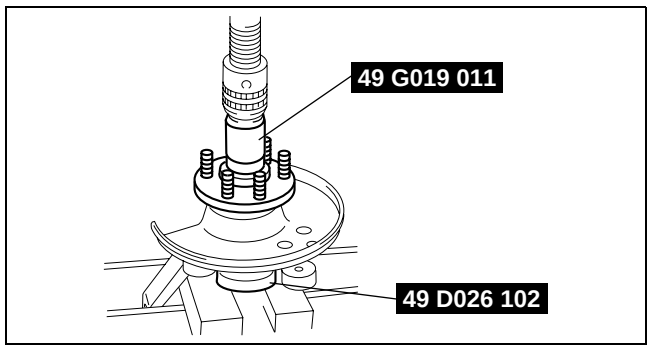
1. Install the new wheel bearing using the **SSTs** and a press.



ABR6312W012

Wheel Hub Component Installation Note

1. Install the wheel hub component using the **SSTs** and a press.

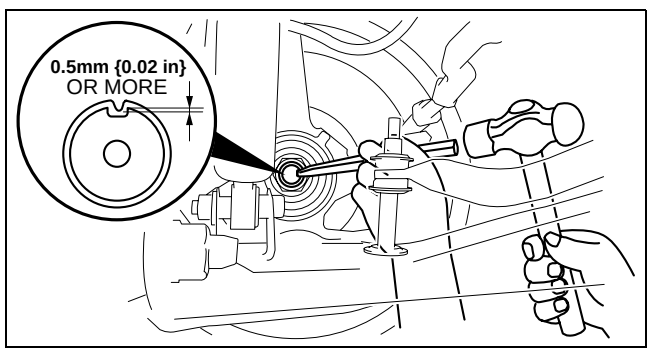


AVF6312W008

Locknut Installation Note

Note
- Install the locknut with the vehicle on level ground.

1. Install a new locknut and stake it as shown.

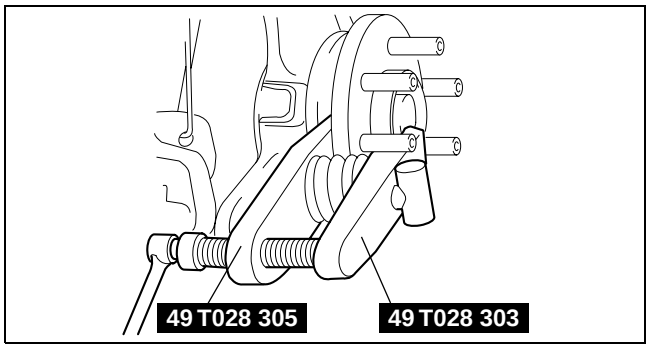


AVF6312W053

WHEEL HUB BOLT (4×2) REPLACEMENT

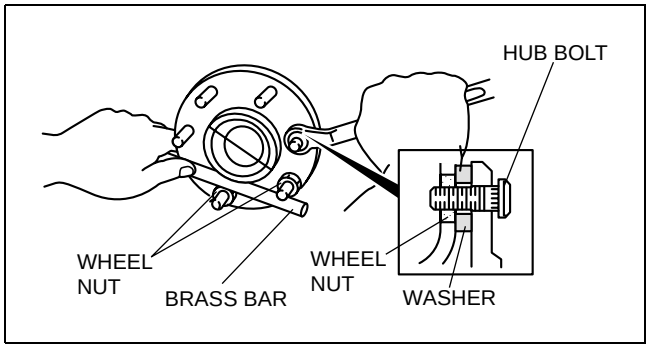
1. Remove the hub bolt using the **SSTs**.
2. Install the hub bolt into the wheel hub and install a washer and hub nut on the hub bolt.

AVF631233060W01



AVF6312W010

3. Tighten the hub nut while holding the wheel hub using a brass bar.



ABR6312W025

BRAKING SYSTEM

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OUTLINE

OUTLINE OF CONSTRUCTION

AVF690201020W01

- The construction and operation of the braking system is essentially carried over from that of the current RANGER, except for the following features. (See RANGER Training Manual F326-10-99A.) (See RANGER Repair Manual Supplement F179-10-02D.) (See RANGER Repair Manual Supplement F182-10-02I.)

FEATURES

AVF690201020W02

Improved Braking Performance

- In the 4x2 model, the following items have been adopted and modified.
  - — A two-piston type front disc brake caliper has been adopted.
  - — The plate thickness of the front disc plate has been increased from **24.0 mm {0.94 in}** to **28.0 mm {1.10 in}**.
  - — The outer diameter of the front disc plate has been enlarged from **256.0 mm {10.07 in}** to **289.0 mm {11.38 in}**.
  - — The lining length of the rear brake lining has been increased from **271 mm {10.7 in}** to **295.0 mm {11.6 in}**.
  - — The inner diameter of the rear brake drum has been enlarged from **270 mm {10.6 in}** to **295.0 mm {11.6 in}**.
  - — The load sensing proportioning valve (LSPV) characteristic has been optimized.
- A large diameter power brake unit has been adopted. (L.H.D. with G6 engine except for the Philippines)

Improved Serviceability

- In the 4x2 model, the front disc plate has been changed from an unseparatable disc plate type to a separatable disc plate type.

SPECIFICATIONS

AVF690201020W03

Item		Specification			
		EVEREST		Current RANGER	
		4x2	4x4	4x2	4x4
Brake pedal	Type	Suspended			
	Pedal lever ratio	4.0			
	Max. stroke (mm {in})	129 {5.08}			
Master cylinder	Type	Tandem (with level sensor)			
	Cylinder diameter (mm {in})	25.4 {1.00}			
Front disc brake	Type	Ventilated disc			
	Cylinder bore × number of piston (mm {in})	42.86 {1.69} × 2	42.86 {1.69} × 2	60.5 {2.38} × 1	42.86 {1.69} × 2
	Pad dimensions (area × thickness) (mm^2 {in^2} × mm {in})	5,500 {8.53} × 10.0 {0.39}	5,500 {8.53} × 10.0 {0.39}	5,000 {7.75} × 10.0 {0.39}	5,500 {8.53} × 10.0 {0.39}
	Disc plate dimensions (outer diameter × thickness) (mm {in})	289 {11.38} × 28 {1.10}	289 {11.38} × 28 {1.10}	256 {10.07} × 24 {0.94}	289 {11.38} × 28 {1.10}
Rear drum brake	Type	Leading-trailing			
	Wheel cylinder inner diameter (mm {in})	23.81 {0.937}			
	Lining dimensions (width × length × thickness) (mm {in})	55 {2.16} × 295 {11.6} × 5.5 {0.22}	55 {2.16} × 295 {11.6} × 5.5 {0.22}	55 {2.16} × 271 {10.7} × 5.5 {0.22}	55 {2.16} × 295 {11.6} × 5.5 {0.22}
	Drum inner diameter (mm {in})	295 {11.6}	295 {11.6}	270 {10.6}	295 {11.6}
	Shoe clearance adjustment	Automatic adjuster			

Item		Specification			
		EVEREST		Current RANGER	
		4x2	4x4	4x2	4x4
Power brake unit	Type	Vacuum multiplier			
		Tandem diaphragm	Tandem diaphragm	Thailand specs. without ABS: Single diaphragm Except above: Tandem diaphragm	Tandem diaphragm
	Diameter (mm {in})	G6 engine except Philippine: 213.4 {8.402} + 240.2 {9.457} Except above: 188.4 {7.417} + 215.2 {8.472}	L.H.D. with G6 engine: 213.4 {8.402} + 240.2 {9.457} Except above: 188.4 {7.417} + 215.2 {8.472}	Thailand specs. without ABS:239.0 {9.409} Except above: 188.4 {7.417} + 215.2 {8.472}	188.4 {7.417} + 215.2 {8.472}
Braking force control device	Type	Load sensing proportioning valve			
Parking brake	Type	Mechanical two-rear-wheel control			
	Operation system	Stick lever			
Brake fluid	Type	SAE J1703, FMVSS116DOT-3			

Bold frames: New specifications

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF690201020W04

- The following changes and/or additions have been made since publication of the below manuals.
  - — RANGER Repair Manual (F161-10-99A)
  - — RANGER Repair Manual Supplement (F179-10-02D)
  - — RANGER Repair Manual Supplement (F182-10-02I)

Power brake unit
- Inspection procedure has been modified.

Load sensing proportioning valve (LSPV)
- Inspection procedure has been modified. (4x2)
- Adjustment procedure has been modified. (4x2)
- Replacement procedure has been modified. (4x2)

Front brake (disc)
- Inspection procedure has been added. (4x2)
- Removal/installation procedure has been modified. (4x2)
- Disassembly/assembly procedure has been modified. (4x2)

Disc pad
- Replacement procedure has been modified. (4x2)

Rear brake (drum)
- Inspection procedure has been modified. (4x2)

Parking brake cable
- Removal/installation procedure has been modified.

ABS wheel-speed sensor
- Removal/installation procedure has been modified. (4x2)

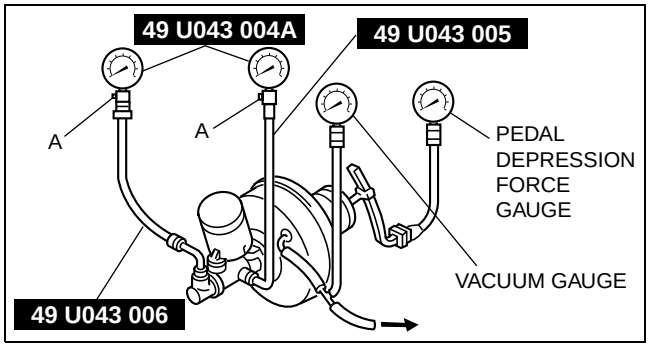
CONVENTIONAL BRAKE SYSTEM

POWER BRAKE UNIT INSPECTION

AVF691243800W01

Power Brake Unit Function Inspection (Inspection using gauges)

1. Connect the **SST** gauges, a vacuum gauge, and a pedal depression gauge as shown in the figure.
2. Bleed the air from the **SST** gauges using air bleed valve A before performing the following tests.



A6E6912W005

Checking for vacuum loss (unloaded condition)

1. Start the engine.
2. Stop the engine when the vacuum gauge indicates **66.7 kPa {500 mmHg, 19.7 inHg}**.
3. Observe the vacuum gauge for **15 s**.
   - If the gauge indicates **63.4—66.6 kPa {475—500 mmHg, 18.8—19.6 inHg}**, the unit is operating.

Checking for vacuum loss (loaded condition)

1. Start the engine.
2. Depress the brake pedal with a force of **196 N {20 kgf, 44 lbf}**.
3. With the brake pedal held depressed, stop the engine when the vacuum gauge indicates **66.7 kPa {500 mmHg, 19.7 inHg}**.
4. Observe the vacuum gauge for **15 s**.
   - If the gauge indicates **63.4—66.6 kPa {475—500 mmHg, 18.8—19.6 inHg}**, the unit is operating.

Checking for hydraulic pressure

1. If the engine is stopped (vacuum **0 kPa {0 mmHg, 0 inHg}**) and the fluid pressure is within the specification, the unit is operating.

Pedal force	Fluid pressure
196 N {20 kgf, 44 lbf}	790 kPa {8.0 kgf/cm^2, 114 psi} min.

2. Start the engine. Depress the brake pedal when the vacuum reaches **66.7 kPa {500 mmHg, 19.7 inHg}**.
   - If the fluid pressure is within specification, the unit is operating.

4x2

Item	Pedal force	Fluid pressure
G6 engine except the Philippines	196 N {20 kgf, 44 lbf}	9,620 kPa {98 kgf/cm^2, 1,395 psi} min.
Except above	196 N {20 kgf, 44 lbf}	7,460 kPa {76 kgf/cm^2, 1,082 psi} min.

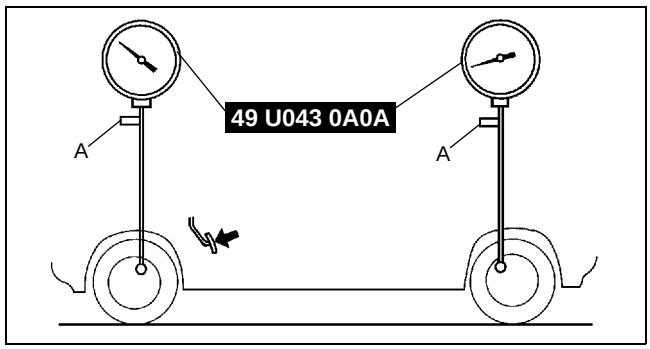
4x4

Item	Pedal force	Fluid pressure
L.H.D. with G6 engine	196 N {20 kgf, 44 lbf}	9,620 kPa {98 kgf/cm^2, 1,395 psi} min.
Except above	196 N {20 kgf, 44 lbf}	7,460 kPa {76 kgf/cm^2, 1,082 psi} min.

LOAD SENSING PROPORTIONING VALVE (LSPV) INSPECTION (4×2)

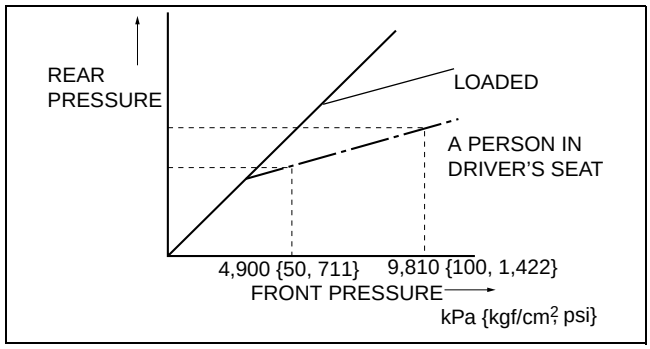
AVF691243901W01

1. Place the vehicle on level ground.
2. Check the tire inflations and set them to the recommended pressure if necessary.
   - If not as specified, replace or adjust.
3. Check the vehicle with a person in the driver's seat; include the standard vehicle tools, the spare wheel and tire, and a full tank of fuel.
4. Install the **SST** to the front wheel cylinder and rear wheel cylinder, then bleed the air in the brake line and load sensing proportioning valve (LSPV) using air bleed valve A.



AVF6912W003

5. Inspect the fluid pressure of rear wheel cylinder while the fluid pressure of front wheel cylinder is **4,900 kPa {50 kgf/cm^2, 711 psi}** and **9,810 kPa {100 kgf/cm^2, 1,422 psi}**.
   - If not as specified, adjust the LSPV.



ABR6912W026

Specification

kPa {kgf/cm^2, psi}

Type	Front wheel cylinder fluid pressure	Rear wheel cylinder fluid pressure
Without ABS	4,900 {50, 711}	2,250—2,850 {22.95—29.06, 327—413}
	9,810 {100, 1,422}	3,130—3,930 {31.92—40.07, 454—569}
With ABS	4,900 {50, 711}	2,650—3,450 {27.03—35.18, 385—500}
	9,810 {100, 1,422}	4,700—5,900 {47.93—60.16, 682—855}

Note

- When applying the specified pressure, the brake pedal must not be "double pumped" or released.
- Read the rear pressure after **approximately two seconds** have elapsed from setting the front wheel cylinder fluid pressure.

LOAD SENSING PROPORTIONING VALVE (LSPV) ADJUSTMENT (4×2)

AVF691243901W02

1. Place the unloaded vehicle on level ground. Unloaded: Fuel tank is full. Engine coolant and tire, jack and tools are in designated position.

Note
- A change of **5 mm {0.197 in}** in dimension L results in a change of the following.

kPa {kgf/cm^2, psl}

Type	Change
without ABS	1,060 {10.81, 154}
with ABS	1,080 {11.01, 157}

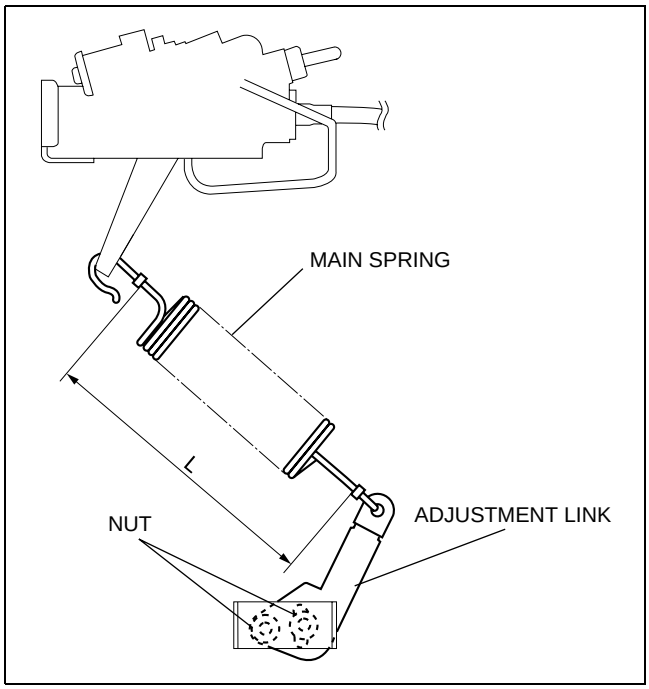
2. Adjust main spring dimension L between the LSPV and the adjustment link loosening and repositioning the LSPV.
   - Decrease dimension L if the fluid pressure is low.
   - Increase dimension L if the fluid pressure is high.

   Specification
   Dimension L: 175.5—182.5 mm {6.91—7.18 in}

3. Tighten the nut.

   Specification
   18.6—25.4 N·m {1.89—2.60 kgf·m, 13.7—18.8 ft·lbf}

4. After adjustment, recheck the fluid pressure.
   - If not as specified, replace the LSPV as a unit.



AVF6912W001

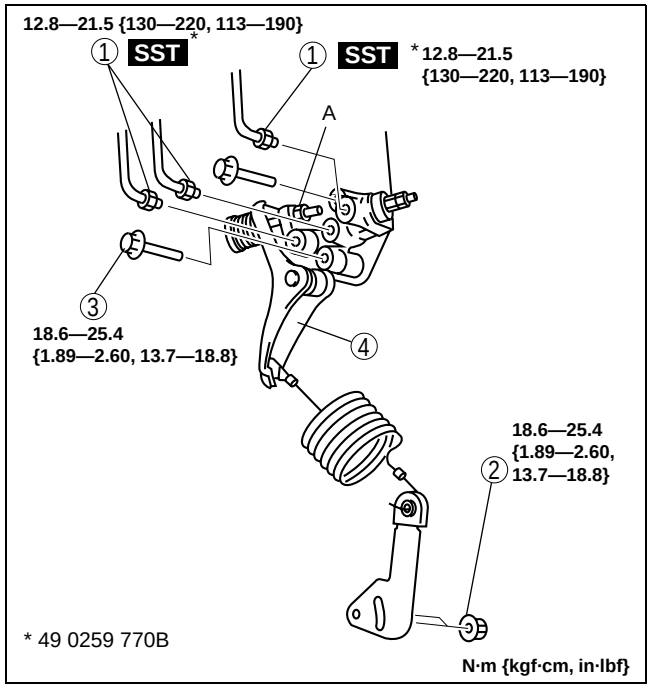
LOAD SENSING PROPORTIONING VALVE (LSPV) REMOVAL/INSTALLATION (4×2)

AVF691243901W03

Caution
- **Do not disassemble the LSPV.**
- **Do not move nut A.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, adjust the main spring dimension. (See P–6 LOAD SENSING PROPORTIONING VALVE (LSPV) ADJUSTMENT (4×2).)

1	Brake pipe (See P–7 Brake Pipe Installation Note)
2	Nut
3	Bolt
4	Load sensing proportioning valve (LSPV)

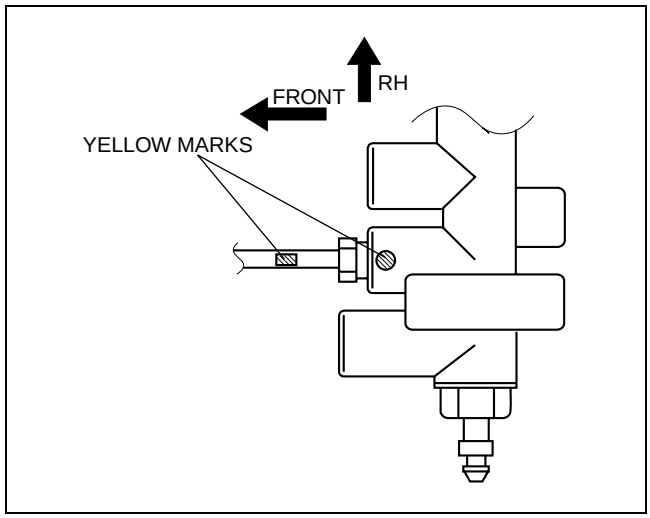


AVF6912W002

P

Brake Pipe Installation Note

1. Install the brake pipe to the load sensing proportioning valve (LSPV) and align the yellow marks on the brake pipe and LSPV.



AVF6912W004

FRONT BRAKE (DISC) INSPECTION (4×2)

AVF691233980W01

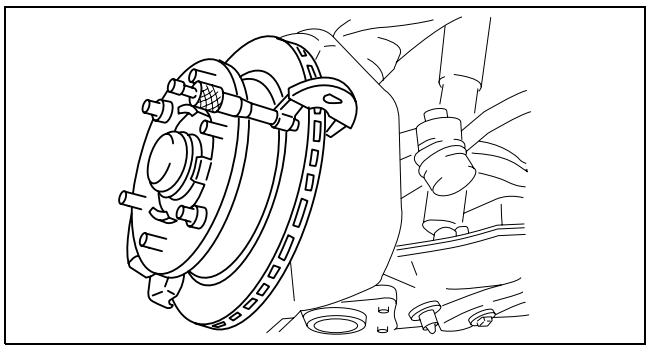
Disc Pad Thickness Inspection

1. Jack up the front of the vehicle on level ground and support it with safety stands.
2. Remove the wheels.
3. Look through the caliper inspection hole and verify the remaining thickness of the pad.

Thickness
2.0 mm {0.079 in} min.

Disc Plate Thickness Inspection

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.



ABR6912W010

Caution
- **When it is necessary to machine the disc plate, make sure the disc plate is not removed from the vehicle when machined, excessive runout may result. Machine the disc plate with it installed on the vehicle.**

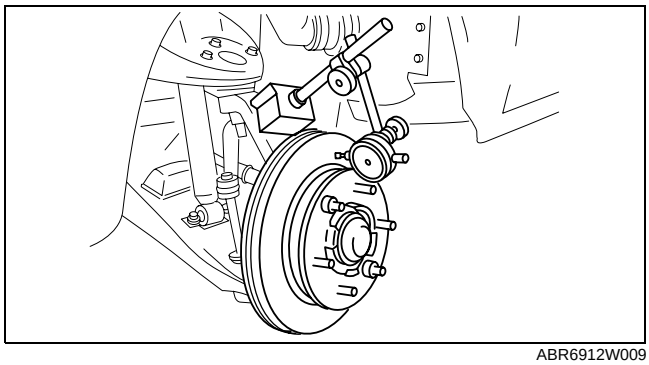
Standard thickness:
28.0 mm {1.10 in}

Minimum thickness:
26.0 mm {1.02 in}

Minimum thickness after machining using a brake lathe on-vehicle:
26.8 mm {1.06 in}

Disc Plate Runout Inspection

1. Tighten the disc plate to the wheel hub using two wheel nuts. When measuring runout, measure at the outer edge of the disc plate surface.



ABR6912W009

Runout limit
0.05 mm {0.002 in} max.

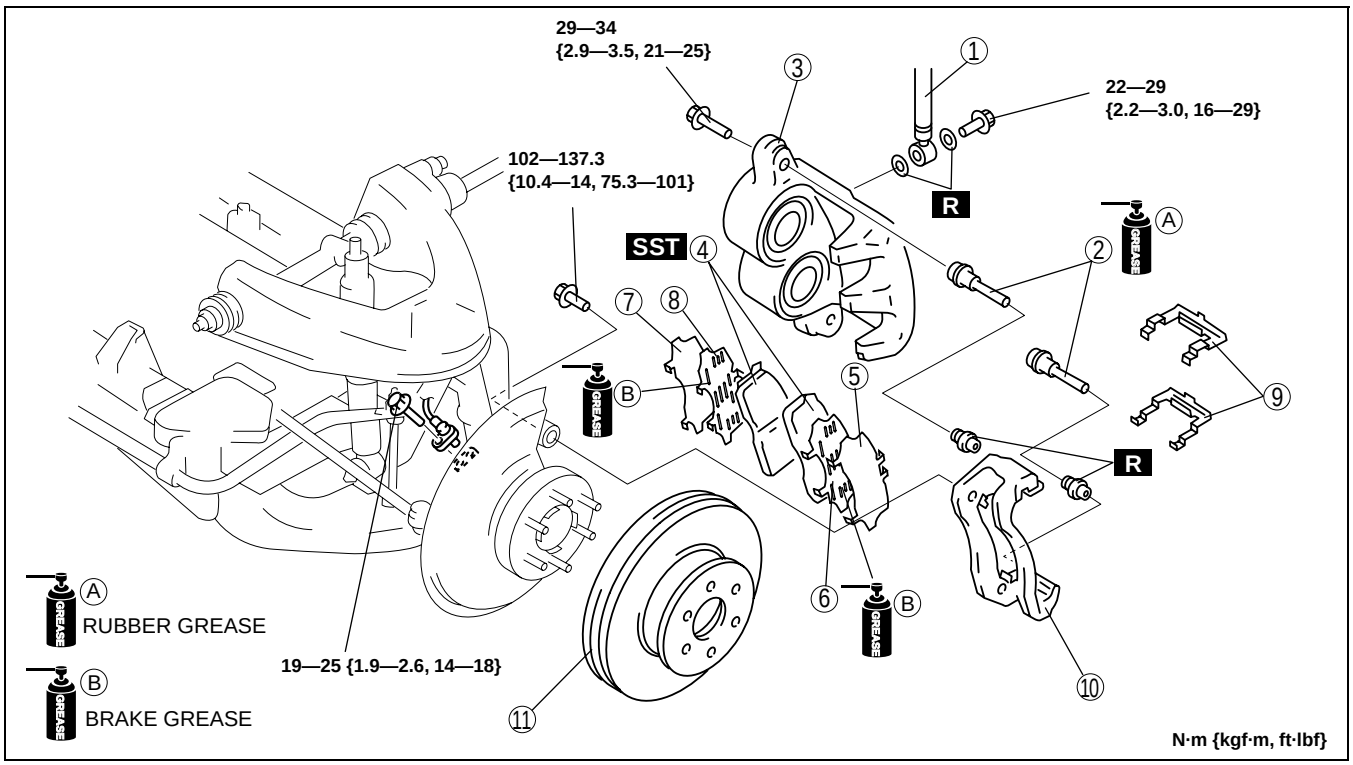
FRONT BRAKE (DISC) REMOVAL/INSTALLATION (4×2)

AVF691233980W02

Caution

- **Performing the following procedures without first removing the ABS wheel-speed sensor may possibly cause an open circuit in the harness if it is pulled by mistake. Before performing the following procedures, remove the ABS wheel-speed sensor (axle side) and fix it to an appropriate place where the sensor will not be pulled by mistake while the vehicle is being serviced.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, depress the pedal a few times, rotate the wheel by hand, and verify that the brake does not drag.



ABR6912W001

1	Flexible hose
2	Guide pin
3	Caliper
4	Disc pad (See P–11 Disc Pad Installation Note)
5	Outer shim (cover shim) (See P–10 Outer Shim, Inner shim Installation Note)
6	Outer shim (rubber coated shim) (See P–10 Outer Shim, Inner shim Installation Note)

7	Inner shim (cover shim) (See P–10 Outer Shim, Inner shim Installation Note)
8	Inner shim (rubber coated shim) (See P–10 Outer Shim, Inner shim Installation Note)
9	Guide plate (See P–10 Guide Plate Removal Note)
10	Mounting support
11	Disc plate (See P–10 Disc Plate Removal Note) (See P–10 Disc Plate Installation Note)

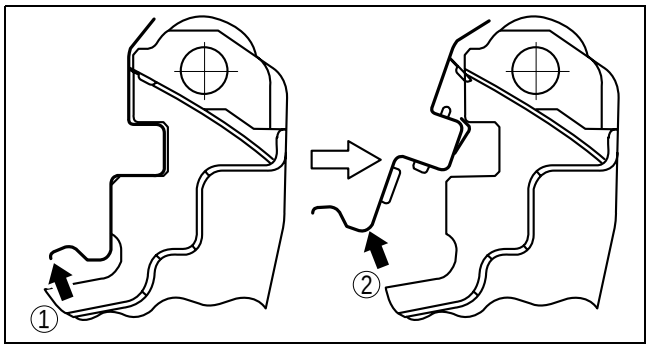
P

Guide Plate Removal Note

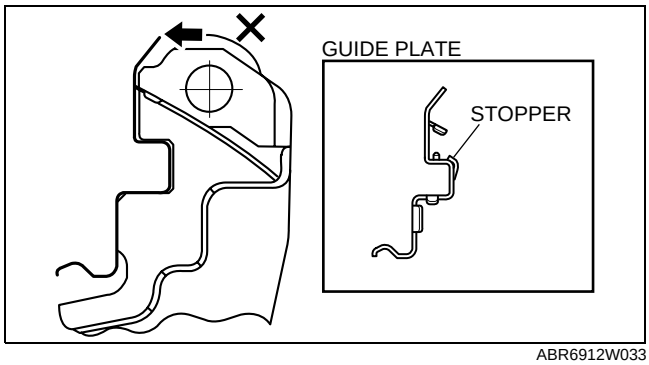
1. Pull up and at a slant on the supporting part of the guide plate in the direction indicated by the arrow (1) and (2) as shown in the figure, to remove the guide plate from the mounting support.

Caution

- **If the guide plate is removed by pulling in the direction indicated by the arrow as shown in the figure, the stopper may be deformed and not able to be reused. Do not remove in this manner.**



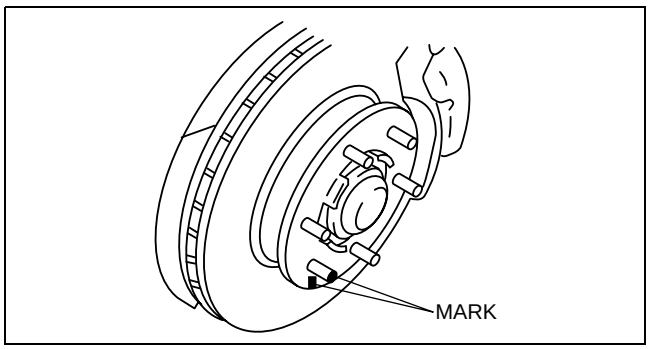
ABR6912W032



ABR6912W033

Disc Plate Removal Note

1. Mark the wheel hub bolt and disc plate before removal for reference during installation.



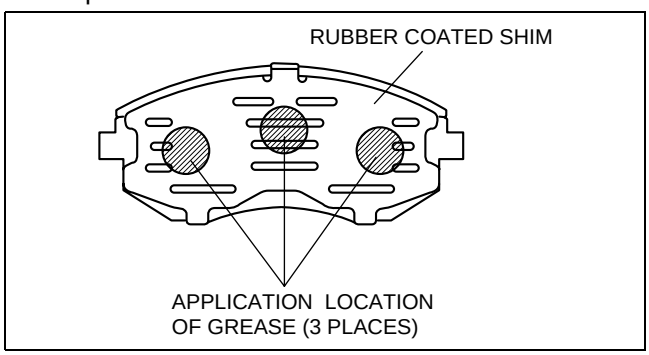
ABR6912W011

Disc Plate Installation Note

1. Remove any rust or grime on the contact face of the disc plate and wheel hub.
2. Install the disc plate and align the marks made before removal.

Outer Shim, Inner shim Installation Note

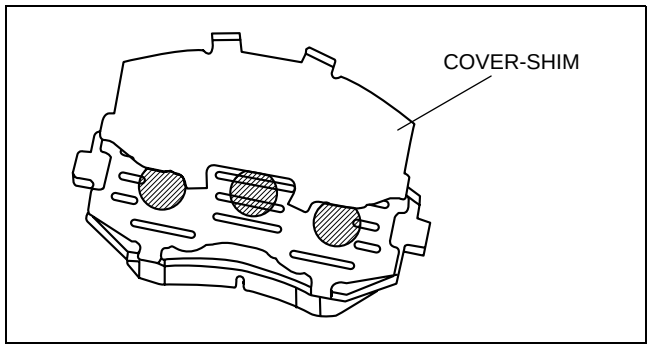
1. Assemble the rubber coated shim to the back plate of the disc pad.
2. Apply brake grease to the rubber coated shim as shown in the figure.



ABR6912W030

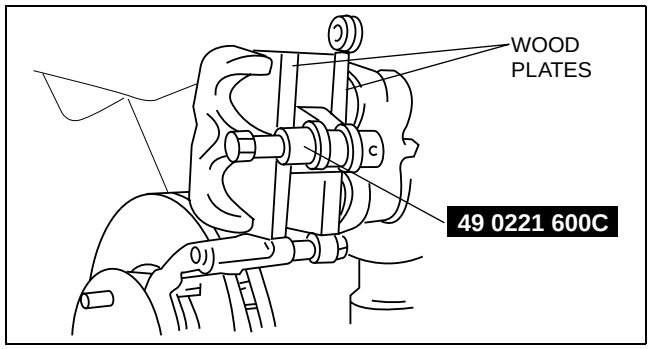
3. Assemble the cover-shim to the grease-applied rubber coated shim.

Caution
- **Be careful not to get any grease on the pad lining surface.**



ACF6912W004

Disc Pad Installation Note
1. Push the piston fully inward using the **SST**.
2. Install the disc pad.



ACF6912W001

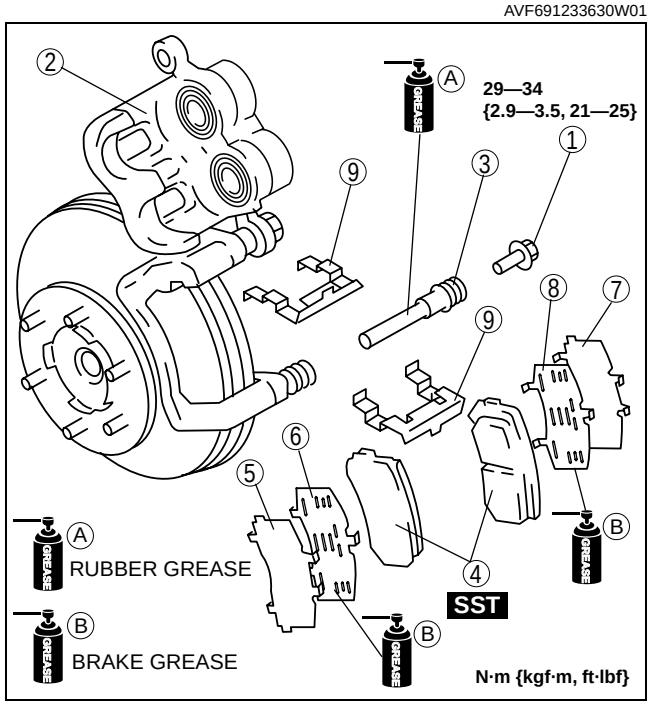
DISC PAD (FRONT) REPLACEMENT (4×2)

AVF691233630W01

1. Remove in the order indicated in the table.

1	Bolt
2	Caliper
3	Guide pin
4	Disc pad (See P–11 Disc Pad Installation Note)
5	Outer shim (cover shim) (See P–10 Outer Shim, Inner shim Installation Note)
6	Outer shim (rubber coated shim) (See P–10 Outer Shim, Inner shim Installation Note)
7	Inner shim (cover shim) (See P–10 Outer Shim, Inner shim Installation Note)
8	Inner shim (rubber coated shim) (See P–10 Outer Shim, Inner shim Installation Note)
9	Guide plate (See P–10 Guide Plate Removal Note)

2. Install in the reverse order of removal.



ABR6912W004

P

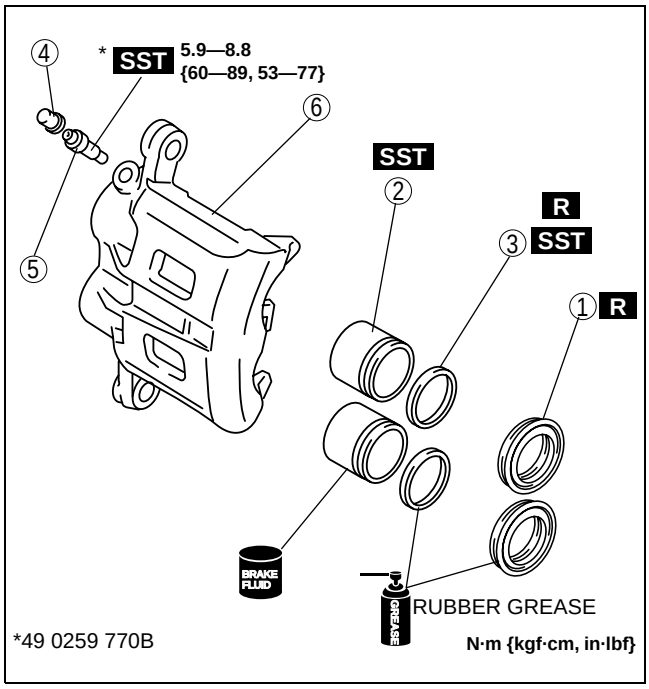
CALIPER (FRONT) DISASSEMBLY/ASSEMBLY (4×2)

AVF691233990W01

1. Disassemble in the order indicated in the table.

1	Dust seal
2	Piston (See P–12 Piston Disassembly Note)
3	Piston seal (See P–12 Piston Seal Disassembly Note)
4	Bleeder cap
5	Bleeder screw
6	Caliper

2. Assemble in the reverse order of removal.



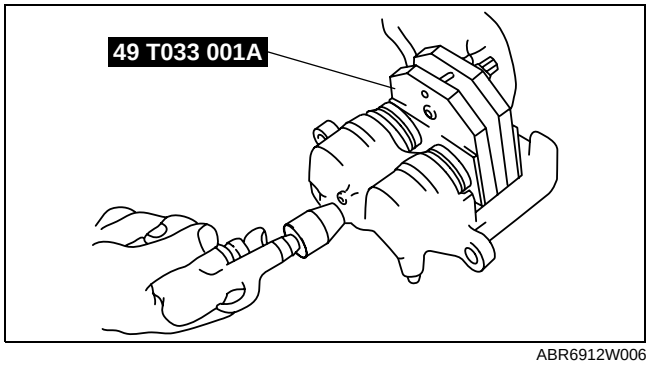
ABR6912W005

Piston Disassembly Note

Caution

- **Blow the compressed air slowly to prevent the piston from suddenly popping out.**

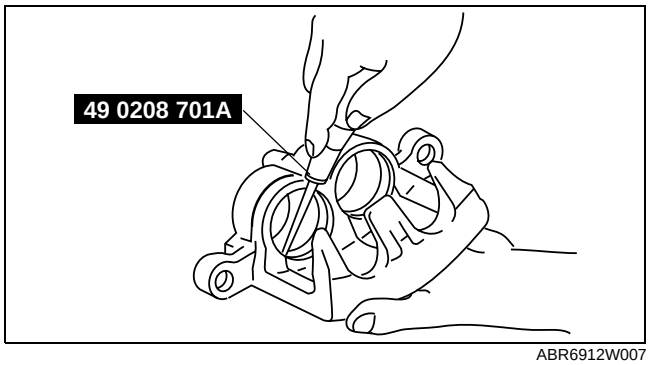
1. Place the **SST** in the caliper, then blow compressed air through the hole to force the piston out of the caliper.



ABR6912W006

Piston Seal Disassembly Note

1. Remove the piston seal from the brake caliper using the **SST**.



ABR6912W007

REAR BRAKE (DRUM) INSPECTION (4×2)

AVF691226250W01

Brake Lining Thickness Inspection

1. Remove the brake drum.
2. Inspect the remaining thickness of the lining.
   - Replace both left and right brake shoes if either is at or less than the minimum thickness.

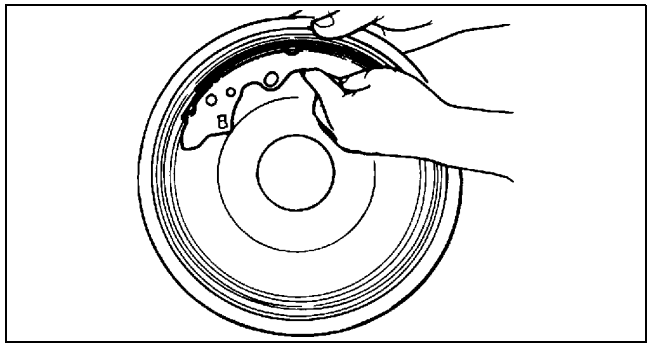
Thickness
1.0 mm {0.04 in} min.

Brake Drum Inspection

1. Measure the inner diameter of the drum.

Maximum diameter
296.5mm {11.67 in}

2. Apply chalk to the inside of the brake drum.
3. Inspect for scratches and uneven or abnormal wear inside the drum as shown in the figure.
4. Repair or replace the drum as necessary. Repair if the problem is minor.
5. When repairing or replacing the drum, inspect the contact with the shoes.
6. Wipe the chalk off after inspection.



YMU411WAL

P

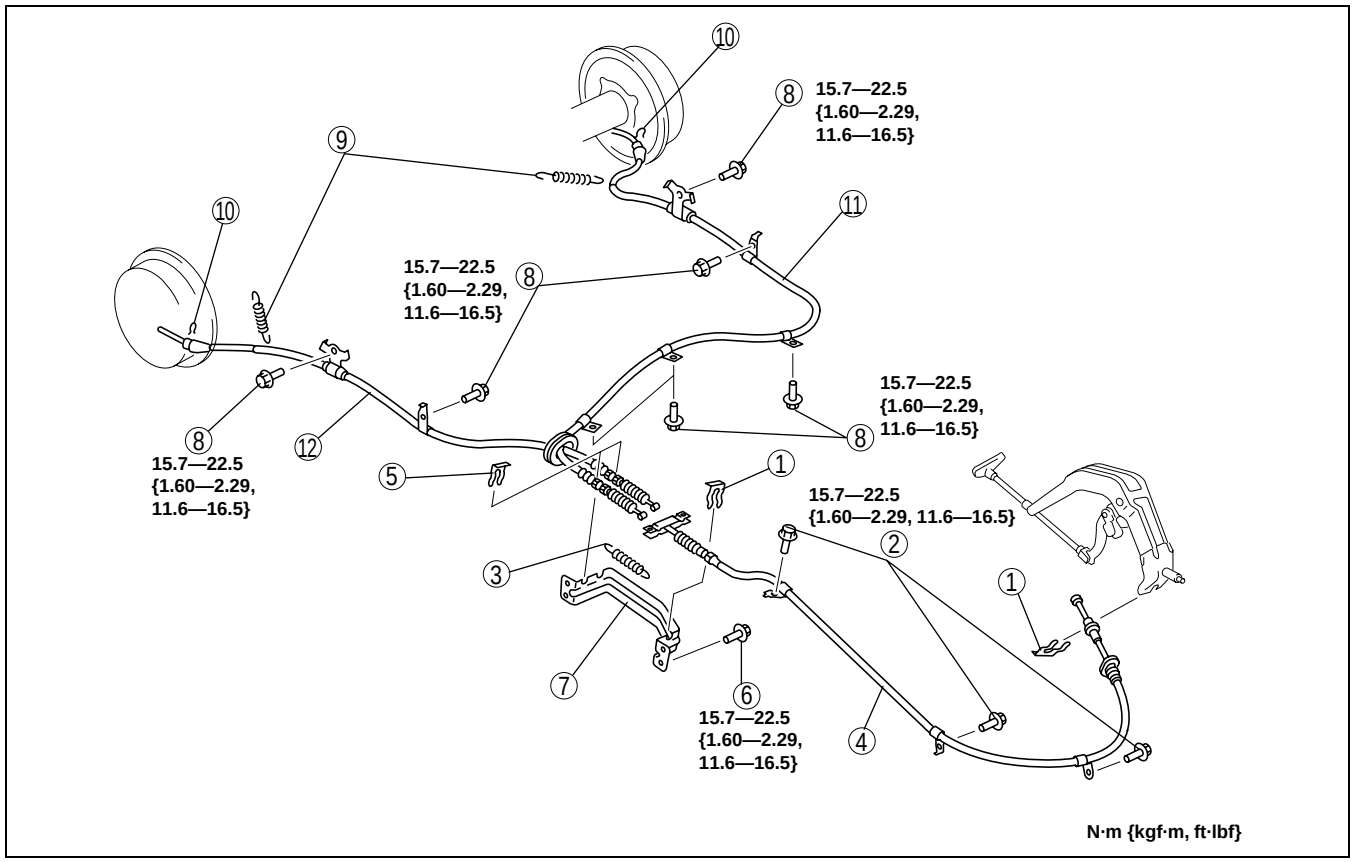
PARKING BRAKE SYSTEM

PARKING BRAKE CABLE (STICK TYPE) REMOVAL/INSTALLATION

AVF691444150W01

1. Remove the brake drum.
2. Remove the under guard.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. After installation, inspect the parking brake lever stroke.

R.H.D



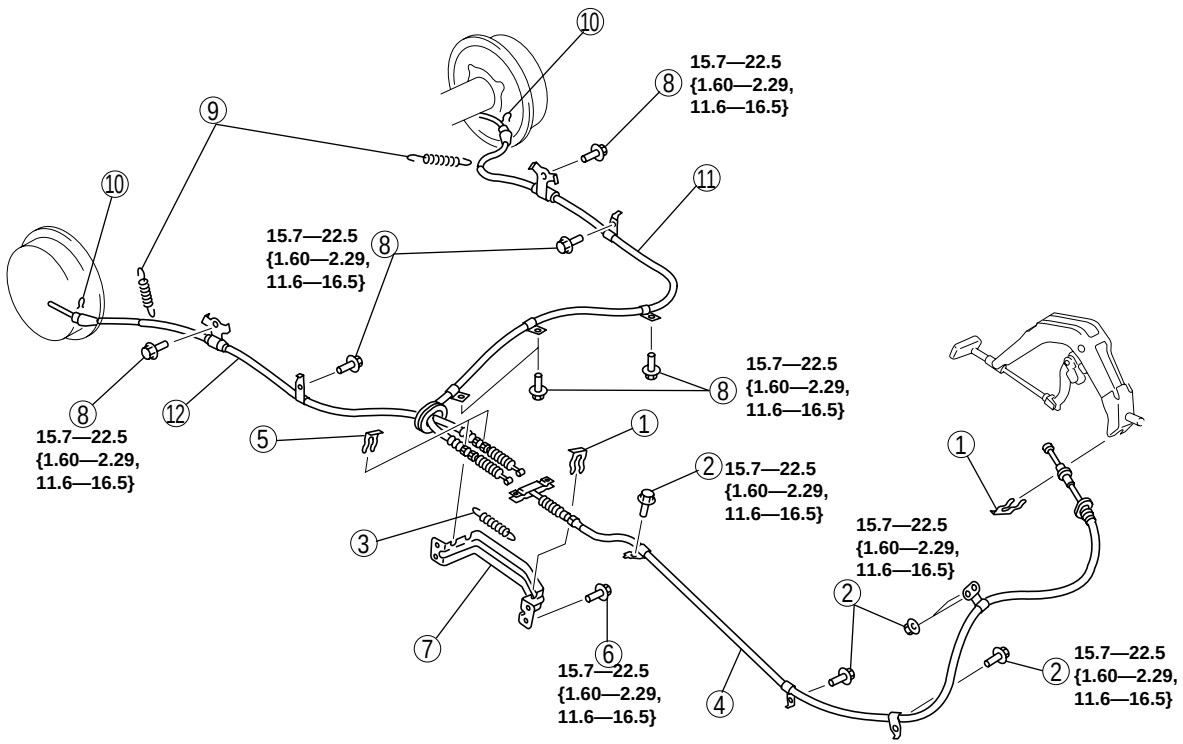
AVF6914W002

1	Clip
2	Bolt
3	Spring
4	Front brake cable
5	Clip
6	Bolt

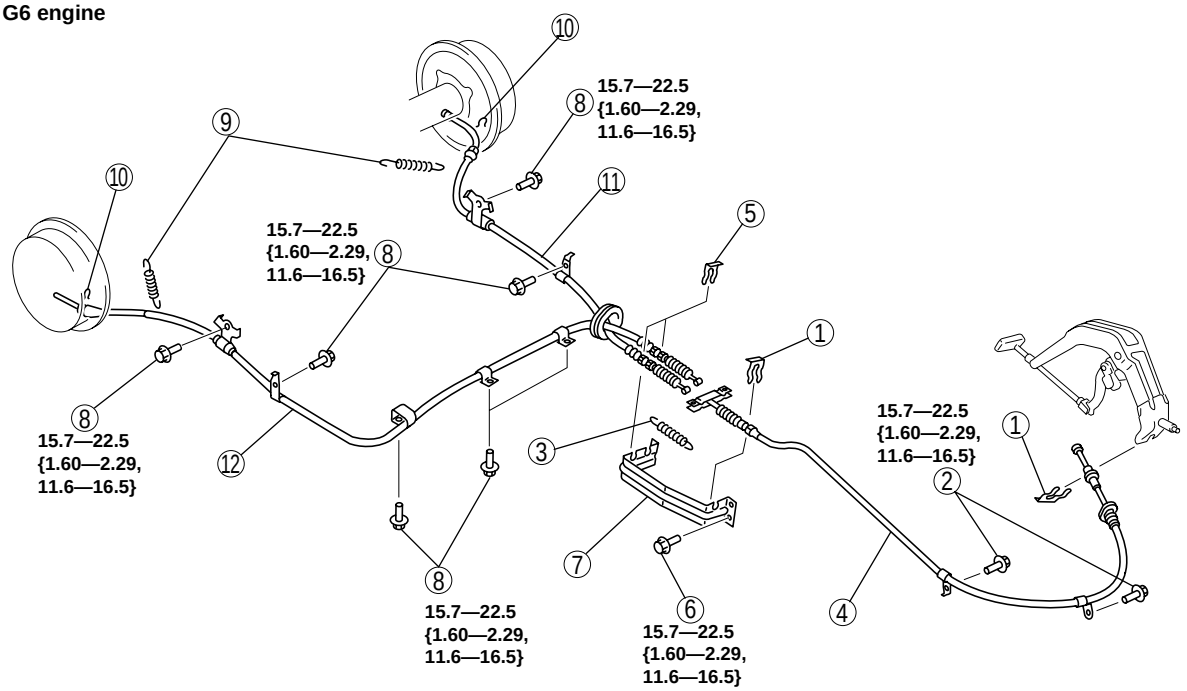
7	Bracket
8	Bolt
9	Spring
10	Clip
11	Rear cable (left)
12	Rear cable (right)

L.H.D.

WL engine



G6 engine



N·m {kgf·m, ft·lbf}

AVF6914W004

1	Clip
2	Bolt, Nut
3	Spring
4	Front brake cable
5	Clip
6	Bolt

7	Bracket
8	Bolt
9	Spring
10	Clip
11	Rear cable (left)
12	Rear cable (right)

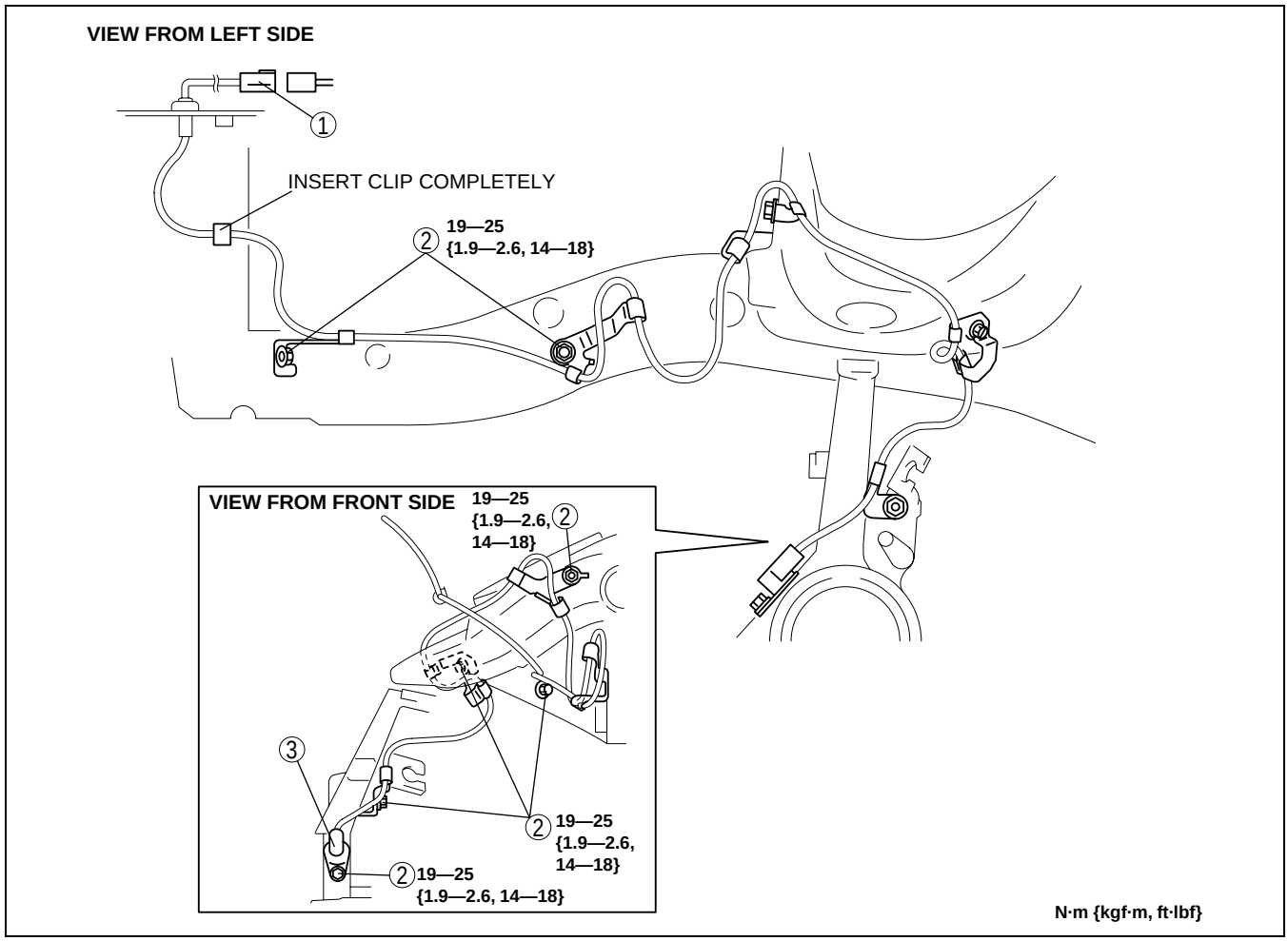
P

ANTILOCK BRAKE SYSTEM

FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION (4×2)

AVF691643720W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



AVF6916W002

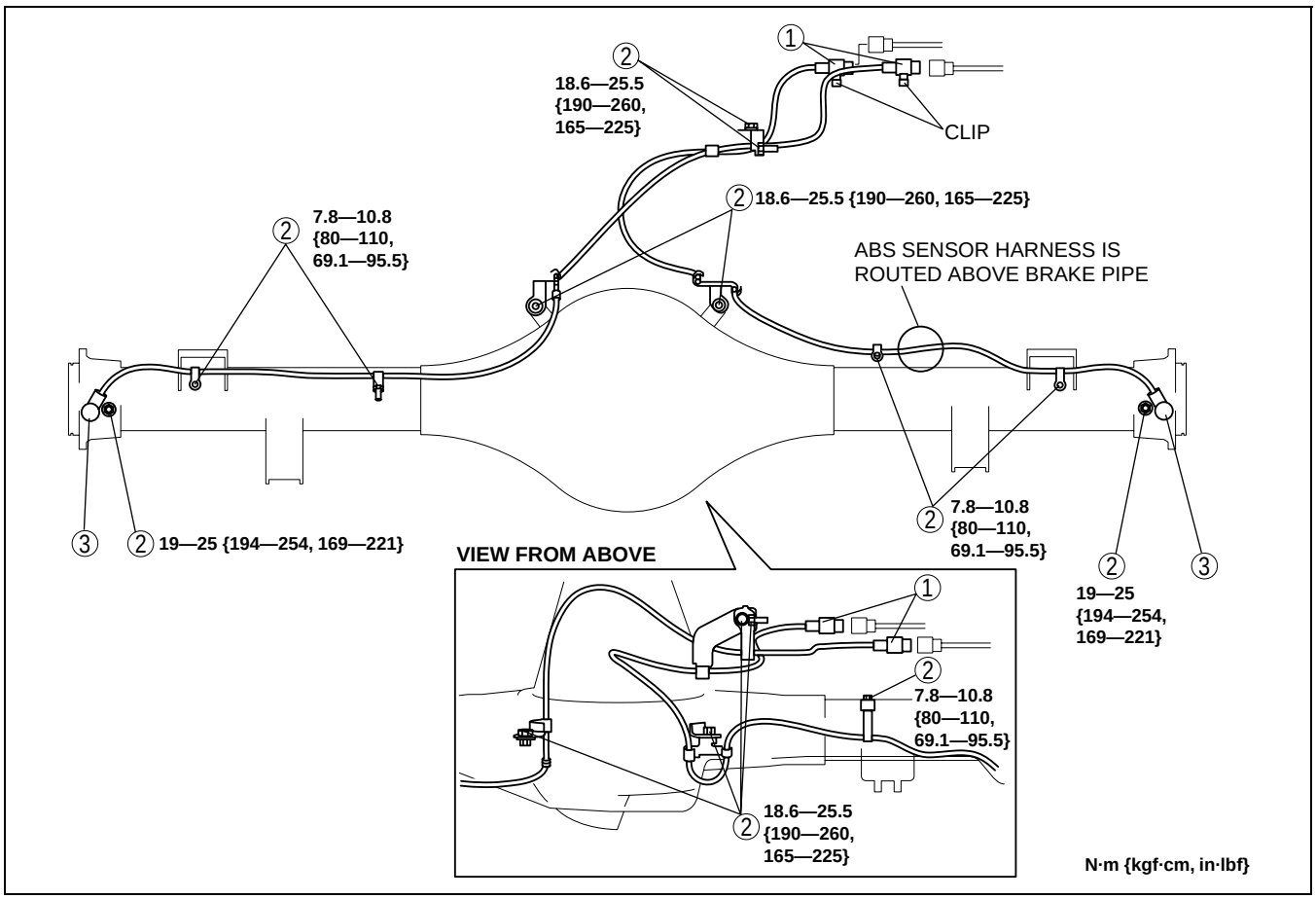
1	Connector
2	Bolt

3	Front ABS wheel-speed sensor

REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION (4x2)

AVF691643710W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



AVF6916W003

1	Connector
2	Bolt
3	Rear ABS wheel-speed sensor

P

SUSPENSION

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FRONT WHEEL ALIGNMENT R-3
FRONT SUSPENSION R-5
VEHICLE HEIGHT ADJUSTMENT R-5
REAR SUSPENSION R-6
REAR SHOCK ABSORBER
AND LEAF SPRING
REMOVAL/INSTALLATION R-6

OUTLINE

OUTLINE OF CONSTRUCTION

AVF740201013W01

- The construction and operation of the suspension system is essentially carried over from that of the current RANGER, except for the following features. (See RANGER Training Manual F326-10-99A.) (See RANGER Repair Manual Supplement F179-10-02D.) (See RANGER Repair Manual Supplement F182-10-02I.)

FEATURES

AVF740201013W02

Improved Handling Stability and Riding Comfort

- Front wheel alignment for 4x2 model has been changed.
- A front stabilizer with a diameter of **28 mm {1.1 in}** has been adopted.

SPECIFICATIONS

AVF740201013W03

Item					Specification			
					EVEREST		Current RANGER	
					4x2	4x4	4x2	4x4
Front suspension	Type				Double wishbone			
	Spring type				Torsion bar spring			
	Shock absorber type				Cylindrical, double-acting (Low-pressure gas charged)			
	Stabilizer	Type			Torsion bar			
		Diameter		(mm {in})	28 {1.1}		24 {0.9}	26 {1.0}
	Wheel alignment (Unloaded)*1	Total toe-in	Tire [Tolerance ±4 {0.16}]	(mm {in})	3 {0.12}			
			Rim inner		1.5±2.0 {0.06±0.08}		1.5±2.0 {0.06±0.08}	
				(degree)	0°15′±0°20′		0°16′±0°21′	0°14′±0°19′
		Maximum steering angle		Inner	31°30′—35°30′	31°30′—35°30′	33°00′—37°00′	31°30′—35°30′
				Outer	27°00′—32°00′	27°00′—32°00′	30°00′—35°00′	27°00′—32°00′
		Caster angle (reference value) [Tolerance ±1°]			2°02′	2°02′	Regular and Stretch*2 Cab: 1°37′ Double Cab: 1°50′	2°02′
		Camber angle (reference value) [Tolerance ±1°]			1°07′	1°07′	0°56′	Regular and Stretch*2 Cab: 1°06′ Double Cab: 1°07′
		Steering axis inclination (reference value)			10°13′	10°13′	8°04′	Regular and Stretch*2 Cab: 10°15′ Double Cab: 10°13′
Rear suspension	Type				Leaf spring			
	Spring type				Semielliptic leaf spring			
	Shock absorber type				Cylindrical, double-acting (Low-pressure gas charged)			

*1 : Engine coolant and engine oil are at specified level. Fuel is full. Spare tire, jack and tools are in designated position.

*2 : Includes Stretch Cab (with Rear Access System) model.

Bold frames: New specifications.

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF740201013W04

- The following change has been made since publication of the RANGER Repair Manual F161-10-99A, RANGER Repair Manual, RANGER Repair Manual Supplement F166-10-00G, and RANGER Repair Manual Supplement F182-10-02I.

Wheel alignment

- Front wheel alignment has been modified.

Vehicle height

- Standard vehicle height has been modified.

Rear shock absorber and leaf spring

- Removal/installation procedure has been modified.

WHEEL ALIGNMENT

FRONT WHEEL ALIGNMENT

AVF741201013W01

Specifications

Item				Specifications	
				4x2	4x4
Front wheel alignment (Unloaded)*1	Total toe-in	Tire [Tolerance ±4 {0.16}]	(mm {in})	3 {0.12}	
		Rim inner		1.5±2.0 {0.06±0.08}	
			(degree)	0°15′±0°20′	
	Maximum steering angle		Inner	31°30′—35°30′	
			Outer	27°00′—32°00′	
	Camber angle (reference value) *2 [Tolerance ±1°]			1°07′	
	Caster angle (reference value) *3 [Tolerance ±1°]			2°02′	
	Steering axis inclination (reference value)			10°13′	

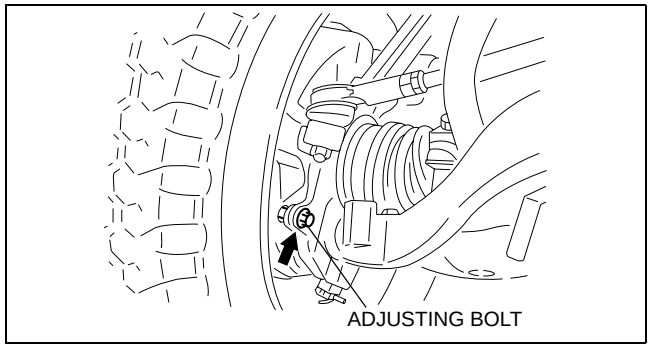
*1 : Fuel tank is full. Engine coolant and engine oil are at specified level. Spare tire, jack, and tools are in designated position.
*2 : Difference between left and right must not exceed 0°30′.
*3 : Difference between left and right must not exceed 0°45′.

Maximum Steering Angle Adjustment

1. Remove the cap.
2. Loosen the adjusting bolt locknut.
3. Turn the adjusting bolt to provide the correct turning angle.
4. After adjustment, tighten the locknut to the specified torque.

   Tightening torque
   39—59 N·m {4.0—6.0 kgf·m, 29—43 ft·lbf}

5. Install the cap.



AVF7412W001

R

Total Toe-in Adjustment

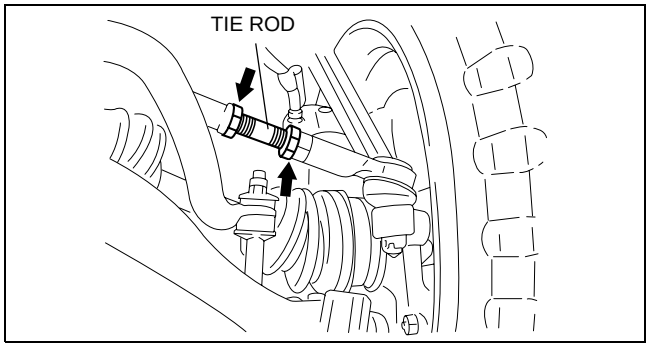
1. Loosen the tie-rod end locknuts.
2. Turn the tie rods by the same amount in the opposite direction.

Note

- The left and right tie rods are both right threaded, to increase the toe-in, turn the right tie rod toward the front of the vehicle and the left tie rod equally toward the rear.

3. Tighten the tie-rod end locknuts.

Tightening torque
69—78 N·m {7.0—8.0 kgf·m, 51—57 ft·lbf}



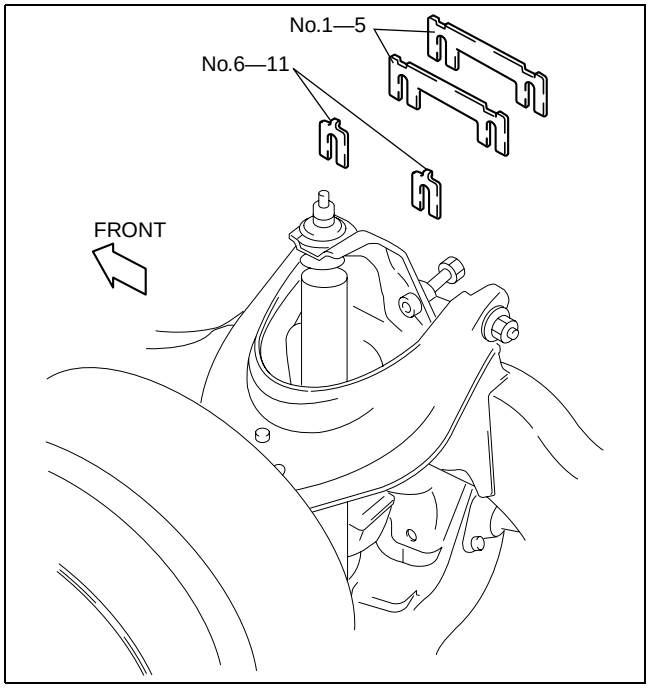
AVF7412W002

Caster and Camber Adjustment

1. Loosen the upper arm shaft bolt and insert or remove adjustment shims to provide the correct angle.

Adjustment shim

No.	Thickness (mm {in})	No.	Thickness (mm {in})
1	1.0 {0.039}	7	1.0 {0.039}
2	1.6 {0.063}	8	1.6 {0.063}
3	2.0 {0.079}	9	2.0 {0.079}
4	3.2 {0.126}	10	3.2 {0.126}
5	4.0 {0.157}	11	4.0 {0.157}
6	0.6 {0.024}		



AVF7412W003

Note

- Shims No.1—5 are used on either side. Do not use more than two.
- Shims No.6—11 are used at the front and rear of either sides. Do not use more than one.
- Camber (Shims No.1—5): A change of shim thickness of **1 mm {0.039 in}** results as follows:

Shim thickness	Variation/1 mm {0.039 in}
Add	Negative 15′
Reduce	Positive 15′

- Caster (Shims No.6—11): A change of shim thickness (at front or rear only) of **1 mm {0.039 in}** results as follows:

	Shim thickness	Variation/1 mm {0.039 in}
Front side	Add	Increase 30′
	Reduce	Decrease 30′
Rear side	Add	Decrease 30′
	Reduce	Increase 30′

2. After adjustment, tighten the upper arm shaft bolt to the specified torque.

Tightening torque
94—116 N·m {9.5—11.9 kgf·m, 69—86 ft·lbf}

3. Confirm the front wheel alignment as in the specification.
   - If not within the specification, adjust the front wheel alignment again.

FRONT SUSPENSION

VEHICLE HEIGHT ADJUSTMENT

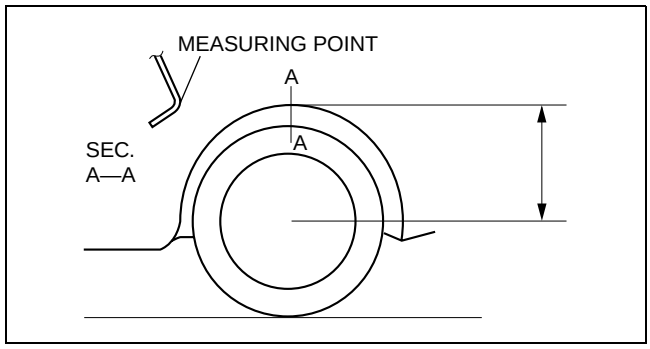
AVF741401015W01

Caution
- **If the vehicle height on a winch or towbar (bullbar or similar accessory) equipped vehicle is adjusted, it is possible that the vehicle height will drop below specification again or the tires will be subject to uneven wear. Without adjusting the vehicle height, adjust only the difference between the left and right sides and perform a wheel alignment to specification.**

1. Place the vehicle on level ground.
2. Inspect the front and rear tire pressure and adjust it as necessary.
3. Measure the distance from the center of each front wheel to the fender brim.

Standard vehicle height
509 mm {20.0 in}

Left/right difference
10 mm {0.39 in} max.

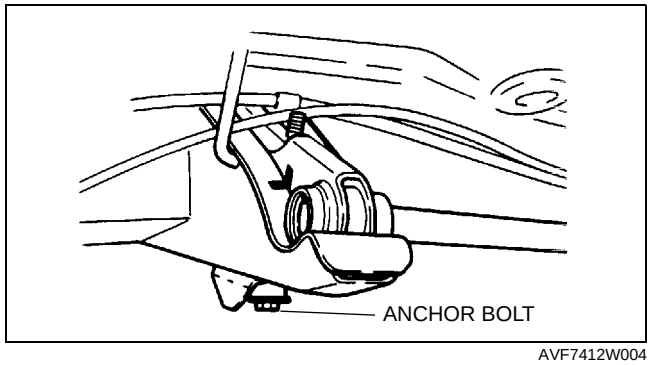


AVF7412W005

Caution
- **Adjust the vehicle height at the left and right wheels at the same time. Otherwise, the vehicle height may not be adjusted correctly.**

4. If the difference between left and right is not within the specification, adjust the vehicle height by turning the torsion bar spring anchor bolt.

Note
- The vehicle height increases/decreases **3.3 mm {0.13 in}** per anchor bolt rotation.



AVF7412W004

5. Move the vehicle forward and back to seat each part.
6. Verify that the vehicle height is within the standard.
   - If not, readjust the vehicle height.

R

REAR SUSPENSION

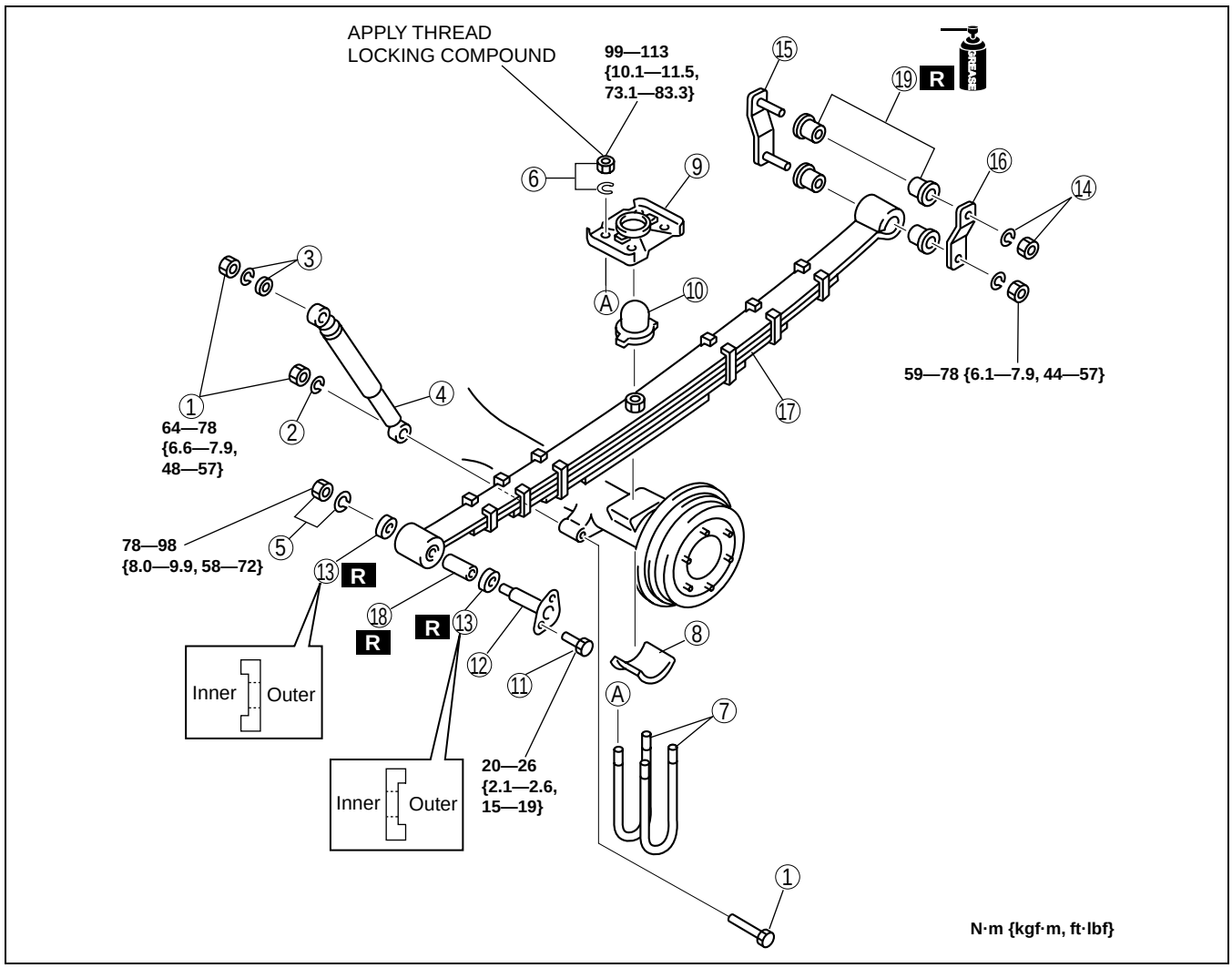
REAR SHOCK ABSORBER AND LEAF SPRING REMOVAL/INSTALLATION

AVF741605910W01

Warning

- **Use safety stands for support of the left and right axle casings, and while supporting the differential casing with a jack, raise or lower the jack as necessary.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



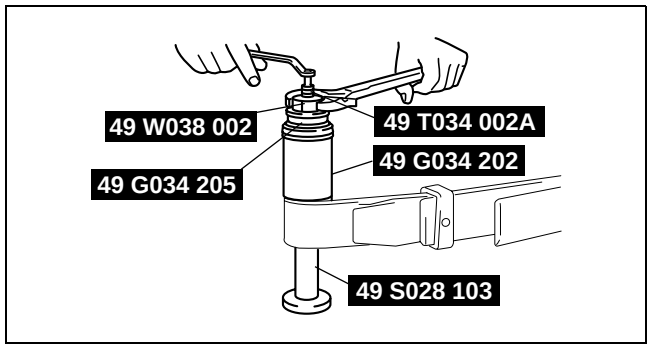
AVF7416W100

1	Bolt and nut
2	Washer
3	Nut, washer, and retainer
4	Shock absorber
5	Nut and washer (See R–7 Nut Installation Note)
6	Nut and washer
7	U-bolt
8	Set plate
9	Spring clamp
10	Stopper rubber
11	Bolt
12	Spring pin

13	Stopper rubber
14	Nut and washer
15	Shackle pin
16	Shackle plate
17	Leaf spring component
18	Leaf spring bushing (front side) (See R–7 Leaf Spring Bushing (Front Side) Removal Note) (See R–7 Leaf Spring Bushing (Front Side) Installation Note)
19	Leaf spring bushing (rear side) (See R–7 Leaf Spring Bushing (Rear Side) Removal Note) (See R–7 Leaf Spring Bushing (Rear Side) Installation Note)

Leaf Spring Bushing (Front Side) Removal Note

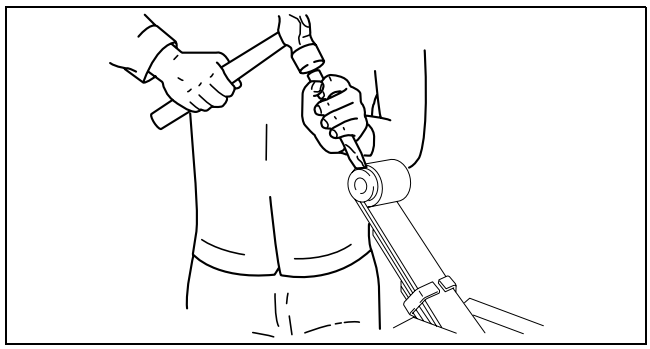
1. Remove the rubber bushing using the **SSTs**.



AVF7416W002

Leaf Spring Bushing (Rear Side) Removal Note

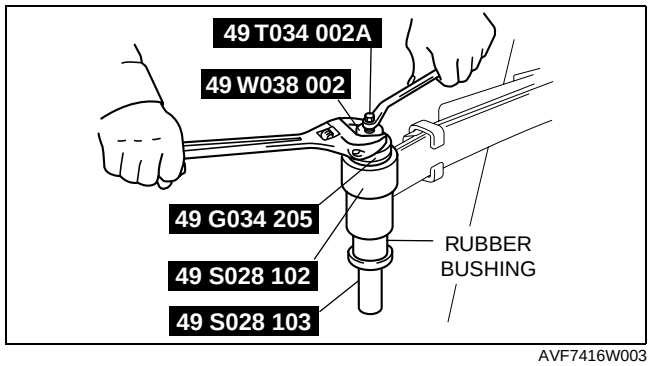
1. Secure the leaf spring in a vise and remove the bushing using a chisel.



AVF7416W004

Leaf Spring Bushing (Front Side) Installation Note

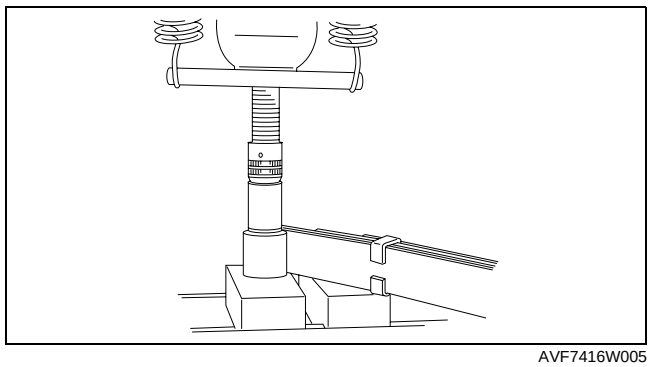
1. Press the rubber bushing in using the **SSTs**.



AVF7416W003

Leaf Spring Bushing (Rear Side) Installation Note

1. Press the bushing in using a suitable pipe and press.



AVF7416W005

Nut Installation Note

1. Temporarily install the nut.
2. Tighten the nut with the vehicle unloaded.

Tightening torque
78—98 N·m {8.0—9.9 kgf·m, 58—72 ft·lbf}

Note

- Unloaded: Engine coolant and engine oil are specified level. Spare tire, jack and tools are in designated position.

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OUTLINE

OUTLINE OF CONSTRUCTION

AVF770201086W01

- The construction and operation of the body system is essentially carried over from that of the current RANGER model, except for the following features. (See RANGER Training Manual F326-10-99A.)

FEATURES

AVF770201086W02

Improved Marketability

- A wagon-shaped body with a side-hinged back door has been adopted.
- A power fuel-filler lid opener has been adopted.
- A rear spoiler with a built in high-mount brake light has been adopted.
- A roof rail has been adopted.
- A third-row seat has been adopted.

Improved Convenience

- A foldable second-row seat has been adopted.
- A cup holder has been adopted at the back of the console.

POWER DOOR LOCK SYSTEM

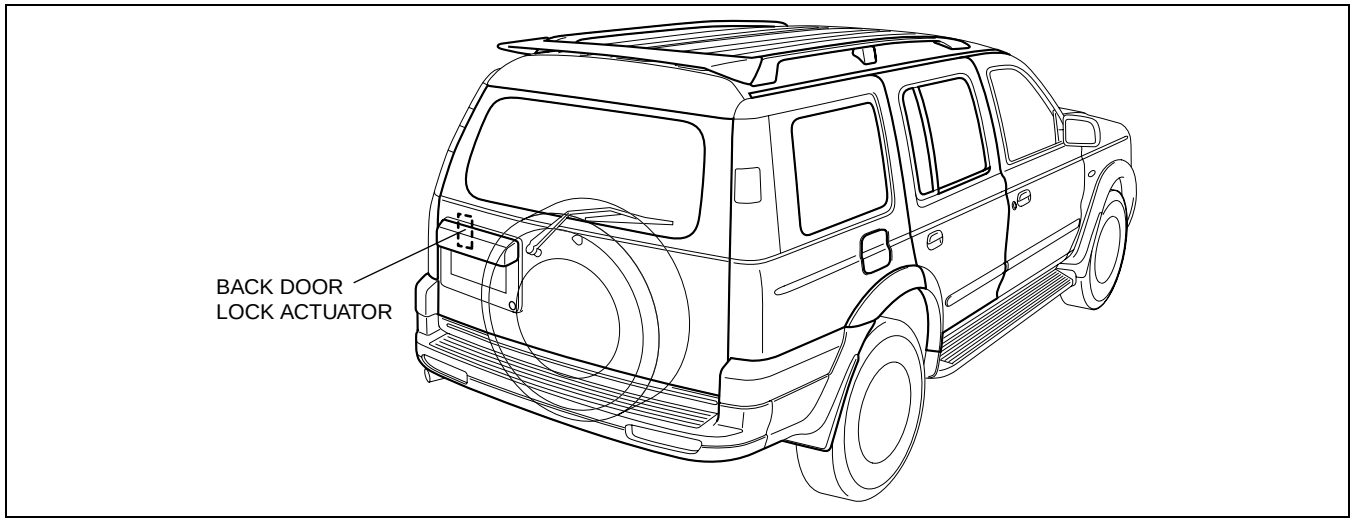
OUTLINE

AVF771866000W01

- The function, structure and operation of the power door lock system is essentially carried over from that of the current RANGER, except for the following.
  — A back door lock actuator has been adopted.

STRUCTURAL VIEW

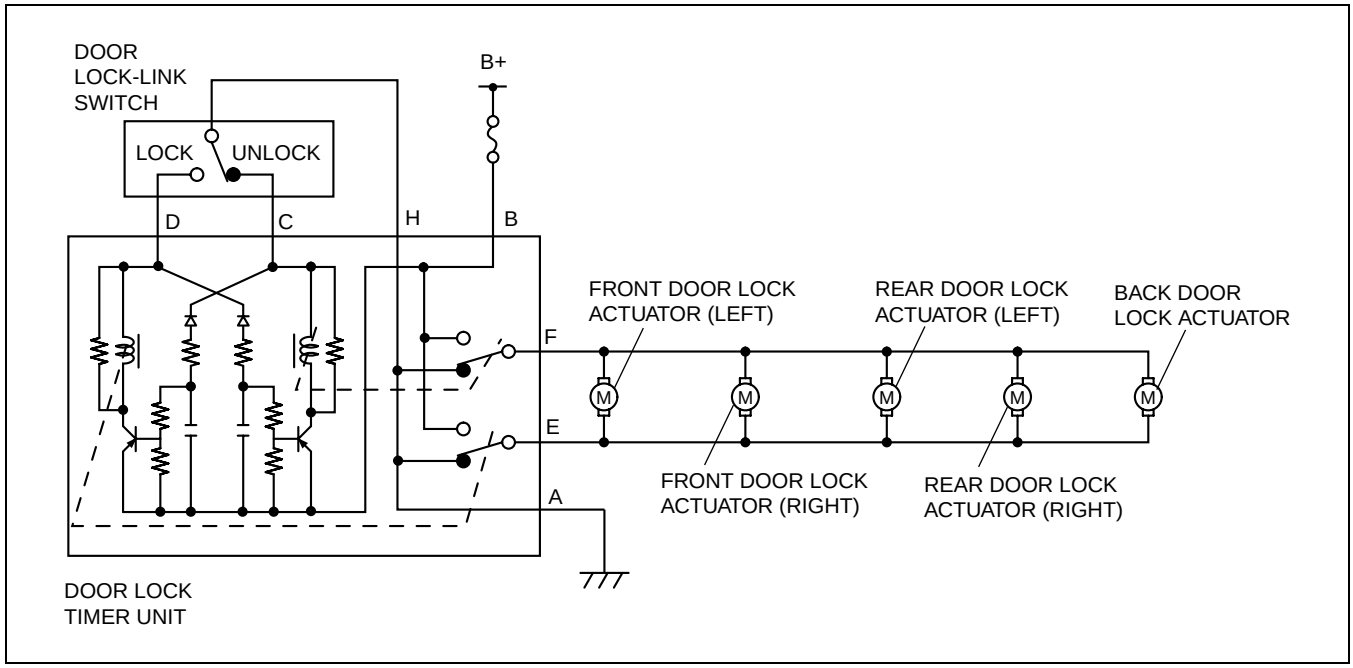
AVF771866000W02



AVF7718W301

SYSTEM WIRING DIAGRAM

AVF771866000W03



AVF7718T101

FUEL-FILLER LID AND OPENER

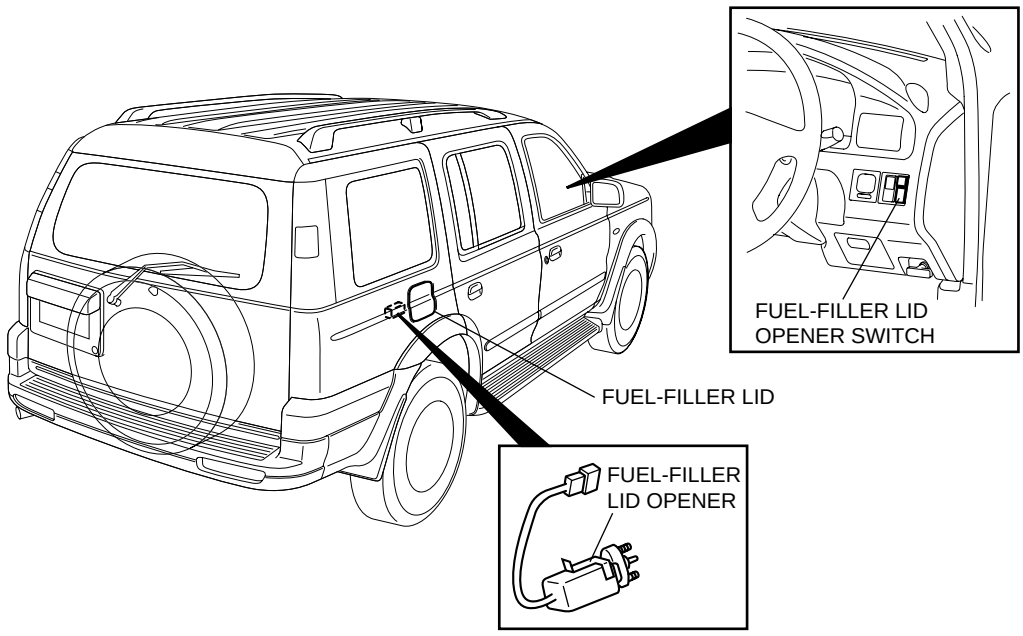
OUTLINE

AVF772466640W01

- A power fuel-filler lid opener has been adopted.

STRUCTURAL VIEW

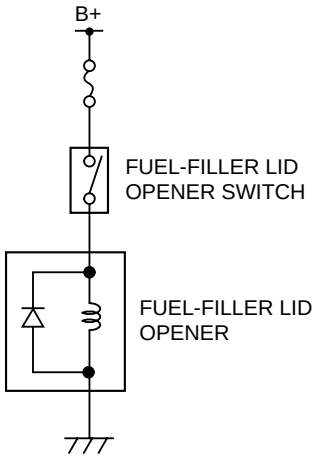
AVF772466640W02



AVF7724T101

SYSTEM WIRING DIAGRAM

AVF772466640W03



AVF7724T102

S

EXTERIOR ATTACHMENT

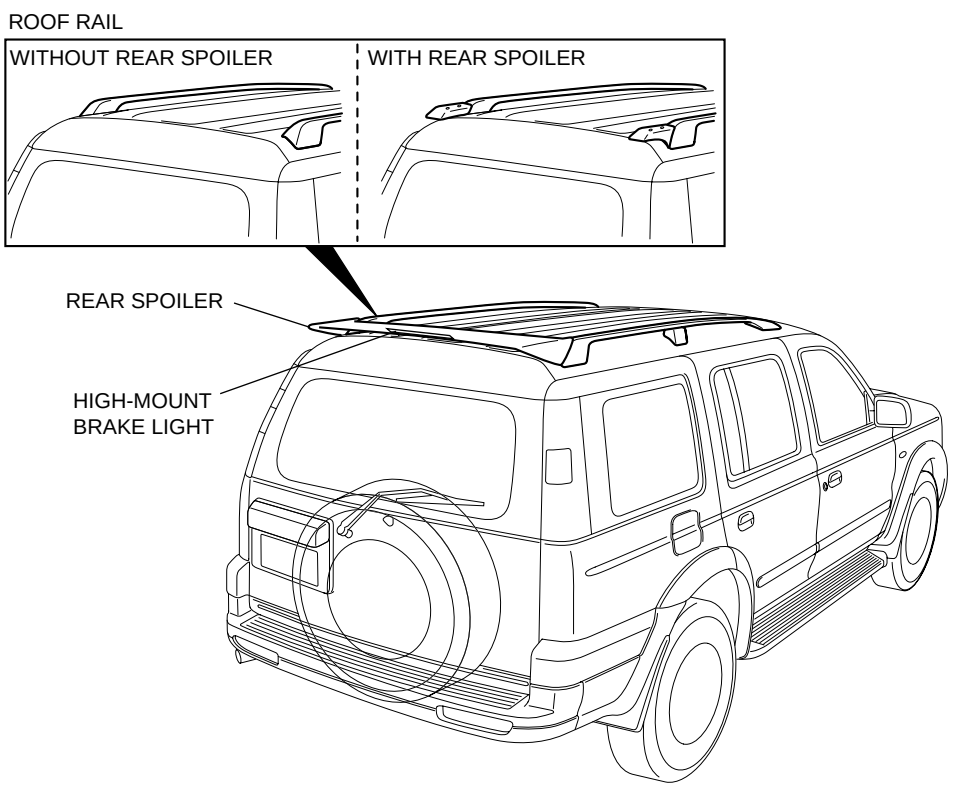
OUTLINE

AVF772801092W01

- A roof rail has been adopted on the roof.
- A rear spoiler with a built in high-mount brake light has been adopted on the end of the roof rail.

STRUCTURAL VIEW

AVF772801092W02



AVF7700T101

SEAT

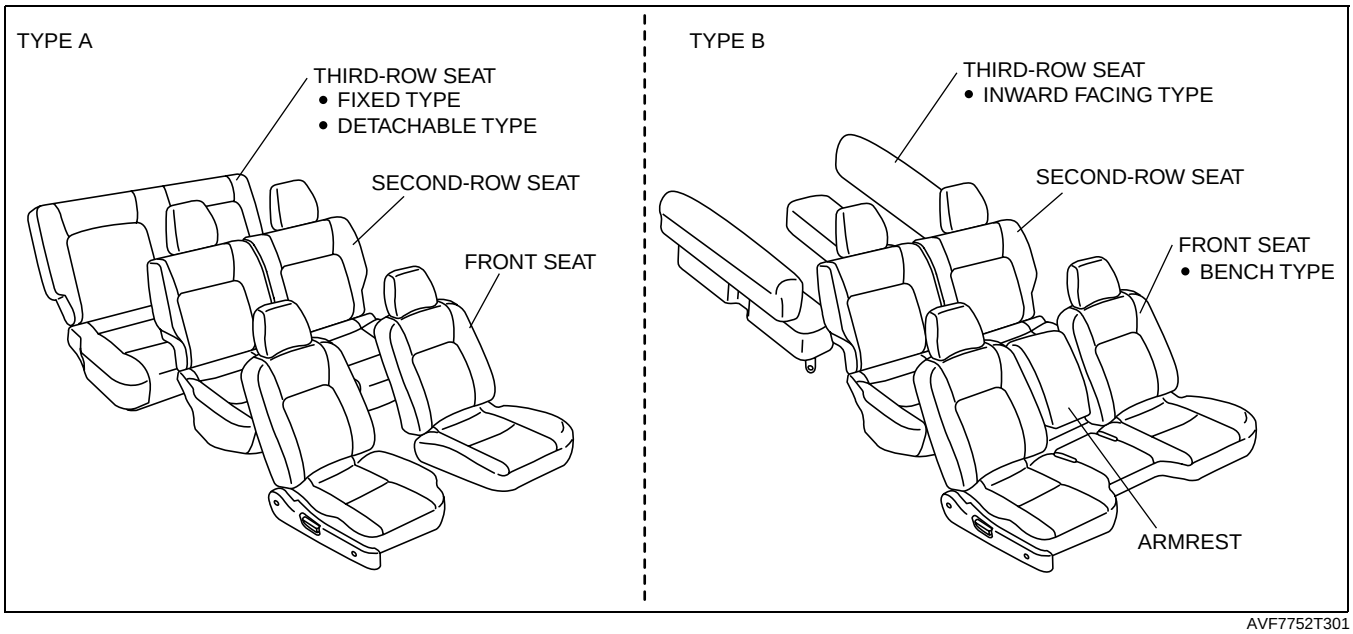
OUTLINE

AVF775257000W01

- An armrest has been adopted on the front seat (bench type).
- A foldable seat has been adopted on the second-row seat.
- A third-row seat has been adopted. There are three type of third-row seats according to market.
  — Fixed type
  — Detachable type
  — Inward facing type

STRUCTURAL VIEW

AVF775257000W02



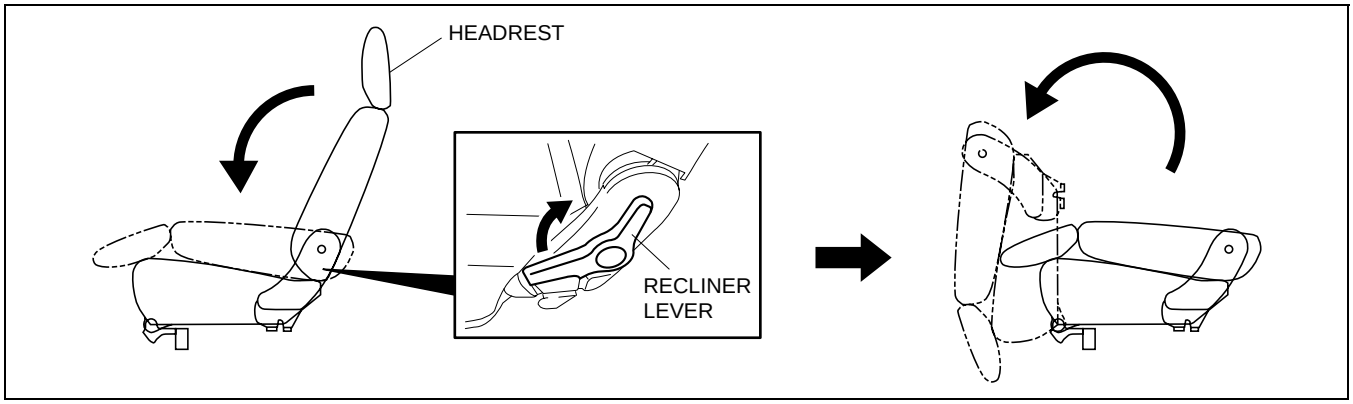
AVF7752T301

SECOND-ROW SEAT

AVF775257000W03

Operation

1. Move headrest to the lowest position.
2. Releasing recliner lever, fold the seat back to forward.
3. Tumble the seat to forward.



AVF7752T103

THIRD-ROW SEAT

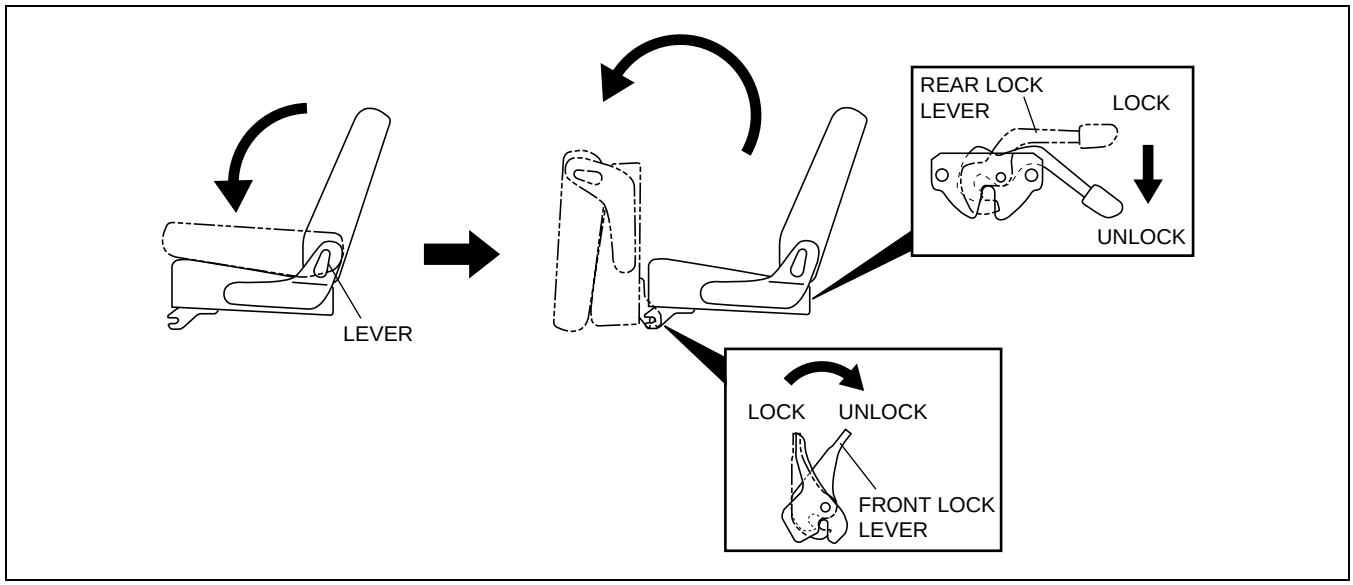
AVF775257000W04

Detachable Type

Operation

1. Releasing lever, fold the seat back to forward.
2. Releasing rear lock by operating the lever, tumble the seat to forward.
3. Releasing front lock by operating the lever.

4. Lift the seat to upward and then remove from floor.



AVF7752T104

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF770201086W03

- The following changes and/or additions have been made since publication of the RANGER Repair Manual (F161-10-99A).

Rear door
- Removal/Installation procedure has been modified.
- Disassembly/Assembly procedure has been modified.
- Adjustment procedure has been modified.

Rear door glass
- Removal/Installation procedure has been added.

Rear door quarter glass
- Removal/Installation procedure has been added.

Back door
- Removal/Installation procedure has been added.
- Disassembly/Assembly procedure has been added.
- Adjustment procedure has been added.

Back door lock actuator
- Inspection procedure has been added.

Back door lock-link switch
- Inspection procedure has been added.

Back door key cylinder switch
- Inspection procedure has been added.

Fuel-filler lid and opener
- Removal/Installation procedure has been added.

Fuel-filler lid
- Adjustment procedure has been modified.

Fuel-filler lid opener
- Inspection procedure has been added.

Fuel-filler lid opener switch
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Rear bumper
- Removal/Installation procedure has been modified.
- Disassembly/Assembly procedure has been modified.

Extractor chamber
- Removal/Installation procedure has been added.

Over fender
- Removal/Installation procedure has been modified.

Back door garnish
- Removal/Installation procedure has been added.

Rear spoiler
- Removal/Installation procedure has been added.

Roof rail
- Removal/Installation procedure has been added.

Rear beltline molding
- Removal/Installation procedure has been modified.

Roof molding
- Removal/Installation procedure has been modified.

Side window glass
- Removal procedure has been added.
- Installation procedure has been added.

Rear window glass
- Removal procedure has been modified.
- Installation procedure has been modified.

Rear console
- Removal/Installation procedure has been modified.

Cup holder
- Removal/Installation procedure has been added.

Overhead console
- Removal/Installation procedure has been added.

Rear scuff plate
- Removal/Installation procedure has been modified.

C-pillar trim
- Removal/Installation procedure has been modified.

D-pillar trim
- Removal/Installation procedure has been added.

Rear door trim
- Removal/Installation procedure has been modified.

Tire house trim
- Removal/Installation procedure has been added.

Rear side trim
- Removal/Installation procedure has been added.

Rear end trim
- Removal/Installation procedure has been added.

Back door upper trim
- Removal/Installation procedure has been added.

Back door side trim
- Removal/Installation procedure has been added.

Back door lower trim
- Removal/Installation procedure has been added.

Headliner
- Removal/Installation procedure has been modified.

Floor covering
- Removal/Installation procedure has been modified.

Second-row seat belt
- Removal/Installation procedure has been added.

Third-row seat belt
- Removal/Installation procedure has been added.

Front buckle
- Removal/Installation procedure has been modified.

Second-row buckle
- Removal/Installation procedure has been added.

Third-row buckle
- Removal/Installation procedure has been added.

Front seat
- Removal/Installation procedure has been modified.
- Disassembly/Assembly procedure has been modified.

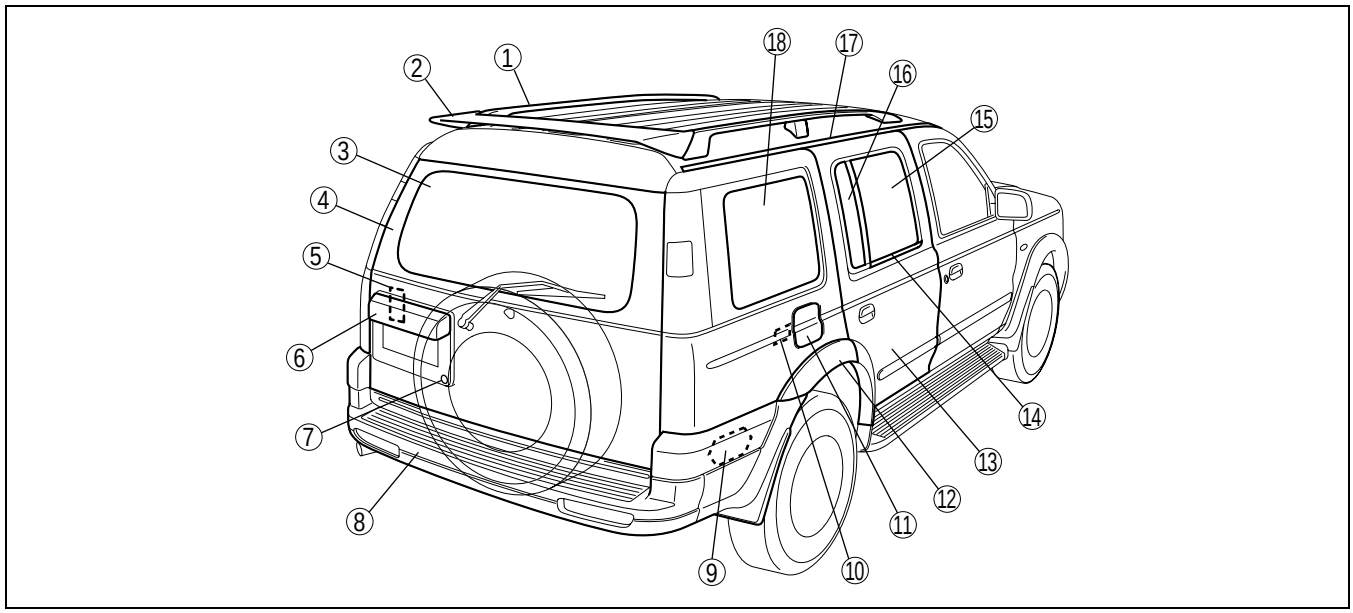
Second-row seat
- Removal/Installation procedure has been added.
- Disassembly/Assembly procedure has been added.

Third-row seat
- Removal/Installation procedure has been added.
- Disassembly/Assembly procedure has been added.

LOCATION INDEX

EXTERIOR

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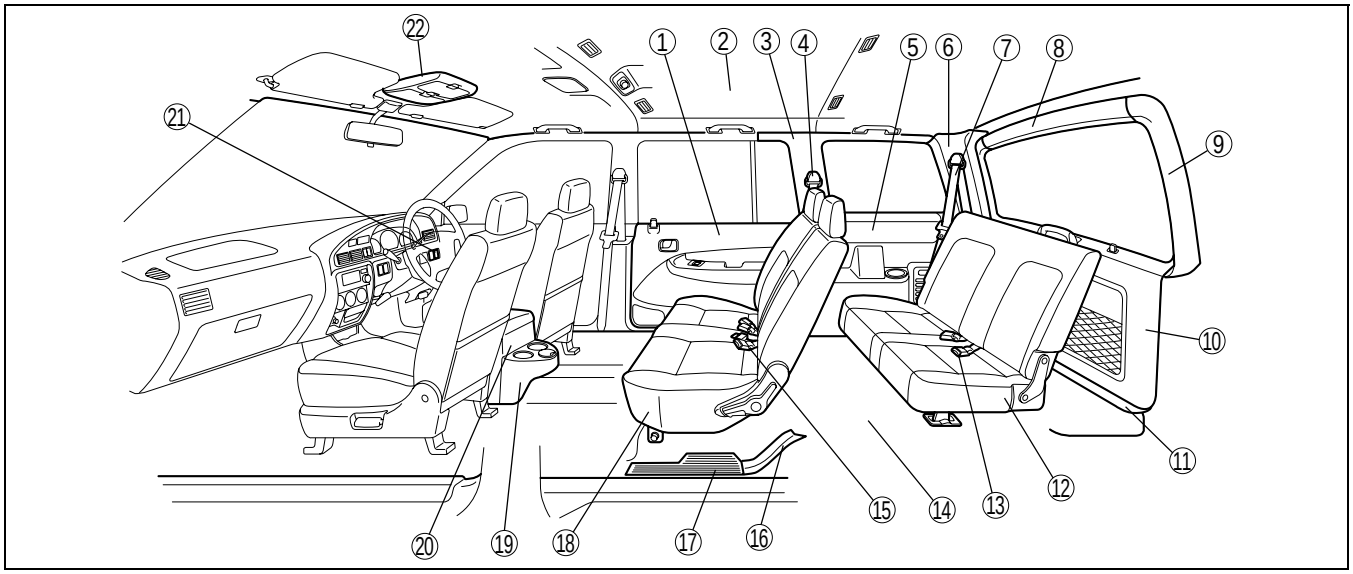
1	Roof rail (See S–21 ROOF RAIL REMOVAL/ INSTALLATION)
2	Rear spoiler (See S–20 REAR SPOILER REMOVAL/ INSTALLATION)
3	Rear window glass (See S–24 REAR WINDOW GLASS REMOVAL) (See S–25 REAR WINDOW GLASS INSTALLATION)
4	Back door (See S–14 BACK DOOR REMOVAL/ INSTALLATION) (See S–15 BACK DOOR DISASSEMBLY/ ASSEMBLY) (See S–15 BACK DOOR ADJUSTMENT)
5	Back door lock actuator (See S–16 BACK DOOR LOCK ACTUATOR INSPECTION) (See S–16 BACK DOOR LOCK-LINK SWITCH INSPECTION)
6	Back door garnish (See S–21 BACK DOOR GARNISH REMOVAL/ INSTALLATION)
7	Back door key cylinder switch (See S–16 BACK DOOR KEY CYLINDER SWITCH INSPECTION)
8	Rear bumper (See S–18 REAR BUMPER REMOVAL/ INSTALLATION) (See S–19 REAR BUMPER DISASSEMBLY/ ASSEMBLY)
9	Extractor chamber (See S–20 EXTRACTOR CHAMBER REMOVAL/ INSTALLATION)

10	Fuel-filler lid opener (See S–17 FUEL-FILLER LID AND OPENER REMOVAL/INSTALLATION) (See S–17 FUEL-FILLER LID AND OPENER INSPECTION)
11	Fuel-filler lid (See S–17 FUEL-FILLER LID AND OPENER REMOVAL/INSTALLATION) (See S–17 FUEL-FILLER LID ADJUSTMENT)
12	Over fender (See S–20 OVER FENDER REMOVAL/ INSTALLATION)
13	Rear door (See S–12 REAR DOOR REMOVAL/ INSTALLATION) (See S–13 REAR DOOR DISASSEMBLY/ ASSEMBLY) (See S–13 REAR DOOR ADJUSTMENT)
14	Rear beltline molding (See S–21 REAR BELTLINE MOLDING REMOVAL/INSTALLATION)
15	Rear door glass (See S–13 REAR DOOR GLASS REMOVAL/ INSTALLATION)
16	Rear door quarter glass (See S–14 REAR DOOR QUARTER GLASS REMOVAL/INSTALLATION)
17	Roof molding (See S–21 ROOF MOLDING REMOVAL/ INSTALLATION)
18	Side glass (See S–22 SIDE WINDOW GLASS REMOVAL) (See S–23 SIDE WINDOW GLASS INSTALLATION)

INTERIOR

AVF770001086W02

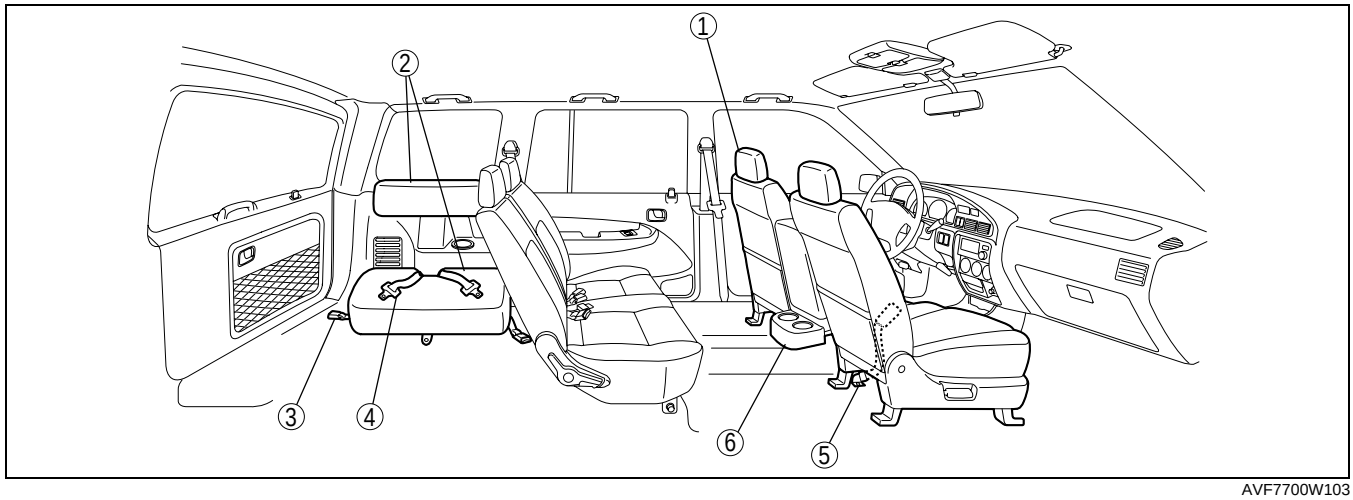
Type A



AVF7700W102

1	Rear door trim (See S–29 REAR DOOR TRIM REMOVAL/ INSTALLATION)
2	Headliner (See S–31 HEADLINER REMOVAL/ INSTALLATION)
3	C-pillar trim (See S–28 C-PILLAR TRIM REMOVAL/ INSTALLATION)
4	Second-row seat belt (See S–32 SECOND-ROW SEAT BELT REMOVAL/INSTALLATION)
5	Rear side trim (See S–29 REAR SIDE TRIM REMOVAL/ INSTALLATION)
6	D-pillar trim (See S–28 D-PILLAR TRIM REMOVAL/ INSTALLATION)
7	Third-row seat belt (See S–33 THIRD-ROW SEAT BELT REMOVAL/ INSTALLATION)
8	Back door upper trim (See S–30 BACK DOOR UPPER TRIM REMOVAL/ INSTALLATION)
9	Back door side trim (See S–30 BACK DOOR SIDE TRIM REMOVAL/ INSTALLATION)
10	Back door lower trim (See S–30 BACK DOOR LOWER TRIM REMOVAL/ INSTALLATION)
11	Rear end trim (See S–30 REAR END TRIM REMOVAL/ INSTALLATION)
12	Third-row seat (See S–38 THIRD-ROW SEAT REMOVAL/ INSTALLATION) (See S–39 THIRD-ROW SEAT DISASSEMBLY/ ASSEMBLY)
13	Third-row buckle (See S–34 THIRD-ROW BUCKLE REMOVAL/ INSTALLATION)
14	Floor covering (See S–32 FLOOR COVERING REMOVAL/ INSTALLATION)
15	Second-row buckle (See S–33 SECOND-ROW BUCKLE REMOVAL/ INSTALLATION)
16	Tire house trim (See S–29 TIRE HOUSE TRIM REMOVAL/ INSTALLATION)
17	Rear scuff plate (See S–28 REAR SCUFF PLATE REMOVAL/ INSTALLATION)
18	Second-row seat (See S–37 SECOND-ROW SEAT REMOVAL/ INSTALLATION) (See S–37 SECOND-ROW SEAT DISASSEMBLY/ ASSEMBLY)
19	Cup holder (See S–27 CUP HOLDER REMOVAL/ INSTALLATION)
20	Rear console (See S–27 REAR CONSOLE REMOVAL/ INSTALLATION)
21	Fuel-filler lid opener switch (See S–18 FUEL-FILLER LID OPENER SWITCH REMOVAL/INSTALLATION) (See S–18 FUEL-FILLER LID OPENER SWITCH INSPECTION)
22	Overhead console (See S–27 OVERHEAD CONSOLE REMOVAL/ INSTALLATION)

Type B



AVF7700W103

1	Front seat (bench type) (See S–35 FRONT SEAT REMOVAL/ INSTALLATION) (See S–36 FRONT SEAT DISASSEMBLY/ ASSEMBLY)
2	Third-row seat (See S–38 THIRD-ROW SEAT REMOVAL/ INSTALLATION)
3	Third-row buckle (See S–34 THIRD-ROW BUCKLE REMOVAL/ INSTALLATION)
4	Third-row seat belt (See S–33 THIRD-ROW SEAT BELT REMOVAL/ INSTALLATION)
5	Front buckle (See S–33 FRONT BUCKLE REMOVAL/ INSTALLATION)
6	Cup holder (See S–36 FRONT SEAT DISASSEMBLY/ ASSEMBLY)

DOOR

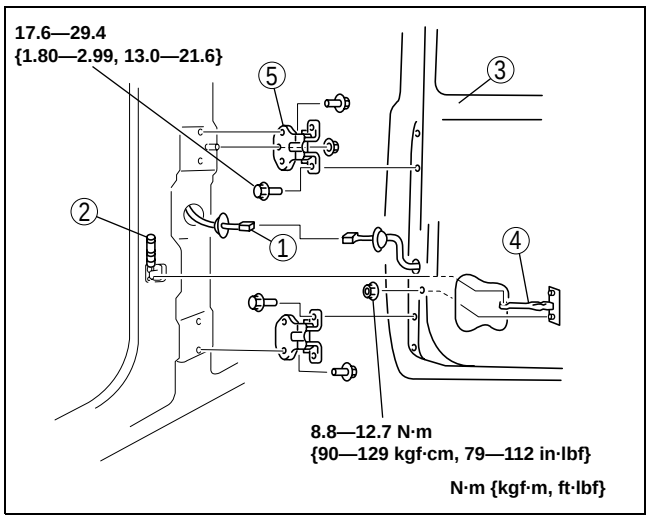
REAR DOOR REMOVAL/INSTALLATION

AVF771472010W01

1. Disconnect the negative battery cable.
2. To remove the checker, remove the rear door speaker.
3. Remove in the order indicated in the table.

1	Connector
2	Checker pin
3	Rear door
4	Checker
5	Rear door hinge

4. Install in the reverse order of removal.
5. Adjust the rear door. (See S–13 REAR DOOR ADJUSTMENT.)



AVF7714W101

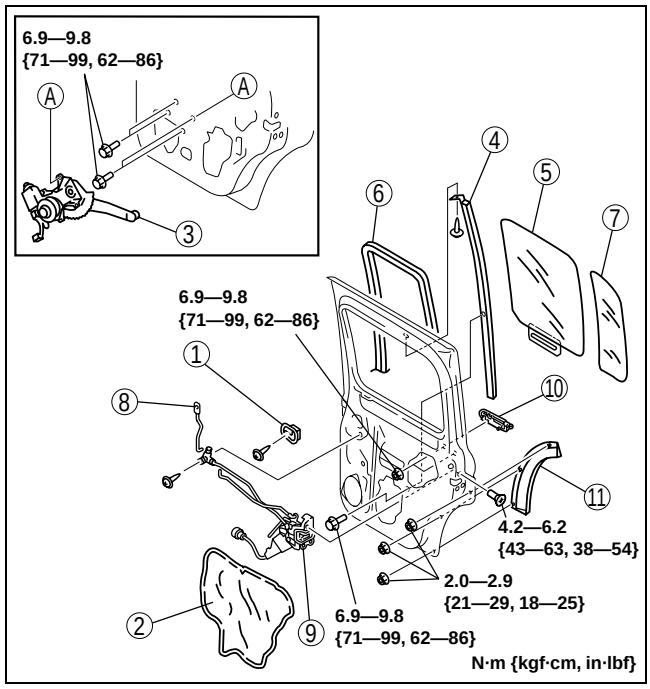
REAR DOOR DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in the table.

1	Inner handle
2	Door screen
3	Rear power window regulator
4	Chan-center
5	Rear door glass
6	Glass run channel
7	Rear door quarter glass
8	Rear door lock knob
9	Rear door lock
10	Outer handle
11	Side garnish

2. Assemble in the reverse order of disassembly.

AVF771472010W02



AVF7714W102

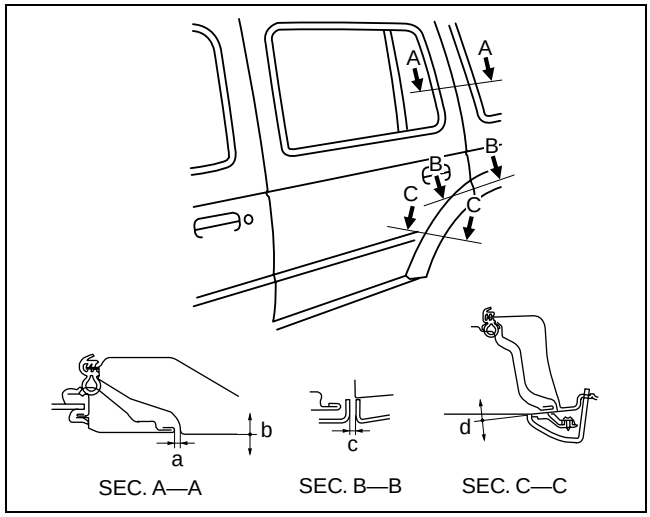
REAR DOOR ADJUSTMENT

AVF771472010W03

1. Measure the gap and height between the rear door and the body.
2. If not as specified, loosen the rear door hinge installation bolts or the door lock striker installation screws, and reposition the door.

   Clearance
   a: 3.5—6.5 mm {0.14—0.25 in}
   b: -1.5—1.5 mm {-0.059—0.059 in}
   c: 3.0—7.0 mm {0.12—0.27 in}
   d: 0.5—1.5 mm {0.020—0.059 in}

3. Tighten the bolts or screws.

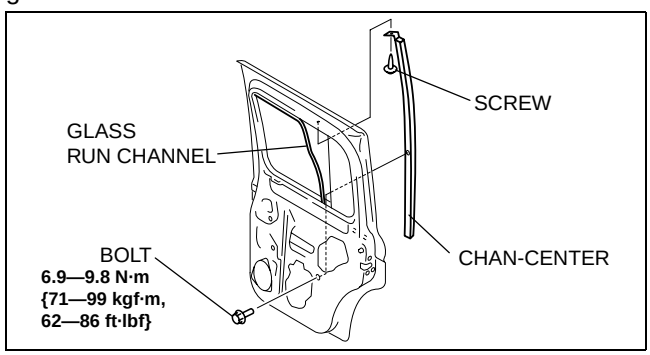


AVF7714W103

REAR DOOR GLASS REMOVAL/INSTALLATION

AVF771472010W04

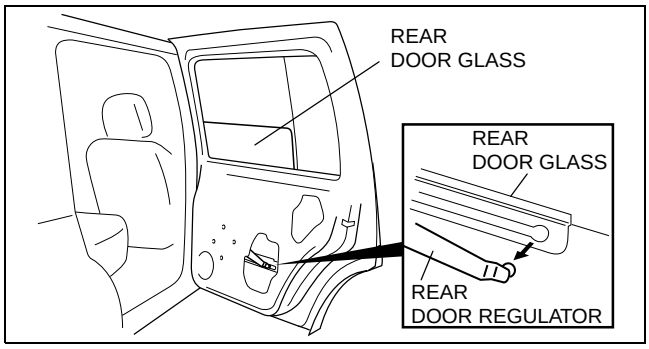
1. Fully lower the rear door glass.
2. Remove the rear door trim.
3. Partially peel back the door screen.
4. Remove the glass run channel from the rear door glass guide.
5. Remove the screw.
6. Remove the bolt, then remove the rear door glass guide.



AVF7714W104

S

7. Raise or lower the rear door glass so that the part connected to the rear door regulator is visible.
8. Detach the connecting part.
9. Insert your hand through the inside of the rear door and lift out the rear door glass.
10. Install in the reverse order of removal.

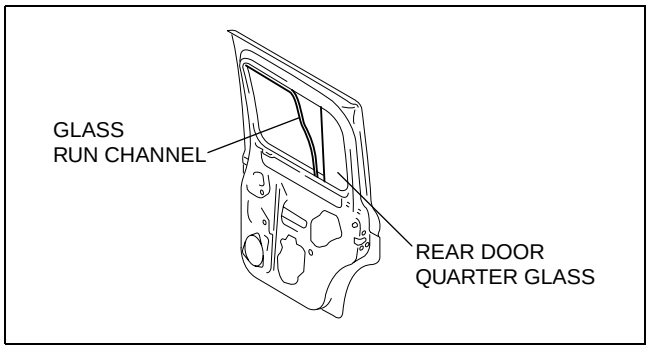


AVF7714W105

REAR DOOR QUARTER GLASS REMOVAL/INSTALLATION

AVF771472010W05

1. Fully lower the rear door glass.
2. Remove the rear door trim.
3. Remove the rear door glass guide. (See S–13 REAR DOOR GLASS REMOVAL/INSTALLATION.)
4. Remove the rear door quarter glass.
5. Install in the reverse order of removal.



AVF7714W106

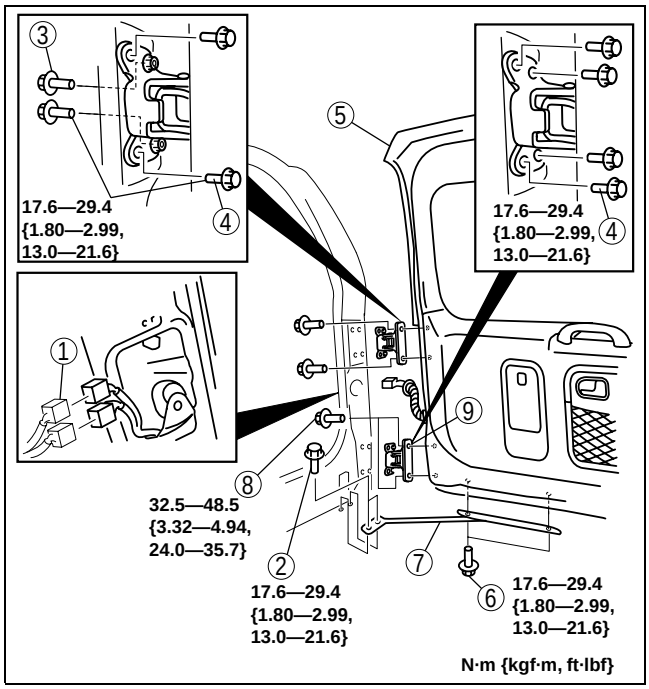
BACK DOOR REMOVAL/INSTALLATION

AVF771462010W01

1. Disconnect the negative battery cable.
2. Disconnect the vehicle harness connector from the back door harness connector.
3. To remove the bolt B, remove the D-pillar trim. (RH side only)
4. Remove in the order indicated in the table.

1	Back door harness connector
2	Bolt A
3	Bolt B
4	Bolt C
5	Back door
6	Bolt D
7	Stay
8	Bolt E
9	Hinge

5. Install in the reverse order of removal.
6. Adjust the back door. (See S–15 BACK DOOR ADJUSTMENT.)

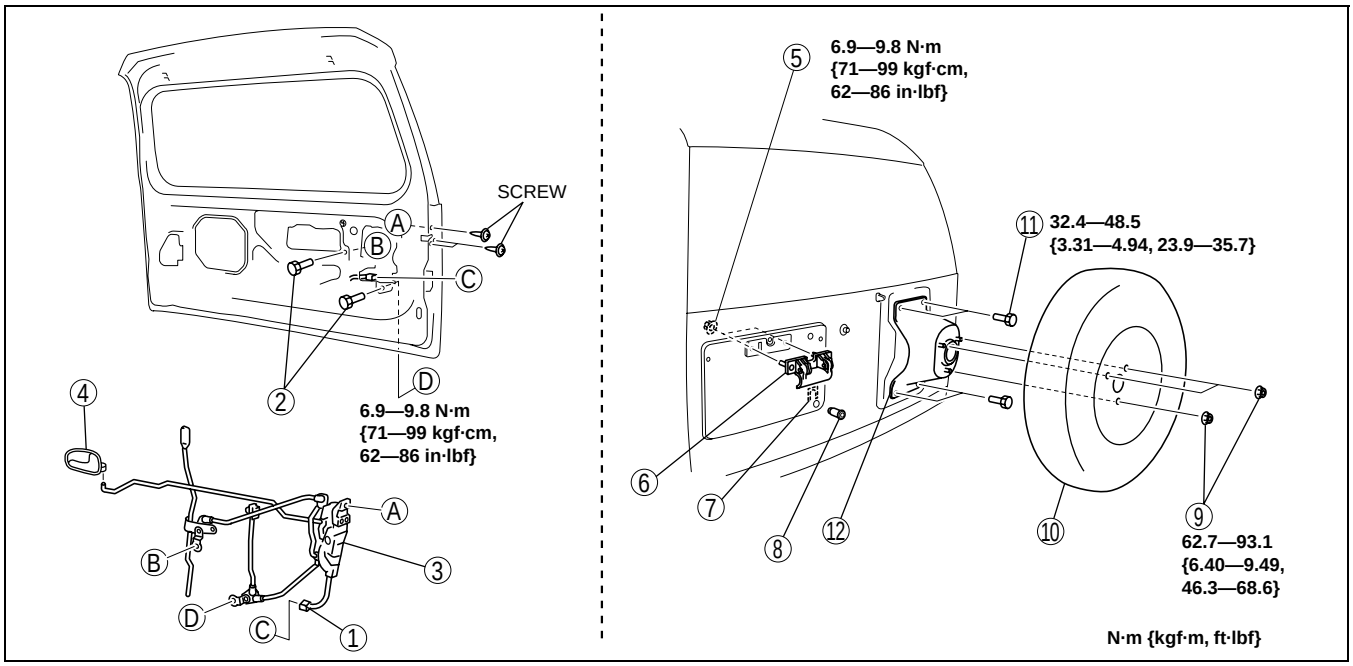


AVF7722W101

BACK DOOR DISASSEMBLY/ASSEMBLY

AVF771462010W02

1. Remove the back door lower trim.
2. To remove the back door outer handle and back door key cylinder, remove the back door garnish.
3. Disassemble in the order indicated in the table.



AVF7722W102

1	Connector
2	Bolt A
3	Back door latch and lock actuator
4	Inner handle
5	Nut A
6	Back door outer handle

7	Retainer
8	Back door key cylinder
9	Nut B
10	Spare tire
11	Bolt C
12	Spare tire carrier

4. Assemble in the reverse order of disassembly.

S

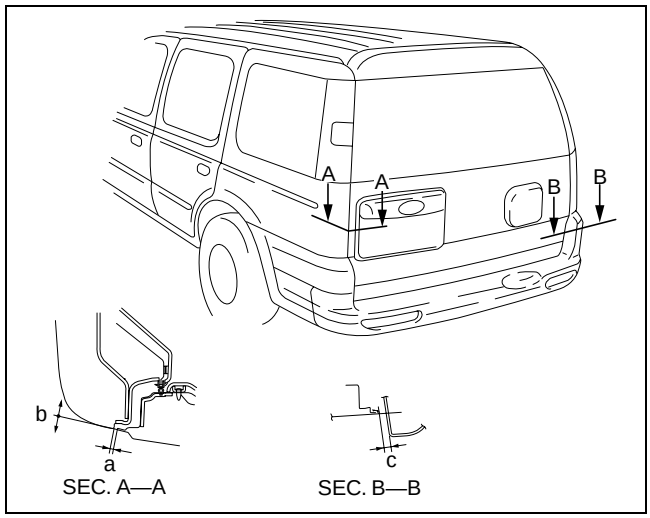
BACK DOOR ADJUSTMENT

AVF771462010W03

1. Measure the gap and height between the back door and the body.
2. If not as specified, loosen the back door hinge installation bolts or the back door striker installation screws, and reposition the back door.

   Clearance
   a: 5.5—8.5 mm {0.22—0.33 in}
   b: -2.6—0.4 mm {-0.10—0.01 in}
   c: 7.0—11.0 mm {0.28—0.43 in}

3. Tighten the bolts or screws.



AVF7722W103

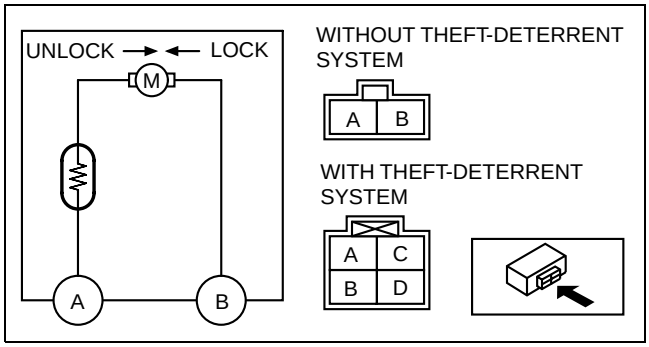
POWER DOOR LOCK SYSTEM

BACK DOOR LOCK ACTUATOR INSPECTION

1. Apply battery positive voltage to the back door lock actuator terminals and inspect the operation of the back door lock actuator.
   - If not as specified, replace the back door lock actuator.

Operation	Terminal	
	A	B
Lock	GND	B+
Unlock	B+	GND

AVF771875911W01



AVF7718W101

BACK DOOR LOCK-LINK SWITCH INSPECTION

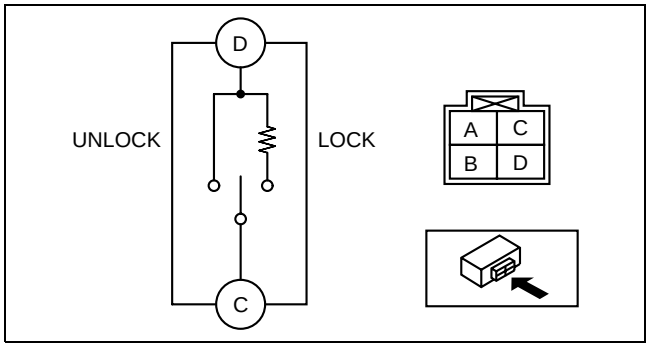
1. Inspect for continuity between the back door lock-link switch terminals using a tester.
   - If not as specified, replace the back door lock-link switch.

○—○ : Continuity ○-WW-○ : Resistance

Key cylinder position	Terminal	
	D	C
Neutral		
Lock	○-WW-○	
Unlock	○——○	

AVF7718W303

AVF771875911W02



AVF7718W302

BACK DOOR KEY CYLINDER SWITCH INSPECTION

1. Inspect for continuity between the back door key cylinder switch terminals using a tester.
   - If not as specified, replace the back door key cylinder switch.

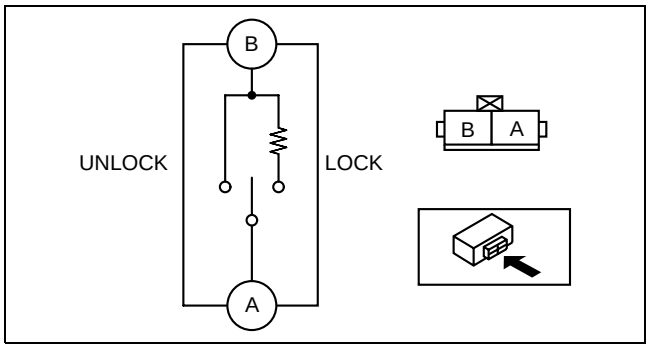
○—○ : Continuity ○-WW-○ : Resistance

Key cylinder position	Terminal	
	A	B
Neutral		
Lock	○-WW-○	R
Unlock	○——○	

R: 950—1050 ohm

AVF7718W103

AVF771875911W03



AVF7718W102

FUEL-FILLER LID AND OPENER

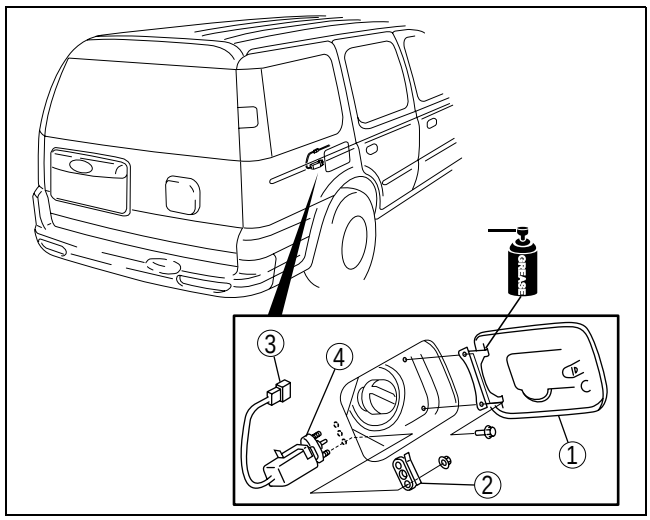
FUEL-FILLER LID AND OPENER REMOVAL/INSTALLATION

AVF772466640W04

1. Disconnect the negative battery cable.
2. Remove the rear side trim.
3. Remove in the order indicated in the table.

1	Fuel-filler lid
2	Lift spring
3	Connector
4	Fuel-filler lid opener

4. Install in the reverse order of removal.
5. Adjust the fuel-filler lid. (See S–17 FUEL-FILLER LID ADJUSTMENT.)



AVF7724W101

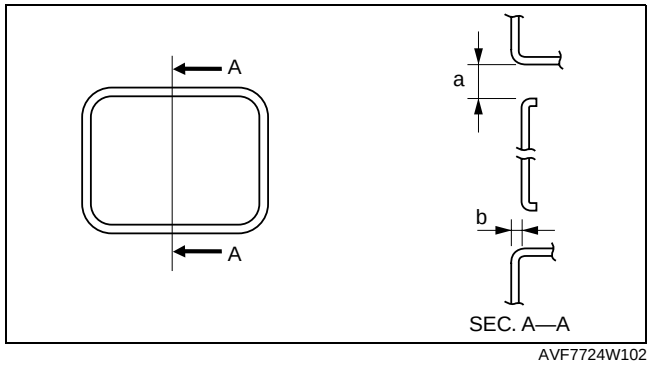
FUEL-FILLER LID ADJUSTMENT

AVF772466640W05

1. Measure the gap and height between the fuel-filler lid and the body.
2. If not as specified, loosen the fuel-filler lid installation bolts and reposition the fuel-filler lid.

Clearance
a: 3.5—5.5 mm {0.14—0.21 in}
b: -1.5—0.5 mm {-0.059—0.02 in}

3. Tighten the bolts.



AVF7724W102

FUEL-FILLER LID AND OPENER INSPECTION

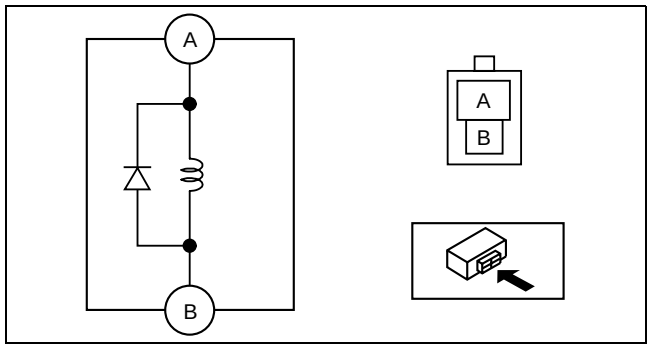
AVF772466640W06

1. Connect battery positive voltage to terminal A and ground to terminal B of the fuel-filler lid opener connector.
2. Verify that the fuel-filler lid opener operates.
   - If not as specified, replace the fuel-filler lid opener.

○—○ : Continuity

Fuel-filler lid operation	Terminal	
	A	B
OPEN	○	○
CLOSE		

AVF7724W108



AVF7724W103

S

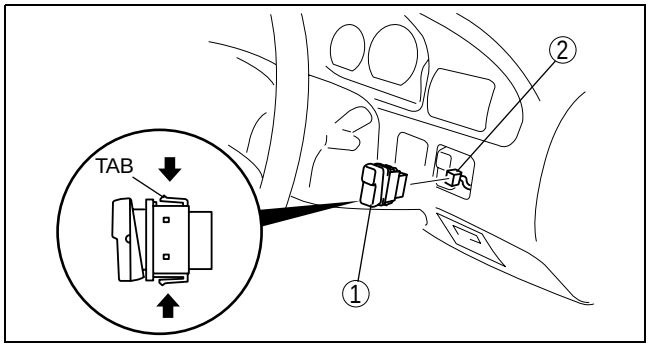
FUEL-FILLER LID OPENER SWITCH REMOVAL/INSTALLATION

AVF772466640W07

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Fuel-filler lid opener switch
2	Connector

3. Install in the reverse order of removal.



AVF7724W104

FUEL-FILLER LID OPENER SWITCH INSPECTION

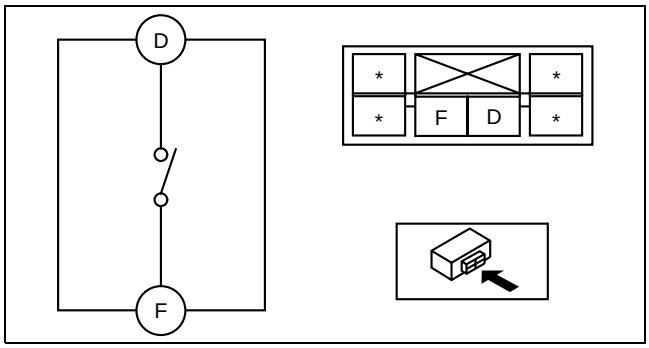
AVF772466640W08

1. Inspect for continuity between the fuel-filler lid opener switch terminals.
   - If not as specified, replace the fuel-filler lid opener switch.

○—○ : Continuity

Switch position	Terminal	
	D	F
ON	○	○
OFF		

AVF7724W106



AVF7724W105

BUMPER

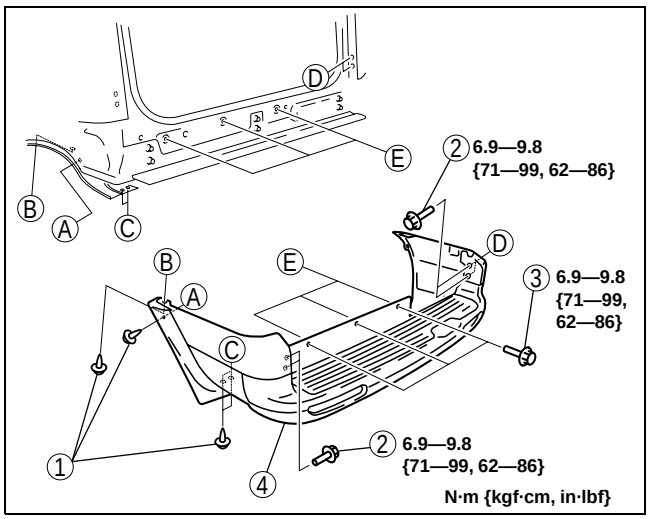
REAR BUMPER REMOVAL/INSTALLATION

AVF772650221W01

1. Disconnect the negative battery cable.
2. Disconnect the back-up light connector.
3. Remove in the order indicated in the table.

1	Screw
2	Bolt A
3	Bolt B
4	Rear bumper (See S–19 Rear Bumper Removal Note.)

4. Install in the reverse order of removal.



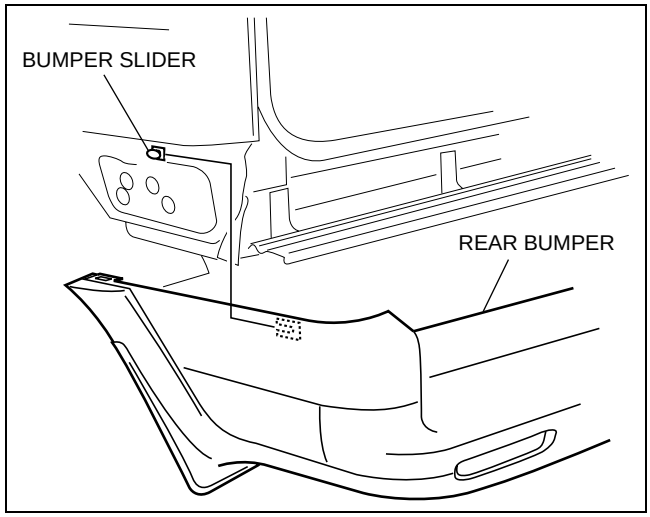
AVF7726W101

Rear Bumper Removal Note

1. Pull the rear bumper rearward to detach it from the bumper slider.

Caution

- **If only one side of the rear bumper is detached from the bumper slider and the bumper falls, it could be damaged. When detaching the rear bumper from the slider, secure the bumper so that it does not fall.**



AVF7726W102

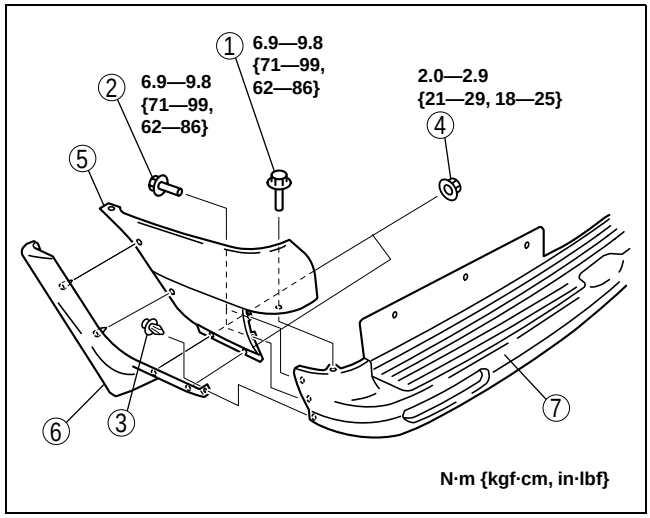
REAR BUMPER DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in the table.

1	Bolt A
2	Bolt B
3	Fastener
4	Nut
5	Rear bumper (side)
6	Rear over fender
7	Rear bumper

2. Assemble in the reverse order of disassembly.

AVF772650221W02



AVF7726W103

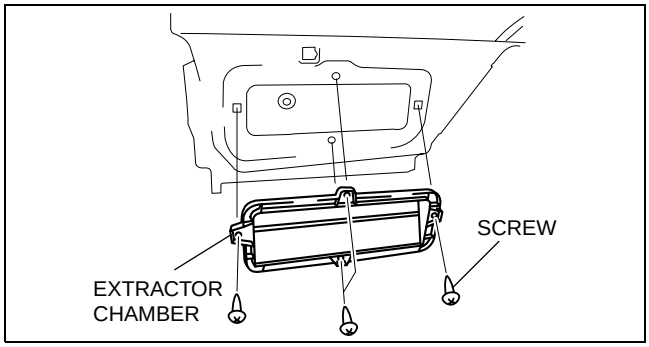
S

EXTERIOR ATTACHMENT

EXTRACTOR CHAMBER REMOVAL/INSTALLATION

AVF772851908W01

1. Remove the rear bumper. (See S–18 REAR BUMPER REMOVAL/INSTALLATION.)
2. Remove the screws, then remove the extractor chamber.
3. Install in the reverse order of removal.

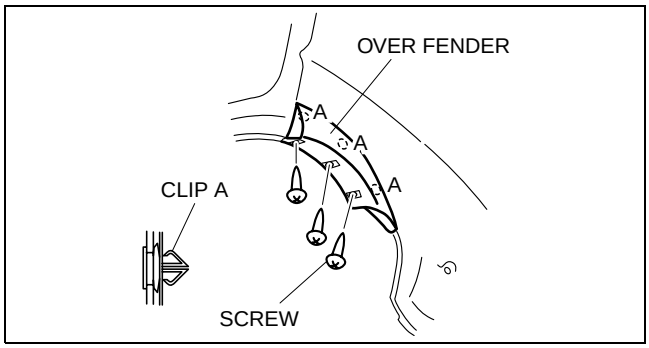


AVF7728W101

OVER FENDER REMOVAL/INSTALLATION

AVF772851908W02

1. Remove the screws.
2. Pull the over fender outward, then detach clips A from the body.
3. Install in the reverse order of removal.

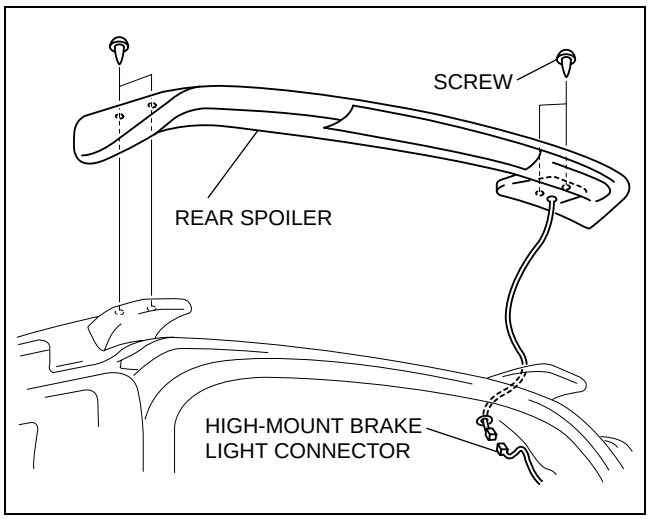


AVF7728W105

REAR SPOILER REMOVAL/INSTALLATION

AVF772851960W01

1. Remove the headliner.
2. Remove the screws.
3. Disconnect the high-mount brake light connector.
4. Remove the rear spoiler.
5. Install in the reverse order of removal.

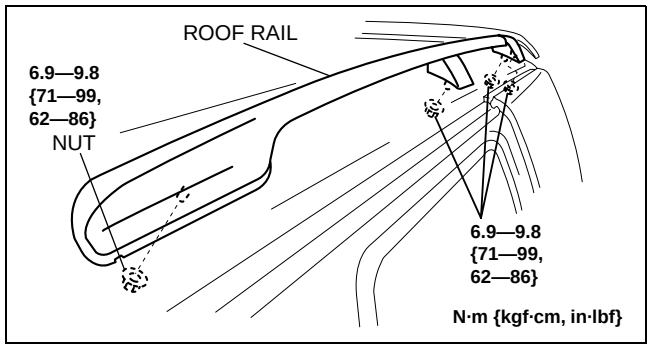


AVF7728W103

ROOF RAIL REMOVAL/INSTALLATION

AVF772851720W01

1. Remove the headliner.
2. Remove the rear spoiler. (vehicles with rear spoiler)
3. Remove the nuts.
4. Pull the roof rail upward, then remove the roof rail from the body.
5. Install in the reverse order of removal.

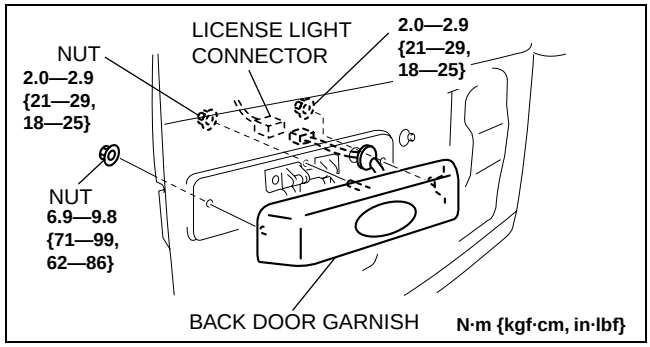


AVF7728W104

BACK DOOR GARNISH REMOVAL/INSTALLATION

AVF772850850W01

1. Remove the back door lower trim.
2. Remove the nuts.
3. Disconnect the license light connector.
4. Remove the back door garnish.
5. Install in the reverse order of removal.



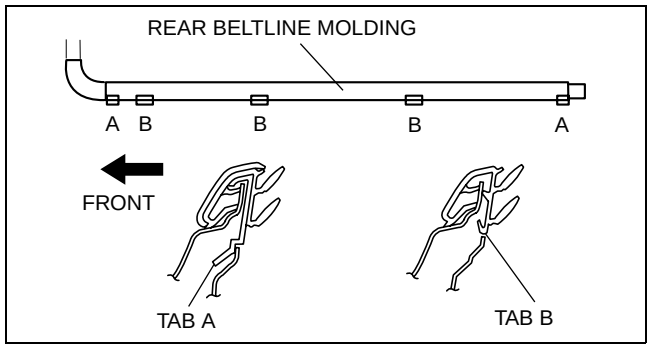
AVF7728W102

MOLDING

REAR BELTLINE MOLDING REMOVAL/INSTALLATION

AVF773050660W01

1. Fully lower the rear door glass.
2. Pull the end of rear beltline molding to detach tabs A.
3. Pull the rear beltline molding upward, remove tabs B, then remove the rear beltline molding.
4. Install in the reverse order of removal.

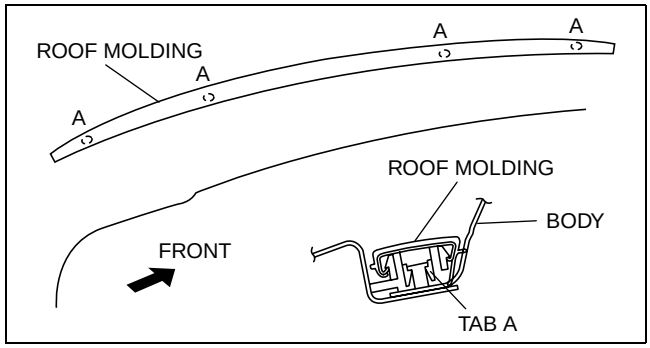


AVF7730W102

ROOF MOLDING REMOVAL/INSTALLATION

AVF773050620W01

1. Pull the rear edge of the roof molding upward, detach tabs A, then remove the roof molding.
2. Install in the reverse order of removal.



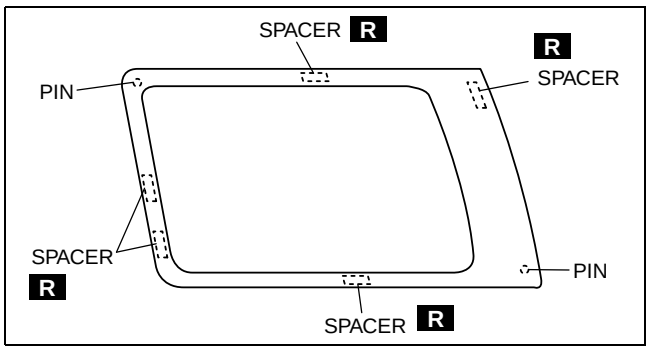
AVF7730W101

WINDOW GLASS

SIDE WINDOW GLASS REMOVAL

AVF773862580W01

1. Remove the C-pillar trim.
2. Apply protective tape along the edge of the body to protect it from damage.
3. Avoiding pins and spacers, make a hole through the sealant from the inside of the vehicle using an awl.



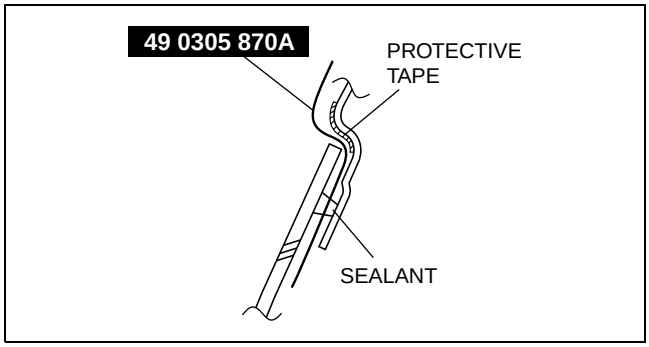
AVF7738W101

4. Pass the **SST** (piano wire) through the hole.

   Warning
   - **Using a SST (piano wire) with bare hands can cause injury. Always wear gloves when using a SST (piano wire).**

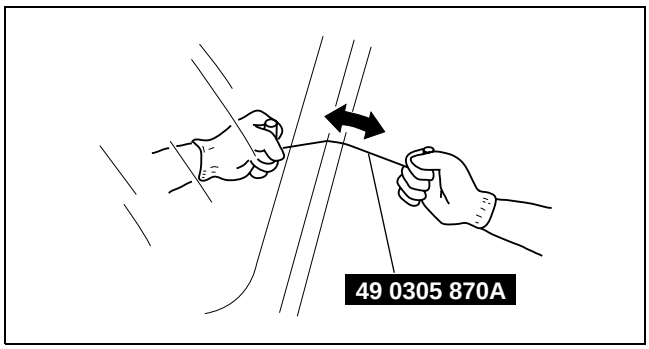
5. Wind each end of the **SST** (piano wire) around a bar.

   Note
   - Use a long sawing action to spread the work over the whole length of the **SST** (piano wire) to prevent it from breaking.



AVF7738W102

6. Working with another person, saw through the sealant around the edge of the glass.
7. Remove the side window glass.



A6E7738W021

SIDE WINDOW GLASS INSTALLATION

AVF773862580W02

Caution

- **Proper installation of the side window glass may be difficult if sealant is cracked or the glass is pushed out by air pressure when a door is opened/closed with all the windows closed. Leave all the windows open until the side window glass is installed completely.**

1. Cut away the old sealant using a razor so that **1—2 mm {0.04—0.07 in}** thickness of sealant remains around the circumference of the frame.

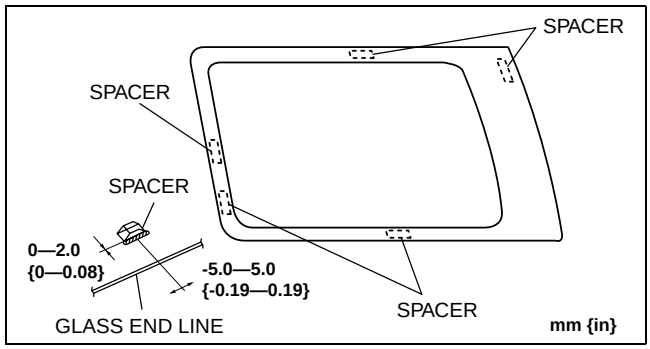
Warning

- **Using a razor with bare hands can cause injury. Always wear gloves when using a razor.**

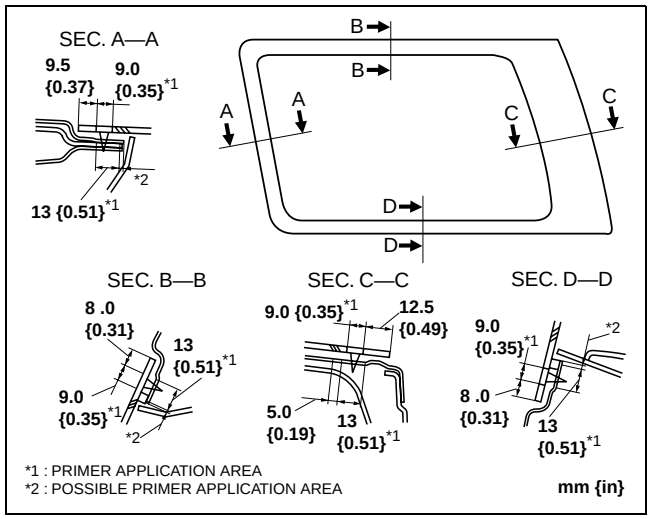
2. If the sealant has come off completely in any one place, apply some primer after degreasing, and allow it **approx. 30 min** to dry. Then put on new sealant to create a **2 mm {0.08 in}** layer.
3. Clean and degrease an **approx. 50.0 mm {1.97 in}** wide strip around the circumference of the glass and the bonding area on the body.
4. Insert the spacers into the body.
5. Use only glass primer on the glass, and body primer on the body and the molding. Allow it to dry for **approx. 30 min**.

Caution

- **Keep the area free of dirt and grease, and do not touch the surface. Otherwise, the primer may not properly bond to the surface of the glass and body, which may cause leaks to occur.**



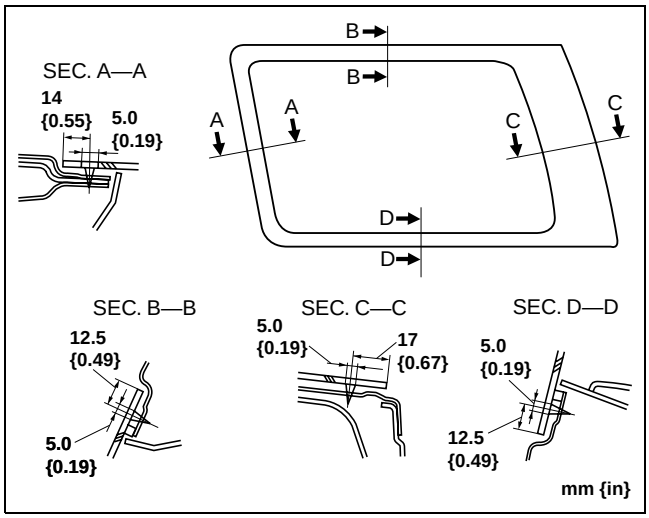
AVF7738W103



AVF7738W104

S

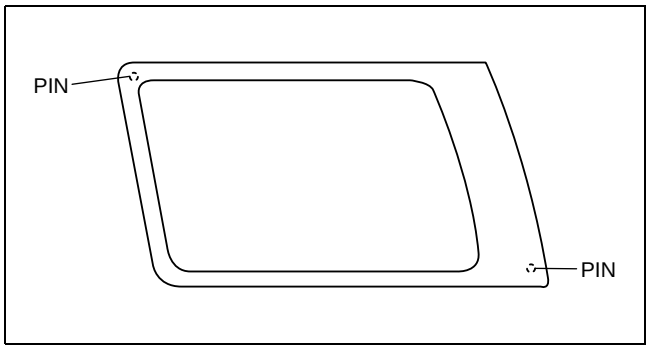
6. Apply sealant to the areas of the glass surface as shown in the figure.



AVF7738W105

7. Set the side window glass in place and insert the pins into the body. Install the side window glass.
8. Allow the sealant to harden completely.

   Sealant hardening time: 24 h

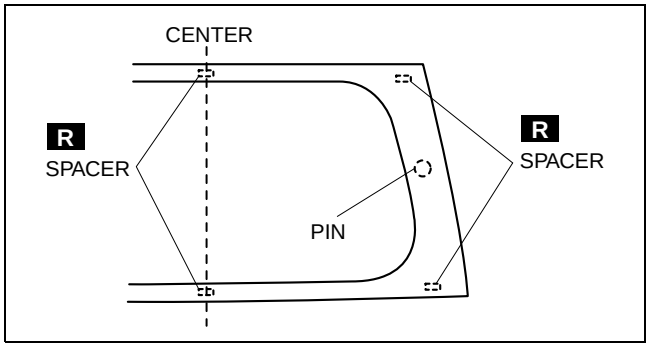


AVF7738W106

REAR WINDOW GLASS REMOVAL

AVF773863931W01

1. Remove the back door lower trim.
2. Apply protective tape along the edge of the body to protect it from damage.
3. Avoiding pins and spacers, make a hole through the sealant from the inside of the vehicle using an awl.



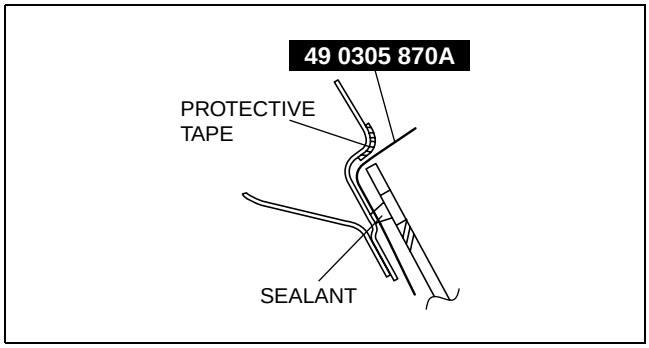
AVF7738W107

4. Pass the **SST** (piano wire) through the hole.

   Warning
   - **Using a SST (piano wire) with bare hands can cause injury. Always wear gloves when using a SST (piano wire).**

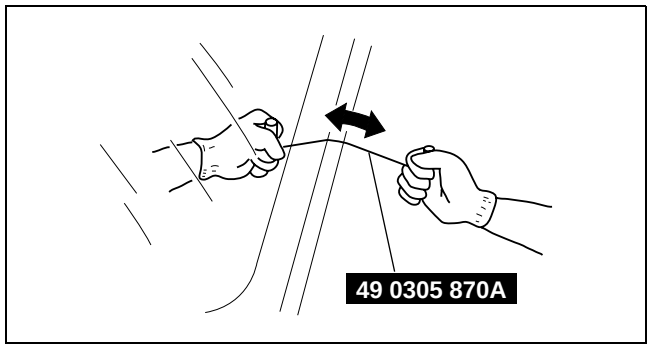
5. Wind each end of the **SST** (piano wire) around a bar.

   Note
   - Use a long sawing action to spread the work over the whole length of the **SST** (piano wire) to prevent it from breaking.



AVF7738W108

6. Working with another person, saw through the sealant around the edge of the glass.
7. Remove the rear window glass.
8. Remove the spacers and pins from the glass.



A6E7738W021

REAR WINDOW GLASS INSTALLATION

AVF773863931W02

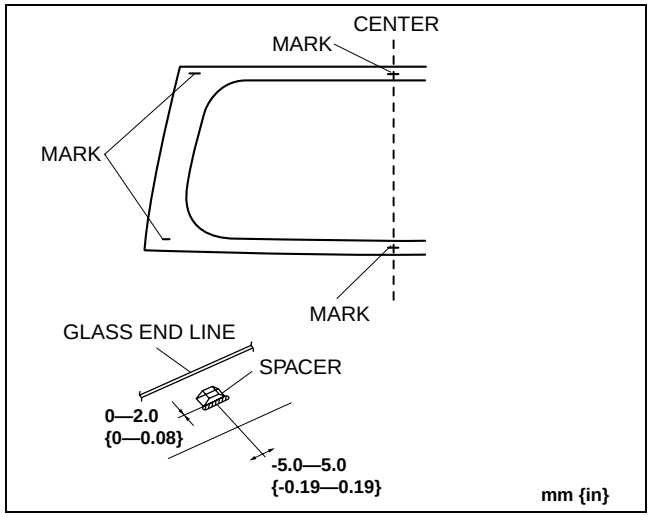
Caution
- **Proper installation of the rear window glass may be difficult if sealant is cracked or the glass is pushed out by air pressure when a door is opened/closed with all the windows closed. Leave all the windows open until the rear window glass is installed completely.**

1. Cut away the old sealant using a razor so that **1—2 mm {0.04—0.07 in}** thickness of sealant remains around the circumference of the frame.

Warning
- **Using a razor with bare hands can cause injury. Always wear gloves when using a razor.**

2. If the sealant has come off completely in any one place, apply some primer after degreasing, and allow it **approx. 30 min** to dry. Then put on new sealant to create a **2 mm {0.08 in}** layer.
3. Clean and degrease an **approx. 50.0 mm {1.97 in}** wide strip around the circumference of the glass and the bonding area on the body.
4. Alien the bottoms of the spacers with the marks, then attach the spacers.

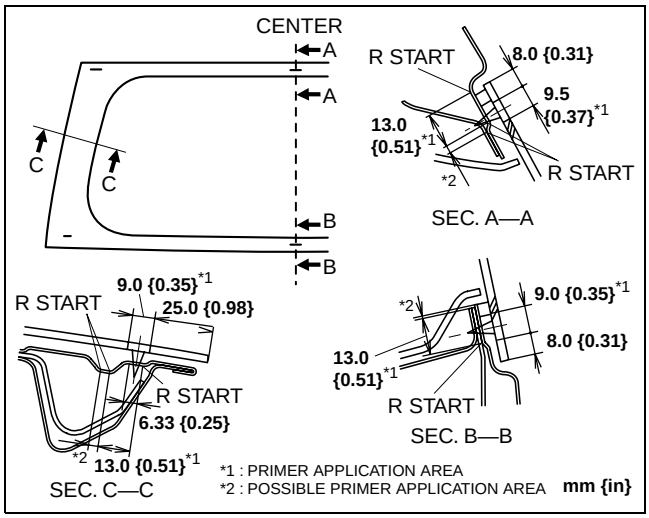
Caution
- **Keep the area free of dirt and grease, and do not touch the surface. Otherwise, the primer may not properly bond to the surface of the glass and body, which may cause leaks to occur.**



AVF7738W109

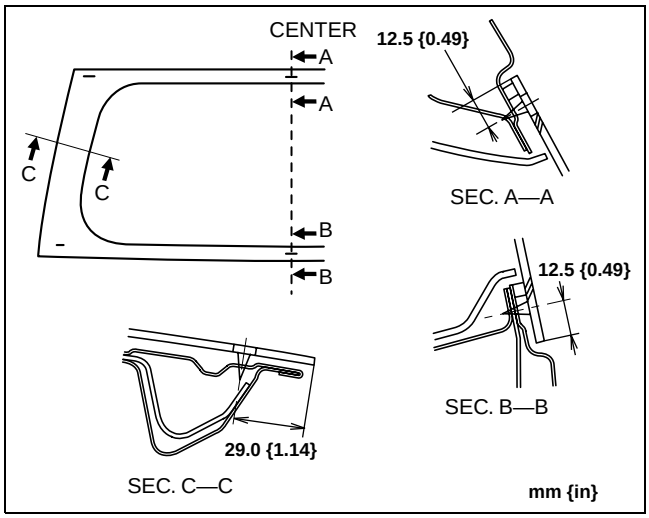
S

5. Use only glass primer on the glass, and body primer on the body. Allow it to dry for **approx. 30 min**.



AVF7738W110

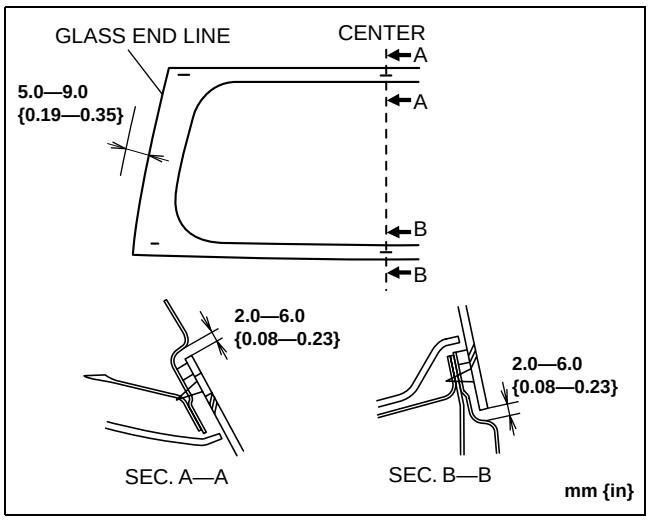
6. After the primer has dried, apply **11.0 mm {0.43 in}** thickness, 4—6 mm {0.16—0.23 in} width of sealant to the areas of the glass surface as shown in the figure.
7. Set the position of the rear window glass and insert the pins into the body. Install the glass.



AVF7738W111

8. Verify that the gap between the glass and the body is **2.0—6.0 mm {0.08—0.23 in}** at the top and the bottom and is **5.0—9.0 mm {0.19—0.35 in}** at the D-pillar.
9. Press firmly inward on the glass to compress the sealant.
10. Install the back door lower trim.
11. Allow the sealant to harden completely.

    Sealant hardening time: 24 h



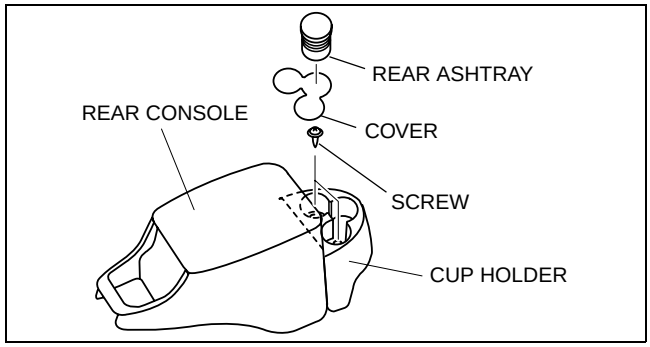
AVF7738W112

DASHBOARD AND CONSOLE

REAR CONSOLE REMOVAL/INSTALLATION

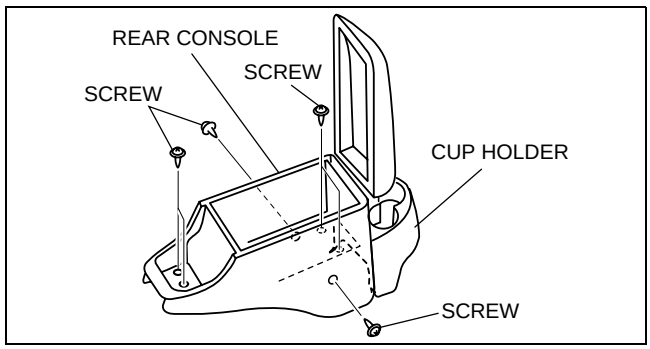
AVF774264271W01

1. Remove the screws.



AVF7742W103

2. Remove the screws.
3. Remove the rear console.
4. Install in the reverse order of removal.

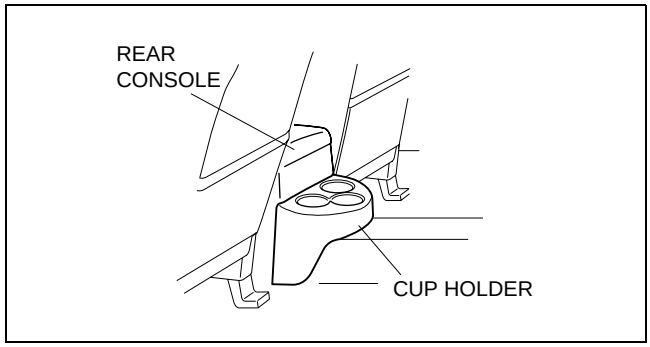


AVF7742W104

CUP HOLDER REMOVAL/INSTALLATION

AVF774264271W02

1. Remove the rear console.
2. Remove the cup holder.
3. Install in the reverse order of removal.

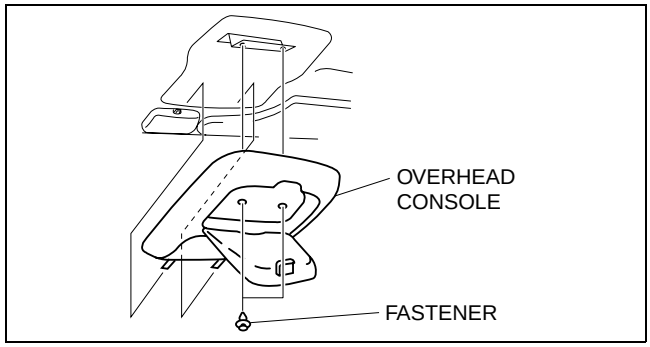


AVF7742W101

OVERHEAD CONSOLE REMOVAL/INSTALLATION

AVF774264271W03

1. Remove the fasteners, then remove the overhead console.
2. Install in the reverse order of removal.



AVF7742W102

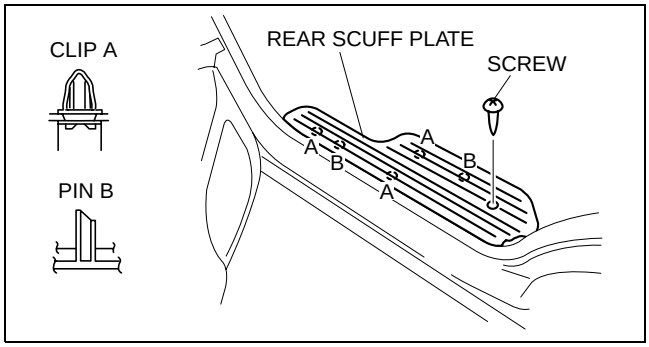
S

TRIM

REAR SCUFF PLATE REMOVAL/INSTALLATION

AVF774468730W01

1. Remove the screw.
2. Pull the rear scuff plate upward, then detach clips A and pins B from the body.
3. Install in the reverse order of removal.

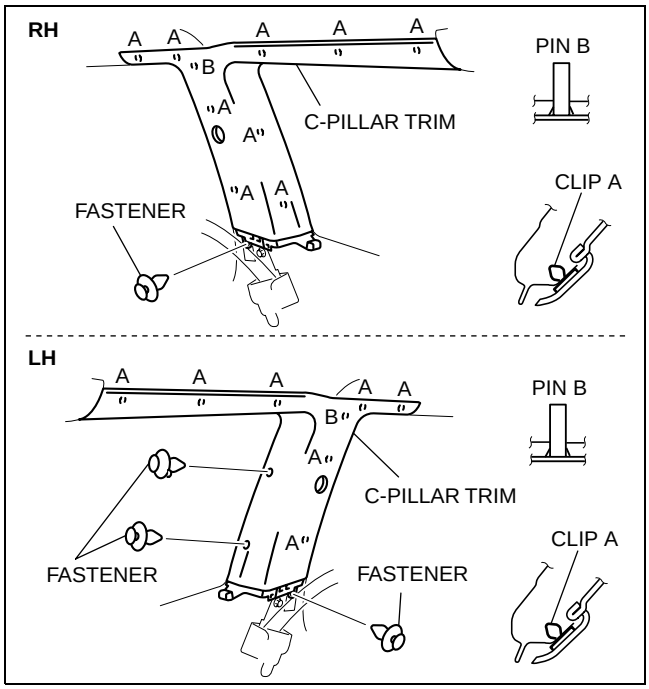


AVF7744W101

C-PILLAR TRIM REMOVAL/INSTALLATION

AVF774468240W01

1. Remove the D-pillar trim.
2. Remove the upper anchor of the second-row seat belt installation bolt.
3. Partially peel back the seaming welt.
4. Remove the fastener.
5. Pull the C-pillar trim outward, then detach clips A and pin B from the body.
6. Remove the C-pillar trim.
7. Install in the reverse order of removal.

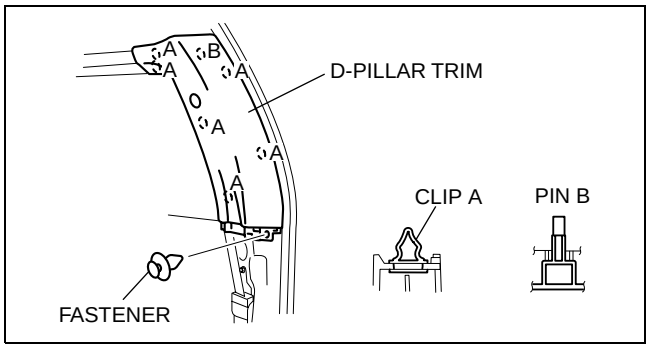


AVF7744W102

D-PILLAR TRIM REMOVAL/INSTALLATION

AVF774468280W01

1. Remove the rear side trim.
2. Remove the upper anchor of the third-row seat belt installation bolt.
3. Remove the fastener.
4. Pull the D-pillar trim outward, then detach clips A and pin B from the body.
5. Remove the D-pillar trim.
6. Install in the reverse order of removal.

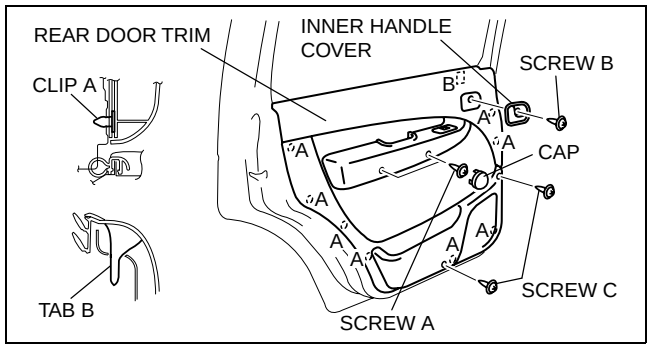


AVF7744W103

REAR DOOR TRIM REMOVAL/INSTALLATION

1. Fully lower the rear door glass.
2. Disconnect the negative battery cable.
3. Open the cap using a small screwdriver, then remove screws A.
4. Remove the inner handle cover.
5. Remove screw B.
6. Remove screws C.
7. Detach clips A from the rear door using a fastener remover.
8. Pull the rear door trim upward, then detach tab B from the rear door.
9. Disconnect the power window subswitch connector.
10. Remove the rear door trim.
11. Install in the reverse order of removal.

AVF77446852YW01

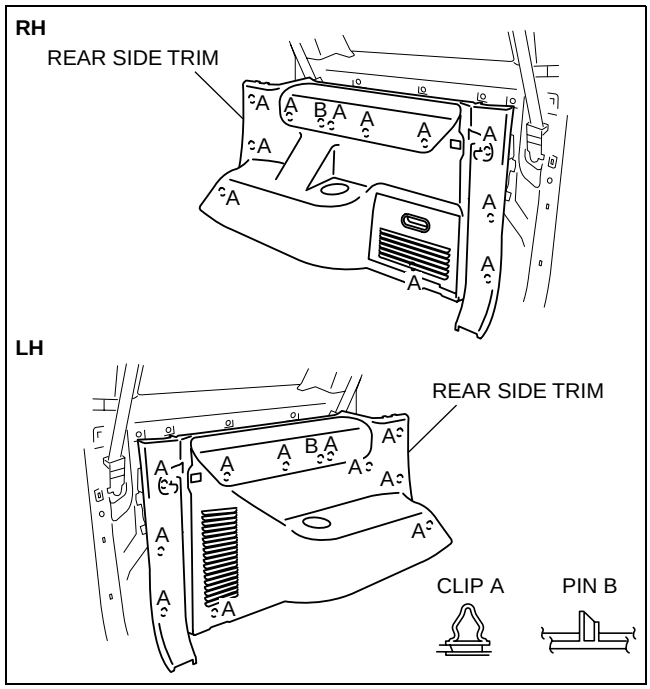


AVF7744W104

REAR SIDE TRIM REMOVAL/INSTALLATION

1. Remove the third-row seat.
2. Remove the rear end trim.
3. Remove the tire house trim.
4. Pull the rear side trim outward, then detach clips A and pin B from the body.
5. Remove the rear side trim.
6. Install in the reverse order of removal.

AVF774468840W01

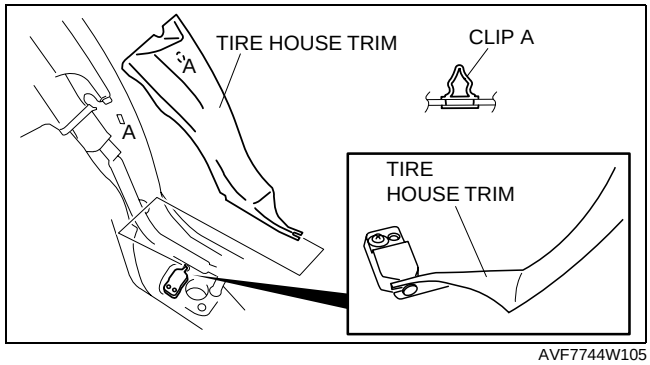


AVF7744W106

TIRE HOUSE TRIM REMOVAL/INSTALLATION

1. Remove the rear scuff plate.
2. Pull the tire house trim outward, then detach clip A from the body.
3. Detach the connecting part from the body, then remove the tire house trim.
4. Install in the reverse order of removal.

AVF774468750W01



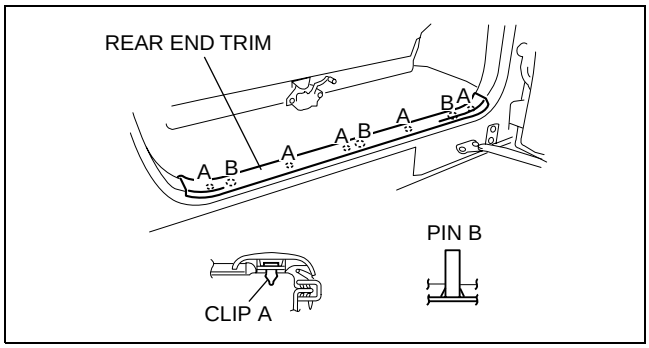
AVF7744W105

S

REAR END TRIM REMOVAL/INSTALLATION

1. Pull the rear end trim upward, then detach clips A and pins B from the body.
2. Remove the rear end trim.
3. Install in the reverse order of removal.

AVF774468890W01

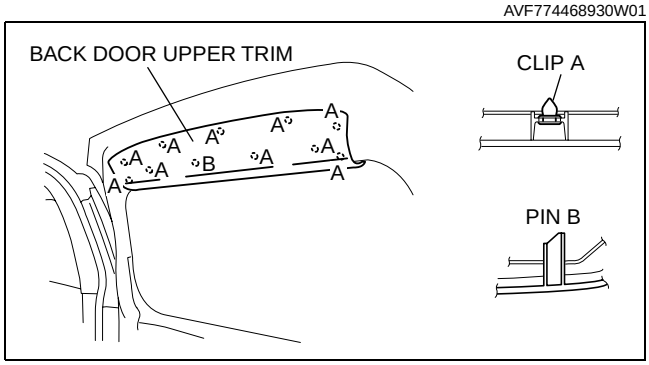


AVF7744W107

BACK DOOR UPPER TRIM REMOVAL/INSTALLATION

1. Pull the back door upper trim outward, then detach clips A and pin B from the body.
2. Remove the back door upper trim.
3. Install in the reverse order of removal.

AVF774468930W01

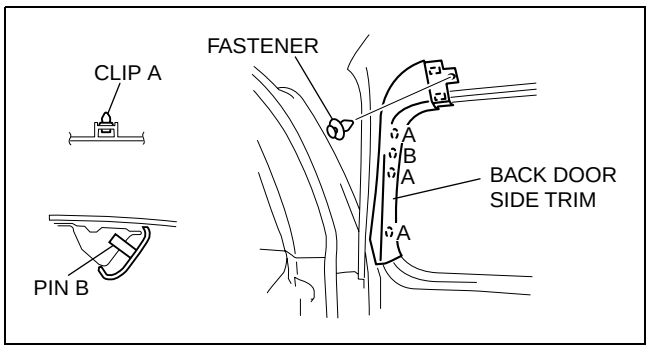


AVF7744W109

BACK DOOR SIDE TRIM REMOVAL/INSTALLATION

1. Remove the back door upper trim.
2. Remove the fastener.
3. Pull the back door side trim outward, then detach clips A and pin B from the body.
4. Remove the back door side trim.
5. Install in the reverse order of removal.

AVF774468940W01

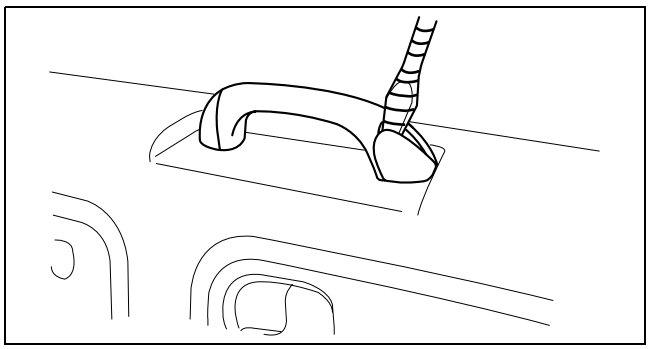


AVF7744W110

BACK DOOR LOWER TRIM REMOVAL/INSTALLATION

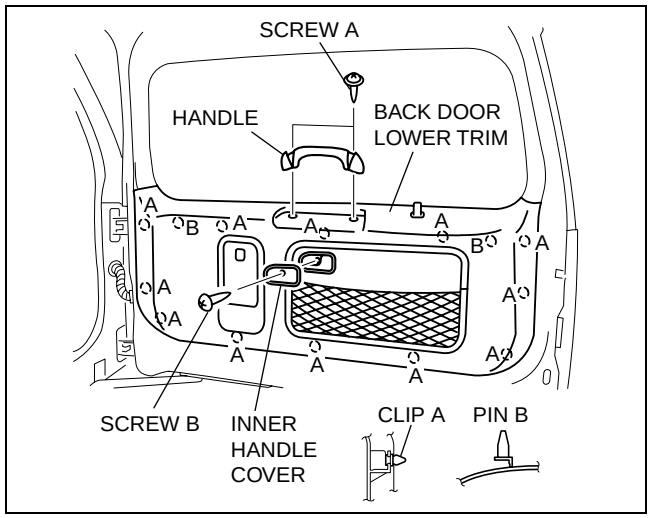
1. Remove the back door side trim.
2. Open the cover using a tape-wrapped flathead small screwdriver.

AVF774468960W01



AVF7744W111

3. Remove screws A, then remove the handle.
4. Remove screw B, then remove the inner handle cover.
5. Pull the back door lower trim outward, then detach clips A and pins B from the body.
6. Remove the back door lower trim.
7. Install in the reverse order of removal.



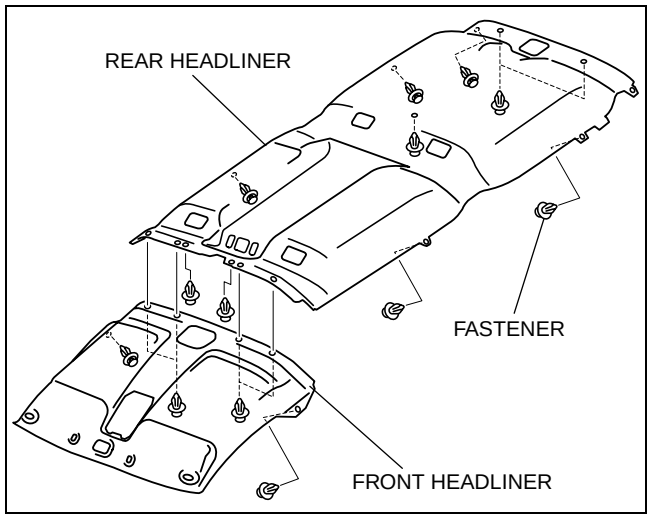
AVF7744W112

HEADLINER

HEADLINER REMOVAL/INSTALLATION

AVF774668030W01

1. Disconnect the negative battery cable.
2. Partially peel back the seaming welt and weatherstrip.
3. Remove the D-pillar trims.
4. Remove the C-pillar upper trims.
5. Remove the B-pillar trims.
6. Remove the A-pillar trims.
7. Remove the interior and map light. (See T–15 INTERIOR AND MAP LIGHT REMOVAL/INSTALLATION.)
8. Remove the cargo compartment light. (See T–16 CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION.)
9. Remove the sunvisors.
10. Remove the overhead console.
11. Remove the assist handles.
12. Remove the ventilator grilles.
13. Remove the rear fan switch.
14. Remove the fasteners.
15. Remove the front headliner.
16. Remove the rear headliner.
17. Take the headliner out through the back door.
18. Install in the reverse order of removal.



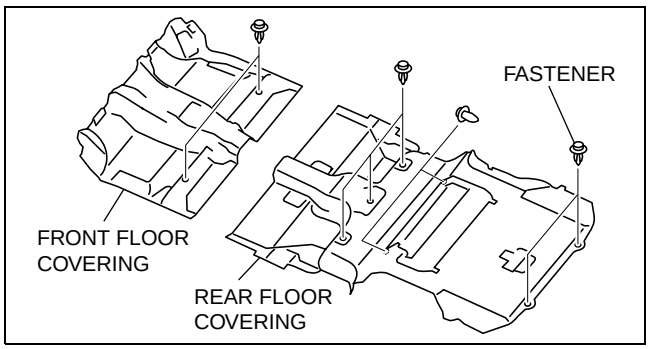
AVF7746W101

FLOOR COVERING

FLOOR COVERING REMOVAL/INSTALLATION

AVF774868670W01

1. Disconnect the negative battery cable.
2. Remove the front seats.
3. Remove the front buckles. (Bench seat type)
4. Remove the second-row seats.
5. Remove the third-row seat.
6. Remove the front scuff plates.
7. Remove the rear scuff plates.
8. Remove the console.
9. Remove the cup holder.
10. Remove the front side trims.
11. Remove the B-pillar lower trims.
12. Remove the lower anchor of the front seat belt installation bolts.
13. Remove the lower anchor of the rear second-row seat belt installation bolts.
14. Remove the lower anchor of the rear third-row seat belt installation bolts.
15. Remove the rear side trims.
16. Remove the tire house trims.
17. Remove the fasteners.
18. Remove the front floor covering and rear floor covering.
19. Take the front floor covering and rear floor covering out through the back door.
20. Install in the reverse order of removal.



AVF7748W101

SEAT BELT

SECOND-ROW SEAT BELT REMOVAL/INSTALLATION

AVF775057730W01

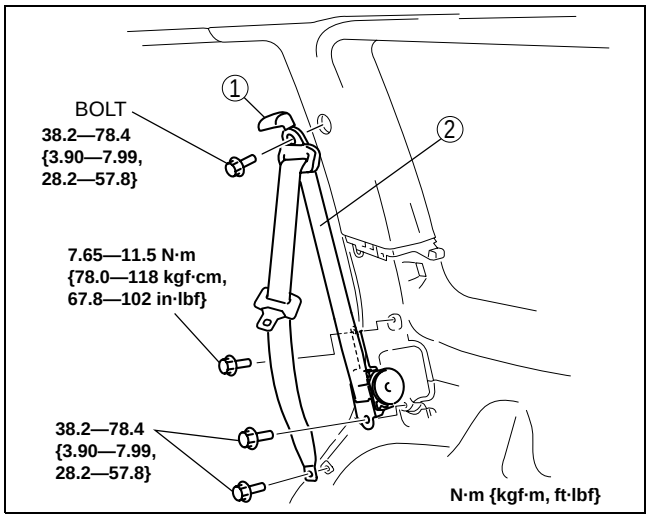
Caution

- **The ELR has a spring that will unwind if the retractor cover is removed. The spring cannot be rewound by hand. If this occurs, the ELR will not work properly. Therefore, do not disassemble the retractor.**

1. Remove the rear side trim.
2. Remove in the order indicated in the table.

1	Anchor cover
2	Second-row seat belt

3. Install in the reverse order of removal.



AVF7750W101

THIRD-ROW SEAT BELT REMOVAL/INSTALLATION

AVF775057830W01

Caution

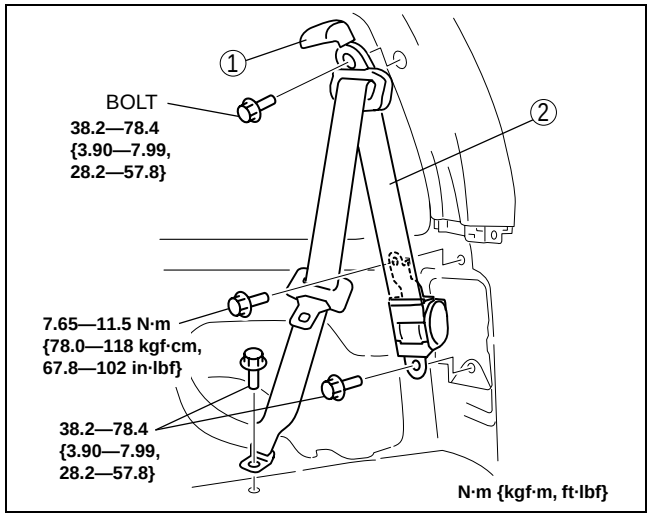
- **The ELR has a spring that will unwind if the retractor cover is removed. The spring cannot be rewound by hand. If this occurs, the ELR will not work properly. Therefore, do not disassemble the retractor.**

Fixed Type Seat, Detachable Type Seat

1. Remove the third-row seat.
2. Remove the rear side trim.
3. Remove in the order indicated in the table.

1	Anchor cover
2	Third-row seat belt

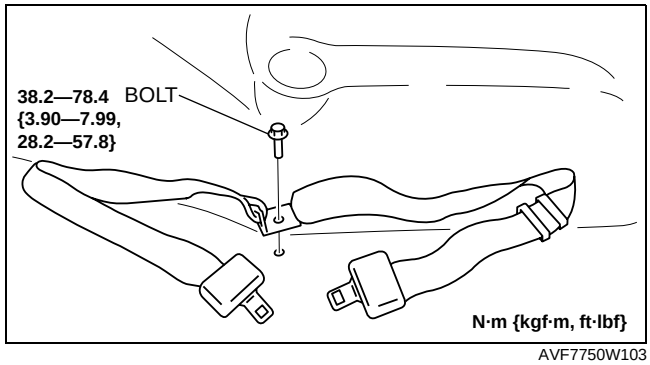
4. Install in the reverse order of removal.



AVF7750W102

Inward Facing Seat Type

1. Remove the third-row seat.
2. Remove the bolt, then remove the third-row seat belt.
3. Install in the reverse order of removal.

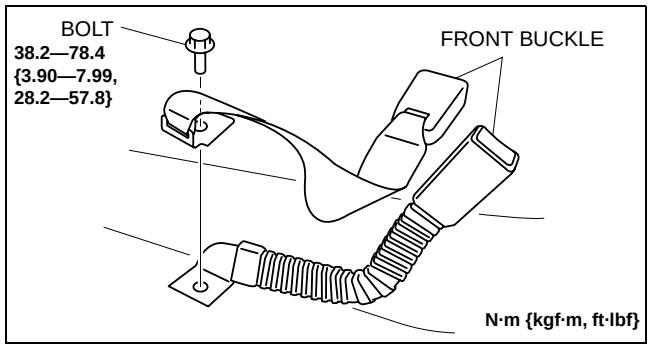


AVF7750W103

FRONT BUCKLE REMOVAL/INSTALLATION

AVF775057620W01

1. Remove the bolt, and then remove the front buckle.
2. Install in the reverse order of removal.



AVF7750W104

SECOND-ROW BUCKLE REMOVAL/INSTALLATION

AVF775057720W01

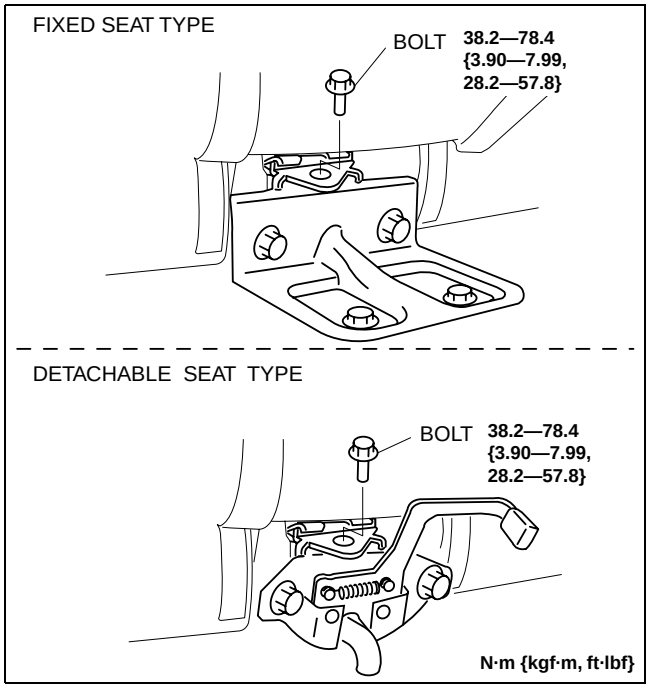
1. Disassemble the second-row seat. (See S–37 SECOND-ROW SEAT DISASSEMBLY/ASSEMBLY.)
2. Remove the second-row buckle.
3. Install in the reverse order of removal.

THIRD-ROW BUCKLE REMOVAL/INSTALLATION

AVF775057720W02

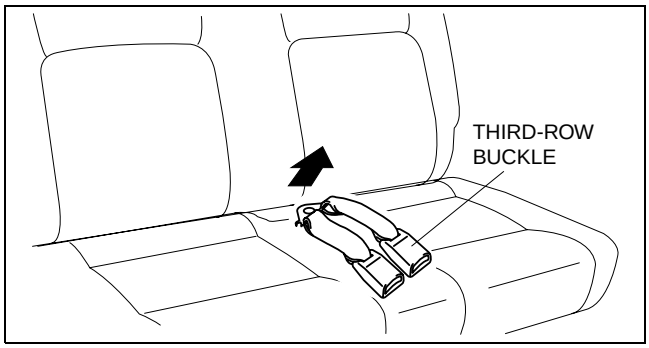
Fixed Seat Type, Detachable Seat Type

1. Remove the bolt.



AVF7750W105

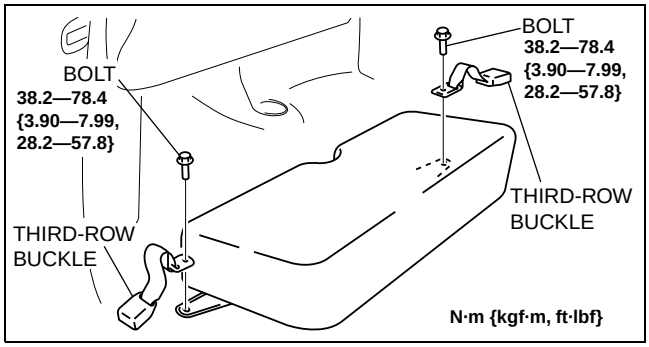
2. Remove the third-row buckle from the third-row seat.
3. Install in the reverse order of removal.



AVF7750W106

Inward Facing Seat Type

1. Remove the bolts, and then remove the third-row buckles.
2. Install in the reverse order of removal.



AVF7750W107

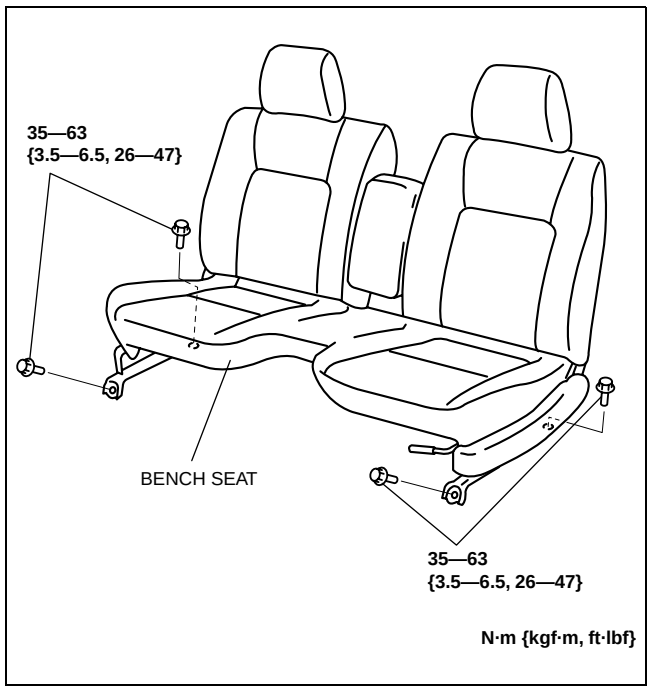
SEAT

FRONT SEAT REMOVAL/INSTALLATION

AVF775257100W01

Bench Type

1. Remove the bolts.
2. Remove the bench seat.
3. Install in the reverse order of removal.



AVF7752W101

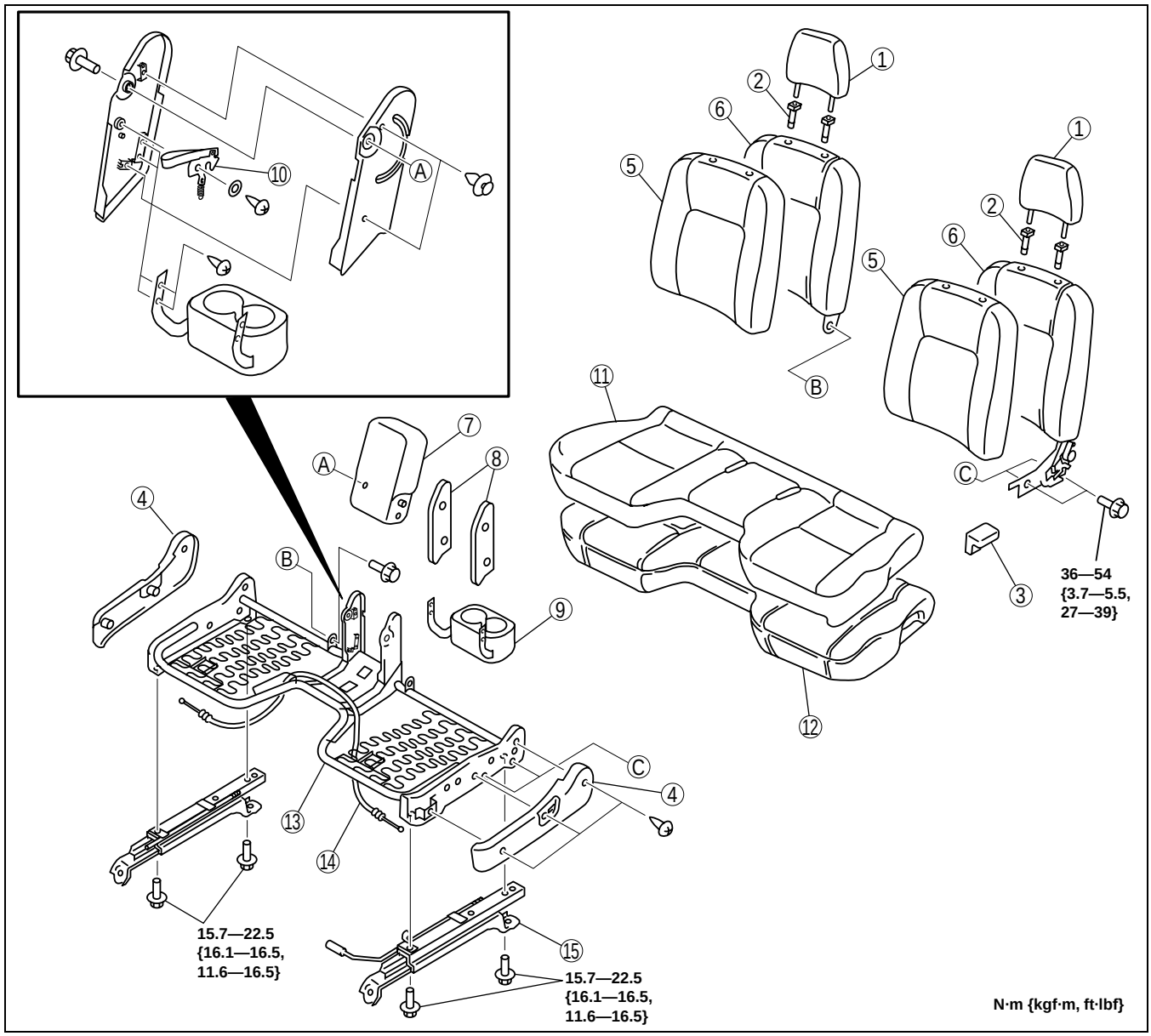
S

FRONT SEAT DISASSEMBLY/ASSEMBLY

AVF775257100W02

Bench Type

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



AVF7752W103

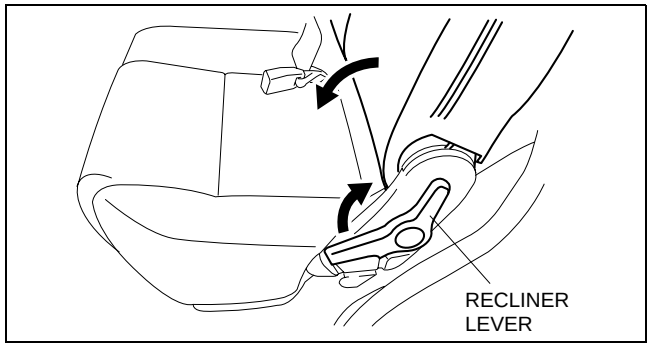
1	Headrest
2	Pole guide
3	Recliner lever
4	Side cover
5	Seat back trim
6	Seat back pad
7	Armrest
8	Cover

9	Cup holder
10	Latch
11	Seat cushion trim
12	Seat cushion pad
13	Seat cushion frame
14	Cable
15	Slide adjuster

SECOND-ROW SEAT REMOVAL/INSTALLATION

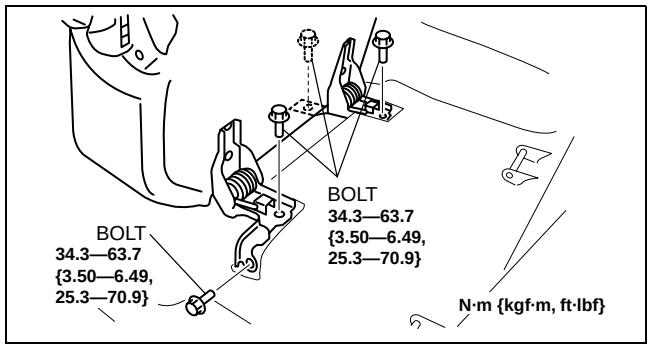
AVF77525720XW01

1. Move headrest to the lowest position.
2. Releasing Recliner lever, fold the seat back to forward.
3. Tumble second-row seat to forward.



AVF7752W104

4. Remove the bolts and remove the second-row seat.
5. Install in the reverse order of removal.



AVF7752W105

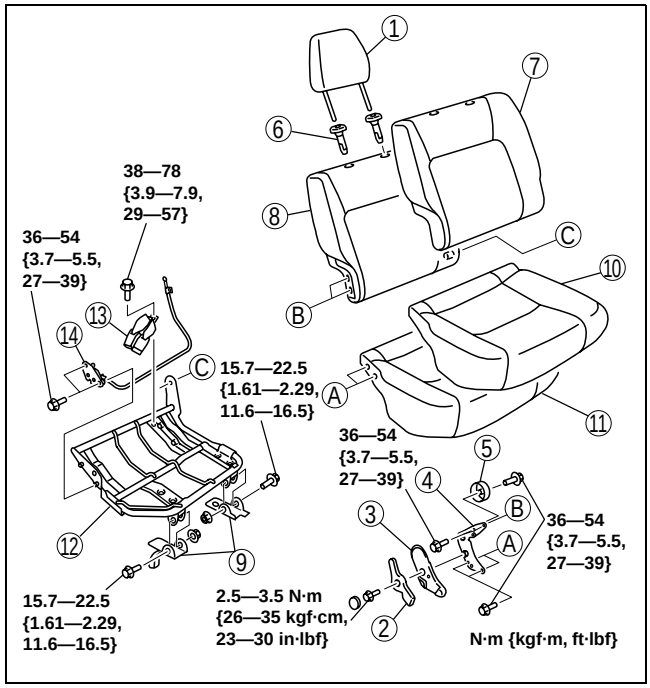
SECOND-ROW SEAT DISASSEMBLY/ASSEMBLY

AVF77525720XW02

1. Disassemble in the order indicated in the table.

1	Headrest
2	Recliner lever
3	Side cover
4	Recliner knuckle
5	Reverse cover
6	Pole guide
7	Seat back trim
8	Seat back pad
9	Seat under bracket
10	Seat cushion trim
11	Seat cushion pad
12	Seat cushion frame
13	Second-row buckle
14	latch

2. Assemble in the reverse order of disassembly.



AVF7752W106

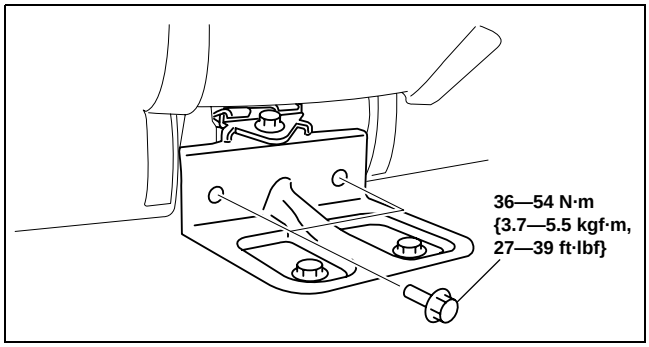
S

THIRD-ROW SEAT REMOVAL/INSTALLATION

AVF77525730XW01

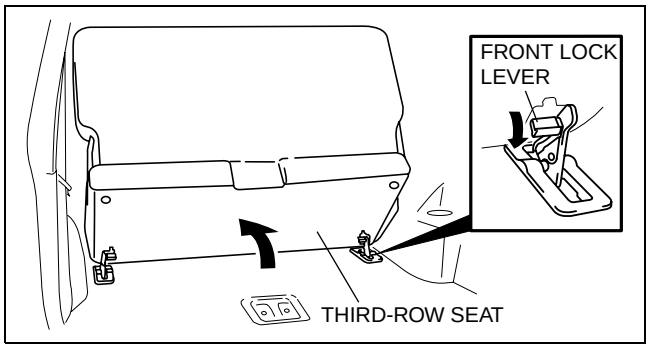
Fixed Type

1. Remove the bolts, then tumble seat to forward.



AVF7752W108

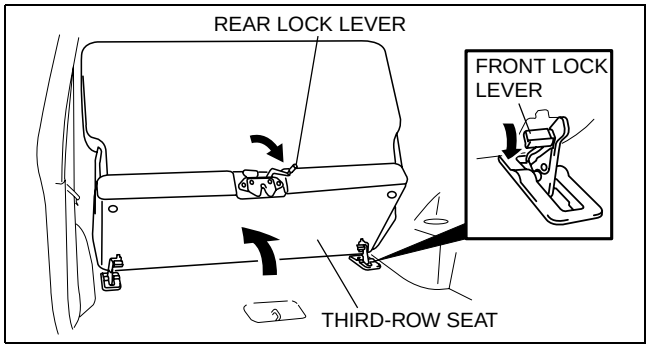
2. Releasing front lock by operating the front lock lever.
3. Lift the third-row seat to upward and then remove from the floor.



AVF7752W109

Detachable Type

1. Releasing rear cushion lock by operating the rear lock lever, tumble seat to forward.
2. Releasing front lock by operating the front lock lever.
3. Lift the third-row seat to upward and then remove from the floor.



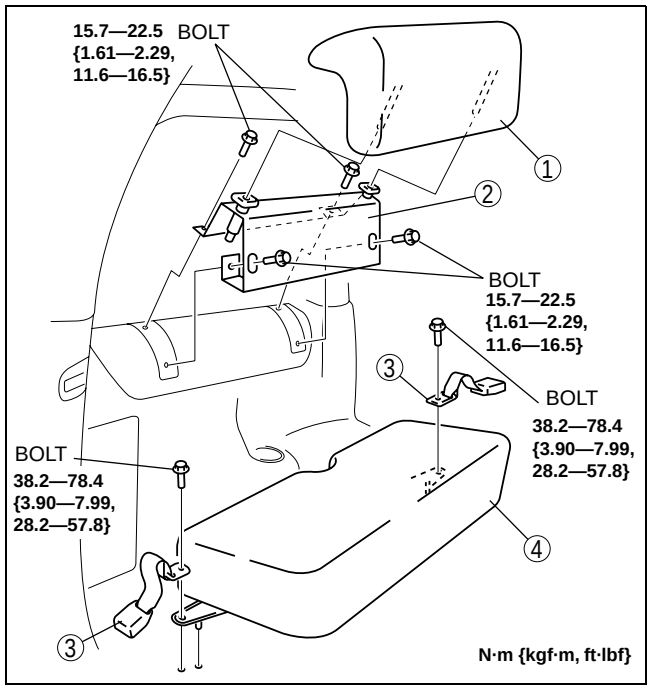
AVF7752W107

Inward Facing Type

1. Remove in the order indicated in the table.

1	Seat back
2	Seat back frame
3	Third-row buckle
4	Seat cushion

2. Install in the reverse order of removal.

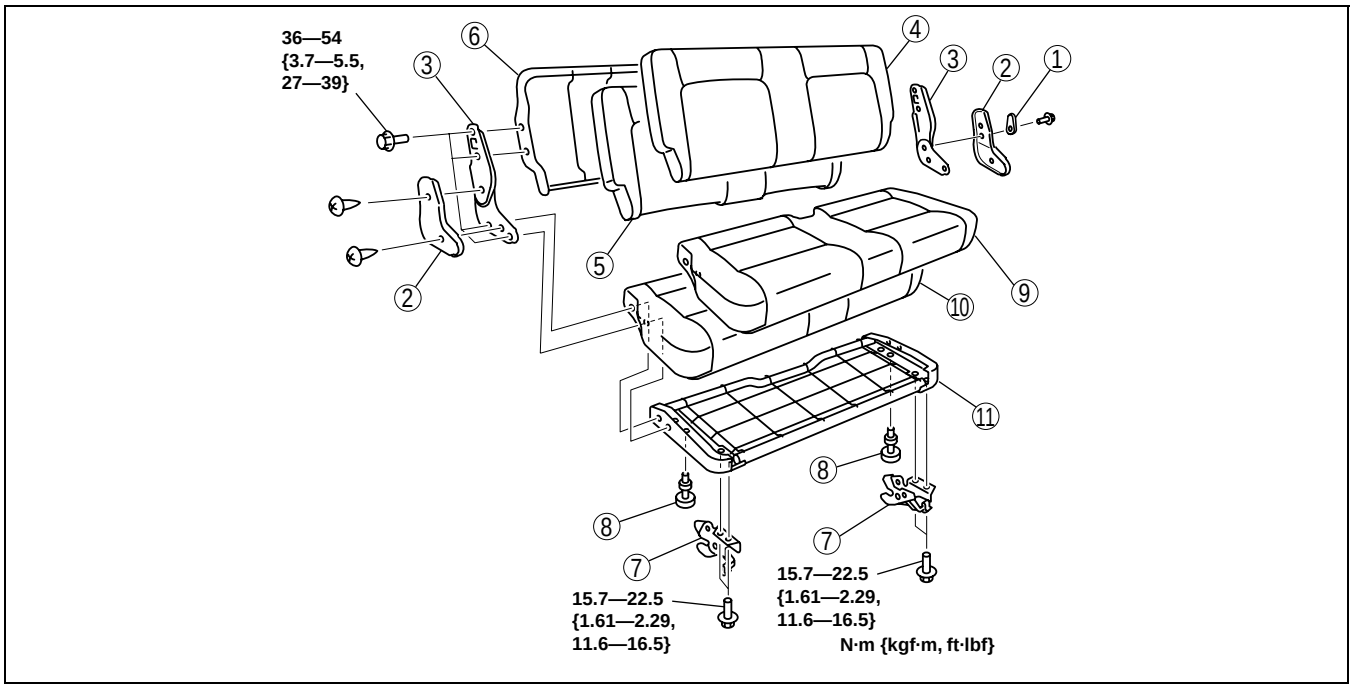


AVF7752W110

THIRD-ROW SEAT DISASSEMBLY/ASSEMBLY

AVF77525730XW02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



AVF7752W111

1	Lever
2	Side cover
3	Bracket
4	Seat back trim
5	Seat back pad
6	Seat back frame

7	Front lock
8	Leg
9	Seat cushion trim
10	Seat cushion pad
11	Seat cushion frame

S

BODY ELECTRICAL SYSTEM

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OUTLINE

OUTLINE OF CONSTRUCTION

AVF810201088W01

- The construction and operation of the body electrical system is essentially carried over from that of the current RANGER model, except for the following features. (See RANGER Training Manual F326-10-99A.)

FEATURES

AVF810201088W02

Improved Marketability

- The rear combination light has been changed.
- A rear wiper and washer have been adopted.
- A cargo compartment light has been adopted.
- The fuel gauge sender unit has been changed.
- The instrument cluster has been changed.

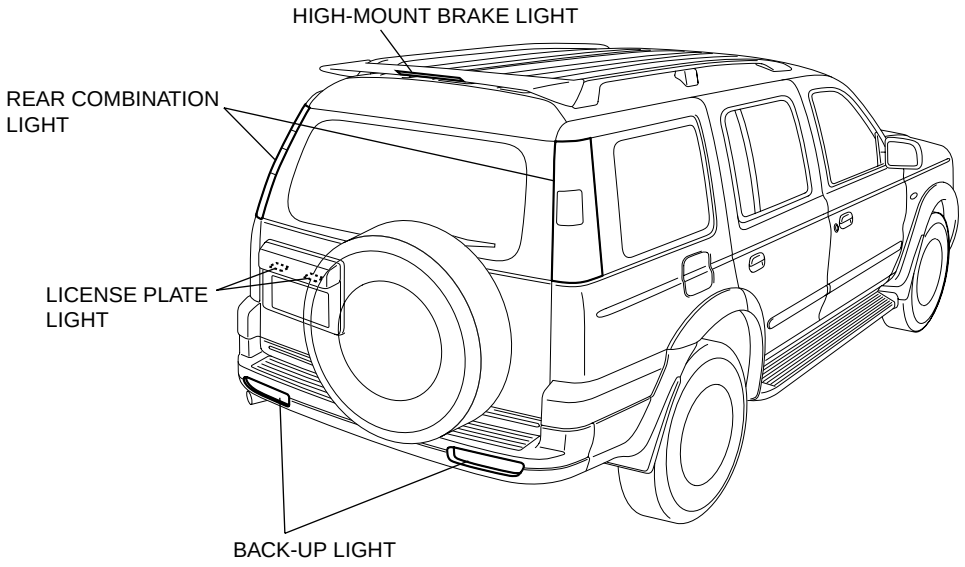
Improved Safety

- A high-mount brake light has been adopted.

EXTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW

AVF811201052W01



AVF8100T101

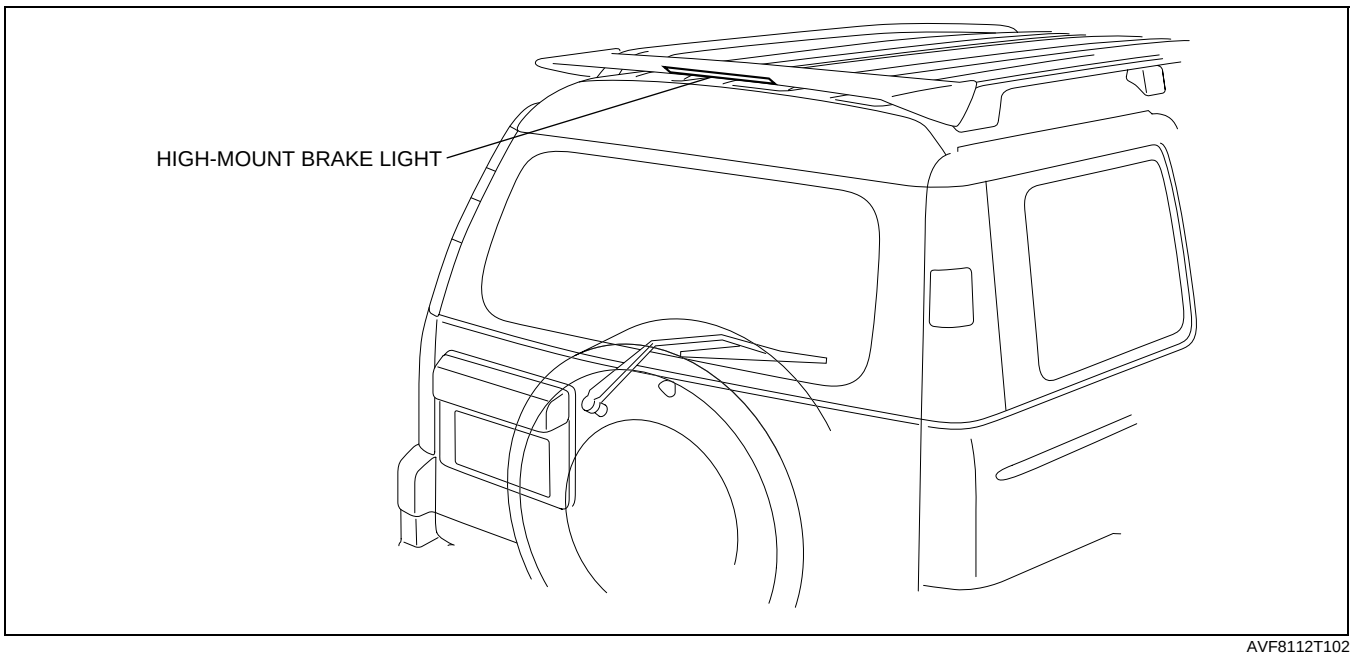
HIGH-MOUNT BRAKE LIGHT

AVF811201052W02

Outline

- A high-mount brake light has been adopted for the rear spoiler.

Structural View



AVF8112T102

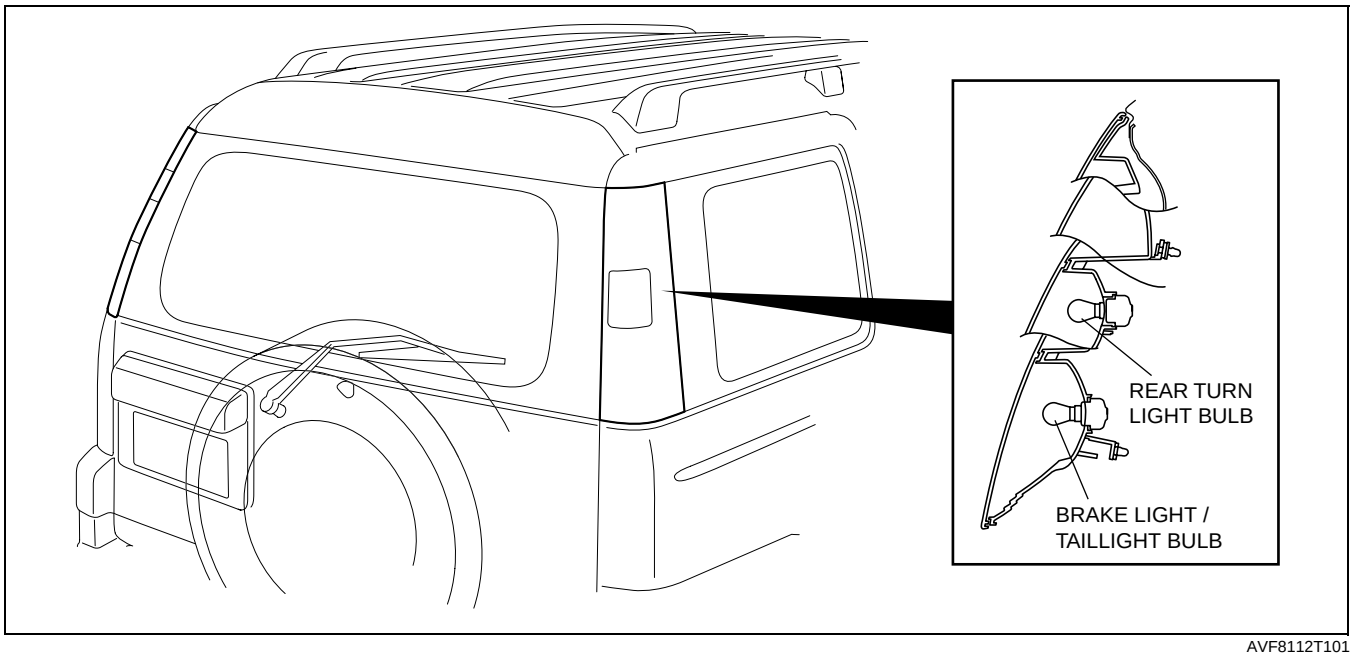
REAR COMBINATION LIGHT

AVF811201052W03

Outline

- A rear combination light has been changed due to a change in the shape of the vehicle rear end.

Structural View



AVF8112T101

T

INTERIOR LIGHTING SYSTEM

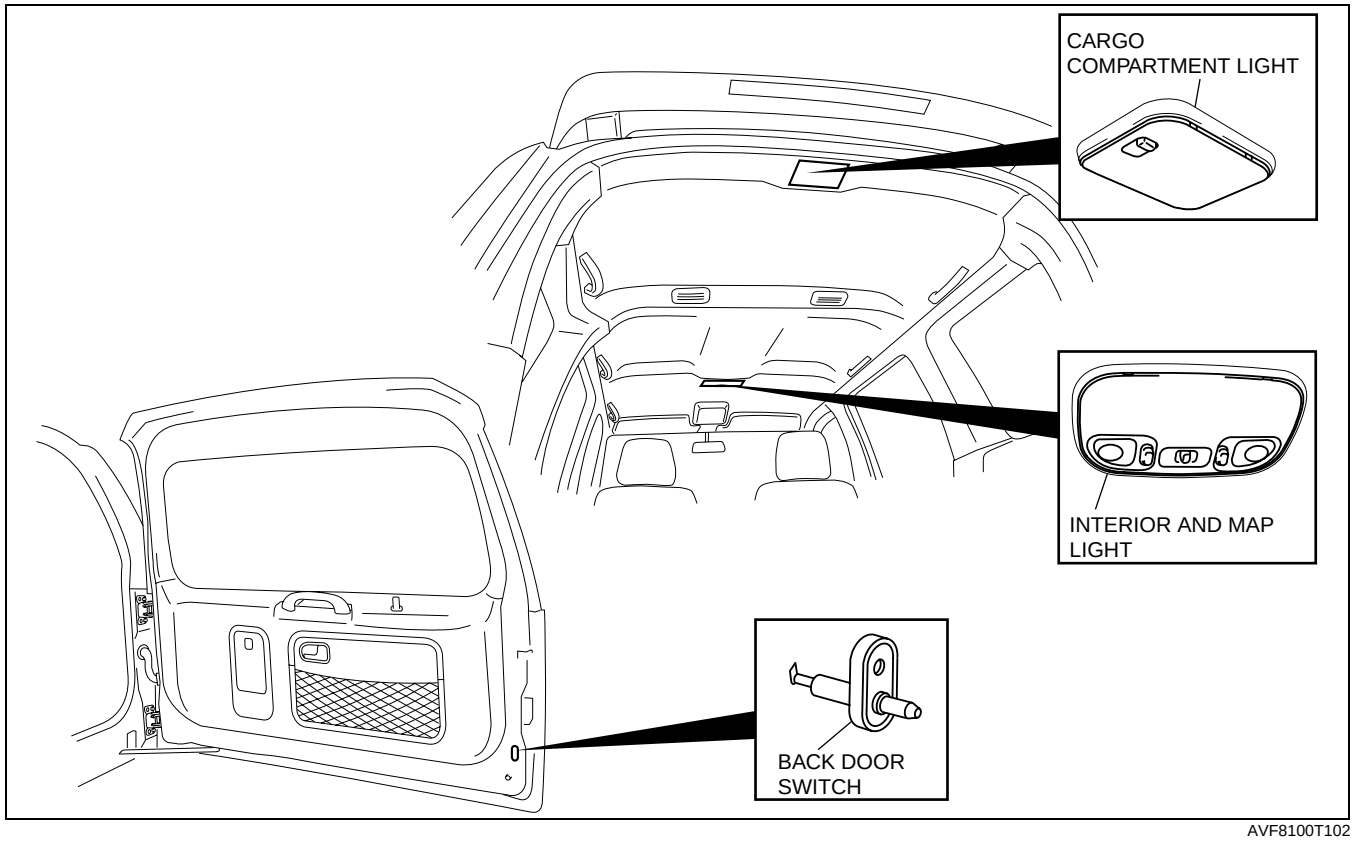
OUTLINE

AVF811401053W01

- An interior and map light has been adopted at the centre of the ceiling.
- A cargo compartment light has been adopted at the rear of the ceiling.
- A back door switch has been adopted. The function of the switch is the same as that of RANGER model.

STRUCTURAL VIEW

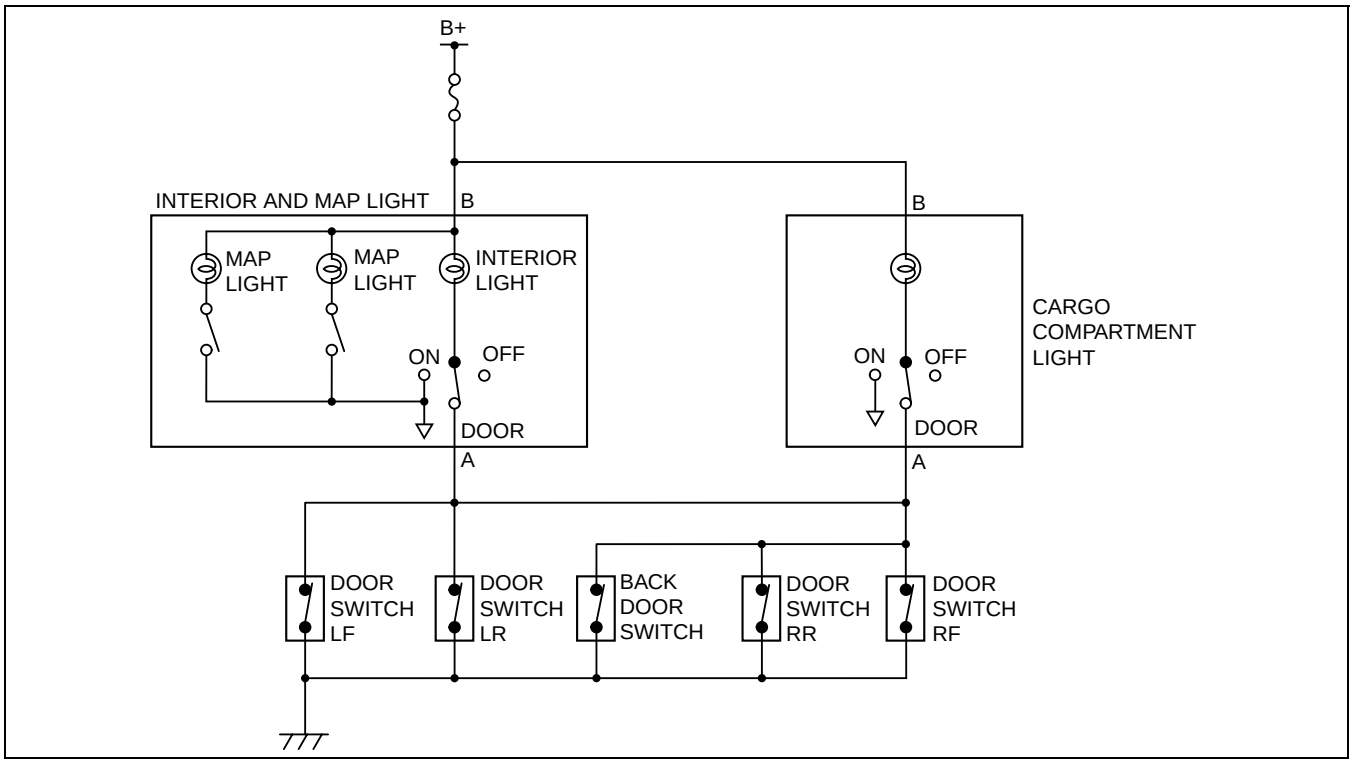
AVF811401053W03



AVF8100T102

SYSTEM WIRING DIAGRAM

AVF811401053W02



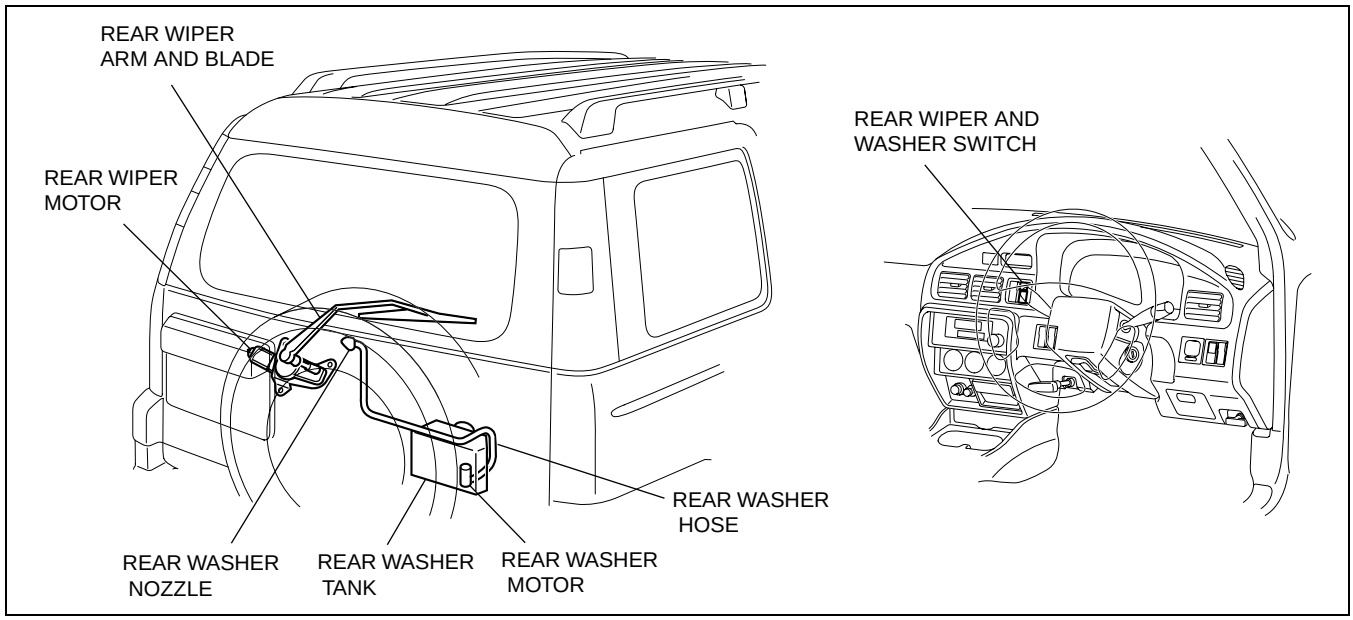
AVF8114T101

T

WIPER AND WASHER

STRUCTURAL VIEW

AVF811601063W02



AVF8100W221

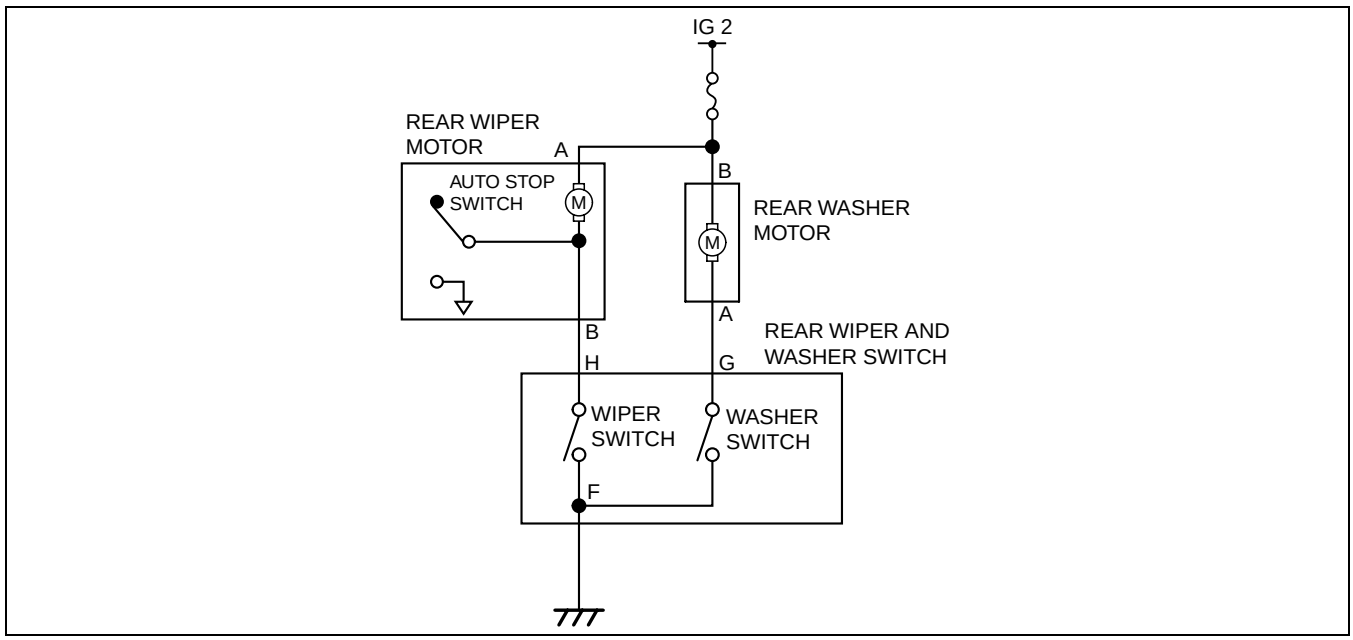
REAR WIPER AND WASHER SYSTEM

AVF811601063W01

Outline

- A rear wiper and washer has been adopted due to a change in the shape of the vehicle rear end.

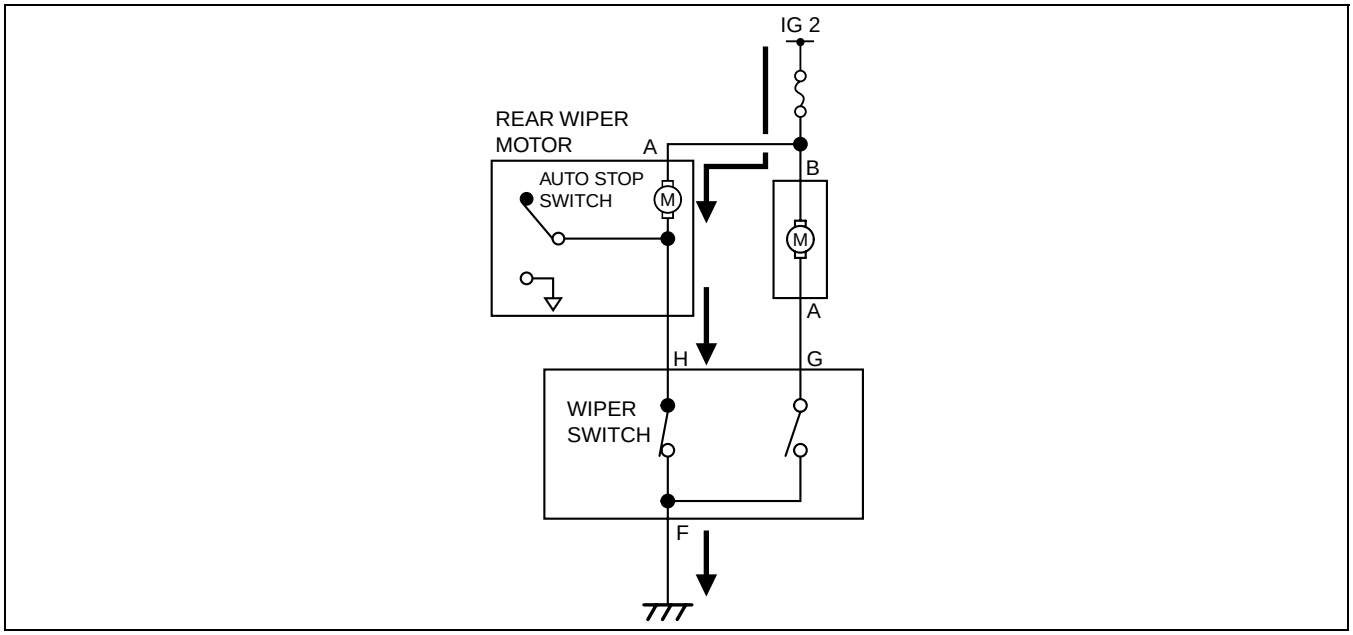
System Wiring Diagram



AVF8116T102

System Operation
Low speed operation

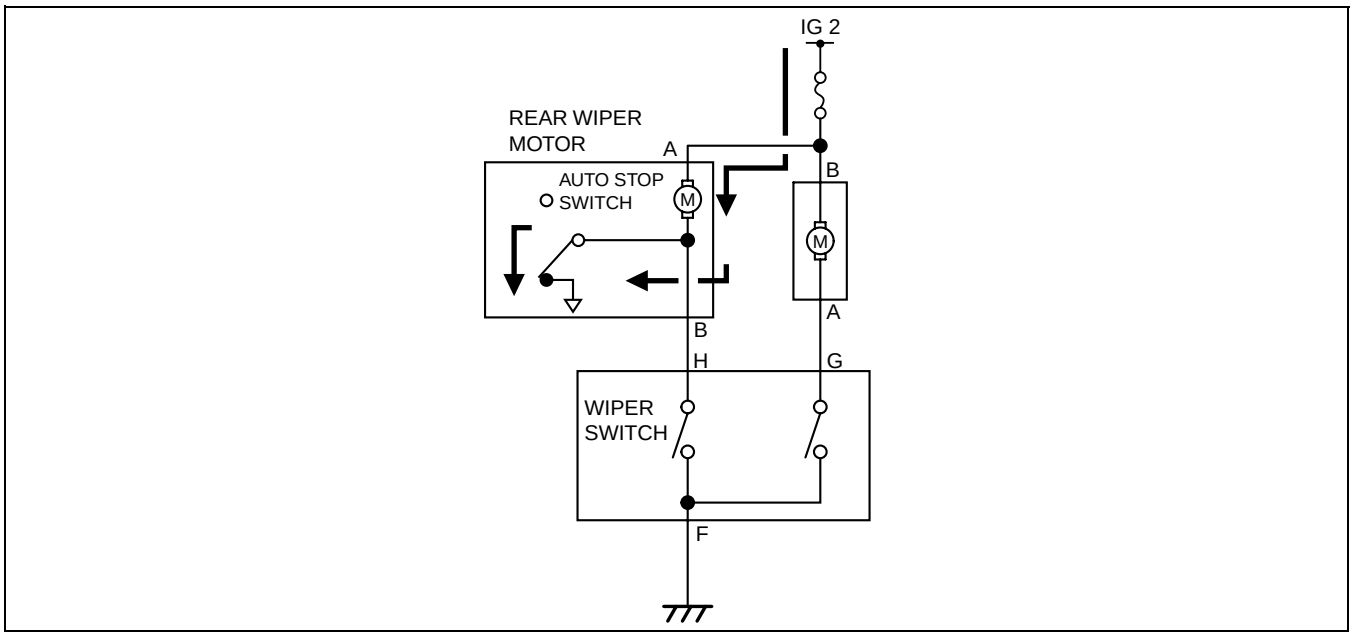
- When the rear wiper switch is turned on, current flows to operate the rear wiper motor continuously.
- When the rear wiper switch is turned off, the auto stop function activates and the rear wiper stops at the park position.



AVF8116T103

Auto stop function

- When the rear wiper switch is turned off while the rear wiper is operating, current flows to the auto stop switch (which is on), and the rear wiper operates until it returns to the park position and then stops.

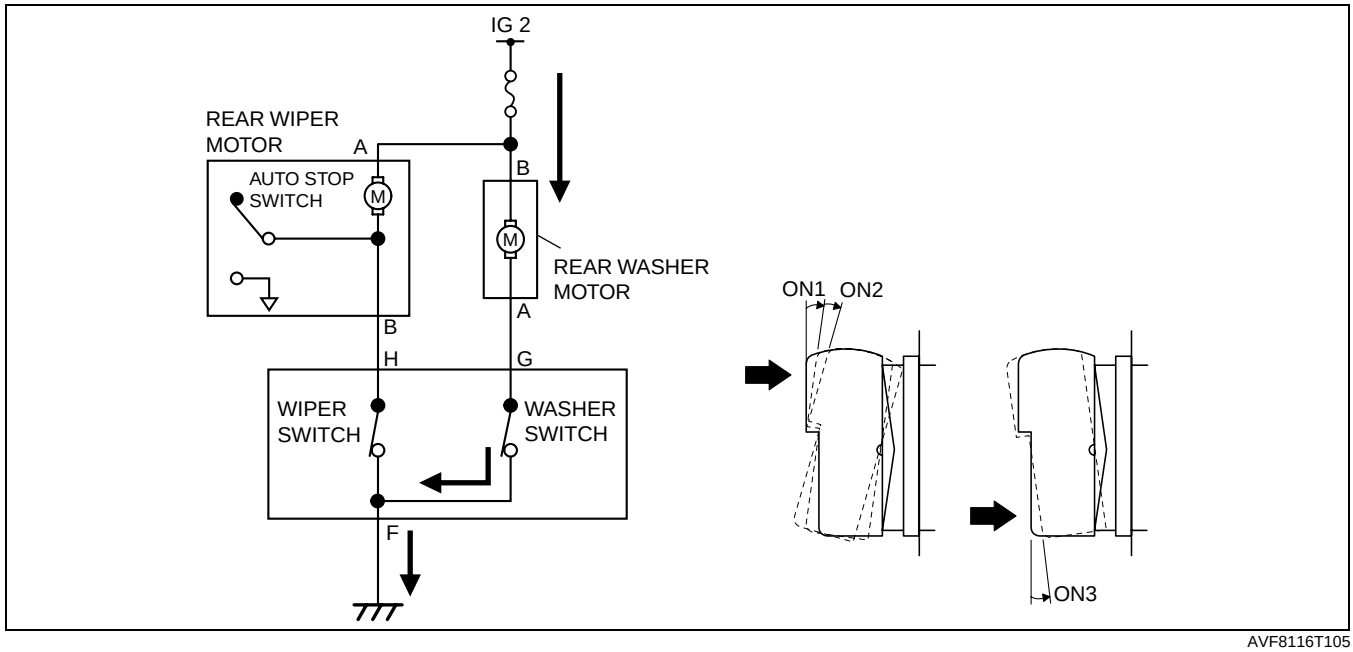


AVF8116T104

T

Washer operation

- When the rear wiper and washer switch is pressed to ON2 while the rear wiper is operating, the rear washer switch turns on, allowing current to flow to the rear washer motor to spray washer fluid. When the rear wiper and washer switch is pressed to ON3 and the rear wiper motor is off, current flows to the rear washer motor to spray washer fluid.

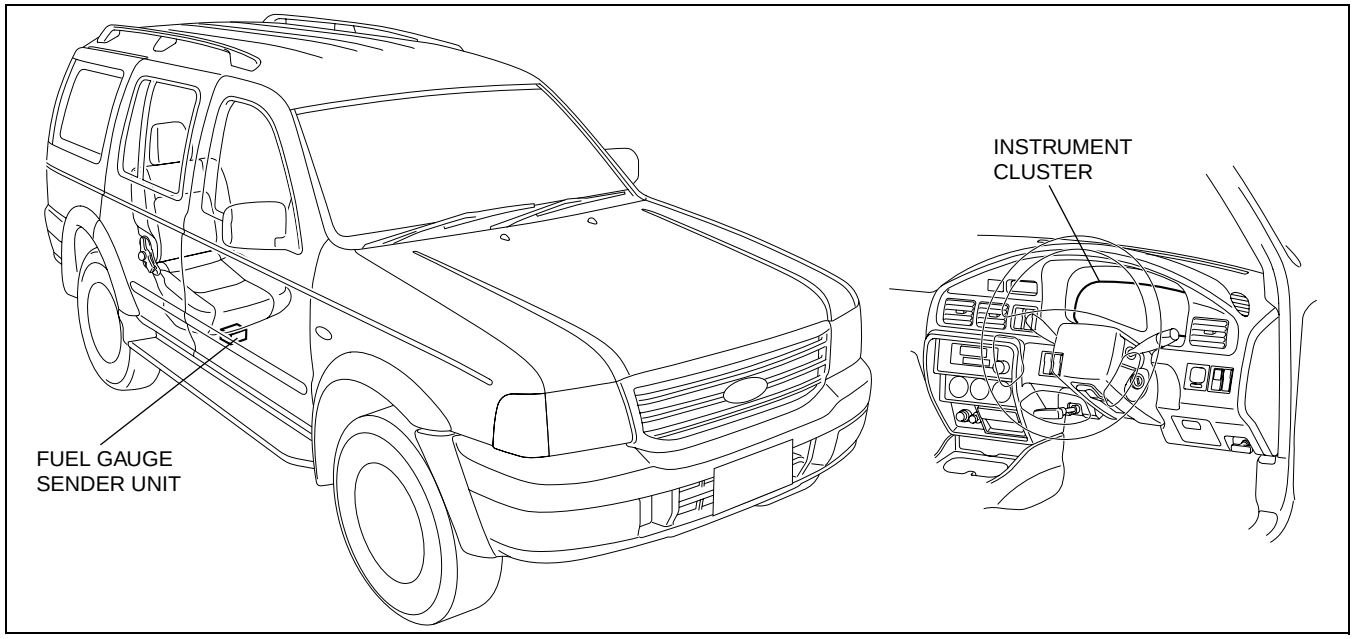


AVF8116T105

WARNING AND INDICATOR SYSTEM

STRUCTURAL VIEW

AVF811855430W02



AVF8100T104

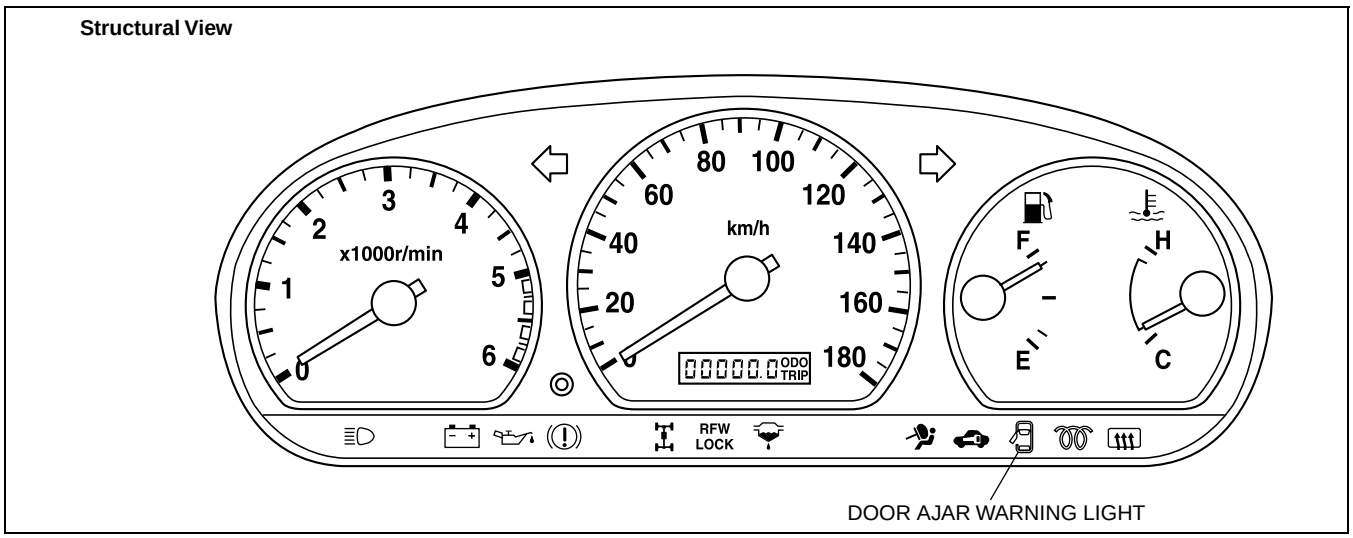
INSTRUMENT CLUSTER

AVF811855430W01

Outline

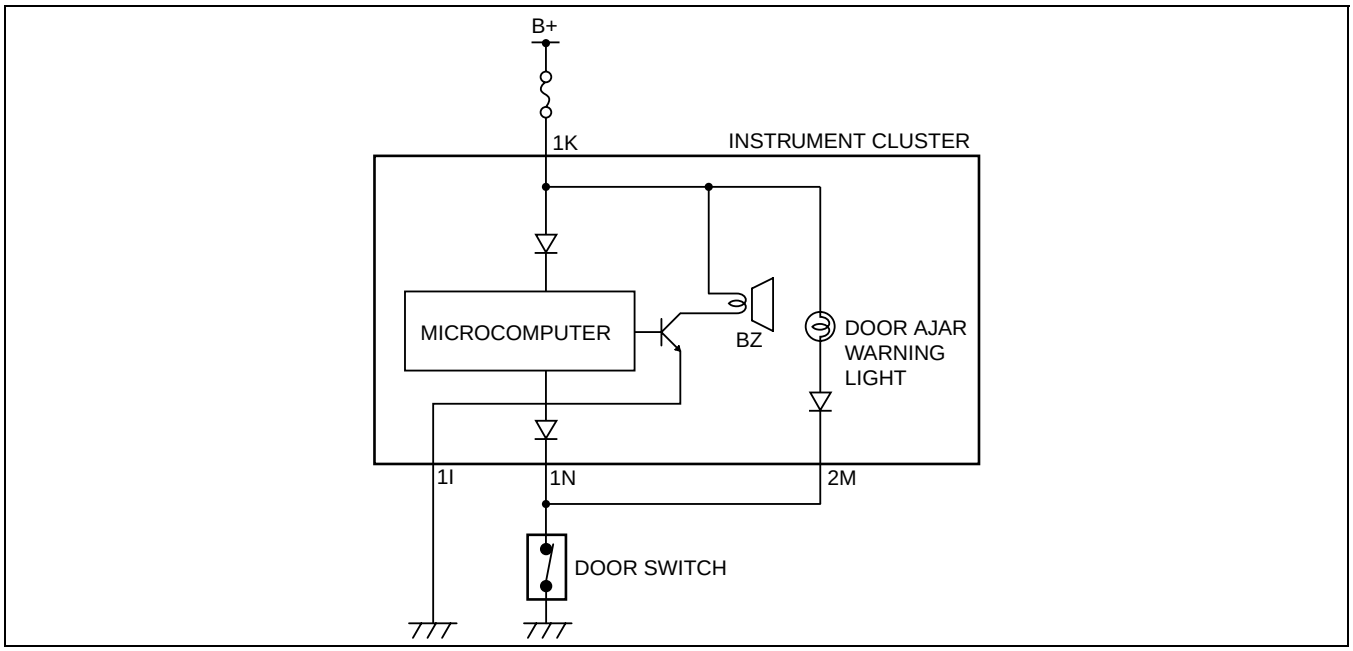
- A door ajar warning light that illuminates to notify the driver when the door is open has been adopted.

Structural View



AVF8118T102

System Wiring Diagram



AVF8118T101

T

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF810201088W03

- The following changes and/or additions have been made since publication of the RANGER Repair Manual (F161-10-99A).

Rear combination light
- Removal/Installation procedure has been modified.

License plate light
- Removal/Installation procedure has been modified.

High-mount brake light
- Removal/Installation procedure has been added.

Back-up light
- Removal/Installation procedure has been modified.

Interior and map light
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Cargo compartment light
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Back door switch
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Rear wiper arm and blade
- Removal/Installation procedure has been added.
- Adjustment procedure has been added.

Rear wiper motor
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Rear washer tank
- Removal/Installation procedure has been added.

Rear washer motor
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Rear washer nozzle
- Removal/Installation procedure has been added.
- Adjustment procedure has been added.

Rear washer hose
- Removal/Installation procedure has been added.

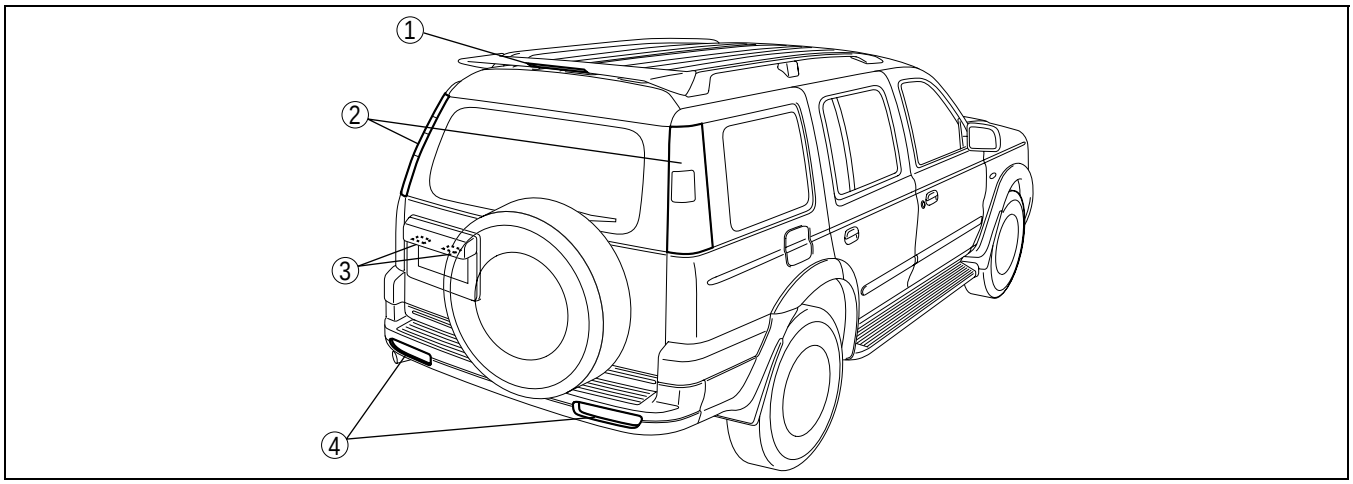
Rear wiper and washer switch
- Removal/Installation procedure has been added.
- Inspection procedure has been added.

Fuel gauge sender unit
- Inspection procedure has been modified.

LOCATION INDEX

LOCATION INDEX EXTERIOR LIGHTING SYSTEM

AVF810001052W01

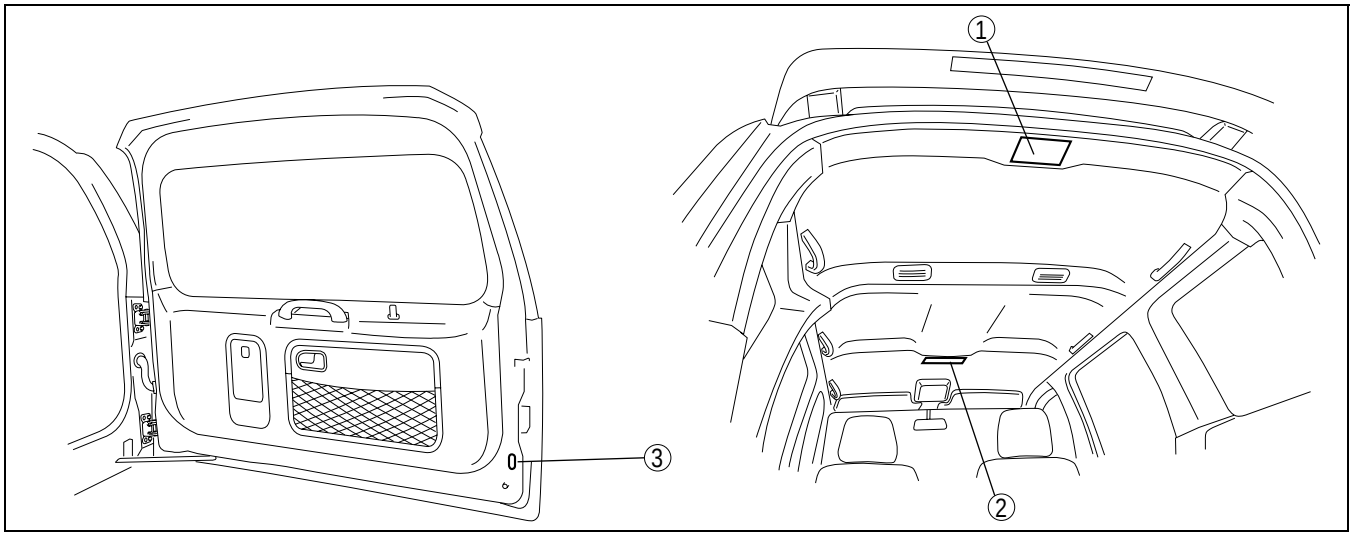


AVF8100W101

1	High-mount brake light (See T–13 HIGH-MOUNT BRAKE LIGHT REMOVAL/INSTALLATION.)
2	Rear combination light (See T–13 REAR COMBINATION LIGHT REMOVAL/INSTALLATION.)
3	License plate light (See T–13 LICENSE PLATE LIGHT REMOVAL/INSTALLATION.)
4	Back-up light (See T–14 BACK-UP LIGHT REMOVAL/INSTALLATION.)

LOCATION INDEX INTERIOR LIGHTING SYSTEM

AVF810001052W02

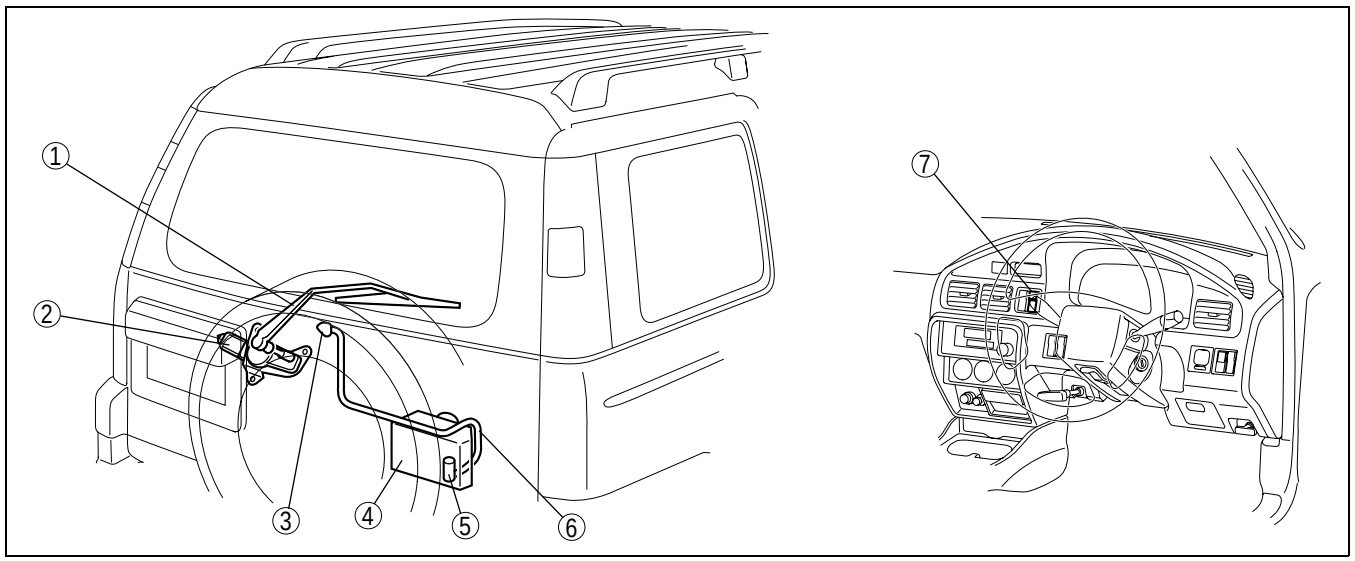


AVF8100W102

1	Cargo compartment light (See T–16 CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION.) (See T–16 CARGO COMPARTMENT LIGHT INSPECTION.)
2	Interior and map light (See T–15 INTERIOR AND MAP LIGHT REMOVAL/INSTALLATION.) (See T–15 INTERIOR AND MAP LIGHT INSPECTION.)
3	Back door switch (See T–16 BACK DOOR SWITCH REMOVAL/INSTALLATION.) (See T–17 BACK DOOR SWITCH INSPECTION.)

LOCATION INDEX WIPER AND WASHER SYSTEM

AVF810001052W03

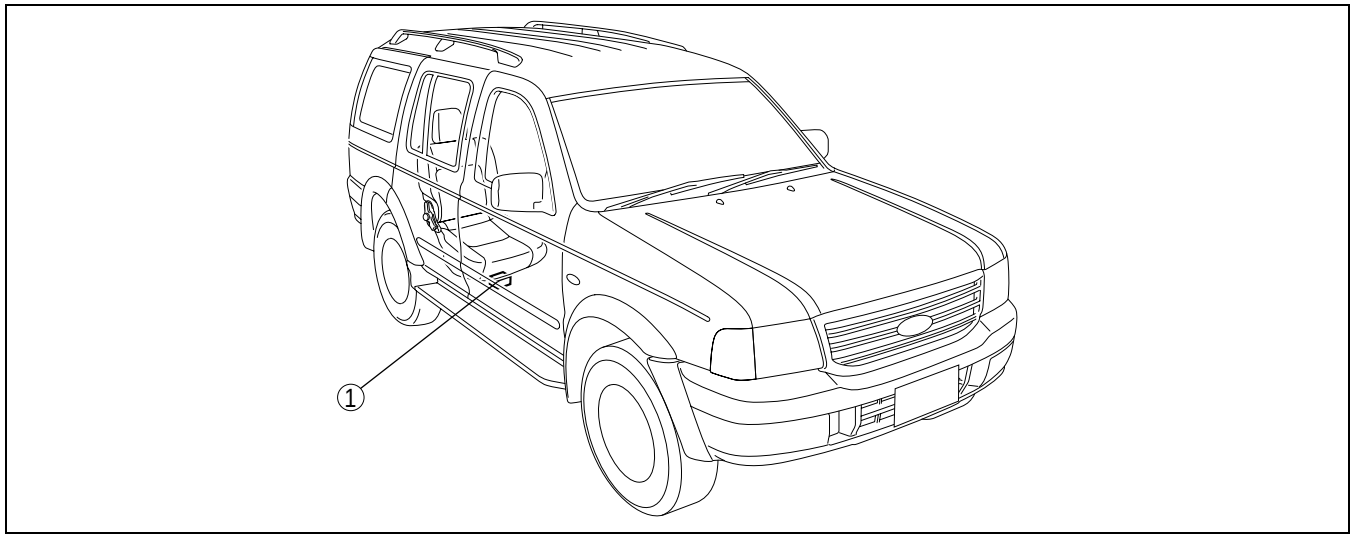


AVF8100W103

1	Rear wiper arm and blade (See T–17 REAR WIPER ARM AND BLADE REMOVAL/INSTALLATION.) (See T–18 REAR WIPER ARM AND BLADE ADJUSTMENT.)
2	Rear wiper motor (See T–18 REAR WIPER MOTOR REMOVAL/INSTALLATION.) (See T–19 REAR WIPER MOTOR INSPECTION.)
3	Rear washer nozzle (See T–21 REAR WASHER NOZZLE REMOVAL/INSTALLATION.) (See T–21 REAR WASHER NOZZLE ADJUSTMENT.)
4	Rear washer tank (See T–20 REAR WASHER TANK REMOVAL/INSTALLATION.)
5	Rear washer motor (See T–20 REAR WASHER MOTOR REMOVAL/INSTALLATION.) (See T–20 REAR WASHER MOTOR INSPECTION.)
6	Rear washer hose (See T–21 REAR WASHER HOSE REMOVAL/INSTALLATION.)
7	Rear wiper and washer switch (See T–22 REAR WIPER AND WASHER SWITCH REMOVAL/INSTALLATION.) (See T–22 REAR WIPER AND WASHER SWITCH INSPECTION.)

LOCATION INDEX WARNING AND INDICATOR SYSTEM

AVF810055430W01



AVF8100W104

1	Fuel gauge sender unit (See T–23 FUEL GAUGE SENDER UNIT INSPECTION.)

EXTERIOR LIGHTING SYSTEM

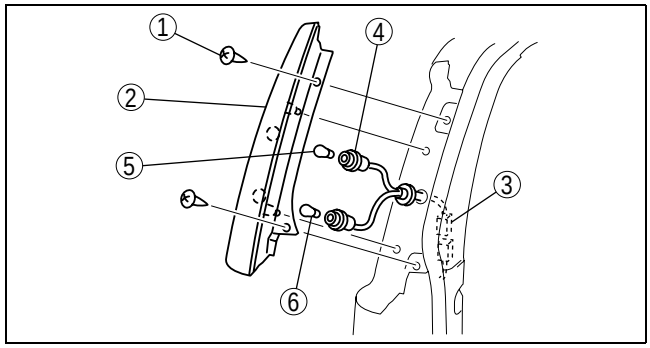
REAR COMBINATION LIGHT REMOVAL/INSTALLATION

AVF811251150W01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Screw
2	Rear combination light
3	Connector
4	Socket
5	Rear turn light bulb
6	Brake light/taillight bulb

3. Install in the reverse order of removal.



AVF8112W101

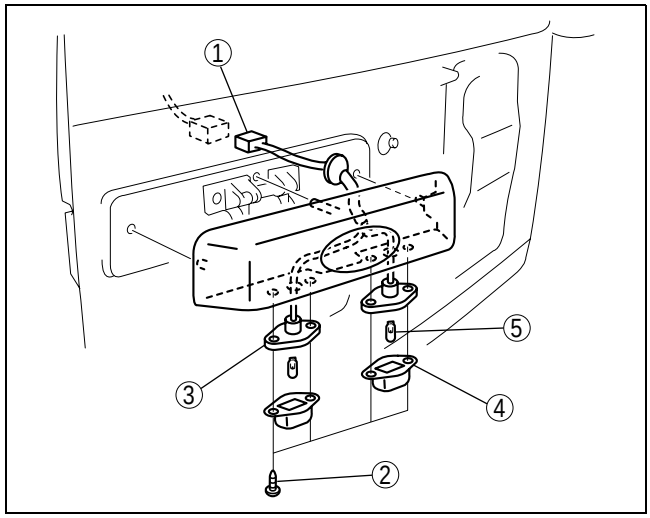
LICENSE PLATE LIGHT REMOVAL/INSTALLATION

AVF811251270W01

1. Disconnect the negative battery cable.
2. Remove the back door garnish.
3. Remove in the order indicated in the table.

1	Connector
2	Screw
3	License plate light
4	Lens
5	License plate light bulb

4. Install in the reverse order of removal.



AVF8112W102

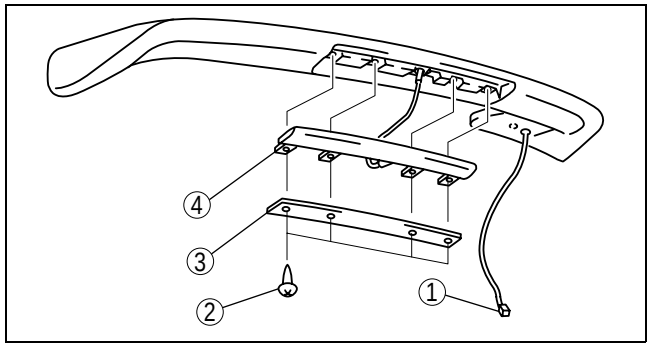
HIGH-MOUNT BRAKE LIGHT REMOVAL/INSTALLATION

AVF811251580W01

1. Disconnect the negative battery cable.
2. Remove the rear spoiler.
3. Remove in the order indicated in the table.

1	Connector
2	Screw
3	Cover
4	High-mount brake light (See T–14 High-Mount Brake Light Removal Note.)

4. Install in the reverse order of removal.

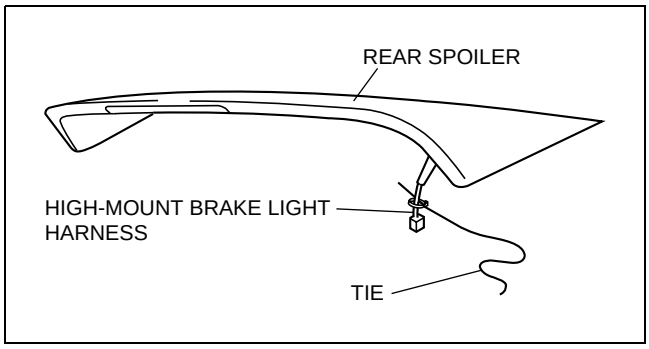


AVF8112W103

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High-Mount Brake Light Removal Note

1. Tie a string to the end of the connector of the high-mount brake light beforehand so that the connector can be passed easily through the rear spoiler during installation.



AVF8112W116

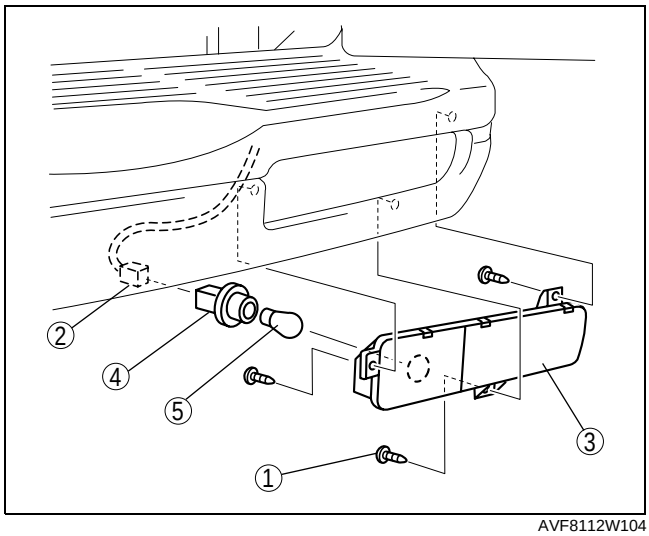
BACK-UP LIGHT REMOVAL/INSTALLATION

AVF811217640W01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Screw
2	Connector
3	Back-up light
4	Socket
5	Back-up light bulb

3. Install in the reverse order of removal.



AVF8112W104

INTERIOR LIGHTING SYSTEM

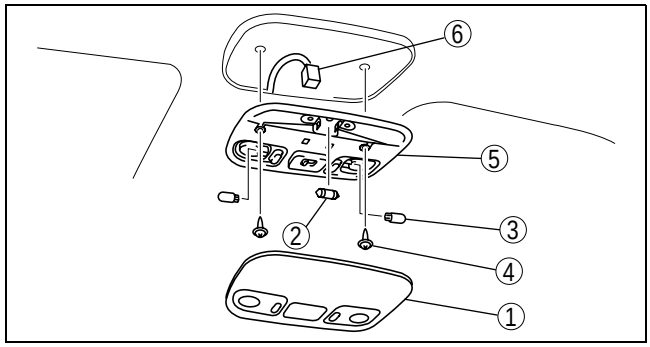
INTERIOR AND MAP LIGHT REMOVAL/INSTALLATION

AVF811401058W01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Lens (See T–15 Lens Removal Note.)
2	Interior light bulb
3	Map light bulb
4	Screw
5	Interior and map light
6	Connector

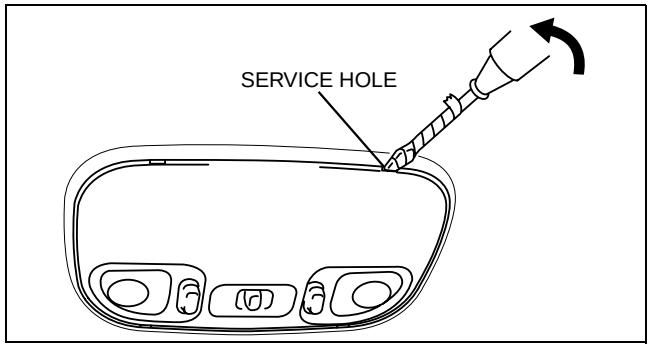
3. Install in the reverse order of removal.



AVF8114W101

Lens Removal Note

1. Insert a tape-wrapped flathead screwdriver into the lens hole.
2. Twist the screwdriver to remove the lens.



AVF8114W112

INTERIOR AND MAP LIGHT INSPECTION

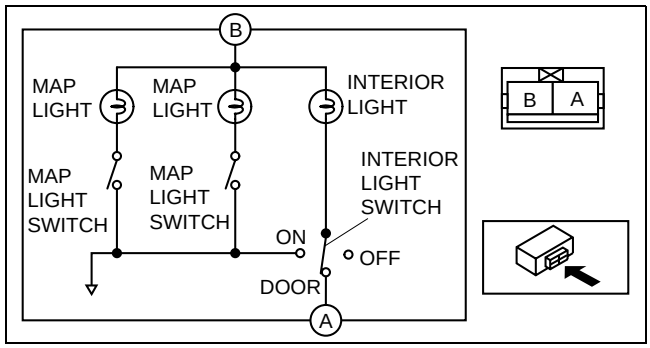
AVF811401058W02

1. Remove the interior and map light. (See T–15 INTERIOR AND MAP LIGHT REMOVAL/INSTALLATION.)
2. Inspect for continuity between the interior and map light terminals using an ohmmeter.
   - If not as indicated in the table, replace the interior and map light.

: Bulb

Switch position		Terminal		
		A	B	Body GND
Map light switch	ON		○—⏠—○	
	OFF			
Interior light switch	ON		○—⏠—○	
	DOOR	○—⏠—○		
	OFF			

AVF8114W103



AVF8114W102

T

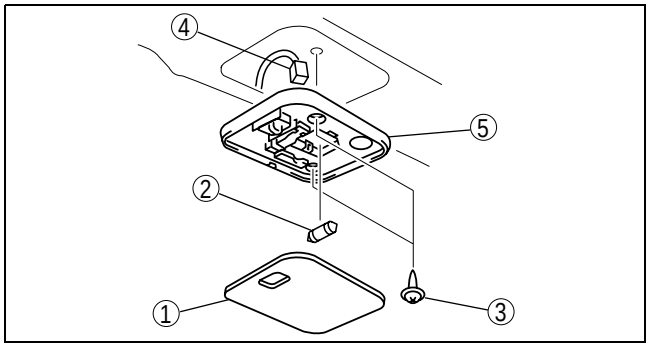
CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION

AVF811451441W01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Lens (See T–16 Lens Removal Note.)
2	Cargo compartment light bulb
3	Screw
4	Connector
5	Cargo compartment light

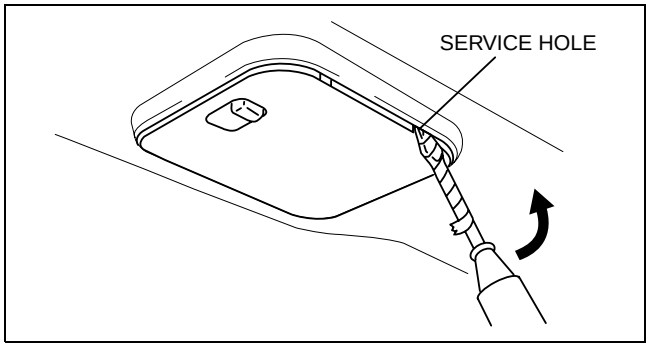
3. Install in the reverse order of removal.



AVF8114W104

Lens Removal Note

1. Insert a tape-wrapped flathead screwdriver into the lens hole.
2. Twist the screwdriver to remove the lens.



AVF8114W113

CARGO COMPARTMENT LIGHT INSPECTION

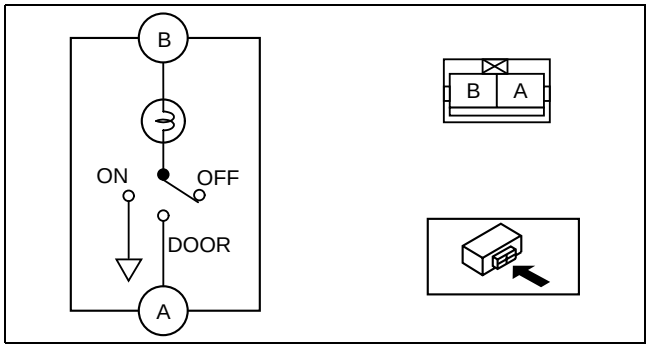
AVF811451441W02

1. Remove the cargo compartment light. (See T–16 CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION.)
2. Inspect for continuity between the cargo compartment light terminals using an ohmmeter.
   - If not as indicated in the table, replace the cargo compartment light.

: Bulb

Switch position	Terminal		
	A	B	Body GND
ON		●	●
DOOR	●	●	
OFF			

AVF8114W109



AVF8114W105

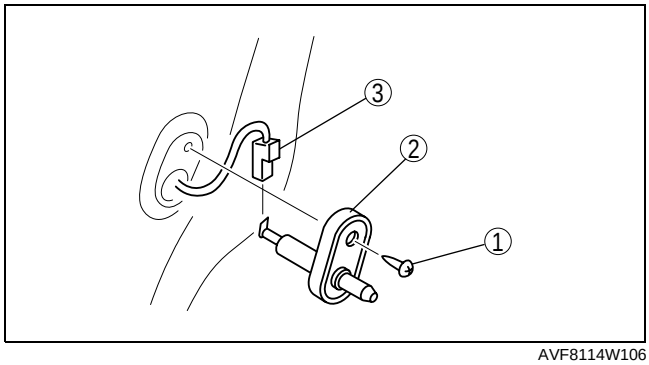
BACK DOOR SWITCH REMOVAL/INSTALLATION

AVF811466540W01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Screw
2	Back door switch
3	Connector

3. Install in the reverse order of removal.



AVF8114W106

BACK DOOR SWITCH INSPECTION

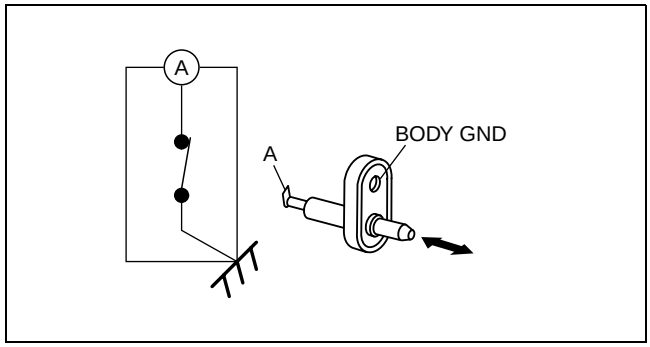
AVF811466540W02

1. Remove the back door switch.
2. Inspect for continuity between back door switch terminal A and a body ground using an ohmmeter.
   - If not as indicated in the table, replace the back door switch.

○—○ : Continuity

Switch condition	Terminal	
	A	Body GND
Pressed		
Released	○	○

AVF8114W108



AVF8114W107

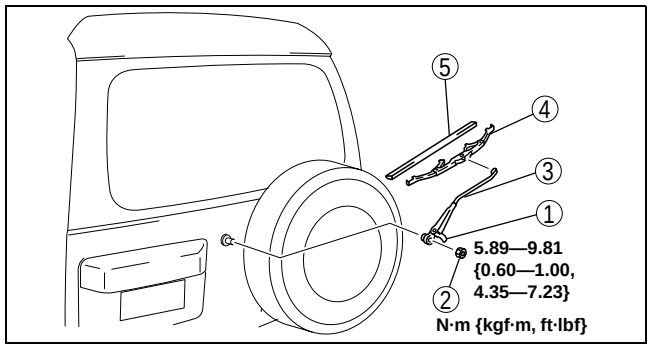
WIPER AND WASHER

REAR WIPER ARM AND BLADE REMOVAL/INSTALLATION

AVF811667420W01

1. Remove in the order indicated in the table.

1	Cap
2	Nut
3	Rear wiper arm (See T–17 Rear Wiper Arm Installation Note.)
4	Rear wiper blade
5	Rubber brush

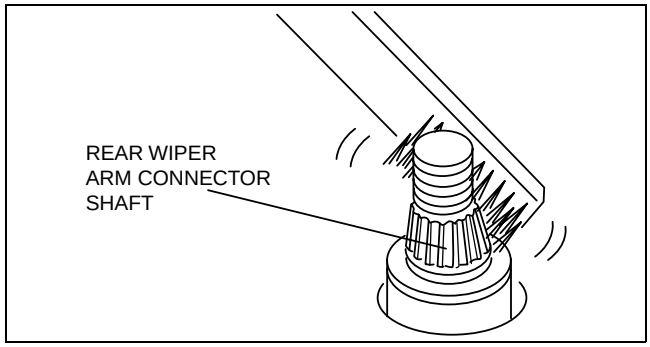


AVF8116W101

2. Install in the reverse order of removal.
3. Adjust the rear wiper arm and blade. (See T–18 REAR WIPER ARM AND BLADE ADJUSTMENT.)

Rear Wiper Arm Installation Note

1. Clean the rear wiper arm connector shaft using a wire brush before installing the rear wiper arm.



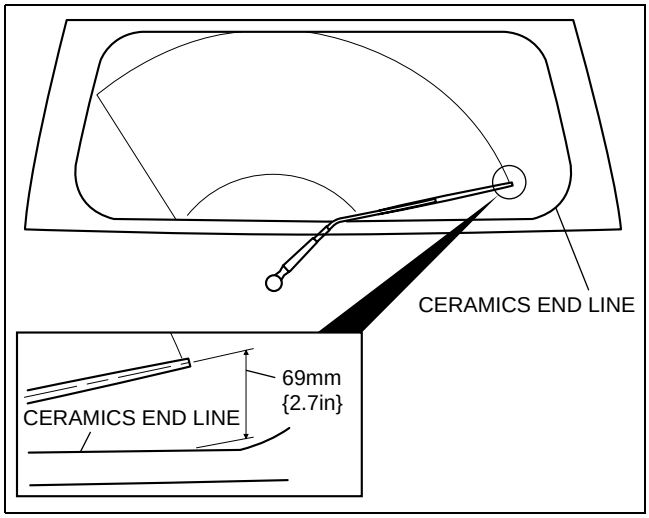
AVF8116W116

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REAR WIPER ARM AND BLADE ADJUSTMENT

AVF811667420W02

1. Operate the rear wiper motor to set the wiper in the park position.
2. Set the rear wiper arm onto the ceramics end line.



AVF8116W102

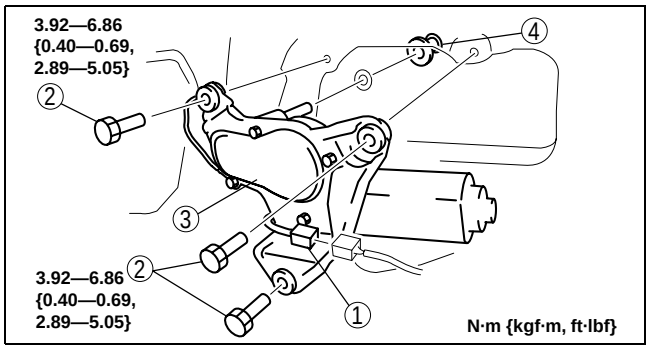
REAR WIPER MOTOR REMOVAL/INSTALLATION

AVF811667450W01

1. Disconnect the negative battery cable.
2. Remove the rear wiper arm and blade. (See T–17 REAR WIPER ARM AND BLADE REMOVAL/INSTALLATION.)
3. Remove the back door lower trim.
4. Remove in the order indicated in the table.

1	Connector
2	Bolt
3	Rear wiper motor
4	Outer bushing

5. Install in the reverse order of removal.
6. Adjust the rear wiper arm and blade. (See T–18 REAR WIPER ARM AND BLADE ADJUSTMENT.)

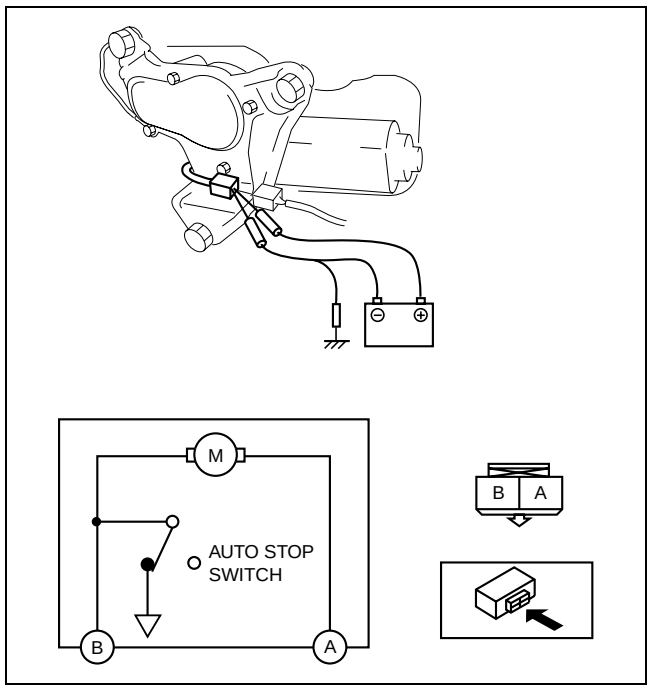


AVF8116W103

REAR WIPER MOTOR INSPECTION

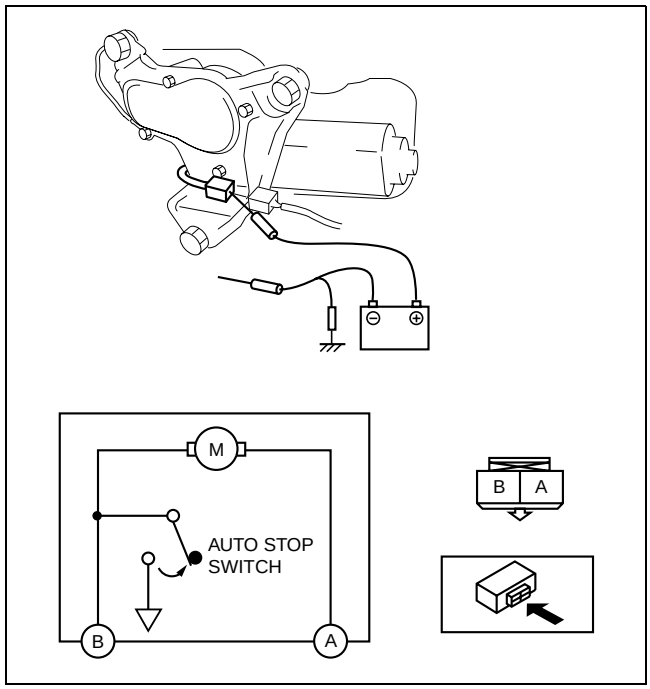
AVF811667450W02

1. Disconnect the negative battery cable.
2. Remove the back door lower trim.
3. Disconnect the rear wiper motor connector.
4. Connect battery positive voltage to the rear wiper motor terminal A and the ground to a bare metal part of the vehicle and the rear wiper motor terminal B.
5. Verify that the rear wiper motor operates.
6. Disconnect the ground to the terminal B while the rear wiper is operating.



AVF8116W104

7. Verify that the rear wiper stops in the park position.
   - If not as indicated, replace the rear wiper motor.



AVF8116W105

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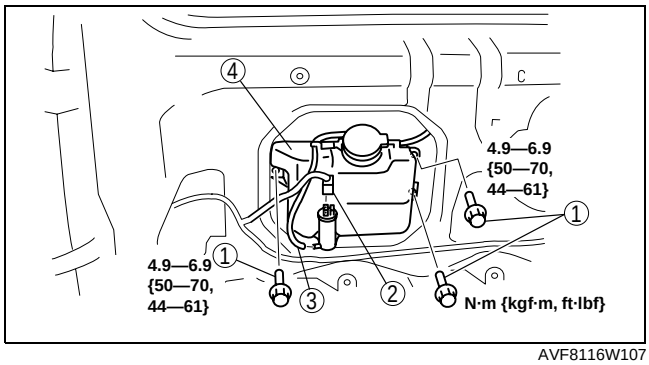
REAR WASHER TANK REMOVAL/INSTALLATION

AVF811667480W01

1. Disconnect the negative battery cable.
2. Remove the back door lower trim.
3. Remove in the order indicated in the table.

1	Bolt
2	Connector
3	Washer hose
4	Washer tank

4. Install in the reverse order of removal.



AVF8116W107

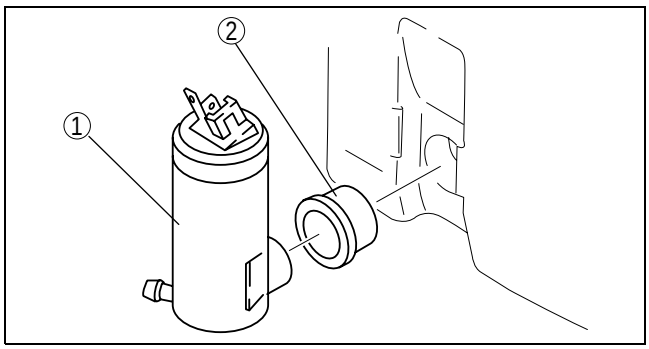
REAR WASHER MOTOR REMOVAL/INSTALLATION

AVF811676672W01

1. Disconnect the negative battery cable.
2. Remove the rear washer tank.
3. Remove in the order indicated in the table.

1	Rear washer motor
2	Grommet

4. Install in the reverse order of removal.

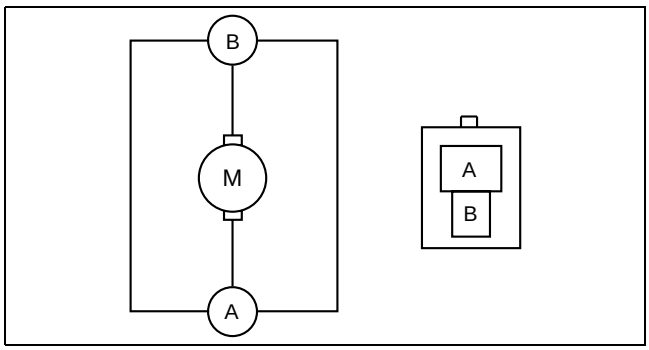


AVF8116W108

REAR WASHER MOTOR INSPECTION

AVF811676672W02

1. Disconnect the negative battery cable.
2. Remove the rear washer tank.
3. Connect battery positive voltage to the terminal B and ground to the terminal A of the motor.
4. Verify that the rear washer motor operates.
   - If the motor does not operate, replace the rear washer motor.

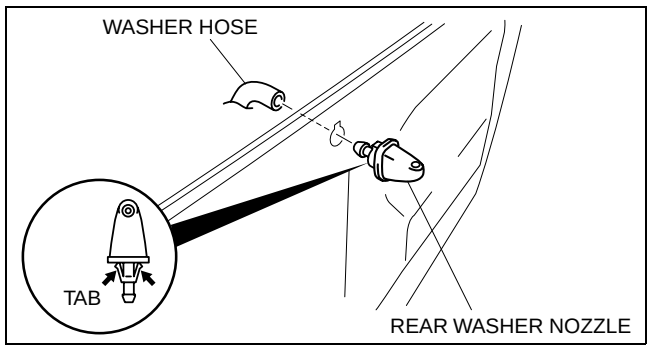


AVF8116W109

REAR WASHER NOZZLE REMOVAL/INSTALLATION

AVF811667511W01

1. Disconnect the negative battery cable.
2. Remove the back door lower trim.
3. Remove the rear wiper motor.
4. Remove the rear washer hose form the rear washer nozzle.
5. Squeeze the tabs of the rear washer nozzle.
6. Pull the rear washer nozzle out to remove it.
7. Install in the reverse order of removal.
8. Adjust the rear washer nozzle. (See T–21 REAR WASHER NOZZLE ADJUSTMENT.)

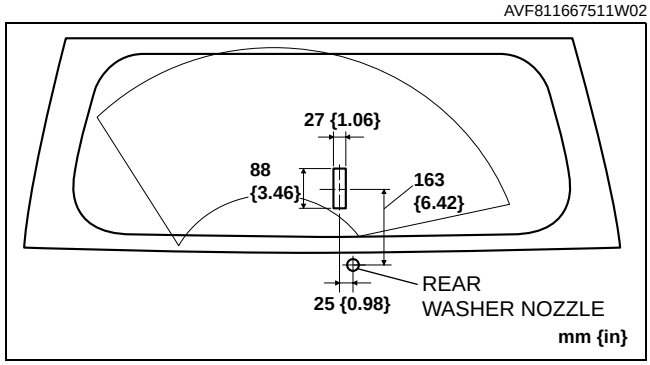


AVF8116W110

REAR WASHER NOZZLE ADJUSTMENT

AVF811667511W02

1. Insert a needle or an equivalent tool into the spray hole of the rear washer nozzle and adjust the nozzle direction as shown.

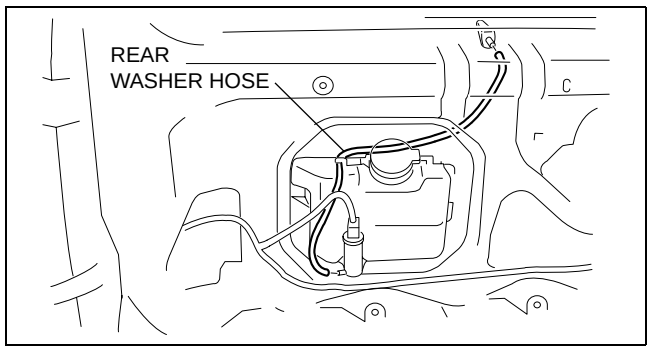


AVF8116W111

REAR WASHER HOSE REMOVAL/INSTALLATION

AVF811667470W01

1. Disconnect the negative battery cable.
2. Remove the back door lower trim.
3. Remove the washer hose.
4. Install in the reverse order of removal.



AVF8116W112

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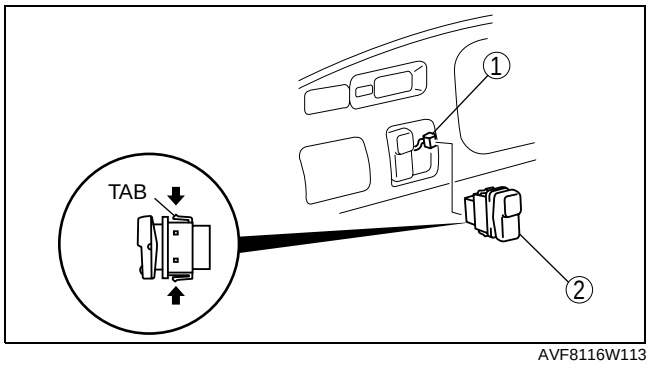
REAR WIPER AND WASHER SWITCH REMOVAL/INSTALLATION

AVF811666122W01

1. Disconnect the negative battery cable.
2. Remove the meter hood.
3. Remove in the order indicated in the table.

1	Connector
2	Wiper and washer switch

4. Install in the reverse order of removal.



AVF8116W113

REAR WIPER AND WASHER SWITCH INSPECTION

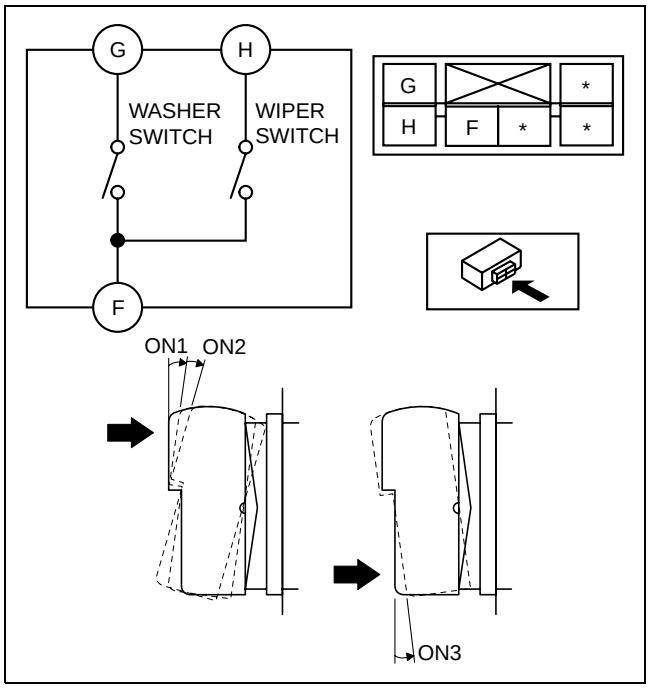
AVF811666122W02

1. Remove the wiper and washer switch.
2. Inspect for continuity between the wiper and washer switch terminals using an ohmmeter.
   - If not as indicated in the table, replace the wiper and washer switch.

○—○ : Continuity

Switch position	Terminal		
	F	G	H
ON 1 (Wiper)	○		○
ON 2 (Wiper and washer)	○	○	○
OFF			
ON 3 (Washer)	○	○	

AVF8116W115



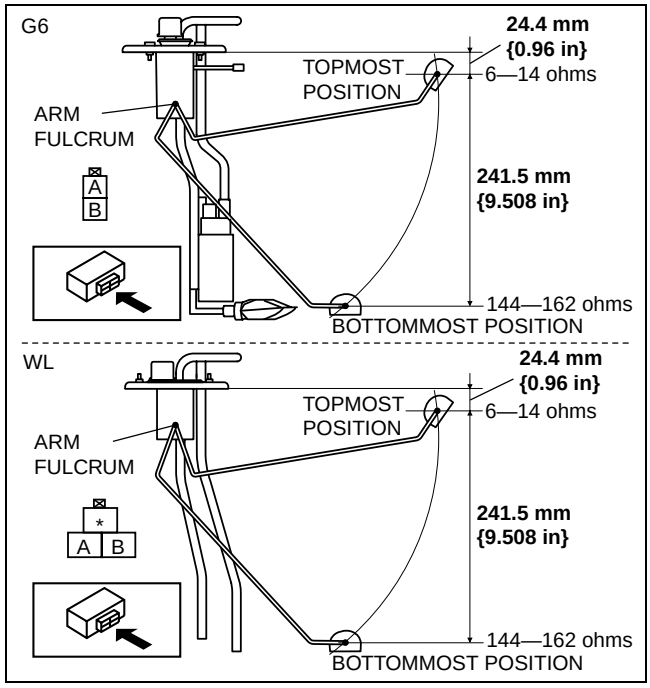
AVF8116W114

WARNING AND INDICATOR SYSTEM

FUEL GAUGE SENDER UNIT INSPECTION

1. Move the float to the topmost and bottommost positions, and verify that the resistance between terminals A and B of the unit and the position of the float are as indicated in the figure.
   - If they are not as indicated, replace the fuel gauge sender unit.

AVF811860960W01



AVF8118W101

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HEATER AND AIR CONDITIONER SYSTEMS

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OUTLINE

OUTLINE OF CONSTRUCTION

AVF850201038W01

- The construction and operation of the heater and air conditioner system is essentially carried over from that of the current RANGER model, except for the following features. (See RANGER Training Manual.)

FEATURES

AVF850201038W02

Improved comfort

- A reusable air filter has been adopted. (Type B)
- A climate control unit with rear A/C main switch has been adopted. (Type B)
- A climate control unit with rear A/C switch has been adopted. (Type A)

Improved quality

- A rear cooling system has been added.

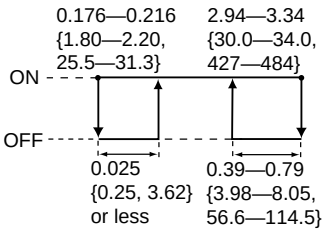
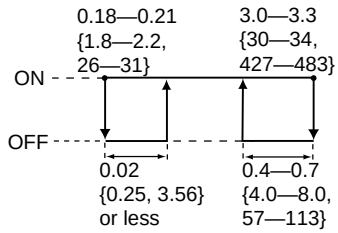
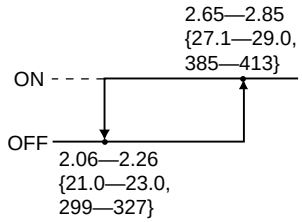
Improved air conditioning performance

- A sub-cooling system integrating the condenser and receiver drier has been adopted to facilitate evaporator operation. This system also reduces the number of parts and amount of refrigerant.

SPECIFICATIONS

AVF850201038W03

Item			Specification	
			EVEREST	Current RANGER
Heating capacity		(kW {kcal/h})	4.186 {3,600}	
Airflow volume (during heater operation)	Front blower motor	(m^3/h)	260	
Electricity consumption (during heater operation)	Front blower motor	(W)	221	
Cooling capacity	Front	(kW {kcal/h})	4.012 {3,450}	
	Rear	(kW {kcal/h})	2.400 {2,064}	–
Airflow volume (during air conditioner operation)	Front blower motor	(m^3/h)	450	
	Rear blower motor	(m^3/h)	240	–
Electricity consumption (during air conditioner operation)	Front blower motor	(W)	220	
	Rear blower motor	(W)	145	–
	Magnetic clutch	(W)	40 or less	48:G6, WL, WL Turbo 38:F2, F2 Cab
	Condenser fan*	(W)	65	–
Fan type	Front and rear blower motor		Sirocco fan	
	Condenser fan*		Axial flowed fan	–
Refrigerant	Type		R-134a	
	Regular amount (approximate quantity)	(g {oz})	675 {23.8}	550 {19.4}
A/C compressor	Type		Swash plate	
	Discharge capacity	(ml {cc, fl oz})	180 {180, 6.08}	154 {154, 5.16}:G6, WL, WL Turbo 147 {147, 4.97}:F2, F2 Cab
	Max. allowable speed	(rpm)	7,000	
	Lube oil: Type		FD46XG	FD46XG:G6, WL, WL ZXL 100PG:F2, F2 Cab
	Lube oil: Sealed volume (approximate quantity)	(ml {cc, fl oz})	180 {180, 6.08}	
	Magnetic clutch clearance	(mm {in})	0.35—0.75 {0.014—0.029}	0.3—0.6 {0.012—0.023}

Item			Specification	
			EVEREST	Current RANGER
Condenser	Type		Multiflow (sub-cooling type)	Multiflow
	Radiated heat (kW {kcal/h})		5.35 {4,600}	9.36 (8,050)
	Receiver/drier capacity (ml {cc, fl oz})		220 {220, 7.44}	250 {250, 8.45}
	Desiccant		XH-7	Synthetic zeolite
Expansion valve	Type	Front	Internal pressure equalizer	
		Rear	Internal pressure equalizer	–
Evaporator	Type	Front	Single-tank drawn cup	
		Rear	Single-tank drawn cup	–
Refrigerant pressure switch	Type		Dual-pressure	
	Operating pressure (MPa {kgf/cm^2, psi})			
	Type		Single-pressure	–
	Operating pressure (MPa {kgf/cm^2, psi})			
Fusible plug	Melting point °C{°F}		–	102—107{216—224}

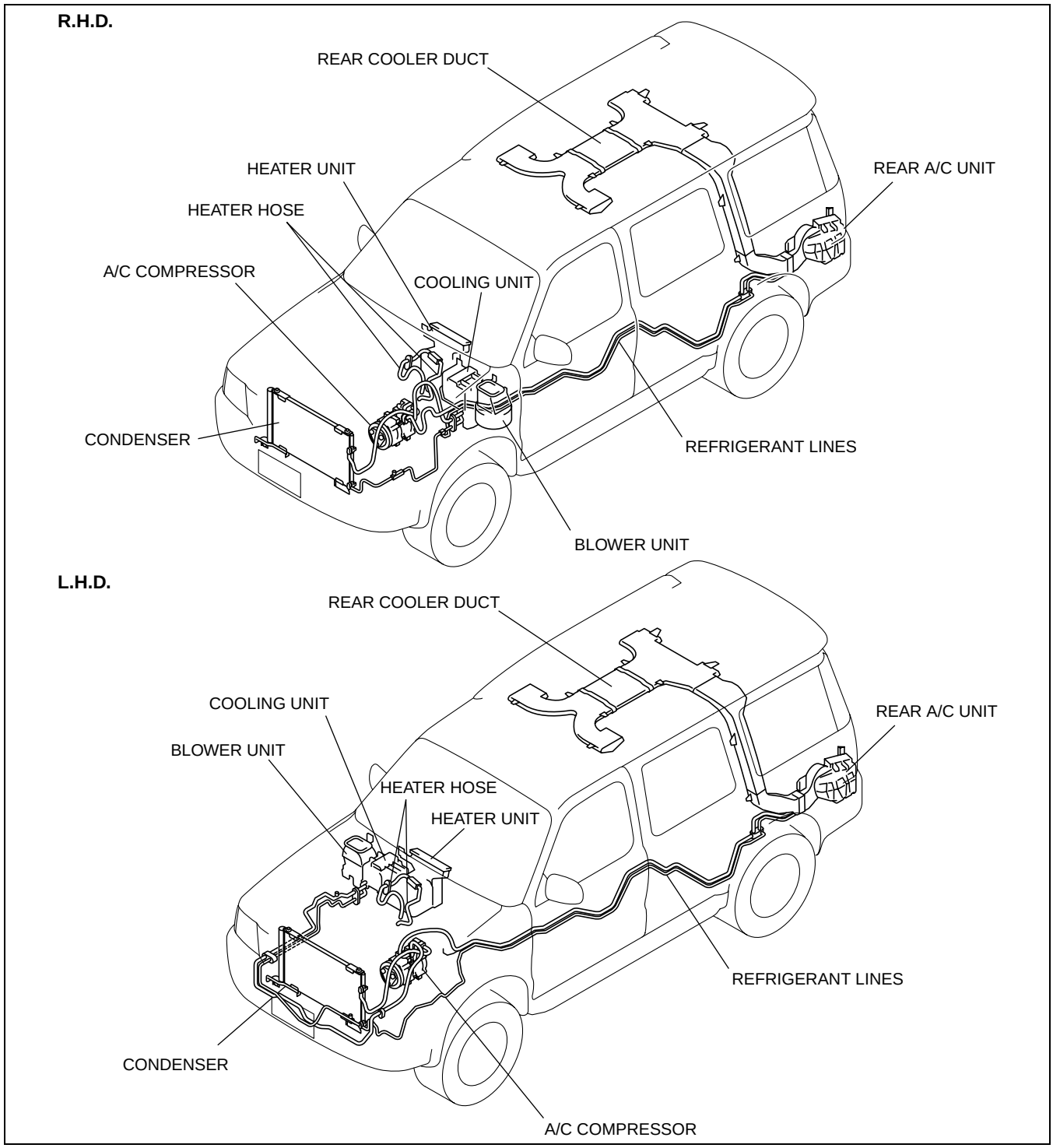
* : For coastal areas and other places with intense heat

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BASIC SYSTEM

BASIC SYSTEM

AVF851601040W01

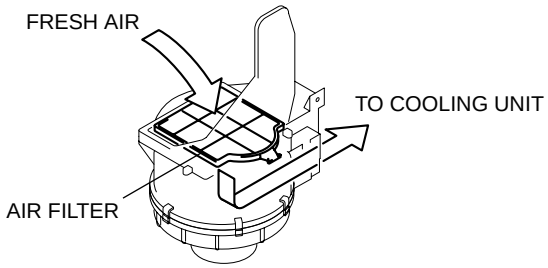


AVF8500W002

AIR FILTER

AVF851613988W01

- An air filter that can be reused after cleaning has been adopted.
- An air filter that can remove pollen and dust has been added.



AVF8516W007

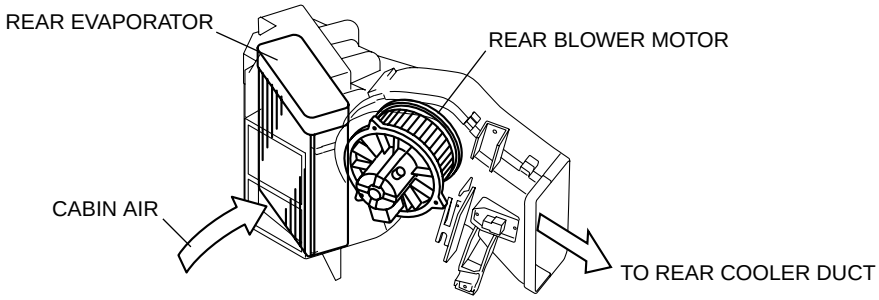
REAR A/C UNIT

AVF851661130W01

- The rear A/C unit which integrates the rear cooling and rear blower units has been adopted.

Airflow Operation

- When the rear blower motor is operated, the air in the cabin is drawn into the rear A/C unit, cooled in the rear evaporator, and then blown from the rear vents through the rear cooler duct into the cabin.



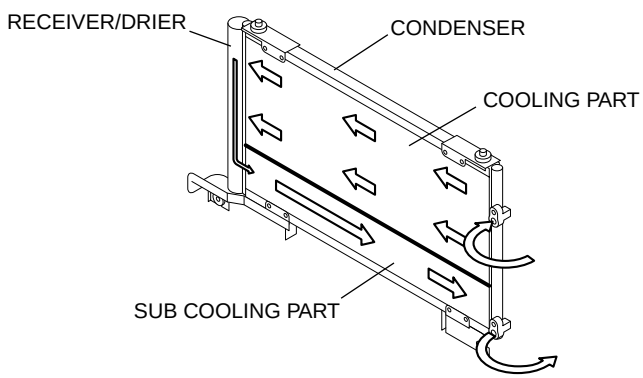
AVF8516W012

CONDENSER

AVF851661480W01

Construction

- A sub cool condenser has been adopted. It is a multi-flow condenser which is equipped with a sub cooling part and integrated with a receiver/drier.
- The sub cool condenser separates liquid-gas refrigerant initially cooled at the condenser via the receiver/drier, where it returns again to the condenser sub cooling part and is cooled, accelerating liquefaction and improving cooling capacity.



AVF8516W001

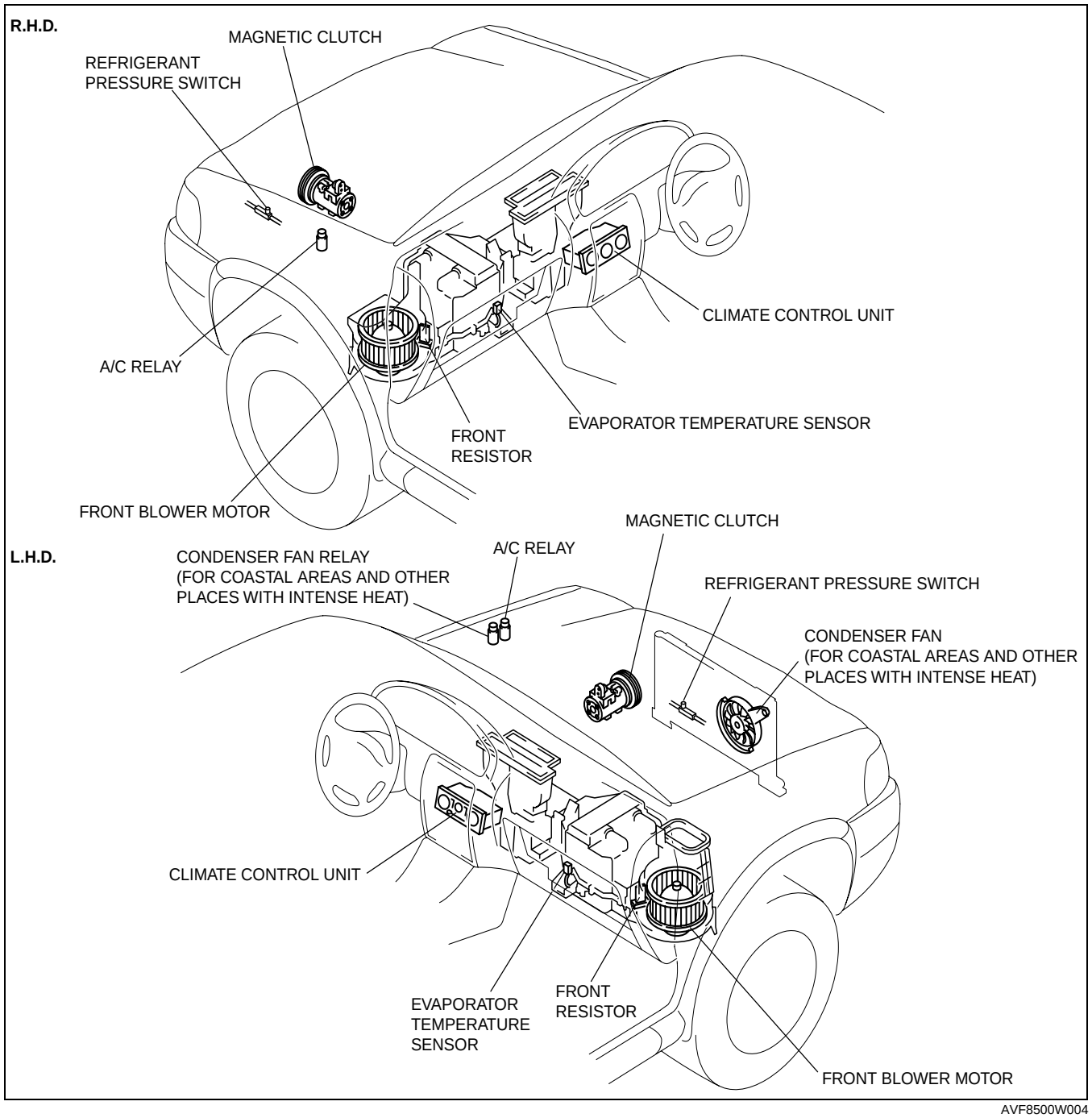
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CONTROL SYSTEM

CONTROL SYSTEM

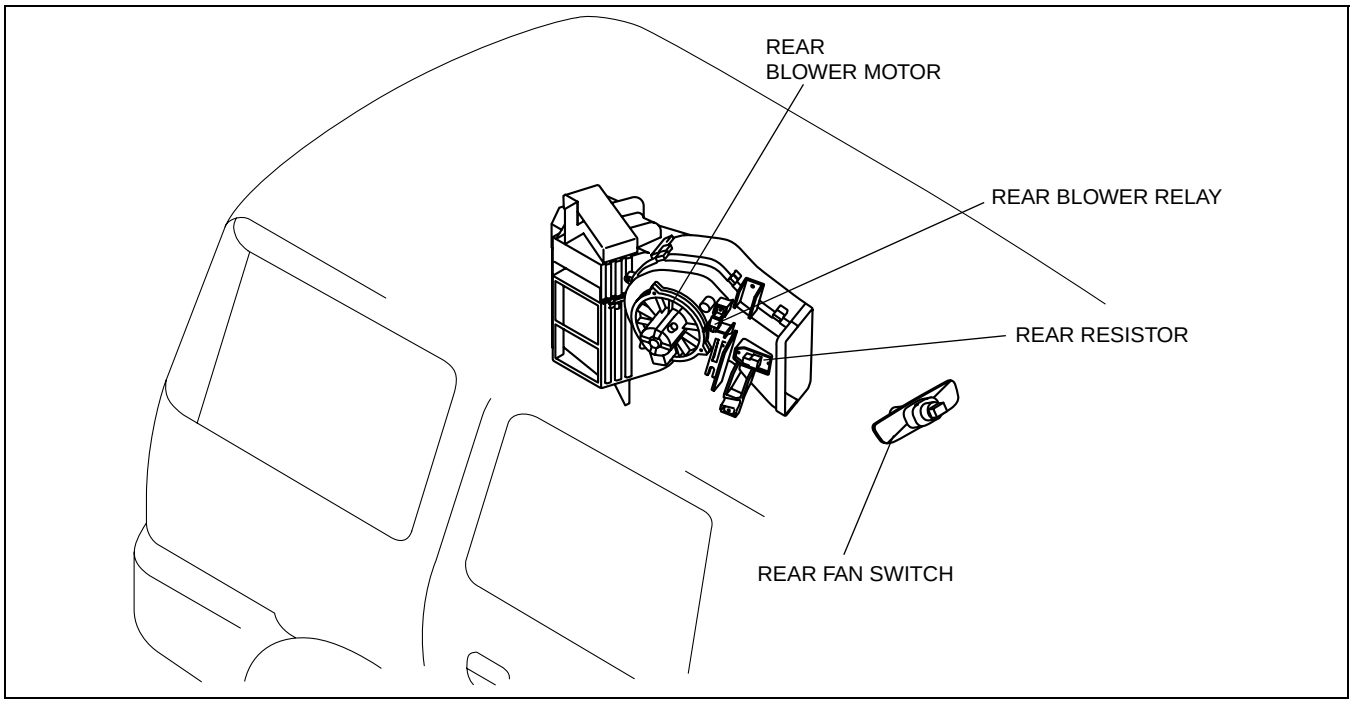
AVF854001042W01

FRONT



AVF8500W004

REAR



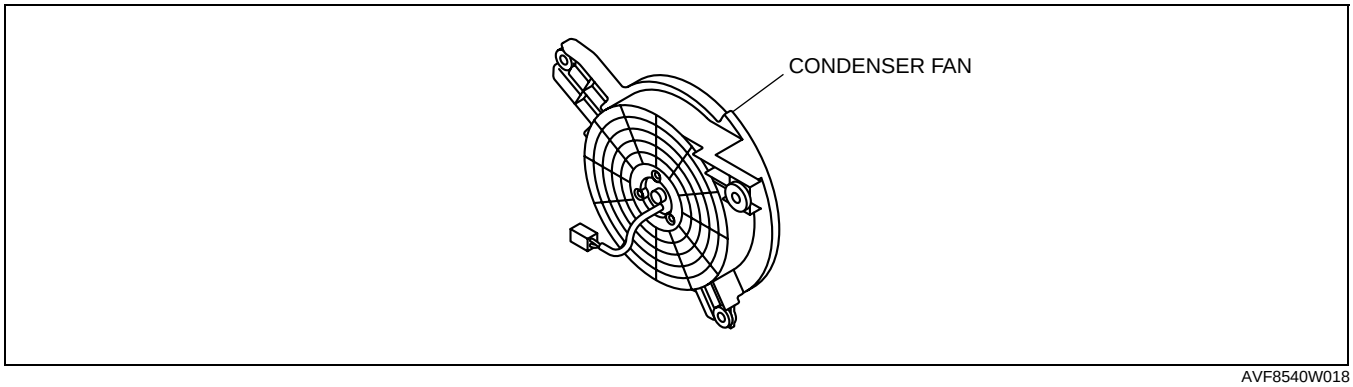
AVF8500W001

CONDENSER FAN

AVF854061190W01

For Coastal Areas And Other Places With Intense heat

- The condenser fan cools the condenser to facilitate coolant liquefaction.



