Mazda6 Workshop Manual Supplement

FOREWORD

This manual contains on-vehicle service and diagnosis for the Mazda6.

For proper repair and maintenance, a thorough familiarization with this manual is important, and it should always be kept in a handy place for quick and easy reference.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing.
As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers. This manual should be kept up-to-date.

Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

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Mazda Motor Corporation
HIROSHIMA, JAPAN

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

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There are explanation given only for the sections marked with shadow (▬).

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VEHICLE IDENTIFICATION NUMBERS (VIN)

U.K. specs.

JMZ	GG12R20#	100001—
JMZ	GG12T20#	100001—
JMZ	GG14R20#	100001—
JMZ	GG14T20#	100001—
JMZ	GY19320#	100001—
JMZ	GY19820#	100001—
JMZ	GY19F20#	100001—
JMZ	GY19F50#	100001—
JMZ	GY19R20#	100001—
JMZ	GY19T20#	100001—
JMZ	GY89370#	100001—

European (L.H.D.) specs.

JMZ	GG12R2*#	100001—
JMZ	GG12T2*#	100001—
JMZ	GG14R2*#	100001—
JMZ	GG14T2*#	100001—
JMZ	GY1932*#	100001—
JMZ	GY1982*#	100001—
JMZ	GY19F2*#	100001—
JMZ	GY19F5*#	100001—
JMZ	GY19R2*#	100001—
JMZ	GY19T2*#	100001—
JMZ	GY8937*#	100001—

GCC specs.

JM7	GG32F**#	100001—
JM7	GG42F**#	100001—
JM7	GG34F**#	100001—
JM7	GG44F**#	100001—
JM7	GY49F**#	100001—
JM7	GY39F**#	100001—
JM7	GY49F*0#	100001—
JM7	GY39F*0#	100001—

RELATED MATERIALS

Mazda6 Training Manual
(European (L.H.D. U.K.), GCC specs.) 3359–1*–02C
Mazda6 Workshop Manual
(European (L.H.D. U.K.), GCC specs.) 1730–1*–02C
Engine Workshop Manual L8, LF, L3 . . . . . 1731–1*–02C
Engine Workshop Manual MZR–CD (RF Turbo) 1744–1E–02D
Manual Transaxle Workshop Manual G35M–R 1732–1*–02C
Manual Transaxle Workshop Manual A65M–R 1739–1E–02D
Automatic Transaxle Workshop Manual FN4A–EL . . . 1623–10–98E
Automatic Transaxle Workshop Manual
Supplement FN4A–EL 1746–1*–02C
Automatic Transaxle Workshop Manual JA5A–EL . . . 1738–1E–02D
Automatic Transaxle Workshop Manual
Supplement JA5AX–EL 1765–1*–02H
Mazda6 Wiring Diagram
(European (L.H.D.), GCC specs.) 5558–1*–02G
Mazda6 Wiring Diagram
(U.K. specs.) 5559–1*–02G
Mazda6 Bodyshop Manual
(European (L.H.D. U.K.), GCC specs.) 3360–1*–02C
Mazda6 Bodyshop Manual Supplement
(European (L.H.D. U.K.), GCC specs.) 3368–1*–02I
EOBD Training Manual
(European (L.H.D. U.K.), Australian specs.) 3345–1*–00B

*** : Indicates the printing location**
E: Europe
0: Japan

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.

GENERAL INFORMATION

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HOW TO USE THIS MANUAL

RANGE OF TOPICS

A6E201000001206

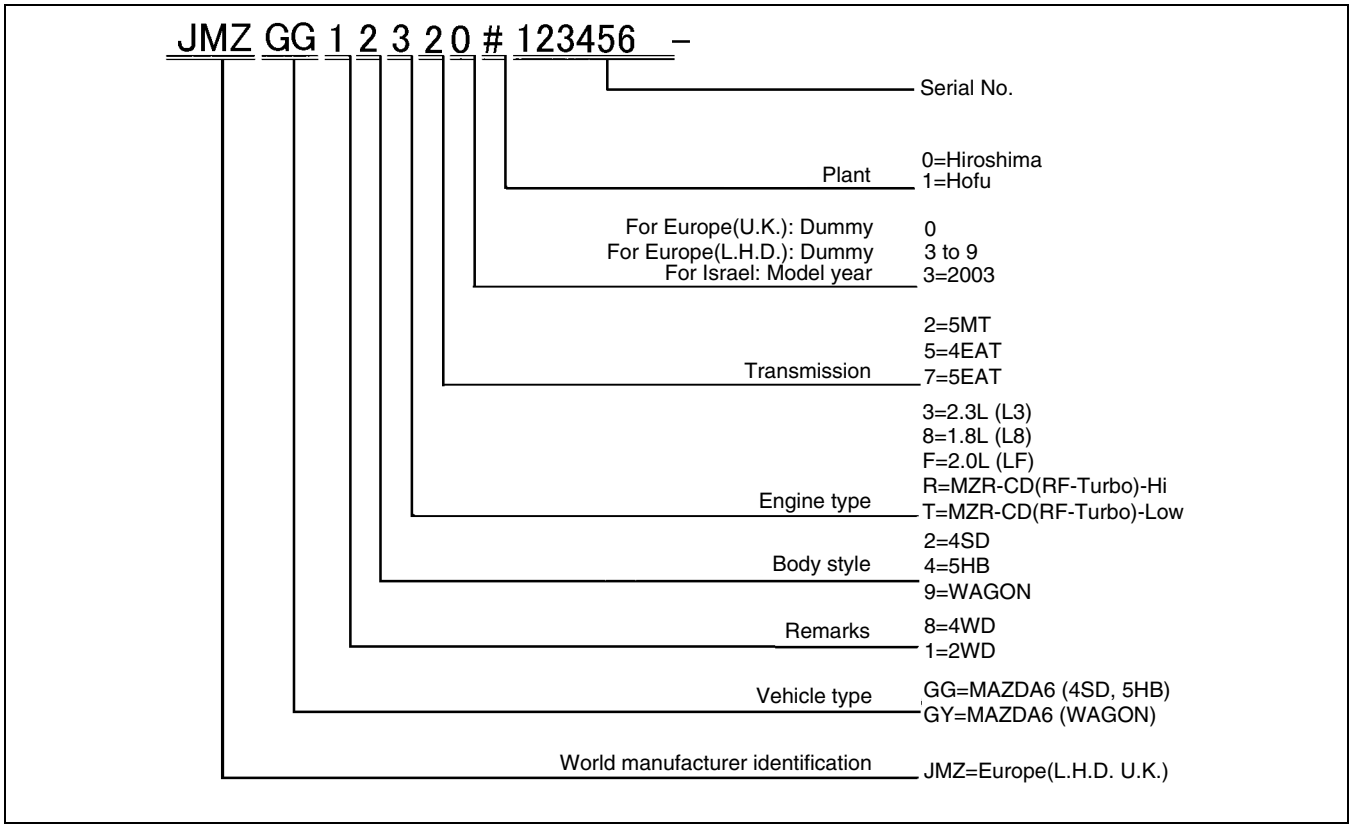
- This manual indicates only changes/additions, as it is supplemental to the related materials. Therefore it may not contain the necessary reference service procedures to perform the service indicated in this manual.

VIN CODE

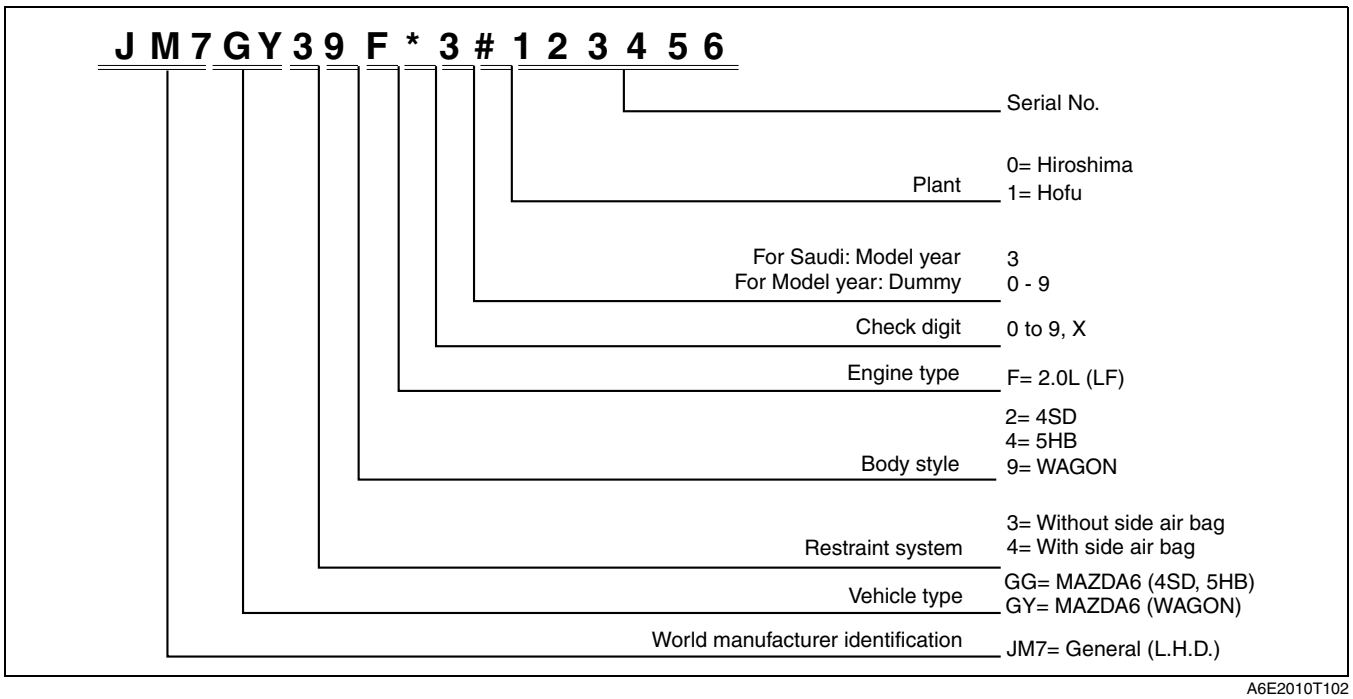
VIN CODE

A6E200800021201

European (L.H.D. U.K.) specs.GCC specs.



A6E2021T101



A6E2010T102

FUNDAMENTAL PROCEDURES

DYNAMOMETER

A6E201400004217

4WD testing/servicing

- Brake tester

Caution
- **To ensure the stability of the drag force of the viscous coupling always perform a brake test after using the dynamometer or speed meter tester.**

Note
- If there is a great amount of brake drag, it is probably due to the viscosity of the viscous coupling or the center differential (RBC). To remove the influence of the coupling, jack up all four wheels of the vehicle and verify that each wheel can be rotated freely by hand.

- Chassis dynamometer/speed meter tester

Caution
- **The vehicle may sway or surge forward when on the dynamometer. To prevent possible vehicle movement, firmly secure it in place using steel retainers (chain, wire or similar) attached to the front and rear towing hooks or to the tie down hooks.**
- **Do not pop the clutch.**
- **Do not accelerate suddenly.**

Note
- The dynamometer/speed meter tester has two setting modes: propeller shaft removed mode and free roller mode. After placing the vehicle on the tester and setting the wheels on the free rollers, start the engine. For MTX vehicles, set the shift lever into second gear and gently, at low idle speed, release the clutch pedal. For ATX vehicles, set the selector lever to D range, and slowly accelerate.

NEW STANDARDS

NEW STANDARDS TABLE

A6E202800020201

- 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 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 TABLE

A6E203000011202

A/C	Air conditioner
ABS	Antilock brake system
ACC	Accessories
ABDC	After bottom dead center
ATDC	After top dead center
ATF	Automatic transaxle fluid
ATX	Automatic transaxle
BBDC	Before bottom dead center
BDC	Bottom dead center
BTDC	Before top dead center
CAN	Controller area network
CM	Control module
DEI	Double electronic ignition
DOHC	Double overhead camshaft
DSC	Dynamic stability control
ESA	Electronic spark advance
EX	Exhaust
HI	High
HU	Hydraulic unit
IDM	Injector driver module
IG	Ignition
IN	Intake
KOEO	Key on engine off
KOER	Key off engine running
LH	Left hand
L.H.D.	Left hand drive
LO	Low
LR	Left rear
M	Motor
MAX	Maximum
MTX	Manual transaxle
MIN	Minimum
O/D	Overdrive
OCV	Oil control valve
OFF	Switch off
ON	Switch on
P/S	Power steering
PATS	Passive anti-theft system
PCV	Positive crankcase ventilation
PID	Parameter identification
RF	Right front
RH	Right hand
R.H.D.	Right hand drive
RR	Right rear
SST	Special service tool
SW	Switch
TCC	Torque converter clutch
TCM	Transaxle control module
TDC	Top dead center
TFT	Transaxle fluid temperature
TNS	Tail number side lights
TR	Transaxle range
TWC	Three way catalytic converter
VAD	Variable air duct
VBC	Variable boost control
VIS	Variable intake-air system
VSC	Variable swirl control
VSS	Vehicle speedometer sensor
VTCS	Variable tumble control system
WGN	Wagon
WDS	Worldwide diagnostic system
1GR	1st gear
2GR	2nd gear
4GR	4th gear
5GR	5th gear
4SD	4 door sedan
5HB	5 door hatchback
4WD	4 wheel drive

SCHEDULED MAINTENANCE

SCHEDULED MAINTENANCE TABLE

A6E203400013202

For Europe (L.H.D. U.K.)

Chart symbols:

I : Inspect and clean, repair, adjust, or replace if necessary.
R : Replace
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 Mazda 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: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter every 10,000 km (6,250 miles) or shorter.
  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 only.

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

*3: 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.

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

*5: Replacement of the timing belt is required at every 100,000 km (62,500 miles). Failure to replace the timing belt may result in damage to the engine.

*6: Replacement of the timing belt is required at every 120,000 km (75,000 miles). Failure to replace the timing belt may result in damage to the engine.

*7: If the vehicle is operated under any of the following conditions, change the rear differential oil every 40,000 km (25,000 miles).
  a. Towing a trailer or using a car - top carrier
  b. Driving in dusty, sandy or wet condition
  c. Extended periods of idling or low speed operation
  d. Repeated short trips of less than 16 km (10 miles)

*8: If this component has been submerged in water, the oil should be changed.

Maintenance Item		Maintenance Interval (Number of months or km (miles), whichever comes first)								
	Months	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**
	×1000 km	**20**	**40**	**60**	**80**	**100**	**120**	**140**	**160**	**180**
	×1000 miles	**12.5**	**25**	**37.5**	**50**	**62.5**	**75**	**87.5**	**100**	**112.5**
GASOLINE ENGINE										
Spark plugs		Replace every 100,000 km (62,500 miles)								
Air cleaner element *4				R			R			R
E.G.R. system					I				I	
DIESEL ENGINE										
Engine valve clearance		I					I			
Engine timing belt	Finland, Sweden, Norway*5	Replace every 100,000 km (62,500 miles)								
	Others*6	Replace every 120,000 km (75,000 miles)								
Fuel filter				R			R			R
Fuel injection system		I		I			I			I
Air cleaner element *4		C	C	R	C	C	R	C	C	R
E.G.R. system				I			I			I
GASOLINE and DIESEL ENGINE										
Engine oil *1		R	R	R	R	R	R	R	R	R
Engine oil filter *1		R	R	R	R	R	R	R	R	R
Drive belts *2				I			I			I
Cooling system (including coolant level adjustment)			I		I		I		I	

Maintenance Item	Maintenance Interval (Number of months or km (miles), whichever comes first)								
	Months	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**
	×1000 km	**20**	**40**	**60**	**80**	**100**	**120**	**140**	**160**	**180**
	×1000 miles	**12.5**	**25**	**37.5**	**50**	**62.5**	**75**	**87.5**	**100**	**112.5**
Engine coolant		Replace at first 4 years or 100,000 km (62,500 miles); after that, every 2 years								
Fuel lines & hoses			I		I		I		I	
Battery electrolyte level & specific gravity		I	I	I	I	I	I	I	I	I
Brake fluid	*3		R		R		R		R	
Brake lines, hoses & connections		I	I	I	I	I	I	I	I	I
Parking brake		I	I	I	I	I	I	I	I	I
Power brake unit & hoses		I	I	I	I	I	I	I	I	I
Disc brakes		I	I	I	I	I	I	I	I	I
Power steering fluid, lines, hoses, and connections		I	I	I	I	I	I	I	I	I
Steering operation & linkages			I		I		I		I	
Manual transaxle oil						R				
Automatic transaxle fluid level				I			I			I
Rear differential oil (for 4WD)		*7*8								
Transfer oil (for 4WD)		*8								
Front & rear suspension & ball joints			I		I		I		I	
Driveshaft dust boots			I		I		I		I	
Exhaust system & heat shields			I		I		I		I	
Cabin air filter (if installed) (aldehyde filter)		R	R	R	R	R	R	R	R	R
Cabin air filter (if installed)(pollen filter)			R		R		R		R	
Body condition (for rust, corrosion & perforation)		Inspect annually								
Bolts & nuts on seats			I		I		I		I	

For Israel

Chart symbols:

I : Inspect and clean, repair, adjust, or replace if necessary.
R : Replace
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 Mazda 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: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter every 10,000 km (6,000 miles) or shorter.
  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 only.

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

*3: 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.

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

*5: This is a full function check of electrical systems such as lights, wiper and washer systems (including wiper blades), and power windows.

Maintenance Item	Maintenance Interval (Number of months or km (miles), whichever 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													
Drive belts	*2	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil	*1	R	R	R	R	R	R	R	R	R	R	R	R
Engine oil filter	*1	R	R	R	R	R	R	R	R	R	R	R	R
COOLING SYSTEM													
Cooling system (Including coolant level adjustment)			I		I		I		I		I		I
Engine coolant		Replace at first 4 years or 90,000 km (54,000 miles); after that, every 2 years											
FUEL SYSTEM													
Air cleaner element	*4	C	C	C	R	C	C	C	R	C	C	C	R
Fuel filter						R					R		
Fuel lines & hoses			I		I		I		I		I		I
IGNITION SYSTEM													
Spark plugs		Replace every 90,000 km (54,000 miles)											
EMISSION CONTROL SYSTEM													
Evaporative system					I				I				I
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
All electrical system	*5	I	I	I	I	I	I	I	I	I	I	I	I
CHASSIS & BODY													
Brake & clutch pedals		I	I	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses & connections		I	I	I	I	I	I	I	I	I	I	I	I
Brake fluid	*3	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
Power steering fluid, lines, hoses, and connections		I	I	I	I	I	I	I	I	I	I	I	I

Maintenance Item	Maintenance Interval (Number of months or km (miles), whichever 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
Steering operation & linkages			I		I		I		I		I		I
Manual transaxle oil							R						R
Automatic transaxle fluid level			I		I		I		I		I		I
Front & rear suspension & ball joints				I		I		I		I		I	
Driveshaft dust boots				I		I		I		I		I	
Exhaust system & heat shields			I		I		I		I		I		I
Bolts & nuts on seats			I		I		I		I		I		I
Body condition (for rust, corrosion & perforation)	Inspect annually												
Cabin air filter (if installed)	R	R	R	R	R	R	R	R	R	R	R	R	R

For GCC
Chart symbols:

I : Inspect and clean, repair, adjust, or replace if necessary.
R : Replace
T : Tighten
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 Mazda 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: 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 only.

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

*3: 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.

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

*5: This is a full function check of electrical systems such as lights, wiper and washer systems (including wiper blades), and power windows.

*6: If the vehicle is operated under any of the following conditions, change the rear differential oil every 45,000 km (27,000 miles).
  a. Towing a trailer or using a car - top carrier
  b. Driving in dusty, sandy or wet condition
  c. Extended periods of idling or low speed operation
  d. Repeated short trips of less than 16 km (10 miles)

*7: If this component has been submerged in water, the oil should be changed.

Maintenance Item	Maintenance Interval (Number of months or km (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	6.25	12.5	18.75	25	31.25	37.5	43.75	50	56.25	62.5	68.75	75	81.25	87.5	93.75	100
ENGINE																	
Engine valve clearance (leaded fuel)					I				I				I				I
Drive belts	*2	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil	*1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Engine oil filter	*1	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	Replace every 2 years																

Maintenance Item	Maintenance Interval (Number of months or km (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	6.25	12.5	18.75	25	31.25	37.5	43.75	50	56.25	62.5	68.75	75	81.25	87.5	93.75	100
FUEL SYSTEM																	
Air cleaner element *4			C		C		R		C		C		R		C		C
Fuel filter					R				R				R				R
Fuel lines & hoses			I		I		I		I		I		I		I		I
IGNITION SYSTEM																	
Spark plugs	Unleaded fuel	Replace every 100,000 km (62,500 miles)															
	Leaded fuel		I		I		I		I		I		I		I		I
EMISSION CONTROL SYSTEM																	
Idle mixture (leaded fuel)			I		I		I		I		I		I		I		I
E.G.R. system (if installed)			I		I		I		I		I		I		I		I
Evaporative system (if installed)			I		I		I		I		I		I		I		I
ELECTRICAL SYSTEM																	
Battery electrolyte level & specific gravity			I		I		I		I		I		I		I		I
All electrical system *5			I		I		I		I		I		I		I		I
CHASSIS & BODY																	
Brake lines, hoses & connections			I		I		I		I		I		I		I		I
Brake fluid *3		I	I	I	R	I	I	I	R	I	I	I	R	I	I	I	R
Brake and clutch pedals		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
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
Power steering fluid, lines, hoses, and connections		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Steering operation & linkages			I		I		I		I		I		I		I		I
Manual transaxle oil											R						
Automatic transaxle fluid level			I		I		I		I				I		I		I
Automatic transaxle fluid						R					R					R	
Rear differential oil (for 4WD)		*6 *7															
Transfer oil (for 4WD)		*7															
Front & rear suspension & ball joints					I				I				I				I
Driveshaft dust boots					I				I				I				I
Bolts & nuts on chassis and body			T		T		T		T		T		T		T		T
Exhaust system heat shields					I				I				I				I
Cabin air filter (if installed)			R		R		R		R		R		R		R		R
Body condition (for rust, corrosion & perforation)		Inspect annually															

For Europe (L.H.D. U.K.)

Applied VIN (assumed):
JMZ GG12820# 202316-, JMZ GG12F20# 202316-, JMZ GG12F50# 202316-, JMZ GG14320# 202316-, JMZ GG14820# 202316-, JMZ GG14F20# 202316-, JMZ GG14F50# 202316-, JMZ GG12350# 202316-, JMZ GG14350# 202316-, JMZ GG1232*# 202316-, JMZ GG1282*# 202316-, JMZ GG12F2*# 202316-, JMZ GG12F5*# 202316-, JMZ GG1432*# 202316-, JMZ GG1482*# 202316-, JMZ GG14F2*# 202316-, JMZ GG14F5*# 202316-, JMZ GY19320# 146118-, JMZ GY19820# 146118-, JMZ GY19F20# 146118-, JMZ GY19F50# 146118-, JMZ GY89370# 146118-, JMZ GY19350# 146118-, JMZ GY1932*# 146118-, JMZ GY1982*# 146118-, JMZ GY8937*# 146118-

Chart symbols:

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

Remarks:

- The ignition and fuel systems are highly important to the emission control system and to efficient engine operation. All inspections and adjustments must be made by an expert repairer, we recommend an Authorized Mazda Repairer.
- 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: If the vehicle is operated under any of the following conditions, change the engine oil and oil filter every 10,000 km (6,250 miles) or shorter.
  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 only.

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

*3: 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.

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

*5: Replacement of the timing belt is required at every 100,000 km (62,500 miles).
Failure to replace the timing belt may result in damage to the engine.

*6: Replacement of the timing belt is required at every 120,000 km (75,000 miles).
Failure to replace the timing belt may result in damage to the engine.

*7: If the vehicle is operated under any of the following conditions, change the rear differential oil every 45,000 km (27,000 miles).
  a. Towing a trailer or using a car - top carrier
  b. Driving in dusty, sandy or wet condition
  c. Extended periods of idling or low speed operation
  d. Repeated short trips of less than 16 km (10 miles)

*8: If this component has been submerged in water, the oil should be changed.

Maintenance Item		Maintenance Interval (Number of months or km (miles), whichever comes first)								
	Months	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**
	×1000 km	**20**	**40**	**60**	**80**	**100**	**120**	**140**	**160**	**180**
	×1000 miles	**12.5**	**25**	**37.5**	**50**	**62.5**	**75**	**87.5**	**100**	**112.5**
GASOLINE ENGINE										
Engine valve clearance		Audible inspect every 120,000 km (75,000 miles), if noisy, adjust								
Spark plugs		Replace every 100,000 km (62,500 miles)								
Air cleaner element *4				R			R			R
Evaporative system (if installed)				I			I			I
DIESEL ENGINE										
Engine valve clearance		I					I			
Engine timing belt	Finland, Sweden, Norway*5	Replace every 100,000 km (62,500 miles)								
	Others*6	Replace every 120,000 km (75,000 miles)								
Fuel filter				R			R			R
Fuel injection system		I		I			I			I
Air cleaner element *4		C	C	R	C	C	R	C	C	R
E.G.R. system				I			I			I
GASOLINE and DIESEL ENGINE										

Maintenance Item	Maintenance Interval (Number of months or km (miles), whichever comes first)								
	Months	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**
	×1000 km	**20**	**40**	**60**	**80**	**100**	**120**	**140**	**160**	**180**
	×1000 miles	**12.5**	**25**	**37.5**	**50**	**62.5**	**75**	**87.5**	**100**	**112.5**
Engine oil *1		R	R	R	R	R	R	R	R	R
Engine oil filter *1		R	R	R	R	R	R	R	R	R
Drive belts *2				I			I			I
Cooling system (including coolant level adjustment)			I		I		I		I	
Engine coolant		Replace at first 4 years or 100,000 km (62,500 miles); after that, every 2 years								
Fuel lines and hoses			I		I		I		I	
Battery electrolyte level and specific gravity		I	I	I	I	I	I	I	I	I
Brake fluid *3			R		R		R		R	
Brake lines, hoses and connections		I	I	I	I	I	I	I	I	I
Parking brake		I	I	I	I	I	I	I	I	I
Power brake unit and hoses		I	I	I	I	I	I	I	I	I
Disc brakes		I	I	I	I	I	I	I	I	I
Power steering fluid, lines, hoses, and connections		I	I	I	I	I	I	I	I	I
Steering operation and linkages			I		I		I		I	
Manual transaxle oil						R				
Automatic transaxle fluid level				I			I			I
Rear differential oil (for 4WD)		*7*8								
Transfer oil (for 4WD)		*8								
Front and rear suspension and ball joints			I		I		I		I	
Driveshaft dust boots			I		I		I		I	
Exhaust system and heat shields					I				I	
Cabin air filter (if installed) (pollen filter)			R		R		R		R	
Body condition (for rust, corrosion and perforation)		Inspect annually								
Tires (including spare tyre) (with inflation pressure adjustment)		I	I	I	I	I	I	I	I	I

For Israel

Applied VIN (assumed):
JMZ GG1235*# 202316-, JMZ GG1435*# 202316-, JMZ GY19F2*# 146118-, JMZ GY19F5*# 146118-

Chart symbols:

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

Remarks:

- The ignition and fuel systems are highly important to the emission control system and to efficient engine operation. All inspections and adjustments must be made by an Authorized Mazda 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 under any of the following conditions, change the engine oil and oil filter every 10,000 km (6,250 miles) or shorter.
  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 only.

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

*3: 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.

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

*5: This is a full function check of electrical systems such as lights, wiper and washer systems (including wiper blades), and power windows.

Maintenance Item	Maintenance Interval (Number of months or km (miles), whichever 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	Audible inspect every 120,000 km (75,000 miles), if noisy, adjust											
Drive belts *2	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil *1	R	R	R	R	R	R	R	R	R	R	R	R
Engine oil filter *1	R	R	R	R	R	R	R	R	R	R	R	R
COOLING SYSTEM												
Cooling system (Including coolant level adjustment)		I		I		I		I		I		I
Engine coolant	Replace at first 4 years or 90,000 km (54,000 miles); after that, every 2 years											
FUEL SYSTEM												
Air cleaner element *4	C	C	C	R	C	C	C	R	C	C	C	R
Fuel filter					R					R		
Fuel lines and hoses		I		I		I		I		I		I
IGNITION SYSTEM												
Spark plugs	Replace every 90,000 km (54,000 miles)											
EMISSION CONTROL SYSTEM												
Evaporative system				I				I				I
ELECTRICAL SYSTEM												
Battery electrolyte level and specific gravity	I	I	I	I	I	I	I	I	I	I	I	I
All electrical system *5	I	I	I	I	I	I	I	I	I	I	I	I
CHASSIS AND BODY												
Brake lines, hoses and connections	I	I	I	I	I	I	I	I	I	I	I	I
Brake fluid *3	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 and 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
Power steering fluid, lines, hoses, and connections	I	I	I	I	I	I	I	I	I	I	I	I
Steering operation and linkages		I		I		I		I		I		I
Manual transaxle oil						R						R
Automatic transaxle fluid level		I		I		I		I		I		I
Front and rear suspension and ball joints			I		I		I		I		I	
Driveshaft dust boots			I		I		I		I		I	
Exhaust system and heat shields	Inspect every 75,000 km (45,000 miles)											
Body condition (for rust, corrosion and perforation)	Inspect annually											
Cabin air filter (if installed)	R	R	R	R	R	R	R	R	R	R	R	R
Tyres (including spare tyre) (with inflation pressure adjustment)	I	I	I	I	I	I	I	I	I	I	I	I

For GCC

Applied VIN (assumed):
JM7 GG323#**# 128767-, JM7 GG423**#**# 128767-, JM7 GG343**#**# 128767-**
JM7 GG443#**# 128767-, JM7 GG32F**#**# 128767-, JM7 GG42F**#**# 128767-**
JM7 GG34F#**# 128767-, JM7 GG44F**#**# 128767-, JM7 GY49F**#**# 101432-**
JM7 GY39F#**# 101432-, JM7 GY49F*0# 101432-, JM7 GY39F*0# 101432-**

Chart symbols:

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

Remarks:

- The ignition and fuel systems are highly important to the emission control system and to efficient engine operation. All inspections and adjustments must be made by an Authorized Mazda 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 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 only.

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

*3: 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.

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

*5: This is a full function check of electrical systems such as lights, wiper and washer systems (including wiper blades), and power windows.

*6: If the vehicle is operated under any of the following conditions, change the rear differential oil every 45,000 km (27,000 miles).
  a. Towing a trailer or using a car - top carrier
  b. Driving in dusty, sandy or wet condition
  c. Extended periods of idling or low speed operation
  d. Repeated short trips of less than 16 km (10 miles)

*7: If this component has been submerged in water, the oil should be changed.

Maintenance Item		Maintenance Interval (Number of months or km (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	6.25	12.5	18.75	25	31.25	37.5	43.75	50	56.25	62.5	68.75	75	81.25	87.5	93.75	100
ENGINE																	
Engine valve clearance	Unleaded fuel	Audible inspect every 120,000 km (75,000 miles), if noisy, adjust															
	leaded fuel				I				I				I				I
Drive belts	*2	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Engine oil	*1	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Engine oil filter	*1	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		Replace every 2 years															
FUEL SYSTEM																	
Air cleaner element	*4		C		C		R		C		C		R		C		C
Fuel filter					R				R				R				R
Fuel lines and hoses			I		I		I		I		I		I		I		I
IGNITION SYSTEM																	
Spark plugs	Unleaded fuel	Replace every 100,000 km (62,500 miles)															
	Leaded fuel		I		I		I		I		I		I		I		I
EMISSION CONTROL SYSTEM																	
Idle mixture (leaded fuel)			I		I		I		I		I		I		I		I

Maintenance Item	Maintenance Interval (Number of months or km (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	6.25	12.5	18.75	25	31.25	37.5	43.75	50	56.25	62.5	68.75	75	81.25	87.5	93.75	100
Evaporative system (if installed)			I		I		I		I		I		I		I		I
ELECTRICAL SYSTEM																	
Battery electrolyte level and specific gravity			I		I		I		I		I		I		I		I
All electrical system *5			I		I		I		I		I		I		I		I
CHASSIS AND BODY																	
Brake lines, hoses and connections			I		I		I		I		I		I		I		I
Brake fluid *3		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
Power steering fluid, lines, hoses, and connections		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Steering operation and linkages			I		I		I		I		I		I		I		I
Manual transaxle oil											R						
Automatic transaxle fluid level			I		I		I		I		I		I		I		I
Rear differential oil (for 4WD)		*6*7															
Transfer oil (for 4WD)		*7															
Front and rear suspension and ball joints					I				I				I				I
Driveshaft dust boots					I				I				I				I
Bolts and nuts on chassis and body			T		T		T		T		T		T		T		T
Exhaust system and heat shields		Inspect every 80,000 km (50,000 miles)															
Cabin air filter (if installed)			R		R		R		R		R		R		R		R
Body condition (for rust, corrosion and perforation)		Inspect annually															
Tyres (including spare tyre) (with inflation pressure adjustment)			I		I		I		I		I		I		I		I

Scheduled Maintenance Service (Specific Work Required)

- The specific work required for each maintenance item is listed in the following table. (Please refer to the section applicable to the model serviced.)

For Europe (L.H.D. U.K.)

Bold frames: New item

Maintenance Item	Specific Work Required
ENGINE	
Engine valve clearance	Measure clearance
Drive belts	Inspect for wear, cracks and fraying, and check tension. Replace drive belt.
Engine timing belt	Replace engine timing belt.
Engine oil	Replace engine oil and inspect for leakage.
Oil filter	Replace oil filter and inspect for leakage.
COOLING SYSTEM	
Cooling system (including coolant level adjustment)	Check coolant level and quality, and inspect for leakage.
Engine coolant	Replace coolant.
FUEL SYSTEM	
Air cleaner element	Inspect for dirt, oil and damage. Clean air cleaner element (by blowing air). Replace air cleaner element.
Fuel filter	Replace fuel filter.
Fuel lines and hoses	Inspect for cracks, leakage and loose connection.
Fuel injection system (for MZR-CD (RF Turbo))	Update to injection amount correction with WDS. (see W/M)
IGNITION SYSTEM (FOR GASOLINE)	
Spark plugs	Inspect for wear, damage, carbon, high-tension lead condition and measure plug gap. Replace spark plugs.
EMISSION CONTROL SYSTEM	
Evaporative system (for gasoline)	Check system operation (see W/M), vapor lines, vacuum fitting hoses and connection.
E.G.R. system (MZR-CR (RF Turbo))	Check system operation (see W/M), vacuum fitting hoses and connection. Update to MAF correction for E.G.R control with WDS. (see W/M)
ELECTRICAL SYSTEM	
Battery electrolyte level and specific gravity	Check level and specific gravity.
CHASSIS AND BODY	
Brake fluid	Check fluid level and inspect for leakage. Replace brake fluid.
Brake lines, hoses and connections	Inspect for cracks, damage, chafing, corrosion, scars, swelling and fluid leakage.
Parking brake	Check lever stroke.
Power brake unit and hoses	Check vacuum lines, connections and check valve for improper attachment, air tightness, cracks chafing and deterioration.
Disc brakes	Test for judder and noise. Inspect caliper for correct operation and fluid leakage, brake pads for wear. Check disc plate condition and thickness.
Power steering fluid and lines	Check fluid level and lines for improper attachment, leakage, cracks, damage, loose connections, chafing and deterioration.
Power steering fluid	Check fluid level.
Power steering system and hoses	Check lines for improper attachment, leakage, cracks, damage, loose connections, chafing and deterioration.
Steering operation and gear housing	Check that the steering wheel has the specified play. Be sure to check for changes, such as excessive play, hard steering or strange noises. Check gear housing and boots for looseness, damage and grease/gear oil leakage.
Steering linkages tie rod ends and arms	Check ball joint, dust cover and other components for looseness, wear, damage and grease leakage.
Front and rear suspension and ball joints	Inspect for grease leakage, cracks, damage and looseness.
Manual transmission/transaxle oil	Check oil level and inspect for leakage. Replace manual transmission/transaxle oil.
Automatic transmission/transaxle fluid level	Check fluid level.

Maintenance Item	Specific Work Required
Rear differential oil	Check oil level and inspect for leakage. Replace rear differential oil.
Transfer oil (for 4×4)	Check oil level and inspect for leakage. Replace transfer oil.
Driveshaft dust boots	Inspect for grease leakage, cracks, damage and looseness.
Body condition (for rust, corrosion and perforation)	Inspect body surface for paint damage, rust, corrosion and perforation.
Exhaust system and heat shields	Inspect for damage, corrosion, looseness of connections and gas leakage.
Tires (including spare tire) (with inflation pressure adjustment)	Check air pressure and inspect tires for tread wear, damage and cracks; and wheels for damage and corrosion.
AIR CONDITIONER SYSTEM (IF EQUIPPED)	
Cabin air filter	Replace cabin air filter.

ENGINE [L8, LF, L3]

FEATURES

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OUTLINE OF CONSTRUCTION B1-2
FEATURES B1-2
ENGINE PERFORMANCE CURVE B1-2
SPECIFICATIONS B1-3

SERVICE

OUTLINE B1-4
SUPPLEMENTAL SERVICE INFORMATION ... B1-4
ENGINE B1-4
ENGINE REMOVAL/INSTALLATION (4WD) B1-4

OUTLINE

OUTLINE OF CONSTRUCTION

A6E220202000201

- The construction and operation of the new Mazda6 (GG, GY) L8, LF, and L3 engine is the same as that of the current Mazda6 (GG) L8, LF, and L3 engine models except for the following features. (See Mazda6 training Manual 3359-1*-02C.)

FEATURES

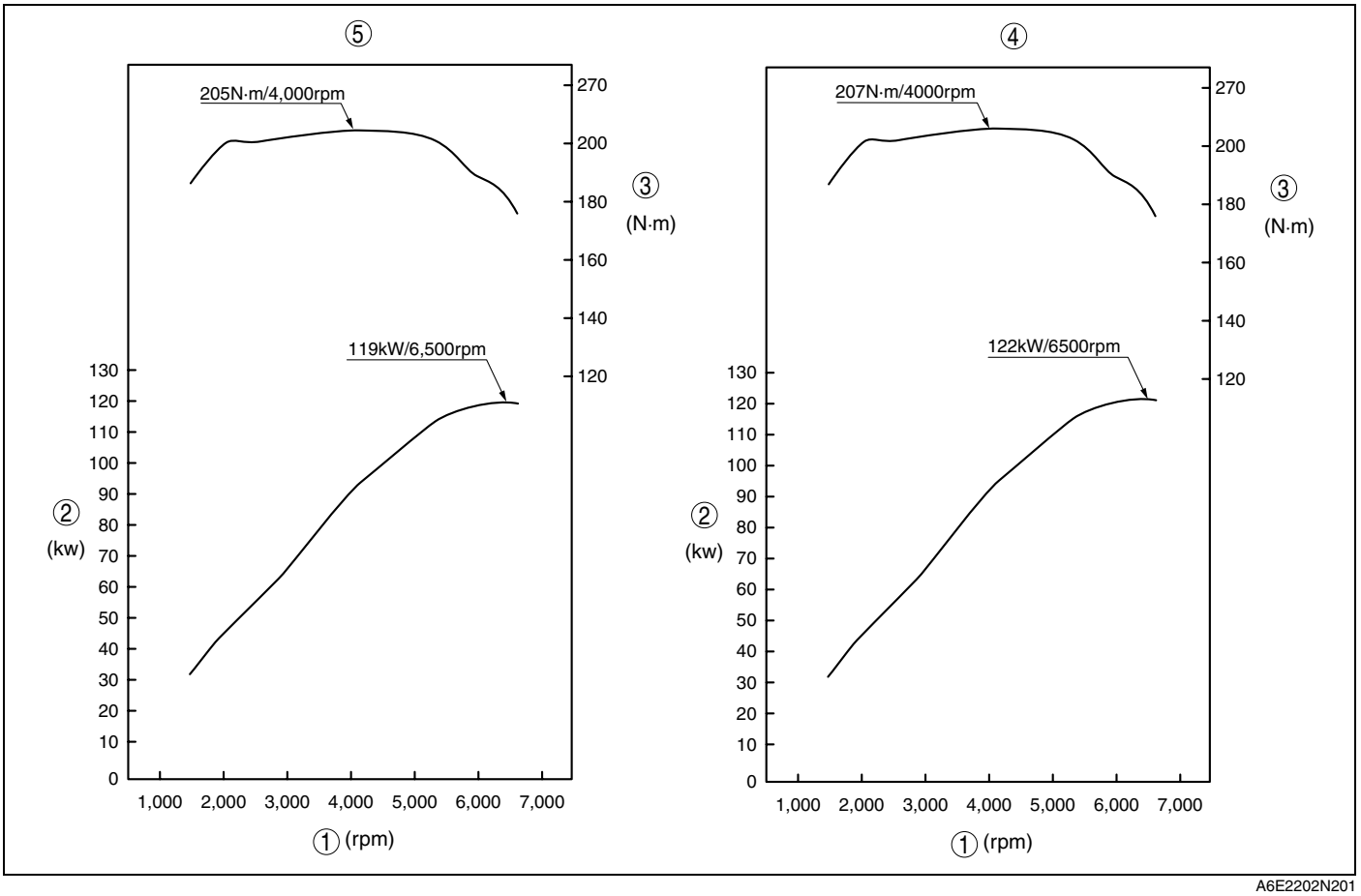
A6E220202000202

Modification to the engine performance

- Engine performance curve has been changed. (4WD model)

ENGINE PERFORMANCE CURVE

A6E220202000203



A6E2202N201

1	Engine speed
2	Output
3	Torque
4	Current 2WD model (L3)
5	New 4WD model (L3)

SPECIFICATIONS

A6E220202000204

Item			Specification					
			New Mazda6 (GG, GY)	Current Mazda6 (GG)	New Mazda6 (GG, GY)	Current Mazda6 (GG)	New Mazda6 (GG, GY)	Current Mazda6 (GG)
			L8		LF		L3	
Type			Gasoline, 4-cycle					
Cylinder arrangement and number			In-line, 4-cylinder					
Combustion chamber			Pentroof					
Valve system			DOHC, Timing chain driven, 16 valves					
Displacement (ml {cc, cu in})			1,798 {1,798, 109.7}		1,999 {1,999, 121.9}		2,261 {2,261, 137.9}	
Bore × stroke (mm {in})			83.0 × 83.1 {3.27 ×3.27}		87.5 × 83.1 {3.44 ×3.27}		87.5 × 94.0 {3.44 × 3.70}	
Compression ratio			10.8:1				10.6:1	
Compression pressure (kPa {kgf/cm^2, psi}) [rpm]			1,750 {17.85, 253.8} [300]		1,720 {17.54, 249.5} [300]		1,430 {14.58, 207.4} [290]	
Valve timing	IN	Open BTDC (°)	4				0—25	
		Close ABDC (°)	33		52		62—37	
	EX	Open BBDC (°)	37				42	
		Close ATDC (°)	4				5	
Valve clearance (mm {in}) [engine cold]		IN	0.22—0.28 {0.0087—0.0110} (0.25±0.03 {0.0098±0.0011})					
		EX	0.27—0.33 {0.0106 —0.0130} (0.30±0.03 {0.0118±0.0011})					

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E220202000205

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Engine

- Removal/Installation procedure for 4WD has been adopted.

ENGINE

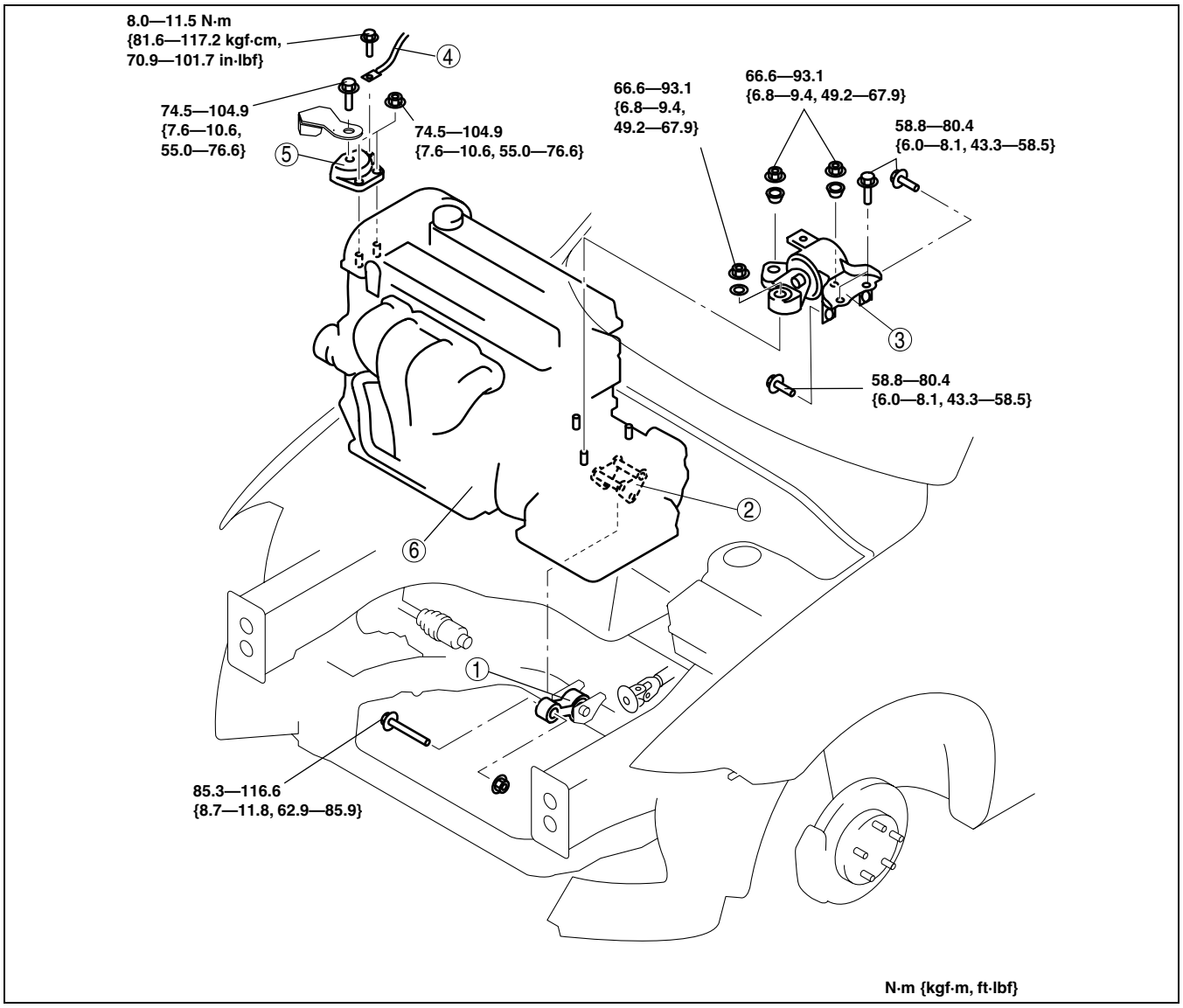
ENGINE REMOVAL/INSTALLATION (4WD)

A6E222401001201

Warning

- **Fuel vapor is hazardous. It can very 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 the "Fuel Line Safety Procedure".**

1. Remove the battery.
2. Remove the battery tray.
3. Remove the radiator.
4. Drain the transaxle oil.
5. Remove the P/S oil pump with the oil hose still connected. Position the P/S oil pump so that it is out of the way. Use wire or rope to secure.
6. Remove the A/C compressor with the pipes still connected. Position the A/C compressor so that it is out of the way. Use wire or rope to secure.
7. Remove the propeller shaft from the transfer.
8. Remove the joint shaft. (See M–31 JOINT SHAFT (4WD) DISASSEMBLY/ASSEMBLY.)
9. Remove the front drive shaft (LH) from the transaxle. (See M–39 FRONT DRIVE SHAFT (4WD) DISASSEMBLY/ASSEMBLY.)
10. Remove the air cleaner, intake air duct, accelerator cable and bracket, and vacuum hose.
11. Remove the ATF hose and selector cable.
12. Remove the vacuum hose and heater hose.
13. Disconnect the fuel hose. (See F1–27 Plastic Fuel Hose Removal Note.) (See F1–28 Plastic Fuel Hose Installation Note.)
14. Disconnect the wiring harness from the engine side.
15. Remove the three way catalyst (TWC). (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
16. Remove in the order indicated in the table.
17. Install in the reverse order of removal.
18. Start the engine and:
    - Inspect for the engine oil, engine coolant, transaxle oil and fuel leakage.
    - Verify the ignition timing, idle speed and idle mixture. (See F1–22 IDLE SPEED INSPECTION (4WD).)
19. Perform a road test.



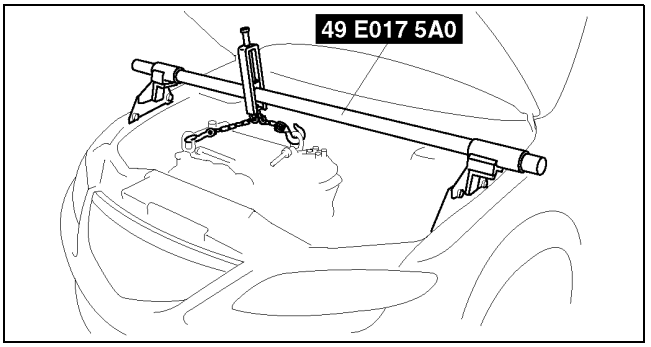
A6E2213W001

1	No.1 Engine mount rubber (See B1–6 No.1 Engine Mount Rubber Removal Note) (See B1–9 No.1 Engine Mount Rubber Installation Note)
2	No.1 Engine mount bracket (See B1–9 No.1 Engine Mount Bracket Installation Note)
3	No.4 Engine mount bracket and No.4 Engine mount rubber (See B1–6 No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Removal Note) (See B1–8 No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Installation Note)

4	Engine ground
5	No.3 Engine joint bracket (See B1–8 No.3 Engine Joint Bracket Installation Note)
6	Engine, transaxle

No.1 Engine Mount Rubber Removal Note

1. Suspend the engine using the **SST**.
2. Remove through-bolt A on the No.1 engine mount bracket side.

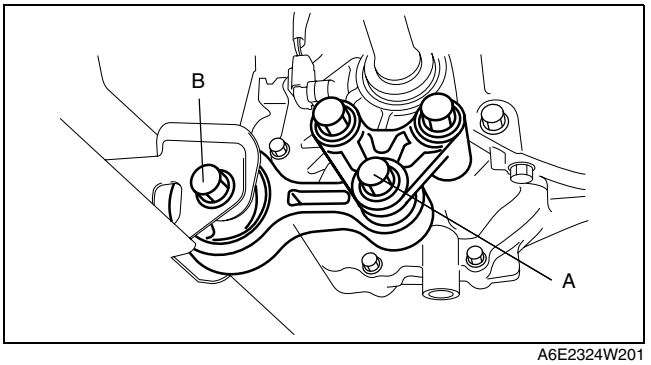


A6E2215W004

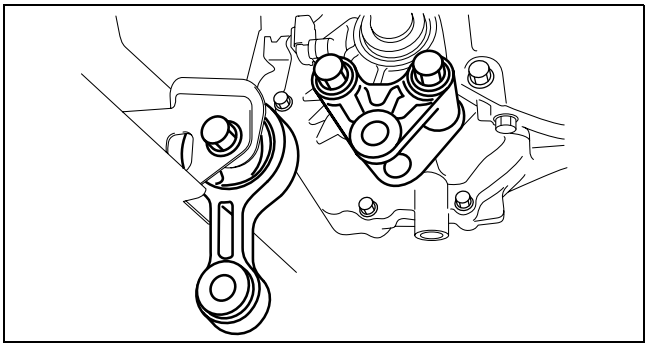
3. Loosen through-bolt B on the front crossmember side until approximately three pitches are showing.

Note

- Do not remove the No.1 engine mount rubber from the front crossmember.



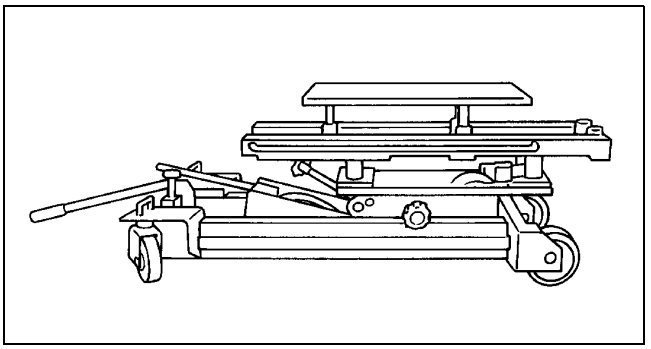
A6E2324W201



A6E2324W202

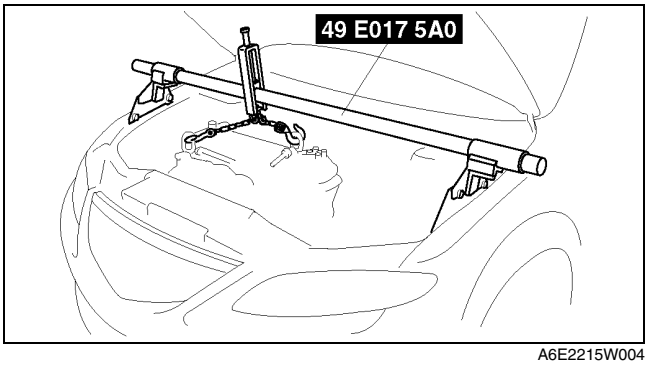
No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Removal Note

1. Secure the engine and the transaxle using an engine jack and attachment as shown.



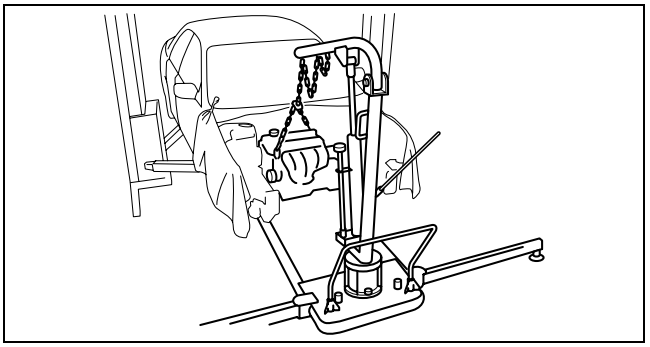
A6E2324W209

2. Remove the **SST**.



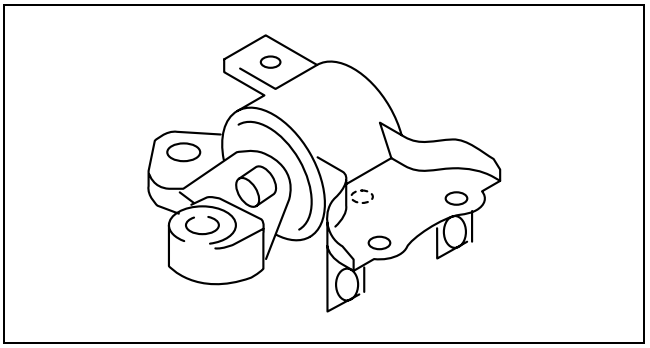
A6E2215W004

3. Secure the engine and the transaxle using a hoist.



A6E2324W203

4. Remove the No.4 engine mount bracket and engine mount rubber together as a unit.

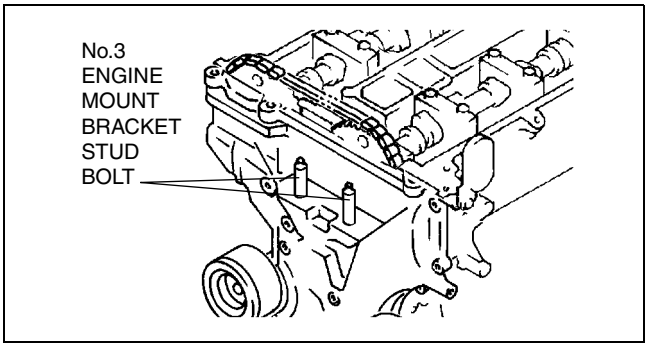


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No.3 Engine Joint Bracket Installation Note

1. Tighten the No.3 engine mount bracket stud bolt.

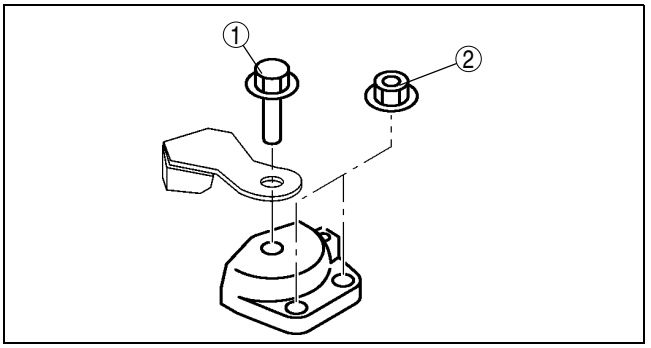
   Tightening torque
   7.0—13 N·m {71.4—132.5 kgf·cm, 62.0—115.0 in·lbf}



A6E2215W011

2. Tighten the No.3 engine joint bracket bolt and nut in the order as shown.

   Tightening torque
   74.5—104.9 N·m {7.6—10.6 kgf·m, 55.0—76.6 ft·lbf}

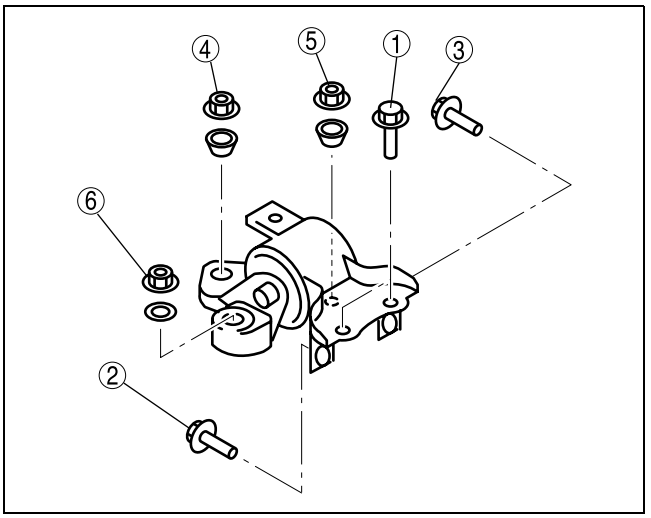


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No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Installation Note

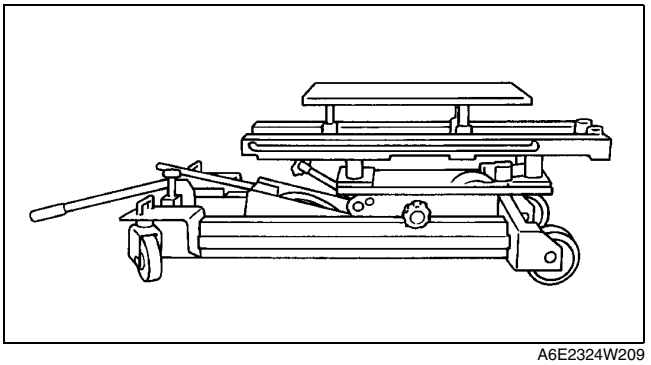
1. Tighten the No.4 engine mount bracket and No.4 engine mount rubber bolt and nut in the order as shown.

Bolt or nut No.	Tightening torque (N·m {kgf·m, ft·lbf})
1, 2, 3	**58.8—80.4 {6.0—8.1, 43.3—58.5}**
4, 5, 6	**66.6—93.1 {6.8—9.4, 49.2—67.9}**



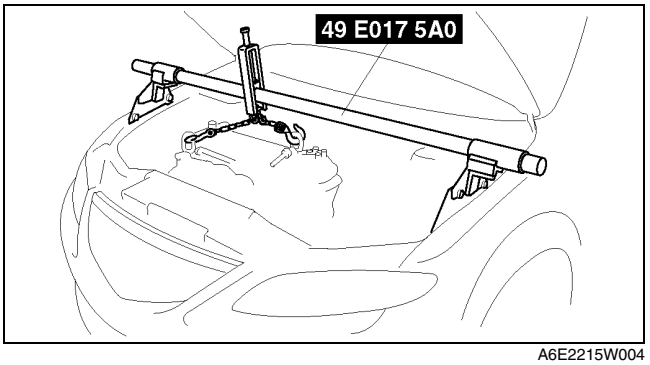
A6E2324W206

2. Secure the engine and the transaxle using an engine jack and attachment as shown.



A6E2324W209

3. Remove the hoist and secure the engine and transaxle using **SST**.



A6E2215W004

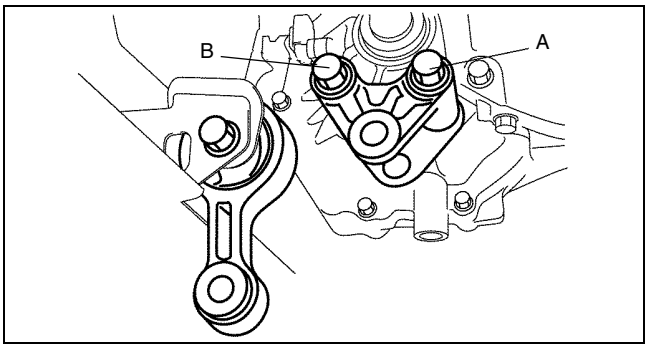
No.1 Engine Mount Bracket Installation Note

1. Tighten No.1 engine mount bracket bolt A.

   Tightening torque
   93.1—116.6 N·m {9.5—11.8 kgf·m, 68.7—85.9 ft·lbf}

2. Tighten No.1 engine mount bracket bolt B.

   Tightening torque
   93.1—116.6 N·m {9.5—11.8 kgf·m, 68.7—85.9 ft·lbf}



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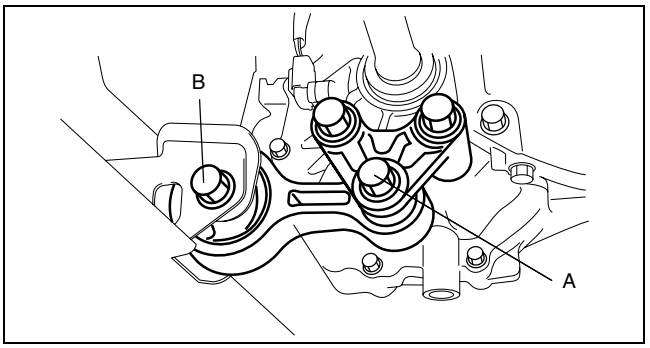
No.1 Engine Mount Rubber Installation Note

1. Tighten through-bolt A on the No.1 engine mount bracket.

   Tightening torque
   85.3—116.6 N·m {8.7—11.8 kgf·m, 62.9—85.9 ft·lbf}

2. Tighten through-bolt B on the front crossmember side.

   Tightening torque
   93.1—116.6 N·m {9.5—11.8 kgf·m, 68.7—85.9 ft·lbf}



A6E2324W201

ENGINE [MZR-CD (RF Turbo)]

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E230202000201

- MZR-CD (RF Turbo) engine is newly adopted as Mazda6 (GG, GY).
- The construction of MZR-CD (RF Turbo) engine and operation which were newly adopted for the Mazda6 (GG, GY) are the same as the current Mazda MPV(LW) MZR-CD (RF Turbo) engine model and current Mazda 323 (BJ) RF Turbo engine model except for the following components. (See Mazda MPV Workshop Manual Supplement 1737-1*-02C.), (See Mazda 323 Workshop Manual Supplement 1633-10-98G.)
  — Engine mount
- The construction and the operation of the engine mount for the new Mazda6 (GG, GY) MZR-CD (RF Turbo) engine model is the same as the current Mazda6 (GG). (See Mazda6 Training Manual 3359-1*-02C)

FEATURES

A6E230202000202

Improved engine performance

- Coated pistons have been adopted.

Reduced engine noise and vibration

- An aluminium alloy oil pan upper block has been adopted.
- An eight counter weight crankshaft has been adopted.
- A crankshaft pulley cover has been adopted.
- An engine cover with insulator has been adopted.
- A pendulum type engine mount has been adopted.

Improved serviceability

- A serpentine type drive belt has been adopted.
- An auto tensioner that automatically adjusts the drive belt tension has been adopted.

Improved design

- An engine cover has been adopted.

SPECIFICATIONS

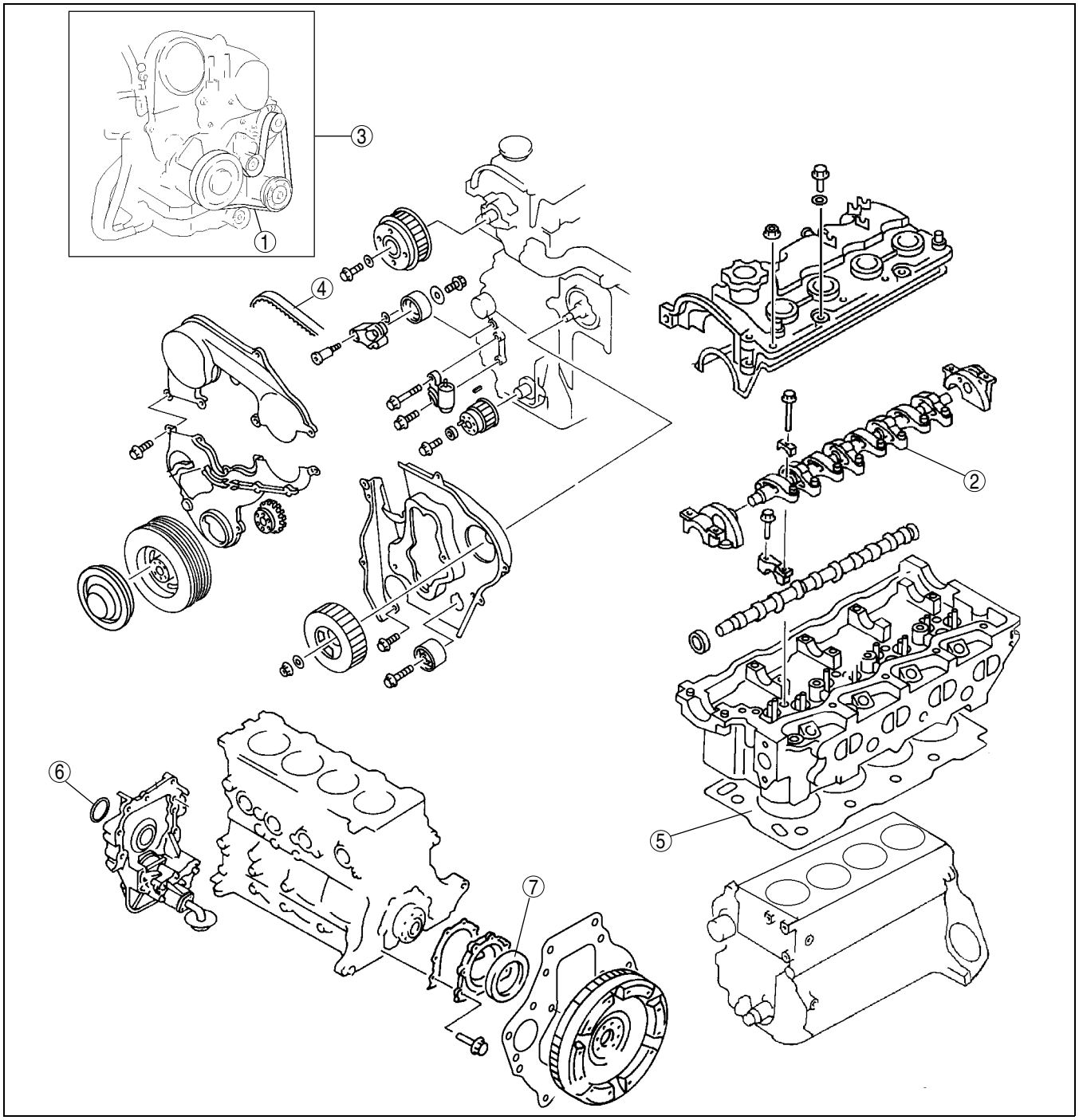
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Item			Specifications	
			New Mazda6 (GG, GY)	Current Mazda MPV (LW)
			MZR-CD (RF Turbo)	MZR-CD (RF Turbo)
Type			Diesel, 4-cycle	
Cylinder arrangement and number			In-line, 4-cylinder	
Combustion chamber			Direct injection	
Valve system			SOHC, belt-driven, 16-valve	
Displacement (ml {cc, cu in})			1,998 {1.998, 122.9}	
Bore × stroke (mm {in})			86.0 × 86.0 {3.39 × 3.39}	
Compression ratio			18.4	
Compression pressure (kPa {kgf/cm^2, psi} [rpm])			3,500 {35.7, 507.7} [250]	
Valve timing	IN	Open BTDC (°)	6	
		Close ABDC (°)	30	
	EX	Open BBDC (°)	41	
		Close ATDC (°)	8	
Valve clearance [engine cold]	IN (mm {in})		0.12 —0.18 {0.005—0.007} (0.15±0.03 {0.006±0.0011})	
	EX (mm {in})		0.32—0.38 {0.013—0.014} (0.35±0.03 {0.014±0.0011})	

LOCATION INDEX

LOCATION INDEX

A6E230001002201



A6E2500W100

1	Drive belt (See B2–4 DRIVE BELT INSPECTION) (See B2–4 DRIVE BELT REPLACEMENT) (See B2–4 DRIVE BELT AUTO TENSIONER INSPECTION)
2	Rocker arm (See B2–5 VALVE CLEARANCE INSPECTION) (See B2–6 VALVE CLEARANCE ADJUSTMENT)
3	Engine (See B2–8 COMPRESSION INSPECTION) (See B2–27 ENGINE REMOVAL/INSTALLATION) (See B2–32 ENGINE DISASSEMBLY/ASSEMBLY)

4	Timing Belt (See B2–9 TIMING BELT REMOVAL/INSTALLATION)
5	Cylinder head gasket (See B2–15 CYLINDER HEAD GASKET REPLACEMENT)
6	Front oil seal (See B2–24 FRONT OIL SEAL REPLACEMENT)
7	Rear oil seal (See B2–26 REAR OIL SEAL REPLACEMENT)

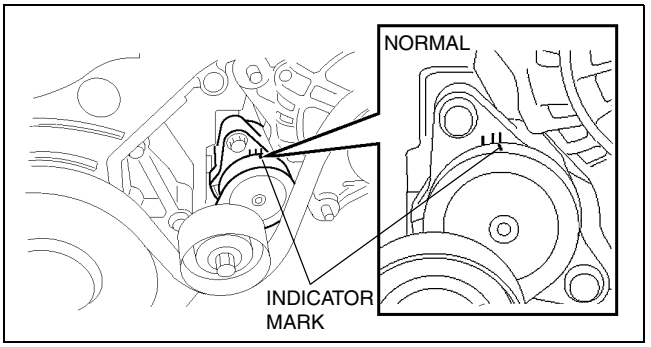
DRIVE BELT

DRIVE BELT INSPECTION

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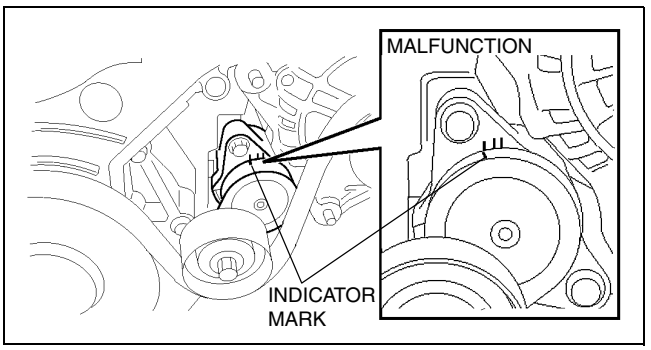
Note
- Drive belt deflection/tension inspection is not necessary because of the use of the drive belt auto tensioner.

1. Remove the washer tank.
2. Verify that the drive belt auto tensioner indicator mark does not exceeds the limit.
   - If it exceeds the limit, replace the drive belt. (See B2–4 DRIVE BELT REPLACEMENT.)



A6E2310W100

3. Install the washer tank.

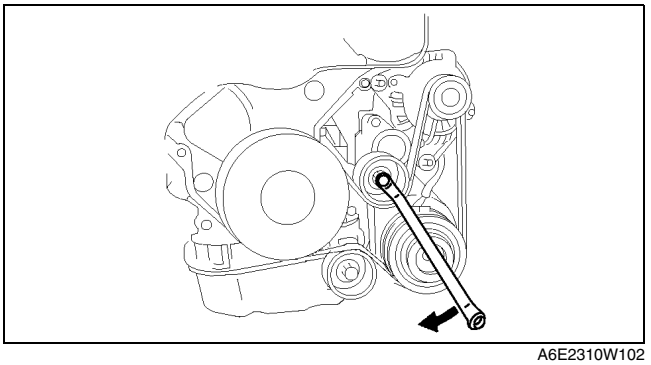


A6E2310W101

DRIVE BELT REPLACEMENT

A6E231015800202

1. Remove the splash shield (RH).
2. Remove the under cover.
3. Turn the center of the tensioner pulley clockwise to release tension to the drive belt.
4. Remove the drive belt.
5. Reinstall the drive belt or install a new drive belt.
6. Verify that the drive belt auto tensioner indicator mark does not exceed the limit. (See B2–4 DRIVE BELT INSPECTION.)
   - If it exceeds the limit, replace the drive belt.
7. Install the under cover.
8. Install the splash shield (RH).

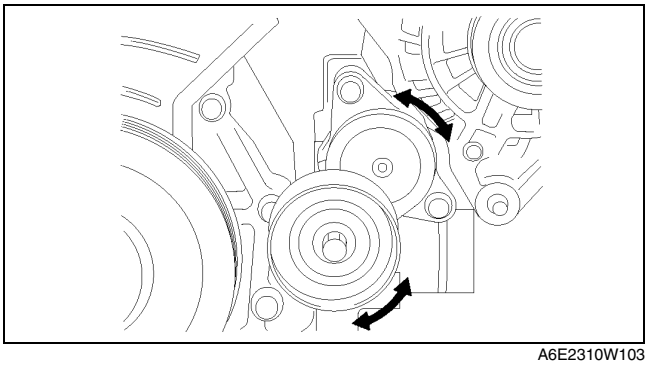

A6E2310W102

DRIVE BELT AUTO TENSIONER INSPECTION

A6E231015980201

1. Remove the drive belt. (See B2–4 DRIVE BELT REPLACEMENT.)
2. Verify that the drive belt auto tensioner moves smoothly in the operational direction.
   - Replace the drive belt auto tensioner if necessary.

3. Turn the drive belt auto tensioner pulley by hand and verify that it rotates smoothly.
   - Replace the drive belt auto tensioner if necessary.
4. Install the drive belt.



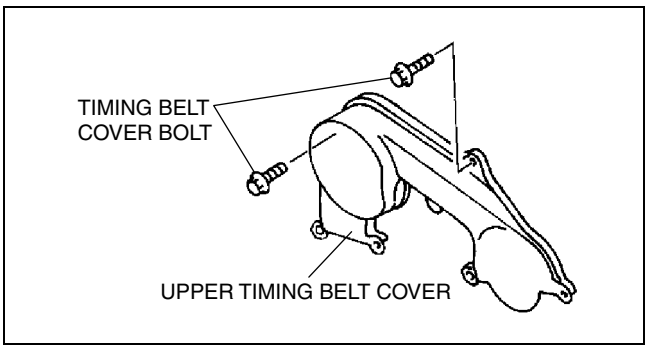
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VALVE CLEARANCE

VALVE CLEARANCE INSPECTION

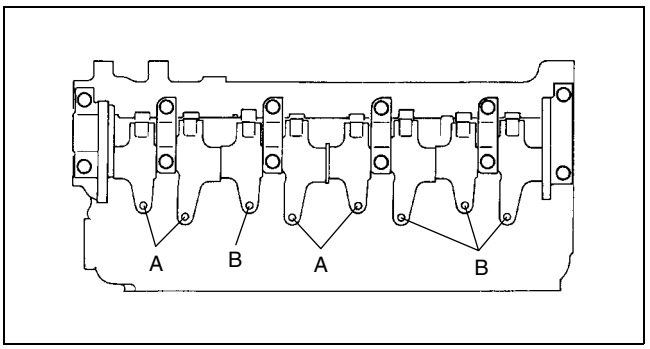
A6E231212111201

1. Remove the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
2. Remove the timing belt cover bolt as shown.
3. Remove the cylinder head cover. (See B2–15 CYLINDER HEAD GASKET REPLACEMENT.)
4. Turn the crankshaft and align the timing mark so that the piston of the No.1 or No.4 cylinder is at TDC of compression.



A6E2312W200

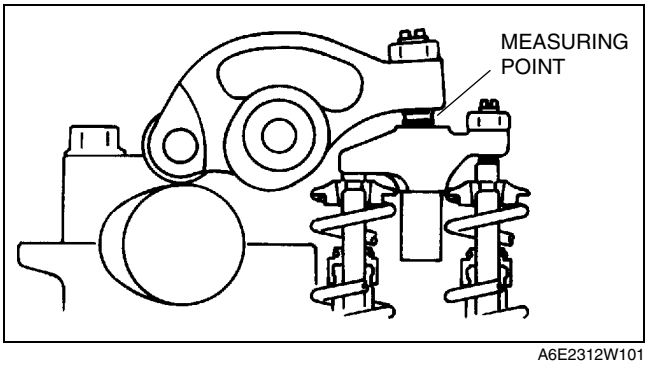
5. Measure valve clearances A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.



A6E2312W201

   - If the valve clearance is not within the specification, adjust the valves. (See B2–6 VALVE CLEARANCE ADJUSTMENT.)

Standard valve clearance [Engine cold]
IN: 0.12—0.18 mm {0.005—0.007 in}
(0.15±0.03 mm {0.006±0.0011 in})
EX: 0.32—0.38 mm {0.013—0.014 in}
(0.35±0.03 mm {0.014±0.0011 in})



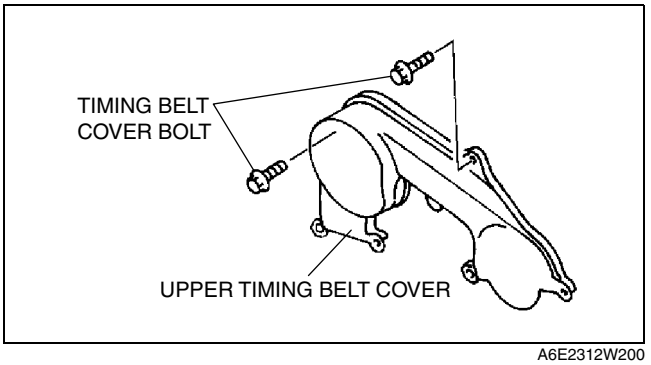
A6E2312W101

6. Turn the crankshaft one full turn and measure the remaining valve clearances.
   - Adjust if necessary. (See B2–6 VALVE CLEARANCE ADJUSTMENT.)
7. Install the cylinder head cover. (See B2–21 Cylinder Head Cover Installation Note.)

8. Install the timing belt cover bolt as shown.

   Tightening torque
   7.9—10.7 N·m {80—110 kgf·cm, 69.5—95.4 in·lbf}

9. Install the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)

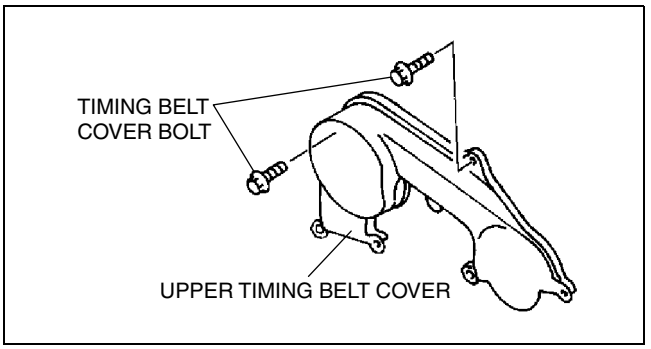


A6E2312W200

VALVE CLEARANCE ADJUSTMENT

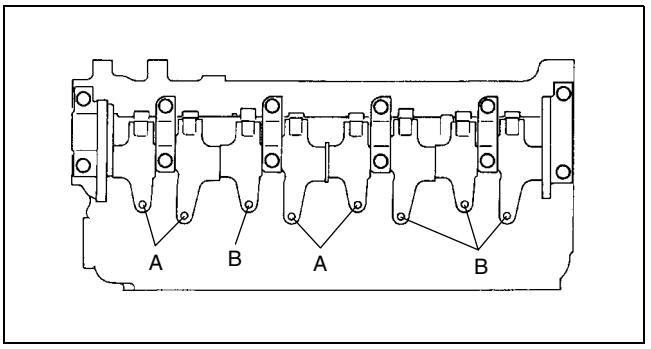
A6E231212111202

1. Remove the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
2. Remove the timing belt cover bolt as shown.
3. Remove the cylinder head cover. (See B2–15 CYLINDER HEAD GASKET REPLACEMENT.)
4. Turn the crankshaft clockwise and set the No.1 cylinder to compression TDC.
5. Remove the fuel injector. (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION.)



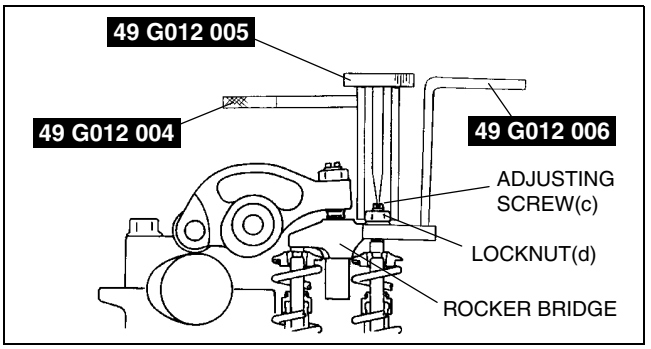
A6E2312W200

6. Adjust the valve clearance A with the No.1 cylinder at TDC of compression, and those of B with the No.4 cylinder at TDC of compression.



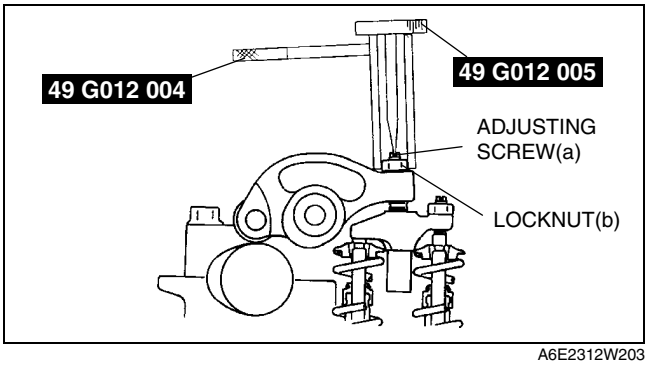
A6E2312W201

   (1) Hold the rocker bridge using the **SST (49 G012 006)**.
   (2) Loosen the locknut (d) using the **SST (49 G012 004)**, and then turn the adjusting screw (c) using the **SST (49 G012 005)** until it is separated from the valve stem completely.



A6E2312W202

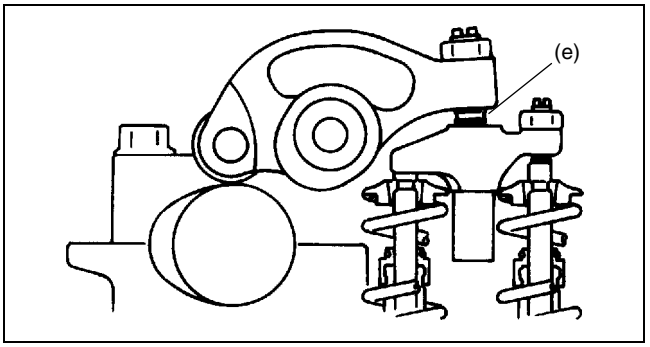
(3) Loosen the rocker arm locknut (b) using the **SST (49 G012 004)**, and then turn the adjusting screw (a) using the **SST (49 G012 005)** until it is separated from the rocker bridge completely.



A6E2312W203

(4) Insert a feeler gauge between the rocker arm and rocker bridge (e).

Standard valve clearance [Engine cold]
IN: 0.12—0.18 mm {0.005—0.007 in}
(0.15±0.03 mm {0.006±0.0011 in})
EX: 0.32—0.38 mm {0.013—0.014 in}
(0.35±0.03 mm {0.014±0.0011 in})



A6E2312W204

(5) Adjust the valve clearance by turning the adjuster (a) using the **SST (49 G012 005)**. Then temporarily tighten locknut (b) using the **SST (49 G012 004)**.

(6) With the feeler gauge inserted between the rocker arm and rocker bridge, verify that the feeler gauge remains firmly in place even when the adjusting screw (c) is loosened.
- If the feeler gauge does not remain firmly in place, repeat procedures from Step 1.

(7) Turn the adjusting screw (c) using the **SST (49 G012 005)** until it reaches the valve stem and the feeler gauge fits more firmly. Then tighten the locknut (d) using the **SST (49 G012 004)** to specified torque.

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

(8) Loosen the locknut (b) using the **SST (49 G012 004)** and readjust the valve clearance (e).

Standard valve clearance [Engine cold]
IN: 0.12—0.18 mm {0.005—0.007 in} (0.15±0.03 mm {0.006±0.0011 in})
EX: 0.32—0.38 mm {0.013—0.014 in} (0.35±0.03 mm {0.014±0.0011 in})

(9) Tighten the locknut (b) using the **SST (49 G012 004)** to specified torque.

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

(10)Verify the valve clearance at (e).

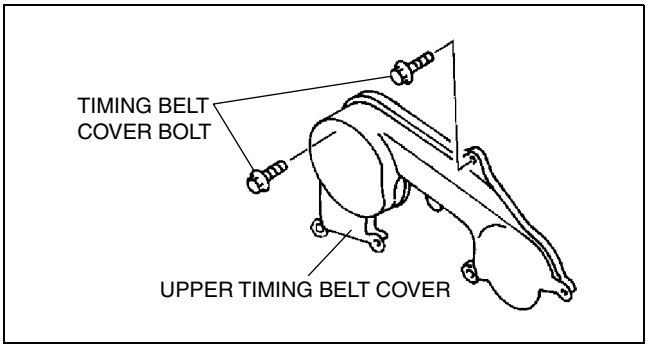
Standard valve clearance [Engine cold]
IN: 0.12—0.18 mm {0.005—0.007 in} (0.15±0.03 mm {0.006±0.0011 in})
EX: 0.32—0.38 mm {0.013—0.014 in} (0.35±0.03 mm {0.014±0.0011 in})

7. Turn the crankshaft one full turn and adjust the remaining valve clearances.
8. Install the fuel injector. (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION.)
9. Install the cylinder head cover. (See B2–21 Cylinder Head Cover Installation Note.)

10. Install the timing belt cover bolt as shown.

    Tightening torque
    7.9—10.7 N·m {80—110 kgf·cm, 69.5—95.4 in·lbf}

11. Install the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)



A6E2312W200

COMPRESSION PRESSURE

COMPRESSION INSPECTION

A6E231402000201

Warning
- **When the engine and the oil are hot, they can badly burn. Be careful not to burn yourself during removal/installation of each component.**

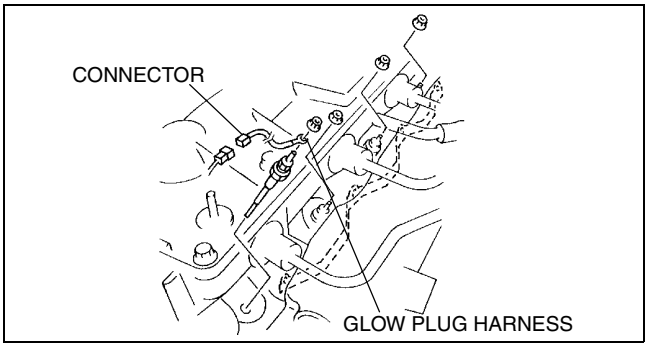
1. Verify that the battery is fully charged.
   - Recharge it if necessary. (See G–6 BATTERY INSPECTION.)
2. Warm up the engine to the normal operating system temperature.
3. Stop the engine and allow it to cool off for **about 10 min**.

Warning
- **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 fuel from spurting out of the glow plug hole, do not ground the fuel injector terminal. (See F2–45 Fuel Line Safety Procedures.)**

4. Disconnect the fuel injector connector.

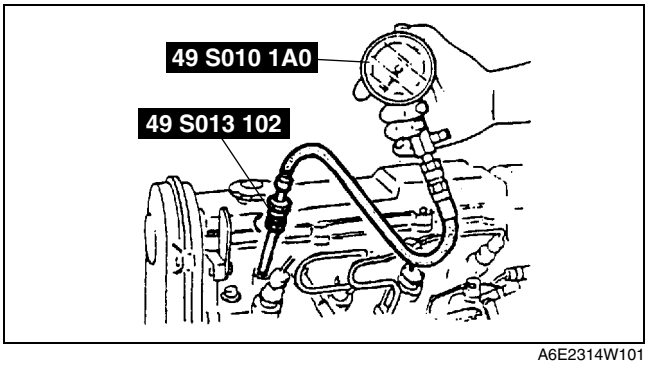
Warning
- **If the glow plug harness connector is connected, the glow plug harness and engine component can come into contact and cause a short when the engine switch is ON. Disconnect the glow plug harness connector before turning the engine switch on.**

5. Remove the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
6. Remove all the glow plugs. (See F2–42 GLOW PLUG REMOVAL/INSTALLATION.)



A6E2314W100

7. Install the **SSTs** into the glow plug hole.
8. Crank the engine and note the maximum gauge reading.
9. Inspect each cylinder as above.
   - If the compression in one or more cylinders is low, pour a small amount of clean engine oil into the cylinder and reinspect the compression.
     — If the compression increases, the piston, the piston rings, or cylinder wall may be worn and overhaul is required.
     — If the compression stays low, a valve may be stuck or improperly seated and overhaul is required.
     — If the compression in adjacent cylinders stays low, the cylinder head gasket may be damaged or the cylinder head may be distorted and overhaul is required.



A6E2314W101

Compression

kPa {kgf/cm^2, psi} [rpm]

Item	Specification
Standard	3,500 {35.7, 507.7} [250]
Minimum	3,100 {31.6, 449.4} [250]
Maximum difference between cylinders	196.1 {1.999, 28.44}

10. Remove the **SSTs**.
11. Install the glow plug. (See F2–42 GLOW PLUG REMOVAL/INSTALLATION.)
12. Instal the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
13. Reconnect the fuel injector connector.
14. Erase DTC from PCM memory using the **SST**. (WDS or equivalent).

TIMING BELT

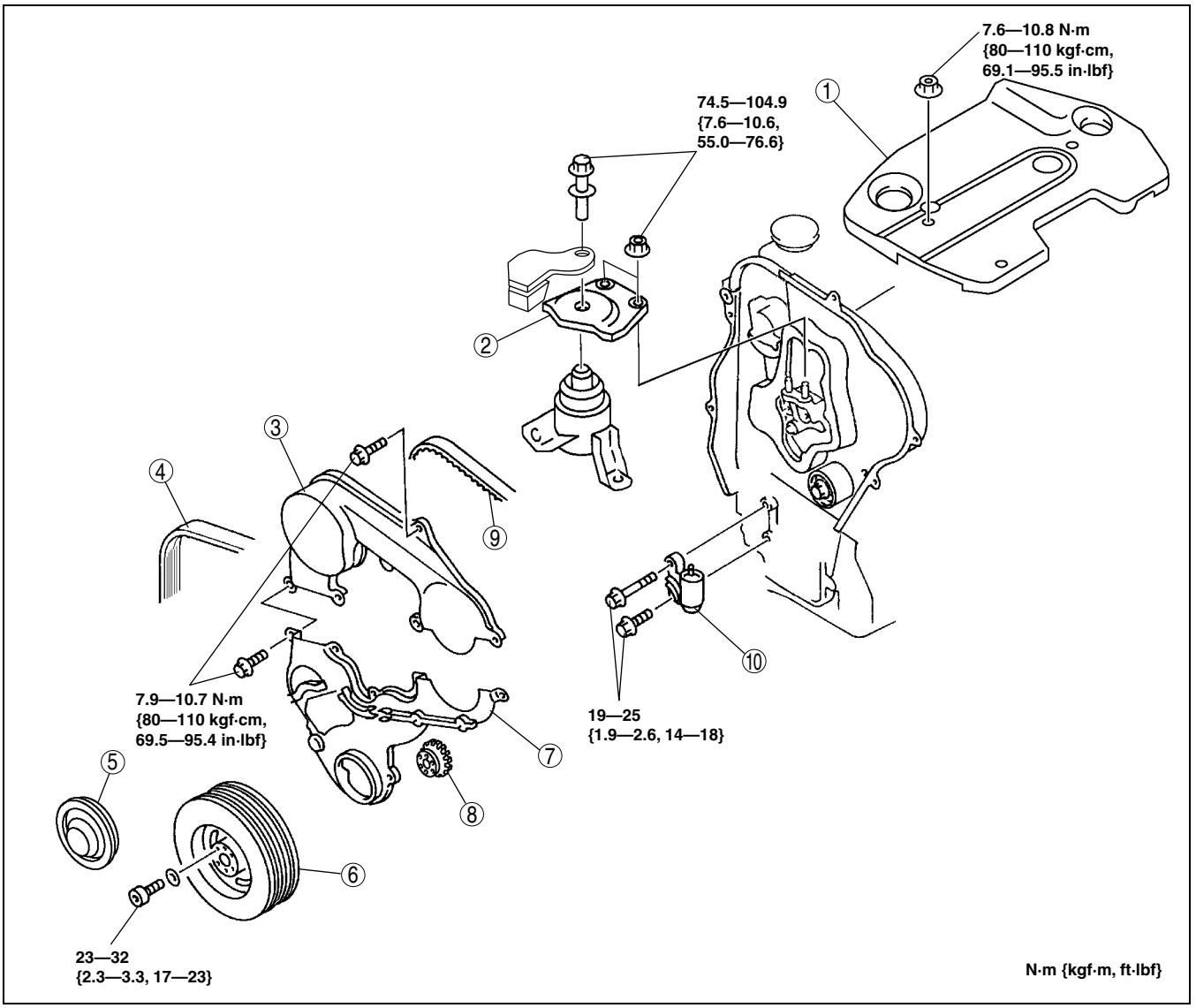
TIMING BELT REMOVAL/INSTALLATION

A6E231612040201

Warning

- **Fuel vapor is hazardous. It can very 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 injures or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure". (See F2–45 Fuel Line Safety Procedures.)**

1. Disconnect the negative battery cable.
2. Remove the front tire (RH).
3. Remove the splash shield (RH).
4. Remove the washer tank.
5. Remove the drive belt. (See B2–4 DRIVE BELT REPLACEMENT.)
6. Remove the fuel filter with the fuel hose still connected and position the fuel filter so that it is out of the way. (L.H.D.) (See F2–50 FUEL FILTER COMPONENT REMOVAL/INSTALLATION.)
7. Remove in the order shown in the table.
8. Install in the reverse order of removal.
9. Start the engine and inspect the pulleys and the drive belt for runout and contact.



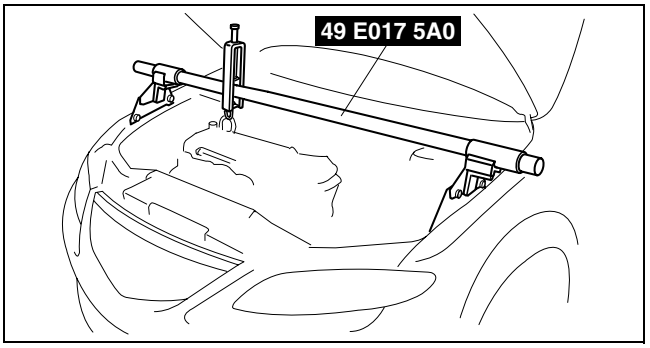
A6E2316W100

1	Engine cover
2	No.3 engine joint bracket (See B2–11 No.3 Engine Joint Bracket Removal Note) (See B2–14 No.3 Engine Joint Bracket Installation Note)
3	Upper timing belt cover
4	Drive belt (See B2–4 DRIVE BELT REPLACEMENT)
5	Crankshaft pulley cover
6	Crankshaft pulley (See B2–14 Crankshaft Pulley Installation Note)

7	Lower timing belt cover (See B2–11 Lower Timing Belt Cover Removal Note)
8	Guide plate
9	Timing belt (See B2–11 Timing Belt, Timing Belt Auto Tensioner Removal Note) (See B2–12 Timing Belt, Timing Belt Auto Tensioner Installation Note)
10	Timing belt auto tensioner (See B2–11 Timing Belt, Timing Belt Auto Tensioner Removal Note) (See B2–12 Timing Belt, Timing Belt Auto Tensioner Installation Note)

No.3 Engine Joint Bracket Removal Note

1. Suspend the engine using the **SST**.

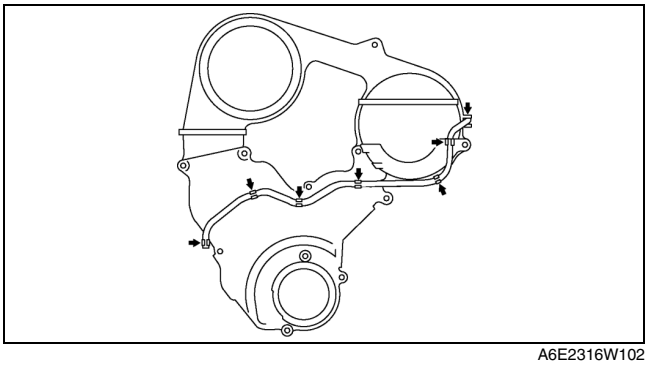


A6E2316W101

Lower Timing Belt Cover Removal Note

Caution

- **The timing belt cover could be damaged easily. Hold the timing belt cover at the locations indicated in the figure and remove the crankshaft position sensor harness slowly.**



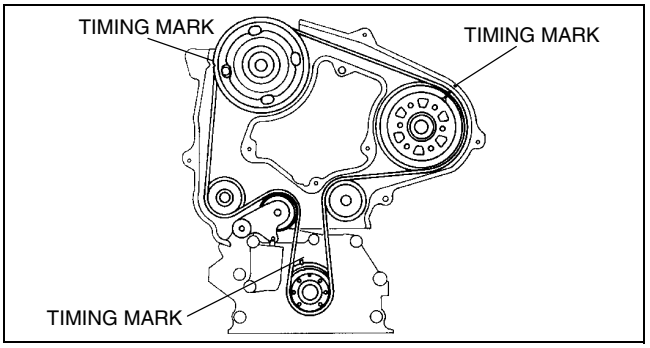
A6E2316W102

Timing Belt, Timing Belt Auto Tensioner Removal Note

1. Turn the crankshaft clockwise and align the timing marks as shown.

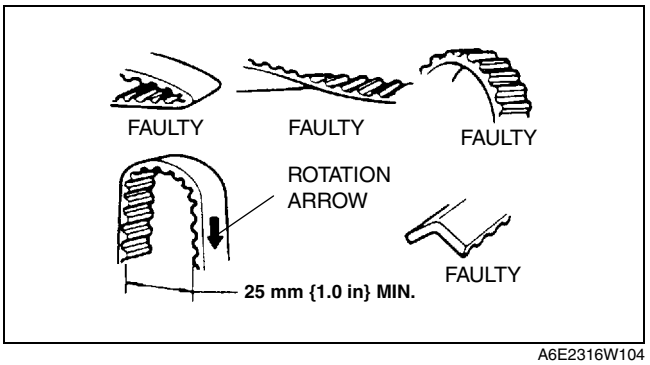
Caution

- **Forcefully twisting the belt, turning it inside out, or allowing oil or grease on it will damage the belt and shorten its life.**
- **After removing the timing belt, do not move the crankshaft and/or camshaft from this position because it can cause the valve and piston to come into contact.**



A6E2316W103

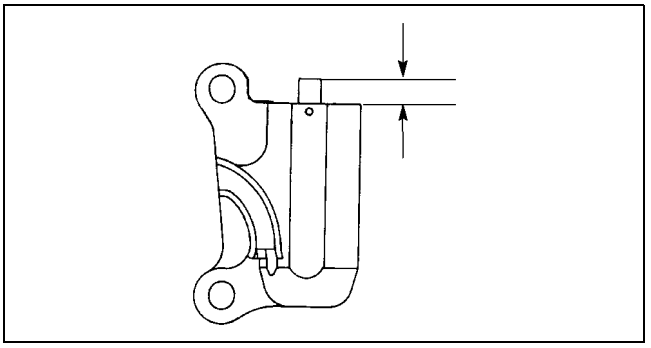
2. Remove the timing belt auto tensioner.
3. Mark the timing belt rotation on the belt for proper reinstallation.



A6E2316W104

Timing Belt, Timing Belt Auto Tensioner Installation Note

1. Measure the tensioned rod projection length.
   - If not as specified, replace the timing belt auto tensioner.
2. Inspect the timing belt auto tensioner for oil leakage.
   - If not as specified, replace the timing belt auto tensioner.



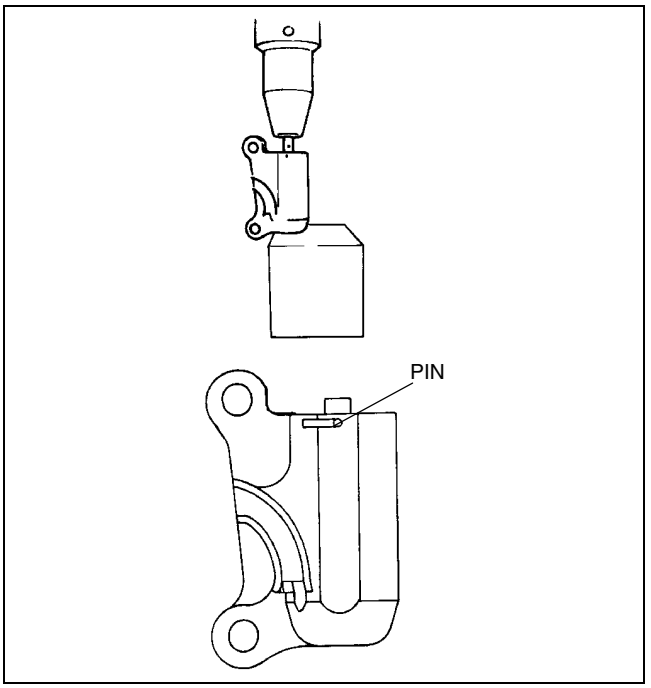
A6E2316W105

Projection (free length)
12.9—14.6 mm {0.508—0.574 in}

Caution
- **Placing the timing belt auto tensioner horizontally can cause oil leakage and damage the timing belt auto tensioner. Place the timing belt auto tensioner vertically when using a vise.**

3. Verify the thrust of the timing belt auto tensioner rod in the following order:
   - If the timing belt auto tensioner rod is rigid when it is pushed with a force of approximately **235 N {24 kgf, 53 lbf}**, push it down slowly and fix the pin in the hole.
   - If there is no resistance on the timing belt auto tensioner rod and it moves slightly when it is pushed with a force of approximately **235 N {24 kgf, 53 lbf}**;

   (1) Push it down slowly two or three times to the bottom end of the rod.
   (2) If the rod protrudes approximately **8.1 mm {0.32 in}**, verify that there is resistance on the timing belt auto tensioner rod.



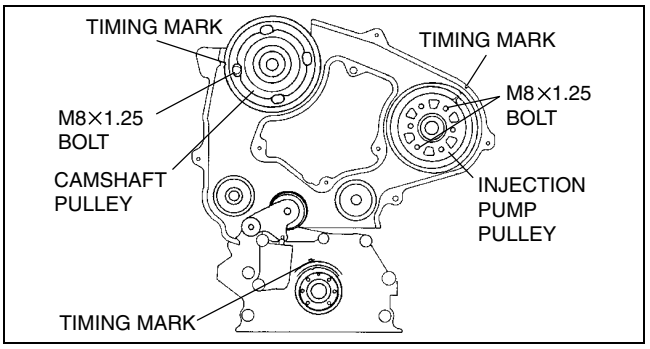
A6E2316W106

Caution
- **To prevent damage to the inside of the timing belt auto tensioner, do not press down the timing belt auto tensioner rod with a force greater than the specified 235 N {24 kgf, 53 lbf}.**
  Be careful that the rod does not touch the bottom.

   - If the timing belt auto tensioner rod projection is restored, push it down slowly and fix the pin in the hole.
     — If the resistance is not restored, replace the timing belt auto tensoner.

Caution
- **To prevent the bolts (M8 x 1.25) from damaging the fuel injection pump and pulley, do not fully tighten the fixing bolts. If it contacts the pulley surface, it will damage the pulley.**

4. Verify that all timing marks are correctly aligned.
   - If not, align all timing marks according to the procedure below.
5. Fix the camshaft pulley to the cylinder head using bolt (**M8 x1.25**).
6. Fix the injection pump pulley to the bracket using two bolts (**M8 x1.25**).

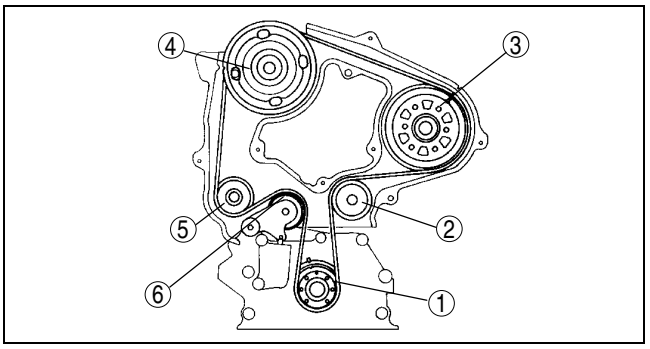


A6E2316W107

Caution
- **Turn the crankshaft in the direction which will prevent the TDC and BDC from being passed. Otherwise it can cause the valve and piston to come into contact.**

(1) Turn the crankshaft and set it at an angle of **45**° or more away from the TDC and BDC.
(2) Align the timing marks of the camshaft pulley.
(3) Align the timing marks of the injection pump pulley.
(4) Turn the crankshaft and align the timing marks of the timing belt pulley.

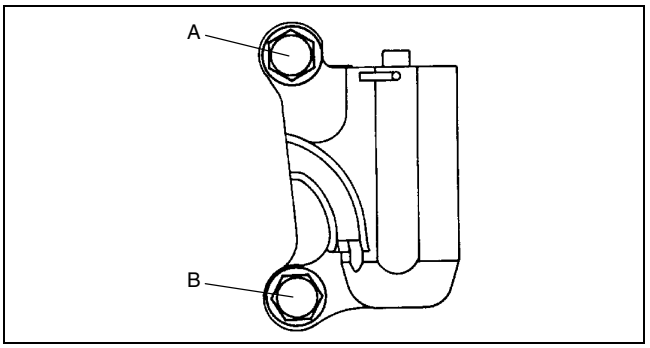
7. Install the timing belt on the pulleys in the order shown below.
   (1) Timing belt pulley
   (2) Idler
   (3) Supply pump pulley
   (4) Camshaft pulley
   (5) Water pump pulley
   (6) Tensioner
8. Remove the supply pump pulley fixing bolts and camshaft pulley fixing bolt (**M8 x 1.25**).
9. Hand tighten the timing belt auto tensioner bolts in the order A to B as indicated in the figure.
10. Tighten the timing belt auto tensioner bolts in the order A to B as indicated in the figure.



A6E2316W108

Tightening torque
19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}

11. Remove the pin from the timing belt auto tensioner to apply tension to the belt.
12. Turn the crankshaft clockwise twice, and align the timing marks.
13. Verify that all timing marks are correctly aligned.
    - If not as specified, repeat from Timing Belt, Timing Belt Auto Tensioner Removal Note.

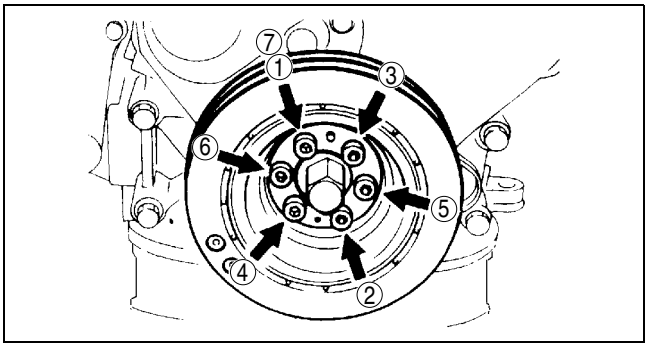


A6E2316W109

Crankshaft Pulley Installation Note

1. Tighten the bolts in the order shown.

Tightening torque
23—32 N·m {2.3—3.3 kgf·m, 17—23 ft·lbf}

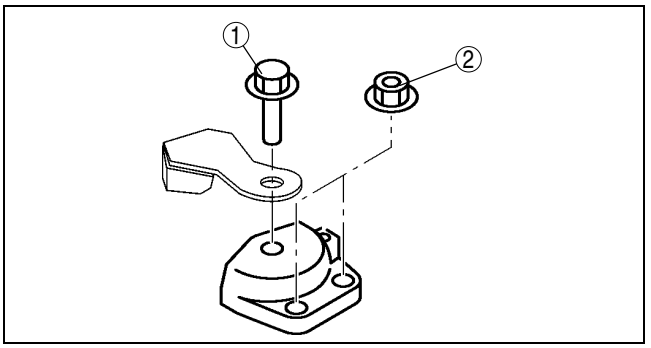


A6E2316W110

No.3 Engine Joint Bracket Installation Note

1. Tighten the No.3 engine joint bracket bolt and nut in the order shown.

Tightening torque
74.5—104.9 N·m {7.6—10.6 kgf·m, 55.0—76.6 ft·lbf}



A6E2316W111

CYLINDER HEAD GASKET

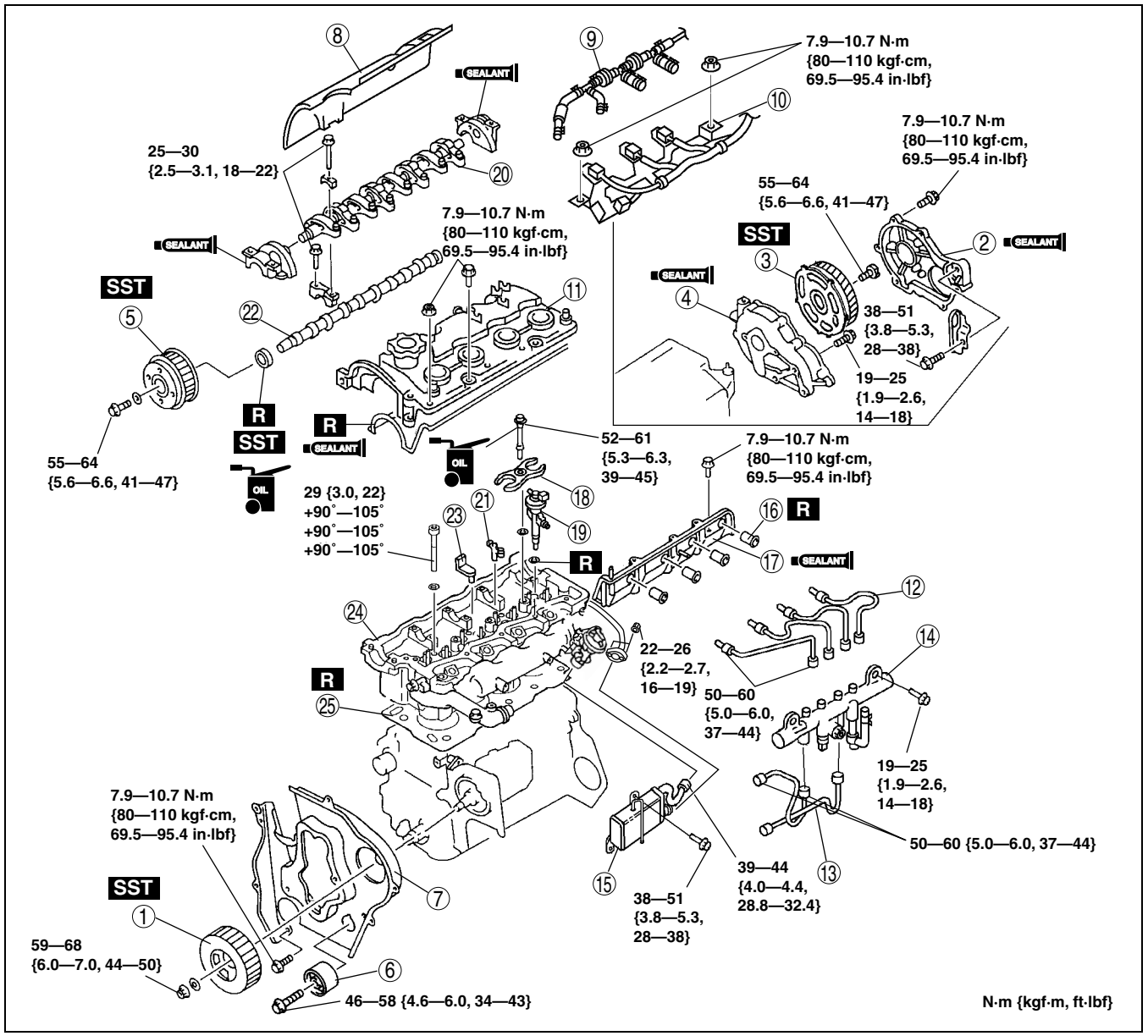
CYLINDER HEAD GASKET REPLACEMENT

A6E231810271201

Warning

- **Fuel vapor is hazardous. It can very 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 the "Fuel Line Safety Procedure". (See F2–45 Fuel Line Safety Procedures.)**

1. Remove the timing belt. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
2. Remove the vacuum pump. (See P–13 VACUUM PUMP REMOVAL/INSTALLATION (MZR-CD (RF TURBO)).)
3. Remove the P/S oil pump with the oil hose still connected. Position the P/S oil pump so that it is out of the way. Use wire or rope to secure. (See N–16 POWER STEERING OIL PUMP (MZR-CD (RF Turbo)) REMOVAL/INSTALLATION.)
4. Remove the turbocharger. (See F2–57 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
5. Remove all the glow plugs. (See F2–42 GLOW PLUG REMOVAL/INSTALLATION.)
6. Remove in the order shown in the table.
7. Install in the reverse order of removal.
8. Inspect valve clearance. (See B2–5 VALVE CLEARANCE INSPECTION.)
9. Inspect the engine oil level.
   - If necessary, add oil. (See D–8 ENGINE OIL INSPECTION.)
10. Inspect the compression. (See B2–8 COMPRESSION INSPECTION.)
11. Start the engine and:
    (1) Inspect the pulleys and the drive belt for runout and contact.
    (2) Inspect the engine oil, engine coolant, and fuel leakage.
    (3) Inspect the idle speed. (See F2–34 IDLE SPEED INSPECTION.)



A6E2318W100

1	Supply pump pulley (See B2–17 Supply Pump Pulley Removal Note) (See B2–23 Supply Pump Pulley Installation Note)
2	Gear cover (See B2–22 Gear Cover Installation Note)
3	Drive gear (See B2–17 Drive Gear Removal Note) (See B2–22 Drive Gear Installation Note)
4	Gear case (See B2–22 Gear Case Installation Note)
5	Camshaft pulley (See B2–18 Camshaft Pulley Removal Note) (See B2–22 Camshaft Pulley Installation Note)
6	Idler (See B2–21 Idler Installation Note)
7	Seal plate (See B2–18 Seal Plate Removal Note) (See B2–21 Seal Plate Installation Note)
8	Insulator
9	Fuel return hose
10	Injector harness bracket

11	Cylinder head cover (See B2–21 Cylinder Head Cover Installation Note)
12	Fuel Injection pipe (Fuel injector side) (See B2–21 Fuel Injection Pipe Installation Note)
13	Fuel Injection pipe (Fuel supply pump side) (See B2–21 Fuel Injection Pipe Installation Note)
14	Common rail (See F2–53 Common Rail Installation Note)
15	EGR water cooler
16	Nozzle seal
17	Side wall (See B2–20 Side Wall Installation Note)
18	Fuel injector bracket
19	Fuel injector (See F2–55 Fuel Injector Installation Note)
20	Rocker arm and rocker arm shaft (See B2–18 Rocker Arm and Rocker Arm Shaft Removal Note) (See B2–19 Rocker Arm and Rocker Arm Shaft Installation Note)
21	Rocker bridge

22	Camshaft
23	Breather pipe

24	Cylinder head (See B2–18 Cylinder Head Removal Note) (See B2–19 Cylinder Head Installation Note)
25	Cylinder head gasket

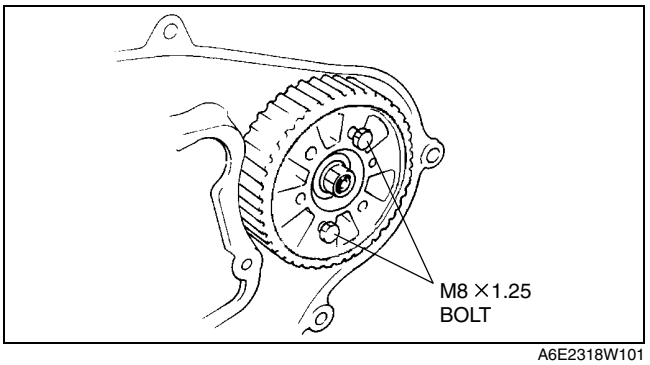
Supply Pump Pulley Removal Note

1. Verify that timing marks are correctly aligned.

Caution

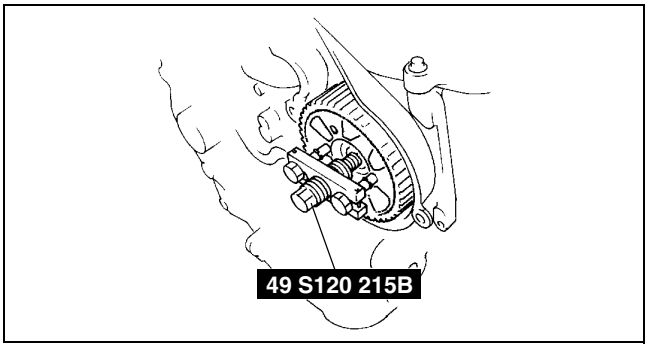
- **To prevent the bolts (M8 x 1.25) from damaging the supply pump and pulley, do not fully tighten the fixing bolts. If it contacts the pulley surface, it will damage the pulley.**

2. Fix the supply pump pulley to the bracket using two bolts (**M8 x 1.25**).
3. Loosen the supply pump pulley lock nut.



A6E2318W101

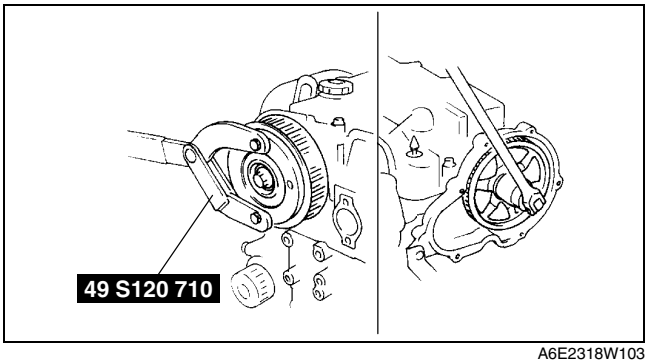
4. Separate the supply pump pulley from the supply pump shaft using the **SST**.
5. Remove the supply pump pulley fixed bolts (**M8 x 1.25**).



A6E2318W102

Drive Gear Removal Note

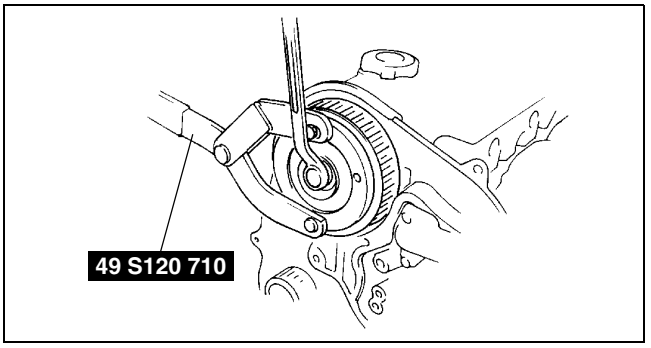
1. Hold the camshaft using the **SST**.
2. Remove the drive gear lock bolt.



A6E2318W103

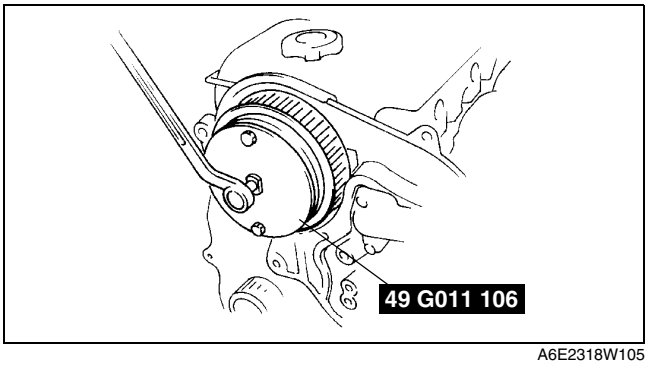
Camshaft Pulley Removal Note

1. Hold the camshaft using the **SST**.
2. Remove the camshaft pulley lock bolt.



A6E2318W104

3. Remove the camshaft pulley using the **SST**.



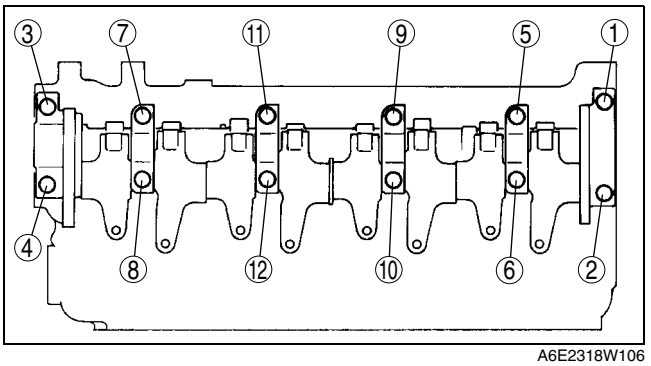
A6E2318W105

Seal Plate Removal Note

1. Remove the seal plate from the engine component. However, the seal plate cannot be removed completely. Separate the seal plate from the engine component by removing the fitting bolts so that the cylinder head can be removed.

Rocker Arm and Rocker Arm Shaft Removal Note

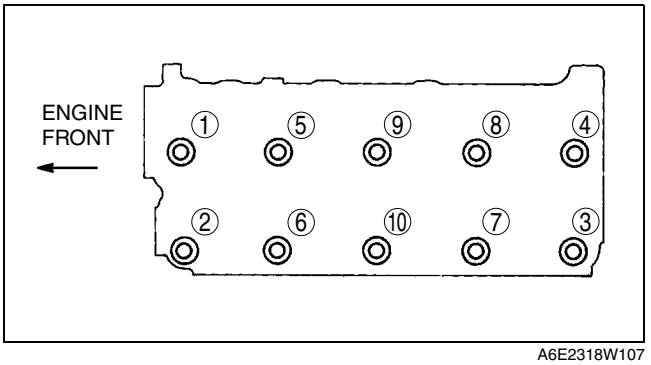
1. Loosen the bolts in two or three steps in the order shown.



A6E2318W106

Cylinder Head Removal Note

1. Loosen the cylinder head bolts in two or three steps in the order shown.



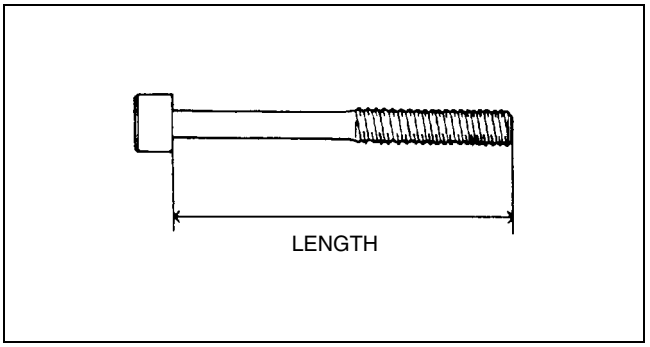
A6E2318W107

Cylinder Head Installation Note

1. Measure the length of each cylinder head bolt.
   - Replace any that exceeds maximum length.

   Length
   159.7—160.3 mm {6.288—6.311 in}

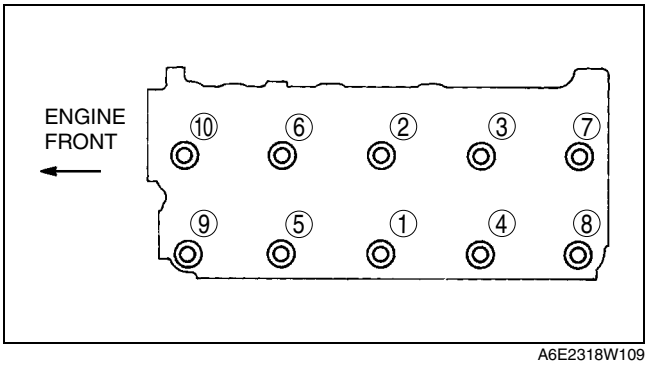
   Maximum
   161.0 mm {6.338 in}



A6E2318W108

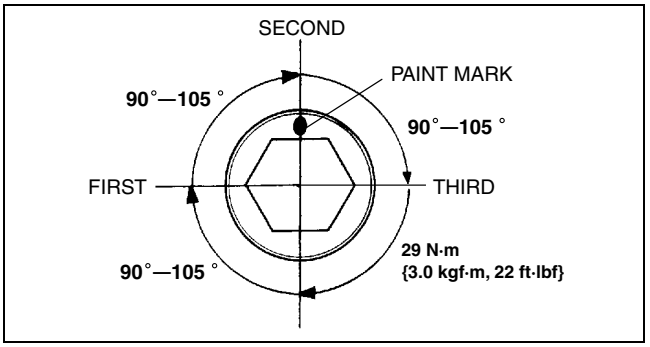
2. Tighten the bolts in two or three steps in the order shown.

   Tightening torque
   29 N·m {3.0 kgf·m, 22 ft·lbf}



A6E2318W109

3. Put a paint mark on each bolt head.
4. Using the marks as a reference, tighten the bolts by turning each **90°—105°** **in** the sequence shown.
5. Further tighten each bolt by turning another **90°—105°**.
6. Then further tighten each bolt by turning another **90°—105°**.



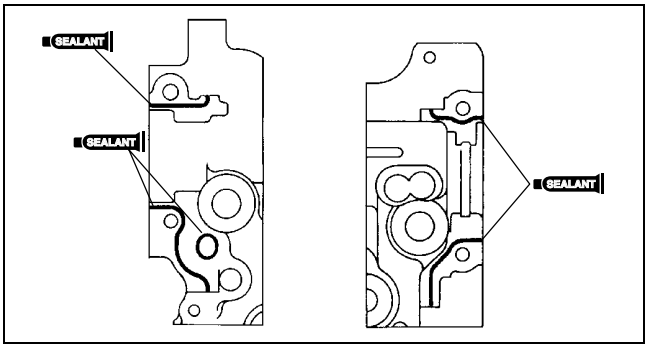
A6E2318W110

Rocker Arm and Rocker Arm Shaft Installation Note

1. Apply sealant as shown in the figure.

   Thickness
   2 mm {0.079 in}

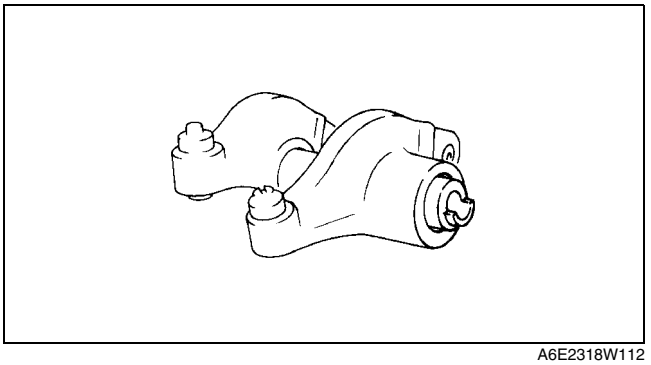
2. Install the camshaft caps according to the cap number.



A6E2318W111

3. Install the rocker arm shaft plane side upward.

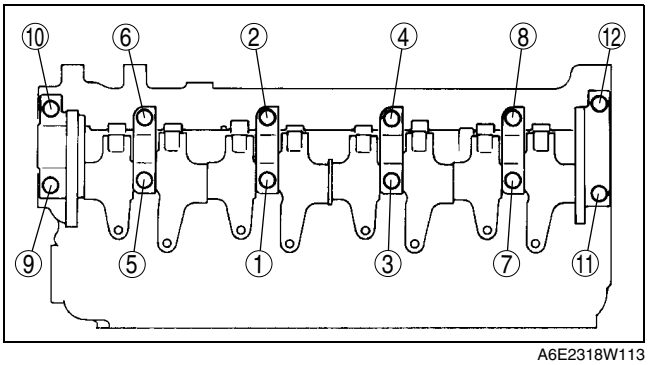
Caution
- **Because there is little camshaft thrust clearance, the camshaft must be held horizontally while it is installed. Otherwise, excessive force will be applied to the thrust area, causing burrs on the thrust receiving area of the cylinder head journal. To avoid this, the following procedure must be observed.**



A6E2318W112

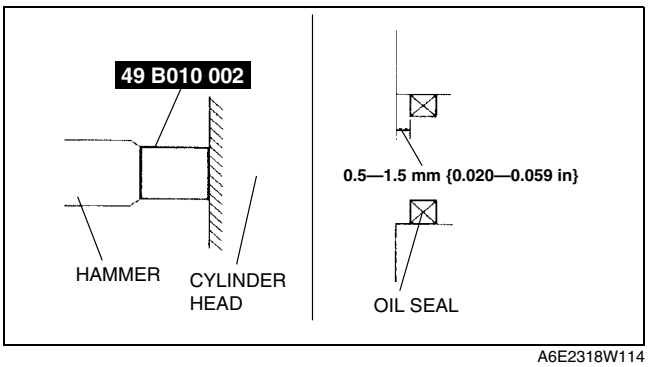
4. Tighten the bolts in two or three steps in the order shown.

Tightening torque
25—30 N·m {2.5—3.1 kgf·m, 18—22 ft·lbf}



A6E2318W113

5. Apply clean engine oil to the new oil seal.
6. Push the oil seal slightly in by hand.
7. Tap the oil seal into the cylinder head using the **SST** and a hammer.

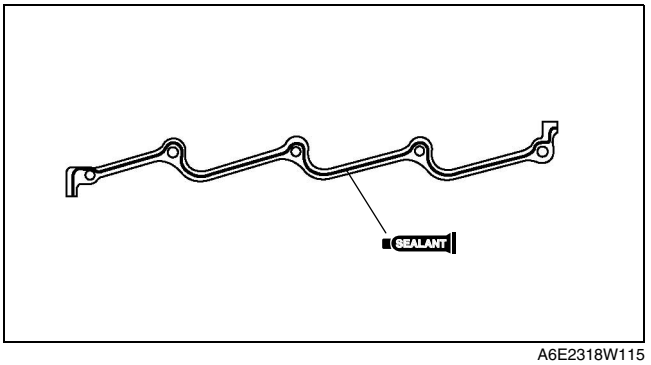


A6E2318W114

Side Wall Installation Note

1. Apply silicone sealant as shown in the figure.

Thickness
2 mm {0.079 in}



A6E2318W115

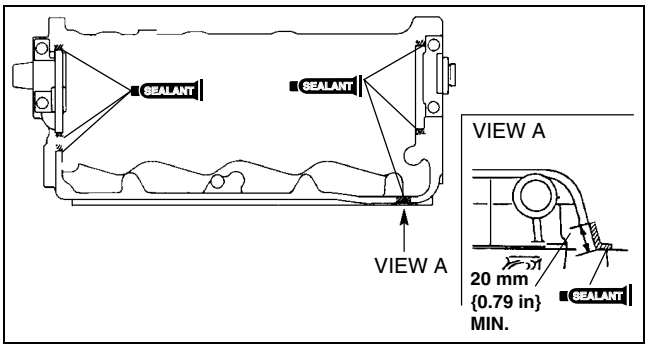
Fuel Injection Pipe Installation Note

Caution
- **Fuel injection pipes can be removed and reinstalled up to five times. If removing them for the sixth time, be sure to replace them with new ones.**

Cylinder Head Cover Installation Note

1. Apply silicone sealant to the shaded areas.

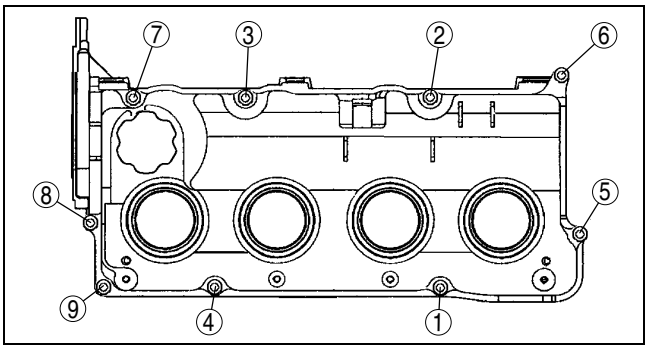
   Thickness
   2 mm {0.079 in}



A6E2318W116

2. Tighten the bolts in the order shown.

   Tightening torque
   7.9—10.7 N·m {80—110 kgf·cm, 69.5—95.4 in·lbf}

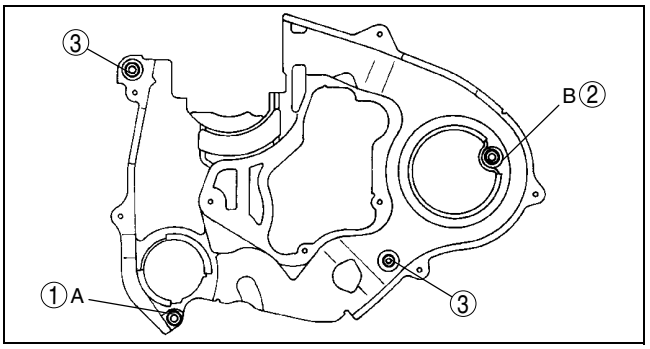


A6E2318W117

Seal Plate Installation Note

1. Install the seal plate and hand tighten the bolt in the order A to B.
2. Tighten the bolts in the order shown.

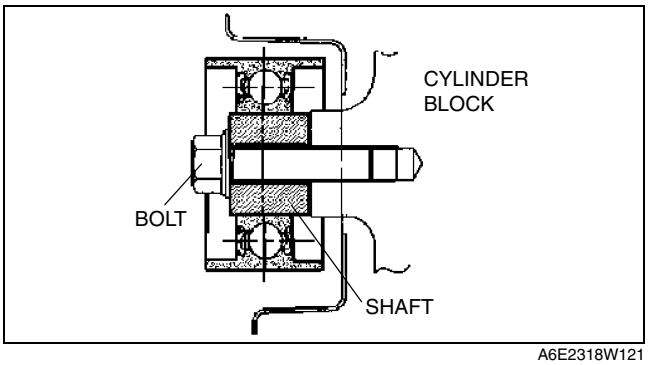
   Tightening torque
   7.9—10.7 N·m {80—110 kgf·cm, 69.5—95.4 in·lbf}



A6E2318W118

Idler Installation Note

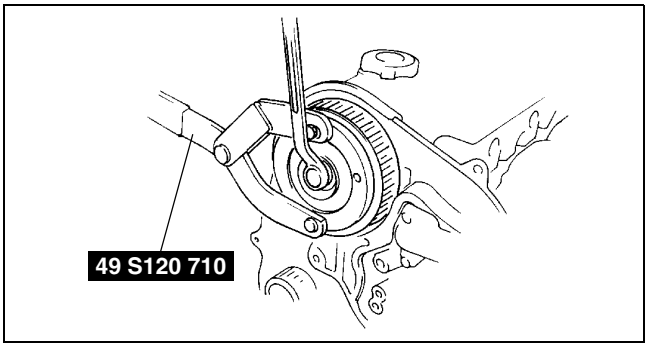
Caution
- **The idler has a front and back relative to the engine, therefore when installing make sure that the longer projection of the shaft is on the engine side as indicated in the figure.**



A6E2318W121

Camshaft Pulley Installation Note

1. Hold the camshaft using the **SST**.



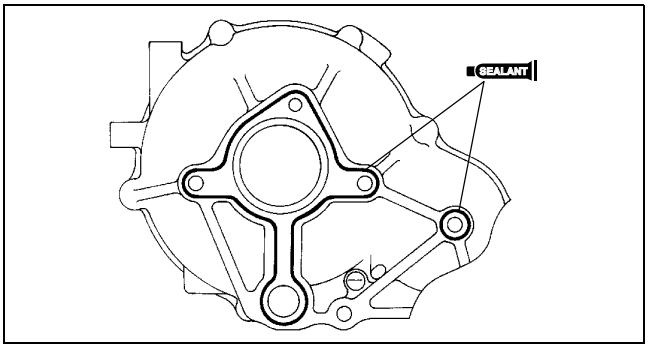
A6E2318W104

Gear Case Installation Note

1. Apply silicone sealant as shown in the figure.

   Thickness
   1.5—2.5 mm {0.060—0.098 in}

2. Tighten the bolts in clockwise order.

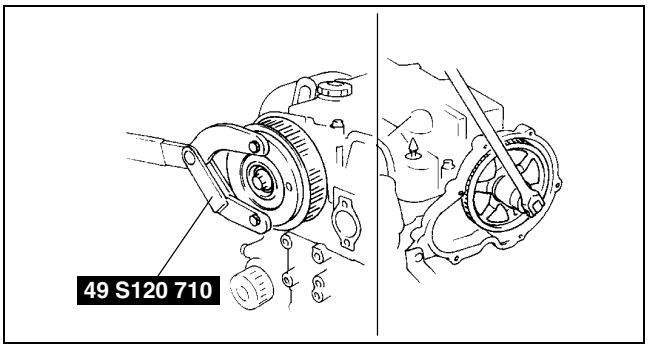


A6E2318W119

Drive Gear Installation Note

1. Hold the camshaft using the **SST**.
2. Tighten the drive gear lock bolt.

   Tightening torque
   55—64 N·m {5.6—6.6 kgf·m, 41—47 ft·lbf}



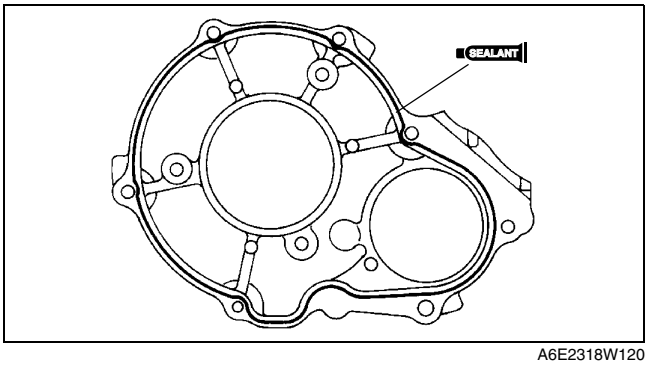
A6E2318W103

Gear Cover Installation Note

1. Apply silicone sealant as shown in the figure.

   Thickness
   1.5—2.5 mm {0.060—0.098 in}

2. Tighten the bolts in clockwise order.

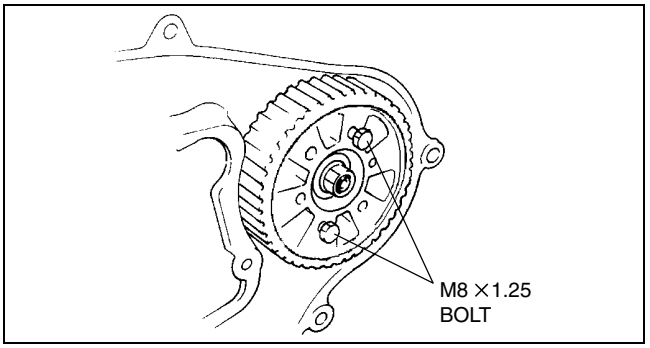


A6E2318W120

Supply Pump Pulley Installation Note

Caution
- **To prevent the bolts (M8 x1.25) from damaging the supply pump and pulley, do not fully tighten the fixing bolts. If they contact the pulley surface, they will damage the pulley.**

1. Fix the supply pump pulley to the bracket using two bolts (**M8 x 1.25**).



A6E2318W101

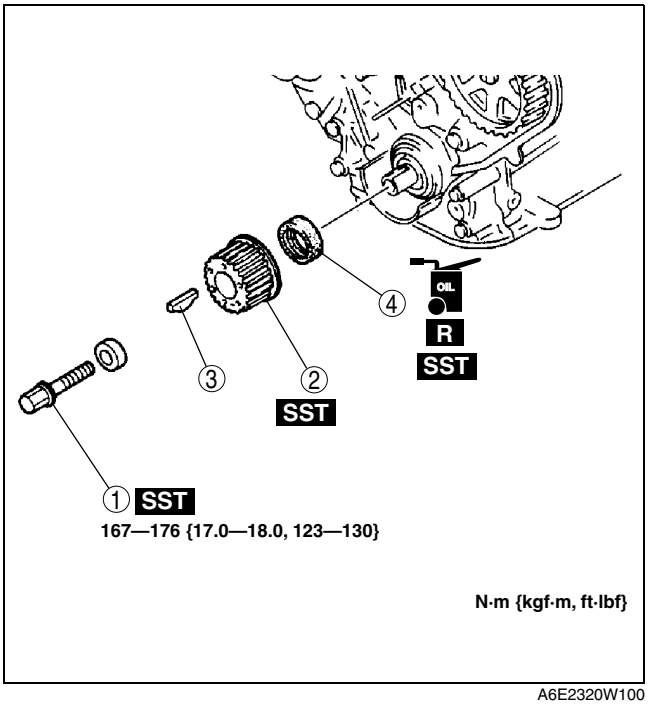
FRONT OIL SEAL

FRONT OIL SEAL REPLACEMENT

A6E232010602201

1. Remove the timing belt. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
2. Remove in the order shown in the table.
3. Install in the reverse order of removal.

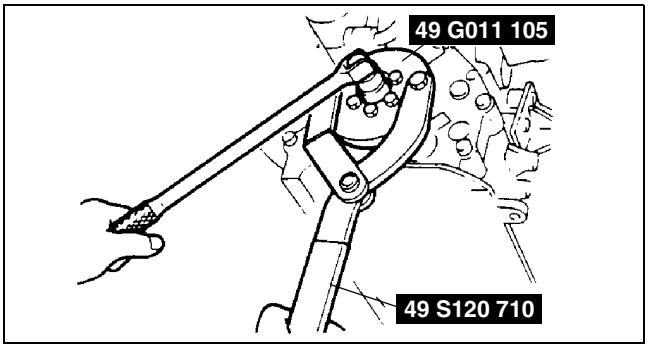
1	Timing belt pulley lock bolt (See B2–24 Timing Belt Pulley Lock Bolt Removal/Installation Note)
2	Timing belt pulley (See B2–24 Timing Belt Pulley Removal Note)
3	Key
4	Front oil seal (See B2–25 Front Oil Seal Removal Note) (See B2–25 Front Oil Seal Installation Note)



A6E2320W100

Timing Belt Pulley Lock Bolt Removal/Installation Note

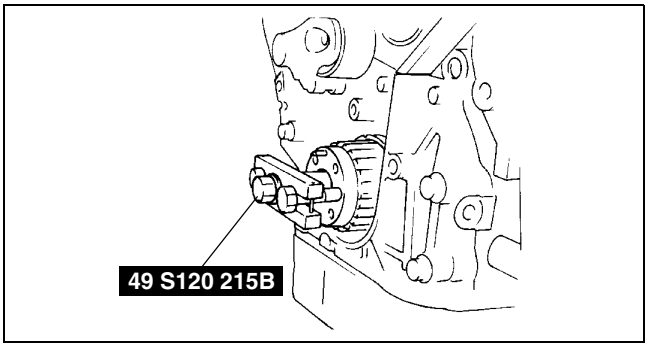
1. Hold the timing belt pulley using the **SSTs**.



A6E2320W101

Timing Belt Pulley Removal Note

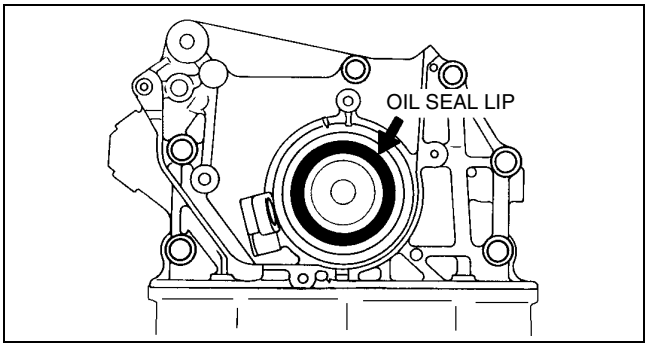
1. Remove the timing belt pulley using the **SST**.



A6E2320W102

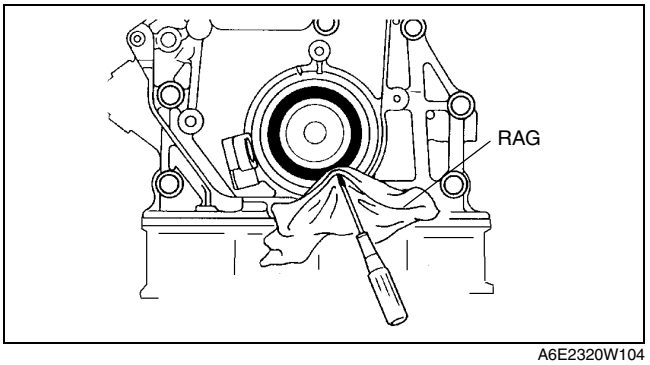
Front Oil Seal Removal Note

1. Cut the oil seal lip using a razor knife.



A6E2320W103

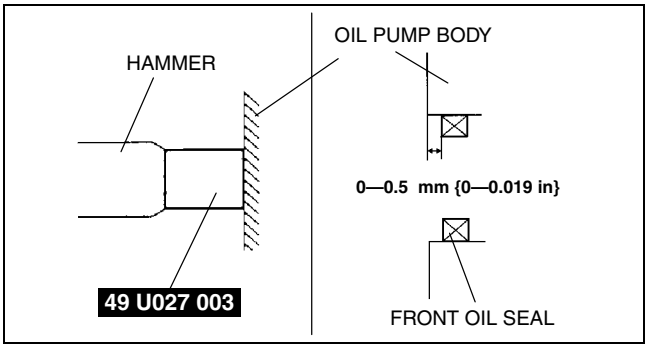
2. Remove the oil seal using a screwdriver protected with a rag.



A6E2320W104

Front Oil Seal Installation Note

1. Apply clean engine oil to the 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. The oil seal must be tapped in until it is flush with the edge of the oil pump body.



A6E2320W105

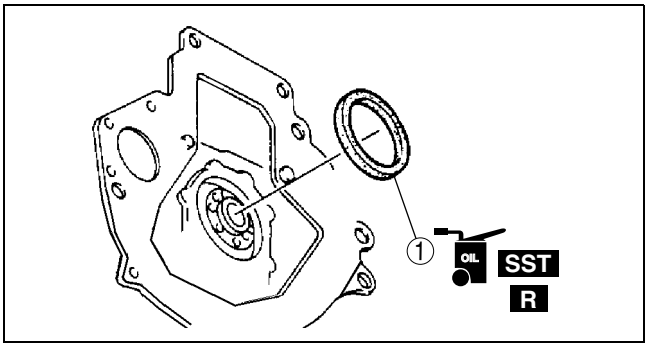
REAR OIL SEAL

REAR OIL SEAL REPLACEMENT

A6E232211399201

1. Remove the flywheel. (See H–5 CLUTCH UNIT REMOVAL/INSTALLATION (A65M-R manual transaxle models).)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

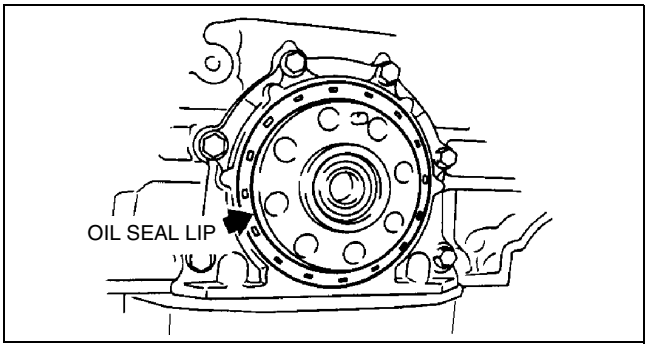
1	Rear oil seal (See B2–26 Rear Oil Seal Removal Note) (See B2–26 Rear Oil Seal Installation Note)



A6E2322W100

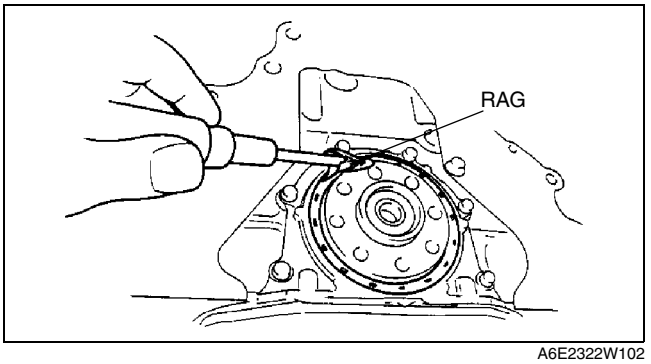
Rear Oil Seal Removal Note

1. Cut the oil seal lip using a razor knife.



A6E2322W101

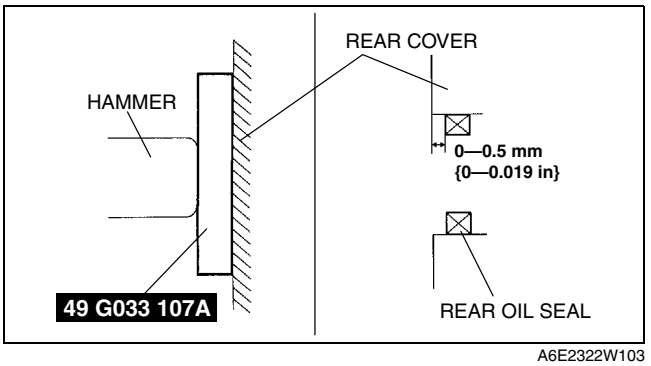
2. Remove the oil seal using a screwdriver protected with a rag.



A6E2322W102

Rear Oil Seal Installation Note

1. Apply clean engine oil to the 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.



A6E2322W103

ENGINE

ENGINE REMOVAL/INSTALLATION

A6E232401001201

Warning

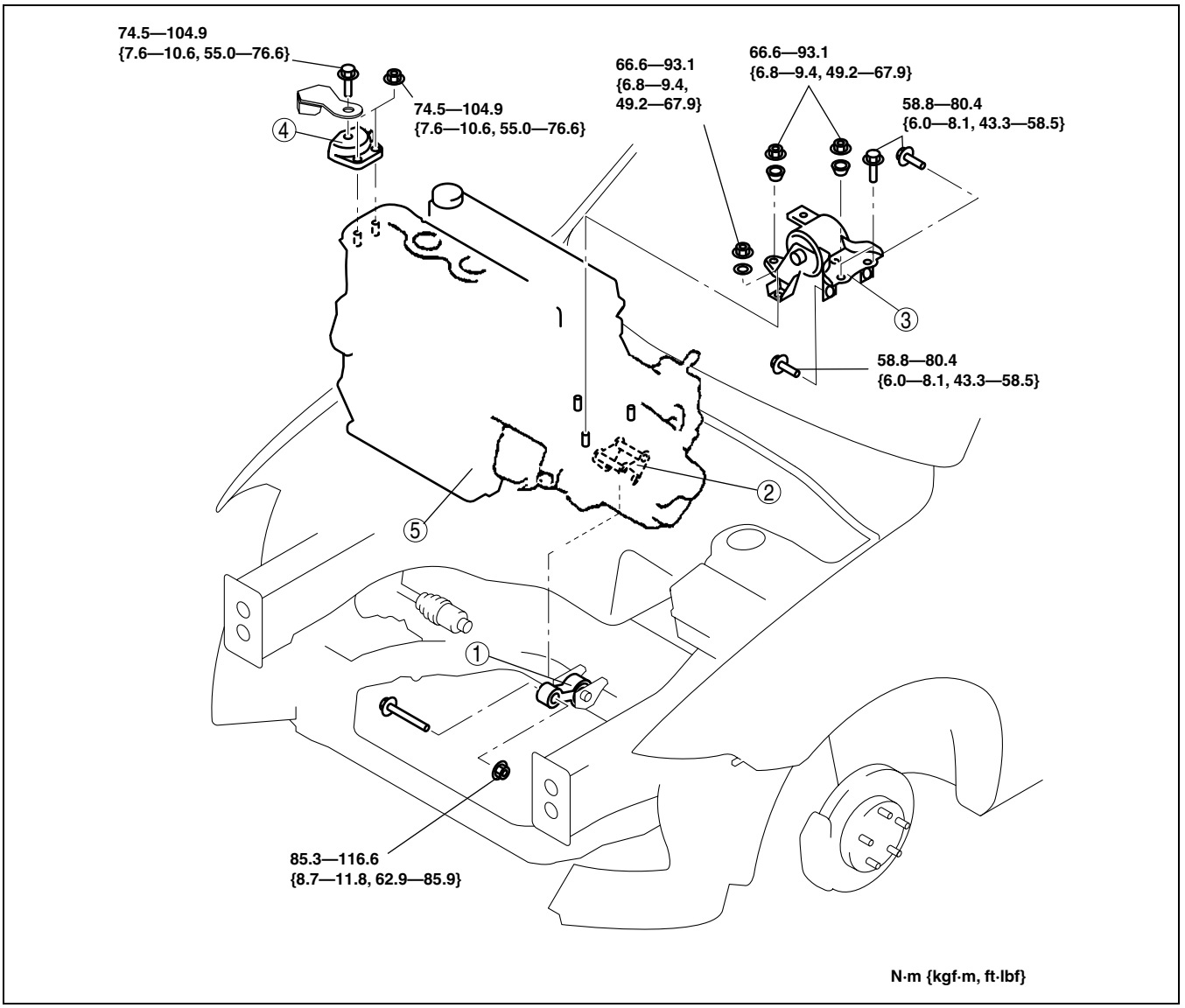
- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injures or death and damage. Fuel can also irritate skin and eyes. To prevent this, always complete the "Fuel Line Safety Procedure". (See F2–45 Fuel Line Safety Procedures.)**

1. Disconnect the negative battery cable.
2. Drain the engine coolant, engine oil, and transaxle oil.
3. Remove the radiator.
4. Remove the engine cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
5. Remove the air cleaner and air hose. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
6. Disconnect the fuel hose. (See F2–45 BEFORE REPAIR PROCEDURE.)
7. Remove the front pipe. (See F2–57 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
8. Remove the battery and tray. (See G–5 BATTERY REMOVAL/INSTALLATION.)
9. Remove the shift cable, select cable and clutch release cylinder related to the transaxle. (See J2–7 MANUAL TRANSAXLE REMOVAL/INSTALLATION.)
10. Remove the clutch release cylinder.
11. Remove the vacuum hose and the heater hose.
12. Disconnect the P/S oil pump pressure pipe and P/S oil pump relief hose from the P/S oil pump side. (See N–16 POWER STEERING OIL PUMP (MZR-CD (RF Turbo)) REMOVAL/INSTALLATION.)

Note

- The P/S oil pump will not be removed from the engine.

13. Remove the A/C compressor with the pipe still connected. Position the A/C compressor so that it is out of the way. Use wire or rope to secure it. (See U–11 A/C COMPRESSOR REMOVAL/INSTALLATION.)
14. Remove the joint shaft.
15. Remove the front drive shaft (LH) from the transaxle.
16. Remove in the order indicated in the table.
17. Install in the reverse order of removal.
18. Fill the engine coolant, engine oil, and transaxle oil.
19. Bleed the air from the fuel line. (See F2–45 AFTER REPAIR PROCEDURE.)
20. Start the engine and:
    - Inspect the pulleys and the drive belt for runout and contact.
    - Inspect the engine oil, engine coolant transaxle oil, P/S fluid, and fuel for leakage.
    - Inspect the idle speed. (See F2–34 IDLE SPEED INSPECTION.)
21. Perform a road test.
22. Reinspect the engine oil, engine coolant, transaxle oil, and P/S fluid levels.



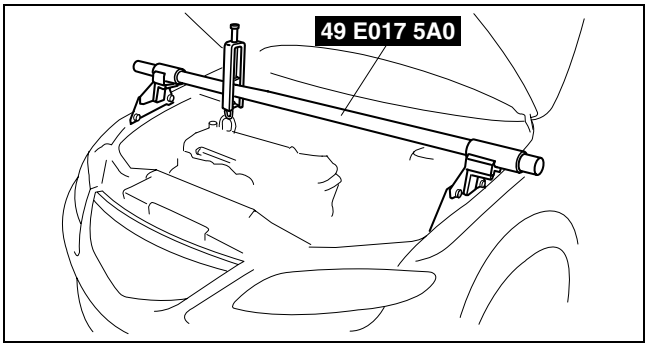
A6E2324W200

1	No.1 Engine mount rubber (See B2–29 No.1 Engine Mount Rubber Removal Note) (See B2–32 No.1 Engine Mount Rubber Installation Note)
2	No.1 Engine mount bracket (See B2–32 No.1 Engine Mount Bracket Installation Note)
3	No.4 Engine mount bracket and No.4 Engine mount rubber (See B2–29 No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Removal Note) (See B2–31 No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Installation Note)

4	No.3 Engine joint bracket (See B2–30 No.3 Engine Joint Bracket Installation Note)
5	Engine, transaxle

No.1 Engine Mount Rubber Removal Note

1. Suspend the engine using the **SST**.
2. Remove through-bolt A on the No.1 engine mount bracket side.

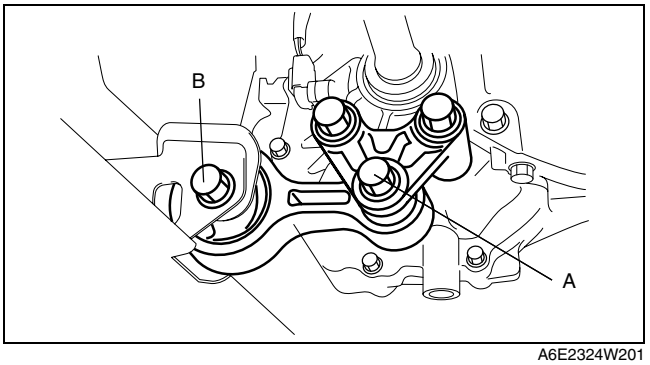


A6E2316W101

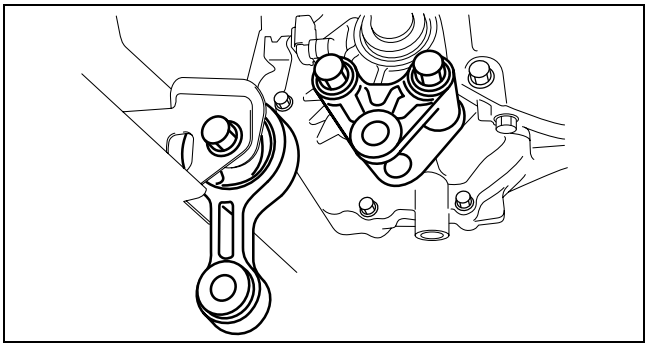
3. Loosen through-bolt B on the front crossmember side until approximately three pitches are showing.

Note

- Do not remove the No.1 engine mount rubber from the front crossmember.



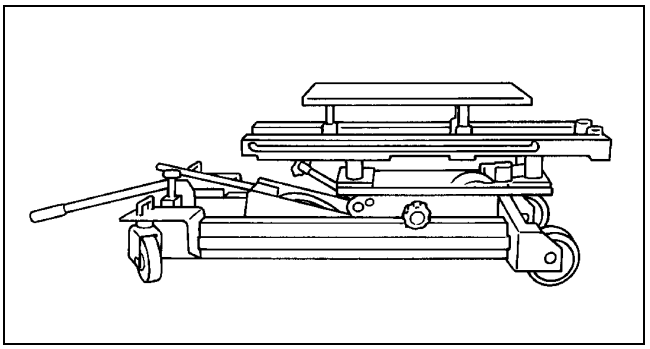
A6E2324W201



A6E2324W202

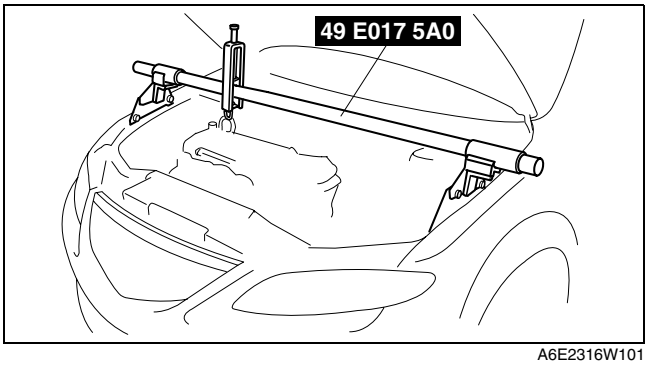
No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Removal Note

1. Secure the engine and the transaxle using an engine jack and attachment as shown.



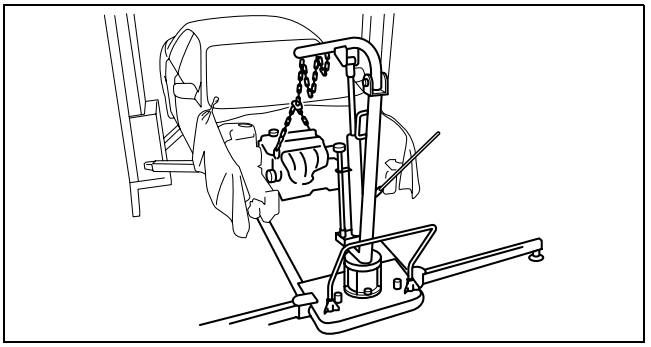
A6E2324W209

2. Remove the **SST**.

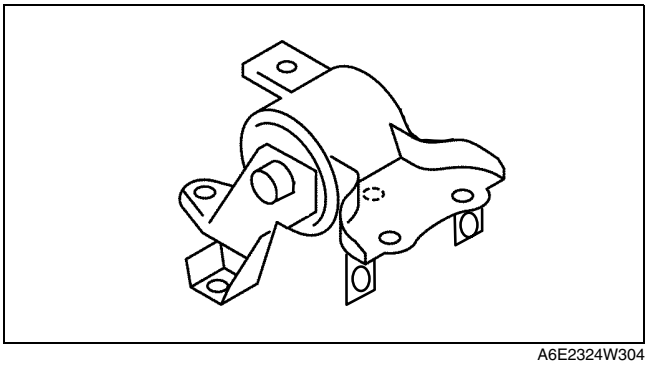


A6E2316W101

3. Secure the engine and the transaxle using a hoist.


A6E2324W203

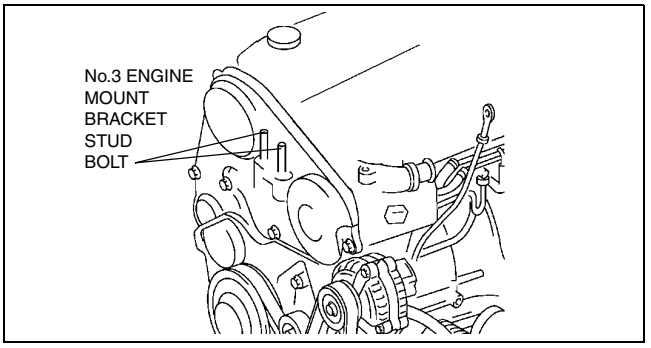
4. Remove the No.4 engine mount bracket and engine mount rubber together as a unit.


A6E2324W304

No.3 Engine Joint Bracket Installation Note

1. Tighten the No.3 engine mount bracket stud bolt.

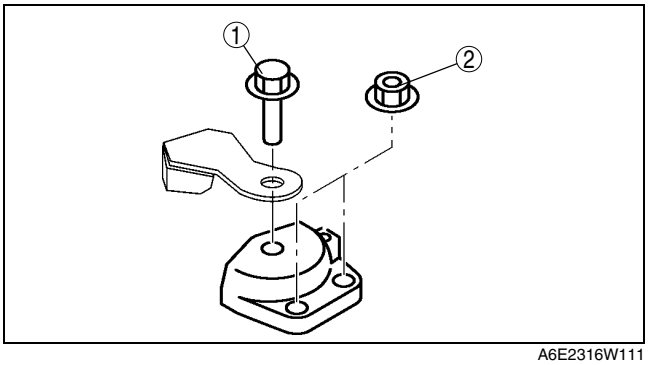
   Tightening torque
   7.0—13 N·m {71.4—132.5 kgf·cm, 62.0—115.0 in·lbf}



A6E2316W200

2. Tighten the No.3 engine joint bracket bolt and nut in the order as shown.

Tightening torque
74.5—104.9 N·m {7.6—10.6 kgf·m, 55.0—76.6 ft·lbf}

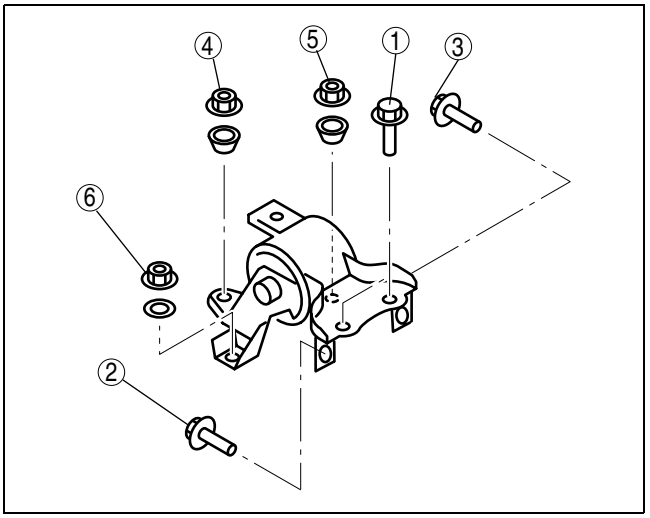


A6E2316W111

No.4 Engine Mount Bracket and No.4 Engine Mount Rubber Installation Note

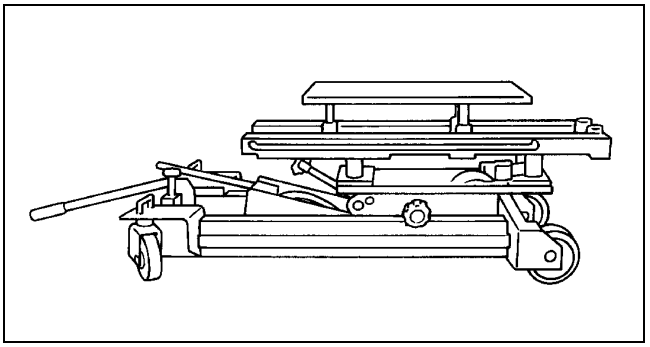
1. Tighten the No.4 engine mount bracket and No.4 engine mount rubber bolt and nut in the order as shown.

Bolt or nut No.	Tightening torque (N·m {kgf·m, ft·lbf})
1, 2, 3	**58.8—80.4 {6.0—8.1, 43.3—58.5}**
4, 5, 6	**66.6—93.1 {6.8—9.4, 49.2—67.9}**

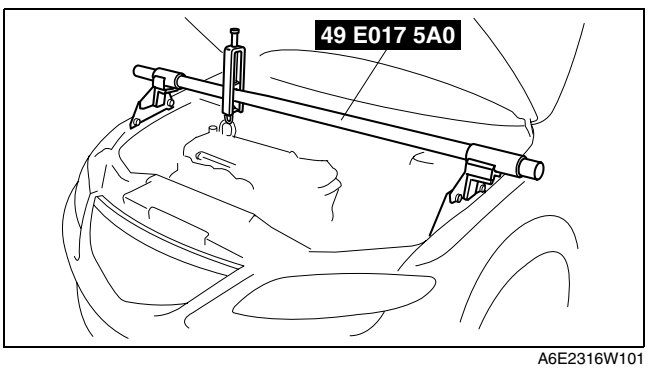


A6E2324W306

2. Secure the engine and the transaxle using an engine jack and attachment as shown.


A6E2324W209

3. Remove the hoist and secure the engine and transaxle using **SST**.



A6E2316W101

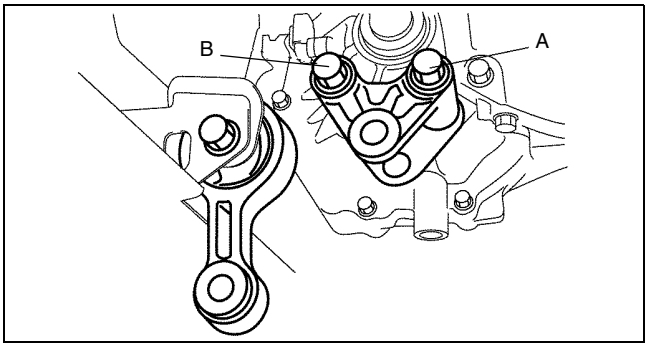
No.1 Engine Mount Bracket Installation Note

1. Tighten No.1 engine mount bracket bolt A.

   Tightening torque
   93.1—116.6 N·m {9.5—11.8 kgf·m, 68.7—85.9 ft·lbf}

2. Tighten No.1 engine mount bracket bolt B.

   Tightening torque
   93.1—116.6 N·m {9.5—11.8 kgf·m, 68.7—85.9 ft·lbf}



A6E2324W207

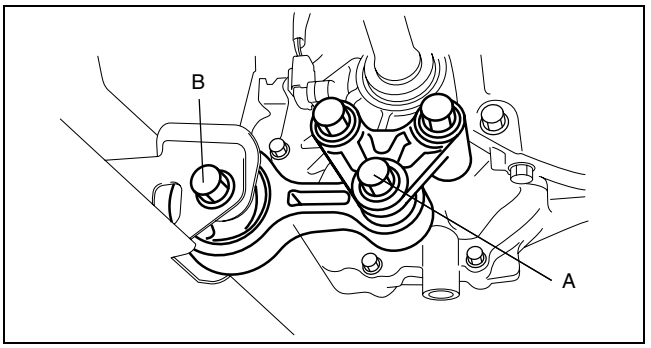
No.1 Engine Mount Rubber Installation Note

1. Tighten through-bolt A on the No.1 engine mount bracket.

   Tightening torque
   85.3—116.6 N·m {8.7—11.8 kgf·m, 62.9—85.9 ft·lbf}

2. Tighten through-bolt B on the front crossmember side.

   Tightening torque
   93.1—116.6 N·m {9.5—11.8 kgf·m, 68.7—85.9 ft·lbf}

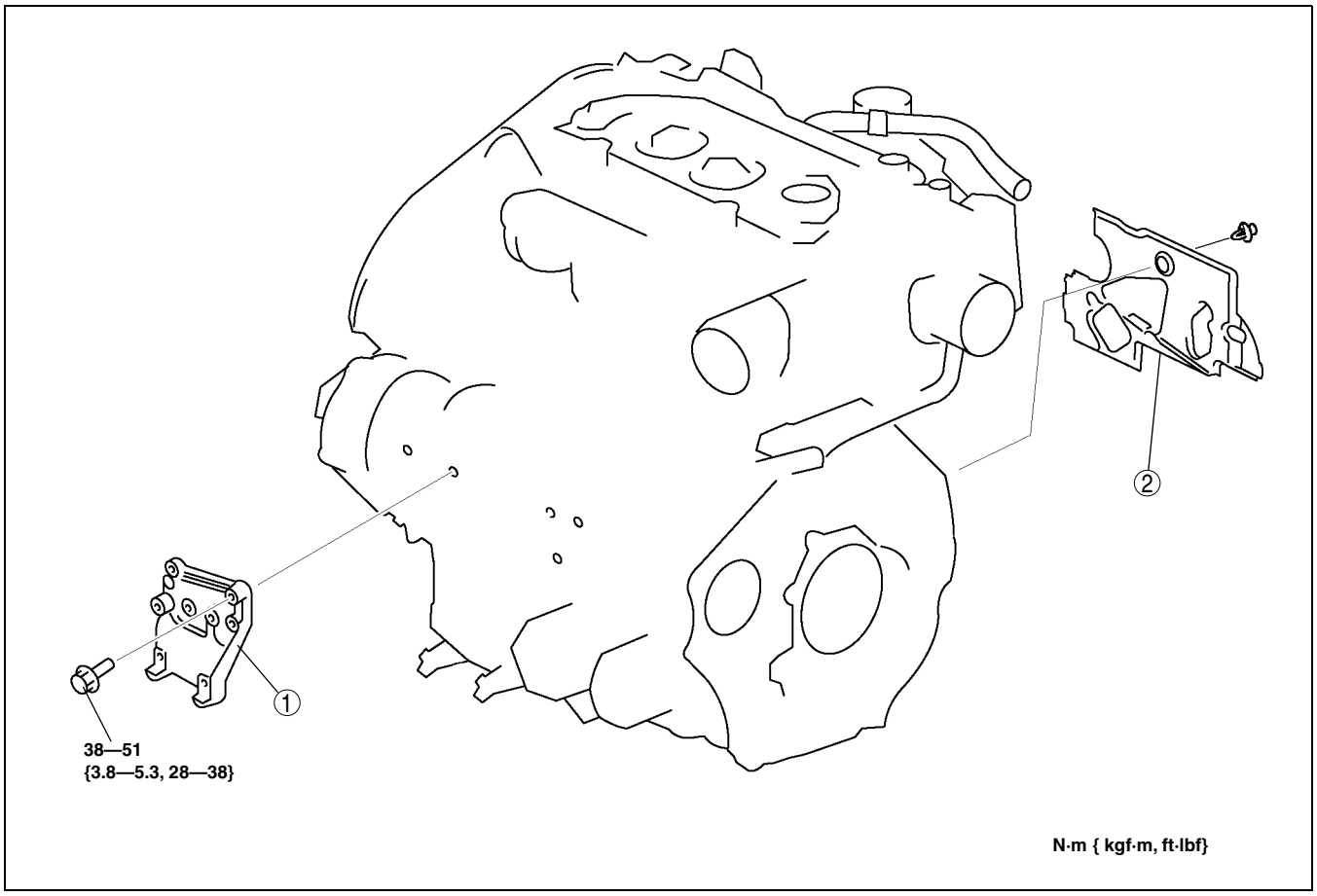


A6E2324W201

ENGINE DISASSEMBLY/ASSEMBLY

A6E232401001202

1. Disconnect the engine and transaxle. (See J2–7 MANUAL TRANSAXLE REMOVAL/INSTALLATION.)
2. Remove the intake-air system. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
3. Remove the exhaust system. (See F2–57 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
4. Remove the generator. (See G–7 GENERATOR REMOVAL/INSTALLATION.)
5. Remove the clutch. (See H–5 CLUTCH UNIT REMOVAL/INSTALLATION (A65M-R manual transaxle models).)
6. Remove the vacuum pump. (See P–13 VACUUM PUMP REMOVAL/INSTALLATION (MZR-CD (RF TURBO)).)
7. Remove the P/S oil pump. (See N–16 POWER STEERING OIL PUMP (MZR-CD (RF Turbo)) REMOVAL/INSTALLATION.)
8. Disassemble in the order indicated in the table.
9. Assemble in the reverse order of disassembly.



A6E2324W105

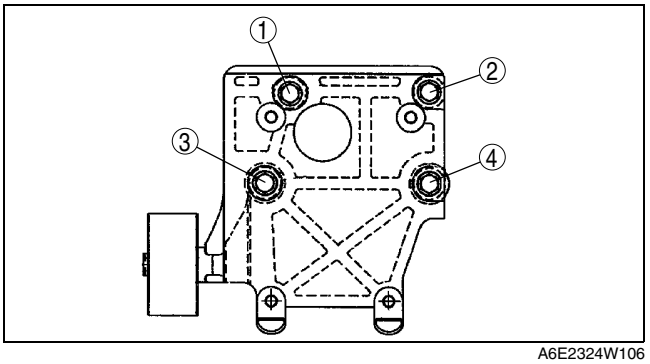
1	A/C compressor bracket (See B2–33 A/C Compressor Bracket Installation Note)

2	Seal plate

A/C Compressor Bracket Installation Note

1. Tighten the A/C compressor bracket bolts in the order shown.

Tightening torque
38—51 N·m {3.8—5.3 kgf·m, 28—38 ft·lbf}



A6E2324W106

LUBRICATION SYSTEM

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SPECIFICATIONS D-2
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OIL FILTER REPLACEMENT D-9
OIL COOLER D-9
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OIL PAN D-10
OIL PAN REMOVAL/INSTALLATION D-10

OUTLINE

OUTLINE OF CONSTRUCTION

A6E330202000201

- The construction and the operation of the oil cooler and the oil filter for the new Mazda6 (GG, GY) MZR-CD (RF Turbo) engine model is the same as the current Mazda MPV (LW) MZR-CD (RF Turbo) engine model. (See Mazda MPV Workshop Manual Supplement 1737-1*-02D.)
- The construction and the operation of the lubrication system except for the oil cooler and oil filter for the new Mazda6 (GG, GY) MZR-CD (RF Turbo) engine model is the same as the current Mazda 626, 626 Station Wagon (GF, GW) RF Turbo engine model. (European specs.) (See Mazda 626, 626 Station Wagon RF Turbo Workshop Manual Supplement 1614-10-98D.)
- The construction and the operation of the lubrication system for the new Mazda6 (GG, GY) L8, LF, and L3 engine models is the same as the current Mazda6 (GG) engine model L8, LF, and L3 engine models. (See Mazda6 Training Manual 3359-1*-02C, Mazda6 Workshop Manual 1730-1*-02C.)

SPECIFICATIONS

A6E330202000202

Gasoline engine

Item			Specification					
			New Mazda6 (GG, GY)	Current Mazda6 (GG)	New Mazda6 (GG, GY)	Current Mazda6 (GG)	New Mazda6 (GG, GY)	Current Mazda6 (GG)
			L8		LF		L3*	
Lubrication system			Force-fed type					
Oil cooler			Water-cooled					
Oil pressure (approximate quantity) [oil temperature: 100°C {212°F}]		(kPa {kgf/cm^2, psi}) min [rpm]	234—521 {2.39—5.31, 33.9—75.5} [3,000]				395—649 {4.03—6.61, 57.3—94.1} [3,000]	
Oil pump	Type		Trochoid gear type					
	Relief pressure (approximate quantity)	(kPa {kgf/cm^2, psi})	500—600 {5.09—6.11, 72.6—87.0}					
Oil filter	Type		Full-flow, Paper element					
	Bypass pressure (approximate quantity)	(kPa kgf/cm^2, psi})	80—120 {0.9—1.2, 12.8—17.0}					
Oil capacity (approximate quantity)	Total (dry engine)	(L {US qt, Imp qt})	4.6 {4.8, 4.0}				Dipstick A: 4.2 {4.4, 3.7} Dipstick B: 5.1 {5.4, 4.5}	
	Oil replacement	(L {US qt, Imp qt})	3.9 {4.0, 3.4}				Dipstick A: 3.1 {3.3, 2.7} Dipstick B: 4.0 {4.2, 3.5}	
	Oil and oil filter replacement	(L {US qt, Imp qt})	4.3 {4.5, 3.8}				Dipstick A: 3.5 {3.7, 3.1} Dipstick B: 4.4 {4.6, 3.9}	

: Always verify the oil level with the dipsticks since the engine oil capacity differs according to dipstick specifications. (See Mazda6 Workshop Manual 1730-1-02C Section D.)

Recommended Engine Oil (Gasoline Engine)

- The maintenance intervals on the scheduled maintenance table (See GI–8 SCHEDULED MAINTENANCE TABLE) can only be supported with the use of following oils.

Item			Specification			
			New Mazda6 (GG, GY),	Current Mazda6 (GG)	New Mazda6 (GG, GY),	Current Mazda6 (GG)
			L8, LF, L3			
Engine oil	Grade	API	SL			
		ACEA	A3			
	Viscosity (SAE)		5W-30, 10W-40		5W-20	
	Remarks		**Mazda genuine Dexelia oil e.g.**		—	

Diesel engine

Item			Specification		
			New Mazda6 (GG, GY)	Current Mazda 626, 626 Station Wagon (GF, GW)	Current Mazda MPV (LW)
			MZR-CD (RF Turbo)	RF Turbo	MZR-CD (RF Turbo)
Lubrication system			Force-fed type		—
Oil cooler			Water-cooled		—
Oil pressure (approximate quantity) [oil temperature: 100°C {212°F}]		(kPa {kgf/cm^2, psi}) min [rpm]	147 {1.5, 21} [1,000], 343 {3.5, 50} [3,000]		—
Oil pump	Type		Trochoid gear type	—	Trochoid gear type
	Relief pressure (approximate quantity)	(kPa {kgf/cm^2, psi}) [rpm]	580—700 {5.9—7.1, 84.1—101.5} [3,000]	—	580—700 {5.9—7.1, 84.1—101.5} [3,000]
Oil filter	Type		Full-flow, Paper element	—	Full-flow, Paper element
	Bypass pressure (approximate quantity)	(kPa kgf/cm^2, psi})	78—118 {0.8—1.2, 11.3—17.1}	—	78—118 {0.8—1.2, 11.3—17.1}
Oil capacity (approximate quantity)	Total (dry engine)	(L {US qt, Imp qt})	5.5 {5.8, 4.8}	5.4 {5.7, 4.8}	—
	Oil replacement	(L {US qt, Imp qt})	4.8 {5.1, 4.2}	4.5 {4.8, 4.0}	—
	Oil and oil filter replacement	(L {US qt, Imp qt})	5.0 {5.3 ,4.4}	4.7 {5.0, 4.1}	—

Bold frames: New specifications

Recommended Engine Oil (Diesel Engine)

- The maintenance intervals on the scheduled maintenance table (See GI–8 SCHEDULED MAINTENANCE TABLE) can only be supported with the use of following oils.

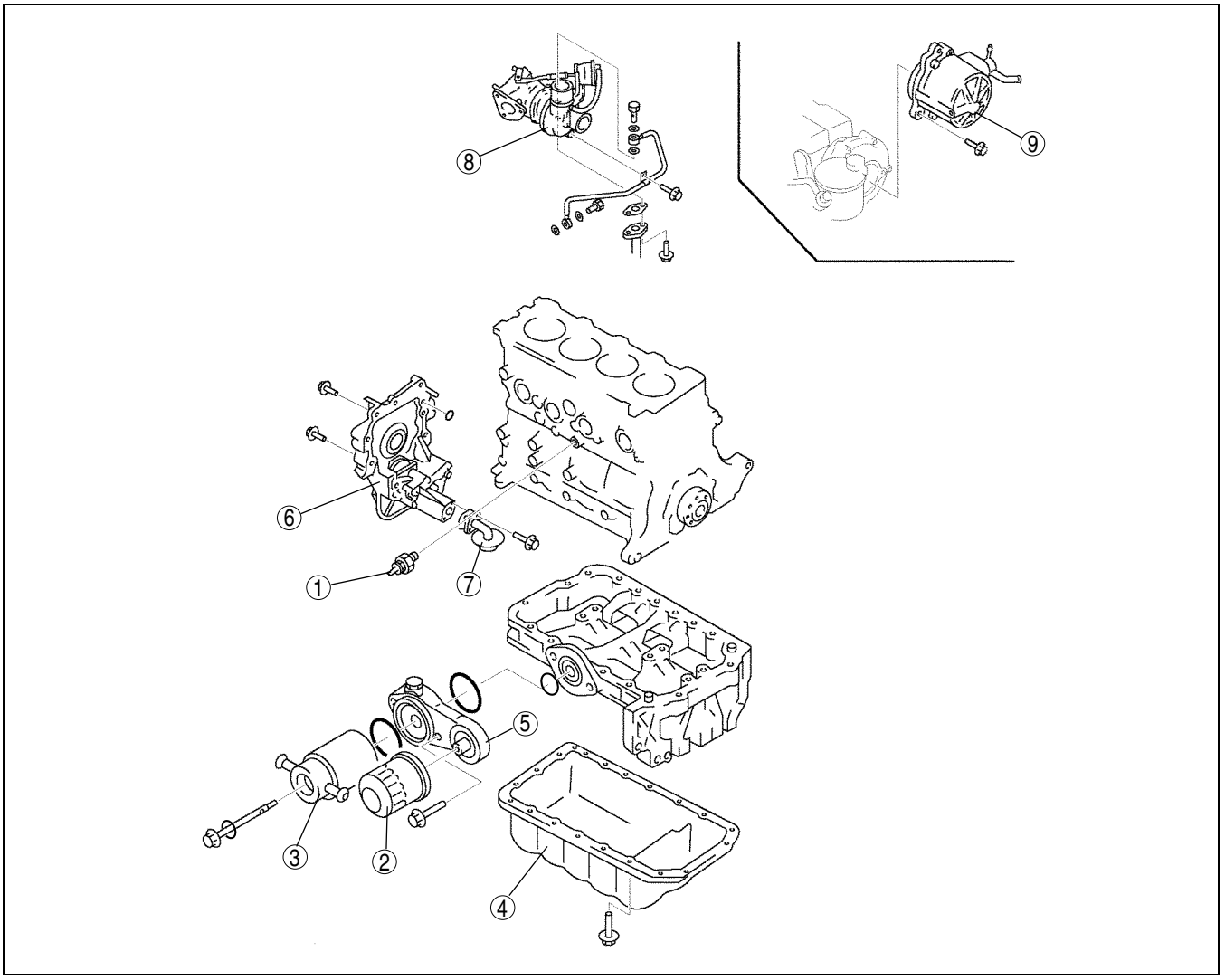
Item			Specification			
			New Mazda6 (GG, GY)			Current Mazda 626, 626 Station Wagon (GF, GW)
			MZR-CD (RF Turbo)			RF Turbo
Engine oil	Grade	API	CF		CD, CE, CF-4	CD
		ACEA	B1 or B3	B3	B3 or B4	—
	Viscosity (SAE)		5W-30	10W-40	5W-30, 10W-30	5W-30, 10W-30
	Remarks		Mazda genuine Dexelia oil e.g.		—	—

Bold frames: New specifications

STRUCTURAL VIEW

A6E330202000203

MZR-CD (RF Turbo)



A6E330W001

1	Oil pressure switch
2	Oil filter
3	Oil cooler
4	Oil pan
5	Oil filter adapter

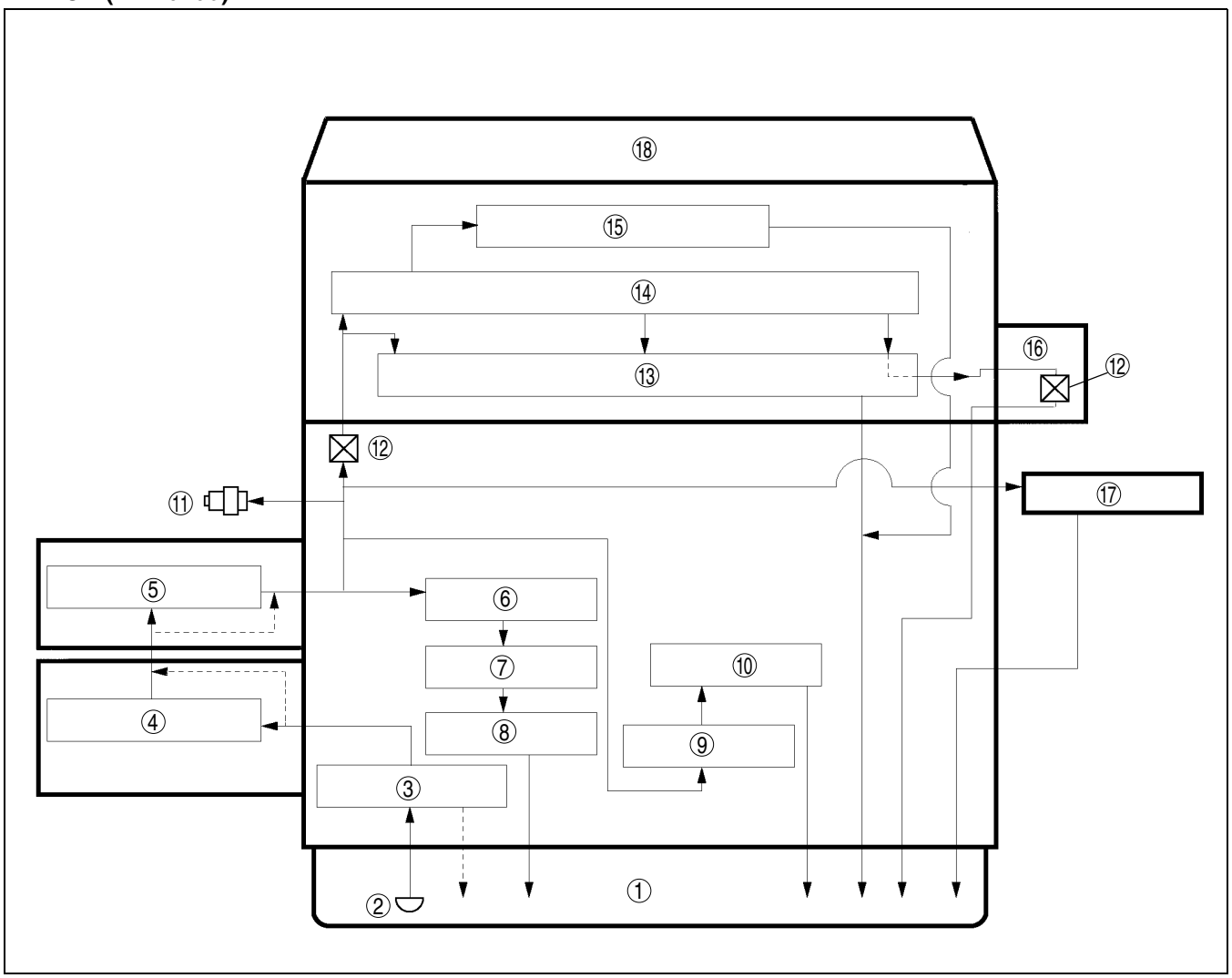
6	Oil pump
7	Oil strainer
8	Turbocharger
9	Vaccum pump

LUBRICATION SYSTEM

LUBRICATION FLOW CHART

A6E333014100202

MZR-CD (RF Turbo)



A6E3300W002

1	Oil pan
2	Oil strainer
3	Oil pump
4	Oil cooler
5	Oil filter
6	Main bearing
7	Crankshaft
8	Connecting rod bearing
9	Oil jet valve

10	Piston
11	Oil pressure switch
12	Orifice
13	Camshaft
14	Rocker arm shaft
15	Rocker arm, rocker arm bridge
16	Vaccum pump
17	Turbocharger
18	Cylinder head

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E330202000204

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Oil pressure

- Inspection procedure has been adopted. (MZR-CD (RF Turbo) engine model)

Engine oil

- Inspection procedure has been adopted. (MZR-CD (RF Turbo) engine model)
- Replacement procedure has been adopted. (MZR-CD (RF Turbo) engine model)

Oil filter

- Replacement procedure has been adopted. (MZR-CD (RF Turbo) engine model)

Oil cooler

- Removal/Installation procedure has been adopted. (MZR-CD (RF Turbo) engine model)

Oil pan

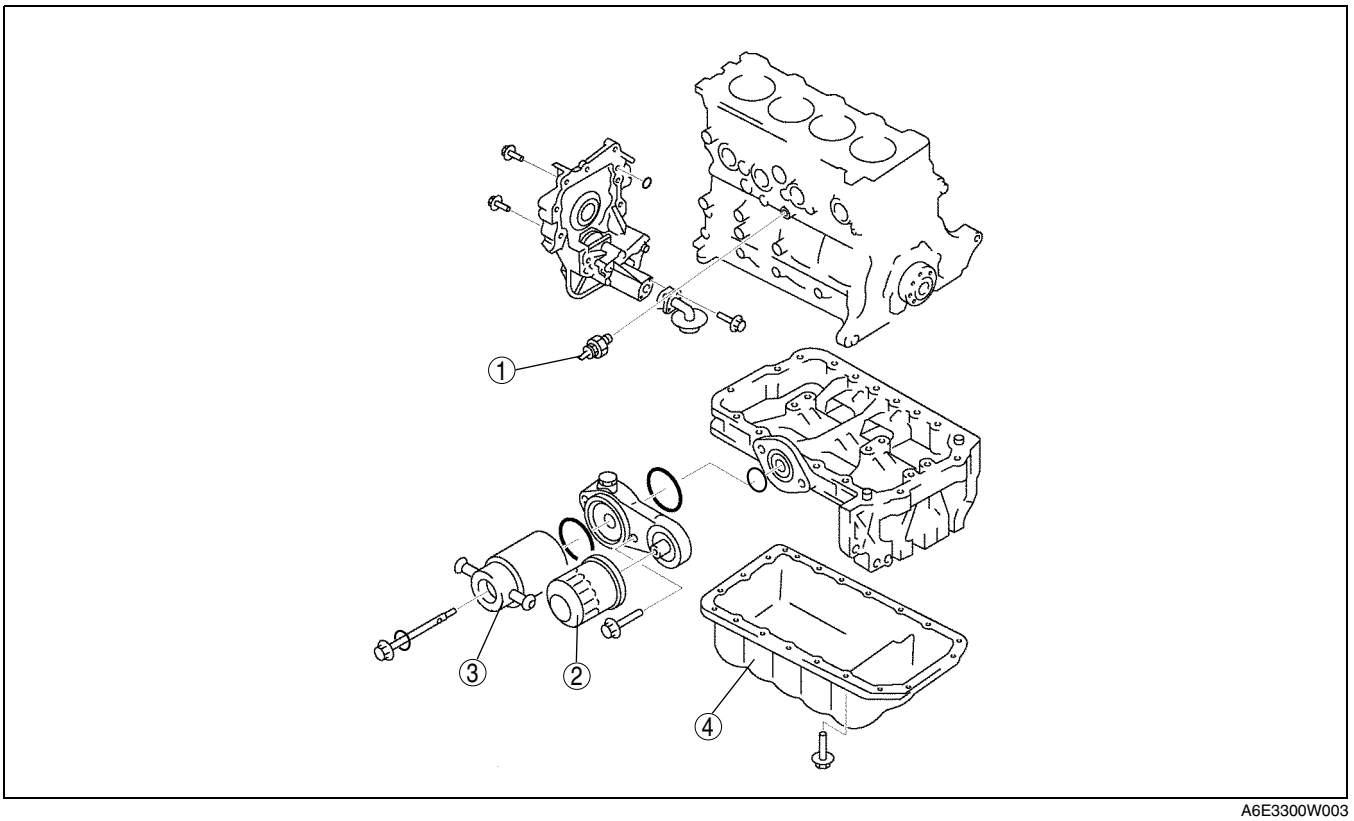
- Removal/Installation procedure has been adopted. (MZR-CD (RF Turbo) engine model)

LUBRICATION SYSTEM

LOCATION INDEX

A6E333014100201

MZR-CD (RF Turbo)



A6E3300W003

1	Oil pressure switch (See D–7 OIL PRESSURE INSPECTION)
2	Oil filter (See D–9 OIL FILTER REPLACEMENT)

3	Oil cooler (See D–9 OIL COOLER REMOVAL/INSTALLATION)
4	Oil pan (See D–10 OIL PAN REMOVAL/INSTALLATION)

OIL PRESSURE INSPECTION

OIL PRESSURE INSPECTION

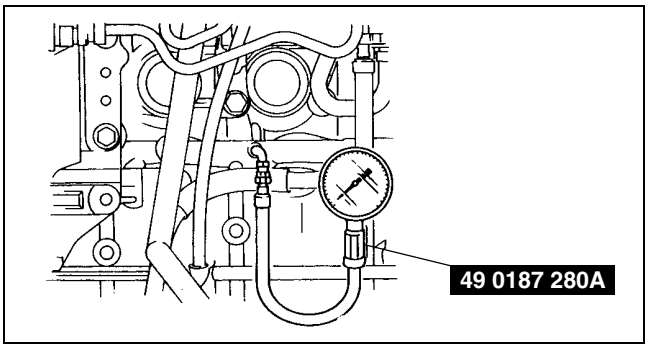
A6E331001003201

MZR-CD (RF Turbo)

Warning

- **Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.**
- **Hot engines and engine oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.**

1. Disconnect the negative battery cable.
2. Remove the under cover.
3. Remove the oil pressure switch.
4. Screw the **SST** into the oil pressure switch installation hole.
5. Warm up the engine to normal operating temperature.
6. Run the engine at the specified speed, and note the gauge readings.
   - If the pressure is not as specified, inspect for the cause and repair or replace if necessary.



A6E3310W100

Oil pressure (approximate quantity) [oil temperature: 100°C {212°F}]
147 kPa {1.5 kgf/cm^2, 21psi} min [1,000 rpm]
343 kPa {3.5 kgf/cm^2, 50 psi} min [3,000 rpm]

Note

- The oil pressure can vary with oil viscosity and temperature.

7. Stop the engine and wait until it is cool.
8. Remove the **SST**.

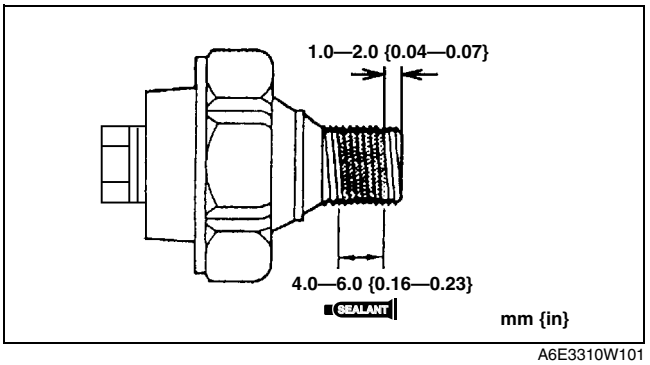
Caution

- **Any sealant stuck at the end of the oil pressure switch can cause operation malfunction of the oil pressure switch.**
  Be sure there is no sealant at the end of the oil pressure switch.

9. Apply silicone sealant to the oil pressure switch threads as shown.
10. Install the oil pressure switch.

Tightening torque
12—17 N·m {1.2—1.8 kgf·m, 9—13 ft·lbf}

11. Install the intake manifold bracket.
12. Start the engine and inspect for oil leakage.
    - If the oil leaks, specify the faulty part and repair or replace it.
13. Install the under cover.



A6E3310W101

ENGINE OIL

ENGINE OIL INSPECTION

A6E331214001201

MZR-CD (RF Turbo)

1. Position the vehicle on level ground.
2. Warm up the engine to normal operating temperature.
3. Stop the engine and wait for **5 min**.
4. Verify that the oil level is between the L and F marks on the dipstick and check the engine oil condition.
   - If the oil level is below the L mark, add engine oil. (See D–8 ENGINE OIL REPLACEMENT.)

ENGINE OIL REPLACEMENT

A6E331214001202

MZR-CD (RF Turbo)

Warning

- **Hot engines and engine oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.**
- **A vehicle that is lifted but not securely supported on safety stands is dangerous. It can slip or fall, causing death or serious injury. Never work around or under a lifted vehicle if it is not securely supported on safety stands.**
- **Continuous exposure to USED engine oil has caused skin cancer in laboratory mice. Protect your skin by washing with soap and water immediately after working with engine oil.**

Caution

- **In case you spill engine oil on the front pipe, wipe it off completely. If you fail to wipe the spilled oil, it will produce fumes because of the heat.**

1. Position the vehicle on level ground.
2. Remove the the oil filler cap.
3. Remove the under cover.
4. Remove the oil pan drain plug.
5. Drain the engine oil into a container.
6. Install the oil pan drain plug with a new the washer.

Tightening torque

12—17 N·m {1.2—1.8 kgf·m, 9—13 ft·lbf}

Note

- The amount of residual oil in the engine can vary with the replacement method, oil temperature, etc. Verify the oil level after engine oil replacement.

7. Refill the engine oil with the specified type and amount, then install the oil filler cap.

Oil capacity (approximate quantity)

L {US qt, Imp qt}

Item	Specification
Total (dry engine)	5.5 {5.8, 4.8}
Oil replacement	4.8 {5.1, 4.2}
Oil and oil filter replacement	5.0 {5.3, 4.4}

Note

- The maintenance intervals on scheduled maintenance table (See GI–8 SCHEDULED MAINTENANCE TABLE) can only be supported with the use of following oils.

Recommended Engine Oil

Item			Specification		
Engine oil	Grade	API	CF		CD, CE, CF-4
		ACEA	B1 or B3	B3	B3 or B4
	Viscosity (SAE)		5W-30	10W-40	5W-30, 10W-30
	Remarks		**Mazda genuine Dexelia oil e.g.**		—

8. Start the engine and inspect for oil leakage.
   - If the oil leaks, specify the faulty part and repair or replace it.
9. Inspect the oil level .
   - If the necessary, add oil. (See D–8 ENGINE OIL INSPECTION.)
10. Install the under cover.

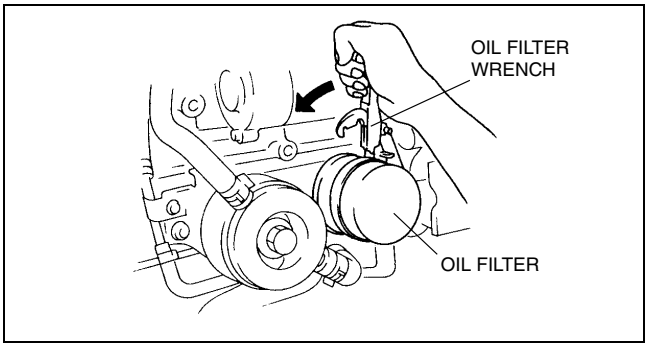
OIL FILTER

OIL FILTER REPLACEMENT

A6E331414300201

MZR-CD (RF Turbo)

1. Disconnect the negative battery cable.
2. Remove the under cover.
3. Remove the oil filter using the oil filter wrench.
4. Use a clean rag to wipe off the mounting surface on the oil filter.
5. Apply clean engine oil to the O-ring of a new oil filter.
6. Using the oil filter wrench, tighten the filter according to the installation procedure indicated on the side of the filter or packing box.
7. Start the engine and inspect for oil leakage.
   - If the oil leaks, specify the faulty part and repair or replace it.
8. Inspect the oil level. (See D–8 ENGINE OIL INSPECTION.)
9. Install the under cover.



A6E3314W100

OIL COOLER

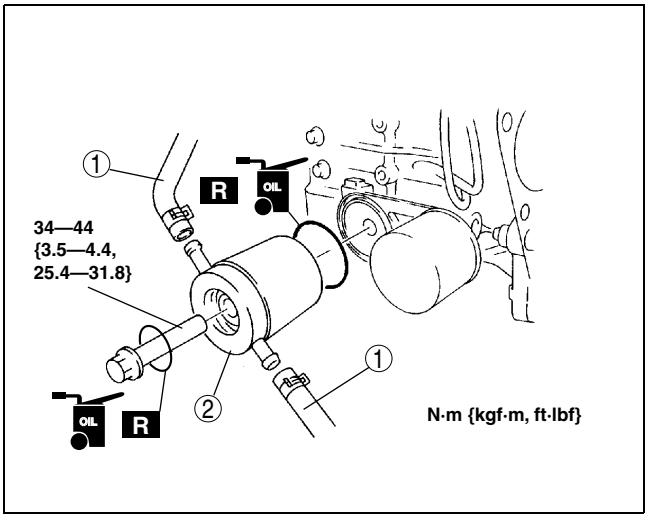
OIL COOLER REMOVAL/INSTALLATION

A6E331819900201

MZR-CD (RF Turbo)

1. Disconnect the negative battery cable.
2. Remove the under cover.
3. Drain the engine coolant.
4. Remove in the order indicated in the table.
5. Install in the reverse order of the removal.
6. Refill the engine coolant.
7. Start the engine and inspect for oil leakage.
   - If the oil leaks, specify the faulty part and repair or replace it.
8. Inspect the oil level. (See D–8 ENGINE OIL INSPECTION.)

1	Water hose
2	Oil cooler



A6E3318W100

OIL PAN

OIL PAN REMOVAL/INSTALLATION

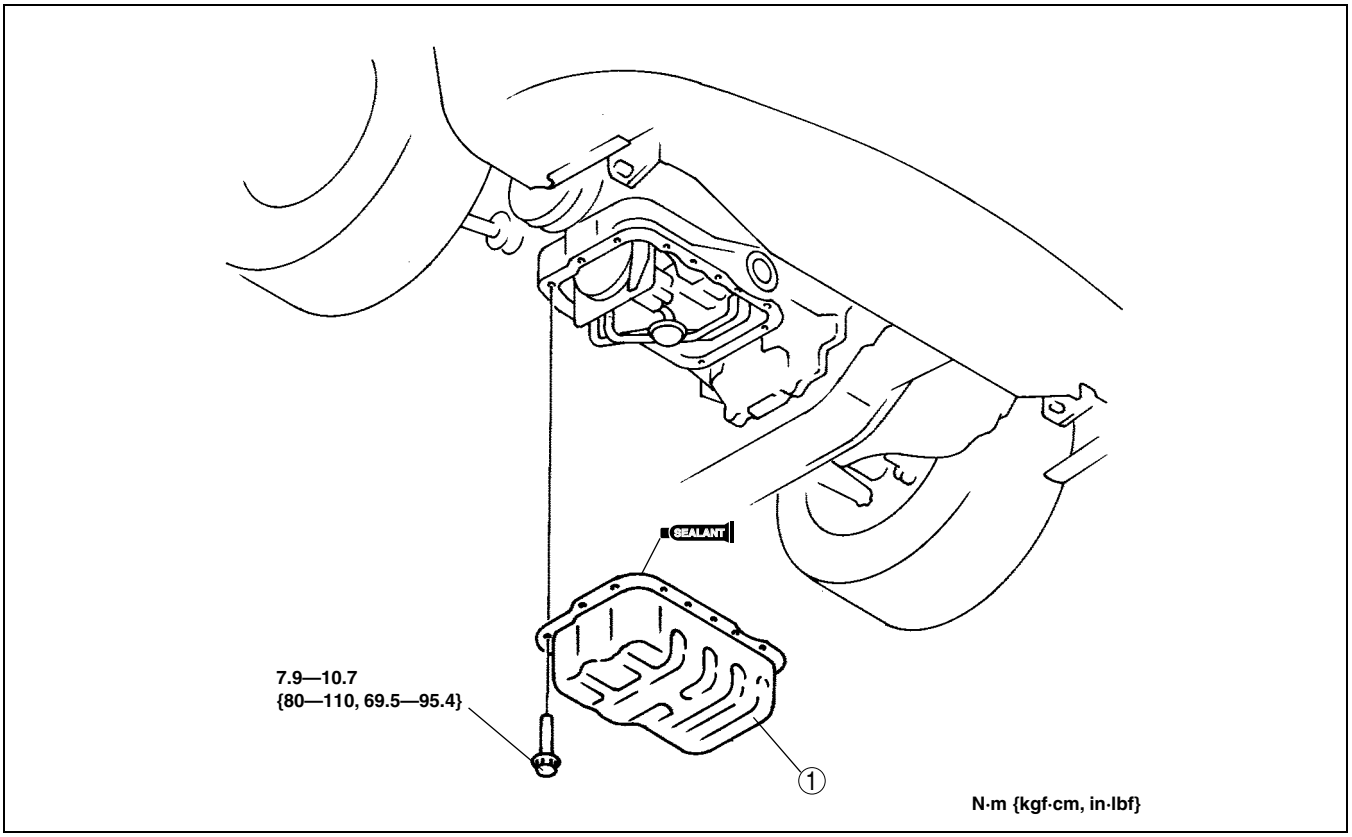
A6E332010040201

MZR-CD (RF Turbo)

Warning

- **Hot engines and engines oil can cause severe burns. Turn off the engine and wait until it and the engine oil have cooled.**

1. Disconnect the negative battery cable.
2. Remove the under cover.
3. Drain the engine oil. (See D–8 ENGINE OIL REPLACEMENT.)
4. Remove the lower radiator hose assembly under the oil pan with the cooling hose still connected. Position the lower radiator hose assembly so that it is out of the way.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Refill the engine oil with the specified type and amount. (See D–8 ENGINE OIL REPLACEMENT.)
8. Start the engine and inspect for oil leakage.
   - If the oil leaks, specify the faulty part and repair or replace it.
9. Inspect the oil level. (See D–8 ENGINE OIL INSPECTION.)