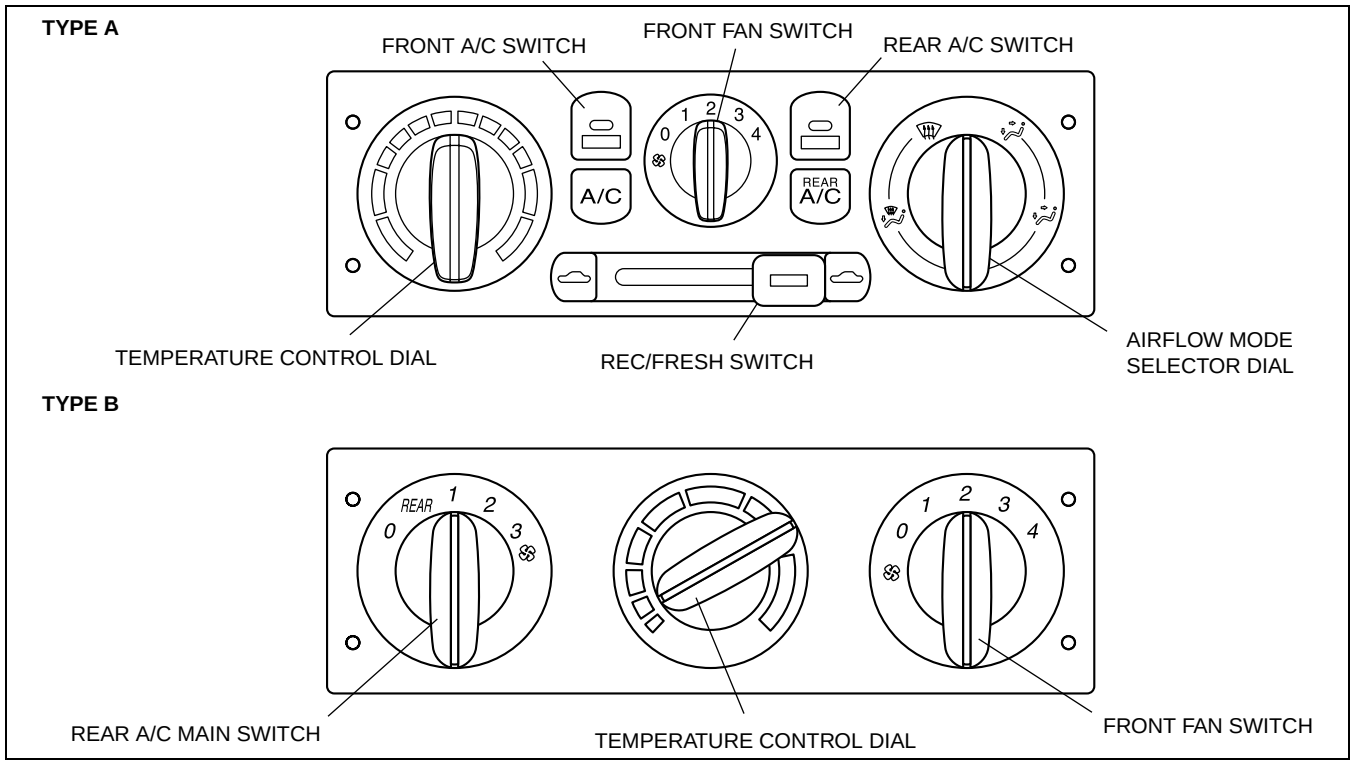
AVF8540W018

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CLIMATE CONTROL UNIT

AVF854061190W02

- A climate control unit with a built-in rear A/C switch has been adopted. (Type A)
- A climate control unit with a built-in rear A/C main switch has been adopted. (Type B)
- The micro switch has been eliminated, and the A/C is turned on by turning the front fan switch on. (Type B)



AVF8540W019

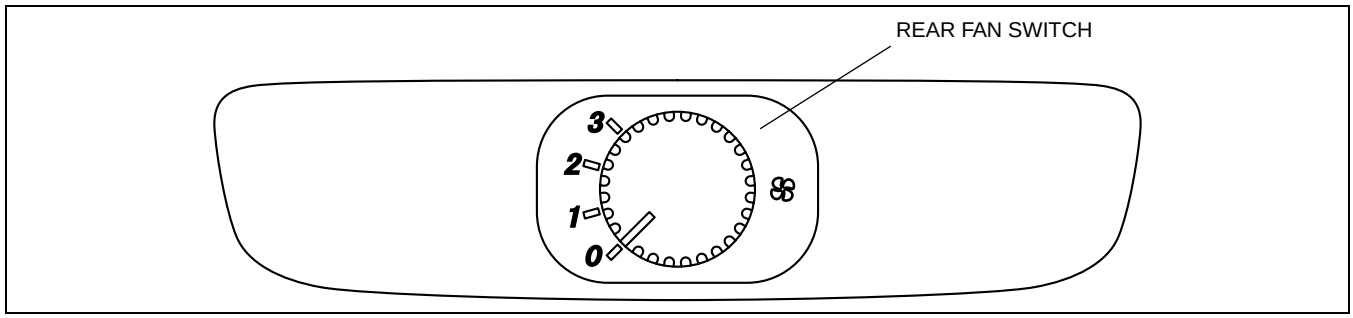
Rear A/C Main Switch (Type B)

- Air volume to the rear part of the cabin can be controlled using the rear A/C main switch. However, when the rear A/C main switch is turned to the “REAR” position, air volume to the rear part of the cabin is controlled by the rear fan switch.

REAR FAN SWITCH

AVF854061190W03

- The rear fan switch is located on the roof above the second-row seat and controls the air volume to the rear part of the cabin.



AVF8540W023

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

AVF850201038W04

- The following changes and additions, or both have been made since publication of the RANGER Repair Manual.

Refrigerant
- Charging procedure has been modified.

Blower unit (Type B)
- Disassembly/assembly procedure has been modified.

Air filter
- Removal/installation procedure has been added.
- Inspection procedure has been added.

Rear A/C unit
- Removal/installation procedure has been added.
- Disassembly/assembly procedure has been added.

Rear evaporator
- Inspection procedure has been added.

A/C compressor
- Removal/installation procedure has been modified.

Condenser
- Removal/installation procedure has been modified.

Rear cooler duct
- Removal/installation procedure has been added.

Refrigerant lines
- Removal/installation procedure has been modified.

Rear blower motor
- Removal/installation procedure has been added.
- Inspection procedure has been added.

Rear resistor
- Removal/installation procedure has been added.
- Inspection procedure has been added.

Condenser fan (For coastal areas and other places with intense heat)
- Removal/installation procedure has been added.
- Inspection procedure has been added.

Refrigerant pressure switch
- Removal/installation procedure has been modified.
- Inspection procedure has been modified.

Climate control unit
- Removal/installation procedure has been modified.
- Disassembly/assembly procedure has been modified.

Rear fan switch
- Removal/installation procedure has been added.
- Disassembly/assembly procedure has been added.
- Inspection procedure has been added.

Air conditioning system
- Troubleshooting procedure has been modified.

REFRIGERANT SYSTEM SERVICE PROCEDURES

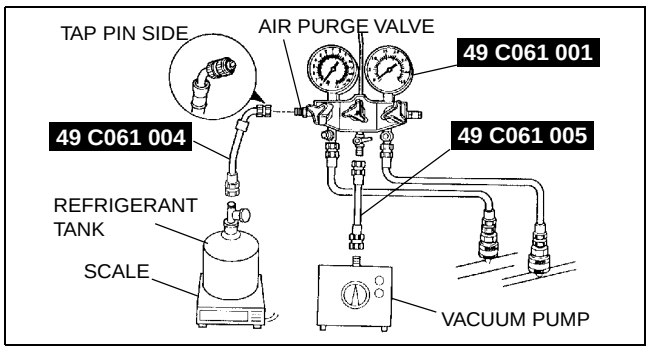
CHARGING

AVF851478834W02

Caution
- **Do not exceed the specification when charging the system with refrigerant. Doing so will decrease the efficiency of the air conditioner or damage the refrigeration cycle parts.**

Charging Recycled R-134a Refrigerant
1. Connect an R-134a recovery/recycling/recharging device to the vehicle and follow the device manufacturer's instructions.

Charging Preparation
1. Install the **SSTs** (gas charging set).
2. Connect the tap pin side of the SST (49 C061 004) to the air purge valve of the SST (49C061 001).
3. Connect the **SST** (49 C061 005) to the center joint of the **SST** (49 C061 001).
4. Connect the **SST** (49 C061 005) to the vacuum pump.
5. Connect the **SST** (49 C061 004) to the refrigerant tank.
6. Place the refrigerant tank on the scale.



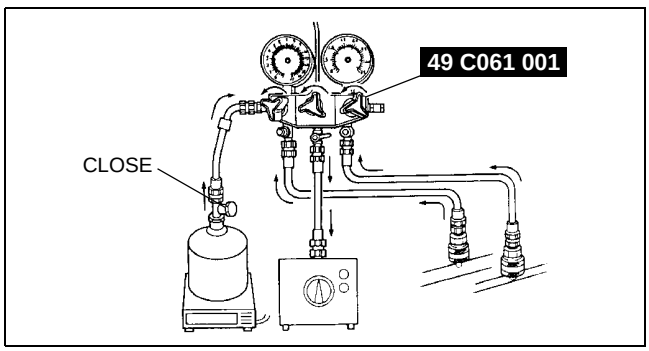
A6E8514W004

Regular amount of refrigerant (approximate quantity)
675 g {23.8 oz}

Evacuation
1. Open all the valves of the **SST** (49 C061 001).

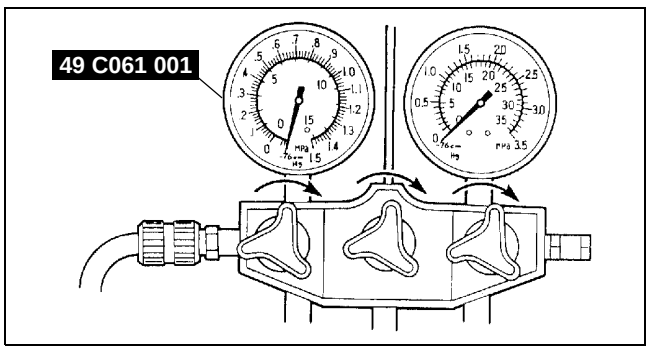
Caution
- **Close the SST (49 C061 001) valve immediately after stopping the vacuum pump. If the valve is left open, the vacuum pump oil will flow back into the refrigeration cycle and cause a decrease in the efficiency of the air conditioner.**

2. Start the vacuum pump and let it operate for **15 min**.



A6E8514W005

3. Verify that high- and low-pressure side readings of the **SST** (49 C061 001) are at **–101 kPa {–760 mmHg, –29.9 inHg}**. Close each valve of the **SST** (49 C061 001).



A6E8514W006

Airtightness Check

1. Stop the vacuum pump and wait for **5 min**.
2. Check the high- and low-pressure side readings of the **SST** (49 C061 001).
   - If the reading has changed, inspect for leakage and go to Evacuation. (See U–10 Evacuation.)
   - If the reading has not changed, go to Charging New R-134a Refrigerant. (See U–11 Charging New R-134a Refrigerant.)

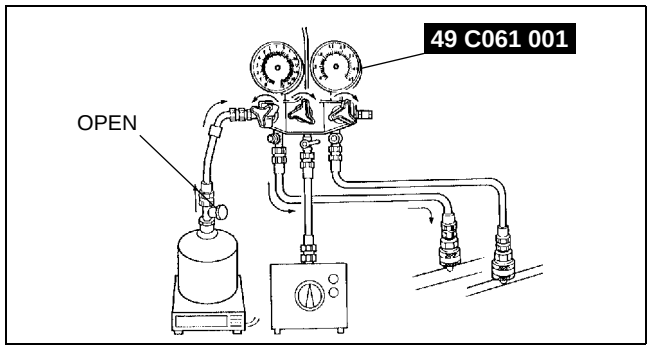
Charging New R-134a Refrigerant

1. Open the valve of the refrigerant tank.
2. Weigh the refrigerant tank to charge the suitable amount of refrigerant.

Warning

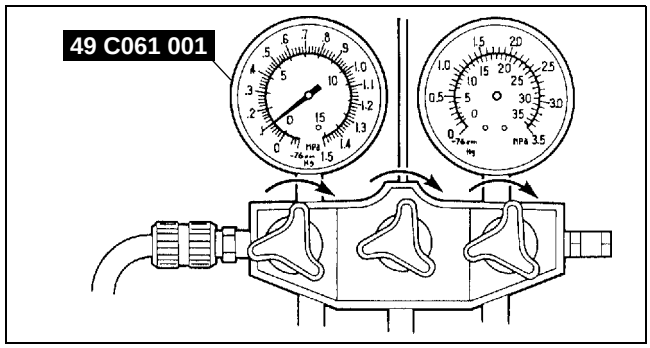
- **If the refrigerant system is charged with a large amount of refrigerant when inspecting for gas leakage, and if any leakage should occur, the refrigerant will be released into the atmosphere. In order to prevent the accidental release of refrigerant which can destroy the ozone layer in the stratosphere, follow the proper procedures and charge with only a small amount of refrigerant when inspecting for gas leakage.**
- **If charging the system with refrigerant using service cans, running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**

3. Open the low-pressure side valve of the **SST** (49 C061 001).



A6E8514W010

4. When the low-pressure side reading increases to **0.098 MPa {1.0 kgf/cm^2, 14 psi}**, close the low-pressure side valve of the **SST** (49 C061 001).
5. Inspect for leakage from the cooler pipe/hose connections using the **SST** (49 C061 013).
   - If there is no leakage, go to Step 7.
   - If leakage is found at a loose joint, tighten the joint, then go to next step.
6. Inspect for leakage again.
   - If there is no leakage after tightening the joint, go to next step.
   - If there is still a leakage at the same joint, discharge the refrigerant and then repair the joint. Repeat the charging procedure from evacuation.



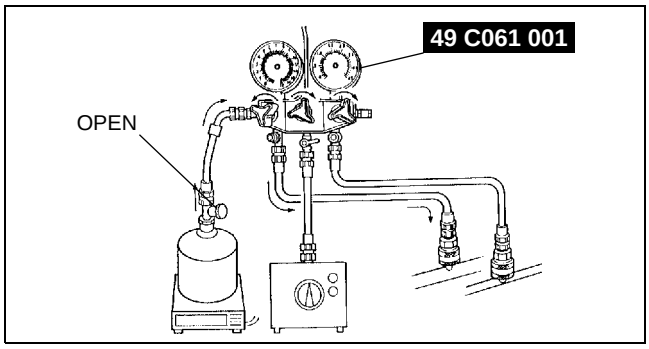
A6E8514W008

Warning

- **If charging the system with refrigerant using service cans, running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**

U

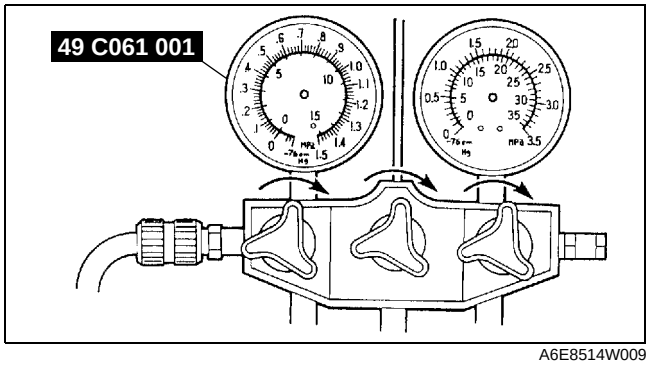
7. Open the low-pressure side valve of the **SST** (49 C061 001) and charge with refrigerant until the weight of refrigerant tank has decreased **350 g {12.4 oz}** from the amount in Step 2.



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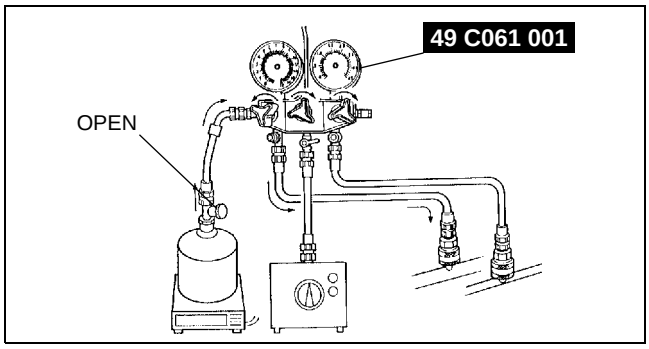
8. Close the low-pressure side valve of the **SST** (49 C061 001).

   Warning
   - **If charging the system with refrigerant using service cans, running the engine with the high-pressure side valve open is dangerous. Pressure within the service cans will increase and the cans could explode, scattering metal fragments and liquid refrigerant that can seriously injure you. Therefore, do not open the high-pressure side valve while the engine is running.**



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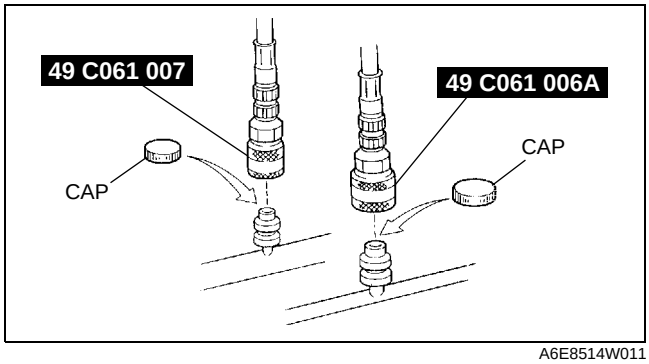
9. Start the engine and actuate the A/C compressor.
10. Open the low-pressure side valve of the **SST** (49 C061 001) and charge with refrigerant until the weight of the refrigerant tank has decreased regular amount from the amount in Step 2.
11. Close the low-pressure side valve of the **SST** (49 C061 001) and the valve of the refrigerant tank.
12. Stop the engine and A/C compressor.



A6E8514W010

Leak Test

1. Inspect for leakage using the **SST** (49 C061 013).
   - If there is no leakage, go to Step 3.
   - If leakage is found at a loose joint, tighten the joint, then go to next step.
2. Inspect for leakage again.
   - If there is no leakage after tightening the joint, go to next step.
   - If there is still leakage at the same joint, discharge the refrigerant and then repair the joint. Repeat the charging procedure from evacuation.
3. Disconnect the **SSTs** (49 C061 006A, 49 C061 007) from the charging valves.
4. Install the caps to the charging valves.



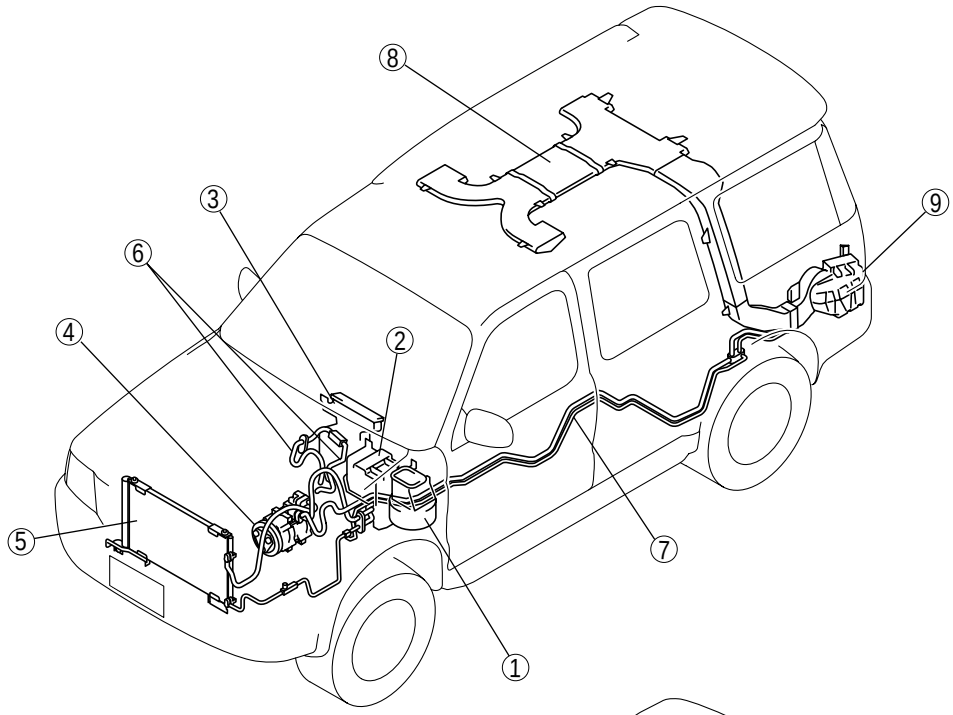
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LOCATION INDEX

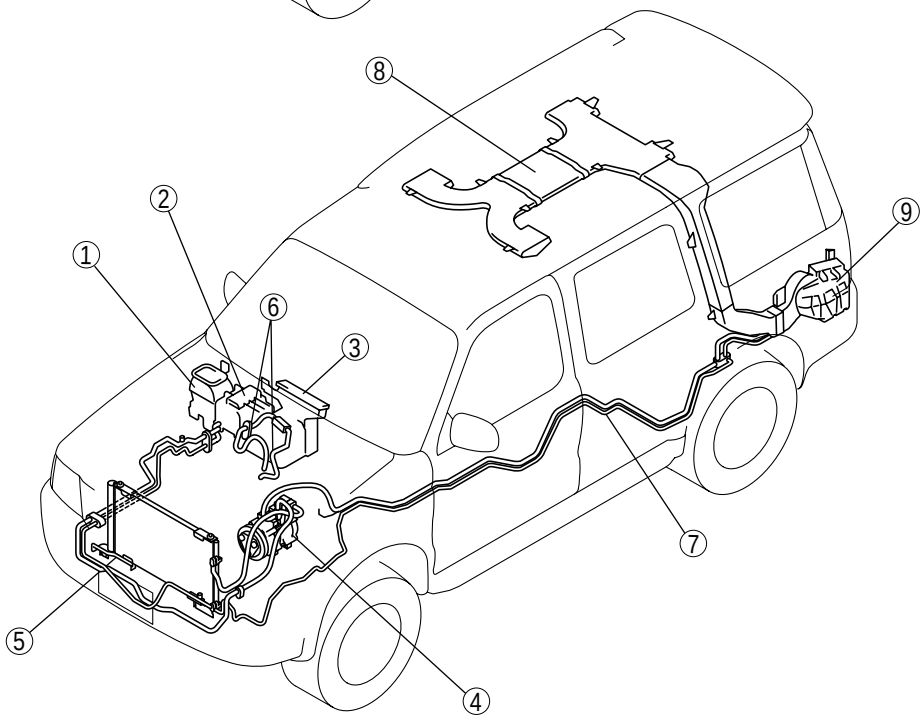
BASIC SYSTEM

AVF850001040W01

R.H.D.



L.H.D.



AVF8500W006

1	Blower unit (See U–16 BLOWER UNIT DISASSEMBLY/ ASSEMBLY)
2	Cooling unit
3	Heater unit
4	A/C compressor (See U–18 A/C COMPRESSOR REMOVAL/ INSTALLATION)
5	Condenser (See U–19 CONDENSER REMOVAL/ INSTALLATION)

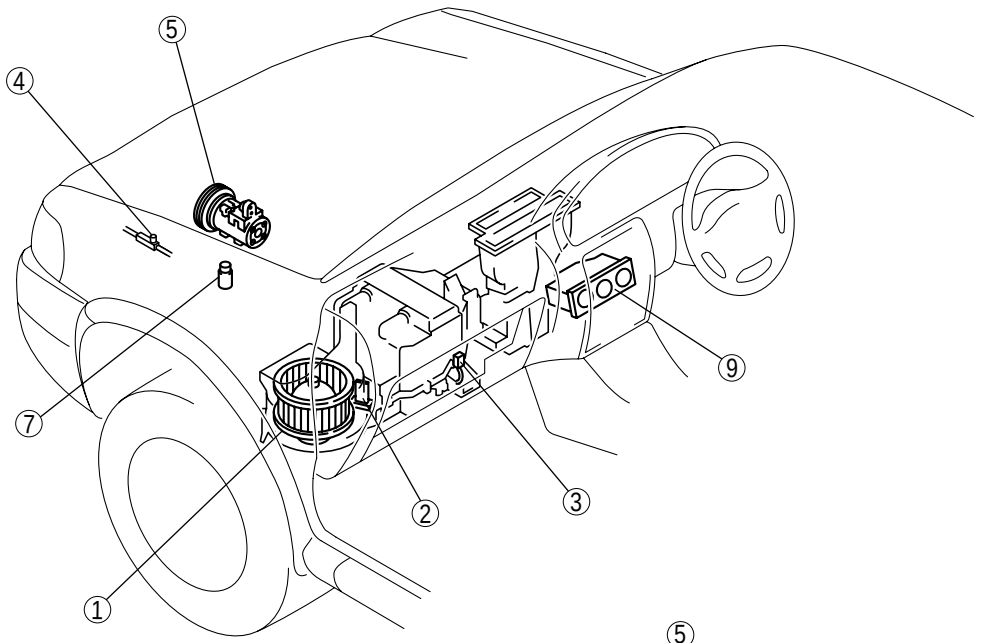
6	Heater hose
7	Refrigerant lines (See U–20 REFRIGERANT LINES REMOVAL/ INSTALLATION)
8	Rear cooler duct (See U–18 REAR COOLER DUCT REMOVAL/ INSTALLATION)
9	Rear A/C unit (See U–17 REAR A/C UNIT REMOVAL/ INSTALLATION) (See U–17 REAR A/C UNIT DISASSEMBLY/ ASSEMBLY)

CONTROL SYSTEM

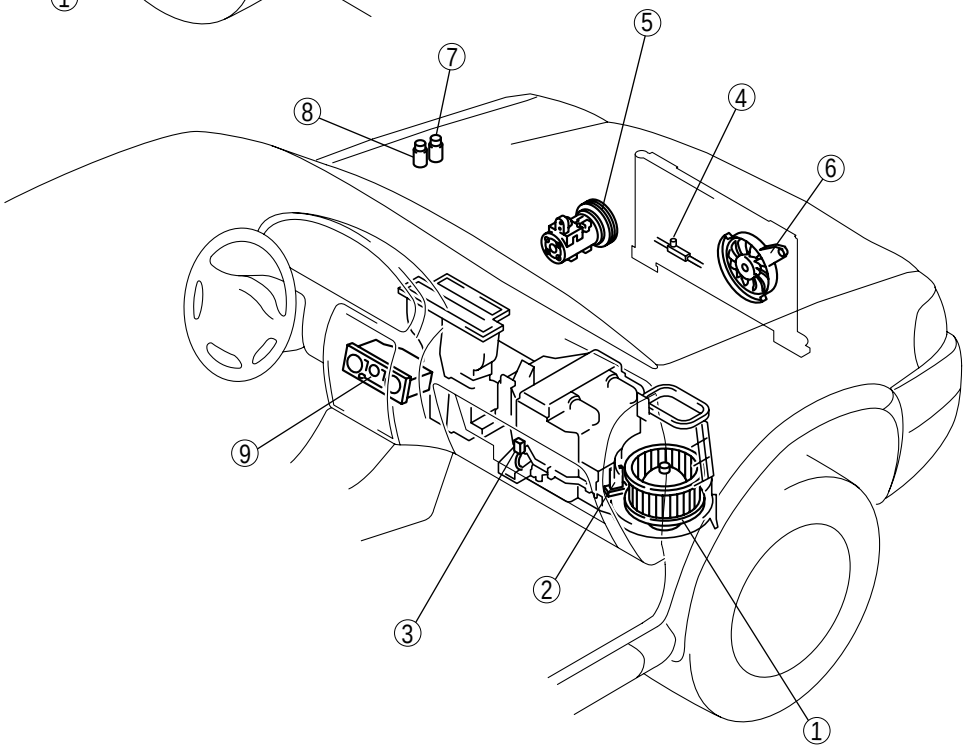
AVF850001042W01

FRONT

R.H.D.



L.H.D.

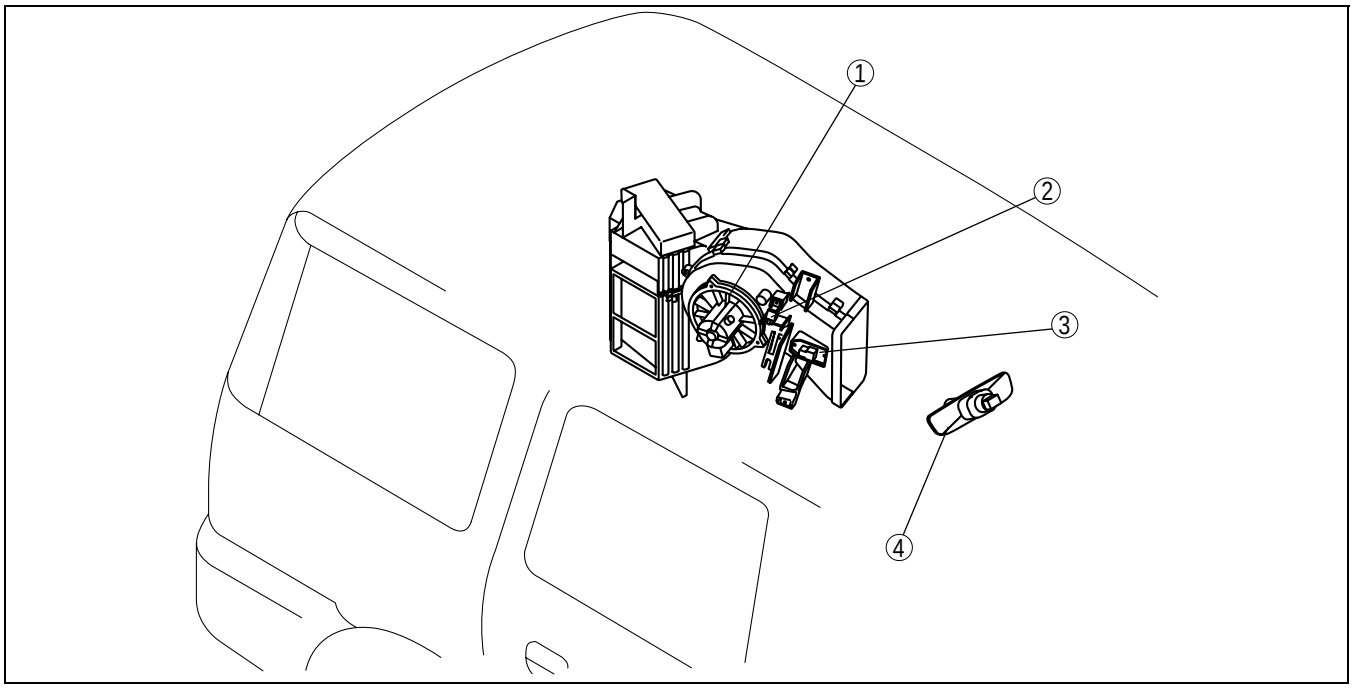


AVF8500W008

1	Front blower motor
2	Front resistor
3	Evaporator temperature sensor
4	Refrigerant pressure switch (SeeU–25 REFRIGERANT PRESSURE SWITCH INSPECTION)
5	Magnetic clutch
6	Condenser fan (For coastal areas and other places with intense heat) (SeeU–24 CONDENSER FAN REMOVAL/ INSTALLATION) (SeeU–24 CONDENSER FAN INSPECTION)

7	A/C relay
8	Condenser fan relay (For coastal areas and other places with intense heat)
9	Climate control unit (SeeU–26 CLIMATE CONTROL UNIT REMOVAL/ INSTALLATION) (SeeU–26 CLIMATE CONTROL UNIT DISASSEMBLY/ASSEMBLY)

REAR



AVF8500W010

1	Rear blower motor (SeeU–23 REAR BLOWER MOTOR REMOVAL/ INSTALLATION) (SeeU–23 REAR BLOWER MOTOR INSPECTION)
2	Rear blower relay
3	Rear resistor (SeeU–23 REAR RESISTOR REMOVAL/ INSTALLATION) (SeeU–23 REAR BLOWER MOTOR INSPECTION)

4	Rear fan switch (SeeU–26 REAR FAN SWITCH REMOVAL/ INSTALLATION) (SeeU–27 REAR FAN SWITCH DISASSEMBLY/ ASSEMBLY) (SeeU–27 REAR FAN SWITCH INSPECTION)

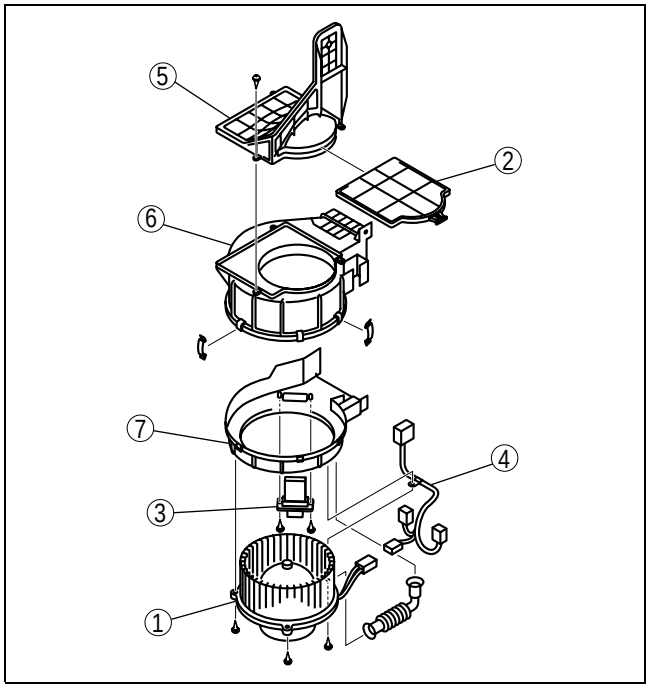
BASIC SYSTEM

BLOWER UNIT DISASSEMBLY/ASSEMBLY

AVF851661140W01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

1	Front blower motor
2	Air filter
3	Front resistor
4	Blower harness
5	Blower case (1)
6	Blower case (2)
7	Blower case (3)

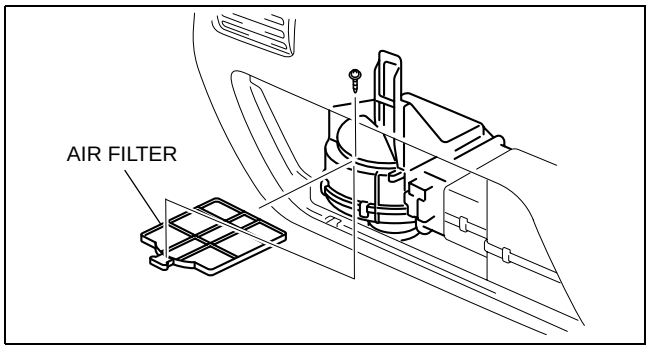


AVF8540W021

AIR FILTER REMOVAL/INSTALLATION

AVF851661140W02

1. Remove the glove compartment.
2. Remove in the order indicated in the figure.
3. Install in the reverse order of removal.



AVF8516W008

AIR FILTER INSPECTION

AVF851661140W03

1. Inspect for damage, excessive dirt.
   - If the air filter is damaged, replace it.
   - If the air filter is excessively dirty, clean it. (See U–16 Air Filter Cleaning.)

Air Filter Cleaning

1. Remove dirt and pollen adhering to the surface of the air filter with an air blower or by flushing with water.

   Caution
   - **When flushing the air filter with water use cool water, as hot water may cause deformation.**
   - **When scrubbing the air filter, do not apply excessive force as it could damage it.**

2. After thoroughly drying the air filter, install it.

REAR A/C UNIT REMOVAL/INSTALLATION

AVF85166187XW01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Remove the third-row seat.
4. Remove the trunk side trim (LH) and C-pillar trim.
5. Remove the rear cooler duct No.5.

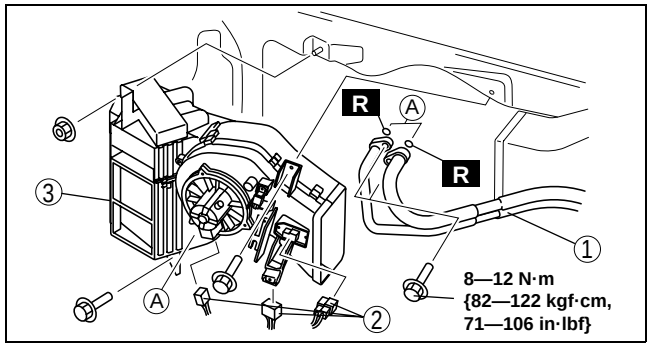
Caution

- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**

6. Remove in the order indicated in the table.

1	Rear evaporator pipe
2	Connector
3	Rear A/C unit

7. Install in the reverse order of removal.
8. Perform the refrigerant system performance test.

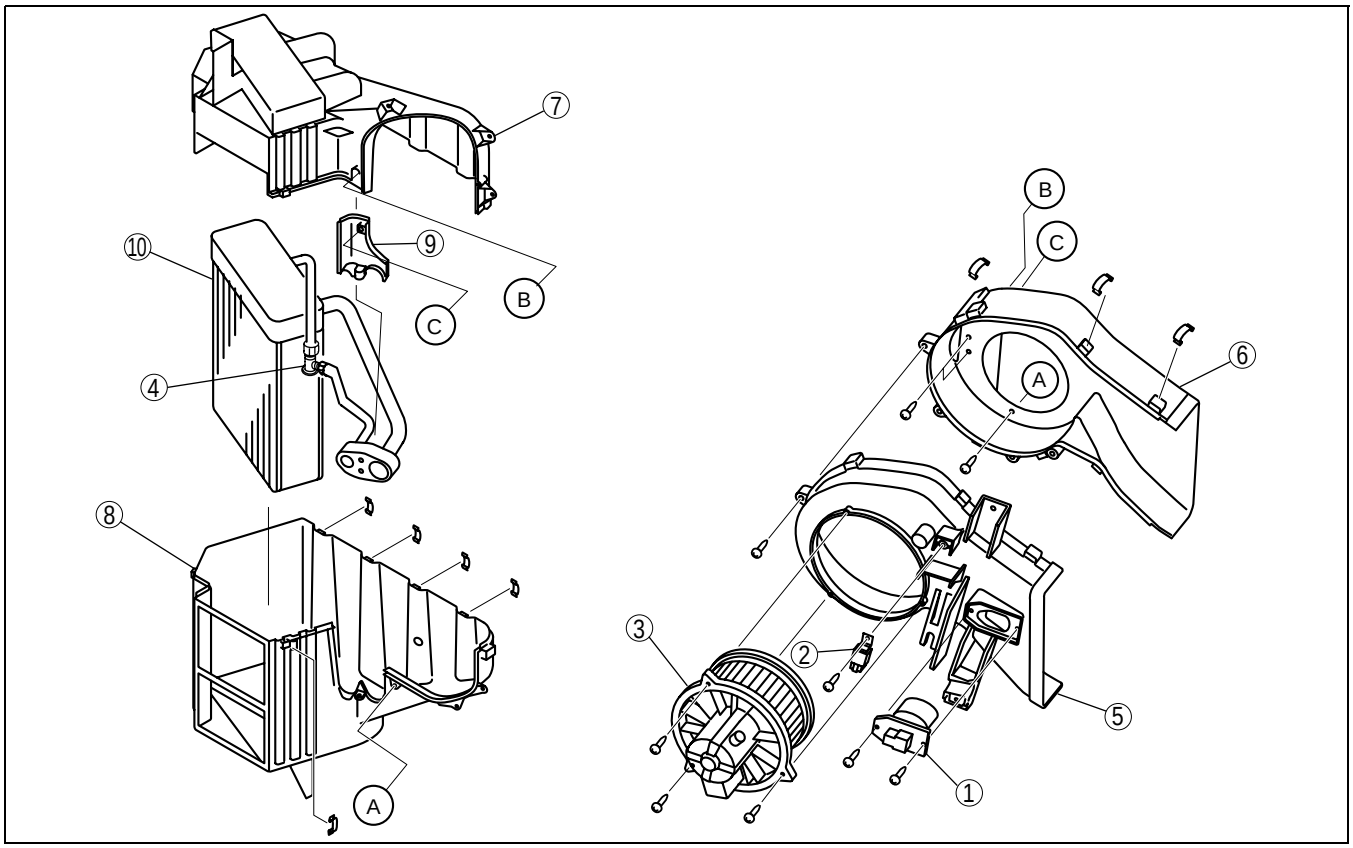


AVF8516W011

REAR A/C UNIT DISASSEMBLY/ASSEMBLY

AVF85166187XW02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



AVF8516W004

1	Rear resistor
2	Rear blower relay
3	Rear blower motor
4	Rear expansion valve
5	Case (1)

6	Case (2)
7	Case (3)
8	Case (4)
9	Plate
10	Rear evaporator (See U–18 Rear Evaporator Assembly Note)

Rear Evaporator Assembly Note

1. When installing a new rear evaporator, add FD46XG compressor oil from the inlet.

Supplemental amount (approximate quantity)
40 ml {40 cc, 1.4 fl oz}

REAR EVAPORATOR INSPECTION

AVF851661210W01

1. Remove the rear evaporator from the rear A/C unit.
2. Inspect for cracks, damage, and oil leakage.
   - There is any malfunction, replace the rear evaporator.
3. Inspect for bent fins.
   - If any are bent, use a flathead screwdriver to straighten them.

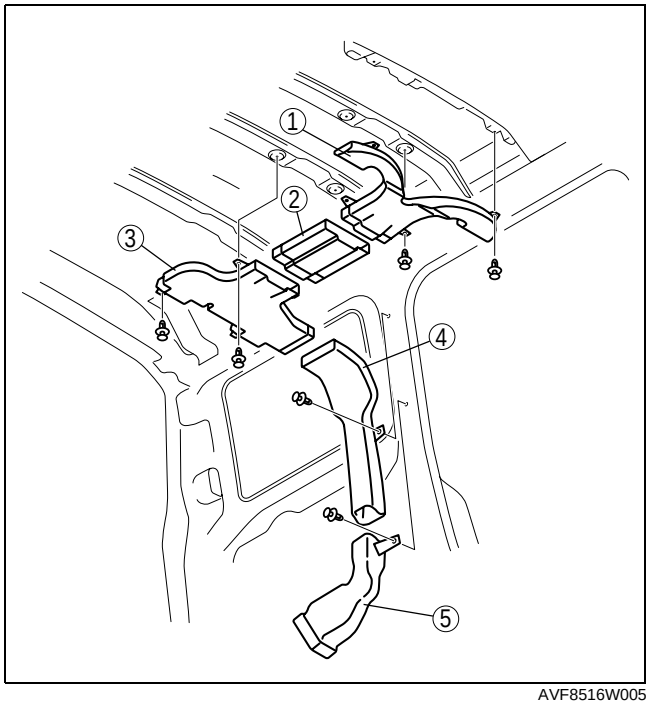
REAR COOLER DUCT REMOVAL/INSTALLATION

AVF851661812W01

1. Disconnect the negative battery cable.
2. Remove the trunk side trim (LH) and C-pillar trim.
3. Remove the headliner. (See S–31 HEADLINER REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Rear cooler duct No.1
2	Rear cooler duct No.2
3	Rear cooler duct No.3
4	Rear cooler duct No.4
5	Rear cooler duct No.5

5. Install in the reverse order of removal.



AVF8516W005

A/C COMPRESSOR REMOVAL/INSTALLATION

AVF851661450W01

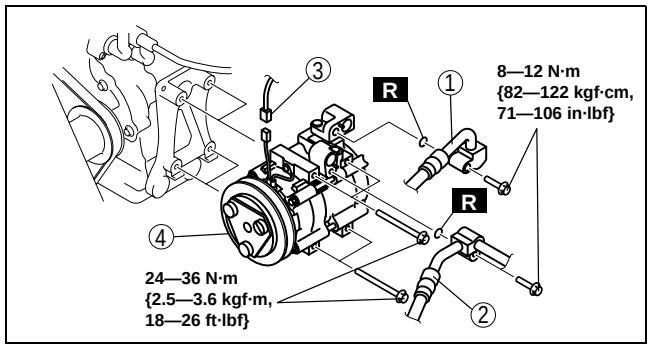
1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Loosen the drive belt and remove it.

Caution

- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**
- **Do not allow A/C compressor oil to spill. Operating the A/C compressor without sufficient A/C compressor oil can lead to abnormal noise and cause the A/C compressor to seize up.**

4. Remove in the order indicated in the table.

1	Cooler hose (HI) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
2	Cooler hose (LO) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
3	Connector
4	A/C compressor (See U–19 A/C Compressor Installation Note)



AVF8516W002

5. Install in the reverse order of removal.
6. Adjust the drive belt.
7. Perform the refrigerant system performance test.

A/C Compressor Installation Note

1. Remove the following amount of compressor oil from the new A/C compressor when replacing the A/C compressor.

Compressor oil to be removed (approximate quantity)
180 ml {180 cc, 6.08 fl oz} – compressor oil from old A/C compressor

CONDENSER REMOVAL/INSTALLATION

AVF851661480W02

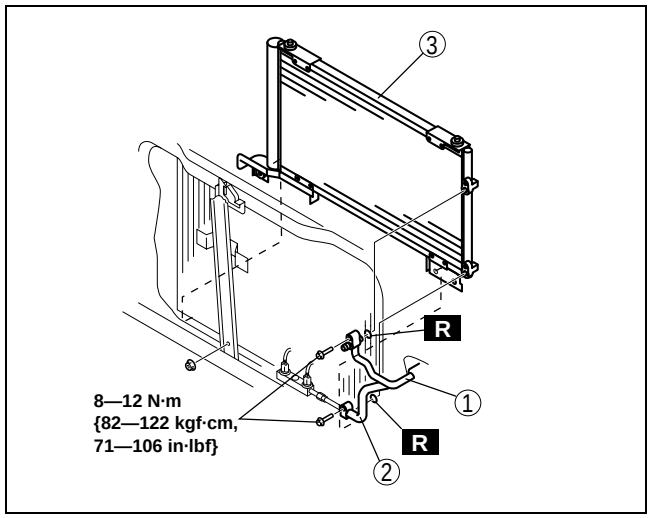
1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Remove the radiator grille.
4. Remove the radiator bracket.

Caution

- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**
- **Do not allow A/C compressor oil to spill. Operating the A/C compressor without sufficient A/C compressor oil can lead to abnormal noise and cause the A/C compressor to seize up.**

5. Remove in the order indicated in the table.

1	Cooler hose (HI) (R.H.D.), front cooler pipe No.3 (L.H.D.) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
2	Front cooler pipe No.1 (R.H.D.), cooler hose (LO) (L.H.D.) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
3	Condenser (See U–19 Condenser Installation Note)



AVF8516W003

6. Install in the reverse order of removal.
7. Perform the refrigerant system performance test.

Condenser Installation Note

1. When installing a new condenser, add a supplemental amount of FD46XG compressor oil from the inlet.

Supplemental amount (approximate quantity)
40 ml {40 cc, 1.4 fl oz}

REFRIGERANT LINES REMOVAL/INSTALLATION

AVF851661460W01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Remove the following parts, depending on pipe and hose to be removed.

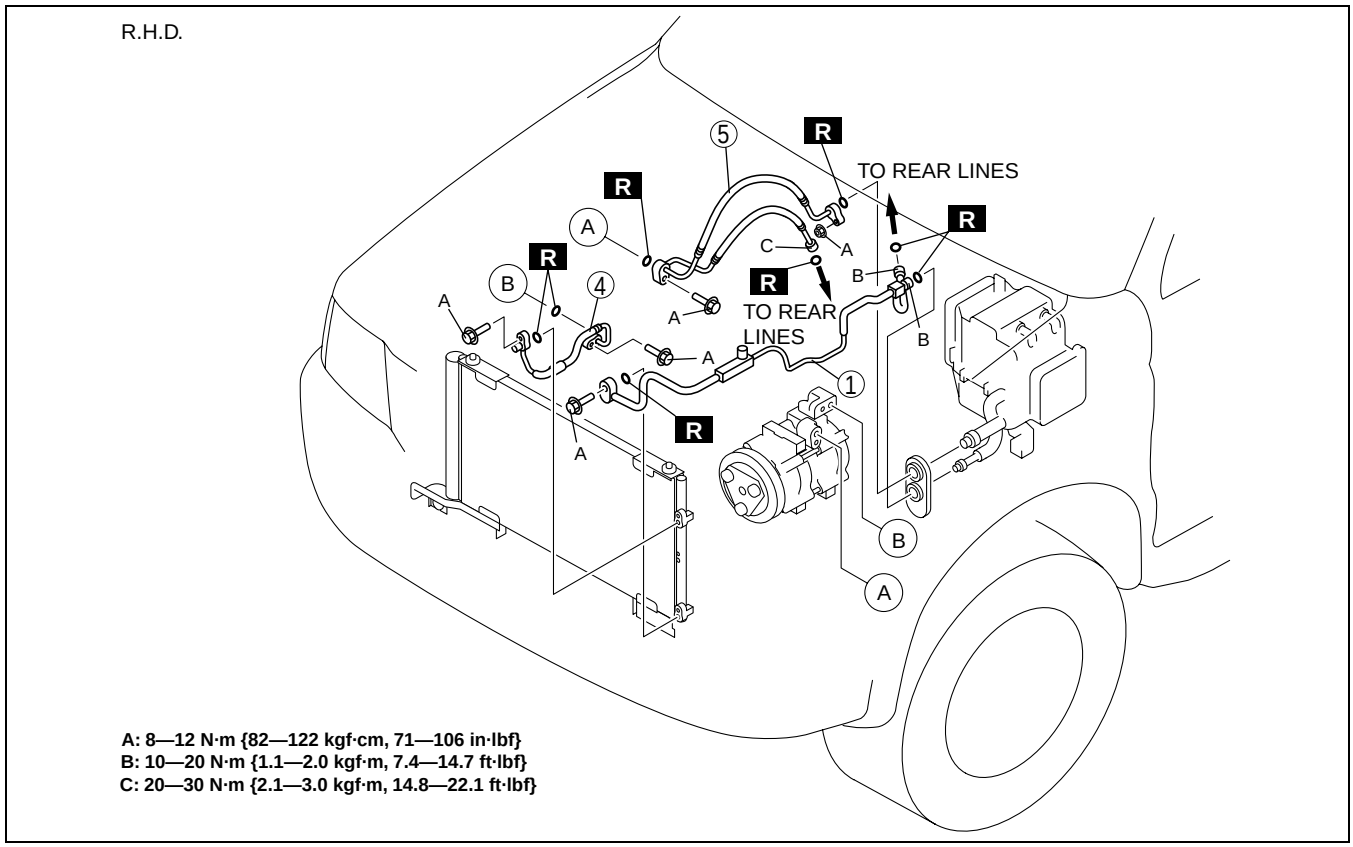
Cooler pipe/hose to be removed	Parts to be removed	
	R.H.D.	L.H.D.
Front cooler pipe No.1	• Radiator grille • Air cleaner box	• Radiator grille • Power steering fluid
Front cooler pipe No.2 (L.H.D.)	–	• Radiator grille • Bumper • Charge air cooler
Front cooler pipe No.3 (L.H.D.)	–	• Radiator grille • Air cleaner box
Cooler hose (HI)	• Radiator grille • Air cleaner box	• Radiator grille
Cooler hose (LO)	• Air cleaner box	–
Rear cooler pipe No.2	• Crossmember	• Crossmember

Caution

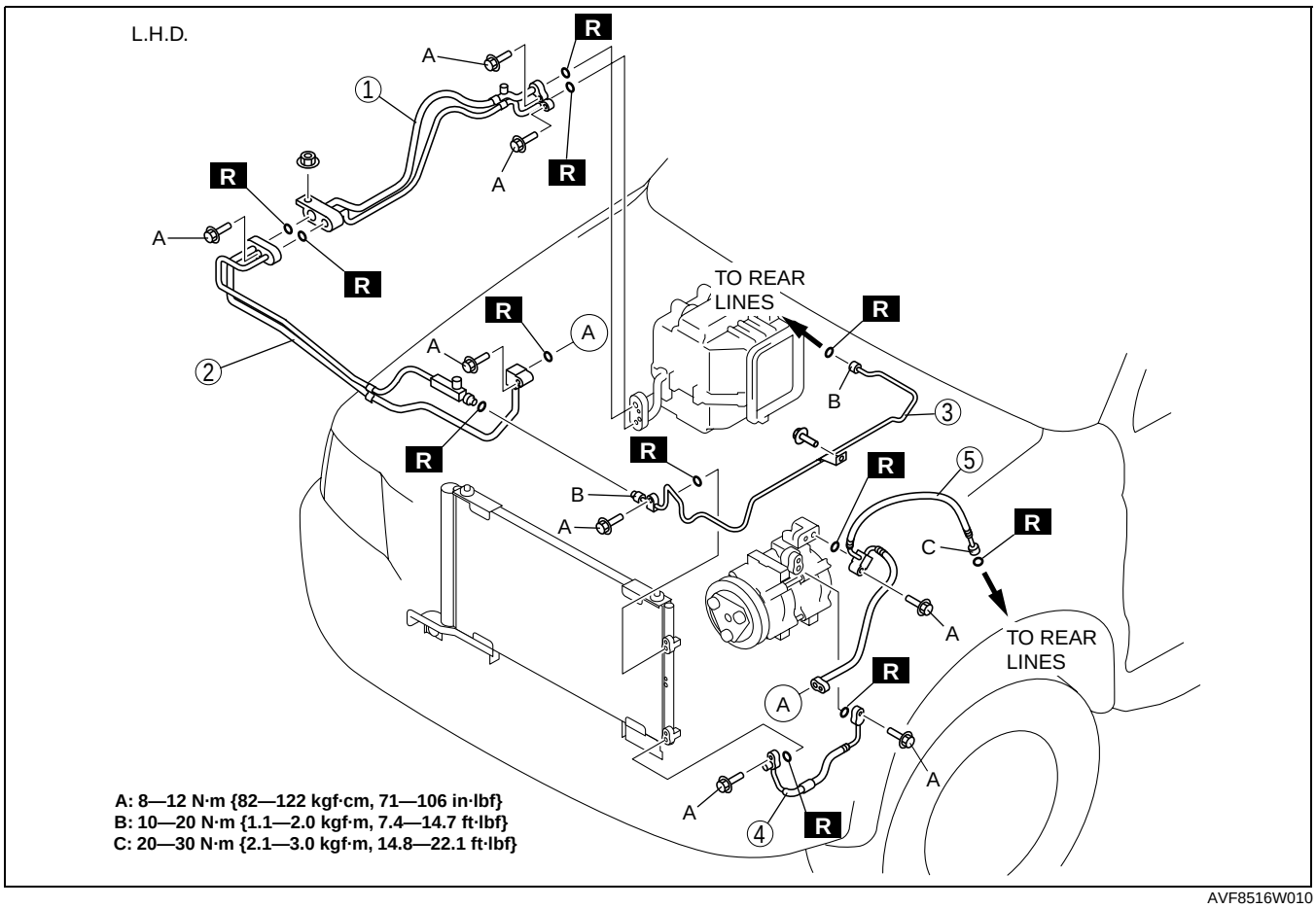
- **If moisture or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise will occur. Always immediately plug all open fittings after removing any refrigeration cycle parts to keep moisture or foreign material out of the cycle.**
- **Do not allow A/C compressor oil to spill. Operating the A/C compressor without sufficient A/C compressor oil can lead to abnormal noise and cause the A/C compressor to seize up.**

4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Perform the refrigerant system performance test.

FRONT



AVF8516W009



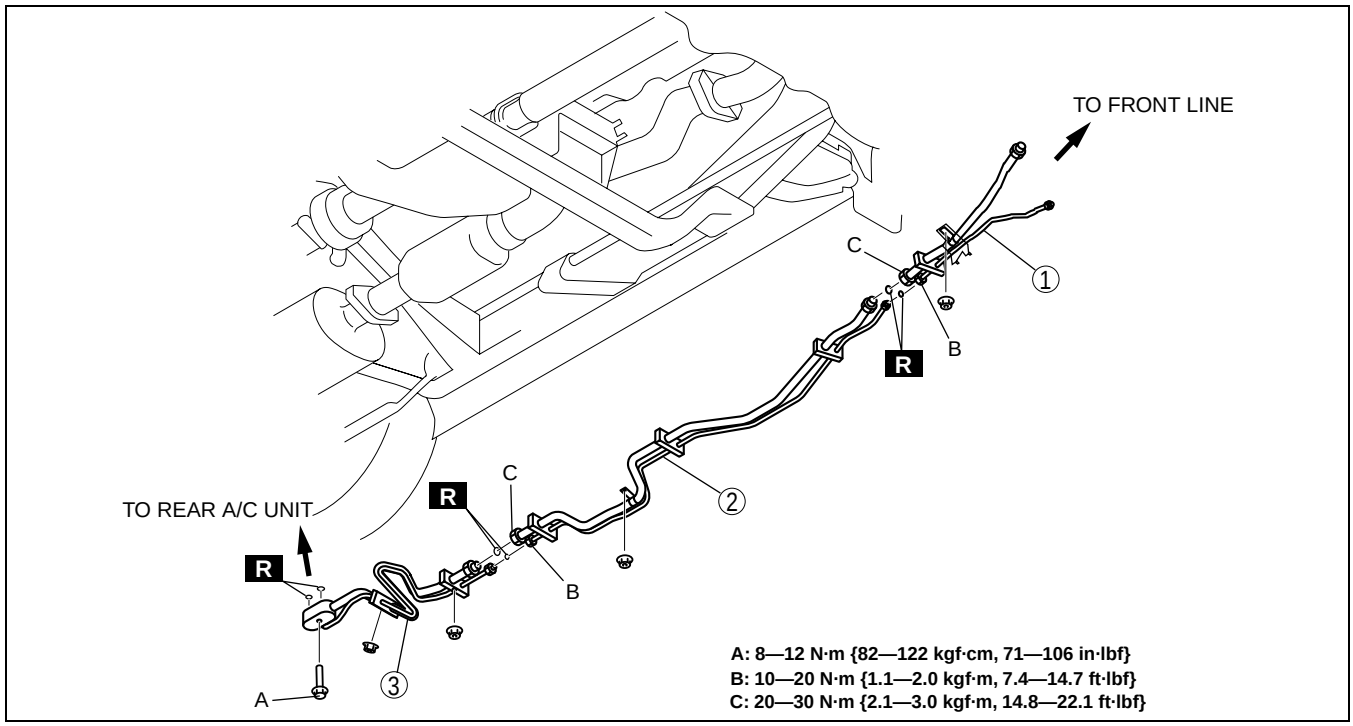
AVF8516W010

1	Front cooler pipe No.1 (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
2	Front cooler pipe No.2 (L.H.D.) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
3	Front cooler pipe No.3 (L.H.D.) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)

4	Cooler hose (HI) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
5	Cooler hose (LO) (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)

U

REAR



AVF8516W006

1	Rear cooler pipe No.1 (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
2	Rear cooler pipe No.2 (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)
3	Rear cooler pipe No.3 (See U–22 Refrigerant Lines Removal Note) (See U–22 Refrigerant Lines Installation Note)

Refrigerant Lines Removal Note

1. Loosen the nut with two wrenches, then remove the cooler pipe or hose.

Refrigerant Lines Installation Note

1. When installing a new cooler pipe or hose, add a supplemental amount of FD46XG compressor oil from the inlet.

   Supplemental amount (approximate quantity)
   10 ml {10 cc, 0.3 fl oz}

2. Apply compressor oil to the O-rings and connect the joints.
3. Tighten the joints.
   (1) Tighten the nut or bolt of the joint by hand.
   (2) Tighten the joint to the specified torque. If it is a nut joint, tighten the nut with a wrench and torque wrench.

CONTROL SYSTEM

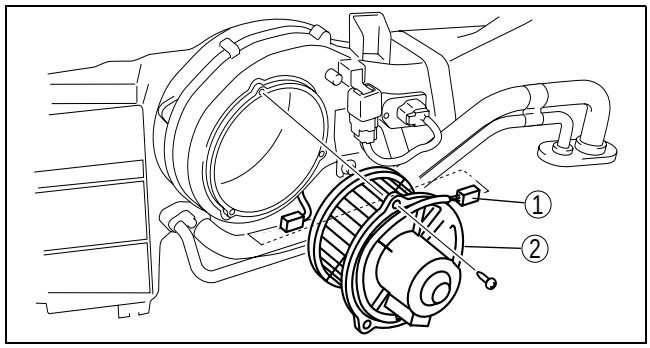
REAR BLOWER MOTOR REMOVAL/INSTALLATION

AVF854061280W01

1. Disconnect the negative battery cable.
2. Remove the third-row sheet.
3. Remove the trunk side trim (LH).
4. Remove in the order indicated in the table.

1	Rear blower motor connector
2	Rear blower motor

5. Install in the reverse order of removal.

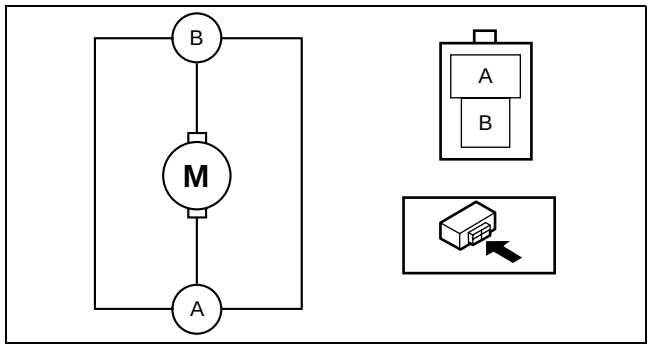


AVF8540W011

REAR BLOWER MOTOR INSPECTION

AVF854061280W02

1. Connect battery positive voltage to terminal B and ground to terminal A of the rear blower motor.
2. Verify that the rear blower motor operates.
   - If there is any malfunction, replace the rear blower motor.



AVF8540W007

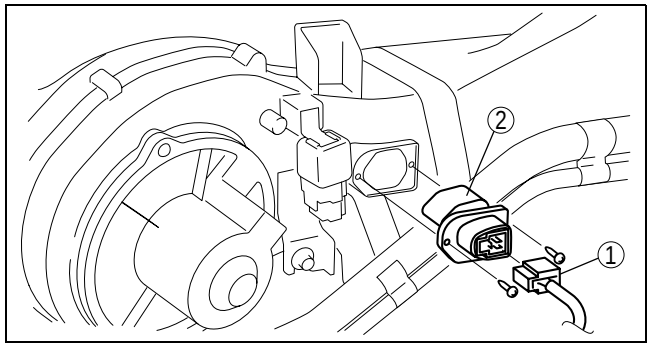
REAR RESISTOR REMOVAL/INSTALLATION

AVF854061221W01

1. Disconnect the negative battery cable.
2. Remove the trunk side trim (LH).
3. Remove in the order indicated in the table.

1	Rear resistor connector
2	Rear resistor

4. Install in the reverse order of removal.



AVF8540W010

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CONDENSER FAN REMOVAL/INSTALLATION

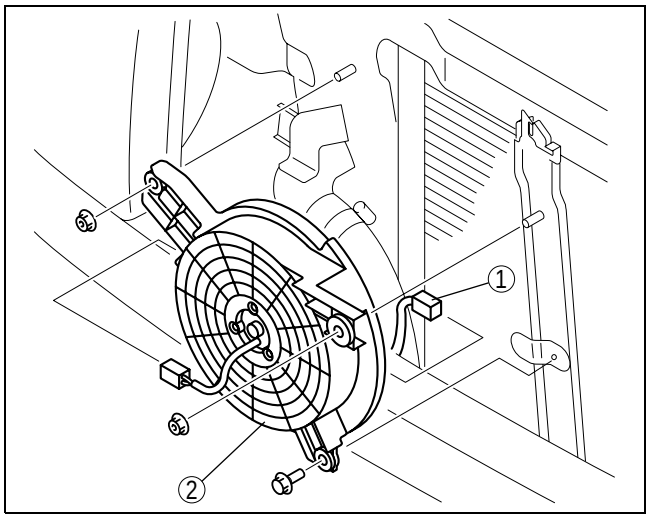
AVF854061221W02

For Coastal Areas And Other Places With Intense Heat

1. Disconnect the negative battery cable.
2. Remove the radiator grille.
3. Remove in the order indicated in the table.

1	Condenser fan connector
2	Condenser fan

4. Install in the reverse order of removal.

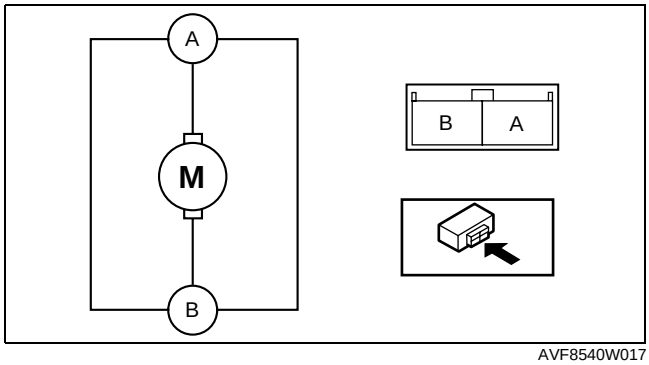


AVF8540W022

CONDENSER FAN INSPECTION

AVF854061221W03

1. Connect battery positive voltage to terminal A and ground to terminal B of the condenser fan.
2. Verify that the condenser fan operates.
   - If there is any malfunction, replace the condenser fan.



AVF8540W017

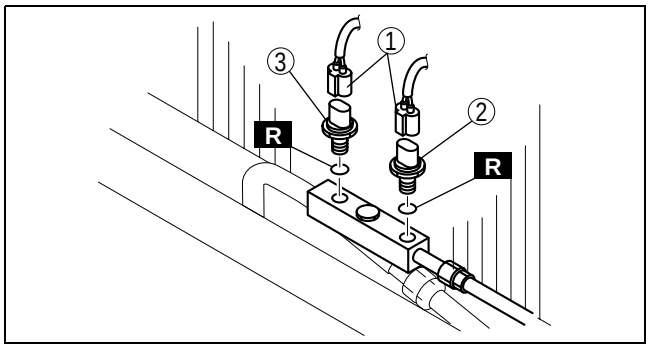
REFRIGERANT PRESSURE SWITCH REMOVAL/INSTALLATION

AVF854061503W01

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Remove the radiator grille.
4. Loosen the refrigerant pressure switch using two spanners.
5. Remove in the order indicated in the table.

1	Refrigerant pressure switch connector
2	Refrigerant pressure switch [dual-pressure] (See U–24 Refrigerant Pressure Switch Installation Note)
3	Refrigerant pressure switch [single-pressure] (See U–24 Refrigerant Pressure Switch Installation Note)

6. Install in the reverse order of removal.



AVF8540W024

Refrigerant Pressure Switch Installation Note

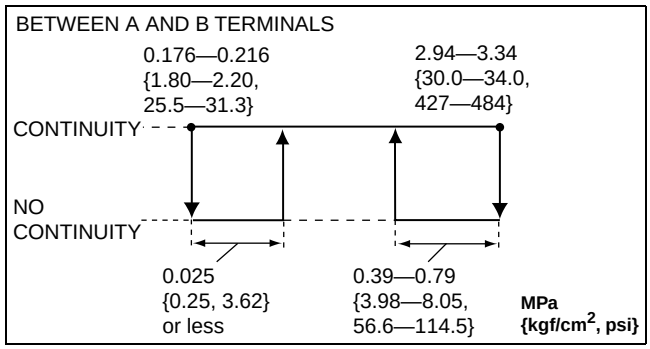
1. Apply compressor oil to O-ring and connect the joint.

REFRIGERANT PRESSURE SWITCH INSPECTION

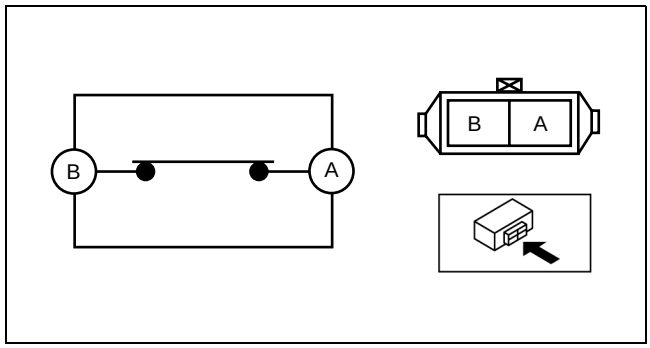
AVF854061503W02

1. Install the gas charging set.
2. Disconnect the refrigerant pressure switch connector.
3. Verify the high-pressure side reading of the manifold gauge and continuity between the terminals of the refrigerant pressure switch.
   - If there is any malfunction, replace the refrigerant pressure switch.

Dual-pressure Switch

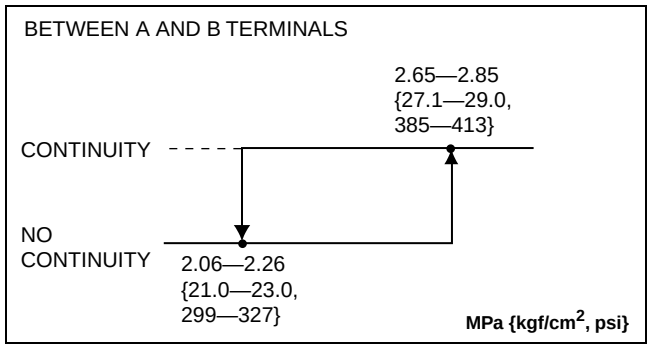


AVF8540W001

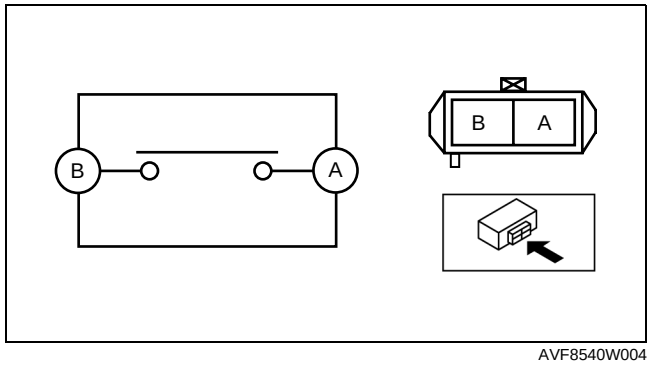


AVF8540W003

Single-pressure Switch



AVF8540W002



AVF8540W004

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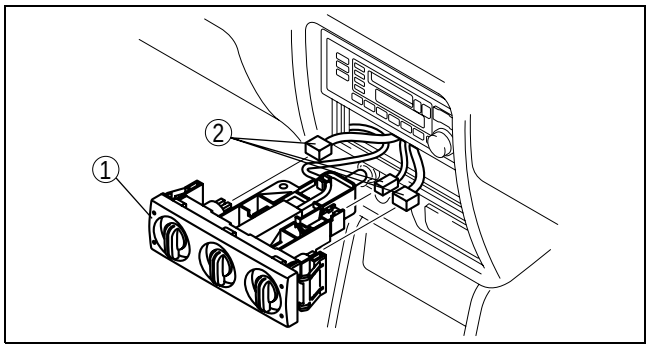
CLIMATE CONTROL UNIT REMOVAL/INSTALLATION

AVF854061325W01

1. Disconnect the negative battery cable.
2. Remove the glove compartment.
3. Disconnect the A/C amplifier connectors.
4. Remove in the order indicated in the table.

1	Climate control unit
2	Climate control unit connector

5. Install in the reverse order of removal.



AVF8540W016

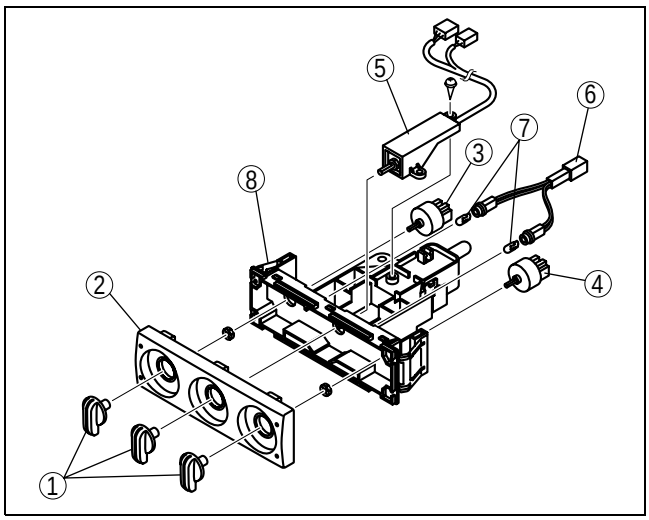
CLIMATE CONTROL UNIT DISASSEMBLY/ASSEMBLY

AVF854061325W02

Type B

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

1	Dial
2	Panel
3	Rear A/C main switch
4	Front fan switch
5	A/C amplifier
6	Harness
7	Bulb
8	Body



AVF8540W014

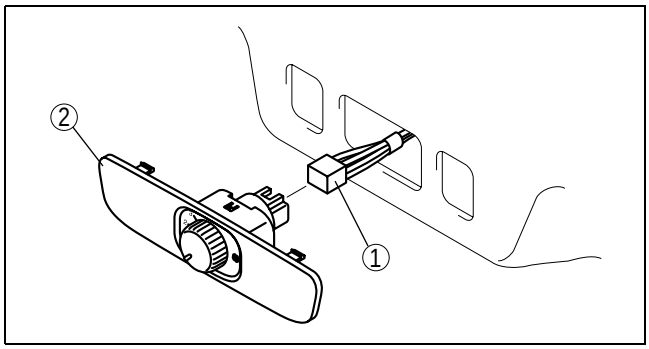
REAR FAN SWITCH REMOVAL/INSTALLATION

AVF854061340W01

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Rear fan switch connector
2	Rear fan switch

3. Install in the reverse order of removal.



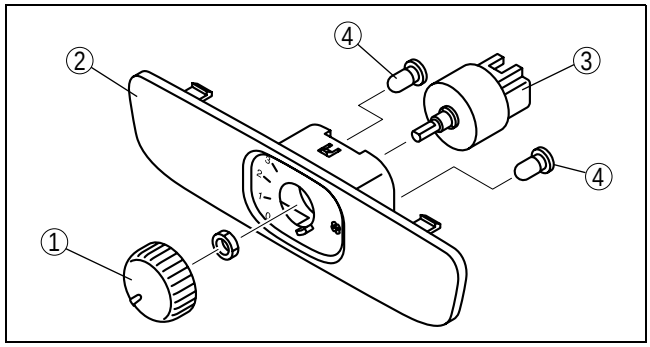
AVF8540W013

REAR FAN SWITCH DISASSEMBLY/ASSEMBLY

AVF854061340W02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

1	Dial
2	Panel
3	Rear fan switch
4	Bulb



AVF8540W012

REAR FAN SWITCH INSPECTION

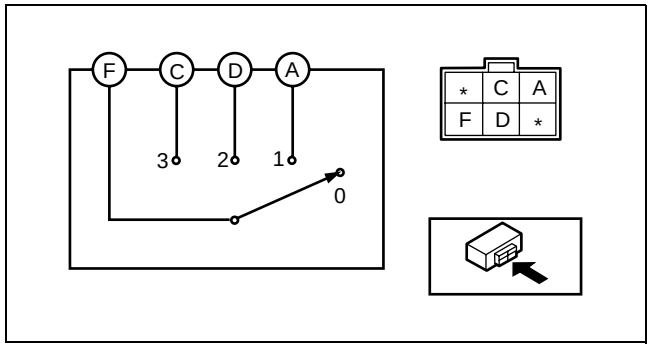
AVF854061340W03

1. Inspect for continuity between the rear fan switch terminals using a tester.
   - If there is any malfunction, replace the rear fan switch.

○—○ : Continuity

Switch position	Terminal			
	F	A	C	D
0				
1	○	○		
2	○			○
3	○		○	

AVF8540W009



AVF8540W008

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TROUBLESHOOTING

FOREWORD

AVF858001038W01

- The areas for inspection (steps) are given according to various circuit malfunctions. Use the chart below to verify the symptoms of the trouble in order to diagnose the appropriate area.

TROUBLESHOOTING INDEX

AVF858001038W02

No.	TROUBLESHOOTING ITEM	DESCRIPTION
1	Insufficient blown air volume and/or no blown air depending on airflow mode.	• Problem with each vent and/or duct.
2	No blown air in any airflow mode. Blown air volume does not change at any fan speed.	• Malfunction in front and/or rear blower system.
3	Airflow mode does not change.	• Malfunction in front heater unit's airflow system.
4	Improper air circulation and/or no air circulation.	• Air intake mode does not change when switching REC/FRESH mode.
5	No temperature control.	• Malfunction in front heater unit's air mix system.
6	Air from vents not cold enough.	• Magnetic clutch operates but A/C system malfunctions.
7	No cool air.	• Magnetic clutch does not operate.
8	Noise while operating A/C system.	• Noise from magnetic clutch, A/C compressor, hose or refrigerant line.

NO.1 INSUFFICIENT BLOWN AIR VOLUME AND/OR NO BLOWN AIR DEPENDING ON AIRFLOW MODE

AVF858001038W03

1	**Insufficient blown air volume and/or no blown air depending on airflow mode.**
DESCRIPTION	• Problem with each vent and/or duct.
POSSIBLE CAUSE	• Malfunction in VENT mode system (Steps 1—4) • Malfunction in HEAT mode system (Step 5) • Malfunction in DEFROSTER mode system (Steps 6—8)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• When airflow mode control dial is operated, is appropriate resistance felt and can it be moved throughout its full range?	Yes	Go to next step.
		No	Go to Step 1 of troubleshooting No. 3.
2	**INSPECT TO SEE WHETHER MALFUNCTION IS IN VENT MODE OR OTHER MODES** • Does air blow out when in VENT mode?	Yes	Go to Step 5.
		No	Go to next step.
3	**INSPECT VENT** • Is vent clogged?	Yes	Remove obstruction, then go to Step 9.
		No	Go to next step.
4	**VERIFY THAT DUCT IN DASHBOARD IS INSTALLED** • Is duct in dashboard properly installed?	Yes	Inspect duct for clogging, deformity and air leakage, then go to Step 9.
		No	Install duct securely in the proper position, then go to Step 9.
5	**INSPECT TO SEE WHETHER MALFUNCTION IS IN HEAT MODE OR DEFROSTER MODE** • Does air blow out when in HEAT mode?	Yes	Go to next step.
		No	Inspect vent for clogging, then go to Step 9.
6	**INSPECT DEFROSTER MODE** • Does air blow out when in DEFROSTER mode?	Yes	Operation is okay. Recheck malfunction symptoms.
		No	Go to next step.
7	**INSPECT VENT** • Is vent clogged?	Yes	Remove obstruction, then go to Step 9.
		No	Go to next step.
8	**VERIFY THAT DEFROSTER DUCT IS INSTALLED** • Is defroster duct properly installed?	Yes	Inspect duct for clogging, deformity, and air leakage, then go to next step.
		No	Install duct securely in proper position, then go to next step.
9	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECUR AFTER REPAIR** • Does air blow out?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.2 NO BLOWN AIR IN ANY AIRFLOW MODE/BLOWN AIR VOLUME DOES NOT CHANGE AT ANY FAN SPEED

AVF858001038W04

2	**No blown air in any airflow mode.** **Blown air volume does not change at any fan speed.**
DESCRIPTION	• Malfunction in front and/or rear blower system.
POSSIBLE CAUSE	• Malfunction in front and/or rear blower motor, resistor, fan switch (Step 1) • Malfunction in front and/or rear blower unit malfunction (Steps 2—4)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FRONT AND/OR REAR BLOWER SYSTEM** • Inspect the following systems and electrical parts. — Front and/or rear blower motor — Resistor — Fan switch • Are they okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part, then go to Step 5.
2	**VERIFY WHETHER MALFUNCTION IS IN BLOWER UNIT OR ELSEWHERE** • Turn ignition switch to ON position. • Turn fan switch on. • Is noise coming from front and/or rear blower unit?	Yes	Go to next step.
		No	Go to Step 4.
3	**INSPECT BLOWER UNIT** • Inspect fan in front and/or rear blower unit as follows. — Is fan free of interference from front and/or rear blower unit case? — Is fan free of foreign material and obstructions? • Is fan okay?	Yes	Go to next step.
		No	Remove obstruction, repair or replace fan and blower unit case, then go to Step 5.
4	**INSPECT BLOWER UNIT INTAKE VENT** • Are front and/or rear blower unit intake vent clogged?	Yes	Remove obstruction, then go to next step.
		No	Check if there are any obstructions in passage between blower unit and heater unit, then go to next step.
5	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does air blow out?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.3 AIRFLOW MODE DOES NOT CHANGE

AVF858001038W05

3	**Airflow mode does not change.**
DESCRIPTION	• Malfunction in front heater unit's airflow system.
POSSIBLE CAUSE	• Malfunction in front heater unit's airflow mode link, crank, wire or wire clamp (Steps 1, 2) • Bevel gear set (2) in front climate control unit, airflow mode wire or wire clamp malfunction (Step 3) • Malfunction in one or more front heater unit doors (Steps 4, 5)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FRONT HEATER UNIT'S AIRFLOW MODE SYSTEM** • Inspect front heater unit's airflow mode main link, rod, cranks, sub links, wire, and wire clamp as follows. — Is there grease on main link, cranks and sub links? — Are main link, rod, cranks and sub links installed securely in their proper positions? — Is wire clamp free of deformation? • Are above items all okay?	Yes	Go to next step.
		No	Apply grease or install main link, rod, cranks and sub links securely in their proper positions. Repair or replace wire clamp, then go to Step 6.

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STEP	INSPECTION		ACTION
2	**VERIFY THAT AIRFLOW MODE WIRE FROM HEATER UNIT IS POSITIONED SECURELY AND CORRECTLY** • Is airflow mode wire positioned securely and correctly in relation to the front heater unit's airflow mode main link?	Yes	Go to next step.
		No	Adjust airflow mode wire or install it correctly, then go to Step 6.
3	**INSPECT FRONT CLIMATE CONTROL UNIT** • Inspect front climate control unit as follows. — Is bevel gear set properly engaged? — Is airflow mode wire properly installed in correct direction on bevel gear? — Is wire clamp free of deformation? • Are above items okay?	Yes	Go to next step.
		No	Properly engage bevel gear set or install airflow mode wire in correct direction, repair or replace wire clamp, then go to Step 6.
4	**INSPECT FRONT HEATER UNIT'S AIRFLOW MODE DOORS** • Is there any foreign material or obstructions in any of front heater unit's doors?	Yes	Remove obstruction, then go to Step 6.
		No	Go to next step.
5	**VERIFY THAT ALL AIRFLOW MODE DOORS WITHIN FRONT HEATER UNIT ARE POSITIONED SECURELY AND PROPERLY** • Are all doors within front heater unit securely and properly positioned?	Yes	Check each door for cracks or damage, then go to next step.
		No	Install malfunction doors securely in proper position, then go to next step.
6	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does airflow mode change?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.4 IMPROPER AIR CIRCULATION AND/OR NO AIR CIRCULATION

AVF858001038W06

4	**Improper air circulation and/or no air circulation.**
DESCRIPTION	• Malfunction in front blower unit's air intake system.
POSSIBLE CAUSE	• Malfunction in front blower unit's air intake crank, link, wire or wire clamp (Steps 1, 2) • Front climate control unit air intake wire or wire clamp malfunction (Step 3) • Front blower unit air intake door malfunction (Steps 4, 5)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT FRONT BLOWER UNIT'S AIRFLOW MODE SYSTEM** • Inspect front blower unit's air intake crank, link and wire clamp as follows. — Is there grease on crank and link? — Are crank and link installed securely in their proper positions? — Is wire clamp free of deformation? • Are above items all okay?	Yes	Go to next step.
		No	Apply grease or install crank and link securely in their proper positions. Repair or replace wire clamp, then go to Step 6.
2	**VERIFY THAT AIR INTAKE WIRE FROM FRONT BLOWER UNIT IS POSITIONED SECURELY AND CORRECTLY** • Is air intake wire positioned securely and correctly in relation to the front blower unit's air intake link?	Yes	Go to next step.
		No	Adjust air intake wire or install it correctly, then go to Step 6.
3	**INSPECT FRONT CLIMATE CONTROL UNIT** • Inspect front climate control unit as follows. — Is air intake wire properly installed in correct direction in relation to the air intake lever of front climate control unit? — Is wire clamp free of deformation? • Are above items okay?	Yes	Go to next step.
		No	Properly install air intake wire in correct direction, repair or replace wire clamp, then go to Step 6.
4	**INSPECT FRONT HEATER UNIT'S AIRFLOW MODE DOOR** • Is there any foreign material or obstructions in front blower unit's door?	Yes	Remove obstruction, then go to Step 6.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**VERIFY THAT ALL AIR INTAKE DOOR WITHIN FRONT BLOWER UNIT IS POSITIONED SECURELY AND PROPERLY** • Is door within front blower unit securely and properly positioned?	Yes	Check door for cracks or damage, then go to next step.
		No	Install malfunction door securely in proper position, then go to next step.
6	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does air circulate?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.5 NO TEMPERATURE CONTROL

AVF858001038W07

5	**No temperature control.**
DESCRIPTION	• Malfunction in front heater unit's air mix system.
POSSIBLE CAUSE	• Malfunction in front heater unit's air mix rod, link, cranks, shaft, wire or wire clamp (Steps 2, 3) • Bevel gear set (2) in front climate control unit, air mix wire or wire clamp malfunction (Step 4) • Front heater unit air mix door malfunction (Steps 5, 6)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT COOLANT TEMPERATURE** • Is coolant sufficiently warmed up?	Yes	Go to next step.
		No	Warm engine up, then go to Step 7.
2	**INSPECT FRONT HEATER UNIT'S AIR MIX SYSTEM** • Inspect front heater unit's air mix rod, link, cranks, shaft and wire clamp as follows. — Is there grease on rod, link and cranks? — Are rod, link, cranks and shaft securely installed in their proper positions? — Is wire clamp free of deformation? • Are above items okay?	Yes	Go to next step.
		No	Apply grease or install rod, link, cranks and shaft securely in their proper positions. Repair or replace wire clamp. Go to Step 7.
3	**VERIFY THAT AIR MIX WIRE FROM HEATER UNIT IS POSITIONED SECURELY AND CORRECTLY** • Is air mix wire securely installed in the correct position in relation to front heater unit's air mix link?	Yes	Go to next step.
		No	Adjust air mix wire or install securely in correct position, then go to Step 7.
4	**INSPECT FRONT CLIMATE CONTROL UNIT** • Inspect front climate control unit as follows. — Is bevel gear set properly engaged? — Is air mix wire properly installed in correct position in relation to bevel gear? — Is wire clamp free of deformation? • Are above items okay?	Yes	Go to next step.
		No	Properly engage bevel gear set or install air mix wire in correct position, repair or replace wire clamp, then go to Step 7.
5	**INSPECT FRONT HEATER UNIT** • Is there any foreign material or obstructions in front heater unit's air mix door?	Yes	Remove obstruction, then go to Step 7.
		No	Go to next step.
6	**INSPECT FRONT HEATER UNIT'S AIR MIX DOOR** • Inspect front heater unit's air mix door as follows. — Is air mix door free of cracks and damage? — Is air mix door securely and properly installed? • Are above items okay?	Yes	Go to next step.
		No	Replace malfunction door or install door securely in proper position, then go to next step.
7	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does unit operate in every temperature setting?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.6 AIR FROM VENT NOT COLD ENOUGH

AVF858001038W08

6	Air from vent not cold enough
DESCRIPTION	• Magnetic clutch operates but A/C system malfunctions.
POSSIBLE CAUSE	• Drive belt malfunction (Step 1) • Malfunction in front and/or rear blower unit or condenser (Steps 4, 5) • Malfunction in RECEIVER/DRIER or front expansion valve (valve closes too much) (Step 8, 9) • Malfunction in refrigerant lines (Steps 10, 11) • Malfunction in piping connections (Steps 1, 2, 13) • A/C compressor system malfunction, insufficient compressor oil (Steps 15, 16) • Compressor oil over-full, malfunction in front expansion valve or heater unit air mix link system (Steps 17—20)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT DRIVE BELT** • Inspect drive belt. • Is it okay?	Yes	Go to next step.
		No	Replace drive belt, then go to Step 21.
2	**INSPECT REFRIGERANT SYSTEM PERFORMANCE** • Carry out refrigerant system performance test. • Is operation normal?	Yes	Operation is normal. (Recheck malfunction symptoms.)
		No	Go to next step.
3	**VERIFY WHETHER MALFUNCTION IS IN HEATER UNIT INTAKE AND CONDENSER OR ELSEWHERE** • Are refrigerant's high-pressure and low-pressure values both high?	Yes	Go to next step.
		No	Go to Step 6.
4	**INSPECT FRONT HEATER UNIT INTAKE** • Is blower unit intake clogged?	Yes	Remove obstruction, then go to Step 21. (If air does not reach evaporator within cooling unit, heat exchange does not occur and refrigerant pressure rises. Therefore, removal of obstruction is necessary.)
		No	Go to next step.
5	**INSPECT CONDENSER** • Inspect condenser. • Is it okay?	Yes	Add or subtract refrigerant to make specified amount, then go to Step 21. (Excessive amount of refrigerant.)
		No	Replace condenser, or repair and clean condenser fins, then go to Step 21.
6	**VERIFY WHETHER MALFUNCTION IS IN EXPANSION VALVE, RECEIVER/DRIER AND REFRIGERANT LINES OR ELSEWHERE** • Are refrigerant's high-pressure and low-pressure values low?	Yes	Go to next step.
		No	Go to Step 14.
7	**VERIFY WHETHER MALFUNCTION IS IN EXPANSION VALVE AND RECEIVER/DRIER OR ELSEWHERE** • Immediately after A/C compressor operates, does refrigerant's high-pressure value momentarily rise to correct value, then fall and stay below it? (Is there negative pressure on low-pressure side?)	Yes	Go to next step.
		No	Go to Step 10.
8	**VERIFY WHETHER MALFUNCTION IS IN EXPANSION VALVE OR RECEIVER/DRIER** • Turn A/C switch off and let air conditioner stop for **10 minutes**. • Start engine. • Turn both A/C switch and front fan switch on. • Does malfunction occur after A/C compressor turns on?	Yes	Go to next step.
		No	Start vacuum pump for **30 minutes** and replace condenser, then go to Step 21. (Since RECEIVER/DRIER has become saturated with water, replacement is necessary.)
9	**INSPECT EXPANSION VALVE** • Is front expansion valve heat-sensing tube within front cooling unit securely installed in proper position?	Yes	Replace front expansion valve, then go to Step 21. (Since valve closes too much, replacement is necessary.)
		No	Install heat-sensing tube securely, then go to Step 21.

STEP	INSPECTION		ACTION
10	**INSPECT REFRIGERANT LINES** • Inspect refrigerant lines as follows. — Is piping free of damage and cracks? — Are piping connections free of oil grime? (Visual inspection) — Are piping connections free of gas leakage? — Are piping installation points on condenser free of gas leakage? — Are piping installation points on RECEIVER/DRIER free of gas leakage? — Are piping installation points on A/C compressor free of gas leakage? — Are piping installation points on cooling unit free of gas leakage? — Perform gas leak inspection using gas leak tester. • Are above items okay?	Yes	Go to next step.
		No	If piping or an A/C component is damaged or cracked, replace it. Then go to Step 21. If there is no damage, go to Step 13.
11	**INSPECT EVAPORATOR PIPING CONNECTIONS IN A/C UNIT FOR GAS LEAKAGE** • Are piping connections for evaporator in cooling unit free of gas leakage?	Yes	If the A/C compressor is making noise, add **10 ml {10 cc, 0.338 fl oz}** of compressor oil and verify that malfunction does not occur. Add or subtract refrigerant to make specified amount, then go to Step 21.
		No	If piping is damaged or cracked, replace it. Then go to Step 21. If there is no damage, go to next step.
12	**INSPECT EVAPORATOR PIPING CONNECTIONS IN A/C UNIT FOR LOOSE** • Are piping connections for evaporator in cooling unit loose?	Yes	Tighten connections to specified torque. If the A/C compressor is making noise, add **10 ml {10 cc, 0.338 fl oz}** of compressor oil and verify that malfunction does not occur. Add or subtract refrigerant to make specified amount, then go to Step 21.
		No	If the A/C compressor is making noise, add **10 ml {10 cc, 0.338 fl oz}** of compressor oil and verify that malfunction does not occur. Replace O-ring on piping, add or subtract refrigerant to make specified amount, then go to Step 21.
13	**INSPECT PIPING CONNECTIONS FOR LOOSE** • Are piping connections loose?	Yes	Tighten connections to specified torque. If the A/C compressor is making noise, add **10 ml {10 cc, 0.338 fl oz}** of compressor oil and verify that malfunction does not occur. Add or subtract refrigerant to make specified amount, then go to Step 21.
		No	If the A/C compressor is making noise, add **10 ml {10 cc, 0.338 fl oz}** of compressor oil and verify that malfunction does not occur. Replace O-ring on piping, add or subtract refrigerant to make specified amount, then go to Step 21.
14	**VERIFY WHETHER MALFUNCTION IS IN EXPANSION VALVE, AIR MIX ACTUATOR AND COMPRESSOR OIL OR ELSEWHERE** • Does refrigerant's high-pressure value hardly increase?	Yes	Go to next step. (Pressure hardly increases.)
		No	Go to Step 17.
15	**VERIFY WHETHER MALFUNCTION IS IN COMPRESSOR OIL AMOUNT AND A/C COMPRESSOR OR ELSEWHERE** • When engine is racing, does high-pressure value increase?	Yes	Return to Step 3.
		No	Go to next step.
16	**VERIFY WHETHER MALFUNCTION IS IN COMPRESSOR OIL AMOUNT OR A/C COMPRESSOR** • After compressor oil is replenished each **10 ml {10 cc, 0.338 fl oz}**, does high-pressure value increase?	Yes	Troubleshooting completed. (Explain to customer that cause was insufficient compressor oil.)
		No	Replace A/C compressor, then go to Step 21. (Cause is defective A/C compressor.)
17	**VERIFY WHETHER MALFUNCTION IS IN EXPANSION VALVE OR ELSEWHERE** • Is only refrigerant low-pressure value high?	Yes	Go to Step 19.
		No	Go to next step.

STEP	INSPECTION		ACTION
18	**VERIFY THAT AIR MIX ACTUATOR IS INSTALLED SECURELY AND PROPERLY** • Are heater unit's air mix rod, link, cranks and shaft securely and properly installed?	Yes	Go to next step.
		No	Repair or install rod, link, cranks and shaft securely in proper position, then go to Step 21.
19	**ADJUST COMPRESSOR OIL** • Set the front fan switch at 4th position. • Turn the A/C switch on. • Set in FRESH mode. • Set the temperature control to MAX COLD. • Set in VENT mode. • Run engine at a constant **1,500 rpm** for **10 minutes**. • Run engine at idle speed for **1 minute**. • 1 engine speed cycle is defined as going from idle speed to **4,000 rpm** and back to idle speed over a period of **12 seconds**. Perform **5 cycles**. • Run engine at idle speed for **30 seconds**. • Remove all compressor oil from A/C compressor and verify that it is **105 ml {105 cc, 3.55 fl oz}**. • If it is more than **105 ml {105 cc, 3.55 fl oz}**, put only **105 ml {105 cc, 3.55 fl oz}** back into A/C compressor. • Carry out above Steps 1 to 10 again and verify that compressor oil is **105 ml {105 cc, 3.55 fl oz}**. • Is there **105 ml {105 cc, 3.55 fl oz}** of compressor oil in A/C compressor?	Yes	Go to next step.
		No	Follow Steps 1 to 10 again until compressor oil is **105 ml {105 cc, 3.55 fl oz}**.
20	**INSPECT EXPANSION VALVE** • Is front expansion valve heatsen-sing tube within front cooling unit securely installed in proper position?	Yes	Replace front expansion valve, then go to next step. (Since valve closes too much, replacement is necessary.)
		No	Install heat-sensing tube securely, then go to next step.
21	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does cool air blow out? (Are results of refrigerant system performance test okay?)	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.7 NO COOL AIR

AVF858001038W09

7	**No cool air**
DESCRIPTION	• Magnetic clutch does not operate.
POSSIBLE CAUSE	• A/C compressor system malfunction (Step 2) • Incorrect amount of refrigerant (Step 3) • A/C switch indicator light malfunction (Steps 4—6) • PCM A/C cut-off control system (WL, WL turbo: Step 18) (G6: Step 7) • PCM (IG1 signal) system malfunction (WL, WL turbo: Steps 8, 9) (G6: Step 20) • Themoswitch, A/C switch malfunction (WL, WL turbo: Steps 11, 12, 14, 15) (G6: Step 10—14) • PCM (A/C signal) system malfunction (WL, WL turbo: Steps 17) (G6: Step 16, 17) • Refrigerant pressure switch malfunction (WL, WL turbo: Step 26) (G6: Step19) • A/C relay malfunction (WL, WL turbo: Steps 22—25) (G6: Step 22—24)

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while doing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT AIR BLOW OUT** • Does air blow out?	Yes	Go to next step.
		No	Go to Step 1 of troubleshooting indexes No.1, 2.
2	**INSPECT A/C COMPRESSOR OPERATION** • Start engine. • Turn both A/C switch and front fan switch on. • Does A/C compressor operate?	Yes	Go to Step 1 of troubleshooting index No. 6.
		No	Go to next step.

STEP	INSPECTION		ACTION
3	**INSPECT REFRIGERANT AMOUNT** • Inspect refrigerant amount. • Is it okay?	Yes	Go to next step.
		No	Add or subtract refrigerant to specified level, then go to Step 27.
4	**INSPECT A/C SWITCH INDICATOR LIGHT** • Does A/C switch indicator light illuminate?	Yes	WL or WL turbo: Go to Step 8. G6: Go to Step 7.
		No	Go to next step.
*5	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND FRONT CLIMATE CONTROL UNIT FOR CONTINUITY** • Turn ignition switch to ON position. • Turn both A/C switch and front fan switch on. • Remove airflow mode wire and air mix wire and pull out front climate control unit. • Test voltage at front climate control unit terminal C (IG2 signal). • Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and A/C switch, then go to Step 27.
*6	**INSPECT A/C SWITCH** • Inspect A/C switch. • Is it okay?	Yes	Inspect wiring harness between A/C switch and resistor, then go to Step 27.
		No	Replace A/C switch, then go to Step 27.
7	**CHECK FOR DTCS IN PCM** • Check the DTC for the ON-BOARD DIAGNOSTIC (ENGINE CONTROL). • Are the following DTCs displayed? — DTC 0120	Yes	Go to appropriate inspection procedure. (The throttle position sensor (DTC 0120), which sends the PCM's A/C cut off control input signal, may be the cause of the trouble.)
		No	Go to Step 10.
*8	**VERIFY WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH SYSTEM OR ELSEWHERE** • Turn ignition switch to ON position. • Does magnetic clutch operate when A/C relay connector terminal B (IG2 signal) is grounded?	Yes	Go to next step.
		No	Go to Step 21.
*9	**VERIFY WHETHER MALFUNCTION IS IN A/C RELAY SYSTEM (COIL-SIDE) OR ELSEWHERE** • Turn A/C switch off. • Test voltage at PCM connector terminal L(IG1 signal). • Is voltage **approximately 12 V**?	Yes	Go to Step 11.
		No	Repair wiring harness between A/C relay and PCM, then go to Step 27.
*10	**VERIFY WHETHER MALFUNCTION IS IN THEMOSWITCH SYSTEM OR ELSEWHERE** • Turn ignition switch to LOCK position. • Remove radiator grille. • Disconnect refrigerant pressure switch connector. • Turn ignition switch to ON position. • Set front fan switch at first speed. • Test voltage at the following refrigerant pressure switch connector terminal B (A/C signal) on wiring harness side. • Is voltage **approximately 12 V** when A/C switch is off and **0 V** when it is on?	Yes	Go to Step 16.
		No	Reconnect refrigerant pressure switch connector, then go to next step.

STEP	INSPECTION		ACTION
*11	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR AND WIRING HARNESS (BETWEEN FUSE BLOCK AND EVAPORATOR TEMPERATURE SENSOR FOR CONTINUITY) OR ELSEWHERE** • Turn ignition switch to LOCK position. • Remove glove compartment. • Disconnect evaporator temperature sensor connector. • Start engine. • Turn both A/C switch and front fan switch on. • When evaporator temperature sensor connector terminals B and C (on wiring harness side) are shorted, does cool air blow out?	Yes	Undo short, then go to next step.
		No	WL or WL turbo: Undo short, then go to Step 14. G6: Undo short, then go to Step 13.
*12	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR OR WIRING HARNESS (BETWEEN FUSE BLOCK AND THEMOSWITCH FOR CONTINUITY)** • Turn ignition switch to ON position. • Test voltage at evaporator temperature sensor connector terminal A (IG2 signal). • Is voltage **approximately 12 V**?	Yes	Inspect evaporator temperature sensor, then go to Step 27.
		No	Repair wiring harness between fuse block and evaporator temperature sensor, then go to Step 27.
*13	**INSPECT WIRING HARNESS BETWEEN EVAPORATOR TEMPERATURE SENSOR AND REFRIGERANT PRESSURE SWITCH FOR CONTINUITY** • Turn ignition switch to LOCK position. • Inspect for continuity between evaporator temperature sensor connector terminal B (A/C signal) and refrigerant pressure switch connector terminal B. • Is there continuity?	Yes	Go to next step.
		No	Repair wiring harness between refrigerant pressure switch and evaporator temperature sensor, then go to Step 27.
*14	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR AND WIRING HARNESS (BETWEEN EVAPORATOR TEMPERATURE SENSOR AND A/C SWITCH FOR CONTINUITY) OR ELSEWHERE** • Turn ignition switch to ON position. • Turn A/C switch ON. • Turn fan switch ON. • Test voltage at A/C switch connector terminal A (A/C signal). • Is voltage **approximately 12 V**?	Yes	WL or WL turbo: Go to next step. G6: Inspect wiring harness between evaporator temperature sensor and A/C switch, then go to Step 27.
		No	Inspect A/C switch, then go to Step 27.
*15	**VERIFY WHETHER MALFUNCTION IS IN EVAPORATOR TEMPERATURE SENSOR AND WIRING HARNESS (BETWEEN EVAPORATOR TEMPERATURE SENSOR AND A/C SWITCH FOR CONTINUITY) OR ELSEWHERE** • Test voltage at evaporator temperature sensor connector terminal C (A/C signal). • Is voltage **approximately 12 V**?	Yes	Go to Step 17.
		No	Repair wiring harness between evaporator temperature sensor and A/C switch, then go to Step 27.
*16	**VERIFY WHETHER MALFUNCTION IS IN PCM AND WIRING HARNESS (BETWEEN PCM AND REFRIGERANT PRESSURE SWITCH FOR CONTINUITY) OR ELSEWHERE** • Test voltage at refrigerant pressure switch connector (on wiring harness side) terminal A (A/C signal). • Is voltage **approximately 12 V**?	Yes	Go to Step 19.
		No	Go to next step.

STEP	INSPECTION		ACTION
*17	**VERIFY WHETHER MALFUNCTION IS IN PCM OR WIRING HARNESS (BETWEEN PCM AND REFRIGERANT PRESSURE SWITCH FOR CONTINUITY)** • Test voltage at the following PCM connector terminals (A/C signal). — Terminal G (WL or WL turbo) — Terminal Q (G6) • Is voltage **approximately 12 V**?	Yes	WL or WL turbo: Go to next step. G6: Inspect wiring harness between PCM and refrigerant pressure switch, then go to Step 27.
		No	Inspect PCM, then go to Step 27.
*18	**VERIFY WHETHER MALFUNCTION IS IN PCM AND WIRING HARNESS (BETWEEN PCM AND EVAPORATOR TEMPERATURE SENSOR FOR CONTINUITY) OR ELSEWHERE** • Inspect the following input signal components: — Engine coolant temperature sensor, including PCM wiring harness (A/C cut-off control) • Are they okay?	Yes	Repair wiring harness between PCM and evaporator temperature sensor, then go to Step 27.
		No	Replace input signal components, then go to Step 27.
*19	**VERIFY WHETHER MALFUNCTION IS IN REFRIGERANT PRESSURE SWITCH OR ELSEWHERE** • When the following refrigerant pressure switch connector terminal A and B (on wiring harness side) are shorted, does cool air blow out?	Yes	Inspect refrigerant pressure switch, then go to Step 27.
		No	Undo short, reconnect refrigerant pressure switch, then go to next step.
*20	**INSPECT TO SEE WHETHER MALFUNCTION IS IN A/C RELAY OR ELSEWHERE** • Does magnetic clutch operate when terminal B (IG2 signal) of A/C relay connector is grounded?	Yes	Inspect wiring harness between A/C relay and PCM, then go to Step 27.
		No	Go to next step.
*21	**VERIFY WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH OR WIRING HARNESS (BETWEEN A/C RELAY AND MAGNETIC CLUTCH FOR CONTINUITY)** • Test voltage at magnetic clutch connector terminal A (A/C control signal). • Is voltage **approximately 12 V**?	Yes	Inspect magnetic clutch, then go to Step 27.
		No	Go to next step.
22	**INSPECT A/C RELAY (SWITCH-SIDE) POWER SUPPLY FUSE** • Are A/C relay power supply fuses okay?	Yes	Go to next step.
		No	Inspect for a short to ground on blown fues's circuit. Repair or replace as necessary. Install appropriate amperage fuse.
*23	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND A/C RELAY (SWITCH-SIDE) FOR CONTINUITY** • Turn ignition switch to ON position. • Test voltage at the following A/C relay connector terminals: — Terminal A (IG2 signal) — Terminal C (A/C control signal) • Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and A/C relay, then go to Step 27.
*24	**VERIFY WHETHER MALFUNCTION IS IN MAGNETIC CLUTCH OR WIRING HARNESS (BETWEEN A/C RELAY AND MAGNETIC CLUTCH FOR CONTINUITY)** • Test voltage at A/C relay connector terminal D (A/C control signal). • Is voltage **approximately 12 V**?	Yes	WL or WL turbo: Go to next step. G6: Repair wiring harness between A/C relay and magnetic clutch, then go to Step 27.
		No	Inspect A/C relay, then go to Step 27.

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STEP	INSPECTION		ACTION
*25	**INSPECT WIRING HARNESS BETWEEN FUSE BLOCK AND A/C RELAY (SWITCH-SIDE) FOR CONTINUITY** • Turn ignition switch to ON position. • Test voltage at refrigerant pressure switch connector (on wiring harness side) terminal A (A/C control signal) • Is voltage **approximately 12 V**?	Yes	Go to next step.
		No	Repair wiring harness between A/C relay and refrigerant pressure switch, then go to Step 27.
*26	**VERIFY WHETHER MALFUNCTION IS IN REFRIGERANT PRESSURE SWITCH OR ELSEWHERE** • When refrigerant pressure switch connector terminal A and B (on wiring harness side) are shorted, does cool air blow out?	Yes	Inspect refrigerant pressure switch, then go to next step.
		No	Repair wiring harness between refrigerant pressure switch and magnetic clutch, then go to next step.
27	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Does cool air blow out? (Is refrigerant system performance test result correct?)	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

NO.8 NOISE WHILE OPERATING A/C SYSTEM

AVF858001038W10

8	**Noise while operating A/C system**
DESCRIPTION	• Noise from magnetic clutch, A/C compressor, hose or refrigerant line.
POSSIBLE CAUSE	• Magnetic clutch operation noise (Step 3) • A/C compressor operation noise (Steps 4—8) • A/C compressor slippage noise (Steps 9—11) • Hose or refrigerant line interference noise (Step 12)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT A/C COMPRESSOR SLIPPAGE NOISE** • Is there a squeaking or whirling sound (A/C compressor slippage noise)?	Yes	Go to Step 9.
		No	Go to next step.
2	**INSPECT A/C COMPRESSOR INTERFERENCE NOISE** • Is there a rattling or vibrating sound (interference noise)?	Yes	Go to Step 12.
		No	Go to next step.
3	**INSPECT MAGNETIC CLUTCH OPERATION NOISE** • Is there clicking sound (magnetic clutch operation noise)?	Yes	Adjust clearance between magnetic clutch pressure plate and A/C compressor pulley, then go to Step 13.
		No	Go to next step.
4	**INSPECT A/C COMPRESSOR NOISE TIME** • Is noise heard continuously for **more than 3 seconds** after A/C compressor comes on?	Yes	Go to next step.
		No	Condition is normal. (Noise normally occurs for **2–3 seconds** immediately after A/C compressor turns on.)
5	**INSPECT IDLE SPEED** • Inspect idle speed. • Is it okay?	Yes	Go to next step.
		No	Adjust idle speed, then go to Step 13.
6	**VERIFY WHETHER MALFUNCTION IS IN COMPRESSOR OIL OR A/C COMPRESSOR** • Drain compressor oil. • Is it contaminated with metal particles?	Yes	Go to next step.
		No	Replace A/C compressor, then go to Step 13.
7	**VERIFY WHETHER MALFUNCTION IS IN ENTIRE A/C SYSTEM OR A/C COMPRESSOR AND CONDENSER** • Is compressor oil whitish and mixed with water?	Yes	Replace entire A/C system (excluding heater), then go to Step 13.
		No	Go to next step.
8	**INSPECT COMPRESSOR OIL** • Is compressor oil darker than normal and contaminated with aluminum chips?	Yes	Replace A/C compressor and RECEIVER/DRIER, then go to Step 13. (Since A/C compressor may be worn and RECEIVER/DRIER may be clogged, replacement of RECEIVER/DRIER is necessary.)
		No	Condition is normal. Recheck malfunction symptoms.

STEP	INSPECTION		ACTION
9	**INSPECT DRIVE BELT** • Inspect drive belt. • Is it okay?	Yes	Go to next step.
		No	Adjust or replace drive belt, then go to Step 13.
10	**INSPECT DRIVE BELT CONDITION** • Is drive belt worn? • Does it have foreign material imbedded in it, or have oil on it?	Yes	Remove obstruction, remove oil, or replace drive belt, then go to Step 13.
		No	Go to next step.
11	**INSPECT MAGNETIC CLUTCH** • Inspect magnetic clutch. • Is it okay?	Yes	Replace A/C compressor (excluding pressure plate, A/C compressor pulley, and stator), then go to Step 13.
		No	Replace magnetic clutch, then go to Step 13.
12	**INSPECT A/C COMPRESSOR NOISE** • Is noise coming from A/C compressor?	Yes	Visually inspect A/C compressor, replace appropriate parts if necessary, then go to next step.
		No	If noise is coming from refrigerant lines, repair any detached or missing clips, tighten loose bolts, then go to next step.
13	**VERIFY THAT MALFUNCTION SYMPTOM OCCURS AFTER REPAIR** • Has A/C compressor noise stopped?	Yes	Troubleshooting completed. Explain repairs to customer.
		No	Recheck malfunction symptoms, then repeat from Step 1 if malfunction recurs.

TECHNICAL DATA

TECHNICAL DATA TD-2
FUEL AND EMISSION CONTROL SYSTEMS TD-2
FRONT AND REAR AXLE TD-2
BRAKING SYSTEM TD-2
SUSPENSION TD-3
BODY ELECTRICAL SYSTEM TD-3
HEATER AND AIR CONDITIONER SYSTEMS TD-4

TECHNICAL DATA

FUEL AND EMISSION CONTROL SYSTEMS

AVF931001001W01

Item			Engine
			G6
Idle speed		(rpm)	730—770 (750±20)
Idle-up speed	(rpm)*1	E/L ON*2	700—800 (750±50)
		P/S ON*3	700—800 (750±50)
		A/C ON*4	780—880 (830±50)

*1 : Excludes temporary idle speed drop just after the electrical loads (E/L) are turned on.
*2 : Headlight is on, blower control switch is above 1st, cooling fan is operating, rear window defroster is on.
*3 : Steering wheel is fully turned.
*4 : A/C switch and fan switch are on.

Item			Engine
			WL Turbo
Idle speed		(rpm)	760—800 (780±20)
Idle-up speed	(rpm)	A/C ON	925—975 (950±25)
		When engine is cold	1,200—1,500 (1,350±150)

FRONT AND REAR AXLE

AVF931001018W01

Item			Specification	
			4x2	4x4
Front axle	Wheel bearing play	(mm {in})	0.05 {0.002}	

BRAKING SYSTEM

AVF931001020W01

Item			Specification	
			4x2	4x4
Power brake unit	Fluid pressure when pedal deplessed at 196 N {20 kgf, 44 lbf} (kPa {kgf/cm^2, psi})	At 0 kPa {0 mmHg, 0 inHg}	790 {8.0, 114} min.	
		At 66.7 kPa {500 mmHg, 19.7 inHg}	G6 engine except the Philippines: 9,620 {98, 1,395} min.	L.H.D. with G6 engine: 9,620 {98, 1,395} min.
			Except above: 7,460 {76, 1,082} mini.	
Load sensing proportioning valve (LSPV)	Rear brake fluid pressure (kPa {kgf/cm^2, psi})	When front pressure is 4,900 kPa {50 kgf/m^2, 711 psi}	Without ABS: 2,250—2,850 {22.95—29.06, 327—413} With ABS: 2,650—3,450 {27.03—35.18, 385—500}	
		When front pressure is 9,810 kPa {100 kgf/cm^2, 1,422 psi}	Without ABS: 3,130—3,930 {31.92—40.07, 454—569} With ABS: 4,700—5,900 {47.93—60.16, 682—855}	
Front disc brake	Minimum disc pad thickness	(mm {in})	2.0 {0.079}	
	Minimum disc plate thickness	(mm {in})	26.0 {1.02}	
	Disc plate runout limit	(mm {in})	0.05 {0.002}	
Rear drum brake	Minimum lining thickness	(mm {in})	1.0 {0.04}	
	Maximum brake drum diameter	(mm {in})	296.5 {11.67}	

SUSPENSION

AVF931001013W01

Suspension

Item				Specification	
Drive type				**4x2**	**4x4**
Front wheel alignment (Unloaded)*1	Maximum steering angle		Inner	31°30′—35°30′	
			Outer	27°00′—32°00′	
	Total toe-in	Tire [Tolerance ±4 {±0.16}]	(mm {in})	3 {0.12}	
		Rim inner		1.5±2.0 {0.06±0.08}	
			(degree)	0°15′±0°20′	
	Caster angle (reference value) [Tolerance ±1°]			2°02′	
	Camber angle (reference value) [Tolerance ±1°]			1°07′	
	Steering axis inclination (reference value)			10°13′	

*1 : Engine coolant and engine oil are at specified level. Spare tire, jack, and tools are in designated position. Adjust to the median when carrying out wheel alignment.

Wheel and Tires

Item				Specification	
Tire	Size			265/70R15 110S	265/70R15 112S
	Air pressure (kPa {kgf/cm^2, psi})	Front	Unloaded	210 {2.1, 30}	
			Loaded		
		Rear	Unloaded		
			Loaded		
	Wear limit (mm {in})			1.6 {0.06}	
Wheel	Size			15 × 7JJ	
	Offset (mm {in})			10 {0.39}	
	Pitch circle diameter (mm {in})			139.7 {5.50}	
Wheel and tire	Tightening torque (N·m {kgf·m, ft·lbf})			88.2—117.6 {9.00—11.99, 65.06—86.73}	
	Runout limit (mm {in})			Vertical: 1.5 {0.059} max., Horizontal: 2.0 {0.079} max.	
	Imbalance limit (g {oz})			10 {0.35} max.	

BODY ELECTRICAL SYSTEM

AVF931001047W01

Item		Specifications
Exterior light bulb capacity (w)	Brake light/taillight	21/5 × 2
	Rear turn light	21 × 2
	Back-up light	21 × 2, 5 × 2
	License plate light	5 × 2
	High-mount brake light	4 × 1
Interior light bulb capacity (w)	Interior and map light	8 × 1, 5 × 2
	Cargo compartment light	10 × 2
Warning and indicator light capacity (w)	Door ajar warning light	1.4 × 1

HEATER AND AIR CONDITIONER SYSTEMS

AVF931001038W01

Item			Specification
REFRIGERANT SYSTEM			
Refrigerant	Type		R-134a
	Regular amount (approximate quantity)	(g {oz})	675 {23.8}
BASIC SYSTEM			
A/C compressor	Lube oil	Type	FD46XG
		Sealed volume (approximate quantity) (ml {cc, fl oz})	160 {160, 5.40}
CONTROL SYSTEM			
Magnetic clutch	Clearance	(mm {in})	0.35—0.75 {0.014—0.029}

SPECIAL TOOLS

SPECIAL TOOLS ST-2
FUEL AND EMISSION CONTROL SYSTEMS ST-2
PROPELLER SHAFT ST-2
FRONT AND REAR AXLE ST-2
BRAKING SYSTEM ST-3
SUSPENSION ST-3
BODY ST-3
HEATER AND AIR CONDITIONER SYSTEMS ST-4

SPECIAL TOOLS

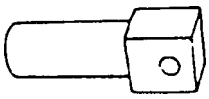
FUEL AND EMISSION CONTROL SYSTEMS

AVF941001001W01

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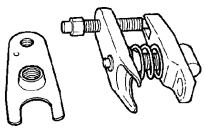
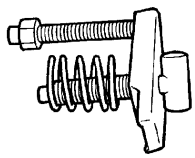
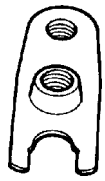
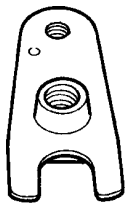
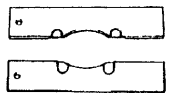
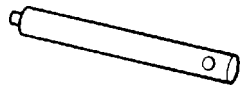
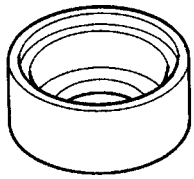
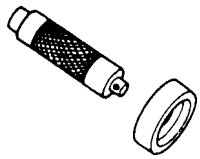
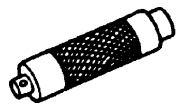
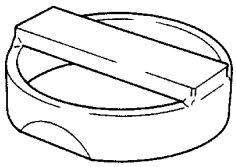
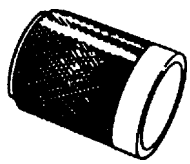
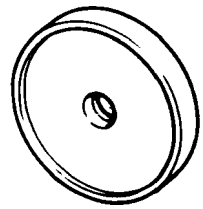
PROPELLER SHAFT

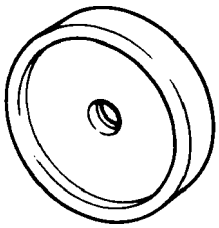
AVF941001018W01

49 S120 440 Mainshaft Holder 	—	—

FRONT AND REAR AXLE

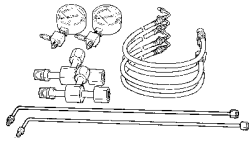
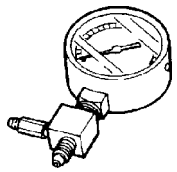
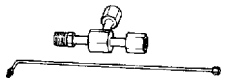
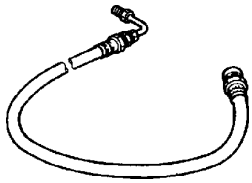
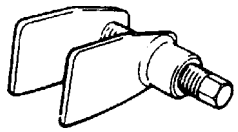
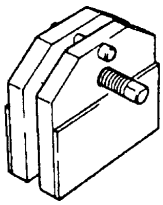
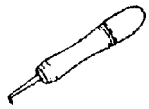
AVF941001018W02

49 T028 3A0 Ball joint puller set 	49 T028 303 Body (Part of 49 T028 3A0) 	49 T028 304 Attachment (Part of 49 T028 3A0) 
49 T028 305 Attachment (Part of 49 T028 3A0) 	49 F026 103 Wheel hub puller 	49 G033 102 Handle 
49 D026 102 Sensor rotor installer 	49 G030 795 Oil seal installer 	49 G030 797 Handle (Part of 49 G030 795) 
49 S011 103 Oil seal installer 	49 G019 011 Bearing installer 	49 S033 106 Oil seal installer 

49 S033 107 Oil seal installer 	—	—

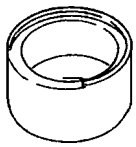
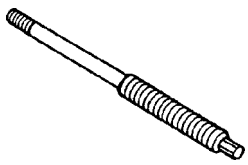
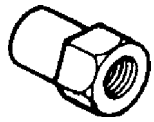
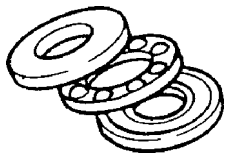
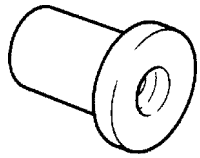
BRAKING SYSTEM

AVF941001020W01

49 0259 770B Flare nut wrench 	49 U043 0A0A Oil pressure gauge set 	49 U043 004A Oil pressure gauge (Part of 49 U043 0A0A) 
49 U043 005 Joint (Part of 49 U043 0A0A) 	49 U043 006 Hose (Part of 49 U043 0A0A) 	49 0221 600C Disc brake expand tool 
49 T033 001A Disc brake piston stopper 	49 0208 701A Boot air-out tool 	—

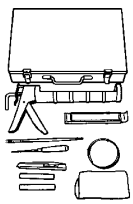
SUSPENSION

AVF941001013W01

49 S028 102 Support Block 	49 T034 002A Shaft 	49 W038 002 Nut 
49 G034 202 Support Block 	49 G034 205 Bearing 	49 S028 103 Attachment 

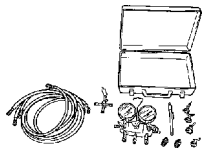
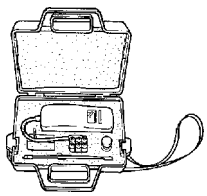
BODY

AVF941001047W01

49 0305 870A Window tool set 	—	—

HEATER AND AIR CONDITIONER SYSTEMS

AVF941001038W01

49 C061 0A0B Gas Charge Set 	49 C061 013 Gas Leak Tester 	—

EVEREST Repair Manual Supplement

FOREWORD

This Manual has been prepared to provide information covering normal service repairs and maintenance for the Everest Series.

As all information in this manual was the best available at the time of printing, all alternations related to modifications will be noticed by Service Information.

Ford Motor Company

APPLICATION:
This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN), shown on the following page.

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General Information		GI
Engine	G6	B1
	WL Turbo	B2
Lubrication System		D
Cooling System		E
Fuel and Emission Control Systems	G6	F1
	WL Turbo	F2
Engine Electrical System		G
Clutch		H
Manual Transmission	M15M–D M15MX–D	J1
	R15M–D R15M–D	J2
	Transfer	J3
Automatic Transmission	RA4AX–EL	K1
	Transfer	K2
Propeller Shaft		L
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Braking System		P
Suspension		R
Body		S
Body Electrical System		T
Heater and Air Conditioner Systems		U
Technical Data		TD
Special Tools		ST

There are explanations given only for the sections marked with shadow (■).

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F187–10–03G

VEHICLE IDENTIFICATION NUMBERS (VIN)

MNB	BS4D40*W	100001—
MNB	LS4D40*W	100001—
MNB	BS4D70*W	100001—
MNB	LS4D70*W	100001—
MNB	BSYD40*W	100001—
MNB	LSYD40*W	100001—

RELATED MATERIALS

RANGER Repair Manual
RANGER Training Manual
RANGER Repair Manual Supplement F165–10–99J
RANGER Repair Manual Supplement F166–10–00G
RANGER Repair Manual Supplement F172–10–00J
RANGER Repair Manual Supplement F176–10–01H
RANGER Repair Manual
(European, General specs.) F161–10–99A
RANGER Training Manual
(European, General specs.) F326–10–99A
EVEREST Repair Manual F183–10–03A
RANGER Overhaul Manual
(European, General specs.) F161–20–99A
RANGER Overhaul Manual F184–20–03C
RANGER Repair Manual Supplement
(Australian, General (L.H.D. R.H.D.) specs.) F182–10–02I
Manual Transmission Workshop Manual
M15M–D M15MX–D
Manual Transmission Workshop Manual
R15M–D R15MX–D
EVEREST Bodyshop Manual F337–10–03A
EVEREST Wiring Diagram F187–20–03H

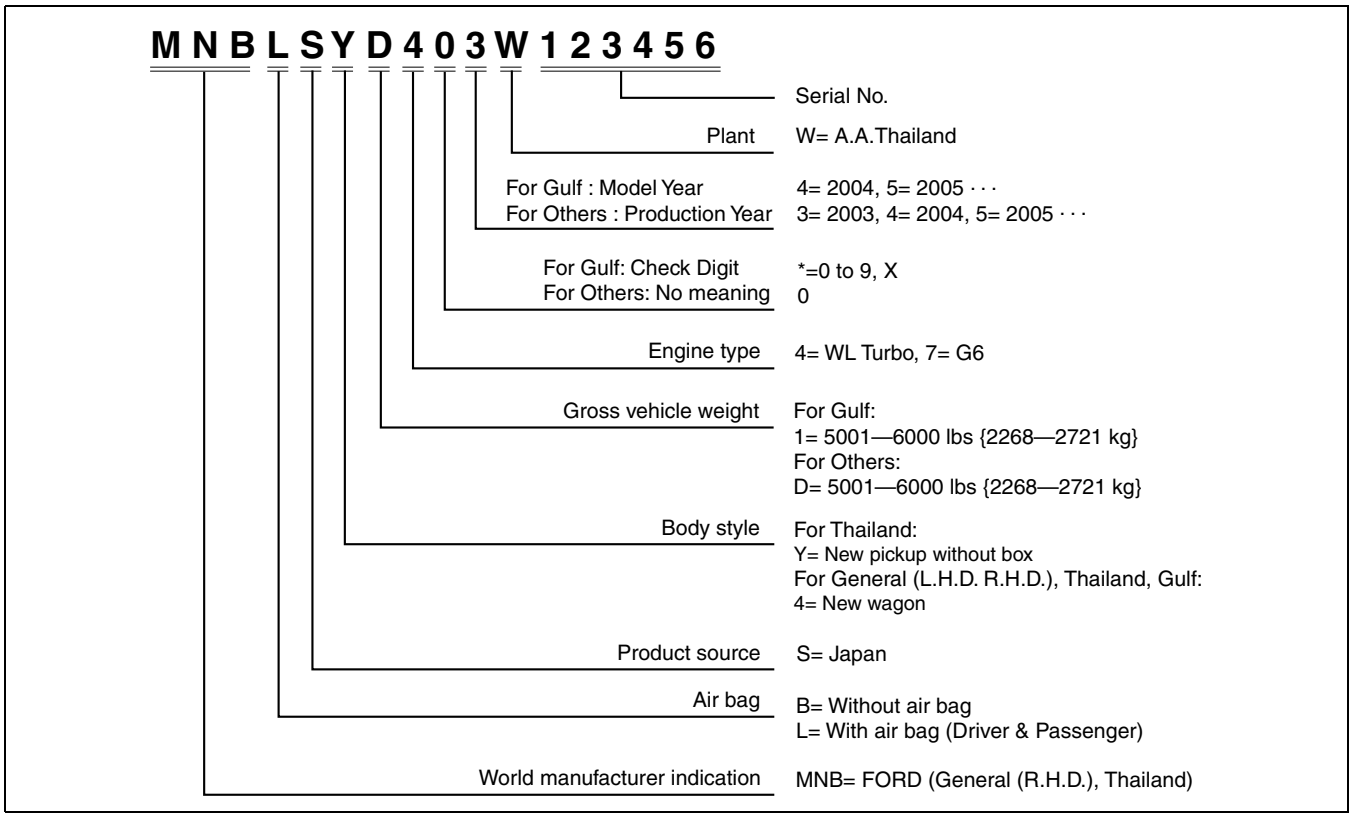
GENERAL INFORMATION

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VIN CODE

VIN CODE

BVF200800000W01



BVF2008W001

HOW TO USE THIS MANUAL

RANGE OF TOPICS

BVF201000000W01

- This manual indicates only changes/additions, as it is supplemental to the related materials. Therefore it may not contain the necessary reference service procedures to perform the service indicated in this manual.

NEW STANDARDS

NEW STANDARDS TABLE

BVF202800000W01

- The following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V_B	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
—	Closed Throttle Position Switch	—	Idle Switch	
CPP	Clutch Pedal Position	—	Clutch Position	
CIS	Continuous Fuel Injection System	EGI	Electronic Gasoline Injection System	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFI	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On Board Diagnostic	—	Diagnosis/Self Diagnosis	

NEW STANDARDS

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
OL	Open Loop	—	Open Loop	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multiport Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1–2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2–3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3–4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	EC-AT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Airflow Meter	
WU-TWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1 : Diagnostic trouble codes depend on the diagnostic test mode.
#2 : Controlled by the PCM
#3 : In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4 : Device that controls engine and powertrain
#5 : Directly connected to exhaust manifold
#6 : Part name of diesel engine

ABBREVIATIONS

ABBREVIATIONS

BVF203000000W01

AT	Automatic Transmission
ATF	Automatic Transmission Fluid
ELR	Emergency locking retractor
EC-AT	Electronic Controlled Automatic Transmission
O/D	Overdrive
SST	Special Service Tool
TFT	Transmission Fluid Temperature
1GR	First Gear
2GR	Second Gear
4×4	4 wheel-4 drive

SCHEDULED MAINTENANCE

SCHEDULED MAINTENANCE TABLE

BVF203400000W02

For Thailand

Maintenance Item	Maintenance Interval (Number of months or kilometers (miles), whichever comes first)											
	Months	**-**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
	×1000 km	**1.5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
	×1000 miles	**0.9**	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	**54**	**60**
ENGINE												
Engine valve clearance				I		I		I		I		I
Engine timing belt *1	Replace every 100,000 km											
Drive belts *2	A	I	I	I	I	I	I	I	I	I	I	I
Engine oil *3		R	R	R	R	R	R	R	R	R	R	R
Engine oil filter *3		R	R	R	R	R	R	R	R	R	R	R
COOLING SYSTEM												
Cooling system				I		I		I		I		I
Engine coolant	Replace every 2 years											
FUEL SYSTEM												
Air cleaner element *4		C	C	R	C	C	R	C	C	R	C	
Fuel filter					R				R			
Fuel lines and hoses		I	I	I	I	I	I	I	I	I	I	I
ELECTRICAL SYSTEM												
Battery electrolyte level and specific gravity	I	I	I	I	I	I	I	I	I	I	I	I
CHASSIS & BODY												
Brake and clutch pedals		I	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses and connections			I		I		I		I		I	
Brake fluid *5		I	I	I	R	I	I	I	R	I	I	
Clutch fluid		I	I	I	I	I	I	I	I	I	I	
Parking brake		I	I	I	I	I	I	I	I	I	I	
Power brake unit and hoses			I		I		I		I		I	
Disc brakes (front)		I	I	I	I	I	I	I	I	I	I	
Drum brakes (rear)			I		I		I		I		I	
Power steering fluid and lines		I	I	I	I	I	I	I	I	I	I	
Steering operation and gear housing			I		I		I		I		I	
Steering linkages, tie rod ends and arms			I		I		I		I		I	
Manual transmission oil		I	I	I	R	I	I	I	R	I	I	
Automatic transmission fluid*6	Does not require replacement under normal service											
Automatic transmission fluid level		I	I	I	I	I	I	I	I	I	I	
Front differential oil (4WD)					R				R			
Rear differential oil					R				R			
Transfer oil (4WD)					R				R			
Propeller shaft joints (4WD)			L		L		L		L		L	
Wheel nuts	T		T		T		T		T		T	
Drive shaft dust boots (4WD)			I		I		I		I		I	
Front suspension ball joints					I				I			
Bolts and nuts on chassis and body	T		T		T		T		T		T	
Exhaust system heat shields					I				I			

Chart symbols:

I : Inspect: Inspect and clean, repair, adjust or replace if necessary.
A : Adjust: Examination resulting in adjustment or replacement
R : Replace
T : Tighten
L : Lubricate
C : Clean (by air blow)

Remarks:

- To ensure efficient operation of the engine and all systems related to emission control, the ignition and fuel systems must be serviced regularly. It is strongly recommended that all servicing related to these systems be done by an authorized Ford Dealer.
- After 100,000 km or 60 months, continue to follow the described maintenance at the recommended intervals.
- Refer below for a description of items marked* in the maintenance chart.

*1: Replacement of the timing belt is required at every 100,000 km.
Failure to replace the timing belt may result in damage to the engine.

*2: Also adjust and inspect the power steering and air conditioner drive belts, if equipped.

*3: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter more often than recommended intervals.
a. Driving in dusty conditions.
b. Extended periods of idling or low speed operation.
c. Driving for long period in cold temperatures or driving regularly at short distance (less than 8 km) only.

*4: If the vehicle is operated in very dusty or sandy areas;
- Inspect the air cleaner element at every 5,000 km or 3 months. Clean or replace if necessary.
- Replace the air cleaner element at every 20,000 km or 12 months.

*5: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, change the brake fluid annually.

*6: Replace at every 48,000 km or every 24 months whichever comes first, if operated under the severe condition such as towing.

COOLING SYSTEM

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SERVICE

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SUPPLEMENTAL SERVICE INFORMATION E-2
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OUTLINE

OUTLINE OF CONSTRUCTION

BVF360201004W01

- The construction and operation of the cooling system for the new RANGER is the same as that of the current RANGER except for the following features. (See RANGER Training Manual F326-10-99A.)

FEATURES

BVF360201004W02

Improved cooling performance

- An ATF oil cooler has been adopted inside the lower tank of the radiator.

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

BVF360201004W03

- The following changes and/or additions have been made since publication of the RANGER Repair Manual. (F161-10-99A).

Radiator

- Removal/installation procedure has been added.

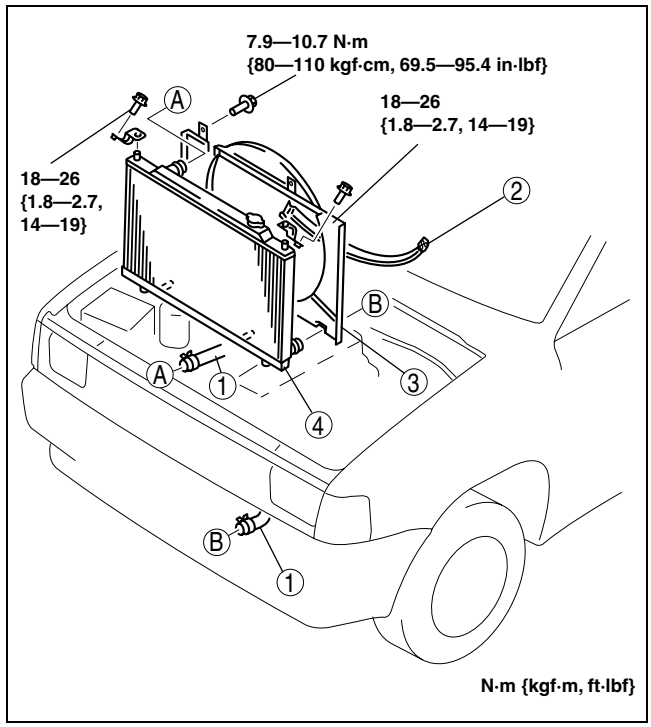
RADIATOR

RADIATOR REMOVAL/INSTALLATION

BVF361615200W01

1. Disconnect the negative battery cable.
2. Drain the engine coolant.
3. Remove the oil hose.
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Refill the radiator with the specified amount and type of engine coolant.
7. Inspect the engine coolant leakage.

1	Radiator hose
2	Lower radiator cowling
3	Radiator cowling
4	Radiator



BCF3616W002

FUEL AND EMISSION CONTROL SYSTEMS (WL Turbo)

FEATURES

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OUTLINE

OUTLINE OF CONSTRUCTION

BVF400202000W01

- An AT (RA4AX-EL) model has been adopted.
- The construction and operation of the fuel and emission control system is essentially carried over from that of the current EVEREST MT model, except for the following features. (See RANGER Training Manual F326-10-99A.)

FEATURES

BVF400202000W02

Improved Idle Stability

- The idle speed has been changed with the adoption of the AT (RA4AX-EL) model.

SPECIFICATIONS

BVF400202000W03

Item		Specification	
		AT model	MT model
Air cleaner element	Type	Non-woven fabric (dry type)	
Supercharger	Type	WL Turbo: Turbocharger with charge-air cooler	
FIP	Type	Bosch VE distributor	
Fuel tank	Capacity (L {US gal, Imp gal})	63 {16.6, 13.9}*1, 70 {18.5, 15.4}*2	
Glow plug	Type	Self-temperature control type	
Catalyst	Type	Oxidation catalyst converter	
EGR control	Type	WL Turbo: ON/OFF	

*1 : 2WD

*2 : 4WD

Bold frames: New specifications

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

BVF400202000W04

- The following changes and/or additions have been made since publication of the EVEREST Repair Manual (F183-10-03A).

Engine tune-up

- Idle speed adjustment procedure has been modified.

ENGINE TUNE-UP

IDLE SPEED ADJUSTMENT

BVF400802000W01

WL Turbo

1. Perform "Engine tune-up preparation".

Caution

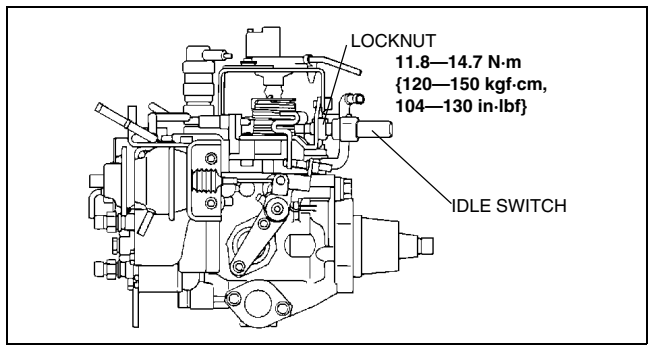
- **Turning the idle switch with its connector connected can break the harness. Be sure to disconnect the connector when turning the idle switch more than one rotation.**

2. Verify that the idle speed is within the specification.
   - If not within the specification, loosen the idle switch locknut and adjust the idle speed by turning the idle switch.

Specification
AT: 780—820 rpm
MT: 700—740 rpm

3. After adjustment, tighten the locknut.

Tightening torque
11.8—14.7 N·m {120—150 kgf·cm, 104—130 in·lbf}



BCF0114W002

F2

AUTOMATIC TRANSMISSION (RA4AX-EL)

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OUTLINE

OUTLINE OF CONSTRUCTION

BVF560201034W01

- The RA4AX-EL type electronically controlled automatic transmission with four-speeds and a TCC mechanism combining advanced electronic and mechanical technologies has been adopted.

FEATURES

BVF560201034W02

Improved marketability

- Electronically controlled automatic transmission has been adopted.

Improved drivability

- Electronically controlled TCC has been adopted.
- Electronic control of clutch apply pressure (line pressure).

Improved serviceability

- Diagnosis system has been adopted.

SPECIFICATIONS

BVF560201034W03

Transmission type		**RA4AX-EL**
Gear ratio	1GR	3.027
	2GR	1.619
	3GR	1.000
	4GR	0.694
	Reverse	2.272
ATF	Type	ATF M-III or equivalent (e.g. Dexron®III)
	Capacity (approx. quantity) (L {US qt, Imp qt})	8.6 {9.1, 7.6}
Torque converter stall torque ratio		2.00:1
Hydraulic system (Number of drive/driven plates)	Reverse clutch	2/2
	High clutch	5/5
	Forward clutch	6/6
	Overrunning clutch	3/5
	Low and reverse brake	6/6

AUTOMATIC TRANSMISSION

OUTLINE

BVF561001030W01

Outline of operation

- The outline of the electronically-controlled automatic transmission is classified into three systems: the powertrain system (includes the torque converter mechanism), the hydraulic control system, and the electronic control system.

Powertrain system

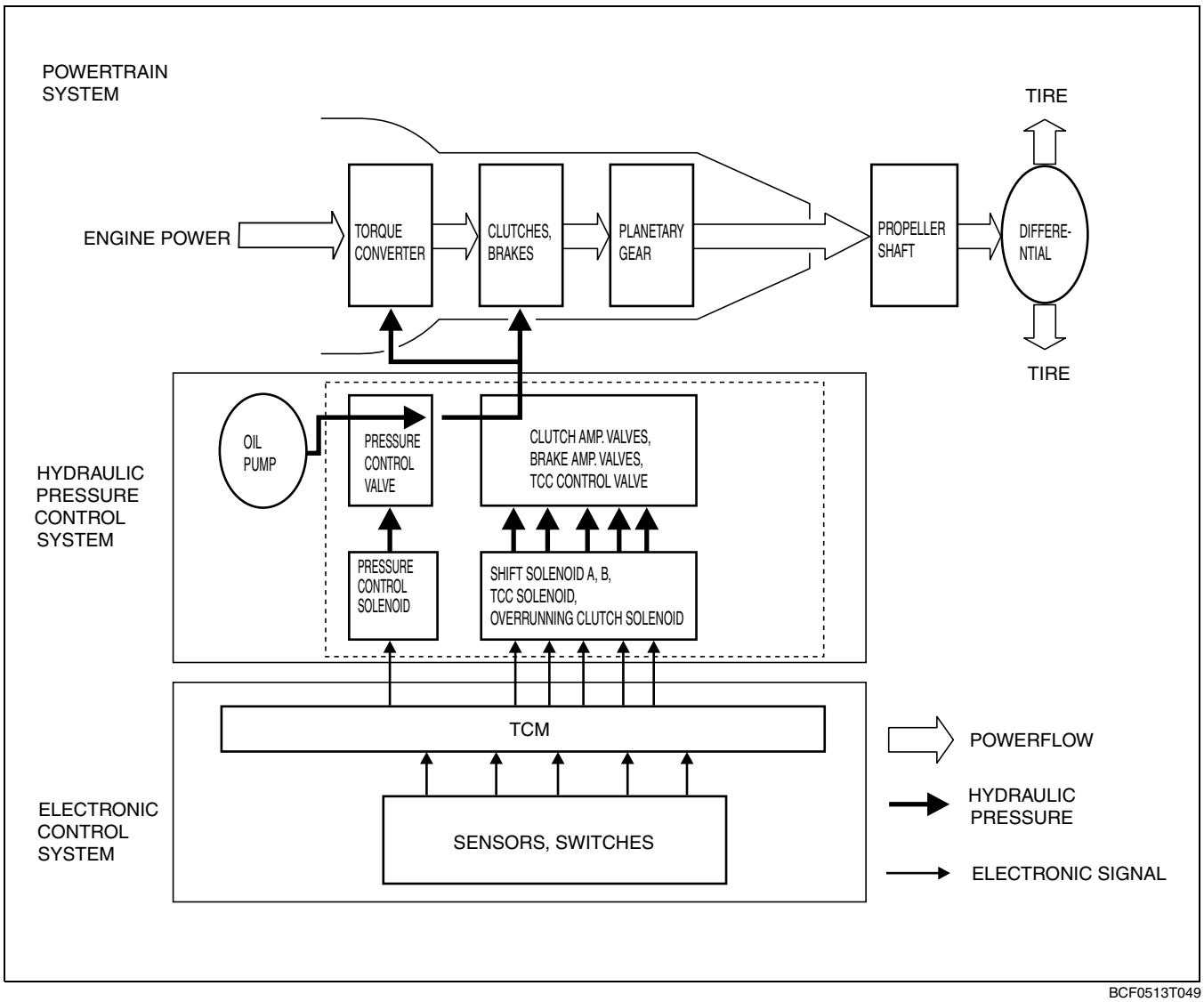
- Driving force from the engine is transmitted through the torque converter to the transmission.
- When the clutch and brakes are engaged by clutch pressure from the control valve, the planetary gear unit switches between fixed and input, and thus transmitted driving force is converted to optimum driving force.
- The converted driving force is transmitted to the propeller shaft, the differential, and the tires.

Hydraulic control system

- The solenoids operate, according to the signals from the TCM, to switch to high or low line pressure (depending on driving conditions) and regulate the clutch pressure.
- The pressure control solenoid switches line pressure between high and low, each shift solenoids regulate clutch pressure, and TCC solenoids control TCC.

Electronic control system

- The TCM sends signals that suit current driving conditions to the solenoids of the hydraulic control system, according to input signals from sensors and switches, and shifts gears.



BCF0513T049

Position/Range	Mode	Gear position	Shift pattern			Transmission										Operation of solenoid valve		
										Brake band								
			Shift	TCC	Engine brake	Reverse clutch	High clutch	Fowarad clutch	Overrunning clutch	2nd applied	3rd released	4th applied	Forward one-way clutch	Low one-way clutch	Low and reverse brake	Shift solenoid A	Shift solenoid B	TCC solenoid
P																X	X	
R		Reverse			X	X									X	X	X	
N																X	X	
D	Non-HOLD	1GR	↑					X					X*8	X*8		X	X	
		2GR	↓↑					X		X			X*8				X	
		3GR	↓↑	X*9			X	X		Ⓧ*1	Ⓧ		X*8					
		4GR	↓	X	X		X	Ⓧ		Ⓧ*2	Ⓧ	X				X		X
	HOLD	2GR	↑		X*7			X	X*7	X			X*8				X	
		3GR	↓↑	X*9	X*7		X	X	X*7	Ⓧ*1	Ⓧ		X*8					
		4GR *3		X*9	X		X	Ⓧ		Ⓧ*2	Ⓧ	X				X		
S	Non-HOLD	1GR	↑					X	X*6				X*8	X*8		X	X	
		2GR	↓↑		X*5			X	X*5	X			X*8				X	
		3GR	↓↑	X*9	X*5		X	X	X*5	Ⓧ*1	Ⓧ		X*8					
		4GR *3			X		X	Ⓧ		Ⓧ*2	Ⓧ	X				X		
	HOLD	1GR	↑					X	X*6				X*8	X*8		X	X	
		2GR	↓↑		X*5			X	X*5	X			X*8				X	
		3GR *3	↑	X	X*5		X	X	X*5	Ⓧ*1	Ⓧ		X*8					
		4GR *3			X		X	Ⓧ		Ⓧ*2	Ⓧ	X				X		
L	Non-HOLD	1GR	↑		X			X	X*4				X*8	X*8	X	X	X	
		2GR	↓↑		X			X	X*4	X			X*8				X	
		3GR *3	↑		X*5		X	X	X*5	Ⓧ*1	Ⓧ		X*8					
		4GR *3			X		X	Ⓧ		Ⓧ*2	Ⓧ	X				X		
	HOLD	1GR	↑		X			X	X*4				X*8	X	X	X	X	
		2GR *3	↑		X			X	X*4	X			X*8				X	
		3GR *3	↑		X*5		X	X	X*5	Ⓧ*1	Ⓧ		X*8					
		4GR *3			X		X	Ⓧ		Ⓧ*2	Ⓧ	X				X		

X : Operating.

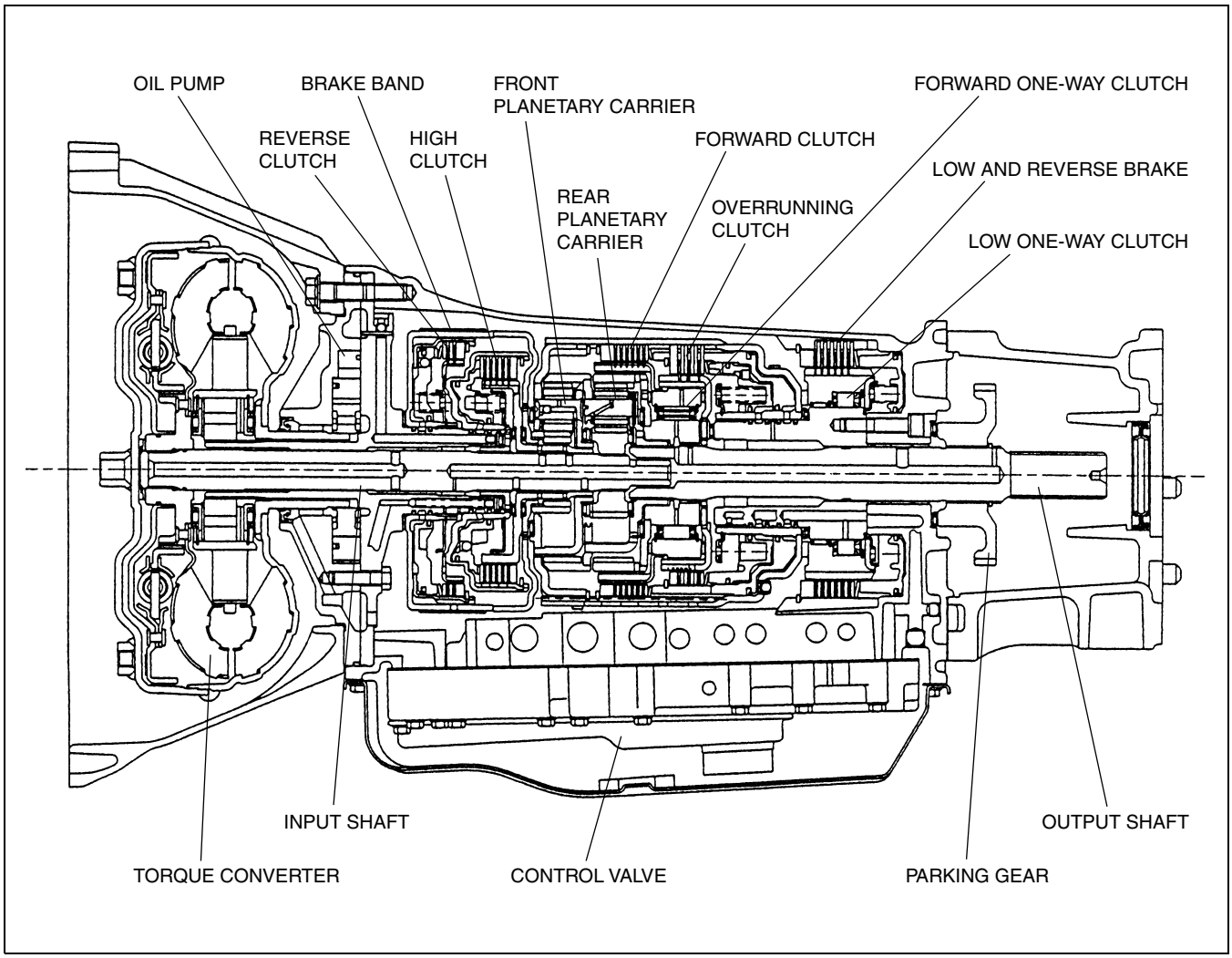
Ⓧ: Transmits the torque only when driving.

BCF0513T038

*1 : Hydraulic pressure is applied to both 2GR applied side and 3GR release side of band servo piston. However, because area of 3GR release side is larger than 2GR applied side, brake band does not operate.
*2 : Hydraulic pressure is applied to 4GR applied side, plus condition *1 above. Brake band is applied.
*3 : Protection of engine overrunning.
*4 : Engine brake is operated by overrunning clutch operation.
*5 : Operates when depressing amount of the accelerator pedal is less than 1/16. Engine braking effect available.
*6 : Operates when depressing amount of the accelerator pedal is less than 1/16. Engine braking effect not available.
*7 : Operates when depressing amount of the accelerator pedal is less than 1/16 and vehicle speed is more than approx. 10 km/h {6.2 mph}. Engine braking effect available.
*8 : Operates during accelerating and cruising.

CROSS-SECTIONAL VIEW

BVF561001030W02



BCF5610A412

ELECTRONIC CONTROL SYSTEM STRUCTURAL VIEW

BVF561001030W03

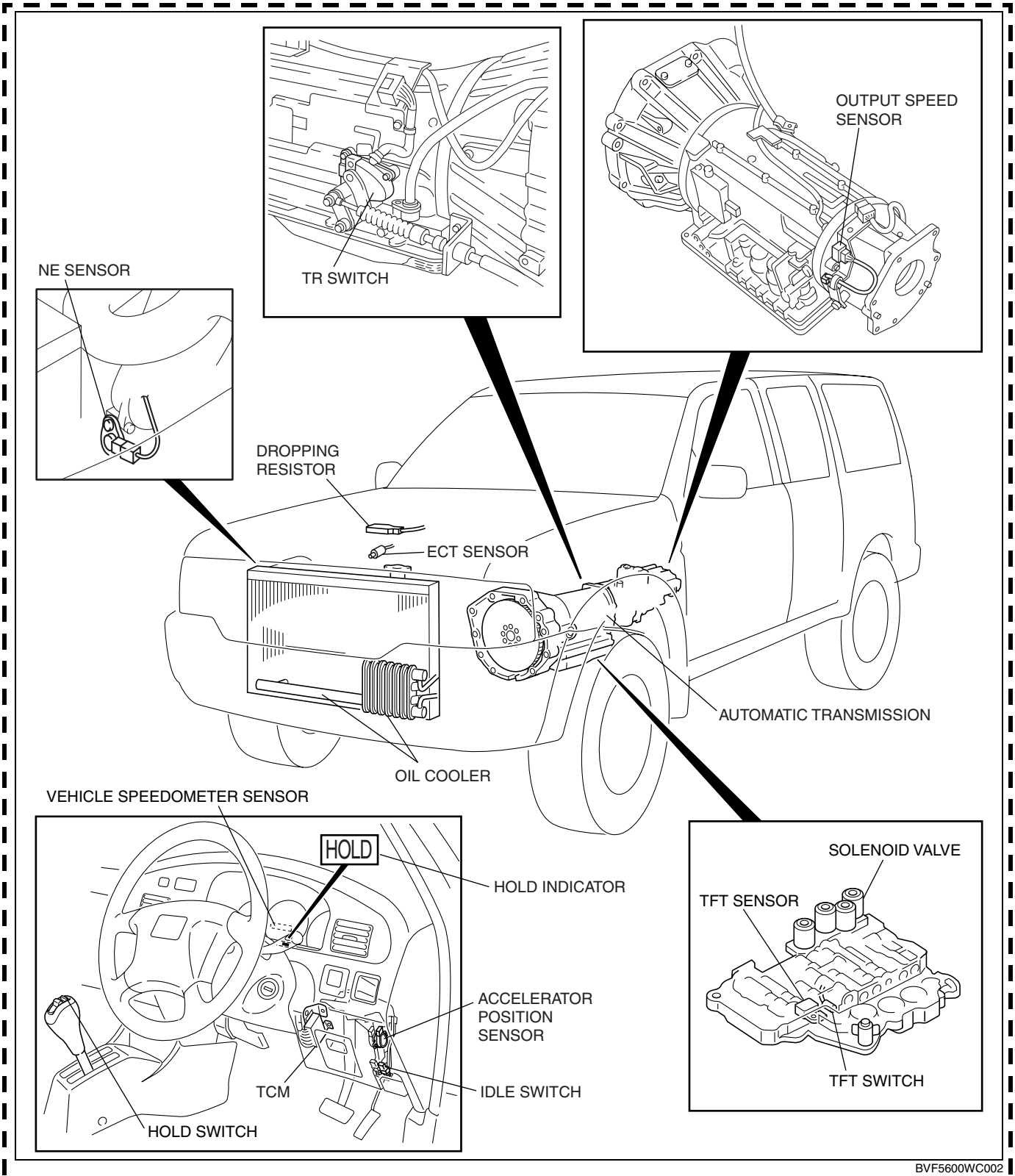
Outline

Features

- A stand-alone TCM, adopted exclusively for transmission control, performs various controls such as up- and down-shifts, according to signals relayed from sensors and switches.
- Direct electronic shift control has been adopted for superior shift quality.

AUTOMATIC TRANSMISSION

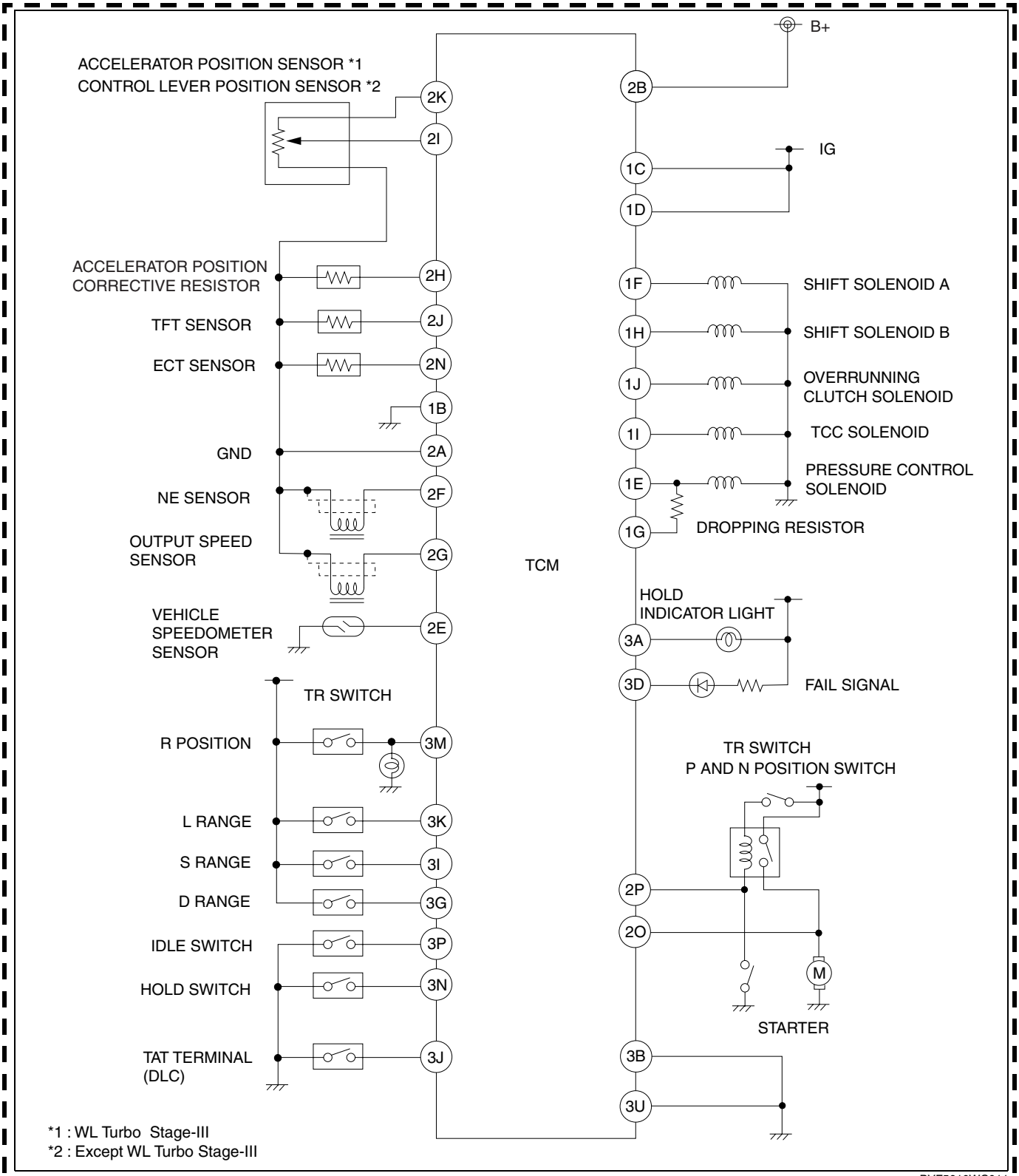
Structure



AUTOMATIC TRANSMISSION

AUTOMATIC TRANSAXLE CONTROL SYSTEM WIRING DIAGRAM

BVF561001030W04

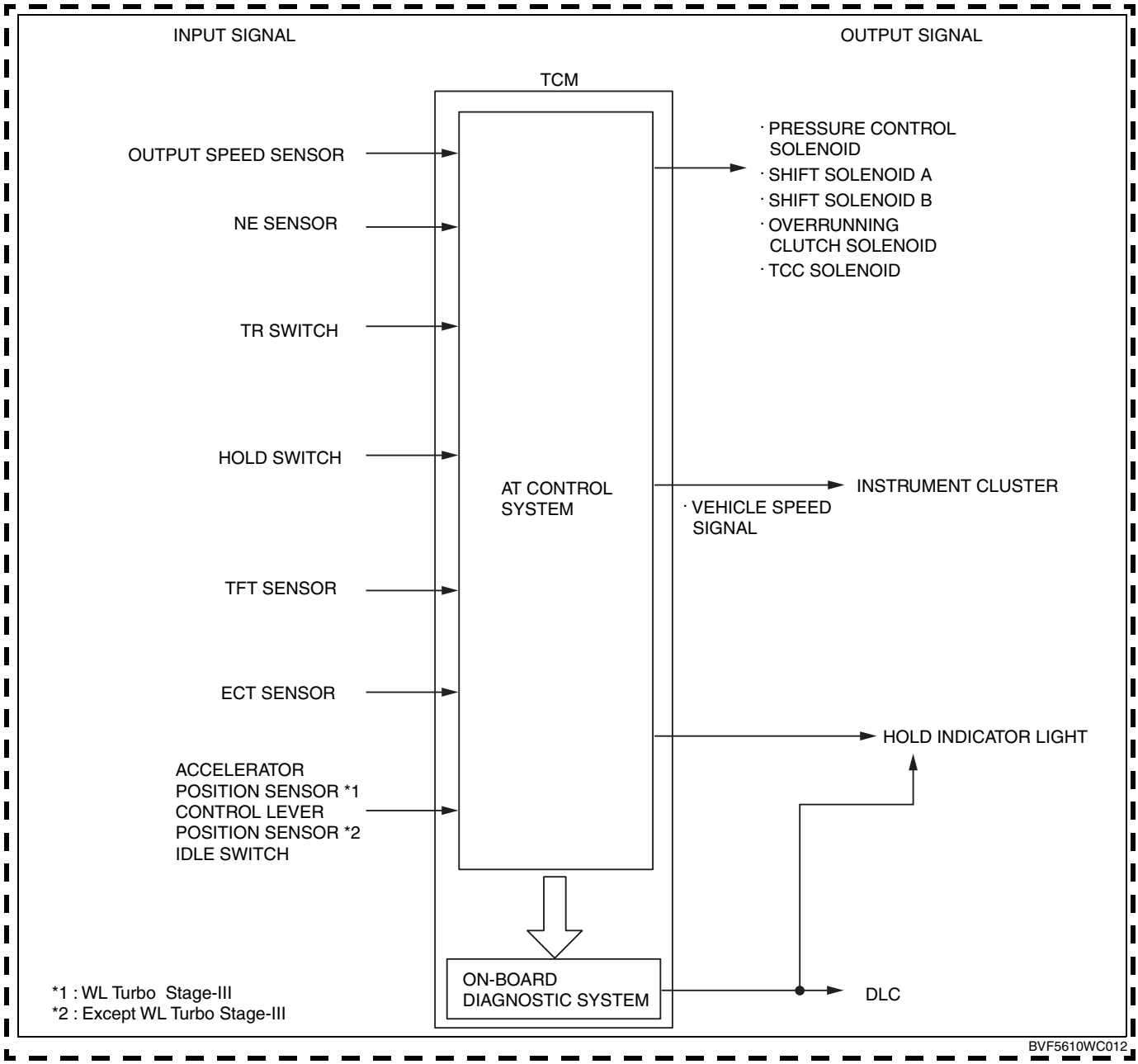


BVF5610WC011

AUTOMATIC TRANSMISSION

AUTOMATIC TRANSAXLE BLOCK DIAGRAM

BVF561001030W05



BVF5610WC012

Electronic Control Item and Contents

Control Item	Contents
Shift control	• Detects engine load and vehicle speed, and switches to optimum gear in accordance with preset shift program
Line pressure control	• Switches between high and low line pressure to suit engine load and vehicle speed, according to pressure control solenoid
TCC control	• Controls TCC smoothly by duty cycle TCC solenoid, in accordance with designated TCC points
Engine braking control (overrunning clutch control)	• According to depressing amount of accelerator, vehicle speed, range position and gear position, TCM activates overrunning clutch solenoid and operates overrunning clutch during deceleration, providing engine braking effect
Self-diagnosis function	• Parts essential for EC-AT control have a self-diagnosis function, which, in the event of trouble, flashes the HOLD indicator light to warn the driver, and stores the DTC in the TCM
Fail-safe function	• Preserve driveability as much as possible if a malfunction has been identified by self-diagnosis of PCM

AUTOMATIC TRANSMISSION

Component Description (Electronic Control)

Part name			Function
Input system	Output speed sensor		• Detects output shaft revolution speed
	Vehicle speedometer sensor		• Detects vehicle speed • If output speed sensor fails, vehicle speed sensor acts as a substitute
	Accelerator position sensor*1		• Detects accelerator position
	Control lever position sensor*2		• Detects control lever position
	Idle switch		• Detects engine idle
	TR switch		• Detects selector lever position
	HOLD switch		• Selects driving modes (HOLD or non-HOLD)
	TFT sensor		• Detects ATF temperature
	NE sensor		• Detects engine speed
Output system	Solenoid valves	Pressure control solenoid	• Switches line pressure between high and low
		Shift solenoid A	• Regulate shifting through 1GR to 4GR by switching oil passages
		Shift solenoid B	
		TCC solenoid	• Controls TCC engagement and disengagement
		Overrunning clutch solenoid	• Controls engine braking based on driving condition
	HOLD indicator light		• By switching HOLD switch, illuminates to indicate that it is in HOLD mode • Flashes when failure is detected by diagnosis function

*1 : WL Turbo Stage-III
*2 : Except WL Turbo Stage-III

AUTOMATIC TRANSMISSION DEVICE RELATIONSHIP CHART

BVF561001030W06

Component		Control item					
		Shift control	Line pressure control	TCC control	Engine braking control (overrunning clutch control)	Fail-safe function	Self-diagnosis function
Input							
Output speed sensor		X	X	X	X	X	X
Vehicle speedometer sensor		X*1	X*1	X*1	X*1	X*1	X*1
Accelerator position sensor*2		X	X	X	X	X	X
control lever position sensor*3		X	X	X	X	X	X
Idle switch							
TR switch		X	X	X	X		
HOLD switch		X		X	X		
TFT sensor		X	X	X			X
NE sensor			X	X			X
Output							
Solenoid valves	Pressure control solenoid		X			X	X
	Shift solenoid A Shift solenoid B	X				X	X
	TCC solenoid			X		X	X
	Overrunning clutch solenoid	X			X	X	X
HOLD indicator light							X

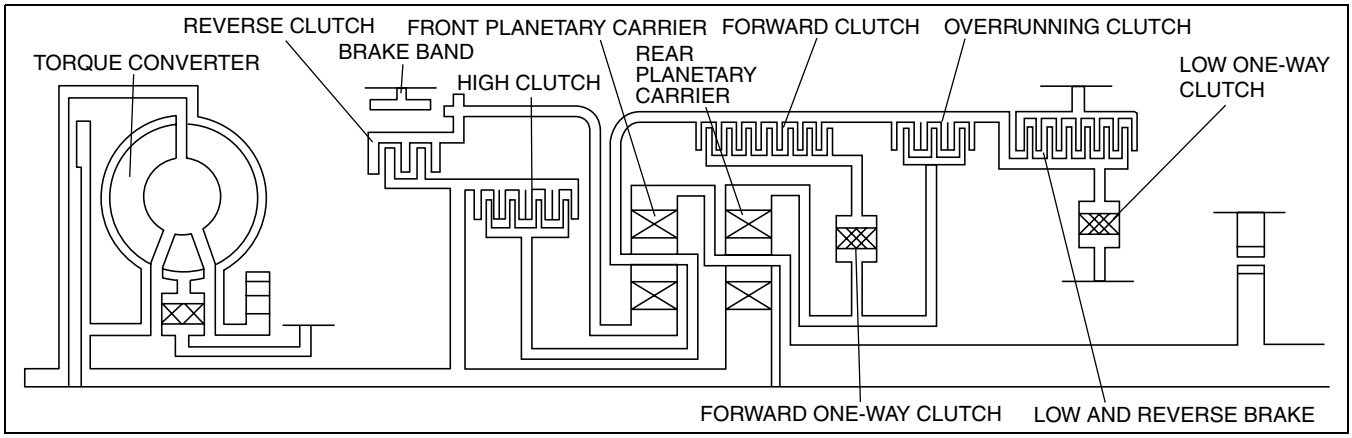
X : Available
*1 : Back up
*2 : WL Turbo Stage-III
*3 : Except WL Turbo Stage-III

POWERTRAIN DESCRIPTION

BVF561001030W07

Outline

- In the powertrain system, hydraulic pressure is transported from the control valves to operate the clutches and brakes and the planetary gear changes the gear ratio according to the vehicle driving condition.
- The powertrain system of the RA4AX-EL type consists of six pairs of clutches, two pairs of brakes, two pair of one-way clutch, and two pairs of single type planetary gears.



BCF0513T010

Operation

Note

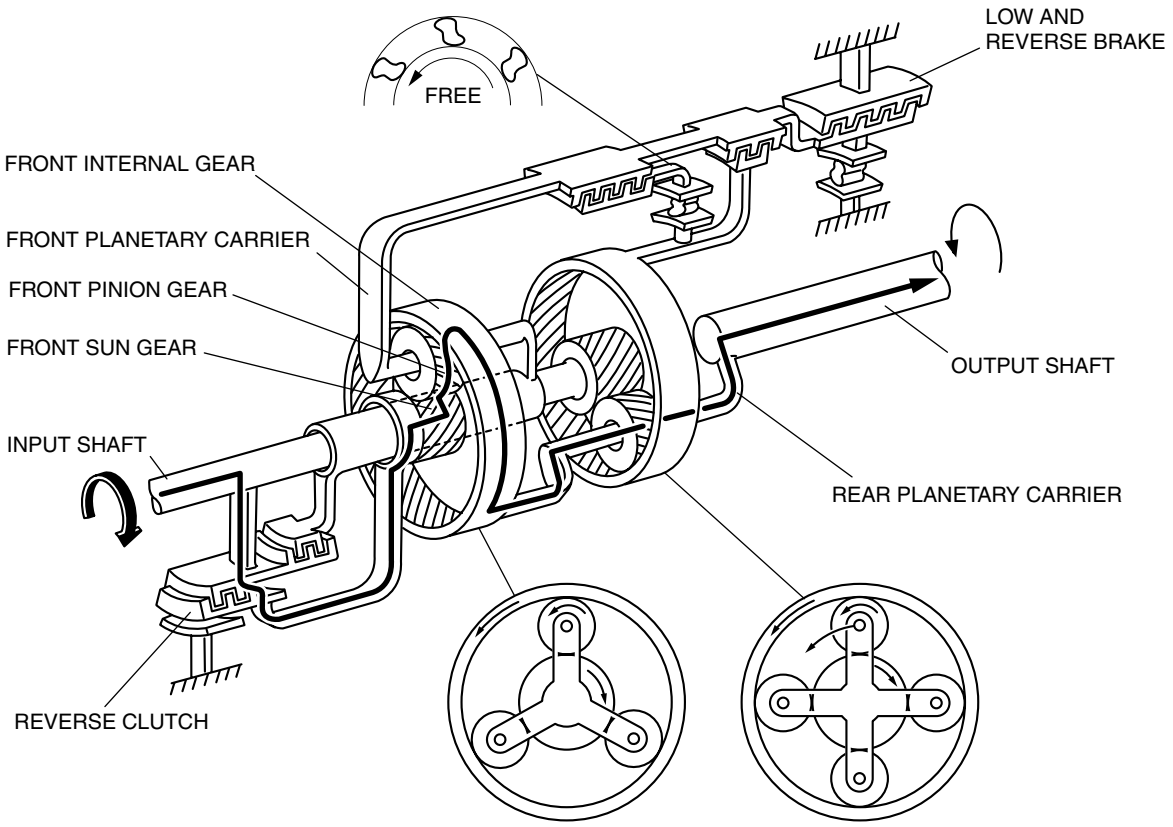
- All rotation are viewed from the side cover.

K1

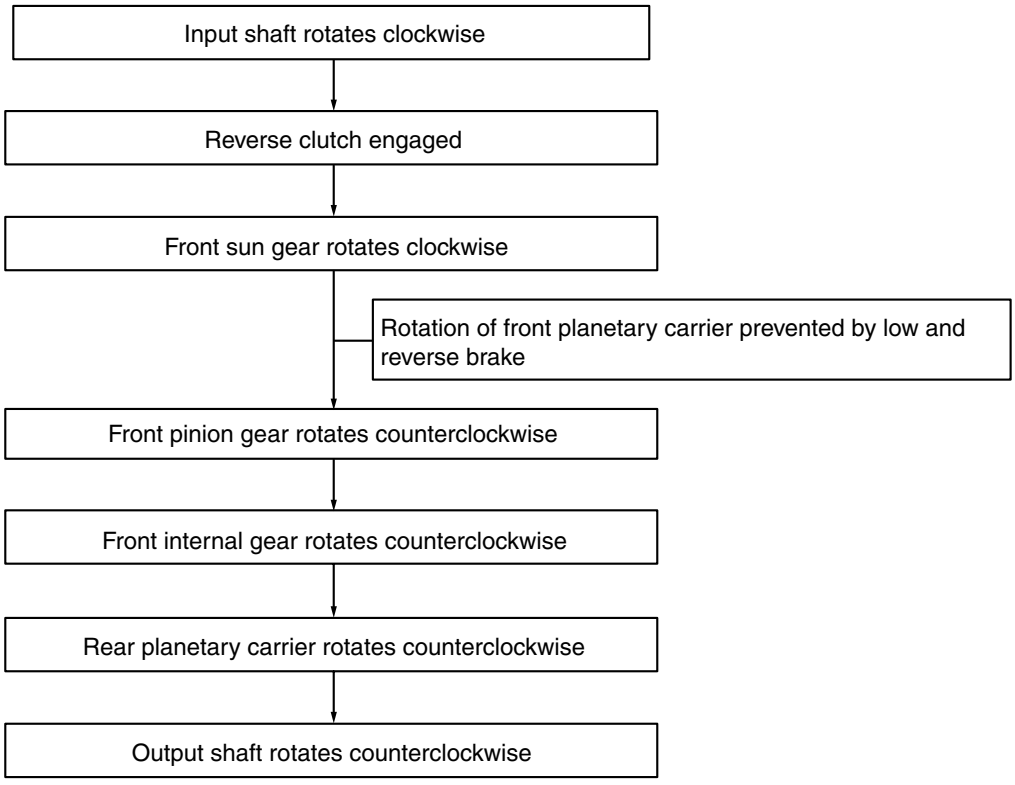
Component description

Component	Function
Reverse clutch	• Transmits rotation of input shaft to front sun gear • Operates when vehicle is reversing
High clutch	• Transmits rotation of input shaft to front planetary carrier • Operates in 3GR or 4GR position
Forward clutch	• Connect front planetary carrier and forward one-way clutch outer race • Operates in 1GR, 2GR, 3GR or 4GR position
Overrunning clutch	• Connect front planetary carrier and rear internal gear • Operates when vehicle decelerated
Brake band	• Prevents rotation of front sun gear • Operates in 2GR, 3GR or 4GR position
Forward one-way clutch	• Locks counter clockwise rotation of rear internal gear, opposes front planetary carrier and low one-way clutch outer race (forward clutch drum) through the forward clutch in 1GR, 2GR or 3GR position
Low one-way clutch	• Locks counter clockwise rotation of front planetary carrier (forward clutch drum) in 1GR position
Low and reverse brake	• Prevents rotation of front planetary carrier (forward clutch drum) • Prevents rotation of rear internal gear when overrunning clutch is engaged • Operates in 1GR position
Planetary gear	• The planetary gear functions as a transmission due to the engagement/disengagement of clutches and/or brakes, converts the transmitted driving force of the input shaft and transmits it to the output shaft

Powerflow
R position

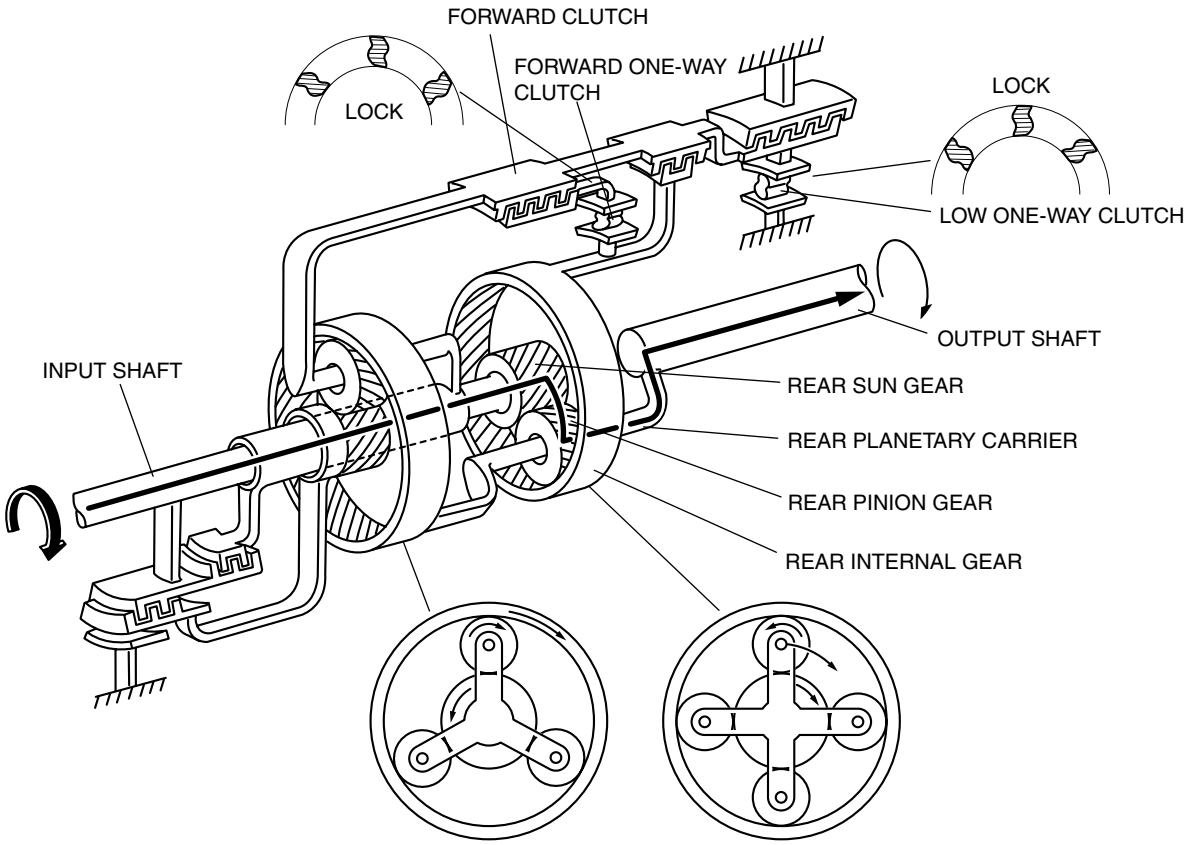


ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.



BCF0513T036

1GR



ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.

Input shaft rotates clockwise

↓

Rear sun gear rotates clockwise

↓

Rear pinion gear rotates counterclockwise

↓

Counterclockwise rotation of rear internal gear prevented by forward one-way clutch and low one-way clutch via forward clutch

↓

Rear planetary carrier rotates clockwise

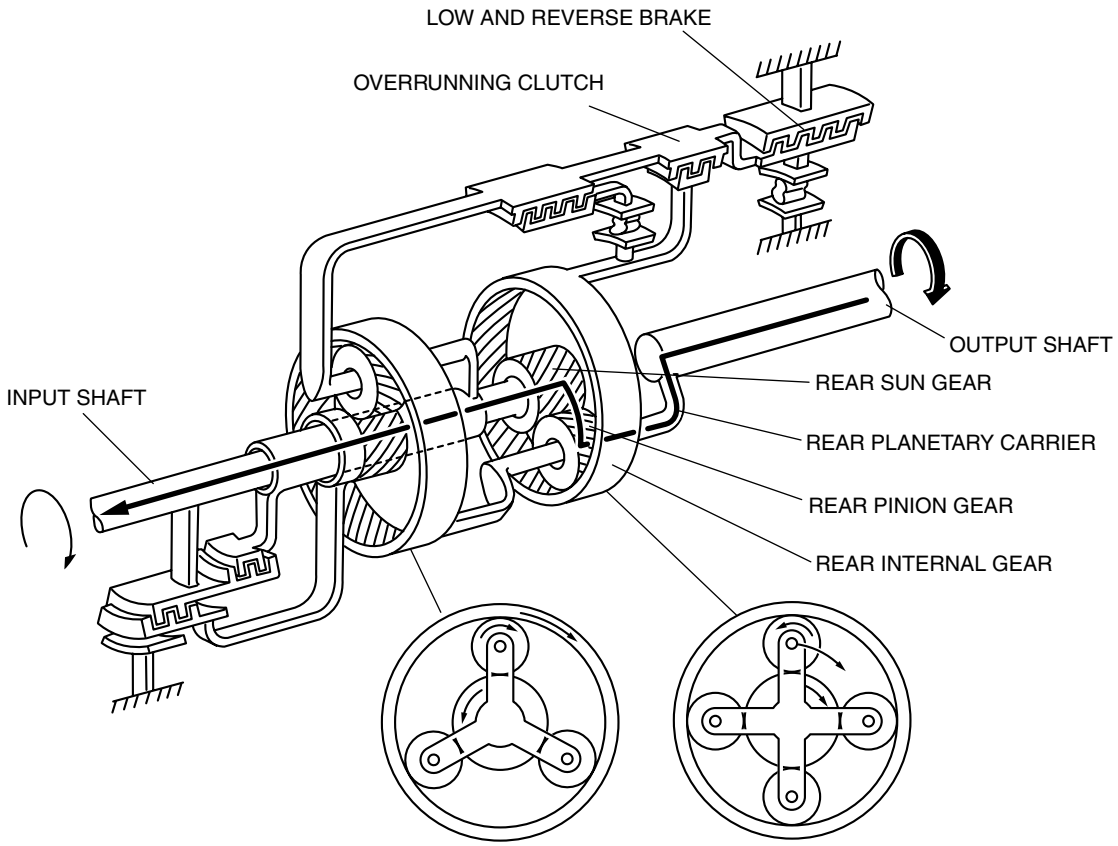
↓

Output shaft rotates clockwise at slower speed than input shaft

BCF0513T029

K1

1GR (engine braking)



ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.

Output shaft rotates clockwise

↓

Rear planetary carrier rotates clockwise

↓

Rotation of rear internal gear prevented by low and reverse brake via overrunning clutch

↓

Rear pinion gear walks clockwise around sun gear while rotating counterclockwise

↓

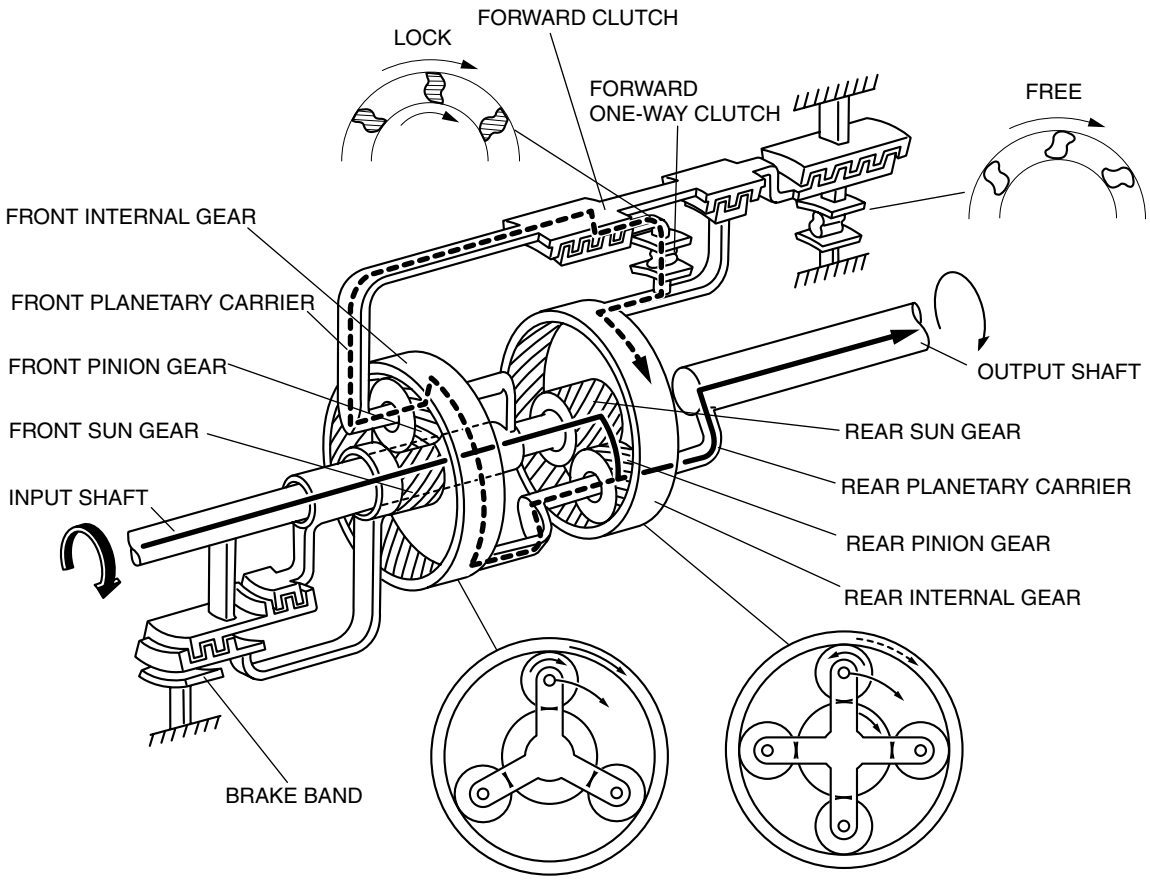
Rear sun gear rotates clockwise

↓

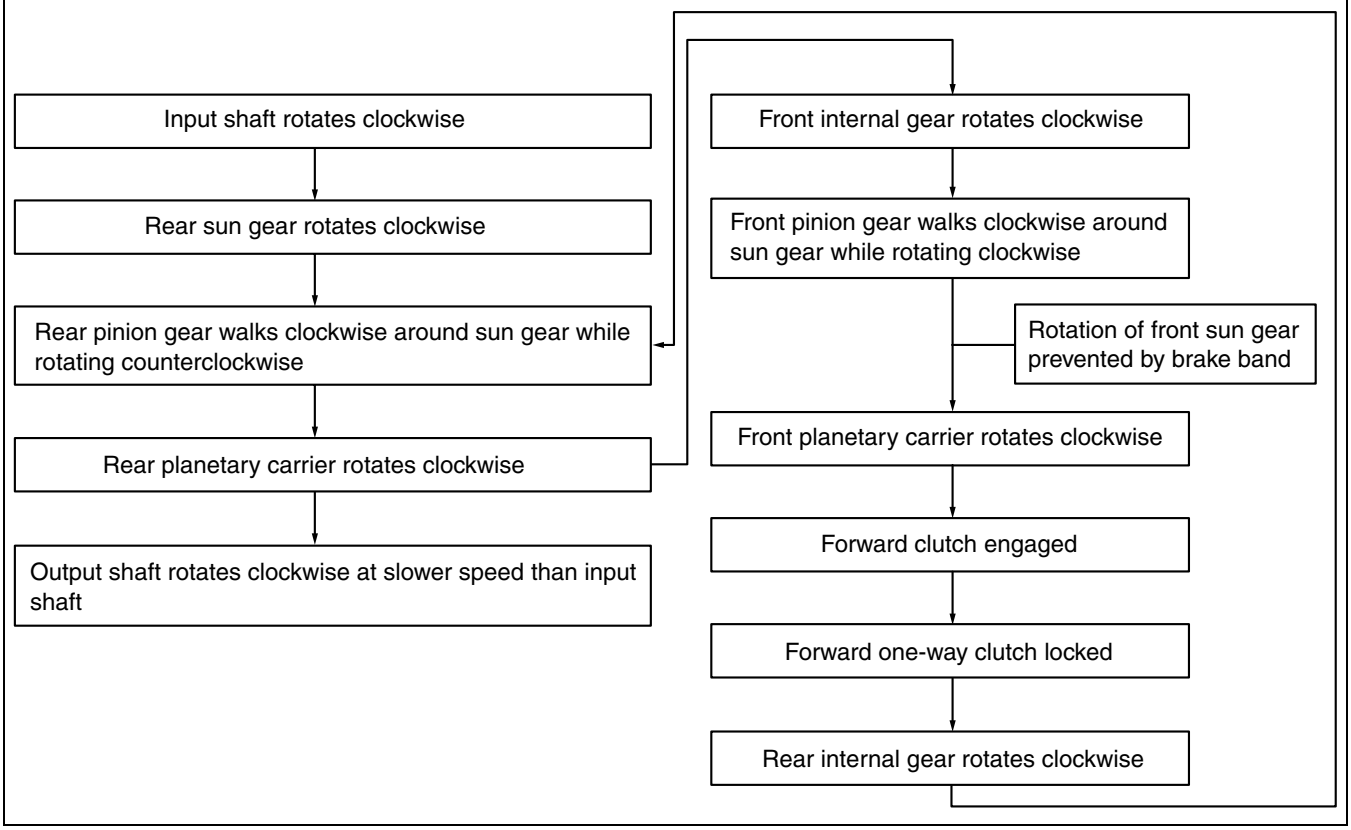
Input shaft rotates clockwise

BCF0513T030

2GR



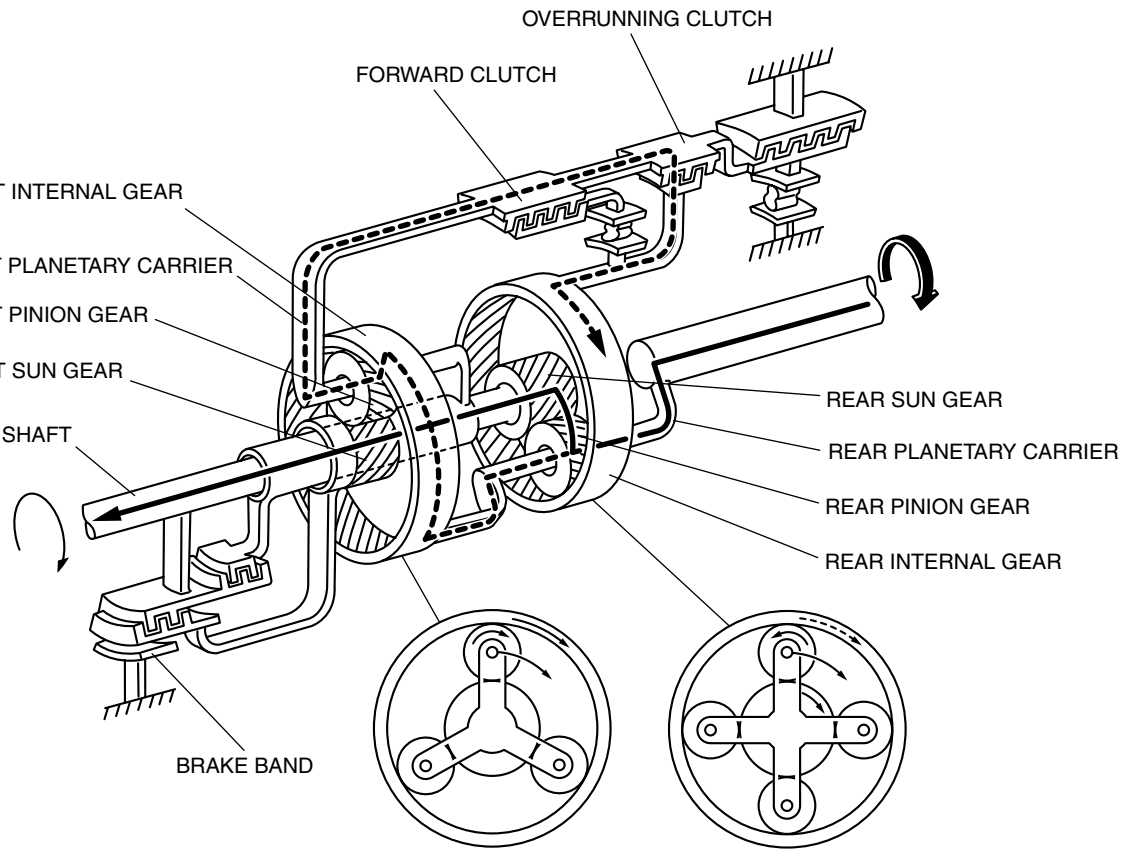
ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.



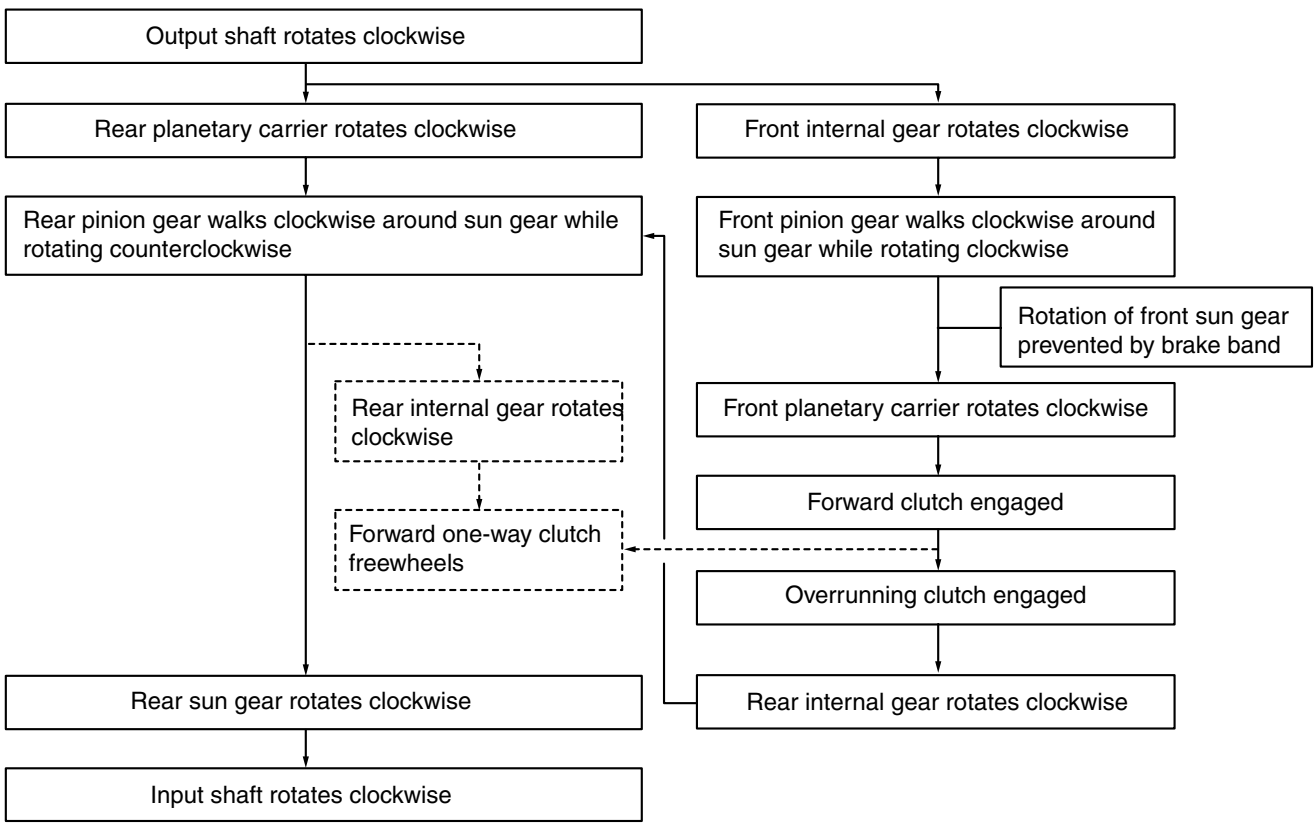
BCF0513T031

K1

2GR (engine braking)

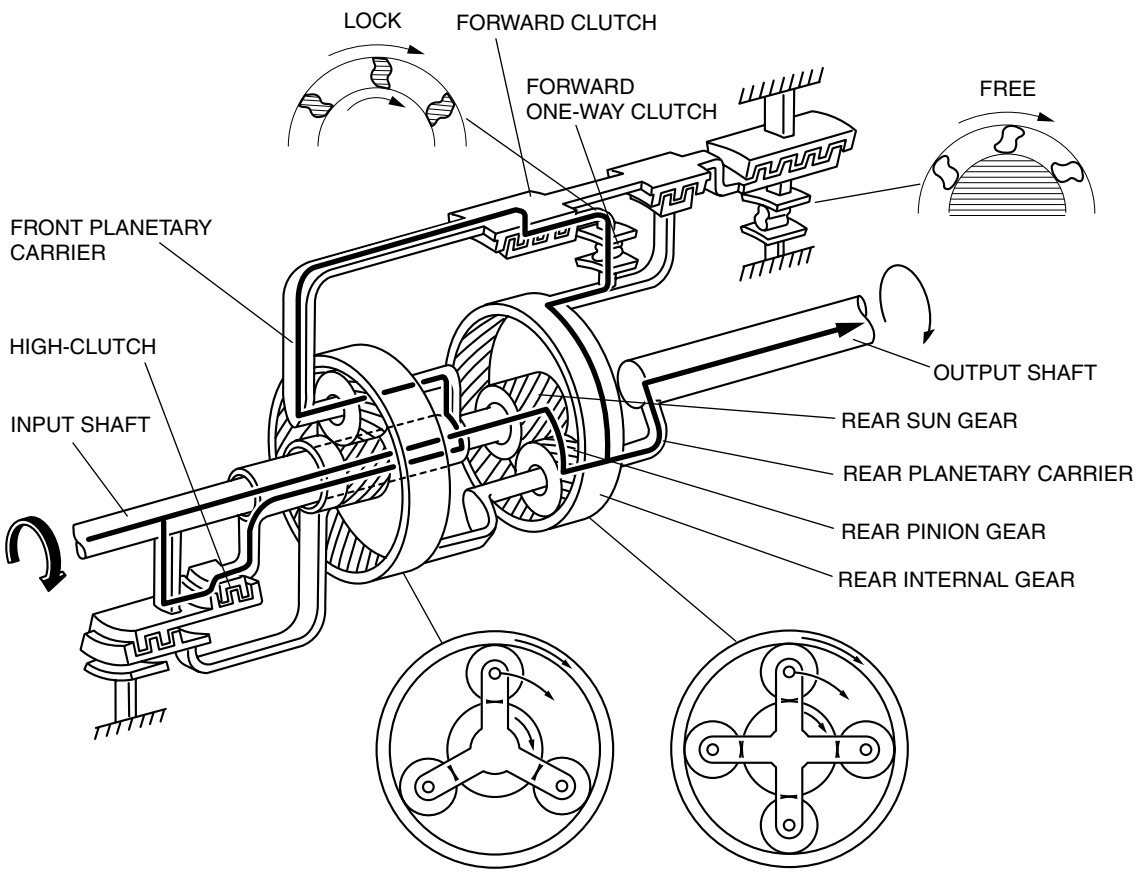


ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.

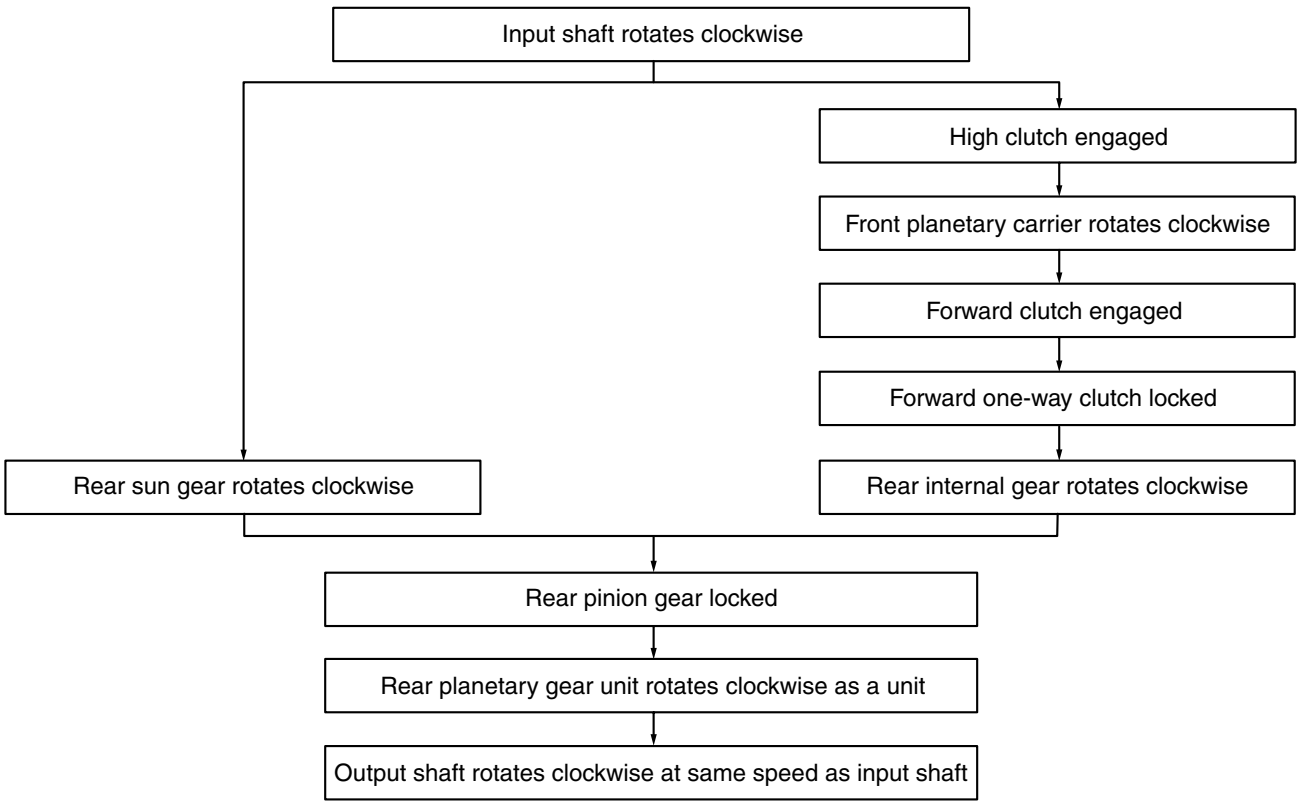


BCF0513T032

3GR



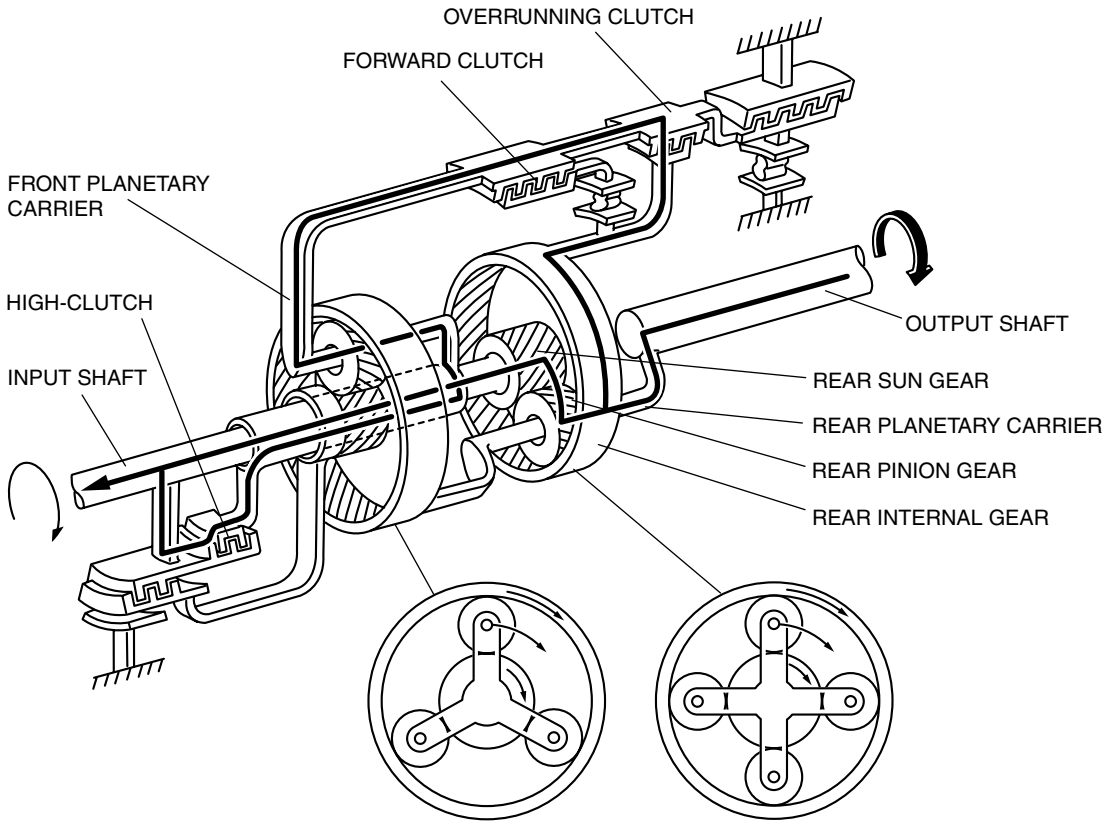
ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.



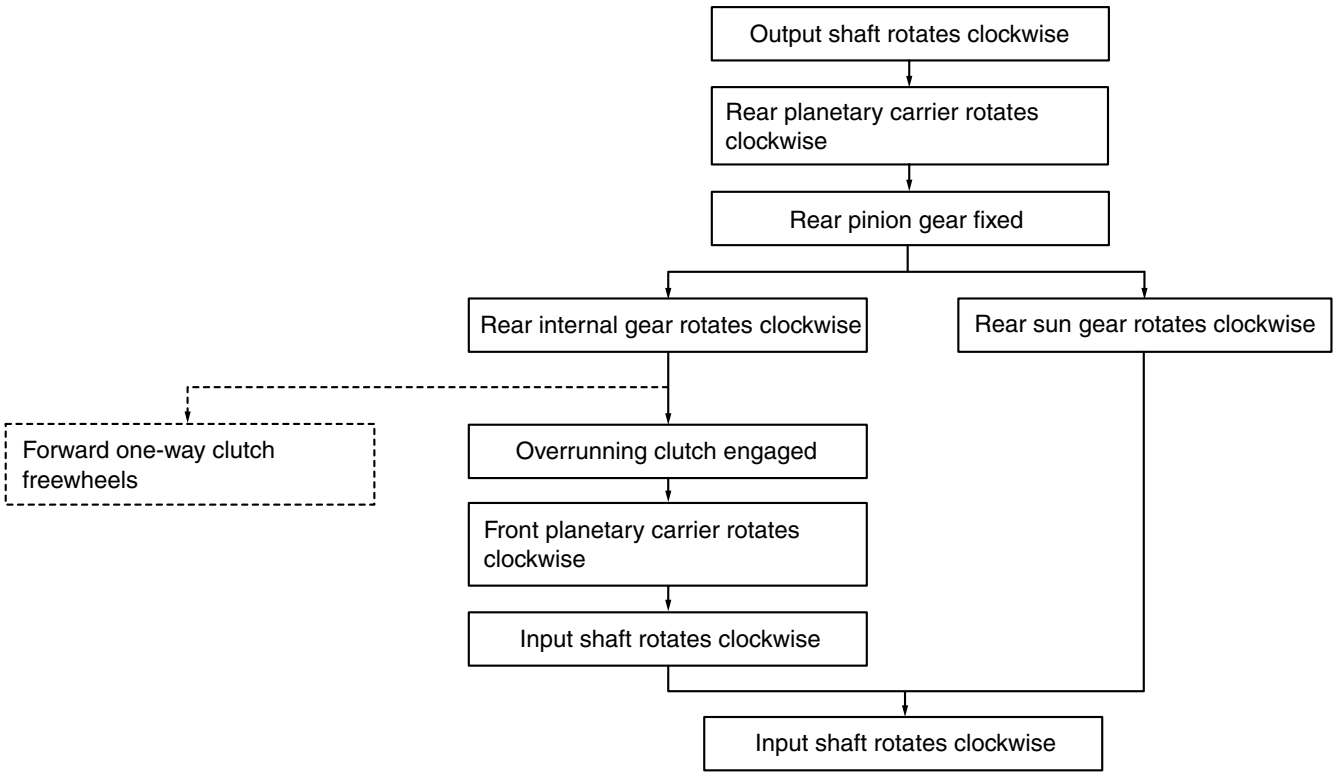
BCF0513T033

K1

3GR (engine braking)

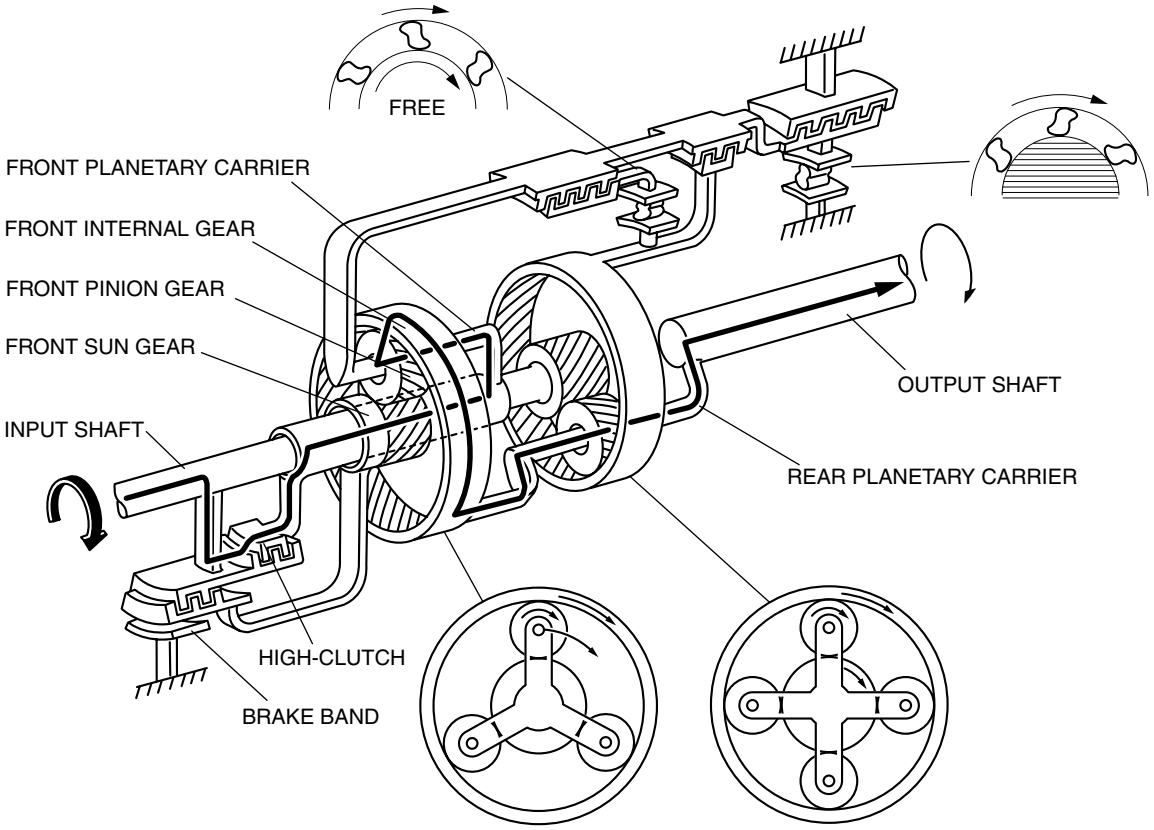


ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.



BCF0513T034

4GR



ALL DIRECTIONS OF ROTATION ARE VIEWED FROM THE ENGINE.

Input shaft rotates clockwise

↓

High clutch engaged

↓

Front planetary carrier rotates clockwise

→ Rotation of front sun gear prevented by brake band

↓

Front pinion gear walks clockwise around sun gear while rotating clockwise

↓

Front internal gear rotates clockwise

↓

Rear planetary carrier rotates clockwise

↓

Output shaft rotates clockwise at faster speed than input shaft

BCF0513T035

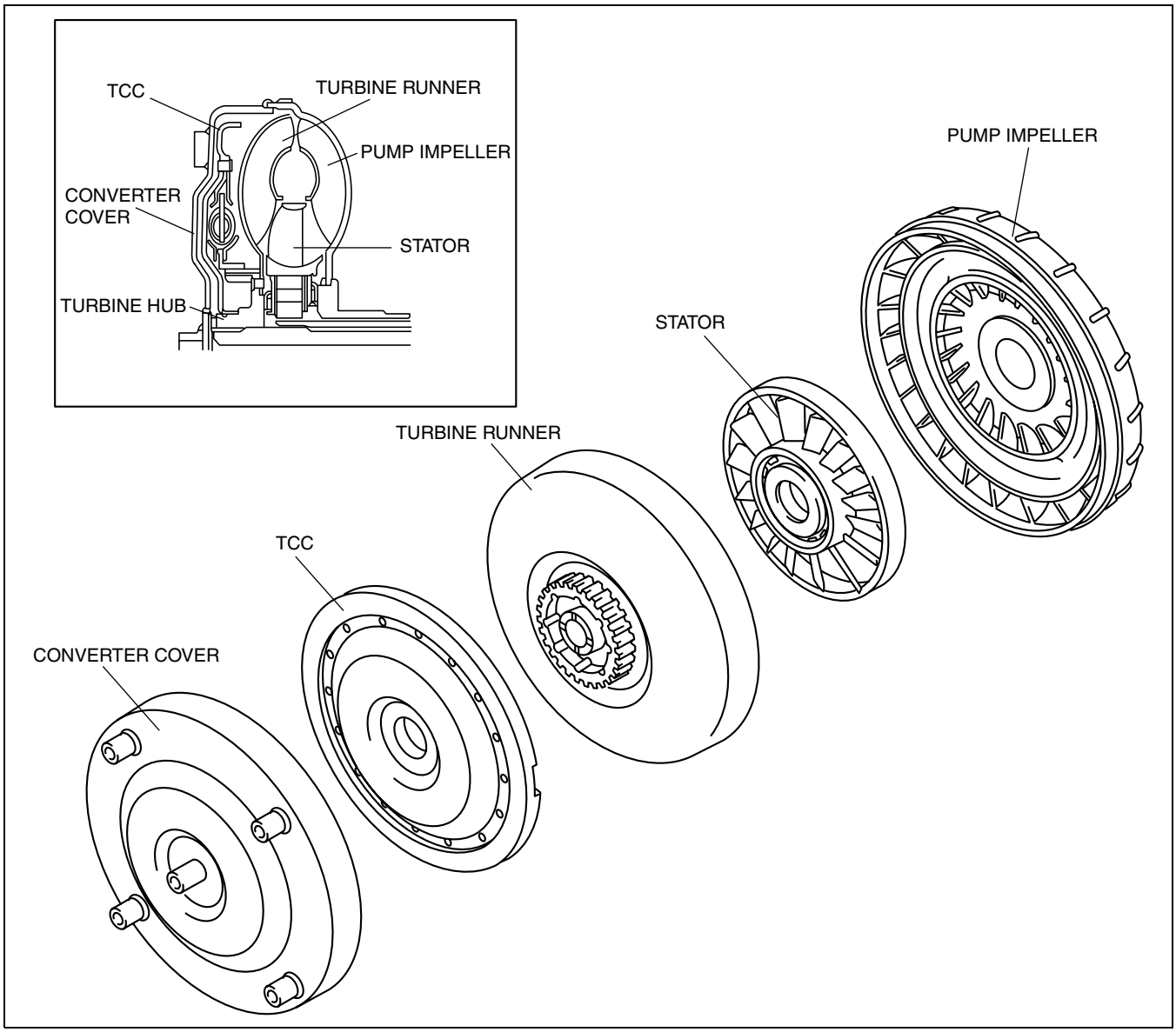
K1

TORQUE CONVERTER DESCRIPTION

BVF561019100W01

Outline

- The RA4AX–EL type torque converter adopts a TCC mechanism.
- The TCC mechanism mechanically engages the pump impeller and the turbine runner under certain conditions, and transmits the power, not through the fluid, but directly, preventing the slip loss of the torque converter.
- The torque converter has obtained sufficient transmission efficiency and torque converting ratio that match the output characteristics of the engine.



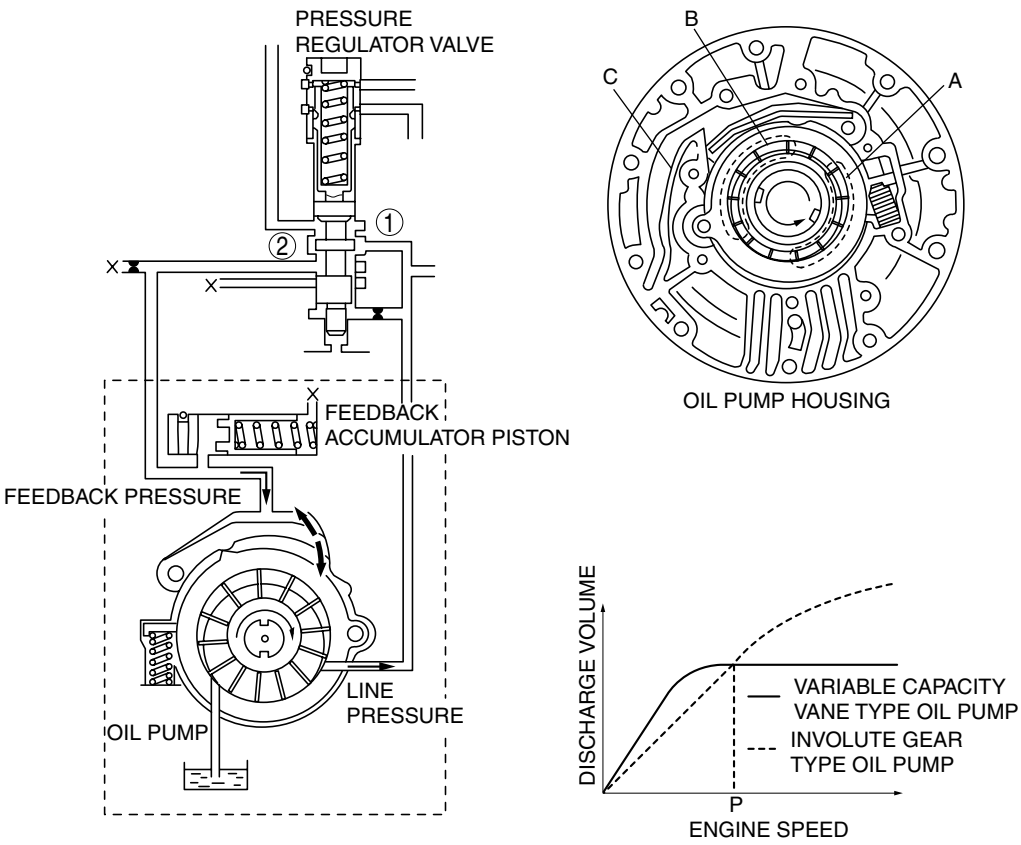
BCF0513T028

OIL PUMP DESCRIPTION

BVF561019220W01

Function

- A variable-capacity-vane type oil pump has been adopted to improve fuel economy.
- In an involute gear type oil pump, discharge volume goes up in proportion to the engine speed; however, the variable-capacity- vane type fixes oil discharge volume when the engine speed reaches or exceeds a certain level to eliminate torque loss caused by feeding more than the required volume of oil.



BCF0513T027

Operation

- Oil charged into chamber A is discharged after being compressed in chamber B. This oil pump discharge volume is controlled by feedback pressure in control piston chamber C.
- When feedback pressure is low, discharge volume will go up due to increased rotor eccentricity. Conversely, rotor eccentricity and discharge volume will go down when feedback pressure is high.
- Oil discharged from the oil pump is mainly used by the pressure regulator valve to regulate line pressure. The amount of discharge needed to generate sufficient line pressure is controlled as follows:
  When discharge volume is too large for required line pressure, line pressure goes up and pushes the pressure regulator valve upward. Consequently, oil lines 1 and 2 will be connected and the line pressure on oil line 1 will flow into the feedback pressure circuit (oil line 2). This will cause the feedback pressure to increase and the discharge volume to decrease, restoring the original line pressure.
  Conversely, when discharge amount is too low for required line pressure, the pressure regulator valve will be pushed downward to close the oil lines 1 and 2, causing feedback pressure to go down. Therefore, the discharge volume will increase and the line pressure will go up.
- Discharge volume, thus controlled to a sufficient level to meet necessary line pressure, will be maintained at a constant level even when rotor input rotation (engine rotation) increases beyond P rotation thereby eliminating excessive driving force.

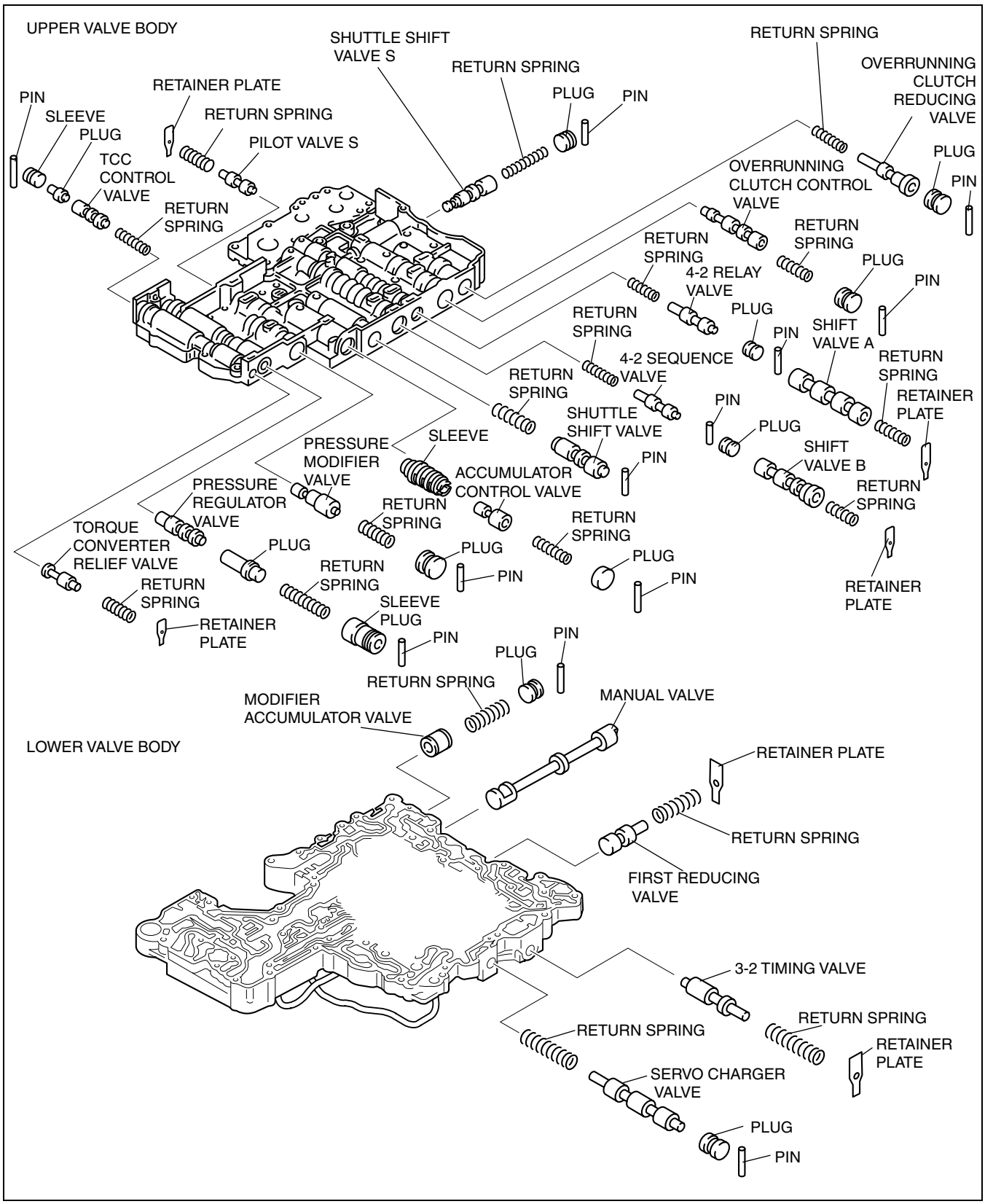
CONTROL VALVE BODY DESCRIPTION

BVF561021100W01

Outline

Features

- The control valve body governs the hydraulic pressure from the oil pump, operates the inner valves according to the level of each hydraulic pressure, and operates each functional part.



BCF0513T039

Construction

- The control valve body comprises an upper control valve body and a lower control valve body.
- Each oil passage inside of the control valve is designed like a maze, and each valve is located within these passages.

Component description

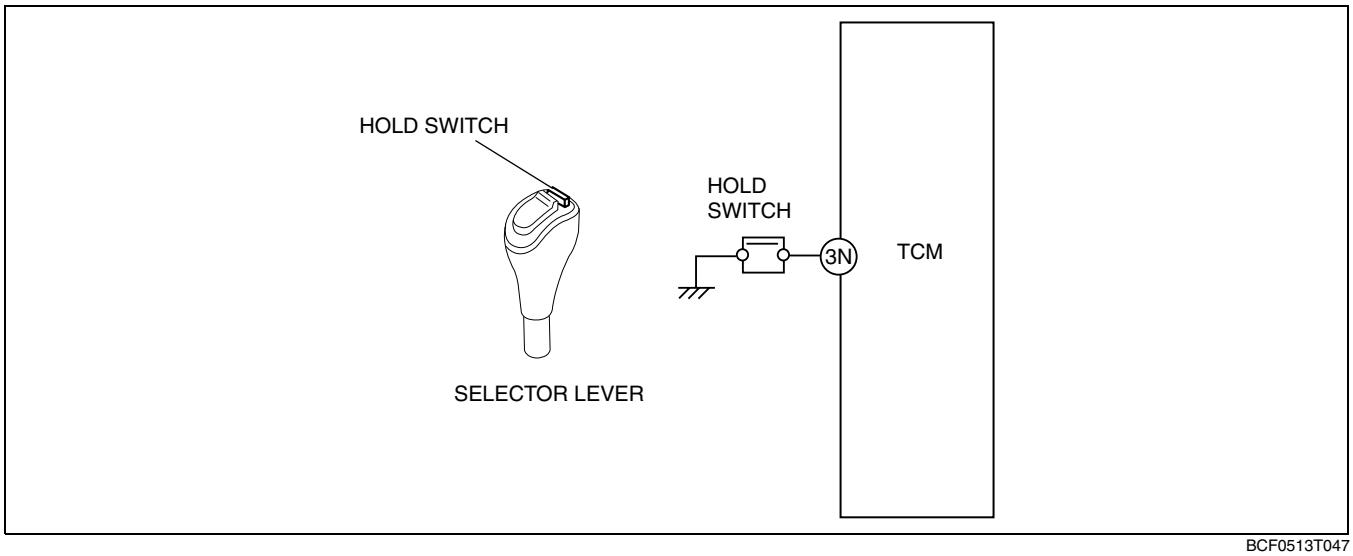
Component	Function
Manual valve	• Distributes line pressure to each circuit corresponding to each selected position • Line pressure will be drained in position where distribution is not required
Pressure regulator valve	• Adjusts oil discharged by oil pump to optimum line pressure for corresponding driving conditions
Pilot valve	• Regulates line pressure to maintain the constant pressure (pilot pressure) required for shift controls such as torque converter clutch and overrunning clutch
Pressure modifier valve	• Auxiliary valve for pressure regulator valve signals • Controls signal pressure (pressure modifier pressure) which adjusts line pressure to optimum level for each driving condition
Accumulator control valve	• Regulates accumulator backup pressure corresponding to driving conditions
Shift valve A	• Simultaneously switches three hydraulic paths by means of shift solenoid A output pressure from driving conditions such as vehicle speed and control lever opening angle • Performs automatic shifting of 1GR⇔2GR⇔3GR⇔4GR in combination with shift valve B
Shift valve B	• Simultaneously switches three hydraulic paths by means of shift solenoid B output pressure from driving conditions such as vehicle speed and control lever opening angle • Performs automatic shifting of 1GR⇔2GR⇔3GR⇔4GR in combination with shift valve A
4–2 relay valve	• Prevents shifting 4GR→3GR→2GR together with 4–2 sequence valve, shift valve A, and shift valve B during down shifting from 4GR to 2GR
4–2 sequence valve	• During 4GR→2GR shifting, prevents drainage of band servo 4GR applied pressure until high clutch applied pressure and band servo 3GR released pressure (in same hydraulic circuit) are drained off
Shuttle shift valve S	• Fixed valve constituting hydraulic line between overrunning clutch solenoid and overrunning clutch control valve
Overrunning clutch control valve	• Switches hydraulic lines of band servo 4GR applied pressure and overrunning clutch applied pressure to prevent operation of overrunning clutch during brake band operation in 4GR
Servo charger valve	• Band servo 2GR applied hydraulic circuit has accumulator and one-way orifice to dampen shock during 1GR→2GR shift • Accordingly, during 4GR→2GR and 3GR→2GR down shifting, the servo charger valve activates in 3GR or 4GR to supply band servo 2GR applied pressure, bypassing one-way orifice in order to assure sufficient flow volume
3–2 timing valve	• Fixed valve constituting hydraulic line between shift valve B and band servo released side
First reducing valve	• Reduce low and reverse brake applied pressure to dampen engine braking shock during 2GR→1GR shifting in L range
Overrunning clutch reducing valve	• To dampen engine brake shock, reduce hydraulic pressure applied to overrunning clutch
Torque converter relief valve	• Prevents excessive torque converter pressure
Shuttle shift valve D	• Shuttle shift valve D has no function • It uses in order to make oil pressure circuit
TCC control valve	• Performs torque converter clutch engagement and release
Feedback accumulator piston	• Prevents line pressure pulsation by stabilizing feedback pressure adjusted by pressure regulator valve

HOLD SWITCH DESCRIPTION

BVF561046030W01

Outline

- The HOLD switch is attached to the selector lever knob. HOLD mode can be selected by ON/OFF of the HOLD switch.



BCF0513T047

Operation

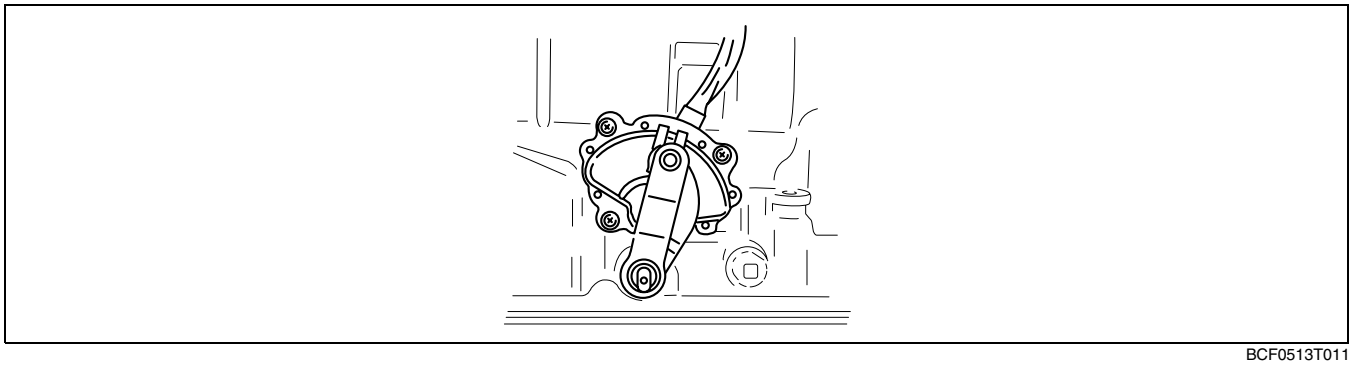
- The PCM detects usage of the HOLD switch and selects the HOLD mode.
- The HOLD mode is designed to be cancelled when the ignition switch is turned OFF. This is for protection in case of the HOLD mode selection is neglected.

TRANSMISSION RANGE (TR) SWITCH DESCRIPTION

BVF561046030W02

Outline

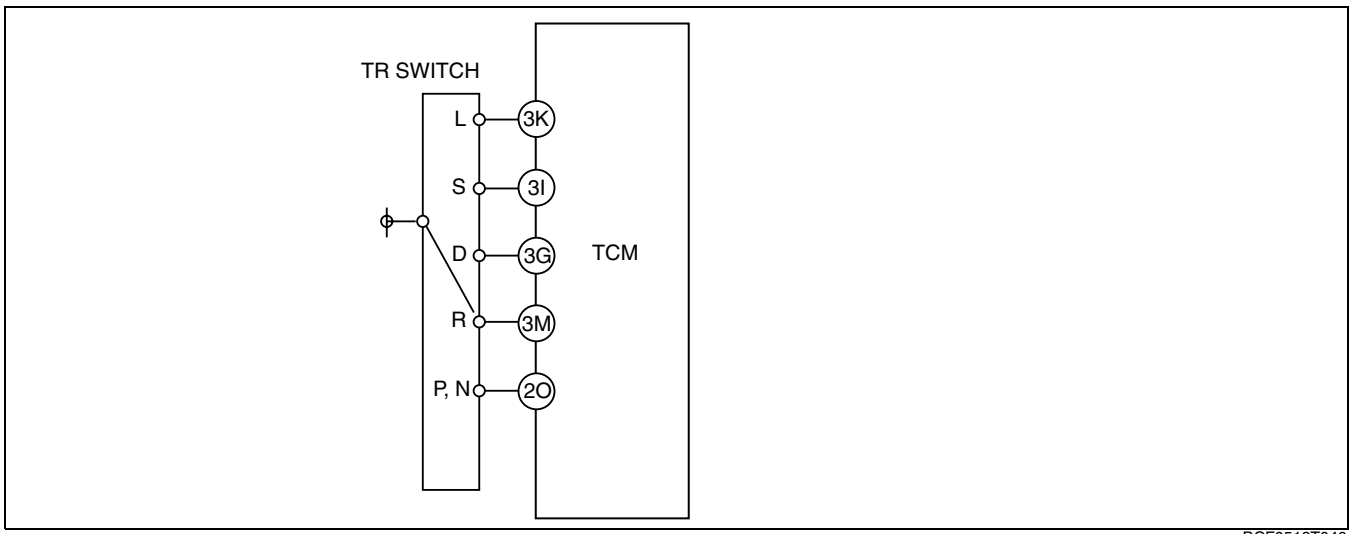
- The TR switch is installed on the right hand side of the transmission, and detects selector lever position.



BCF0513T011

Operation

- When some one of the range or position is selected, each range switch of the TR switch is turned ON.



BCF0513T046

CONTROL LEVER POSITION SENSOR AND IDLE SWITCH DESCRIPTION

BVF561046030W03

Outline

- The control lever position sensor inputs the depressing amount of the accelerator pedal to the TCM. The TCM detects the signal inputted from the control lever position sensor as a FIP control lever opening signal. position.
- The idle switch inputs the accelerator pedal condition (depress or not) to the TCM. The TCM detects the signal from the idle switch as an idle judgement signal.
- The construction and operation of the control lever position sensor and the idle switch are the same as those of the current Ranger WL Turbo model. (See RANGER Training Manual F326-10-99A Section F2.)

OUTPUT SPEED SENSOR DESCRIPTION

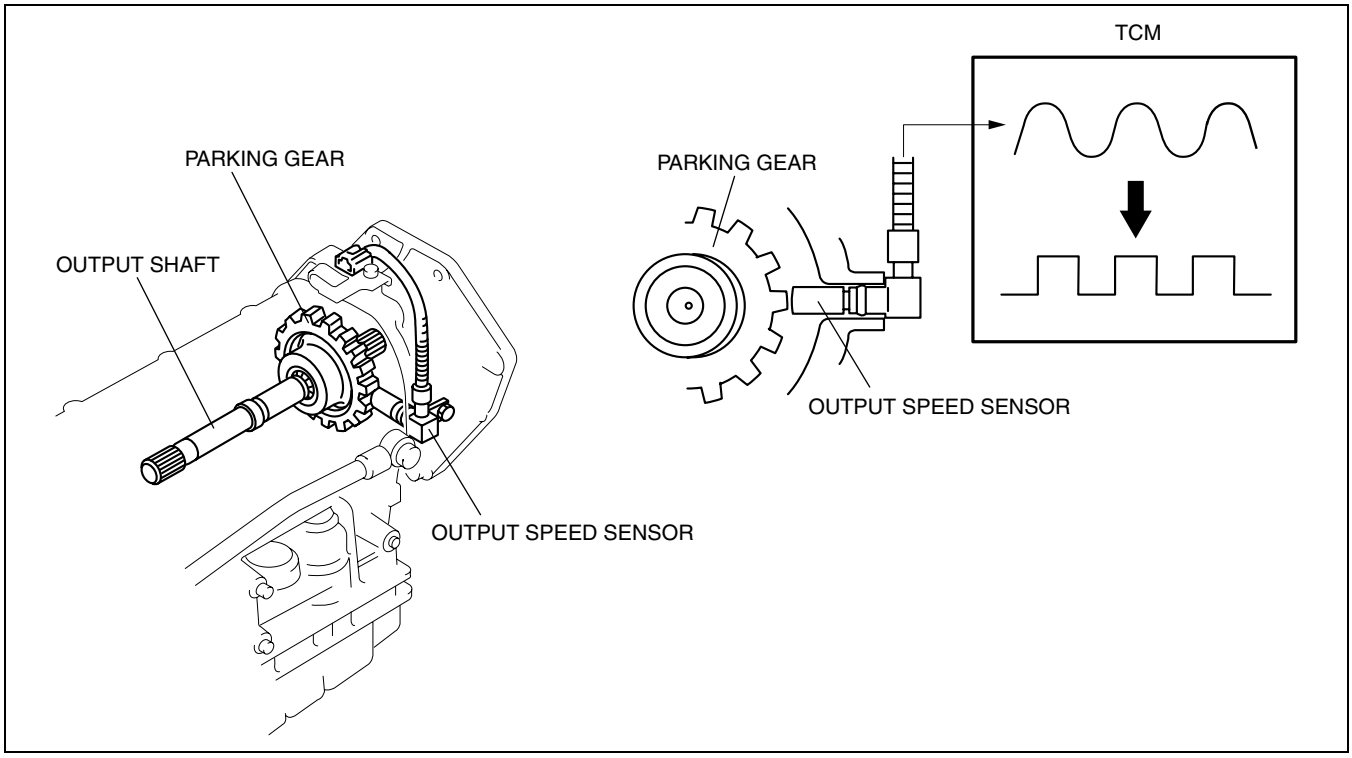
BVF561046030W04

Outline

- The output speed sensor detects the rotational speed of the output shaft, and sends a pulse signal to the TCM. This signal is the main signal with which the TCM performs various controls.

Structure/Operation

- The output speed sensor is mounted on the extension housing, next to the parking gear. It generates a 21-pulse signal for each rotation of the parking gear, and sends this signal to the TCM.



BCF0513T002

K1

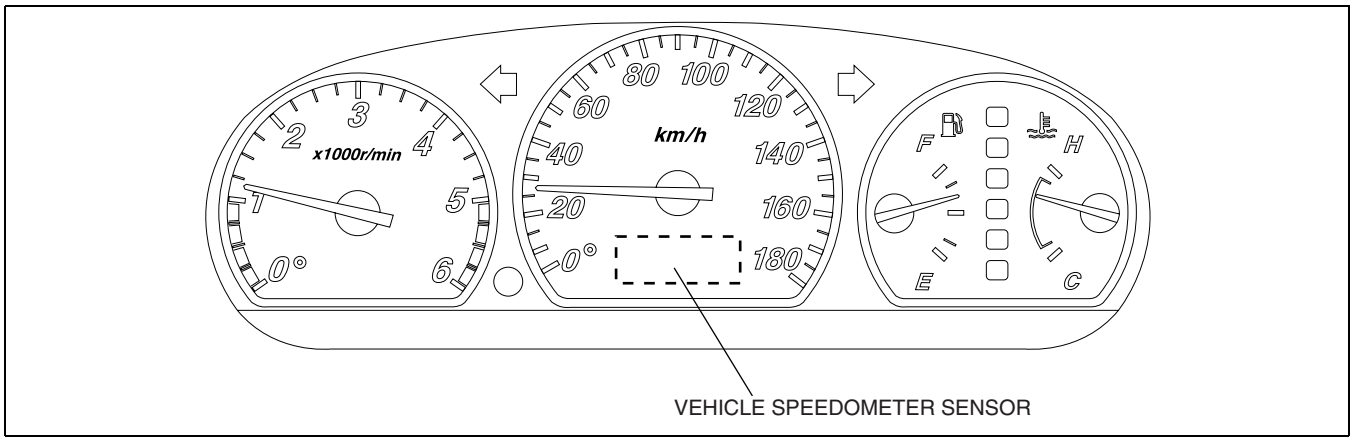
AUTOMATIC TRANSMISSION

VEHICLE SPEEDOMETER SENSOR DESCRIPTION

BVF561046030W05

Outline

- The vehicle speedometer sensor is located in the speedometer (instrument cluster).
- The vehicle speedometer sensor acts as a substitute for output speed sensor if it malfunction.



BVF0513T048

NE SENSOR DESCRIPTION

BVF561046030W06

Outline

- The NE sensor detects the rotation speed of the FIP gear, which is inputted to the TCM as an engine speed signal.
- The structure and operation of the NE sensor are the same as those of the current Ranger WL Turbo model. (See RANGER Training Manual F326-10-99A Section F2.)

ENGINE COOLANT TEMPERATURE (ECT) SENSOR DESCRIPTION

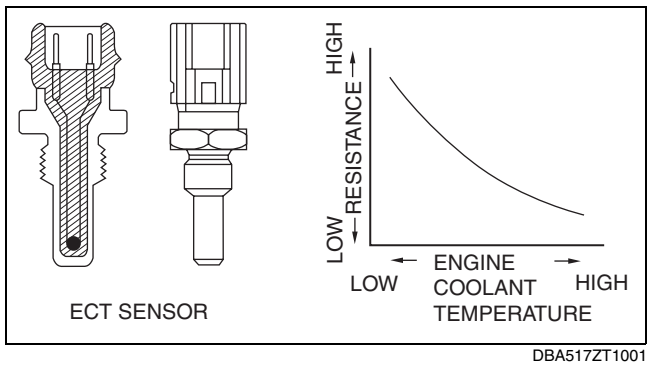
BVF561019200W01

Function

- The ECT sensor detects the engine coolant temperature.

Structure

- The ECT sensor is thermistor type, and is installed in the water outlet.
- The ECT sensor inputs the thermistor resistance, which changes according to the engine coolant temperature, to the TCM as a voltage.



DBA517ZT1001

AUTOMATIC TRANSMISSION

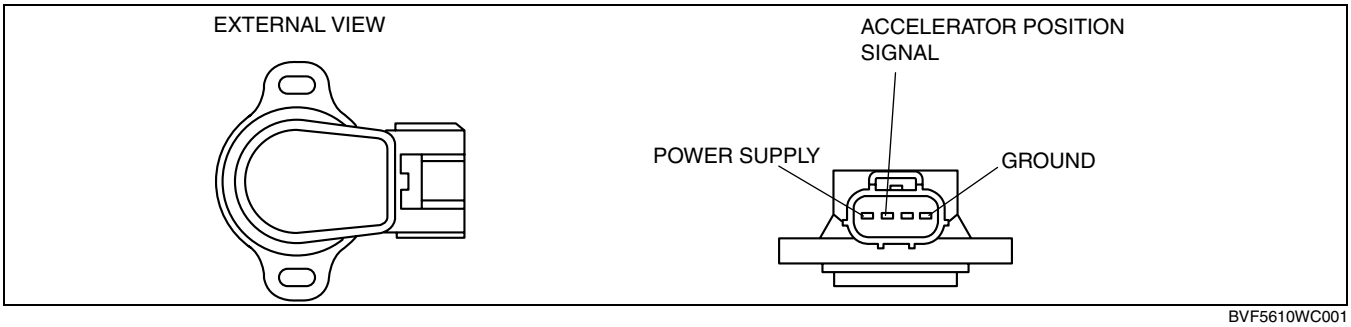
ACCELERATOR POSITION SENSOR, IDLE SWITCH DESCRIPTION

BVF561019200W02

Accelerator Position Sensor

Outline

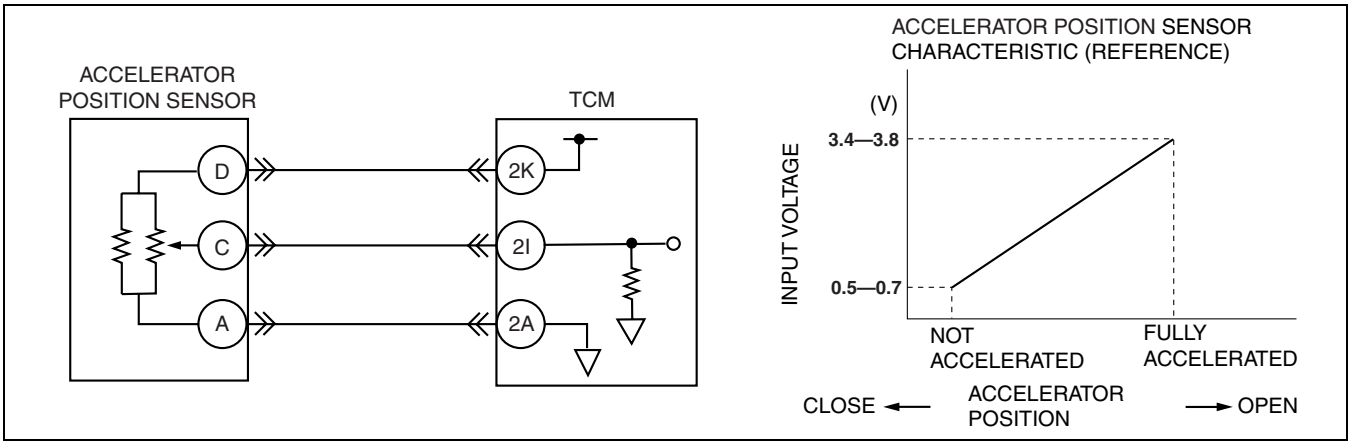
- The accelerator position sensor is installed on the accelerator pedal, and detects how much the accelerator pedal is being depressed from the change in the resistance value (variable resistance).



BVF5610WC001

Operation

- The accelerator position sensor is a potentiometer type and works is the same way as the throttle position sensor.
- The input voltage characteristic of the accelerator position sensor is as shown.

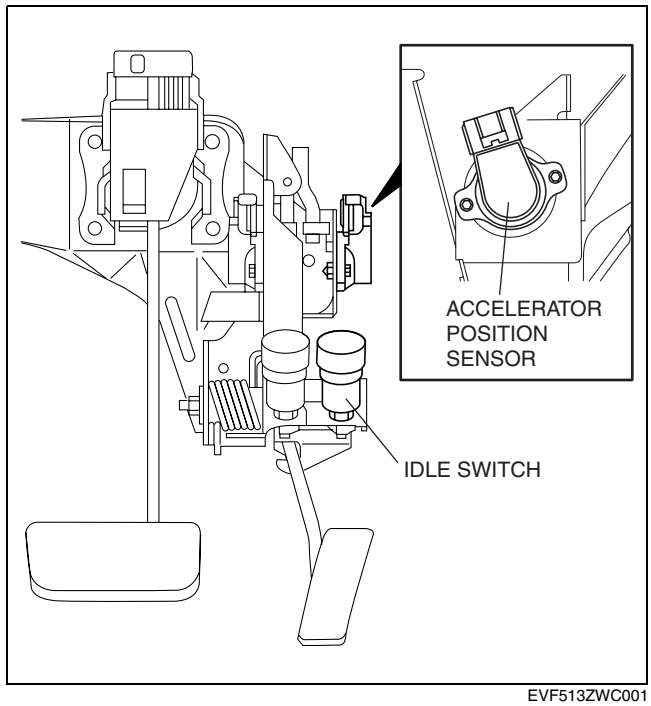


BVF5610WC002

Idle Switch

Function

- The idle switch is mounted to the accelerator panel and inputs to the TCM whether the accelerator panel is depressed or released. the TCM detects the idle switch signal as an idle signal.



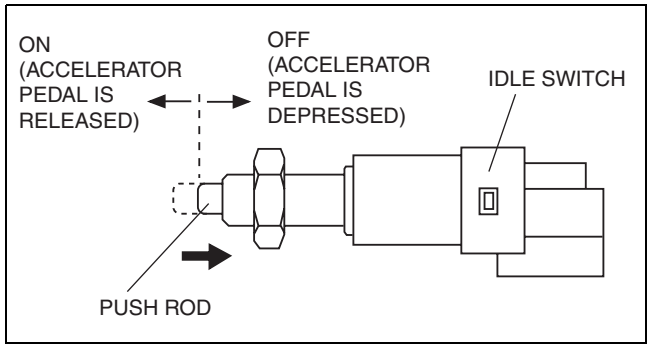
EVF513ZWC001

K1

AUTOMATIC TRANSMISSION

Structure/Operation

- When the push rod is pushed in (the accelerator pedal is released) a preset amount, the contact of the idle switch closes, and the TCM determines that the engine is idling. When the contact of the idle switch is open (OFF), the TCM determines that the engine is not idling.



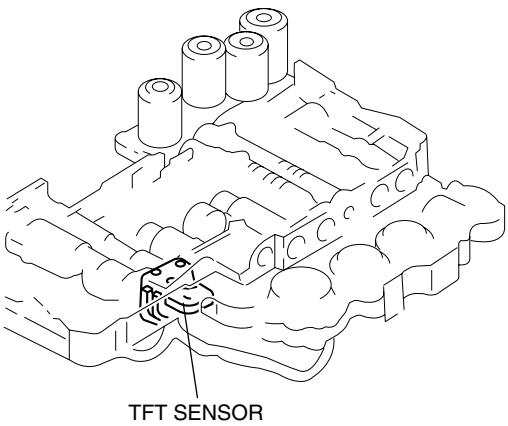
EVF513ZWC002

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR DESCRIPTION

BVF561046030W07

Outline

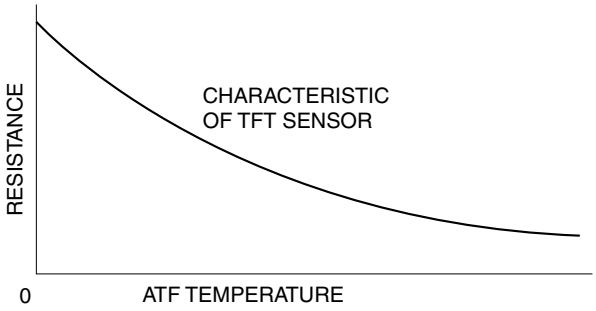
- The TFT sensor detects the ATF temperature in the oil pan, and sends the control signal to the TCM. The TCM controls the driving pattern selection and the torque converter clutch based on the signal from the TFT sensor.



BCF0513T040

Structure/Operation

- The TFT sensor is a thermistor type and the resistance changes according to the ATF temperature.
- The characteristic of the resistance is as shown in the figure below: when the ATF temperature increases, the resistance decreases, and when the ATF temperature decreases, the resistance increases.
- The TFT sensor is installed on the control valve body.



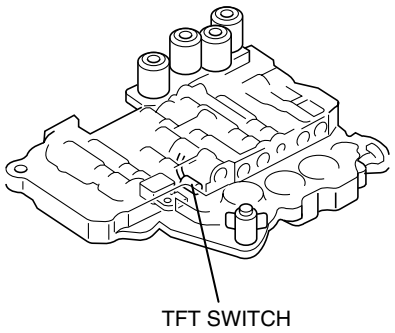
BCF0513T050

TRANSMISSION FLUID TEMPERATURE (TFT) SWITCH DESCRIPTION

BVF561046030W08

Outline

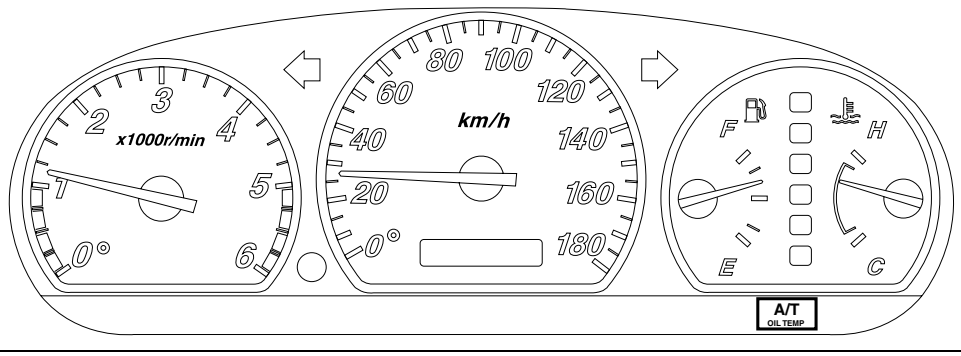
- The TFT switch detects the ATF temperature in the oil pan, and sends the warning signal to the instrument cluster.



BCF0513T051

Structure/Operation

- When ATF temperature is above **150 °C {302 °F}**, the TFT switch is turned on and A/T OIL TEMP warning light is illuminated.
- The TFT switch is installed on the control valve body.



BVF0513T052

SOLENOID VALVE DESCRIPTION

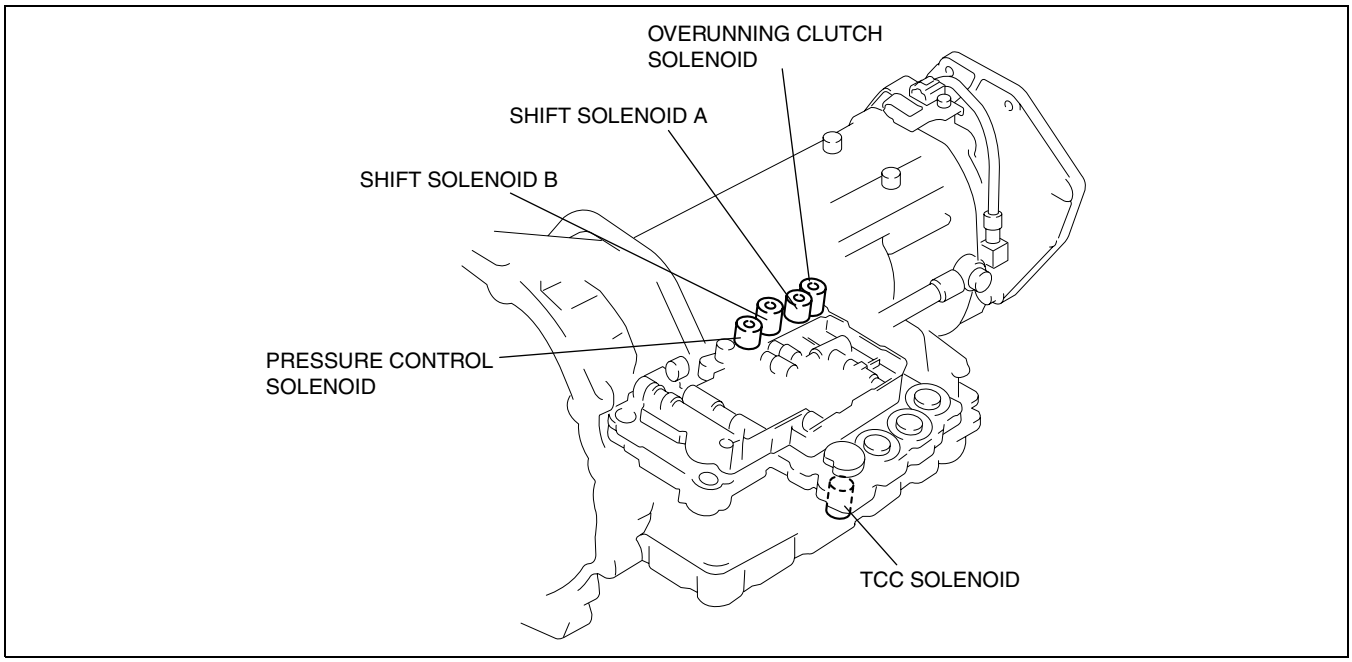
BVF561019900W01

Outline

- The solenoid valves are located on the control valve body.
- The solenoids have the following functions.

Function chart

Solenoid	Type	Application
Pressure control solenoid	Duty cycle type	• Switches line pressure between high and low
Shift solenoid A	ON/OFF type	• Regulate shifting through 1GR to 4GR by switching oil passages
Shift solenoid B		
TCC solenoid	Duty cycle type	• Controls TCC engagement and disengagement
Overrunning clutch solenoid	ON/OFF type	• Controls engine braking based on driving condition



BCF0513T004

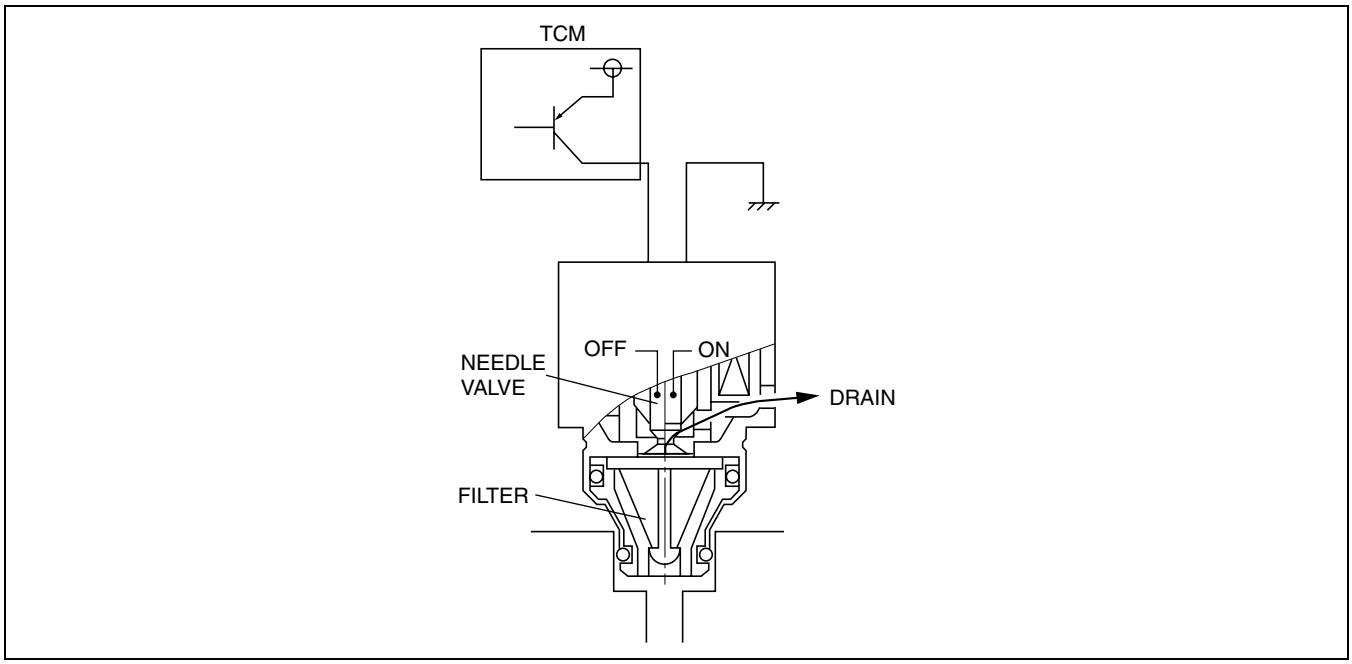
Structure/Operation

Pressure control solenoid

- The pressure control solenoid regulates throttle pressure based on TCM signals and controls line pressure.
- Since the pressure control solenoid requires high current to activate the needle valve, current from the TCM is applied directly to the pressure control solenoid without passing through the dropping resistor. However, once the needle valve is activated, comparatively low current is enough to control the ON/OFF maintaining current. Therefore, the TCM causes the current to flow to the pressure control solenoid via the drooping resistor.
- The pressure control solenoid is a duty cycle type which freely controls the ratio of ON time to OFF time in one cycle from 0 to 100%. It repeats ON/OFF at a frequency of 50 Hz (0.02 s cycle), and opens and closes the drain circuit to adjust throttle pressure to a specified hydraulic pressure.

Condition	ATF flow	Operation
ON	Drain	• The TCM applies an electronic current to the solenoid valve • The rod moves upward and the drain port opens
OFF	Hydraulic pressure retention	• The TCM does not apply an electronic current to the solenoid valve • The rod moves downward by spring force to retain hydraulic pressure

- Due to the above reasons, throttle pressure increases when the duty ratio (ratio of 50Hz ON time) decreases; conversely, throttle pressure decreases when the duty ratio increases.



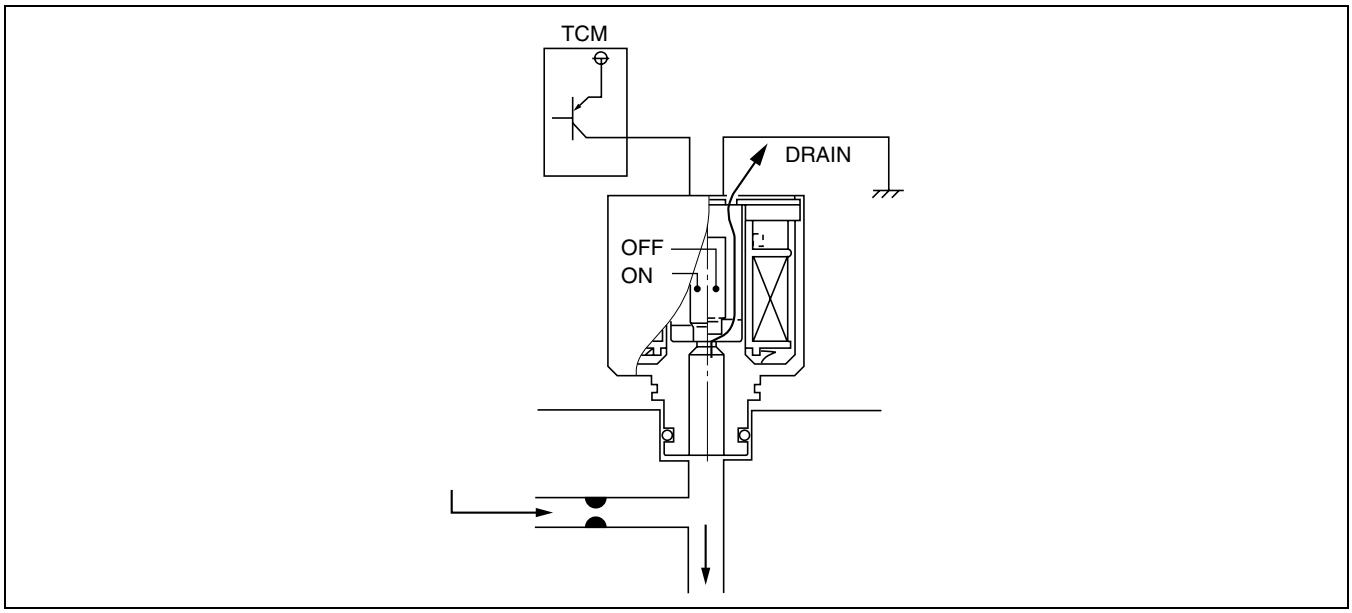
BCF0513T016

Shift solenoid A/Shift solenoid B

- The shift solenoids control pilot pressure (line pressure adjusted by the pilot valve) applied to the shift valve A and the shift valve B.
- The shift solenoids are switched ON/OFF by electrical signals from the TCM.
- The ON/OFF combination of solenoid valves as shown in the below.

Solenoid / Gear position	1GR	2GR	3GR	4GR
Shift solenoid A	ON	OFF	OFF	ON
Shift solenoid B	ON	ON	OFF	OFF

Condition	ATF flow	Operation
ON	Hydraulic pressure retention	• The TCM applies an electronic current to the solenoid valve • The rod moves downward by spring force to retain hydraulic pressure
OFF	Drain	• The TCM does not apply an electronic current to the solenoid valve • The rod moves upward and the drain port opens

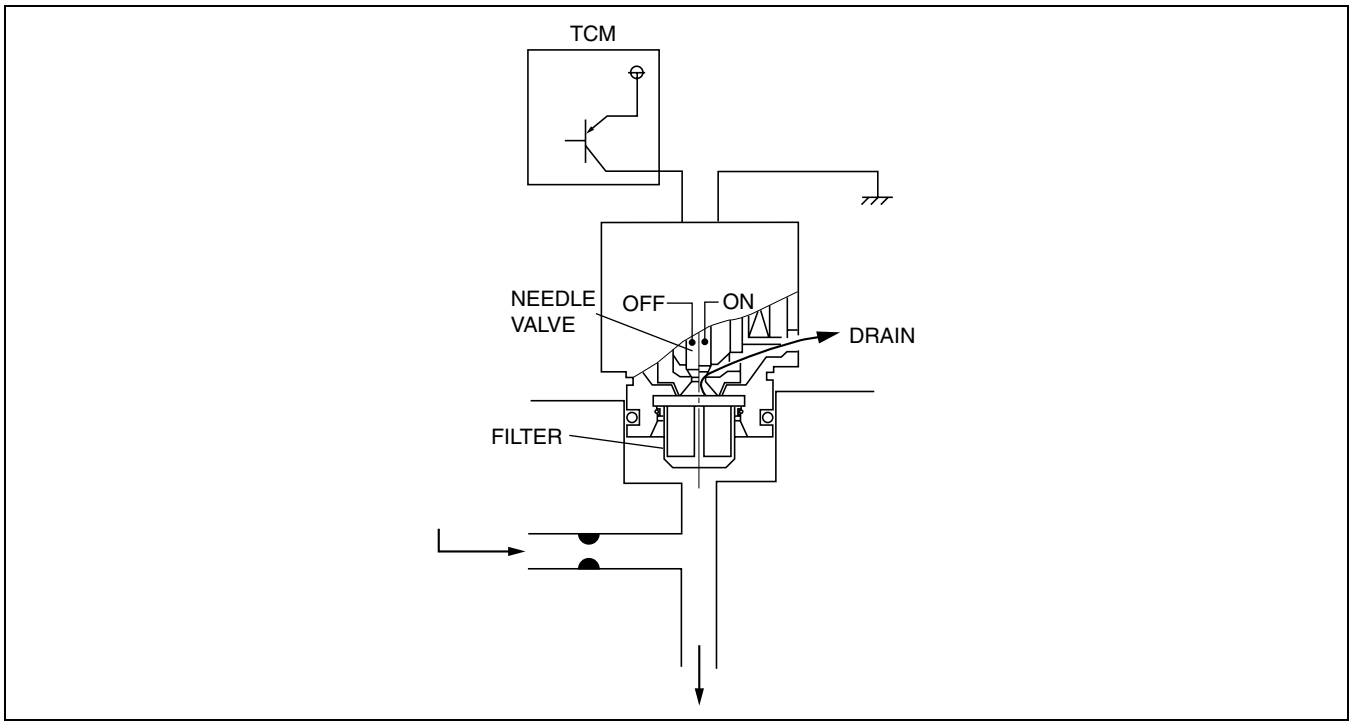


BCF0513T015

TCC solenoid

- The TCC solenoids controls TCC control valve operation.
- The TCC solenoid is a duty cycle type which freely controls the ratio of ON time to OFF time in one cycle from 5 to 95%. It repeats ON/OFF at a frequency of 50 Hz (0.02 s cycles) and opens and closes the drain circuit to control pilot pressure.
- When TCC is released, the duty ratio (50 Hz ON time ratio) is 5% and pilot pressure is retained.
  When TCC is engaged, the duty ratio is 95% and pilot pressure is decreased.

Condition	ATF flow	Operation
ON	Drain	• The TCM applies an electronic current to the solenoid valve • The rod moves upward and the drain port opens
OFF	Hydraulic pressure retention	• The TCM does not apply an electronic current to the solenoid valve • The rod moves downward by spring force to retain hydraulic pressure

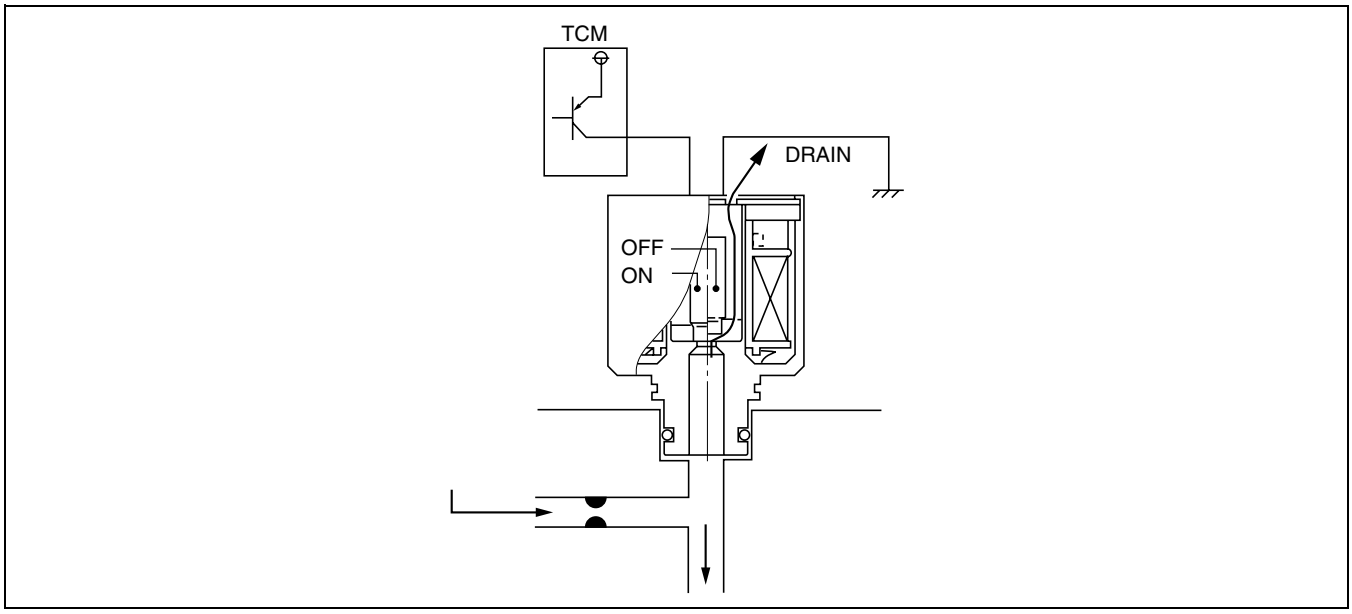


BCF0513T017

Overrunning clutch solenoid

- The overrunning clutch solenoid controls the overrunning clutch (engine braking).
- The TCM signals switch the overrunning clutch solenoid ON/OFF.

Condition	ATF flow	Operation
ON	Hydraulic pressure retention	• The TCM applies an electronic current to the solenoid valve • The rod moves downward by spring force to retain hydraulic pressure
OFF	Drain	• The TCM does not apply an electronic current to the solenoid valve • The rod moves upward and the drain port opens



BCF0513T015

TRANSMISSION CONTROL MODULE (TCM) DESCRIPTION

BVF561018901W01

Outline

- The TCM controls the automatic transmission operations. The TCM outputs a control signal to the transmission according to the signal from other sensors and/or switches.

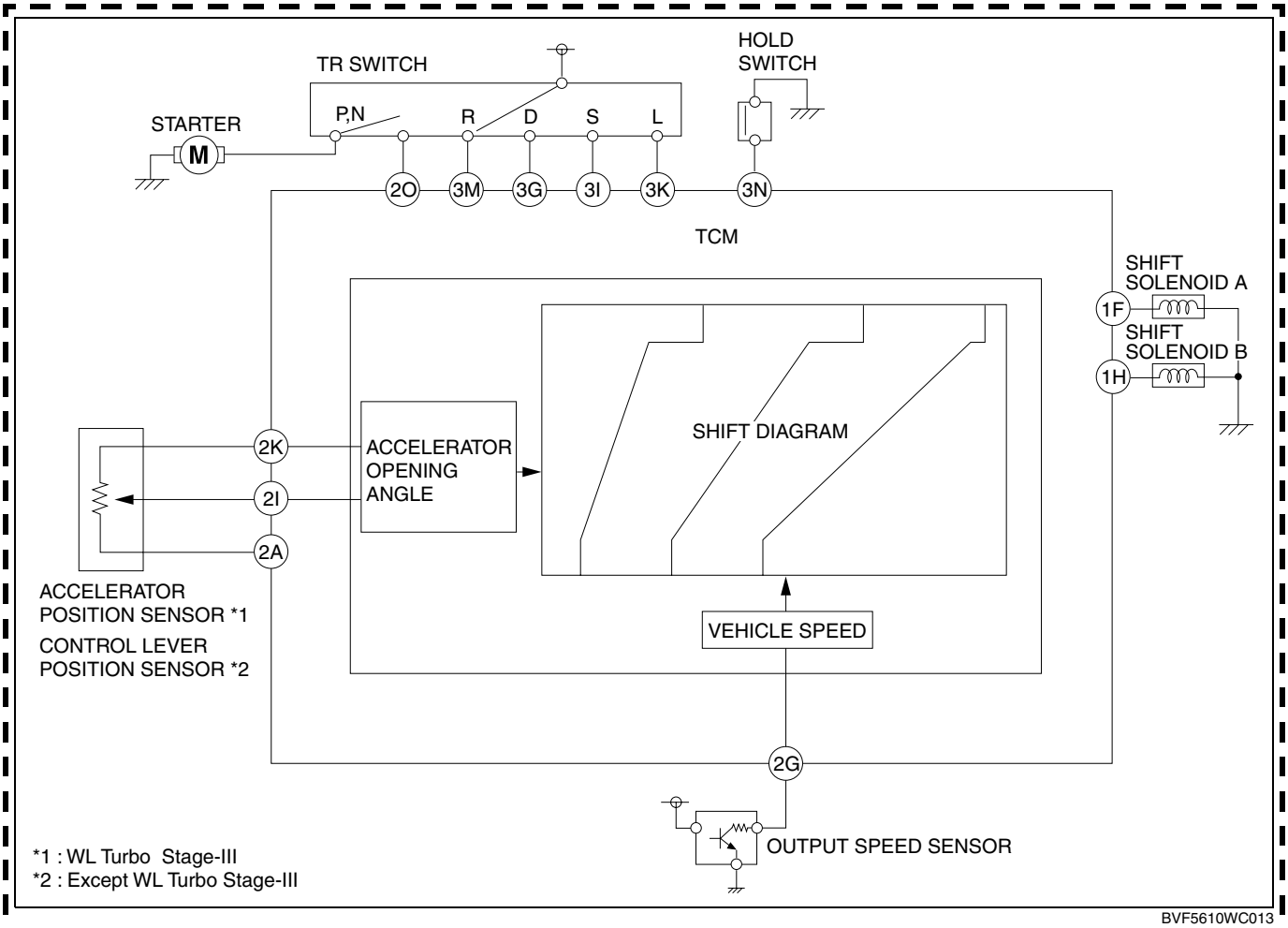
SHIFT CONTROL DESCRIPTION

BVF561018901W02

Outline

- The TCM selects and determines the shift diagram based on the signals from TR switch and HOLD switch. Then, based on the shift diagram, the TCM sends the signal to the duty-cycle type solenoid valves and the ON/OFF type solenoid valves, according to the output speed sensor signal (vehicle speed signal) and the depressing amount of accelerator pedal, to perform shifting.

Structure (system diagram)



BVF5610WC013

Operation

Range determination

- Each range is determined by operating the selector lever, and switching ON/OFF the switch in the TR switch internal circuit. The present range is detected according to the ON/OFF signal of the switch.
- The following switches are built into the TR switch, and determine each range when the switch is ON.
  P and N position switch
  R position switch
  D range switch
  S range switch
  L range switch

Drive Mode Determination

- Non-HOLD and HOLD modes can be selected by switching the HOLD switch ON/OFF.

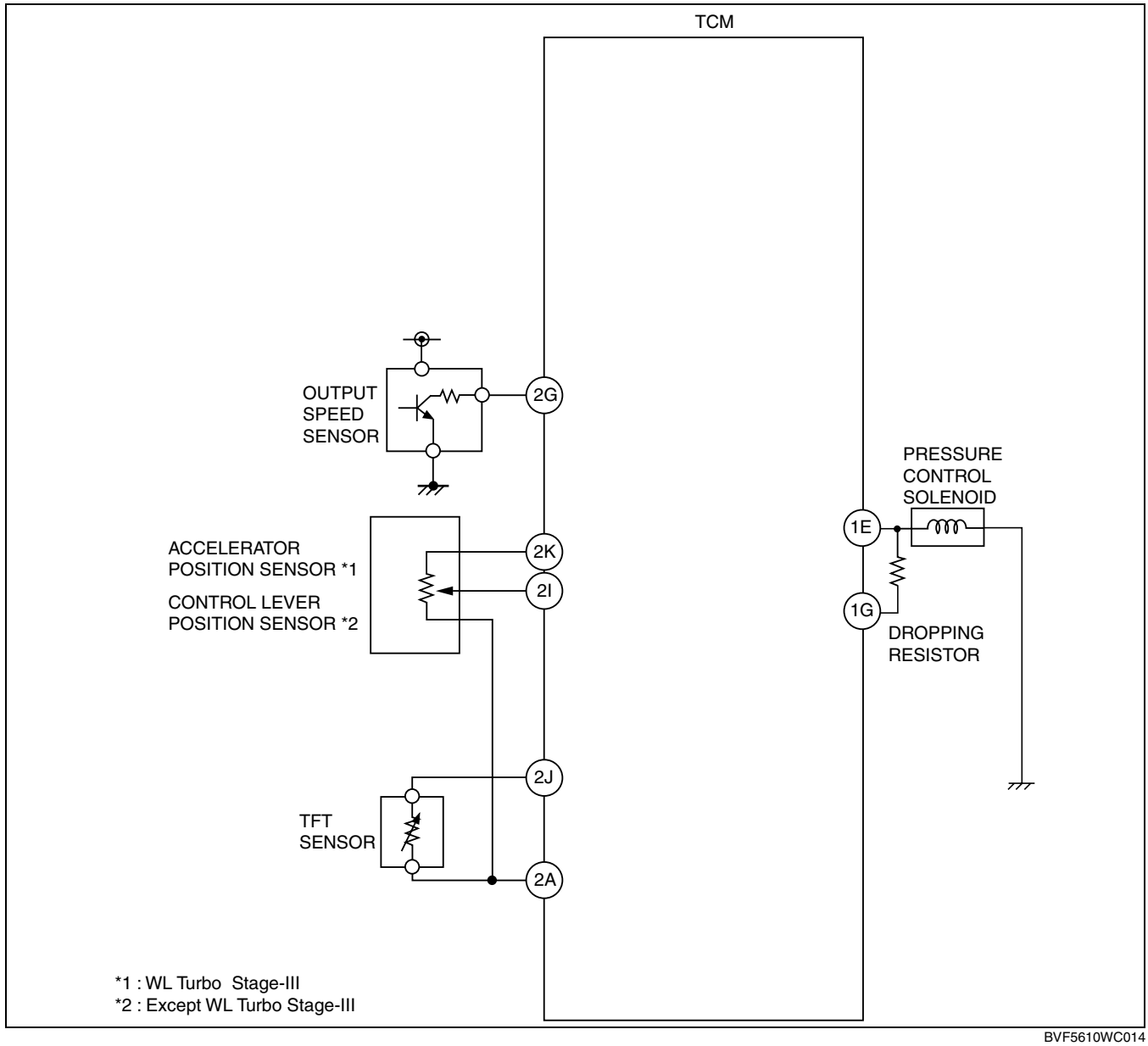
LINE PRESSURE CONTROL DESCRIPTION

BVF561018901W03

Outline

- The TCM controls the pressure control solenoid to regulate throttle pressure based on electronic signals received from the control lever position sensor or accelerator position sensor which detects the depressing amount of accelerator pedal. Using this throttle pressure as a signal pressure, the pressure regulator valve controls the hydraulic pressure discharged from the oil pump to the optimum line pressure corresponding to driving conditions.
- The TCM detects the engine load by control lever position sensor or accelerator position sensor, line pressure characteristics are set based on the depressing amount of accelerator pedal.

Construction (System diagram)



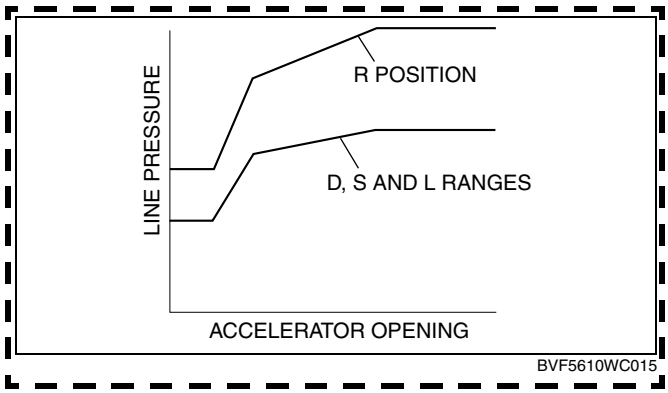
K1

AUTOMATIC TRANSMISSION

Operation

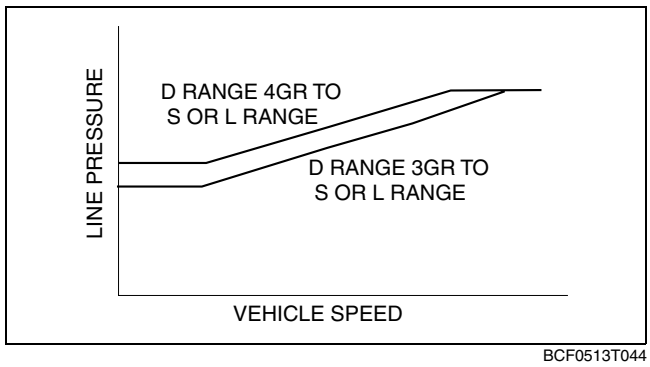
Normal condition

- Line pressure is adjusted to meet the required pressure for each clutch and minimizes oil pump driving loss.



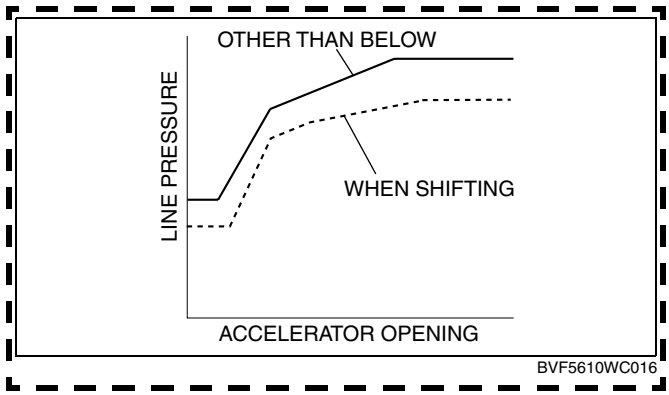
When engine braking

- The driving force applied to the clutches and brake when selected from D range 4GR to S or L range 2GR is different from that when selected from D or S range 3GR to S or L range 2GR. For this reason, optimum line pressure characteristics are programmed for each condition.



When shifting

- To reduce shift shock, line pressure characteristics are set to match engine driving force during shifting. Optimum line pressure characteristics are temporarily selected based on each shifting condition.



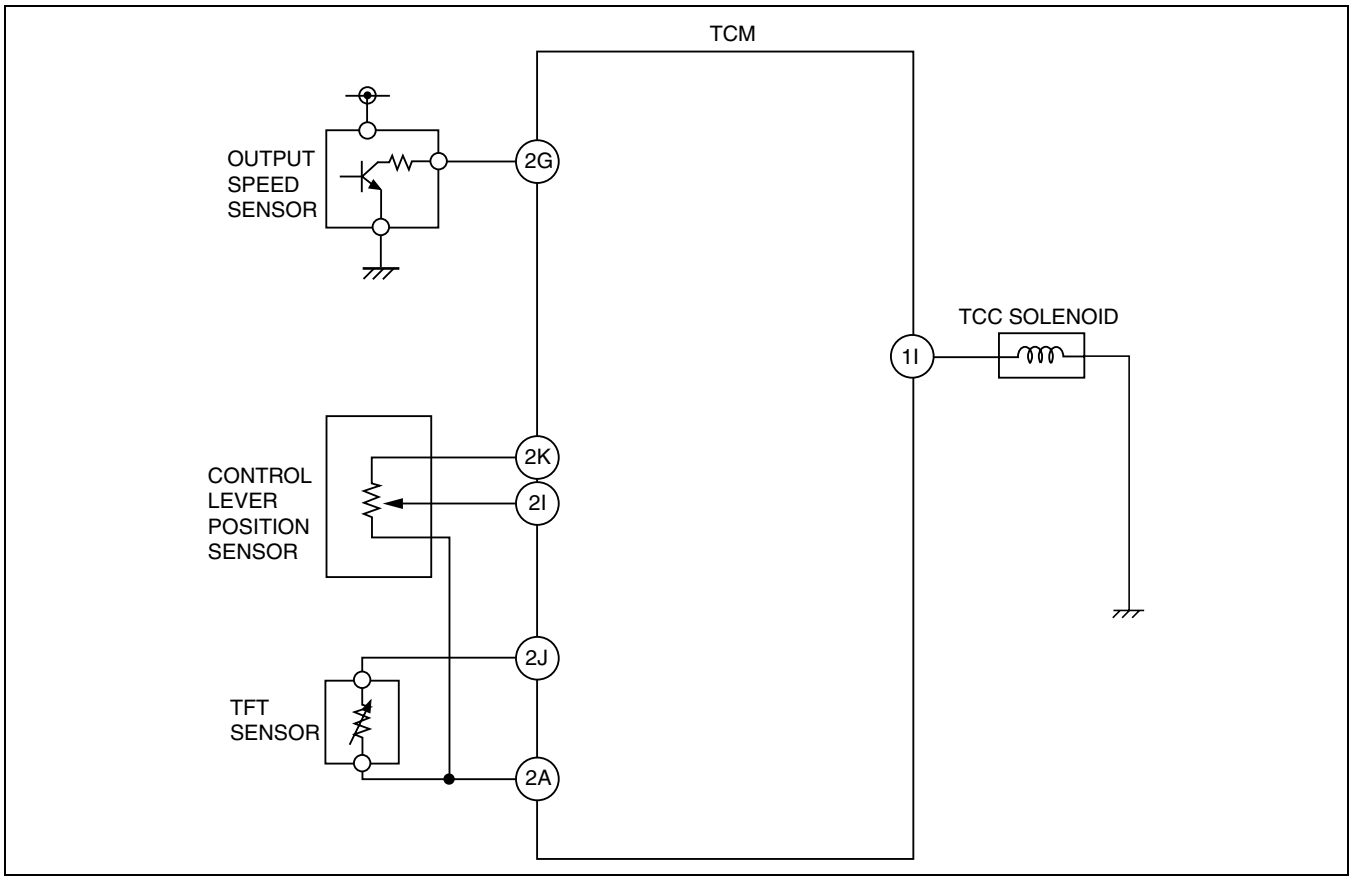
TORQUE CONVERTER CLUTCH (TCC) CONTROL DESCRIPTION

BVF561018901W04

Outline

- Based on vehicle speed, the depressing amount of accelerator pedal, ATF temperature and the result of range determination, the TCM determines the TCC diagram and sends signals to the TCC solenoid.
- As a result, minute hydraulic control is possible, unlike with conventional clutch engagement pressure control using an accumulator.
- Even for select lever operation and HOLD switch operation, the TCM provides the optimum torque capacity of clutch to the engagement- and release-side clutches according to the transmission input torque (turbine torque).

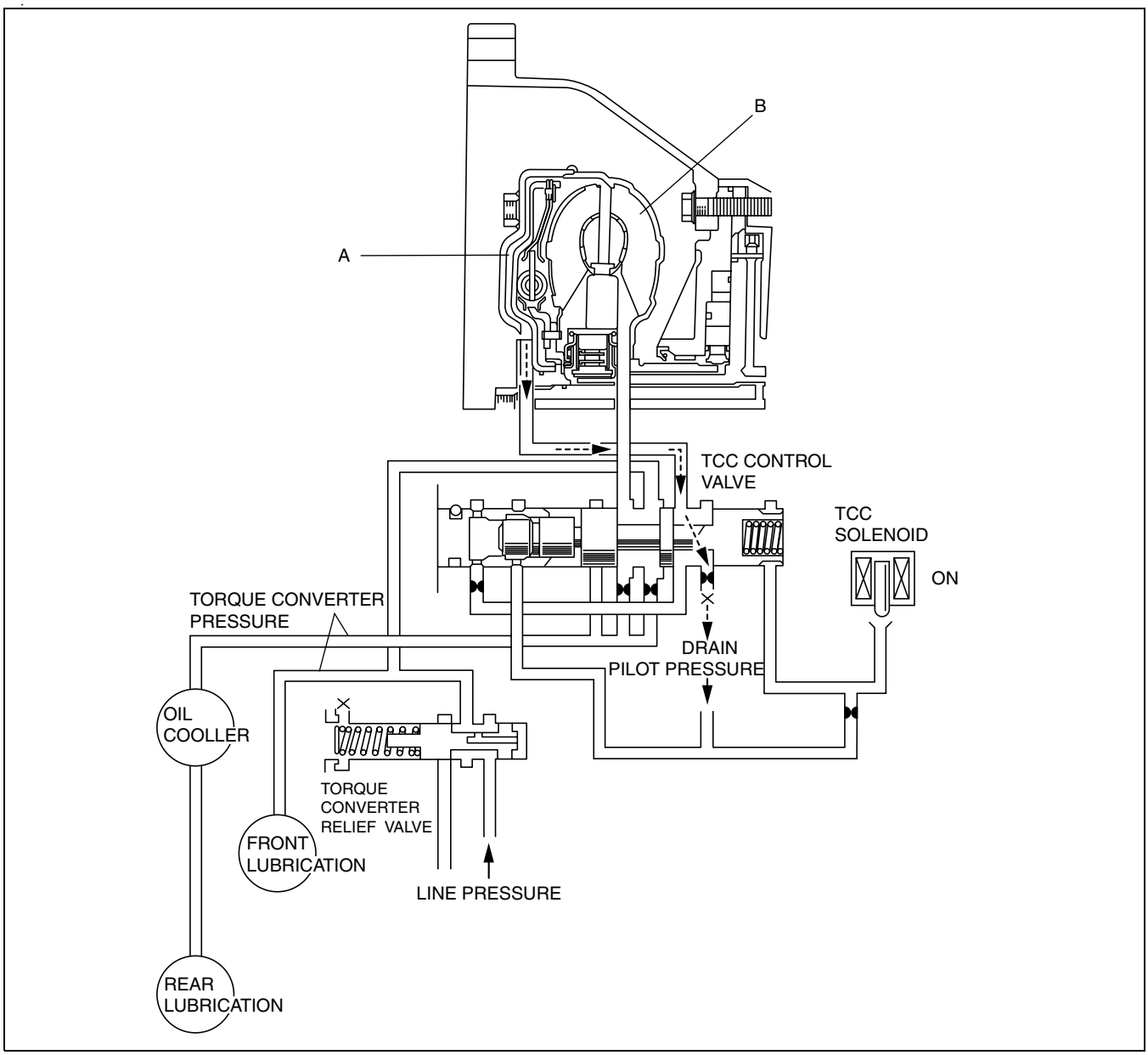
Structure (System diagram)



BCF0513T024

Operation
TCC engagement

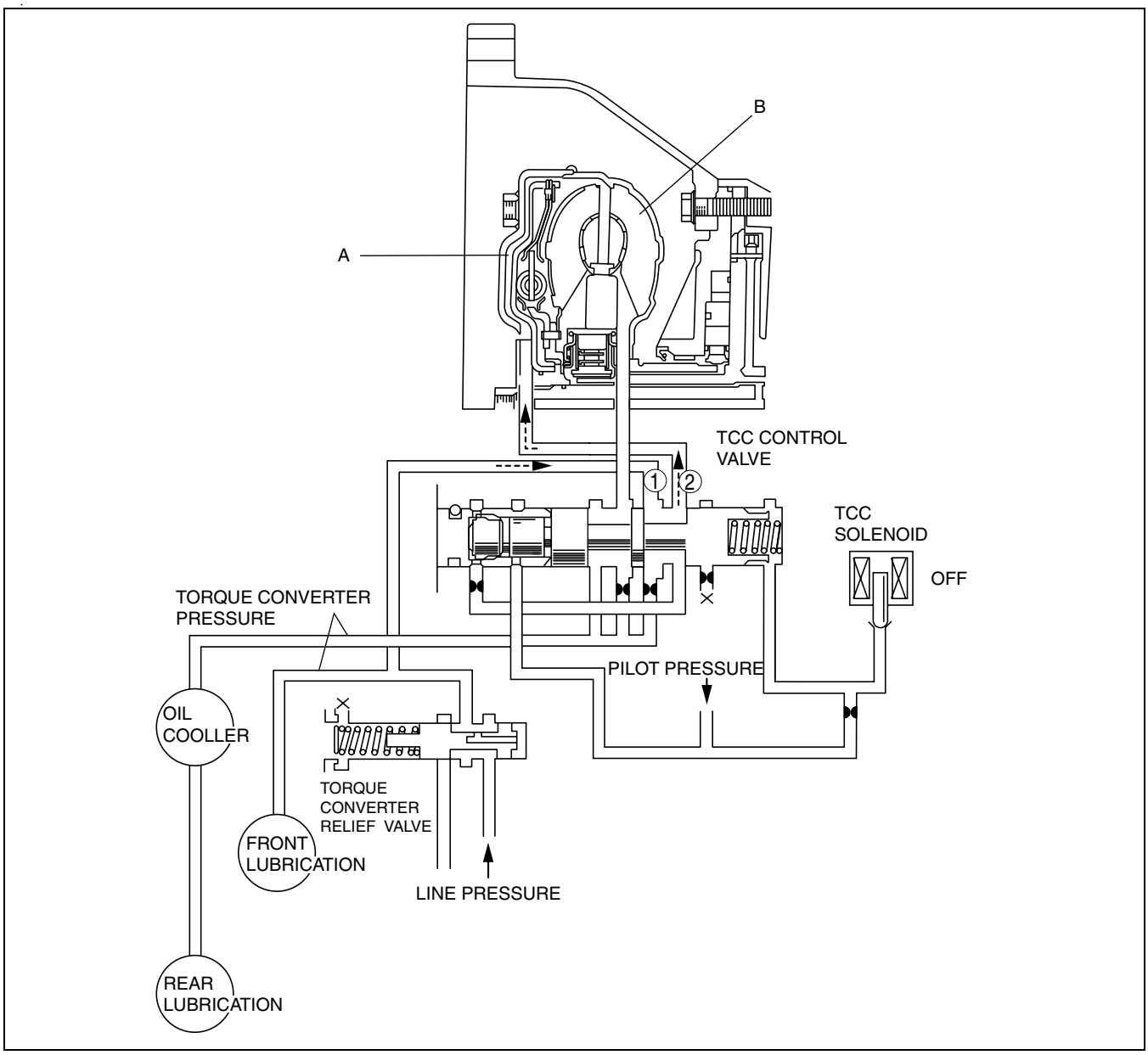
- When the TCM determines TCC engagement, it sends signals of 95% duty ratio (50 Hz ON time ratio) to the TCC solenoid. Subsequently the pilot pressure applied to the right end of the TCC control valve is drained.
- The TCC control valve is pushed to right side because of the pilot pressure applied to the left side of the TCC control valve. Consequently, torque converter release pressure is drained and the TCC is pressed tightly to the converter cover, thus engaging TCC.



BCF0513T045

TCC release

- When the TCM determines TCC release, it sends signals of approximately 5% duty ratio (50 Hz ON time ratio) to the TCC solenoid. The pilot pressure applied to the right end of the TCC control valve and the TCC control valve is pushed to the left side by pilot pressure and spring force.
- At the same time, the torque converter relief valve adjusts the line pressure to produce torque converter release pressure. The torque converter pressure passes through ports 1 and 2 of the TCC control valve and is applied to chamber A of the torque converter. Consequently, the torque converter release pressure is not drained and the TCC is released.



BCF0513T025

Determine of TCC inhibition

- TCC is inhibition when any of the following conditions are met.
  - — idle switch is ON while vehicle speed is **120 km/h {74 mph}**.
  - — ATF temperature is below **40°C {104°F}**

ENGINE BRAKING CONTROL (OVERRUNNING CLUTCH) DESCRIPTION

BVF561018901W05

Outline

- The forward one-way clutch is employed to reduce shift shock during down shifting.

Operation

- Drive force from the engine is transmitted to the rear wheels by the forward one-way clutch, but reverse-direction drive force from the rear wheels is not transmitted to the engine because the one-way clutch freewheels. Because of this, the overrunning clutch is engaged to actuate engine braking according to driving conditions.

Overrunning clutch engagement conditions

- The overrunning clutch is engaged when the following conditions are met.

Range	D		S		L	
Mode	Non-HOLD	HOLD	Non-HOLD	HOLD	Non-HOLD	HOLD
Gear position	—	2GR,3GR	1GR,2GR,3GR		1GR,2GR	
Condition	Does not operate	Operates when depressing amount of accelerator pedal is below 1/16 and vehicle speed is above **10 km/h {6.2 mph}**	Operates when depressing amount of accelerator pedal is below 1/16		Constantly engaged	

Note

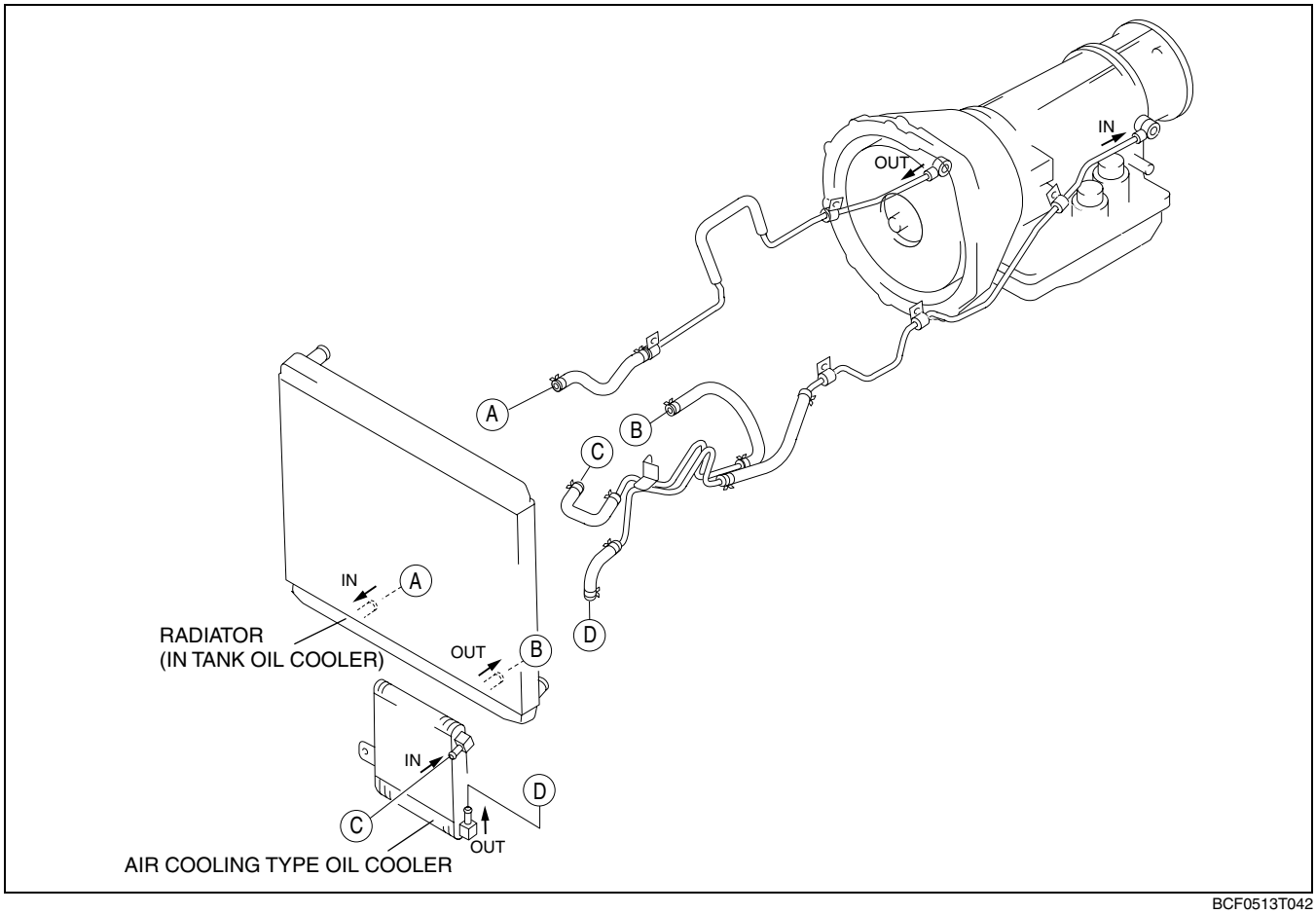
- In D or S range 1GR, engine braking is not available because the low and reverse brake does not engage. Also the overrunning clutch does not engage in 4GR, but engine braking is available.

COOLING SYSTEM DESCRIPTION

BVF561019900W02

Outline

- A water cooling type AT oil cooler is adopted and installed in the radiator. The oil cooler cools the ATF heated in the AT body.
- A air cooling type AT oil cooler is adopted and installed in front of the radiator.



BCF0513T042

ON-BOARD DIAGNOSTIC

ON-BOARD DIAGNOSTIC (OBD) SYSTEM DESCRIPTION

BVF567001030W01

- If a malfunction occurs, the OBD system warns the driver by flashing the HOLD indicator and records it in the TCM.
- The recorded DTC is output on the HOLD indicator by short the TAT terminal of the DLC to the GND.
- The OBD system has a self-diagnosis function for the components shown below:
  - — NE sensor (engine speed signal)
  - — Output speed sensor
  - — Vehicle speedometer sensor
  - — ECT sensor
  - — Accelerator position sensor*1
  - — Control lever position sensor*2
  - — TFT sensor
  - — Shift solenoid A
  - — Shift solenoid B
  - — Overrunning clutch solenoid
  - — TCC solenoid
  - — Pressure control solenoid

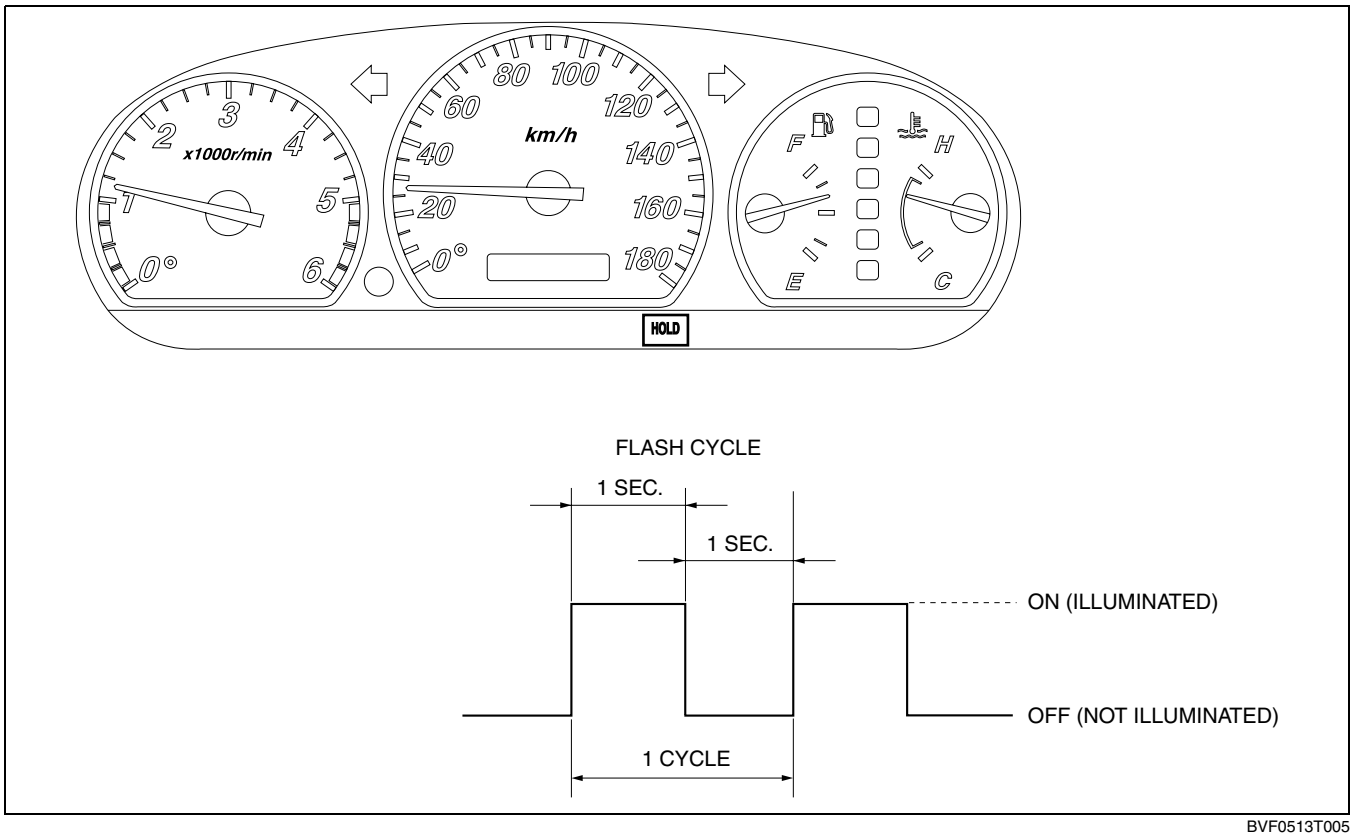
*1 : WL Turbo Stage-III
*2 : Except WL Turbo Stage-III

Failure Indication Function

- If malfunction occurs, the system warns the driver by flashing the HOLD indicator.
- The TCM judges that normal condition has been recovered, the flashing will cease, but the malfunction will be recorded in the TCM.

Note

- If a malfunction occurs in the TFT sensor, it will be recorded in the TCM, but it will not be displayed.



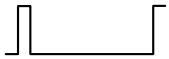
BVF0513T005

ON-BOARD DIAGNOSTIC

Display of DTC

- When the TAT terminal of the DTC is short to the GND with the ignition switch ON, the HOLD indicator will flash the DTC recorded by the TCM.
- The TCM displays each service code currently in memory one time in numerical order starting with the lowest number.
- When the last DTC is displayed, the first code will be displayed again.
- The malfunctions recorded in memory can be deleted by disconnecting the negative battery cable at least 20 s.

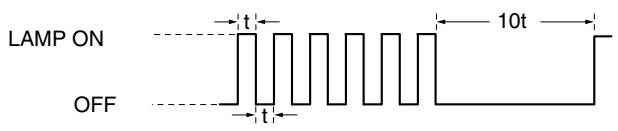
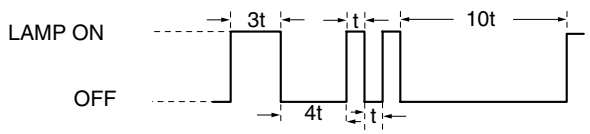
DTC Table

DTC No.	Components	Display	Condition
01	Engine speed signal (NE sensor signal)		No input engine speed signal (NE sensor signal)
06	Output speed sensor		No input signal from output speed sensor
07	Vehicle speedometer sensor		No input signal from vehicle speedometer sensor
09	Engine coolant temperature sensor		No input signal from engine coolant temperature sensor
12	Accelerator position sensor *1		No input signal from accelerator position sensor
	Control lever position sensor *2		No input signal from control lever position sensor
56	Transmission fluid temperature sensor		No input signal from transmission temperature sensor
60	Shift solenoid A		Solenoid valve shorted or open
61	Shift solenoid B		Solenoid valve shorted or open
62	Overrunning clutch solenoid		Solenoid valve shorted or open
63	Torque converter clutch solenoid		Solenoid valve shorted or open
64	Pressure control solenoid		Solenoid valve shorted or open

EVF502ZWC002

*1 : WL Turbo Stage-III
*2 : Except WL Turbo Stage-III

Example of service code display

Code No.	Display pattern (t = 0.4 s)
06	
12	

BCF0513T009

K1

ON-BOARD DIAGNOSTIC

Fail-safe Function
- If any malfunction is detected by the self-diagnosis function, the TCM will preserve driveability as much as possible.

Output speed sensor
- If a malfunction occurs in the output speed sensor, signals from the vehicle speedometer sensor control the shift.
- If the output speed sensor and vehicle speedometer sensor fail simultaneously, driving of the shift solenoid A and shift solenoid B are suspended, and gear position will be fixed to 3GR while in D and S ranges, and fixed to 2GR while in L range, thus inhibiting TCC.

Accelerator position sensor/Control lever position sensor
- If a malfunction occurs in the accelerator position sensor/control lever position sensor, The TCM judges the depressing amount of accelerator pedal from the idle switch and sets the line pressure as shown in the table.

Idle switch	Depressing amount of accelerator pedal	Line pressure
OFF	4/8	Maximum
ON	0/8	Minimum

Shift solenoid A/Shift solenoid B
- If either or both of the solenoid valves fails, driving of the both solenoids are suspended, and gear position will be fixed to 3GR while in D and S ranges, and fixed to 2GR while in L range.

Overrunning clutch solenoid
- If a malfunction occurs with the overrunning clutch solenoid, driving of the solenoid is suspended, and the overrunning clutch will be engaged. Engine braking will be always activated during deceleration.
- The line pressure is set at maximum in 4GR.

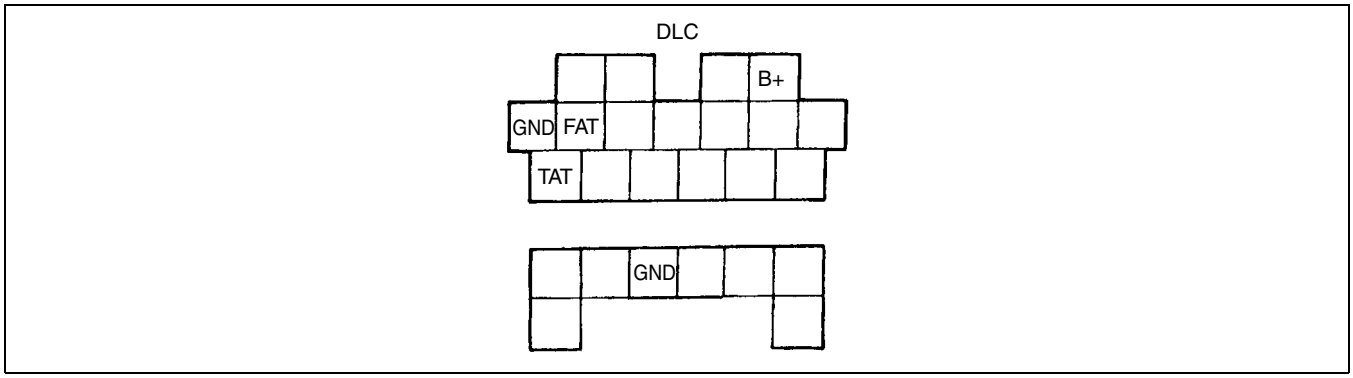
TCC solenoid
- If the TCC solenoid fails, driving of the solenoid is suspended, and TCC will be released (inhibited).

Pressure control solenoid
- If a malfunction is occurs with the pressure control solenoid, driving of the solenoid is suspended, and line pressure will be maximized to enable vehicle driving.

DLC DESCRIPTION

BVF567001030W02

Structure
- Various connectors for servicing purposes are grouped into the DLC.
- The DLC consists of a 17-pin connector which is to be connected to the SST and a 8-pin connector.



BVF5710T999

Terminal	Purpose	Remark
FAT	For TCM-related DTCs indication	Connected to SST
TAT	For TCM testing	
+B	Battery power supply for SST	–
GND	Ground	–

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

BVF560201034W04

- The following changes and/or additions have been made since publication of the EVEREST Repair Manual (F183–10–03A).

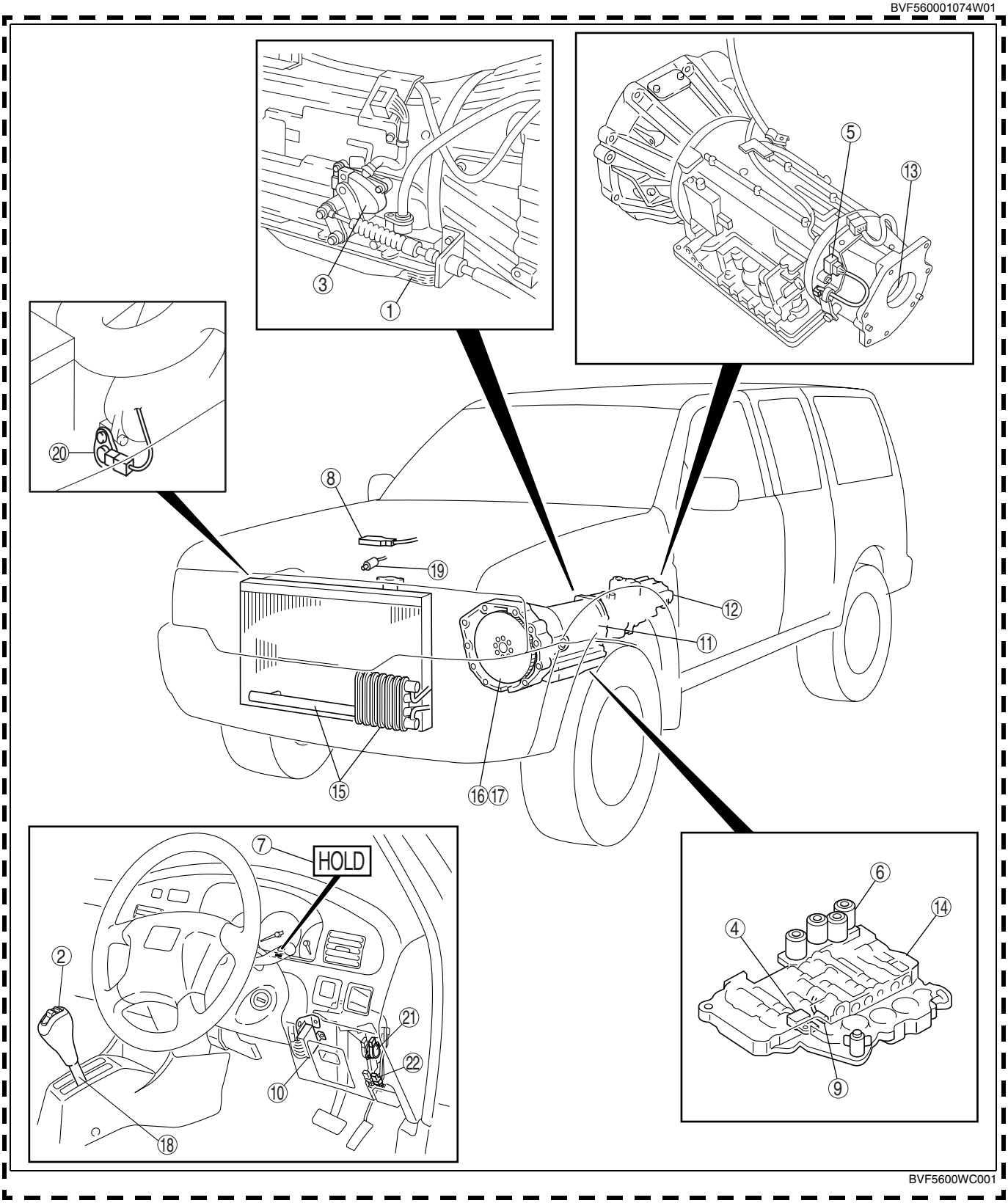
Automatic Transmission

- RA4AX-EL type automatic transmission has been adopted.

LOCATION INDEX

AUTOMATIC TRANSMISSION LOCATION INDEX

BVF560001074W01



BVF5600WC001

LOCATION INDEX

1	Automatic transmission fluid (ATF) (See K1–51 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION.) (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
2	HOLD switch (See K1–54 HOLD SWITCH INSPECTION.) (See K1–55 HOLD SWITCH REMOVAL/INSTALLATION.)
3	Transmission range (TR) switch (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) (See K1–57 TRANSMISSION RANGE (TR) SWITCH REMOVAL/INSTALLATION.) (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)
4	Transmission fluid temperature (TFT) sensor (See K1–58 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION.) (See K1–59 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR REMOVAL/INSTALLATION.)
5	Output speed sensor (See K1–59 OUTPUT SPEED SENSOR INSPECTION.) (See K1–60 OUTPUT SPEED SENSOR REMOVAL/INSTALLATION.)
6	Solenoid valve (See K1–60 SOLENOID VALVE INSPECTION.) (See K1–61 SOLENOID VALVE REMOVAL/INSTALLATION.)
7	HOLD indicator light (See K1–61 HOLD INDICATOR LIGHT INSPECTION.)
8	Dropping resistor (See K1–62 DROPPING RESISTOR INSPECTION.) (See K1–62 DROPPING RESISTOR REMOVAL/INSTALLATION.)
9	Transmission fluid temperature (TFT) switch (See K1–64–5 TRANSMISSION FLUID TEMPERATURE (TFT) SWITCH INSPECTION.)
10	TCM (See K1–64–6 TCM INSPECTION.) (See K1–68 TCM REMOVAL/INSTALLATION.)
11	Automatic transmission (See K1–69 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION.)
12	Transfer (See K1–75 TRANSFER REMOVAL/INSTALLATION.)
13	Oil seal (See K1–75 OIL SEAL REPLACEMENT.)
14	Control valve body (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
15	Oil cooler (See K1–80 OIL COOLER FLUSHING.) (See K1–81 OIL COOLER REMOVAL/INSTALLATION.) (See K1–84 OIL COOLER DISASSEMBLY/ASSEMBLY.)
16	Drive plate (See K1–87 DRIVE PLATE REMOVAL/INSTALLATION.)
17	Flywheel (See K1–88 FLYWHEEL INSPECTION.)
18	Selector lever (See K1–89 SELECTOR LEVER INSPECTION.) (See K1–89 SELECTOR LEVER ADJUSTMENT.) (See K1–90 SELECTOR LEVER REMOVAL/INSTALLATION.) (See K1–94 SELECTOR LEVER DISASSEMBLY/ASSEMBLY.)
19	Engine coolant temperature (ECT) sensor (See K1–64 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION.) (See K1–64–1 ENGINE COOLANT TEMPERATUR (ECT) SENSOR REMOVAL/INSTALLATION .)
20	NE sensor (See K1–63 NE SENSOR INSPECTION.) (See K1–64 NE SENSOR REMOVAL/INSTALLATION.)
21	Accelerator position sensor (See K1–64–1 ACCELERATOR POSITION SENSOR, IDLE SWITCH INSPECTION.) (See K1–64–3 ACCELERATOR POSITION SENSOR, IDLE SWITCH REMOVAL/INSTALLATION.) (See K1–64–4 ACCELERATOR POSITION SENSOR, IDLE SWITCH ADJUSTMENT.)
22	Idle switch (See K1–64–1 ACCELERATOR POSITION SENSOR, IDLE SWITCH INSPECTION.) (See K1–64–2 ACCELERATOR POSITION SENSOR, IDLE SWITCH REMOVAL/INSTALLATION.) (See K1–64–4 ACCELERATOR POSITION SENSOR, IDLE SWITCH ADJUSTMENT.)

AUTOMATIC TRANSMISSION

MECHANICAL SYSTEM TEST

BVF561001030W08

Mechanical System Test Preparation

1. Engage the parking brake and use wheel chocks at the front and rear of the wheels.
2. Inspect the engine coolant level. (See Section E.)
3. Inspect the engine oil level. (See Section E.)
4. Inspect the ATF level. (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
5. Inspect the idle speed in the P position. (See Section F2.)
6. Wait until the engine and transmission reach normal operating temperature.