A6E3320W100

1	Oil pan (See D–10 Oil Pan Removal Note) (See D–11 Oil Pan Installation Note)

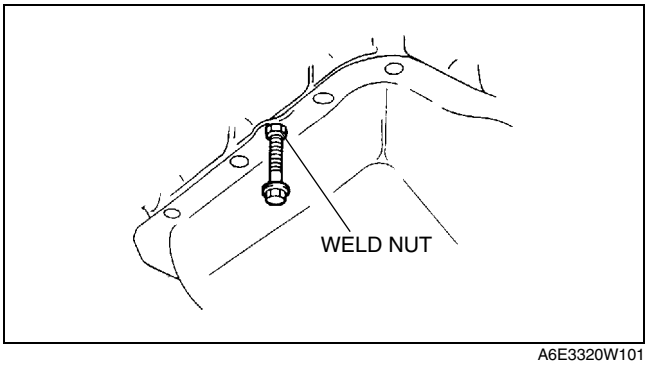
Oil Pan Removal Note

Caution

- **Pry tools can easily scratch the oil pan mounting surfaces. Prying off the oil pan can easily bend the oil pan flange.**
  Refer to the following instructions before removing the oil pan.

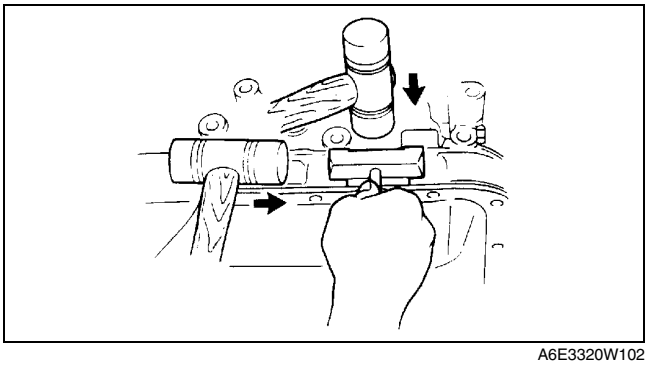
1. Remove the oil pan mounting bolts.
2. Remove the sealant from the bolt threads.

3. Screw an oil pan bolt into the weldnut to make a small gap between the cylinder block and the oil pan.



A6E3320W101

4. Remove the oil pan using the separator tool.



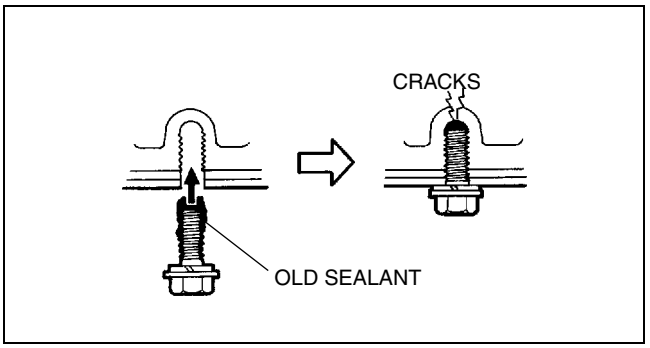
A6E3320W102

Oil Pan Installation Note

Caution
- **If the bolts are reused, remove the old sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause bolt hole damage.**

1. Apply silicone sealant to the oil pan along the inside of the bolt holes and overlap the ends.

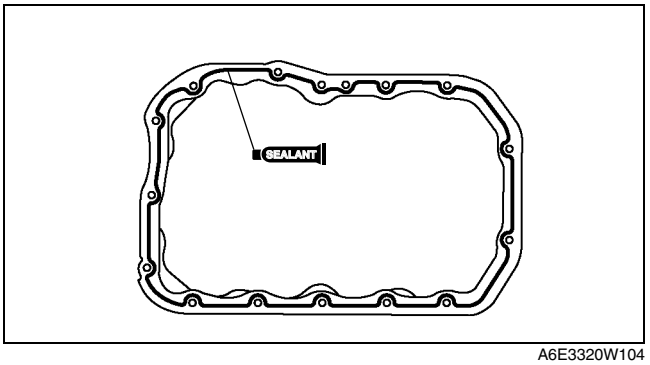
   Thickness
   2.5—3.5 mm {0.099—0.137 in}



A6E3320W103

2. Install the oil pan.
3. Hand tighten the flangeless bolts and tighten the flanged bolts

   Tightening torque
   7.9—10.7 N·m
   {80—110 kgf·cm, 69.5—95.4 in·lbf}



A6E3320W104

COOLING SYSTEM

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E360202000205

- The construction and operation of the water pump and the thermostat for the new Mazda6 (GG, GY) MZR-CD (RF Turbo) engine model are the same as the current Mazda 323 (BJ) RF Turbo engine model. (European specs.) (See Mazda 323 RF Turbo Workshop Manual Supplement 1633-10-98G.)
- The construction and operation of the cooling system except for the water pump and the thermostat for the new Mazda6 (GG, GY) MZR-CD (RF Turbo) engine model are the same as the current Mazda6 (GG) L3 engine model except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)
- The construction and operation of the engine cooling system for the new Mazda6 (GG, GY) L8, LF, and L3 engine models is the same as the current Mazda6 (GG) L8, LF, and L3 engine models. (See Mazda6 Training Manual 3359-1*-02C.)

FEATURES

A6E360202000206

Modification to fit the engine performance

- Cooling fan motor output has been changed. (MZR-CD (RF Turbo) engine model)

SPECIFICATIONS

A6E360202000209

Gasoline engine

Item			Specification					
			New Mazda6 (GG, GY)	Current Mazda6 (GG)	New Mazda6 (GG, GY)	Current Mazda6 (GG)	New Mazda6 (GG, GY)	Current Mazda6 (GG)
			L8		LF		L3	
Cooling system			Water-cooled					
Coolant capacity (approximate quantity)		(L {US qt, Imp qt})	7.5 {7.9, 6.6}					
Water pump	Type		Centrifugal, V-ribbed belt-driven					
Thermostat	Type		Wax, Bottom-bypass					
	Opening temperature	(°C {°F})	80—84 {176—183}					
	Full-open temperature	(°C {°F})	97 {206}					
	Full-open lift	(mm {in})	More than 8.0 {0.31}					
Radiator	Type		Corrugated fin					
	Cap valve opening pressure	(kPa {kgf/cm^2, psi})	113—142 {1.15—1.44, 16.4—20.4}					
Cooling fan	Type		Electric					
	Blade — Outer diameter	(mm {in})	300 {11.8}				320 {12.6}	
	Blade — Number of blade	(sheet)	Cooling fan No.1: 5 Cooling fan No.2: 7				Cooling fan No.1: 7 Cooling fan No.2: 5	

Bold frames: New specifications

Diesel engine

Item			Specification	
			New Mazda6 (GG, GY)	Current Mazda 323 (BJ)
			MZR-CD (RF Turbo)	RF Turbo
Cooling system			Water-cooled	
Coolant capacity (approximate quantity)		(L {US qt, Imp qt})	9.0 {9.5, 7.9}	
Water pump	Type		Centrifugal, Timing-belt driven	
Thermostat	Type		Wax, Bottom-bypass	
	Opening temperature	(°C {°F})	80—84 {176—183}	
	Full-open temperature	(°C {°F})	95 {203}	
	Full-open lift	(mm {in})	More than 8.5 {0.33}	
Radiator	Type		Corrugated fin	
	Cap valve opening pressure	(kPa {kgf/cm^2, psi})	94—122 {0.96—1.24, 13.7—17.6}	
Cooling fan	Type		Electric	
	Blade — Outer diameter	(mm {in})	320 {12.6}	300 {11.9}
	Blade — Number of blade	(sheet)	Cooling fan No.1: 7 Cooling fan No.2: 5	4

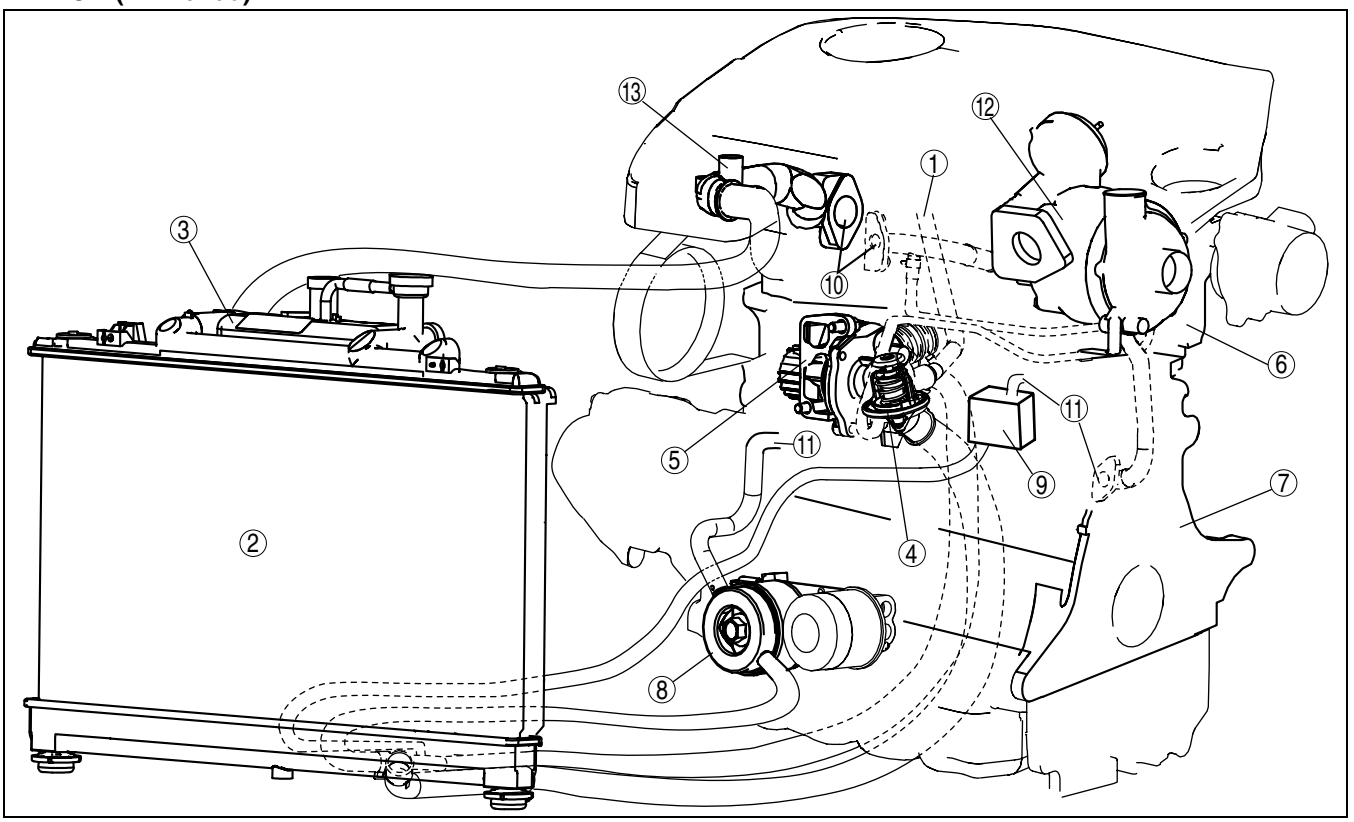
Bold frames: New specifications

COOLING SYSTEM

STRUCTURAL VIEW

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MZR-CD (RF Turbo)



A6E3602W201

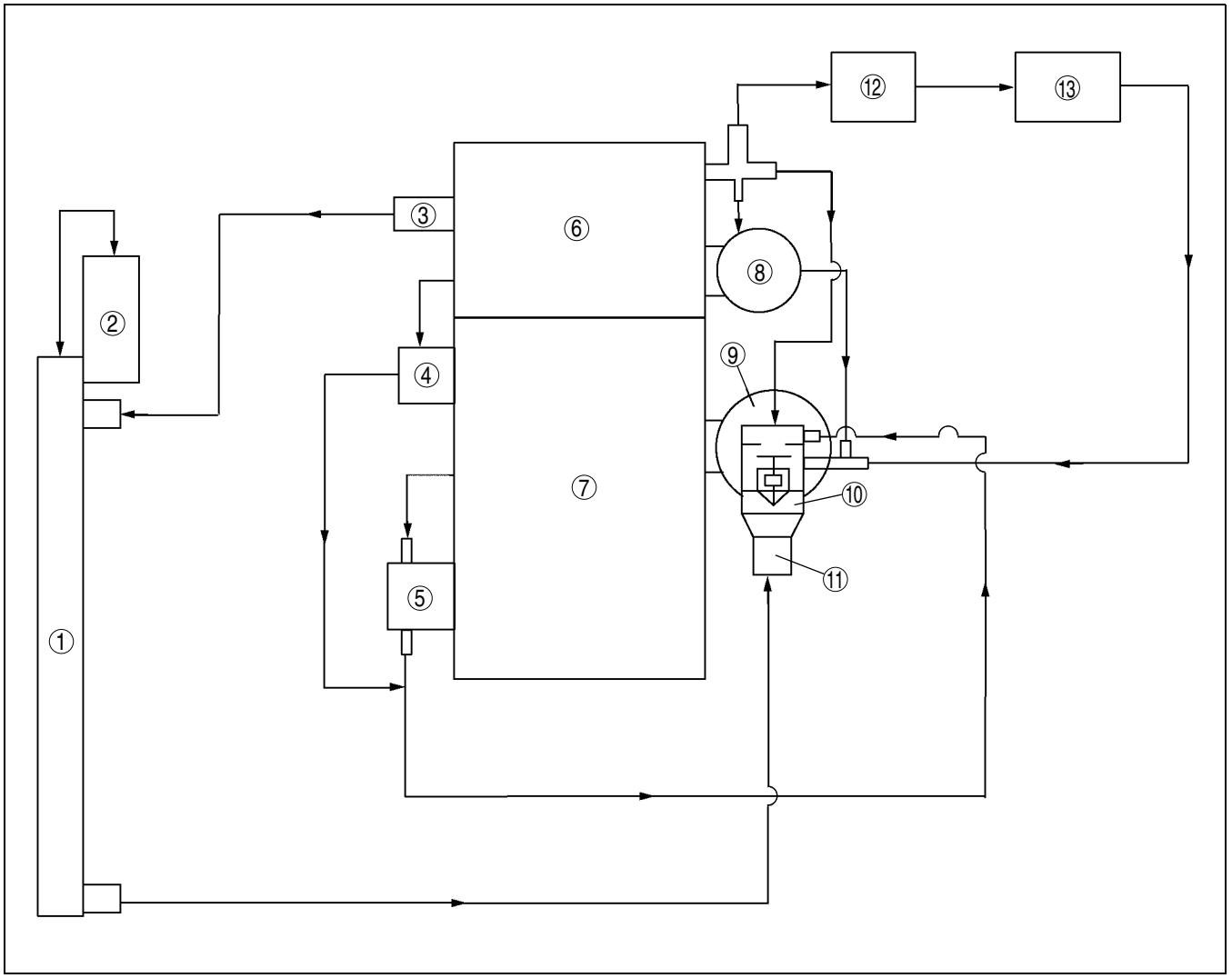
1	To water heater system
2	Radiator
3	Coolant reservoir tank
4	Thermostat
5	Water pump
6	Cylinder head
7	Cylinder block

8	Engine oil cooler
9	EGR water cooler
10	To cylinder head
11	To cylinder block
12	Turbocharger
13	Water outlet

COOLING FLOW DIAGRAM

A6E363002000202

MZR-CD (RF Turbo)



A6E3600W300

1	Radiator
2	Coolant reservoir tank
3	Water outlet
4	EGR water cooler
5	Engine oil cooler
6	Cylinder head
7	Cylinder block

8	Turbocharger
9	Water pump
10	Thermostat case
11	Thermostat cover
12	Water heater system
13	Heater core

COOLING FAN

A6E363002000204

MZR-CD (RF Turbo)

Structure

- Electric cooling fans No.1 and No.2, operated according to a cooling fan control signal from the PCM, have been adopted. Due to this, engine noise is reduced and rapid warm-up is possible.
- Cooling fans No.1 and No.2 are attached to the radiator cowling.
- The cooling fan motor output has been changed.

Cooling fan, Fan motor specification

ITEM				Specification
Cooling fan No.1	Fan	Number of blades	(sheet)	7
	Motor	Motor output	(W)	70
Cooling fan No.2	Fan	Number of blades	(sheet)	5
	Motor	Motor output	(W)	80

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E360202000208

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Radiator cap

- Inspection procedure has been added. (MZR-CD (RF Turbo) engine model)

Thermostat

- Removal/Installation procedure has been added. (MZR-CD (RF Turbo) engine model)
- Inspection procedure has been added. (MZR-CD (RF Turbo) engine model)

Water pump

- Removal/Installation procedure has been added. (MZR-CD (RF Turbo) engine model)

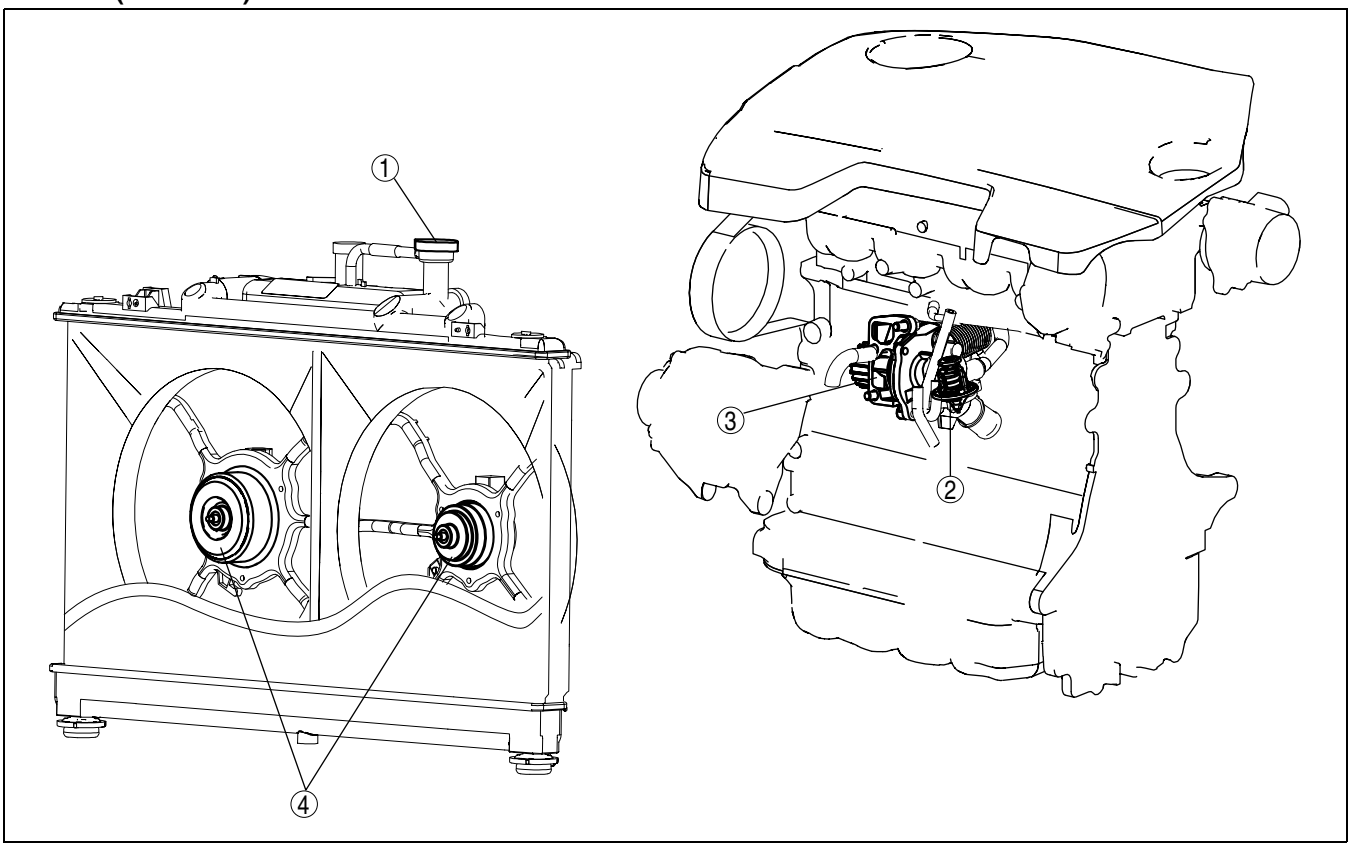
Fan motor

- Removal/Installation procedure has been added. (MZR-CD (RF Turbo) engine model)
- Inspection procedure has been added. (MZR-CD (RF Turbo) engine model)

LOCATION INDEX

A6E360202000210

MZR-CD (RF Turbo)



A6E3602W202

1	Radiator cap (See E–7 RADIATOR CAP INSPECTION)
2	Thermostat (See E–9 THERMOSTAT REMOVAL/INSTALLATION) (See E–10 THERMOSTAT INSPECTION)

3	Water pump (See E–11 WATER PUMP REMOVAL/INSTALLATION)
4	Cooling fan motor (See E–12 COOLING FAN MOTOR REMOVAL/INSTALLATION) (See E–13 COOLING FAN MOTOR INSPECTION)

RADIATOR CAP

RADIATOR CAP INSPECTION

A6E361415201201

MZR-CD (RF Turbo)

Warning

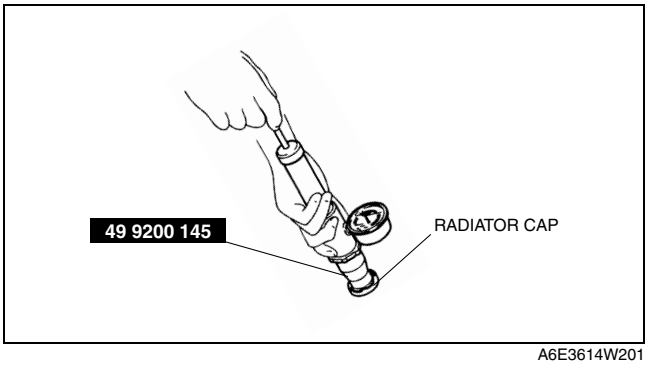
- **Never remove the radiator cap while the engine is running, or when the engine and radiator are hot. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you are sure all the pressure is gone, press down on the cap using the cloth, turn it, and remove it.**

1. Clean the radiator cap negative pressure valve and the sealed part.
2. Inspect the crack or turn over on the sealed part of the radiator cap.
   - If not as specified, repace the radiator cap.
3. Fill the **SST** with the water or the engine coolant to the full level and attach the radiator cap to the **SST**.
4. Hold the radiator cap downward and apply pressure gradually. Verify that the pressure become held for **10 s** within the specification.
   - If the pressure is not held stable within the specification, replace the radiator cap.

Pressure

94—122 kPa

{0.96—1.24 kgf/cm^2, 13.7—17.6 psi}



A6E3614W201

ENGINE COOLANT

ENGINE COOLANT LEAKAGE INSPECTION

A6E361215201201

MZR-CD (RF Turbo)

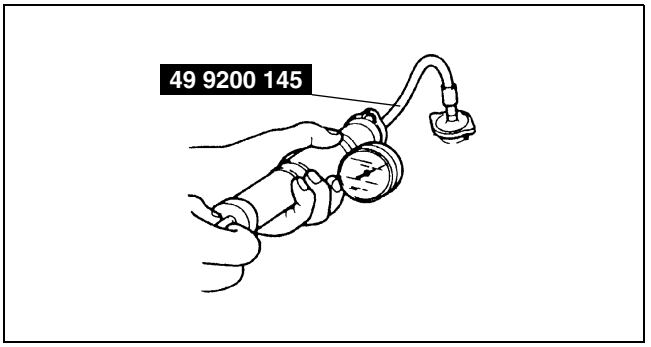
Warning

- **Never remove the radiator cap while the engine is running, or when the engine and radiator are hot. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system.**
- **Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counterclockwise to the first stop. Step back while the pressure escapes.**
- **When you are sure all the pressure is gone, press down on the cap using the cloth, turn it, and remove it.**

1. Inspect the coolant level.
2. Remove the radiator cap.
3. Clean the mounting surface of the rediator cap and the upper radiator hose.
4. Connect the **SST** to the reservoir filler port.
5. Apply specified pressure to the radiator.

Pressure
122 kPa { 1.24 kgf/cm^2, 17.6 psi}

6. Verify that the pressure is held.
   - If not, inspect the system for coolant leakage.
     — If the coolant leaks from the upper hose attachment part, replace the upper hose and the clamp.
     — If the coolant leaks from the main body of the radiator (caulked part), replace the radiator.



A6E3612W200

THERMOSTAT

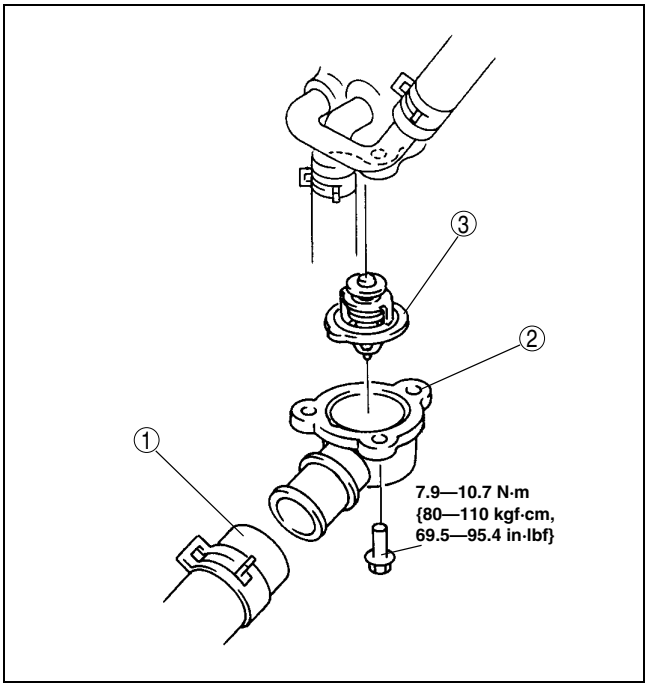
THERMOSTAT REMOVAL/INSTALLATION

A6E361815171201

MZR-CD (RF Turbo)

1. Disconnect the negative battery cable.
2. Remove the under cover.
3. Drain the engine coolant.
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Fill the radiator with the specified amount and type of engine coolant.
7. Inspect the engine coolant leakage. (See E–8 ENGINE COOLANT LEAKAGE INSPECTION.)

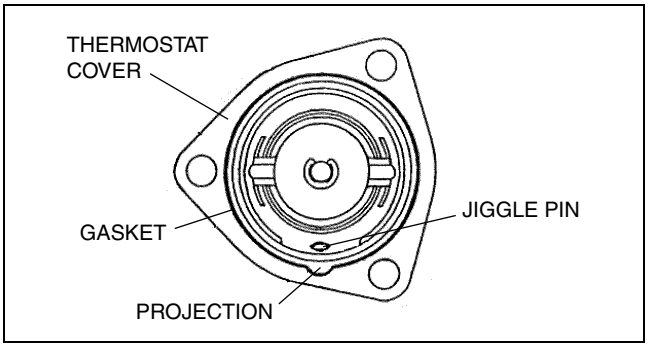
1	Lower radiator hose
2	Thermostat cover
3	Thermostat (See E–9 Thermostat Installation Note)



A6E3618W100

Thermostat Installation Note

1. Verify that the positions of the jiggle pin and the projection on the gasket are as shown.
2. Install the thermostat into the thermostat case, aligning the projection on the gasket to the thermostat cover.



A6A3618W101

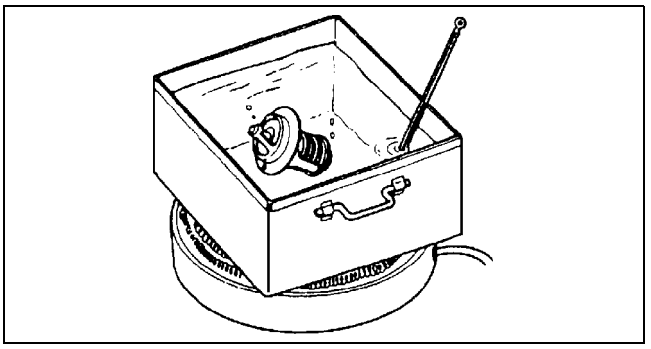
THERMOSTAT INSPECTION

MZR-CD (RF Turbo)

A6E361815171202

1. Inspect the thermostat for the following.
   - Closed valve at room temperature
   - Opening temperature and lift of the valve
     — If not as specified, replace the thermostat.

Condition	Specification
Initial-opening temperature (°C {°F})	80—84 {176—183}
Full-open temperature (°C {°F})	95 {203}
Full-open lift (mm {in})	More than 8.5 {0.33}



A6E3618W102

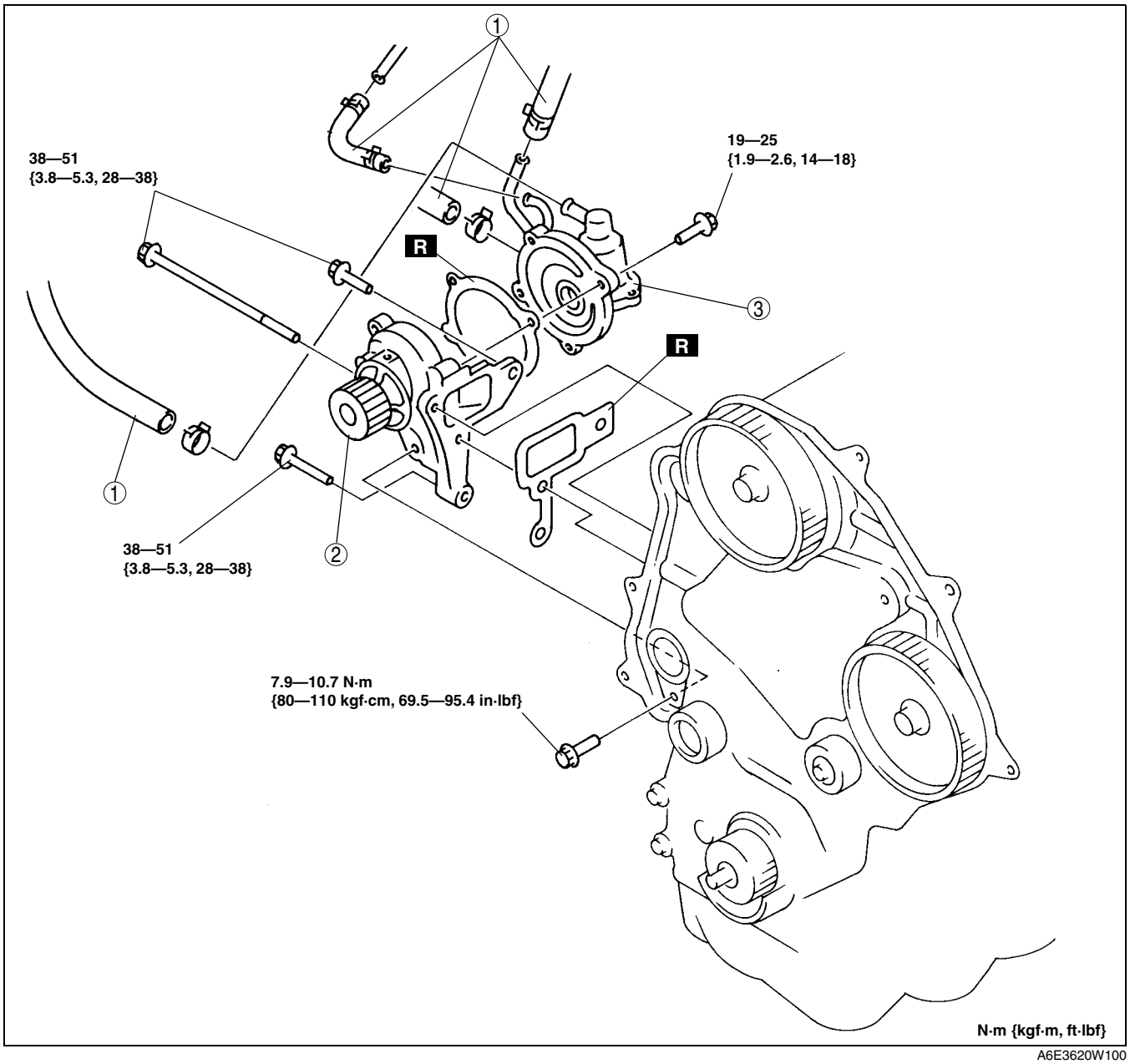
WATER PUMP

WATER PUMP REMOVAL/INSTALLATION

A6E362015010201

MZR-CD (RF Turbo)

1. Disconnect the negative battery cable.
2. Remove the under cover.
3. Drain the engine coolant.
4. Remove the timing belt. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
5. Remove the thermostat. (See E–9 THERMOSTAT REMOVAL/INSTALLATION.)
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Insect the drive belt. (See B2–4 DRIVE BELT INSPECTION.)
9. Fill the radiator with the specified amount and type of engine coolant.
10. Inspect the engine coolant leakage. (See E–8 ENGINE COOLANT LEAKAGE INSPECTION.)



A6E3620W100

1	Hose
2	Water pump
3	Thermostat case

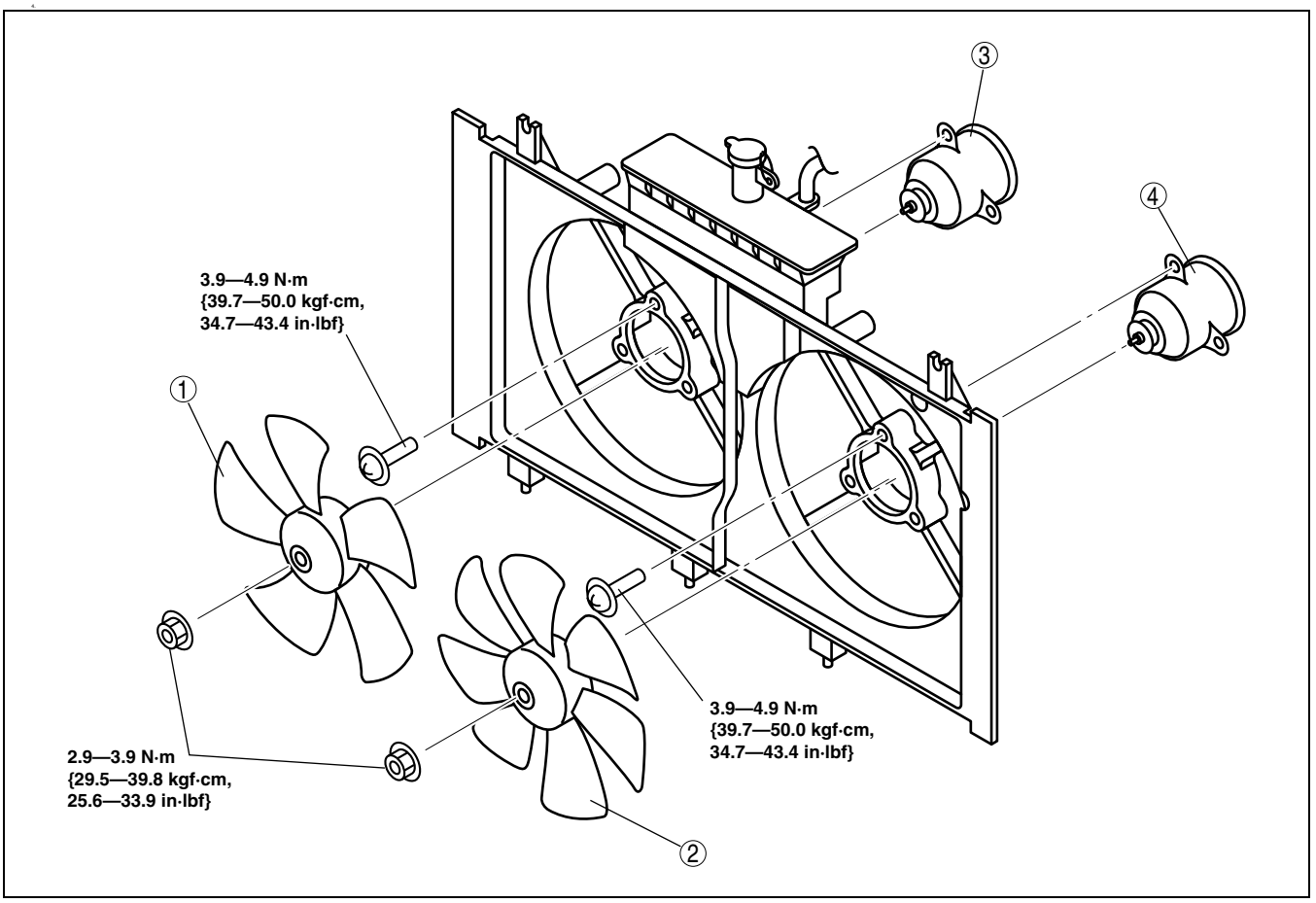
FAN MOTOR

COOLING FAN MOTOR REMOVAL/INSTALLATION

A6E362215025201

MZR-CD (RF Turbo)

1. Remove the cooling fan component.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



A6E3621W101

1	Cooling fan No.2
2	Cooling fan No.1
3	Cooling fan motor No.2
4	Cooling fan motor No.1

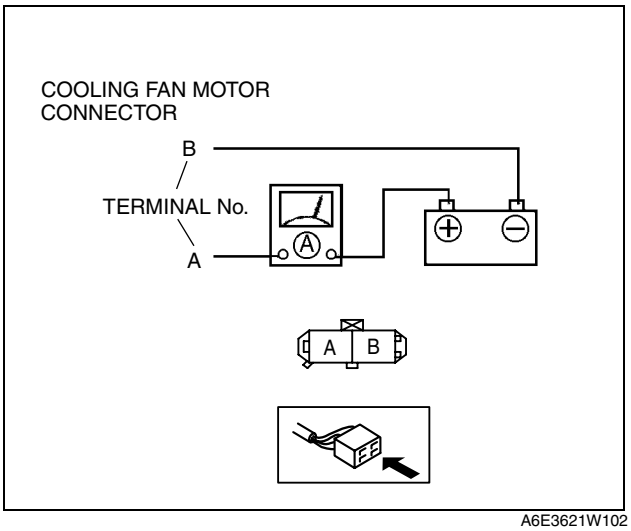
COOLING FAN MOTOR INSPECTION

A6E362215025202

MZR-CD (RF Turbo)

1. Verify that the battery is fully charged.
   - Charge if necessary. (See G–6 BATTERY RECHARGING.)
2. Connect battery positive voltage and an ammeter to the cooling fan motor connector.
3. Verify that the cooling fan motor operates smoothly at the standard current draw.
   - If not as specified, replace the cooling fan motor.

Item	Current (A) [12V]
Cooling fan motor No.1	4.4—7.4
Cooling fan motor No.2	6.3—9.3



A6E3621W102

FUEL AND EMISSION CONTROL SYSTEM [L8, LF, L3]

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E390218881201

- The fuel and emission control systems are essentially carried over from the current Mazda6 (GG), except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)

FEATURES

A6E390218881202

System simplification

- Controller area network has been adopted with TCM communication (4WD).

TCM adoption

- DTC for CAN (TCM communication) has been adopted.

Modifications to match the vehicle characteristics

- The idle speed has been modified.
- Fuel pump (transfer) has been adopted.

SPECIFICATIONS

A6E390218881203

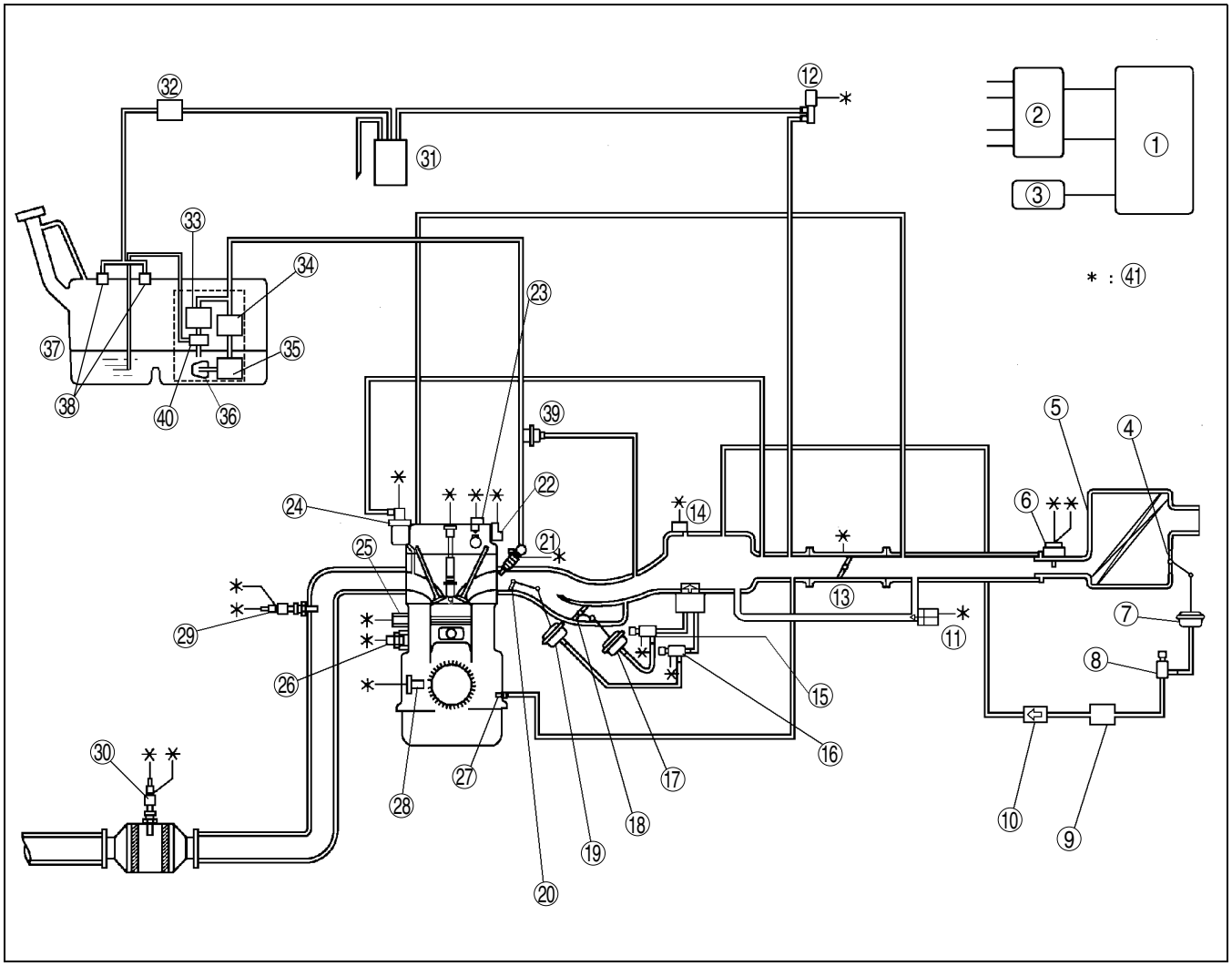
Item		2WD	4WD
Air cleaner element	Type	Paper element (oil permeated)	
IAC valve	Type	Duty control	
Fuel injector	Type	Hi-ohmic	
	Type of fuel delivery	Top-feed	
	Type of drive	Voltage	
Pressure regulator	Regulating pressure (kPa {kgf/cm^2, psi})	440 {4.5, 64}	
Fuel tank	Capacity (L {US qt, Imp qt})	64 {68, 56}	62 {65, 54}
Fuel	Specification	Unleaded (RON 90*1/95*2 or above)	Unleaded (RON 95 or above)
Catalyst	Type	TWC (monolythic)	
EGR control	Type	Stepping motor type	
Evaporative emission control system	Type	Canister type	
PCV system	Type	Closed type	

*1 : Without the BARO sensor
*2 : With the BARO sensor

Bold frames: New specifications

CONTROL SYSTEM DIAGRAM (4WD)

A6E390218881204



A6E39022000

1	PCM
2	Ignition coil
3	Generator
4*	VAD shutter valve
5	Air cleaner
6	MAF sensor
7*	VAD shutter valve actuator
8*	VAD control solenoid valve
9*	Vacuum chamber
10*	VAD check valve (one-way)
11	IAC valve
12	Purge solenoid valve
13	TP sensor
14	MAP sensor
15*	VIS control solenoid valve
16	Variable tumble control solenoid valve
17*	VIS shutter valve actuator
18*	VIS shutter valve
19	VTCS shutter valve actuator
20	VTCS shutter valve
21	Fuel injector

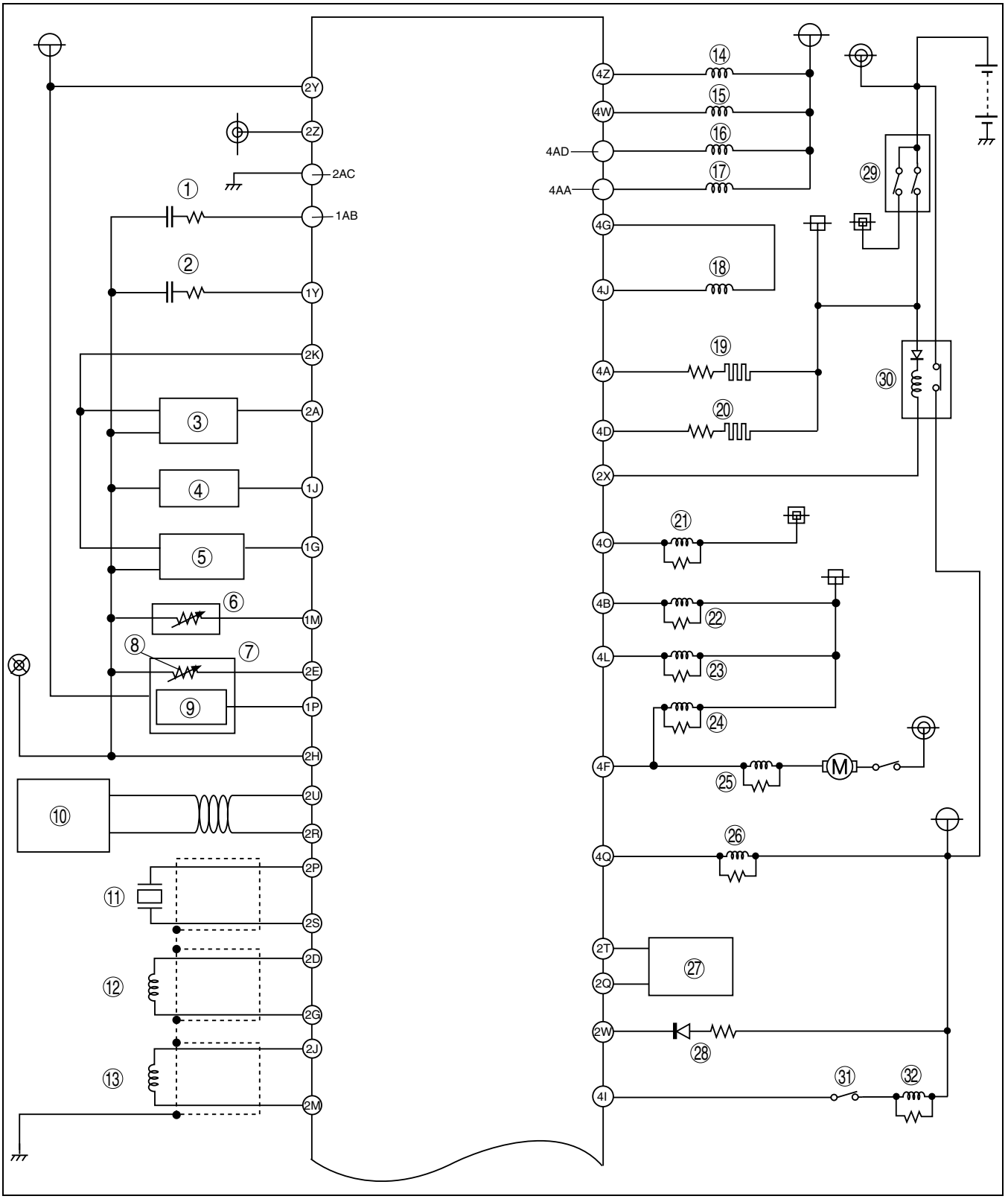
22*	OCV
23	CMP sensor
24	EGR valve
25	Knock sensor
26	ECT sensor
27	PCV valve
28	CKP sensor
29	HO2S (front)
30	HO2S (rear)
31	Charcoal canister
32	Check valve (two-way)
33	Pressure regulator
34	Fuel filter (high-pressure)
35	Fuel pump
36	Fuel filter (low-pressure)
37	Fuel tank
38	Rollover valve
39	Pulsation damper
40	Fuel pump (transfer)
41	To PCM

* : Equipped for L3 engine model

CONTROL SYSTEM WIRING DIAGRAM (4WD)

A6E390218881205

With Immobilizer System



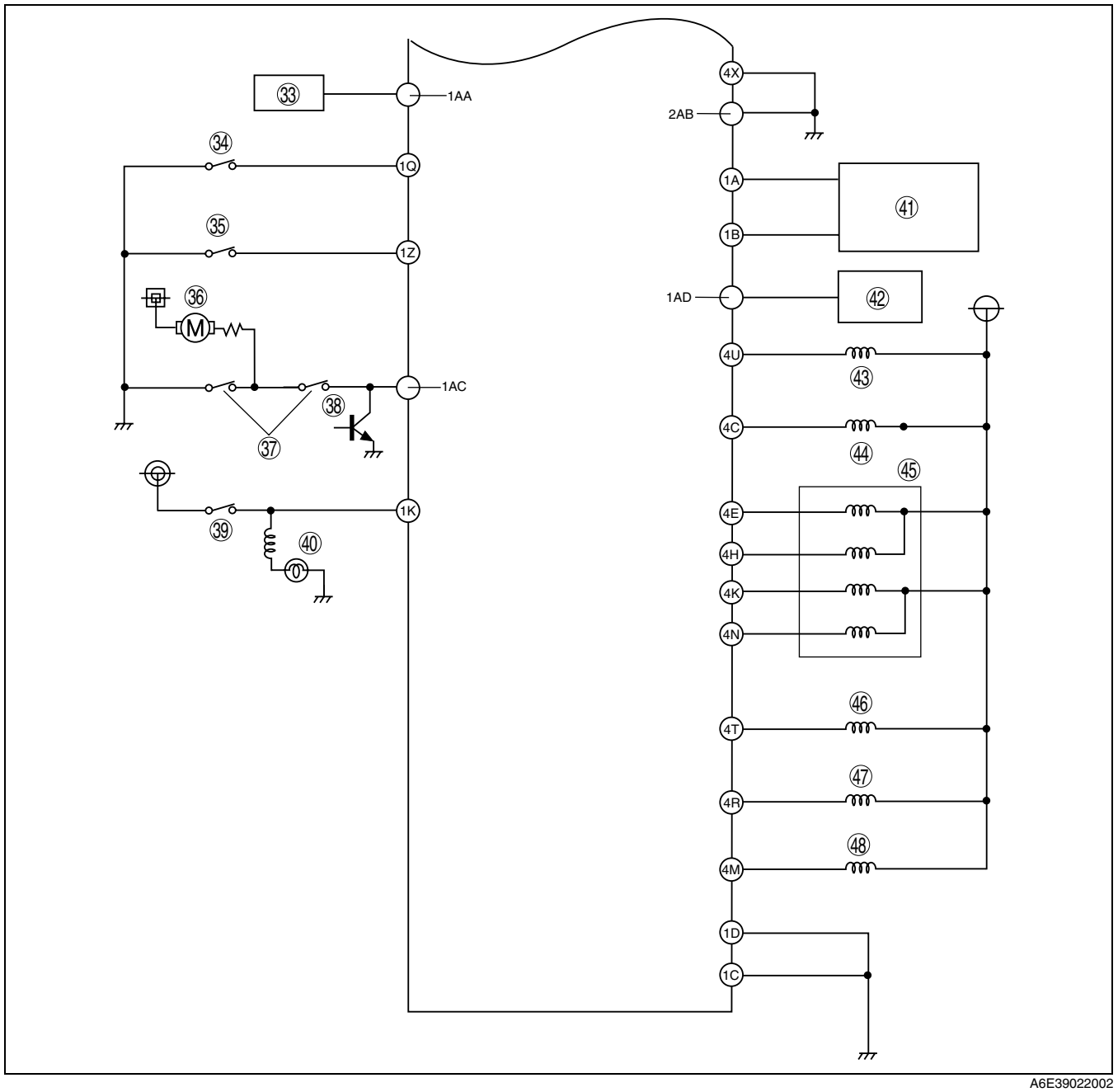
A6E39022001

1	HO2S (front)
2	HO2S (rear)
3	TP sensor
4	MAP sensor
5	BARO sensor

6	ECT sensor
7	MAF/IAT sensor
8	IAT sensor
9	MAF sensor
10	Controller area network (CAN)

11	Knock sensor
12	CKP sensor
13	CMP sensor
14	Fuel injector No.1
15	Fuel injector No.2
16	Fuel injector No.3
17	Fuel injector No.4
18	IAC valve
19	Oxygen sensor heater (front)
20	Oxygen sensor heater (rear)
21	A/C relay

22	Cooling fan relay
23	Cooling fan relay
24	Cooling fan relay
25	TR switch
26	Fuel pump relay
27	Coil
28	Security light
29	Ignition switch
30	Main relay
31	TR switch
32	Starter relay

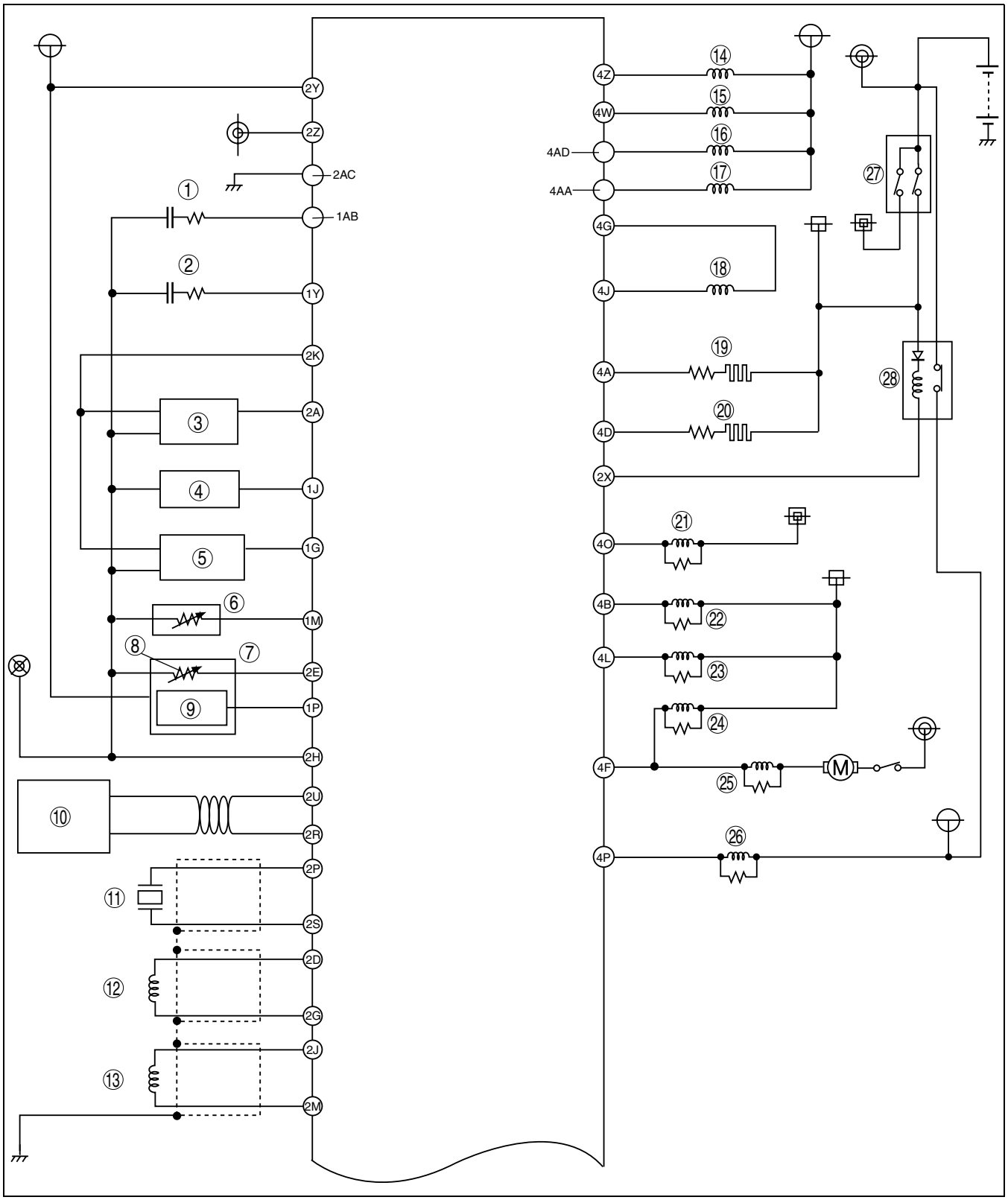


A6E39022002

33	Generator
34	Refrigerant pressure switch (middle)
35	PSP switch
36	Blower motor
37	Refrigerant pressure switch (high and low)
38	A/C switch
39	Brake switch
40	Brake light

41	Ignition coil
42	Generator
43	Purge solenoid valve
44	VAD control solenoid valve
45	EGR valve
46	Variable tumble control solenoid valve
47	VIS control solenoid valve
48	OCV

Without Immobilizer system



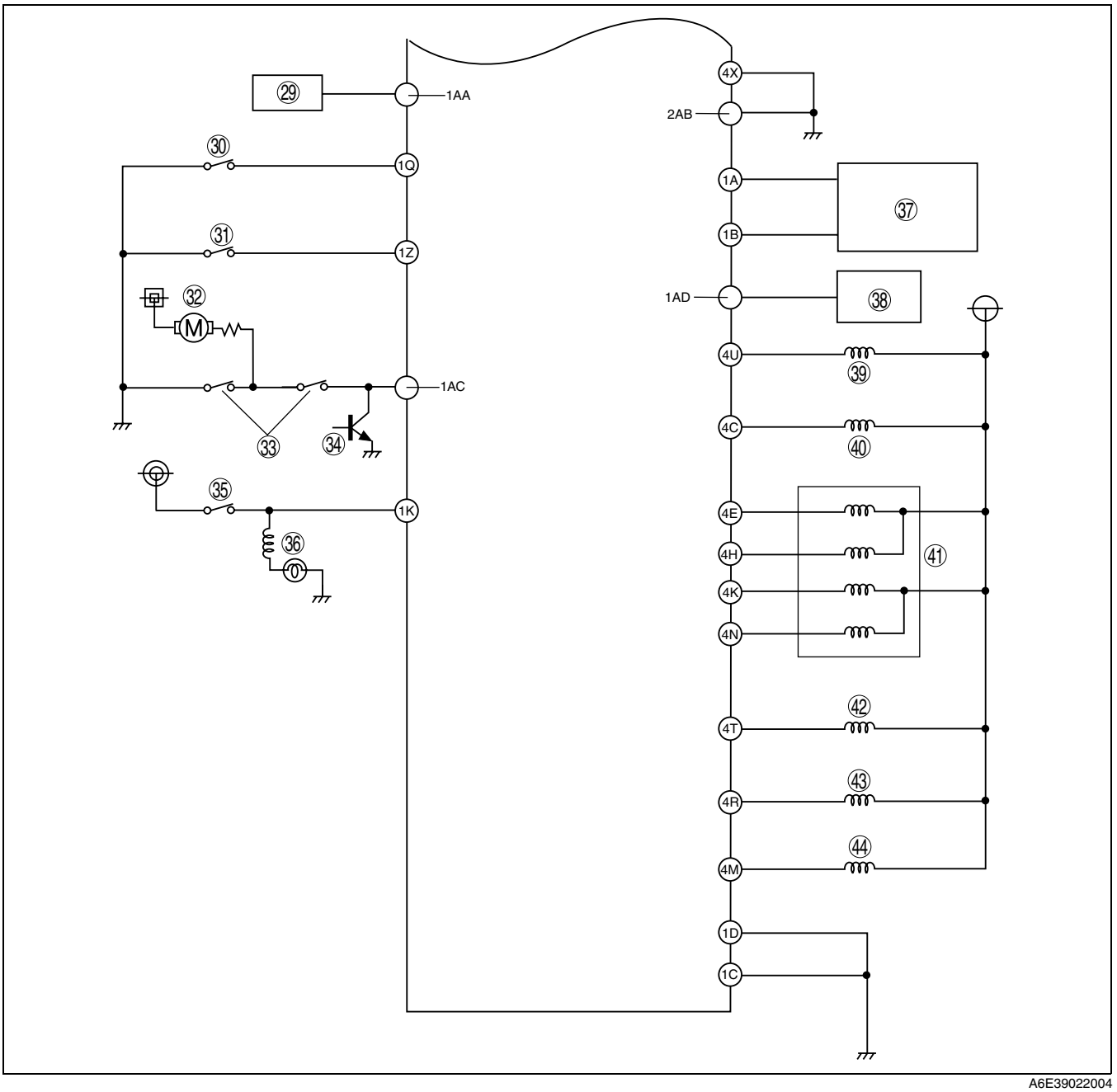
A6E39022003

1	HO2S (front)
2	HO2S (rear)
3	TP sensor
4	MAP sensor
5	BARO sensor
6	ECT sensor
7	MAF/IAT sensor

8	IAT sensor
9	MAF sensor
10	Controller area network (CAN)
11	Knock sensor
12	CKP sensor
13	CMP sensor
14	Fuel injector No.1

15	Fuel injector No.2
16	Fuel injector No.3
17	Fuel injector No.4
18	IAC valve
19	Oxygen sensor heater (front)
20	Oxygen sensor heater (rear)
21	A/C relay

22	Cooling fan relay
23	Cooling fan relay
24	Cooling fan relay
25	Cooling fan relay
26	Fuel pump relay
27	Ignition switch
28	Main relay



A6E39022004

29	Generator
30	Refrigerant pressure switch (middle)
31	PSP switch
32	Blower motor
33	Refrigerant pressure switch (high and low)
34	A/C switch
35	Brake switch
36	Brake light

37	Ignition coil
38	Generator
39	Purge solenoid valve
40	VAD control solenoid valve
41	EGR valve
42	Variable tumble control solenoid valve
43	VIS control solenoid valve
44	OCV

FUEL SYSTEM

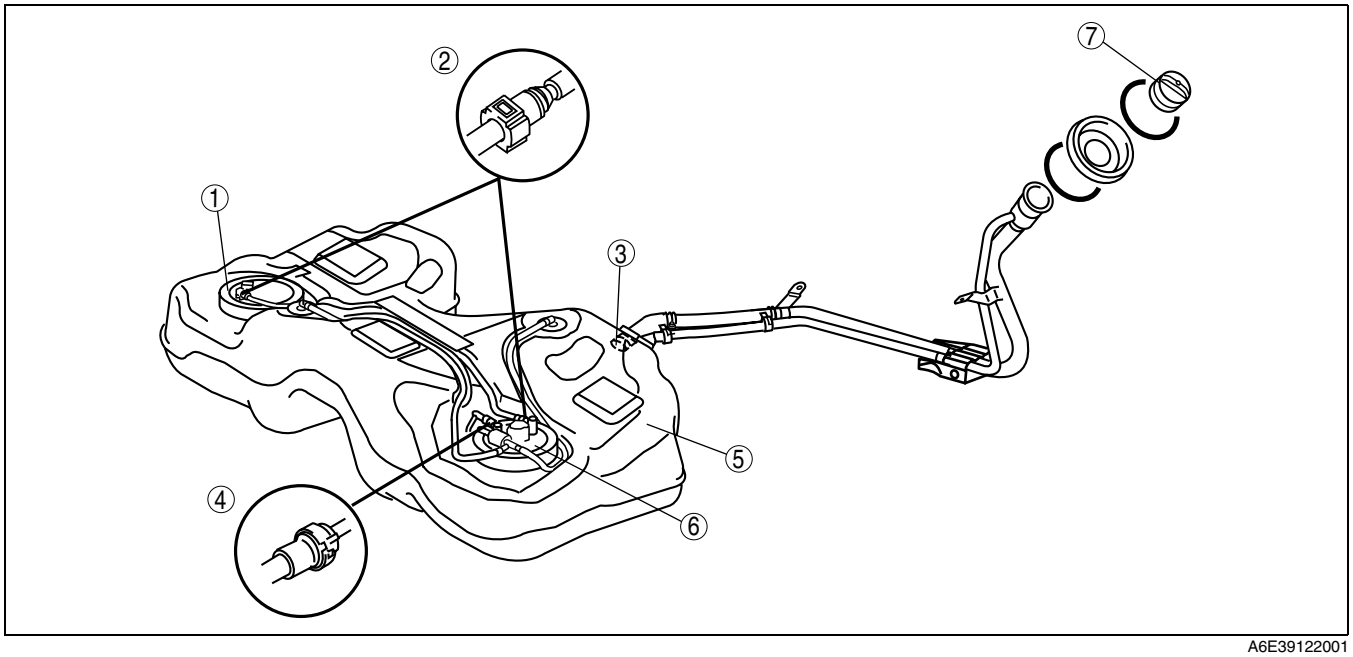
OUTLINE

A6E391201006201

- The fuel system is essentially carried over from that of the current Mazda6 (GG), except for the following. (See Mazda6 Training Manual 3359-1*-02C.)
  — A saddle type fuel tank has been adopted.
  — A fuel pump (transfer) for fuel transmission has been added.

STRUCTURAL VIEW

A6E391201006202



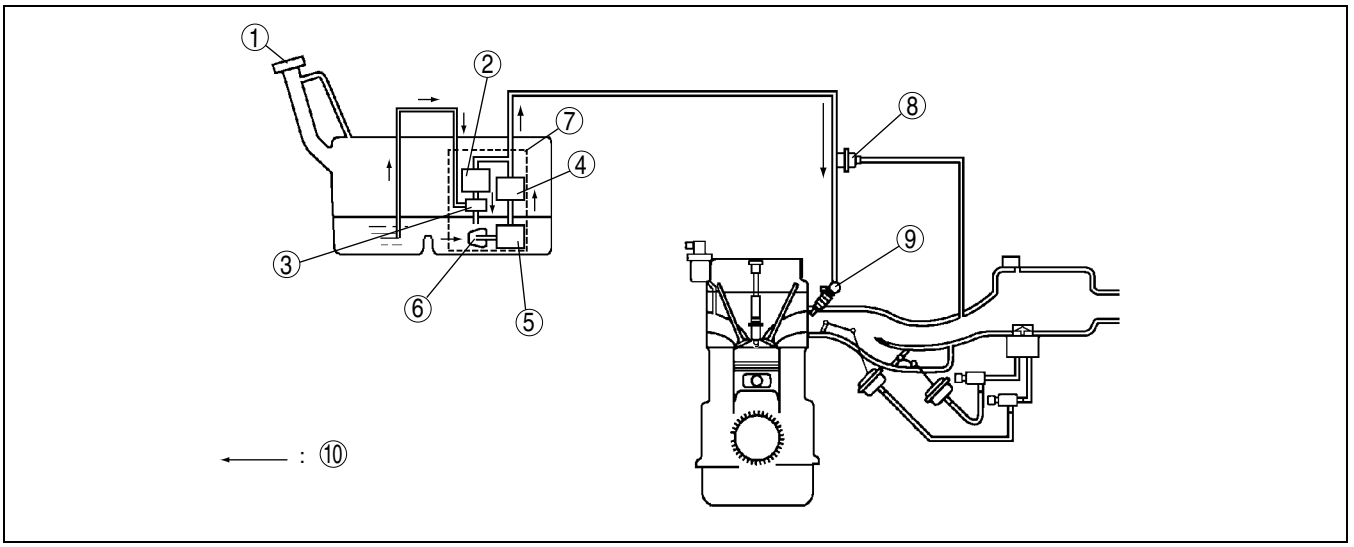
A6E39122001

1	Fuel gauge sender sub-unit
2	Quick release connector (fuel tank side, transfer hose part)
3	Non-return valve

4	Quick release connector (fuel tank side, main fuel pipe part)
5	Fuel tank
6	Fuel pump unit
7	Filler cap

SYSTEM DIAGRAM

A6E391201006203



A6E39122002

1	Filler cap
2	Pressure regulator
3	Fuel pump (transfer)
4	Fuel filter (high-pressure)
5	Fuel pump

6	Fuel filter (low-pressure)
7	Fuel pump unit
8	Pulsation damper
9	Fuel injector
10	Fuel flow

FUEL PUMP (TRANSFER)

A6E391213350201

Function

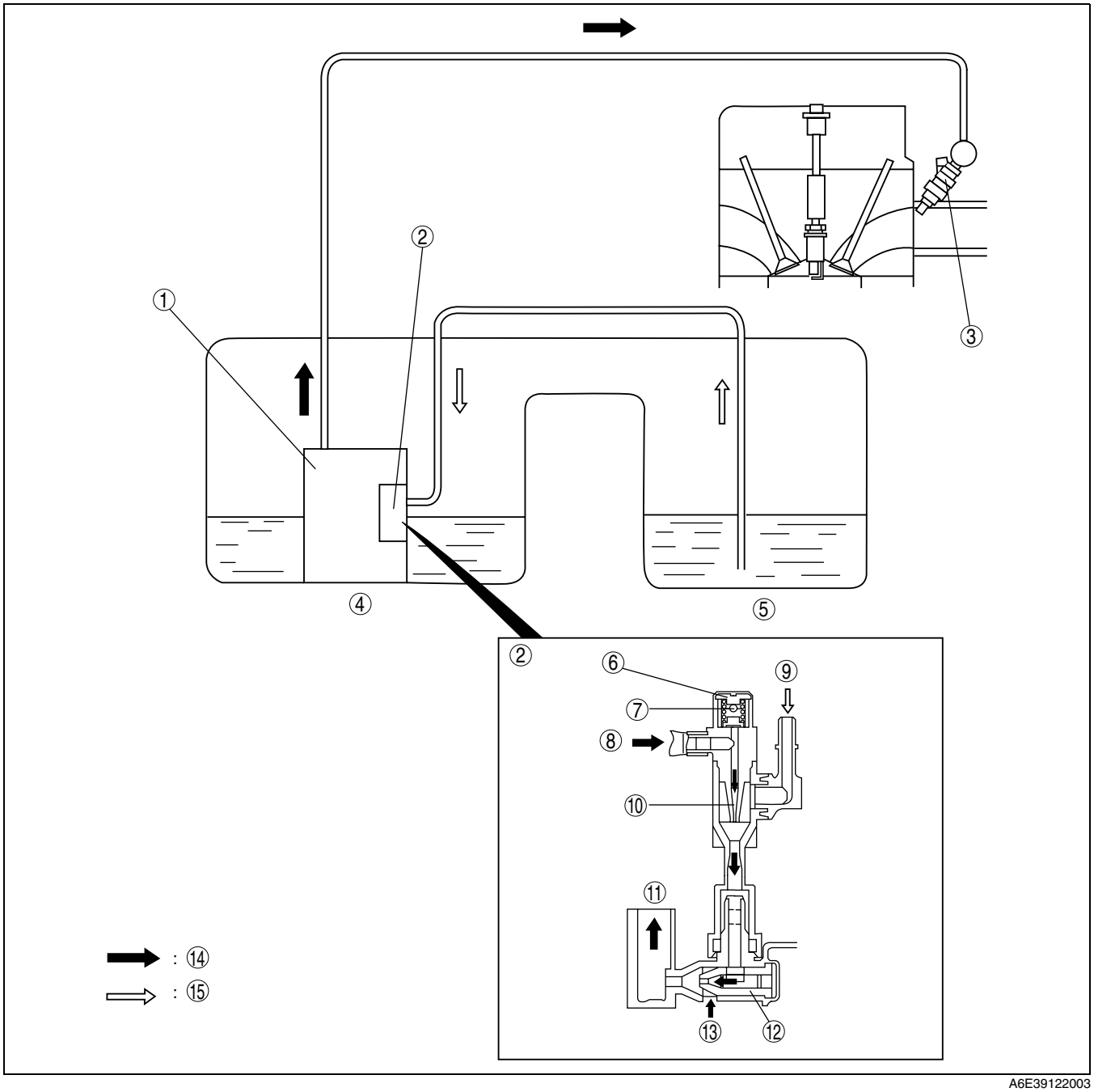
- The fuel tank for 4WD is saddle type. Fuel in the fuel gauge sender sub-unit side (right side) is pumped to the left side of the fuel tank using the fuel pump (transfer).

Structure

- The fuel pump (transfer) is integrated into the fuel pump unit and it cannot be separately disassembled.
- The fuel pump (transfer) is composed of a relief valve and fuel jet pump.

Operation

- The fuel jet pump (venturi) is installed in the return passage from the pressure regulator, and fuel in the fuel tank is pumped to the left side from the right side using the vacuum generated in the passage.
- When the return fuel pressure exceeds a specified value, the relief valve is opened. The relief valve delivers the return fuel directly to the fuel tank. In this way, pressure of the return fuel passing through the fuel jet pump is kept constantly below the specified value.



A6E39122003

1	Fuel pump unit
2	Fuel pump (transfer)
3	Fuel injector
4	Fuel tank (left side)
5	Fuel tank (right side)
6	Relief valve
7	Discharge outlet
8	From pressure regulator

9	From fuel tank (right side)
10	Fuel jet pump
11	To fuel tank (left side)
12	Fuel jet pump
13	From fuel tank (left side)
14	Fuel flow
15	Pumped fuel flow

QUICK RELEASE CONNECTOR (FUEL TANK SIDE, TRANSFER HOSE PART)

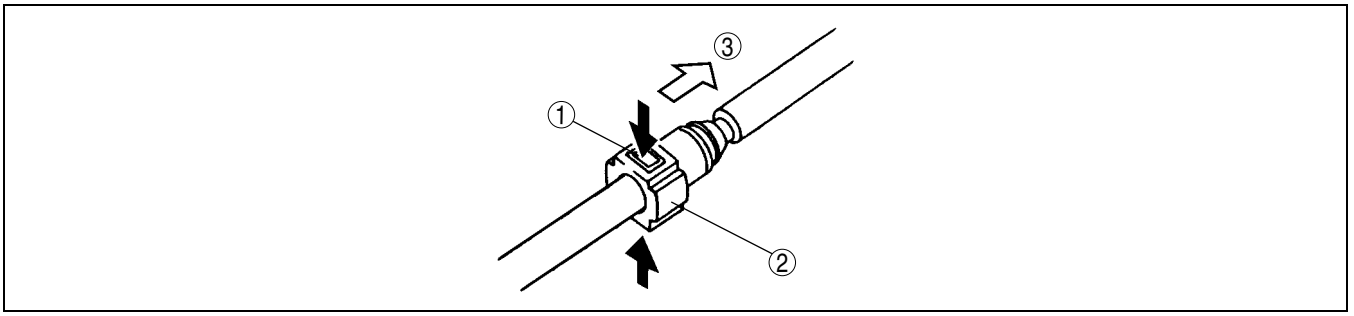
A6E391242692201

Function

- The quick release connector makes disconnecting and connecting of fuel hoses and fuel pipes easy.

Structure

- The quick release connector is adopted for the transfer hose part of the fuel tank side.
- The quick release connector is composed of a retainer, O-ring and other parts. The quick release connector and plastic fuel hose are integrated and cannot be disconnected.
- The retainer and quick release connector are integrated and cannot be disconnected.
- An **SST** is not required to uncouple this type of quick release connector.



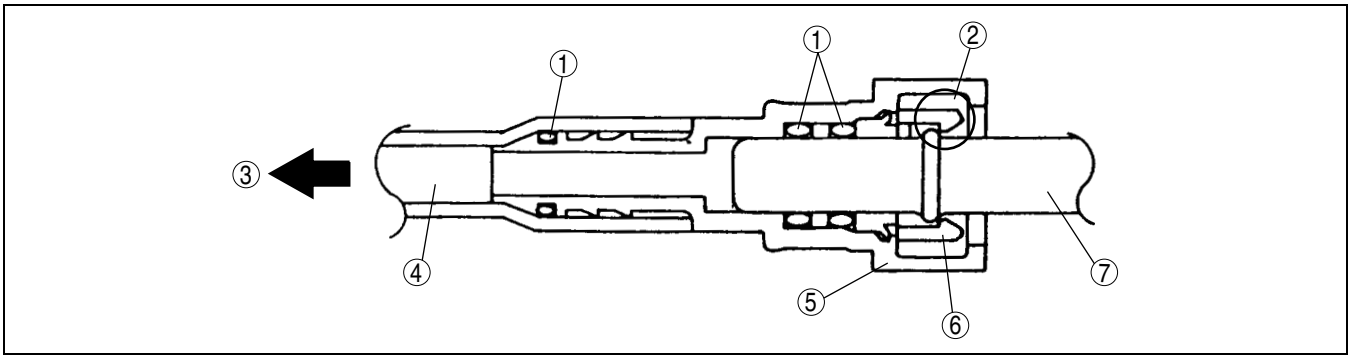
A6E39122010

1	Tab
2	Quick release connector

3	Disconnect

Operation

- Squeeze the tabs of the retainer to unlock and disconnect the quick release connector from the fuel pipe.
- A click is heard when the tabs of the retainer are pushed correctly into the lock point of the quick release connector.



A6E39122011

1	O-ring
2	Lock point
3	Disconnect
4	Fuel hose

5	Quick release connector
6	Retainer
7	Fuel pipe

EXHAUST SYSTEM

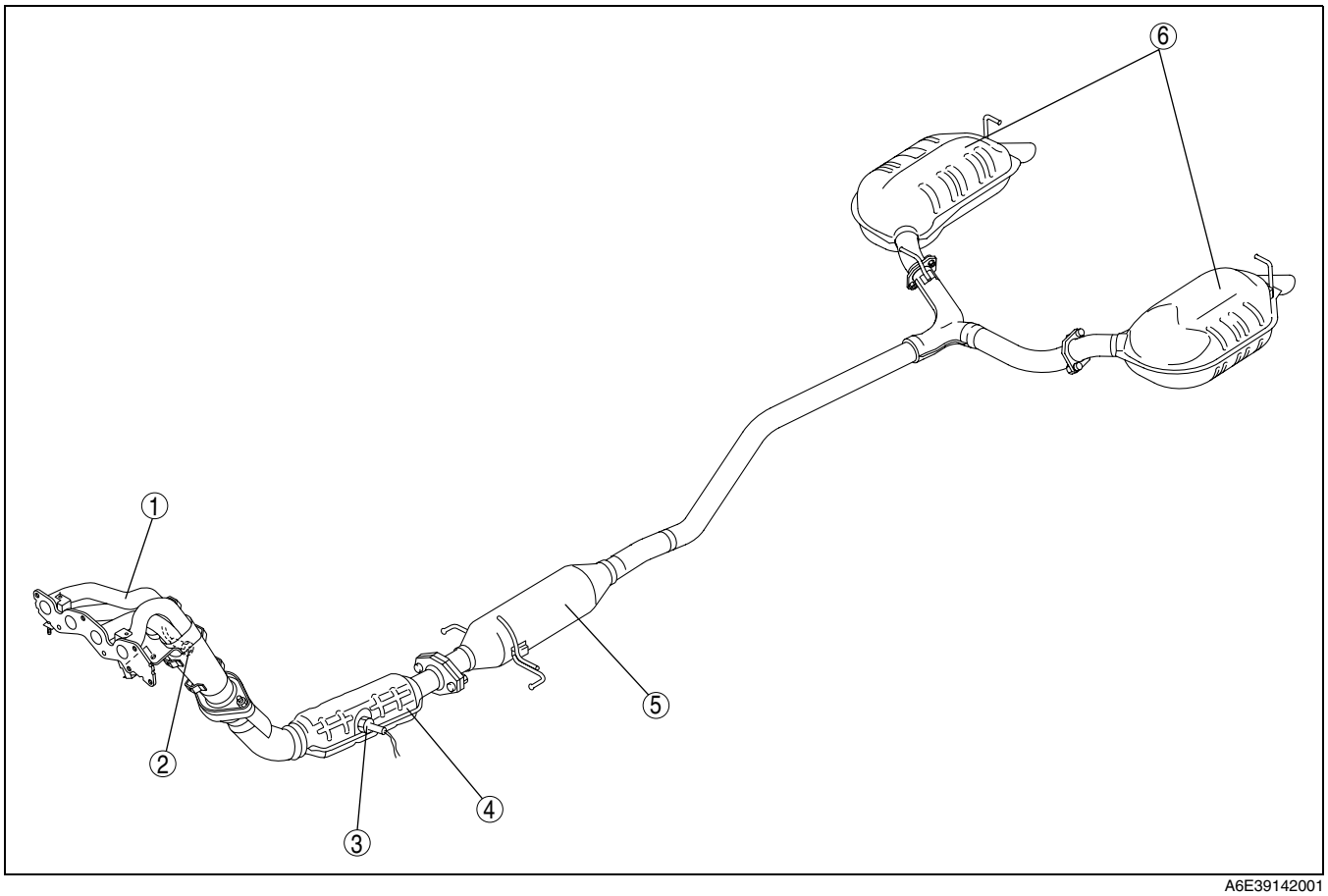
OUTLINE

A6E391440000201

- The exhaust system is essentially carried over from that of the current Mazda6 (GG), except for the following. (See Mazda6 Training Manual 3359-1*-02C.)
  - — The TWC and the presilencer have been become separate parts, and removal/installation procedure has been changed.
  - — The layout of the front HO2S has been changed.

STRUCTURAL VIEW

A6E391440000202



A6E39142001

1	Exhaust manifold
2	HO2S (front)
3	HO2S (rear)

4	TWC
5	Presilencer
6	Main silencer

CONTROL SYSTEM

OUTLINE

A6E394018880201

- The control system is essentially carried over from the current Mazda6 (GG), except for the following. (See Mazda6 Training Manual 3359-1*-02C.)

Vehicle Adoption

4WD ATX model

- TCM has been adopted. Due to this the PCM terminal of ATX device has been replaced to TCM. The ATX device information which is needed by the fuel and emission control systems is communicated to the PCM by the controller area network (CAN).

Unleaded (RON 90 or above) model

- BARO sensor has been eliminated. Due to this the BARO factor for purge control has been eliminated.

Input Device

×:Applicable
—: Not applicable

Item	Signal	Mazda6 (GG, GY)			Remark for new model
		4WD ATX	Unleaded (RON 90 or above)	Current model	
MAF/IAT sensor	MAF and IAT	×			Same as current model
TP sensor	TP	×			Same as current model
MAP sensor	MAP	×			Same as current model
ECT sensor	ECT	×			Same as current model
CMP sensor	Cylinder identification	×			Same as current model
CKP sensor	Engine revolution	×			Same as current model
Knock sensor	Knocking	×			Same as current model
HO2S (Front, Rear)	Oxygen concentration	×			Same as current model
BARO sensor	BARO	×	—	×	Same as current model
Neutral switch*1	Load/no load distinction	×			Same as current model
Clutch switch*1	Load/no load distinction	×			Same as current model
Brake switch	Brake pedal condition	×			Same as current model
PSP switch	P/S oil pump load condition	×			Same as current model
VSS	Vehicle speed	—	×		—
A/C switch, refrigerant pressure switch (high, low pressure)	A/C operational	×			Same as current model
Refrigerant pressure switch (middle pressure)	A/C compressor load	×	—	×	Same as current model
Battery	Battery voltage	×			Same as current model
Generation voltage (Generator terminal P)	Generation voltage	×			Same as current model
Immobilizer unit*2	Immobilizer system communication	×	—	×	Same as current model

*1 : For MTX model
*2 : With Immobilizer system

Output Device

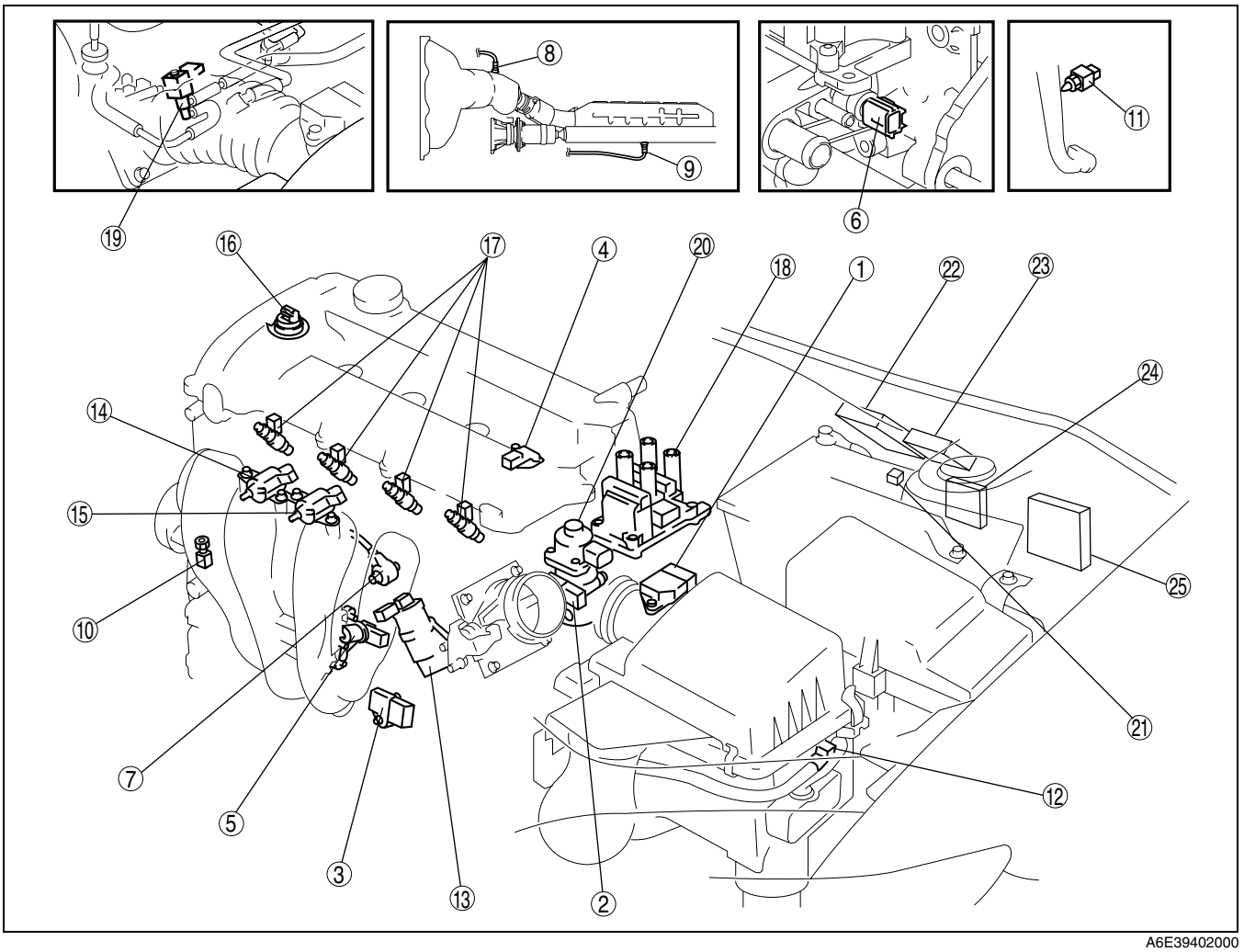
×:Applied
—: Not applied

Item	Signal	Mazda6 (GG, GY)			Remark for new model
		4WD ATX	Unleaded (RON 90 or above)	Current model	
IAC valve	IAC	×			Same as current model
VIC solenoid valve*	VIC	×	—	×	Same as current model
Variable tumble control solenoid valve	VTCS	×			Same as current model
Oil control valve (OCV)*	Variable valve timing control	×	—	×	Same as current model
Fuel injector	Fuel injection control	×			Same as current model
Fuel pump relay	Fuel pump control	×			Same as current model
Ignition coil	ESA control	×			Same as current model
EGR valve	EGR control	×			Same as current model
Purge solenoid valve	Purge control	×			Same as current model BARO factor for Purge control has been eliminated.
Heated oxygen sensor heater (Front, rear)	O2S heater control	×			Same as current model
Field coil (Generator terminal D)	Generator control	×			Same as current model
Cooling fan relay	Electric fan control	×			Same as current model
A/C relay	A/C cut-off control	×			Same as current model
Controller area network (CAN)	Information function	×			Same as current model TCM (ATX) information have been adopted for 4WD ATX model.

* : For L3 engine only

STRUCTURAL VIEW (4WD)

A6E394018880202



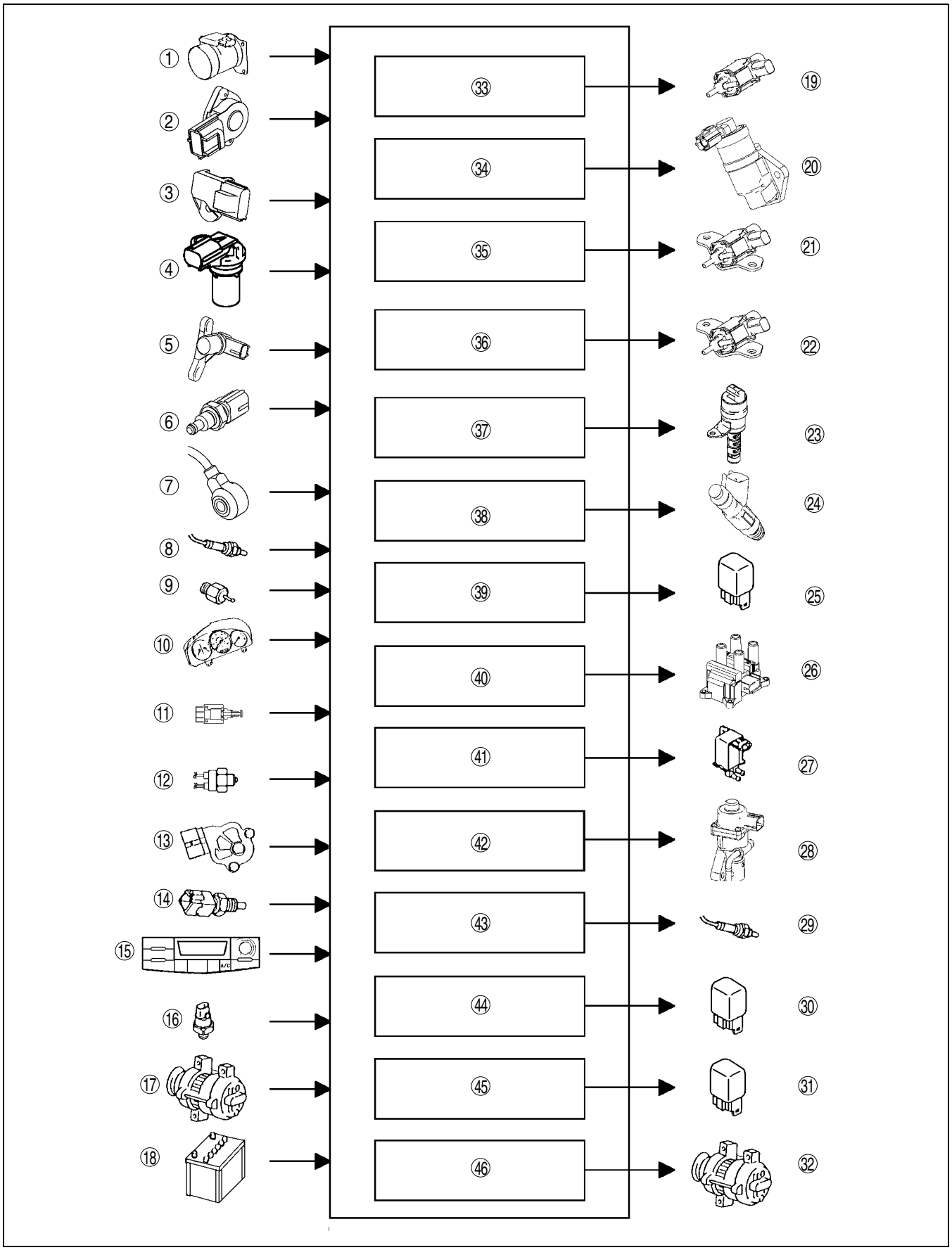
A6E39402000

1	MAF/IAT sensor
2	TP sensor
3	MAP sensor
4	CMP sensor
5	CKP sensor
6	ECT sensor
7	Knock sensor
8	HO2S (front)
9	HO2S (rear)
10	PSP switch
11	Brake switch
12	VAD control solenoid valve
13	IAC valve

14	VIC solenoid valve
15	Variable tumble control solenoid valve
16	OCV
17	Fuel injector
18	Ignition coil
19	Purge solenoid valve
20	EGR valve
21	BARO sensor
22	PCM (R.H.D.)
23	TCM (R.H.D)
24	PCM (L.H.D.)
25	TCM (L.H.D)

BLOCK DIAGRAM

A6E394018880203



A6E3940T001

F1

1	MAF/IAT sensor
2	TP sensor
3	MAP sensor
4	CMP sensor
5	CKP sensor
6	ECT sensor
7	Knock sensor
8	HO2S (front, rear)
9	PSP switch
10	Vehicle speedometer sensor
11	Clutch switch*1
12	Neutral switch*1
13	TR switch*2
14	Brake switch
15	A/C switch
16	Refrigerant pressure switch
17	Generator (terminal P: generation voltage)
18	Battery
19	VAD control solenoid valve*3
20	IAC valve
21	VIC solenoid valve*3
22	Variable tumble control solenoid valve
23	OCV*3
24	Fuel injector
25	Fuel pump relay
26	Ignition coil
27	Purge solenoid valve
28	EGR valve
29	Oxygen sensor heater (front, rear)
30	A/C relay
31	Cooling fan relay
32	Generator (terminal D: field coil)
33	VAD control*3
34	IAC
35	VIC*3
36	VTCS
37	Variable valve timing control*3
38	Fuel injection control
39	Fuel pump control
40	Electronic spark advance (ESA) control
41	Purge control
42	EGR control
43	Oxygen sensor heater control
44	A/C cut-off control
45	Electrical fan control
46	Generator control

*1 : For MTX model
*2 : For 2WD ATX model
*3 : For L3 engine

CONTROL DEVICE AND CONTROL RELATIONSHIP CHART

A6E394018880204

Input devices

x: Applicable

Component	Idle air control (IAC)	Variable air duct (VAD) control	Variable intake-air control (VIC)	Variable tumble control system (VTCS)	Variable valve timing control	Fuel injection control	Fuel pump control	Electronic spark advance (ESA) control	Purge control	EGR control	Front HO2S heater control	Rear HO2S heater control	A/C cut-off control	Electrical fan control	Generator control	Traction control	Immobilizer system
IAT sensor	x					x		x		x	x	x	x		×		
MAF sensor	x				x	x		x	x	x	x	x					
TP sensor	x	x		x	x	x		x		x	x						
MAP sensor	x					x											
ECT sensor	x	x		x	x	x		x	x	x	x	x		x			
CMP sensor					x	x											
CKP sensor	x	x	x	x	x	x	x	x	x	x	x	x	x				
Knock sensor								x									
Front HO2S						x			x								
Rear HO2S						x											
BARO sensor*1									x								
Neutral switch*2	x					x		x	x								
Clutch switch*2	x					x		x	x				x				
TR switch*3	x					x		x	x				x				
Brake switch																	
PSP switch	x					x		x									
VSS										×							
A/C switch, refrigerant pressure switch (high, low pressure)	x					x		x					×	×			
Refrigerant pressure switch (middle pressure)														×			
Battery voltage						x		x	x						×		
Generator terminal P (Generation voltage)	x					x		x							×		
ABS/TCS HU/CM																×	
Coil																	×

*1 : For unleaded fuel (RON 90 or above) model
*2 : For MTX model
*3 : For 2WD ATX model

F1

Output devices

×: Applicable

Component	Idle air control (IAC)	Variable air duct (VAD) control	Variable intake-air control (VIC)	Variable tumble control system (VTCS)	Variable valve timing control	Fuel injection control	Fuel pump control	Electronic spark advance (ESA) control	Purge control	EGR control	Front HO2S heater control	Rear HO2S heater control	A/C cut-off control	Electrical fan control	Generator control	Traction control	Immobilizer system
IAC valve	×																
VAD control solenoid valve*		×															
VIC solenoid valve*			×														
Variable tumble control solenoid valve				×													
Oil control valve (OCV)*					×												
Fuel injectors						×											×
Fuel pump relay							×										
Ignition coil								×									×
Purge solenoid valve									×								
EGR valve										×							
HO2S heaters											×	×					
A/C relay													×				
Cooling fan relay														×			
Generator (terminal D: field coil)															×		
ABS/TCS HU/CM																×	

* : For L3 engine

CONTROLLER AREA NETWORK (CAN)

A6E394018880205

- PCM transmit/received the information in the CAN. For detail information of the CAN, see the “MULTIPLEX COMMUNICATION SYSTEM.” (See T–3 OUTLINE.)

Transmit Information (4WD ATX Model)

- Engine control condition
- Torque reduction inhibit
- Engine speed
- Vehicle Speed
- TP
- Engine torque (without torque reduction)
- Engine torque (with torque reduction)
- Battery reconnection
- Engine loss torque
- ECT
- Travelled distance
- Fuel injection information
- MIL condition
- Generator warning light conditions
- Engine displacement
- Number of cylinders
- Air induction type
- Fuel type and delivery
- Country
- Transmission/axle type
- Tire circumference (front/rear)

Received Information (4WD ATX Model)
From ABS HU/CM, ABS/TCS HU/CM, or DSC HU/CM

- Wheel speed
  — Front left, Front right, Rear left, and Rear right
- Travelled distance
- Brake system status
- Torque reduction request
- Brake system configuration

From TCM

- Desired torque
- Upper torque limit
- Turbineshaft speed
- Vehicle speed
- Torque reduction request
- Idle speed up request
- Racing select determination
- MIL indicate request
- Desired gear/selector lever position
- AT warning indicator light condition
- TCC condition

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E390218881206

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1621-10-98E).

Idle speed
- Adjustment procedure has been modified.

Fuel tank
- Removal/installation procedure has been modified.

Fuel pump unit
- Removal/installation procedure has been modified.

Quick release connector (fuel tank side, transfer hose part)
- Removal/installation procedure has been added.

Exhaust system
- Removal/installation procedure has been modified.

PCM
- Inspection procedure has been modified.

On-board diagnostic
- Inspection procedure has been modified.

Troubleshooting
- Inspection procedure has been modified.

ENGINE TUNE-UP

IDLE SPEED INSPECTION (4WD)

A6E390802000201

Note
- Ignition timing is not adjustable.
- Ignition timing verification requires 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 (WDS: RPM PID) is within the specification using WDS or equivalent.

Idle speed

Condition	Engine speed (rpm)*1
No load	650—750
Electrical loads*2 ON	650—750
P/S ON	650—750
A/C ON and refrigerant pressure switch (middle) OFF	650—750
A/C ON and refrigerant pressure switch (middle) ON	700—800

*1 : Excludes temporary idle speed drop just after the electrical loads are turned on.

*2 : Blower motor is operating at high speed. Headlight switch is turned on. Rear window defroster switch is turned on. Cooling fans are operating.

FUEL SYSTEM

FUEL TANK REMOVAL/INSTALLATION

A6E391242110201

Warning

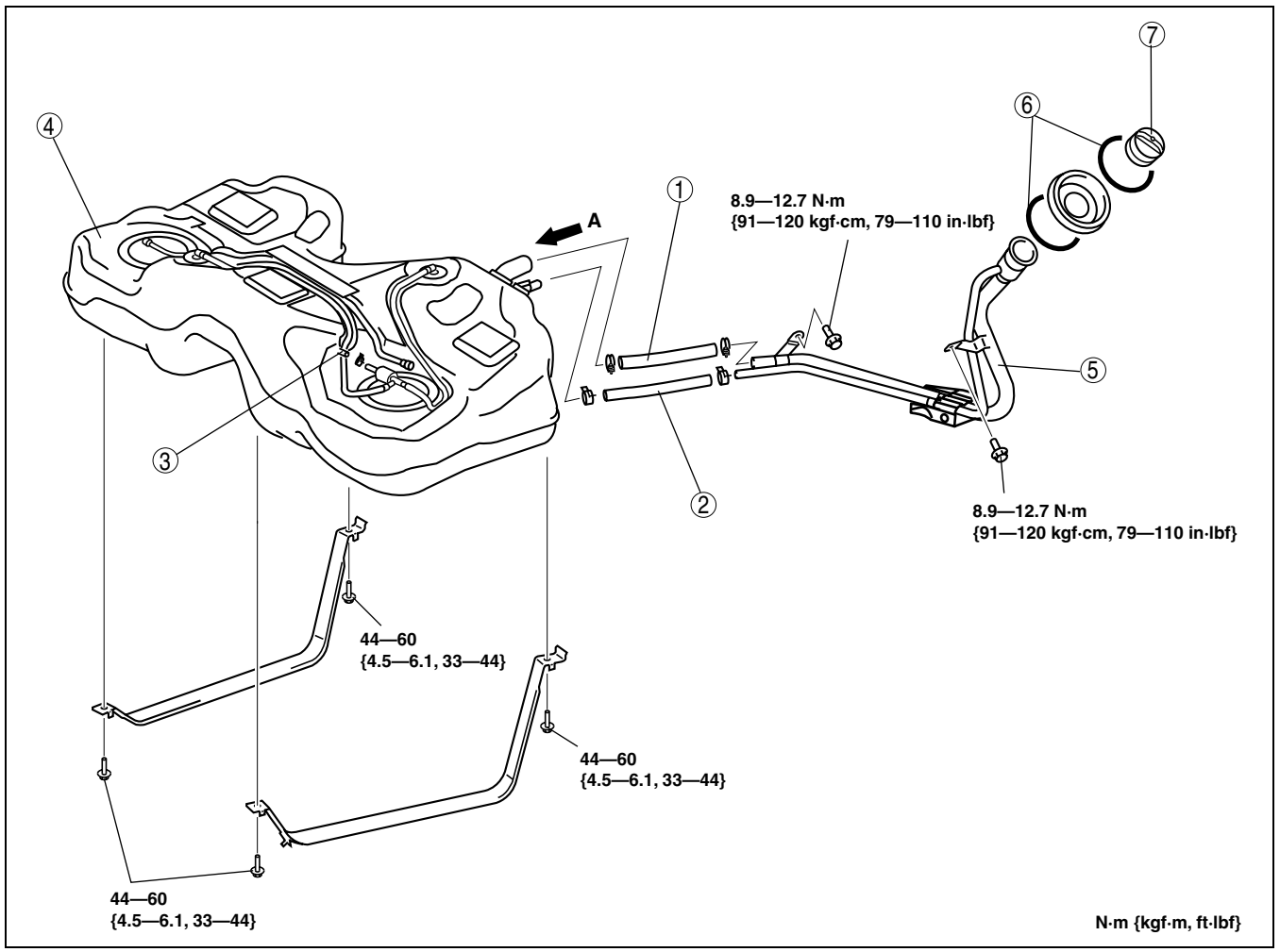
- **Repairing a fuel tank that has not been properly steam cleaned can be dangerous. Explosion or fire may cause death or serious injury. Always properly steam clean a fuel tank before repairing it.**
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death 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.**

Caution

- **Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting using a cloth or soft brush, and make sure that it is free of foreign material.**

1. Level the vehicle.
2. Complete the “BEFORE REPAIR PROCEDURE”.
3. Disconnect the negative battery cable.
4. Remove the fuel pump unit. (See F1–26 FUEL PUMP UNIT REMOVAL/INSTALLATION.)
5. Remove the fuel gauge sender sub-unit. (See T–27 Fuel Gauge Sender Sub-Unit.)
6. Siphon the fuel from the service hole.
7. Remove the presilencer. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
8. Remove the TWC. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
9. Remove the propeller shaft. (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION.)

10. Remove in the order indicated in the table.
11. Install in the reverse order of removal.
12. Complete the “AFTER REPAIR PROCEDURE”.



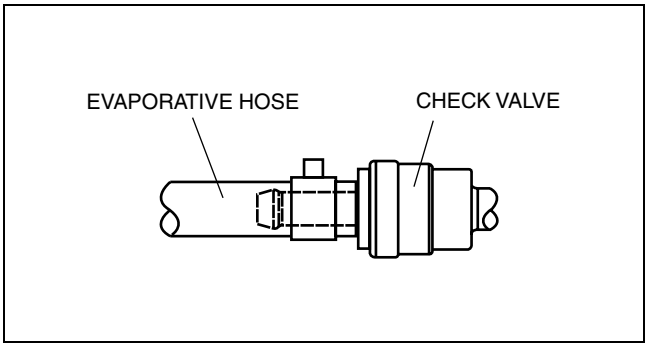
A6E39122008

1	Joint hose (See F1–25 Joint Hose Installation Note)
2	Breather hose (See F1–25 Breather Hose Installation Note)
3	Evaporative hose (See F1–25 Evaporative Hose Installation Note)

4	Fuel tank
5	Fuel-filler pipe
6	C-ring
7	Filler cap

Evaporative Hose Installation Note

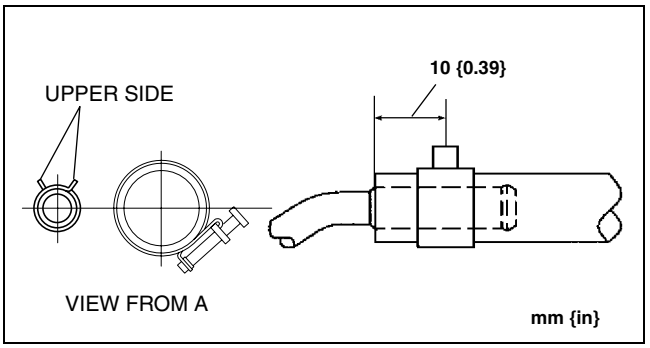
1. Fit the evaporative hose until it hits the check valve as shown.



A6E39122006

Breather Hose Installation Note

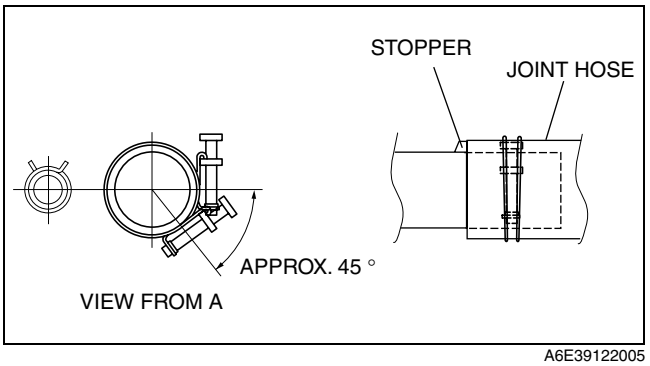
1. Fit the breather hose onto the respective fittings, and install clamps as shown.



A6E39122004

Joint Hose Installation Note

1. Fit the joint hose onto the respective fittings, and install clamps as shown.



A6E39122005

FUEL PUMP UNIT REMOVAL/INSTALLATION

A6E391213350202

Warning

- **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.**

Caution

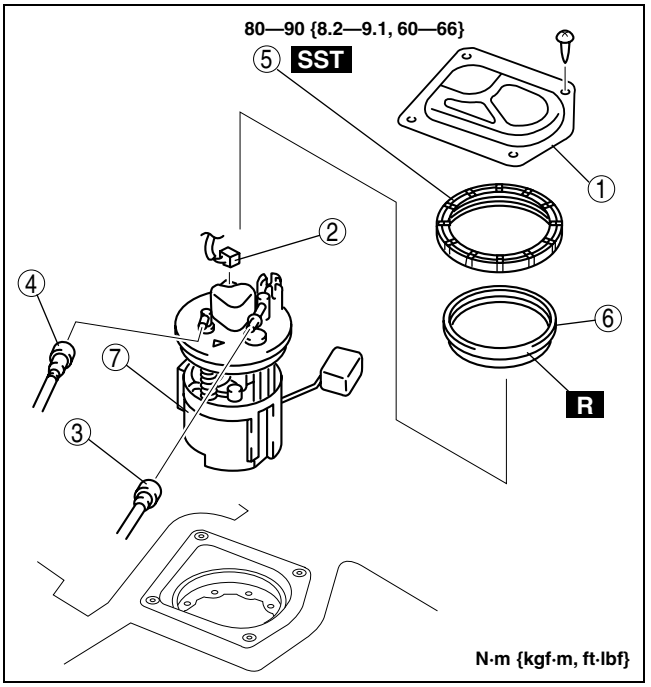
- **Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting using a cloth or soft brush, and make sure that it is free of foreign material.**

Note

- Since the fuel pump unit is integrated with the fuel filter, it needs to be replaced **every 75,000 km**.

1. Complete the “BEFORE REPAIR PROCEDURE”.
2. Disconnect the negative battery cable.
3. Complete the following in order to the work area.
   (1) Loosen the bolt of the fuel tank strap.
   (2) Lower the fuel tank to a position where the **SST** can be attached from the service hole cover.
4. Remove the rear seat cushion.
5. Remove in the order indicated in the table.

1	Service hole cover
2	Connector
3	Plastic fuel hose (fuel tank side, main fuel pipe part) (See F1–27 Plastic Fuel Hose Removal Note) (See F1–28 Plastic Fuel Hose Installation Note)
4	Plastic fuel hose (fuel tank side, transfer hose part) (See F1–29 FUEL HOSE (FUEL TANK SIDE, TRANSFER HOSE PART) REMOVAL/INSTALLATION)
5	Fuel pump cap (See F1–27 Fuel Pump Cap Removal Note) (See F1–28 Fuel Pump Cap Installation Note)
6	Packing
7	Fuel pump unit



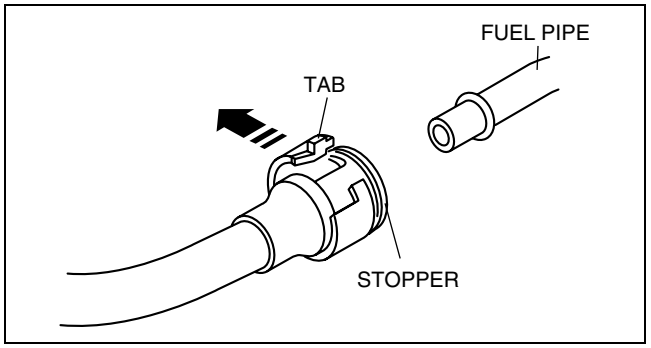
A6E39122009

6. Install in the reverse order of removal.
7. Complete the “AFTER REPAIR PROCEDURE”.
8. Complete the “Fuel Leak Inspection After Fuel Pump Unit Installation.“ (See F1–28 Fuel Leak Inspection After Fuel Pump Unit Installation.)

Plastic Fuel Hose Removal Note

Caution
- **The quick release connector may be damaged if the tab is bent excessively. Do not expand the tab over the stopper.**

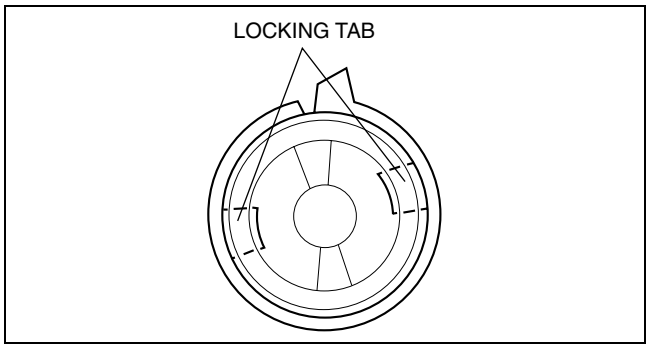
1. Disconnect the quick release connector.
   (1) Push the tab on the locking coupler **90 degrees** until it stops.
   (2) Pull the fuel hose straight back.



A6E3912W001

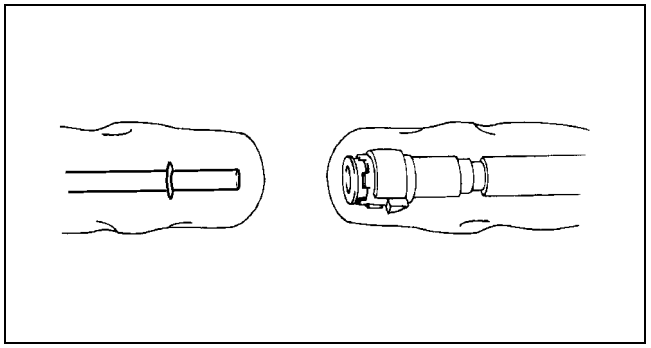
Note
- The stopper may be removed from the quick connector. Take care not to lose it. Reinstall it to the quick release connector before reconnecting the fuel line.

- The locking coupler has two internal locking tabs which retain the fuel pipe. Be sure that the tab on the locking coupler is rotated until it stops to release two internal locking tabs.



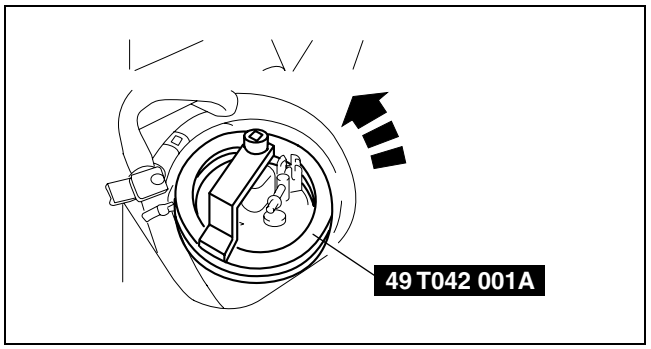
A6E3912W002

2. Cover the disconnected quick release connector and fuel pipe with vinyl sheets or the like to prevent them from being scratched or contaminated with foreign material.


A6E39122015

Fuel Pump Cap Removal Note

1. Using the **SST**, remove the fuel pump cap.

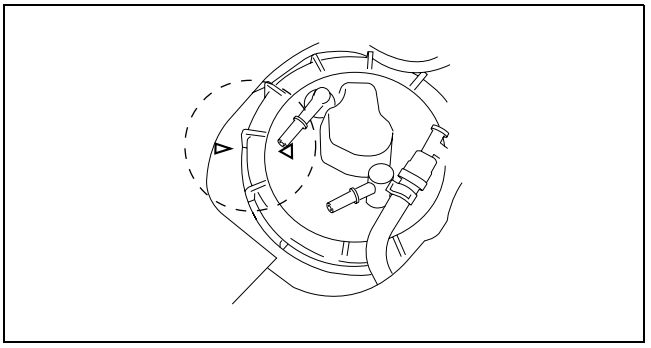


A6E39122012

Fuel Pump Cap Installation Note

1. Verify that the fuel tank mark is aligned with the fuel pump unit mark as shown.
2. Using the **SST**, tighten the fuel pump cap without shifting the mark.

   Tightening torque
   80—90 N·m {8.2—9.1 kgf·m, 60—66 ft·lbf}



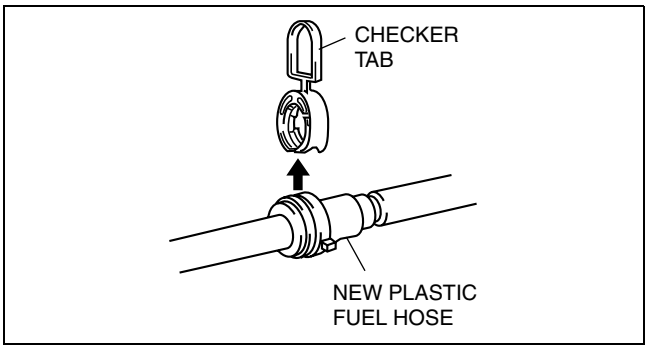
A6E39122013

Plastic Fuel Hose Installation Note

Note

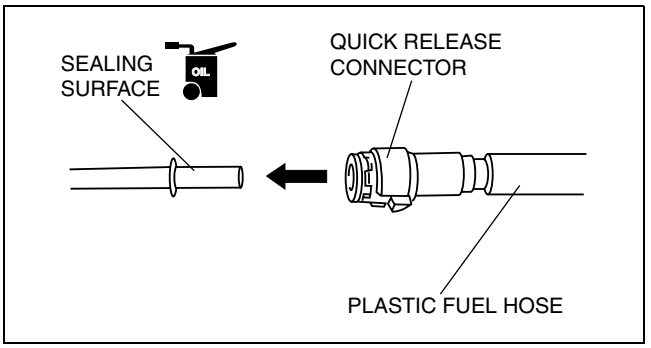
- A checker tab is integrated with quick release connector for new plastic fuel hoses. The checker tab will be released from the quick release connector after it is completely engaged with the fuel pipe.

1. Inspect the fuel pump unit sealing surface for damage and deformation, and replace as necessary.
   - If the quick release connector O-ring is damaged, replace the plastic fuel hose.



A6E3912W004

2. Slightly apply clean engine oil to the sealing surface of the fuel pump unit.
3. Align the fuel pipe on the fuel pump unit and quick release connector so that the tabs of the retainer are correctly fitted into the quick release connector. Push the quick release connector straight into the retainer until a click is heard.
4. Lightly pull and push the quick release connector a few times by hand and verify that it can move **2.0—3.0 mm {0.08—0.11 in}** and it is connected securely.
   - If quick release connector does not move at all, verify that O-ring is not damaged and slipped, and reconnect the quick release connector.



A6E3912W006

Fuel Leak Inspection After Fuel Pump Unit Installation

1. Drive the vehicle.
2. Perform a quick start and a hard brake **5—6 times**.
3. Stop the vehicle.
4. Verify that there is no fuel leakage near the fuel pump unit in the vehicle interior.

FUEL HOSE (FUEL TANK SIDE, TRANSFER HOSE PART) REMOVAL/INSTALLATION

A6E391242692202

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.**

Caution

- **Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting using a cloth or soft brush, and make sure that it is free of foreign material.**

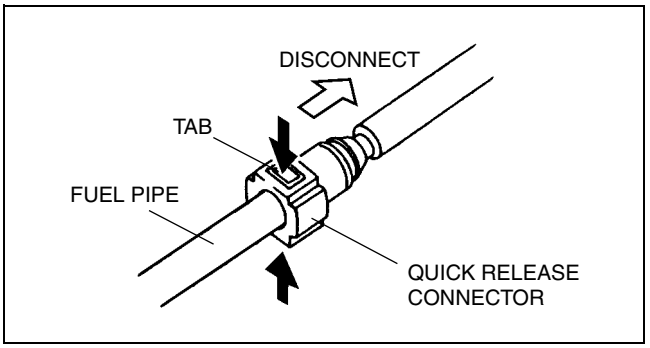
Removal

1. Complete the “BEFORE REPAIR PROCEDURE”.
2. Disconnect the negative battery cable.

Note

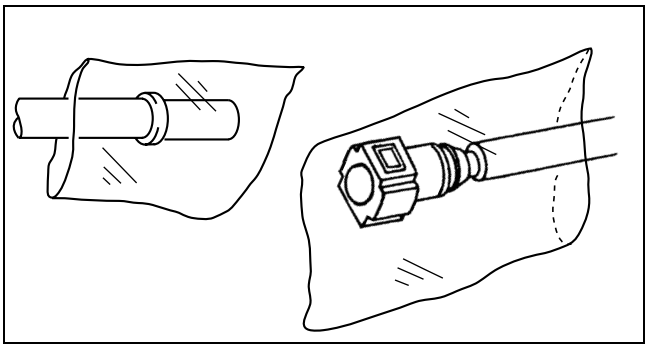
- Squeezing the tab while lightly pushing the fuel hose on the fuel pipe side will make removal easier.

3. Squeeze the tabs on the quick release connector and disconnect the quick release connector from the fuel pipe by pulling it straight back.



A6E39122007

4. Cover the disconnected quick release connector and fuel pipe with vinyl sheets or the like to prevent them from being scratched or contaminated with foreign material.



A6E39122014

Installation

Caution

- **If the quick release connector O-ring is damaged, replace the plastic fuel hose. A fuel leak may be caused.**

1. Inspect the fuel hose and fuel pipe sealing surface for damage and deformation, and replace as necessary.
2. Slightly apply clean engine oil to the sealing surface of the fuel pump unit.
3. Align the fuel pipe and quick release connector. Push the quick release connector straight into the fuel pipe until a click is heard.
4. Lightly pull and push the quick release connector a few times by hand and verify that it can move **2.0—3.0 mm {0.08—0.11 in}** and it is connected securely.
   - If the quick release connector does not move at all, verify that O-ring is not damaged and slipped, and reconnect the quick release connector.
5. Complete the “AFTER REPAIR PROCEDURE”.

EXHAUST SYSTEM

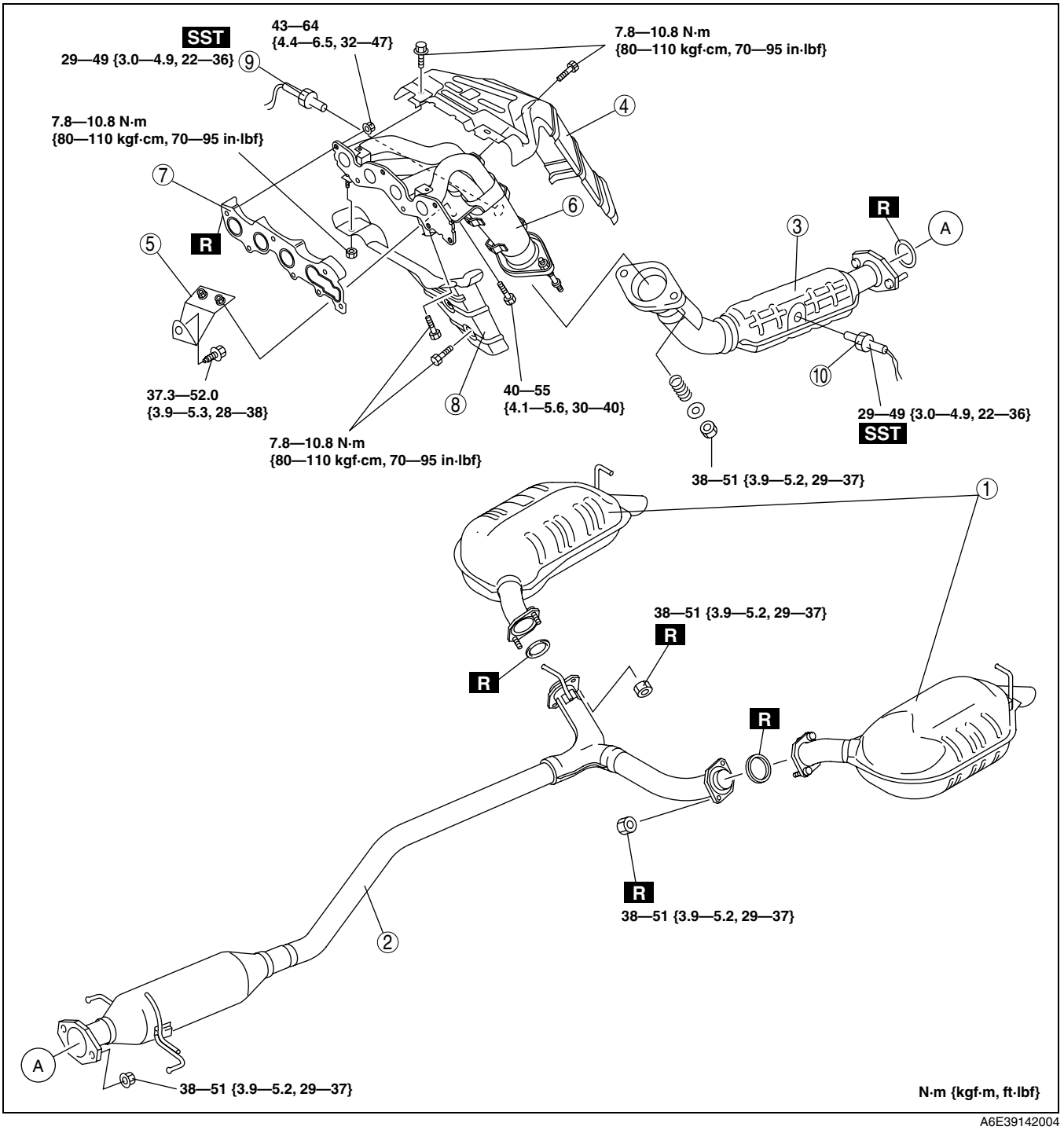
EXHAUST SYSTEM REMOVAL/INSTALLATION

A6E391440000203

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. Remove in the order indicated in the table.
2. Install in the reverse order of removal.

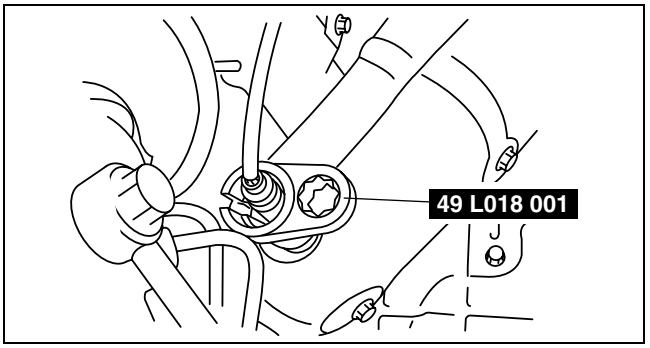


A6E39142004

1	Main silencer
2	Presilencer
3	TWC
4	Exhaust manifold insulator (upper) (See F1–32 Exhaust Manifold Insulator (Upper) Installation Note)
5	Bracket (See F1–32 Bracket Installation Note)
6	Exhaust manifold (See F1–32 Exhaust Manifold Installation Note)
7	Exhaust manifold gasket
8	Exhaust manifold insulator (lower) (See F1–31 Exhaust Manifold Insulator (Lower) Installation Note)
9	HO2S (front) (See F1–31 HO2S Removal Note)
10	HO2S (rear) (See F1–31 HO2S Removal Note)

HO2S Removal Note

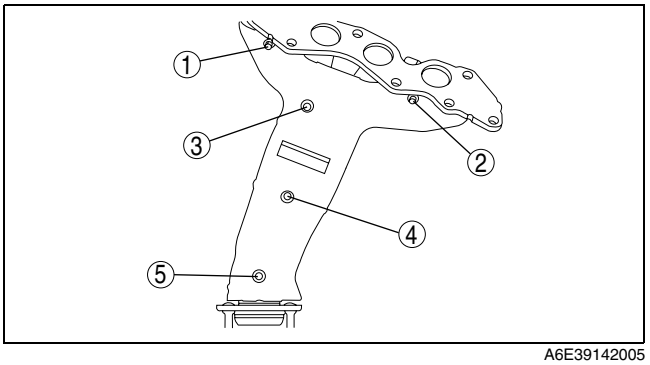
1. Using the **SST**, remove the HO2S.



A6J39142003

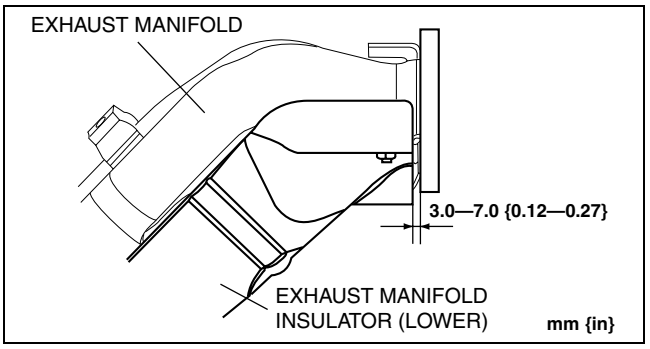
Exhaust Manifold Insulator (Lower) Installation Note

1. Tighten the exhaust manifold insulator (lower) installation bolts in the order shown.



A6E39142005

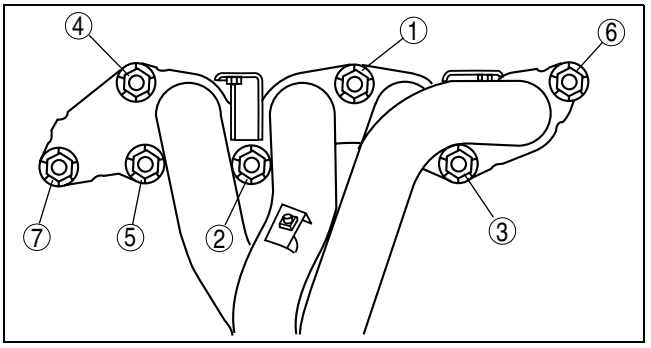
2. Verify that there is **3.0—7.0 mm {0.12—0.27 in}** gap between the exhaust manifold and the exhaust manifold insulator (lower).



A6E39142002

Exhaust Manifold Installation Note

1. Tighten the exhaust manifold installation nuts in the order shown.



A6J3914W003

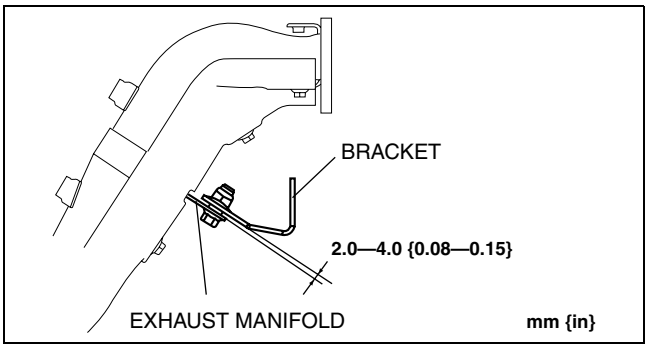
Bracket Installation Note

1. Temporarily tighten the bracket installation bolt by the side of the exhaust manifold.
2. Verify that there is **2.0—4.0 mm {0.08—0.15 in}** gap between the exhaust manifold and the bracket.
3. Tighten the bracket installation bolt by the side of the cylinder block.

   Tightening torque
   37.3—52.0 N·m {3.81—5.30 kgf·m, 27.6—38.3 ft·lbf}

4. Tighten the bracket installation bolt by the side of the exhaust manifold.

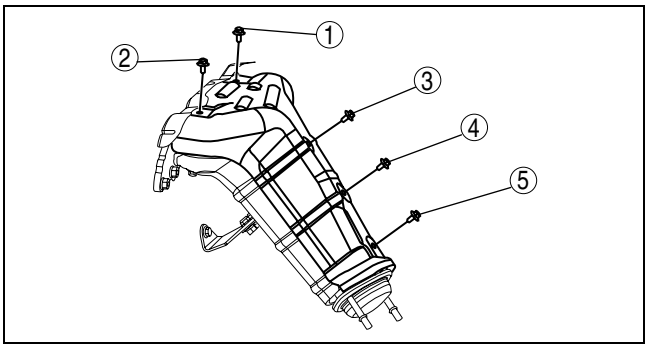
   Tightening torque
   40—55 N·m {4.1—5.6 kgf·m, 30—40 ft·lbf}



A6E39142003

Exhaust Manifold Insulator (Upper) Installation Note

1. Tighten the exhaust manifold insulator (upper) installation bolts in the order shown.



A6E39142006

CONTROL SYSTEM

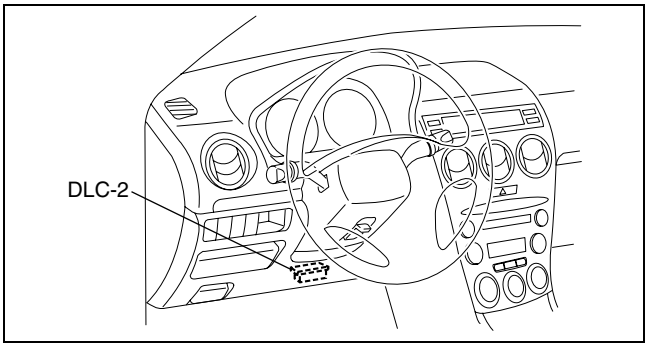
PCM INSPECTION (4WD)

A6E394018880207

Using SST (WDS or equivalent)

Note
- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
  — CMP sensor
  — Main relay

1. Connect the **SST** (WDS or equivalent) to the DLC-2.
2. Turn the ignition switch to ON position.
3. Measure the PID value.
   - If PID value is not within the specification, follow the instructions in Action column.



A6E3970W002

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.
- For input/output signals except those of the monitoring items, use a voltmeter to measure the PCM terminal voltage.
- The simulation items that are used in the ENGINE CONTROL SYSTEM OPERATION INSPECTION are as follows.
  — ACCS, ALTF, EVAPCP, FAN1, FAN2, FAN3, FP, HTR11, HTR12, IAC, IASV, IMRC, IMTV, VT DUTY1

PID/DATA monitor table (reference)

Monitor item (Definition)	Unit/ Condition	Condition/Specification (Reference)	Action	PCM terminal
ACCS (A/C relay)	ON/OFF	Ignition switch ON: OFF A/C switch ON and fan switch ON at idle: ON	Inspect following PIDs: RPM, TP, ECT, ACSW, TR. Inspect A/C relay.	4O
ACSW (A/C switch)	ON/OFF	A/C switch and fan switch ON at ignition switch ON: OFF A/C switch OFF at ignition switch ON: OFF	Inspect A/C switch.	1AC
ALTF (Generator field coil control duty value)	%	Ignition switch ON: 0% Idle: 0—100% Just after A/C switch ON and fan switch ON at idle: Duty value rises	Inspect following PIDs: IAT, ECT, RPM, VPWR, ALTT V. Inspect generator.	1AD
ALTT V (Generator output voltage)	V	Ignition switch ON: 0 V Idle: Approx. 14.9 V[*1] (E/L not operating)	Inspect generator.	1AA
ARPMDES (Target engine speed)	RPM	**LF Unleaded fuel (RON 90 or above) model** No load: 650 rpm E/L operating: 700 rpm P/S operating: 700 rpm A/C ON: 750 rpm **L3 4WD ATX model** No load: 700 rpm E/L operating: 700 rpm P/S operating: 700 rpm A/C ON: 700 rpm[*2], 750 rpm[*3]	Inspect following PIDs: IAT, RPM, MAP, ECT, MAF, TP, INGEAR, ACSW, TR, PSP, ALTT V. Inspect IAC valve. Inspect CKP sensor.	—
AST (After start timer)	Sec	—	—	—

Monitor item (Definition)	Unit/ Condition	Condition/Specification (Reference)	Action	PCM terminal
BARO*7 (Barometric pressure)	kPa, inHg	Ignition switch ON (at sea level): approx. 101 kPa {29.8 inHg}	Inspect BARO sensor.	1G
	V	Ignition switch ON (at sea level): approx. 4.1 V		
BOO (Brake switch)	ON/OFF	Brake pedal depressed: ON Brake pedal released: OFF	Inspect brake switch.	1K
CHRGLP (Generator warning light)	ON/OFF	Ignition switch ON: ON Idle: OFF	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
COLP*4 (Refrigerant pressure switch (middle))	ON/OFF	Refrigerant pressure switch (middle) ON *2 at idle: ON Refrigerant pressure switch (middle) OFF*3 at idle: OFF	Inspect refrigerant pressure switch.	1Q
CPP*8 (Clutch pedal position)	ON/OFF	Clutch pedal depressed: ON Clutch pedal released: OFF	Inspect clutch switch.	1R
CPP/PNP*8 (Shift lever position)	Drive/ Neutral	Neutral position: Neutral Others: Drive	Inspect neutral switch.	1W
DTCCNT (Number of DTC detected)	—	—	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
ECT (Engine coolant temperature)	°C / °F	ECT 20 °C {68 °F}: 20 °C {68 °F} ECT 60 °C {140 °F}: 60 °C {140 °F}	Inspect ECT sensor.	1M
	V	ECT 20 °C {68 °F}: 3.04—3.14 V ECT 60 °C {140 °F}: 1.29—1.39 V		
EVAPCP (Purge solenoid valve duty value)	%	Ignition switch ON: 0% Idle: 0%	Inspect following PIDs: IAT, RPM, ECT, MAF, O2S11,BARO, INGEAR, TR, VPWR.	4U
FAN1 (Cooling fan control)	ON/OFF	ECT below 100 °C {212 °F}: OFF Others: ON	Inspect following PIDs: RPM, TP, ECT, ACSW, COLP, TEST. Inspect cooling fan relay.	4L
FAN2 (Cooling fan control)	ON/OFF	ECT below 108 °C {226 °F}: OFF A/C operating, refrigerant pressure switch (middle) is OFF, and ECT below 108 °C {226 °F}: OFF Others: ON	Inspect following PIDs: RPM, TP, ECT, ACSW, COLP, TEST. Inspect cooling fan relay.	4F
FAN3 (Cooling fan control)	ON/OFF	ECT below 100 °C {212 °F}: OFF A/C operating, refrigerant pressure switch (middle) is ON, and ECT below 108 °C {226 °F}: OFF Other: ON	Inspect following PIDs: RPM, TP, ECT, ACSW, COLP, TEST. Inspect cooling fan relay.	4B
FDPDTC (Pending code caused FFD storage)	—	—	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
FP (Fuel pump relay)	ON/OFF	Ignition switch ON: OFF Idle: ON Cranking: ON	Inspect following PIDs: RPM. Inspect fuel pump relay.	4P*5 4Q*6
FUELPW (Fuel injector duration)	ms	Ignition switch ON: 0 ms Idle (after warm up): approx. 2.5 ms	Inspect following PIDs: IAT, MAF, TP, MAP, ECT, RPM, O2S11, O2S12, INGEAR, TR, PSP, ACSW, VPWR, ALTT V. Inspect fuel injector.	4W, 4Z, 4AA, 4AD
FUELSYS (Fuel system status)	OL_Drive/ OL/ CL_Fault/ OL_Fault/CL	Ignition switch ON: OL Idle (after warm up): CL	Inspect following PIDs: IAT, MAF, TP, MAP, ECT, RPM, O2S11, O2S12, INGEAR, TR, PSP, ACSW, VPWR, ALTT V. Inspect fuel injector.	—
GENVDSD (Generator voltage desired)	V	Ignition switch ON: 0 V Idle: Approx. 14.9 V*1 (E/L not operating)	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
HTR11 (HO2S heater (front))	ON/OFF	Idle (after warm up): ON⇔OFF	Inspect following PIDs: IAT, MAF, TP, ECT, RPM, ACSW.	4A

Monitor item (Definition)	Unit/ Condition	Condition/Specification (Reference)	Action	PCM terminal
HTR12 (HO2S heater (rear))	ON/OFF	Ignition switch ON: ON (HO2S heater operated) Idle: ON (HO2S heater operated)	Inspect following PIDs: IAT, MAF, ECT, RPM, ACSW.	4D
IAC (IAC valve)	%	Ignition switch ON: 0% Idle: Approx. 60% (ECT 90°C {194 °F} and E/L not operating)	Inspect following PIDs: IAT, RPM, MAP, ECT, MAF, TP, INGEAR, TR, PSP, ACSW. Inspect IAC valve.	4G, 4J
IASV (Variable air duct control solenoid valve)	ON/OFF	ECT is above 70 °C {158 °F}, engine speed is above 5,800 rpm, and TP opening angle is above 50%: ON Others: OFF	Inspect following PIDs: ECT, RPM, TP. Inspect VAD control solenoid valve.	4C
IAT (Intake air temperature)	°C / °F	IAT 20 °C {68 °F}: 20 °C {68 °F} IAT 30 °C {86 °F}: 30 °C {86 °F}	Inspect IAT sensor.	2E
	V	IAT 20 °C {68 °F}: 2.4—2.6 V IAT 30 °C {86 °F}: 1.7—1.9 V		
IMRC (Variable tumble control solenoid valve)	ON/OFF	Engine speed is below approx. 3,500 rpm: ON Others: OFF	Inspect following PIDs: TP, ECT, RPM. Inspect variable tumble control solenoid valve.	4T
IMTV*7 (Variable Intake-air control solenoid valve)	ON/OFF	Engine speed is below approx. 4,350 rpm: ON Others: OFF	Inspect following PIDs: RPM. Inspect VIC control solenoid valve.	4R
INGEAR*8 (Load/no load condition)	ON/OFF	CPP or CPP/PNP is ON: OFF Others: ON	Perform applicable DTC troubleshooting.	1R, 1W
IVS (CTP condition)	IDLE/ OFF IDLE	CTP: IDLE Others: OFF IDLE	Perform applicable DTC troubleshooting.	2A
KNOCKR (Knocking retard)	°	Ignition switch ON: 0° Idle: 0°	Inspect knock sensor.	2P, 2S
LOAD (Engine load)	%	Ignition switch ON: 0% Idle (after warm up): approx.19%	Inspect MAF sensor.	—
LONGFT1 (long term fuel trim)	%	Idle (after warm up): approx. –14—14%	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
MAF (Mass airflow)	g/s	Ignition switch ON: approx. 0 g/s Idle (after warm up): approx. 1.5 g/s	Inspect MAF sensor.	1P
	V	Ignition switch ON: approx. 0.7 V Idle (after warm up): approx. 1.3 V		
MAP (Manifold absolute pressure)	kPa, inHg	Ignition switch ON (at sea level): approx 101 kPa {29.8 inHg}	Inspect MAP sensor.	1J
	V	Ignition switch ON (at sea level): approx 4.1 V		
MIL (Malfunction indicator lamp)	ON/OFF	Ignition switch ON: ON Idle: OFF	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
MIL_DIS (Trabelled distance since the MIL illuminated)	km, mile	No DTC: 0 km {0 mile} DTC detected: Not 0 km {0 mile}	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
O2S11 (Front oxygen sensor)	V	Ignition switch ON: 0—1.0 V Idle (After warm up): 0—1.0 V	Inspect HO2S (front).	1AB
	Rich/Lean	Acceleration (After warm up): Rich Deceleration (After warm up): Lean		
O2S12 (Rear oxygen sensor)	V	Idle (After warm up): approx 0.6 V	Inspect HO2S (rear).	1Y
	Rich/Lean	Idle (After warm up): Rich		
PSP (Power steering pressure switch)	Low/High	Steering wheel in straight ahead position: Low Others: High	Inspect PSP switch.	1Z
RFCFLAG (Readness function code)	Learnt/Not Learnt	Before running PCM adaptive memory procedure drive mode: Not Learnt After running PCM adaptive memory procedure drive mode: Learnt	Run PCM adaptive memory procedure drive mode.	—

Monitor item (Definition)	Unit/ Condition	Condition/Specification (Reference)	Action	PCM terminal
RO2FT1 (Rear oxygen sensor fuel trim)	—	Idle (after warm up): approx. –0.03—0.03	Perform applicable DTC troubleshooting.	—
RPM (Engine speed)	rpm	**LF Unleaded fuel (RON 90 or above) model** No load: 600—700 rpm E/L operating: 650—750 rpm P/S operating: 650—750 rpm A/C ON: 700—800 rpm **L3 4WD ATX model** No load: 650—750 rpm E/L operating: 650—750 rpm P/S operating: 650—750 rpm A/C ON: 650—750 rpm*2, 700—800 rpm*3	Inspect CKP sensor.	2D, 2G
SEGRP (EGR valve (stepping motor) position)	Step	Ignition switch ON: 0 step Idle: 0 step Cranking: 0—60 steps	Inspect following PIDs: MAF, TP, ECT, RPM, VSS. Inspect EGR valve.	4E, 4H, 4K, 4N
SHRTFT1 (Short term fuel trim)	%	Idle (after warm up): approx.–30—25%	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
SPARKADV (Ignition timing)	°	Ignition switch ON: BTDC 0° Idle: BTDC approx. 10°	Inspect following PIDs: MAF, TP, ECT, RPM, INGEAR, TR, PSP, ACSW, VPWR. Inspect ignition timing.	2J, 2M
TEST (Test mode)	ON/OFF	—	—	—
TP (TP)	%	CTP: 13—23% WOT: 86—96%	Inspect TP sensor.	2A
	V	CTP: 0.65—1.15 V WOT: 4.3—4.8 V		
TPCT (TP sensor voltage at CTP)	V	0.65—1.15 V	Inspect TP sensor.	2A
VPWR (Battery positive voltage)	V	Ignition switch ON: B+	Inspect main relay. Inspect battery.	2Y, 2Z
VSS (Vehicle speed)	kph, mph	Vehicle speed 20 kph {12 mph}: 20 kph {12 mph} Vehicle speed 40 kph {25 mph}: 20 kph {12 mph}	Perform applicable DTC troubleshooting. (See F1–54 DTC TABLE)	—
VT DUTY1*7	%	Idle: 0%	Inspect following PIDs: TP, ECT, RPM. Inspect OCV.	2I, 2L

*1 : Calculated value; differs from terminal voltage
*2 : Refrigerant pressure switch (middle) turns on when the refrigerant pressure is 1.69—1.84 MPa {17.3—18.7 kgf/cm^2, 247—265 psi}
*3 : Refrigerant pressure switch (middle) turns off when the refrigerant pressure is 1.26—1.49 MPa {12.9—15.1 kgf/cm^2, 184—214 psi}
*4 : L3 and L8, LF (Intensely hot area) engine models
*5 : Immobilizer system equipped model
*6 : Immobilizer system not equipped
*7 : L3 engine model only
*8 : MTX model only

- Following PIDs are for the ATX models. If inspects for following PIDs, see K2–180 PID/DATA MONITOR INSPECTION.
  PIDs for the ATX models
  — GEAR, LINEDES, LPS, OP_SW_B, SSA/SS1, SSB/SS2, SSC/SS3, TCS, TFT, TFTV, THOP, TR, TR_SENS, TSS

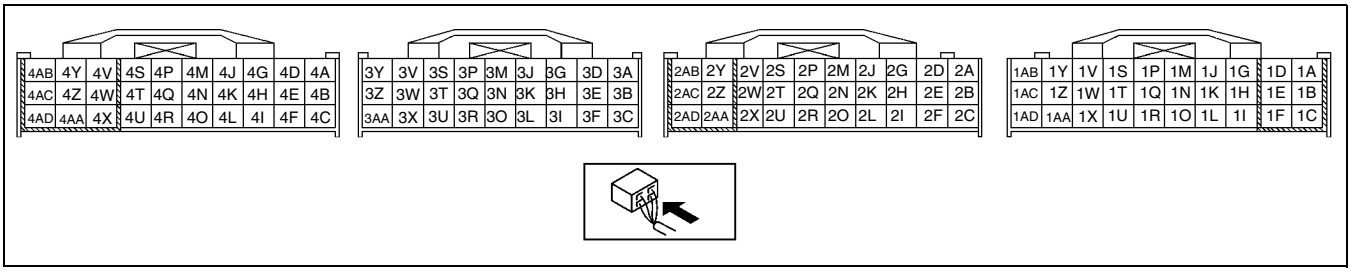
Without Using the SST

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, a wrong diagnosis will be made.**

1. Measure the voltage at each terminal.
   - If any incorrect voltage is detected, inspect the related system(s), wiring harnesses and connector(s) referring to the Action column in the terminal voltage table.

Terminal voltage table (Reference)



A6A3940W002

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
1A	IGT1	Ignition coil (No. 1, 4 cylinders)	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect ignition coil • Inspect related harness
1B	IGT2	Ignition coil (No. 2, 3 cylinders)	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect ignition coil • Inspect related harness
1C	GND	GND	Under any condition		Below 1.0	• Inspect related harness
1D	GND	GND	Under any condition		Below 1.0	• Inspect related harness
1E	—	—	—		—	—
1F	—	—	—		—	—
1G	BARO	BARO sensor	Ignition switch ON (at sea level)		Approx. 4.1 V	• Inspect BARO sensor • Inspect related harness
1H	—	—	—		—	—
1I	—	—	—		—	—
1J	Manifold absolute pressure	MAP sensor	Ignition switch ON (Engine OFF)		Approx. 4.1	• Inspect MAP sensor • Inspect related harness
			Idle		Approx. 1.5	
1K	Brake	Brake switch	Brake pedal depressed		B+	• Inspect brake switch • Inspect related harness
			Brake pedal released		Below 1.0	
1L	—	—	—		—	—
1M	ECT	ECT sensor	Ignition switch ON	ECT 20 °C {68 °F}	3.04—3.14	• Inspect ECT sensor • Inspect related harness
				ECT 60 °C {140 °F}	1.29—1.39	
1N	—	—	—		—	—
1O	—	—	—		—	—
1P	MAF	MAF sensor	Ignition switch ON		Approx. 0.7	• Inspect MAF sensor • Inspect related harness
			Idle (after warm up)		Approx. 1.3	

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
1Q	Refrigerant pressure switch (middle)	Refrigerant pressure switch (middle)	A/C ON	Refrigerant pressure is above 1.52 MPa	Below 1.0	• Inspect refrigerant pressure switch • Inspect related harness
				Refrigerant pressure is below 1.23 MPa	B+	
1R	Clutch operation*2	Clutch switch	Clutch pedal depressed		Below 1.0	• Inspect clutch switch • Inspect related harness
			Clutch pedal released		B+	
	—*3	—	—		—	—
1S	—	—	—		—	—
1T	—	—	—		—	—
1U	—	—	—		—	—
1V	—	—	—		—	—
1W	Neutral position*2	Neutral switch	Shift lever is at neutral position		Below 1.0	• Inspect neutral switch • Inspect related harness
			Shift lever is not at neutral position		B+	
	Selector lever position*11	TR switch (terminal C)	Ignition switch ON	P range	Approx. 4.6	• Inspect TR switch • Inspect related harness
				R range	Approx. 3.9	
				N range	Approx. 3.2	
				D range*4 M range*5	Approx. 2.5	
				S range*4	Approx. 1.7	
				L range*4	Approx. 0.94	
	—*12	—	—		—	—
1X	—	—	—		—	—
1Y	HO2S (rear)	HO2S (rear)	Ignition switch ON		Approx. 0	• Inspect HO2S (rear) • Inspect related harness
			Idle (after warm up)		0—1.0	
1Z	PSP	PSP switch	Idle	Steering wheel at straight ahead position	B+	• Inspect PSP switch • Inspect power steering system • Inspect related harness
				While turning steering wheel	Below 1.0	
1AA	Generator output voltage	Generator (terminal P)	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect generator • Inspect related harness
1AB	HO2S (front)	HO2S (front)	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect HO2S (front) • Inspect related harness
1AC	A/C on signal	Refrigerant pressure switch	Idle	A/C switch and fan switch on	Below 1.0	• Inspect refrigerant pressure switch • Inspect related harness
				A/C switch off	B+	
1AD	Generator field coil control	Generator (terminal D)	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect generator • Inspect related harness
2A	Throttle position	TP sensor	Ignition switch ON	CTP	0.65—1.15	• Inspect TP sensor • Inspect related harness
				WOT	4.3—4.8	
2B	—	—	—		—	—
2C	—	—	—		—	—

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
2D	CKP (+)	CKP sensor	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect CKP sensor • Inspect related harness
2E	IAT	MAF/IAT sensor	Ignition switch ON	IAT 20 °C {68 °F}	2.4—2.6	• Inspect IAT sensor • Inspect related harness
				IAT 30 °C {86 °F}	1.7—1.9	
2F	—	—	—		—	—
2G	CKP (–)	CKP sensor	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect CKP sensor • Inspect related harness
2H	Sensor GND	MAF/IAT sensor, HO2S (Front, Rear), BARO sensor*6, ECT sensor, TP sensor, MAP sensor, TFT sensor, TR switch	Under any condition		Below 1.0	• Inspect related harness
2I	VSS (–)*8	VSS	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect VSS sensor • Inspect related harness
	—*13	—	—		—	—
2J	CMP (+)	CMP sensor	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect CMP sensor • Inspect related harness
2K	Constant voltage (Vref)	MAP sensor, TP sensor, BARO sensor*6	Ignition switch ON		Approx. 5.0	• Inspect related harness
2L	VSS (+)*8	VSS	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect VSS sensor • Inspect related harness
	—*13	—	—		—	—
2M	CMP (–)	CMP sensor	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect CMP sensor • Inspect related harness
2N	—	—	—		—	—
2O	—	—	—		—	—
2P	Knocking (–)	Knock sensor	Ignition switch ON (Use digital type voltmeter, because measurement voltage will be detected less than true voltage when using analog type voltmeter)		Below 1.0	• Perform “On-Board Diagnostic Test” • Inspect related harness
2Q	Coil (Immobilizer system)*9	Coil	Because this terminal is for communication, good/no good judgment by terminal voltage is not possible.			• Inspect coil • Inspect related harness
	—*10	—	—		—	—
2R	CAN (–)	Instrument cluster, ABS HU/CM, ABS/TCS HU/CM, DSC HU/CM, TCM*12	Because this terminal is for CAN, good/no good judgment by terminal voltage is not possible.			• Inspect related harness
2S	Knocking (+)	Knock sensor	Ignition switch ON (Use digital type voltmeter, because measurement voltage will be detected less than true voltage when using analog type voltmeter)		Approx. 4.3	• Perform “On-Board Diagnostic Test” • Inspect related harness

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
2T	Coil*9 (Immobilizer system)	Coil	Because this terminal is for communication, good/no good judgment by terminal voltage is not possible.			• Inspect coil • Inspect related harness
	—*10	—	—		—	—
2U	CAN (+)	Instrument cluster, ABS HU/CM, ABS/TCS HU/CM, DSC HU/CM, TCM*12	Because this terminal is for CAN, good/no good judgment by terminal voltage is not possible.			• Inspect related harness
2V	—	—	—		—	—
2W	Security light control*9	Instrument cluster (Security light)	Security light illuminate		—	• Inspect related harness
			Others		Below 1.0	
	—*10	—	—		—	—
2X	Main relay control	Main relay	Ignition switch OFF		B+	• Inspect main relay • Inspect related harness
			Ignition switch ON		Below 1.0	
2Y	B+	Main relay	Ignition switch OFF		Below 1.0	• Inspect battery • Inspect related harness
			Ignition switch ON		B+	
2Z	Back-up power supply	Battery (positive terminal)	Under any condition		B+	• Inspect battery • Inspect related harness
2AA	—	—	—		—	—
2AB	GND	GND	Under any condition		Below 1.0	• Inspect related harness
2AC	GND	GND	Under any condition		Below 1.0	• Inspect related harness
2AD	—	—	—		—	—
3A	—	—	—		—	—
3B	—	—	—		—	—
3C	Vehicle speed*3	VSS	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect VSS • Inspect related harness
	—*13	—	—		—	—
3D	ATF temperature*11	TFT sensor	Ignition switch ON	TFT 20 °C {68 °F}	Approx. 3.3	• Inspect TFT sensor • Inspect related harness
				TFT 40 °C {104 °F}	Approx. 2.4	
				TFT 60 °C {140 °F}	Approx. 1.5	
	—*14	—	—		—	—
3E	—	—	—		—	—
3F	—	—	—		—	—
3G	Input/turbine speed sensor (+)*11	Input/turbine speed sensor	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect input/turbine speed sensor • Inspect related harness
	—*14	—	—		—	—
3H	—	—	—		—	—
3I	—	—	—		—	—
3J	Input/turbine speed sensor (–)*11	Input/turbine speed sensor	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect input/turbine speed sensor • Inspect related harness
	—*14	—	—		—	—

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
3K	Manual down*5, 11	Down switch	Ignition switch ON	Detects down-shift operation of selector lever in M range	Below 1.0	• Inspect down switch • Inspect related harness
				Others	B+	
	—*14	—	—		—	—
3L	—	—	—		—	—
3M	—	—	—		—	—
3N	Manual up*5, 11	Up switch	Ignition switch ON	Detects up-shift operation of selector lever in M range	Below 1.0	• Inspect up switch • Inspect related harness
				Others	B+	
	—*14	—	—		—	—
3O	—	—	—		—	—
3P	Shift solenoid E control*11	Shift solenoid E	Detects TCC operation		B+	• Inspect shift solenoid E • Inspect related harness
			Others		Below 1.0	
	—*14	—	—		—	—
3Q	HOLD*4, 11	HOLD switch	Ignition switch ON	HOLD switch pushed	Below 1.0	• Inspect HOLD switch • Inspect related harness
				Others	B+	
	M range*5, 11	M range switch	Ignition switch ON	Manual mode	Below 1.0	• Inspect M range switch • Inspect related harness
				Others	B+	
	—*14	—	—		—	—
3R	—	—	—		—	—
3S	Shift solenoid D control*11	Shift solenoid D	Selector lever is at P, N position		B+	• Inspect shift solenoid D • Inspect related harness
			Others		Below 1.0	
	—*14	—	—		—	—
3T	Oil pressure*11	Oil pressure switch	Ignition switch ON	Detects forward clutch pressure	Below 1.0	• Inspect oil pressure switch • Inspect related harness
				Others	B+	
	—*14	—	—		—	—
3U	—	—	—		—	—
3V	Pressure control solenoid (–)*11	Pressure control solenoid valve	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect pressure control solenoid valve • Inspect related harness
	—*14	—	—		—	—
3W	—	—	—		—	—
3X	—	—	—		—	—
3Y	Pressure control solenoid (+)*11	Pressure control solenoid valve	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect pressure control solenoid valve • Inspect related harness
	—*14	—	—		—	—
3Z	—	—	—		—	—
3AA	—	—	—		—	—
4A	HO2S (Front) heater control	HO2S (Front) heater	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect HO2S (Front) heater. • Inspect related harness

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
4B	Cooling fan control	Cooling fan relay	Idling	ECT below 100 °C {212 °F}	B+	• Inspect cooling fan relay • Inspect related harness
				A/C operating	Below 1.0	
4C	VAD control*5	VAD control solenoid valve	Ignition switch ON	Engine speed below 5,800 rpm	B+	• Inspect VAD control solenoid valve • Inspect related harness
				Engine speed above 5,800 rpm	Below 1.0	
	—*7	—	—		—	—
4D	HO2S (Rear) heater control	HO2S (Rear) heater	Ignition switch ON	Engine speed below 4,000 rpm	B+	• Inspect HO2S (Front) heater. • Inspect related harness
				Engine speed above 4,000 rpm	Below 1.0	
4E	EGR valve #1 coil control	EGR valve (terminal E)	Ignition switch ON		Below 1.0	• Inspect EGR valve • Inspect related harness
			Idle		Below 1.0	
4F	Cooling fan control	Cooling fan relay	Idling	ECT below 100 °C {212 °F}	B+	• Inspect cooling fan relay • Inspect related harness
				A/C operating and refrigerant pressure switch (middle) ON	Below 1.0	
4G	IAC (+)	IAC valve	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect IAC valve • Inspect related harness
4H	EGR valve #2 coil control	EGR valve (terminal A)	Ignition switch ON		B+	• Inspect EGR valve • Inspect related harness
			Idle		B+	
4I	Starter relay control	Starter relay (MTX) TR switch (ATX)	Under any condition		Below 1.0	• Perform “On-Board Diagnostic Test” • Inspect related harness
4J	IAC (–)	IAC valve	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect IAC valve • Inspect related harness
4K	EGR valve #3 coil control	EGR valve (terminal B)	Ignition switch ON		B+	• Inspect EGR valve • Inspect related harness
			Idle		B+	
4L	Cooling fan control	Cooling fan relay	Idling	ECT below 100 °C {212 °F}	B+	• Inspect cooling fan relay • Inspect related harness
				A/C operating	Below 1.0	
4M	OCV control*5	OCV	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)			• Inspect OCV valve • Inspect related harness
	—*7	—	—		—	—
4N	EGR valve #4 coil control	EGR valve (terminal F)	Ignition switch ON		Below 1.0	• Inspect EGR valve • Inspect related harness
			Idle		Below 1.0	
4O	A/C	A/C relay	A/C operating		Below 1.0	• Inspect A/C relay • Inspect related harness
			A/C not operating		B+	
4P	Fuel pump control*10	Fuel pump relay	Ignition switch ON		B+	• Inspect fuel pump relay • Inspect related harness
			Cranking		Below 1.0	
			Idle		Below 1.0	
	—*9	—	—		—	—

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
4Q	Fuel pump control*9	Fuel pump relay	Ignition switch ON	B+	• Inspect fuel pump relay • Inspect related harness
			Cranking	Below 1.0	
			Idle	Below 1.0	
	—*10	—	—	—	—
4R	VIC control*5	VIC control solenoid valve	Engine speed: above 4,500 rpm	B+	• Inspect VIC solenoid valve • Inspect related harness
			Engine speed: below 4,500 rpm	Below 1.0	
	—*7	—	—	—	—
4S	—	—	—	—	—
4T	Variable tumble control	Variable tumble control solenoid valve	ECT above 63 °C { 145 °F} while idling.	B+	• Inspect variable tumble control solenoid valve • Inspect related harness
			ECT below 63 °C {145 °F} and engine speed below 3,750 rpm	Below 1.0	
4U	Purge control	Purge solenoid valve	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect purge solenoid valve • Inspect related harness
4V	B+*3	Main relay	Ignition switch OFF	Below 1.0	• Inspect battery • Inspect related harness
			Ignition switch ON	B+	
	—	—	—	—	—
4W	Fuel injection (#2)	Fuel injector No.2	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect fuel injector No.2 • Inspect related harness
4X	GND	GND	Under any condition	Below 1.0	• Inspect related harness
4Y	Shift solenoid C control*11	Shift solenoid C	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect shift solenoid C • Inspect related harness
	—*14	—	—	—	—
4Z	Fuel injection (#1)	Fuel injector No.1	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect fuel injector No.1 • Inspect related harness
4AA	Fuel injection (#4)	Fuel injector No.4	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect fuel injector No.4 • Inspect related harness
4AB	Shift solenoid A control*11	Shift solenoid A	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect shift solenoid A • Inspect related harness
	—*14	—	—	—	—
4AC	Shift solenoid B control*11	Shift solenoid B	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect shift solenoid B • Inspect related harness
	—*14	—	—	—	—
4AD	Fuel injection (#3)	Fuel injector No.3	• Inspect using the wave profile. (See F1–44 Inspection Using An Oscilloscope (Reference).)		• Inspect fuel injector No.3 • Inspect related harness

*1 : Calculated value; differs from terminal voltage
*2 : MTX models
*3 : ATX models
*4 : LF engine models
*5 : L3 engine models

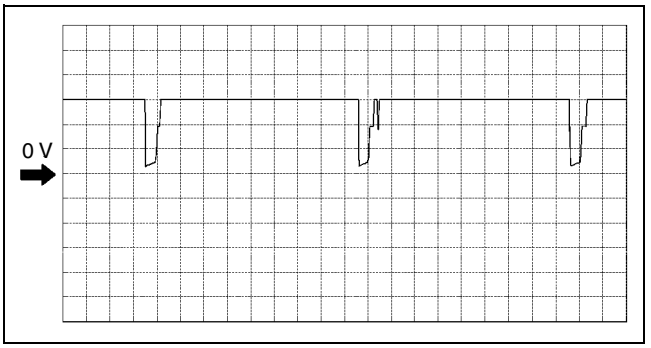
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*6 : Unleaded fuel (RON 90 or above) models
*7 : Exclude L3 engine models
*8 : MTX, without ABS models
*9 : Immobilizer system equipped
*10 : Immobilizer system not equipped
*11 : 2WD ATX models
*12 : 4WD ATX models
*13 : Exclude MTX models without ABS
*14 : Exclude 2WD ATX models

Inspection Using An Oscilloscope (Reference)
IGT1, IGT2 control signals
PCM terminals
- IGT1(No.1 and No.4): 1A(+)—1D(–)
- IGT2(No.2 and No.3): 1B(+)—1C(–)

Oscilloscope setting
- 4 V/DIV (Y), 0.01 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

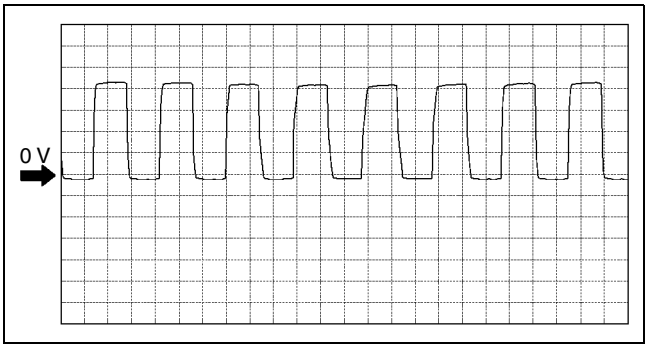


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Generator output voltage signal
PCM terminals
- 1AA(+)—2AC(–)

Oscilloscope setting
- 2 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

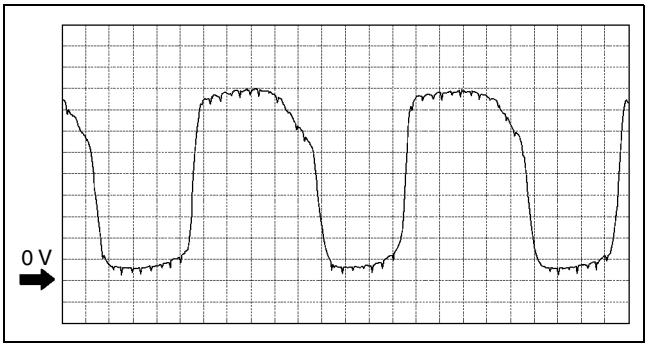


A6A3940W004

HO2S (front) signal
PCM terminals
- 1AB(+)—2H(–)

Oscilloscope setting
- 0.1 V/DIV (Y), 400 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX], 700 rpm [ATX], no load, P/S off, A/C off)

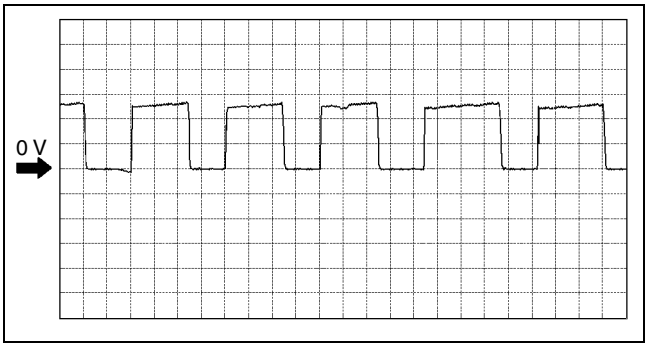


A6A3940W005

Generator field coil control signal
PCM terminals
- 1AD(+)—1C(–)

Oscilloscope setting
- 0.5 V/DIV (Y), 1 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

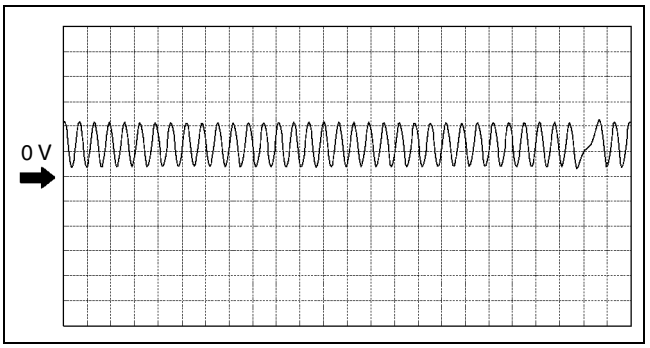


A6A3940W006

CKP sensor signal
(+)
PCM terminals
- 2D(+)—2H(–)

Oscilloscope setting
- 2 V/DIV (Y), 4 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

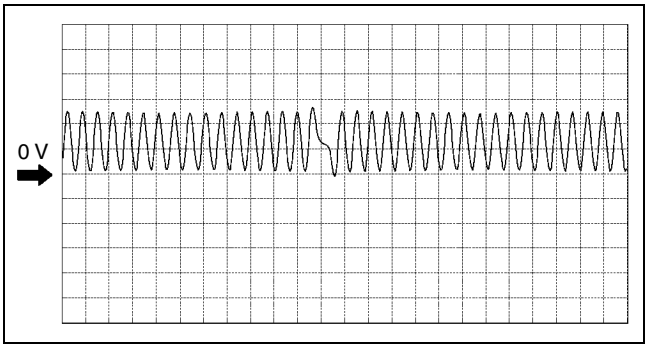


A6A3940W007

(–)
PCM terminals
- 2G(+)—2H(–)

Oscilloscope setting
- 2 V/DIV (Y), 4 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

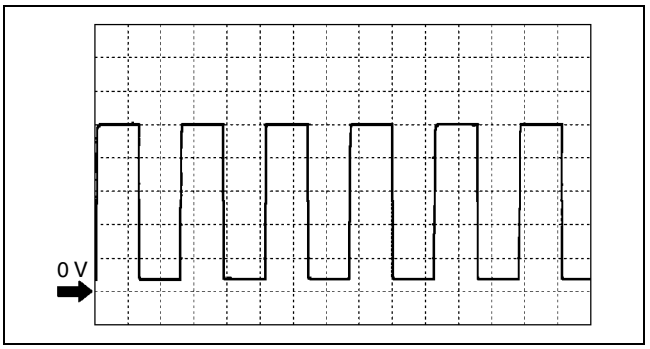


A6A3940W008

VSS signal
PCM terminals
- 3C(+)—2AC(–)

Oscilloscope setting
- 1 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Drive the vehicle with approx. 10 km/h {6.2 mph}

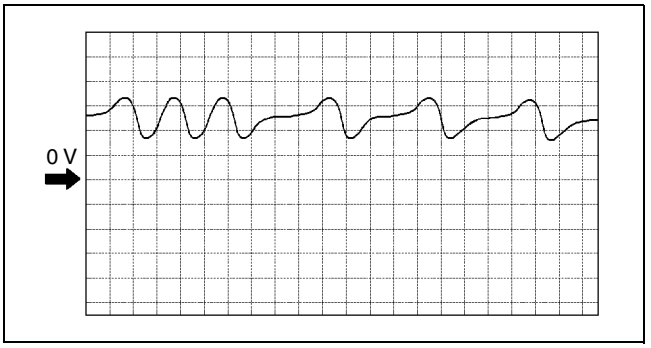


A6A3940W011

CMP sensor signal
L3 engine (+)
PCM terminals
- 2J(+)—2H(–)

Oscilloscope setting
- 1 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

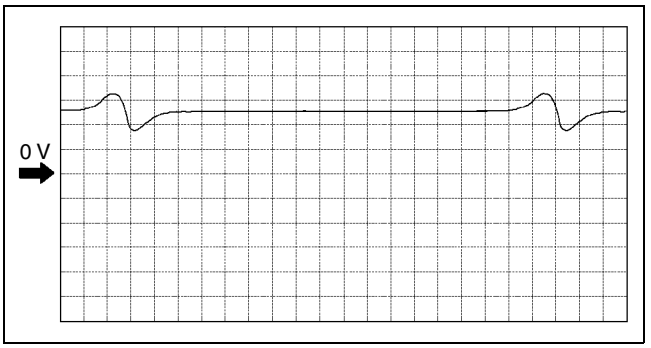


A6A3940W012

LF engine (+)
PCM terminals
- 2J(+)—2H(–)

Oscilloscope setting
- 1 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

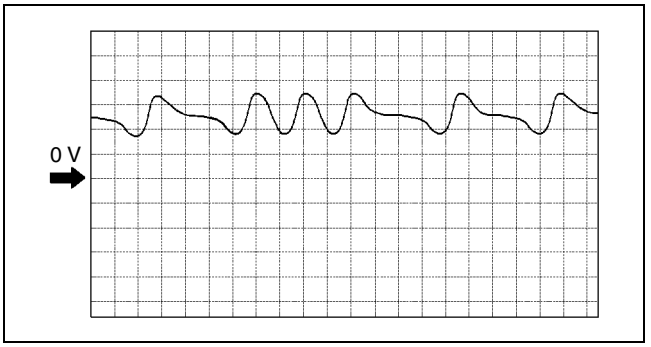


A6A3940W013

L3 engine (–)
PCM terminals
- 2M(+)—2H(–)

Oscilloscope setting
- 1 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

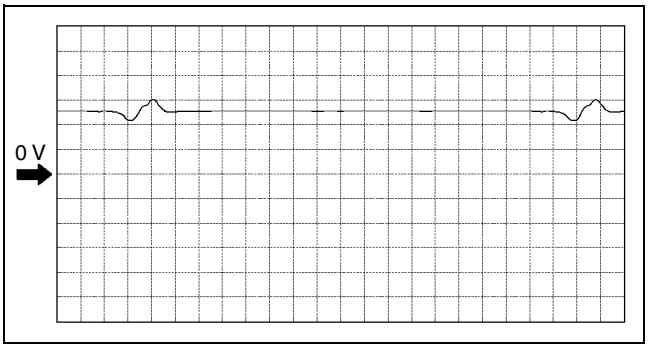


A6A3940W014

LF engine (–)
PCM terminals
- 2M(+)—2H(–)

Oscilloscope setting
- 1 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

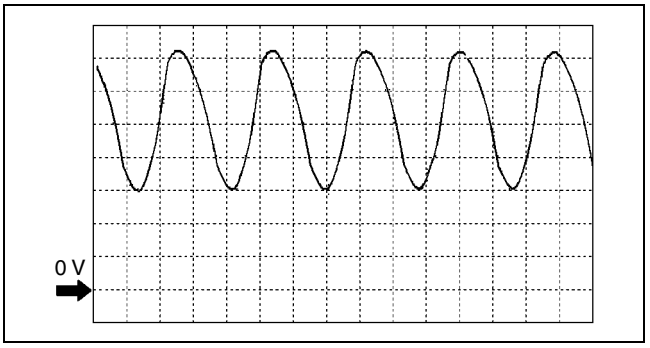


A6A3940W015

Input/turbine speed sensor signal
PCM terminals
- 3G(+)—2AC(–)

Oscilloscope setting
- 500 mV/DIV (Y), 1 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

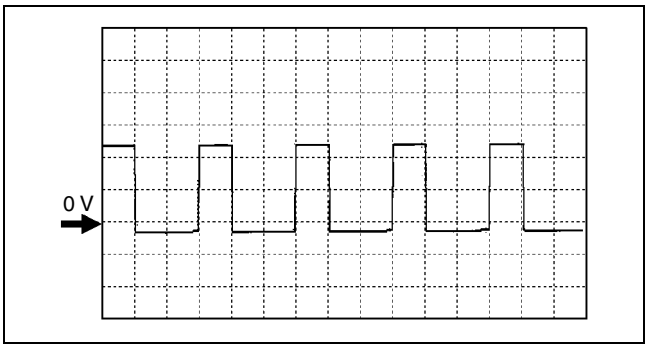


A6A3940W016

Pressure control solenoid signal
(–)
PCM terminals
- 3V(+)—1C(–)

Oscilloscope setting
- 5 V/DIV (Y), 1 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

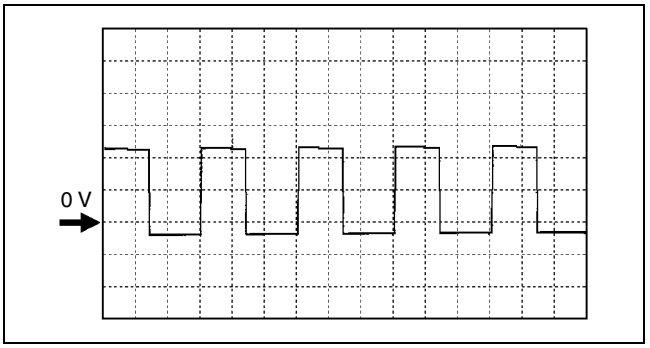


A6A3940W017

(+)
PCM terminals
- 3Y(+)—1C(–)

Oscilloscope setting
- 5 V/DIV (Y), 1 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

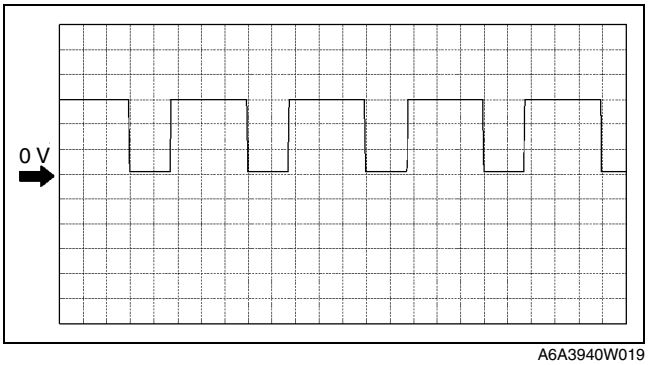


A6A3940W018

HO2S (front) heater control signal
PCM terminals
- 4A(+)—1C(–)

Oscilloscope setting
- 4 V/DIV (Y), 200 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

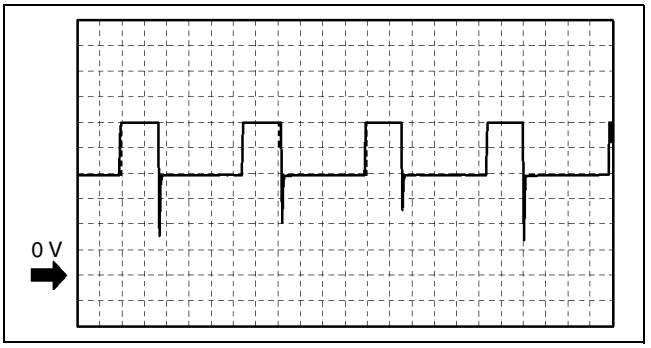


A6A3940W019

IAC signal
(+)
PCM terminals
- 4G(+)—1C(–)

Oscilloscope setting
- 2 V/DIV (Y), 0.4 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

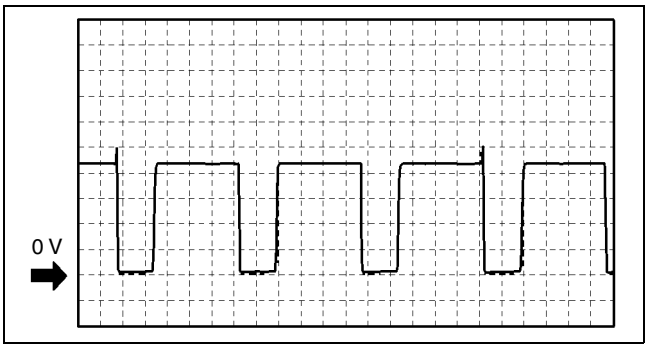


A6A3940W020

(–)
PCM terminals
- 4J(+)—1C(–)

Oscilloscope setting
- 2 V/DIV (Y), 0.4 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

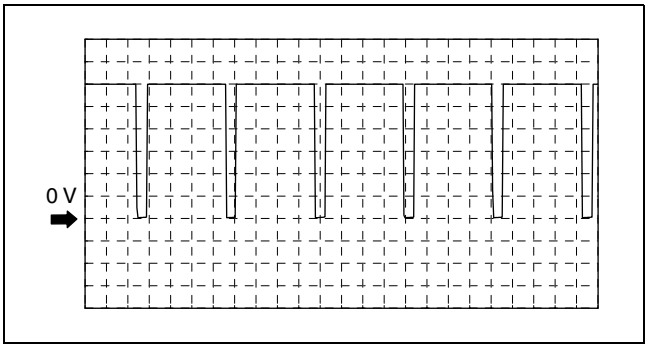


A6A3940W021

OCV control signal
PCM terminals
- 4M(+)—1C(–)

Oscilloscope setting
- 2 V/DIV (Y), 0.8 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

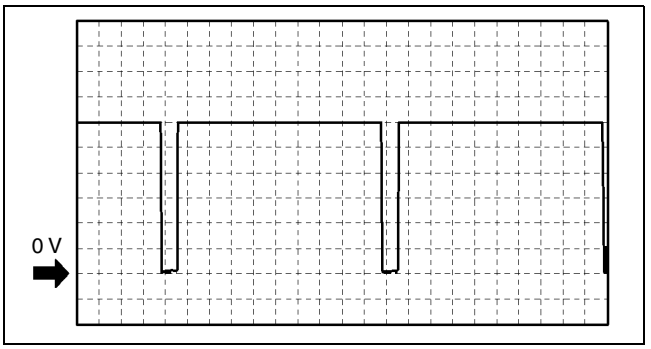


A6A3940W022

Purge control signal
PCM terminals
- 4U(+)—1C(–)

Oscilloscope setting
- 1 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

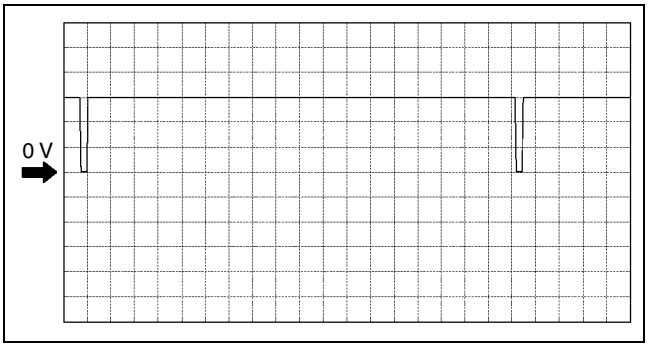


A6A3940W023

Fuel injection control
PCM terminals
- Fuel Injection No.1: 4Z(+)—1C(–)
- Fuel Injection No.1: 4W(+)—1C(–)
- Fuel Injection No.1: 4AD(+)—1C(–)
- Fuel Injection No.1: 4AA(+)—1C(–)

Oscilloscope setting
- 4 V/DIV (Y), 10 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

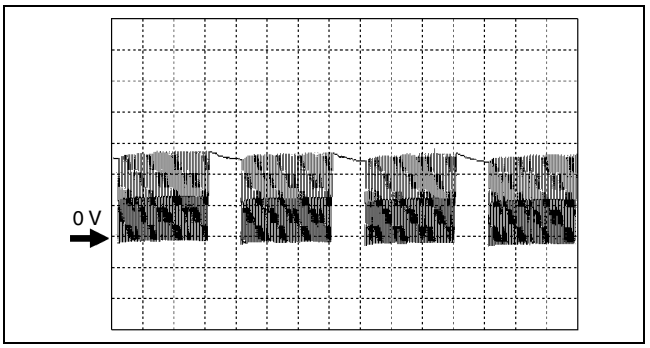


A6A3940W024

Shift solenoid C control
PCM terminals
- 4Y(+)—1C(–)

Oscilloscope setting
- 5 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

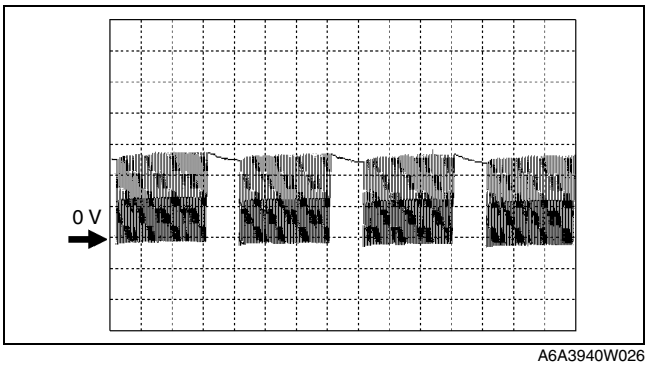


A6A3940W025

Shift solenoid A control
PCM terminals
- 4AB(+)—1C(–)

Oscilloscope setting
- 5 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)

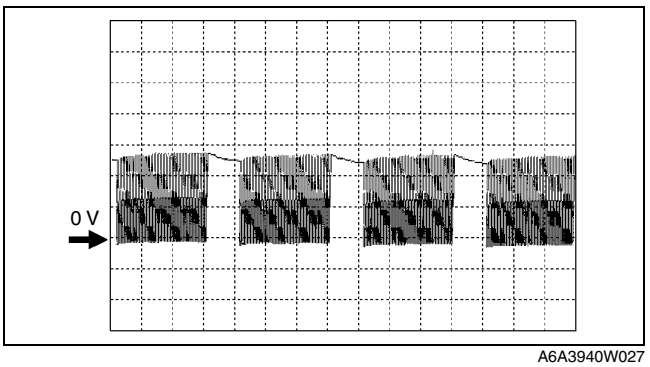


A6A3940W026

Shift solenoid B control
PCM terminals
- 4AC(+)—1C(–)

Oscilloscope setting
- 5 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition
- Idle after warm up (engine speed approx. 650 rpm [MTX] or 700 rpm [ATX], no load, P/S off, A/C off)



A6A3940W027

ON-BOARD DIAGNOSTIC

OUTLINE

A6E397018881201

- The construction and operation of the on-board diagnostic system is essentially carried over from that of the current Mazda6 (GG), except for the following. (See Mazda6 Training Manual 3359-1*-02C.)
  4WD ATX model
  — DTCs, PID monitoring items, and simulation items have been deleted to match the vehicle characteristics.
  Unleaded fuel (RON 90 or above) model
  — DTCs and PID monitoring items which relevant to BARO sensor have been deleted to match the vehicle characteristics.

CONTROL DEVICE AND MONITORING SYSTEM RELATIONSHIP CHART

A6E397018881202

Monitoring System

×: Applicable

Component	Monitor item				
	Catalyst	Misfire	Fuel system	Oxygen sensor	Oxygen sensor heater
Input					
CKP sensor	×	×	×	×	×
CMP sensor	×	×	×	×	×
VSS		×	×	×	
MAF sensor	×	×	×	×	×
ECT sensor	×	×	×	×	×
IAT sensor	×	×	×	×	
TP sensor	×	×	×	×	
Rear HO2S	×			×	×
Front HO2S	×		×	×	×
Output					
DLC-2	×	×	×	×	×
MIL	×	×	×	×	×
Purge solenoid valve			×	×	
Fuel injectors			×		

DIAGNOSTIC TEST MODE (4WD)

A6E397018881203

Sending Emission-related Malfunction code (DTC) (Mode 03)

- The DTCs are shown in the table.

DTC table

×: Applicable
—: Not applicable

DTC No.	Condition	MIL	DC	Monitor item	Memory function
P0010	CMP actuator circuit malfunction	ON	1	CCM	×
P0011	CMP timing over-advanced	ON	1	CCM	×
P0012	CMP timing over-retarded	ON	1	CCM	×
P0031	Front HO2S heater circuit low input	ON	2	O_2 sensor heater	×
P0032	Front HO2S heater circuit high input	ON	2	O_2 sensor heater	×
P0037	Rear HO2S heater circuit low input	ON	2	O_2 sensor heater	×
P0038	Rear HO2S heater circuit high input	ON	2	O_2 sensor heater	×
P0101	MAF sensor inconsistent with TP sensor	ON	2	CCM	×
P0102	MAF circuit low input	ON	1	CCM	×
P0103	MAF circuit high input	ON	1	CCM	×
P0107	MAP sensor circuit low input	ON	1	CCM	×
P0108	MAP sensor circuit high input	ON	1	CCM	×
P0111	IAT circuit performance problem	ON	2	CCM	×

DTC No.	Condition	MIL	DC	Monitor item	Memory function
P0112	IAT circuit low input	ON	1	CCM	×
P0113	IAT circuit high input	ON	1	CCM	×
P0117	ECT circuit low input	ON	1	CCM	×
P0118	ECT circuit high input	ON	1	CCM	×
P0121	TP stuck closed	ON	2	CCM	×
P0122	TP circuit low input	ON	1	CCM	×
P0123	TP circuit high input	ON	1	CCM	×
P0125	Excessive time to enter closed loop fuel control	ON	2	CCM	×
P0131	Front HO2S no inversion (stuck low)	ON	2	CCM	×
P0132	Front HO2S no inversion (stuck high)	ON	2	CCM	×
P0133	Front HO2S circuit malfunction	ON	2	O_2 sensor	×
P0134	Front HO2S circuit no activity detected	ON	2	CCM	×
P0138	Rear HO2S circuit high input	ON	2	CCM	×
P0140	Rear HO2S circuit no activity detected	ON	2	CCM	×
P0171	Fuel trim system too lean	ON	2	Fuel	×
P0172	Fuel trim system too rich	ON	2	Fuel	×
P0300	Random misfire detected	Flash / ON	1 or 2	Misfire	×
P0301	Cylinder No.1 misfire detected	Flash / ON	1 or 2	Misfire	×
P0302	Cylinder No.2 misfire detected	Flash / ON	1 or 2	Misfire	×
P0303	Cylinder No.3 misfire detected	Flash / ON	1 or 2	Misfire	×
P0304	Cylinder No.4 misfire detected	Flash / ON	1 or 2	Misfire	×
P0327	Knock sensor circuit low input	ON	1	CCM	×
P0328	Knock sensor circuit high input	ON	1	CCM	×
P0335	CKP sensor circuit malfunction	ON	1	CCM	×
P0340	CMP sensor circuit malfunction	ON	1	CCM	×
P0403	EGR valve motor coils open or short	ON	2	CCM	×
P0420	Catalyst system efficiency below threshold	ON	2	Catalyst	×
P0443	Evaporative emission control system purge control valve circuit malfunction	ON	2	CCM	×
P0480	Fan relay control circuit malfunction	OFF	2	Other	×
P0500	Vehicle speed sensor (VSS) circuit malfunction	ON	2	CCM	×
P0505	Idle control system malfunction	OFF	—	Other	—
P0506	Idle control system RPM lower than expected	ON	2	CCM	×
P0507	Idle control system RPM higher than expected	ON	2	CCM	×
P0511	Idle control system circuit malfunction	ON	1	CCM	×
P0550	PSP switch circuit malfunction	ON	2	CCM	×
P0602	PCM programming error	ON	1	CCM	×
P0610	Control module vehicle options error	ON	1	CCM	×
P0661	VIS control circuit low input	OFF	2	Other	×
P0662	VIS control circuit high input	OFF	2	Other	×
P0703	Brake switch input malfunction	ON	2	CCM	×
P0704	Clutch switch input malfunction	ON	2	CCM	×
P0850	Neutral switch input malfunction	ON	2	CCM	×
P1410	Variable air duct valve circuit malfunction	OFF	2	Other	×
P1562	PCM +BB voltage low	ON	1	CCM	×
P2006	Variable tumble control shutter valve stuck closed	ON	2	CCM	×
P2009	Variable tumble control solenoid circuit low input	ON	2	CCM	×
P2010	Variable tumble control solenoid circuit high input	ON	2	CCM	×
P2228	BARO sensor circuit low input	ON	1	CCM	×
P2229	BARO sensor circuit high input	ON	1	CCM	×
P2502	Generator output voltage signal no electricity	OFF	1	Other	—
P2503	Battery overcharge	OFF	1	Other	—
P2504	Generator terminal B circuit open	OFF	1	Other	—
U0073	CAN bus off	OFF	1	Other	—

DTC No.	Condition	MIL	DC	Monitor item	Memory function
U0101	PCM cannot receive any signals from TCM	ON	1	Other	×
U0121	PCM cannot receive any signals from ABS, ABS/TCS or DSC HU/CM	ON	1	Other	×
U0155	PCM cannot receive any signals from instrument cluster	ON	1	Other	×

DTC (4WD)

A6E397018881204

- Detection logics and conditions are as shown below.

Controller Area Network (CAN)
PCM cannot receive any signals from TCM (U0101)

- PCM cannot receive any signals from TCM.

OBD DRIVE MODE

A6E397018881205

- Performing the Drive Mode inspects the OBD system for proper operation. The Drive Mode must be performed to ensure that no additional DTCs are present.
- During Drive Mode, the following systems are inspected:
  — Oxygen sensor (HO2S)
  — Oxygen sensor heater
  — Catalytic converter (TWC)

Caution

- **While performing the Drive Mode, always operate the vehicle in a safe and lawful manner.**
- **When the WDS or equivalent is used to observe monitor system condition while driving, be sure to have another technician with you, or record the data in the WDS or equivalent using the PID/DATA MONITOR AND RECORD function and inspect later.**

Note

- Vehicle speed and engine speed detected by the PCM may differ from that indicated by the speedometer and tachometer. Use the WDS or equivalent to monitor vehicle speed.
- If the OBD system inspection is not completed during the Drive Mode, the following causes are considered:
  1. The OBD system detects the malfunction.
  2. The Drive Mode procedure is not completed correctly.
- Disconnecting the battery will reset the memory. Do not disconnect the battery during and after Drive Mode.

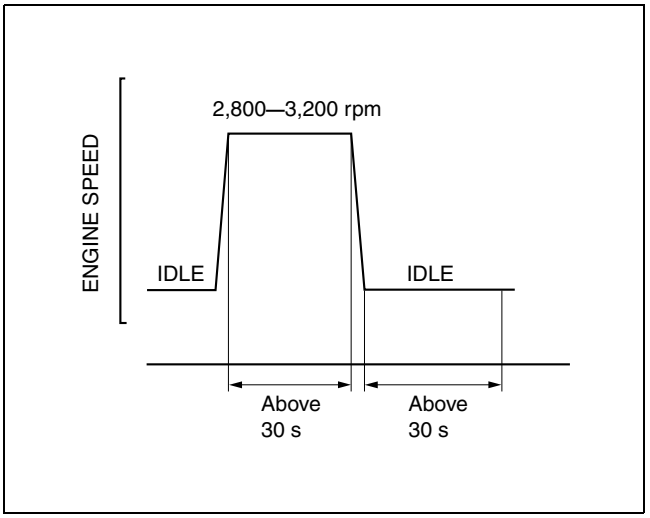
PCM Adaptive Memory Procedure Drive Mode

Note

- The PCM adaptive memory condition can be confirmed with RFCFLAG PID.
- If RFCFLAG PID is “Learnt”, PCM Adaptive Memory Procedure Drive Mode is not necessary, because PCM already has adaptive memory.
- If RFCFLAG PID is “Not Learnt”, PCM Adaptive Memory Procedure Drive should be performed before HO2S Heater, HO2S, and TWC Repair Verification Drive Mode.

1. Start the engine and warm it up completely.
2. Verify all accessory loads (A/C, headlights, blower fan, rear window defroster) are off.

3. Perform no load racing at the engine speed shown in the graph, then idle the engine for **more than 30 s** after the cooling fan is stopped. If possible, monitor RPM PID for engine speed and FAN1 PID for cooling fan condition during this procedure.
4. Turn ignition key off then on again.
5. Access to RFCFLAG PID to confirm PCM adaptive memory condition. If RFCFLAG PID is "Learnt", PCM Adaptive Memory Procedure Drive is completed.
6. If RFCFLAGPID is still "Not Learnt", go back to Step 1.



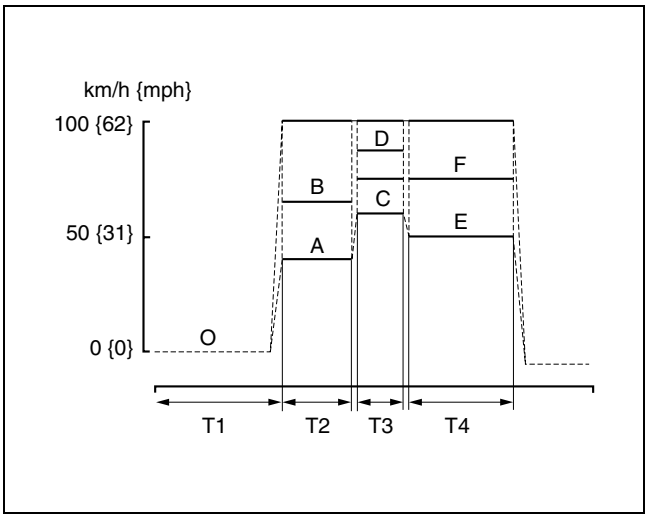
A6E3970W003

HO2S Heater, HO2S, and TWC Repair Verification Drive Mode

1. Access to RFCFLAG PID to confirm PCM adaptive memory condition. If RFCFLAG PID is OFF, perform PCM Adaptive Memory Procedure Drive first.
2. If RFCFLAG PID is ON, start the engine and warm it up completely.
3. Verify all accessory loads (A/C, headlights, blower fan, rear window defroster) are off.
4. Drive the vehicle as shown in the graph; first drive in zone O, then A or B, followed by C or D, finally E or F. Driving condition before the constant speed driving is not specified.

For MTX

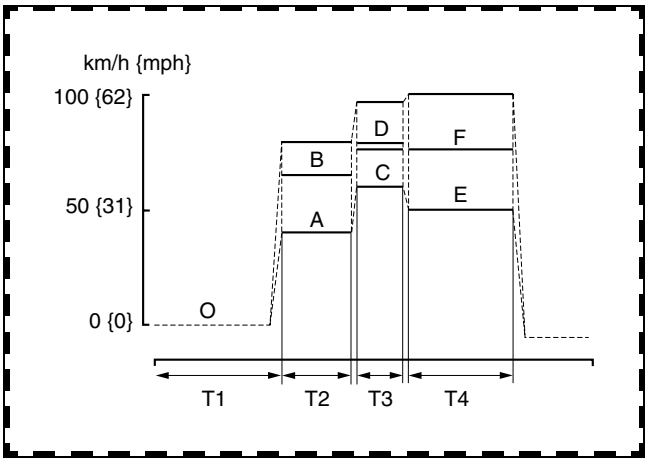
Zone	Shift Position	Vehicle Speed km/h {mph}	Time Sec.
O	Neutral	0	T1: Above 455
A	2nd	40—50 {25—32}	T2: Above 30
B	3rd	65—75 {41—47}	
C	2nd	60—75 {38—46}	T3: Above 20
D	3rd	75—100 {47—62}	
E	4th	50—75 {31—46}	T4: Above 120
F	5th	75—100 {47—62}	



A6E3970W004

For L3 engine ATX

Zone	Range	Vehicle Speed km/h {mph}	Time Sec.
O	P or N	0	T1: Above 455
A	M (3rd)	40—65 {25—41}	T2: Above 30
B	M (3rd)	65—80 {41—49}	
C	M (2nd)	60—75 {38—46}	T3: Above 20
D	M (3rd)	80—95 {50—59}	
E	M (4th)	50—75 {31—47}	T4: Above 120
F	M (5th)	75—100 {46—62}	



A6E3970W999

5. Stop vehicle and access to ON BOARD SYSTEM READINESS menu of GENERIC OBD FUNCTION to inspect the Drive Mode completion condition. If completed, RFC changes from NO to YES.
6. If not completed, turn the ignition key to OFF, then go back to Step 4.
7. Access DIAGNOSTIC MONITORING TEST RESULTS menu of GENERIC OBD FUNCTIONS to inspect the monitor results. If MEAS are not within the specification, repair has not completed.
8. Verify no DTC is available.

DTC TABLE

DTC table

A6E397018881206

×: Applicable
—: Not applicable

DTC No.	Condition	MIL	DC	Monitor item	Memory function	Page
P0010	CMP actuator circuit malfunction	ON	1	CCM	×	—
P0011	CMP timing over-advanced	ON	1	CCM	×	—
P0012	CMP timing over-retarded	ON	1	CCM	×	—
P0031	Front HO2S heater circuit low input	ON	2	O_2 sensor heater	×	—
P0032	Front HO2S heater circuit high input	ON	2	O_2 sensor heater	×	—
P0037	Rear HO2S heater circuit low input	ON	2	O_2 sensor heater	×	—
P0038	Rear HO2S heater circuit high input	ON	2	O_2 sensor heater	×	—
P0101	MAF sensor inconsistent with TP sensor	ON	2	CCM	×	—
P0102	MAF circuit low input	ON	1	CCM	×	—
P0103	MAF circuit high input	ON	1	CCM	×	—
P0107	MAP sensor circuit low input	ON	1	CCM	×	—
P0108	MAP sensor circuit high input	ON	1	CCM	×	—
P0111	IAT circuit performance problem	ON	2	CCM	×	—
P0112	IAT circuit low input	ON	1	CCM	×	—
P0113	IAT circuit high input	ON	1	CCM	×	—
P0117	ECT circuit low input	ON	1	CCM	×	—
P0118	ECT circuit high input	ON	1	CCM	×	—
P0121	TP stuck closed	ON	2	CCM	×	—
P0122	TP circuit low input	ON	1	CCM	×	—
P0123	TP circuit high input	ON	1	CCM	×	—
P0125	Excessive time to enter closed loop fuel control	ON	2	CCM	×	—
P0131	Front HO2S no inversion (stuck low)	ON	2	CCM	×	—
P0132	Front HO2S no inversion (stuck high)	ON	2	CCM	×	—

DTC No.	Condition	MIL	DC	Monitor item	Memory function	Page
P0133	Front HO2S circuit malfunction	ON	2	O_2 sensor	×	—
P0134	Front HO2S circuit no activity detected	ON	2	CCM	×	—
P0138	Rear HO2S circuit high input	ON	2	CCM	×	—
P0140	Rear HO2S circuit no activity detected	ON	2	CCM	×	—
P0171	Fuel trim system too lean	ON	2	Fuel	×	—
P0172	Fuel trim system too rich	ON	2	Fuel	×	—
P0300	Random misfire detected	Flash / ON	1 or 2	Misfire	×	—
P0301	Cylinder No.1 misfire detected	Flash / ON	1 or 2	Misfire	×	—
P0302	Cylinder No.2 misfire detected	Flash / ON	1 or 2	Misfire	×	—
P0303	Cylinder No.3 misfire detected	Flash / ON	1 or 2	Misfire	×	—
P0304	Cylinder No.4 misfire detected	Flash / ON	1 or 2	Misfire	×	—
P0327	Knock sensor circuit low input	ON	1	CCM	×	—
P0328	Knock sensor circuit high input	ON	1	CCM	×	—
P0335	CKP sensor circuit malfunction	ON	1	CCM	×	—
P0340	CMP sensor circuit malfunction	ON	1	CCM	×	—
P0403	EGR valve motor coils open or short	ON	2	CCM	×	—
P0420	Catalyst system efficiency below threshold	ON	2	Catalyst	×	—
P0443	Evaporative emission control system purge control valve circuit malfunction	ON	2	CCM	×	—
P0480	Fan relay control circuit malfunction	OFF	2	Other	×	—
P0500	Vehicle speed sensor (VSS) circuit malfunction (MTX)	ON	2	CCM	×	—
P0505	Idle control system malfunction	OFF	—	Other	—	—
P0506	Idle control system RPM lower than expected	ON	2	CCM	×	—
P0507	Idle control system RPM higher than expected	ON	2	CCM	×	—
P0511	Idle control system circuit malfunction	ON	1	CCM	×	—
P0550	PSP switch circuit malfunction	ON	2	CCM	×	—
P0602	PCM programming error	ON	1	CCM	×	—
P0610	Control module vehicle options error	ON	1	CCM	×	—
P0661	VIS control circuit low input	OFF	2	Other	×	—
P0662	VIS control circuit high input	OFF	2	Other	×	—
P0703	Brake switch input malfunction	ON	2	CCM	×	—
P0704	Clutch switch input malfunction	ON	2	CCM	×	—
P0850	Neutral switch input malfunction	ON	2	CCM	×	—
P1410	Variable air duct valve circuit malfunction	OFF	2	Other	×	—
P1562	PCM +BB voltage low	ON	1	CCM	×	—
P2006	Variable tumble control system shutter valve stuck closed	ON	2	CCM	×	—
P2009	Variable tumble control solenoid valve circuit low input	ON	2	CCM	×	—
P2010	Variable tumble control solenoid valve circuit high input	ON	2	CCM	×	—
P2228	BARO sensor circuit low input	ON	1	CCM	×	—
P2229	BARO sensor circuit high input	ON	1	CCM	×	—
P2502	Generator output voltage signal no electricity	OFF	1	Other	—	—
P2503	Battery overcharge	OFF	1	Other	—	—

DTC No.	Condition	MIL	DC	Monitor item	Memory function	Page
P2504	Generator terminal B circuit open	OFF	1	Other	—	—
U0073	CAN bus off	OFF	1	Other	—	—
U0101	PCM cannot receive any signals from TCM	ON	1	Other	×	(See T–39 MULTIPLEX COMMUNICATION SYSTEM)
U0121	PCM cannot receive any signals from ABS, ABS/TCS or DSC HU/CM	ON	1	Other	×	—
U0155	PCM cannot receive any signals from combination meter	ON	1	Other	×	—

TROUBLESHOOTING

ENGINE SYMPTOM TROUBLESHOOTING

A6E398018881201

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

Diagnostic Index

No.	TROUBLESHOOTING ITEM		DESCRIPTION
1	Melting of main or other fuses		—
2	MIL illuminates		MIL is illuminated incorrectly.
3	Will not crank		Starter does not work.
4	Hard to start/long crank/erratic start/erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking time before starting.
5	Engine stalls.	After start/at idle	Engine stops unexpectedly at idle and/or after start.
6	Cranks normally but will not start		Starter cranks engine at normal speed but engine will not run.
7	Slow return to idle		Engine takes more time than normal to return to idle speed.
8	Engine runs rough/rolling idle		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively.
9	Fast idle/runs on		Engine speed continues at fast idle after warm-up. Engine runs after ignition switch is turned to off.
10	Low idle/stalls during deceleration		Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.
11	Engine stalls/quits.	Acceleration/cruise	Engine stops unexpectedly at beginning of acceleration or during acceleration. Engine stops unexpectedly 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
12	Lack/loss of power	Acceleration/cruise	Performance is poor under load. (e.g., power down when climbing hills)
13	Knocking/pinging	Acceleration/cruise	Sound is produced when air/fuel mixture is ignited by something other than spark plug. (e.g., hot spot in combustion chamber)
14	Poor fuel economy		Fuel economy is unsatisfactory.
15	Emission compliance		Fails emissions test.
16	High oil consumption/leakage		Oil consumption is excessive.
17	Cooling system concerns	Overheating	Engine runs at higher than normal temperature/overheats.
18	Cooling system concerns	Runs cold	Engine does not reach normal operating temperature.
19	Exhaust smoke		Blue, black, or white smoke from exhaust system
20	Fuel odor (in engine compartment)		Gasoline fuel smell or visible leakage
21	Engine noise		Engine noise from under hood
22	Vibration concerns (engine)		Vibration from under hood or driveline
23	A/C does not work sufficiently.		A/C compressor magnetic clutch does not engage when A/C is turned on.
24	A/C is always on or A/C compressor runs continuously.		A/C compressor magnetic clutch does not disengage.
25	A/C is not cut off under WOT conditions.		A/C compressor magnetic clutch does not disengage under WOT.
26	Exhaust sulphur smell		Rotten egg smell (sulphur) from exhaust
27	Constant voltage		Incorrect constant voltage
28	Spark plug condition		Incorrect spark plug condition
29	ATX concerns	Upshift/downshift/ engagement	ATX concerns not related to engine performance

QUICK DIAGNOSTIC CHART

A6E398018881202

X: Applicable

Troubleshooting item			Possible factor	Starter motor malfunction (Mechanical or electrical)	Starter circuit including ignition switch is open.	Starter interlock switch malfunction (MTX with starter interlock system)	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	Drive plate or flywheel are seized.	Improper tension or damaged drive belts	Improper engine coolant level	Water and anti-freeze mixture is improper.	Cooling system malfunction (Radiator, hoses, overflow system, thermostat, etc.)	Cooling fan system malfunction	Engine or transaxle mounts are improperly installed.	Cooling fan or condenser fan seat are improper.	Accelerator cable free play misadjustment	Cruise control cable misadjustment	Fuel quality
1	Melting of main or other fuses																									
2	MIL illuminates			x	x	x		x	x			x				x										
3	Will not crank																									
4	Hard to start/long crank/erratic start/erratic crank																									x
5	Engine stalls.	After start/at idle							x	x	x															x
6	Cranks normally but will not start								x	x	x															x
7	Slow return to idle																			x						
8	Engine runs rough/rolling idle								x	x																x
9	Fast idle/runs on																						x	x		
10	Low idle/stalls during deceleration																									
11	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
12	Lack/loss of power	Acceleration/cruise							x	x																x
13	Knocking/pinging	Acceleration/cruise							x											x						
14	Poor fuel economy								x	x								x		x	x					x
15	Emission compliance								x	x				x						x						
16	High oil consumption/leakage											x	x	x												
17	Cooling system concerns	Overheating														x	x	x	x	x						
18	Cooling system concerns	Runs cold																	x	x						
19	Exhaust smoke								x					x					x							
20	Fuel odor (in engine compartment)																									
21	Engine noise						x							x		x										
22	Vibration concerns (engine)															x					x	x				
23	A/C does not work sufficiently.																									
24	A/C is always on or A/C compressor runs continuously.																									
25	A/C is not cut off under WOT conditions.																									
26	Exhaust sulfur smell																									x
27	Constant voltage																									
28	Spark plug condition								x					x												
29	ATX concerns	Upshift/downshift engagement	See Section K, TROUBLESHOOTING																							

A6E39802001

X: Applicable

	Possible factor / Troubleshooting item		Variable valve timing system malfunction (L3 engine model)	VICS malfunction	Engine overheating	Air cleaner element clogging or restriction	Air leakage from intake-air system (Loose tubes, cracks, gaskets breakage)	IAC valve improper operation	Throttle body malfunction	VICS malfunction (L3 engine model)	VACS malfunction (L3 engine model)	Vacuum leakage (Vacuum hose damage, misrouting)	Ignition coil malfunction (e.g. open, short or cracks)	Initial ignition timing misadjustment (CKP sensor & crankshaft pulley misadjustment)	Spark plug malfunction	High-tension leads malfunction (Cracks, open, low resistance)	CKP sensor is damaged. (e.g. open or short circuits)	Crankshaft pulley is damaged	Improper gap between CKP sensor and crankshaft	Fuel pump malfunction (Mechanically or electrically)	Pressure regulator malfunction	Fuel hoses restriction or clogging
1	Melting of main or other fuses																					
2	MIL illuminates		x	x				x		x							x					
3	Will not crank																					
4	Hard to start/long crank/erratic start/erratic crank					x	x	x				x			x	x	x	x	x	x	x	x
5	Engine stalls.		x		x	x	x	x				x	x	x	x	x	x	x	x	x	x	x
6	Cranks normally but will not start				x	x	x	x				x	x	x	x	x	x	x	x	x	x	x
7	Slow return to idle								x													
8	Engine runs rough/rolling idle		x		x	x	x	x				x		x	x	x	x	x	x	x	x	x
9	Fast idle/runs on						x		x													
10	Low idle/stalls during deceleration						x	x				x										
11	Engine stalls/quits.	Acceleration/cruise		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
	Misses	Acceleration/cruise		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
	Hesitation/stumble	Acceleration		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
12	Lack/loss of power	Acceleration/cruise	x	x	x	x	x		x	x		x			x		x	x	x	x	x	x
13	Knocking/pinging	Acceleration/cruise			x															x	x	
14	Poor fuel economy		x	x		x				x					x	x					x	
15	Emission compliance					x	x		x			x			x	x				x	x	x
16	High oil consumption/leakage																					
17	Cooling system concerns	Overheating																				
18	Cooling system concerns	Runs cold																				
19	Exhaust smoke					x									x	x				x	x	x
20	Fuel odor (in engine compartment)																				x	
21	Engine noise						x				x	x										
22	Vibration concerns (engine)																					
23	A/C does not work sufficiently.																					
24	A/C is always on or A/C compressor runs continuously.																					
25	A/C is not cut off under WOT conditions.																					
26	Exhaust sulfur smell											x								x	x	x
27	Constant voltage																					
28	Spark plug condition					x									x		x			x	x	x
29	ATX concerns	Upshift/downshift engagement	See Section K, TROUBLESHOOTING																			

A6E39802002

F1

X: Applicable

Troubleshooting item / Possible factor			Injectors malfunction (Leakage or clogging, inope-rative	Fuel leakage from fuel system (including insulator, injector O-ring)	Fuel filters restriction or clogging	CMP sensor is damaged. (e.g. open or short circuit)	Camshaft is damaged.	Improper air/fuel mixture ratio control	Exhaust system restriction or clogging	Catalytic converter malfunction	EGR system malfunction (Unleaded gasoline models)	EVAP control system malfunction	PCV valve malfunction	Constant voltage supply circuit malfunction	Main relay malfunction (Mechanically or electrically)	ECT sensor malfunction	TR sensor misadjustment (ATX)	TR sensor malfunction (ATX)	Break switch and related circuit malfunction	Manifold absolute pressure sensor and related circuit malfunction	HO2S and related circuit malfunction (Unleaded gasoline models)	Variable resistor misadjustment (Leaded gasoline models)	Improper electrically controlled 4WD system operation
1	Melting of main or other fuses																						
2	MIL illuminates					x		x								x	x		x	x	x		
3	Will not crank																x	x					
4	Hard to start/long crank/erratic start/erratic crank				x			x	x		x	x	x								x		
5	Engine stalls.	After start/at idle	x	x				x	x		x	x	x		x							x	
6	Cranks normally but will not start		x	x				x	x		x	x	x	x	x						x		
7	Slow return to idle															x							
8	Engine runs rough/rolling idle		x		x	x	x	x	x		x	x	x								x		
9	Fast idle/runs on															x							
10	Low idle/stalls during deceleration							x				x					x		x		x		
11	Engine stalls/quits.	Acceleration/cruise	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	
	Misses	Acceleration/cruise	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	
	Hesitation/stumble	Acceleration	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	
12	Lack/loss of power	Acceleration/cruise	x			x	x		x		x	x	x			x							
13	Knocking/pinging	Acceleration/cruise				x																	
14	Poor fuel economy				x	x	x		x				x										x
15	Emission compliance				x	x	x	x	x	x	x	x	x								x		
16	High oil consumption/leakage												x										
17	Cooling system concerns	Overheating																					
18	Cooling system concerns	Runs cold																					
19	Exhaust smoke		x										x										
20	Fuel odor (in engine compartment)			x								x											
21	Engine noise																						
22	Vibration concerns (engine)																						x
23	A/C does not work sufficiently.																						
24	A/C is always on or A/C compressor runs continuously.																						
25	A/C is not cut off under WOT conditions.																						
26	Exhaust sulfur smell				x							x											
27	Constant voltage													x		x		x		x	x		
28	Spark plug condition		x	x				x								x							
29	ATX concerns	Upshift/downshift/en gagement	See Section K, TROUBLESHOOTING																				

A6E39802003

X: Applicable

	Troubleshooting item / Possible factor		IAT sensor and related circuit malfunction	Barometric pressure sensor malfunction	Neutral or clutch switch and related circuit malfunction (MTX)	MAF sensor and related circuit malfunction	Knock sensor and related circuit malfunction	TP sensor and related circuit malfunction	TP sensor misadjustment (including looseness)	P/S pressure switch and related circuit malfunction	Improper refrigerant charging amount	A/C relay (A/C control signal circuit malfunction	A/C compressor magnetic clutch malfunction	Condenser fan system malfunction	Improper load signal input	Clutch slippage	ATX related parts malfunction	VSS and related circuit malfunction	Improper ATF level	Brake dragging	Loose parts	Improper balance of wheels and tires	Drive line malfunction	Suspension malfunction	PATS operating (if equipped)
1	Melting of main or other fuses																								
2	MIL illuminates		x	x	x	x	x	x		x								x							
3	Will not crank																								x
4	Hard to start/long crank/erratic start/erratic crank					x																			
5	Engine stalls.	After start/at idle		x							x	x													x
6	Cranks normally but will not start																								x
7	Slow return to idle																								
8	Engine runs rough/rolling idle			x						x	x	x		x	x										
9	Fast idle/runs on														x										
10	Low idle/stalls during deceleration			x	x	x		x	x			x													
11	Engine stalls/quits.	Acceleration/cruise		x		x		x	x		x	x				x	x	x							
	Engine runs rough.	Acceleration/cruise		x		x		x	x		x	x				x	x	x							
	Misses	Acceleration/cruise				x		x	x		x	x				x	x	x							
	Buck/jerk	Acceleration/cruise /deceleration				x		x	x		x	x				x	x	x							
	Hesitation/stumble	Acceleration		x		x		x	x		x	x				x	x	x							
	Surges	Acceleration/cruise				x		x	x		x	x				x	x	x							
12	Lack/loss of power	Acceleration/cruise				x		x			x	x				x	x	x		x					
13	Knocking/pinging	Acceleration/cruise	x			x	x																		
14	Poor fuel economy					x								x		x			x	x					
15	Emission compliance			x																					
16	High oil consumption/leakage																								
17	Cooling system concerns	Overheating									x	x		x											
18	Cooling system concerns	Runs cold												x											
19	Exhaust smoke																								
20	Fuel odor (in engine compartment)																								
21	Engine noise																			x					
22	Vibration concerns (engine)																			x	x	x	x		
23	A/C does not work sufficiently.										x	x	x												
24	A/C is always on or A/C compressor runs continuously.											x	x												
25	A/C is not cut off under WOT conditions							x	x																
26	Exhaust sulfur smell																								
27	Constant voltage		x	x		x		x				x					x								
28	Spark plug condition				x	x																			
29	ATX concerns	Upshift/downshift/engagement	See Section K, TROUBLESHOOTING																						

A6E39802004

F1

NO.14 POOR FUEL ECONOMY

A6E398018881203

14	POOR FUEL ECONOMY
DESCRIPTION	Fuel economy is unsatisfactory.
POSSIBLE CAUSE	• Contaminated air cleaner element • VIS malfunction (if equipped) • Engine cooling system malfunction • Improper ATF level (ATX) • Weak spark • Poor fuel quality • Erratic or no signal from CMP sensor • Clutch slippage (MTX) • VTCS malfunction • Improper variable valve timing control system operation (if equipped) • 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 • Improper electrically controlled 4WD system operation **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.** **Caution** • **Disconnecting/connecting quick release connector without cleaning it may possibly cause damage to fuel pipe and quick release connector. Always clean quick release connector joint area before disconnecting/connecting, and make sure that it is free of foreign material.**

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect for following: • Air cleaner element for contamination • ATF level • Fuel quality • Coolant level • Brake dragging • Clutch slippage Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	Connect WDS or equivalent to DLC-2. Retrieve any continuous memory, KOEO and KOER DTCs. Are there any DTCs 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 F1–33 PCM INSPECTION (4WD).) 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 • CMP sensor is improperly installed. • Trigger wheel damage on camshaft • Open or short circuit on CMP sensor • Open or short circuit between CMP sensor and PCM terminal 2J or 2M 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 pipe and fuel distributor. Start engine and run it at idle. Measure fuel line pressure at idle. Is fuel line pressure correct at idle?	Yes	Go to next step.
		No	**Zero or low:** Inspect for clogged fuel line. If okay, replace fuel pump unit **High:** Replace fuel pump unit.
6	Inspect for VTCS operation. Does VTCS work properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
7	**Note** • The following test should be performed for vehicles with variable valve timing control system. Go to next step for vehicles without variable valve timing control system. Inspect for variable valve timing control system operation. Does variable valve timing control system work properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
8	**Note** • The following test should be performed for vehicles with VIS. Go to next step for vehicles without VIS. Inspect for VIS operation. Does VIS work properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
9	Remove and shake PCV valve. Does PCV valve rattle?	Yes	Go to next step.
		No	Replace PCV valve.
10	Inspect for restriction in the exhaust system. Is there any restriction?	Yes	Inspect exhaust system.
		No	Go to next step.
11	Inspect for contaminated MAF sensor. Is there any contamination?	Yes	Go to next step.
		No	Inspect for cause.
12	Inspect MAF sensor for contamination. Is there any contamination?	Yes	Replace MAF sensor.
		No	Go to Step 14. (2WD) Go to next step. (4WD)
13	Inspect electrically controlled 4WD system operation. Is operation of electrically controlled 4WD system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning parts.
14	Is engine compression correct?	Yes	Inspect valve timing.
		No	Inspect for cause.
15	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM.		