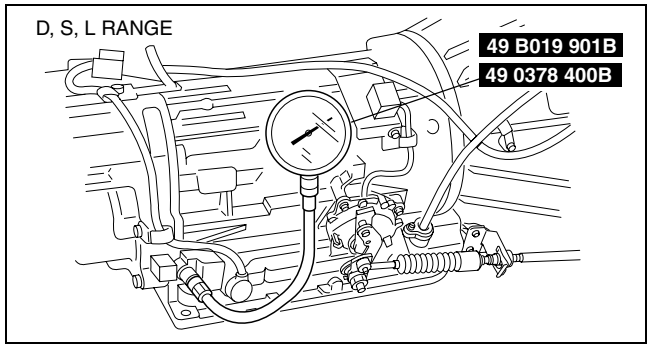
Line Pressure Test

1. Perform mechanical system test preparation. (See K1–46 Mechanical System Test Preparation.)

Warning

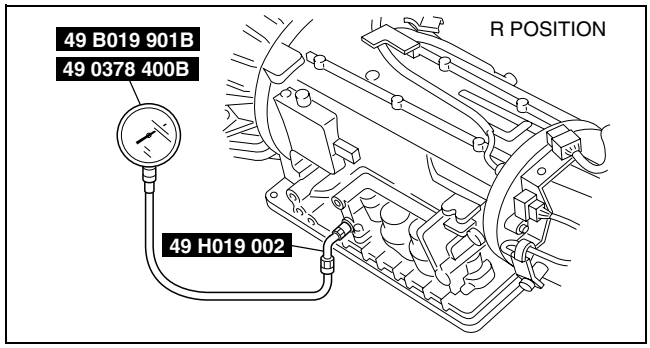
- **Removing the square head plug when the ATF is hot can be dangerous. Hot ATF can come out of the opening and badly burn you. Before removing the square head plug, allow the ATF to cool.**

2. Connect the **SST** (49 0378 400B) to the D, S, and L range line pressures inspection port or connect the **SSTs** (49 H019 002, 49 0378 400B) to the R position line pressure inspection port and replace the gauge of the **SST** (49 0378 400B) with the **SST** (49 B019 901B).



BCF5610W001

3. Start the engine and warm it up until the ATF reaches **60—70 °C {140—158 °F}**.
4. Shift the selector lever to the D range.
5. Read the line pressure while the engine is idling for the D range.
6. Read the line pressure while the engine is idling for the R position and S, L ranges in the same manner as in Steps 4—5.
7. Stop the engine, then replace the **SST** (49 B019 901B) with the gauge of the **SST** (49 0378 400B).
8. Start the engine.
9. Firmly depress the brake pedal with the left foot.
10. Shift the selector lever to the D range.



BCF5610W002

Caution

- **If the accelerator pedal is pressed for more than 5 s while the brake pedal is pressed, the transmission could be damaged. Therefore, perform Steps 11 and 12 within 5 s.**

11. Gradually depress the accelerator pedal with the right foot.
12. When the engine speed no longer increases, quickly read the line pressure and release the accelerator pedal.
13. Shift the selector lever to the N position and idle the engine for **1 min or more** to cool the ATF.
14. Read the line pressure at the engine stall speed for the S, L ranges and R position in the same manner as in Steps 9—13.

Line pressure

Position/Range		Line pressure (kPa {kgf/cm^2, psi})
D, S, L	Idle	490—529 {5.0—5.4, 71—77}
	Stall	1,197—1,275 {12.2—13.0, 174—185}
R	Idle	618—657 {6.3—6.7, 90—95}
	Stall	1,501—1,578 {15.3—16.1, 218—229}

Warning
- **Removing the square head plug when the ATF is hot can be dangerous. Hot ATF can come out of the opening and badly burn you. Before removing the square head plug, allow the ATF to cool.**

15. Remove the **SSTs**.
16. Install a new square head plug in the inspection port.

Tightening torque
5.0—9.8 N·m {50—100 kgf·cm, 44—87 in·lbf}

Evaluation of line pressure test

Condition			Possible cause
Idle	Below specification	Low pressure in all ranges	Worn oil pump Damaged control piston (in oil pump) Fluid leakage from oil strainer and pressure regulator valve Pressure regulator valve or plug sticking Damaged pressure regulator valve spring
		Low pressure in forward ranges	Fluid leakage from hydraulic circuit of forward clutch
		Low pressure in S range	Fluid leakage from hydraulic circuit of band servo second gear apply side
		Low pressure in R position only	Fluid leakage from hydraulic circuit of reverse clutch
		Low pressure in R position and L range only	Fluid leakage from hydraulic circuit of low and reverse brake
	Above specification	High pressure in all ranges	Accelerator position sensor/control lever position sensor improper adjustment TFT sensor malfunction Pressure control solenoid sticking Short circuit of pressure control solenoid circuit Pressure modifier valve sticking Pressure regulator valve or plug sticking
Stall	Below specification	Low pressure in all ranges	Accelerator position sensor/control lever position sensor improper adjustment Damaged control piston (in oil pump) Pressure control solenoid sticking Short circuit of pressure control solenoid circuit Pilot valve sticking Pressure modifier valve sticking Pressure regulator valve or plug sticking

Stall Speed Test
1. Perform mechanical system test preparation. (See K1–46 Mechanical System Test Preparation.)
2. Start the engine.
3. Firmly depress the brake pedal with the left foot.
4. Shift the selector lever to the D range.

Caution
- **If the accelerator pedal is pressed for more than 5 s while the brake pedal is pressed, the transmission could be damaged. Therefore, perform Steps 5 and 6 within 5 s.**

5. Gently depress the accelerator pedal with the right foot.
6. When the engine speed no longer increases, quickly read the engine speed and release the accelerator pedal.
7. Shift the selector lever to the N position and idle the engine for **1 min or more** to cool the ATF.
8. Perform a stall test of the S, L ranges and R position in the same manner as in Steps 3—7.
9. Turn off the engine.

Engine stall speed

Position/Range	Engine stall speed (rpm)
D, S, L	2,800—3,000
R	

Evaluation of stall test

Condition		Possible cause
Above specification	In all forward ranges and R position	Insufficient line pressure Worn oil pump Poor adjustment or malfunction of TR switch Oil leakage from oil pump, control valve, or transmission case Pressure regulator valve sticking
	In D and S ranges	Forward clutch slippage Forward one-way clutch slippage Low one-way clutch slippage
	In R position	Low and reverse brake slippage Reverse clutch slippage Perform road test to determine whether problem is low and reverse clutch or reverse clutch • Engine braking felt in the L range first gear: Reverse clutch • Engine braking not felt in L range first gear: Low and reverse brake
Below specification	In all forward ranges and R position	Engine out of tune One-way clutch slippage within torque converter

Time Lag Test

1. Perform mechanical system test preparation. (See K1–46 Mechanical System Test Preparation.)
2. Start the engine.
3. Warm up the engine until the ATF temperature reaches **60—70°C {140—158°}**.
4. Shift the selector lever from the N position to D range (non-HOLD mode).
5. Use a stopwatch to measure the time it takes from shifting until shock is felt. Take three measurements for each test and average from the results using the following formula.

   Formula
   Average time lag = (Time 1 + Time 2 + Time 3) / 3

6. Perform the test for the following shifts in the same manner Step 5.
   - N position → D range (HOLD mode)
   - N position → R position

   Time lag
   N → D range: approx. 1.0 s or below
   N → R position: approx. 1.0 s or below

Evaluation of time lag test

Condition		Possible Cause
Above specification	N → D shift (Non-HOLD mode)	Insufficient line pressure Forward clutch slippage Low one-way clutch slippage N-D accumulator not operating properly
	N → D shift (HOLD mode)	Insufficient line pressure Brake band slippage 1-2 accumulator not operating properly
	N → R shift	Insufficient line pressure Low and reverse brake slippage Reverse clutch slippage 3-4/N-R accumulator not operating properly

ROAD TEST

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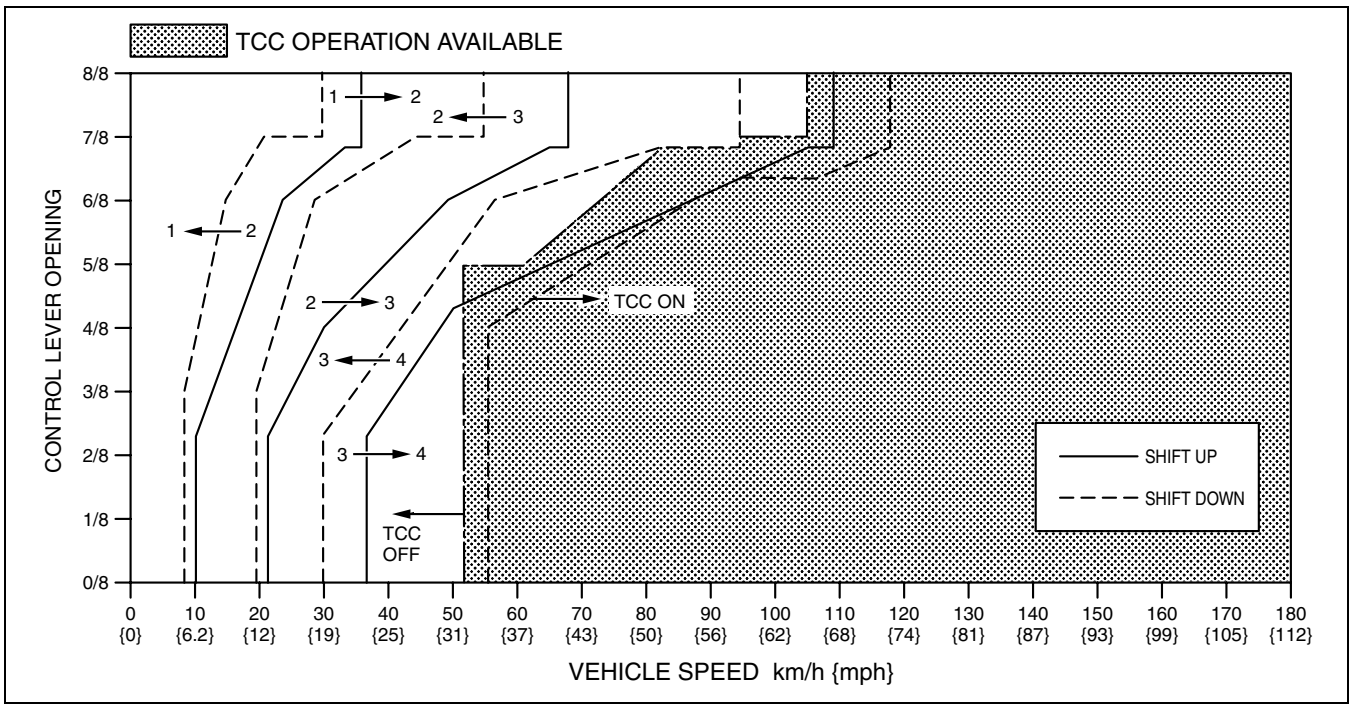
Warning
- **When performing a road test, be aware of other vehicles, people, impediments to avoid an accident.**

Note
- When the legal speed limit must be exceeded, use a chassis dynamomenter instead of performing a road test.

Road Test Preparation

1. Inspect the engine coolant level. (See Section E.)
2. Inspect the engine oil level. (See Section E.)
3. Inspect the ATF level. (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
4. Inspect the idle speed in the P position. (See Section F2.)
5. Wait until the engine and transmission reach normal operating temperature.

Shift Diagram
D range (normal mode)



BCF5610W003

D Range Test

1. Perform road test preparation. (See K1–49 Road Test Preparation.)
2. Shift the selector lever to the D range.
3. Accelerate with the depressing amount of accelerator pedal half and then fully depress.
4. Verify that 1→2, 2→3, and 3→4 upshifts can be obtained. The shift points must be as shown in the table below.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
5. Drive the vehicle in 4GR, 3GR, and 2GR and verify that kickdown occurs for 4→3, 3→2, 2→1 downshifts, and that the shift points are as shown in the table below.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
6. Decelerate the vehicle and verify that engine braking effect is felt in 3GR and 4GR.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)

   Note
   - There is TCC non-operation in the following conditions.
     1. The ATF temperature is **10 °C {50 °F}** or below.

7. Drive the vehicle and verify that TCC operation is obtained. The operation points must be as shown in the table below.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
8. Drive the vehicle in 4GR (TCC operation), 4GR (TCC non-operation), and 2GR (HOLD mode), and listen closely for any out of the ordinary noise or vibration. The torque converter, propeller shaft, and differential can be sources of abnormal noise and vibration if they are not functioning properly. Inspect these when searching for sources of noise and vibration.
9. Select HOLD mode.
10. Accelerate with the depressing amount of accelerator pedal half and fully depress.

11. Verify that 3→2, and 2→3 shift can be obtained. The shift points must be as shown in the table below.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
12. Decelerate the vehicle and verify that engine braking effect is felt in 2GR and 3GR.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)

Shift point table

Range	Mode	Depressing amount of accelerator pedal condition	Shift	Vehicle speed (km/h {mph})	Turbine speed (rpm)
D	NORMAL	Fully depress	$D_1 \rightarrow D_2$	32—38 {20—23}	3,350—3,900
			$D_2 \rightarrow D_3$	66—74 {41—45}	3,700—4,100
			$D_3 \rightarrow D_4$	113—123 {71—76}	3,900—4,200
		Half depress	$D_1 \rightarrow D_2$	13—21 {9—13}	1,350—2,150
			$D_2 \rightarrow D_3$	24—39 {15—24}	1,350—2,150
			$D_3 \rightarrow D_4$	37—57 {23—35}	1,300—1,950
			TCC ON (D_4)	49—70 {31—43}	1,200—1,650
		Released	$D_4 \rightarrow D_3$	27—33 {17—20}	650—750
			$D_3 \rightarrow D_2$	16—22 {10—13}	550—750
			$D_2 \rightarrow D_1$	5—11 {4—6}	300—600
		Kickdown	$D_4 \rightarrow D_3$	101—111 {63—68}	2,450—2,600
			$D_3 \rightarrow D_2$	58—66 {36—40}	2,000—2,250
			$D_2 \rightarrow D_1$	27—33 {17—20}	1,500—1,800
	HOLD	All around	$D_4 \rightarrow D_3$	113—119 {71—73}	2,700—2,800
			$D_3 \rightarrow D_2$	5—11 {4—6}	200—350
			$D_2 \rightarrow D_3$	17—27 {11—16}	950—1,450

S Range Test

1. Perform road test preparation. (See K1–49 Road Test Preparation.)
2. Shift the selector lever to the S range.
3. Accelerate with the depressing amount of accelerator pedal half and fully depress.
4. Verify that 1→2 and 2→3 upshifts can be obtained. The shift points must be as shown in the table below.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
5. Drive the vehicle in 2GR, 3GR and verify that kickdown occurs for 3→2, 2→1 downshift, and that the shift point is as shown in the table below.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
6. Decelerate the vehicle and verify that engine braking effect is felt in 2GR and 3GR.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
7. Select HOLD mode.
8. Drive the vehicle in 2GR and listen closely for any out of the ordinary noise or vibration. The torque converter, propeller shaft, and differential can be sources of abnormal noise and vibration if they are not functioning properly. Inspect these when searching for sources of noise and vibration.
9. Accelerate the vehicle in 2GR with the depressing amount of accelerator pedal half and fully depress.
10. Verify that 2GR is held.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
11. Decelerate the vehicle and verify that engine braking effect is felt.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)

Shift point table

Range	Mode	Depressing amount of accelerator pedal condition	Shift	Vehicle speed (km/h {mph})	Turbine speed (rpm)
S	NORMAL	Fully depress	$S_1 \rightarrow S_2$	32—38 {20—23}	3,350—3,900
			$S_2 \rightarrow S_3$	66—74 {41—45}	3,700—4,100
		Half depress	$S_1 \rightarrow S_2$	13—21 {9—13}	1,350—2,150
			$S_2 \rightarrow S_3$	24—39 {15—24}	1,350—2,150
		Released	$S_3 \rightarrow S_2$	16—22 {10—13}	550—750
			$S_2 \rightarrow S_1$	5—11 {4—6}	300—600
		Kickdown	$S_3 \rightarrow S_2$	58—66 {36—40}	2,000—2,250
			$S_2 \rightarrow S_1$	27—33 {17—20}	1,500—1,800
	HOLD	ALL round	$S_3 \rightarrow S_2$	65—71 {41—44}	2,250—2,400

L Range Test

1. Perform road test preparation. (See K1–49 Road Test Preparation.)
2. Shift the selector lever to the L range.
3. Accelerate with the depressing amount of accelerator pedal half and fully depress.
4. Verify that 1→2 upshift. The shift points must be as shown in the table below.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
5. Drive the vehicle in 2GR and verify that kickdown occurs for 2→1 downshift, and that the shift point is as shown in the table below.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
6. Decelerate the vehicle and verify that engine braking effect is felt in 2GR.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
7. Select HOLD mode.
8. Accelerate the vehicle in 1GR with the depressing amount of accelerator pedal half and fully depress.
9. Verify that 1GR is held.
   - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)
10. Decelerate the vehicle and verify that engine braking effect is felt.
    - If there is any malfunction, inspect the TCM and AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)

Shift point table

Range	Mode	Depressing amount of accelerator pedal condition	Shift	Vehicle speed (km/h {mph})	Turbine speed (rpm)
L	NORMAL	Fully depress	$L_1 \rightarrow L_2$	32—38 {20—23}	3,350—3,900
		Half depress	$L_1 \rightarrow L_2$	13—21 {9—13}	1,350—2,150
		Released	$L_2 \rightarrow L_1$	5—11 {4—6}	300—600
		Kickdown	$L_2 \rightarrow L_1$	27—33 {17—20}	1,500—1,800
	HOLD	ALL round	$L_2 \rightarrow L_1$	30—36 {19—22}	1,700—1,950

P Position Test

1. Shift into P position on a gentle slope. Release the brake, and verify that the vehicle does not roll.
   - If there is any malfunction, inspect the AT. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)

AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION

BVF561019001W01

Automatic Transmission Fluid (ATF) Condition Inspection

1. Inspect the ATF for the following to determine whether the transmission should be disassembled.
- The ATF is muddy.
- The ATF smells strange or unusual.

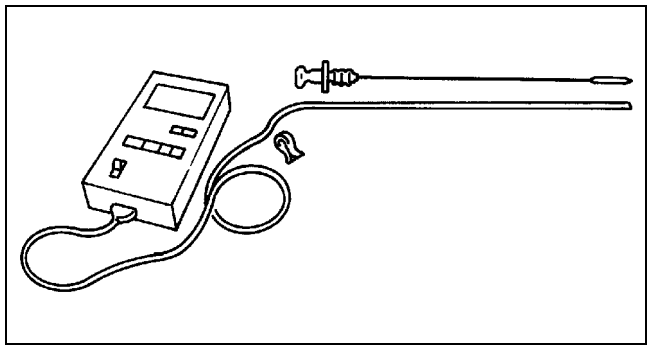
ATF Condition

Condition			Possible cause
Clear dark red		Normal	—
Light red (pink)		Contaminated with water	• Damaged oil cooler inside of the radiator • Poor filler tube installation: Problem could occur to parts inside the transmission by water contamination. It is necessary to overhaul the transmission and detect defected parts. If necessary, replace the transmission.
Reddish brown	Has burnt smell and metal specs are found	Deteriorated ATF	Defect the powertrain components inside of transmission: Particles cause wide range of problems by plugging up in oil pipe, control valve body and oil cooler in radiator. • When large amount of metal particles are found, overhaul the transmission and inspect for defective parts. If necessary, replace the transmission. • Implement flushing operation as there is a possibility to have particles plugging up the oil pipe or oil cooler inside the radiator.
	Has no burnt smell	Normal	• Discoloration by oxidation

Automatic Transmission Fluid (ATF) Level Inspection

Caution
- **The ATF amount varies according to ATF's temperature. Therefore, when inspecting the ATF level or replacing the ATF, use a thermometer to measure the temperature then adjust the ATF amount to the specified level according to the specified temperature.**

1. Park the vehicle on level ground.
2. Apply the parking brake and position wheel chocks securely to prevent the vehicle from rolling.
3. Adjust the length of the thermistor probe measure to the measure same as the dipstick and hold the probe with a paper holder.
4. Insert into the filler tube and measure the temperature.
5. Warm up the engine until the ATF reaches (**60—70 °C {140—158 °F}**).



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Caution
- **Do not warm the transmission by stall speed test. This will damage the torque converter.**

Note
- In some cases it may be necessary to inspect the ATF in the cool range **15—25 °C {59—77 °F}** before warming up the engine.

6. While depressing the brake pedal, shift the selector lever to each range (P–L), pausing momentarily in each range.

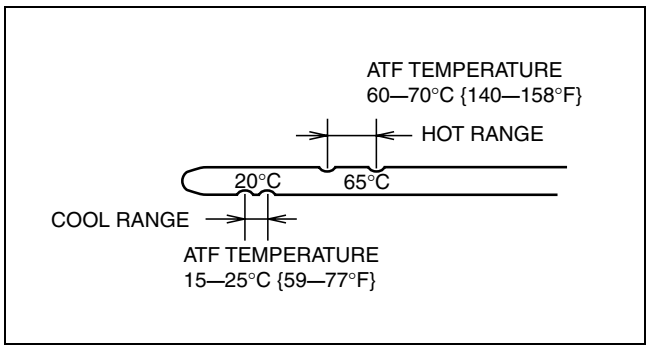
7. Shift back to P position.

Note
- If the ATF level is too high or too low when the engine is hot, the following malfunctions may occur.

ATF level	Condition	Possible cause
Too low	Line pressure is lower than the specification	Air in transmission oil passage causes slipping or damages clutch mechanism.
Too high	ATF is hot	ATF deterioration cause slipping clutch or stuck valve.

8. While the engine is idling, verify that the ATF level is in the HOT (**65 °C {149 °F}**) range. Add the specified type of ATF if necessary. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)

ATF type
ATF M-III or equivalent (e.g. Dexron®III)



BCF5610W004

K1

AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT

BVF561019001W02

Warning
- **A hot transmission and ATF can cause severe burns. Turn off the engine and wait until they are cool before replacing ATF.**

1. Remove the oil dipstick.
2. Loosen the oil pan mounting bolts.
3. Drain the ATF into a container.
4. Remove the oil pan and gasket.
5. Eliminate the sealant dust from the bolt hole.
6. Install the oil pan and a new gasket with new bolts.

Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

7. Add the specified type of ATF through the oil filler tube until ATF level reaches lower notch of dipstick.

ATF type
ATF M-III or equivalent (e.g. Dexron®III)
Capacity (approx. quantity)
8.6 L {9.1 US qt, 7.6 Imp qt}

8. Verify that the ATF level is in the HOT (**65 °C {149 °F}**) range.
   - Add ATF to the specified level if necessary.

HOLD SWITCH INSPECTION

BVF561046030W09

Operating Inspection

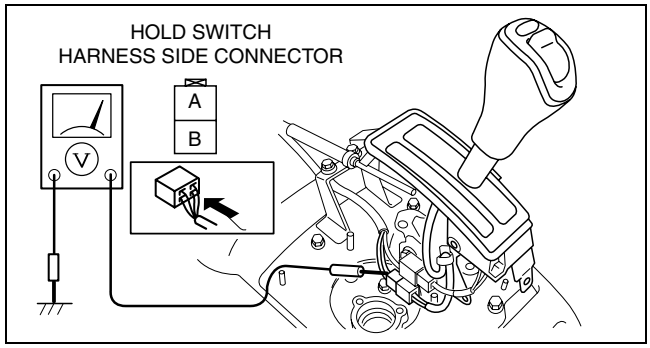
1. Turn the engine switch to the ON position (engine OFF).
2. Verify that the HOLD indicator light is not illuminated. Depress the HOLD switch and verify that the HOLD indicator light illuminates.
   - If there is any malfunction, inspect the terminal voltage of the HOLD switch.

Voltage Inspection

1. Remove the shift lever knob.
2. Remove the console.
3. Turn the engine switch to the ON position (engine OFF).
4. Measure the voltage at the HOLD switch connector.
   - If there is any malfunction, inspect for continuity at the HOLD switch.

(v)

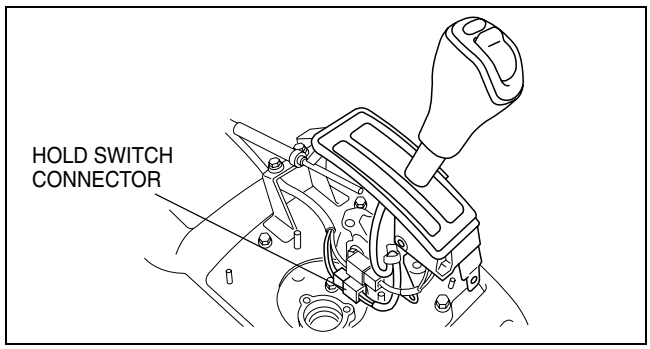
HOLD switch position	Connector Terminal	
	A	B
OFF	B+	0
ON	0	0



BCF5610W005

Continuity Inspection

1. Disconnect the negative battery cable.
2. Remove the console.
3. Disconnect the HOLD switch connector.

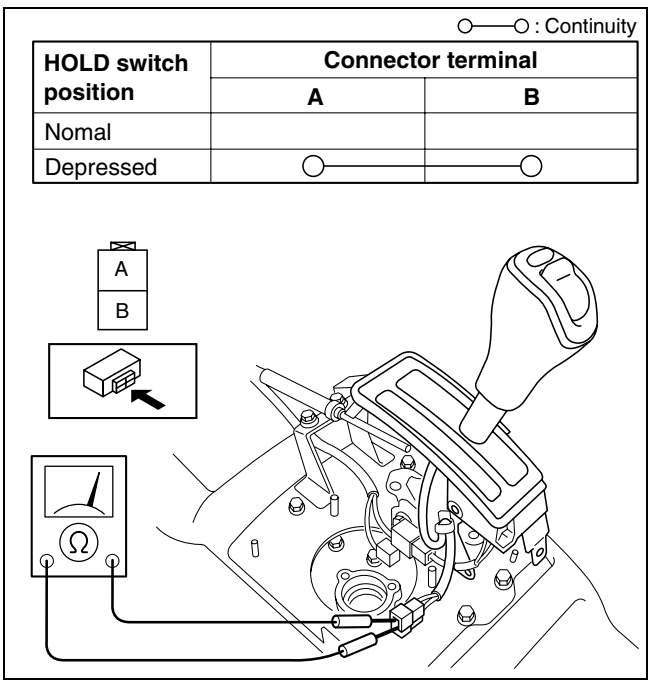


BCF5610W007

4. Verify continuity as indicated in the table.
   - If the switch is okay, inspect the wiring harness. (HOLD switch—TCM, HOLD switch—Body ground.)
   - If there is any malfunction, replace the HOLD switch. (See K1–55 HOLD SWITCH REMOVAL/INSTALLATION.)

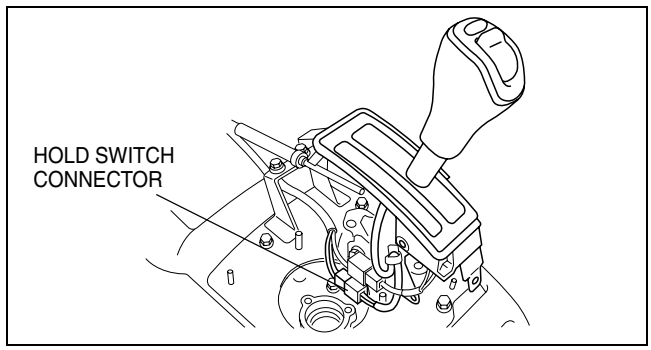
○——○ : Continuity

HOLD switch position	Connector terminal	
	A	B
Nomal		
Depressed	○	○



BCF5610W006

5. Connect the HOLD switch connector.
6. Install the console.
7. Install the shift lever knob.
8. Connect the negative battery cable.

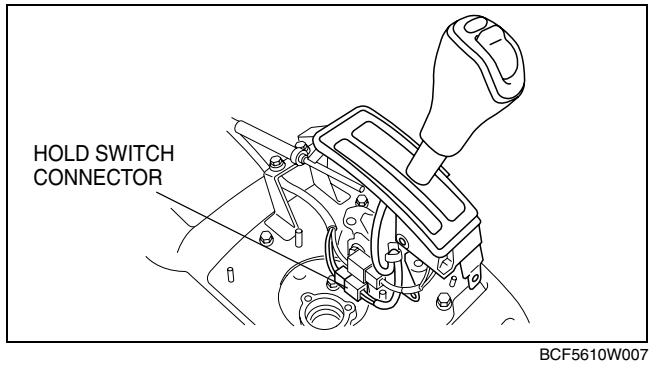


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HOLD SWITCH REMOVAL/INSTALLATION

BVF561046030W10

1. Disconnect the negative battery cable.
2. Remove the shift lever knob.
3. Remove the console.
4. Disconnect the HOLD switch connector.
5. Remove the selector lever knob component.
6. Remove the HOLD switch.
7. Install the HOLD switch to selector lever knob component.

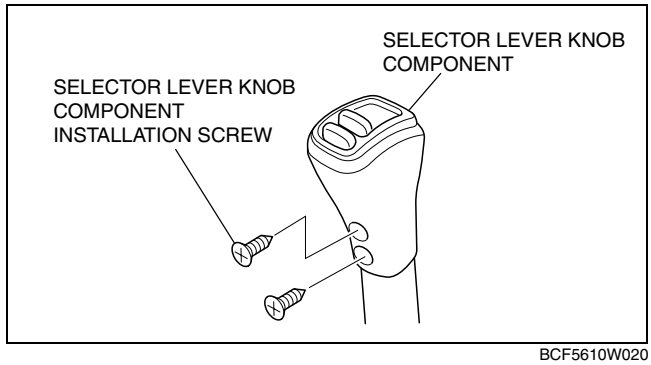


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8. Install the selector lever knob component.

   Tightening torque
   1.5—2.9 N·m {15—30 kgf·cm, 13—26 in·lbf}

9. Connect the HOLD switch connector.
10. Install the console.
11. Install the shift lever knob.
12. Connect the negative battery cable.



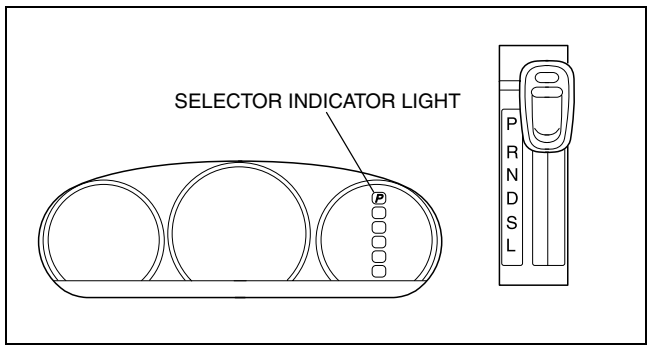
BCF5610W020

TRANSMISSION RANGE (TR) SWITCH INSPECTION

BVF561046030W11

Operating Inspection

1. Verify that the starter operates only with the engine switch is turned to the START position with the selector lever in the P or N position.
   - If there is any malfunction, adjust the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)
2. Verify that the back-up lights illuminate when shifted to the R position with the engine switch at the ON position.
   - If there is any malfunction, adjust the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)
3. Verify that the positions of the selector lever and the indicator are aligned.
   - If there is any malfunction, adjust the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)



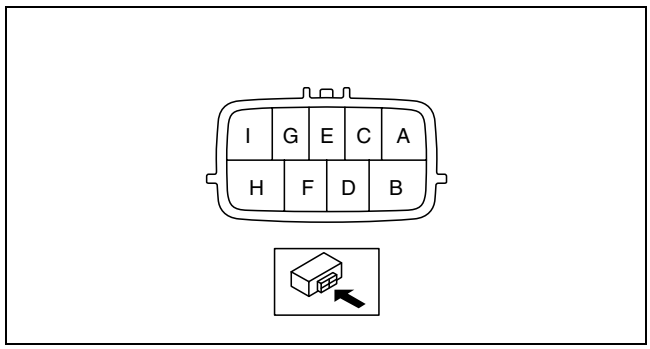
BCF5610W009

Continuity Inspection

Caution

- **Water or foreign material entering the connector can cause a poor connection or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

1. Disconnect the negative battery cable.
2. Disconnect the TR switch connector.
3. Remove the TR switch connector from bracket.
4. Verify continuity as indicated in the table.
   - If there is any malfunction, adjust the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)



BHJ0513W010

○—○ : Continuity

Position/ Range	Terminal								
	A	B	C	D	E	F	G	H	I
P	○				○				
		○						○	
R	○		○						
N	○					○			
		○						○	
D	○						○		
S	○			○					
L	○								○

BCF5610W010

5. Reinspect for continuity at TR switch.
   - If there is any malfunction, replace the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH REMOVAL/INSTALLATION.)
6. Connect the TR switch connector.
7. Install the TR switch connector to bracket.
8. Connect the negative battery cable.

TRANSMISSION RANGE (TR) SWITCH REMOVAL/INSTALLATION

BVF561046030W12

Caution
- **Water or foreign material entering the connector can cause a poor connection or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

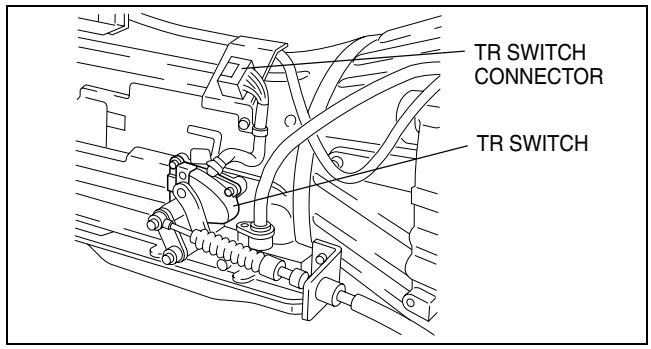
1. Disconnect the negative battery cable.
2. Disconnect the TR switch connector.
3. Remove the TR switch connector from bracket.

Caution
- **Do not use an impact wrench. Hold the manual shaft lever when removing the manual shaft nut, otherwise the transmission may be damaged.**

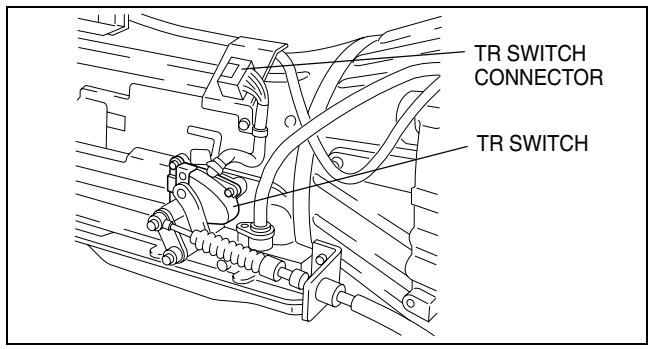
4. Remove the selector cable, manual shaft nut, and manual shaft lever.
5. Remove the TR switch.
6. Install the TR switch.
7. Adjust the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)
8. Install the manual shaft lever and manual shaft nut.

Tightening torque
31—47 N·m
{3.2—4.7 kgf·m, 23—34 ft·lbf}

9. Install the selector cable.
10. Connect the TR switch connector.
11. Install the TR switch connector to bracket.
12. Connect the negative battery cable.
13. Inspect TR switch operation. (See K1–56 Operating Inspection.)



BCF5610W014



BCF5610W014

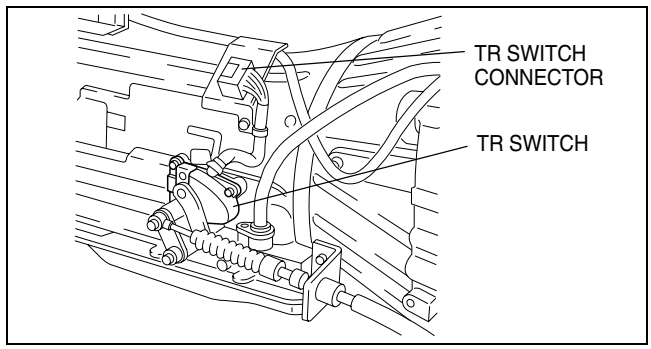
TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT

BVF561046030W13

1. Disconnect the negative battery cable.
2. Disconnect the TR switch connector.
3. Remove the TR switch connector from bracket.

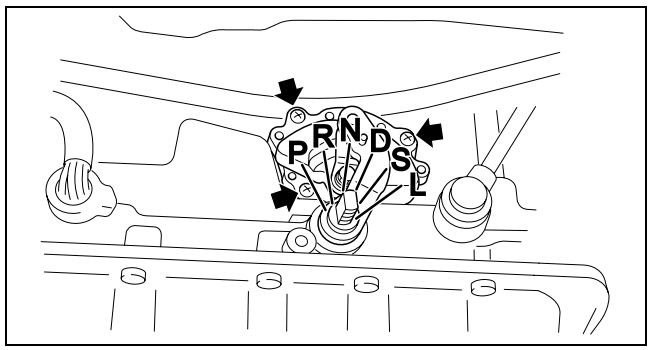
Caution
- **Do not use an impact wrench. Hold the manual shaft lever when removing the manual shaft nut, otherwise the transmission may be damaged.**

4. Remove the selector cable, manual shaft nut, and manual shaft lever.
5. Rotate the manual shaft to the N position.



BCF5610W014

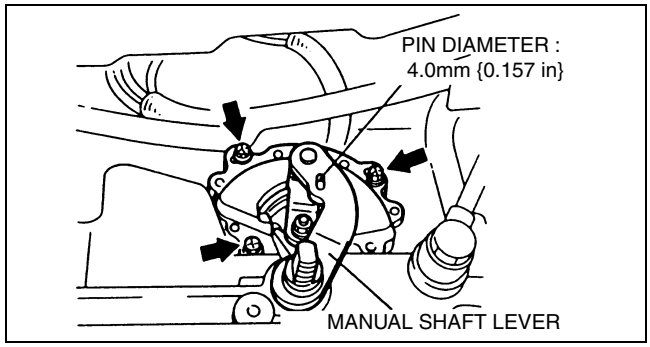
6. Loosen the TR switch mounting bolts.
7. Align the holes of the TR switch and the manual shaft lever.
8. Insert an **approx. 4.0 mm {0.157 in}** outer diameter pin through the holes.



BCF5610W008

9. Tighten the mounting bolts, then remove the pin.

Tightening torque
2.5—3.9 N·m
{25—40 kgf·cm, 22—34 in·lbf}

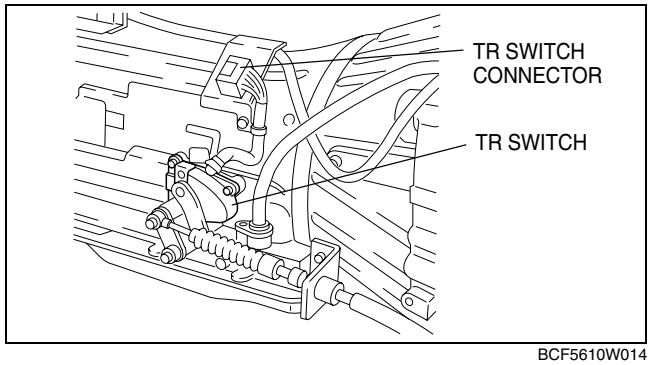


BCF5610W012

10. Inspect TR switch continuity. (See K1–56 Continuity Inspection.)
    - If there is any malfunction, replace the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH REMOVAL/INSTALLATION.)
11. Install the manual shaft lever and manual shaft nut.

Tightening torque
31—47 N·m
{3.2—4.7 kgf·m, 23—34 ft·lbf}

12. Install the selector cable.
13. Connect the TR switch connector.
14. Install the TR switch connector to bracket.
15. Connect the negative battery cable.



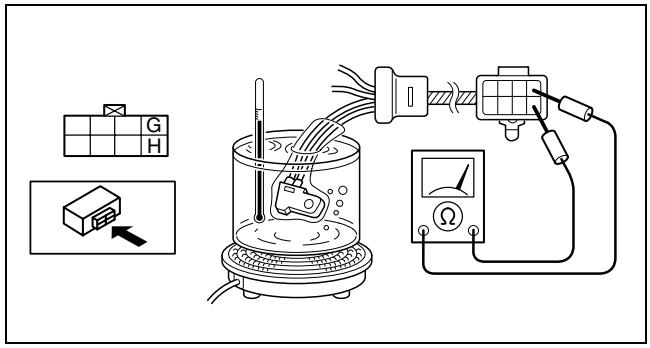
BCF5610W014

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION

BVF561046030W14

1. Remove the TFT sensor. (See K1–59 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR REMOVAL/INSTALLATION.)
2. Place the TFT sensor in ATF with a thermometer as shown in the figure and heat the ATF gradually.
3. Measure the resistance between the terminals.
    - If there is any malfunction, replace the TFT sensor.

ATF temperature (°C {°F})	Resistance (kilohm)
20 {68}	Approx. 2.5
80 {176}	Approx. 0.3



BCF5610W016

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR REMOVAL/INSTALLATION

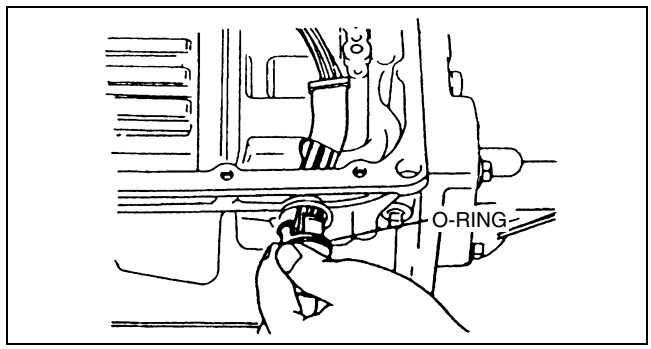
BVF561046030W15

Warning
- **A hot transmission and ATF can cause severe burn. Turn off the engine and wait until they are cool before replacing the ATF.**

1. Disconnect the negative battery cable.
2. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
3. Remove the oil pan and gasket.
4. Remove the control valve body. (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)

Note
- The TFT sensor is part of the solenoid valve harness.

5. Remove the solenoid valve harness from the transmission case.
6. Apply ATF to a new O-ring and install it on the solenoid valve harness.
7. Install the solenoid valve harness into the transmission case.
8. Install the control valve body. (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
9. Connect the negative battery cable.
10. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.) (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
11. Perform the line pressure test and time lag test. (See K1–46 MECHANICAL SYSTEM TEST.)
12. Perform the road test. (See K1–48 ROAD TEST.)



BCF5610A121

K1

OUTPUT SPEED SENSOR INSPECTION

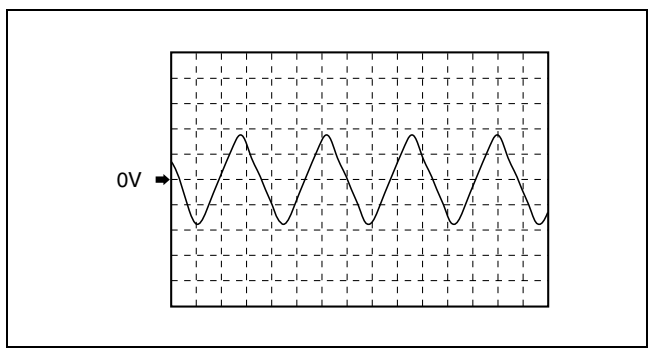
BVF561046030W16

Visual Inspection

1. Remove the output speed sensor. (See K1–60 OUTPUT SPEED SENSOR REMOVAL/INSTALLATION.)
2. Make sure that the sensor is free of any metallic shavings or particles.
   - If there is any malfunction, clean them off.
3. Install the output speed sensor. (See K1–60 OUTPUT SPEED SENSOR REMOVAL/INSTALLATION.)

Wave profile Inspection

1. Remove the TCM. (See K1–68 TCM REMOVAL/INSTALLATION.)
2. Connect oscilloscope test leads to the following TCM connector terminals.
   - (+) lead: TCM terminal 2G
   - (–) lead: TCM terminal 1B
3. Start the engine.
4. Inspect wave profile.
   - TCM terminal: 2G (+) —1B (–)
   - Oscilloscope setting: 2 V/DIV (Y), 2 ms/DIV (X)
   - Vehicle condition: drive the vehicle with 10 km/h {6 mph}
     — If there is any malfunction, replace the output speed sensor.



BCF5610W063

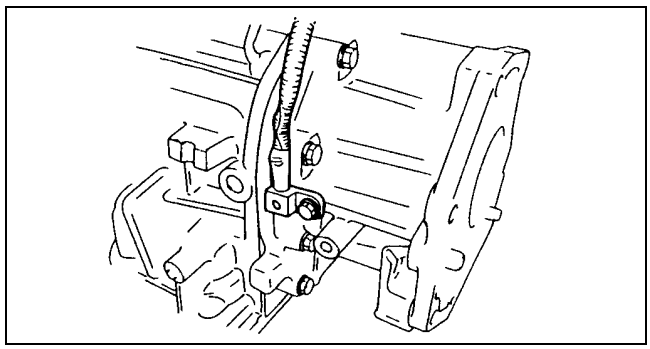
OUTPUT SPEED SENSOR REMOVAL/INSTALLATION

BVF561046030W17

1. Disconnect the negative battery cable.
2. Disconnect the output speed sensor connector.
3. Remove the output speed sensor.
4. Apply ATF to a new O-ring and install it on the output speed sensor.
5. Install the new output speed sensor.

Tightening torque
5.0—6.8 N·m {50—70 kgf·cm, 44—60 in·lbf}

6. Connect the output speed sensor connector.
7. Connect the negative battery cable.



BCF5610W018

SOLENOID VALVE INSPECTION

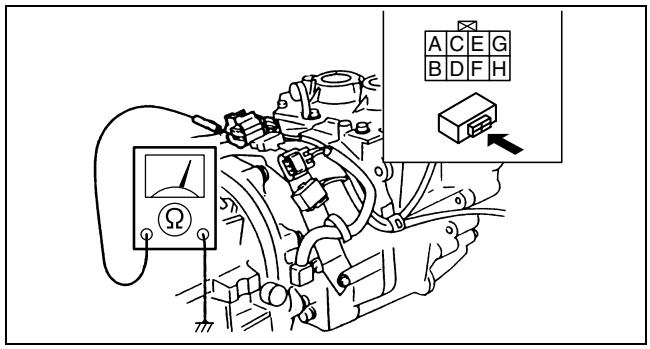
BVF561021280W01

Caution
- **Water or foreign material entering the connector can cause a poor connection or corrosion. Be sure that water or foreign material do not enter the connector when disconnecting it.**

Resistance Inspection (On-Vehicle)

1. Disconnect the negative battery cable.
2. Disconnect the solenoid valve connector.
3. Measure the resistance between terminals B through F and a ground.
   - If not as specified, perform the output duty inspection. (See K1–60 Output Duty Inspection.)

Terminal	Solenoid valve	Resistance (ohm)
B	Shift solenoid A	20—40
C	Shift solenoid B	20—40
D	Overrunning clutch	20—40
E	Pressure control	2.5—5
F	TCC	10—20



BCF5610W019

4. Connect the solenoid valve connector.
5. Connect the negative battery cable.

Output Duty Inspection
Pressure Control Solenoid

1. Connect the (+) and (–) terminals of a dwell meter to terminals 1E and 1B (GND) of the TCM.
2. Turn the engine switch to the ON position.

Note
- The dwell meter indicates the OFF duty ratio.

3. Verify the duty ratio by depressing and releasing the accelerator pedal.
   - If there is any malfunction, inspect the TCM. (See K1–64 TCM INSPECTION.)

Depressing amount of accelerator pedal condition	Duty ratio (ON %)
Released (0/8)	Approx. 100
Fully depress (8/8)	Approx. 5

TCC Solenoid Valve

1. Connect the (+) and (–) terminals of a dwell meter to terminals 1I and 1B (GND) of the TCM.
2. Drive the vehicle.

Note
- The dwell meter indicates the OFF duty ratio.

3. Verify the duty ratio in the TCC condition.
   - If there is any malfunction, inspect the TCM. (See K1–64 TCM INSPECTION.)

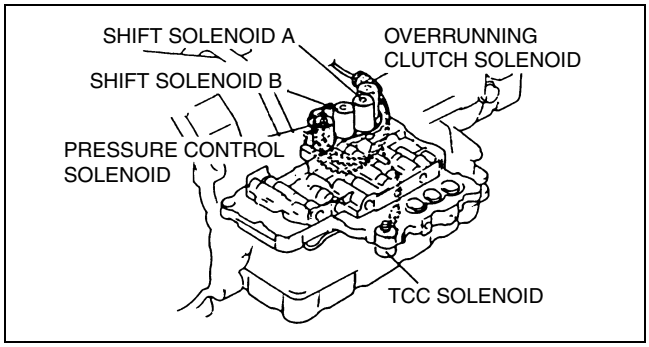
Condition	Duty ratio (ON %)
TCC non-operation	Approx. 5
TCC operation	Approx. 95

SOLENOID VALVE REMOVAL/INSTALLATION

BVF561021280W02

1. Disconnect the negative battery cable.
2. Remove the front propeller shaft.
3. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
4. Remove the oil pan and gasket.
5. Remove the control valve body. (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
6. Remove the solenoid valve.
7. Apply ATF to a new O-ring and install it on the solenoid valve.
8. Install the solenoid valve to the control valve body.

   Tightening torque
   9.9—12.7 N·m
   {100—130 kgf·cm, 87—112 in·lbf}



BCF5610W021

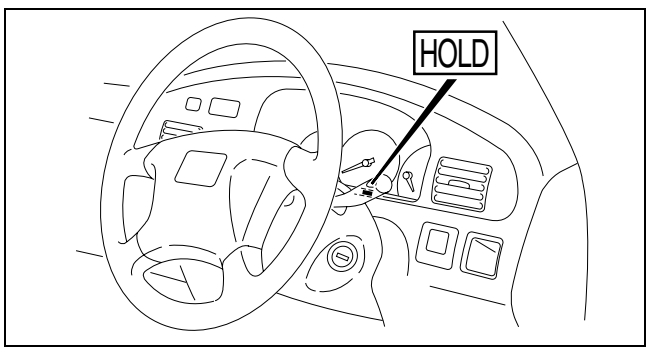
9. Install the control valve body. (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
10. Install the front propeller shaft.
11. Connect the negative battery cable.
12. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.) (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
13. Perform the line pressure test and time lag test. (See K1–46 MECHANICAL SYSTEM TEST.)
14. Perform the road test. (See K1–48 ROAD TEST.)

HOLD INDICATOR LIGHT INSPECTION

BVF561021280W03

Operating Inspection

1. Turn the engine switch to the ON position.
2. Depress the HOLD switch and verify that the HOLD indicator light illuminates.
   - If there is any malfunction, inspect the terminal voltage of the HOLD indicator light.



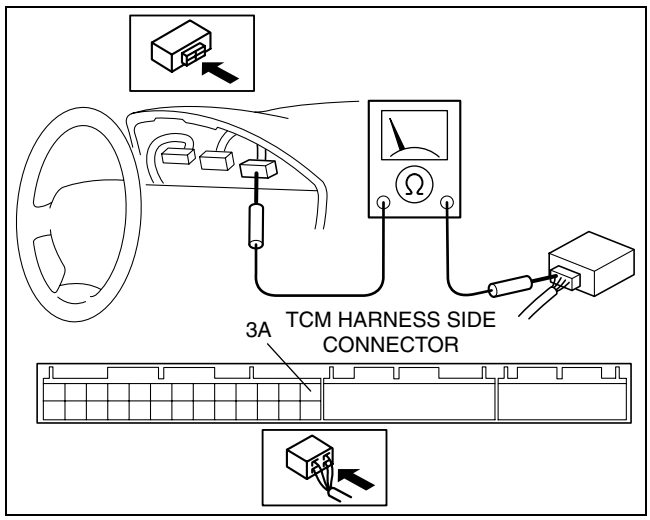
BCF5610W070

Continuity Inspection

1. Disconnect the negative battery cable.
2. Disconnect the instrument cluster connector.
3. Inspect for continuity between terminal 3A and the TCM 3A terminal.
   - If there is any malfunction, inspect the wiring harness (instrument cluster—TCM).

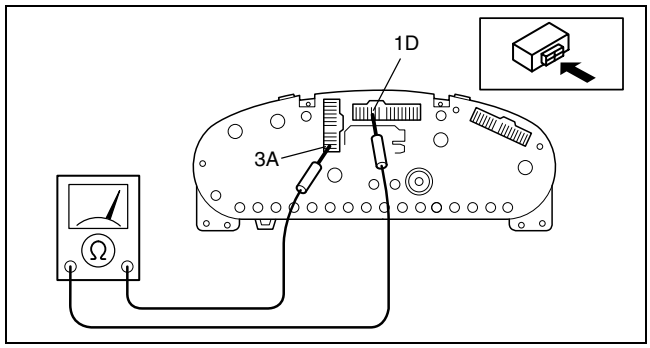
Terminals	Continuity
3A—3A	Yes

4. If correct, go to the next step.



BCF5610W049

5. Inspect continuity between terminal 3A and 1D.
   - If there is any malfunction, replace the instrument cluster or bulb.
6. Install the instrument cluster.
7. Connect the negative battery cable.



BCF5610W050

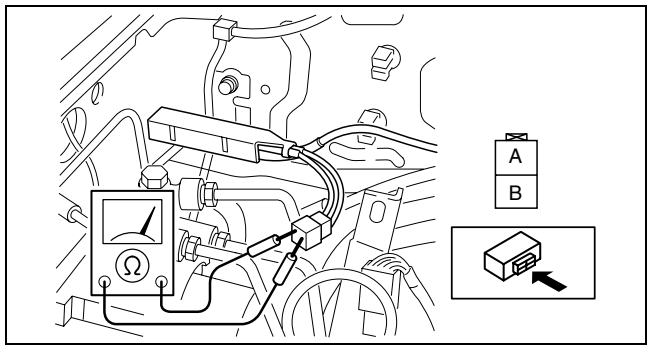
DROPPING RESISTOR INSPECTION

BVF561021280W04

1. Disconnect the negative battery cable.
2. Disconnect the dropping resistor connector.
3. Measure the resistance of the terminals.
   - If there is any malfunction, replace the dropping resistor. (See K1–62 DROPPING RESISTOR REMOVAL/INSTALLATION.)

   Resistance
   10—14 ohm

4. Connect the dropping resistor connector.
5. Connect the negative battery cable.



BCF5610W022

DROPPING RESISTOR REMOVAL/INSTALLATION

BVF561021280W05

1. Disconnect the negative battery cable.
2. Disconnect the dropping resistor connector.
3. Remove the dropping resistor.
4. Install the new dropping resistor.
5. Connect the dropping resistor connector.
6. Connect the negative battery cable.

AUTOMATIC TRANSMISSION

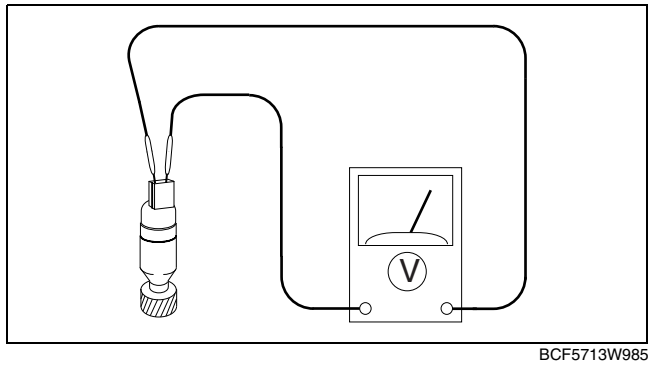
VEHICLE SPEED SENSOR (VSS) INSPECTION

BVF561021280W06

1. Remove the VSS. (See K1–63 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION.)
2. Measure voltage between terminals of the VSS while the gear is turning.

Voltmeter needle	Action
Moves slightly under 5V	Repair wiring harness (Instrument cluster-vehicle speedometer sensor)
Does not move	Replace VSS

3. Install the VSS. (See K1–63 VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION.)



BCF5713W985

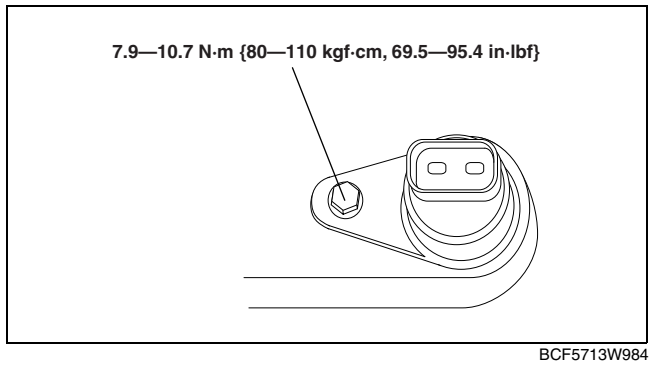
VEHICLE SPEED SENSOR (VSS) REMOVAL/INSTALLATION

BVF561021280W07

1. Disconnect the negative battery cable.
2. Disconnect the VSS connector.
3. Remove the VSS.
4. Apply ATF to a new O-ring and install it on a VSS.
5. Install the VSS.

   Tightening torque
   7.9—10.7 N·m {80—110 kgf·cm, 69.4—95.4 in·lbf}

6. Connect the VSS connector.
7. Connect the negative battery cable.



BCF5713W984

K1

NE SENSOR INSPECTION

BVF561019200W03

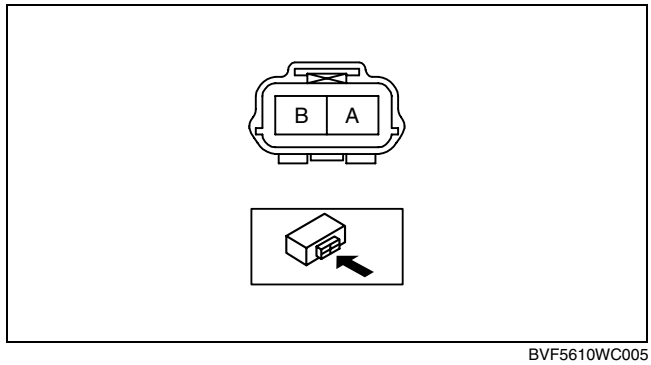
Note
- Perform the following test only when directed.

1. Disconnect the NE sensor connector.
2. Measure the resistance between the NE sensor connector terminals A and B by using an ohmmeter.

   Specification
   800—920 ohm

3. If not as specified, replace the NE sensor.

   Tightening torque
   7.8—10.8 N·m {80—110 kgf·cm, 69.0—95.5 in·lbf}



BVF5610WC005

4. If NE sensor is okay, but TCM terminal 2F voltage is out of specification, inspect the following:
   Open circuit
   - Engine speed (input) circuit (NE sensor connector terminal A and TCM connector terminal 2F)
   - Ground circuit (NE sensor connector terminal B and TCM connector terminal 2A)

   Short circuit
   - NE sensor connector terminal A and TCM connector terminal 2F to ground.
5. Repair or replace faulty areas.
6. Reconnect the NE sensor connector.

AUTOMATIC TRANSMISSION

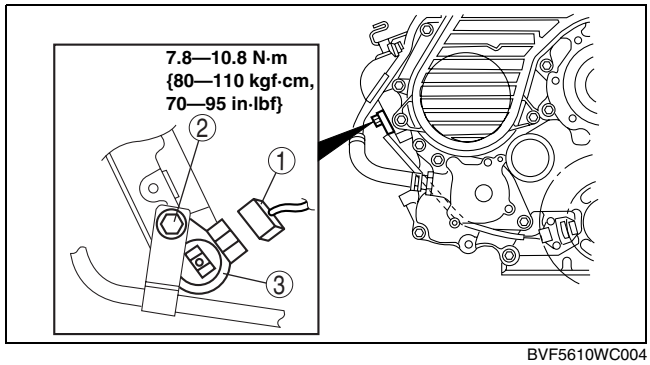
NE SENSOR REMOVAL/INSTALLATION

BVF561019200W04

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Connector
2	Bolt
3	NE sensor

3. Install in the reverse order of removal.



BVF5610WC004

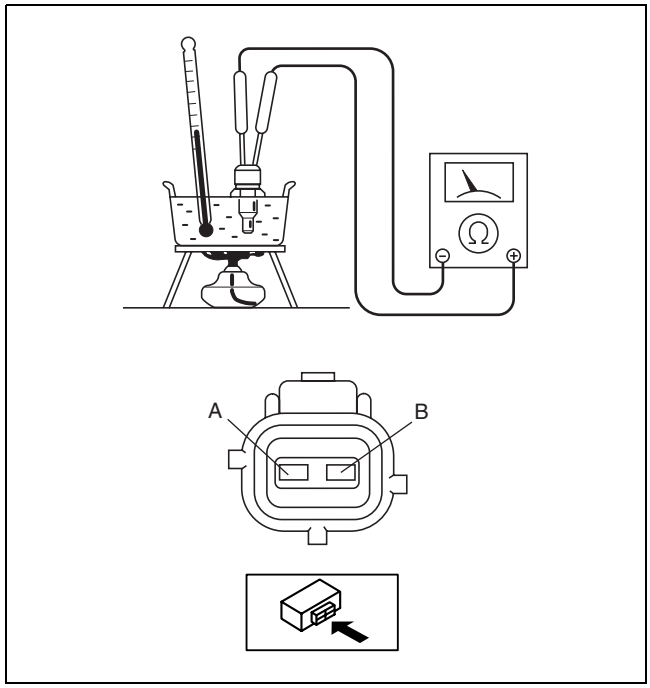
ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

BVF561019200W05

1. Disconnect the negative battery cable.
2. Drain the engine coolant from the radiator.
3. Remove the ECT sensor. (See K1–64–1 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION.)
4. Place the sensor in water with a thermometer, and heat the water gradually.
5. Measure the resistance between the ECT sensor terminal A and B.
   - If there is any malfunction, replace the ECT sensor.

Water temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.27—2.73
80 {176}	0.29—0.34

6. Refill the radiator with the specified engine coolant.
7. Install the ECT sensor. (See K1–64–1 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION.)
8. Connect the negative battery cable.



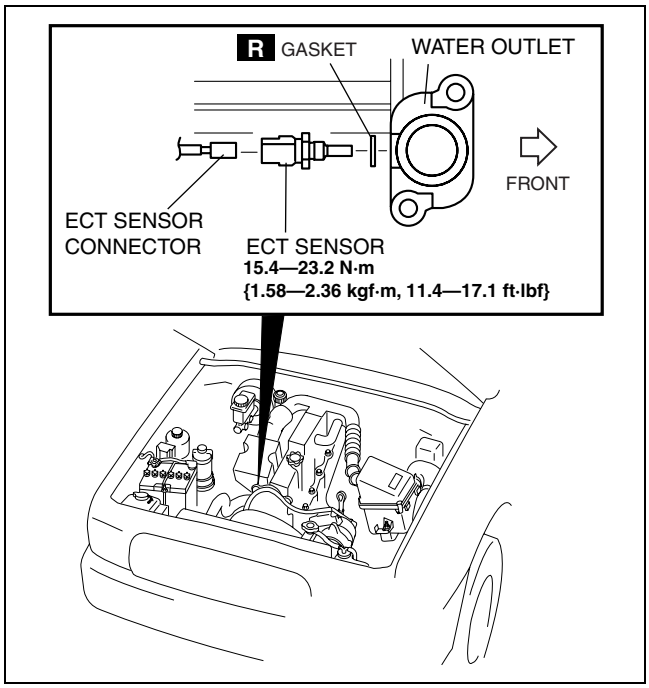
DBA517ZW1002

AUTOMATIC TRANSMISSION

ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION

BVF561019200W06

1. Disconnect the negative battery cable.
2. Disconnect the ECT sensor connector
3. Remove the ECT sensor.
4. Install a new gasket and the ECT sensor.
5. Connect the ECT sensor connector.
6. Connect the negative battery cable.



DBA517ZW1003

K1

ACCELERATOR POSITION SENSOR, IDLE SWITCH INSPECTION

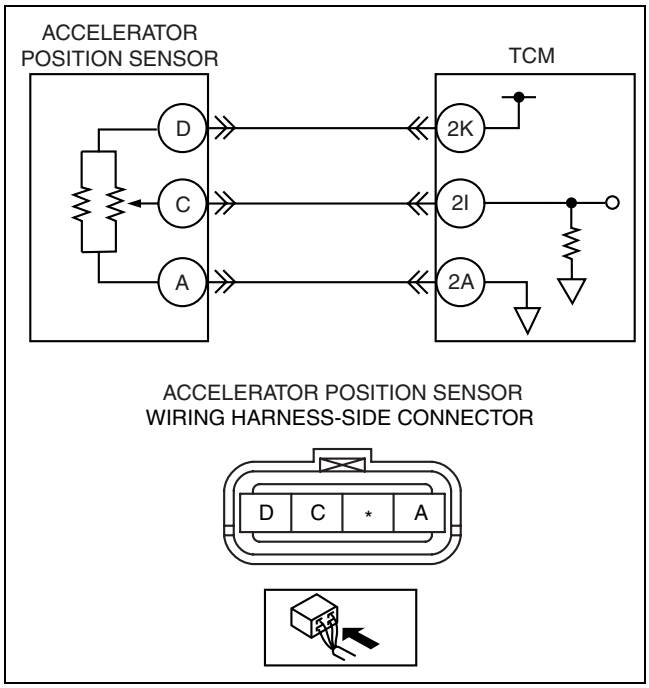
BVF561019200W07

Accelerator Position Sensor

Note
- Perform the following inspection only when directed.

Voltage inspection

1. Verify that the accelerator position sensor is installed to the accelerator pedal properly.
2. Visually inspect all accelerator pedal components for looseness.
3. Check the power circuit voltage.
   (1) Verify that the voltage between the accelerator position sensor terminals D (power circuit) and A (ground circuit) is **4.9—5.1 V**.
4. Verify that the voltage between the accelerator position sensor terminals A—C is as shown below according to the accelerator pedal conditions.
   - If not as specified, carry out the “Circuit Open/Short Inspection.”
     — If there is no open/short circuit, replace the accelerator position sensor.



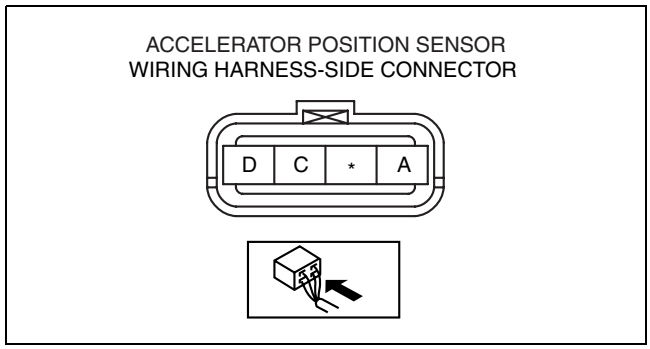
BVF5610WC006

Specification (Reference)

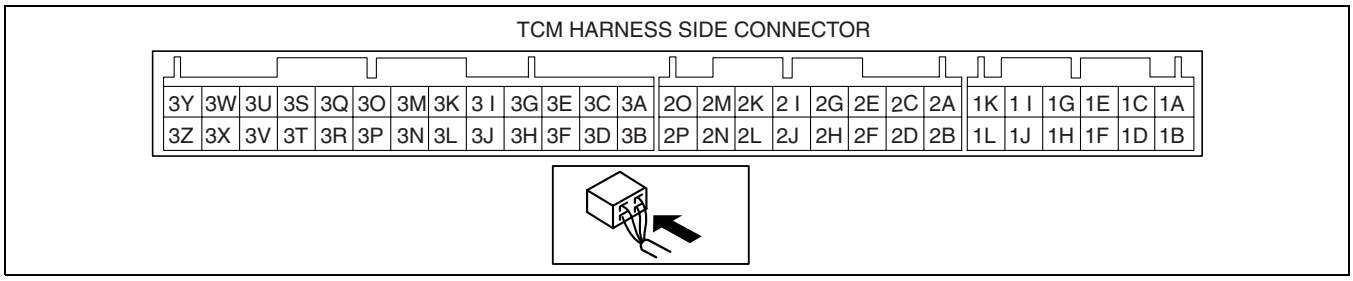
Accelerator pedal condition	Output voltage (V)
Fully released	0.5—0.7
Gradually depressed	Increases linearly
Fully depressed	3.4—3.8

Circuit open/short inspection

5. Disconnect the TCM connector. (See K1–68 TCM REMOVAL/INSTALLATION.)
6. Disconnect the accelerator position sensor connector.
7. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



BVF5610WC007



BCF5610W024

Open circuit

- Power circuit (accelerator position sensor connector terminal D and TCM connector terminal 2K)
- Signal circuit (accelerator position sensor connector terminal C and TCM connector terminal 2I)
- Ground circuit (accelerator position sensor connector terminal A and TCM connector terminal 2A)

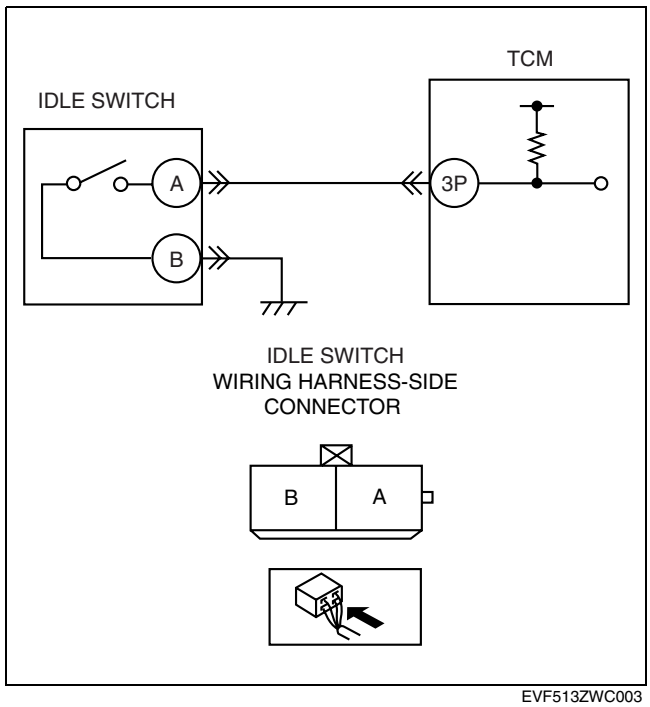
Short circuit

- Accelerator position sensor connector terminal D and TCM connector terminal 2K short to ground
- Accelerator position sensor connector terminal C and TCM connector terminal 2I short to power supply
- Accelerator position sensor connector terminal C and TCM connector terminal 2I short to ground
- Accelerator position sensor connector terminal A and TCM connector terminal 2A short to power supply

Idle Switch

Voltage inspection

1. Verify that the voltage at the TCM terminal 3P (idle signal) is 1 V or less with the accelerator pedal fully released.
2. Depress the accelerator pedal gradually and hold the pedal when the TCM terminal 3P voltage changes to **approx. 10 V**.
   - If not as specified, carry out the “Circuit Open/ Short Inspection.”
     — If there is no open/short circuit, replace the idle switch.

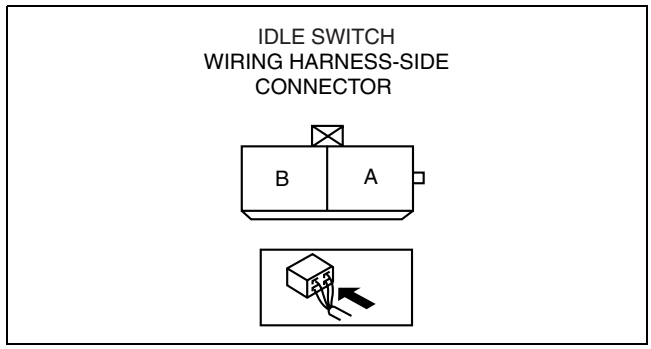


EVF513ZWC003

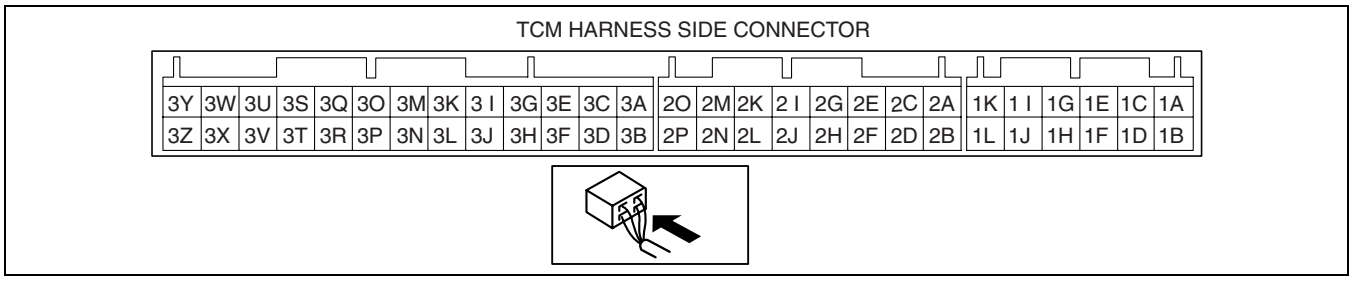
AUTOMATIC TRANSMISSION

Circuit open/short inspection

1. Disconnect the TCM connector. (See K1–68 TCM REMOVAL/INSTALLATION.)
2. Disconnect the idle switch connector.
3. Inspect for an open or short circuit in the following wiring harnesses.
   - If there is an open or short circuit, repair or replace wiring harnesses.



EVF513ZWC004



BCF5610W024

Open circuit

- Signal circuit (idle switch connector terminal A and TCM connector terminal 3P)
- Ground circuit (idle switch connector terminal B and GND)

Short circuit

- Idle switch connector terminal A and TCM connector terminal 3P short to ground

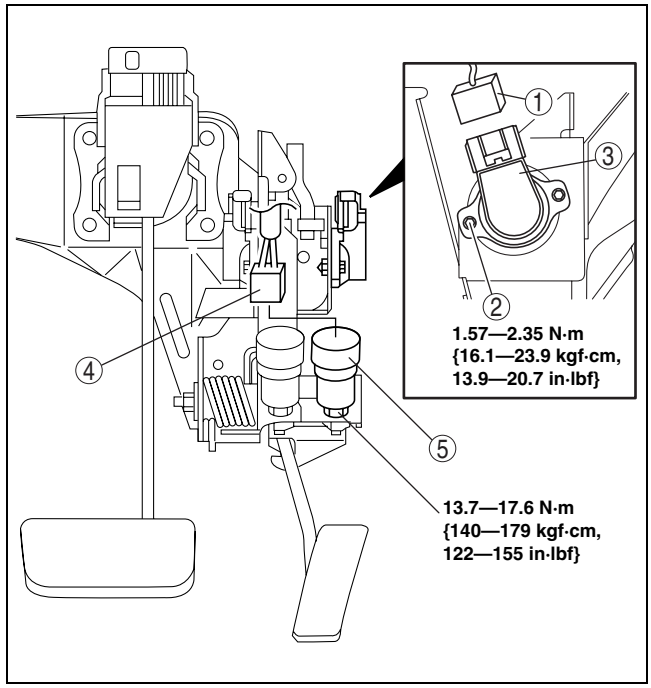
ACCELERATOR POSITION SENSOR, IDLE SWITCH REMOVAL/INSTALLATION

BVF561019200W08

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	Accelerator position sensor connector
2	Bolt
3	Accelerator position sensor
4	Idle switch connector
5	Idle switch

3. Install in the reverse order of removal.



EVF513ZWC005

ACCELERATOR POSITION SENSOR, IDLE SWITCH ADJUSTMENT

BVF561019200W09

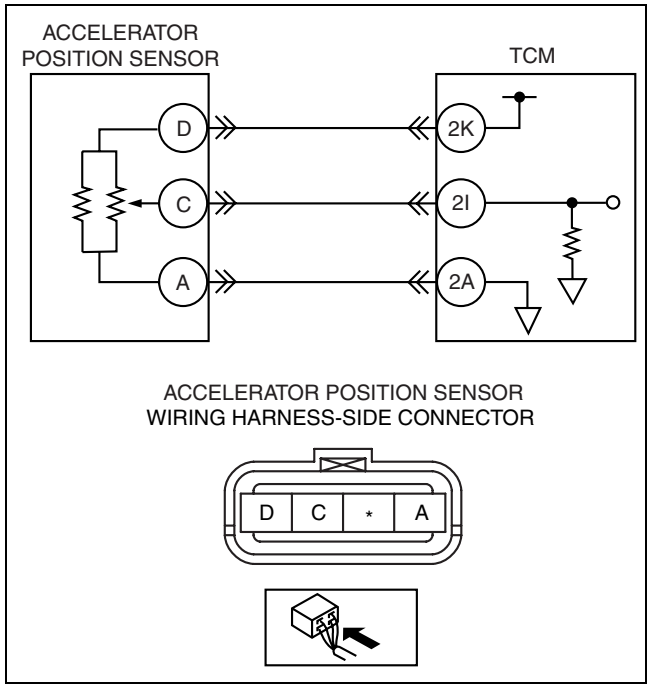
Caution

- **Adjusting the accelerator position sensor and idle switch unnecessarily may adversely affect engine control. Therefore, adjust accelerator position sensor and/or idle switch only when it is replaced.**

Note

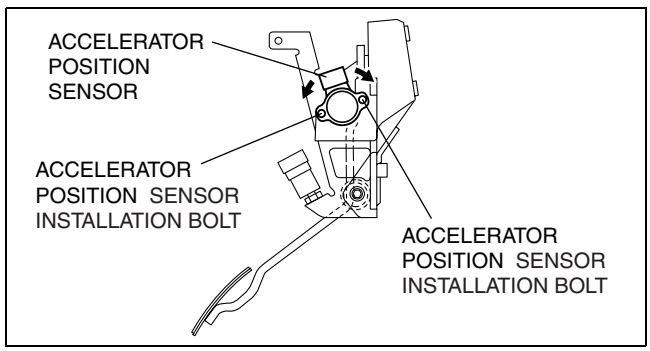
- Perform the following adjustment only when directed.

1. Temporarily install the accelerator position sensor and the idle switch to the pedal assembly and verify that the accelerator position sensor installation bolts and idle switch locknut are lightly tightened.
2. Connect the accelerator position sensor and the idle switch connector.
3. Turn the engine switch to the ON position.
4. Verify that the voltage between accelerator position sensor terminals A and D is **between 4.9 to 5.1 V (target value 5.0 V)**.
5. Set the current diagnostic tool and monitor TP, TP2 V and IDLE SW PIDs.



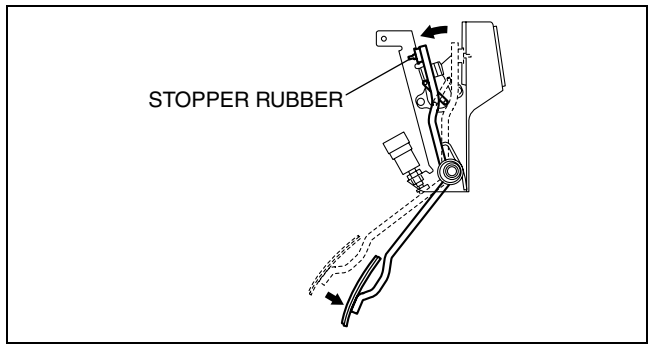
BVF5610WC006

6. Adjust the accelerator position sensor installation position so that the TP and TP2 V PIDs value is **between 0.5 to 0.7 V (target value 0.6 V)** with the accelerator pedal fully released, then tighten the accelerator position sensor installation bolts



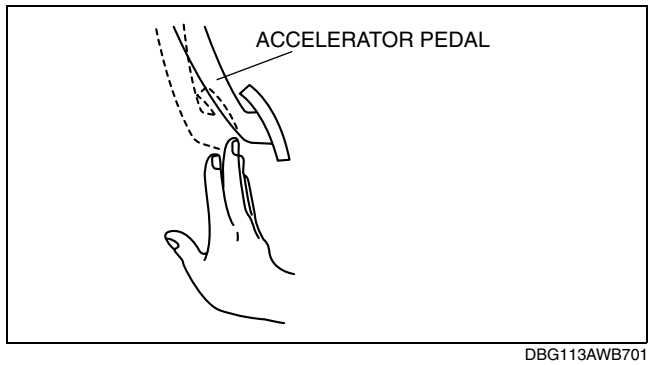
BVF5610WC009

7. While fully depressing the accelerator pedal until it contacts the stopper rubber, adjust the stopper rubber installation position so that the TP and TP2 V value is between 3.4 to 3.8 V (target value 3.6 V).



BVF5610WC010

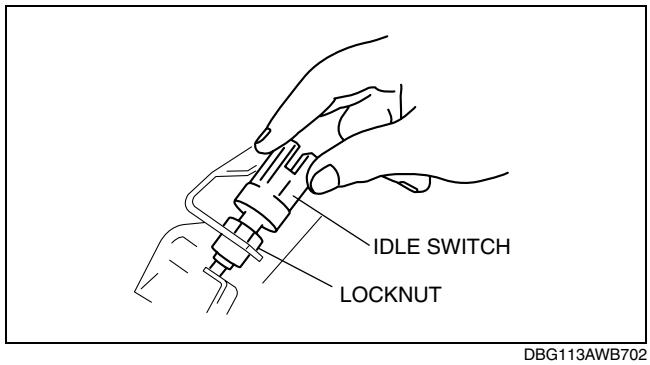
8. While slowly depressing the accelerator pedal by hand, adjust the idle switch installation position so that the IDLE SW PID turns from ON to OFF with the TP and TP2 V value is between 1.0 to 1.2 V (target value 1.1 V), then tighten the idle switch locknut.



DBG113AWB701

Tightening torque
13.7—17.6 N·m {1.40—1.79 kgf·m, 10.2—12.9 ft·lbf}

9. Verify that the IDLE SW PID turns from OFF to ON when the accelerator pedal is full released.
10. While depressing the accelerator pedal again, verify that the IDLE SW PID turns from ON to OFF with the TP and TP2 V PIDs value is **between 1.0 to 1.2 V (target value 1.1 V)**.



DBG113AWB702

K1

TRANSMISSION FLUID TEMPERATURE (TFT) SWITCH INSPECTION

BVF561021280W08

1. Disconnect the negative battery cable.
2. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
3. Remove the control valve body and disconnect the solenoid connector. (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
4. Place the TFT switch in ATF with a thermometer, and heat the fluid gradually.
5. Measure the continuity between the terminal and bracket.
   - If there is any malfunction, replace the TFT switch.

ATF temperature (°C {°F})	Continuity
Above 150 {302}	Yes
Below 145 {293}	No

6. Install the solenoid connector and control valve body. (See K1–76 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
7. Connect the negative battery cable.
8. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.) (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
9. Perform the line pressure test and time lag test. (See K1–46 MECHANICAL SYSTEM TEST.)
10. Perform the road test. (See K1–48 ROAD TEST.)

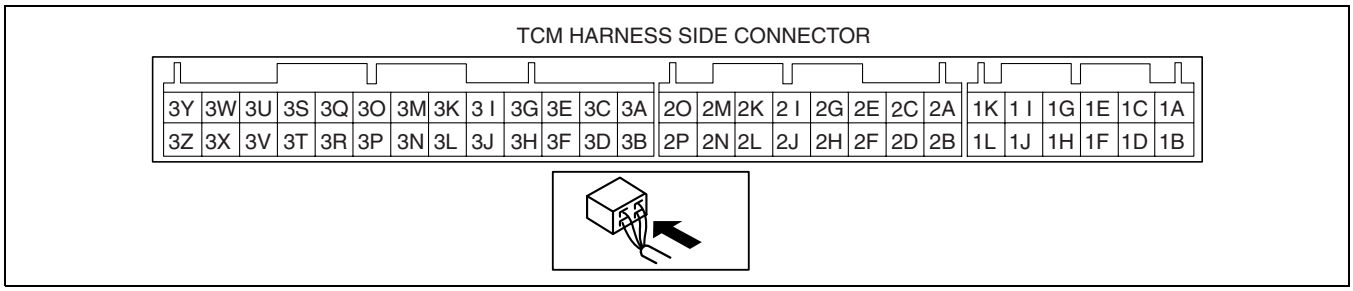
TCM INSPECTION

BVF561018901W06

Terminal Voltage Table (Reference)

Note

- Use the ground of terminal 3B and 3U of the TCM when measuring terminal voltage, as an error may occur when connecting the negative circuit tester to ground.



BCF5610W024

Terminal	Signal	Connected to	Condition		Voltage (V)	Inspection item(s)
1A	—	—	—		—	—
1B	System ground	GND	Constant		Below 1.0	• Related harness
1C	Power supply	Main relay	Engine switch OFF		Below 1.0	• Main relay • Related harness
			Engine switch ON		B+	
1D	Power supply	Main relay	Engine switch OFF		Below 1.0	• Main relay • Related harness
			Engine switch ON		B+	
1E	Pressure solenoid valve control	Pressure control solenoid	Inspect using the wave profile (See K1–67 Inspection Using An Oscilloscope (Reference).)			• Pressure control solenoid (See K1–60 SOLENOID VALVE INSPECTION.) • Related harness
1F	Shift solenoid A control	Shift solenoid A	While driving	1GR or 4GR positions	B+	• Shift solenoid A (See K1–60 SOLENOID VALVE INSPECTION.) • Related harness
				2GR or 3GR positions	Below 1.0	
1G	Dropping resistor control	Dropping resistor	Engine switch ON	Accelerator pedal fully released	Approx. 5.7	• Dropping resistor (See K1–62 DROPPING RESISTOR INSPECTION.) • Related harness
				Accelerator pedal fully depressed	Below 1.0	
1H	Shift solenoid B control	Shift solenoid B	Engine switch ON	P, R, N position or 1GR or 2GR positions	B+	• Shift solenoid B (See K1–60 SOLENOID VALVE INSPECTION.) • Related harness
				3GR or 4GR positions	Below 1.0	
1I	TCC solenoid control	TCC solenoid	While driving	TCC OFF	Below 1.0	• TCC solenoid (See K1–60 SOLENOID VALVE INSPECTION.) • Related harness
				TCC ON	B+	
1J	Overrunning clutch solenoid control	Overrunning clutch solenoid	Overrunning clutch solenoid not operated		Below 1.0	• Overrunning clutch solenoid (See K1–60 SOLENOID VALVE INSPECTION.) • Related harness
			Overrunning clutch solenoid operated		B+	
1K	—	—	—		—	—
1L	—	—	—		—	—
2A	Input parts ground	GND (for sensors)	Constant		Below 1.0	• Related harness

Terminal	Signal	Connected to	Condition		Voltage (V)	Inspection item(s)
2B	Battery back up supply	Battery	Constant		B+	• Related harness
2C	—	—	—		—	—
2D	—	—	—		—	—
2E	Vehicle speed signal	Speedometer sensor	Engine switch ON		0 or 4.5—5.5	• Instrument cluster • Related harness
			While driving		2.0—3.0	
2F	Engine speed signal (input)	NE sensor	Engine switch ON		Below 1.0	• NE sensor • Related harness
			While idling			
2G	Output shaft speed signal	Output speed sensor	Inspect using the wave profile (See K1–67 Inspection Using An Oscilloscope (Reference).)			• Output speed sensor (See K1–59 OUTPUT SPEED SENSOR INSPECTION.) • Related harness
2H	Accelerator position voltage correction	Accelerator position corrective resistor	Engine switch ON		Approx. 2.0	• Related harness
			While idling			
2I	Accelerator opening signal	Accelerator position sensor*1	Engine switch ON	Accelerator pedal fully released	Approx. 0.6	• Accelerator position sensor*1 • Related harness
				Accelerator pedal fully depressed	Approx. 3.6	
		Control lever position sensor*2	Engine switch ON	Accelerator pedal fully released	Approx. 1.1	• Control lever position sensor*2 • Related harness
				Accelerator pedal fully depressed	Approx. 4.1	
2J	Transmission fluid temperature	TFT sensor	Engine switch ON	ATF temperature 10 °C {50 °F}	Approx. 1.8	• TFT sensor (See K1–58 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION.) • Related harness
				ATF temperature 40 °C {104 °F}	Approx. 1.1	
				ATF temperature 80 °C {176 °F}	Approx. 0.4	
2K	Voltage regulator	TP sensor	Engine switch ON		4.5—5.5	• TP sensor • Related harness
2L	—	—	—		—	—
2M	—	—	—		—	—
2N	Engine coolant temperature	ECT sensor	Engine switch ON	Engine coolant temperature below 20 °C {68 °F}	Approx. 2.1	• ECT sensor • Related harness
				Engine coolant temperature below 60 °C {140 °F}	Approx. 1.3	
2O	Start signal	Engine switch (Starter motor)	Engine switch ON		Below 1.0	• Engine switch • Starter motor • Related harness
			While cranking		Approx. 10	
2P	Load/no load check	TR switch	Engine switch ON	P or N position	Below 1.0	• TR switch (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) • Related harness
				Other positions	B+	
3A	HOLD indicator light signal	HOLD indicator light	Engine switch ON	HOLD mode	Below 1.0	• Instrument cluster • Related harness
				Other mode	B+	
3B	TCM ground	GND	Constant		Below 1.0	• Related harness
3C	—	—	—		—	—
3D	Service code output signal	Check connector	Engine switch ON	No service code exists	B+	• Related harness
				Service code exists	Below 1.0	

K1

AUTOMATIC TRANSMISSION

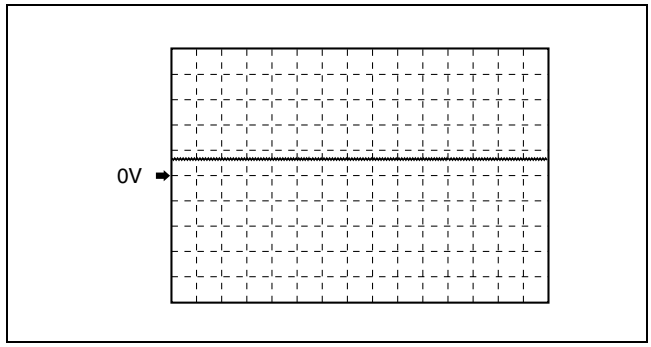
Terminal	Signal	Connected to	Condition		Voltage (V)	Inspection item(s)
3E	—	—	—		—	—
3F	—	—	—		—	—
3G	D range signal	TR switch (D range)	Engine switch ON	D range	B+	• TR switch (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) • Related harness
				Other ranges	Below 1.0	
3H	—	—	—		—	—
3I	S range signal	TR switch (S range)	Engine switch ON	S range	B+	• TR switch (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) • Related harness
				Other ranges	Below 1.0	
3J	Test mode check signal	Diagnosis connector 1 (TAT terminal)	Engine switch ON/OFF	Test connector opened	B+	• Related harness
				Test connector closed	Below 1.0	
3K	L range signal	TR switch (L range)	Engine switch ON	L range	B+	• TR switch (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) • Related harness
				Other ranges	Below 1.0	
3L	—	—	—		—	—
3M	R range signal	TR switch (R range)	Engine switch ON	R range	B+	• TR switch (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) • Related harness
				Other ranges	Below 1.0	
3N	HOLD mode check signal	HOLD switch	Engine switch ON	HOLD switch button not depressed	B+	• HOLD switch (See K1–54 HOLD SWITCH INSPECTION.) • Related harness
				HOLD switch button depressed	Below 1.0	
3O	—	—	—		—	—
3P	Idling signal	Idle switch	Engine switch ON	Accelerator pedal fully released	Below 1.0	• Idle switch • Related harness
				Accelerator pedal depressed	B+	
3Q	—	—	—		—	—
3R	—	—	—		—	—
3S	—	—	—		—	—
3T	—	—	—		—	—
3U	TCM ground	ground	Constant		Below 1.0	• Related harness
3V	—	—	—		—	—
3W	—	—	—		—	—
3X	—	—	—		—	—
3Y	—	—	—		—	—
3Z	—	—	—		—	—

*1 : WL Turbo Stage-III
*2 : Except WL Turbo Stage-III

Inspection Using An Oscilloscope (Reference)

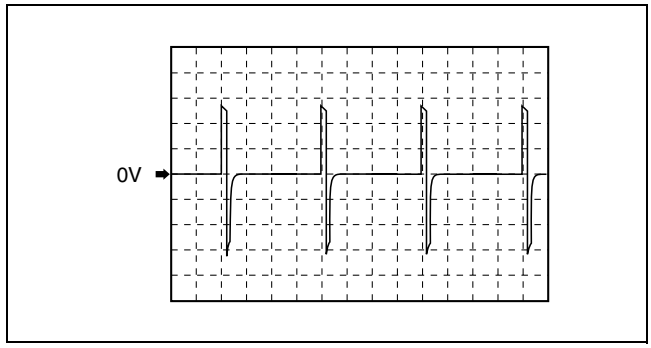
Pressure solenoid valve control

- TCM terminal: 1E (+)—1B (–)
- Oscilloscope setting: 5V/DIV (Y) 5ms/DIV (X)
- Measuring condition: N position, Idle



BCF5610W060

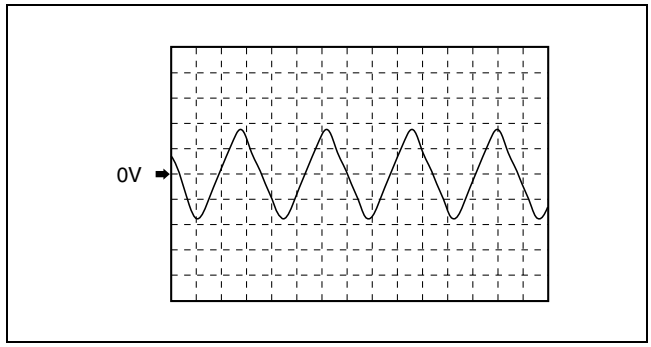
- TCM terminal: 1E (+)—1B (–)
- Oscilloscope setting: 5V/DIV (Y) 5ms/DIV (X)
- Measuring condition: N position, Wide open throttle



BCF5610W062

Output speed sensor

- TCM terminal: 2G (+)—1B (–)
- Oscilloscope setting: 2V/DIV (Y) 2ms/DIV (X)
- Measuring condition: D range, vehicle speed at 10 km/h {6 mph}

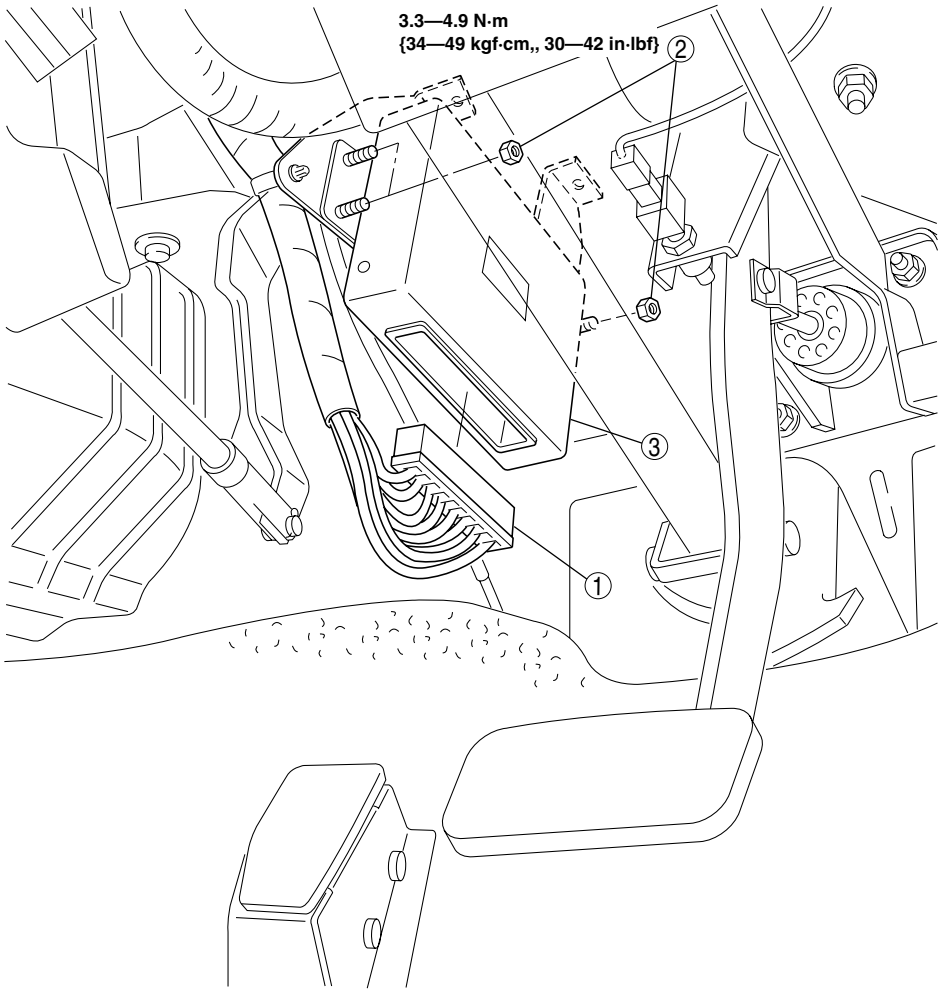


BCF5610W063

TCM REMOVAL/INSTALLATION

BVF561018901W07

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Connect the negative battery cable.



BCF5610W025

1	TCM connector
2	Nut

3	TCM

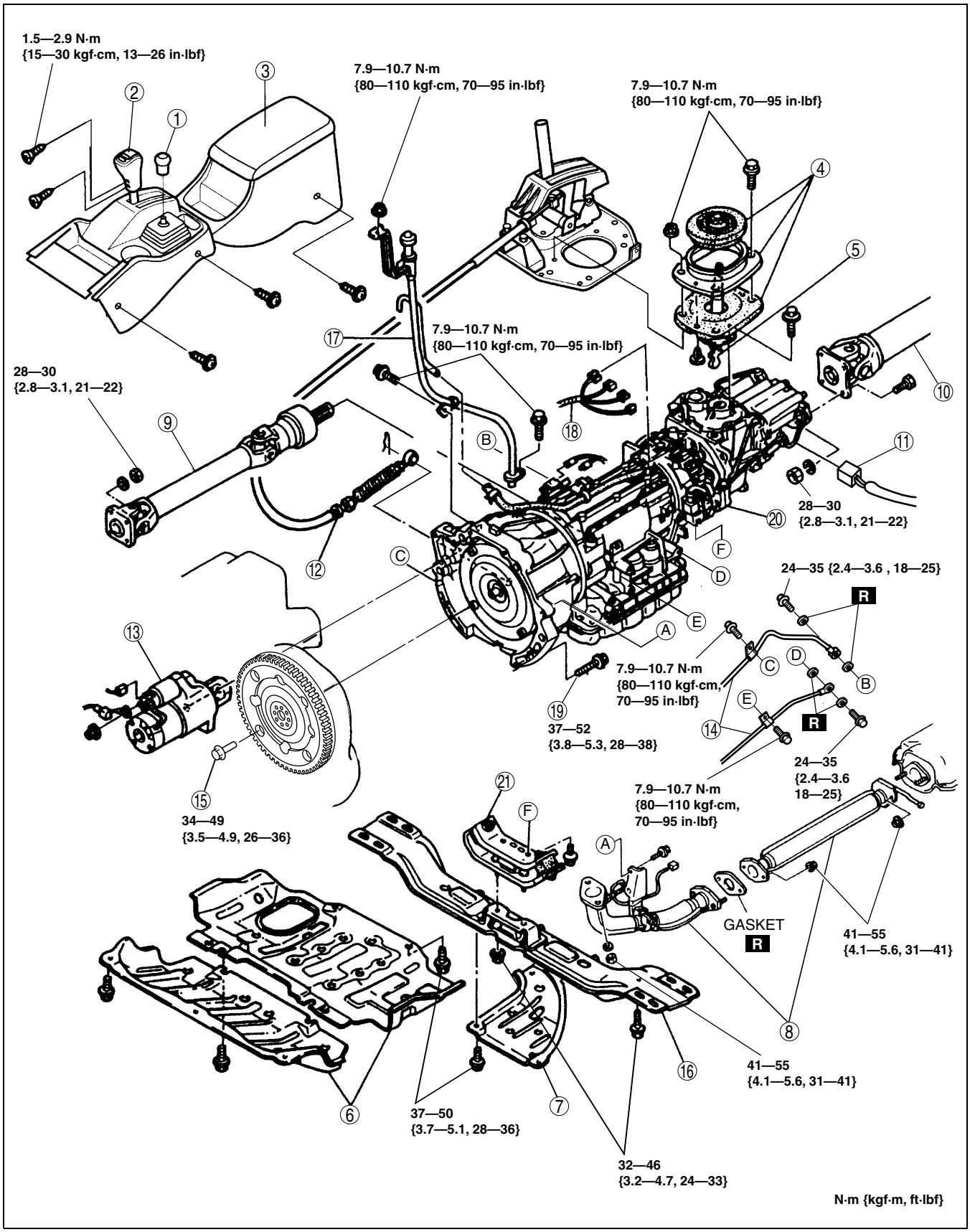
AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION

BVF561019090W01

1. Disconnect the negative battery cable.
2. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.) (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
6. Inspect selector lever operation. (See K1–89 SELECTOR LEVER INSPECTION.)
7. Inspect for leakage of ATF from all connecting points.
8. Perform the mechanical system test. (See K1–46 MECHANICAL SYSTEM TEST.)

Service item	Test item		
	Line pressure test	Stall speed test	Time lag test
Automatic transmission replacement	×		
Automatic transmission overhaul	×	×	×
Torque converter replacement	×	×	
Oil pump replacement	×		
Clutch system replacement	×		×

9. Perform the road test. (See K1–48 ROAD TEST.)



BCF5610W026

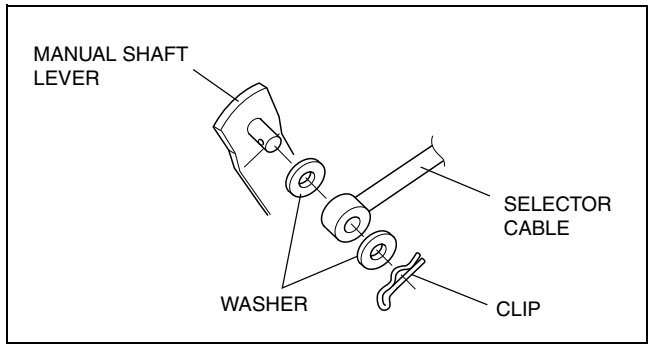
1	Shift lever knob
2	Selector lever knob component
3	Console
4	Insulator plate, boot

5	4 × 4 σηιφτ λεϖερ
6	Under cover
7	Under cover
8	Exhaust pipe

9	Front propeller shaft
10	Rear propeller shaft
11	VSS connector
12	Selector cable (See K1–71 Selector Cable Removal Note.) (See K1–74 Selector Cable Installation Note.)
13	Starter
14	Oil pipe, oil hose (See K1–81 OIL COOLER REMOVAL/ INSTALLATION.)
15	Torque converter installation bolts (See K1–72 Torque Converter Installation Bolts Removal Note.) (See K1–74 Torque Converter Installation Bolts Installation Note.)
16	Crossmember (See K1–72 Crossmember Removal Note.)
17	Oil filter tube, Dipstick
18	Connector
19	Transmission installation bolt
20	Transmission (See K1–73 Transmission Removal Note.) (See K1–73 Transmission Installation Note.)
21	Transmission mount

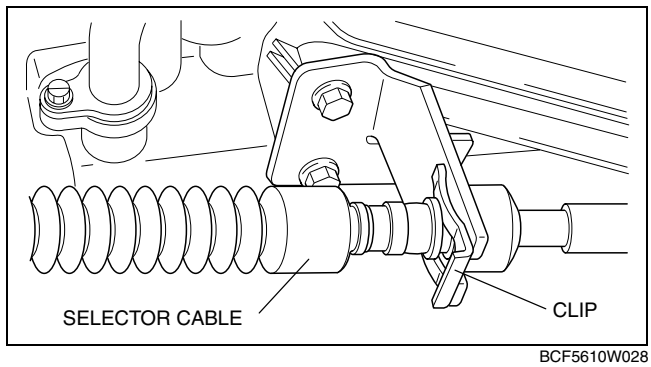
Selector Cable Removal Note

1. Remove the clip and washer.



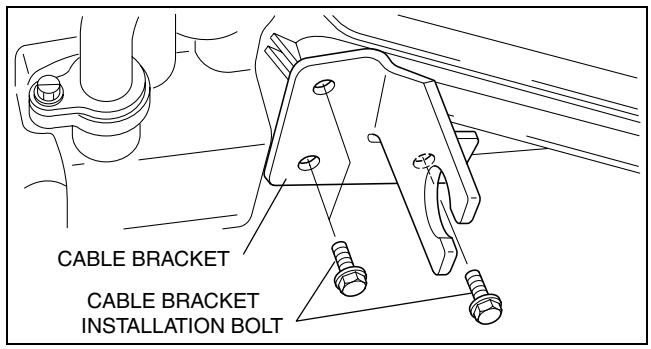
BCF5610W027

2. Remove the clip.
3. Remove the selector cable.



BCF5610W028

4. Remove the cable bracket.

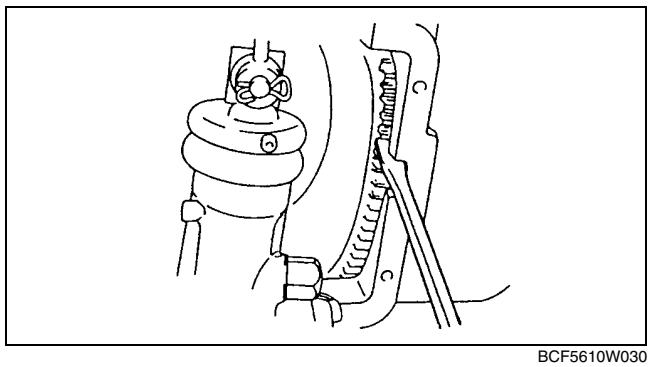


BCF5610W029

Torque Converter Installation Bolts Removal Note

Caution
- **Do not remove the drive plate installation nuts.**

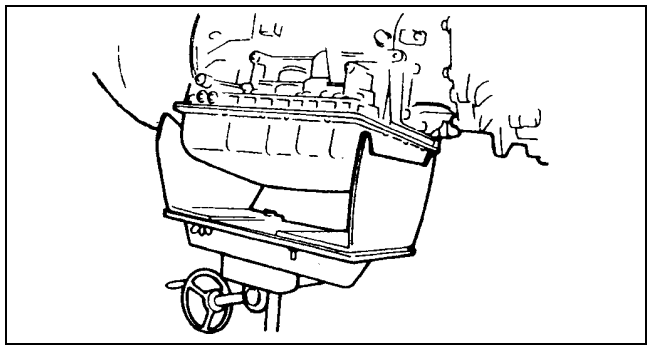
1. Lock the drive plate using a flathead screwdriver as shown in the figure.
2. Remove the torque converter installation bolts.



BCF5610W030

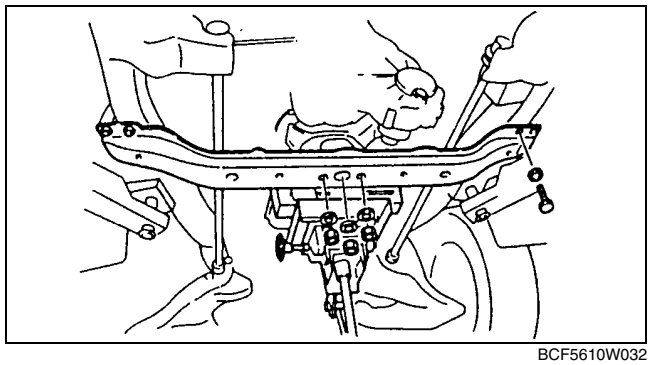
Crossmember Removal Note

1. Support the transmission securely using a transmission jack.



BCF5610W033

2. Remove the crossmember.



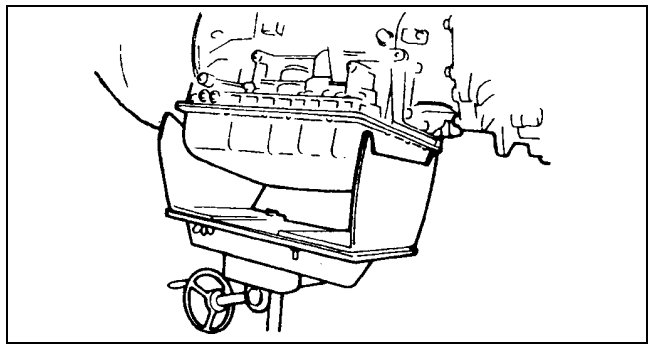
BCF5610W032

Transmission Removal Note

Warning
- **Verify that the transmission is securely supported by the jack. If the transmission falls, serious injury or death and damage to the vehicle could result. Before removing the transmission make sure that the jack is securely supporting the transmission.**

Caution
- **To prevent the torque converter and transmission from separating, remove the transmission without tilting it toward the torque converter.**

1. Support the transmission securely using a transmission jack.
2. Remove the transmission installation bolt.



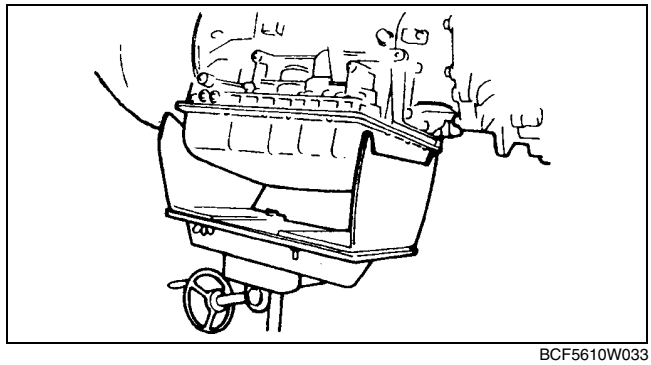
BCF5610W033

Transmission Installation Note

Warning
- **Verify that the transmission is securely supported by the jack. If the transmission falls, serious injury or death and damage to the vehicle could result. Before removing the transmission make sure that the jack is securely supporting the transmission.**

Caution
- **To prevent the torque converter and transmission from separating, remove the transmission without tilting it toward the torque converter**

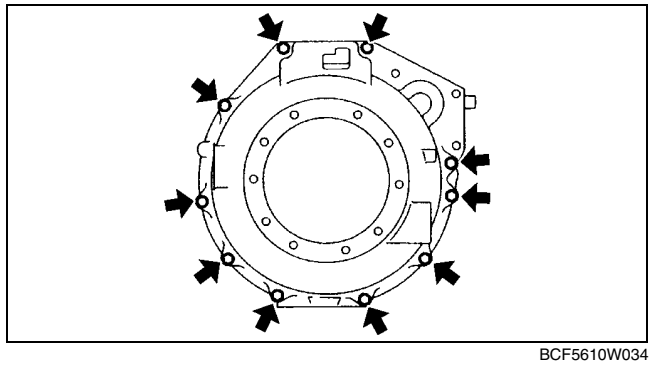
1. Support the transmission securely using a transmission jack.
2. Install the transmission.



BCF5610W033

3. Tighten the transmission mounting bolts.

Tightening torque
37—52 N·m {3.8—5.3 kgf·m, 28—38 ft·lbf}



BCF5610W034

Torque Converter Installation Bolts Installation Note

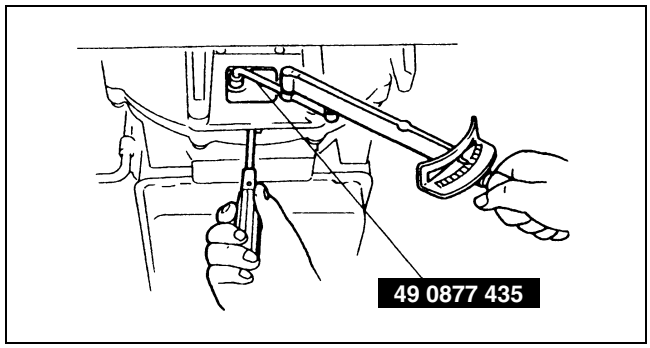
1. Align the holes by turning the torque converter.
2. Lock the drive plate using a flathead screwdriver.

Caution

- **Loosely and equally tighten the torque converter bolts, then further tighten them to the specified tightening torque.**

3. Tighten the torque converter installation bolts.

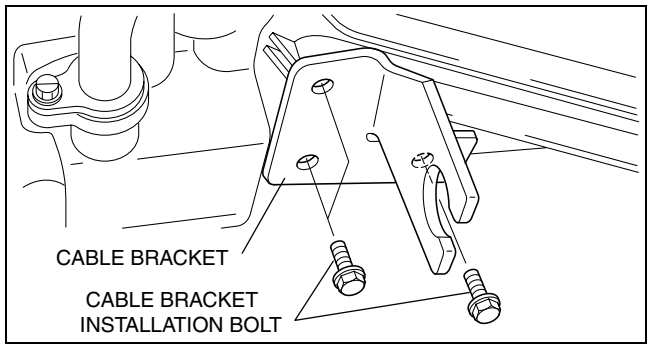
Tightening torque
34—49 N·m {3.5—4.9 kgf·m, 26—36 ft·lbf}



BCF5610W035

Selector Cable Installation Note

1. Install the cable bracket.
2. Install the selector cable to the cable bracket securely.

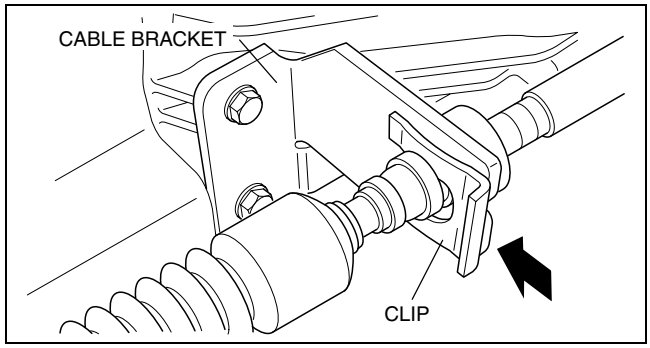


BCF5610W029

3. Install the clip to the cable bracket securely as shown in the figure.

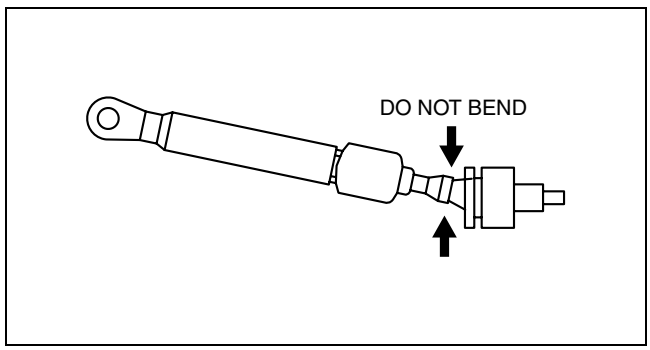
Caution

- **Bending the selector cable in the manner as shown in the figure will damage the cable and it may become loose when shifted.**
  when installing the selector cable, hold it straight.



BCF5610W031

4. Install the selector cable to the manual shaft lever in such a way that the selector cable does not bear load.
5. Confirm that the end of the manual shaft lever sticks out of the end of the selector cable.



A6E5616W007

TRANSFER REMOVAL/INSTALLATION

BVF561019090W02

1. Disconnect the negative battery cable.
2. Remove the following parts.
   (1) Shift lever knob
   (2) Selector lever knob component
   (3) Console
   (4) Insulator plate, boot
   (5) 4 × 4 shift lever
   (6) Crossmember
   (7) Front propeller shaft
   (8) Rear propeller shaft
   (9) Speedometer cable
   (10)Under cover (transfer side)
   (11)Connector
3. Remove the transfer.
4. Install in the reverse order of removal.
5. Connect the negative battery cable.

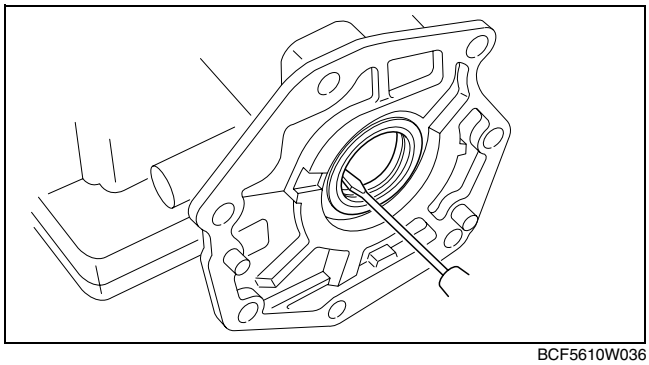
OIL SEAL REPLACEMENT

BVF561019240W01

1. Clean the transmission and transfer exterior thoroughly using a steam cleaner or cleaning solvent.
2. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
3. Remove the transfer. (See K1–75 TRANSFER REMOVAL/INSTALLATION.)

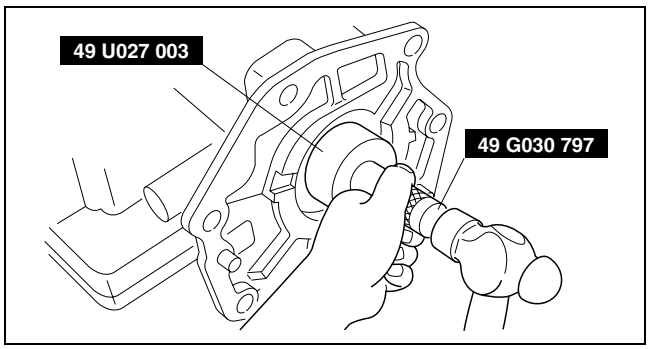
Caution
- **Do not scratch or damage the adapter case and output shaft.**

4. Remove the oil seal using a flathead screwdriver.
5. Apply ATF to the oil seal lip.



BCF5610W036

6. Using the **SSTs** and a hammer, tap the new oil seal in evenly until the **SST** (49 U027 003) contacts the adapter case.
7. Install the transfer. (See K1–75 TRANSFER REMOVAL/INSTALLATION.)
8. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.) (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)



BCF5610W037

K1

CONTROL VALVE BODY REMOVAL/INSTALLATION

BVF561021100W02

On-Vehicle Removal/Installation

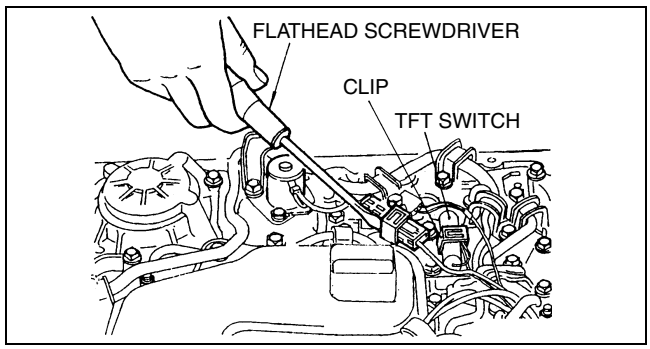
Warning

- **A hot transmission and ATF can cause severe burns. Turn off the engine and wait until they are cool before replacing ATF.**
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution

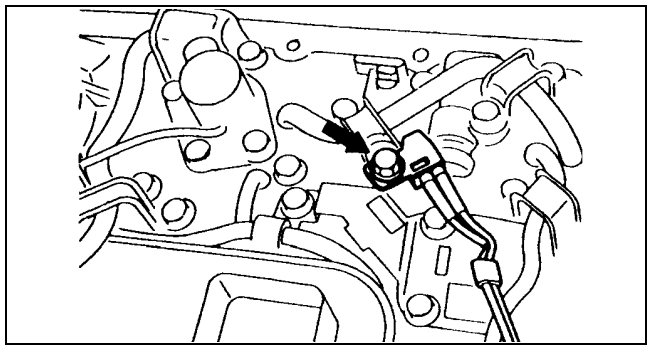
- **Clean the transmission exterior thoroughly with a stream cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transmission during installation of the oil pan, trouble may occur in the transmission case and oil pan. Clean with cleaning fluids.**

1. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvents.
2. Disconnect the negative battery cable.
3. Remove the front propeller shaft.
4. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
5. Remove the oil pan and gasket.
6. Remove the clip by carefully prying with a small flathead screwdriver.
7. Disconnect the TCC solenoid connector.
8. Remove the TFT switch.



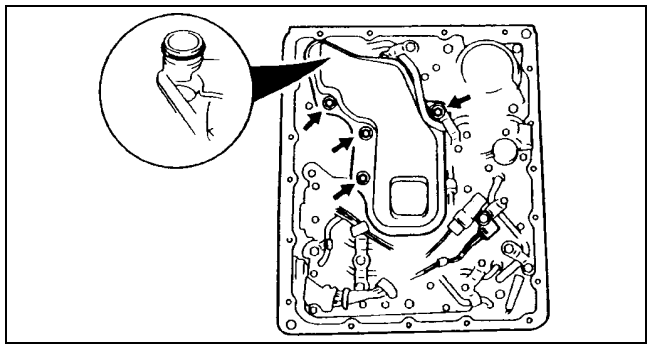
BCF5610A113

9. Remove the TFT sensor.
10. Remove the oil strainer.



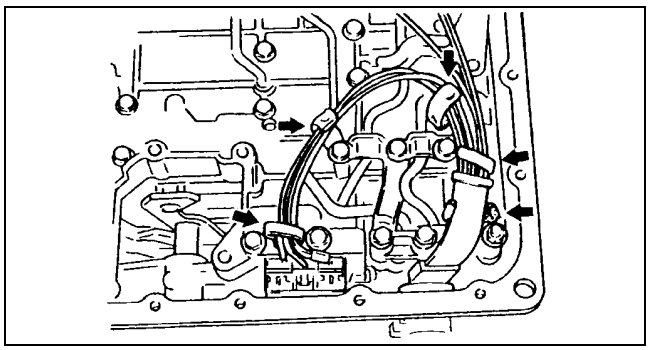
BCF5610A371

11. Remove the O-ring from the oil strainer.



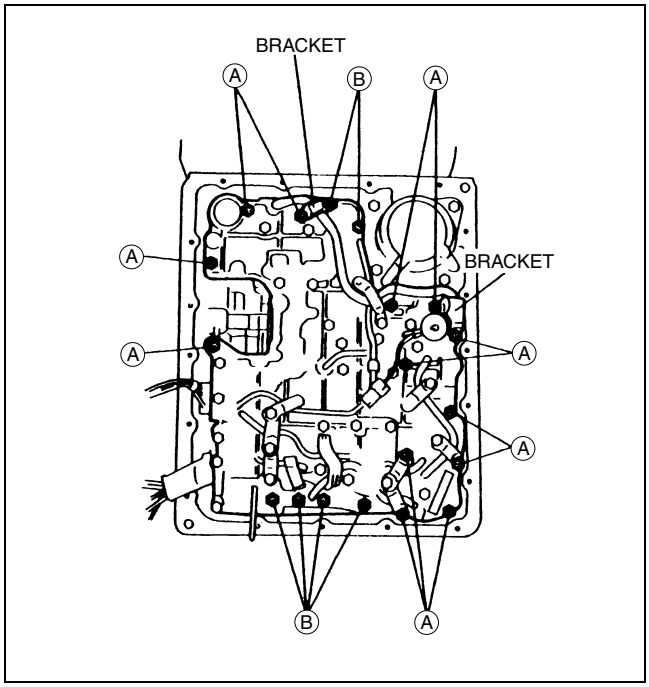
BCF5610A115

12. Separate the solenoid harness from the harness clip.



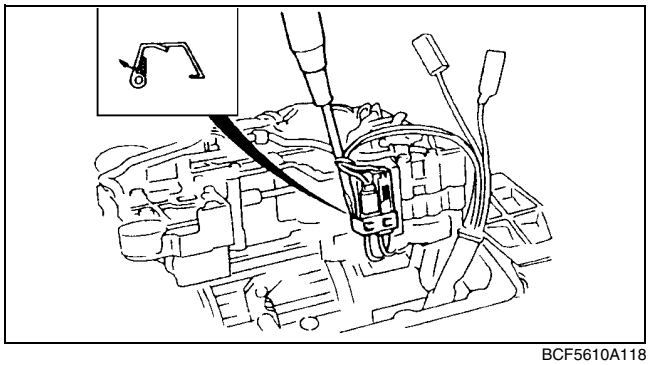
BCF5610A116

13. Remove bolts A and B and the bracket as shown in the figure.



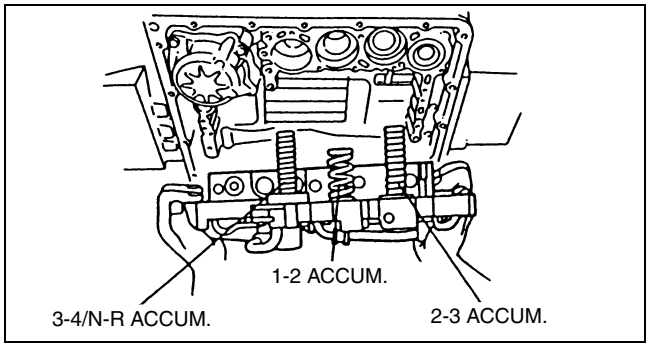
BCF5610A368

14. Remove the clip.
15. Separate the solenoid connectors.



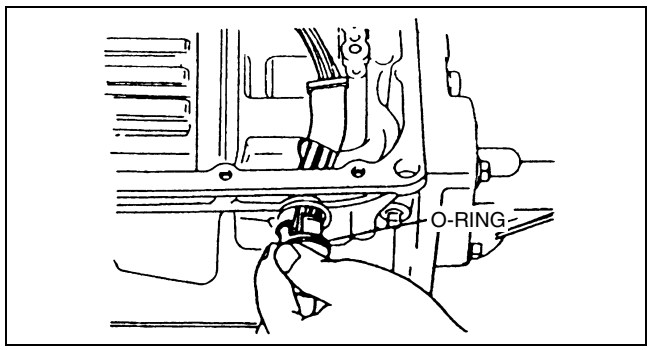
BCF5610A118

16. Carefully remove the control valve body component and accumulator springs.



BCF5610W038

17. If necessary, remove the solenoid connector from the transmission case.
18. Install the solenoid connector into the transmission case if removed.
19. Connect the solenoid connector to the solenoids.
20. Install the clip.

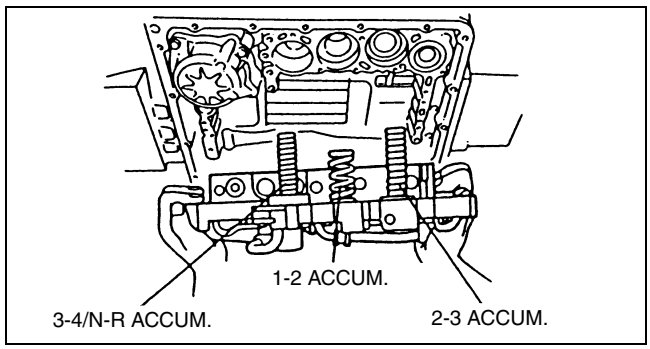


BCF5610A121

21. Set the accumulator springs into the control valve body as shown in the figure.

Spring specifications

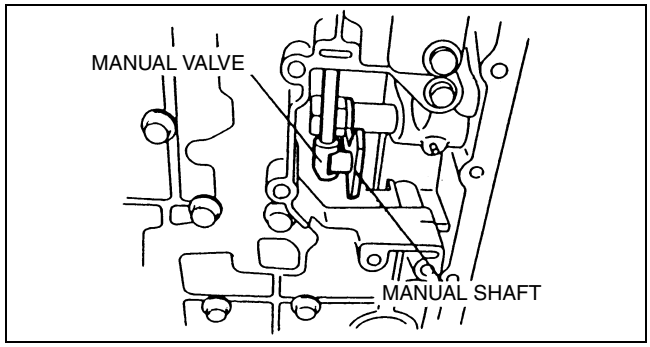
Spring	Item			
	Outer dia. mm {in}	Free length mm {in}	No. of coil	Wire dia. mm {in}
3-4/N-R accumulator piston	17.3 {0.681}	58.4 {2.299}	12.3	2.3 {0.091}
1-2 accumulator piston	29.3 {1.154}	45.0 {1.772}	3.6	4.0 {0.157}
2-3 accumulator piston	20.0 {0.787}	66.0 {2.598}	7.6	3.2 {0.126}



BCF5610W038

22. Verify that the manual valve and manual shaft are assembled correctly.
23. Set the control valve body into the transmission case and secure it.
24. Install bolts A and B and the brackets as shown in the figure.

Bolt length (Measured from below the head)
A: 33 mm {1.30 in}
B: 45 mm {1.77 in}

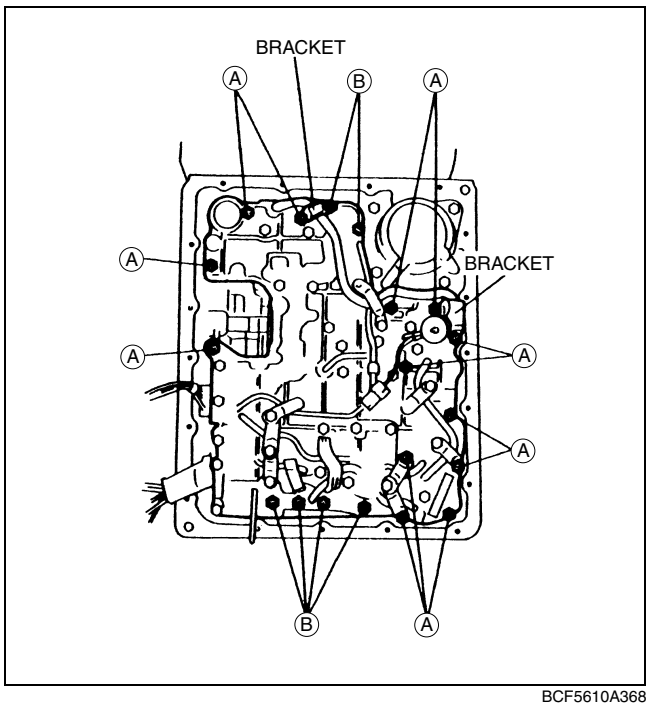


BCF5610W039

25. Tighten the bolts in sequence.

Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

26. Apply ATF to the new O-ring and install it onto the oil strainer.



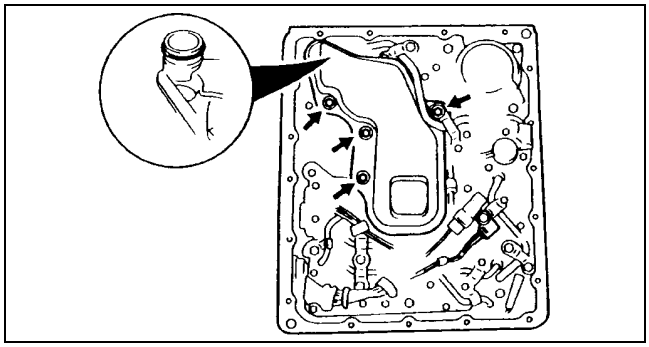
BCF5610A368

27. Install the oil strainer.

Bolt length (Measured from below the head)
52 mm {2.03 in}

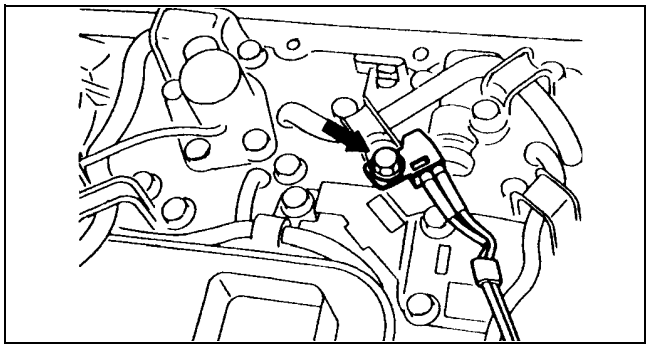
Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

28. Mount the solenoid harness with the harness clip.


BCF5610A115

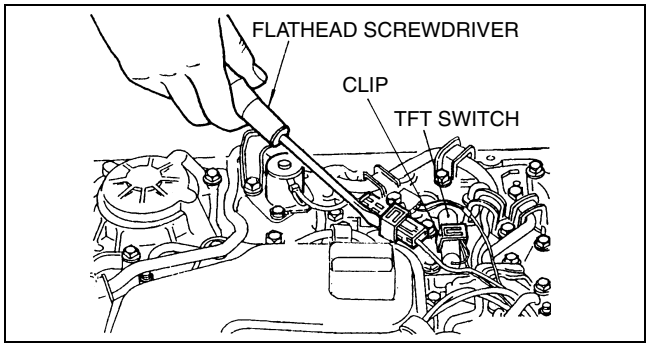
29. Install the TFT sensor.

Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}


BCF5610A371

30. Install the TFT switch.
31. Connect the TCC solenoid connector.
32. Install the clip.
33. Remove any old locking compound from the bolt holes.
34. Install the oil pan and a new gasket.

Caution
- **When installing sealant-covered bolts, tighten them immediately. Leaving these bolts in a half-installed condition could cause them to be stuck that way, due to the natural hardening of the sealant.**



BCF5610A113

35. Tighten the new bolts evenly and quickly.

Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

36. Install the front propeller shaft.
37. Add ATF and, with the engine idling, inspect the ATF level and inspect for leakage. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.) (See K1–52 Automatic Transmission Fluid (ATF) Level Inspection.)
38. Perform the line pressure test and time lag test. (See K1–46 MECHANICAL SYSTEM TEST.)
39. Perform the road test. (See K1–48 ROAD TEST.)

OIL COOLER FLUSHING

BVF561019900W03

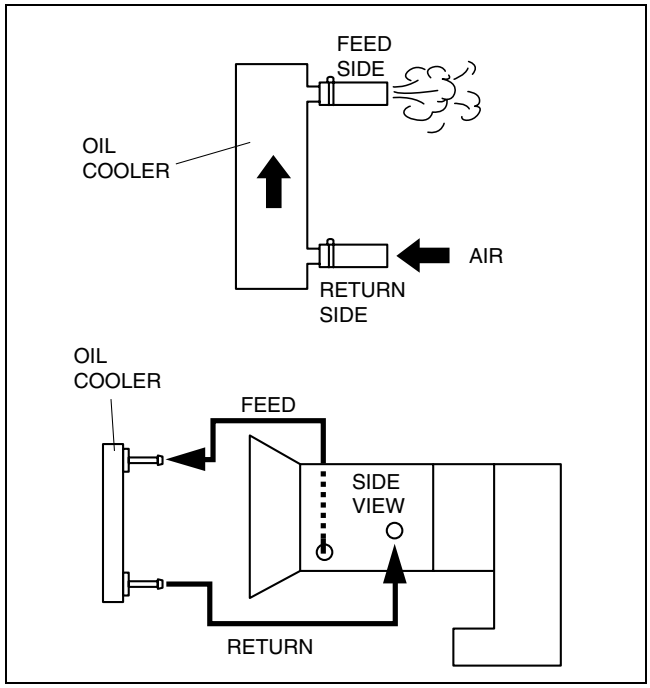
Note
- The contaminated cooler line (oil pipes and hoses) and auxiliary cooler must be flushed completely when AT is overhauled or replaced.

1. Remove the two oil cooler line hoses and apply air pressure of **196 kPa {2.0 kgf/cm^2, 28 psi}** from the return hose (pipe) side.

Caution
- **Power flushing should be performed very carefully when removing the accumulated debris from the fluid baffle, otherwise the debris cannot be removed or the problem becomes even worse.**

Note
- Performing back and reverse power flushing two times each does not work because debris or particles flow out from the feed pipe side of AT.

2. If there is no air blown out the feed side, flush the oil cooler lines using the power-flushing tool. (See K1–80 Power Flushing.)



BCF5610W040

Recommended power-flushing manufacturer

Manufacturer	Part number	Description
Kent Moore	J35944-AMAZ	Flushing kit or equivalent
OTC	60081	Portable torque converter, oil cooler cleaner or equivalent

Power Flushing
Repair procedure
1. Before power flushing, inspect the hoses/lines and clamps. Power flushing must begin with back flushing followed by forward flushing to quickly dislodge the restriction. If back flushing is not performed before forward flushing, the restriction could further reduce the ATF flow through the internal mesh type baffle of the cooler and flushing will not be effective or possible.

Inspecting oil lines and clamps
1. Be sure to inspect the lines (hoses/pipes) for cuts, crimps (pinched), cracks or any other damage before reusing them.
   - If there is any malfunction, replace lines and clamps.

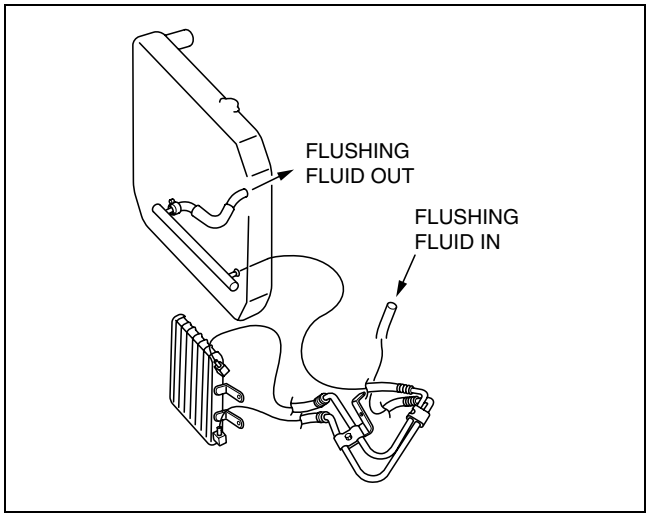
Caution
- **Always use new clamps when replacing hoses.**

Back flushing

1. Using the power flushing equipment manufacturer's instructions, connect equipment so the flushing fluid flows in the opposite direction of normal fluid flow.
2. Flush oil cooler/lines until discharge fluid is clean.

Caution

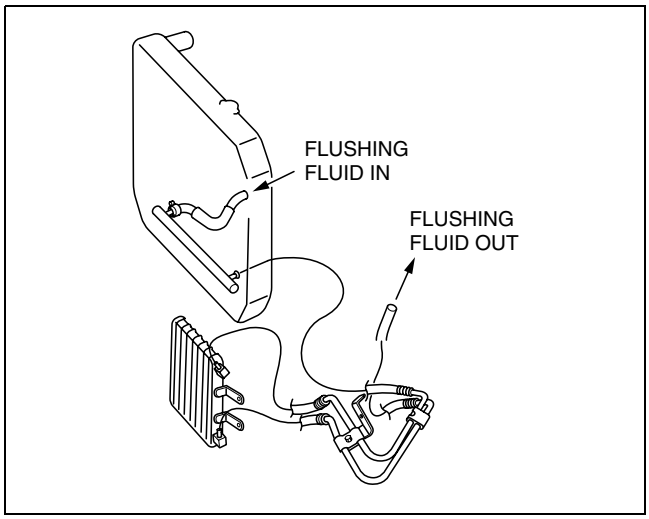
- **If the cooler can not be properly flushed using recommended equipment, send the radiator out for sublet cleaning or replace.**



BCF5610W041

Forward flushing

1. Connect power flushing equipment so the flushing fluid flows in the direction of normal fluid flow.
2. Flush oil cooler/lines until discharged fluid is clean.

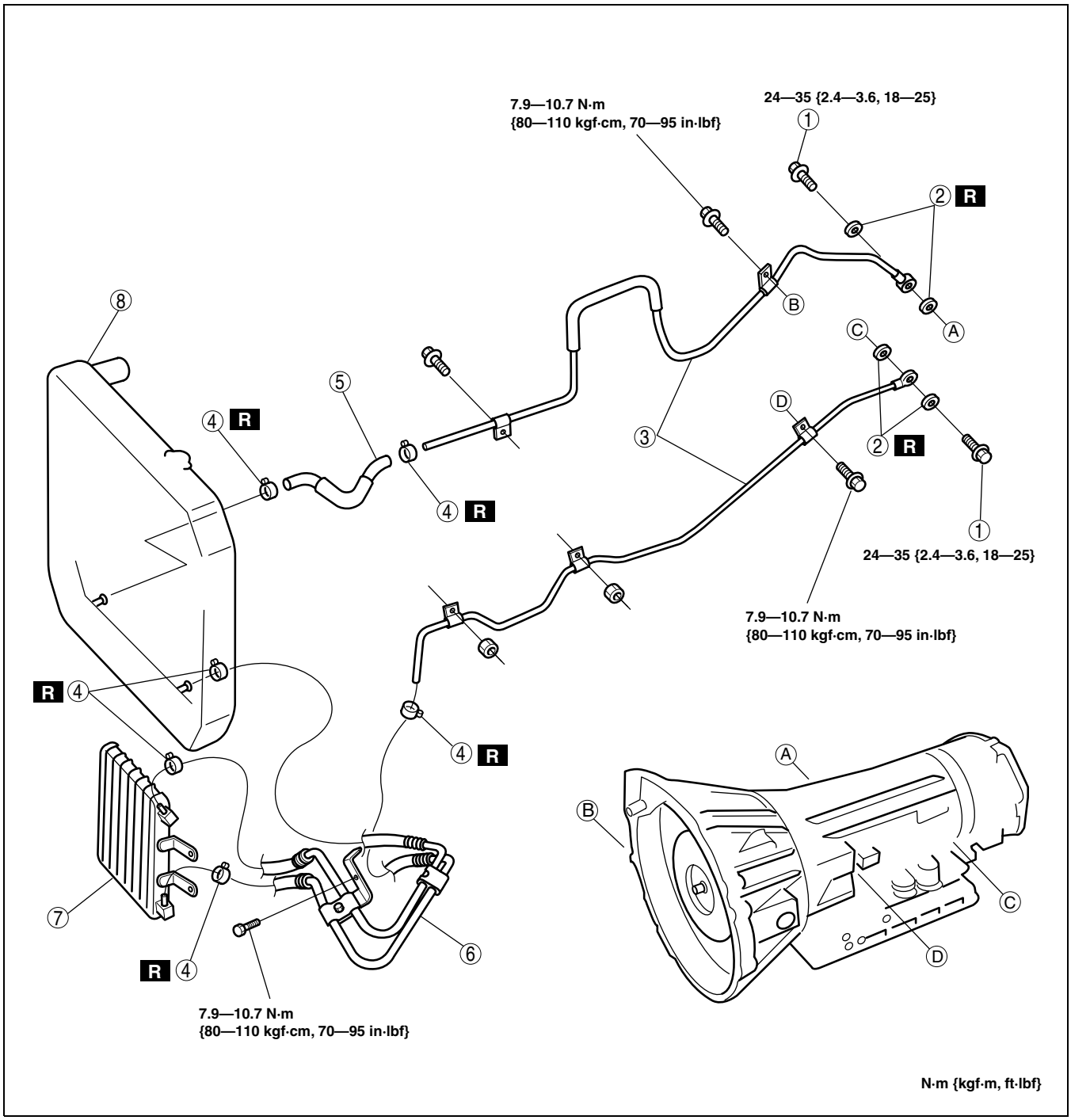


BCF5610W042

OIL COOLER REMOVAL/INSTALLATION

BVF561019900W04

1. Disconnect the negative battery cable.
2. Drain the ATF. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
3. Remove the front bumper.
4. Remove the under cover.
5. Remove the exhaust pipe.
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Install the exhaust pipe.
9. Install the under cover.
10. Install the front bumper.
11. Add ATF to the specified level. (See K1–53 AUTOMATIC TRANSMISSION FLUID (ATF) REPLACEMENT.)
12. Inspect for oil leakage from the oil pipes and oil hoses.
13. Inspect for coolant from the hoses.
14. Inspect the ATF level and condition. (See K1–52 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION.)
15. Perform the line pressure test. (See K1–46 Line Pressure Test.)
16. Perform the road test. (See K1–48 ROAD TEST.)



BCF5610W043

1	Connector bolt
2	Washer
3	Oil pipe (See K1–83 Oil Pipe, Hose clamp, Oil hose Installation Note.)
4	Hose clamp (See K1–83 Oil Pipe, Hose clamp, Oil hose Installation Note.)

5	Oil hose (See K1–83 Oil Pipe, Hose clamp, Oil hose Installation Note.)
6	Oil pipe, oil hose (See K1–83 Oil Pipe, Hose clamp, Oil hose Installation Note.)
7	Oil cooler
8	Radiator (in tank oil cooler) (See K1–83 Radiator (In Tank Oil Cooler) Installation Note.)

Radiator (In Tank Oil Cooler) Installation Note

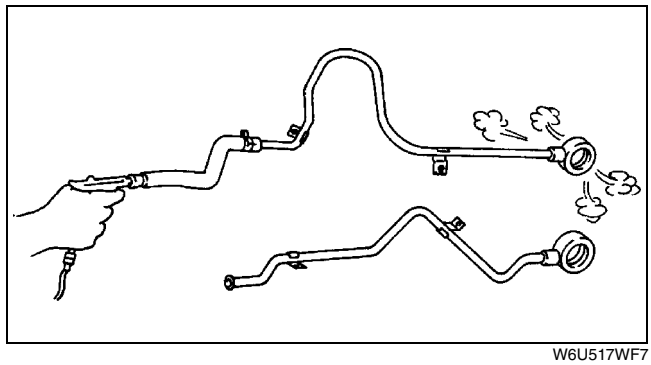
1. The automatic transmission oil cooler flushing must be performed whenever a transmission is removed for service because the existing fluid may be contaminated, and to prevent contamination of new fluid.

   Note
   - Flushing must be performed after installation of the overhauled or replaced transmission.

2. Follow the instructions in the manufacturer's publication for flushing operation.

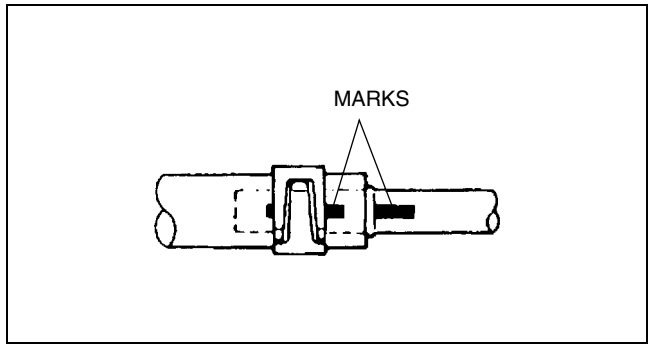
Oil Pipe, Hose clamp, Oil hose Installation Note

1. Apply compressed air to cooler-side opening, and blow any remaining grime and foreign material from the cooler pipes. Compressed air should be applied for **more than 1 min**.



W6U517WF7

2. Align the marks, and slide the oil hose onto the oil pipe until it is fully seated as shown.

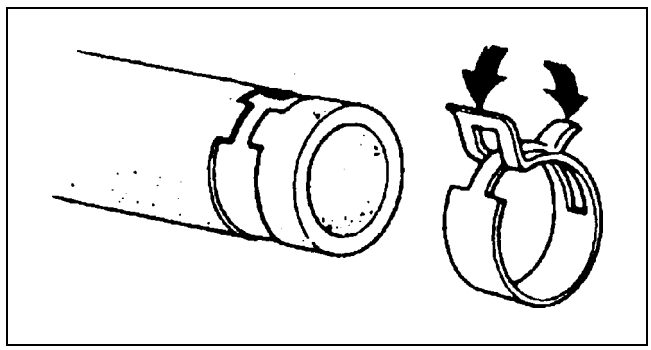


AEA5714W076

3. Install the hose clamp onto the hose.

   Note
   - If reusing the hose, install the new hose clamp exactly on the mark left by the previous hose clamp. Then apply force to the hose clamp in the direction of the arrow in order to fit the clamp in place.

4. Verify that the hose clamp does not interfere with any other components.

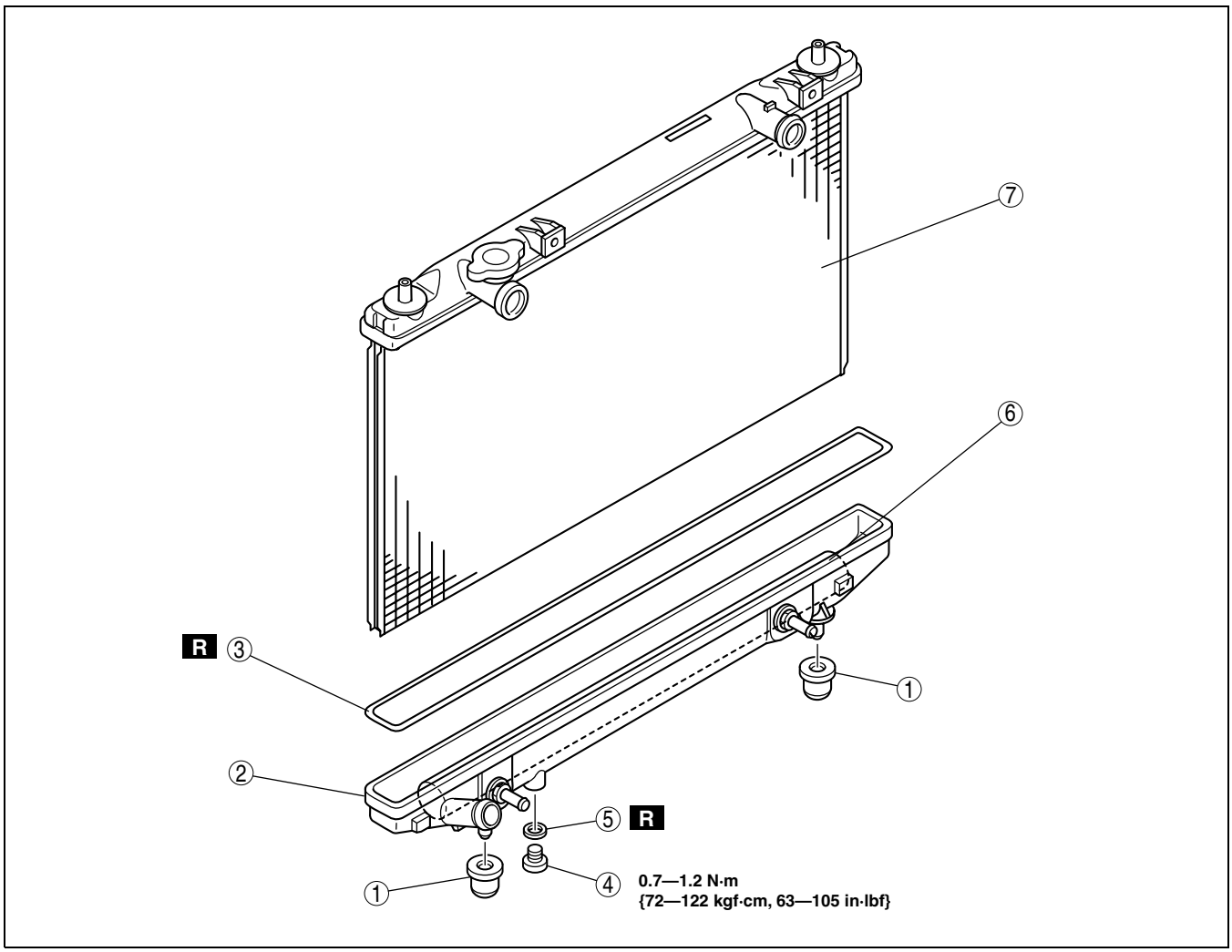


X3U517WC3

OIL COOLER DISASSEMBLY/ASSEMBLY

BVF561019900W05

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



BCF5610W048

1	Mount rubber
2	Radiator outer tank (in-tank oil cooler) (See K1–84 Radiator Outer Tank (In-Tank Oil Cooler) Disassembly Note.) (See K1–85 Radiator Outer Tank (In Tank Oil Cooler) Assembly Note.)
3	O-ring
4	Drain cock

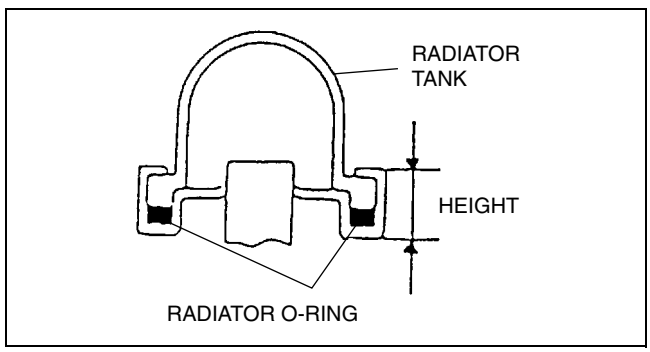
5	Packing
6	ATF cooler
7	Radiator

Radiator Outer Tank (In-Tank Oil Cooler) Disassembly Note

1. Inspect the height of the header tabs.
2. Insert the end of a medium tip screwdriver between the end of the header tab and the outer tank.

Note

- Do not open more tabs than necessary for tank removal.

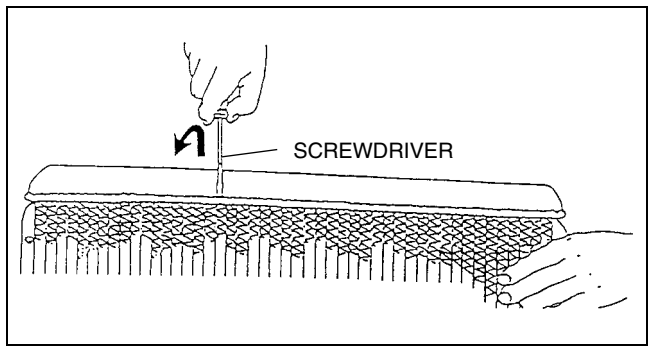


AEA5714W079

3. Pivot the screwdriver to pry the tab away from the tank and repeat the procedure for each tab.

Note
- If any header tabs are missing from the core, replace the radiator.

4. Remove the radiator outer tank and O-ring (gasket) from the core header when all of the tabs are opened.
5. Inspect the gasket surface of the radiator core header to ensure it is clean and free of foreign material or damage.
6. Inspect the radiator outer tank for warping. If it is warped, replace the radiator tank.



AEA5714W080

Radiator Outer Tank (In Tank Oil Cooler) Assembly Note

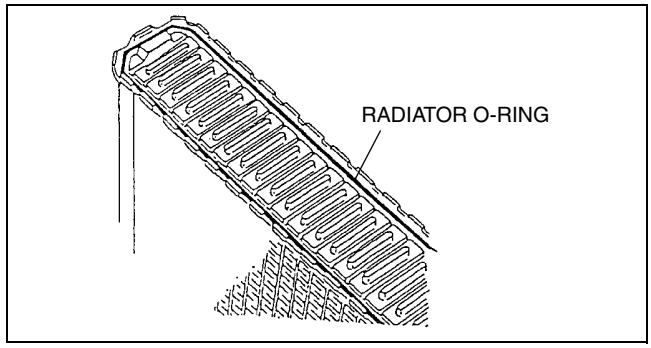
1. Install a new O-ring and ensure it is not twisted.

Note
- The old O-ring must be replaced.

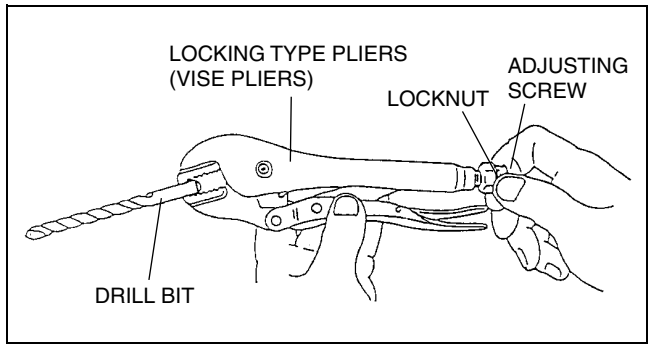
2. Position the radiator tank in the original direction to the core using care not to scratch the tank sealing surface with the header tabs.

Note
- Step 3 will set jaw opening to the correct specification.

3. With the jaws of locking-type pliers (vise grips) closed and locked, turn the adjusting screw to position the jaws against the drill bit with the diameter measured (height) in removal procedure 1. Tighten the lock nut on the adjusting screw against the handle to lock the adjustment in place.

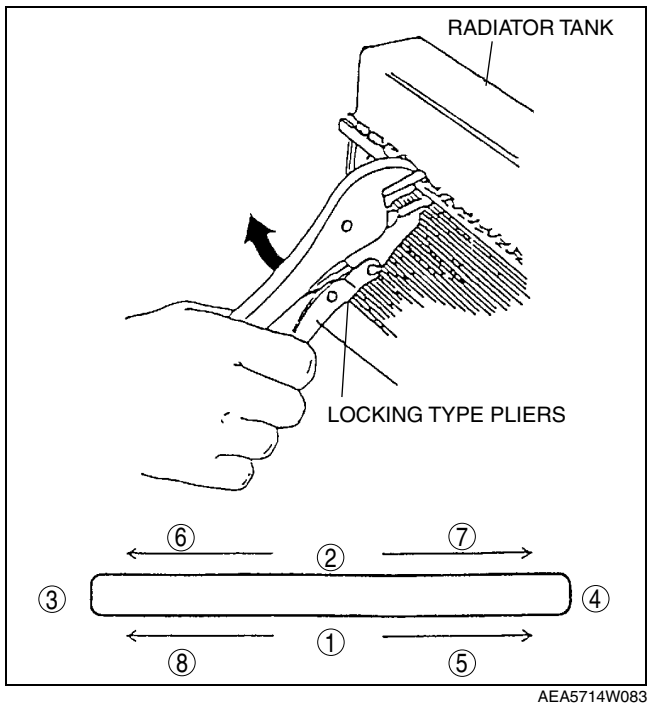


AEA5714W081



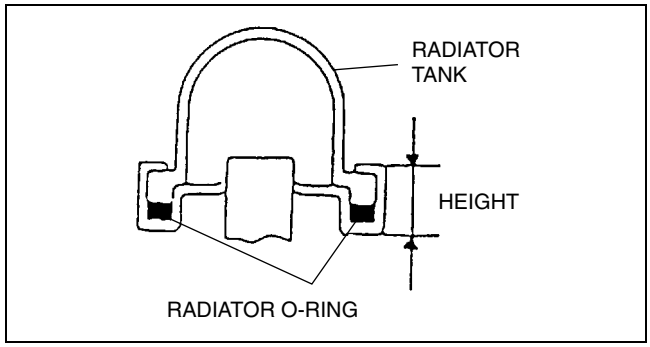
AEA5714W082

4. Squeeze the header tabs down in the order as shown in the figure against the lip of the radiator outer tank base with the locking-type pliers while rotating the pliers toward the tank.



AEA5714W083

5. Verify that the height of the header tabs is same as the height before removal.
6. Inspect for leakage from radiator.

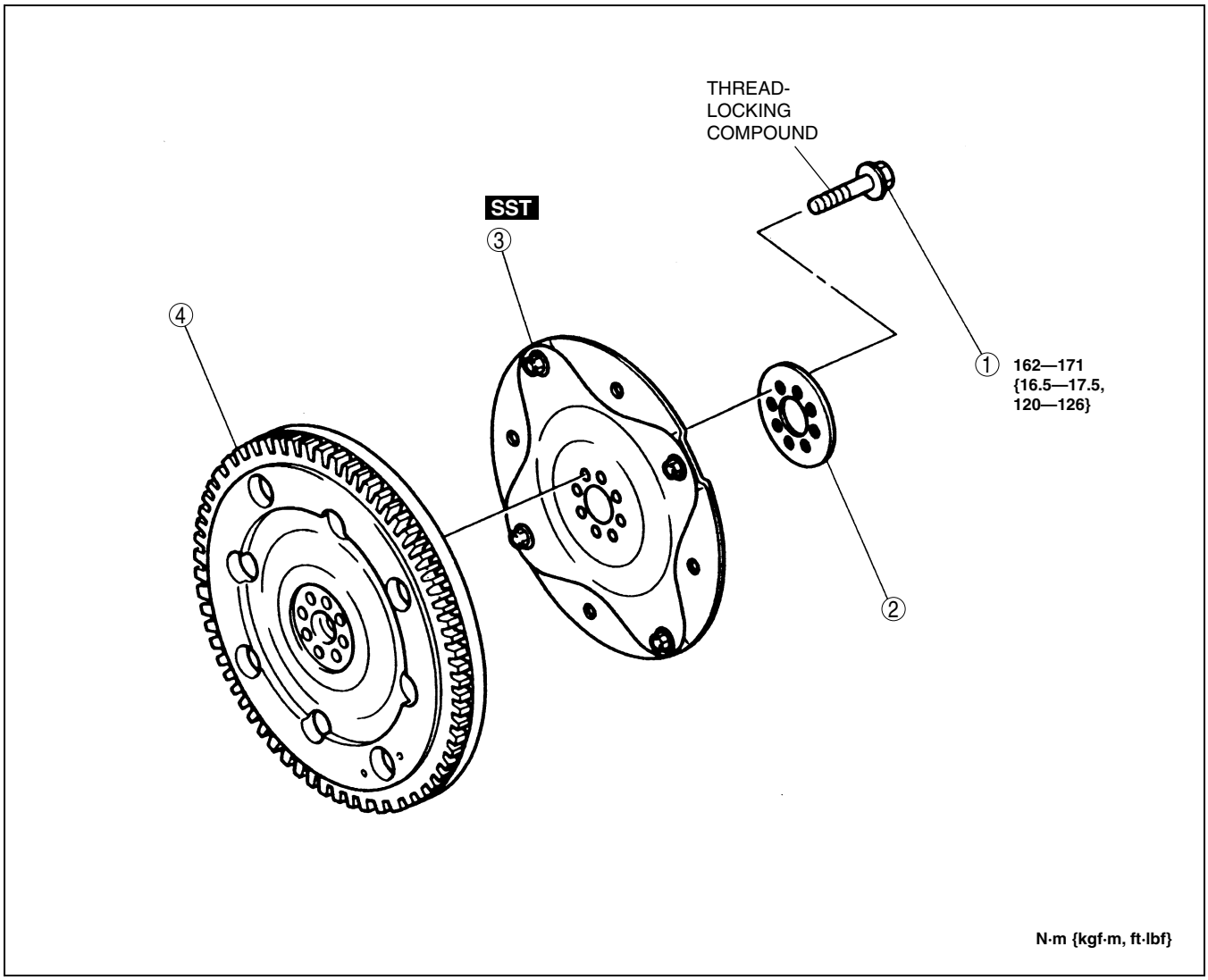


AEA5714W079

DRIVE PLATE REMOVAL/INSTALLATION

BVF561019020W01

1. Remove the transmission (See K1–69 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



BCF5610W044

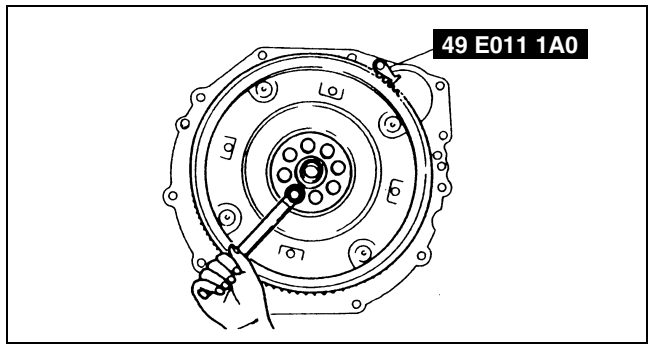
1	Bolt
2	Backing plate

3	Drive plate (See K1–87 Drive Plate Removal Note.)
4	Flywheel (See K1–88 Flywheel Installation Note.)

Drive Plate Removal Note

Caution
- **Do not disassembly the drive plate.**

1. Set the **SST** against the flywheel.
2. Remove the bolts, drive plate and the flywheel.



BCF5610W045

Flywheel Installation Note

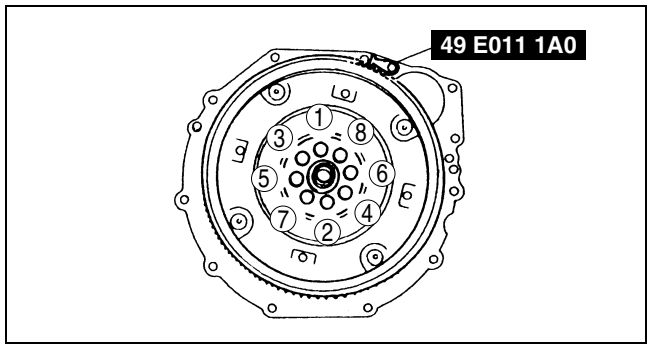
1. Install the flywheel and the drive plate to the crankshaft.
2. When reusing the bolts, clean threads and hole, then apply locking compound to the threads.

Note

- No locking compound is needed when using new bolts.

3. Hand-tighten the bolts.
4. Install the **SST** to the flywheel.
5. Tighten the drive plate mounting bolts in two or three steps in the order as shown in the figure.

Tightening torque
176—187 N·m {18—19 kgf·m, 130—137 ft·lbf}



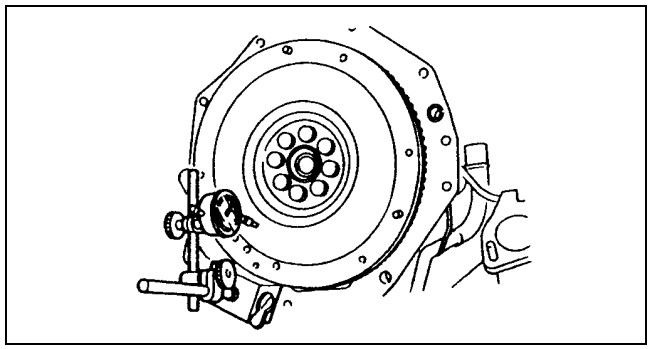
BCF5610W046

FLYWHEEL INSPECTION

BVF561011500W01

1. Install a dial gauge on the cylinder block.
2. Measure the flywheel runout using a dial indicator.
   - If it exceeds the maximum specification, replace the flywheel.

Maximum runout
0.2 mm {0.008 in}



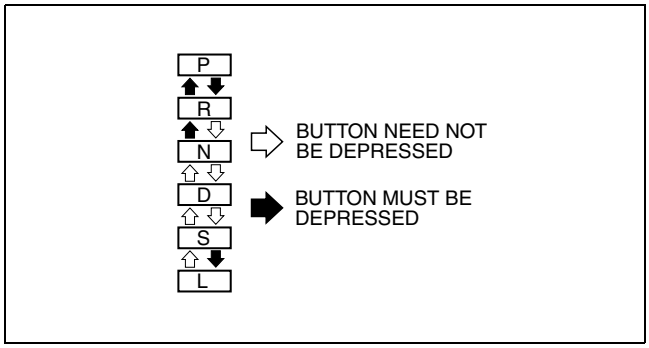
BCF5610W047

AUTOMATIC TRANSMISSION SHIFT MECHANISM

SELECTOR LEVER INSPECTION

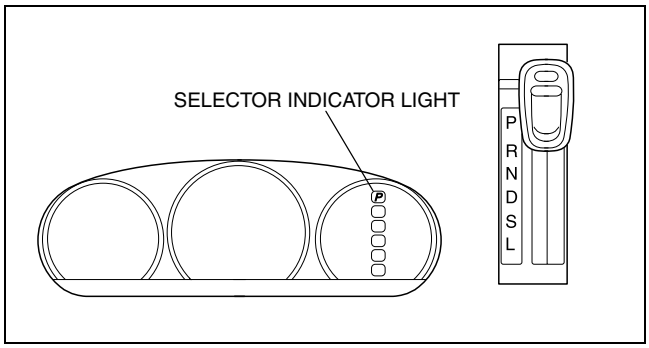
BVF561246102W01

1. Turn the engine switch to the ON position (engine OFF).
2. With the brake pedal depressed, verify that there is a “click” at each range when shifted.
3. Verify that the selector lever can be shifted.
4. Verify that there is a “click” at each position when shifted from the P position to the L range.



A6E5616W002

5. Verify that the positions of the selector lever and the indicator are aligned.
   - If there is any malfunction, adjust the TR switch. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.)
6. Verify that the vehicle operates in each selected range.



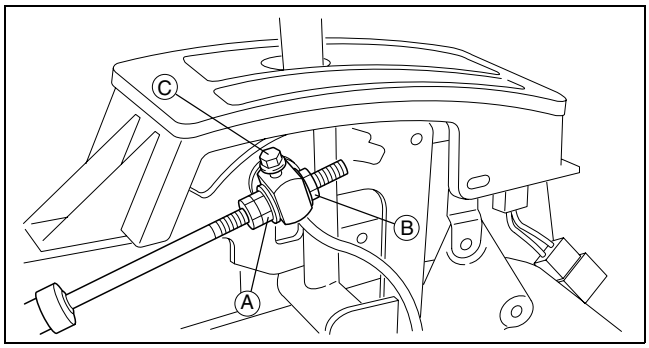
BCF5610W009

SELECTOR LEVER ADJUSTMENT

BVF561246102W02

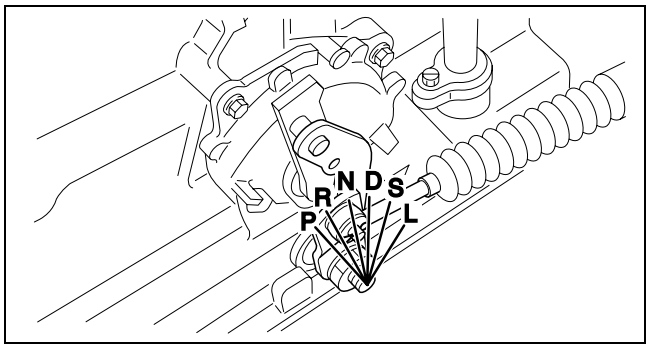
Selector Lever Position

1. Disconnect the negative battery cable.
2. Remove the shift lever knob, selector lever knob and console.
3. Loosen the locknut A, locknut B and locknut C.



BCF5712W001

4. Rotate the manual shaft to the P position.



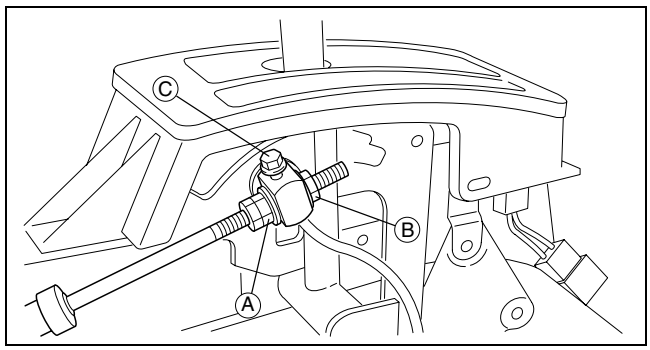
BCF5712W002

5. Press the selector lever forward with **40—98 N {4—10 kgf, 9—22 lbf}**, tighten lockbolt C while maintaining force.

   Tightening torque
   7.9—10.7 N·m {80—110 kgf·cm, 70—95 in·lbf}

6. Turn locknut A by hand until it contacts the spacer.
7. Tighten the locknut B.

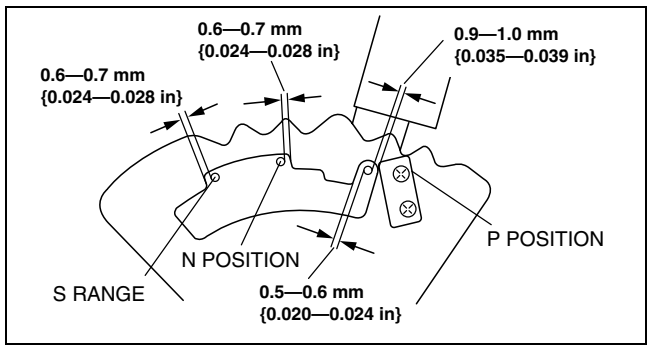
   Tightening torque
   7.9—10.7 N·m {80—110 kgf·cm, 70—95 in·lbf}



BCF5712W001

8. While in P range and slightly pressing the push rod forward, verify that the gap between the guide plate and guide pin is as shown in the figure.
9. Verify that the gap between the guide plate and guide pin is the same at both the N and S ranges.
   - If there is any malfunction, readjust the selector lever.
10. Install the console.
11. Apply a thread-locking compound to the selector lever knob screw and tighten.

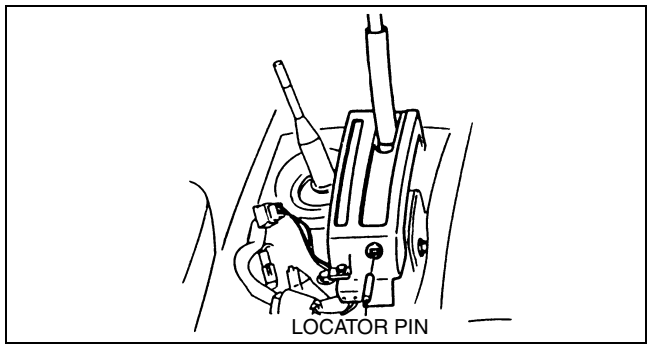
    Tightening torque
    1.5—2.9 N·m {15—30 kgf·cm, 13—26 in·lbf}



BCF5712W003

Indicator Panel

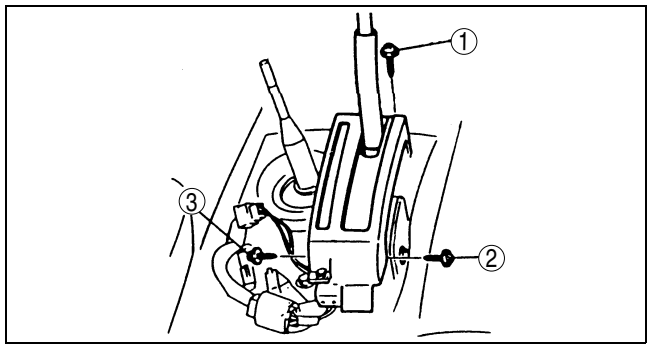
1. Remove the shift lever knob, selector lever knob and console.
2. Shift the selector lever to P position.
3. Loosen the indicator screw.
4. Align the slider groove with the indicator panel hole. Install the locator pin to fix the slider.



BCF5712W004

5. Tighten the screw in the order as shown in the figure.
6. Remove the locator pin.
7. Verify that the positions of the selector lever and the indicator are aligned.
8. Install the console.
9. Apply a thread-locking compound to the selector lever knob component installation screw and tighten.

   Tightening torque
   1.5—2.9 N·m {15—30 kgf·cm, 13—26 in·lbf}

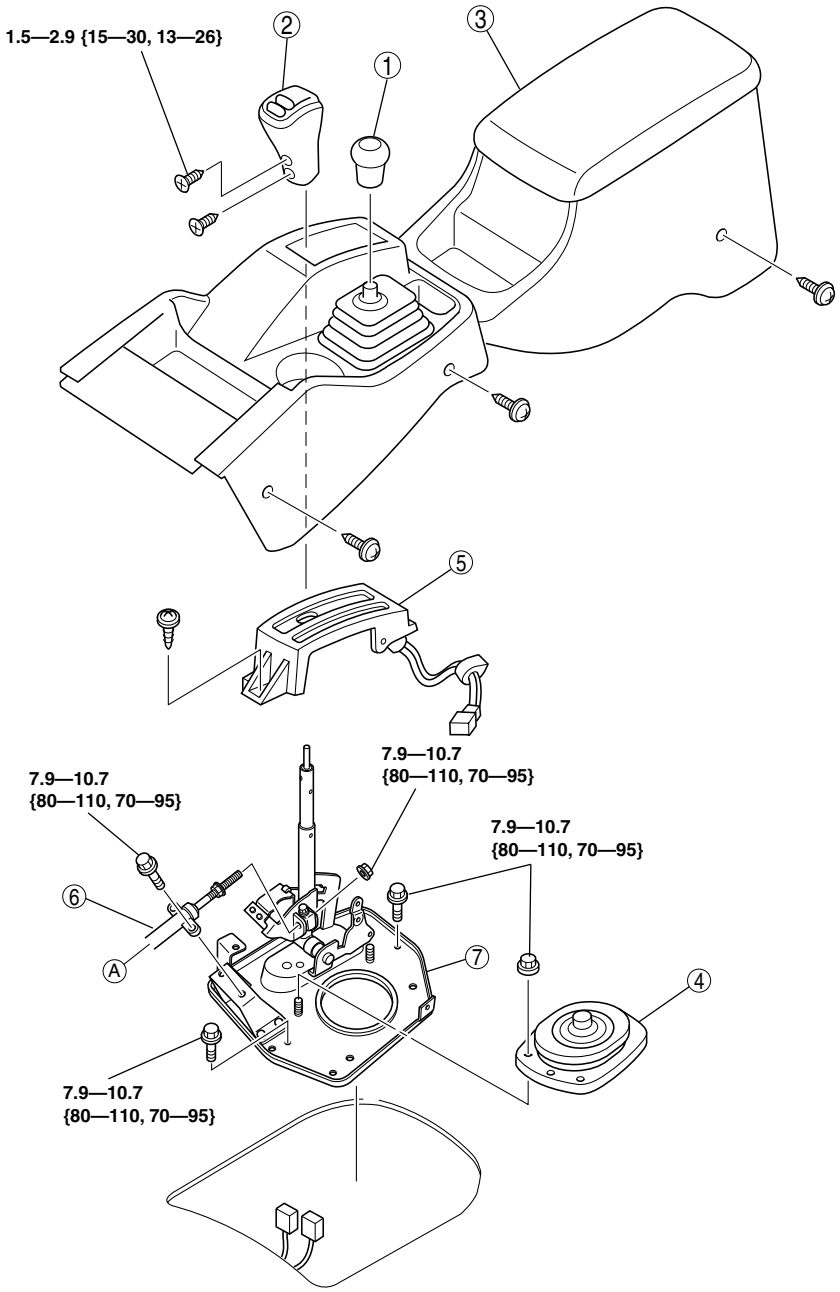


BCF5712W005

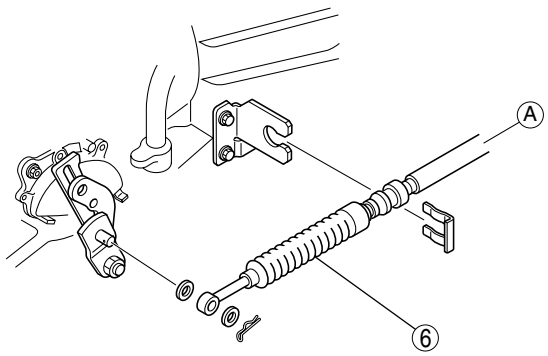
SELECTOR LEVER REMOVAL/INSTALLATION

BVF561246102W03

1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



TRANSMISSION SIDE



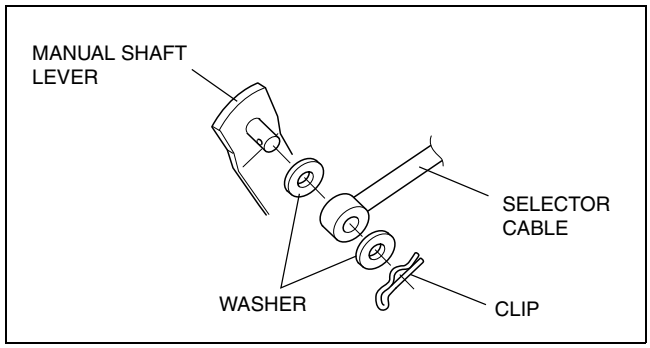
N·m {kgf·cm, in·lbf}

BCF5712W006

1	Shift lever knob
2	Selector lever knob component
3	Console
4	Insulator plate, boot (See K1–93 Insulator Plate, Boot Installation Note.)
5	Indicator panel (See K1–93 Indicator Panel Installation Note.)
6	Selector cable (See K1–92 Selector Cable Removal Note.) (See K1–92 Selector Cable Installation Note.)
7	Selector lever

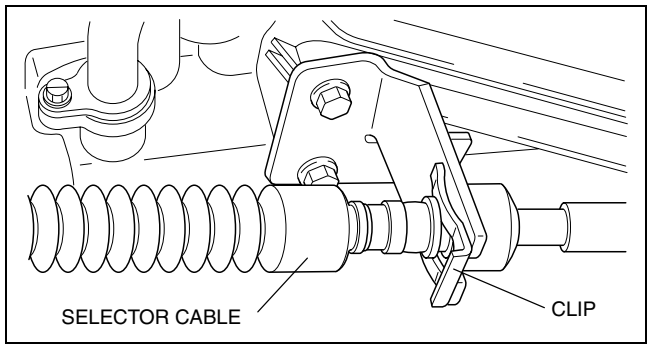
Selector Cable Removal Note

1. Remove the clip and washer.



BCF5610W027

2. Remove the clip.
3. Remove the selector cable.



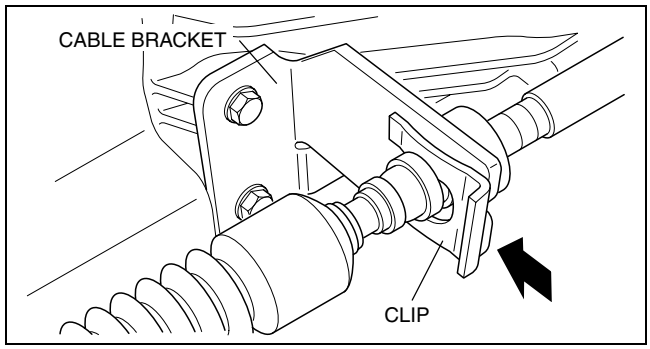
BCF5610W028

Selector Cable Installation Note

1. Install the selector cable to the cable bracket securely.
2. Install the clip to the cable bracket securely as shown in the figure.

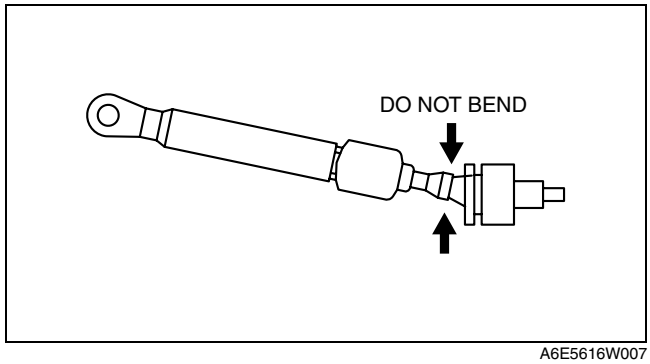
Caution

- **Bending the selector cable in the manner as shown in the figure will damage the cable and it may become loose when shifted.**
  when installing the selector cable, hold it straight.



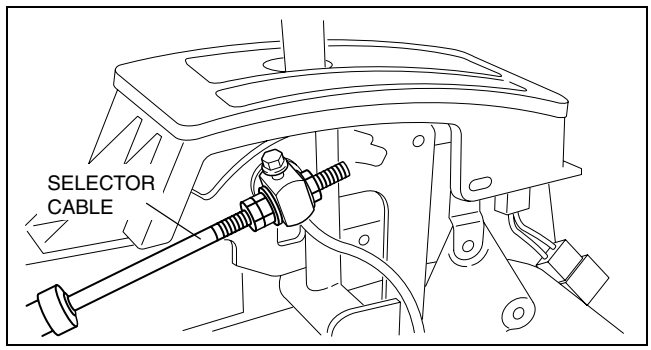
BCF5610W031

3. Install the selector cable to the manual shaft lever in such a way that the selector cable does not bear load.
4. Confirm that the end of the manual shaft lever sticks out of the end of the selector cable.



A6E5616W007

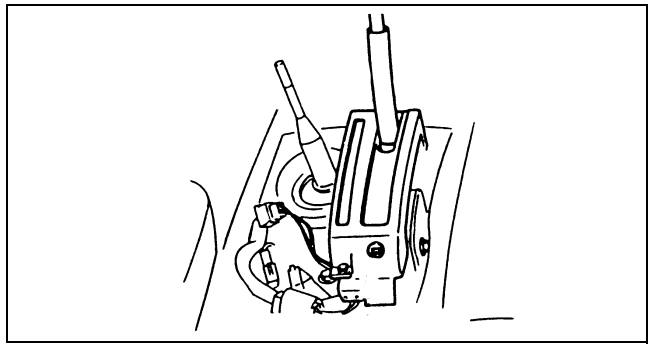
5. Install the selector cable to selector lever as shown in the figure.
6. Adjust the selector lever position. (See K1–89 Selector Lever Position.)



BCF5712W021

Indicator Panel Installation Note

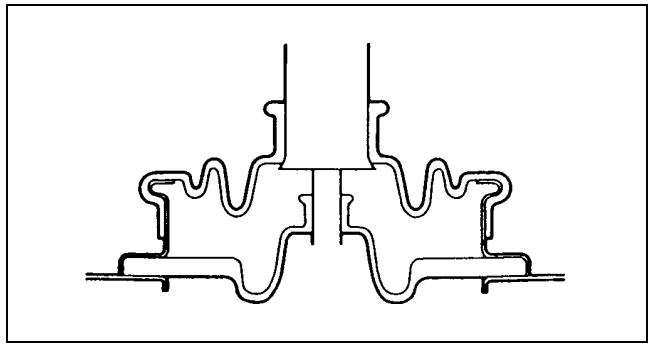
1. Install the indicator panel.
2. Adjust the indicator panel. (See K1–90 Indicator Panel.)



BCF5712W020

Insulator Plate, Boot Installation Note

1. Install the insulator plate and boot as shown in the figure.

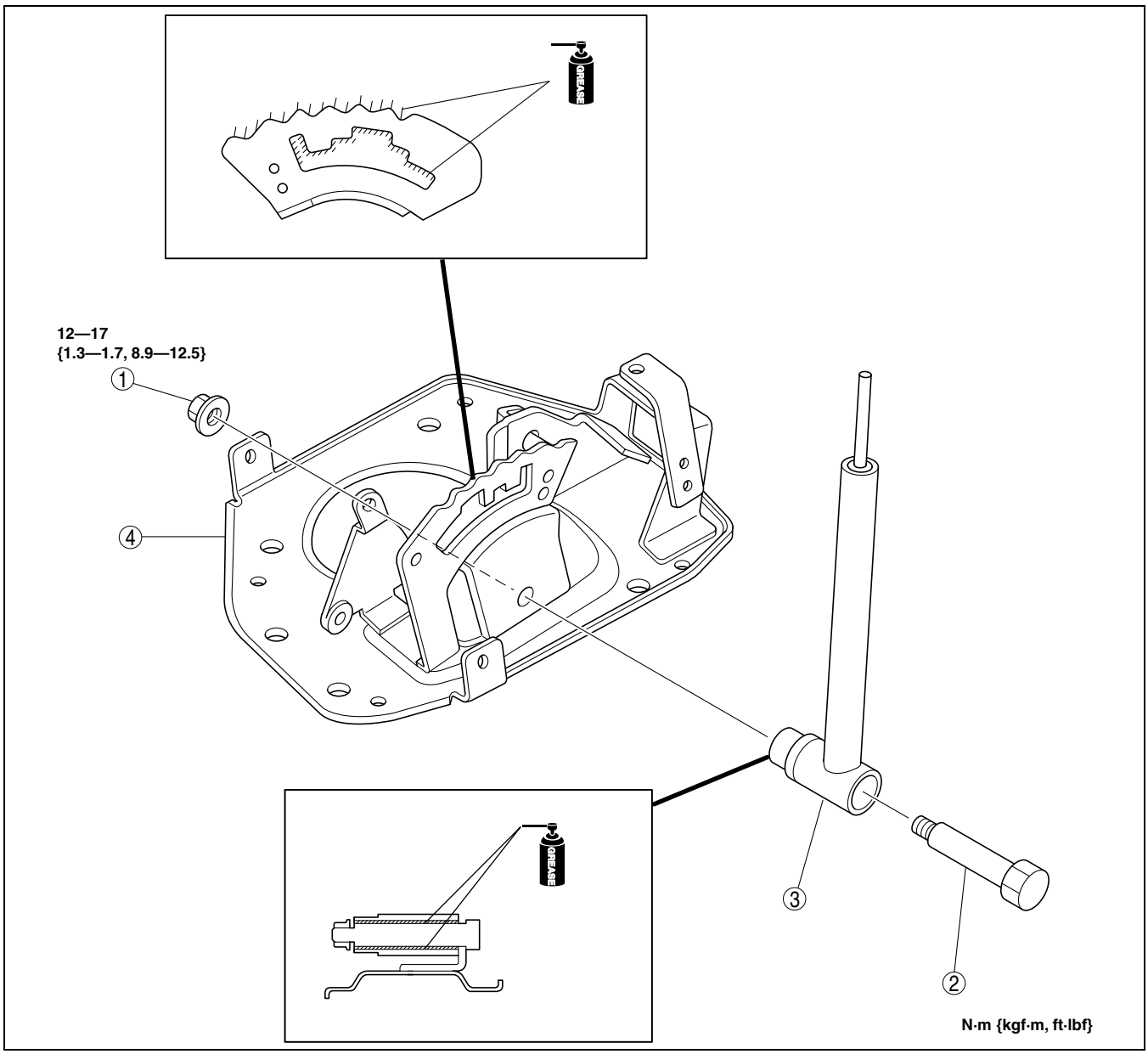


BCF5712W008

SELECTOR LEVER DISASSEMBLY/ASSEMBLY

BVF561246102W04

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



BCF5712W007

1	Nut
2	Spindle

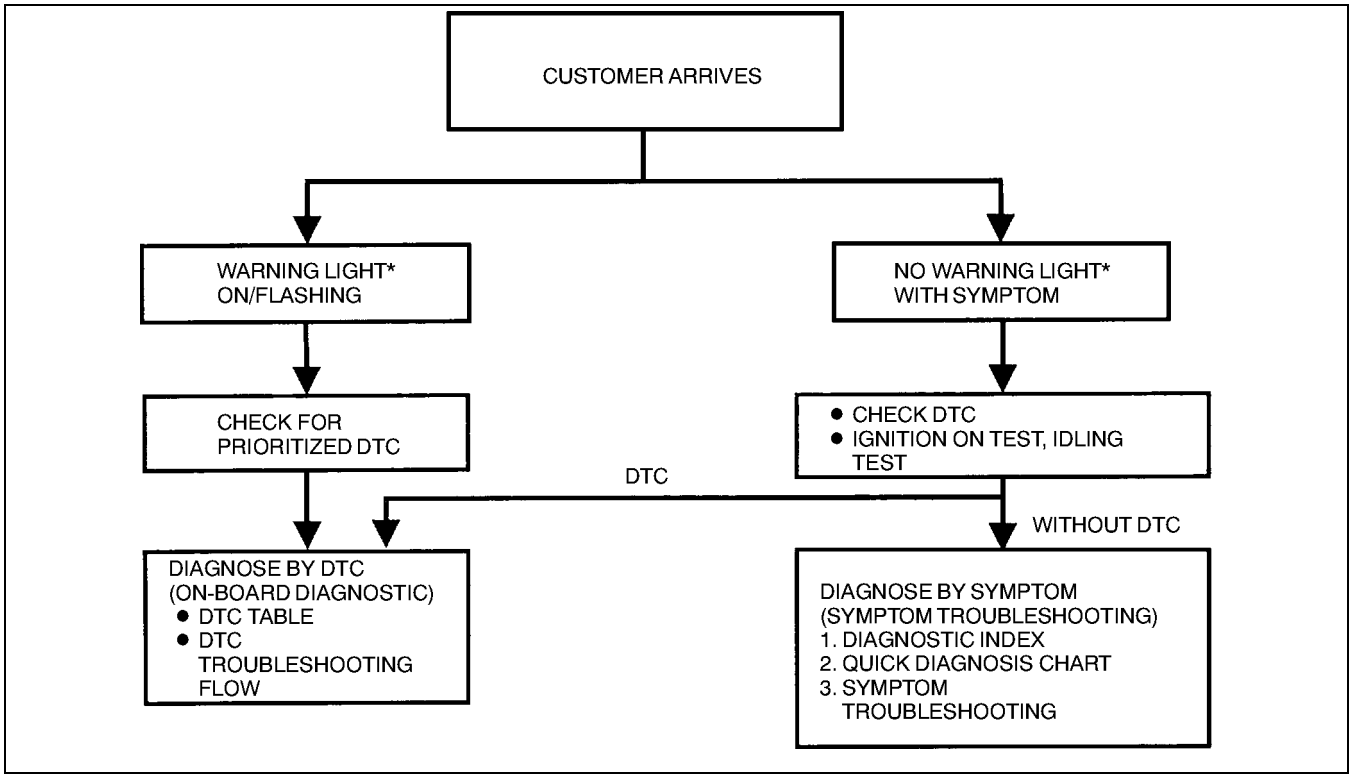
3	Rod component
4	Selector lever

ON-BOARD DIAGNOSTIC

FOREWORD

BVF567018901W01

- When the customer reports vehicle malfunction, check the HOLD indicator light flash, and diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
  - — If the DTC exists, diagnose the applicable DTC inspection. (See K1–97 DTC TABLE.)
  - — If the DTC does not exist, the HOLD indicator light does not flashes, diagnose the applicable symptom troubleshooting. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)



YMU102WBX

*: HOLD Indicator light

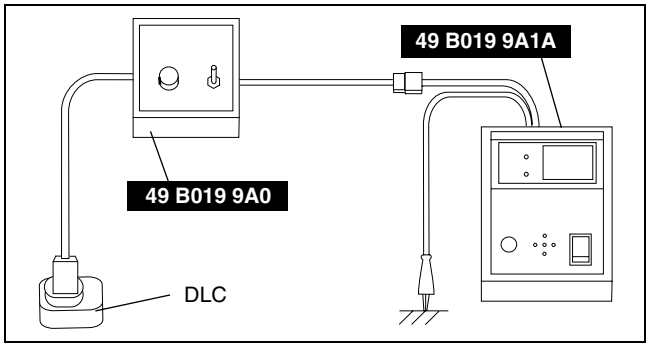
AUTOMATIC TRANSMISSION ON-BOARD DIAGNOSTIC FUNCTION

BVF567018901W02

DTC Reading Procedure

Using the SST (self-diagnosis checker)

1. Connect the **SSTs** to the DLC located in the engine compartment and GND the black (negative) lead to the body.
2. Set the select switch on the **SST** (self-diagnosis checker) to A.
3. Turn the dial switch on the **SST** (system selector) to 2, and the test switch to SELF TEST.
4. Turn the engine switch to the ON position.
5. Verify that the buzzer sounds for approximately **3 s** and code “88” flashes for **5 s**. If DTC is not detected, “00” will then be indicated.



BCF5713W999

Note

- If the “88” does not flash, inspect B+ terminal of the DLC, and the related harnesses and connectors.
- If the “88” flashes and the buzzer sound more than **20 s**, inspect the harness between the TCM terminal and the DLC. If the harness is normal, replace the TCM and re-inspect.

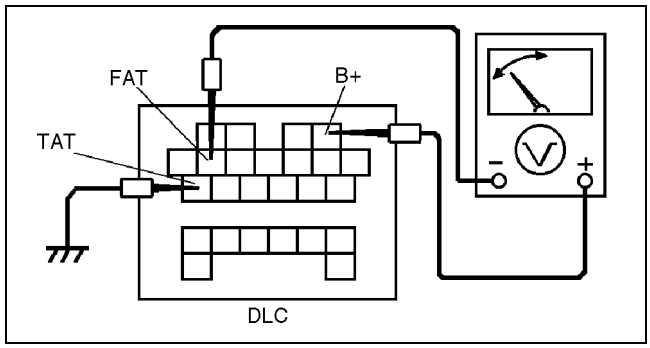
6. If any DTC is indicated, inspect the appropriate area and repair as necessary.
7. After completion of repairs, erase all DTC from the memory. (See K1–96 AFTER REPAIR PROCEDURE.)
8. Remove the **SSTs**

Using the HOLD indicator light

1. Turn the ignition switch off.

Caution
- **Connecting to the wrong DLC terminal may cause a malfunction. Carefully connect only to the specified terminal.**

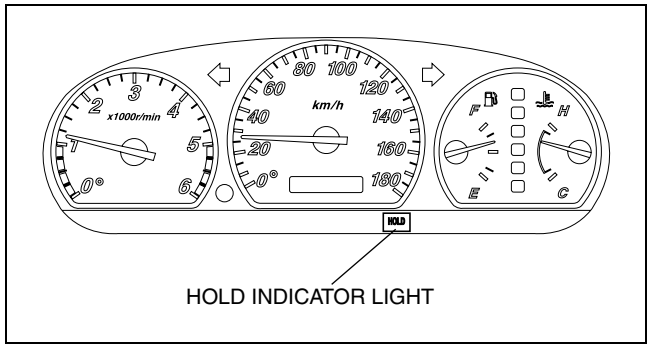
2. Connect the DLC located in the engine compartment terminal TAT and ground using a jumper wire.
3. Turn the ignition switch to the ON position.



BVF0502W999

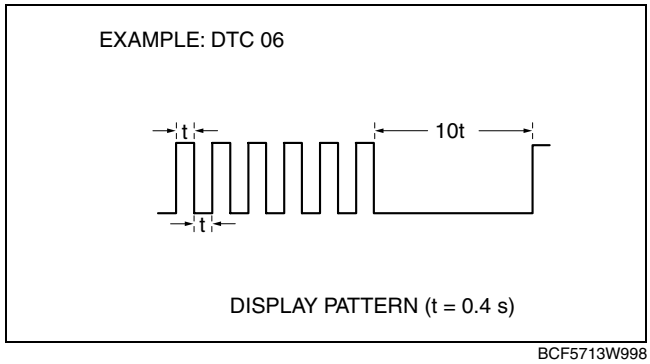
4. The HOLD indicator light illuminates for **approximately 3 s**, then indicates DTC.
5. Read the DTC indicated by the flashes of the HOLD indicator light. If DTC is not detected, the HOLD indicator light does not flash.

Note
- Code No. indication by the HOLD indicator light is as shown.



BVF5713W997

6. If any DTCs is indicated, inspect the appropriate area and repair as necessary.
7. After completion of repairs, erase all DTC from the memory. (See K1–96 AFTER REPAIR PROCEDURE.)
8. Remove the voltmeter and jumper wire.



BCF5713W998

AFTER REPAIR PROCEDURE

BVF567018901W03

1. Cancel the memory of DTC by disconnecting the negative battery cable for at least **20 s** and the brake pedal is depressed.
2. Reconnect the negative battery cable.
3. Remove the **SST (Self-diagnosis checker)** if connected.
4. Drive the vehicle at **50 km/h {34 mph}**, and depress the accelerator pedal fully to activate kickdown.
5. Gradually slow down and stop the vehicle.
6. Make sure that the repaired DTC does not recur.

ON-BOARD DIAGNOSTIC

DTC TABLE

BVF567018901W04

X: Applicable

DTC No.	Condition	HOLD indicator light flashes	Memory function	Page
01	NE sensor circuit malfunction	YES	X	(See K1–98 DTC 01)
06	Output speed sensor circuit malfunction	YES	X	(See K1–100 DTC 06)
07	Vehicle speedometer circuit malfunction	YES	X	(See K1–102 DTC 07)
09	Engine coolant temperature (ECT) sensor circuit malfunction	YES	X	(See K1–104 DTC 09)
12	Accelerator position sensor circuit malfunction *1 Control lever position sensor circuit malfunction *2	YES	X	(See K1–106 DTC 12)
56	Transmission fluid temperature (TFT) sensor circuit malfunction	NO	X	(See K1–108 DTC 56)
60	Shift solenoid A circuit malfunction	YES	X	(See K1–110 DTC 60)
61	Shift solenoid B circuit malfunction	YES	X	(See K1–112 DTC 61)
62	Overrunning clutch solenoid circuit malfunction	YES	X	(See K1–114 DTC 62)
63	Torque converter clutch (TCC) solenoid circuit malfunction	YES	X	(See K1–116 DTC 63)
64	Pressure control solenoid circuit malfunction	YES	X	(See K1–118 DTC 64)

*1 : WL Turbo Stage-III
*2 : Except WL Turbo Stage-III

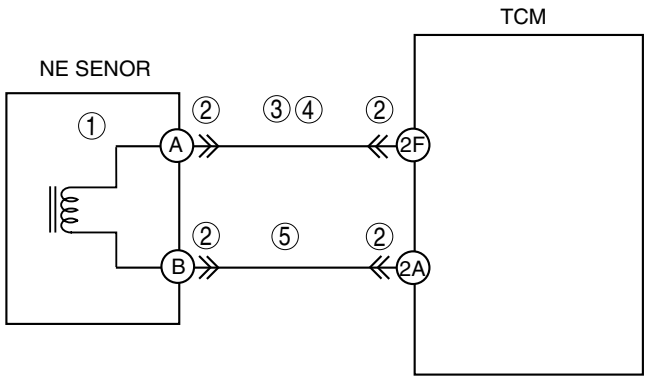
Note

- When there is more than one malfunction, each DTC is displayed one time in numerical order starting from the lowest number.
- When there are no more DTC to display, the first one will be displayed.

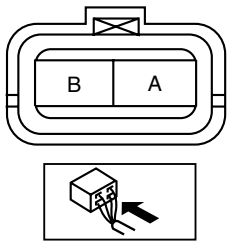
DTC 01

BVF567018901W05

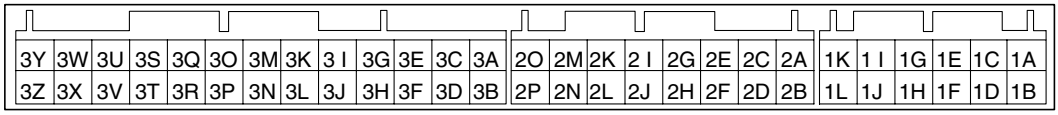
DTC 01	NE sensor circuit malfunction
DETECTION CONDITION	• Signal from NE sensor is not input to TCM when engine running. **Diagnostic support note:** • HOLD indicator light flash. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between NE sensor terminal A and TCM terminal 2F • Short to ground between NE sensor terminal A and TCM terminal 2F • Open circuit between NE sensor terminal B and TCM terminal 2A • Damaged connectors between NE sensor and TCM • NE sensor malfunction • TCM malfunction

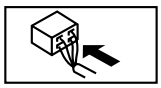


NE SENSOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR





Diagnostic procedure

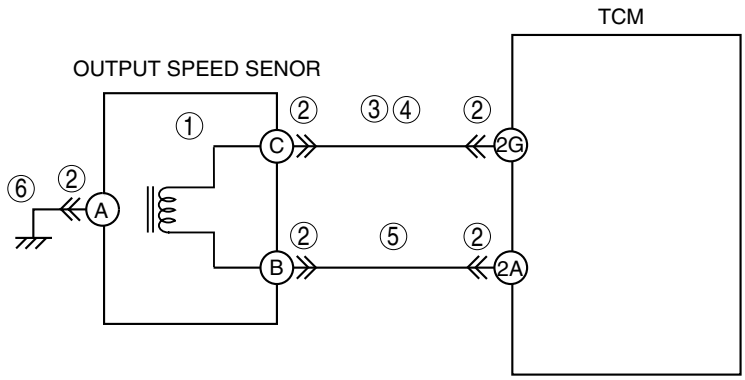
STEP	INSPECTION		ACTION
1	**INSPECT NE SENSOR** • Inspect NE sensor. (See Section F2.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace NE sensor, then go to Step 7.
2	**INSPECT NE SENSOR CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect NE sensor connector and TCM connector. • Check connection of NE sensor connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are NE sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace NE sensor, then go to Step 6. (See Section F2.)

STEP	INSPECTION		ACTION
3	**INSPECT NE SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that NE sensor connector and TCM connector are disconnected. • Check continuity between NE sensor connector terminal A and TCM connector terminal 2F. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 6.
4	**INSPECT NE SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that NE sensor connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 2F and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 6.
		No	Go to next step.
5	**INSPECT NE SENSOR GROUND CIRCUIT FOR OPEN** • Verify that NE sensor connector and TCM connector are disconnected. • Check continuity between NE sensor connector terminal B and TCM terminal 2A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 6.
6	**VERIFY TROUBLESHOOTING OF DTC 01 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

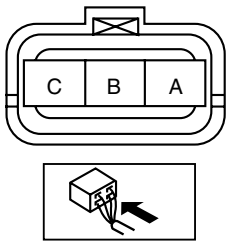
DTC 06

BVF567018901W06

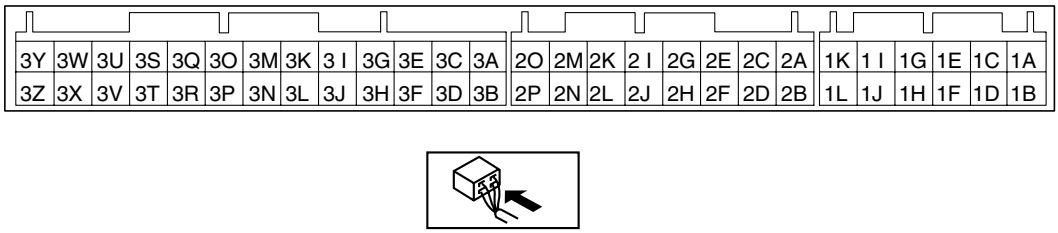
DTC 06	Output speed sensor circuit malfunction
DETECTION CONDITION	• Signal from output speed sensor is not input to TCM when vehicle moving. **Diagnostic support note:** • HOLD indicator light flash. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between output speed sensor terminal C and TCM terminal 2G • Short to ground between output speed sensor terminal C and TCM terminal 2G • Open circuit between output speed sensor terminal B and TCM terminal 2A • Open circuit between output speed sensor terminal A and body ground • Output speed sensor malfunction • TCM malfunction



OUTPUT SPEED SENSOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



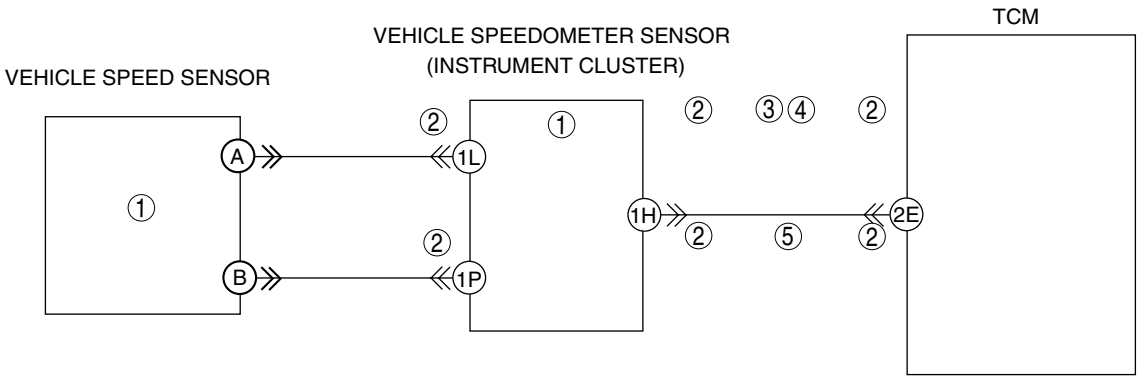
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT OUTPUT SPEED SENSOR** • Inspect output speed sensor. (See K1–59 OUTPUT SPEED SENSOR INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace output speed sensor, then go to Step 8.
2	**INSPECT OUTPUT SPEED SENSOR CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect output speed sensor connector and TCM connector. • Check connection of output speed sensor connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace output speed sensor, then go to Step 7. (See K1–60 OUTPUT SPEED SENSOR REMOVAL/ INSTALLATION.)
3	**INSPECT OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that output speed sensor connector and TCM connector are disconnected. • Check continuity between output speed sensor connector terminal A and TCM connector terminal 2G. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 7.
4	**INSPECT OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that output speed sensor connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 2G and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 7.
		No	Go to next step.
5	**INSPECT OUTPUT SPEED SENSOR GROUND CIRCUIT FOR OPEN** • Verify that output speed sensor connector and TCM connector are disconnected. • Check continuity between output speed sensor connector terminal B and TCM terminal 2A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 7.
6	**INSPECT OUTPUT SPEED SENSOR GROUND FOR OPEN** • Verify that output speed sensor connector is disconnected. • Check continuity between output speed sensor connector terminal C and body ground. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 7.
7	**VERIFY TROUBLESHOOTING OF DTC 06 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

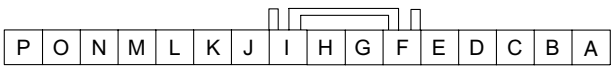
DTC 07

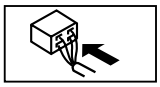
BVF567018901W07

DTC 07	Vehicle speedometer sensor circuit malfunction
DETECTION CONDITION	• Signal from vehicle speedometer sensor is not input to TCM when vehicle moving. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Vehicle speedometer sensor malfunction • Short to ground between instrument cluster connector terminal 1H and TCM terminal 2E • Open circuit between instrument cluster connector terminal 1H and TCM terminal 2E • Damaged connectors between vehicle speedometer sensor and TCM • Vehicle speed sensor malfunction • TCM malfunction

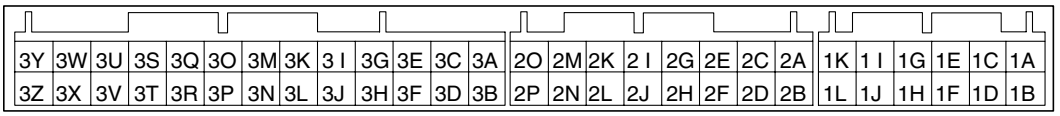


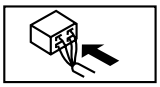
INSTRUMENT CLUSTER HARNESS SIDE CONNECTOR (16 PIN)





TCM HARNESS SIDE CONNECTOR





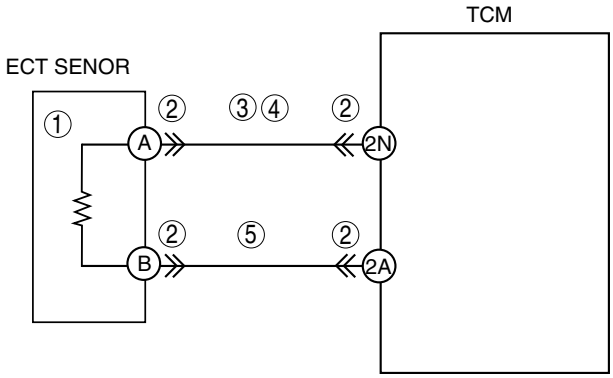
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT VEHICLE SPEEDOMETER SENSOR** • Inspect speedometer. (See Section T.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace speedometer, then go to Step 6.
2	**INSPECT INSTRUMENT CLUSTER CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect instrument cluster connector (16 pin) and TCM connector. • Check connection of instrument cluster connector (16 pin) and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are instrument cluster and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace instrument cluster, then go to Step 5. (See Section T.)
3	**INSPECT VEHICLE SPEEDOMETER SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that instrument cluster connector (16 pin) and TCM connector are disconnected. • Check continuity between instrument cluster connector (16 pin) connector terminal 1H and TCM connector terminal 2E. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 5.
4	**INSPECT VEHICLE SPEEDOMETER SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that instrument cluster connector (16 pin) connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 2E and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC 07 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

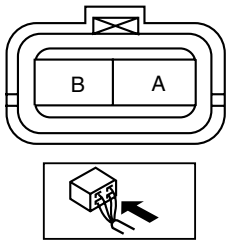
DTC 09

BVF567018901W08

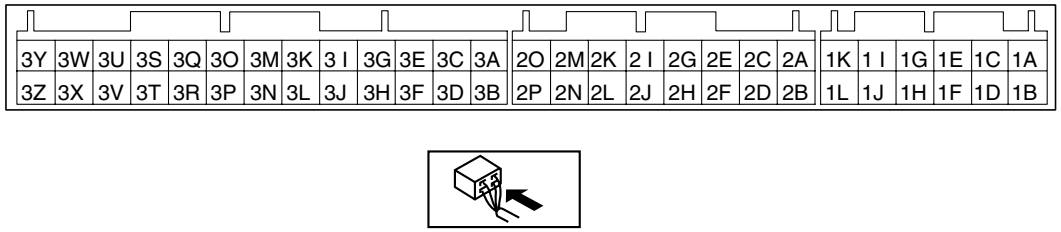
DTC 09	Engine coolant temperature (ECT) sensor circuit malfunction
DETECTION CONDITION	• Signal from ECT sensor is not input to TCM. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between ECT sensor terminal A and TCM terminal 2N • Short to ground between ECT sensor terminal A and TCM terminal 2N • Open circuit between ECT sensor terminal B and TCM terminal 2A • ECT sensor malfunction • TCM malfunction



ECT SENSOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ECT SENSOR** • Inspect ECT sensor. (See section F2.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace ECT sensor, then go to Step 7.
2	**INSPECT ECT SENSOR CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect ECT sensor connector and TCM connector. • Check connection of ECT sensor connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace ECT sensor, then go to Step 6. (See Section F2.)
3	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that ECT sensor connector and TCM connector are disconnected. • Check continuity between ECT sensor connector terminal A and TCM connector terminal 2N. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 6.
4	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that ECT sensor connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 2N and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 6.
		No	Go to next step.
5	**INSPECT ECT SENSOR GROUND CIRCUIT FOR OPEN** • Verify that ECT sensor connector and TCM connector are disconnected. • Check continuity between ECT sensor connector terminal B and TCM terminal 2A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 6.
6	**VERIFY TROUBLESHOOTING OF DTC 09 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

ON-BOARD DIAGNOSTIC

STEP	INSPECTION		ACTION
2	**INSPECT ACCELERATOR POSITION SENSOR CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect accelerator position sensor and TCM connector. • Check connection of accelerator position sensor and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace accelerator position sensor, then go to Step 9. (See K1–106–2 ACCELERATOR POSITION SENSOR, IDLE SWITCH REMOVAL/INSTALLATION.)
3	**INSPECT ACCELERATOR POSITION SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that accelerator position sensor and TCM connector are disconnected. • Check continuity between accelerator position sensor terminal C and TCM connector terminal 2I. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 9.
4	**INSPECT ACCELERATOR POSITION SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Verify that accelerator position sensor connector and TCM connector are disconnected. • Turn the engine switch to the ON position (engine off) • Inspect voltage at TCM connector terminal 2I • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 9.
5	**INSPECT ACCELERATOR POSITION SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Verify that accelerator position sensor and TCM connector are disconnected. • Check continuity between TCM connector terminal 2I and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 9.
		No	Go to next step.
6	**INSPECT ACCELERATOR POSITION SENSOR CIRCUIT FOR OPEN** • Verify that accelerator position sensor and TCM connector are disconnected. • Check continuity between accelerator position sensor terminal D and TCM connector terminal 2K. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 9.
7	**INSPECT ACCELERATOR POSITION SENSOR CIRCUIT FOR SHORT TO GROUND** • Verify that accelerator position sensor and TCM connector are disconnected. • Check continuity between TCM connector terminal 2K and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 9.
		No	Go to next step.
8	**INSPECT ACCELERATOR POSITION SENSOR GROUND CIRCUIT FOR OPEN** • Verify that accelerator position sensor and TCM connector are disconnected. • Check continuity between accelerator position sensor terminal A and TCM terminal 2A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 9.
9	**VERIFY TROUBLESHOOTING OF DTC 12 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

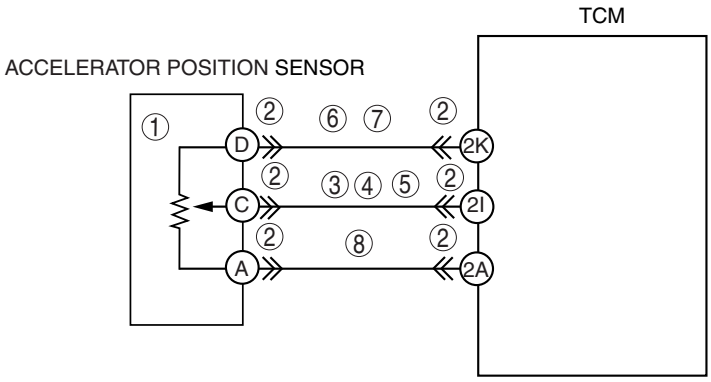
ON-BOARD DIAGNOSTIC

DTC 12

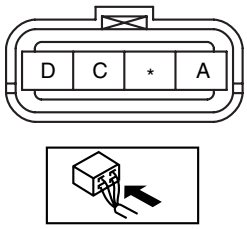
BVF567018901W09

WL Turbo Stage-III

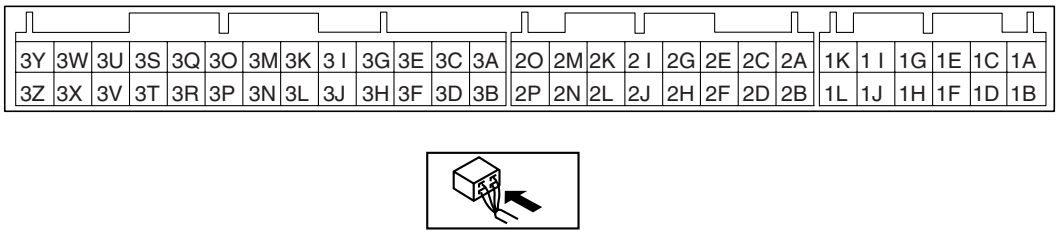
DTC 12	Accelerator position sensor circuit malfunction
DETECTION CONDITION	• When all condition below satisfied. — Idle switch is ON. — Accelerator position sensor signal voltage is **0.1 V or below** or **4.9 V or above**. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between accelerator position sensor terminal C and TCM terminal 2I • Short to power between accelerator position sensor terminal C and TCM terminal 2I • Short to ground between accelerator position sensor terminal C and TCM terminal 2I • Open circuit between accelerator position sensor terminal D and TCM terminal 2K • Short to ground between accelerator position sensor terminal D and TCM terminal 2K • Open circuit between accelerator position sensor terminal A and TCM terminal 2A • Accelerator position sensor malfunction • TCM malfunction



ACCELERATOR POSITION SENSOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



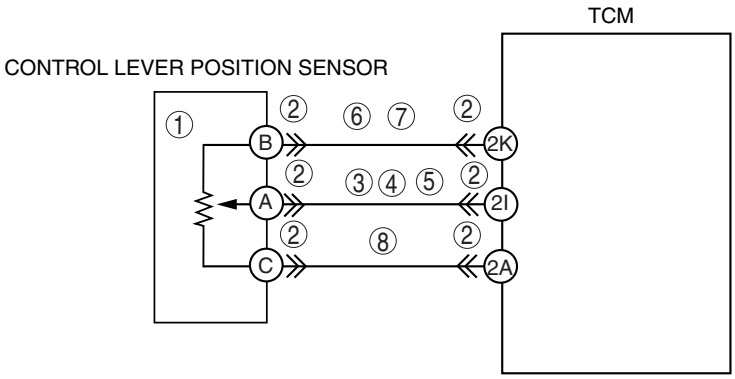
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ACCELERATOR POSITION SENSOR** • Inspect accelerator position sensor. (See K1–64–1 ACCELERATOR POSITION SENSOR, IDLE SWITCH INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace accelerator position sensor, then go to Step 10.

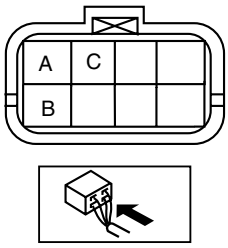
ON-BOARD DIAGNOSTIC

Except WL Turbo Stage-III

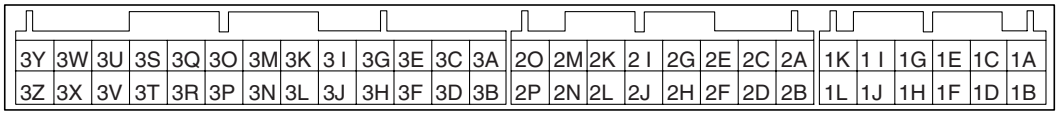
DTC 12	Control lever position sensor circuit malfunction
DETECTION CONDITION	• When all condition below satisfied. — Idle switch is ON. — Control lever position sensor signal voltage is **0.1 V or below** or **4.9 V or above**. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between control lever position sensor terminal A and TCM terminal 2I • Short to power between control lever position sensor terminal A and TCM terminal 2I • Short to ground between control lever position sensor terminal A and TCM terminal 2I • Open circuit between control lever position sensor terminal B and TCM terminal 2K • Short to ground between control lever position sensor terminal B and TCM terminal 2K • Open circuit between control lever position sensor terminal C and TCM terminal 2A • Control lever position sensor malfunction • TCM malfunction



FIP HARNESS SIDE CONNECTOR (8 PIN)



TCM HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT CONTROL LEVER POSITION SENSOR** • Inspect control lever position sensor. (See section F2.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace control lever position sensor, then go to Step 10.

ON-BOARD DIAGNOSTIC

Diagnostic procedure

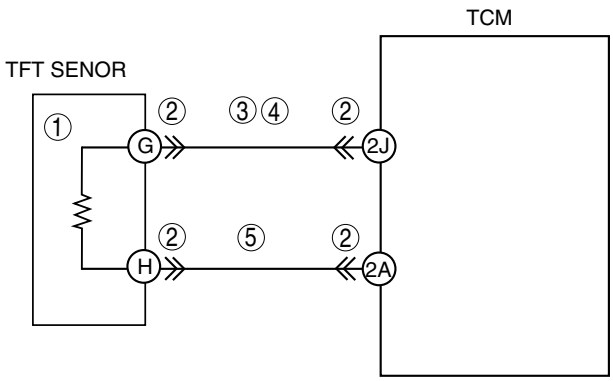
STEP	INSPECTION		ACTION
2	**INSPECT CONTROL LEVER POSITION SENSOR CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect FIP connector (8 pin) and TCM connector. • Check connection of FIP connector (8 pin) and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace control lever position sensor, then go to Step 9. (See Section F2.)
3	**INSPECT CONTROL LEVER POSITION SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that FIP connector (8 pin) and TCM connector are disconnected. • Check continuity between FIP connector (8 pin) terminal A and TCM connector terminal 2I. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 9.
4	**INSPECT CONTROL LEVER POSITION SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Verify that FIP connector (8 pin) connector and TCM connector are disconnected. • Turn the engine switch to the ON position (engine off) • Inspect voltage at TCM connector terminal 2I • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 9.
5	**INSPECT CONTROL LEVER POSITION SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn the engine switch off. • Verify that FIP connector (8 pin) and TCM connector are disconnected. • Check continuity between TCM connector terminal 2I and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 9.
		No	Go to next step.
6	**INSPECT CONTROL LEVER POSITION SENSOR CIRCUIT FOR OPEN** • Verify that FIP connector (8 pin) and TCM connector are disconnected. • Check continuity between FIP connector (8 pin) terminal B and TCM connector terminal 2K. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 9.
7	**INSPECT CONTROL LEVER POSITION SENSOR CIRCUIT FOR SHORT TO GROUND** • Verify that FIP connector (8 pin) and TCM connector are disconnected. • Check continuity between TCM connector terminal 2K and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 9.
		No	Go to next step.
8	**INSPECT CONTROL LEVER POSITION SENSOR GROUND CIRCUIT FOR OPEN** • Verify that FIP connector (8 pin) and TCM connector are disconnected. • Check continuity between FIP connector (8 pin) terminal C and TCM terminal 2A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 9.
9	**VERIFY TROUBLESHOOTING OF DTC 12 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.

STEP	INSPECTION		ACTION
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

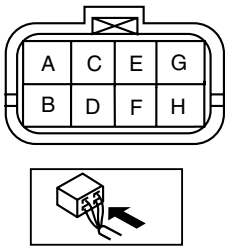
DTC 56

BVF567018901W10

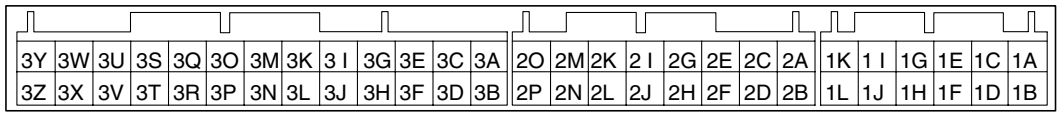
DTC 56	Transmission fluid temperature (TFT) sensor circuit malfunction
DETECTION CONDITION	• Signal from TFT sensor is not input to TCM. **Diagnostic support note:** • HOLD indicator light does not flash. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between solenoid valve connector terminal G and TCM terminal 2J • Short to ground between solenoid valve connector terminal G and TCM terminal 2J • Open circuit between solenoid valve connector terminal H and TCM terminal 2A • TFT sensor malfunction • TCM malfunction



SOLENOID VALVE CONNECTOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



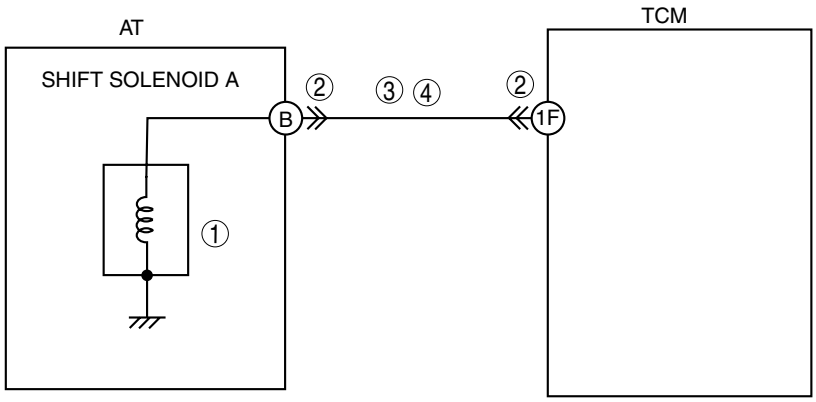
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT TFT SENSOR** • Inspect TFT sensor. (See K1–58 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace TFT sensor, then go to Step 7.
2	**INSPECT TFT SENSOR CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect solenoid valve connector and TCM connector. • Check connection of solenoid valve connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace TFT sensor, then go to Step 6. (See K1–58 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION.)
3	**INSPECT TFT SENSOR SIGNAL CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between solenoid valve connector terminal G and TCM connector terminal 2J. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 6.
4	**INSPECT TFT SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 2J and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 6.
		No	Go to next step.
5	**INSPECT TFT SENSOR GROUND CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between solenoid valve connector terminal H and TCM terminal 2A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 6.
6	**VERIFY TROUBLESHOOTING OF DTC 56 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

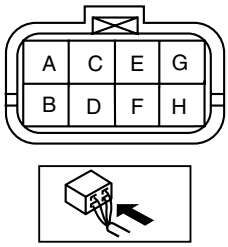
DTC 60

BVF567018901W11

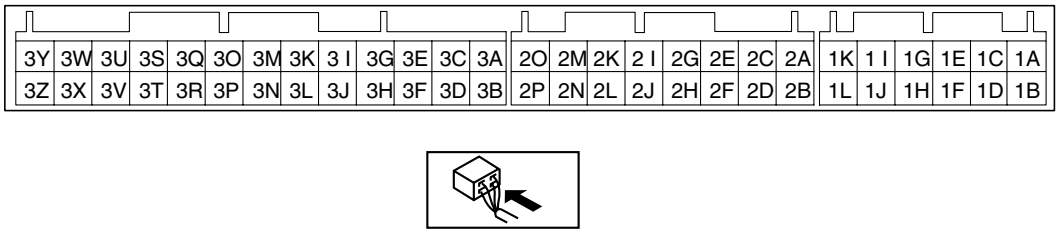
DTC 60	Shift solenoid A malfunction
DETECTION CONDITION	• Open or short in shift solenoid A signal circuit. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between solenoid valve connector terminal B and TCM terminal 1F • Short to ground between solenoid valve connector terminal B and TCM terminal 1F • Open circuit between solenoid valve connector terminal B and ground • Shift solenoid A malfunction • TCM malfunction



SOLENOID VALVE CONNECTOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



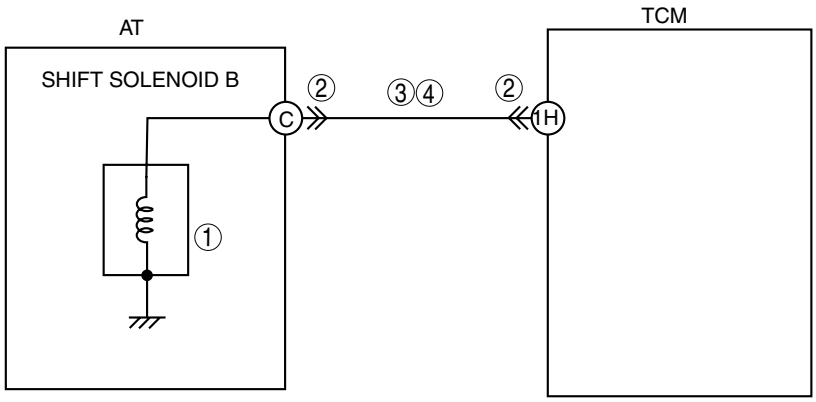
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT SHIFT SOLENOID A** • Inspect shift solenoid A. (See K1–60 SOLENOID VALVE INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace shift solenoid A, then go to Step 6.
2	**INSPECT SOLENOID VALVE CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect solenoid valve connector and TCM connector. • Check connection of solenoid valve connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace shift solenoid A, then go to Step 5. (See K1–60 SOLENOID VALVE INSPECTION.)
3	**INSPECT SHIFT SOLENOID A SIGNAL CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between solenoid valve connector terminal B and TCM connector terminal 1F. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 5.
4	**INSPECT SHIFT SOLENOID A SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 1F and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC 60 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

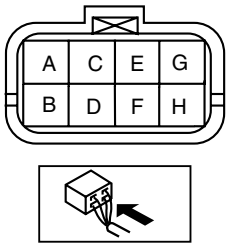
DTC 61

BVF567018901W12

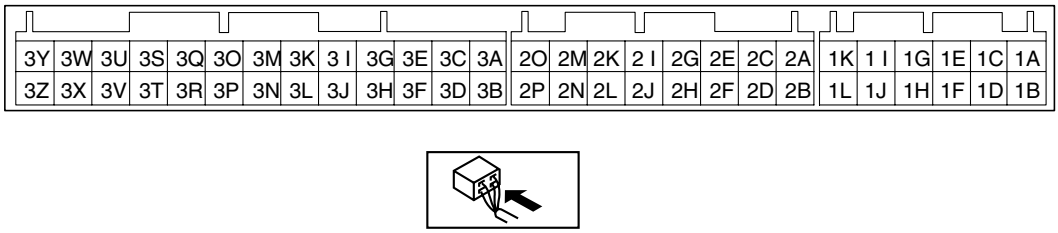
DTC 61	Shift solenoid B malfunction
DETECTION CONDITION	• Open or short in shift solenoid B signal circuit. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between solenoid valve connector terminal C and TCM terminal 1H • Short to ground between solenoid valve connector terminal C and TCM terminal 1H • Open circuit between solenoid valve connector terminal C and ground • Shift solenoid B malfunction • TCM malfunction



SOLENOID VALVE CONNECTOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



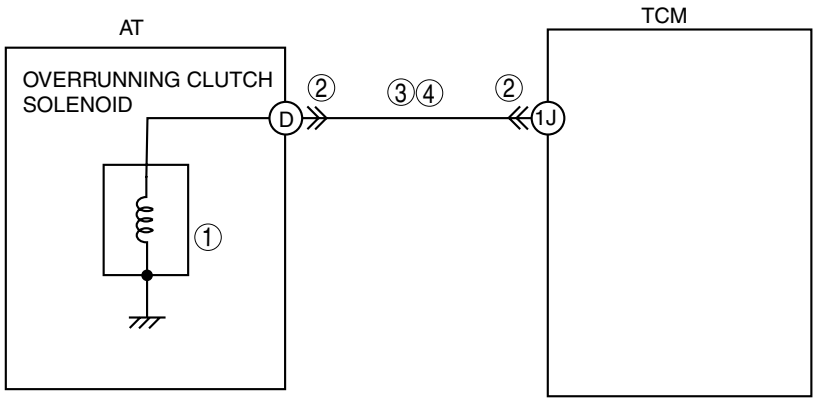
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT SHIFT SOLENOID B** • Inspect shift solenoid B. (See K1–60 SOLENOID VALVE INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace shift solenoid B, then go to Step 6.
2	**INSPECT SOLENOID VALVE CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect solenoid valve connector and TCM connector. • Check connection of solenoid valve connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace shift solenoid B, then go to Step 5. (See K1–60 SOLENOID VALVE INSPECTION.)
3	**INSPECT SHIFT SOLENOID B SIGNAL CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between solenoid valve connector terminal C and TCM connector terminal 1H. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 5.
4	**INSPECT SHIFT SOLENOID B SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 1H and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC 61 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

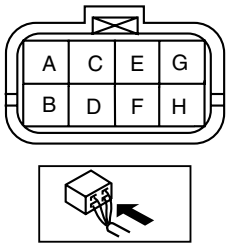
DTC 62

BVF567018901W13

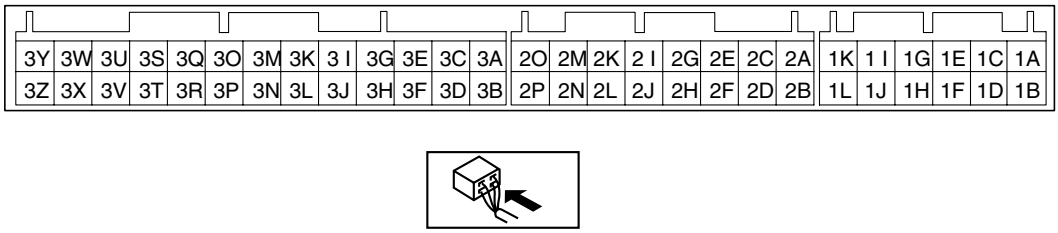
DTC 62	Overrunning clutch solenoid malfunction
DETECTION CONDITION	• Open or short in overrunning clutch solenoid signal circuit. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between solenoid valve connector terminal D and TCM terminal 1J • Short to ground between solenoid valve connector terminal D and TCM terminal 1J • Open circuit between solenoid valve connector terminal D and ground • Overrunning clutch solenoid malfunction • TCM malfunction



SOLENOID VALVE CONNECTOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



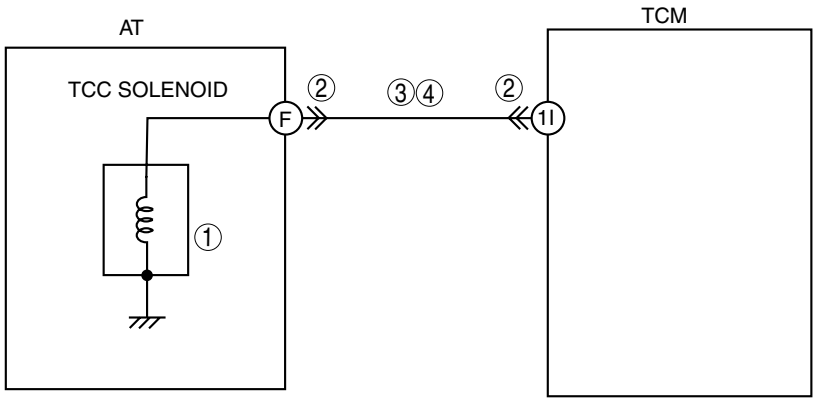
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT OVERRUNNING CLUTCH SOLENOID** • Inspect overrunning clutch solenoid. (See K1–60 SOLENOID VALVE INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace overrunning clutch solenoid, then go to Step 6.
2	**INSPECT SOLENOID VALVE CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect solenoid valve connector and TCM connector. • Check connection of solenoid valve connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace overrunning clutch solenoid, then go to Step 5. (See K1–60 SOLENOID VALVE INSPECTION.)
3	**INSPECT OVERRUNNING CLUTCH SOLENOID SIGNAL CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between solenoid valve connector terminal D and TCM connector terminal 1J. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 5.
4	**INSPECT OVERRUNNING CLUTCH SOLENOID SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 1J and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC 62 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

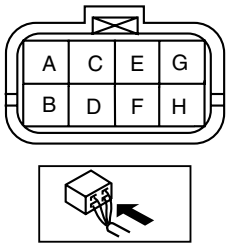
DTC 63

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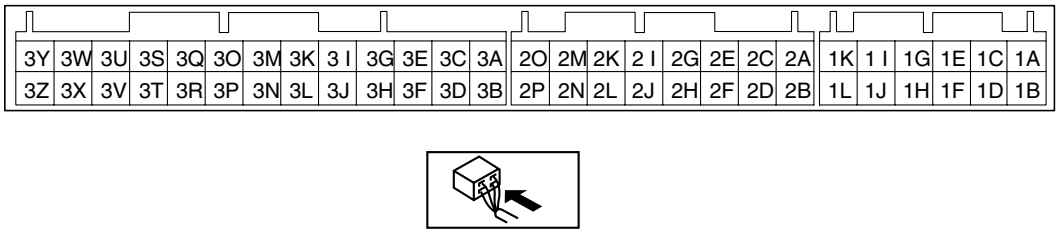
DTC 63	Torque converter clutch (TCC) solenoid malfunction
DETECTION CONDITION	• Open or short in TCC solenoid signal circuit. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between solenoid valve connector terminal F and TCM terminal 1I • Short to ground between solenoid valve connector terminal F and TCM terminal 1I • Open circuit between solenoid valve connector terminal F and ground • TCC solenoid malfunction • TCM malfunction



SOLENOID VALVE CONNECTOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



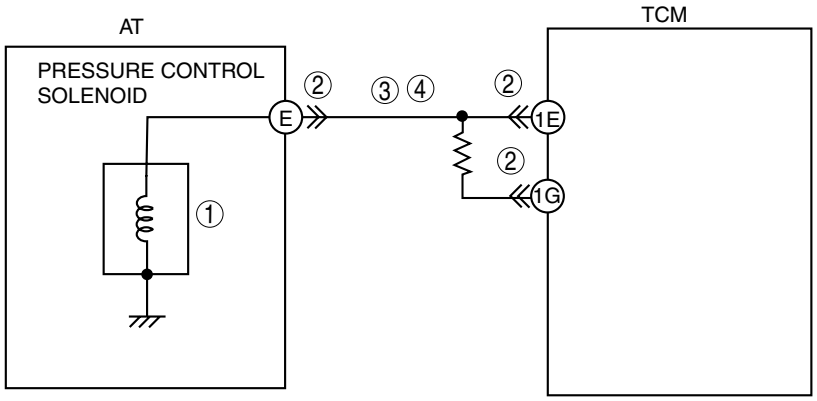
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT TCC SOLENOID** • Inspect TCC solenoid. (See K1–60 SOLENOID VALVE INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace TCC solenoid, then go to Step 6.
2	**INSPECT SOLENOID VALVE CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect solenoid valve connector and TCM connector. • Check connection of solenoid valve connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace TCC solenoid, then go to Step 5. (See K1–60 SOLENOID VALVE INSPECTION.)
3	**INSPECT TCC SOLENOID SIGNAL CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between solenoid valve connector terminal F and TCM connector terminal 1I. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 5.
4	**INSPECT TCC SOLENOID SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 1I and body ground. • Is there continuity?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC 63 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

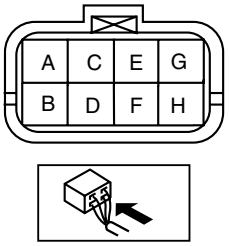
DTC 64

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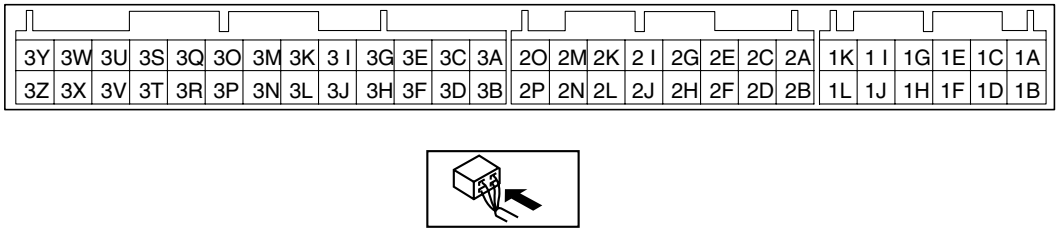
DTC 64	Pressure control solenoid malfunction
DETECTION CONDITION	• Open or short in pressure control solenoid signal circuit. **Diagnostic support note:** • HOLD indicator light flashes. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between solenoid valve connector terminal E and TCM terminal 1E • Short to ground between solenoid valve connector terminal E and TCM terminal 1E • Open circuit between solenoid valve connector terminal E and TCM terminal 1G • Short to ground between solenoid valve connector terminal E and TCM terminal 1G • Open circuit between solenoid valve connector terminal E and ground • Pressure control solenoid malfunction • Dropping resistor malfunction • TCM malfunction



SOLENOID VALVE CONNECTOR HARNESS SIDE CONNECTOR



TCM HARNESS SIDE CONNECTOR



Diagnostic procedure

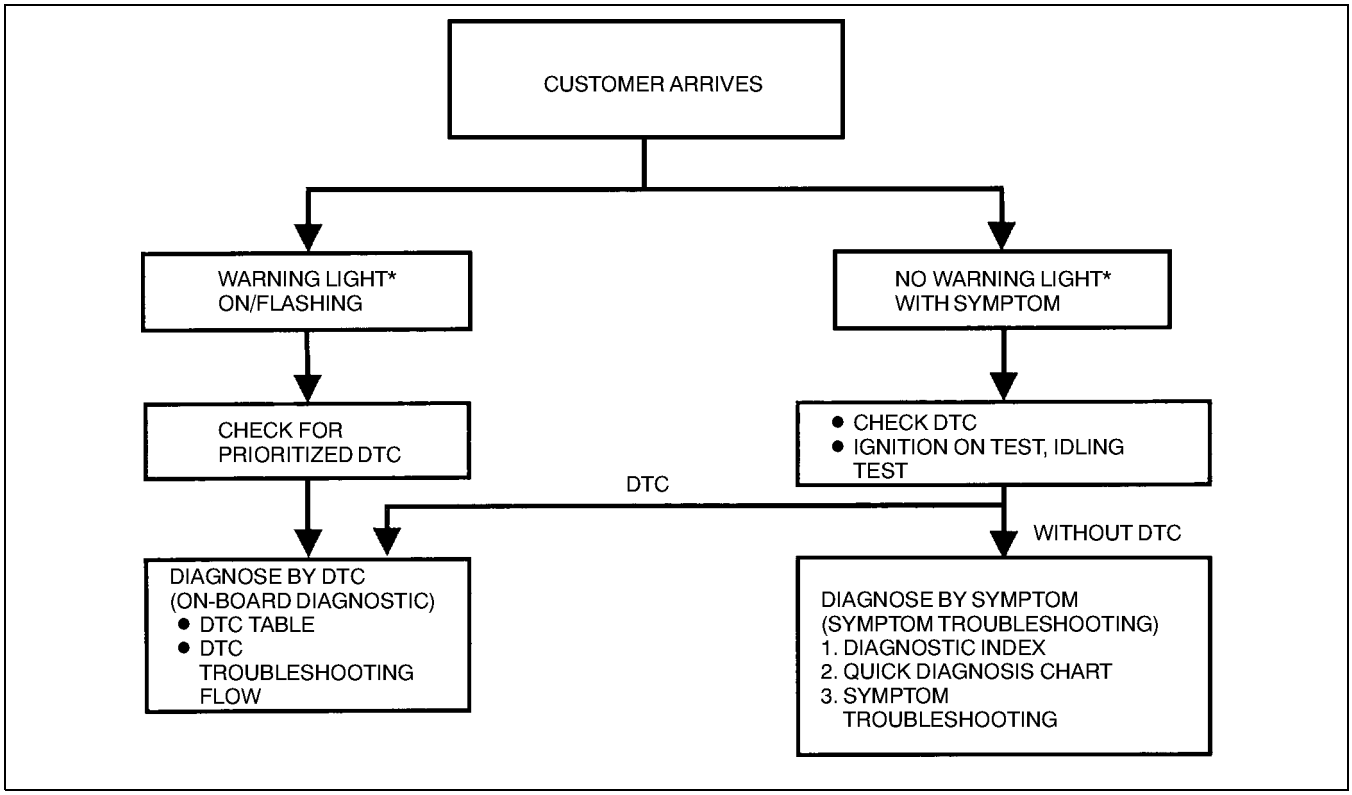
STEP	INSPECTION		ACTION
1	**INSPECT PRESSURE CONTROL SOLENOID** • Inspect pressure control solenoid. (See K1–60 SOLENOID VALVE INSPECTION.) • Is result normal?	Yes	Go to next step.
		No	Repair or replace pressure control solenoid, then go to Step 6.
2	**INSPECT SOLENOID VALVE CONNECTOR AND TCM CONNECTOR** • Turn the engine switch off. • Disconnect solenoid valve connector and TCM connector. • Check connection of solenoid valve connector and TCM connector pin. • Inspect bent terminals of pins using mirror. • Are output speed sensor and TCM terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace pressure control solenoid, then go to Step 5. (See K1–60 SOLENOID VALVE INSPECTION.)
3	**INSPECT PRESSURE CONTROL SOLENOID SIGNAL CIRCUIT FOR OPEN** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between following terminals. — Solenoid valve connector terminal E and TCM connector terminal 1E — Solenoid valve connector terminal E and TCM connector terminal 1G • Is there continuity?	Yes	Go to next step.
		No	Repair or replace wiring, then go to Step 5.
4	**INSPECT PRESSURE CONTROL SOLENOID SIGNAL CIRCUIT FOR SHORT TO GROUND** • Verify that solenoid valve connector and TCM connector are disconnected. • Check continuity between TCM connector terminal 1I and body ground. — TCM connector terminal 1E and body ground — TCM connector terminal 1G and body ground • Is there continuity?	Yes	Repair or replace harness, then go to Step 5.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC 64 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory, then perform after repair procedure. (See K1–96 AFTER REPAIR PROCEDURE.) • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K1–68 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K1–96 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

TROUBLESHOOTING

FOREWORD

BVF568001030W01

- When the customer reports a vehicle malfunction, check the HOLD indicator light flash, and diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
  - — If the DTC exists, diagnose the applicable DTC inspection. (See K1–97 DTC TABLE.)
  - — If the DTC does not exist and the HOLD indicator light does not flash, diagnose the applicable symptom troubleshooting. (See K1–121 SYMPTOM TROUBLESHOOTING ITEM TABLE.)



YMU102WBX

*: HOLD indicator light.

BASIC INSPECTION

BVF568001030W02

STEP	INSPECTION		ACTION
1	Turn the engine switch to the ON position. Does HOLD indicator light (illuminate/go out) correspond to HOLD switch position (ON/OFF)?	Yes	Go to the next step.
		No	Perform malfunction diagnosis according to No.26 “HOLD INDICATOR LIGHT DOES NOT ILLUMINATE WHEN HOLD SWITCH IS TURNED ON”, or No.27 “HOLD INDICATOR LIGHT ILLUMINATES WHEN HOLD SWITCH IS NOT TURNED ON”.
2	Inspect ATF color and condition. (See K1–52 AUTOMATIC TRANSMISSION FLUID (ATF) INSPECTION.) Are ATF color and odor normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.
3	Perform the line pressure test. (See K1–46 Line Pressure Test.) Is the line pressure normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.
4	Perform the stall test. (See K1–47 Stall Speed Test.) Is the stall speed normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts according to the inspection result.

STEP	INSPECTION		ACTION
5	Inspect the voltage at the following TCM terminals. (See K1–64 TCM INSPECTION.) • Terminal 2J (TFT sensor) • Terminal 2G (Output speed sensor) Is the voltage normal? Inspect the continuity at the following TR switch terminals. (See K1–56 TRANSMISSION RANGE (TR) SWITCH INSPECTION.) • Terminal G, D, I, C Is the continuity normal?	Yes	Perform the symptom troubleshooting and follow the procedures.
		No	Repair or replace any malfunctioning parts according to the inspection result.
6	Inspect the voltage at the following PCM terminals. • Control lever position sensor signal Is the voltage normal?	Yes	Perform the symptom troubleshooting and follow the procedures.
		No	Repair or replace any malfunctioning parts according to the inspection result.

SYMPTOM TROUBLESHOOTING ITEM TABLE

BVF568001030W03

Diagnostic Index

- Use the chart below to verify the symptoms of the trouble in order to diagnose the appropriate area.

No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
1	Vehicle does not move in D, S, L ranges, or in R position	Vehicle does not move when accelerator pedal is depressed.	(See K1–125 NO.1 VEHICLE DOES NOT MOVE IN D, S, L RANGES, OR IN R POSITION.)
2	Vehicle moves in N position	Vehicle creeps in N position. Vehicle creeps if brake pedal is not depressed in N position.	(See K1–126 NO.2 VEHICLE MOVES IN N POSITION.)
3	Vehicle moves in P position, or parking gear does not disengage when shifted out of P position	Vehicle rolls when on a downward slope and tires do not lock in P position. Tires lock when shifted out of P position. Vehicle does not move in D, S, L ranges, and R position when accelerator pedal is depressed, and engine remains in stall condition.	(See K1–126 NO.3 VEHICLE MOVES IN P POSITION, OR PARKING GEAR DOES NOT DISENGAGE WHEN SHIFTED OUT OF P POSITION.)
4	Excessive creep	Vehicle accelerates in D, S, L ranges, and R position when accelerator pedal is not depressed.	(See K1–126 NO.4 EXCESSIVE CREEP.)
5	No creep at all	Vehicle does not move in D, S, L ranges, or R position when idling on a flat paved road.	(See K1–127 NO.5 NO CREEP AT ALL.)
6	Low maximum speed and poor acceleration	Vehicle acceleration poor at start. Delayed acceleration when accelerator pedal is depressed while driving.	(See K1–128 NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION.)
7	No shifting	Single shift range only. Sometimes shifts correctly.	(See K1–129 NO.7 NO SHIFTING.)
8	Does not shift to fourth gear (4GR)	Vehicle does not upshift from 3GR to 4GR even though vehicle speed is increased. Vehicle does not shift to 4GR even though accelerator pedal is released D range at **60 km/h {37 mph}**.	(See K1–129 NO.8 DOES NOT SHIFT TO FOURTH GEAR (4GR).)
9	Abnormal shifting	Shifts incorrectly (incorrect shift pattern).	(See K1–130 NO.9 ABNORMAL SHIFTING.)
10	Frequent shifting	Downshifting occurs suddenly even when accelerator pedal is depressed slightly in D, S, L ranges (except HOLD mode).	(See K1–131 NO.10 FREQUENT SHIFTING.)
11	Shift point is high or low	Shift point considerably different from automatic shift diagram. Shifts delayed when accelerating. Shifts occur suddenly when accelerating and engine speed does not increase.	(See K1–131 NO.11 SHIFT POINT IS HIGH OR LOW.)
12	Torque converter clutch (TCC) non-operation	TCC does not operate when vehicle reaches TCC operation range.	(See K1–132 NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION.)

No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
13	No kickdown	Does not downshift when accelerator pedal is fully depressed when within kickdown range.	(See K1–132 NO.13 NO KICKDOWN.)
14	Engine flares up or slips when upshifting or downshifting	When accelerator pedal is depressed, engine speed increases normally but vehicle speed increase slowly. When accelerator pedal is depressed while driving, engine speed increases but vehicle speed does not.	(See K1–133 NO.14 ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING.)
15	Engine flares up or slips when accelerating vehicle	Engine flares up when accelerator pedal is depressed for upshifting. Engine flares up suddenly when accelerator pedal is depressed for downshifting.	(See K1–133 NO.15 ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE.)
16	Judder upon torque converter clutch (TCC) operation	Vehicle jolts when TCC is engaged.	(See K1–134 NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION.)
17	Excessive shift shock from N to D or N to R position/range	Strong shock is felt when shifting from N to D or N to R position/range at idle.	(See K1–134 NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE.)
18	Excessive shift shock is felt when upshifting and downshifting	Excessive shift shock is felt when depressing accelerator pedal to accelerate at upshifting. During cruising, excessive shift shock is felt when depressing accelerator pedal at downshifting.	(See K1–135 NO.18 EXCESSIVE SHIFT SHOCK IS FELT WHEN UPSHIFTING AND DOWNSHIFTING.)
19	Excessive shift shock on torque converter clutch (TCC)	Strong shock is felt when TCC is engaged.	(See K1–135 NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC).)
20	Noise occurs at idle when vehicle is stopped in all positions/ranges	Transmission is noisy in all positions and ranges when vehicle is idling.	(See K1–135 NO.20 NOISE OCCURS AT IDLE WHEN VEHICLE IS STOPPED IN ALL POSITIONS/RANGES.)
21	Noise occurs at idle when vehicle is stopped in D, S, L ranges, or in R position	Transmission is noisy in driving ranges when vehicle idling.	(See K1–136 NO.21 NOISE OCCURS AT IDLE WHEN VEHICLE IS STOPPED IN D, S, L RANGES, OR IN R POSITION.)
22	No engine braking in HOLD mode	Engine speed drops to idle but vehicle coasts when accelerator pedal is released during cruising at medium to high speeds. Engine speed drops to idle but vehicle coasts when accelerator pedal is released when in L range at low vehicle speed.	(See K1–136 NO.22 NO ENGINE BRAKING IN HOLD MODE.)
23	Transmission overheats	Burnt smell is emitted from transmission. Smoke is emitted from transmission.	(See K1–137 NO.23 TRANSMISSION OVERHEATS.)
24	Engine stalls when shifted to D, S, L ranges, or in R position	Engine stalls when shifting from N or P position to D, S, L ranges or R position at idle.	(See K1–138 NO.24 ENGINE STALLS WHEN SHIFTED TO D, S, L RANGES, OR IN R POSITION.)
25	Engine stalls when driving at slow speeds or stopping	Engine stalls when brake pedal is depressed while driving at low speeds or stopping.	(See K1–138 NO.25 ENGINE STALLS WHEN DRIVING AT SLOW SPEEDS OR STOPPING.)
26	HOLD indicator light does not illuminate when HOLD switch is turned ON	HOLD indicator light in instrument cluster does not illuminate when HOLD switch is turned ON and engine switch at ON.	(See K1–139 NO.26 HOLD INDICATOR LIGHT DOES NOT ILLUMINATE WHEN HOLD SWITCH IS TURNED ON.)
27	HOLD indicator light illuminates when HOLD switch is not turned ON	HOLD indicator light in instrument cluster illuminates even though HOLD switch is turned OFF and engine switch at ON.	(See K1–139 NO.27 HOLD INDICATOR LIGHT ILLUMINATES WHEN HOLD SWITCH IS NOT TURNED ON.)

TROUBLESHOOTING

QUICK DIAGNOSIS CHART

BVF568001030W04

× : Applied

	Symptom item / Cause of trouble	Selector lever mis adjusted	Ignition system malfunction	Not within ATF level specification	Not within line pressure specification	Idle speed mis adjusted	Ignition timing mis adjusted	TR switch mis adjusted	Electrical system components: Accelerator position senor *1 / Control lever position senor *2 — No signal input	Electrical system components: Accelerator position senor *1 / Control lever position senor *2 — Malfunction signal is output	Output speed sensor — No signal input	Output speed sensor — Malfunction signal is output	AT outer parts: HOLD switch — No signal input	AT outer parts: HOLD switch — Malfunction signal is output	AT outer parts: Brake switch — No signal input	AT outer parts: Brake switch — Malfunction signal is output	Poor ground	Wiring or connectors between TWS unit and heater control unit — Open	Wiring or connectors between TWS unit and heater control unit — Short
1	Vehicle does not move in D, S, L ranges, or in R Position	×		×	×				×	×	×	×					×		
2	Vehicle moves in N position	×		×	×				×	×	×	×					×		
3	Vehicle moves in P position, or parking gear does not disengage when shifted out of P position	×																	
4	Excessive creep			×		×	×	×	×	×									
5	No creep at all	×		×	×				×	×	×	×					×	×	×
6	Low maximum speed and poor acceleration	×		×	×		×	×	×	×	×	×	×	×			×	×	×
7	No shifting			×	×				×	×	×	×	×	×			×	×	×
8	Does not shift to fourth gear (4GR)	×		×	×			×	×	×	×	×	×	×			×	×	×
9	Abnormal shifting	×		×	×			×	×	×	×	×					×	×	×
10	Frequent shifting			×	×				×	×	×	×					×		
11	Shift point is high or low								×	×	×	×					×	×	×
12	Torque converter clutch (TCC) non-operation			×	×			×	×	×	×	×	×	×			×	×	×
13	No kickdown	×		×	×				×	×	×	×	×	×			×	×	×
14	Engine flares up or slips when upshifting or downshifting	×		×	×				×	×	×	×					×		
15	Engine flares up or slips when accelerating vehicle	×		×	×				×	×	×	×					×		
16	Judder upon torque converter clutch (TCC) operation			×	×		×		×	×	×	×			×				
17	Excessive shift shock from N to D or N to R position/range			×	×	×		×	×	×									
18	Excessive shift shock is felt when upshifting and downshifting			×	×				×	×	×	×							
19	Excessive shift shock on torque converter clutch (TCC)			×					×	×	×	×							
20	Noise occurs at idle when vehicle is stopped in all positions/ranges			×					×	×	×	×							
21	Noise occurs at idle when vehicle is stopped in D, S, L ranges, or in R position			×					×	×	×	×							
22	No engine braking in HOLD mode	×		×	×			×	×	×	×	×						×	×
23	Transmission overheats			×	×				×	×									
24	Engine stalls when shifted to D, S, L ranges, or in R position					×		×	×	×	×	×							
25	Engine stalls when driving at slow speeds or stopping			×		×		×			×	×			×				
26	HOLD indicator light does not illuminate when HOLD switch is turned ON												×	×				×	×
27	HOLD indicator light illuminates when HOLD switch is not turned ON												×	×					

*1 : WL Turbo Stage-III
*2 : Except WL Turbo Stage-III

BVF5680WC001

K1

× : Applied

	Symptom item / Cause of trouble	Signal is not output	Malfunction signal is output	Shift solenoid A (Open or short)	Shift solenoid B (Open or short)	Overrunning clutch solenoid valve (Open or short)	TCC solenoid valve (Open or short)	Pressure control solenoid (Open or short)	Control valve not operatig properly	N-D accumulater not operatig properly	3-4/N-R accumulater not operating properly	Oil cooler not operating properly	Slipping (Brake, clutch)	Burnt (Brake, clutch)	Touque converter not operating properly	TCC piston burnt
		Electrical system components		AT inner parts					Hydraulic system components				Powertrain system			
		TFT sensor														
1	Vehicle does not move in D, S, L ranges, or in R Position			×	×	×		×	×				×	×	×	
2	Vehicle moves in N position			×	×	×		×	×					×		
3	Vehicle moves in P position, or parking gear does not disengage when shifted out of P position													×		
4	Excessive creep								×	×	×			×		
5	No creep at all			×	×	×		×	×				×		×	
6	Low maximum speed and poor acceleration			×	×	×		×	×				×		×	
7	No shifting			×	×	×		×	×				×	×		
8	Does not shift to fourth gear (4GR)	×	×	×	×	×		×	×				×			
9	Abnormal shifting			×	×	×		×	×				×	×		
10	Frequent shifting							×	×				×			
11	Shift point is high or low															
12	Torque converter clutch (TCC) non-operation	×	×				×	×	×						×	
13	No kickdown			×	×	×		×	×					×		
14	Engine flares up or slips when upshifting or downshifting			×	×	×		×	×				×			
15	Engine flares up or slips when accelerating vehicle			×	×	×		×	×				×			
16	Judder upon torque converter clutch (TCC) operation						×	×	×						×	×
17	Excessive shift shock from N to D or N to R position/range							×	×	×	×		×	×		
18	Excessive shift shock is felt when upshifting and downshifting	×	×	×	×	×		×	×		×		×	×		
19	Excessive shift shock on torque converter clutch (TCC)						×		×							
20	Noise occurs at idle when vehicle is stopped in all positions/ranges							×							×	
21	Noise occurs at idle when vehicle is stopped in D, S, L ranges, or in R position							×							×	
22	No engine braking in HOLD mode					×		×	×				×			
23	Transmission overheats						×	×				×		×		×
24	Engine stalls when shifted to D, S, L ranges, or in R position								×							×
25	Engine stalls when driving at slow speeds or stopping								×							
26	HOLD indicator light does not illuminate when HOLD switch is turned ON															
27	HOLD indicator light illuminates when HOLD switch is not turned ON															

BCF5680W002

TROUBLESHOOTING

NO.1 VEHICLE DOES NOT MOVE IN D, S, L RANGES, OR IN R POSITION

BVF568001030W05

1	Vehicle does not move in D, S, L ranges, or in R position
DESCRIPTION	• Vehicle does not move when accelerator pedal is depressed.
POSSIBLE CAUSE	• Clutch slippage, worn (D, S, L ranges: Forward clutch, R position: Reverse clutch, Low and reverse brake). — Line pressure low — Input sensor system malfunction (disparity in setting sensor settings) • Control lever position sensor • Accelerator position sensor • Output speed sensor • Sensor ground — Output solenoid valve system malfunction (stuck) • Shift solenoid A • Shift solenoid B • Pressure control solenoid • Body ground — Control valve body system malfunction (improper operation, stuck) • Manual valve • Pressure regulator valve • Pressure modifier valve • Pilot valve • Selector lever malfunction • Parking mechanism not properly operation **Note** • Before following the troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted. (See K1–120 BASIC INSPECTION.)

K1

Diagnostic procedure

STEP	INSPECTION		ACTION
1	When the vehicle is stopped on a flat, level road and the engine is off, does the vehicle move when pushed? (in D, S, L ranges or N, R positions with the brake pedal released)	Yes	Go to the next step.
		No	Inspect for parking mechanism. (See AT Workshop Manual.)
2	Does vehicle move when selector lever is in between N position and D range?	Yes	Go to the next step.
		No	Adjust the selector lever. (See K1–89 SELECTOR LEVER ADJUSTMENT.)
3	Inspect the voltage at the following terminal of the TCM. (See K1–64–5 TCM INSPECTION.) • 1E (Pressure control solenoid) Is terminal voltage normal?	Yes	Go to the next step.
		No	Repair or replace any malfunctioning parts.
4	Inspect duty of pressure control solenoid. (See K1–60 Output Duty Inspection.) Is duty normal?	Yes	Overhaul the control valve body and repair or replace any malfunctioning parts. (See AT Workshop Manual.) If any problem remains, overhaul the transmission and repair or replace any malfunctioning parts. (See AT workshop Manual.)
		No	Inspect the voltage at the following values. (See K1–64–5 TCM INSPECTION.) PCM terminal voltage: • Control lever position sensor signal • Accelerator position sensor signal • NE signal • GND (engine, body) TCM terminal voltage: • 2G (output speed sensor) Repair or replace any malfunctioning parts.
5	• Verify the test results. — If normal, return to the diagnostic index to service any additional symptoms. — If the malfunction remains, inspect the related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. • If the vehicle is repaired, troubleshooting completed. • If the vehicle is not repaired or additional diagnostic information is not available, replace the TCM.		

NO.2 VEHICLE MOVES IN N POSITION

BVF568001030W06

2	Vehicle moves in N position
DESCRIPTION	• Vehicle creeps in N position. • Vehicle creeps if brake pedal not depressed in N position.
POSSIBLE CAUSE	• If vehicle moves in N position, basically, malfunction is in AT. Since a malfunction in sensor circuit or output circuit is cause of malfunction in AT, inspect sensors, output circuit, and related harnesses. — Clutch burned (Low clutch, Low one-way clutch, Low and reverse brake) • Line pressure low • Malfunction of control valve body — Selector lever position disparity (Although the selector indicator shows N position, hydraulic circuit shows D range or R position) **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Does vehicle creep when selector lever moved slightly in N position?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) — If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See K1–69 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION.) (See AT Workshop Manual.)
		No	Inspect and adjust selector lever. (See K1–89 SELECTOR LEVER INSPECTION.) (See K1–89 SELECTOR LEVER ADJUSTMENT.)
2	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.3 VEHICLE MOVES IN P POSITION, OR PARKING GEAR DOES NOT DISENGAGE WHEN SHIFTED OUT OF P POSITION

BVF568001030W07

3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged
DESCRIPTION	• Vehicle rolls when on a downward slope and tires do not lock in P position. • Tires locked when P disengaged, vehicle does not move in D, S, L ranges, and R position when accelerator pedal depressed, and engine remains in stall condition.
POSSIBLE CAUSE	• Malfunction of parking mechanism (May have effect on noise or shock from transmission) • Improper adjustment of selector lever • If vehicle moves in N position, perform symptom troubleshooting No.2 “Vehicle moves in N position” **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.4 EXCESSIVE CREEP

BVF568001030W08

4	Excessive creep
DESCRIPTION	• Vehicle accelerates in D, S, L ranges, and R position without depressing accelerator pedal.
POSSIBLE CAUSE	• Engine idle speed high (transmission system is not cause of problem) • Go to symptom troubleshooting “Fast idle/runs on” **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.5 NO CREEP AT ALL

BVF568001030W09

5	No creep at all
DESCRIPTION	• Vehicle does not move in D, S, L ranges, or R position when idling on flat paved road.
POSSIBLE CAUSE	• Either engine output low or there is clutch circuit slippage. — Clutch burned • Line pressure low • Malfunction of shift solenoid A, B, C or F • Malfunction of body ground • Malfunction of control valve body — Transmission fixed in 3GR (Operation of fail-safe function) • Short or open circuit in wiring • Poor connection of connector • Electronic parts of output and input system malfunctioning — Engine torque is not start • Malfunction of torque converter **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Does vehicle creep in P and/or N position?	Yes	Inspect or adjust the selector lever. (See K1–89 SELECTOR LEVER INSPECTION.) (See K1–89 SELECTOR LEVER ADJUSTMENT.)
		No	Go to next step.
2	• Stop engine. • Inspect pressure control solenoid circuit. • Is it okay?	Yes	Go to next step.
		No	• Inspect for pressure control solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.) — If pressure control solenoid okay, inspect for open or short circuit between TCM connector terminal 2X and solenoid valve connector terminal K.
3	• Remove torque converter. • Inspect torque converter. (See AT Workshop Manual.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) — If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See K1–69 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION.) (See AT Workshop Manual.)
		No	Replace torque converter.
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

TROUBLESHOOTING

NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION

BVF568001030W10

6	Low maximum speed and poor acceleration
DESCRIPTION	• Vehicle acceleration poor at start. • Delayed acceleration when accelerator pedal depressed while driving.
POSSIBLE CAUSE	• If clutch is stuck or does not stay in 3GR, malfunction is in engine circuit. — Clutch slipped, burned • Line pressure low • Incorrect accelerator position signal • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground • Malfunction of shift solenoids A, B, C, or F • Malfunction of body ground • Malfunction of control valve body — Transmission fixed in 3GR (Operation of fail-safe function) • Short or open circuit in wiring • Poor connection of connector • Electronic parts of output and input system malfunction are malfunctioning — Insufficient starting torque (Suspected when in-gear condition, shift control and engine circuit are normal) • Malfunction of torque converter (Poor operation, sticking) — Engagement of TCC operation range (Operation of fail-safe function) • Malfunction of TFT sensor (Short or open circuit) **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• With ignition switch at ON, does HOLD indicator light indication correspond to HOLD switch operation?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.26 “HOLD indicator light does not illuminate when HOLD switch is turned on”, or No.27 “HOLD indicator light illuminates when HOLD switch is not turned on”.
2	• Go to symptom troubleshooting “Lack/loss of power-acceleration/cruise”. • Does engine control system okay?	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
3	• Stop engine. • Inspect shift solenoid A, B, C or F. • Are they okay?	Yes	Go to next step.
		No	• Inspect for shift solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.) — If shift solenoids okay, inspect for open or short circuit between TCM connector terminals 2P, 2S, 2V, 2Y and solenoid valve connector terminals E, F, H or I.
4	• Remove torque converter. • Inspect torque converter. (See AT Workshop Manual.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) — If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See K1–69 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION.) (See AT Workshop Manual.)
		No	Replace torque converter.
5	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

TROUBLESHOOTING

NO.7 NO SHIFTING

BVF568001030W11

7	No shifting
DESCRIPTION	• Single shift range only. • Sometimes it shifts correctly.
POSSIBLE CAUSE	• When gear position is fixed in 3GR due to the fail-safe operation, malfunction is in the AT. • Perform malfunction diagnosis according to No.6 “Low maximum speed and poor acceleration”. — Clutch burned • Line pressure low • Incorrect accelerator position signal • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B, C or F • Malfunction of control valve body — 3GR is fixed (Operation in fail-safe function) • Short or open circuit in wiring • Poor connection of connector • Poor ground of shift solenoid • Electrical parts of output and input system malfunctioning **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.8 DOES NOT SHIFT TO FOURTH GEAR (4GR)

BVF568001030W12

8	Does not shift to fourth gear (4GR)
DESCRIPTION	• Vehicle does not upshift from 3GR to 4GR even though vehicle speed increased. • Vehicle does not shift to 4GR even though accelerator pedal released in D range at **60 km/h {37 mph}**.
POSSIBLE CAUSE	• Basically, TCC does not operate when fail-safe is operating. Verify DTC at first. If TCC operates when driving at high speeds only, malfunction (improper adjustment) is in the HOLD switch circuit or TR switch circuit. **Note** • If the TCC or piston is stuck, inspect them. In addition, inspect the oil cooler for foreign particles which may have mixed in with the ATF. — TCC piston slipped, burned • Line pressure low • Incorrect accelerator position signal • Malfunction of ECT sensor • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground — Malfunction of TFT sensor • Short or open circuit in wiring • Poor connection of connector • Malfunction of sensor — Malfunction of TR switch • Selector lever adjustment incorrect • TR switch adjustment incorrect — Malfunction of TCC solenoid • Short or open circuit in wiring • Poor connection of connector • Solenoid valve stuck — Malfunction of HOLD switch — Malfunction of torque converter — Malfunction of control valve body **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

TROUBLESHOOTING

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Does HOLD indicator light indication correspond to HOLD switch operation?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.26 “HOLD indicator light does not illuminate when HOLD switch is turned on”, or No.27 “HOLD indicator light illuminates when HOLD switch is not turned on”.
2	• Drive vehicle in D range and inspect following: — 1–2 shift up and down — 2–3 shift up and down — 3–4 shift up and down • Are all shift-up and shift-down possible?	Yes	Go to next step.
		No	**No shift at all:** • Go to symptom troubleshooting No.7 “No shifting”. **Abnormal shift:** • Go to symptom troubleshooting No.9 “Abnormal shifting”.
3	• Stop engine. • Inspect shift solenoid A, B, or C circuit. • Are they okay?	Yes	Go to next step.
		No	• Inspect for shift solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.)
4	• Remove torque converter. • Inspect torque converter. (See AT Workshop.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) — If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See K1–69 AUTOMATIC TRANSMISSION REMOVAL/INSTALLATION.) (See AT Workshop Manual.)
		No	Replace torque converter.
5	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.9 ABNORMAL SHIFTING

BVF568001030W13

9	**Abnormal shifting**
DESCRIPTION	• Shift incorrectly (incorrect shift pattern).
POSSIBLE CAUSE	• There is a malfunction in signal circuit which controls shifting (Accelerator position signal, turbine sensor, VSS), control valve is stuck, or clutch circuit is stuck. — Clutch slipped, burned • Line pressure low • Incorrect accelerator position signal • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B, or C • Malfunction of TCC solenoid • Malfunction of body ground • Misadjustment of accelerator cable • Malfunction of control valve body • Malfunction or misadjustment of TR switch **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

TROUBLESHOOTING

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect continuity between TCM connector terminals 2M and 2Q and transmission case. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace ground circuit.
2	• Stop engine. • Inspect shift solenoid A, B, or C circuit. • Are they okay?	Yes	Inspect TCM connector terminal for bend, damage, corrosion or poor contact.
		No	• Inspect connection of shift solenoid A, B, or C terminal on AT for bend, damage, corrosion or looseness. • Inspect for shift solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.) — If shift solenoids okay, inspect for open or short circuit between TCM connector terminals 2S, 2V, 2Y and solenoid valve connector terminals E, F or H.
3	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.10 FREQUENT SHIFTING

BVF568001030W14

10	Frequent shifting
DESCRIPTION	• Downshifting occurs immediately even when accelerator pedal depressed slightly in D, S, L ranges except HOLD mode.
POSSIBLE CAUSE	• The circuit which is the cause is basically the same as for No.9 “Abnormal shifting”. However, a malfunction of input signal to accelerator position sensor or control lever position sensor, turbine sensor, VSS (including the sensor ground, sensor harness and connector), or clutch slippage (clutch stuck, low pressure in line) may also be the cause. **Note** • Before following troubleshooting steps, make sure that the Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.11 SHIFT POINT IS HIGH OR LOW

BVF568001030W15

11	Shift point is high or low
DESCRIPTION	• Shift point considerably different from automatic shift diagram. • Shift delays when accelerating. • Shift occurs quickly when accelerating and engine speed does not increase.
POSSIBLE CAUSE	• If the transmission does not shift abnormally, there is a malfunction of input signal to accelerator position sensor or control lever position sensor, turbine sensor, or VSS. • If engine speed is high or low regardless that shifting is normal, inspect tachometer. • Verify that output signal of accelerator position sensor or control lever position sensor changes linearly. **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

TROUBLESHOOTING

NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION

BVF568001030W16

12	Torque converter clutch (TCC) non-operation
DESCRIPTION	• TCC does not operate when vehicle reaches TCC operation range.
POSSIBLE CAUSE	• Basically, TCC does not operate when fail-safe is operating. Verify DTC at first. If TCC operates when driving at high speeds only, the malfunction (improper adjustment) is in HOLD switch circuit or TR switch circuit. **Note** • If the TCC or piston is stuck, inspect them. In addition, inspect the oil cooler for foreign particles which may have mixed in with the ATF. • TCC piston slipped, burned — Line pressure low • Incorrect accelerator position signal • Turbine sensor malfunction • TFT sensor malfunction • Sensor ground malfunction • VSS malfunction • Malfunction of output solenoid valve system (Sticking) • TCC solenoid malfunction • Malfunction of control valve body system (Poor operation, sticking) • TCC piston hydraulic pressure system malfunction • Malfunction of accelerator position sensor or control lever position sensor (Not operating linearly) • Malfunction of turbine sensor or VSS **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn the ignition switch to the ON position. • Does HOLD indicator light indication correspond to HOLD switch operation?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.26 “HOLD indicator light does not illuminate when HOLD switch is turned on”, or No.27 “HOLD indicator light illuminates when HOLD switch is not turned on”.
2	• Disconnect TCM. • Is resistance between ground terminals 2M, 2Q at TCM connector and body ground less than **5.0 ohm**?	Yes	Go to next step.
		No	Repair open ground circuit.
3	• Remove torque converter. • Inspect torque converter. (See AT Workshop Manual.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) • If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See AT Workshop Manual.)
		No	• Replace torque converter.
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.13 NO KICKDOWN

BVF568001030W17

13	No kickdown
DESCRIPTION	• Does not downshift when accelerator pedal fully depressed within kickdown range.
POSSIBLE CAUSE	• If transmission does not downshift though shifting is normal, malfunction is in accelerator position sensor or control lever position sensor circuit (including sensor ground, sensor harness and connector). Note • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

TROUBLESHOOTING

NO.14 ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING

BVF568001030W18

14	Engine flares up or slips when upshifting or downshifting
DESCRIPTION	• When accelerator pedal depressed for driveway, engine speed increases but vehicle speed increase slowly. • When accelerator pedal depressed while driving, engine speed increases but vehicle does not.
POSSIBLE CAUSE	• There is clutch slip because clutch is stuck or line pressure is low. — Clutch stuck, slippage • Line pressure low • Incorrect accelerator position signal • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B, or C • Malfunction of TCC solenoid • Malfunction of body ground • Misadjumstment of accelerator cable • Malfunction of control valve body — Poor operation of mechanical pressure • Selector lever position disparity • TR switch position disparity **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Is line pressure okay? (See K1–46 Line Pressure Test.)	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
2	• Is shift point okay? (See K1–48 ROAD TEST.)	Yes	Go to next step.
		No	Go to symptom troubleshooting No.9 “Abnormal shifting”.
3	• Stop engine. • Inspect shift solenoid A, B, or C circuit. • Are they okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) • If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See AT Workshop Manual.)
		No	• Inspect for shift solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.)
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.15 ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE

BVF568001030W19

15	Engine flares up or slips when accelerating vehicle
DESCRIPTION	• Engine flares up when accelerator pedal depressed for upshifting. • Engine flares up suddenly when accelerator pedal depressed for downshifting.
POSSIBLE CAUSE	• Malfunction is basically the same as for No.14 “Engine flares up or slips when upshifting or downshifting”. — If conditions for No.14 worsen, malfunction will develop into No.15. **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

TROUBLESHOOTING

NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION

BVF568001030W20

16	Judder upon torque converter clutch (TCC) operation
DESCRIPTION	• Vehicle jolts when TCC engaged.
POSSIBLE CAUSE	• Poor TCC engagement due to either slippage because TCC piston is stuck or line pressure is low. **Caution** • **If the TCC or piston are stuck, inspect them. In addition, inspect the oil cooler for foreign particles which may have mixed in with the ATF.** — Torque converter clutch piston slipped, burned • Line pressure low • Incorrect accelerator position signal • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground • Malfunction of TCC solenoid • Malfunction of control valve body — Malfunction of torque converter **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE

BVF568001030W21

17	Excessive shift shock from N to D or N to R position/range
DESCRIPTION	• Strong shock felt when shifting from N to D or N to R position/range at idle.
POSSIBLE CAUSE	• Shift shock may worsen when fail-safe is operating. If no DTC is output, shift shock may worsen due to poor operation of control valve body or sticking of clutch. — Clutch burned (N→D: Low clutch, N→R: Reverse clutch or low and reverse brake) • Line pressure low • Incorrect accelerator position signal • Malfunction of TFT sensor • Malfunction of sensor ground • Misadjustment of accelerator cable • Malfunction of control valve body — Poor hydraulic operation (Malfunction in range change) — Idle speed high — Poor tightening torque of engine mount, exhaust mount — Line pressure high **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Does shift shock occur only when engine cold?	Yes	Go to next step.
		No	Go to Step 3.
2	• Inspect TFT sensor and related harness: vibration, intermittent open/short circuit. • Is it okay?	Yes	Go to next step.
		No	Repair or replace part if necessary.
3	• Is line pressure okay? (See K1–46 Line Pressure Test.)	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
4	• Is stall speed okay? (See K1–47 Stall Speed Test.)	Yes	Go to next step.
		No	Go to Step 6.
5	• Inspect TR switch and related harness: vibration, intermittent open/short circuit. • Is it okay?	Yes	• Go to next step.
		No	Repair or replace part if necessary.

TROUBLESHOOTING

STEP	INSPECTION		ACTION
6	• Stop engine and turn the ignition switch to the ON position. • Inspect pressure control solenoid circuit. • Is it okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) • If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See AT Workshop Manual.)
		No	• Inspect for pressure control solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.)
7	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.18 EXCESSIVE SHIFT SHOCK IS FELT WHEN UPSHIFTING AND DOWNSHIFTING

BVF568001030W22

18	Excessive shift shock is given when upshifting and downshifting
DESCRIPTION	• Excessive shift shock felt when depressing accelerator pedal to accelerate at upshifting. • During cruising, excessive shift shock felt when depressing accelerator pedal at downshifting.
POSSIBLE CAUSE	• Shift shock may worsen when fail-safe is operating. The shift shock has worsen if accelerator position sensor or control lever position sensor, turbine sensor, or VSS signal malfunctions. — Clutch slipped, burned • Line pressure high • Incorrect accelerator position signal • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of TFT sensor • Malfunction of shift solenoid A, B, C or F • Malfunction of TCC solenoid • Misadjustment of accelerator cable • Malfunction of body ground and sensor ground • Malfunction of control valve body — Poor hydraulic operation (Malfunction in range change) **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC)

BVF568001030W23

19	Excessive shift shock on torque converter clutch (TCC)
DESCRIPTION	• Strong shock felt when TCC engaged.
POSSIBLE CAUSE	• The troubleshooting flow is the same as No.16 “Judder upon torque converter clutch (TCC) operation”. **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.20 NOISE OCCURS AT IDLE WHEN VEHICLE IS STOPPED IN ALL POSITIONS/RANGES

BVF568001030W24

20	Noise occurs at idle when vehicle is stopped in all positions/ranges
DESCRIPTION	• Transmission noisy in all positions and ranges when vehicle idling.
POSSIBLE CAUSE	• Malfunction is in pressure solenoid or oil pump which causes a high-pitched noise to be emitted from transmission at idle. **Note** • If a noise is emitted during shifting only, malfunction is in shift solenoid A, B, or C. • If a noise is emitted during shifting at certain gears only or during deceleration only, it is gear noise. • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect engine condition. • Is any engine concern (e.g. Rough idle)?	Yes	Go to appropriate symptom troubleshooting.
		No	Replace basic inspection and repair or replace any defective parts according to inspection result
2	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.21 NOISE OCCURS AT IDLE WHEN VEHICLE IS STOPPED IN D, S, L RANGES, OR IN R POSITION

BVF568001030W25

21	Noise occurs at idle when vehicle is stopped in D, S, L ranges, or in R position
DESCRIPTION	• Transmission noisy in driving ranges when vehicle idling.
POSSIBLE CAUSE	• Although the malfunction is basically the same as No.20 “Noise occurs at idle when vehicle is stopped in all positions/ranges”, other causes may be selector lever position disparity or TR switch position disparity. **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

NO.22 NO ENGINE BRAKING IN HOLD MODE

BVF568001030W26

22	No engine braking in L range
DESCRIPTION	• Engine speed drops to idle but vehicle coasts when accelerator pedal released during cruising at medium to high speeds. • Engine speed drops to idle but vehicle coasts when accelerator pedal released when in L range at low vehicle speed.
POSSIBLE CAUSE	• Clutch slipped, burned (Reduction brake) — Line pressure low • Malfunction of VSS • Malfunction of turbine sensor • Malfunction of sensor ground • Malfunction of control valve body — HOLD switch on not judged by TCM (short, or open circuit, poor operation) • Malfunction of HOLD switch signal **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect TR switch adjustment. • Does TR switch adjusted properly? • Select PNP–TCM PID. • Is PNP–TCM PID reading okay when selecting range?	Yes	Go to next step.
		No	Adjust TR switch as necessary. (See K1–57 TRANSMISSION RANGE (TR) SWITCH ADJUSTMENT.) Inspect TR switch. Repair or replace any defective parts.
2	• Do following symptoms concurrently occur? — Engine flares up or slips during acceleration — Engine flares up or slips when shifting	Yes	Go to symptom troubleshooting No.14 “Engine flares up or slips when upshifting or downshifting” or No.15 “Engine flares up or slips when accelerating vehicle”.
		No	Go to next step.
3	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

TROUBLESHOOTING

NO.23 TRANSMISSION OVERHEATS

BVF568001030W27

23	TRANSMISSION OVERHEATS
DESCRIPTION	• Burnt smell emitted from transmission. • Smoke emitted from transmission.
POSSIBLE CAUSE	• Malfunction is restricted to hindrance of coolant at oil cooler. In addition, overheating of transmission may be caused by a malfunction of TFT sensor. — Line pressure low • ATF level low • Incorrect accelerator position signal • Misadjustment of accelerator cable — Oil cooler malfunction (Foreign material mixed in with ATF) — TFT sensor malfunction — Excessive amount of ATF **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Is line pressure okay? (See K1–46 Line Pressure Test.)	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
2	• Is stall speed okay? (See K1–47 Stall Speed Test.)	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
3	• Inspect TFT sensor and related harness: vibration, intermittent open/short circuit • Is it okay?	Yes	Go to next step.
		No	Repair or replace part if necessary.
4	• Inspect pressure control solenoid circuit. • Is it okay?	Yes	Go to next step.
		No	• Inspect for pressure control solenoid mechanical stuck. (See K1–60 SOLENOID VALVE INSPECTION.)
5	• Inspect for bend, damage, corrosion or kinks of oil cooler pipes. • Are oil cooler pipes okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) • If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See AT Workshop Manual.)
		No	Replace any defective parts.
6	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.24 ENGINE STALLS WHEN SHIFTED TO D, S, L RANGES, OR IN R POSITION

BVF568001030W28

24	Engine stalls when shifted to D, S, L ranges, or in R position
DESCRIPTION	• Engine stalls when shifting from N or P position to D, S, L ranges or R position at idle.
POSSIBLE CAUSE	• Malfunction is on the engine control side (e.g. IAC system). Otherwise, malfunction is in turbine sensor (engine sometimes starts) or TCC piston circuit (engine always stalls). • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Go to symptom troubleshooting “Engine stalls-after start/at idle”. • Is engine control system okay?	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.
2	• Remove torque converter. • Inspect torque converter. (See AT Workshop Manual.) • Is torque converter okay?	Yes	• Inspect for bend, damage or kinks of oil cooler line pipes. If okay, overhaul control valve body and repair or replace any defective parts. (See AT Workshop Manual.) • If problem remains, replace or overhaul transmission and repair or replace any defective parts. (See AT Workshop Manual.)
		No	Replace torque converter.
3	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.25 ENGINE STALLS WHEN DRIVING AT SLOW SPEEDS OR STOPPING

BVF568001030W29

25	Engine stalls when driving at slow speeds or stopping
DESCRIPTION	• Engine stalls when brake pedal depressed while driving at low speed or stopping.
POSSIBLE CAUSE	• Malfunction is on engine control side (e.g. Fuel injection control, IAC system) **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Go to symptom troubleshooting “Low idle/ stalls during deceleration”. • Is engine control system okay?	Yes	Go to symptom troubleshooting No.24 “Engine stalls when shifted to D, S, L ranges, or in R position”.
		No	Repair or replace any defective parts according to inspection results.
2	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.26 HOLD INDICATOR LIGHT DOES NOT ILLUMINATE WHEN HOLD SWITCH IS TURNED ON

BVF568001030W30

26	HOLD indicator light does not illuminate when HOLD switch is turned ON
DESCRIPTION	• HOLD indicator light on instrument cluster does not illuminate when HOLD switch is turned on and ignition switch at ON.
POSSIBLE CAUSE	• HOLD switch or related wiring harness malfunction. **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Are other indicator lights illuminated with ignition switch on?	Yes	Go to next step.
		No	Inspect meter fuse.
2	• Inspect TCS PID value using WDS or equivalent. • Is TCS PID value okay?	Yes	Go to next step.
		No	• Inspect HOLD switch. (See K1–54 HOLD SWITCH INSPECTION.) • If HOLD switch okay, inspect for continuity between HOLD switch and TCM terminal 1AA.
3	• Remove HOLD indicator light. • Is HOLD indicator light bulb burned out?	Yes	Replace HOLD indicator light.
		No	Inspect for open circuit or disconnected connector in following harness. • Ignition switch and HOLD indicator light • HOLD indicator light and TCM terminal 1F including instrument cluster circuit board
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

K1

NO.27 HOLD INDICATOR LIGHT ILLUMINATES WHEN HOLD SWITCH IS NOT TURNED ON

BVF568001030W31

27	HOLD indicator light illuminates when HOLD switch is not turned ON
DESCRIPTION	• HOLD indicator light in dashboard illuminates even though HOLD switch turned off and ignition switch at ON.
POSSIBLE CAUSE	• HOLD switch or related wiring harness malfunction. **Note** • Before following troubleshooting steps, make sure that Automatic Transmission On-Board Diagnostic and Automatic Transmission Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect TCS PID value using WDS or equivalent. • Is TCS PID value okay?	Yes	Inspect for short to GND circuit in following harness. • HOLD indicator light on instrument cluster and TCM connector terminal F including instrument cluster circuit board
		No	• Inspect HOLD switch. (See K1–54 HOLD SWITCH INSPECTION.) • If HOLD switch okay, inspect for short to ground circuit between HOLD switch terminal and TCM terminal 1AA.
2	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Bulletins and/or On-line Repair Information and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

AUTOMATIC TRANSMISSION (Transfer)

FEATURES

TRANSFER.....K2-2
OUTLINE OF CONSTRUCTION.....K2-2
SPECIFICATIONS K2-2

TRANSFER

OUTLINE OF CONSTRUCTION

BVF571827500W01

- The construction and operation of the transfer are the same as those of the current Ranger EC-AT model. (See RANGER Repair Manual Supplement F184-10-03C.)

SPECIFICATIONS

BVF571827500W02

Item			transmission
			RA4AX–EL
Trasfer type			Constant mesh
Trasfer control			Floor shift
Operation system			Direct
Gear ratio	High		1.000
	Low		2.210
Oil	Grade		A.P.I. Service GL–4 or GL–5
	Viscosity	All-season	SAE 75W–90
		Above 10 °C{50 °F}	SAE 80W–90
	Capacity	(L {US qt, Imp qt})	2.0 {2.1, 1.8}

PROPELLER SHAFT

FEATURES

OUTLINE L-2
OUTLINE OF CONSTRUCTION..... L-2
SPECIFICATIONS L-2

L

OUTLINE

OUTLINE OF CONSTRUCTION

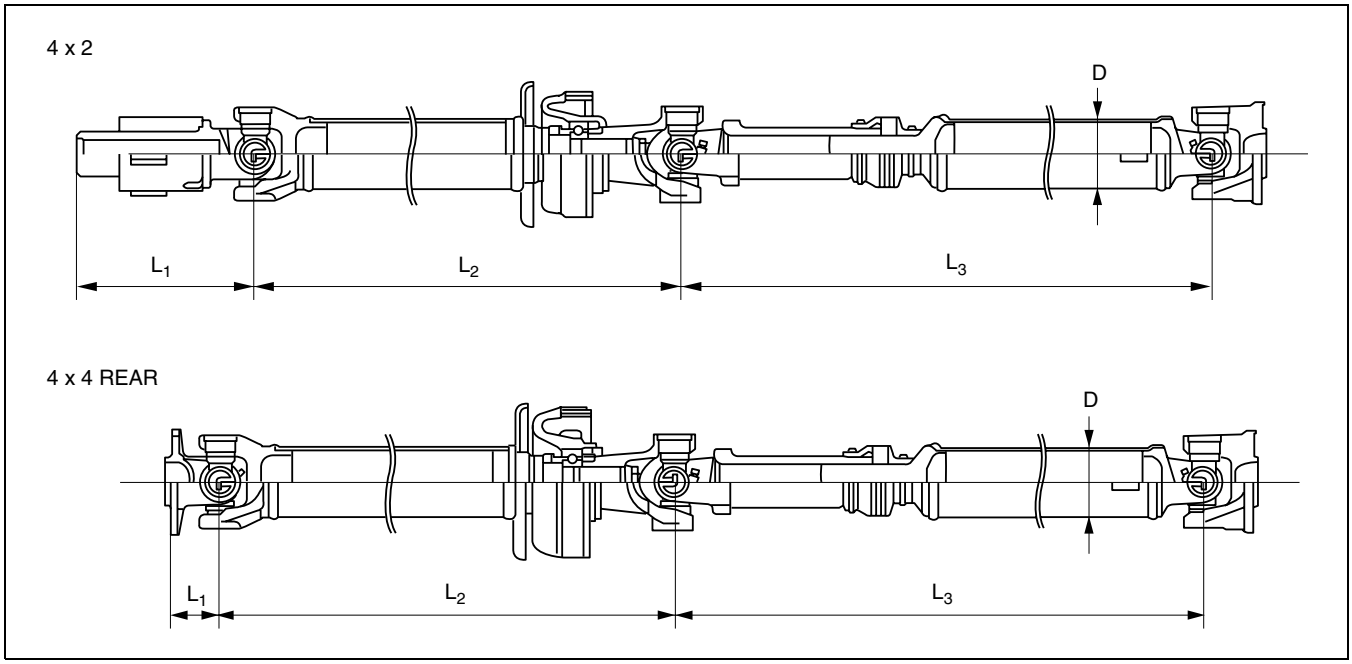
BVF610225002W01

- A dynamic damper has been eliminated (WL Turbo 4×4 AT model).
- The construction and operation of the propeller shaft for the new EVEREST AT model is the same as that of the current EVEREST exept for the following features. (See EVEREST Repair Manual F183–10–03A.)

SPECIFICATIONS

BVF610225002W02

Item			EVEREST		
			4 x 2	4 x 4	
			Propeller shaft	Front propeller shaft	Rear propeller shaft
Length	(mm {in})	L1	159.0 {6.26}	40.0 {1.57}	45.3 {1.78}
		L2	657.6 {25.89}	470.0 {18.50}	545.8 {21.49}
		L3	808.2 {31.82}	245.0 {9.65}	799.7 {31.48}
Outer diameter	(mm {in})	D	63.5 {2.50}	57.0 {2.24}	63.5 {2.50}
Joint type			3–cross joint	2–cross joint	3–cross joint



AVG6110T001

BODY ELECTRICAL SYSTEM

FEATURES

OUTLINE T-2
OUTLINE OF CONSTRUCTION..... T-2
FEATURES T-2
WARNING AND INDICATOR SYSTEM T-3
OUTLINE..... T-3
INSTRUMENT CLUSTER..... T-3

T

OUTLINE

OUTLINE OF CONSTRUCTION

BVF810218510W03

- The construction and operation of the body electrical system for the new EVEREST is the same as that of the current EVEREST except for the following features. (See EVEREST Repair Manual Supplement F183-10-03A.)

FEATURES

BVF810218510W04

Improved marketability

- A hold indicator light has been added.

WARNING AND INDICATOR SYSTEM

OUTLINE

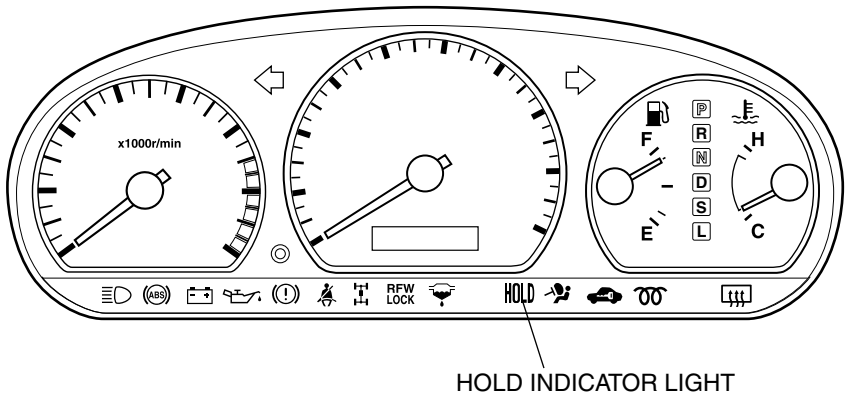
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- A hold indicator light has been added. (vehicles with RA4AX-EL type automatic transmission)

INSTRUMENT CLUSTER

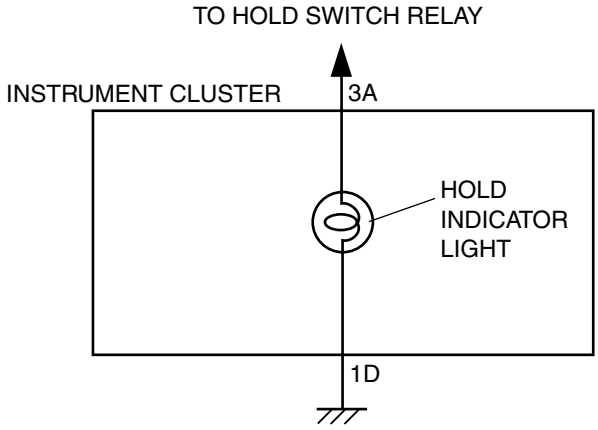
BVF811818510W02

Structural View



BVF0922W003

System Wiring Diagram



BVF0922W002

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TECHNICAL DATA

TECHNICAL DATA TD-2
AUTOMATIC TRANSMISSION..... TD-2

TECHNICAL DATA

AUTOMATIC TRANSMISSION

BVF931000000W02

Item			Automatic transmission type
			RA4AX-EL
ATF	Type		ATF M-III or equivalent (e.g. Dexron®III)
	Capacity (Approx. quantity) (L {US qt, Imp qt})		8.6 {9.1, 7.6}
Line pressure (kPa {kgf/cm^2, psi})	D, S, L range	Idle	490—529 {5.0—5.4, 71—77}
		Stall	1,197—1,275 {12.2—13.0, 174—185}
	R position	Idle	618—657 {6.3—6.7, 90—95}
		Stall	1,501—1,578 {15.3—16.1, 218—229}
Engine stall speed (rpm)	R, D, S, L		2,800—3,000
Time lag (s)	N-D		Approx. 1.0 or below
	N-R		Approx. 1.0 or below
Transmission fluid temperature (TFT) sensor (kilohm)	ATF temperature 20 °C {68 °F}		Approx. 2.5
	ATF temperature 80 °C {176 °F}		Approx. 0.3
Solenoid valve (ohm)	Shift solenoid A		20—40
	Shift solenoid B		20—40
	Overrunning clutch		20—40
	Pressure control		2.5—5
	TCC		10—20
Dropping resistor (ohm)			10—14
Flywheel	Maximum runout (mm {in})		0.2 {0.008}

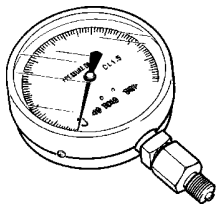
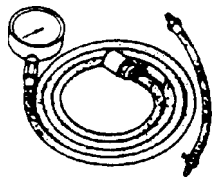
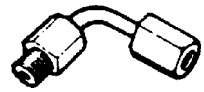
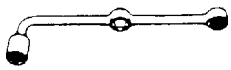
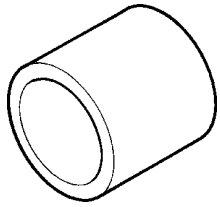
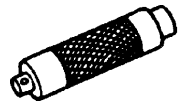
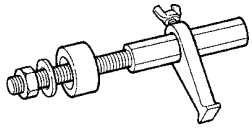
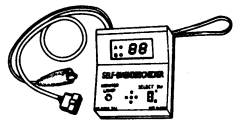
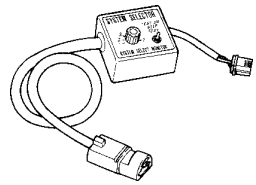
SPECIAL TOOLS

SPECIAL TOOLS ST-2
AUTOMATIC TRANSMISSION.....ST-2

SPECIAL TOOLS

AUTOMATIC TRANSMISSION

BVF941000000W01

49 B019 901B Oil pressure gauge 	49 0378 400B Oil pressure gauge set 	49 H019 002 Adapter 
49 0877 435 Wrench 	49 U027 003 Oil seal installer 	49 G030 797 Handle 
49 E011 1A0 Ring gear brake set 	49 B019 9A1A Self-diagnosis checker 	49 B019 9A0 System selector 

EVEREST
Wiring Diagrams

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FOREWORD

This Manual has been prepared to provide information covering normal service repairs and maintenance for the EVEREST.

All information in this manual was the best available at the time of printing. All alternations related to modifications will be advised by Service Information.

Ford Motor Company

Ⓒ Ford Motor Company
PRINTED IN AUG. 2003
F187-20-03H

VEHICLE IDENTIFICATION NUMBERS (VIN)
(CHASSIS NUMBER)

MNB BS4D40*W 100956—
MNB BSYD40*W 100956—
MNB LS4D40*W 100956—
MNB LSYD40*W 100956—

WIRING COLOR CODE

COLOR	CODE	COLOR	CODE
BLACK	B	ORANGE	O
BLUE	L	PINK	P
BROWN	BR	RED	R
DARK BLUE	DL	SKY BLUE	SB
DARK GREEN	DG	TAN	T
GRAY	GY	VIOLET	V
GREEN	G	WHITE	W
LIGHT BLUE	LB	YELLOW	Y
LIGHT GREEN	LG		

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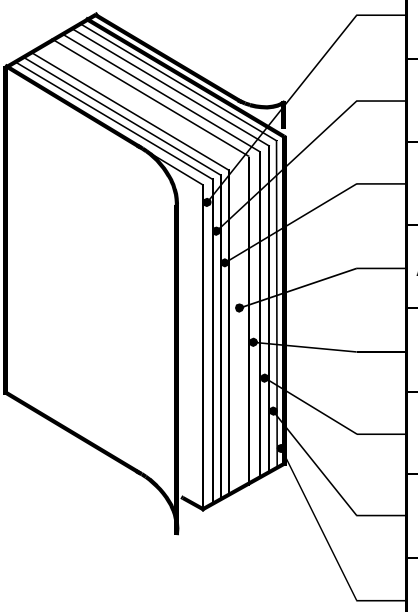
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Contents of wiring diagrams

- This manual comprises the sections shown below.



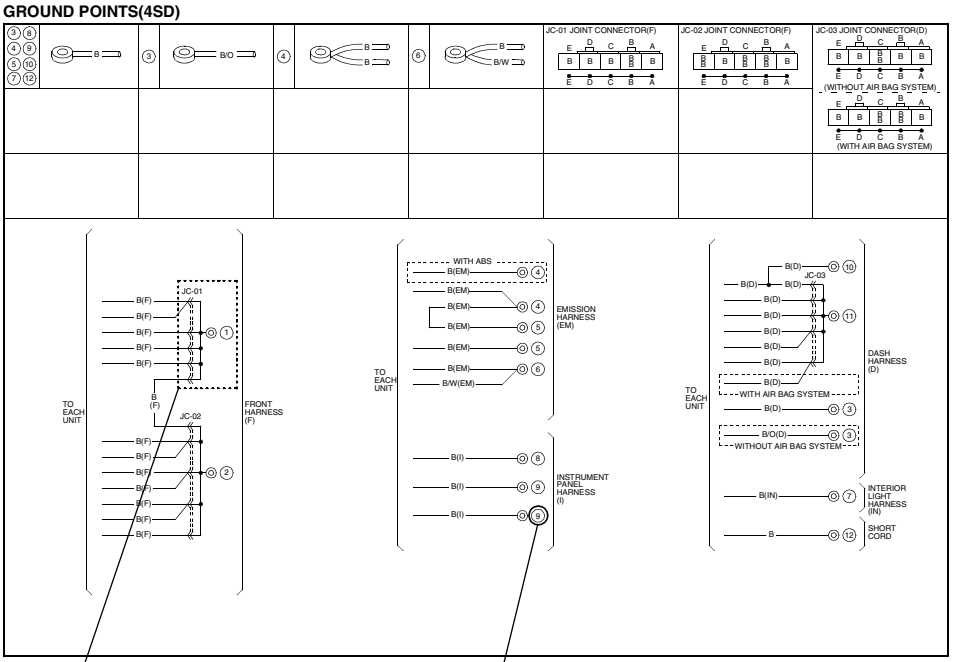
GI	**General information of wiring diagrams**	A how-to on using and reading wiring diagrams, using test equipment,checking harness and connectors,and finding trouble spots
Y	**Ground points**	Ground routes from and to the battery
W	**Electrical wiring schematic**	Shows main fuses and other fuses for each system
A-U	**System circuit diagram/ connector locations**	Shows circuit and connector diagrams and component and connector location diagrams
X	**Common connectors**	Shows connectors common throughout system
JB	**Joint box complete wiring system**	Shows internal circuits and connectors
FB	**Main fuse block complete wiring system**	Shows internal circuits and connectors
AI	**Alphabetical Index**	Gives page number of circuit diagram for each component

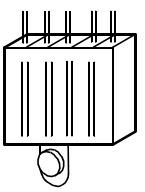
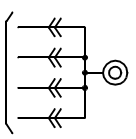
Depending on the vehicle model, the actual sections may be different.

Ground points

- This shows ground points of the harness.

GROUND POINTS(4SD)

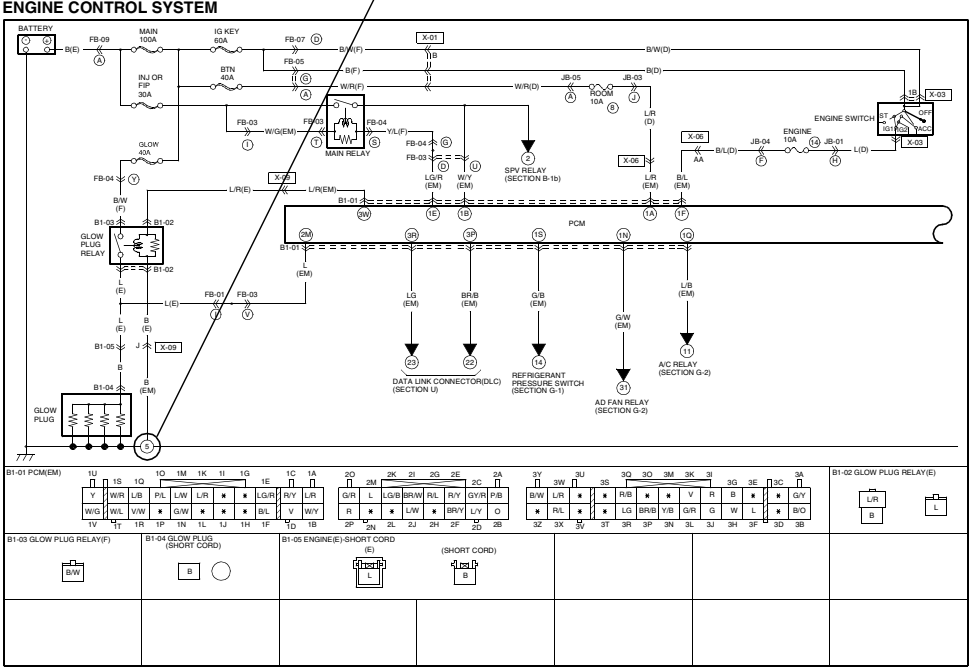


Ground indication	
On vehide	Indication
	To circuit 

On circuit diagrams and ground points

The ground connection numbers in system circuit diagrams correspond to those in the ground point diagram.

ENGINE CONTROL SYSTEM



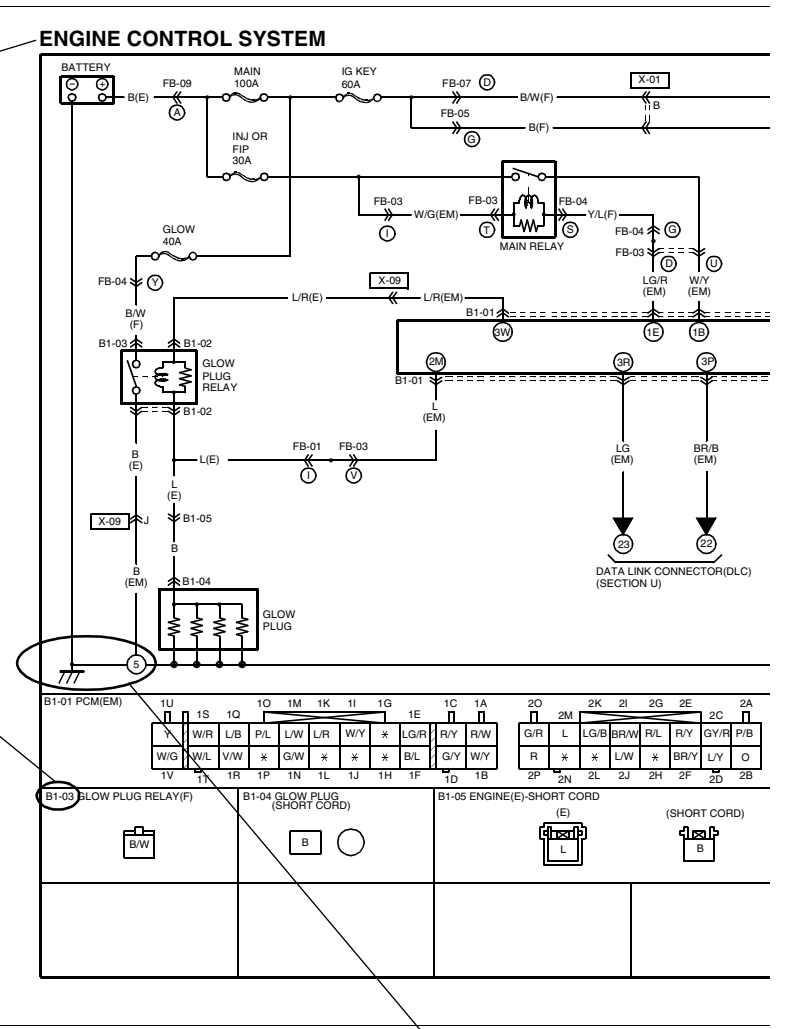
Reading Wiring Diagrams

System circuit diagram/connector diagram

- These diagrams show the circuits for each system, from the power supply to the ground. The power supply side is on the upper part of the page, the ground side on the lower part. The diagrams describe circuits with the ignition switch off.

  Below is an explanation of the various points in the diagram.

System name



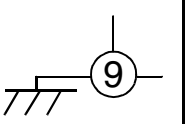
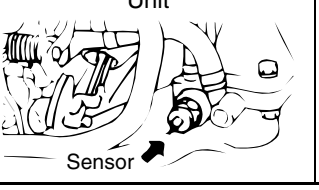
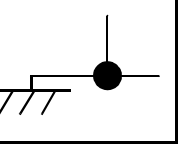
Connector code

The prefix letter indicates the system in which the connector is used.

- Y : Ground connector
- A : Charging system/starting system connectors
- B : Engine control system connectors
- C : Gauge control system connectors
- D : Wiper system connectors
- E : Lighting system connectors
- F : Signal system connectors
- G : Air-conditioning system connectors
- H : Transmission control/Key interlock/ Shift-lock system connectors
- I : Interior light system connectors
- J : Audio/radio connectors
- K : Power window/power door lock system connectors
- L : Remote control mirror system connectors
- M : Sliding sunroof system connectors
- O : Anti-lock brake system connectors
- P : Power seat/seat warmer system connectors
- Q : Auto cruise control system connectors
- S : Passive shoulder belt control/Airbag system connectors
- T : Others
- U : Data link connector
- X : Common connectors
- JB : Joint box connections
- FB : Main fuse block

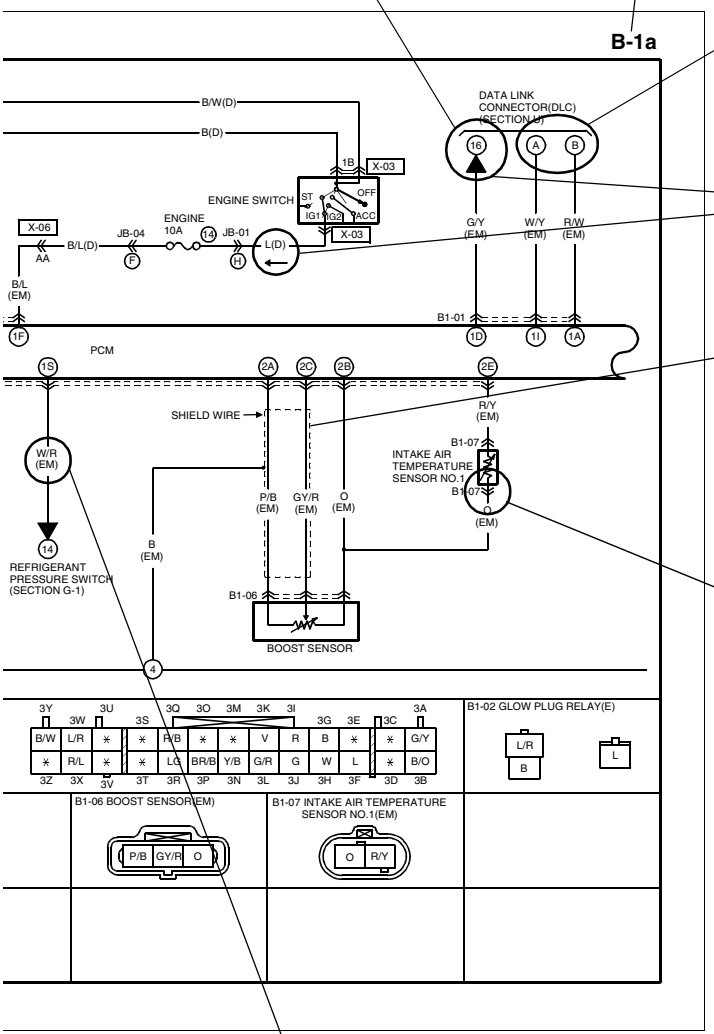
Ground numbers

A harness ground is represented differently than a unit ground.

Types of grounds	Symbol
Harness 	
Unit 	

The number indicates that the circuit continues to the related system diagram.

System code



Multiplex communication

Indicates communication with connected parts. Signals are transmitted back and forth between connected parts.

Current symbol

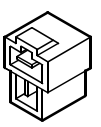
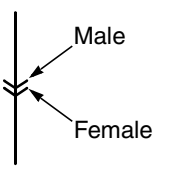
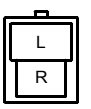
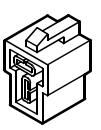
Current flows in the direction of the arrow.

Indicates shielded wire.*

* Shielded wire :
Prevents signal disturbances from electrical interference.
Wire is covered by a metal meshing for grounding.

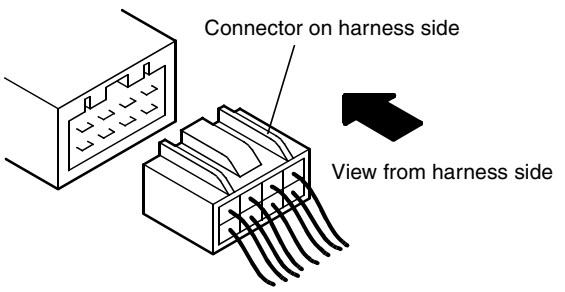
Connector symbols

- Male and female connectors are represented as follows in the circuit and connector diagrams.

		Circuit diagram symbol	Connector diagram symbol
Male			
Female			

- Like connectors are linked by dashed lines between the connector symbols.
- Connector diagrams show connectors on the harness side. The terminal indicates the view from the harness side.

(Example)



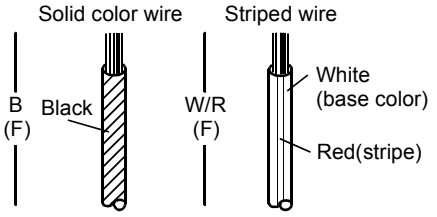
- Colors for connectors except white are given in locations.
- Unused terminals are indicated by ✻ .

Wire color code (harness symbol)

- Two-color wires are indicated by a two-letter symbol.The first indicates the base color of the wire, the second the color of the stripe.
  For example:

  W/R is a white wire with a red strip
  BR/Y is a brown wire with a yellow strip

Symbol (Example)



- The harness symbol is in ( ) following the harness symbols (refer to P-7.).

Routing diagram

- The routing diagram shows where electrical components are on the system circuit diagram by call out line and connector symbols.

Connector symbol

Shows the system that uses the connector.

(Example)

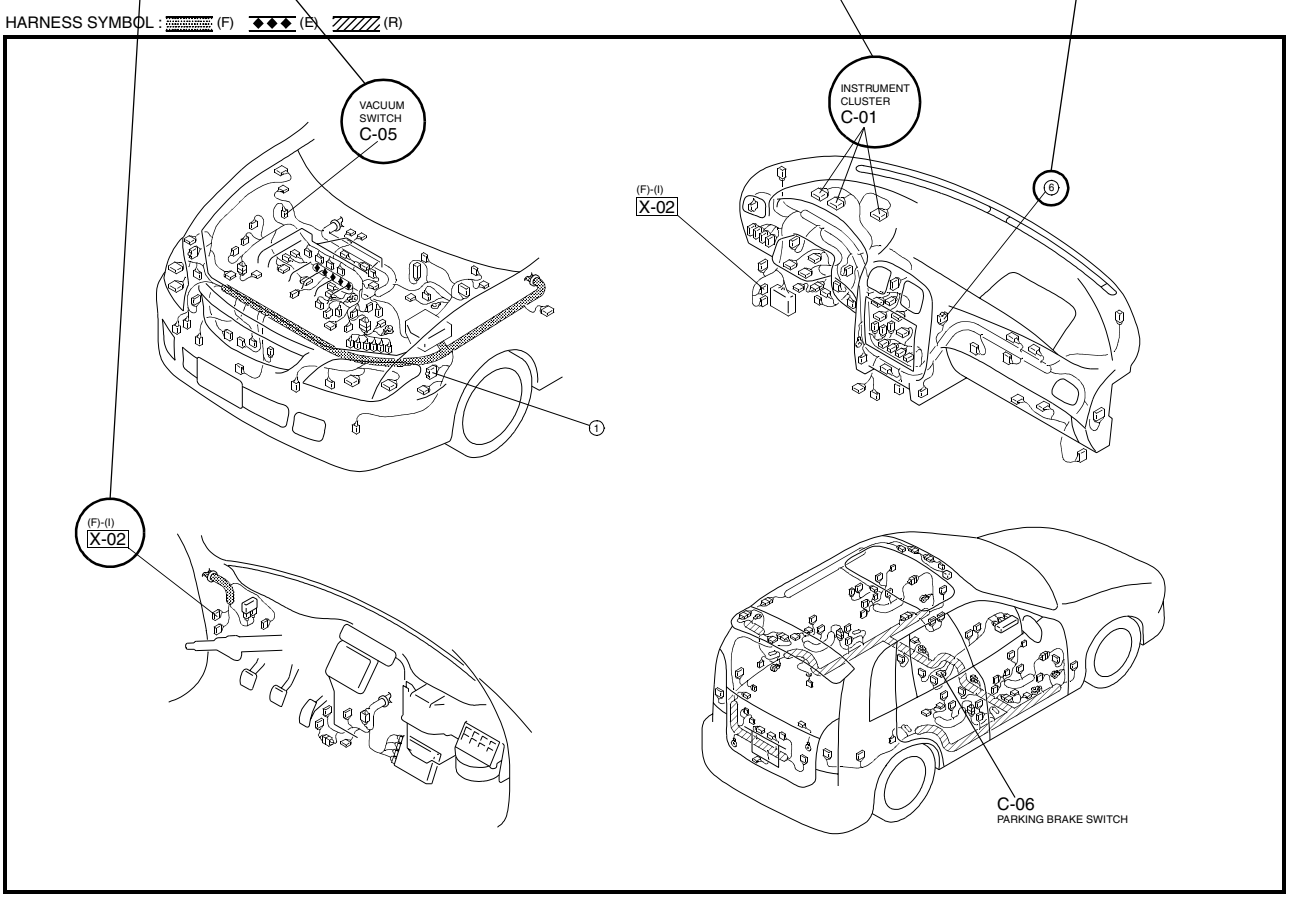
Connector	Symbol
Common connectors	X-19
System connectors	I-03

Component name

Shows the names of components in routing diagrams.

Ground symbol

Shows the ground in system diagrams.

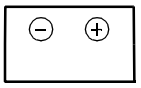
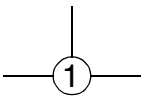
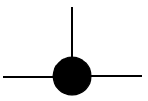
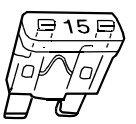
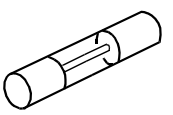
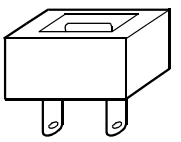
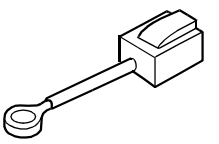
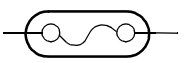
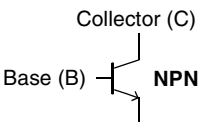
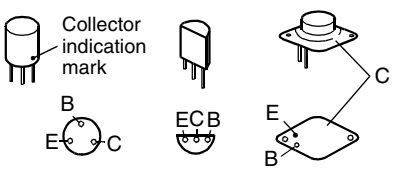
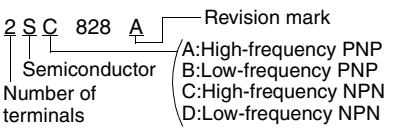
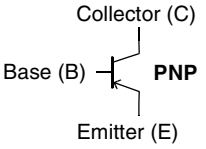


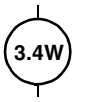
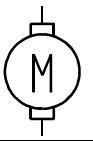
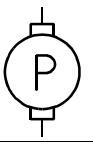
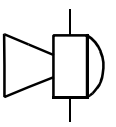
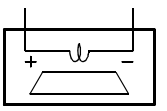
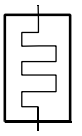
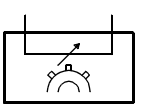
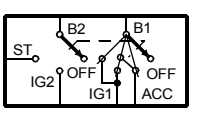
Harness symbols

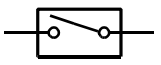
DESCRIPTION OF HARNESS	SYMBOL		DESCRIPTION OF HARNESS	SYMBOL	
FRONT HARNESS	(F)		DOOR NO.1 HARNESS	(DR1)	
FRONT NO.2 HARNESS	(F2)		DOOR NO.2 HARNESS	(DR2)	
ENGINE HARNESS	(E)		DOOR NO.3 HARNESS	(DR3)	
DASH HARNESS	(D)		DOOR NO.4 HARNESS	(DR4)	
REAR HARNESS	(R)		FLOOR HARNESS	(FR)	
REAR NO.2 HARNESS	(R2)		INTERIOR LIGHT HARNESS	(IN)	
REAR NO.3 HARNESS	(R3)		A/C HARNESS	(AC)	
INSTRUMENT PANEL HARNESS	(I)		INJECTION HARNESS	(INJ)	
EMISSION HARNESS	(EM)		HAND BRAKE HARNESS	(HB)	
EMISSION NO.2 HARNESS	(EM2)				
EMISSION NO.3 HARNESS	(EM3)				

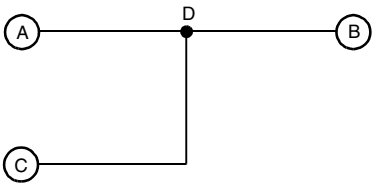
Reading Wiring Diagrams

Symbols

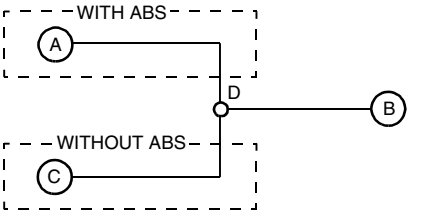
Symbol	Meaning
Battery 	• Generates electricity through chemical reaction. • Supplies direct current to circuits.
Ground (1) 	• Connecting point to vehicle body or other ground wire where current flows from positive to negative terminal of battery. • Ground (1) indicates a ground point to body through wire harness. • Ground (2) indicates point where component is grounded directly to body. Remarks • Current will not flow through a circuit if ground is faulty.
Ground (2) 	
Fuse (1)  (box)	• Melts when current flow exceeds that specified for circuit, interrupts current flow. Precautions • Do not replace with fuses exceeding specified capacity. <Blade type>  <Tube type>  <Cartridge type>  <Fusible link> 
Fuse (2)  (Cartridge)	
Main fuse/ Fusible link 	
Transistor (1) 	• Electrical switching component. • Turns on when voltage is applied to the base (B).  • Reading code. 
Transistor (2) 	

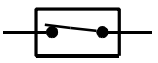
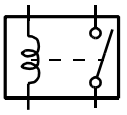
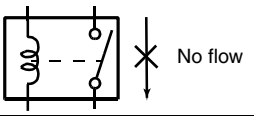
Symbol	Meaning
Light 	• Emits light and generates heat when current flows through filament.
Resistance 	• A resistor with a constant value. • Mainly used to protect electrical components in circuits by maintaining rated voltage.
Motor 	• Converts electrical energy into mechanical energy.
Pump 	• Pulls in and discharges gases and liquids.
Cigarette lighter 	• Electrical coil that generates heat.
Horn 	• Generates sound when current flows.
Speaker 	
Heater 	• Generates heat when current flows.
Speed sensor 	• Movement of magnet in speedometer turns contact within sensor on and off.
Ignition switch 	• Turning ignition key switches circuit to operate various component. (NOTE) Ignition switch is called engine switch on diesel vehicles.

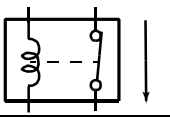
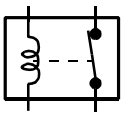
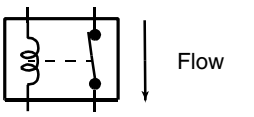
<table>
<tr><th>Symbol</th><th>Meaning</th><th>Symbol</th><th>Meaning</th></tr>
<tr><td>Switch (1)
 
Normally open (NO)</td><td rowspan="2">• Allows or breaks current flow by opening and closing curcuits.</td><td>Harness
Connection
 
When circuit C-D is connected to circuit A-B, the connection D is indicated by a black dot.

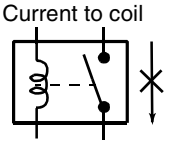
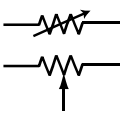
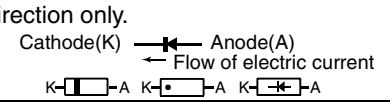
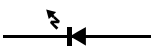
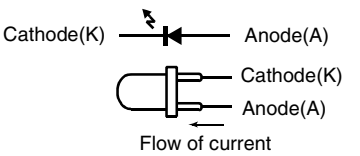
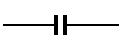
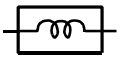
Selection
 
Diversion point D for the different circuits according to the vehicle's specification is indicated by a white dot.</td><td> 

For vehicles with ABS, use the A-B circuit.

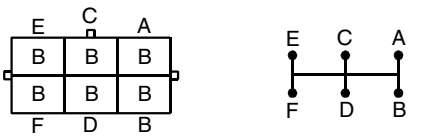
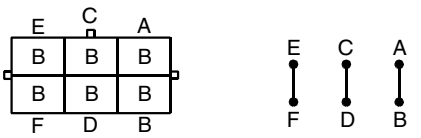
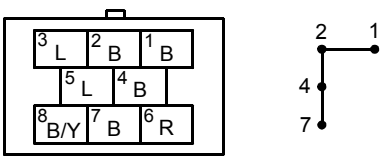
 

For vehicles without ABS, use the C-B circuit.</td></tr>
<tr><td>Switch (2)
 
Normally closed (NC)</td></tr>
<tr><td>Relay (1)
 
Normally open (NO)</td><td colspan="3">• Current flowing through coil produces electromagnetic force causing contact to open or close.
No current to coil
 

Current to coil
 
</td></tr>
<tr><td>Relay (2)
 
Normally closed (NC)</td><td colspan="3">• Current flowing through coil produces electromagnetic force causing contact to close.
No current to coil
 

Current to coil
 
</td></tr>
<tr><td>Sensor (variable)
  </td><td>• Resistance changes with other components operation.</td><td>Diode
  </td><td>• Known as a semiconductor rectifier, the diode allows current flow in one direction only.
 
</td></tr>
<tr><td>Sensor (thermistor)
  </td><td>• Resistance changes with temperature.</td><td rowspan="2">Light-emitting diode (LED)
  </td><td rowspan="2">• A diode that lights when current flows.
• Unlike ordinary bulbs, the diode does not generate heat when lit.
 
</td></tr>
<tr><td>Capacitor
  </td><td>• Component that temporarily stores electrical charge.</td></tr>
<tr><td>Solenoid
  </td><td>• Current flowing through coil generates electromagnetic force to operate plungers.</td><td>Reference diode (Zener diode)
  </td><td>• Allows current to flow in one direction up to a certain voltage; allows current to flow in the other direction once that voltage is exceeded.</td></tr>
</table>

Reading Wiring Diagrams

Symbol	Meaning
Extent of the change in the wiring position (1) 	• The wiring position can be exchanged freely within the connector.
Extent of the change in the wiring position (2) 	• The wiring position can be exchanged according to the following combinations only. Between A and B, Between C and D, Between E and F
Extent of the change in the wiring position (3) 	• The wiring position can be exchanged according to the following combinations only. Between 1, 2, 4 and 7. • The wiring positions may be indicated by numbers for some connectors.

Abbreviations used in this manual

3GR	THIRD GEAR
4GR	FOURTH GEAR
A	AMPERE
A/C	AIR CONDITIONING
A/F	AIR FUEL
AAS	AUTO ADJUSTING SUSPENSION
ABS	ANTI-LOCK BRAKING SYSTEM
ACC	ACCESSORIES
ACV	AIR CONTROL VALVE
ADD	ADDITIONAL
AIS	AIR INJECTION SYSTEM
ALL	AUTOMATIC LOAD LEVELING
AM	AMPLITUDE MODULATION
AMP	AMPLIFIER
ANT	ANTENNA
ASV	AIR SUPPLY VALVE
AT	AUTOMATIC TRANSMISSION
ATX	AUTOMATIC TRANSAXLE
B+	BATTERY POSITIVE VOLTAGE
BAC	BYPASS AIR CONTROL
CAN	CONTROLLER AREA NETWORK
CARB	CARBURETOR
CIGAR	CIGARETTE
CIS	CONTINUOUS FUEL INJECTION SYSTEM
CKP	CRANKSHAFT POSITION SENSOR
CM	CONTROL MODULE
CMP	CAMSHAFT POSITION SENSOR

COMBI	COMBINATION
CON	CONDITIONER
CONT	CONTROL
CPU	CENTRAL PROCESSING UNIT
DEF	DEFROSTER
DI	DISTRIBUTOR IGNITION
DLC	DATA LINK CONNECTOR
DLI	DISTRIBUTORLESS IGNITION
DOHC	DOUBLE-OVERHEAD CAMSHAFT
DRL	DAYTIME RUNNING LIGHT
DTC	DIAGNOSTIC TROUBLE CODE(S)
DTM	DIAGNOSTIC TEST MODE
ECPS	ELECTRONICALLY CONTROLLED POWER STEERING
ECT	ENGINE CONTROL TEMPERATURE
EGR	EXHAUST GAS RECIRCULATION
EI	ELECTRONIC IGNITION
ELEC	ELECTRIC
ELR	EMERGENCY LOCKING RETRACTOR
ET	ELECTRONIC THROTTLE
EVAP	EVAPORATIVE EMISSION
F	FRONT
F/I	FUEL INJECTOR
FICB	FAST-IDLE CAM BREAKER
FM	FREQUENCY MODULATION
FP	FUEL PUMP
FPR	FUEL PUMP RELAY
GEN	GENERATOR

GND	GROUND
H/D	HEATER/DEFROSTER
HEAT	HEATER
HI	HIGH
HO2S	HEATED OXYGEN SENSOR
HU	HYDRAULIC UNIT
IAC	IDLE AIR CONTROL
IAT	INTAKE AIR TEMPERATURE
IG	IGNITION
ILLUMI	ILLUMINATION
INT	INTERMITTENT
JB	JOINT BOX
KS	KNOCK SENSOR
LCD	LIQUID CRYSTAL DISPLAY
LF	LEFT FRONT
LH	LEFT HAND
LO	LOW
LR	LEFT REAR
M	MOTOR
MAF	MASS AIR FLOW
MAP	MANIFOLD ABSOLUTE PRESSURE
MFI	MULTIPORT FUEL INJECTION
MID	MIDDLE
MIL	MALFUNCTION INDICATOR LAMP
MIN	MINUTE
MIX	MIXTURE
MPX	MULTIPLEX
MT	MANUAL TRANSMISSION
MTX	MANUAL TRANSAXLE
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
O2S	OXYGEN SENSOR
OBD	ON-BOARD DIAGNOSTIC
O/D	OVER DRIVE
OFF	SWITCH OFF
ON	SWITCH ON
OSC	OSCILLATOR
P	POWER
P/S	POWER STEERING
PCM	POWERTRAIN CONTROL MODULE
PNP	PARK/NEUTRAL POSITION
PRC	PRESSURE REGULATOR CONTROL
PRG	PURGE SOLENOID VALVE
PSP	POWER STEERING PRESSURE
PTC	POSITIVE TEMPERATURE COEFFICIENT HEATER
PWM	PULSE WIDTH MODULATION
QSS	QUICK-START SYSTEM
R	REAR
REC	RECIRCULATION

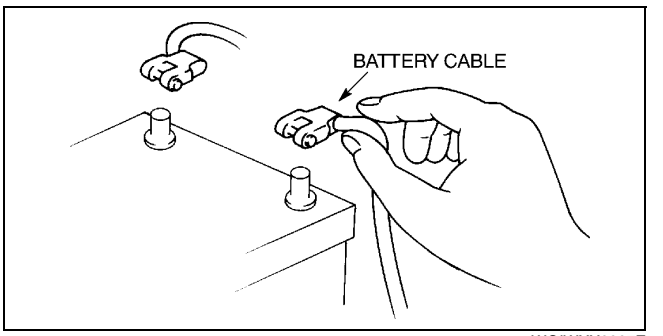
RF	RIGHT FRONT
RH	RIGHT HAND
RPM	REVOLUTIONS PER MINUTE
RR	RIGHT REAR
SAS	SOPHISTICATED AIR BAG SENSOR
SFI	SEQUENTIAL MULTIPOINT FUEL INJECTION
SOL	SOLENOID
SPV	SPILL VALVE
ST	START
SW	SWITCH
TC	TURBOCHARGER
TCC	TORQUE CONVERTER CLUTCH
TCM	TRANSMISSION(TRANSAXLE)CONTROL MODULE
TCS	TRACTION CONTROL SYSTEM
TEMP	TEMPERATURE
TFT	TRANSAXLE FLUID TEMPERATURE
TNS	TAIL NUMBER SIDE LIGHTS
TICS	TRIPLE INDUCTION CONTROL SYSTEM
TP	THROTTLE POSITION SENSOR
TR	TRANSMISSION(TRANSAXLE)RANGE
TWS	TOTAL WIRING SYSTEM
V	VOLT
VAF	VOLUME AIR FLOW SENSOR
VENT	VENTILATION
VICS	VARIABLE INERTIA CHARGING SYSTEM
VOL	VOLUME
VR	VOLTAGE REGULATOR
VRIS	VARIABLE RESONANCE INDUCTION SYSTEM
VSS	VEHICLE SPEED SENSOR
VTCS	VARIABLE TUMBLE CONTROL SYSTEM
W	WATT(S)
WOT	WIDE OPEN THROTTLE

ELECTRICAL PARTS

B6U000000006W03

Battery cable

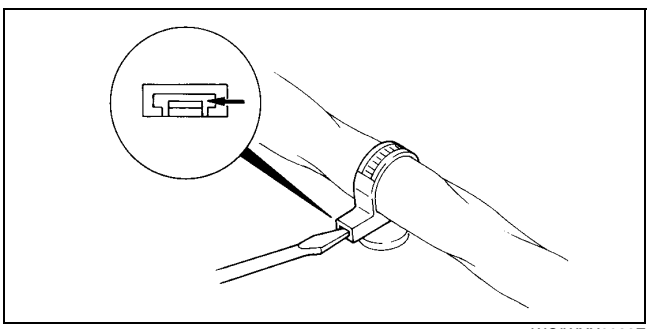
- Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



WGIWXX0007E

Wiring Harness

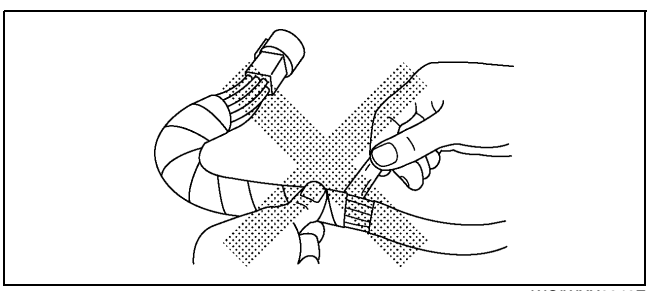
- To remove the wiring harness from the clip in the engine room, pry up the hook of the clip using a flathead screwdriver.



WGIWXX0039E

Caution

- **Do not remove the Harness protective tape. Otherwise, the wires could rub against the body, which could result in water penetration and electrical shorting.**



WGIWXX0040E

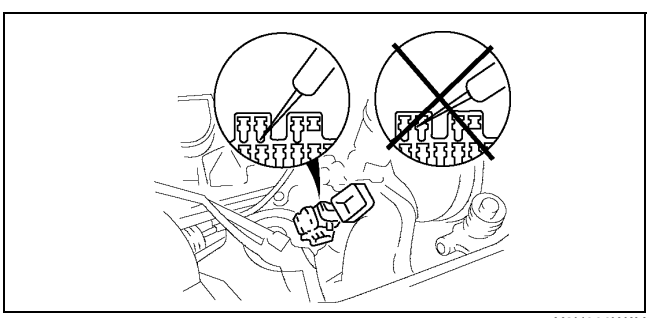
CONNECTORS

Data link connector

- Insert the probe into the terminal when connecting a jumper wire to the data link connector.

Caution

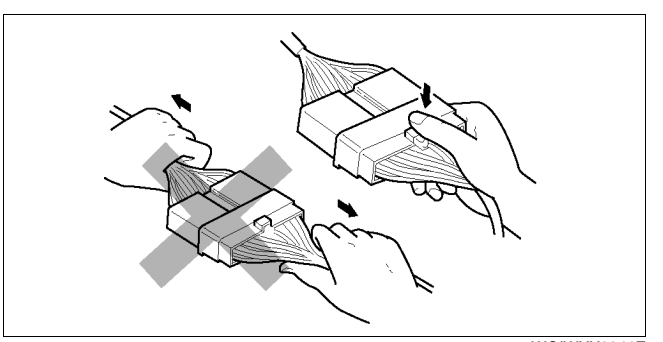
- **Inserting a jumper wire probe into the data link connector terminal may damage the terminal.**



X3U000WAY

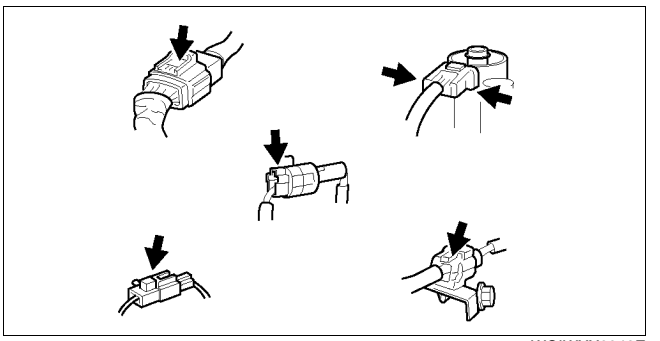
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



WGIWXX0041E

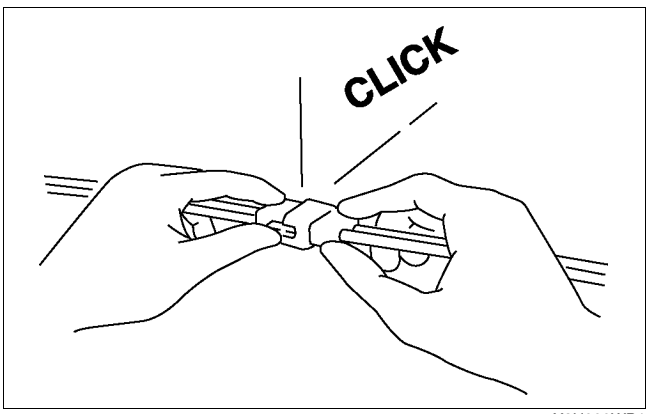
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

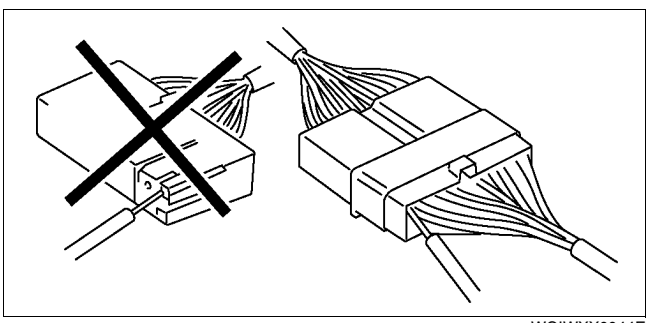
- When locking connectors, listen for a click indicating they are securely locked.



X3U000WB1

Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

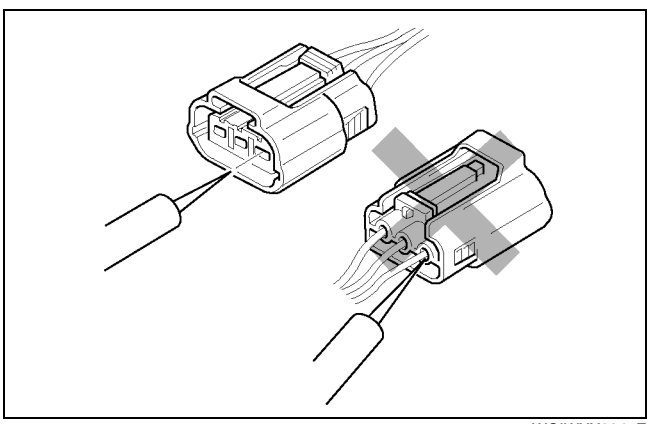


WGIWXX0044E

- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

  Caution

  - **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**

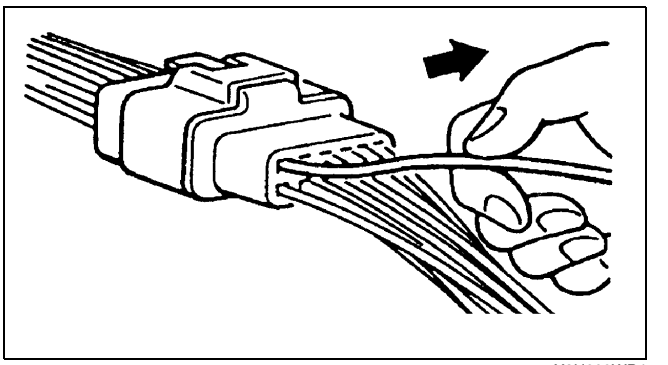


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Terminals

Inspection

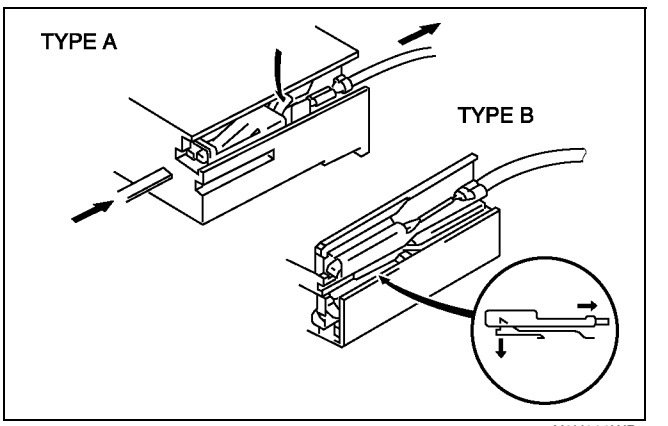
- Pull lightly on individual wires to verify that they are secured in the terminal.



X3U000WB4

Replacement

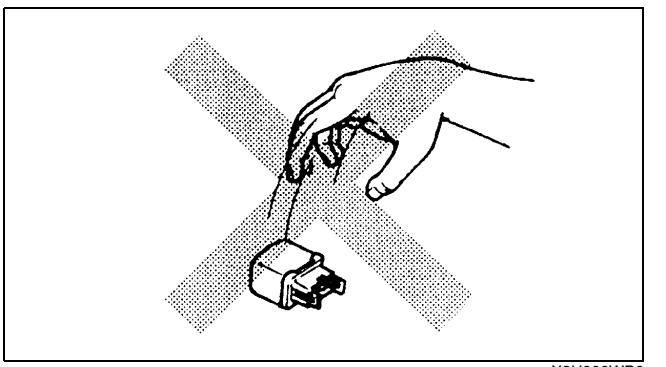
- Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



X3U000WB5

Sensors, Switches, and Relays

- Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.

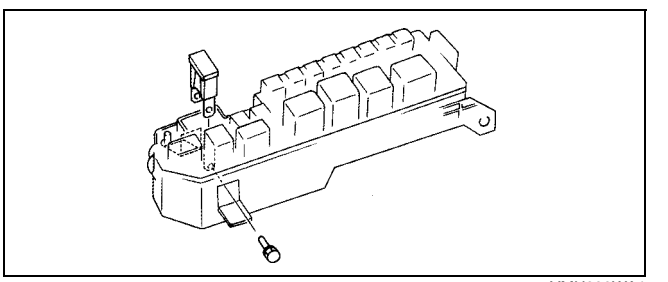


X3U000WB6

Fuse

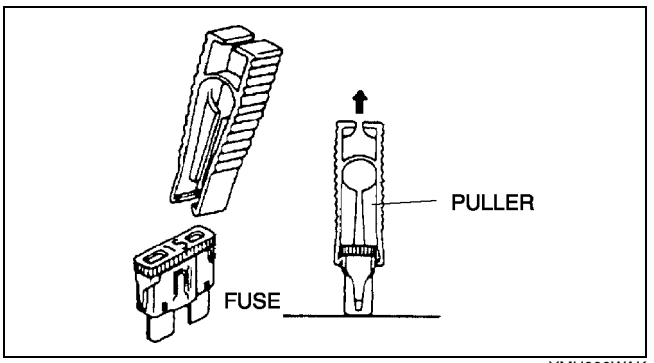
Replacement

- When replacing a fuse, be sure to replace it with one of the same capacity. If a fuse fails again, the circuit probably has a short and the wiring should be inspected.
- Be sure the negative battery terminal is disconnected before replacing a main fuse.



YMU000WA1

- When replacing a pullout fuse, use the fuse puller.



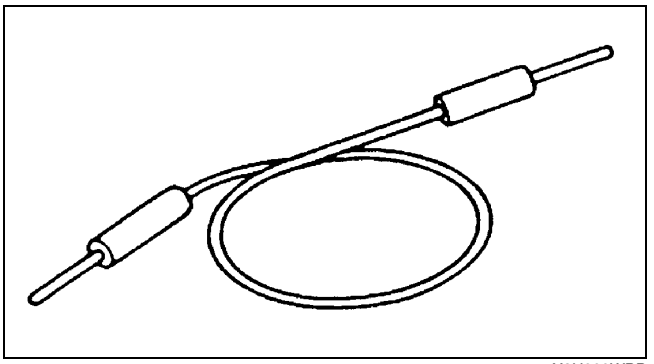
YMU000WAK

ELECTRICAL TROUBLESHOOTING TOOLS

Jumper wire

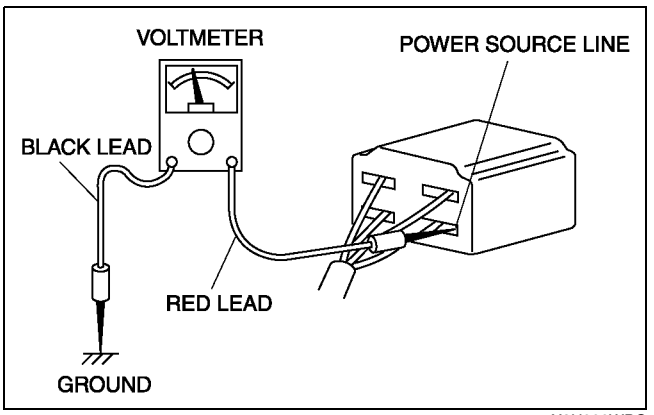
- A jumper wire is used to create a temporary circuit. Connect the jumper wire between the terminals of a circuit to bypass a switch.

  Caution
  - **Do not connect a jumper wire from the power source line to a body ground. This may cause burning or other damage to wiring harnesses or electronic components.**


X3U000WBB

Voltmeter

- The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of **15 V or more** is used by connecting the positive (+) probe (red lead wire) to the point where voltage will be measured and the negative (-) probe (black lead wire) to a body ground.

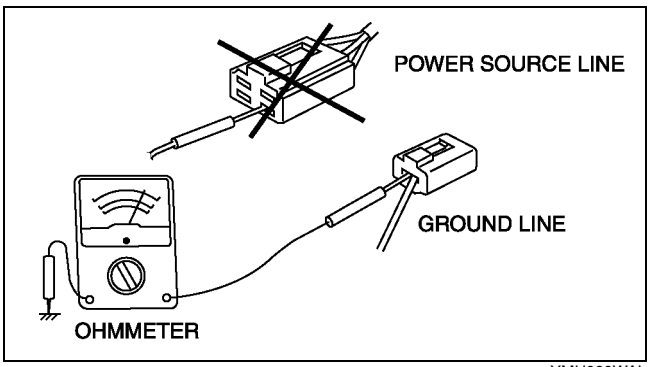


X3U000WBC

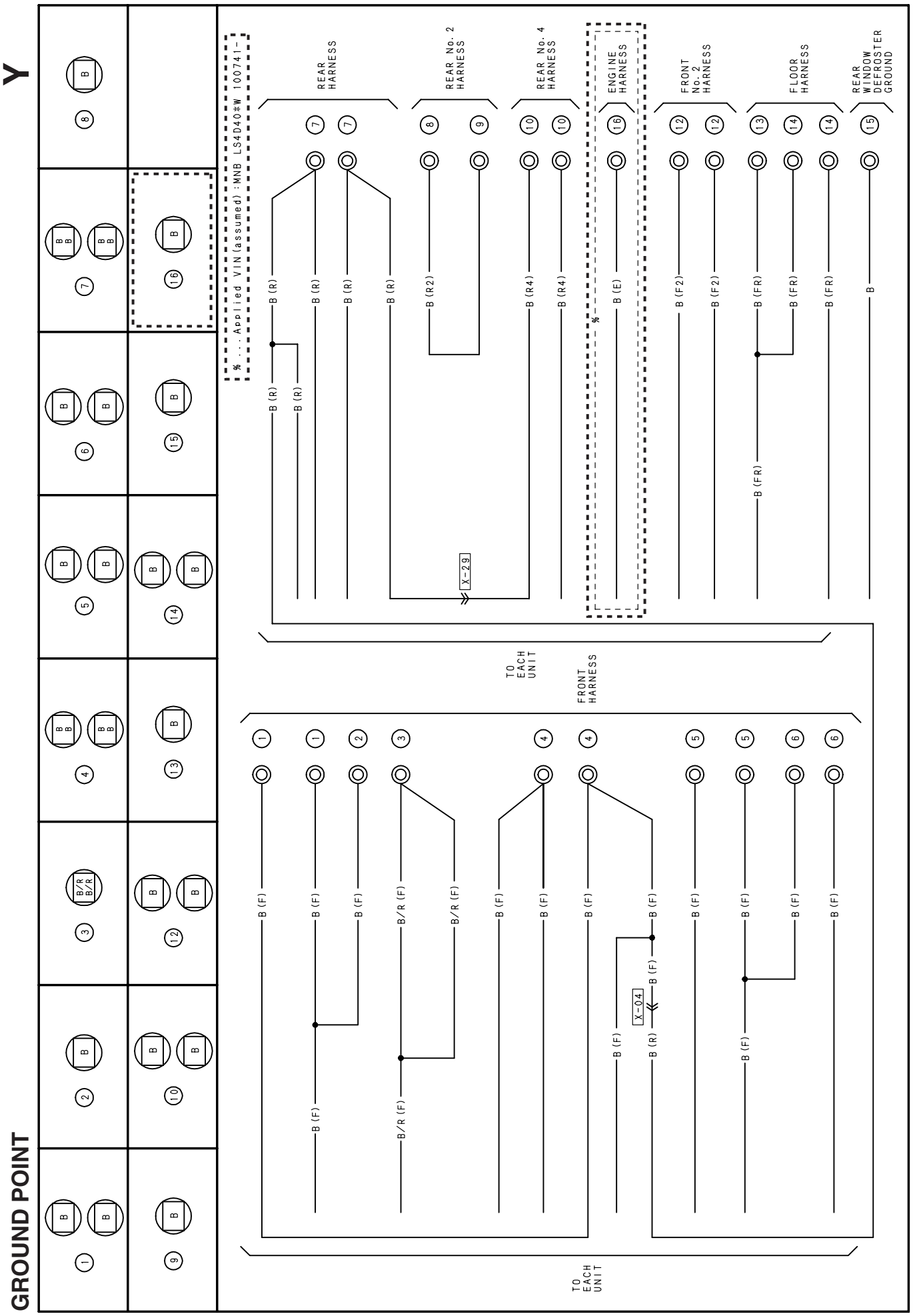
Ohmmeter

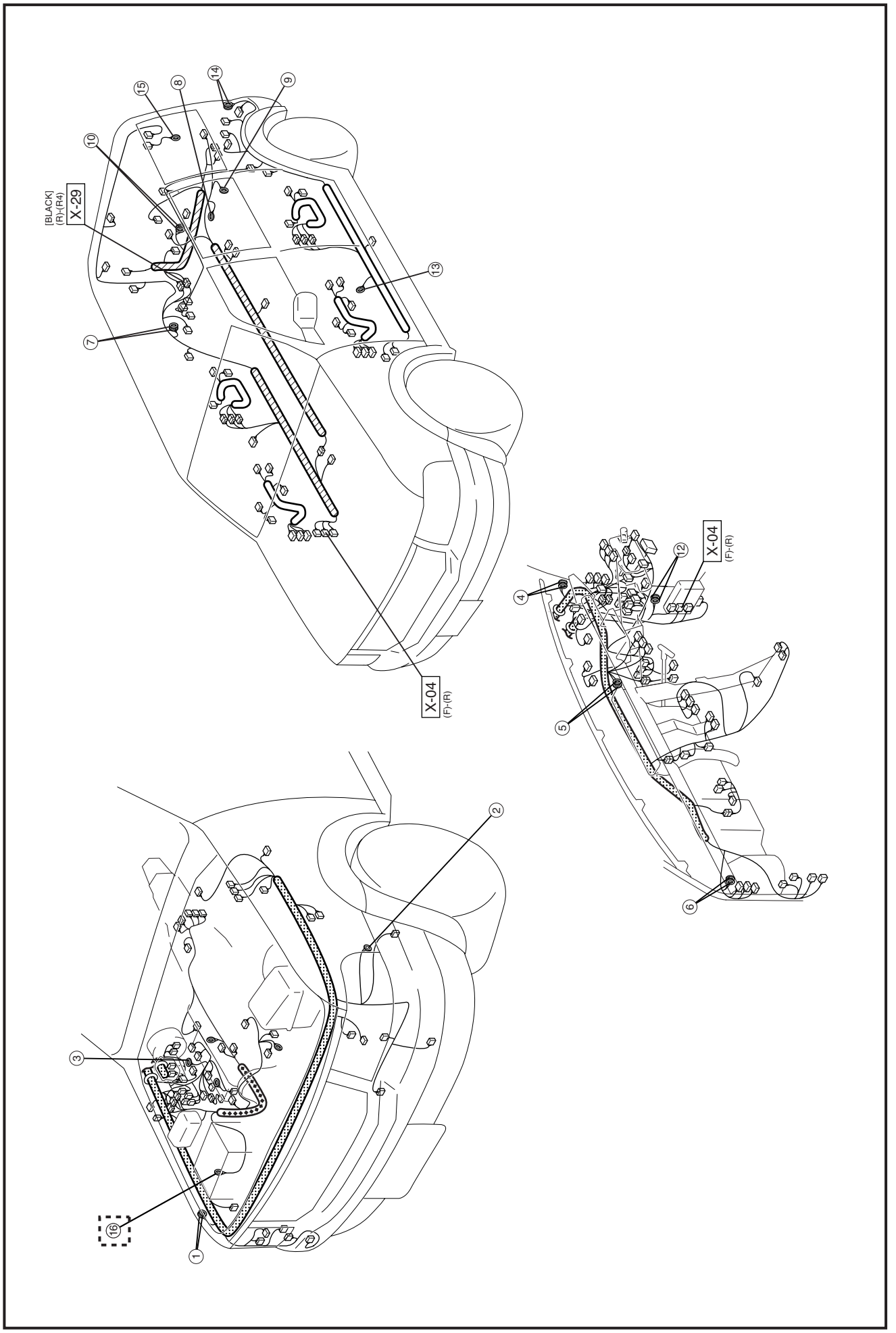
- The ohmmeter is used to measure the resistance between two points in a circuit and to inspect for continuity and short circuits.

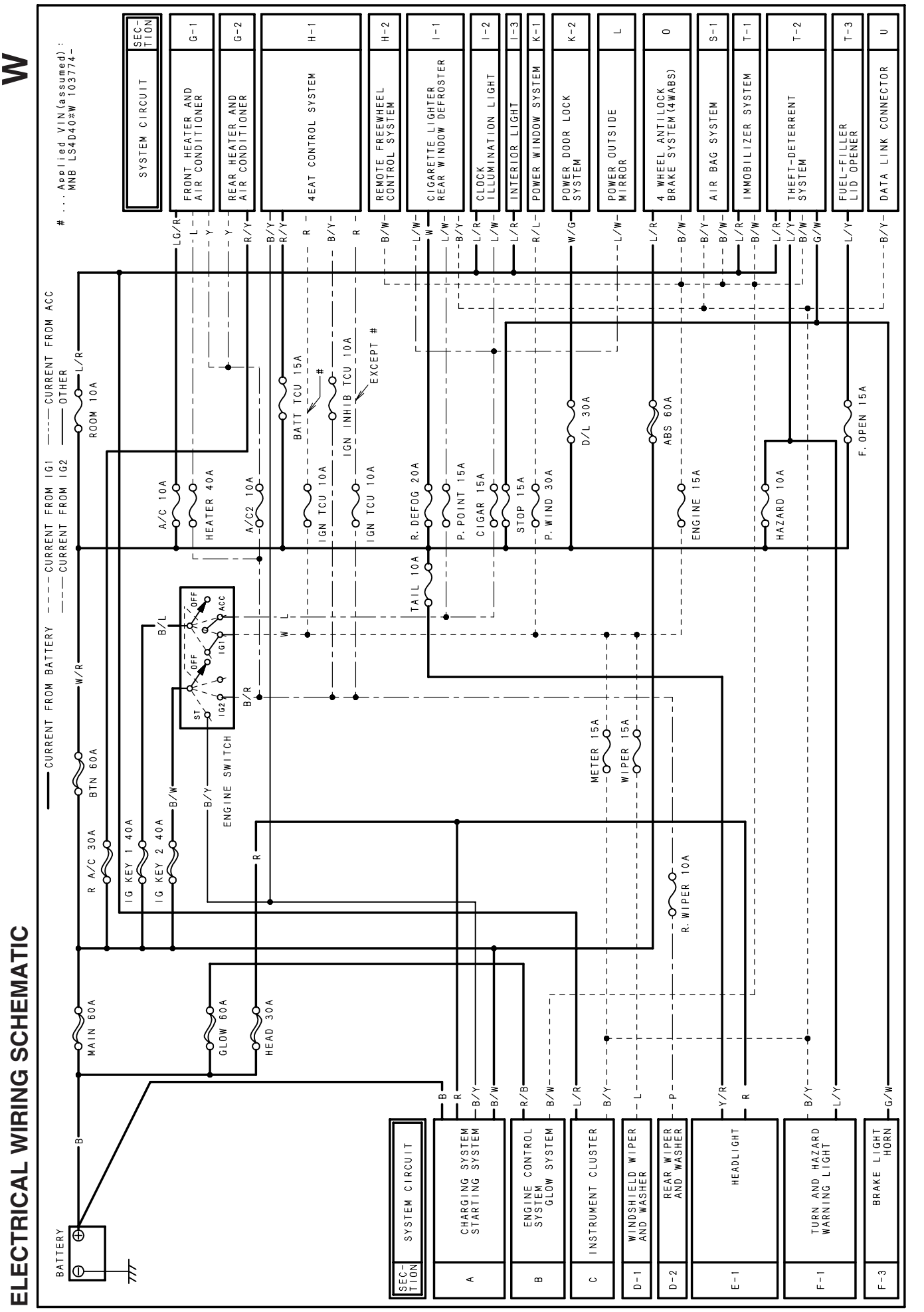
  Caution
  - **Do not connect the ohmmeter to any circuit where voltage is applied. This will damage the ohmmeter.**



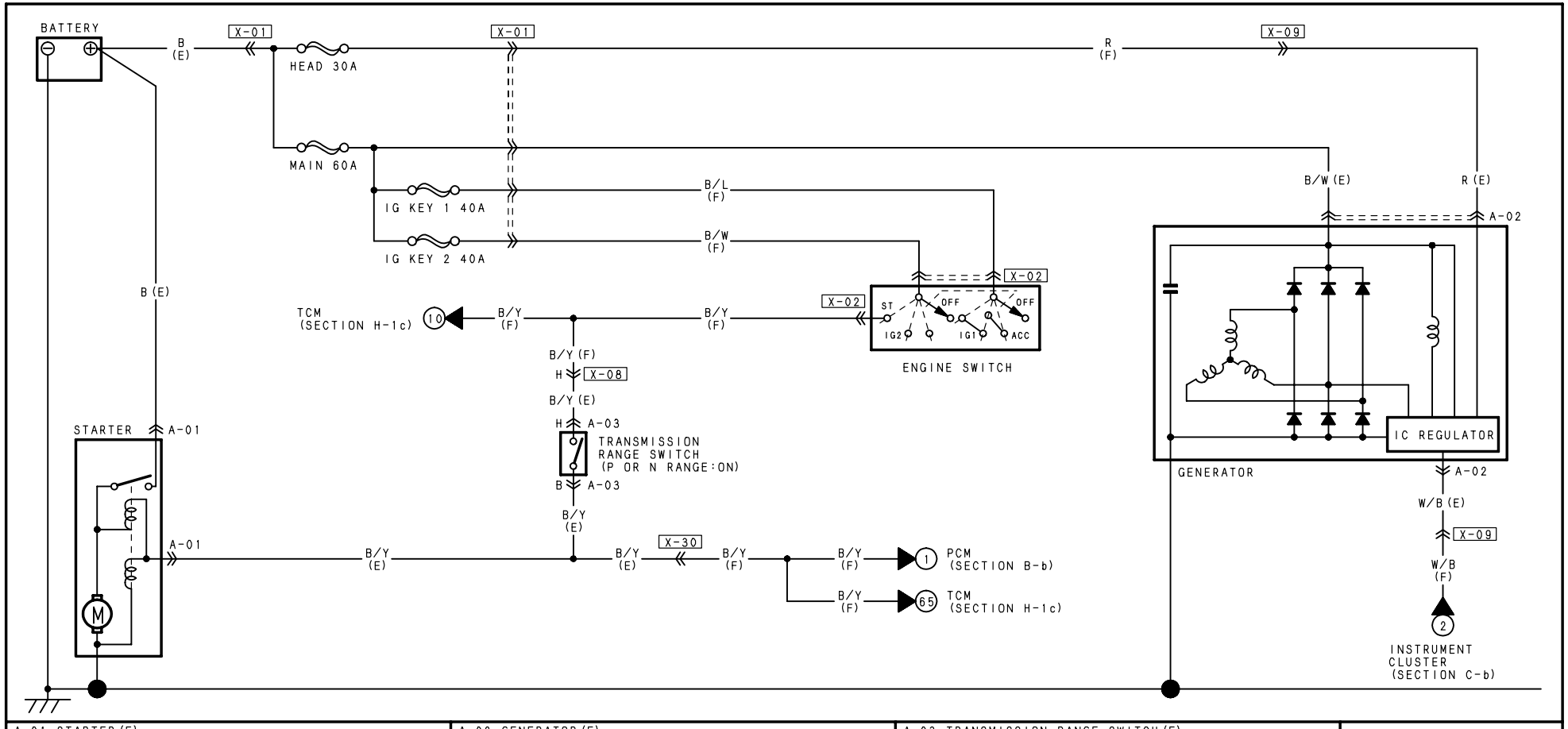
YMU000WAL


Y
GROUND POINT
※ ... Applied VIN (assumed) : MNB LS4D40*W 100741-
REAR HARNESS
REAR No. 2 HARNESS
REAR No. 4 HARNESS
ENGINE HARNESS
FRONT No. 2 HARNESS
FLOOR HARNESS
REAR WINDOW DEFROSTER GROUND
X-29
X-04
TO EACH UNIT
FRONT HARNESS
TO EACH UNIT


[BLACK]
(R)-(R4)
X-29
X-04
(F)-(R)
X-04
(F)-(R)
HARNESS SYMBOL: (F) (E) (R)


W
ELECTRICAL WIRING SCHEMATIC
... Applied VIN(assumed):
MNB LS4D40#W 103774-
CURRENT FROM BATTERY
CURRENT FROM IG1
CURRENT FROM IG2
CURRENT FROM ACC
OTHER
SYSTEM CIRCUIT
SEC-TION
FRONT HEATER AND AIR CONDITIONER
REAR HEATER AND AIR CONDITIONER
4EAT CONTROL SYSTEM
REMOTE FREEWHEEL CONTROL SYSTEM
CIGARETTE LIGHTER REAR WINDOW DEFROSTER
CLOCK ILLUMINATION LIGHT
INTERIOR LIGHT
POWER WINDOW SYSTEM
POWER DOOR LOCK SYSTEM
POWER OUTSIDE MIRROR
4 WHEEL ANTILOCK BRAKE SYSTEM(4WABS)
AIR BAG SYSTEM
IMMOBILIZER SYSTEM
THEFT-DETERRENT SYSTEM
FUEL-FILLER LID OPENER
DATA LINK CONNECTOR
ROOM 10A
A/C 10A
HEATER 40A
A/C2 10A
BATT TCU 15A
IGN TCU 10A
IGN INHIB TCU 10A
EXCEPT #
TAIL 10A
R. DEFOG 20A
P. POINT 15A
CIGAR 15A
STOP 15A
P. WIND 30A
D/L 30A
ABS 60A
ENGINE 15A
HAZARD 10A
F. OPEN 15A
METER 15A
WIPER 15A
R. WIPER 10A
R A/C 30A
BTN 60A
IG KEY 1 40A
IG KEY 2 40A
MAIN 60A
GLOW 60A
HEAD 30A
ENGINE SWITCH
OFF
ACC
IG1
IG2
ST
BATTERY
SYSTEM CIRCUIT
CHARGING SYSTEM STARTING SYSTEM
ENGINE CONTROL SYSTEM GLOW SYSTEM
INSTRUMENT CLUSTER
WINDSHIELD WIPER AND WASHER
REAR WIPER AND WASHER
HEADLIGHT
TURN AND HAZARD WARNING LIGHT
BRAKE LIGHT HORN

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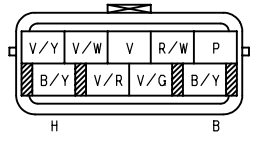
A-01 STARTER (E)



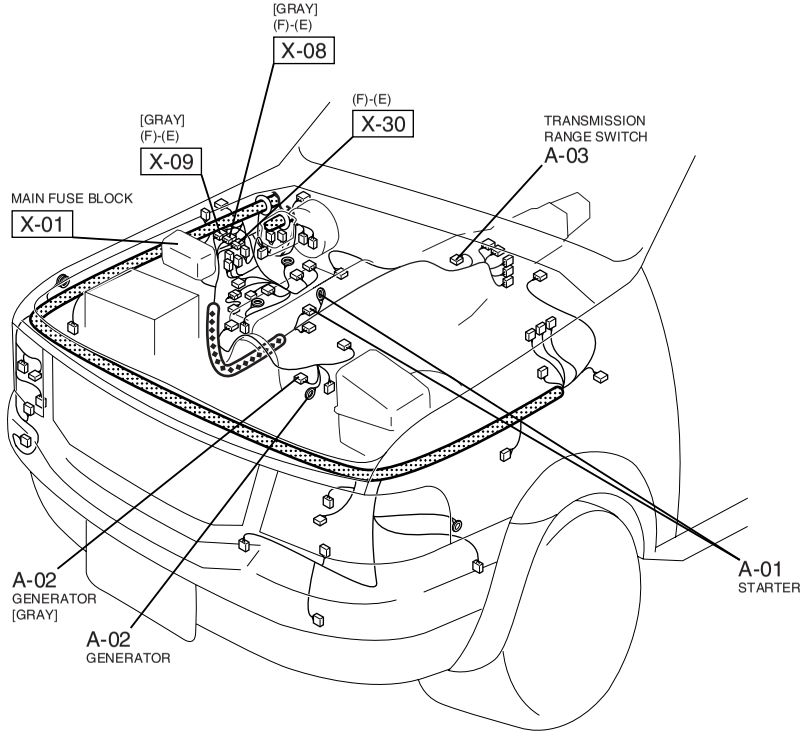
A-02 GENERATOR (E)

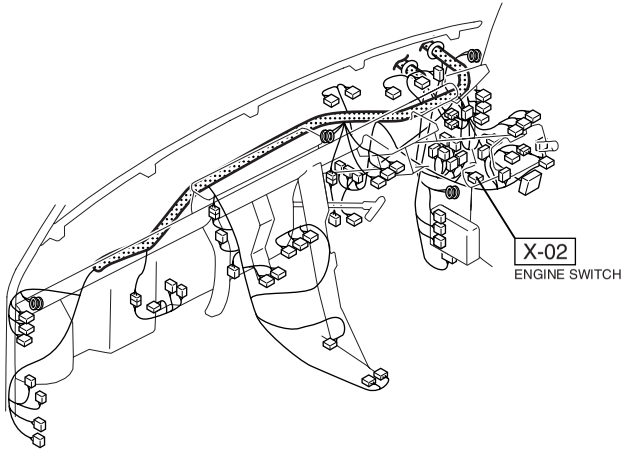


A-03 TRANSMISSION RANGE SWITCH (E)



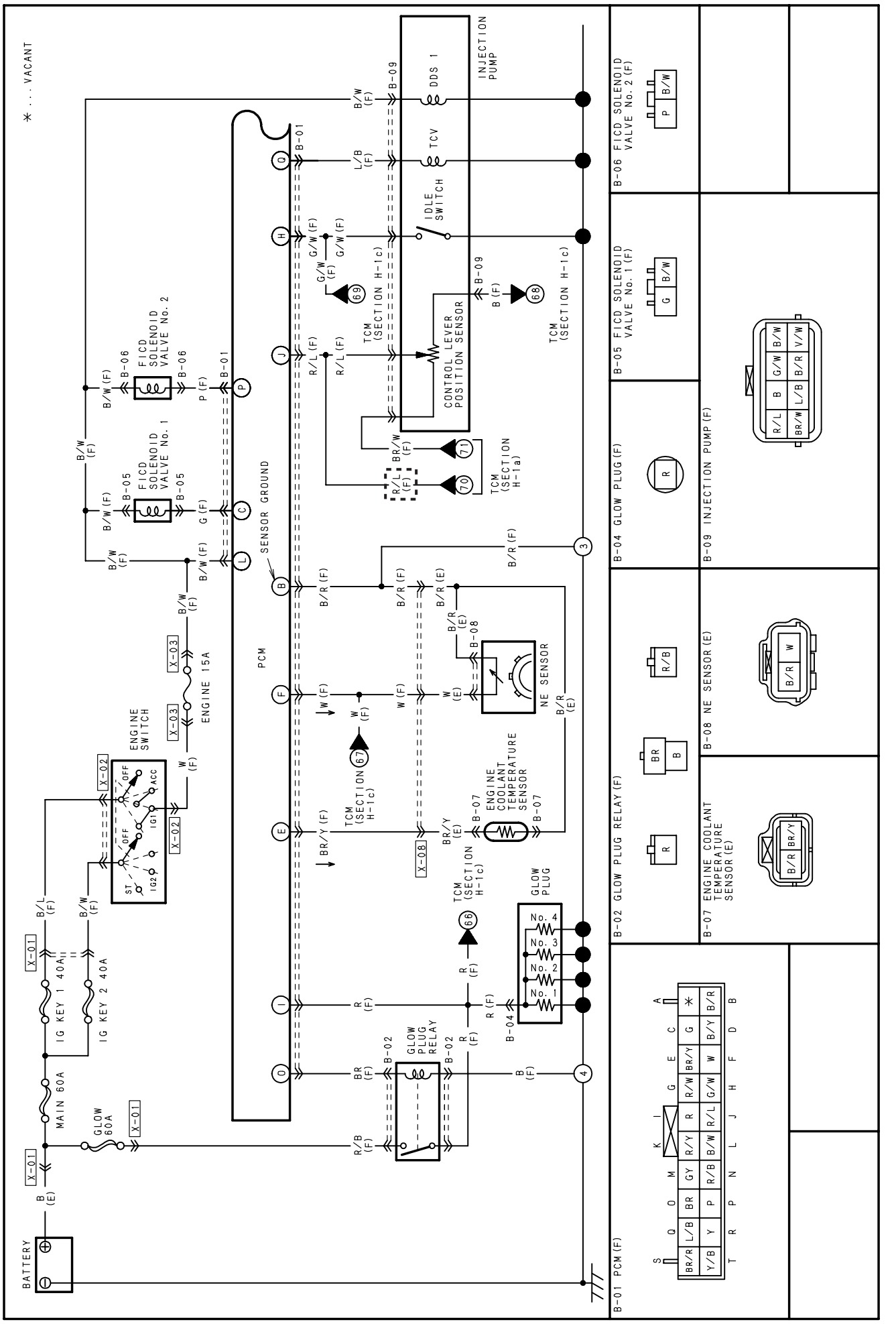
HARNESS SYMBOL: (F) (E) (R)



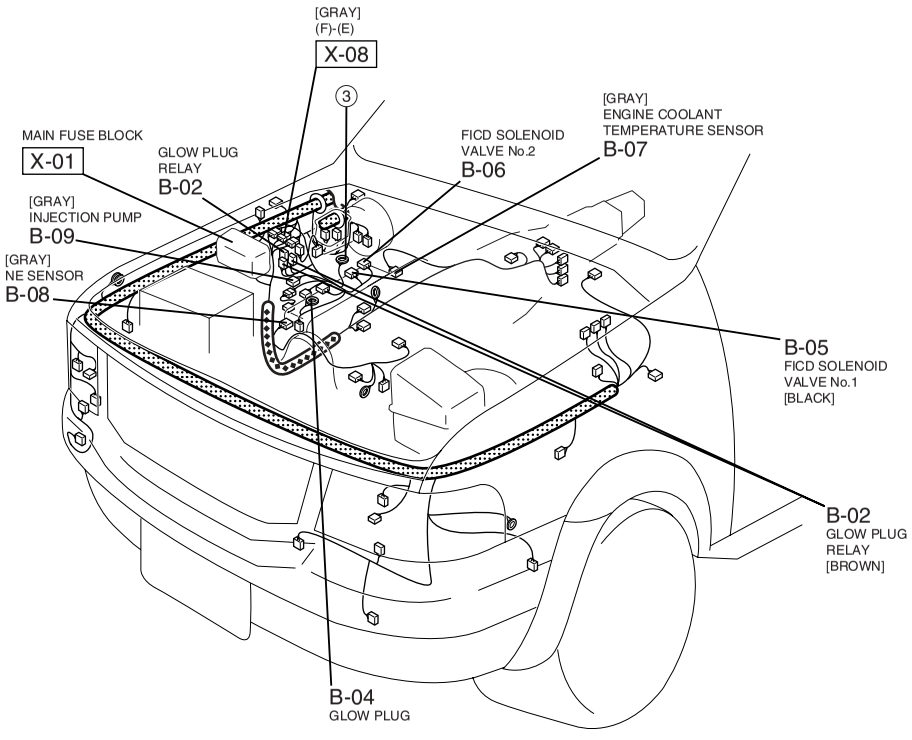


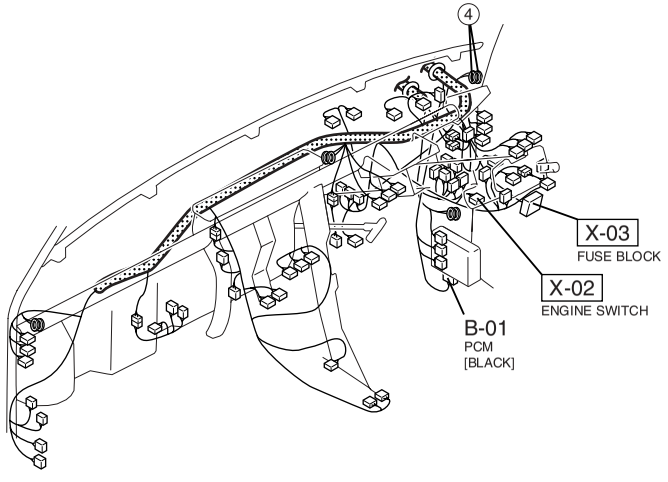
B-a

ENGINE CONTROL SYSTEM / GLOW SYSTEM

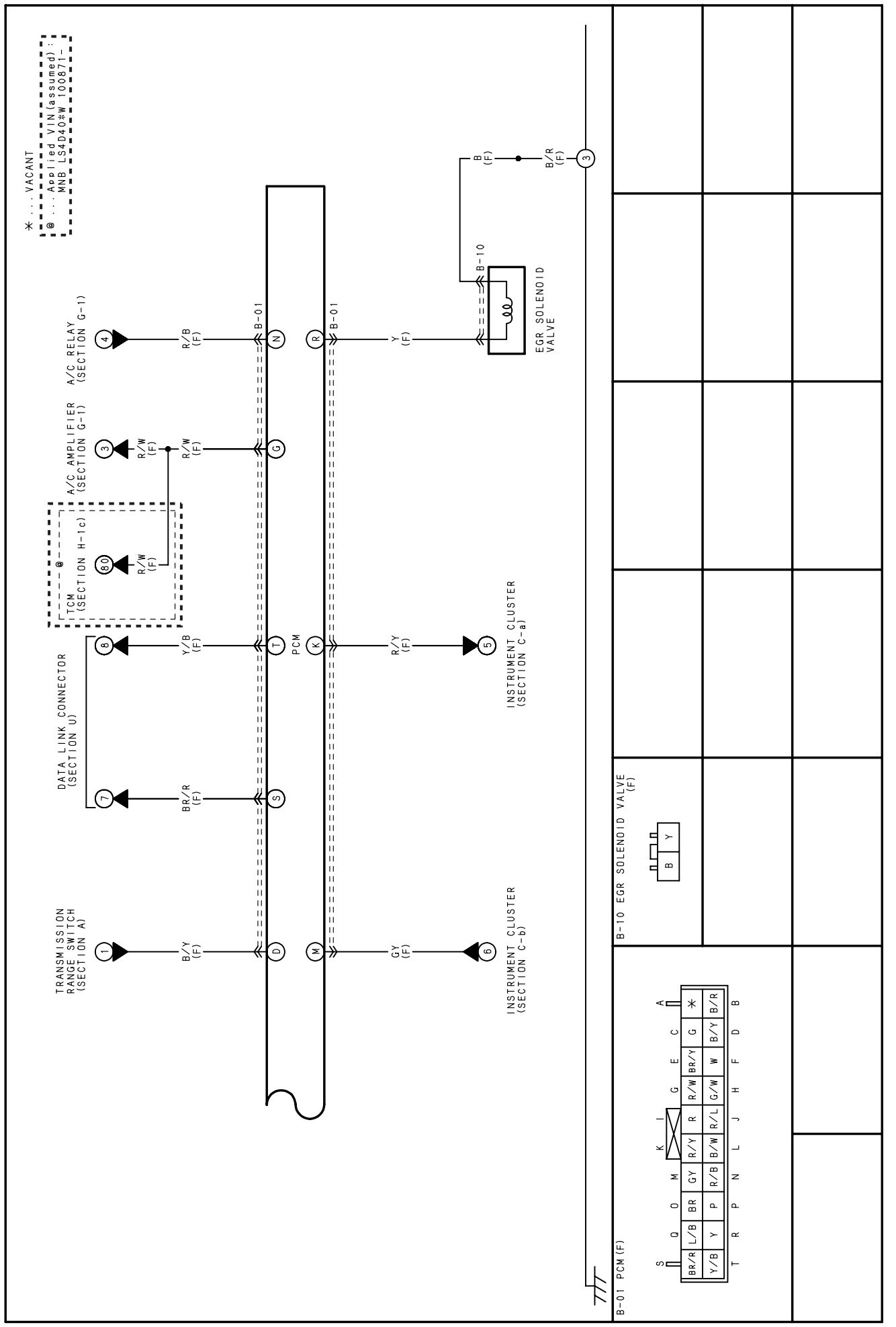


HARNESS SYMBOL: (F) (E) (R)

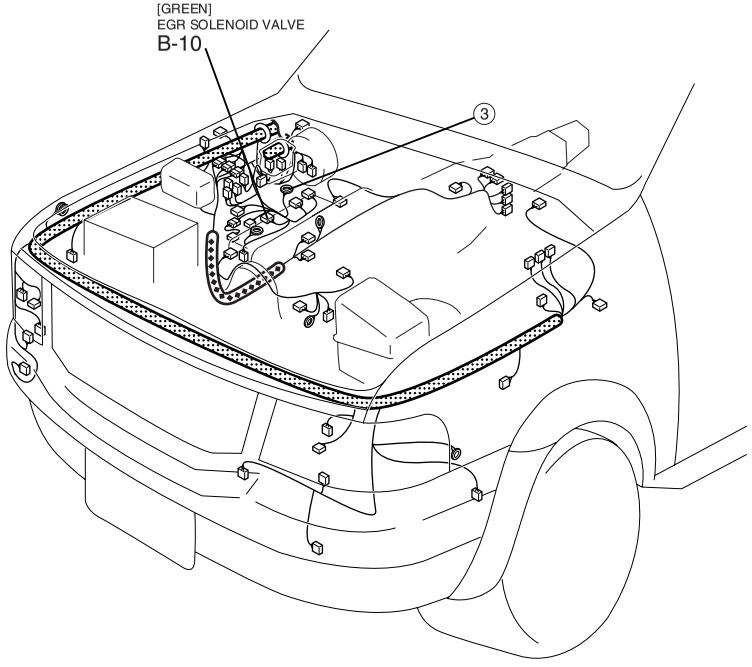


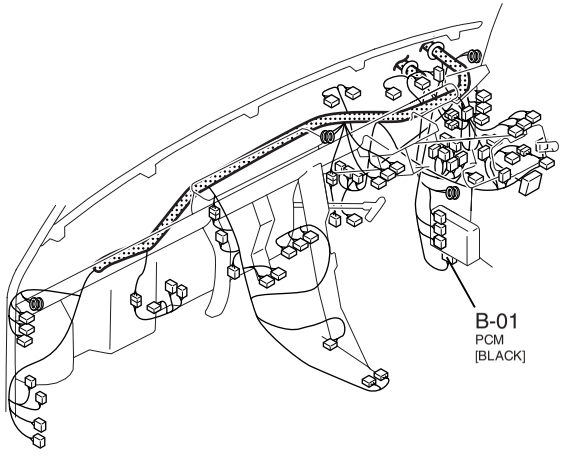


B-a

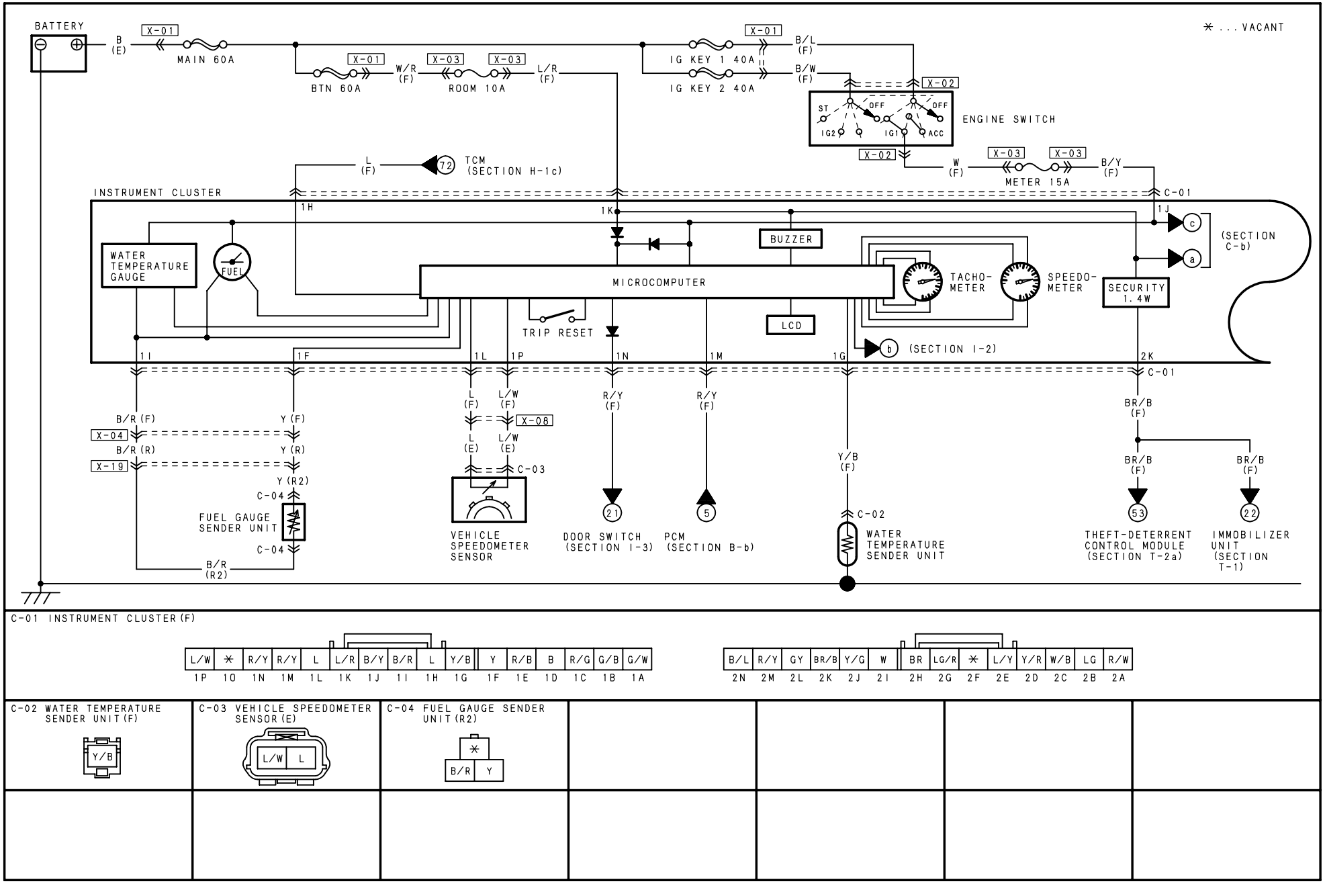

B-b
ENGINE CONTROL SYSTEM / GLOW SYSTEM
* ... VACANT
@ ... Applied VIN(assumed):
MNB LS4D40*W 100871-
TRANSMISSION RANGE SWITCH (SECTION A)
DATA LINK CONNECTOR (SECTION U)
TCM (SECTION H-1c)
A/C AMPLIFIER (SECTION G-1)
A/C RELAY (SECTION G-1)
PCM
INSTRUMENT CLUSTER (SECTION C-a)
INSTRUMENT CLUSTER (SECTION C-b)
EGR SOLENOID VALVE
B-10 EGR SOLENOID VALVE (F)
B-01 PCM(F)
B/Y (F)
BR/R (F)
Y/B (F)
R/W (F)
R/B (F)
R/Y (F)
GY (F)
Y (F)
B (F)
B/R (F)
B-01
B-10

HARNESS SYMBOL: (F) (E) (R)





INSTRUMENT CLUSTER



C-01 INSTRUMENT CLUSTER (F)

L/W	✳	R/Y	R/Y	L	L/R	B/Y	B/R	L	Y/B	Y	R/B	B	R/G	G/B	G/W
1P	1O	1N	1M	1L	1K	1J	1I	1H	1G	1F	1E	1D	1C	1B	1A

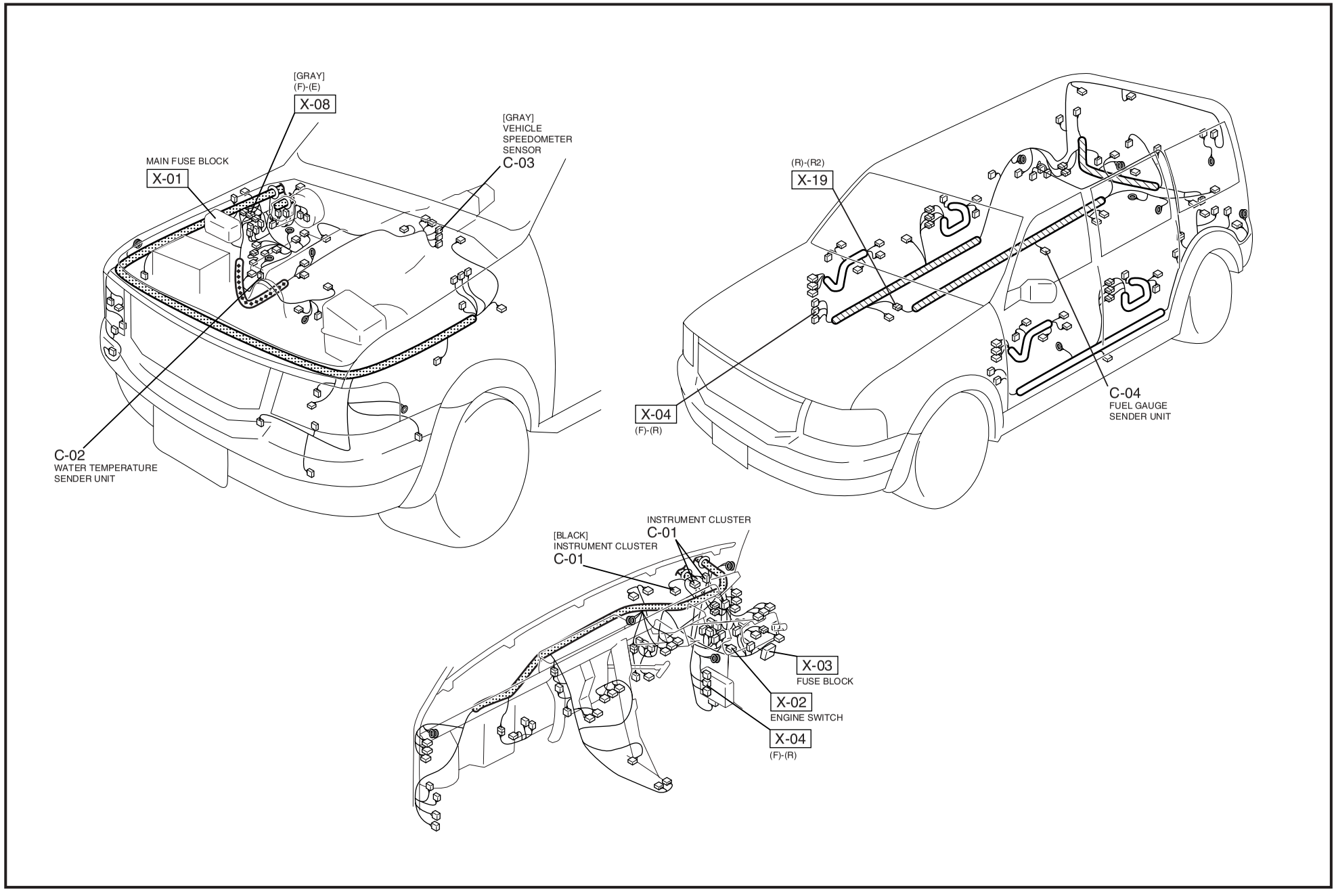
B/L	R/Y	GY	BR/B	Y/G	W	BR	LG/R	✳	L/Y	Y/R	W/B	LG	R/W
2N	2M	2L	2K	2J	2I	2H	2G	2F	2E	2D	2C	2B	2A

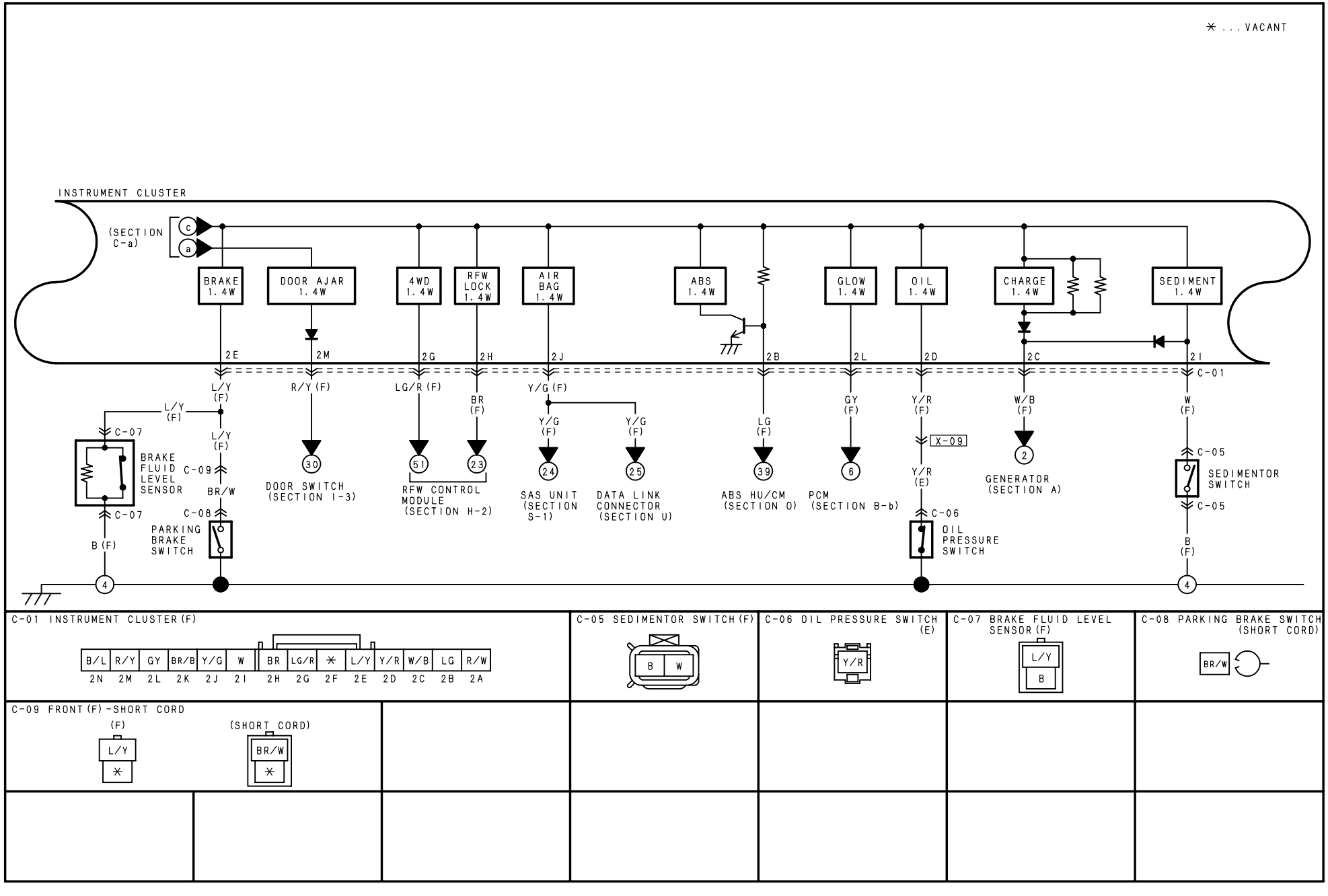
C-02 WATER TEMPERATURE SENDER UNIT (F)

C-03 VEHICLE SPEEDOMETER SENSOR (E)

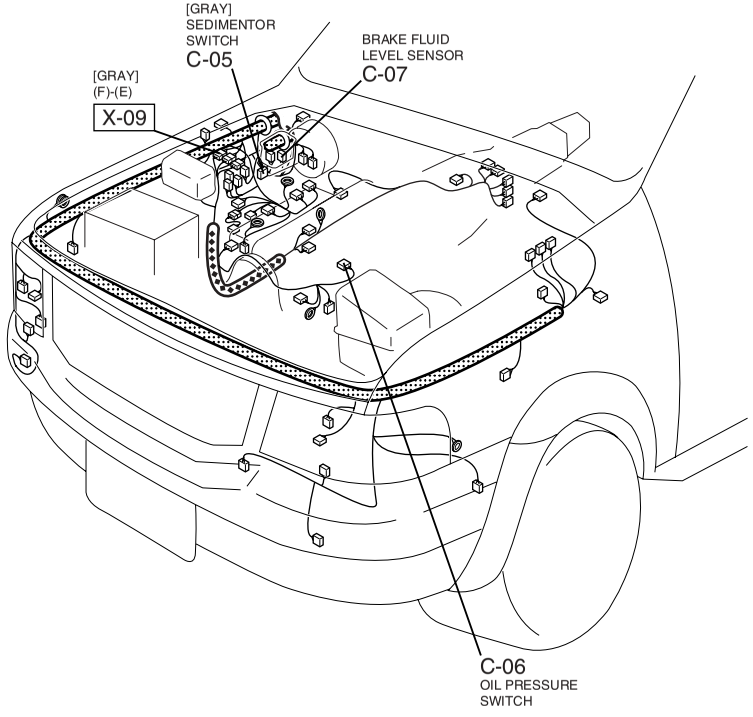
C-04 FUEL GAUGE SENDER UNIT (R2)

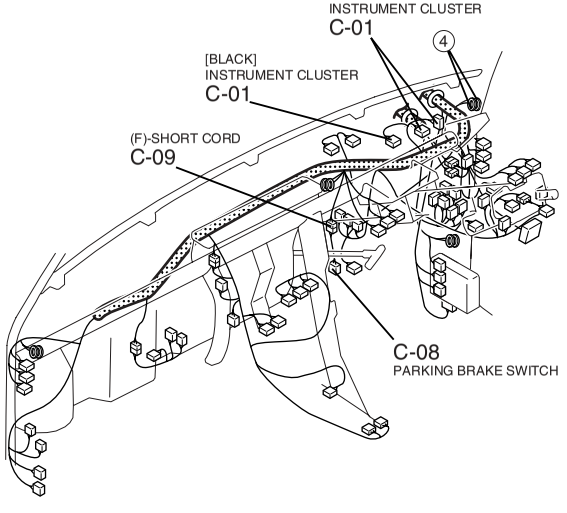
HARNESS SYMBOL: (F) (E) (R)

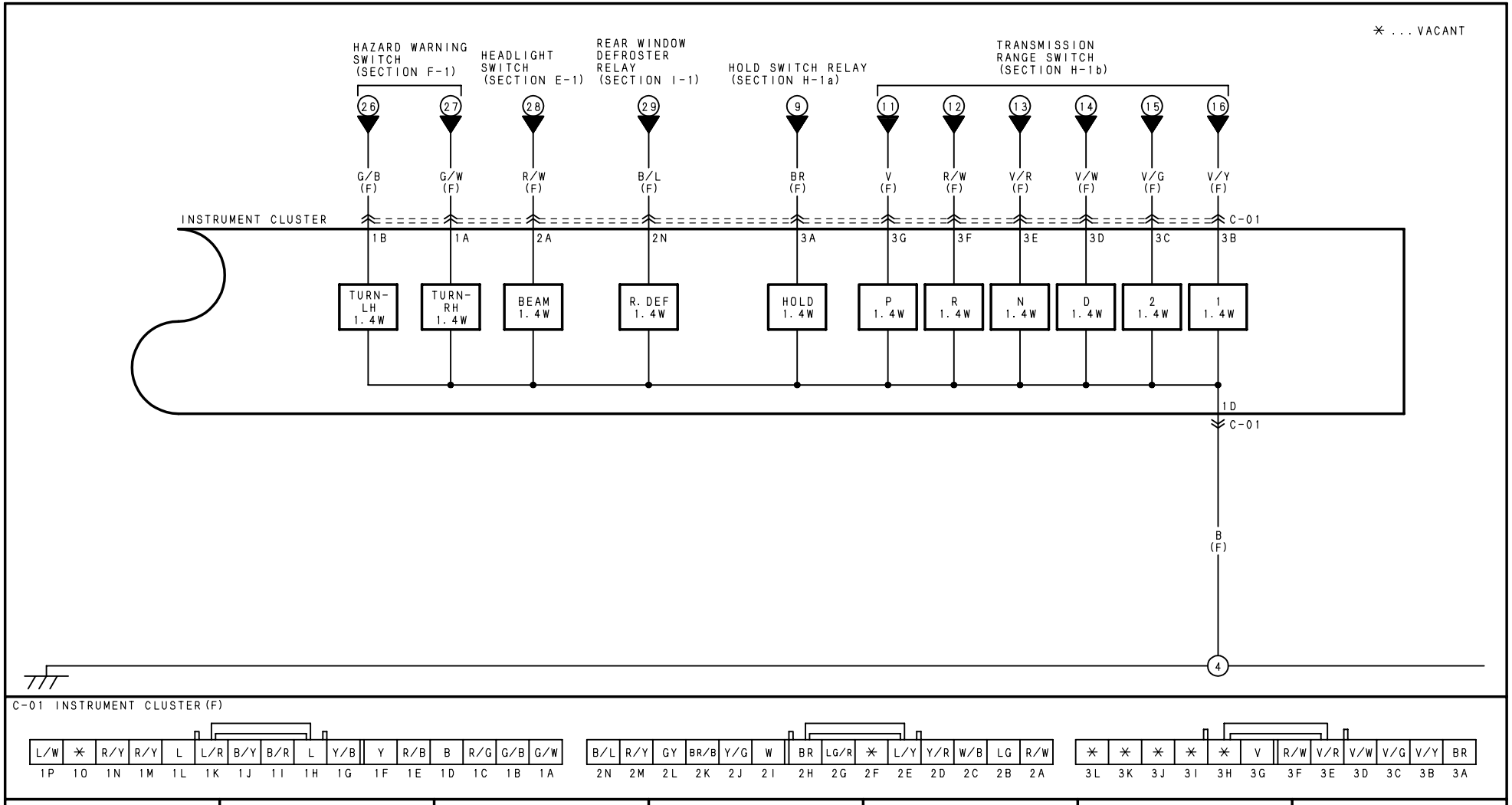



✳ . . . VACANT
INSTRUMENT CLUSTER
(SECTION C-a)
BRAKE 1.4W
DOOR AJAR 1.4W
4WD 1.4W
RFW LOCK 1.4W
AIR BAG 1.4W
ABS 1.4W
GLOW 1.4W
OIL 1.4W
CHARGE 1.4W
SEDIMENT 1.4W
2E
2M
2G
2H
2J
2B
2L
2D
2C
2I
C-01
L/Y (F)
R/Y (F)
LG/R (F)
BR (F)
Y/G (F)
LG (F)
GY (F)
Y/R (F)
W/B (F)
W (F)
X-09
C-07
BRAKE FLUID LEVEL SENSOR
C-09
BR/W
C-08
PARKING BRAKE SWITCH
B (F)
30
DOOR SWITCH (SECTION I-3)
51
23
RFW CONTROL MODULE (SECTION H-2)
24
25
SAS UNIT (SECTION S-1)
DATA LINK CONNECTOR (SECTION U)
39
ABS HU/CM (SECTION O)
6
PCM (SECTION B-b)
Y/R (E)
C-06
OIL PRESSURE SWITCH
2
GENERATOR (SECTION A)
C-05
SEDIMENTOR SWITCH
4
C-01 INSTRUMENT CLUSTER (F)
B/L R/Y GY BR/B Y/G W BR LG/R ✳ L/Y Y/R W/B LG R/W
2N 2M 2L 2K 2J 2I 2H 2G 2F 2E 2D 2C 2B 2A
C-05 SEDIMENTOR SWITCH (F)
B W
C-06 OIL PRESSURE SWITCH (E)
Y/R
C-07 BRAKE FLUID LEVEL SENSOR (F)
L/Y
B
C-08 PARKING BRAKE SWITCH (SHORT CORD)
BR/W
C-09 FRONT (F) -SHORT CORD
(F)
L/Y
✳
(SHORT CORD)
BR/W
✳

HARNESS SYMBOL: (F) (E) (R)







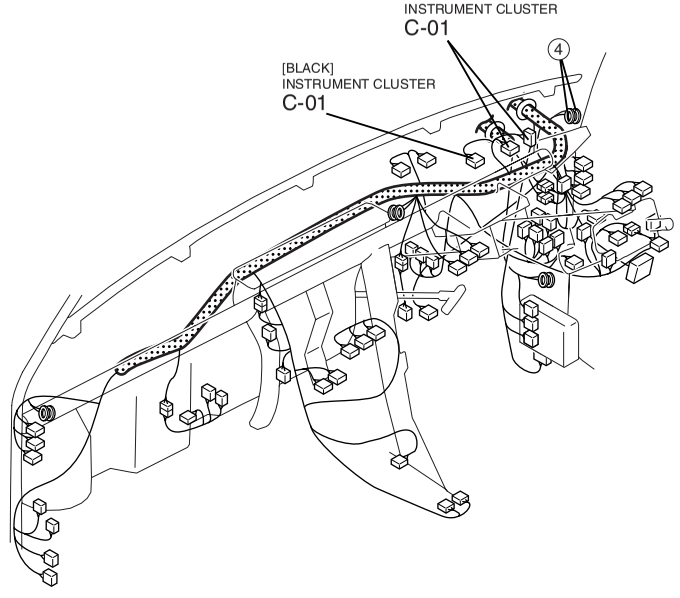
C-01 INSTRUMENT CLUSTER (F)

L/W	✳	R/Y	R/Y	L	L/R	B/Y	B/R	L	Y/B	Y	R/B	B	R/G	G/B	G/W
1P	1O	1N	1M	1L	1K	1J	1I	1H	1G	1F	1E	1D	1C	1B	1A

B/L	R/Y	GY	BR/B	Y/G	W	BR	LG/R	✳	L/Y	Y/R	W/B	LG	R/W
2N	2M	2L	2K	2J	2I	2H	2G	2F	2E	2D	2C	2B	2A

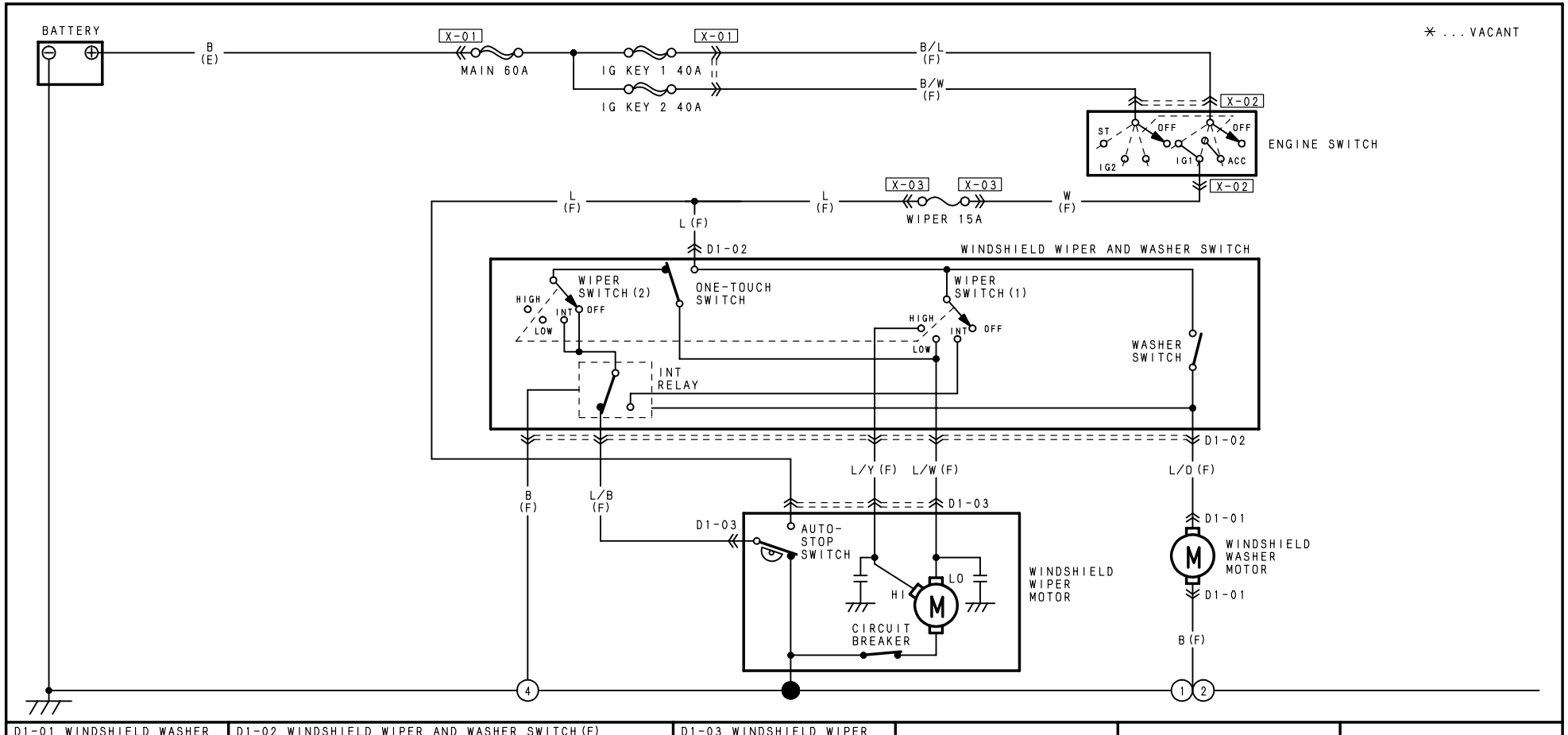
✳	✳	✳	✳	✳	V	R/W	V/R	V/W	V/G	V/Y	BR
3L	3K	3J	3I	3H	3G	3F	3E	3D	3C	3B	3A

HARNESS SYMBOL: (F) (E) (R)



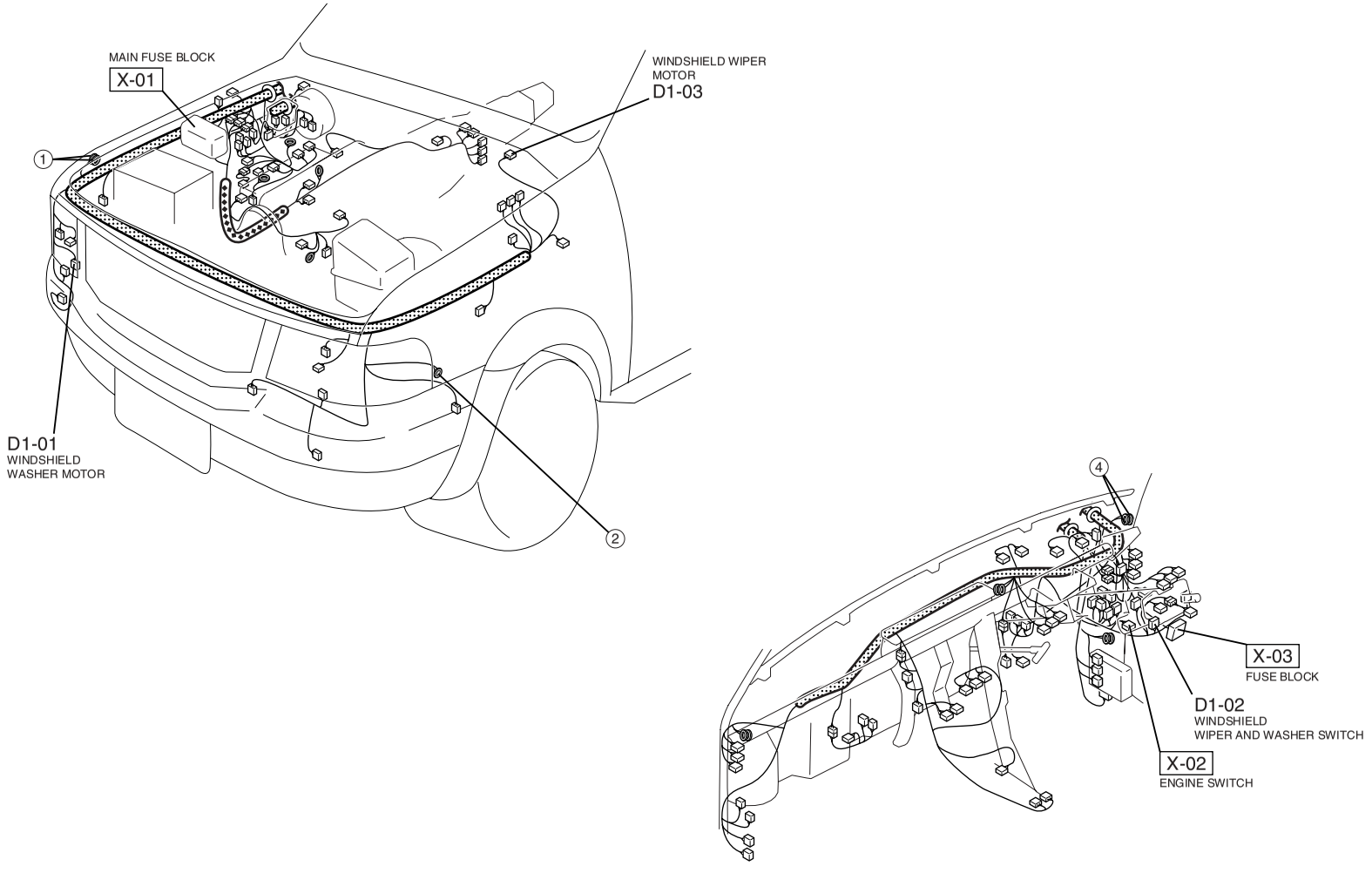
C-c

WINDSHIELD WIPER AND WASHER

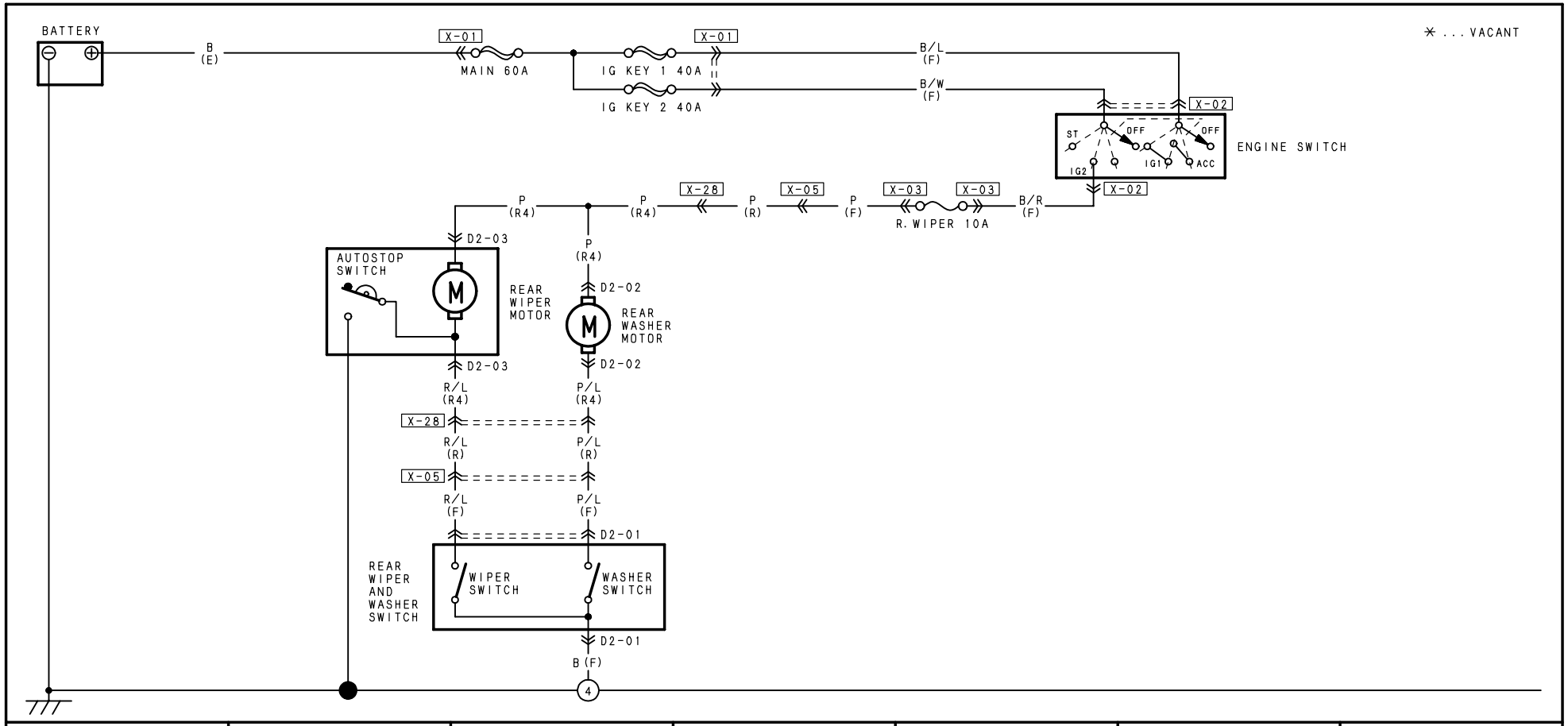


D1-01 WINDSHIELD WASHER MOTOR (F)	D1-02 WINDSHIELD WIPER AND WASHER SWITCH (F)		D1-03 WINDSHIELD WIPER MOTOR (F)			
B L/O	✳ L/O ✳ ✳ ✳ B ✳ L/W L/Y ✳ ✳ ✳ ✳ B ✳ L/B L ✳		L/W L/Y L L/B			

HARNESS SYMBOL: (F) (E) (R)

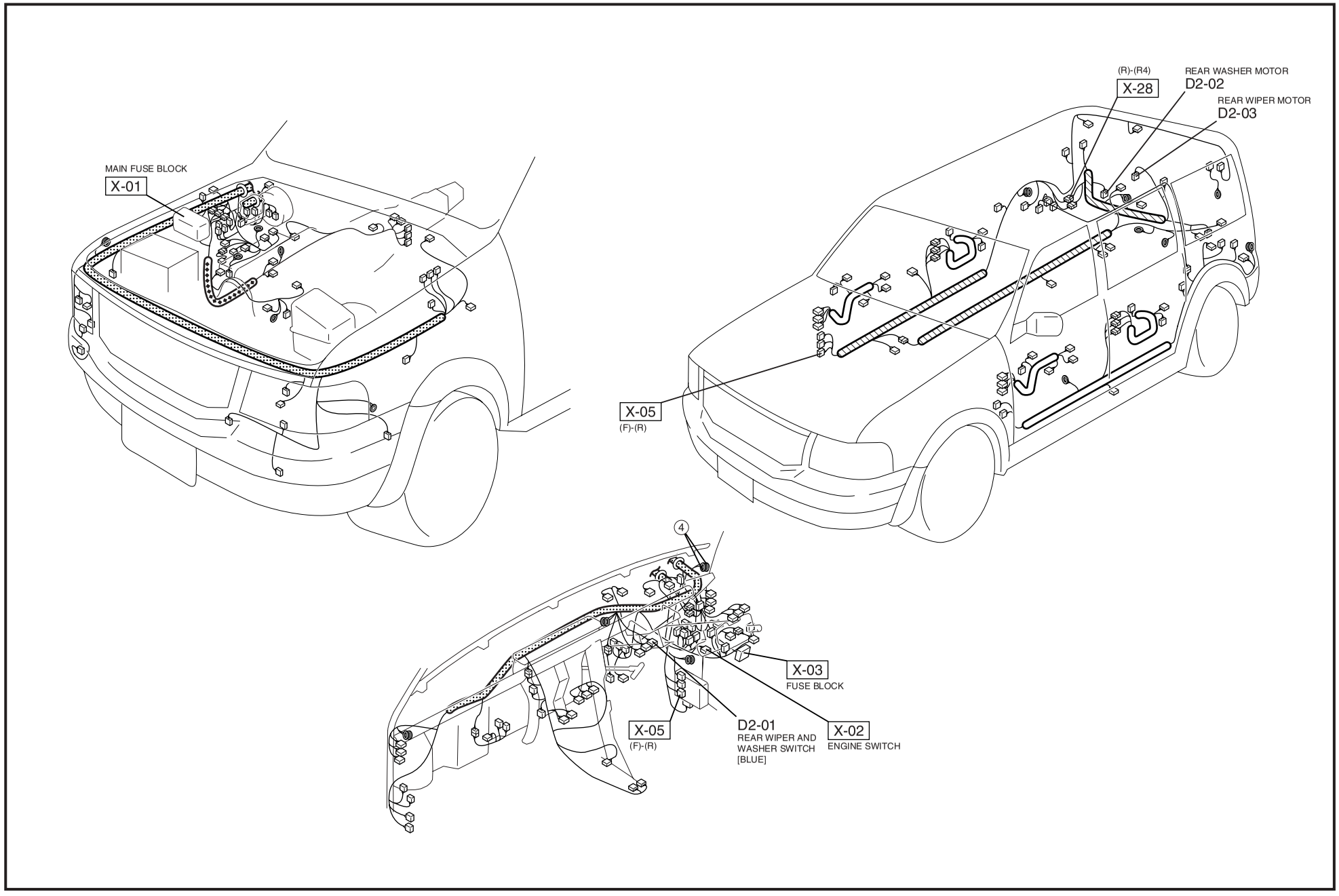


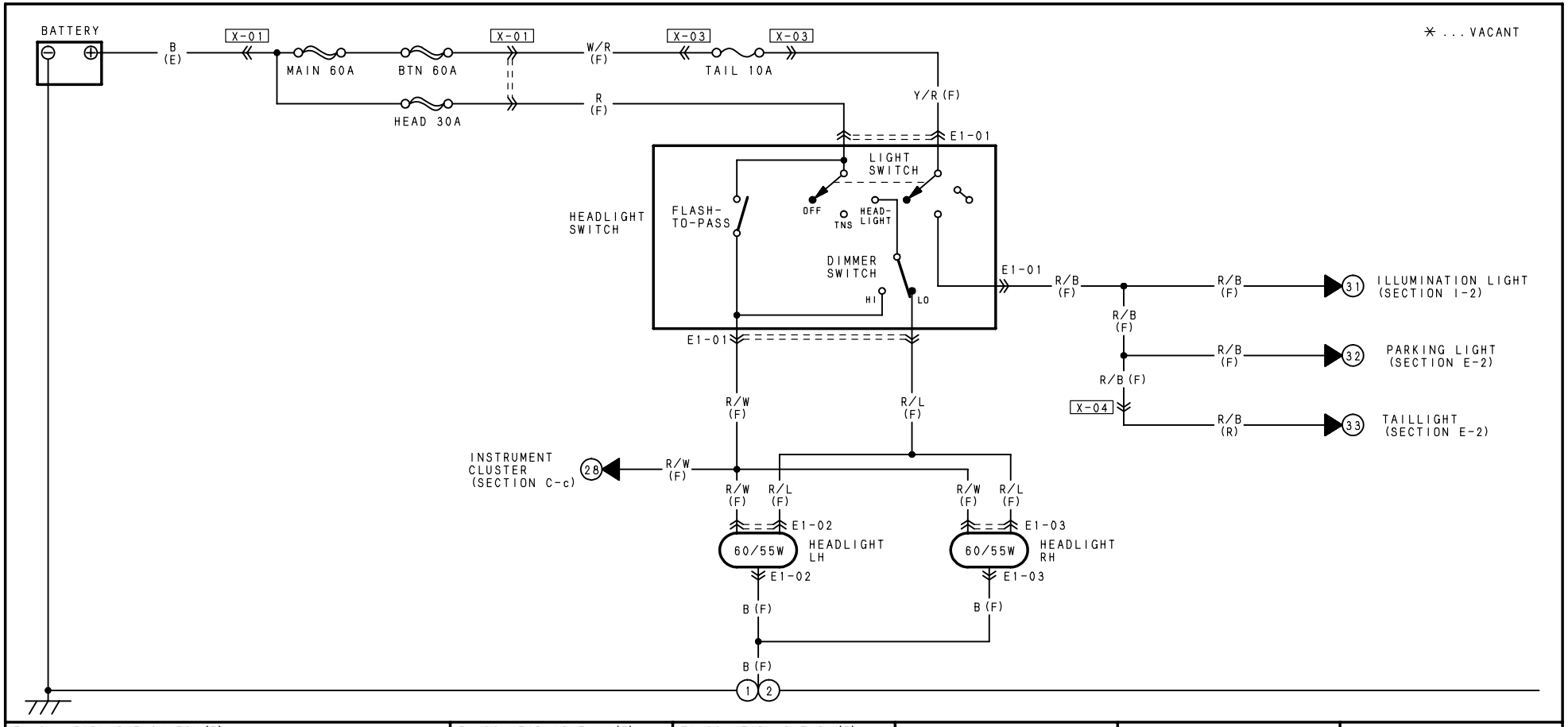
REAR WIPER AND WASHER



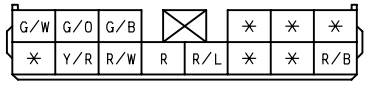
D2-01 REAR WIPER AND WASHER SWITCH (F)	D2-02 REAR WASHER MOTOR (R4)	D2-03 REAR WIPER MOTOR (R4)				
P/L, ✳, R/L, B, ✳, ✳	P/L, P	P, R/L				

HARNESS SYMBOL: (F) (E) (R)

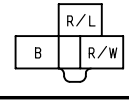




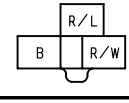
E1-01 HEADLIGHT SWITCH (F)



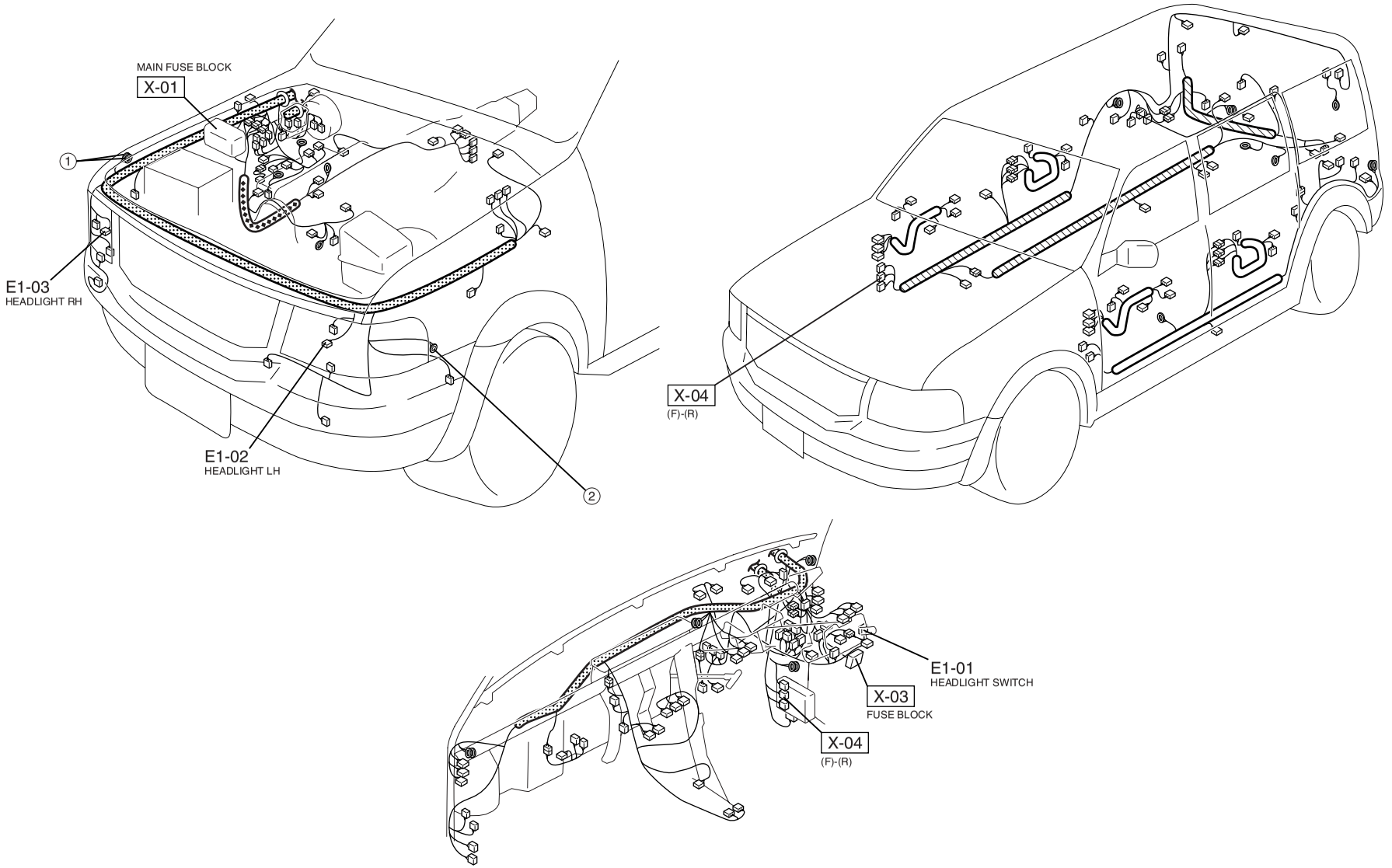
E1-02 HEADLIGHT LH (F)



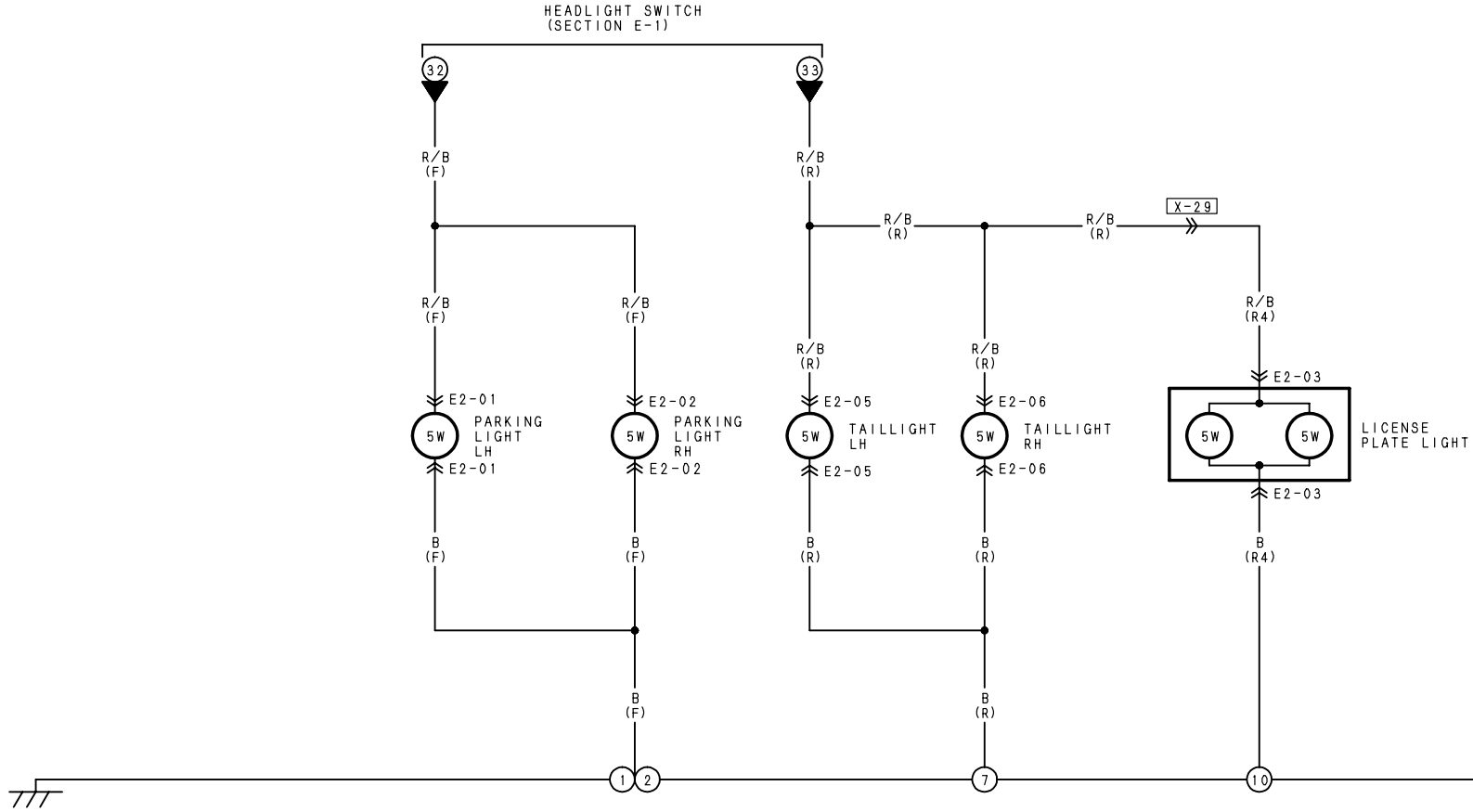
E1-03 HEADLIGHT RH (F)



HARNESS SYMBOL: (F) (E) (R)

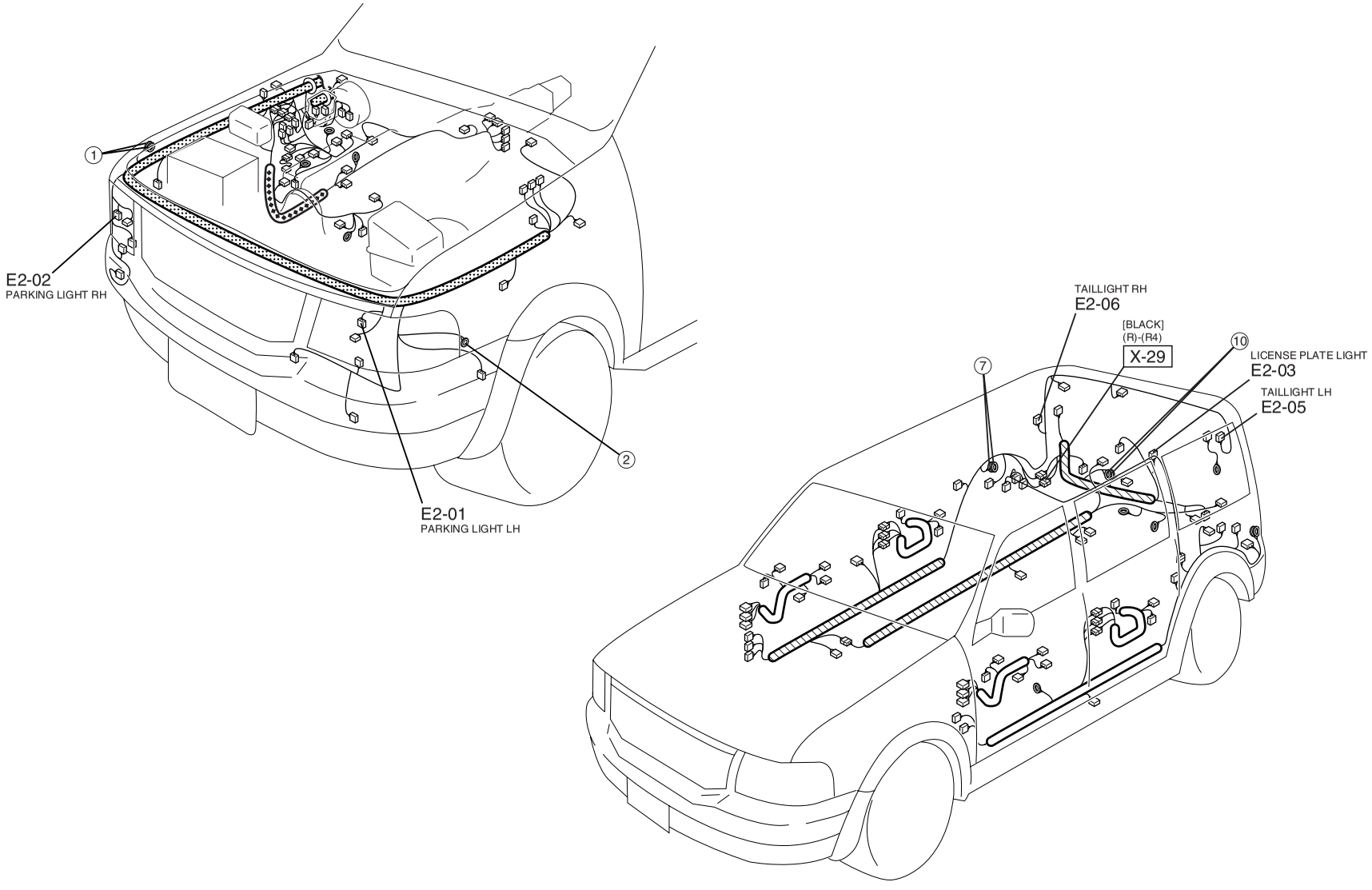


LICENSE PLATE LIGHT / PARKING LIGHT / TAILLIGHT

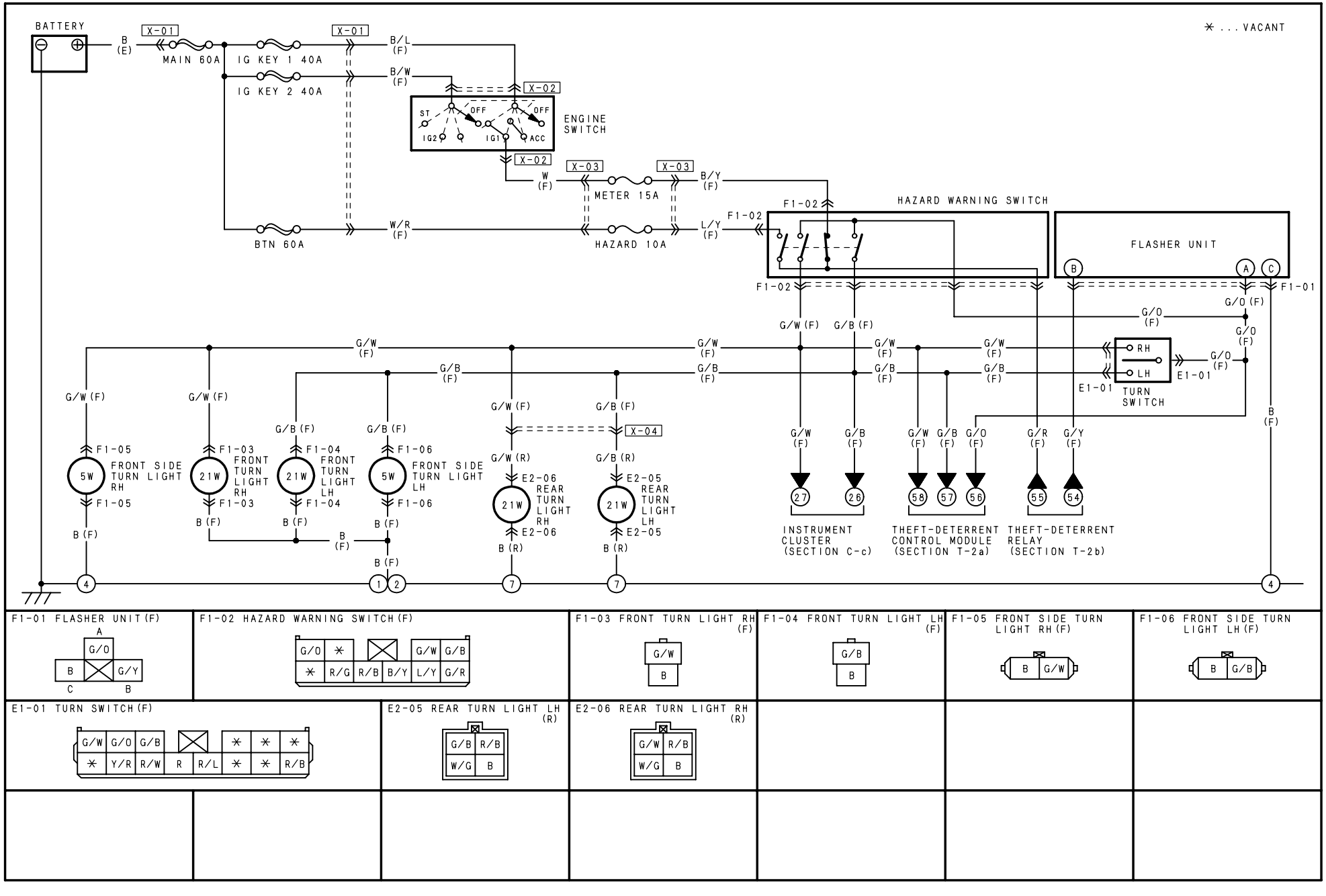


E2-01 PARKING LIGHT LH(F)	E2-02 PARKING LIGHT RH(F)	E2-03 LICENSE PLATE LIGHT (R4)	E2-05 TAILLIGHT LH(R)	E2-06 TAILLIGHT RH(R)		
R/B / B	R/B / B	R/B | B	G/B | R/B / W/G | B	G/W | R/B / W/G | B		

HARNESS SYMBOL: (F) (E) (R)



TURN AND HAZARD WARNING LIGHT



F1-01 FLASHER UNIT (F)

F1-02 HAZARD WARNING SWITCH (F)

F1-03 FRONT TURN LIGHT RH (F)

F1-04 FRONT TURN LIGHT LH (F)

F1-05 FRONT SIDE TURN LIGHT RH (F)

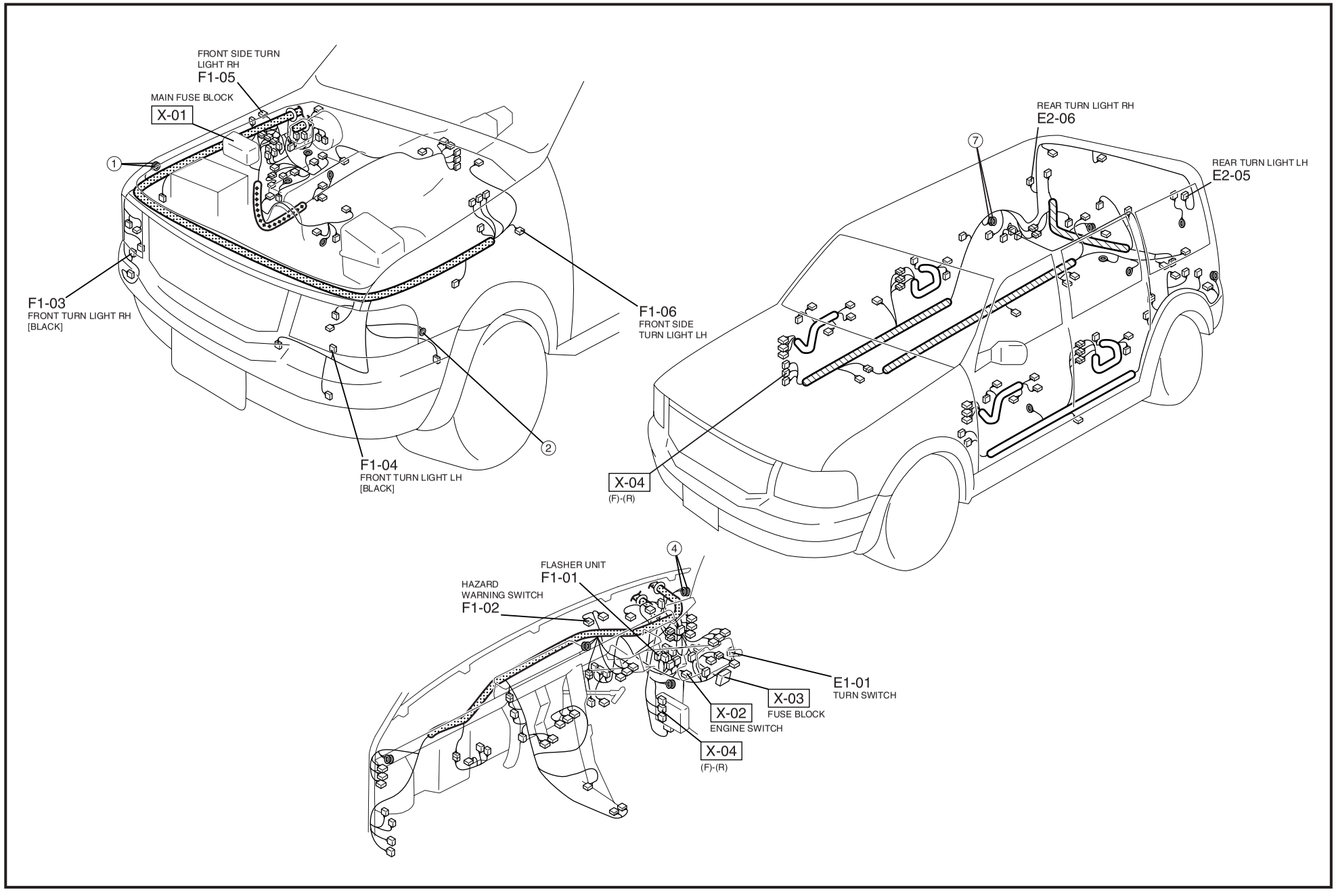
F1-06 FRONT SIDE TURN LIGHT LH (F)

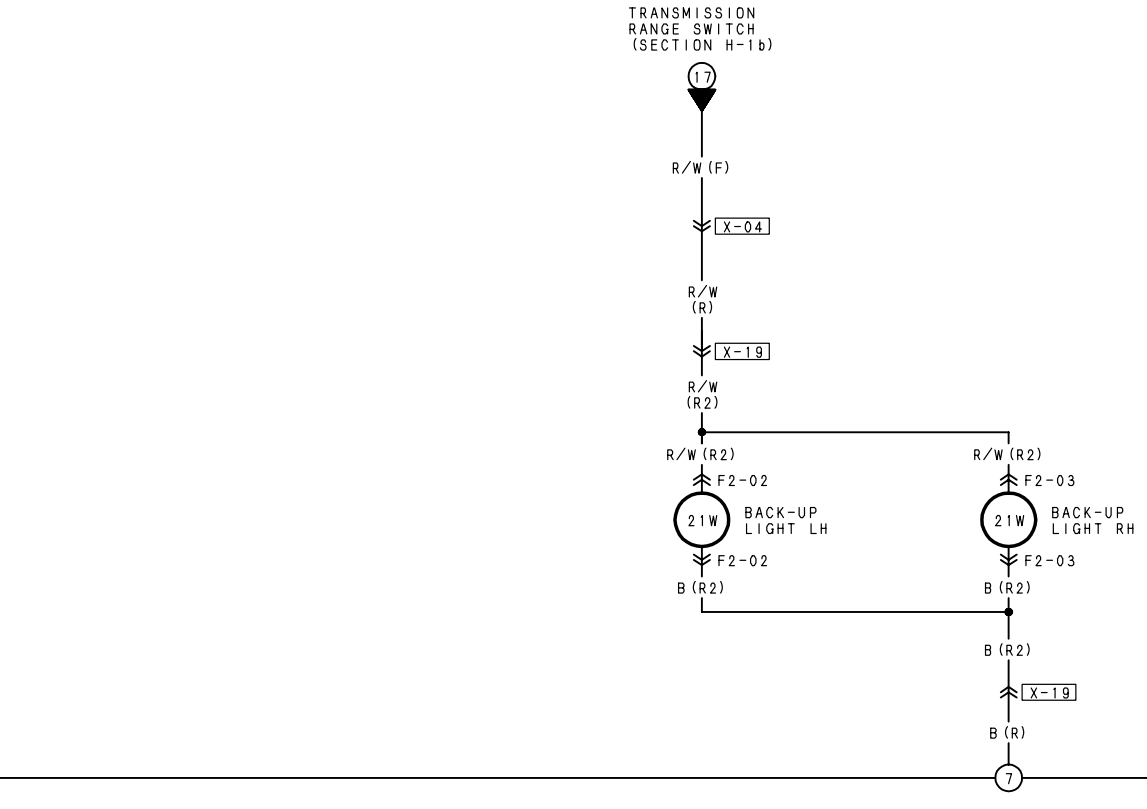
E1-01 TURN SWITCH (F)

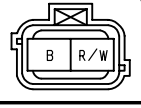
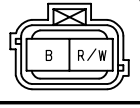
E2-05 REAR TURN LIGHT LH (R)

E2-06 REAR TURN LIGHT RH (R)

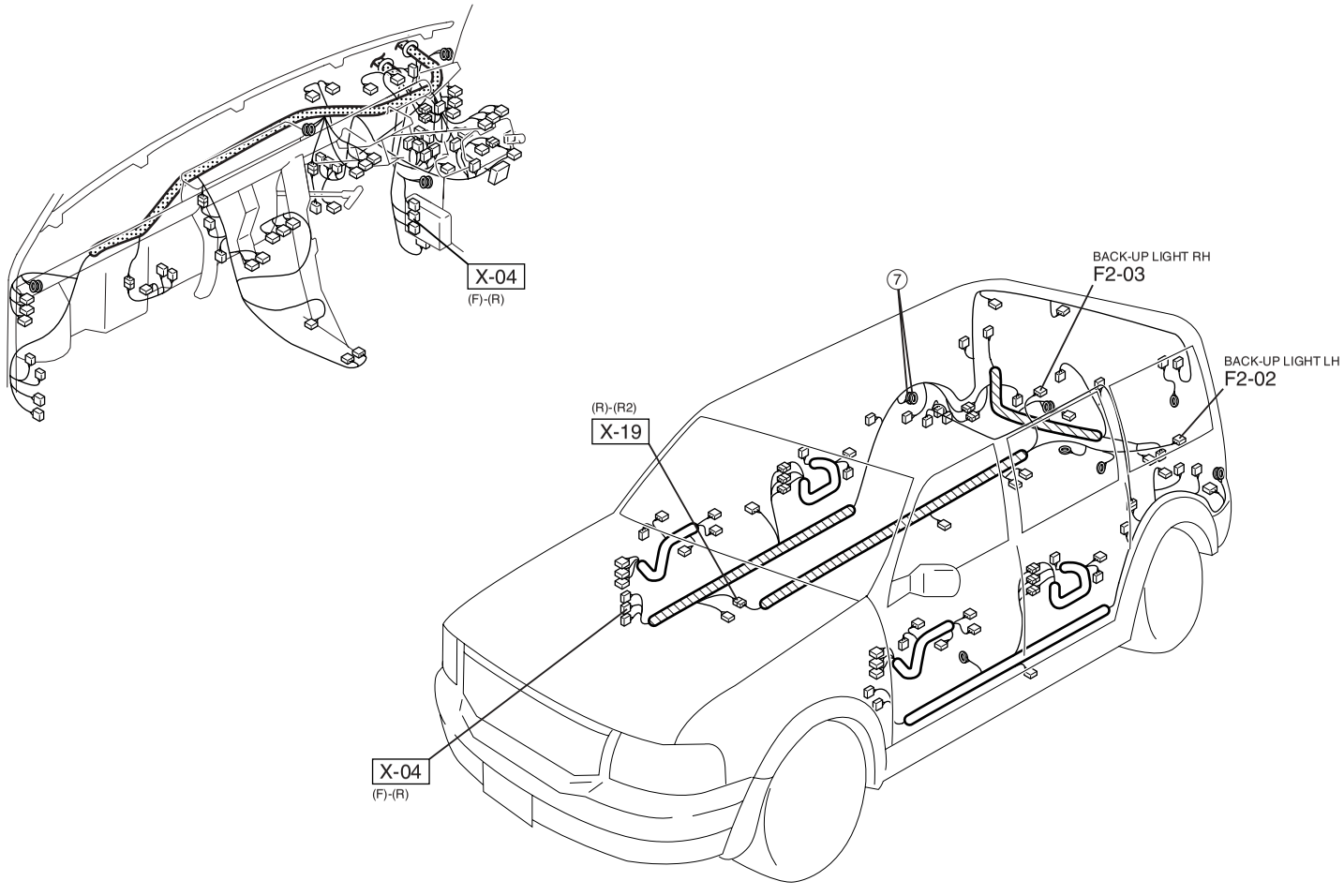
HARNESS SYMBOL: (F) (E) (R)

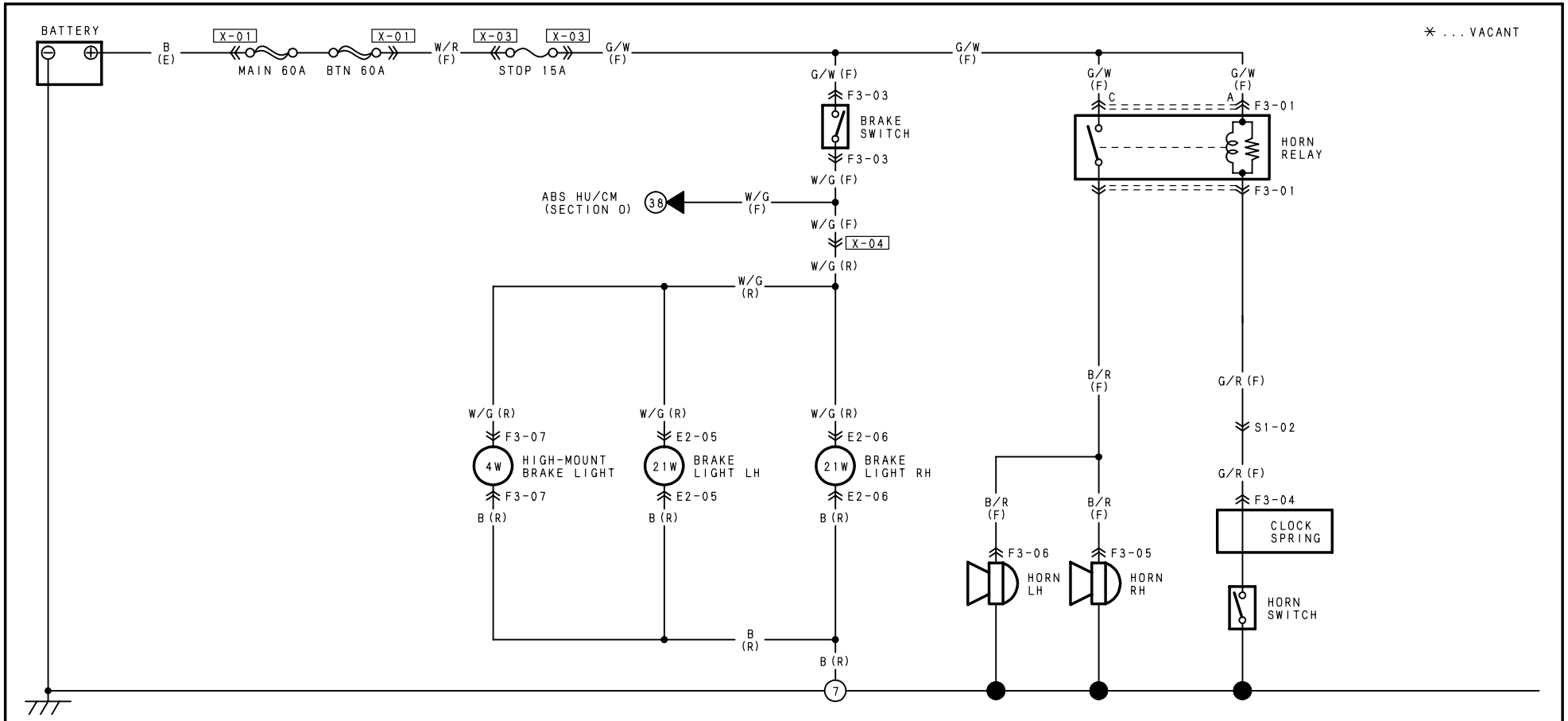




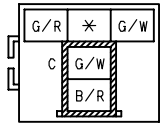
F2-02 BACK-UP LIGHT LH (R2) 	F2-03 BACK-UP LIGHT RH (R2) 					

HARNESS SYMBOL: (F) (E) (R)





F3-01 HORN RELAY (F)

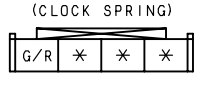


F3-03 BRAKE SWITCH (F)



F3-04 HORN SWITCH (F)

(CLOCK SPRING)



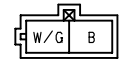
F3-05 HORN RH (F)



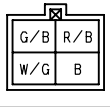
F3-06 HORN LH (F)



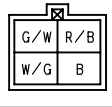
F3-07 HIGH-MOUNT BRAKE LIGHT (R)



E2-05 BRAKE LIGHT LH (R)



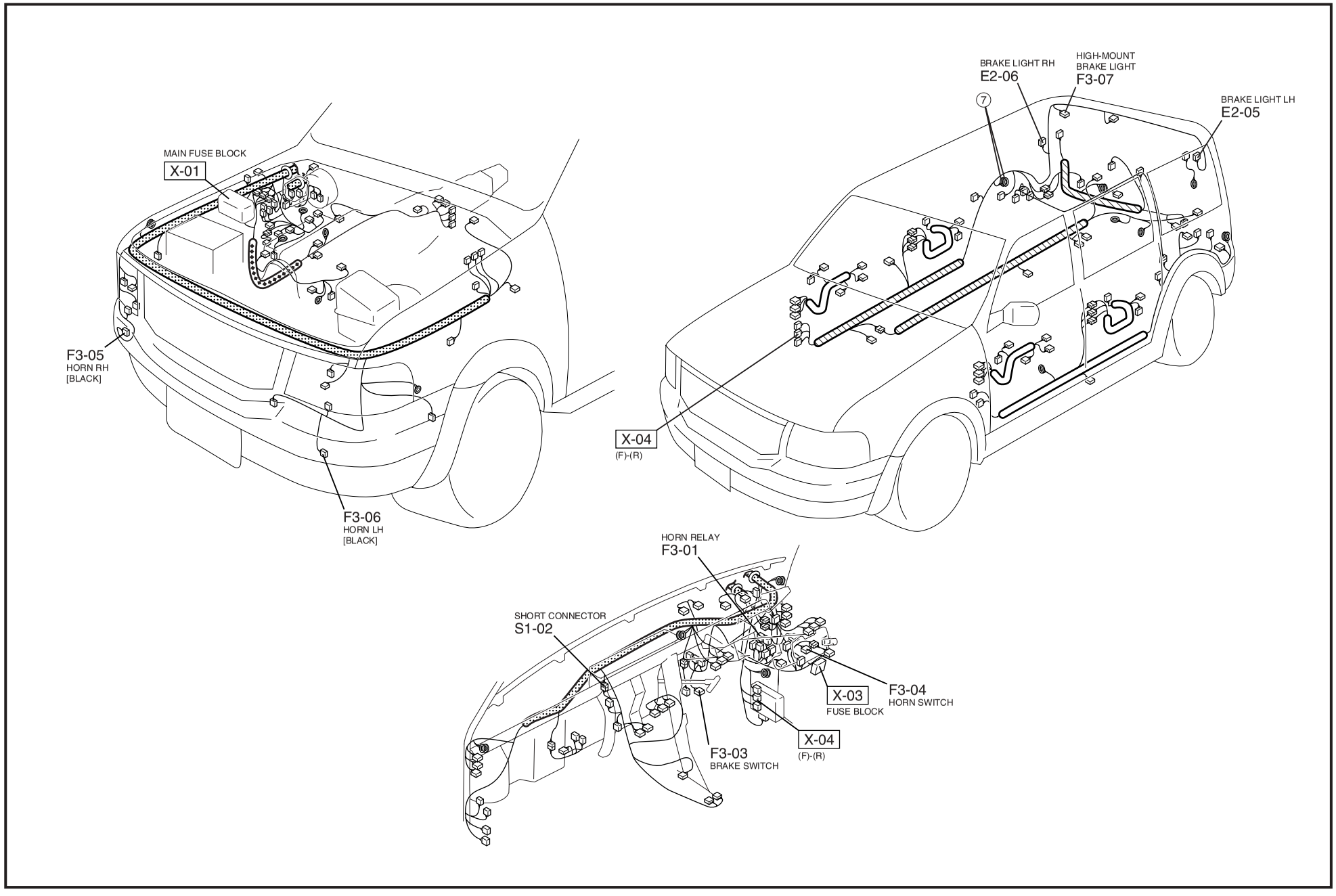
E2-06 BRAKE LIGHT RH (R)



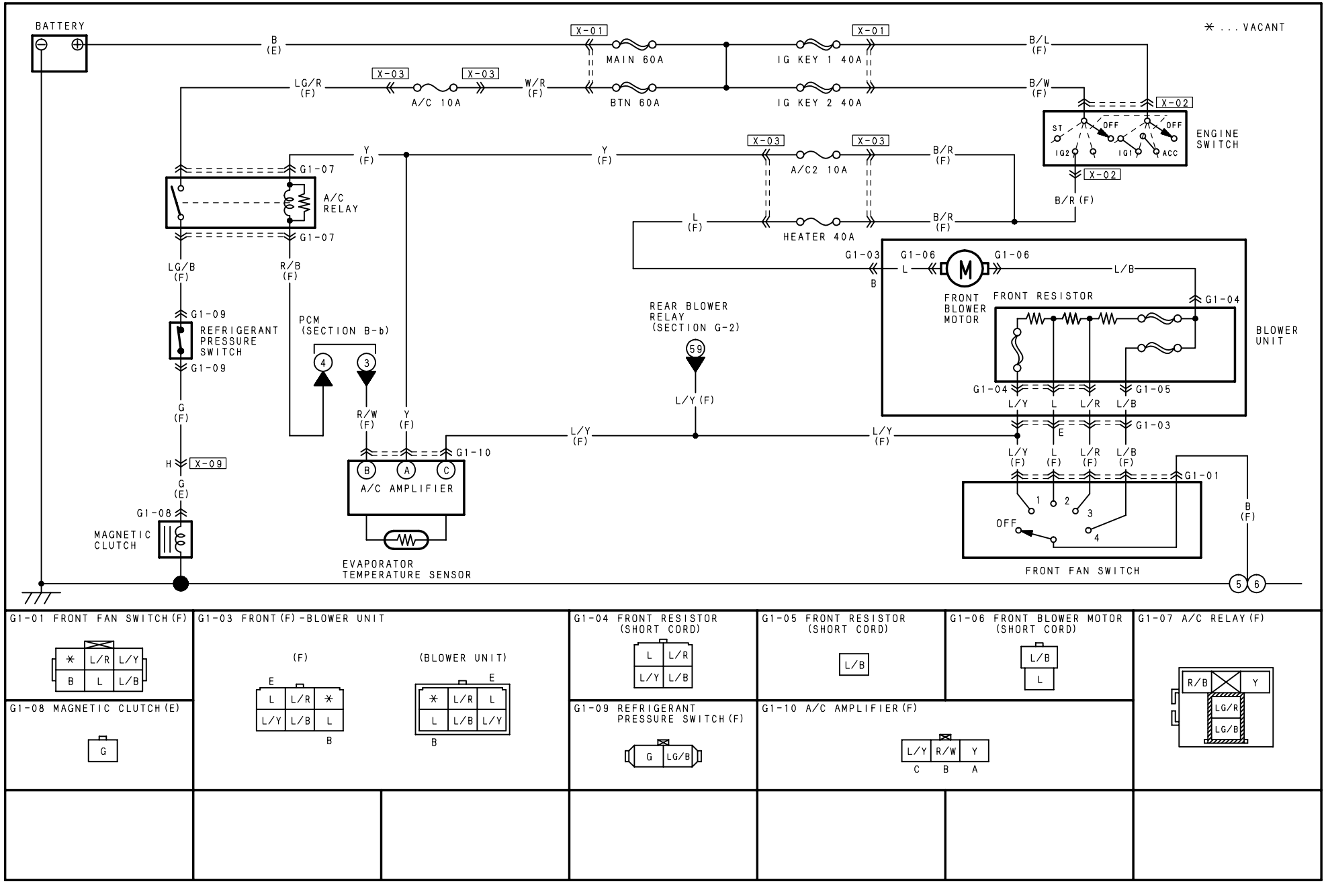
S1-02 SHORT CONNECTOR (F)



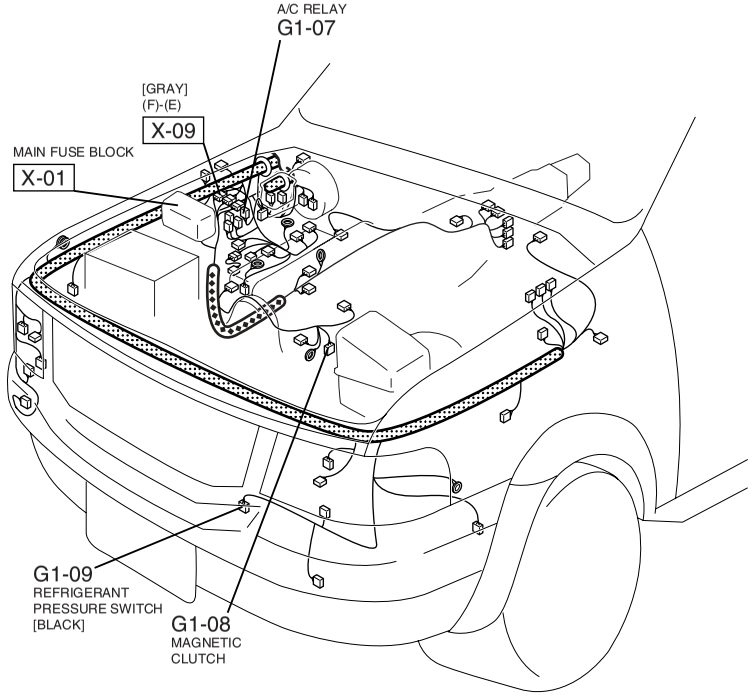
HARNESS SYMBOL: (F) (E) (R)

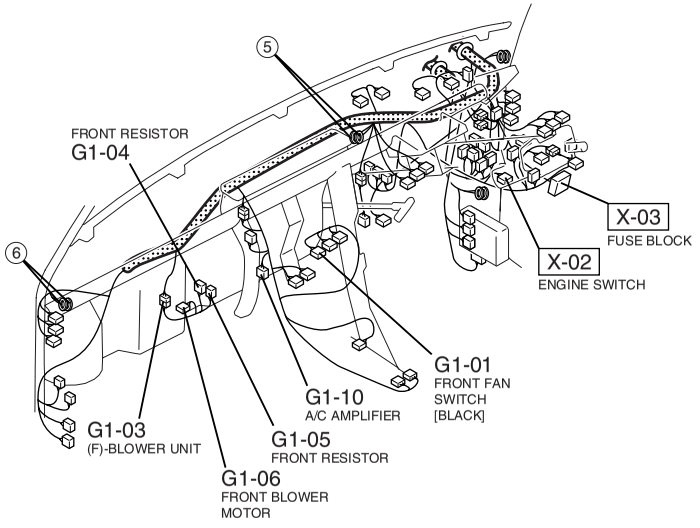


FRONT HEATER AND AIR CONDITIONER

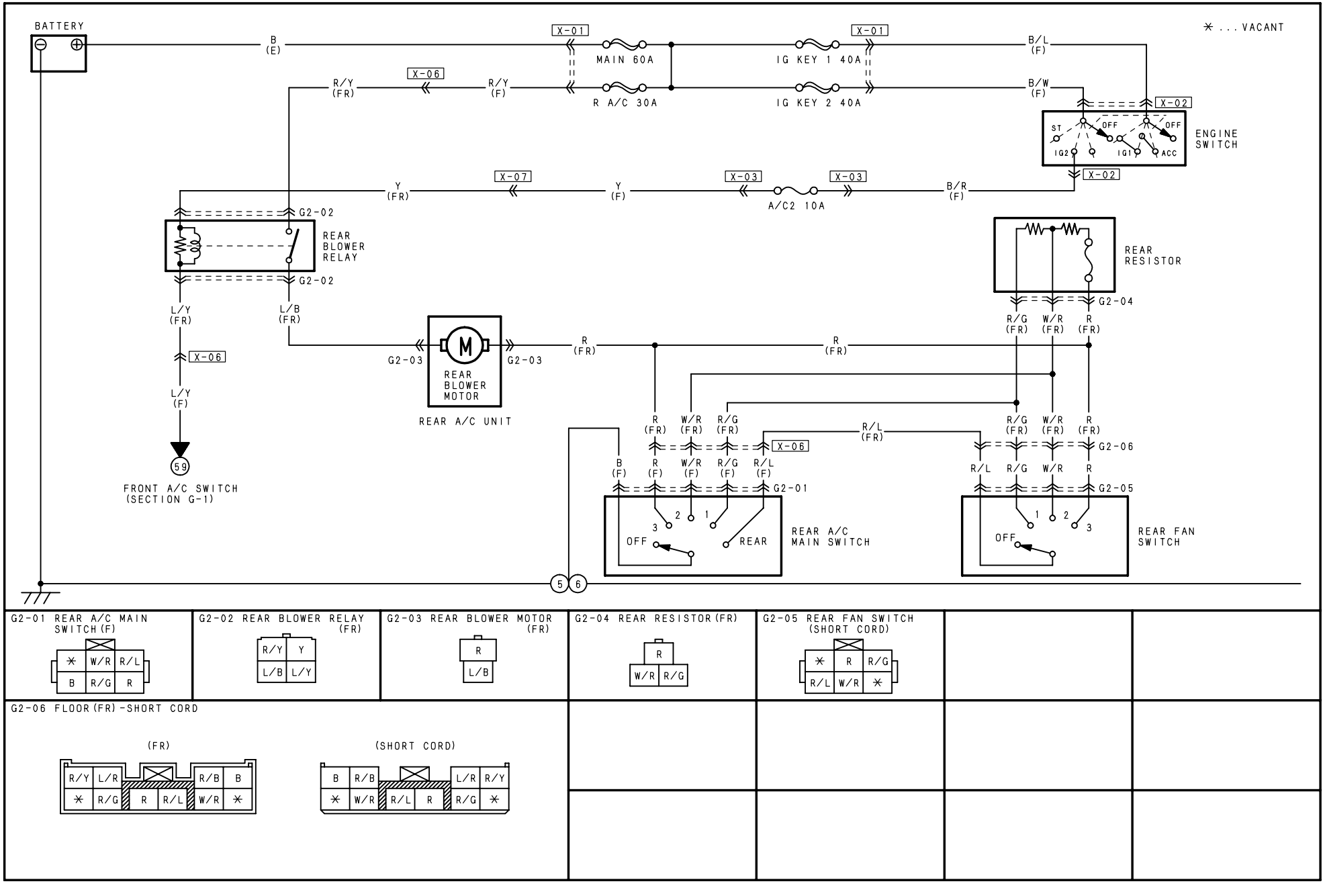


HARNESS SYMBOL: (F) (E) (R)





REAR HEATER AND AIR CONDITIONER



G2-01 REAR A/C MAIN SWITCH (F)

G2-02 REAR BLOWER RELAY (FR)

G2-03 REAR BLOWER MOTOR (FR)

G2-04 REAR RESISTOR (FR)

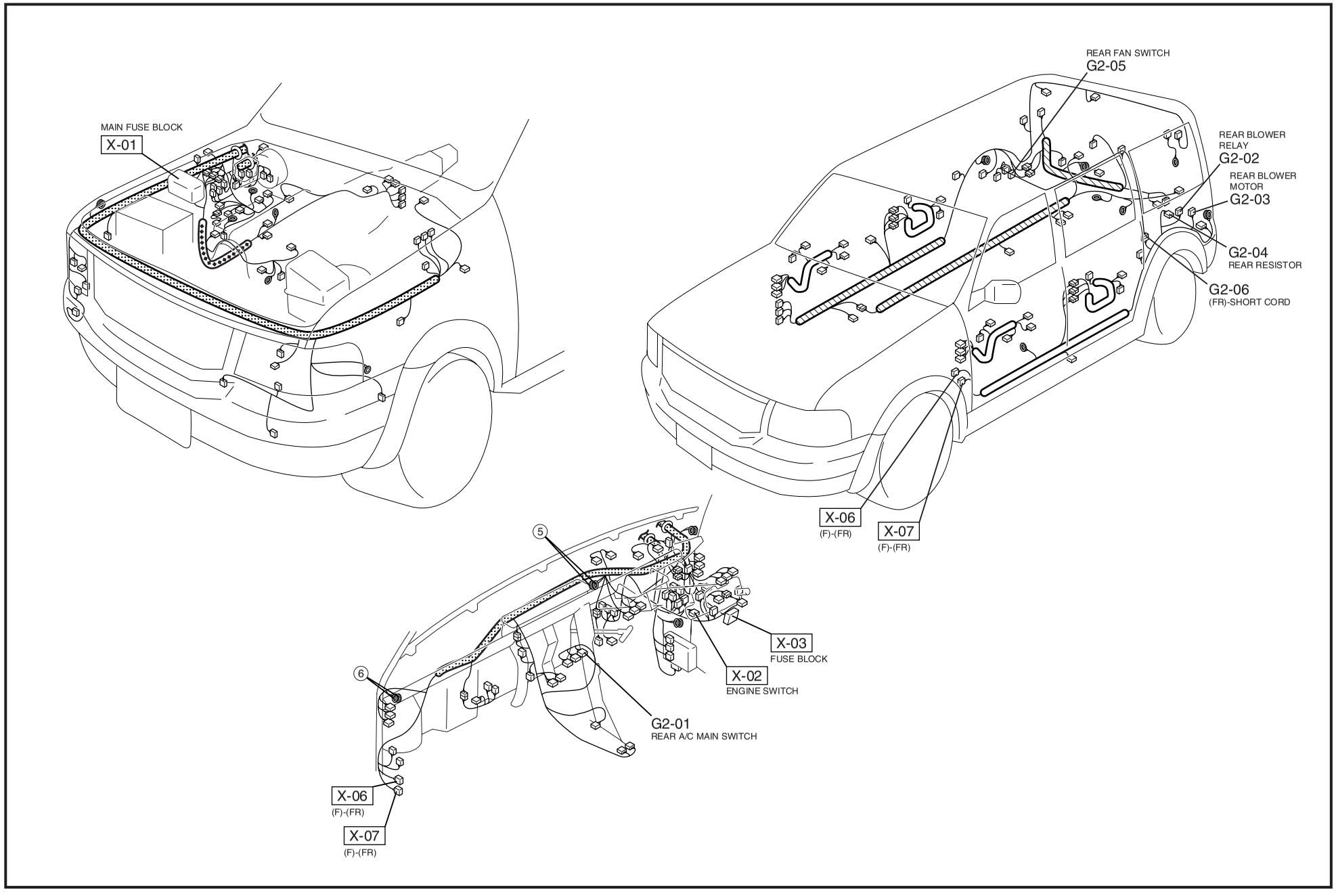
G2-05 REAR FAN SWITCH (SHORT CORD)

G2-06 FLOOR (FR) -SHORT CORD

(FR)

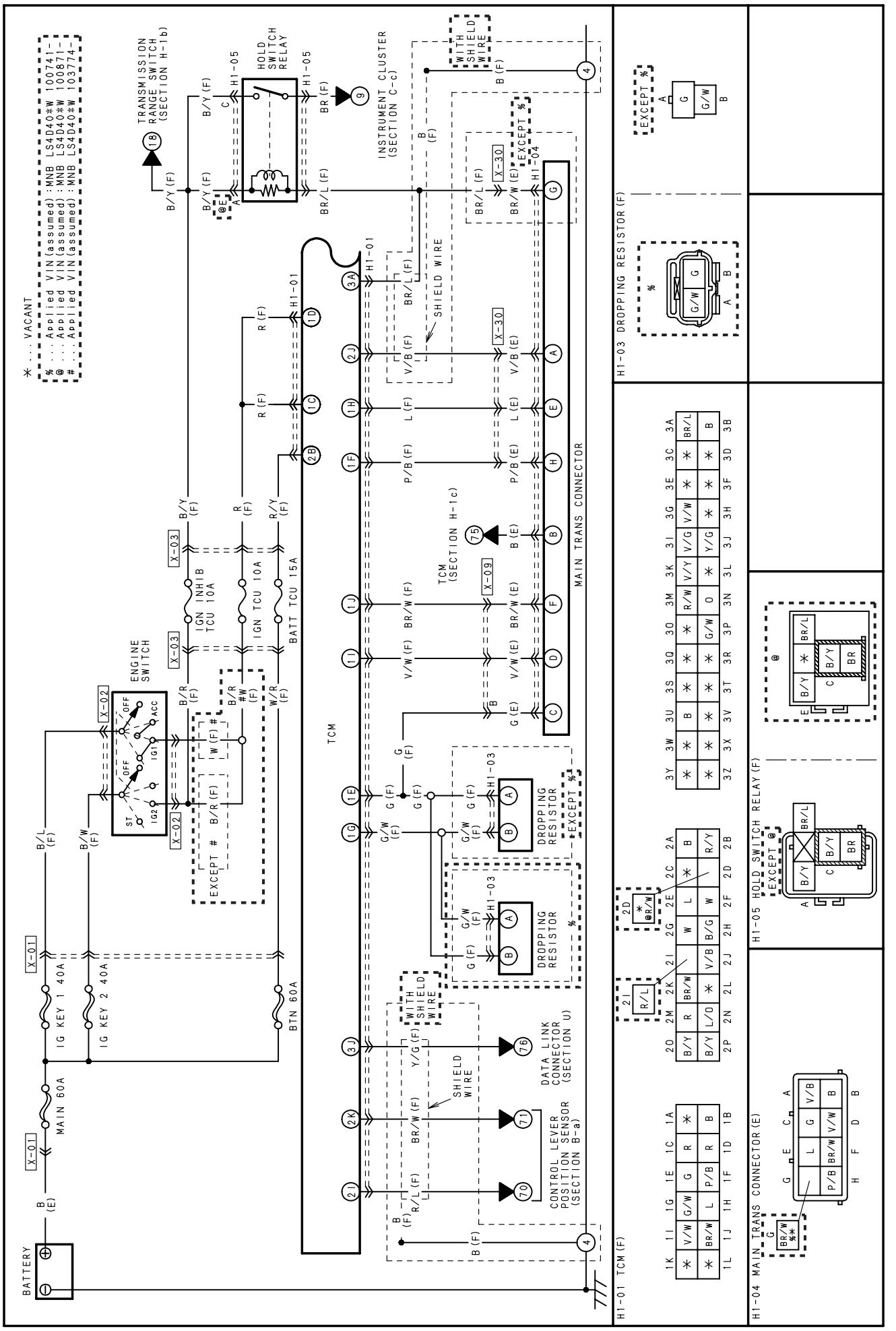
(SHORT CORD)

HARNESS SYMBOL: (F) (E) (R)

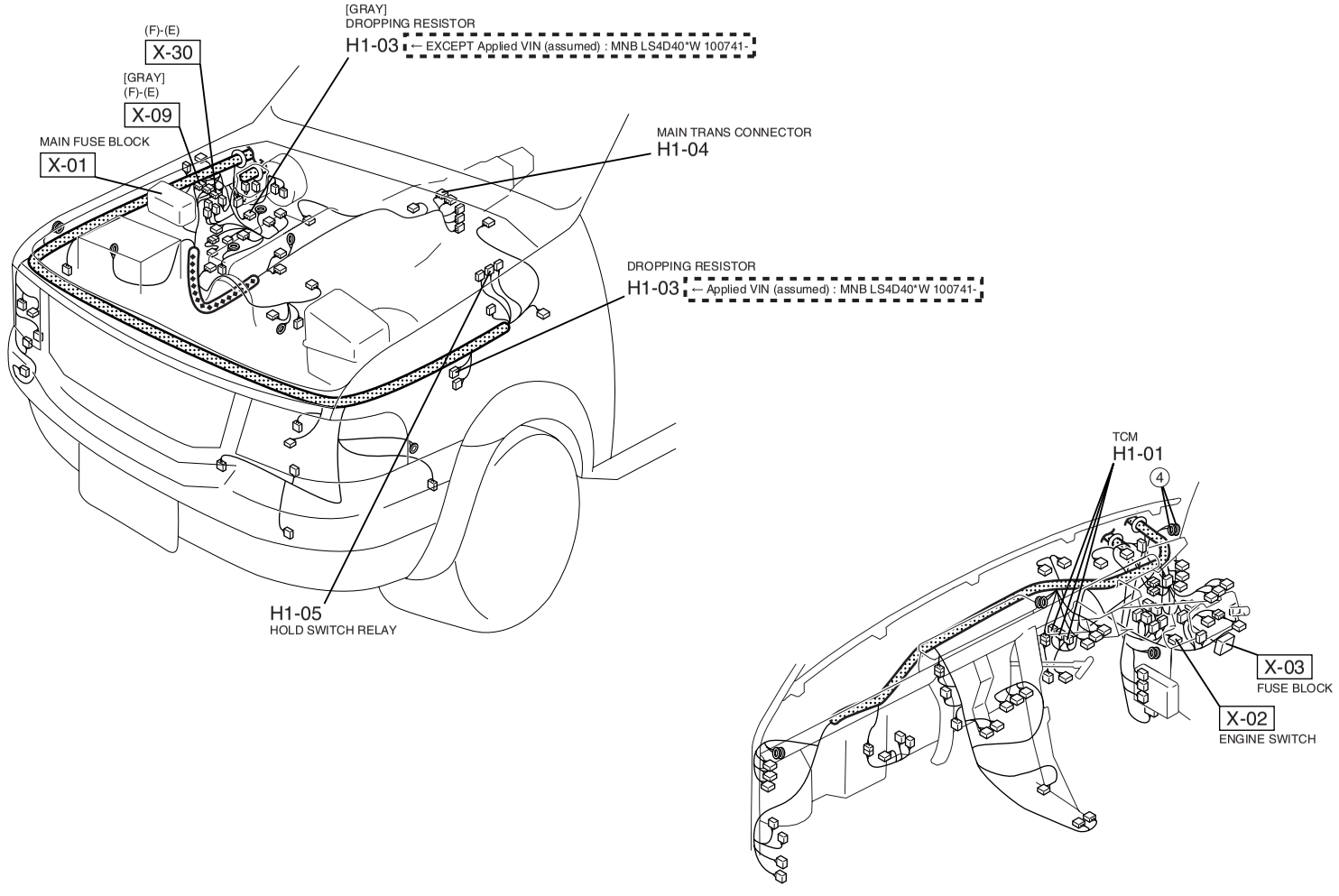


4EAT CONTROL SYSTEM

H-1a

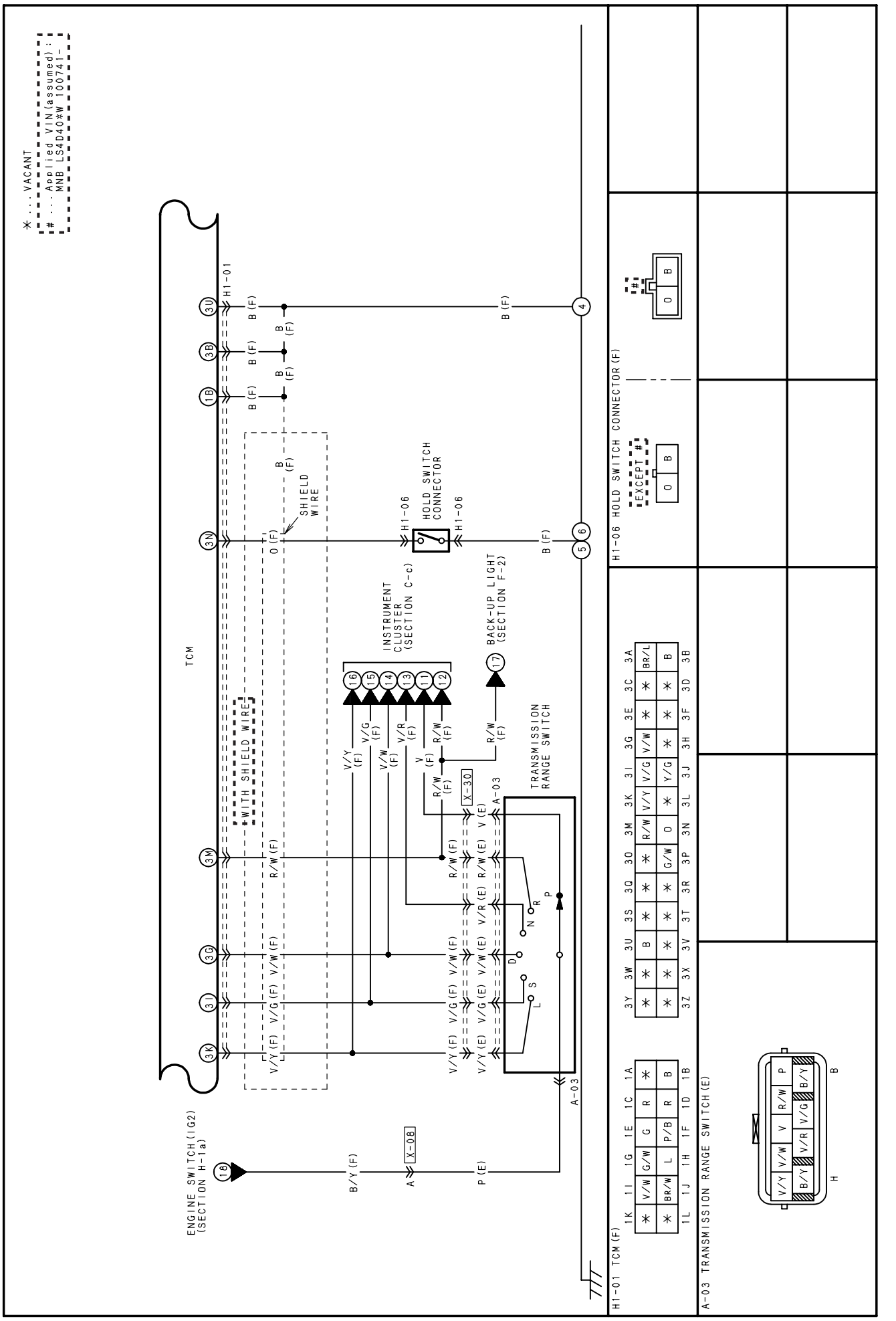


HARNESS SYMBOL: (F) (E) (R)

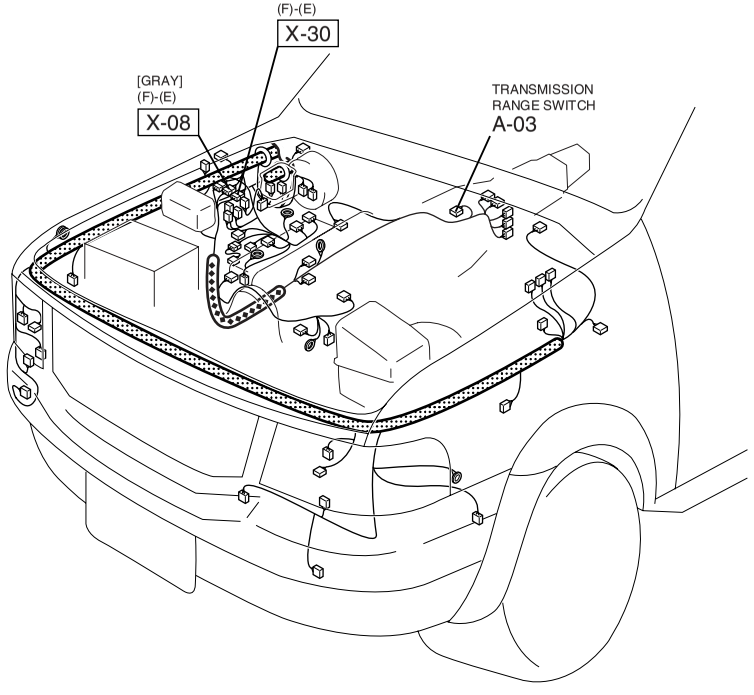


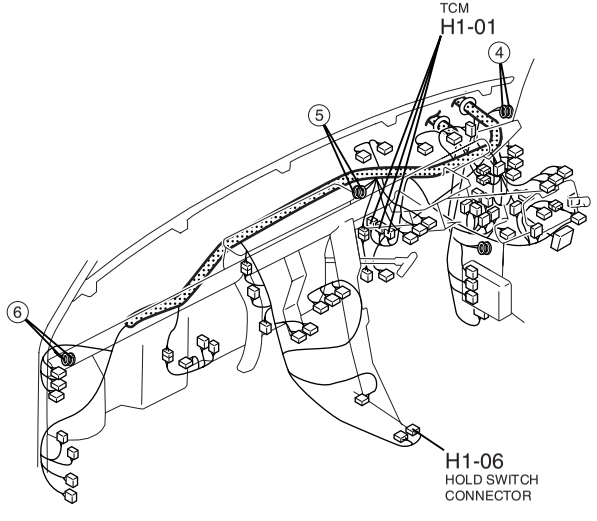
H-1b

4EAT CONTROL SYSTEM



HARNESS SYMBOL: (F) (E) (R)

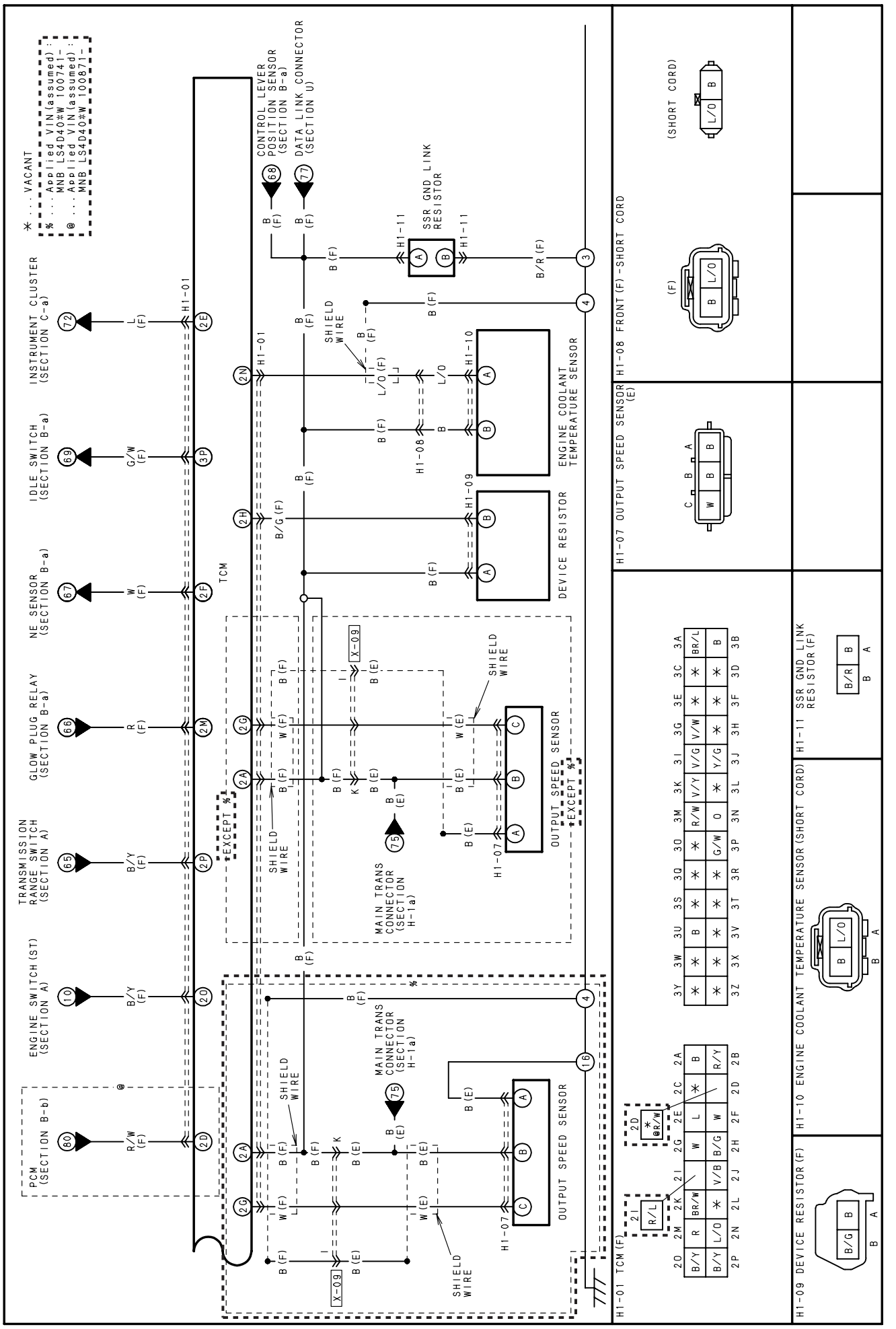


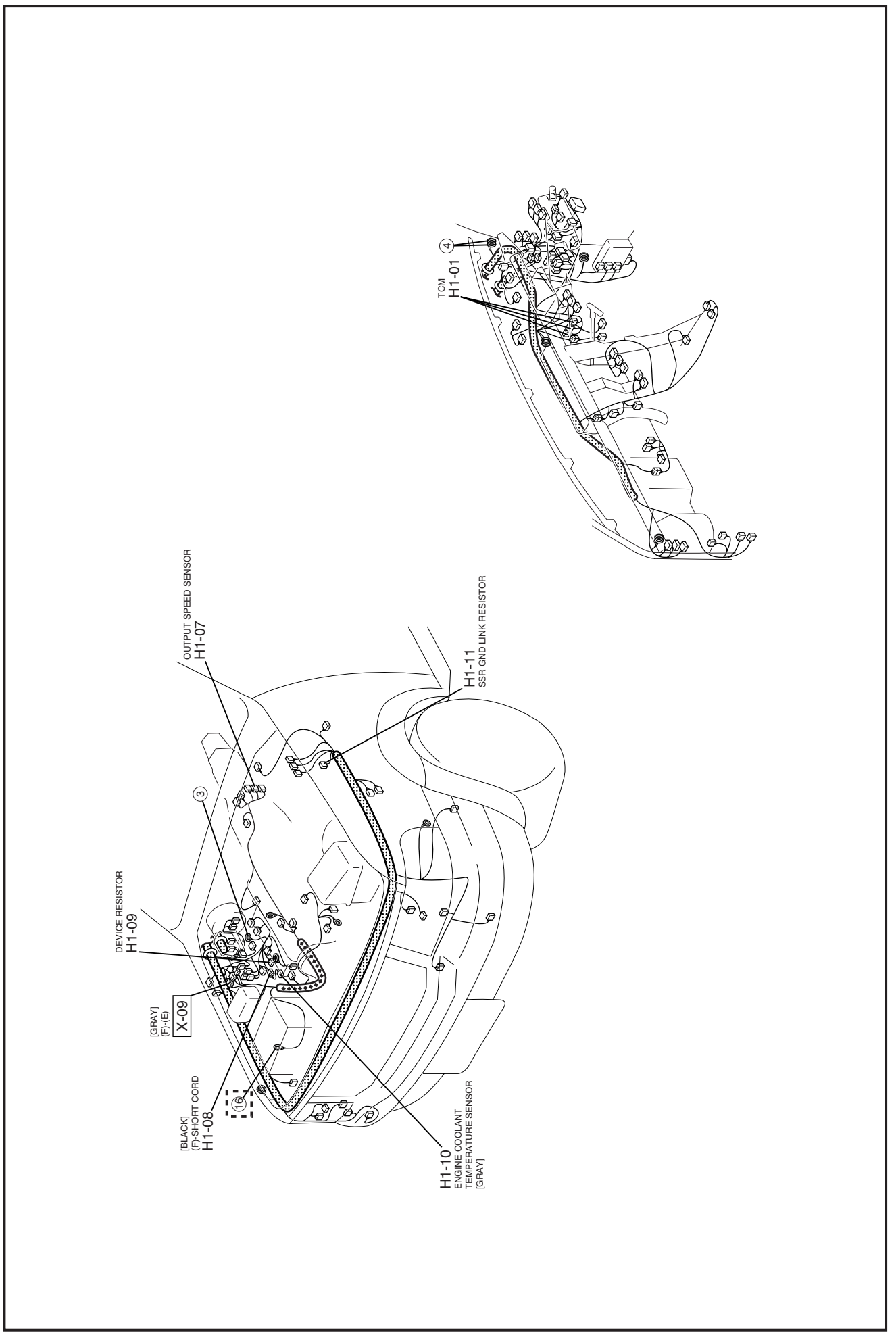


H-1b

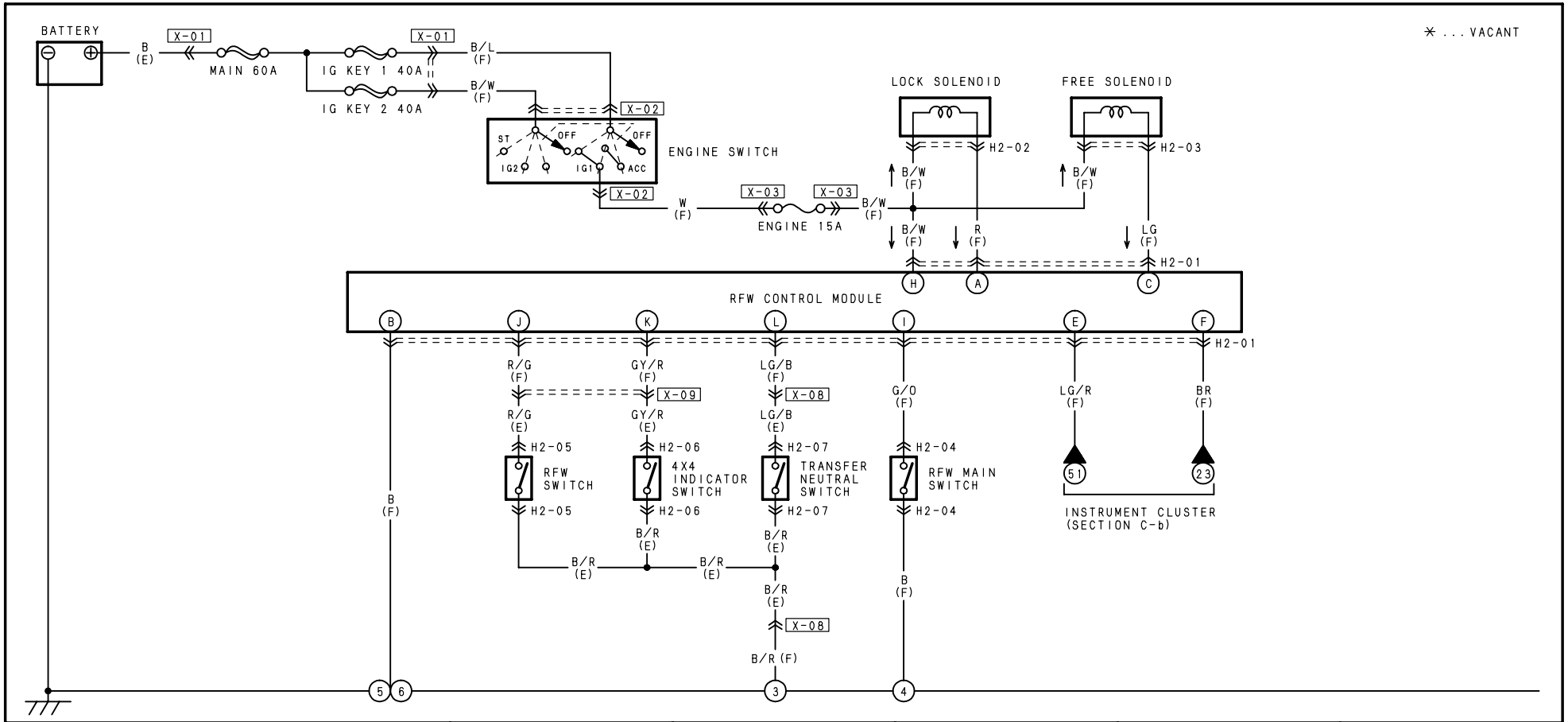
H-1C

4EAT CONTROL SYSTEM

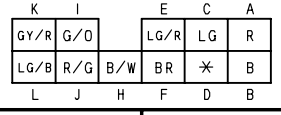



H-1c
HARNESS SYMBOL: (F) (E) (R)
TCM
H1-01
4
OUTPUT SPEED SENSOR
H1-07
H1-11
SSR GND LINK RESISTOR
3
DEVICE RESISTOR
H1-09
[GRAY]
(F)-(E)
X-09
[BLACK]
(F)-SHORT CORD
H1-08
16
H1-10
ENGINE COOLANT
TEMPERATURE SENSOR
[GRAY]

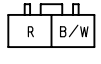
REMOTE FREEWHEEL CONTROL SYSTEM



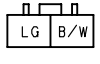
H2-01 RFW CONTROL MODULE (F)



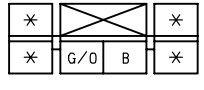
H2-02 LOCK SOLENOID (F)



H2-03 FREE SOLENOID (F)



H2-04 RFW MAIN SWITCH (F)



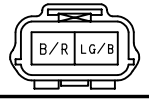
H2-05 RFW SWITCH (E)



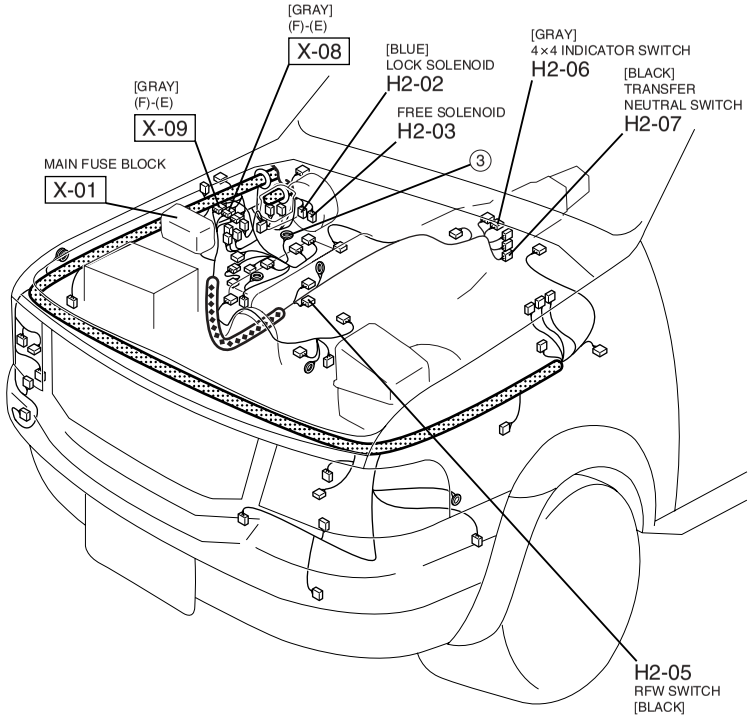
H2-06 4X4 INDICATOR SWITCH (E)

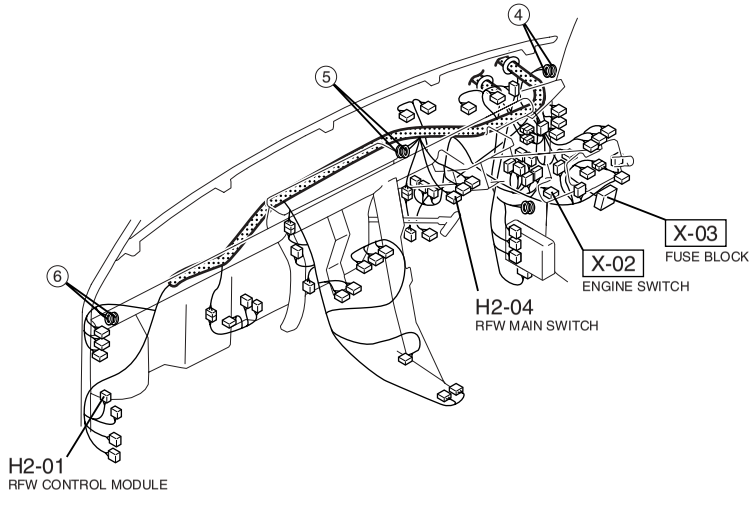


H2-07 TRANSFER NEUTRAL SWITCH (E)

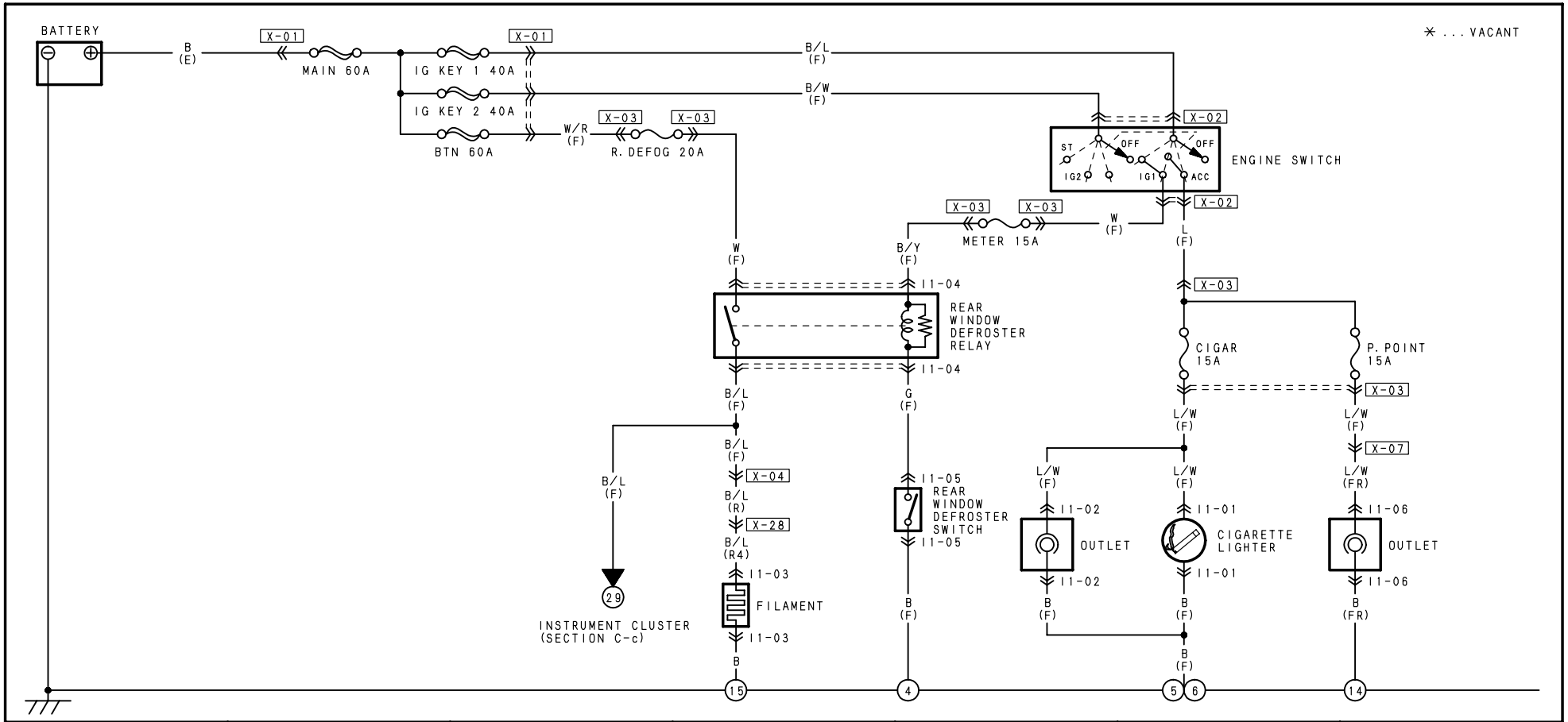


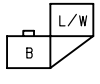
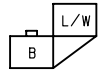
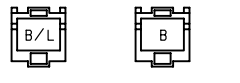
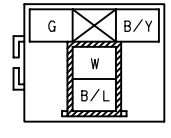
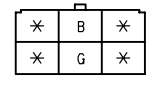
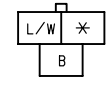
HARNESS SYMBOL: (F) (E) (R)



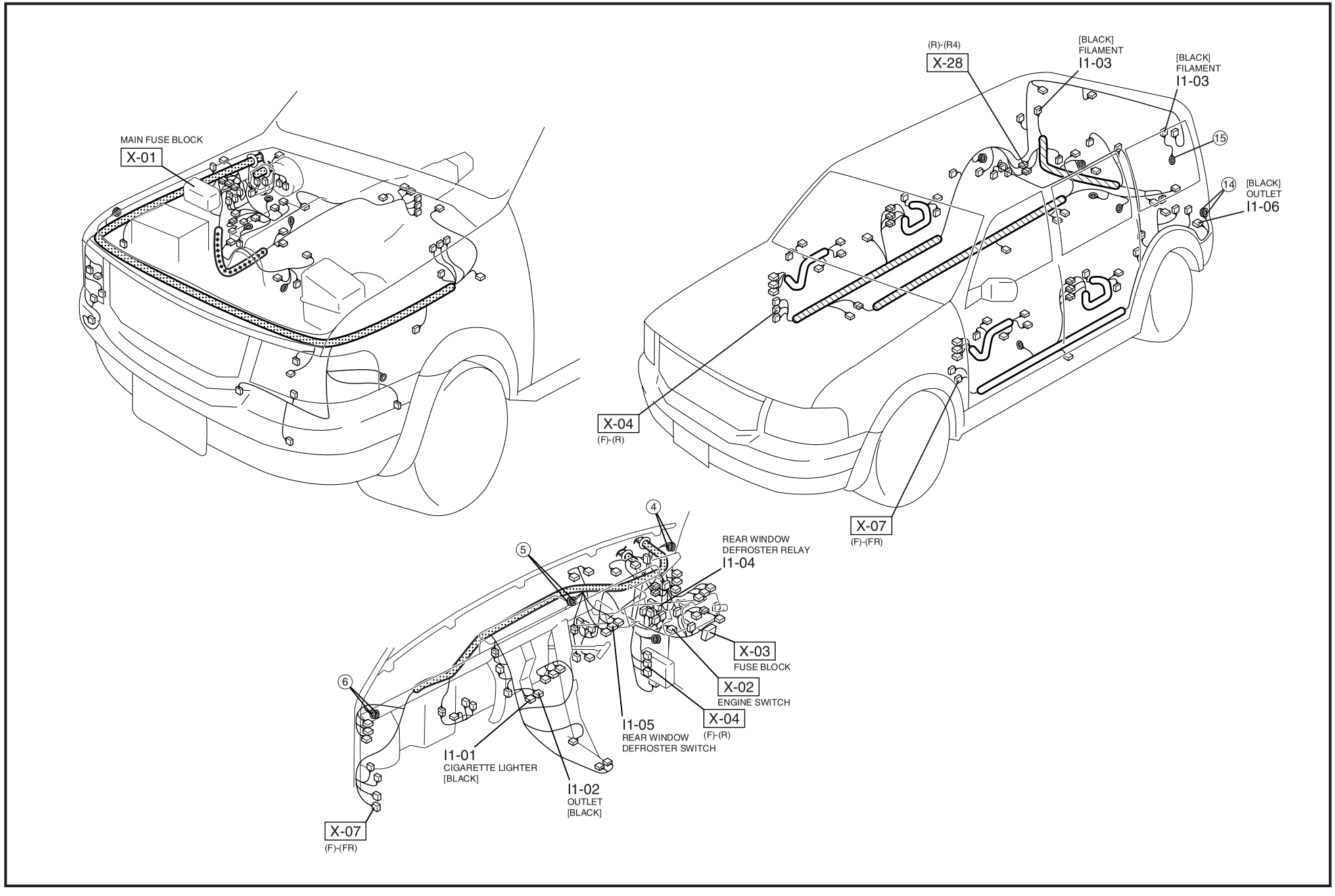


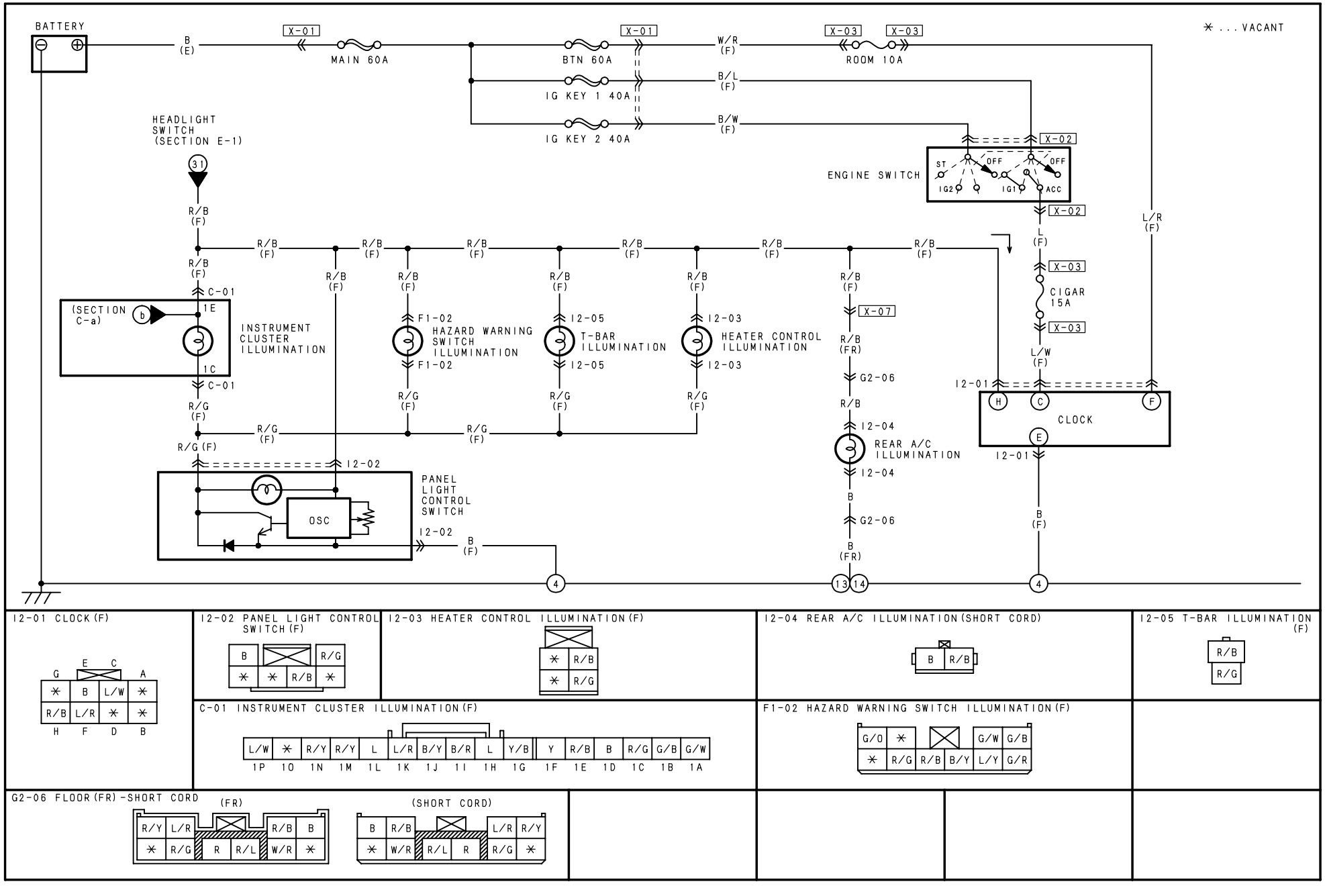
CIGARETTE LIGHTER / REAR WINDOW DEFROSTER



I1-01 CIGARETTE LIGHTER (F)	I1-02 OUTLET (F)	I1-03 FILAMENT	I1-04 REAR WINDOW DEFROSTER RELAY (F)	I1-05 REAR WINDOW DEFROSTER SWITCH (F)	I1-06 OUTLET (FR)	
						

HARNESS SYMBOL: (F) (E) (R)





I2-01 CLOCK (F)

I2-02 PANEL LIGHT CONTROL SWITCH (F)

I2-03 HEATER CONTROL ILLUMINATION (F)

I2-04 REAR A/C ILLUMINATION (SHORT CORD)

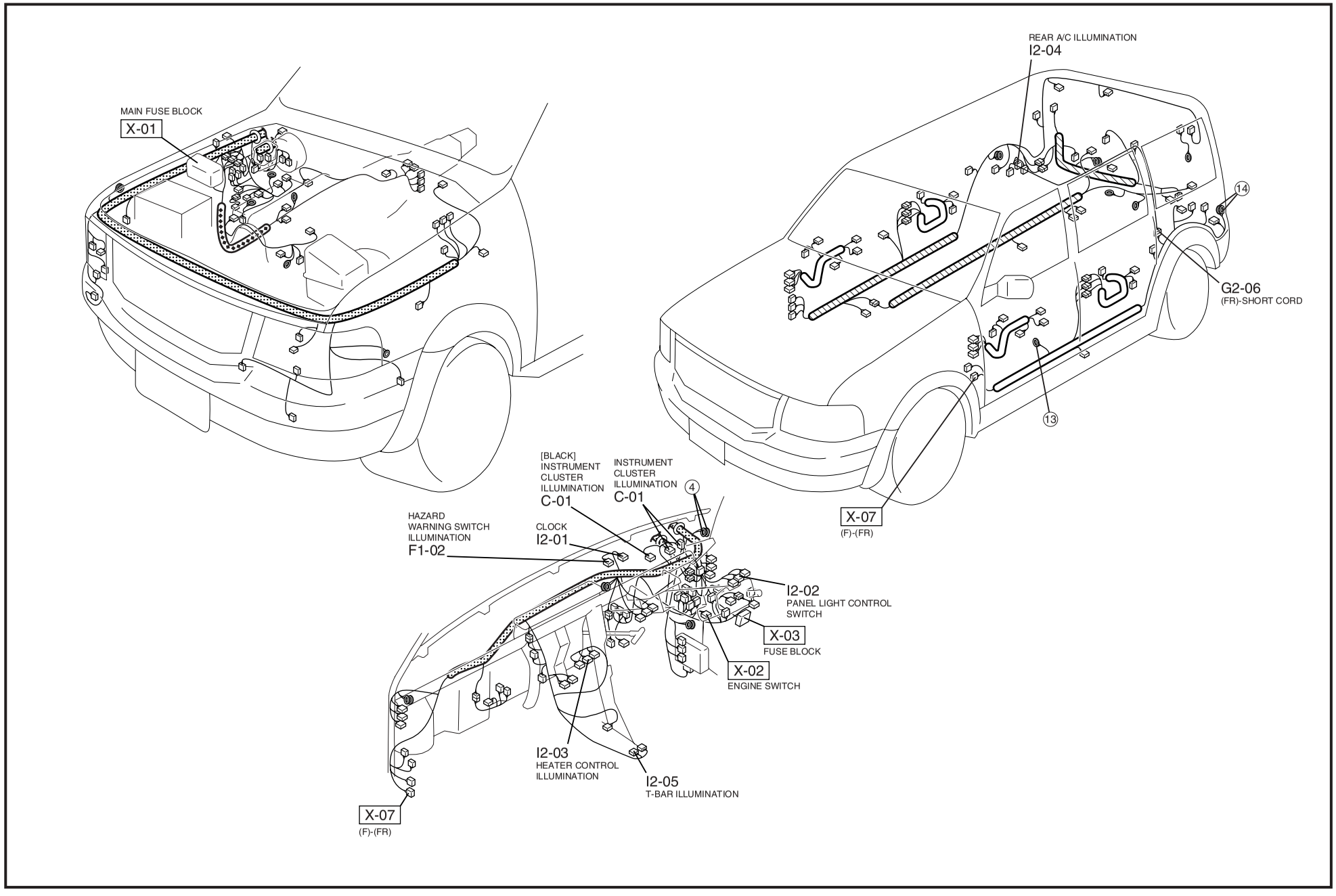
I2-05 T-BAR ILLUMINATION (F)

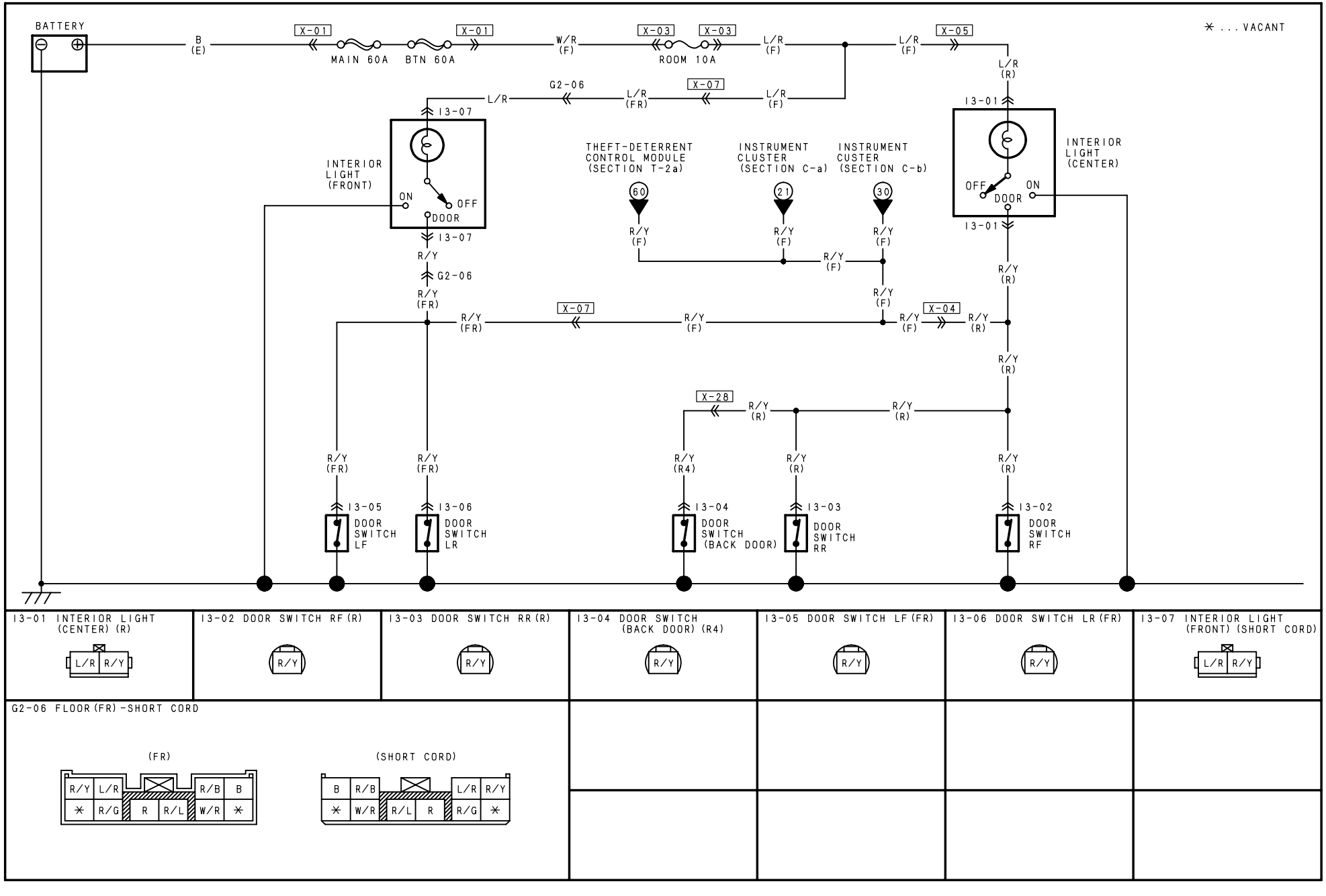
C-01 INSTRUMENT CLUSTER ILLUMINATION (F)

F1-02 HAZARD WARNING SWITCH ILLUMINATION (F)

G2-06 FLOOR (FR) -SHORT CORD

HARNESS SYMBOL: (F) (E) (R)

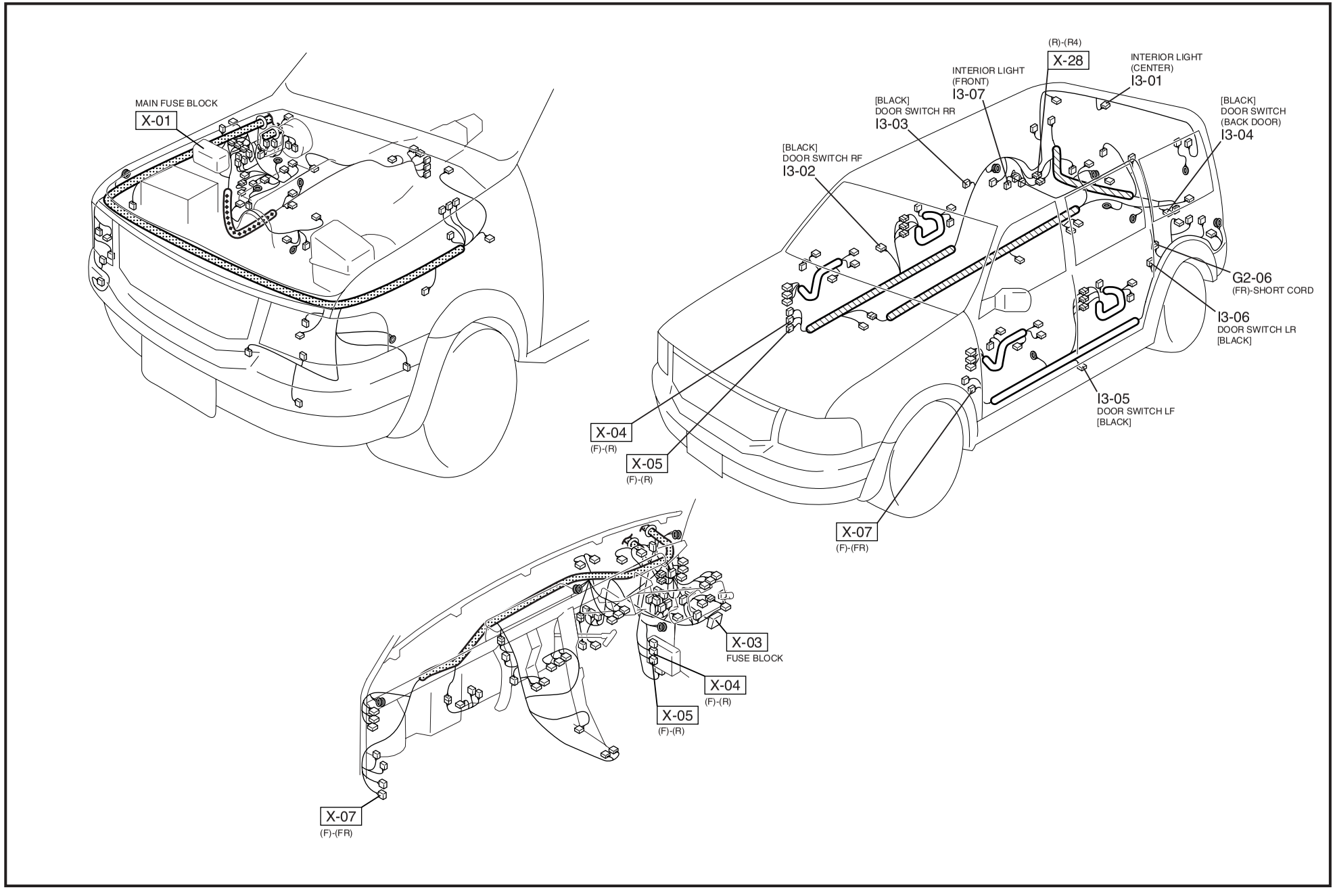


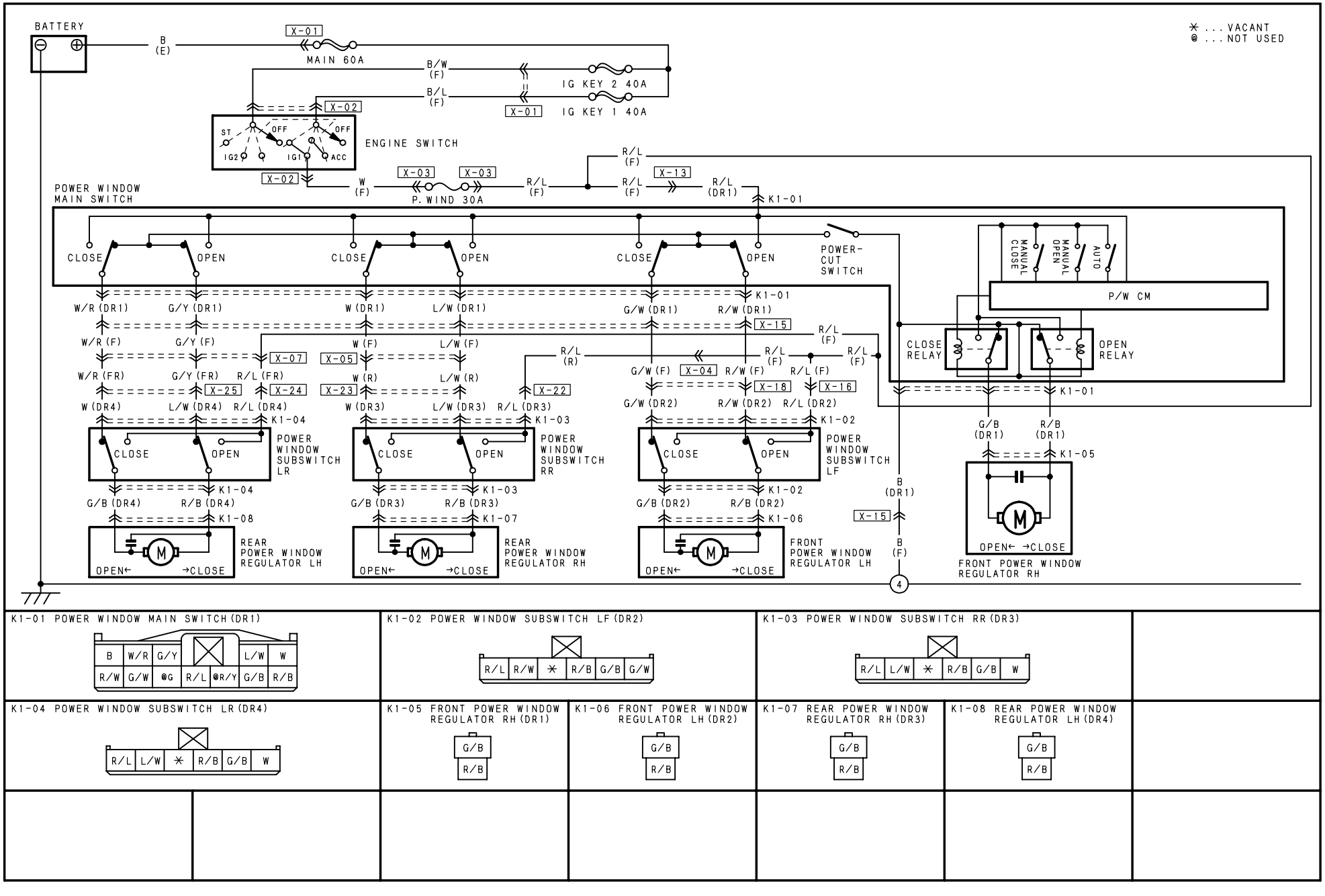


I3-01 INTERIOR LIGHT (CENTER) (R)	I3-02 DOOR SWITCH RF (R)	I3-03 DOOR SWITCH RR (R)	I3-04 DOOR SWITCH (BACK DOOR) (R4)	I3-05 DOOR SWITCH LF (FR)	I3-06 DOOR SWITCH LR (FR)	I3-07 INTERIOR LIGHT (FRONT) (SHORT CORD)
L/R R/Y	R/Y	R/Y	R/Y	R/Y	R/Y	L/R R/Y

G2-06 FLOOR (FR) -SHORT CORD

HARNESS SYMBOL: (F) (E) (R)





K1-01 POWER WINDOW MAIN SWITCH (DR1)

B	W/R	G/Y		L/W	W	
R/W	G/W	@G	R/L	@R/Y	G/B	R/B

K1-02 POWER WINDOW SUBSWITCH LF (DR2)

R/L	R/W	✳	R/B	G/B	G/W

K1-03 POWER WINDOW SUBSWITCH RR (DR3)

R/L	L/W	✳	R/B	G/B	W

K1-04 POWER WINDOW SUBSWITCH LR (DR4)

R/L	L/W	✳	R/B	G/B	W

K1-05 FRONT POWER WINDOW REGULATOR RH (DR1)

G/B
R/B

K1-06 FRONT POWER WINDOW REGULATOR LH (DR2)

G/B
R/B

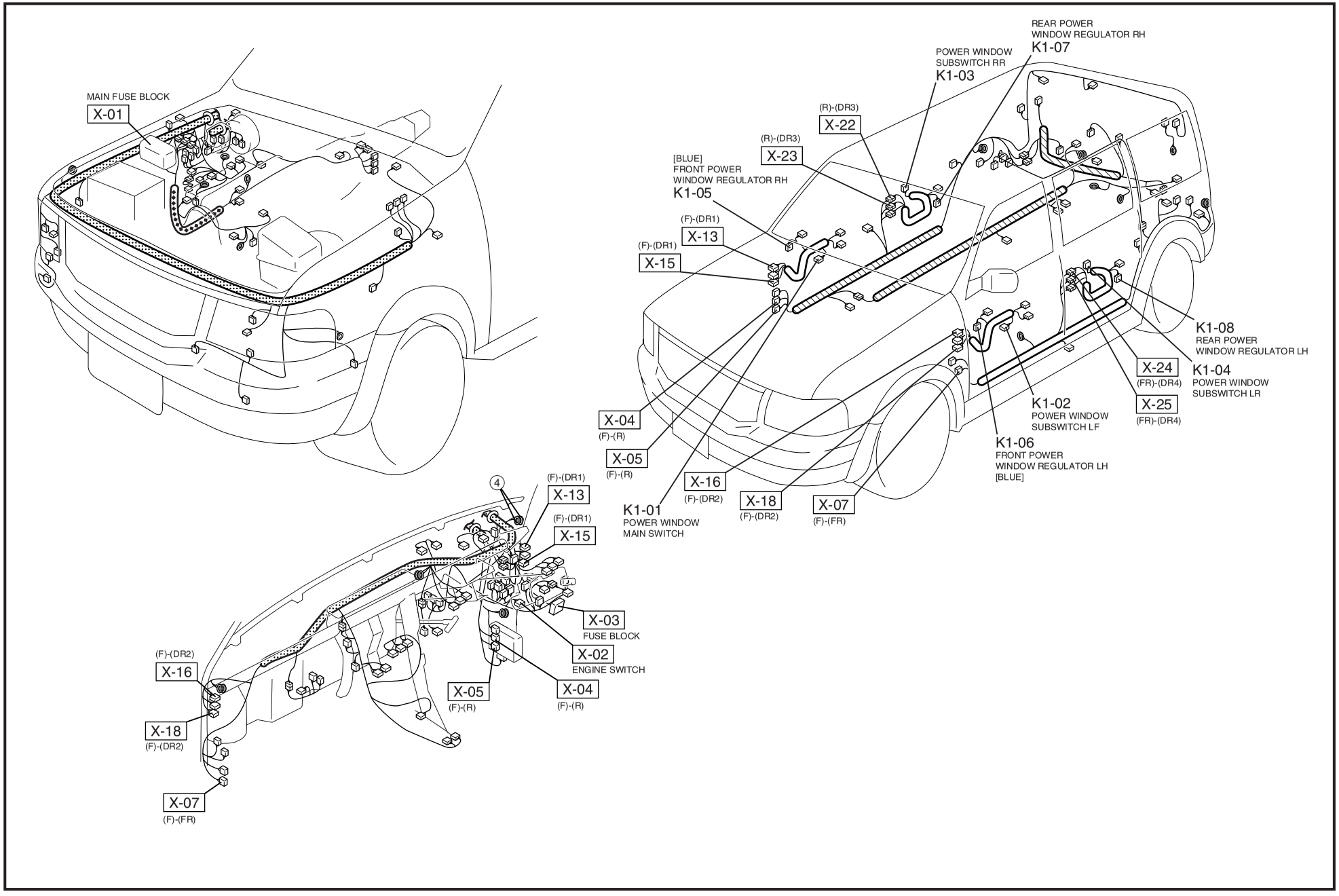
K1-07 REAR POWER WINDOW REGULATOR RH (DR3)

G/B
R/B

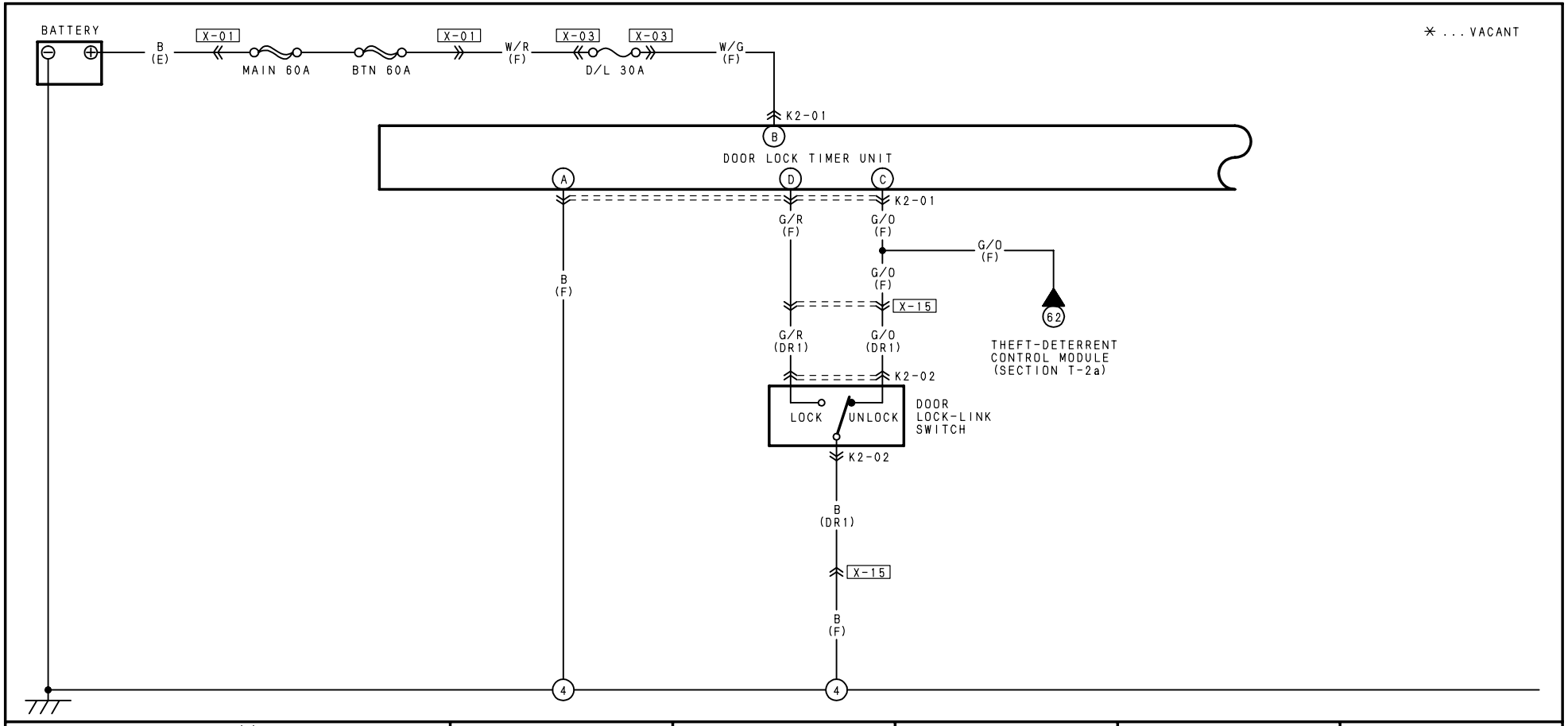
K1-08 REAR POWER WINDOW REGULATOR LH (DR4)

G/B
R/B

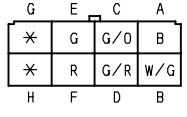
HARNESS SYMBOL: (F) (E) (R)



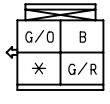
POWER DOOR LOCK SYSTEM



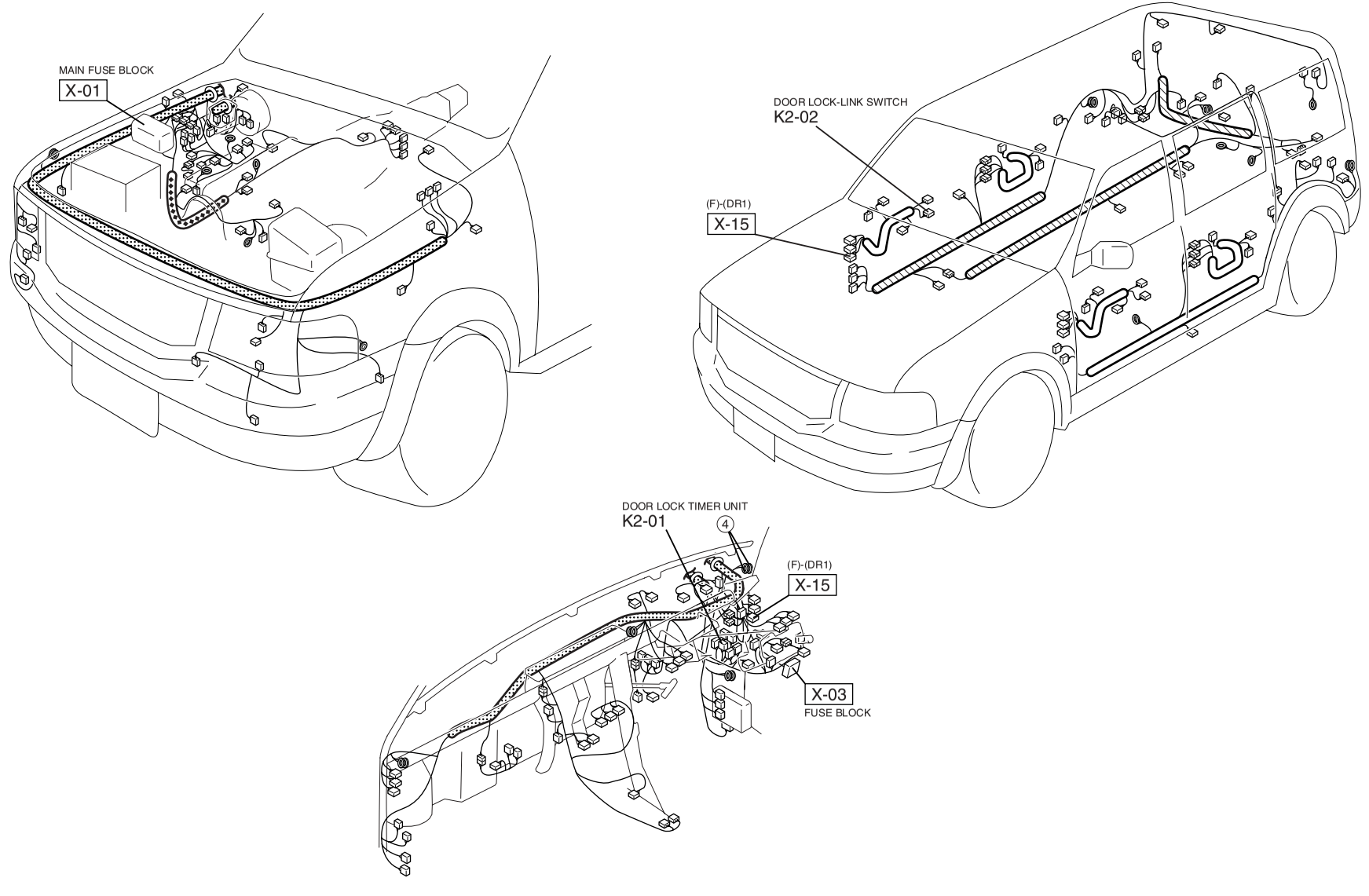
K2-01 DOOR LOCK TIMER UNIT (F)

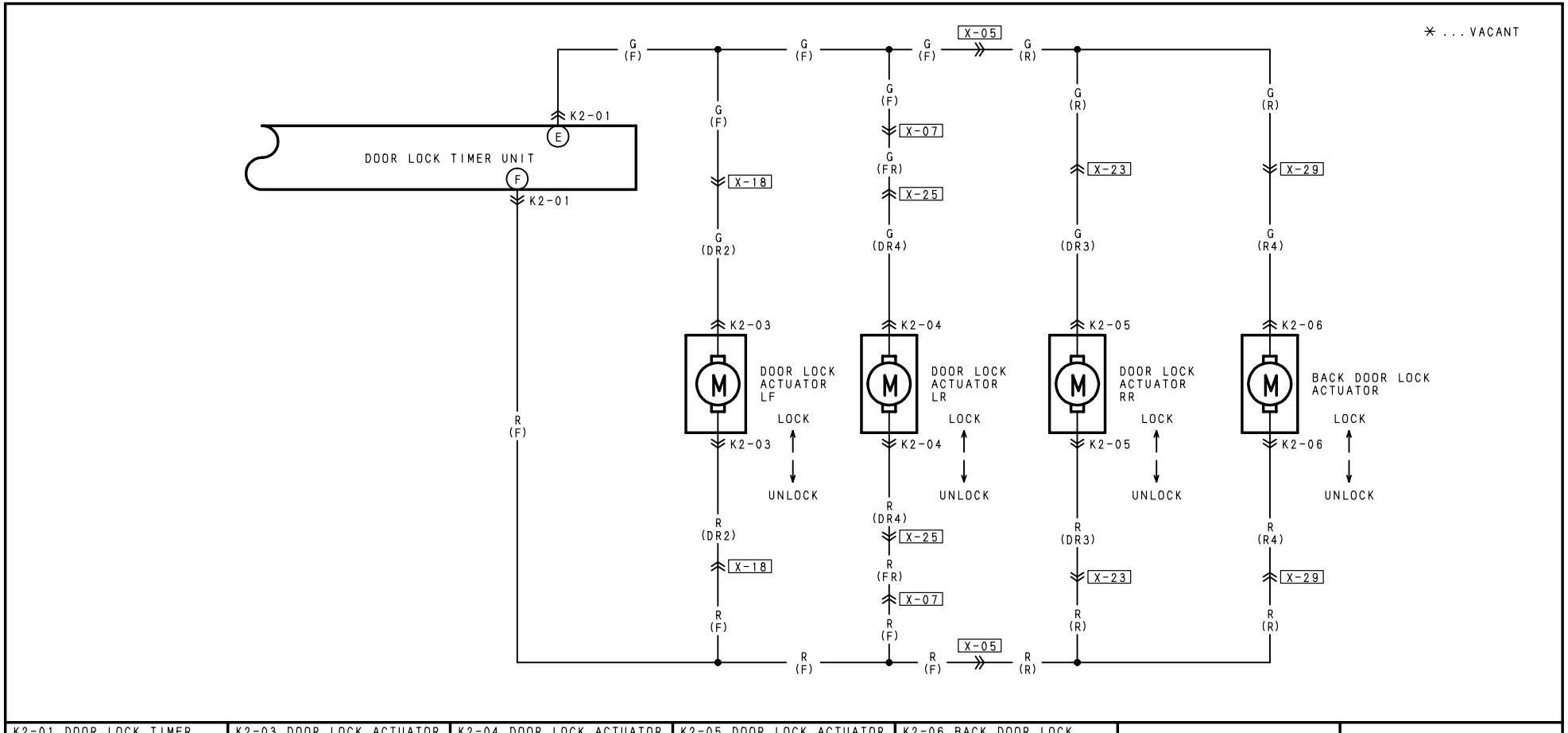


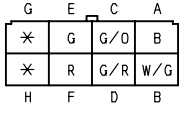
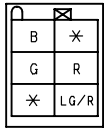
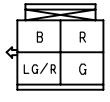
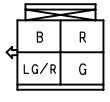
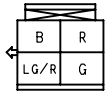
K2-02 DOOR LOCK-LINK SWITCH (DR1)



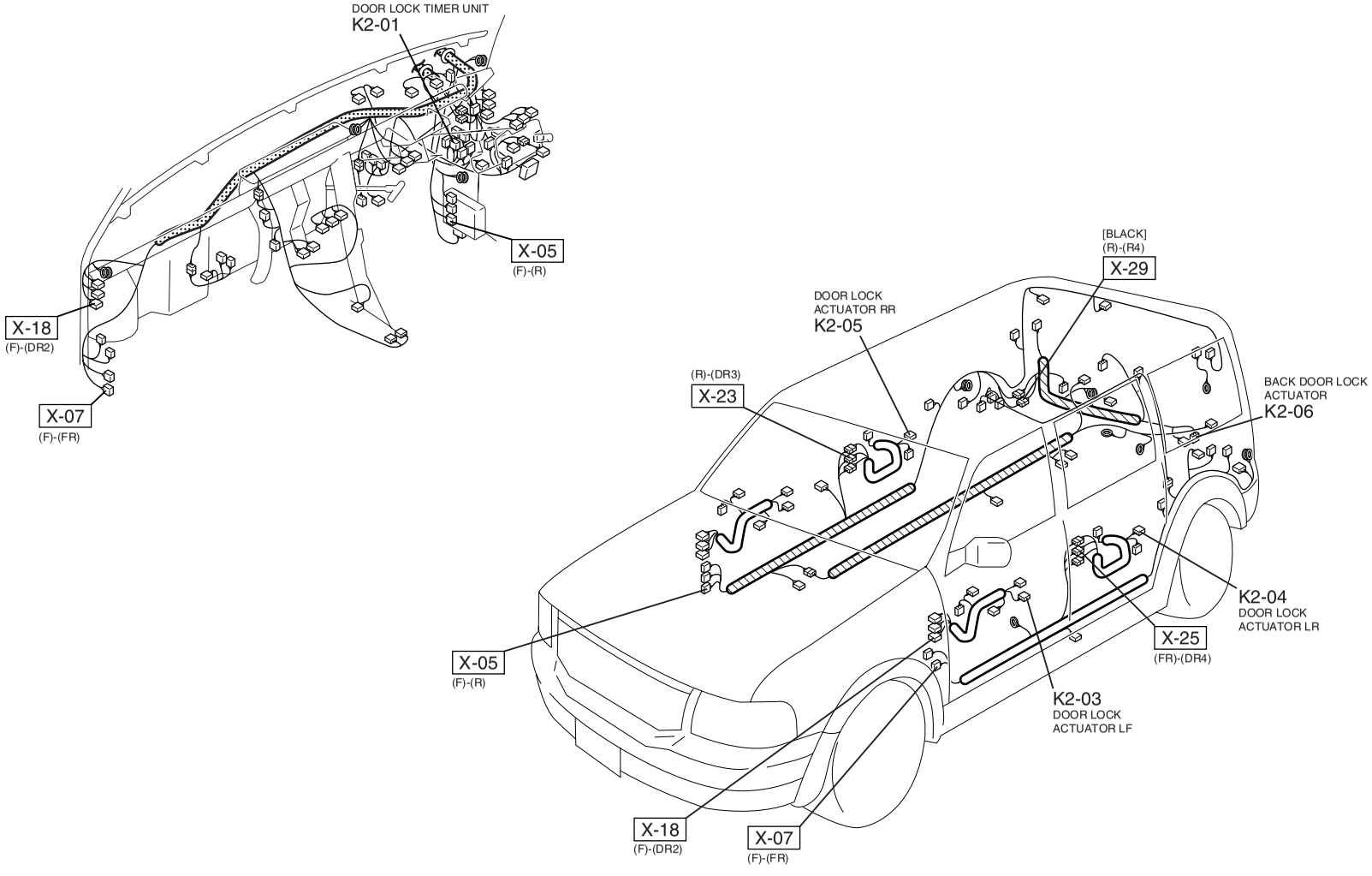
HARNESS SYMBOL: (F) (E) (R)



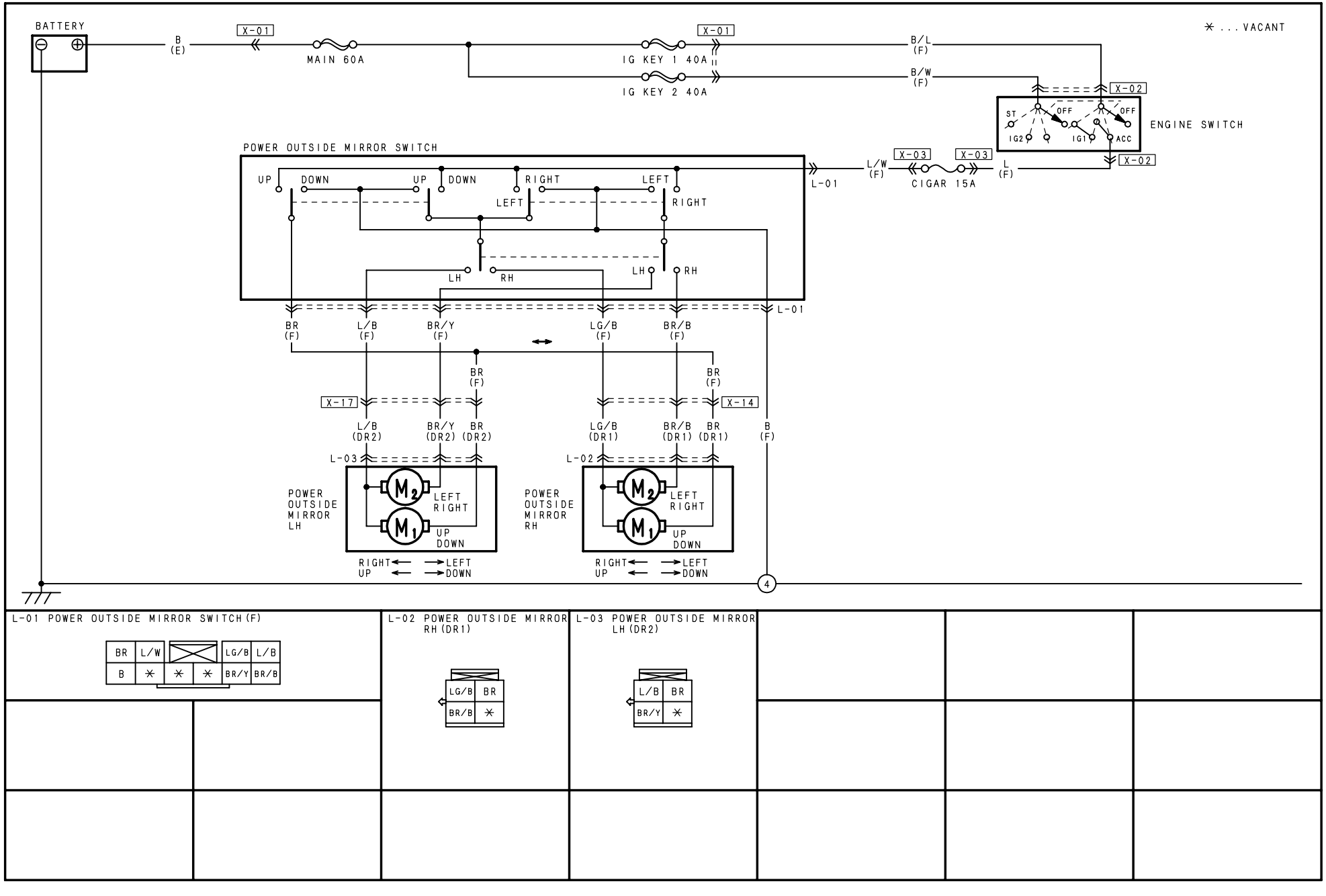


K2-01 DOOR LOCK TIMER UNIT (F)	K2-03 DOOR LOCK ACTUATOR LF (DR2)	K2-04 DOOR LOCK ACTUATOR LR (DR4)	K2-05 DOOR LOCK ACTUATOR RR (DR3)	K2-06 BACK DOOR LOCK ACTUATOR (R4)		
						

HARNESS SYMBOL: (F) (E) (R)



POWER OUTSIDE MIRROR



L-01 POWER OUTSIDE MIRROR SWITCH (F)

BR	L/W			LG/B	L/B
B	*	*	*	BR/Y	BR/B

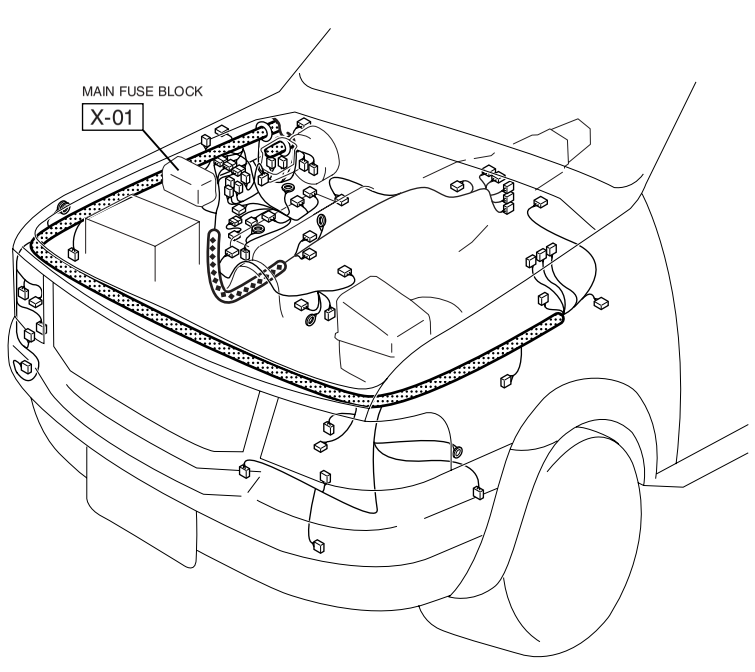
L-02 POWER OUTSIDE MIRROR RH (DR1)

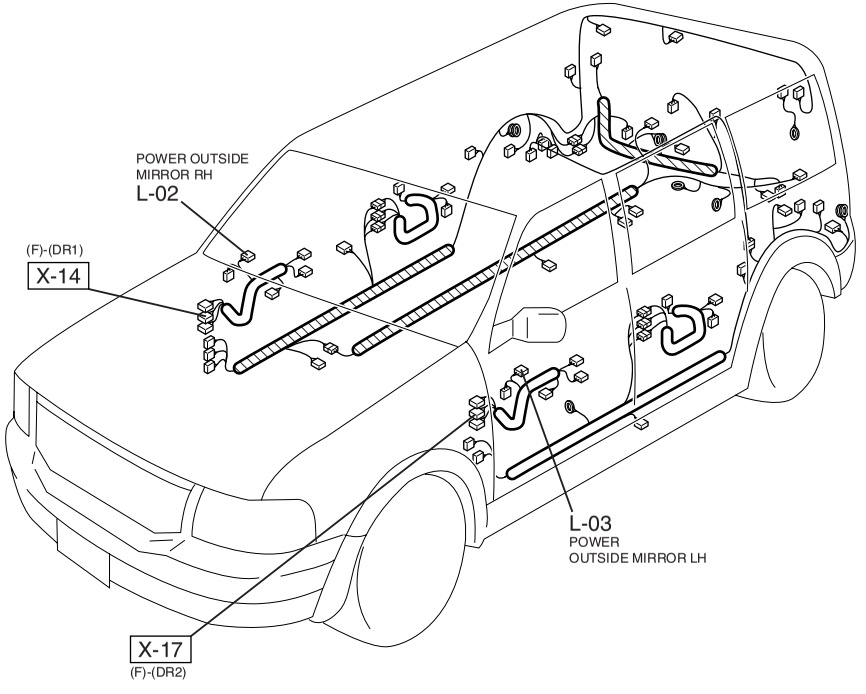
LG/B	BR
BR/B	*

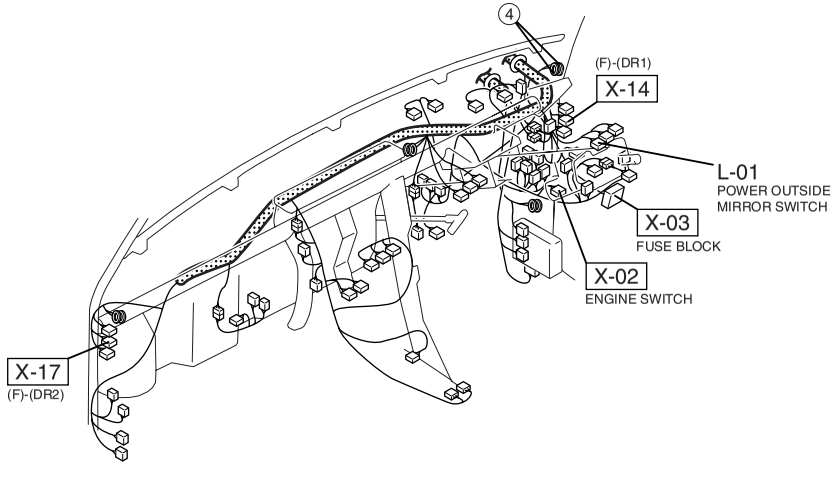
L-03 POWER OUTSIDE MIRROR LH (DR2)

L/B	BR
BR/Y	*

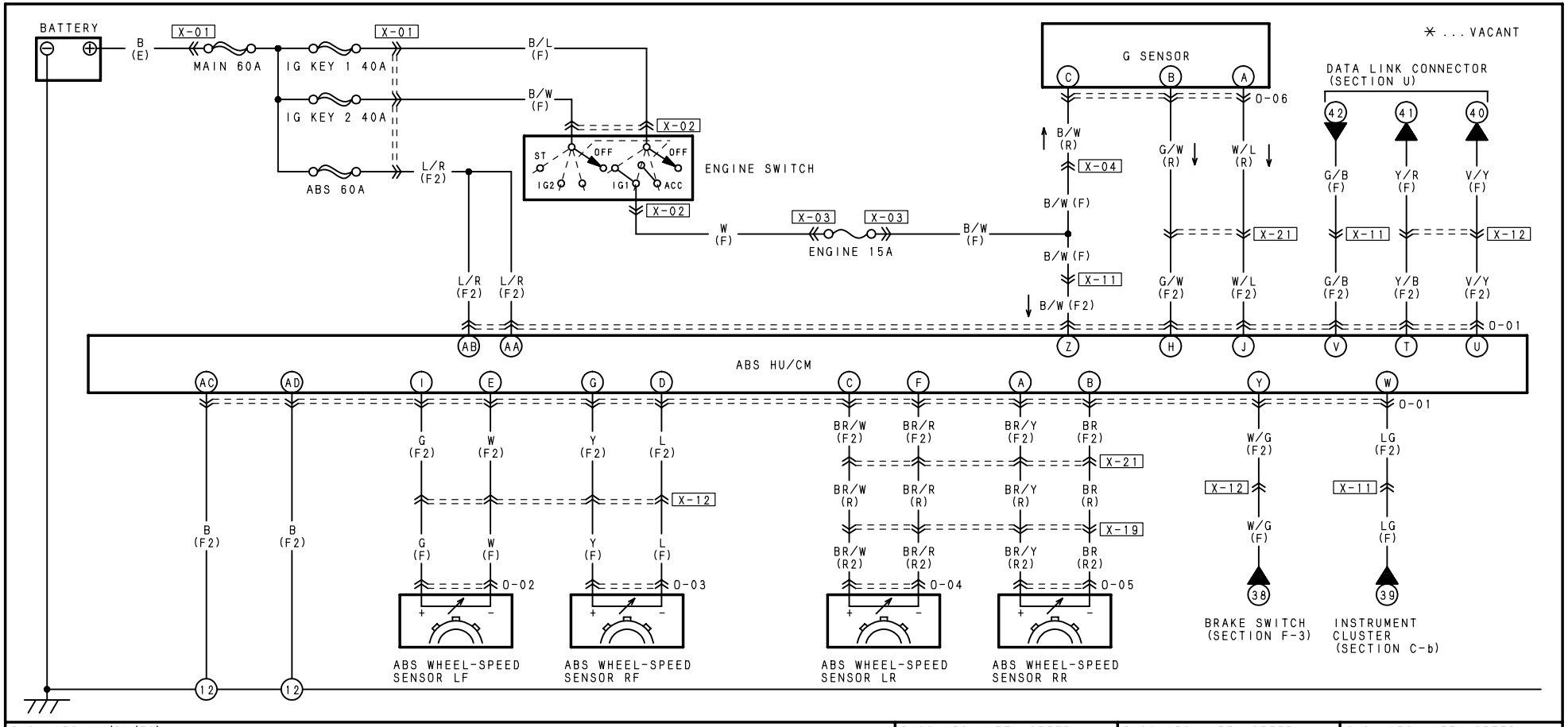
HARNESS SYMBOL: (F) (E) (R)

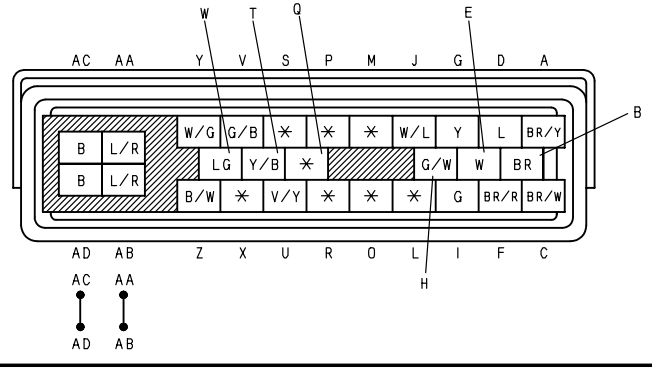




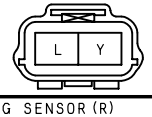


4 WHEEL ANTILOCK BRAKE SYSTEM (4WABS)

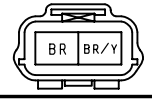


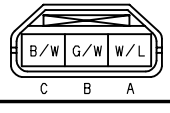


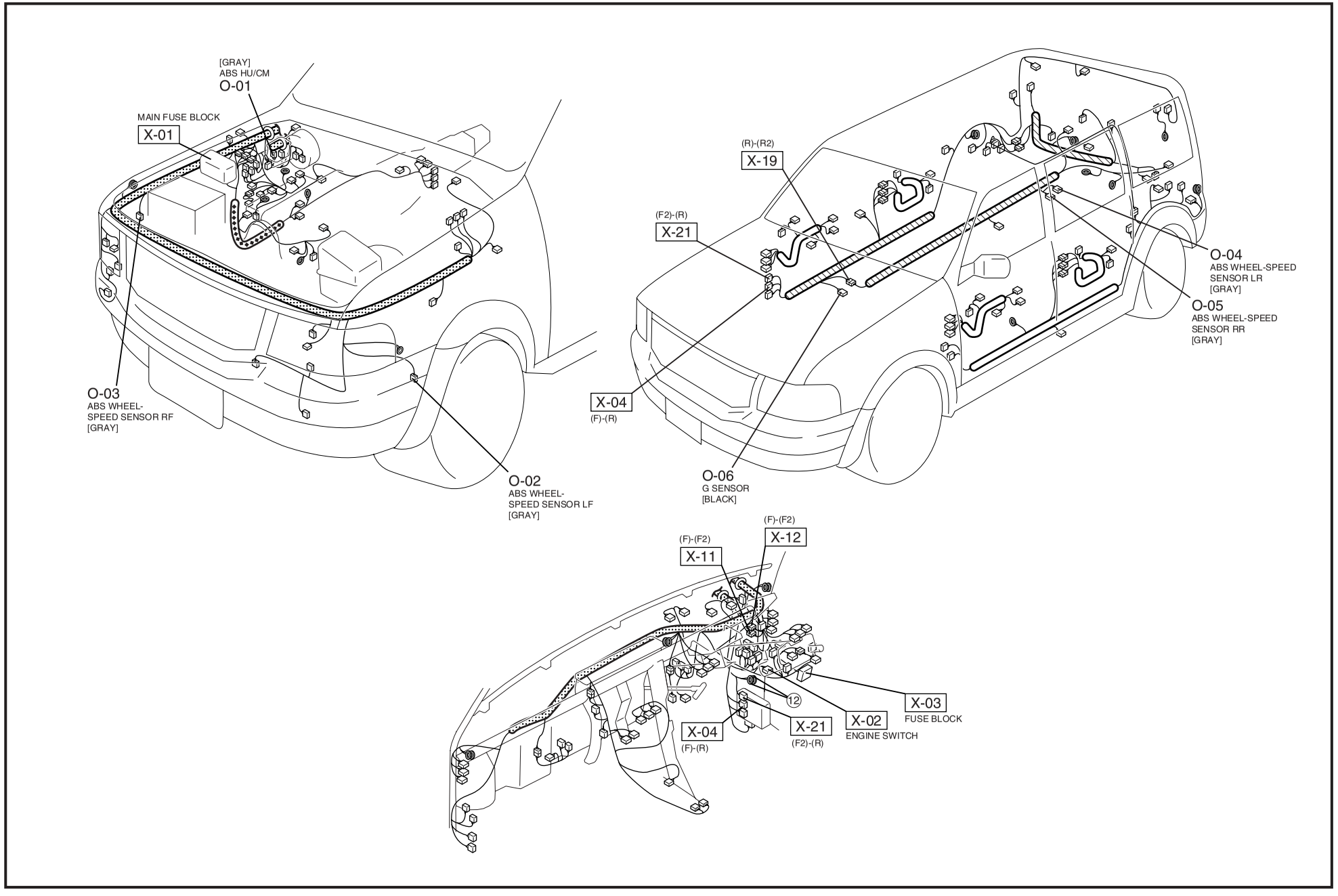










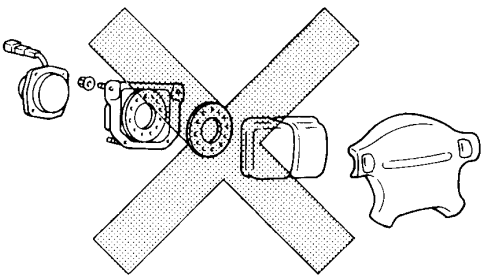

[GRAY]
ABS HU/CM
O-01
MAIN FUSE BLOCK
X-01
O-03
ABS WHEEL-
SPEED SENSOR RF
[GRAY]
O-02
ABS WHEEL-
SPEED SENSOR LF
[GRAY]
(R)-(R2)
X-19
(F2)-(R)
X-21
X-04
(F)-(R)
O-04
ABS WHEEL-SPEED
SENSOR LR
[GRAY]
O-05
ABS WHEEL-SPEED
SENSOR RR
[GRAY]
O-06
G SENSOR
[BLACK]
(F)-(F2)
X-12
(F)-(F2)
X-11
X-03
FUSE BLOCK
X-02
ENGINE SWITCH
X-21
(F2)-(R)
X-04
(F)-(R)

AIR BAG SYSTEM

SERVICE WARNINGS

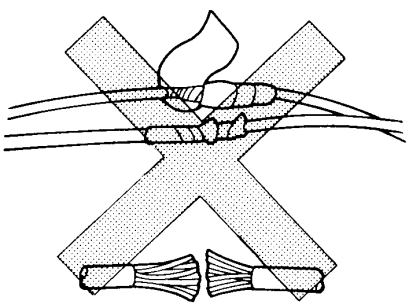
Component Disassembly

- **Disassembling and reassembling the components of the air bag system can render the system inoperative, which may result in serious injury or death in the event of an accident. Do not disassemble any air bag system component.**



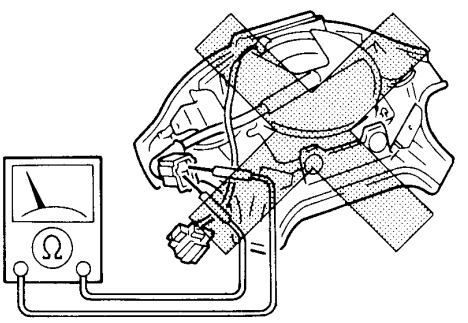
Wiring Harness Repair

- **Incorrectly repairing an air bag system wiring harness can accidentally deploy the air bag module, which can cause serious injury. If a problem is found in the system wiring, replace the wiring harness. Do not try to repair it.**



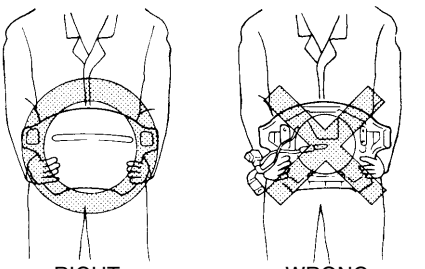
Air Bag Module Inspection

- **Inspecting an air bag module using an ohmmeter can deploy the air bag module, which may cause serious injury. Do not use an ohmmeter to inspect an air bag module. Always use the on-board diagnostic function to diagnose the air bag for malfunctions. (Refer to ON-BOARD DIAGNOSTIC FUNCTION, AIR BAG SYSTEM.)**

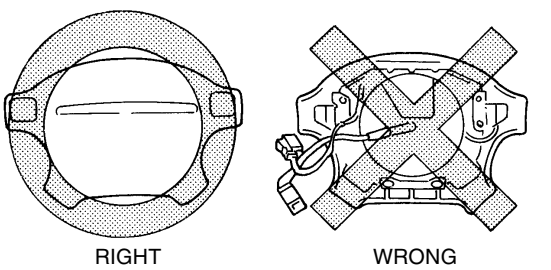


Air Bag Mudule Handling

- **A live (undeployed) air bag module may accidentally deploy when it is handled and cause serious injury. When carrying a live (undeployed) air bag module, point the front surface away from your body to lessen the chance of injury in case it deploys.**



- **A live (undeployed) air bag module placed face down on a surface is dangerous. If the air bag module deploys, the motion of the module can cause serious injury. Always face the front surface up to reduce the motion of the module in case it accidentally deploys.**



*The references in this section can be found in Repair Manual [F161-10-99A (1999-1)]

SAS Unit Handling

- **Disconnecting the SAS unit connector or removing the SAS unit with the ignition switch at ON position can cause the air bag modules to deploy, which may seriously injure you. Before disconnecting the SAS unit connector or removing the SAS unit, turn the ignition switch to LOCK position, then disconnect the negative battery cable and wait for more than 1 minute to allow the backup power supply of the SAS unit to deplete its stored power.**
- **Connecting the SAS unit connector without firmly installing the SAS unit to the vehicle is dangerous. The crash sensor inside the unit may send an electrical signal to the air bag modules. This will deploy the air bag modules, which may result in serious injury. Therefore, before connecting the connector, firmly mount the unit to the vehicle.**
- **For vehicles with a single point sensor, once an air bag is deployed due to an accident or other causes, the SAS unit must be replaced with a new one even if the used one does not have any external signs of damage. The used SAS unit may have been damaged internally which may cause improper operation, resulting in major injuries or even death. The used single point SAS unit cannot be bench-checked or self-checked.**

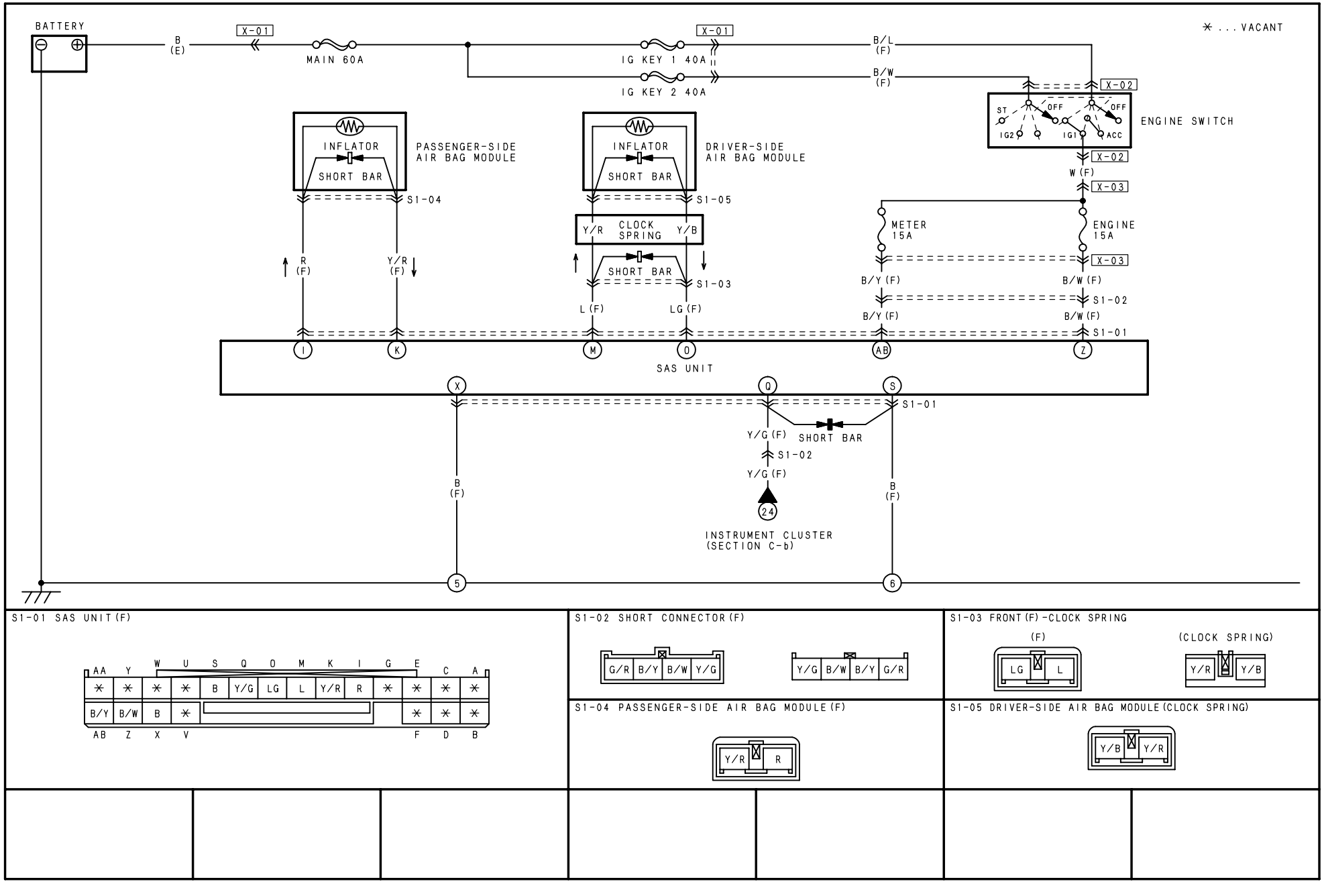
Component Handling

- **Oil, grease, water, etc on components may cause the air bag modules to fail to deploy in an accident, which may cause serious injury. Do not allow oil, grease, water, etc on components.**
- **Inserting a screwdriver, etc into the connector of an air bag module may damage the connector and cause the air bag module to deploy improperly, which may cause serious injury. Do not insert any foreign objects into the connector.**

Component Reusing

- **Even if an air bag madule does not deploy in a collision and does not have any external signs of damage, it may have been damaged internally, which may cause improper operation. Improper operation may cause serious injury. Always self-check the undamaged air bag module to determine whether it can be reused. (Refer to ON-BOARD DIAGNOSTIC FUNCTION, AIR BAG SYSTEM.)**

*The references in this section can be found in Repair Manual [F161-10-99A (1999-1)]



S1-01 SAS UNIT (F)

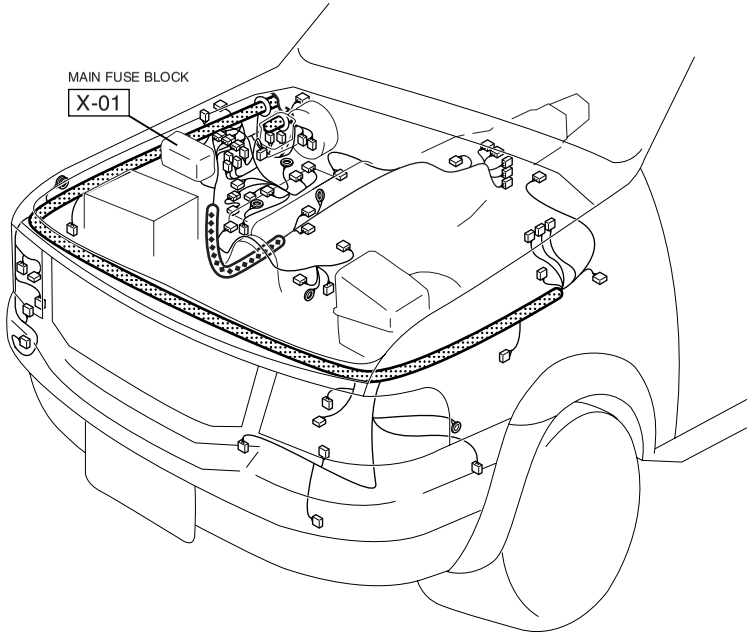
S1-02 SHORT CONNECTOR (F)

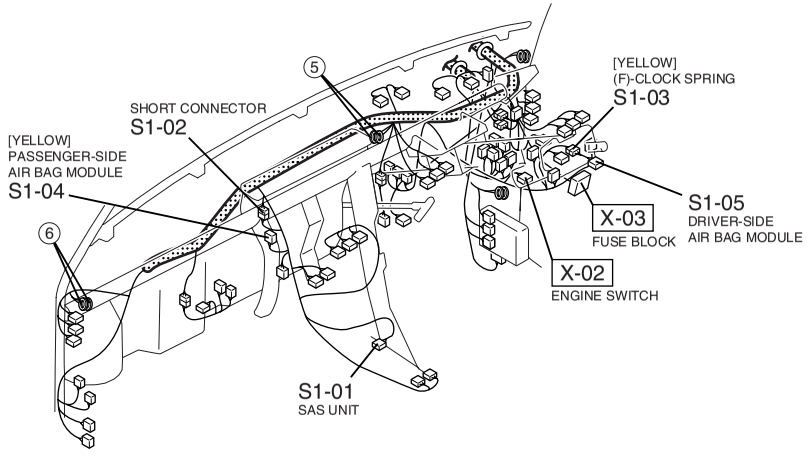
S1-03 FRONT (F) -CLOCK SPRING

S1-04 PASSENGER-SIDE AIR BAG MODULE (F)

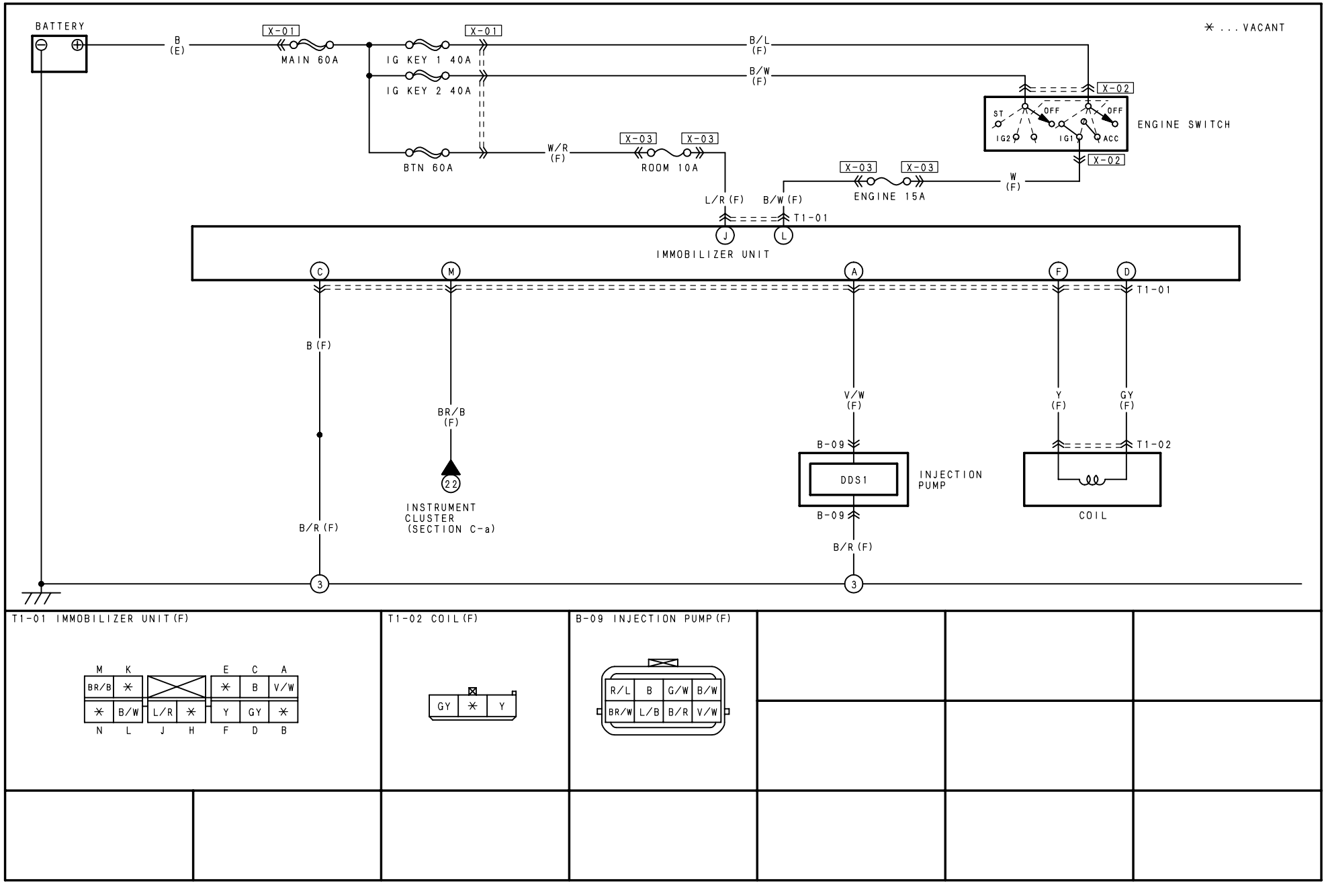
S1-05 DRIVER-SIDE AIR BAG MODULE (CLOCK SPRING)

HARNESS SYMBOL: (F) (E) (R)

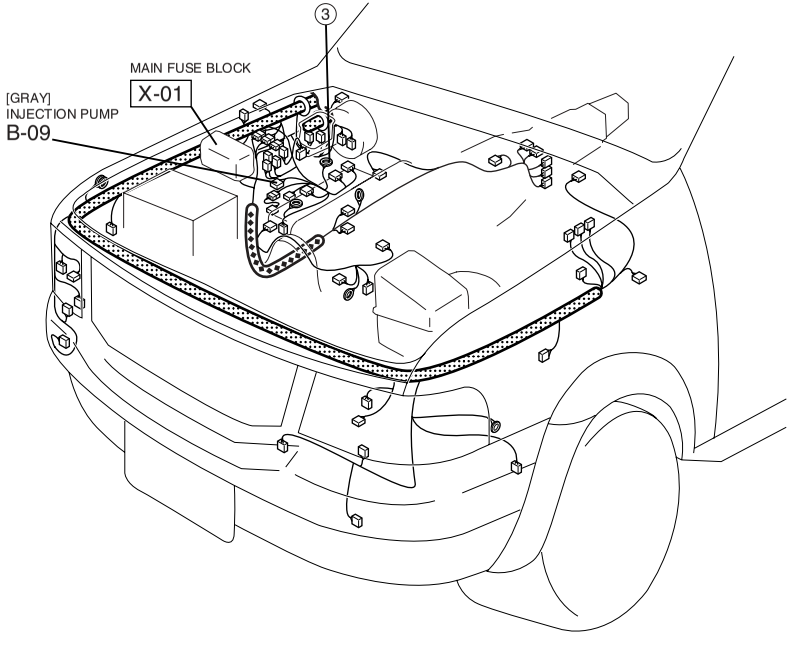


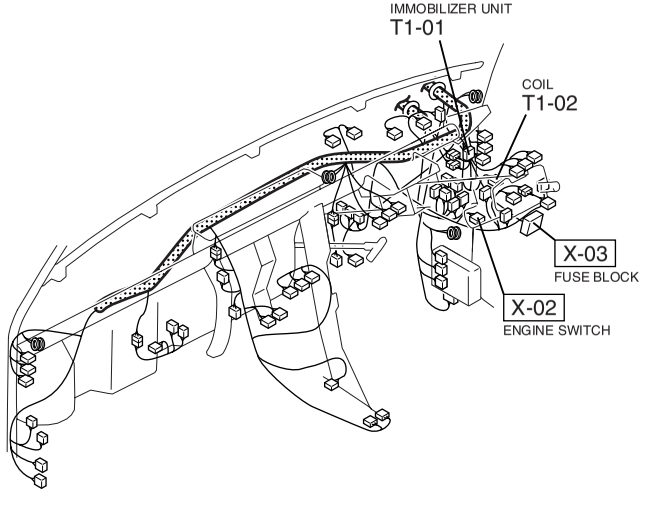


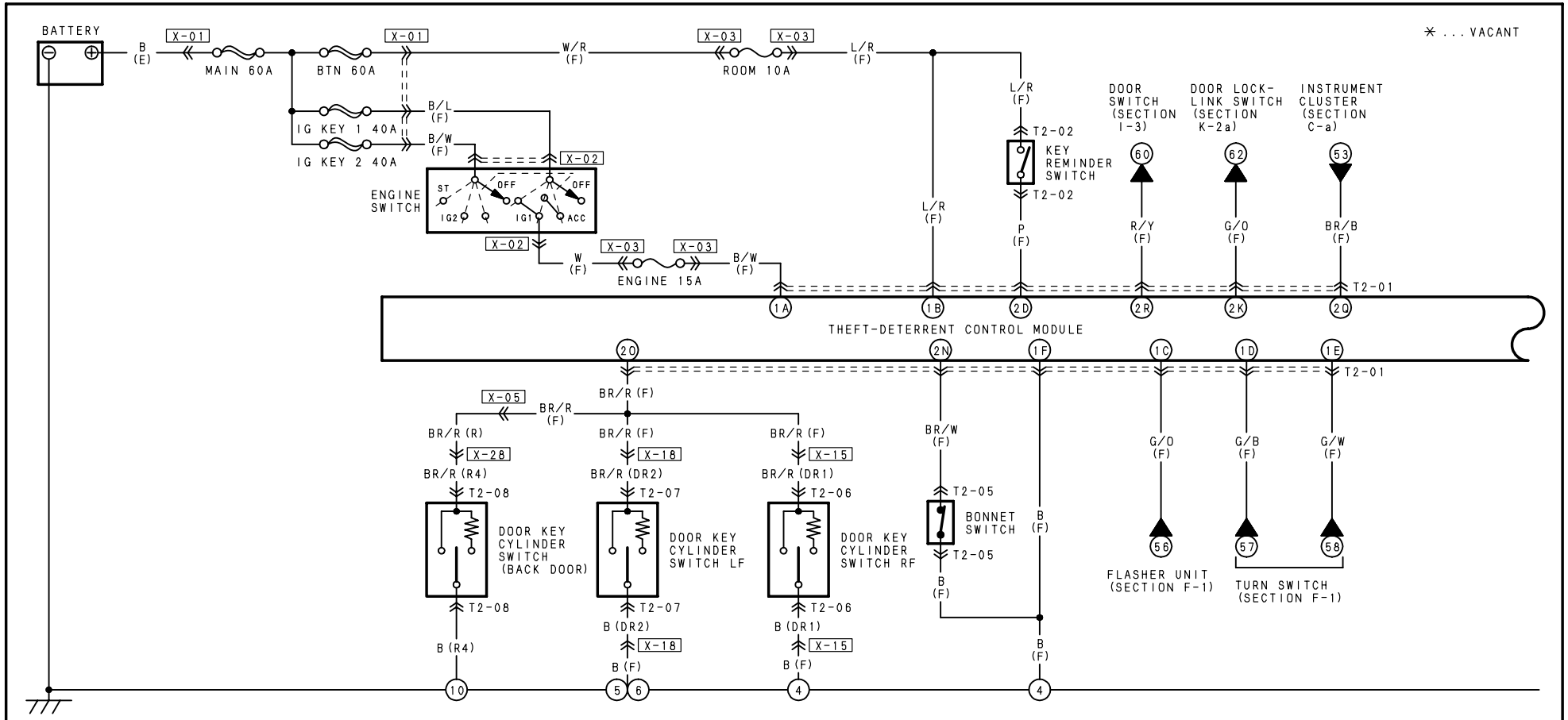
IMMOBILIZER SYSTEM



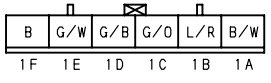
HARNESS SYMBOL: (F) (E) (R)

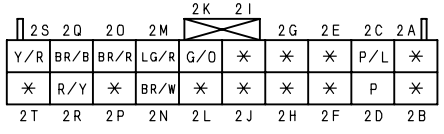




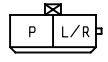


T2-01 THEFT-DETERRENT CONTROL MODULE (F)





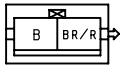
T2-02 KEY REMINDER SWITCH (F)



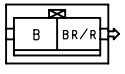
T2-05 BONNET SWITCH (F)



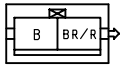
T2-06 DOOR KEY CYLINDER SWITCH RF (DR1)



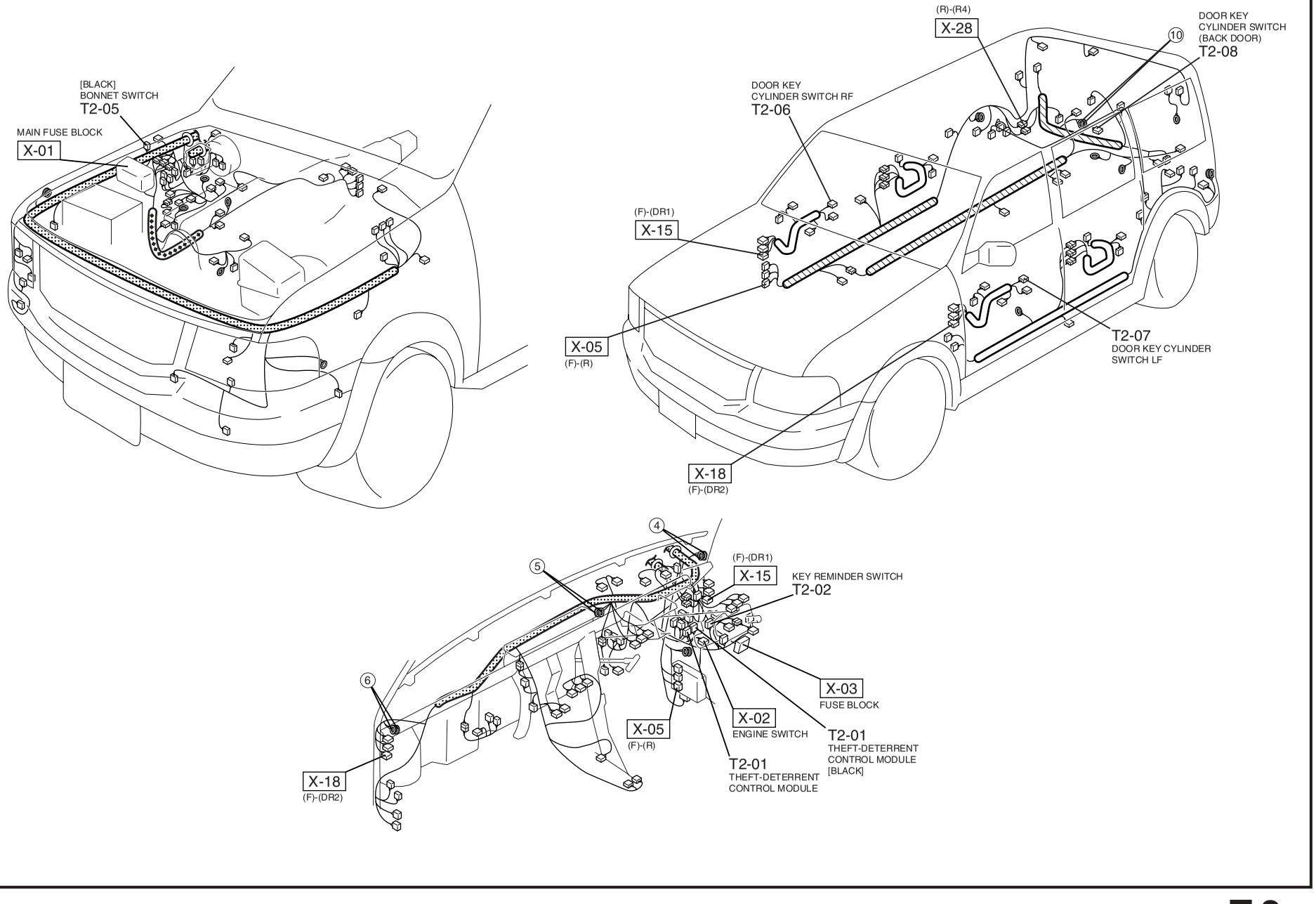
T2-07 DOOR KEY CYLINDER SWITCH LF (DR2)

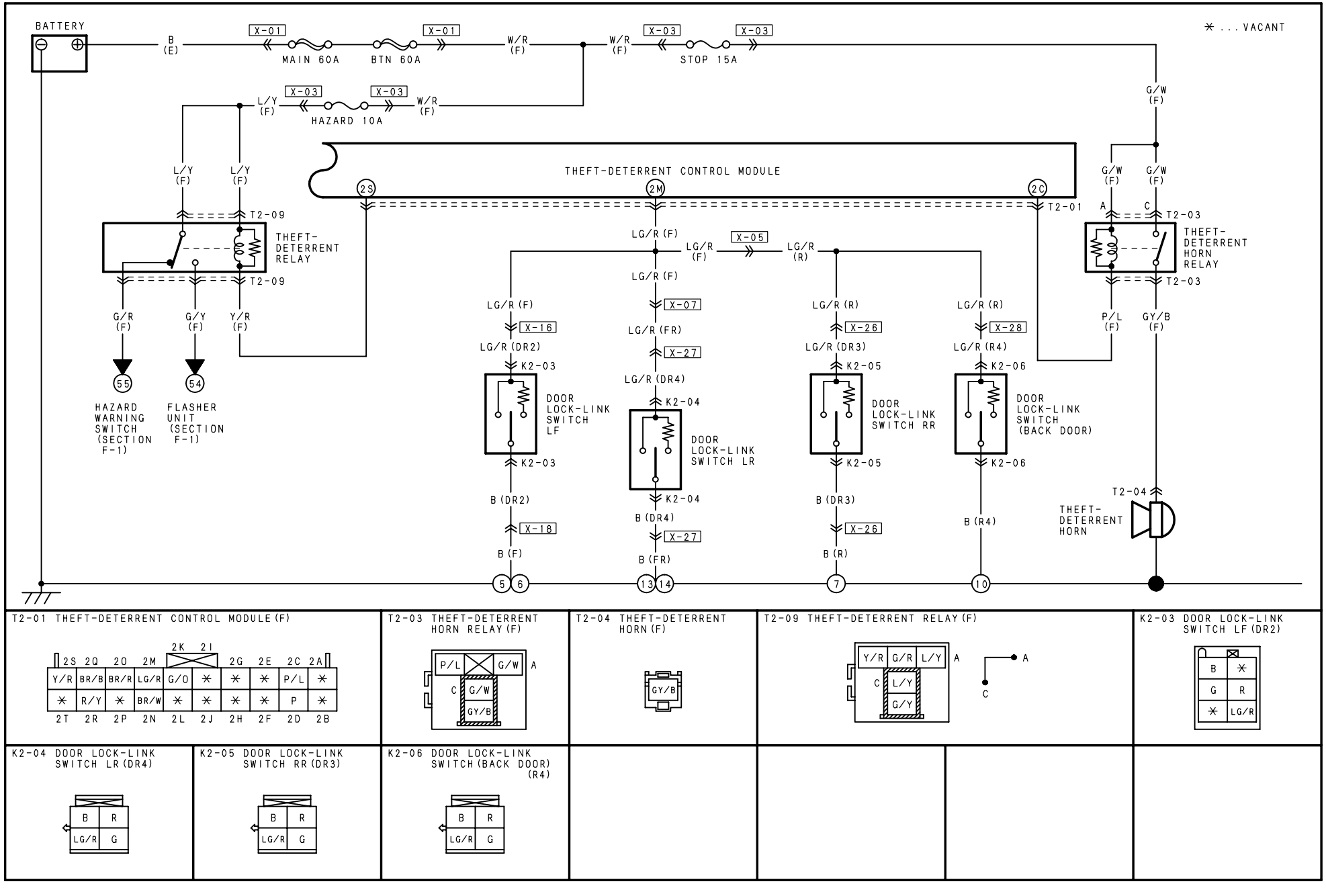


T2-08 DOOR KEY CYLINDER SWITCH (BACK DOOR) (R4)

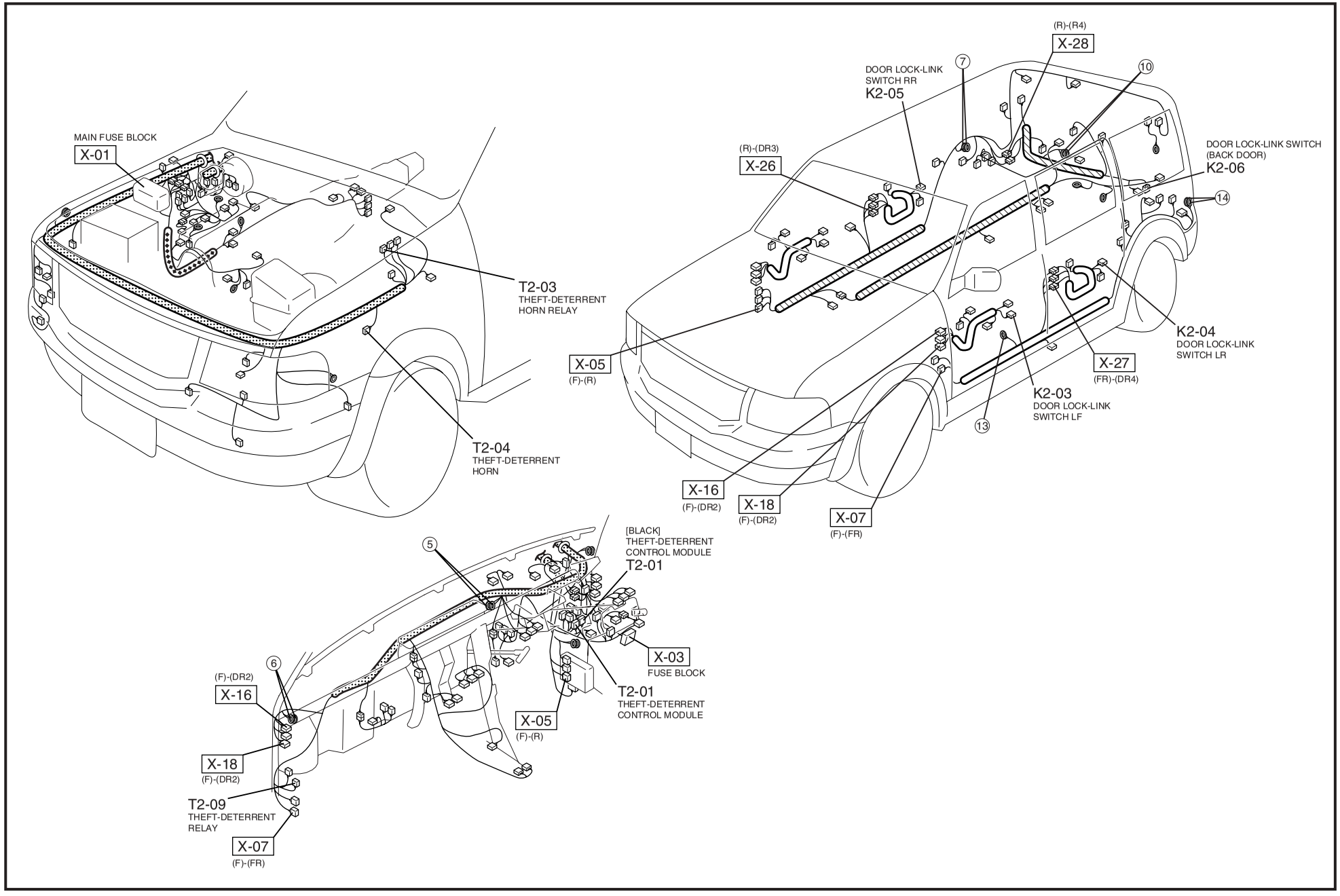


HARNESS SYMBOL: (F) (E) (R)

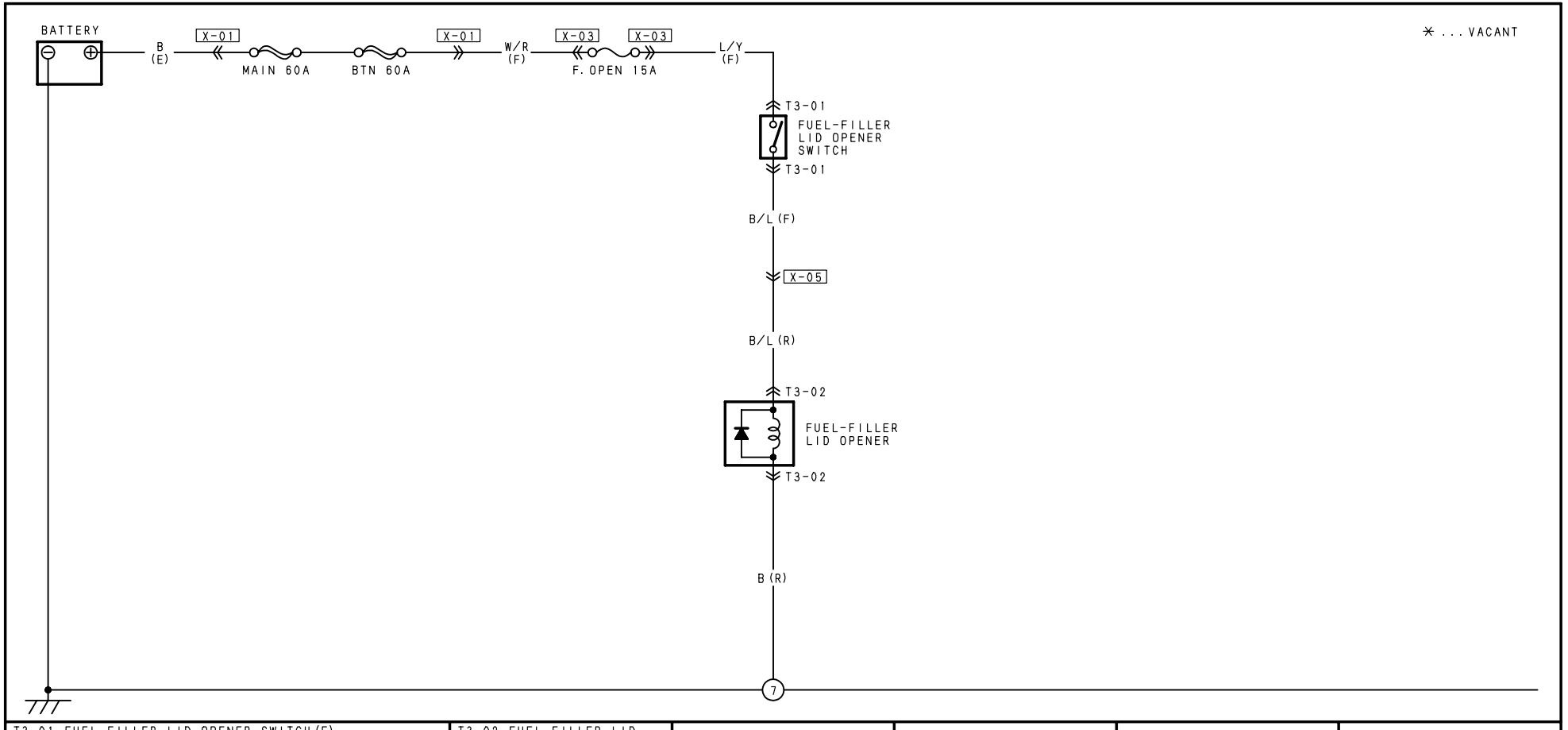



BATTERY
B (E)
X-01
MAIN 60A
X-01
BTN 60A
W/R (F)
W/R (F)
X-03
STOP 15A
X-03
L/Y (F)
X-03
HAZARD 10A
X-03
W/R (F)
G/W (F)
THEFT-DETERRENT CONTROL MODULE
2S
2M
2C
T2-01
L/Y (F)
L/Y (F)
T2-09
THEFT-DETERRENT RELAY
T2-09
G/R (F)
G/Y (F)
Y/R (F)
55
54
HAZARD WARNING SWITCH (SECTION F-1)
FLASHER UNIT (SECTION F-1)
LG/R (F)
LG/R (F)
X-05
LG/R (R)
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✳ . . . VACANT
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2S 2Q 2O 2M 2K 2I 2G 2E 2C 2A
Y/R BR/B BR/R LG/R G/O ✳ ✳ ✳ P/L ✳
✳ R/Y ✳ BR/W ✳ ✳ ✳ ✳ P ✳
2T 2R 2P 2N 2L 2J 2H 2F 2D 2B
T2-03 THEFT-DETERRENT HORN RELAY (F)
P/L G/W A
C G/W
GY/B
T2-04 THEFT-DETERRENT HORN (F)
GY/B
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C L/Y
G/Y
A
C
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G R
✳ LG/R
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B R
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B R
LG/R G

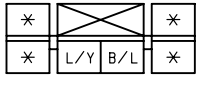
HARNESS SYMBOL: (F) (E) (R)



FUEL-FILLER LID OPENER



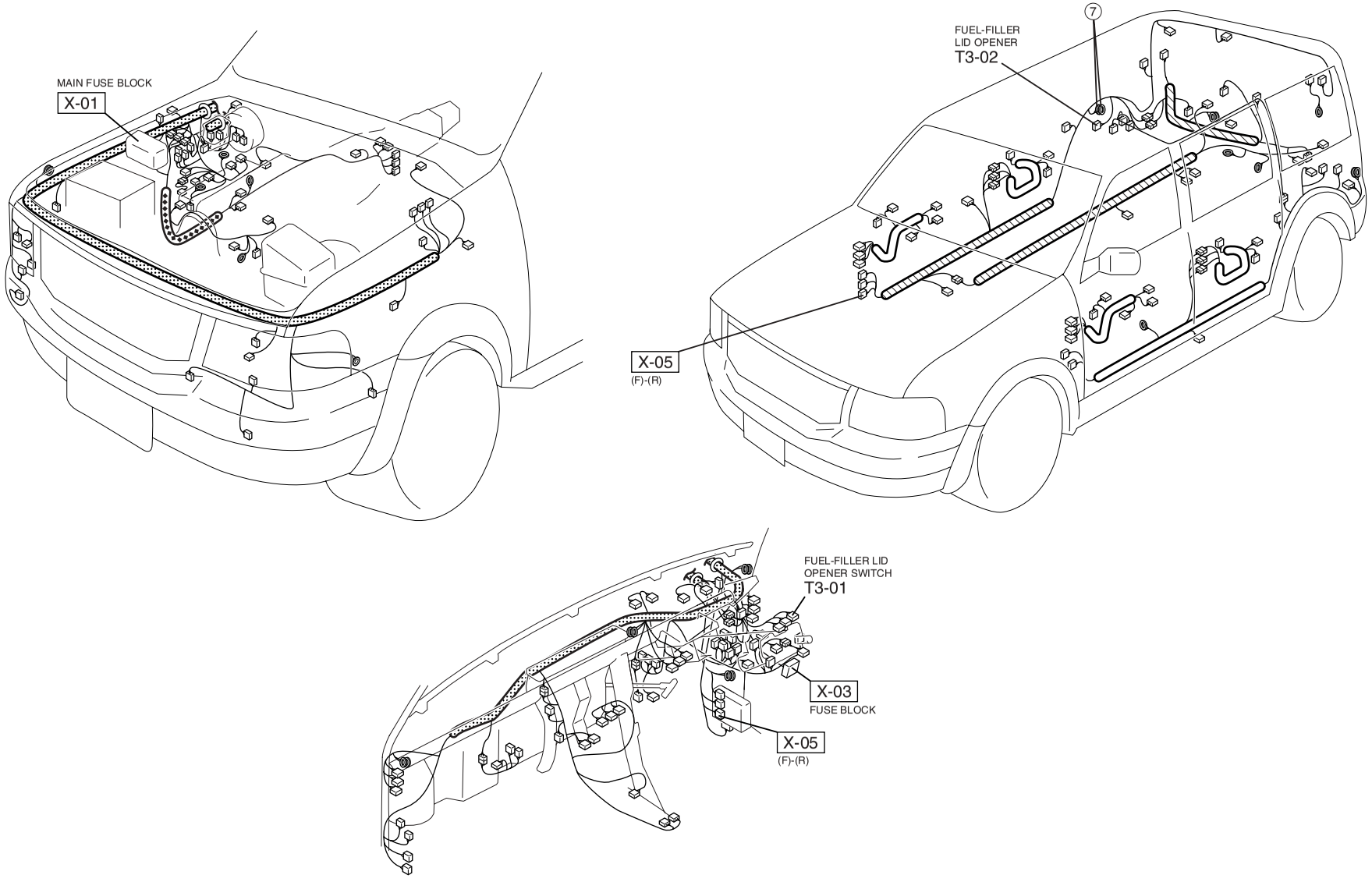
T3-01 FUEL-FILLER LID OPENER SWITCH (F)



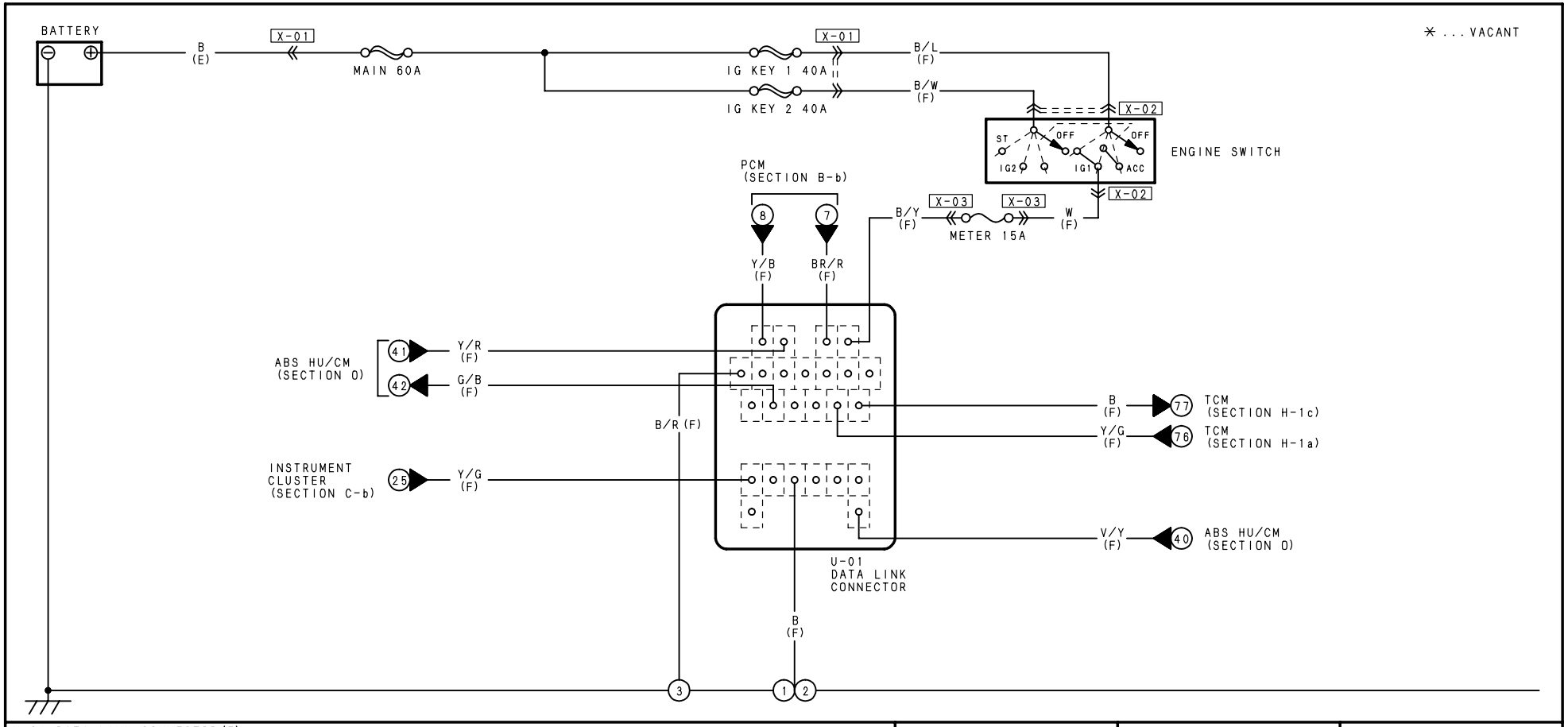
T3-02 FUEL-FILLER LID OPENER (R)



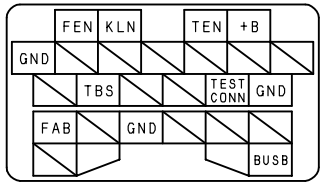
HARNESS SYMBOL: (F) (E) (R)

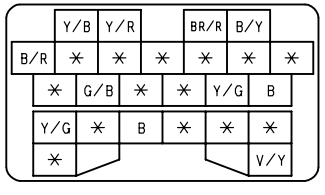


DATA LINK CONNECTOR



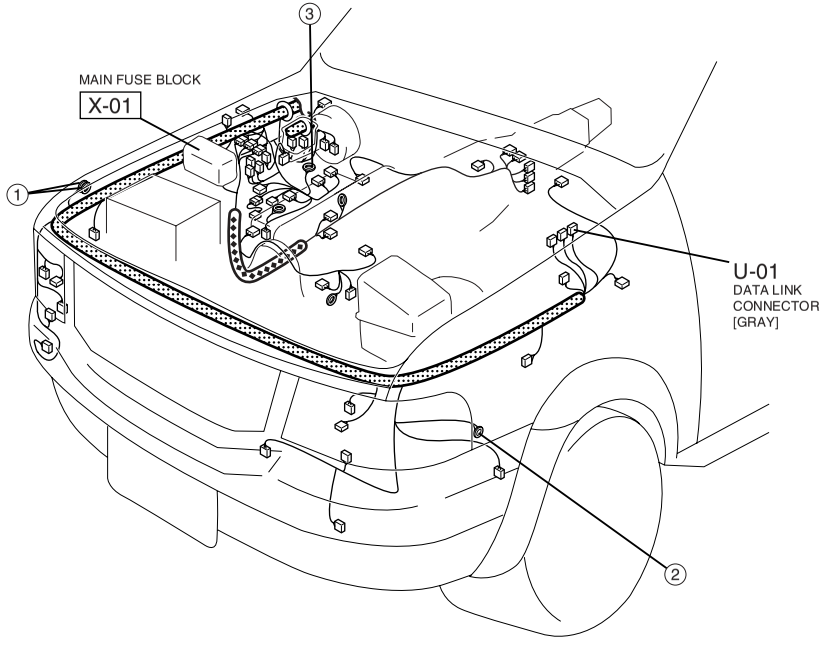
U-01 DATA LINK CONNECTOR (F)

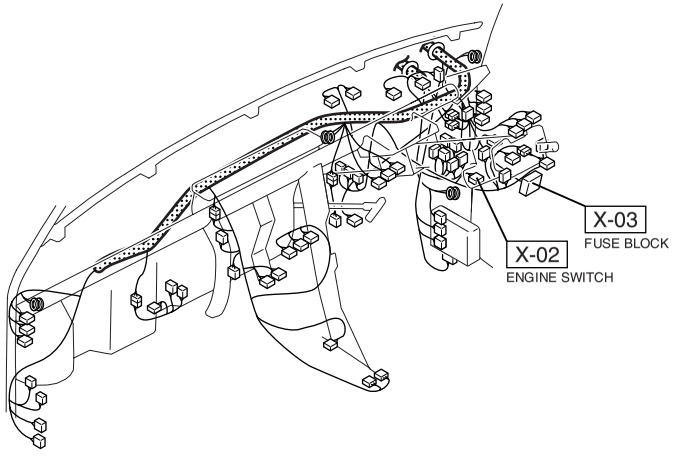




NOTE: SEEN FROM TERMINAL SIDE

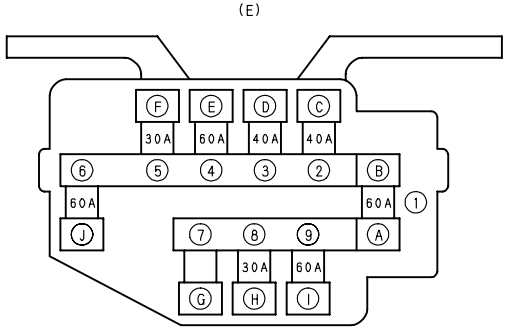
HARNESS SYMBOL: (F) (E) (R)

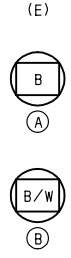


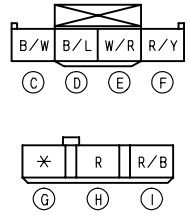


COMMON CONNECTOR LIST

X-01 MAIN FUSE BLOCK







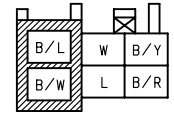


✳ . . . VACANT

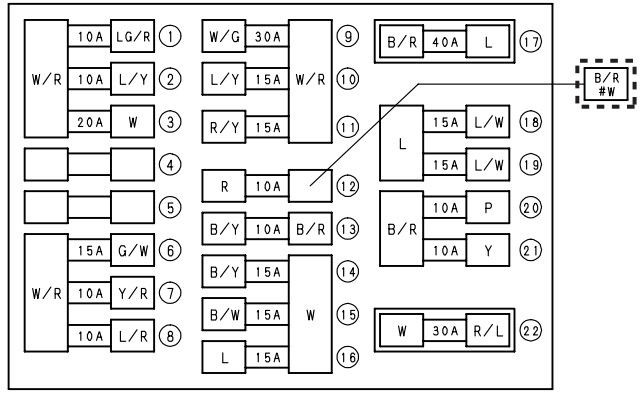
NOTE:SEEN FROM TERMINAL SIDE

① MAIN	④ BTN	⑦ (FIP/INJ)	
② IG KEY 2	⑤ (R A/C)	⑧ HEAD	
③ IG KEY 1	⑥ (ABS)	⑨ (GLOW)	( ) IF EQUIPPED

X-02 ENGINE SWITCH(F)



X-03 FUSE BLOCK(F)



... Applied VIN(assumed) : MNB LS4D40*W 103774-

NOTE:SEEN FROM TERMINAL SIDE

① (A/C)	⑫ IGN TCU		
② HAZARD	⑬ IGN INHIB TCU		
③ (R. DEFOG)	⑭ METER		
④ —	⑮ ENGINE		
⑤ —	⑯ WIPER		
⑥ STOP	⑰ (HEATER)		
⑦ TAIL	⑱ CIGAR		
⑧ ROOM	⑲ (P. POINT)		
⑨ (D/L)	⑳ (R. WIPER)		
⑩ F. OPEN	㉑ (A/C2)		
⑪ BATT TCU	㉒ (P. WIND)		

( ) IF EQUIPPED

Revised 9/2004 (Ref. No. LF017/04)

COMMON CONNECTOR LIST

X-04 FRONT (F) - REAR (R)

✳ . . . VACANT
. . . NOT USED

(F)

M

✳	R/B	W/G	G/W		#GY/R	Y	✳	B/R
B/W	R/Y	R/W	G/B	R/L	B/L	#GY/R	✳	✳	B

N

(R)

B/R	✳	Y	#GY/R		G/W	W/G	R/B	✳
B	✳	#G/R	#GY	B/L	R/L	G/B	R/W	R/Y	B/W

X-05 FRONT (F) - REAR (R)

✳ . . . VACANT

(F)

✳	✳	BR/R	P	R/L		G	L/R	✳	✳
✳	✳	B/L	LG/R	P/L	W	L/W	R	✳	✳	✳

(R)

✳	✳	L/R	G		R/L	P	BR/R	✳	✳
✳	✳	✳	R	L/W	W	P/L	LG/R	B/L	✳	✳

X-06 FRONT (F) - FLOOR (FR)

(F)

R/G			W/R
R	L/Y	R/Y	R/L

(FR)

W/R			R/G
R/L	R/Y	L/Y	R

X-07 FRONT (F) - FLOOR (FR)

✳ . . . VACANT
. . . NOT USED

(F)

LG/R	Y	✳		W/R	G	#GY/L
R/Y	R/B	L/R	L/W	R/L	G/Y	R	#P/L

(FR)

#GY/L	G	W/R		✳	Y	LG/R
#P/L	R	G/Y	R/L	L/W	L/R	R/B	R/Y

X-08 FRONT (F) - ENGINE (E)

✳ . . . VACANT

(F)

A

B/Y	BR/Y	B/R	L	L/W
LG/B	✳	W	B/Y

H

(E)

L/W	L	B/R	BR/Y	P
B/Y	W	✳	LG/B

X-09 FRONT (F) - ENGINE (E)

. . . SHIELD WIRE

(F)

H

GY/R	W/B	R		R/G
G	Y/R	G		B
V/W	BR/W	#B		W

B K

I

(E)

H

R/G		R	W/B	GY/R
B		G	Y/R	G
W		#B	BR/W	V/W

K B

I

COMMON CONNECTOR LIST

X-11 FRONT (F) -FRONT No. 2 (F2)

✳ . . . VACANT
. . . NOT USED

(F)

LG	B/W
#B	G/B

(F2)

B/W	LG
G/B	✳

X-12 FRONT (F) -FRONT No. 2 (F2)

✳ . . . VACANT

(F)

Y			Y/R	✳
L	G	W	W/G	V/Y

(F2)

✳	Y/B			Y
V/Y	W/G	W	G	L

X-13 FRONT (F) -DOOR No. 1 (DR1)

✳ . . . VACANT
. . . NOT USED

(F)

R/L	#L/R
#L/Y	✳

(DR1)

#L/R	R/L
#G	#L/Y

X-14 FRONT (F) -DOOR No. 1 (DR1)

(F)

LG/B	BR/B	BR

(DR1)

BR	BR/B	LG/B

X-15 FRONT (F) -DOOR No. 1 (DR1)

✳ . . . VACANT
@ . . . NOT USED

(F)

✳	BR/R	G/Y			G/W	✳	L/W
✳	@R/Y	W/R	B	R/W	G/O	G/R	W

(DR1)

L/W	✳	G/W			G/Y	BR/R	✳
W	G/R	G/O	R/W	B	W/R	@R/Y	✳

X-16 FRONT (F) -DOOR No. 2 (DR2)

. . . NOT USED

(F)

R/L	#L
#L/W	LG/R

(DR2)

#L	R/L
LG/R	#L/W

X-17 FRONT (F) -DOOR No. 2 (DR2)

(F)

L/B	BR/Y	BR

(DR2)

BR	BR/Y	L/B

X-18 FRONT (F) -DOOR No. 2 (DR2)

(F)

BR/R			B
R/W	G/W	R	G

(DR2)

B			BR/R
G	R	G/W	R/W

X-19 REAR (R) -REAR No. 2 (R2)

✳ . . . VACANT
. . . NOT USED

(R)

#R/B	#W/G			BR/R	BR	B
#G/R	R/W	Y	BR/W	BR/Y	✳	B/R

(R2)

B	BR	BR/R			✳	✳
B/R	✳	BR/Y	BR/W	Y	R/W	✳

X-21 FRONT No. 2 (F2) -REAR (R)

(F2)

G/W			BR/Y
W/L	BR/R	BR/W	BR

(R)

BR/Y			G/W
BR	BR/W	BR/R	W/L

COMMON CONNECTOR LIST

X-22 REAR (R) - DOOR No. 3 (DR3)

. . . NOT USED



X-23 REAR (R) - DOOR No. 3 (DR3)



X-24 FLOOR (FR) - DOOR No. 4 (DR4)

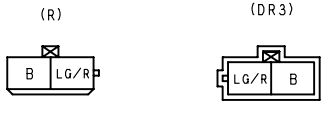
. . . NOT USED



X-25 FLOOR (FR) - DOOR No. 4 (DR4)



X-26 REAR (R) - DOOR No. 3 (DR3)

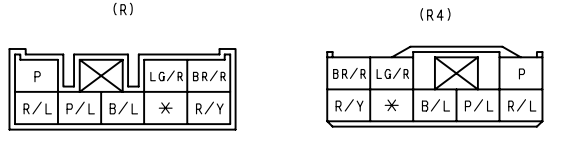


X-27 FLOOR (FR) - DOOR No. 4 (DR4)



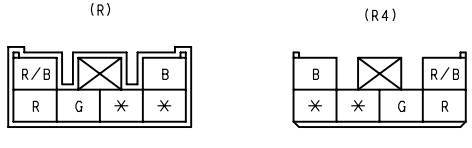
X-28 REAR (R) - REAR No. 4 (R4)

✳ . . . VACANT



X-29 REAR (R) - REAR No. 4 (R4)

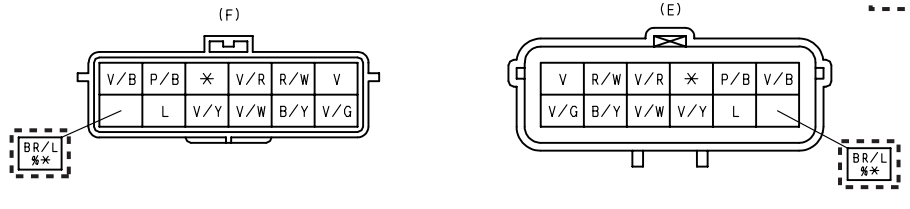
✳ . . . VACANT



X-30 FRONT (F) - ENGINE (E)

✳ . . . VACANT

※ . . . Applied VIN (assumed) : MNB LS4D40*W 100741-



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EVEREST
RHD
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FOREWORD

This Manual has been prepared to provide information covering normal service repairs and maintenance for the EVEREST.

All information in this manual was the best available at the time of printing. All alternations related to modifications will be advised by Service Information.

Ford Motor Company

Ⓒ Ford Motor Company
PRINTED IN OCT. 2003
F190-30-03J

VEHICLE IDENTIFICATION NUMBERS (VIN)
(CHASSIS NUMBER)

MNB BS4D40*W 100001—
MNB BS4D70*W 100001—
MNB BSYD40*W 100001—
MNB LS4D40*W 100001—
MNB LS4D70*W 100001—
MNB LSYD40*W 100001—

WIRING COLOR CODE

COLOR	CODE	COLOR	CODE
BLACK	B	ORANGE	O
BLUE	L	PINK	P
BROWN	BR	RED	R
DARK BLUE	DL	SKY BLUE	SB
DARK GREEN	DG	TAN	T
GRAY	GY	VIOLET	V
GREEN	G	WHITE	W
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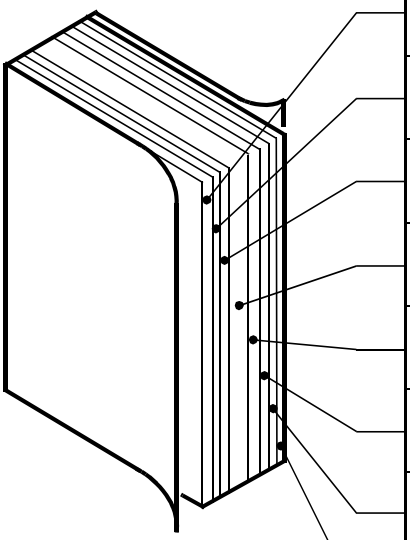
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Contents of wiring diagrams

- This manual comprises the sections shown below.



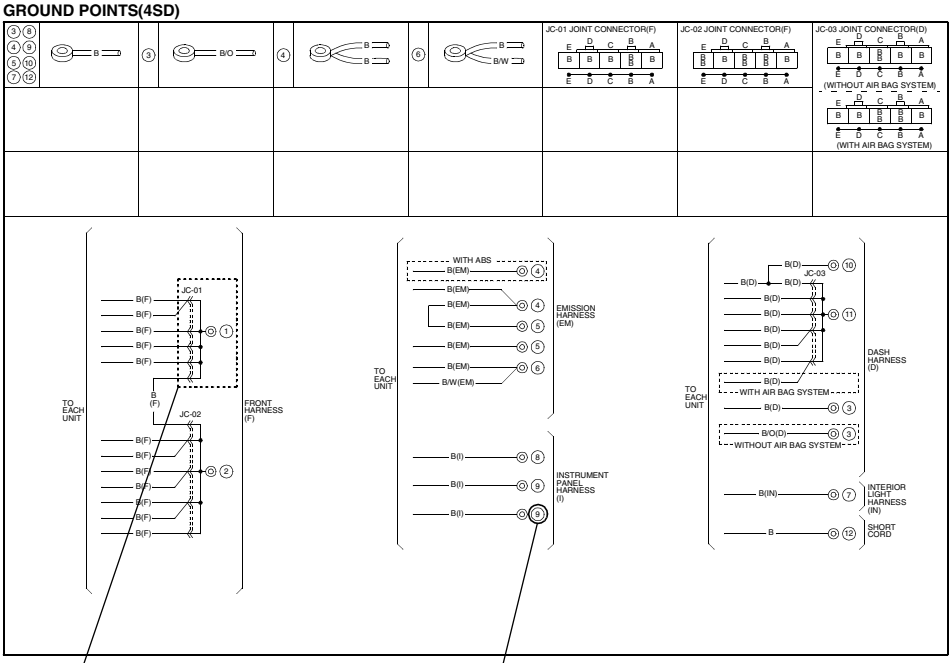
GI	**General information of wiring diagrams**	A how-to on using and reading wiring diagrams, using test equipment,checking harness and connectors,and finding trouble spots
Y	**Ground points**	Ground routes from and to the battery
W	**Electrical wiring schematic**	Shows main fuses and other fuses for each system
A-U	**System circuit diagram/ connector locations**	Shows circuit and connector diagrams and component and connector location diagrams
X	**Common connectors**	Shows connectors common throughout system
JB	**Joint box complete wiring system**	Shows internal circuits and connectors
FB	**Main fuse block complete wiring system**	Shows internal circuits and connectors
AI	**Alphabetical Index**	Gives page number of circuit diagram for each component

Depending on the vehicle model, the actual sections may be different.

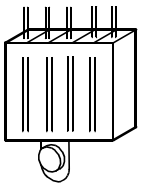
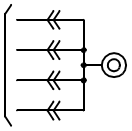
Ground points

- This shows ground points of the harness.

GROUND POINTS(4SD)



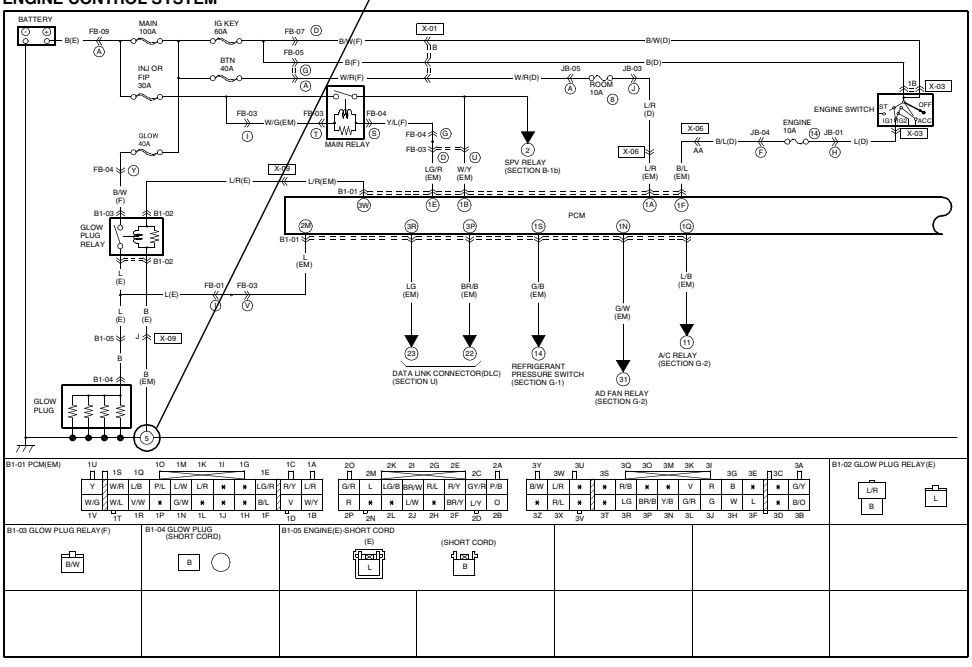
Ground indication

On vehide	Indication
	To circuit 

On circuit diagrams and ground points

The ground connection numbers in system circuit diagrams correspond to those in the ground point diagram.

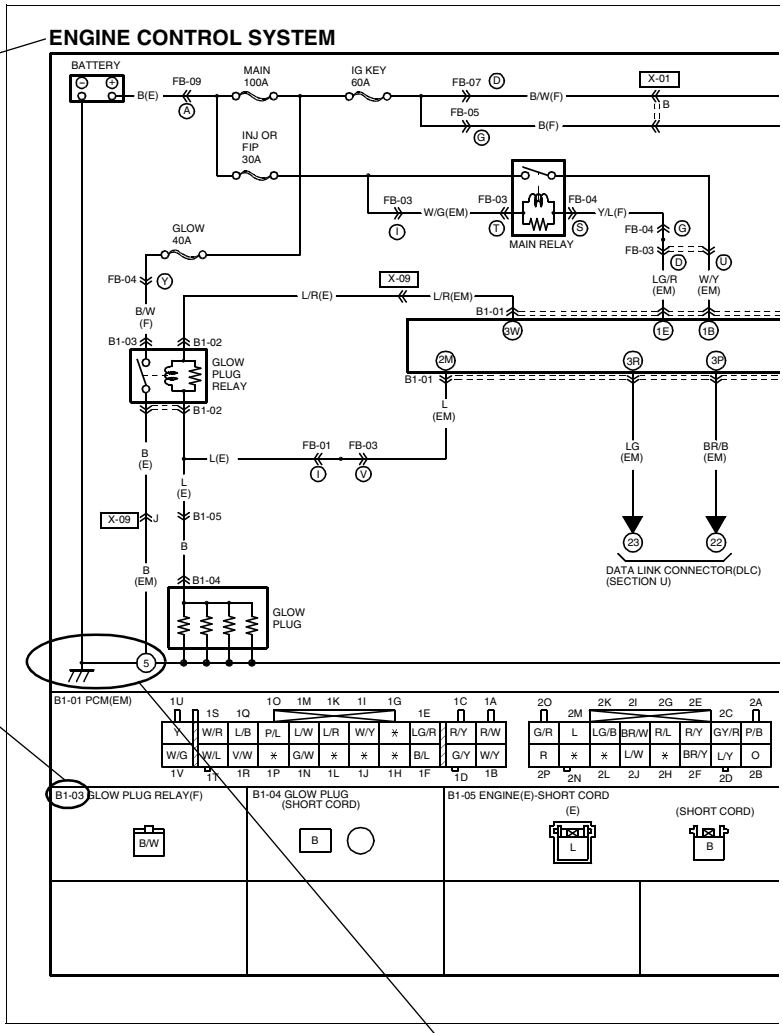
ENGINE CONTROL SYSTEM



System circuit diagram/connector diagram

- These diagrams show the circuits for each system, from the power supply to the ground. The power supply side is on the upper part of the page, the ground side on the lower part. The diagrams describe circuits with the ignition switch off.
  Below is an explanation of the various points in the diagram.

System name



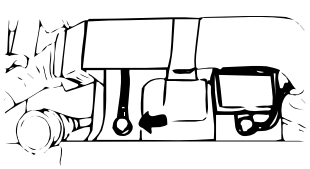
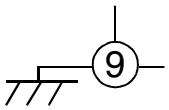
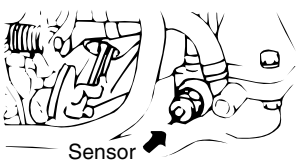
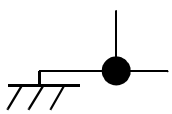
Connector code

The prefix letter indicates the system in which the connector is used.

- Y : Ground connector
- A : Charging system/starting system connectors
- B : Engine control system connectors
- C : Gauge control system connectors
- D : Wiper system connectors
- E : Lighting system connectors
- F : Signal system connectors
- G : Air-conditioning system connectors
- H : Transmission control/Key interlock/ Shift-lock system connectors
- I : Interior light system connectors
- J : Audio/radio connectors
- K : Power window/power door lock system connectors
- L : Remote control mirror system connectors
- M : Sliding sunroof system connectors
- O : Anti-lock brake system connectors
- P : Power seat/seat warmer system connectors
- Q : Auto cruise control system connectors
- S : Passive shoulder belt control/Airbag system connectors
- T : Others
- U : Data link connector
- X : Common connectors
- JB : Joint box connections
- FB : Main fuse block

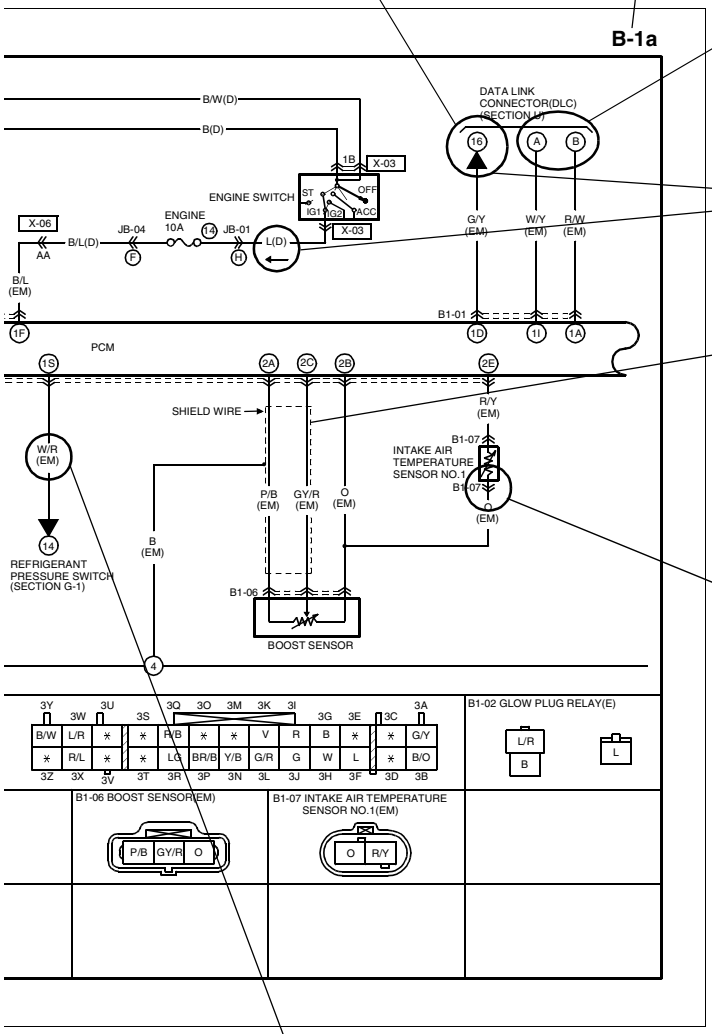
Ground numbers

A harness ground is represented differently than a unit ground.

Types of grounds	Symbol
Harness	 
Unit	 

The number indicates that the circuit continues to the related system diagram.

System code



Multiplex communication

Indicates communication with connected parts. Signals are transmitted back and forth between connected parts.

Current symbol

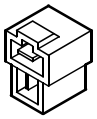
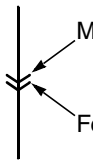
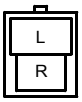
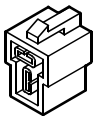
Current flows in the direction of the arrow.

Indicates shielded wire.*

* Shielded wire :
Prevents signal disturbances from electrical interference.
Wire is covered by a metal meshing for grounding.