NO.22 VIBRATION CONCERNS (ENGINE)

A6E398018881204

22	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 • Condenser fan • Drive belt and pulleys • Engine mounts All items okay?	Yes	Inspect following systems: • Wheels • ATX • Driveline • Suspension • Electrically controlled 4WD system
		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. • If malfunction remains, replace PCM.		

FUEL AND EMISSION CONTROL SYSTEMS [MZR-CD (RF Turbo)]

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E400218881201

- The common rail injection system has been adopted for Mazda6 (GG, GY) MZR-CD (RF Turbo) engine models.
- The fuel and emission control system is essentially carried over from that of the current MPV (LW) MZR-CD (RF Turbo) engine models, except for the following features. (See MPV Workshop Manual Supplement 1737-1*-02C.)

FEATURES

A6E400218881202

Improved Emission Performance

- Warm up oxidation catalytic converter capacity has been increased.

System Simplification

- Immobilizer unit has been equipped into PCM
- Cruise control system has been adopted.
- Electrical fan control has been changed.
- CAN has been changed.

Improved Serviceability

- DTCs, PID monitoring items, and simulation test items have been changed.
- KOEO/KOER self-test items have been changed.

SPECIFICATIONS

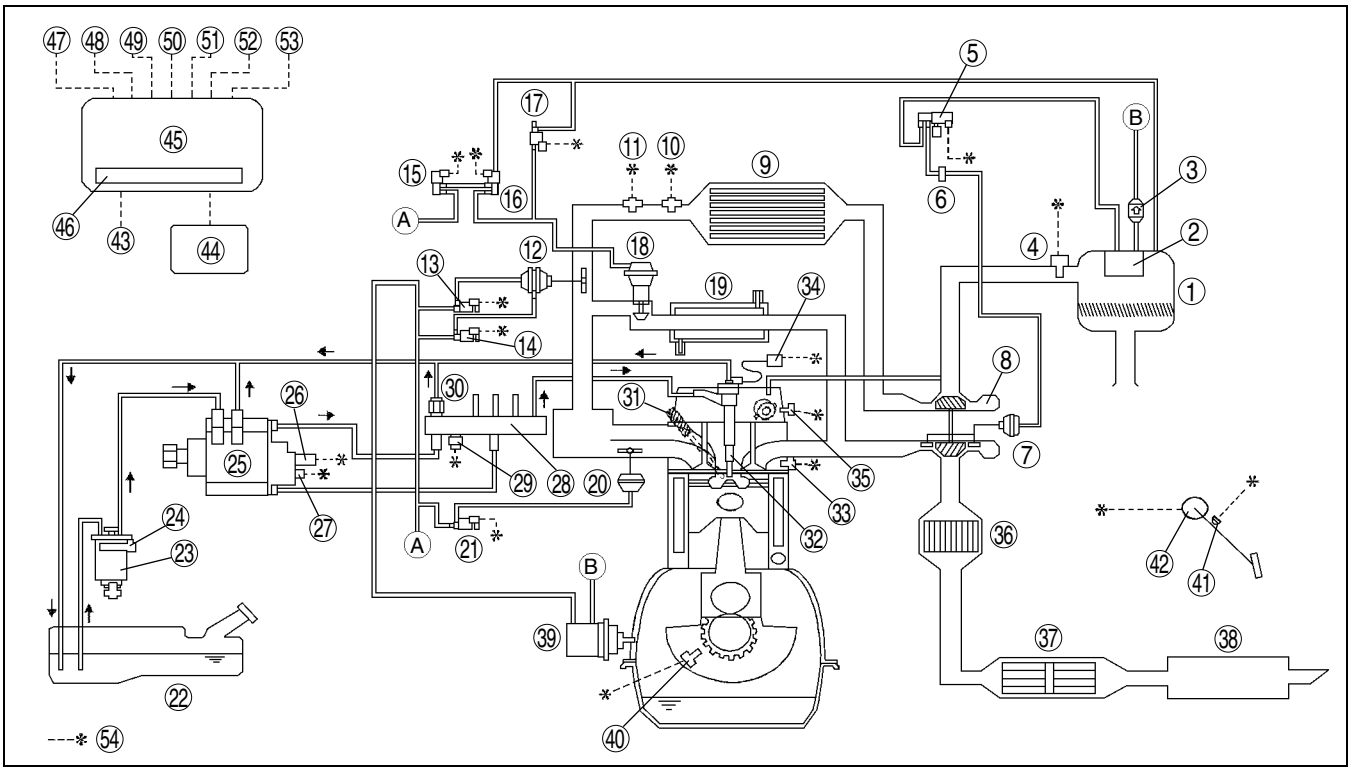
A6E400218881203

Item		New Mazda6 (GG, GY)	Current MPV (LW)
		MZR-CD (RF Turbo)	
Air cleaner element	Type	Non woven fabric (dry)	
Supercharger	Type	Turbocharger	
Glow plug	Type	Metal	
Pump	Type	Supply pump	
Fuel tank	Capacity (L {US gal, Imp gal})	64 {16.9, 14.1}	75 {19.8, 16.5}
Catalyst	Type	Warm up oxidation catalyst, Oxidation catalyst	
EGR control	Type	Duty control	
PCV system	Type	Closed	

Bold frames: New specifications

CONTROL SYSTEM DIAGRAM

A6E400218881204



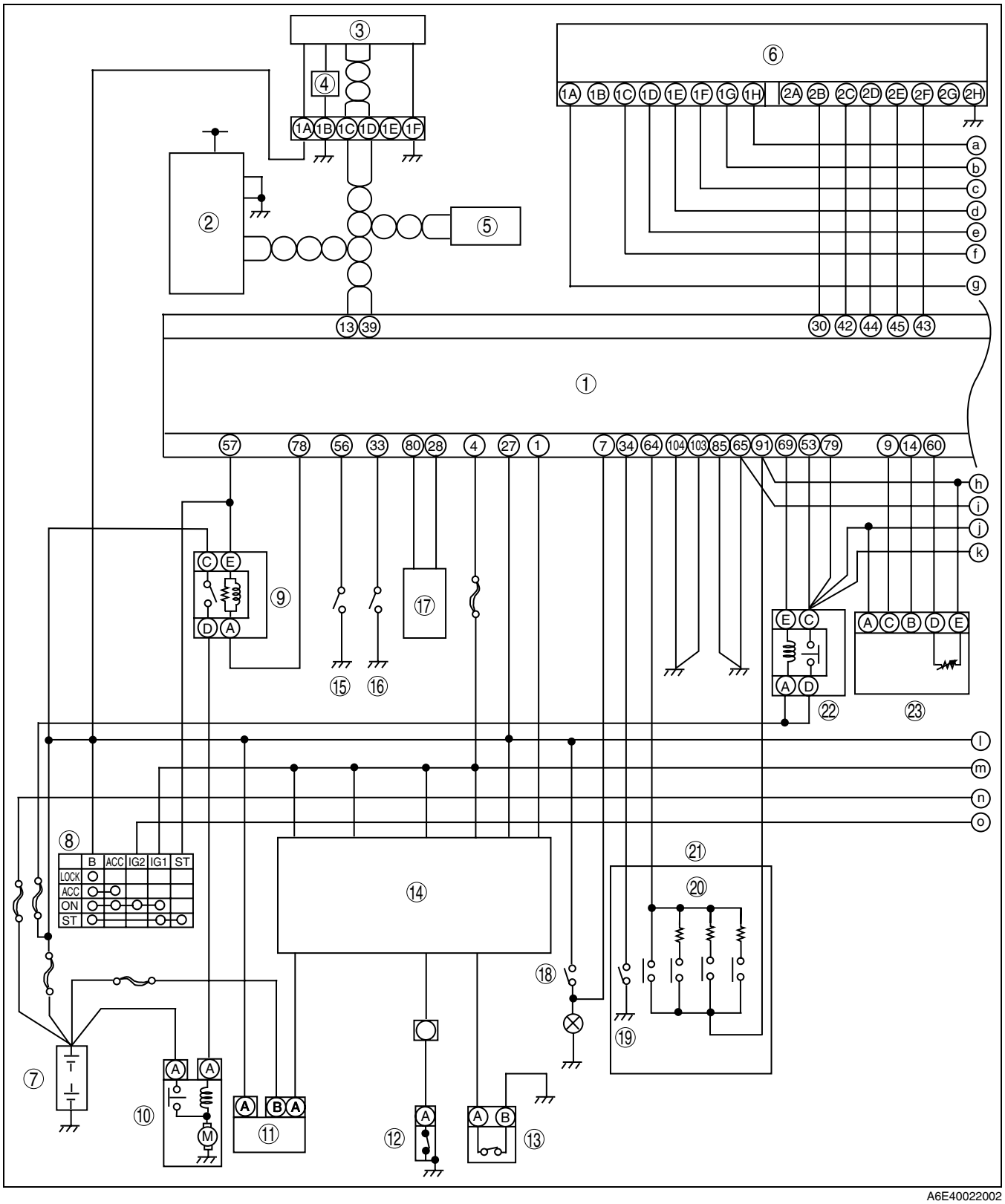
A6E40022001

1	Air cleaner
2	Vacuum chamber
3	VBC check valve
4	MAF/IAT sensor
5	VBC solenoid valve
6	Vacuum damper
7	Guide blade actuator
8	Turbocharger
9	Charge air cooler
10	IAT sensor No.2
11	Boost sensor
12	Intake shutter valve actuator
13	Intake shutter solenoid valve (half)
14	Intake shutter solenoid valve (full)
15	EGR solenoid valve (vacuum)
16	EGR solenoid valve (vent)
17	EGR control solenoid valve
18	EGR valve
19	EGR water cooler
20	VSC valve actuator
21	VSC solenoid valve
22	Fuel tank
23	Fuel filter
24	Fuel warmer
25	Supply pump
26	Suction control valve
27	Fuel temperature sensor

28	Common rail
29	Fuel pressure sensor
30	Fuel pressure limiter
31	Glow plug
32	Fuel injector
33	ECT sensor
34	Calibration resistor
35	CMP sensor
36	Warm up oxidation catalytic converter
37	Oxidation catalytic converter
38	Silencer
39	Vacuum pump
40	CKP sensor
41	Idle switch
42	Accelerator position sensor
43	Glow plug relay
44	IDM
45	PCM
46	BARO sensor
47	PCM control relay
48	Engine switch
49	Starter (starter signal)
50	Neutral switch
51	Clutch switch
52	A/C switch
53	CAN bus
54	To PCM

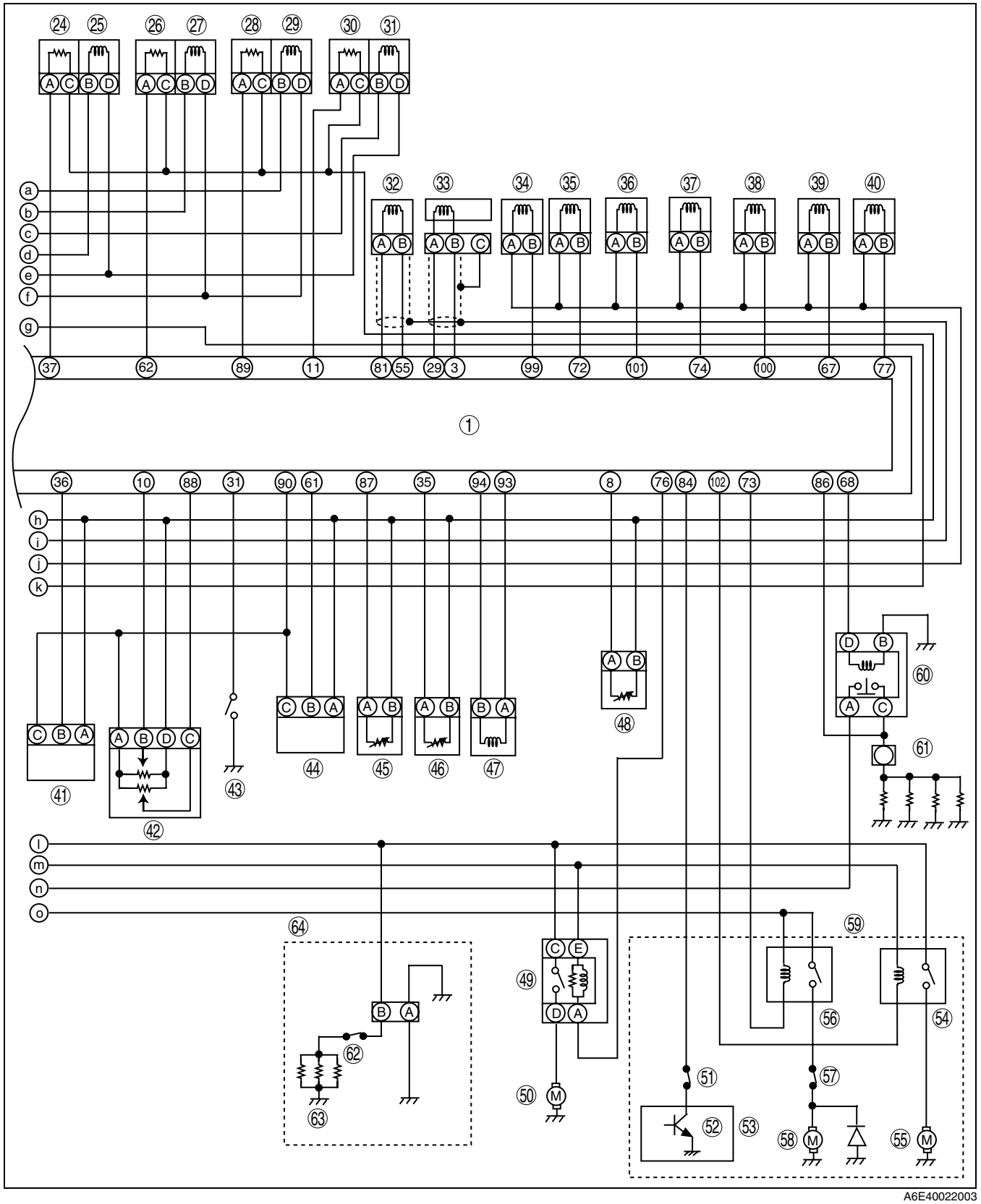
CONTROL SYSTEM WIRING DIAGRAM

A6E400218881205



A6E40022002

F2



A6E40022003

1	PCM
2	DLC-2
3	Water heater unit
4	Fuel pump
5	Other unit

6	IDM
7	Battery
8	Engine switch
9	Starter relay
10	Starter

11	Generator
12	Oil pressure switch
13	Sedimentor switch
14	Instrument cluster
15	Neutral switch
16	Clutch switch
17	Coil
18	Brake switch
19	Brake switch 2
20	Cruise control switch
21	With cruise control system
22	PCM control relay
23	MAF/IAT sensor
24	Calibration resistor No.1
25	Fuel injector No.1
26	Calibration resistor No.2
27	Fuel injector No.2
28	Calibration resistor No.3
29	Fuel injector No.3
30	Calibration resistor No.4
31	Fuel injector No.4
32	CMP sensor
33	CKP sensor
34	EGR solenoid valve (vacuum)
35	EGR solenoid valve (vent)
36	VSC solenoid valve
37	Intake shutter solenoid valve (half)

38	Intake shutter solenoid valve (full)
39	VBC solenoid valve
40	EGR control solenoid valve
41	Boost sensor
42	Accelerator position sensor
43	Idle switch
44	Fuel pressure sensor
45	ECT sensor
46	Fuel temperature sensor
47	Suction control valve
48	IAT sensor No.2
49	Cooling fan relay No.2
50	Cooling fan No.1
51	Refrigerant pressure switch (middle)
52	A/C switch
53	A/C amplifier
54	Cooling fan relay No.1
55	Cooling fan No.2
56	A/C relay
57	Refrigerant pressure switch (HI and LO)
58	Magnetic clutch
59	With A/C
60	Glow plug relay
61	Glow plug
62	Vacuum switch
63	Fuel warmer
64	With fuel warmer

INTAKE-AIR SYSTEM

OUTLINE

A6E401001005201

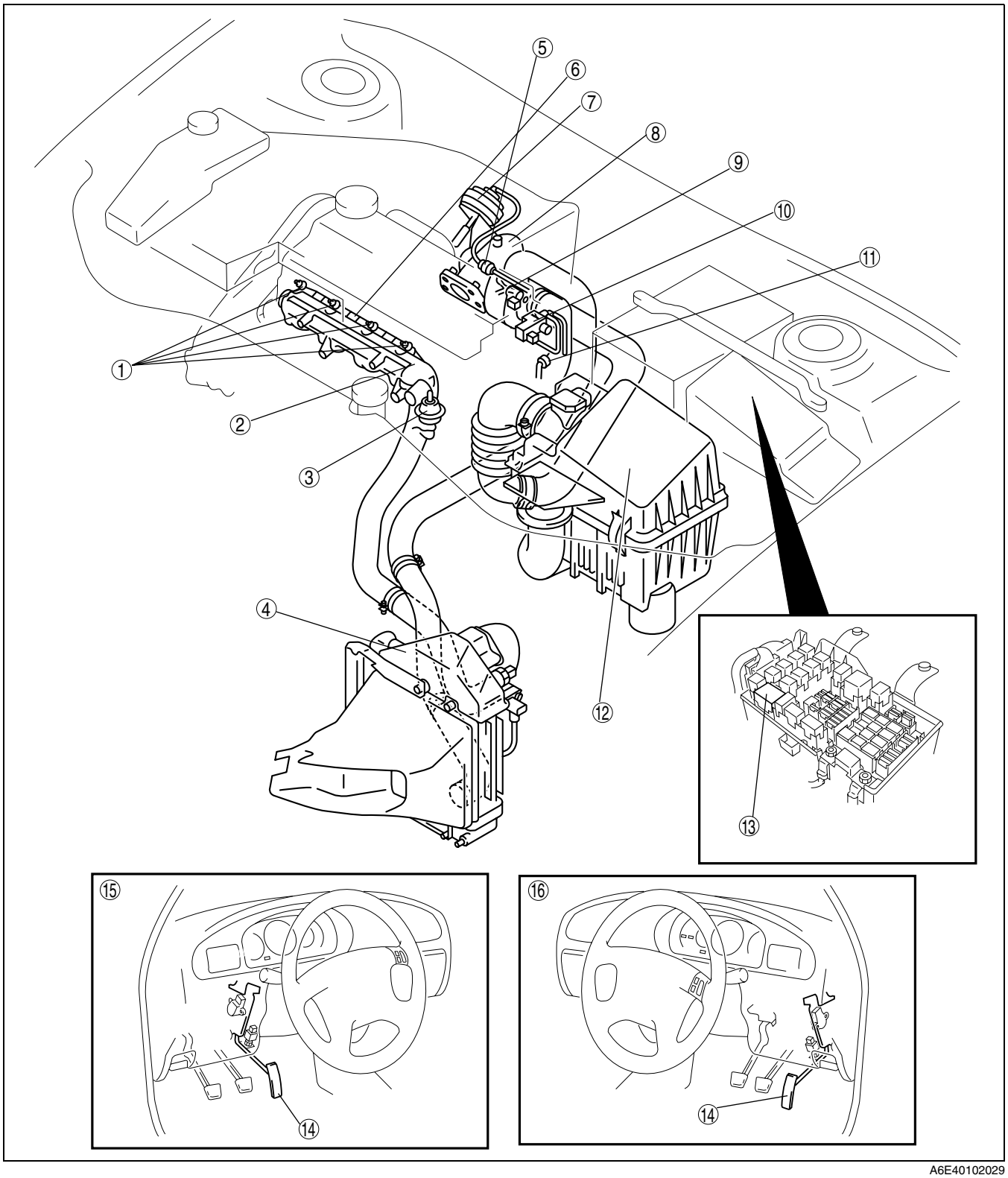
- The intake-air system is essentially carried over from that of the current MPV (LW) MZR-CD (RF Turbo) engine model. (See MPV Workshop Manual Supplement 1737-1*-02D.)

×:Applicable

Item	Mazda6 (GG, GY)	Current MPV (LW)	Remark for new model
	MZR-CD (RF Turbo)		
Fresh-air duct	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Air cleaner	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Turbocharger	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Charge air cooler	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Intake manifold	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
VBC system	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
VSC system	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Glow plug	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Glow plug lead	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Glow plug relay	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model

STRUCTURAL VIEW

A6E401001005202



A6E40102029

1	Glow plug
2	Intake manifold
3	VSC valve actuator
4	Charge air cooler
5	Vacuum damper
6	Glow plug lead
7	Guide blade actuator
8	Turbocharger

9	VSC solenoid valve
10	VBC solenoid valve
11	VBC check valve
12	Air cleaner
13	Glow plug relay
14	Accelerator pedal component
15	L.H.D.
16	R.H.D.

FUEL SYSTEM

OUTLINE

A6E401201006201

- The fuel system is essentially carried over from that of the current MPV (LW) MZR-CD (RF Turbo) engine model. (See MPV Wordshop Manual Supplement 1737-1*-02D.)

×:Applicable

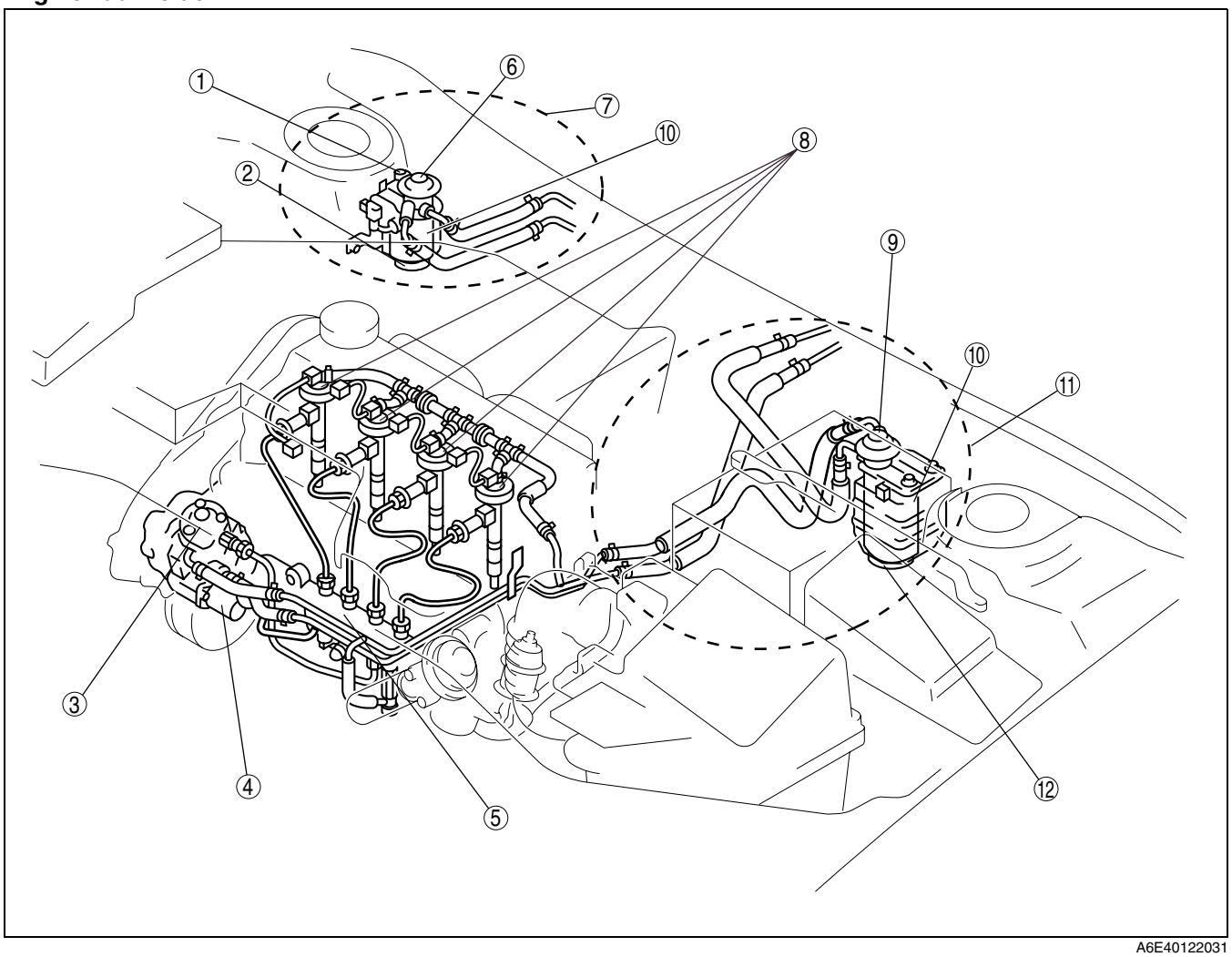
Item		Mazda6 (GG, GY)	Current MPV (LW)	Remark for new model
		MZR-CD (RF Turbo)		
Fuel tank		×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Fuel gauge sender unit		×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Fuel filter body	Fuel filter	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
	Priming pump	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
	Fuel warmer*1	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Common rail injection system		×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model

*1: With fuel warmer

STRUCTURAL VIEW

A6E401201006202

Engine room side

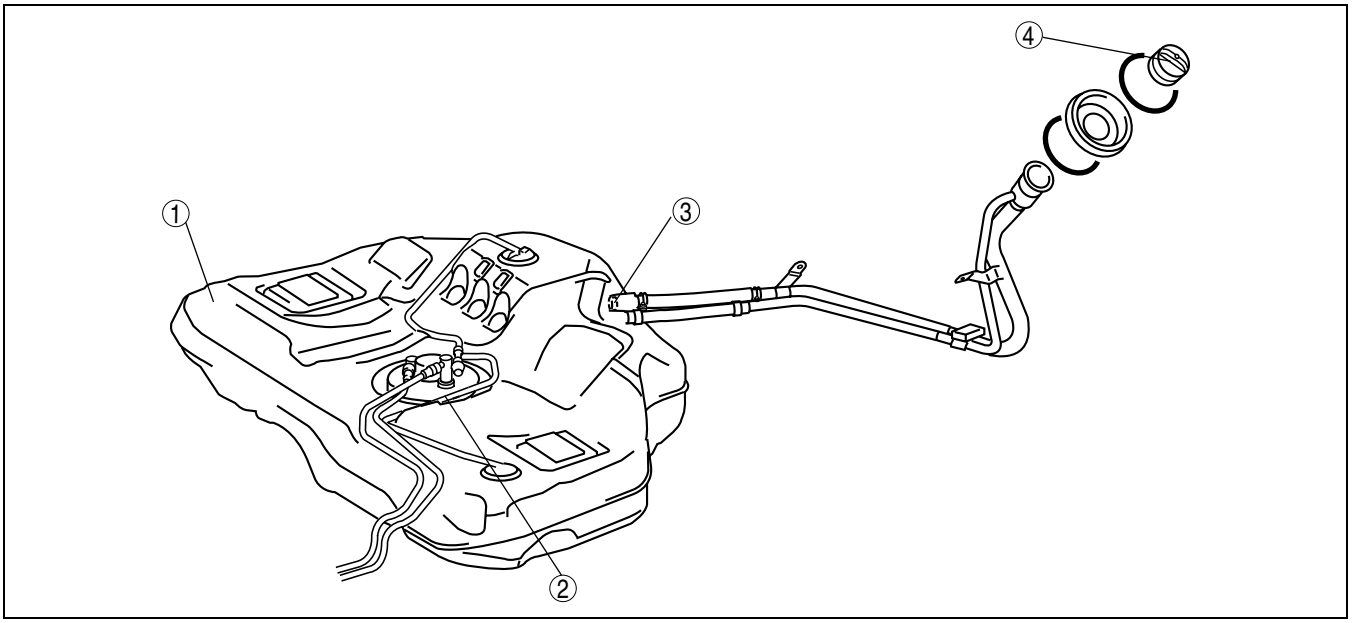


A6E40122031

1	Fuel warmer
2	Sedimentor switch
3	Supply pump
4	Suction control valve
5	Common rail
6	Priming pump

7	L.H.D.
8	Fuel injector
9	Priming pump
10	Fuel filter
11	R.H.D.
12	Sedimentor switch

Fuel tank side



A6E40122032

1	Fuel tank	3	Nonreturn valve
2	Fuel pump	4	Fuel filler cap

EXHAUST SYSTEM

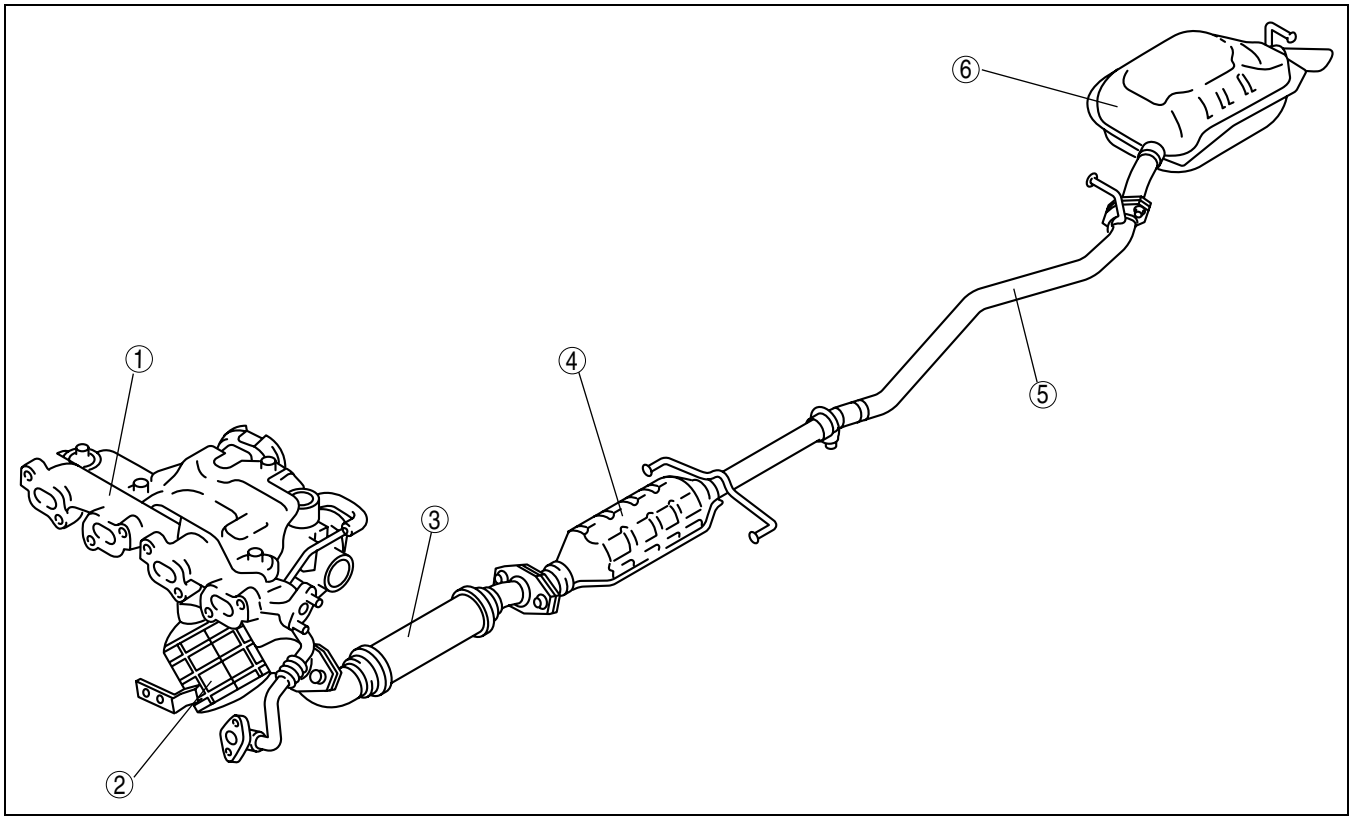
OUTLINE

A6E401440000201

- The exhaust system is essentially carried over from that of the current 626 (GF)/626 Station Wagon (GW) RF Turbo engine models. (See 626 626 Station Wagon Workshop Manual Supplement 1688-1*-00G.)

STRUCTURAL VIEW

A6E401440000202



A6E40142005

1	Exhaust manifold
2	Warm up oxidation catalytic converter
3	Front pipe

4	Oxidation catalytic converter
5	Middle pipe
6	Main silencer

EMISSION SYSTEM

OUTLINE

A6E401601007201

- The emission system is essentially carried over from that of the current MPV (LW) MZR-CD (RF Turbo) engine model. (See MPV Workshop Manual Supplement 1737-1*-02D.)

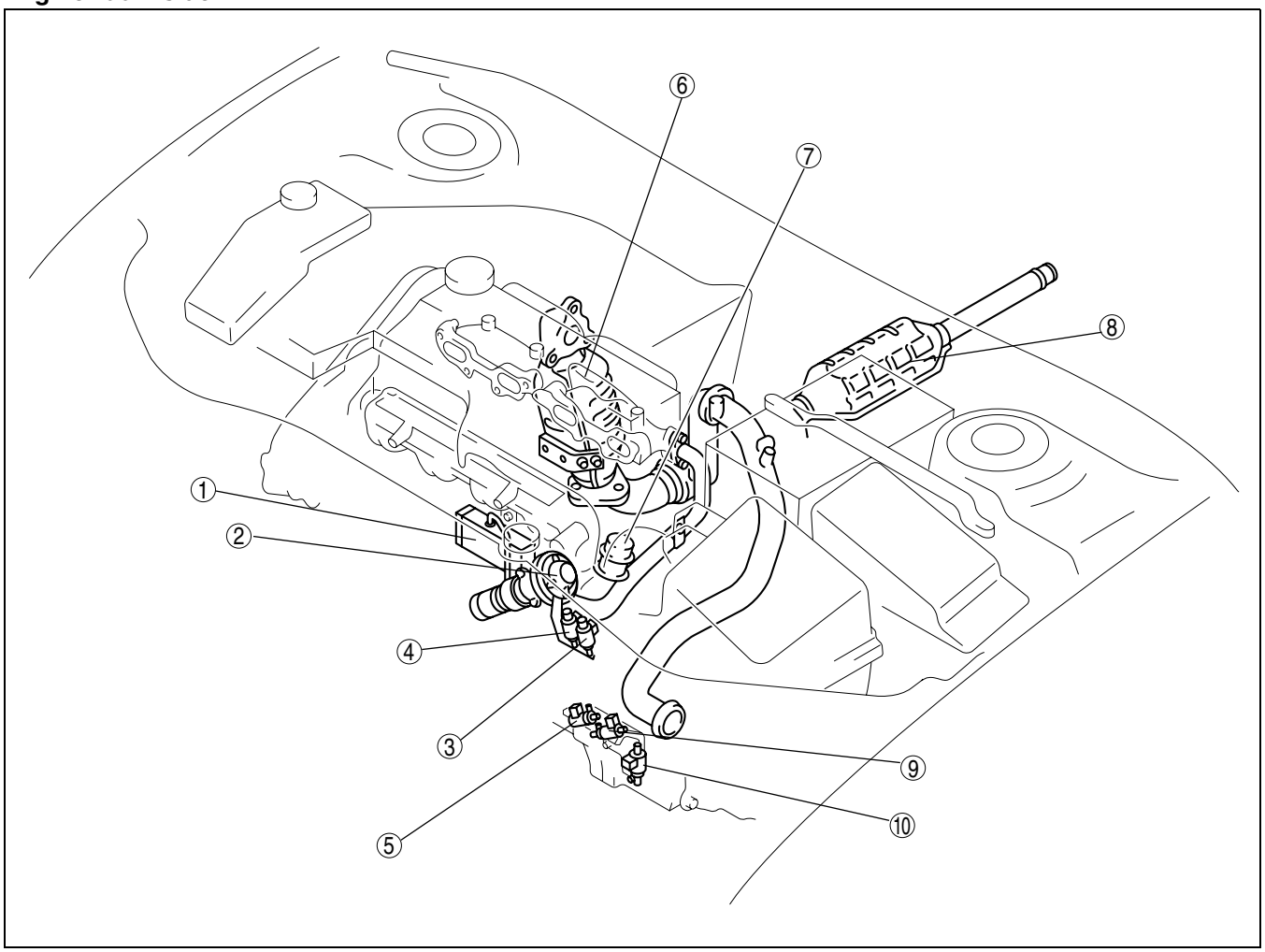
×:Applicable

Item	Mazda6 (GG,GY)	Current MPV (LW)	Remark for new model
	MZR-CD (RF Turbo)		
Rollover valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Check valve (two-way)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model Shape has been changed
Intake shutter valve actuator	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Intake shutter solenoid valve (half) (full)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR solenoid valve (vacuum) (vent)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR control solenoid valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR water cooler	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Warm up oxidation catalytic converter	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Oxidation catalytic converter	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model

STRUCTURAL VIEW

A6E401601007202

Engine room side

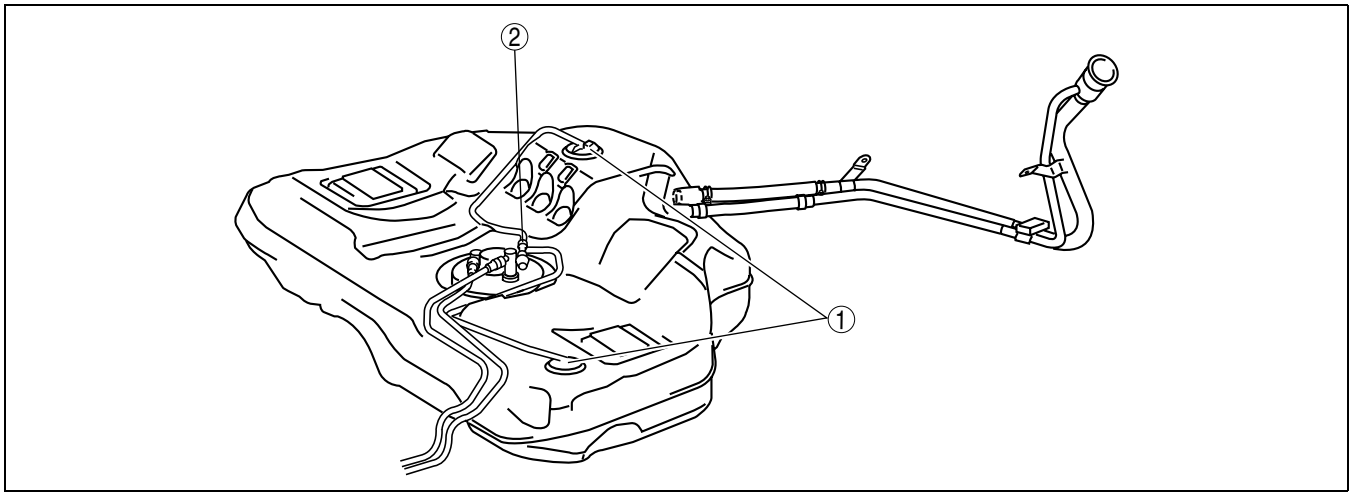


A6E40162018

1	EGR water cooler
2	EGR valve
3	Intake shutter solenoid valve (full)
4	Intake shutter solenoid valve (half)
5	EGR solenoid valve (vacuum)

6	Warm up oxidation catalytic converter
7	Intake shutter valve actuator
8	Oxidation catalytic converter
9	EGR solenoid valve (vent)
10	EGR control solenoid valve

Fuel tank side



A6E40162019

1	Rollover valve

2	Check valve (two-way)

WARM UP OXIDATION CATALYTIC CONVERTER DESCRIPTION

A6E401601007203

- The warm up oxidation catalytic converter capacity has been increased to **1,920 ml {1,920 cc, 117 cu in}** in order to improve emission performance.

CONTROL SYSTEM

OUTLINE

A6E404018881201

- The control system is essentially carried over from that of the current MPV (LW) MZR-CD (RF Turbo) engine models. (See MPV Workshop Manual Supplement 1737-1*-02C.)

Input Device

×:Applicable –: Not applicable

Item	Mazda6 (GG, GY)	Current MPV (LW)	Remark for new model
	MZR-CD (RF Turbo)		
Battery	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Starter (starter signal)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Starter relay	×	–	Newly adopted
Clutch switch	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Neutral switch	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Brake switch	×		Same function as Mazda6 (GG) L series engine model
Idle switch	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
A/C switch	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Refrigerant pressure switch	×		Same function as 626 (GF, GW) RF Turbo engine model
Cruise control switch	×		Same function as Mazda6 (GG) L series engine model
Accelerator position sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
MAF/IAT sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
IAT sensor No.2	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
ECT sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Fuel temperature sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
BARO sensor (integrated in PCM)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Boost sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Fuel pressure sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
CMP sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
CKP sensor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
VSS	×		Vehicle speed signal is received by CAN
Calibration resistor	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Immobilizer unit (integrated in PCM)	×		Immobilizer unit equipped into PCM

Output Device

×:Applicable –: Not applicable

Item	Mazda6 (GG, GY)	Current MPV (LW)	Remark for new model
	MZR-CD (RF Turbo)		
Suction control valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
IDM	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
VSC solenoid valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
VBC solenoid valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR control solenoid valve	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR solenoid valve (vacuum)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR solenoid valve (vent)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Intake shutter solenoid valve (half)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Intake shutter solenoid valve (full)	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Glow indicator light	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Cruise main indicator light	×	–	Same function as Mazda6 (GG) L series engine model
Cruise set indicator light	×	–	Same function as Mazda6 (GG) L series engine model
Glow plug relay	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Cooling fan relay No.1	×	–	Same function as cooling fan relay of 626 (GF, GW) RF Turbo engine model
Cooling fan relay No.2	×	–	Same function as condenser fan relay of 626 (GF, GW) RF Turbo engine model
A/C relay	×		Same function as 626 (GF, GW) RF Turbo engine model

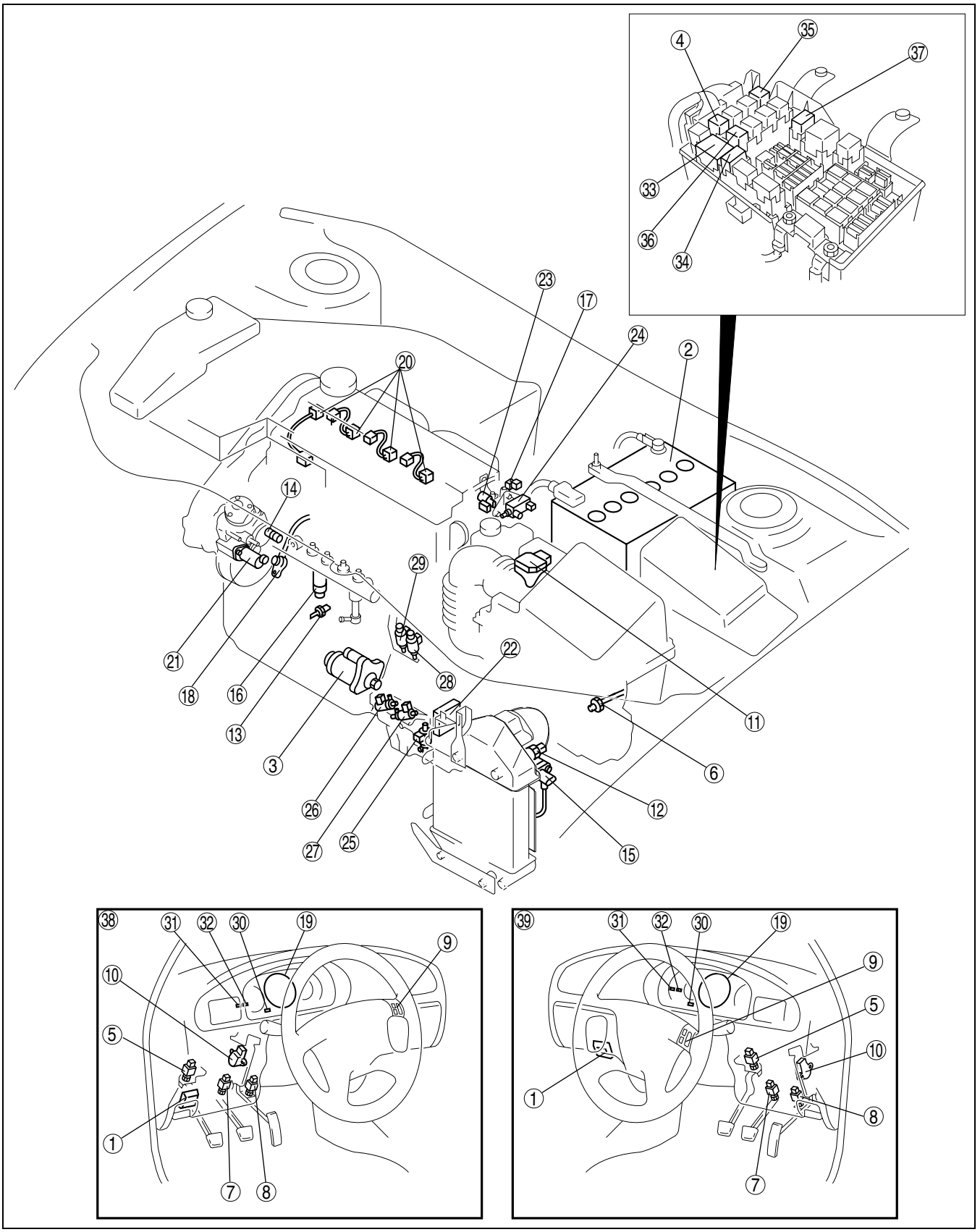
Control System

×:Applicable –: Not applicable

Item	Mazda6 (GG, GY)	Current MPV (LW)	Remark for new model
	MZR-CD (RF Turbo)		
Idle speed control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Glow control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
VSC	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Boost pressure control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Fuel injection amount control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Fuel injection timing control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Multiple fuel injection control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Fuel pressure control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
EGR control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Cruise control system	×	–	Newly adopted
Electrical fan control	×		Same function as 626 (GF, GW) RF Turbo engine model
A/C cut-off control	×		Same function as MPV (LW) MZR-CD (RF Turbo) engine model
Immobilizer system	×		Same function as Mazda6 (GG) L series engine model

STRUCTURAL VIEW

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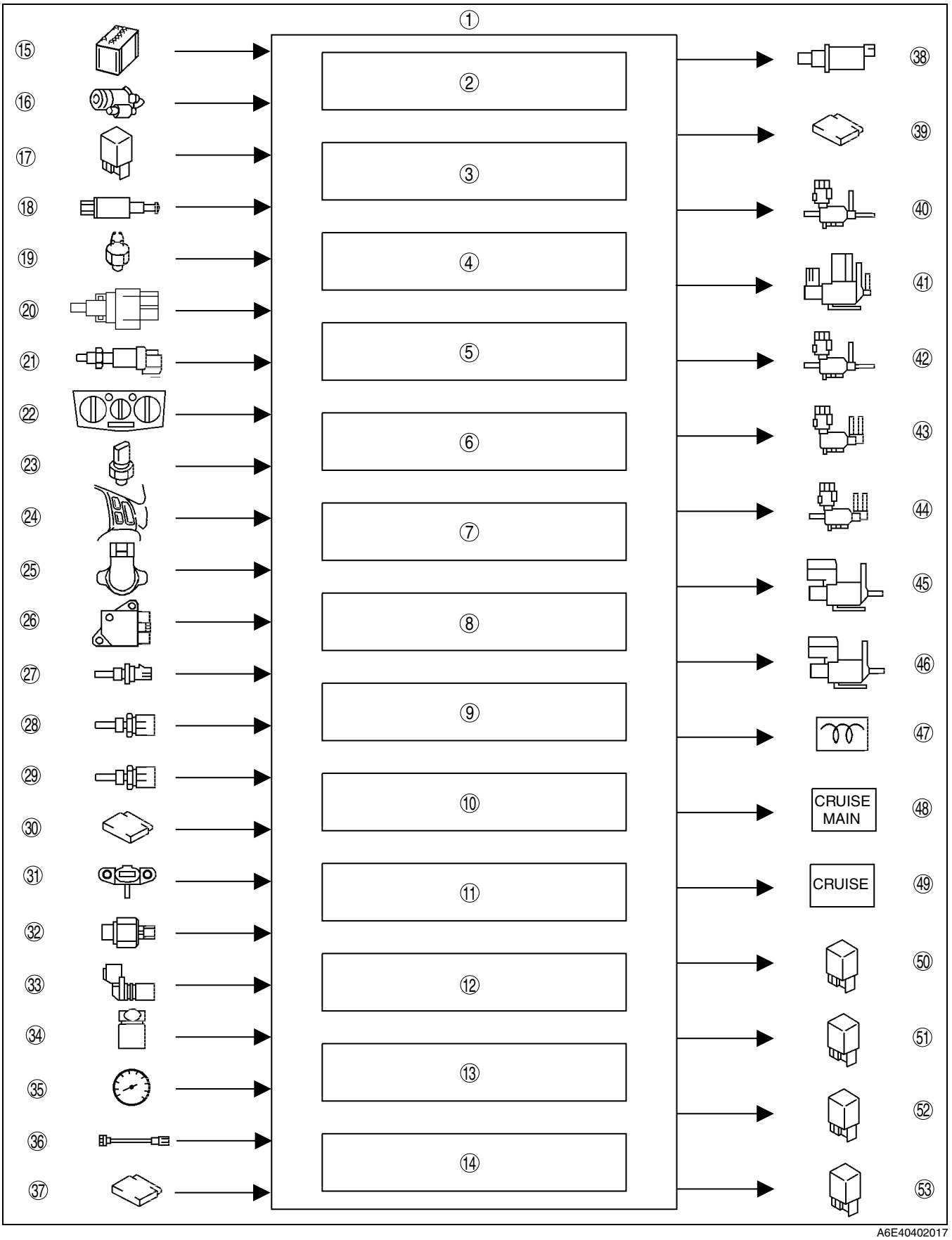


A6E40402024

1	PCM (with built-in BARO sensor and immobilizer unit)
2	Battery
3	Starter
4	Starter relay
5	Clutch switch
6	Neutral switch
7	Brake switch
8	Idle switch
9	Cruise control switch
10	Accelerator position sensor
11	MAF/IAT sensor
12	IAT sensor No.2
13	ECT sensor
14	Fuel temperature sensor
15	Boost sensor
16	Fuel pressure sensor
17	CMP sensor
18	CKP sensor
19	VSS
20	Calibration resistor
21	Suction control valve
22	IDM
23	VSC solenoid valve
24	VBC solenoid valve
25	EGR control solenoid valve
26	EGR solenoid valve (vacuum)
27	EGR solenoid valve (vent)
28	Intake shutter solenoid valve (half)
29	Intake shutter solenoid valve (full)
30	Glow indicator light
31	Cruise main indicator light
32	Cruise set indicator light
33	Glow plug relay
34	Cooling fan relay No.1
35	Cooling fan relay No.2
36	A/C relay
37	PCM control relay
38	L.H.D.
39	R.H.D.

BLOCK DIAGRAM

A6E404018881203



A6E40402017

1	PCM
2	Idle speed control
3	Glow control
4	VSC
5	Boost pressure control
6	Fuel injection amount control
7	Fuel injection timing control
8	Multiple fuel injection control
9	Fuel pressure control
10	EGR control
11	Cruise control system
12	Electrical fan control
13	A/C cut-off control
14	Immobilizer system
15	Battery
16	Starter (starter signal)
17	Starter relay
18	Clutch switch
19	Neutral switch
20	Brake switch
21	Idle switch
22	A/C switch
23	Refrigerant pressure switch
24	Cruise control switch
25	Accelerator position sensor
26	MAF/IAT sensor
27	IAT sensor No.2
28	ECT sensor
29	Fuel temperature sensor
30	BARO sensor (integrated in PCM)
31	Boost sensor
32	Fuel pressure sensor
33	CMP sensor
34	CKP sensor
35	VSS
36	Calibration resistor
37	Immobilizer unit (integrated in PCM)
38	Suction control valve
39	IDM
40	VSC solenoid valve
41	VBC solenoid valve
42	EGR control solenoid valve
43	EGR solenoid valve (vacuum)
44	EGR solenoid valve (vent)
45	Intake shutter solenoid valve (half)
46	Intake shutter solenoid valve (full)
47	Glow indicator light
48	Cruise main indicator light
49	Cruise set indicator light
50	Glow plug relay
51	Cooling fan relay No.1
52	Cooling fan relay No.2
53	A/C relay

CONTROL DEVICE AND CONTROL RELATIONSHIP CHART

A6E404018881204

×: Applicable

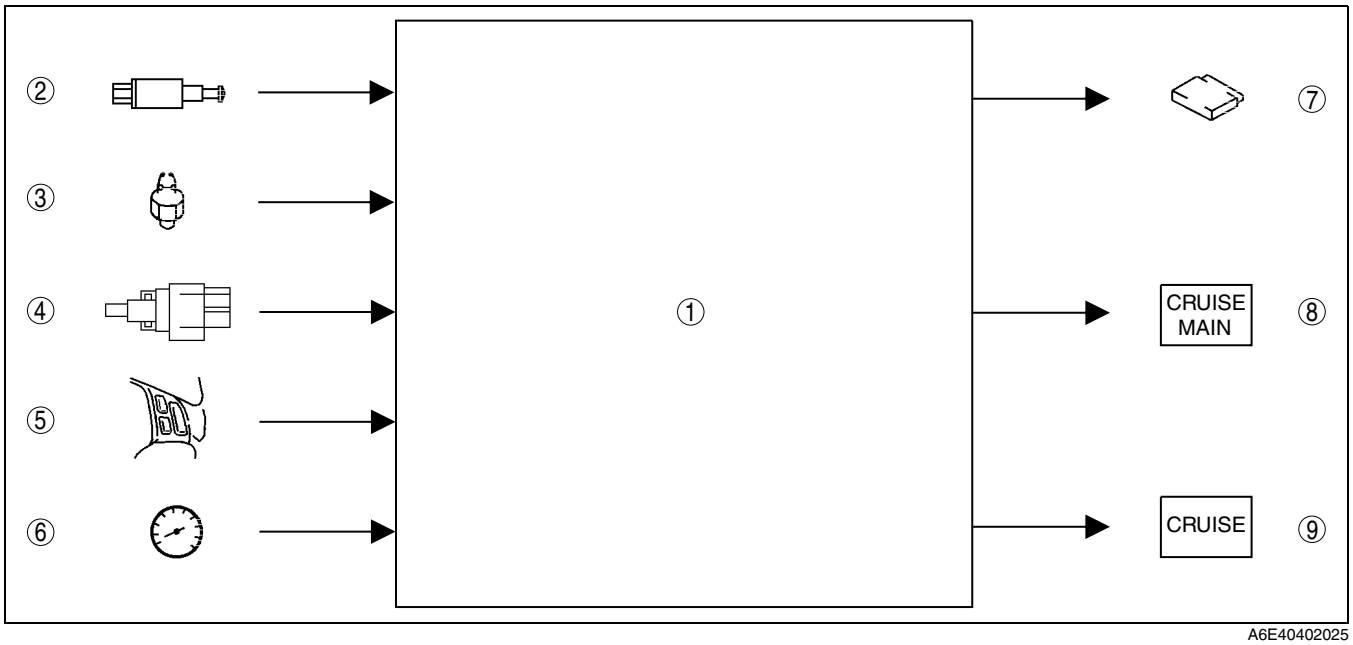
Item	Idle speed control	Glow control	VSC	Boost pressure control	Fuel injection amount control	Fuel injection timing control	Multiple fuel injection control	Fuel pressure control	EGR control	Cruise control system	Electrical fan control	A/C cut-off control	Immobilizer system
Input device													
Battery				×							×		
Starter (starter signal)	×	×	×	×	×	×	×	×	×			×	
Starter relay	×	×	×	×	×	×	×	×	×			×	
Clutch switch	×		×		×	×	×		×	×		×	
Neutral switch	×		×		×	×	×		×	×		×	
Brake switch										×			
Idle switch	×		×		×	×	×		×			×	
A/C switch	×				×				×		×	×	
Refrigerant pressure switch	×				×				×		×	×	
Cruise control switch										×			
Accelerator position sensor	×		×	×	×		×		×		×	×	
MAF/IAT sensor			×			×	×	×	×				
IAT sensor No.2					×		×						
ECT sensor	×	×	×		×	×	×	×	×		×	×	
Fuel temperature sensor							×						
BARO sensor (integrated in PCM)				×				×	×				
Boost sensor		×		×	×				×				
Fuel pressure sensor					×	×		×	×				
CMP sensor			×	×	×	×	×						
CKP sensor	×		×	×	×	×	×	×	×			×	
VSS	×	×	×		×	×	×		×	×			
Calibration resistor					×		×						
Immobilizer unit (integrated in PCM)													×
Output device													
Suction control valve								×					×
IDM	×				×	×	×			×			×
VSC solenoid valve			×										
VBC solenoid valve				×									
EGR control solenoid valve									×				
EGR solenoid valve (vacuum)									×				
EGR solenoid valve (vent)									×				
Intake shutter solenoid valve (half)									×				
Intake shutter solenoid valve (full)									×				
Glow indicator light		×											
Cruise main indicator light										×			
Cruise set indicator light										×			
Glow plug relay		×											
Cooling fan relay No.1											×		
Cooling fan relay No.2											×		
A/C relay												×	

CRUISE CONTROL SYSTEM

A6E404018881205

Outline

- The cruise control system has been adopted for MZR-CD (RF Turbo) engine models.
- Cruise control module has been equipped into the PCM. Due to this, the PCM controls cruise control system.
- Function of the cruise control system is basically the same as that of the Mazda6 (GG) L series engine model, except for the following:
  — The PCM controls the fuel injection amount to maintain vehicle speed.



A6E40402025

1	PCM
2	Clutch switch
3	Neutral switch
4	Brake switch
5	Cruise control switch

6	VSS
7	IDM
8	Cruise main indicator light
9	Cruise set indicator light

Operation

Operating condition

- The PCM can excute cruise control when the following conditions are met:
  — Cruise control main switch is on
  — Brake pedal is released (brake switch 1 is off, brake switch 2 is on)
  — Clutch pedal is released (clutch switch is off)
  — Gear is not neutral position (neutral switch is off)
  — Vehicle speed of 27 km/h {16.7 mph} or more
  — No DTC is memorized

Driving at set speed

- Once the desired speed has been set, the PCM determines the target fuel injection amount based on the vehicle speed signal.
- If the actual vehicle speed goes below the set speed, the PCM increases the fuel injection amount, and if it goes above the set speed the PCM decreases the fuel injection amount.

Tap up/Tap down operation

- When driving at a set speed, if the SET/COAST or RESUME/ACCEL signal is input to the PCM for a very short interval, the set speed will be increased or decreased respectively by 6 km/h {3.7 mph}.

CONTROLLER AREA NETWORK (CAN)

A6E404018881206

Outline

- The PCM transmit/received the information other units using CAN to simplify the system.

Transmit Information

- Engine speed
- Vehicle speed
- Accelerator pedal position
- Fuel injection information
- Torque reduction inhibit
- Intake air temperature
- Engine coolant temperature
- Travelled distance
- Glow indicator light conditions
- Engine displacement
- Number of cylinders
- Air induction type
- Fuel type and delivery
- Country
- Transmission/axle type
- Tire circumference (front/rear)
- Cruise main indicator light conditions
- Cruise set indicator light conditions

Received Information

- Torque reduction request from DSC HU/CM
- Wheel speed from ABS HU/CM or DSC HU/CM
  - — Front left
  - — Front right
- Travelled distance from ABS HU/CM or DSC HU/CM

ON-BOARD DIAGNOSTIC

OUTLINE

A6E407018881201

- The on-board diagnostic system is essentially carried over from that of the current MPV (LW) MZR-CD (RF Turbo) engine models, except for the following. (See MPV Workshop Manual Supplement 1737-1*-02C.)
  - — DTCs, PID monitoring items, and simulation items have been changed.
  - — KOEO/KOER self-test items have been changed.

DTC

A6E407018881202

×: Applicable –: Not applicable

DTC	Condition	Detection condition	MIL	Memory function
P0016	Crankshaft position-camshaft position correlation malfunction	Input signals from CKP sensor and CMP sensor are misaligned.	×	×
P0088	Fuel pressure system too high	Fuel pressure is higher than preprogrammed criteria.	–	×
P0091	Suction control valve circuit low input	Input voltage from suction control valve does not change from off to on.	×	×
P0092	Suction control valve circuit high input	Input voltage from suction control valve does not change from on to off.	×	×
P0093	Fuel system leak detection	Fuel pressure after fuel injection is lower than preprogrammed criteria.	×	×
P0097	IAT sensor No.1 circuit low input	Input voltage from IAT sensor No.1 is below 0.1 V.	×	×
P0098	IAT sensor No.1 circuit high input	Input voltage from IAT sensor No.1 is above 5.0 V.	×	×
P0102	MAF sensor circuit low input	Input voltage from MAF sensor is below 0.2 V.	×	×
P0103	MAF sensor circuit high input	Input voltage from MAF sensor is above 4.9 V.	×	×
P0107	Boost sensor circuit low input	Input voltage from boost sensor is below 1.9 V when engine speed is 2,400 rpm or above and accelerator opening angle is 50% or above.	×	×
P0108	Boost sensor circuit high input	Input voltage from boost sensor is above 4.9 V.	×	×

DTC	Condition	Detection condition	MIL	Memory function
P0112	IAT sensor No.2 circuit low input	Input voltage from IAT sensor No.2 is below 0.1 V.	×	×
P0113	IAT sensor No.2 circuit high input	Input voltage from IAT sensor No.2 is above 5.0 V.	×	×
P0117	ECT sensor circuit low input	Input voltage from ECT sensor is below 0.1 V.	×	×
P0118	ECT sensor circuit high input	Input voltage from ECT sensor is above 5.0V.	×	×
P0121	Accelerator position sensor No.1 circuit performance problem	Input voltage from accelerator position sensor No.1 is above 1.3 V when accelerator pedal is depressed.	×	×
P0122	Accelerator position sensor No.1 circuit low input	Input voltage from accelerator position sensor No.1 is below 0.3 V.	×	×
P0123	Accelerator position sensor No.1 circuit high input	Input voltage from accelerator position sensor No.1 is above 4.7 V.	×	×
P0182	Fuel temperature sensor circuit low input	Input voltage from fuel temperature sensor is below 0.1 V.	×	×
P0183	Fuel temperature sensor circuit high input	Input voltage from fuel temperature sensor is above 5.0 V.	×	×
P0191	Fuel pressure sensor circuit performance problem	Pressure difference between actual fuel pressure and target fuel pressure exceeds preprogrammed criteria.	×	×
P0192	Fuel pressure sensor circuit low input	Input voltage from fuel pressure sensor is below 0.4 V.	×	×
P0193	Fuel pressure sensor circuit high input	Input voltage from fuel pressure sensor is above 4.8 V.	×	×
P0200	Fuel injector circuit malfunction	Injection confirmation signal is not input normally.	×	×
P0221	Accelerator position sensor No.2 circuit performance problem	Voltage difference between accelerator position sensor No.1 and accelerator position sensor No.2 exceeds 0.9 V.	×	×
P0222	Accelerator position sensor No.2 circuit low input	Input voltage from accelerator position sensor No.2 is below 0.3 V.	×	×
P0223	Accelerator position sensor No.2 circuit high input	Input voltage from accelerator position sensor No.2 is above 4.7 V.	×	×
P0300	Random misfire detection	Interval time of CKP sensor input signal exceeds preprogrammed criteria.	×	×
P0336	CKP sensor circuit performance problem	Input signal from CKP sensor is not proper pulse number.	×	×
P0337	CKP sensor circuit low input	Input signal from CKP sensor is not input at 12 crankshaft revolutions.	×	×
P0341	CMP sensor circuit performance problem	Input signal from CMP sensor is not proper pulse number.	×	×
P0342	CMP sensor circuit low input	Input signal from CMP sensor is not input at 12 crankshaft revolutions.	×	×
P0380	Glow plug relay circuit malfunction	Input voltage from glow plug relay is as following: — 1.0 V or below when glow plug relay is on. — 4.0 V or above when glow plug relay is off.	×	×
P0504	Brake switch signal correlation malfunction	Input signal from brake switch 1 brake switch 2 is as following:. — Brake switch 1 is ON and brake switch 2 is ON. — Brake switch 1 is OFF and brake switch 2 is OFF.	×	×
P0510	Idle switch circuit malfunction	Input voltage from idle switch is B+ when accelerator position sensor No.1 voltage is below 0.7 V.	×	×
P0512	Engine switch circuit malfunction	Input voltage from engine switch is B+ when engine speed is 1,200 rpm or above.	×	×
P0564	Cruise control signal malfunction	Input voltage from cruise control switch is as following for 120 s: — Below 0.1 V. — 1.4—1.9 V. — 3.7—3.9 V. — 4.5—4.6 V.	×	×
P0602	PCM programming error	No configuration data in PCM.	×	×
P0606	PCM malfunction	PCM does not read DTC from output devices.	×	×

DTC	Condition	Detection condition	MIL	Memory function
P0610	Control module vehicle options error	PCM data configuration error.	×	×
P0661	VSC solenoid valve circuit low input	Input voltage from VSC solenoid valve is below 0.1 V.	–	×
P0662	VSC solenoid valve circuit high input	Input voltage from VSC solenoid valve is above B+.	–	×
P0850	Neutral switch circuit malfunction	Input voltage from neutral switch does not change when vehicle stops after accelerating to above 60 km/h {37 mph} and decelerating to 0 km/h {0 mph} 2 times.	×	×
P1190	Calibration resistor circuit malfunction	Input voltage from calibration resistor is below 0.2 V or above 4.8 V.	×	×
P2228	BARO sensor circuit low input	Input voltage from BARO sensor is below 0.7 V.	×	×
P2229	BARO sensor circuit high input	Input voltage from BARO sensor is above 4.5 V.	×	×
U0073	CAN bus off	CAN controller is damaged.	–	×
U0121	PCM cannot receive any signals from ABS, ABS/TCS or DSC HU/CM	PCM cannot receive any signals from ABS, ABS/TCS or DSC HU/CM.	×	×
U0155	PCM cannot receive any signals from instrument cluster	PCM cannot receive any signals from instrument cluster.	×	×

KOEO/KOER SELF-TEST

A6E407018881203

KOEO/KOER self-test function table

×: Applicable –: Not applicable

DTC	Condition	KOEO	KOER
P0097	IAT sensor No.1 circuit low input	×	×
P0098	IAT sensor No.1 circuit high input	×	×
P0102	MAF sensor circuit low input	×	×
P0103	MAF sensor circuit high input	×	×
P0107	Boost sensor circuit low input	×	×
P0108	Boost sensor circuit high input	×	×
P0112	IAT sensor No.2 circuit low input	×	×
P0113	IAT sensor No.2 circuit high input	×	×
P0117	ECT sensor circuit low input	×	×
P0118	ECT sensor circuit high input	×	×
P0122	Accelerator position sensor No.1 circuit low input	×	×
P0123	Accelerator position sensor No.1 circuit high input	×	×
P0222	Accelerator position sensor No.2 circuit low input	×	×
P0223	Accelerator position sensor No.2 circuit high input	×	×
P0602	PCM programming error	×	×
P0610	Control module vehicle options error	×	×
P0661	VSC solenoid valve circuit low input	×	×
P0662	VSC solenoid valve circuit high input	×	×
P2228	BARO sensor circuit low input	×	×
P2229	BARO sensor circuit high input	×	×
U0073	CAN bus off	×	×
U0121	PCM cannot receive any signals from ABS, ABS/TCS or DSC HU/CM	×	×
U0155	PCM cannot receive any signals from instrument cluster	×	×

PID/DATA MONITOR AND RECORD

A6E407018881204

PID monitoring item table

Item	Definition	Condition/unit	PCM terminal
ACCS	A/C relay	ON/OFF	73
ACSW	A/C switch	ON/OFF	84
APS1	Accelerator position sensor No.1 signal voltage	V	10
APS2	Accelerator position sensor No.2 signal voltage	V	88
BARO	Barometric pressure	kPa, inHg	-
	Barometric pressure signal voltage	V	
BOO	Brake switch	ON/OFF	7
CPP	Clutch switch	ON/OFF	33
CPP/PNP	Neutral switch	Neutral/Drive	56
CRUISESW	Cruise control switch	ON/OFF	64
DTCCNT	DTC count	-	-
ECT	Engine coolant temperature	°C, °F	87
	Engine coolant temperature signal voltage	V	
FAN2	Cooling fan relay No.2	ON/OFF	76
FAN3	Cooling fan relay No.1	ON/OFF	102
IAT	Intake air temperature	°C, °F	60
	Intake air temperature signal voltage	V	
IMRC	VSC solenoid valve	ON/OFF	101
INGEAR	In gear	ON/OFF	33, 56
INJ_LRN_DIS	Distance from the last injector learning	Km, Mile	-
MAF	Mass air flow amount	g/s	9
	Mass air flow signal voltage	V	
MAF_LRN_DIS	Distance from the last MAF learning	Km, Mile	-
MAINRLY	PCM control relay	ON/OFF	69
MAP	Manifold absolute pressure	kPa, inHg	36
	Manifold absolute pressure signal voltage	V	
MIL	Malfunction indicator lamp	ON/OFF	71
NUMKEYS	Number of keys stored in module	-	-
RPM	Engine speed	rpm	3, 29
VPWR	Battery positive voltage	V	27
VSS	Vehicle speed	km/h, mph	13, 39

SIMULATION TEST

A6E407018881205

Simulation test item table

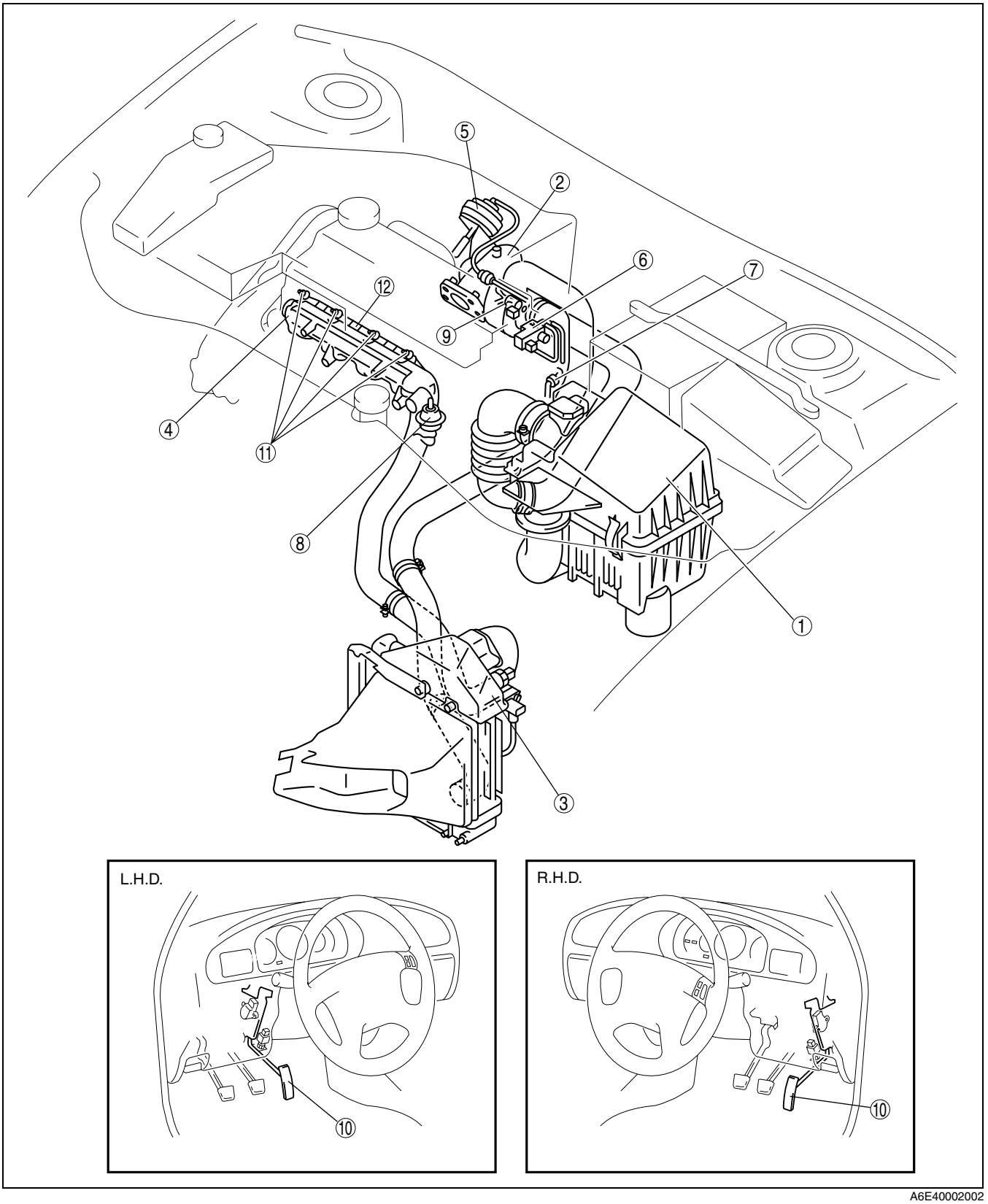
×: Applicable

Item	Definition	Operation	Test condition		PCM terminal
			Key ON	Idle	
ACCS	A/C relay	ON or OFF	×	×	73
EGRA	EGR solenoid valve (vent)	Actuated by any duty value (0—100%)	×	×	72
EGRV	EGR solenoid valve (vacuum)	Actuated by any duty value (0—100%)	×	×	99
EGRV2	EGR control solenoid valve	ON or OFF	×	×	77
FAN	Cooling fan No.2	ON or OFF	×	×	76
FAN3	Cooling fan No.1	ON or OFF	×	×	102
GP_LMP	Glow indicator light	ON or OFF	×	×	97
GPC	Glow plug relay	ON or OFF	×	×	68
IASV	Intake shutter solenoid valve (half)	ON or OFF	×	×	74
IASV2	Intake shutter solenoid valve (full)	ON or OFF	×	×	100
IMRC	VSC solenoid valve	ON or OFF	×	×	101
VBCV	VBC solenoid valve	Actuated by any duty value (0—100%)	×	×	67

LOCATION INDEX

INTAKE-AIR SYSTEM

A6E400001005201



A6E40002002

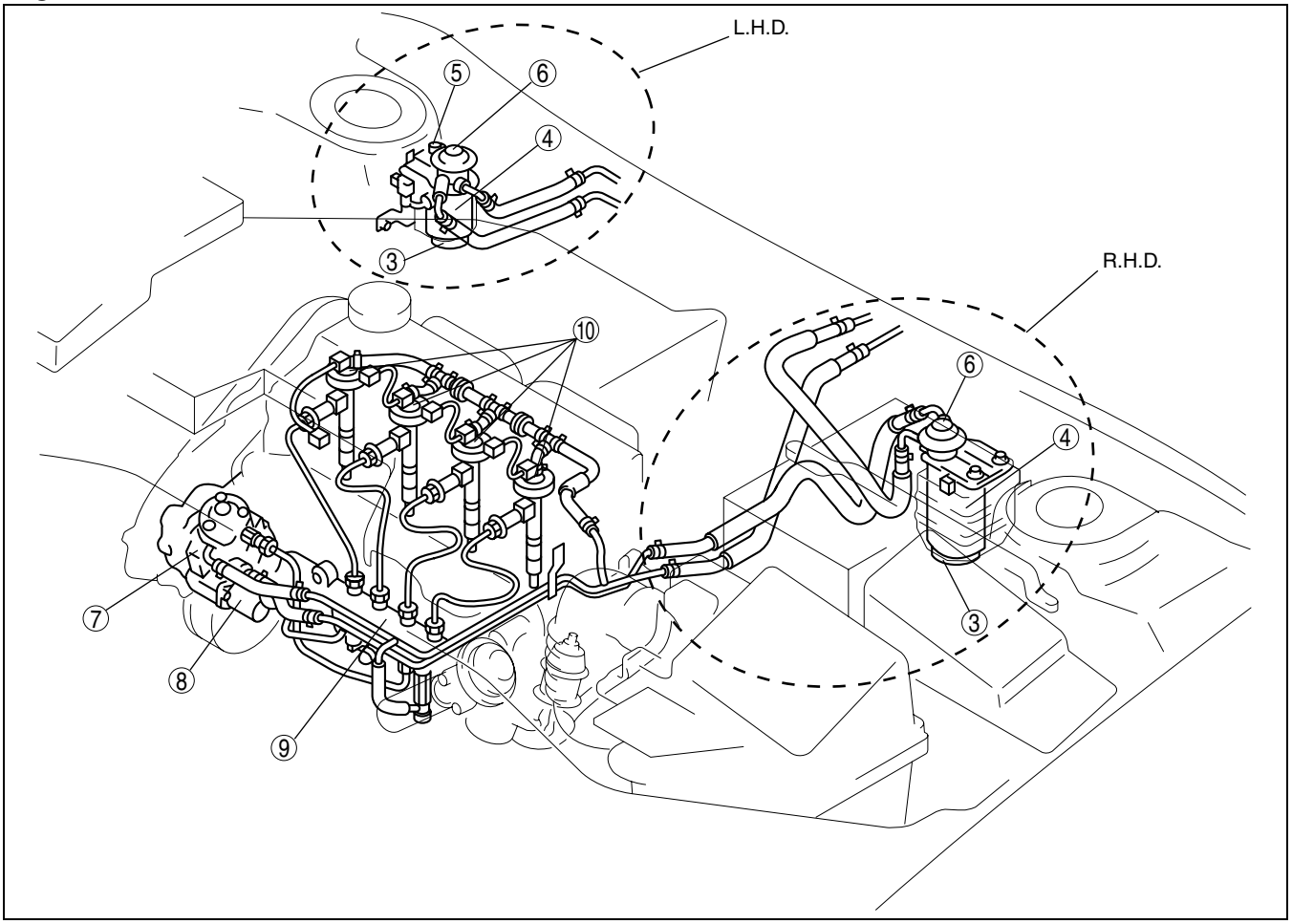
1	Air cleaner (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION) (See F2–37 AIR CLEANER ELEMENT INSPECTION)
2	Turbocharger (See F2–38 TURBOCHARGER INSPECTION)
3	Charge air cooler (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION)
4	Intake manifold (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION)
5	Guide blade actuator (See F2–39 GUIDE BLADE ACTUATOR INSPECTION)
6	VBC solenoid valve (See F2–40 VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION)
7	VBC check valve (See F2–41 VARIABLE BOOST CONTROL (VBC) CHECK VALVE INSPECTION)
8	VSC valve actuator (See F2–41 VARIABLE SWIRL CONTROL (VSC) VALVE ACTUATOR INSPECTION)
9	VSC solenoid valve (See F2–42 VARIABLE SWIRL CONTROL (VSC) SOLENOID VALVE INSPECTION)
10	Accelerator pedal component (See F2–44 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION) (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
11	Glow plug (See F2–42 GLOW PLUG REMOVAL/INSTALLATION) (See F2–43 GLOW PLUG INSPECTION)
12	Glow plug lead (See F2–43 GLOW PLUG LEAD INSPECTION)

F2

FUEL SYSTEM

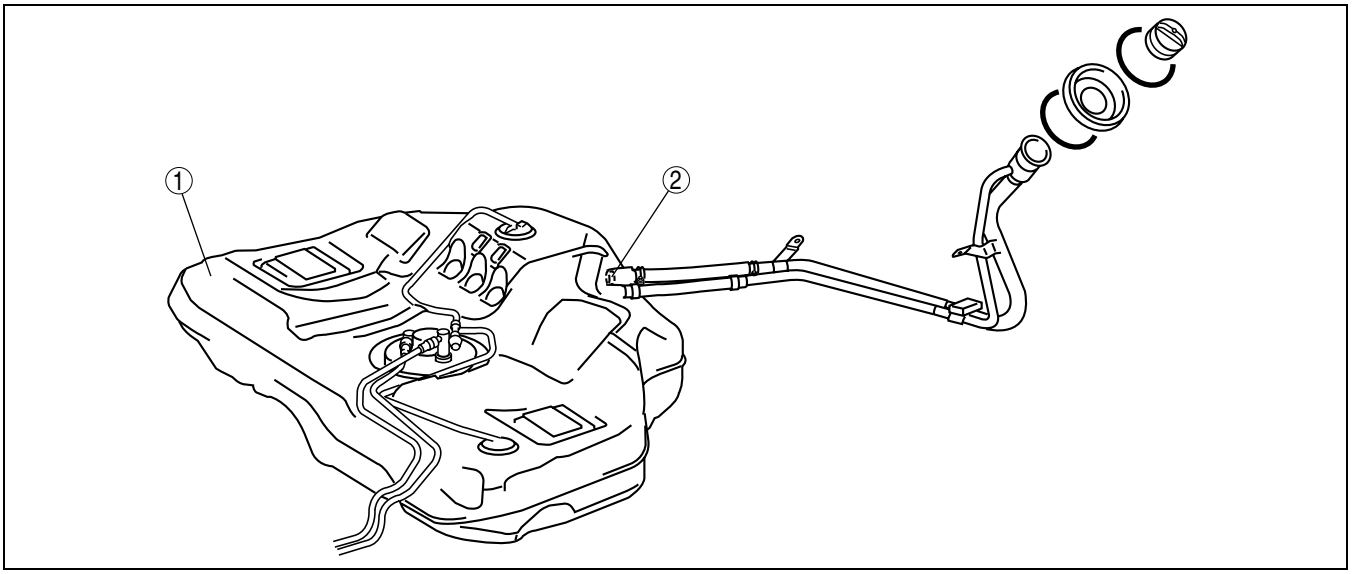
A6E400001006201

Engine room side



A6E40002003

Fuel tank side



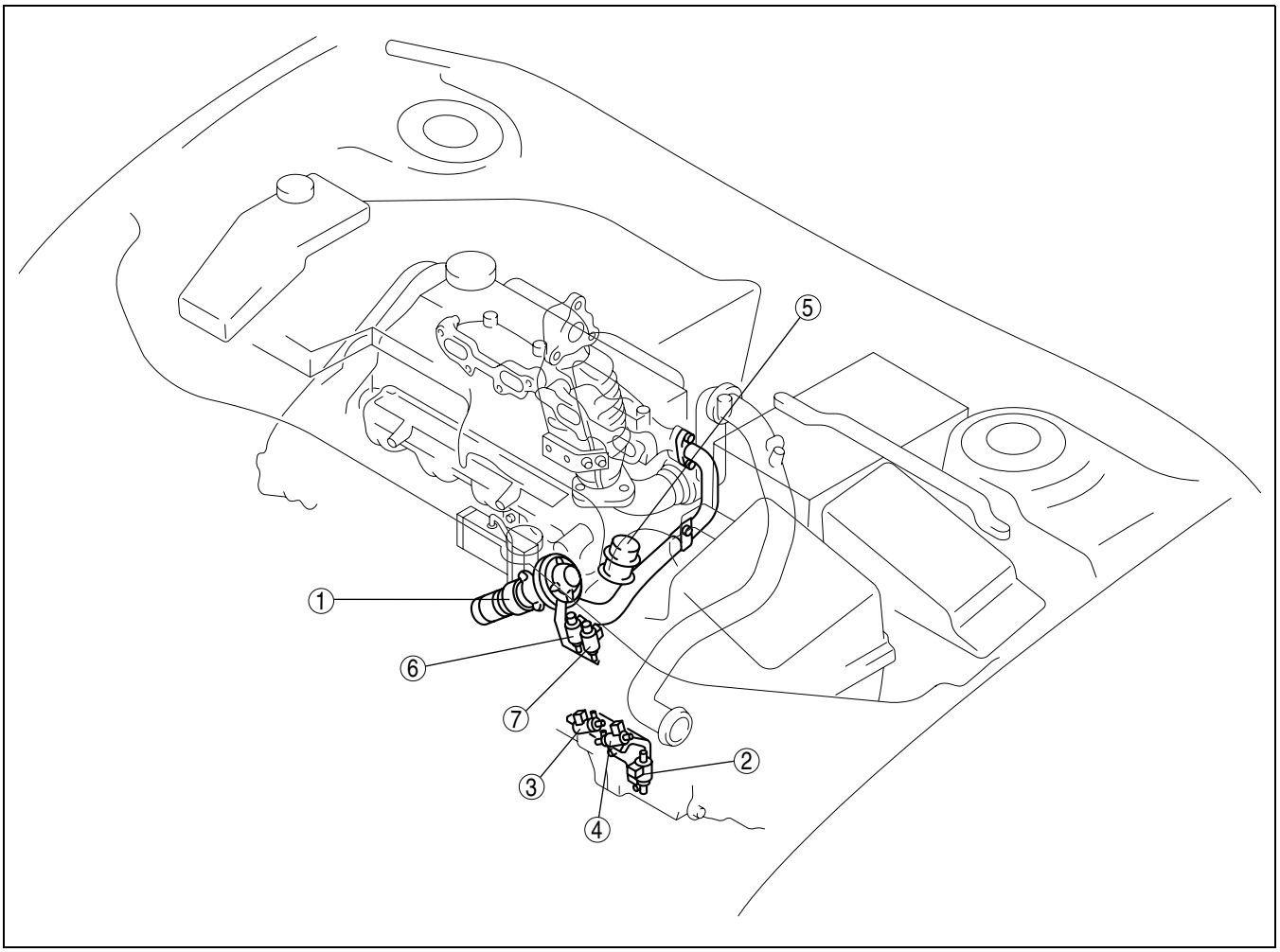
A6E40002004

1	Fuel tank (See F2–45 FUEL TANK REMOVAL/INSTALLATION) (See F2–49 FUEL TANK INSPECTION)
2	Nonreturn valve (See F2–50 NONRETURN VALVE INSPECTION)
3	Sedimentor switch (See F2–52 SEDIMENTOR SWITCH INSPECTION)
4	Fuel filter (See F2–50 FUEL FILTER COMPONENT REMOVAL/INSTALLATION) (See F2–51 FUEL FILTER COMPONENT DISASSEMBLY/ASSEMBLY)
5	Fuel warmer (See F2–51 FUEL WARMER INSPECTION)

6	Priming pump (See F2–52 SEDIMENTOR WATER DRAINING)
7	Supply pump (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION) (See F2–54 SUPPLY PUMP INSPECTION)
8	Suction control valve (See F2–54 SUCTION CONTROL VALVE INSPECTION)
9	Common rail (See F2–54 COMMON RAIL INSPECTION)
10	Fuel injector (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION) (See F2–56 FUEL INJECTOR INSPECTION)

EMISSION SYSTEM

A6E400001007201

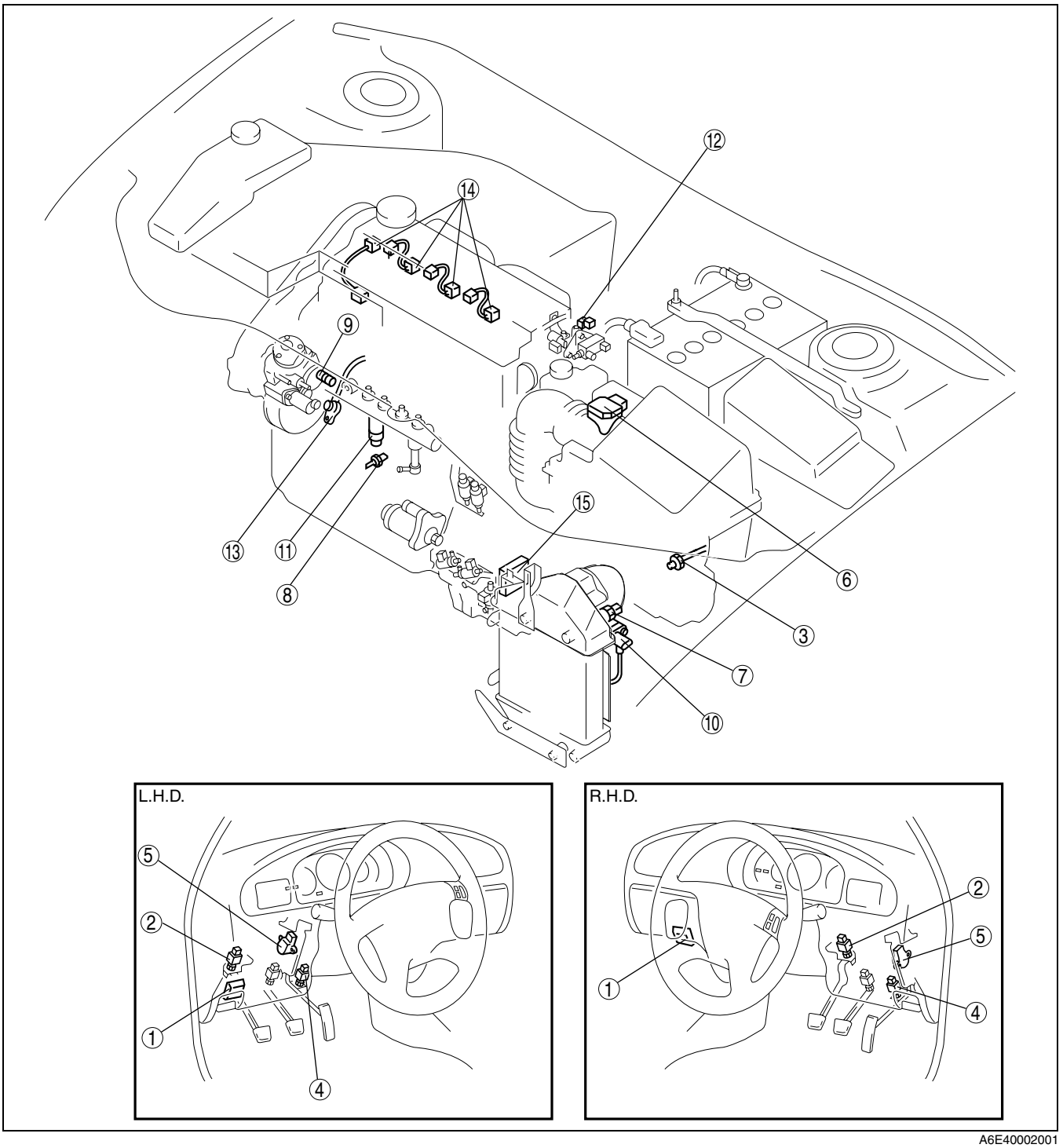


A6E40002005

1	EGR valve (See F2–59 EGR VALVE REMOVAL/ INSTALLATION) (See F2–59 EGR VALVE INSPECTION)
2	EGR control solenoid valve (See F2–61 EGR CONTROL SOLENOID VALVE INSPECTION)
3	EGR solenoid valve (vacuum) (See F2–60 EGR SOLENOID VALVE (VACUUM) INSPECTION)
4	EGR solenoid valve (vent) (See F2–60 EGR SOLENOID VALVE (VENT) INSPECTION)
5	Intake shutter valve actuator (See F2–62 INTAKE SHUTTER VALVE ACTUATOR INSPECTION)
6	Intake shutter solenoid valve (half) (See F2–63 INTAKE SHUTTER SOLENOID VALVE INSPECTION)
7	Intake shutter solenoid valve (full) (See F2–63 INTAKE SHUTTER SOLENOID VALVE INSPECTION)

CONTROL SYSTEM

A6E400018881201



A6E40002001

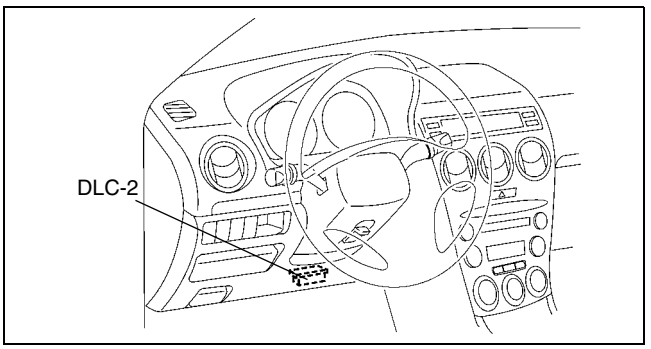
1	PCM (with built-in BARO sensor and immobilizer unit) (SeeF2–64 PCM REMOVAL/INSTALLATION) (SeeF2–65 PCM INSPECTION) (SeeF2–68 PCM CONFIGURATION)
2	Clutch switch (SeeF2–68 CLUTCH SWITCH INSPECTION)
3	Neutral switch (SeeF2–69 NEUTRAL SWITCH INSPECTION)
4	Idle switch (SeeF2–70 IDLE SWITCH INSPECTION) (SeeF2–71 IDLE SWITCH ADJUSTMENT)
5	Accelerator position sensor (SeeF2–72 ACCELERATOR POSITION SENSOR INSPECTION) (SeeF2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT)
6	MAF/IAT sensor (SeeF2–74 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)
7	IAT sensor No.2 (SeeF2–75 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION)
8	ECT sensor (SeeF2–76 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION) (SeeF2–76 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION)
9	Fuel temperature sensor (SeeF2–77 FUEL TEMPERATURE SENSOR INSPECTION)
10	Boost sensor (SeeF2–78 BOOST SENSOR INSPECTION)
11	Fuel pressure sensor (SeeF2–79 FUEL PRESSURE SENSOR INSPECTION)
12	CMP sensor (SeeF2–80 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION) (SeeF2–80 CAMSHAFT POSITION (CMP) SENSOR INSPECTION)
13	CKP sensor (SeeF2–81 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION) (SeeF2–82 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION)
14	Calibration resistor (SeeF2–83 CALIBRATION RESISTOR INSPECTION)
15	IDM (SeeF2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION)

ENGINE TUNE-UP

ENGINE TUNE-UP PREPARATION

A6E400802000201

1. Start the engine and warm up completely.
2. Verify that the gear is in neutral position.
3. Verify that the accelerator pedal is released.
4. Turn off the A/C switch.
5. Turn off all electrical loads.
6. Verify that no DTC is present.
7. Connect the WDS or equivalent to the DLC-2.
8. Wait until the electrical fan stops.



A6E40702001

IDLE SPEED INSPECTION

A6E400802000202

1. Perform “Engine Tune-up Preparation”. (See F2–34 ENGINE TUNE-UP PREPARATION.)
2. Monitor the RPM PID using the WDS or equivalent.
3. Verify that engine speed is within specification.
   - If not as specified, inspect the following.
     — Suction control valve
     — Fuel injector
     — Accelerator position sensor
     — ECT sensor
     — Fuel pressure sensor
     — CMP sensor
     — CKP sensor

Specification

Load condition	Engine speed (rpm)
No load	725—825 (775±50)
A/C switch is on	725—825 (775±50)

CORRECTION PROCEDURE

A6E400802000203

Note

- Perform each procedure by selecting the corresponding menu on the WDS screen. These procedures appear when “Powertrain” in the “Toolbox tab” is selected.

Correction after Parts Installation

Note

- Perform this procedure after replacing the PCM and/or fuel injectors.

1. Perform “Engine Tune-up Preparation”. (See F2–34 ENGINE TUNE-UP PREPARATION.)
2. Perform “Correction after Parts Installation” using the WDS or equivalent.

Injection Amount Correction

Note
- Perform this procedure at the recommended interval as described under “Fuel injection system” in “SCHEDULED MAINTENANCE.”

1. Perform “Engine Tune-up Preparation”. (See F2–34 ENGINE TUNE-UP PREPARATION.)
2. Perform “Injection Amount Correction” using the WDS or equivalent.