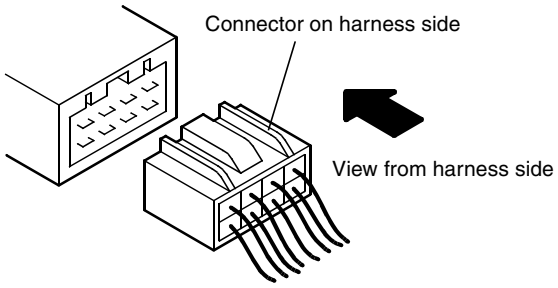
Connector symbols

- Male and female connectors are represented as follows in the circuit and connector diagrams.

		Circuit diagram symbol	Connector diagram symbol
Male			
Female			

- Like connectors are linked by dashed lines between the connector symbols.
- Connector diagrams show connectors on the harness side. The terminal indicates the view from the harness side.

(Example)



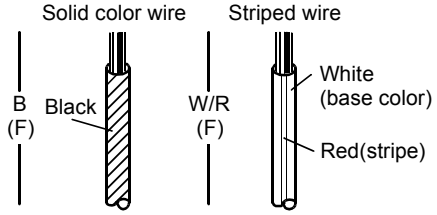
- Colors for connectors except white are given in locations.
- Unused terminals are indicated by ✻.

Wire color code (harness symbol)

- Two-color wires are indicated by a two-letter symbol.The first indicates the base color of the wire, the second the color of the stripe.
  For example:

  W/R is a white wire with a red strip
  BR/Y is a brown wire with a yellow strip

Symbol (Example)



- The harness symbol is in ( ) following the harness symbols (refer to P-7.).

Routing diagram

- The routing diagram shows where electrical components are on the system circuit diagram by call out line and connector symbols.

Connector symbol

Shows the system that uses the connector.

(Example)

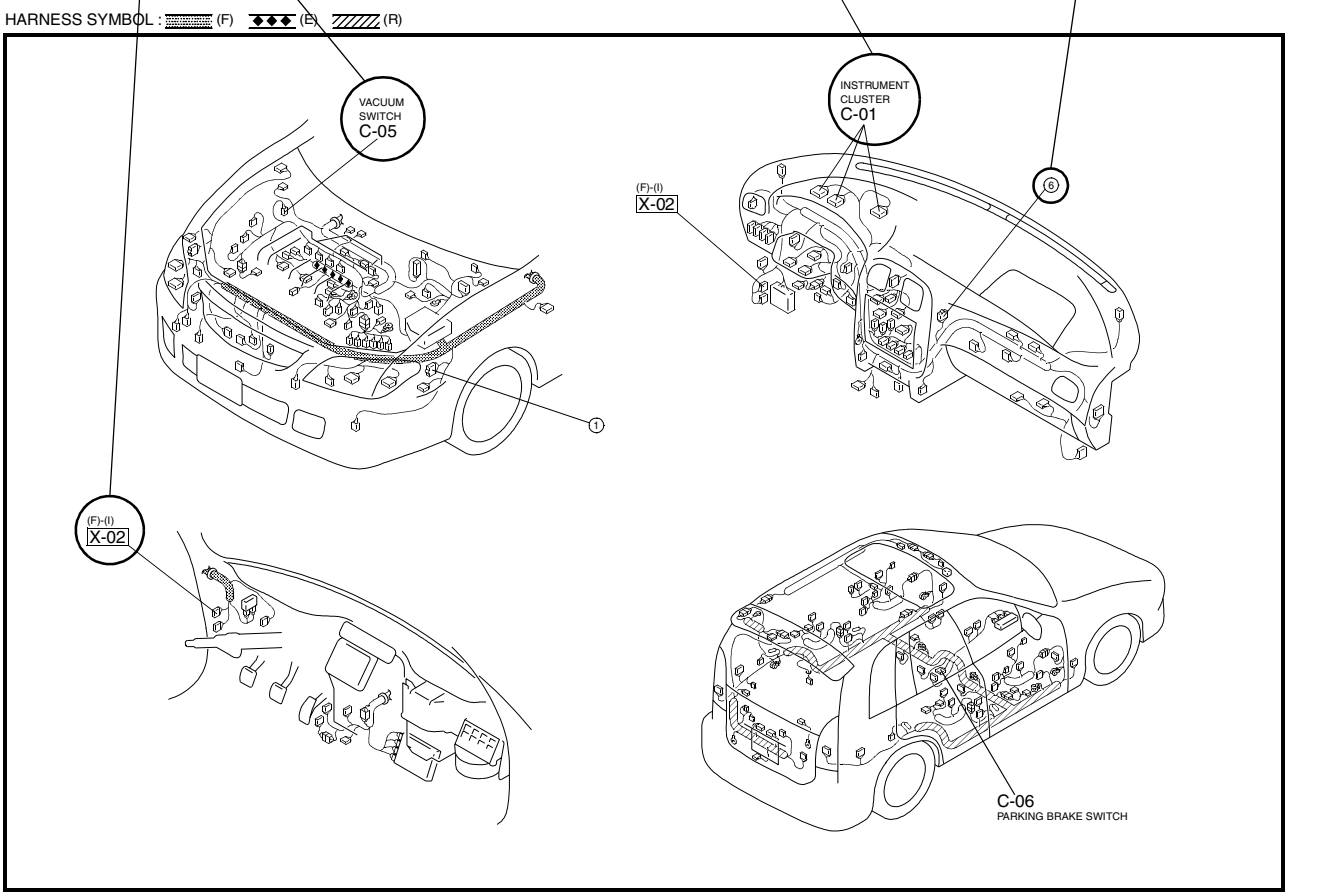
Connector	Symbol
Common connectors	X-19
System connectors	I-03

Component name

Shows the names of components in routing diagrams.

Ground symbol

Shows the ground in system diagrams.

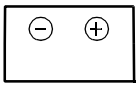
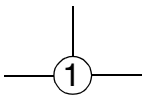
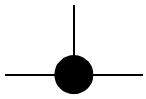
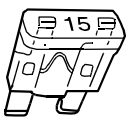
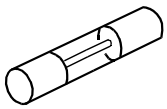
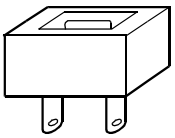
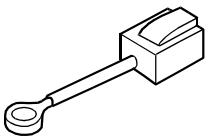
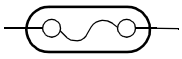
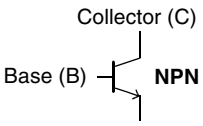
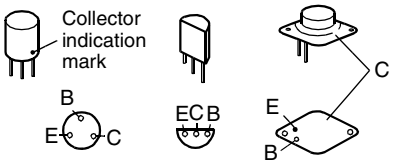
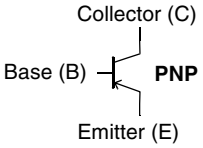
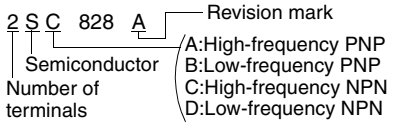


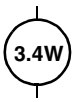
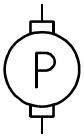
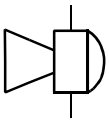
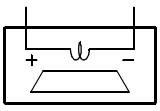
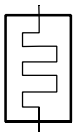
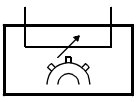
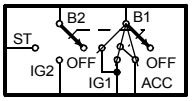
Harness symbols

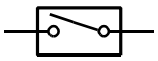
DESCRIPTION OF HARNESS	SYMBOL		DESCRIPTION OF HARNESS	SYMBOL	
FRONT HARNESS	(F)		DOOR NO.1 HARNESS	(DR1)	
FRONT NO.2 HARNESS	(F2)		DOOR NO.2 HARNESS	(DR2)	
ENGINE HARNESS	(E)		DOOR NO.3 HARNESS	(DR3)	
DASH HARNESS	(D)		DOOR NO.4 HARNESS	(DR4)	
REAR HARNESS	(R)		FLOOR HARNESS	(FR)	
REAR NO.2 HARNESS	(R2)		INTERIOR LIGHT HARNESS	(IN)	
REAR NO.3 HARNESS	(R3)		A/C HARNESS	(AC)	
INSTRUMENT PANEL HARNESS	(I)		INJECTION HARNESS	(INJ)	
EMISSION HARNESS	(EM)		HAND BRAKE HARNESS	(HB)	
EMISSION NO.2 HARNESS	(EM2)				
EMISSION NO.3 HARNESS	(EM3)				

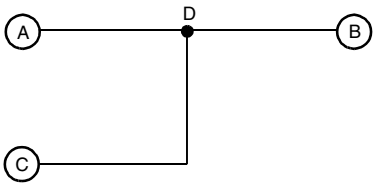
Reading Wiring Diagrams

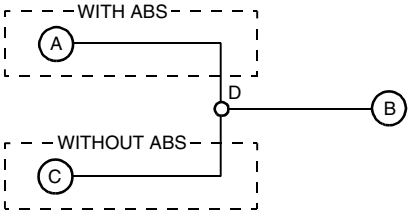
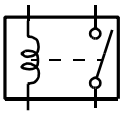
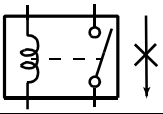
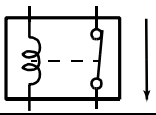
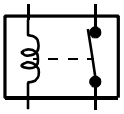
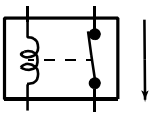
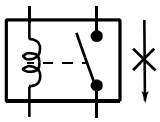
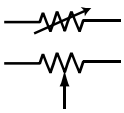
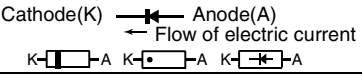
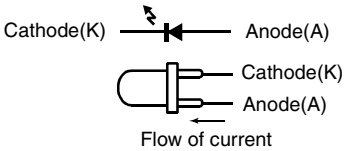
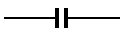
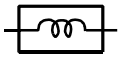
Symbols

Symbol	Meaning
Battery 	• Generates electricity through chemical reaction. • Supplies direct current to circuits.
Ground (1) 	• Connecting point to vehicle body or other ground wire where current flows from positive to negative terminal of battery. • Ground (1) indicates a ground point to body through wire harness. • Ground (2) indicates point where component is grounded directly to body. Remarks • Current will not flow through a circuit if ground is faulty.
Ground (2) 	
Fuse (1)  (box)	• Melts when current flow exceeds that specified for circuit, interrupts current flow. Precautions • Do not replace with fuses exceeding specified capacity. <Blade type>  <Tube type>  <Cartridge type>  <Fusible link> 
Fuse (2)  (Cartridge)	
Main fuse/ Fusible link 	
Transistor (1) 	• Electrical switching component. • Turns on when voltage is applied to the base (B). 
Transistor (2) 	• Reading code. 

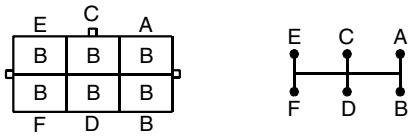
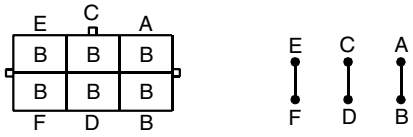
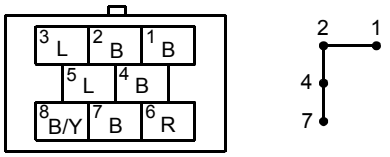
Symbol	Meaning
Light 	• Emits light and generates heat when current flows through filament.
Resistance	• A resistor with a constant value. • Mainly used to protect electrical components in circuits by maintaining rated voltage.
Motor 	• Converts electrical energy into mechanical energy.
Pump 	• Pulls in and discharges gases and liquids.
Cigarette lighter 	• Electrical coil that generates heat.
Horn 	• Generates sound when current flows.
Speaker 	
Heater 	• Generates heat when current flows.
Speed sensor 	• Movement of magnet in speedometer turns contact within sensor on and off.
Ignition switch 	• Turning ignition key switches circuit to operate various component. (NOTE) Ignition switch is called engine switch on diesel vehicles.

<table>
<tr><th>Symbol</th><th>Meaning</th><th>Symbol</th><th>Meaning</th></tr>
<tr><td>Switch (1)
 
Normally open (NO)</td><td rowspan="2">• Allows or breaks current flow by opening and closing curcuits.</td><td>Harness
Connection
 
When circuit C-D is connected to circuit A-B, the connection D is indicated by a black dot.

Selection
 
Diversion point D for the different circuits according to the vehicle's specification is indicated by a white dot.</td><td> 
For vehicles with ABS, use the A-B circuit.

 
For vehicles without ABS, use the C-B circuit.</td></tr>
<tr><td>Switch (2)
 
Normally closed (NC)</td></tr>
<tr><td>Relay (1)
 
Normally open (NO)</td><td colspan="3">• Current flowing through coil produces electromagnetic force causing contact to open or close.
No current to coil
 
No flow
Current to coil
 
Flow</td></tr>
<tr><td>Relay (2)
 
Normally closed (NC)</td><td colspan="3">• Current flowing through coil produces electromagnetic force causing contact to close.
No current to coil
 
Flow
Current to coil
 
No flow</td></tr>
<tr><td>Sensor (variable)
  </td><td>• Resistance changes with other components operation.</td><td>Diode
  </td><td>• Known as a semiconductor rectifier, the diode allows current flow in one direction only.
  </td></tr>
<tr><td>Sensor (thermistor)
  </td><td>• Resistance changes with temperature.</td><td rowspan="2">Light-emitting diode (LED)
  </td><td rowspan="2">• A diode that lights when current flows.
• Unlike ordinary bulbs, the diode does not generate heat when lit.
  </td></tr>
<tr><td>Capacitor
  </td><td>• Component that temporarily stores electrical charge.</td></tr>
<tr><td>Solenoid
  </td><td>• Current flowing through coil generates electromagnetic force to operate plungers.</td><td>Reference diode (Zener diode)
  </td><td>• Allows current to flow in one direction up to a certain voltage; allows current to flow in the other direction once that voltage is exceeded.</td></tr>
</table>

Reading Wiring Diagrams

Symbol	Meaning
Extent of the change in the wiring position (1) 	• The wiring position can be exchanged freely within the connector.
Extent of the change in the wiring position (2) 	• The wiring position can be exchanged according to the following combinations only. Between A and B, Between C and D, Between E and F
Extent of the change in the wiring position (3) 	• The wiring position can be exchanged according to the following combinations only. Between 1, 2, 4 and 7. • The wiring positions may be indicated by numbers for some connectors.

Abbreviations used in this manual

3GR	THIRD GEAR
4GR	FOURTH GEAR
A	AMPERE
A/C	AIR CONDITIONING
A/F	AIR FUEL
AAS	AUTO ADJUSTING SUSPENSION
ABS	ANTI-LOCK BRAKING SYSTEM
ACC	ACCESSORIES
ACV	AIR CONTROL VALVE
ADD	ADDITIONAL
AIS	AIR INJECTION SYSTEM
ALL	AUTOMATIC LOAD LEVELING
AM	AMPLITUDE MODULATION
AMP	AMPLIFIER
ANT	ANTENNA
ASV	AIR SUPPLY VALVE
AT	AUTOMATIC TRANSMISSION
ATX	AUTOMATIC TRANSAXLE
B+	BATTERY POSITIVE VOLTAGE
BAC	BYPASS AIR CONTROL
CAN	CONTROLLER AREA NETWORK
CARB	CARBURETOR
CIGAR	CIGARETTE
CIS	CONTINUOUS FUEL INJECTION SYSTEM
CKP	CRANKSHAFT POSITION SENSOR
CM	CONTROL MODULE
CMP	CAMSHAFT POSITION SENSOR

COMBI	COMBINATION
CON	CONDITIONER
CONT	CONTROL
CPU	CENTRAL PROCESSING UNIT
DEF	DEFROSTER
DI	DISTRIBUTOR IGNITION
DLC	DATA LINK CONNECTOR
DLI	DISTRIBUTORLESS IGNITION
DOHC	DOUBLE-OVERHEAD CAMSHAFT
DRL	DAYTIME RUNNING LIGHT
DTC	DIAGNOSTIC TROUBLE CODE(S)
DTM	DIAGNOSTIC TEST MODE
ECPS	ELECTRONICALLY CONTROLLED POWER STEERING
ECT	ENGINE CONTROL TEMPERATURE
EGR	EXHAUST GAS RECIRCULATION
EI	ELECTRONIC IGNITION
ELEC	ELECTRIC
ELR	EMERGENCY LOCKING RETRACTOR
ET	ELECTRONIC THROTTLE
EVAP	EVAPORATIVE EMISSION
F	FRONT
F/I	FUEL INJECTOR
FICB	FAST-IDLE CAM BREAKER
FM	FREQUENCY MODULATION
FP	FUEL PUMP
FPR	FUEL PUMP RELAY
GEN	GENERATOR

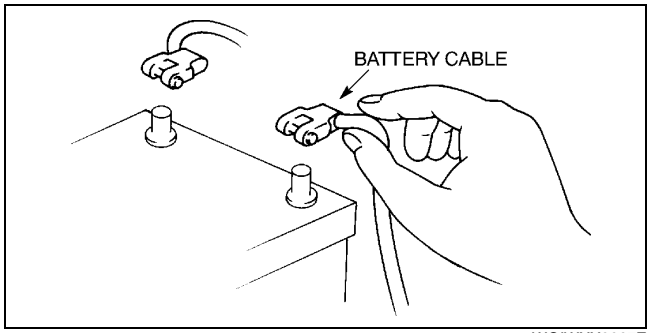
GND	GROUND
H/D	HEATER/DEFROSTER
HEAT	HEATER
HI	HIGH
HO2S	HEATED OXYGEN SENSOR
HU	HYDRAULIC UNIT
IAC	IDLE AIR CONTROL
IAT	INTAKE AIR TEMPERATURE
IG	IGNITION
ILLUMI	ILLUMINATION
INT	INTERMITTENT
JB	JOINT BOX
KS	KNOCK SENSOR
LCD	LIQUID CRYSTAL DISPLAY
LF	LEFT FRONT
LH	LEFT HAND
LO	LOW
LR	LEFT REAR
M	MOTOR
MAF	MASS AIR FLOW
MAP	MANIFOLD ABSOLUTE PRESSURE
MFI	MULTIPORT FUEL INJECTION
MID	MIDDLE
MIL	MALFUNCTION INDICATOR LAMP
MIN	MINUTE
MIX	MIXTURE
MPX	MULTIPLEX
MT	MANUAL TRANSMISSION
MTX	MANUAL TRANSAXLE
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
O2S	OXYGEN SENSOR
OBD	ON-BOARD DIAGNOSTIC
O/D	OVER DRIVE
OFF	SWITCH OFF
ON	SWITCH ON
OSC	OSCILLATOR
P	POWER
P/S	POWER STEERING
PCM	POWERTRAIN CONTROL MODULE
PNP	PARK/NEUTRAL POSITION
PRC	PRESSURE REGULATOR CONTROL
PRG	PURGE SOLENOID VALVE
PSP	POWER STEERING PRESSURE
PTC	POSITIVE TEMPERATURE COEFFICIENT HEATER
PWM	PULSE WIDTH MODULATION
QSS	QUICK-START SYSTEM
R	REAR
REC	RECIRCULATION
RF	RIGHT FRONT
RH	RIGHT HAND
RPM	REVOLUTIONS PER MINUTE
RR	RIGHT REAR
SAS	SOPHISTICATED AIR BAG SENSOR
SFI	SEQUENTIAL MULTIPOINT FUEL INJECTION
SOL	SOLENOID
SPV	SPILL VALVE
ST	START
SW	SWITCH
TC	TURBOCHARGER
TCC	TORQUE CONVERTER CLUTCH
TCM	TRANSMISSION(TRANSAXLE)CONTROL MODULE
TCS	TRACTION CONTROL SYSTEM
TEMP	TEMPERATURE
TFT	TRANSAXLE FLUID TEMPERATURE
TNS	TAIL NUMBER SIDE LIGHTS
TICS	TRIPLE INDUCTION CONTROL SYSTEM
TP	THROTTLE POSITION SENSOR
TR	TRANSMISSION(TRANSAXLE)RANGE
TWS	TOTAL WIRING SYSTEM
V	VOLT
VAF	VOLUME AIR FLOW SENSOR
VENT	VENTILATION
VICS	VARIABLE INERTIA CHARGING SYSTEM
VOL	VOLUME
VR	VOLTAGE REGULATOR
VRIS	VARIABLE RESONANCE INDUCTION SYSTEM
VSS	VEHICLE SPEED SENSOR
VTCS	VARIABLE TUMBLE CONTROL SYSTEM
W	WATT(S)
WOT	WIDE OPEN THROTTLE

ELECTRICAL PARTS

B6U000000006W03

Battery cable

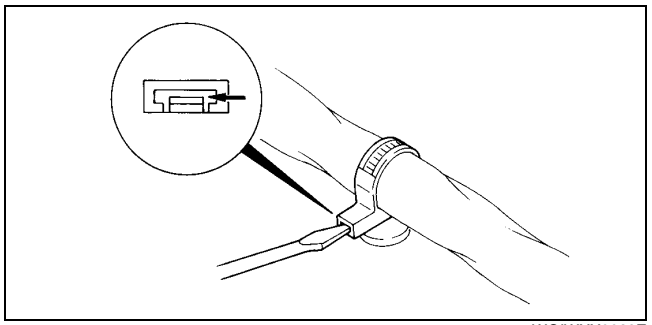
- Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.



WGIWXX0007E

Wiring Harness

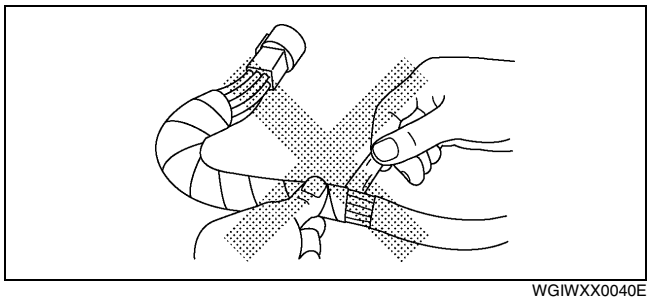
- To remove the wiring harness from the clip in the engine room, pry up the hook of the clip using a flathead screwdriver.



WGIWXX0039E

Caution

- **Do not remove the Harness protective tape. Otherwise, the wires could rub against the body, which could result in water penetration and electrical shorting.**



WGIWXX0040E

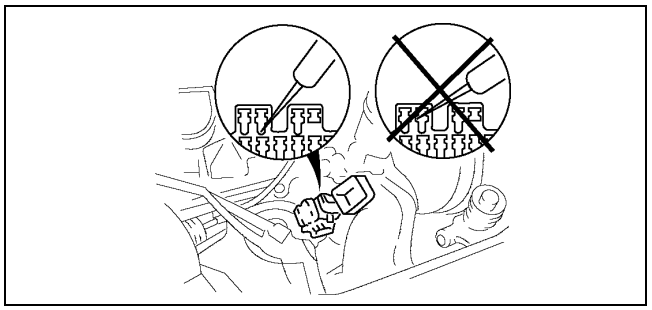
CONNECTORS

Data link connector

- Insert the probe into the terminal when connecting a jumper wire to the data link connector.

Caution

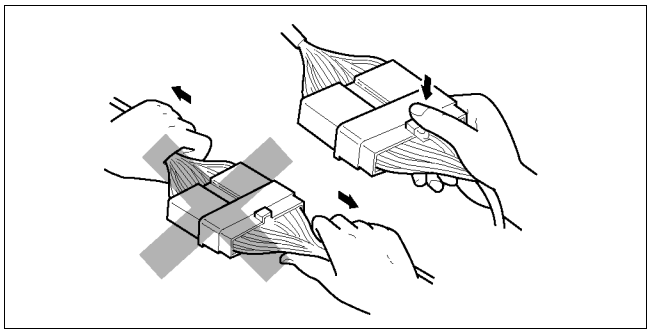
- **Inserting a jumper wire probe into the data link connector terminal may damage the terminal.**



X3U000WAY

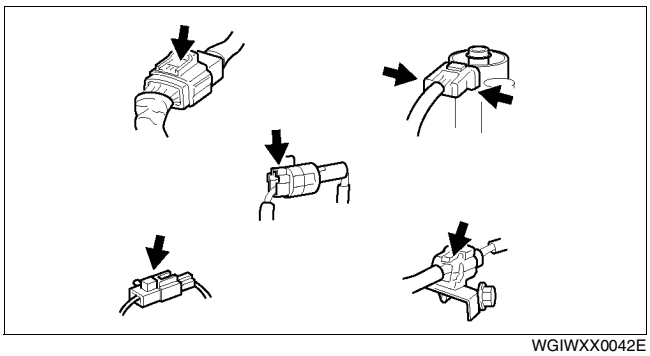
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



WGIWXX0041E

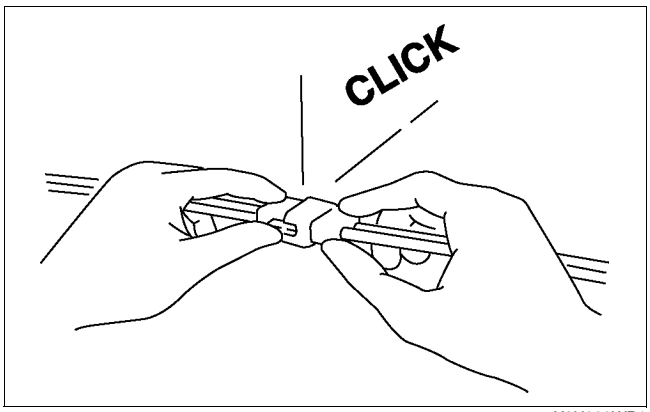
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

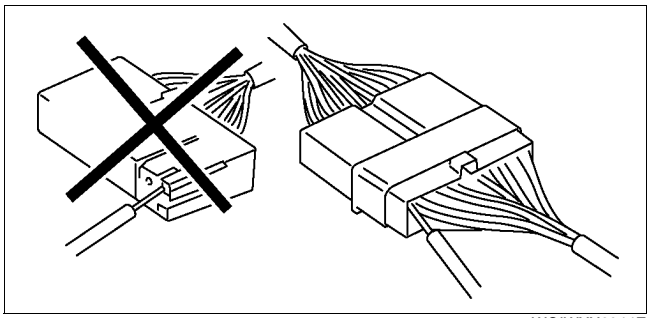
- When locking connectors, listen for a click indicating they are securely locked.



X3U000WB1

Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

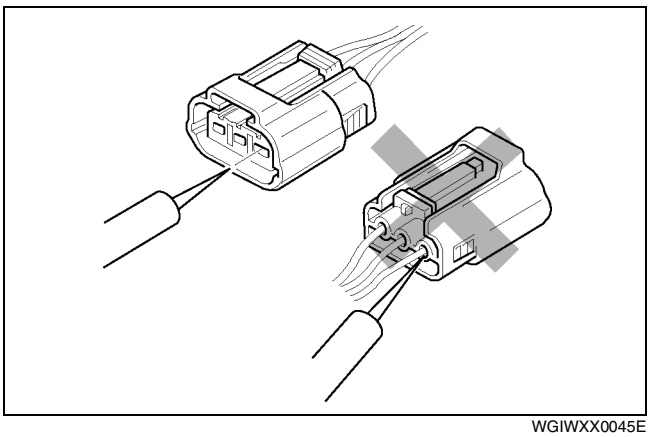


WGIWXX0044E

- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

  Caution

  - **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**

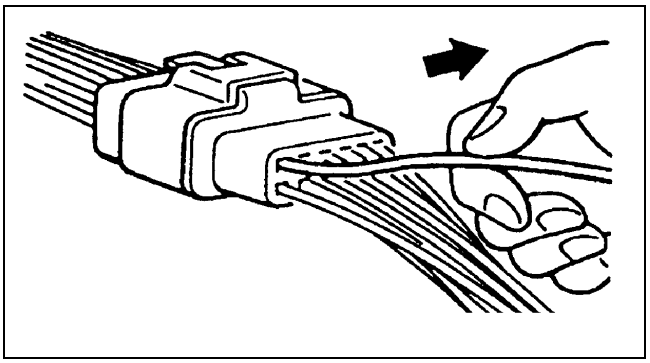


WGIWXX0045E

Terminals

Inspection

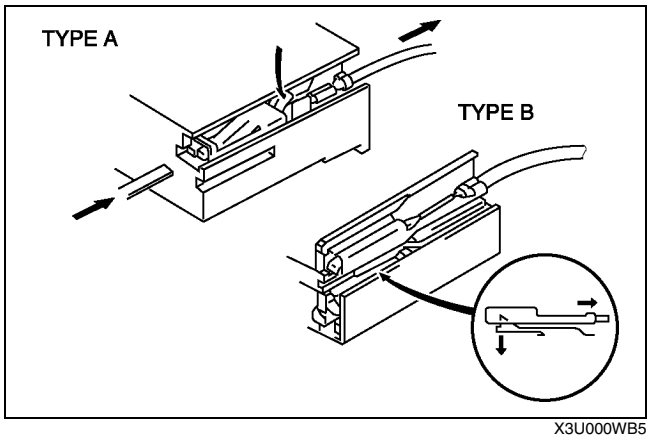
- Pull lightly on individual wires to verify that they are secured in the terminal.



X3U000WB4

Replacement

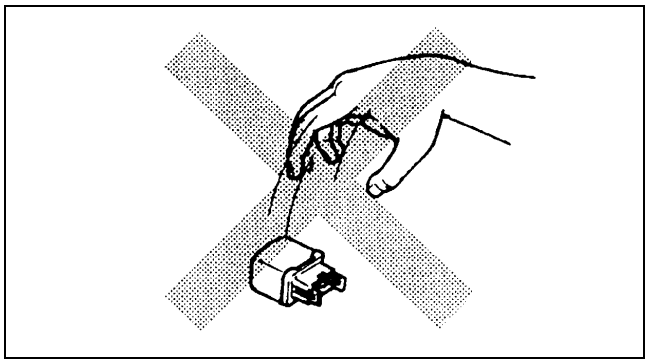
- Use the appropriate tools to remove a terminal as shown. When installing a terminal, be sure to insert it until it locks securely.
- Insert a thin piece of metal from the terminal side of the connector and with the terminal locking tab pressed down, pull the terminal out from the connector.



X3U000WB5

Sensors, Switches, and Relays

- Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.

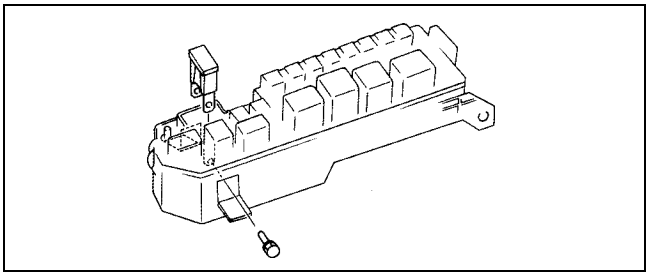


X3U000WB6

Fuse

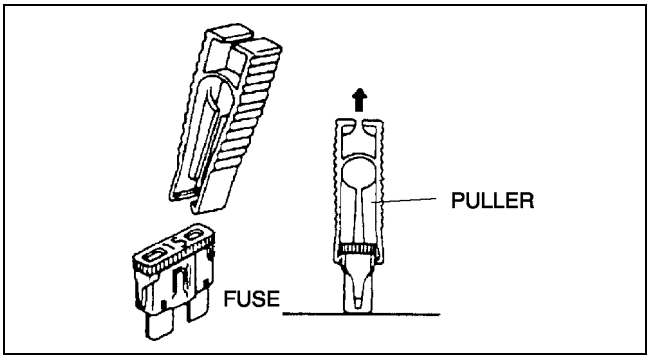
Replacement

- When replacing a fuse, be sure to replace it with one of the same capacity. If a fuse fails again, the circuit probably has a short and the wiring should be inspected.
- Be sure the negative battery terminal is disconnected before replacing a main fuse.



YMU000WA1

- When replacing a pullout fuse, use the fuse puller.



YMU000WAK

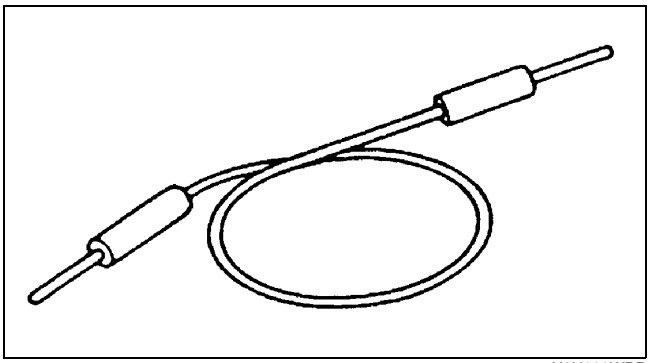
ELECTRICAL TROUBLESHOOTING TOOLS

Jumper wire

- A jumper wire is used to create a temporary circuit. Connect the jumper wire between the terminals of a circuit to bypass a switch.

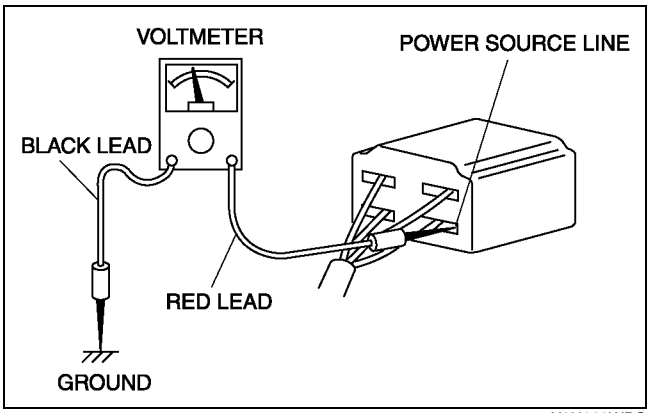
Caution

- **Do not connect a jumper wire from the power source line to a body ground. This may cause burning or other damage to wiring harnesses or electronic components.**


X3U000WBB

Voltmeter

- The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of **15 V or more** is used by connecting the positive (+) probe (red lead wire) to the point where voltage will be measured and the negative (-) probe (black lead wire) to a body ground.



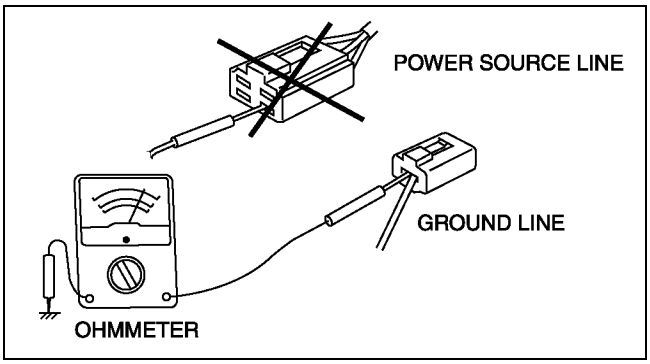
X3U000WBC

Ohmmeter

- The ohmmeter is used to measure the resistance between two points in a circuit and to inspect for continuity and short circuits.

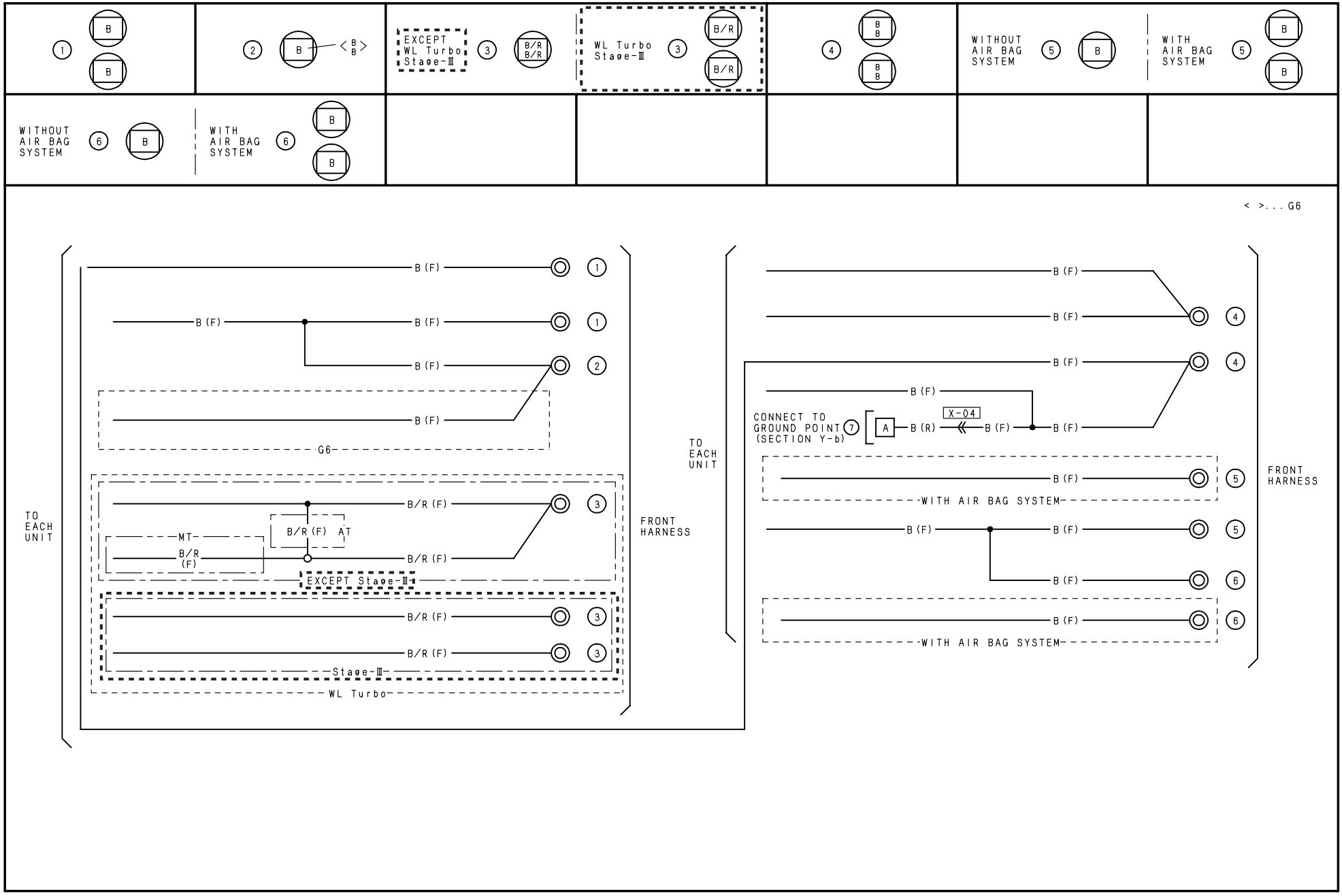
Caution

- **Do not connect the ohmmeter to any circuit where voltage is applied. This will damage the ohmmeter.**

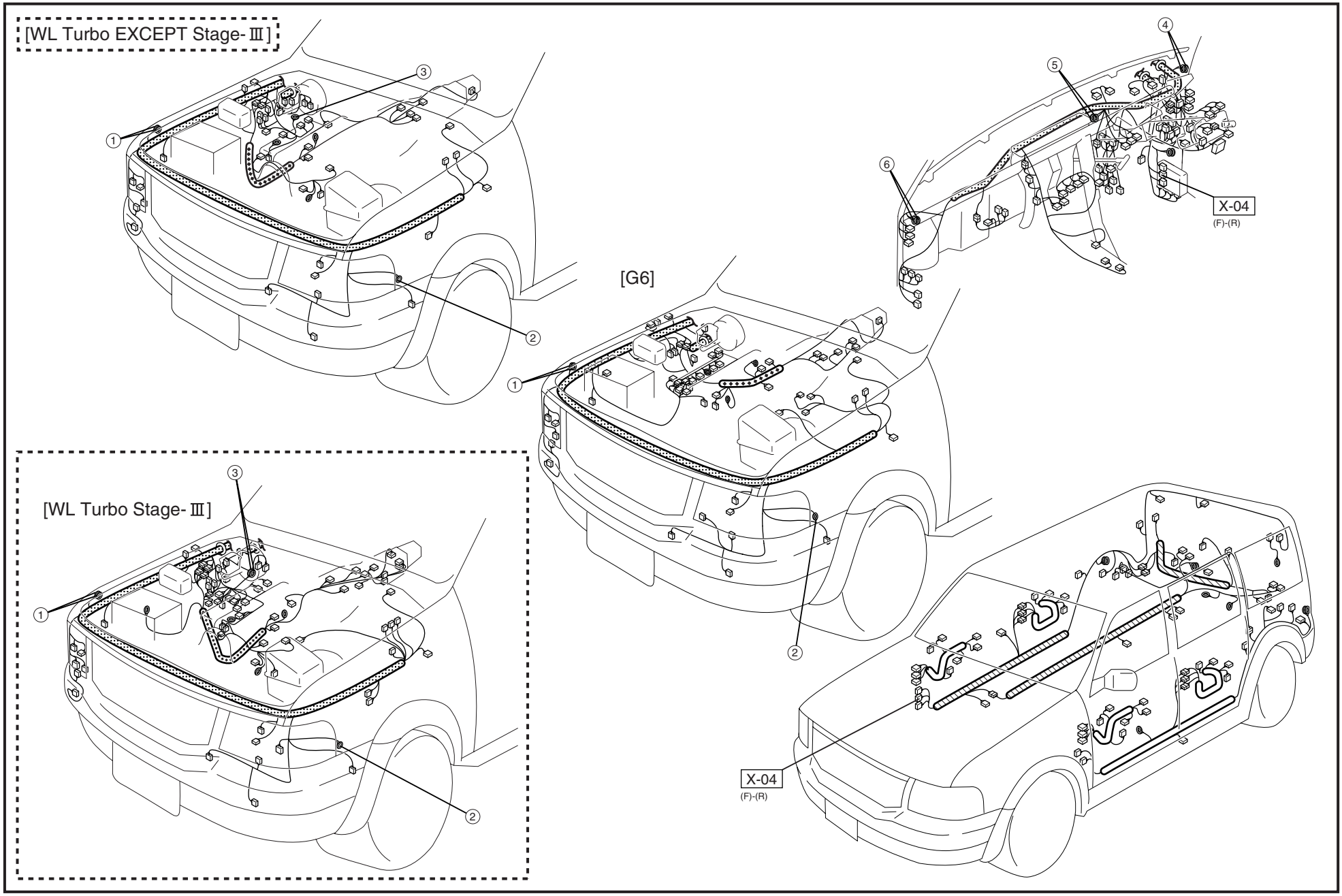


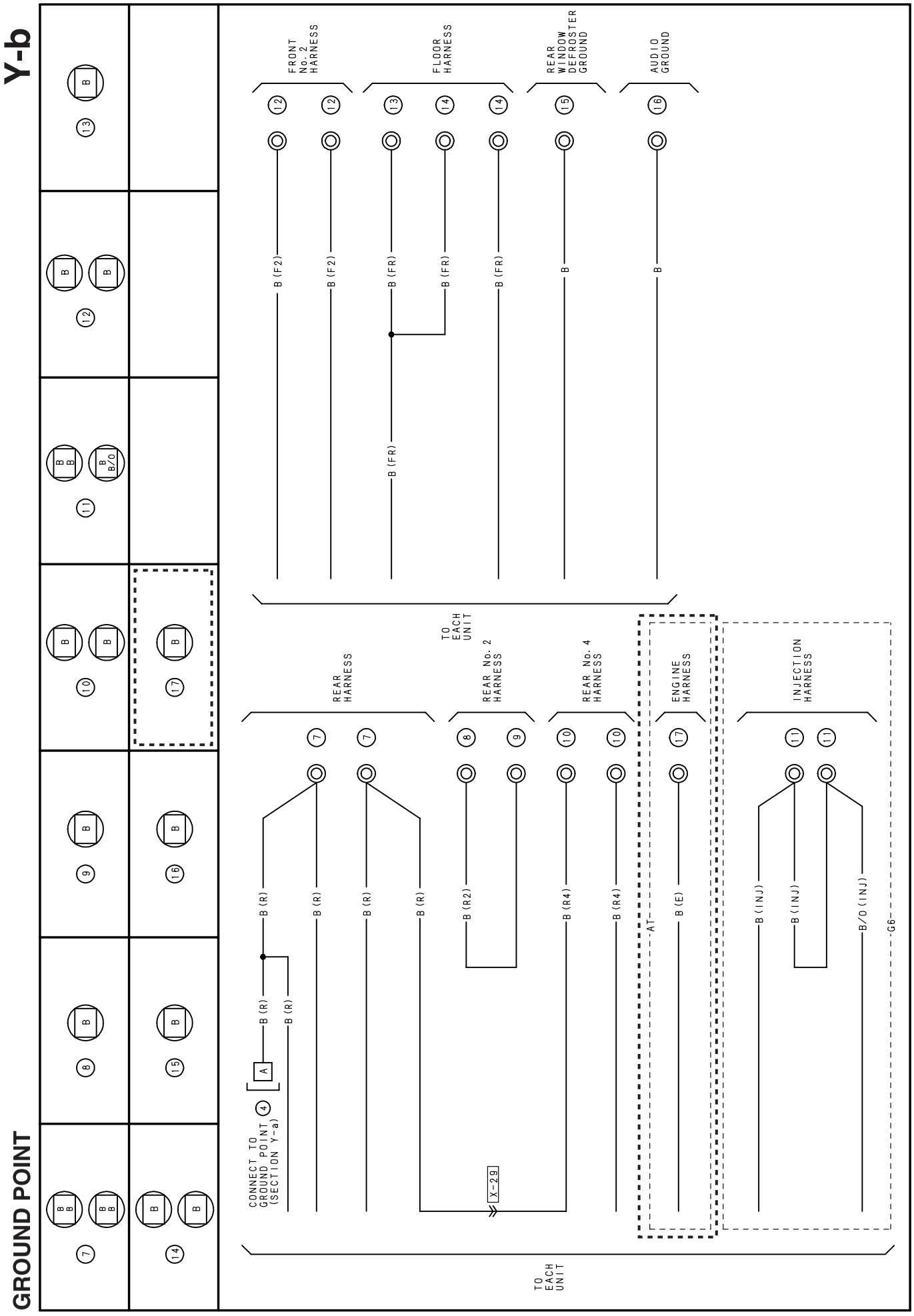
YMU000WAL

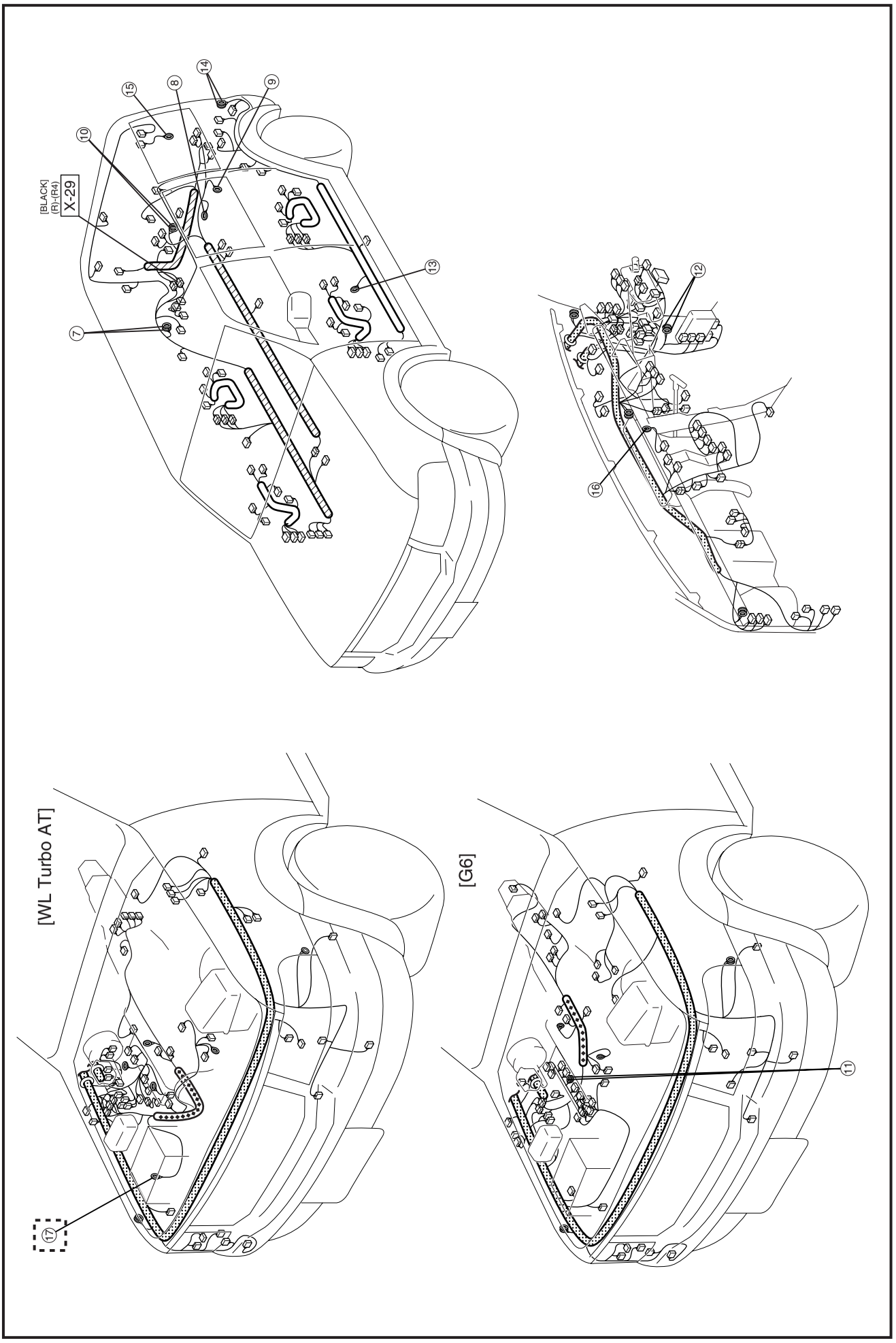
GROUND POINT

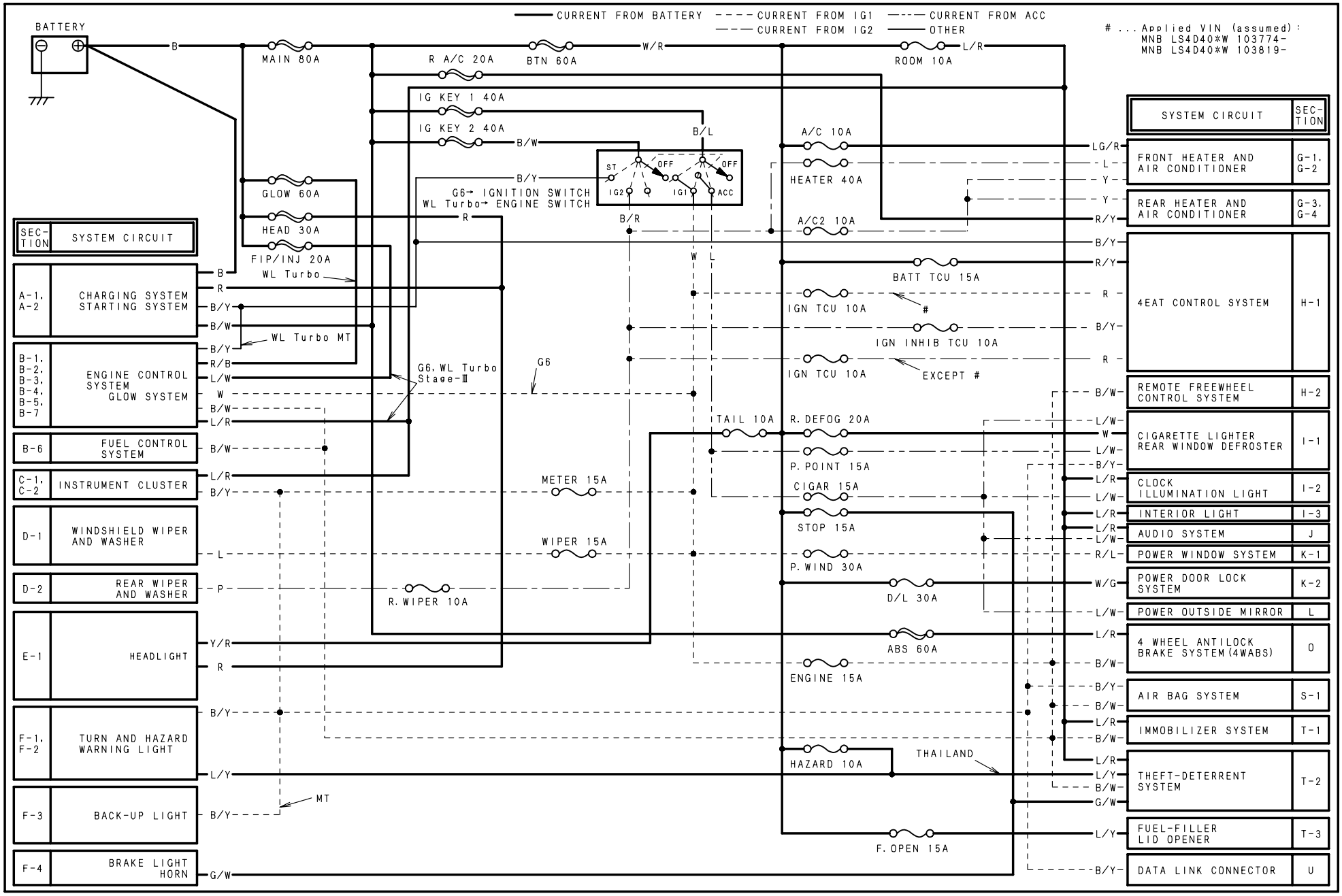


HARNESS SYMBOL: (F) (E) (R)



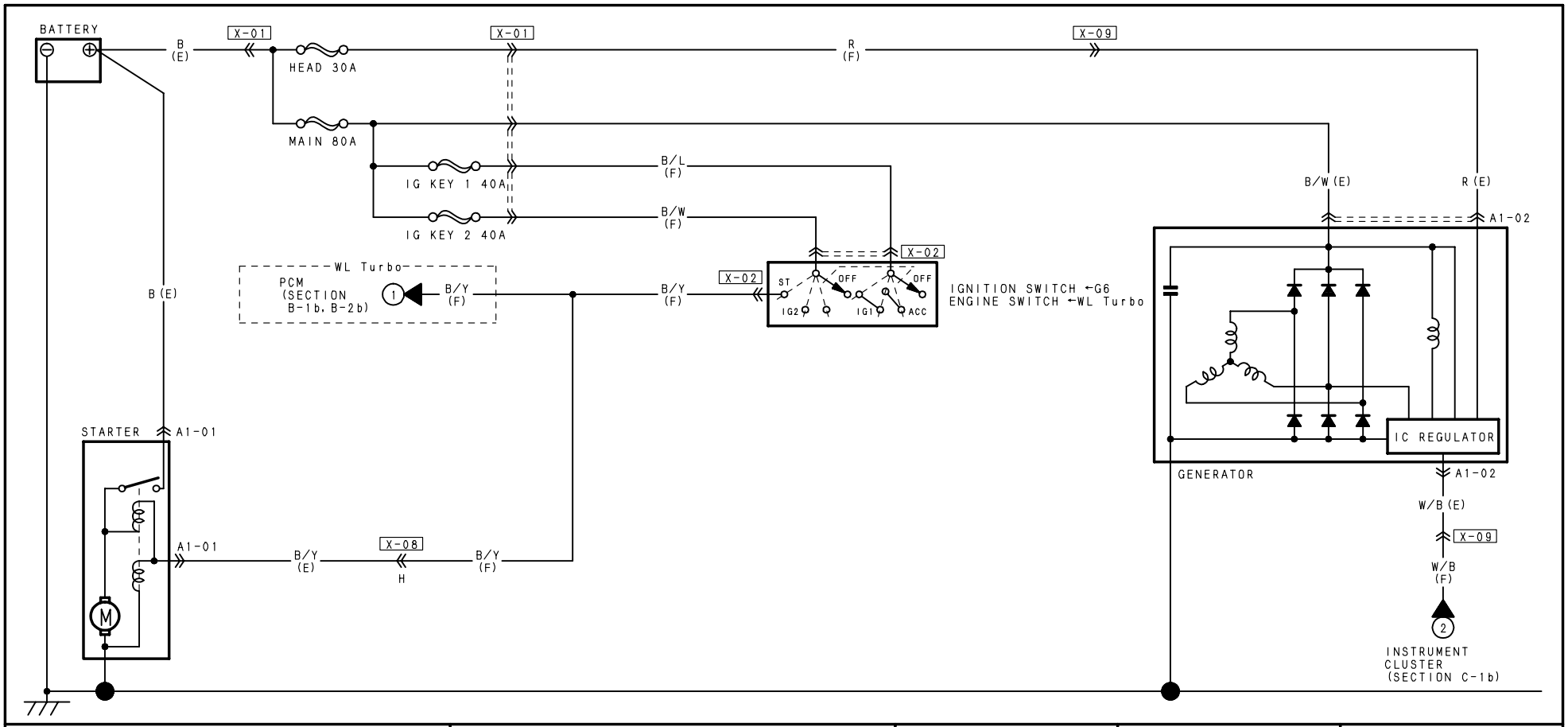

Y-b
GROUND POINT
FRONT No.2 HARNESS
FLOOR HARNESS
REAR WINDOW DEFROSTER GROUND
AUDIO GROUND
REAR HARNESS
REAR No.2 HARNESS
REAR No.4 HARNESS
ENGINE HARNESS
INJECTION HARNESS
TO EACH UNIT
CONNECT TO GROUND POINT (4) (SECTION Y-a)
X-29
AT
G6


Y-b
[BLACK]
(R)-(R4)
X-29
[WL Turbo AT]
[G6]
HARNESS SYMBOL: (F) (E) (R)


CURRENT FROM BATTERY
CURRENT FROM IG1
CURRENT FROM ACC
CURRENT FROM IG2
OTHER
... Applied VIN (assumed):
MNB LS4D40*W 103774-
MNB LS4D40*W 103819-
BATTERY
MAIN 80A
R A/C 20A
BTN 60A
ROOM 10A
IG KEY 1 40A
IG KEY 2 40A
GLOW 60A
HEAD 30A
FIP/INJ 20A
WL Turbo
G6→ IGNITION SWITCH
WL Turbo→ ENGINE SWITCH
ST
OFF
IG2
IG1
ACC
A/C 10A
HEATER 40A
A/C2 10A
BATT TCU 15A
IGN TCU 10A
IGN INHIB TCU 10A
EXCEPT #
TAIL 10A
R. DEFOG 20A
P. POINT 15A
CIGAR 15A
STOP 15A
P. WIND 30A
D/L 30A
ABS 60A
ENGINE 15A
HAZARD 10A
THAILAND
F. OPEN 15A
METER 15A
WIPER 15A
R. WIPER 10A
WL Turbo MT
G6, WL Turbo Stage-Ⅲ
G6
MT
SECTION
SYSTEM CIRCUIT
A-1, A-2 CHARGING SYSTEM STARTING SYSTEM
B-1, B-2, B-3, B-4, B-5, B-7 ENGINE CONTROL SYSTEM GLOW SYSTEM
B-6 FUEL CONTROL SYSTEM
C-1, C-2 INSTRUMENT CLUSTER
D-1 WINDSHIELD WIPER AND WASHER
D-2 REAR WIPER AND WASHER
E-1 HEADLIGHT
F-1, F-2 TURN AND HAZARD WARNING LIGHT
F-3 BACK-UP LIGHT
F-4 BRAKE LIGHT HORN
FRONT HEATER AND AIR CONDITIONER G-1, G-2
REAR HEATER AND AIR CONDITIONER G-3, G-4
4EAT CONTROL SYSTEM H-1
REMOTE FREEWHEEL CONTROL SYSTEM H-2
CIGARETTE LIGHTER REAR WINDOW DEFROSTER I-1
CLOCK ILLUMINATION LIGHT I-2
INTERIOR LIGHT I-3
AUDIO SYSTEM J
POWER WINDOW SYSTEM K-1
POWER DOOR LOCK SYSTEM K-2
POWER OUTSIDE MIRROR L
4 WHEEL ANTILOCK BRAKE SYSTEM (4WABS) O
AIR BAG SYSTEM S-1
IMMOBILIZER SYSTEM T-1
THEFT-DETERRENT SYSTEM T-2
FUEL-FILLER LID OPENER T-3
DATA LINK CONNECTOR U

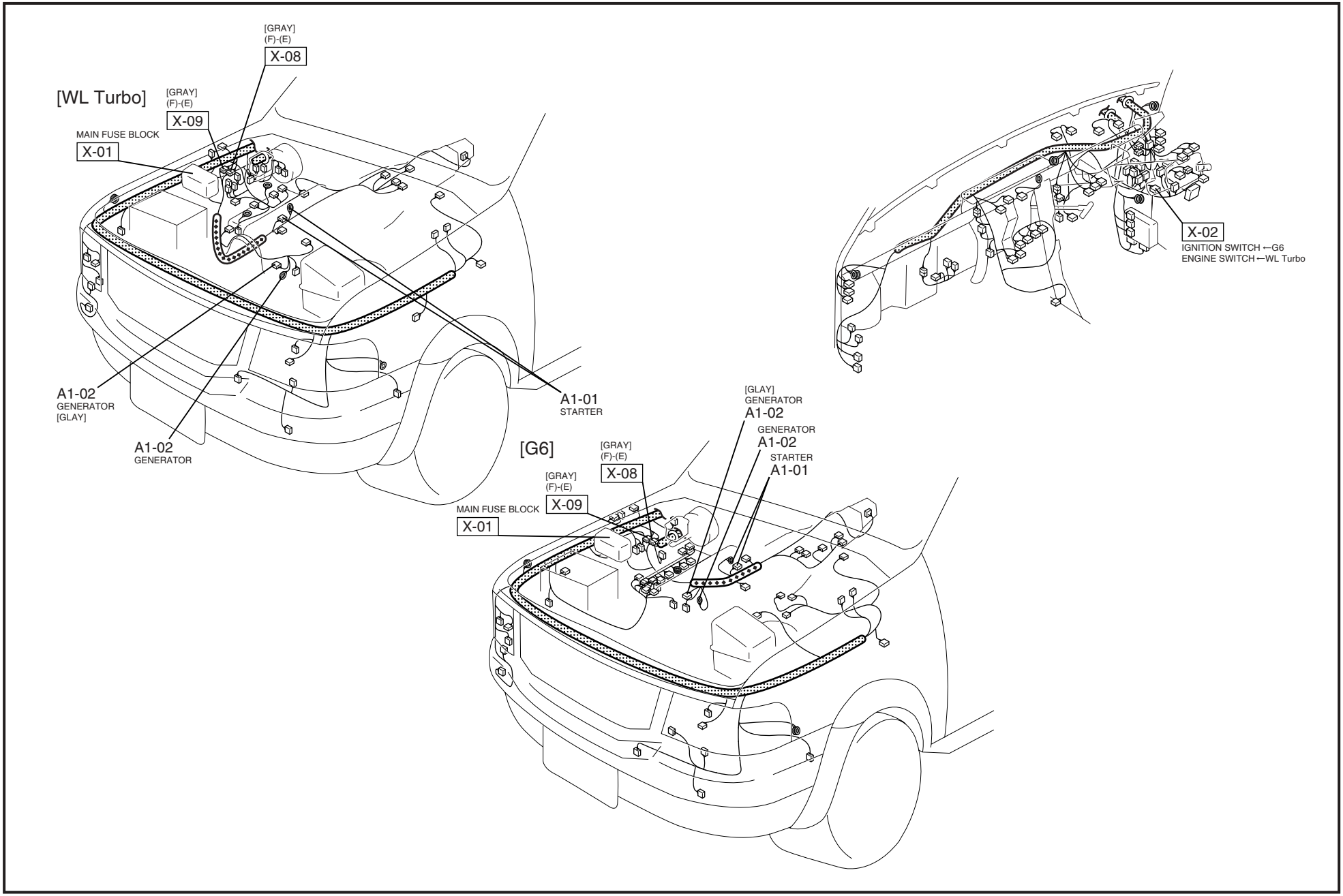
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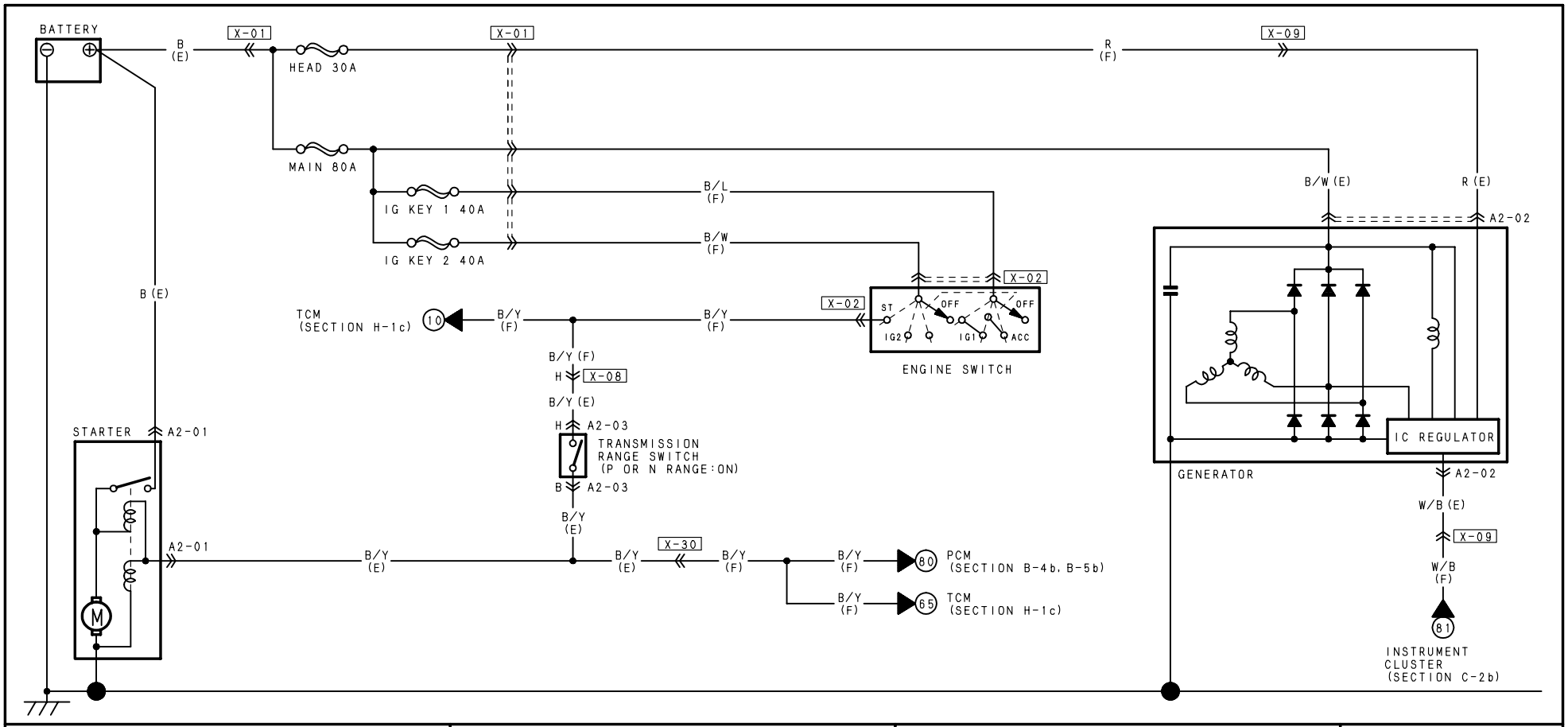
CHARGING SYSTEM (MT) / STARTING SYSTEM (MT)



A1-01 STARTER (E)		A1-02 GENERATOR (E)				
B	B/Y	B/W	R W/B			

HARNESS SYMBOL: (F) (E) (R)





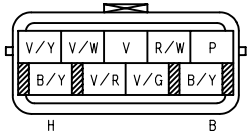
A2-01 STARTER (E)



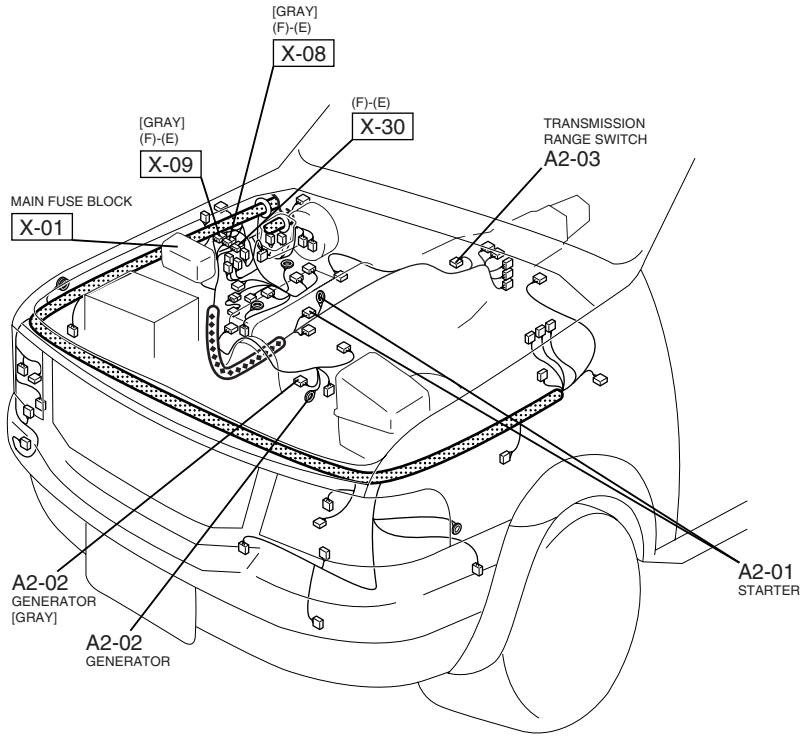
A2-02 GENERATOR (E)

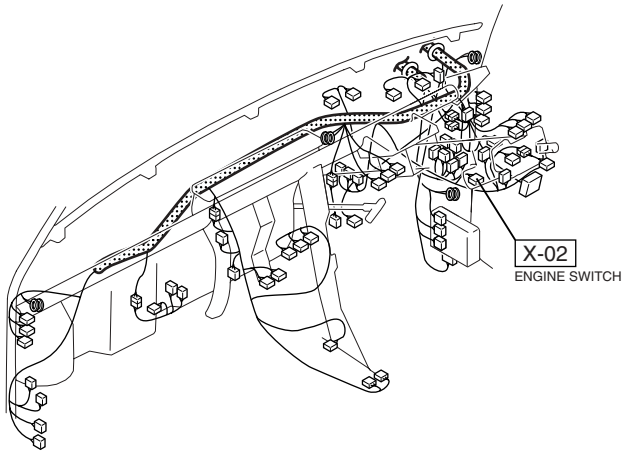


A2-03 TRANSMISSION RANGE SWITCH (E)

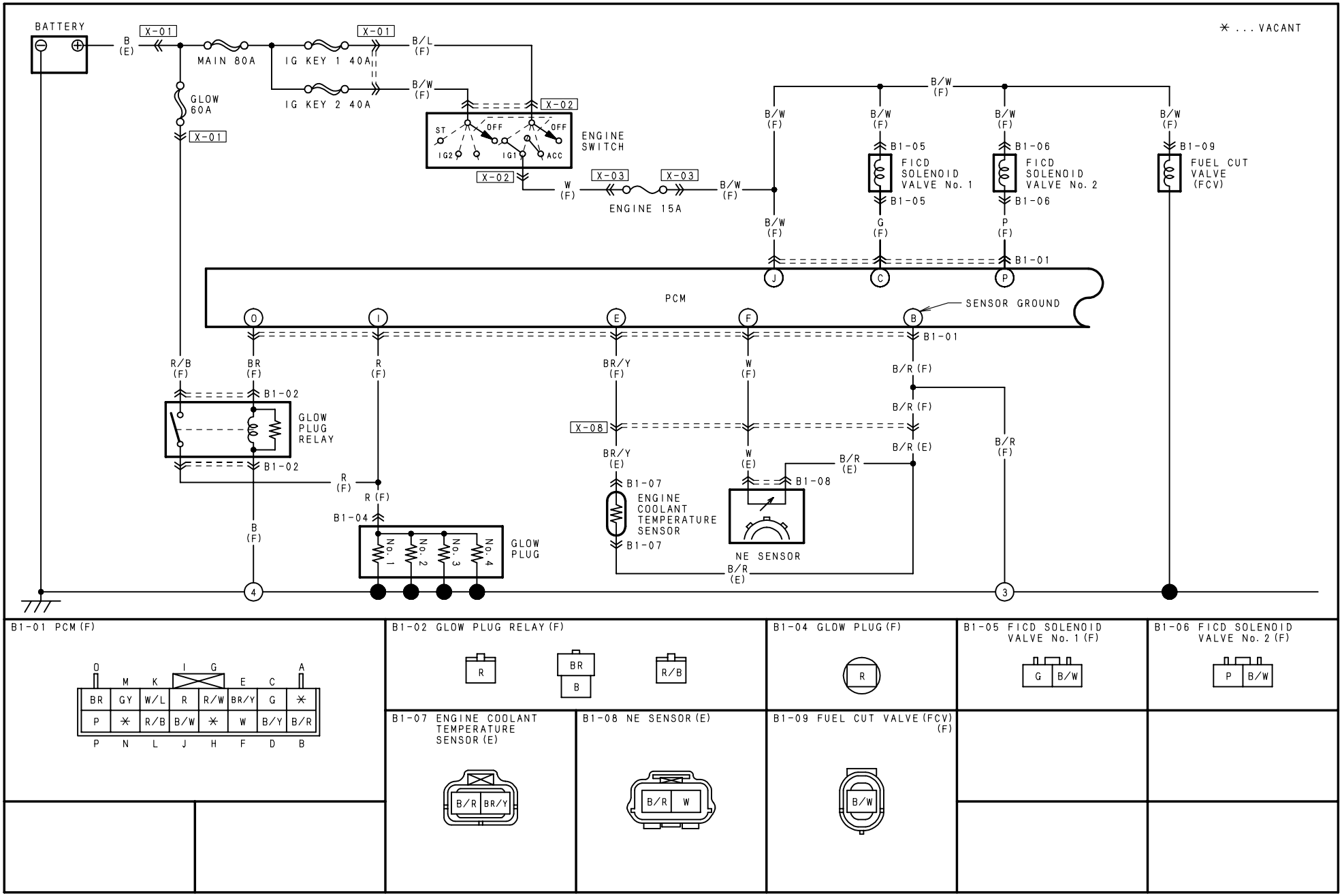


HARNESS SYMBOL: (F) (E) (R)





ENGINE CONTROL SYSTEM ("WL Turbo MT" WITHOUT IMMOBILIZER SYSTEM) / GLOW SYSTEM ("WL Turbo MT" WITHOUT IMMOBILIZER SYSTEM)



B1-01 PCM (F)

B1-02 GLOW PLUG RELAY (F)

B1-04 GLOW PLUG (F)

B1-05 FICD SOLENOID VALVE No. 1 (F)

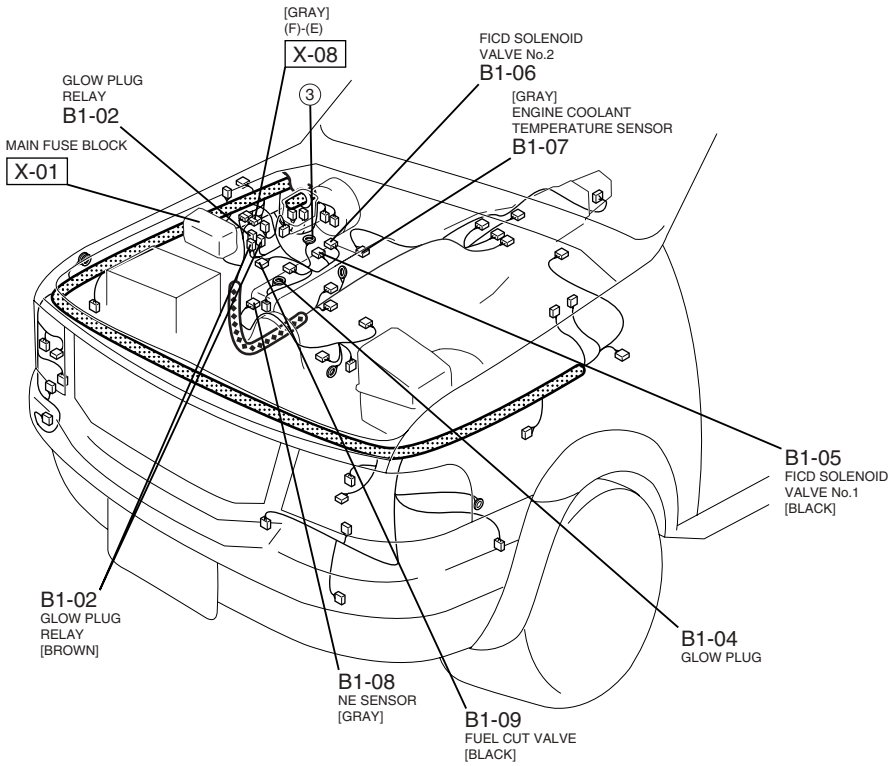
B1-06 FICD SOLENOID VALVE No. 2 (F)

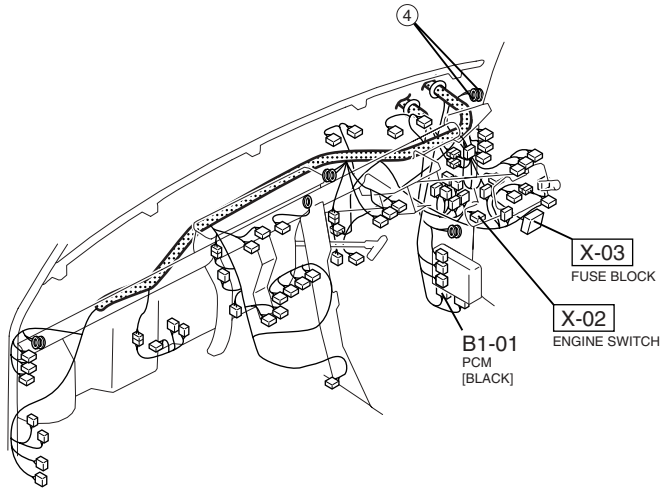
B1-07 ENGINE COOLANT TEMPERATURE SENSOR (E)

B1-08 NE SENSOR (E)

B1-09 FUEL CUT VALVE (FCV) (F)

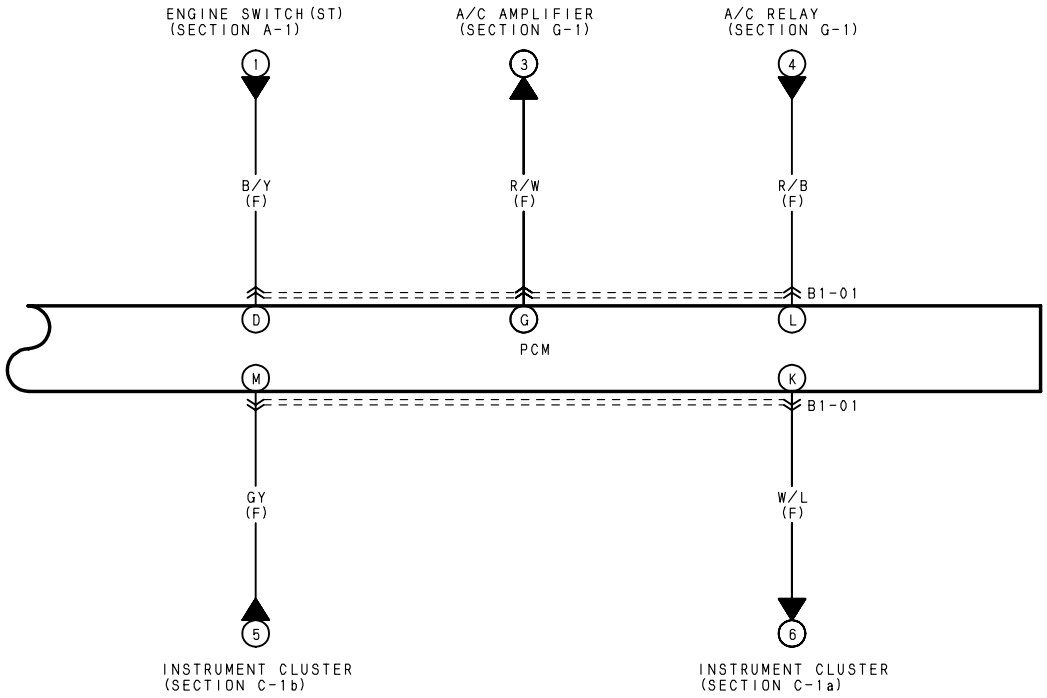
HARNESS SYMBOL: (F) (E) (R)



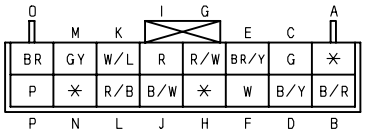


B-1a

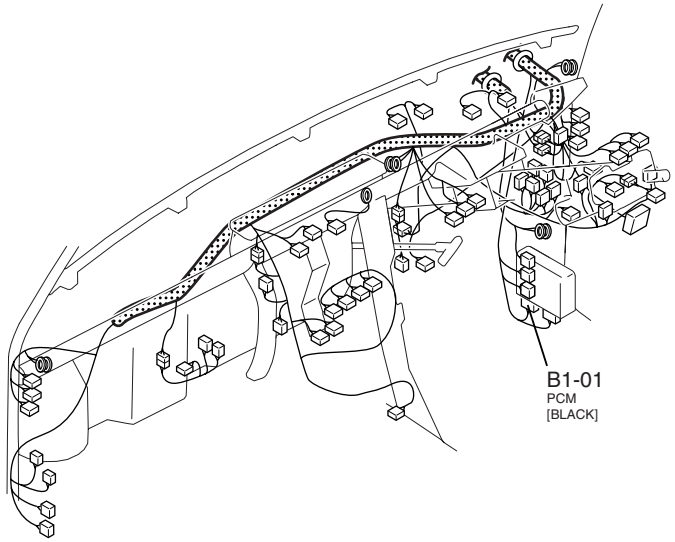
✳ . . . VACANT



B1-01 PCM(F)

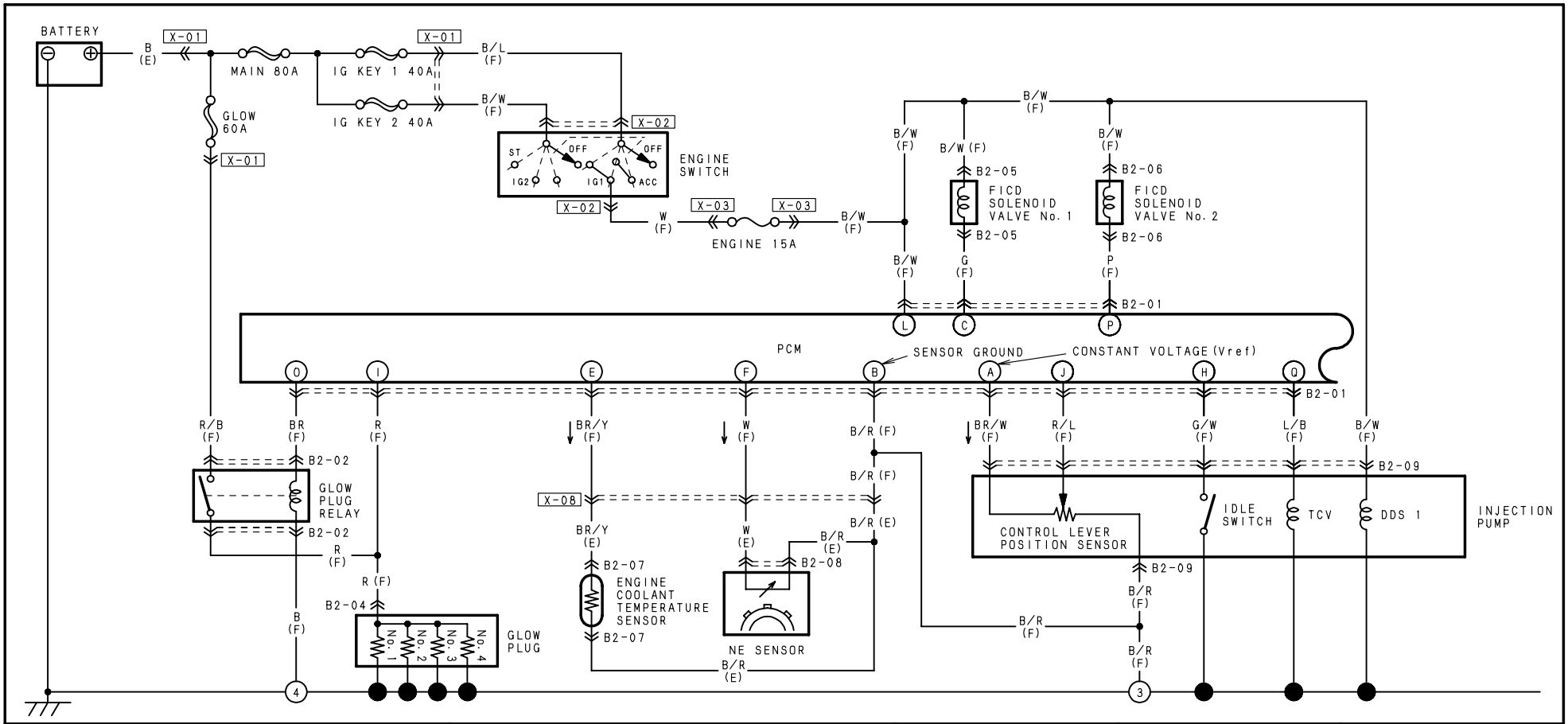


HARNESS SYMBOL: (F) (E) (R)

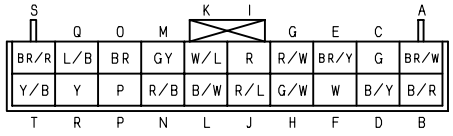


B-1b

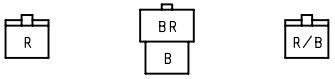
ENGINE CONTROL SYSTEM ("WL Turbo MT" WITH IMMOBILIZER SYSTEM) / GLOW SYSTEM ("WL Turbo MT" WITH IMMOBILIZER SYSTEM)



B2-01 PCM (F)



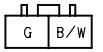
B2-02 GLOW PLUG RELAY (F)



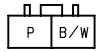
B2-04 GLOW PLUG (F)



B2-05 FICD SOLENOID VALVE No. 1 (F)



B2-06 FICD SOLENOID VALVE No. 2 (F)



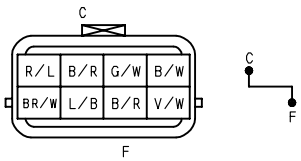
B2-07 ENGINE COOLANT TEMPERATURE SENSOR (E)



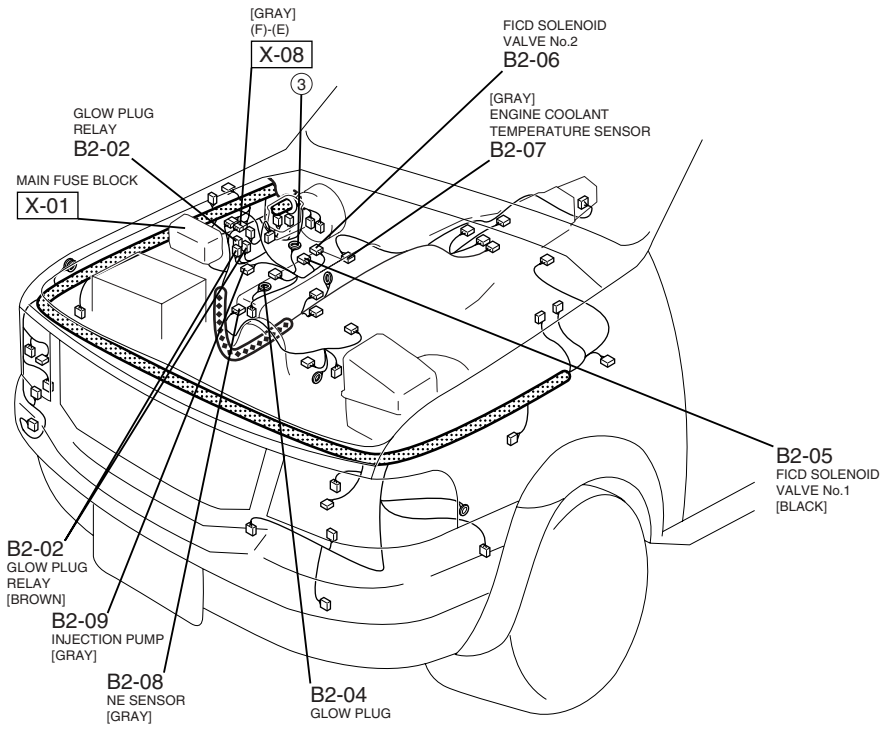
B2-08 NE SENSOR (E)

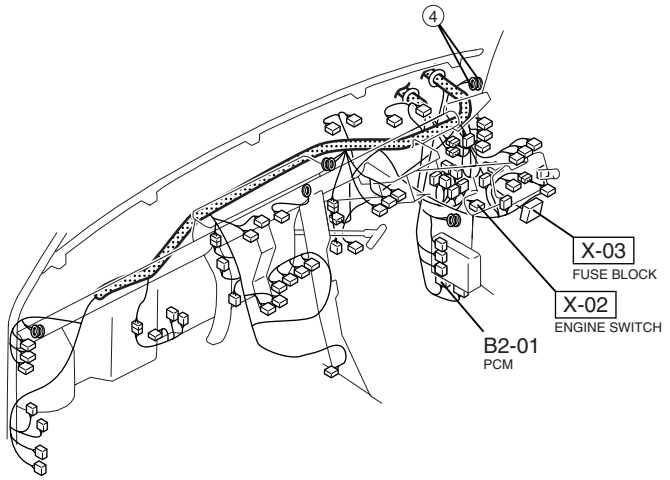


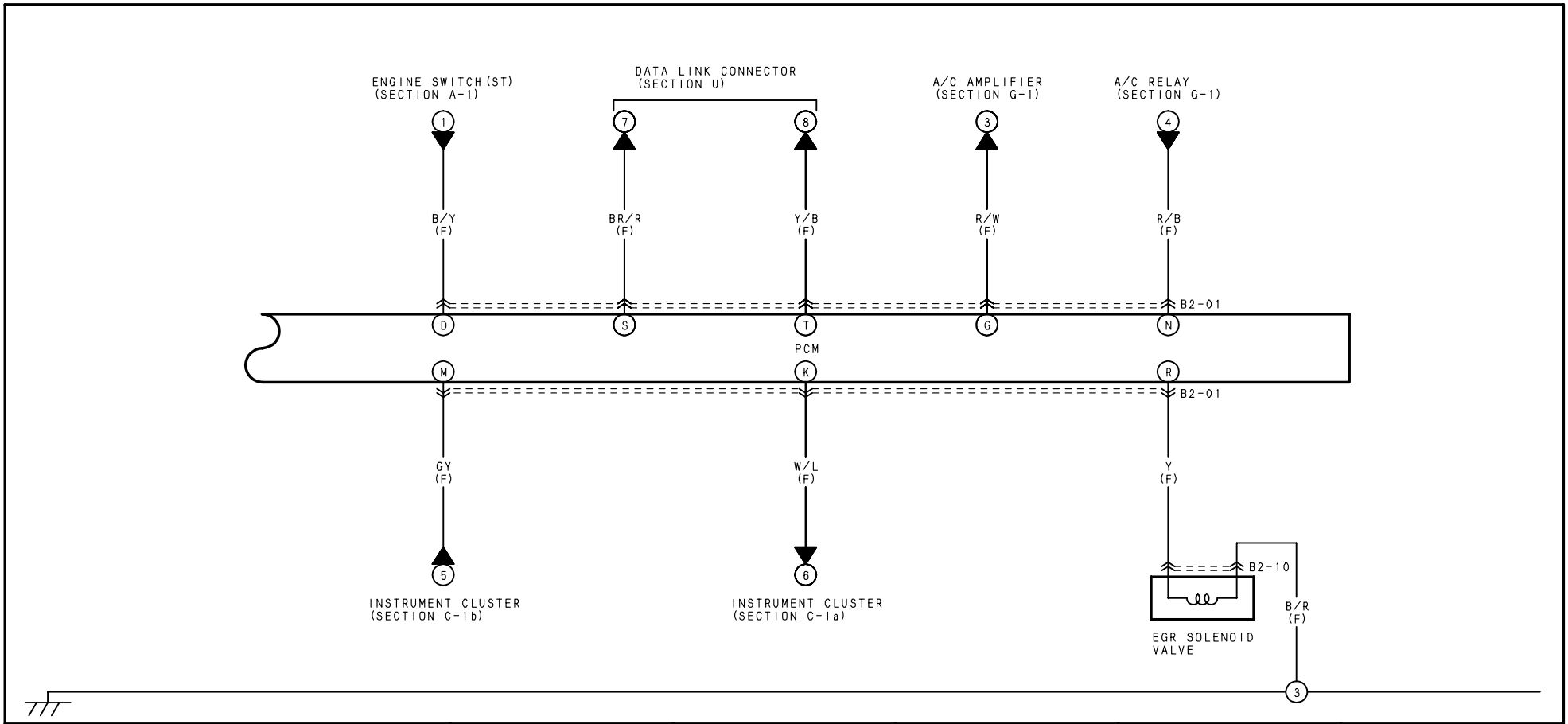
B2-09 INJECTION PUMP (F)



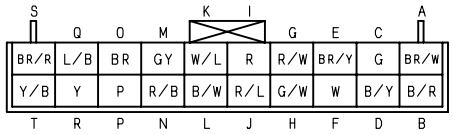
HARNESS SYMBOL: (F) (E) (R)







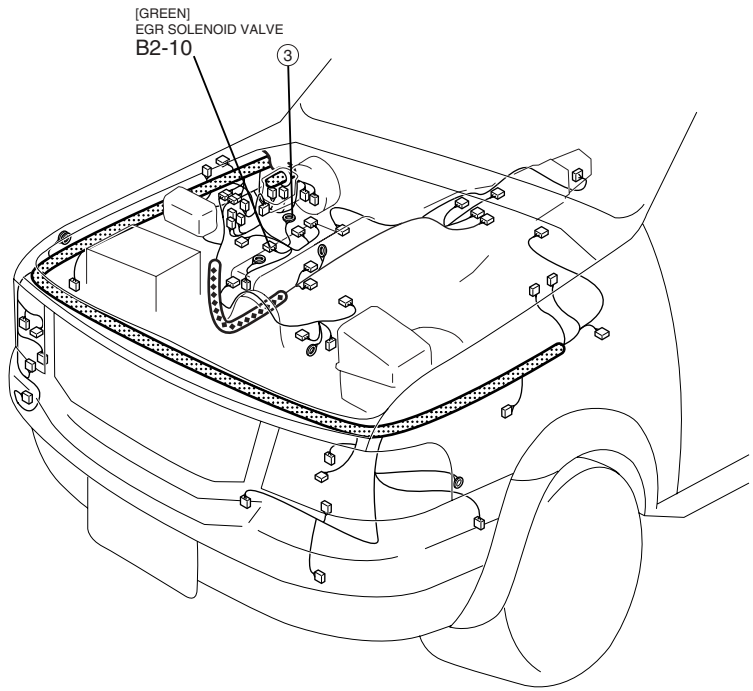
B2-01 PCM (F)

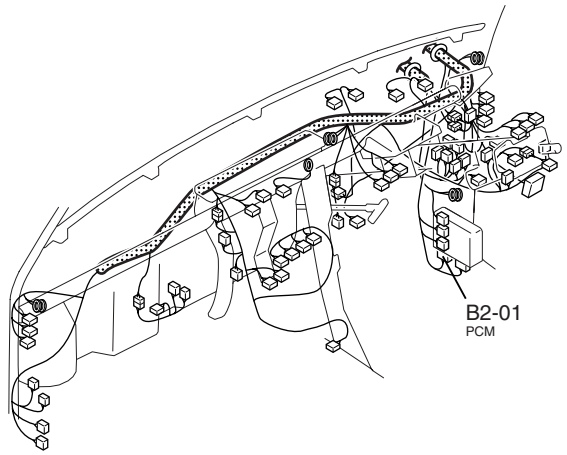


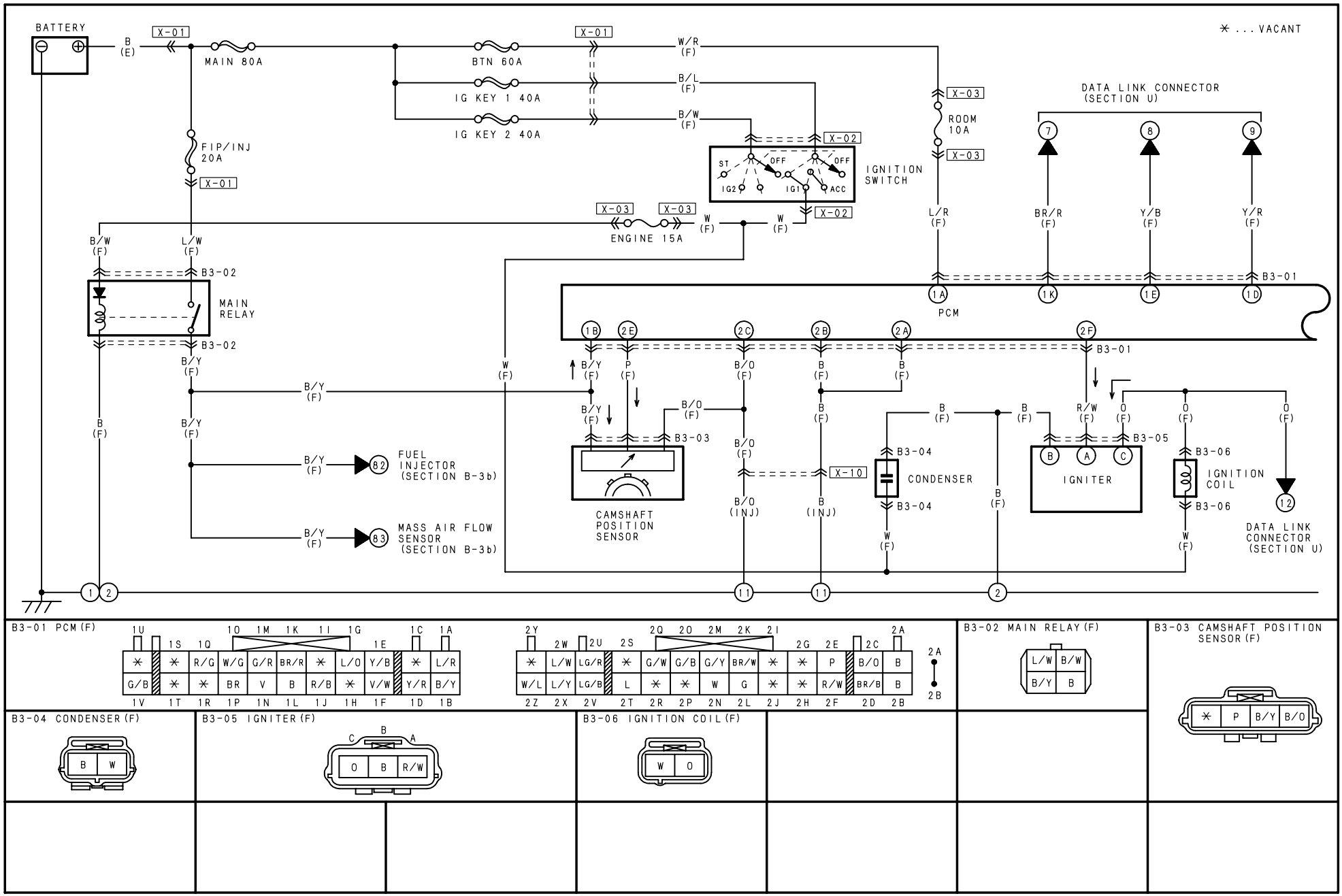
B2-10 EGR SOLENOID VALVE (F)



HARNESS SYMBOL: (F) (E) (R)







B3-01 PCM (F)

1U	1S	1Q	1O	1M	1K	1I	1G	1E	1C	1A
✳	✳	R/G	W/G	G/R	BR/R	✳	L/O	Y/B	✳	L/R
G/B	✳	✳	BR	V	B	R/B	✳	V/W	Y/R	B/Y
1V	1T	1R	1P	1N	1L	1J	1H	1F	1D	1B

2Y	2W	2U	2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A
✳	L/W	LG/R	✳	G/W	G/B	G/Y	BR/W	✳	✳	P	B/O	B
W/L	L/Y	LG/B	L	✳	✳	W	G	✳	✳	R/W	BR/B	B
2Z	2X	2V	2T	2R	2P	2N	2L	2J	2H	2F	2D	2B

2A
2B

B3-02 MAIN RELAY (F)

L/W	B/W
B/Y	B

B3-03 CAMSHAFT POSITION SENSOR (F)

✳	P	B/Y	B/O

B3-04 CONDENSER (F)

B	W

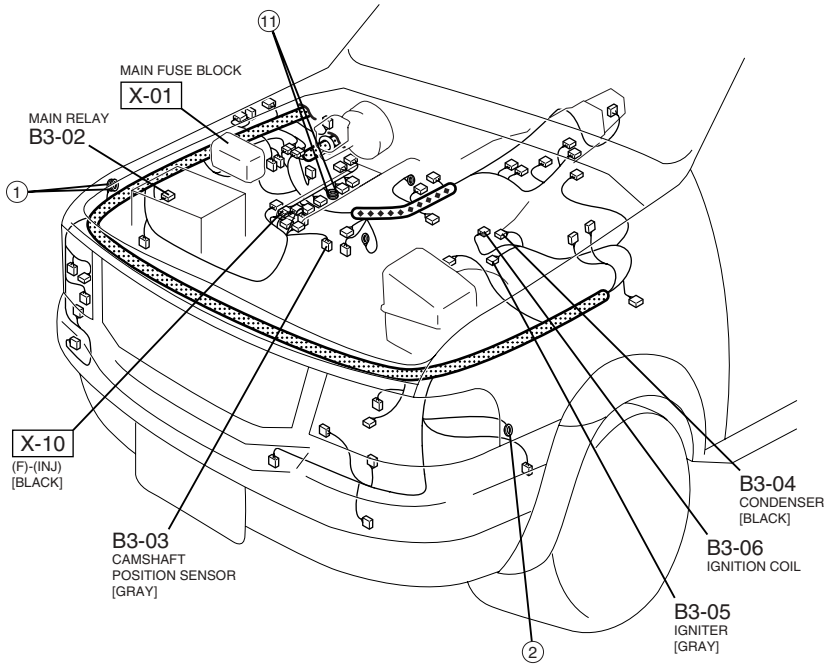
B3-05 IGNITER (F)

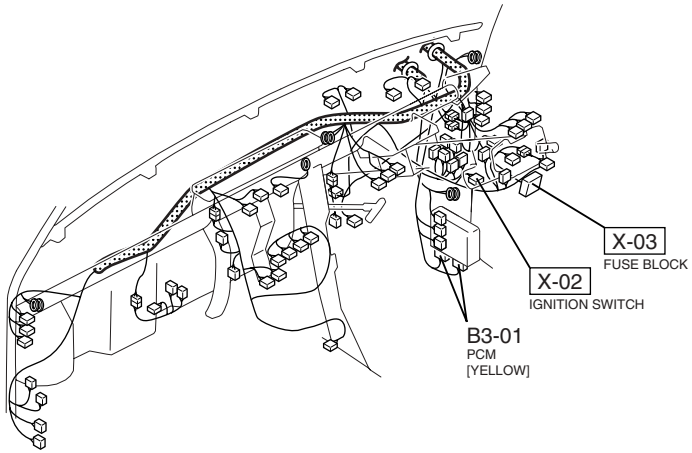
C	B	A
O	B	R/W

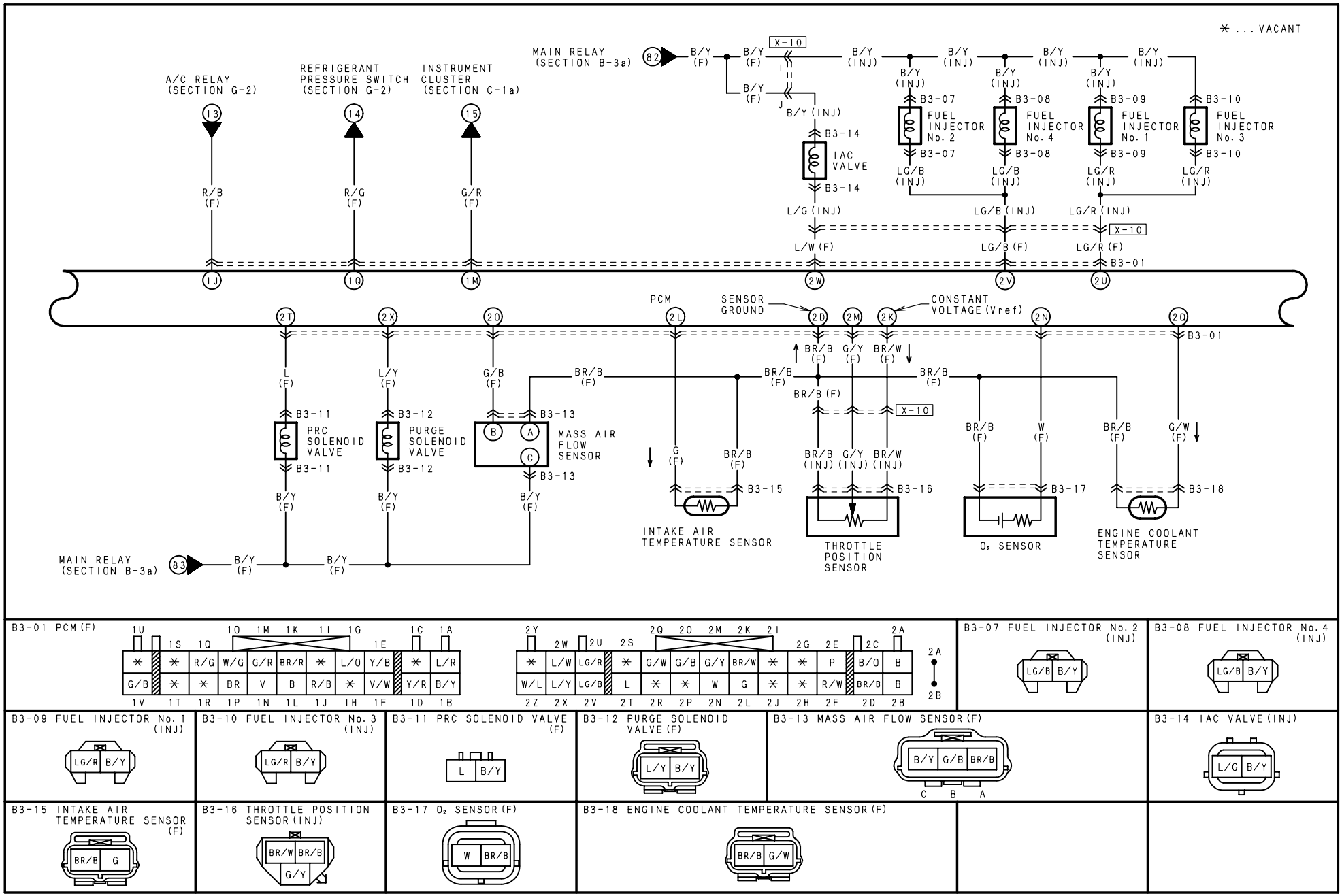
B3-06 IGNITION COIL (F)

W	O

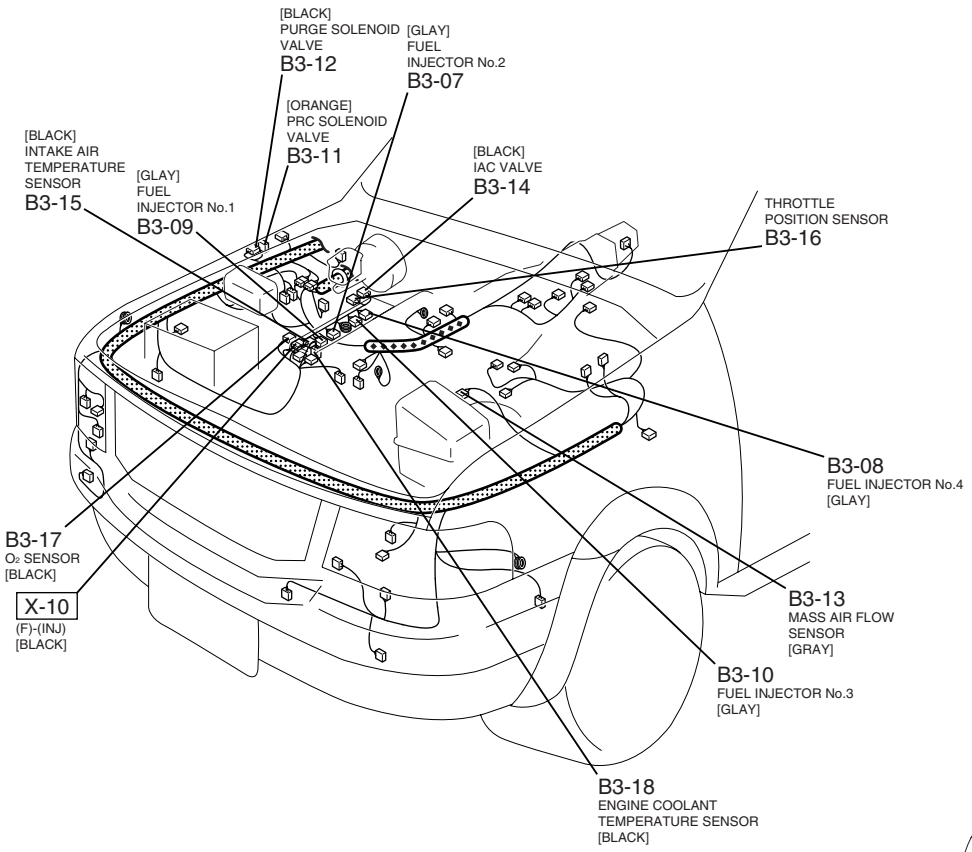
HARNESS SYMBOL: (F) (E) (R)

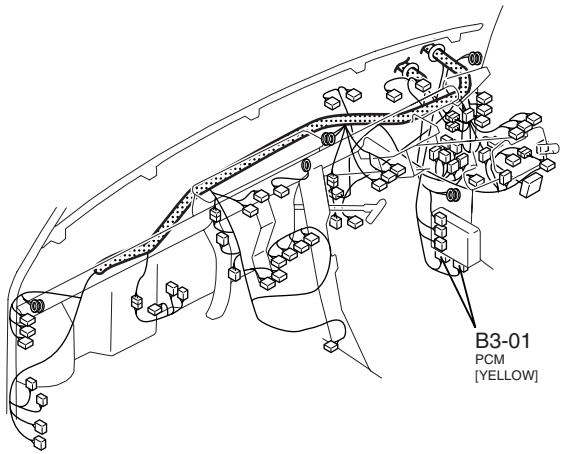


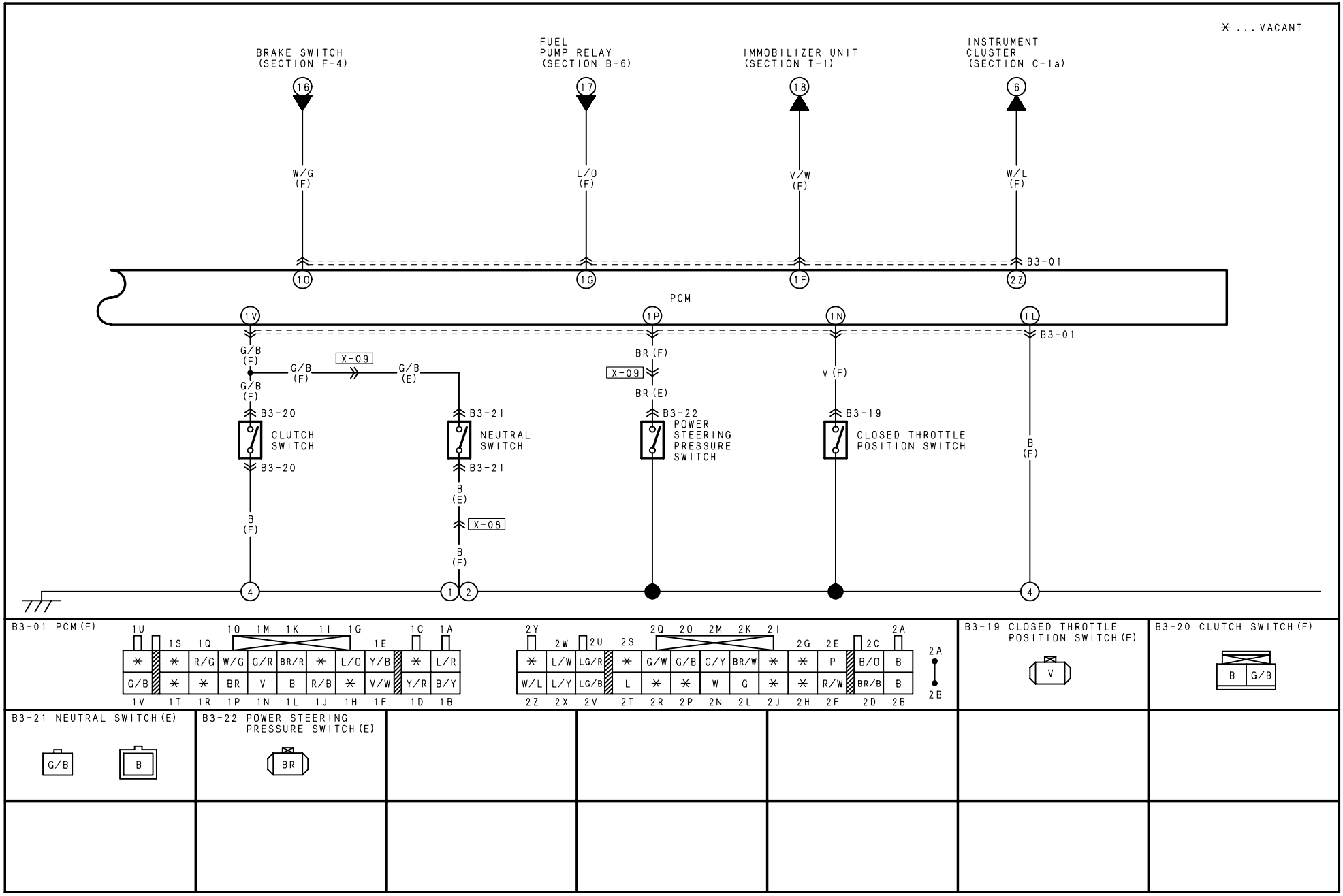



* . . . VACANT
MAIN RELAY (SECTION B-3a)
A/C RELAY (SECTION G-2)
REFRIGERANT PRESSURE SWITCH (SECTION G-2)
INSTRUMENT CLUSTER (SECTION C-1a)
FUEL INJECTOR No. 2
FUEL INJECTOR No. 4
FUEL INJECTOR No. 1
FUEL INJECTOR No. 3
IAC VALVE
PRC SOLENOID VALVE
PURGE SOLENOID VALVE
MASS AIR FLOW SENSOR
PCM
SENSOR GROUND
CONSTANT VOLTAGE (Vref)
INTAKE AIR TEMPERATURE SENSOR
THROTTLE POSITION SENSOR
O2 SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
B3-01 PCM (F)
B3-07 FUEL INJECTOR No. 2 (INJ)
B3-08 FUEL INJECTOR No. 4 (INJ)
B3-09 FUEL INJECTOR No. 1 (INJ)
B3-10 FUEL INJECTOR No. 3 (INJ)
B3-11 PRC SOLENOID VALVE (F)
B3-12 PURGE SOLENOID VALVE (F)
B3-13 MASS AIR FLOW SENSOR (F)
B3-14 IAC VALVE (INJ)
B3-15 INTAKE AIR TEMPERATURE SENSOR (F)
B3-16 THROTTLE POSITION SENSOR (INJ)
B3-17 O2 SENSOR (F)
B3-18 ENGINE COOLANT TEMPERATURE SENSOR (F)

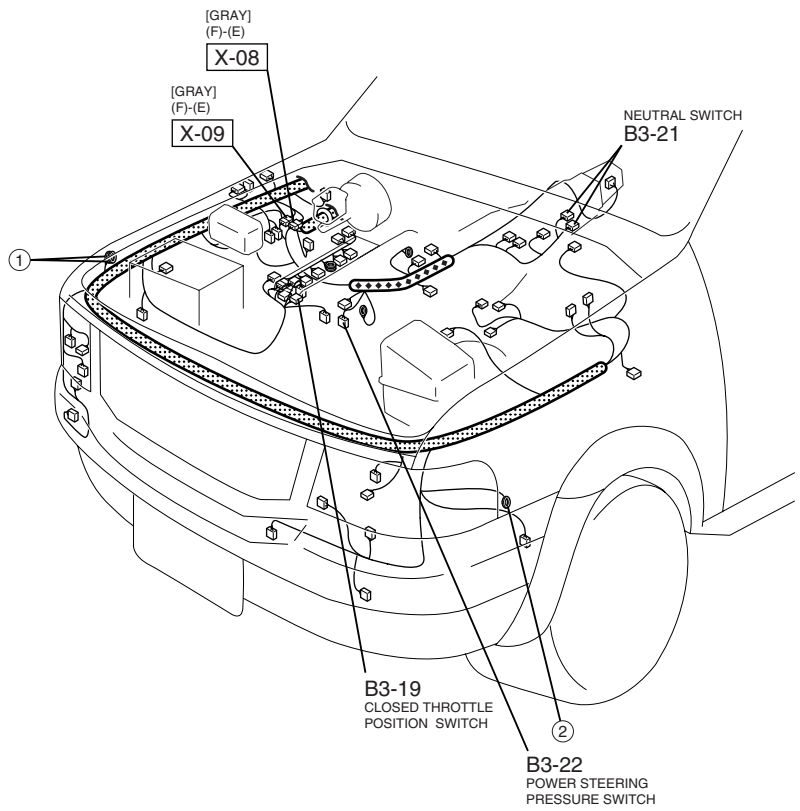
HARNESS SYMBOL: (F) (E) (R)

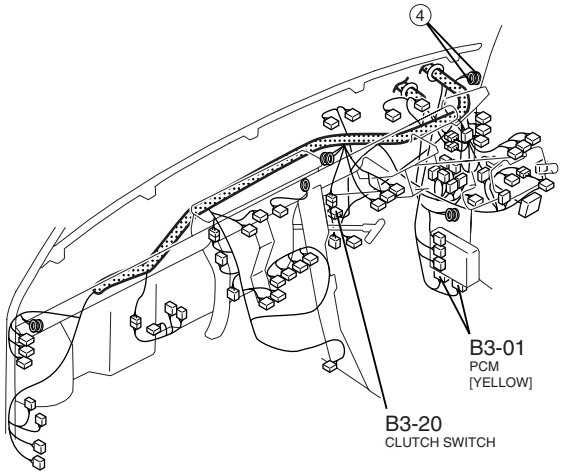


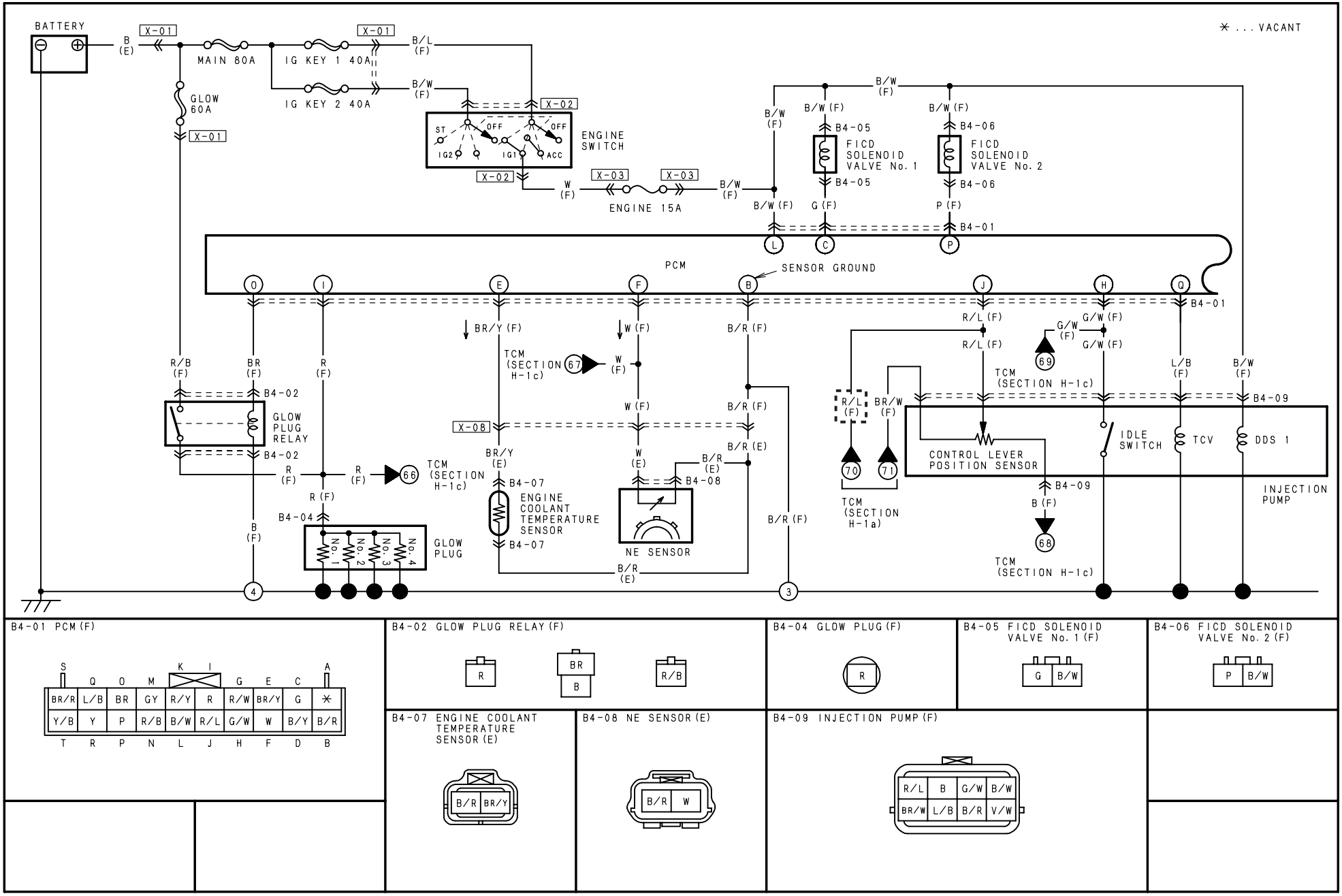



✳ . . . VACANT
BRAKE SWITCH (SECTION F-4)
FUEL PUMP RELAY (SECTION B-6)
IMMOBILIZER UNIT (SECTION T-1)
INSTRUMENT CLUSTER (SECTION C-1a)
16
17
18
6
W/G (F)
L/O (F)
V/W (F)
W/L (F)
B3-01
1O
1G
1F
2Z
PCM
1V
1P
1N
1L
G/B (F)
X-09
G/B (E)
BR (F)
BR (E)
V (F)
B3-20
B3-21
B3-22
B3-19
CLUTCH SWITCH
NEUTRAL SWITCH
POWER STEERING PRESSURE SWITCH
CLOSED THROTTLE POSITION SWITCH
B (E)
X-08
B (F)
4
1
2
B3-01 PCM (F)
1U 1S 1Q 1O 1M 1K 1I 1G 1E 1C 1A
✳ ✳ R/G W/G G/R BR/R ✳ L/O Y/B ✳ L/R
G/B ✳ ✳ BR V B R/B ✳ V/W Y/R B/Y
1V 1T 1R 1P 1N 1L 1J 1H 1F 1D 1B
2Y 2W 2U 2S 2Q 2O 2M 2K 2I 2G 2E 2C 2A
✳ L/W LG/R ✳ G/W G/B G/Y BR/W ✳ ✳ P B/O B
W/L L/Y LG/B L ✳ ✳ W G ✳ ✳ R/W BR/B B
2Z 2X 2V 2T 2R 2P 2N 2L 2J 2H 2F 2D 2B
2A
2B
B3-19 CLOSED THROTTLE POSITION SWITCH (F)
V
B3-20 CLUTCH SWITCH (F)
B G/B
B3-21 NEUTRAL SWITCH (E)
G/B
B
B3-22 POWER STEERING PRESSURE SWITCH (E)
BR

HARNESS SYMBOL: (F) (E) (R)







B4-01 PCM (F)

S	Q	O	M	K	I	G	E	C	A
BR/R	L/B	BR	GY	R/Y	R	R/W	BR/Y	G	✳
Y/B	Y	P	R/B	B/W	R/L	G/W	W	B/Y	B/R
T	R	P	N	L	J	H	F	D	B

B4-02 GLOW PLUG RELAY (F)

B4-04 GLOW PLUG (F)

B4-05 FICD SOLENOID VALVE No. 1 (F)

B4-06 FICD SOLENOID VALVE No. 2 (F)

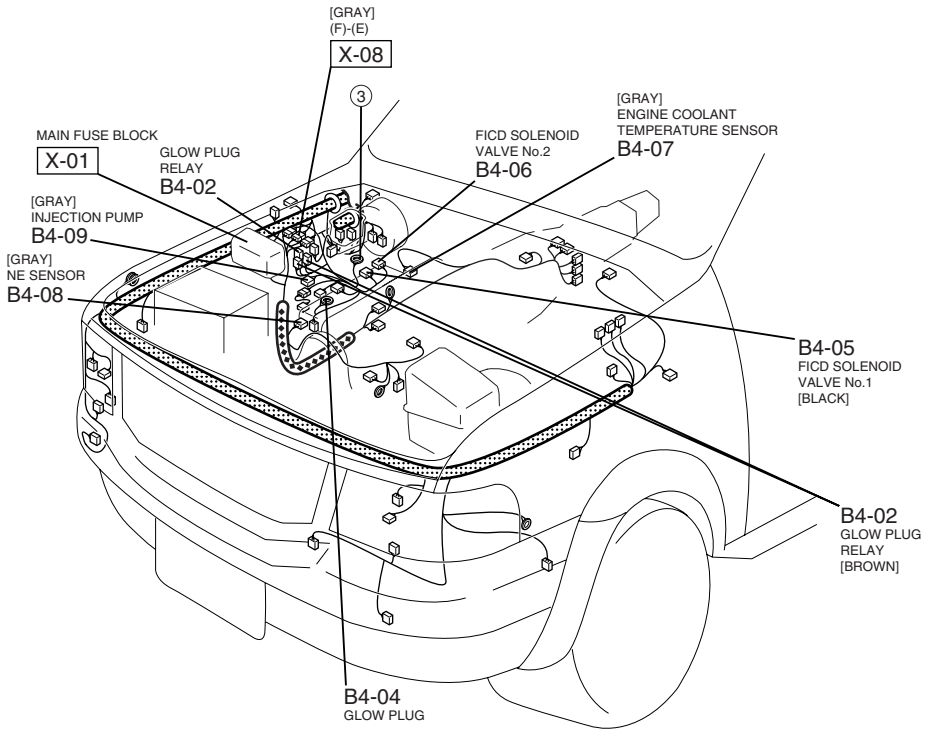
B4-07 ENGINE COOLANT TEMPERATURE SENSOR (E)

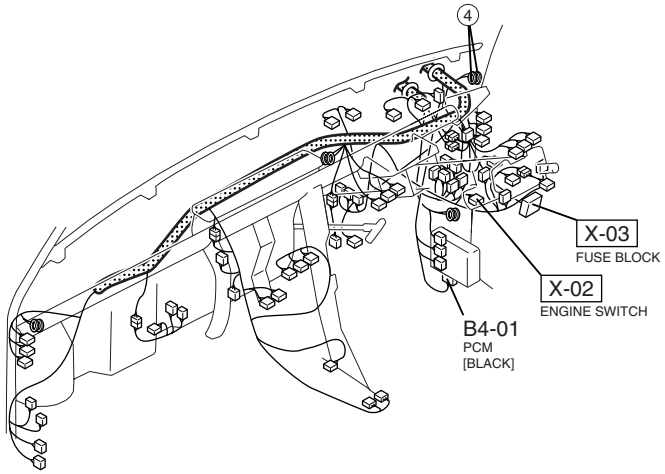
B4-08 NE SENSOR (E)

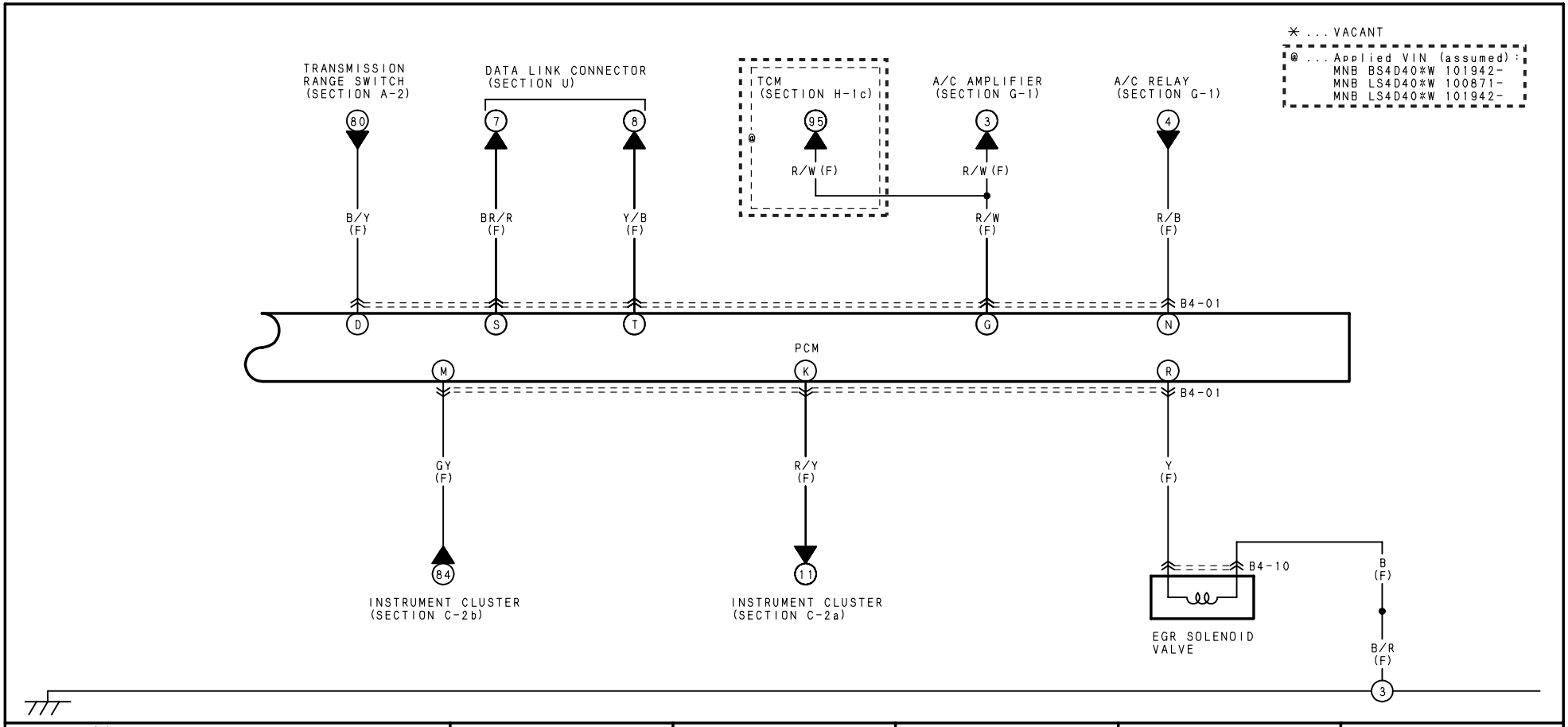
B4-09 INJECTION PUMP (F)

R/L	B	G/W	B/W
BR/W	L/B	B/R	V/W

HARNESS SYMBOL: (F) (E) (R)







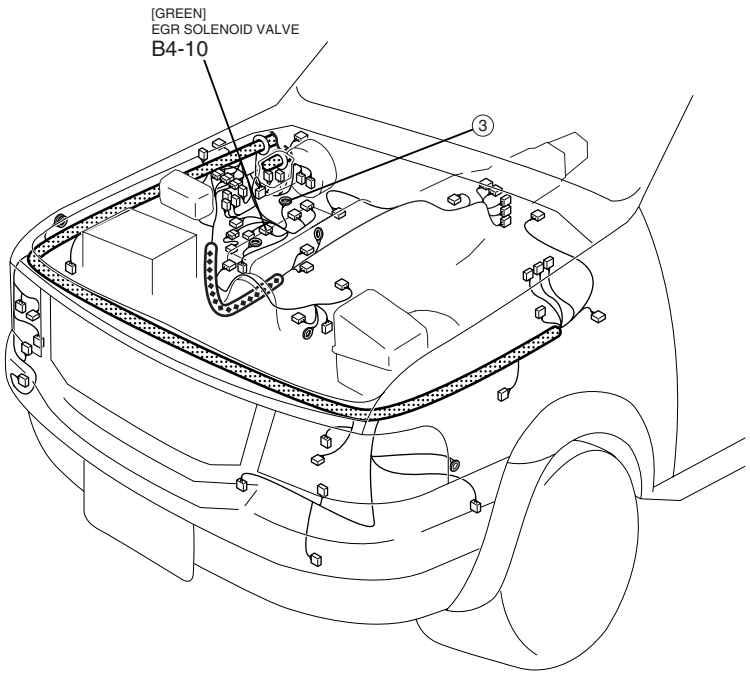
B4-01 PCM (F)

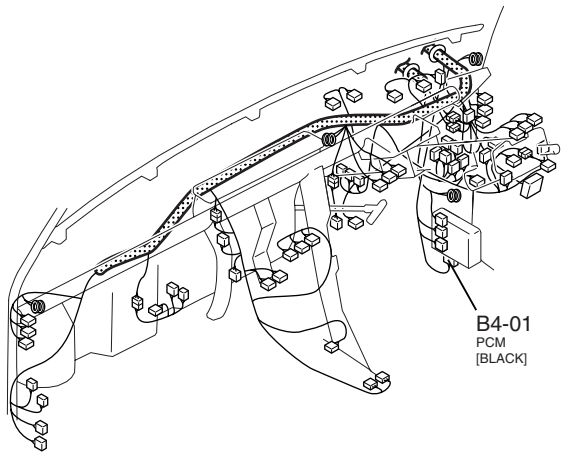
S	Q	O	M	K	I	G	E	C	A
BR/R	L/B	BR	GY	R/Y	R	R/W	BR/Y	G	✳
Y/B	Y	P	R/B	B/W	R/L	G/W	W	B/Y	B/R
T	R	P	N	L	J	H	F	D	B

B4-10 EGR SOLENOID VALVE (F)

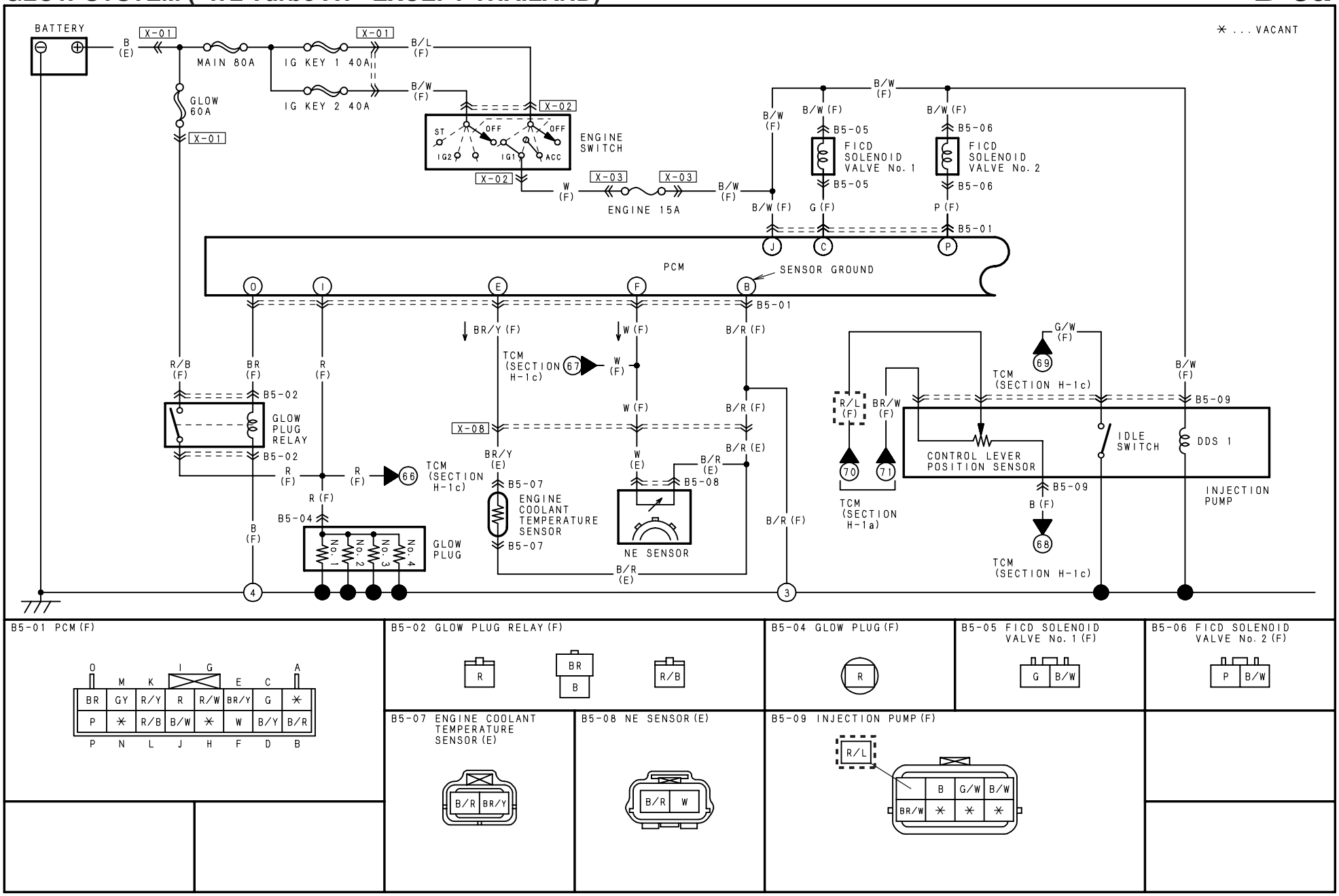
B	Y

HARNESS SYMBOL: (F) (E) (R)





ENGINE CONTROL SYSTEM ("WL Turbo AT" EXCEPT THAILAND) / GLOW SYSTEM ("WL Turbo AT" EXCEPT THAILAND)



B5-01 PCM (F)

B5-02 GLOW PLUG RELAY (F)

B5-04 GLOW PLUG (F)

B5-05 FICD SOLENOID VALVE No. 1 (F)

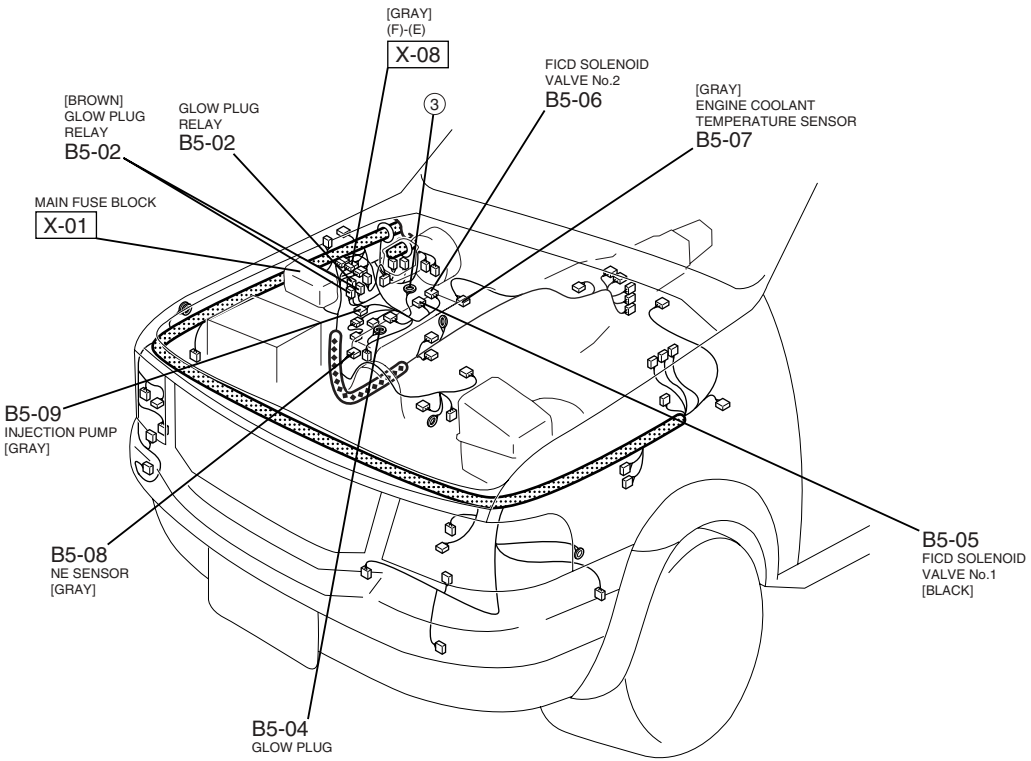
B5-06 FICD SOLENOID VALVE No. 2 (F)

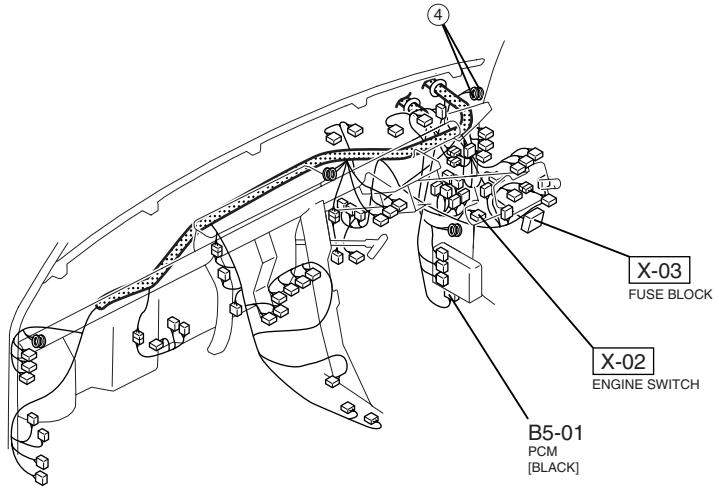
B5-07 ENGINE COOLANT TEMPERATURE SENSOR (E)

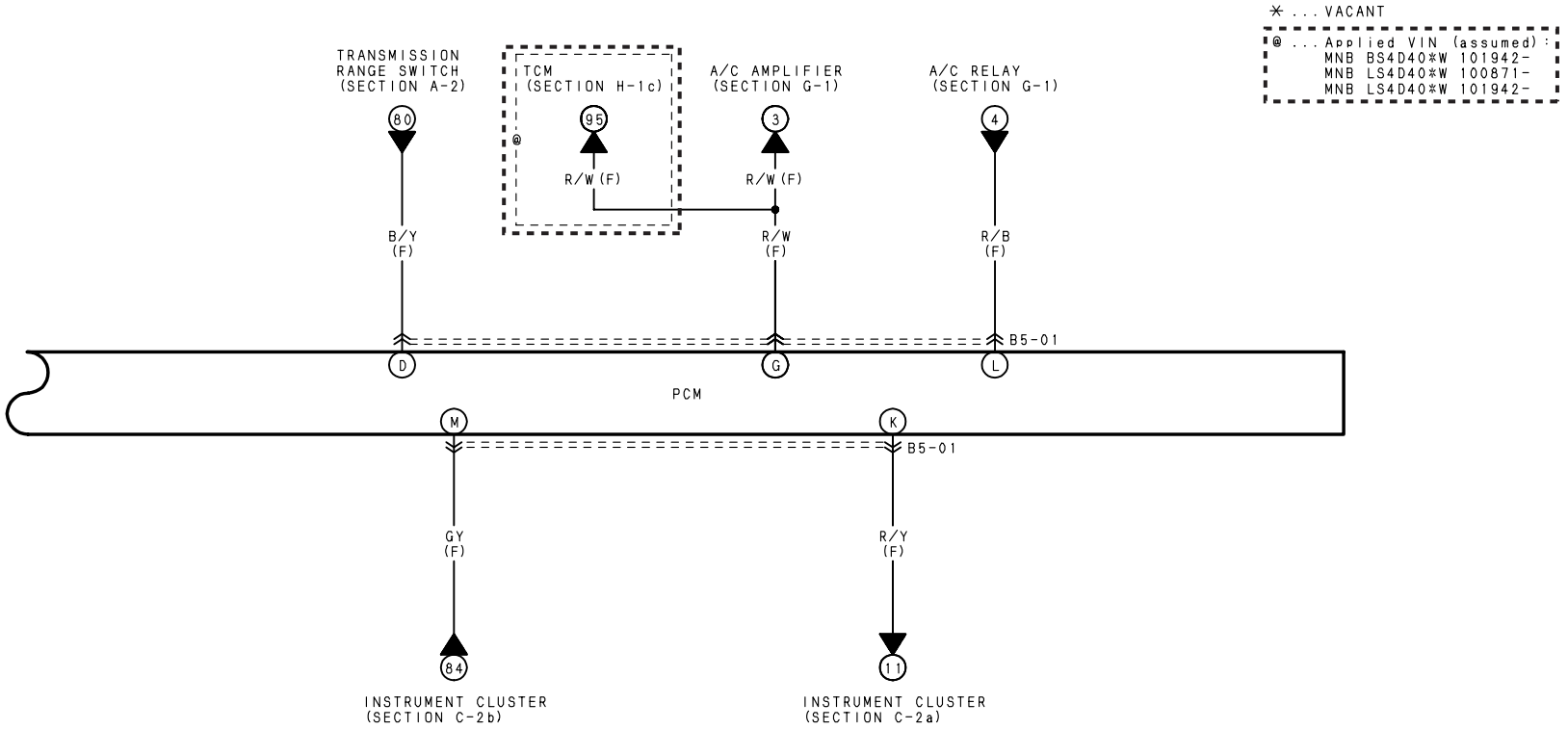
B5-08 NE SENSOR (E)

B5-09 INJECTION PUMP (F)

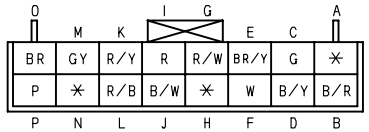
HARNESS SYMBOL: (F) (E) (R)



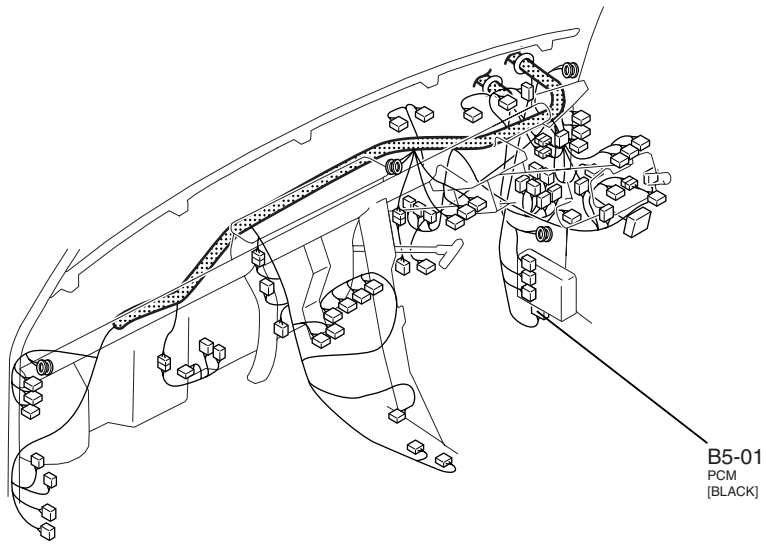


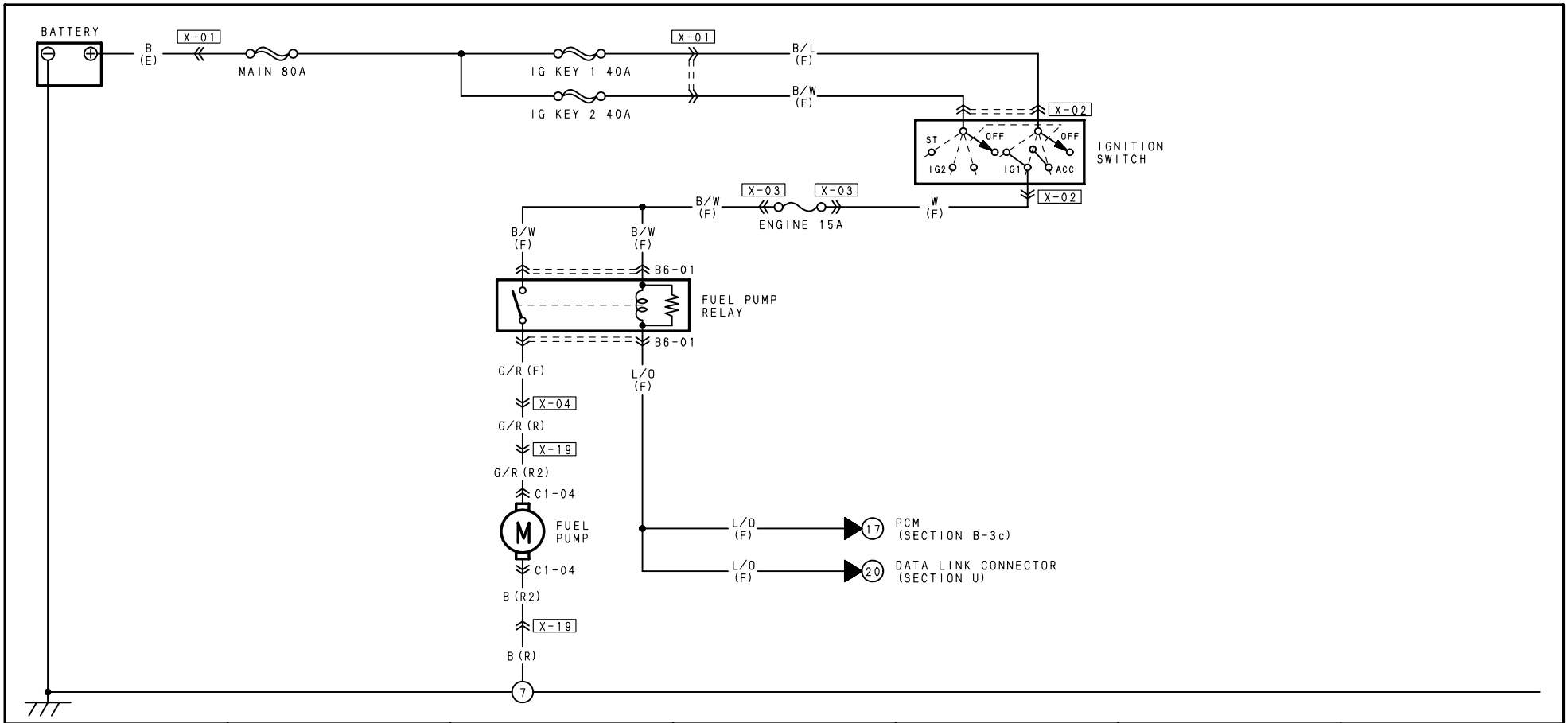

✳ . . . VACANT
@ . . . Applied VIN (assumed):
MNB BS4D40*W 101942-
MNB LS4D40*W 100871-
MNB LS4D40*W 101942-
TRANSMISSION RANGE SWITCH (SECTION A-2)
TCM (SECTION H-1c)
A/C AMPLIFIER (SECTION G-1)
A/C RELAY (SECTION G-1)
80
95
3
4
@
R/W (F)
R/W (F)
B/Y (F)
R/W (F)
R/B (F)
B5-01
D
G
L
PCM
M
K
B5-01
GY (F)
R/Y (F)
84
11
INSTRUMENT CLUSTER (SECTION C-2b)
INSTRUMENT CLUSTER (SECTION C-2a)

B5-01 PCM (F)

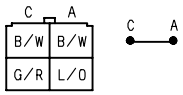

O
M
K
I
G
E
C
A
BR
GY
R/Y
R
R/W
BR/Y
G
✳
P
✳
R/B
B/W
✳
W
B/Y
B/R
P
N
L
J
H
F
D
B

HARNESS SYMBOL: (F) (E) (R)





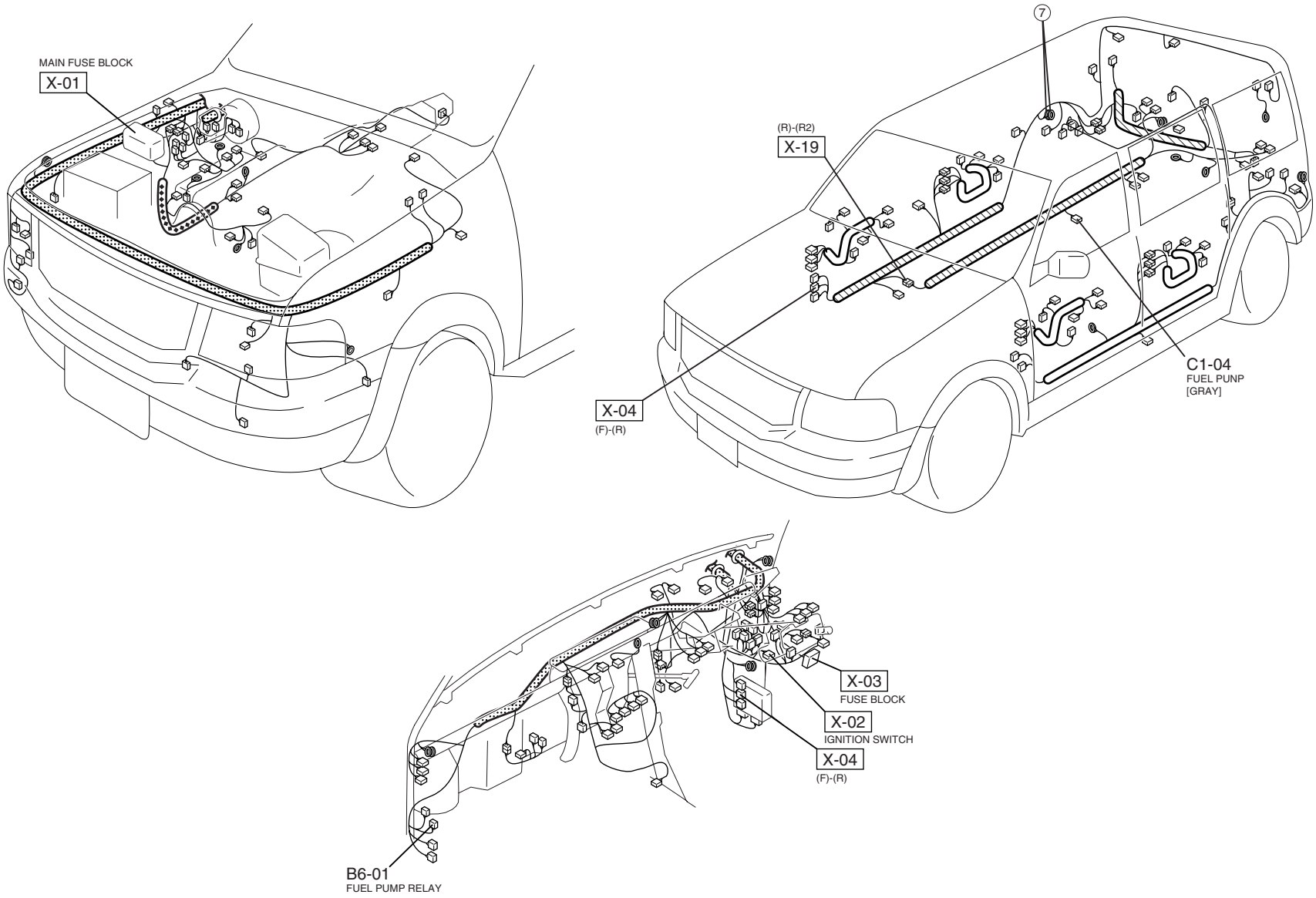
B6-01 FUEL PUMP RELAY (F)



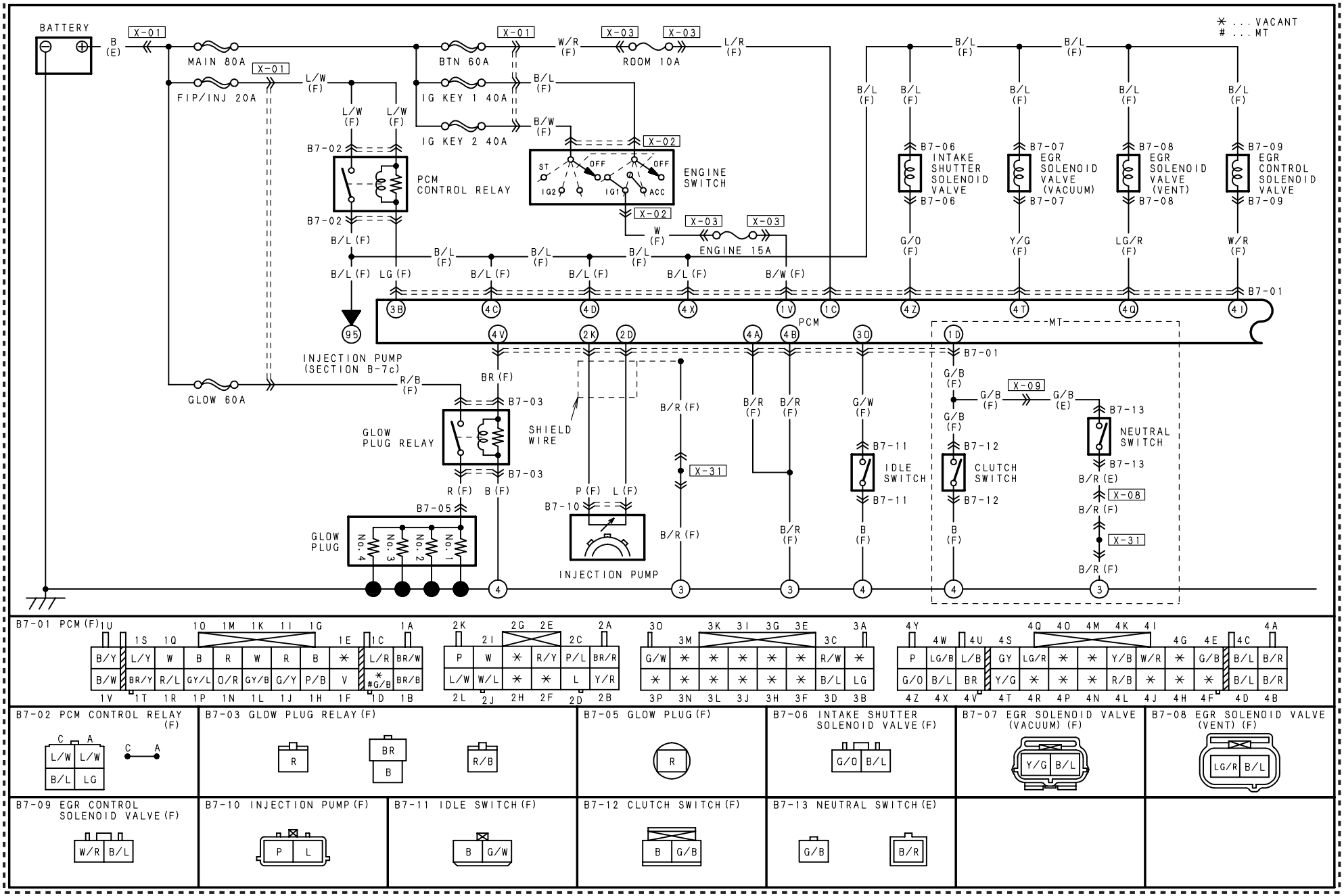
C1-04 FUEL PUMP (R2)



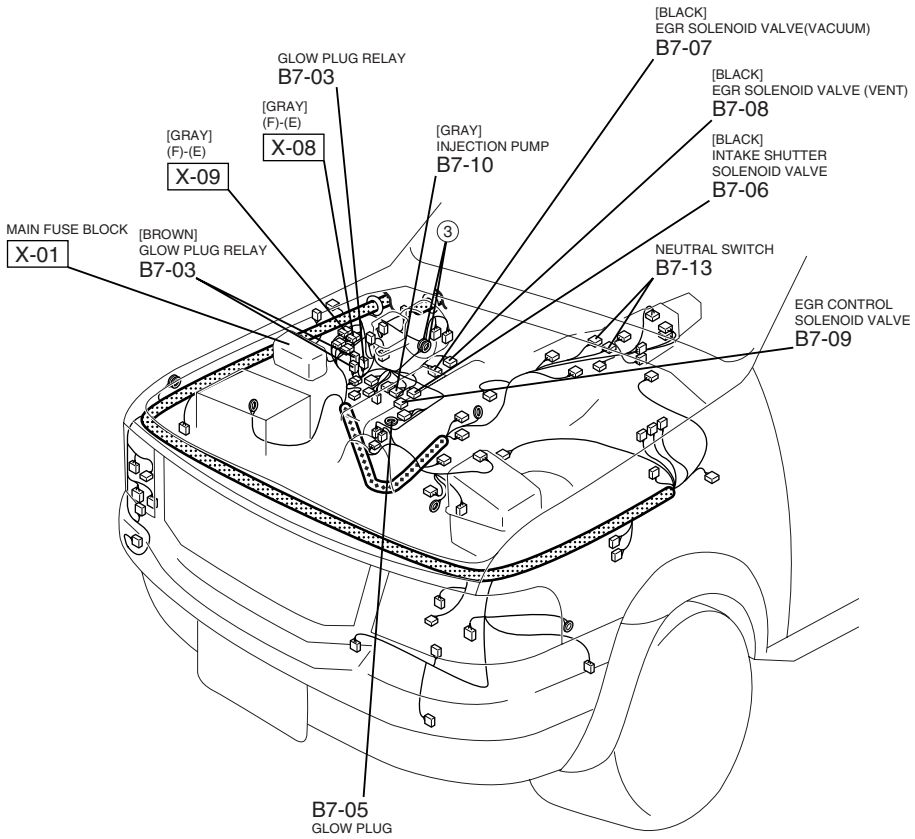
HARNESS SYMBOL: (F) (E) (R)

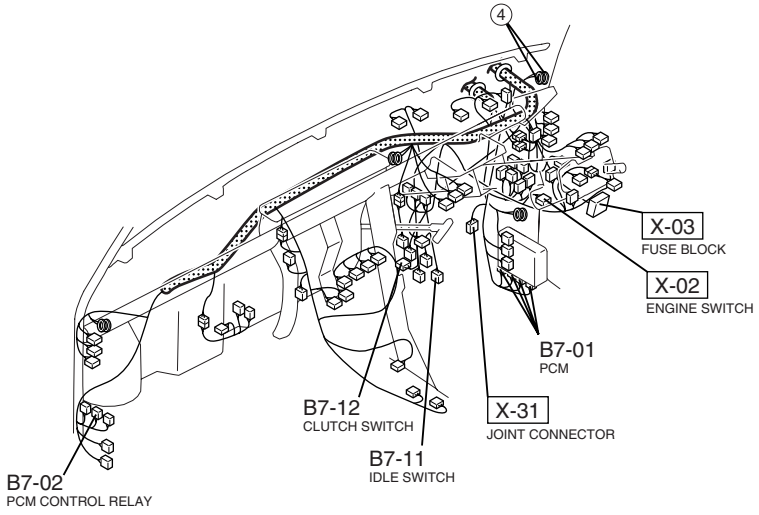


ENGINE CONTROL SYSTEM (WL Turbo Stage-Ⅲ) / GLOW SYSTEM (WL Turbo Stage-Ⅲ)

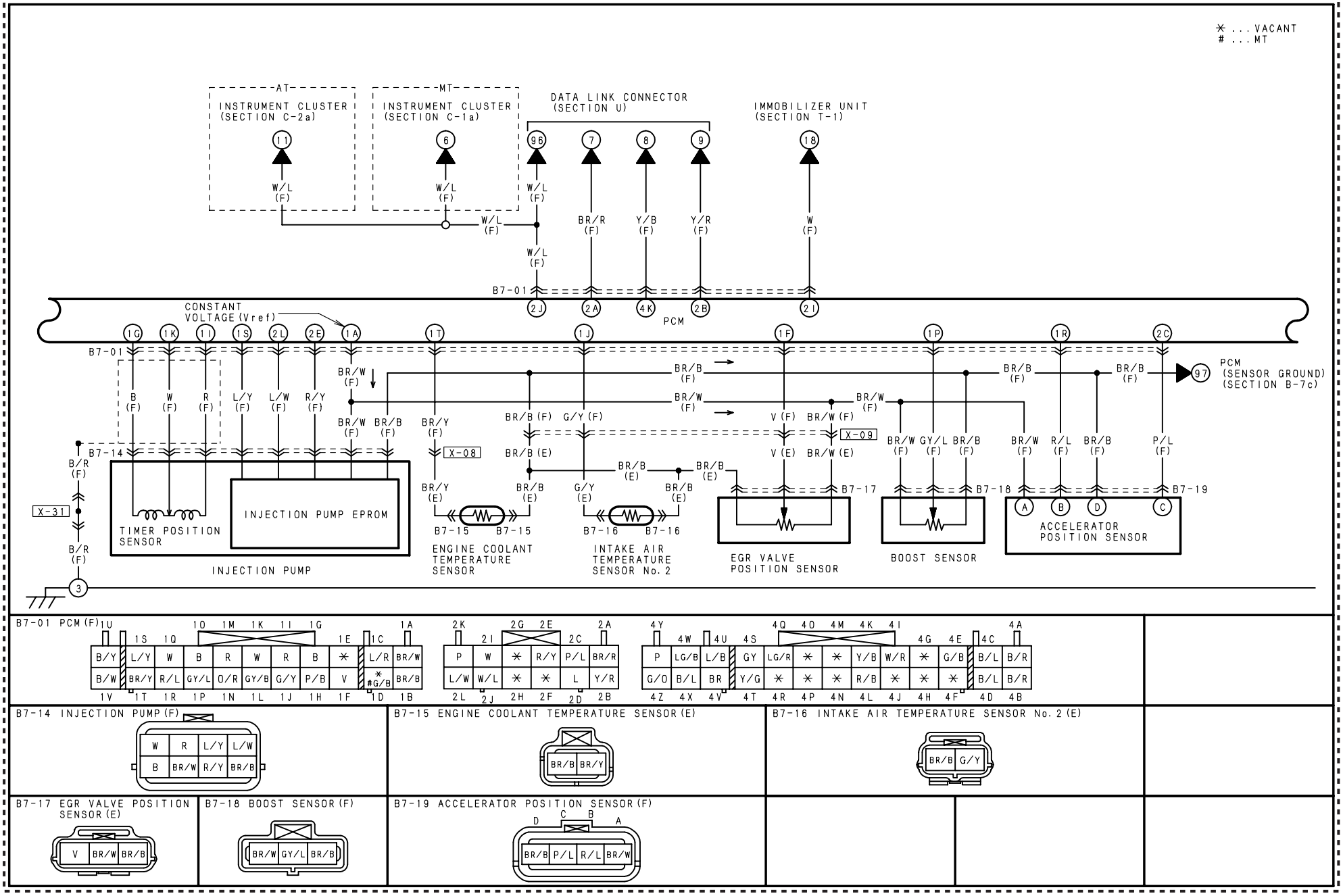


HARNESS SYMBOL: (F) (E) (R)

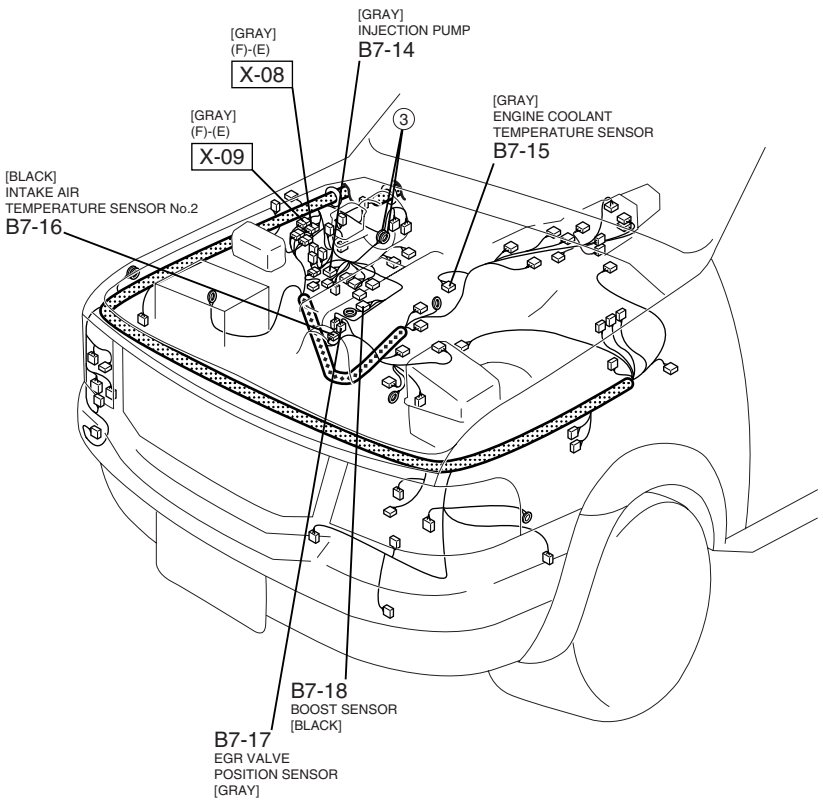


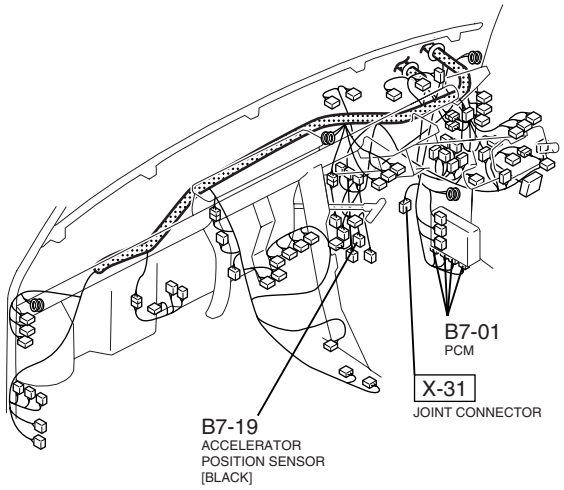


B-7a

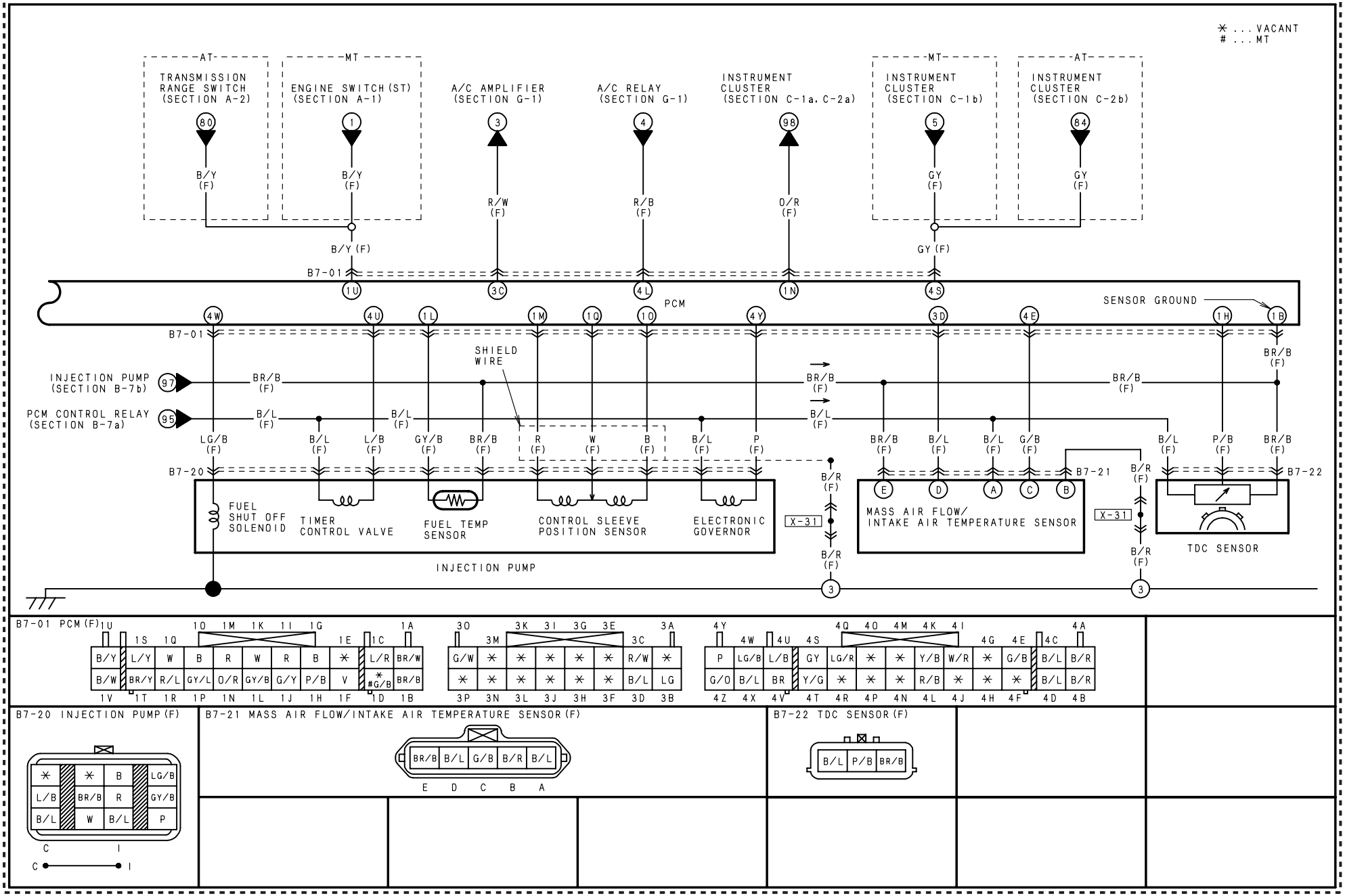

✳ . . . VACANT
. . . MT
AT
INSTRUMENT CLUSTER (SECTION C-2a)
MT
INSTRUMENT CLUSTER (SECTION C-1a)
DATA LINK CONNECTOR (SECTION U)
IMMOBILIZER UNIT (SECTION T-1)
CONSTANT VOLTAGE (Vref)
PCM
PCM (SENSOR GROUND) (SECTION B-7c)
INJECTION PUMP
TIMER POSITION SENSOR
INJECTION PUMP EPROM
ENGINE COOLANT TEMPERATURE SENSOR
INTAKE AIR TEMPERATURE SENSOR No. 2
EGR VALVE POSITION SENSOR
BOOST SENSOR
ACCELERATOR POSITION SENSOR
B7-01 PCM (F)
B7-14 INJECTION PUMP (F)
B7-15 ENGINE COOLANT TEMPERATURE SENSOR (E)
B7-16 INTAKE AIR TEMPERATURE SENSOR No. 2 (E)
B7-17 EGR VALVE POSITION SENSOR (E)
B7-18 BOOST SENSOR (F)
B7-19 ACCELERATOR POSITION SENSOR (F)

HARNESS SYMBOL: (F) (E) (R)

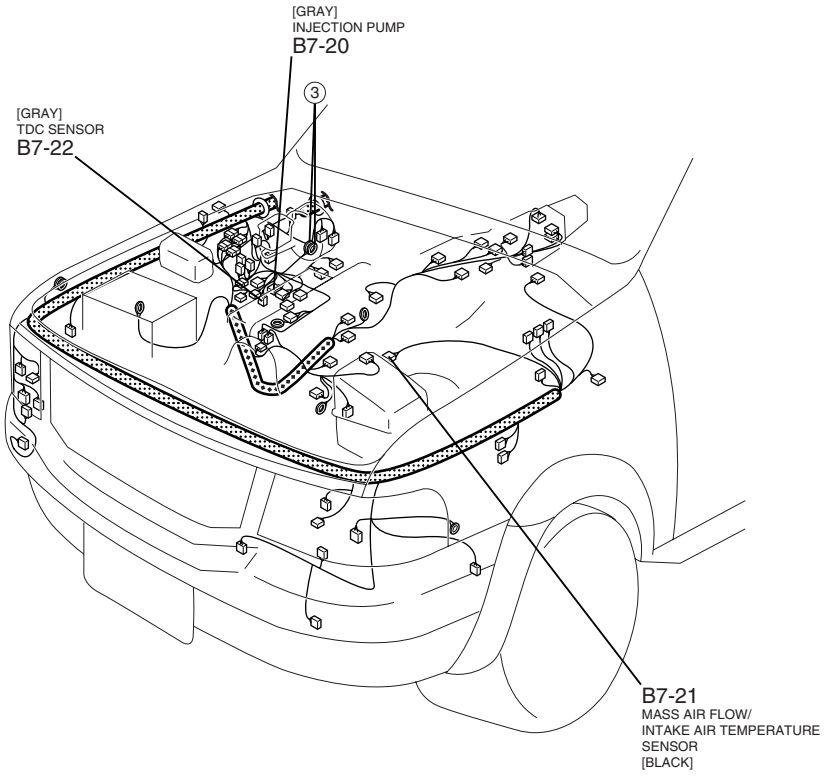


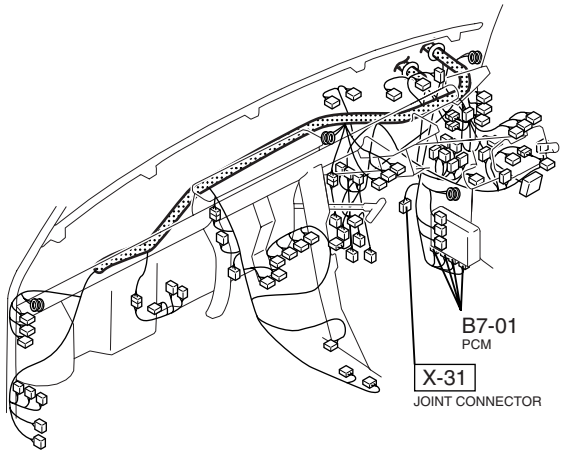


B-7b


✳ . . . VACANT
. . . MT
AT
TRANSMISSION RANGE SWITCH (SECTION A-2)
MT
ENGINE SWITCH (ST) (SECTION A-1)
A/C AMPLIFIER (SECTION G-1)
A/C RELAY (SECTION G-1)
INSTRUMENT CLUSTER (SECTION C-1a, C-2a)
MT
INSTRUMENT CLUSTER (SECTION C-1b)
AT
INSTRUMENT CLUSTER (SECTION C-2b)
B/Y (F)
R/W (F)
R/B (F)
O/R (F)
GY (F)
B7-01
PCM
SENSOR GROUND
SHIELD WIRE
INJECTION PUMP (SECTION B-7b)
PCM CONTROL RELAY (SECTION B-7a)
BR/B (F)
B/L (F)
LG/B (F)
L/B (F)
GY/B (F)
R (F)
W (F)
B (F)
P (F)
B7-20
FUEL SHUT OFF SOLENOID
TIMER CONTROL VALVE
FUEL TEMP SENSOR
CONTROL SLEEVE POSITION SENSOR
ELECTRONIC GOVERNOR
INJECTION PUMP
X-31
MASS AIR FLOW/ INTAKE AIR TEMPERATURE SENSOR
B7-21
TDC SENSOR
B7-22
B7-01 PCM (F)
B7-20 INJECTION PUMP (F)
B7-21 MASS AIR FLOW/INTAKE AIR TEMPERATURE SENSOR (F)
B7-22 TDC SENSOR (F)

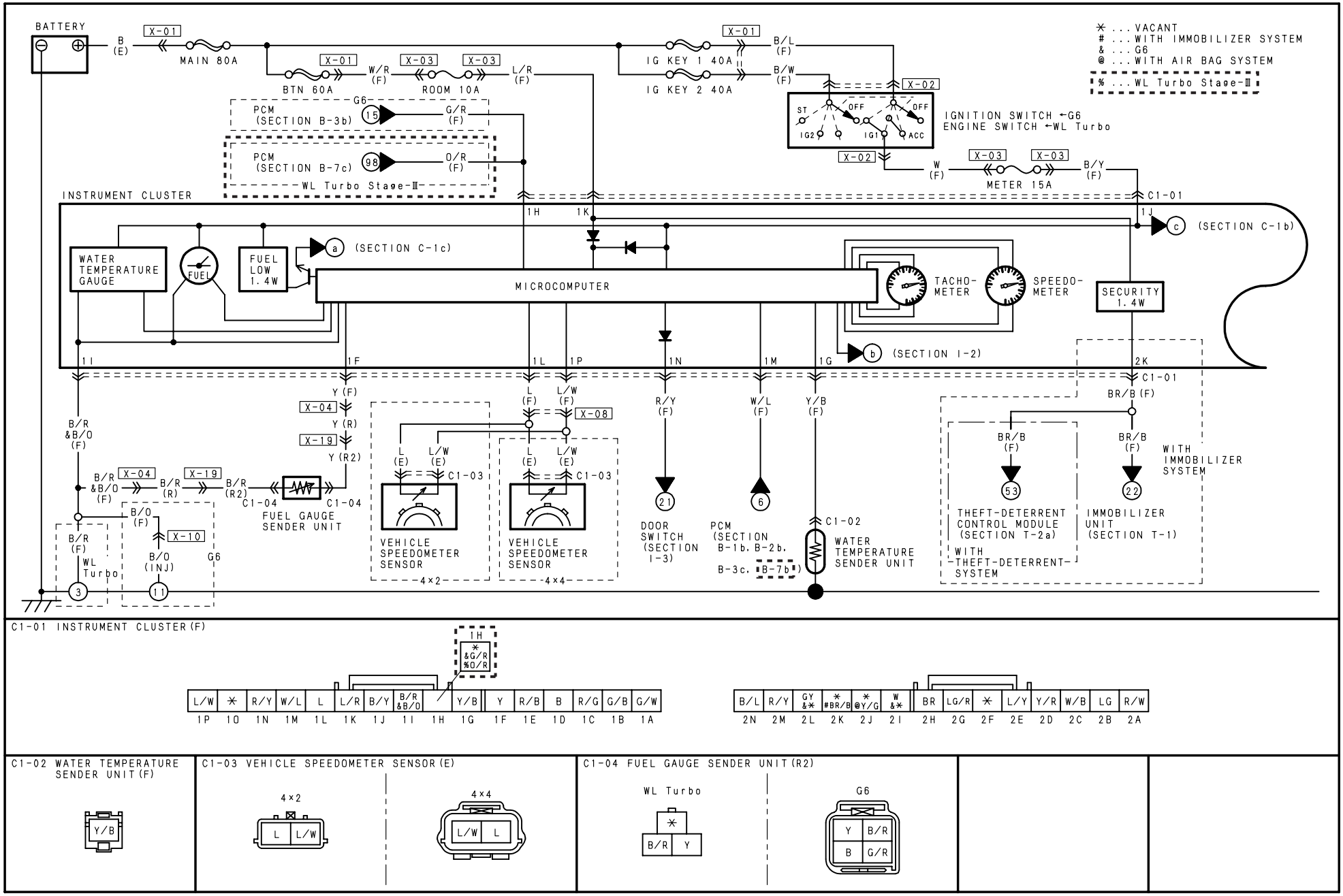
HARNESS SYMBOL: (F) (E) (R)



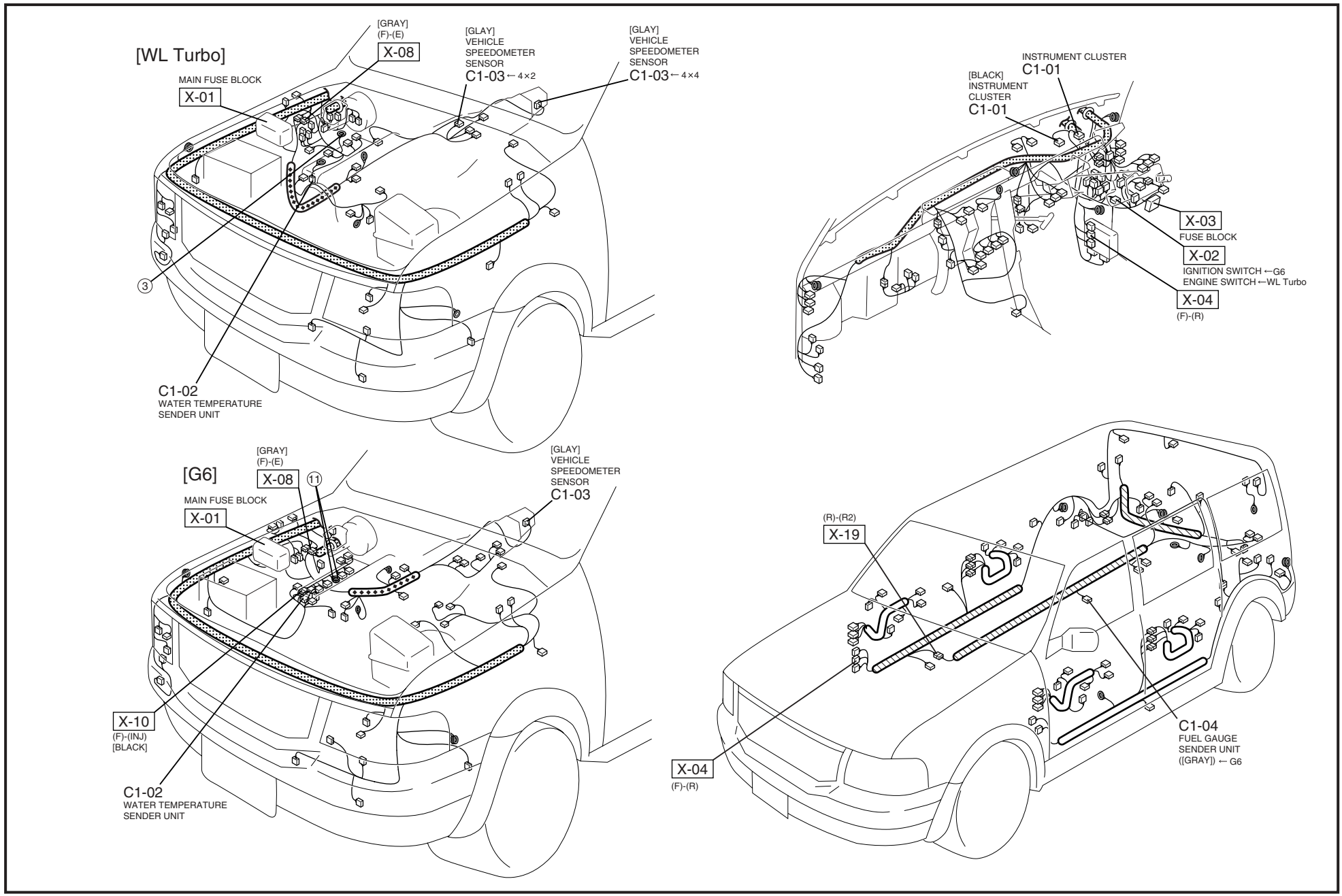


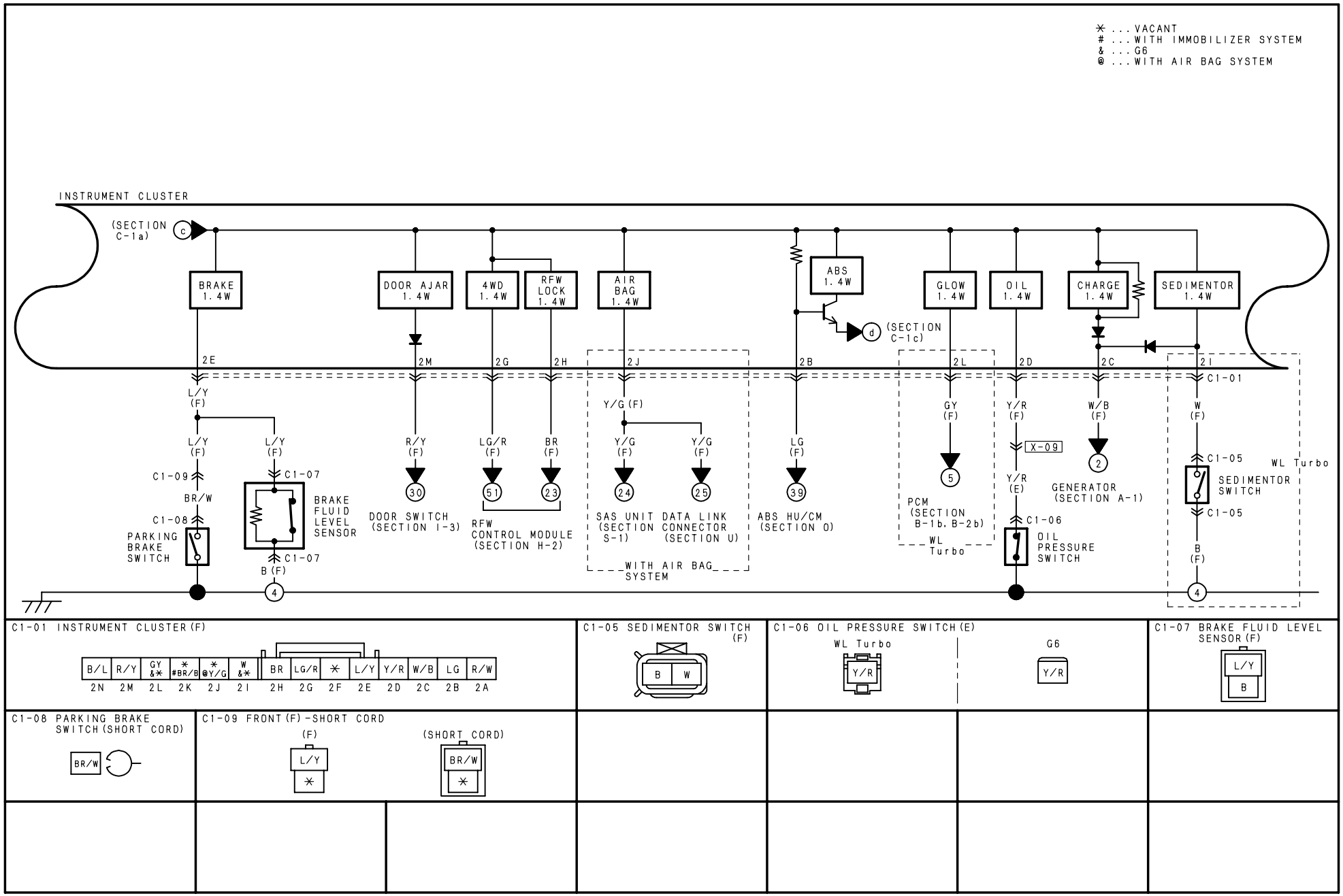
B-7c

INSTRUMENT CLUSTER (MT)



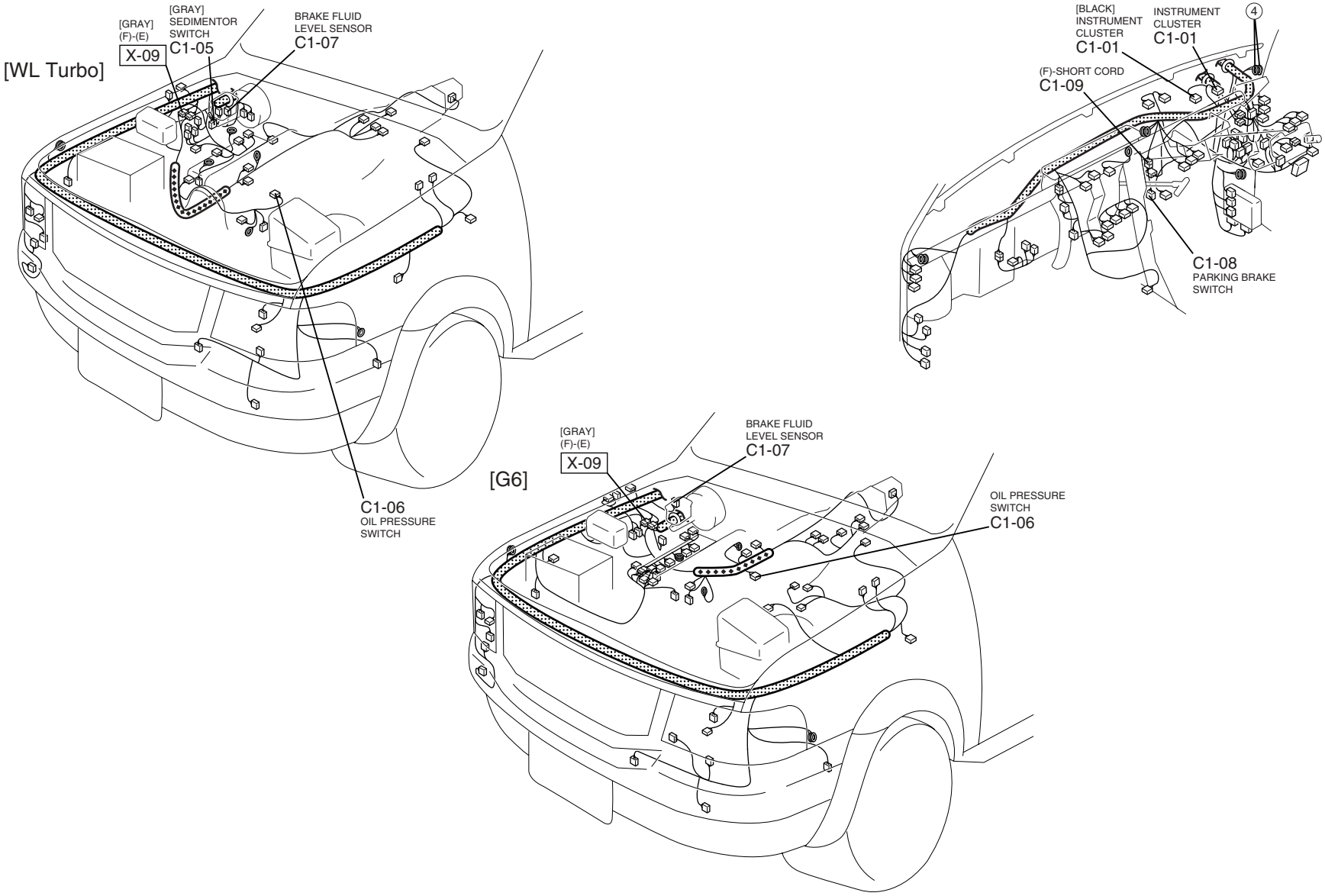
HARNESS SYMBOL: (F) (E) (R)

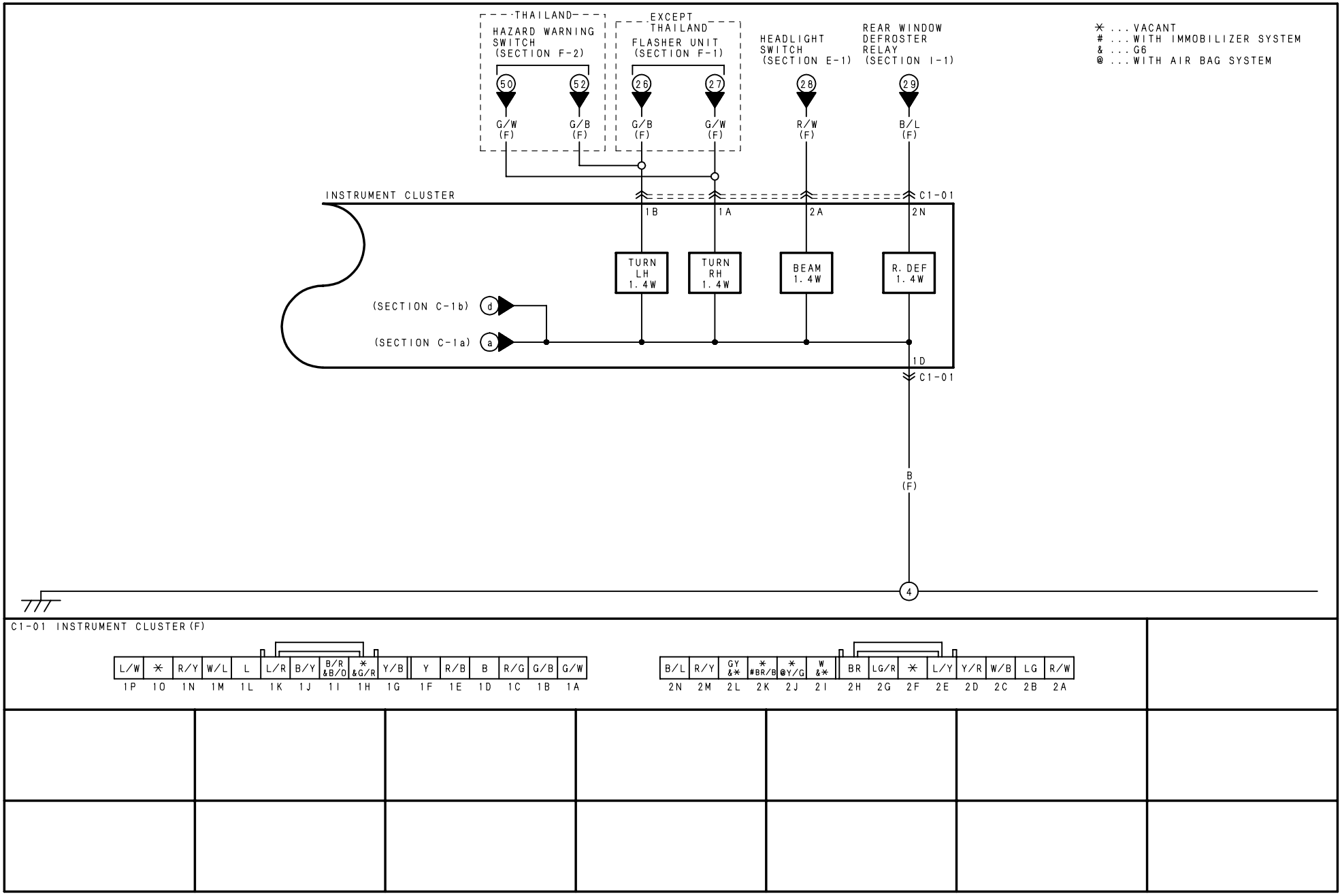



✳ . . . VACANT
. . . WITH IMMOBILIZER SYSTEM
& . . . G6
@ . . . WITH AIR BAG SYSTEM
INSTRUMENT CLUSTER
(SECTION C-1a)
BRAKE 1.4W
DOOR AJAR 1.4W
4WD 1.4W
RFW LOCK 1.4W
AIR BAG 1.4W
ABS 1.4W
GLOW 1.4W
OIL 1.4W
CHARGE 1.4W
SEDIMENTOR 1.4W
(SECTION C-1c)
2E
2M
2G
2H
2J
2B
2L
2D
2C
2I
C1-01
L/Y (F)
Y/G (F)
GY (F)
Y/R (F)
W/B (F)
W (F)
C1-09
BR/W
C1-08
PARKING BRAKE SWITCH
C1-07
BRAKE FLUID LEVEL SENSOR
B (F)
R/Y (F)
30
DOOR SWITCH (SECTION I-3)
LG/R (F)
51
BR (F)
23
RFW CONTROL MODULE (SECTION H-2)
Y/G (F)
24
25
SAS UNIT (SECTION S-1)
DATA LINK CONNECTOR (SECTION U)
WITH AIR BAG SYSTEM
LG (F)
39
ABS HU/CM (SECTION O)
5
PCM (SECTION B-1b, B-2b)
WL Turbo
X-09
Y/R (E)
C1-06
OIL PRESSURE SWITCH
2
GENERATOR (SECTION A-1)
C1-05
SEDIMENTOR SWITCH
WL Turbo
4

C1-01 INSTRUMENT CLUSTER (F)
B/L R/Y GY &✳ ✳ #BR/B @Y/G W &✳ BR LG/R ✳ L/Y Y/R W/B LG R/W
2N 2M 2L 2K 2J 2I 2H 2G 2F 2E 2D 2C 2B 2A
C1-05 SEDIMENTOR SWITCH (F)
B W
C1-06 OIL PRESSURE SWITCH (E)
WL Turbo
Y/R
G6
Y/R
C1-07 BRAKE FLUID LEVEL SENSOR (F)
L/Y
B
C1-08 PARKING BRAKE SWITCH (SHORT CORD)
BR/W
C1-09 FRONT (F) -SHORT CORD
(F)
L/Y
✳
(SHORT CORD)
BR/W
✳

HARNESS SYMBOL: (F) (E) (R)



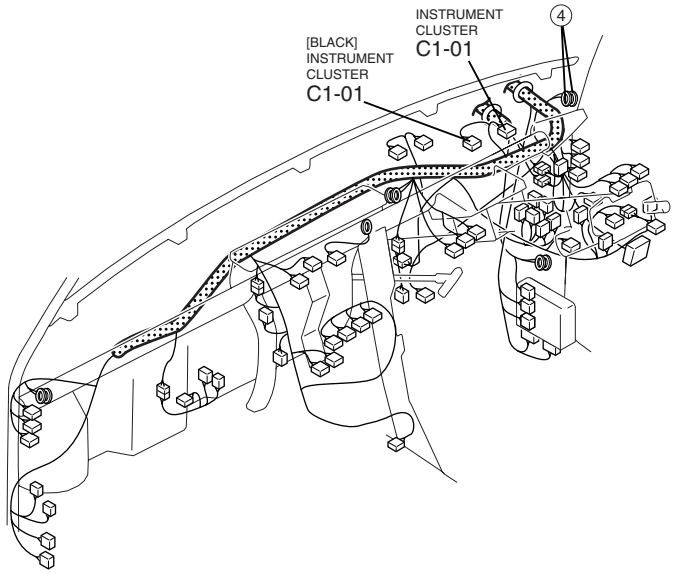


C1-01 INSTRUMENT CLUSTER (F)

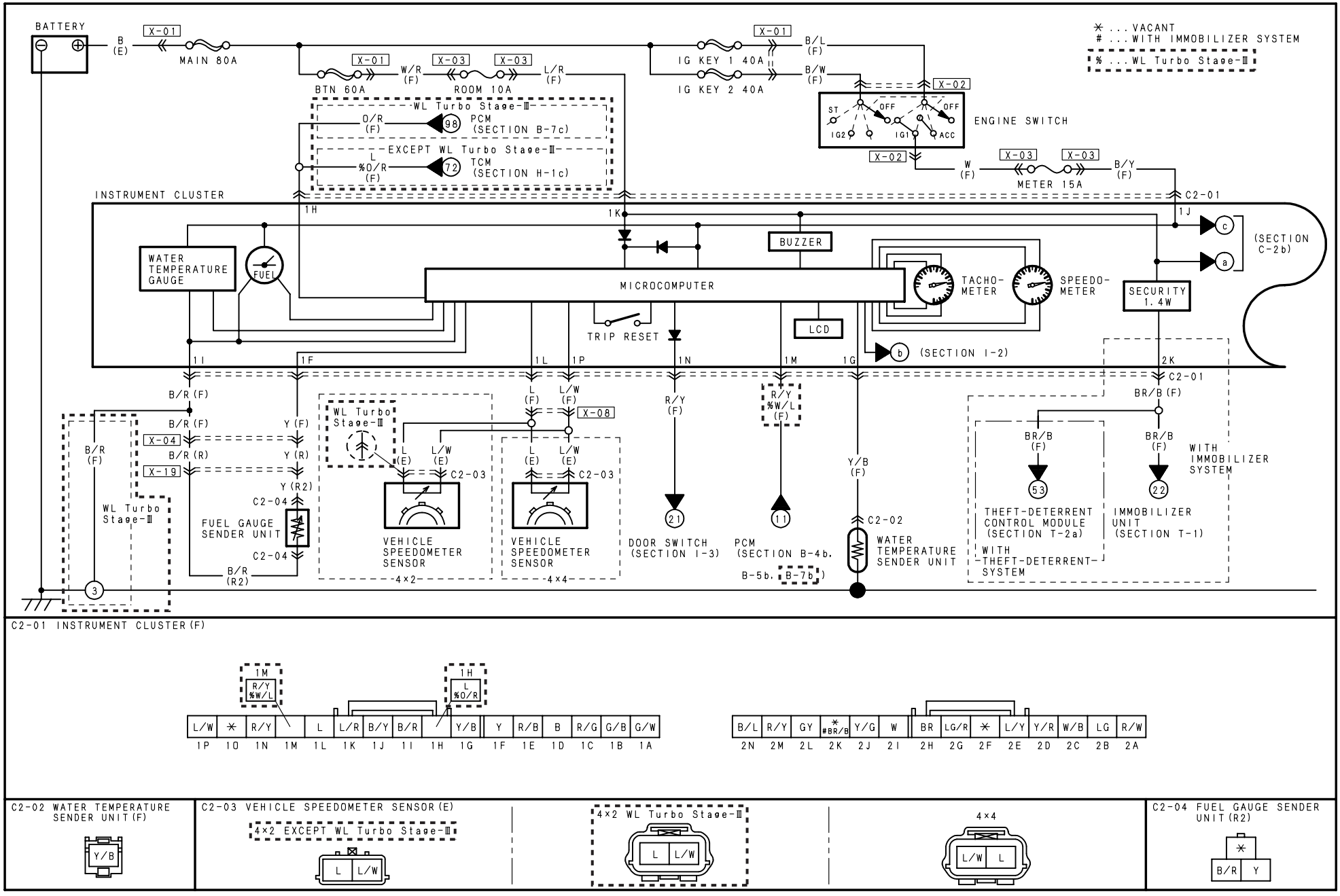
L/W	✳	R/Y	W/L	L	L/R	B/Y	B/R &B/O	✳ &G/R	Y/B	Y	R/B	B	R/G	G/B	G/W
1P	1O	1N	1M	1L	1K	1J	1I	1H	1G	1F	1E	1D	1C	1B	1A

B/L	R/Y	GY &✳	✳ #BR/B	✳ @Y/G	W &✳	BR	LG/R	✳	L/Y	Y/R	W/B	LG	R/W
2N	2M	2L	2K	2J	2I	2H	2G	2F	2E	2D	2C	2B	2A

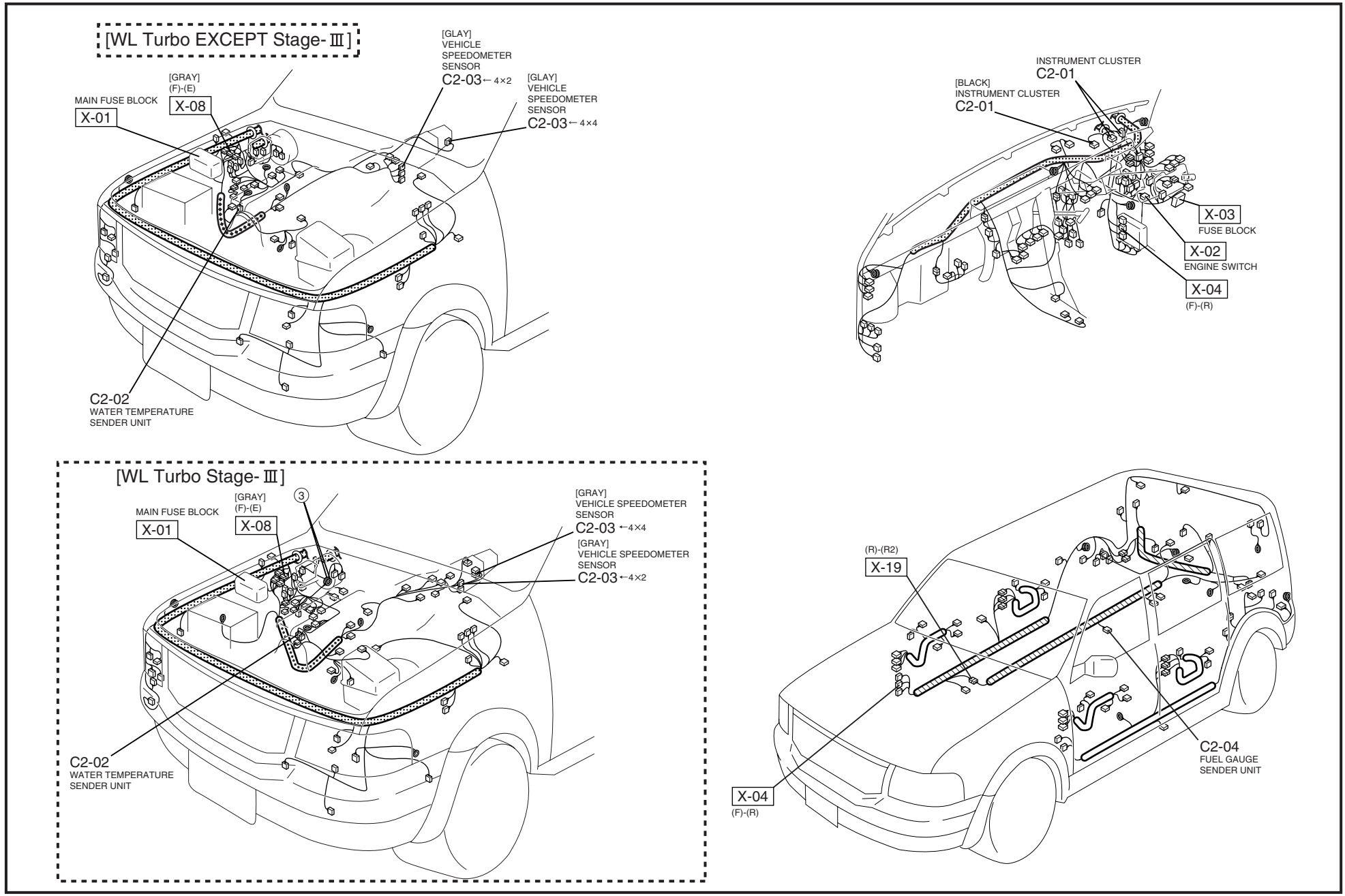
HARNESS SYMBOL: (F) (E) (R)

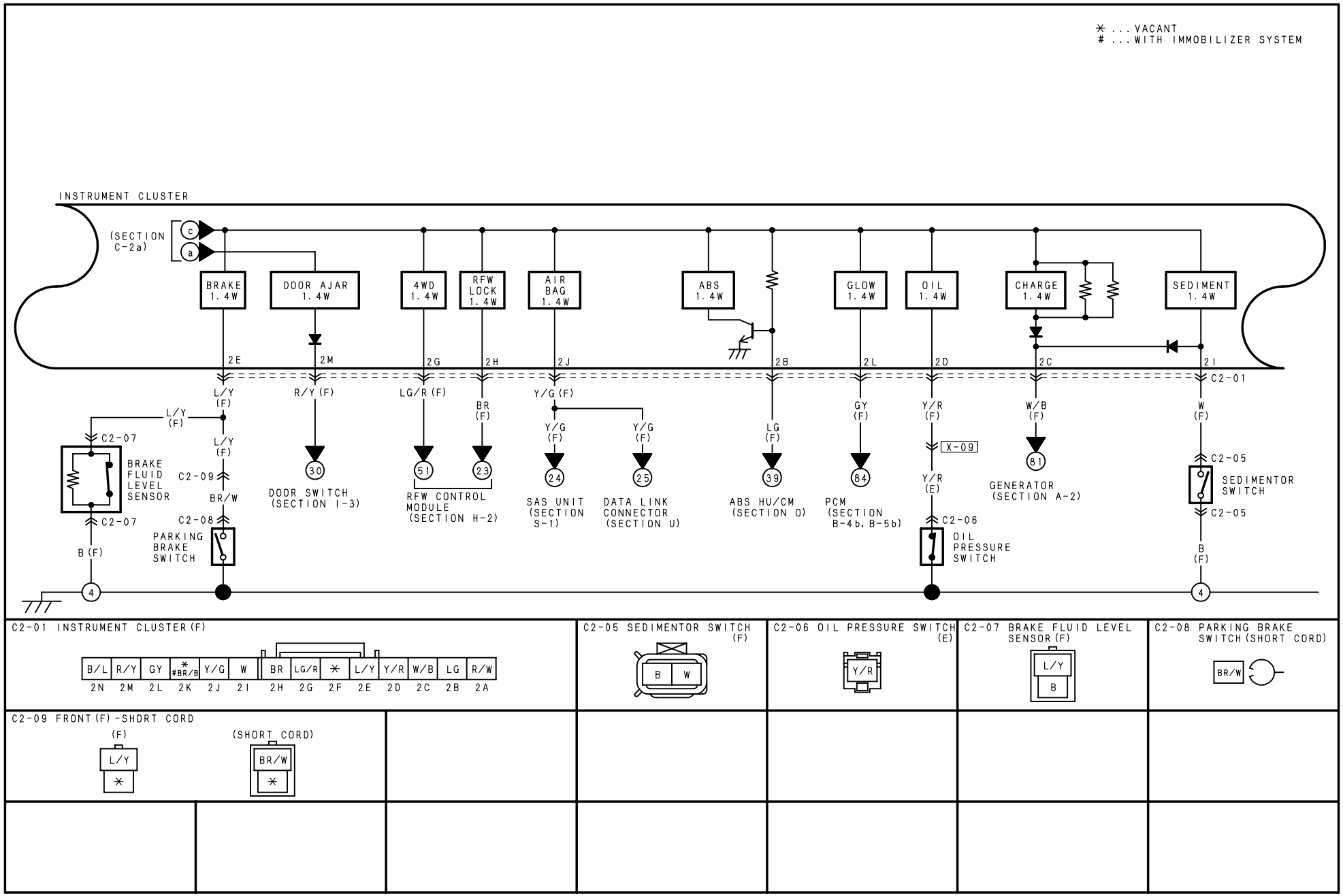


INSTRUMENT CLUSTER (AT)

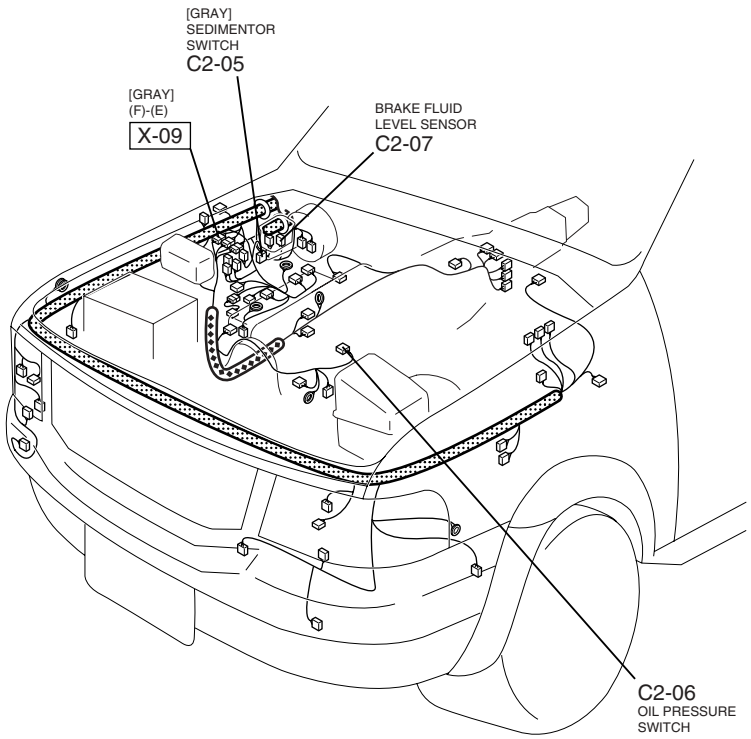


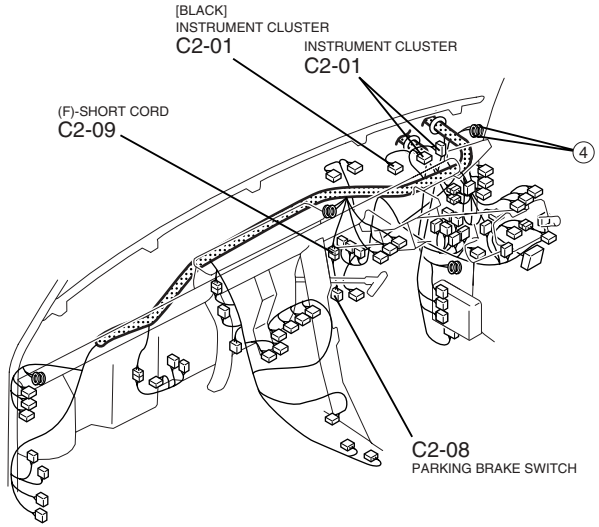
HARNESS SYMBOL: (F) (E) (R)




✳ . . . VACANT
. . . WITH IMMOBILIZER SYSTEM
INSTRUMENT CLUSTER
(SECTION C-2a)
BRAKE 1.4W
DOOR AJAR 1.4W
4WD 1.4W
RFW LOCK 1.4W
AIR BAG 1.4W
ABS 1.4W
GLOW 1.4W
OIL 1.4W
CHARGE 1.4W
SEDIMENT 1.4W
2E
2M
2G
2H
2J
2B
2L
2D
2C
2I
C2-01
L/Y (F)
R/Y (F)
LG/R (F)
BR (F)
Y/G (F)
LG (F)
GY (F)
Y/R (F)
W/B (F)
W (F)
C2-07
C2-09
C2-08
BR/W
B (F)
BRAKE FLUID LEVEL SENSOR
PARKING BRAKE SWITCH
DOOR SWITCH (SECTION I-3)
RFW CONTROL MODULE (SECTION H-2)
SAS UNIT (SECTION S-1)
DATA LINK CONNECTOR (SECTION U)
ABS HU/CM (SECTION O)
PCM (SECTION B-4b, B-5b)
X-09
Y/R (E)
C2-06
OIL PRESSURE SWITCH
GENERATOR (SECTION A-2)
C2-05
SEDIMENTOR SWITCH
30
51
23
24
25
39
84
81
4
C2-01 INSTRUMENT CLUSTER (F)
B/L R/Y GY ✳ #BR/B Y/G W BR LG/R ✳ L/Y Y/R W/B LG R/W
2N 2M 2L 2K 2J 2I 2H 2G 2F 2E 2D 2C 2B 2A
C2-05 SEDIMENTOR SWITCH (F)
B W
C2-06 OIL PRESSURE SWITCH (E)
Y/R
C2-07 BRAKE FLUID LEVEL SENSOR (F)
L/Y
B
C2-08 PARKING BRAKE SWITCH (SHORT CORD)
BR/W
C2-09 FRONT (F) - SHORT CORD
(F)
L/Y
✳
(SHORT CORD)
BR/W
✳

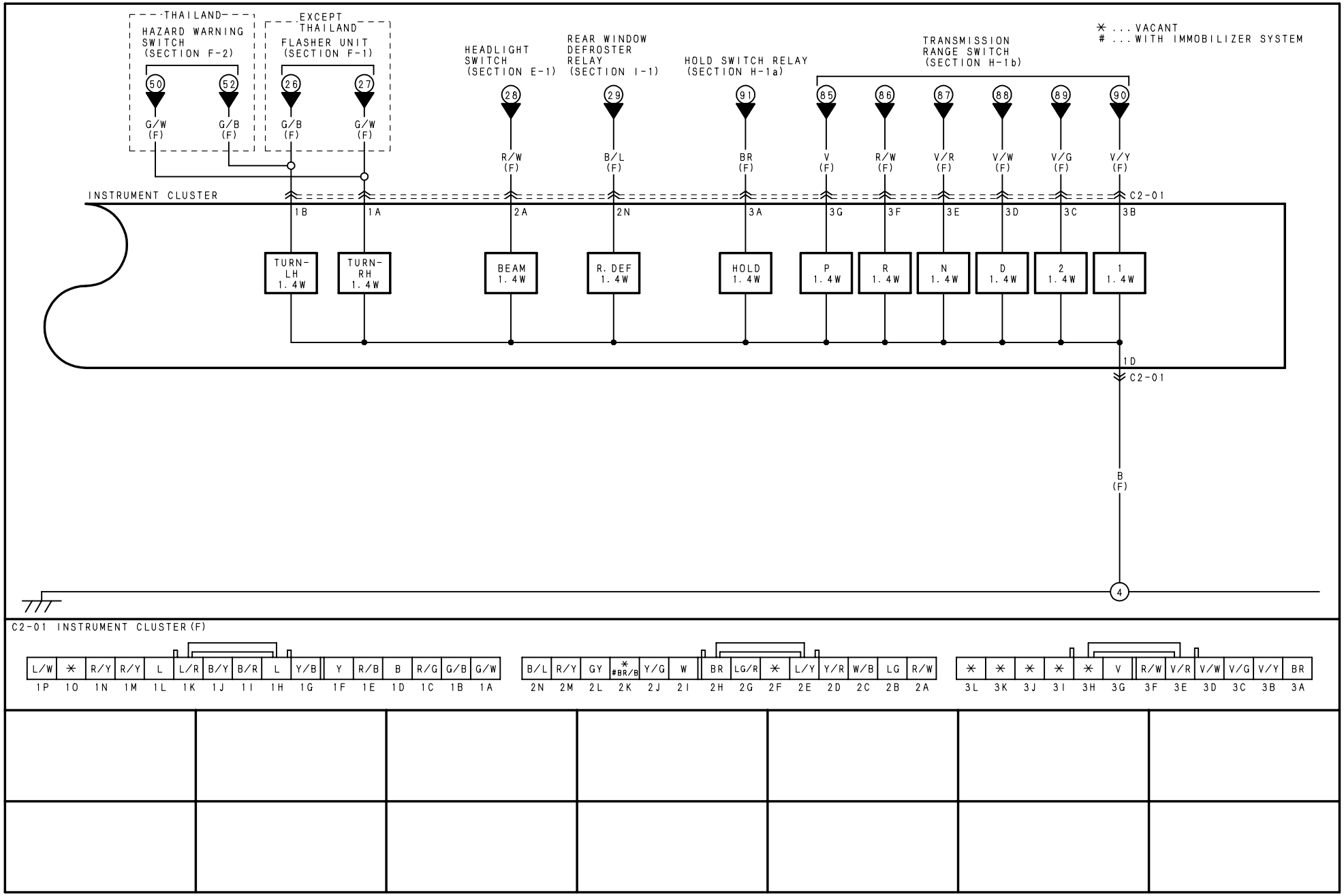
HARNESS SYMBOL: (F) (E) (R)





C-2b

INSTRUMENT CLUSTER (AT)



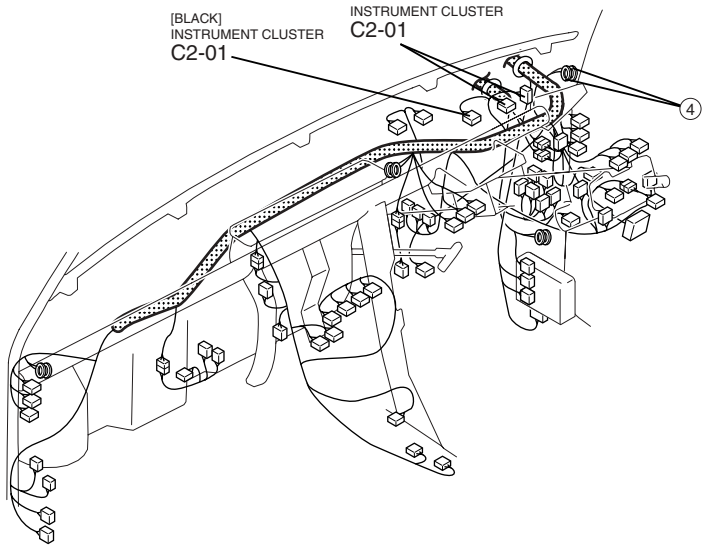
C2-01 INSTRUMENT CLUSTER (F)

L/W	*	R/Y	R/Y	L	L/R	B/Y	B/R	L	Y/B	Y	R/B	B	R/G	G/B	G/W
1P	1O	1N	1M	1L	1K	1J	1I	1H	1G	1F	1E	1D	1C	1B	1A

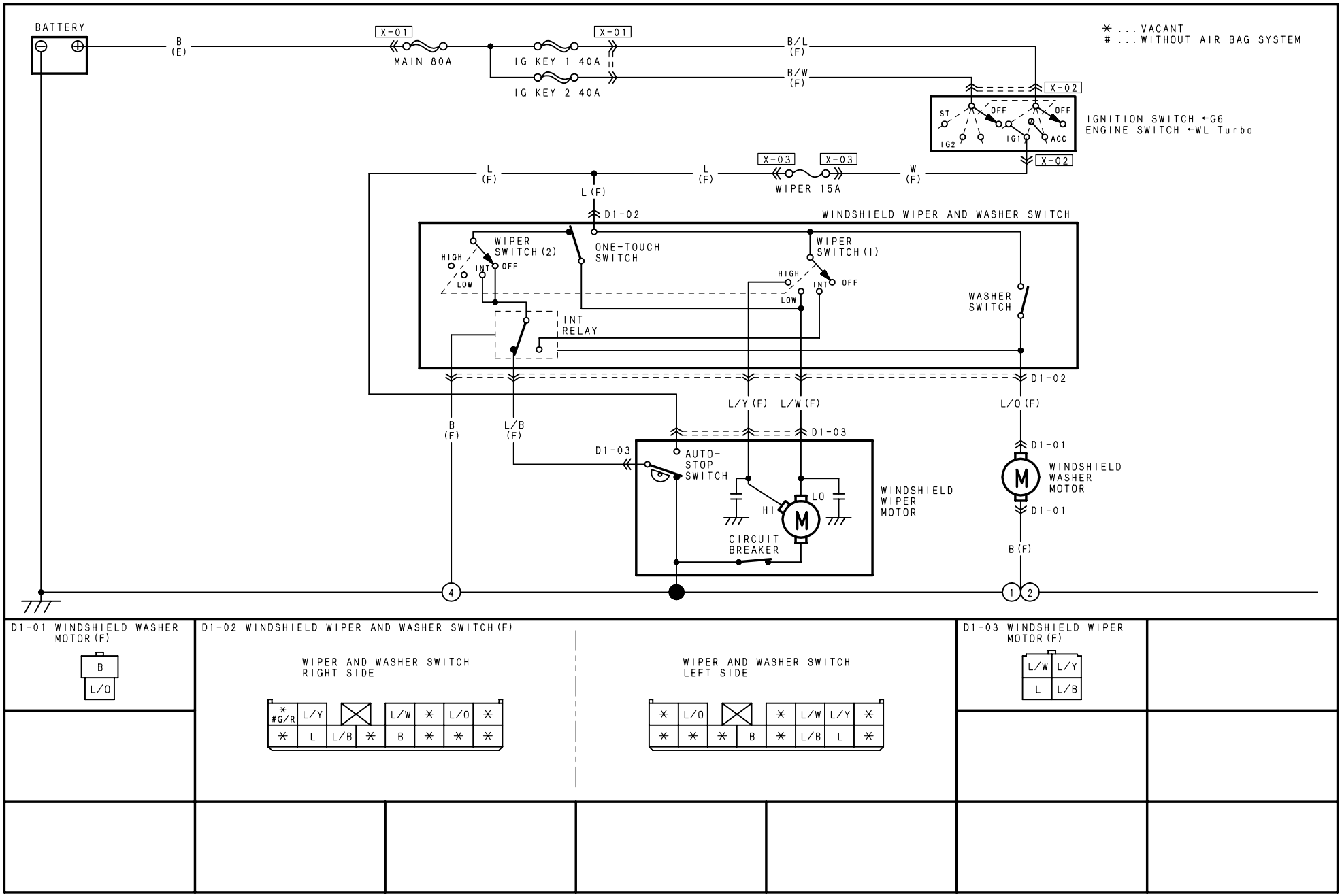
B/L	R/Y	GY	*#BR/B	Y/G	W	BR	LG/R	*	L/Y	Y/R	W/B	LG	R/W
2N	2M	2L	2K	2J	2I	2H	2G	2F	2E	2D	2C	2B	2A

*	*	*	*	*	V	R/W	V/R	V/W	V/G	V/Y	BR
3L	3K	3J	3I	3H	3G	3F	3E	3D	3C	3B	3A

HARNESS SYMBOL: (F) (E) (R)



WINDSHIELD WIPER AND WASHER



D1-01 WINDSHIELD WASHER MOTOR (F)

B
L/O

D1-02 WINDSHIELD WIPER AND WASHER SWITCH (F)

WIPER AND WASHER SWITCH RIGHT SIDE

✳ #G/R	L/Y		L/W	✳	L/O	✳
✳	L	L/B	✳	B	✳	✳	✳

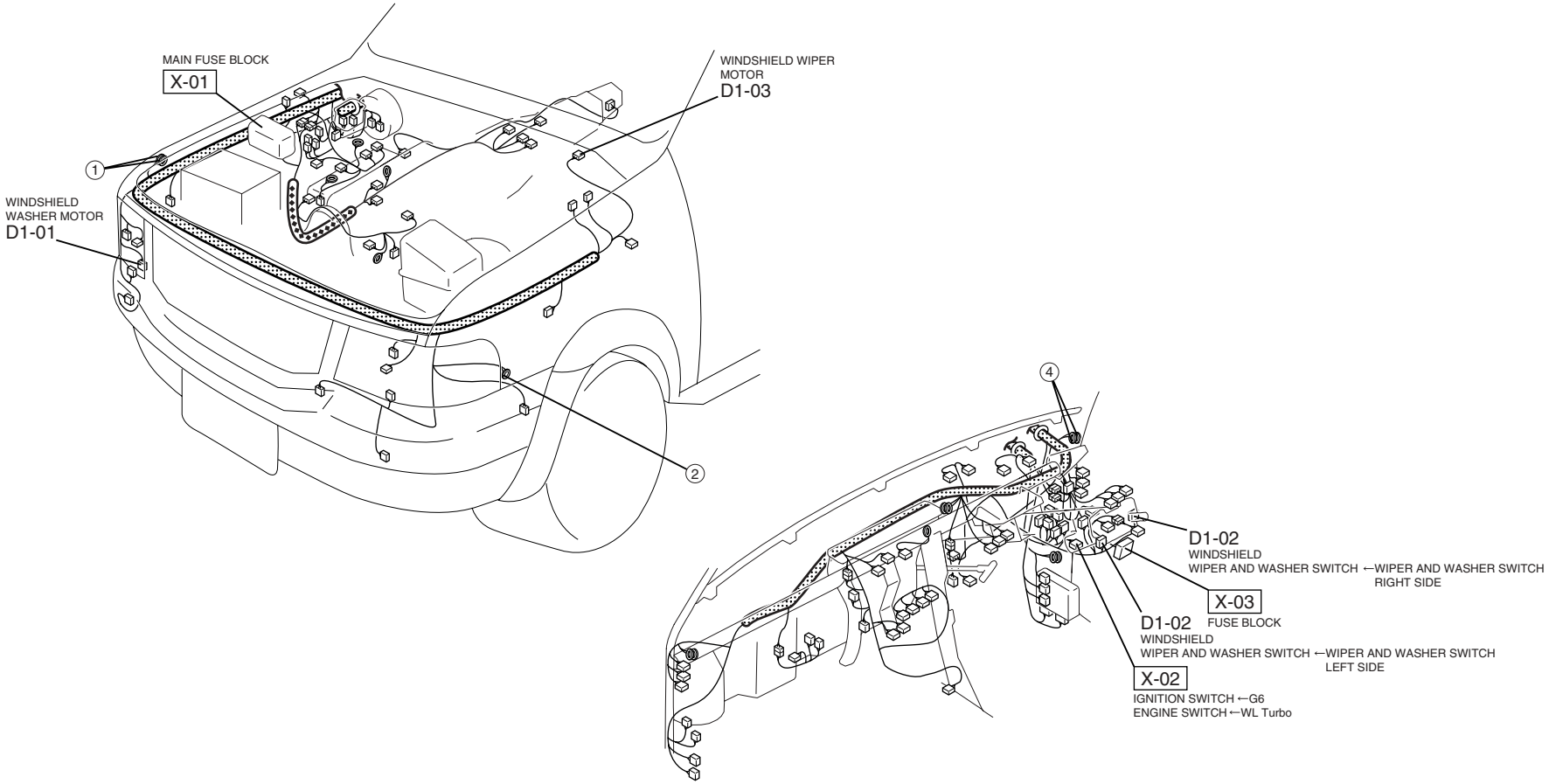
WIPER AND WASHER SWITCH LEFT SIDE

✳	L/O		✳	L/W	L/Y	✳
✳	✳	✳	B	✳	L/B	L	✳

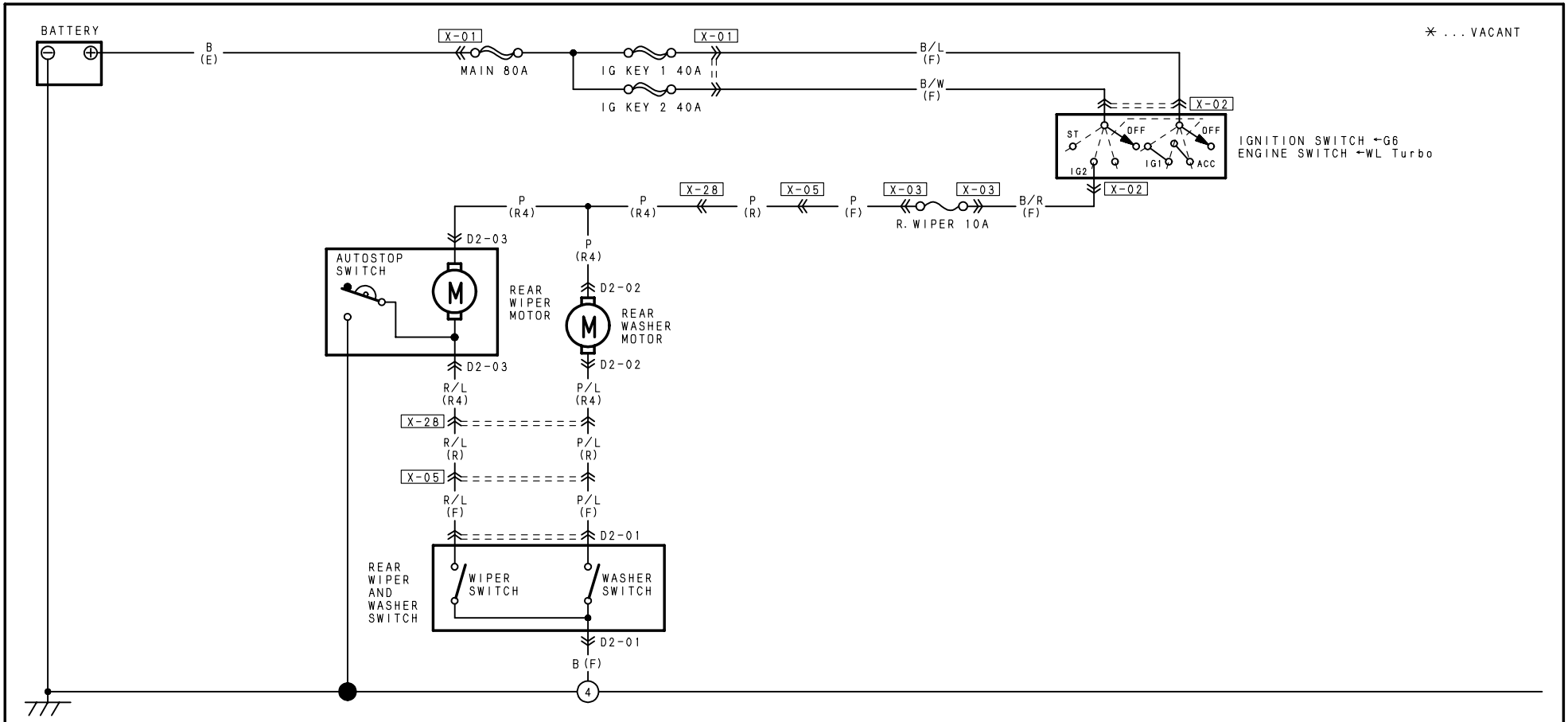
D1-03 WINDSHIELD WIPER MOTOR (F)

L/W	L/Y
L	L/B

HARNESS SYMBOL: (F) (E) (R)

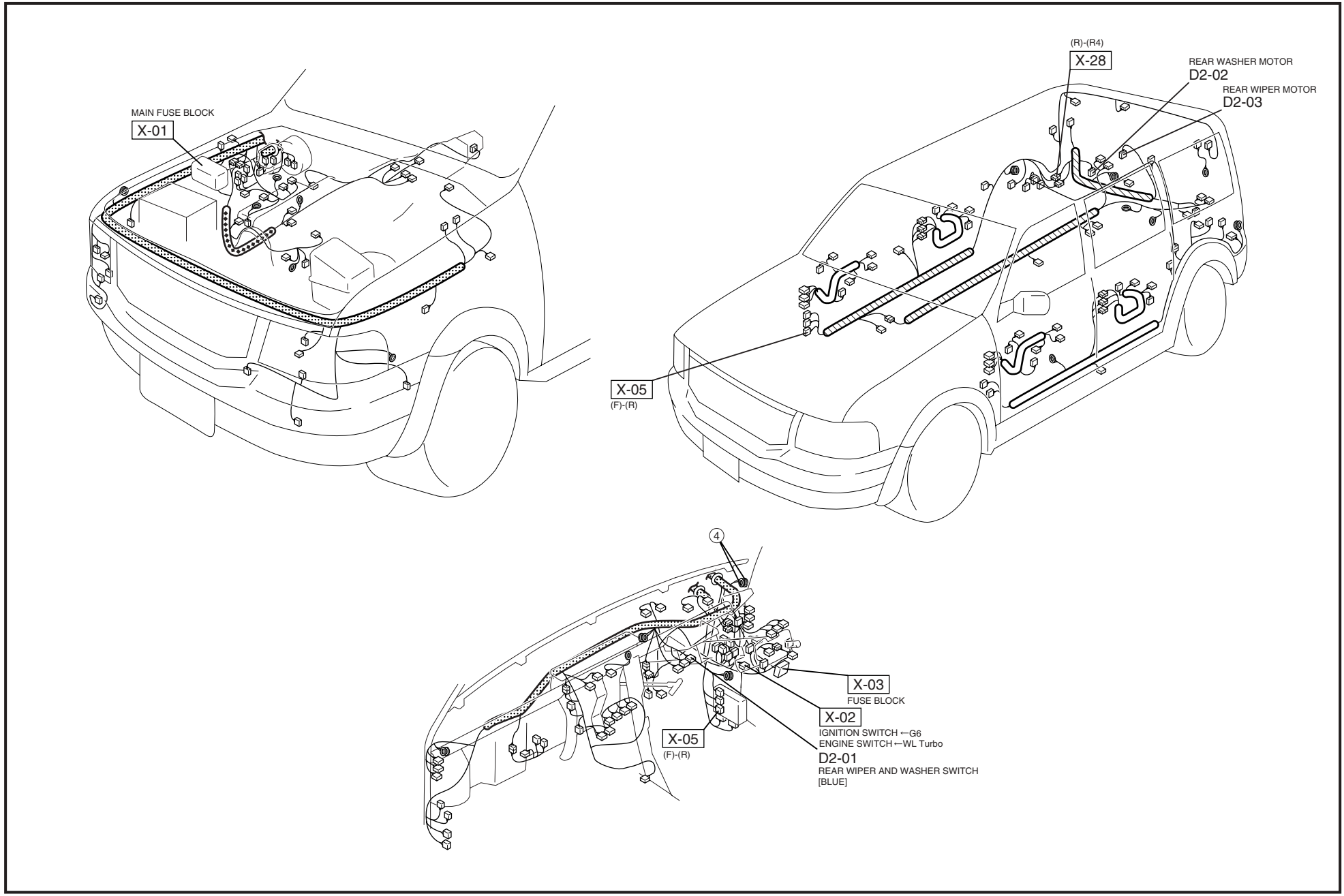


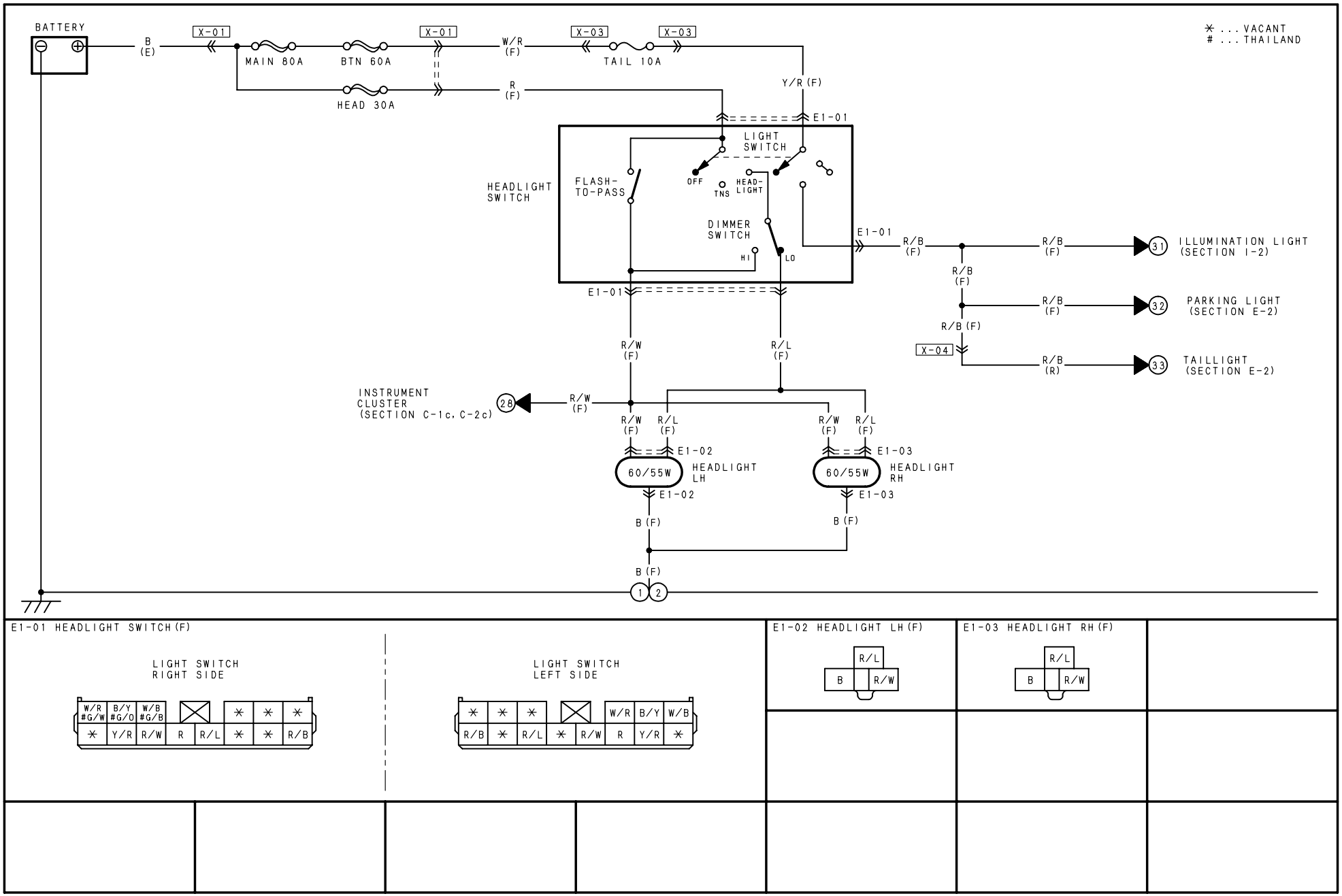
REAR WIPER AND WASHER



D2-01 REAR WIPER AND WASHER SWITCH (F)	D2-02 REAR WASHER MOTOR (R4)	D2-03 REAR WIPER MOTOR (R4)				
P/L, R/L, B, ✳	P/L, P	P, R/L				

HARNESS SYMBOL: (F) (E) (R)





E1-01 HEADLIGHT SWITCH (F)

LIGHT SWITCH RIGHT SIDE

W/R #G/W	B/Y #G/O	W/B #G/B			*	*	*
*	Y/R	R/W	R	R/L	*	*	R/B

LIGHT SWITCH LEFT SIDE

*	*	*			W/R	B/Y	W/B
R/B	*	R/L	*	R/W	R	Y/R	*

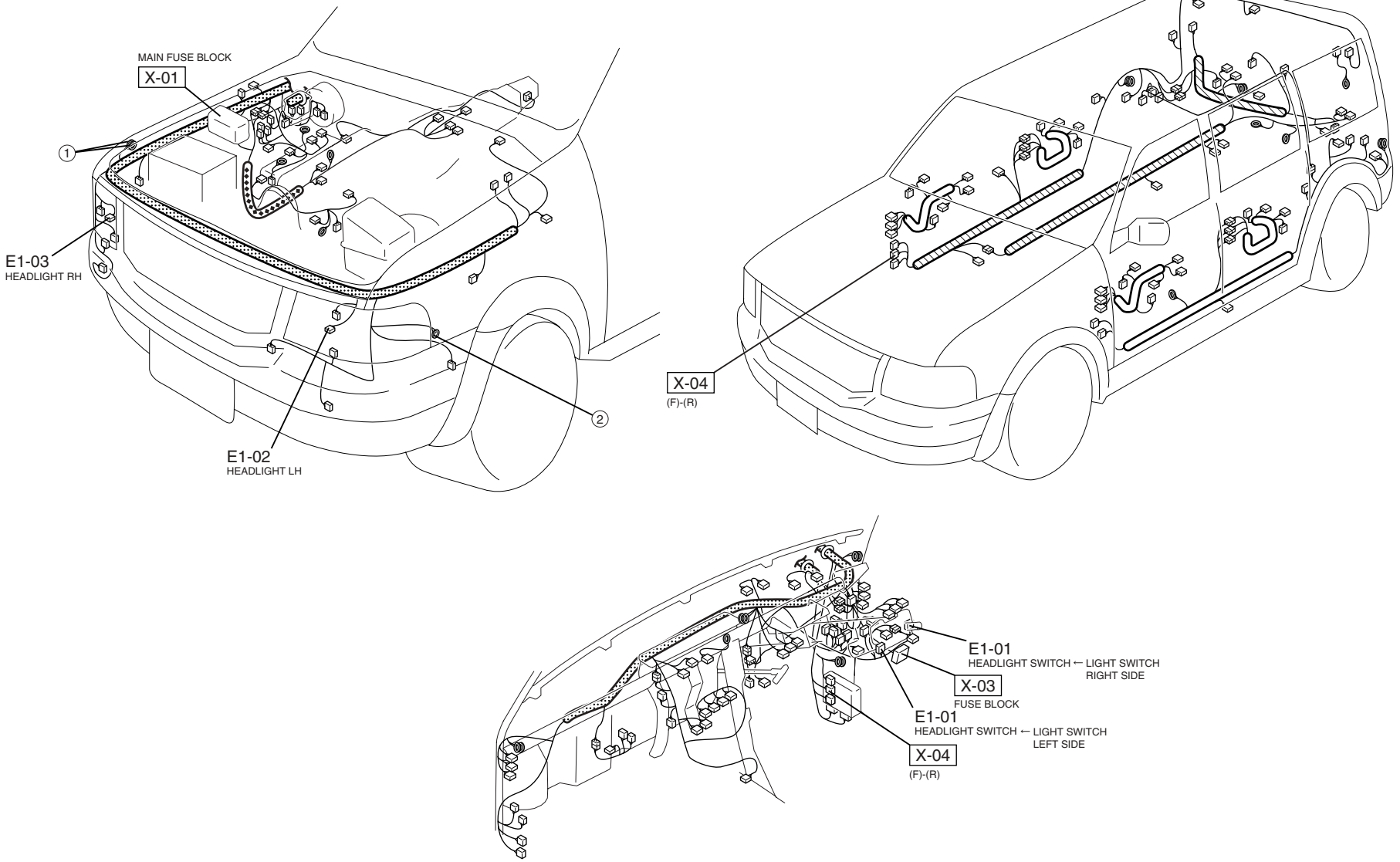
E1-02 HEADLIGHT LH (F)

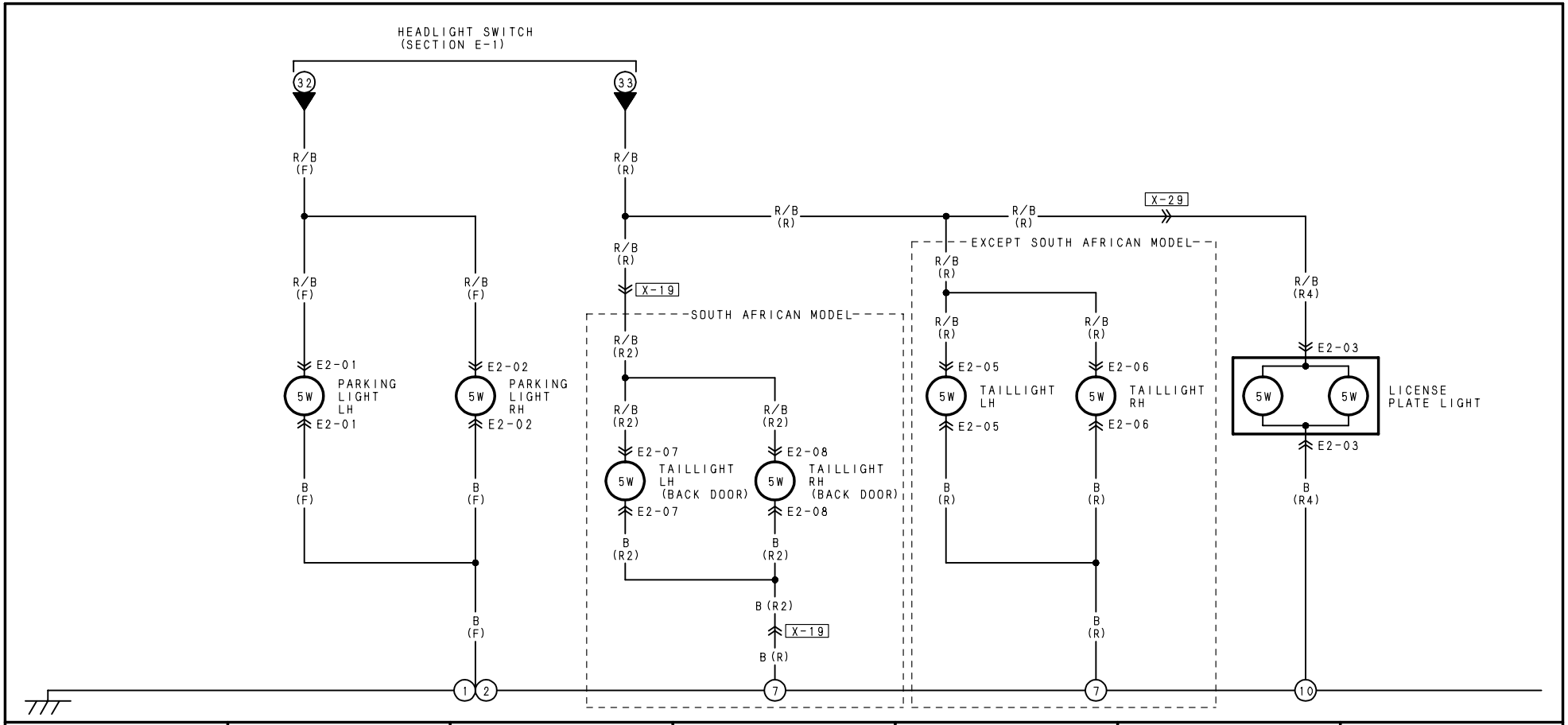
	R/L
B	R/W

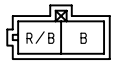
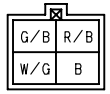
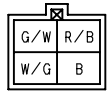
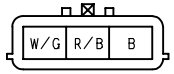
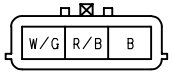
E1-03 HEADLIGHT RH (F)

	R/L
B	R/W

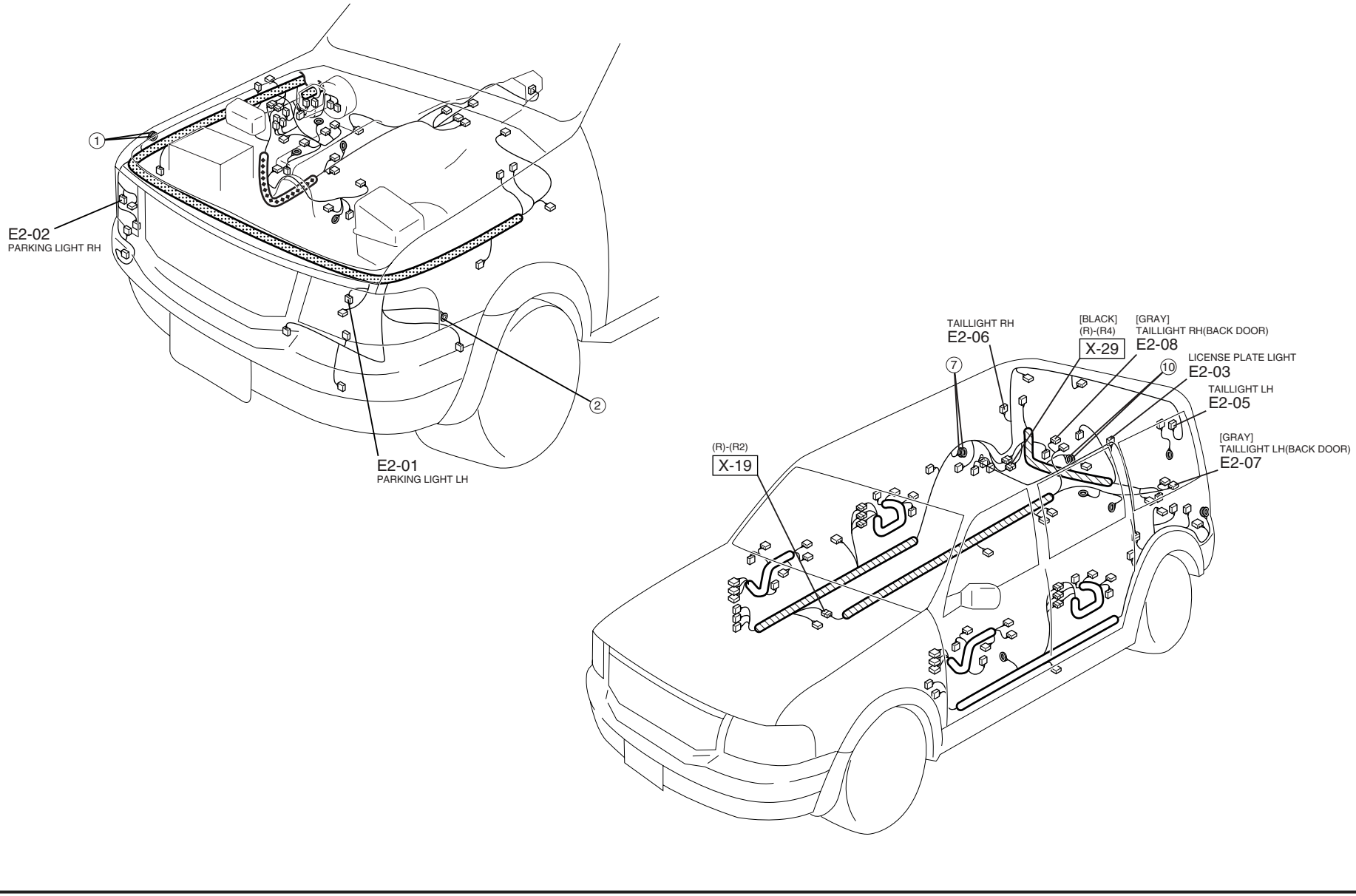
HARNESS SYMBOL: (F) (E) (R)



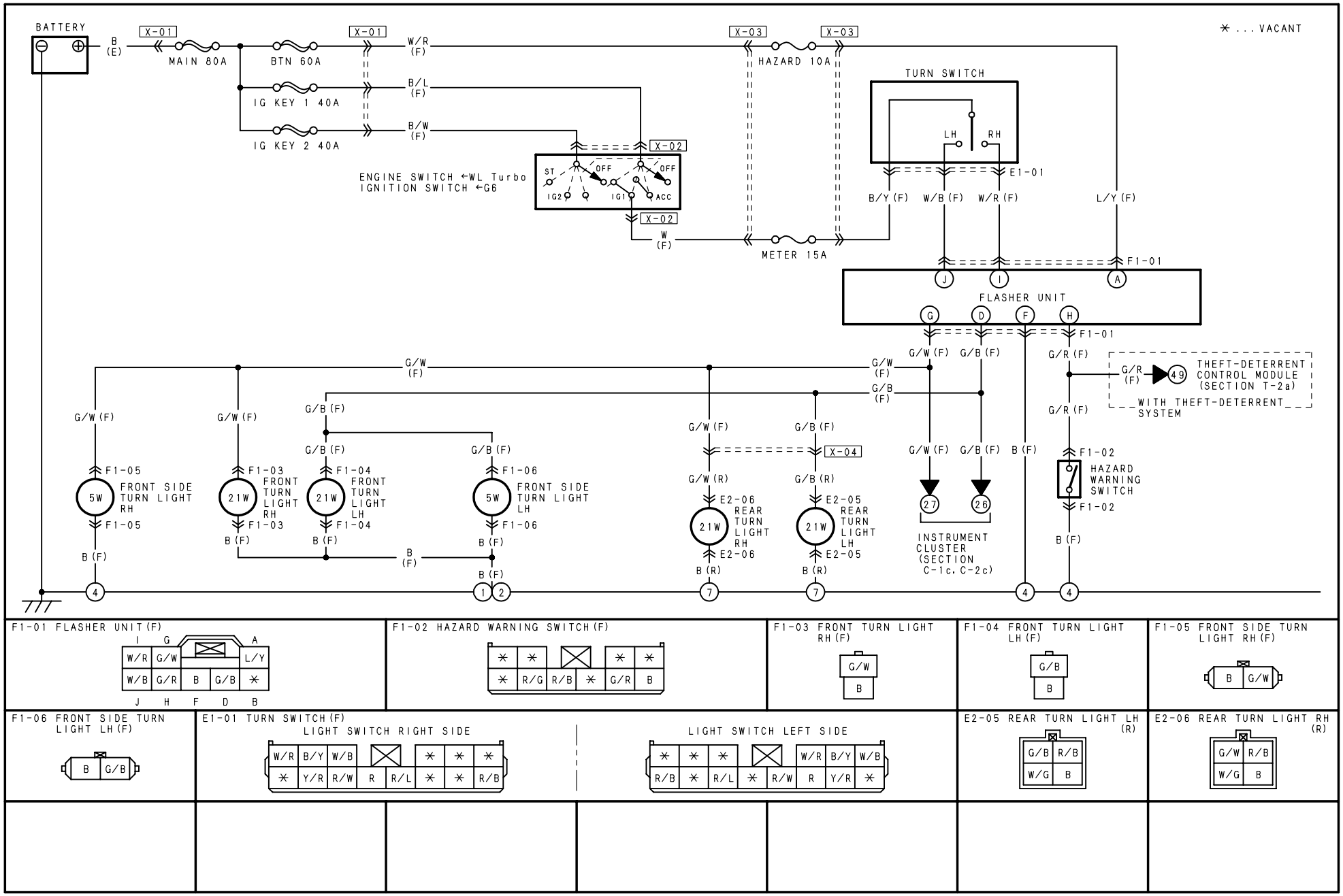


E2-01 PARKING LIGHT LH (F)	E2-02 PARKING LIGHT RH (F)	E2-03 LICENSE PLATE LIGHT (R4)	E2-05 TAILLIGHT LH (R)	E2-06 TAILLIGHT RH (R)	E2-07 TAILLIGHT LH (BACK DOOR) (R2)	E2-08 TAILLIGHT RH (BACK DOOR) (R2)
						

HARNESS SYMBOL: (F) (E) (R)



TURN AND HAZARD WARNING LIGHT (EXCEPT THAILAND)



F1-01 FLASHER UNIT (F)

F1-02 HAZARD WARNING SWITCH (F)

F1-03 FRONT TURN LIGHT RH (F)

F1-04 FRONT TURN LIGHT LH (F)

F1-05 FRONT SIDE TURN LIGHT RH (F)

F1-06 FRONT SIDE TURN LIGHT LH (F)

E1-01 TURN SWITCH (F)

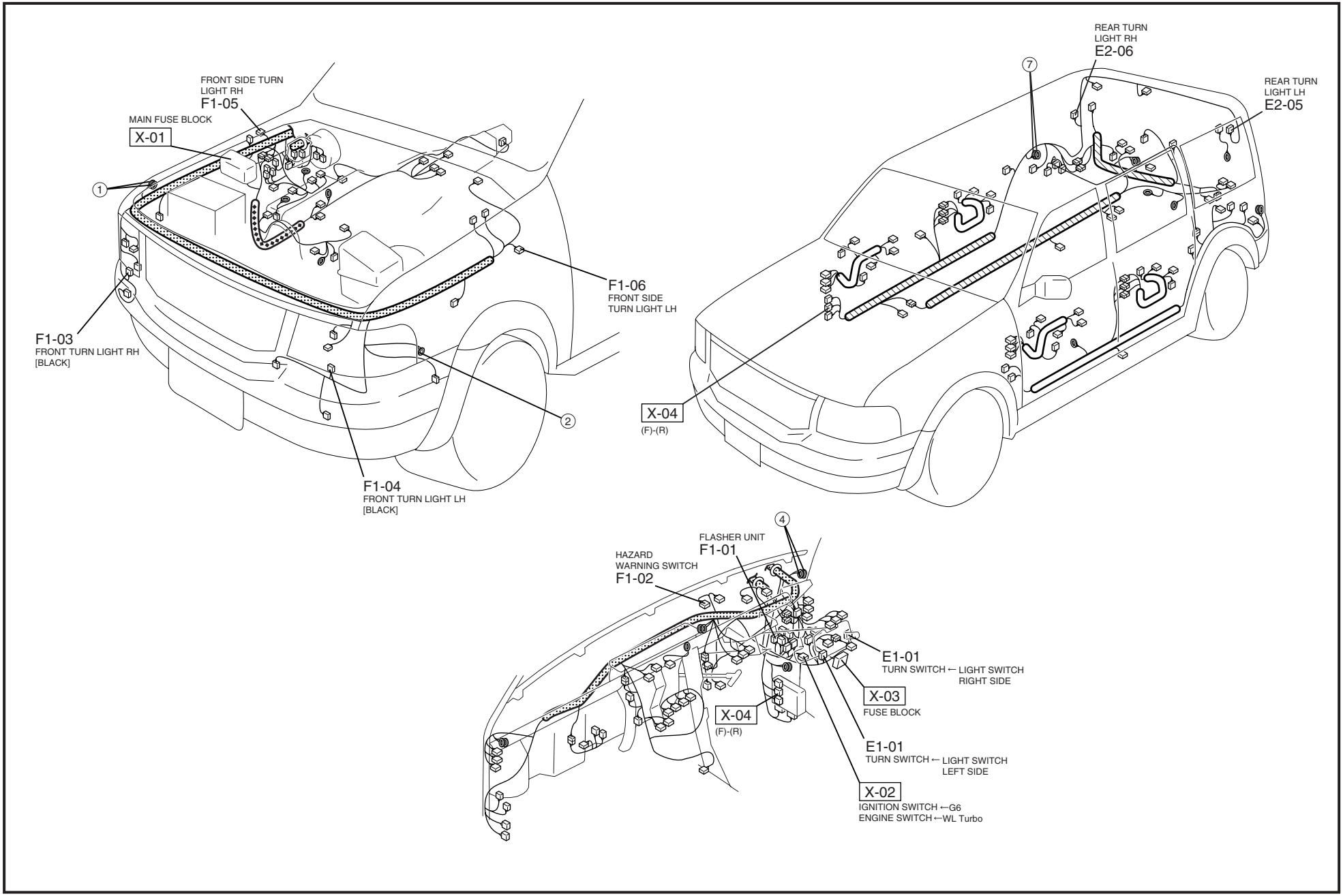
LIGHT SWITCH RIGHT SIDE

LIGHT SWITCH LEFT SIDE

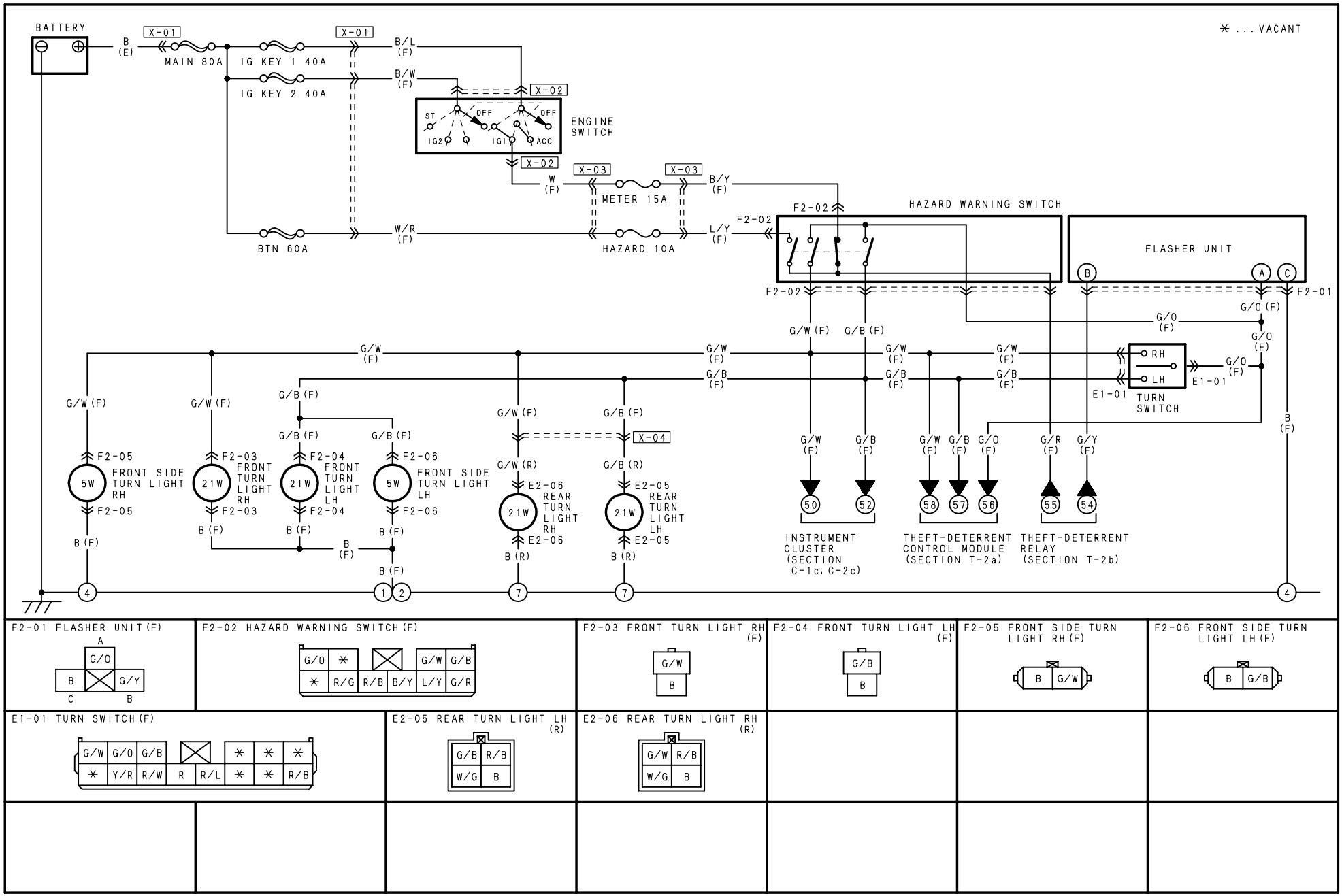
E2-05 REAR TURN LIGHT LH (R)

E2-06 REAR TURN LIGHT RH (R)

HARNESS SYMBOL: (F) (E) (R)



TURN AND HAZARD WARNING LIGHT (THAILAND)



F2-01 FLASHER UNIT (F)

F2-02 HAZARD WARNING SWITCH (F)

F2-03 FRONT TURN LIGHT RH (F)

F2-04 FRONT TURN LIGHT LH (F)

F2-05 FRONT SIDE TURN LIGHT RH (F)

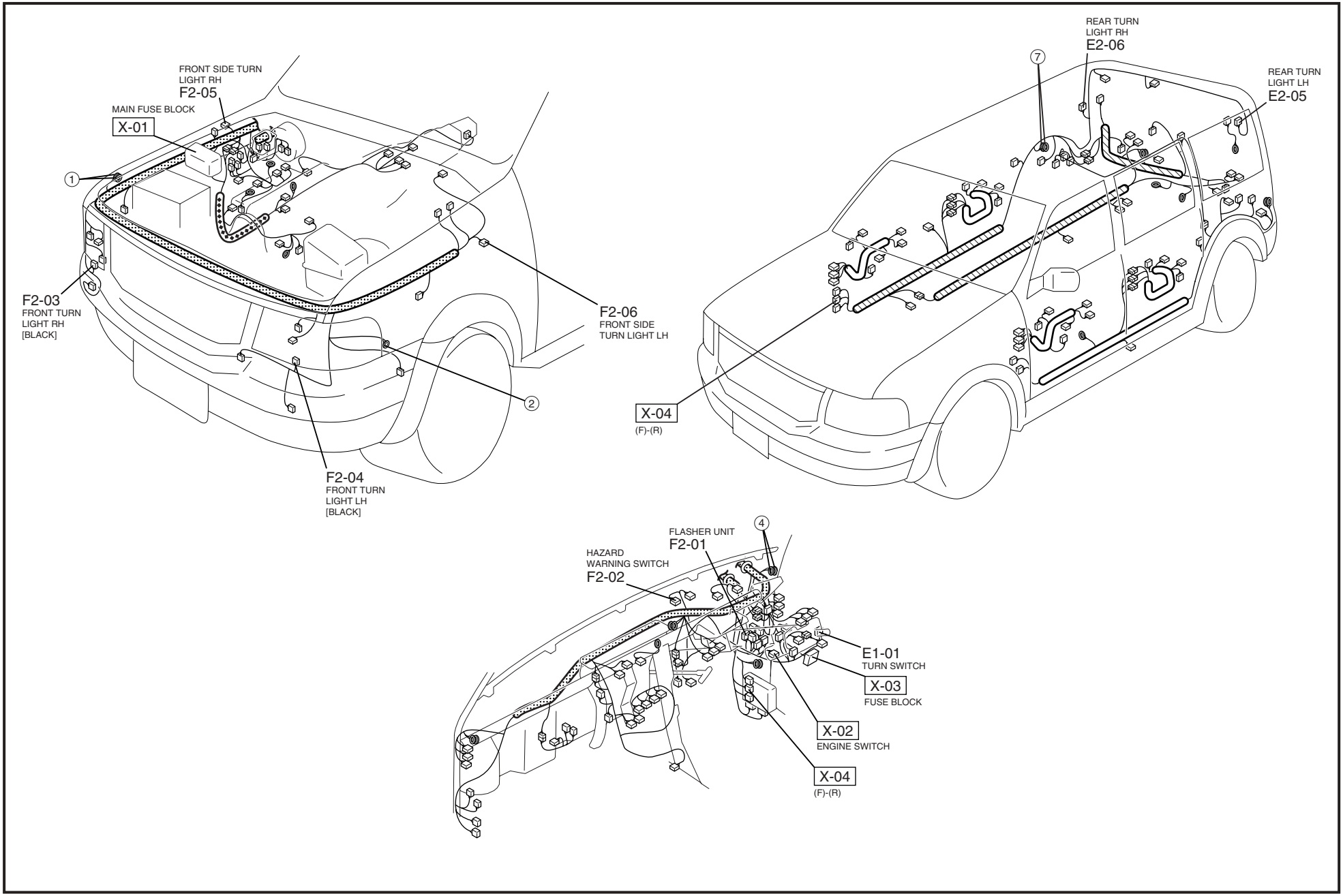
F2-06 FRONT SIDE TURN LIGHT LH (F)

E1-01 TURN SWITCH (F)

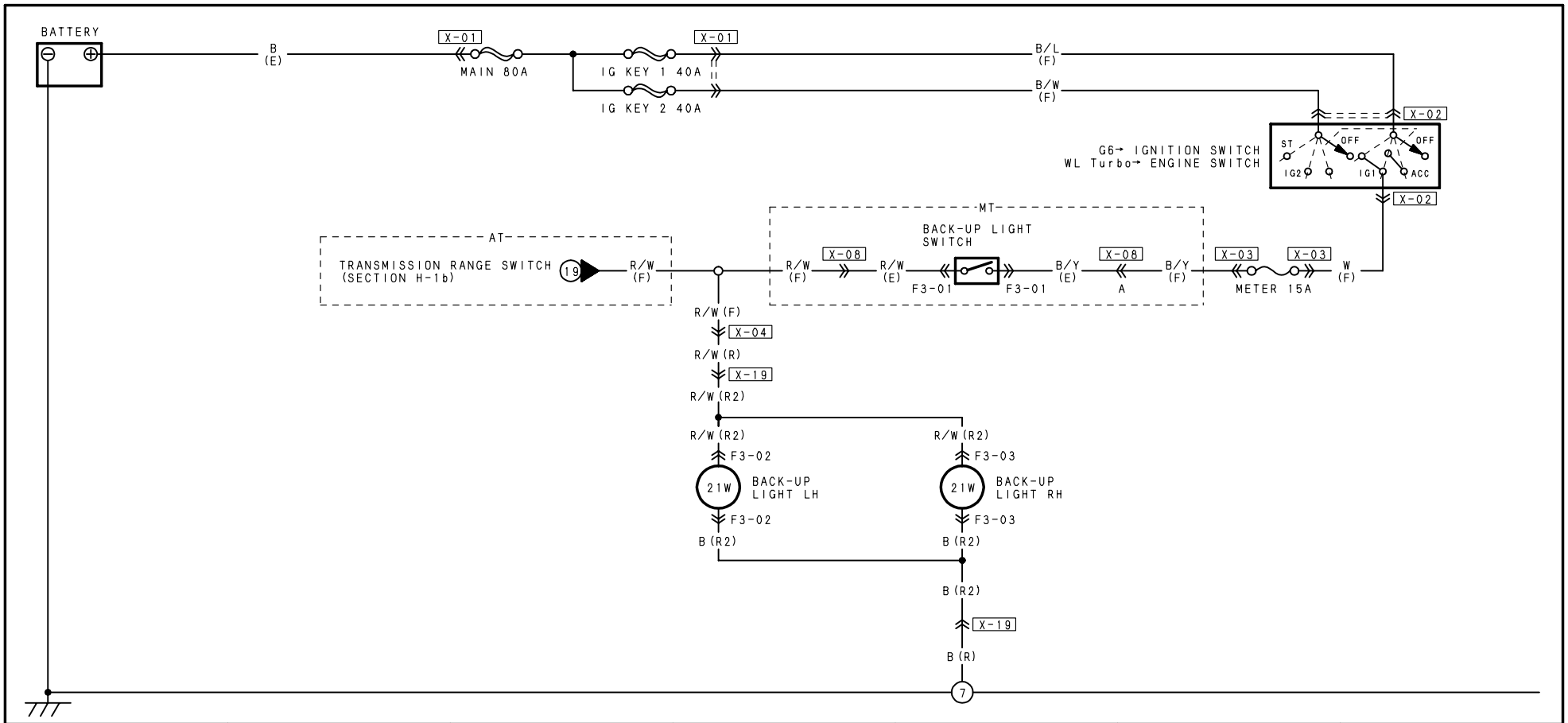
E2-05 REAR TURN LIGHT LH (R)

E2-06 REAR TURN LIGHT RH (R)

HARNESS SYMBOL: (F) (E) (R)

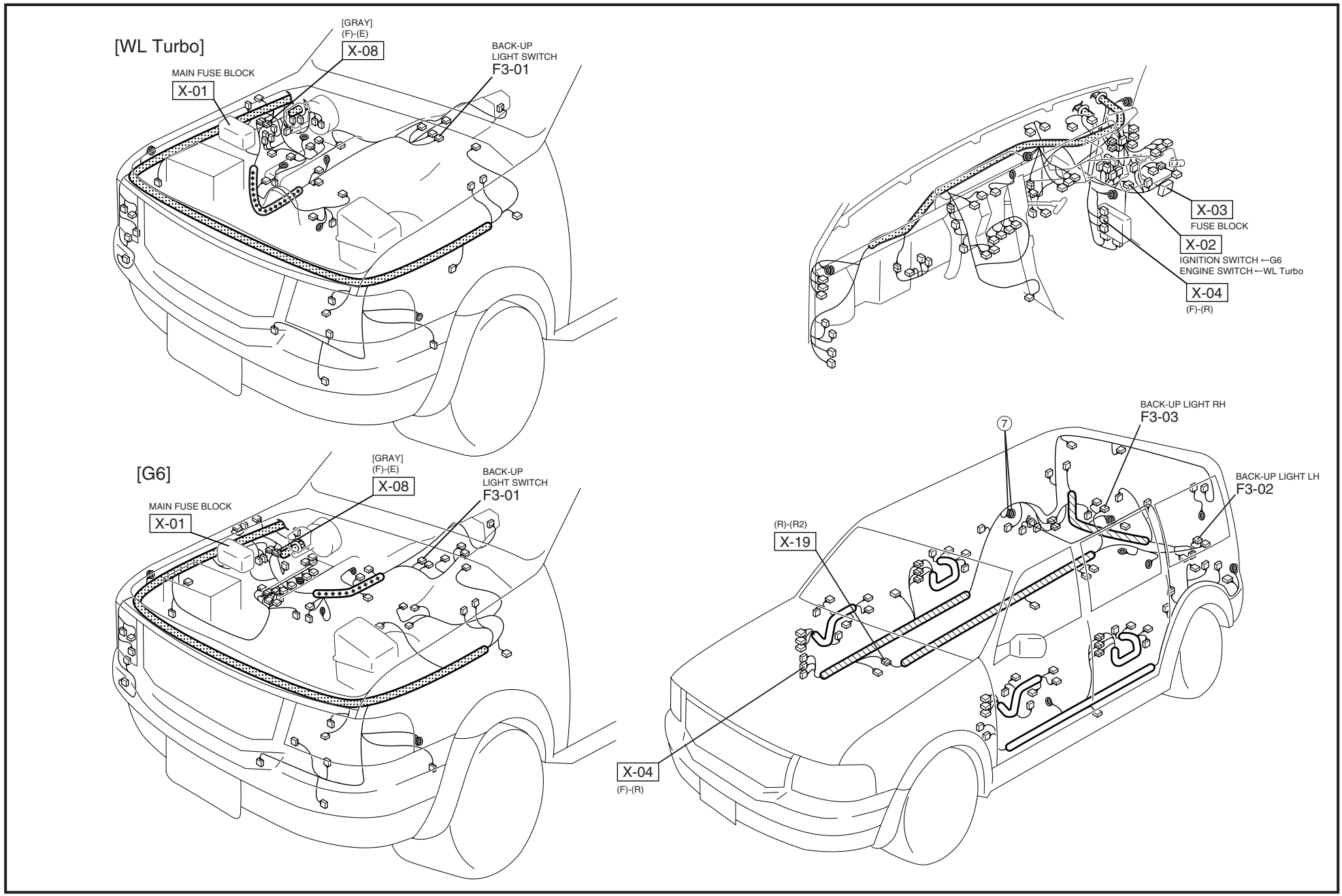


F-2

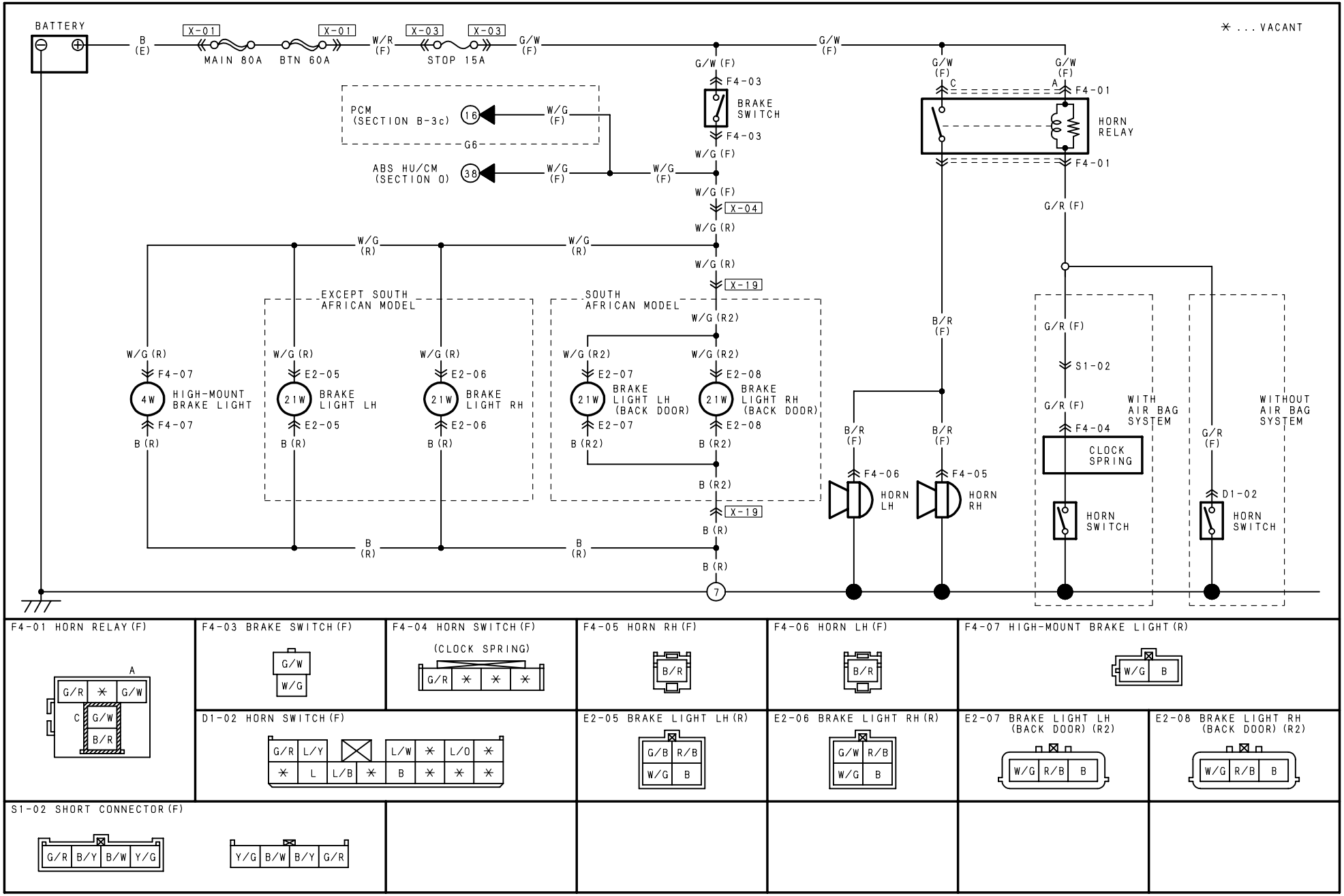


F3-01 BACK-UP LIGHT SWITCH (E)	F3-02 BACK-UP LIGHT LH (R2)	F3-03 BACK-UP LIGHT RH (R2)				
						

HARNESS SYMBOL: (F) (E) (R)



BRAKE LIGHT / HORN



F4-01 HORN RELAY (F)

F4-03 BRAKE SWITCH (F)

F4-04 HORN SWITCH (F) (CLOCK SPRING)

F4-05 HORN RH (F)

F4-06 HORN LH (F)

F4-07 HIGH-MOUNT BRAKE LIGHT (R)

D1-02 HORN SWITCH (F)

E2-05 BRAKE LIGHT LH (R)

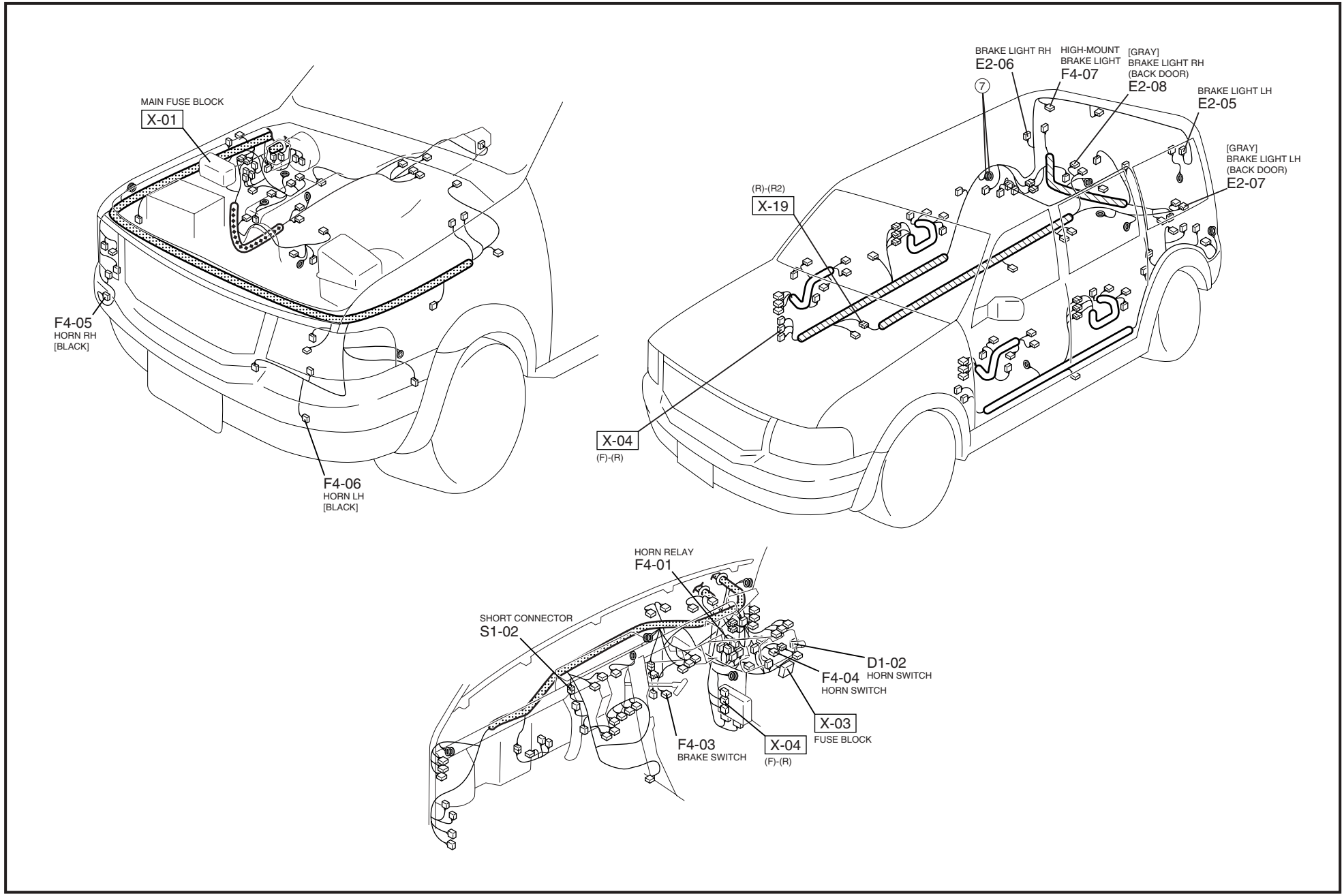
E2-06 BRAKE LIGHT RH (R)

E2-07 BRAKE LIGHT LH (BACK DOOR) (R2)

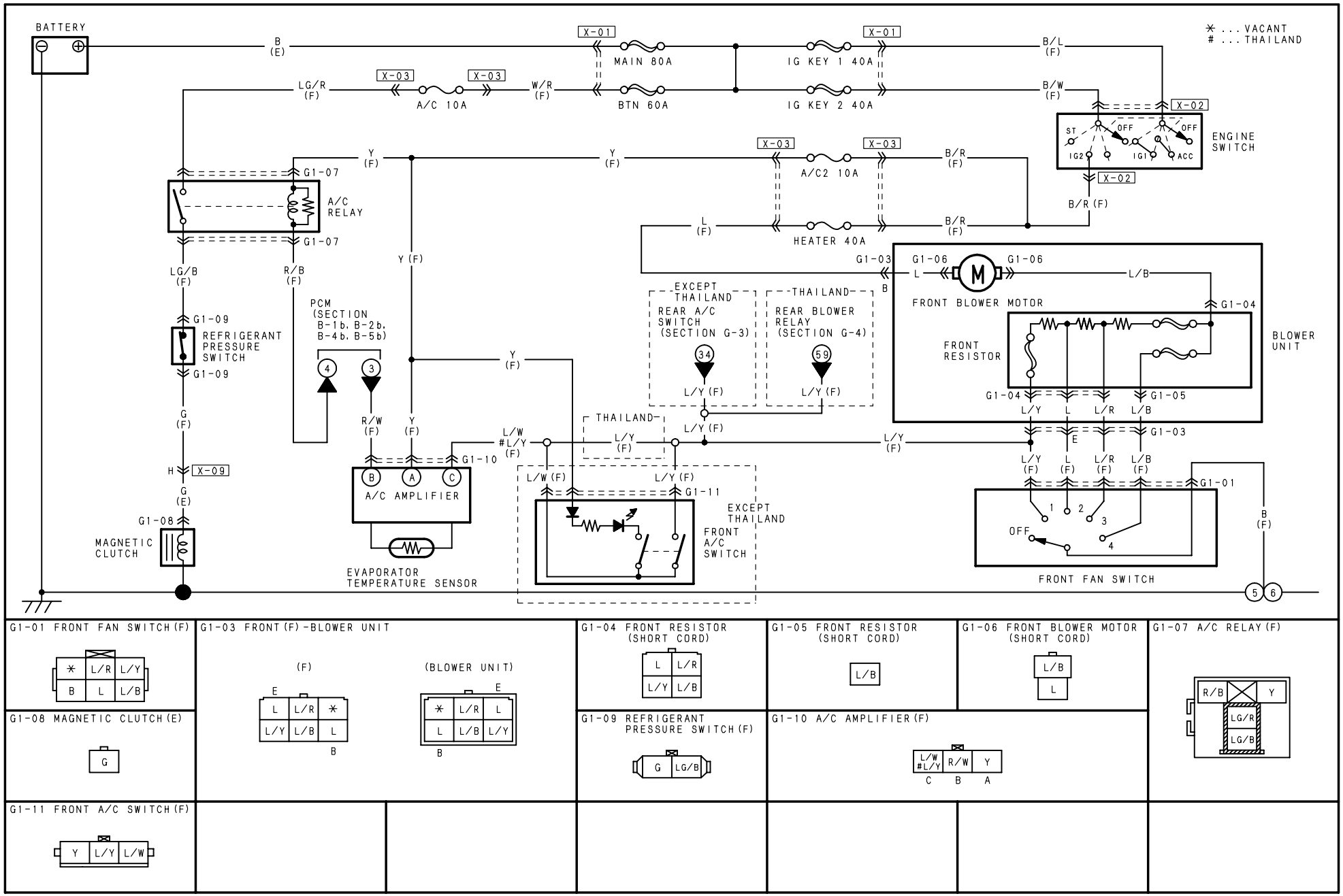
E2-08 BRAKE LIGHT RH (BACK DOOR) (R2)

S1-02 SHORT CONNECTOR (F)

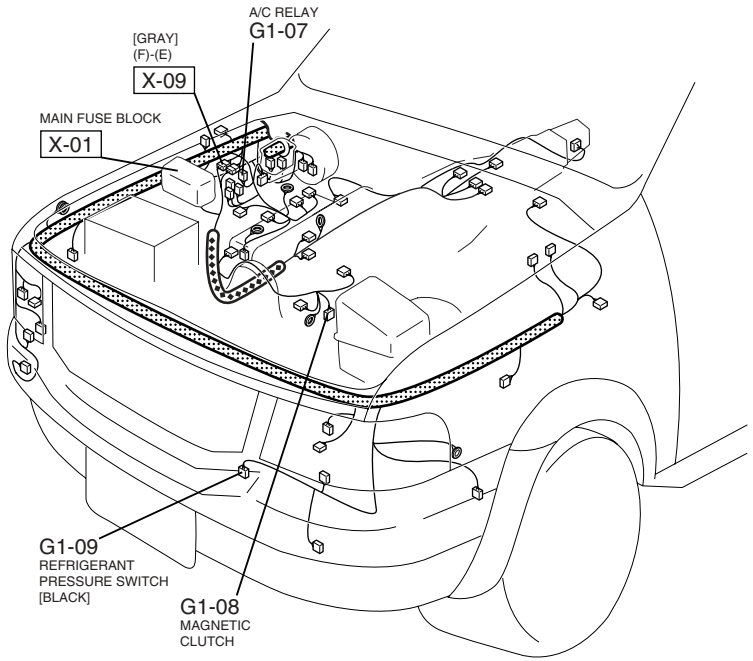
HARNESS SYMBOL: (F) (E) (R)

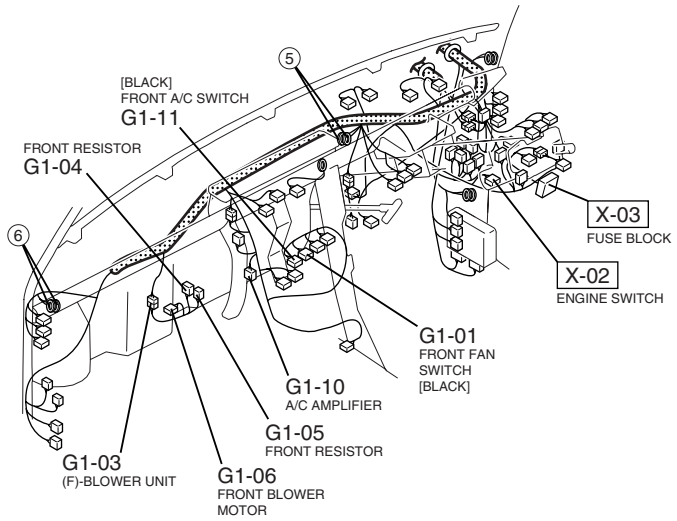


FRONT HEATER AND AIR CONDITIONER (WL Turbo)

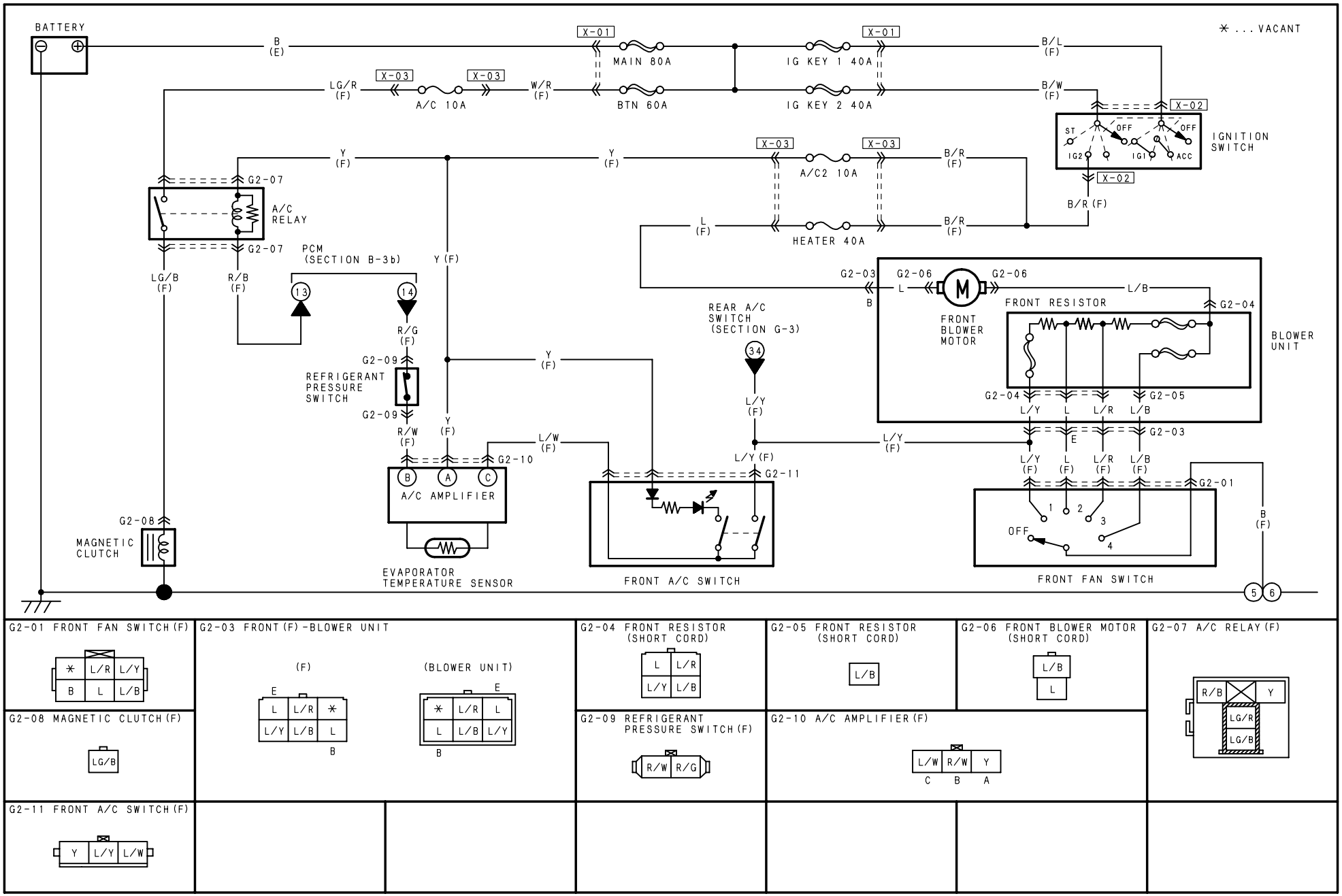


HARNESS SYMBOL: (F) (E) (R)

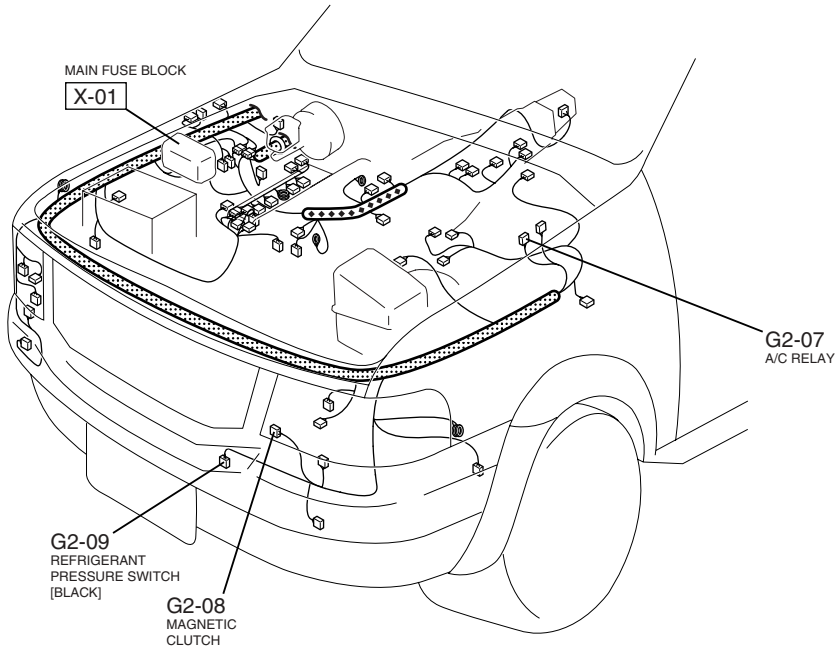


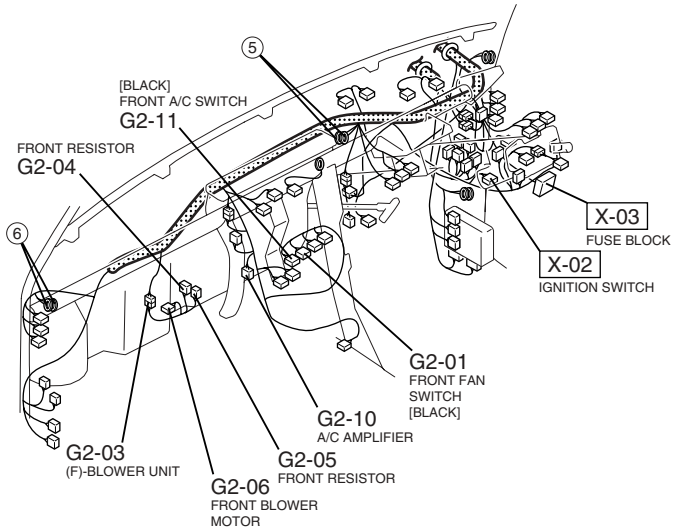


FRONT HEATER AND AIR CONDITIONER (G6)

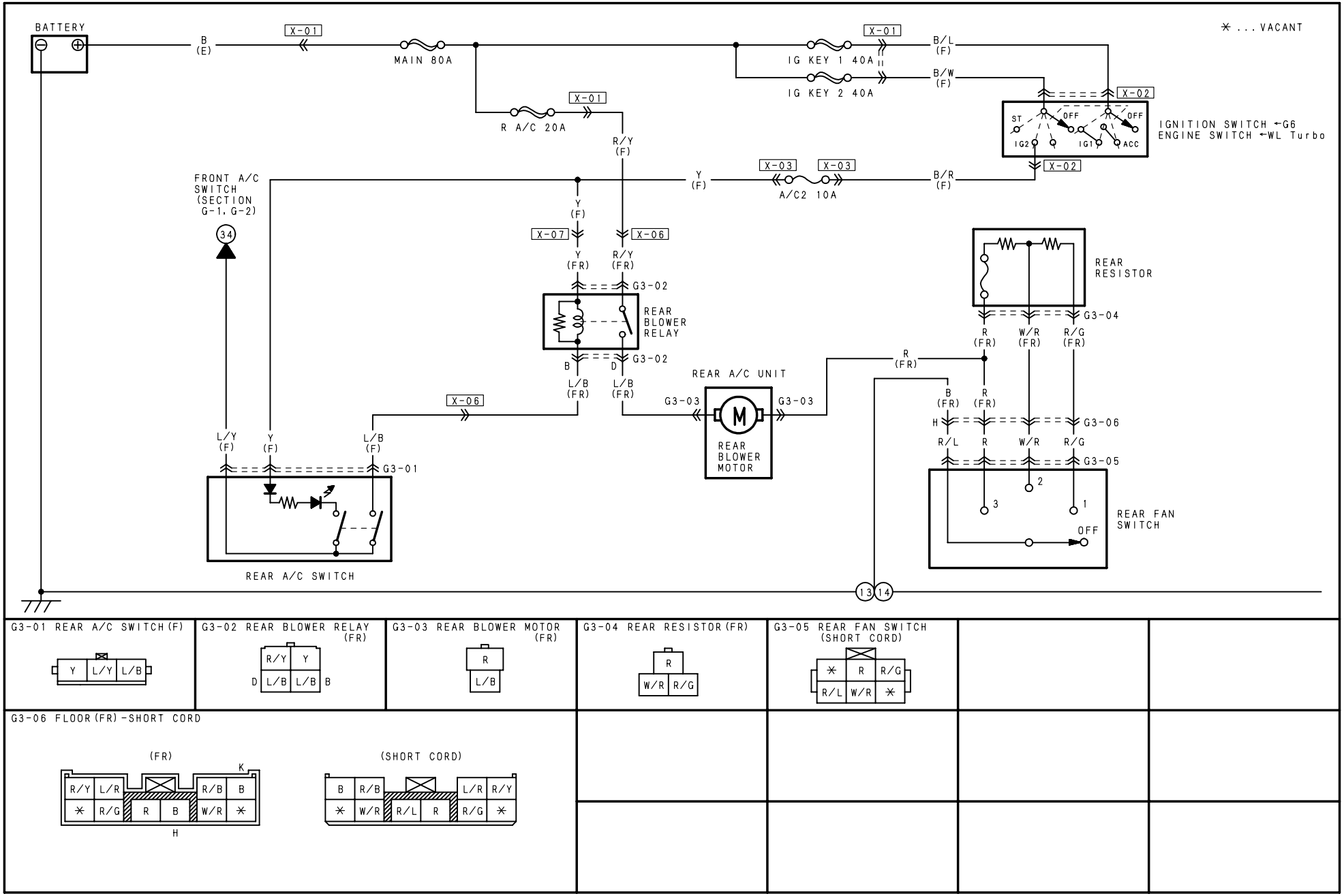


HARNESS SYMBOL: (F) (E) (R)





REAR HEATER AND AIR CONDITIONER (EXCEPT THAILAND)



G3-01 REAR A/C SWITCH (F)

G3-02 REAR BLOWER RELAY (FR)

G3-03 REAR BLOWER MOTOR (FR)

G3-04 REAR RESISTOR (FR)

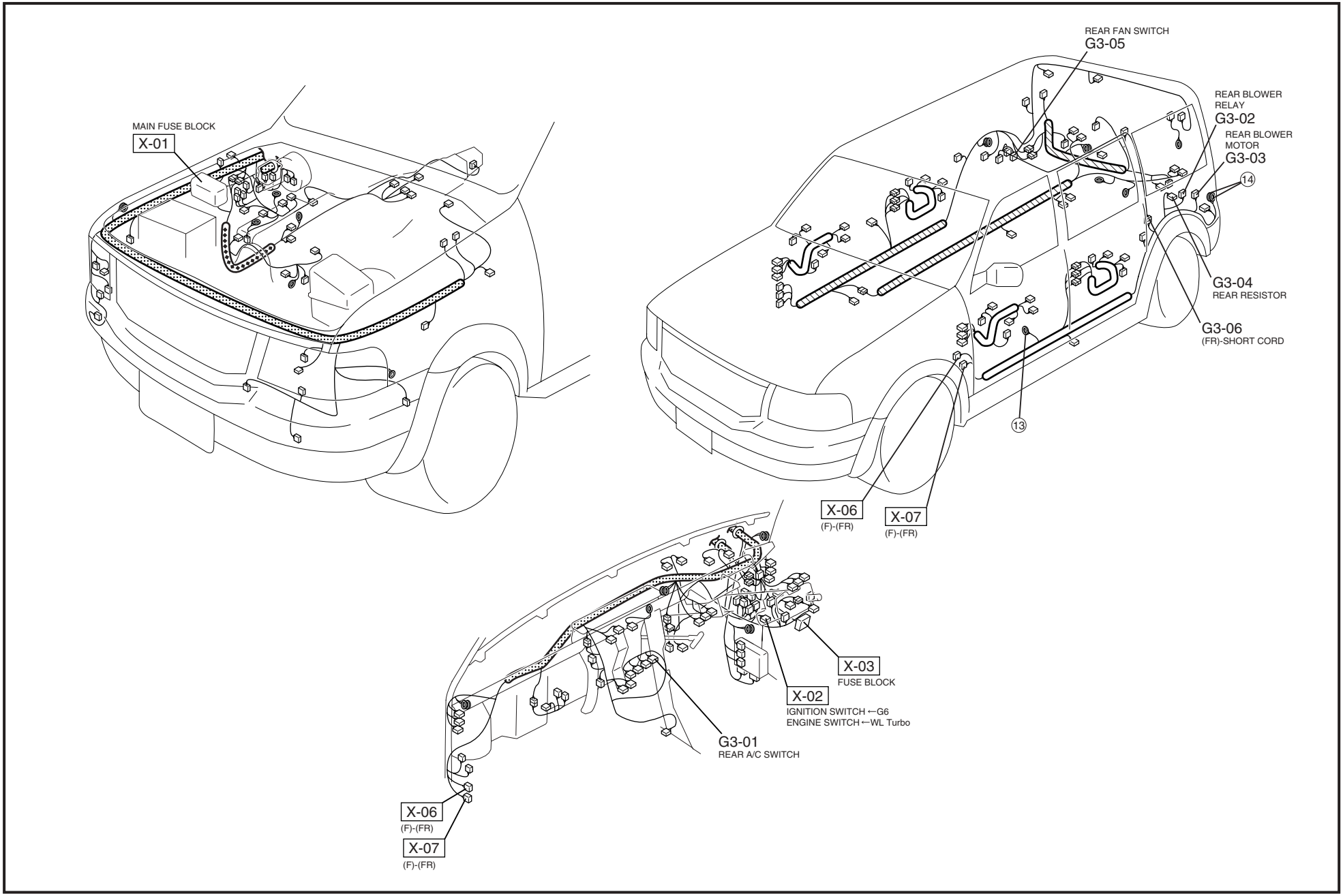
G3-05 REAR FAN SWITCH (SHORT CORD)

G3-06 FLOOR (FR) -SHORT CORD

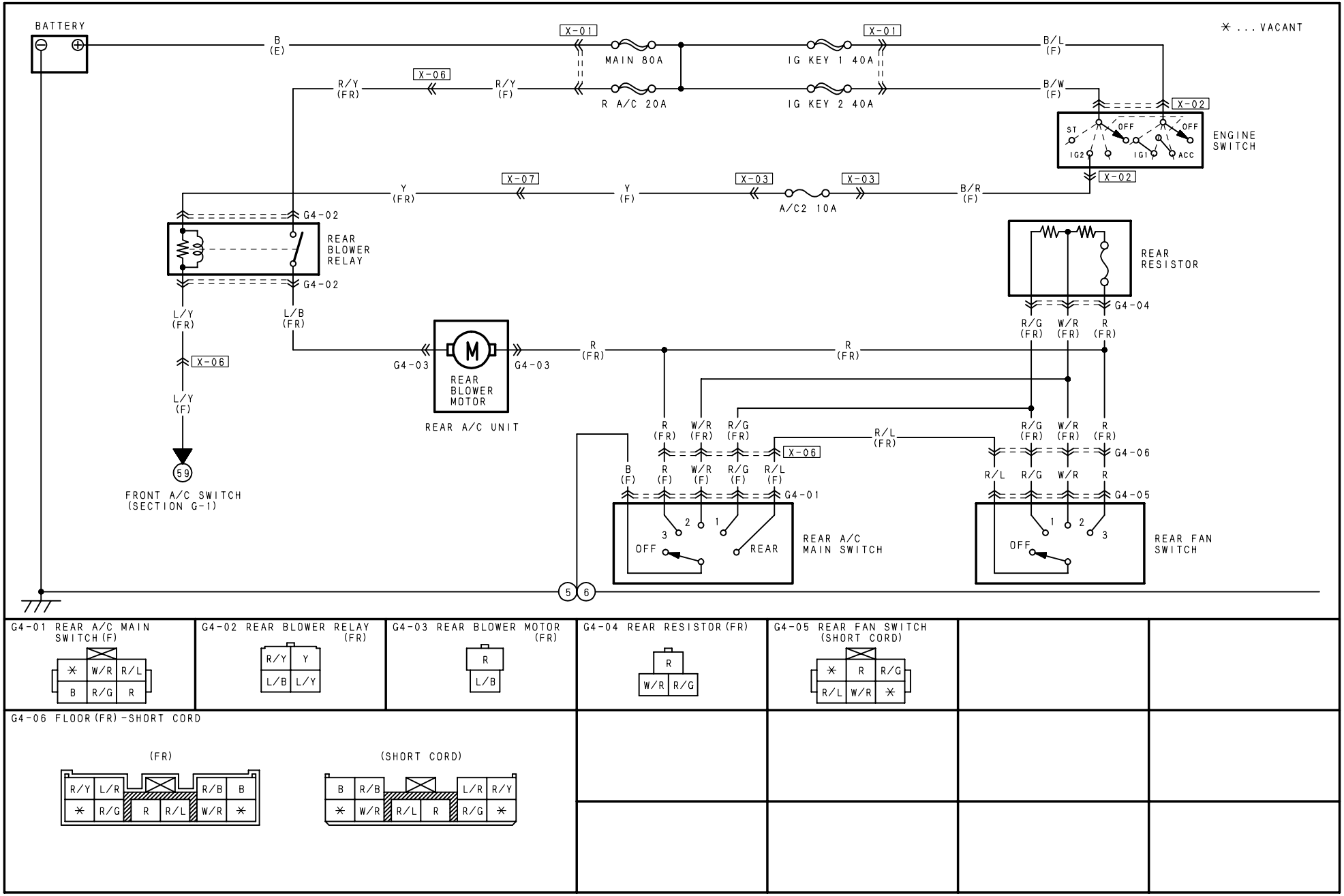
(FR)

(SHORT CORD)

HARNESS SYMBOL: (F) (E) (R)



REAR HEATER AND AIR CONDITIONER (THAILAND)



G4-01 REAR A/C MAIN SWITCH (F)

G4-02 REAR BLOWER RELAY (FR)

G4-03 REAR BLOWER MOTOR (FR)

G4-04 REAR RESISTOR (FR)

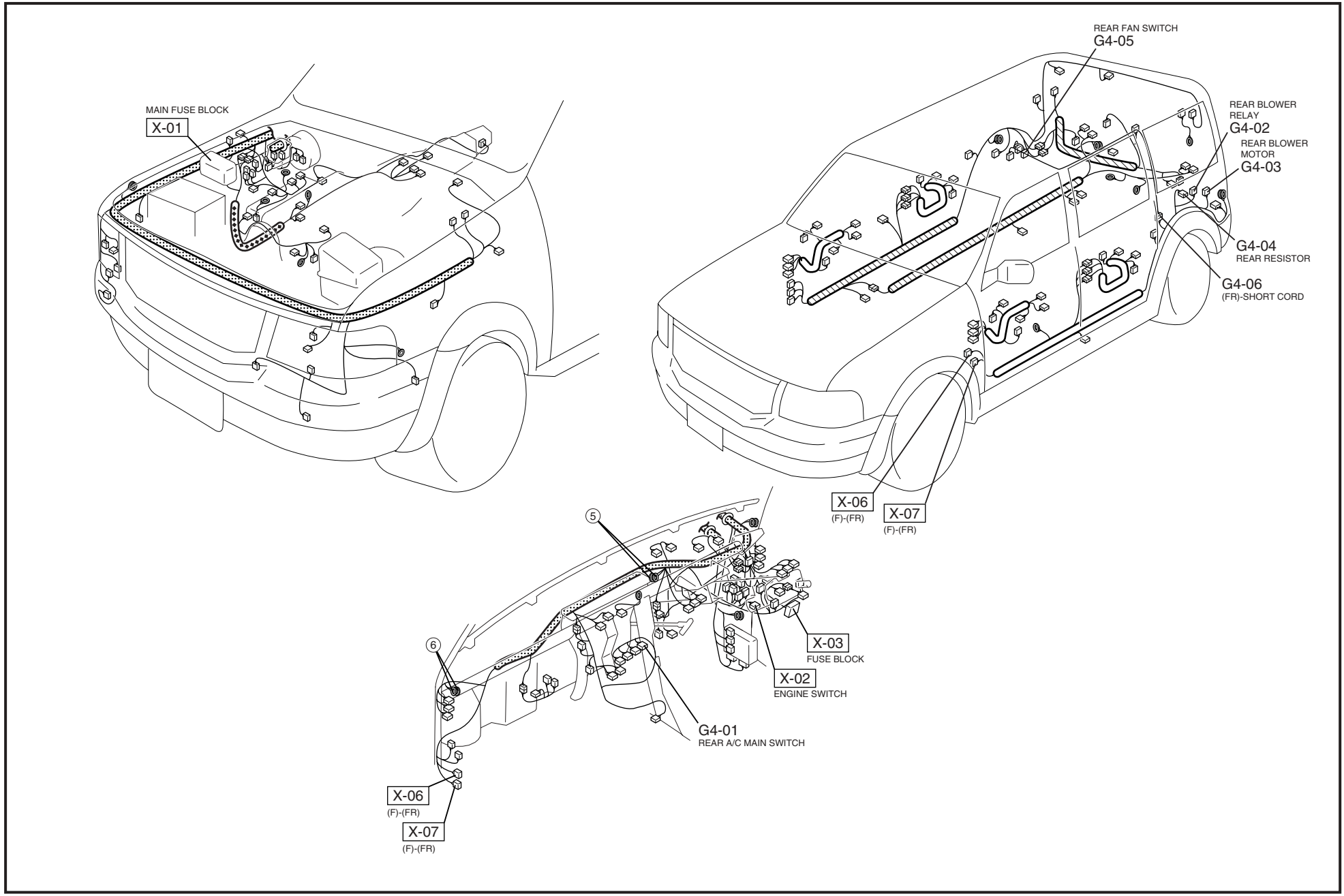
G4-05 REAR FAN SWITCH (SHORT CORD)

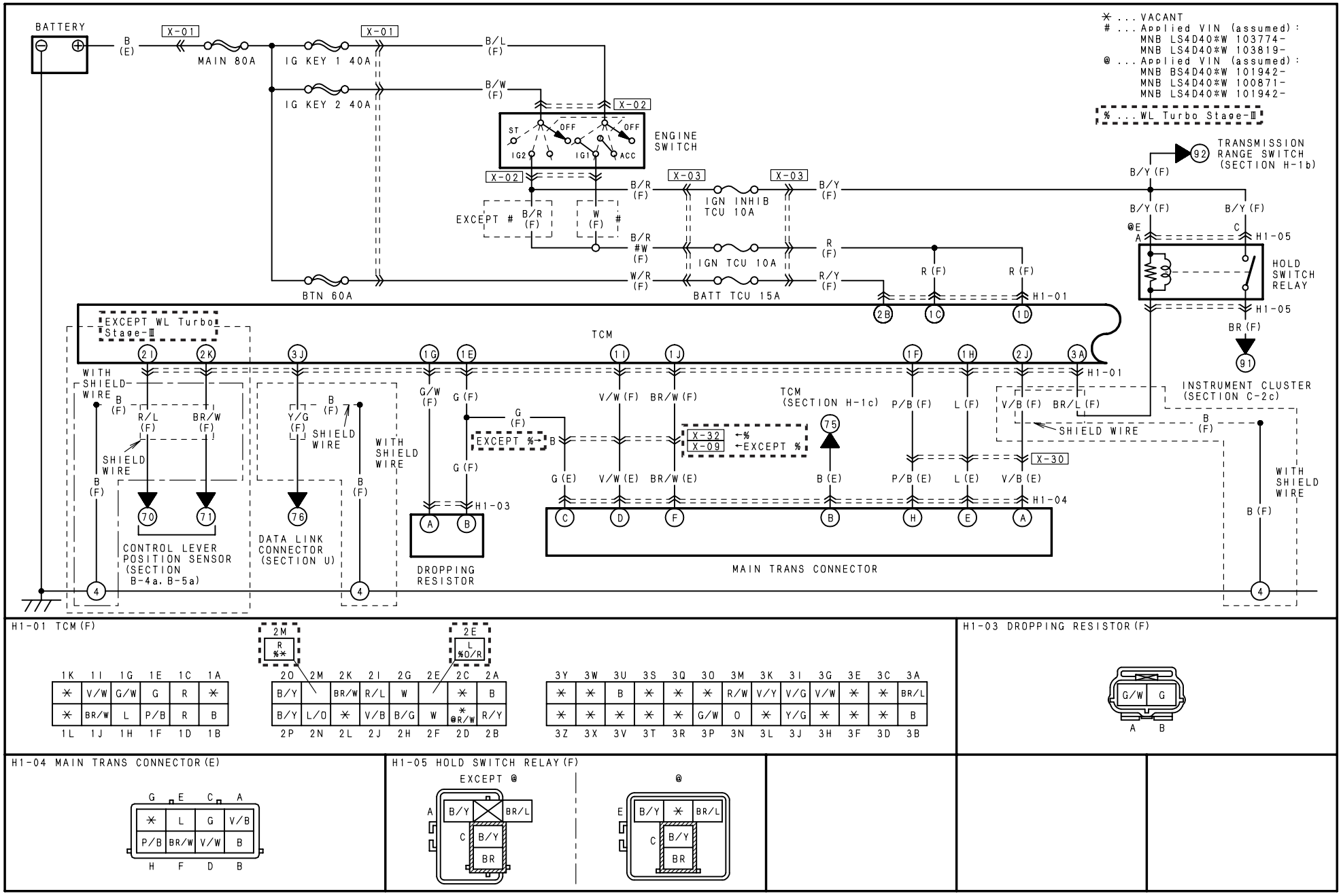
G4-06 FLOOR (FR) -SHORT CORD

(FR)

(SHORT CORD)

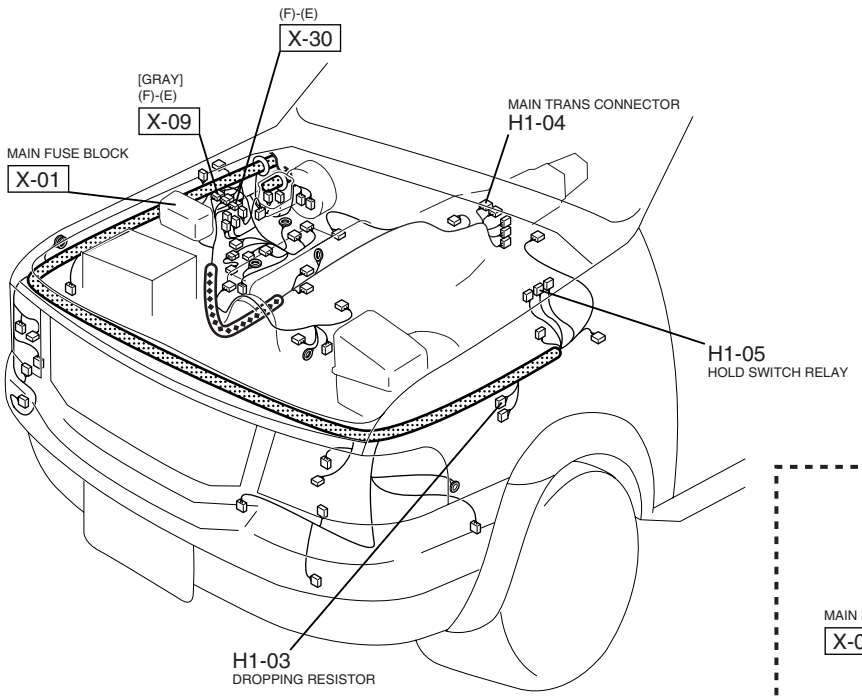
HARNESS SYMBOL: (F) (E) (R)

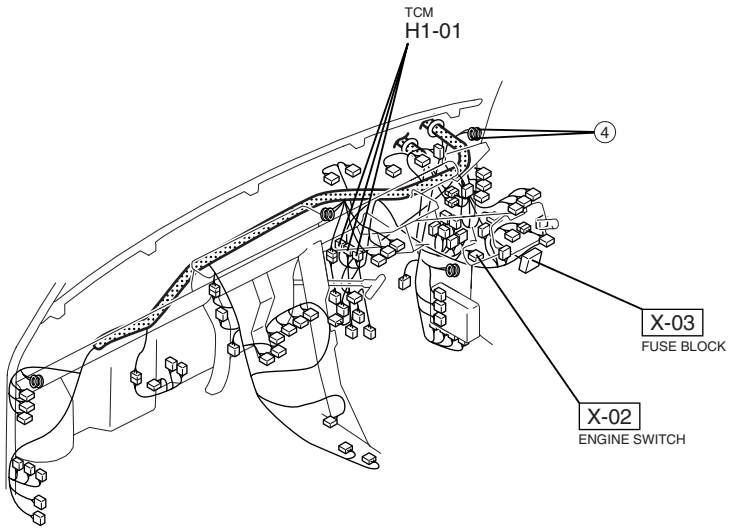



✳ ... VACANT
... Applied VIN (assumed):
MNB LS4D40*W 103774-
MNB LS4D40*W 103819-
@ ... Applied VIN (assumed):
MNB BS4D40*W 101942-
MNB LS4D40*W 100871-
MNB LS4D40*W 101942-
% ... WL Turbo Stage-Ⅲ
BATTERY
MAIN 80A
IG KEY 1 40A
IG KEY 2 40A
BTN 60A
ENGINE SWITCH
IGN INHIB TCU 10A
IGN TCU 10A
BATT TCU 15A
TRANSMISSION RANGE SWITCH (SECTION H-1b)
HOLD SWITCH RELAY
EXCEPT WL Turbo Stage-Ⅲ
WITH SHIELD WIRE
SHIELD WIRE
CONTROL LEVER POSITION SENSOR (SECTION B-4a, B-5a)
DATA LINK CONNECTOR (SECTION U)
DROPPING RESISTOR
TCM
TCM (SECTION H-1c)
MAIN TRANS CONNECTOR
INSTRUMENT CLUSTER (SECTION C-2c)
EXCEPT %
EXCEPT #
H1-01 TCM(F)
H1-03 DROPPING RESISTOR(F)
H1-04 MAIN TRANS CONNECTOR(E)
H1-05 HOLD SWITCH RELAY(F)
EXCEPT @
@

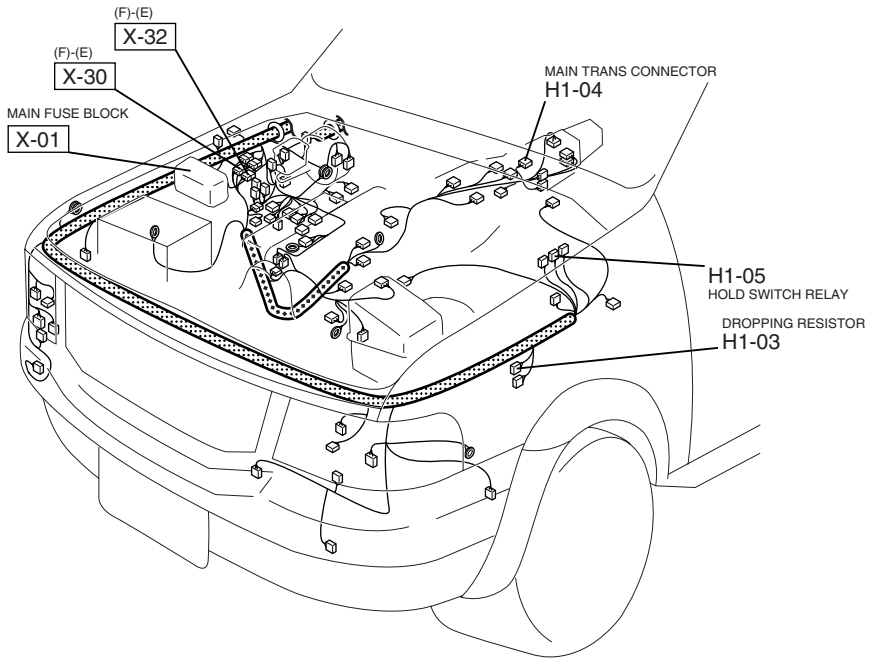
HARNESS SYMBOL: (F) (E) (R)

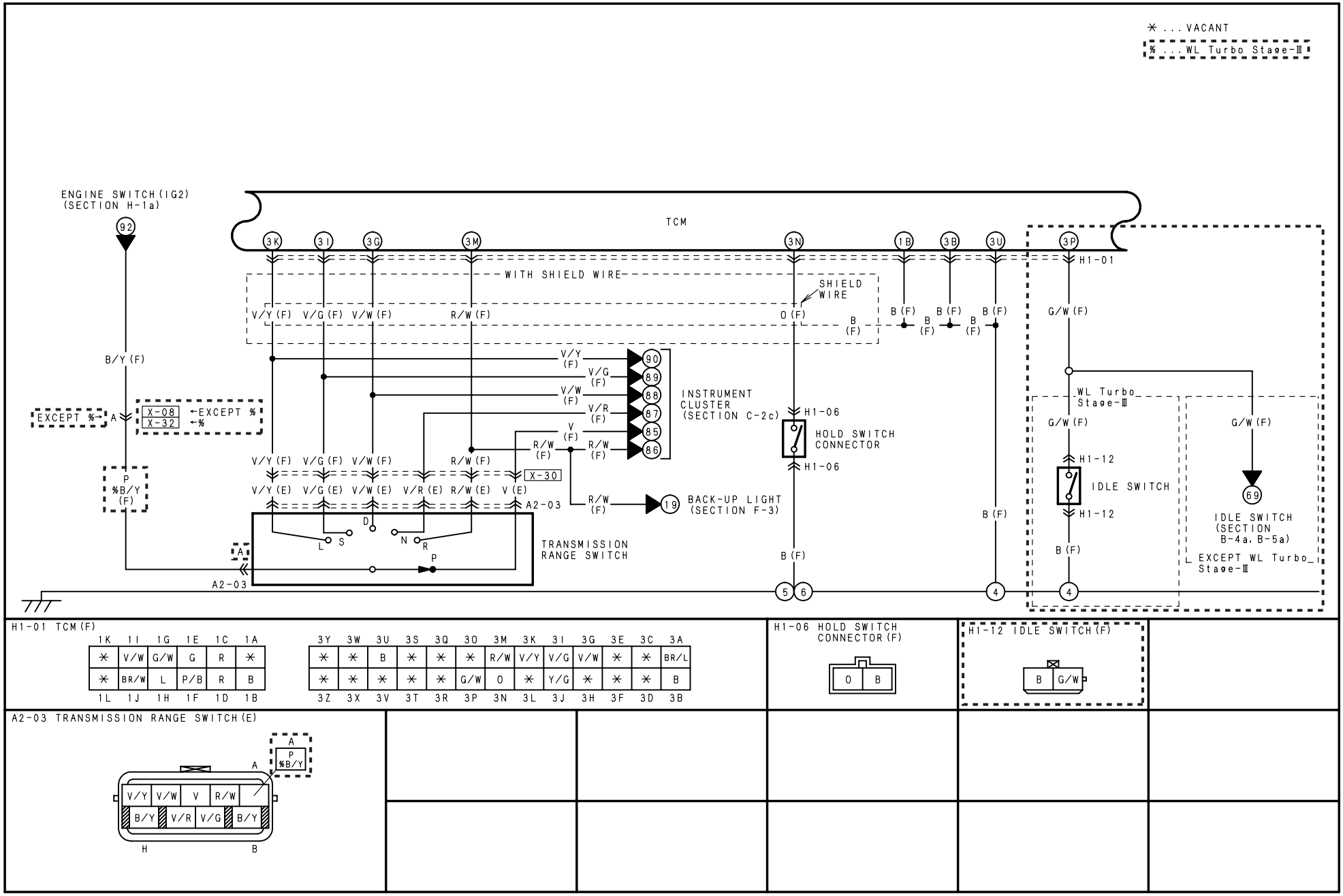
[WL Turbo EXCEPT Stage-Ⅲ]



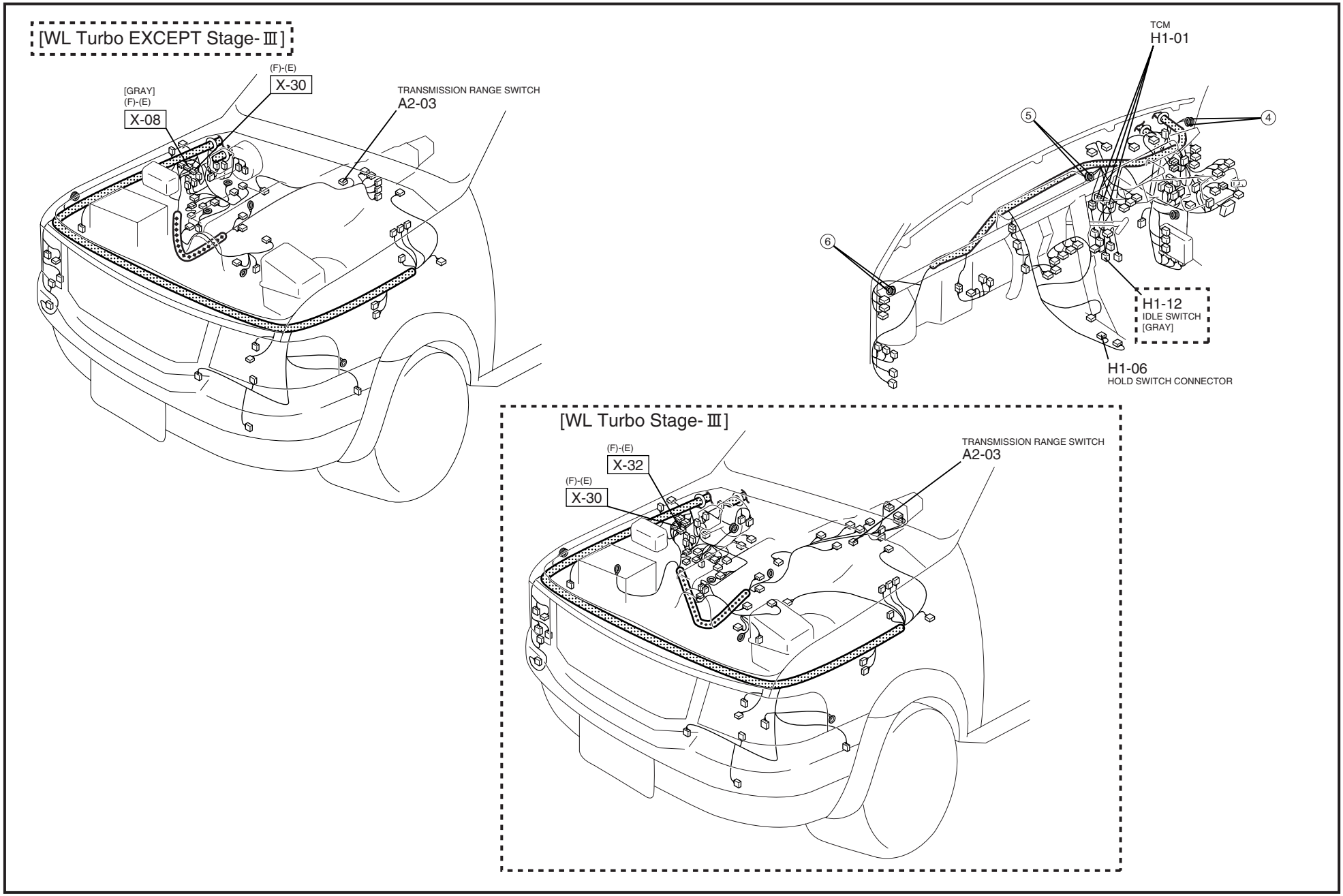


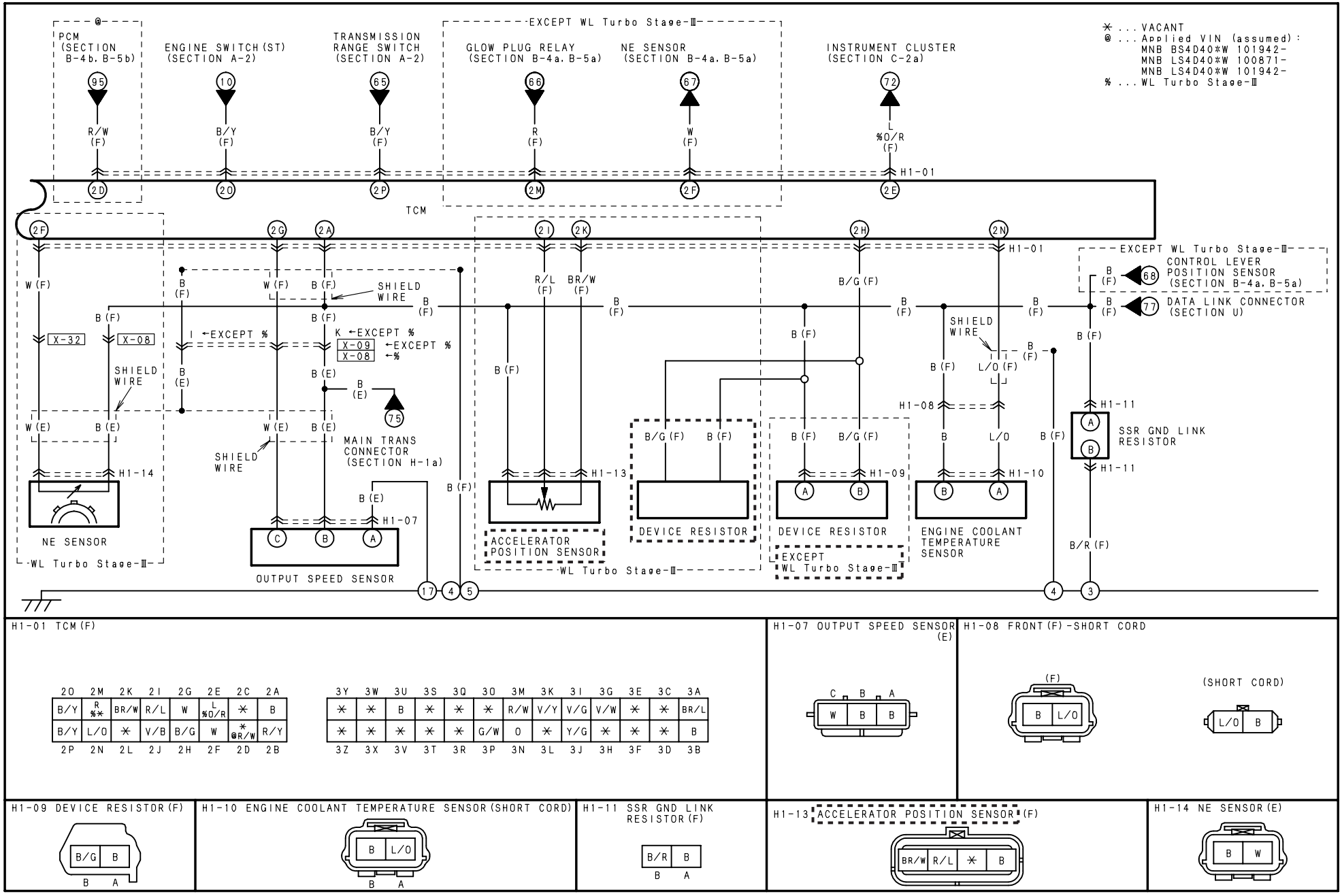
[WL Turbo Stage-Ⅲ]




✳ . . . VACANT
% . . . WL Turbo Stage-Ⅲ
ENGINE SWITCH (IG2)
(SECTION H-1a)
92
B/Y (F)
EXCEPT %
A
X-08
X-32
←EXCEPT %
←%
P
%B/Y
(F)
TCM
3K
3I
3G
3M
3N
1B
3B
3U
3P
H1-01
WITH SHIELD WIRE
SHIELD WIRE
V/Y (F) V/G (F) V/W (F) R/W (F) O (F) B (F)
B (F) B (F) B (F)
G/W (F)
V/Y (F)
V/G (F)
V/W (F)
V/R (F)
V (F)
R/W (F)
90
89
88
87
85
86
INSTRUMENT CLUSTER (SECTION C-2c)
H1-06
HOLD SWITCH CONNECTOR
H1-06
WL Turbo Stage-Ⅲ
G/W (F)
H1-12
IDLE SWITCH
H1-12
B (F)
G/W (F)
69
IDLE SWITCH (SECTION B-4a, B-5a)
EXCEPT WL Turbo Stage-Ⅲ
V/Y (F) V/G (F) V/W (F) R/W (F)
X-30
V/Y (E) V/G (E) V/W (E) V/R (E) R/W (E) V (E)
A2-03
R/W (F)
19
BACK-UP LIGHT (SECTION F-3)
D
L
S
N
R
P
A
TRANSMISSION RANGE SWITCH
A2-03
B (F)
5
6
4
4
H1-01 TCM (F)
1K 1I 1G 1E 1C 1A
✳ V/W G/W G R ✳
✳ BR/W L P/B R B
1L 1J 1H 1F 1D 1B
3Y 3W 3U 3S 3Q 3O 3M 3K 3I 3G 3E 3C 3A
✳ ✳ B ✳ ✳ ✳ R/W V/Y V/G V/W ✳ ✳ BR/L
✳ ✳ ✳ ✳ ✳ G/W O ✳ Y/G ✳ ✳ ✳ B
3Z 3X 3V 3T 3R 3P 3N 3L 3J 3H 3F 3D 3B
H1-06 HOLD SWITCH CONNECTOR (F)
O B
H1-12 IDLE SWITCH (F)
B G/W
A2-03 TRANSMISSION RANGE SWITCH (E)
A
P
%B/Y
V/Y V/W V R/W
B/Y V/R V/G B/Y
H
B

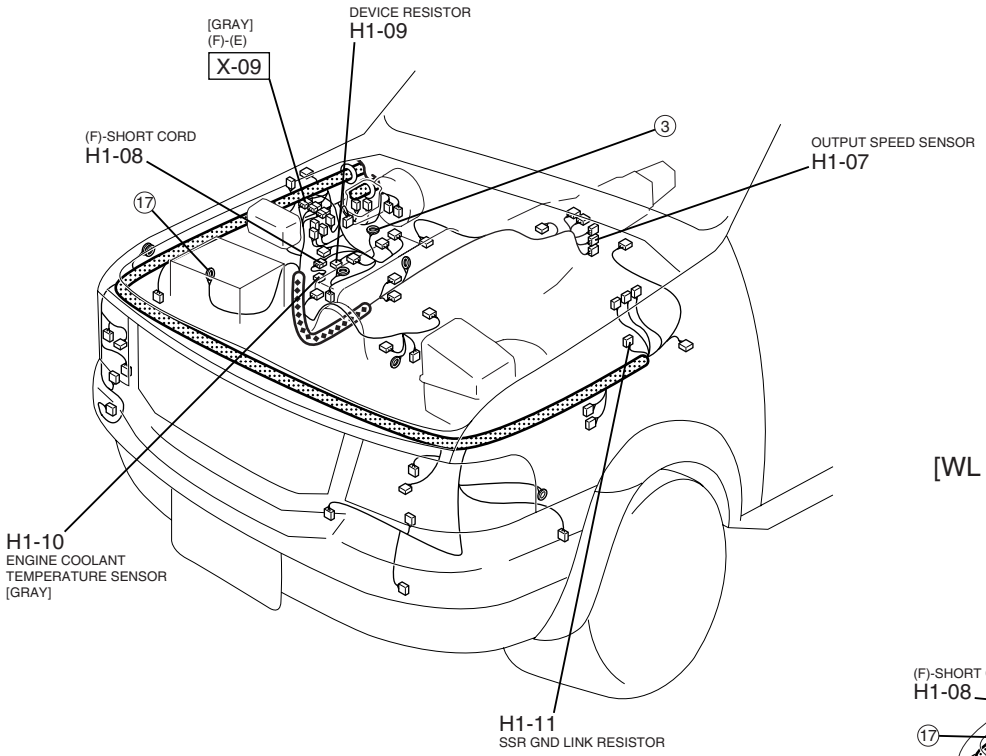
HARNESS SYMBOL: (F) (E) (R)

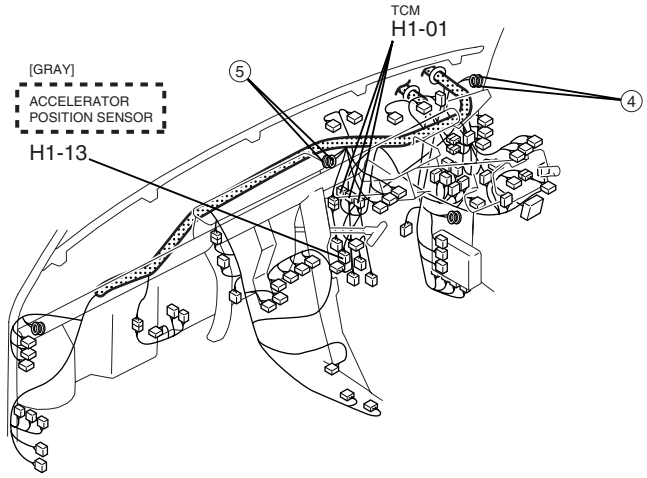



✳ ...VACANT
@ ...Applied VIN (assumed):
MNB BS4D40*W 101942-
MNB LS4D40*W 100871-
MNB LS4D40*W 101942-
% ...WL Turbo Stage-Ⅲ
PCM (SECTION B-4b, B-5b)
ENGINE SWITCH (ST) (SECTION A-2)
TRANSMISSION RANGE SWITCH (SECTION A-2)
EXCEPT WL Turbo Stage-Ⅲ
GLOW PLUG RELAY (SECTION B-4a, B-5a)
NE SENSOR (SECTION B-4a, B-5a)
INSTRUMENT CLUSTER (SECTION C-2a)
TCM
SHIELD WIRE
MAIN TRANS CONNECTOR (SECTION H-1a)
NE SENSOR
OUTPUT SPEED SENSOR
ACCELERATOR POSITION SENSOR
DEVICE RESISTOR
ENGINE COOLANT TEMPERATURE SENSOR
SSR GND LINK RESISTOR
CONTROL LEVER POSITION SENSOR (SECTION B-4a, B-5a)
DATA LINK CONNECTOR (SECTION U)
H1-01 TCM(F)
H1-07 OUTPUT SPEED SENSOR (E)
H1-08 FRONT(F)-SHORT CORD
(SHORT CORD)
H1-09 DEVICE RESISTOR(F)
H1-10 ENGINE COOLANT TEMPERATURE SENSOR(SHORT CORD)
H1-11 SSR GND LINK RESISTOR(F)
H1-13 ACCELERATOR POSITION SENSOR (F)
H1-14 NE SENSOR(E)

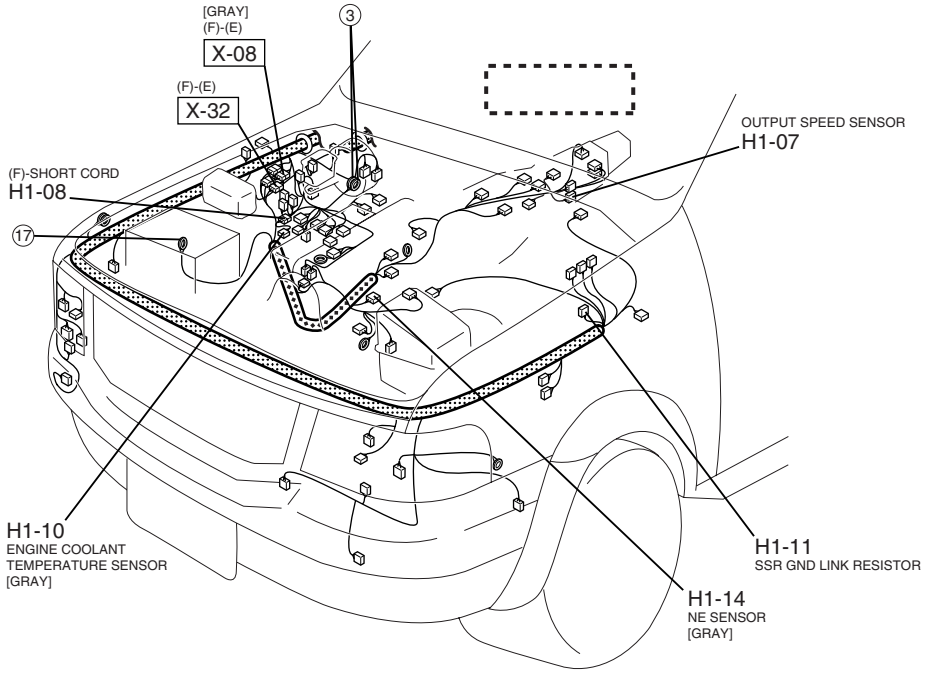
HARNESS SYMBOL: (F) (E) (R)

[WL Turbo EXCEPT Stage-Ⅲ]

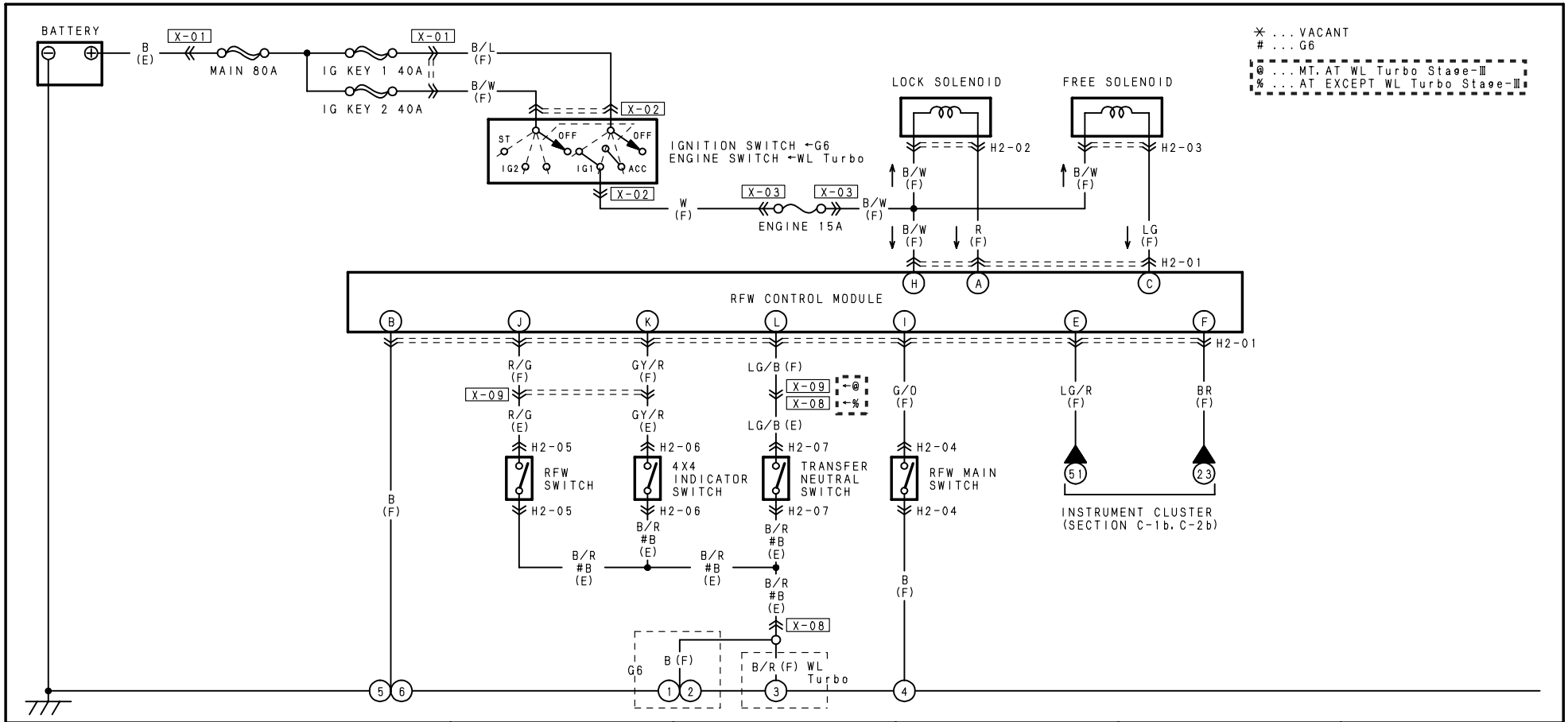




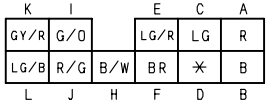
[WL Turbo Stage-Ⅲ]



REMOTE FREEWHEEL CONTROL SYSTEM



H2-01 RFW CONTROL MODULE (F)



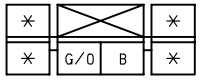
H2-02 LOCK SOLENOID (F)



H2-03 FREE SOLENOID (F)



H2-04 RFW MAIN SWITCH (F)



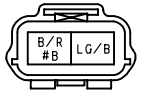
H2-05 RFW SWITCH (E)



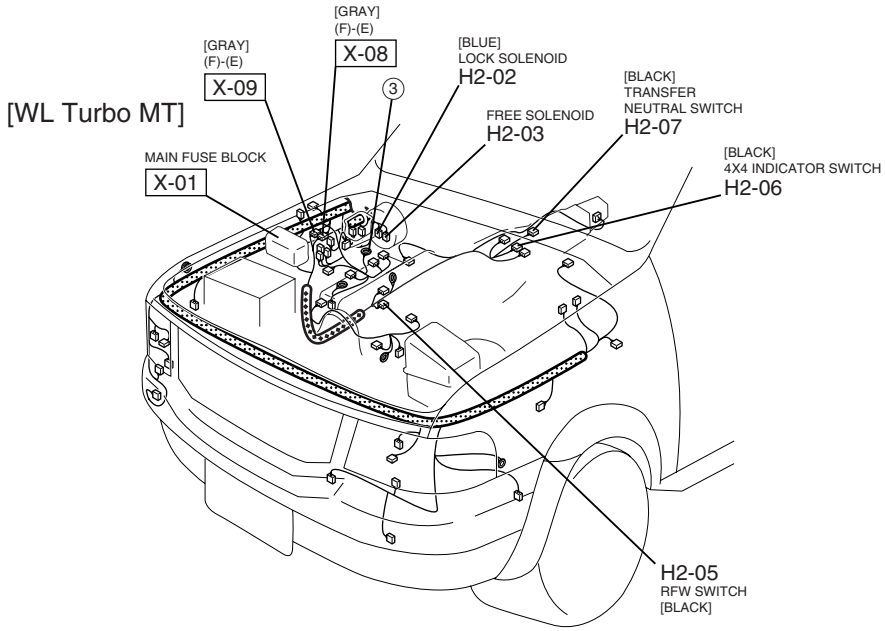
H2-06 4X4 INDICATOR SWITCH (E)

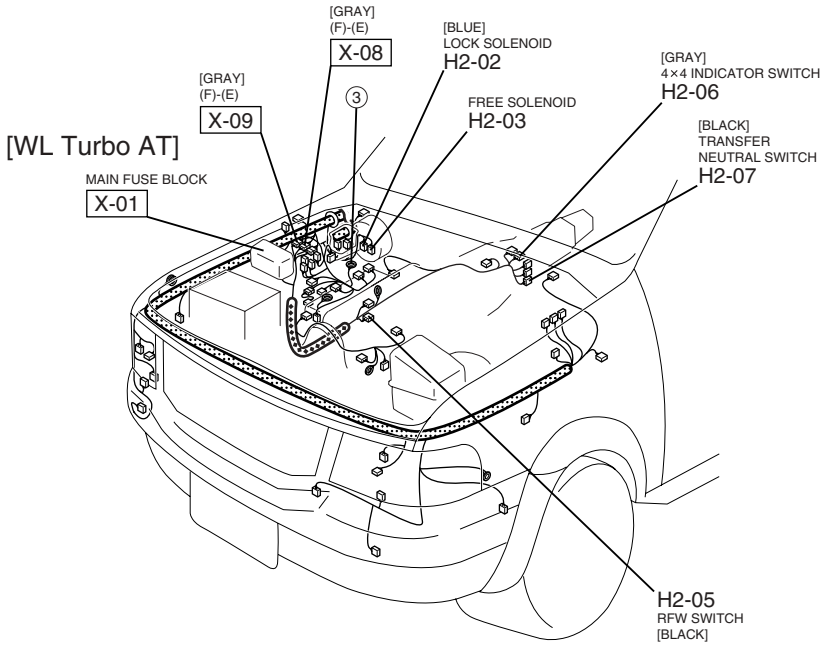


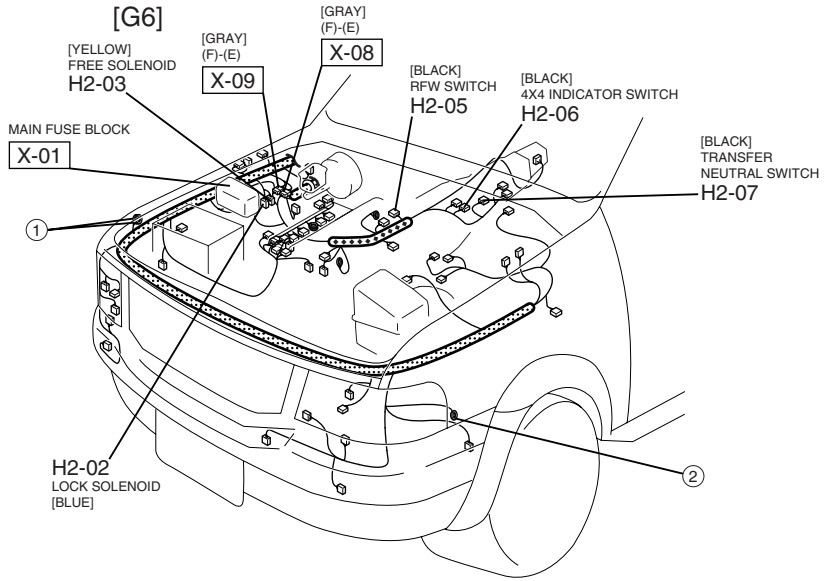
H2-07 TRANSFER NEUTRAL SWITCH (E)

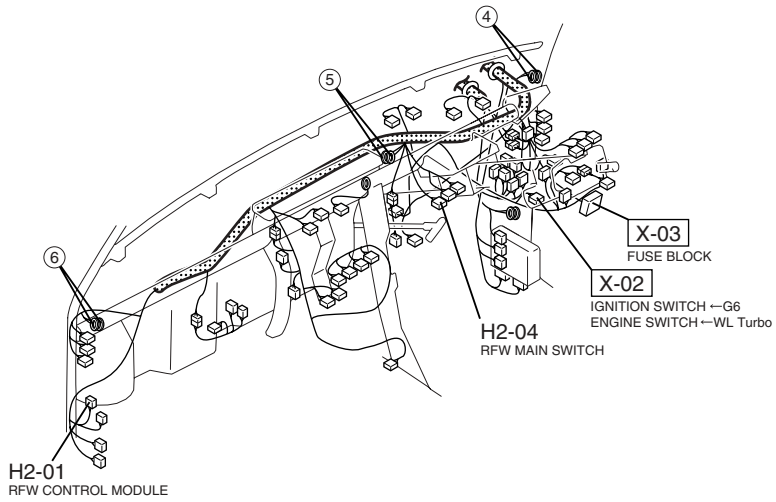


HARNESS SYMBOL: (F) (E) (R)

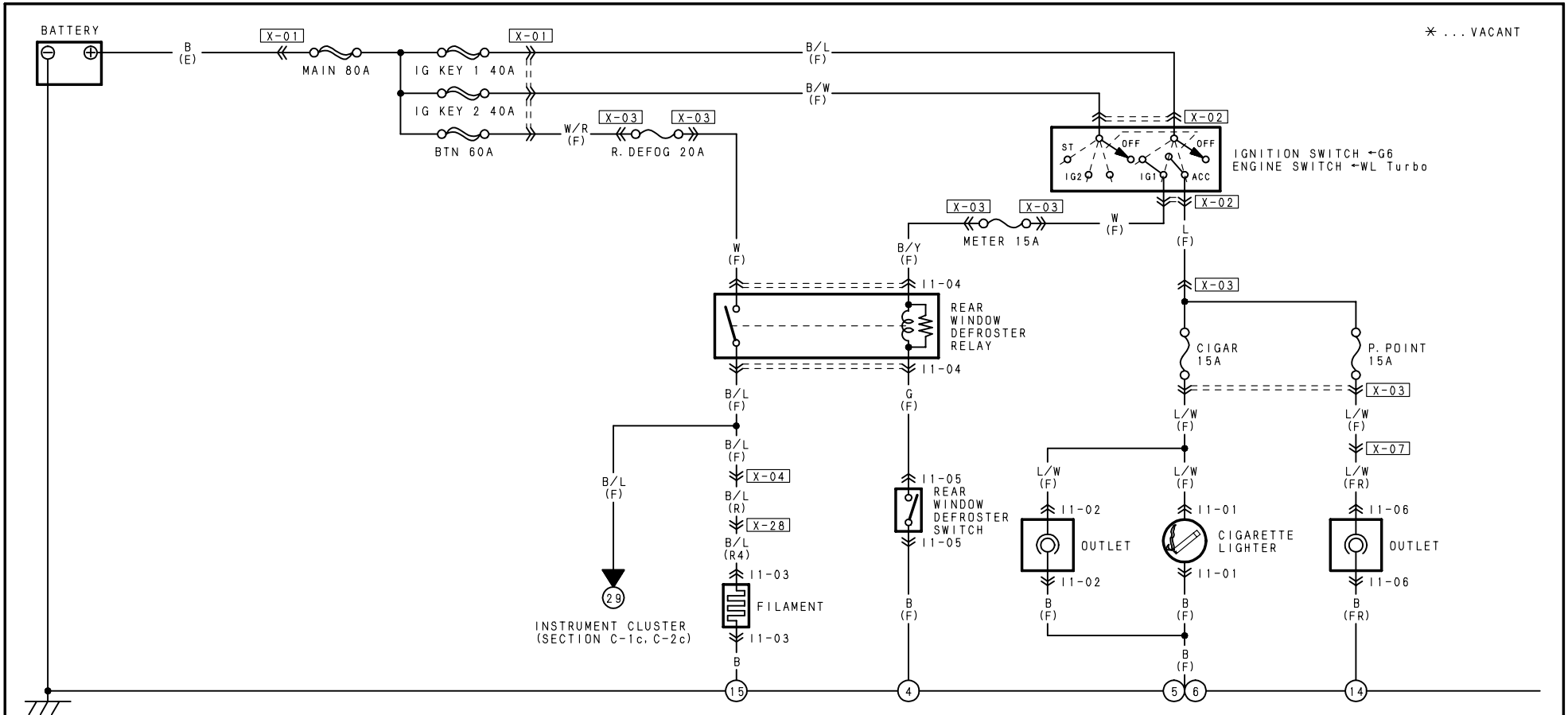






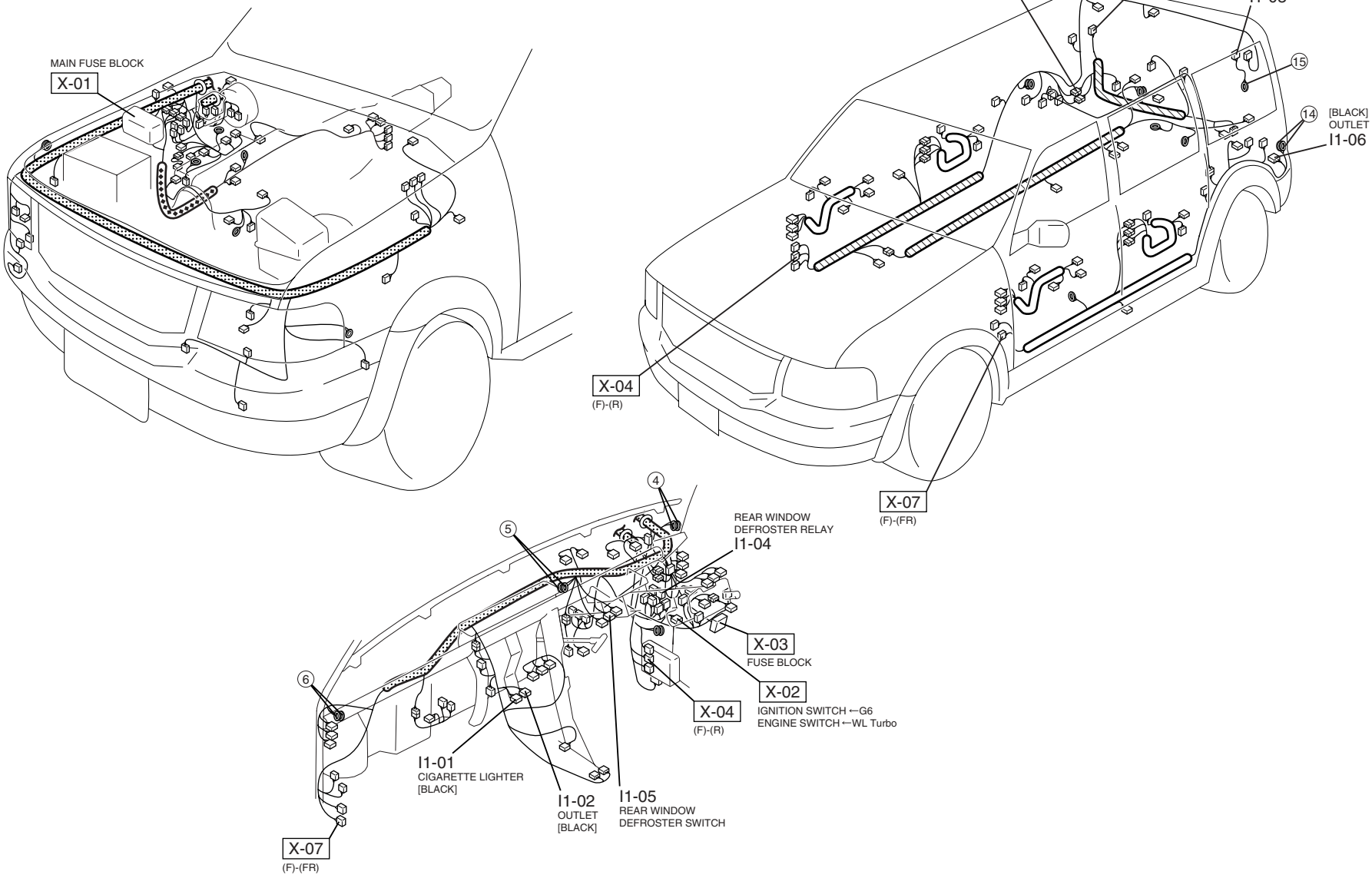


CIGARETTE LIGHTER / REAR WINDOW DEFROSTER

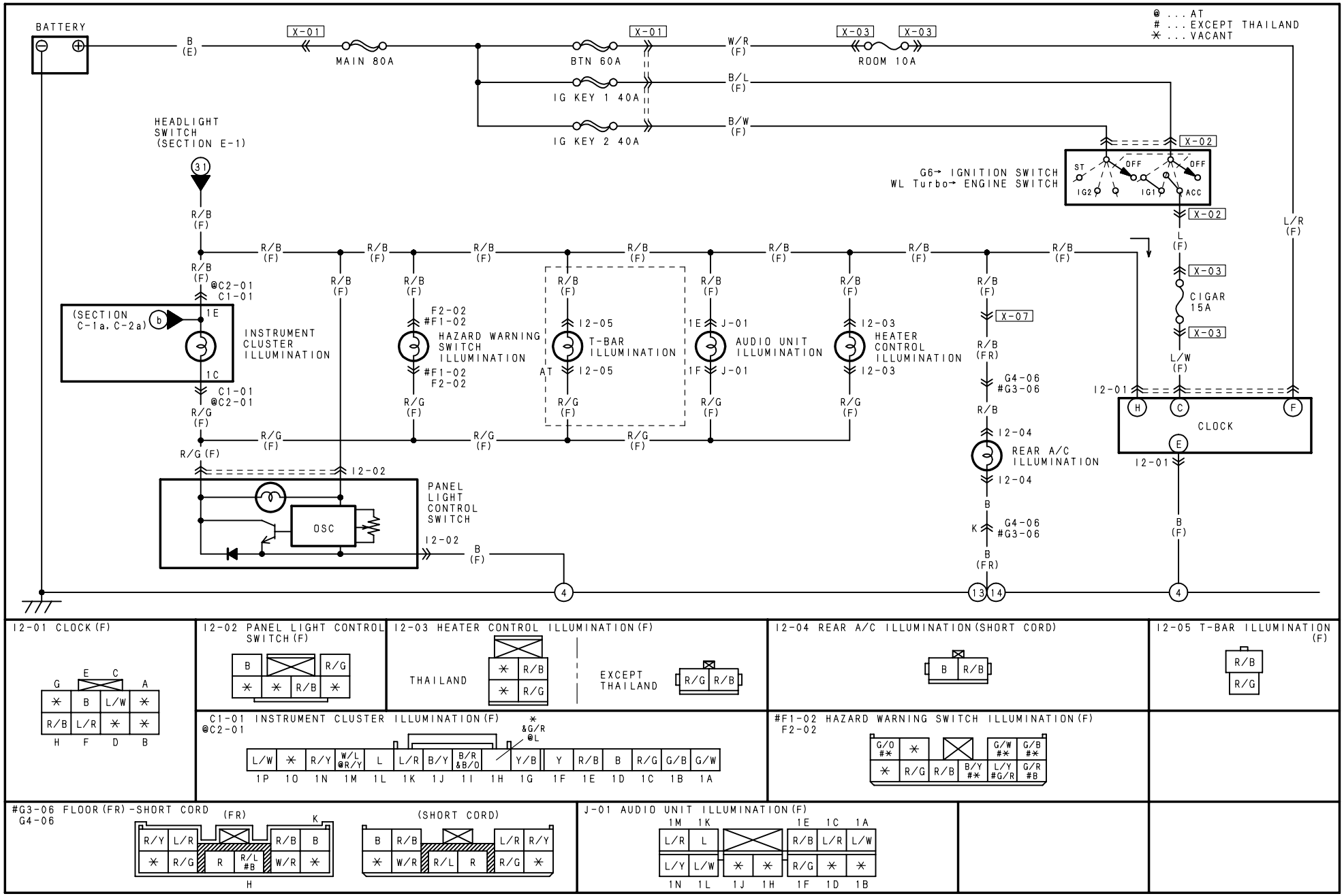


I1-01 CIGARETTE LIGHTER (F)	I1-02 OUTLET (F)	I1-03 FILAMENT (R4) (SHORT CORD)	I1-04 REAR WINDOW DEFROSTER RELAY (F)	I1-05 REAR WINDOW DEFROSTER SWITCH (F)	I1-06 OUTLET (FR)	
L/W, B	L/W, B	B/L, B	G, B/Y, W, B/L	✳, B, ✳, ✳, G, ✳	L/W, ✳, B	

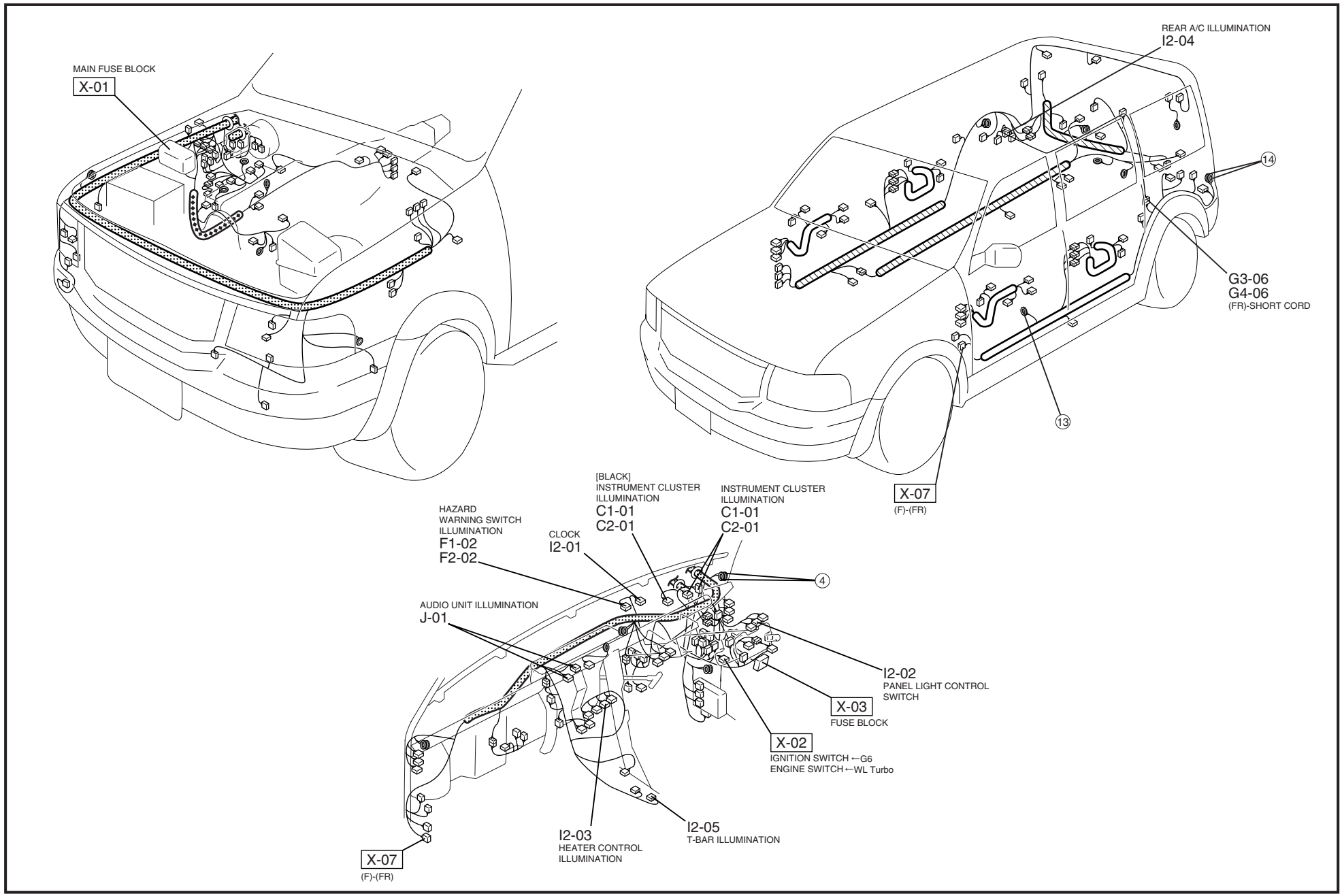
HARNESS SYMBOL: (F) (E) (R)

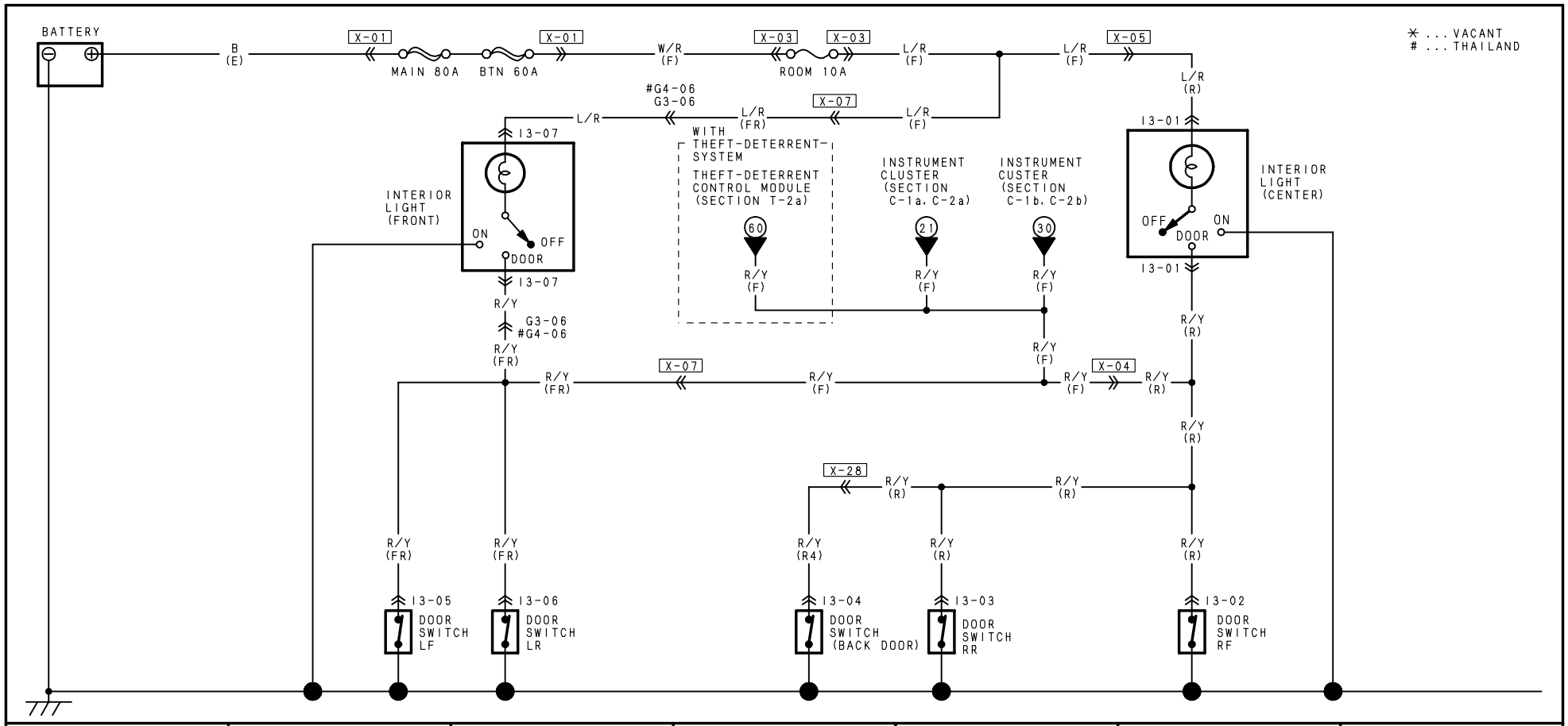


CLOCK / ILLUMINATION LIGHT



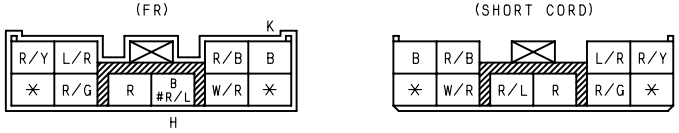
HARNESS SYMBOL: (F) (E) (R)



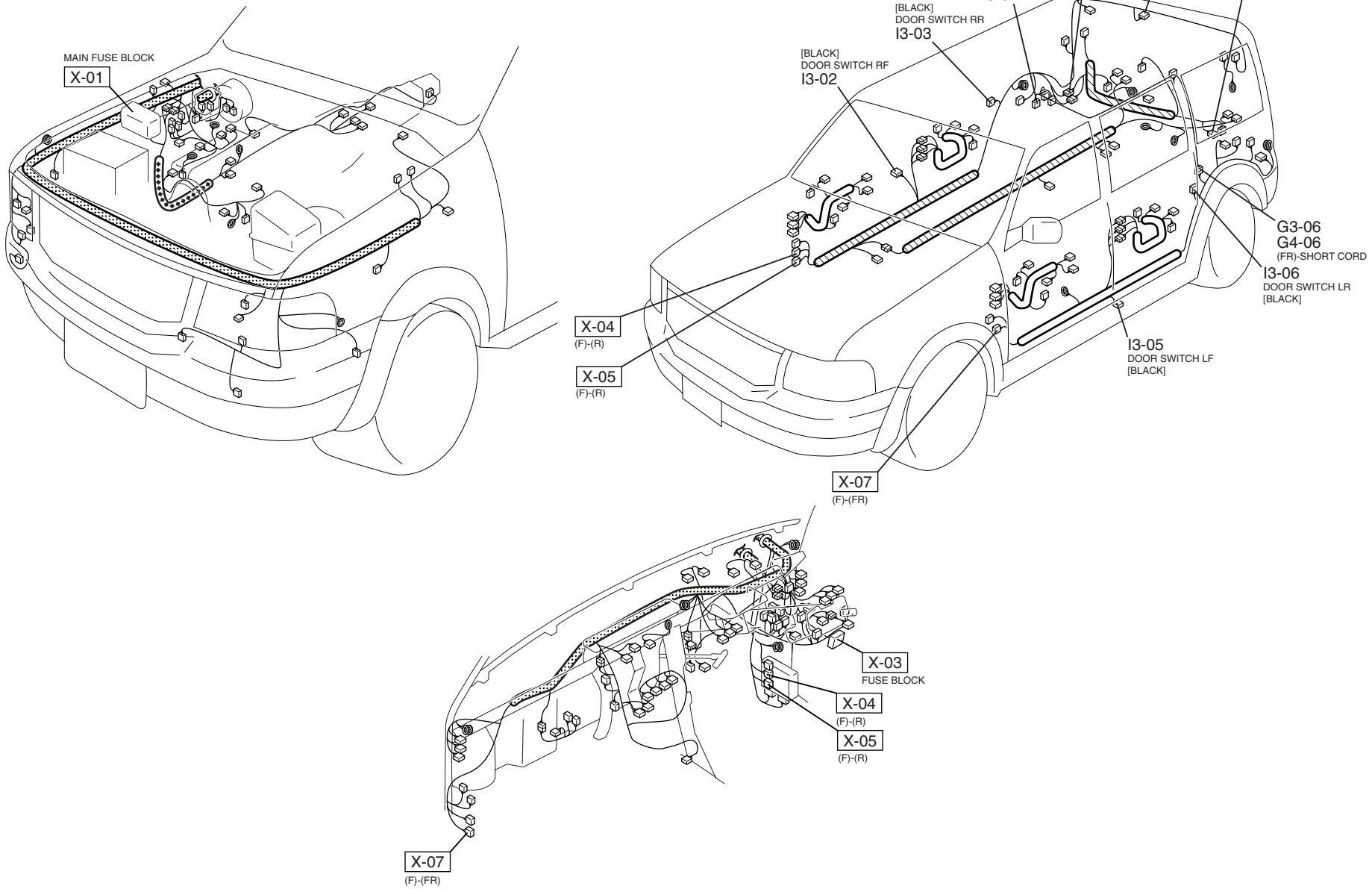


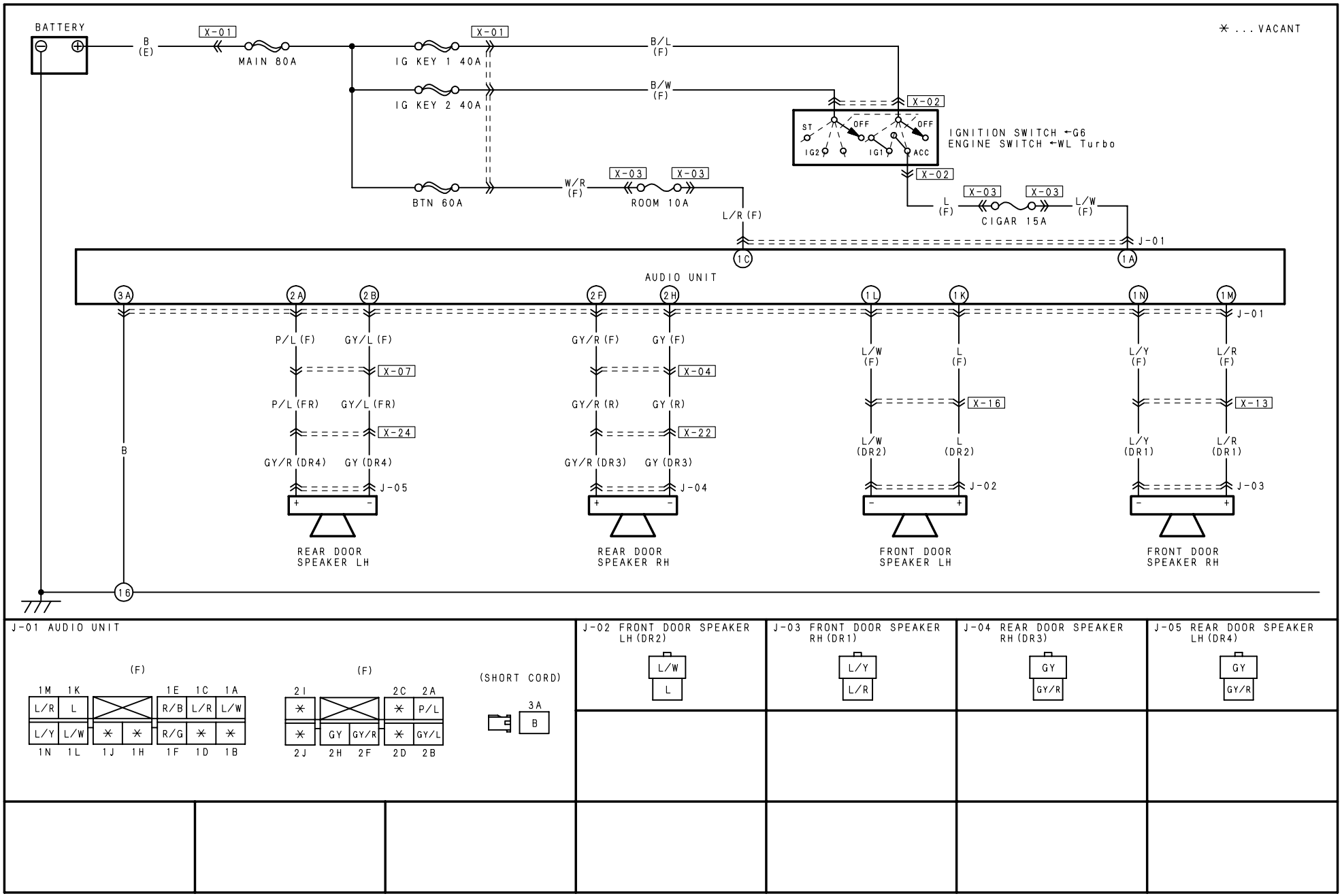
I3-01 INTERIOR LIGHT (CENTER) (R)	I3-02 DOOR SWITCH RF (R)	I3-03 DOOR SWITCH RR (R)	I3-04 DOOR SWITCH (BACK DOOR) (R4)	I3-05 DOOR SWITCH LF (FR)	I3-06 DOOR SWITCH LR (FR)	I3-07 INTERIOR LIGHT (FRONT) (SHORT CORD)
L/R R/Y	R/Y	R/Y	R/Y	R/Y	R/Y	L/R R/Y

G3-06 FLOOR (FR) -SHORT CORD
#G4-06



HARNESS SYMBOL: (F) (E) (R)





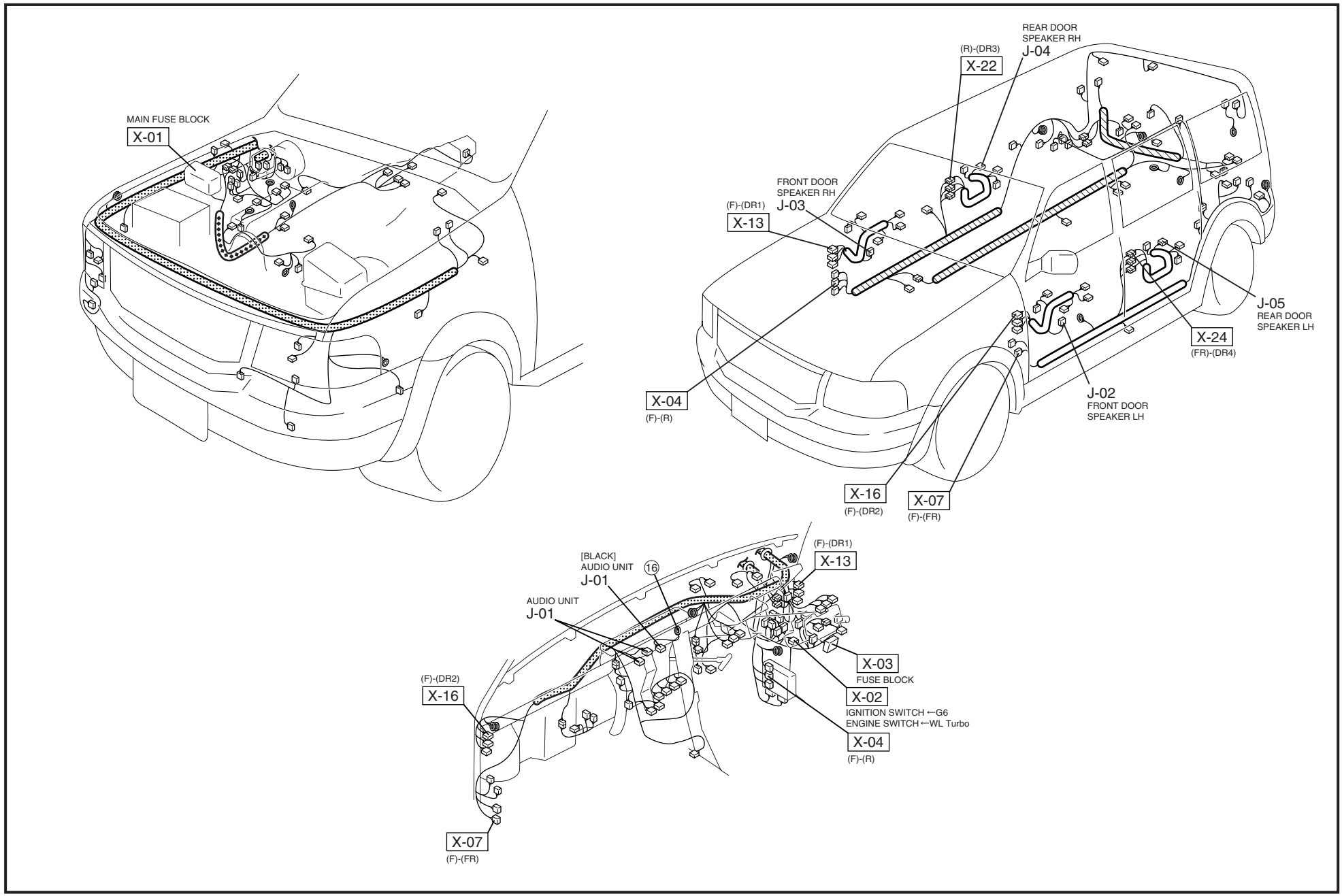
J-02 FRONT DOOR SPEAKER LH (DR2)

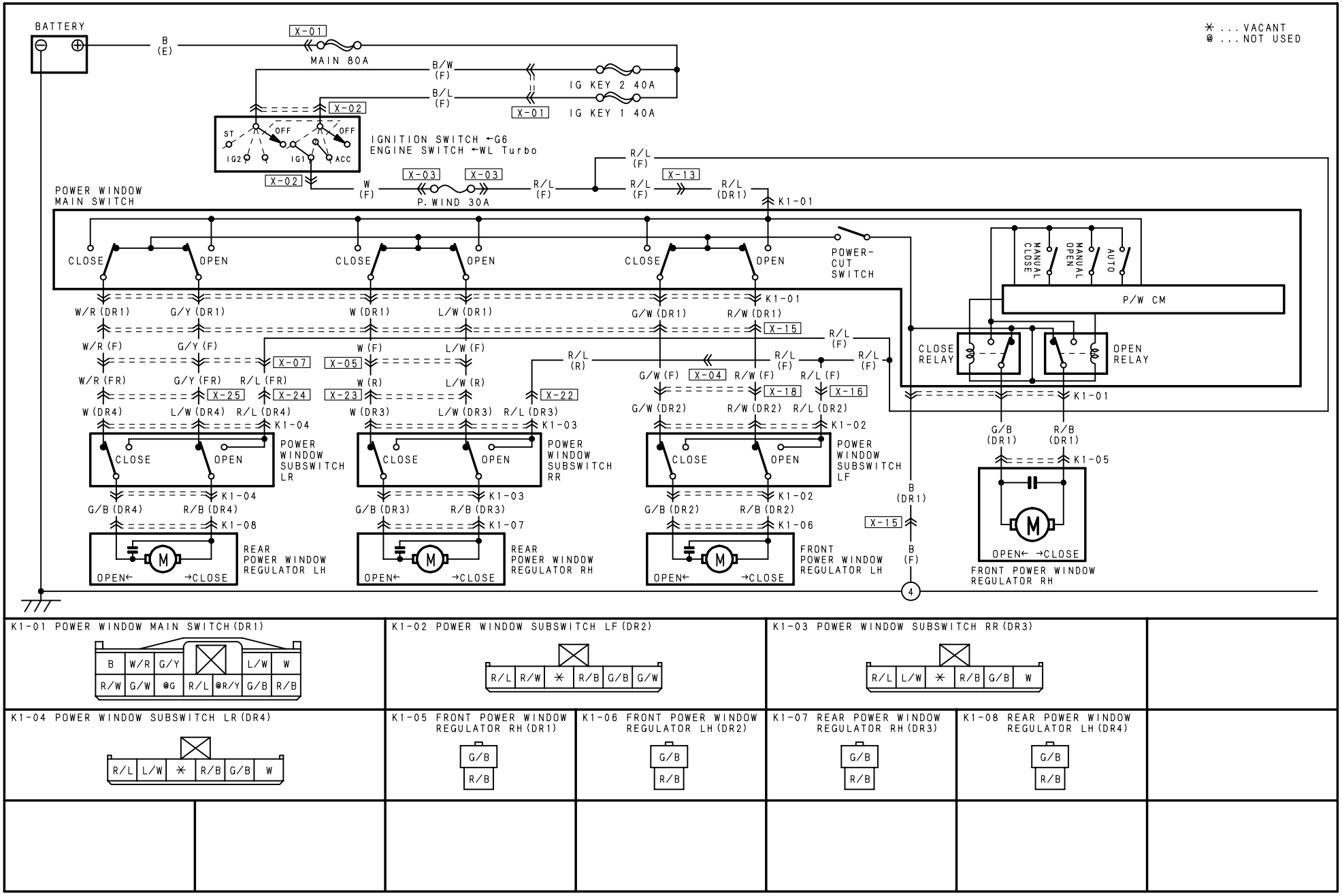
J-03 FRONT DOOR SPEAKER RH (DR1)

J-04 REAR DOOR SPEAKER RH (DR3)

J-05 REAR DOOR SPEAKER LH (DR4)

HARNESS SYMBOL: (F) (E) (R)





K1-01 POWER WINDOW MAIN SWITCH (DR1)

K1-02 POWER WINDOW SUBSWITCH LF (DR2)

K1-03 POWER WINDOW SUBSWITCH RR (DR3)

K1-04 POWER WINDOW SUBSWITCH LR (DR4)

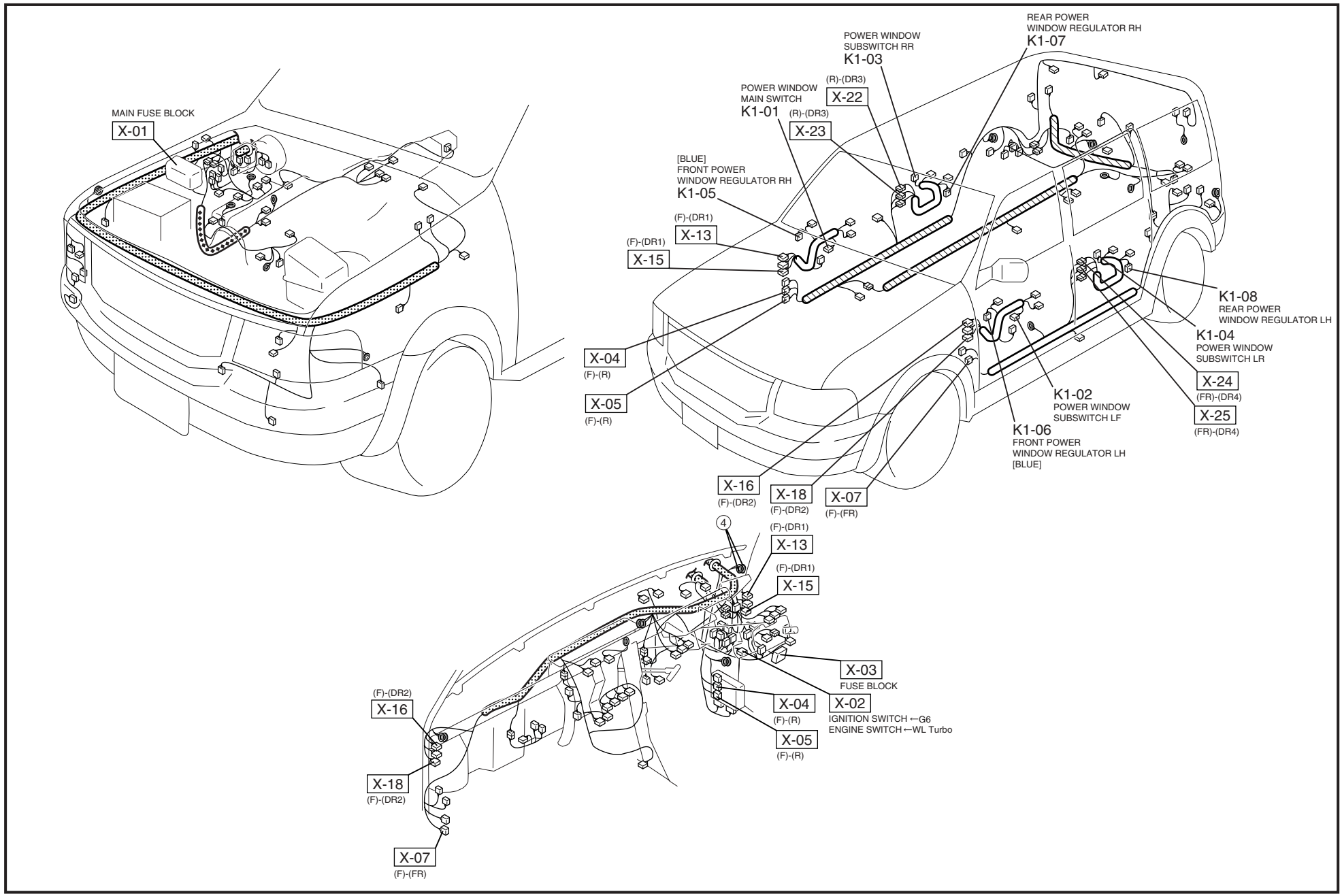
K1-05 FRONT POWER WINDOW REGULATOR RH (DR1)

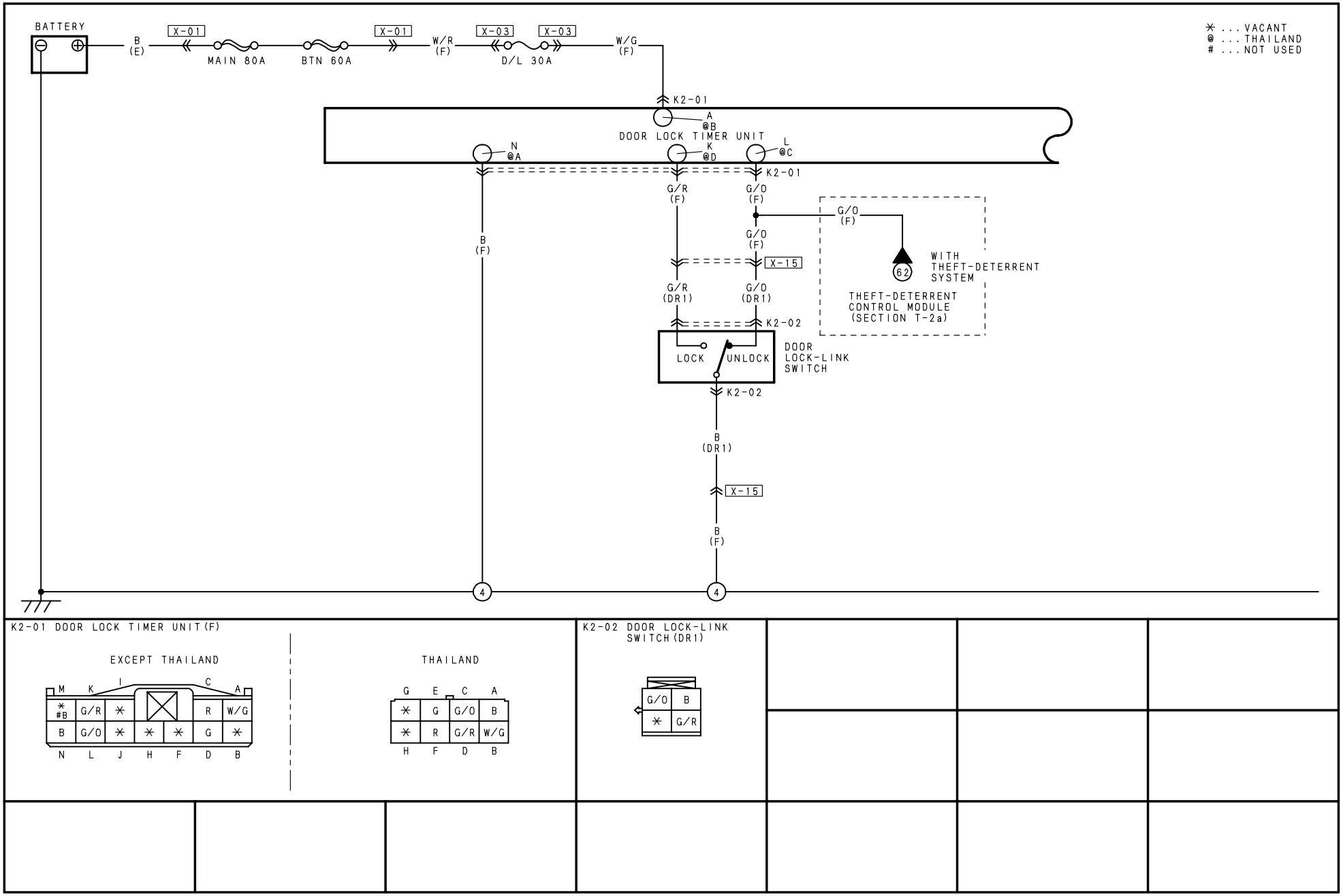
K1-06 FRONT POWER WINDOW REGULATOR LH (DR2)

K1-07 REAR POWER WINDOW REGULATOR RH (DR3)

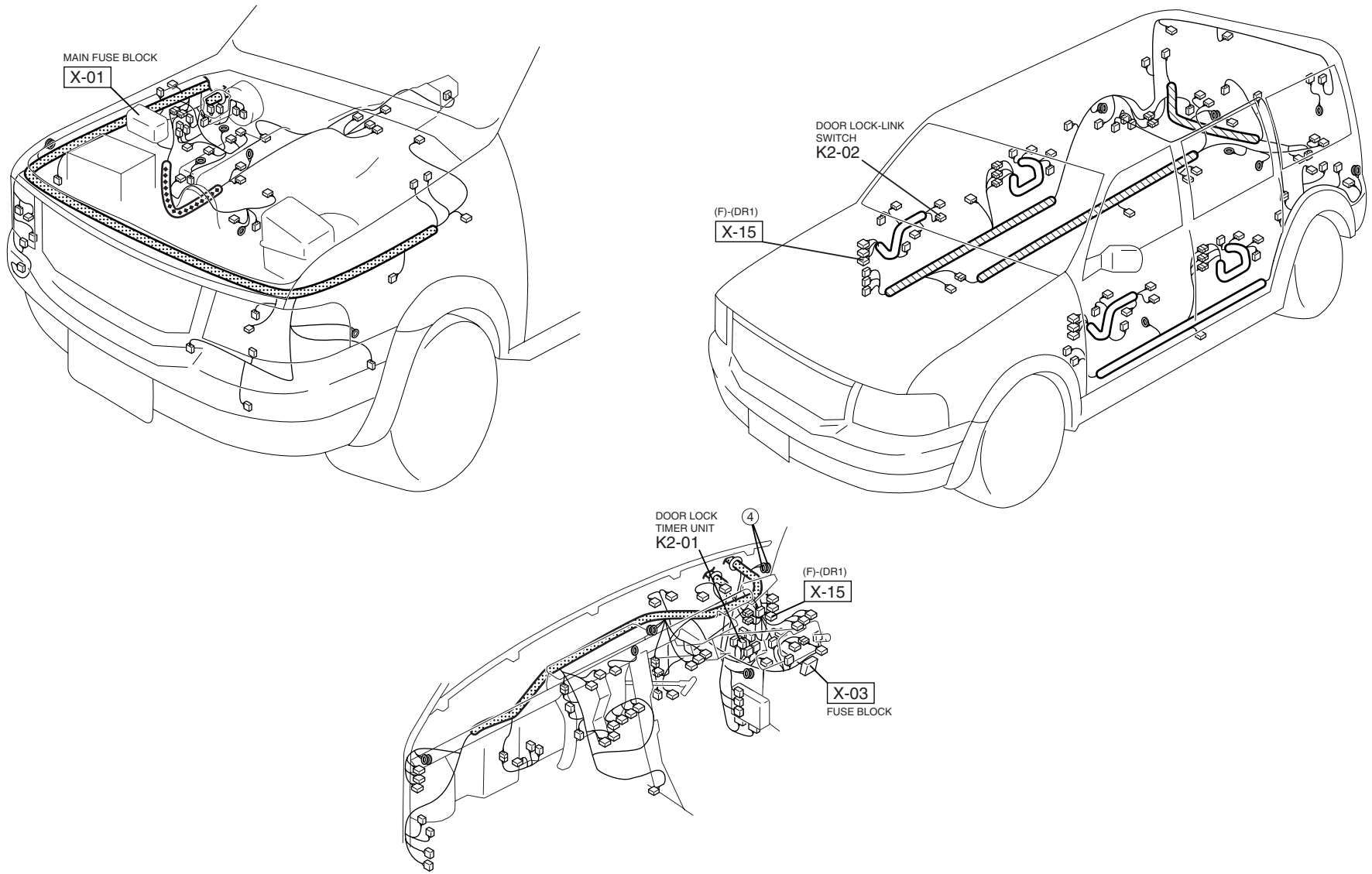
K1-08 REAR POWER WINDOW REGULATOR LH (DR4)

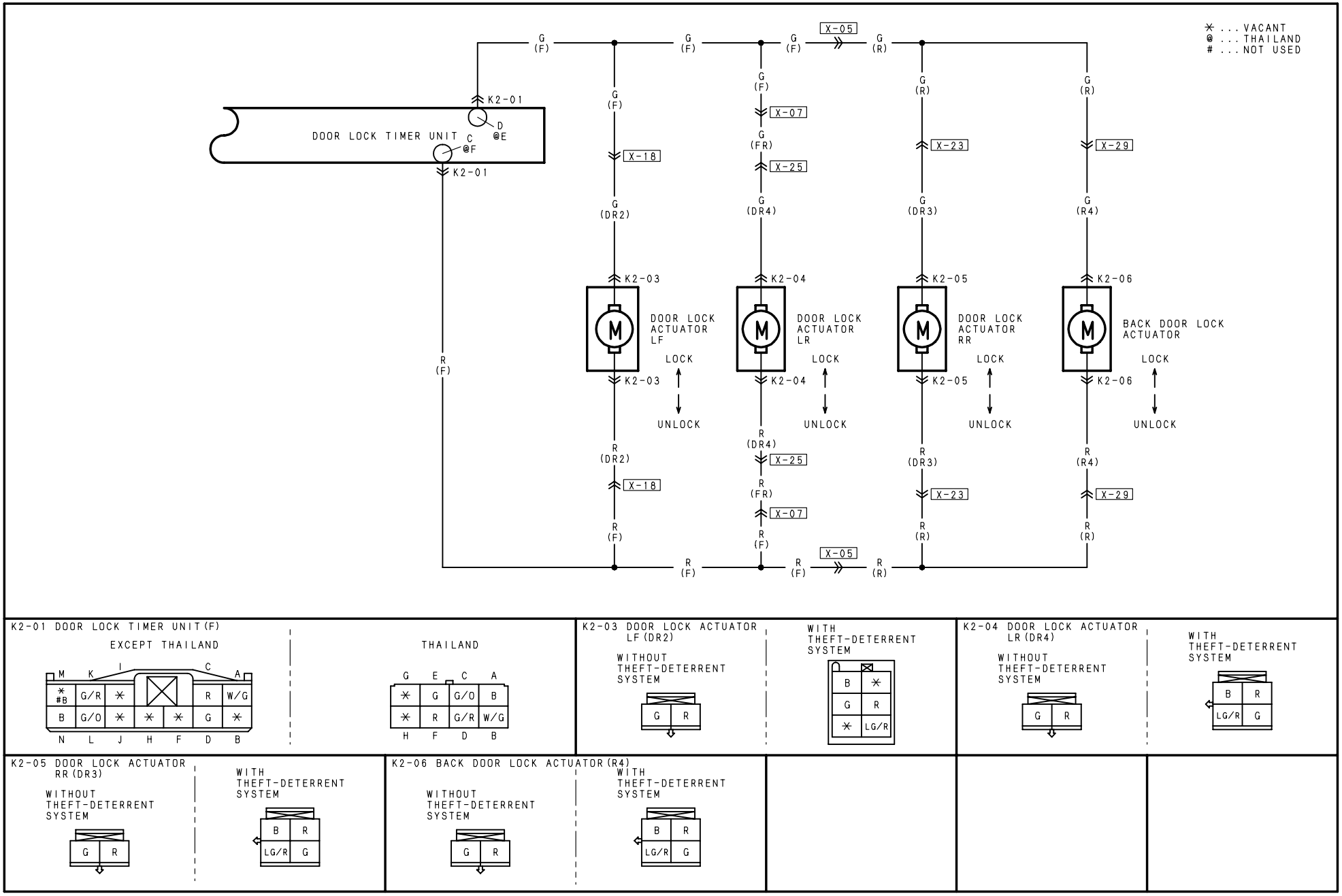
HARNESS SYMBOL: (F) (E) (R)




BATTERY
B (E)
X-01
MAIN 80A
BTN 60A
X-01
W/R (F)
X-03
D/L 30A
X-03
W/G (F)
K2-01
A @B
DOOR LOCK TIMER UNIT
N @A
K @D
L @C
K2-01
G/R (F)
G/O (F)
G/O (F)
G/O (F)
B (F)
X-15
WITH THEFT-DETERRENT SYSTEM
62
G/R (DR1)
G/O (DR1)
THEFT-DETERRENT CONTROL MODULE (SECTION T-2a)
K2-02
LOCK
UNLOCK
DOOR LOCK-LINK SWITCH
K2-02
B (DR1)
X-15
B (F)
4
4
✳ . . . VACANT
@ . . . THAILAND
. . . NOT USED
K2-01 DOOR LOCK TIMER UNIT (F)
EXCEPT THAILAND
M K I C A
✳ #B G/R ✳ R W/G
B G/O ✳ ✳ ✳ G ✳
N L J H F D B
THAILAND
G E C A
✳ G G/O B
✳ R G/R W/G
H F D B
K2-02 DOOR LOCK-LINK SWITCH (DR1)
G/O B
✳ G/R

HARNESS SYMBOL: (F) (E) (R)





K2-01 DOOR LOCK TIMER UNIT (F)

EXCEPT THAILAND

M	K	I		C	A
✳ #B	G/R	✳		R	W/G
B	G/O	✳	✳	G	✳
N	L	J	H	F	D	B

THAILAND

G	E	C	A
✳	G	G/O	B
✳	R	G/R	W/G
H	F	D	B

K2-03 DOOR LOCK ACTUATOR LF (DR2)

WITHOUT THEFT-DETERRENT SYSTEM

G	R

WITH THEFT-DETERRENT SYSTEM

B	✳
G	R
✳	LG/R

K2-04 DOOR LOCK ACTUATOR LR (DR4)

WITHOUT THEFT-DETERRENT SYSTEM

G	R

WITH THEFT-DETERRENT SYSTEM

B	R
LG/R	G

K2-05 DOOR LOCK ACTUATOR RR (DR3)

WITHOUT THEFT-DETERRENT SYSTEM

G	R

WITH THEFT-DETERRENT SYSTEM

B	R
LG/R	G

K2-06 BACK DOOR LOCK ACTUATOR (R4)

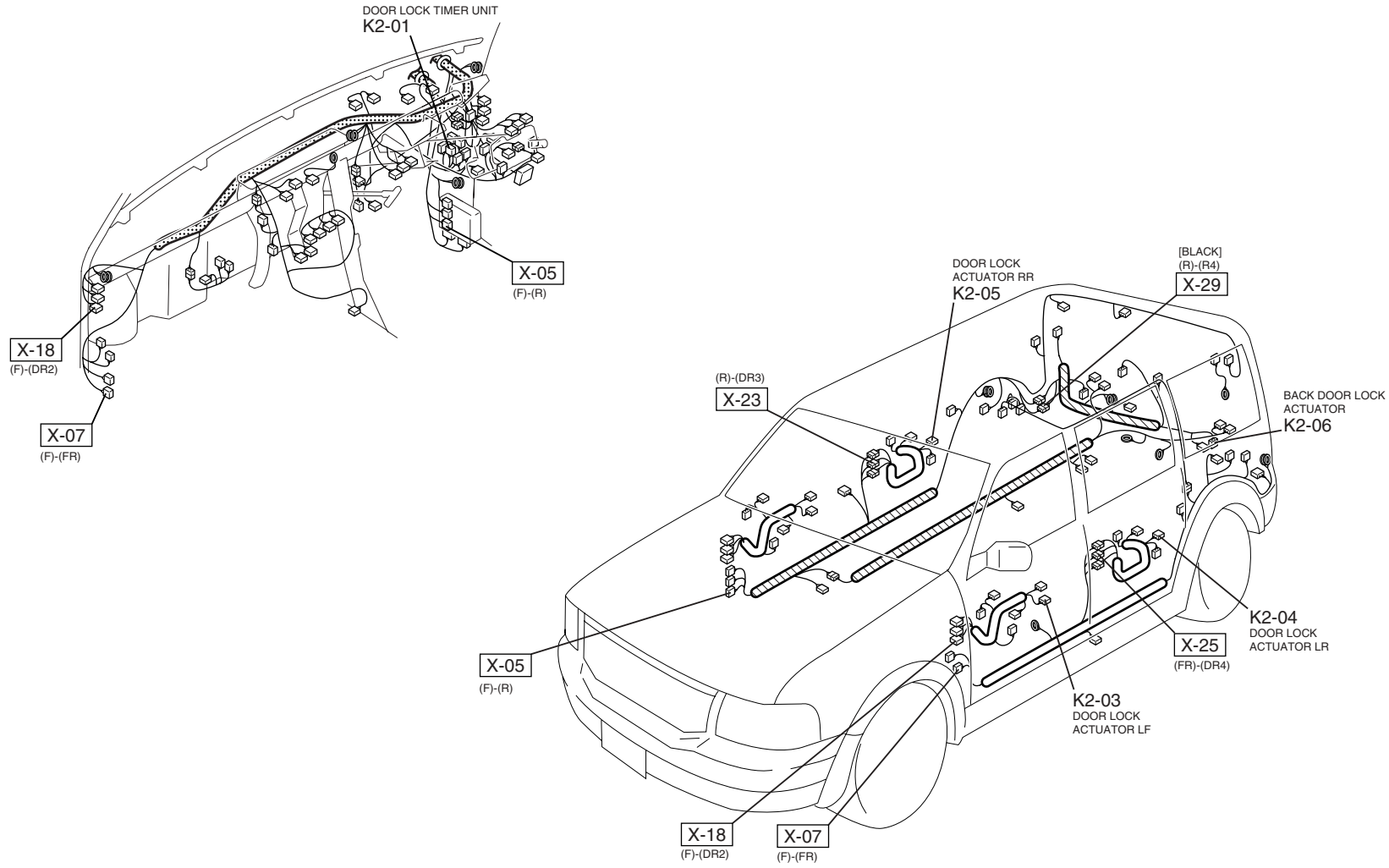
WITHOUT THEFT-DETERRENT SYSTEM

G	R

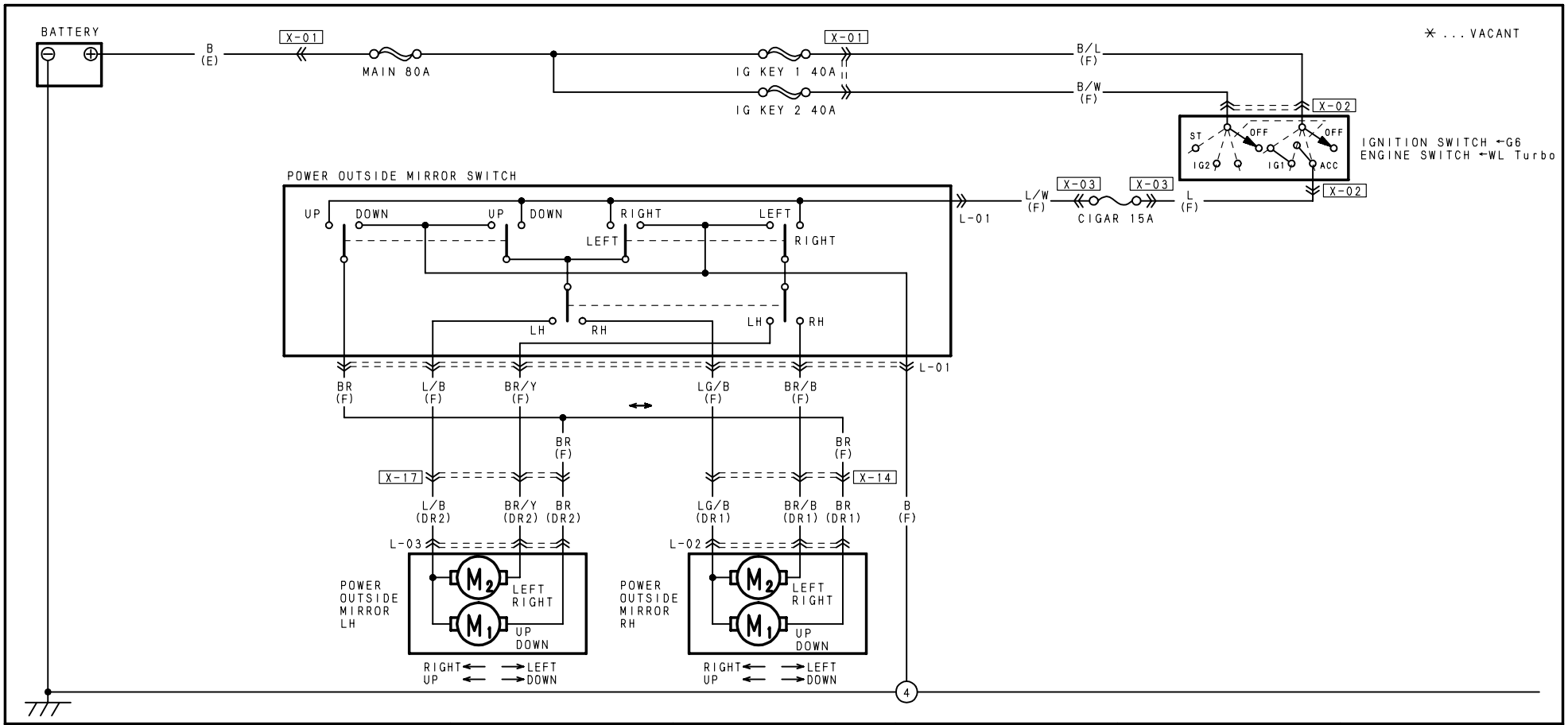
WITH THEFT-DETERRENT SYSTEM

B	R
LG/R	G

HARNESS SYMBOL: (F) (E) (R)



POWER OUTSIDE MIRROR



L-01 POWER OUTSIDE MIRROR SWITCH (F)

BR	L/W			LG/B	L/B
B	*	*	*	BR/Y	BR/B

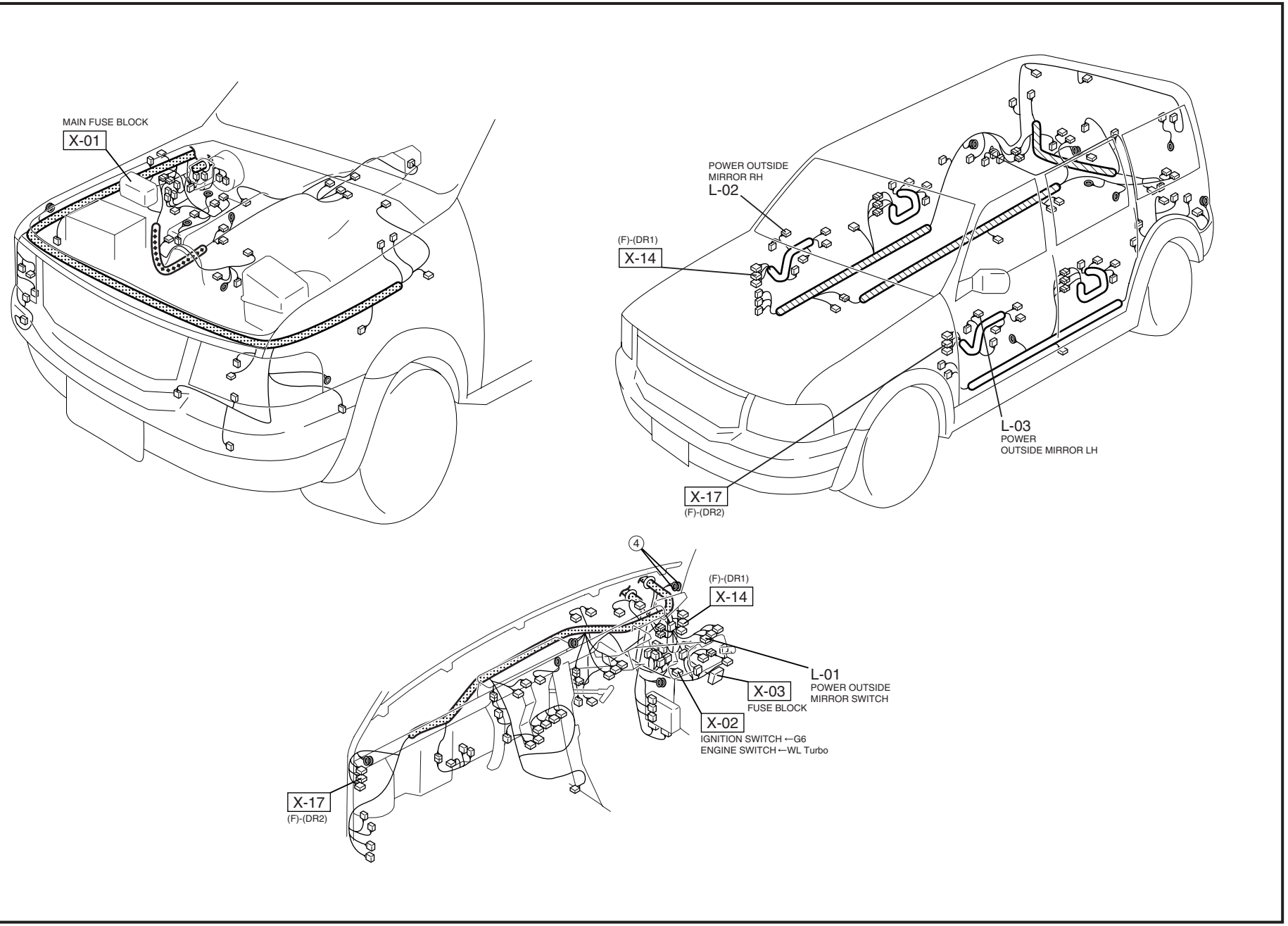
L-02 POWER OUTSIDE MIRROR RH (DR1)

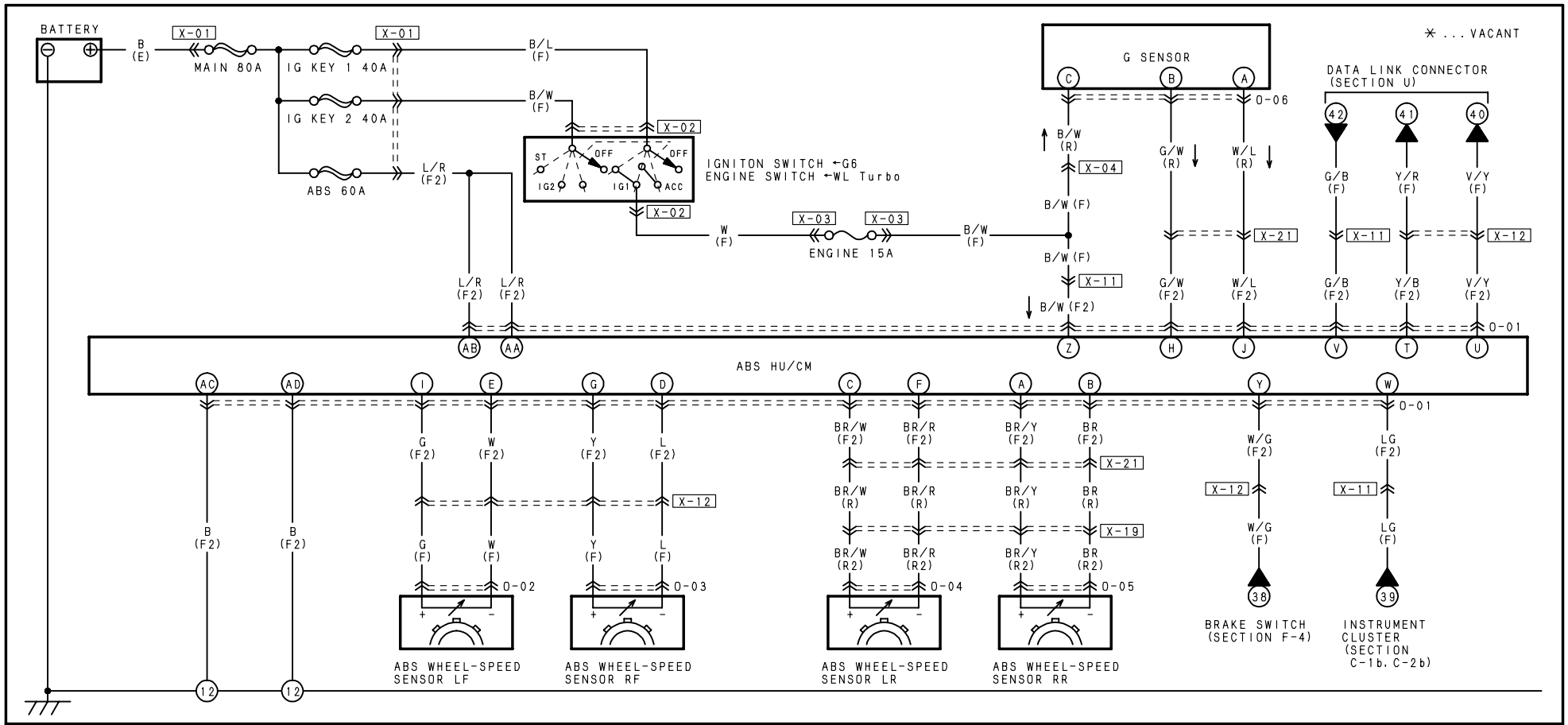
LG/B	BR
BR/B	*

L-03 POWER OUTSIDE MIRROR LH (DR2)

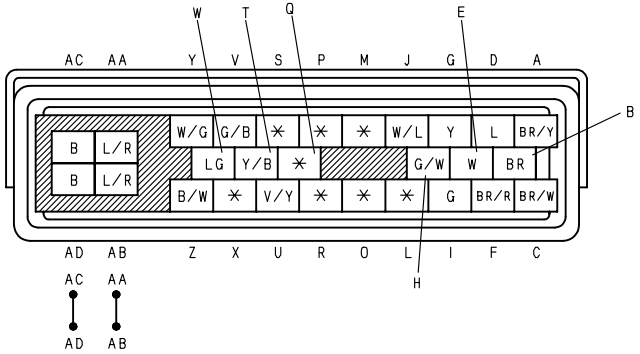
L/B	BR
BR/Y	*

HARNESS SYMBOL: (F) (E) (R)





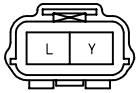
O-01 ABS HU/CM (F2)



O-02 ABS WHEEL-SPEED SENSOR LF (F)



O-03 ABS WHEEL-SPEED SENSOR RF (F)



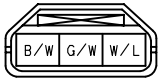
O-04 ABS WHEEL-SPEED SENSOR LR (R2)



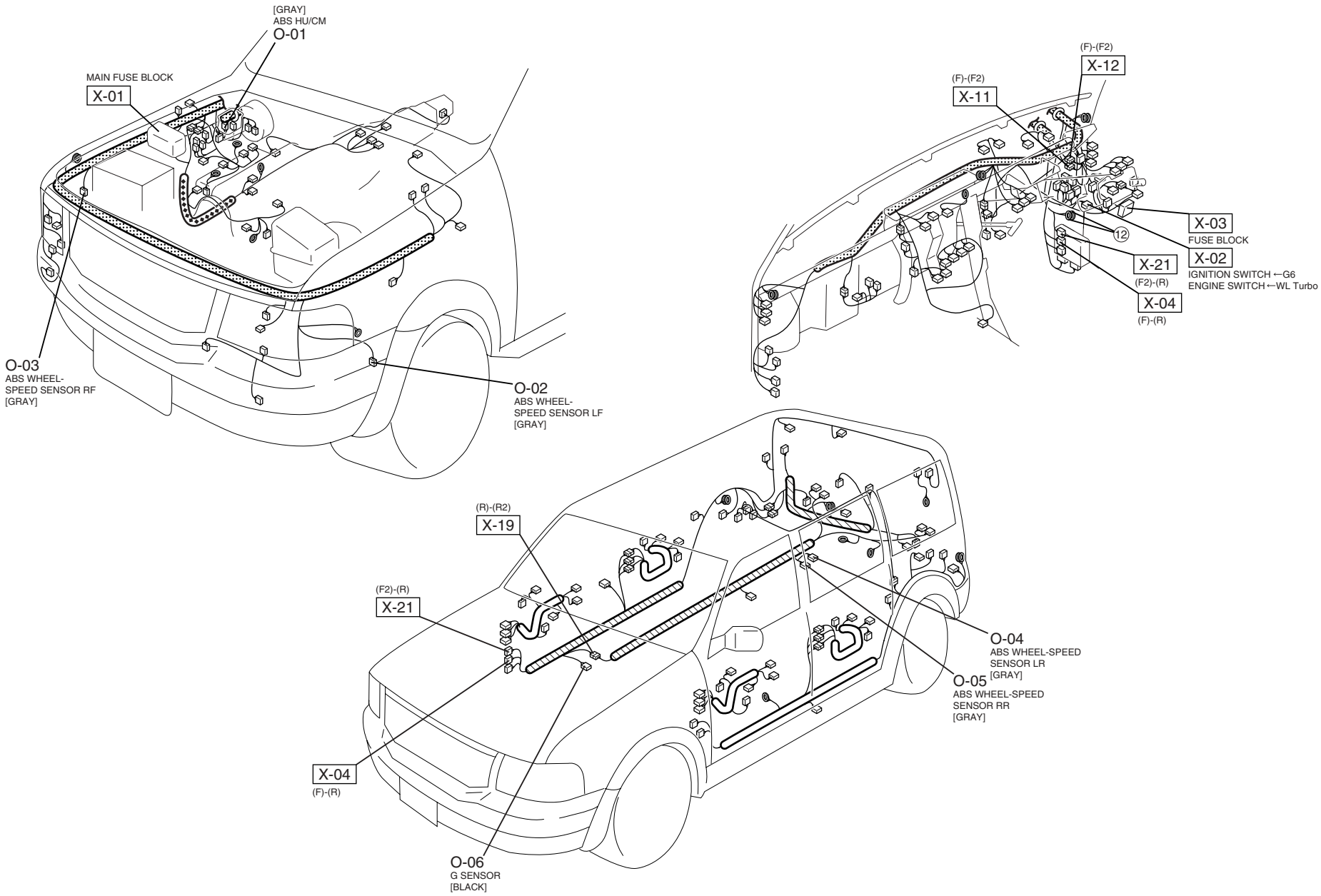
O-05 ABS WHEEL-SPEED SENSOR RR (R2)



O-06 G SENSOR (R)



HARNESS SYMBOL: (F) (E) (R)

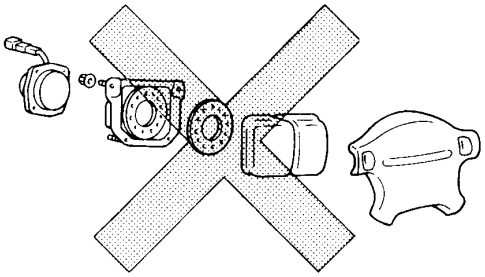


AIR BAG SYSTEM

SERVICE WARNINGS

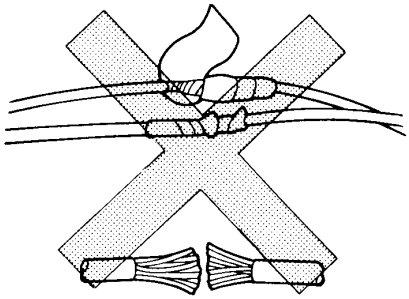
Component Disassembly

- **Disassembling and reassembling the components of the air bag system can render the system inoperative, which may result in serious injury or death in the event of an accident. Do not disassemble any air bag system component.**



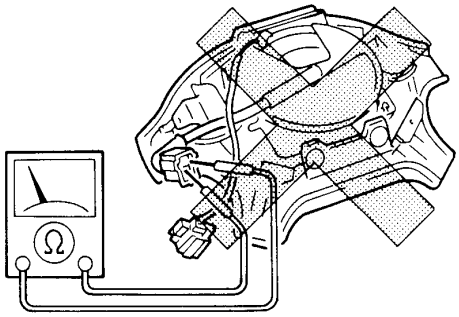
Wiring Harness Repair

- **Incorrectly repairing an air bag system wiring harness can accidentally deploy the air bag module, which can cause serious injury. If a problem is found in the system wiring, replace the wiring harness. Do not try to repair it.**



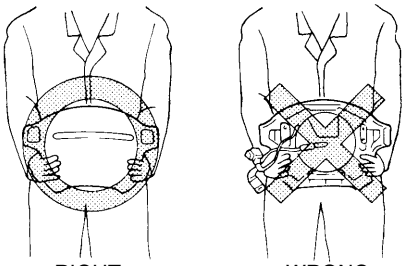
Air Bag Module Inspection

- **Inspecting an air bag module using an ohmmeter can deploy the air bag module, which may cause serious injury. Do not use an ohmmeter to inspect an air bag module. Always use the on-board diagnostic function to diagnose the air bag for malfunctions. (Refer to ON-BOARD DIAGNOSTIC FUNCTION, AIR BAG SYSTEM.)**



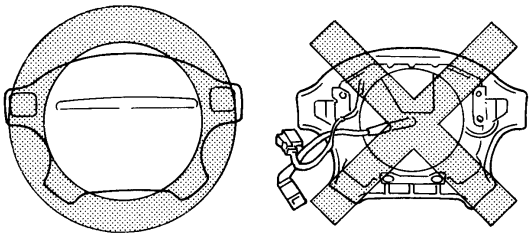
Air Bag Mudule Handling

- **A live (undeployed) air bag module may accidentally deploy when it is handled and cause serious injury. When carrying a live (undeployed) air bag module, point the front surface away from your body to lessen the chance of injury in case it deploys.**



RIGHT WRONG

- **A live (undeployed) air bag module placed face down on a surface is dangerous. If the air bag module deploys, the motion of the module can cause serious injury. Always face the front surface up to reduce the motion of the module in case it accidentally deploys.**



RIGHT WRONG

*The references in this section can be found in Repair Manual [F161-10-99A (1999-1)]

SAS Unit Handling

- **Disconnecting the SAS unit connector or removing the SAS unit with the ignition switch at ON position can cause the air bag modules to deploy, which may seriously injure you. Before disconnecting the SAS unit connector or removing the SAS unit, turn the ignition switch to LOCK position, then disconnect the negative battery cable and wait for more than 1 minute to allow the backup power supply of the SAS unit to deplete its stored power.**
- **Connecting the SAS unit connector without firmly installing the SAS unit to the vehicle is dangerous. The crash sensor inside the unit may send an electrical signal to the air bag modules. This will deploy the air bag modules, which may result in serious injury. Therefore, before connecting the connector, firmly mount the unit to the vehicle.**
- **For vehicles with a single point sensor, once an air bag is deployed due to an accident or other causes, the SAS unit must be replaced with a new one even if the used one does not have any external signs of damage. The used SAS unit may have been damaged internally which may cause improper operation, resulting in major injuries or even death. The used single point SAS unit cannot be bench-checked or self-checked.**

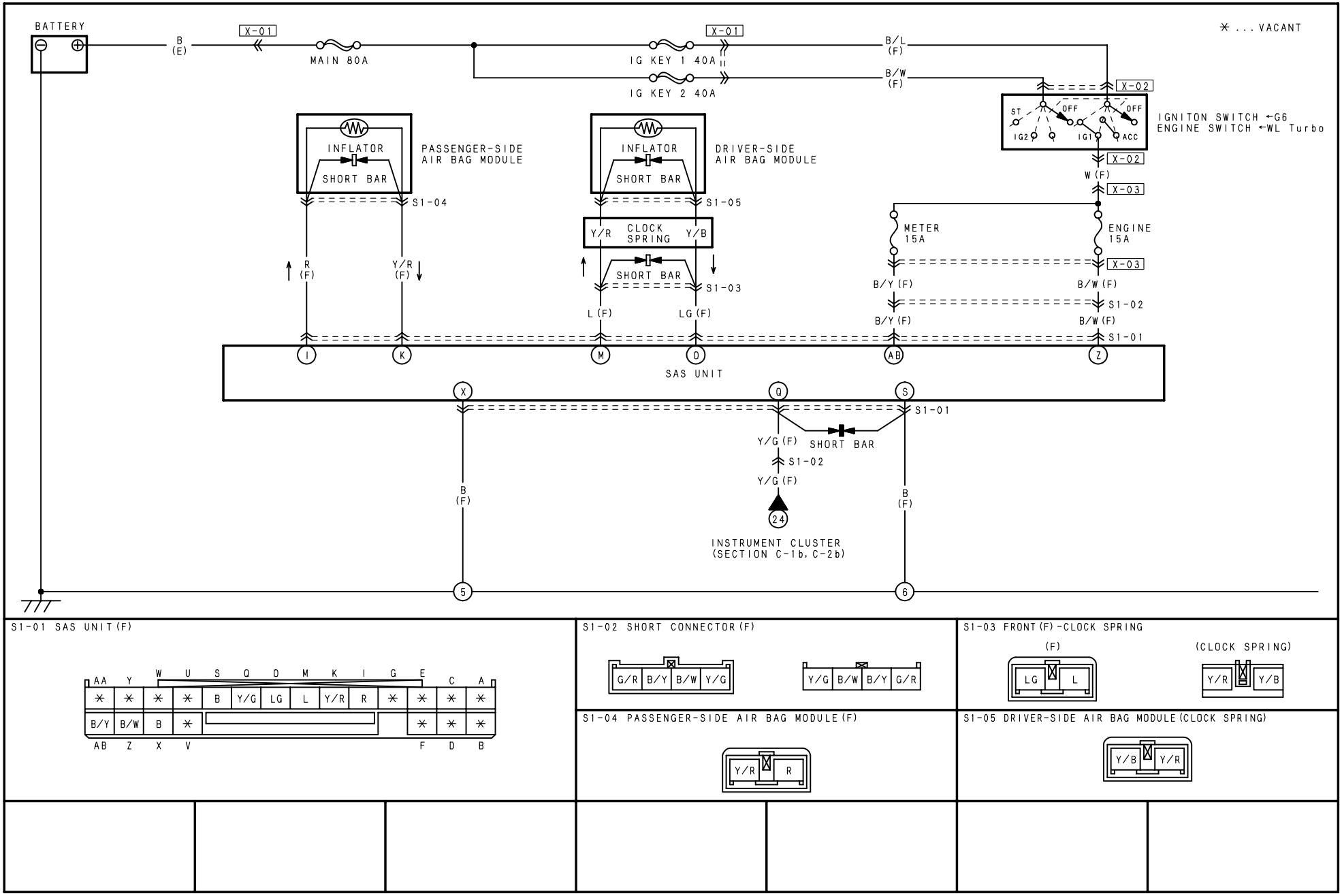
Component Handling

- **Oil, grease, water, etc on components may cause the air bag modules to fail to deploy in an accident, which may cause serious injury. Do not allow oil, grease, water, etc on components.**
- **Inserting a screwdriver, etc into the connector of an air bag module may damage the connector and cause the air bag module to deploy improperly, which may cause serious injury. Do not insert any foreign objects into the connector.**

Component Reusing

- **Even if an air bag madule does not deploy in a collision and does not have any external signs of damage, it may have been damaged internally, which may cause improper operation. Improper operation may cause serious injury. Always self-check the undamaged air bag module to determine whether it can be reused. (Refer to ON-BOARD DIAGNOSTIC FUNCTION, AIR BAG SYSTEM.)**

*The references in this section can be found in Repair Manual [F161-10-99A (1999-1)]



S1-01 SAS UNIT (F)

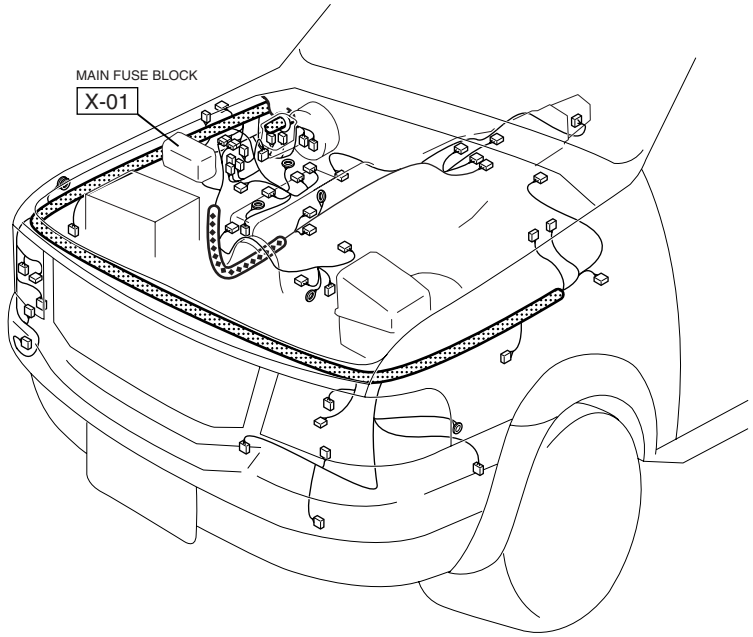
S1-02 SHORT CONNECTOR (F)

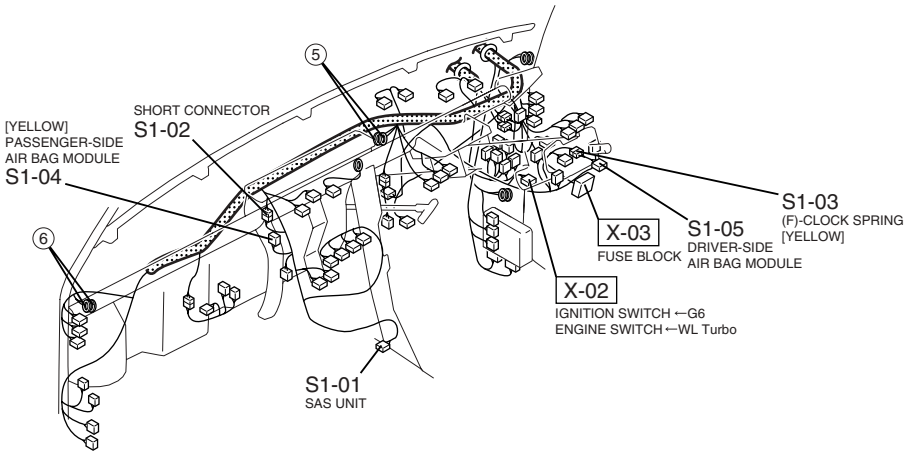
S1-03 FRONT (F) -CLOCK SPRING

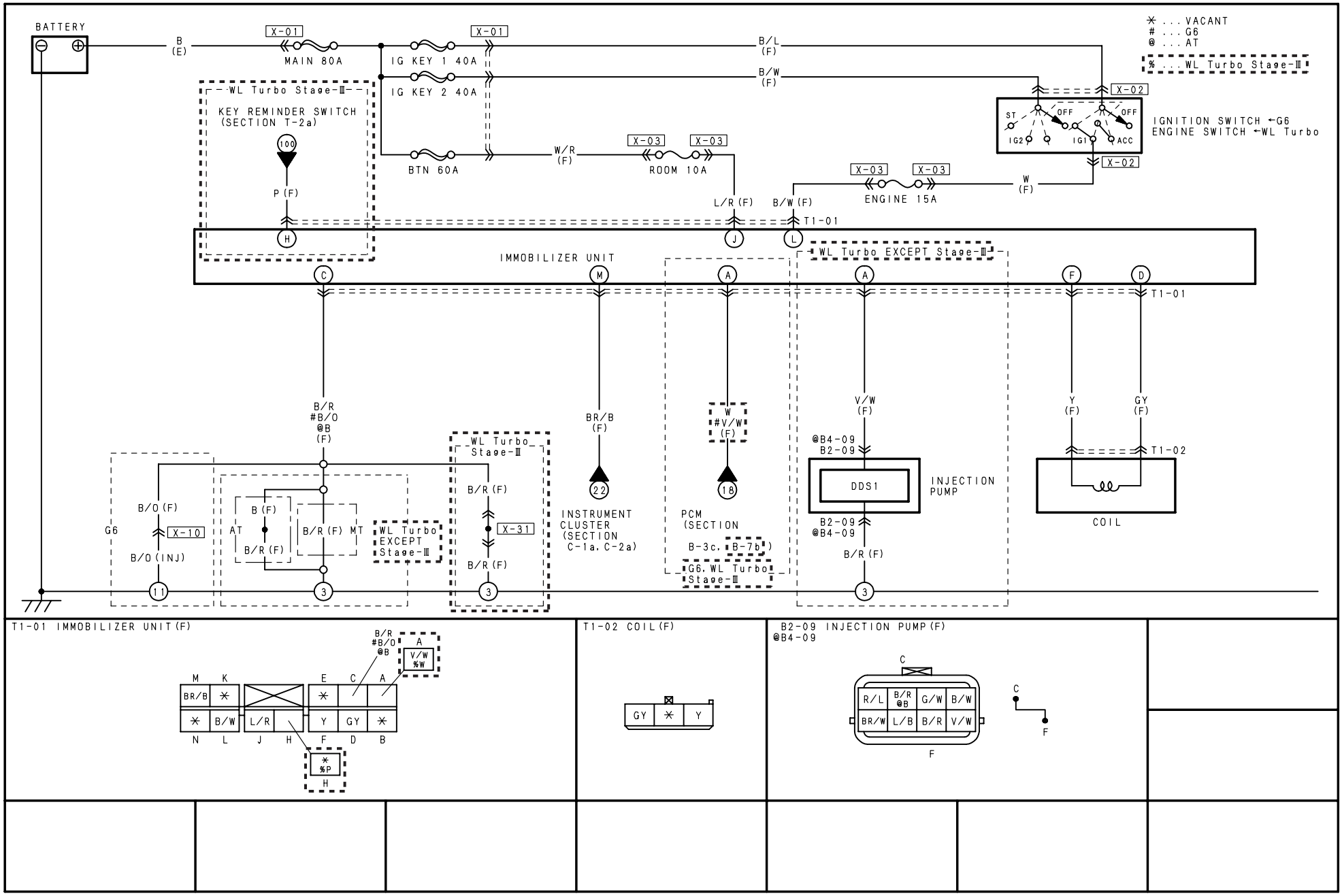
S1-04 PASSENGER-SIDE AIR BAG MODULE (F)

S1-05 DRIVER-SIDE AIR BAG MODULE (CLOCK SPRING)

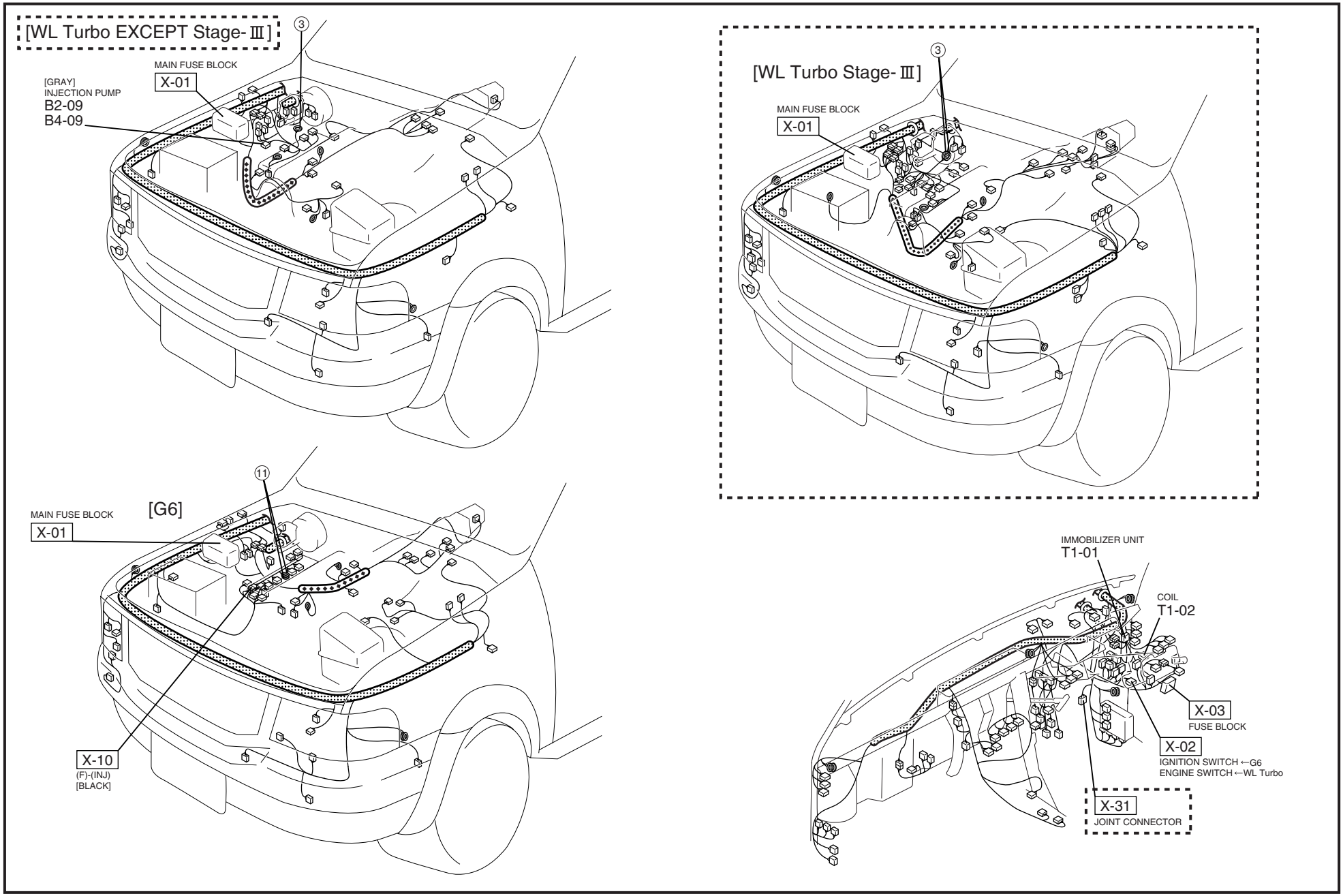
HARNESS SYMBOL: (F) (E) (R)

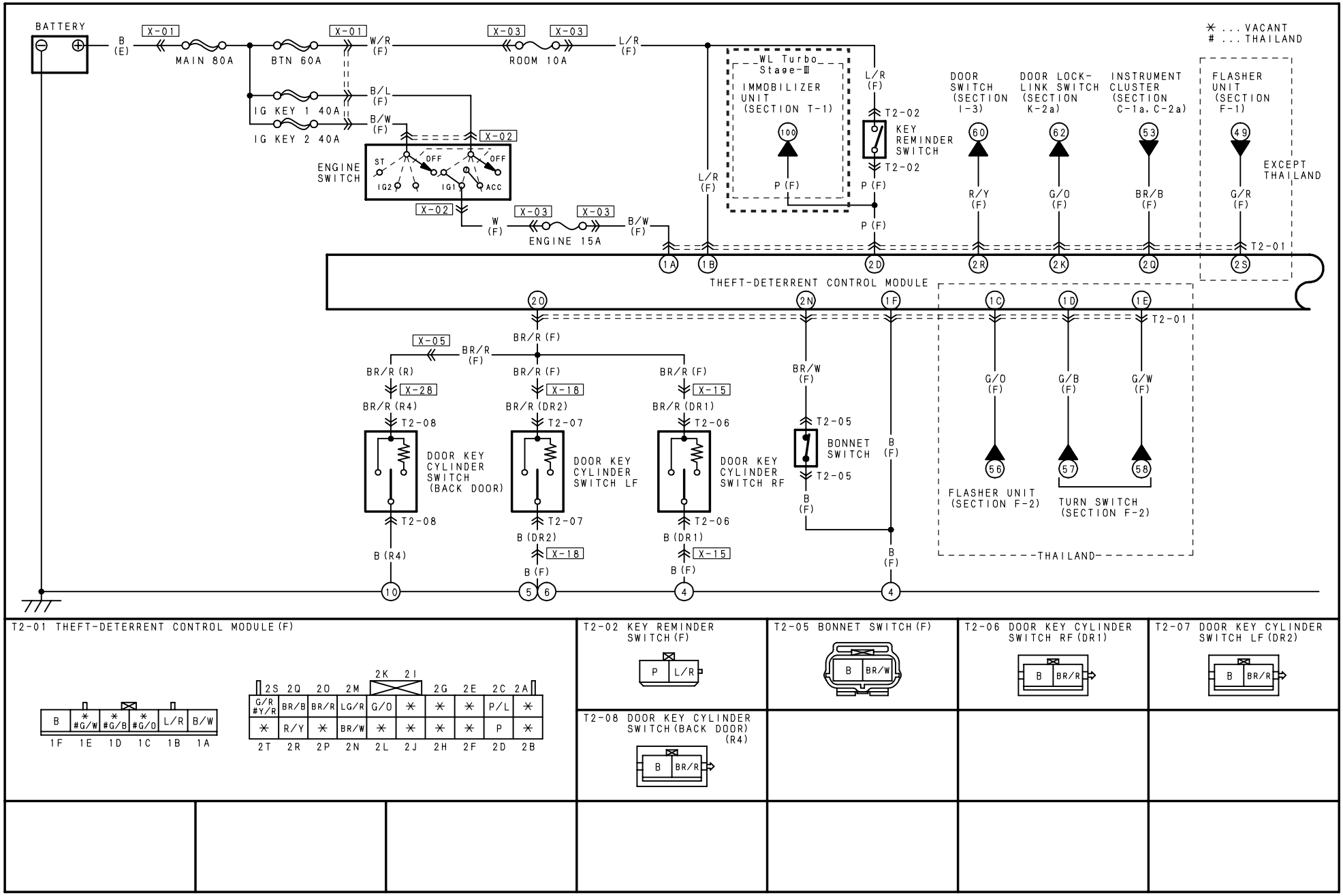





BATTERY
B (E)
X-01
MAIN 80A
IG KEY 1 40A
IG KEY 2 40A
BTN 60A
B/L (F)
B/W (F)
W/R (F)
X-03
ROOM 10A
ENGINE 15A
W (F)
L/R (F)
B/W (F)
X-02
IGNITION SWITCH ←G6
ENGINE SWITCH ←WL Turbo
ST
OFF
IG2
IG1
ACC
* . . . VACANT
. . . G6
@ . . . AT
% . . . WL Turbo Stage-Ⅲ
WL Turbo Stage-Ⅲ
KEY REMINDER SWITCH
(SECTION T-2a)
100
P (F)
H
J
L
T1-01
IMMOBILIZER UNIT
C
M
A
WL Turbo EXCEPT Stage-Ⅲ
F
D
B/R
#B/O
@B
(F)
BR/B (F)
W
#V/W
(F)
V/W (F)
@B4-09
B2-09
DDS1
INJECTION PUMP
Y (F)
GY (F)
T1-02
COIL
WL Turbo Stage-Ⅲ
B/R (F)
X-31
B/O (F)
G6
X-10
B/O (INJ)
11
B (F)
AT
B/R (F)
MT
WL Turbo EXCEPT Stage-Ⅲ
3
INSTRUMENT CLUSTER (SECTION C-1a, C-2a)
22
PCM (SECTION B-3c, B-7b)
18
G6, WL Turbo Stage-Ⅲ
B2-09
@B4-09
T1-01 IMMOBILIZER UNIT (F)
M K
BR/B
B/W
N L
L/R
J H
E C A
Y GY
F D B
%P
T1-02 COIL (F)
GY
Y
B2-09 INJECTION PUMP (F)
@B4-09
R/L
B/R @B
G/W
B/W
BR/W
L/B
B/R
V/W

HARNESS SYMBOL: (F) (E) (R)





T2-01 THEFT-DETERRENT CONTROL MODULE (F)

T2-02 KEY REMINDER SWITCH (F)

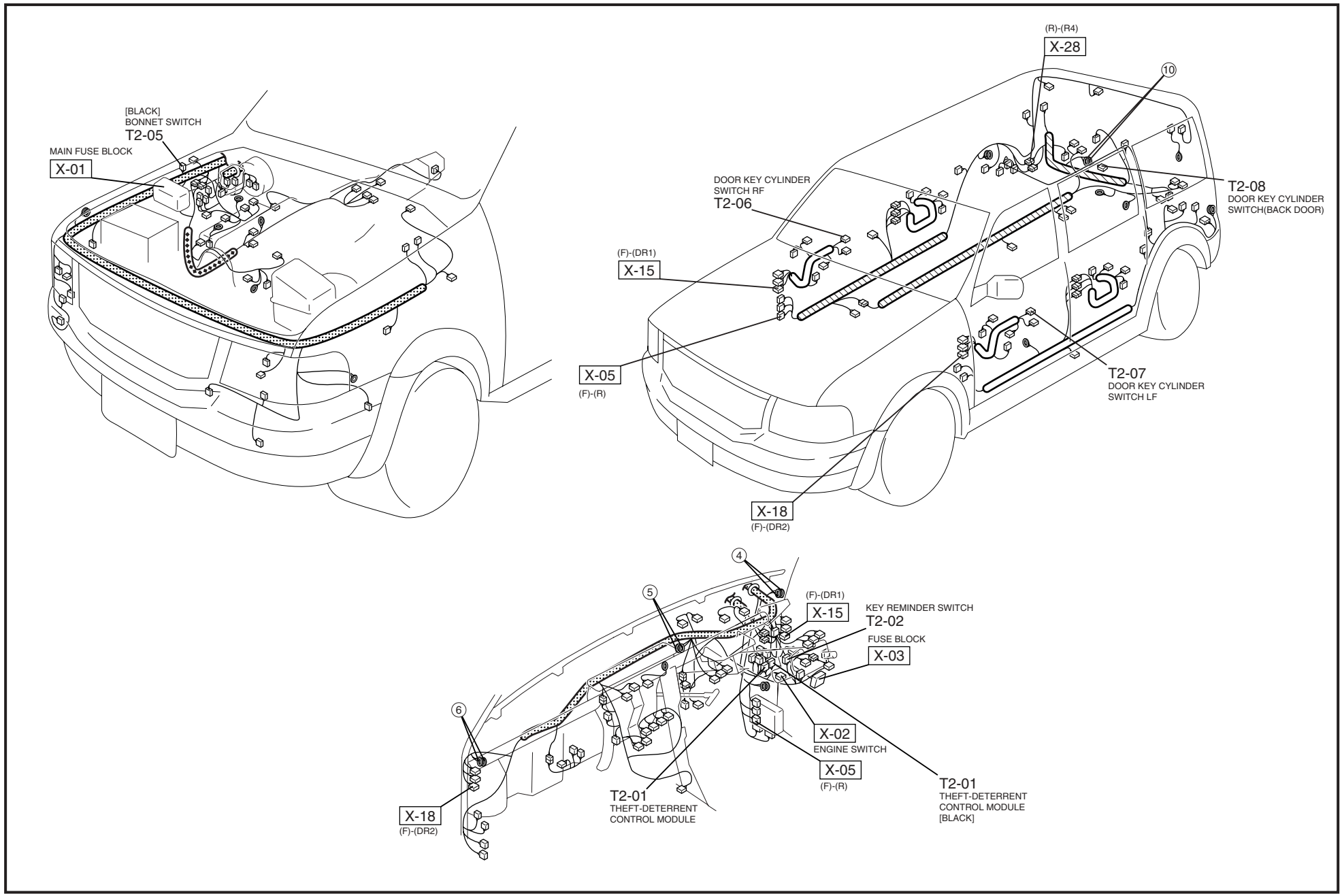
T2-05 BONNET SWITCH (F)

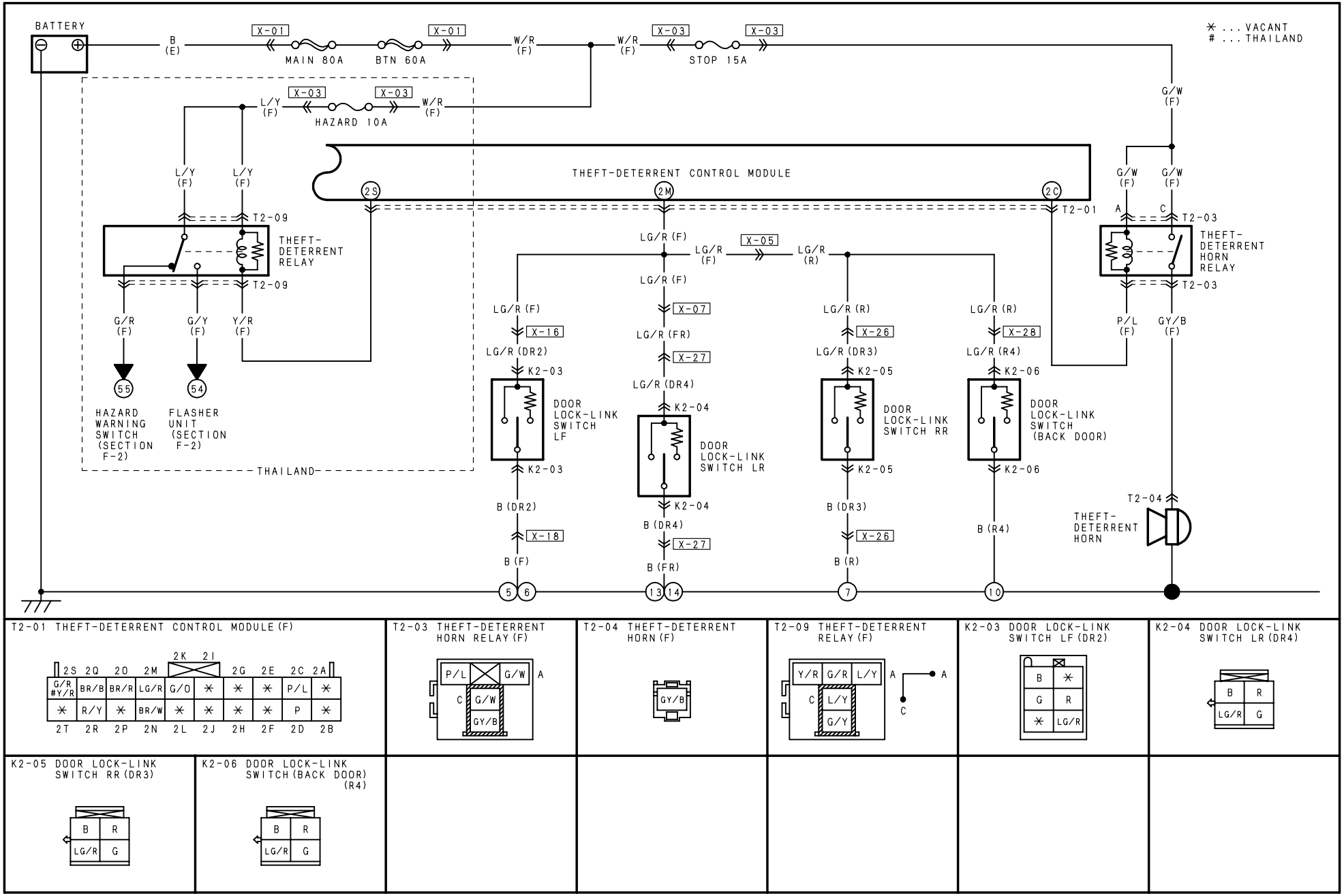
T2-06 DOOR KEY CYLINDER SWITCH RF (DR1)

T2-07 DOOR KEY CYLINDER SWITCH LF (DR2)

T2-08 DOOR KEY CYLINDER SWITCH (BACK DOOR) (R4)

HARNESS SYMBOL: (F) (E) (R)





T2-01 THEFT-DETERRENT CONTROL MODULE (F)

2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A
G/R #Y/R	BR/B	BR/R	LG/R	G/O	*	*	*	P/L	*
*	R/Y	*	BR/W	*	*	*	*	P	*
2T	2R	2P	2N	2L	2J	2H	2F	2D	2B

T2-03 THEFT-DETERRENT HORN RELAY (F)

T2-04 THEFT-DETERRENT HORN (F)

T2-09 THEFT-DETERRENT RELAY (F)

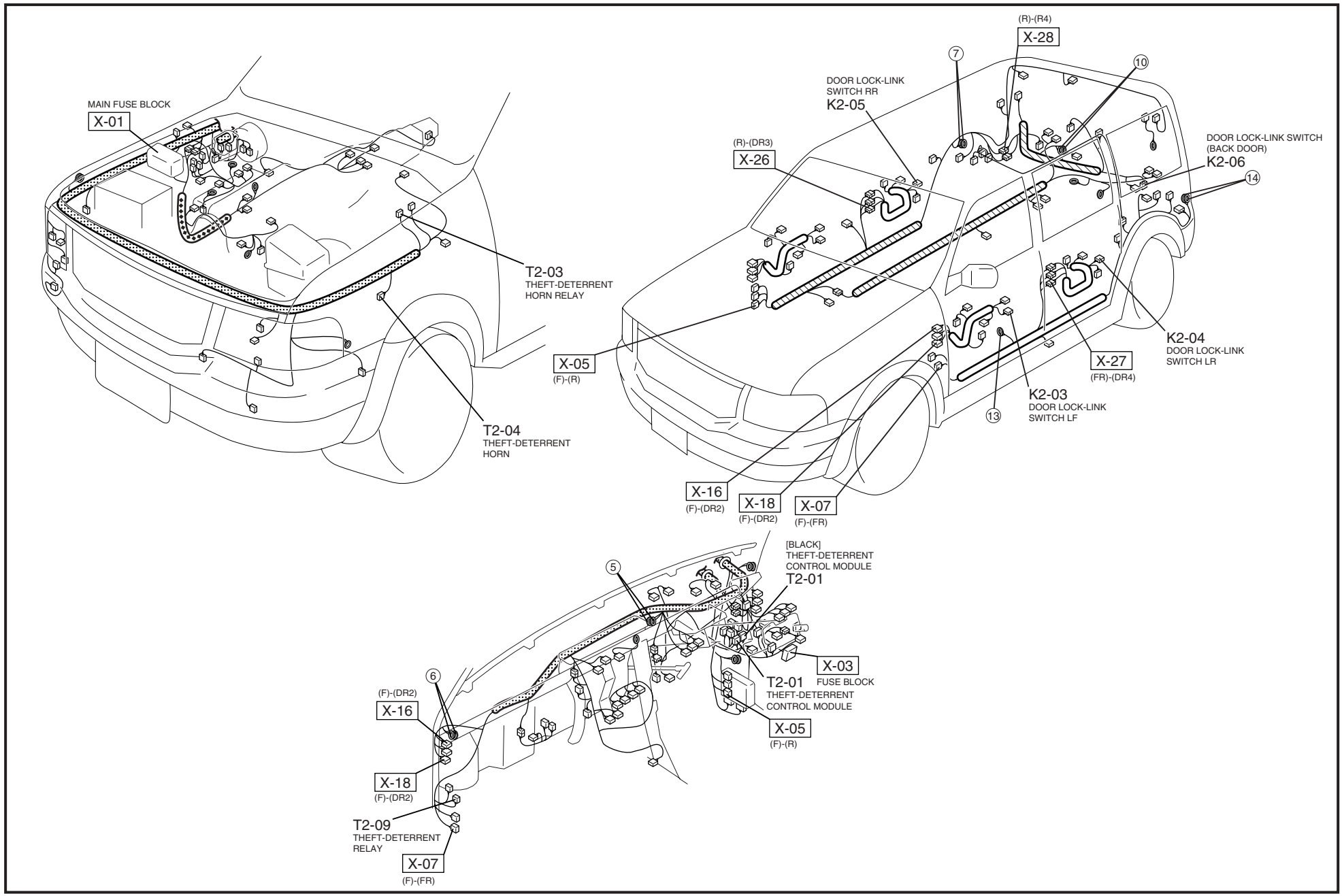
K2-03 DOOR LOCK-LINK SWITCH LF (DR2)

K2-04 DOOR LOCK-LINK SWITCH LR (DR4)

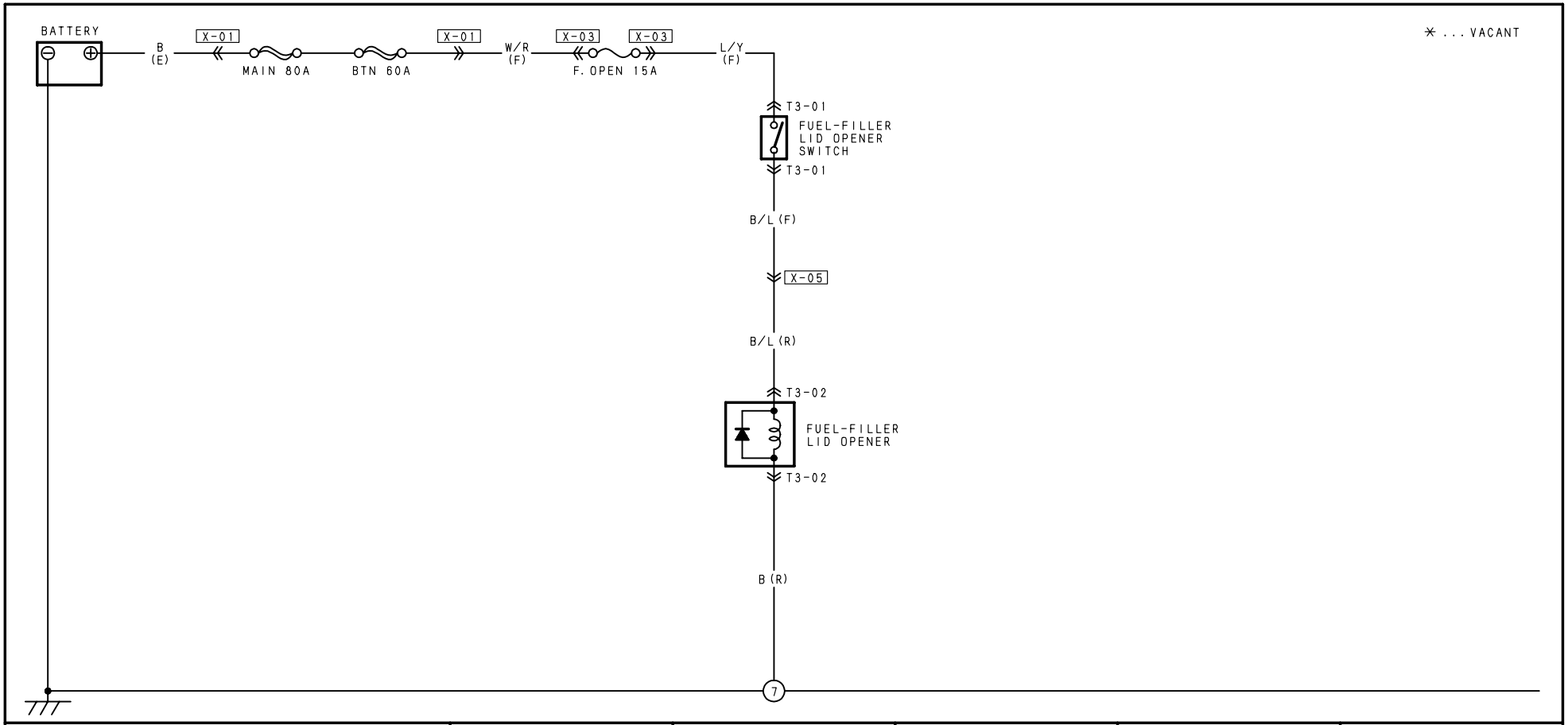
K2-05 DOOR LOCK-LINK SWITCH RR (DR3)

K2-06 DOOR LOCK-LINK SWITCH (BACK DOOR) (R4)

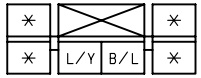
HARNESS SYMBOL: (F) (E) (R)



FUEL-FILLER LID OPENER



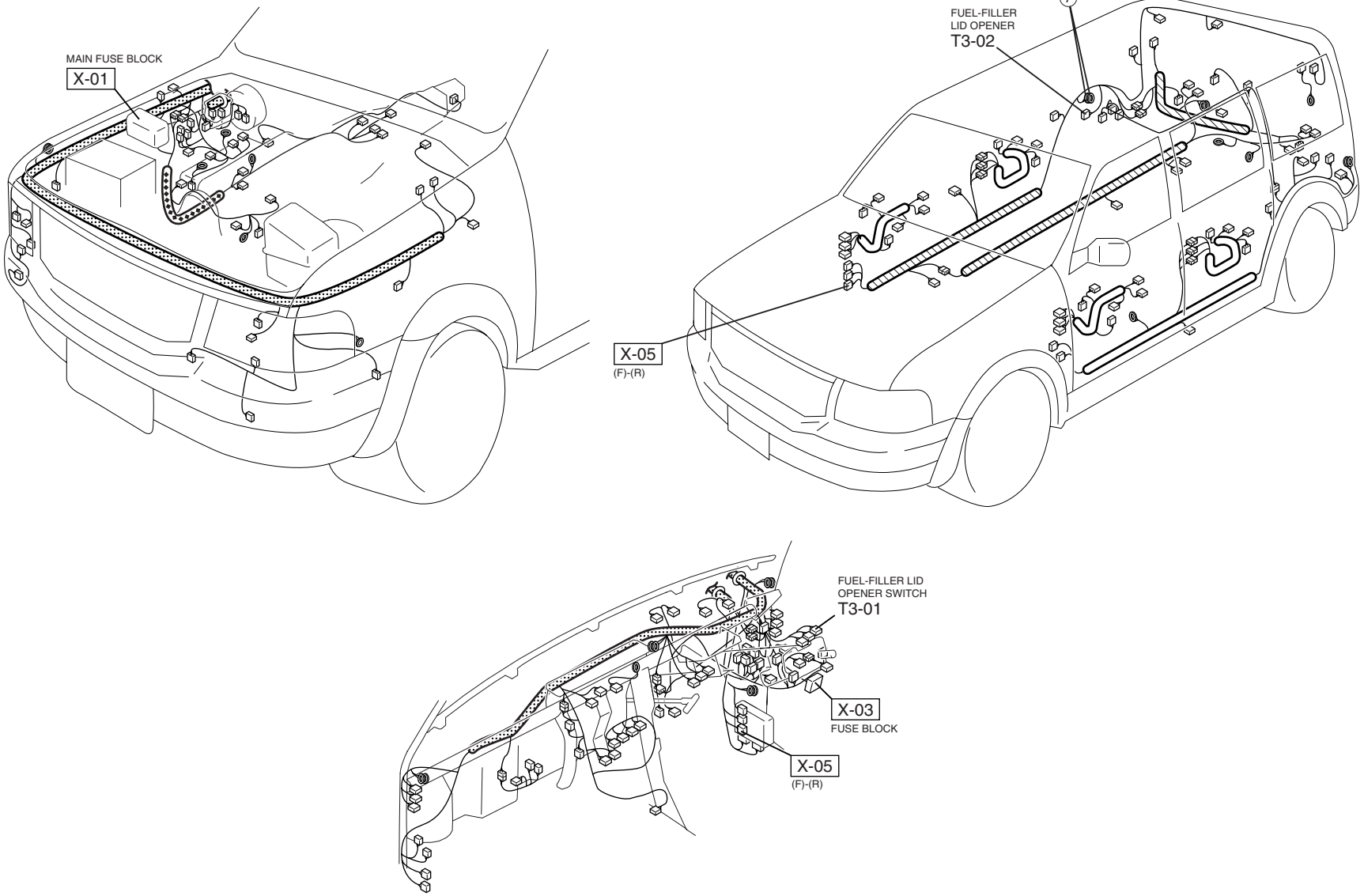
T3-01 FUEL-FILLER LID OPENER SWITCH (F)



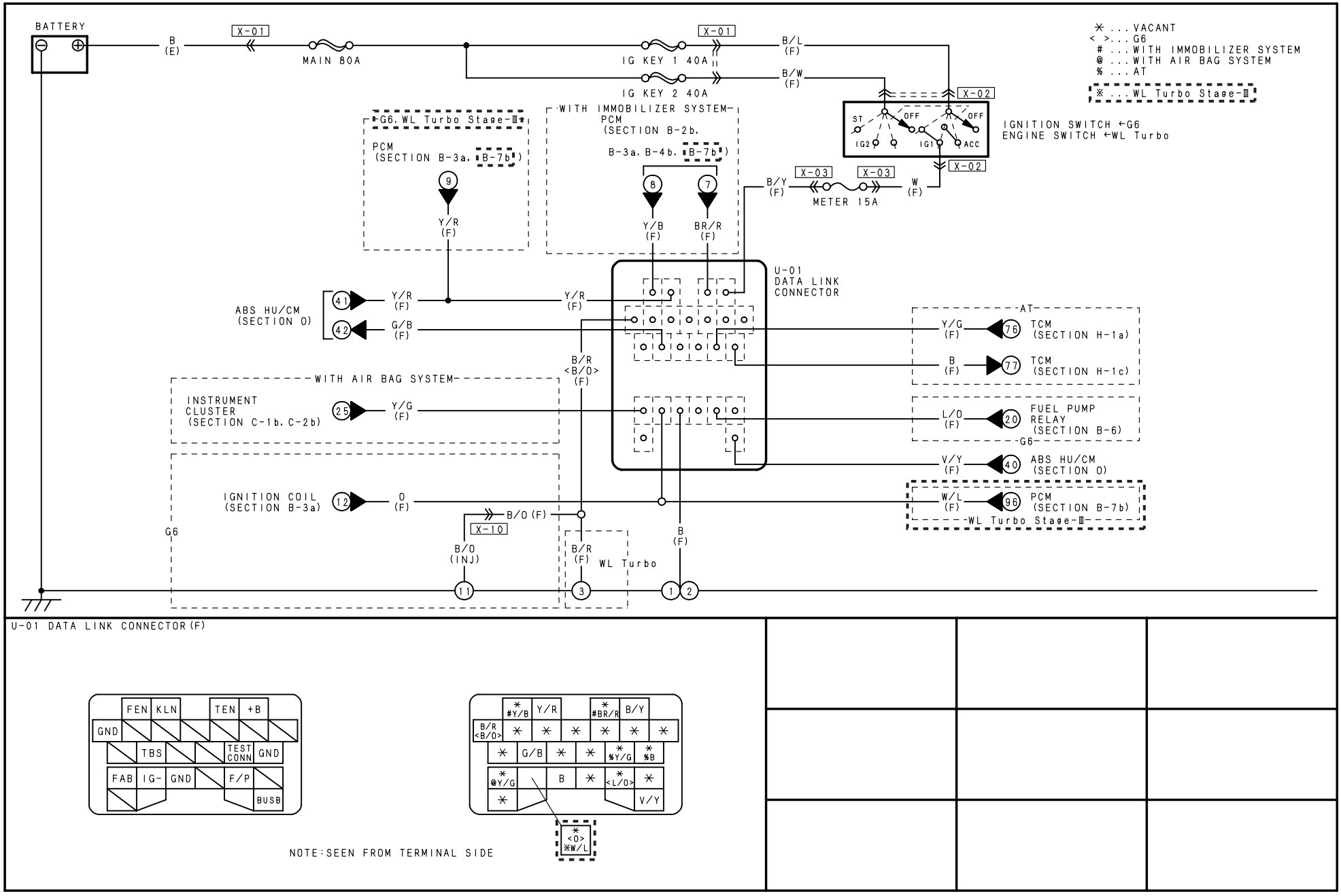
T3-02 FUEL-FILLER LID OPENER (R)



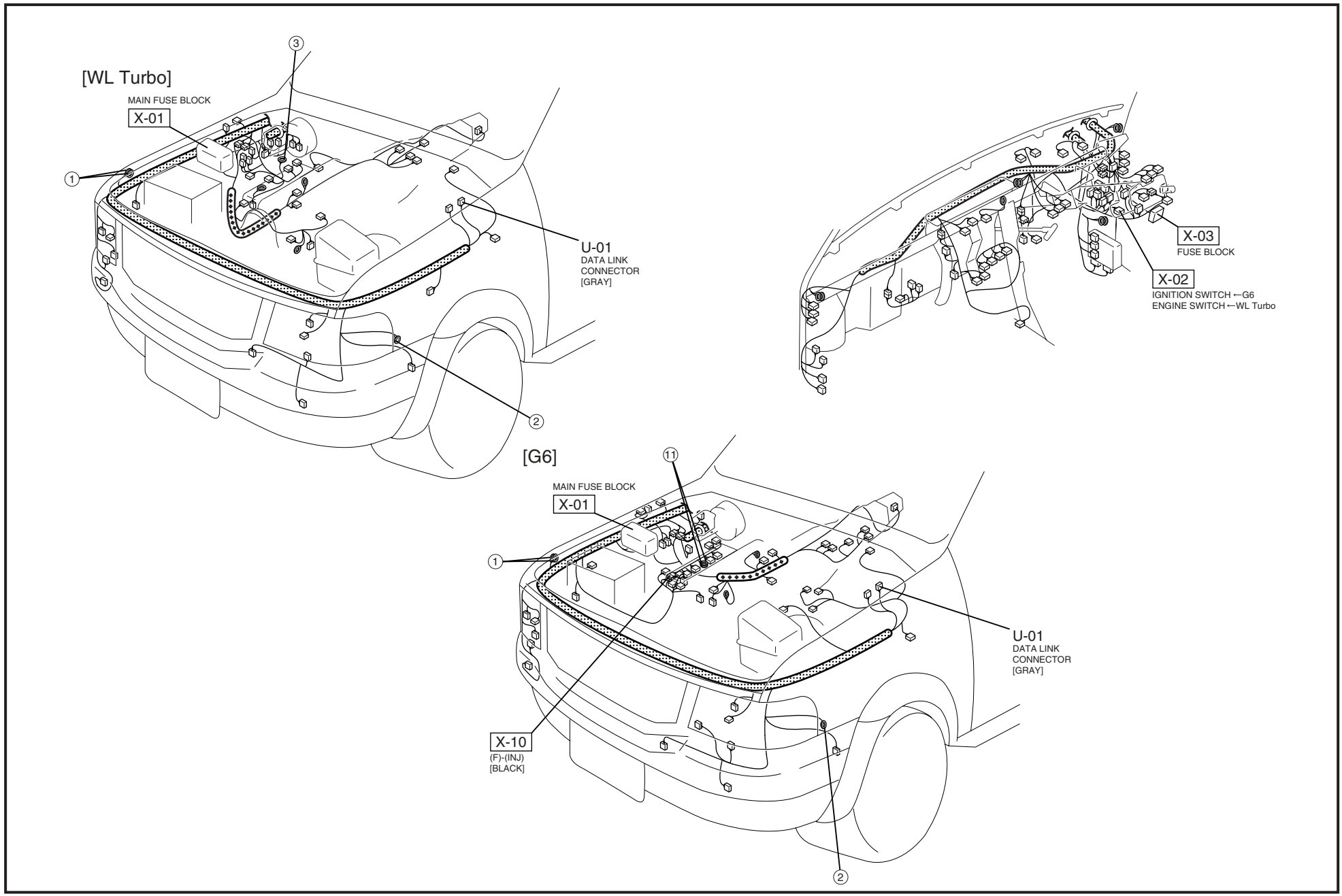
HARNESS SYMBOL: (F) (E) (R)



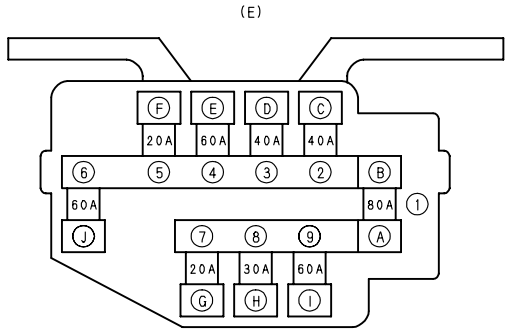
DATA LINK CONNECTOR

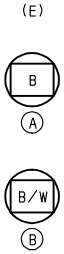


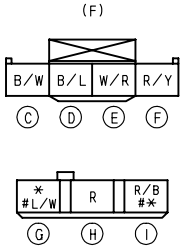
HARNESS SYMBOL: (F) (E) (R)

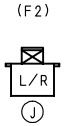


X-01 MAIN FUSE BLOCK









* . . . VACANT

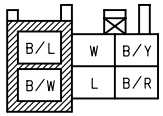
. . . G6, WL Turbo Stage-Ⅲ

NOTE:SEEN FROM TERMINAL SIDE

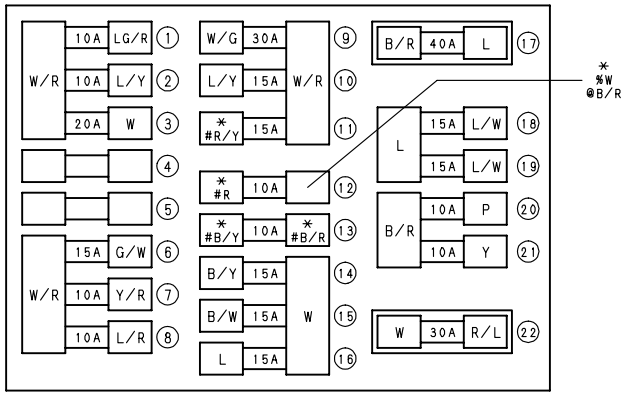
① MAIN
② IG KEY 2
③ IG KEY 1
④ BTN
⑤ (R A/C)
⑥ (ABS)
⑦ (FIP/INJ)
⑧ HEAD
⑨ (GLOW)

( ) IF EQUIPPED

X-02 IGNITION SWITCH(F) ←G6
ENGINE SWITCH(F) ←WL Turbo



X-03 FUSE BLOCK(F)



① (A/C)
② HAZARD
③ (R. DEFOG)
④ —
⑤ —
⑥ STOP
⑦ TAIL
⑧ ROOM
⑨ (D/L)
⑩ F. OPEN
⑪ BATT TCU
⑫ IGN TCU
⑬ IGN INHIB TCU
⑭ METER
⑮ ENGINE
⑯ WIPER
⑰ (HEATER)
⑱ CIGAR
⑲ (P. POINT)
⑳ (R. WIPER)
㉑ (A/C2)
㉒ (P. WIND)

( ) IF EQUIPPED

% . . . AT Applied VIN (assumed):
MNB LS4D40*W 103774-
MNB LS4D40*W 103819-
@ . . . AT EXCEPT Applied VIN (assumed):
MNB LS4D40*W 103774-
MNB LS4D40*W 103819-
. . . AT

NOTE:SEEN FROM TERMINAL SIDE

COMMON CONNECTOR LIST

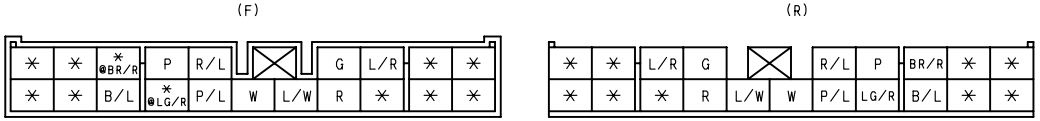
X-04 FRONT (F) - REAR (R)

✳ . . . VACANT
. . . G6



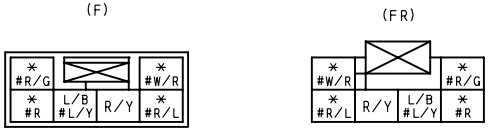
X-05 FRONT (F) - REAR (R)

✳ . . . VACANT
@ . . . WITH THEFT-DETERRENT SYSTEM



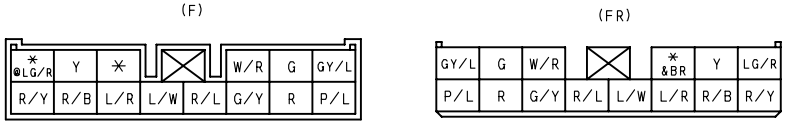
X-06 FRONT (F) - FLOOR (FR)

✳ . . . VACANT
. . . THAILAND



X-07 FRONT (F) - FLOOR (FR)

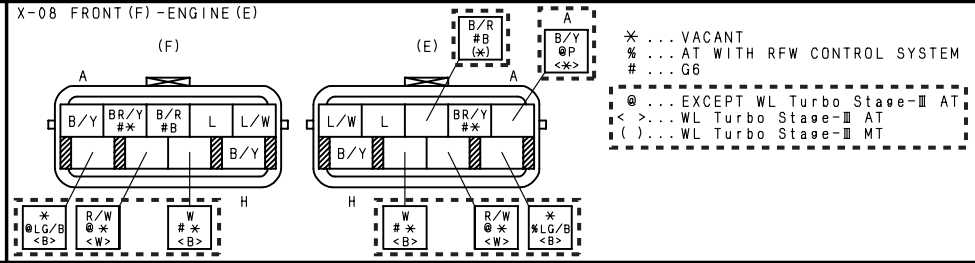
✳ . . . VACANT
@ . . . WITH THEFT-DETERRENT SYSTEM
& . . . NOT USED



X-08 FRONT (F) - ENGINE (E)

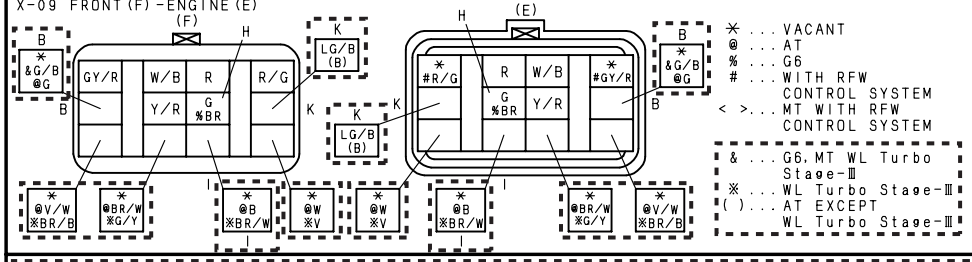
✳ . . . VACANT
% . . . AT WITH RFW CONTROL SYSTEM
. . . G6

@ . . . EXCEPT WL Turbo Stage-Ⅲ AT
< >. . . WL Turbo Stage-Ⅲ AT
( ) . . . WL Turbo Stage-Ⅲ MT

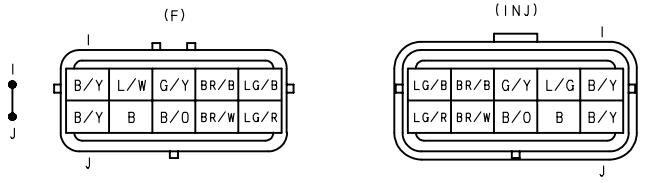


X-09 FRONT (F) - ENGINE (E)

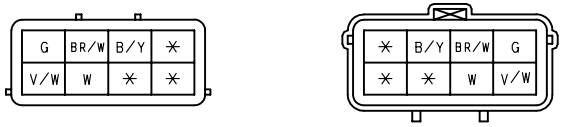
✳ . . . VACANT
@ . . . AT
% . . . G6
. . . WITH RFW CONTROL SYSTEM
< >. . . MT WITH RFW CONTROL SYSTEM
& . . . G6, MT WL Turbo Stage-Ⅲ
※ . . . WL Turbo Stage-Ⅲ
( ) . . . AT EXCEPT WL Turbo Stage-Ⅲ



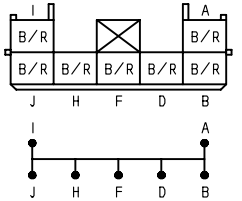
X-10 FRONT (F) - INJECTION (INJ)



X-32 FRONT (F) - ENGINE (E)



X-31 JOINT CONNECTOR (F)



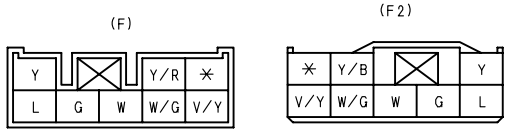
X-11 FRONT (F) -FRONT No. 2 (F2)

✳ . . . VACANT
. . . NOT USED



X-12 FRONT (F) -FRONT No. 2 (F2)

✳ . . . VACANT



X-13 FRONT (F) -DOOR No. 1 (DR1)

✳ . . . VACANT
. . . NOT USED

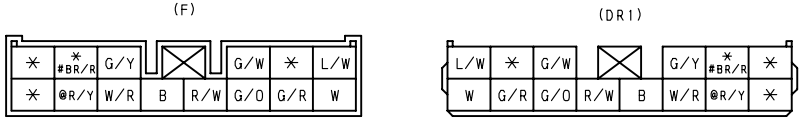


X-14 FRONT (F) -DOOR No. 1 (DR1)



X-15 FRONT (F) -DOOR No. 1 (DR1)

✳ . . . VACANT
. . . WITH THEFT-DETERRENT SYSTEM
@ . . . NOT USED



X-16 FRONT (F) -DOOR No. 2 (DR2)

✳ . . . VACANT
. . . WITH THEFT-DETERRENT SYSTEM

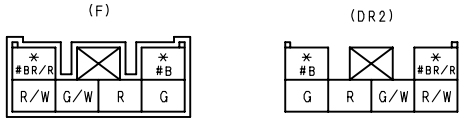


X-17 FRONT (F) -DOOR No. 2 (DR2)



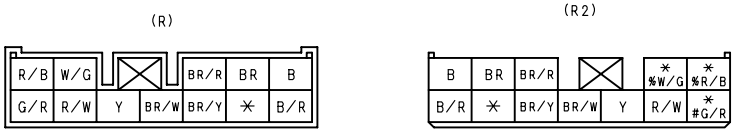
X-18 FRONT (F) -DOOR No. 2 (DR2)

✳ . . . VACANT
. . . WITH THEFT-DETERRENT SYSTEM



X-19 REAR (R) -REAR No. 2 (R2)

✳ . . . VACANT
. . . G6
% . . . SOUTH AFRICAN MODEL



X-21 FRONT No. 2 (F2) -REAR (R)



COMMON CONNECTOR LIST

X-22 REAR (R) - DOOR No. 3 (DR3)

(R)

GY/R	GY	R/L

(DR3)

R/L	GY	GY/R

X-23 REAR (R) - DOOR No. 3 (DR3)

(R)

R	L/W
G	W

(DR3)

L/W	R
W	G

X-24 FLOOR (FR) - DOOR No. 4 (DR4)

(FR)

P/L	GY/L	R/L

(DR4)

R/L	GY	GY/R

X-25 FLOOR (FR) - DOOR No. 4 (DR4)

(FR)

R	G/Y
G	W/R

(DR4)

L/W	R
W	G

X-26 REAR (R) - DOOR No. 3 (DR3)

(R)

B	LG/R

(DR3)

LG/R	B

X-27 FLOOR (FR) - DOOR No. 4 (DR4)

(FR)

B	LG/R

(DR4)

LG/R	B

X-28 REAR (R) - REAR No. 4 (R4)

✳ . . . VACANT
. . . WITH THEFT-DETERRENT SYSTEM

(R)

P				LG/R	BR/R
R/L	P/L	B/L	✳		R/Y

(R4)

✳ #BR/R	✳ #LG/R			P
R/Y	✳	B/L	P/L	R/L

X-29 REAR (R) - REAR No. 4 (R4)

✳ . . . VACANT

(R)

R/B			B
R	G	✳	✳

(R4)

B			R/B
✳	✳	G	R

X-30 FRONT (F) - ENGINE (E)

✳ . . . VACANT

(F)

V/B	P/B	✳	V/R	R/W	V	
✳	L	V/Y	V/W	B/Y	V/G	

(E)

V	R/W	V/R	✳	P/B	V/B
V/G	B/Y	V/W	V/Y	L	✳

ALPHABETICAL INDEX

4

4X4 INDICATOR SWITCH 92

A

A/C AMPLIFIER..... 78, 80
A/C MAIN SWITCH..... 84
A/C RELAY..... 78, 80
A/C SWITCH
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EVEREST RHD Wiring Diagrams Supplement

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Ⓒ Ford Motor Company

MAR. 2004

F192-10-04C

FOREWORD

This is a supplement to the previous Wiring Diagrams and this covers only main service points of major parts modified from them. As to the service points, important safety notice and general service instructions in service which are not covered by this supplement, please refer to the previous Manuals shown on the following page.

EVEREST RHD WIRING DIAGRAMS
(F190-30-03J)

As all information in this supplement was the best available at the time of printing, all alternations related to modifications will be noticed by Service Information.

Ford Motor Company

VEHICLE IDENTIFICATION NUMBERS (VIN)
(CHASSIS NUMBER)

WIRING COLOR CODE

COLOR	CODE	COLOR	CODE
BLACK	B	ORANGE	O
BLUE	L	PINK	P
BROWN	BR	RED	R
DARK BLUE	DL	SKY BLUE	SB
DARK GREEN	DG	TAN	T
GRAY	GY	VIOLET	V
GREEN	G	WHITE	W
LIGHT BLUE	LB	YELLOW	Y
LIGHT GREEN	LG		

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ENGINE CONTROL SYSTEM
"WL Turbo AT" MALAYSIA 8
GLOW SYSTEM
"WL Turbo AT" MALAYSIA 8

CHASSIS-RELATED SYSTEM
4EAT CONTROL SYSTEM 20

INSTRUMENT CLUSTER-RELATED SYSTEM
INSTRUMENT CLUSTER
AT 12

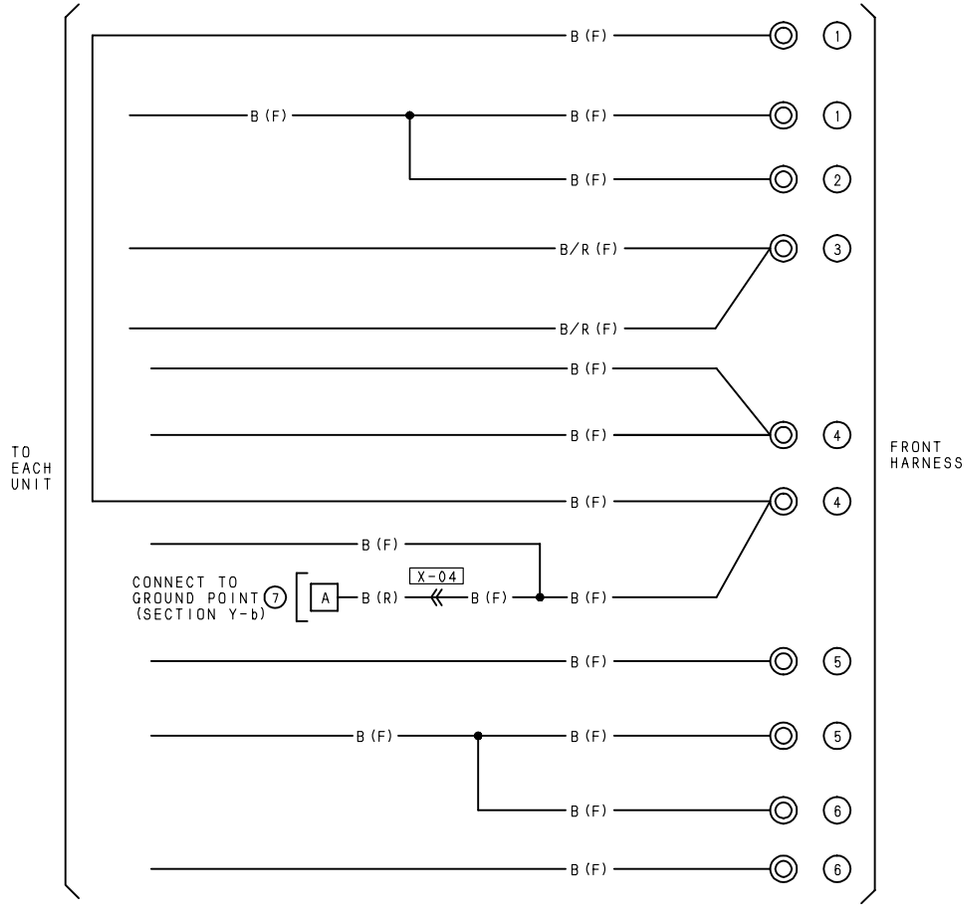
BODY-RELATED SYSTEM
IMMOBILIZER SYSTEM 26
THEFT-DETERRENT SYSTEM 28

EXTERIOR LIGHTING SYSTEM
TURN AND HAZARD WARNING LIGHT
EXCEPT THAILAND 18

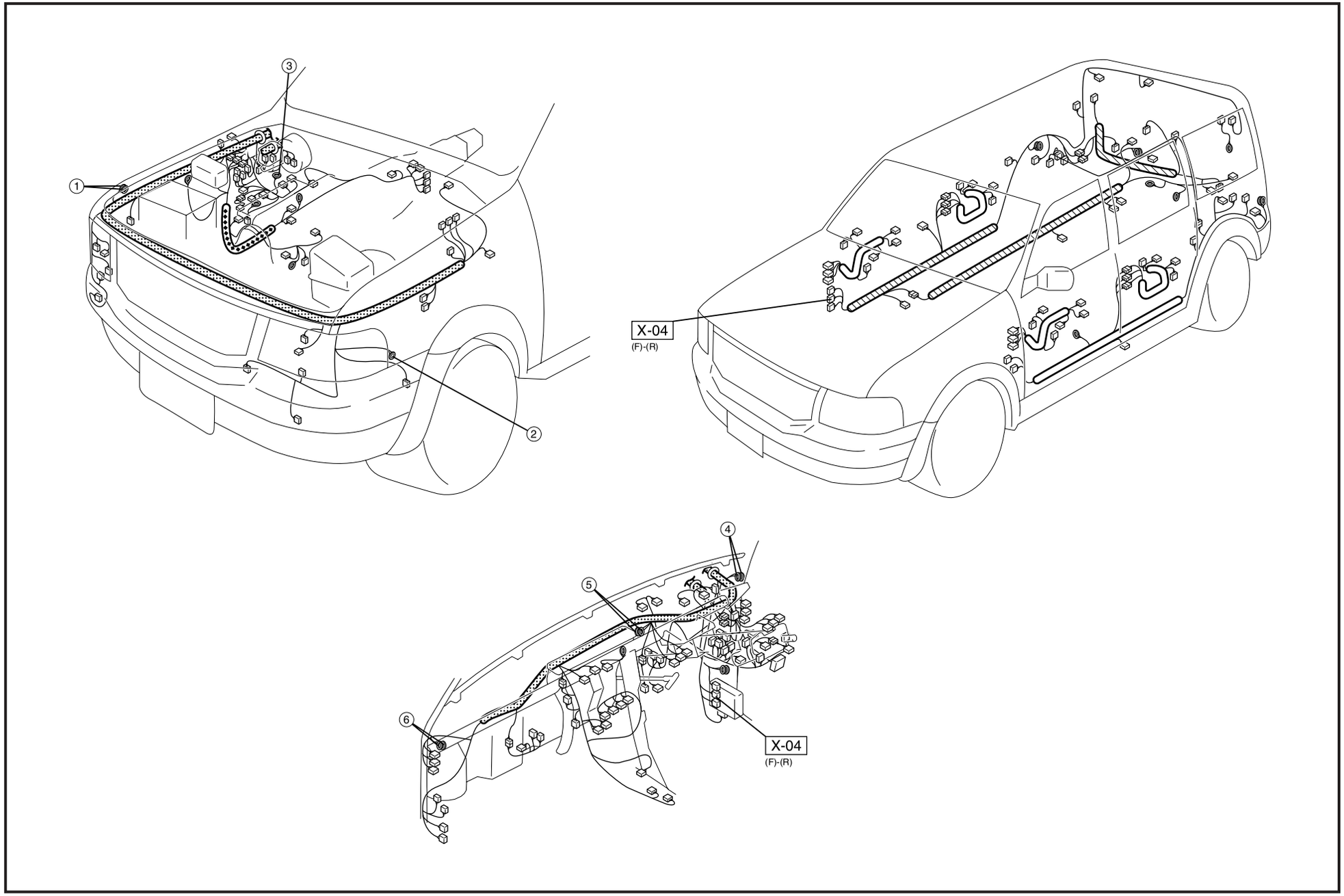
COMMON CONNECTOR LIST 32
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GROUND POINT

① B / B	② B	③ B/R / B/R	④ B / B	⑤ B / B	⑥ B / B	



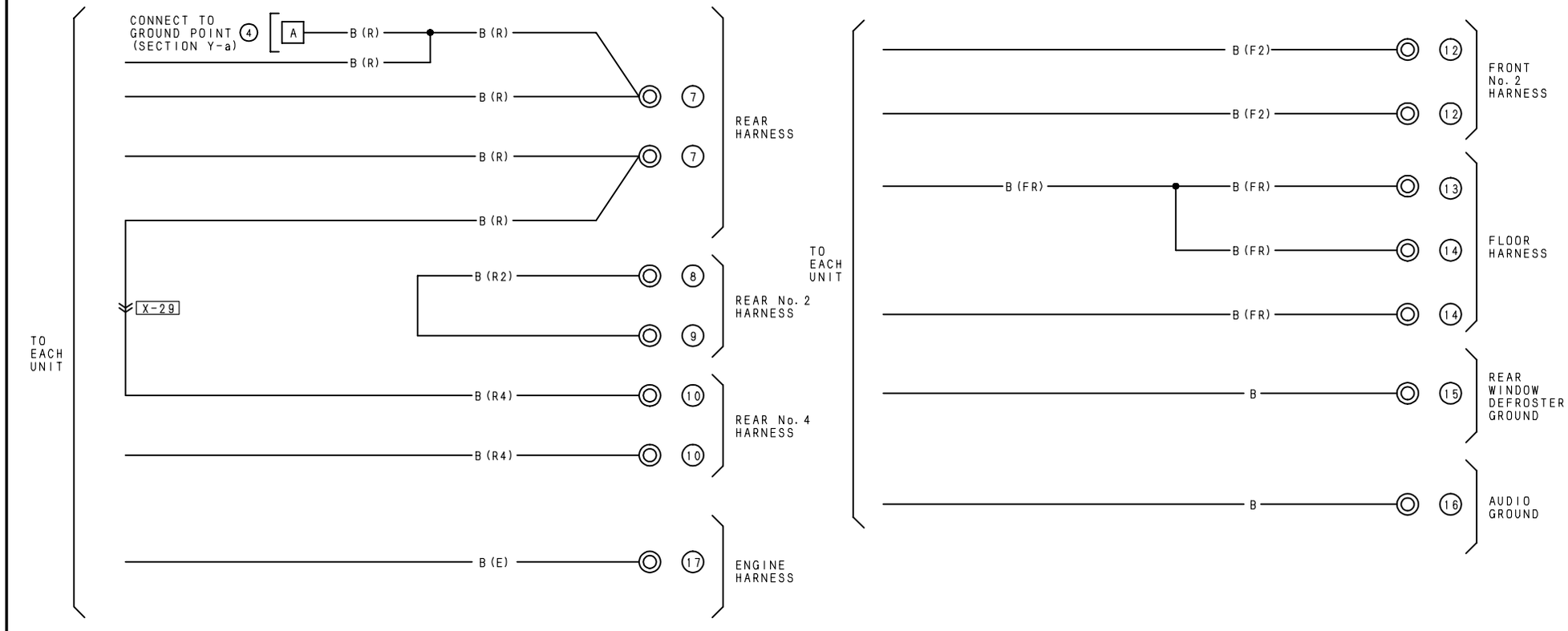
HARNESS SYMBOL: (F) (E) (R)



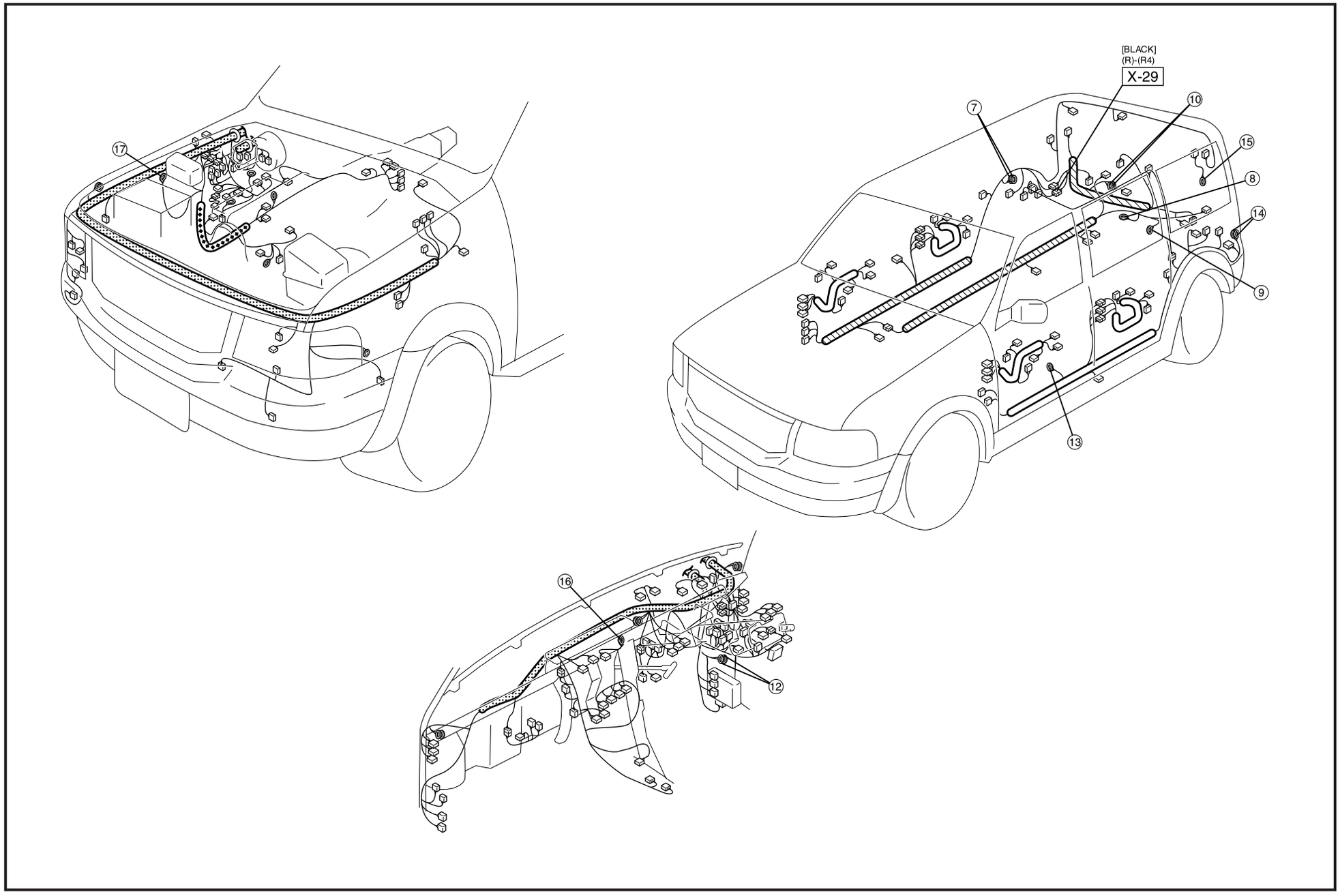
GROUND POINT

Y-b

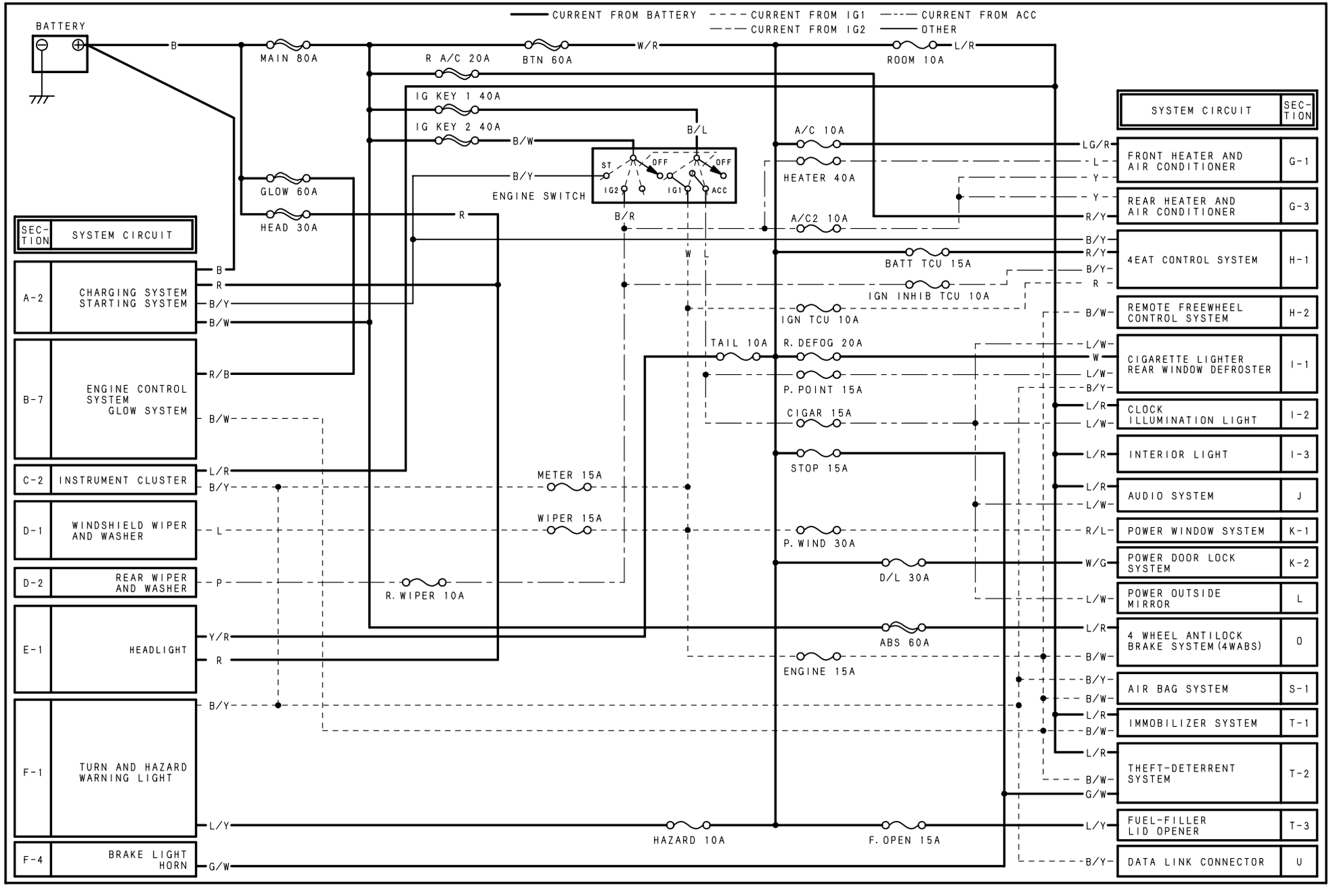
7 B B B B	8 B	9 B	10 B B	12 B B	13 B	14 B B
15 B	16 B	17 B				



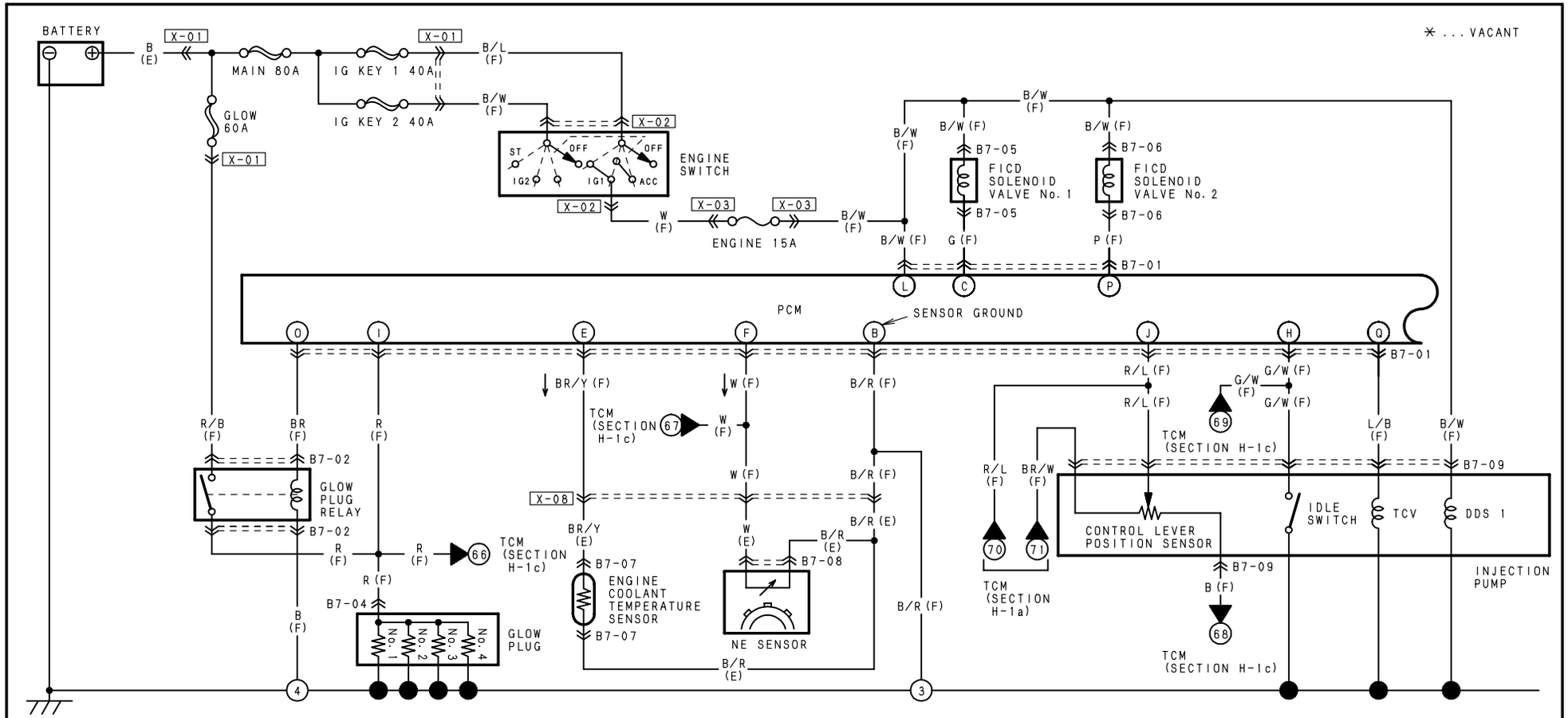
HARNESS SYMBOL: (F) (E) (R)



ELECTRICAL WIRING SCHEMATIC



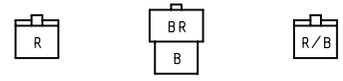
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B7-01 PCM (F)

S		Q	O	M	K	I	G	E	C		A
BR/R	L/B	BR	GY	W/L	R	R/W	BR/Y	G	✳		
Y/B	Y	P	R/B	B/W	R/L	G/W	W	B/Y	B/R		
T	R	P	N	L	J	H	F	D	B		

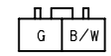
B7-02 GLOW PLUG RELAY (F)



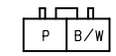
B7-04 GLOW PLUG (F)



B7-05 FICD SOLENOID VALVE No. 1 (F)



B7-06 FICD SOLENOID VALVE No. 2 (F)



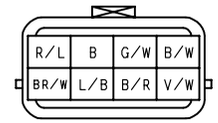
B7-07 ENGINE COOLANT TEMPERATURE SENSOR (E)



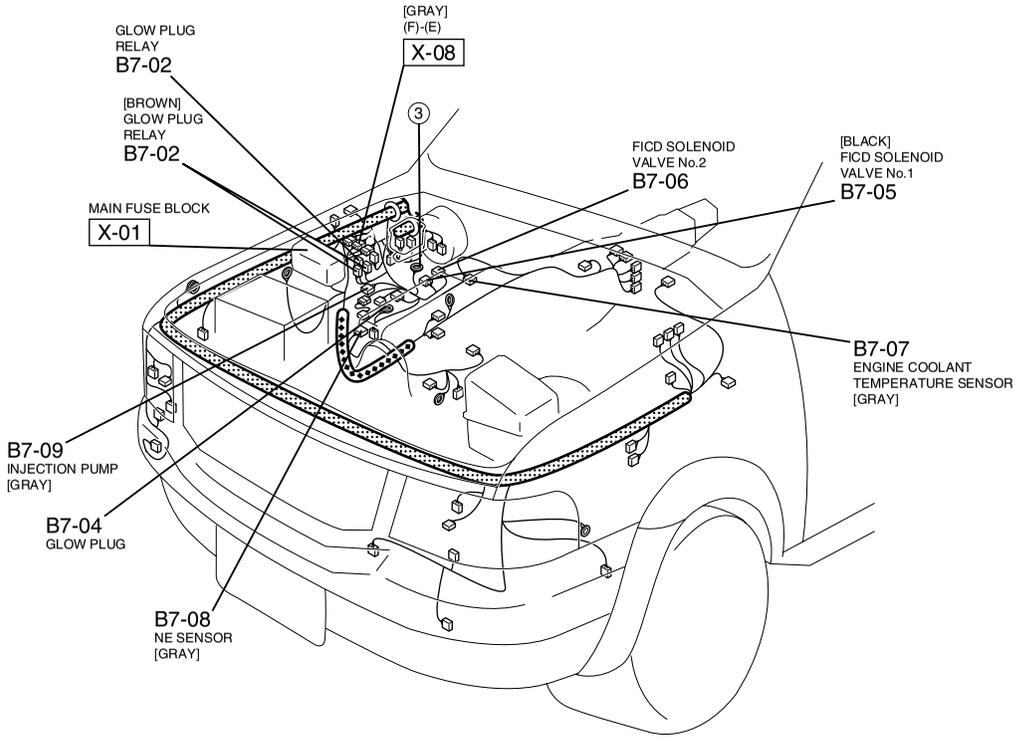
B7-08 NE SENSOR (E)

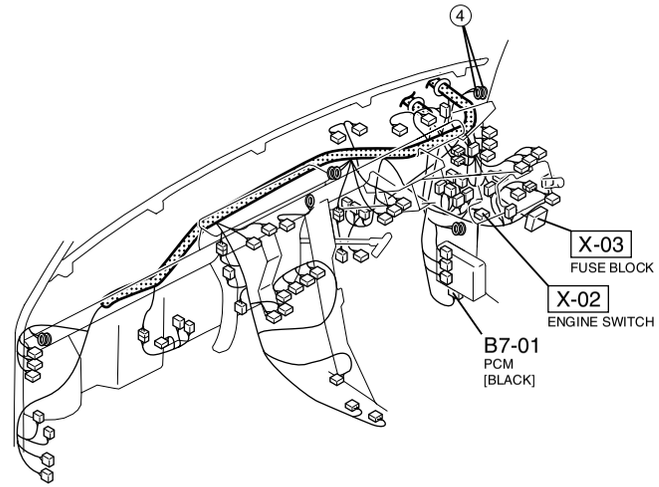


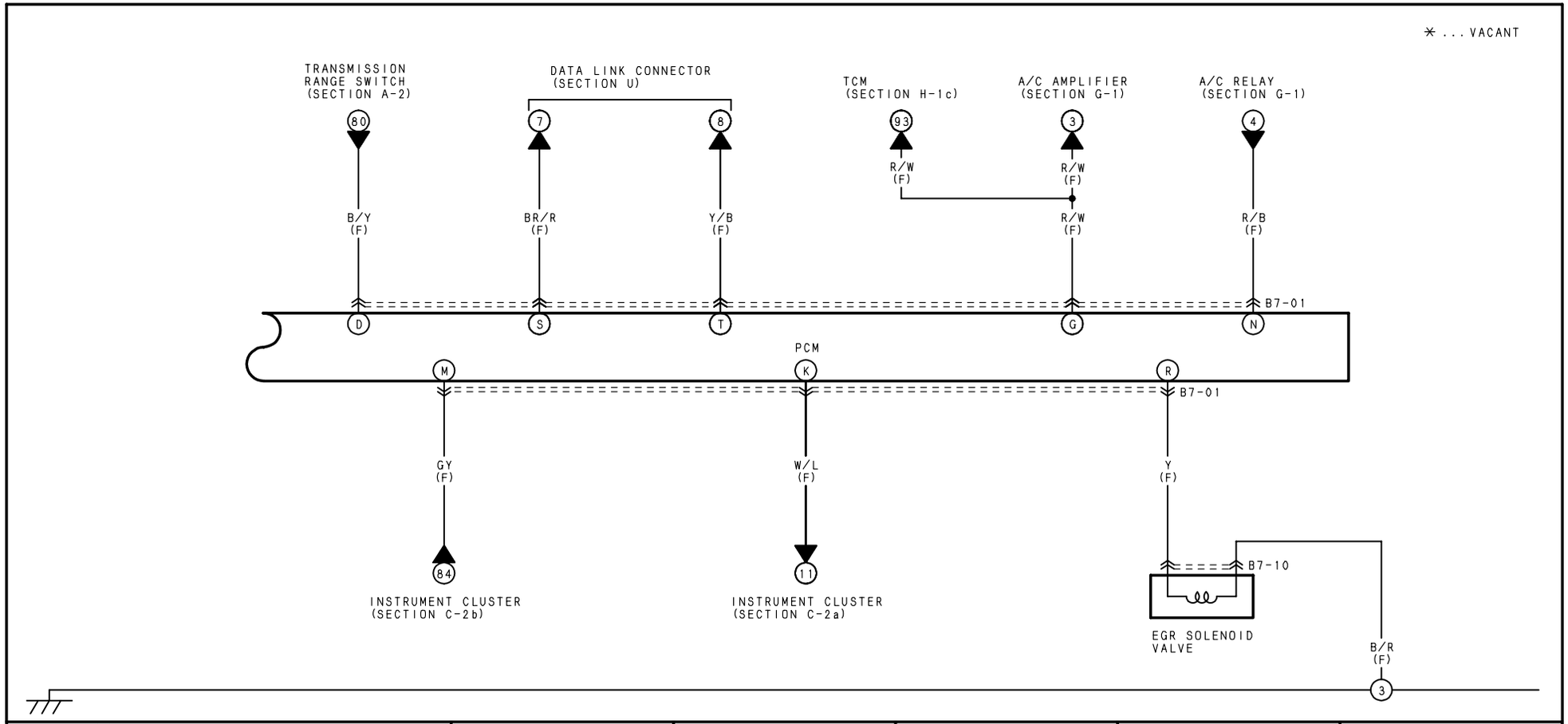
B7-09 INJECTION PUMP (F)



HARNESS SYMBOL: (F) (E) (R)







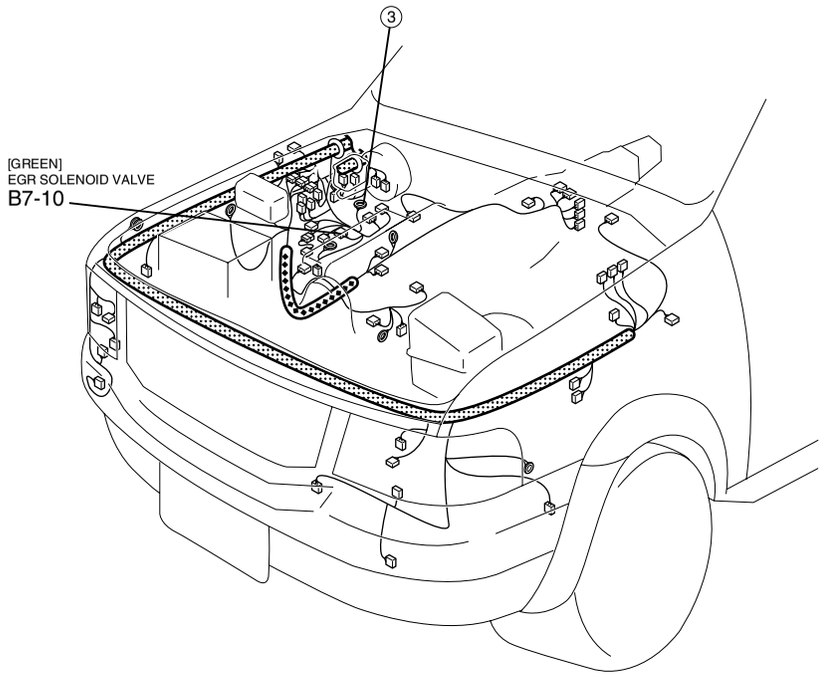
B7-01 PCM (F)

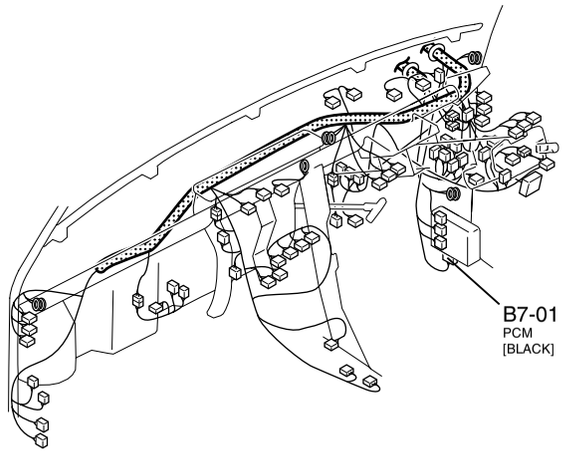
S		Q	O	M	K	I	G	E	C	A
BR/R	L/B	BR	GY	W/L	R	R/W	BR/Y	G	*
Y/B	Y	P	R/B	B/W	R/L	G/W	W	B/Y	B/R
T	R	P	N	L	J	H	F	D	B

B7-10 EGR SOLENOID VALVE (F)

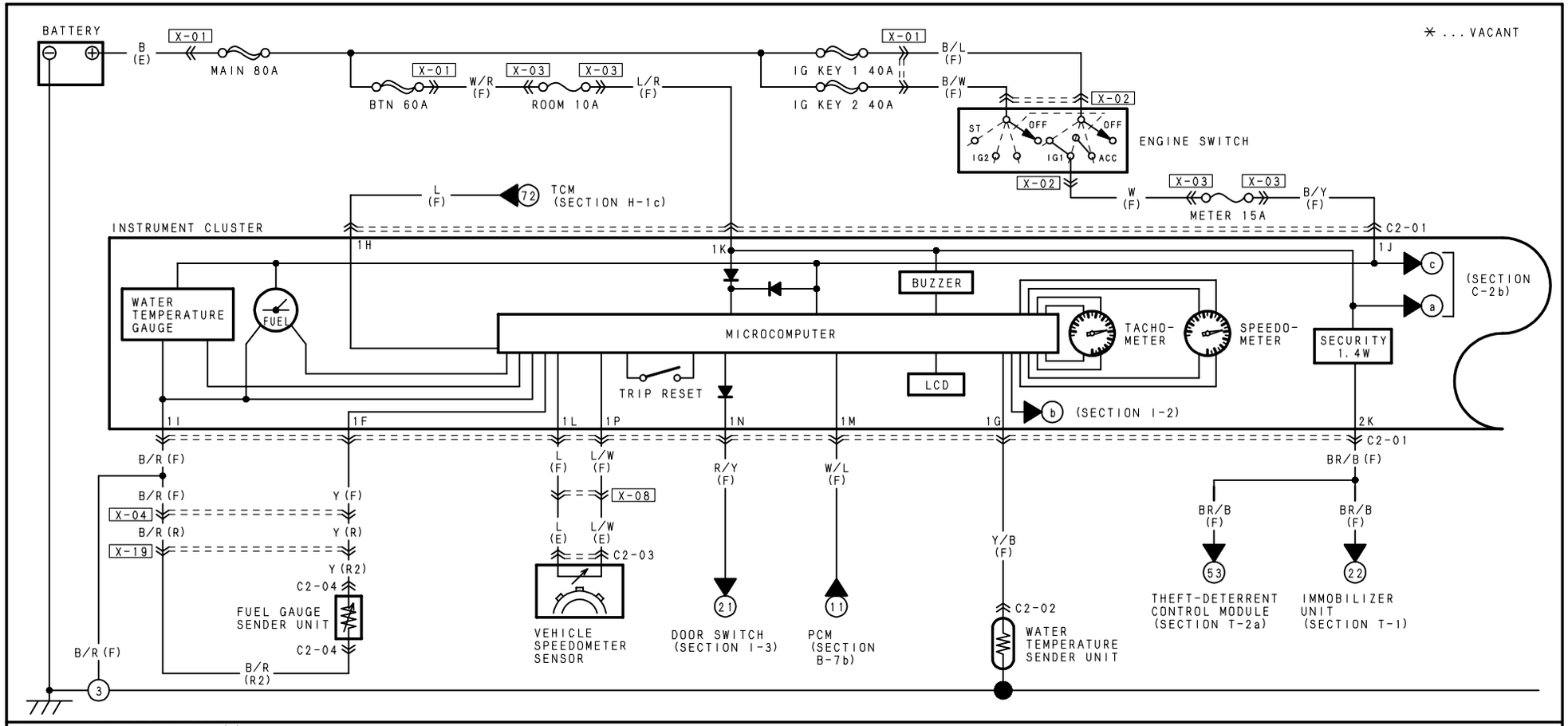
B/R	Y

HARNESS SYMBOL: (F) (E) (R)





INSTRUMENT CLUSTER (AT)



C2-01 INSTRUMENT CLUSTER (F)

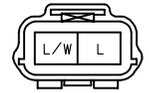
L/W	✳	R/Y	W/L	L	L/R	B/Y	B/R	L	Y/B	Y	R/B	B	R/G	G/B	G/W
1P	1O	1N	1M	1L	1K	1J	1I	1H	1G	1F	1E	1D	1C	1B	1A

B/L	R/Y	GY	BR/B	Y/G	W	BR	LG/R	✳	L/Y	Y/R	W/B	LG	R/W
2N	2M	2L	2K	2J	2I	2H	2G	2F	2E	2D	2C	2B	2A

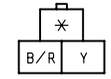
C2-02 WATER TEMPERATURE SENDER UNIT (F)



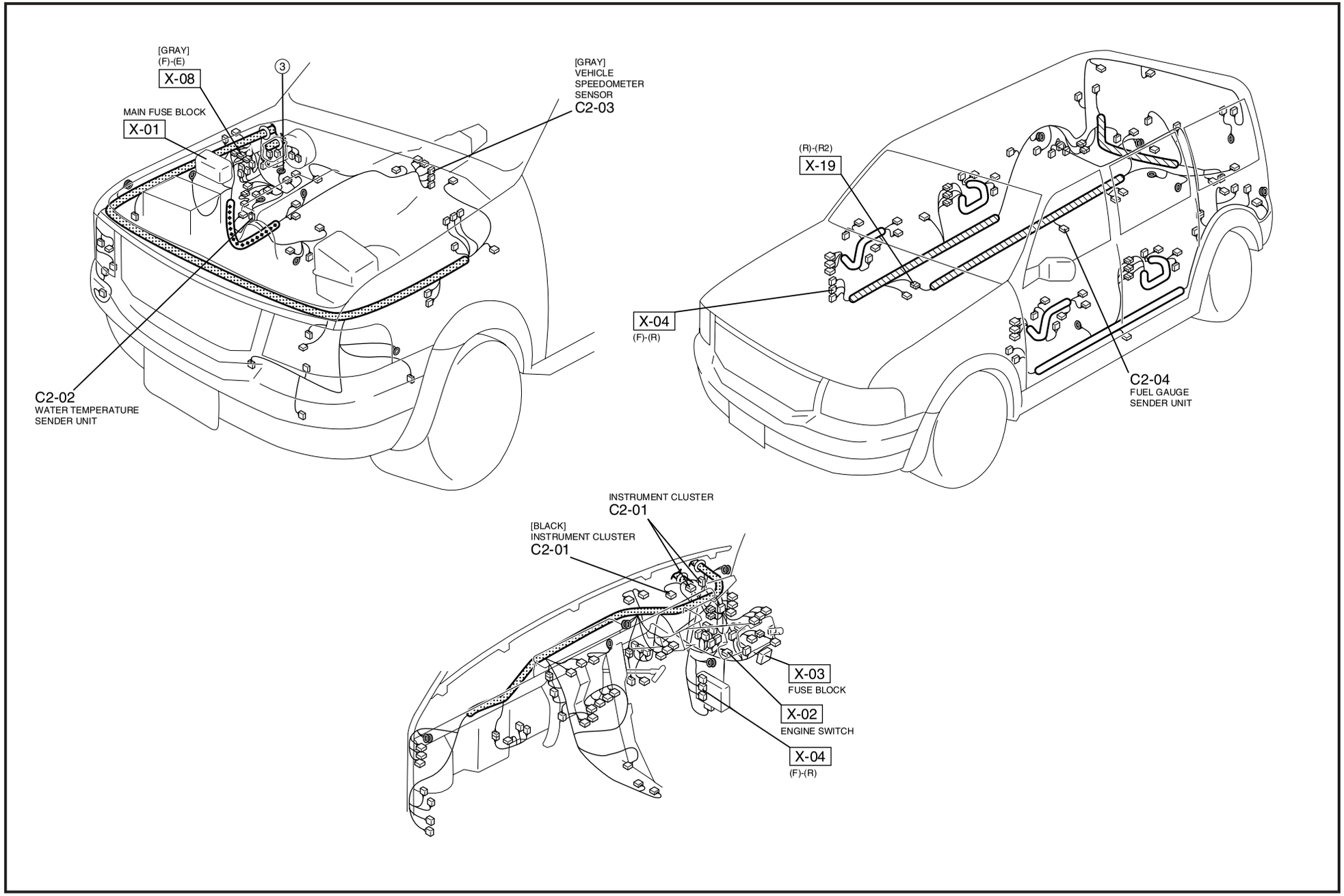
C2-03 VEHICLE SPEEDOMETER SENSOR (E)

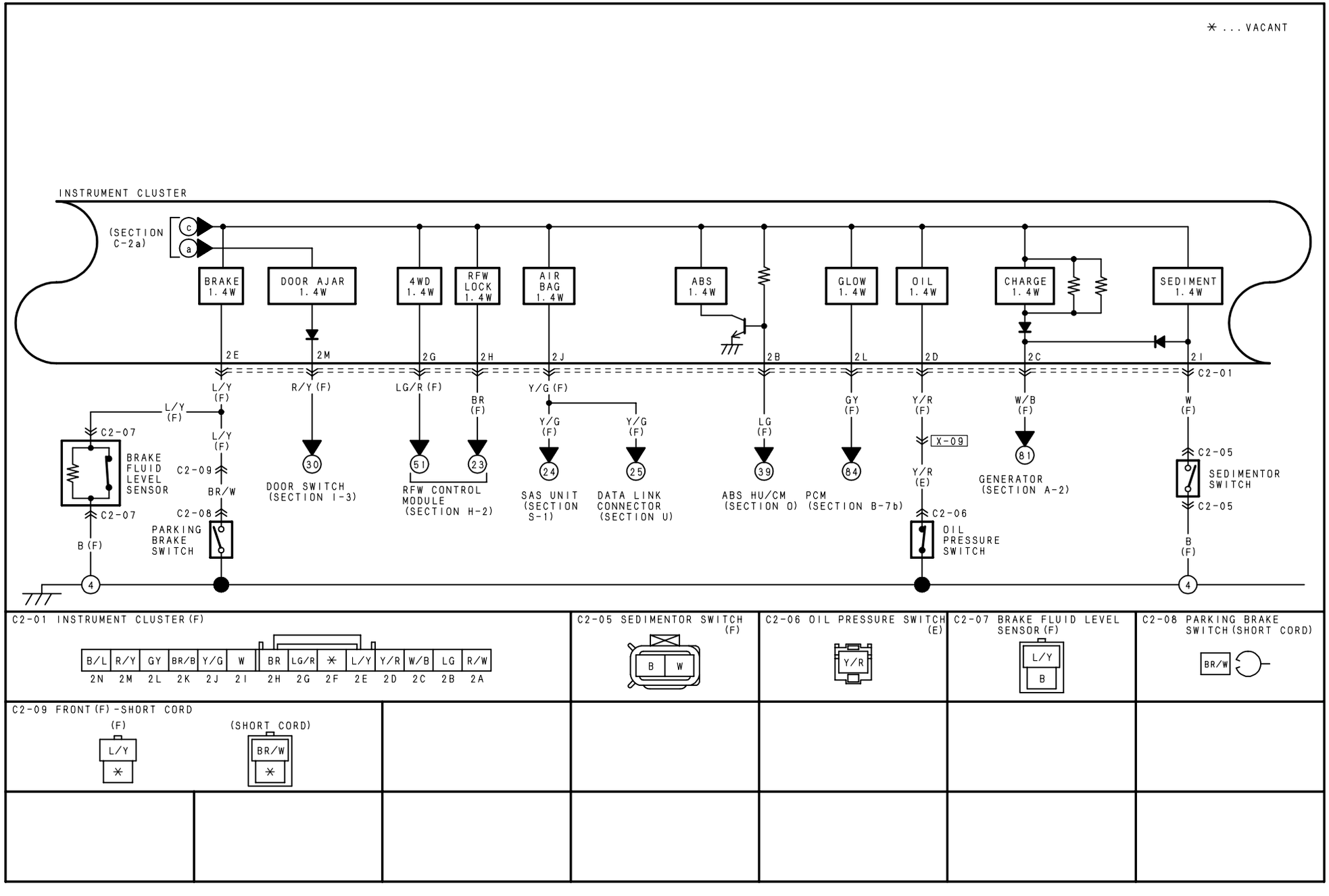


C2-04 FUEL GAUGE SENDER UNIT (R2)

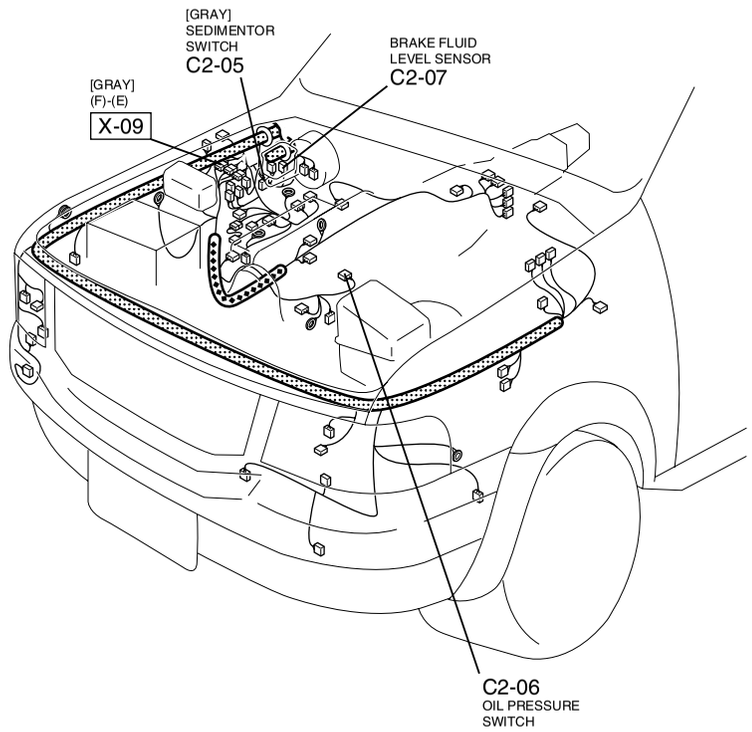


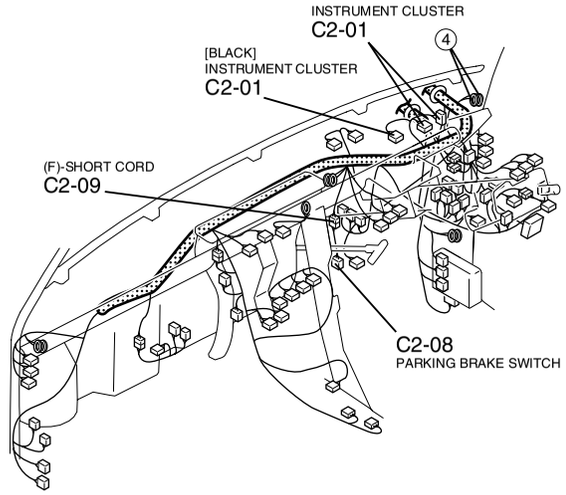
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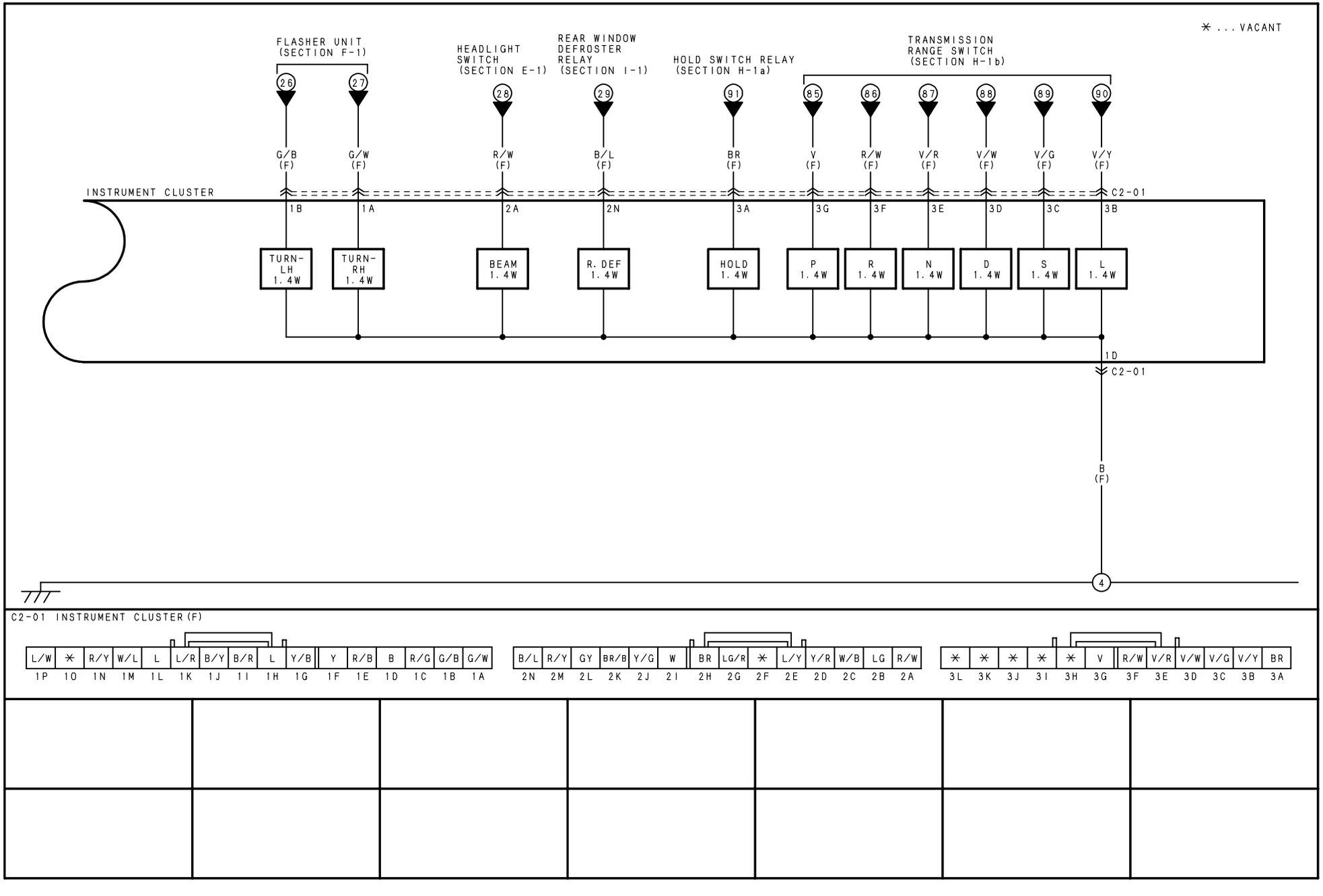



✳ . . . VACANT
INSTRUMENT CLUSTER
(SECTION C-2a)
BRAKE 1.4W
DOOR AJAR 1.4W
4WD 1.4W
RFW LOCK 1.4W
AIR BAG 1.4W
ABS 1.4W
GLOW 1.4W
OIL 1.4W
CHARGE 1.4W
SEDIMENT 1.4W
2E
2M
2G
2H
2J
2B
2L
2D
2C
2I
C2-01
L/Y (F)
R/Y (F)
LG/R (F)
BR (F)
Y/G (F)
LG (F)
GY (F)
Y/R (F)
W/B (F)
W (F)
C2-07
BRAKE FLUID LEVEL SENSOR
C2-09
BR/W
C2-08
PARKING BRAKE SWITCH
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SAS UNIT (SECTION S-1)
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C2-06
OIL PRESSURE SWITCH
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GENERATOR (SECTION A-2)
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SEDIMENTOR SWITCH
4
C2-01 INSTRUMENT CLUSTER (F)
B/L R/Y GY BR/B Y/G W BR LG/R ✳ L/Y Y/R W/B LG R/W
2N 2M 2L 2K 2J 2I 2H 2G 2F 2E 2D 2C 2B 2A
C2-05 SEDIMENTOR SWITCH (F)
B W
C2-06 OIL PRESSURE SWITCH (E)
Y/R
C2-07 BRAKE FLUID LEVEL SENSOR (F)
L/Y
B
C2-08 PARKING BRAKE SWITCH (SHORT CORD)
BR/W
C2-09 FRONT (F) -SHORT CORD
(F)
L/Y
✳
(SHORT CORD)
BR/W
✳

HARNESS SYMBOL: (F) (E) (R)







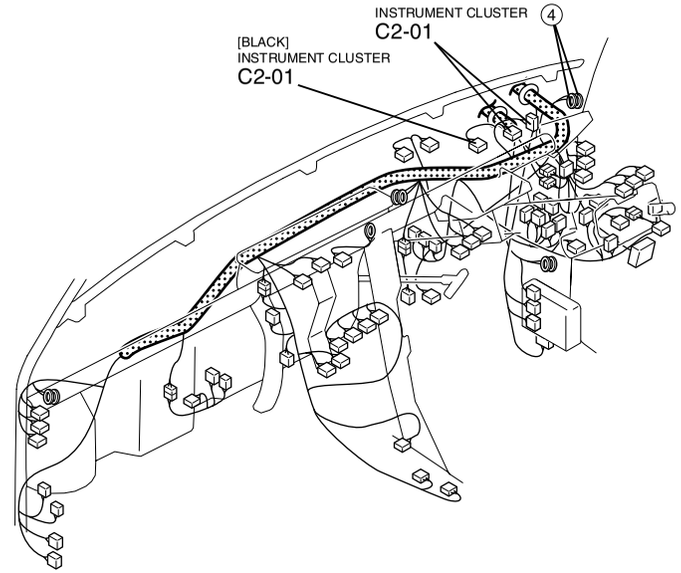
C2-01 INSTRUMENT CLUSTER (F)

L/W	✳	R/Y	W/L	L	L/R	B/Y	B/R	L	Y/B	Y	R/B	B	R/G	G/B	G/W
1P	1O	1N	1M	1L	1K	1J	1I	1H	1G	1F	1E	1D	1C	1B	1A

B/L	R/Y	GY	BR/B	Y/G	W	BR	LG/R	✳	L/Y	Y/R	W/B	LG	R/W
2N	2M	2L	2K	2J	2I	2H	2G	2F	2E	2D	2C	2B	2A

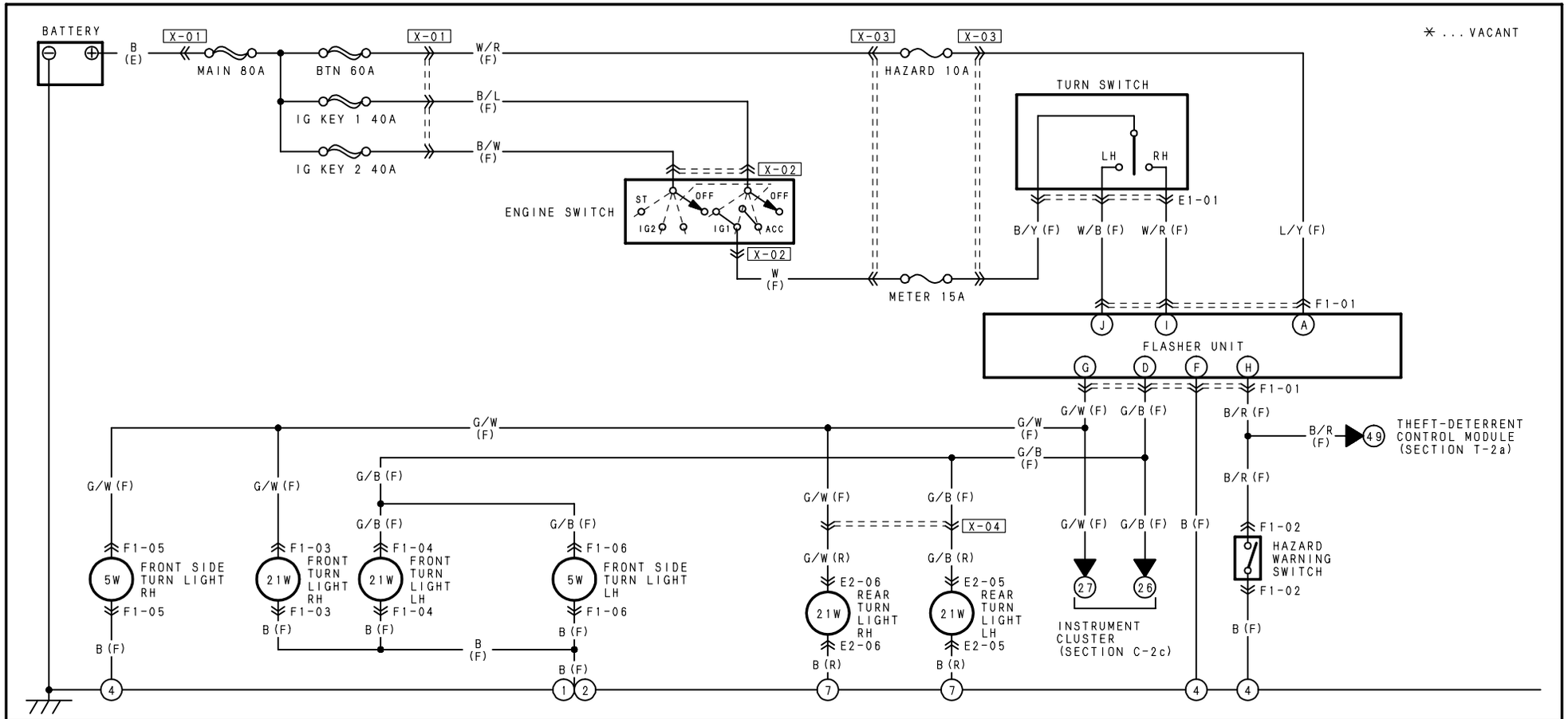
✳	✳	✳	✳	✳	V	R/W	V/R	V/W	V/G	V/Y	BR
3L	3K	3J	3I	3H	3G	3F	3E	3D	3C	3B	3A

HARNESS SYMBOL: (F) (E) (R)



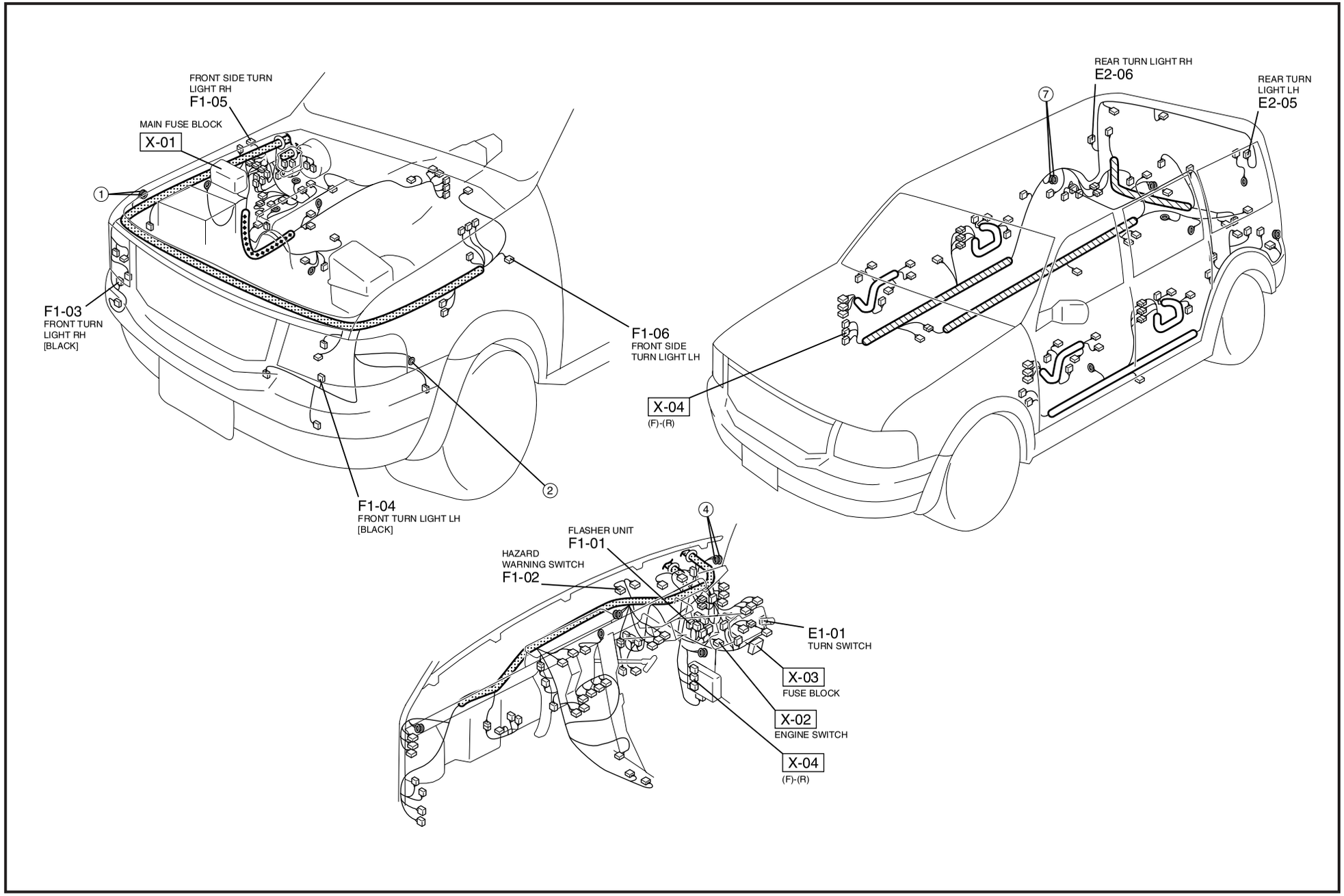
C-2c

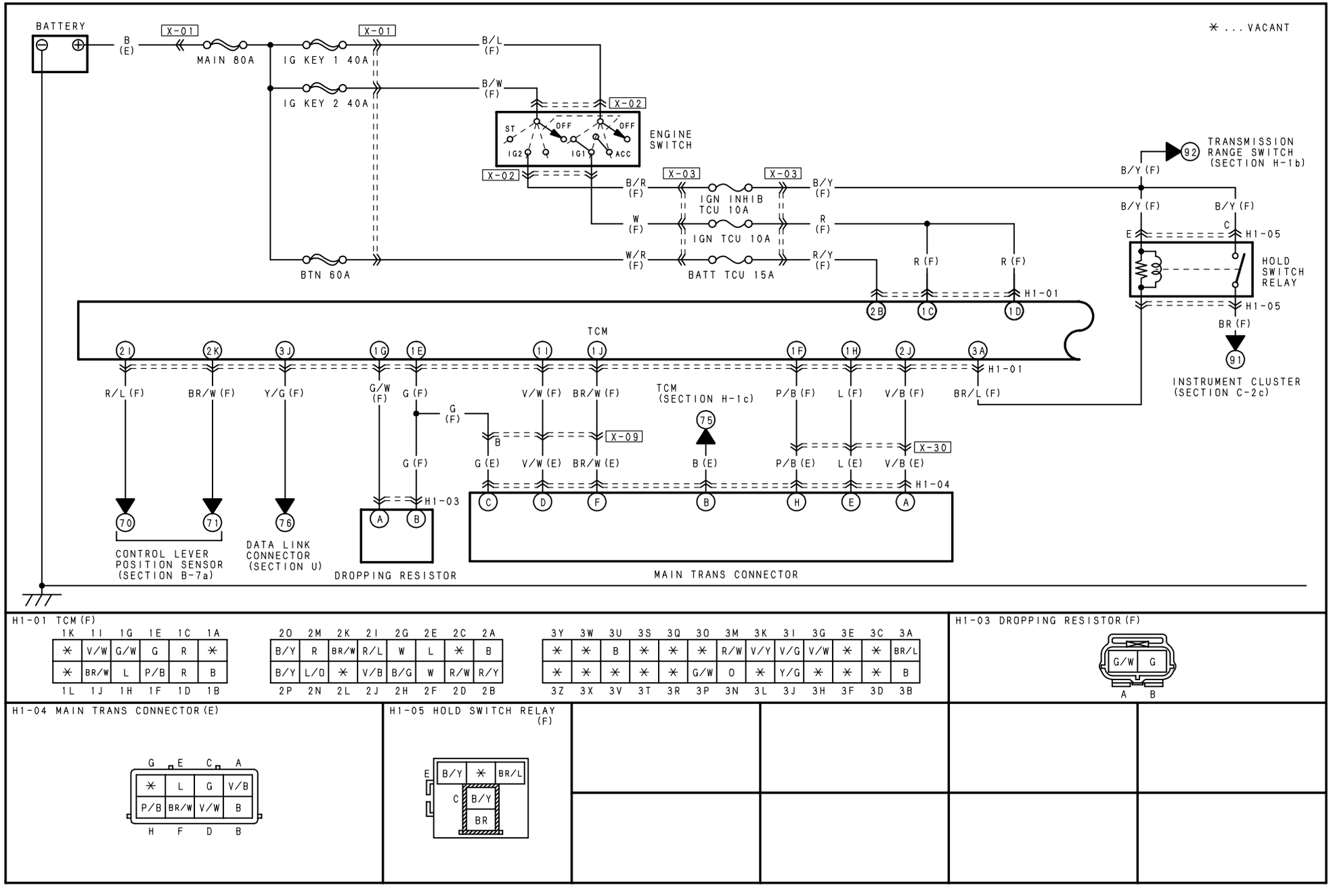
TURN AND HAZARD WARNING LIGHT (EXCEPT THAILAND)



F1-01 FLASHER UNIT (F) I G A W/R G/W L/Y W/B B/R B G/B * J H F D B	F1-02 HAZARD WARNING SWITCH (F) * * * * * R/G R/B * B/R B	F1-03 FRONT TURN LIGHT RH (F) G/W B	F1-04 FRONT TURN LIGHT LH (F) G/B B	F1-05 FRONT SIDE TURN LIGHT RH (F) B G/W
F1-06 FRONT SIDE TURN LIGHT LH (F) B G/B	E1-01 TURN SWITCH (F) W/R B/Y W/B * * * * Y/R R/W R R/L * R/B	E2-05 REAR TURN LIGHT LH (R) G/B R/B W/G B	E2-06 REAR TURN LIGHT RH (R) G/W R/B W/G B	

HARNESS SYMBOL: (F) (E) (R)





H1-01 TCM (F)

1K	1I	1G	1E	1C	1A
*	V/W	G/W	G	R	*
*	BR/W	L	P/B	R	B
1L	1J	1H	1F	1D	1B

2O	2M	2K	2I	2G	2E	2C	2A
B/Y	R	BR/W	R/L	W	L	*	B
B/Y	L/O	*	V/B	B/G	W	R/W	R/Y
2P	2N	2L	2J	2H	2F	2D	2B

3Y	3W	3U	3S	3Q	3O	3M	3K	3I	3G	3E	3C	3A
*	*	B	*	*	*	R/W	V/Y	V/G	V/W	*	*	BR/L
*	*	*	*	*	G/W	O	*	Y/G	*	*	*	B
3Z	3X	3V	3T	3R	3P	3N	3L	3J	3H	3F	3D	3B

H1-03 DROPPING RESISTOR (F)

G/W	G
A	B

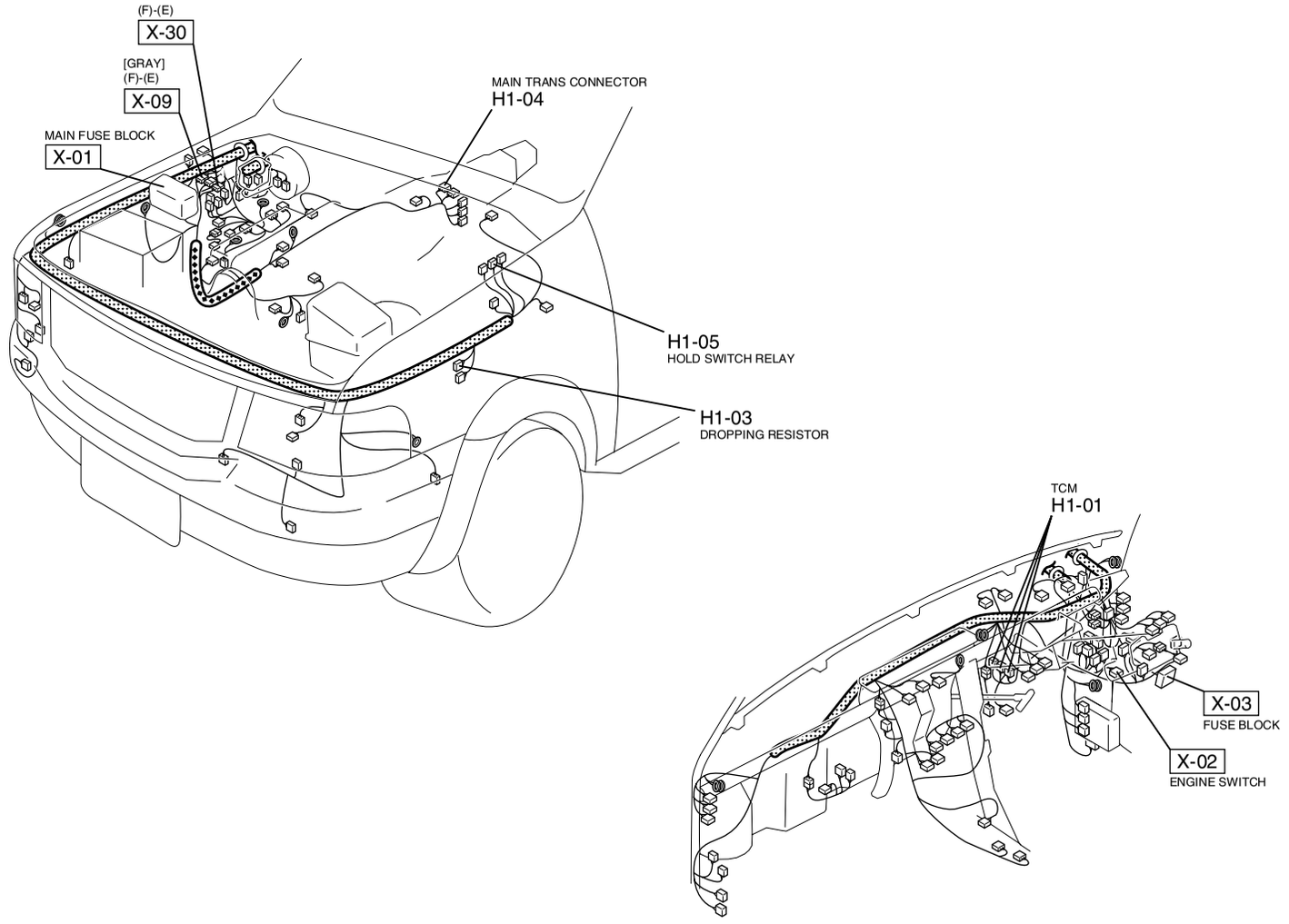
H1-04 MAIN TRANS CONNECTOR (E)

G	E	C	A
*	L	G	V/B
P/B	BR/W	V/W	B
H	F	D	B

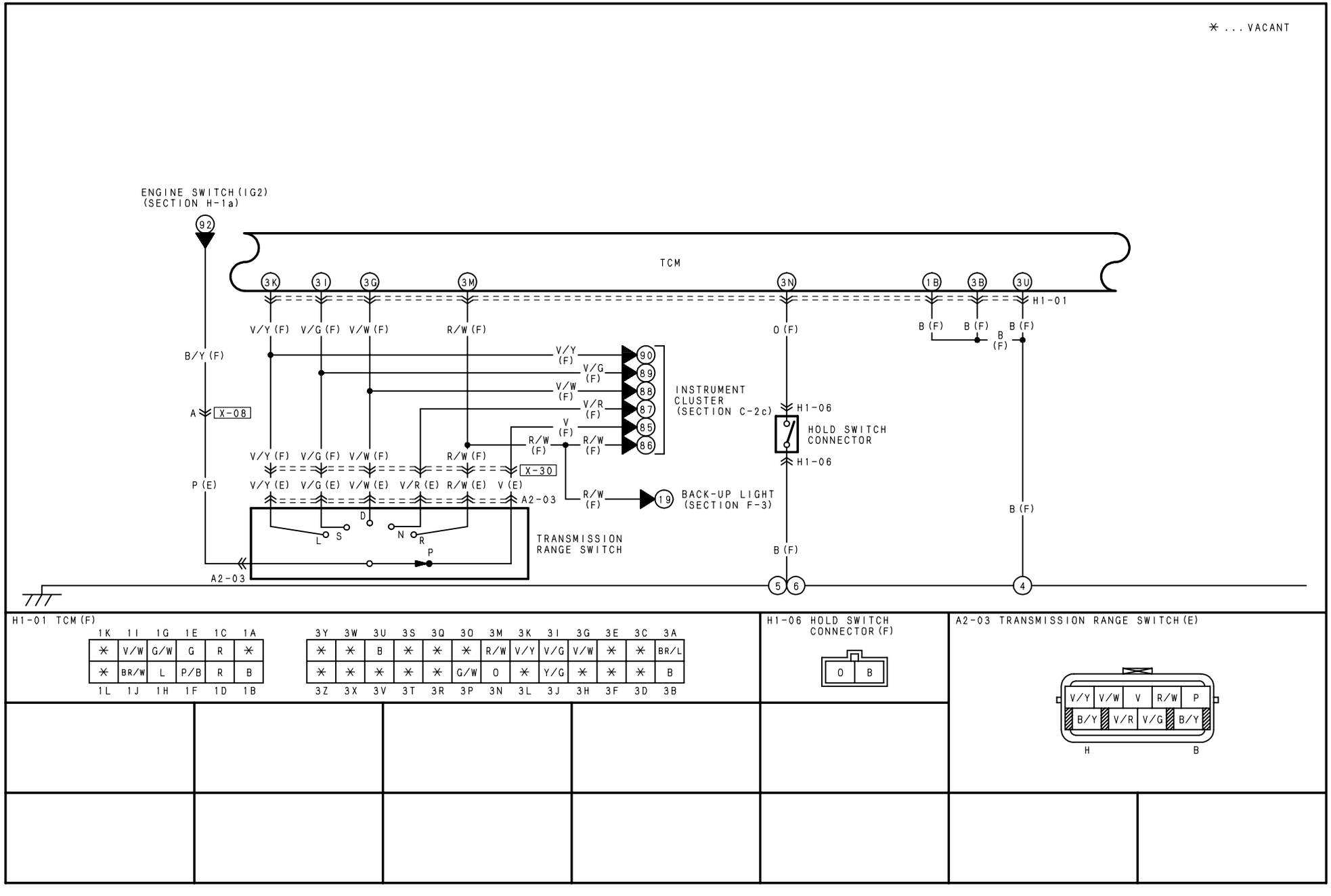
H1-05 HOLD SWITCH RELAY (F)

E	B/Y	*	BR/L
C	B/Y		
	BR		

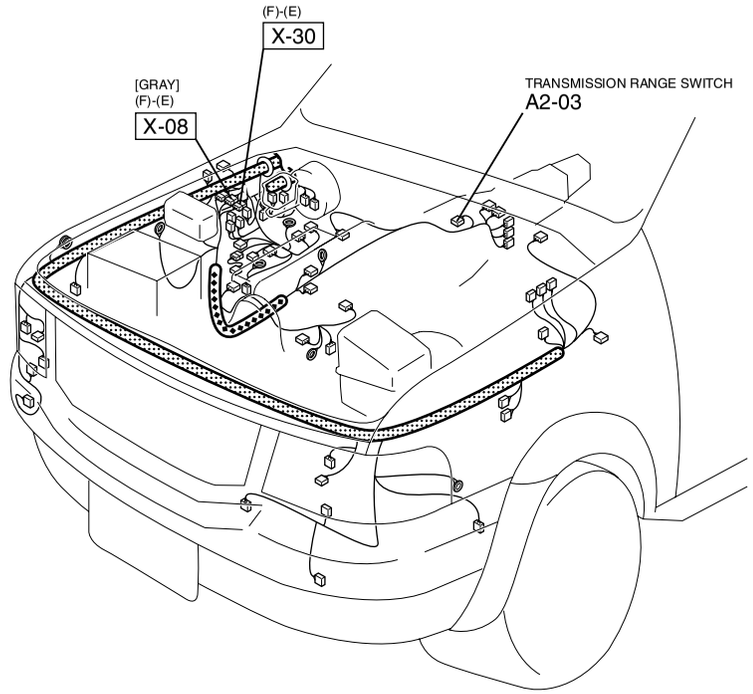
HARNESS SYMBOL: (F) (E) (R)

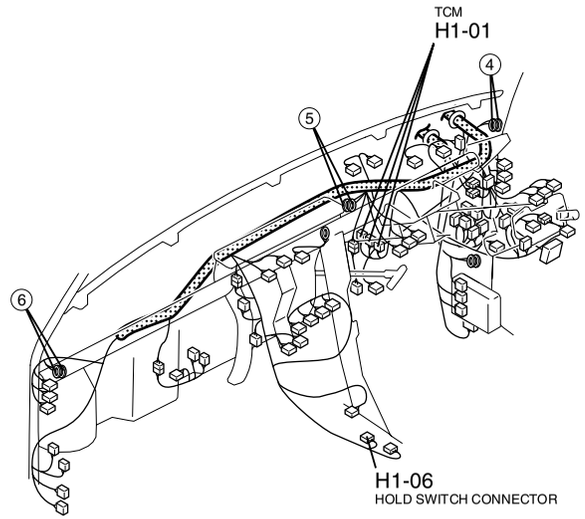


H-1a

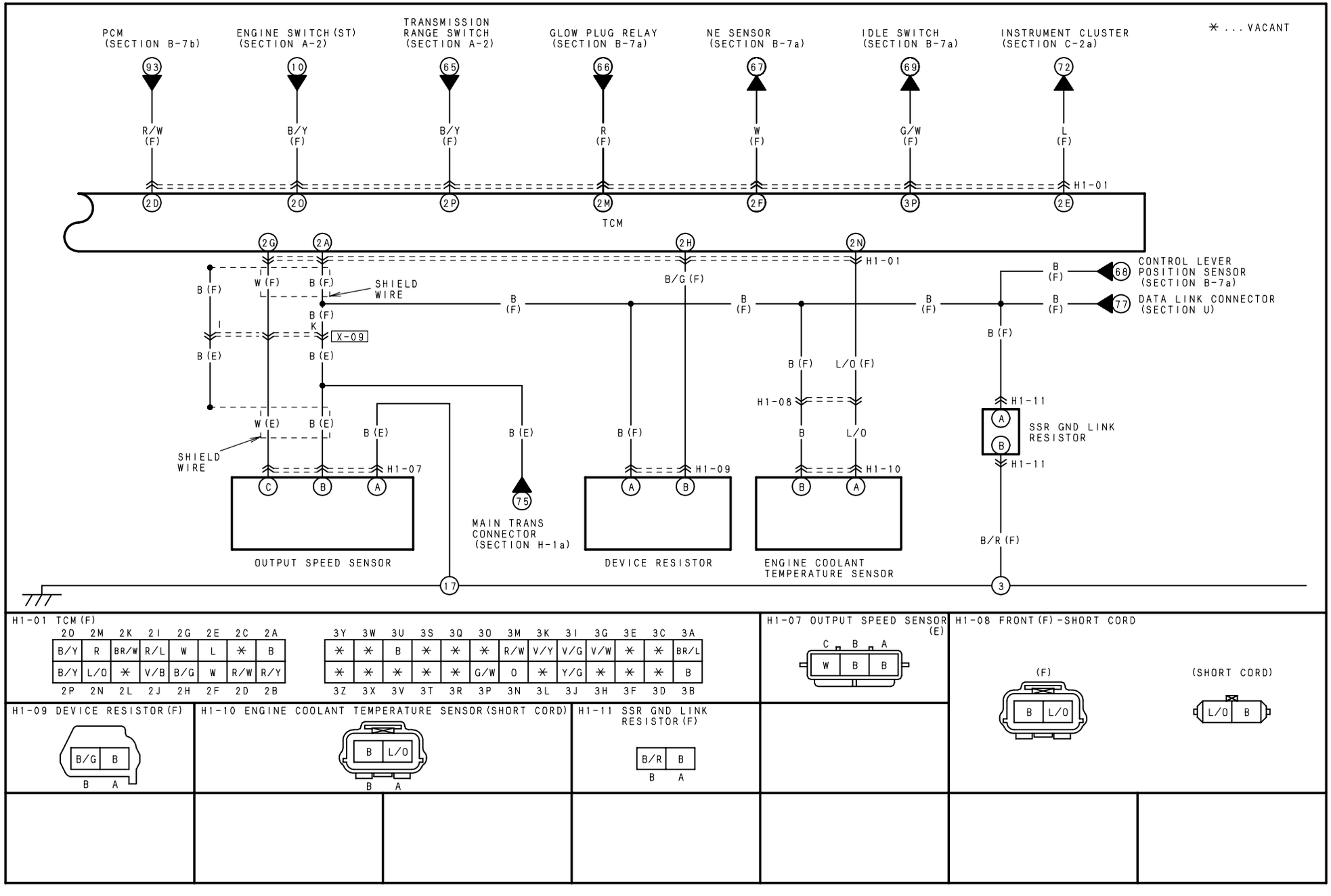

✳ . . . VACANT
ENGINE SWITCH (IG2)
(SECTION H-1a)
92
TCM
3K
3I
3G
3M
3N
1B
3B
3U
H1-01
V/Y (F)
V/G (F)
V/W (F)
R/W (F)
O (F)
B (F)
B/Y (F)
A
X-08
INSTRUMENT
CLUSTER
(SECTION C-2c)
H1-06
HOLD SWITCH
CONNECTOR
90
89
88
87
85
86
X-30
P (E)
V/Y (E)
V/G (E)
V/W (E)
V/R (E)
R/W (E)
V (E)
A2-03
19
BACK-UP LIGHT
(SECTION F-3)
TRANSMISSION
RANGE SWITCH
D
L
S
N
R
P
5
6
4
H1-01 TCM (F)
1K 1I 1G 1E 1C 1A
✳ V/W G/W G R ✳
✳ BR/W L P/B R B
1L 1J 1H 1F 1D 1B
3Y 3W 3U 3S 3Q 3O 3M 3K 3I 3G 3E 3C 3A
✳ ✳ B ✳ ✳ ✳ R/W V/Y V/G V/W ✳ ✳ BR/L
✳ ✳ ✳ ✳ ✳ G/W O ✳ Y/G ✳ ✳ ✳ B
3Z 3X 3V 3T 3R 3P 3N 3L 3J 3H 3F 3D 3B
H1-06 HOLD SWITCH
CONNECTOR (F)
O B
A2-03 TRANSMISSION RANGE SWITCH (E)
V/Y V/W V R/W P
B/Y V/R V/G B/Y
H B

HARNESS SYMBOL: (F) (E) (R)





H-1b



H1-01 TCM (F)

2O	2M	2K	2I	2G	2E	2C	2A
B/Y	R	BR/W	R/L	W	L	*	B
B/Y	L/O	*	V/B	B/G	W	R/W	R/Y
2P	2N	2L	2J	2H	2F	2D	2B

3Y	3W	3U	3S	3Q	3O	3M	3K	3I	3G	3E	3C	3A
*	*	B	*	*	*	R/W	V/Y	V/G	V/W	*	*	BR/L
*	*	*	*	*	G/W	O	*	Y/G	*	*	*	B
3Z	3X	3V	3T	3R	3P	3N	3L	3J	3H	3F	3D	3B

H1-07 OUTPUT SPEED SENSOR (E)

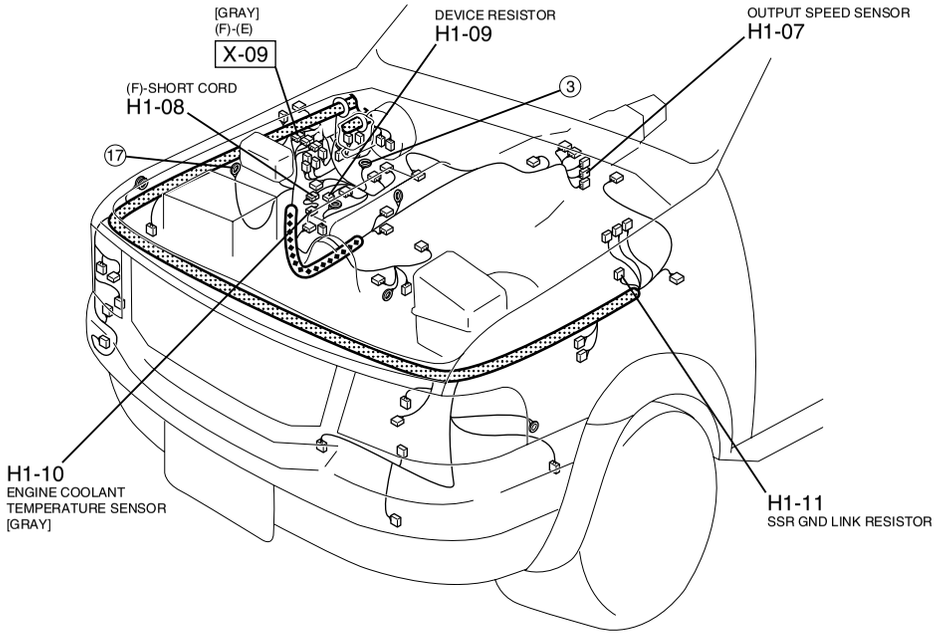
H1-08 FRONT (F) -SHORT CORD

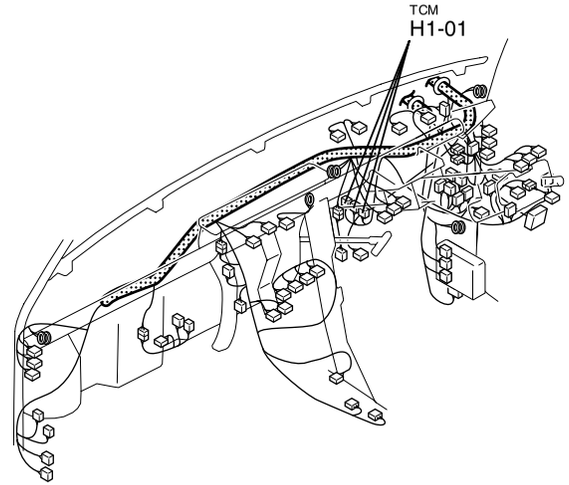
H1-09 DEVICE RESISTOR (F)

H1-10 ENGINE COOLANT TEMPERATURE SENSOR (SHORT CORD)

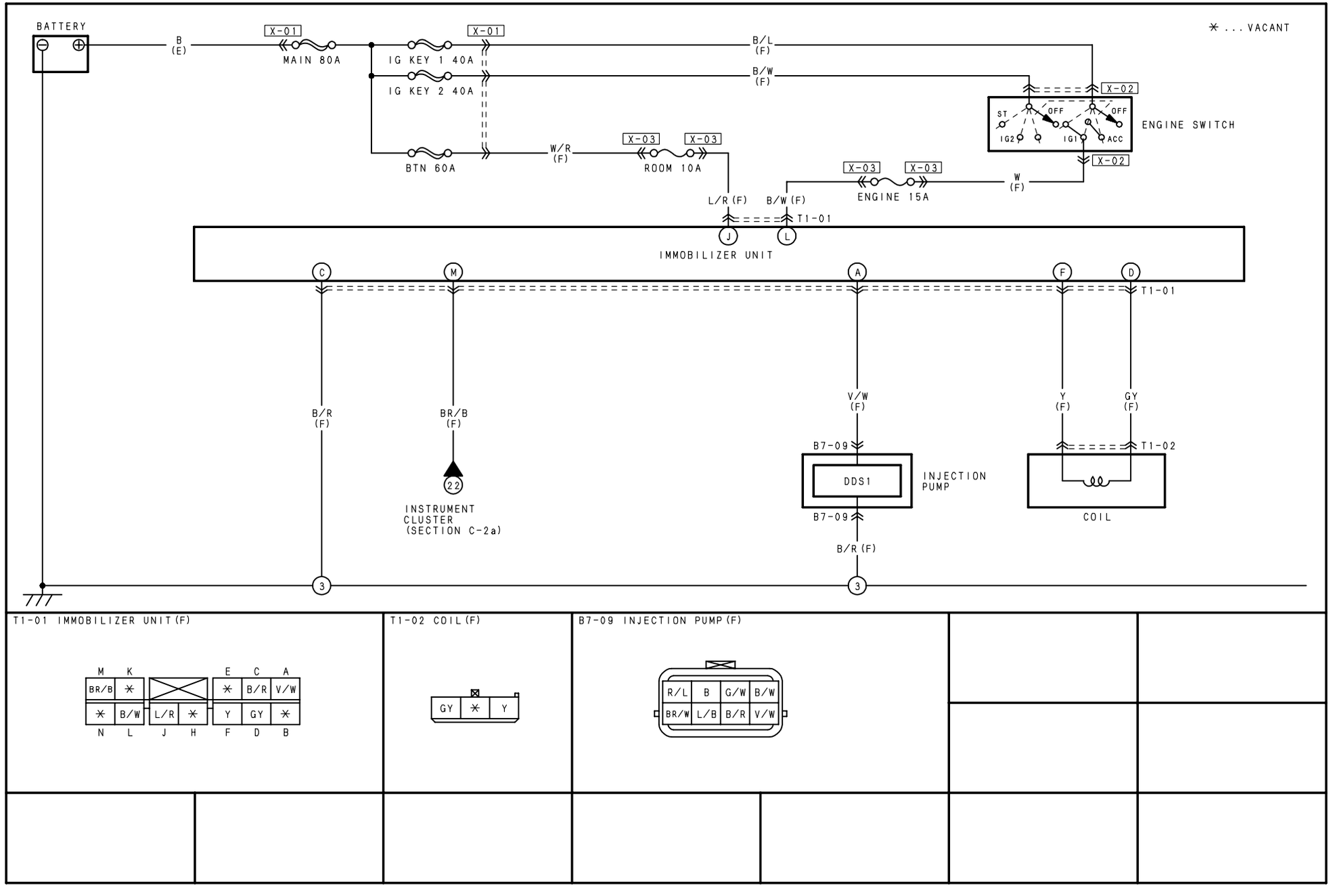
H1-11 SSR GND LINK RESISTOR (F)

HARNESS SYMBOL: (F) (E) (R)





IMMOBILIZER SYSTEM

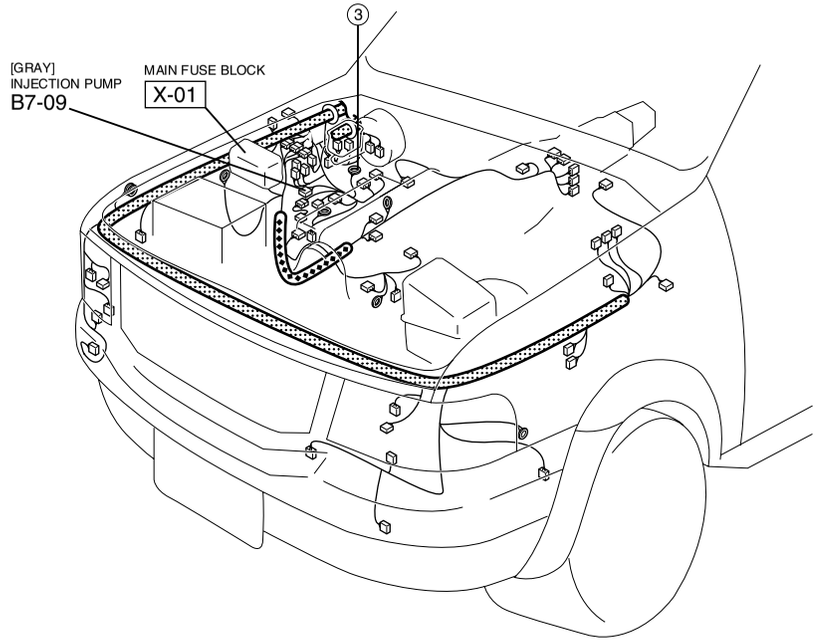


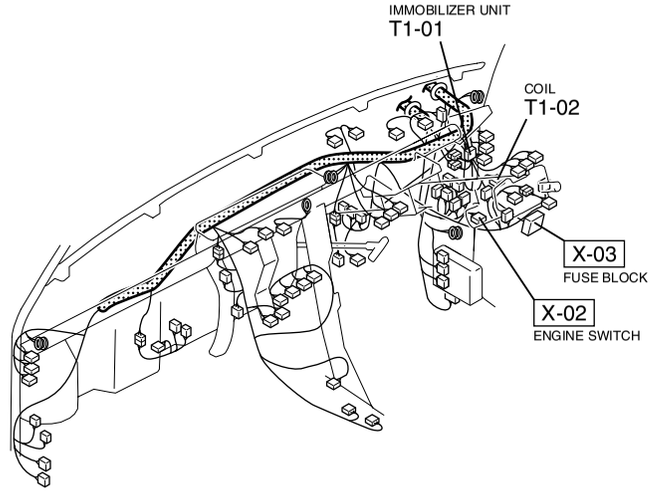
T1-01 IMMOBILIZER UNIT(F)

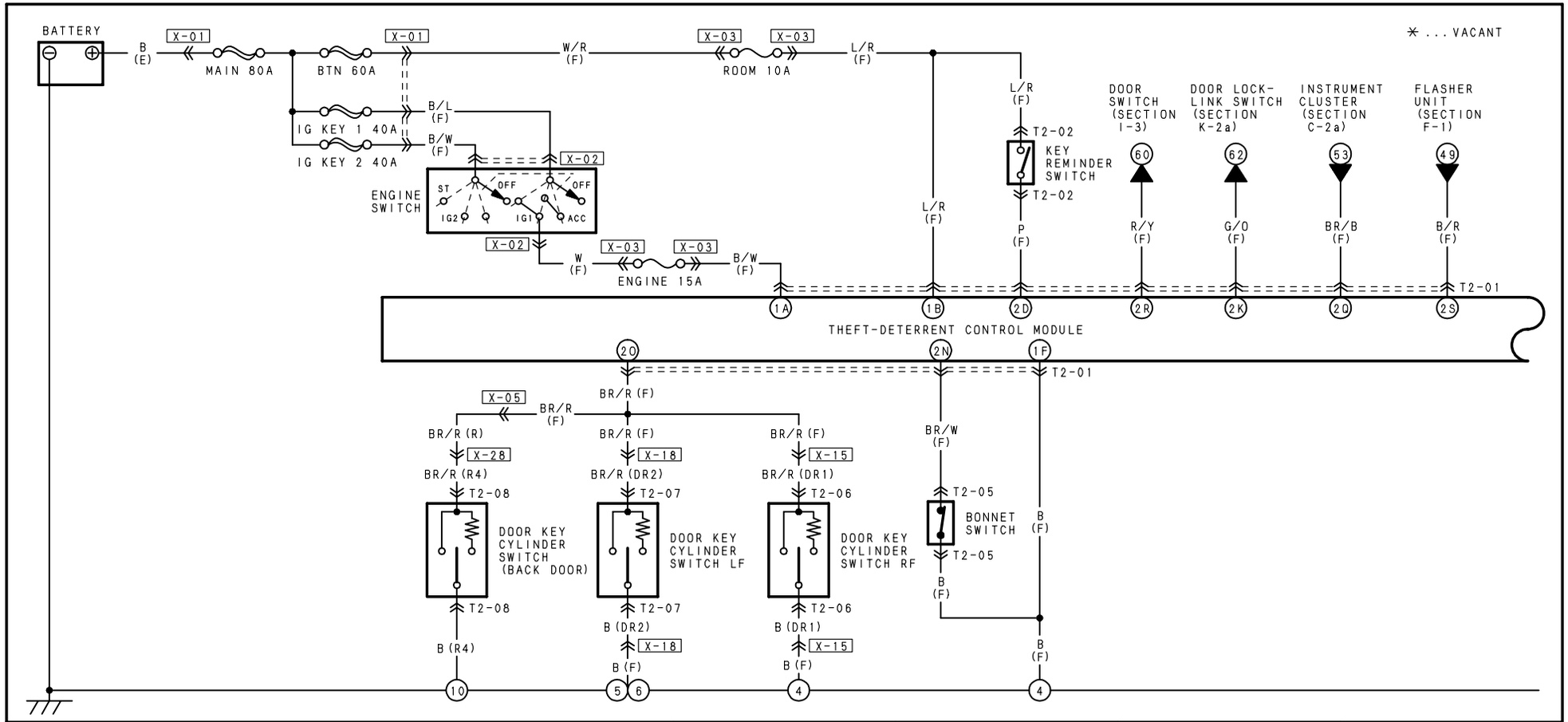
T1-02 COIL(F)

B7-09 INJECTION PUMP(F)

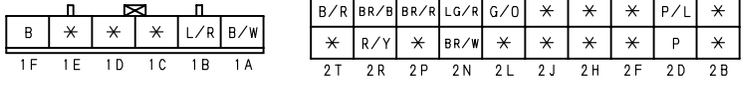
HARNESS SYMBOL: (F) (E) (R)



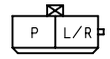




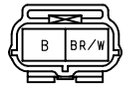
T2-01 THEFT-DETERRENT CONTROL MODULE (F)



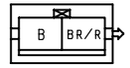
T2-02 KEY REMINDER SWITCH (F)



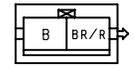
T2-05 BONNET SWITCH (F)



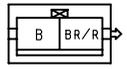
T2-06 DOOR KEY CYLINDER SWITCH RF (DR1)



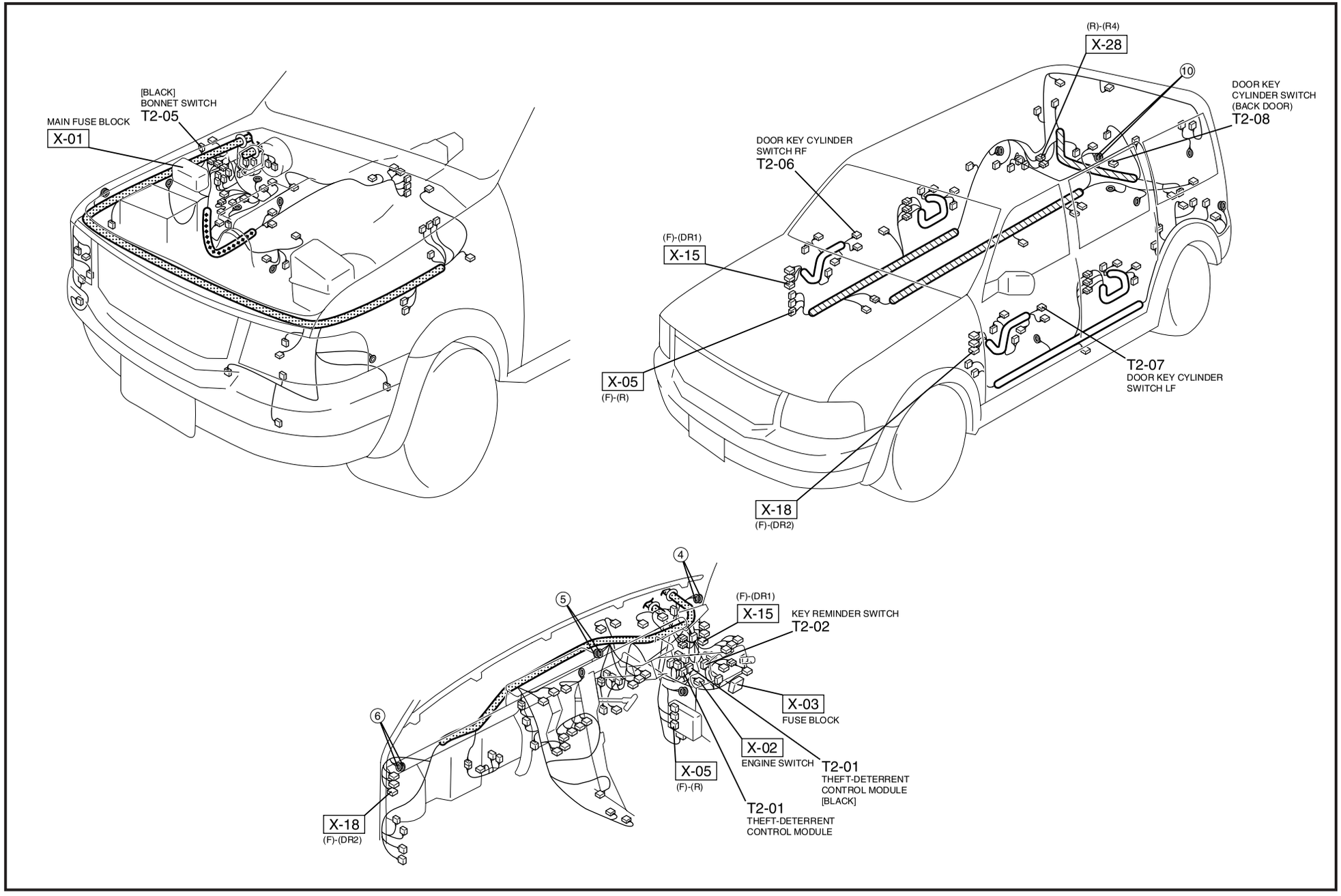
T2-07 DOOR KEY CYLINDER SWITCH LF (DR2)

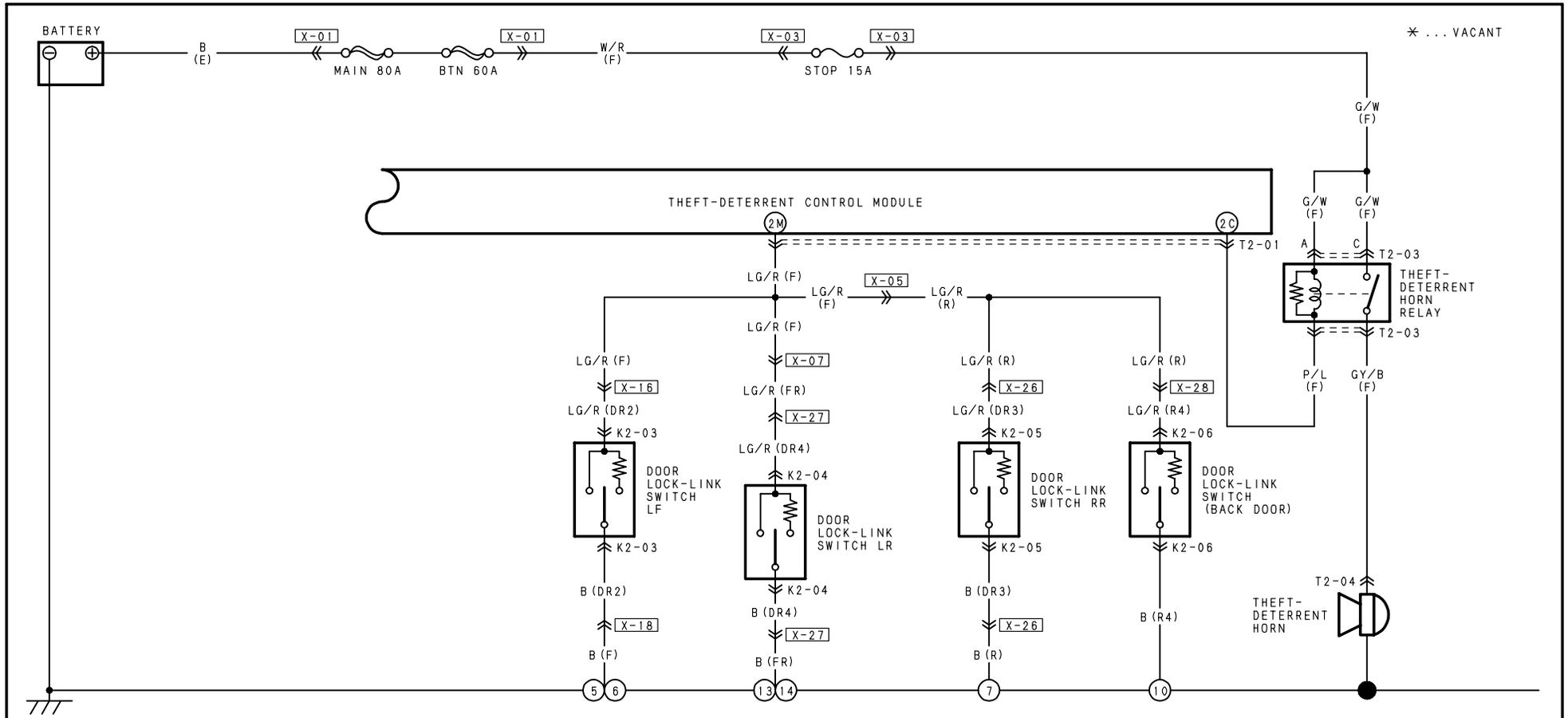


T2-08 DOOR KEY CYLINDER SWITCH (BACK DOOR) (R4)

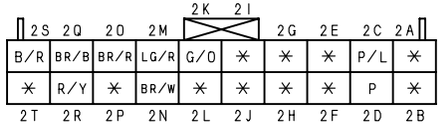


HARNESS SYMBOL: (F) (E) (R)

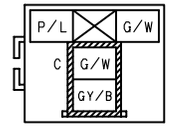




T2-01 THEFT-DETERRENT CONTROL MODULE (F)



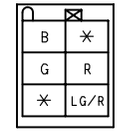
T2-03 THEFT-DETERRENT HORN RELAY (F)



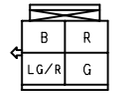
T2-04 THEFT-DETERRENT HORN (F)



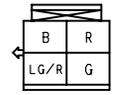
K2-03 DOOR LOCK-LINK SWITCH LF (DR2)



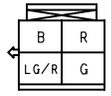
K2-04 DOOR LOCK-LINK SWITCH LR (DR4)



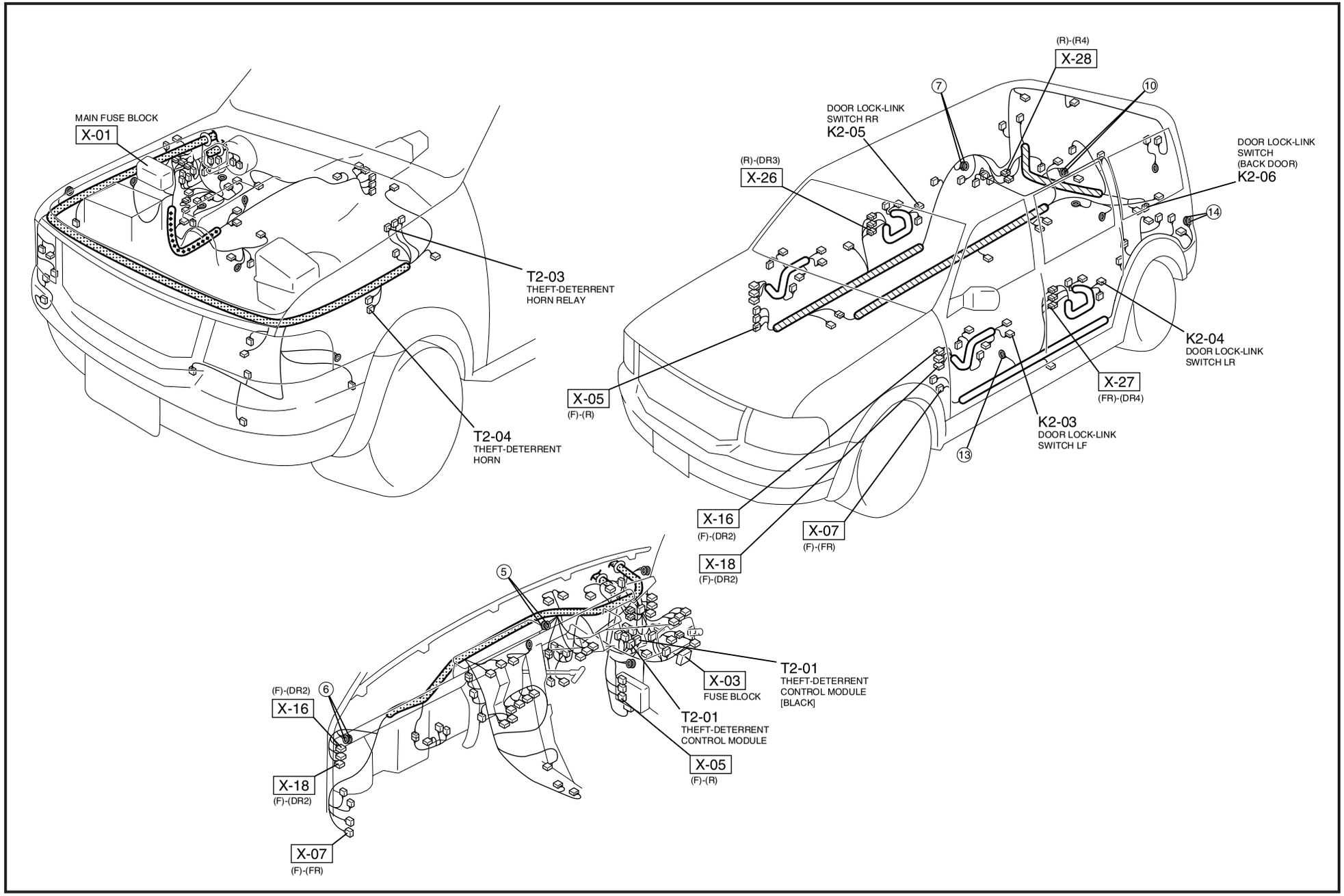
K2-05 DOOR LOCK-LINK SWITCH RR (DR3)



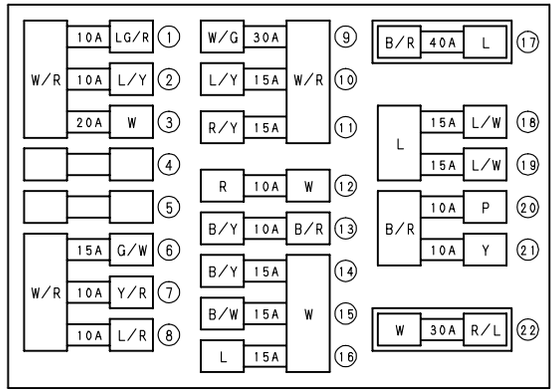
K2-06 DOOR LOCK-LINK SWITCH (BACK DOOR) (R4)



HARNESS SYMBOL: (F) (E) (R)



X-03 FUSE BLOCK(F)



NOTE:SEEN FROM TERMINAL SIDE

1	(A/C)	12	IGN TCU
2	HAZARD	13	IGN INHIB TCU
3	(R. DEFOG)	14	METER
4	—	15	ENGINE
5	—	16	WIPER
6	STOP	17	(HEATER)
7	TAIL	18	CIGAR
8	ROOM	19	(P. POINT)
9	(D/L)	20	(R. WIPER)
10	F. OPEN	21	(A/C2)
11	BATT TCU	22	(P. WIND)

( ) IF EQUIPPED

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W
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- WIRING COLOR CODE 0

EVEREST
Body Measurement Manual

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Title	Section
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F337–10–03A

FOREWORD

This manual has been prepared to provide information covering normal service repairs and maintenance for the EVEREST.

As all information in this manual was the best available at the time of printing, vehicle specification and other information will be updated in Service Information.

Ford Moter Company

VEHICLE IDENTIFICATION NUMBERS (VIN)

General (L.H.D.) specs.

MNB BS4D40*W	**10001—**
MNB LS4D40*W	**10001—**
MNB BS4D70*W	**10001—**
MNB LS4D70*W	**10001—**
MNB BSYD40*W	**10001—**
MNB LSYD40*W	**10001—**
MNB BS4D40*W	**10001—**

General (R.H.D.) specs.

MNC BS4D40*W	**10001—**
MNC LS4D40*W	**10001—**
MNC BS4D70*W	**10001—**
MNC LS4D70*W	**10001—**
MNC BS417W**	**10001—**
MNC LS417W**	**10001—**

GENERAL INFORMATION

HOW TO USE THIS MANUAL I-2
HOW TO USE THIS MANUAL I-2

HOW TO USE THIS MANUAL

HOW TO USE THIS MANUAL

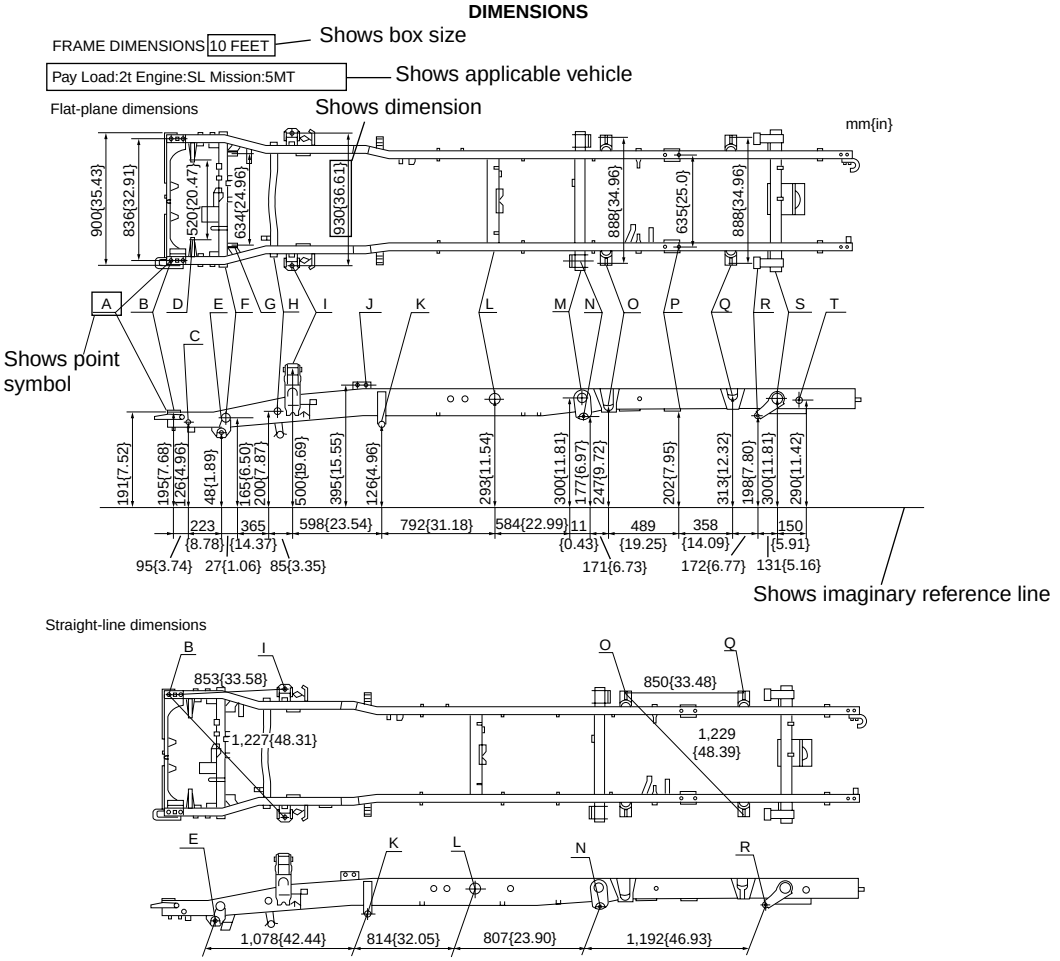
AVF201000001B01

This manual contains frame and cabin dimensions. An explanation of how to read the dimensional drawing is given below.

How To Read Frame Dimensions

- Frame dimensions are the dimensions measured by projecting certain reference points onto a plane surface.
- When there are no specific indications, the standard points and dimensions are symmetrical in regard to the center of the vehicle.
- The hypothetical lines may differ according to the vehicle model.
- The outline drawing shows the figure that projected vehicle from the upper side.

DIMENSIONS



Shows point name

Point symbol	Designation	Hole diameter or bolt or nut size mm{in}
A	Side member outer front end	-
B	Crossmember No.1 guide pipe	ϕ14.5 {0.57}
C	Side member standard hole	ϕ10 {0.39}
D	Air duct bracket	ϕ10 {0.39}
E	Front spring hanger front	ϕ19 {0.75}
F	Crossmember No.2 side hole	ϕ54 {2.13}
G	Radiator guide bracket	ϕ10 {0.39}
H	Crossmember No.3 side hole	ϕ40 {1.57}
I	Dumper mounting hole	ϕ13 {0.51}
J	Cabin mounting bracket	13x15 {0.51x0.59}

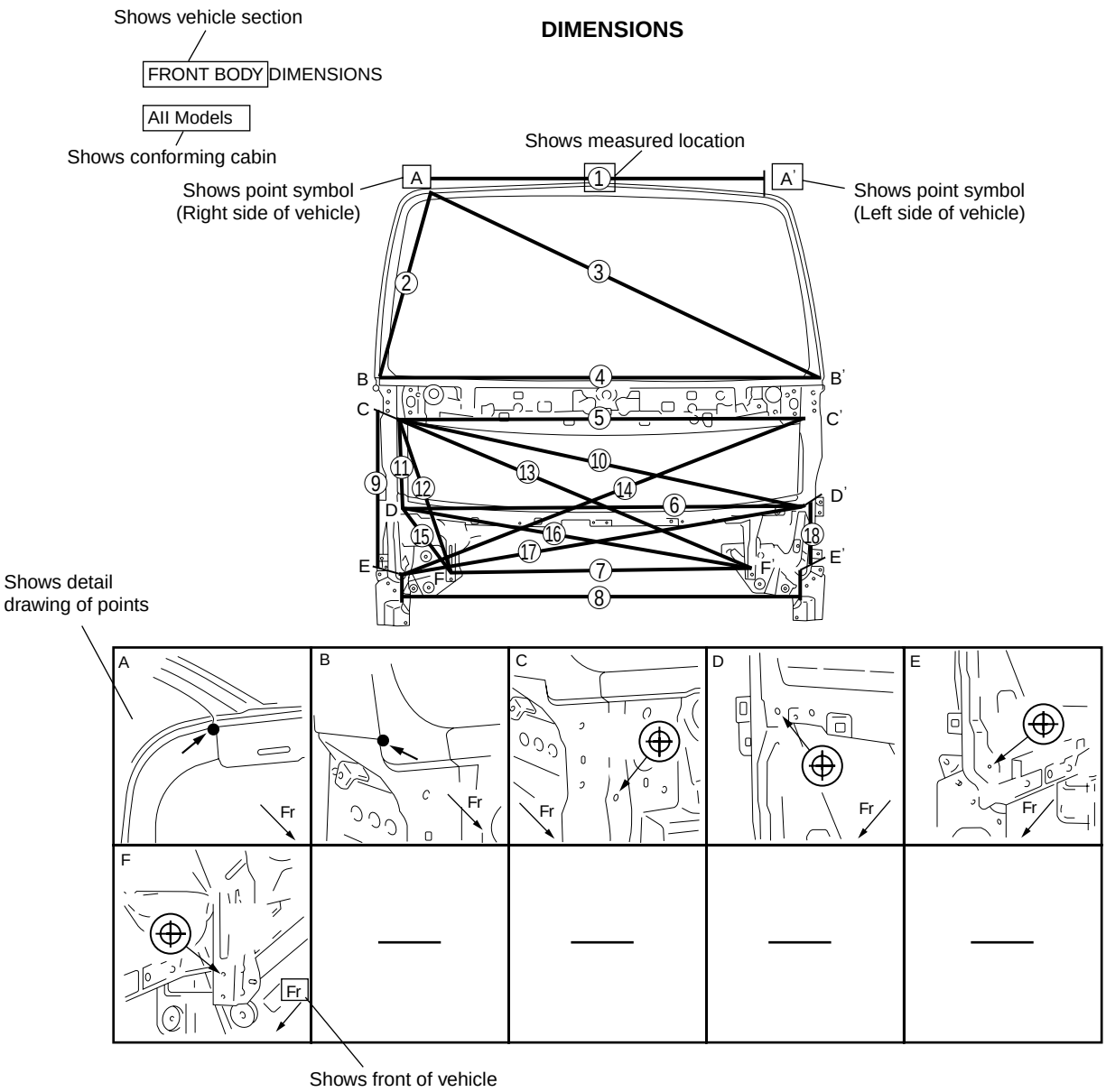
Shows slot

Point symbol	Designation	Hole diameter or bolt or nut size mm{in}
K	Front spring hanger rear	ϕ33 {1.30}
L	Crossmember No.4 side hole	ϕ70 {2.76}
M	Crossmember No.5 side hole	ϕ70 {2.76}
N	Rear spring hanger front	ϕ19 {0.75}
O	Spring helper bracket	ϕ10 {0.39}
P	Stopper bracket	ϕ13.7 {0.54}
Q	Spring helper bracket	ϕ10 {0.39}
R	Rear spring hanger rear	ϕ33 {1.30}
S	Crossmember No.6 side hole	ϕ67 {2.64}
T	Side member standard hole	ϕ19 {0.75}

AVF2010B001

How To Read Cabin Dimensions

- Cabin dimensions are the actual dimensions between two standard points.
- When there are no specific indications, the standard points and dimensions are symmetrical in regard to the center of the vehicle.



Mesured location	Dimensions mm{in}
1	1,589 {62.56}
2	740 {29.13}
3	1,881 {74.06}
4	1,881 {74.06}
5	1,723 {67.83}
6	1,705 {67.13}
7	1,399 {55.08}
8	1,735 {68.31}
9	554 {21.81}

Mesured location	Dimensions mm{in}
10	1,742 {68.58}
11	313 {12.32}
12	585 {23.03}
13	1,659 {65.31}
14	1,815 {71.46}
15	305 {12.01}
16	1,574 {61.97}
17	1,737 {68.39}
18	246 {9.69}

AVF2010B002

Symbols of Body Dimensions

- The following 8 symbols are used to indicate the standard points.