MAF Correction

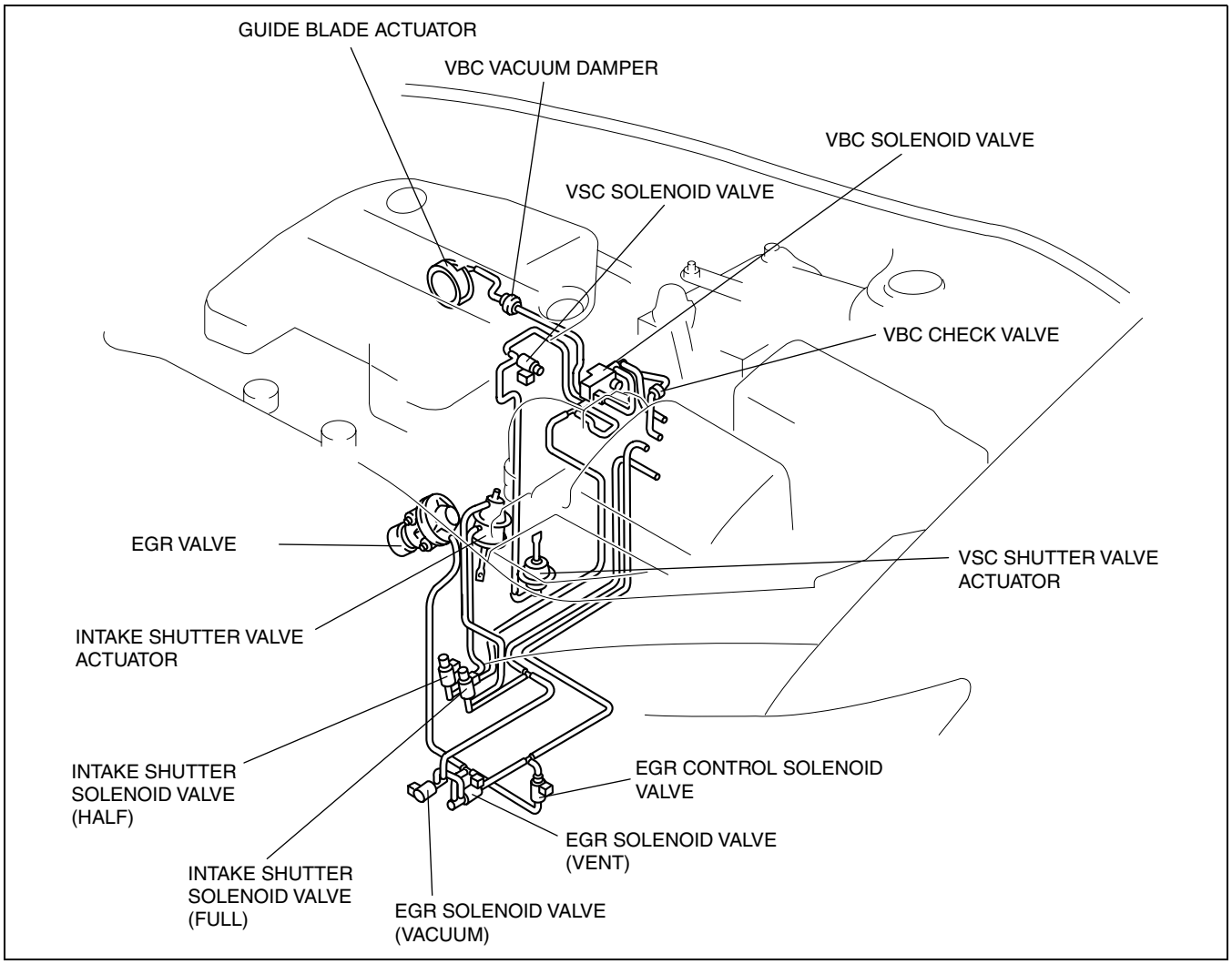
Note
- Perform this procedure after replacing the MAF/IAT sensor or at the recommended interval as described under “E.G.R. system” in “SCHEDULED MAINTENANCE.”

1. Perform “Engine Tune-up Preparation”. (See F2–34 ENGINE TUNE-UP PREPARATION.)
2. Perform “MAF Correction” using the WDS or equivalent.

INTAKE-AIR SYSTEM

VACUUM TUBE ROUTING DIAGRAM

A6E401020030201



A6E40102007

INTAKE-AIR SYSTEM REMOVAL/INSTALLATION

A6E401001005203

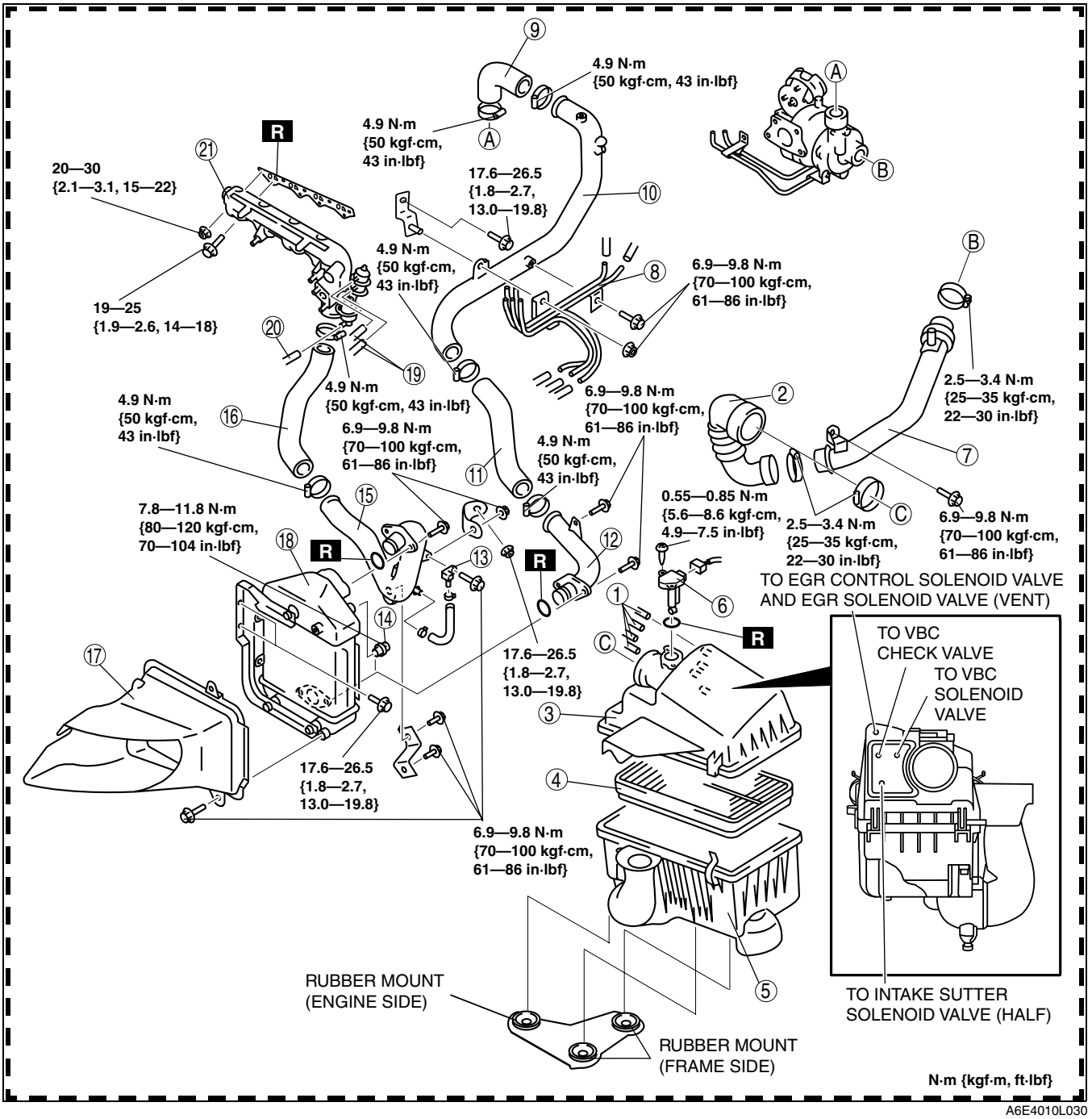
Warning

- **When the engine and intake-air system are hot, they can cause severe burns or injury. Turn off the engine and wait until they are cool before removing or installing the intake-air system.**
- **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 the following "Fuel Line Safety Procedure". (See F2–45 Fuel Line Safety Procedures.)**

Note

- Perform " MAF Correction" after replacing the MAF/IAT sensor. (See F2–35 MAF Correction.)

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



A6E4010L030

1	Vacuum hose
2	Air hose
3	Air cleaner cover
4	Air cleaner element
5	Air cleaner case (See F2–37 Air Cleaner Case Installation Note)
6	MAF/IAT sensor
7	Air pipe (See F2–37 Air Pipe Removal Note)
8	Vacuum pipe
9	Air hose
10	Air pipe

11	Air hose
12	Air pipe
13	Boost sensor
14	IAT sensor No. 2
15	Air pipe
16	Air hose
17	Air duct
18	Charge air cooler
19	Vacuum hose (Intake shutter valve actuator)
20	Vacuum hose (VSC shutter valve actuator)
21	Intake manifold (See F2–37 Intake Manifold Removal Note)

Air Pipe Removal Note

1. Remove the battery and the battery tray before removing the air pipe. (See G–5 BATTERY REMOVAL/INSTALLATION.)

Intake Manifold Removal Note

1. Remove the supply pump before removing the intake manifold. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION.)
2. Remove the EGR valve before removing the intake manifold. (See F2–59 EGR VALVE REMOVAL/INSTALLATION.)

Air Cleaner Case Installation Note

Note

- Before assembling the air cleaner, verify that the rubber mounts have not fallen off from the air cleaner bracket (3 locations).
- Always install the air cleaner case using the following procedure.
- When inserting the rubber mounts into the air cleaner case, soapy water can be applied.

1. Verify that the rubber mounts are set in the air cleaner bracket (3 locations).
2. Install the projections on the frame side (2 locations).
3. Verify that the projections on the frame side are installed securely.
4. Install the projection on the engine side (remaining location).
5. Verify that the projection on the engine side installed securely.

AIR CLEANER ELEMENT INSPECTION

A6E401001005204

1. Remove the air cleaner element. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
2. Verify that the air cleaner element surface is free of dirt.
   - If there is dirt present, use an air gun or similar tool to clean the element.
   - If the replacement time limit has passed, replace the element.

TURBOCHARGER INSPECTION

A6E401013700201

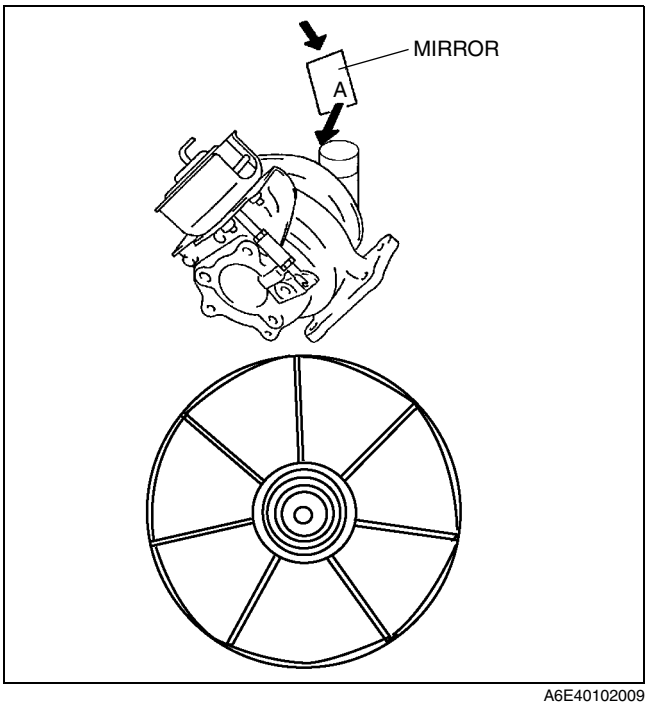
Note
- If the following problems exist, diagnosis the turbocharger using the following symptom troubleshooting procedures.

1. Lack of power: perform “NO.12 LACK/LOSS OF POWER”. (See F2–195 NO.12 LACK/LOSS OF POWER-ACCELERATION/CRUISE.)
2. Oil leak: perform “NO.16 HIGH OIL CONSUMPTION/LEAKAGE”. (See F2–209 NO.16 HIGH OIL CONSUMPTION/LEAKAGE.)
3. Noise: perform “NO. 21 ENGINE NOISE”. (See F2–217 NO.21 ENGINE NOISE.)

Compressor Wheel Inspection

1. Remove the air pipe between the air cleaner and the turbocharger. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
2. Visually inspect the compressor wheel from view A and verify that all fins are free from damage, cracks or bends.
   - If there are damaged fins, cracks or bends, replace the turbocharger.

Note
- To make the inspection easier, set a small mirror as shown in the figure and use a penlight.
- If the compressor wheel is interfering with the compressor housing, it is likely that the fin edges are cracked, damaged, or bent.
- If the compressor wheel is damaged, check the following before replacing the turbocharger to avoid reoccurrence of the problem.
  — Foreign material in intake air/exhaust system.
  — Oil pipe clogging.



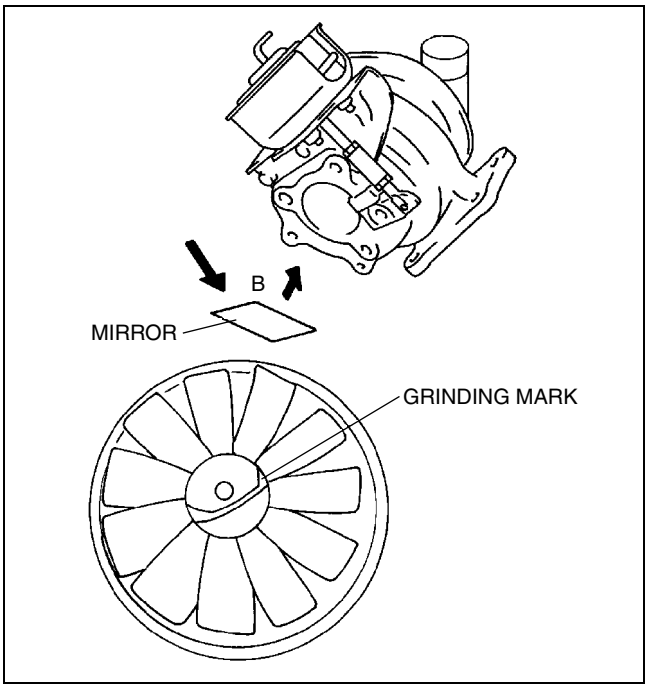
A6E40102009

Turbine Wheel Inspection

1. Remove the warm up oxidation catalytic converter between the flexible pipe and the turbocharger. (See F2–57 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
2. Visually inspect the turbine wheel from view B and verify that all fins are free from damage, cracks or bends.
   - If there are damaged fins, cracks or bends, replace the turbocharger.

Note

- To make the inspection easier, set a small mirror as shown in the figure and use a penlight.
- If the turbine wheel is interfering with the turbine housing, it is likely that the fin edges are cracked, damaged, or bent.
- If the turbine wheel is damaged, check the following before replacing the turbocharger to avoid reoccurrence of the problem.
  — Foreign material in intake air/exhaust system.
  — Oil pipe clogging.



A6E40102010

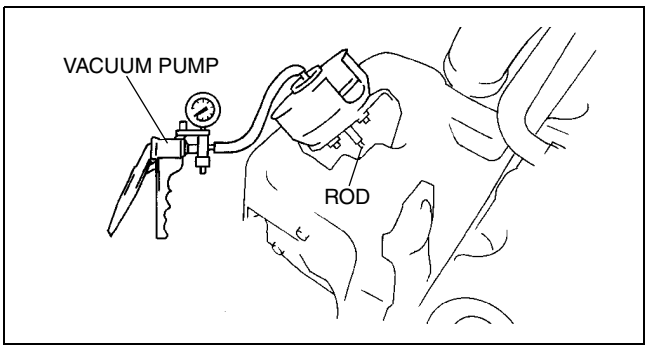
GUIDE BLADE ACTUATOR INSPECTION

A6E401013700202

1. Disconnect the vacuum hose from the guide blade actuator.
2. Connect the vacuum pump to the guide blade actuator.
3. Apply vacuum and verify that the rod moves as specified.
   - If not as specified, replace the turbocharger.

Specification

Vacuum (kPa {mmHg, inHg})	Rod movement
Below –14.5 {–108, –4.27}	Starts to move
Above –44.9 {–337, –13.3}	Fully pulled



A6E40102011

VARIABLE BOOST CONTROL (VBC) SOLENOID VALVE INSPECTION

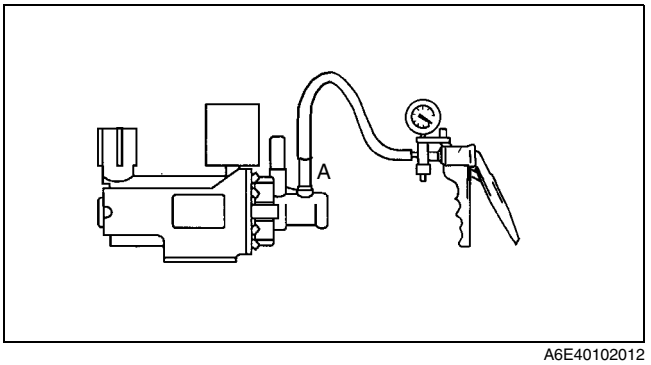
A6E401013710201

Air Tightness Inspection

1. Connect a vacuum pump to the VBC solenoid valve port A, and apply vacuum.

   Note
   - Even if there is vacuum leakage, the VBC solenoid valve is okay if vacuum increases to **–47 kPa {–353 mmHg, –14 inHg} or more**.

2. Verify that the vacuum increases to **–47 kPa {–353 mmHg, –14 inHg} or more**.
   - If not as specified, replace the VBC solenoid valve.
   - If VBC solenoid valve is okay, perform the “Operation Inspection”.



A6E40102012

Operation Inspection

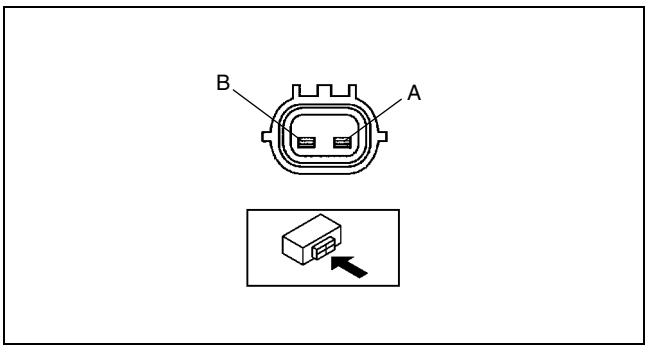
1. Connect a vacuum pump to the VBC solenoid valve port A, and apply vacuum.
2. Turn the engine switch to ON.
3. Simulate the VBCV PID to **100 %** using the WDS or equivalent.
4. Verify that the vacuum is decreased.
   - If not as specified, replace the VBC solenoid valve.
   - If VBC solenoid valve is okay, perform the “Resistance Inspection”.

Resistance Inspection

Note
- Perform the following test only when directed.

1. Measure the resistance between the VBC solenoid valve terminals using an ohmmeter.
   - If not as specified, replace the VBC solenoid valve.
   - If VBC solenoid valve is okay, perform the “Circuit Open/Short Inspection”.

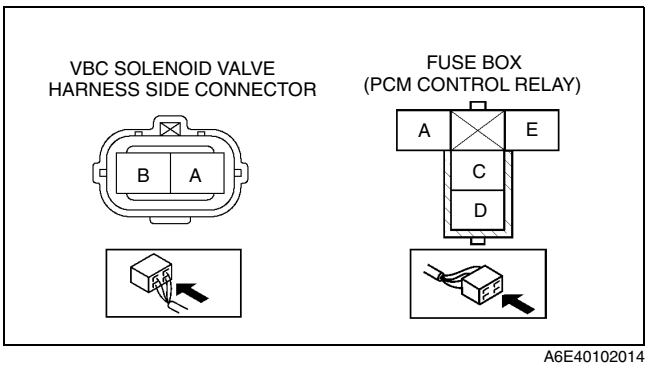
Specification
11—13 kilohms [20°C {68°F}]



A6E40102031

Circuit Open/Short Inspection

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



A6E40102014

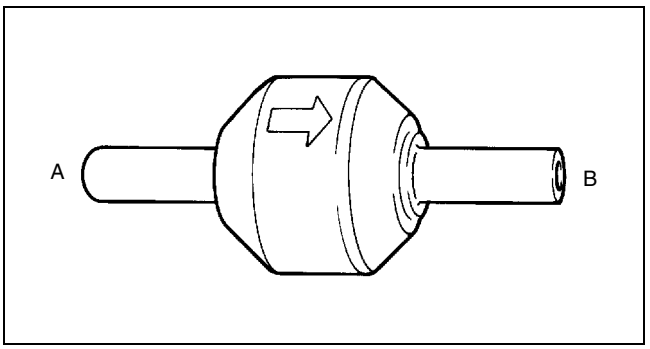
Open circuit
- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — VBC solenoid valve terminal A (harness-side) and PCM control relay terminal C
  - — VBC solenoid valve terminal B (harness-side) and PCM connector terminal 67

Short circuit
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — VBC solenoid valve terminal A (harness-side) and GND
  - — VBC solenoid valve terminal B (harness-side) and power supply

VARIABLE BOOST CONTROL (VBC) CHECK VALVE INSPECTION

A6E401013710202

1. Remove the VBC check valve. (See F2–35 VACUUM TUBE ROUTING DIAGRAM.)
2. Blow through port A and verify that the air flows from port B.
   - If not as specified, replace the VBC check valve.
3. Blow through port B and verify that the air does not flow from port A.
   - If not as specified, replace the VBC check valve.

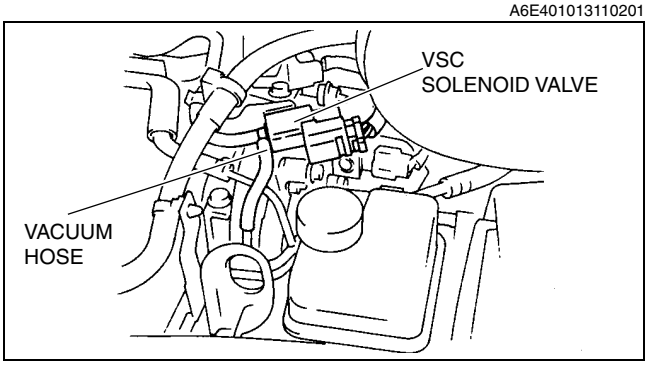


A6E40102015

VARIABLE SWIRL CONTROL (VSC) VALVE ACTUATOR INSPECTION

A6E401013110201

1. Disconnect the vacuum hose from the VSC solenoid valve.
2. Connect a vacuum pump to the vacuum hose.

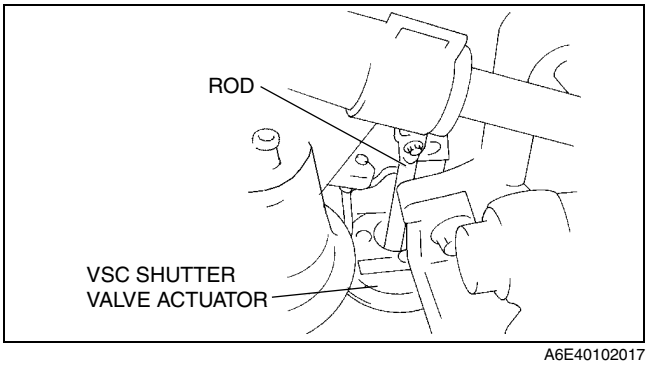


A6E40102016

3. Apply vacuum and verify that the rod moves as specified.
   - If not as specified, replace the intake manifold.

Specification

Vacuum (kPa {mmHg, inHg})	Rod movement
Below –20 {–150, –5.9}	Starts to move
Above –69.4 {–521, –20.5}	Fully pulled



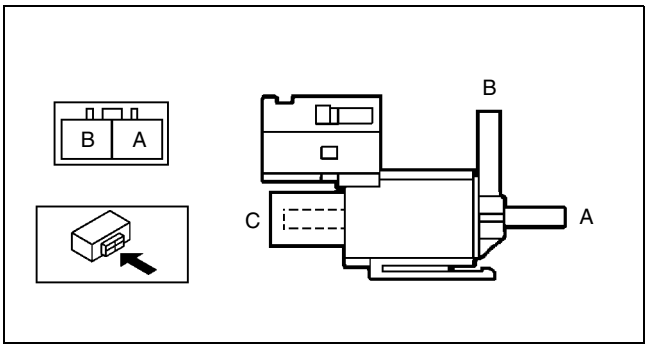
A6E40102017

VARIABLE SWIRL CONTROL (VSC) SOLENOID VALVE INSPECTION

A6E401013110202

Note
- Perform the following test only when directed.

1. Inspect airflow between the ports under the following conditions.
   - If not as specified, replace the VSC solenoid valve.
   - If VSC solenoid valve is okay, perform the "Circuit Open/Short Inspection".



A6E40102018

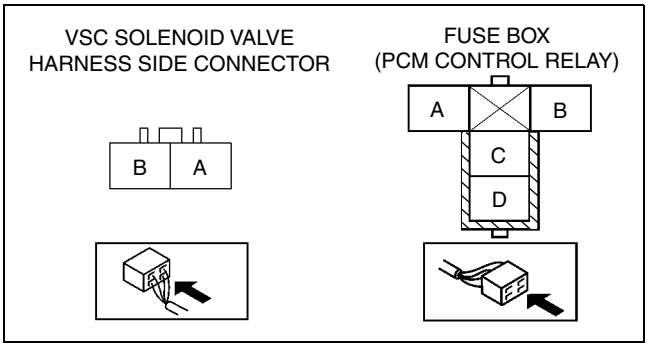
○—○ : Airflow

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

A6E40102020

Circuit Open/Short Inspection

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



A6E40102021

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — VSC solenoid valve terminal A (harness-side) and PCM control relay terminal C
  - — VSC solenoid valve terminal B (harness-side) and PCM terminal 101

Short circuit

- If there is continuity, the circuit is shorted. Repair of replace the harness.
  - — VSC solenoid valve terminal A (harness-side) and GND.
  - — VSC solenoid valve terminal B (harness-side) and power supply

GLOW PLUG REMOVAL/INSTALLATION

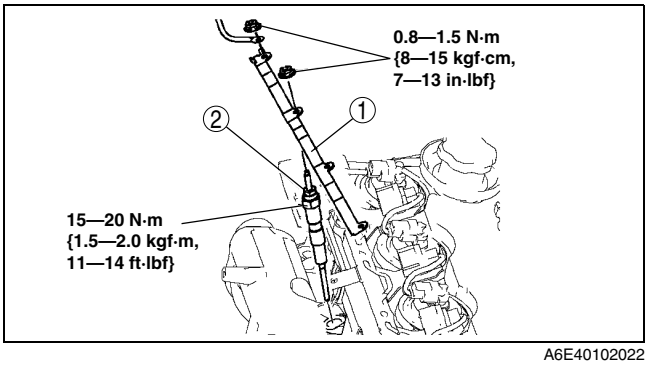
A6E401018601201

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 (approx. 0.6 ohms [20°C {68°F}]).**
- **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 lead
2	Glow plug (See F2–43 Glow Plug Removal Note) (See F2–43 Glow Plug Installation Note)

3. Install in the reverse order of removal.



A6E40102022

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 at least one pitch by hand, and continue tightening with a tool.

GLOW PLUG INSPECTION

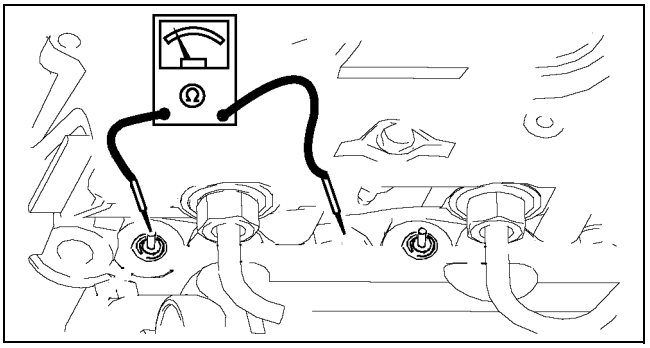
A6E401018601202

Note
- Perform the following test only when directed.

1. Remove the glow plug lead. (See F2–42 GLOW PLUG REMOVAL/INSTALLATION.)
2. Measure the resistance between the glow plug terminal and the cylinder head using an ohmmeter.
   - If not as specified, replace the glow plug.

   Resistance
   Approx. 0.6 ohms [20°C {68°F}]

3. Install the glow plug lead.



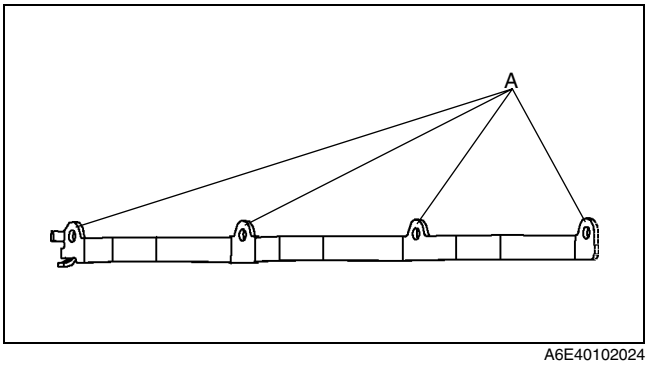
A6E40102023

GLOW PLUG LEAD INSPECTION

A6E401018611201

1. Remove the glow plug lead from the glow plug. (See F2–42 GLOW PLUG REMOVAL/INSTALLATION.)
2. Verify that the glow plug lead is not broken or bent.
3. Verify there is continuity at both ends of the glow plug lead.
   - If there is no continuity, replace the glow plug lead.

   Note
   - When inspecting for continuity in the glow plug lead, do not let the uncovered parts (A) come into contact with other parts and be shorted.



A6E40102024

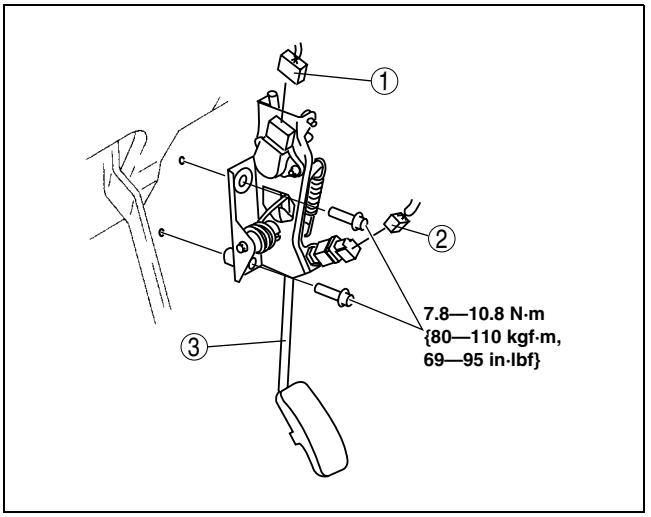
ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION

A6E401041600201

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

1	Accelerator position sensor connector
2	Idle switch connector
3	Pedal component

3. Install in the reverse order of removal.



A6E40102026

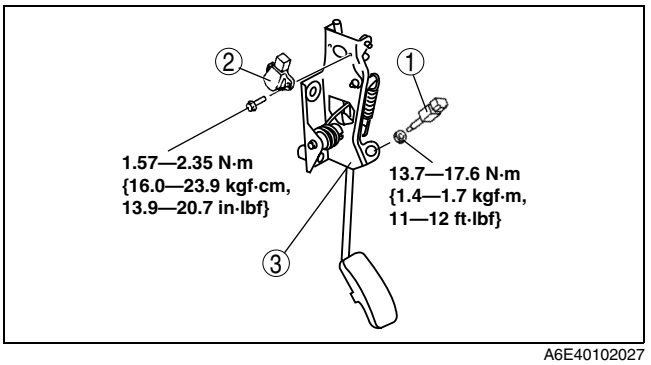
ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY

A6E401041600202

1. Remove the accelerator pedal component. (See F2–44 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION.)
2. Disassemble in the order indicated in the table.

1	Idle switch
2	Accelerator position sensor
3	Accelerator pedal

3. Assemble in the reverse order of removal.
4. Install the accelerator pedal component. (See F2–44 ACCELERATOR PEDAL COMPONENT REMOVAL/INSTALLATION.)
5. Adjust the accelerator position sensor. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT.)
6. Adjust the idle switch. (See F2–71 IDLE SWITCH ADJUSTMENT.)



A6E40102027

FUEL SYSTEM

BEFORE REPAIR PROCEDURE

A6E401201006203

Warning
- **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 leads 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 the following "Fuel Line Safety Procedures".**

Fuel Line Safety Procedures

Note
- Fuel in the fuel system is under high pressure when the engine is not running.

1. Avoid fuel line spills and leaks by completing the following procedures.
   (1) Remove the fuel-filler cap and release the pressure in the fuel tank.
   (2) When disconnecting a fuel line hose, wrap a rag around it to protect against fuel leakage.
   (3) Plug the hose after removal.

AFTER REPAIR PROCEDURE

A6E401201006204

Warning
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. When installing the fuel hose, observe "Fuel Hose Installation" described below.**

Fuel Line Air Bleeding

Caution
- **Continuously cranking the engine for over 30 s can damage the battery and the starter.**

1. Continue cranking the engine for **30 s** and stop for **5—10 s** until the engine starts.

Fuel Hose Installation

1. Verify that there is no damage or deformation on the fuel hose and fuel pipe when installing.

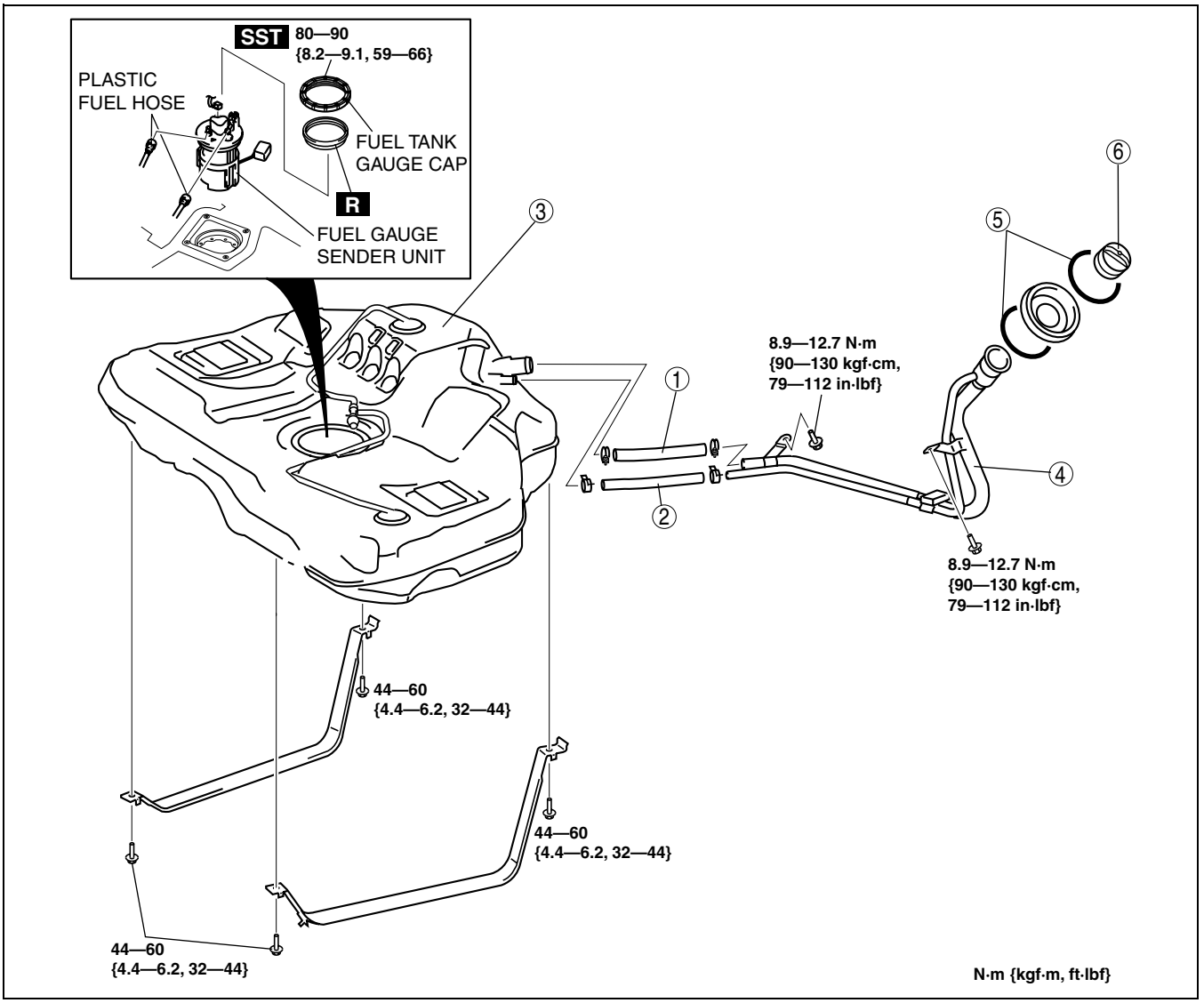
FUEL TANK REMOVAL/INSTALLATION

A6E401242110201

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 also irritate skin and eyes. To prevent this, do not damage the sealing surface of the fuel gauge sender unit when removing or installing.**

Caution
- **Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting using a cloth or soft brush, and make sure that it is free of foreign material.**

1. Verify that vehicle is level.
2. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
3. Disconnect the negative battery cable.
4. Remove the rear seat cushion.
5. Remove the service hole cover.
6. Remove the plastic fuel hose from the fuel gauge sender unit. (See F2–47 Plastic Fuel Hose Removal Note.) (See F2–48 Plastic Fuel Hose Installation Note.)
7. Remove the fuel gauge sender unit connector.
8. Remove the fuel tank gauge cap. (See F2–47 Fuel Tank Gauge Cap Removal Note.)
9. Remove the fuel gauge sender unit. (See F2–48 Fuel Gauge Sender Unit Installation Note.)
10. Siphon the fuel from the fuel tank.
11. Remove in the order indicated in the table.
12. Install in the reverse order of removal.
13. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)



A6E40122025

1	Joint hose (See F2–48 Joint Hose Installation Note)
2	Breather hose (See F2–48 Breather Hose Installation Note)

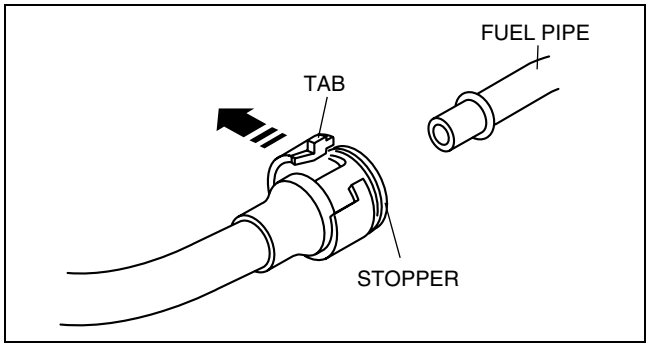
3	Fuel tank
4	Fuel-filler pipe
5	C-ring
6	Filler cap

Plastic Fuel Hose Removal Note

Caution
- **The quick release connector may be damaged if the tab is bent excessively. Do not expand the tab over the stopper.**

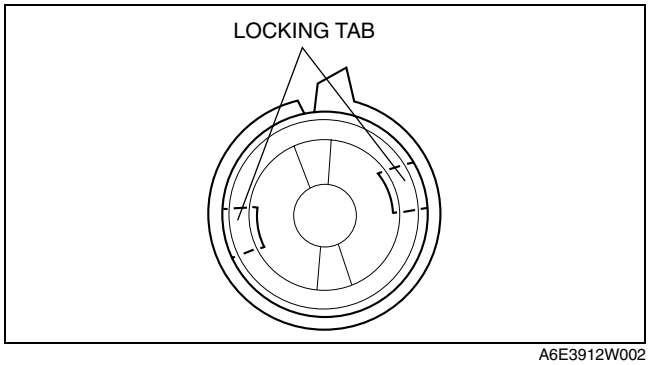
1. Disconnect the quick release connector.
   (1) Push the tab on the locking coupler **90 degrees** until it stops.
   (2) Pull the fuel hose straight back.

Note
- The stopper may be removed from the quick connector. Take care not to lose it. Reinstall it to the quick release connector before reconnecting the fuel line.



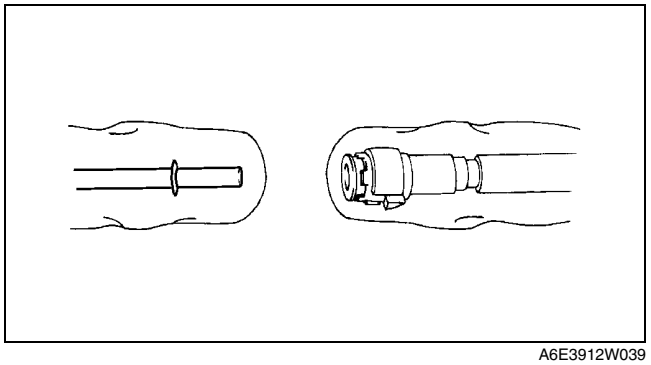
A6E3912W001

- The locking coupler has two internal locking tabs which retain the fuel pipe. Be sure that the tab on the locking coupler is rotated until it stops to release two internal locking tabs.



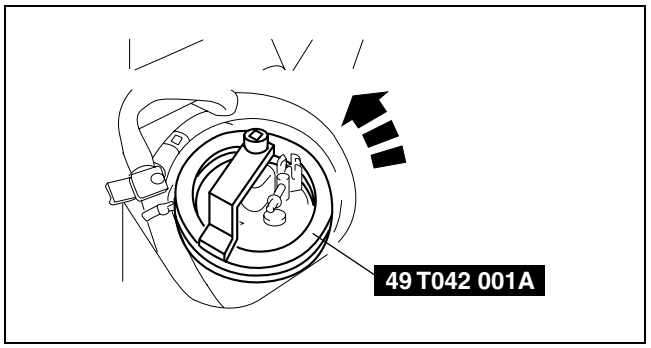
A6E3912W002

2. Cover the disconnected quick release connector and fuel pipe with vinyl sheets or the like to prevent them from being scratched or contaminated with foreign material.


A6E3912W039

Fuel Tank Gauge Cap Removal Note

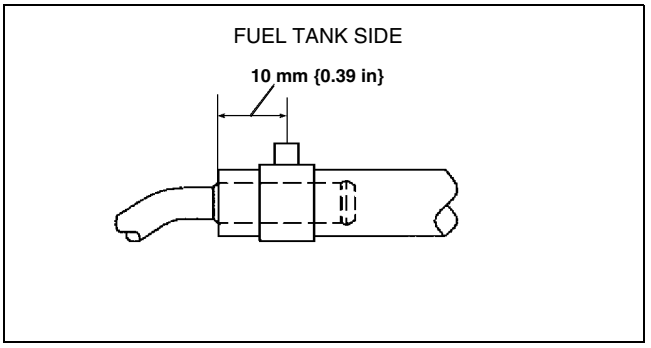
1. Using the **SST**, remove the fuel tank gauge cap.



A6A3912W007

Breather Hose Installation Note

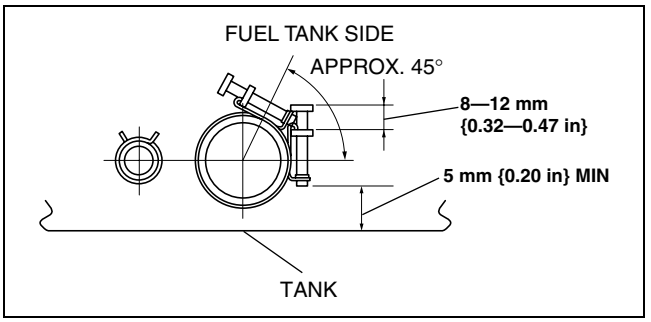
1. Fit the breather hose onto the respective fittings, and install clamps as shown.



A6E3912W038

Joint Hose Installation Note

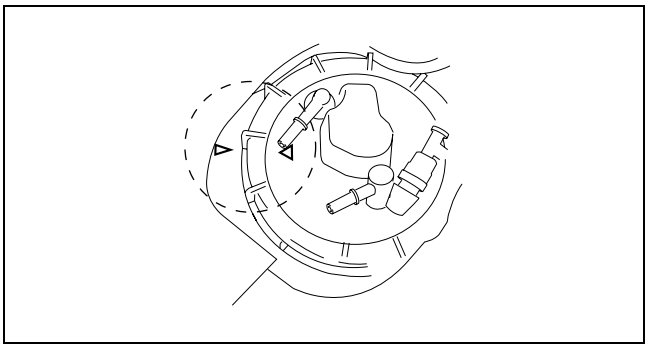
1. Fit the joint hose onto the respective fittings, and install clamps as shown.



A6E3912W040

Fuel Gauge Sender Unit Installation Note

1. Verify that the fuel tank mark is aligned with the fuel pump mark as shown.



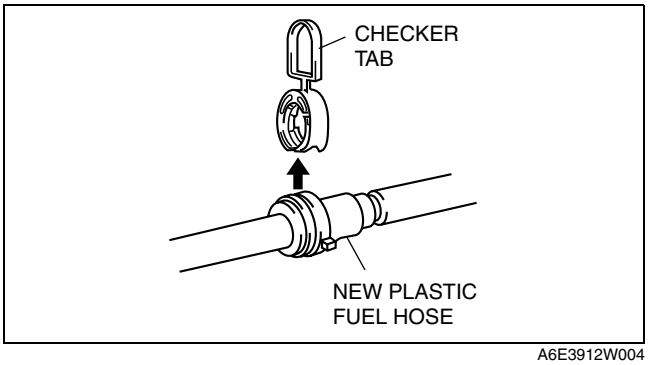
A6E40122026

Plastic Fuel Hose Installation Note

Note

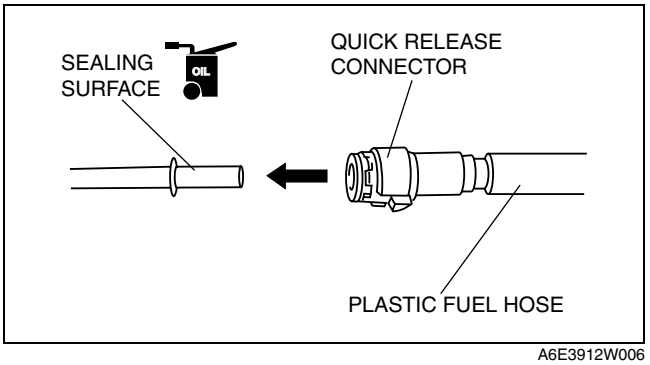
- A checker tab is integrated with quick release connector for new plastic fuel hoses. The checker tab will be released from the quick release connector after it is completely engaged with the fuel pipe.

1. When the retainer is not removed, perform the following procedure.
   (1) Inspect the fuel pump unit sealing surface for damage and deformation, and replace as necessary.
   - If the quick release connector O-ring is damaged, replace the plastic fuel hose.



A6E3912W004

(2) Apply a slight amount of clean engine oil to the sealing surface of the fuel pump unit.
(3) Align the fuel pipe on the fuel pump unit and quick release connector so that the tabs of the retainer are correctly fitted into the quick release connector. Push the quick release connector straight into the retainer until a click is heard.
(4) Lightly pull and push the quick release connector a few times by hand and verify that it can move **2.0—3.0 mm {0.08—0.11 in}** and it is connected securely.
- If the quick release connector does not move at all, verify that O-ring is not damaged of that is has not slipped, and reconnect the quick release connector.



A6E3912W006

2. When the retainer is removed, perform the following procedure.

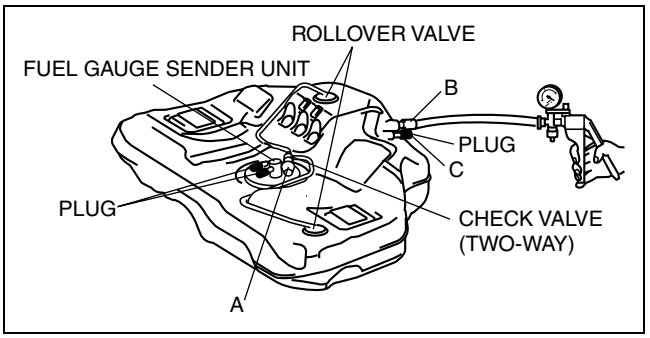
FUEL TANK INSPECTION

A6E401242110202

Caution
- **Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting using a cloth or soft brush, and make sure that it is free of foreign material.**

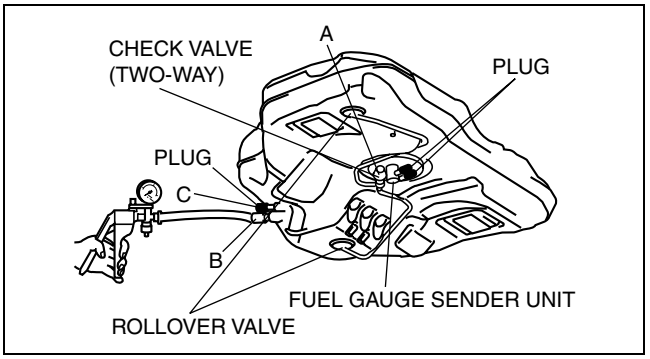
Note
- This inspection is for two rollover valves and check valve (two-way) integrated in the fuel tank.

1. Remove the fuel tank with the fuel gauge sender unit. (See F2–45 FUEL TANK REMOVAL/INSTALLATION.)
2. Plug the fuel pipe of the fuel gauge sender unit.
3. Plug port C.
4. Connect the pump to port B.
5. Level the fuel tank.
6. Apply pressure of **+2.0 kpa {+34 mmHg, +1.3 inHg}** to port B.
   (1) Verify there is airflow from port A.
   - If there is no airflow, replace the fuel tank.
7. Apply pressure of **–5.9 kPa {–44 mmHg, –1.7 inHg}** to port B.
   - If there is no vacuum, replace the fuel tank.
   - If there is vacuum, turn the fuel tank upside-down and proceed to next step.



A6E40122034

8. Apply pressure of **+2.0 kPa {+15 mmHg, +0.6 inHg}** to port B.
   (1) Verify there is no airflow from port A.
   - If there is airflow, replace the fuel tank.



A6E40122035

NONRETURN VALVE INSPECTION

A6E401242270201

Note
- Nonreturn valve is integrated in the fuel tank. Therefore, before inspecting the nonreturn valve perform the follwing:

1. Remove the fuel gauge sender unit. (See F2–45 FUEL TANK REMOVAL/INSTALLATION.)
2. Siphon the fuel from the fuel tank.

Note
- The nonreturn valve is normally closed by the spring force.

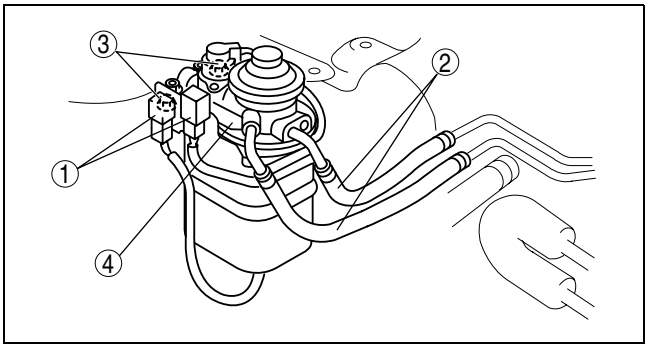
3. Verify that the nonreturn valve is closed.
   - If it is stuck open, replace the fuel tank.
4. Verify that the nonreturn valve opens when pulled up by a finger.
   - If it does not open, replace the nonreturn valve.

FUEL FILTER COMPONENT REMOVAL/INSTALLATION

A6E401234802201

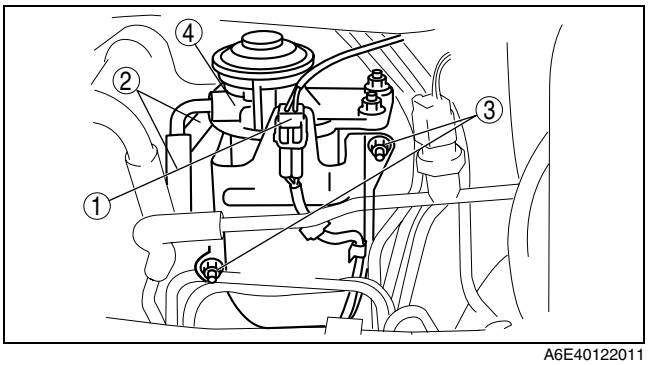
1. Disconnect the negative battery cable.
2. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
3. Remove in the order indicated in the table.

L.H.D.



A6E40122010

R.H.D.



A6E40122011

1	Connector
2	Fuel hose
3	Installation nut
4	Fuel filter body

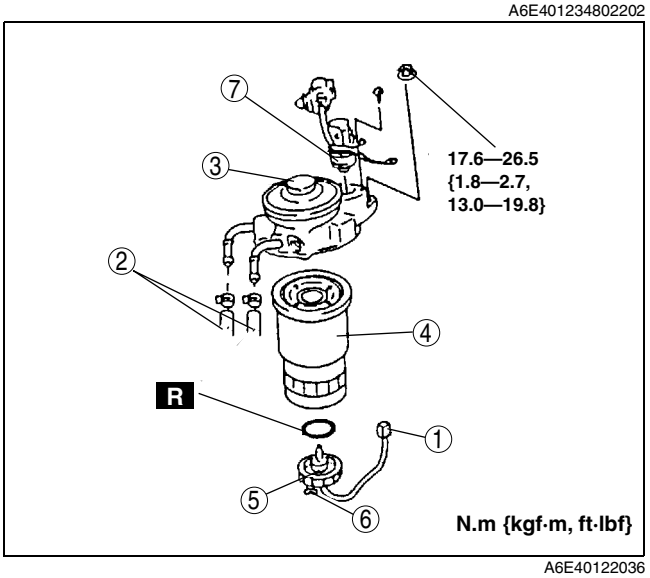
4. Install in the reverse order of removal.
5. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)
6. Start the engine and verify that fuel does not leak from the fuel system.
   - If fuel leaks, reinstall the fuel filter.

FUEL FILTER COMPONENT DISASSEMBLY/ASSEMBLY

A6E401234802202

1. Disassemble in the order indicated in the table.

1	Connector
2	Fuel hose
3	Priming pump
4	Fuel filter (See F2–51 Fuel Filter Installation Note)
5	Sedimentor switch (See F2–51 Sedimentor Switch Installation Note)
6	Drain plug
7	Fuel warmer



A6E40122036

2. Assemble in the reverse order of removal.

Sedimentor Switch Installation Note

1. Apply a small amount of fuel to a new O-ring.
2. Tighten the sedimentor switch enough to the fuel filter by hand.

Fuel Filter Installation Note

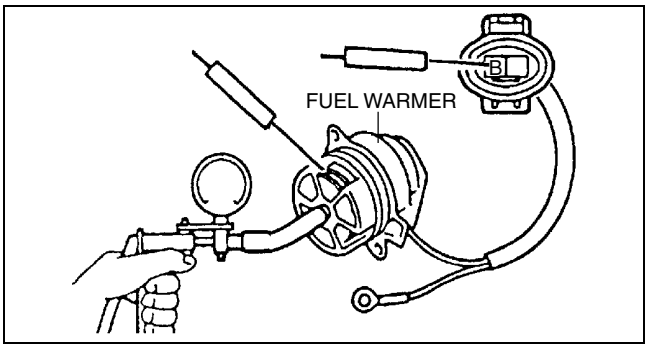
1. Apply a small amount of fuel to the fuel filter O-ring.
2. Tighten the fuel filter **approx. 3/4** by hand after the O-ring contacts the priming pump.

FUEL WARMER INSPECTION

A6E401234802203

For Cold Areas

1. Remove the fuel warmer. (See F2–51 FUEL FILTER COMPONENT DISASSEMBLY/ASSEMBLY.)
2. Verify that the resistance between terminal A and the fuel warmer body is within the specification when vacuum of **–31.3— –38.0 kPa {–235— –285 mmHg, –9.2— –11.2 inHg}** is applied to port A of the fuel warmer.
   - If as specified, carry out the “Circuit Open/Short Inspection”.
   - If not as specified, replace the fuel warmer.



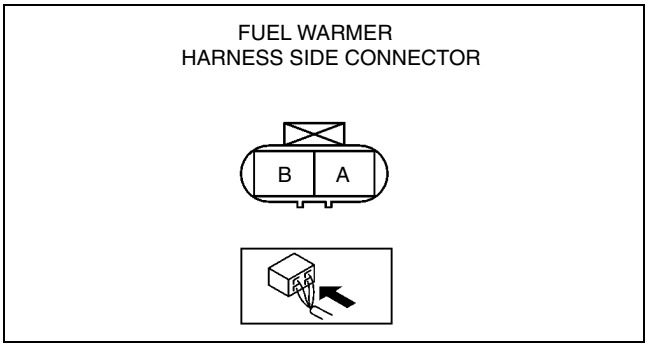
A6E40122013

Specification

Ambient temperature (°C {°F})	Resistance (ohms)
20 {68}	0.5—1.5

Circuit Open/Short Inspection

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



A6E40122014

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — Fuel warmer terminal A (harness-side) and GND
  - — Fuel warmer terminal B (harness-side) and power supply

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — Fuel warmer terminal B (harness-side) and GND

F2

SEDIMENTOR WATER DRAINING

A6E401234802204

1. Disconnect the negative battery cable.
2. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
3. Loosen the drain plug located at the bottom of the fuel filter.
4. Pump the priming pump and drain the water.
5. After all the water has been drained, tighten the drain plug.
6. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)
7. Reconnect the negative battery cable.

SEDIMENTOR SWITCH INSPECTION

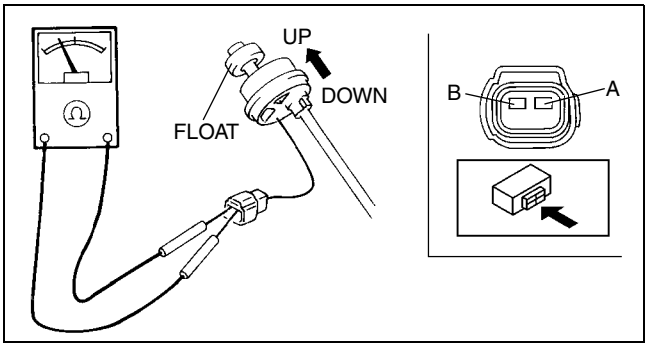
A6E401213840201

Note
- Perform the following test only when directed.

1. Disconnect the negative battery cable.
2. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
3. Drain fuel from the fuel filter. (See F2–52 SEDIMENTOR WATER DRAINING.)
4. Remove the sedimentor switch.
5. Inspect for continuity of the sedimentor switch using an ohmmeter.
   - If as specified, inspect the following and carry out the “Circuit Open/Short Inspection.”
   - If not as specified, replace the sedimentor switch.

Specification

Float	Continuity
Up	Yes
Down	No



A6E40122015

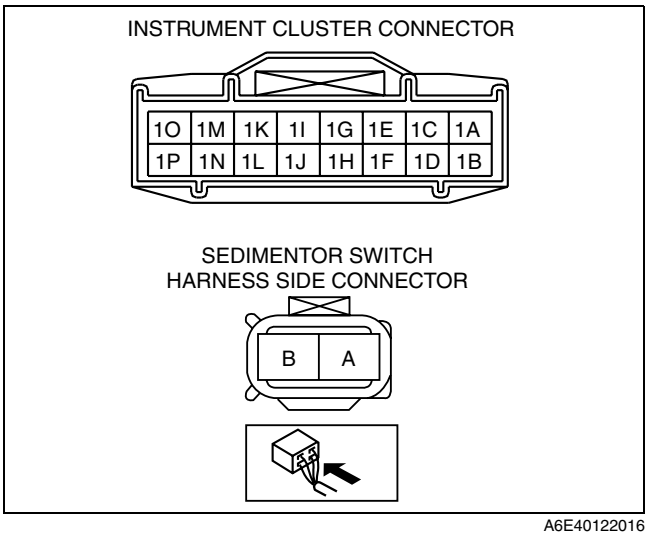
6. Install the sedimentor switch.
7. Reconnect the negative battery cable.
8. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)

Circuit Open/Short Inspection

1. Inspect the following wiring harnesses for open or short (continuity check).

   Open circuit
   - If there is no continuity, the circuit is open. Repair or replace the harness.
     — Sedimentor switch terminal B (harness-side) and GND.
     — Sedimentor switch terminal A (harness-side) and instrument cluster terminal 1C.

   Short circuit
   - If there is continuity, the circuit is shorted. Repair of replace the harness.
     — Sedimentor switch terminal A (harness-side) and GND.
     — Sedimentor switch terminal B (harness-side) and power supply.



A6E40122016

SUPPLY PUMP REMOVAL/INSTALLATION

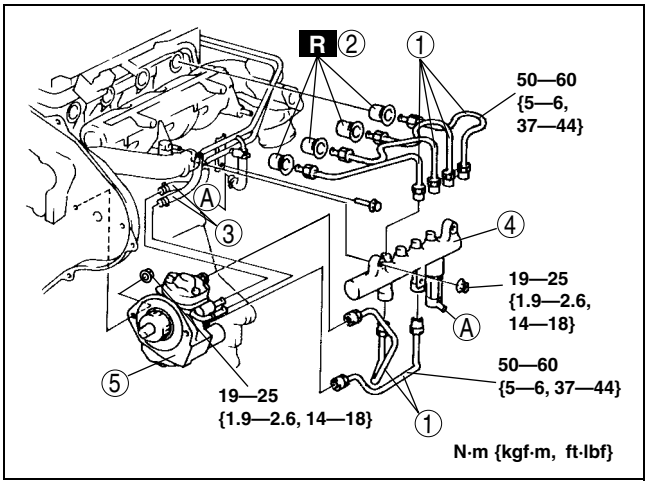
A6E401213350201

Caution

- **Fuel line spills and leakage on the parts are dangerous. Fuel can ignite and also deteriorate the parts. To prevent this, always cover the mouths of the removed parts in the fuel system with rags to soak up the fuel.**
- **To prevent the fuel injection pipe from clogging, be careful that foreign material has not entered the pipe. Also, be sure to tighten the bolts with the specified tightening torque when installing the fuel injection pipe.**
- **To prevent fuel leakage, follow the procedure indicated in the workshop manual when removing and installing the fuel injector.**
- **The fuel injection pipe can be removed and reinstalled up to five times. Be sure to record in the service record when removing and installing the fuel injection pipe. If removing it for the sixth time, be sure to replace it with a new one.**

1. Disconnect the negative battery cable.
2. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
3. Remove in the order indicated in the table.

1	Injection pipe
2	Nozzle seal
3	Return fuel hose
4	Common rail (See F2–53 Common Rail Installation Note)
5	Supply pump (See B2–17 Supply Pump Pulley Removal Note)



A6E40122033

4. Install in the reverse order of removal.
5. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)

Common Rail Installation Note

1. Temporarily tighten the common rail.
2. Temporarily tighten the injection pipes.
3. Fully tighten the injector side injection pipes, then tighten the common rail side.

   Tightening torque
   50—60 N·m {5—6 kgf·m, 37—44 ft·lbf}

4. Fully tighten the supply pump side and common rail side injection pipes.

   Tightening torque
   50—60 N·m {5—6 kgf·m, 37—44 ft·lbf}

5. Fully tighten the common rail.

   Tightening torque
   20—30 N·m {2.0—3.1 kgf·m, 15—22 ft·lbf}

SUPPLY PUMP INSPECTION

A6E401213350202

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

1. Supply pump inner parts
2. Suction control valve
3. Fuel temperature sensor

SUCTION CONTROL VALVE INSPECTION

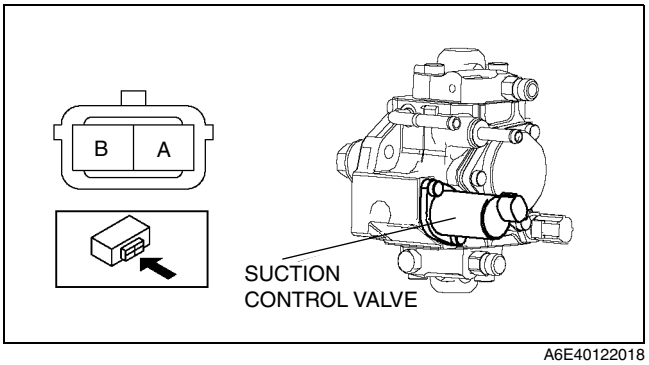
A6E401213350203

Caution
- **The supply pump is sealed to maintain proper function. Special tools and testers are required when disassembling the supply pump. Disassembling the supply pump without special tools and testers will cause a malfunction.**
- **Consult an authorized DENSO parts distributor for repair if suction control valve is possibly malfunctioning.**

Resistance Inspection
1. Disconnect the negative battery cable.
2. Disconnect the suction control valve connector.
3. Measure the resistance between the suction control valve terminals using an ohmmeter.
   - If not as specified, repair the supply pump. (See F2–54 SUPPLY PUMP INSPECTION.)
   - If as specified, carry out the “Circuit Open/ Short Inspection”.

Specification

Ambient temperature (°C {°F})	Resistance (ohms)
20 {68}	Approx. 2.1



A6E40122018

Circuit Open/Short Inspection
1. Disconnect the PCM connector. (See F2–64 PCM REMOVAL/INSTALLATION.)
2. Inspect the following wiring harnesses for an open or short circuit (continuity check).

Open circuit
- If there is no continuity, the circuit is open. Repair of replace the harness.
  - — Suction control valve terminal A (harness-side) and PCM terminal 93
  - — Suction control valve terminal B (harness-side) and PCM terminal 94

Short circuit
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — Suction control valve terminal A (harness-side) and power supply
  - — Suction control valve terminal A (harness-side) and GND
  - — Suction control valve terminal B (harness-side) and power supply
  - — Suction control valve terminal B (harness-side) and GND

COMMON RAIL INSPECTION

A6E401213015201

Caution
- **Do not remove the fuel pressure sensor nor the fuel pressure limiter from the common rail. Since fuel pressure in the common rail is extremely high, the fuel pressure sensor, fuel pressure limiter, or the common rail can be damaged, leading to fuel leakage if any of them are removed.**

1. Visually inspect the common rail for damage and cracks. Also verify that there is no extreme rust which will cause fuel leakage.
   - If either is observed, replace the common rail.

FUEL INJECTOR REMOVAL/INSTALLATION

A6E401213250201

Caution

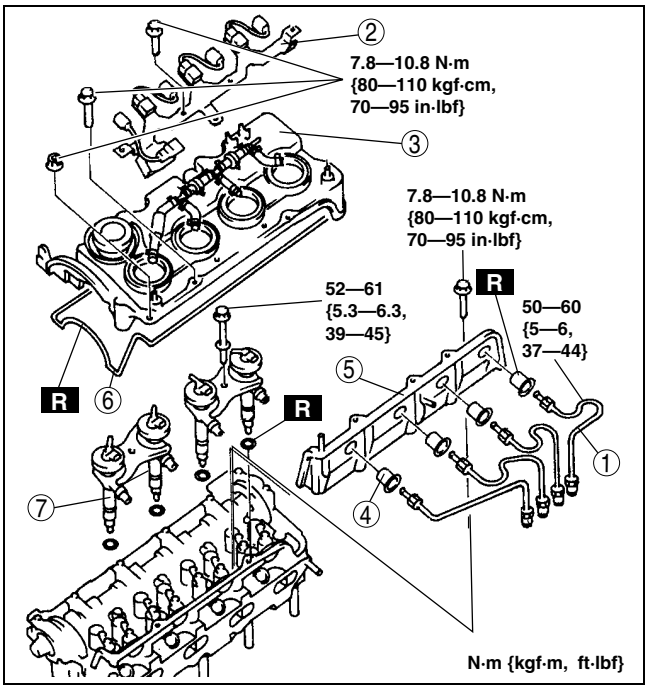
- **Fuel line spills and leakage on the parts are dangerous. Fuel can ignite and also deteriorate the parts. To prevent this, always cover the mouths of the removed parts in the fuel system with rags to soak up the fuel.**
- **To prevent the fuel injection pipe from clogging, be careful that foreign material has not entered the pipe. Also, be sure to tighten the bolts with the specified tightening torque when installing the fuel injection pipe.**
- **To prevent fuel leakage, follow the procedure indicated in the workshop manual when removing and installing the fuel injector.**
- **The fuel injection pipe can be removed and reinstalled up to five times. Be sure to record in the service record when removing and installing the fuel injection pipe. If removing it for the sixth time, be sure to replace it with a new one.**

Note

- Perform “Correction after Parts Installation” after replacing fuel injector. (See F2–34 Correction after Parts Installation.)

1. Disconnect the negative battery cable.
2. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)

1	Injection pipe
2	Calibration register
3	Cylinder head cover
4	Nozzle seal
5	Side wall
6	Injector bracket
7	Fuel injector (See F2–55 Fuel Injector Installation Note)



A6E40122019

Fuel Injector Installation Note

1. Temporarily tighten the injector bracket.

   Tightening torque
   10—20 N·m {1.1—2.0 kgf·m, 7.4—14.8 ft·lbf}

2. Temporarily tighten the injection pipes.
3. Tighten the injector side injection pipes, then tighten the common rail side.

   Tightening torque
   50—60 N·m {5—6 kgf·m, 37—44 ft·lbf}

4. Fully tighten the injector bracket.

   Tightening torque
   52—62 N·m {5.3—6.3 kgf·m, 39—45 ft·lbf}

FUEL INJECTOR INSPECTION

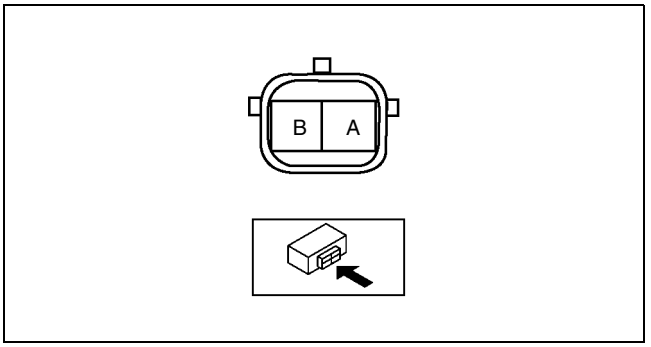
A6E401213250202

Resistance Inspection

Note
- Perform the following test only when directed.
- Perform “Correction after Parts Installation” after replacing the fuel injector. (See F2–34 Correction after Parts Installation.)

1. Disconnect the negative battery cable.
2. Disconnect the fuel injector connectors.
3. Measure the resistance of the fuel injector using an ohmmeter.
   - If not as specified, replace the fuel injector. (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION.)
   - If as specified, carry out the “Circuit Open/Short Inspection”.

Resistance
approx. 0.45 ohm

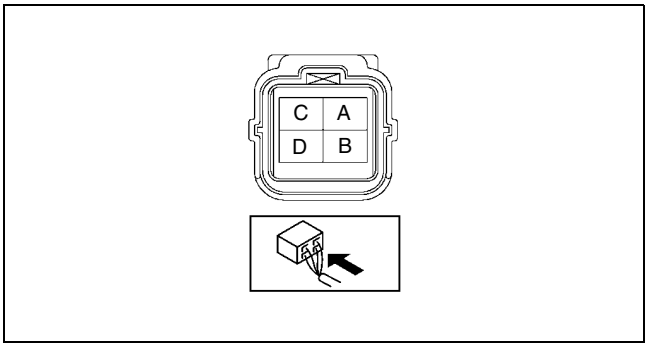


A6E40122021

Circuit Open/Short Inspection

1. Disconnect the IDM connector.
2. Inspect the following wiring harnesses for an open or short circuit (continuity check).

Open circuit
- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — No.1 cylinder fuel injector terminal B (harness-side) and IDM terminal 1E.
  - — No.2 cylinder fuel injector terminal B (harness-side) and IDM terminal 1G.
  - — No.3 cylinder fuel injector terminal B (harness-side) and IDM terminal 1H.
  - — No.4 cylinder fuel injector terminal B (harness-side) and IDM terminal 1F.
  - — No.1 cylinder fuel injector terminal D (harness-side) and IDM terminal 1D.
  - — No.2 cylinder fuel injector terminal D (harness-side) and IDM terminal 1C.
  - — No.3 cylinder fuel injector terminal D (harness-side) and IDM terminal 1D.
  - — No.4 cylinder fuel injector terminal D (harness-side) and IDM terminal 1C



A6E40122020

Short circuit
- If there is continuity, the circuit is short. Repair or replace the harness.
  - — No.1 cylinder fuel injector terminal B (harness-side) and GND.
  - — No.2 cylinder fuel injector terminal B (harness-side) and GND.
  - — No.3 cylinder fuel injector terminal B (harness-side) and GND.
  - — No.4 cylinder fuel injector terminal B (harness-side) and GND.
  - — No.1 cylinder fuel injector terminal D (harness-side) and power supply.
  - — No.2 cylinder fuel injector terminal D (harness-side) and power supply.
  - — No.3 cylinder fuel injector terminal D (harness-side) and power supply.
  - — No.4 cylinder fuel injector terminal D (harness- side) and power supply.

EXHAUST SYSTEM

EXHAUST SYSTEM INSPECTION

A6E401440000203

1. Start the engine and inspect each exhaust system component for exhaust gas leakage.
   - If leakage is found, repair or replace as necessary.

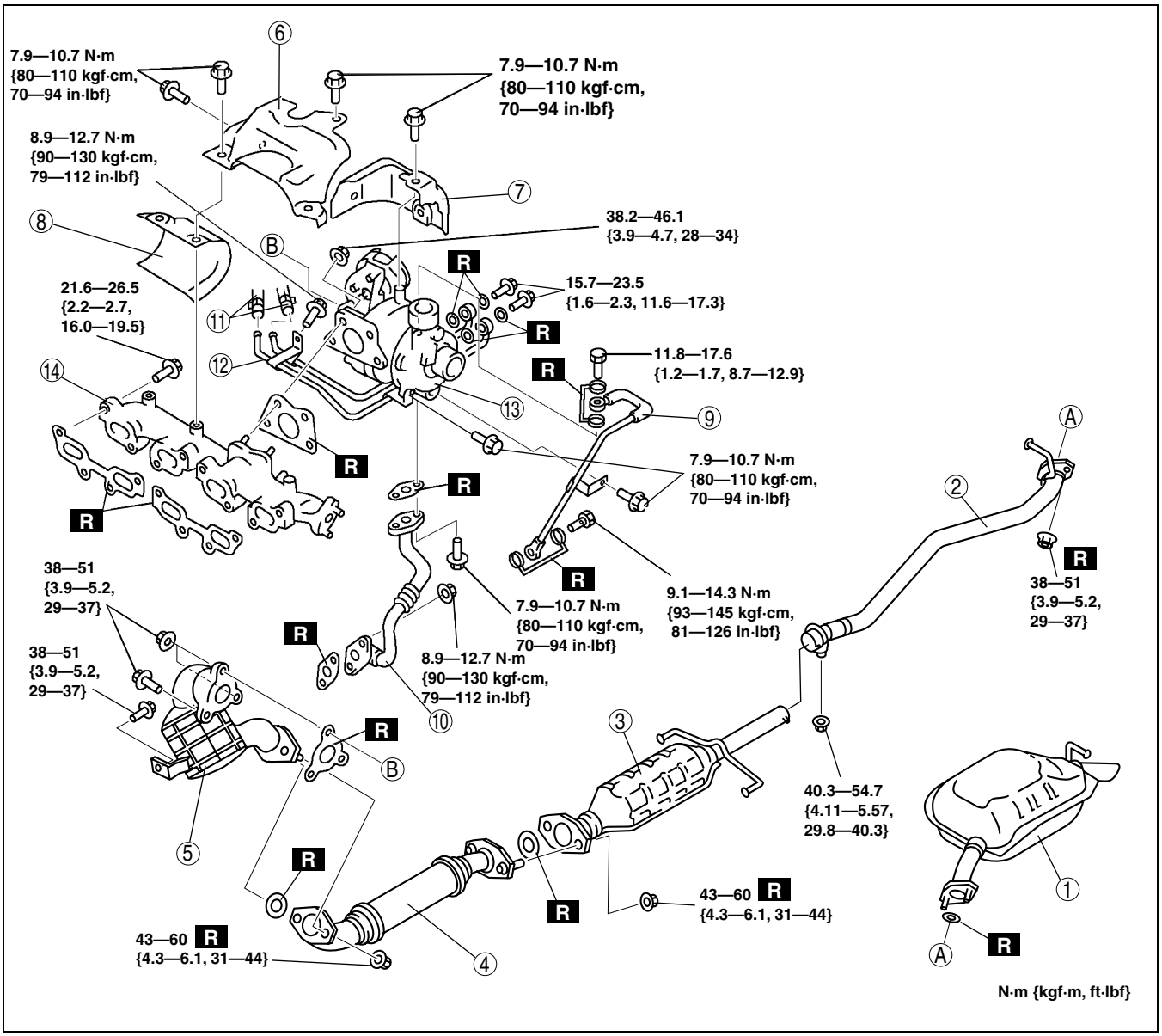
EXHAUST SYSTEM REMOVAL/INSTALLATION

A6E401440000204

Warning

- **When the engine and exhaust system are hot, they can cause severe burns or injury. 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.



A6E40142006

1	Main silencer
2	Middle pipe
3	Oxidation catalytic converter
4	Front pipe

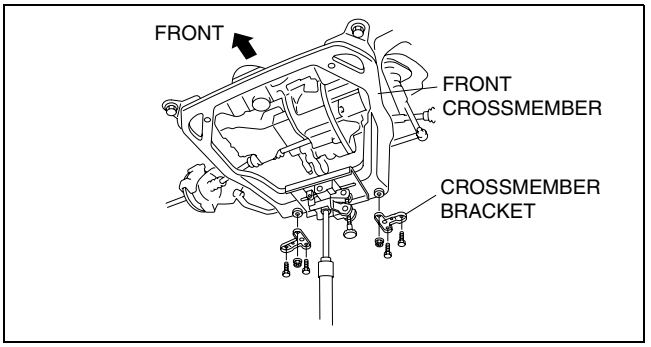
5	Warm up oxidation catalytic converter (See F2–58 Warm Up Oxidation Catalytic Converter Removal Note)
6	Turbocharger insulator No. 1
7	Turbocharger insulator No. 2

8	Exhaust manifold insulator
9	Oil pipe (supply) (See F2–58 Oil Pipe (Supply) Installation Note)
10	Oil pipe (return)
11	Water hose (See F2–58 Water Hose Removal Note)

12	Water pipe (See F2–58 Water Pipe Installation Note)
13	Turbocharger (See F2–58 Turbocharger Removal Note)
14	Exhaust manifold (See F2–58 Exhaust Manifold Removal Note) (See F2–58 Exhaust Manifold Installation Note)

Warm Up Oxidation Catalytic Converter Removal Note

1. Support the crossmember using a jack before removing the crossmember bracket.
2. Loosen the jack and lower the crossmember.
3. Remove the warm up oxidation catalytic converter.



A6E0612W107

Water Hose Removal Note

1. Drain the engine coolant.

Turbocharger Removal Note

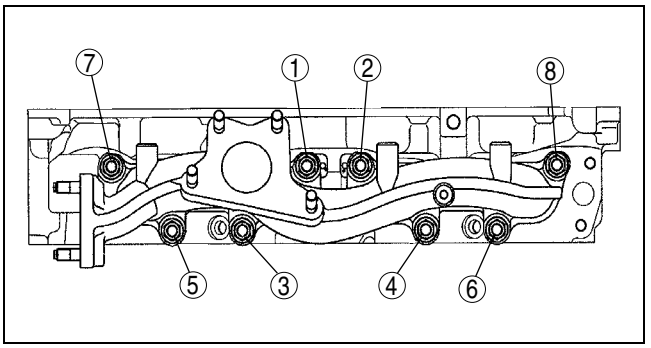
1. Remove the air pipe and the air hose before removing the turbocharger. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION.)

Exhaust Manifold Removal Note

1. Remove the EGR pipe before removing the exhaust manifold. (See F2–59 EGR VALVE REMOVAL/ INSTALLATION.)

Exhaust Manifold Installation Note

1. Tighten the exhaust manifold installation nuts in the order shown.



A6E40142003

Water Pipe Installation Note

1. Install the connector bolt before installing the water pipe bracket.

Oil Pipe (Supply) Installation Note

1. Install the connector bolt before installing the water pipe bracket.

EMISSION SYSTEM

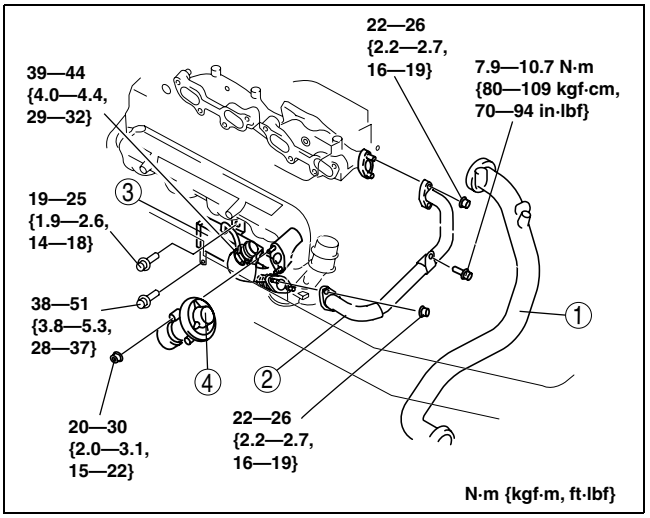
EGR VALVE REMOVAL/INSTALLATION

A6E401620300201

1. Disconnect the negative battery cable.
2. Remove the air cleaner. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
3. Remove the common rail. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	Air pipe (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION)
2	EGR pipe
3	EGR water cooler
4	EGR valve

5. Install in the reverse order of removal.



A6E40122023

EGR VALVE INSPECTION

A6E401620300202

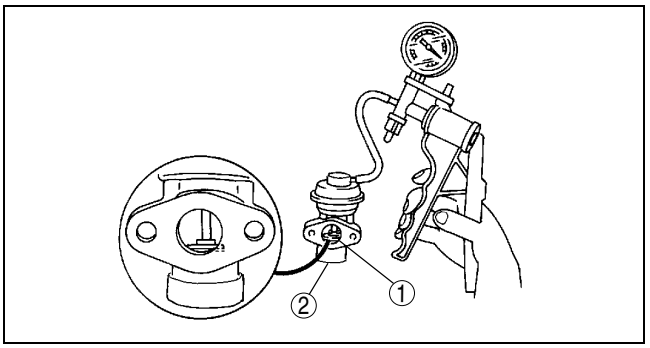
Note

- Perform the following test only when directed.

1. Remove the EGR valve. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
2. 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 –25.0— –41.6 {–188— –312, –7.39 — –12.3}	Yes
Except above	No



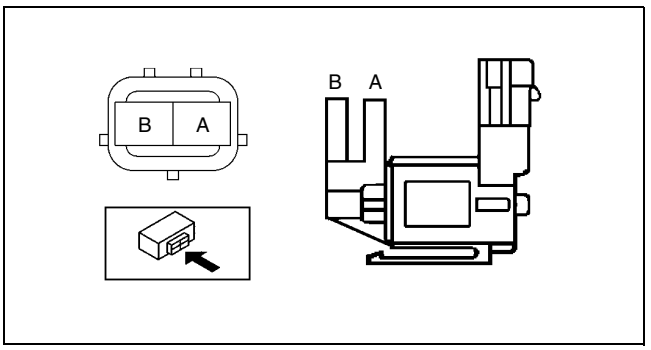
A6E40122024

EGR SOLENOID VALVE (VACUUM) INSPECTION

A6E401618741201

Note
- Perform the following inspection only when directed.

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”.



A6E40162001

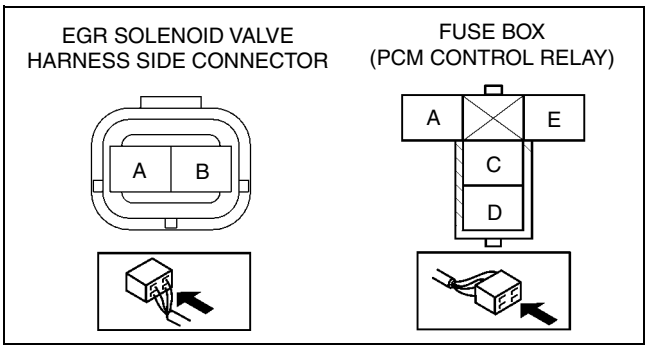
○—○ : Continuity ○=○ : Airflow

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

A6E40162020

Circuit Open/Short Inspection

1. Inspect the following wiring harness for open or short (continuity check).



A6E40162002

Open circuit
- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — EGR solenoid valve (vacuum) terminal A (harness-side) and PCM control relay terminal C (harness-side)
  - — EGR solenoid valve (vacuum) terminal B (harness-side) and PCM terminal 99

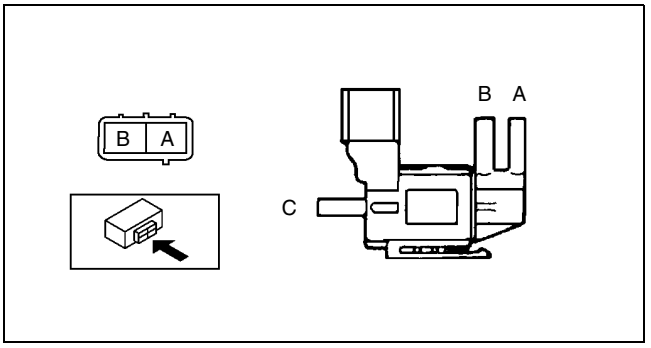
Short circuit
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — EGR solenoid valve (vacuum) terminal A (harness-side) and GND
  - — EGR solenoid valve (vacuum) terminal B (harness-side) and power supply

EGR SOLENOID VALVE (VENT) INSPECTION

A6E401618741202

Note
- Perform the following inspection only when directed.

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



A6E40162003

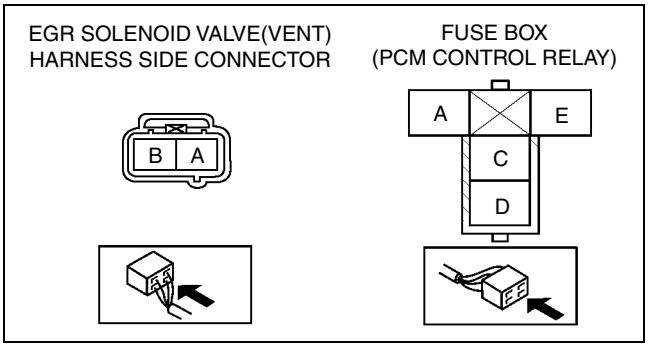
○—○: Continuity ○=○ : Airflow

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

A6E40162021

Circuit Open/Short Inspection

1. Inspect the following wiring harness for an open or short circuit (continuity check).



A6E40162004

Open circuit

- If there is no continuity, the circuit is open, Repair or replace the harness.
  - — EGR solenoid valve (vent) terminal A (harness-side) and PCM control relay terminal C (harness-side)
  - — EGR solenoid valve (vent) terminal B (harness-side) and PCM terminal 72

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — EGR solenoid valve (vent) terminal A (harness-side) and GND
  - — EGR solenoid valve (vent) terminal B (harness-side) and power supply

F2

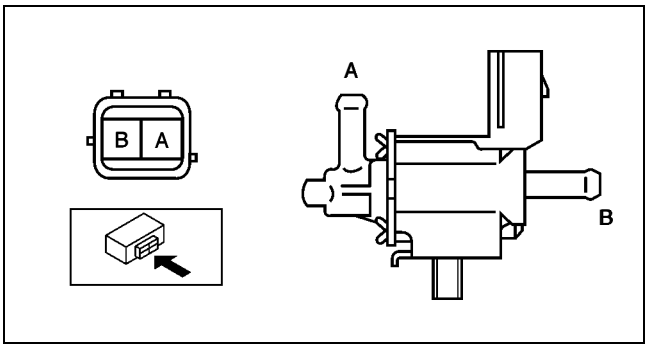
EGR CONTROL SOLENOID VALVE INSPECTION

A6E401618741203

Note

- Perform the following inspection only when directed.

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”.



A6E40162005

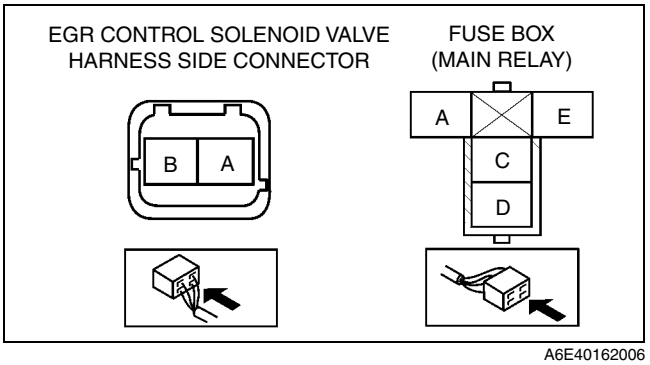
○—○ : Continuity ○═○ : Airflow

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

A6E40162022

Circuit Open/Short inspection

1. Inspect the following wiring harness for an open or short circuit (continuity check).



A6E40162006

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — EGR control solenoid valve terminal A (harness-side) and PCM control relay terminal C (harness-side)
  - — EGR control solenoid valve terminal B (harness-side) and PCM terminal 77

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — EGR control solenoid valve terminal A (harness-side) and GND
  - — EGR control solenoid valve terminal B (harness-side) and power supply

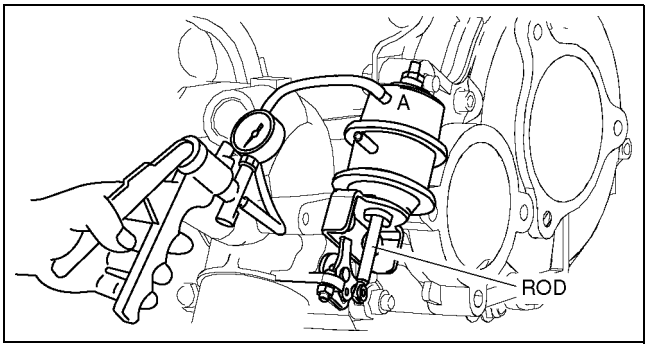
INTAKE SHUTTER VALVE ACTUATOR INSPECTION

A6E401620100201

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

Specification

Vacuum kPa {mmHg, inHg}	Rod movement
Below –20 {–150, –5.9}	Starts to move
Above –66 {–495, –19}	Fully pulled



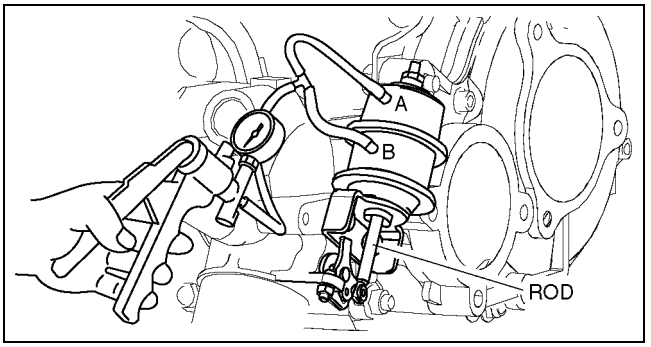
A6E40162007

4. Connect a vacuum pump to port A and B.

5. Apply vacuum and verify that the rod moves.
   - If the rod does not move, replace the intake manifold.

Specification

Vacuum kPa {mmHg, inHg}	Rod movement
Above –69.4 {–520, –21}	Fully pulled



A6E40162008

INTAKE SHUTTER SOLENOID VALVE INSPECTION

A6E401613937201

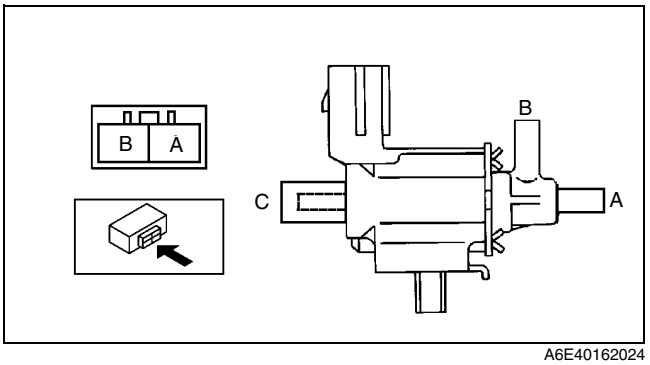
Note
- Perform the following inspection only when directed.
- The inspection includes both intake shutter solenoid valve (half) and intake shutter solenoid valve (full).

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”.

○—○ : Continuity ○═○ : Airflow

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

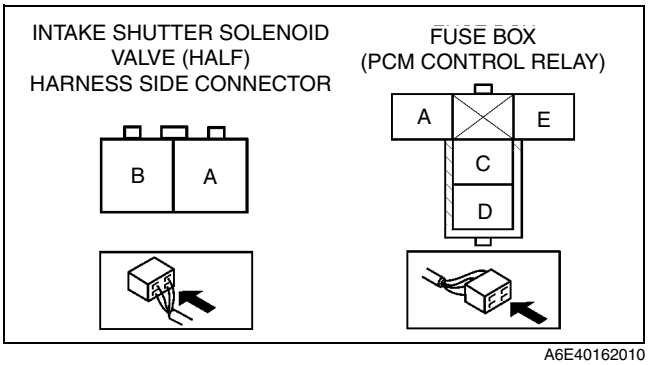
A6E40162023



A6E40162024

Intake Shutter Solenoid Valve (Half) Circuit Open/ Short Inspection

1. Disconnect the PCM connector. (See F2–64 PCM REMOVAL/INSTALLATION.)
2. Inspect the following wiring harness for an open or short circuit (continuity check).



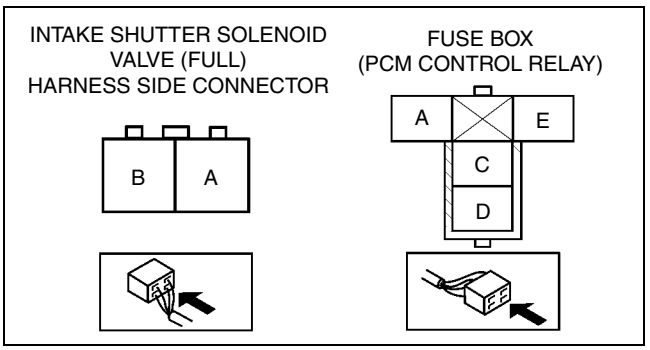
A6E40162010

Open circuit
- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — Intake shutter solenoid valve (half) terminal A (harness-side) and PCM control relay terminal C (harness-side)
  - — Intake shutter solenoid valve (half) terminal B (harness-side) and PCM terminal 74

Short circuit
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — Intake shutter solenoid valve (half) terminal A (harness-side) and GND
  - — Intake shutter solenoid valve (half) terminal B (harness-side) and power supply

Intake Shutter Solenoid Valve (Full) Circuit Open/Short Inspection

1. Disconnect the PCM connector. (See F2–64 PCM REMOVAL/INSTALLATION.)
2. Inspect the following wiring harness for an open or short circuit (continuity check).



A6E40162011

Open circuit
- If there is no continuity, the circuit is open. Repair or replace the harness.
  - — Intake shutter solenoid valve (full) terminal A (harness-side) and PCM control relay terminal C (harness-side)
  - — Intake shutter solenoid valve (full) terminal B (harness-side) and PCM terminal 100

Short circuit
- If there is continuity, the circuit is shorted. Repair or replace the harness.
  - — Intake shutter solenoid valve (full) terminal A (harness-side) and GND
  - — Intake shutter solenoid valve (full) terminal B (harness-side) and power supply

CONTROL SYSTEM

PCM REMOVAL/INSTALLATION

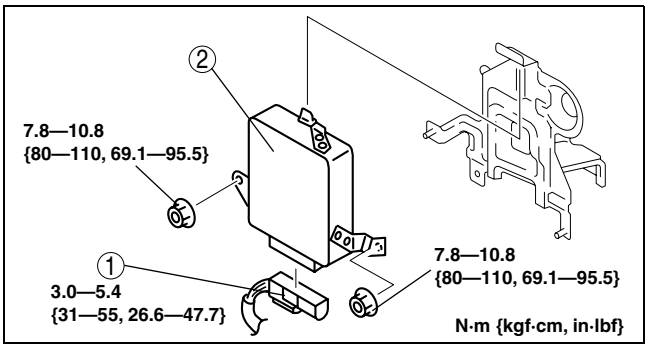
A6E404018881207

Note
- For replace the PCM, setup the WDS and perform the following.
  — "PCM configuration" (See F2–68 PCM CONFIGURATION.)
  — "Correction after Parts Installation" (See F2–34 Correction after Parts Installation.)

European (L.H.D.) Specs.
1. Disconnect the negative battery cable.
2. Remove in the order indicated in the table.

1	PCM connector
2	PCM

3. Install in the reverse order of removal.

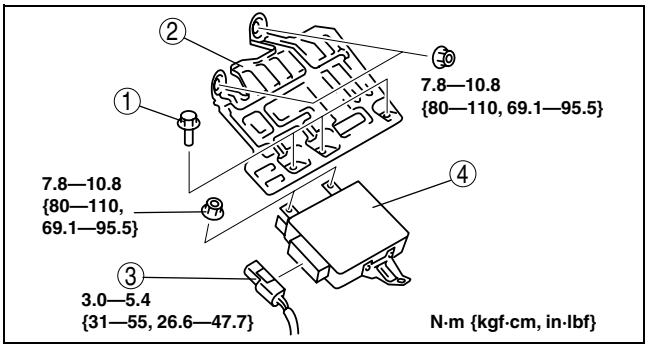


A6E40402022

U.K. Specs.
1. Disconnect the negative battery cable.
2. Remove the front side trim (left-side).
3. Partially peek back the flower covering.
4. Remove in the order indicated in the table.

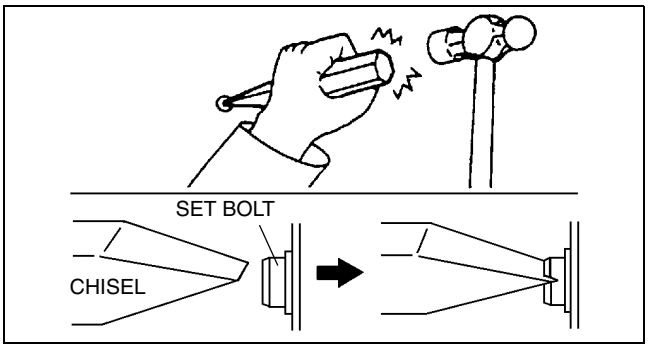
1	Set bolt (See F2–64 Set bolt removal note) (See F2–64 Set bolt installation note)
2	PCM cover
3	PCM connector
4	PCM

5. Install in the reverse order of removal.



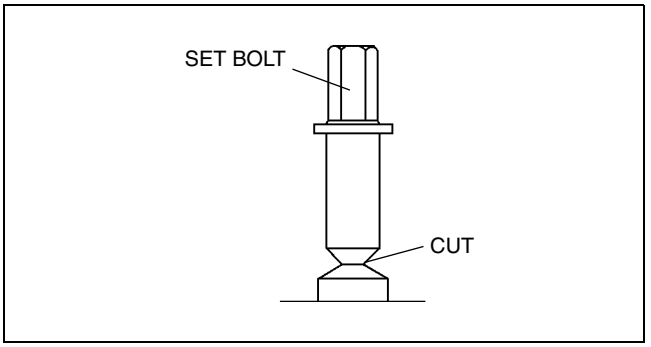
A6E40402023

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 using an impact screwdriver or pliers.



A6E40402020

Set bolt installation note
1. Install a new set bolt and tighten it until the neck of the bolt is cut.



A6E40402021

PCM INSPECTION

A6E404018881208

Using WDS or Equivalent

Caution

- **The PCM terminal voltage 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

- For replace the PCM, setup the WDS and perform the following.
  - — "PCM configuration" (See F2–68 PCM CONFIGURATION.)
  - — "Correction after Parts Installation" (See F2–34 Correction after Parts Installation.)

1. Connect the WDS or equivalent to the DLC-2. (See F2–85 ON-BOARD DIAGNOSTIC TEST.)
2. Turn the engine switch to ON.
3. Measure the PID value.
   - If PID value is not within the specification, follow the instructions in ACTION column.

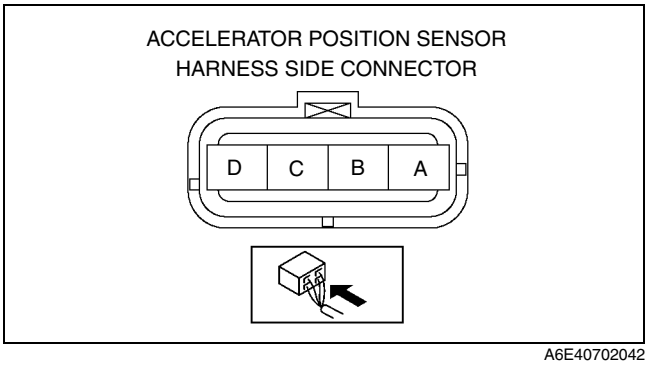
PID Monitor Table

Monitor item (Definition)	Unit/ Condition		Condition/Specification (Reference)	Action	PCM terminal
ACCS (A/C relay)	ON/OFF		• A/C operating: ON • Engine switch is on: OFF	Inspect A/C relay. (See T–19 RELAY INSPECTION)	73
ACSW (A/C switch)	ON/OFF		• A/C switch is on: ON • A/C switch is off: OFF	Inspect A/C switch.	84
APS1 (Accelerator position sensor No.1 signal voltage)	V		• Accelerator pedal depressed: 3.35—4.03 V • Accelerator pedal released: 0.4—0.7 V	Inspect accelerator position sensor. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION)	10
APS2 (Accelerator position sensor No.2 signal voltage)	V		• Accelerator pedal depressed: 3.35—4.03 V • Accelerator pedal released: 0.4—0.7 V	Inspect accelerator position sensor. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION)	88
BARO (BARO)	kPa	inHg	• Elevation 0—400 m {0—1310 ft}: 100—103 kPa {29.5—30.4 inHg}	Replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)	–
BARO (BARO signal voltage)	V		• Elevation 0—400 m {0—1310 ft}: approx. 4.0 V		
BOO (Brake switch)	ON/OFF		• Brake pedal depressed: ON • Brake pedal released: OFF	Inspect brake switch.	7
CPP (Clutch switch)	ON/OFF		• Clutch pedal depressed: ON • Clutch pedal released: OFF	Inspect clutch switch. (See F2–68 CLUTCH SWITCH INSPECTION)	33
CPP/PNP (neutral switch)	Neutral/Drive		• Gear is neutral position: Neutral • Gear is not neutral position: Drive	Inspect neutral switch. (See F2–69 NEUTRAL SWITCH INSPECTION)	56
CRUISESW (Cruise control switch)	ON/OFF		• Cruise control switch is on: ON • Cruise control switch is off: OFF	Inspect cruise control switch.	64
DTCCNT (DTC count)	–		• Number of output DTC	Follow DTC inspection. (See F2–87 DTC TABLE)	–
ECT (ECT)	°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 F2–76 ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION)	87
ECT (ECT signal voltage)	V		• ECT is 20°C {68°F}: 3.0—3.2 V • ECT is 85°C {185°F}: 0.7—0.9 V		
FAN2 (Cooling fan relay No.2)	ON/OFF		• Engine coolant temperature is above 100°C {212°F}: ON • Others: OFF	Inspect cooling fan relay No.2.	76
FAN3 (Cooling fan relay No.1)	ON/OFF		• Engine coolant temperature is above 108°C {226°F}: ON • A/C switch is on: ON • Others: OFF	Inspect cooling fan relay No.1.	102

Monitor item (Definition)	Unit/ Condition		Condition/Specification (Reference)	Action	PCM terminal
IAT (IAT)	°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.1. (See F2–74 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)	60
IAT (IAT signal voltage)	V		• IAT is 20°C {68°F}: 2.2—2.5 V • IAT is 30°C {86°F}: 1.7—2.0 V		
IMRC (VSC solenoid valve)	ON/OFF		• Idle: ON • Engine speed is above approx. 2,500 rpm: OFF	Inspect following PIDs: BARO, ECT, IAT, RPM, VSS	101
INGEAR (In gear)	ON/OFF		• Gear is not neutral position and clutch pedal released: ON • Gear is neutral position: OFF • Clutch pedal depressed: OFF	Inspect following PIDs: CPP, CPP/PNP	33, 56
INJ_LRN_DIS (Distance from the last injector learning)	Km	Mile	• Distance from the last injector learning	–	–
MAF (Mass air flow amount)	g/s		• Engine switch is on: approx. 0 g/s • Idle: 6.8—7.4 g/s	Inspect MAF/IAT sensor. (See F2–74 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION)	9
MAF (Mass air flow signal voltage)	V		• Engine switch is on: 0.0—1.0 V • Idle: 1.5—2.1 V		
MAF_LRN_DIS (Distance from the last MAF learning)	Km	Mile	• Distance from the last MAF learning	–	–
MAINRLY (PCM control relay)	ON/OFF		• Engine switch is on: ON	Inspect PCM control relay. (See T–19 RELAY INSPECTION)	69
MAP (MAP)	kPa	inHg	• Engine switch is on: 100—103 kPa {29.5—30.4 inHg} • Idle: 100—103 kPa {29.5—30.4 inHg}	Inspect boost sensor. (See F2–78 BOOST SENSOR INSPECTION)	36
MAP (MAP signal voltage)	V		• Engine switch is on: 2.1—2.5 V • Idle: 2.1—2.5 V		
MIL (MIL)	ON/OFF		• Engine switch is on: ON • DTC output: ON • Others: OFF	Inspect instrument cluster. Inspect CAN system. (See T–39 MULTIPLEX COMMUNICATION SYSTEM)	13, 39
NUMKEYS (Number of keys stored in module)	–		• Number of keys stored in module	–	–
RPM (Engine speed)	rpm		• Idle: 725—825 rpm	Inspect CKP sensor. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR INSPECTION)	3, 29
VPWR (Battery positive voltage)	V		• Engine switch is ON: B+	Inspect Battery. Inspect fuse.	4
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 CAN system. (See T–39 MULTIPLEX COMMUNICATION SYSTEM)	13, 39

Not Using WDS or Equivalent
Constant voltage terminal inspection

1. Turn the engine switch to ON.
2. Measure the voltage between the accelerator position sensor terminal A (vehicle side) and body GND using a voltmeter.
   (1) Measurement voltage is **below 1.0 V**.
      1) Turn the engine switch to OFF.
      2) Disconnect the accelerator position sensor connector.
      3) Verify there is no continuity between the accelerator position sensor terminal A (vehicle side) and body GND using an ohmmeter.
         • If there is continuity, repair or replace the related harness.
      4) Inspect for continuity between the PCM terminal 90 (vehicle side) and accelerator position sensor terminal A (vehicle side) using an ohmmeter.
         • If there is no continuity, repair or replace the related harness.
   (2) Measurement voltage is **B+**.
      1) Turn the engine switch to OFF.
      2) Disconnect the battery negative cable and battery positive cable.
      3) Verify there is no continuity between the accelerator position sensor terminal A (vehicle side) and battery positive cable using an ohmmeter.
         • If there is continuity, repair or replace the related harness.
   (3) Measurement voltage is **approx. 5 V**.
      • Constant voltage terminal of PCM is okay.



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GND terminal inspection

1. Turn the engine switch to OFF.
2. Disconnect the PCM connector.
3. Inspect for continuity between the PCM GND terminals and body GND using an ohmmeter.
   • If there is no continuity, repair or replace the related harness.

PCM GND terminal
65
85
103
104

Power supply terminal inspection

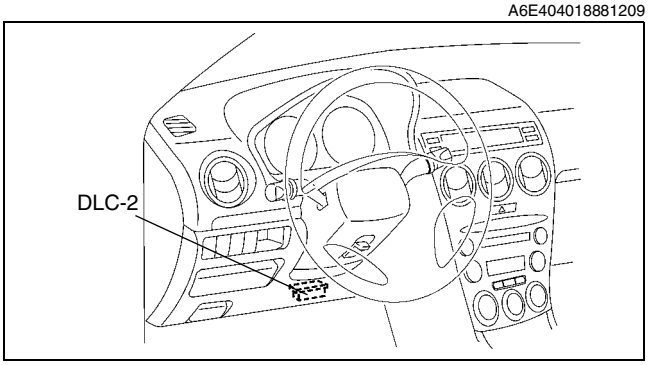
1. Disconnect the PCM connector.
2. Turn the engine switch to ON.
3. Measure the voltage between the PCM battery power terminal and body GND using a voltmeter.
   • If not as specified, repair or replace the related harness.

Specification
B+

PCM power supply terminal
27

PCM CONFIGURATION

A6E404018881209



A6E40702001

1. Connect the WDS to DLC-2.
2. Set up the WDS (including the vehicle recognition).
3. Select “Module programming.”
4. Select “Programmable module installation.”
5. Select “PCM” and perform procedures according to directions on the WDS screen.

Note
- If the PCM is replaced with a new one, the PCM stores DTC P0602 and illuminates the MIL even though no malfunction is detected. After completing the "PCM CONFIGURATION" procedure, clear DTC P0602 using the WDS or equivalent.

6. Retrieve DTC’s by the WDS or equivalent, then verify that there in no DTC present.
   - If DTC is present, perform applicable DTC inspection.

CLUTCH SWITCH INSPECTION

A6E404018660201

Note
- Perform the following test only when directed.

Continuity Inspection

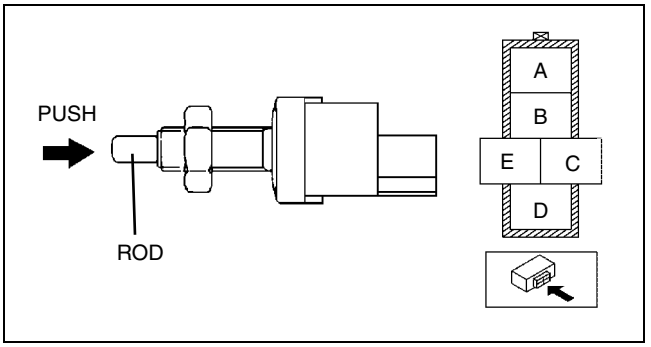
1. Inspect continuity between the clutch switch terminals using an ohmmeter.
   - If the clutch switch is okay, but the CPP PID is out of specification, perform the “Circuit Open/ Short Inspection”
   - If not as specified, replace the clutch switch.

Specification

O——O : Continuity

Condition	Clutch pedal	Terminal	
		C	E
Rod pushed	Released		
Except above	Depressed	O	O

A6E40702033



A6E40702034

Circuit Open/Short Inspection

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

Open circuit
- Signal circuit
  — Clutch switch terminal C and PCM terminal 33
- GND circuit
  — Clutch switch terminal E and GND

Short circuit
- Signal circuit
  — Clutch switch terminal C and PCM terminal 33 to GND.

NEUTRAL SWITCH INSPECTION

A6E404017640201

Note
- Perform the following test only when directed.

Continuity Inspection

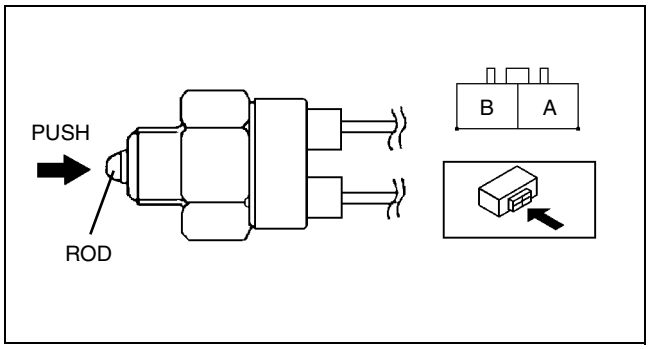
1. Inspect for continuity between the neutral switch terminals using an ohmmeter.
   - If the neutral switch is okay, but the CPP/PNP PID is out of specification, perform the “Circuit Open/Short Inspection”
   - If not as specified, replace the neutral switch.

Specification

: Continuity

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

A6E40702035



A6E40702036

Circuit Open/Short Inspection

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

Open circuit
- Signal circuit
  — Neutral switch terminal A and PCM terminal 56
- GND circuit
  — Neutral switch terminal B and GND

Short circuit
- Signal circuit
  — Neutral switch terminal A and PCM terminal 56 to GND

F2

IDLE SWITCH INSPECTION

A6E404041600201

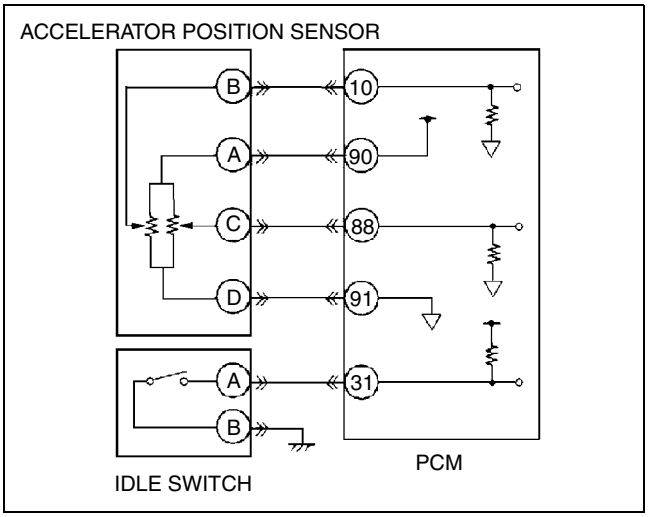
Note
- Perform the following test only when directed.

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 90 (power circuit) and 91(GND circuit) is **4.75—5.25 V**.

Note
- Voltage at the PCM terminal 10 may deviate when the power circuit voltage is abnormal.

5. Verify that the voltage at the PCM terminal 31 (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 31 voltage changes to approximately **10 V**.
7. Verify that the voltage between the PCM terminals 10 (accelerator position detection signal) and 91 is within the specification.
   - If the circuit is okay, replace the idle switch.

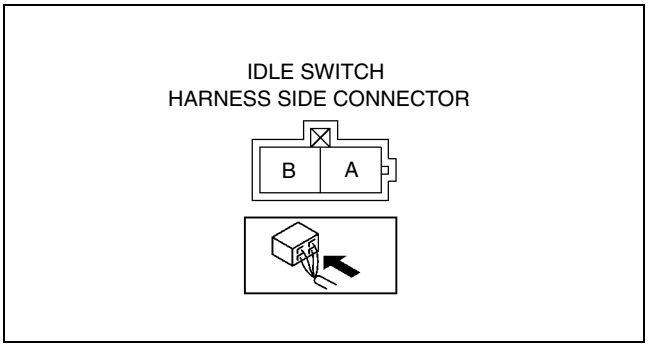
Specification
0.85—1.15 V (Target value: 1.0 V)



A6E40702037

Circuit Open/Short Inspection

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



A6E40702038

Open circuit
- Signal circuit
  — Idle switch terminal A and PCM terminal 31
- GND circuit
  — Idle switch terminal B and GND

Short circuit
- Signal circuit
  — Idle switch terminal A and PCM terminal 31 to GND

IDLE SWITCH ADJUSTMENT

A6E404041600202

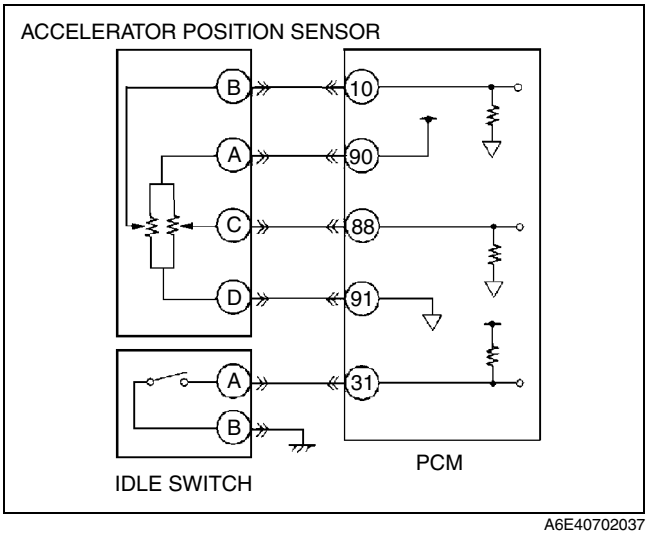
Caution
- **Adjusting the idle switch unnecessarily may adversely affect engine control. Therefore, adjust the idle switch only when it is replaced.**

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 90 (power circuit) and 91(GND circuit) is **4.75—5.25 V**.

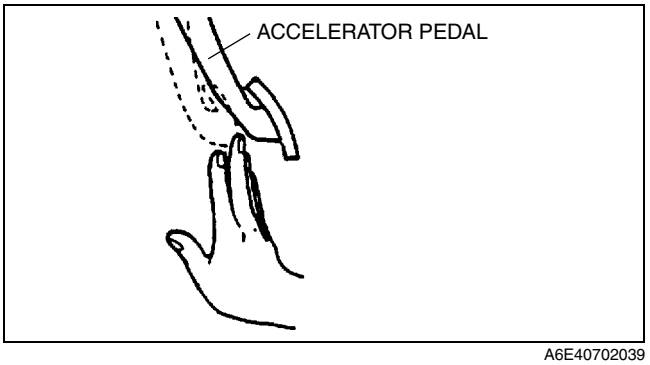
Note
- Voltage at the PCM terminal 10 may deviate when the power circuit voltage is abnormal.

5. Depress the accelerator pedal by hand and secure it when the voltage between the PCM terminals 10 (accelerator position detection signal) and 91 is within the range specified below.

   Voltage range
   0.9—1.1V (Target value: 1.0 V)

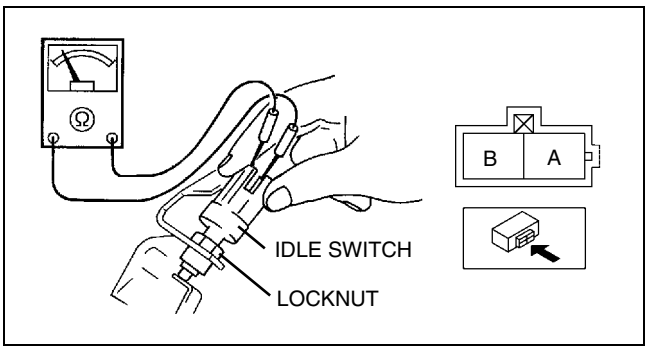


A6E40702037



A6E40702039

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.
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 10 voltage is within **0.9—1.1 V**.
   - If the continuity does not change, repeat Step 6.



A6E40702040

ACCELERATOR POSITION SENSOR INSPECTION

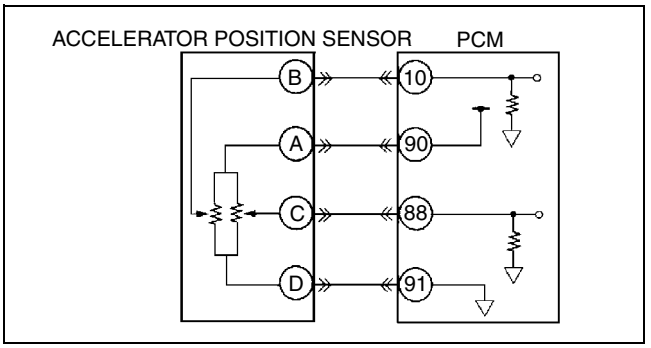
A6E404041602201

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. Verify the power circuit voltage.
   (1) Verify that the voltage between the PCM terminal 90 (power circuit) and 91 (GND circuit) is **4.75—5.25 V**.

Note
- Voltage at the PCM terminal 10 may deviate when the power circuit voltage is abnormal.

4. Verify that the voltage between the PCM terminals 10 (accelerator position detection signal) and 91 is as shown below according to the accelerator pedal conditions.
   - If the circuit is okay, replace the accelerator position sensor.



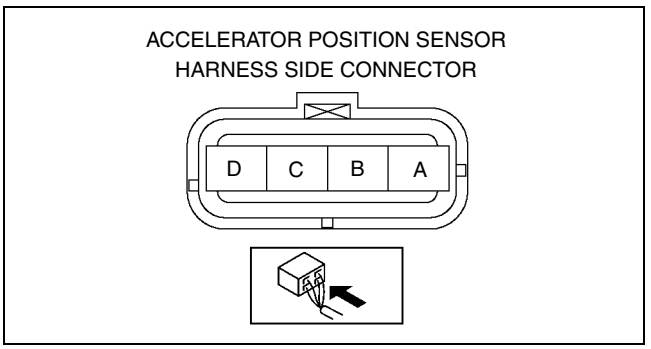
A6E40702041

Specification

Accelerator pedal condition	Output voltage (V)
Fully released	0.45—0.75 (Target value: 0.6)
Gradually depressed	Increases linearly
Fully depressed	3.35—4.03 (Target value: 3.6)

Circuit Open/Short Inspection

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



A6E40702042

Open circuit
- Power circuit
  — Accelerator position sensor terminal A and PCM terminal 90
- Signal circuit
  — Accelerator position sensor terminal B and PCM terminal 10
  — Accelerator position sensor terminal C and PCM terminal 88
- GND circuit
  — Accelerator position sensor terminal D and PCM terminal 91

Short circuit
- Power circuit
  — Accelerator position sensor terminal A and PCM terminal 90 to GND
- Signal circuit
  — Accelerator position sensor terminal B and PCM terminal 10 to power circuit
  — Accelerator position sensor terminal B and PCM terminal 10 to GND
  — Accelerator position sensor terminal C and PCM terminal 88 to power circuit
  — Accelerator position sensor terminal C and PCM terminal 88 to GND

ACCELERATOR POSITION SENSOR ADJUSTMENT

A6E404041602202

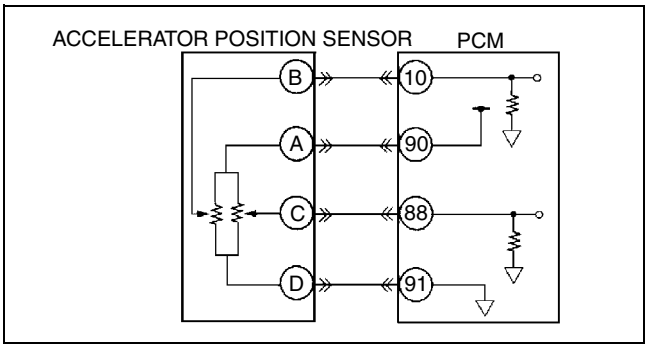
Caution
- **Adjusting the accelerator position sensor unnecessarily may adversely affect engine control. Therefore, adjust accelerator position sensor only when it is replaced.**

Note
- 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. Verify the power circuit voltage.
   (1) Verify that the voltage between the PCM terminals 90 (power circuit) and 91 (GND circuit) is **4.75—5.25 V**.

Note
- Voltage at the PCM terminal 10 may deviate when the power circuit voltage is abnormal.

4. Adjust the output voltage when the accelerator pedal is fully released.
   (1) Verify that the voltage between the PCM terminals 10 (accelerator position detection signal) and 91 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 10 voltage is within the specification.



A6E40702041

Specification

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

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 10 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.

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

A6E404013210201

Note
- Perform the following test only when directed.
- Perform “MAF Correction” after replacing the MAF/IAT sensor. (See F2–35 MAF Correction.)

MAF Sensor Voltage Inspection

1. Turn the engine switch to ON.
2. Monitor the MAF PID using the WDS or equivalent.
   - If not as specified, perform the “Circuit Open/Short Inspection”.

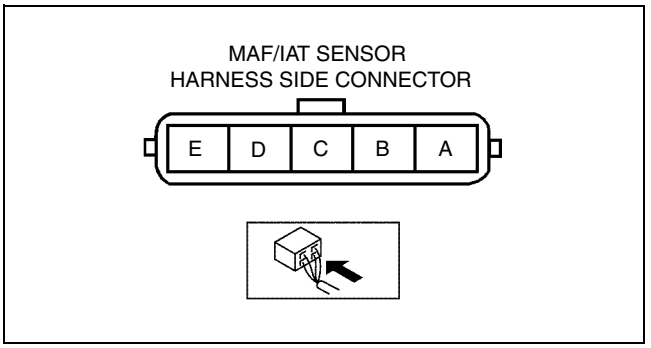
MAF PID
0.0—1.0 V

3. Start the engine and warm up the engine completely.
4. Monitor the MAF PID using the WDS or equivalent at idle.
   - If not as specified, perform the “Circuit Open/Short Inspection”.

MAF PID
1.5—2.1 V

MAF Sensor CIrcuit Open/Short Inspection

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



A6E40702043

Open circuit
- Power circuit
  — MAF/IAT sensor terminal A and PCM control relay terminal C
- Signal circuit
  — MAF/IAT sensor terminal C and PCM terminal 9
- GND circuit
  — MAF/IAT sensor terminal B and PCM terminal 14

Short circuit
- Power circuit
  — MAF/IAT sensor terminal A and PCM control relay terminal C to GND
- Signal circuit
  — MAF/IAT sensor terminal C and PCM terminal 9 to power circuit
  — MAF/IAT sensor terminal C and PCM terminal 9 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.

Specification

Ambient temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.21—2.69

IAT Sensor No.1 CIrcuit Open/Short Inspection

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

Open circuit

- Signal circuit
  — MAF/IAT sensor terminal D and PCM terminal 60
- GND circuit
  — MAF/IAT sensor terminal E and PCM terminal 91

Short circuit

- Signal circuit
  — MAF/IAT sensor terminal D and PCM terminal 60 to power circuit
  — MAF/IAT sensor terminal D and PCM terminal 60 to GND

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION

A6E404018845201

Note

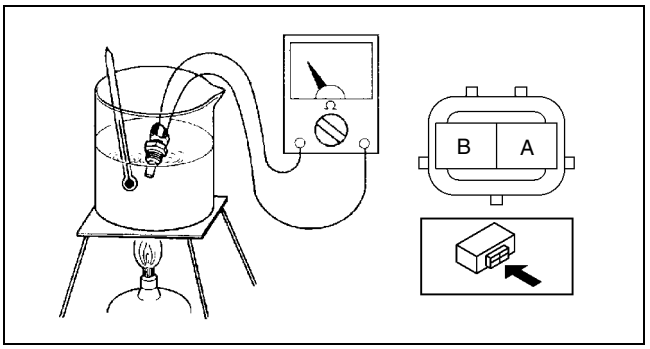
- Perform the following test only when directed.

Resistance Inspection

1. Place the IAT sensor No.2 in water with a thermometer, and heat the water gradually.
2. Measure the resistance between the IAT sensor No.2 terminals using an ohmmeter.
   - If not as specified, replace the IAT sensor No.2.

Specification

Water temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.21—2.69
80 {176}	0.29—0.35



A6E40702044

Circuit Open/Short Inspection

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

Open circuit

- Signal circuit
  — IAT sensor No.2 terminal A and PCM terminal 8
- GND circuit
  — IAT sensor No.2 terminal B and PCM terminal 91

Short circuit

- Signal circuit
  — IAT sensor No.2 terminal A and PCM terminal 8 to power circuit
  — IAT sensor No.2 terminal A and PCM terminal 8 to GND

ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION

A6E404018840201

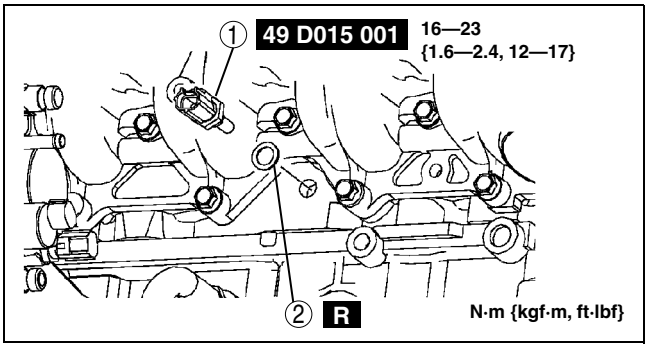
Warning

- **When the engine is hot, it can badly burn. Turn off the engine and wait until it is cool before removing the ECT sensor.**

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (See D–8 ENGINE OIL REPLACEMENT.)
3. Remove the common rail. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	ECT sensor
2	Gasket

5. Install in the reverse order of removal.



A6E40702045

ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

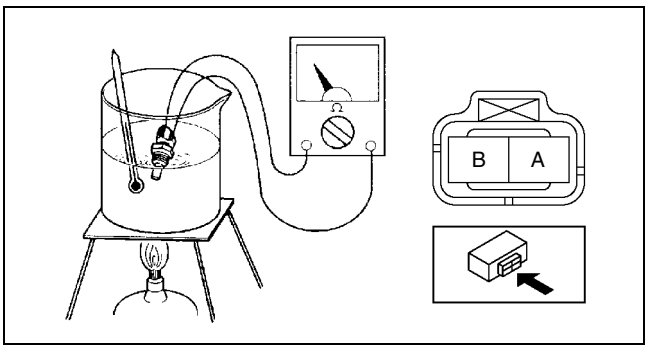
A6E404018840202

Note

- Perform the following test only when directed.

Resistance Inspection

1. Place the ECT sensor in water with a thermometer, and heat the water gradually.
2. Measure the resistance between the ECT sensor terminals using an ohmmeter.
   - If not as specified, replace the ECT sensor.



A6E40702046

Specification

Water temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.21—2.69
80 {176}	0.29—0.34

Circuit Open/Short Inspection

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

Open circuit

- Signal circuit
  — ECT sensor terminal A and PCM terminal 87
- GND circuit
  — ECT sensor terminal B and PCM terminal 91

Short circuit

- Signal circuit
  — ECT sensor terminal A and PCM terminal 87 to power circuit
  — ECT sensor terminal A and PCM terminal 87 to GND

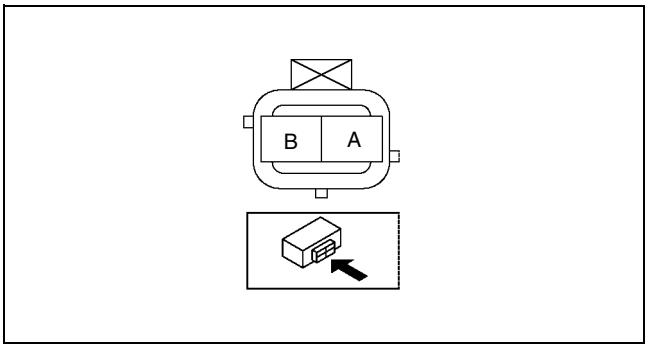
FUEL TEMPERATURE SENSOR INSPECTION

A6E404013350201

Note
- Perform the following test only when directed.

Resistance Inspection

1. Disconnect the negative battery cable.
2. Remove the supply pump. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION.)
3. Measure the resistance between the fuel temperature sensor terminals using an ohmmeter.
   - If not as specified, repair the supply pump. (See F2–54 SUPPLY PUMP INSPECTION.)



A6E40702047

Specification

Ambient temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.0—3.0

Circuit Open/Short Inspection

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

Open circuit
- Signal circuit
  — Fuel temperature sensor terminal A and PCM terminal 35
- GND circuit
  — Fuel temperature sensor terminal B and PCM terminal 91

Short circuit
- Signal circuit
  — Fuel temperature sensor terminal A and PCM terminal 35 to power circuit
  — Fuel temperature sensor terminal A and PCM terminal 35 to GND

BOOST SENSOR INSPECTION

A6E404013214201

Note
- Perform the following test only when directed.

Visual Inspection
1. Inspect the boost sensor for damage and cracks.
   - If not as specified, replace the boost sensor.
2. Inspect vacuum hose for improper routing, kinks or leakage.
   - If there is any malfunction, repair or replace suspected hose.

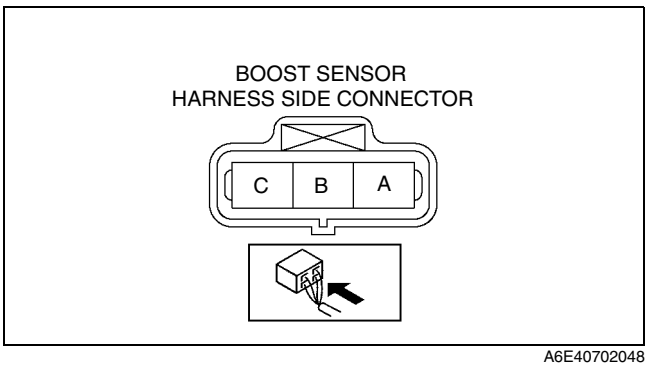
Voltage Inspection
1. Turn the engine switch to ON.
2. Monitor the MAP PID using the WDS or equivalent.
   - If not as specified, perform the “Circuit Open/Short Inspection”.

MAP PID
2.1—2.5 V

3. Start the engine and warm up the engine completely.
4. Monitor the MAP PID using the WDS or equivalent at idle.
   - If not as specified, perform the “Circuit Open/Short Inspection”.

MAP PID
2.1—2.5 V

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



A6E40702048

Open circuit
- Power circuit
  — Boost sensor terminal C and PCM terminal 90
- Signal circuit
  — Boost sensor terminal B and PCM terminal 36
- GND circuit
  — Boost sensor terminal A and PCM terminal 91

Short circuit
- Power circuit
  — Boost sensor terminal C and PCM terminal 90 to GND
- Signal circuit
  — Boost sensor terminal B and PCM terminal 36 to power circuit
  — Boost sensor terminal B and PCM terminal 36 to GND

FUEL PRESSURE SENSOR INSPECTION

A6E404013015201

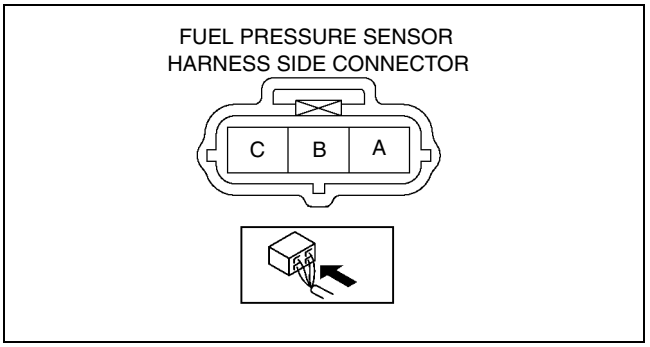
Note
- Perform the following test only when directed.

Voltage Inspection
1. Start the engine and warm up the engine completely.
2. Measure the voltage between fuel pressure sensor terminals A and B using a voltmeter at idle.
   - If not as specified, perform the “Circuit Open/Short Inspection”.
     — If there is no open/short circuit, replace the common rail.

Specification
1.4—1.7 V

3. Turn off the engine and wait three minutes.
4. Turn the engine switch to ON.
5. Measure the voltage between fuel pressure sensor terminals A and B using a voltmeter.
   - If not as specified, perform the “Circuit Open/Short Inspection”.
     — If there is no open/short circuit, replace the common rail.

Specification
0.9—1.1 V



A6E40702049

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

Open circuit
- Power circuit
  — Fuel pressure sensor terminal C and PCM terminal 90
- Signal circuit
  — Fuel pressure sensor terminal B and PCM terminal 61
- GND circuit
  — Fuel pressure sensor terminal A and PCM terminal 91

Short circuit
- Power circuit
  — Fuel pressure sensor terminal C and PCM terminal 90 to GND
- Signal circuit
  — Fuel pressure sensor terminal B and PCM terminal 61 to power circuit
  — Fuel pressure sensor terminal B and PCM terminal 61 to GND

CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION

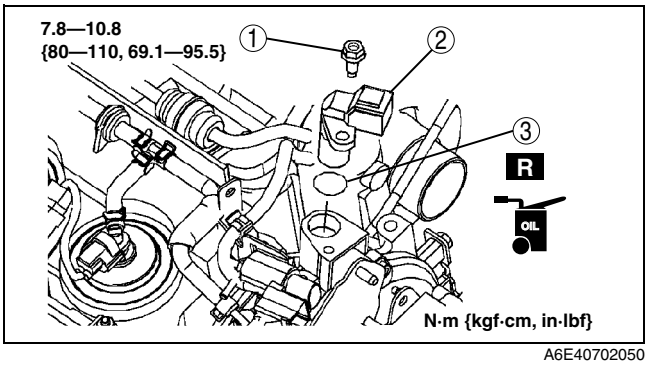
A6E404018200201

Caution
- **When foreign material, such as iron chips, gets on the CMP sensor, it can cause abnormal output from the sensor because of flux turbulence and adversely affect engine control. Be sure there is no foreign material on the CMP sensor when replacing.**
- **Do not forcefully pull the wiring harness of the CMP sensor. Doing so will break the harness.**

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

1	CMP sensor installation bolt
2	CMP sensor
3	O-ring (See F2–80 O-ring Installation Note)

4. Install in the reverse order of removal.



A6E40702050

O-ring Installation Note
1. Apply engine oil to new O-ring thinly and install it as does not damage.

CAMSHAFT POSITION (CMP) SENSOR INSPECTION

A6E404018200202

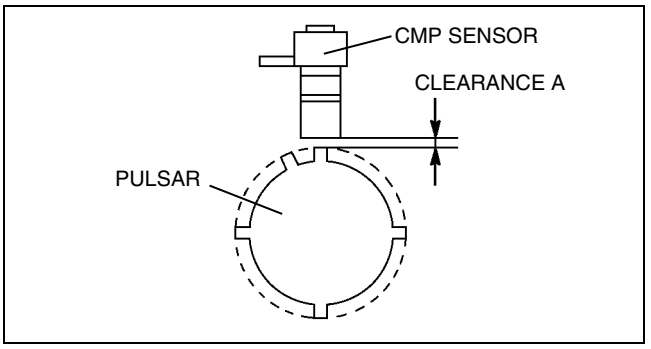
Note
- Perform the following test only when directed.

Caution
- **When foreign material, such as iron chips, gets on the CMP sensor, it can cause abnormal output from the sensor because of flux turbulence and adversely affect engine control. Be sure there is no foreign material on the CMP sensor when replacing.**
- **Do not forcefully pull the wiring harness of the CMP sensor. Doing so will break the harness.**

Visual Inspection
1. Verify that the CMP sensor and the pulsar are free of any metallic shavings or particles.
   - If any are found on the CMP sensor and the pulsar, clean them off.

Air Gap Inspection
1. Disconnect the negative battery cable.
2. Remove the gear cover.
3. Verify that clearance A between the CMP sensor and the pulsar is within the specification.
   - If not as specified, replace the CMP sensor.

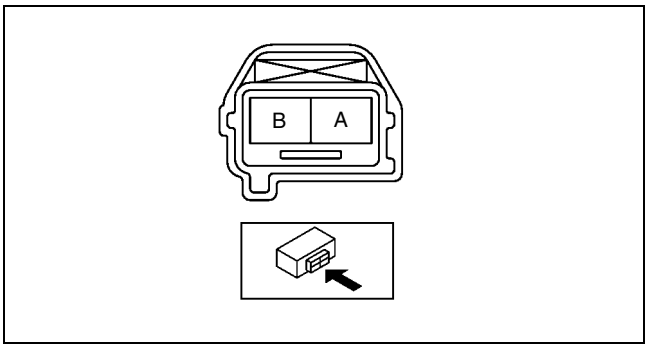
Clearance A
0.5—1.5 mm {0.020—0.059 in}



A6E40702051

Resistance Inspection

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Disconnect the CMP sensor connector.
4. Inspect the resistance between the terminals under the following condition.
   - If not as specified, replace the CMP sensor.



A6E40702052

Specification

Terminal	Atmospheric temperature (°C {°F})	Resistance (kilohm)
A—B	20 {68}	1.85—2.45

Circuit Open/Short Inspection

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

Open circuit

- CMP sensor terminal A and PCM terminal 81
- CMP sensor terminal B and PCM terminal 55

Short circuit

- CMP sensor terminal A and PCM terminal 81 to GND
- CMP sensor terminal B and PCM terminal 55 to GND

CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION

A6E404018230201

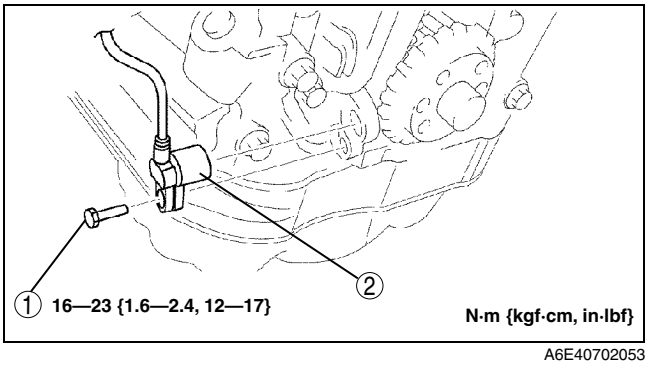
Caution

- **When foreign material, such as iron chips, gets on the CKP sensor, it can cause abnormal output from the sensor because of flux turbulence and adversely affect engine control. Be sure there is no foreign material on the CKP sensor when replacing.**
- **Do not forcefully pull the wiring harness of the CKP sensor. Doing so will break the harness.**

1. Disconnect the negative battery cable.
2. Remove the crankshaft pulley. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
3. Remove the lower timing belt cover. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.

1	CKP sensor installation bolt
2	CKP sensor

5. Install in the reverse order of removal.



A6E40702053

F2

CRANKSHAFT POSITION (CKP) SENSOR INSPECTION

A6E404018230202

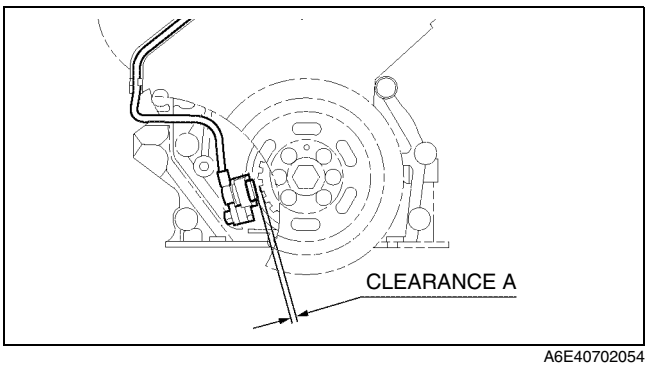
Note
- Perform the following test only when directed.

Caution
- **When foreign material, such as iron chips, gets on the CKP sensor, it can cause abnormal output from the sensor because of flux turbulence and adversely affect engine control. Be sure there is no foreign material on the CKP sensor when replacing.**
- **Do not forcefully pull the wiring harness of the CKP sensor. Doing so will break the harness.**

Visual Inspection
1. Verify that the CKP sensor and the pulsar are free of any metallic shavings or particles.
   - If any are found on the CKP sensor and the pulsar, clean them off.

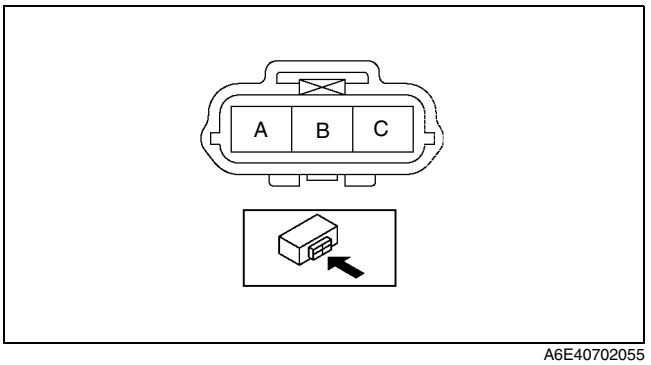
Air Gap Inspection
1. Disconnect the negative battery cable.
2. Remove the crankshaft pulley. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
3. Remove the crankshaft pulley. (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
4. Verify that clearance A between the CKP sensor and the pulsar is within the specification.
   - If not as specified, replace the CKP sensor.

Clearance A
1.5—2.5 mm {0.059—0.098 in}



A6E40702054

Resistance Inspection
1. Disconnect the negative battery cable.
2. Disconnect the CKP sensor connector.
3. Measure the resistance between the CKP sensor terminals under the following condition.
   - If not as specified, replace the CKP sensor.



A6E40702055

Specification

Terminal	Atmospheric temperature °C {°F}	Resistance (kilohm)
A—B	20 {68}	1.8—2.45

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

Open circuit
- CKP sensor terminal A and PCM terminal 29
- CKP sensor terminal B and PCM terminal 3

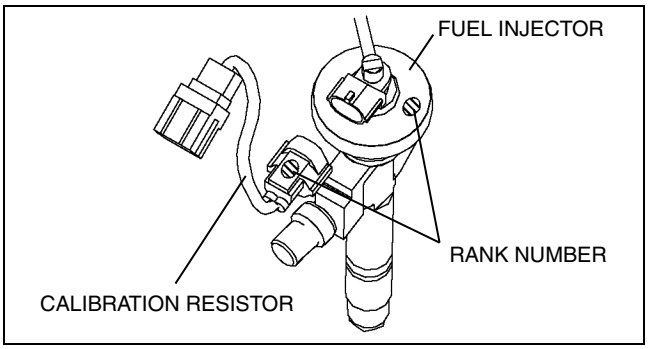
Short circuit
- CKP sensor terminal A and PCM terminal 29 to GND
- CKP sensor terminal B and PCM terminal 3 to GND

CALIBRATION RESISTOR INSPECTION

A6E404013050201

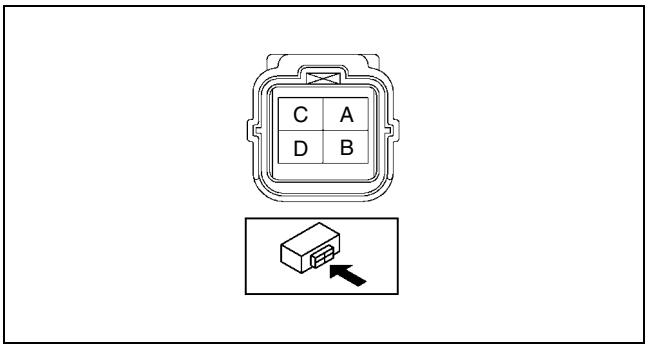
Note
- Perform the following test only when directed.

Resistance Inspection
1. Remove the calibration resistor.
2. Verify the calibration resistor rank number.
3. Refer to the table below and verify the resistance corresponding to the resistor rank number.



A6E40702056

4. Measure the resistance between the calibration resistor terminals A and C using an ohmmeter.
   - If not as specified, replace the calibration resistor.



A6E40702057

Specification

Fuel injector rank number	Calibration resistor	
	Rank number	Resistance (ohm)
1	1	30.9
2	2	41.2
3	3	53.6
4	4	68.1
5	5	84.5
6	6	105
7	7	130
8	8	158
9	9	196
10	10	243
11	11	301
12	12	365
13	13	442
14	14	549
15	15	665
16	16	825
17	17	1020
18	18	1240
19	19	1540
20	20	1920
21	21	2370
22	22	3010
23	23	4020
24	24	5760
25	25	9530

CIrcuit Open/Short Inspection

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

Open circuit

- Signal circuit
  - — Calibration resistor No.1 terminal A and PCM terminal 37
  - — Calibration resistor No.2 terminal A and PCM terminal 62
  - — Calibration resistor No.3 terminal A and PCM terminal 89
  - — Calibration resistor No.4 terminal A and PCM terminal 11
- GND circuit
  - — Each calibration resistor terminal C and PCM terminal 91

Short circuit

- Signal circuit
  - — Calibration resistor No.1 terminal A and PCM terminal 37 to power circuit
  - — Calibration resistor No.1 terminal A and PCM terminal 37 to GND
  - — Calibration resistor No.2 terminal A and PCM terminal 62 to power circuit
  - — Calibration resistor No.2 terminal A and PCM terminal 62 to GND
  - — Calibration resistor No.3 terminal A and PCM terminal 89 to power circuit
  - — Calibration resistor No.3 terminal A and PCM terminal 89 to GND
  - — Calibration resistor No.4 terminal A and PCM terminal 11 to power circuit
  - — Calibration resistor No.4 terminal A and PCM terminal 11 to GND

INJECTOR DRIVER MODULE (IDM) INSPECTION

A6E404018701201

Warning

- **The IDM outputs high voltage and current for fuel injector driving. Do not inspect the IDM terminal voltage, as it may cause an electric shock.**

Note

- Perform the following test only when directed.

1. If any IDM-related failures are suspected, inspect the following:
   - DTCs
   - IDM-related harnesses
   - Fuel injectors

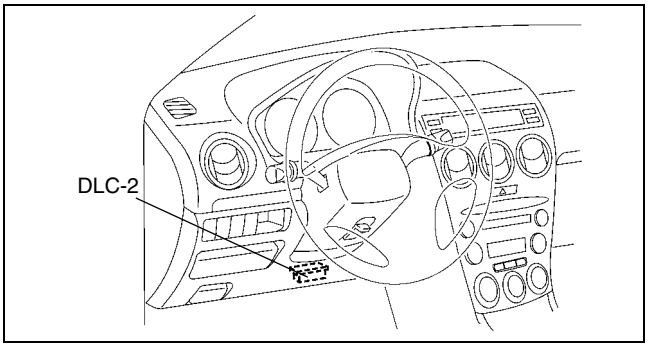
ON-BOARD DIAGNOSTIC

ON-BOARD DIAGNOSTIC TEST

A6E407018881206

DTCs Retrieving Procedure

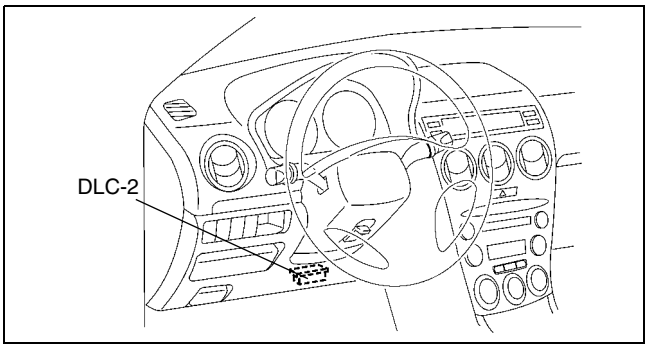
1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS or equivalent to the vehicle DLC-2 16-pin connector.
3. Retrieve DTC using the WDS or equivalent.



A6E40702001

PID/DATA Monitor and Record Procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect the WDS or equivalent to the vehicle DLC-2 16-pin connector.
3. Access and monitor PIDs using the WDS or equivalent.



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DTC CONFIRMATION PROCEDURE

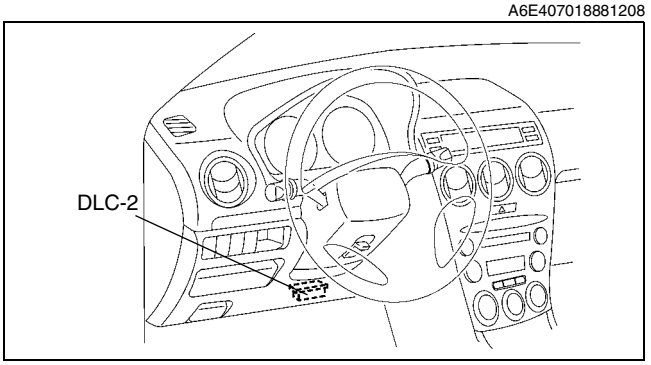
A6E407018881207

STEP	INSPECTION		ACTION
1	**RECORD CONTINUOUS MEMORY DTC** • Turn engine switch to ON (Engine OFF). • Retrieve all stored DTCs using WDS or equivalent. • Are there any DTCs present?	Yes	Record all stored DTCs (continuous memory DTC), then go to next step.
		No	Go to next step.
2	**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 Service information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
3	**PERFORM KOEO SELF-TEST** • Start engine. • Warm up engine completely. • Turn off all electrical loads. • Perform KOEO SELF-TEST PROCEDURE. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Are there any KOEO DTCs present?	Yes	Repair KOEO DTC. (See F2–87 DTC TABLE)
		No	Go to next step.
4	**PERFORM KOER SELF-TEST** • Start engine. • Perform KOER SELF-TEST PROCEDURE. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Are there any KOER DTCs present?	Yes	Repair KOER DTC. (See F2–87 DTC TABLE)
		No	• If continuous memory DTC is present at Step 1, return to applicable DTC troubleshooting procedure step. • If continuous memory DTC is not present at Step 1, go to symptom troubleshooting.

KOEO/KOER SELF-TEST PROCEDURE

1. Connect the WDS or equivalent to the vehicle DLC-2 16-pin connector.
2. Perform KOEO/KOER self-test.

A6E407018881208

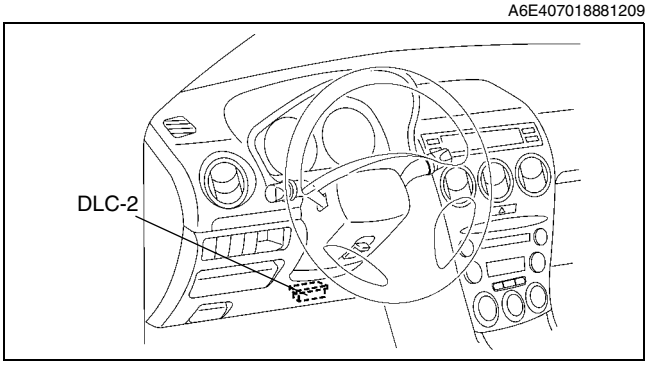


A6E40702001

AFTER REPAIR PROCEDURE

1. Connect the WDS or equivalent to the vehicle DLC-2 16-pin connector.
2. Turn the engine switch to ON.
3. Record DTC if retrieved.
4. Erase all diagnostic data using WDS or equivalent.

A6E407018881209



A6E40702001

DTC TABLE

A6E407018881210

×: Applicable –: Not applicable

DTC	Condition	MIL	Memory function	Page
P0016	Crankshaft position-camshaft position correlation malfunction	×	×	(See F2–88 DTC P0016)
P0088	Fuel pressure system too high	–	×	(See F2–89 DTC P0088)
P0091	Suction control valve circuit low input	×	×	(See F2–90 DTC P0091)
P0092	Suction control valve circuit high input	×	×	(See F2–92 DTC P0092)
P0093	Fuel system leak detection	×	×	(See F2–94 DTC P0093)
P0097	IAT sensor No.1 circuit low input	×	×	(See F2–95 DTC P0097)
P0098	IAT sensor No.1 circuit high input	×	×	(See F2–97 DTC P0098)
P0102	MAF sensor circuit low input	×	×	(See F2–99 DTC P0102)
P0103	MAF sensor circuit high input	×	×	(See F2–101 DTC P0103)
P0107	Boost sensor circuit low input	×	×	(See F2–103 DTC P0107)
P0108	Boost sensor circuit high input	×	×	(See F2–105 DTC P0108)
P0112	IAT sensor No.2 circuit low input	×	×	(See F2–107 DTC P0112)
P0113	IAT sensor No.2 circuit high input	×	×	(See F2–109 DTC P0113)
P0117	ECT sensor circuit low input	×	×	(See F2–111 DTC P0117)
P0118	ECT sensor circuit high input	×	×	(See F2–113 DTC P0118)
P0121	Accelerator position sensor No.1 circuit performance problem	×	×	(See F2–115 DTC P0121)
P0122	Accelerator position sensor No.1 circuit low input	×	×	(See F2–116 DTC P0122)
P0123	Accelerator position sensor No.1 circuit high input	×	×	(See F2–118 DTC P0123)
P0182	Fuel temperature sensor circuit low input	×	×	(See F2–120 DTC P0182)
P0183	Fuel temperature sensor circuit high input	×	×	(See F2–122 DTC P0183)
P0191	Fuel pressure sensor circuit performance problem	×	×	(See F2–124 DTC P0191)
P0192	Fuel pressure sensor circuit low input	×	×	(See F2–125 DTC P0192)
P0193	Fuel pressure sensor circuit high input	×	×	(See F2–127 DTC P0193)
P0200	Fuel injector circuit malfunction	×	×	(See F2–129 DTC P0200)
P0221	Accelerator position sensor No.2 circuit performance problem	×	×	(See F2–131 DTC P0221)
P0222	Accelerator position sensor No.2 circuit low input	×	×	(See F2–132 DTC P0222)
P0223	Accelerator position sensor No.2 circuit high input	×	×	(See F2–134 DTC P0223)
P0300	Random misfire detection	×	×	(See F2–136 DTC P0300)
P0336	CKP sensor circuit performance problem	×	×	(See F2–137 DTC P0336)
P0337	CKP sensor circuit low input	×	×	(See F2–138 DTC P0337)
P0341	CMP sensor circuit performance problem	×	×	(See F2–140 DTC P0341)
P0342	CMP sensor circuit low input	×	×	(See F2–141 DTC P0342)
P0380	Glow plug relay circuit malfunction	×	×	(See F2–143 DTC P0380)
P0504	Brake switch signal correlation malfunction	×	×	(See F2–145 DTC P0504)
P0510	Idle switch circuit malfunction	×	×	(See F2–148 DTC P0510)
P0512	Engine switch circuit malfunction	×	×	(See F2–150 DTC P0512)
P0564	Cruise control signal malfunction	–	×	(See F2–152 DTC P0564)
P0602	PCM programming error	×	×	(See F2–154 DTC P0602)
P0606	PCM malfunction	×	×	(See F2–155 DTC P0606)
P0610	Control module vehicle options error	×	×	(See F2–155 DTC P0610)
P0661	VSC solenoid valve circuit low input	–	×	(See F2–156 DTC P0661)
P0662	VSC solenoid valve circuit high input	–	×	(See F2–158 DTC P0662)
P0850	Neutral switch circuit malfunction	×	×	(See F2–160 DTC P0850)
P1190	Calibration resistor circuit malfunction	×	×	(See F2–162 DTC P1190)
P2228	BARO sensor circuit low input	×	×	(See F2–164 DTC P2228)
P2229	BARO sensor circuit high input	×	×	(See F2–164 DTC P2229)
U0073	CAN bus off	–	×	(See T–39 MULTIPLEX COMMUNICATION SYSTEM)
U0121	PCM cannot receive any signals from ABS, ABS/TCS or DSC HU/CM	×	×	(See T–39 MULTIPLEX COMMUNICATION SYSTEM)
U0155	PCM cannot receive any signals from instrument cluster	×	×	(See T–39 MULTIPLEX COMMUNICATION SYSTEM)

DTC P0016

A6E407001082201

DTC P0016	Crankshaft position-camshaft position correlation malfunction
DETECTION CONDITION	• PCM monitors input signals from CKP sensor and CMP sensor while engine is running. If input signals from CKP sensor and CMP sensor are misaligned, PCM determines crankshaft position-camshaft position correlation malfunction.
POSSIBLE CAUSE	• CKP sensor malfunction • CMP sensor malfunction • Timing belt is loose • PCM malfunction

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P0016 DETECTED AGAIN** • 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”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**FOLLOW OTHER DETECTED DTC FIRST** • Turn engine switch to OFF. • Start engine. • Have P0336, P0337, P0341, P0342 been detected?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Go to next step.
4	**INSPECT CKP SENSOR** • Inspect CKP sensor. (See F2–82 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CKP sensor, go to Step 7. (See F2–81 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT CMP SENSOR** • Inspect CMP sensor. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CMP sensor, go to Step 7. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
6	**INSPECT TIMING BELT** • Inspect timing belt installation. • Is there any malfunction?	Yes	Reinstall timing belt, go to next step.
		No	Go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0016 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0088

A6E407001082202

DTC P0088	Fuel pressure system too high
DETECTION CONDITION	• PCM monitors fuel pressure in common rail from fuel pressure sensor while engine running. If fuel pressure is higher than preprogrammed criteria, PCM determines fuel pressure system too high.
POSSIBLE CAUSE	• Suction control valve malfunction • Fuel pressure sensor malfunction • Fuel pressure limiter malfunction • PCM malfunction

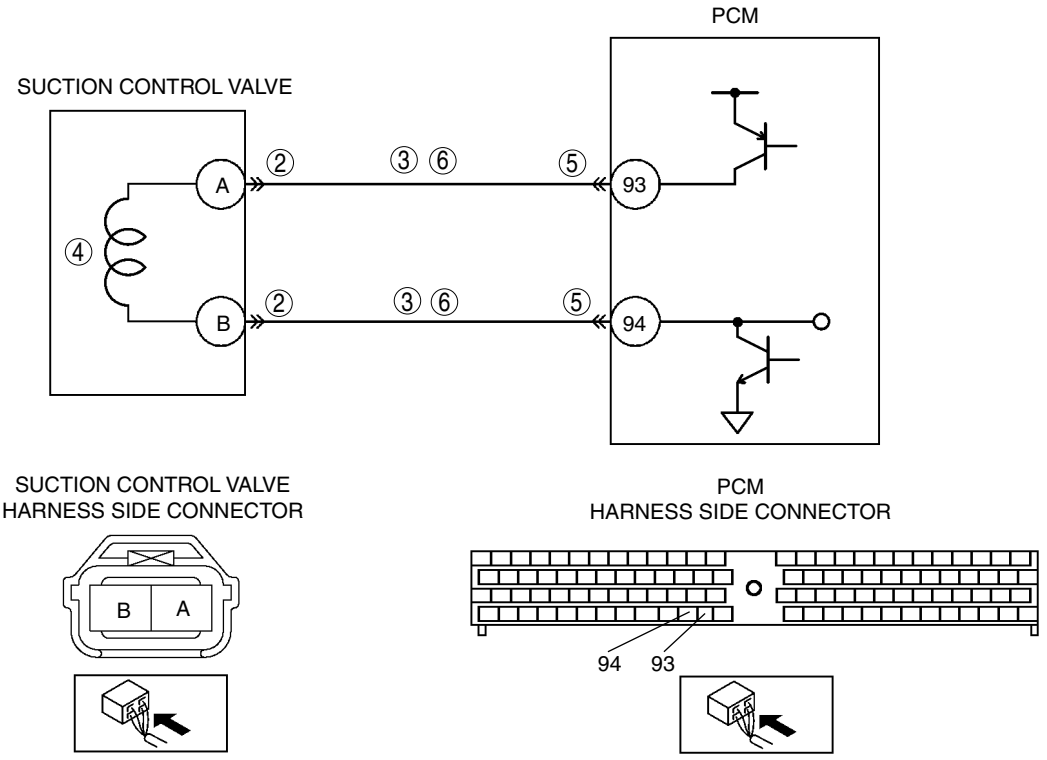
Diagnostic procedure

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** • Turn engine switch to OFF. • Start engine. • Have P0091, P0092, P0191, P0192, P0193 been detected?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Go to next step.
3	**INSPECT SUCTION CONTROL VALVE** • Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 6. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
4	**INSPECT FUEL PRESSURE SENSOR** • Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace common rail, go to Step 6. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT COMMON RAIL** • Inspect common rail. (See F2–54 COMMON RAIL INSPECTION) • Is there any malfunction?	Yes	Replace common rail, go to next step. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION)
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0088 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0091

A6E407001082203

DTC P0091	Suction control valve circuit low input
DETECTION CONDITION	• PCM monitors input voltage from suction control valve while engine is running. If input voltage from suction control valve does not change from off to on, PCM determines suction control valve circuit low input.
POSSIBLE CAUSE	• Suction control valve malfunction • Connector or terminal malfunction • Short to GND in wiring between suction control valve terminal A and PCM terminal 93 • Short to GND in wiring between suction control valve terminal B and PCM terminal 94 • Open circuit in wiring between suction control valve terminal A and PCM terminal 93 • Open circuit in wiring between suction control valve terminal B and PCM terminal 94 • PCM malfunction



Diagnostic procedure

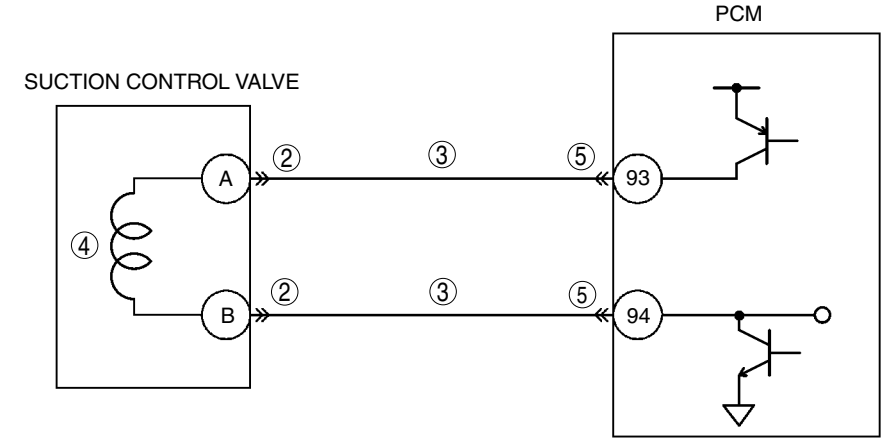
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.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

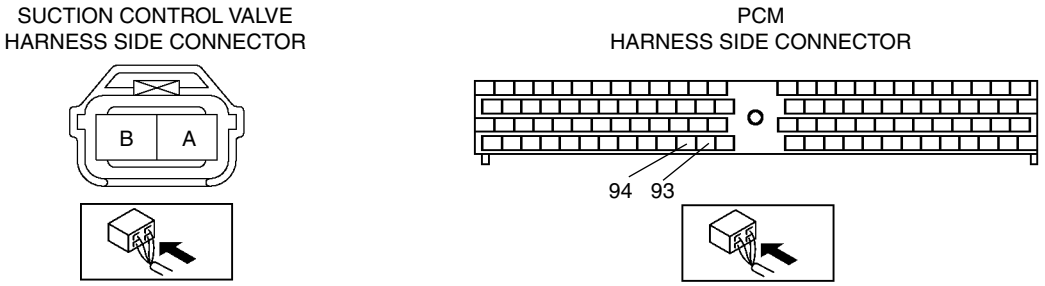
STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF SUCTION CONTROL VALVE CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT SUCTION CONTROL VALVE CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Suction control valve terminal A and body GND. — Suction control valve terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.
4	**INSPECT SUCTION CONTROL VALVE** • Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 7. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT SUCTION CONTROL VALVE CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Suction control valve terminal A and PCM terminal 93. — Suction control valve terminal B and PCM terminal 94. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0091 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0092

A6E407001082204

DTC P0092	Suction control valve circuit high input
DETECTION CONDITION	• PCM monitors input voltage from suction control valve while engine is running. If input voltage from suction control valve does not change from on to off, PCM determines suction control valve circuit high input.
POSSIBLE CAUSE	• Suction control valve malfunction • Connector or terminal malfunction • Short to power circuit in wiring between suction control valve terminal A and PCM terminal 93 • Short to power circuit in wiring between suction control valve terminal B and PCM terminal 94 • PCM malfunction





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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF SUCTION CONTROL VALVE CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
3	**INSPECT SUCTION CONTROL VALVE CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspected voltage between following harnesses: — Suction control valve terminal A and body GND. — Suction control valve terminal B and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 6.
4	**INSPECT SUCTION CONTROL VALVE** • Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 6. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0092 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0093

A6E407001082205

DTC P0093	Fuel system leak detection
DETECTION CONDITION	• PCM monitors fuel pressure in common rail from fuel pressure sensor while engine running. If fuel pressure is lower after fuel injection than preprogrammed criteria, PCM determines fuel system leak detection.
POSSIBLE CAUSE	• Fuel leakage or clogged fuel line • Suction control valve malfunction • Fuel pressure sensor malfunction • Fuel injector malfunction • PCM malfunction

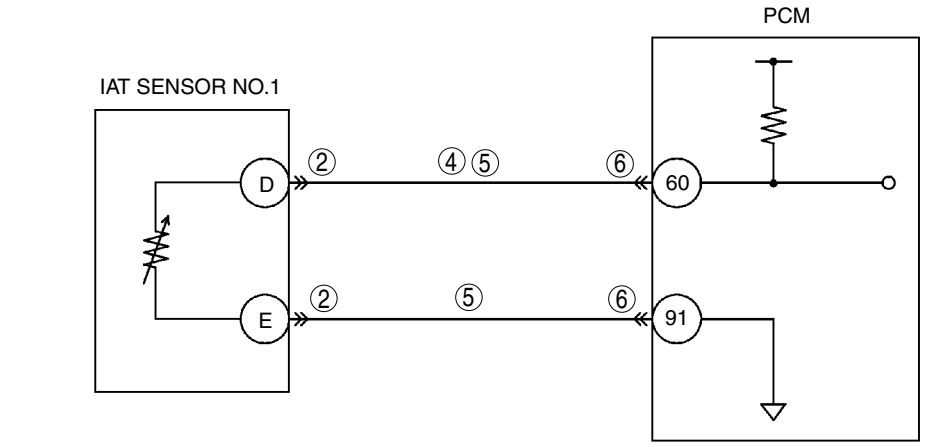
Diagnostic procedure

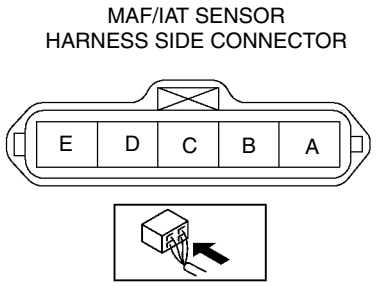
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** • Turn engine switch to OFF. • Start engine. • Have P0192, P0193, P1190 been detected?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Go to next step.
3	**INSPECT FUEL LINE** • Turn engine switch to OFF. • Inspect for fuel leakage or clogs in following fuel lines for each cylinder: — Supply pump and Common rail. — Common rail and fuel injector. • Is there any malfunction?	Yes	Repair or replace suspected fuel line, go to Step 7.
		No	Go to next step.
4	**INSPECT SUCTION CONTROL VALVE** • Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 7. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
5	**INSPECT FUEL PRESSURE SENSOR** • Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace common rail, go to Step 7. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION)
		No	Go to next step.
6	**INSPECT FUEL INJECTOR** • Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) • Is there any malfunction?	Yes	Replace fuel injector, go to next step. (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0093 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

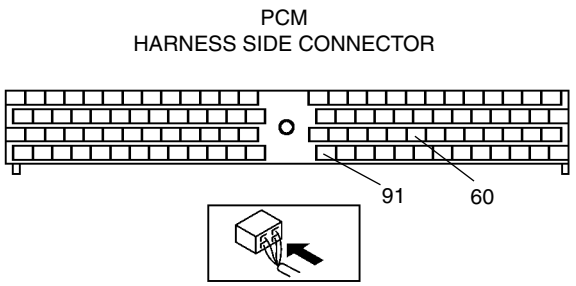
DTC P0097

A6E407001082206

DTC P0097	IAT sensor No.1 circuit low input
DETECTION CONDITION	• PCM monitors input voltage from IAT sensor No.1 while engine is running. If input voltage from IAT sensor No.1 is **below 0.1 V**, PCM determines IAT sensor No.1 circuit low input.
POSSIBLE CAUSE	• IAT sensor No.1 malfunction • Connector or terminal malfunction • Short to GND in wiring between MAF/IAT sensor terminal D and PCM terminal 60 • IAT sensor No.1 signal and GND circuits short each other • PCM malfunction







Diagnostic procedure

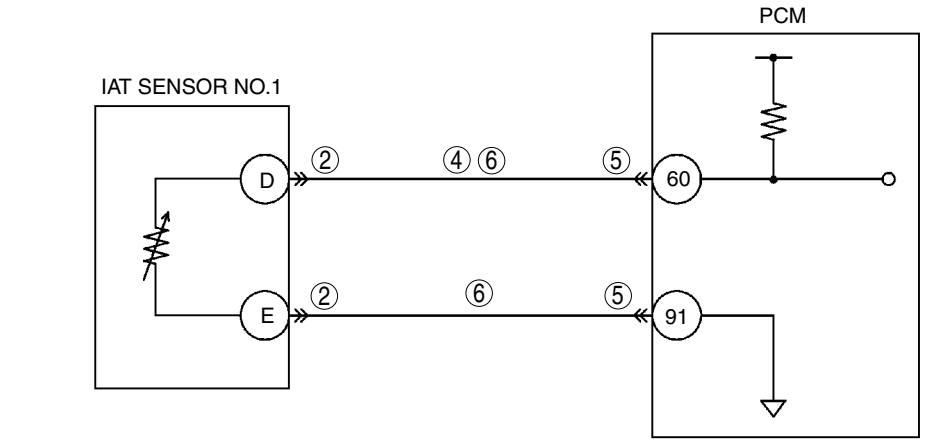
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF IAT SENSOR NO.1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**CLASSIFY IAT SENSOR NO.1 MALFUNCTION OR HARNESS MALFUNCTION** • Turn engine switch to ON (Engine OFF). • Disconnect MAF/IAT sensor connector. • Access IAT PID using WDS or equivalent. • Is IAT PID **below 0.1 V**?	Yes	Go to next step.
		No	Replace MAF/IAT sensor, go to Step 7. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION)
4	**INSPECT IAT SENSOR NO.1 SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminal D and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.

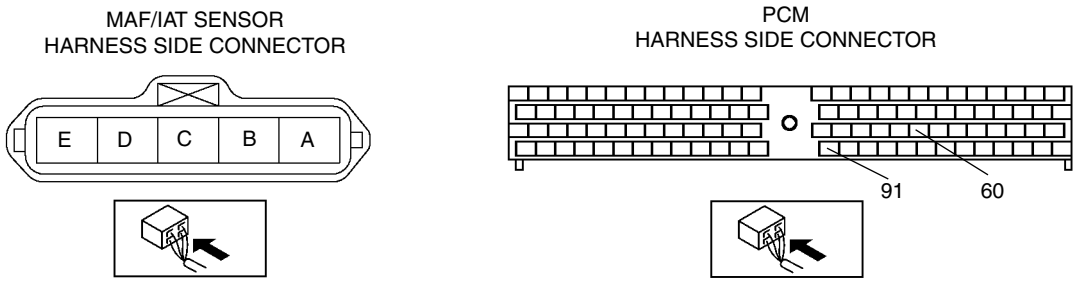
STEP	INSPECTION		ACTION
5	**INSPECT IAT SENSOR NO.1 CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminals D and E. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
6	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0097 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0098

A6E407001082207

DTC P0098	IAT sensor No.1 circuit high input
DETECTION CONDITION	• PCM monitors input voltage from IAT sensor No.1 while engine is running. If input voltage from IAT sensor No.1 is **above 5.0 V**, PCM determines IAT sensor No.1 circuit high input.
POSSIBLE CAUSE	• IAT sensor No.1 malfunction • Connector or terminal malfunction • Short to power circuit in wiring between MAF/IAT sensor terminal D and PCM terminal 60 • Open circuit in wiring between MAF/IAT sensor terminal D and PCM terminal 60 • Open circuit in wiring between MAF/IAT sensor terminal E and PCM terminal 91 • PCM malfunction





Diagnostic procedure

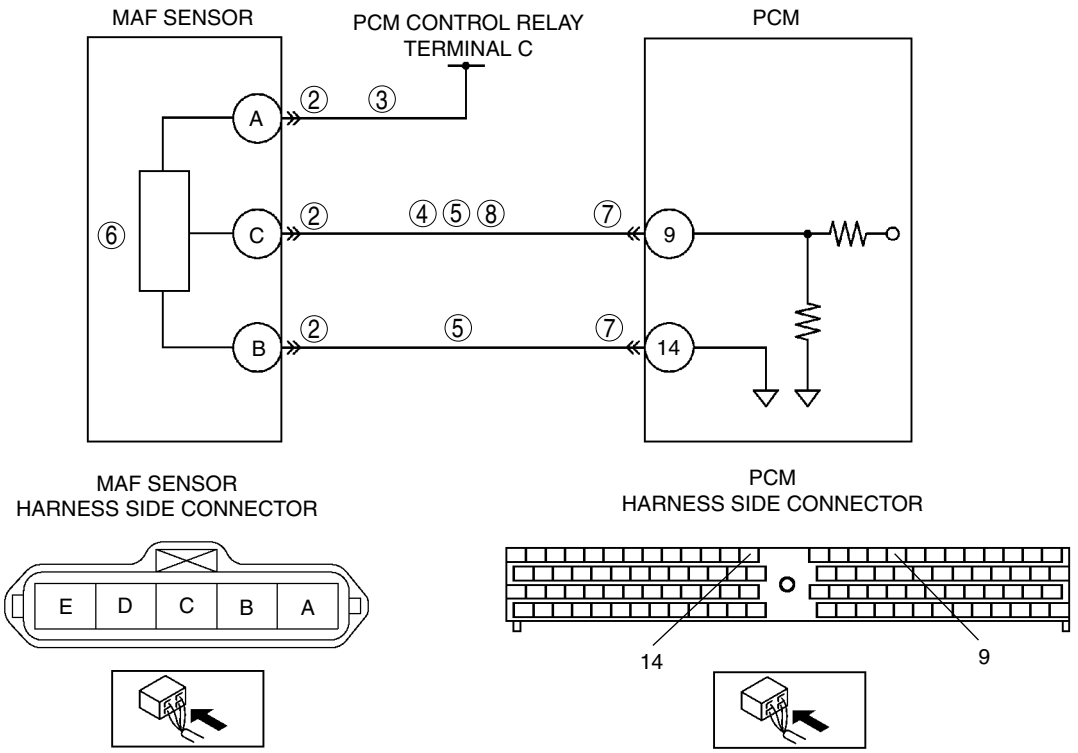
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF IAT SENSOR NO.1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**CLASSIFY IAT SENSOR NO.1 MALFUNCTION OR HARNESS MALFUNCTION** • Turn engine switch to ON (Engine OFF). • Connect jumper wire between MAF/IAT sensor connector terminal D and E. • Access IAT PID using WDS or equivalent. • Is IAT PID **below 1.0 V**?	Yes	Replace MAF/IAT sensor, go to Step 7. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION)
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT IAT SENSOR NO.1 SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between MAF/IAT sensor terminal D and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 7.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT IAT SENSOR NO.1 CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — MAF/IAT sensor terminal D and PCM terminal 60. — MAF/IAT sensor terminal E and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0098 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0102

A6E407001082208

DTC P0102	MAF sensor circuit low input
DETECTION CONDITION	• PCM monitors input voltage from MAF sensor while engine is running. If input voltage from MAF sensor is **below 0.2 V**, PCM determines MAF sensor circuit low input.
POSSIBLE CAUSE	• MAF sensor malfunction • Connector or terminal malfunction • Open circuit in wiring between PCM control relay terminal C and MAF/IAT sensor terminal A • Short to GND in wiring between MAF/IAT sensor terminal C and PCM terminal 9 • MAF sensor signal and GND circuits short each other • Open circuit in wiring between MAF/IAT sensor terminal C and PCM terminal 9 • PCM malfunction



Diagnostic procedure

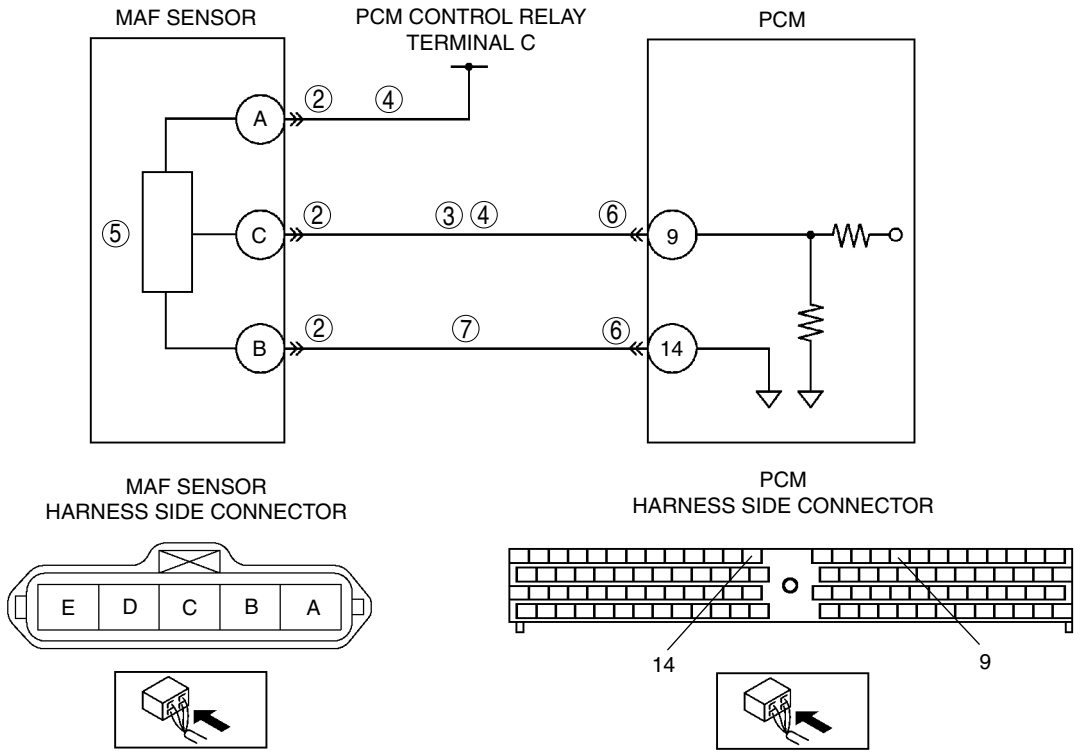
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF MAF SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
3	**INSPECT MAF SENSOR POWER CIRCUIT FOR OPEN** • Turn engine switch to ON. (Engine OFF) • Inspect voltage at MAF/IAT sensor terminal A (harness side). • Is voltage **below 1.0 V**?	Yes	Repair or replace harness for open, go to Step 9.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminal C and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
5	**INSPECT MAF SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminals C and B. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 9.
		No	Go to next step.
6	**INSPECT MAF SENSOR** • Inspect MAF sensor. (See F2–74 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace MAF/IAT sensor, go to Step 9. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION)
		No	Go to next step.
7	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
8	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminal C and PCM terminal 9. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0102 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0103

A6E407001082209

DTC P0103	MAF sensor circuit high input
DETECTION CONDITION	• PCM monitors input voltage from MAF sensor while engine is running. If input voltage from MAF sensor is **above 4.9 V**, PCM determines MAF sensor circuit high input.
POSSIBLE CAUSE	• MAF sensor malfunction • Connector or terminal malfunction • Short to power circuit in wiring between MAF/IAT sensor terminal C and PCM terminal 9 • MAF sensor power and signal circuits short each other • Open circuit in wiring between MAF/IAT sensor terminal B and PCM terminal 14 • PCM malfunction



Diagnostic procedure

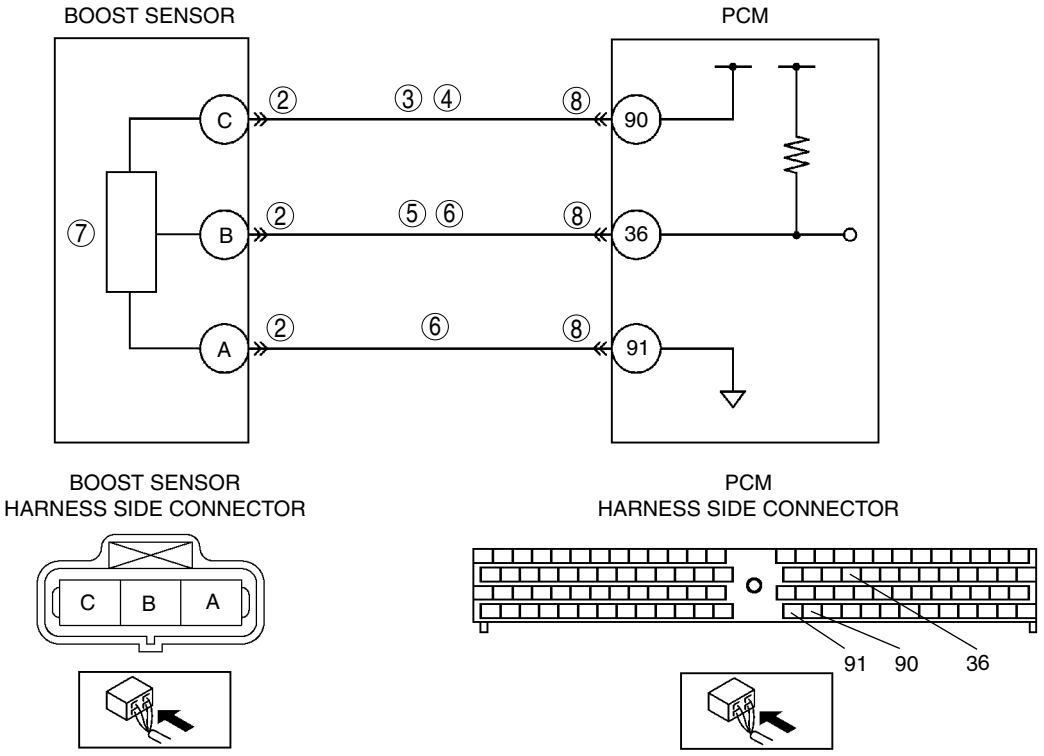
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF MAF SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 8.
		No	Go to next step.
3	**INSPECT MAF SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON. (Engine OFF) • Inspect voltage between MAF/IAT sensor terminal C and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 8.
4	**INSPECT MAF SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminals A and C. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 8.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT MAF SENSOR** • Inspect MAF sensor. (See F2–74 MASS AIR FLOW (MAF)/INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace MAF/IAT sensor, go to Step 8. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION)
		No	Go to next step.
6	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 8.
		No	Go to next step.
7	**INSPECT MAF SENSOR GND CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between MAF/IAT sensor terminal B and PCM terminal 14. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0103 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0107

A6E407001082210

DTC P0107	Boost sensor circuit low input
DETECTION CONDITION	• PCM monitors input voltage from boost sensor while engine is running. If input voltage from boost sensor is **below 1.9 V** when engine speed is **2,400 rpm or above** and accelerator opening angle is **50% or above**, PCM determines boost sensor circuit low input.
POSSIBLE CAUSE	• Boost sensor malfunction • Connector or terminal malfunction • Short to GND in wiring between boost sensor terminal C and PCM terminal 90 • Open circuit in wiring between boost sensor terminal C and PCM terminal 90 • Short to GND in wiring between boost sensor terminal B and PCM terminal 36 • Boost sensor signal and GND circuits short each other • PCM malfunction



Diagnostic procedure

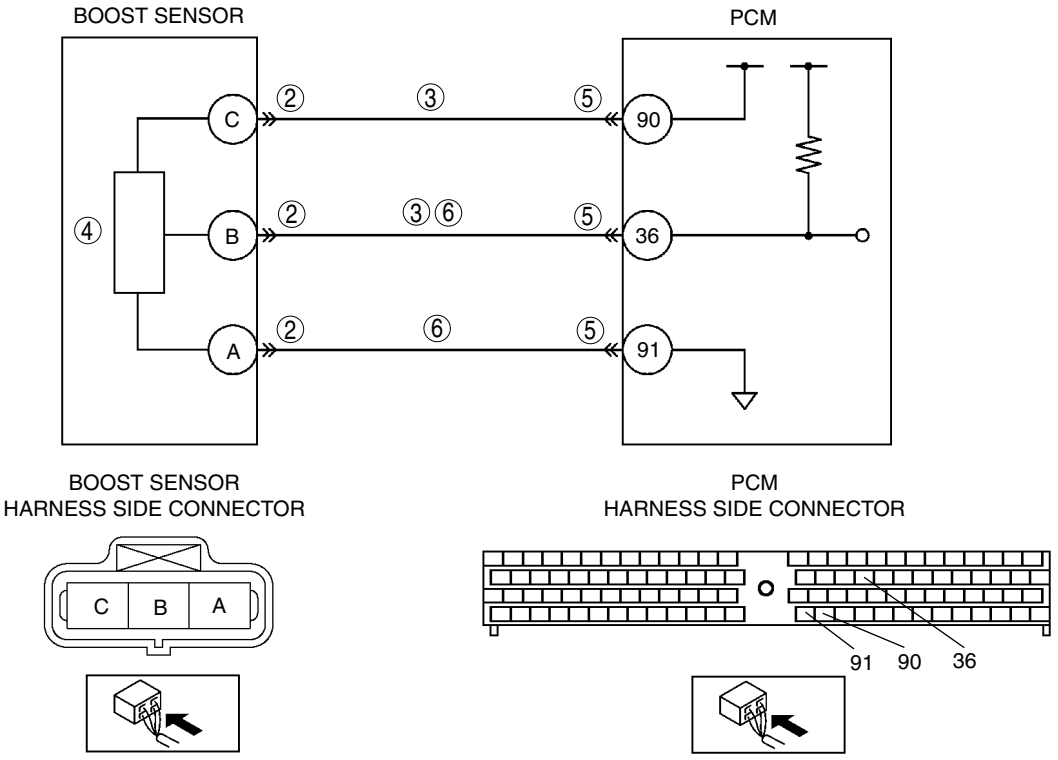
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF BOOST SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
3	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between boost sensor terminal C and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT BOOST SENSOR POWER CIRCUIT FOR OPEN** • Turn engine switch to ON. (Engine OFF) • Inspect voltage at boost sensor terminal C (harness side). • Is voltage **below 1.0 V**?	Yes	Repair or replace harness for open, go to Step 9.
		No	Go to next step.
5	**INSPECT BOOST SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between boost sensor terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
6	**INSPECT BOOST SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between boost sensor terminals B and A. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 9.
		No	Go to next step.
7	**INSPECT BOOST SENSOR** • Inspect boost sensor. (See F2–78 BOOST SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace boost sensor, go to Step 9. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0107 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0108

A6E407001082211

DTC P0108	Boost sensor circuit high input
DETECTION CONDITION	• PCM monitors input voltage from boost sensor while engine is running. If input voltage from boost sensor is **above 4.9 V**, PCM determines boost sensor circuit high input.
POSSIBLE CAUSE	• Boost sensor malfunction • Connector or terminal malfunction • Boost sensor power and signal wiring short each other • Open circuit in wiring between boost sensor terminal B and PCM terminal 36 • Open circuit in wiring between boost sensor terminal A and PCM terminal 91 • PCM malfunction



Diagnostic procedure

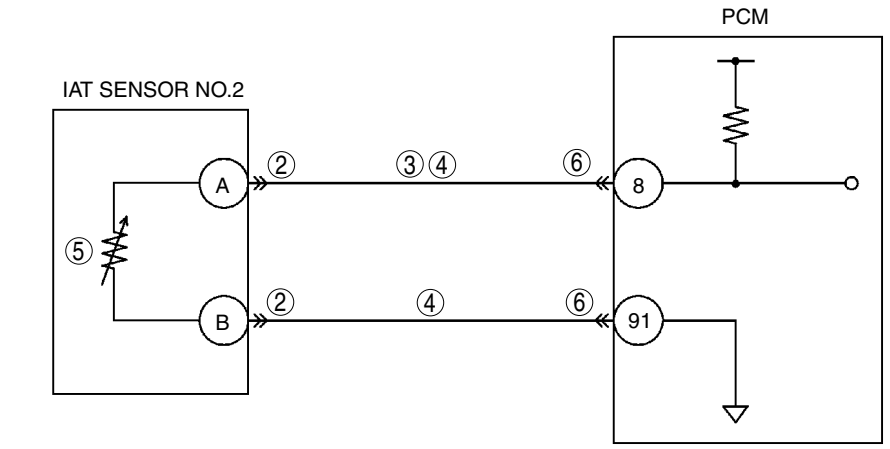
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF BOOST SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT BOOST SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between boost sensor terminals C and B • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
4	**INSPECT BOOST SENSOR** • Inspect boost sensor. (See F2–78 BOOST SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace boost sensor, go to Step 7. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION)
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT BOOST SENSOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Boost sensor terminal B and PCM terminal 36. — Boost sensor terminal A and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0108 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

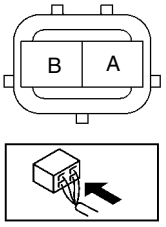
DTC P0112

A6E407001082212

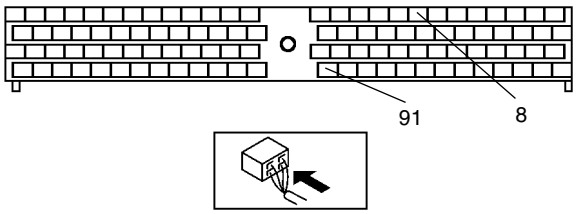
DTC P0112	IAT sensor No.2 circuit low input
DETECTION CONDITION	• PCM monitors input voltage from IAT sensor No.2 while engine is running. If input voltage from IAT sensor No.2 is **below 0.1 V**, PCM determines IAT sensor No.2 circuit low input.
POSSIBLE CAUSE	• IAT sensor No.2 malfunction • Connector or terminal malfunction • Short to GND in wiring between IAT sensor No.2 terminal A and PCM terminal 8 • IAT sensor No.2 signal and GND circuits short each other • PCM malfunction



IAT SENSOR NO.2
HARNESS SIDE CONNECTOR



PCM
HARNESS SIDE CONNECTOR



Diagnostic procedure

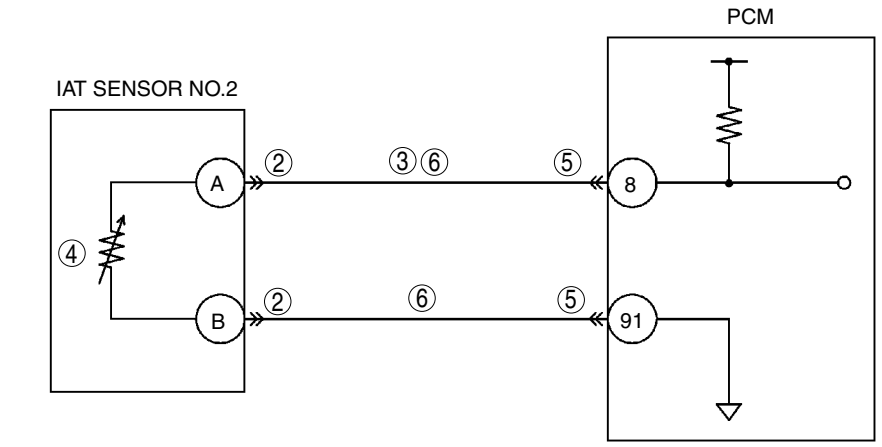
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF IAT SENSOR NO.2 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT IAT SENSOR NO.2 SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between IAT sensor No.2 terminal A and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.
4	**INSPECT IAT SENSOR NO.2 CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between IAT sensor No.2 terminals A and B. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.