SYMBOL	MEANING
	Center of circular hole
	Center elliptical hole
	Edge of hole
	Notch

SYMBOL	MEANING
	Panel seam, bead, etc.
(arrow only)	Bolt tip
	Center of rectangular-shaped hole
	Edge of rectangular-shaped hole

AVF2010B003

DIMENSIONS

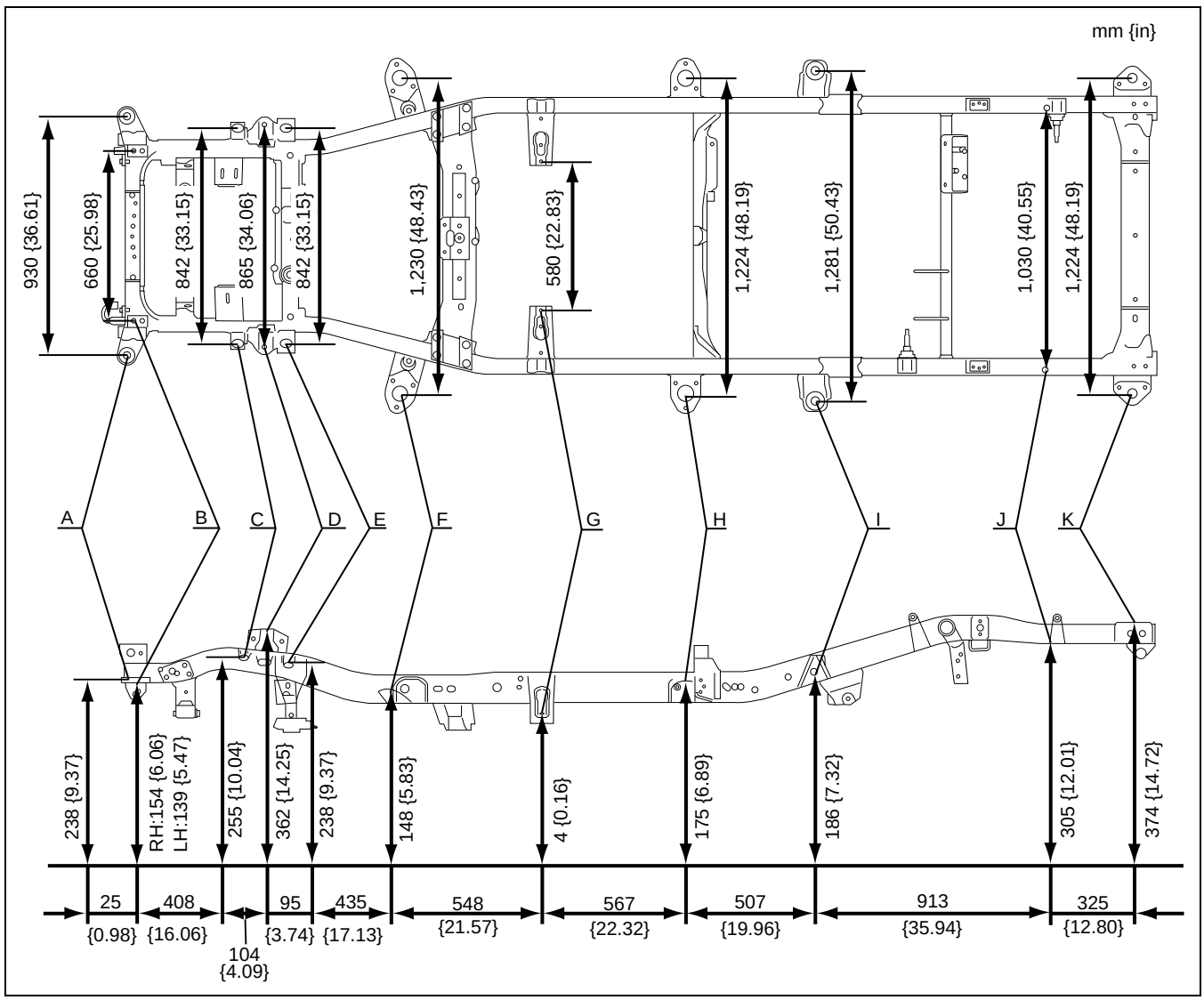
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DIMENSIONS

FRAME DIMENSIONS

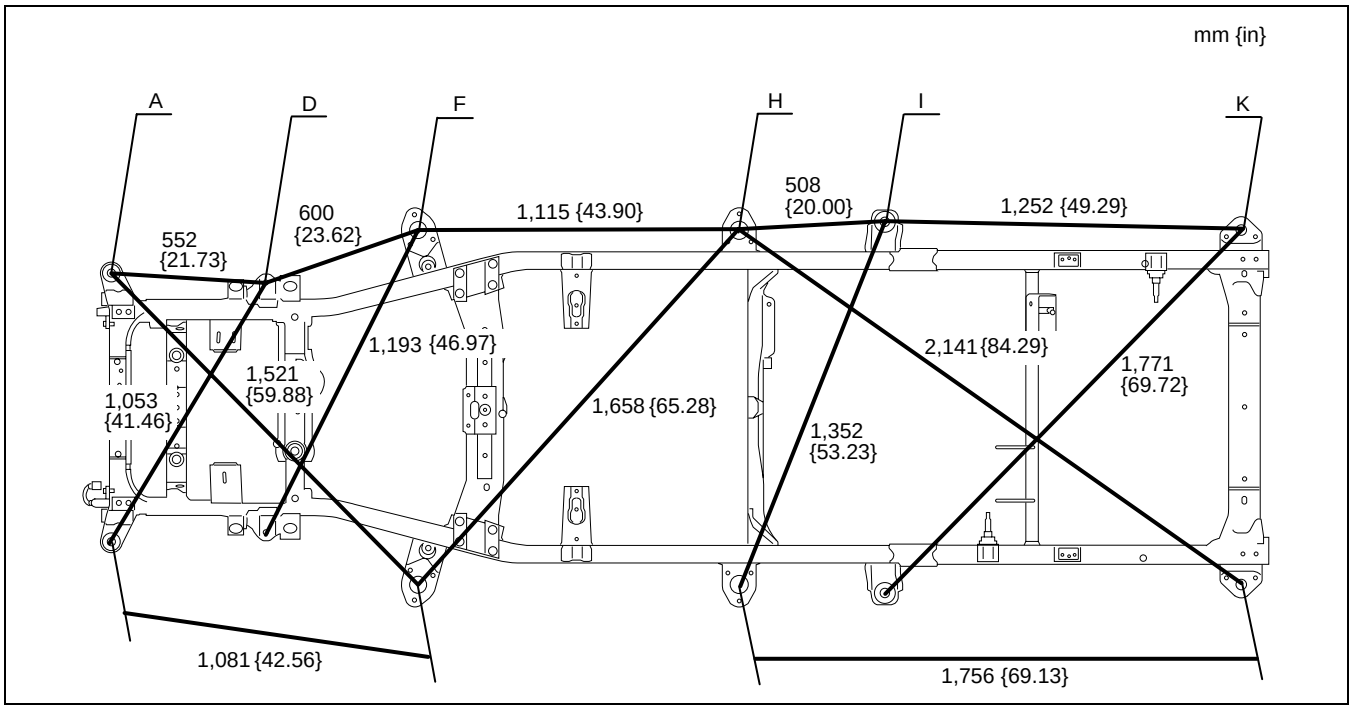
AVF981638010B01

Flat-plane dimensions



AVF9816B001

Straight-line dimensions



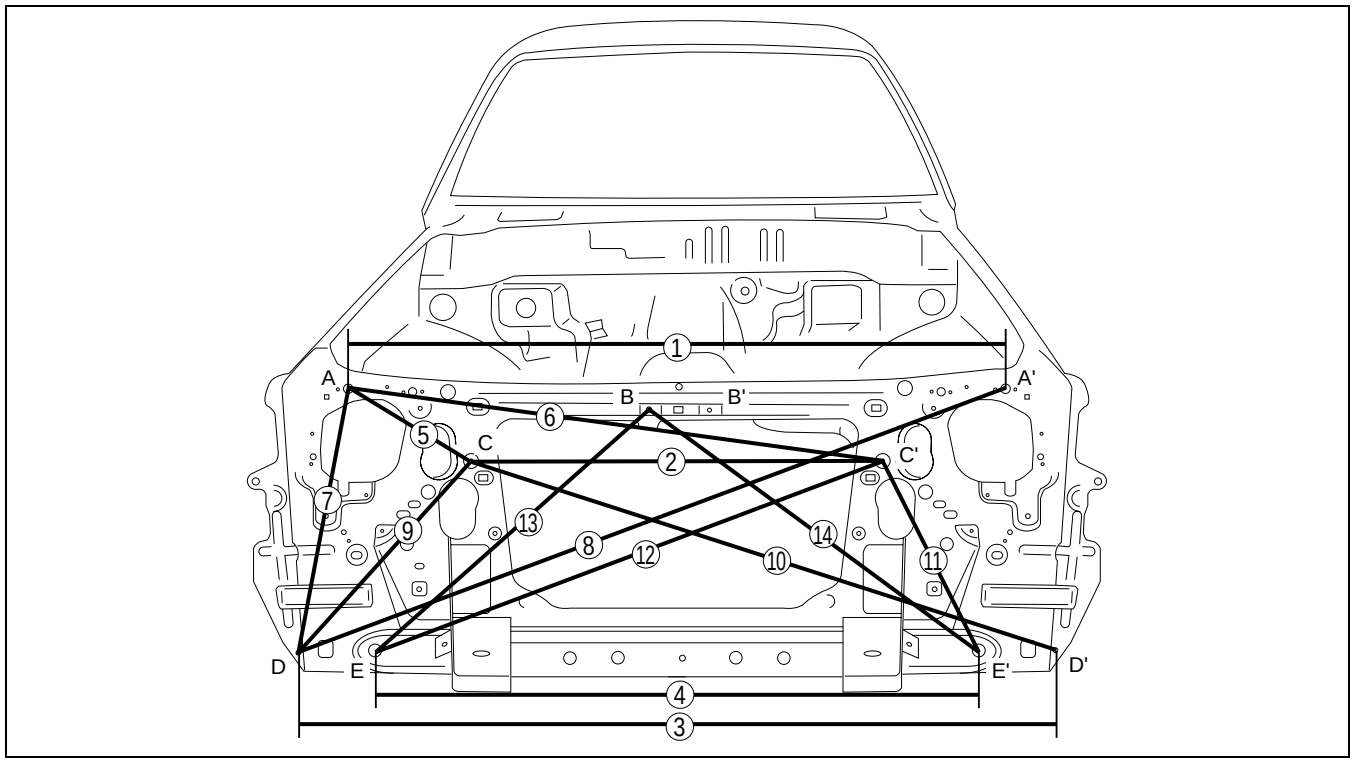
AVF9816B002

Point symbol	Designation	Hole diameter or bolt or nut size mm{in}
A	Cabin mounting bracket	ø23 {0.91}
B	Bumper stay bracket	ø15 {0.59}
C	Rebound stop bracket	ø12.5 {0.49}
D	Upper arm bracket	ø16 {0.63}
E	Rebound stop bracket	ø12.5 {0.49}
F	Cabin mounting bracket	ø60 {2.36}

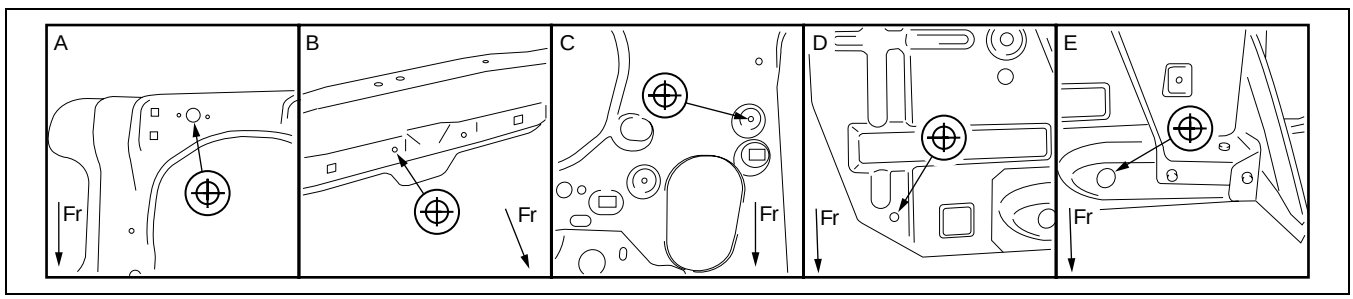
Point symbol	Designation	Hole diameter or bolt or nut size mm{in}
G	Torsion bar bracket	ø13.7 {0.54}
H	Cabin mounting bracket	ø65 {2.56}
I	Cabin mounting bracket	ø26 {1.02}
J	Side member	ø15 {0.59}
K	Cabin mounting bracket	ø36 {1.42}

FRONT BODY STRAIGHT-LINE DIMENSIONS (1)

AVF981653020B01



AVF9816B003



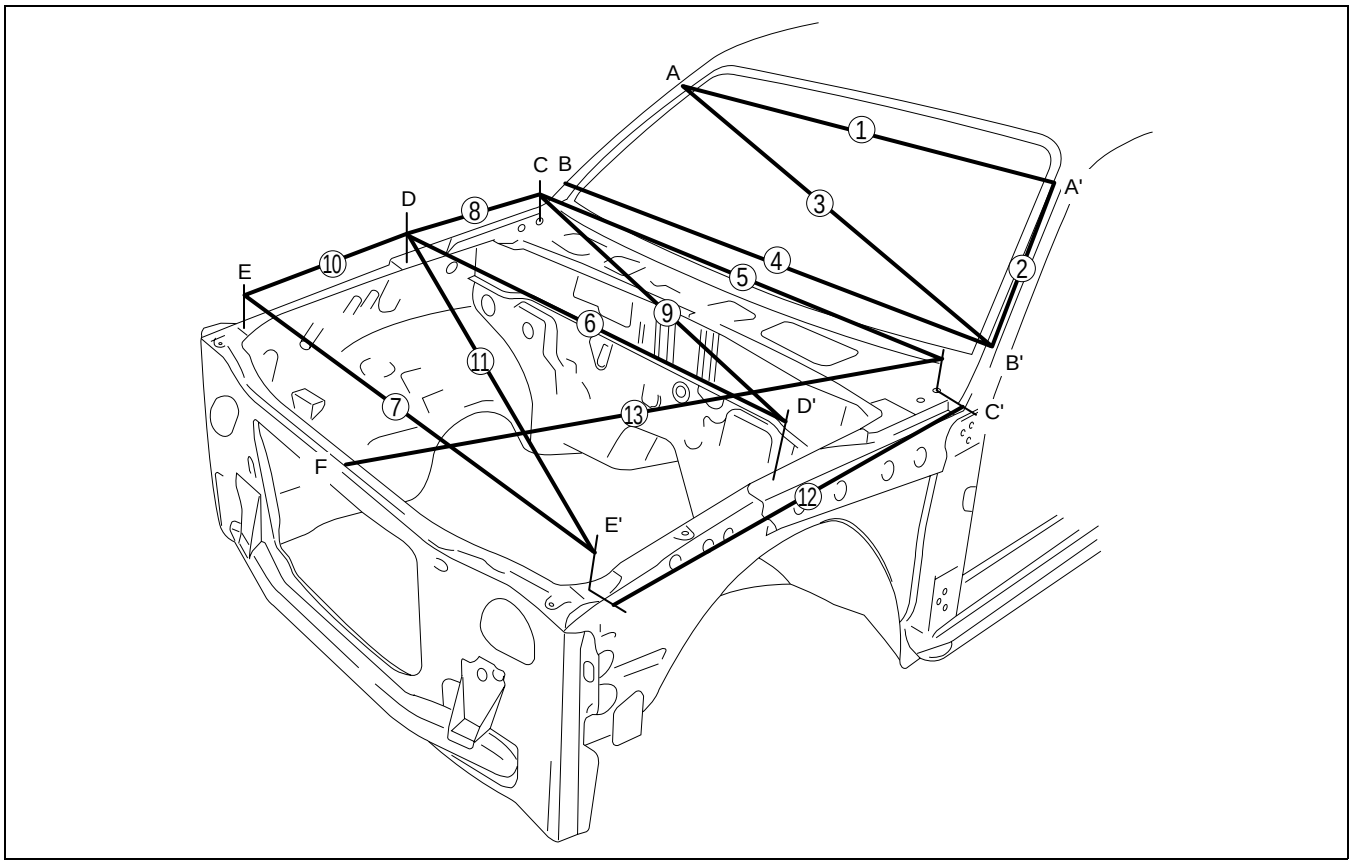
AVF9816B004

Mesured location	Dimensions mm{in}
1	1,229 {48.39}
2	714 {28.11}
3	1,410 {55.51}
4	1,120 {44.09}
5	288 {11.34}
6	980 {38.58}
7	504 {19.84}

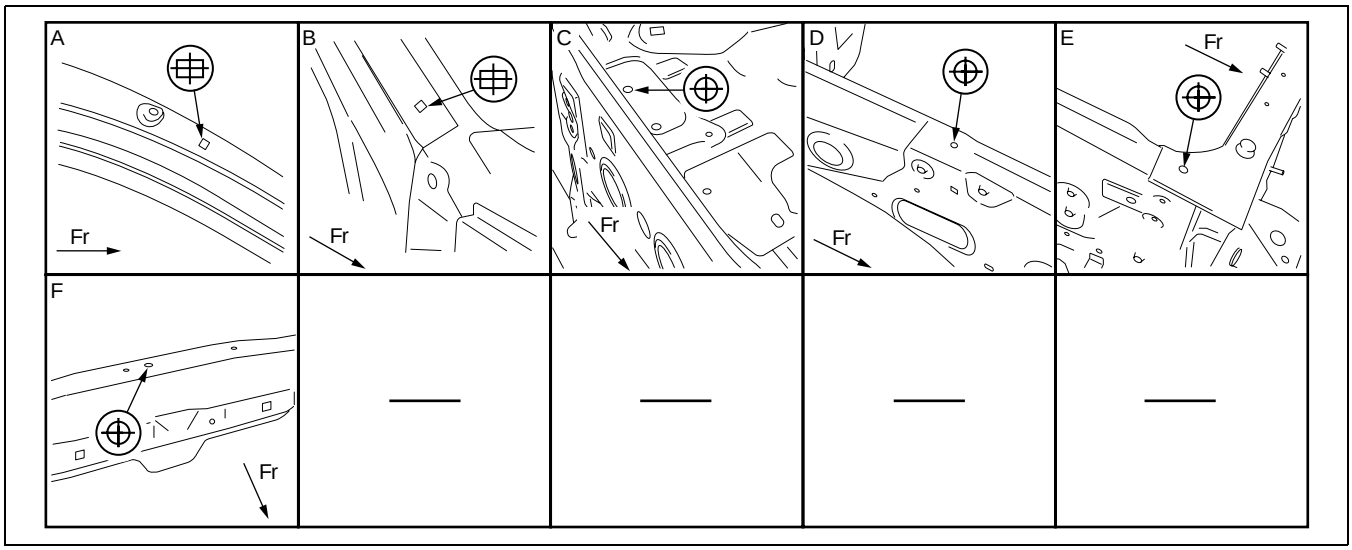
Mesured location	Dimensions mm{in}
8	1,410 {55.51}
9	509 {20.04}
10	1,125 {44.29}
11	415 {16.34}
12	986 {38.82}
13	711 {27.99}
14	785 {30.91}

FRONT BODY STRAIGHT-LINE DIMENSIONS (2)

AVF981653020B02



AVF9816B005



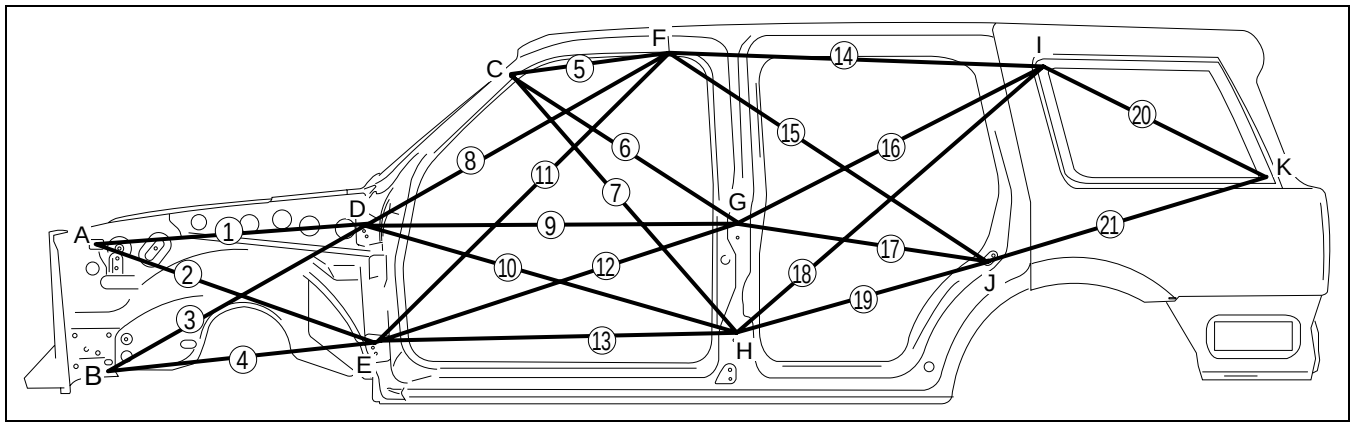
AVF9816B006

Mesured location	Dimensions mm{in}
1	1,240 {48.82}
2	570 {22.44}
3	1,452 {57.17}
4	1,438 {56.61}
5	1,434 {56.46}
6	1,360 {53.54}
7	1,342 {52.83}

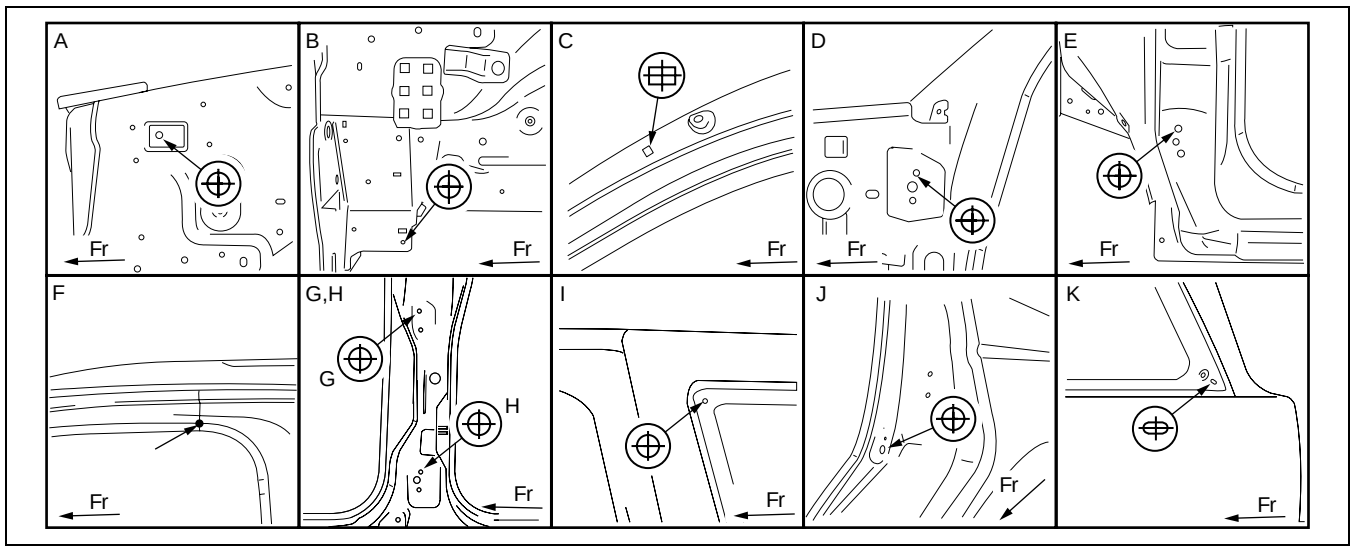
Mesured location	Dimensions mm{in}
8	383 {15.08}
9	1,448 {57.01}
10	546 {21.50}
11	1,457 {57.36}
12	928 {36.54}
13	1,236 {48.66}

CABIN SIDE FRAME STRAIGHT-LINE DIMENSIONS

AVF981670010B01



AVF9816B007



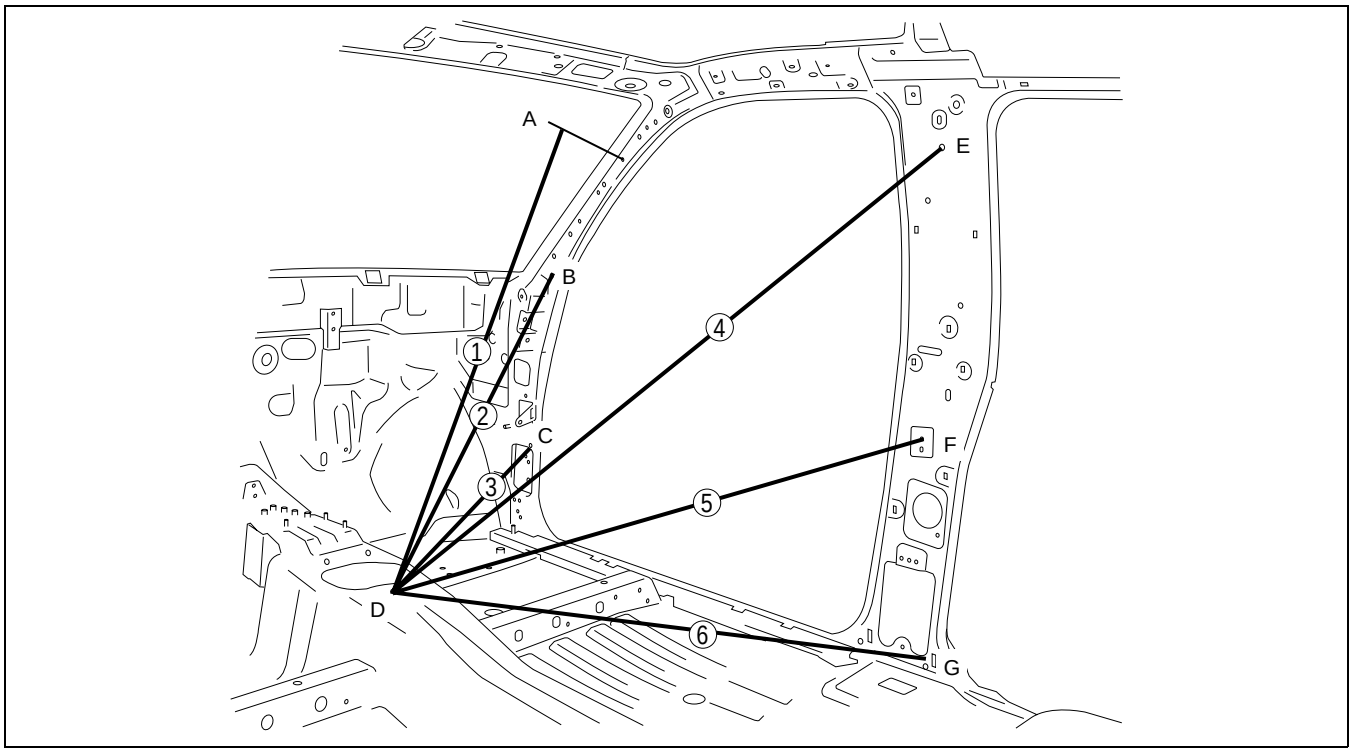
AVF9816B008

Mesured location	Dimensions mm{in}
1	989 {38.94}
2	1,032 {40.63}
3	1,155 {45.47}
4	1,023 {40.28}
5	447 {17.60}
6	844 {33.23}
7	1,116 {43.94}
8	1,127 {44.37}
9	1,125 {44.29}
10	1,194 {47.01}
11	1,376 {54.17}

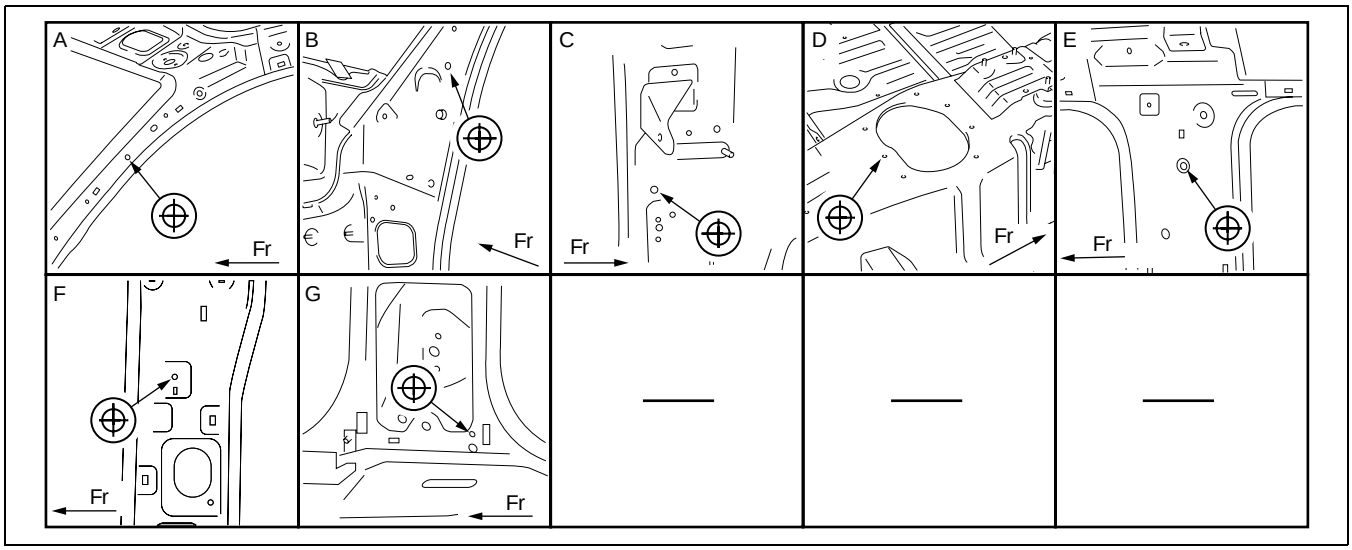
Mesured location	Dimensions mm{in}
12	1,186 {46.69}
13	1,133 {44.61}
14	1,253 {49.33}
15	1,293 {50.91}
16	1,241 {48.86}
17	924 {36.38}
18	1,436 {56.54}
19	941 {37.05}
20	917 {36.10}
21	1,046 {41.18}

ROOM STRAIGHT-LINE DIMENSIONS (1)

AVF981670001B01



AVF9816B009



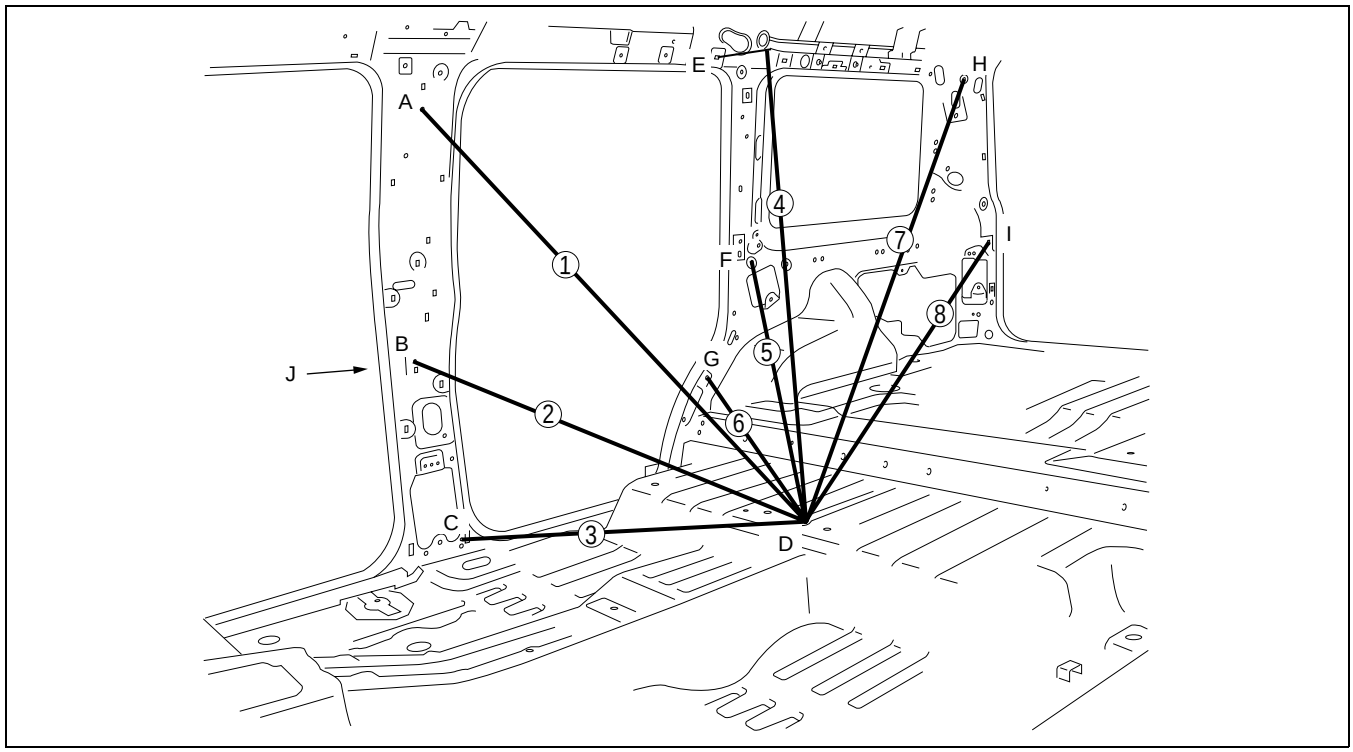
AVF9816B010

Mesured location	Dimensions mm{in}
1	RH:1,000 {39.37}, LH:1,012 {39.84}
2	RH:914 {35.98}, LH:927 {36.50}
3	RH:805 {31.69}, LH:820 {32.28}

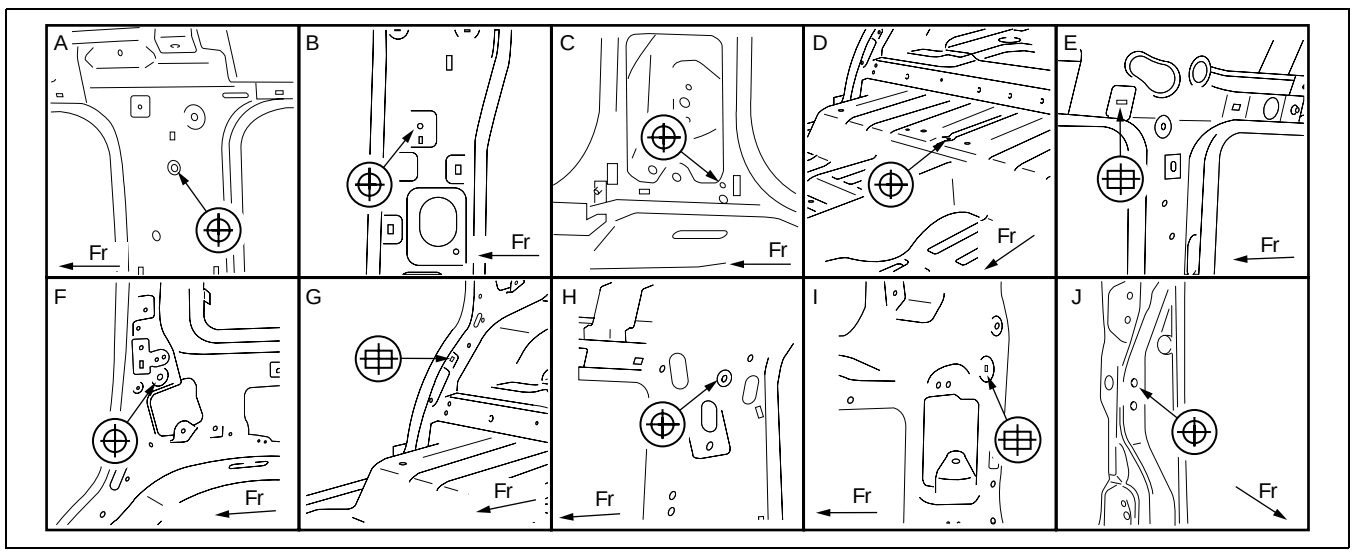
Mesured location	Dimensions mm{in}
4	RH:1,239 {48.78}, LH:1,248 {49.13}
5	RH:1,003 {35.49}, LH:1,015 {39.96}
6	RH:1,002 {39.45}, LH:1,015 {39.96}

ROOM STRAIGHT-LINE DIMENSIONS (2)

AVF981670001B02



AVF9816B011



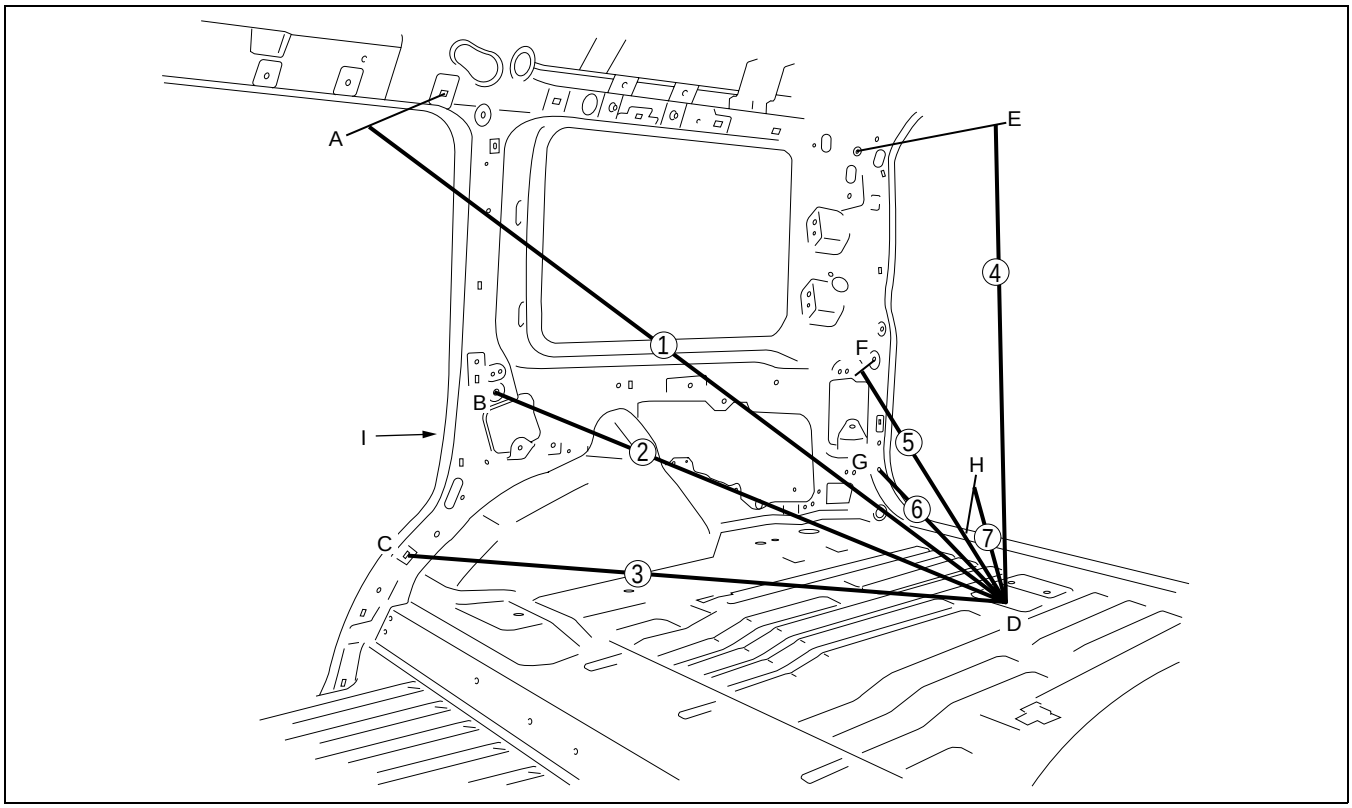
AVF9816B012

Mesured location	Dimensions mm{in}
1	1,120 {44.09}
2	880 {34.65}
3	793 {31.22}
4	1,190 {46.85}
5	1,017 {40.04}

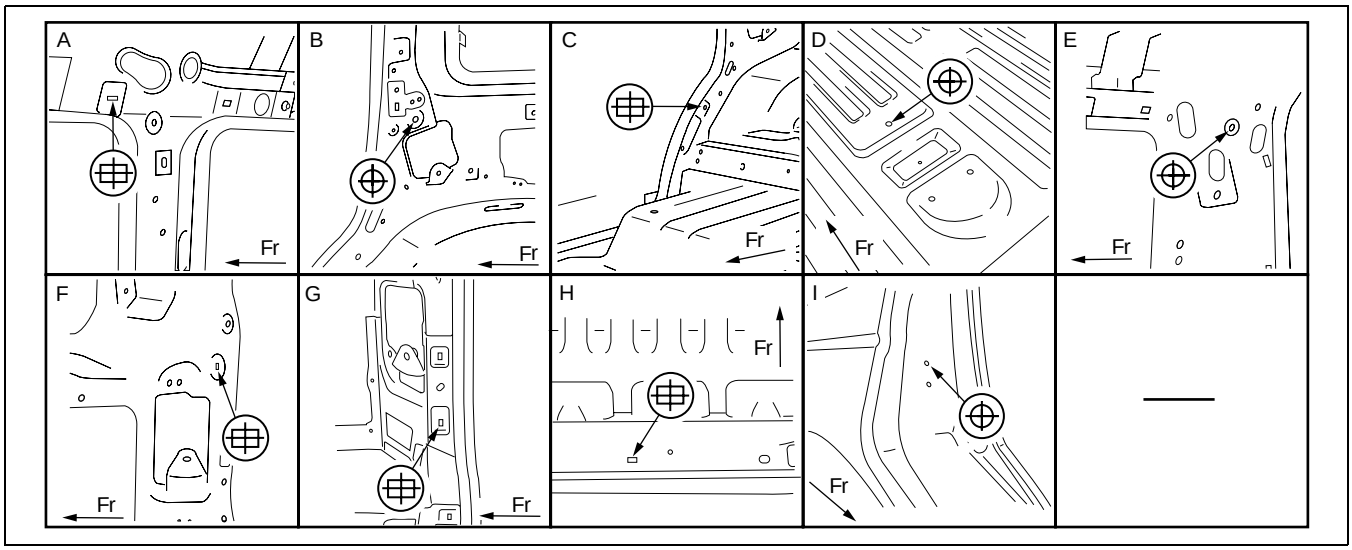
Mesured location	Dimensions mm{in}
6	823 {32.40}
7	1,774 {69.84}
8	1,727 {67.99}
J-J'	1,506 {59.29}

ROOM STRAIGHT-LINE DIMENSIONS (3)

AVF981670001B03



AVF9816B013



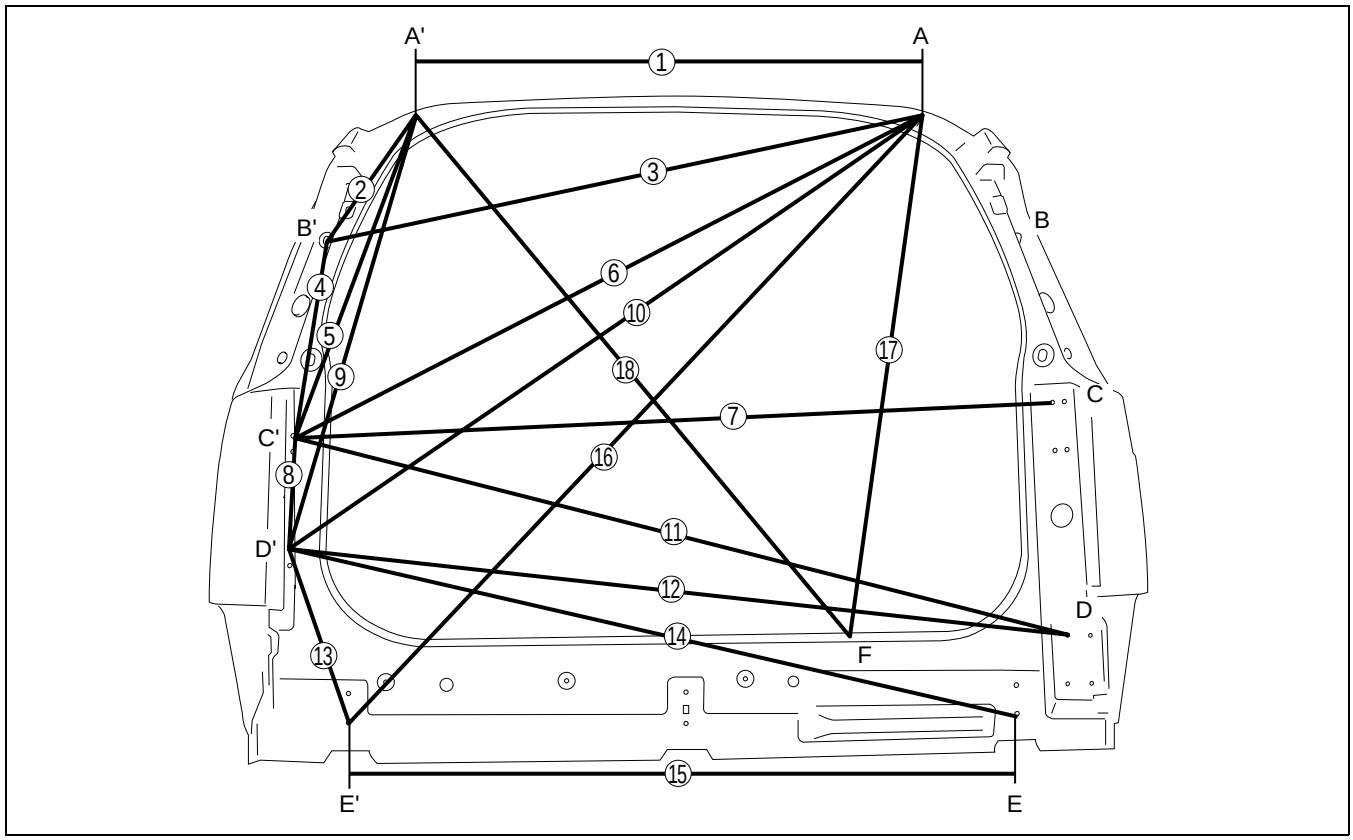
AVF9816B014

Mesured location	Dimensions mm{in}
1	1,288 {50.71}
2	983 {38.70}
3	1,050 {41.34}
4	1,023 {40.28}

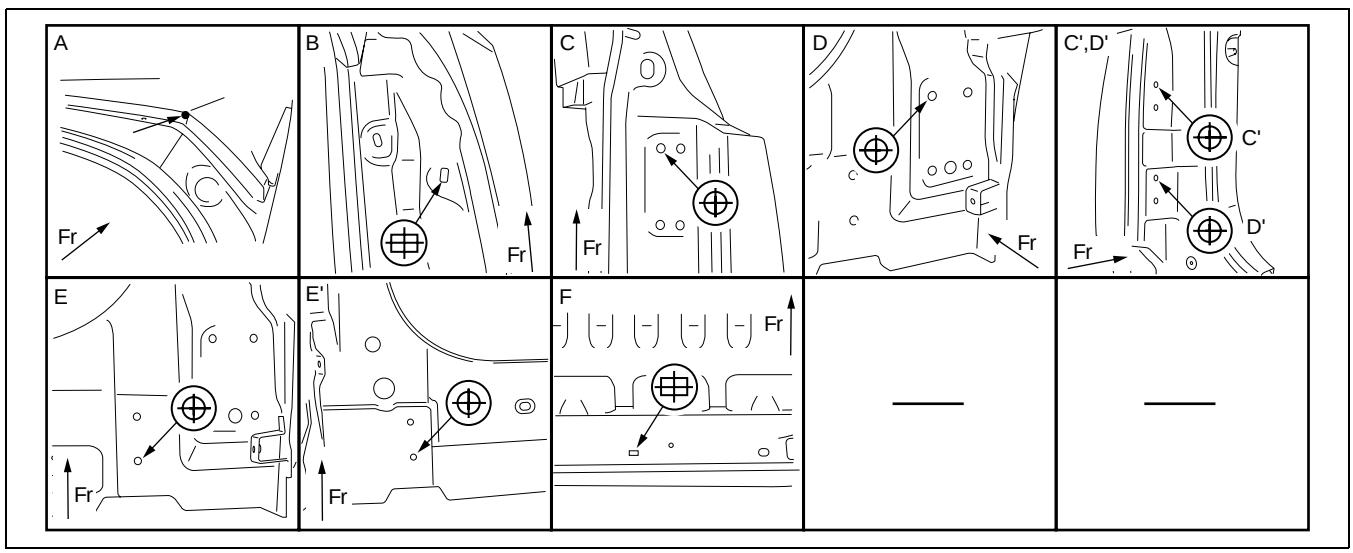
Mesured location	Dimensions mm{in}
5	801 {31.54}
6	712 {28.03}
7	483 {19.02}
I-I'	1,529 {60.20}

REAR BODY STRAIGHT-LINE DIMENSIONS (1)

AVF981670002B01



AVF9816B015



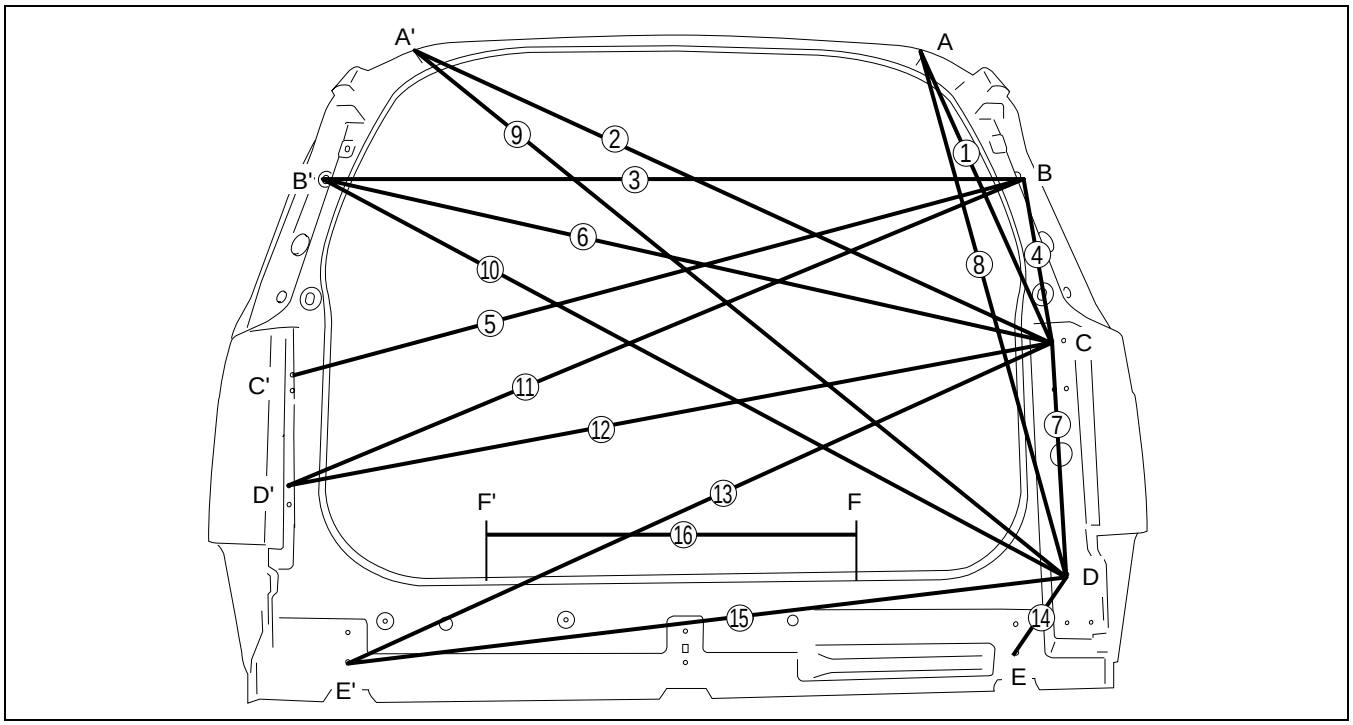
AVF9816B016

Mesured location	Dimensions mm{in}
1	938 {36.93}
2	325 {12.80}
3	1,139 {44.84}
4	437 {17.20}
5	737 {29.02}
6	1,334 {52.52}
7	1,300 {51.18}
8	158 {6.22}
9	881 {34.70}

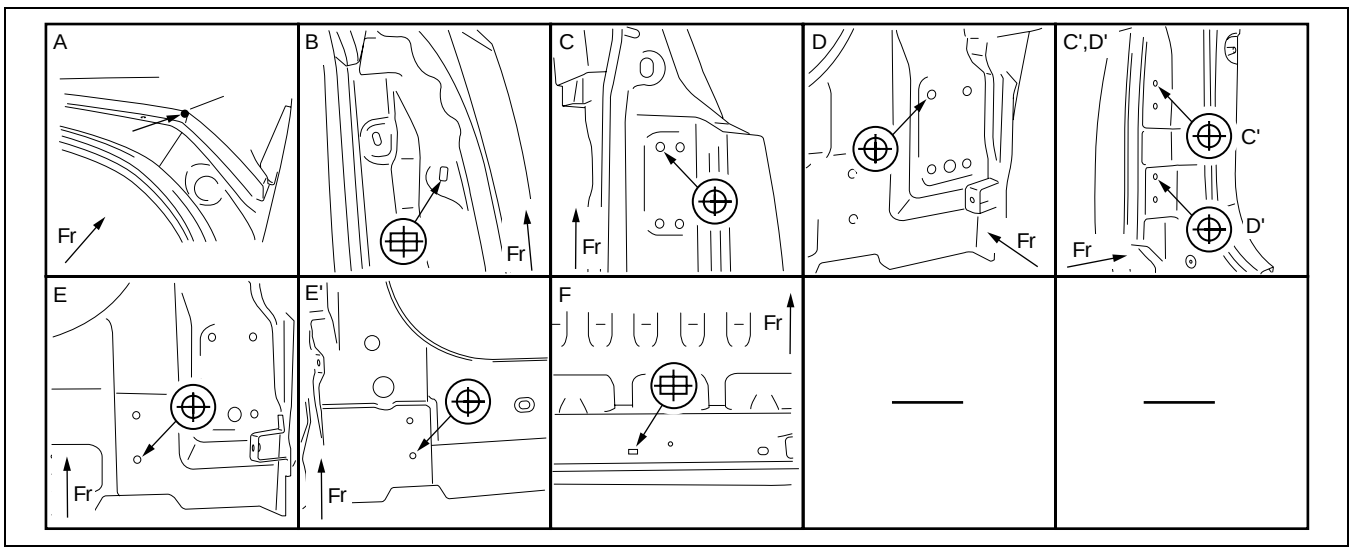
Mesured location	Dimensions mm{in}
10	1,417 {55.79}
11	1,344 {52.91}
12	1,312 {51.65}
13	312 {12.30}
14	1, 257 {49.49}
15	1,130 {44.49}
16	1,541 {60.67}
17	1,025 {40.35}
18	1,229 {48.39}

REAR BODY STRAIGHT-LINE DIMENSIONS (2)

AVF981670002B02



AVF9816B017



AVF9816B018

Mesured location	Dimensions mm{in}
1	652 {25.67}
2	1,334 {52.52}
3	1,270 {50.00}
4	354 {13.94}
5	1,365 {53.74}
6	1,322 {52.05}
7	400 {15.75}
8	1,033 {40.67}

Mesured location	Dimensions mm{in}
9	1,510 {59.45}
10	1,479 {58.23}
11	1,416 {55.75}
12	1,316 {51.81}
13	1,316 {51.81}
14	156 {6.14}
15	1,218 {47.95}
16	490 {19.29}

EVEREST

Automatic Transmission and Transfer Workshop Manual

RA4AX–EL



WARNING

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury, property damage, and failure of servicing increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Mazda-trained technicians in mind. This manual may be useful to non-Mazda trained technicians, but a technician with our service-related training and experience will be at less risk when performing service operations. However, all users of this manual are expected to at least know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Persons using procedures and tools which are not recommended by Mazda Motor Corporation must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

The contents of this manual, including drawings and specifications, are the latest available at the time of printing, and Mazda Motor Corporation reserves the right to change the vehicle designs and alter the contents of this manual without notice and without incurring obligation.

Parts should be replaced with genuine Mazda replacement parts or with parts which match the quality of genuine Mazda replacement parts. Persons using replacement parts of lesser quality than that of genuine Mazda replacement parts must satisfy themselves thoroughly that neither personal safety nor safety of the vehicle will be jeopardized.

Mazda Motor Corporation is not responsible for any problems which may arise from the use of this manual. The cause of such problems includes but is not limited to insufficient service-related training, use of improper tools, use of replacement parts of lesser quality than that of genuine Mazda replacement parts, or not being aware of any revision of this manual.

Automatic Transmission and Transfer Workshop Manual RA4AX–EL

FOREWORD

This manual explains the structure, operation, and service points for the above-indicated automatic Transmission.

This manual covers all models with the above-indicated automatic transaxle, not any one specific model.

In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.
Sections in this manual are divided in two parts, structure and service points, appearing in that order.

The information in this manual is current up to April, 2004. Any changes that occur after that time will not be reflected in this particular manual. Therefore, the contents of this manual may not exactly match the mechanism that you are currently servicing.

Mazda Motor Corporation
HIROSHIMA, JAPAN

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Technical Data		TD
Special Tools		ST

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APRIL 2004
1819–10–04D

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HOW TO USE THIS MANUAL

RANGE OF TOPICS

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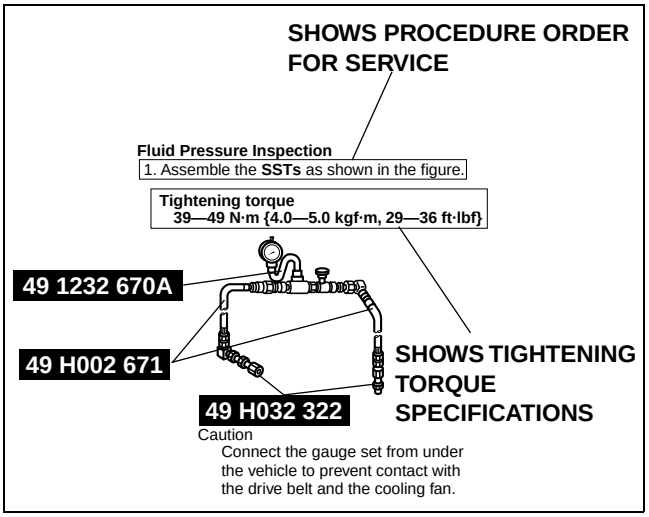
- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  — Removal/Installation
  — Disassembly/Assembly
  — Replacement
  — Inspection
  — Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts and visual inspection) have been omitted.

SERVICING PROCEDURE

CBG201000000A02

Inspection, Adjustment

- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.

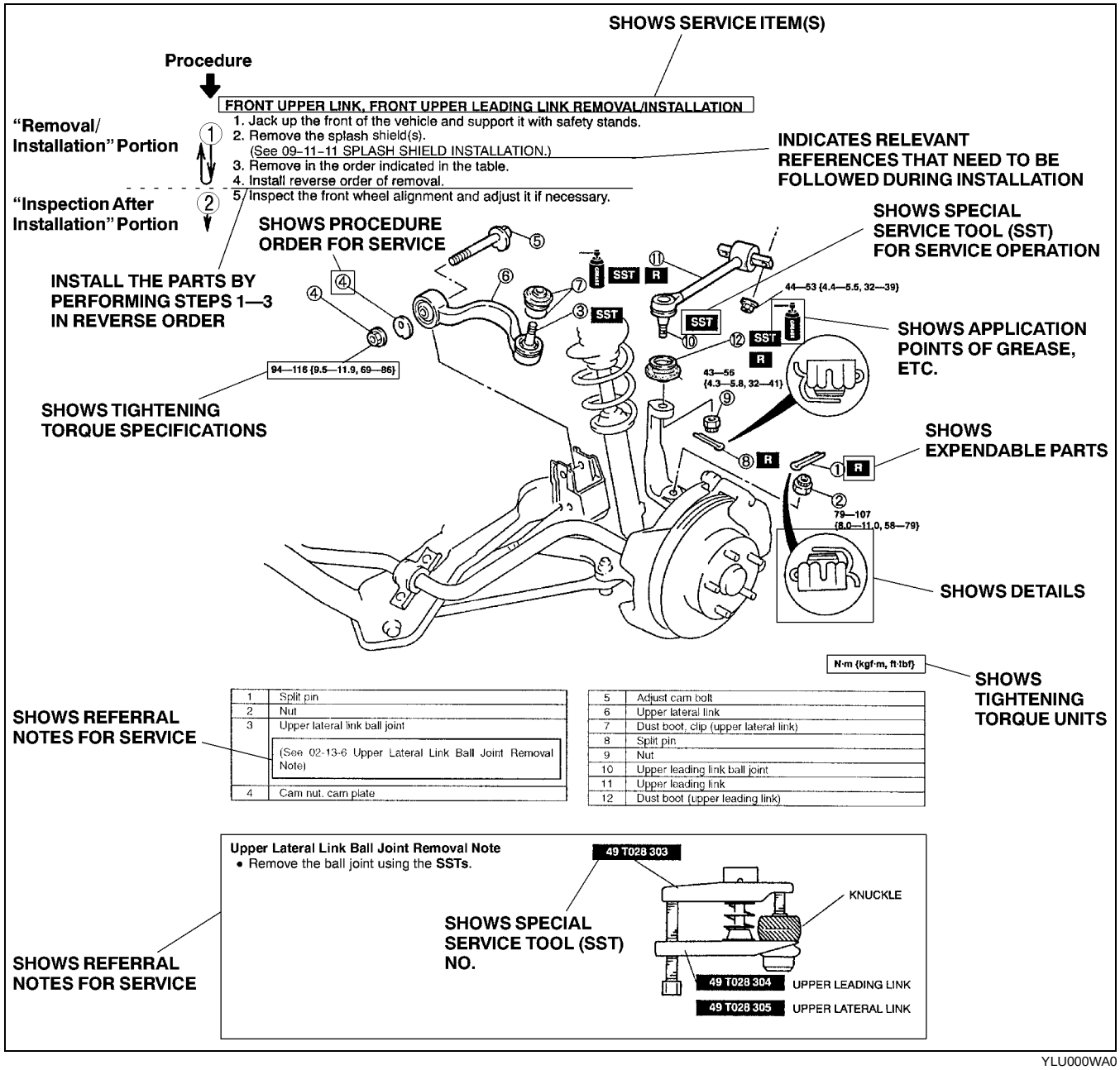


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Repair Procedure

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.

3. Procedure steps are numbered and the part that is the main point of the procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.



YLU000WA0

SYMBOLS

CBG201000000A03

- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/ transmission fluid	New appropriate automatic transaxle/ transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
	Replace part	O-ring, gasket, etc.
	Use SST or equivalent	Appropriate tools

ADVISORY MESSAGES

CBG201000000A04

- You will find several **Warnings**, **Cautions**, **Notes**, **Specifications** and **Upper and Lower Limits** in this manual.

Warning

- A Warning indicates a situation in which serious injury or death could result if the warning is ignored.

Caution

- A Caution indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

Note

- A Note provides added information that will help you to complete a particular procedure.

Specifications

- The values indicate the allowable range when performing inspections or adjustments.

Upper and Lower Limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

UNITS

UNITS TABLE

CBG201200000A01

Electrical current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Number of revolutions	rpm (revolutions per minute)
Positive pressure	kPa (kilo pascal)
	kgf/cm^2 (kilogram force per square centimeter)
	psi (pounds per square inch)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	imp qt (Imperial quart)
	ml (millilitre)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	N (Newton)
	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm^2 in the following specifications:

  210—260 kPa {2.1—2.7 kgf/cm^2, 30—38 psi}
  270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}

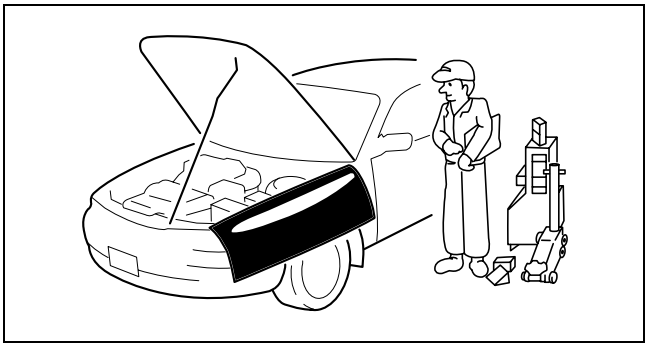
- The actual converted values for 2.7 kgf/cm^2 are 265 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

FUNDAMENTAL PROCEDURES

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

- Be sure that all necessary tools and measuring equipment are available before starting any work.

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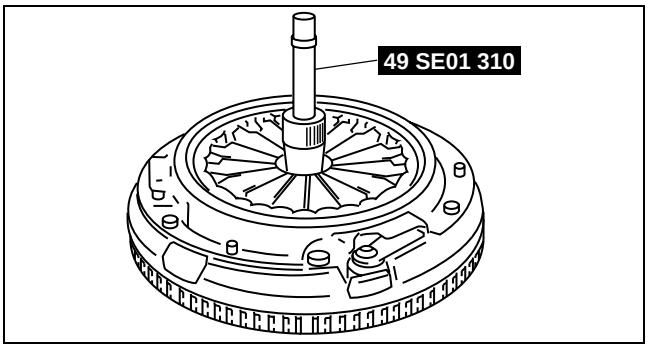


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SPECIAL SERVICE TOOLS

- Use special service tools or equivalent when they are required.

CBG201400000A02

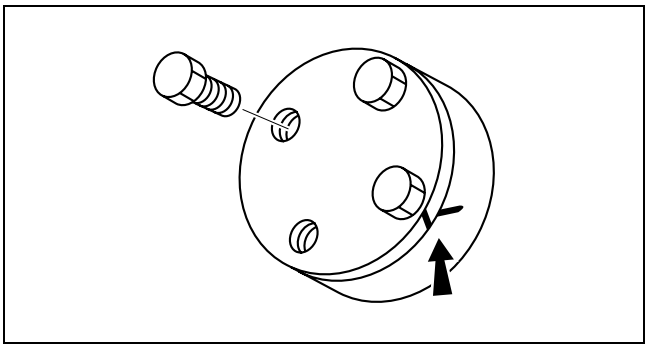


WGIWXX0024E

DISASSEMBLY

- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.

CBG201400000A03

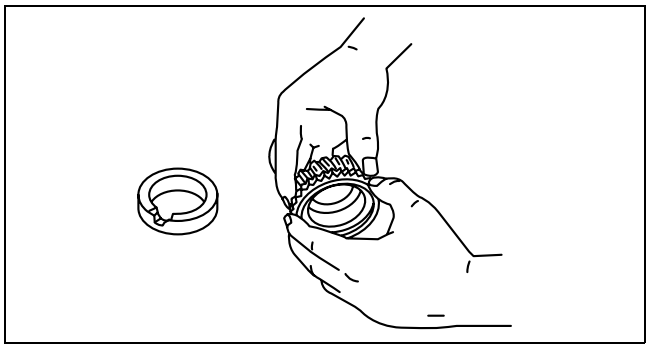


WGIWXX0027E

INSPECTION DURING REMOVAL, DISASSEMBLY

- When removed, each part should be carefully inspected for malfunction, deformation, damage, and other problems.

CBG201400000A04

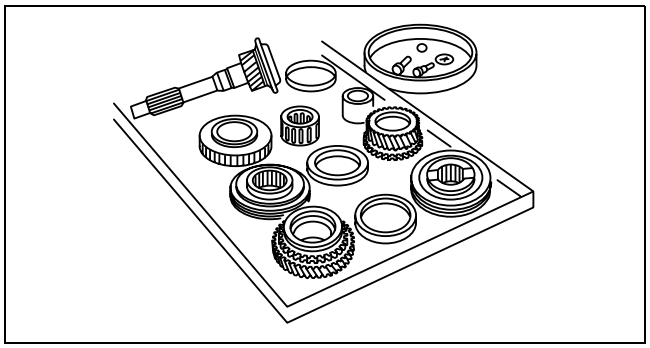


WGIWXX0028E

ARRANGEMENT OF PARTS

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.

CBG201400000A05



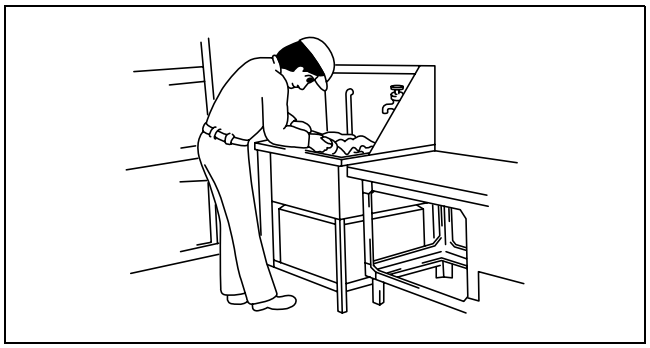
WGIWXX0029E

CLEANING OF PARTS

- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

  Warning
  - **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

CBG201400000A06

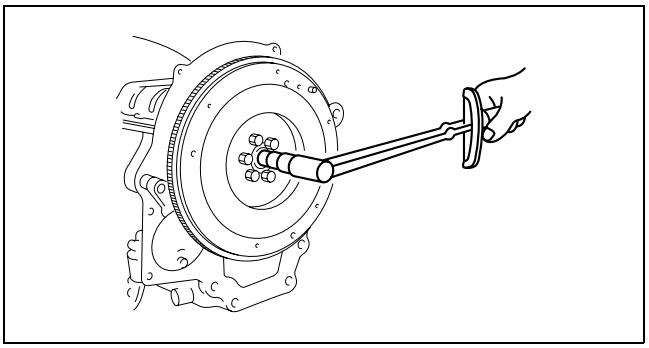


WGIWXX0030E

REASSEMBLY

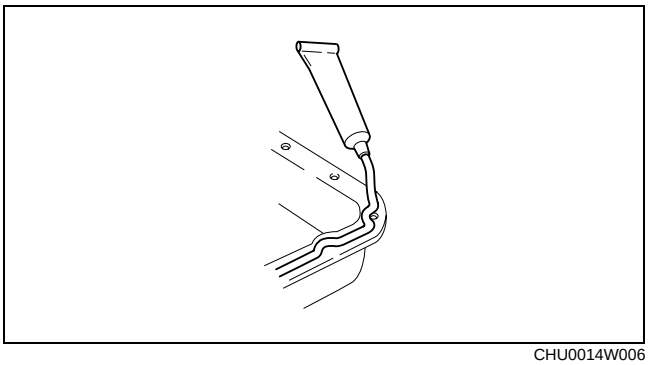
- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, these parts should be replaced with new ones:
  — Oil seals
  — Gaskets
  — O-rings
  — Lock washers
  — Cotter pins
  — Nylon nuts

CBG201400000A07



WGIWXX0031E

- Depending on location:
  — Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  — Oil should be applied to the moving components of parts.
  — Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.

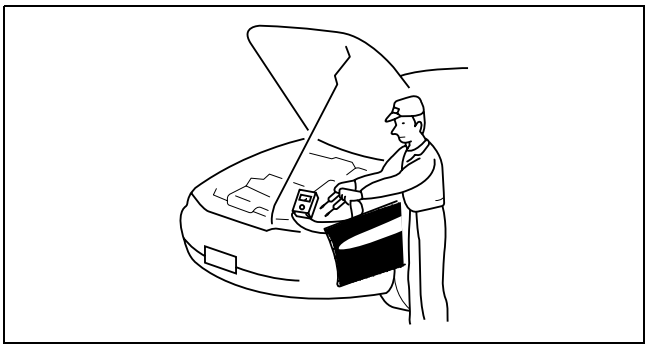


CHU0014W006

ADJUSTMENT

- Use suitable gauges and/or testers when making adjustments.

CBG201400000A08

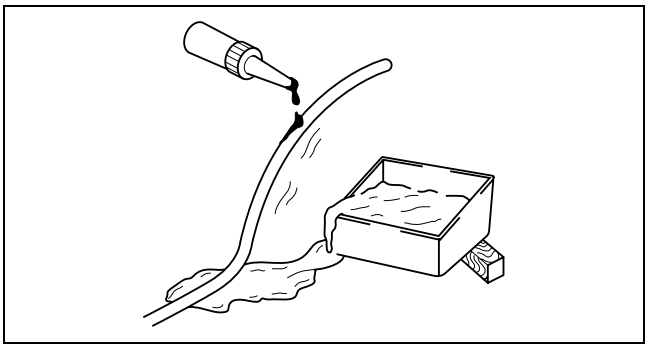


CHU0014W005

RUBBER PARTS AND TUBING

- Prevent gasoline or oil from getting on rubber parts or tubing.

CBG201400000A09

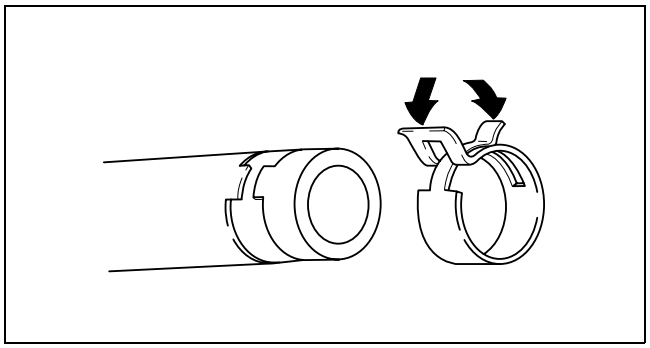


WGIWXX0034E

HOSE CLAMPS

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.

CBG201400000A10



WGIWXX0035E

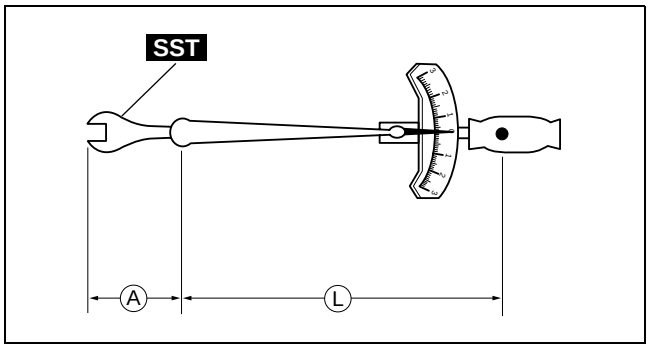
TORQUE FORMULAS

- When using a torque wrench-**SST** or equivalent combination, the written torque must be recalculated due to the extra length that the **SST** or equivalent adds to the torque wrench. Recalculate the torque using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	N·m × [L/(L+A)]
kgf·m	kgf·m × [L/(L+A)]
kgf·cm	kgf·cm × [L/(L+A)]
ft·lbf	ft·lbf × [L/(L+A)]
in·lbf	in·lbf × [L/(L+A)]

A : The length of the **SST** past the torque wrench drive
L : The length of the torque wrench

CBG201400000A11

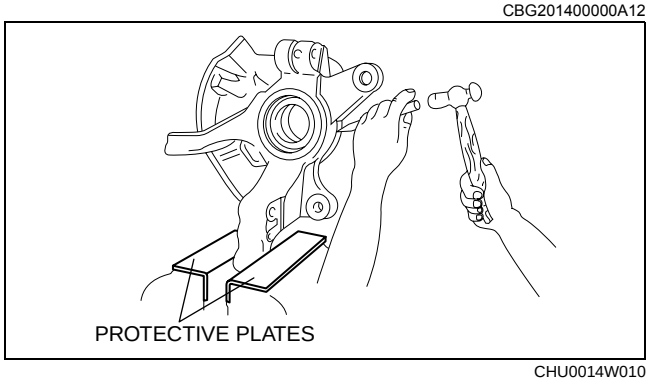


WGIWXX0036E

VISE

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.

CBG201400000A12



CHU0014W010

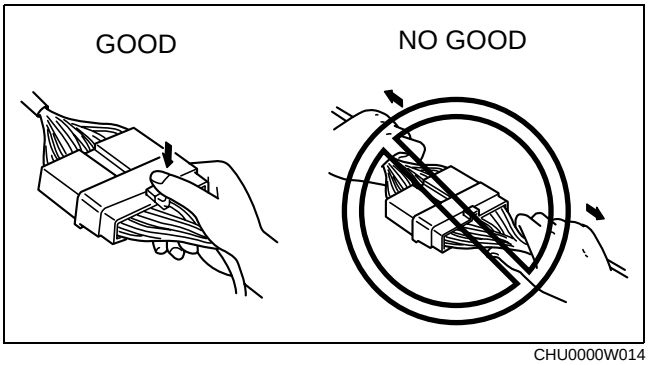
ELECTRICAL SYSTEM

CONNECTORS

CBG201700000A01

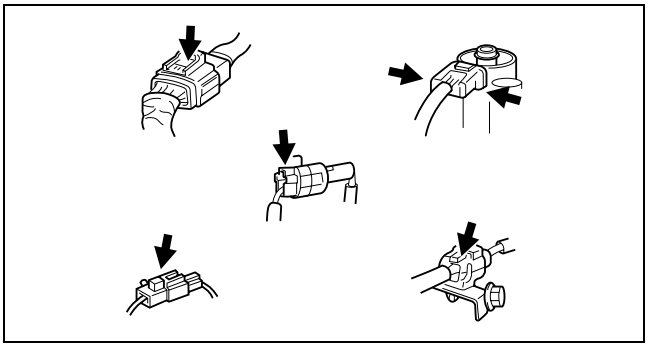
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



CHU0000W014

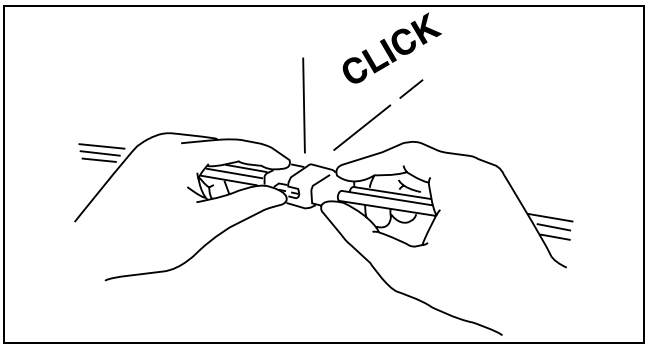
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

- When locking connectors, listen for a click indicating they are securely locked.



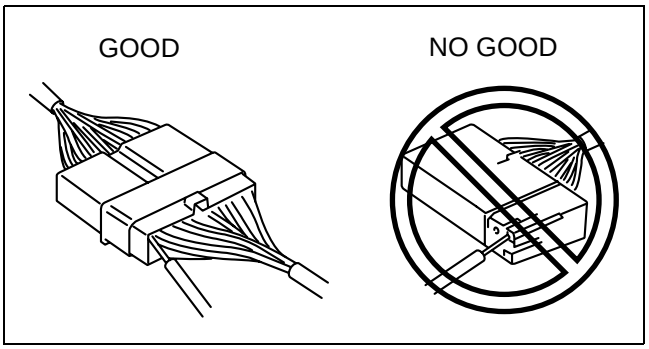
WGIWXX0043E

Inspection

- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.

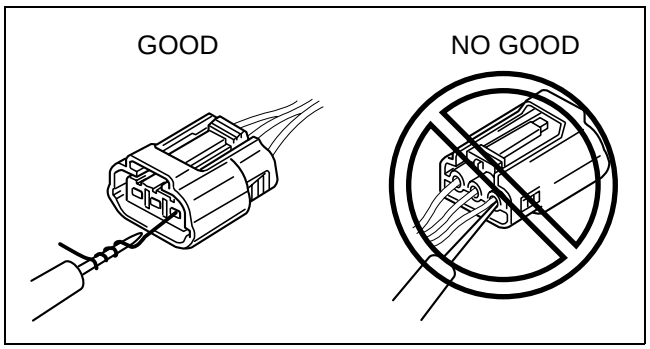
Caution

- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**



CHU0000W011

- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.



CHU0000W012

NEW STANDARDS

NEW STANDARDS TABLE

CBG202800000A01

- Following is a comparison of the previous standard and the new standard.

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
AP	Accelerator Pedal	—	Accelerator Pedal	
ACL	Air Cleaner	—	Air Cleaner	
A/C	Air Conditioning	—	Air Conditioning	
BARO	Barometric Pressure	—	Atmospheric Pressure	
B+	Battery Positive Voltage	V_B	Battery Voltage	
—	Brake Switch	—	Stoplight Switch	
—	Calibration Resistor	—	Corrected Resistance	#6
CMP sensor	Camshaft Position Sensor	—	Crank Angle Sensor	
CAC	Charge Air Cooler	—	Intercooler	
CLS	Closed Loop System	—	Feedback System	
CTP	Closed Throttle Position	—	Fully Closed	
CPP	Clutch Pedal Position	—	Idle Switch	
CIS	Continuous Fuel Injection System	—	Clutch Position	
CS sensor	Control Sleeve Sensor	CSP sensor	Control Sleeve Position Sensor	#6
CKP sensor	Crankshaft Position Sensor	—	Crank Angle Sensor 2	
DLC	Data Link Connector	—	Diagnosis Connector	
DTM	Diagnostic Test Mode	—	Test Mode	#1
DTC	Diagnostic Trouble Code(s)	—	Service Code(s)	
DI	Distributor Ignition	—	Spark Ignition	
DLI	Distributorless Ignition	—	Direct Ignition	
EI	Electronic Ignition	—	Electronic Spark Ignition	#2
ECT	Engine Coolant Temperature	—	Water Thermo	
EM	Engine Modification	—	Engine Modification	
—	Engine Speed Input Signal	—	Engine RPM Signal	
EVAP	Evaporative Emission	—	Evaporative Emission	
EGR	Exhaust Gas Recirculation	—	Exhaust Gas Recirculation	
FC	Fan Control	—	Fan Control	
FF	Flexible Fuel	—	Flexible Fuel	
4GR	Fourth Gear	—	Overdrive	
—	Fuel Pump Relay	—	Circuit Opening Relay	#3
FSO solenoid	Fuel Shut Off Solenoid	FCV	Fuel Cut Valve	#6
GEN	Generator	—	Alternator	
GND	Ground	—	Ground/Earth	
HO2S	Heated Oxygen Sensor	—	Oxygen Sensor	With heater
IAC	Idle Air Control	—	Idle Speed Control	
—	IDM Relay	—	Spill Valve Relay	#6
—	Incorrect Gear Ratio	—	—	
—	Injection Pump	FIP	Fuel Injection Pump	#6
—	Input/Turbine Speed Sensor	—	Pulse Generator	
IAT	Intake Air Temperature	—	Intake Air Thermo	
KS	Knock Sensor	—	Knock Sensor	
MIL	Malfunction Indicator Lamp	—	Malfunction Indicator Light	
MAP	Manifold Absolute Pressure	—	Intake Air Pressure	
MAF sensor	Mass Air Flow Sensor	—	Airflow Sensor	
MFL	Multiport Fuel Injection	—	Multiport Fuel Injection	
OBD	On-Board Diagnostic	—	Diagnosis/Self Diagnosis	
OL	Open Loop	—	Open Loop	
—	Output Speed Sensor	—	Vehicle Speed Sensor 1	

New Standard		Previous Standard		Remark
Abbreviation	Name	Abbreviation	Name	
OC	Oxidation Catalytic Converter	—	Catalytic Converter	
O2S	Oxygen Sensor	—	Oxygen Sensor	
PNP	Park/Neutral Position	—	Park/Neutral Range	
—	PCM Control Relay	—	Main Relay	#6
PSP	Power Steering Pressure	—	Power Steering Pressure	
PCM	Powertrain Control Module	ECU	Engine Control Unit	#4
—	Pressure Control Solenoid	—	Line Pressure Solenoid Valve	
PAIR	Pulsed Secondary Air Injection	—	Secondary Air Injection System	Pulsed injection
—	Pump Speed Sensor	—	NE Sensor	#6
AIR	Secondary Air Injection	—	Secondary Air Injection System	Injection with air pump
SAPV	Secondary Air Pulse Valve	—	Reed Valve	
SFI	Sequential Multipoint Fuel Injection	—	Sequential Fuel Injection	
—	Shift Solenoid A	—	1-2 Shift Solenoid Valve	
		—	Shift A Solenoid Valve	
—	Shift Solenoid B	—	2-3 Shift Solenoid Valve	
		—	Shift B Solenoid Valve	
—	Shift Solenoid C	—	3-4 Shift Solenoid Valve	
3GR	Third Gear	—	3rd Gear	
TWC	Three Way Catalytic Converter	—	Catalytic Converter	
TB	Throttle Body	—	Throttle Body	
TP sensor	Throttle Position Sensor	—	Throttle Sensor	
TCV	Timer Control Valve	TCV	Timing Control Valve	#6
TCC	Torque Converter Clutch	—	Lockup Position	
TCM	Transmission (Transaxle) Control Module	—	ECAT Control Unit	
—	Transmission (Transaxle) Fluid Temperature Sensor	—	ATF Thermosensor	
TR	Transmission (Transaxle) Range	—	Inhibitor Position	
TC	Turbocharger	—	Turbocharger	
VSS	Vehicle Speed Sensor	—	Vehicle Speed Sensor	
VR	Voltage Regulator	—	IC Regulator	
VAF sensor	Volume Air Flow Sensor	—	Air flow Sensor	
WUTWC	Warm Up Three Way Catalytic Converter	—	Catalytic Converter	#5
WOT	Wide Open Throttle	—	Fully Open	

#1 : Diagnostic trouble codes depend on the diagnostic test mode
#2 : Controlled by the PCM
#3 : In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).
#4 : Device that controls engine and powertrain
#5 : Directly connected to exhaust manifold
#6 : Part name of diesel engine

ABBREVIATIONS

ABBREVIATIONS TABLE

CBG203000000A01

1GR	First Gear
2GR	Second Gear
2W	2 Wheel
4W	4 Wheel
4×4	4 Wheel–4 Drive
ATF	Automatic Transmission Fluid
RFW	Remote Free Wheel
SST	Special Service Tool
TFT	Transmission Fluid Temperature

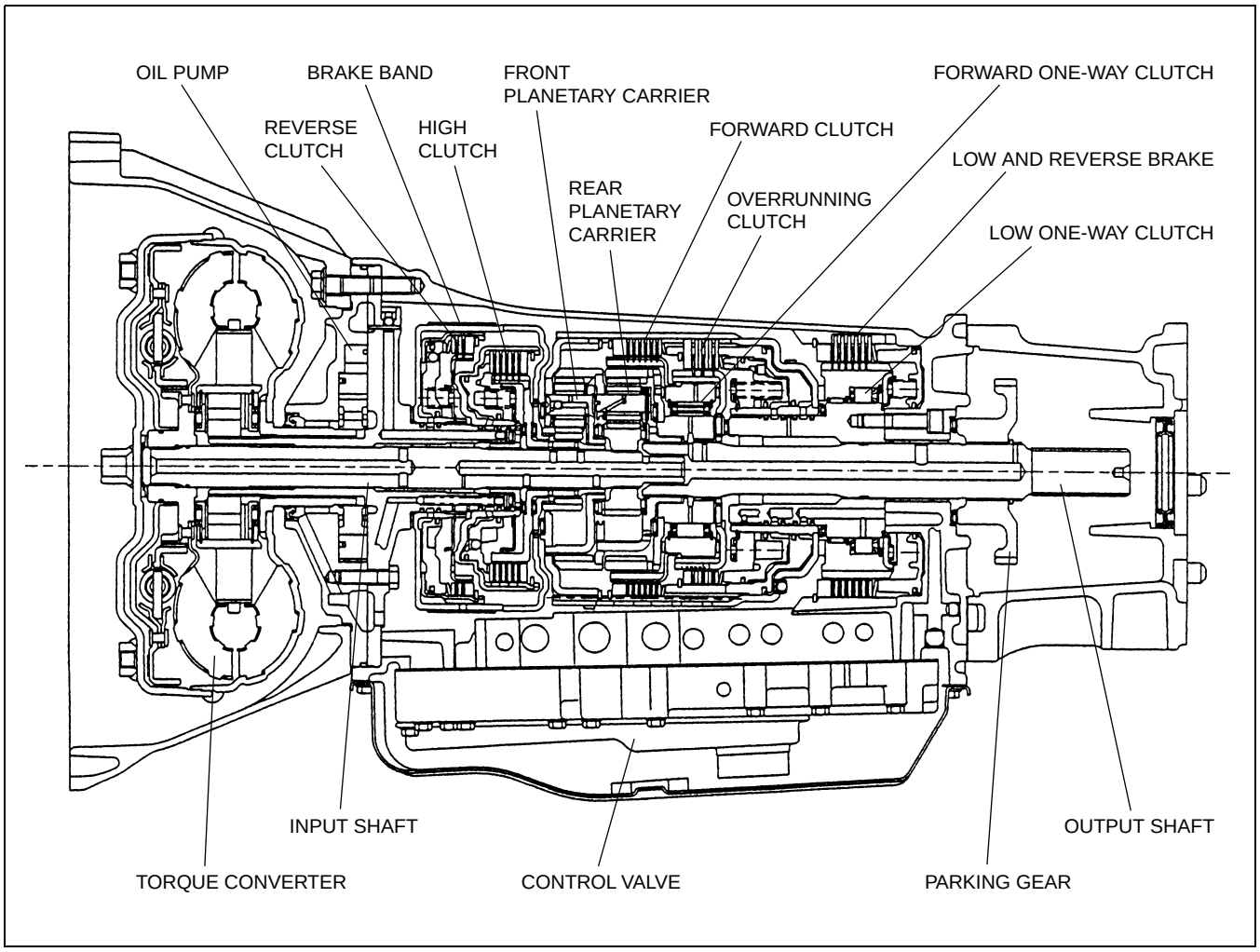
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OUTLINE

CROSS-SECTIONAL VIEW

CBG560200000A01



BCF5610A412

SPECIFICATIONS

CBG560200000A02

Item		Specification
Transmission type		RA4AX-EL
Transmission control		Floor Shift
Operation system		Cable
Gear ratio	1GR	3.027
	2GR	1.619
	3GR	1.000
	4GR	0.694
	Reverse	2.272
Final gear ratio		4.444
ATF	Type	ATF M-III or equivalent (e.g. Dexron®II)
	Capacity (Approx. quantity) L {US qt, Imp qt}	10.0 {10.6, 8.8}
Torque converter	Stall torque ratio	2.000
Hydraulic system (number of drive/driven plates)	Reverse clutch	2/2
	High clutch	5/5
	Forward clutch	6/6
	Overrunning clutch	3/5
	Low and reverse brake	6/6
Band servo	Servo piston diameter large/small mm {in}	72/44 {2.83/1.73}
	4GR servo piston outer diameter mm {in}	68 {2.68}
Front planetary carrier (Number of teeth)	Sun gear	33
	Pinion gear	21
	Internal gear	75
Rear planetary carrier (Number of teeth)	Sun gear	42
	Pinion gear	17
	Internal gear	75

Operation of Components

Range	Mode	Gear	Reverse clutch	High clutch	For-ward clutch	Over-running clutch	Band servo piston			Forward OWC	Low OWC	Low and reverse brake	Shift sole-noid A	Shift sole-noid B
							2GR applied	3GR released	4GR applied					
P	—	—											○	○
R	—	Reverse	○									○	○	○
N	—	—											○	○
D	Except HOLD	1GR			○	*5 △				●	●		○	○
		2GR			○	*5 ◎	○			●				○
		3GR		○	○	*5 △	*1 ⊗	⊗		●				
		4GR		○	⊗		*2 ⊗	⊗	○				○	
	HOLD	2GR			○	□	○			●				○
		3GR		○	○	□	*1 ⊗	⊗		●				
		*3 4GR		○	⊗		*2 ⊗	⊗	○				○	
S	Except HOLD	1GR			○	△				●	●		○	○
		2GR			○	◎	○			●				○
		3GR		○	○	◎	*1 ⊗	⊗		●				
	HOLD	1GR			○	△				●	●		○	○
		2GR			○	◎	○			●				○
		*3 3GR		○	○	◎	*1 ⊗	⊗		●				
		*3 4GR		○	⊗		*2 ⊗	⊗	○				○	
L	Except HOLD	1GR			○	*4 ○				●	●	○	○	○
		2GR			○	*4 ○	○			●				○
	HOLD	1GR			○	*4 ○				●	●	○	○	○
		*3 2GR			○	*4 ○	○			●				○

OWC: One-way clutch
*1: Hydraulic pressure is applied to both 2GR applied side and 3GR released side of band servo piston. However, because area of 3GR released side is larger than 2GR applied side, brake band does not operate.
*2: Hydraulic pressure is applied to 4GR applied side, plus conditions (*1) above. Brake band is applied.
*3: Protection of engine overrunning.
*4: Engine braking is operated by overrunning clutch operation.
*5: Operates when only POWER mode.
○: Operates.
◎: Operates when control lever opening is less than 1/16. Engine braking effect available.
△: Operates when control lever opening is less than 1/16. Engine braking effect not available.
□: Operates when control lever opening is less than 1/16 and vehicle speed is more than approx. 10 km/h {6 mph}. Engine braking effect available.
■: Operates when control lever opening is less than 1/16 and vehicle speed is more than approx. 10 km/h {6 mph}. Engine braking effect not available.
⊗: Operates but does not transmit power.
●: Operates during accelerating and cruising.

BCF5610A002

Range	Gear position	Gear ratio	Non-HOLD			HOLD		
			Shift	TCC operation	Engine brake	Shift	TCC operation	Engine brake
P	—	—		—			—	
R	Reverse	2.272	—	—	◯	—	—	◯
N	—	—		—			—	
D	1GR	3.027	↕	—	—	—	—	—
	2GR	1.619	↕	—	—	↕	—	●
	3GR	1.000	↕	◯*1	—	↕	◯*1	●
	4GR	0.694	↕	◯	◯		◯*1	◯
S	1GR	3.027	↕	—	—	↕	—	—
	2GR	1.619	↕	—	⊗	↕	—	⊗
	3GR	1.000	↕	◯*1	⊗	↕	◯*1	⊗
	4GR	0.694	—	—	◯		—	◯
L	1GR	3.027	↕	—	◯	↕	—	◯
	2GR	1.619	↕	—	◯		—	◯

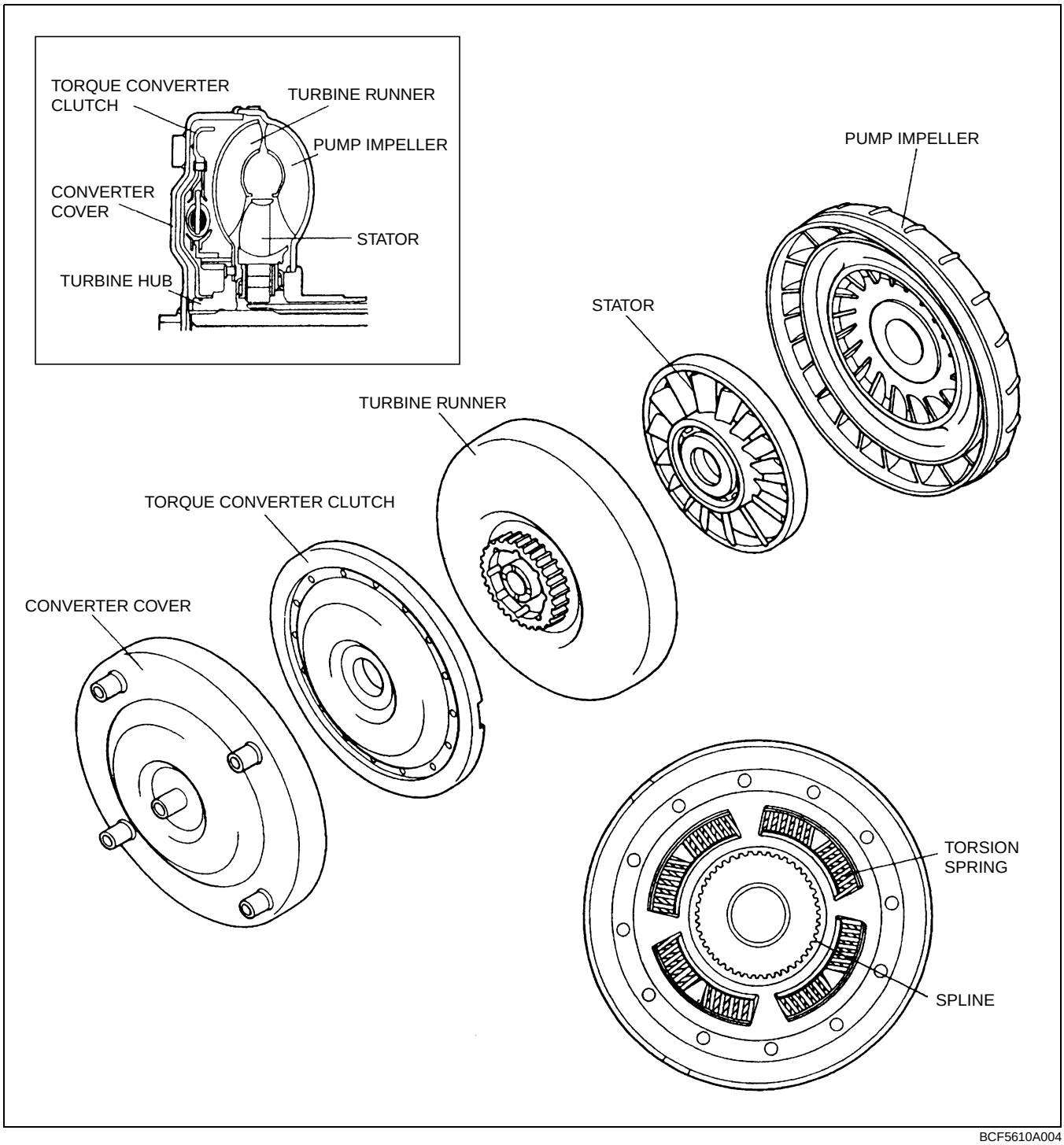
*1: Indicates lock up available when high temperature mode.
↕: Indicates that availability of shift up or/and down toward arrow.
◯: Indicates that TCC or engine braking is possible.
⊗: Indicates engine braking available when control lever opening is less than 1/16.
●: Indicates engine braking available when control lever opening is less than 1/16 as well as vehicle speed is more than 10 km/h {6 mph}.

BCF5610A003

AUTOMATIC TRANSMISSION

OUTLINE

CBG561019100A01



BCF5610A004

- The torque converter improves drivability by transmitting the drive force through the use of the transmission fluid. However, in certain ranges, a difference in rotation between the pump and the turbine caused by slippage due to the fluid, decreases the transmission efficiency of the drive force as well as fuel efficiency.
- Under certain conditions, the torque converter clutch mechanism transmits the drive force by automatically connecting the pump impeller with the turbine runner as opposed to the fluid force.
  Therefore, the torque converter clutch mechanism prevents the torque converter from slipping in the manner mentioned above.

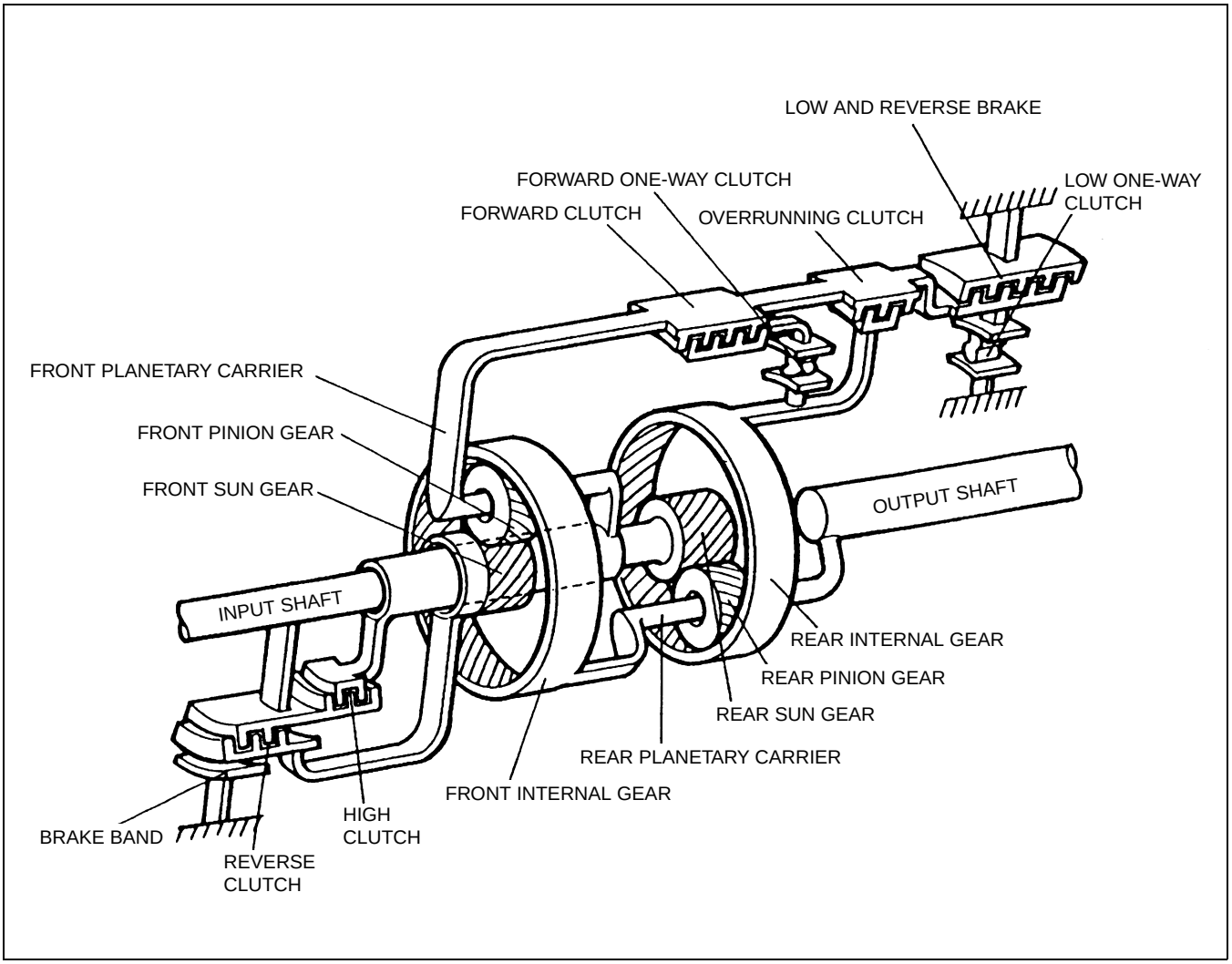
CONSTRUCTION

CBG561019100A02

The torque converter which includes the torque converter clutch mechanism houses the turbine runner, the pump impeller, the stator, and the torque converter clutch. The torque converter clutch is spline-fitted to the turbine hub. During torque converter clutch engagement, it slides over the turbine hub and is pressed tightly together with the converter cover. A torsion spring is installed in the torque converter clutch to absorb engine torque fluctuation when the torque converter clutch is pressed onto the torque converter.

COMPONENT DESCRIPTIONS

CBG561000000A01



BCF5610A005

Component	Function
Reverse clutch	Transmits rotation of input shaft to front sun gear
High clutch	Transmits rotation of input shaft to front planetary carrier
Forward clutch	Connects front planetary carrier and forward one-way clutch outer race
Overrunning clutch	Connects front planetary carrier and rear internal gear
Brake band	Prevents rotation of front sun gear
Forward one-way clutch	Locks counterclockwise rotation of rear internal gear, opposes front planetary carrier and low one-way clutch outer race (forward clutch drum) through forward clutch
Low one-way clutch	Locks counterclockwise rotation of front planetary carrier (forward clutch drum)
Low and reverse brake	Prevents rotation of front planetary carrier (forward clutch drum) Prevents rotation of rear internal gear when overrunning clutch in engaged

REVERSE CLUTCH AND HIGH CLUTCH DESCRIPTION

CBG561000000A02

Reverse clutch

- When hydraulic pressure acts upon the reverse clutch piston, the drive and driven plates are pressed tightly together. The driving force transmitted from the input shaft is transmitted to the high clutch drum, reverse clutch hub, reverse clutch drum, connecting shell, and front sun gear sequentially.
- When hydraulic pressure not acts upon the reverse clutch piston, the clutch is pushed back by the return spring.
  Therefore, the drive plates and driven plates are detached and no driving force is transmitted.

Note

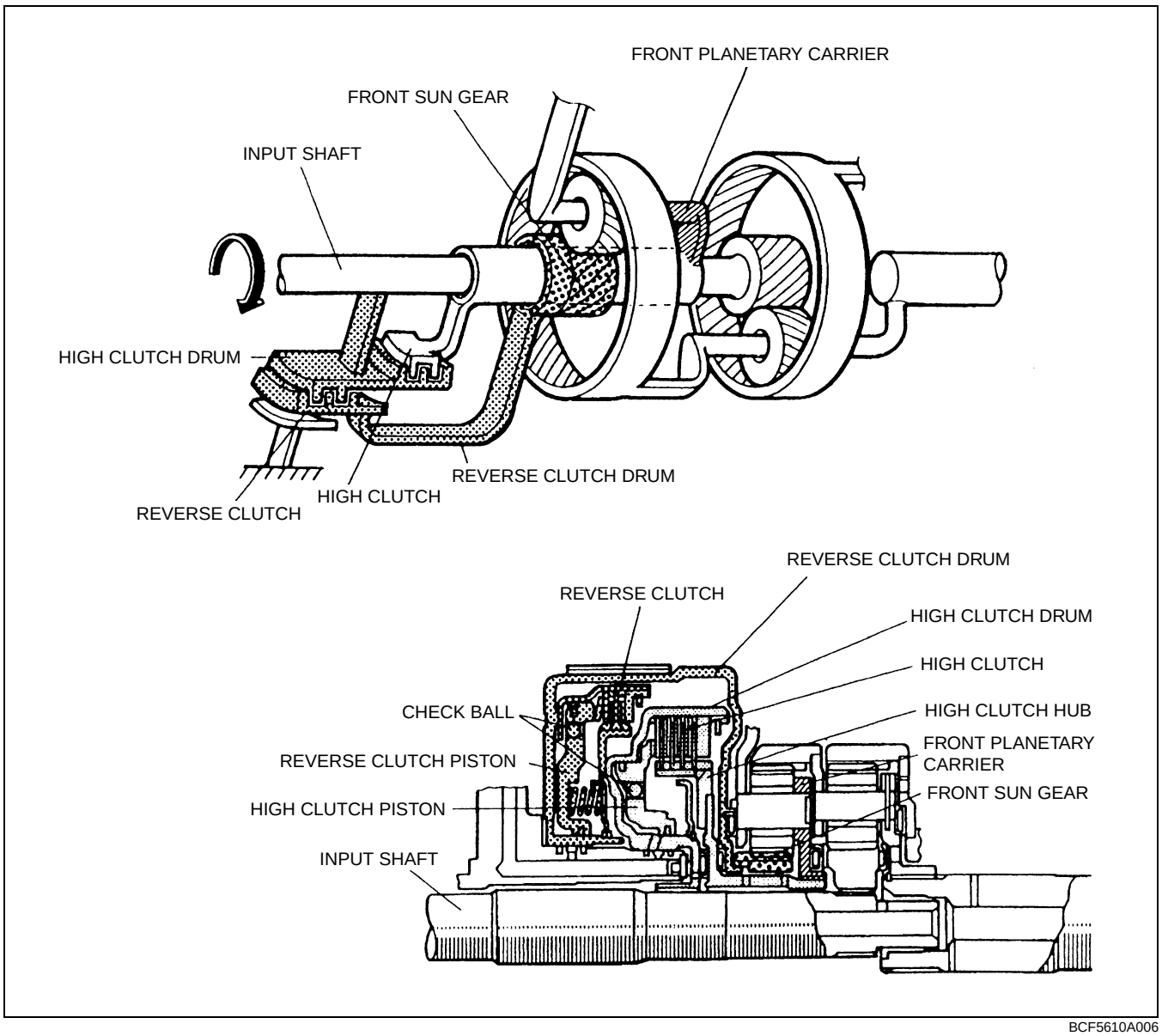
- The reverse clutch operates only in R position.

High clutch

- When hydraulic pressure acts upon the high clutch piston, the drive plates and driven plates are pressed tightly together. The driving force transmitted from the input shaft is transmitted to the high clutch drum, high clutch hub, and front planetary carrier sequentially.

Note

- The high clutch operates in 3GR and 4GR positions.

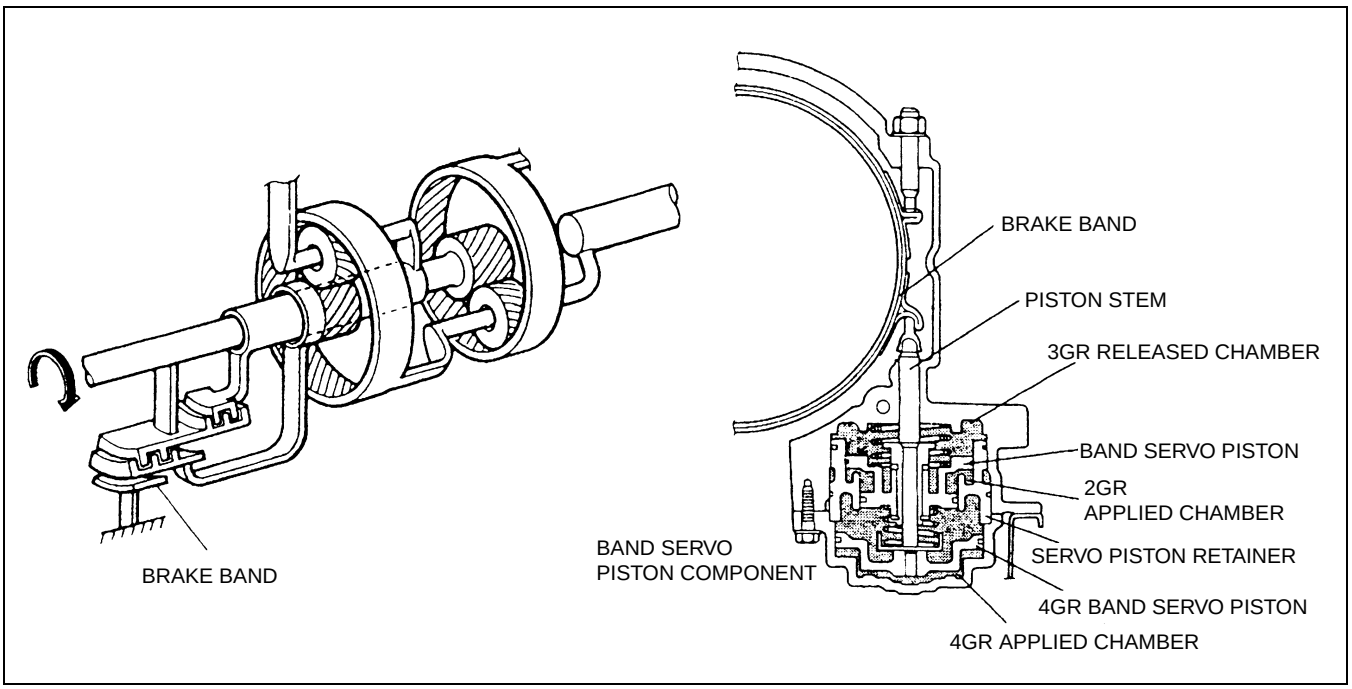


BCF5610A006

BAND SERVO PISTON AND BRAKE BAND DESCRIPTION

CBG561000000A03

- The band servo piston component contains three chambers to which hydraulic pressure is applied. Hydraulic pressure is applied to each chamber depending on gear positions, which acts upon the piston stem for engagement and disengagement of the brake band.



BCF5610A007

1GR

- No hydraulic pressure is applied to the band servo piston component. The brake band is disengaged due to the reaction force of the return spring.

2GR

- Hydraulic pressure is applied to the 2GR applied chamber. The band servo piston pushes up the piston stem and the brake band is engaged.

3GR

- Hydraulic pressure is applied to the 2GR applied chamber and the 3GR released chamber simultaneously. The band servo piston will push down the piston stem as a result of force applied to the difference between the surface areas of the band servo piston and the reaction force of the return spring, thus disengaging the brake band.

4GR

- When hydraulic pressure is applied simultaneously to the 4GR applied chamber, the 2GR applied chamber, and the 3GR released chamber, the 4GR servo piston will push up the piston stem, engaging the brake band.
- At this time, however, the band servo piston remains disengaged.

Note

- The rotational direction of the reverse clutch drum is opposite for 2GR and 4GR. In 2GR, the reverse clutch drum will rotate in direction A (opposite from engine rotation). In 4GR, the reverse clutch drum will rotate in direction B (same as engine rotation). When seen from the band servo side, direction A is leading direction and direction B is trading direction. Consequently, brake band engagement force needs to be changed between the 2GR and 4GR position.

FORWARD CLUTCH, OVERRUNNING CLUTCH AND LOW AND REVERSE BRAKE DESCRIPTION

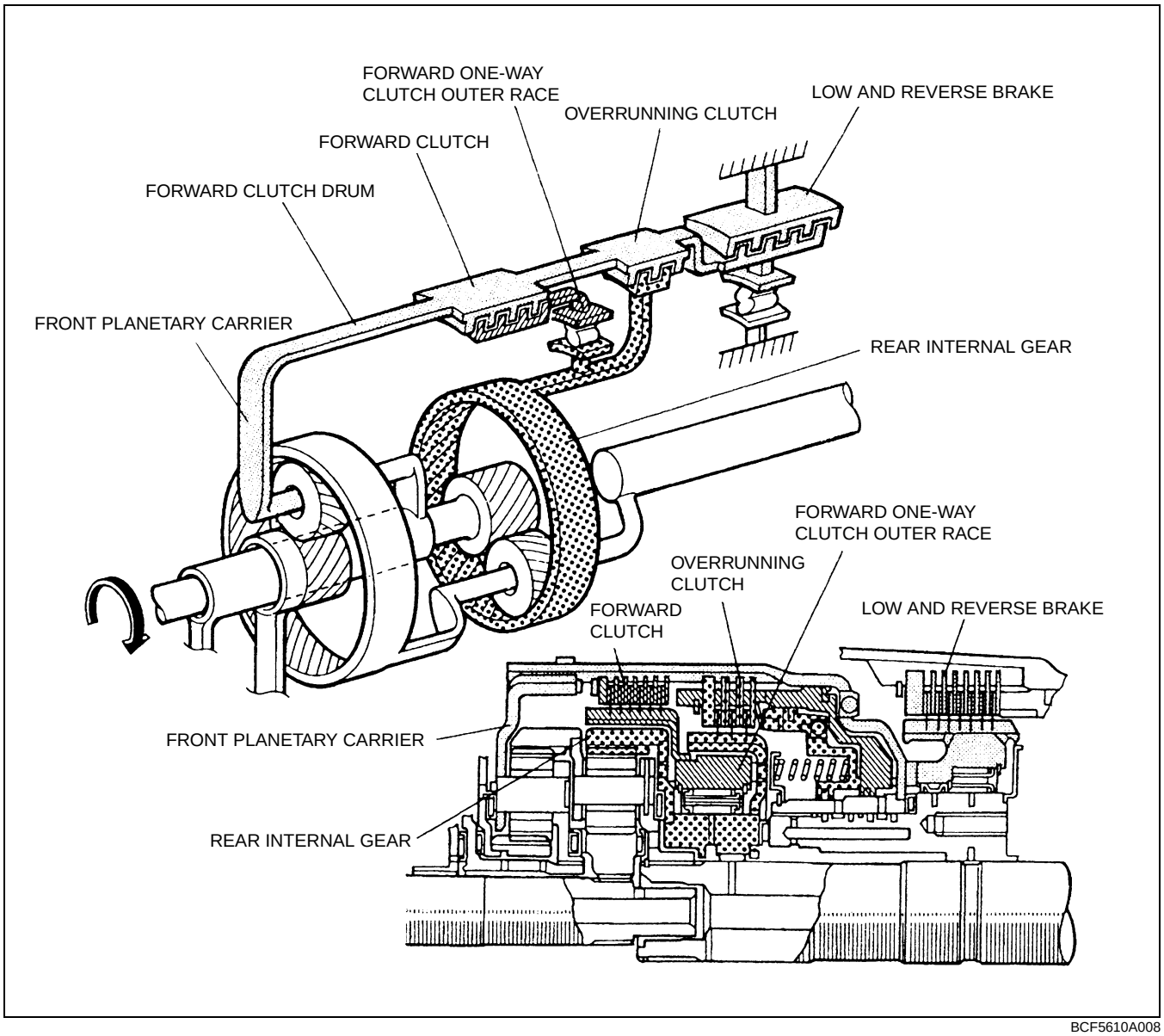
CBG561000000A04

Forward Clutch

- When hydraulic pressure acts upon the forward clutch piston, the drive and driven plates are pressed tightly together, and the front planetary carrier and forward one-way clutch outer race are connected by the forward clutch drum.

Note

- The forward clutch operates in all forward gear positions.



BCF5610A008

Overrunning clutch

- When hydraulic pressure acts upon the overrunning clutch piston, the drive and driven plates are pressed tightly together, and the front planetary carrier and rear internal gear are connected by the forward clutch drum and overrunning clutch hub.

Low and reverse brake

- When hydraulic pressure acts upon the low and reverse brake piston, the drive and driven plates are pressed tightly together, and the forward clutch drum is fixed to the transmission case.
- As a result, the front planetary carrier will be fixed.

Note

- The low and reverse brake operated in L range 1GR and R position.

ONE-WAY CLUTCH DESCRIPTION

CBG561000000A05

The one-way clutches are sprag-type.

Forward one-way clutch

1GR

- Driven by the inner race rotating counterclockwise, the sprags stand up, causing the one-way clutch to be locked.
- As a result, the forward one-way clutch, together with the low one-way clutch, prevents the rotation of the rear internal gear and front planetary carrier through the forward clutch.

2GR and 3GR

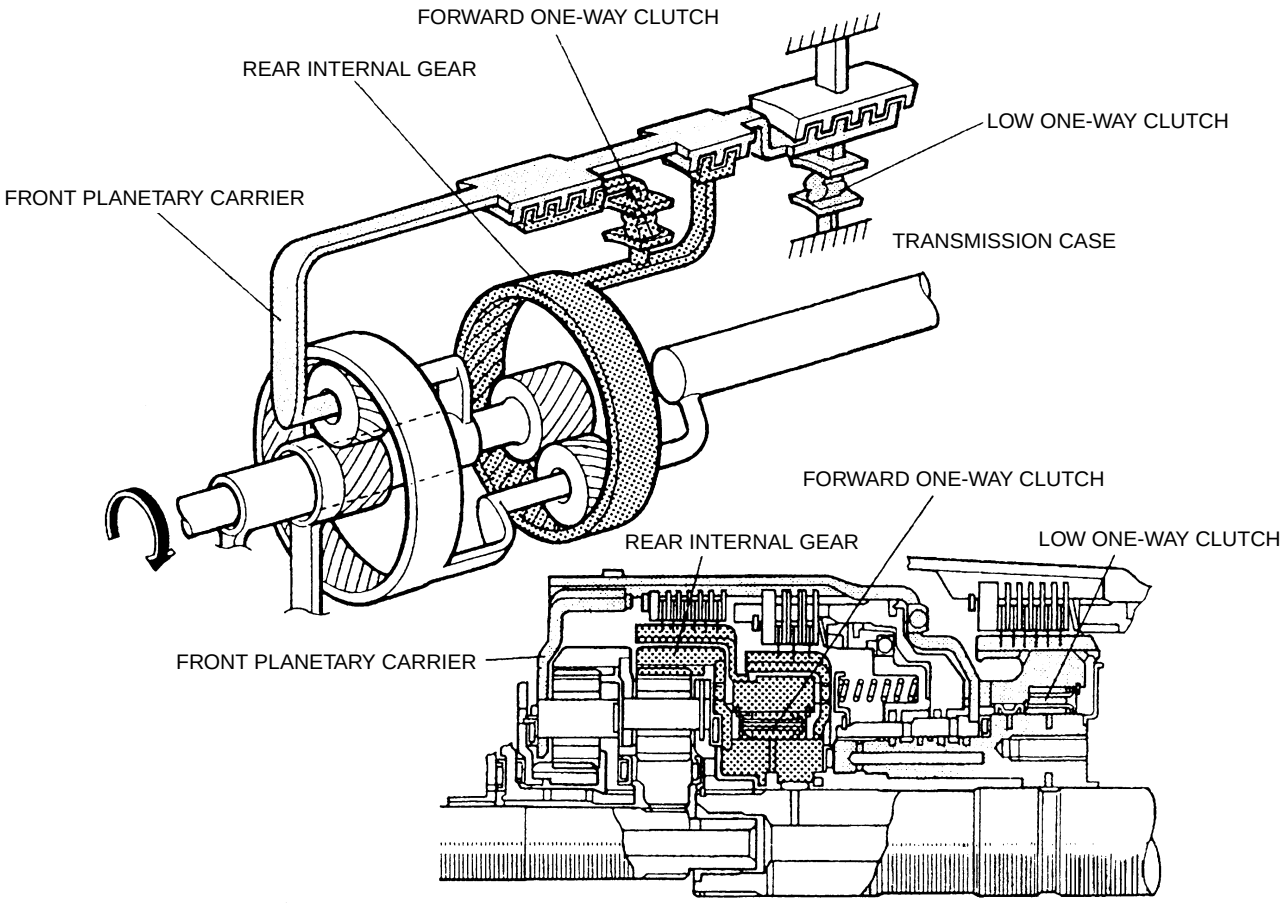
- Driven by the outer race rotating clockwise, the sprags stand up, causing the one-way clutch to be locked.
- As a result, the clockwise rotation of the front planetary carrier is transmitted to the rear internal gear through the forward clutch.

4GR

- The one-way clutch transmits the clockwise rotation of the front planetary carrier to the outer race through the forward clutch. The one-way clutch, however, will be freed due to a higher speed of internal gear clockwise rotation transmitted to the inner race.
- As a result, appropriate downshifting timing from 4GR to 3GR or 2GR will be maintained to reduce shift shock.

Low one-way clutch

- The inner race is installed on the transmission case. When a counterclockwise driving force is applied to the outer race, the sprags stand up causing the one-way clutch to be locked.
- When a clockwise driving force is applied to the outer race, the one-way clutch will be freed.



BCF5610A009

PARKING MECHANISM DESCRIPTION

CBG561000000A06

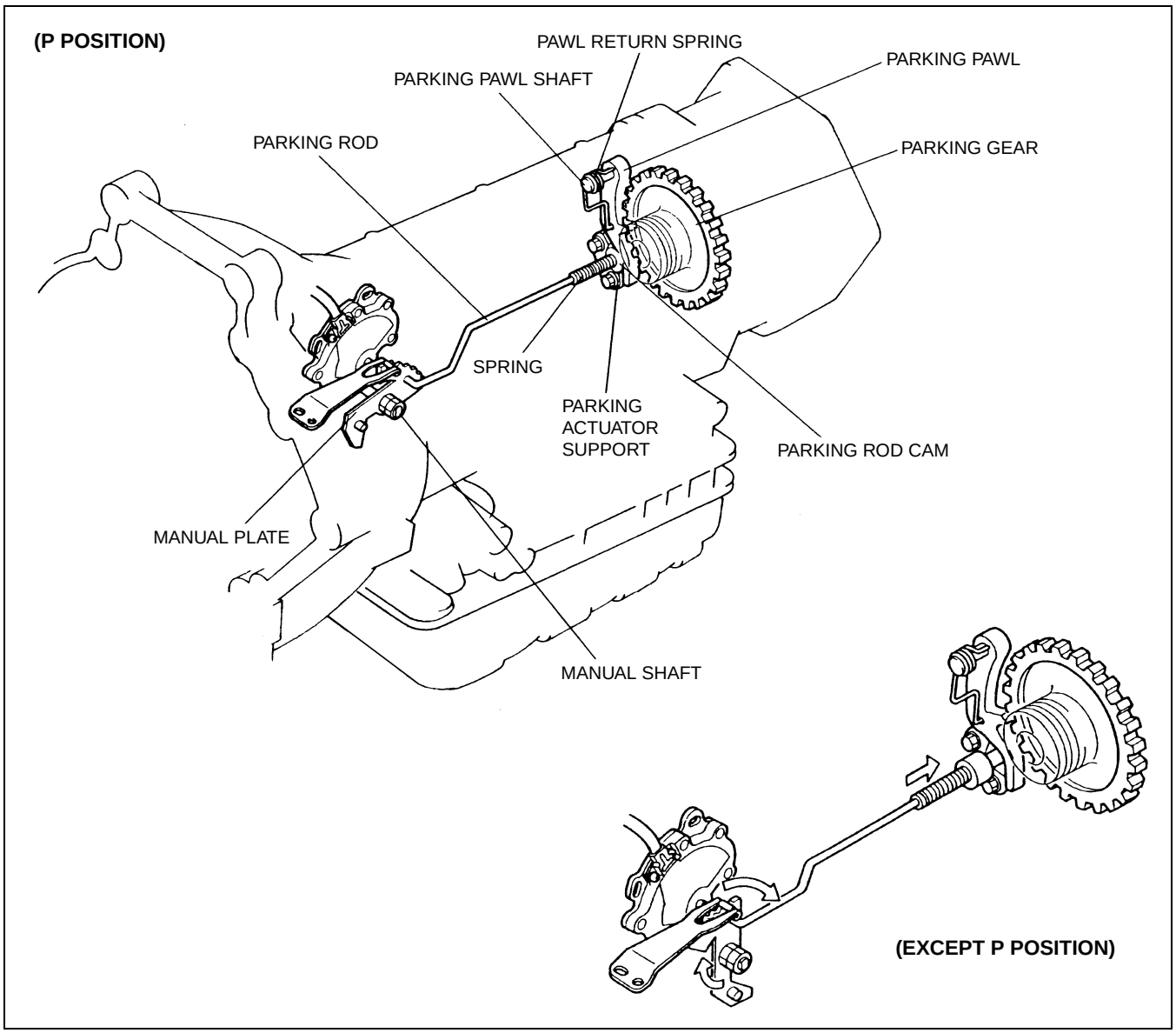
When the selector lever is moved to P position, the parking pawl engages the parking gear, locks the output shaft and prevents rotation of the driving wheel.

Construction

Only in P position, the parking pawl engages the parking gear via the parking pawl shaft. In the other ranges, the return spring holds the parking pawl away from the parking gear. The parking rod slides on the parking actuator support and is connected to the manual plate.

Operation

When the selector lever is moved to P position, the manual shaft and manual plate rotate clockwise to the position as shown in the figure. Following this, the parking rod moves in the direction indicated by the arrow, with the result that the cam of the parking rod pushes the parking pawl upward, allowing the parking pawl to engage the parking gear. If the parking pawl hits the tooth of the parking gear, only the parking rod will be able to move because the parking pawl cannot be raised up. The parking rod cam will press the spring onto the parking pawl and the actuator support. If the vehicle runs under this condition, the wheels will rotate, and the parking gear will also rotate slightly. As a result, the parking pawl slides into the groove, and engages the parking gear.



BCF5610A010

OIL PUMP DESCRIPTION

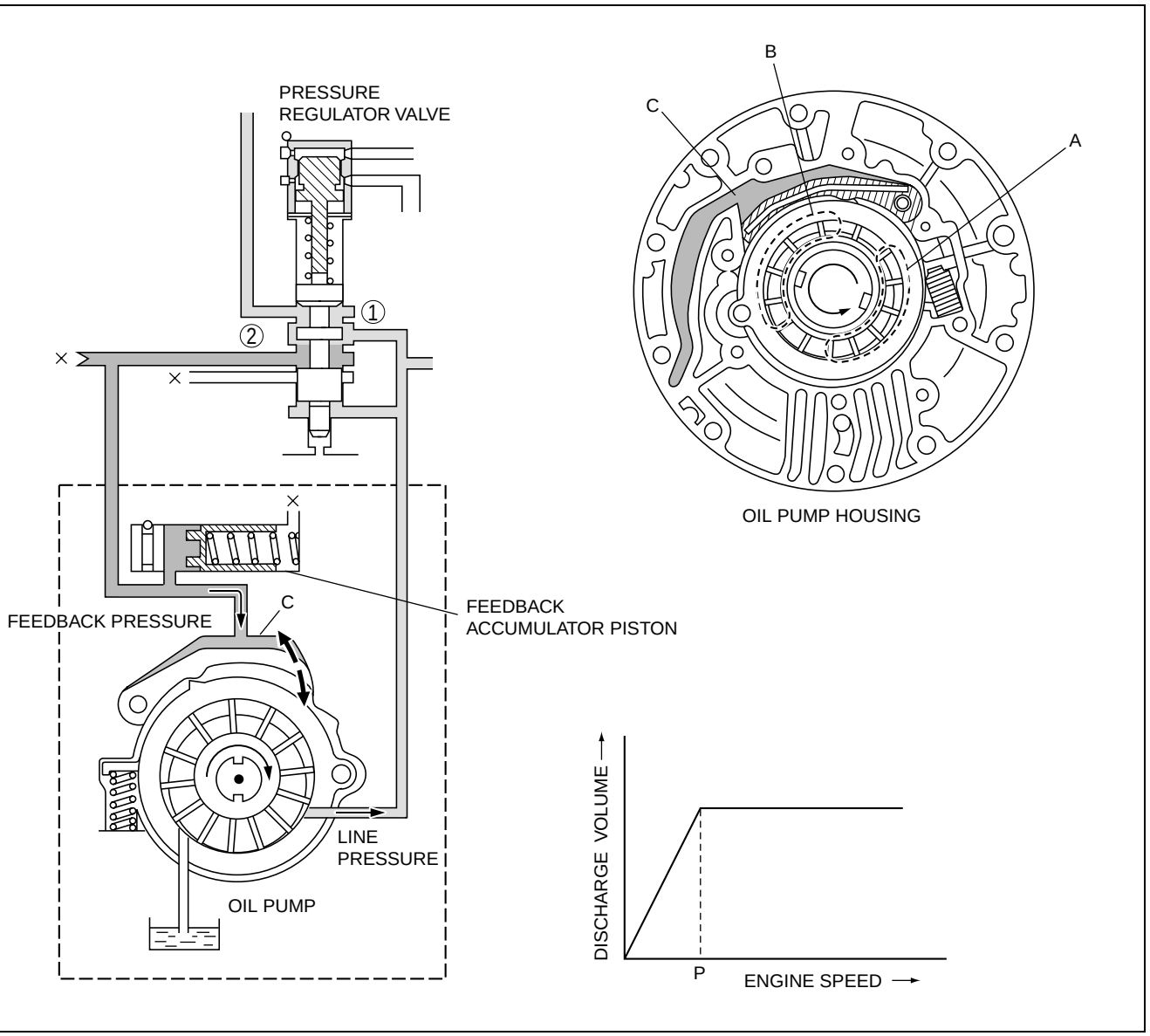
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Outline

- A variable-capacity-vane type oil pump has been added to improve fuel economy.
- In an internal gear engagement type involute gear type oil pump, discharge volume goes up in proportion to the engine speed; however, the variable-capacity-vane type oil pump fixes oil discharge volume when the engine speed reaches or exceeds a certain level to eliminate torque loss caused by feeding more than the required volume of oil.

Operation

- Oil charged into chamber A is discharged after being compressed in chamber B. This oil pump discharge volume is controlled by feedback pressure in control piston chamber C.
- When feedback pressure is low, discharge volume will go up due to increased rotor eccentricity. Conversely, rotor eccentricity and discharge volume will go down when feedback pressure is high.
- Oil discharged from the oil pump is mainly used by the pressure regulator valve to regulate line pressure. The amount of discharge needed to generate sufficient line pressure is controlled as follows:
  When discharge volume is too large for required line pressure, line pressure goes up and pushes the pressure regulator valve upward. Consequently, oil lines 1 and 2 will be connected and the line pressure on oil line 1 will flow into the feedback pressure circuit (oil line 2). This will cause the feedback pressure to increase and the discharge volume to decrease, restoring the original line pressure. Conversely, when discharge amount is too low for required line pressure, the pressure regulator valve will be pushed downward to close the oil lines 1 and 2, causing feedback pressure to go down. Therefore, the discharge volume will increase and the line pressure will go up.
- Discharge volume, thus controlled to a sufficient level to meet necessary line pressure, will be maintained at a constant level even when rotor input rotation (engine rotation) increases beyond P rotation thereby eliminating excessive driving force.



BCF5610A011

COMPONENT DESCRIPTIONS

CBG561000000A08

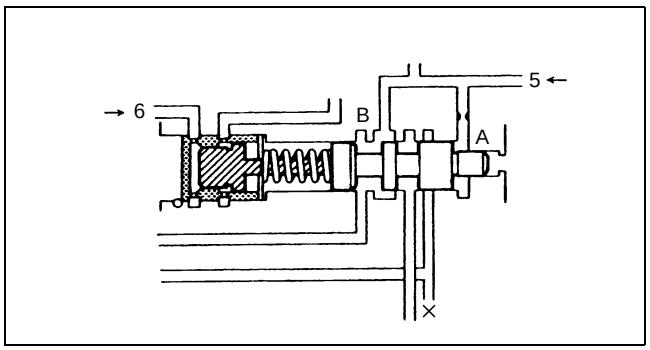
Component	Function
Manual valve	Distributes line pressure to each circuit corresponding to each selected position. Line pressure will be drained in position where distribution is not required
Pressure regulator valve	Adjusts oil discharged by oil pump to optimum line pressure for corresponding driving conditions
Pilot valve	Regulates line pressure to maintain the constant pressure (pilot pressure) required for shift controls such as torque converter clutch and overrunning clutch
Pressure modifier valve	Auxiliary valve for pressure regulator valve signals. Controls signal pressure (pressure modifier pressure) which adjusts line pressure to the optimum level for each driving condition
Accumulator control valve	Regulates accumulator backup pressure corresponding to driving conditions
Modifier accumulator valve	Stabilizes pressure adjusted by pressure modifier valve to prevent line pulsation
Shift valve A	Simultaneously switches three hydraulic paths by means of shift solenoid A output pressure from driving conditions such as vehicle speed and control lever opening angle Performs automatic shifting of 1 ⇔ 2 ⇔ 3 ⇔ 4 in combination with shift valve B
Shift valve B	Simultaneously switches three hydraulic paths by means of shift solenoid B output pressure from driving conditions such as vehicle speed and control lever opening angle Performs automatic shifting of 1 ⇔ 2 ⇔ 3 ⇔ 4 in combination with shift valve A
4-2 relay valve	Memorizes 4GR condition and prevents shifting 4 → 3 → 2 together with 4-2 sequence valve, shift valve A, and shift valve B during downshifting from 4GR to 2GR
4-2 sequence valve	During 4 → 2 shifting, prevents drainage of band servo 4GR applied pressure until high clutch applied pressure and band servo 3GR released pressure (in same hydraulic circuit) are drained off
Shuttle shift valve S	Fixed valve constituting hydraulic line between overrunning clutch solenoid valve and overrunning clutch control valve
Overrunning clutch control valve	Switches hydraulic lines of band servo 4GR applied pressure and overrunning clutch applied pressure to prevent overrunning clutch from operating during brake band operation in 4GR
Servo charger valve	Band servo 2GR applied hydraulic circuit has accumulator and one-way orifice to dampen shock during 1-2 shift. Accordingly, during 4 → 2 and 3 → 2 downshifting, the servo charger valve activates in 3GR position or 4GR to supply band servo second applied pressure, bypassing one-way orifice in order to assure sufficient flow volume
3-2 timing valve	Fixed valve constituting hydraulic line between shift valve B and band servo released side
1st reducing valve	Reduces low and reverse brake applied pressure to dampen engine braking shock during 2GR to 1GR shifting in L range
Overrunning clutch reducing valve	To dampen engine braking shock, reduces hydraulic pressure applied to overrunning clutch; in S and L ranges, increases engine braking capacity by applying line pressure to valve and raising pressure adjusting point
Torque converter relief valve	Prevents excessive torque converter pressure
Shuttle shift valve D	This valve has no function. It uses in order to make oil pressure circuit.
Torque converter clutch control valve	Performs TCC engagement and release Provides smooth TCC operation by properly controlling engagement and release
Torque converter clutch modifier valve	Switches pressure applied to torque converter clutch control plug so that line pressure is applied only while TCC is engaged and pilot pressure is applied in other conditions
Feedback accumulator piston	Prevents line pressure pulsation by stabilizing feedback pressure adjusted by pressure regulator valve

Manual Valve
Outline
The manual valve is operated by the gear selector and switches the passage for line pressure produced by the oil pump.

Operation
The manual valve determines where line pressure (5) (for P, R, N, D, S and L ranges/positions) is to be distributed. The valve is in a position where line pressures (1), (3), and (4) cannot be supplied by (5).

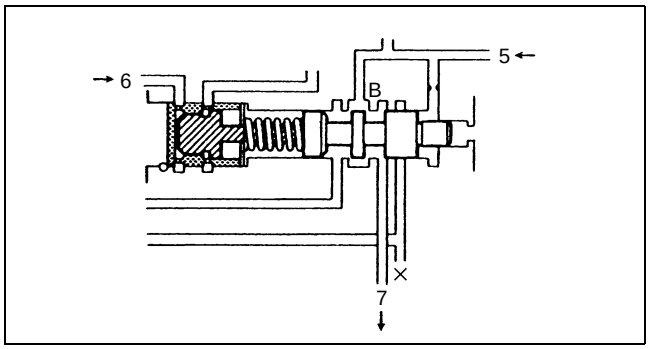
Pressure Regulator Valve
Outline
The pressure regulator valve adjusts oil discharged by the oil pump to optimum line pressure corresponding to the driving conditions.

Operation
Oil pump discharge pressure (5) is applied to chambers (A) and (B). Because there is difference in the areas of the pressure regulator valve, pressure (5) applied to chamber (A) pushes the valve to the left. The pressure regulator valve adjusts the discharge pressure to the line pressure so that the discharge pressure applied to chamber (A) which pushes the valve to the left, pressure modifier pressure (6) which pushes the valve to the right, and the spring force are balanced.
Therefore, the oil pump discharge pressure balances with the line pressure.
When the accelerator pedal is depressed, line pressure (5) is increased by pressure modifier pressure (6) and the spring force, and pushes the pressure regulator valve to the left.



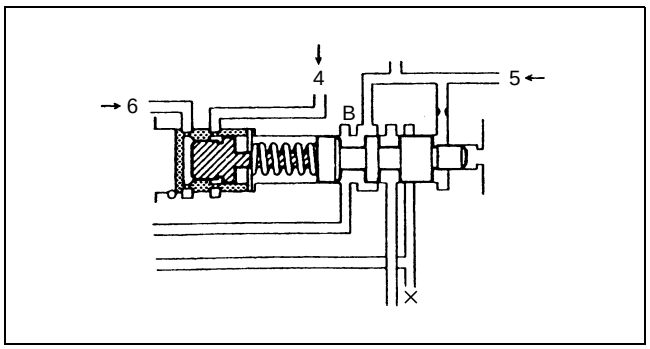
BCF5610A012

Line pressure (5) in chamber (B) is converted into feedback pressure (7) and applied to the oil pump control piston. As a result, oil pump discharge amount is reduced and line pressure (5) is adjusted so that it balances with the pressure modifier pressure and the spring force.
When the gear is in R position, line pressure (4) and pressure modifier pressure (6) are applied to the pressure regulator plug, and together with the spring force, pushed the valve to the right.



BCF5610A013

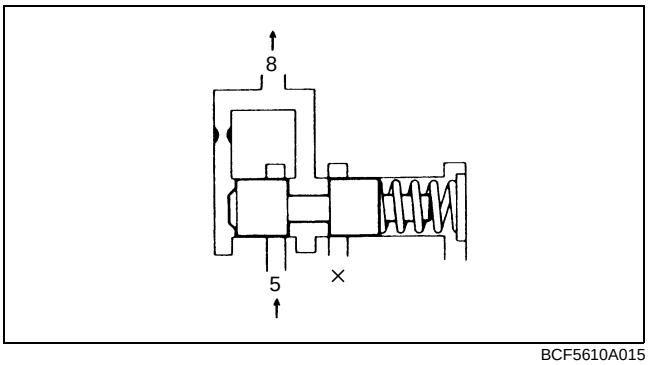
Line pressure (5) in chamber (B) will not be converted into the feedback pressure, and the pressure regulator valve balances at a high level.



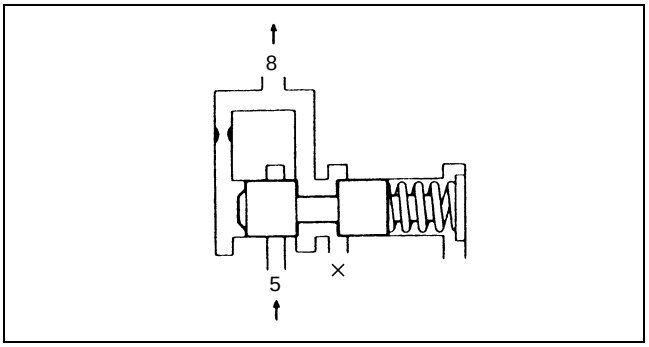
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Pilot Valve
Outline
The pilot valve converts the line pressure into pilot pressure. The pilot pressure is maintained at a constant level so that it can operate as a signal for the solenoid valve which is required for shift controls such as torque converter clutch and overrunning clutch.

Operation
The pilot valve is supplied with pilot pressure (8) which pushes the valve to the right, and the spring force which pushes the valve to the left.
When pilot pressure (8) becomes higher than the spring force, the valve moves to the right until the pilot pressure is drained. As a result, line pressure (5) is adjusted so that it balances with the spring force, and the pilot pressure in maintained at a constant level.



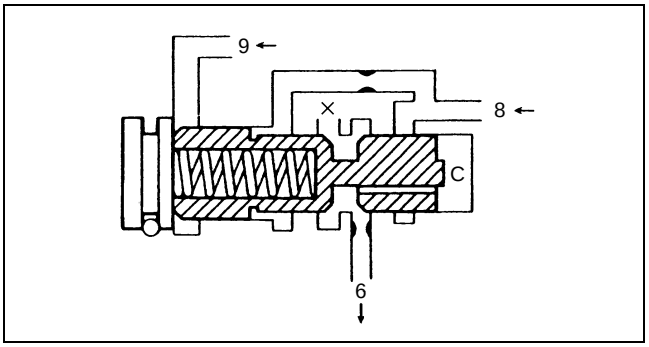
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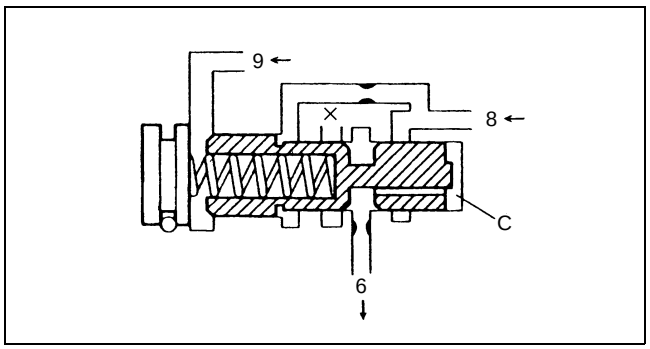
Pressure Modifier Valve
Outline
The pressure modifier valve converts the pilot pressure into the modifier pressure in response to the fluctuation in the throttle pressure which has been adjusted by the line pressure solenoid valve. The modifier pressure is applied to the pressure regulator valve, and operates as a signal to adjust the line pressure.

Operation
The pressure modifier valve is supplied with the spring force and throttle pressure (9) output from the line pressure solenoid, which push the valve to the right, at the left side of the valve.
The valve is also supplied with pilot pressure (8), which is applied to the part where there is difference in the area, and pressure modifier pressure (6), which push the valve to the left, in chamber (C) at the right side of the valve.
When throttle pressure (9) becomes lower, the valve moves to the left. The drain path opens, and pressure modifier pressure (6) is reduced until it balances with throttle pressure (9).
When throttle pressure (9) becomes higher, the valve moves to the right. Pilot pressure (8) flows into the path of pressure modifier pressure (6). Pressure modifier pressure is increased, thus the pressure balance.
In this way, the valve is maintained in balanced condition because pilot pressure (8) is adjusted to pressure modifier pressure (6) which balances with throttle pressure (9), output from the line pressure solenoid, which varies with the spring force and the accelerator pedal depressed amount.



BCF5610A017

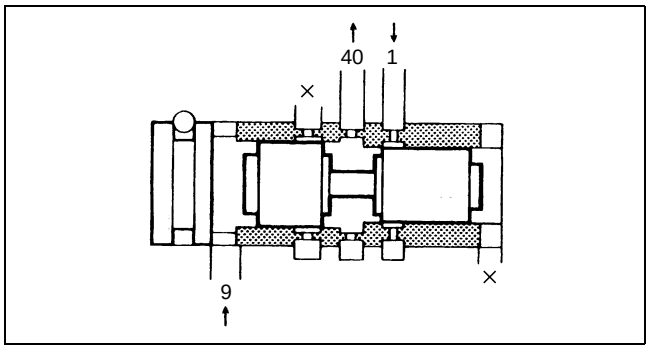
The adjusted pressure modifier pressure (6) is converted into the signal pressure and applied to the pressure regulator valve.



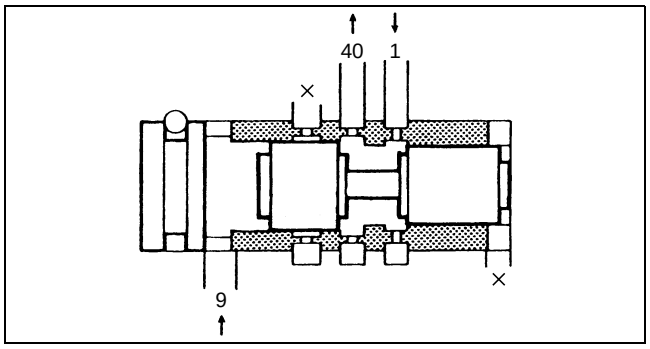
BCF5610A018

Accumulator Control Valve
Outline
The accumulator control valve generates the accumulator control pressure from the line pressure, according to the fluctuation in throttle pressure. The accumulator control pressure is applied to the accumulator at a level that matches each driving condition.

Operation
The accumulator control valve is supplied with the spring force and throttle pressure (9) output from the line pressure solenoid, which push the valve to the right, at the left edge of the valve.
The valve is also supplied with accumulator control pressure (40), which pushes the valve to the left, to the part where there is difference in the pressure receiving area on the valve.
When throttle pressure (9) becomes lower, the valve moves to the left. The drain path opens, and accumulator control pressure (40) is reduced until it balances with throttle pressure (9).
When throttle pressure (9) becomes higher, the valve moves to the right. Line pressure (1) flows into the path of accumulator control pressure (40).
Accumulator control pressure (40) is increased, thus the pressures balance.
In this way, line pressure (1) is adjusted to the accumulator control pressure which balances with throttle pressure (9), output from the line pressure solenoid, which varies with the spring force and the input signals from the EC-AT control module during gear change.
In other words, the accumulator control valve adjusts the accumulator control pressure according to the vehicle operating conditions.



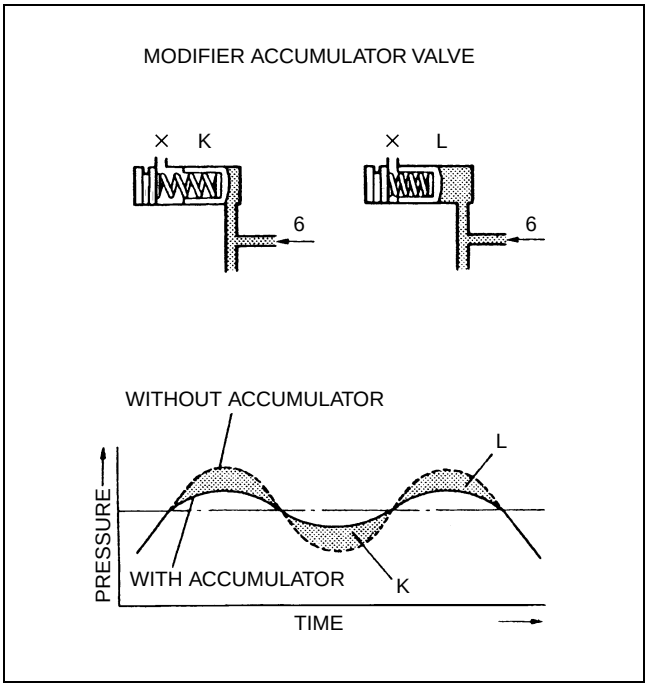
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BCF5610A020

Modiier Accumulator Valve
Outline
The modifier accumulator valve stabilizes the pressure adjusted by the pressure modifier valve to prevent line pulsation.

Operation
The modifier accumulator valve is supplied with pressure modifier pressure (6) which pushes the valve to the left, and the spring force which pushes the valve to the right.
When the pressure is high, the valve moves to the left to absorb the pressure as indicated by (L).
When the pressure is low, the valve moves to the right to compensate the pressure as indicated by (K).
Pulsating pressure modifier pressure (6) is thus flattened to prevent the line pressure from oscillating.



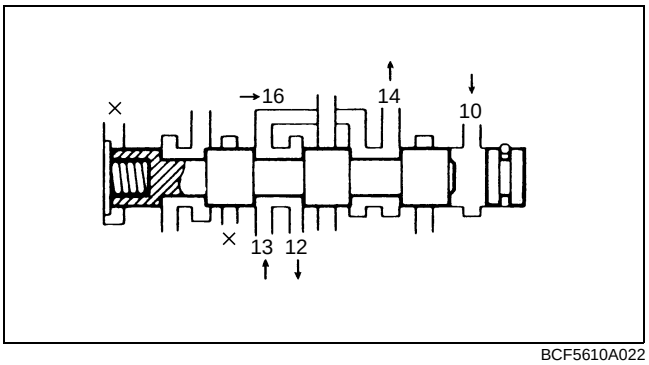
BCF5610A021

Shift Valve A
Outline
Shift valve A simultaneously switches three hydraulic paths based on the pilot pressure which is controlled by the shift solenoid A ON-OFF signals. It performs automatic shifting of 1GR, 2GR, 3GR and 4GR in combination with shift valve B, in response to driving conditions such as vehicle speed and control lever opening angle.

Operation
The spring force pushes shift valve A to the right. The pilot pressure (10), which is controlled by the shift solenoid A, pushes the valve to the left.

Conditions in 1GR and 4GR
The valve is pushed to the left side by the pilot pressure (10) which is controlled by shift solenoid A.

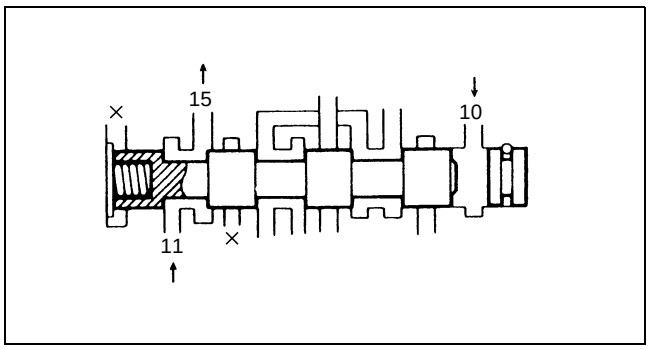
4GR
Line pressure provided from hydraulic path (13) is applied to the band servo (2GR engage hydraulic path) via hydraulic path (12).
Also, line pressure provided from hydraulic path (16) is applied to the band servo (4GR engages hydraulic path) and the 4-2 relay valve via hydraulic path (14).



BCF5610A022

L range 1GR

The 1GR reducing pressure which flows through hydraulic path (11) is convected into the low and reverse brake pressure in hydraulic (15), to allow low and reverse brake engagement.



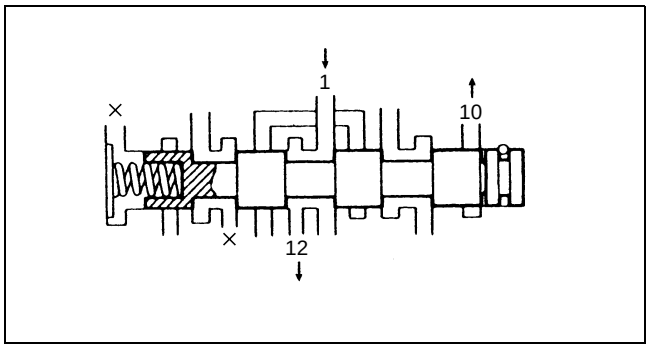
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Conditions in 2GR and 3GR

The valve is pushed to the right side because the pilot pressure (10) controlled by the shift solenoid A is not being applied to it.

2GR and 3GR

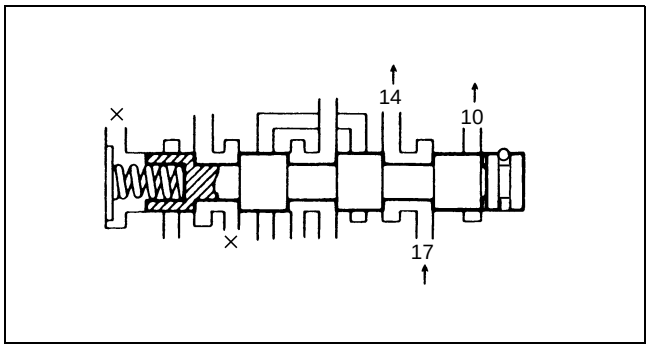
The line pressure which flows through the hydraulic path (1) is converted into the band servo 2GR applied pressure after passing through the hydraulic path (12) and the 1-2 accumulator.



BCF5610A024

Downshift from 4GR to 2GR

Until band servo 3GR release pressure has been completely drained, line pressure provided from hydraulic path (17) is applied to the band servo (4GR engage hydraulic path) and the 4-2 relay valve via hydraulic path (14).



BCF5610A025

Shift Valve B

Outline

Shift valve B simultaneously switches three hydraulic paths based on the pilot pressure controlled by the shift solenoid B ON-OFF signals. It performs automatic shifting of 1GR, 2GR, 3GR and 4GR in combination with shift valve A, in response to driving conditions such as vehicle speed and control lever opening angle.

Operation

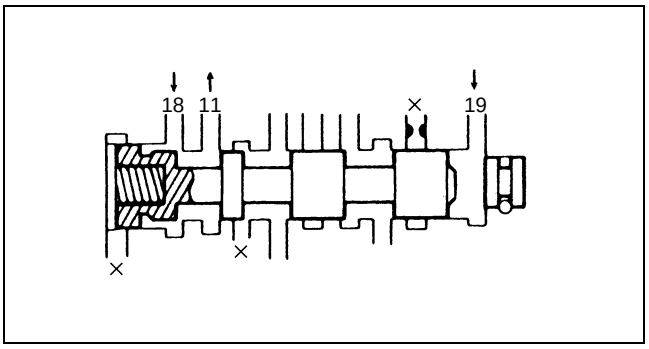
The spring force pushes shift valve B to the right. The pilot pressure (19), which is controlled by shift solenoid B, pushes it to the left.

Conditions in 1GR and 2GR

The valve is pushed toward the left by the pilot pressure (19) which is controlled by the shift solenoid B.

L range 1GR

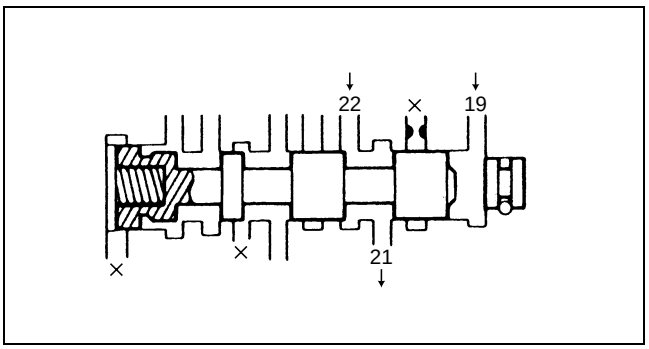
The first reducing pressure which flows through hydraulic path (18) is applied to the low and reverse brake after passing through hydraulic path (11) and the shift valve A.



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Downshift form 4GR to 2GR

The line pressure which flows through hydraulic path (22) is applied to the 4-2 sequence valve after flowing into hydraulic path (21).



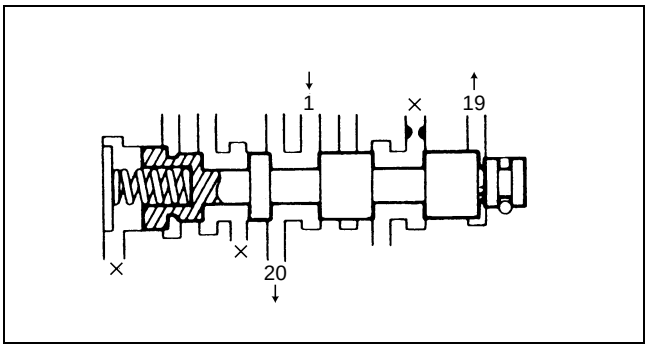
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Conditions in 3GR and 4GR

The valve is pushed to the right side because the pilot pressure (19) controlled by the shift solenoid B is not being applied to it.

3GR

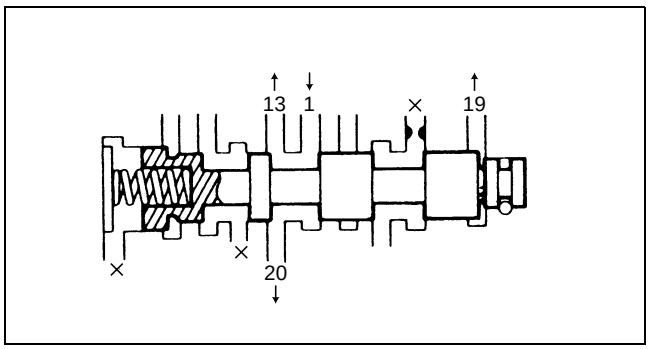
The line pressure which flows through hydraulic path (1) is applied to the band servo 3GR released hydraulic circuit and high clutch after flowing into hydraulic path (20).



BCF5610A028

4GR

Line pressure provided from oil passage (1) is applied to the band servo (3GR release hydraulic path) and to the high clutch vial oil passage (20), and to the band servo (4GR engage hydraulic path) via shift valve A.



BCF5610A029

4-2 Relay Valve and 4-2 Sequence Valve

Outline

The 4-2 relay valve prevents the 4 → 3 → 2 shifting during the 4 → 2 shifting in combination with the 4-2 sequence valve, shift valve A, and shift valve B. The 4-2 sequence valve prevents the band servo engage pressure (4GR engage pressure), applied during 4GR is selected, from draining during the 4 → 2 downshifting until the high clutch operation pressure and the band servo 3GR release pressure are drained.

Operation

The 4-2 relay valve is supplied with the band servo 4GR engage pressure (14) which pushes the valve downward, and the spring force which pushes the valve upward. The 4-2 sequence valve is supplied with the band servo 3GR release pressure (23) which pushes the valve downward, and the spring force which pushes the valve upward.

4GR

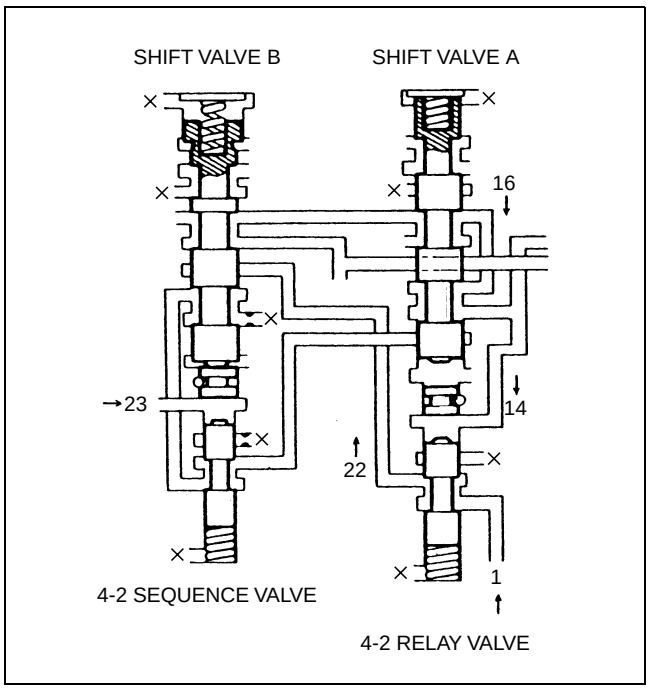
Shift solenoid A: ON

Pilot pressure is applied to shift valve A. Line pressure provided from hydraulic path (16) is applied to the end of the 4-2 relay valve via hydraulic path (14).

Shift solenoid B: ON

No pilot pressure is applied to shift valve B. Line pressure is applied to the end of the 4-2 sequence valve via hydraulic path (23).

- 4-2 relay valve
  The valve is pushed down when the line pressure provided from hydraulic path (14) is applied to the end of the valve.
  Then the line pressure provided from the manual valve flows through hydraulic path (1) to (22), and applied to shift valve B.
- 4-2 sequence valve
  The valve is pushed down when the line pressure provided via hydraulic path (23) is applied to the end of the valve.

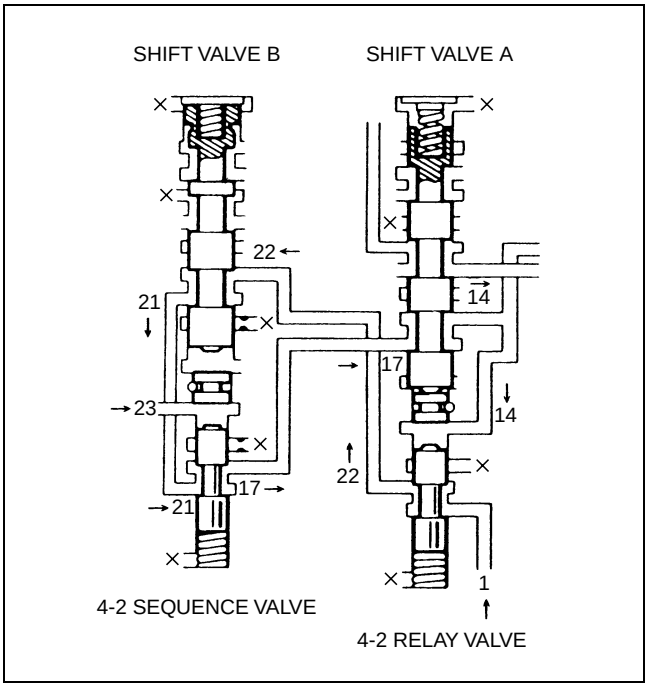


BCF5610A030

Downshift from 4GR to 2GR
Shift solenoid A: ON → OFF
No pilot pressure is applied to shift valve A. Line pressure is applied to the end of the 4-2 relay valve via hydraulic path (17).
Shift solenoid B: OFF → ON
Pilot pressure is applied to shift valve B. Line pressure provided from hydraulic path (21) is applied to the 4-2 sequence valve.

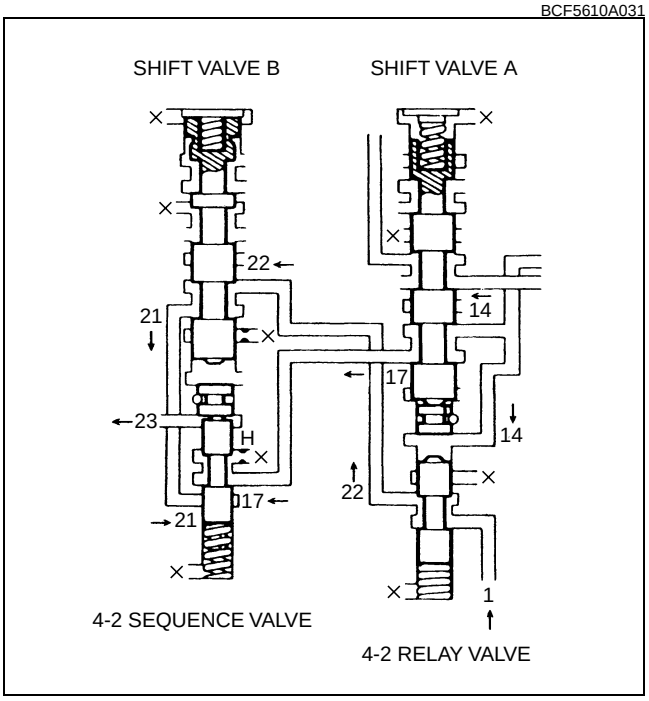
4-2 relay valve
When shift solenoid B turned ON, the line pressure provided from manual valve flows through hydraulic path (1) to (22), then to (21) via shift valve B. The 4-2 relay valve will remain in the depressed position until band servo 4GR engage pressure (17) is drained.

4-2 sequence valve
The line pressure provided from hydraulic path (21) is applied to band servo 4GR engage hydraulic path, through hydraulic path (17) and shift valve A.
The 4-2 sequence valve will remain in the depressed position until the band servo 3GR release pressure and the high clutch operation pressure are drained from the drain port in shift valve B.
(Under this condition, band servo 4GR engage pressure (17) will not be drained.)



BCF5610A031

When the band servo 3GR release pressure and the high clutch operation pressure are drained from the drain port in shift valve B, pressure in hydraulic path (23) is drained and as a result, the 4-2 sequence valve is pushed up by the spring force.
Drain port (H) opens and band servo 4GR engage pressure (17) is drained.
Consequently, the band servo 4GR engage pressure is maintained until the band servo 3GR release pressure and the high clutch operation pressure are drained.

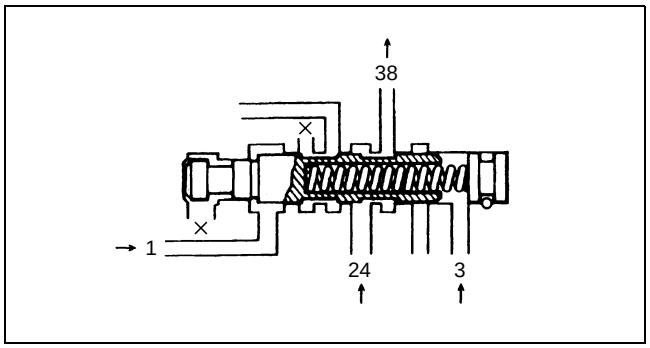


BCF5610A032

Shuttle Shift Valve S
Outline
Shuttle shift valve S switches the hydraulic path to apply output voltage generated when the overrunning clutch solenoid is turned ON to either the overrunning clutch control valve or the 3-2 timing valve.

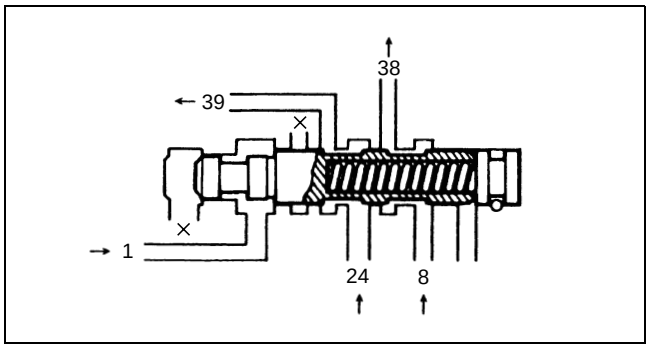
Operation
The spring force pushes shuttle shift valve S to the left. The line pressure (1) pushes shuttle shift valve S to the right.

In D or S at low control lever opening, and in L
When the gear is in either D or S range and the control lever opening angle is low, shuttle shift valve S is pushed to the left by the spring force because line pressure (1) is low, and hydraulic paths (24) and (38) are connected. In L range, shuttle shift valve S is pushed to the left, regardless of the control lever opening angle, because the spring force and the line pressure provided via hydraulic path (3) is higher than line pressure (1), and hydraulic paths (24) and (38) are connected. Because hydraulic paths (24) and (38) are connected, the overrunning clutch control valve is controlled by the overrunning clutch solenoid ON/OFF operation.



BCF5610A033

In D or S at high control lever opening
When the gear is in either D or S range and the control lever opening angle is high, shuttle shift valve S is pushed to the right by the spring force because line pressure (1) is high, and hydraulic paths (24) and (39) are connected. Because hydraulic paths (24) and (39) are connected, pilot pressure (8) is applied to the overrunning clutch control valve regardless of the overrunning clutch solenoid ON/OFF operation.



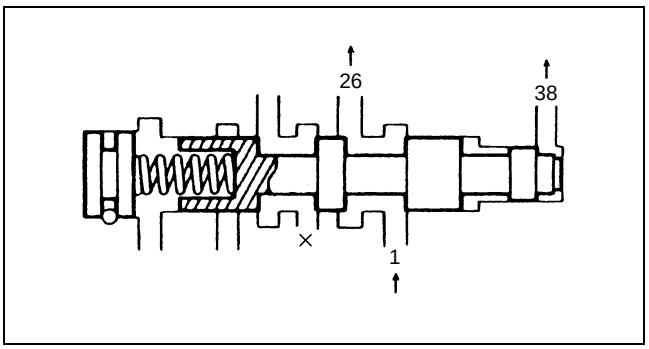
BCF5610A034

Overrunning Clutch Control Valve
Outline
The overrunning clutch control valve controls the engagement of the overrunning clutch based on the signals from the overrunning clutch solenoid valve. It also prevents the overrunning clutch from engaging in 4GR.

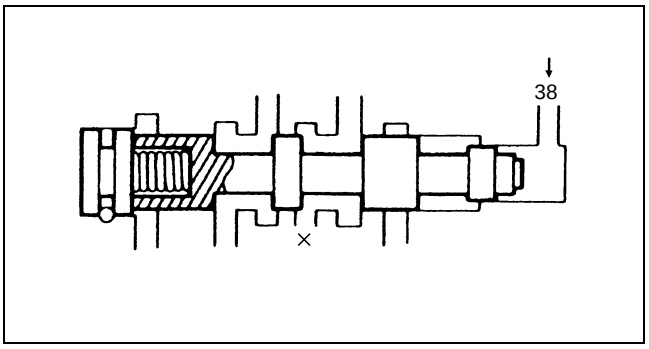
Operation
The pilot pressure (24) of the overrunning clutch solenoid valve acts as a leftward pushing force, passing through shuttle shift valve S and is applied from hydraulic passage (38) to the end face of the overrunning clutch control valve.
When in L range, the spring force and first reducing pressure (18) are applied as rightward pushing force.

D range (HOLD mode with a vehicle speed of approx. 10 km/h {6 mph} or more)

1. Control lever opening angle of approx. 1/16 or less
   - With a control lever opening angle of approx. 1/16 or less, the overrunning clutch solenoid valve turns off and the output pressure applied to the overrunning clutch control valve dissipates.
     Due to this, the overrunning clutch control valve is pressed rightward by spring force and the oil provided from hydraulic passage (1) flows from hydraulic passage (26) through the overrunning clutch reducing valve, causing the overrunning clutch to engage.
2. Control lever opening angle of approx. 1/16 or more
   - With a control lever opening angle of approx. 1/16 or more, the overrunning clutch solenoid valve turns on.
     Solenoid valve output pressure at the low opening angle side and pilot pressure at the high opening angle side flows through shuttle shift valve S and is applied from hydraulic passage (38) to the end face of the overrunning clutch control valve. Due to this, the valve is pushed leftward, releasing the overrunning clutch.



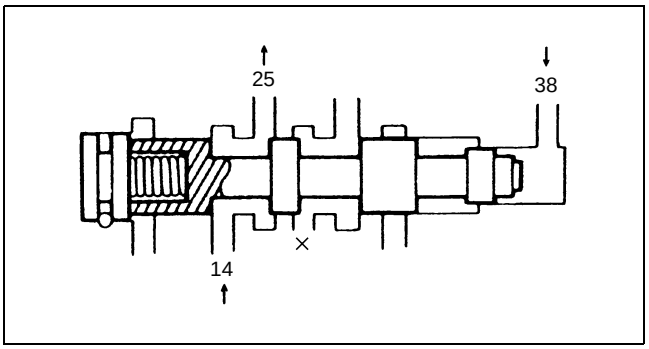
BCF5610A035



BCF5610A036

D range (POWER and NORMAL modes; HOLD mode with a vehicle speed of approx. 10 km/h {6 mph} or less)

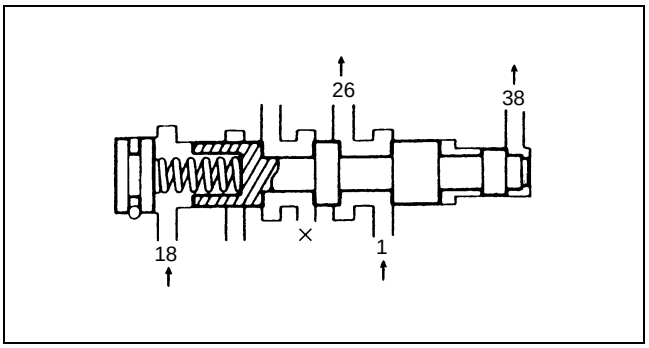
The overrunning clutch control valve is constantly pushed leftward and the overrunning clutch is released due to the output pressure of the overrunning clutch solenoid valve pressure or pilot pressure.
For 4GR, oil flowing from hydraulic passage (14) through hydraulic passage (25) is applied to the band servo 4GR applied chamber.



BCF5610A037

L range

In L range, the first reducing pressure from hydraulic passage (18) is applied to the end face of the overrunning clutch control valve, pushing and fixing the valve rightward.
As a result, the overrunning clutch is engaged since hydraulic passages (1) and (26) are connected, and reverse driving force is transmitted to the engine when the accelerator pedal is released or when downshifting from 2GR to 1GR.

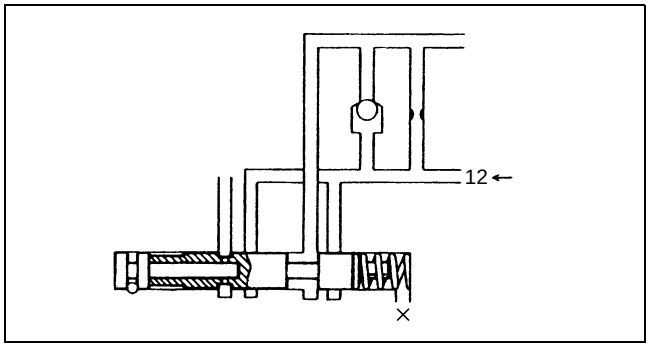


BCF5610A038

Servo Charger Valve
Outline
Band servo 2GR applied hydraulic circuit has accumulator and one-way orifice to dampen shock during 1-2 shift. Accordingly, during 4-3 and 3-2 downshifting, the servo charger valve activates in 3GR position or 4GR to supply band servo 2GR applied pressure, bypassing one-way orifice in order to assure sufficient flow volume.

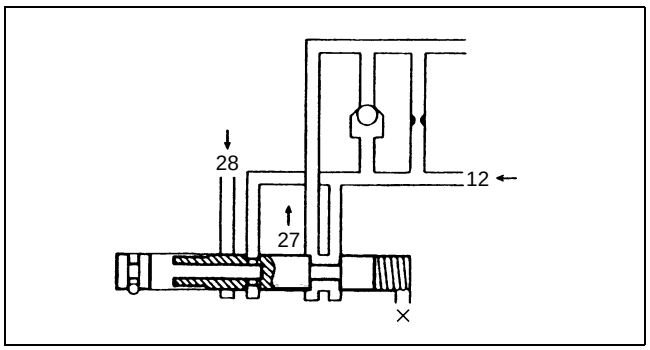
Operation
The spring force pushes the servo charger valve to the left. The band servo 3GR released pressure (28) pushes the valve to the right.

4GR-2GR, 3GR-2GR downshift
When the gear is in either 4GR or 3GR position, band servo 3GR release pressure, provided via hydraulic path (28), is applied to the end of the valve, pushes the valve toward the right. Hydraulic path (28) is closed and hydraulic path (12) opens, let the band servo 2GR engage pressure applied to the end of the valve, fixes the valve to the right.



BCF5610A039

As a result, hydraulic paths (27) and (12) are joined and the band servo 2GR engage pressure from shift valve A is directly applied without passing through the orifice.
This quickly replenishes the pressure reduced as the band servo 3GR release pressure during the 4-2 or 3-2 downshift, helps quick stroke of the servo piston, and operate the brake band.
When the servo charger valve is pushed to the right, the band servo 2GR engage pressure is applied to retain the valve in the right until the gear is shifted to the 1GR position.

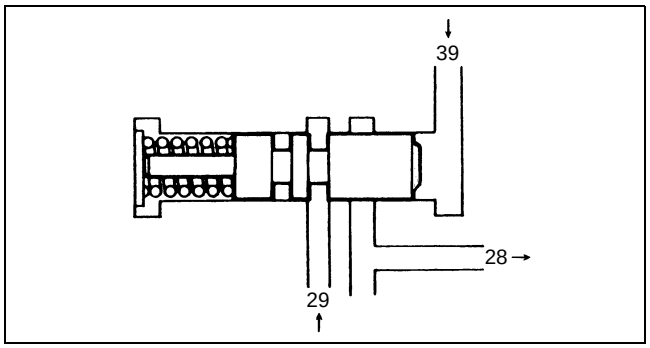


BCF5610A040

3-2 Timing Valve
Outline
While downshifting from the 3GR to the 2GR in D range, engine speed will increase quickly when the vehicle speed is low. When the vehicle speed is high, however, engine speed will take some time to increase. The 3-2 timing valve switches the draining speed of the hydraulic pressure in the band servo 3GR release chamber during downshift from the 3GR to the 2GR according to the vehicle speed.

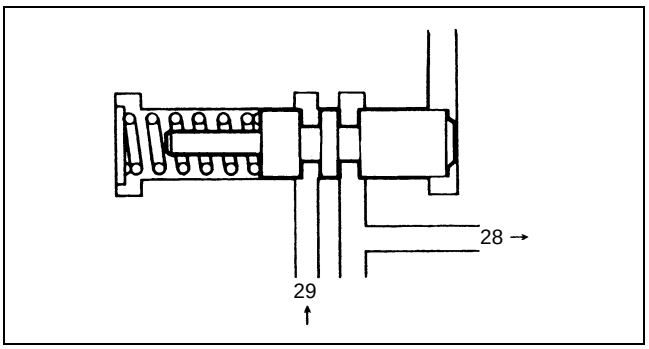
Operation
The 3-2 timing valve is supplied with the overrunning clutch solenoid output pressure which pushes the valve to the left, and the spring force which pushes the valve to the right.

Downshift at high speed (high control lever opening)
The overrunning clutch solenoid is turned ON and output pressure is generated.
The output pressure is applied to the 3-2 timing valve via shuttle shift valve S, and the valve is pushed to the left to close hydraulic paths (28) and (29).
Because the operation pressure in the band servo 3GR release chamber is drained through the orifice, the draining time is made slower.



BCF5610A041

Downshift at low speed (low control lever opening)
The overrunning clutch solenoid is turned OFF and no output pressure is generated. The 3-2 timing valve is pushed to the right and hydraulic paths (29) and (28) are connected.
The operation pressure in the band servo 3GR release chamber is drained through the 3-2 timing valve to make the draining time faster.
Also, the 3-2 timing valve is equipped with a diaphragm to prevent the quick draining.

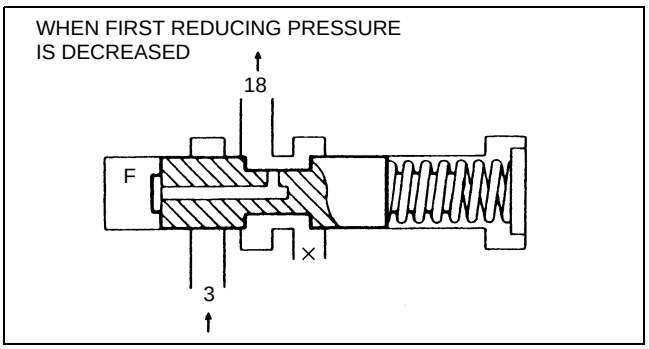


BCF5610A042

First Reducing Valve
Outline
The first reducing valve generates the first reducing pressure through line pressure. The first reducing pressure does not increase over a certain amount of pressures to damper engine braking shock during 2-1 shifting in L range.

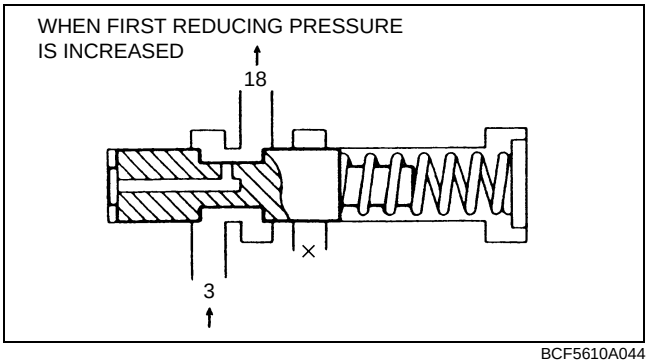
Operation
The spring force pushes the first reducing valve to the left. The first reducing pressure which flows through hydraulic path (18), pushes the valve to the right in L range.

L range
The line pressure, supplied from hydraulic path (3) and switched by the manual valve, passes through an oil port in the first reducing valve and applied to chamber (F) at the end of the valve and pushes the valve to the right. When this force exceeded the spring force that pushes the valve to the left, the valve further moves to the right until the pressure drains. For this reason, the first reducing pressure adjusted by the first reducing valve will not become higher than the specific pressure.



BCF5610A043

As a result, the line pressure provided from hydraulic path (3) is reduced and converted into the first reducing pressure, and applied to the low and reverse brake via overrunning clutch control valve, shift valve A, and shift valve B when the 1GR is selected.

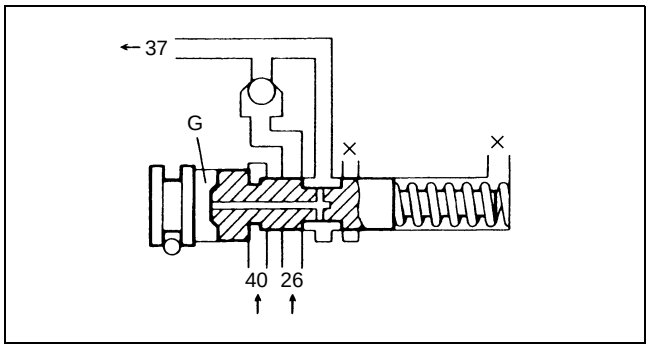


BCF5610A044

Overrunning Clutch Reducing Valve
Outline
The overrunning clutch reducing valve controls the overrunning clutch applied pressure to reduce engine braking shock.

Operation
The overrunning clutch reducing pressure (37) is applied to the left side of the valve, pushing it to the right. The spring force and accumulator control pressure (40) are applied to the right side of the valve, pushing it to the left.

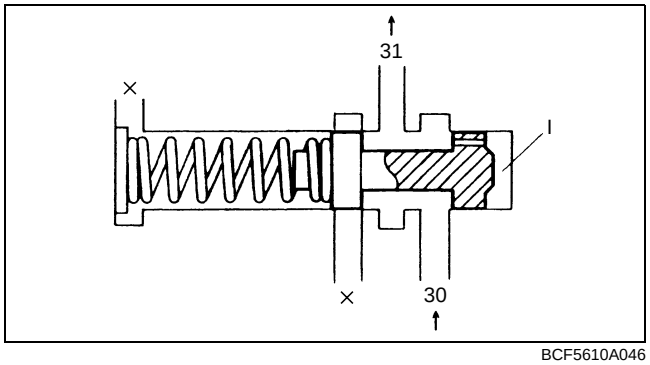
D range
The line pressure, supplied from hydraulic path (26) via overrunning clutch control valve, passes through an oil port in the valve and applied to chamber (G) at the end of the valve and pushes the valve to the right.
When this force exceeded the spring force and accumulator control pressure (40) that pushes the valve to the left, the valve further moves to the right until the pressure drains.
For this reason, the overrunning clutch reducing pressure adjusted by the overrunning clutch reducing valve will not become higher than the specific pressure.
As a result, the line pressure provided from hydraulic path (26) is reduced and converted into the overrunning clutch reducing pressure, and provided to the overrunning clutch via hydraulic path (37).



BCF5610A045

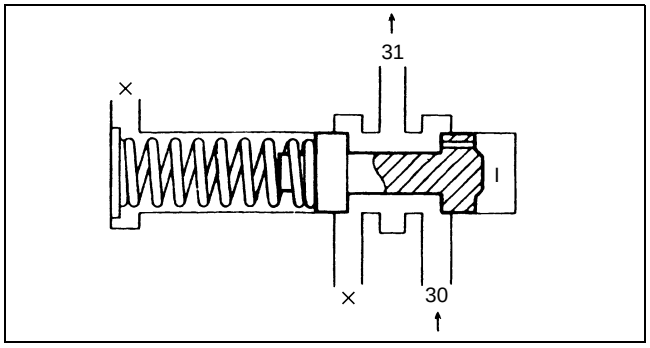
Torque Converter Relief Valve
Outline
The torque converter relief valve prevents torque converter pressure from exceeding a specified level.

Operation
The torque converter relief valve is supplied with the spring force which pushes the valve to the right, and torque converter pressure (31) which pushes the valve to the left.



BCF5610A046

The line pressure, supplied from the pressure regulator valve via hydraulic path (30), passage through an oil port in the torque converter relief valve and applied to chamber (I) at the end of the valve and pushes the valve to the left.
When this force exceeded the spring force that pushes the valve to the right, the valve further moves to the left until the pressure drains.
For this reason, the torque converter pressure adjusted by the torque converter relief valve will not become higher than the specific pressure.
As a result, the line pressure provided from hydraulic path (30) is reduced and converted into the torque converter pressure, and provided to the torque converter and the lubrication system from hydraulic path (31) via torque converter clutch control valve.

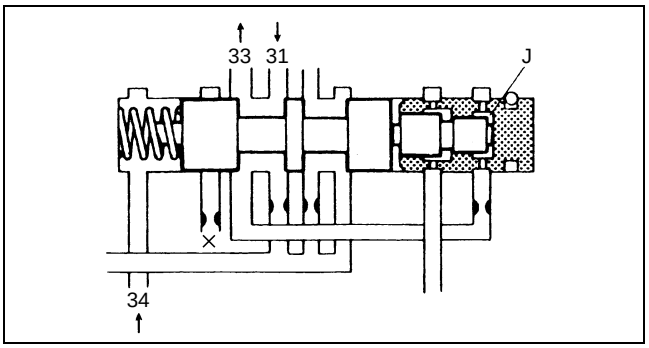


BCF5610A047

Torque Converter Clutch Control Valve
Outline
The torque converter clutch control valve controls torque converter clutch engagement by switching the hydraulic path of the torque converter pressure. This function is carried out under the control of the pilot pressure based on the duty signals from the TCC solenoid valve.

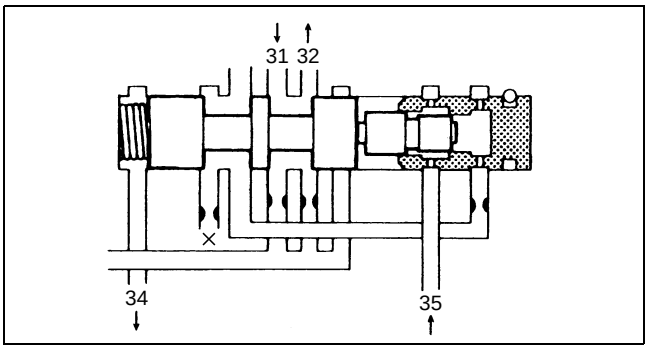
Operation
The pilot pressure (35) pushes the torque converter clutch control valve to the left. The TCC is released due to the action of torque converter pressure in chamber (J). Conversely, the pilot pressure (34) and the spring force push the valve to the right.

Torque converter clutch (TCC) released
Pilot pressure (34), provided from the TCC solenoid or shuttle shift valve D, is applied to the end of the valve and push the valve to the right.
As a result, the torque converter pressure that provided from hydraulic path (33) is applied to hydraulic path (33) and chamber (J) at the edge of the plug.
The torque converter pressure that provided from hydraulic path (33) is applied to chamber (F) and the damper piston release side, thus prevents TCC operation.



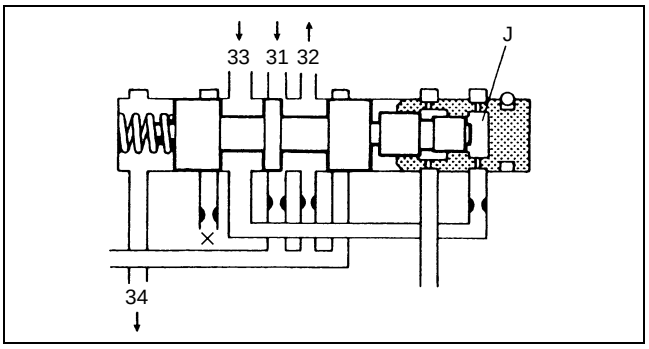
BCF5610A050

Torque converter clutch (TCC) engaged
Since the TCC solenoid valve does not generate pilot pressure (34), the pilot pressure provided from hydraulic passage (35) is applied to the pressure receiving differential surface portion of the TCC control valve, pressing the valve leftward. As a result, the torque converter pressure provided from hydraulic passage (31) flows from hydraulic passage (32) through torque converter chamber (R), and is applied to the engaging side of the TCC, causing the TCC to engage.



BCF5610A051

Smooth torque converter clutch (TCC) engaged
TCC solenoid output pressure (34) is gradually reduced. According to this, the valve moves to the left until torque converter pressure (33) is drained.
When TCC solenoid pressure (34) is further reduced, drain port opens to reduce torque converter pressure (33). Because torque converter pressure (33) is also applied to chamber (J) at the end of the plug, the valve adjusts (reduces) torque converter pressure (33) so that the pressure balances with the TCC solenoid output pressure (34). By reducing TCC solenoid output pressure (34) gradually, TCC release side torque converter pressure (33) is also reduce gradually, allowing smooth TCC engage.

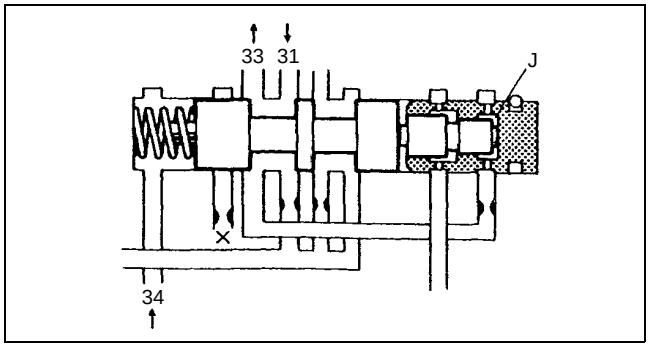


BCF5610A052

In P, R, or N position and 1GR (in D, S, or L range)

Pilot pressure (34), provided from shuttle shift valve D, is applied to the end of the torque converter clutch control valve to hold the valve to the right.

The torque converter pressure that provided from hydraulic path (31) is applied to chamber F via hydraulic path (33) and the damper piston is held to the release side.

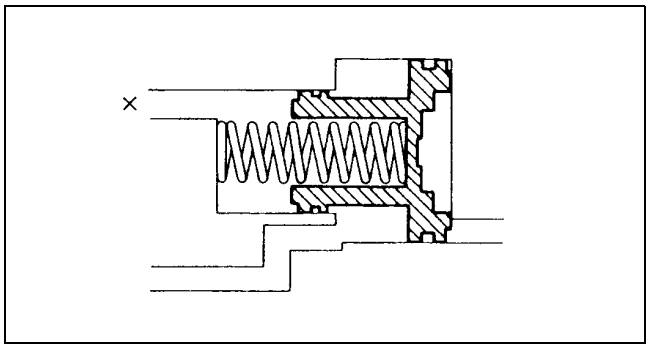


BCF5610A053

N-D Accumulator

Online

The N-D accumulator moderates the rapid increase in hydraulic pressure during forward clutch engagement. This reduces the shift shock generated when D range is selected from N position.

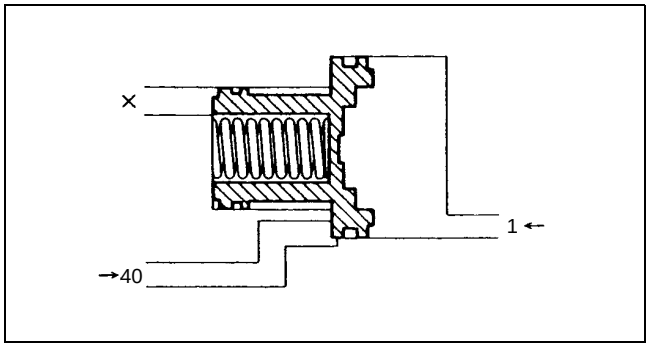


BCF5610A054

Operation

In N position, the spring force and the accumulator control pressure (40) are constantly applied to the left side of the piston, pushing it to the right side. This also occurs in other positions.

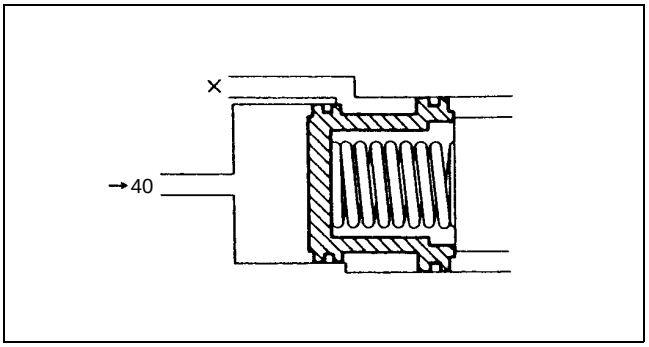
When D range is selected from N position, the line pressure (1) created by the manual valve is applied to the piston. Under this condition, line pressure (1) overcomes the combination of the spring force and the accumulator control pressure (40), moving the piston to the left side.



BCF5610A055

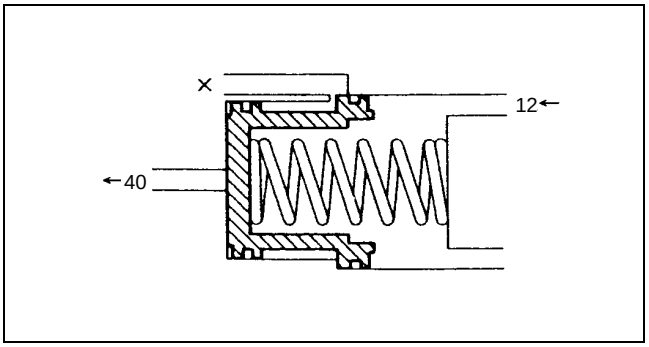
1-2 Accumulator
Outline
The 1-2 accumulator reduces shift shock by moderating the rapid increase in hydraulic pressure during 1-2 shifting when the brake band is applied.

Operation
In 1GR, the accumulator is pushed to the right side because the line pressure (40) is applied to it.
When shift solenoid A is turned OFF in order to shift into the 2GR, line pressure for brake band engage (12) is applied to the 1-2 accumulator by shift valve A.
When this line pressure (12) exceeds the specification, the piston moves to the left.



BCF5610A056

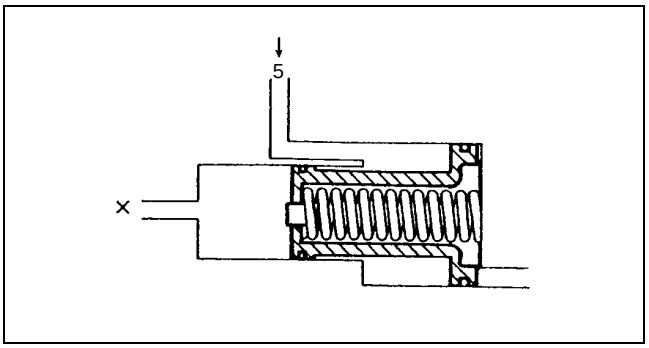
This piston movement prevents sharp increase in line pressure (12).



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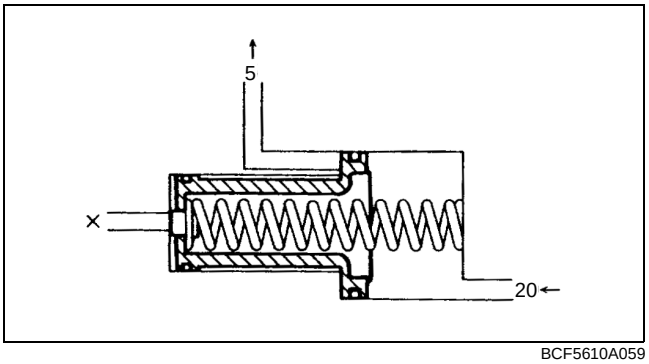
2-3 Accumulator
Outline
The 2-3 accumulator moderates the rapid increase in hydraulic pressure during brake band release. This reduces the shift shock generated during 2-3 shifting.

Operation
In 2GR, the line pressure (5) is applied to the left side of the 2-3 accumulator. The line pressure overcomes the spring force to move the piston to the right side. The same procedure occurs in 1GR.
When shift solenoid B is turned OFF in order to shift into the 3GR, line pressure for brake band release (20) is applied to the 2-3 accumulator by shift valve B.
When this line pressure (20) exceeds the specification, the piston moves to the left.



BCF5610A058

This piston movement prevents sharp increase in line pressure (12).



BCF5610A059

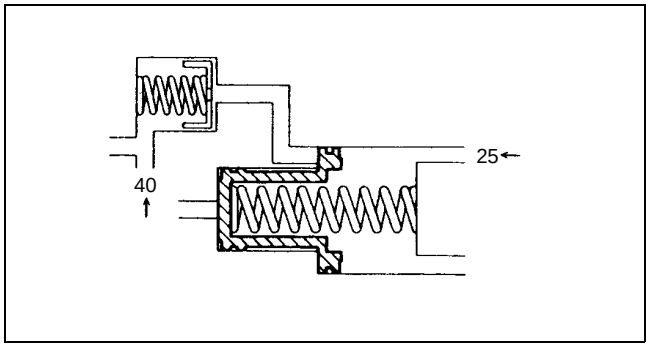
3-4/N-R Accumulator

Outline

The 3-4/N-R accumulator moderates the rapid increase in hydraulic pressure during brake band engagement and reverse clutch engagement. This reduces the shift shock generated during 3-4 shifting or N-R shifting.

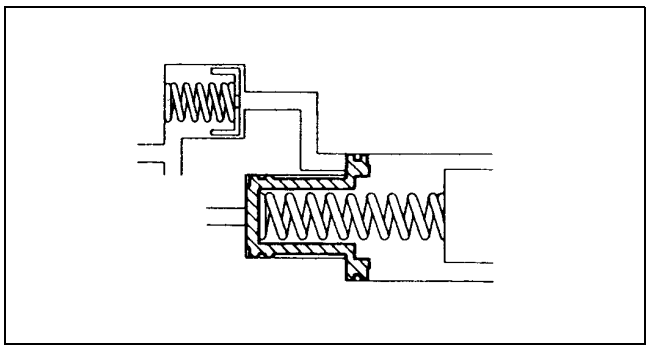
Operation

When shift solenoid A is turned ON in order to shift into the 4GR, line pressure for brake band engage (25) is applied to the 3-4/N-R accumulator.
When this line pressure (25) exceeds the specification, the piston moves to the left.



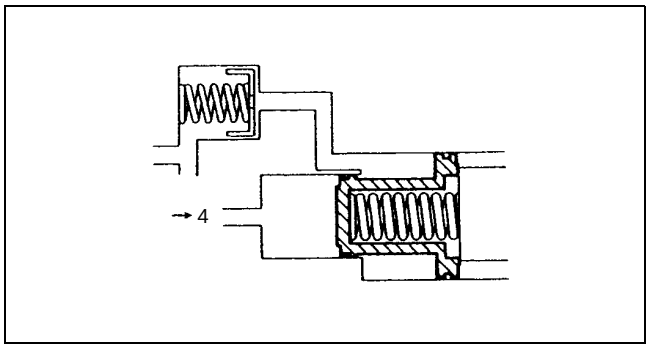
BCF5610A060

This piston movement prevents sharp increase in line pressure (25).
When in N position, spring force is always applied to the right side of the piston, pushing the piston to the left.
When the gear is shifted from N position to R position, line pressure for reverse clutch engage (4) is applied to the 3-4/N-R accumulator.



BCF5610A061

This line pressure (4) overcomes the spring force and moves the piston to the right.
This piston movement prevents sharp increase in line pressure (25).



BCF5610A062

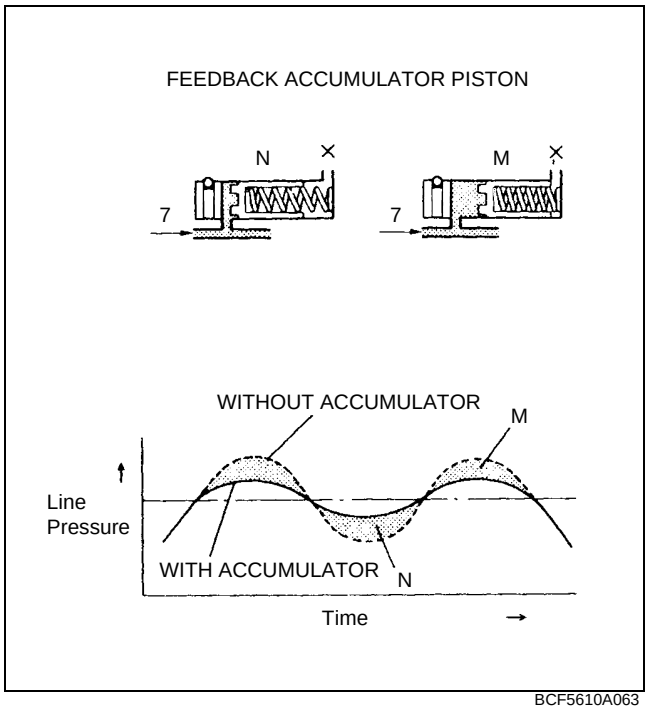
Feedback Accumulator Piston

Outline

The feedback accumulator piston prevents line pressure pulsation by stabilizing feedback pressure adjusted by pressure regulator valve.

Operation

The feedback accumulator piston is supplied with the spring force which pushes the piston to the left, and feedback pressure (7) which pushes the piston to the right.
When the pressure is high, the piston moves to the right to absorb the pressure as indicated by (M).
When the pressure in low, the piston moves to the left to compensate the pressure as indicated by (N).
Pulsating feedback pressure (7) is thus flattened to prevent the line pressure from oscillating.

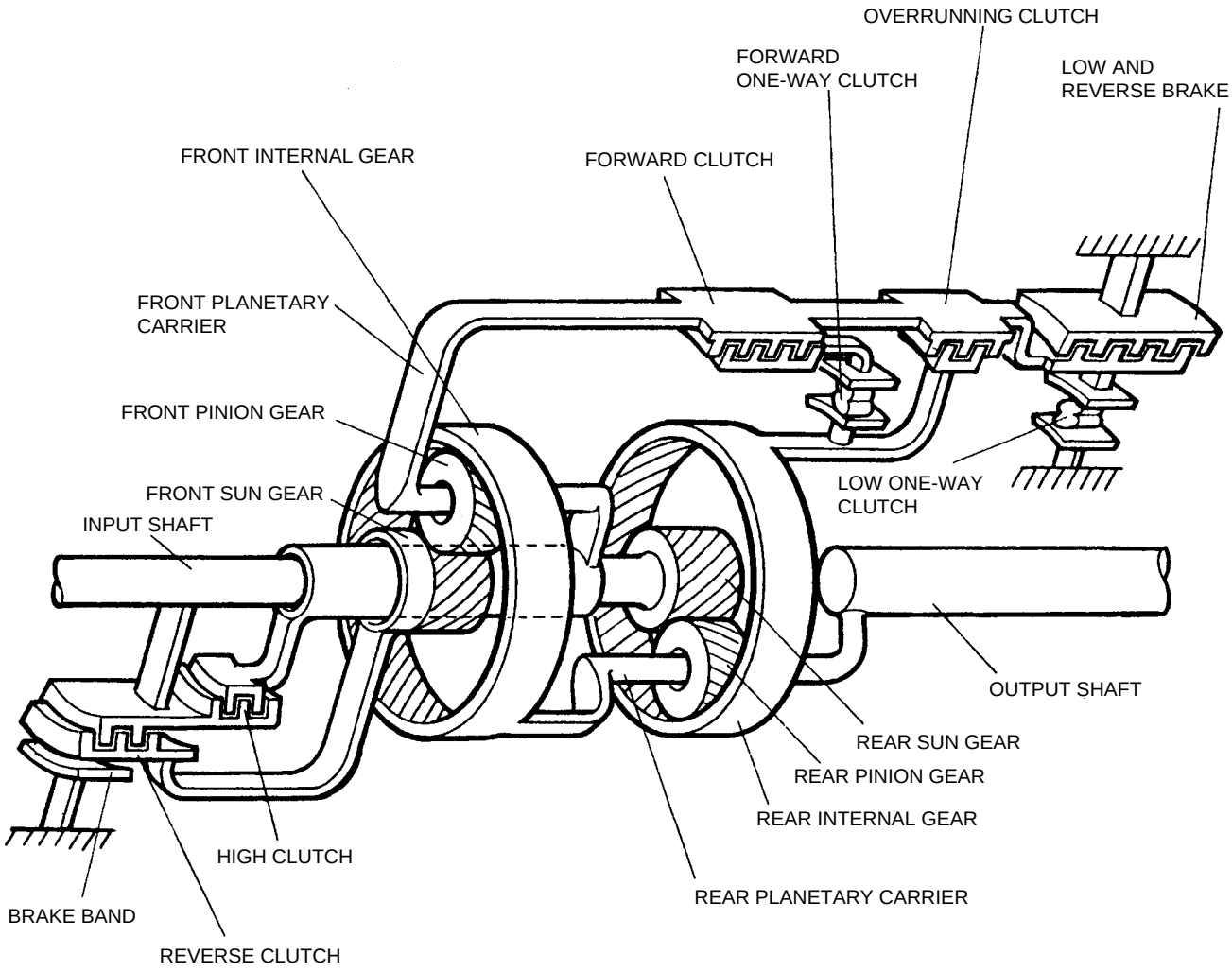


BCF5610A063

P POSITION, N POSITION

CBG561000000A09

The driving force of the input shaft is transmitted to the high clutch drum. None of the clutches are operating, however, so this force is not transmitted to the output shaft. Therefore, the vehicle cannot move. The output shaft is locked because the parking gear is mechanically locked by the parking pawl (in P position).

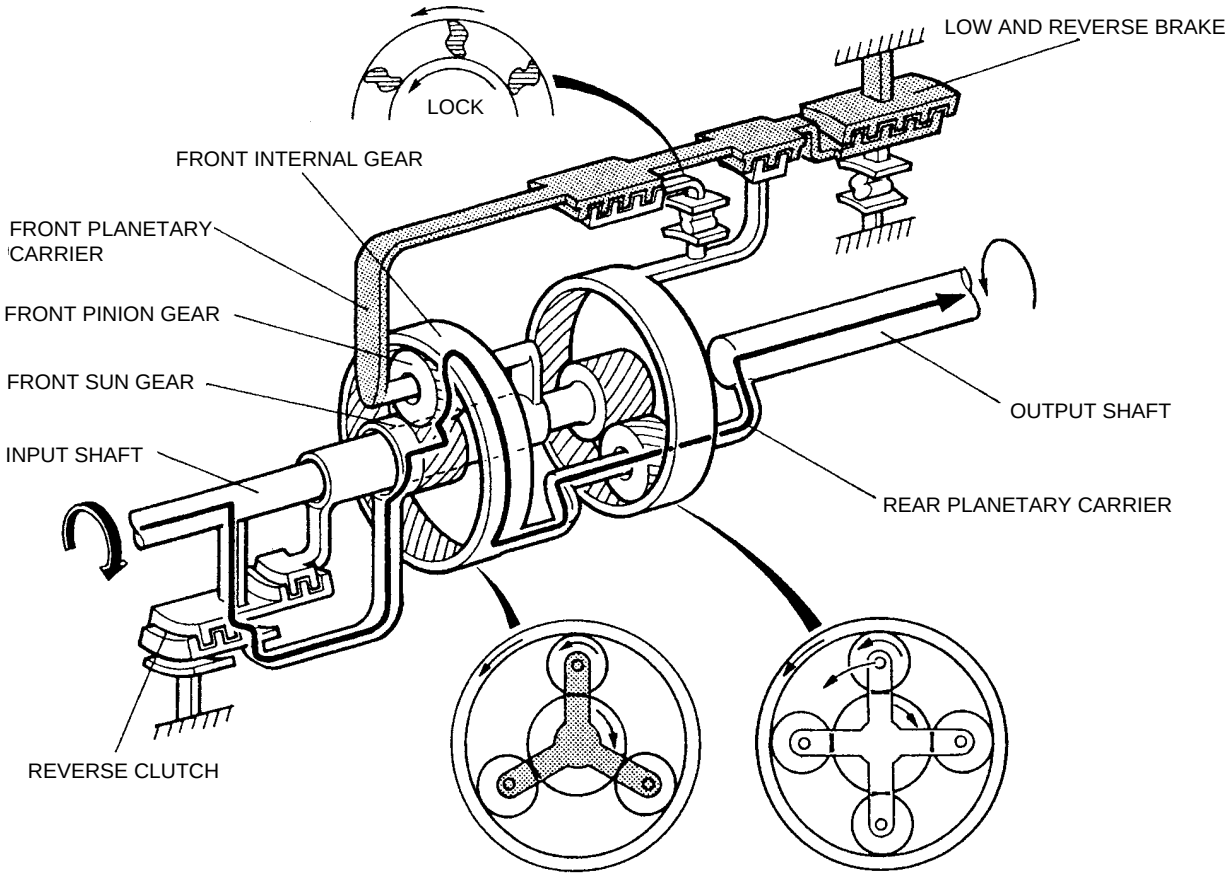


BCF5610A064

R POSITION

CBG561000000A10

The driving force of the input shaft is transmitted to the high clutch drum, and then to the front sun gear through the reverse clutch, causing the front sun gear to rotate clockwise. The front pinion gear, however, does not revolve around the front sun gear because the planetary carrier is locked by the low and reverse brake. As a result, the front internal gear rotates counterclockwise due to the rear planetary carrier set operation, and the driving force is transmitted to the driving wheels.



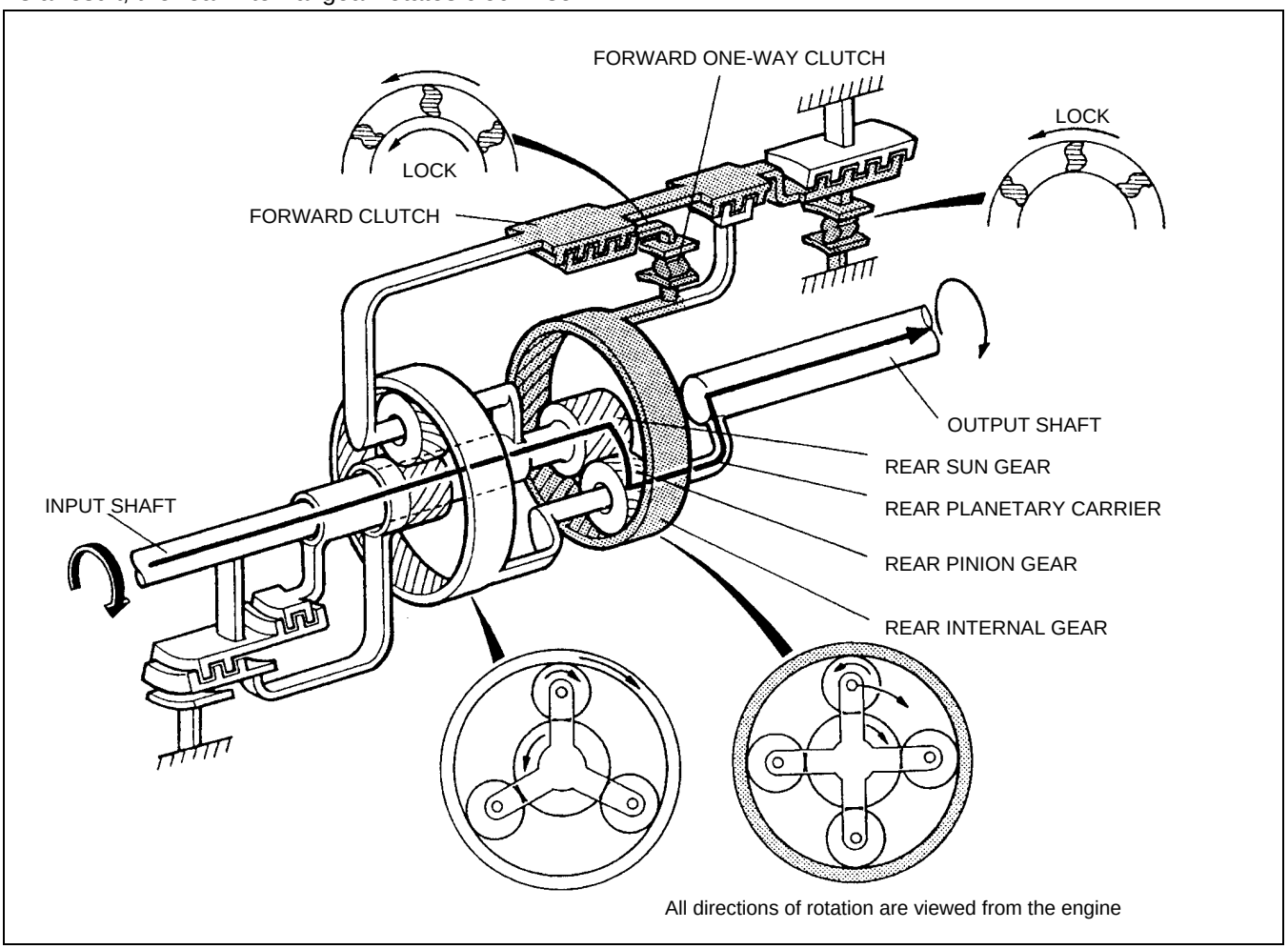
All directions of rotation are viewed from the engine

BCF5610A065

FIRST GEAR

CBG561000000A11

The driving force of the input shaft is transmitted to the rear sun gear, causing the rear pinion gear to rotate counterclockwise. As a result, the front internal gear also tries to turn counterclockwise but is prevented from doing so due to the action of the forward one-way clutch, forward clutch and overrunning clutch on the low one-way clutch.
As a result, the rear pinion gear rotates clockwise due to the rear planetary carrier set operation, and the driving force is transmitted to the driving wheels. During deceleration, the rear sun gear rotates at a higher speed that the rear planetary carrier, causing low one-way clutch to freewheel.
As a result, the rear internal gear rotates clockwise.

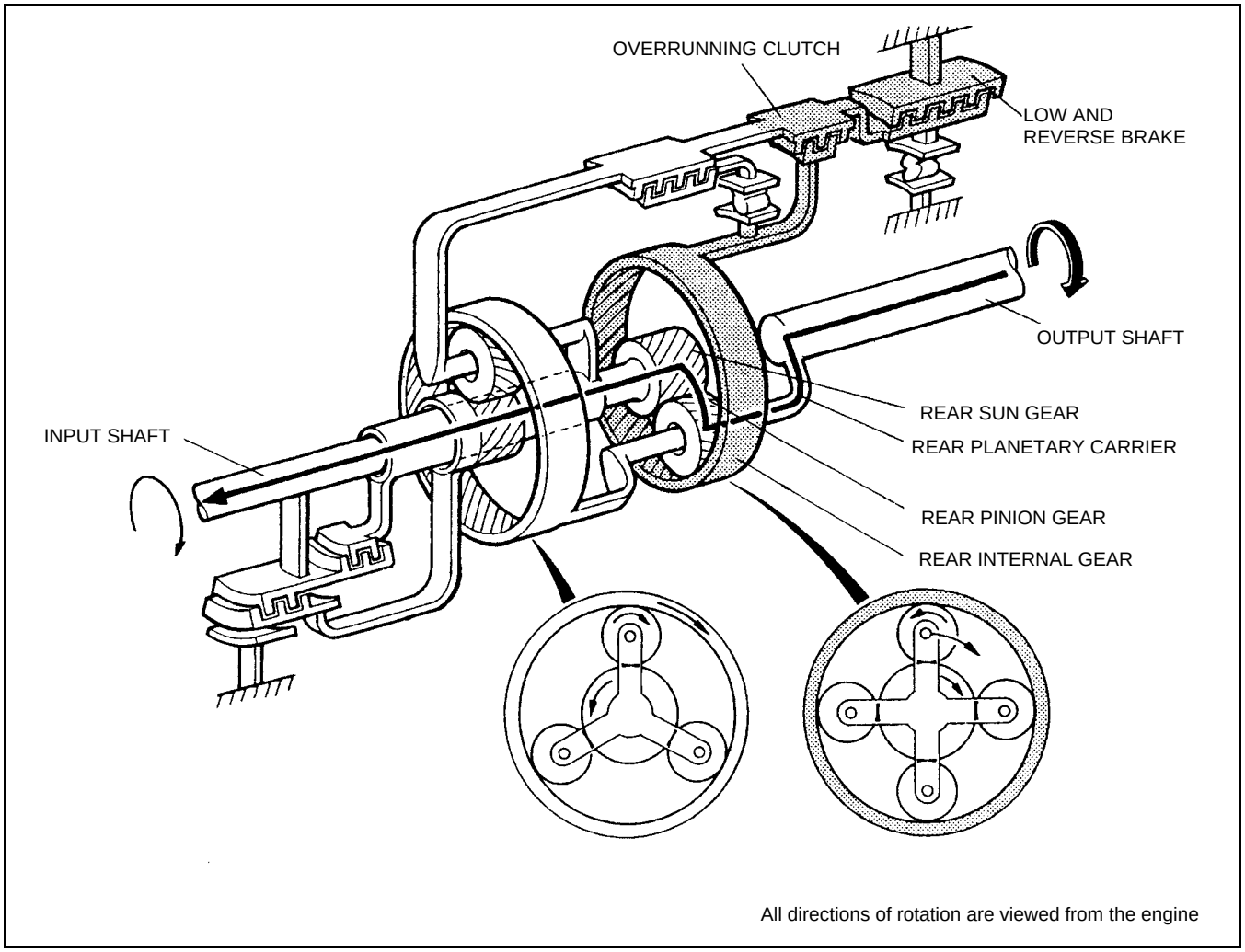


BCF5610A066

FIRST GEAR (ENGINE BRAKING)

CBG561000000A12

The driving force of the input shaft is transmitted to the rear sun gear, causing the rear pinion gear to rotate counterclockwise. However, the internal gear does not rotate because it is locked by the overrunning clutch and low and reverse brake.
As a result, the rear pinion gear rotates clockwise due to the rear planetary gear set operation, and the driving force is transmitted to the driving wheels.
The driving force during deceleration actuates the engine brake and is transmitted in the opposite direction during acceleration.

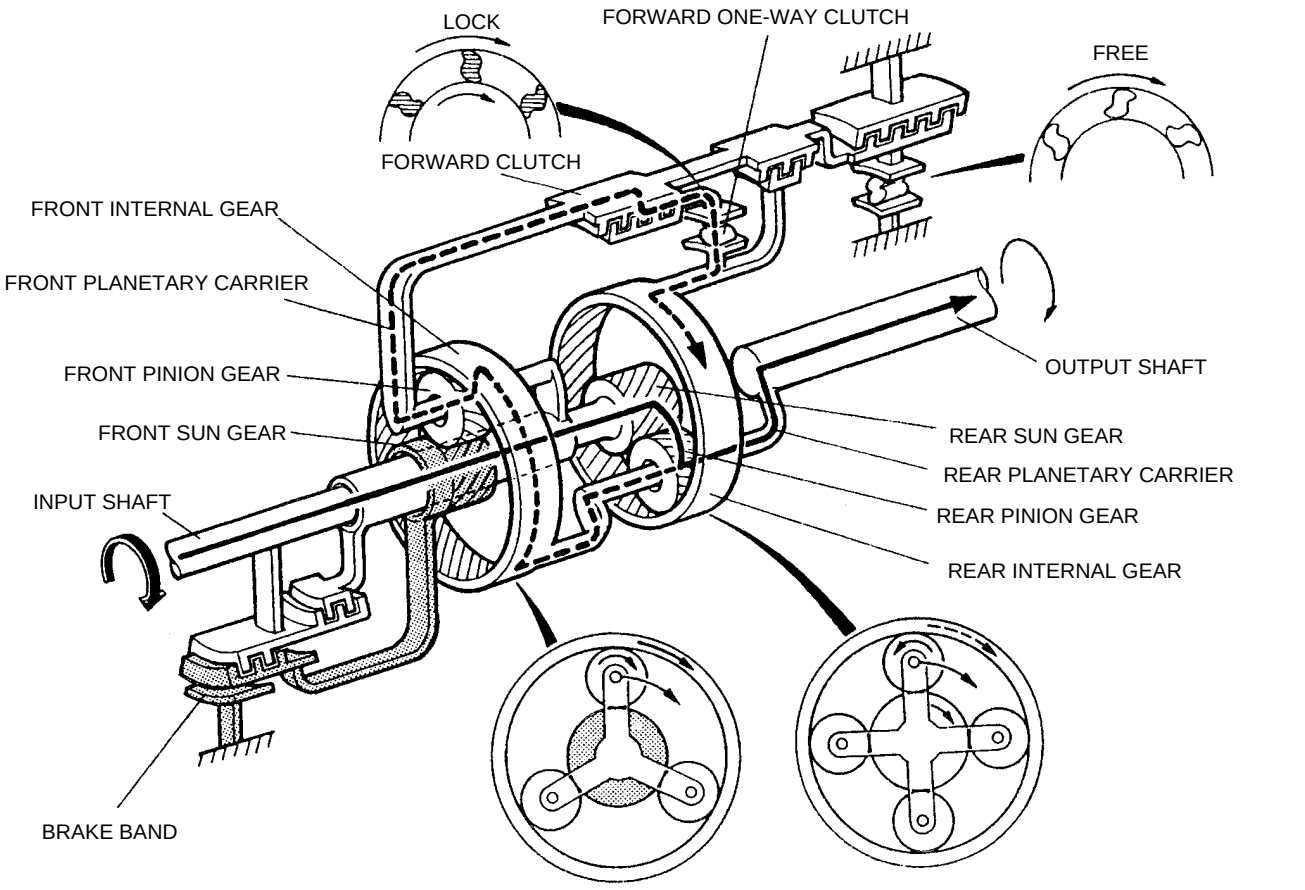


BCF5610A067

SECOND GEAR

CBG561000000A13

The driving force of the input shaft is transmitted to the rear sun gear, causing the rear pinion gear to rotate counterclockwise and as in 1GR, also causes the rear planetary gear to rotate clockwise. The front internal gear rotates clockwise together with the rear planetary gear. Because the front sun gear is locked by the brake band, the front pinion gear rotates clockwise on its own axis and the front planetary carrier also rotates clockwise. This driving force is transmitted to the forward clutch and the forward one-way clutch before causing the rear internal gear to rotate clockwise. As a result, the rotational speed (driving force) of the rear planetary gear is transmitted to the driving wheels. This rotational speed increases because the rear internal gear rotates faster than when in 1GR. During deceleration, the rear sun gear rotates at a higher speed that the rear planetary carrier, causing forward one-way clutch to freewheel.
As a result, the rear internal gear rotates clockwise.



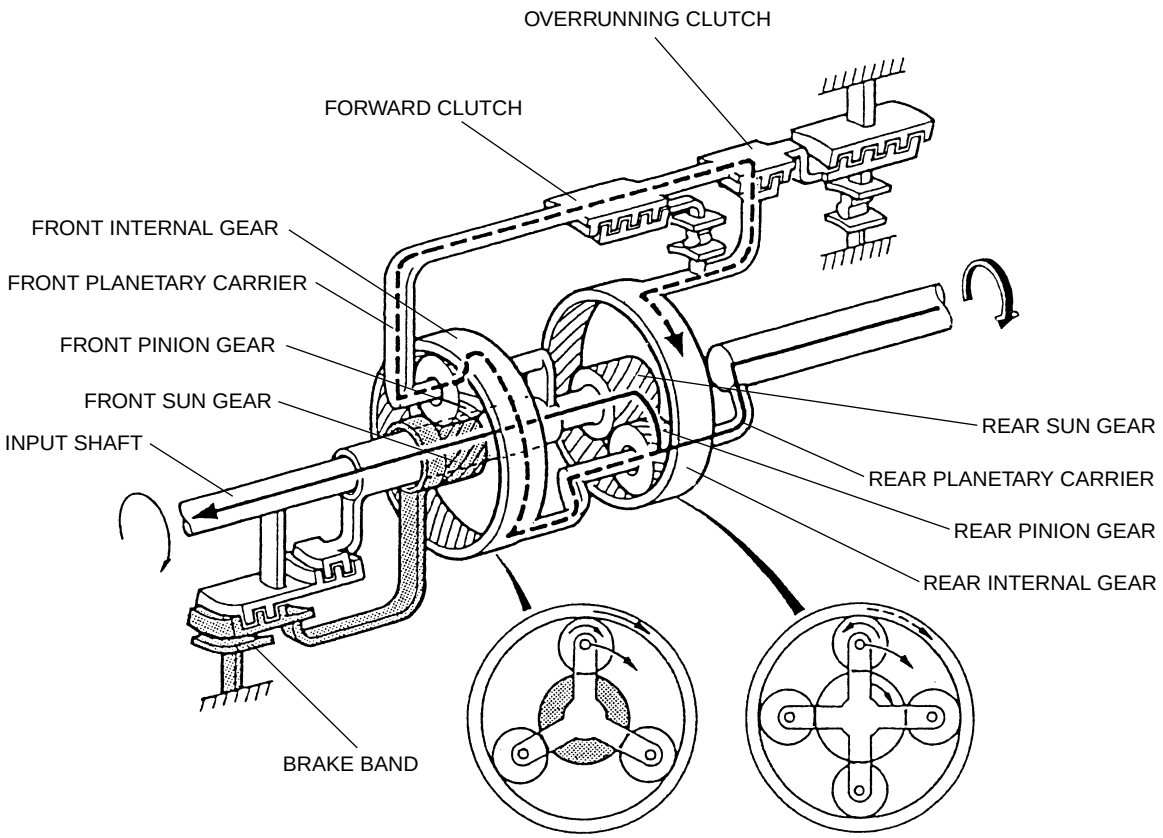
BCF5610A068

SECOND GEAR (ENGINE BRAKING)

CBG561000000A14

The driving force of the input shaft is transmitted to the rear sun gear, causing the rear pinion gear to rotate counterclockwise and as in 1GR, also causes the rear planetary gear to rotate clockwise. The front internal gear rotates clockwise together with the rear planetary gear. Because the front sun gear is locked by the brake band, the front pinion gear rotates clockwise on its own axis and the front planetary carrier also rotates clockwise. This driving force is transmitted to the forward clutch, forward one-way clutch and the overrunning clutch before causing the rear internal gear to rotate clockwise. As a result, the rotational speed (driving force) of the rear planetary gear is transmitted to the driving wheels. This rotational speed increases because the rear internal gear rotates faster than when in 1GR.

During deceleration, engine braking in obtained when the overrunning clutch is engaged.



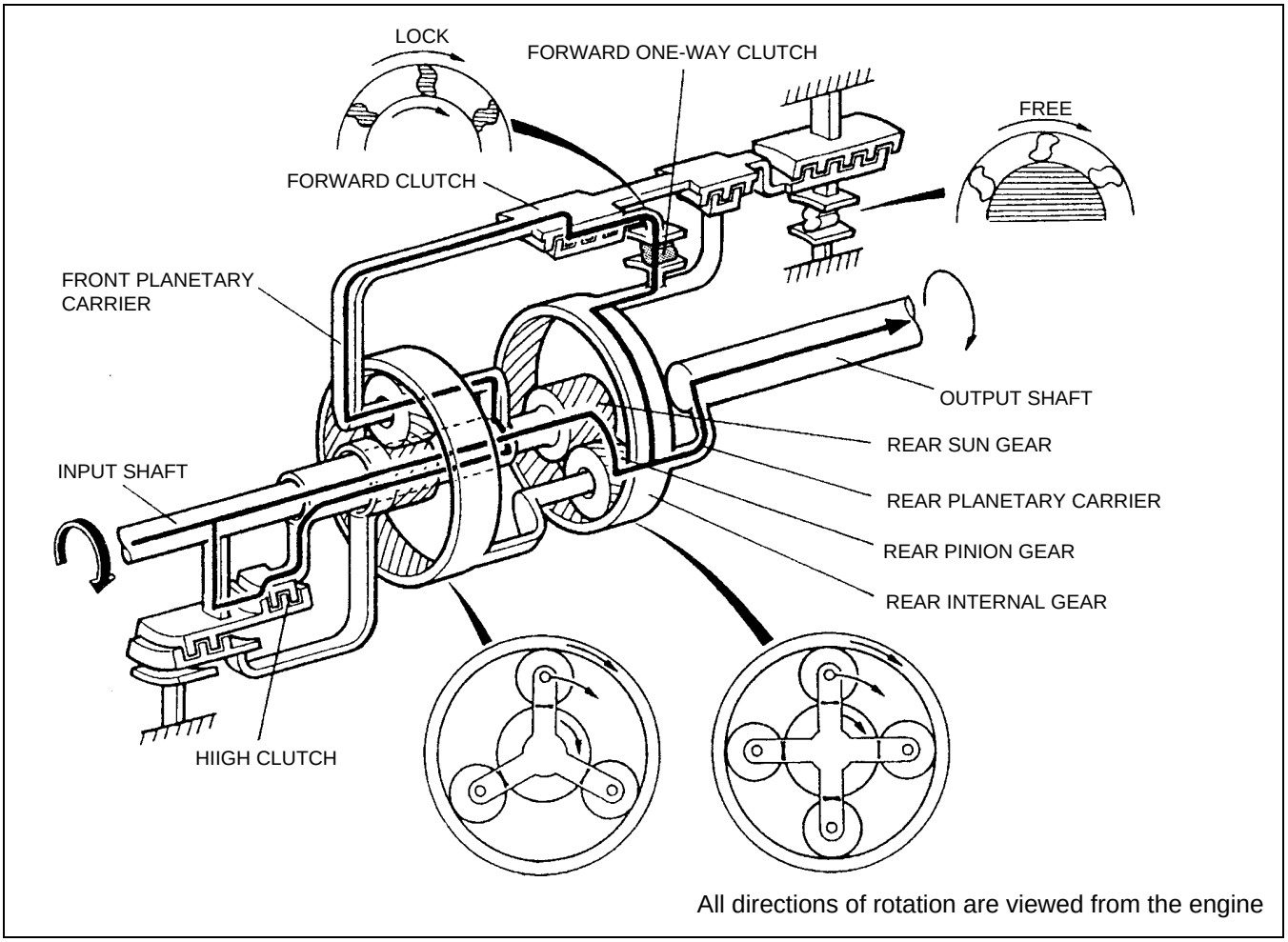
All directions of rotation are viewed from the engine

BCF5610A702

THIRD GEAR

CBG561000000A15

The driving force of the input shaft is transmitted to the high clutch drum, causing the front planetary carrier to rotate clockwise.
This driving force is also transmitted to the rear internal gear through the forward clutch, forward one-way clutch and overrunning clutch making it rotate clockwise.
The rear sun gear and rear internal gear rotate at the same speed, and so the rear pinion gear, which rotates with them as a until instead of on its own axis, transmits the driving force to the driving wheels.
During deceleration, the rear sun gear rotates at a higher speed that the rear planetary carrier, causing forward one-way clutch to freewheel.
As a result, the rear internal gear rotates clockwise.

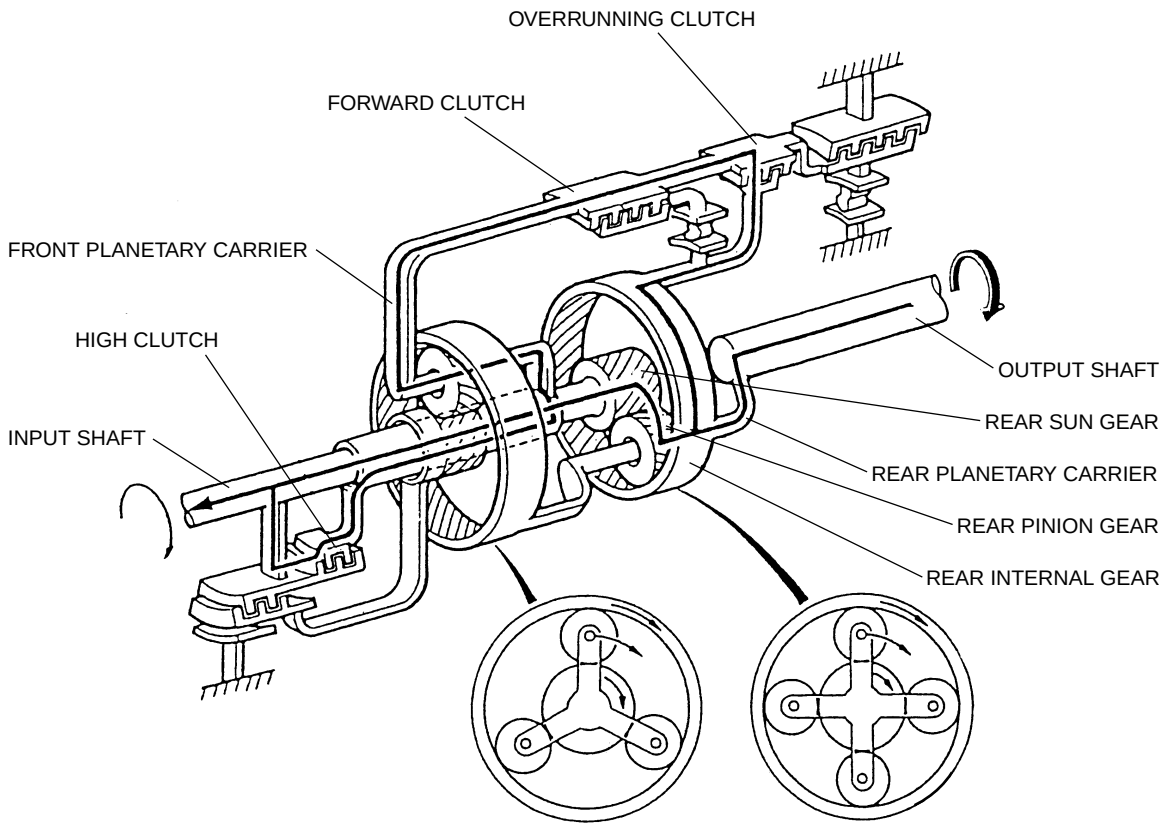


BCF5610A069

THIRD GEAR (ENGINE BRAKING)

CBG561000000A16

The driving force of the input shaft is transmitted to the high clutch drum, causing the front planetary carrier to rotate clockwise.
This driving force is also transmitted to the rear internal gear through the forward clutch, forward one-way clutch and overrunning clutch making it rotate clockwise.
The rear sun gear and rear internal gear rotate at the same speed, and so the rear pinion gear, which rotates with them as a until instead of on its own axis, transmits the driving force to the driving wheels. During deceleration, engine braking is obtained when the overrunning clutch is engaged.



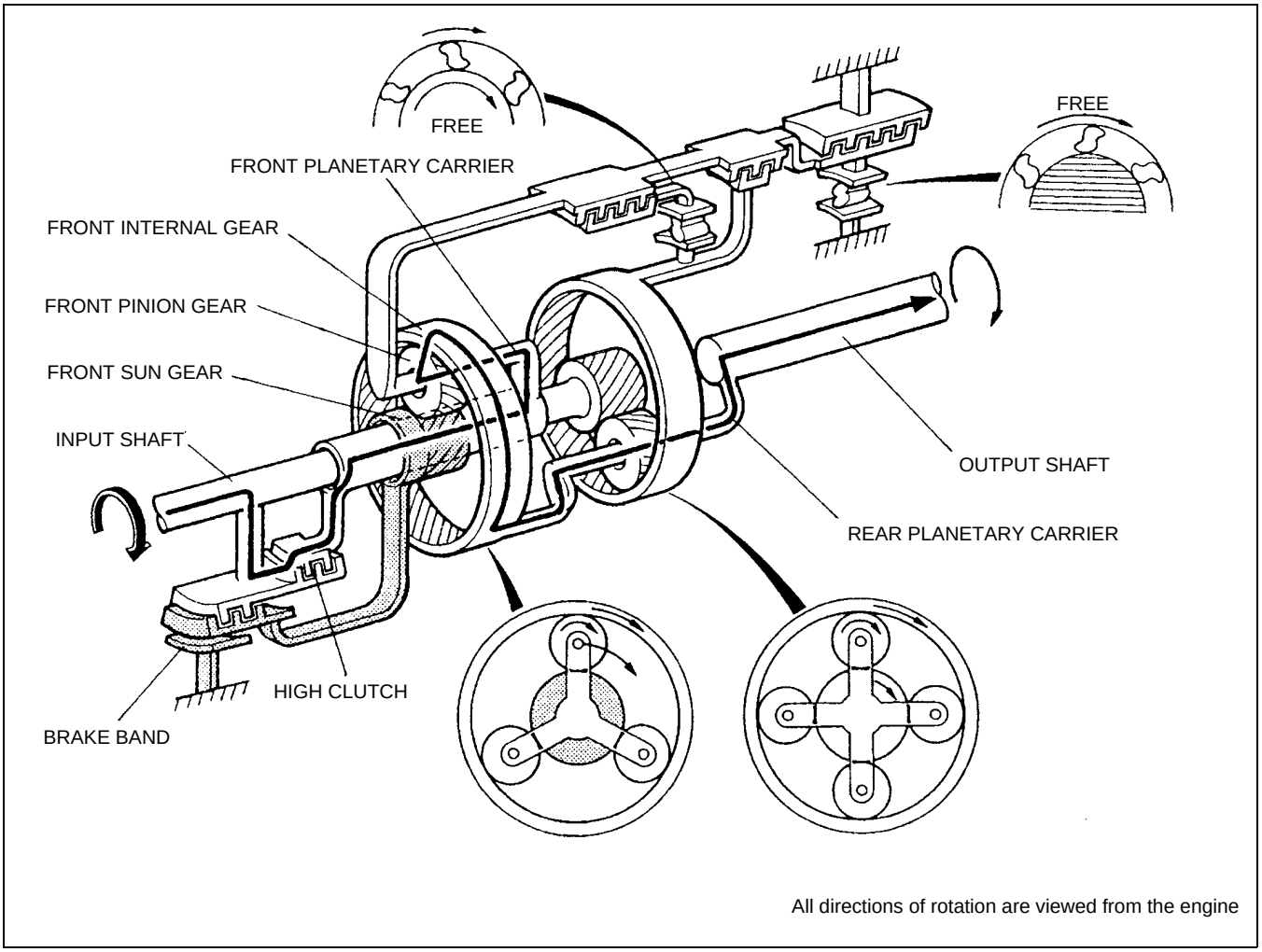
All directions of rotation are viewed from the engine

BCF5610A701

FOURTH GEAR (D RANGE, TCC NON-OPERATION)

CBG561000000A17

The driving force of the input shaft is transmitted to the front planetary gear via the high clutch, causing it to rotate clockwise.
As a result, the front pinion gear rotates clockwise. This rotation causes the front internal gear to rotate at an increased speed and the rear planetary carrier to rotate clockwise. The driving force of the rear planetary carrier, whose speed has also been increased, is transmitted to the driving wheels. The driving force during deceleration actuates the engine brake and is transmitted in the opposite direction during acceleration.

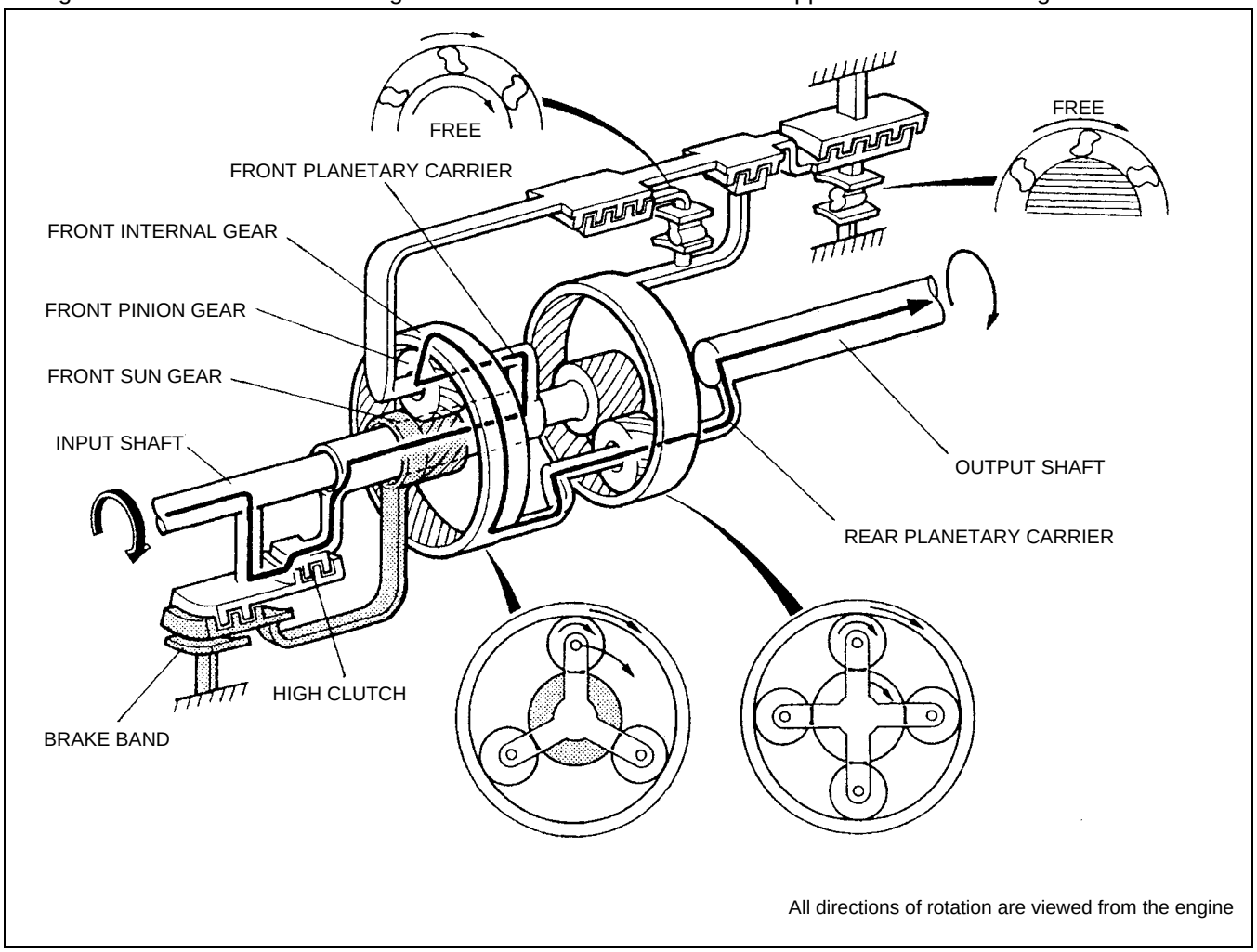


BCF5610A071

FOURTH GEAR (D RANGE, TCC OPERATION)

CBG561000000A18

The driving force of the input shaft is transmitted to the front planetary via the high clutch, causing it to rotate clockwise. The front sun gear, however, is locked by the brake band and thus does not rotate. As a result, the front pinion gear rotates clockwise. This rotation causes the front internal gear to rotate at an increased speed and the rear planetary carrier, whose speed has also been increased, is transmitted to the driving wheels. The driving force during deceleration actuates the engine brake and is transmitted in the opposite direction during acceleration.



BCF5610A071

AUTOMATIC TRANSMISSION (RA4AX–EL)

AUTOMATIC TRANSMISSION K1-2
TRANSMISSION UNIT DISASSEMBLY K1-2
TORQUE CONVERTER INSPECTION K1-13
TORQUE CONVERTER CLEANING K1-13
ACCUMULATOR DISASSEMBLY/ASSEMBLY K1-14
OIL PUMP DISASSEMBLY/ASSEMBLY K1-16
REVERSE CLUTCH PREINSPECTION K1-20
REVERSE CLUTCH DISASSEMBLY/ASSEMBLY K1-21
HIGH CLUTCH AND FRONT SUN GEAR PREINSPECTION K1-26
HIGH CLUTCH AND FRONT SUN GEAR DISASSEMBLY/ASSEMBLY K1-27
BAND SERVO PREINSPECTION K1-31
BAND SERVO DISASSEMBLY/ASSEMBLY K1-32
FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB PREINSPECTION K1-36
FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB DISASSEMBLY/ASSEMBLY K1-36
FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH) PREINSPECTION K1-38
FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH) DISASSEMBLY/ASSEMBLY K1-39
LOW AND REVERSE BRAKE PREINSPECTION K1-48
LOW AND REVERSE BRAKE DISASSEMBLY/ASSEMBLY K1-49
ADAPTER CASE/PARKING MECHANISM DISASSEMBLY/ASSEMBLY K1-54
CONTROL VALVE BODY DISASSEMBLY K1-57
UPPER VALVE BODY DISASSEMBLY/ASSEMBLY K1-61
LOWER VALVE BODY DISASSEMBLY/ASSEMBLY K1-68
CONTROL VALVE BODY ASSEMBLY K1-71
TRANSMISSION UNIT ASSEMBLY K1-76

AUTOMATIC TRANSMISSION

TRANSMISSION UNIT DISASSEMBLY

CBG571000000A01

Transmission Unit Disassembly Precaution

Warning

- **A hot transmission and ATF can cause severe burns. Turn off the engine and wait until they are cool before replacing ATF.**
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution

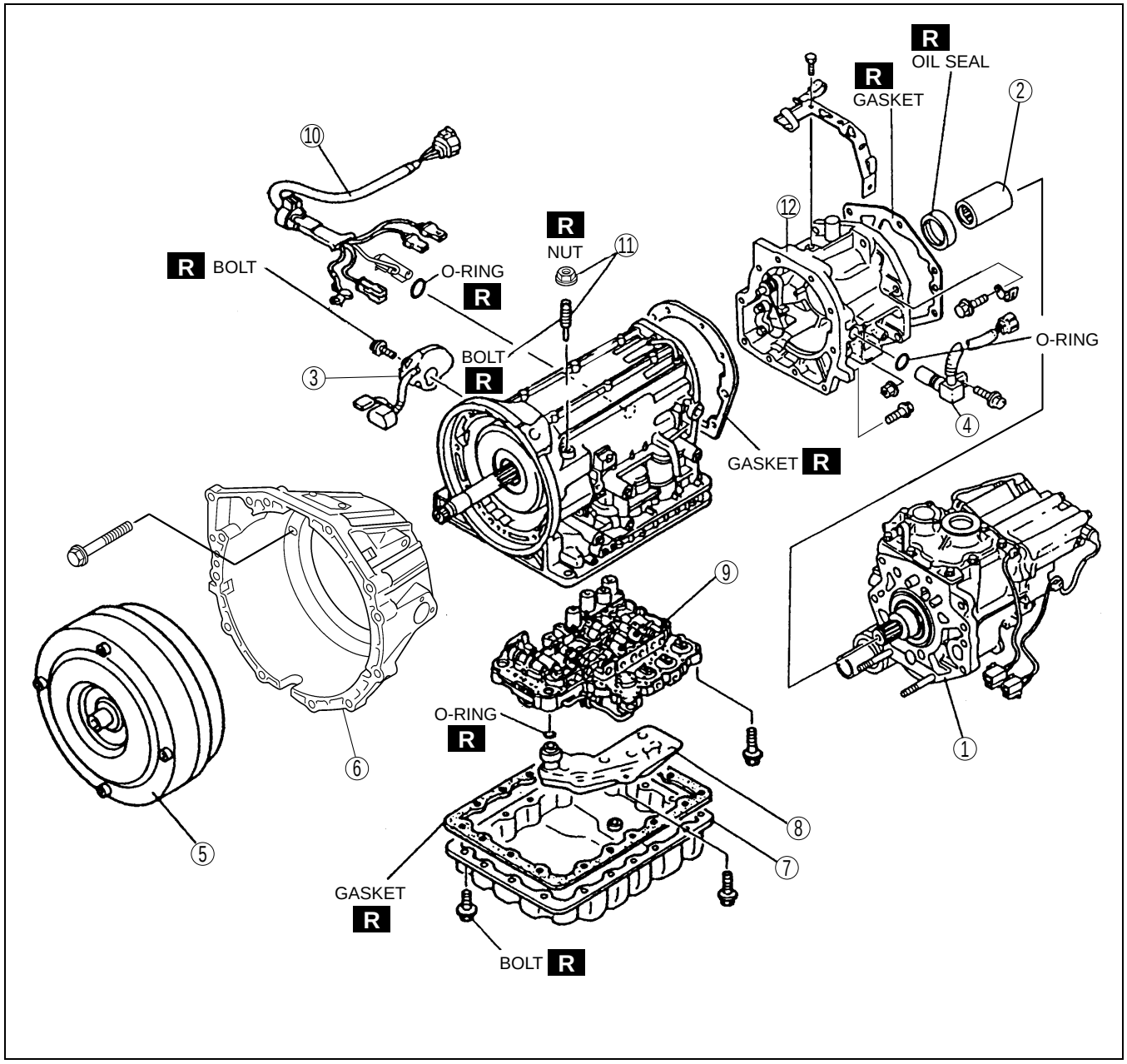
- **Clean the transmission exterior thoroughly with a stream cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transmission during installation of the oil pan, trouble may occur in the transmission case and oil pan. Clean with cleaning fluids.**

1. Disassemble the transmission in a clean area (clean work space) to prevent contaminants from entering into the mechanisms.
2. Use only plastic hammers when applying force to separate the light alloy case joints.
3. Never use rags during disassembly; they may leave particles that can clog fluid passages.
4. Several parts resemble one another; organize them so that they do not get mixed up.
5. Disassemble the control valve assembly and thoroughly clean it when the clutch or brake band has burned out or when the ATF has degenerated.
6. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvent, or both, before disassembly.
7. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and check that there are no obstructions.

Transmission Unit Disassembly

1. Disassemble in the order indicated in the table.

Components 1

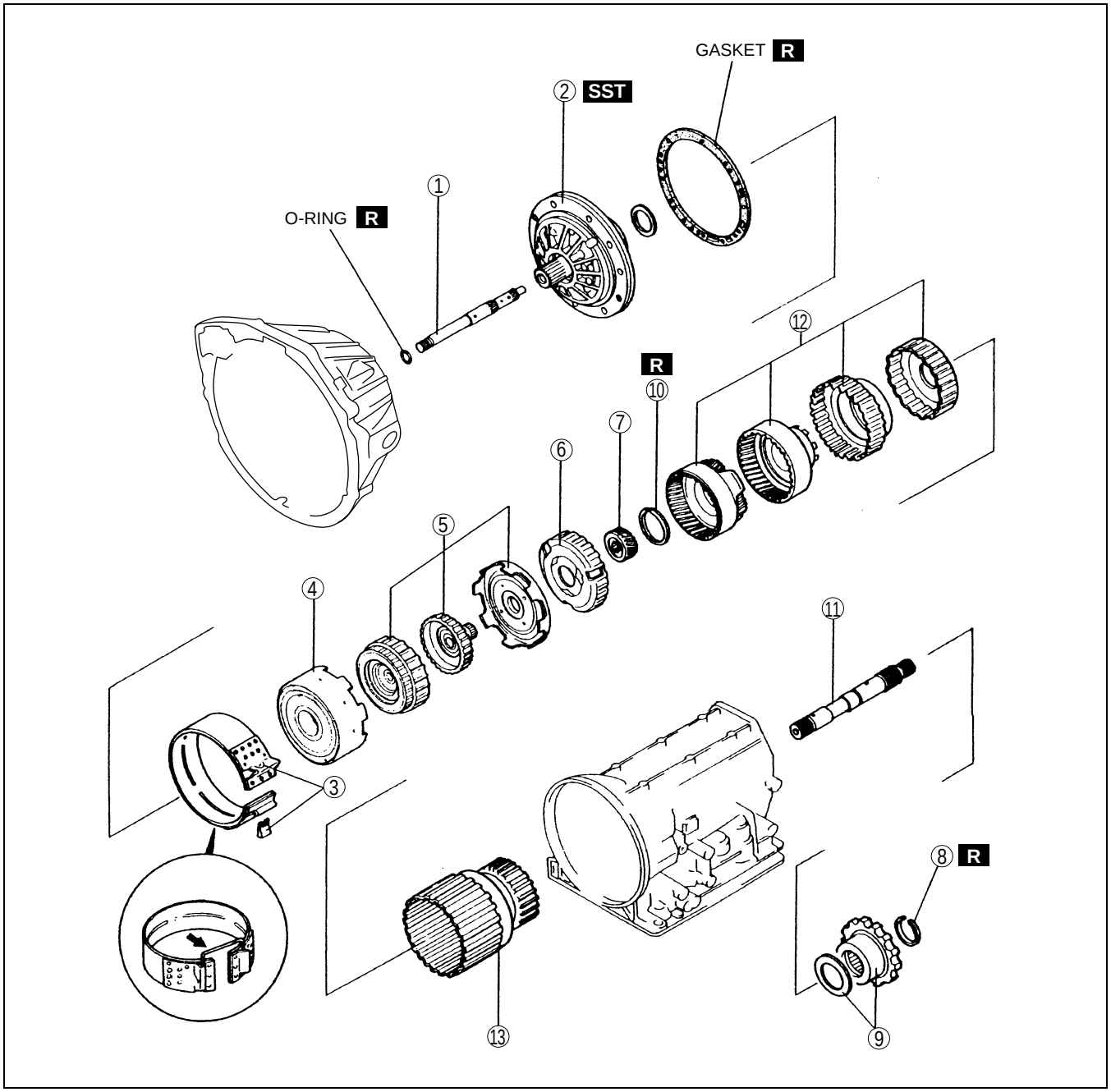


BCF5610A101

1	Transfer
2	Input sleeve
3	TR switch
4	Output speed sensor
5	Torque converter
6	Converter housing
7	Oil pan
8	Oil strainer

9	Control valve body (See K1–57 CONTROL VALVE BODY DISASSEMBLY.)
10	Solenoid valve harness
11	Anchor end bolt and nut
12	Adapter case/parking mechanism (See K1–54 ADAPTER CASE/PARKING MECHANISM DISASSEMBLY/ASSEMBLY.)

Components 2

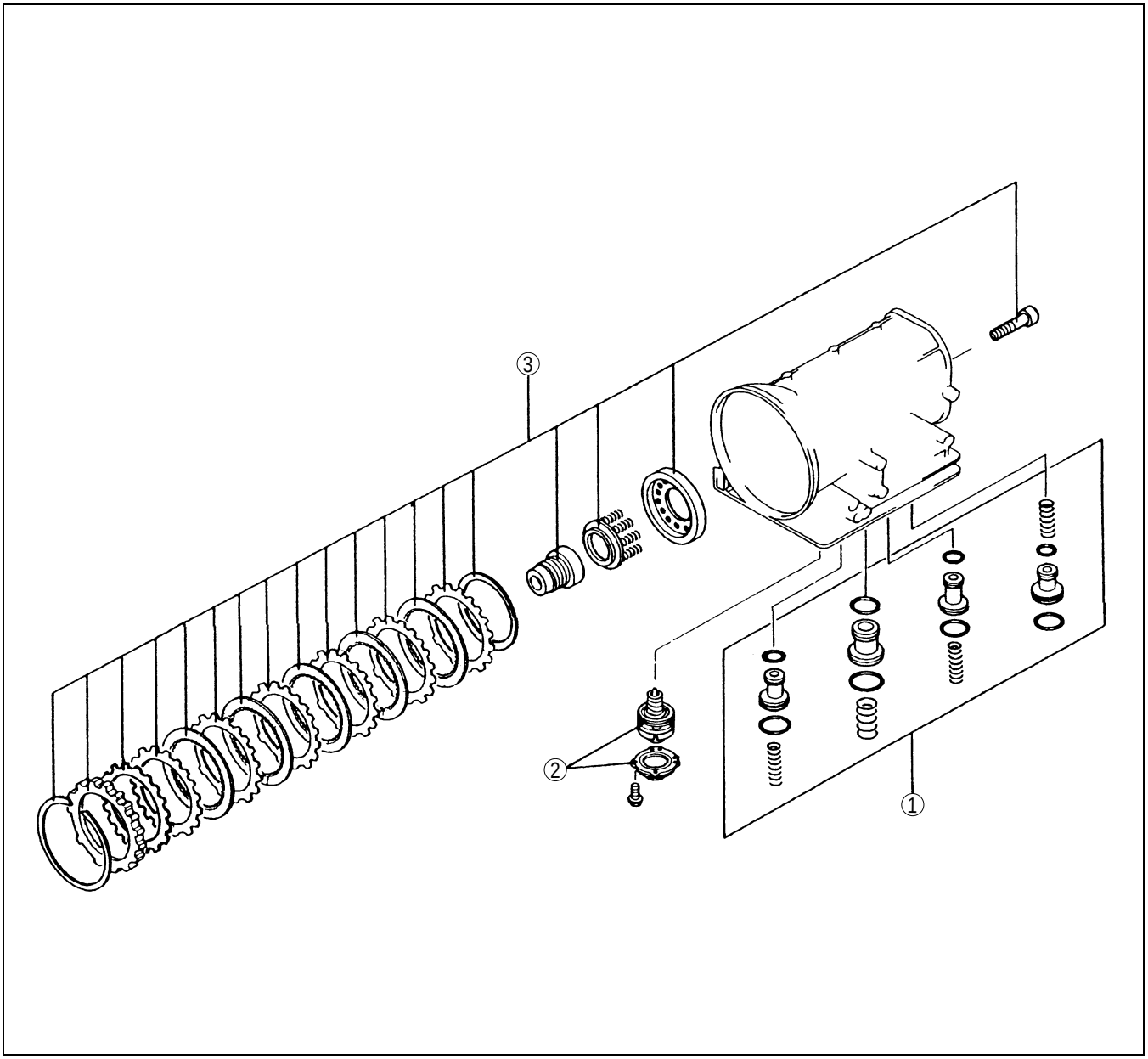


BCF5610A102

1	Input shaft
2	Oil pump (See K1–16 OIL PUMP DISASSEMBLY/ ASSEMBLY.)
3	Brake band and strut
4	Reverse clutch (See K1–21 REVERSE CLUTCH DISASSEMBLY/ ASSEMBLY.)
5	High clutch and front sun gear (See K1–27 HIGH CLUTCH AND FRONT SUN GEAR DISASSEMBLY/ASSEMBLY.)
6	Front planetary carrier
7	Rear sun gear
8	Snap ring

9	Parking gear and bearing
10	Snap ring
11	Output shaft
12	Front internal gear, rear internal gear, forward clutch hub, overrunning clutch hub (See K1–36 FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB DISASSEMBLY/ ASSEMBLY.)
13	Forward clutch drum (forward clutch, overrunning clutch, low one-way clutch) (See K1–39 FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH) DISASSEMBLY/ ASSEMBLY.)

Components 3

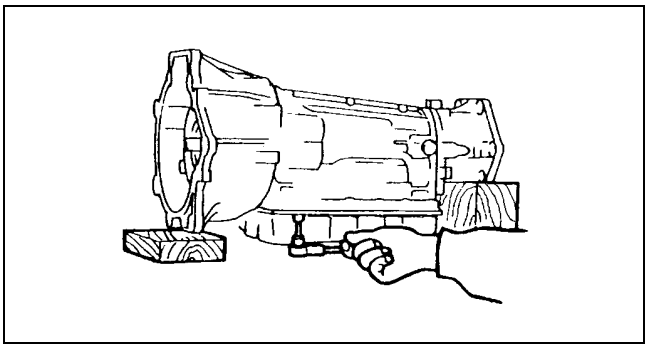


BCF5610A103

1	Accumulator spring and piston (See K1–14 ACCUMULATOR DISASSEMBLY/ ASSEMBLY.)
2	Band servo (See K1–32 BAND SERVO DISASSEMBLY/ ASSEMBLY.)
3	Low and reverse brake piston and spring (See K1–49 LOW AND REVERSE BRAKE DISASSEMBLY/ASSEMBLY.)

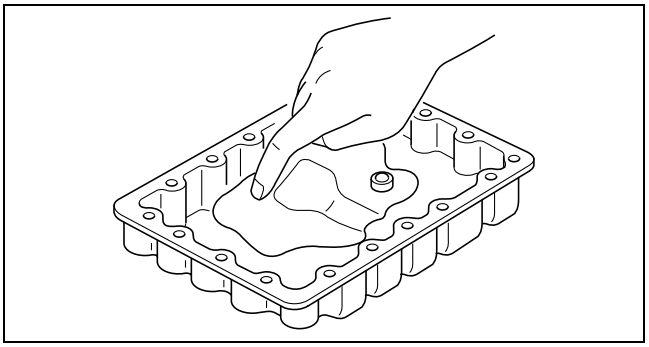
Transmission unit disassembly procedure

1. Support the transmission by placing wooden blocks under the converter housing and the adapter case.
2. Remove the oil pan and gasket. If large amounts of material are found in the oil pan, replace the torque converter and inspect the transmission for the cause.

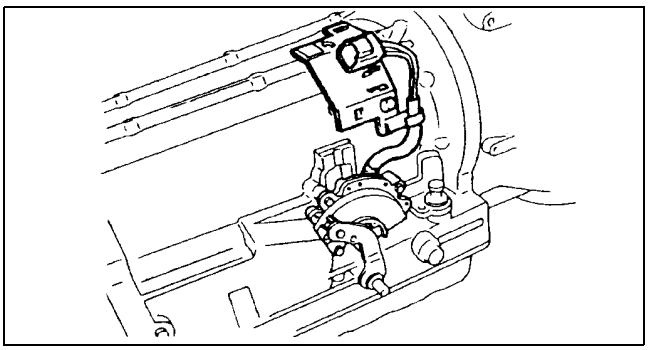


BCF5610A104

3. Examine any material found in the pan or on the magnet to determine the condition of the transmission.
   (1) Clutch facing material
      - Drive plate and brake band wear
   (2) Steel (magnetic)
      - Bearing, gear, and driven plate wear
   (3) Aluminum (nonmagnetic)
      - Bushings or cast aluminum parts wear
4. Install the oil pan with a new bolts to protect the control valve body.
5. Remove the connector bracket from the transmission case.
6. Remove the TR switch.
7. Disconnect the harness from the connector bracket.

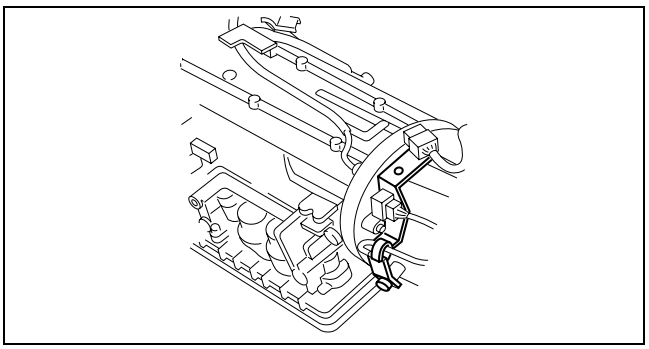


BCF5610A381



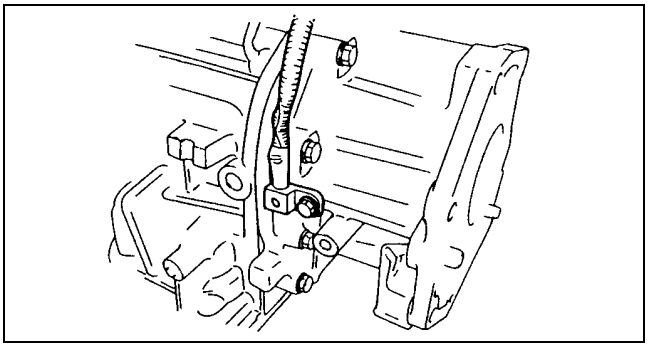
BCF5610A106

8. Remove the connector bracket from the adapter case.



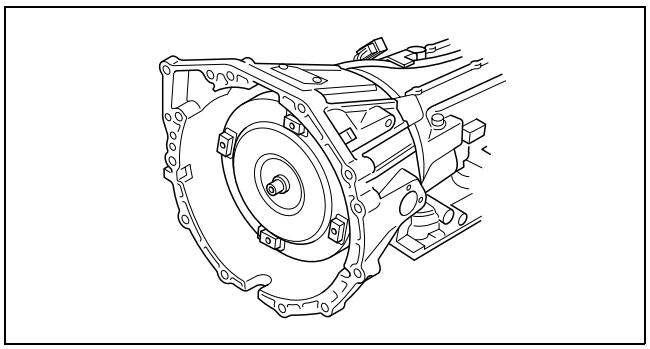
BCF5610A500

9. Remove the output speed sensor.
10. Remove the O-ring from the output speed sensor.



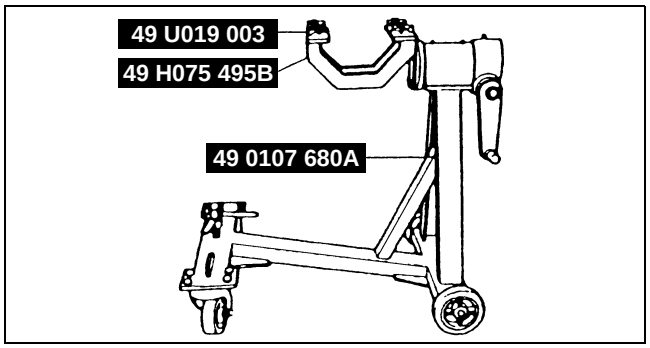
BCF5610W018

11. Remove the torque converter, and immediately turn it so that the hole faces upward. This will help to keep any remaining fluid from spilling. Inspect and replace the torque converter as necessary. (See K1–13 TORQUE CONVERTER INSPECTION.)



BCF5610A109

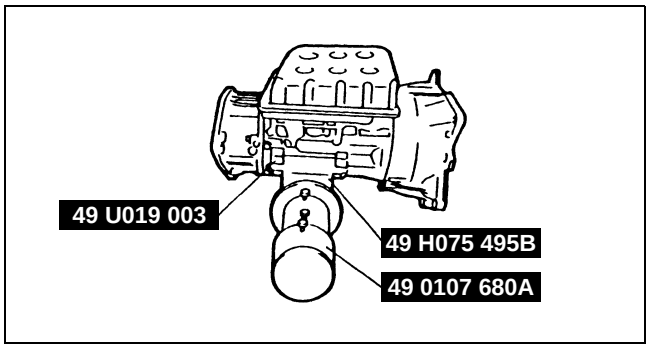
12. Assemble the **SSTs** as shown in the figure.
13. Mount the transmission to the **SSTs**.



BCF5610A110

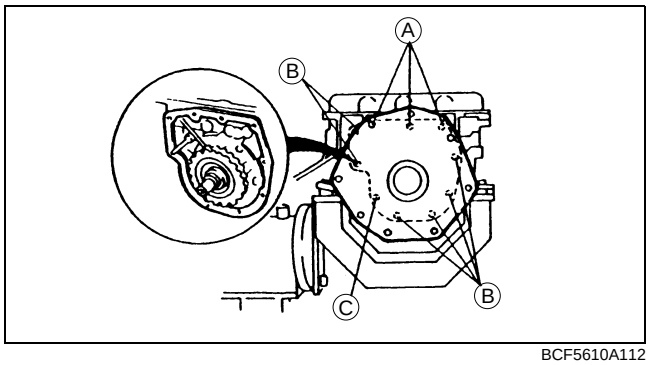
14. Remove the oil pan, gasket, and magnet.

Caution
- **The adapter case is made of aluminum, and is therefore easily dented and scratched by metal tools, when removing old gasket, do not gouge or strike the sealing surface of the adapter case.**



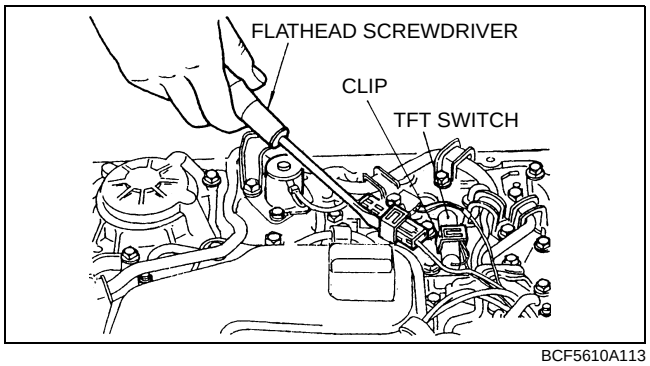
BCF5610A111

15. Remove the adapter case and gasket.



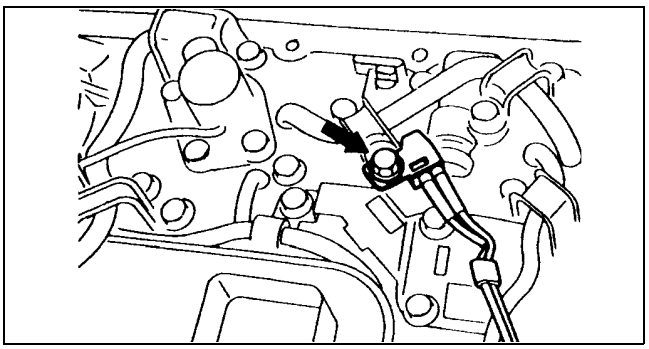
BCF5610A112

16. Remove the clip by carefully prying with a small flathead screwdriver.
17. Disconnect the TCC solenoid valve connector.
18. Remove the TFT switch.



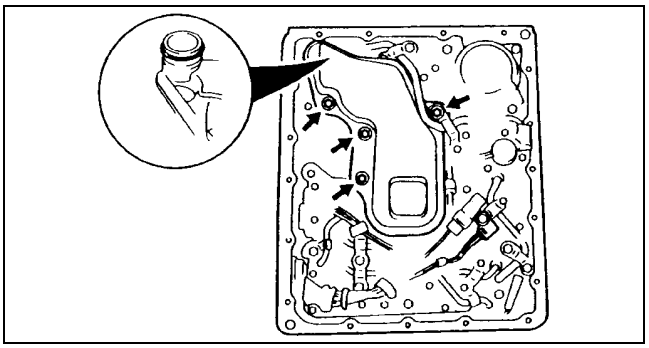
BCF5610A113

19. Remove the TFT sensor.
20. Remove the oil strainer.



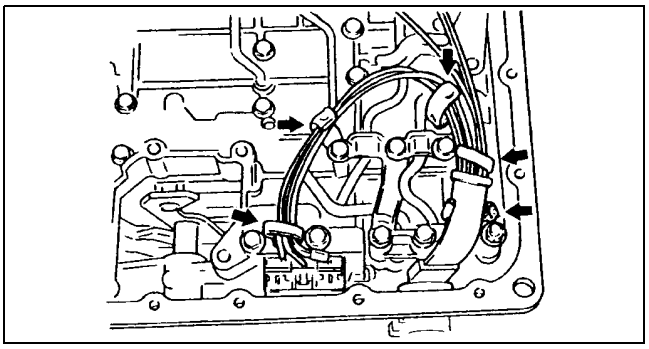
BCF5610A371

21. Remove the O-ring from the oil strainer.



BCF5610A115

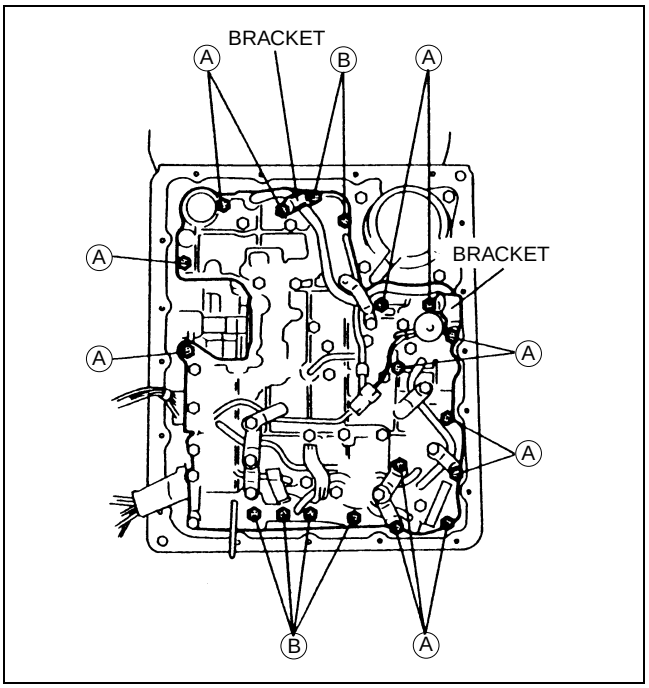
22. Separate the solenoid valve harness from the harness clip.



BCF5610A116

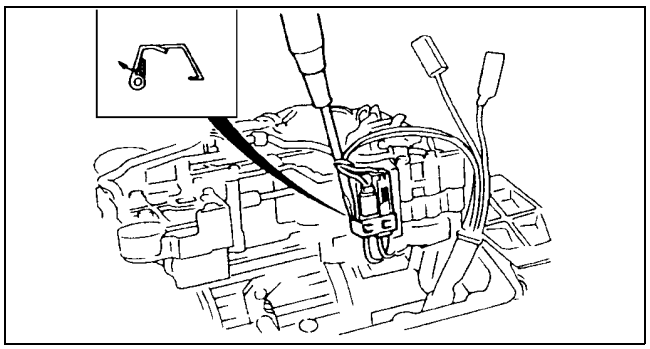
23. Remove bolts A and B and the brackets as shown in the figure.

Bolt length (measured from below bolt head)
A: 33 mm {1.30 in}
B: 45 mm {1.77 in}



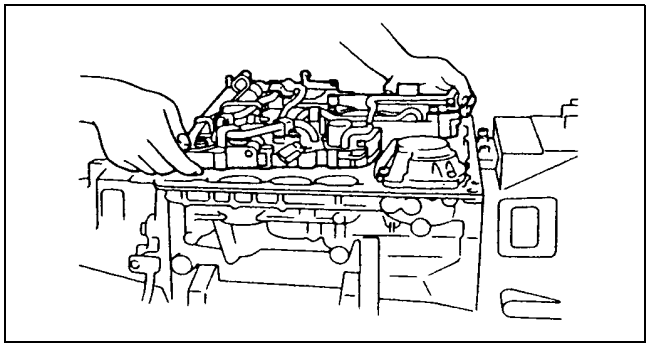
BCF5610A117

24. Remove the clip carefully prying with a small flathead screwdriver.
25. Disconnect the solenoid valve connectors.



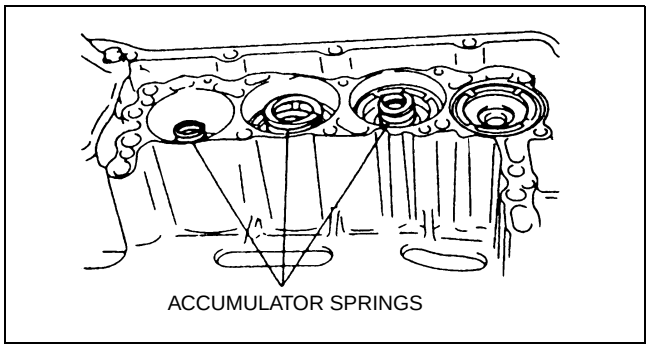
BCF5610A118

26. Remove the control valve body.



BCF5610A119

27. Remove the accumulator springs.

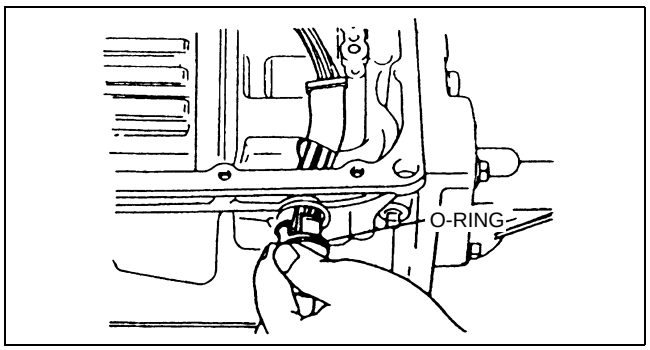


BCF5610A120

28. Remove the solenoid connector from the transmission case.
29. Remove the O-ring from the solenoid valve harness.
30. Remove the converter housing from the transmission case.

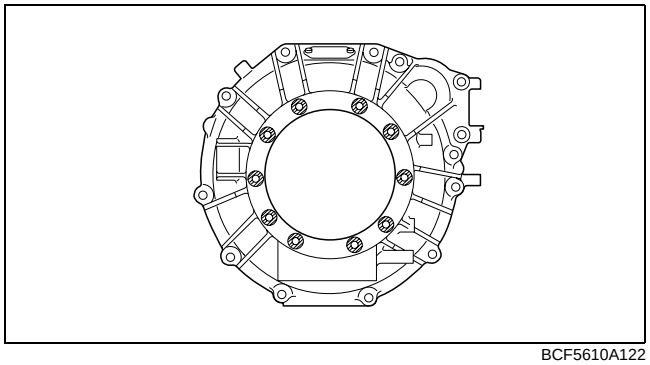
Caution

- **The converter housing is made of aluminum, and is therefore easily dented and scratched by metal tools. When removing old sealant, do not gouge or strike the sealing surface of the converter housing.**



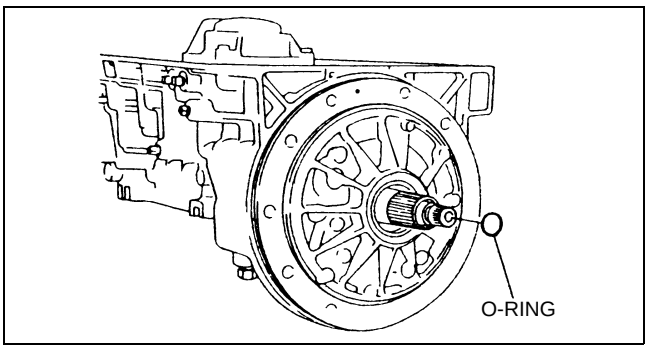
BCF5610A121

31. Remove the sealing compound from the converter housing.



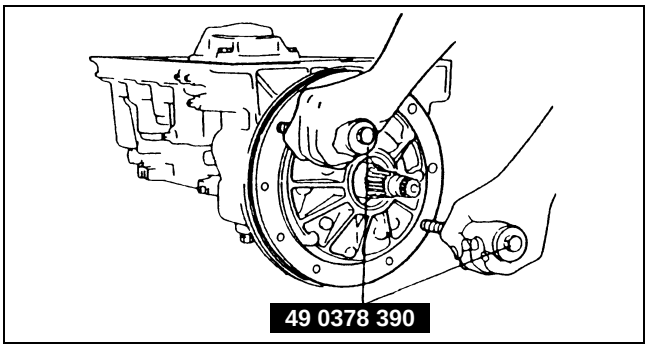
BCF5610A122

32. Remove the O-ring from the input shaft.
33. Install the **SST** to the oil pump.
34. Slowly remove the oil pump from the transmission case by evenly sliding the weights of the **SST**.



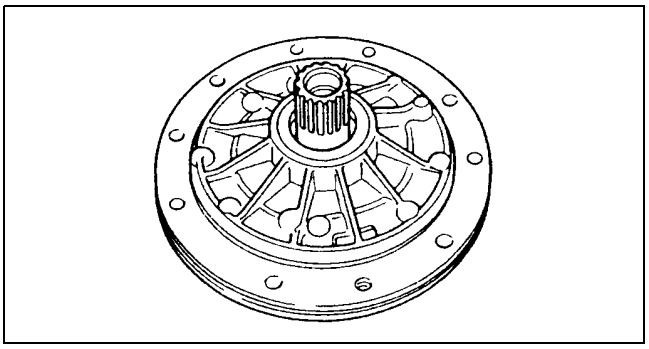
BCF5610A123

35. Remove the **SST** from the oil pump.



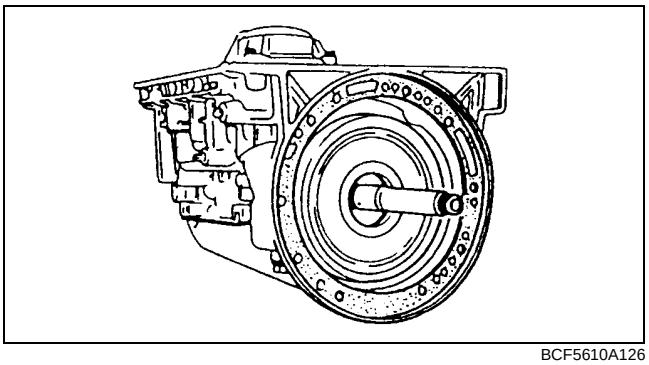
BCF5610A124

36. Clean the sealant from the oil pump housing, being careful not to scratch or dent the machined surfaces.
37. Remove the oil pump gasket.



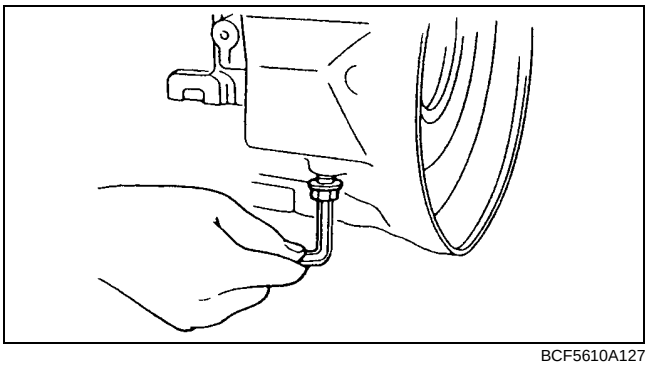
BCF5610A125

38. Pull out the input shaft while holding the reverse clutch drum.
39. While holding the anchor end bolt, loosen the locknut.



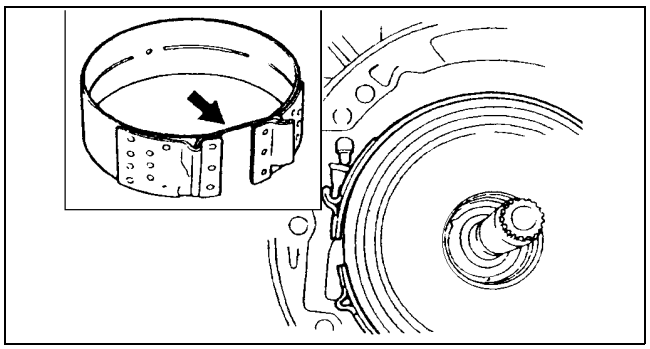
BCF5610A126

40. Remove the anchor end bolt.
41. Clean the sealing compound from the transmission case threads.



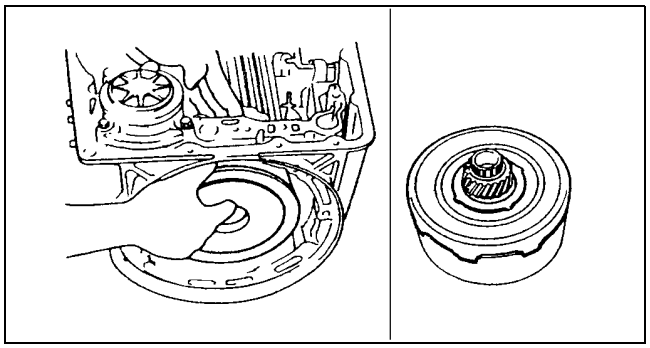
BCF5610A127

42. Remove the brake band and hold it together with a piece of wire as shown in the figure.
43. Remove the band strut.



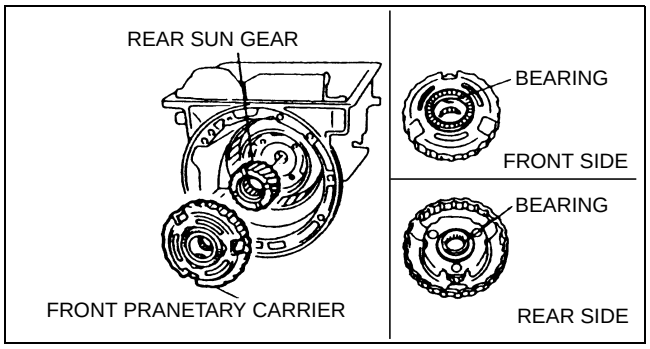
BCF5610A128

44. Remove the reverse clutch, high clutch, and the front sun gear from the transmission case as a component.



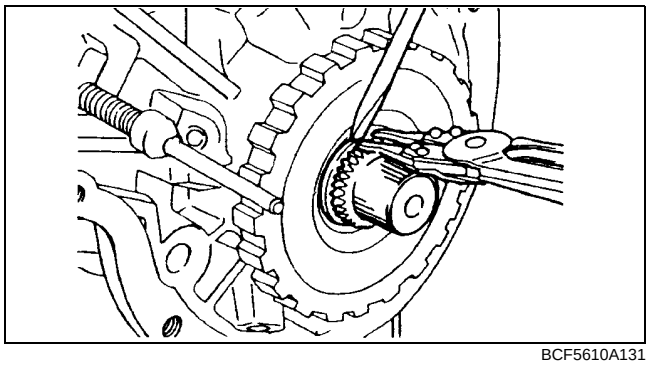
BCF5610A129

45. Remove the front planetary carrier, bearings, and rear sun gear.
46. Remove the snap ring from the output shaft.



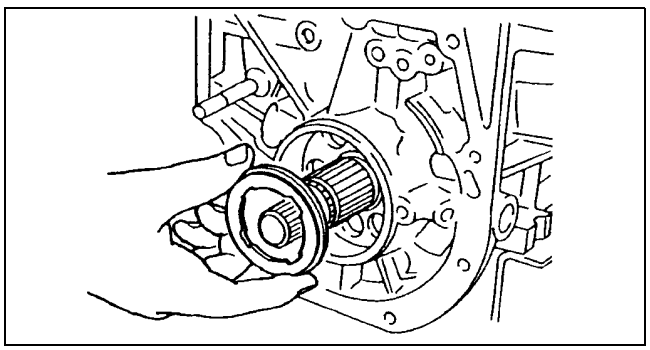
BCF5610A130

47. Remove the parking gear.



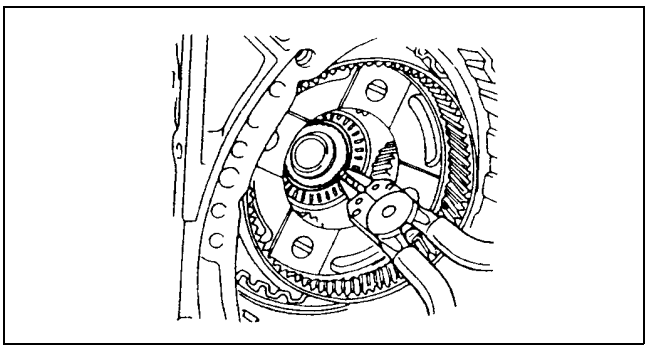
BCF5610A131

48. Remove the bearing from the rear of the transmission case.



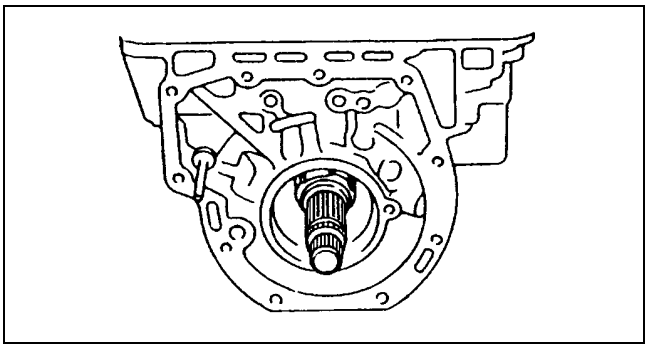
BCF5610A132

49. Push the output shaft slightly forward and remove the snap ring from the output shaft.



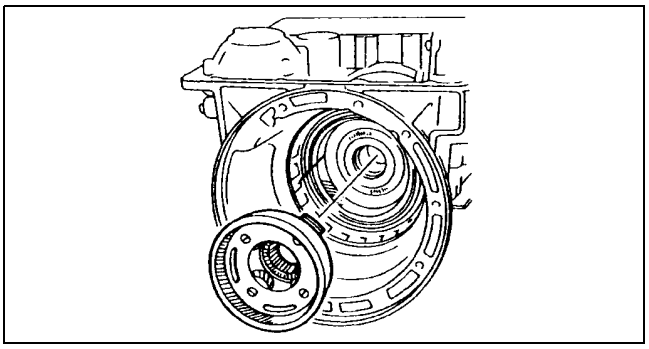
BCF5610A133

50. Slide out the output shaft from the rear of the transmission case.



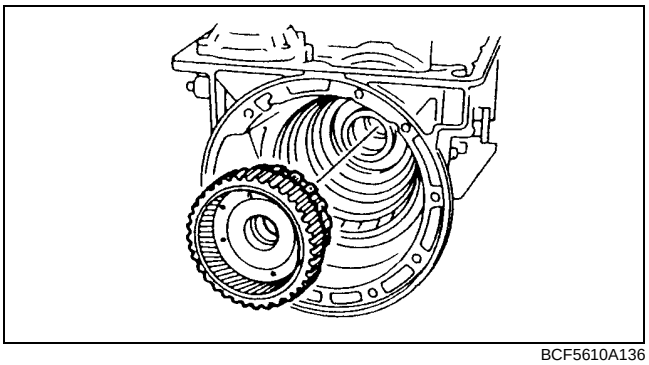
BCF5610A134

51. Remove the front internal gear (integrated with rear planetary carrier).



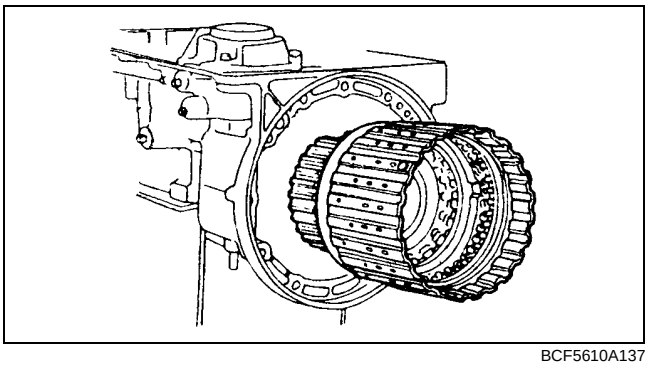
BCF5610A135

52. Remove the rear internal gear, forward clutch hub, and overrunning clutch hub component.



BCF5610A136

53. Remove the forward clutch drum (forward clutch, overrunning clutch, and low one-way clutch) component.

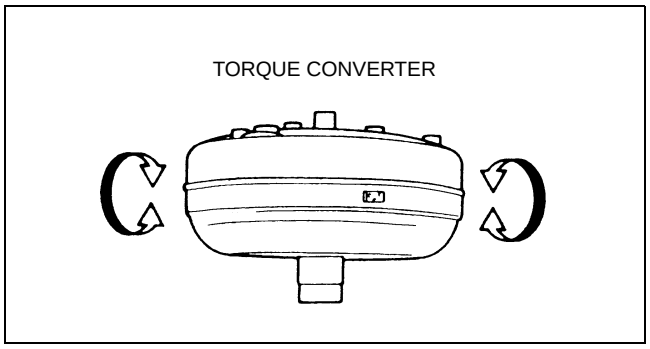


BCF5610A137

TORQUE CONVERTER INSPECTION

CBG571019100A01

1. Check the outside of the converter for damage and cracks.
   - If there is any malfunction, replace the torque converter.
2. Check for rust on the pilot hub or the boss.
   Remove any rust completely.

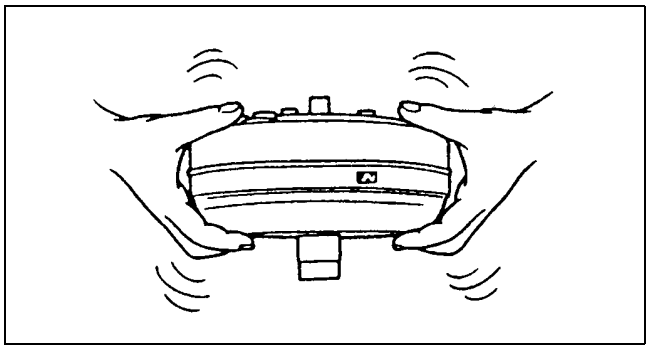


BCF5610A138

TORQUE CONVERTER CLEANING

CBG571019100A02

1. Drain all ATF remaining in the converter.
2. Pour in ATF **{2.0 L, 2.1 US qt, 1.8 Imp qt}**.
3. Shake the converter to clean the inside. Pour out the ATF.
4. Repeat steps 2 and 3 until you are sure that the inside of the torque converter is clean.

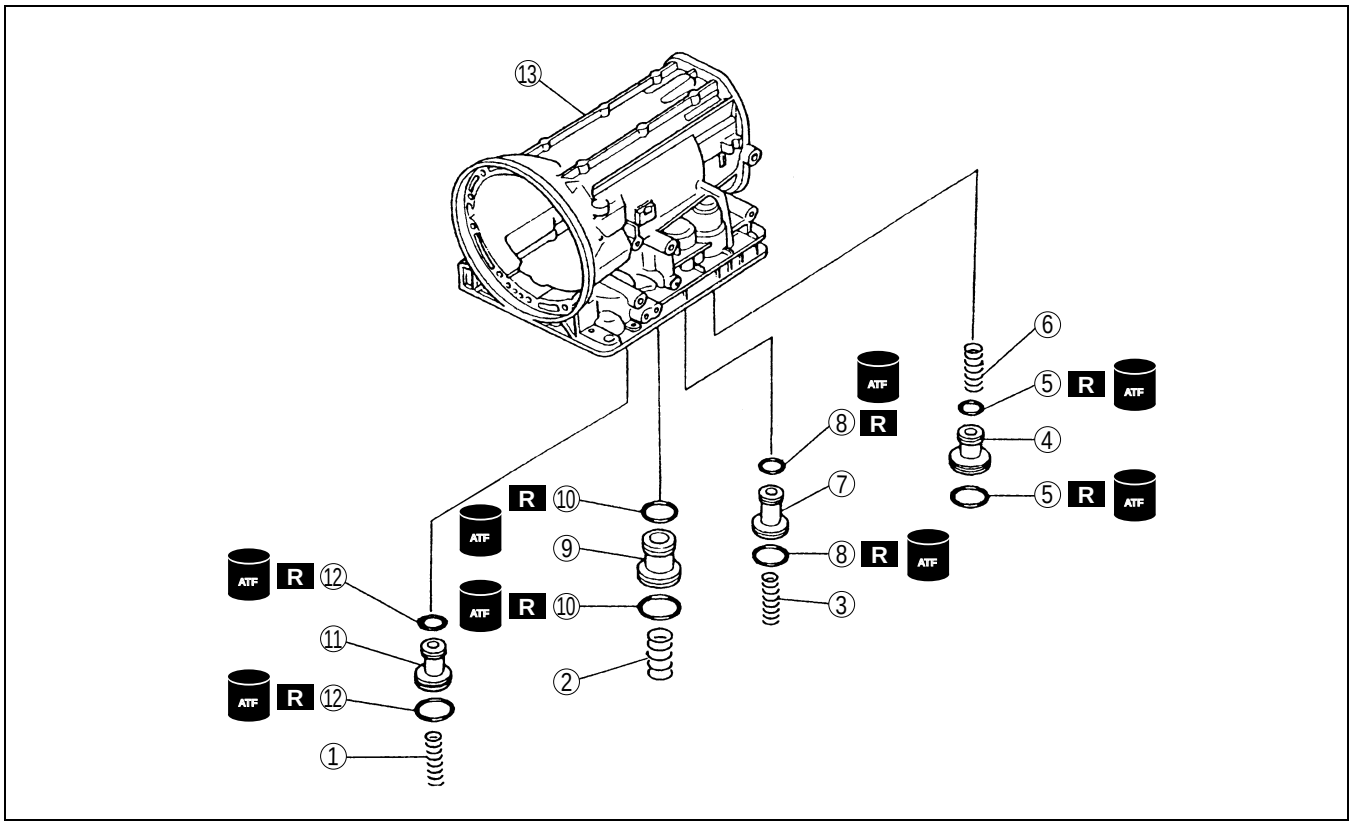


BCF5610A139

ACCUMULATOR DISASSEMBLY/ASSEMBLY

CBG571021272A01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



BCF5610A140

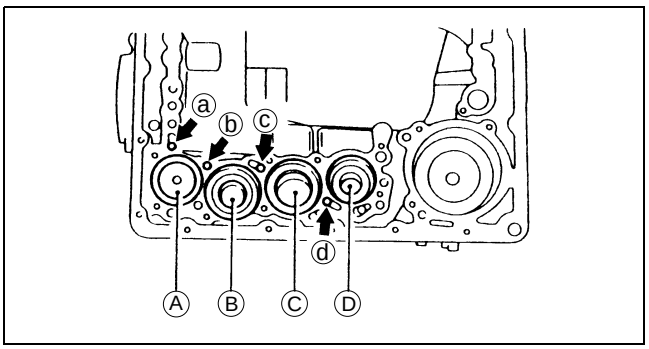
1	3-4/N-R accumulator spring
2	1-2 accumulator spring
3	2-3 accumulator spring
4	N-D accumulator piston (See K1–14 Accumulator Piston Disassembly Note.)
5	O-ring
6	N-D accumulator spring
7	2-3 accumulator piston (See K1–14 Accumulator Piston Disassembly Note.)

8	O-ring
9	1-2 accumulator piston (See K1–14 Accumulator Piston Disassembly Note.)
10	O-ring
11	3-4/N-R accumulator piston (See K1–14 Accumulator Piston Disassembly Note.)
12	O-ring
13	Transmission case

Accumulator Piston Disassembly Note

1. Remove the accumulator pistons from transmission case by applying compressed air through the oil passage as shown in the figure.
   Inspect and replace the accumulator springs as necessary. (See K1–15 Accumulator Spring Inspection.)

Accumulator	Location	Oil passage
N-D accumulator	A	a
2-3 accumulator	B	b
1-2 accumulator	C	c
3-4/N-R accumulator	D	d

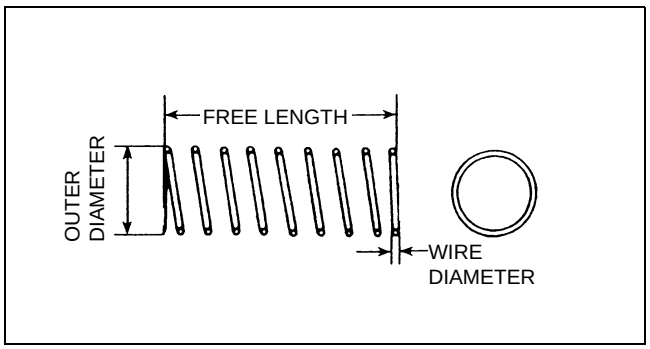


BCF5610A141

Accumulator Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the spring.

Spring Specification	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
N-D accumulator spring	18.0 {0.709}	43.0 {1.693}	7.9	2.3 {0.091}
1-2 accumulator spring	29.3 {1.154}	45.0 {1.772}	3.6	4.0 {0.157}
2-3 accumulator spring	20.0 {0.787}	66.0 {2.598}	7.6	3.2 {0.126}
3-4/N-R accumulator spring	17.3 {0.681}	58.4 {2.299}	12.3	2.3 {0.091}

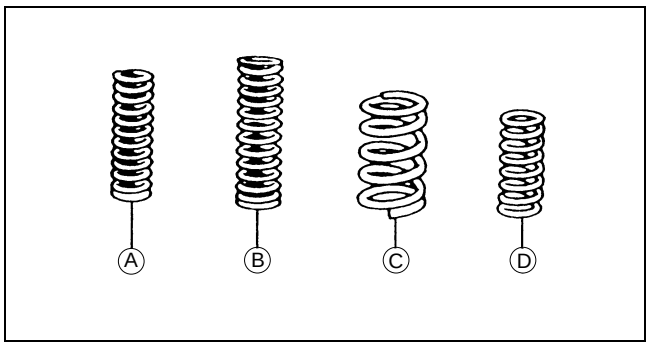


BCF5610A142

Accumulator Assembly Procedure

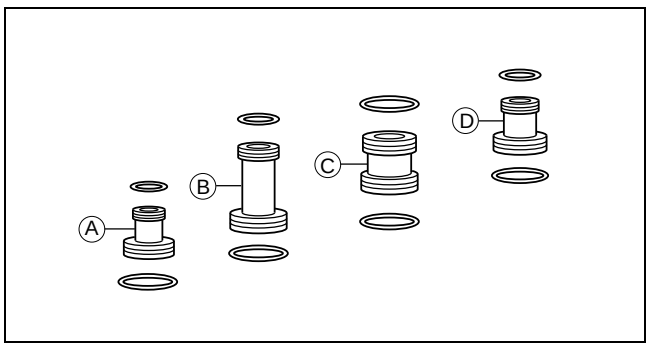
Outer diameter and installation order of springs

Spring		Installation order	Outer dia. mm {in}
A	N-D accumulator	Spring – Piston	18.0 {0.709}
B	2-3 accumulator	Piston – Spring	20.0 {0.787}
C	1-2 accumulator	Piston – Spring	29.3 {1.154}
D	3-4/N-R accumulator	Piston – Spring	17.3 {0.681}



BCF5610A143

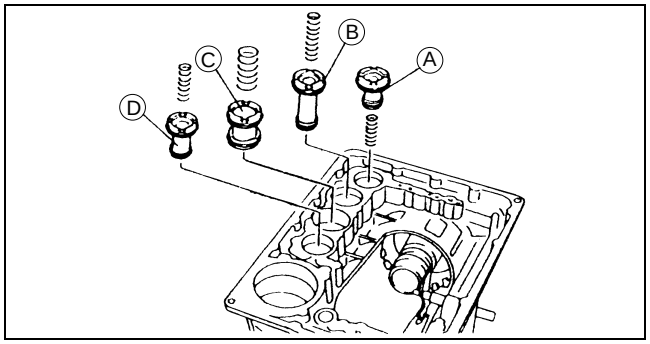
1. Apply ATF to the new O-rings and install them onto the accumulator pistons.



BCF5610A144

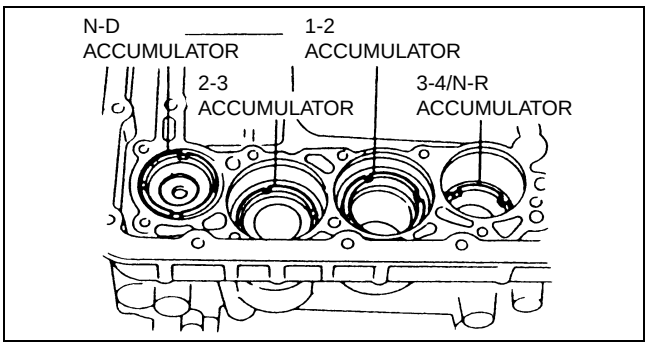
Piston specification		Large mm {in}	Small mm {in}
A	N-D accumulator	45.0 {1.772}	29.0 {1.142}
B	2-3 accumulator	50.0 {1.969}	32.0 {1.260}
C	1-2 accumulator	50.0 {1.969}	45.0 {1.772}
D	3-4/N-R accumulator	45.0 {1.772}	29.0 {1.142}

2. Apply even pressure to the perimeter of the accumulator pistons and install them into the transmission case.



BCF5610A145

3. Install each spring into its own accumulator piston.

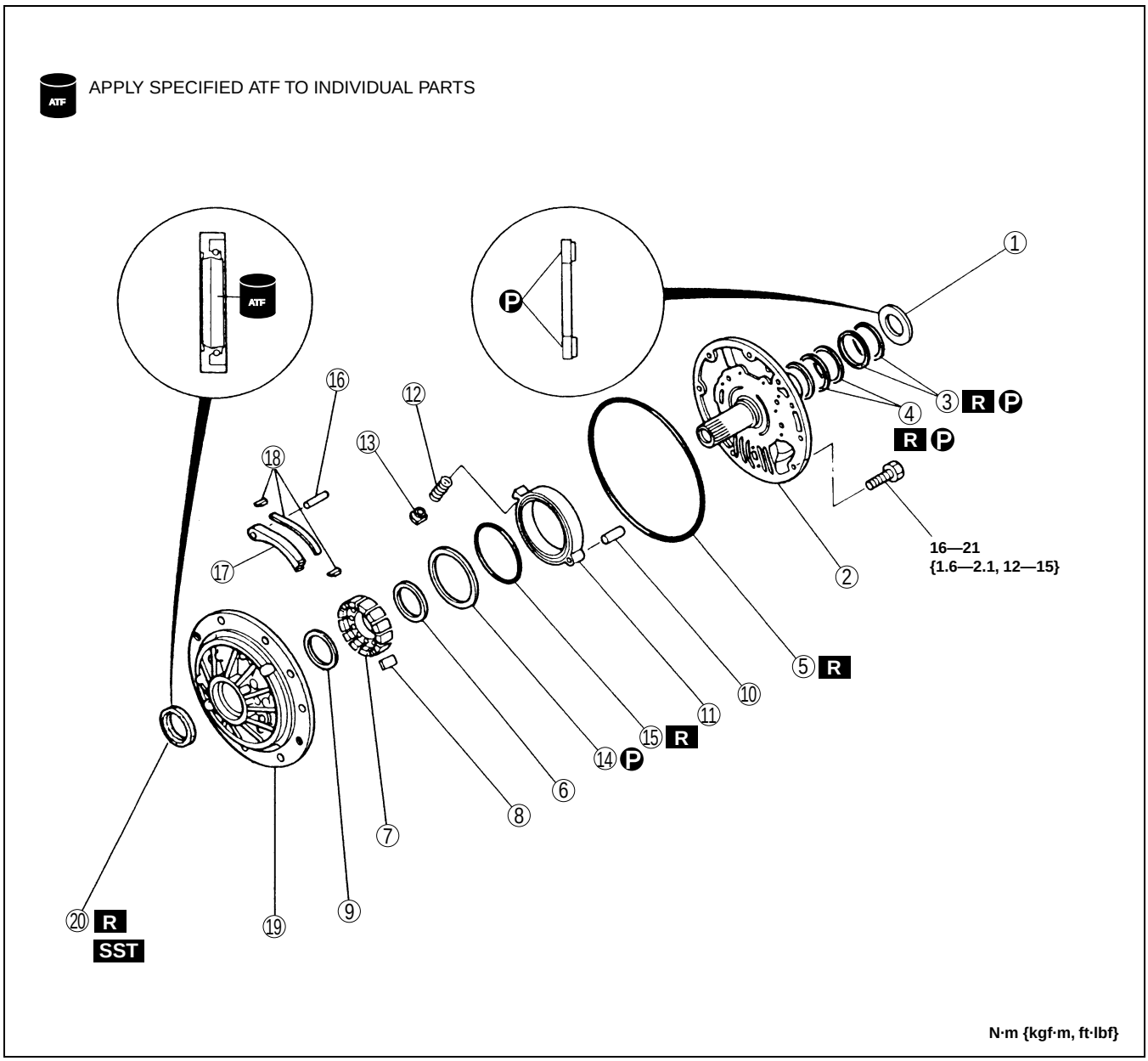


BCF5610A146

OIL PUMP DISASSEMBLY/ASSEMBLY

CBG571019220A01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



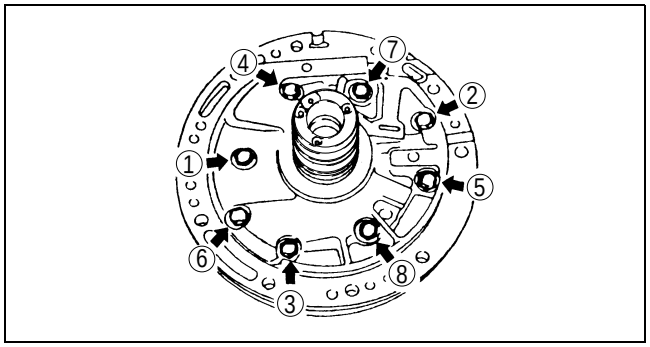
BCF5610A147

1	Bearing
2	Oil pump cover (See K1–17 Oil Pump Cover Disassembly Note.)
3	Seal ring (small diameter)
4	Seal ring (large diameter)
5	O-ring
6	Vane ring

7	Rotor (See K1–17 Rotor Disassembly Note.)
8	Vane
9	Vane ring
10	Pivot pin (See K1–17 Pivot Pin Disassembly Note.)
11	Cam ring (See K1–17 Cam Ring Disassembly Note.)
12	Cam ring spring
13	Spring seat
14	Friction ring
15	O-ring
16	Pivot pin
17	Control piston
18	Side seal
19	Oil pump housing
20	Oil seal

Oil Pump Cover Disassembly Note

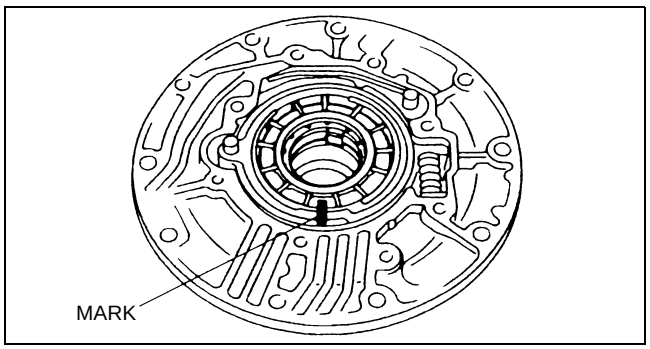
1. Gradually loosen the mounting bolts in the order as shown in the figure.
2. Remove the oil pump cover from the oil pump housing.
3. Inspect and replace the oil pump cover as necessary.
   (See K1–18 Oil Pump Cover Inspection.)



BCF5610A148

Rotor Disassembly Note

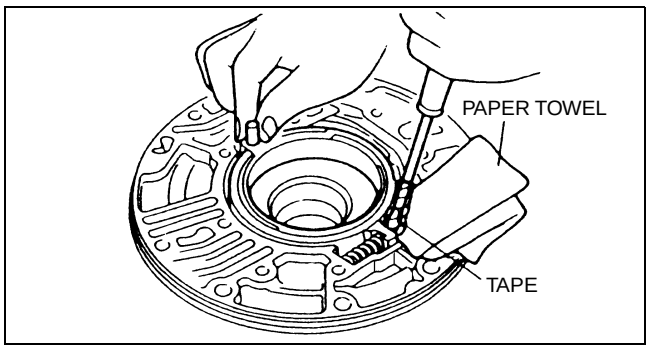
1. Mark the rotor and cam ring without scratching or denting them.
2. Remove the rotor and vanes from the cam ring.
3. Inspect and replace the rotor as necessary.
   (See K1–18 Oil Pump Housing, Cam Ring, Rotor, Vane, and Control Piston Inspection.)



BCF5610A149

Pivot Pin Disassembly Note

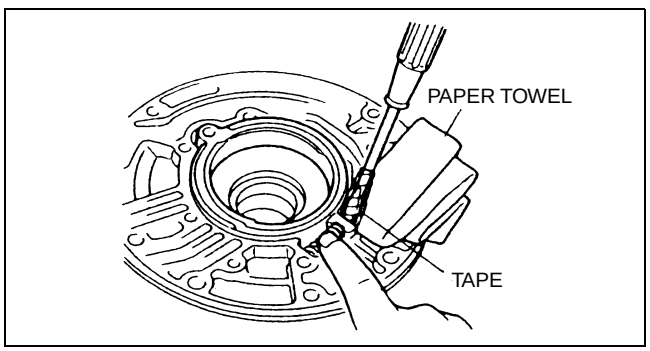
1. Hold the cam ring back with a tape-wrapped flathead screwdriver and remove the pivot pin.



BCF5610A150

Cam Ring Disassembly Note

1. Hold the cam ring spring back and remove the cam ring.
2. Remove the cam ring spring.
3. Inspect and replace the cam ring as necessary.
   (See K1–18 Oil Pump Housing, Cam Ring, Rotor, Vane, and Control Piston Inspection.)
4. Inspect and replace the cam ring spring as necessary.
   (See K1–18 Cam Ring Spring Inspection.)

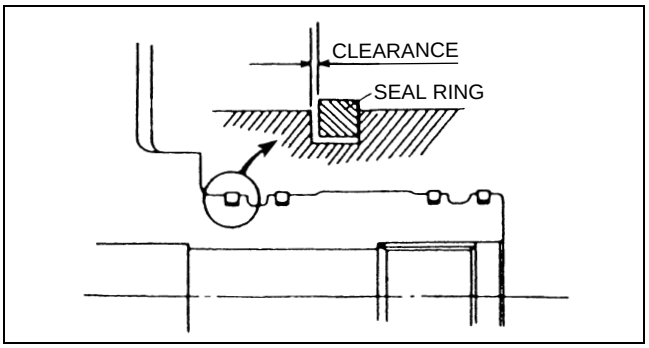


BCF5610A151

Oil Pump Cover Inspection

1. Fit a new seal rings into the oil pump cover.
2. Measure the clearance between the seal ring and the ring groove.
   - If not within the specification, replace the oil pump component.

Standard clearance
0.10—0.25 mm {0.0039—0.0098 in}
Maximum clearance
0.25 mm {0.0098 in}



BCF5610A152

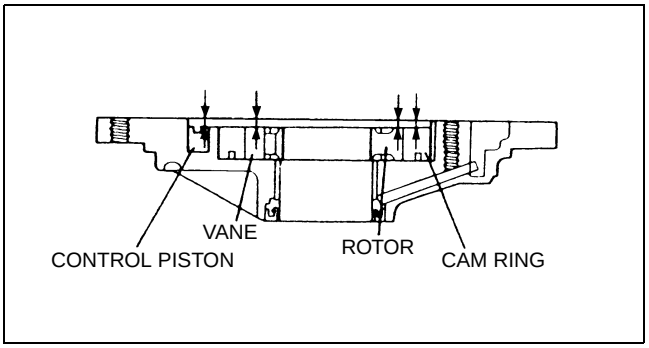
Oil Pump Housing, Cam Ring, Rotor, Vane, and Control Piston Inspection

1. Install the cam ring, vanes, rotor, and control piston.
   Do not install the friction ring, O-ring, control piston, side seals, and cam ring spring yet.
2. Measure the distance from the edge of the oil pump housing to the cam ring, rotor, vanes, and control piston at least four points along their circumferences.
   - If not within the specification, replace the oil pump component.

Clearance

(mm {in})

Part	Standard	Maximum
Cam ring	0.010—0.024 {0.00039—0.00094}	0.030 {0.0012}
Rotor, vane, control piston	0.030—0.044 {0.0012—0.0017}	0.050 {0.0020}



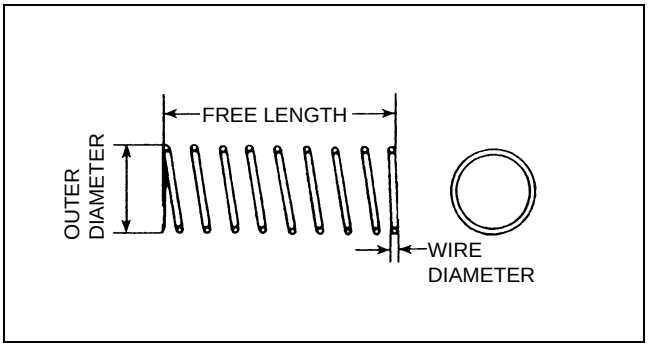
BCF5610A153

Cam Ring Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the cam ring spring.

Specification

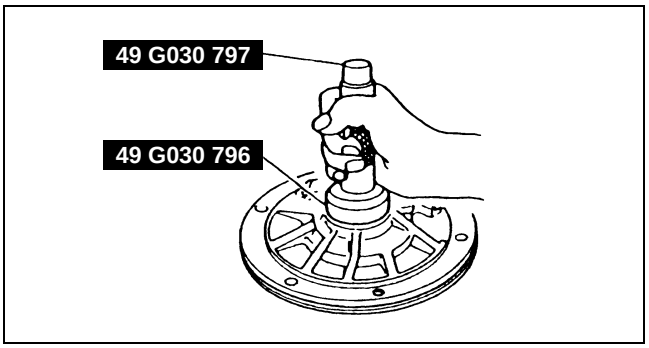
Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
13.7 {0.539}	39.8 {1.567}	8.0	2.3 {0.091}



BCF5610A142

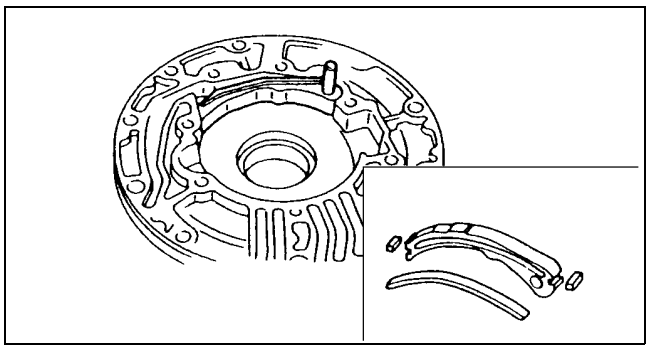
Oil Pump Assembly Procedure

1. Apply ATF to the lip of a new oil seal, and install it using the **SSTs**.
2. Apply ATF to side seals, and install them on the control piston with the black surface facing the control piston.



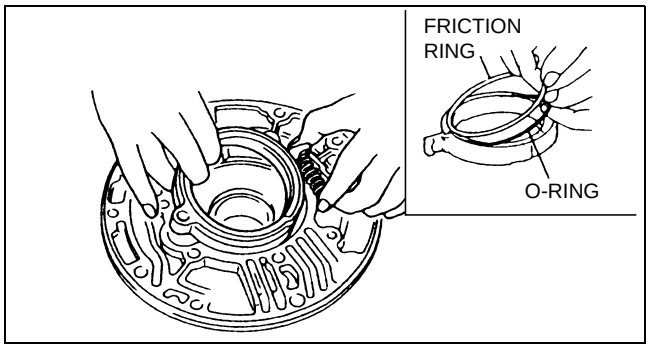
BCF5610A154

3. Install the control piston and pivot pin.
4. Apply petroleum jelly to the cam ring groove and install a new O-ring and friction ring into the cam ring.



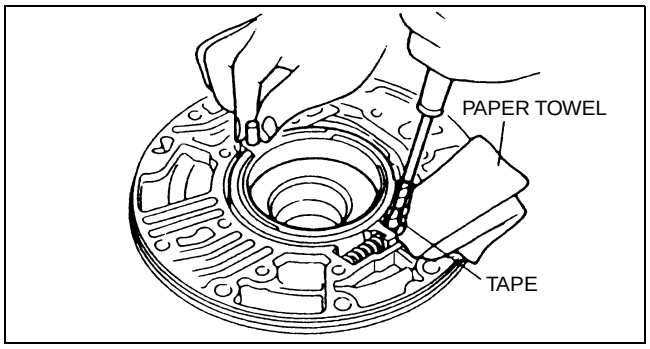
BCF5610A155

5. Install the cam ring and spring while compressing the spring against the oil pump housing.



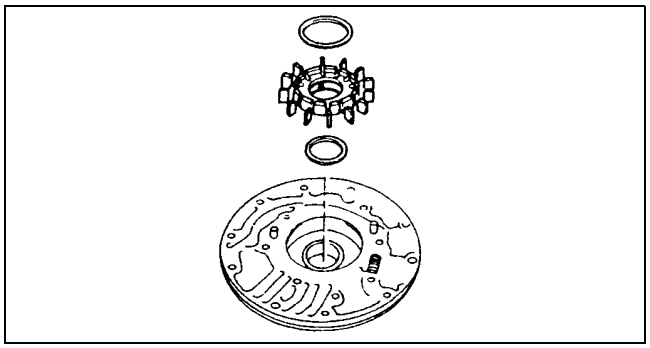
BCF5610A156

6. Hold the cam ring with a tape-wrapped flathead screwdriver, and install the pivot pin.



BCF5610A150

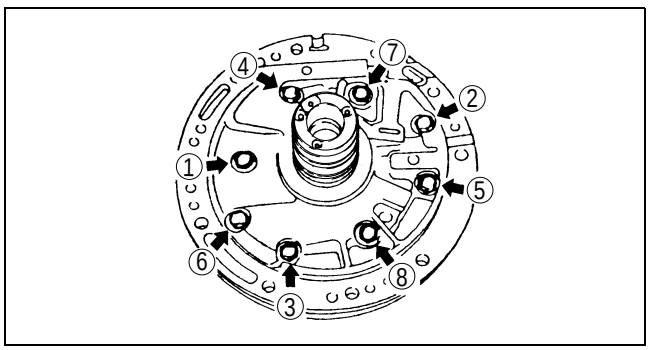
7. Confirm that the mark on the rotor is facing upward, and install the rotor, vanes, and vane rings.
8. Carefully install the oil pump cover onto the oil pump housing.



BCF5610A157

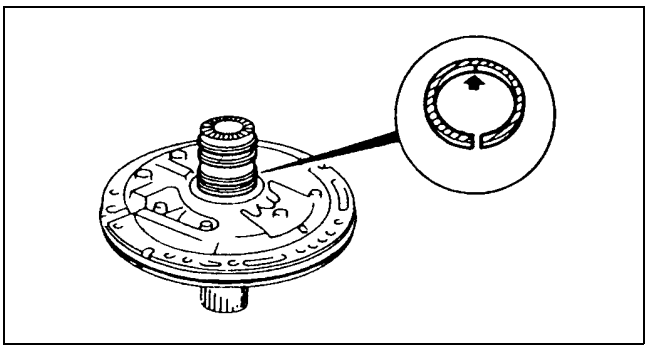
9. Tighten the bolts evenly and gradually in the order as shown in the figure.

Tightening torque
16—21 N·m {1.6—2.1 kgf·m, 12—15 ft·lbf}



BCF5610A148

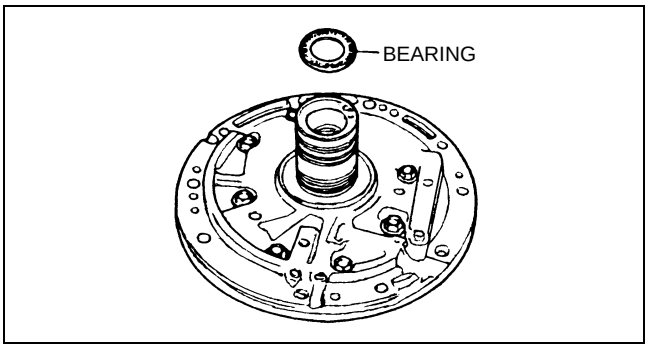
10. Apply petroleum jelly to the seal rings. Fit the large seal ring (yellow mark) into the bottom ring groove and the small ring (no mark) into the top ring groove.
11. Apply ATF to a new O-ring and install it onto the oil pump.



BCF5610A159

12. Apply petroleum jelly to the bearing and set it on the oil pump.

    Bearing outer diameter
    47.0 mm {1.850 in}



BCF5610A160

REVERSE CLUTCH PREINSPECTION

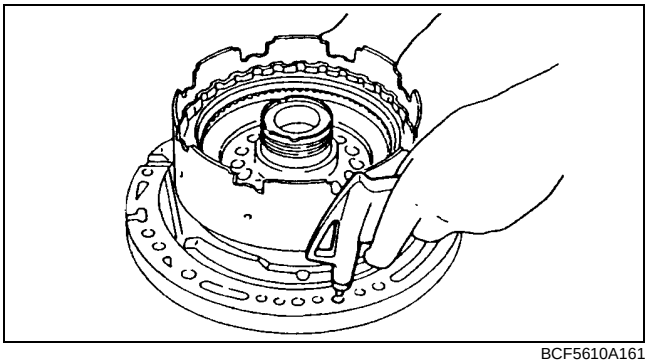
CBG571019500A01

Reverse Clutch Operation

1. Install the reverse clutch onto the oil pump along with the seal rings. Apply compressed air to the oil passage as shown in the figure.
2. Verify that the retaining plate moves toward the snap ring.

    Air pressure
    392 kPa {4.0 kg/cm^2, 57 psi} max.

3. If there is any malfunction, the D-ring or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling.



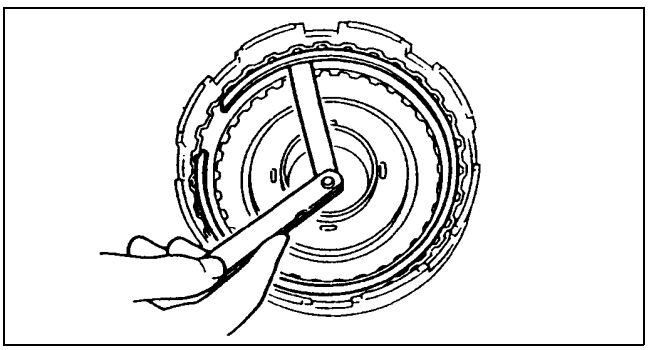
BCF5610A161

Reverse Clutch Clearance

1. Measure the clearance between the retaining plate and the snap ring.

    Clearance
    0.50—1.20 mm {0.020—0.047 in}

2. Select the correct retaining plate when assembling.

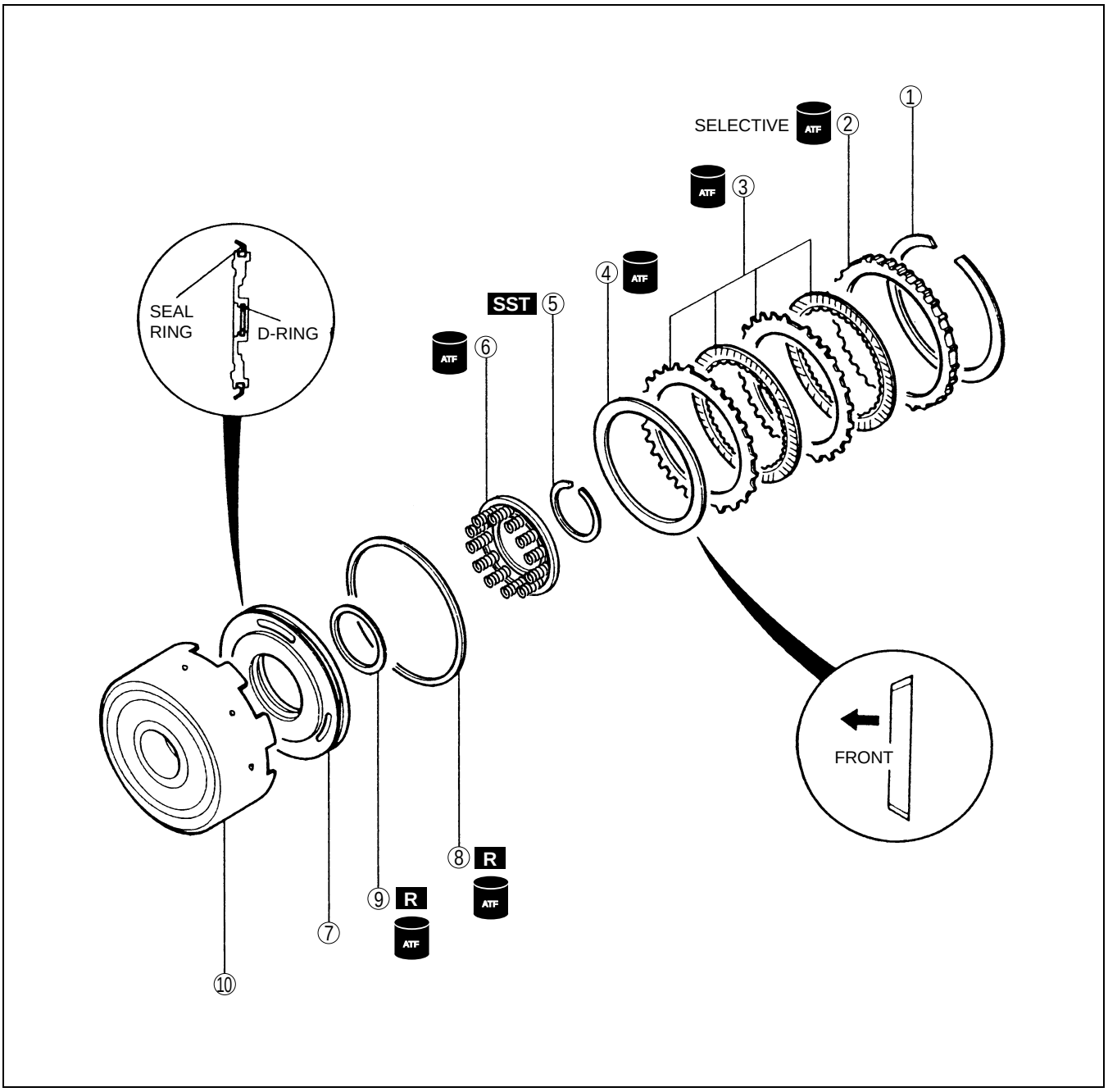


BCF5610A162

REVERSE CLUTCH DISASSEMBLY/ASSEMBLY

CBG571019500A02

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



BCF5610A400

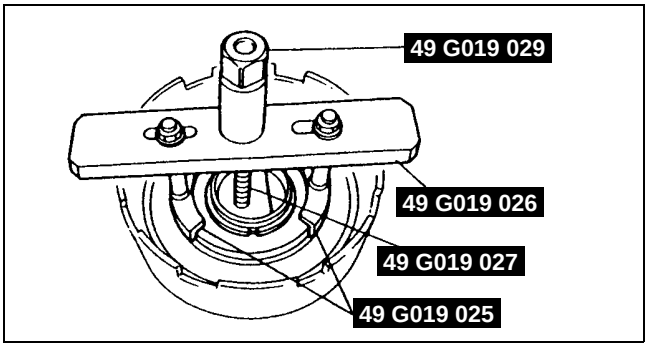
1	Snap ring
2	Retaining plate
3	Drive and driven plates
4	Dished plate
5	Snap ring (See K1–22 Snap Ring Disassembly Note.)

6	Spring retainer component
7	Clutch piston (See K1–22 Clutch Piston Disassembly Note.)
8	Seal ring
9	D-ring
10	Reverse clutch drum

Snap Ring Disassembly Note

Caution
- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.**

1. While holding the spring retainer component down using the **SSTs**, remove the snap ring using snap ring pliers.
2. Remove the spring retainer component.
3. Inspect and replace the return spring as necessary. (See K1–22 Return Spring Inspection.)



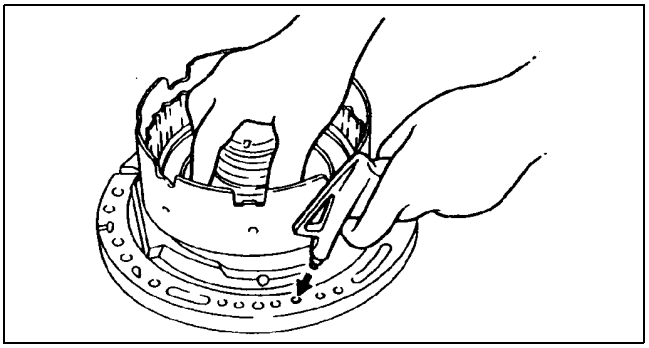
BCF5610A164

Clutch Piston Disassembly Note

1. Install the reverse clutch with seal rings onto the oil pump.
2. Remove the piston by applying compressed air through the oil passage.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

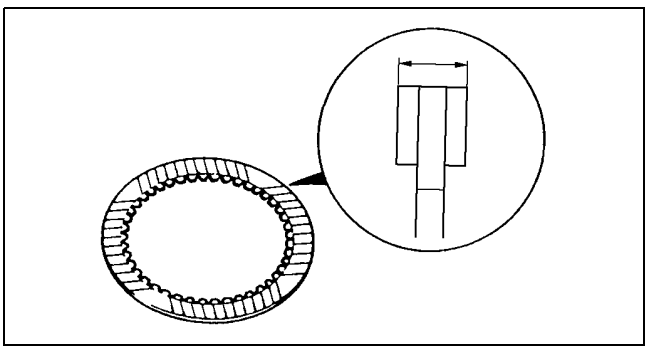
3. Inspect and replace the piston as necessary. (See K1–23 Clutch Piston Inspection.)


BCF5610A165

Drive Plate Inspection

1. Measure the facing thickness in three places, and calculate the average.
   - If it is less than the minimum specification, replace the drive plate.

   Thickness
   Standard: 2.0 mm {0.079 in}
   Minimum: 1.8 mm {0.071 in}

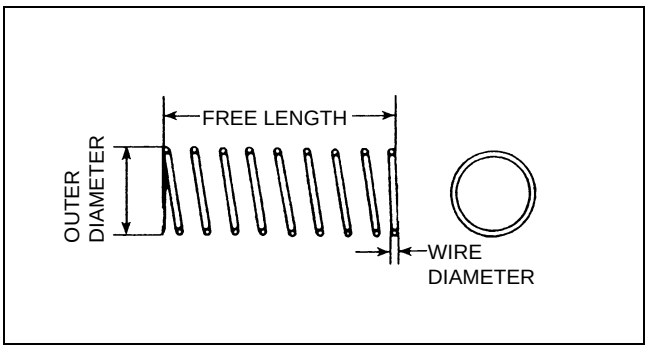

BCF5610A166

Return Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the return spring.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
11.6 {0.457}	19.7 {0.776}	4.0	1.3 {0.051}

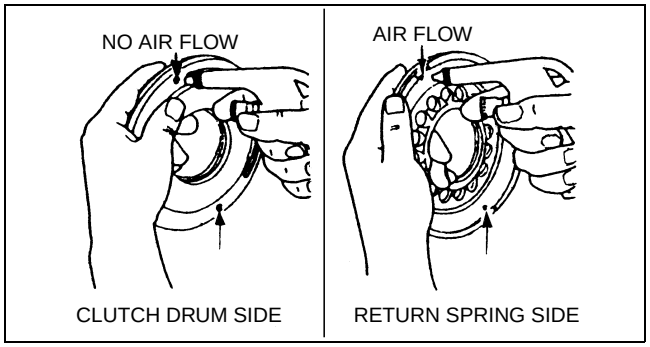


BCF5610A142

Clutch Piston Inspection

1. Shake the clutch piston and verify that the check ball is free.
2. Verify that there is no air flow when applying compressed air through the oil hole on the clutch drum side.
3. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

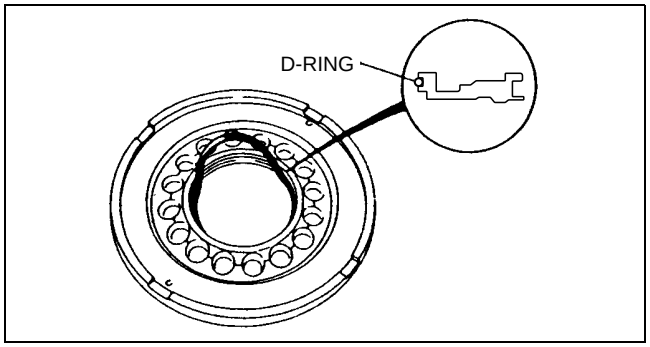
Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



BCF5610A167

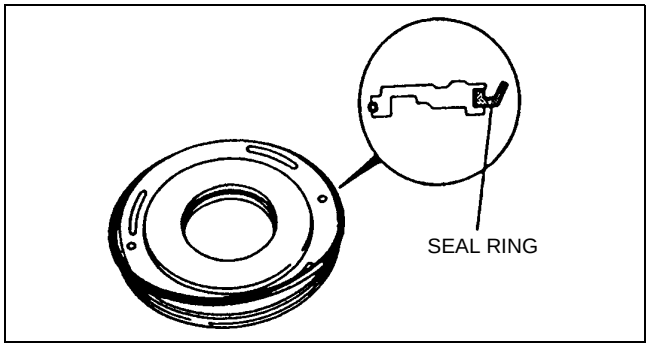
Reverse Clutch Assembly Procedure

1. Apply ATF to a new D-ring and install it into the clutch piston.



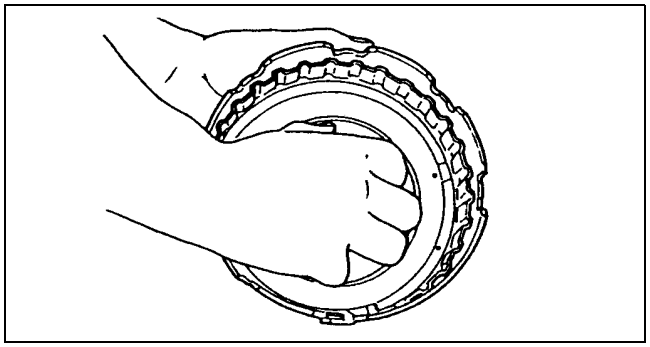
BCF5610A168

2. Apply ATF to a new seal ring and install it into the clutch piston.
3. Apply ATF to the inner face of the reverse clutch drum.



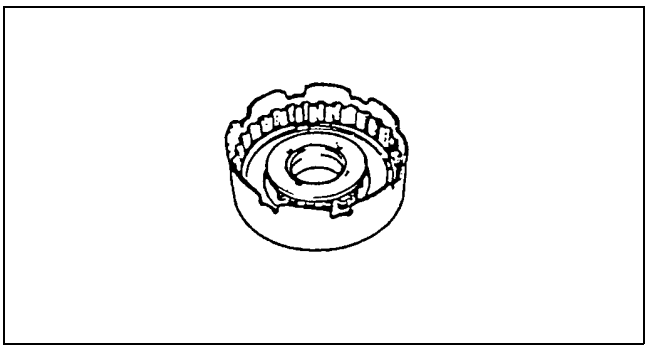
BCF5610A169

4. Apply even pressure to the perimeter of the clutch piston, and install it into the reverse clutch drum by turning it evenly and gradually.
5. Verify that the piston can be turned by hand. If it can not, then remove it and check for damage to the seal ring.



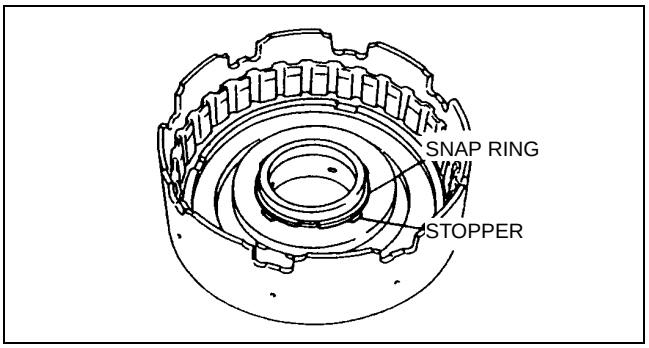
BCF5610A170

6. Install the spring retainer component.



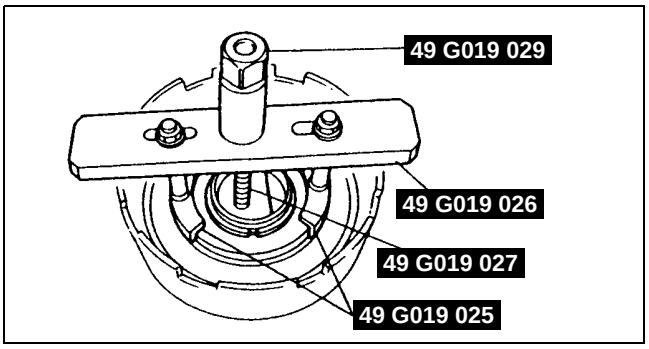
BCF5610A703

Caution
- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer component edges.**



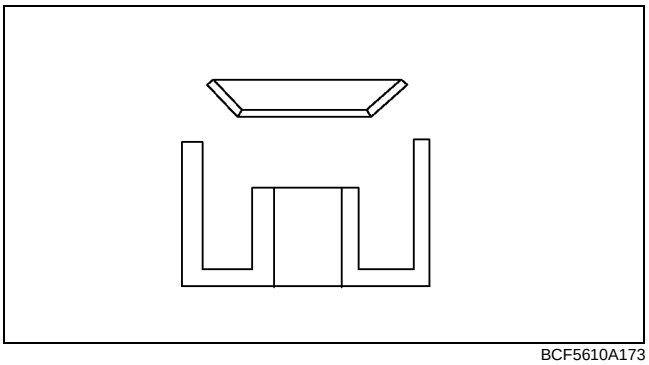
BCF5610A172

7. While holding the snap ring retainer down using **SSTs**, install the snap ring into the spring retainer stopper.



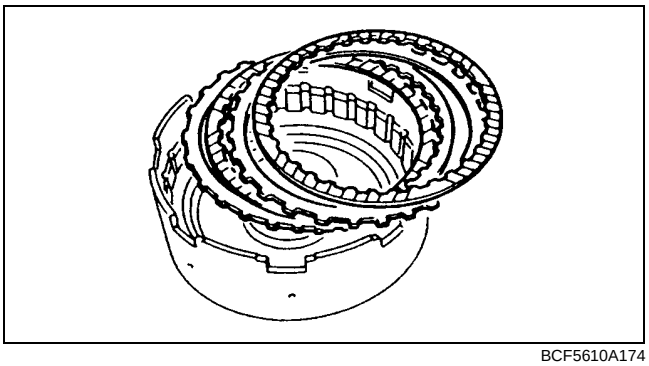
BCF5610A164

8. Install the dished plate as shown in the figure.
9. Soak new drive plates in ATF for at least two hours.
10. Apply ATF to the driven plates immediately before assembly.



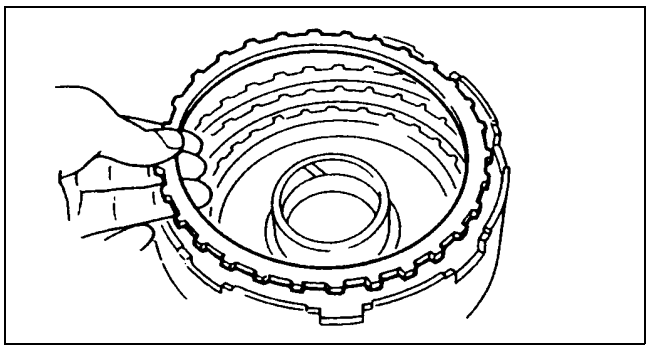
BCF5610A173

11. Install the drive and driven plates into the reverse clutch drum in the following order.
Driven-Drive-Driven-Drive



BCF5610A174

12. Install the retaining plate.
13. Install the snap ring.



BCF5610A175

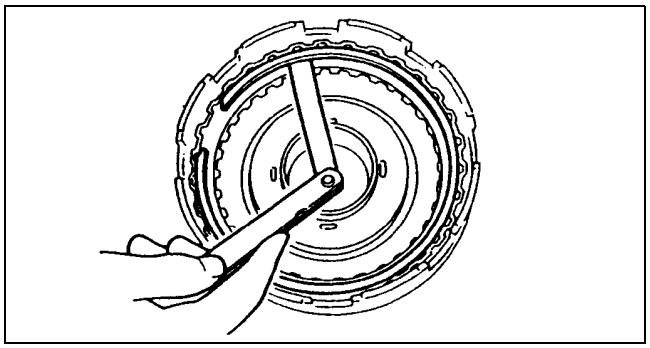
14. Measure the clearance between the retaining plate and the snap ring using a feeler gauge.
    - If not within the specification, adjust the clearance by selecting the correct retaining plate.

    Clearance
    0.50—1.20 mm {0.020—0.047 in}

Retaining plate size

(mm {in})

4.6 {0.181}	4.8 {0.189}	5.0 {0.197}	5.2 {0.205}
5.4 {0.213}	5.6 {0.220}	5.8 {0.228}	—

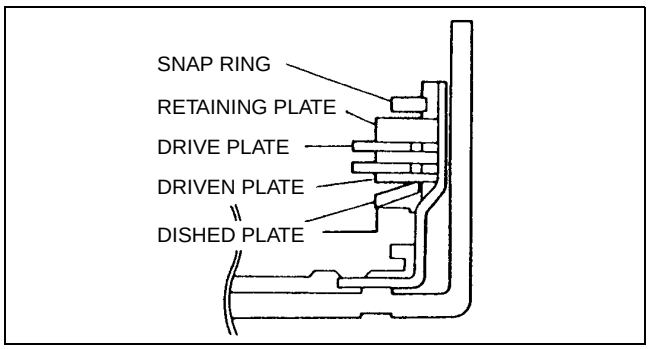


BCF5610A162

15. If the clearance cannot be brought to within specification after installation of the thickest retaining plate, replace the dished plate, driven plates, and drive plates. Adjust the clearance by selecting the correct retaining plate.

    Clearance
    0.50—0.80 mm {0.020—0.031 in}

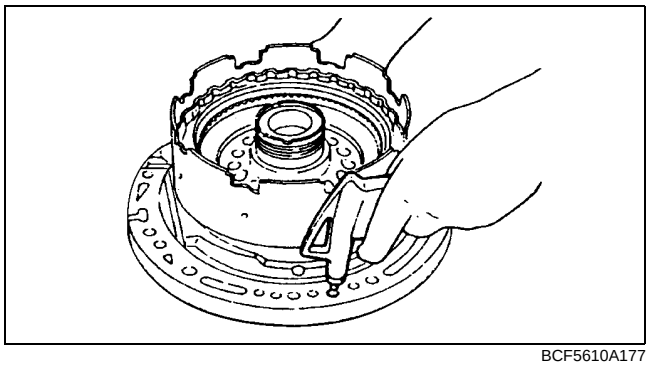
    Caution
    - **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**



BCF5610A176

16. Install the reverse clutch with seal rings onto the oil pump. Apply compressed air through the oil passage and verify clutch operation.

    Air pressure
    392 kPa {4.0 kgf/cm^2, 57 psi} max.



BCF5610A177

HIGH CLUTCH AND FRONT SUN GEAR PREINSPECTION

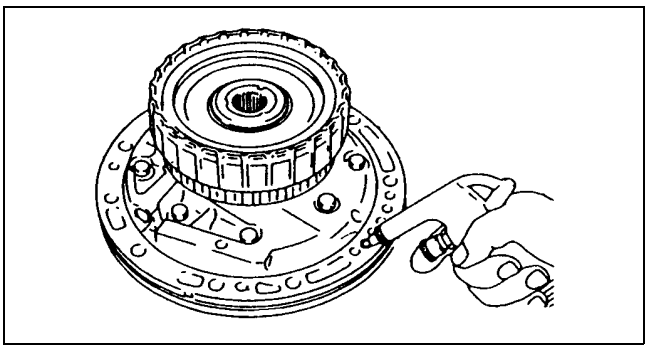
CBG571019500A03

High Clutch Operation

1. Install the high clutch with seal rings onto the oil pump.
   Apply compressed air through the oil passage as shown in the figure.
2. Verify that the retaining plate moves toward the snap ring.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

3. If there is any malfunction, the D-rings may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling.



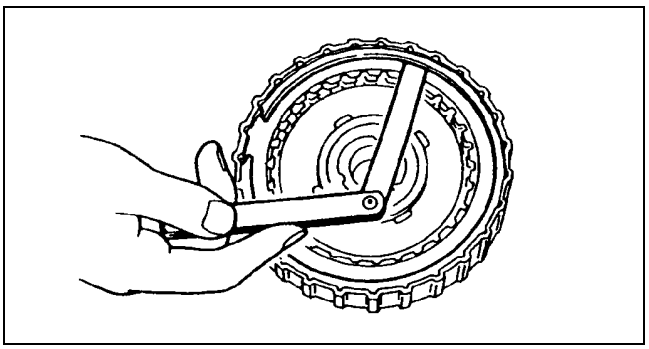
BCF5610A178

High Clutch Clearance

1. Measure the clearance between the retaining plate and the snap ring.

   Clearance
   1.8—3.0 mm {0.071—0.118 in}

2. Select the correct retaining plate when assembling.

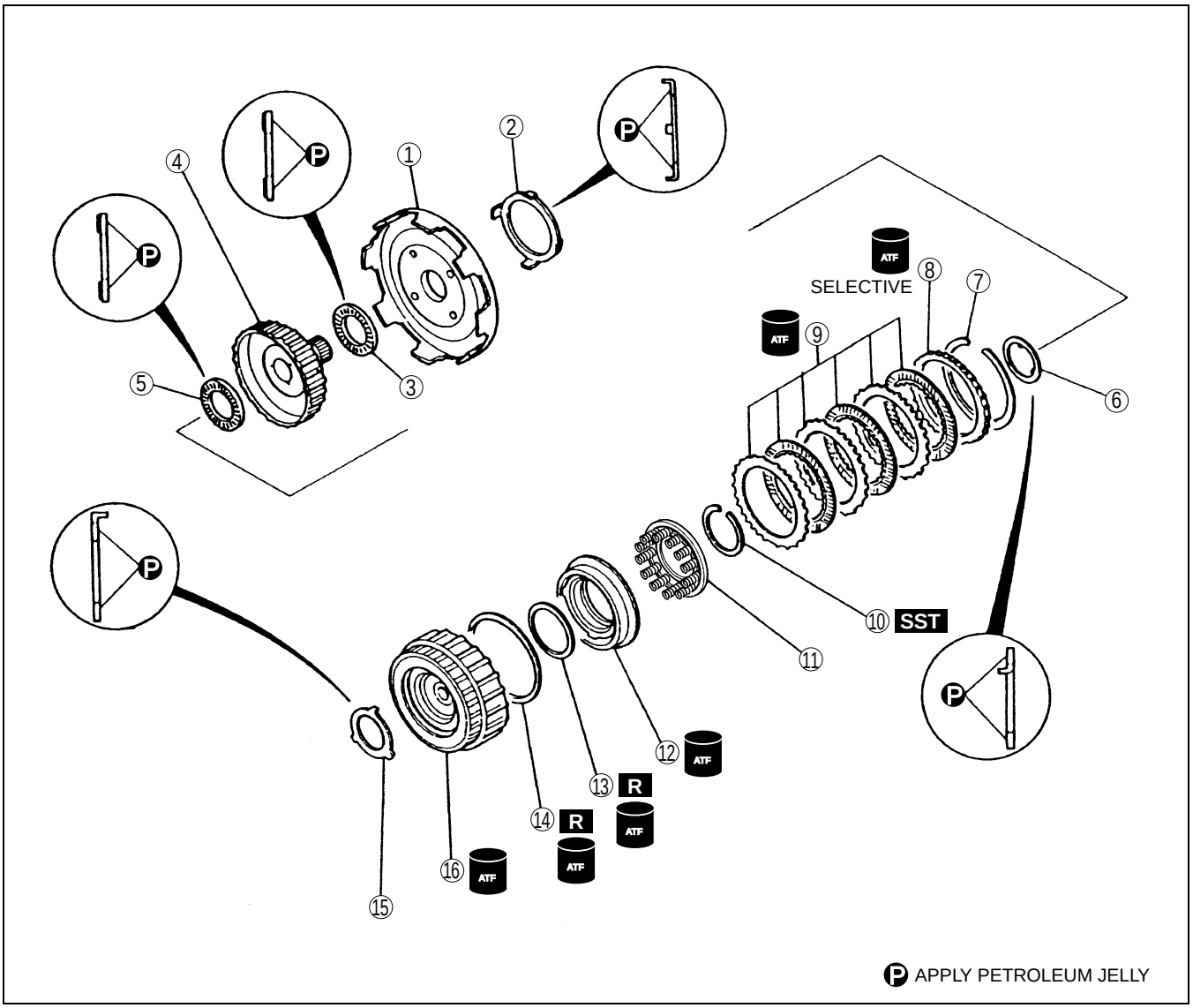


BCF5610A179

HIGH CLUTCH AND FRONT SUN GEAR DISASSEMBLY/ASSEMBLY

CBG571019500A04

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



BCF5610A401

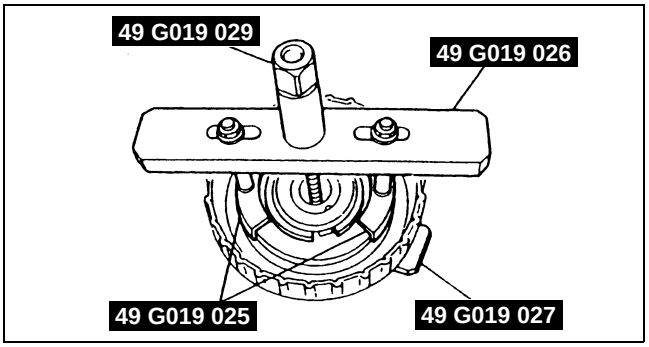
1	Front sun gear
2	Bearing race
3	Bearing
4	High clutch hub
5	Bearing
6	Bearing race
7	Snap ring
8	Retaining plate
9	Drive and driven plates

10	Snap ring (See K1–28 Snap Ring Disassembly Note.)
11	Spring retainer component
12	Clutch piston (See K1–28 Clutch Piston Disassembly Note.)
13	D-ring
14	D-ring
15	Bearing race
16	High Clutch drum

Snap Ring Disassembly Note

Caution
- **Depress the spring retainer only enough to remove the snap ring. Overpressing will damage the retainer component edges.**

1. While holding the spring retainer component down with **SSTs**, remove the snap ring using snap ring pliers.
2. Remove the spring retainer component.
3. Inspect and replace the return springs as necessary. (See K1–28 Return Spring Inspection.)



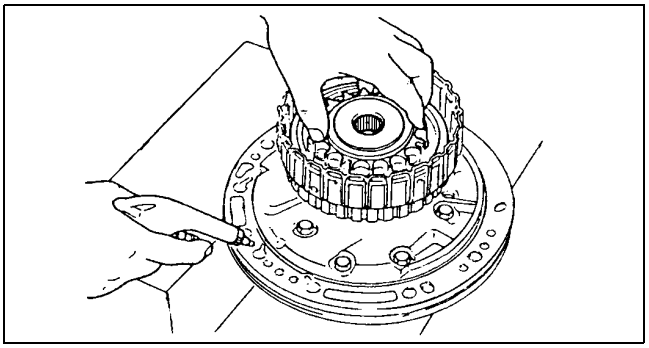
BCF5610A181

Clutch Piston Disassembly Note

1. Install the high clutch with seal rings onto the oil pump.
2. Remove the piston by applying compressed air through the oil passage.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

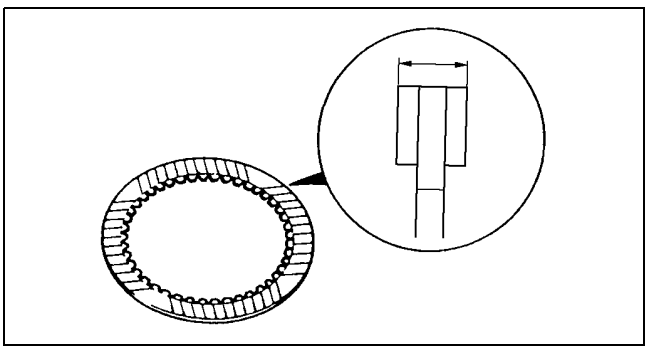
3. Inspect and replace piston as necessary. (See K1–29 Clutch Piston Inspection.)


BCF5610A182

Drive Plate Inspection

1. Measure the facing thickness in three places, and calculate the average.
   - If it is less than the minimum specification, replace the drive plate.

   Thickness
   Standard: 1.6 mm {0.063 in}
   Minimum: 1.4 mm {0.055 in}

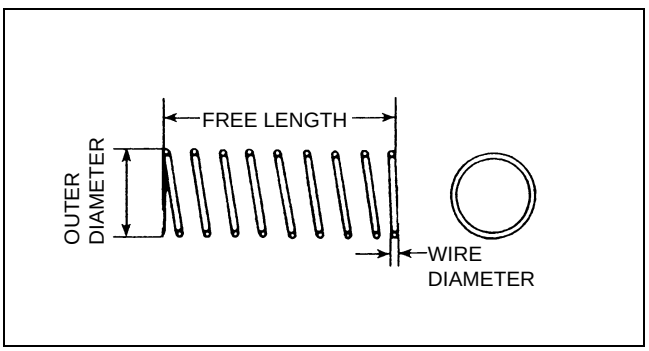

BCF5610A166

Return Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the return spring.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
11.6 {0.457}	24.2 {0.953}	5.15	1.4 {0.055}

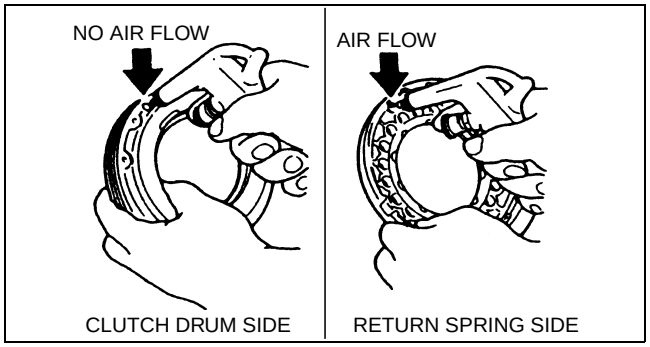


BCF5610A142

Clutch Piston Inspection

1. Shake the clutch piston and verify that the check ball is free.
2. Verify that there is no air flow when applying compressed air through the oil hole on the clutch drum side.
3. Verify that there is air flow when applying compressed air through the oil hole on the return spring side.

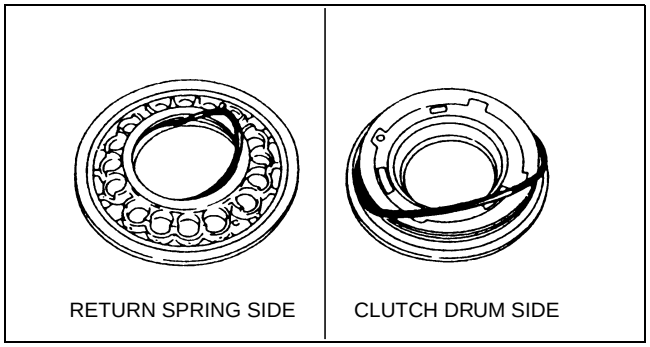
   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.



BCF5610A183

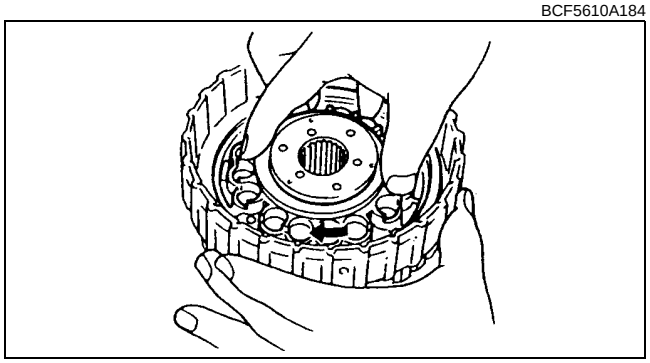
High Clutch and Front Sun Gear Assembly Procedure

1. Apply ATF to new D-rings and install them into the clutch piston.
2. Apply ATF to the inner face of the high clutch drum.

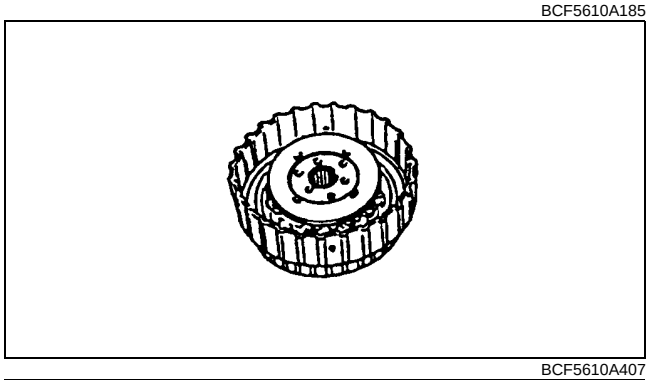


BCF5610A184

3. Apply even pressure to the perimeter of the clutch piston, and install it into the reverse clutch drum by turning it evenly and gradually.
4. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.

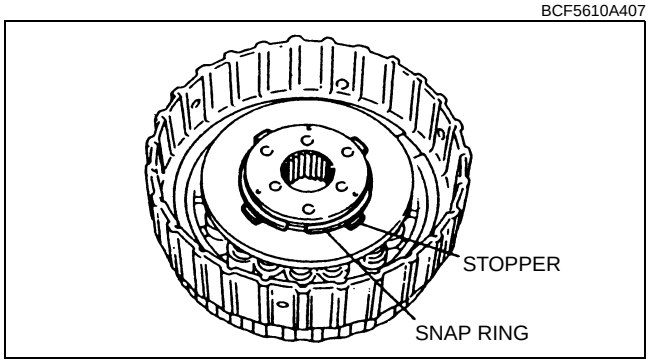

BCF5610A185

5. Install the spring retainer component.


BCF5610A407

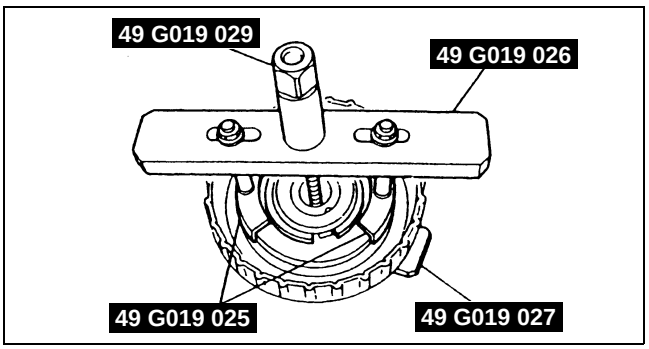
Caution

- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer component edges.**



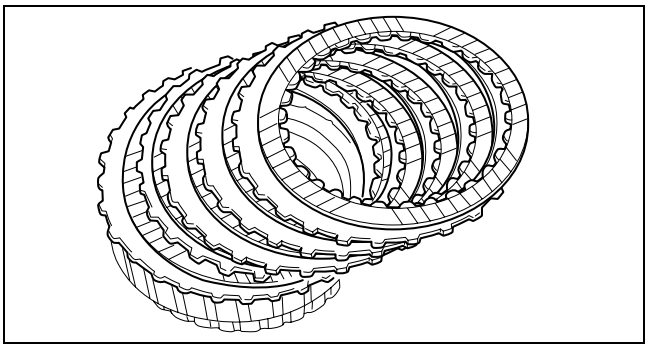
BCF5610A187

6. While holding the spring retainer down by using the **SSTs**, install the snap ring into the spring retainer stopper.
7. Soak new drive plates in ATF for at least two hours.
8. Apply ATF to the driven plates immediately before assembly.

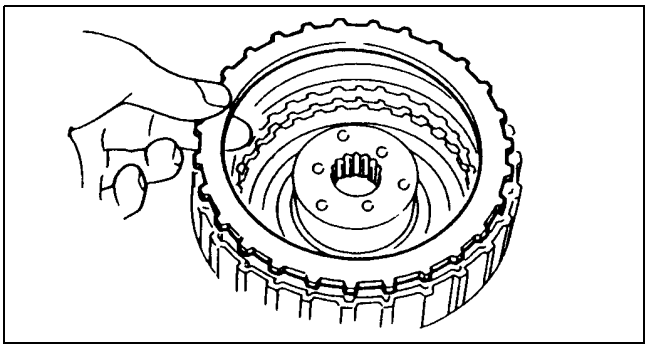


BCF5610A181

9. Install the drive and driven plates into the high clutch drum in the following order.
Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive


BCF5610A431

10. Install the retaining plate.
11. Install the snap ring.


BCF5610A189

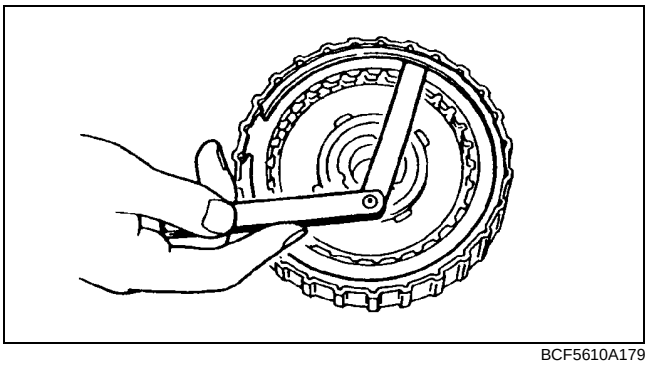
12. Measure the clearance between the retaining plate and the snap ring using a feeler gauge.
    - If not within specification, adjust the clearance by selecting the correct retaining plate.

Clearance
1.8—3.0 mm {0.071—0.118 in}

Retaining plate size

(mm {in})

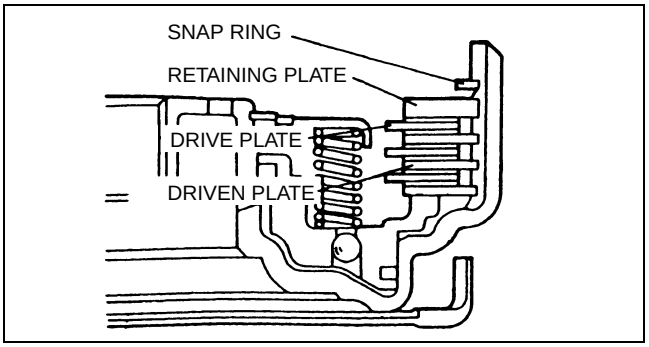
3.4 {0.134}	3.6 {0.142}	3.8 {0.150}	4.0 {0.157}
4.2 {0.165}	4.4 {0.173}	4.6 {0.181}	4.8 {0.189}


BCF5610A179

13. If the clearance cannot be brought to within the specification after installation of the thickest retaining plate, replace the driven plates and drive plates. Adjust the clearance by selecting the correct retaining plate.

Clearance
1.8—2.2 mm {0.071—0.087 in}

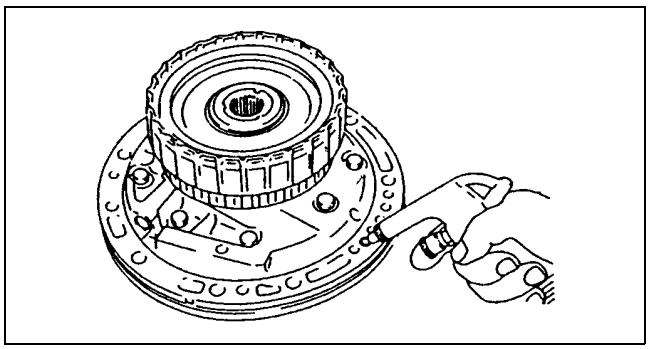
Caution
- **Apply compressed air to the assembled clutch pack for longer than 3 seconds at a time will damage the seal.**



BCF5610A190

14. Install the high clutch with the seal rings onto the oil pump. Apply compressed air through the oil passage and verify clutch operation.

    Air pressure
    392 kPa {4.0 kgf/cm^2, 57 psi} max.



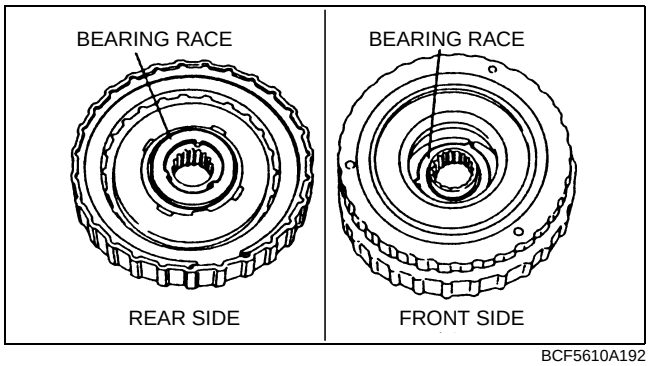
BCF5610A191

15. Apply petroleum jelly to the bearing races and install them in the high clutch drum as shown in the figure.

    Bearing race outer diameter
    Front: 43.5 mm {1.713 in}
    Rear: 51.5 mm {2.028 in}

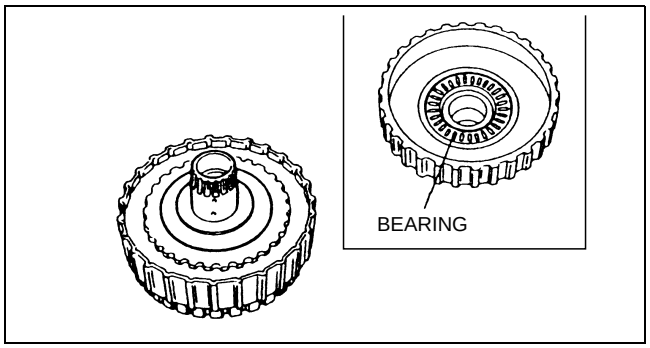
16. Apply petroleum jelly to the bearing and install it in the high clutch hub.

    Bearing outer diameter
    53.0 mm {2.087 in}



BCF5610A192

17. Apply ATF to the high clutch hub, and install it in the high clutch drum by turning it evenly and gradually.

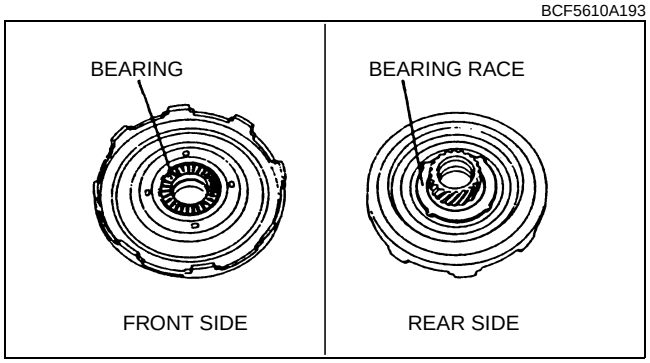


BCF5610A193

18. Apply petroleum jelly to the bearing and bearing race, and install them to the front sun gear.

    Bearing outer diameter
    53.0 mm {2.087 in}
    Bearing race outer diameter
    75.0 mm {2.953 in}

19. Assemble the front sun gear, reverse clutch, high clutch, and high clutch hub.



BCF5610A194

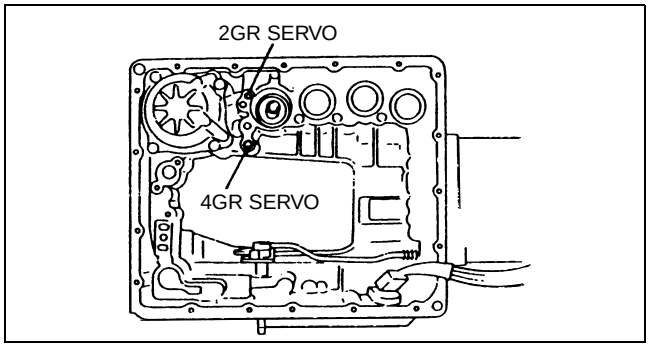
BAND SERVO PREINSPECTION
Band Servo Operation

CBG571019500A05

1. Apply compressed air through the oil passage as shown in the figure.
2. Verify that the piston stem moves toward the brake band.

    Air pressure
    392 kPa {4.0 kgf/cm^2, 57 psi} max.

3. If there is any malfunction, the D-rings or the O-rings may be damaged or the piston component may be sticking. Inspect and replace as necessary when assembling.

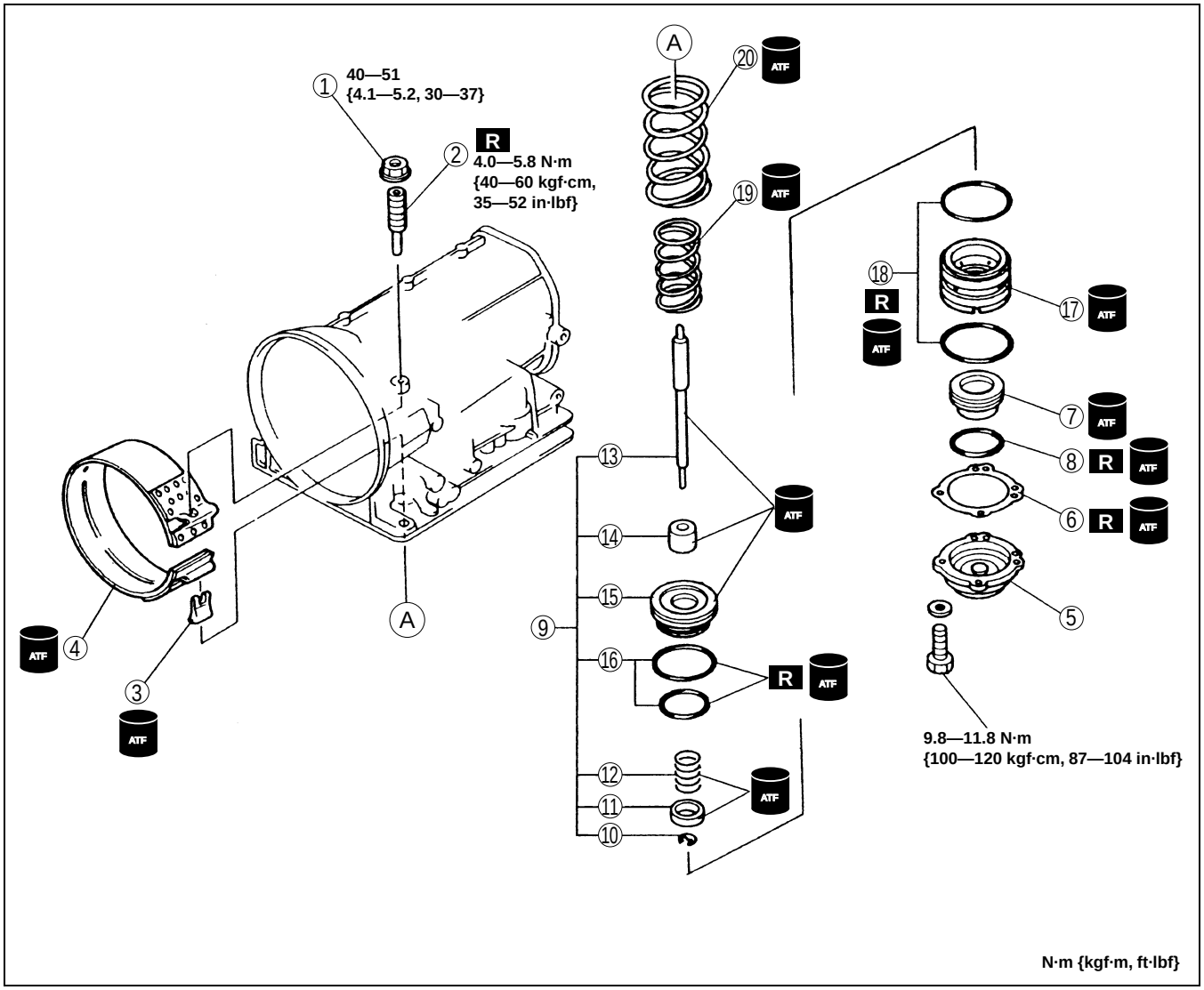


BCF5610A195

BAND SERVO DISASSEMBLY/ASSEMBLY

CBG571019500A06

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



CBG5710A001

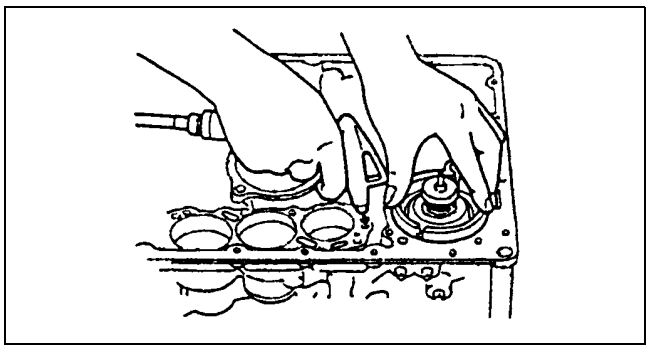
1	Locknut
2	Anchor end bolt
3	Band strut
4	Brake band
5	Band servo retainer
6	Gasket
7	4GR band servo piston (See K1–33 4GR Band Servo Piston Disassembly Note.)
8	D-ring
9	Piston component and servo piston retainer (See K1–33 Piston Component and Servo Piston Retainer Disassembly Note.)

10	Retaining ring
11	Spring retainer
12	Return spring C
13	Piston stem
14	Servo spring retainer
15	Band servo piston
16	D-rings
17	Servo piston retainer
18	O-rings
19	Return spring B
20	Return spring A

Piston Component and Servo Piston Retainer Disassembly Note

1. Apply compressed air to the oil hole in the transmission case to remove the piston component and servo piston retainer from the transmission case.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.



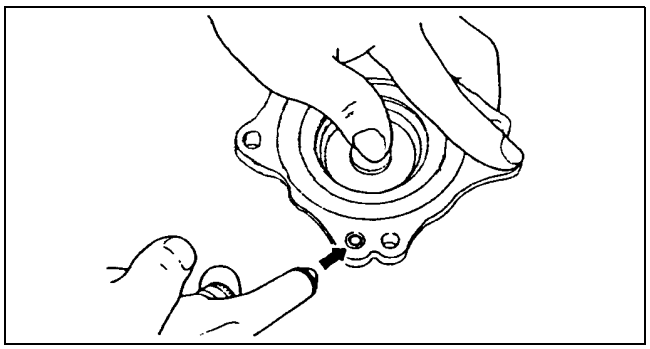
BCF5610A420

4GR Band Servo Piston Disassembly Note

1. Block one oil hole of the 4GR servo piston retainer and the centre hole in the 4GR band servo piston.
2. Apply compressed air through the other oil hole in the 4GR servo piston retainer to remove 4GR band servo piston.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

3. Remove the D-ring from the 4GR band servo piston.



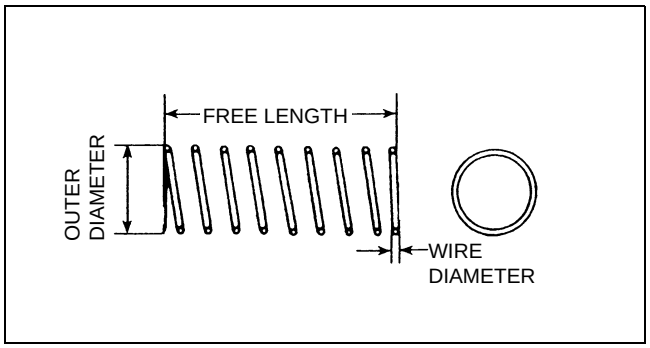
BCF5610A198

Return Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the return spring.

Specification

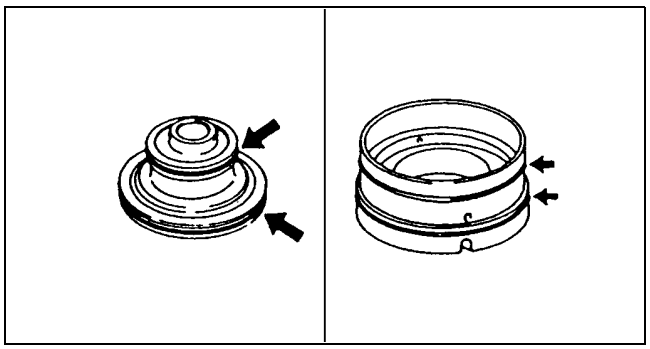
Spring specification	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
Spring A	40.3 {1.587}	53.8 {2.118}	3.0	2.3 {0.091}
Spring B	34.3 {1.350}	45.6 {1.795}	3.0	2.3 {0.091}
Spring C	27.6 {1.087}	29.0 {1.142}	3.2	2.6 {0.102}



BCF5610A142

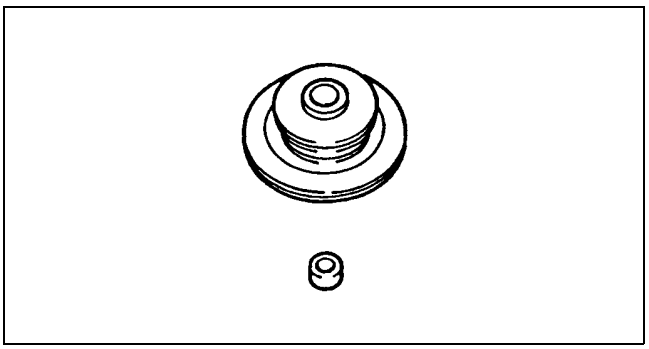
Band Servo Assembly Procedure

1. Apply ATF to new O-rings and install them onto the servo piston retainer.
2. Apply ATF to new D-rings and install them onto the band servo piston.



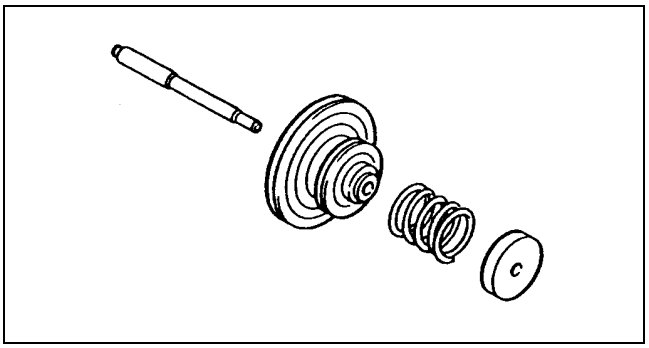
BCF5610A199

3. Apply ATF to the servo spring retainer. Assemble them in the band servo piston.



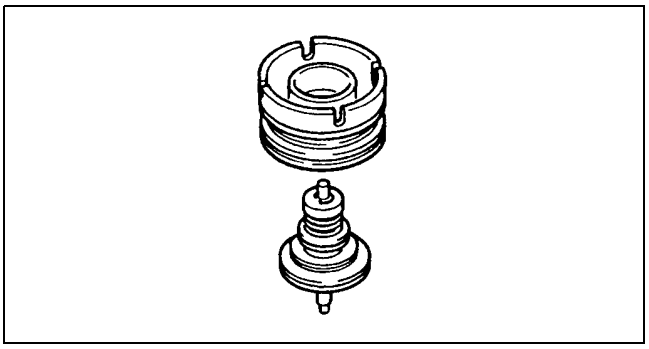
BCF5610A200

4. Assemble the band servo piston, piston stem, return spring, and spring retainer.
5. Install the retaining ring.
6. Apply ATF to the band servo piston component.



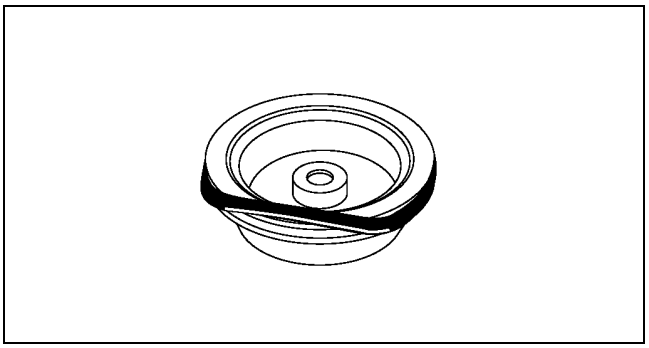
BCF5610A201

7. Apply even pressure to the perimeter of the piston, and install it into the band servo retainer.



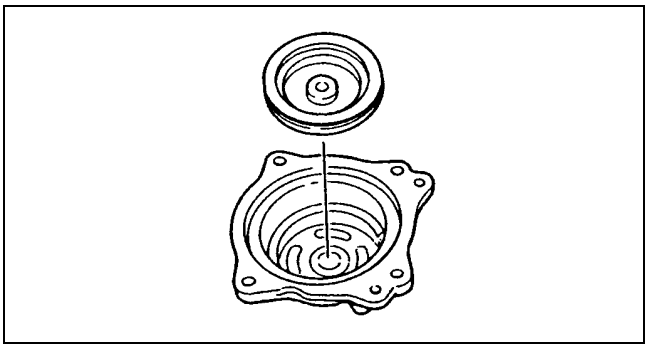
BCF5610A202

8. Apply ATF to a new D-ring and install it onto the 4GR band servo piston.
9. Apply ATF to the 4GR band servo piston.



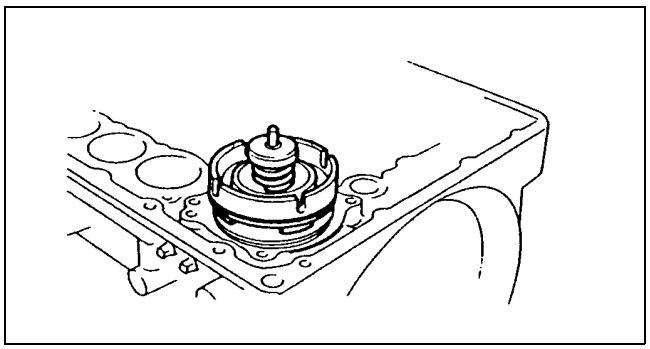
BCF5610A203

10. Apply even pressure to the perimeter of the piston, and install it into the band servo retainer.
11. Install return springs A and B.
12. Apply ATF to the piston component.



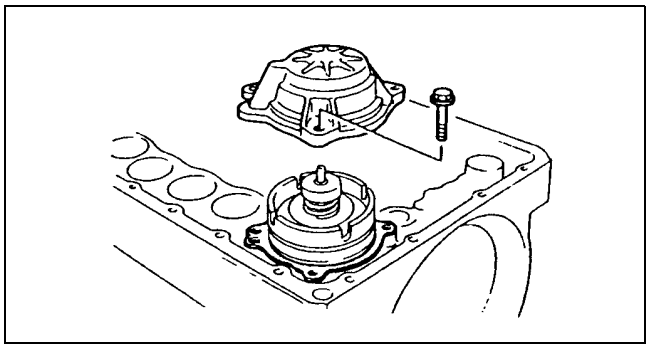
BCF5610A204

13. Apply even pressure to the perimeter of the piston component, and install it into the transmission case.



BCF5610A205

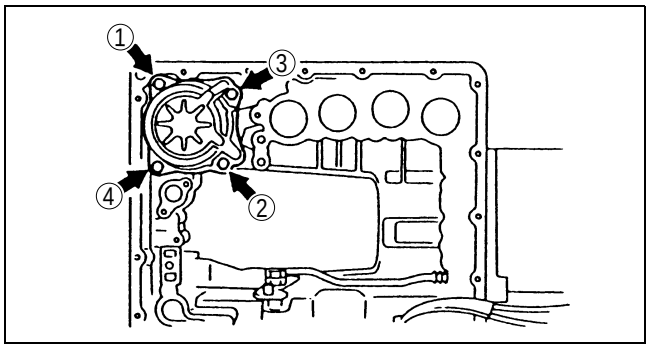
14. Apply ATF to the band servo retainer and a new gasket, and install them onto the transmission case.



BCF5610A206

15. Tighten the bolts evenly and gradually in the order as shown in the figure.

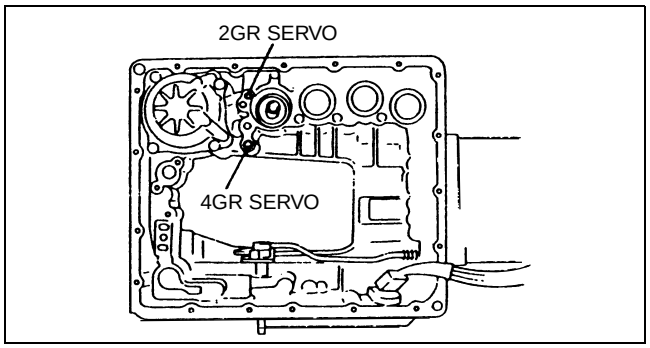
Tightening torque
9.8—11.8 N·m
{100—120 kgf·cm, 87—104 in·lbf}



BCF5610A207

16. Inspect the servo piston operation by applying compressed air through the oil holes as shown in the figure.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



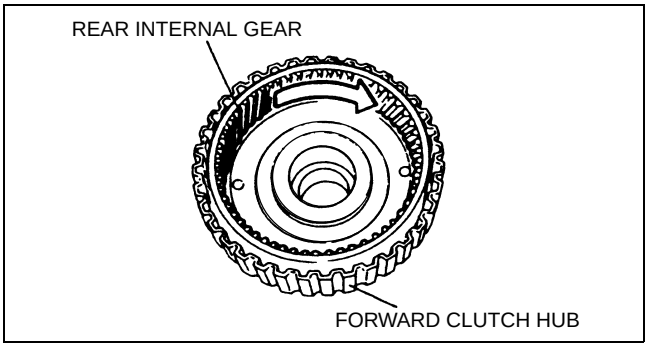
BCF5610A195

FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB PREINSPECTION

CBG571019500A07

Forward One-Way Clutch Operation

1. While holding the forward clutch hub, verify that the rear internal gear rotates smoothly when turned clockwise and locks when turned counterclockwise.
   - If not as specified, replace the one-way clutch.

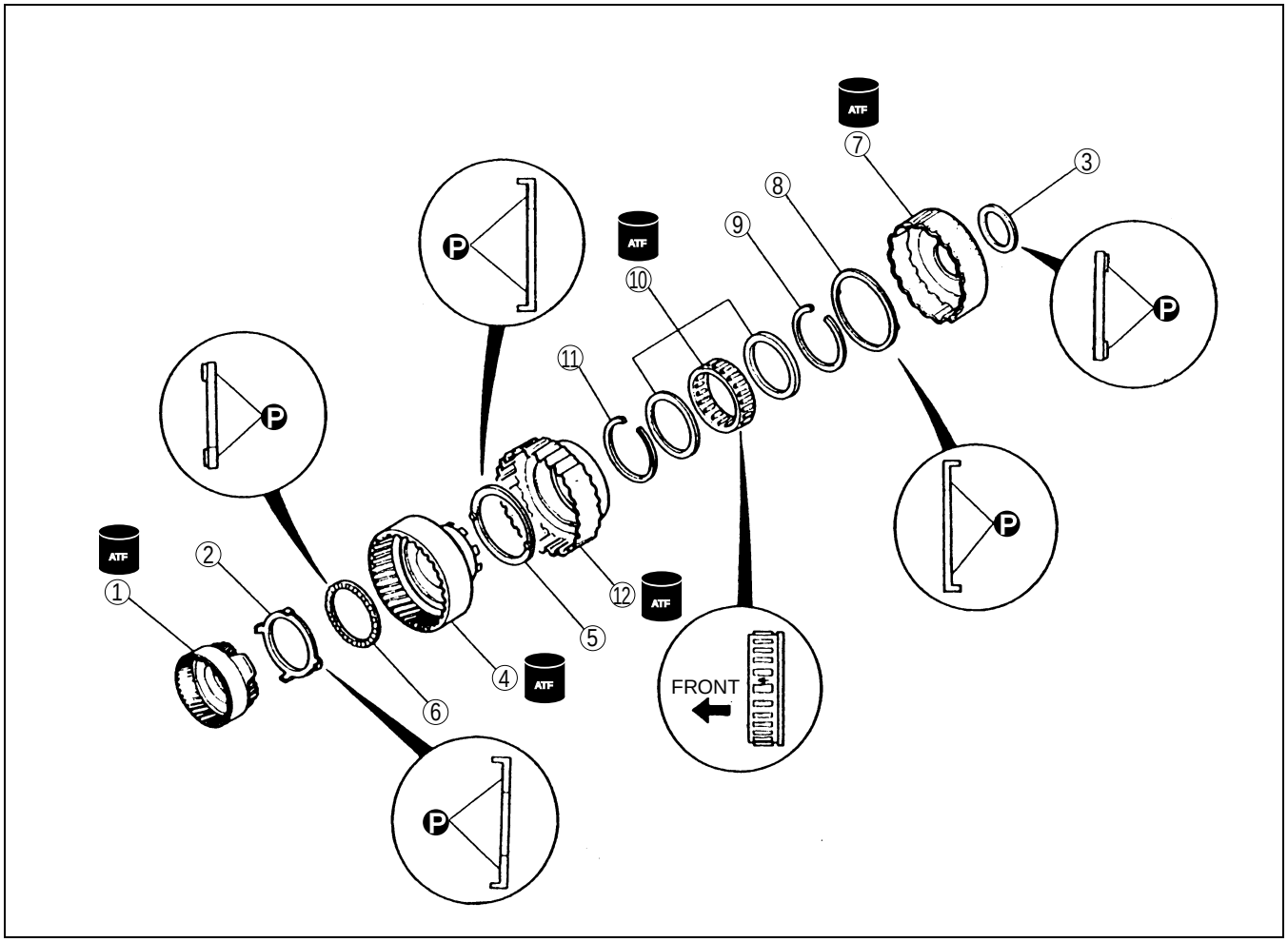


BCF5610A210

FRONT INTERNAL GEAR, REAR INTERNAL GEAR, FORWARD CLUTCH HUB, OVERRUNNING CLUTCH HUB DISASSEMBLY/ASSEMBLY

CBG571019500A08

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



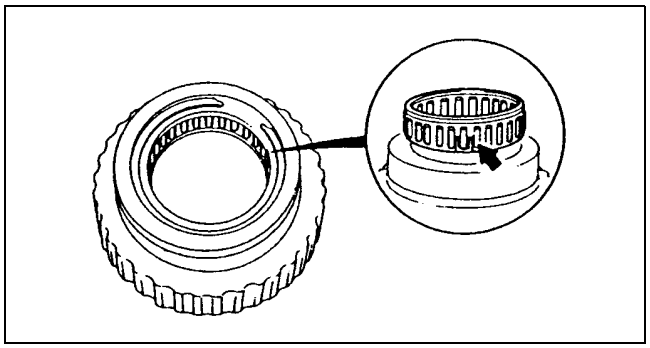
BCF5610A211

1	Front internal gear (with rear planetary carrier)
2	Bearing race
3	Bearing
4	Rear internal gear
5	Thrust washer
6	Bearing

7	Overrunning clutch hub
8	Thrust washer
9	Snap ring
10	Forward one-way clutch
11	Snap ring
12	Forward clutch hub

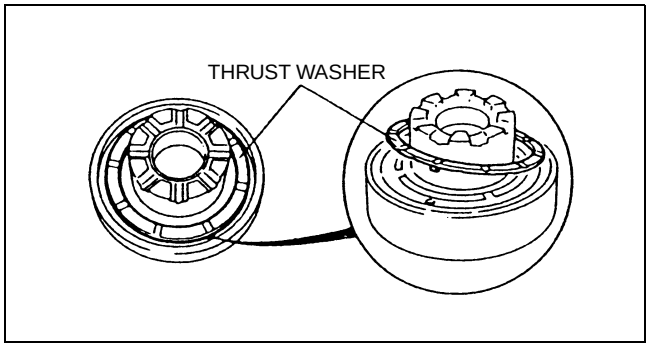
Front Internal Gear, Rear Internal Gear, Forward Clutch Hub, Overrunning Clutch Hub Assembly Procedure

1. Install the snap ring into the forward clutch hub.
2. Apply ATF to the forward one-way clutch. Install it into the forward clutch hub, with the flange facing upward.



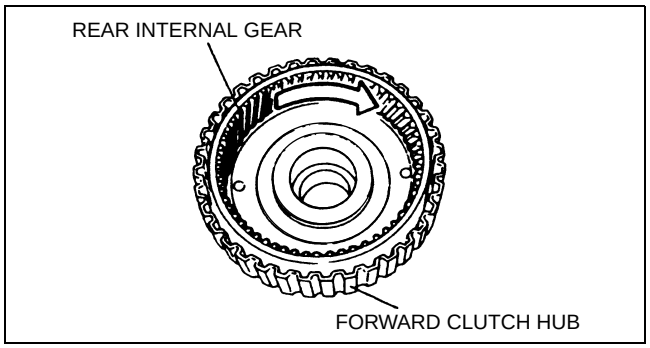
BCF5610A212

3. Apply petroleum jelly to the thrust washer, and set it so that the tabs fit in the holes of the rear internal gear.
4. Apply ATF to the rear internal gear, and install it in the forward clutch hub by turning it evenly and gradually.



BCF5610A213

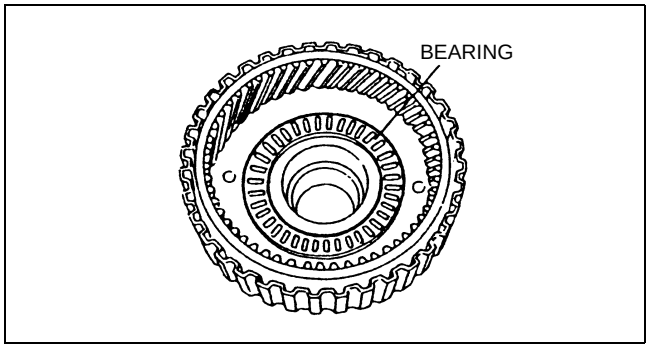
5. Hold the forward clutch hub and verify that the rear internal gear turns counter clockwise. If it does not, then the one-way clutch is installed upside down.



BCF5610A210

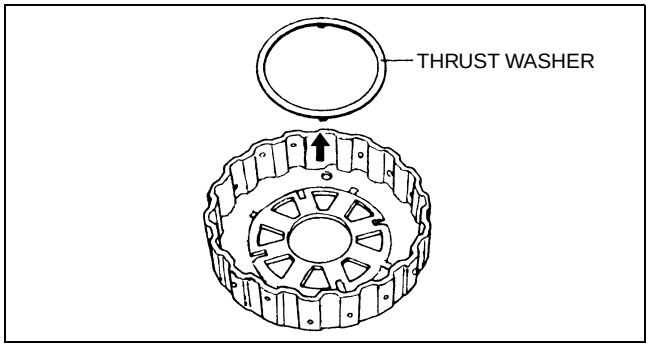
6. Apply petroleum jelly to the bearing, and install it on the rear internal gear.

   Bearing outer diameter
   78.0 mm {3.071 in}



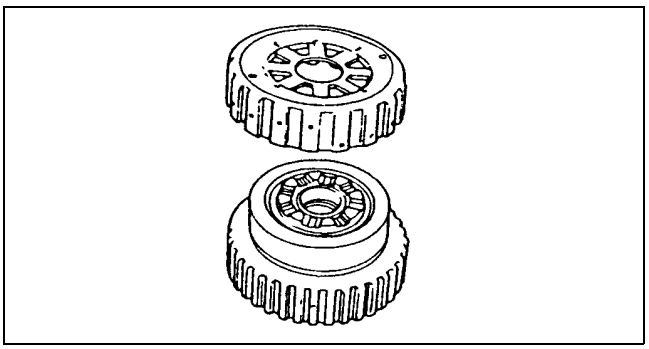
BCF5610A215

7. Apply petroleum jelly to the thrust washer, and set it so that the tabs fit in the holes of the overrunning clutch hub.



BCF5610A216

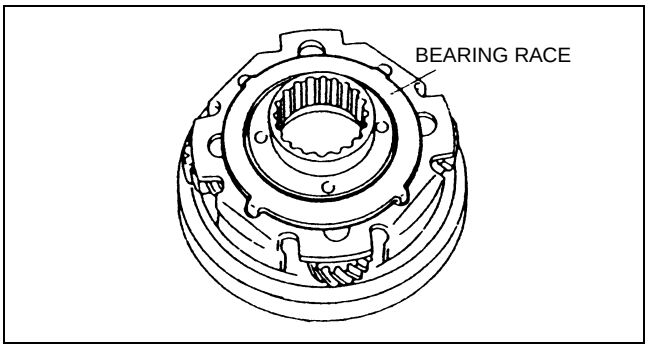
8. Set the overrunning clutch hub on the rear internal gear.



BCF5610A217

9. Apply petroleum jelly to the bearing race, and set it on the front internal gear.

   Bearing race outer diameter
   75.0 mm {2.953 in}



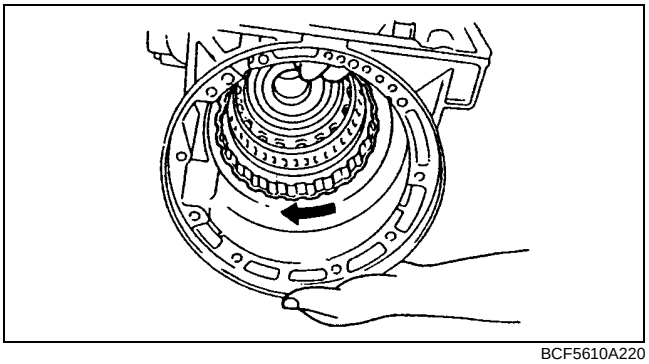
BCF5610A219

FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH) PREINSPECTION

CBG571019500A09

Low One-Way Clutch Operation

1. Install the forward clutch drum into the transmission case.
2. Verify that the forward clutch drum rotates smoothly when turned clockwise, and locks when turned counterclockwise.
   - If there is any malfunction, replace the one-way clutch.



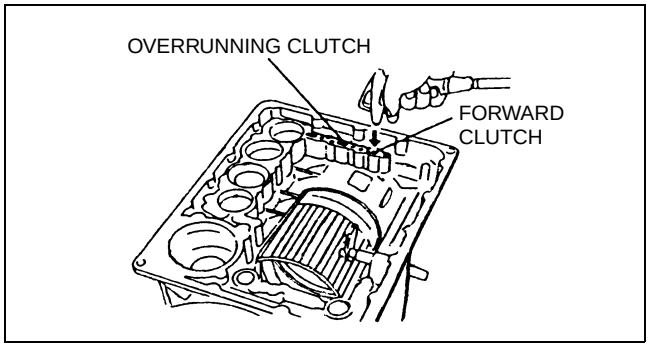
BCF5610A220

Forward Clutch and Overrunning Clutch Operation

1. Install the forward clutch drum and low one-way clutch inner race into the transmission case. Apply compressed air through the oil passage as shown in the figure.
2. Verify that the retaining plates move toward the snap rings.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi) max.

   - If there is any malfunction, the D-rings or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling.



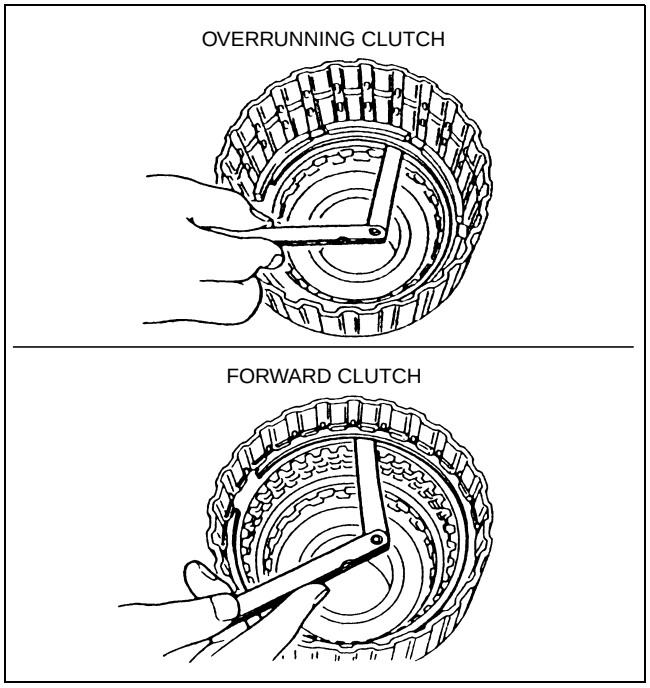
BCF5610A221

Forward Clutch, Overrunning Clutch Clearance

1. Measure the clearance between the retaining plate and the snap ring of the forward clutch and the overrunning clutch.

   Clearance
   Forward clutch:
   0.45—2.05 mm {0.018—0.081 in}
   Overrunning clutch:
   1.0—2.0 mm {0.039—0.079 in}

2. Select the correct retaining plate when assembling.



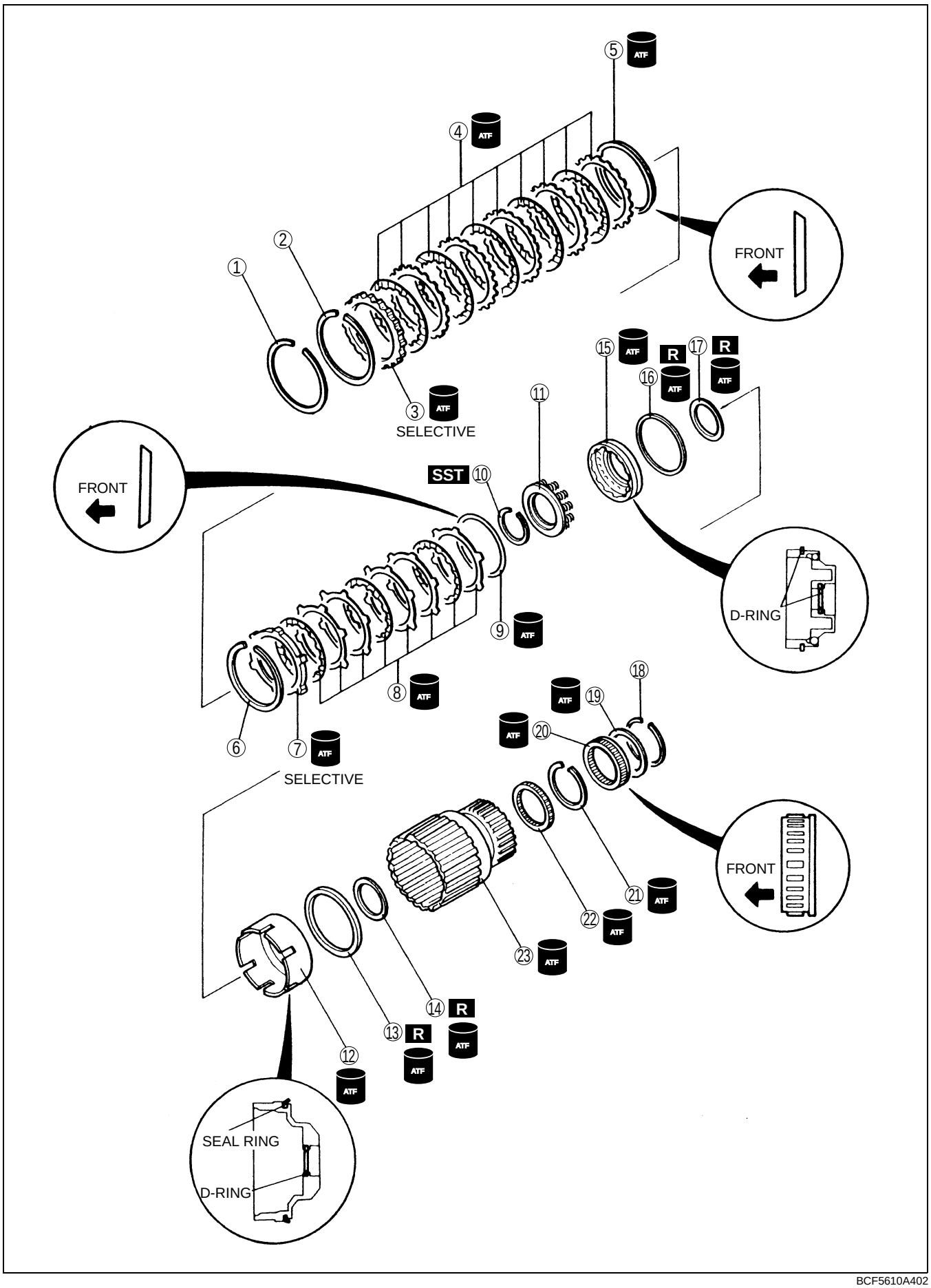
BCF5610A222

FORWARD CLUTCH DRUM (FORWARD CLUTCH, OVERRUNNING CLUTCH, LOW ONE-WAY CLUTCH) DISASSEMBLY/ASSEMBLY

CBG571019500A10

1. Disass
   emble in the order indicated in the table.

2. Assemble in the reverse order of disassembly.



BCF5610A402

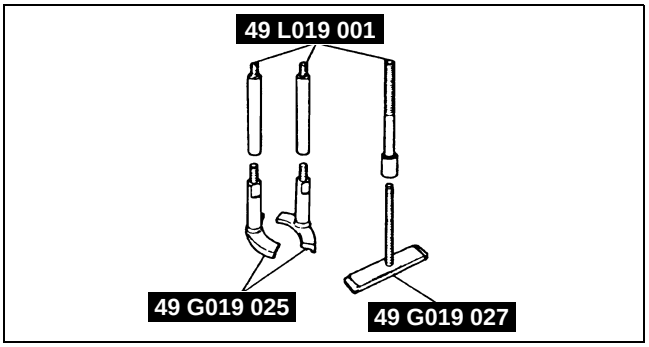
1	Snap ring
2	Snap ring
3	Retaining plate
4	Drive and driven plates
5	Dished plate
6	Snap ring
7	Retaining plate
8	Drive and driven plates
9	Dished plate
10	Snap ring (See K1–41 Snap Ring Disassembly Note.)
11	Spring retainer component
12	Forward clutch piston (See K1–42 Forward Clutch Piston, Overrunning Clutch Piston Disassembly Note.)
13	Seal ring
14	D-ring
15	Overrunning clutch piston (See K1–42 Forward Clutch Piston, Overrunning Clutch Piston Disassembly Note.)
16	D-ring
17	D-ring
18	Snap ring
19	Side plate
20	Low one-way clutch
21	Snap ring
22	Bearing (radial bearing)
23	Forward clutch drum

Snap Ring Disassembly Note

1. Assemble the **SSTs**.

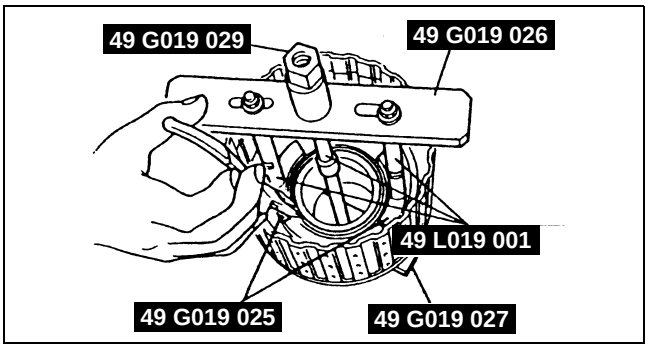
Caution

- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer component edges.**



BCF5610A224

2. While holding the spring retainer component down using the **SSTs**, remove the snap ring using the snap ring pliers.
3. Remove the spring retainer component.
4. Inspect and replace the return springs as necessary. (See K1–42 Return Spring Inspection.)



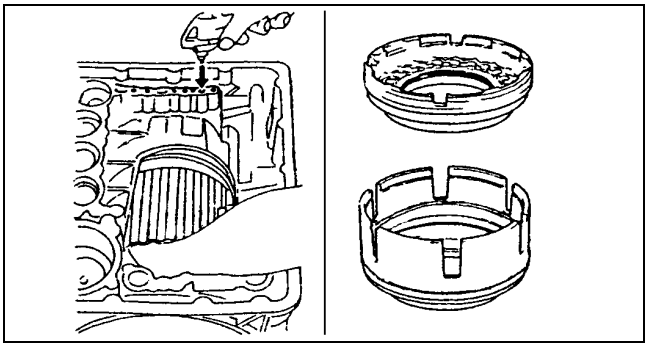
BCF5610A225

Forward Clutch Piston, Overrunning Clutch Piston Disassembly Note

1. Set the forward clutch drum in the transmission case.
2. Remove the piston by applying compressed air through the oil passage.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.

3. Remove the overrunning clutch piston from the forward clutch piston.
4. Inspect and replace the overrunning clutch piston as necessary.
(See K1–43 Overrunning Clutch Piston Inspection.)

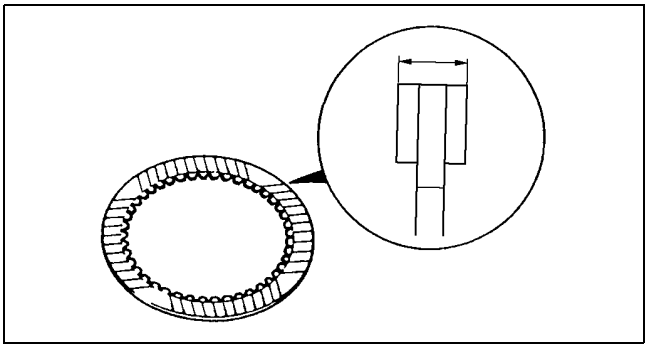


BCF5610A226

Drive Plates Inspection

1. Measure the facing thickness in three places, and calculate the average.
   - If it is less than the minimum specification, replace the drive plate.

Thickness
Standard: 2.0 mm {0.079 in}
Minimum: 1.8 mm {0.071 in}



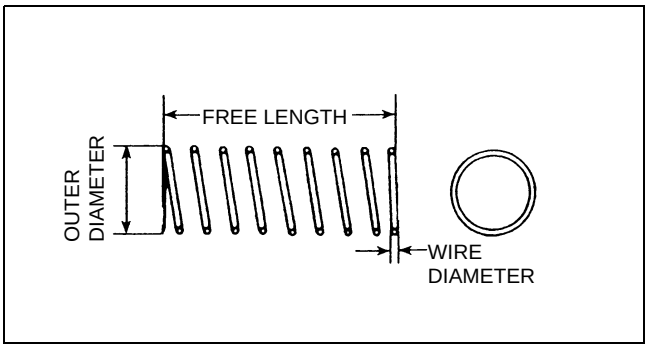
BCF5610A166

Return Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the return spring.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
9.7 {0.382}	35.8 {1.409}	10.3	1.3 {0.051}

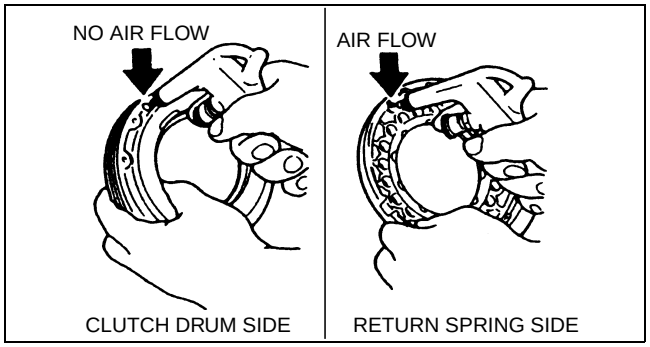


BCF5610A142

Overrunning Clutch Piston Inspection

1. Shake the clutch piston and verify that the check ball is free.
2. Verify that there is no air flow when applying compressed air through the oil hole on the clutch drum side.
3. Verify that is air flow when applying compressed air through the oil hole on return spring side.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.

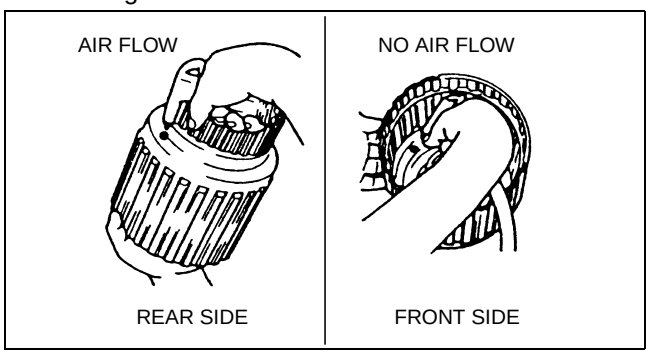


BCF5610A183

Forward Clutch Drum Inspection

1. Verify that there is no air flow when applying compressed air through the oil hole on the front side.
2. Verify that there is air flow when applying compressed air through the oil hole on the rear side.

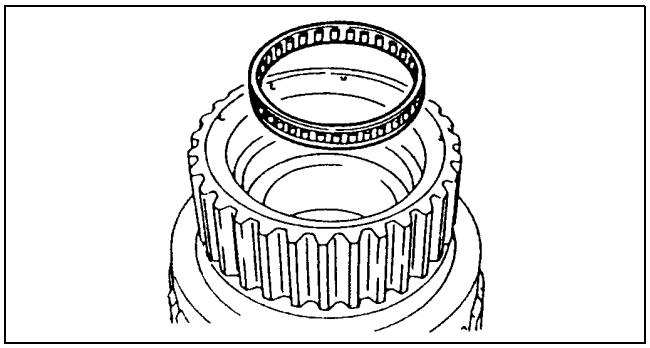
Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



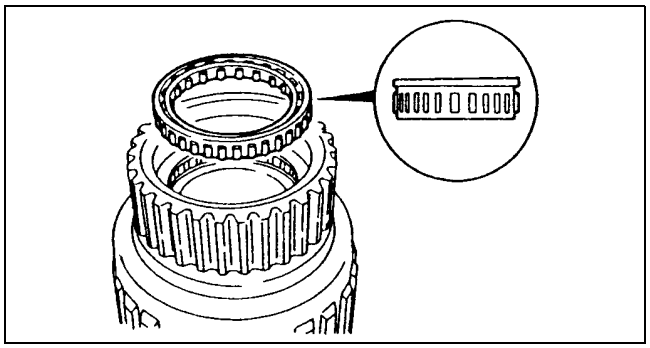
BCF5610A227

Forward Clutch Drum (Forward Clutch, Overrunning Clutch, Low One-Way Clutch) Assembly Procedure

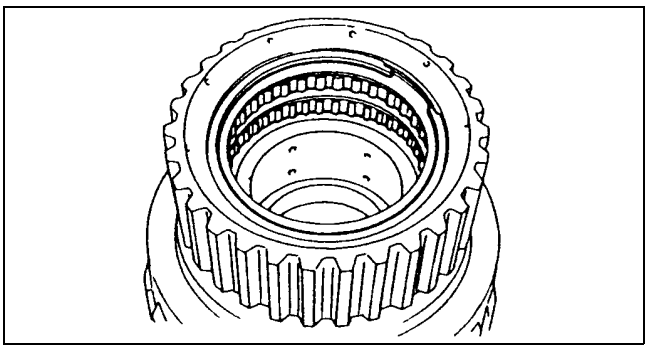
1. Apply ATF to the bearing and install it into the forward clutch drum.
2. Install the snap ring.


BCF5610A228

3. Apply ATF to the low one-way clutch. Install it carefully into the forward clutch drum, with the flange facing upward.

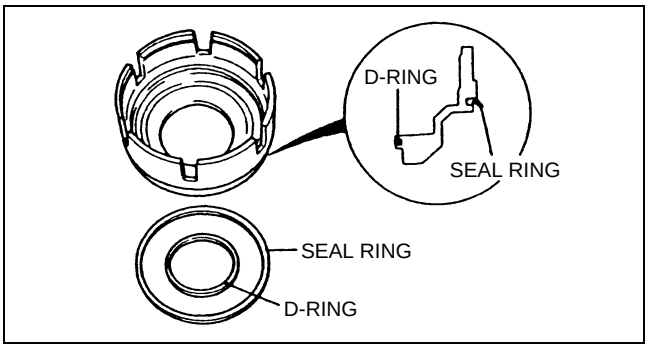

BCF5610A229

4. Apply ATF to the side plate and snap ring, and install them into the forward clutch drum.



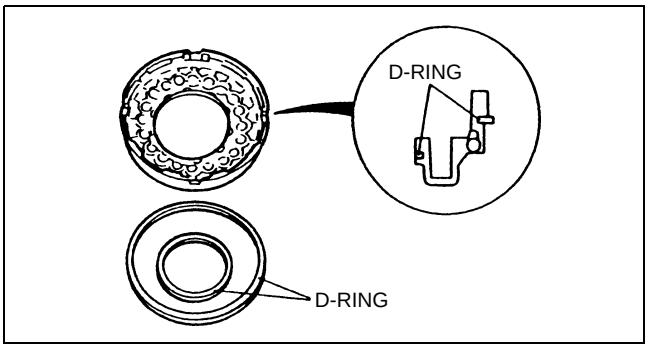
BCF5610A230

5. Apply ATF to a new D-ring and seal ring, and install them into the forward clutch piston as shown in the figure.



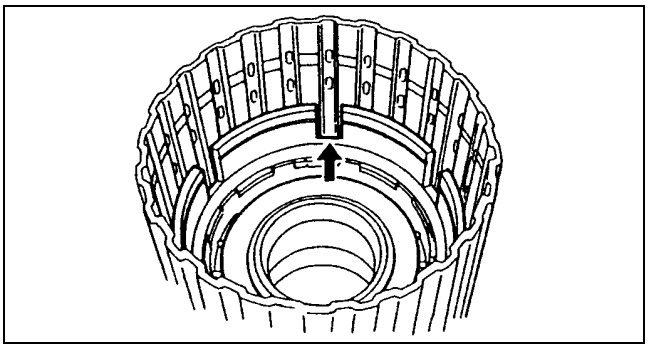
BCF5610A231

6. Apply ATF to the new D-rings, and install them to the overrunning clutch piston as shown in the figure.
7. Apply ATF to the inner face of the forward clutch drum and to the forward clutch piston.



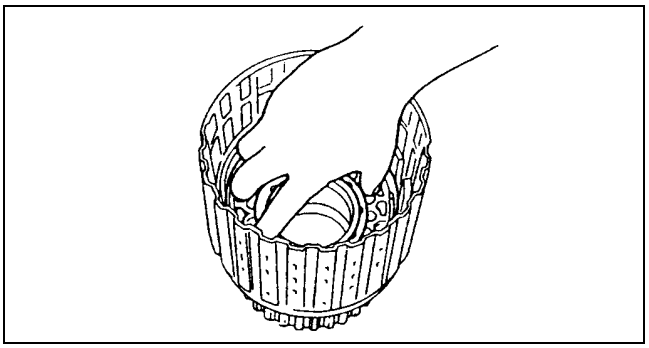
BCF5610A232

8. Apply even pressure to the perimeter of the forward clutch piston, and install it into the forward clutch drum by turning it evenly and gradually. Align the notches in the forward clutch piston with the grooves in the forward clutch drum.
9. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.
10. Apply ATF to the inner face of the forward clutch piston and to the overrunning clutch piston.



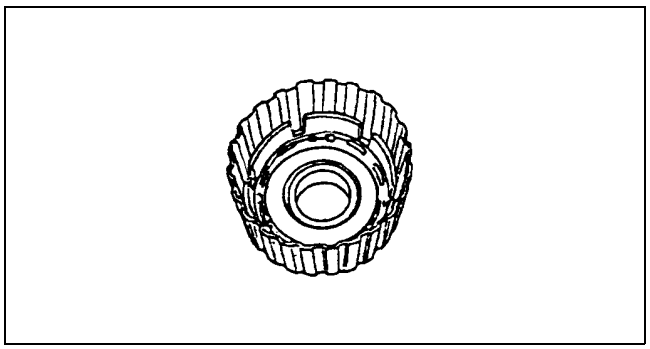
BCF5610A233

11. Apply even pressure to the perimeter of the overrunning clutch piston, and install it into the forward clutch piston by turning it evenly and gradually.



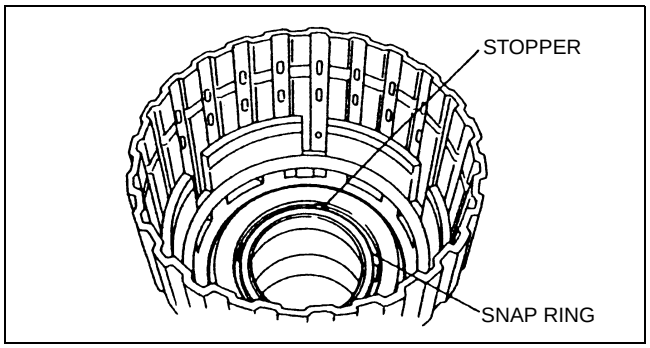
BCF5610A234

12. Install the spring retainer component.



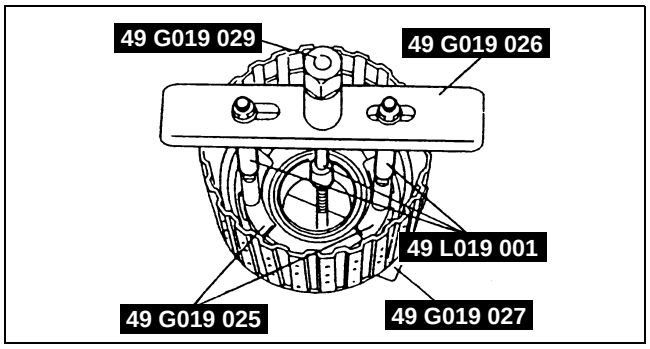
BCF5610A406

Caution
- **Depress the spring retainer only enough to install the snap ring. Overpressing will damage the retainer component edges.**



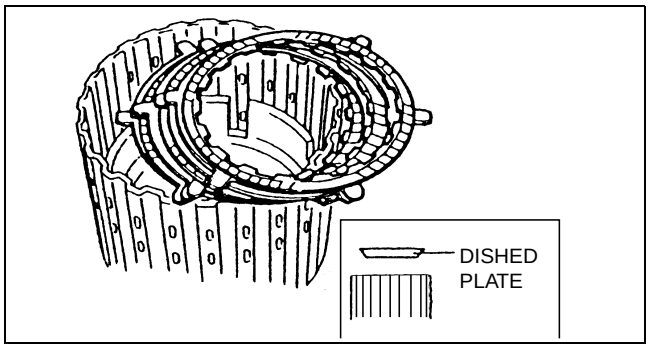
BCF5610A236

13. While holding the spring retainer down using the **SSTs**, install the snap ring into the spring retainer stopper.



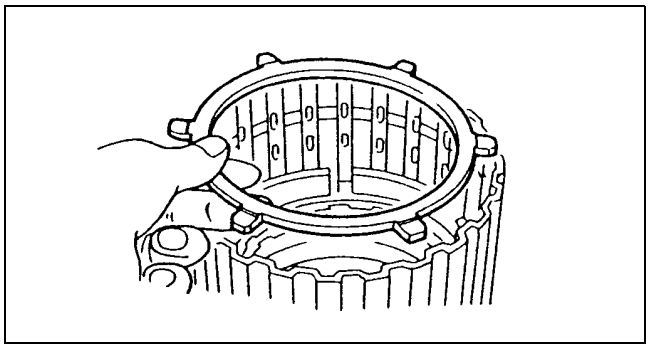
BCF5610A237

14. Install the dished plate as shown in the figure.
15. Soak new drive plates in ATF for at least two hours.
16. Apply ATF to the driven plates immediately before assembly.
17. Install the drive and driven plates into the forward clutch piston in the following order.
    Driven-Drive-Driven-Driven-Drive-Driven-Driven-Drive



BCF5610A378

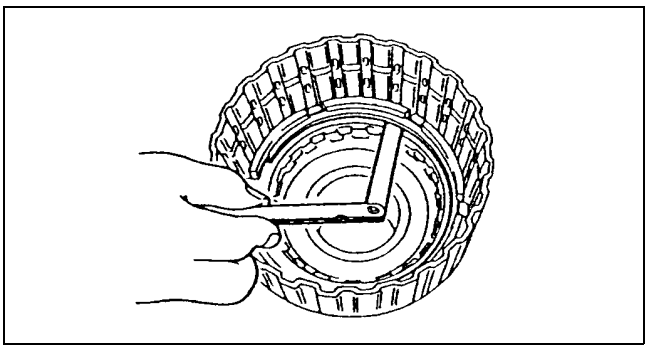
18. Install the retaining plate.
19. Install the snap ring.



BCF5610A238

20. Measure the clearance between the retaining plate and the snap ring using a feeler gauge.
    - If not within the specification, adjust the clearance by selecting the correct retaining plate.

    Clearance
    1.0—2.0 mm {0.039—0.079 in}


BCF5610A239

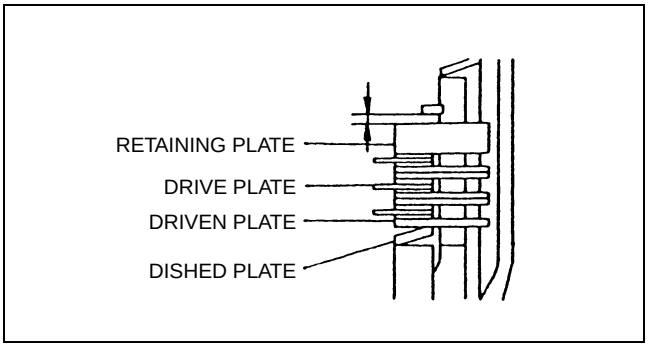
Retaining plate size

(mm {in})

4.0 {0.157}	4.2 {0.165}	4.4 {0.173}	4.6 {0.181}
4.8 {0.189}	5.0 {0.197}	5.2 {0.205}	—

21. If the clearance cannot be brought to within the specification after installation of the thickest retaining plate, replace the dished plate, driven plates, and drive plates. Adjust the clearance by selecting the correct retaining plate.

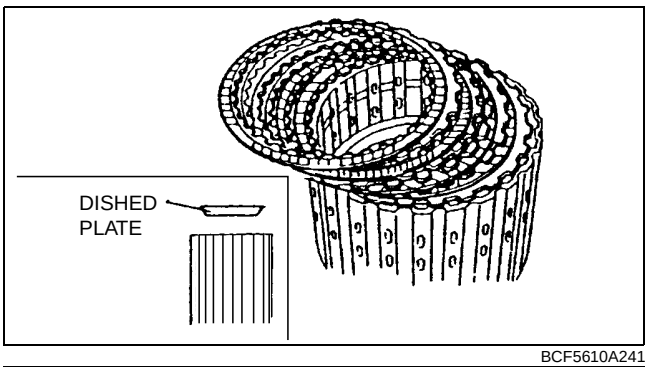
    Clearance
    1.0—1.4 mm {0.039—0.055 in}



BCF5610A240

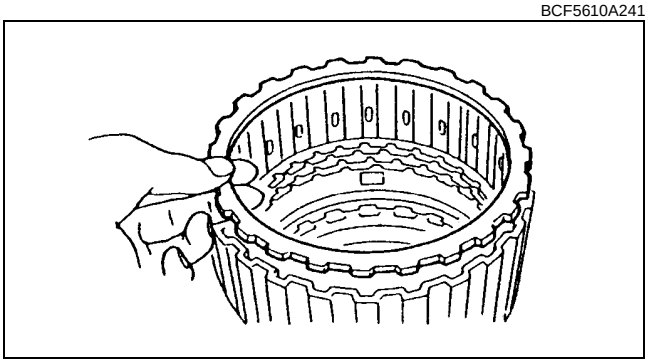
22. Install the dished plate as shown in the figure.
23. Soak new drive plates in ATF for at least two hours.
24. Apply ATF to the driven plates immediately before assembly.

25. Install the drive and driven plates into the forward clutch drum in the following order.
    Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive



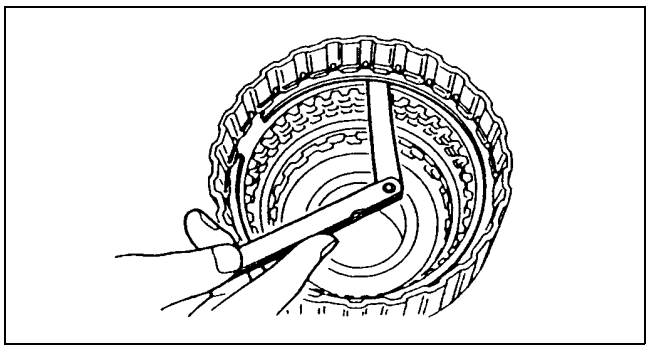
BCF5610A241

26. Install the retaining plate.
27. Install the snap ring.


BCF5610A242

28. Measure the clearance between the retaining plate and the snap ring using a feeler gauge.
    - If not within the specification, adjust the clearance by selecting the correct retaining plate.

    Clearance
    0.45—2.05 mm {0.018—0.081 in}


BCF5610A243

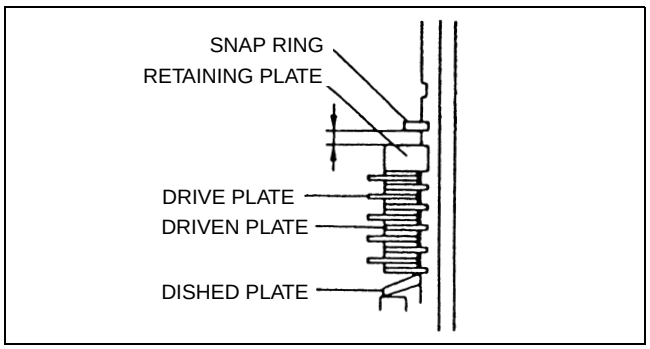
Retaining plate size

(mm {in})

8.1 {0.319}	8.3 {0.327}	8.5 {0.335}	8.7 {0.343}
8.9 {0.350}	9.1 {0.358}	—	—

29. If the clearance cannot be brought to within the specification after installation of the thickest retaining plate, replace the dished plate, driven plates, and drive plates. Adjust the clearance by selecting the correct retaining plate.

    Clearance
    0.35—0.75 mm {0.014—0.029 in}



BCF5610A244

30. Install the snap ring.

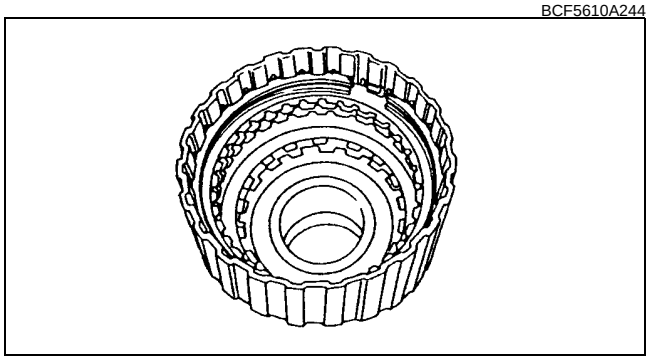
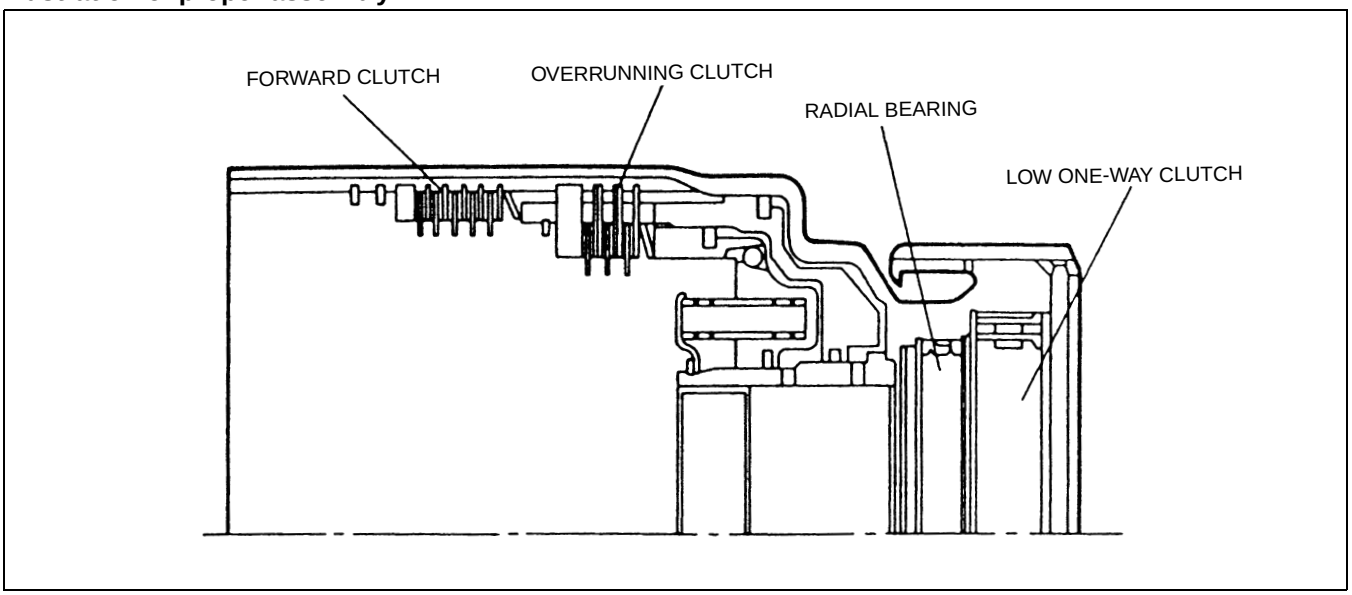

BCF5610A245

Illustration of proper assembly

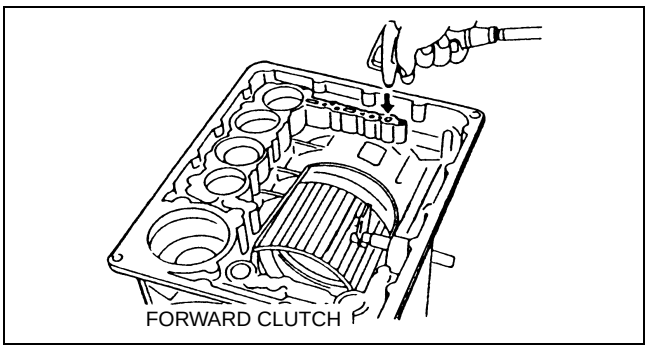


BCF5610A246

Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**

31. Set the forward clutch drum in the transmission.
32. Apply compressed air through the oil passage as shown in the figure, and check the forward clutch operation.

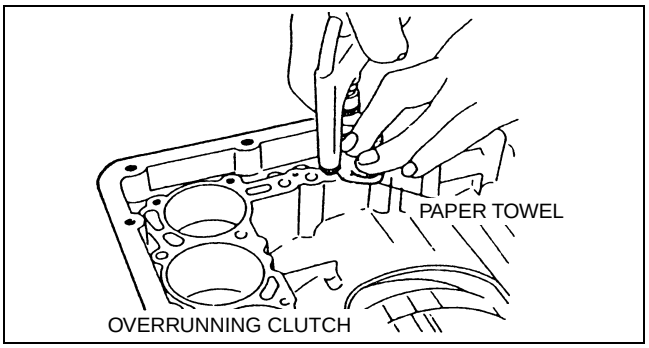
    Air pressure
    392 kPa {4.0 kgf/cm^2, 57 psi} max.



BCF5610A247

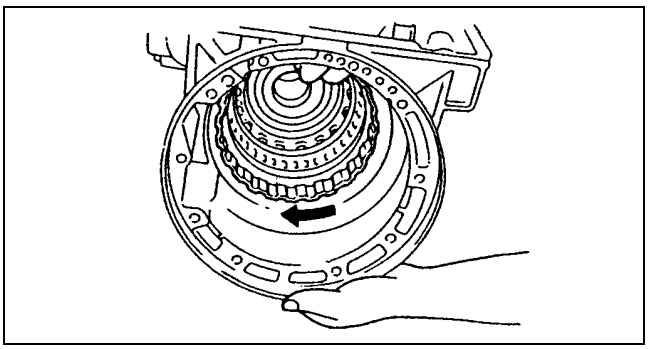
33. Apply compressed air through the oil passage and check the overrunning clutch operation. Hold a paper towel around the nozzle of the air gun to keep air from escaping around the edges.

    Air pressure
    392 kPa {4.0 kgf/cm^2, 57 psi} max.



BCF5610A248

34. Verify that the forward clutch drum turns clockwise only. If it turns counterclockwise, the one-way clutch could be installed upside down.



BCF5610A220

LOW AND REVERSE BRAKE PREINSPECTION

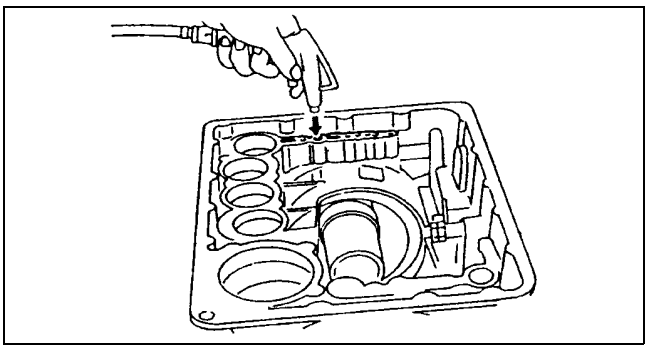
CBG571019500A11

Low and Reverse Brake Operation

1. Apply compressed air through the oil passage as shown in the figure.
2. Verify that the retaining plate move toward the snap ring.

    Air pressure
    392 kPa {4.0 kgf/cm^2, 57 psi} max.

3. If there is any malfunction, the D-ring or the seal ring may be damaged or fluid may be leaking at the piston check ball. Inspect and replace as necessary when assembling.



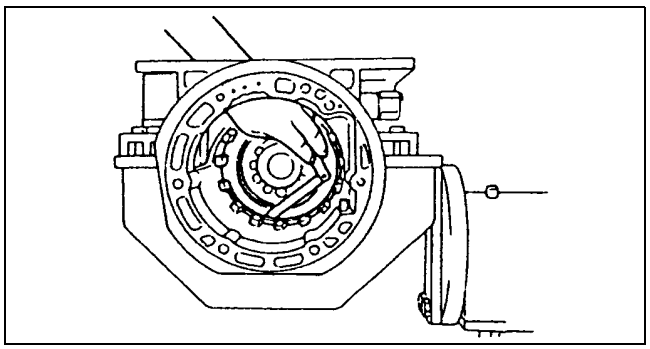
BCF5610A249

Low and Reverse Brake Clearance

1. Measure the clearance between the retaining plate and the snap ring.

   Clearance
   0.7—2.3 mm {0.028—0.091 in}

2. Select the correct retaining plate when assembling.

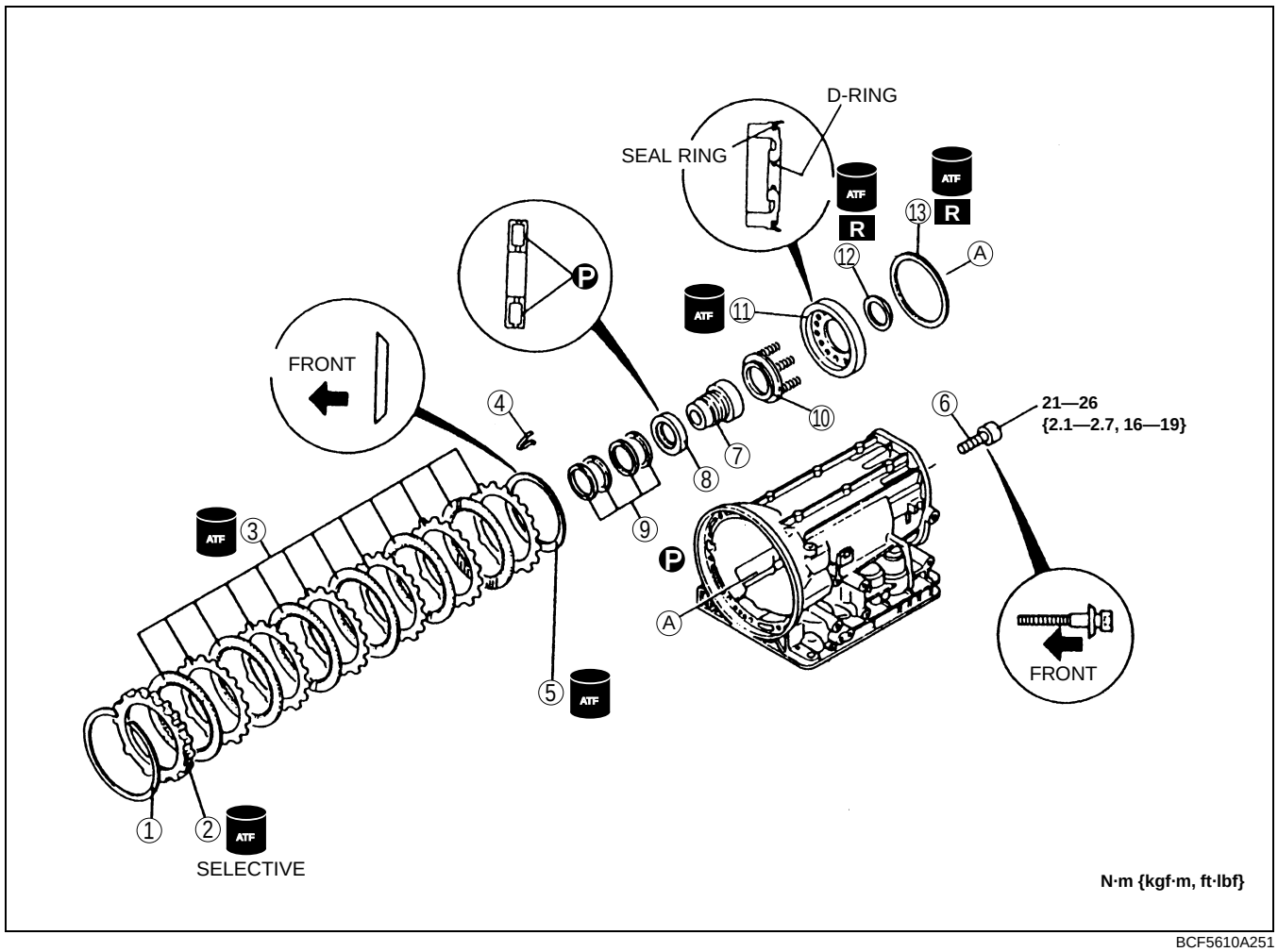


BCF5610A250

LOW AND REVERSE BRAKE DISASSEMBLY/ASSEMBLY

CBG571019500A12

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



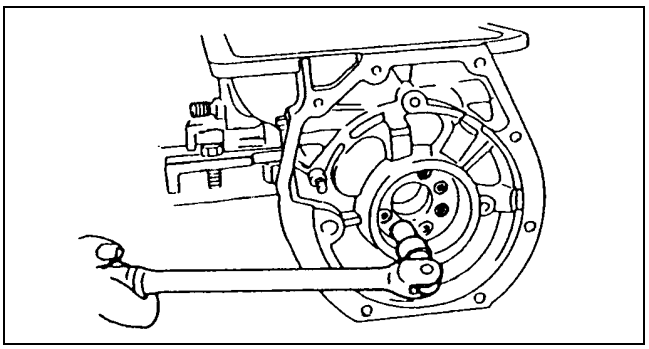
BCF5610A251

1	Snap ring
2	Retaining plate
3	Drive and driven plates
4	Spring
5	Dished plate
6	Allen-head bolt
7	Low one-way clutch inner race (See K1–50 Low One-Way Clutch Inner Race Disassembly Note.)

8	Bearing
9	Seal ring
10	Spring retainer component
11	Low and reverse brake piston (See K1–50 Low and Reverse Brake Piston Disassembly Note.)
12	D-ring
13	Seal ring

Low One-Way Clutch Inner Race Disassembly Note

1. Loosen the bolts gradually in a crisscross pattern. Hold the inner race with your free hand so that it doesn't spring out as the last bolt is removed.
2. Remove the Allen-head bolts and low one-way clutch inner race.
3. Inspect and repair the low one-way clutch inner race as necessary.
   (See K1–51 Low One-Way Clutch Inner Race Inspection.)

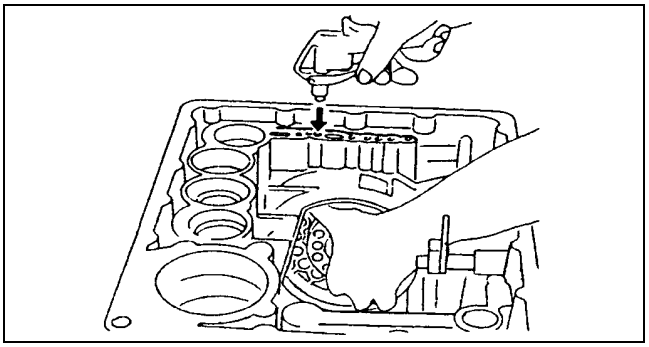


BCF5610A252

Low and Reverse Brake Piston Disassembly Note

1. Remove the low and reverse brake piston by applying compressed air through the oil passage as shown in the figure.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

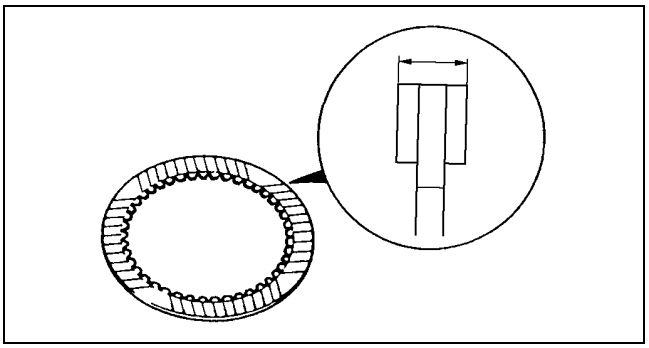


BCF5610A253

Drive Plates Inspection

1. Measure the facing thickness in three places, and calculate the average.
   - If it is less than the minimum specification, replace the drive plate.

   Thickness
   Standard: 2.0 mm {0.079 in}
   Minimum: 1.8 mm {0.071 in}



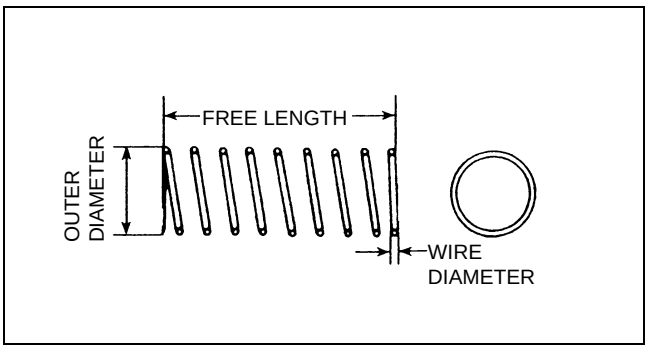
BCF5610A166

Return Springs Inspection

1. Measure the spring free length.
   - If not within specification, replace the return spring.

Specification

Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
11.2 {0.441}	22.3 {0.878}	4.76	1.14 {0.045}

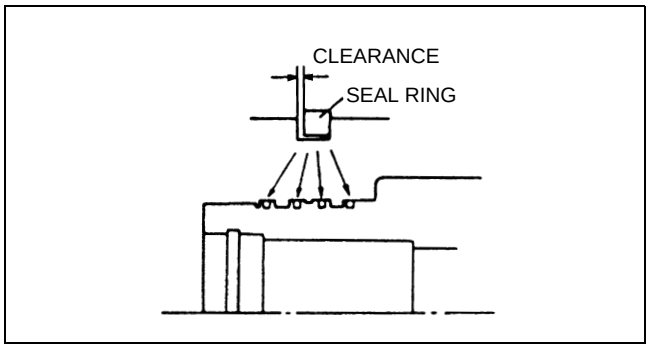


BCF5610A142

Low One-Way Clutch Inner Race Inspection

1. Apply petroleum jelly to new seal rings and install them to the one-way clutch inner race.
2. Measure the clearance between each seal ring and ring groove.
   - If it exceeds the maximum specification, replace the low one-way clutch inner race.

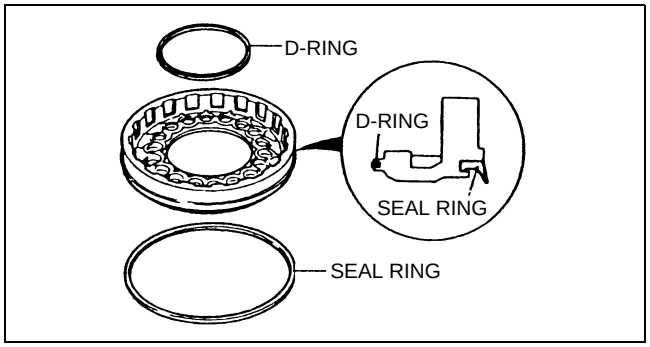
   Standard clearance
   0.10—0.25 mm {0.0039—0.0098 in}
   Maximum clearance
   0.25 mm {0.0098 in}



BCF5610A254

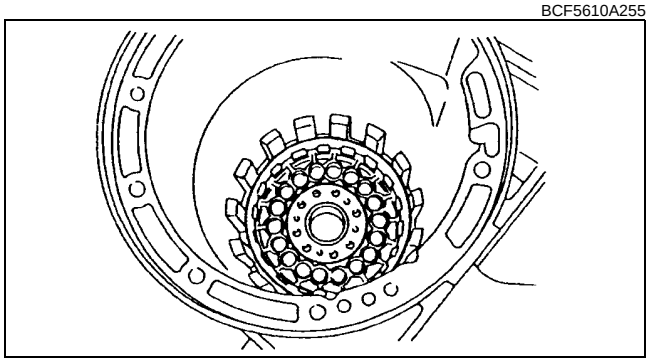
Low and Reverse Brake Assembly Procedure

1. Apply ATF to a new D-ring and seal ring and install them to the low and reverse brake piston.



BCF5610A255

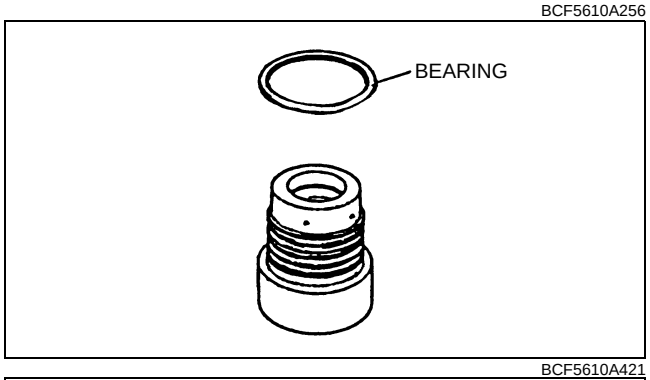
2. Apply ATF to the inner surface of the transmission case.
3. Apply even pressure to the perimeter of the low and reverse brake piston, and install it into the transmission case by turning it evenly and gradually.
4. Verify that the piston can be turned by hand. If it cannot, then remove it and check for damage to the seal ring.



BCF5610A256

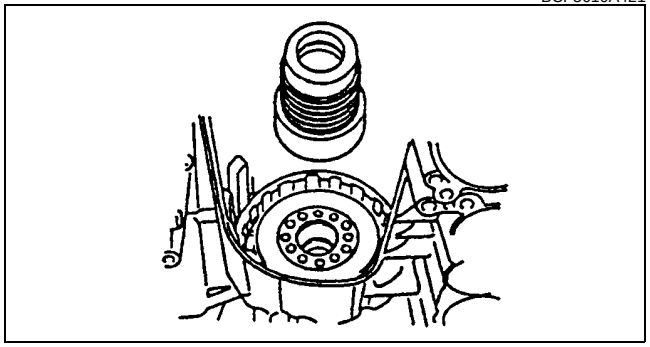
5. Apply petroleum jelly to the bearing, then install it on the low one-way clutch inner race.

   Bearing outer diameter
   78.0 mm {3.071 in}



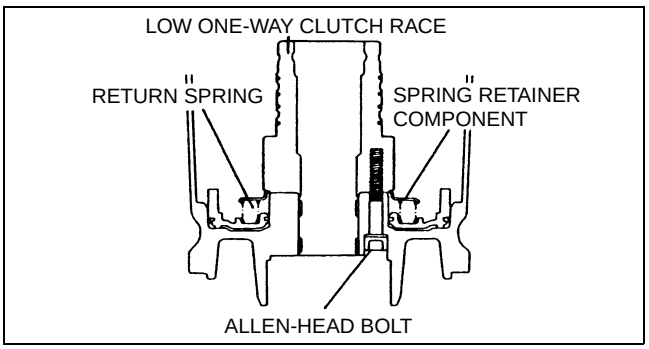
BCF5610A421

6. Assemble the spring retainer component, and low one-way clutch inner race to the low and reverse brake piston.



BCF5610A405

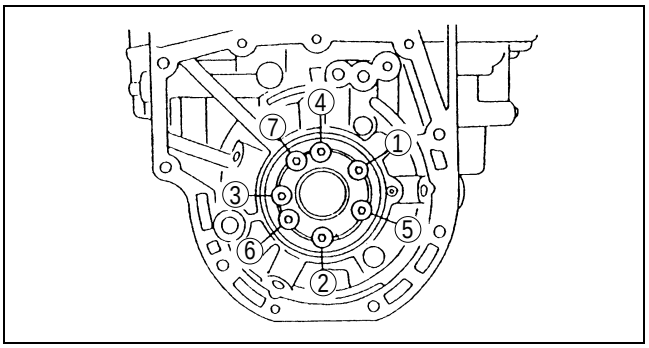
7. Verify that the spring retainer component, and low one-way clutch inner race are properly positioned before securing them with the Allen-head bolts.



BCF5610A258

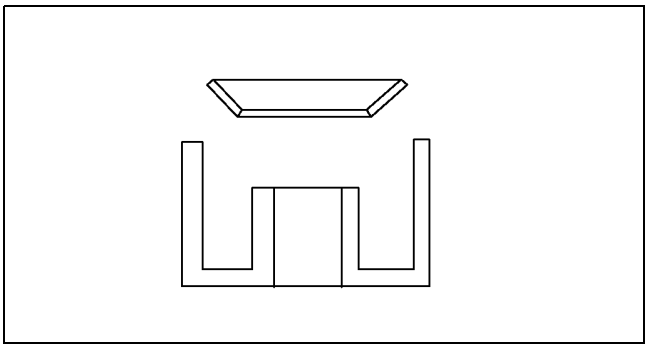
8. Tighten the Allen-head bolts evenly and gradually in the order as shown in the figure.

   Tightening torque
   21—26 N·m {2.1—2.7 kgf·m, 16—19 ft·lbf}

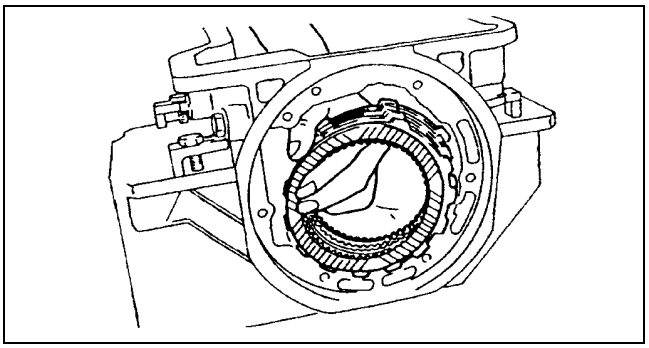


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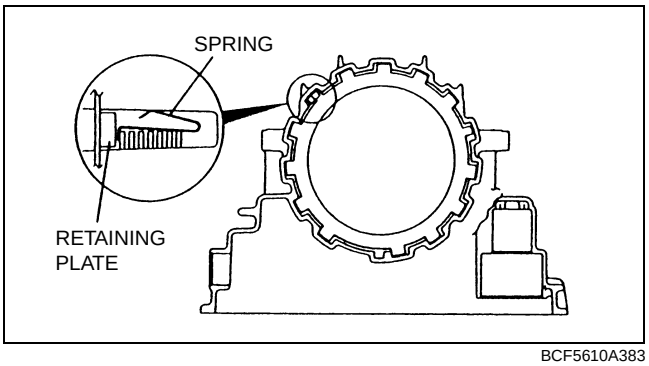
9. Install the dished plate as shown in the figure.
10. Soak new drive plates in ATF for at least two hours.
11. Apply ATF to the driven plates immediately before assembly.


BCF5610A173

12. Install the drive and driven plates into the transmission case in the following order.
    Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive-Driven-Drive

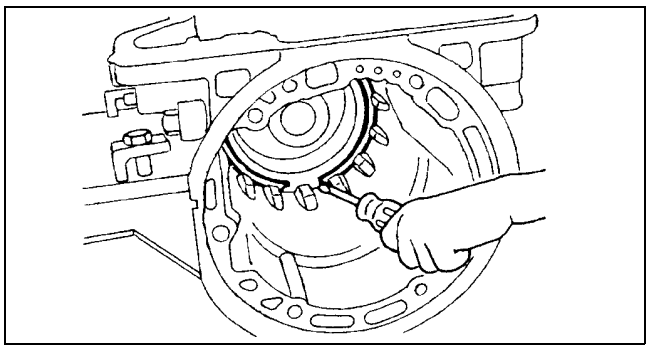

BCF5610A260

13. Install the spring as shown in the figure.
14. Install the retaining plate.



BCF5610A383

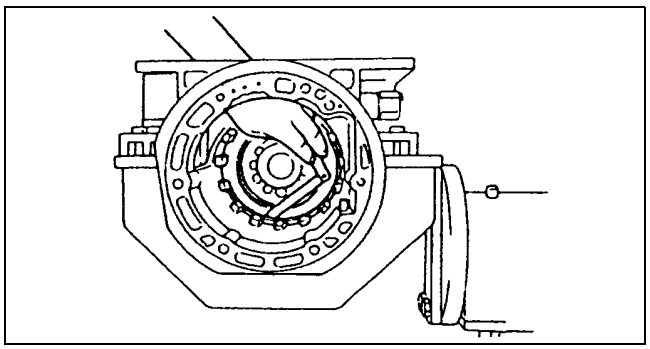
15. Install the snap ring.



BCF5610A261

16. Measure the clearance between the retaining plate and the snap ring using a feeler gauge.
    - If not within the specification, adjust the clearance by selecting the correct retaining plate.

    Clearance
    0.7—2.3 mm {0.028—0.091 in}



BCF5610A250

Retaining plate size

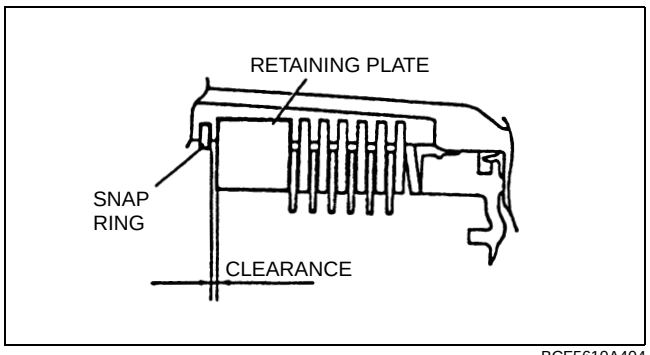
(mm {in})

6.4 {0.252}	6.6 {0.260}	6.8 {0.268}	7.0 {0.276}
7.2 {0.283}	7.4 {0.291}	7.6 {0.299}	7.8 {0.307}

17. If the clearance cannot be brought to within the specification after installation of the thickest retaining plate, replace the dished plate, driven plates and drive plates. Adjust the clearance by selecting the correct retaining plate.

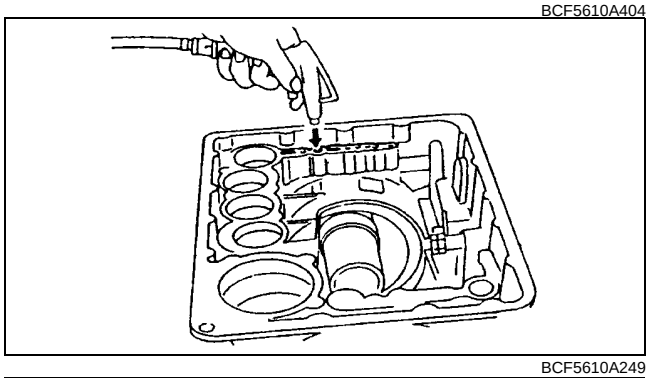
    Clearance
    0.7—1.1 mm {0.028—0.043 in}

    Caution
    - **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**



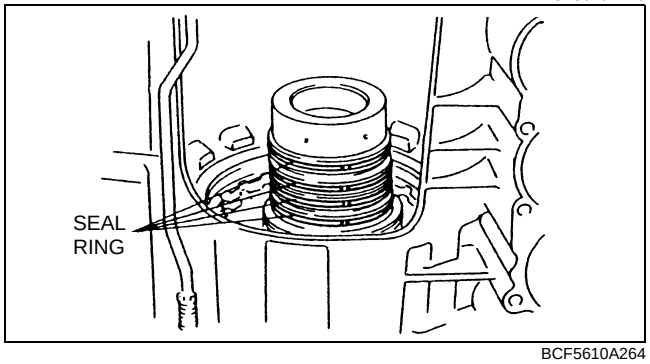
BCF5610A404

18. Check operation of the piston by applying compressed air through the oil passage of the low and reverse brake as shown in the figure.



BCF5610A249

19. Apply petroleum jelly to the seal rings, and fit them into the ring grooves of the low one-way clutch inner race.

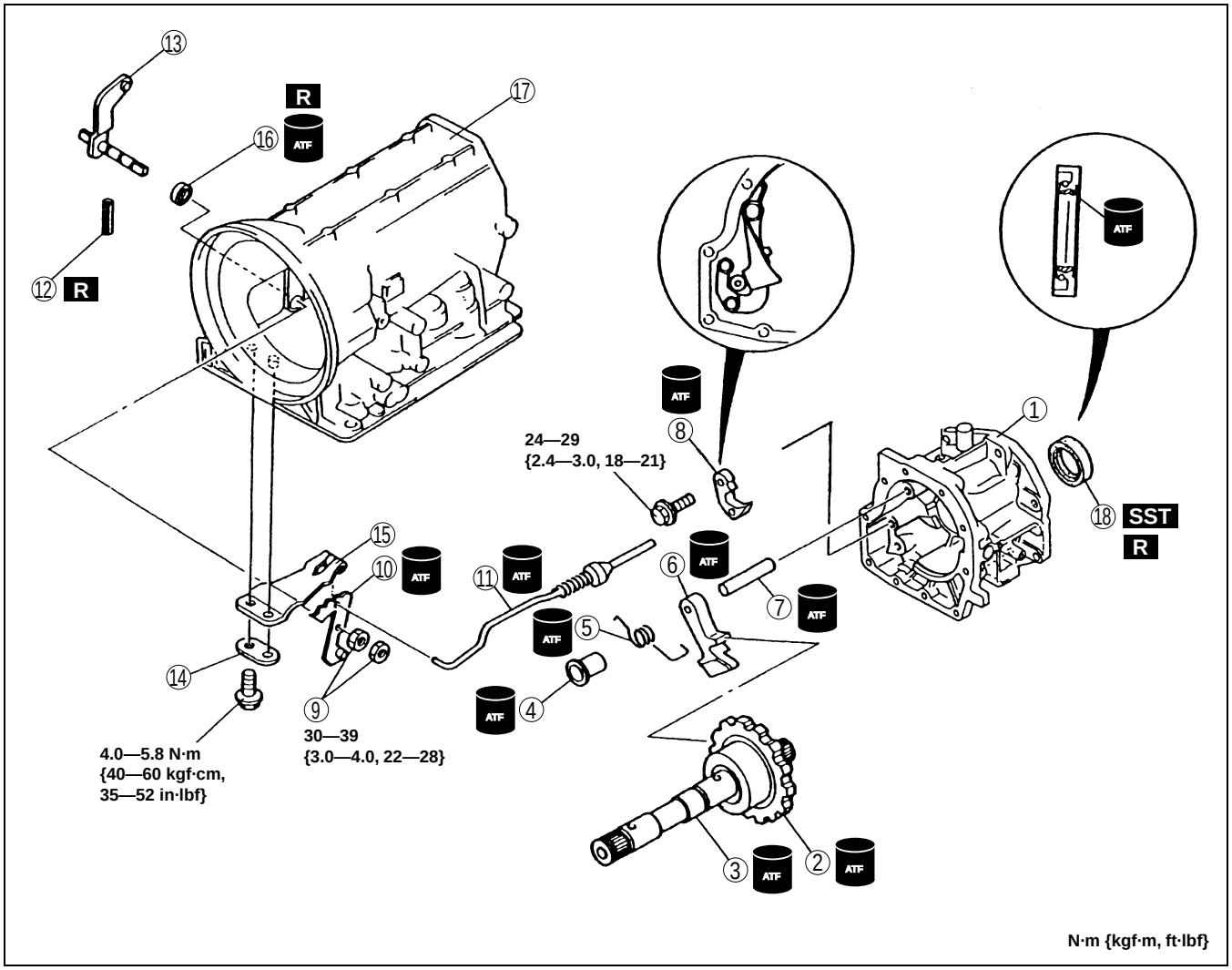


BCF5610A264

ADAPTER CASE/PARKING MECHANISM DISASSEMBLY/ASSEMBLY

CBG571017071A01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



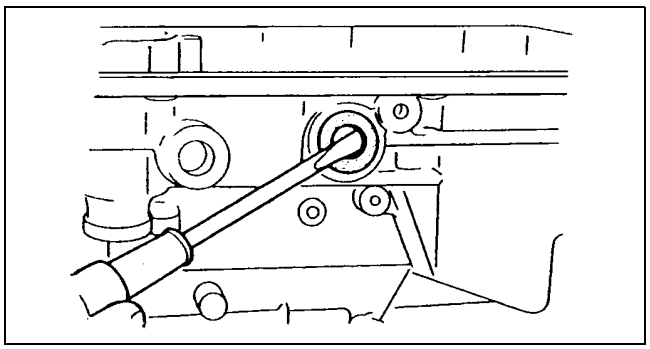
CBG5818A001

1	Adapter case
2	Parking gear
3	Output shaft
4	Parking pawl spacer
5	Return spring
6	Parking pawl
7	Parking pawl shaft
8	Parking actuator
9	Locknut
10	Manual plate

11	Parking rod
12	Roll pin
13	Manual shaft
14	Spacer
15	Detent spring
16	Oil seal (transmission side) (See K1–55 Oil Seal (Transmission Side) Disassembly Note.)
17	Transmission case
18	Oil seal (adapter case)

Oil Seal (Transmission Side) Disassembly Note

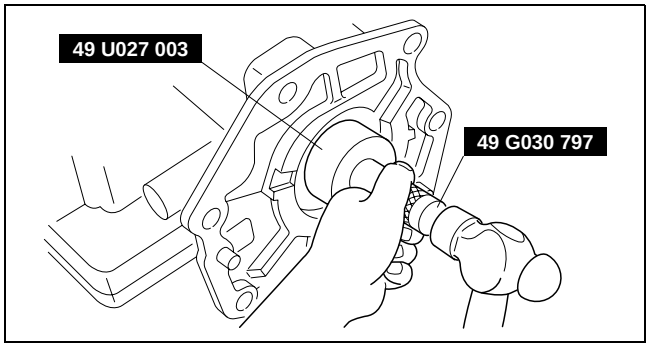
1. Remove the oil seal, being careful to not allow any metal tools to scratch the inside of the transmission case.



BCF5610A266

Adapter Case/Parking Mechanism Assembly Procedure

1. Apply ATF to the lip of the new oil seal.
2. Install the oil seal using the **SSTs**.

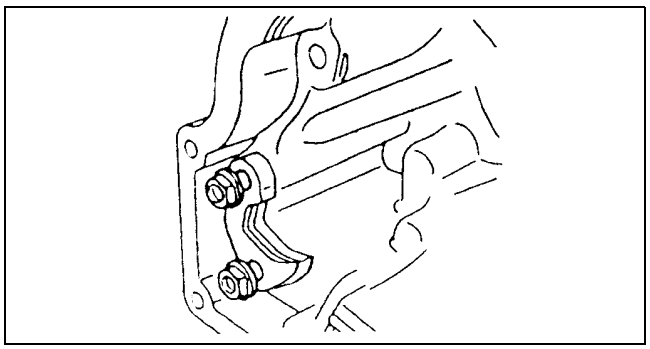


BCF5610W037

3. Apply ATF to the parking actuator and install them in the adapter case.

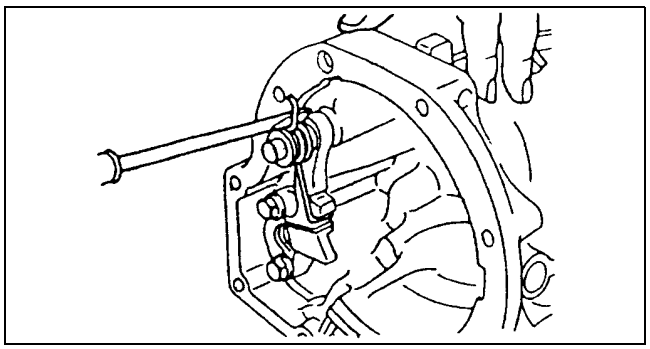
   Tightening torque
   24—29 N·m {2.4—3.0 kgf·m, 18—21 ft·lbf}

4. Apply ATF to the parking pawl shaft and install it in the adapter case.



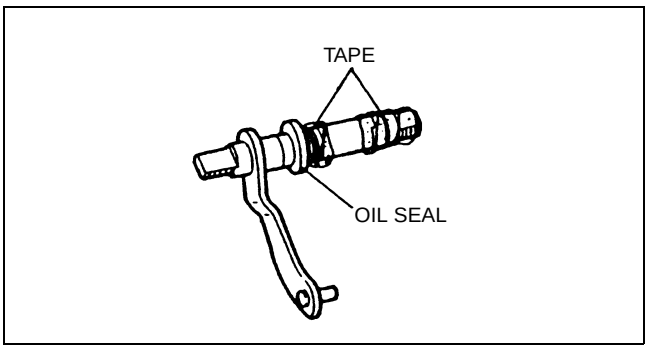
BCF5610A268

5. Apply ATF to the parking pawl, return spring, and spacer. Install them in the adapter case.
6. Apply ATF to the lip of a new oil seal and install it onto the manual shaft.



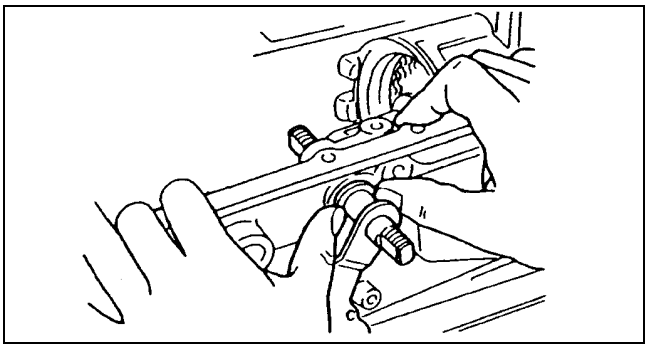
BCF5610A269

7. Wrap the threads of the manual shaft with tape.
8. Apply ATF to the bearing in the transmission case.

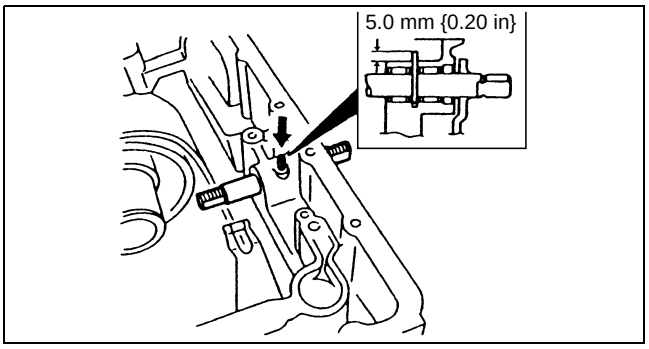


BCF5610A270

9. Install the manual shaft into the transmission case.
10. Push the oil seal squarely into the transmission case.
11. Remove the tape.
12. Align the groove in the manual shaft with the roll pin hole.


BCF5610A271

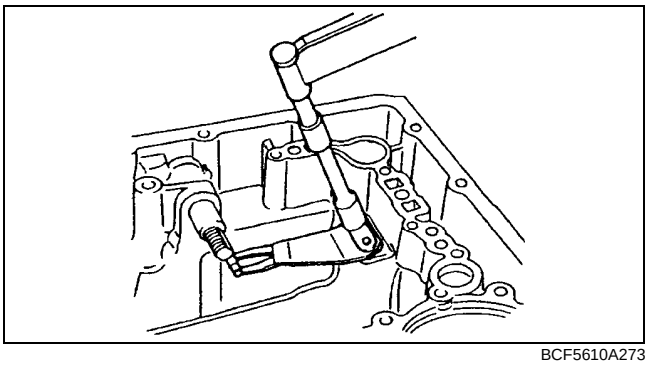
13. Tap the roll pin into the case as shown in the figure.



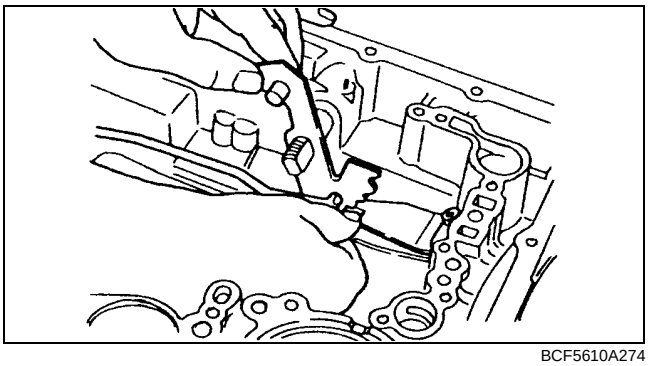
BCF5610A272

14. Install the detent spring and spacer.

Tightening torque
4.0—5.8 N·m {40—60 kgf·cm, 35—52 in·lbf}

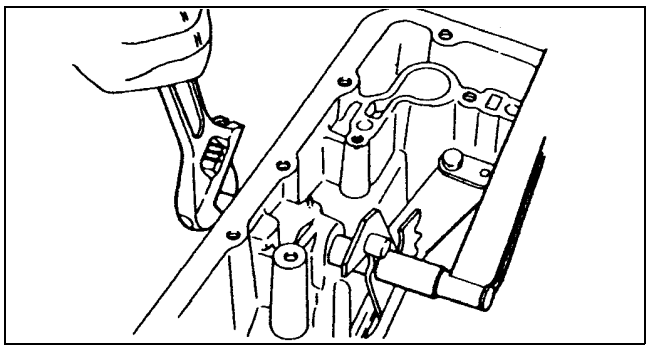

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15. Install the manual plate and parking rod.


BCF5610A274

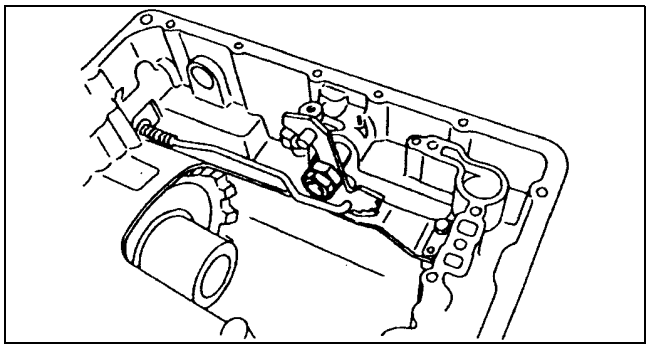
16. While holding the manual shaft as shown in the figure, tighten the locknuts.

Tightening torque
30—39 N·m {3.0—4.0 kgf·m, 22—28 ft·lbf}



BCF5610A275

17. Inspect the parking mechanism operation.



BCF5610A276

CONTROL VALVE BODY DISASSEMBLY

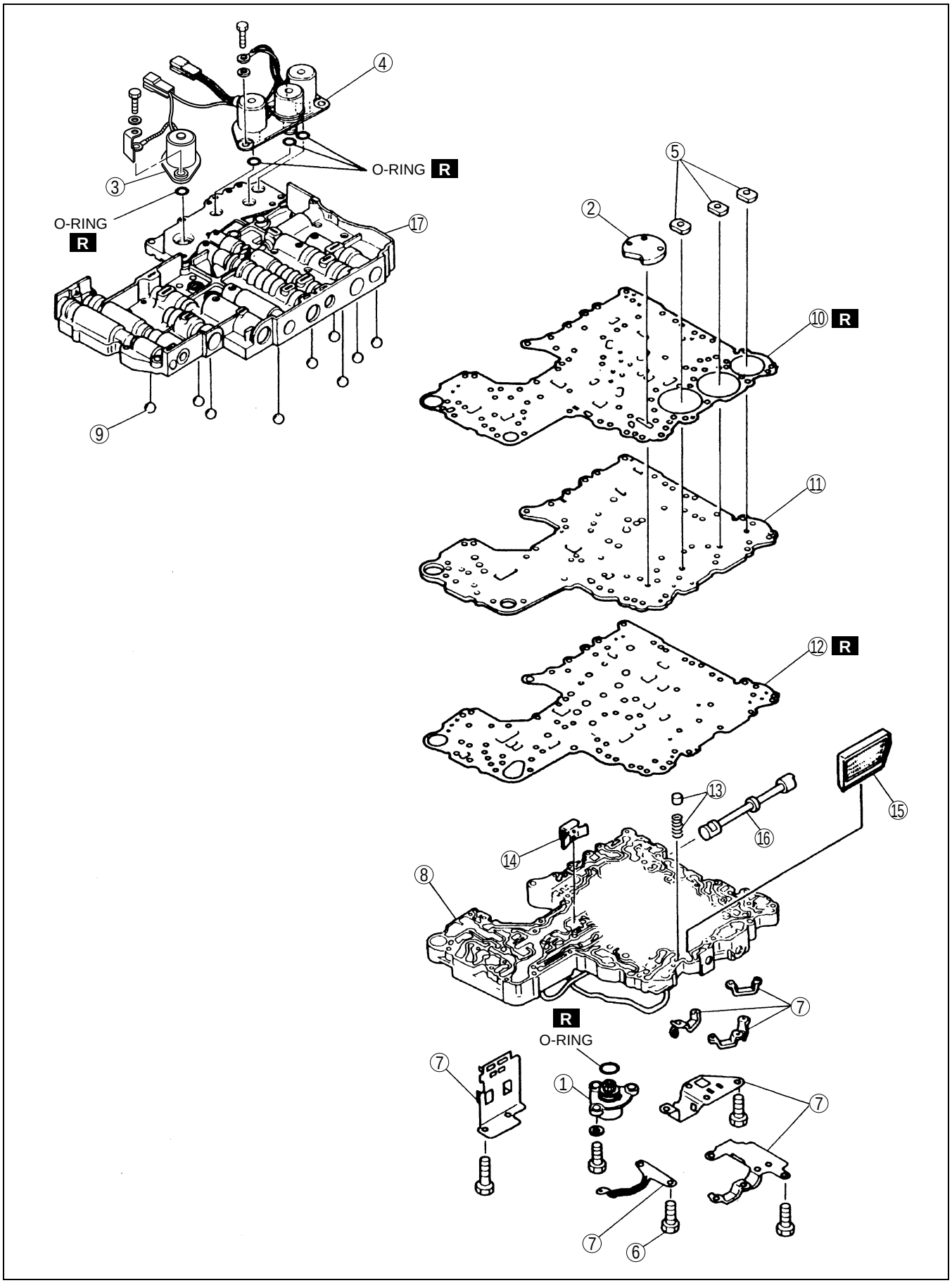
CBG571021100A01

Caution
- **Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**

1. Disassemble in the order indicated in the table.
2. Neatly arrange the removed parts to avoid confusing similar parts.
3. Inspect all parts and repair or replace as necessary.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

4. Clean the removed parts with cleaning solvent, and dry them with compressed air. Clean out all holes and passages with compressed air.

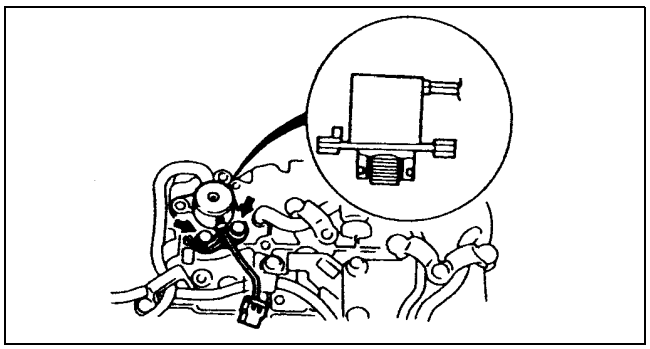


BCF5610A277

1	TCC solenoid valve
2	Side plate
3	Pressure control solenoid
4	Overrunning clutch solenoid, shift solenoid A, and shift solenoid B
5	Support plate
6	Retaining bolt and nut
7	Bracket
8	Lower valve body (See K1–68 LOWER VALVE BODY DISASSEMBLY/ ASSEMBLY.)
9	Steel balls
10	Upper gasket
11	Separator plate
12	Lower gasket
13	Orifice check valve and spring
14	Pilot filter
15	Accumulator filter
16	Manual valve
17	Upper valve body (See K1–61 UPPER VALVE BODY DISASSEMBLY/ ASSEMBLY.)

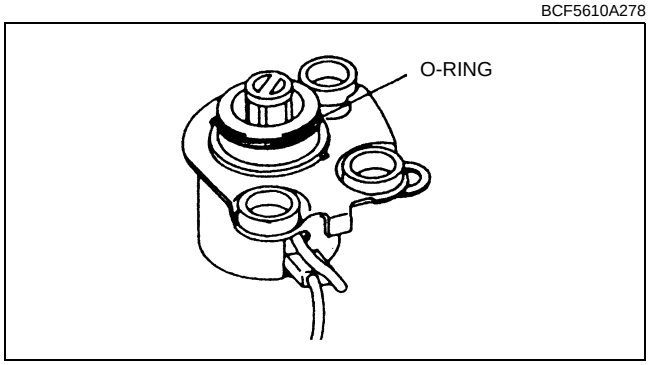
Control Valve Body Disassembly Procedure

1. Remove the TCC solenoid valve and side plate from the lower valve body.



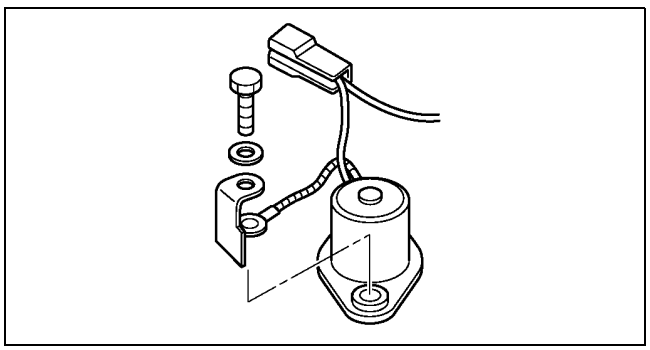
BCF5610A278

2. Remove the O-ring from the TCC solenoid valve.



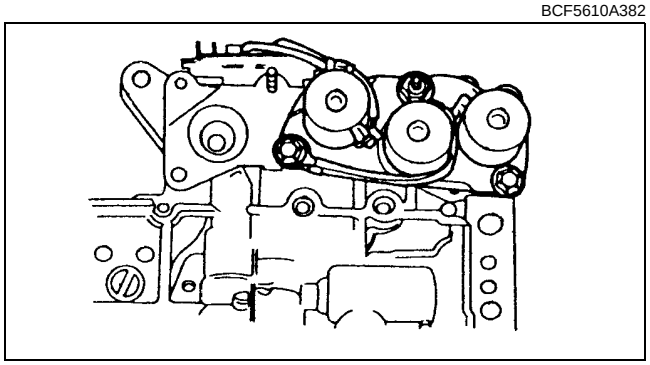
BCF5610A279

3. Remove the pressure control solenoid and clip from the upper valve body.
4. Remove the O-ring from the pressure control solenoid.



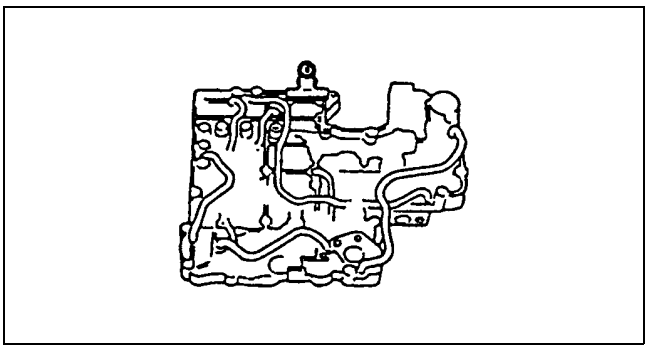
BCF5610A382

5. Remove the solenoids from the upper valve body.
6. Remove the O-rings from the solenoids.
7. Remove the support plate.



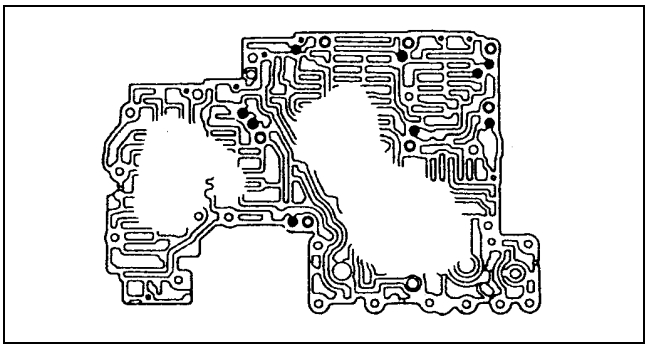
BCF5610A281

8. Hold the lower valve body, lower and upper gaskets, and separator plate using a large clip.
9. Separate the lower valve body from the upper valve body.



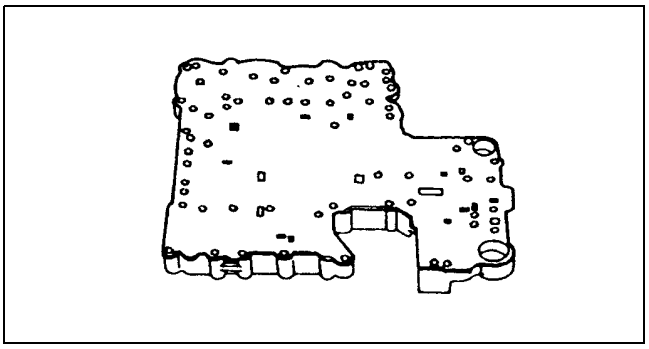
BCF5610A403

10. Remove the steel balls from the upper valve body.
11. Face the lower valve body downward, and remove the holding clip.



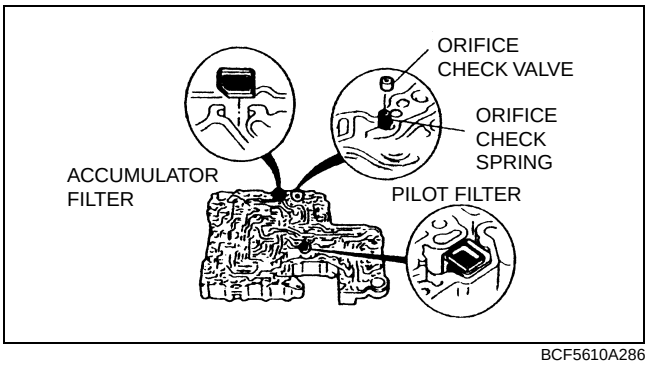
BCF5610A284

12. Remove the separator plate and gaskets.



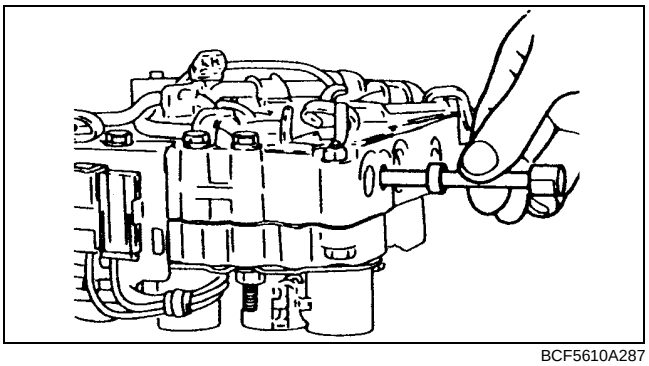
BCF5610A285

13. Remove the orifice check valve, orifice check spring, pilot filter, and accumulator filter.



BCF5610A286

14. Remove the manual valve from the lower valve body.



BCF5610A287

UPPER VALVE BODY DISASSEMBLY/ASSEMBLY

CBG571021100A02

Caution

- **Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**
- **Using a magnet in this procedure could magnetize the valve body inner components, reducing the ability of the transmission to shift properly.**

Note

- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

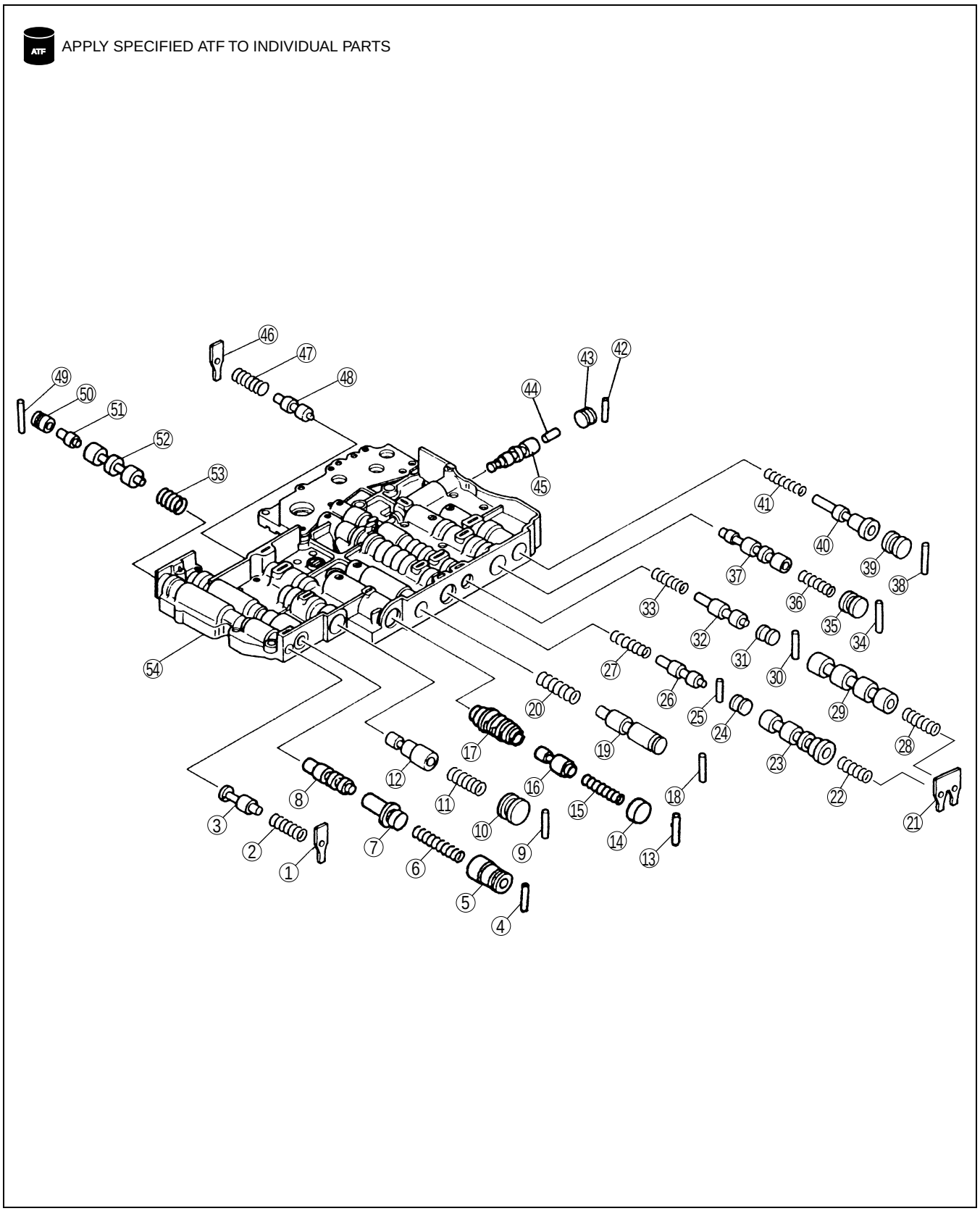
1. Disassemble in the order indicated in the table.

Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean all parts and bores with compressed air and apply ATF to them immediately before assembly.

3. Assemble in the reverse order of disassembly.



BCF5610A408

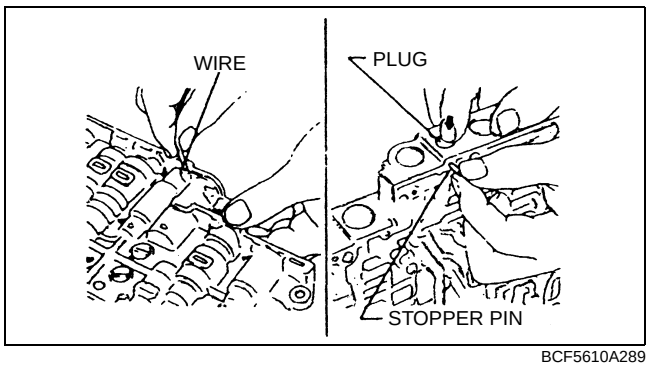
1	Retainer (See K1–64 Retainer Disassembly Note.)
2	Torque converter relief spring
3	Torque converter relief valve

4	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
5	Pressure regulator sleeve
6	Pressure regulator spring
7	Pressure regulator plug

8	Pressure regulator valve
9	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
10	Pressure modifier plug
11	Pressure modifier spring
12	Pressure modifier valve
13	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
14	Accumulator control plug
15	Accumulator control spring
16	Accumulator control valve
17	Accumulator control sleeve
18	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
19	Shuttle shift valve D
20	Shuttle shift valve D spring
21	Retainer (See K1–64 Retainer Disassembly Note.)
22	Shift valve B spring
23	Shift valve B
24	Stopper pin (See K1–64 Stopper Pin (4-2 Sequence Valve and 4-2 Relay Valve) Disassembly Note.)
25	4-2 sequence plug
26	4-2 sequence valve
27	4-2 sequence spring
28	Shift valve A spring
29	Shift valve A
30	Stopper pin (See K1–64 Stopper Pin (4-2 Sequence Valve and 4-2 Relay Valve) Disassembly Note.)
31	4-2 relay plug
32	4-2 relay valve
33	4-2 relay spring
34	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
35	Overrunning clutch control plug
36	Overrunning clutch control spring
37	Overrunning clutch control valve
38	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
39	Overrunning clutch reducing plug
40	Overrunning clutch reducing spring
41	Overrunning clutch reducing spring
42	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
43	Shuttle shift valve S plug
44	Plug
45	Shuttle shift valve S
46	Retainer (See K1–64 Retainer Disassembly Note.)
47	Pilot spring
48	Pilot valve
49	Stopper pin (See K1–63 Stopper Pin Disassembly Note.)
50	TCC control sleeve
51	TCC control plug
52	TCC control valve
53	TCC control spring
54	Upper valve body

Stopper Pin Disassembly Note

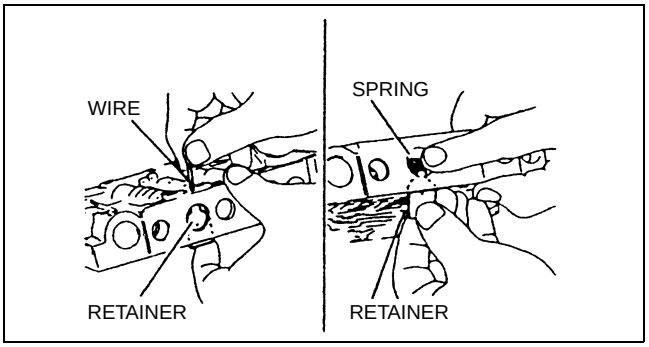
1. Push the stopper pin way out using a wire.
2. Depress and hold the plug or sleeve with a finger to prevent the valve from pepping out.
3. Remove the stopper pin, and remove the valve and internal parts.



BCF5610A289

Retainer Disassembly Note

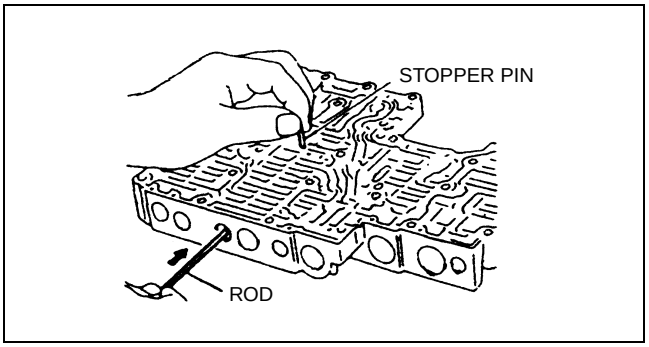
1. Push the retainer way out using a wire.
2. Hold the inside parts with a finger to prevent the valve from pepping out.
3. Remove the retainer, the valve, and the internal parts.



BCF5610A290

Stopper Pin (4-2 Sequence Valve and 4-2 Relay Valve) Disassembly Note

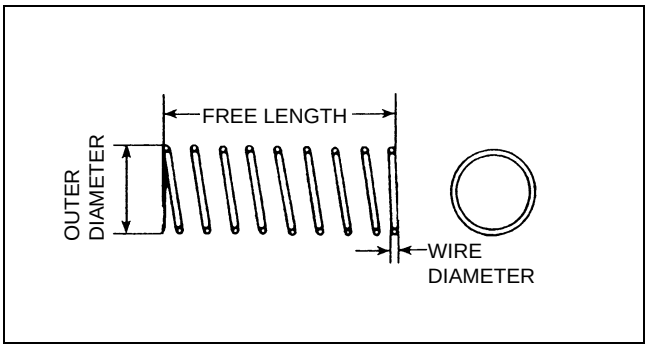
1. Push the stopper pin way out using a wire.
2. Depress the plug with a vinyl tape-wrapped **1.5 mm {0.059 in}** around diameter rod to prevent the valve from popping out.
3. Remove the stopper pin, the valve, and the internal parts.



BCF5610A291

Spring Inspection

1. Measure the spring free length.
   - If not as specified, replace the spring.



BCF5610A142

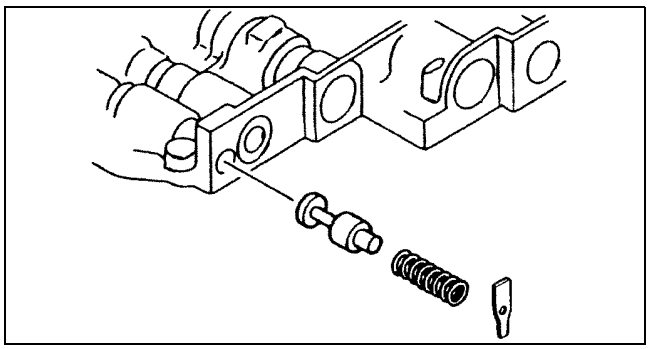
Specification

Spring specification		Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
Torque converter relief valve		9.0 {0.354}	38.0 {1.496}	12.7	1.4 {0.055}
Pressure regulator valve		14.0 {0.551}	31.5 {1.240}	5.64	1.6 {0.063}
Pressure modifier valve*	A	6.8 {0.268}	31.95 {1.258}	10.0	0.8 {0.031}
	B	6.9 {0.272}	32.60 {1.283}	13.2	0.8 {0.031}
	C	6.9 {0.272}	32.80 {1.291}	15.6	0.9 {0.035}
Accumulator control plug		10.5 {0.413}	17.0 {0.669}	4.3	0.5 {0.020}
Shuttle shift valve D		7.0 {0.276}	25.0 {0.984}	9.5	0.65 {0.026}
4-2 sequence valve		6.95 {0.274}	29.1 {1.146}	11.0	0.55 {0.022}
Shift valve B		7.0 {0.276}	25.0 {0.984}	9.5	0.65 {0.026}
4-2 relay valve		6.95 {0.274}	29.1 {1.146}	11.0	0.55 {0.022}
Shift valve A		7.0 {0.276}	25.0 {0.984}	9.5	0.65 {0.026}
Overrunning clutch control valve		7.0 {0.276}	23.6 {0.929}	7.9	0.6 {0.024}
Overrunning clutch reducing valve		7.1 {0.279}	32.7 {1.287}	14.1	1.1 {0.043}
Pilot valve		9.1 {0.358}	25.7 {1.012}	8.4	1.1 {0.043}
TCC control valve		13.0 {0.512}	18.5 {0.728}	3.5	0.75 {0.030}

* : Either A, B, or C type spring is installed before shipment. Only A type spring is available for replacement.

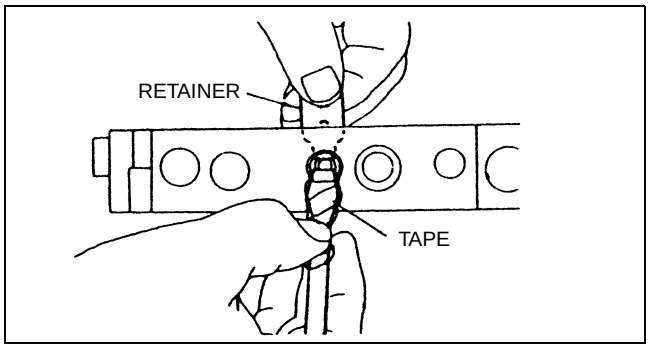
Upper valve body assemble procedure

1. Insert the torque converter relief valve and spring.



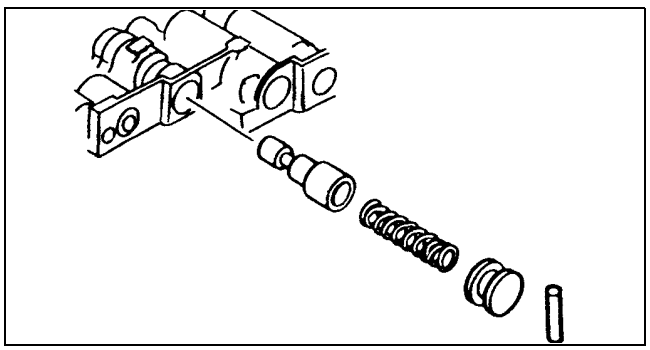
BCF5610A292

2. Install the retainer while compressing the spring.



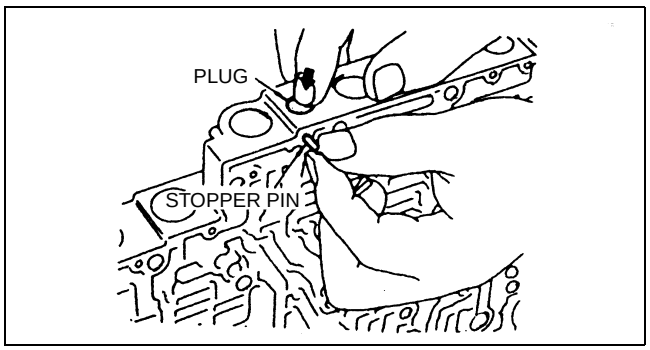
BCF5610A293

3. Center the plug so that it fits onto the sleeve. While turning the sleeve slightly, insert the pressure regulator valve, plug, spring, and sleeve.



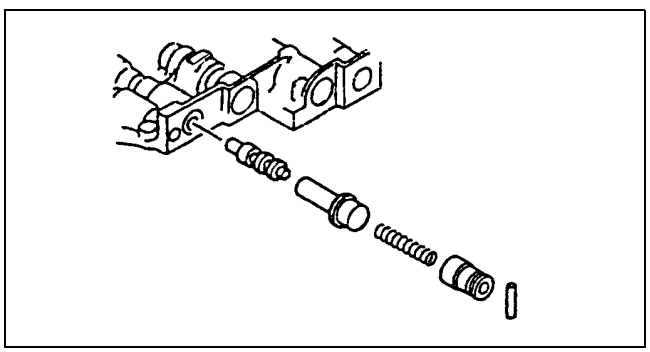
BCF5610A296

4. Insert the stopper pin while pushing the sleeve.
5. Insert the pressure modifier valve, spring, and plug.



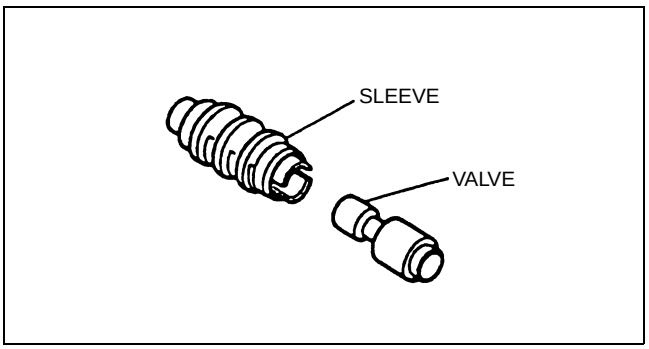
BCF5610A295

6. Insert the stopper pin while pushing the sleeve.



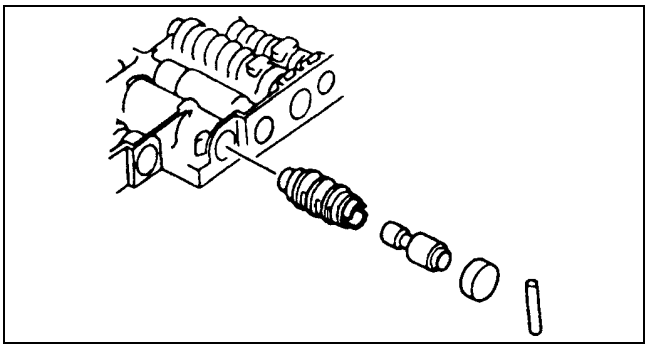
BCF5610A410

7. Align the tab of the sleeve with the valve notch.
8. Insert the accumulator control valve, sleeve, spring, and plug.

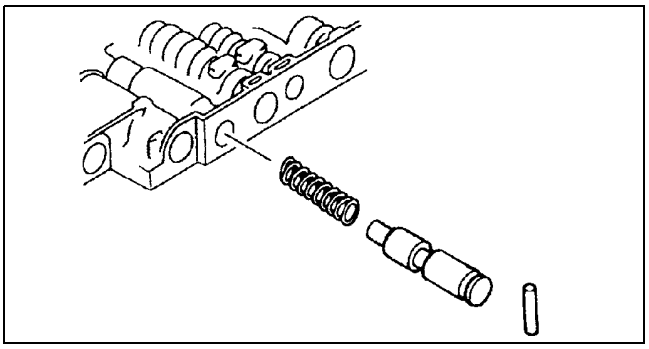


BCF5610A422

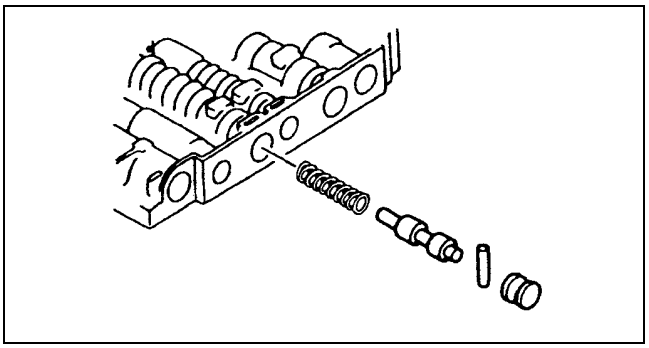
9. Insert the stopper pin while pushing the plug.
10. Insert the shuttle shift valve D and spring.


BCF5610A298

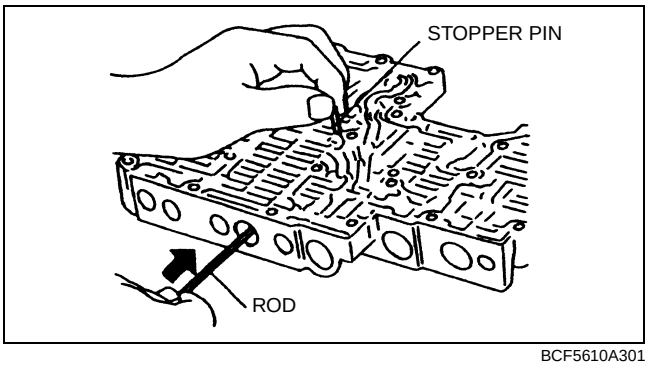
11. Insert the stopper pin while pushing the valve.


BCF5610A299

12. Insert the 4-2 sequence valve, spring, and plug.
13. Push in the plug using a vinyl tape-wrapped **1.5 mm {0.059 in}** diameter rod.

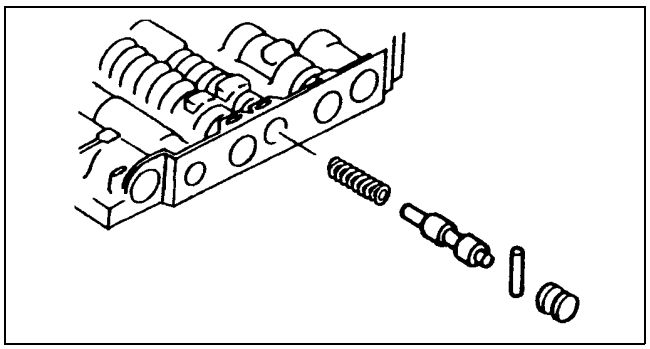

BCF5610A300

14. Insert the stopper pin.



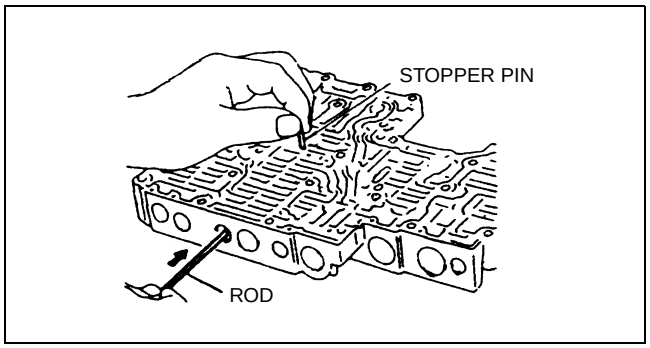
BCF5610A301

15. Insert the 4-2 relay valve and spring.



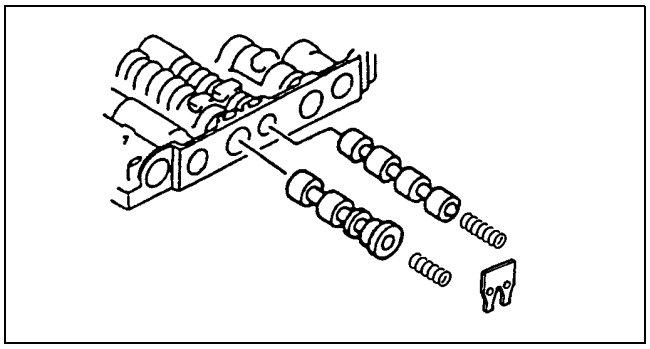
BCF5610A303

16. Push in the plug by using a vinyl tape-wrapped **1.5 mm {0.059 in}** diameter rod and insert the stopper pin.
17. Insert shift valve B and spring.
18. Insert shift valve A and spring.



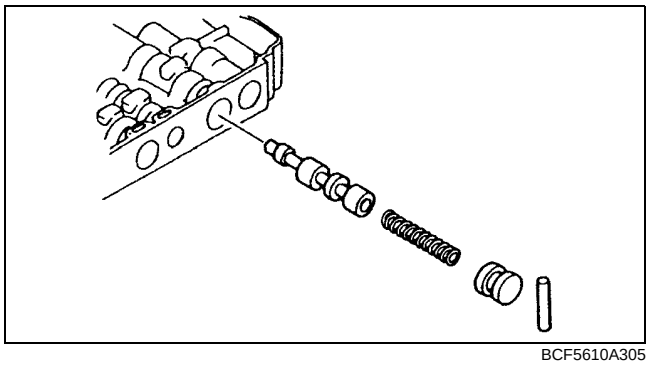
BCF5610A291

19. Insert the retainer while compressing the springs.
20. Insert the overrunning clutch control valve, spring, and plug.



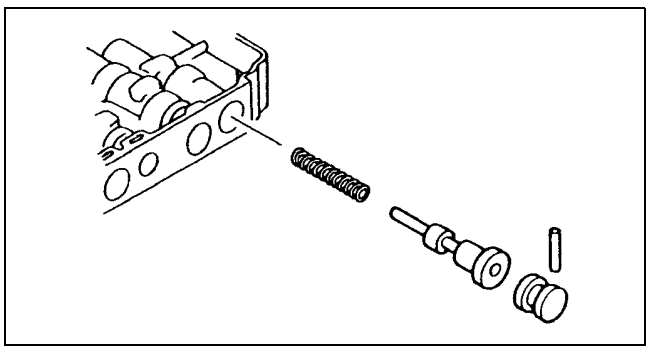
BCF5610A409

21. Insert the stopper pin while pushing the plug.
22. Insert the overrunning clutch reducing valve, spring, and plug.



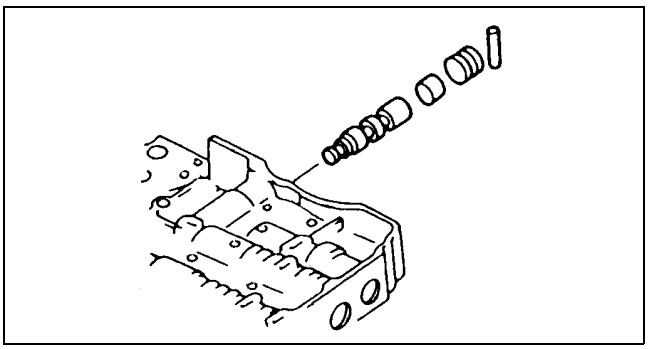
BCF5610A305

23. Insert the stopper pin while pushing the plug.
24. Insert the shuttle shift valve S, plug, and plug.



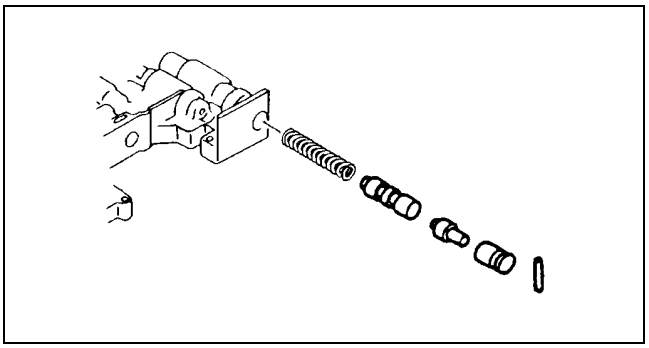
BCF5610A306

25. Insert the stopper pin while pushing the plug.
26. Insert the TCC control valve, spring, plug, and sleeve.



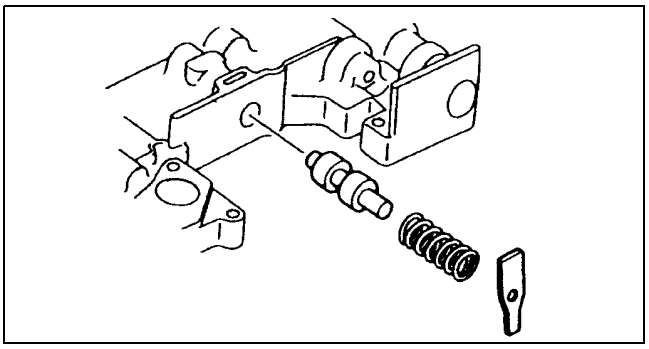
BCF5610A423

27. Insert the stopper pin while pushing the sleeve.
28. Insert the pilot valve and spring.



BCF5610A308

29. Insert the retainer while pushing the spring.



BCF5610A309

LOWER VALVE BODY DISASSEMBLY/ASSEMBLY

CBG571021100A03

Caution

- **Denting or scratching these precisely machined components will reduce the ability of the transmission to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**
- **Using a magnet in this procedure could magnetize the valve body inner components, reducing the ability of the transmission to shift properly.**

Note

- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

1. Disassemble in the order indicated in the table.

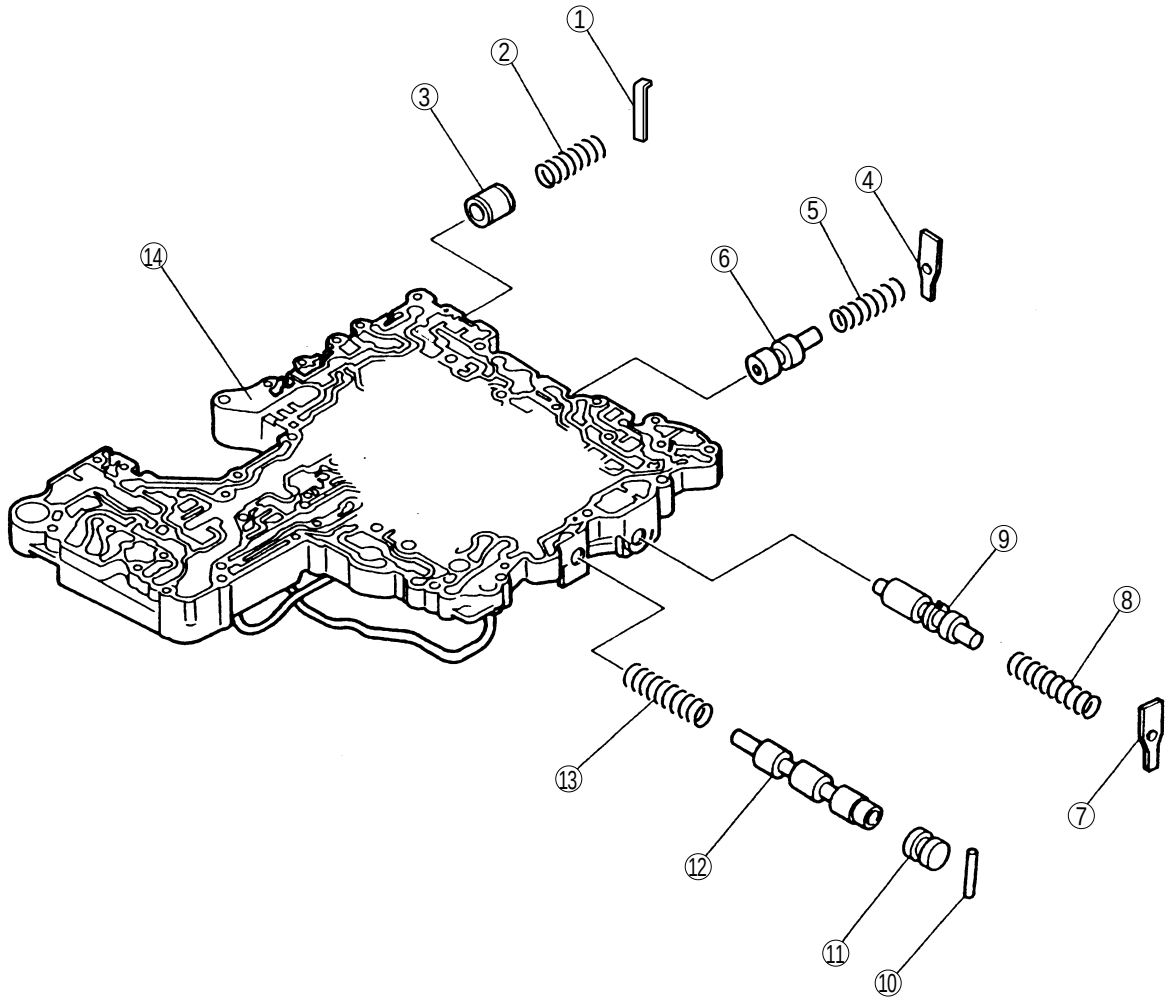
Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean all parts and bores with compressed air and apply ATF to them immediately before assembly.

3. Assemble in the reverse order of disassembly.

APPLY SPECIFIED ATF TO INDIVIDUAL PARTS



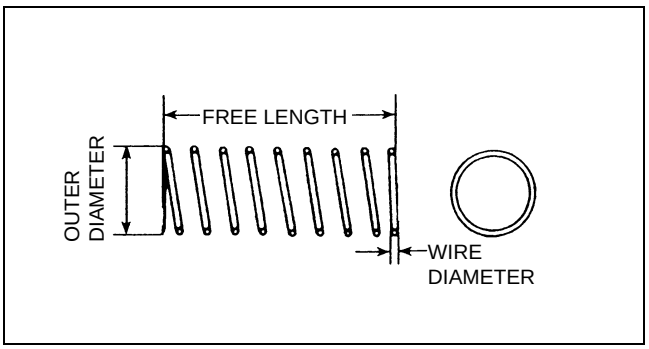
BCF5610A310

1	Stopper key
2	Modifier accumulator spring
3	Modifier accumulator valve
4	Retainer
5	First reducing spring
6	First reducing valve
7	Retainer

8	3-2 timing spring
9	3-2 timing valve
10	Stopper pin
11	Servo charger plug
12	Servo charger valve
13	Servo charger spring
14	Lower valve body

Springs Inspection

1. Measure the spring free length.
   - If not within specification, replace the spring.



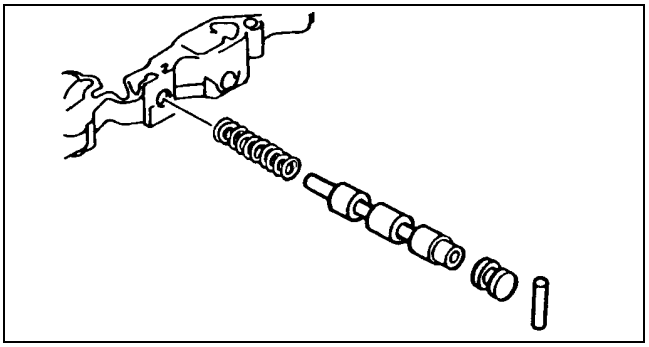
BCF5610A142

Specification

Spring specification	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
Modifier accumulator valve	9.8 {0.386}	31.4 {1.236}	9.3	1.3 {0.051}
First reducing valve	6.75 {0.266}	25.4 {1.000}	12.5	0.75 {0.030}
3-2 timing valve	6.75 {0.266}	20.55 {0.809}	7.5	0.75 {0.030}
Servo charger valve	6.7 {0.252}	23.0 {0.901}	9.0	0.7 {0.028}

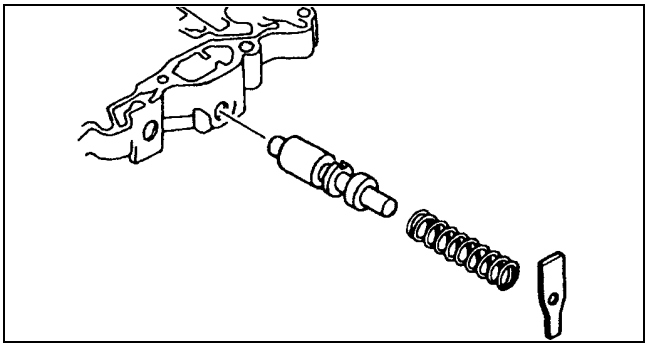
Lower Valve Body Assembly Procedure

1. Insert the servo charger valve, spring, and plug.
2. Insert the stopper pin while pushing the plug.
3. Insert the 3-2 timing valve and spring.



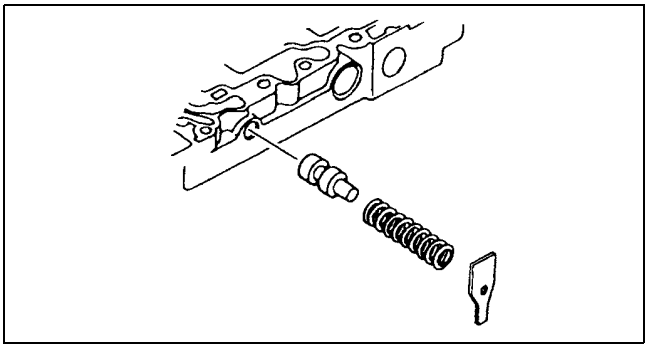
BCF5610A311

4. Insert the retainer while compressing the spring.
5. Insert the first reducing valve and spring.



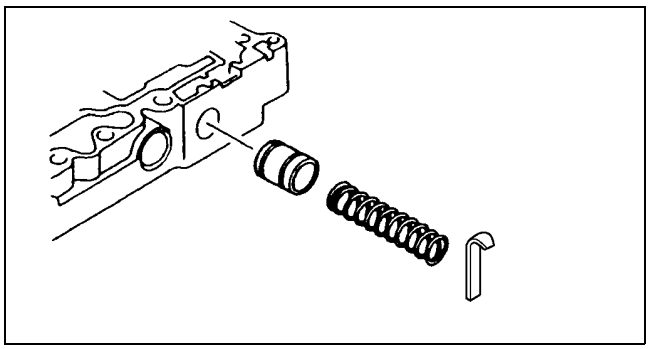
BCF5610A312

6. Insert the retainer while compressing the spring.
7. Insert the modifier accumulator valve and spring.



BCF5610A313

8. Insert the stopper key while pushing the spring.

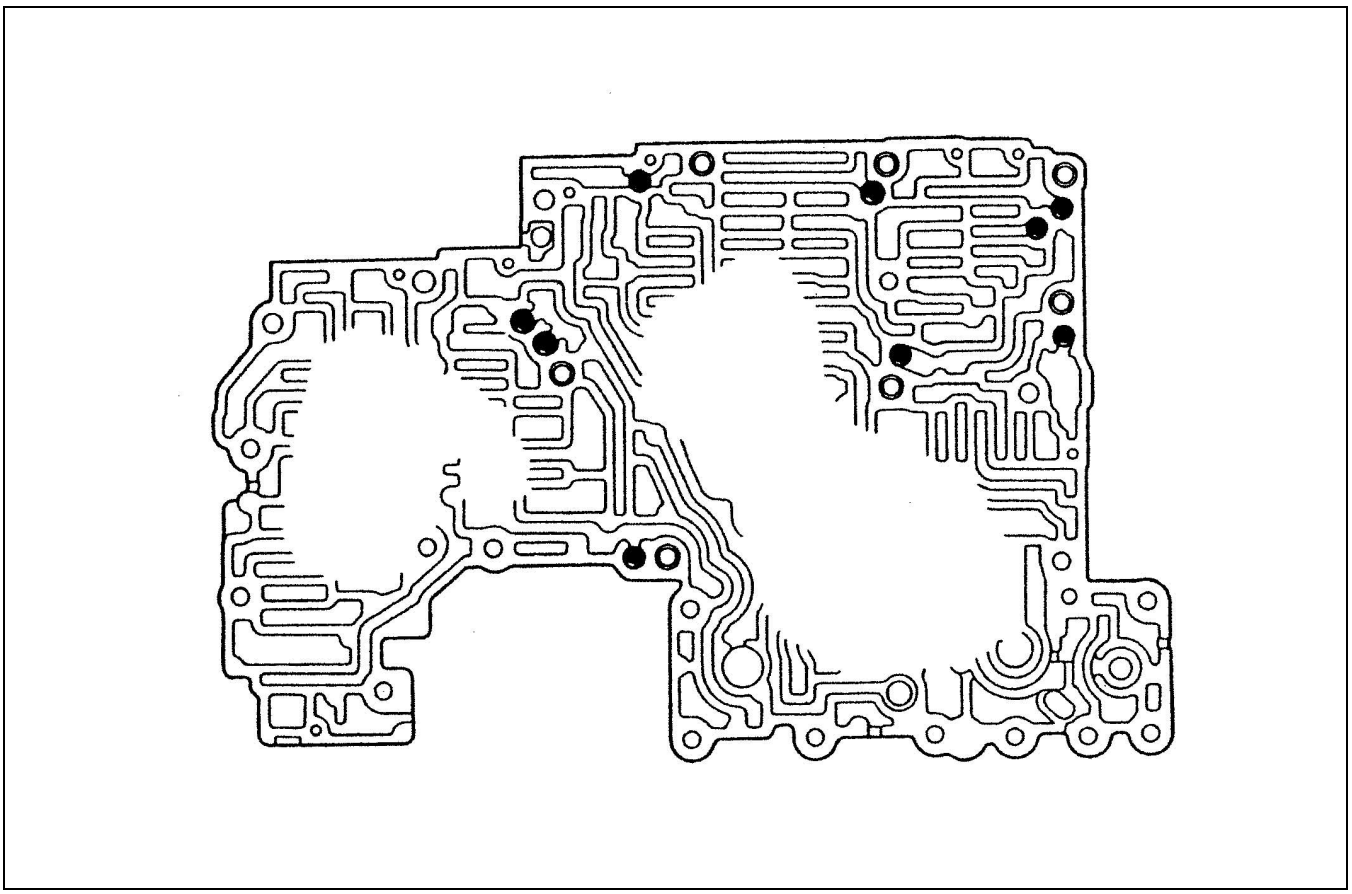


BCF5610A314

CONTROL VALVE BODY ASSEMBLY

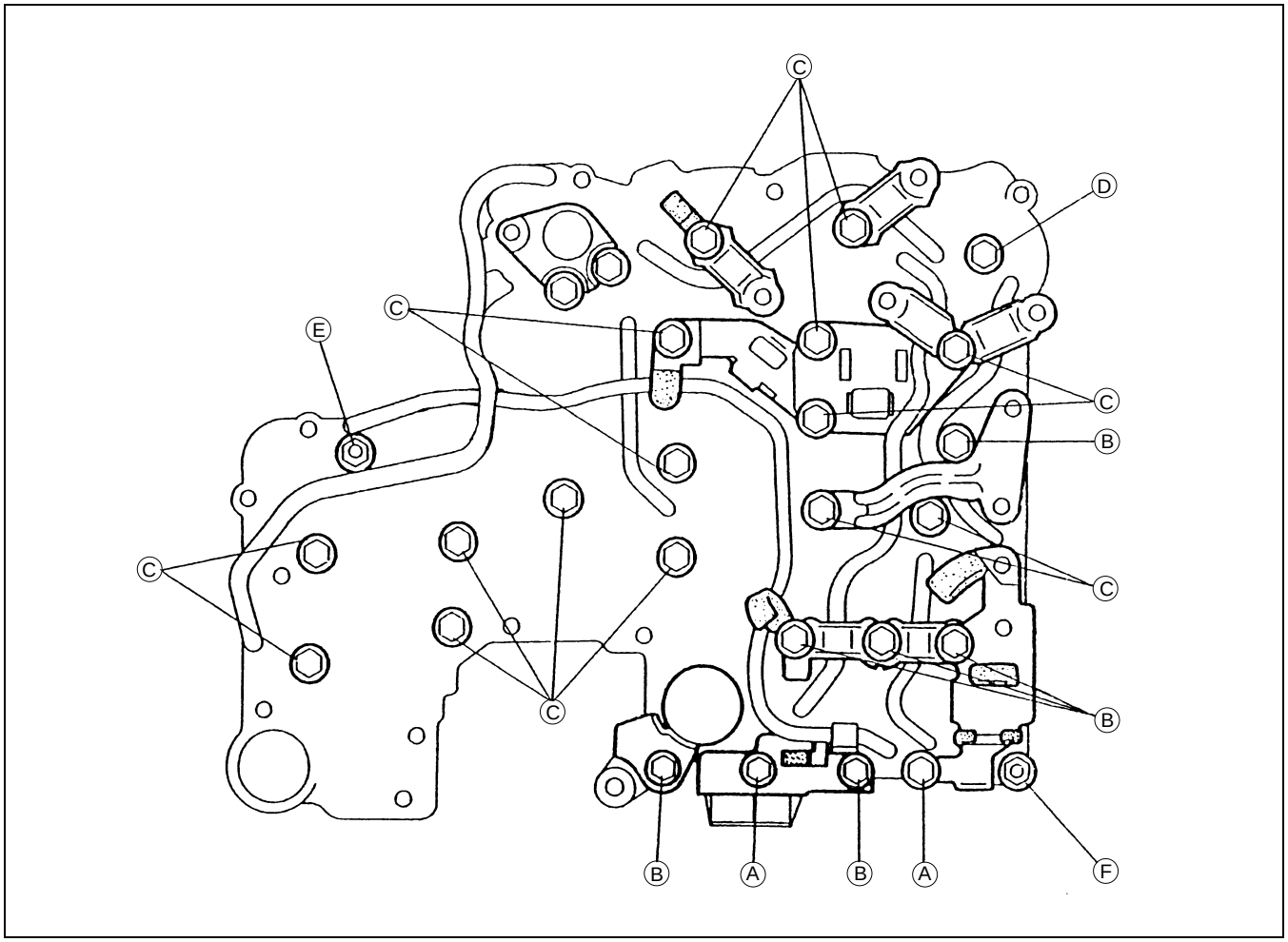
CBG571021100A04

Steel ball installation positions



BCF5610A315

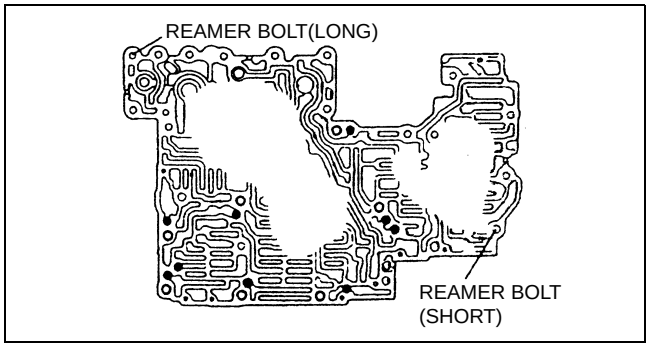
Bracket, bolt and nuts installation positions



BCF5610A317

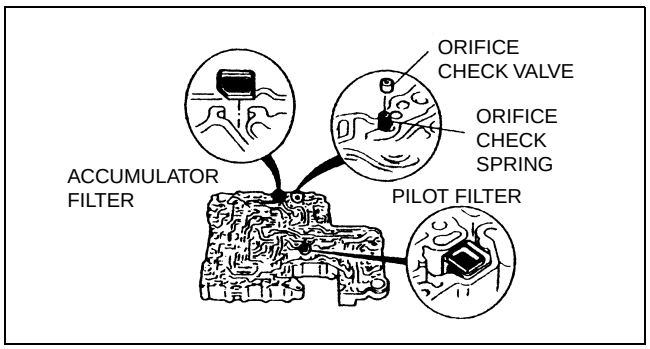
Identification letter	Bolt and nut	Length mm {in}	Torque specification N·m {kgf·cm, in·lbf}
A		70 {2.76}	6.9—8.8 {70—90, 61—78}
B		50 {1.97}	
C		33 {1.30}	
D		27 {1.06}	
E		55 {2.17}	
F		45 {1.77}	

1. Verify that all parts are clean and free of dust or other small particles.
2. Apply ATF to all O-rings and gaskets.
3. Assemble as shown in the figure, referring to Assembly procedure.
4. Install the steel balls and reamer bolts into their proper positions of the upper valve body. (See K1–71 Steel ball installation positions.)



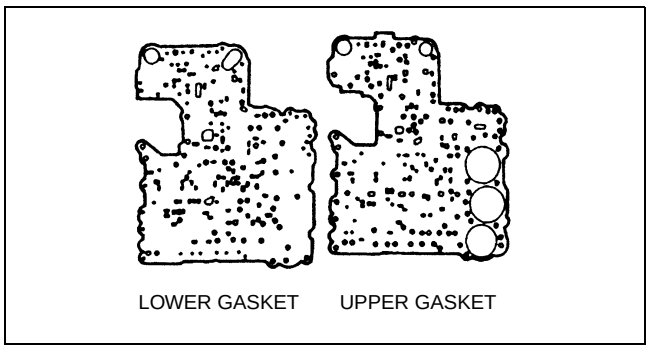
BCF5610A325

5. Install the pilot filter, accumulator filter, orifice check valve, and spring into their proper positions in the lower valve body.

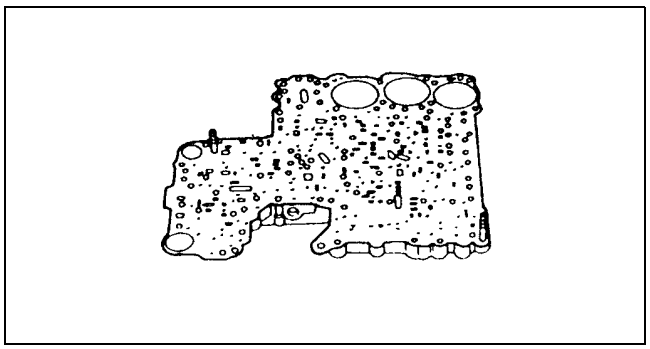


BCF5610A286

6. Set the new upper and lower gaskets and separator plate onto the lower valve body. Refer to the figure to distinguish the two gaskets.

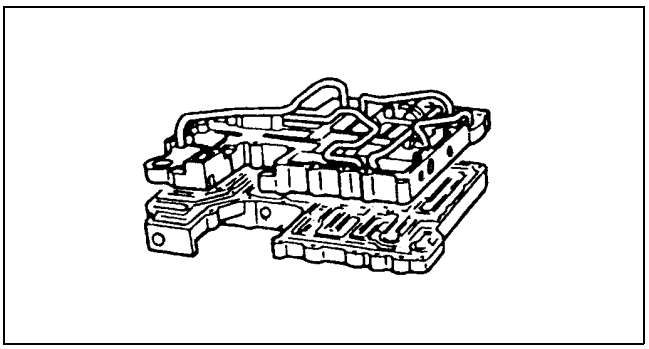


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BCF5610A379

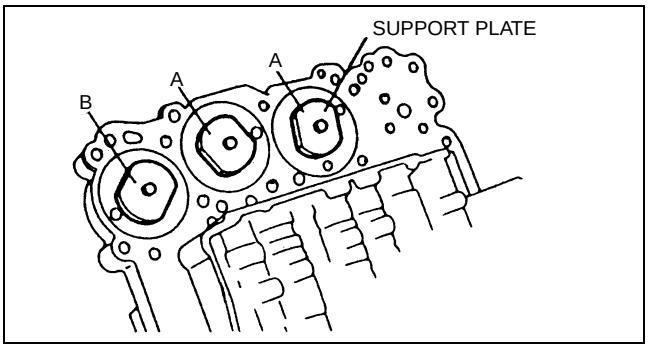
7. Set the lower valve body onto the upper valve body.



BCF5610A327

8. Install the support plates as shown in the figure.

   Bolt length (measured from below bolt head)
   A: 33 mm {1.30 in}
   B: 27 mm {1.06 in}

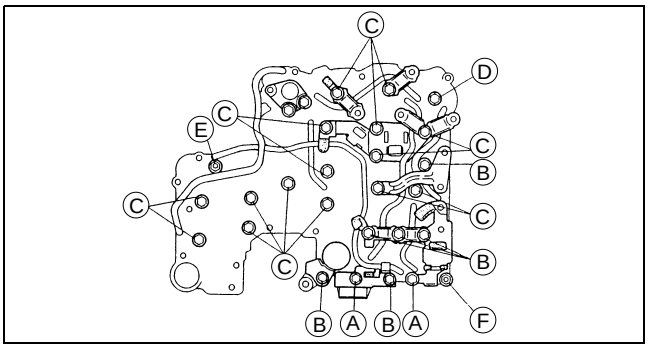


BCF5610A328

9. Install the brackets in their proper positions. (See K1–72 Bracket, bolt and nuts installation positions.)
10. Install the bolts and nuts in their proper positions, and tighten the fasteners evenly and gradually.

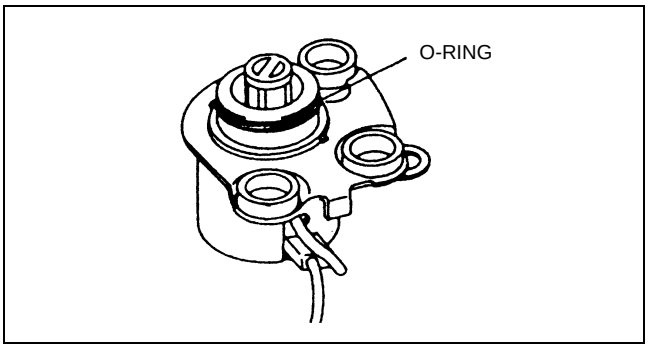
    (See K1–72 Bracket, bolt and nuts installation positions.)

    Tightening torque
    6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}



BCF5610A329

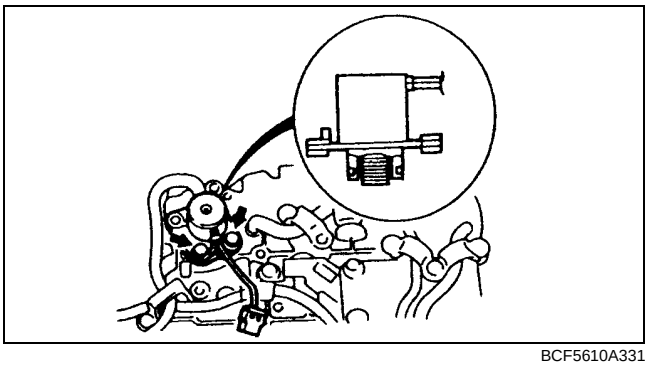
11. Install a new O-ring onto the TCC solenoid valve.



BCF5610A279

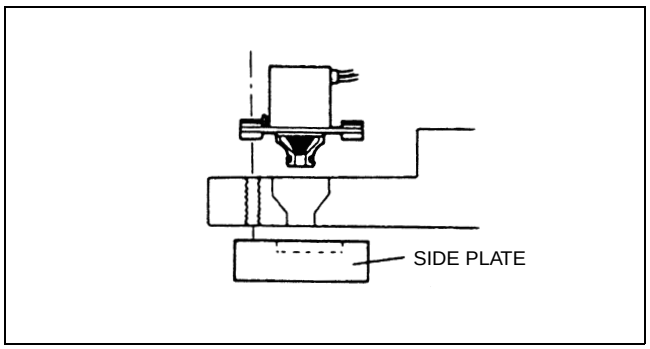
12. Install the TCC solenoid valve and side plate to the lower valve body as shown in the figure.

    Tightening torque
    9.8—12.7 N·m
    {100—130 kgf·cm, 87—112 in·lbf}



BCF5610A331

13. Install the side plate as shown in the figure.
14. Install the new O-rings onto the solenoids.

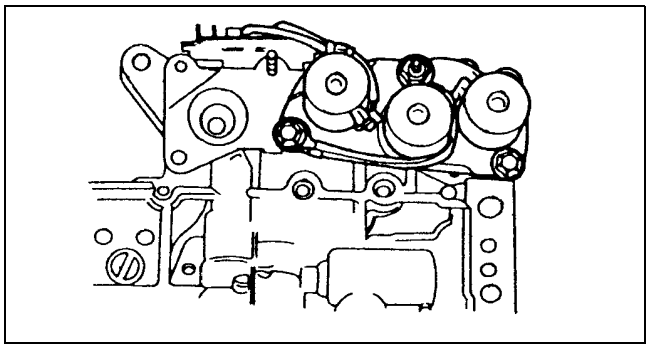


BCF5610A330

15. Install the solenoids into the upper valve body.

    Tightening torque
    6.9—9.8 N·m {70—100 kgf·cm, 61—87 in·lbf}

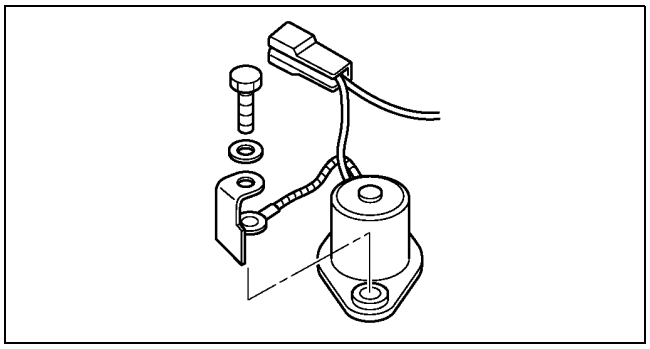
16. Install a new O-ring onto the pressure control solenoid.



BCF5610A281

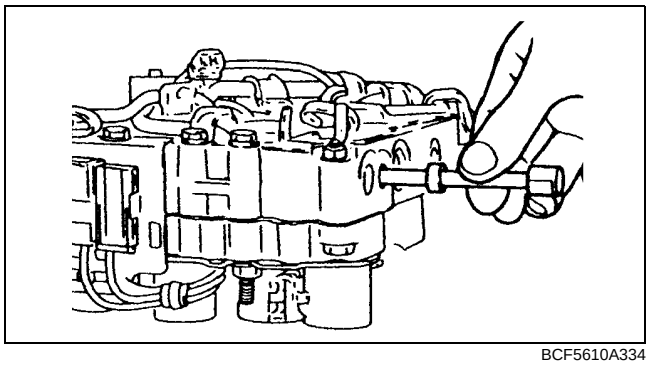
17. Install the pressure control solenoid and clip into the upper valve body.

    Tightening torque
    6.9—9.8 N·m {70—100 kgf·cm, 61—87 in·lbf}



BCF5610A382

18. Insert the manual valve.



BCF5610A334

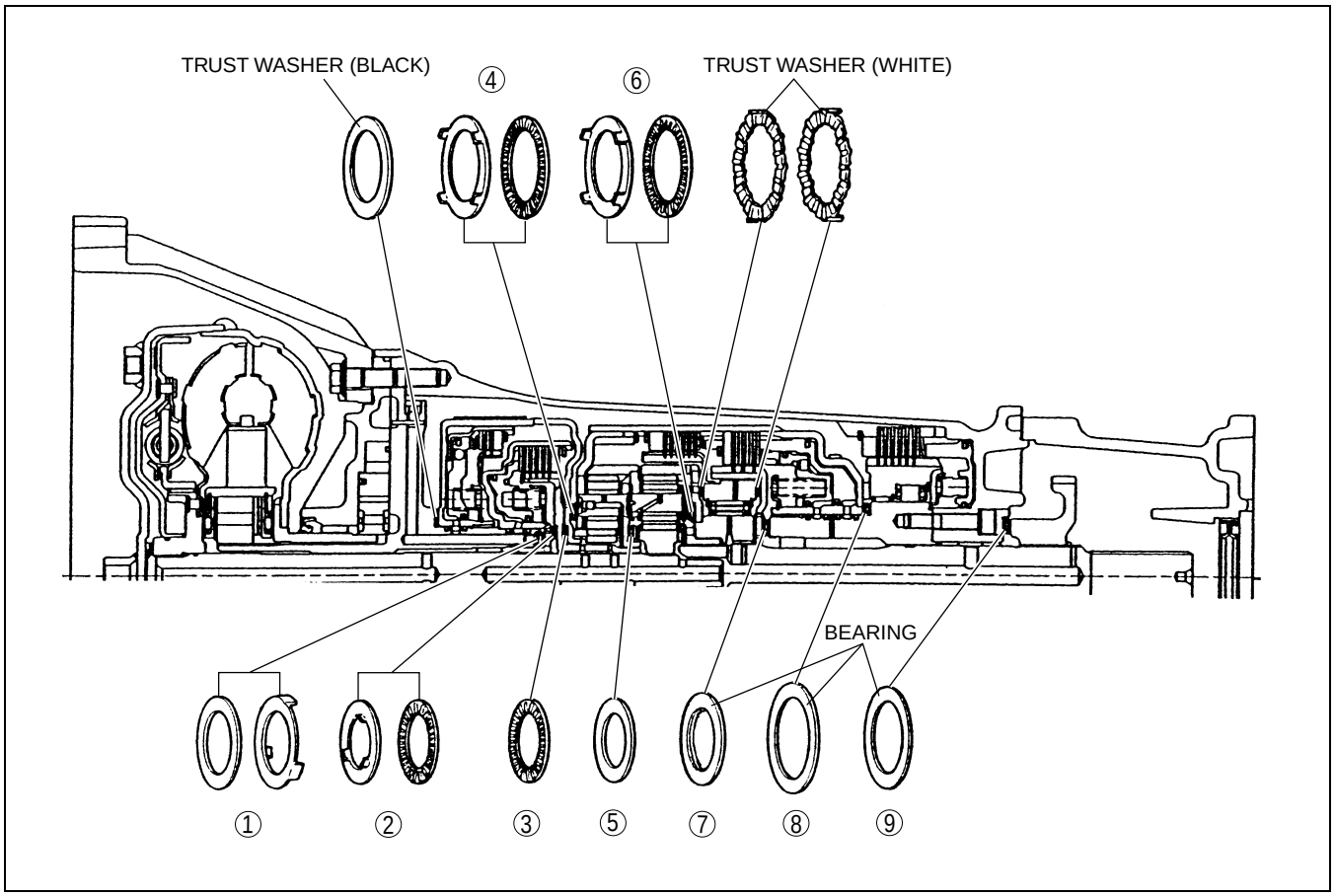
TRANSMISSION UNIT ASSEMBLY

CBG571000000A02

Transmission Unit Precaution

1. If the drive plates or brake band are replaced with new ones, soak in ATF for at least 2 hours before installation.
2. Before assembly, apply ATF to all seal rings, rotating parts, O-rings, D-rings, and sliding parts.
3. All O-rings, D-rings, seals, and gaskets must be replaced with new ones included in the overhaul kit.
4. Use petroleum jelly, not grease, during reassembly.
5. When it is necessary to replace a bushing, replace the subassembly that includes that bushing.
6. Assemble the housing within **10 min** after applying sealant, and allow it to cure at least **30 min** after assembly before filling the transmission with ATF.

Thrust washer, bearing, and bearing race locations

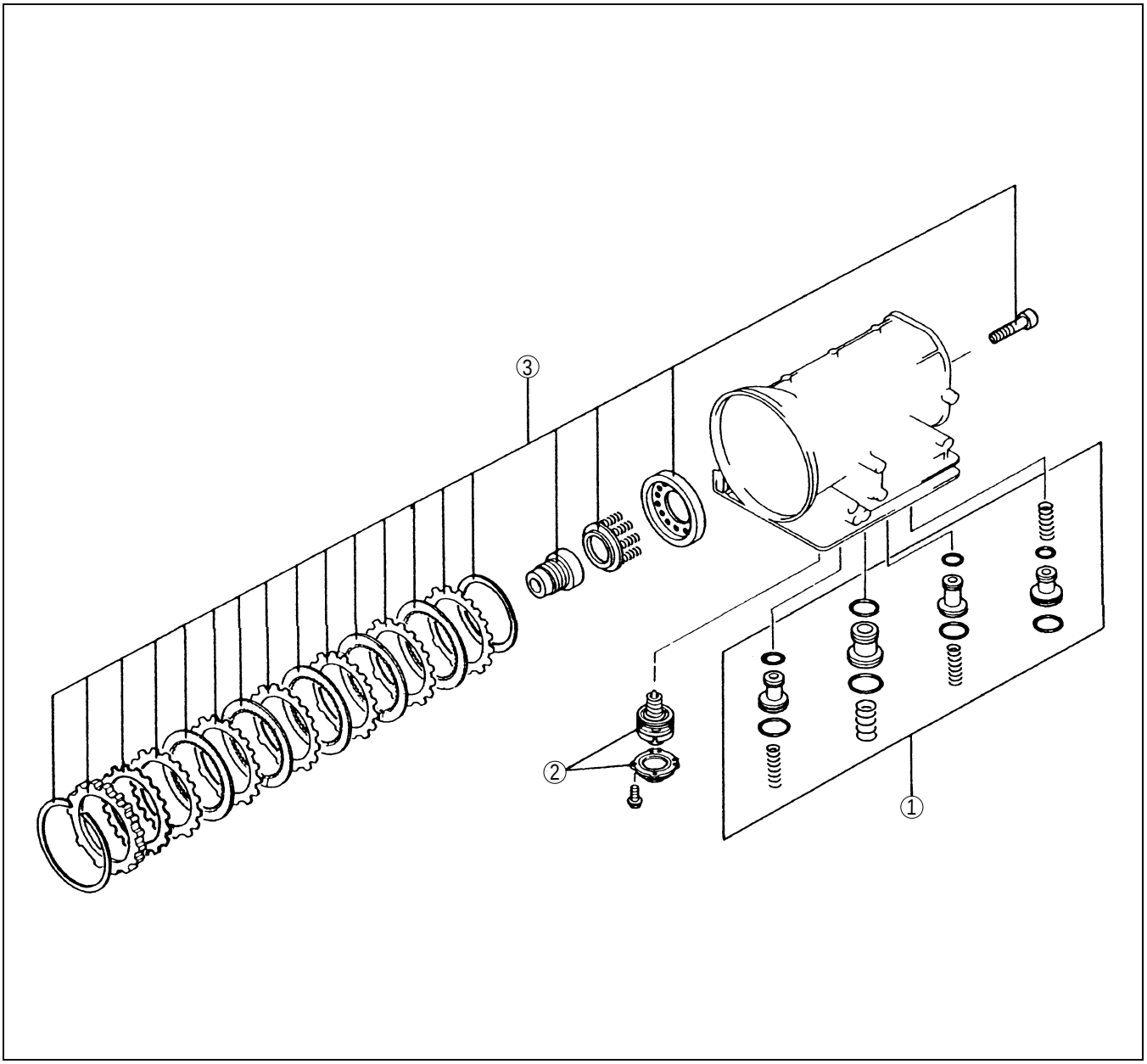


BCF5610A335

Outer diameter of bearing and race

		1	2	3	4	5	6	7	8	9
Bearing	mm {in}	47.0 {1.850}	53.0 {2.087}	53.0 {2.087}	78.0 {3.071}	53.0 {2.087}	78.0 {3.071}	59.0 {2.323}	78.1 {3.075}	64.0 {2.520}
Race	mm {in}	43.5 {1.713}	51.5 {2.028}	—	75.0 {2.953}	—	75.0 {2.953}	—	—	—

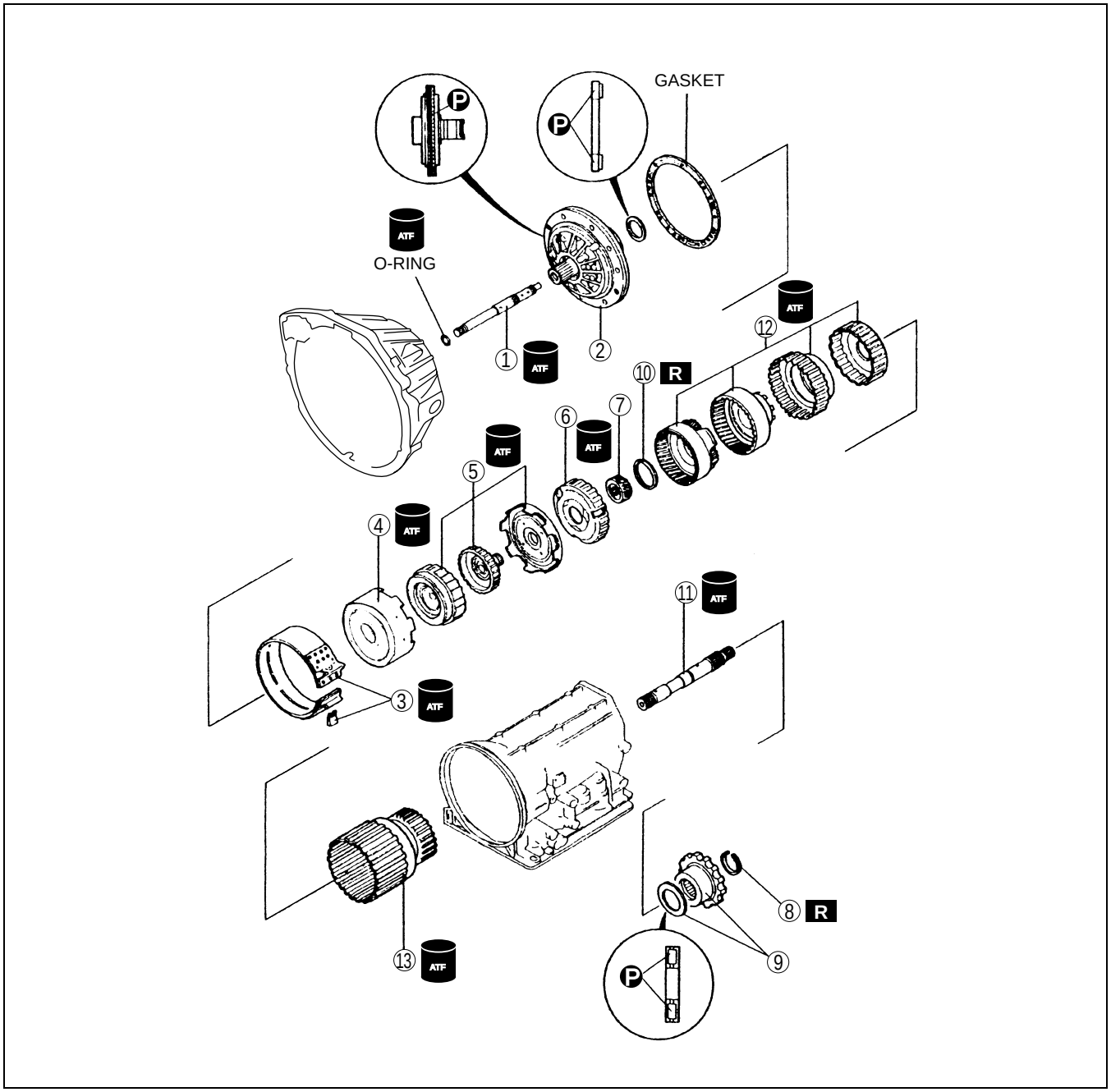
Components 1



BCF5610A103

1	Accumulator spring and piston
2	Band servo
3	Low and reverse brake piston and spring

Components 2

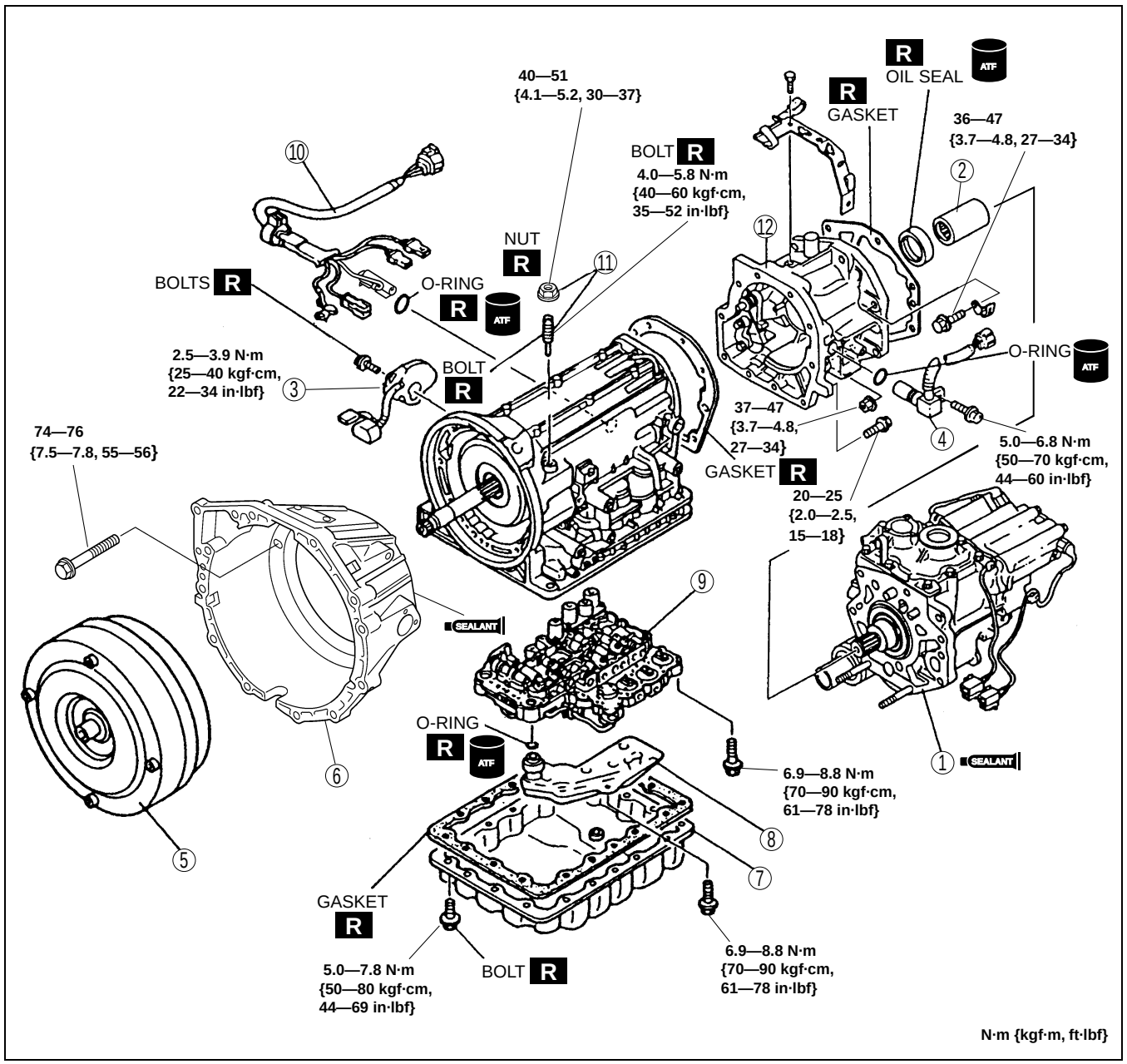


BCF5610A336

1	Input shaft
2	Oil pump
3	Brake band and strut
4	Reverse clutch
5	High clutch and front sun gear
6	Front planetary carrier
7	Rear sun gear

8	Snap ring
9	Parking gear and bearing
10	Snap ring
11	Output shaft
12	Front internal gear, rear internal gear, forward clutch hub, overrunning clutch hub
13	Forward clutch drum (forward clutch, overrunning clutch, low one-way clutch)

Components 3



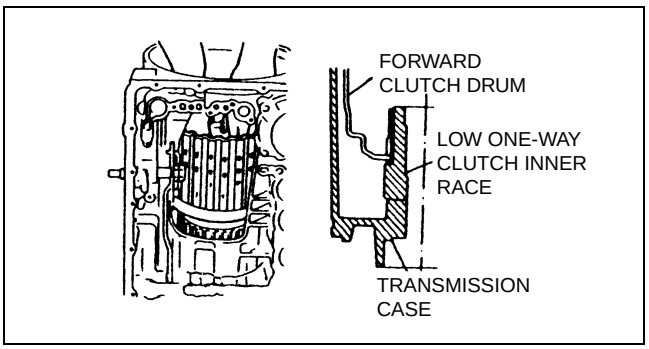
BCF5610A337

1	Transfer
2	Input sleeve
3	TR switch
4	Output speed sensor
5	Torque converter
6	Converter housing

7	Oil pan
8	Oil strainer
9	Control valve body
10	Solenoid valve harness
11	Anchor end bolt and nut
12	Adapter case/parking mechanism

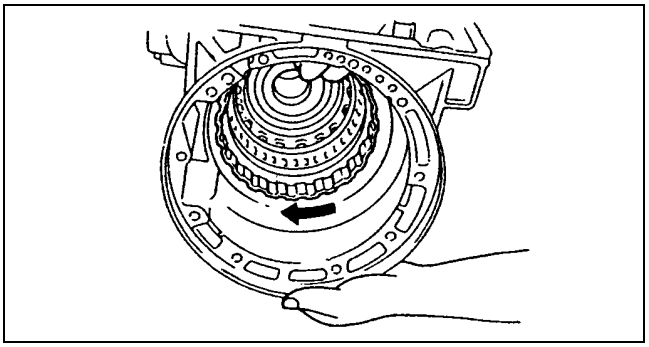
Transmission unit assembly procedure

1. Install the forward clutch drum while slowly turning it clockwise until its hub passes fully over the low one-way clutch inner race.



BCF5610A338

2. Verify that the forward clutch drum will turn only clockwise.
3. Install the rear internal gear, forward clutch hub, and overrunning clutch hub in the forward clutch component.

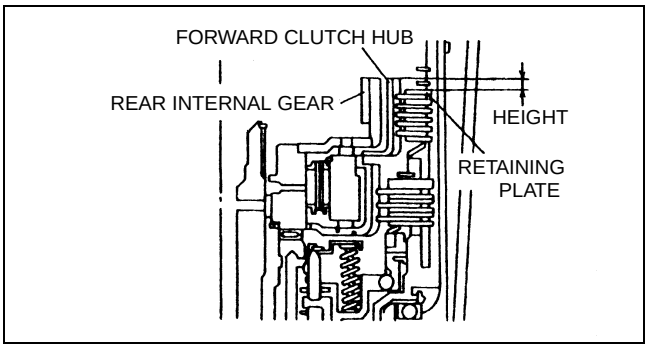


BCF5610A220

4. Measure the height difference between the forward clutch retaining plate and the top of the forward clutch hub.

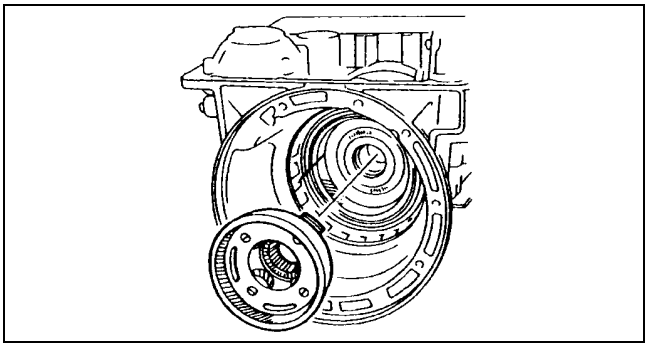
   Height
   Approx. 2.0—3.0 mm {0.079—0.118 in}

5. Verify that the bearing race is installed on the front internal gear (rear planetary carrier).



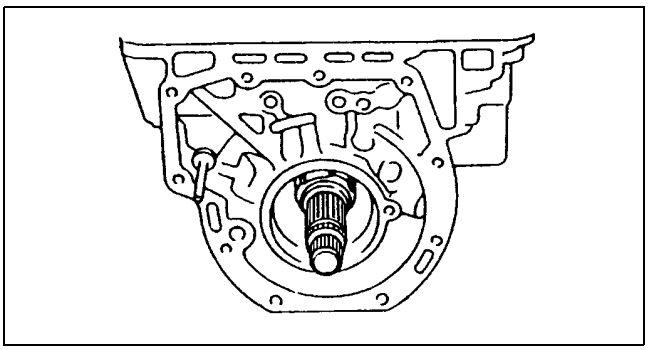
BCF5610A341

6. Install the front internal gear and rear planetary carrier into the forward clutch component.



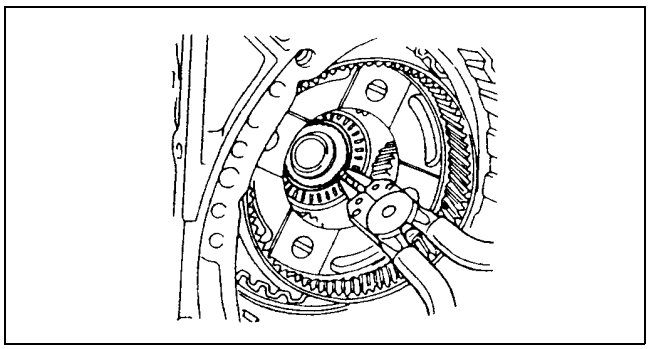
BCF5610A135

7. Insert the output shaft from the rear of the transmission case.



BCF5610A134

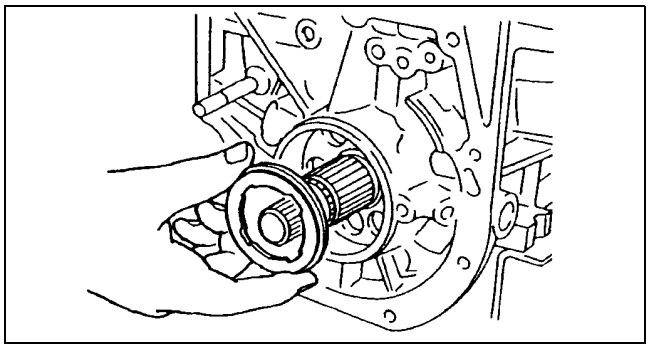
8. Push the output shaft forward slightly, and install a new snap ring on the output shaft. Verify that the output shaft cannot be removed from the rear of the transmission case.



BCF5610A133

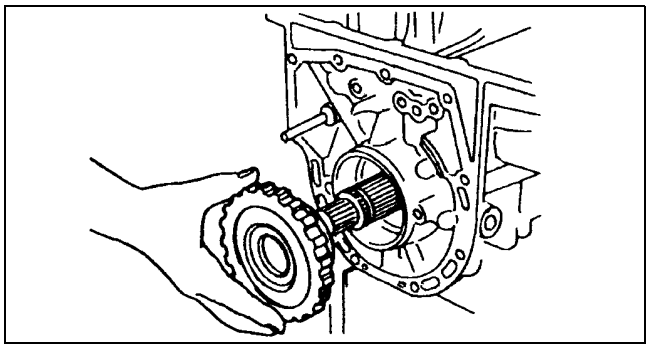
9. Apply petroleum jelly to the bearing and install it to the transmission case with the black surface facing toward the rear.

   Bearing outer diameter
   64.0 mm {2.520 in}



BCF5610A132

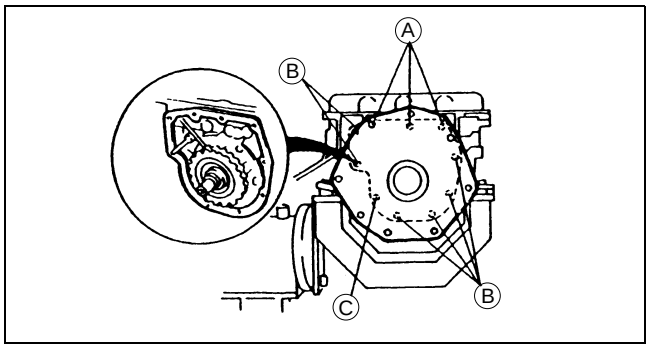
10. Install the parking gear.
11. Pull the output shaft back slightly, and install a new snap ring on the output shaft. Verify that the output shaft does not move forward.



BCF5610A342

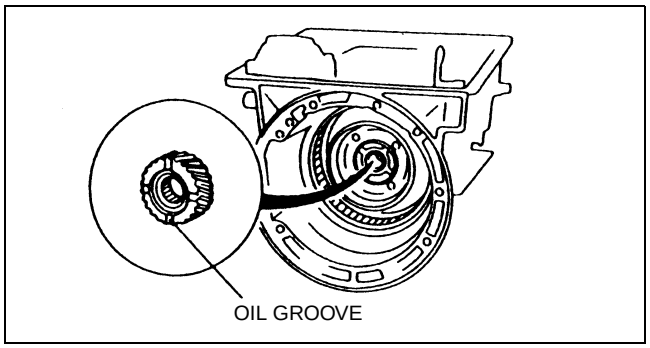
12. Install a new gasket and the adapter case.

    Bolt length (measured from below bolt head)
    A: 30 mm {1.18 in}
    B: 45 mm {1.77 in}
    Tightening torque
    20—24 N·m {2.0—2.5 kgf·m, 15—18 ft·lbf}



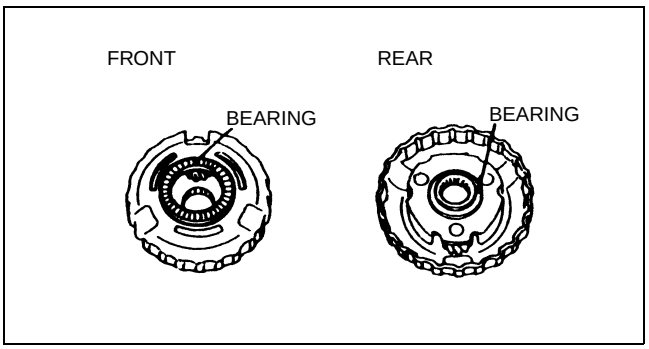
BCF5610A112

13. Install the rear sun gear into the front internal gear, with the oil groove facing as shown in the figure.



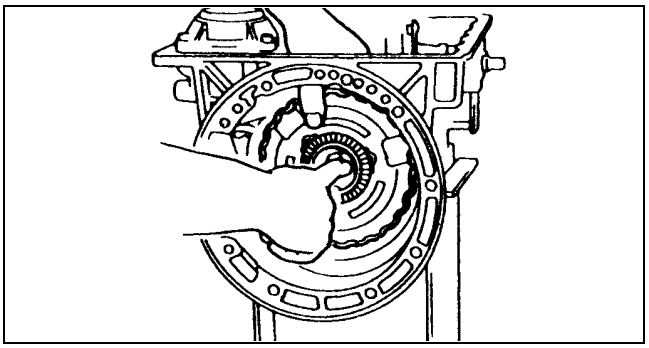
BCF5610A344

14. Verify that the bearing and bearing race are installed correctly.



BCF5610A345

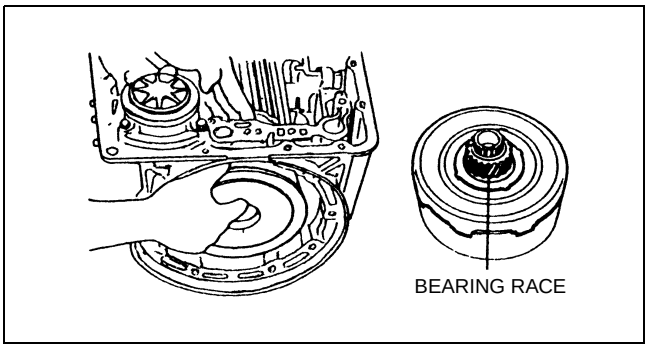
15. While rotating the forward clutch drum clockwise, install the front planetary carrier into the forward clutch component.



BCF5610A346

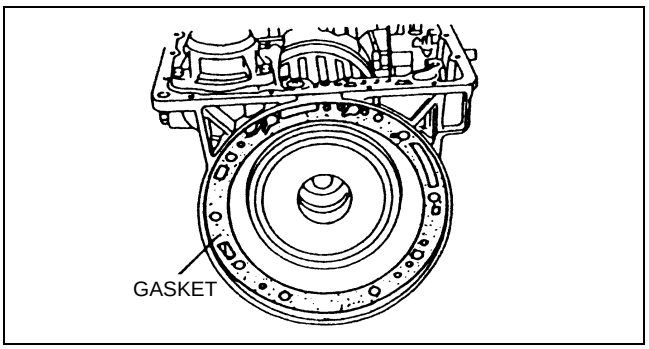
16. Install the reverse clutch, high clutch, and front sun gear into the transmission case as a component.
17. When any part in the following table is replaced, the total end play and/or reverse end play must be adjusted.

Part name	Item	
	Total end play	Reverse end play
Transmission case	×	×
Low one-way clutch inner race	×	×
Overrunning clutch hub	×	×
Rear internal gear	×	×
Rear planetary carrier	×	×
Rear sun gear	×	×
Front planetary carrier	×	×
Front sun gear	×	×
High clutch hub	×	×
High clutch drum	×	×
Oil pump cover	×	×
Reverse clutch drum	—	×



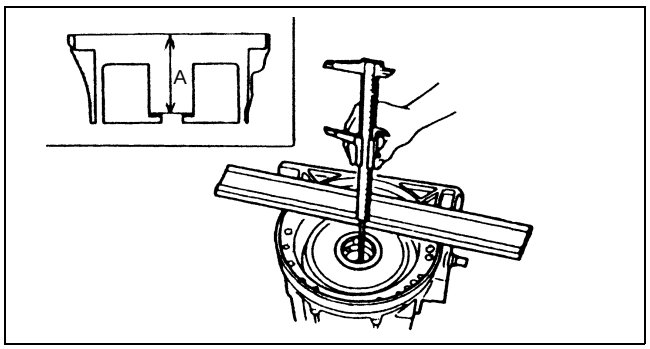
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18. Adjust the total end play.
    (1) Install a new oil pump gasket.



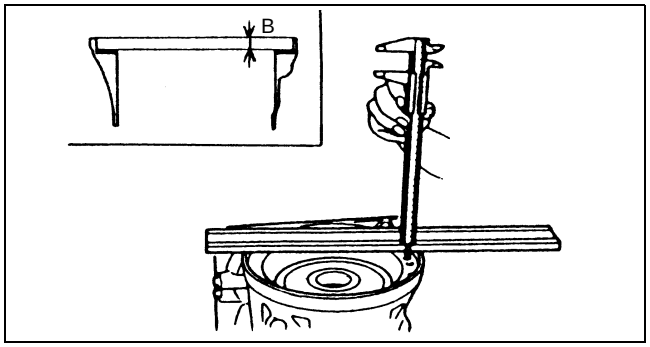
BCF5610A348

(2) Measure height A using vernier calipers and a straight edge.



BCF5610A349

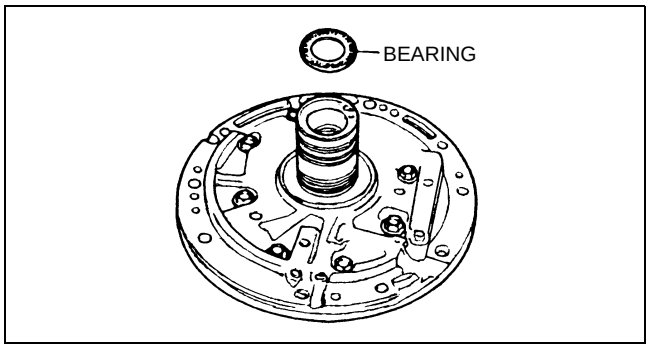
(3) Measure height B using vernier calipers.



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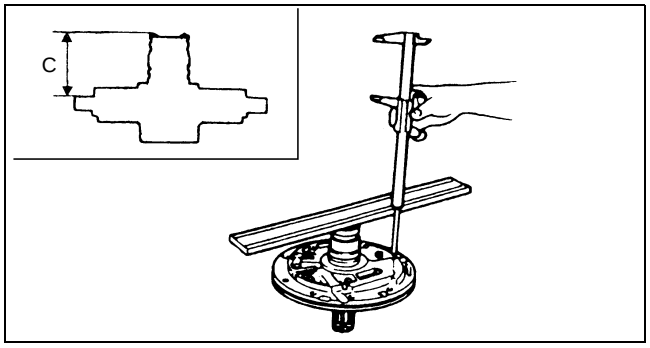
(4) Apply petroleum jelly to the bearing and install it on the oil pump.

Bearing outer diameter
47.0 mm {1.850 in}



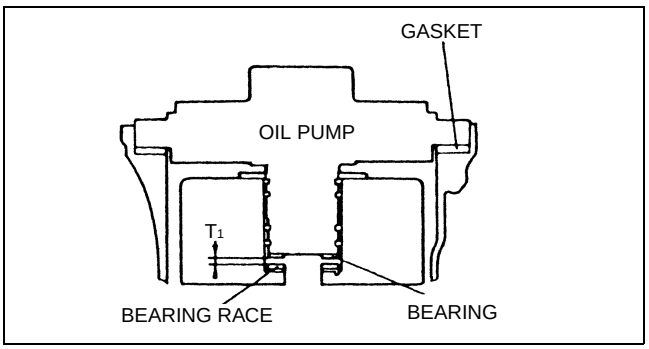
BCF5610A160

(5) Measure height C using vernier calipers and a straight edge.



BCF5610A351

(6) Calculate the total end play using the formula below.



BCF5610A352

Formula
T1 = A – B – C – 0.1 mm {0.0039 in}

T1 : Total end play
A : Distance between bearing race of front side of transmission case and reverse clutch
B : Distance between front side of transmission case and oil pump gasket
C : Distance between upper surface of oil pump bearing and oil pump gasket contact surface
0.1 mm {0.0039 in}: Amount of compression of new oil pump gasket

Total end play
0.25—0.55 mm {0.010—0.022 in}

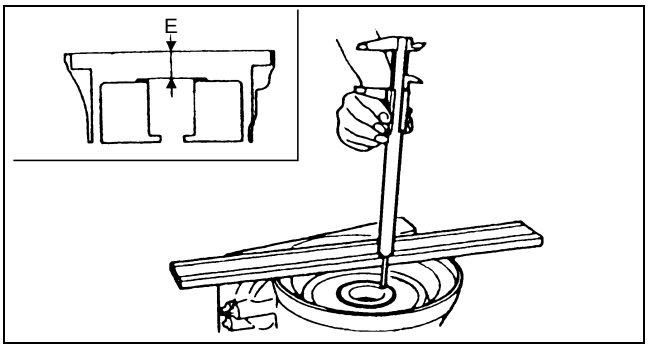
(7) If the total end play is not within the specification, adjust it by selecting and installing the proper bearing race.

Bearing race size

(mm {in})

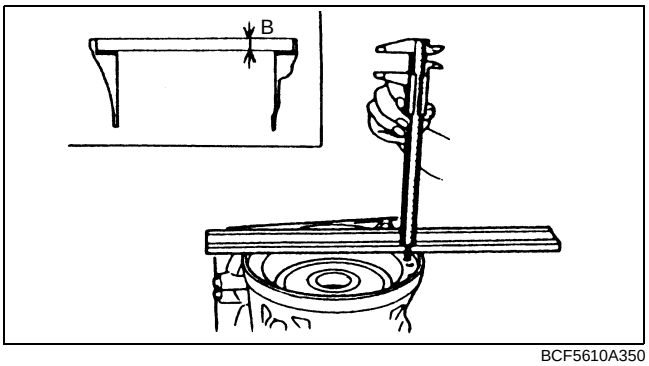
0.8 {0.031}	1.0 {0.039}	1.2 {0.047}	1.4 {0.055}
1.6 {0.063}	1.8 {0.071}	2.0 {0.079}	—

19. Adjust the reverse clutch end play.
(1) Install the thrust washer on the reverse clutch.
(2) Measure height E using vernier calipers and a straight edge.



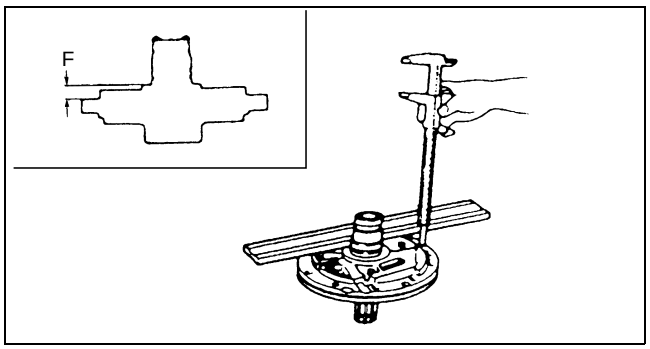
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(3) Measure height B using vernier calipers and a straight edge.



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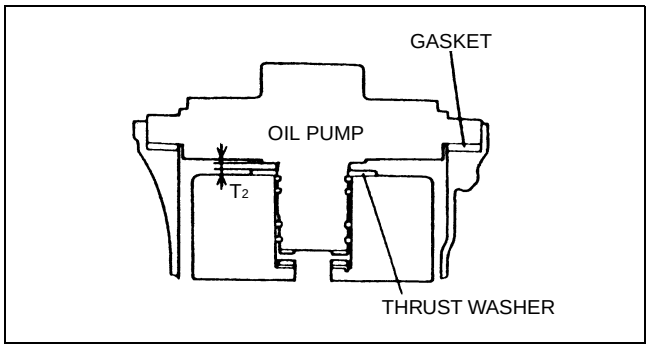
(4) Measure height F using vernier calipers and a straight edge.



BCF5610A354

(5) Calculate the reverse clutch end play using the formula below.

Formula
T2 = E – B – F – 0.1 mm {0.0039 in}



BCF5610A355

T2 : Reverse clutch end play
B : Distance between front side of transmission case and oil pump gasket
E : Distance between thrust washers of front side of transmission case and reverse clutch
F : Distance between reverse clutch thrust washer contact surface of oil pump and oil pump gasket contact surface
0.1 mm {0.0039 in}: Amount of compression of new oil pump gasket

Reverse clutch end play
0.55—0.90 mm {0.022—0.035 in}

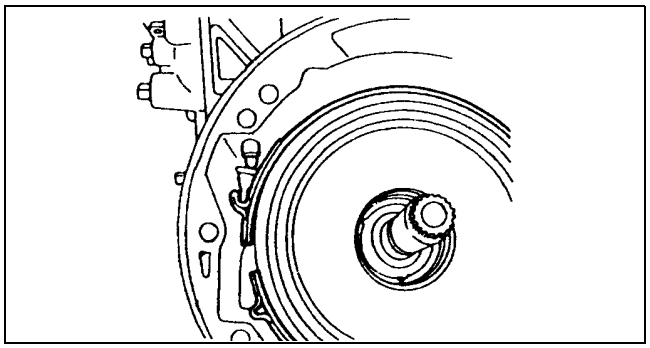
(6) If the reverse clutch end play is not within the specification, adjust it by selecting and installing the proper reverse clutch thrust washer.

Trust washer size

(mm {in})

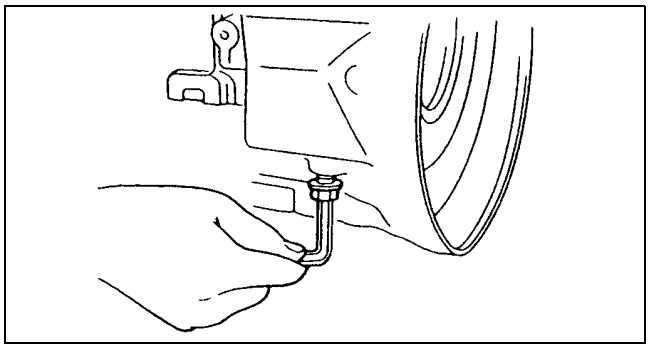
0.7 {0.028}	0.9 {0.035}	1.1 {0.043}	1.3 {0.051}
1.5 {0.059}	1.7 {0.067}	1.9 {0.075}	—

20. Apply ATF to the brake band and band strut, then install them into the transmission.



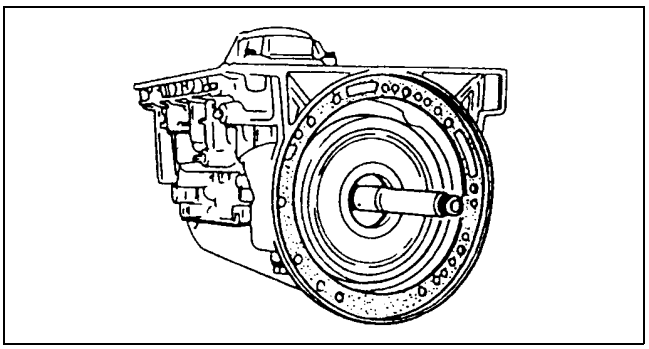
BCF5610A356

21. Temporarily install a new anchor end bolt.



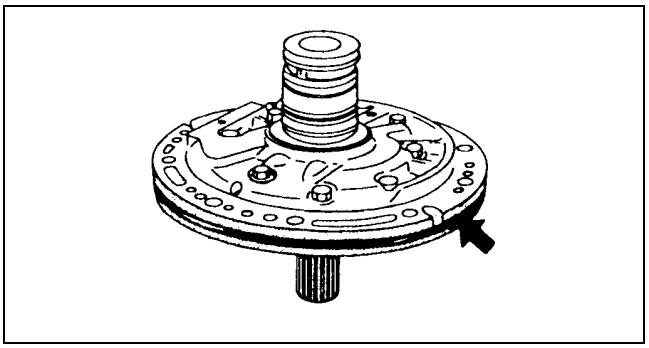
BCF5610A127

22. Apply ATF to the input shaft and install it into the transmission case.



BCF5610A126

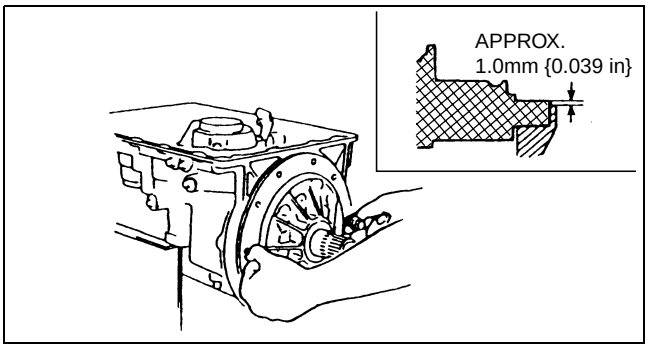
23. Apply petroleum jelly to the oil pump component as shown in the figure.
24. Install the oil pump component into the transmission case by hand only, using two converter housing bolts as guides.



BCF5610A357

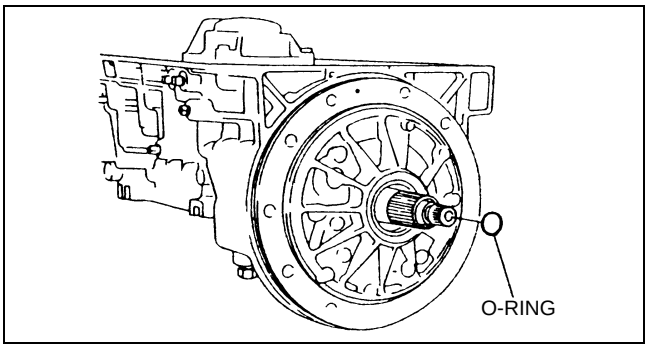
Measure the height difference between the top of the transmission case and the oil pump as shown in the figure.

Height
Approx. 1.0 mm {0.039 in}



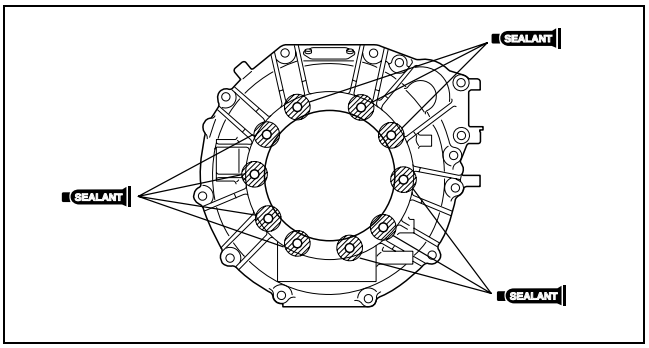
BCF5610A358

25. Apply ATF to a new O-ring, and install it onto the input shaft.



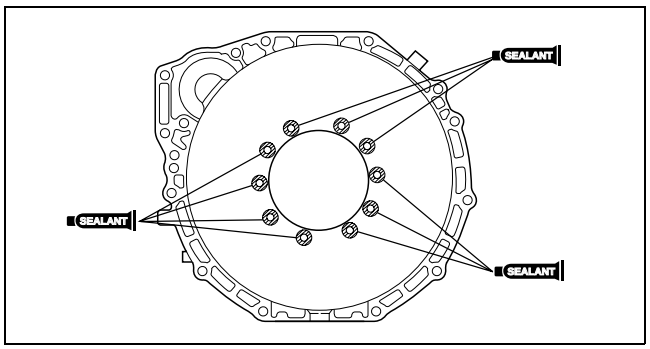
BCF5610A123

26. After remove ATF from mating surface of the oil pump side of converter housing, apply sealant around the 10 holes of bolts.



BCF5610A359

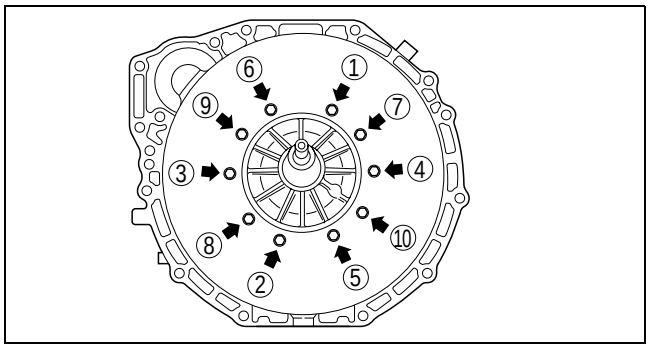
27. Apply sealant lightly as shown in the figure.
28. Remove the converter housing bolts used as guides.



BCF5610A360

29. Install the converter housing onto the transmission case, and tighten the bolts evenly in the order as shown in the figure.

Tightening torque
74—76 N·m {7.5—7.8 kg·fm, 55—56 ft·lbf}

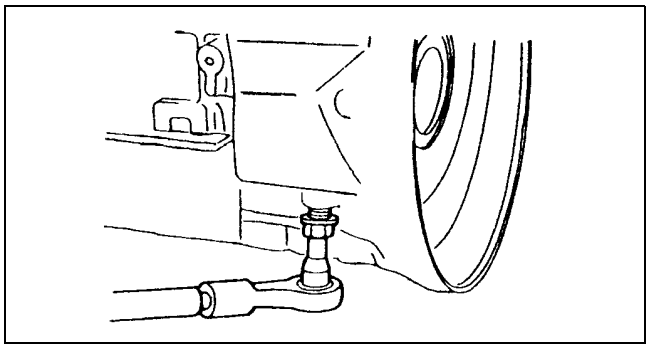


BCF5610A361

30. Adjust the brake band.
    (1) Tighten the anchor end bolt using a hex wrench.

Tightening torque
4.0—5.8 N·m {40—60 kgf·cm, 35—52 in·lbf}

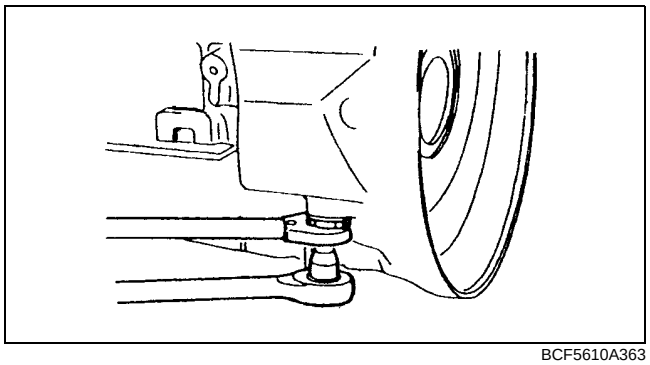
    (2) Loosen the anchor end bolt **2.5** turns.
    (3) Install the locknut.


BCF5610A362

    (4) Hold the anchor end bolt using a hex wrench and tighten the locknut.

Tightening torque
40—51 N·m {4.1—5.2 kg·fm, 30—37 ft·lbf}

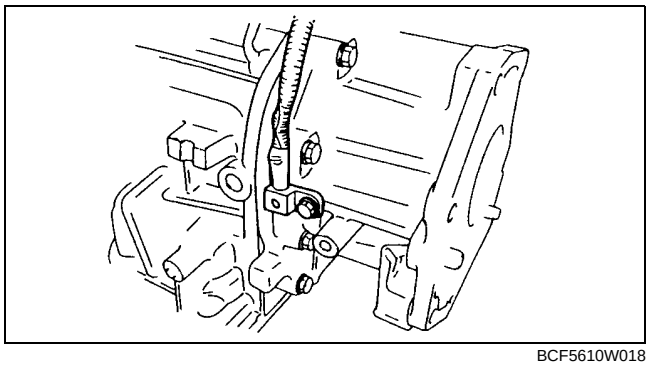
31. Apply ATF to a new O-ring and install it onto output speed sensor.


BCF5610A363

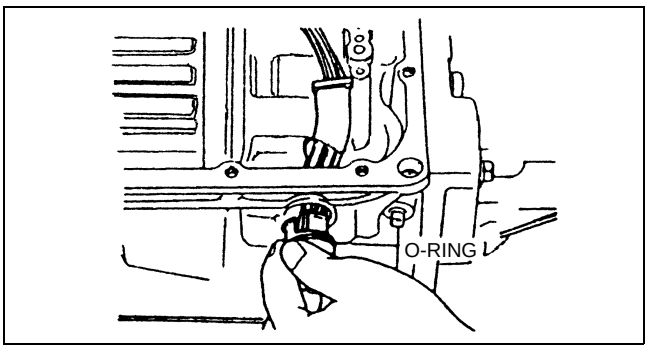
32. Install the output speed sensor into the adapter case.

Tightening torque
5.0—6.8 N·m {50—70 kgf·cm, 44—60 in·lbf}

33. Apply ATF to a new O-ring, then install it onto the solenoid valve harness.


BCF5610W018

34. Install the solenoid valve harness into the transmission case.

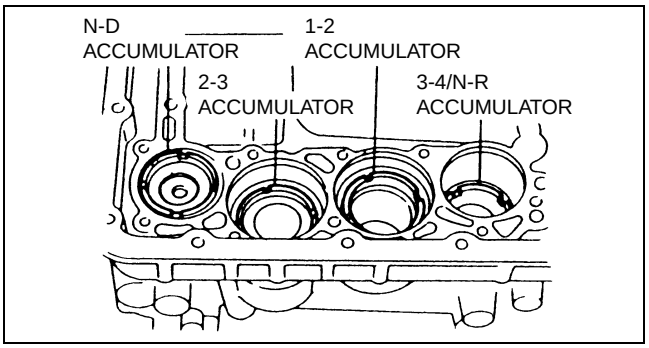


BCF5610A365

35. Install the accumulator spring into the accumulator piston.

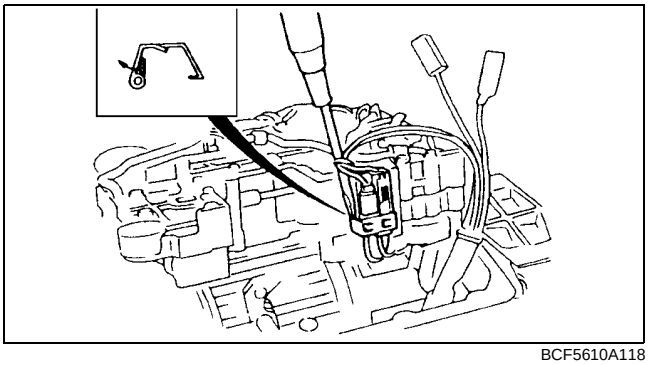
Spring specifications

Spring specification	Outer dia. mm {in}	Free length mm {in}	No. of coils	Wire dia. mm {in}
3-4/N-R accumulator piston	17.3 {0.681}	58.4 {2.299}	12.3	2.3 {0.091}
1-2 accumulator piston	29.3 {1.154}	45.0 {1.772}	3.6	4.0 {0.157}
2-3 accumulator piston	20.0 {0.787}	66.0 {2.598}	7.6	3.2 {0.126}



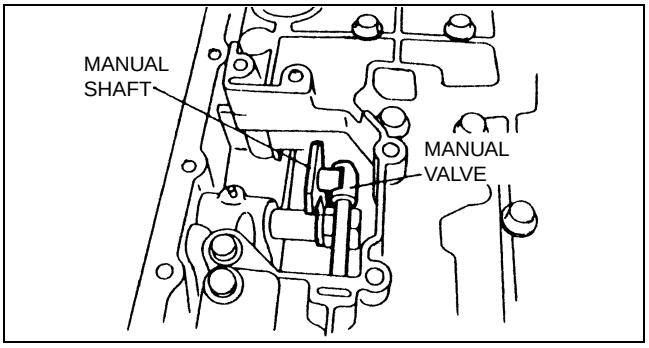
BCF5610A146

36. Connect the solenoid valve connectors.
37. Install the clip.



BCF5610A118

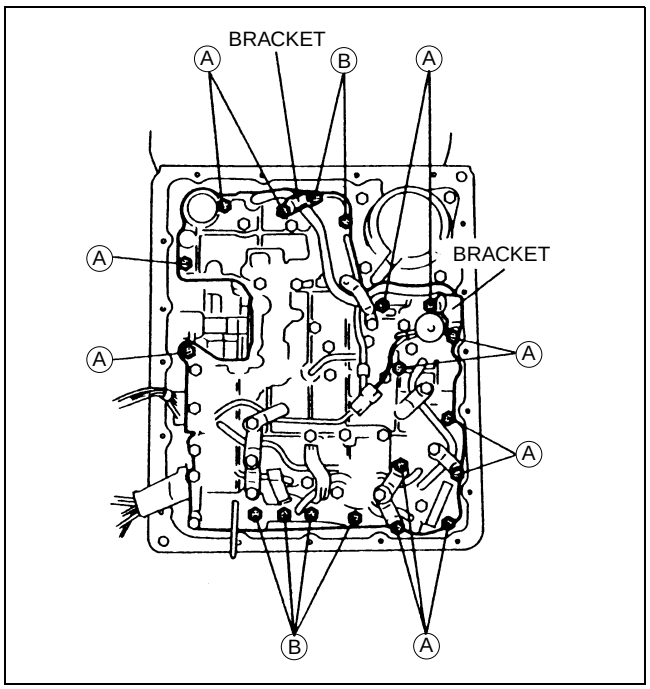
38. Verify that the manual valve and manual shaft are assembled correctly.



BCF5610A367

39. Install the valve body component, and tighten the bolts evenly.

Bolt length (measured from below bolt head)
A: 33 mm {1.30 in}
B: 45 mm {1.77 in}
Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

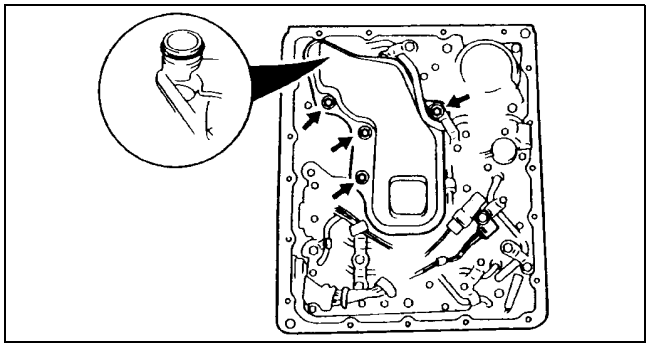


BCF5610A117

40. Apply ATF to a new O-ring and install it onto the oil strainer.

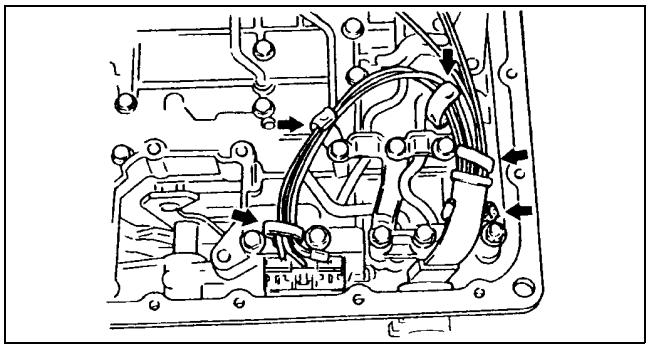
41. Install the oil strainer into the control valve body.

Bolt length (measured from below bolt head)
52 mm {2.03 in}
Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}



BCF5610A115

42. Secure the solenoid valve harness with the clips.

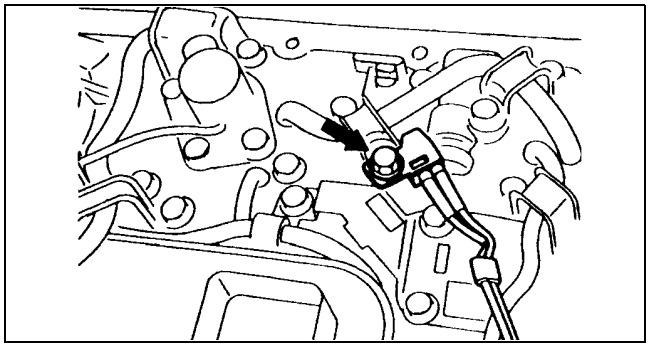


BCF5610A116

43. Install the TFT sensor as shown in the figure.

Bolt length (measured from below bolt head)
45 mm {1.77 in}
Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

44. Connect the TCC solenoid valve connector.



BCF5610A371

45. Install the clip.
46. Install the TFT switch.
47. Remove any old locking compound from the bolt holes.
48. Install the magnet to the inside of the oil pan.

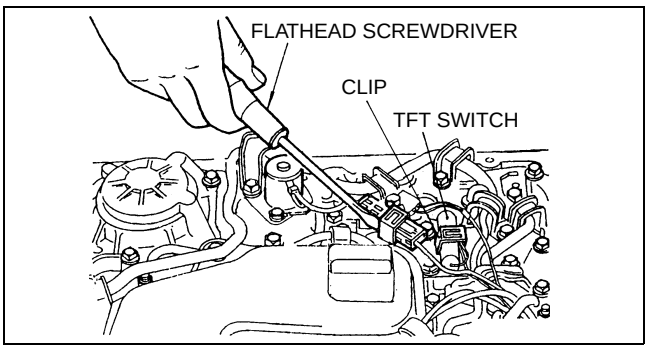
Caution
- **When installing sealant-coated bolts, tighten them immediately. Leaving these bolts in a half-installed condition could cause them to be stuck that way, due to the natural hardening of the sealant.**

49. Install the new gasket to the oil pan, and tighten the bolts in the order as shown in the figure.

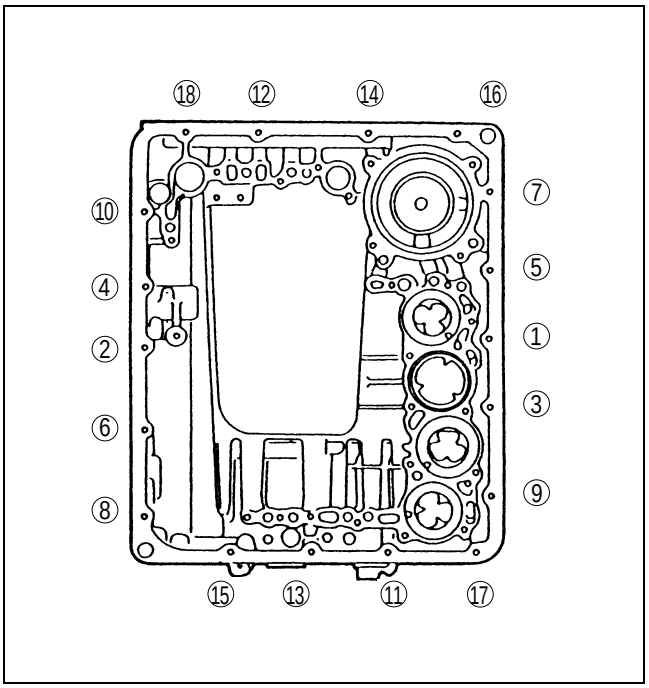
Tightening torque
6.9—8.8 N·m {70—90 kgf·cm, 61—78 in·lbf}

50. Install the connector brackets onto the adapter case.

Tightening torque
7.9—11.7 N·m {80—120 kgf·cm, 70—104 in·lbf}

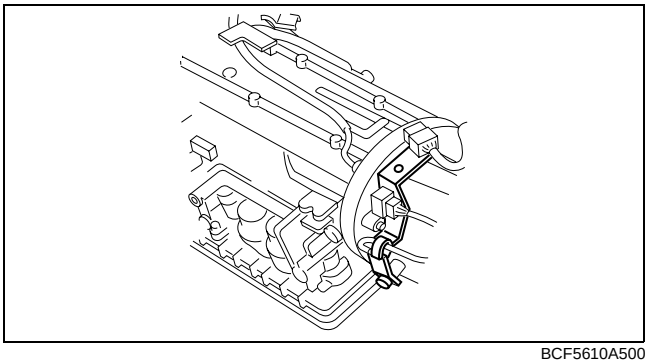


BCF5610A113

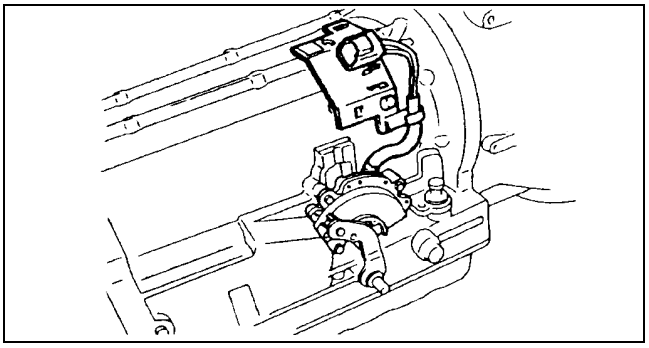


BCF5610A372

51. Install the harness onto the connector bracket.
52. Install and adjust the TR switch.
    (1) Verify that the manual shaft is positioned at the L position (fully forward).


BCF5610A500

    (2) Install the TR switch over the manual shaft and install new bolts.
    (3) Turn the manual shaft fully rearward, then return it **2 notches** (N position).

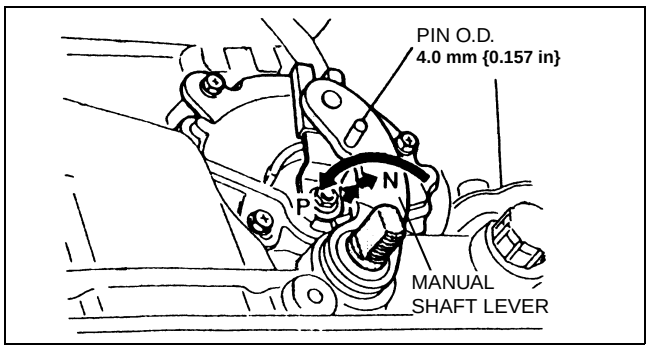

BCF5610A106

(4) Insert a **4.0 mm {0.157 in}** outer diameter pin through the holes of the TR switch and the manual shaft lever.
(5) Tighten the TR switch mounting bolts.

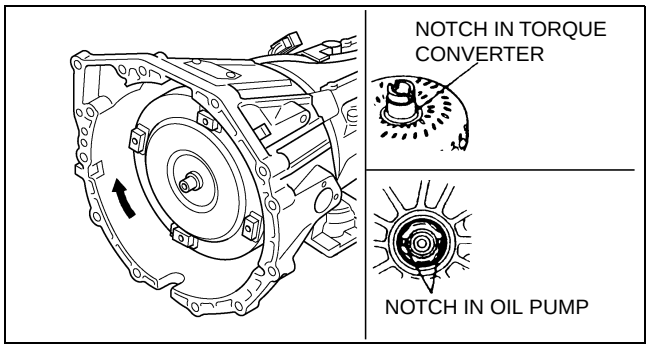
Tightening torque
2.5—3.9 N·m {25—40 kgf·cm, 22—34 in·lbf}

(6) Remove the pin.

53. Remove the transmission from the **SST**. If the torque converter is completely empty, hold it upright and fill it with **2.0 L {2.1 US qt, 1.8 Imp qt}** of ATF.
54. Install the torque converter in the transmission while rotating it to align the splines.



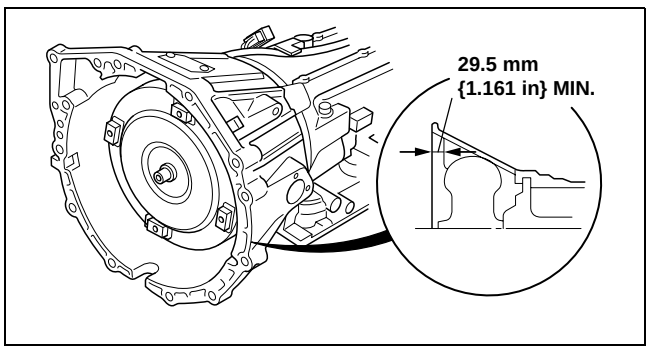
BCF5610A374



BCF5610A704

55. Measure the installation depth of the torque converter using vernier calipers and a straight edge.

Specification
29.5 mm {1.161 in}



BCF5610A376

AUTOMATIC TRANSMISSION (TRANSFER)

TRANSFER.....K2-2
PRECAUTION.....K2-2
TRANSFER COMPONENT DISASSEMBLY.....K2-3
FRONT DRIVE SPROCKET COMPONENT DISASSEMBLY/ASSEMBLY.....K2-6
OUTPUT SHAFT COMPONENT DISASSEMBLY/ASSEMBLY.....K2-7
TRANSFER COMPONENT ASSEMBLY.....K2-9
TRANSFER INSPECTION.....K2-13

TRANSFER

PRECAUTION

CBG581827500A01

1. Clean the transfer exterior thoroughly using a steam cleaner or cleaning solvents before disassembly.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution
- **Cleaning sealed bearings using cleaning fluids or a steam cleaner can wash the grease out of the bearing.**

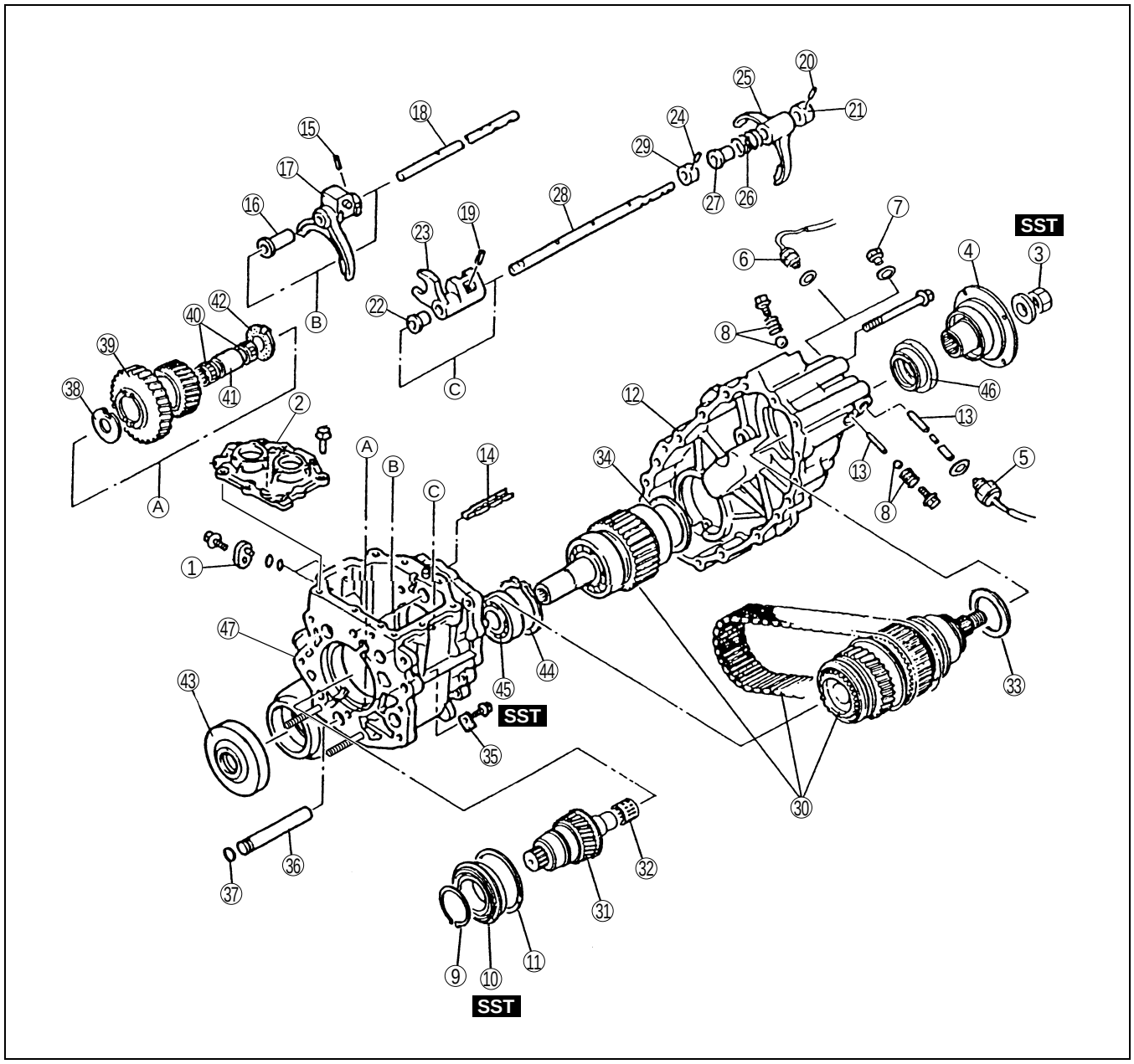
2. Clean the removed parts using cleaning solvent, and dry them using compressed air.
3. Clean out all holes and passages using compressed air, and check that there are no obstructions.
4. Use a plastic hammer when disassembling the transmission case and other light alloy metal parts.
5. Make sure each part is cleaned before assembling.
6. Coat all movable parts with the specified oil.
7. Replace parts whenever required.
8. Remove old sealant from contact surfaces before applying new sealant.
9. Assemble the parts within **10 min** after applying sealant. Allow all sealant to cure at least **30 min** after assembly before filling the transmission with transmission oil.

Warning
- **Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transmission is held in a lopsided position on the stand. This would cause the transmission to turn suddenly, causing serious injury. Never keep the transmission tilted to one side. Always hold the rotating handle firmly when turning the transmission.**

TRANSFER COMPONENT DISASSEMBLY

CBG581827500A02

1. Disassemble in the order indicated in the table.



BCF5818A001

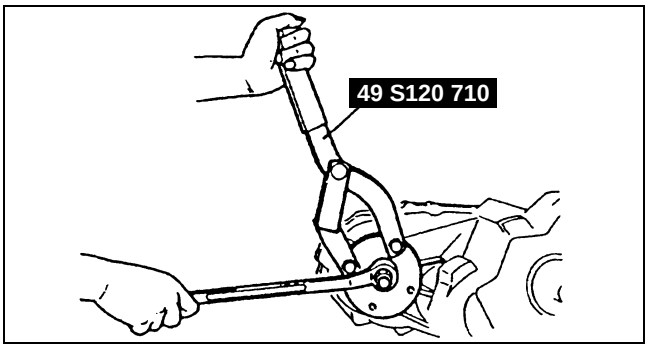
1	Stopper pin
2	Control cover component
3	Locknut (See K2–4 Locknut Disassembly Note.)
4	Companion flange
5	4 × 4 indicator switch
6	Transfer neutral switch (RFW model)
7	Plug (except RFW model)
8	Detent ball and spring
9	Snap ring
10	Bearing (input shaft gear) (See K2–4 Bearing (Input Shaft Gear) Disassembly Note.)
11	Adjustment shim
12	Chain cover
13	Interlock pin

14	Oil passage
15	Roll pin
16	Spacer
17	H/L shift fork
18	H/L shift rod
19	Roll pin
20	Roll pin
21	Retainer
22	Spacer
23	2W/4W shift end
24	Roll pin
25	2W/4W shift fork
26	Spring
27	Spacer
28	2W/4W shift rod

29	Retainer
30	Output shaft component, chain, and front drive sprocket component (See K2–5 Output Shaft Component, Chain, and Front Drive Sprocket Component Disassembly Note.)
31	Input shaft gear
32	Bearing
33	Adjustment shim
34	Adjustment shim
35	Lock plate
36	Counter shaft gear support (See K2–5 Counter Shaft Gear Support Disassembly Note.)
37	O-ring
38	Thrust washer
39	Counter gear
40	Bearing
41	Spacer
42	Thrust washer
43	Oil seal
44	Snap ring
45	Bearing (front drive sprocket) (See K2–5 Bearing (Front Drive Sprocket) Disassembly Note.)
46	Oil seal
47	Transfer case

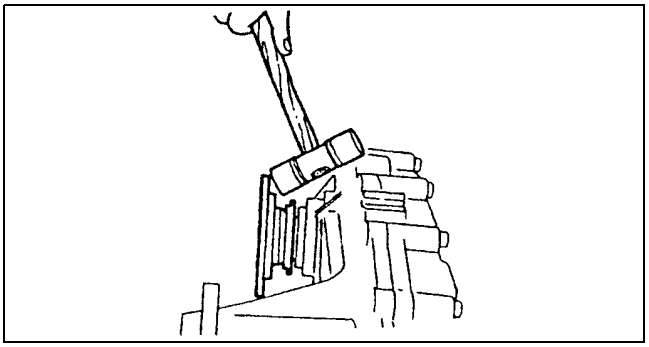
Locknut Disassembly Note

1. Hold the companion flange using the **SST** and remove the locknut.



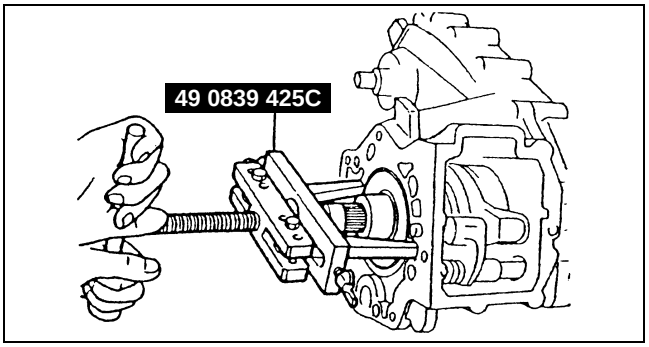
BCF5818A002

2. Remove the companion flange by lightly tapping the back side using a plastic hammer.


BCF5818A003

Bearing (Input Shaft Gear) Disassembly Note

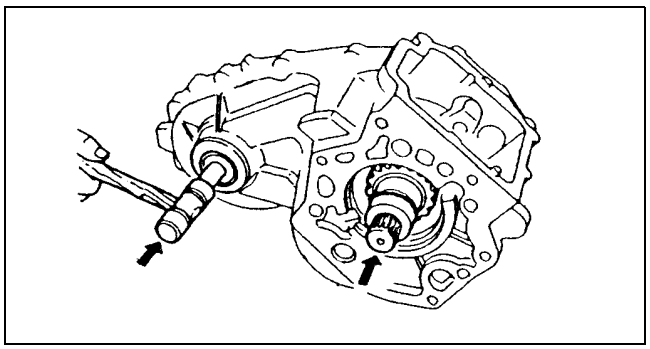
1. Remove the bearing using the **SST**.



BCF5818A004

Output Shaft Component, Chain, and Front Drive Sprocket Component Disassembly Note

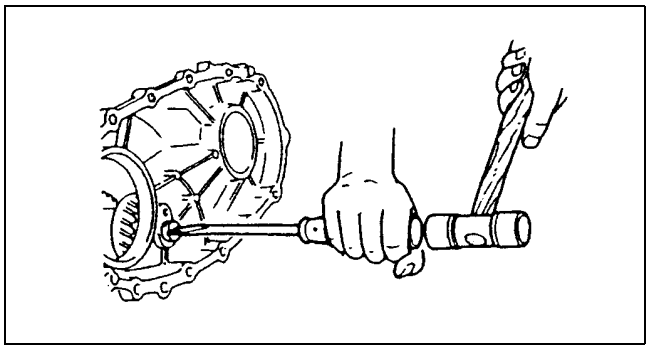
1. Remove the output shaft and the front drive sprocket from the transfer case housing by lightly tapping the input shaft gear and the front drive sprocket using a plastic hammer.



BCF5818A005

Counter Shaft Gear Support Disassembly Note

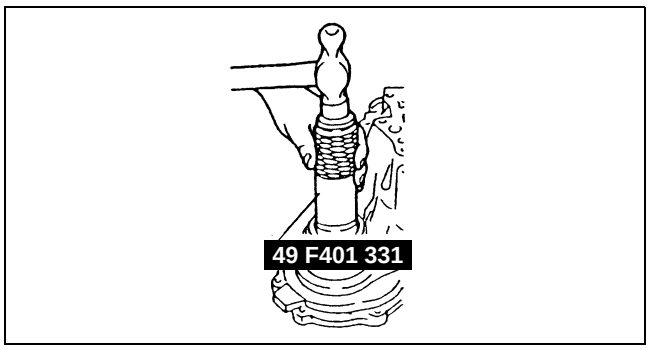
1. Tap out the counter shaft gear support using a tape-wrapped flathead screwdriver and a plastic hummer.



BCF5818A006

Bearing (Front Drive Sprocket) Disassembly Note

1. Remove the bearing using the **SST**.



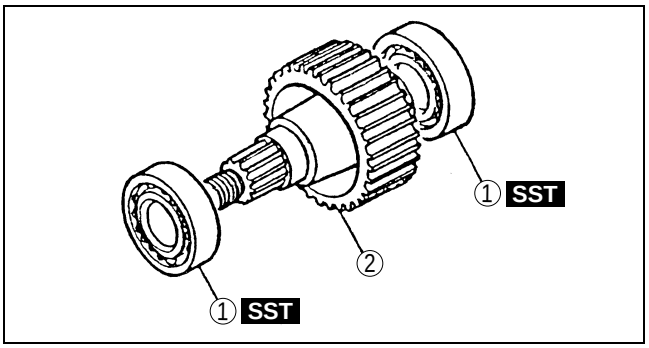
BCF5818A007

FRONT DRIVE SPROCKET COMPONENT DISASSEMBLY/ASSEMBLY

CBG581827500A03

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

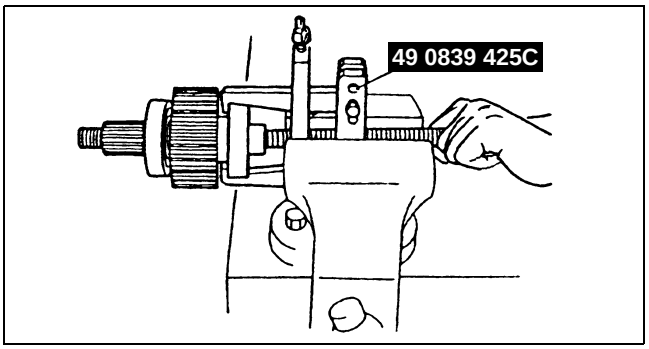
1	Bearing (See K2–6 Bearing Disassembly Note.) (See K2–6 Bearing Assembly Note.)
2	Front drive sprocket



BCF5818A008

Bearing Disassembly Note

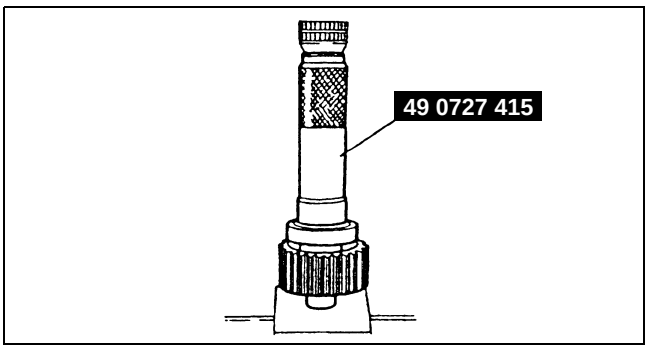
1. Remove the bearings from both sides of the front drive sprocket using the **SST**.



BCF5818A009

Bearing Assembly Note

1. Press the bearings on both sides of the front drive sprocket using the **SST**. Press the bearings on until they stop.

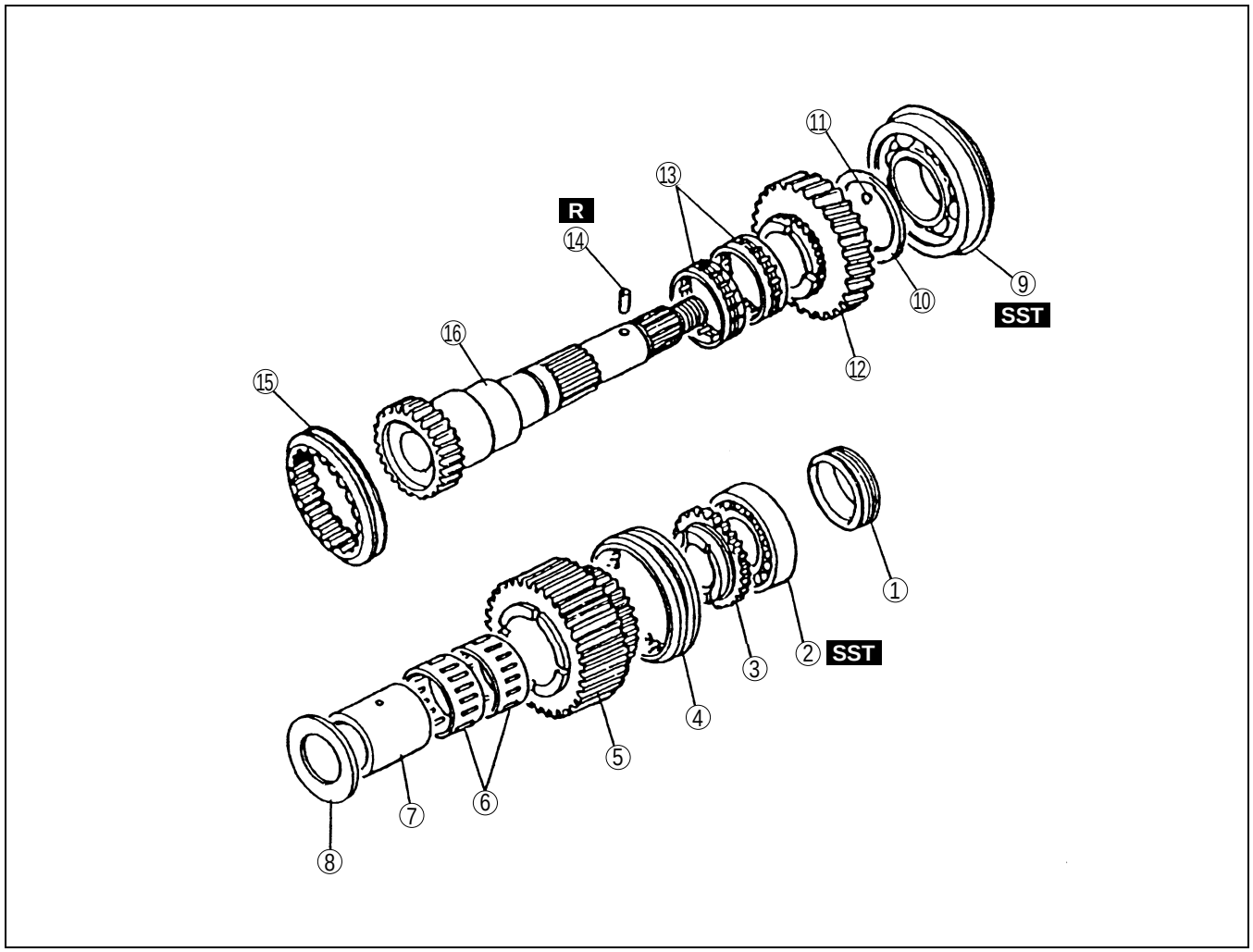


BCF5818A010

OUTPUT SHAFT COMPONENT DISASSEMBLY/ASSEMBLY

CBG581827500A04

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



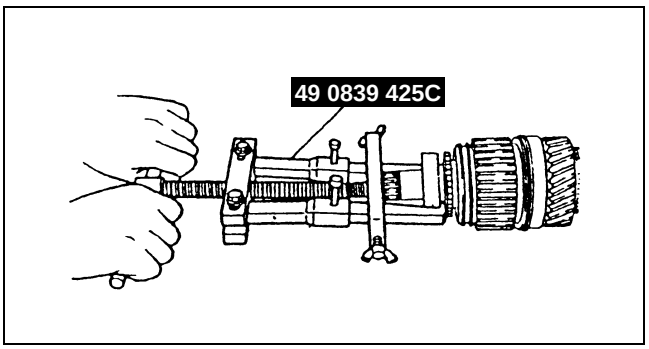
BCF5818A011

1	Speedometer drive gear
2	Bearing (2W/4W clutch hub side) (See K2–8 Bearing (2W/4W Clutch Hub Side) Disassembly Note.) (See K2–8 Bearing (2W/4W Clutch Hub Side) Assembly Note.)
3	2W/4W clutch hub
4	2W/4W hub sleeve
5	Drive sprocket
6	Needle bearing
7	Spacer
8	Thrust washer

9	Bearing (low gear side) (See K2–8 Bearing (Low Gear Side) Disassembly Note.) (See K2–8 Bearing (Low Gear Side) Assembly Note.)
10	Thrust lock washer
11	Steel ball
12	Low gear
13	Needle bearing
14	Roll pin
15	H/L hub sleeve
16	Output shaft

Bearing (2W/4W Clutch Hub Side) Disassembly Note

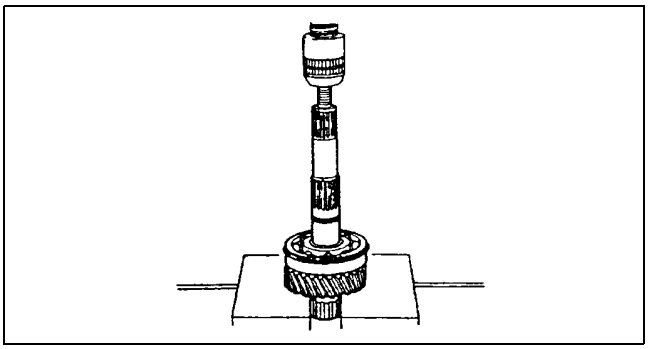
1. Remove the bearing from output shaft using the **SST**.



BCF5818A012

Bearing (Low Gear Side) Disassembly Note

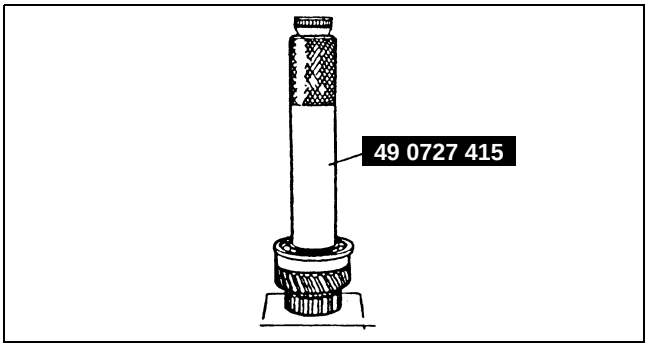
1. Remove the bearing, lock washer, steel ball and low gear using the press.



BCF5818A013

Bearing (Low Gear Side) Assembly Note

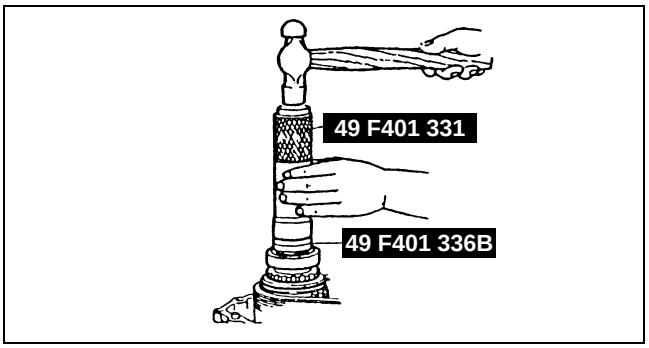
1. Install the bearing using the **SST**.



BCF5818A014

Bearing (2W/4W Clutch Hub Side) Assembly Note

1. Install the bearing using the **SST**.

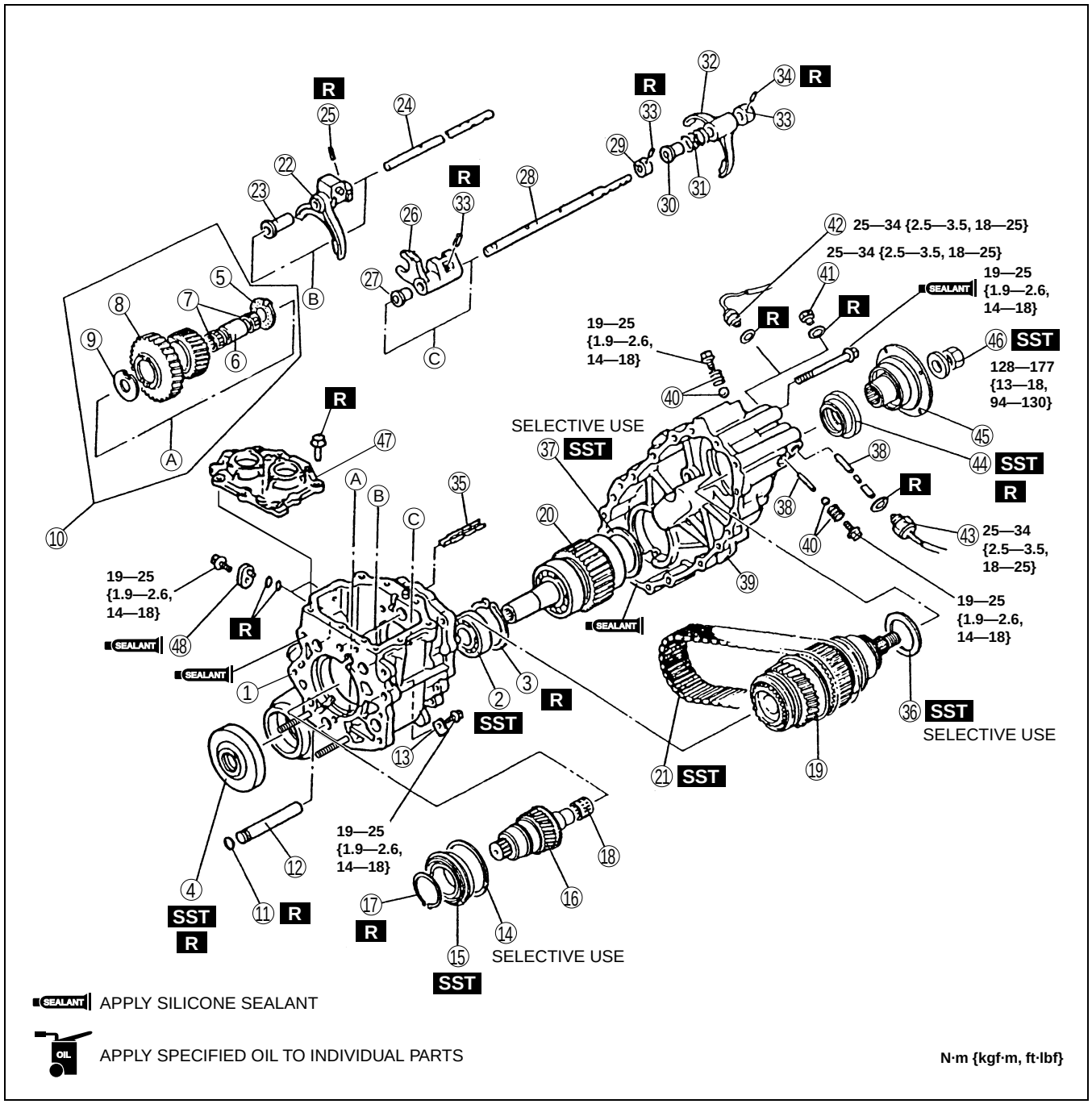


BCF5818A015

TRANSFER COMPONENT ASSEMBLY

CBG581827500A05

1. Assemble in the order indicated in the table.



BCF5818A016

1	Transfer case
2	Bearing (front drive sprocket) (See K2–10 Bearing (Front Drive Sprocket) Assembly Note.)
3	Snap ring
4	Oil seal (transfer case) (See K2–10 Oil Seal (Transfer Case) Assembly Note.)
5	Thrust washer
6	Spacer
7	Bearing
8	Counter gear
9	Thrust washer

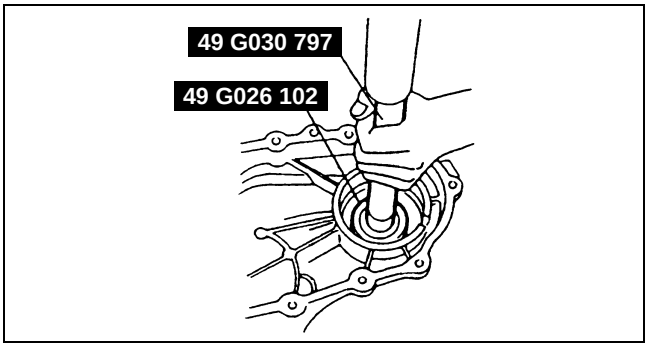
10	Counter gear component
11	O-ring
12	Counter shaft gear support
13	Lock plate
14	Adjustment shim (input shaft gear) (See K2–11 Adjustment Shim (Input Shaft Gear) Assembly Note.)
15	Bearing (input shaft gear) (See K2–11 Bearing (Input Shaft Gear) Assembly Note.)
16	Input shaft
17	Snap ring
18	Bearing

19	Output shaft component
20	Front drive sprocket component
21	Chain (See K2–12 Chain Assembly Note.)
22	H/L shift fork
23	Spacer
24	H/L shift rod
25	Roll pin
26	2W/4W shift end
27	Spacer
28	2W/4W shift rod
29	Retainer
30	Spacer
31	Spring
32	2W/4W shift fork
33	Retainer
34	Roll pin
35	Oil passage

36	Adjustment shim (output shaft) (See K2–12 Adjustment Shim (Output Shaft and Front Drive Sprocket) Assembly Note.)
37	Adjustment shim (front drive sprocket) (See K2–12 Adjustment Shim (Output Shaft and Front Drive Sprocket) Assembly Note.)
38	Interlock pin
39	Chain cover
40	Detent ball and spring
41	Plug (except RFW model)
42	Transfer neutral switch (RFW model)
43	4 × 4 indicator switch
44	Oil seal (chain cover) (See K2–13 Oil seal (Chain Cover) Assembly Note.)
45	Companion flange
46	Locknut (See K2–13 Locknut Assembly Note.)
47	Control cover component
48	Stopper pin

Bearing (Front Drive Sprocket) Assembly Note

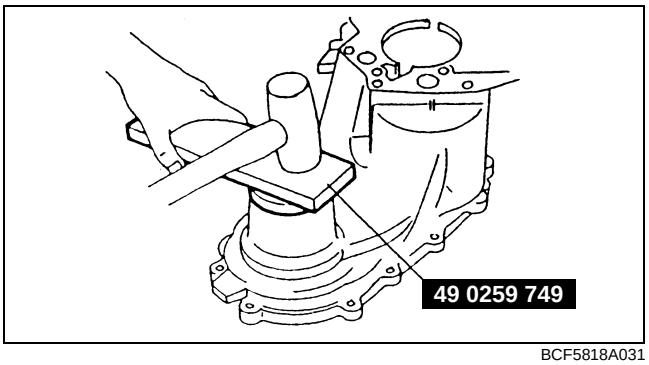
1. Install the bearing to the transfer case using the **SSTs**.



BCF5818A030

Oil Seal (Transfer Case) Assembly Note

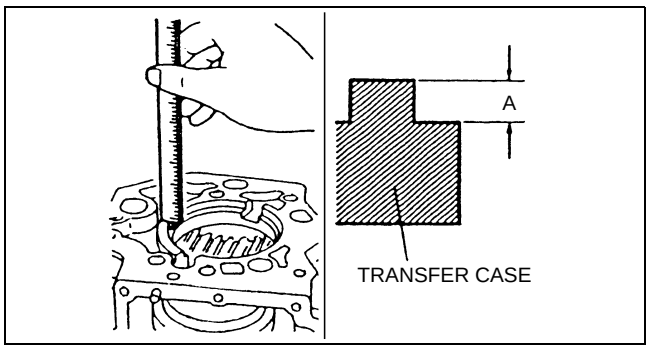
1. Apply oil to the lip of a new oil seal and install the oil seal in the transfer case using the **SST**.



BCF5818A031

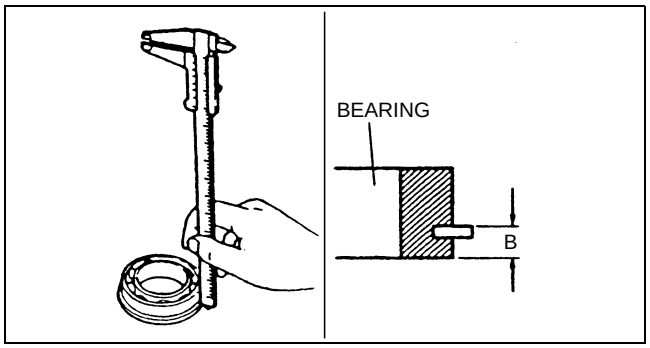
Adjustment Shim (Input Shaft Gear) Assembly Note

1. Measure the bearing bore depth (A) of the transfer case using vernier calipers.



BCF5818A032

2. Measure height (B) of the bearing clip using vernier calipers and a surface plate.



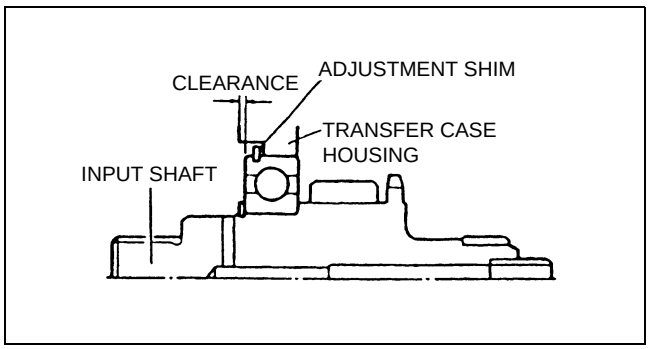
BCF5818A033

3. Calculate the difference between (A) and (B) to determine the clearance.

   Clearance= (A) – (B)

4. Select and install the proper shim to obtain the standard clearance.

   Clearance
   0—0.1 mm {0—0.0039 in}



BCF5818A034

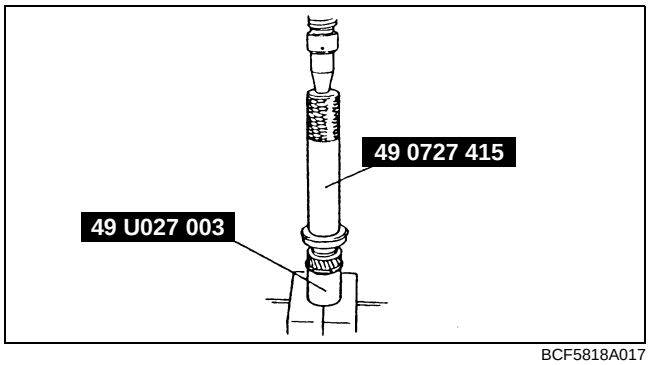
Adjustment shim thickness

(mm {in})

0.6 {0.024}	0.7 {0.028}	0.8 {0.032}	0.9 {0.035}
1.0 {0.039}	1.1 {0.043}	1.2 {0.047}	1.3 {0.051}
1.4 {0.055}	—	—	—

Bearing (Input Shaft Gear) Assembly Note

1. Press the bearing on the input shaft gear using the **SSTs**.

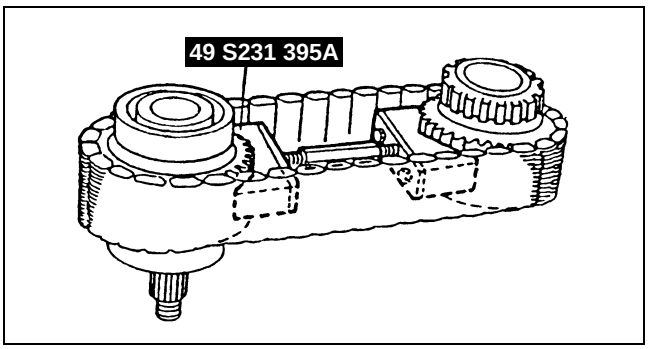


BCF5818A017

Chain Assembly Note

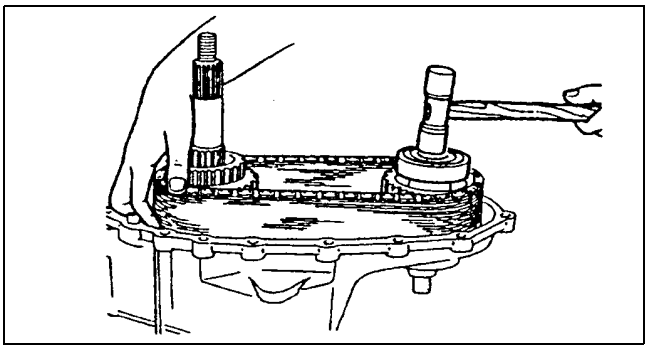
Note
- Do not overtighten the chain expansion tool.

1. Install the chain on the drive sprocket component and the front drive sprocket, and expand the chain using the **SST** to set the center to center distance for easy installation into the transfer case.



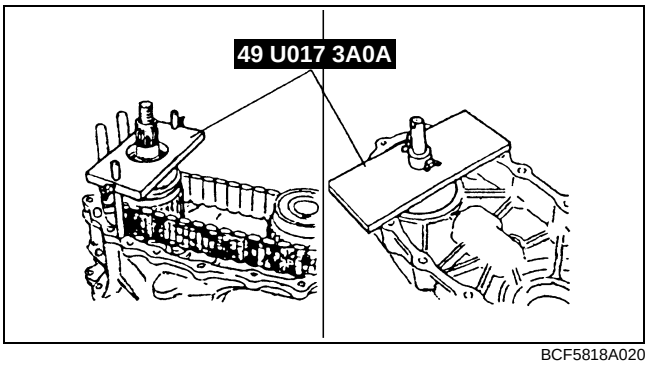
BCF5818A018

2. Install the front drive sprocket component into the transfer case by lightly tapping it with a plastic hammer, keeping the chain horizontal.
3. After installing, check that the chain rotates smoothly.


BCF5818A019

Adjustment Shim (Output Shaft and Front Drive Sprocket) Assembly Note

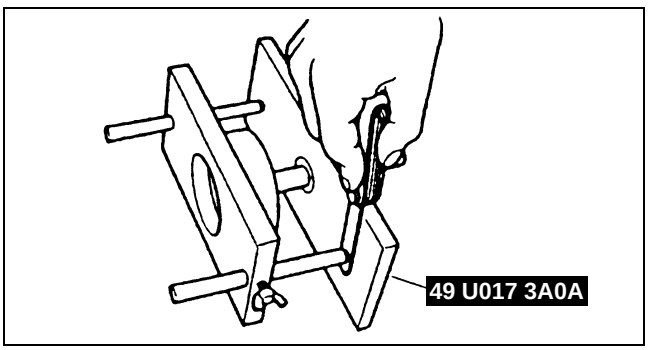
1. Measure the bearing height and the bearing bore depth for the output shaft using the **SST**.
2. Put the two pieces of the gauge set together and measure the clearance.



BCF5818A020

3. Select the proper adjustment shim to adjust the clearance.

Clearance
0.1—0.3 mm {0.004—0.011 in}



BCF5818A021

Adjustment shim thickness

(mm {in})

0.5 {0.020}	0.6 {0.024}	0.7 {0.028}	0.8 {0.031}
0.9 {0.035}	1.0 {0.039}	1.1 {0.043}	1.2 {0.047}
1.3 {0.051}	1.4 {0.055}	1.5 {0.059}	1.6 {0.063}
1.7 {0.067}	—	—	—

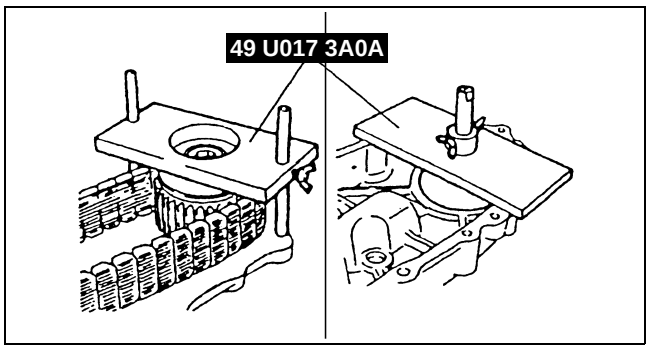
4. Select the proper adjustment shim for the front drive sprocket bearing in same way as for the output shaft side.

Clearance
0—0.1 mm {0—0.0039 in}

Adjustment shim thickness

(mm {in})

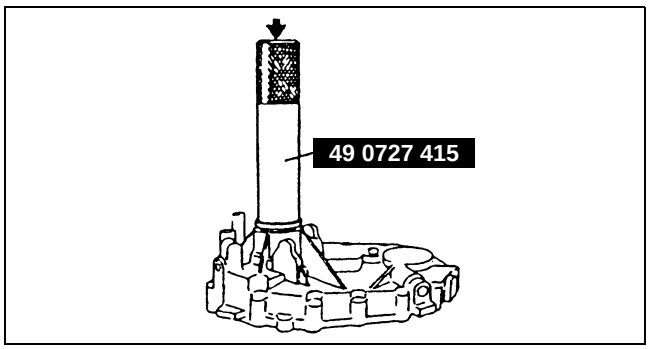
0.5 {0.020}	0.6 {0.024}	0.7 {0.028}	0.8 {0.031}
0.9 {0.035}	1.0 {0.039}	1.1 {0.043}	1.2 {0.047}



BCF5818A022

Oil seal (Chain Cover) Assembly Note

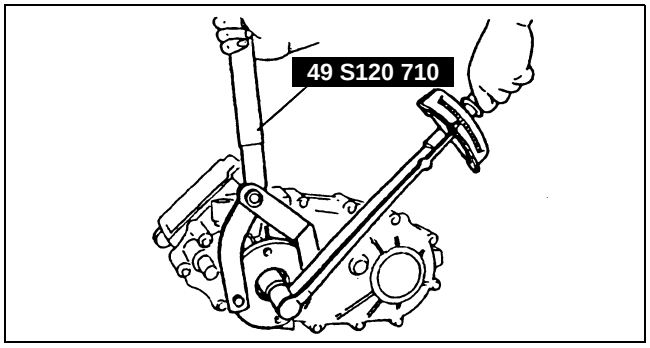
1. Apply oil to the lip of a new oil seal and install the oil seal in the chain cover case using the **SST**.



BCF5818A023

Locknut Assembly Note

1. Apply silicone sealant to the companion flange spline.
2. Use a new locknut and tighten the flange. Hold the companion flange using the **SST**.



BCF5818A024

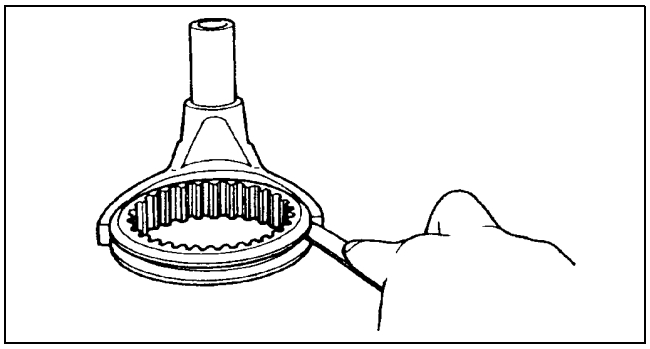
TRANSFER INSPECTION

CBG581827500A06

Hub Sleeve and Shift Fork Inspection

1. Measure the clearance between the hub sleeve and shift fork.
   - If it exceeds the maximum specification, replace the shift fork and hub sleeve.

Clearance
Standard:
0.38—0.52 mm {0.015—0.020 in}
Maximum:
0.8 mm {0.031 in}



BCF5618A018

TECHNICAL DATA

TECHNICAL DATA TD-2
TECHNICAL DATA TD-2

TECHNICAL DATA

TECHNICAL DATA

CBG931000000A01

AUTOMATIC TRANSMISSION

Item			Transmission type
			RA4AX-EL
Oil pump	Seal ring and groove clearance	(mm {in})	0.10—0.25 {0.0039—0.0098}
	Cam ring clearance	(mm {in})	Minimum: 0.030 {0.0012}
	Rotor, vane, control piston clearance	(mm {in})	Minimum: 0.050 {0.0020}
Reverse clutch	Number of drive/driven plates		2/2
	Drive plate thickness	(mm {in})	Minimum: 1.8 {0.071}
	Clutch clearance	(mm {in})	0.50—1.20 {0.020—0.047}
	Retaining plate size	(mm {in})	4.6 {0.181}, 4.8 {0.189}, 5.0 {0.197}, 5.2 {0.205}, 5.4 {0.213}, 5.6 {0.220}, 5.8 {0.228}
High clutch	Number of drive/driven plates		5/5
	Drive plate thickness	(mm {in})	Minimum: 1.4 {0.055}
	Clutch clearance	(mm {in})	1.8—3.0 {0.071—0.118}
	Retaining plate size	(mm {in})	3.4 {0.134}, 3.6 {0.142},3.8 {0.150}, 4.0 {0.157}, 4.2 {0.165}, 4.4 {0.173}, 4.6 {0.181}, 4.8 {0.189}
Overrunning clutch	Number of drive/driven plates		3/5
	Drive plate thickness	(mm {in})	Minimum: 1.8 {0.071}
	Clutch clearance	(mm {in})	1.0—2.0 {0.039—0.079}
	Retaining plate size	(mm {in})	4.0 {0.157}, 4.2 {0.165}, 4.4 {0.173}, 4.6 {0.181}, 4.8 {0.189}, 5.0 {0.197}, 5.2 {0.205}
Forward clutch	Number of drive/driven plates		6/6
	Drive plate thickness	(mm {in})	Minimum: 1.8 {0.071}
	Clutch clearance	(mm {in})	0.45—2.05 {0.018—0.081}
	Retaining plate size	(mm {in})	8.1 {0.319}, 8.3 {0.327}, 8.5 {0.335}, 8.7 {0.343}, 8.9 {0.350}, 9.1 {0.358}
Low and reverse brake	Number of drive/driven plates		6/6
	Drive plate thickness	(mm {in})	Minimum: 1.8 {0.071}
	Clutch clearance	(mm {in})	0.7—2.3 {0.028—0.091}
	Retaining plate size	(mm {in})	6.4 {0.252}, 6.6 {0.260}, 6.8 {0.268}, 7.0 {0.276}, 7.2 {0.283}, 7.4 {0.291}, 7.6 {0.299}, 7.8 {0.307}
Low one-way clutch inner race	Seal ring and groove clearance	(mm {in})	0.10—0.25 {0.0039—0.0098}
End play	Total end play	(mm {in})	0.25—0.55 {0.010—0.022}
	Bearing race size	(mm {in})	0.8 {0.031}, 1.0 {0.039}, 1.2 {0.047}, 1.4 {0.055}, 1.6 {0.063}, 1.8 {0.071}, 2.0 {0.079}
	Reverse clutch end play	(mm {in})	0.55—0.90 {0.022—0.035}
	Bearing race size	(mm {in})	0.7 {0.028}, 0.9 {0.035}, 1.1 {0.043}, 1.3 {0.051}, 1.5 {0.059}, 1.7 {0.067}, 1.9 {0.075}
Distance between end of torque converter and face of converter housing		(mm {in})	29.5 {1.161}

Spring		Item			
		Outer diameter (mm {in})	Free length (mm {in})	No. of coils	Wire diameter (mm {in})
Reverse clutch return spring		11.6 {0.457}	19.7 {0.776}	4.0	1.3 {0.051}
High clutch return spring		11.6 {0.457}	24.2 {0.953}	5.15	1.4 {0.055}
Band servo return spring	Return A	40.3 {1.587}	53.8 {2.118}	3.0	2.3 {0.091}
	Return B	34.3 {1.350}	45.6 {1.795}	3.0	2.3 {0.091}
	Return C	27.6 {1.087}	29.0 {1.142}	3.2	2.6 {0.102}
Forward clutch return spring		9.7 {0.382}	35.8 {1.409}	10.3	1.3 {0.051}
Low and reverse brake return spring		11.2 {0.441}	22.3 {0.878}	4.76	1.14 {0.045}

TRANSFER

Item				Specification
Transfer oil	Type			A.P.I. Service GL-4 or GL-5
	Viscosity	All-season		SAE 75W-90
		Above 10 °C {50 °F}		SAE 80W-90
	Capacity (Approx. quantity) (L {US qt, Imp qt})			2.0 {2.1, 1.8}
Hub sleeve and shift fork	Clearance between hub sleeve and shift fork (mm {in})		Standard	0.38—0.52 {0.015—0.020}
			Wear limit	0.8 {0.031}

SPECIAL TOOLS

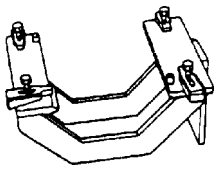
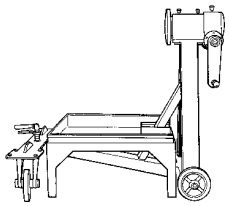
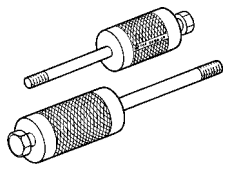
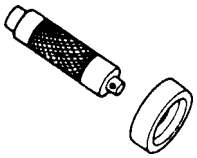
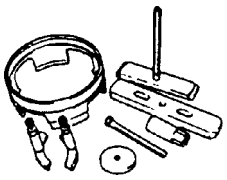
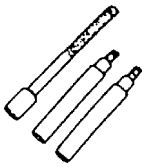
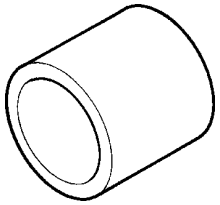
SPECIAL TOOLS ST-2
SPECIAL TOOLS ST-3

SPECIAL TOOLS

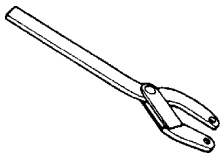
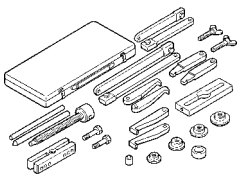
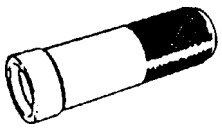
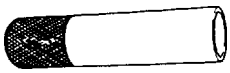
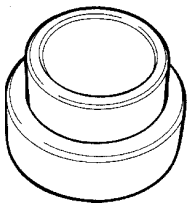
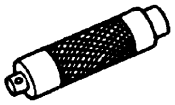
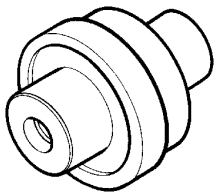
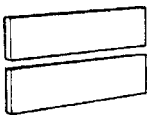
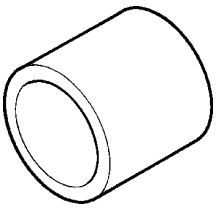
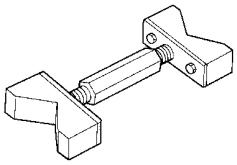
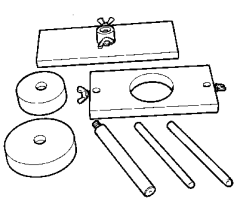
SPECIAL TOOLS

CBG941000000A01

AUTOMATIC TRANSMISSION

49 U019 0A0A Transmission hanger set 	49 0107 680A Engine stand 	49 0378 390 Oil pump puller 
49 G030 795 Oil seal installer 	49 G019 0A7A Return spring compressor set 	49 L019 001 Bolts 
49 U027 003 Oil seal installer 	—	—

TRANSFER

49 S120 710 Coupling flange holder 	49 0839 425C Bearing puller set 	49 F401 331 Body 
49 0727 415 Bearing installer 	49 F401 336B Attachment B 	49 G030 797 Handle 
49 G026 102 Bearing replacer 	49 0259 749 Plate 	49 U027 003 Oil seal installer 
49 S231 395A Chain expansion tool 	49 U017 3A0A Shim select gauge set 	—