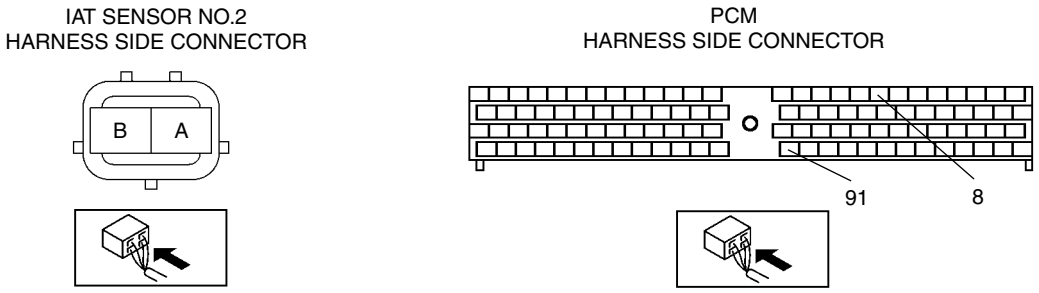
STEP	INSPECTION		ACTION
5	**INSPECT IAT SENSOR NO.2** • Inspect IAT sensor No.2. (See F2–75 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION) • Is there any malfunction?	Yes	Replace IAT sensor No.2, go to next Step 7. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/ INSTALLATION)
		No	Go to next step.
6	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0112 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0113

A6E407001082213

DTC P0113	IAT sensor No.2 circuit high input
DETECTION CONDITION	• PCM monitors input voltage from IAT sensor No.2 while engine is running. If input voltage from IAT sensor No.2 is **above 5.0 V**, PCM determines IAT sensor No.2 circuit high input.
POSSIBLE CAUSE	• IAT sensor No.2 malfunction • Connector or terminal malfunction • Short to power circuit in wiring between IAT sensor No.2 terminal A and PCM terminal 8 • Open circuit in wiring between IAT sensor No.2 terminal A and PCM terminal 8 • Open circuit in wiring between IAT sensor No.2 terminal B and PCM terminal 91 • PCM malfunction





Diagnostic procedure

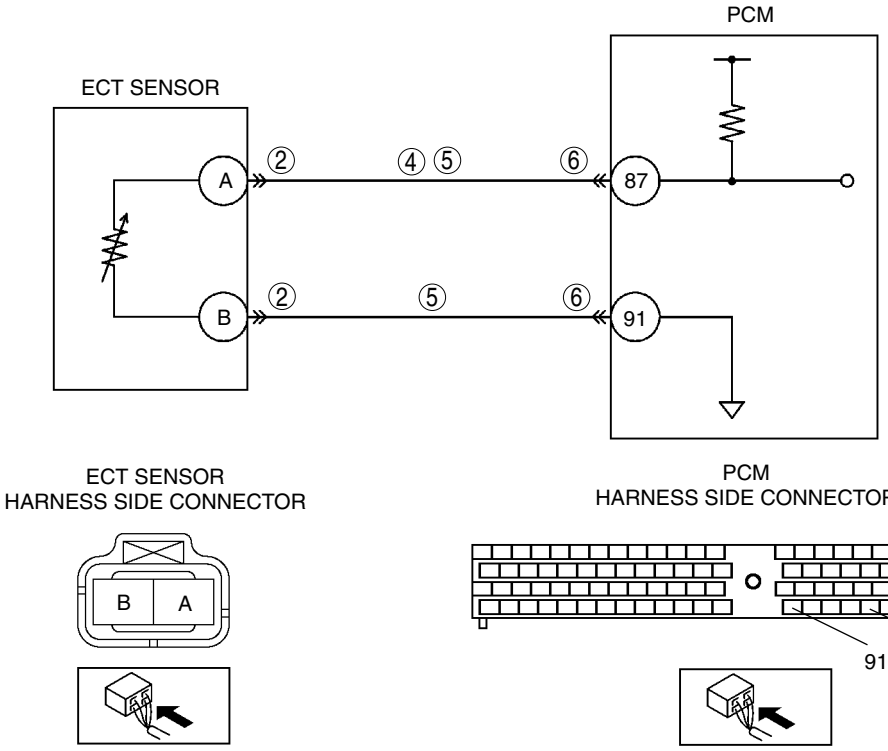
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF IAT SENSOR NO.2 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT IAT SENSOR NO.2 SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between IAT sensor No.2 terminal A and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 7.
4	**INSPECT IAT SENSOR NO.2** • Inspect IAT sensor No.2. (See F2–75 INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION) • Is there any malfunction?	Yes	Replace IAT sensor No.2, go to Step 7. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION)
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT IAT SENSOR NO.2 CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — IAT sensor No.2 terminal A and PCM terminal 8. — IAT sensor No.2 terminal B and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0113 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0117

A6E407001082214

DTC P0117	ECT sensor circuit low input
DETECTION CONDITION	• PCM monitors input voltage from ECT sensor while engine is running. If input voltage from ECT sensor is **below 0.1 V**, PCM determines ECT sensor circuit low input.
POSSIBLE CAUSE	• ECT sensor malfunction • Connector or terminal malfunction • Short to GND in wiring between ECT sensor terminal A and PCM terminal 87 • ECT sensor signal and GND circuits short each other • PCM malfunction



Diagnostic procedure

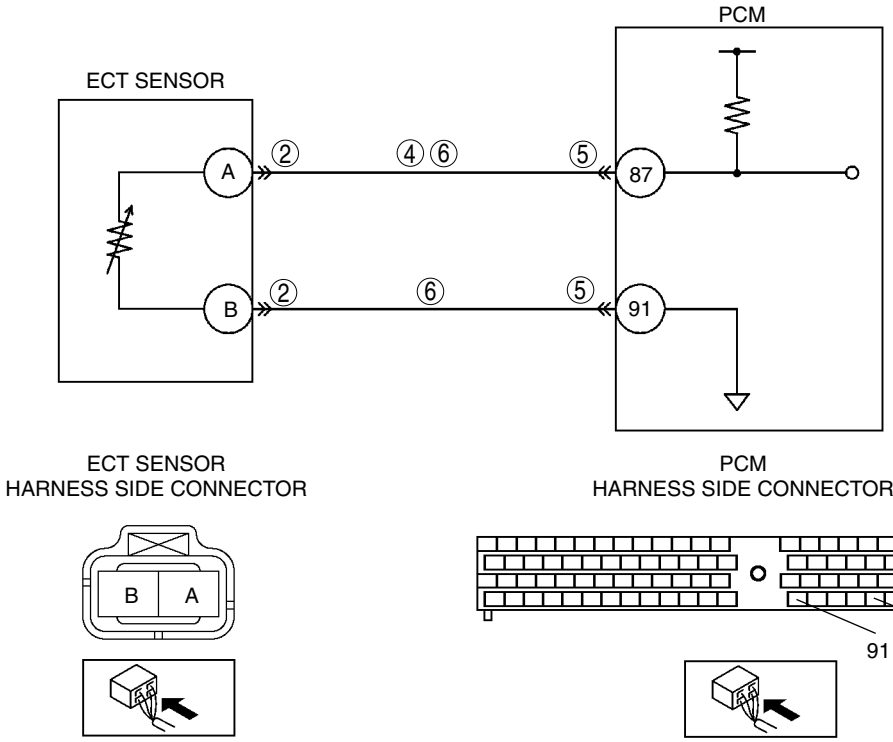
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF ECT SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**CLASSIFY ECT SENSOR MALFUNCTION OR HARNESS MALFUNCTION** • Turn engine switch to ON (Engine OFF). • Disconnect ECT sensor connector. • Access ECT PID using WDS or equivalent. • Is ECT PID **below 0.1 V**?	Yes	Go to next step.
		No	Replace ECT sensor, go to Step 7. (See F2–76 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION)
4	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between ECT sensor terminal A and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT ECT SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between ECT sensor terminals A and B. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
6	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0117 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0118

A6E407001082215

DTC P0118	ECT sensor circuit high input
DETECTION CONDITION	• PCM monitors input voltage from ECT sensor while engine is running. If input voltage from ECT sensor is **above 5.0 V**, PCM determines ECT sensor circuit high input.
POSSIBLE CAUSE	• ECT sensor malfunction • Connector or terminal malfunction • Short to power circuit in wiring between ECT sensor terminal A and PCM terminal 87 • Open circuit in wiring between ECT sensor terminal A and PCM terminal 87 • Open circuit in wiring between ECT sensor terminal B and PCM terminal 91 • PCM malfunction



Diagnostic procedure

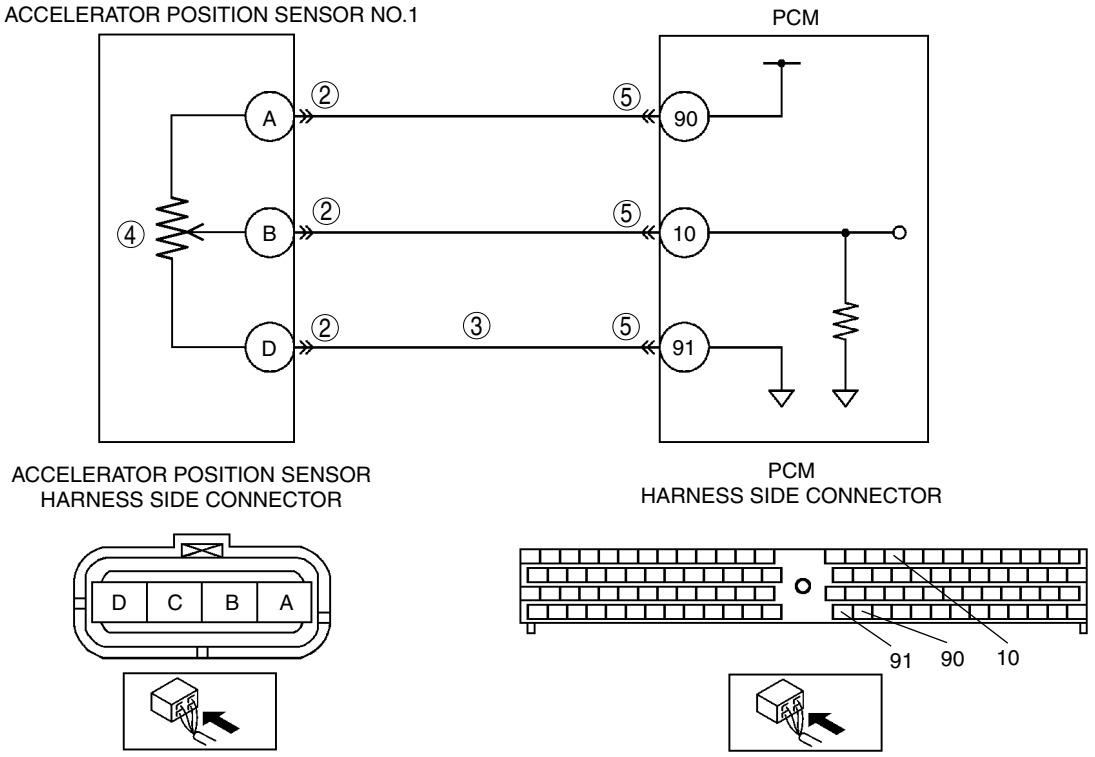
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF ECT SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**CLASSIFY ECT SENSOR MALFUNCTION OR HARNESS MALFUNCTION** • Turn engine switch to ON (Engine OFF). • Connect jumper wire between ECT sensor connector terminals. • Access ECT PID using WDS or equivalent. • Is ECT PID **below 1.0 V**?	Yes	Replace ECT sensor, go to Step 7. (See F2–76 ENGINE COOLANT TEMPERATURE (ECT) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT ECT SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between ECT sensor terminal A and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 7.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT ECT SENSOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — ECT sensor terminal A and PCM terminal 87. — ECT sensor terminal B and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0118 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0121

A6E407001082216

DTC P0121	Accelerator position sensor No.1 circuit performance problem
DETECTION CONDITION	• PCM monitors input voltage from accelerator position sensor No.1 while engine is running. If input voltage from accelerator position sensor No.1 is **above 1.3 V** when accelerator pedal is depressed, PCM determines accelerator position sensor No.1 circuit performance problem.
POSSIBLE CAUSE	• Accelerator position sensor No.1 malfunction • Connector or terminal malfunction • Voltage drops in GND circuit • Accelerator position sensor misadjustment • PCM malfunction



Diagnostic procedure

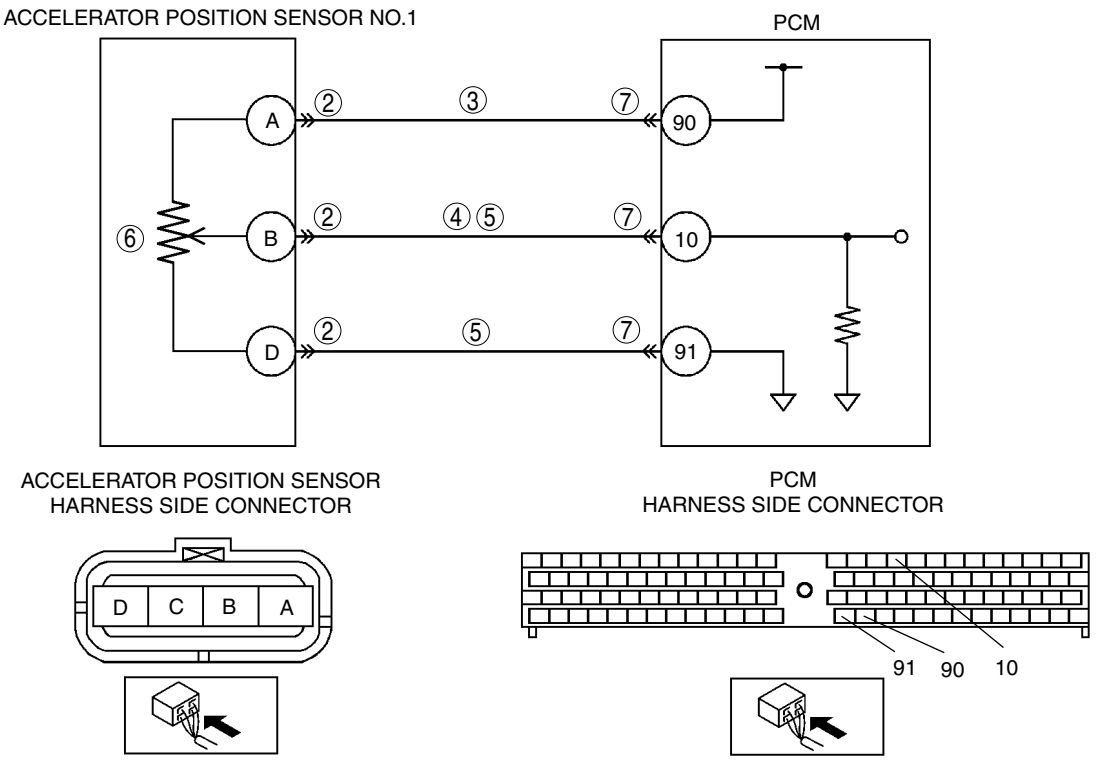
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF ACCELERATOR POSITION SENSOR NO.1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
3	**INSPECT ACCELERATOR POSITION SENSOR NO.1 GND CIRCUIT FOR VOLTAGE DROP** • Turn engine switch to OFF. • Inspect resistance between accelerator position sensor terminal D and body GND. • Is resistance **approx. 0 ohm**?	Yes	Go to next step.
		No	Repair or replace suspected terminal, go to Step 6.
4	**INSPECT ACCELERATOR POSITION SENSOR NO.1** • Inspect accelerator position sensor No.1. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) • Is there any malfunction?	Yes	Adjust or replace accelerator position sensor, go to Step 6. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0121 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0122

A6E407001082217

DTC P0122	Accelerator position sensor No.1 circuit low input
DETECTION CONDITION	• PCM monitors input voltage from accelerator position sensor No.1 while engine is running. If input voltage from accelerator position sensor No.1 is **below 0.3 V**, PCM determines accelerator position sensor No.1 circuit low input.
POSSIBLE CAUSE	• Accelerator position sensor No.1 malfunction • Connector or terminal malfunction • Open circuit in wiring between accelerator position sensor terminal A and PCM terminal 90 • Short to GND in wiring between accelerator position sensor terminal B and PCM terminal 10 • Accelerator position sensor No.1 signal and GND circuits short each other • PCM malfunction



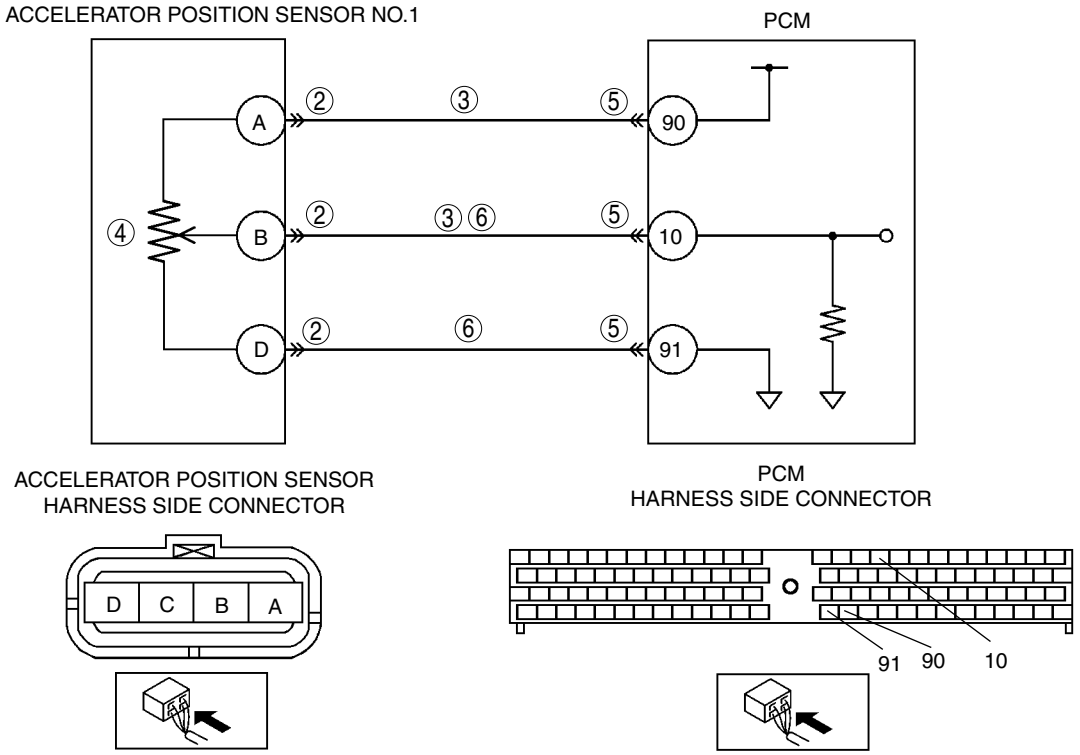
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF ACCELERATOR POSITION SENSOR NO.1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 8.
		No	Go to next step.
3	**INSPECT ACCELERATOR POSITION SENSOR NO.1 POWER CIRCUIT FOR OPEN** • Turn engine switch to ON. (Engine OFF) • Inspect voltage at accelerator position sensor terminal A (harness side). • Is voltage **below 1.0 V**?	Yes	Repair or replace harness for open, go to Step 8.
		No	Go to next step.
4	**INSPECT ACCELERATOR POSITION SENSOR NO.1 SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between accelerator position sensor terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 8.
		No	Go to next step.
5	**INSPECT ACCELERATOR POSITION SENSOR NO.1 CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between accelerator position sensor terminals B and D. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 8.
		No	Go to next step.
6	**INSPECT ACCELERATOR POSITION SENSOR NO.1** • Inspect accelerator position sensor No.1. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace accelerator position sensor, go to Step 8. (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.
7	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0122 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0123

A6E407001082218

DTC P0123	Accelerator position sensor No.1 circuit high input
DETECTION CONDITION	• PCM monitors input voltage from accelerator position sensor No.1 while engine is running. If input voltage from accelerator position sensor No.1 is **above 4.7 V**, PCM determines accelerator position sensor No.1 circuit high input.
POSSIBLE CAUSE	• Accelerator position sensor No.1 malfunction • Connector or terminal malfunction • Accelerator position sensor No.1 power and signal circuits short each other • Open circuit in wiring between accelerator position sensor terminal B and PCM terminal 10 • Open circuit in wiring between accelerator position sensor terminal D and PCM terminal 91 • PCM malfunction



Diagnostic procedure

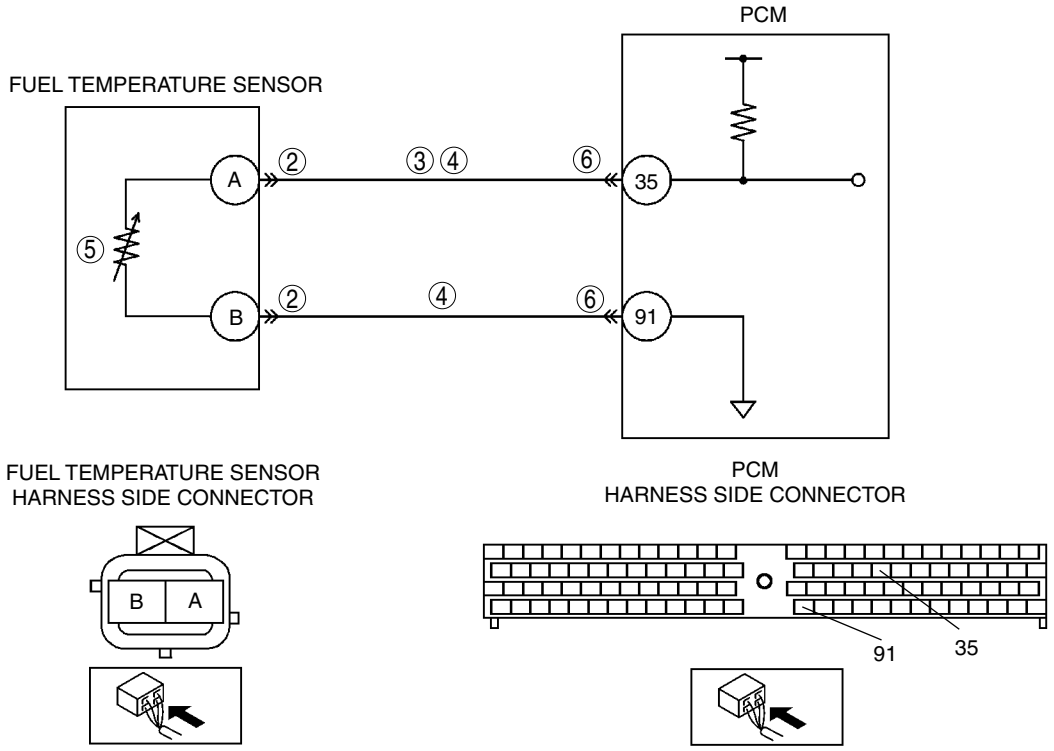
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF ACCELERATOR POSITION SENSOR NO.1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT ACCELERATOR POSITION SENSOR NO.1 CIRCUIT FOR SHORT EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between accelerator position sensor terminals A and B • Is there continuity?	Yes	Repair or replace harness for short each other, go to Step 7.
		No	Go to next step.
4	**INSPECT ACCELERATOR POSITION SENSOR NO.1** • Inspect accelerator position sensor No.1. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace accelerator position sensor, go to Step 7. (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT ACCELERATOR POSITION SENSOR NO.1 CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Accelerator position sensor terminal B and PCM terminal 10. — Accelerator position sensor terminal D and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0123 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0182

A6E407001082219

DTC P0182	Fuel temperature sensor circuit low input
DETECTION CONDITION	• PCM monitors input voltage from fuel temperature sensor while engine is running. If input voltage from fuel temperature sensor is **below 0.1 V**, PCM determines fuel temperature sensor circuit low input.
POSSIBLE CAUSE	• Fuel temperature sensor malfunction • Connector or terminal malfunction • Short to GND in wiring between fuel temperature sensor terminal A and PCM terminal 35 • Fuel temperature sensor signal and GND circuits short each other • PCM malfunction



Diagnostic procedure

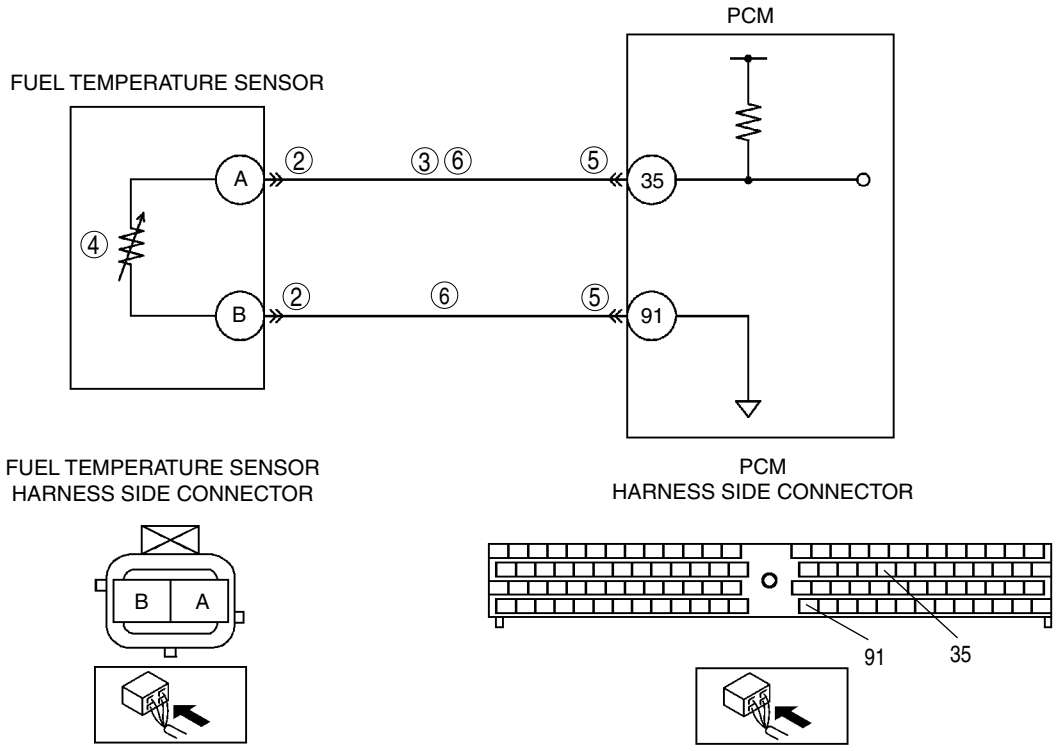
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.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

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF FUEL TEMPERATURE SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between fuel temperature sensor terminal A and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.
4	**INSPECT FUEL TEMPERATURE SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between fuel temperature sensor terminals A and B. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
5	**INSPECT FUEL TEMPERATURE SENSOR** • Inspect fuel temperature sensor. (See F2–77 FUEL TEMPERATURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 7. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
6	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0182 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0183

A6E407001082220

DTC P0183	Fuel temperature sensor circuit high input
DETECTION CONDITION	• PCM monitors input voltage from fuel temperature sensor while engine is running. If input voltage from fuel temperature sensor is **above 5.0 V**, PCM determines fuel temperature sensor circuit high input.
POSSIBLE CAUSE	• Fuel temperature sensor malfunction • Connector or terminal malfunction • Short to power circuit in wiring between fuel temperature sensor terminal A and PCM terminal 35 • Open circuit in wiring between fuel temperature sensor terminal A and PCM terminal 35 • Open circuit in wiring between fuel temperature sensor terminal B and PCM terminal 91 • PCM malfunction



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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF FUEL TEMPERATURE SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between fuel temperature sensor terminal A and body GND. • Is voltage below 1.0 V?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 7.
4	**INSPECT FUEL TEMPERATURE SENSOR** • Inspect fuel temperature sensor. (See F2–77 FUEL TEMPERATURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 7. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT FUEL TEMPERATURE SENSOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Fuel temperature sensor terminal A and PCM terminal 35. — Fuel temperature sensor terminal B and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0183 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0191

A6E407001082221

DTC P0191	Fuel pressure sensor circuit performance problem
DETECTION CONDITION	• PCM monitors fuel pressure in common rail from fuel pressure sensor while engine is running. PCM calculates difference between actual fuel pressure and target fuel pressure. If pressure difference exceeds preprogrammed criteria, PCM determines fuel pressure sensor circuit performance problem.
POSSIBLE CAUSE	• Fuel pressure sensor malfunction • Suction control valve malfunction • Clogged fuel line • PCM malfunction

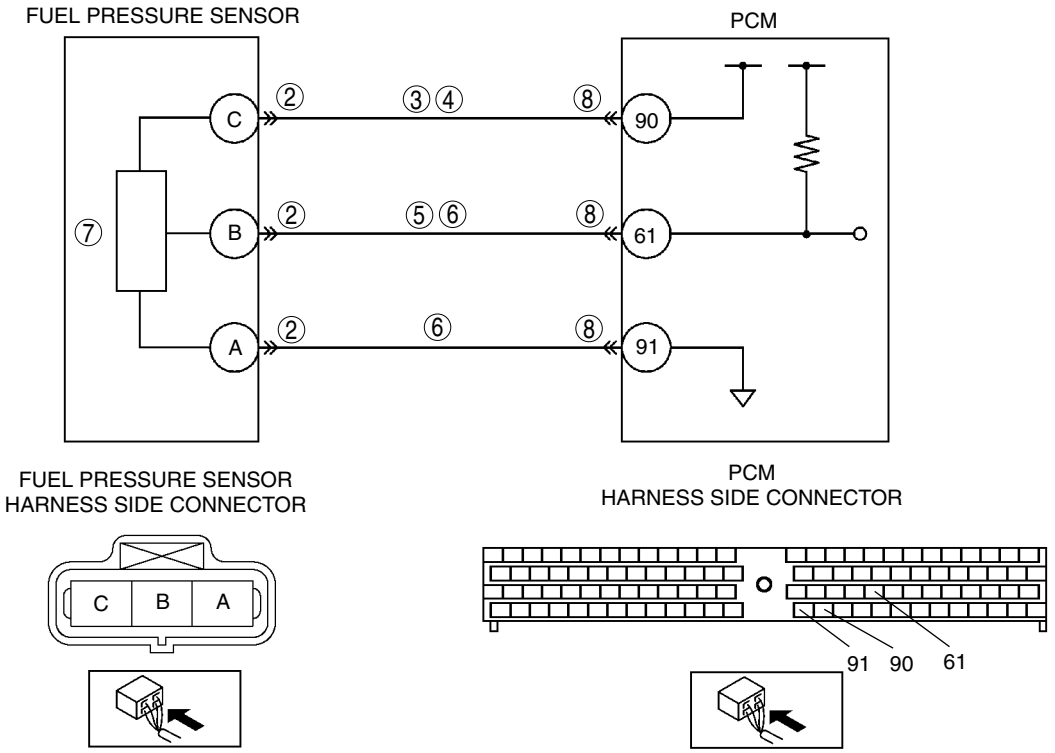
Diagnostic procedure

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** • Turn engine switch to OFF. • Start engine. • Have P0091, P0092, P0192, P0193 been detected?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Go to next step.
3	**INSPECT FUEL PRESSURE SENSOR** • Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace common rail, go to Step 6. (See F2–53 SUPPLY PUMP REMOVAL/INSTALLATION)
		No	Go to next step.
4	**INSPECT SUCTION CONTROL VALVE** • Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 6. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
5	**INSPECT FUEL LINE** • Turn engine switch to OFF. • Inspect for clogs in following fuel lines for each cylinder: — Common rail and fuel injector. — Common rail and fuel tank. • Is there any malfunction?	Yes	Repair or replace suspected fuel line, go to next step.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0016 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0192

A6E407001082222

DTC P0192	Fuel pressure sensor circuit low input
DETECTION CONDITION	• PCM monitors input voltage from fuel pressure sensor while engine is running. If input voltage from fuel pressure sensor is **below 0.4 V**, PCM determines fuel pressure sensor circuit low input.
POSSIBLE CAUSE	• Fuel pressure sensor malfunction • Connector or terminal malfunction • Short to GND in wiring between fuel pressure sensor terminal C and PCM terminal 90 • Open circuit in wiring between fuel pressure sensor terminal C and PCM terminal 90 • Short to GND in wiring between fuel pressure sensor terminal B and PCM terminal 61 • Fuel pressure sensor signal and GND circuits short each other • PCM malfunction



Diagnostic procedure

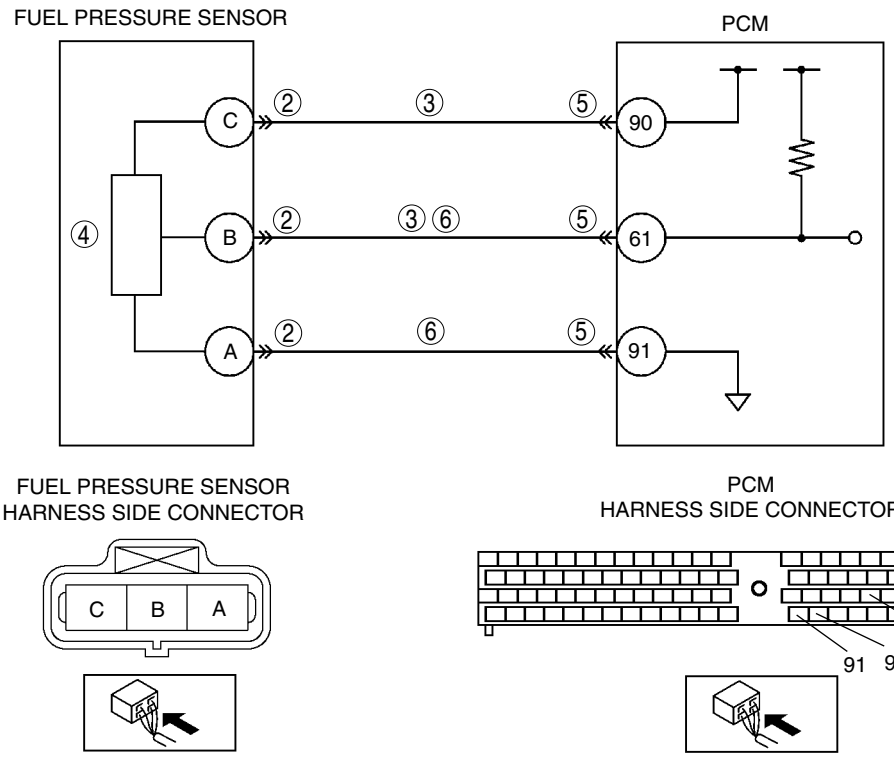
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF FUEL PRESSURE SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
3	**INSPECT FUEL PRESSURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between fuel pressure sensor terminal C and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
4	**INSPECT FUEL PRESSURE SENSOR POWER CIRCUIT FOR OPEN** • Turn engine switch to ON. (Engine OFF) • Inspect voltage at fuel pressure sensor terminal C (harness side). • Is voltage **below 1.0 V**?	Yes	Repair or replace harness for open, go to Step 9.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT FUEL PRESSURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between fuel pressure sensor terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
6	**INSPECT FUEL PRESSURE SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between fuel pressure sensor terminals B and A. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 9.
		No	Go to next step.
7	**INSPECT FUEL TEMPERATURE SENSOR** • Inspect fuel temperature sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 9. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.
8	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0192 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0193

A6E407001082223

DTC P0193	Fuel pressure sensor circuit high input
DETECTION CONDITION	• PCM monitors input voltage from fuel pressure sensor while engine is running. If input voltage from fuel pressure sensor is **above 4.8 V**, PCM determines fuel pressure sensor circuit high input.
POSSIBLE CAUSE	• Fuel pressure sensor malfunction • Connector or terminal malfunction • Fuel pressure sensor power and signal circuits short each other • Open circuit in wiring between fuel pressure sensor terminal B and PCM terminal 61 • Open circuit in wiring between fuel pressure sensor terminal A and PCM terminal 91 • PCM malfunction



Diagnostic procedure

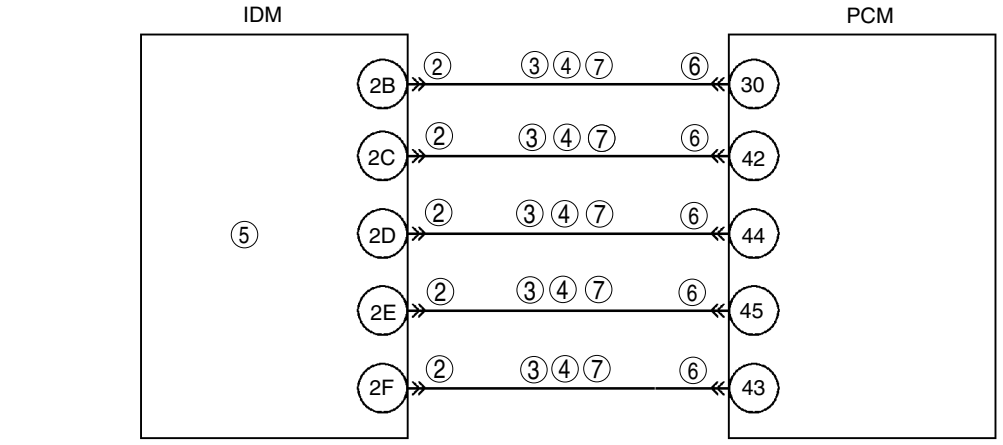
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF FUEL PRESSURE SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT FUEL PRESSURE SENSOR CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between fuel pressure sensor terminals C and B • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
4	**INSPECT FUEL TEMPERATURE SENSOR** • Inspect fuel temperature sensor. (See F2–77 FUEL TEMPERATURE SENSOR INSPECTION) • Is there any malfunction?	Yes	Repair supply pump, go to Step 7. (See F2–54 SUPPLY PUMP INSPECTION)
		No	Go to next step.

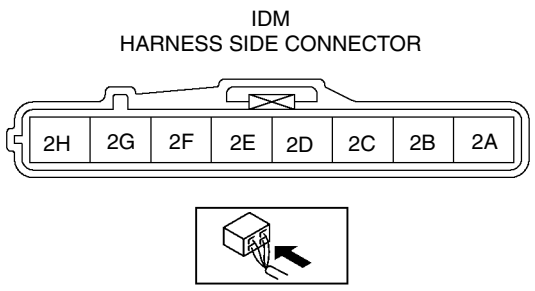
STEP	INSPECTION		ACTION
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT FUEL PRESSURE SENSOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Fuel pressure sensor terminal B and PCM terminal 61. — Fuel pressure sensor terminal A and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0193 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

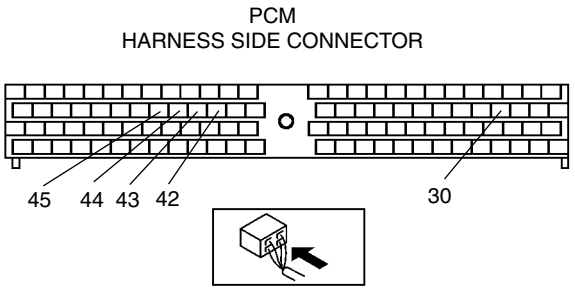
DTC P0200

A6E407001082224

DTC P0200	Fuel injector circuit malfunction
DETECTION CONDITION	• PCM monitors injection confirmation signal from IDM while engine is running. If injection confirmation signal is not input normally, PCM determines fuel injector circuit malfunction.
POSSIBLE CAUSE	• IDM • Connector or terminal malfunction • Short to GND in wiring between IDM terminal 2B and PCM terminal 30 • Short to GND in wiring between IDM terminal 2C and PCM terminal 42 • Short to GND in wiring between IDM terminal 2D and PCM terminal 44 • Short to GND in wiring between IDM terminal 2E and PCM terminal 45 • Short to GND in wiring between IDM terminal 2F and PCM terminal 43 • Short to power circuit in wiring between IDM terminal 2B and PCM terminal 30 • Short to power circuit in wiring between IDM terminal 2C and PCM terminal 42 • Short to power circuit in wiring between IDM terminal 2D and PCM terminal 44 • Short to power circuit in wiring between IDM terminal 2E and PCM terminal 45 • Short to power circuit in wiring between IDM terminal 2F and PCM terminal 43 • Open circuit in wiring between IDM terminal 2B and PCM terminal 30 • Open circuit in wiring between IDM terminal 2C and PCM terminal 42 • Open circuit in wiring between IDM terminal 2D and PCM terminal 44 • Open circuit in wiring between IDM terminal 2E and PCM terminal 45 • Open circuit in wiring between IDM terminal 2F and PCM terminal 43 • PCM malfunction







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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** • Turn engine switch to OFF. • Start engine. • Has P0300 been detected?	Yes	Go to DTC P0300 inspection. (See F2–136 DTC P0300)
		No	Go to next step.

STEP	INSPECTION		ACTION
3	**INSPECT POOR CONNECTION OF IDM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
4	**INSPECT IDM CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — IDM terminal 2B and body GND. — IDM terminal 2C and body GND. — IDM terminal 2D and body GND. — IDM terminal 2E and body GND. — IDM terminal 2F and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
5	**INSPECT IDM CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between following harnesses: — IDM terminal 2B and body GND. — IDM terminal 2C and body GND. — IDM terminal 2D and body GND. — IDM terminal 2E and body GND. — IDM terminal 2F and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 9.
6	**INSPECT IDM** • Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) • Is there any malfunction?	Yes	Replace IDM, go to Step 9.
		No	Go to next step.
7	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
8	**INSPECT IDM CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — IDM terminal 2B and PCM terminal 30. — IDM terminal 2C and PCM terminal 42. — IDM terminal 2D and PCM terminal 44. — IDM terminal 2E and PCM terminal 45. — IDM terminal 2F and PCM terminal 43. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0200 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0221

A6E407001082225

DTC P0221	Accelerator position sensor No.2 circuit performance problem
DETECTION CONDITION	• PCM monitors input voltage from accelerator position sensor No.1 and accelerator position sensor No.2 while engine is running. If voltage difference exceeds **0.9 V**, PCM determines accelerator position sensor No.2 circuit performance problem.
POSSIBLE CAUSE	• Accelerator position sensor malfunction • Connector or terminal malfunction • Accelerator position sensor misadjustment • PCM malfunction

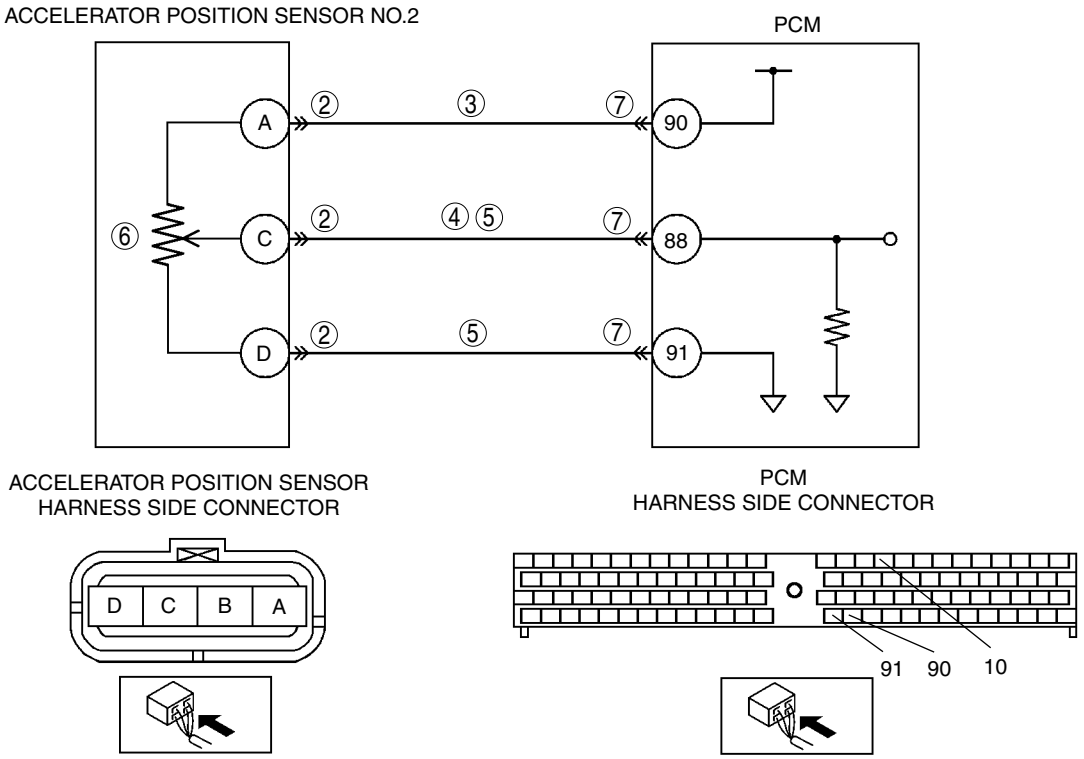
Diagnostic procedure

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF ACCELERATOR POSITION SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 5.
		No	Go to next step.
3	**INSPECT ACCELERATOR POSITION SENSOR** • Turn engine switch to OFF. • Inspect accelerator position sensor. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) • Is there any malfunction?	Yes	Adjust or replace accelerator position sensor, go to Step 5. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.
4	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0221 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0222

A6E407001082226

DTC P0222	Accelerator position sensor No.2 circuit low input
DETECTION CONDITION	• PCM monitors input voltage from accelerator position sensor No.2 while engine is running. If input voltage from accelerator position sensor No.2 is **below 0.3 V**, PCM determines accelerator position sensor No.2 circuit low input.
POSSIBLE CAUSE	• Accelerator position sensor No.2 malfunction • Connector or terminal malfunction • Open circuit in wiring between accelerator position sensor terminal A and PCM terminal 90 • Short to GND in wiring between accelerator position sensor terminal C and PCM terminal 88 • Accelerator position sensor No.2 signal and GND circuits short each other • PCM malfunction



Diagnostic procedure

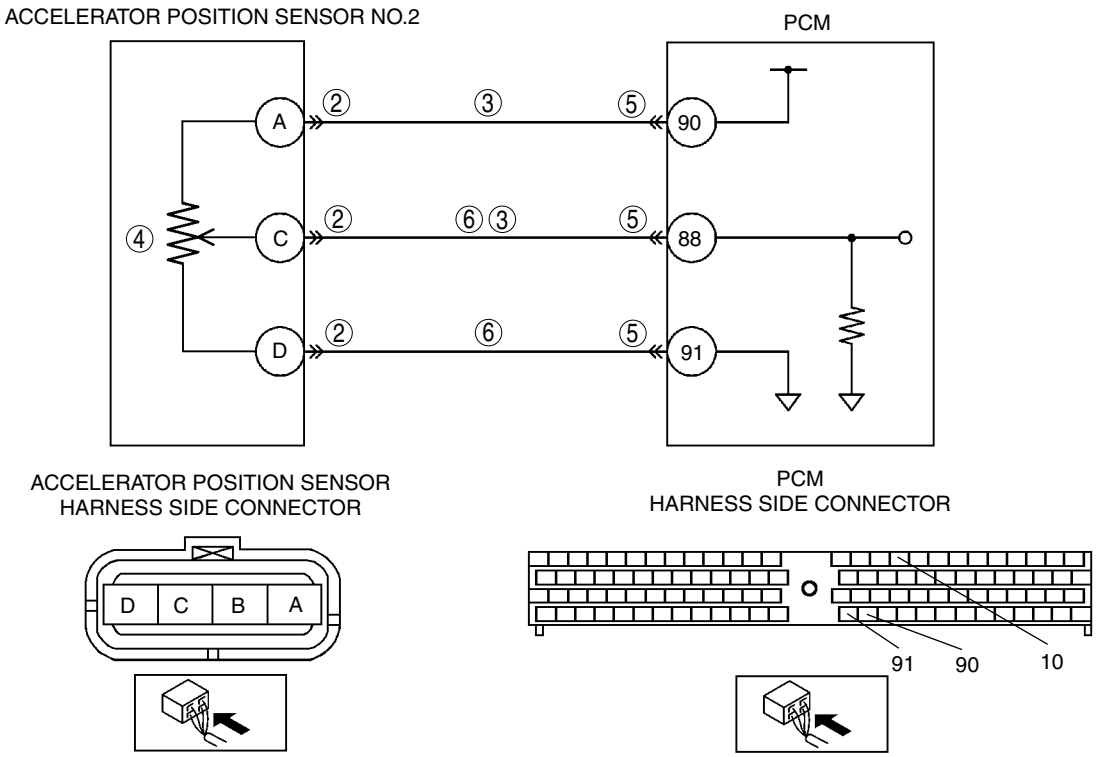
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF ACCELERATOR POSITION SENSOR NO.2 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 8.
		No	Go to next step.
3	**INSPECT ACCELERATOR POSITION SENSOR NO.2 POWER CIRCUIT FOR OPEN** • Turn engine switch to ON. (Engine OFF). • Inspect voltage at accelerator position sensor terminal A (harness side). • Is voltage **below 1.0 V**?	Yes	Repair or replace harness for open, go to Step 8.
		No	Go to next step.
4	**INSPECT ACCELERATOR POSITION SENSOR NO.2 SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between accelerator position sensor terminal C and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 8.
		No	Go to next step.
5	**INSPECT ACCELERATOR POSITION SENSOR NO.2 CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between accelerator position sensor terminals C and D. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 8.
		No	Go to next step.
6	**INSPECT ACCELERATOR POSITION SENSOR NO.2** • Inspect accelerator position sensor No.2. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace accelerator position sensor, go to Step 8. (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.
7	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0222 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0223

A6E407001082227

DTC P0223	Accelerator position sensor No.2 circuit high input
DETECTION CONDITION	• PCM monitors input voltage from accelerator position sensor No.2 while engine is running. If input voltage from accelerator position sensor No.2 is **above 4.7 V**, PCM determines accelerator position sensor No.2 circuit high input.
POSSIBLE CAUSE	• Accelerator position sensor No.2 malfunction • Connector or terminal malfunction • Accelerator position sensor No.2 power and signal circuits short each other • Open circuit in wiring between accelerator position sensor terminal C and PCM terminal 88 • Open circuit in wiring between accelerator position sensor terminal D and PCM terminal 91 • PCM malfunction



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF ACCELERATOR POSITION SENSOR NO.2 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT ACCELERATOR POSITION SENSOR NO.2 CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between accelerator position sensor terminals A and C • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
4	**INSPECT ACCELERATOR POSITION SENSOR NO.2** • Inspect accelerator position sensor No.2. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace accelerator position sensor, go to Step 7. (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT ACCELERATOR POSITION SENSOR NO.2 CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Accelerator position sensor terminal C and PCM terminal 88. — Accelerator position sensor terminal D and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to Step 7.
7	**VERIFY TROUBLESHOOTING OF DTC P0223 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0300

A6E407001082228

DTC P0300	Random misfire detection
DETECTION CONDITION	• PCM monitors CKP sensor input signal interval time. PCM calculates change of interval time for each cylinder. If the interval time exceeds preprogrammed criteria, PCM determines random misfire detection.
POSSIBLE CAUSE	• Fuel leakage or clogged in fuel line • Fuel injector malfunction • CKP sensor malfunction • CMP sensor malfunction • Inadequate engine compression • PCM malfunction

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**FOLLOW OTHER DETECTED DTC FIRST** • Turn engine switch to OFF. • Start engine. • Has P0200 been detected?	Yes	Go to DTC P0200 inspection. (See F2–129 DTC P0200)
		No	Go to next step.
3	**INSPECT FUEL LINE** • Turn engine switch to OFF. • Inspect for fuel leakage or clogs in following fuel lines for each cylinder: — Common rail and fuel injector. — Fuel injector and fuel tank. • Is there any malfunction?	Yes	Repair or replace suspected fuel line, go to Step 8.
		No	Go to next step.
4	**INSPECT FUEL INJECTOR** • Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) • Is there any malfunction?	Yes	Replace fuel injector, go to Step 8. (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT CKP SENSOR** • Inspect CKP sensor. (See F2–82 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CKP sensor, go to Step 8. (See F2–81 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
6	**INSPECT CMP SENSOR** • Inspect CMP sensor. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CMP sensor, go to Step 8. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
7	**INSPECT ENGINE COMPRESSION** • Inspect engine compression. (See B2–8 COMPRESSION INSPECTION) • Is there any malfunction?	Yes	Implement engine overhaul for repairs, go to next step.
		No	Go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0300 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0336

A6E407001082229

DTC P0336	CKP sensor circuit performance problem
DETECTION CONDITION	• PCM monitors input signal from CKP sensor while engine is running. If input signal from CKP sensor is not proper pulse number, PCM determines CKP sensor circuit performance problem.
POSSIBLE CAUSE	• CKP sensor malfunction • Connector or terminal malfunction • PCM malfunction

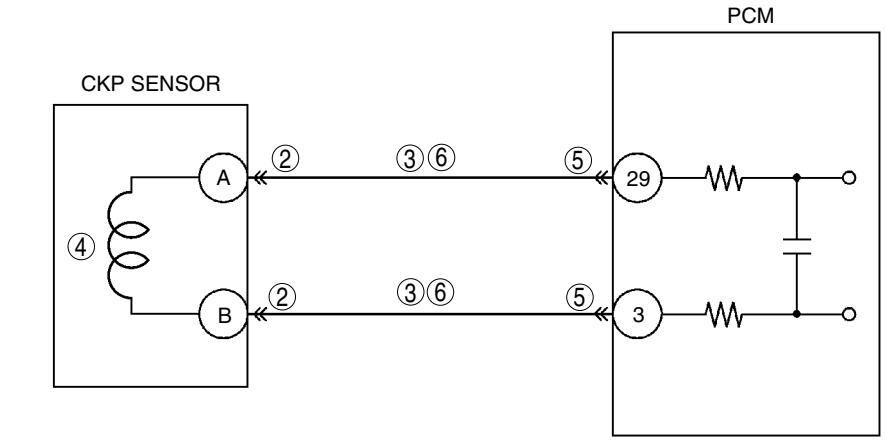
Diagnostic procedure

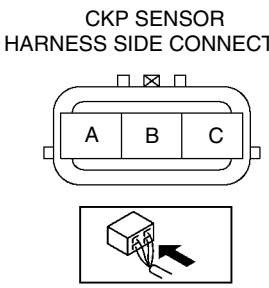
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P0336 DETECTED AGAIN** • 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”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT POOR CONNECTION OF CKP SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
4	**INSPECT CKP SENSOR** • Inspect CKP sensor. (See F2–82 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CKP sensor, go to Step 6. (See F2–81 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0336 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

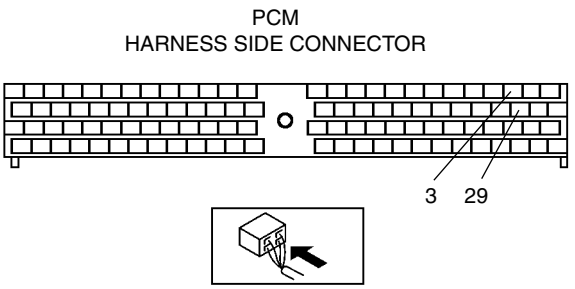
DTC P0337

A6E407001082230

DTC P0337	CKP sensor circuit low input
DETECTION CONDITION	• PCM monitors input signal from CKP sensor while engine is running. If input signal from CKP sensor is not input at **12 crankshaft revolutions**, PCM determines CKP sensor circuit low input.
POSSIBLE CAUSE	• CKP sensor malfunction • Connector or terminal malfunction • Short to GND in wiring between CKP sensor terminal A and PCM terminal 29 • Short to GND in wiring between CKP sensor terminal B and PCM terminal 3 • Open circuit in wiring between CKP sensor terminal A and PCM terminal 29 • Open circuit in wiring between CKP sensor terminal B and PCM terminal 3 • PCM malfunction







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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF CKP SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT CKP SENSOR CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — CKP sensor terminal A and body GND. — CKP sensor terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.
4	**INSPECT CKP SENSOR** • Inspect CKP sensor. (See F2–82 CRANKSHAFT POSITION (CKP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CKP sensor, go to Step 7. (See F2–81 CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT CKP SENSOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — CKP sensor terminal A and PCM terminal 29. — CKP sensor terminal B and PCM terminal 3. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0337 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0341

A6E407001082231

DTC P0341	CMP sensor circuit performance problem
DETECTION CONDITION	• PCM monitors input signal from CMP sensor while engine is running. If input signal from CMP sensor is not proper pulse number, PCM determines CMP sensor circuit performance problem.
POSSIBLE CAUSE	• CMP sensor malfunction • Connector or terminal malfunction • PCM malfunction

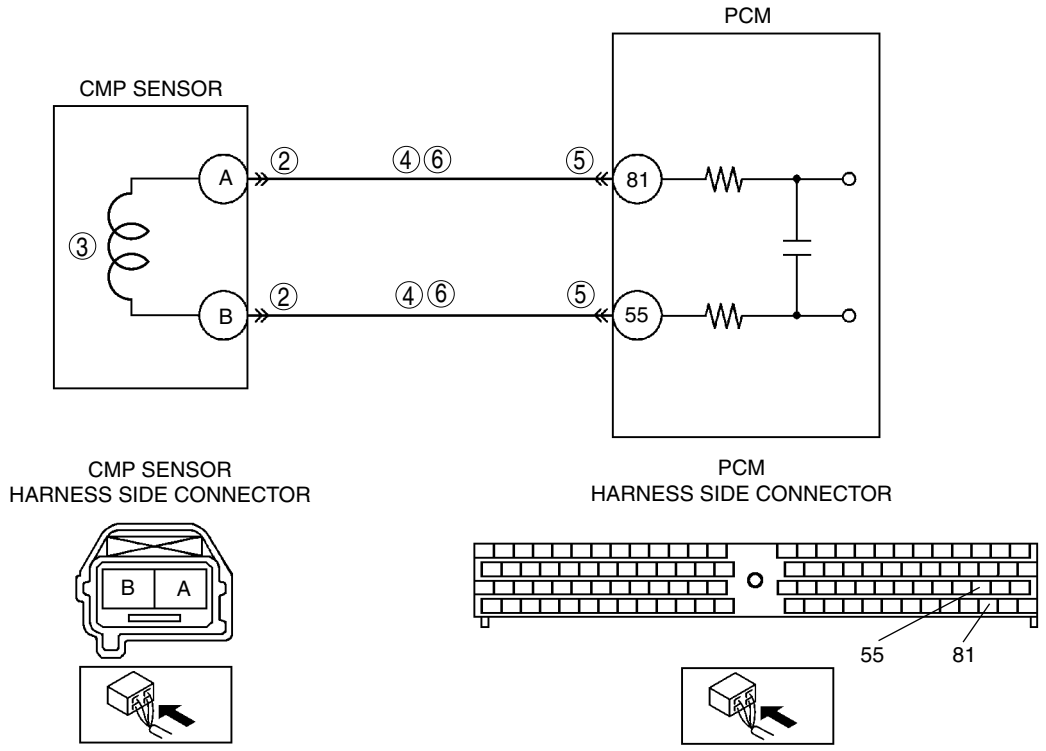
Diagnostic procedure

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**VERIFY DTC P0341 DETECTED AGAIN** • 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”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
3	**INSPECT POOR CONNECTION OF CMP SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
4	**INSPECT CMP SENSOR** • Inspect CMP sensor. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CMP sensor, go to Step 6. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0341 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0342

A6E407001082232

DTC P0342	CMP sensor circuit low input
DETECTION CONDITION	• PCM monitors input signal from CMP sensor while engine is running. If input signal from CMP sensor is not input at **12 crankshaft revolutions**, PCM determines CMP sensor circuit low input.
POSSIBLE CAUSE	• CMP sensor malfunction • Connector or terminal malfunction • Short to GND in wiring between CMP sensor terminal A and PCM terminal 81 • Short to GND in wiring between CMP sensor terminal B and PCM terminal 55 • Open circuit in wiring between CMP sensor terminal A and PCM terminal 81 • Open circuit in wiring between CMP sensor terminal B and PCM terminal 55 • PCM malfunction



Diagnostic procedure

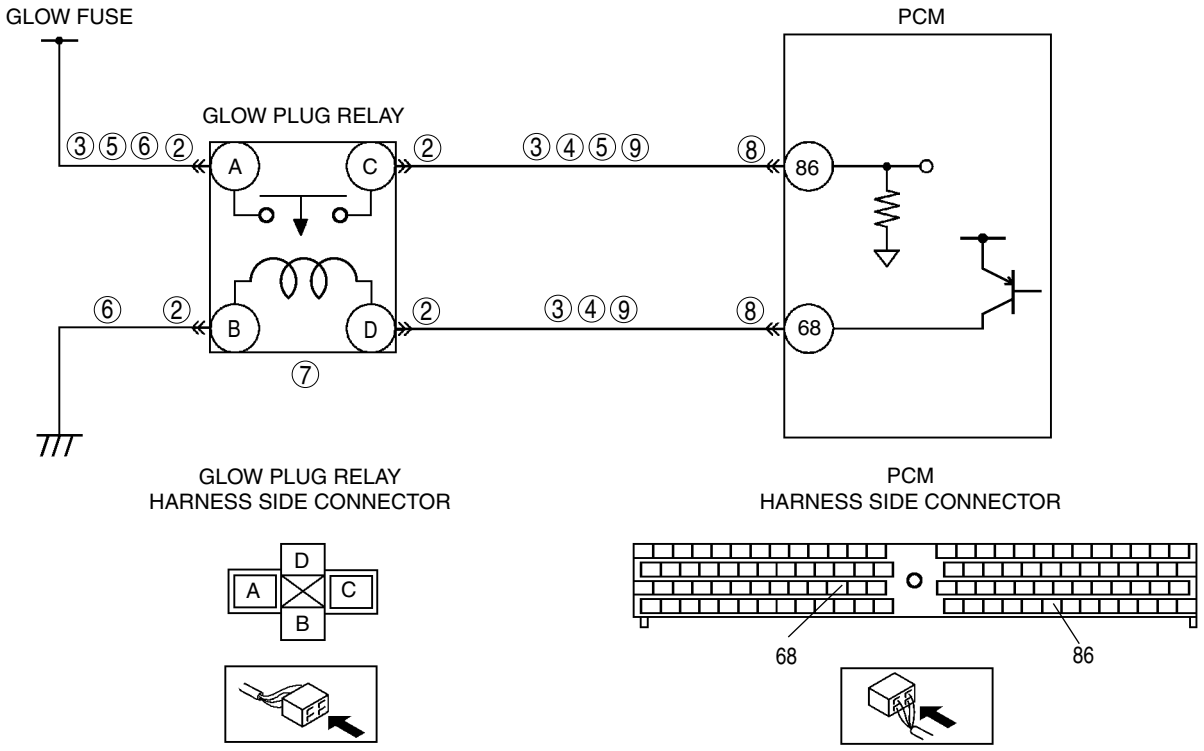
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF CMP SENSOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT CMP SENSOR CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — CMP sensor terminal A and body GND. — CMP sensor terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT CMP SENSOR** • Inspect CMP sensor. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR INSPECTION) • Is there any malfunction?	Yes	Replace CMP sensor, go to Step 7. (See F2–80 CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT CMP SENSOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — CMP sensor terminal A and PCM terminal 81. — CMP sensor terminal B and PCM terminal 55. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0342 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0380

A6E407001082233

DTC P0380	Glow plug relay circuit malfunction
DETECTION CONDITION	• PCM monitors input voltage from glow plug relay while engine is running. PCM determines glow plug relay circuit malfunction if input voltage from glow plug relay is as following: — **1.0 V or below** when glow plug relay is on. — **4.0 V or above** when glow plug relay is off.
POSSIBLE CAUSE	• Glow plug relay malfunction • Connector or terminal malfunction • Short to GND in wiring between glow plug relay terminal D and PCM terminal 68 • Short to GND in wiring between glow plug fuse and glow plug relay terminal A • Short to GND in wiring between glow plug relay terminal C and PCM terminal 86 • Short to power circuit in wiring between glow plug relay terminal D and PCM terminal 68 • Short to power circuit in wiring between glow plug relay terminal C and PCM terminal 86 • Glow plug relay power and signal circuits short each other • Open circuit in wiring between glow plug fuse and glow plug relay terminal A • Open circuit in wiring between glow plug relay terminal B and GND • Open circuit in wiring between glow plug relay terminal D and PCM terminal 68 • Open circuit in wiring between glow plug relay terminal C and PCM terminal 86 • PCM malfunction



Diagnostic procedure

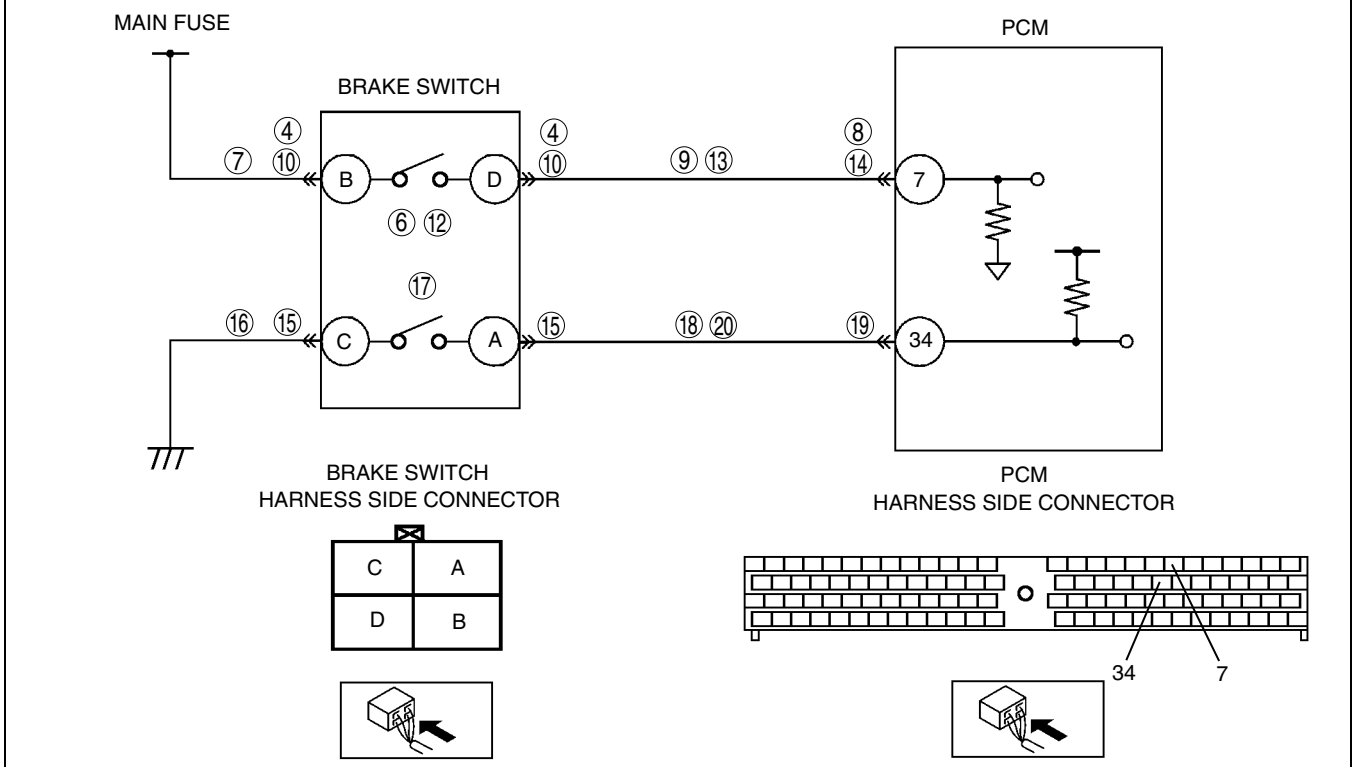
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF GLOW PLUG RELAY CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.

STEP	INSPECTION		ACTION
3	**INSPECT GLOW PLUG RELAY CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Glow plug relay terminal A and body GND. — Glow plug relay terminal C and body GND. — Glow plug relay terminal D and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
4	**INSPECT GLOW PLUG RELAY CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between following harnesses: — Glow plug relay terminal C and body GND. — Glow plug relay terminal D and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 9.
5	**INSPECT GLOW PLUG RELAY CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between glow plug relay terminals A and C. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 7.
		No	Go to next step.
6	**INSPECT GLOW PLUG RELAY CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Glow plug fuse and glow plug relay terminal A. — Glow plug relay terminal B and body GND. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to Step 9.
7	**INSPECT GLOW PLUG RELAY** • Inspect glow plug relay. (See T–19 RELAY INSPECTION) • Is there any malfunction?	Yes	Replace glow plug relay, go to Step 9.
		No	Go to next step.
8	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
9	**INSPECT GLOW PLUG RELAY CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Glow plug relay terminal D and PCM terminal 68. — Glow plug relay terminal C and PCM terminal 86. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0380 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0504

A6E407001082234

DTC P0504	Brake switch signal correlation malfunction
DETECTION CONDITION	• PCM monitors input signal from brake switch 1 and brake switch 2 while engine is running. PCM determines brake switch signal correlation malfunction if input signal from brake switch 1 brake switch 2 is as following: — Brake switch 1 is ON and brake switch 2 is ON. — Brake switch 1 is OFF and brake switch 2 is OFF.
POSSIBLE CAUSE	• Brake switch malfunction • Connector or terminal malfunction • Open circuit in wiring between main fuse and brake switch terminal B • Open circuit in wiring between brake switch terminal D and PCM terminal 7 • Short to power circuit in wiring between brake switch terminal D and PCM terminal 7 • Open circuit in wiring between brake switch terminal C and GND • Short to GND in wiring between brake switch terminal A and PCM terminal 34 • Open circuit in wiring between brake switch terminal A and PCM terminal 34 • PCM malfunction



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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY MALFUNCTION OF BRAKE SWITCH 1 OR BRAKE SWITCH 2** • Turn engine switch to ON (Engine OFF). • Access BOO PID using WDS or equivalent. • Verify that BOO PID is changed according to brake pedal condition. (See F2–65 PCM INSPECTION) • Is BOO PID okay?	Yes	Go to Step 15.
		No	Go to next step.
3	**CLASSIFY HIGH INPUT OR LOW INPUT** • Turn engine switch to ON (Engine OFF). • Access BOO PID using WDS or equivalent. • Verify BOO PID during brake pedal operation. • Is BOO PID always OFF?	Yes	Go to next step.
		No	Go to Step 10.

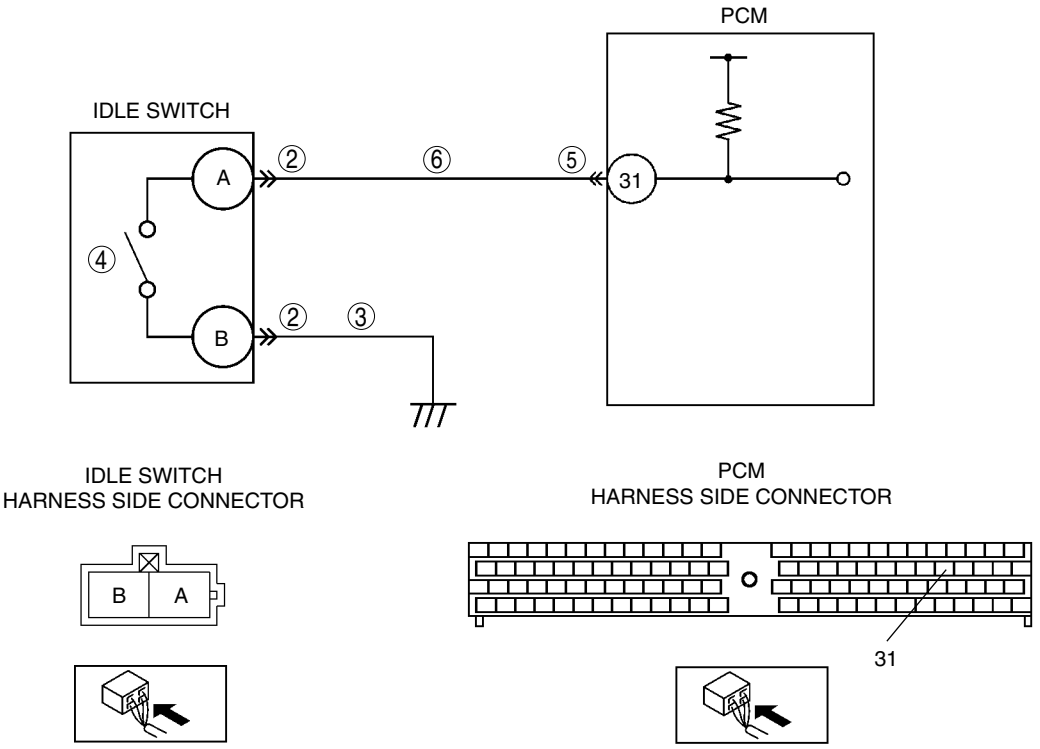
STEP	INSPECTION		ACTION
4	**INSPECT POOR CONNECTION OF BRAKE SWITCH 1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 21.
		No	Go to next step.
5	**CLASSIFY MALFUNCTION OF BRAKE SWITCH 1 OR CIRCUIT** • Connect a jumper wire between brake switch terminals B and D. • Turn engine switch to ON (Engine OFF). • Access BOO PID using WDS or equivalent. • Is BOO PID ON?	Yes	Go to next step.
		No	Go to Step 7.
6	**INSPECT BRAKE SWITCH 1** • Inspect brake switch 1. • Is there any malfunction?	Yes	Replace brake switch, go to Step 21.
		No	Go to Step 21.
7	**INSPECT BRAKE SWITCH 1 POWER CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between main fuse and brake switch terminal B. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to Step 21.
8	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 21.
		No	Go to next step.
9	**INSPECT BRAKE SWITCH 1 SIGNAL CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between brake switch terminal D and PCM terminal 7. • Is there continuity?	Yes	Go to Step 21.
		No	Repair or replace harness for open, go to Step 21.
10	**INSPECT POOR CONNECTION OF BRAKE SWITCH 1 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 21.
		No	Go to next step.
11	**CLASSIFY MALFUNCTION OF BRAKE SWITCH 1 OR CIRCUIT** • Turn engine switch to ON (Engine OFF). • Access BOO PID using WDS or equivalent. • Verify that BOO PID changes from ON to OFF when brake switch connector disconnected. • Does BOO PID change from ON to OFF?	Yes	Go to next step.
		No	Go to Step 13.
12	**INSPECT BRAKE SWITCH 1** • Inspect brake switch 1. • Is there any malfunction?	Yes	Replace brake switch, go to Step 21.
		No	Go to Step 21.
13	**INSPECT BRAKE SWITCH 1 SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between brake switch terminal D and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 21.

STEP	INSPECTION		ACTION
14	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 21.
		No	Go to Step 21.
15	**INSPECT POOR CONNECTION OF BRAKE SWITCH 2 CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 21.
		No	Go to next step.
16	**INSPECT BRAKE SWITCH 2 GND CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between brake switch terminal C and body GND. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to Step 21.
17	**INSPECT BRAKE SWITCH 2** • Inspect brake switch 2. • Is there any malfunction?	Yes	Replace brake switch, go to Step 21.
		No	Go to next step.
18	**INSPECT BRAKE SWITCH 2 SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between brake switch terminal A and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 21.
		No	Go to next step.
19	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 21.
		No	Go to next step.
20	**INSPECT BRAKE SWITCH 2 SIGNAL CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between brake switch terminal A and PCM terminal 34. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
21	**VERIFY TROUBLESHOOTING OF DTC P0504 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
22	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0510

A6E407001082235

DTC P0510	Idle switch circuit malfunction
DETECTION CONDITION	• PCM monitors input voltage from idle switch while engine is running. If input voltage from idle switch is **B+** when accelerator position sensor No.1 voltage is **below 0.7 V**, PCM determines idle switch circuit malfunction.
POSSIBLE CAUSE	• Idle switch malfunction • Connector or terminal malfunction • Open circuit in wiring between idle switch terminal B and GND • Open circuit in wiring between idle switch terminal A and PCM terminal 31 • PCM malfunction



Diagnostic procedure

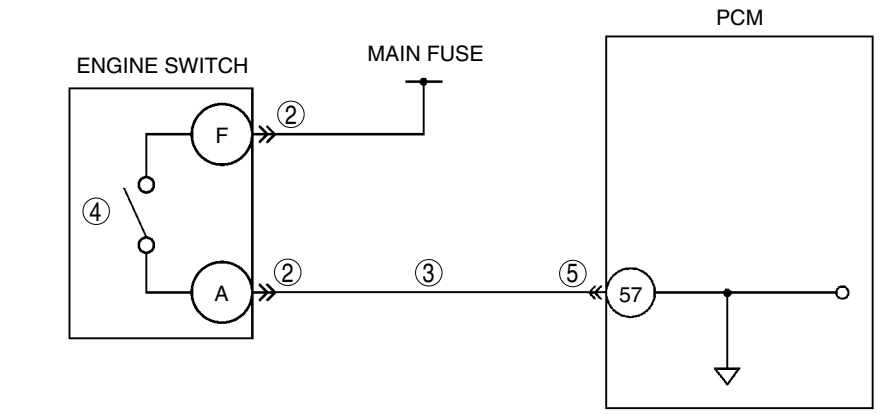
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.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

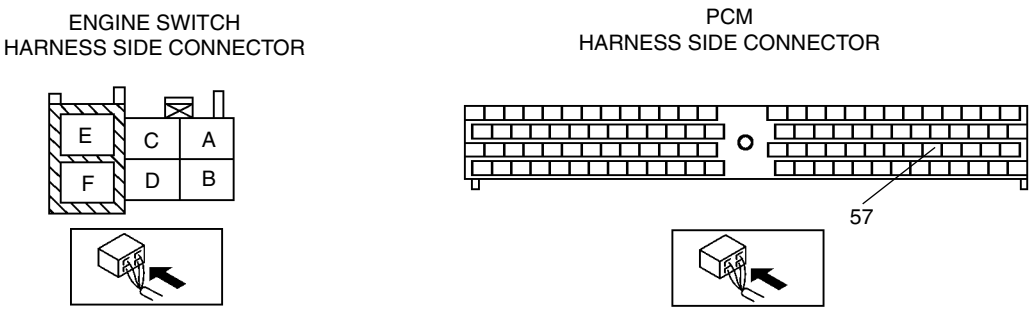
STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF IDLE SWITCH CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT IDLE SWITCH GND CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between idle switch terminal B and body GND. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to Step 7.
4	**INSPECT IDLE SWITCH** • Inspect idle switch. (See F2–70 IDLE SWITCH INSPECTION) • Is there any malfunction?	Yes	Replace idle switch, go to Step 7. (See F2–44 ACCELERATOR PEDAL COMPONENT DISASSEMBLY/ASSEMBLY)
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT IDLE SWITCH SIGNAL CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between idle switch terminal A and PCM terminal 31. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0510 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0512

A6E407001082236

DTC P0512	Engine switch circuit malfunction
DETECTION CONDITION	• PCM monitors input voltage from engine switch while engine is running. If input voltage from engine switch is **B+** when engine speed is **1,200 rpm or above**, PCM determines engine switch circuit malfunction.
POSSIBLE CAUSE	• Engine switch malfunction • Connector or terminal malfunction • Short to power circuit in wiring between engine switch terminal A and PCM terminal 57 • PCM malfunction





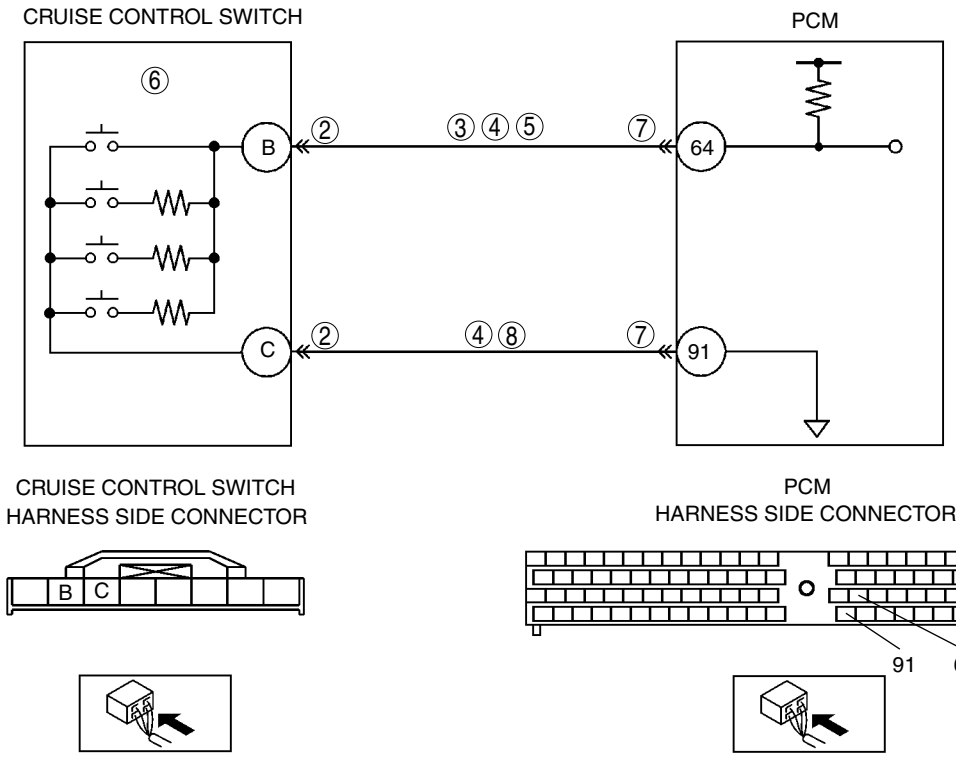
Diagnostic procedure

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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT POOR CONNECTION OF ENGINE SWITCH CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
3	**INSPECT ENGINE SWITCH SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between engine switch terminal A and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 6.
4	**INSPECT ENGINE SWITCH** • Inspect engine switch. • Is there any malfunction?	Yes	Replace engine switch, go to Step 6.
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0512 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0564

A6E407001082237

DTC P0564	Cruise control signal malfunction
DETECTION CONDITION	• PCM monitors input voltage from cruise control switch while engine is running. PCM determines cruise control signal malfunction if input voltage from cruise control switch is as following for **120 s**: — **Below 0.1 V**. — **1.4—1.9 V**. — **3.7—3.9 V**. — **4.5—4.6 V**.
POSSIBLE CAUSE	• Cruise control switch malfunction • Connector or terminal malfunction • Short to GND in wiring between cruise control switch terminal B and PCM terminal 64 • Cruise control switch signal and GND circuits short each other • Open circuit in wiring between cruise control switch terminal B and PCM terminal 64 • Open circuit in wiring between cruise control switch terminal C and PCM terminal 91 • PCM malfunction



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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF CRUISE CONTROL SWITCH CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
3	**INSPECT CRUISE CONTROL SWITCH SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between cruise control switch terminal B and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 9.
		No	Go to next step.
4	**INSPECT CRUISE CONTROL SWITCH CIRCUIT FOR SHORT WITH EACH OTHER** • Turn engine switch to OFF. • Inspect continuity between cruise control switch terminals B and C. • Is there continuity?	Yes	Repair or replace harness for short with each other, go to Step 9.
		No	Go to next step.
5	**INSPECT CRUISE CONTROL SWITCH SIGNAL CIRCUIT FOR OPEN** • Turn engine switch to ON. (Engine OFF) • Inspect voltage at cruise control switch terminal B (harness side). • Is voltage **below 1.0 V**?	Yes	Repair or replace harness for open, go to Step 9.
		No	Go to next step.
6	**INSPECT CRUISE CONTROL SWITCH** • Inspect cruise control switch. • Is there any malfunction?	Yes	Replace cruise control switch, go to Step 9.
		No	Go to next step.
7	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 9.
		No	Go to next step.
8	**INSPECT CRUISE CONTROL SWITCH GND CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between cruise control switch terminal C and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0564 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0602

A6E407001082238

DTC P0602	PCM programming error
DETECTION CONDITION	• No configuration data in PCM **Note** • If “PCM CONFIGURATION” is successful, the PCM stored DTC P0602 and illuminates the MIL (System i s normal). Clear the DTC P0602 using WDS or equivalent after “PCM CONFIGURATION”. • MIL goes off after three drive cycles with no failure (DTCs remain in PCM).
POSSIBLE CAUSE	• Complete configuration has not been completed. • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Perform “PCM Configuration Procedure”, then go to next step. (See F2–68 PCM CONFIGURATION)
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**VERIFY TROUBLESHOOTING OF DTC P0602 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0606

A6E407001082239

DTC P0606	PCM malfunction
DETECTION CONDITION	• PCM does not read DTC from output devices.
POSSIBLE CAUSE	• PCM internal malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	–	–	Replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)

DTC P0610

A6E407001082240

DTC P0610	Control module vehicle options error
DETECTION CONDITION	• PCM data configuration error
POSSIBLE CAUSE	• Configuration procedure has not been completed • PCM malfunction

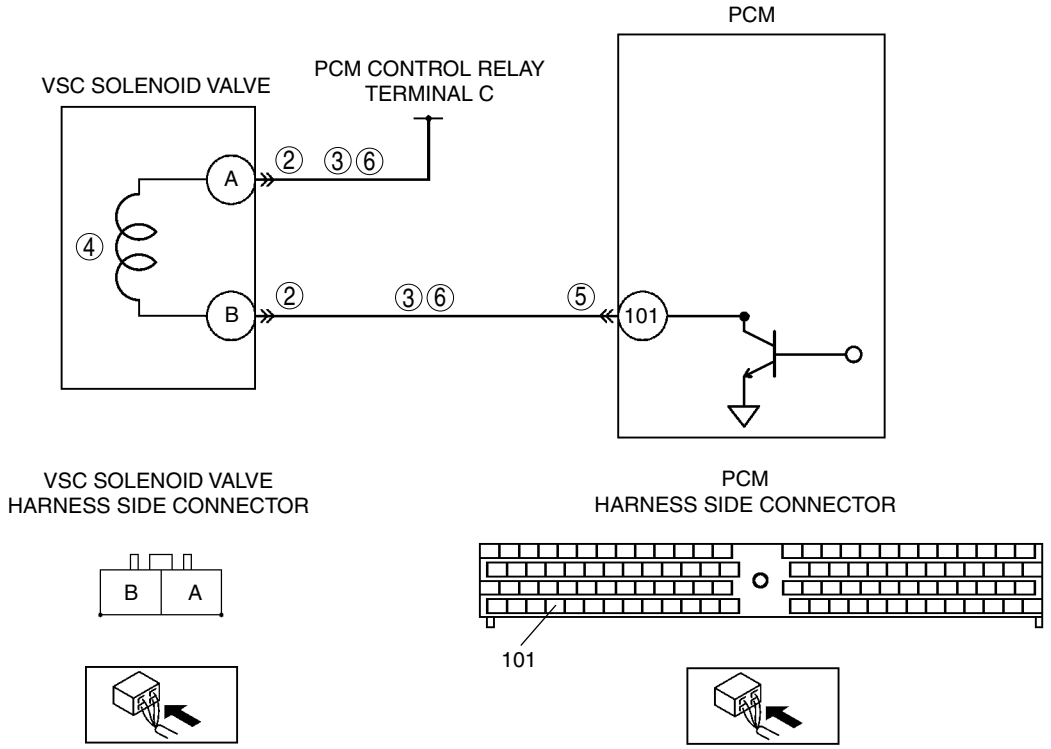
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Perform “PCM Configuration Procedure”, then go to next step. (See F2–68 PCM CONFIGURATION)
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**VERIFY TROUBLESHOOTING OF DTC P0610 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–86 KOEO/KOER SELF-TEST PROCEDURE) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0661

A6E407001082241

DTC P0661	VSC solenoid valve circuit low input
DETECTION CONDITION	• PCM monitors input voltage from VSC solenoid valve while engine is running. If input voltage from VSC solenoid valve is **below 0.1 V**, PCM determines suction control valve circuit low input.
POSSIBLE CAUSE	• VSC solenoid valve malfunction • Connector or terminal malfunction • Short to GND in wiring between VSC solenoid valve terminal A and PCM control relay terminal C • Short to GND in wiring between VSC solenoid valve terminal B and PCM terminal 101 • Open circuit in wiring between VSC solenoid valve terminal PCM control relay terminal C • Open circuit in wiring between VSC solenoid valve terminal B and PCM terminal 101 • PCM malfunction



Diagnostic procedure

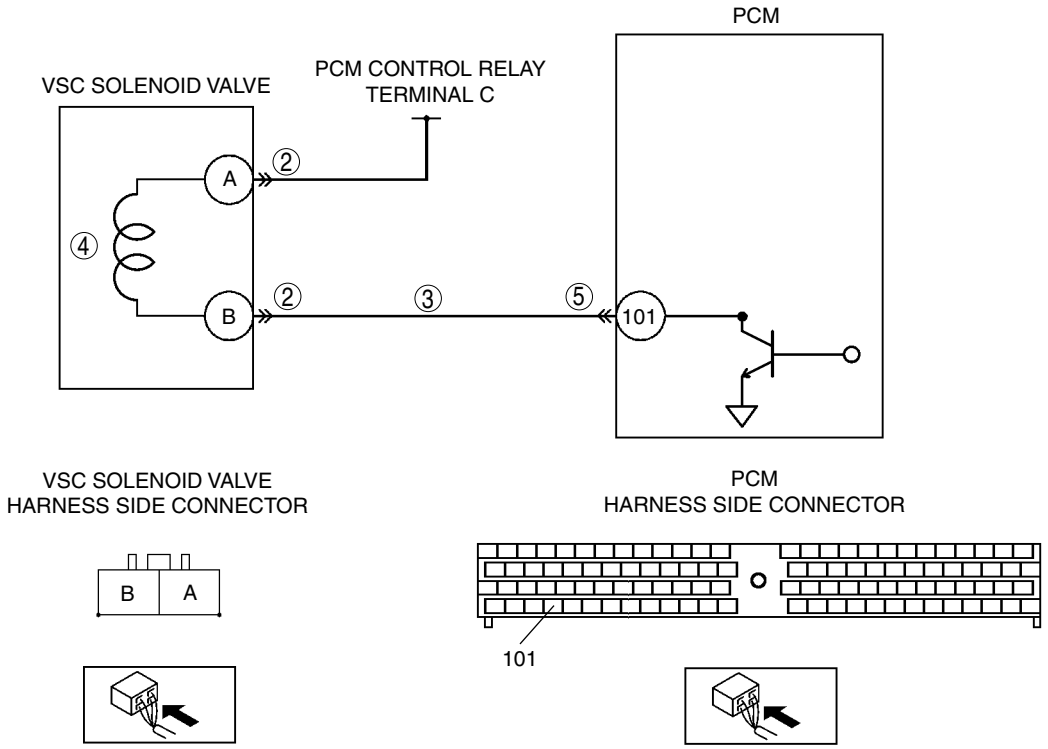
STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF VSC SOLENOID VALVE CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
3	**INSPECT VSC SOLENOID VALVE CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — VSC solenoid valve terminal A and PCM control relay terminal C. — VSC solenoid valve terminal B and PCM terminal 101. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 7.
		No	Go to next step.
4	**INSPECT VSC SOLENOID VALVE** • Inspect VSC solenoid valve. (See F2–42 VARIABLE SWIRL CONTROL (VSC) SOLENOID VALVE INSPECTION) • Is there any malfunction?	Yes	Replace VSC solenoid valve, go to Step 7.
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 7.
		No	Go to next step.
6	**INSPECT VSC SOLENOID VALVE CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — VSC solenoid valve terminal A and PCM control relay terminal C. — VSC solenoid valve terminal B and PCM terminal 101. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
7	**VERIFY TROUBLESHOOTING OF DTC P0661 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0662

A6E407001082242

DTC P0662	**VSC solenoid valve circuit high input**
DETECTION CONDITION	• PCM monitors input voltage from VSC solenoid valve while engine is running. If input voltage from VSC solenoid valve is **above B+**, PCM determines suction control valve circuit high input.
POSSIBLE CAUSE	• VSC solenoid valve malfunction • Connector or terminal malfunction • Short to power circuit in wiring between VSC solenoid valve terminal B and PCM terminal 101 • PCM malfunction



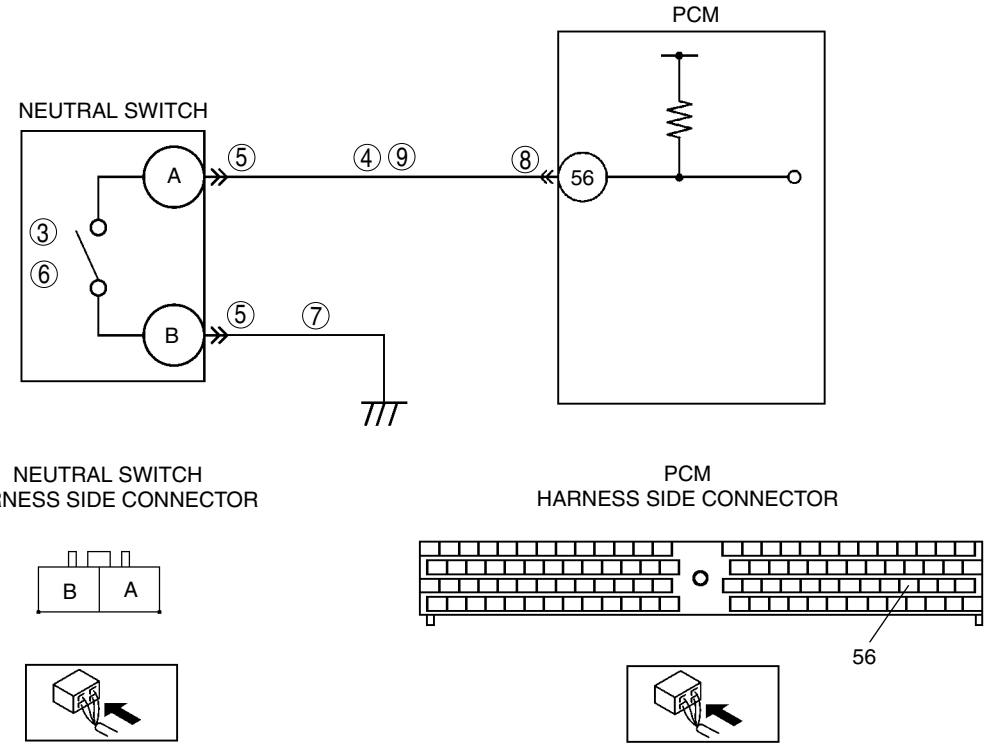
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**INSPECT POOR CONNECTION OF VSC SOLENOID VALVE CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 6.
		No	Go to next step.
3	**INSPECT VSC SOLENOID VALVE CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine switch OFF). • Inspect voltage between VSC solenoid valve terminal B and body GND. • Is voltage **below 1.0 V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 6.
4	**INSPECT VSC SOLENOID VALVE** • Inspect VSC solenoid valve. (See F2–42 VARIABLE SWIRL CONTROL (VSC) SOLENOID VALVE INSPECTION) • Is there any malfunction?	Yes	Replace VSC solenoid valve, go to Step 6.
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to next step.
		No	Go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0662 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P0850

A6E407001082243

DTC P0850	Neutral switch circuit malfunction
DETECTION CONDITION	• PCM monitors input voltage from neutral switch while engine is running. If input voltage from neutral switch does not change when vehicle stops after accelerating to **above 60 km/h {37 mph}** and decelerating to **0 km/h {0 mph}** two times, PCM determines neutral switch circuit malfunction.
POSSIBLE CAUSE	• Neutral switch malfunction • Connector or terminal malfunction • Short to GND in wiring between neutral switch terminal A and PCM terminal 56 • Open circuit in wiring between neutral switch terminal B and GND • Open circuit in wiring between neutral switch terminal A and PCM terminal 56 • PCM malfunction



Diagnostic procedure

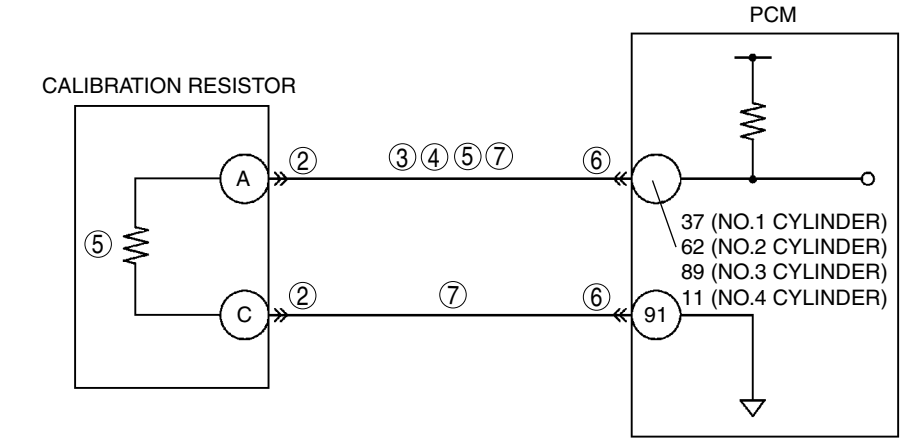
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**CLASSIFY MALFUNCTION OF SHORT TO GND OR OPEN** • Turn engine switch to ON (Engine OFF). • Engage gear. • Access CPP/PNP PID using WDS or equivalent. • Is CPP/PNP PID OFF?	Yes	Go to Step 5.
		No	Go to next step.

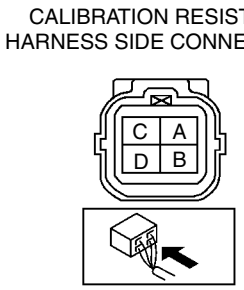
STEP	INSPECTION		ACTION
3	**INSPECT NEUTRAL SWITCH FOR CLOSE STUCK** • Turn engine switch to ON (Engine OFF). • Disconnect neutral switch connector. • Access CPP/PNP PID using WDS or equivalent. • Is CPP/PNP PID OFF?	Yes	Replace neutral switch, go to Step 10.
		No	Go to next step.
4	**INSPECT NEUTRAL SWITCH SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between neutral switch terminal A and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 10.
		No	Go to next step.
5	**INSPECT POOR CONNECTION OF NEUTRAL SWITCH CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 10.
		No	Go to next step.
6	**INSPECT NEUTRAL SWITCH FOR OPEN STUCK** • Turn engine switch to ON (Engine OFF). • Disconnect neutral switch connector. • Connect jumper wire between neutral switch connector terminals. • Access CPP/PNP PID using WDS or equivalent. • Is CPP/PNP PID ON?	Yes	Replace neutral switch, go to Step 10.
		No	Go to next step.
7	**INSPECT NEUTRAL SWITCH GND CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between neutral switch terminal B and body GND. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to Step 10.
8	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 10.
		No	Go to next step.
9	**INSPECT NEUTRAL SWITCH SIGNAL CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between neutral switch terminal A and PCM terminal 56. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
10	**VERIFY TROUBLESHOOTING OF DTC P0850 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
11	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

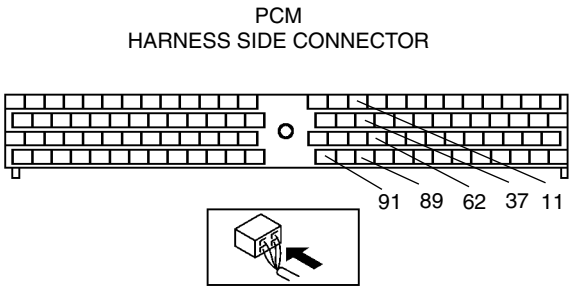
DTC P1190

A6E407001083201

DTC P1190	Calibration resistor circuit malfunction
DETECTION CONDITION	• PCM monitors input voltage from calibration resistor while engine is running. If input voltage from calibration resistor is **below 0.2 V** or **above 4.8 V**, PCM determines calibration resistor circuit malfunction.
POSSIBLE CAUSE	• Calibration resistor malfunction • Connector or terminal malfunction • Short to GND in wiring between calibration resistor terminal A and PCM terminal 37, 62, 89, 11 • Short to power circuit in wiring between calibration resistor terminal A and PCM terminal 37, 62, 89, 11 • Open circuit in wiring between calibration resistor terminal A and PCM terminal 37, 62, 89, 11 • Open circuit in wiring between calibration resistor terminal C and PCM terminal 91 • PCM malfunction







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 Service Information. • If vehicle is not repaired, go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**INSPECT POOR CONNECTION OF CALIBRATION RESISTOR CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 8.
		No	Go to next step.
3	**INSPECT CALIBRATION RESISTOR SIGNAL CIRCUIT FOR SHORT TO GND** • Turn engine switch to OFF. • Inspect continuity between calibration resistor terminal A and body GND. • Is there continuity?	Yes	Repair or replace harness for short to GND, go to Step 8.
		No	Go to next step.
4	**INSPECT CALIBRATION RESISTOR SIGNAL CIRCUIT FOR SHORT TO POWER** • Turn engine switch to ON (Engine OFF). • Inspect voltage between calibration resistor terminal A and body GND. • Is voltage **below 1.0V**?	Yes	Go to next step.
		No	Repair or replace harness for short to power, go to Step 8.
5	**INSPECT CALIBRATION RESISTOR** • Inspect calibration resistor. (See F2–83 CALIBRATION RESISTOR INSPECTION) • Is there any malfunction?	Yes	Replace calibration resistor, go to Step 8.
		No	Go to next step.
6	**INSPECT POOR CONNECTION OF PCM CONNECTOR** • Turn engine switch to OFF. • Inspect for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Is there any malfunction?	Yes	Repair or replace suspected terminal, go to Step 8.
		No	Go to next step.
7	**INSPECT CALIBRATION RESISTOR CIRCUIT FOR OPEN** • Turn engine switch to OFF. • Inspect continuity between following harnesses: — Calibration resistor terminal A and PCM terminal 37, 62, 89, 11. — Calibration resistor terminal C and PCM terminal 91. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open, go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P1190 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from PCM memory using WDS or equivalent. • Start engine. • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P2228

A6W407001082244

DTC P2228	BARO sensor circuit low input
DETECTION CONDITION	• PCM monitors input voltage from BARO sensor while engine is running. If input voltage from BARO sensor is **below 0.7 V**, PCM determines BARO sensor circuit low input.
POSSIBLE CAUSE	• BARO sensor malfunction • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**VERIFY TROUBLESHOOTING OF DTC P2228 COMPLETED** • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–26 KOEO/KOER SELF-TEST) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

DTC P2229

A6E407001082245

DTC P2229	BARO sensor circuit high input
DETECTION CONDITION	• PCM monitors input voltage from BARO sensor while engine is running. If input voltage from BARO sensor is **above 4.5 V**, PCM determines BARO sensor circuit high input.
POSSIBLE CAUSE	• BARO sensor malfunction • PCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**PERFORM DTC CONFIRMATION PROCEDURE** • Perform “DTC Confirmation Procedure”. (See F2–85 DTC CONFIRMATION PROCEDURE) • Is same DTC present during KOEO or KOER self-test?	Yes	Go to next step.
		No	Intermittent concern exists. Go to “Intermittent Concern Troubleshooting”. (See F2–227 INTERMITTENT CONCERN TROUBLESHOOTING)
2	**VERIFY TROUBLESHOOTING OF DTC P2229 COMPLETED** • Clear DTC from PCM memory using WDS or equivalent. • Perform KOEO/KOER self-test. (See F2–26 KOEO/KOER SELF-TEST) • Is same DTC present?	Yes	Replace PCM, go to next step. (See F2–64 PCM REMOVAL/INSTALLATION)
		No	Go to next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See F2–86 AFTER REPAIR PROCEDURE) • Is there any DTC present?	Yes	Go to applicable DTC inspection. (See F2–87 DTC TABLE)
		No	Troubleshooting completed.

TROUBLESHOOTING

SYMPTOM DIAGNOSTIC INDEX

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No.	TROUBLESHOOTING ITEM		DESCRIPTION	PAGE
1	Melting of main or other fuses		—	(See F2–173 NO.1 MELTING OF MAIN OR OTHER FUSES)
2	MIL illuminates		MIL is illuminated incorrectly.	(See F2–174 NO.2 MIL ILLUMINATES)
3	Will not crank		Starter does not work.	(See F2–174 NO.3 WILL NOT CRANK)
4	Hard start/long crank/erratic start/ erratic crank		Starter cranks engine at normal speed but engine requires excessive cranking time before starting.	(See F2–176 NO.4 HARD START/LONG CRANK/ ERRATIC START/ERRATIC CRANK)
5	Engine stalls	After start/at idle	Engine stops unexpectedly at idle and/or after start.	(See F2–178 NO.5 ENGINE STALLS-AFTER START/AT IDLE)
6	Cranks normally but will not start		Starter cranks engine at normal speed but engine will not run.	(See F2–181 NO.6 CRANKS NORMALLY BUT WILL NOT START)
7	Slow return to idle		Engine takes more time than normal to return to idle speed.	(See F2–184 NO.7 SLOW RETURN TO IDLE)
8	Engine runs rough/rolling idle		Engine speed fluctuates between specified idle speed and lower speed and engine shakes excessively.	(See F2–186 NO.8 ENGINE RUNS ROUGH/ROLLING IDLE)
9	Fast idle/runs on		Engine speed continues at fast idle after warm-up. Engine runs after engine switch is turned to OFF.	(See F2–189 NO.9 FAST IDLE/RUNS ON)
10	Low idle/stalls during deceleration		Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.	(See F2–190 NO.10 LOW IDLE/STALLS DURING DECELERATION)
11	Engine stalls/quits	Acceleration/ cruise	Engine stops unexpectedly at beginning of acceleration or during acceleration. Engine stops unexpectedly while cruising.	(See F2–192 NO.11 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/ STUMBLE, SURGES)
	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.	
12	Lack/loss of power	Acceleration/ cruise	Performance is poor under load (e.g. power down when climbing hills).	(See F2–195 NO.12 LACK/ LOSS OF POWER-ACCELERATION/CRUISE)
13	Knocking/pinging		Excessive shrilly knocking sound from engine.	(See F2–199 NO.13 KNOCKING/PINGING)
14	Poor fuel economy		Fuel economy is unsatisfactory.	(See F2–202 NO.14 POOR FUEL ECONOMY)
15	Emissions compliance		Fails emissions test.	(See F2–205 NO.15 EMISSION COMPLIANCE)
16	High oil consumption/leakage		Oil consumption is excessive.	(See F2–209 NO.16 HIGH OIL CONSUMPTION/LEAKAGE)
17	Cooling system concerns	Overheating	Engine runs at higher than normal temperature/overheats.	(See F2–210 NO.17 COOLING SYSTEM CONCERNS-OVERHEATING)

No.	TROUBLESHOOTING ITEM		DESCRIPTION	PAGE
18	Cooling system concerns	Runs cold	Engine does not reach normal operating temperature.	(See F2–212 NO.18 COOLING SYSTEM CONCERNS-RUNS COLD)
19	Excessive black smoke		Excessive black smoke is observed in exhaust gas.	(See F2–213 NO.19 EXCESSIVE BLACK SMOKE)
20	Fuel odor (in engine compartment)		Fuel smell or visible leakage.	(See F2–216 NO.20 FUEL ODOR (IN ENGINE COMPARTMENT)
21	Engine noise		Engine noise from under hood.	(See F2–217 NO.21 ENGINE NOISE)
22	Vibration concerns (engine)		Vibration from under hood or driveline.	(See F2–220 NO.22 VIBRATION CONCERNS (ENGINE)
23	A/C does not work sufficiently		A/C compressor magnetic clutch does not engage when A/C is turned on.	(See F2–222 NO.23 A/C DOES NOT WORK SUFFICIENTLY)
24	A/C always on or A/C compressor runs continuously		A/C compressor magnetic clutch does not disengage.	(See F2–223 NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY)
25	A/C does not cut off under wide open throttle conditions		A/C compressor magnetic clutch does not disengage under wide open throttle.	(See F2–224 NO.25 A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS)
26	Constant voltage		Incorrect Constant voltage.	(See F2–225 NO.26 CONSTANT VOLTAGE)

SYMPTOM QUICK DIAGNOSIS CHART

A6E408018881202

×: Applicable

	Troubleshooting item		Starter motor malfunction (Mechanical or electrical)	Starter circuit including engine switch is open	Improper engine oil level	Low or dead batery	Charging system malfunction	Low engine compression	Improper valve timing	Hydrolocked egine	Improper engine oil viscosity	Improper dipstick	Base engine malfunction	Seized flywheel	Improper tension or damaged drivebelts
1	Melting of main or other fuses														
2	MIL illuminates														
3	Will not crank		×	×		×	×			×				×	
4	Hard start/long crank/erratic start/erratic crank		×	×				×							
5	Engine stalls	After start/at idle						×	×						
6	Cranks normally but will not start							×	×						
7	Slow return to idle														
8	Engine runs rough/rolling idle							×	×						
9	Fast idle/runs on														
10	Low idle/stalls during deceleration							×	×						
11	Engine stalls/quits	Acceleration/cruise						×	×						
	Engine runs rough	Acceleration/cruise						×	×						
	Misses	Acceleration/cruise						×	×						
	Buck/jerk	Acceleration/cruise/ deceleration						×	×						
	Hesitation/stumble	Acceleration						×	×						
	Surges	Acceleration/cruise						×	×						
12	Lack/loss of power	Acceleration/cruise						×	×						
13	Knocking/pinging							×	×						
14	Poor fuel economy							×	×						
15	Emissions compliance							×	×				×		
16	High oil consumption/leakage				×						×	×	×		
17	Cooling system concerns	Overheating											×		×
18	Cooling system concerns	Runs cold													
19	Excessive black smoke												×		
20	Fuel odor (in engine compartment)														
21	Engine noise							×	×				×		×
22	Vibration concerns (engine)														×
23	A/C does not work sufficiently														
24	A/C always on or A/C compressor runs continuously														
25	A/C does not cut off under wide open throttle conditions														
26	Constant voltage														

×: Applicable

	Troubleshooting item		Improper engine coolant level	Water and anti-freeze mixture is improper	Cooling system malfunction (Radiator, hose, over-flow system, thermostat, etc.)	Cooling fan system malfunction	Engine or transaxle mounts are improperly installed	Cooling fan No.1 or No.2 seat are improper	Fuel quality	Engine overheating	Intake-air system clogging or restriction	Air leakage from intake-air system	VSC system malfunction	Vacuum leakage
1	Melting of main or other fuses													
2	MIL illuminates													
3	Will not crank													
4	Hard start/long crank/erratic start/erratic crank								×	×	×			
5	Engine stalls	After start/at idle							×	×	×			
6	Cranks normally but will not start								×		×			
7	Slow return to idle				×									
8	Engine runs rough/rolling idle								×	×	×	×		
9	Fast idle/runs on													×
10	Low idle/stalls during deceleration								×		×			
11	Engine stalls/quits	Acceleration/cruise						×		×	×		×	
	Engine runs rough	Acceleration/cruise						×	×	×	×		×	
	Misses	Acceleration/cruise						×	×	×	×	×	×	
	Buck/jerk	Acceleration/cruise/ deceleration						×	×	×	×	×	×	
	Hesitation/stumble	Acceleration						×	×	×	×	×	×	
	Surges	Acceleration/cruise						×	×	×	×	×	×	
12	Lack/loss of power	Acceleration/cruise						×	×	×	×	×	×	×
13	Knocking/pinging				×				×		×	×	×	
14	Poor fuel economy				×				×		×			×
15	Emissions compliance				×				×	×	×	×	×	×
16	High oil consumption/leakage													
17	Cooling system concerns	Overheating	×	×	×	×								
18	Cooling system concerns	Runs cold			×	×								
19	Excessive black smoke										×	×	×	×
20	Fuel odor (in engine compartment)													
21	Engine noise											×		×
22	Vibration concerns (engine)						×	×						×
23	A/C does not work sufficiently													
24	A/C always on or A/C compressor runs continuously													
25	A/C does not cut off under wide open throttle conditions													
26	Constant voltage													

×: Applicable

	Troubleshooting item		Turbocharger malfunction	Carge air cooler malfunction	VBC system malfunction	Glow system malfunction	Incorrect fuel injection timing	Incorrect idle speed	CKP sensor is damaged (e.g.: open or short circuits)	CKP sensor pulse wheel is damaged	Improper gap between CKP sensor and pulse wheel	Supply pump malfunction	Suction control valve malfunction	Fuel pressure limiter malfunction	Fuel line restriction or clogging
1	Melting of main or other fuses														
2	MIL illuminates				×	×			×				×		
3	Will not crank														
4	Hard start/long crank/erratic start/erratic crank					×	×		×	×	×	×	×	×	×
5	Engine stalls	After start/at idle				×	×		×	×	×	×	×	×	×
6	Cranks normally but will not start					×	×		×	×	×	×	×	×	×
7	Slow return to idle						×	×	×	×	×	×	×	×	
8	Engine runs rough/rolling idle						×	×	×	×	×	×	×	×	×
9	Fast idle/runs on												×		
10	Low idle/stalls during deceleration					×	×	×	×	×	×	×	×	×	×
11	Engine stalls/quits	Acceleration/cruise	×				×		×	×	×	×	×	×	×
	Engine runs rough	Acceleration/cruise	×			×	×	×	×	×	×	×	×	×	×
	Misses	Acceleration/cruise	×			×	×	×	×	×	×	×	×	×	×
	Buck/jerk	Acceleration/cruise/ deceleration	×			×	×	×	×	×	×	×	×	×	×
	Hesitation/stumble	Acceleration	×			×	×	×	×	×	×	×	×	×	×
	Surges	Acceleration/cruise	×			×	×		×	×	×	×	×	×	×
12	Lack/loss of power	Acceleration/cruise	×	×	×		×	×	×	×	×	×	×	×	×
13	Knocking/pinging		×	×	×	×	×		×	×	×		×		×
14	Poor fuel economy		×	×	×		×	×	×	×	×	×			×
15	Emissions compliance		×	×	×	×	×	×	×	×	×	×	×	×	×
16	High oil consumption/leakage		×												
17	Cooling system concerns	Overheating	×												
18	Cooling system concerns	Runs cold													
19	Excessive black smoke		×	×	×		×		×	×	×		×	×	×
20	Fuel odor (in engine compartment)												×	×	
21	Engine noise						×		×	×	×		×		
22	Vibration concerns (engine)														
23	A/C does not work sufficiently														
24	A/C always on or A/C compressor runs continuously														
25	A/C does not cut off under wide open throttle conditions														
26	Constant voltage														

×: Applicable

	Troubleshooting item		Fuel injectors malfunction (Leakage or clogging, inoperative)	Fuel leakage from fuel system (including insulator, fuel injector)	Fuel filter restriction or clogging	CMP sensor is damaged (e.g: open or short circuit)	CMP sensor pulse wheel is damaged	IDM or related circuit malfunction	Exhaust system restriction or clogging	Catalyst converter malfunction	EGR system malfunction	EGR water cooler malfunction	V-reference voltage supply circuit malfunction
1	Melting of main or other fuses												
2	MIL illuminates		×			×							
3	Will not crank												
4	Hard start/long crank/erratic start/erratic crank		×	×	×	×	×	×	×		×		
5	Engine stalls	After start/at idle	×	×	×	×	×	×	×		×		×
6	Cranks normally but will not start		×	×	×	×	×	×			×		×
7	Slow return to idle		×			×	×	×					
8	Engine runs rough/rolling idle		×	×	×	×	×	×			×	×	
9	Fast idle/runs on		×					×					
10	Low idle/stalls during deceleration		×	×	×	×	×	×			×		
11	Engine stalls/quits	Acceleration/cruise	×		×	×	×	×	×		×		
	Engine runs rough	Acceleration/cruise	×		×	×	×	×	×		×		
	Misses	Acceleration/cruise	×		×	×	×	×	×		×		
	Buck/jerk	Acceleration/cruise/ deceleration	×		×	×	×	×	×		×		
	Hesitation/stumble	Acceleration	×		×	×	×	×	×		×		
	Surges	Acceleration/cruise	×		×	×	×	×	×		×		
12	Lack/loss of power	Acceleration/cruise	×		×	×	×	×	×		×		
13	Knocking/pinging					×	×		×		×		
14	Poor fuel economy		×	×	×	×	×		×		×		
15	Emissions compliance		×			×	×	×	×	×	×	×	
16	High oil consumption/leakage												
17	Cooling system concerns	Overheating									×		
18	Cooling system concerns	Runs cold											
19	Excessive black smoke		×					×	×		×		
20	Fuel odor (in engine compartment)			×									
21	Engine noise		×			×	×				×		
22	Vibration concerns (engine)		×			×	×						
23	A/C does not work sufficiently												
24	A/C always on or A/C compressor runs continuously												
25	A/C does not cut off under wide open throttle conditions												
26	Constant voltage												×

×: Applicable

	Troubleshooting item		PCM control relay malfunction	ECT sensor or related circuit malfunction	Neutral switch or related circuit malfunction	MAF/IAT sensor or related circuit malfunction	IAT sensor No.2 or related circuit malfunction	Boost sensor or related circuit malfunction	Accelerator position sensor or related circuit malfunction	Accelerator position sensor misadjustment (including looseness)	Idle switch or related circuit malfunction	Idle switch misadjustment (including looseness)	Fuel pressure sensor or related circuit malfunction	Improper refrigerant charging amount
1	Melting of main or other fuses													
2	MIL illuminates			×	×	×	×	×	×	×	×	×	×	
3	Will not crank													
4	Hard start/long crank/erratic start/erratic crank			×		×			×	×			×	
5	Engine stalls	After start/at idle	×	×		×			×	×			×	×
6	Cranks normally but will not start		×	×									×	
7	Slow return to idle			×	×	×			×	×	×	×	×	
8	Engine runs rough/rolling idle			×	×	×			×	×	×	×	×	×
9	Fast idle/runs on			×						×		×		
10	Low idle/stalls during deceleration			×	×	×			×	×	×	×	×	×
11	Engine stalls/quits	Acceleration/cruise		×		×			×	×	×	×	×	×
	Engine runs rough	Acceleration/cruise		×	×	×			×	×	×	×	×	×
	Misses	Acceleration/cruise		×		×			×	×	×	×	×	×
	Buck/jerk	Acceleration/cruise/ deceleration		×		×	×	×	×	×	×	×	×	×
	Hesitation/stumble	Acceleration		×		×	×	×	×	×	×	×	×	×
	Surges	Acceleration/cruise		×		×	×	×	×	×	×	×	×	×
12	Lack/loss of power	Acceleration/cruise		×		×	×	×	×	×	×	×	×	×
13	Knocking/pinging			×		×	×	×	×				×	
14	Poor fuel economy			×		×	×	×	×			×	×	×
15	Emissions compliance			×	×	×	×	×	×	×	×	×	×	
16	High oil consumption/leakage													
17	Cooling system concerns	Overheating												×
18	Cooling system concerns	Runs cold												
19	Excessive black smoke						×	×					×	
20	Fuel odor (in engine compartment)												×	
21	Engine noise			×		×	×	×	×				×	
22	Vibration concerns (engine)			×		×			×	×	×	×		
23	A/C does not work sufficiently													×
24	A/C always on or A/C compressor runs continuously													
25	A/C does not cut off under wide open throttle conditions								×	×				
26	Constant voltage			×		×	×	×	×				×	

F2

×: Applicable

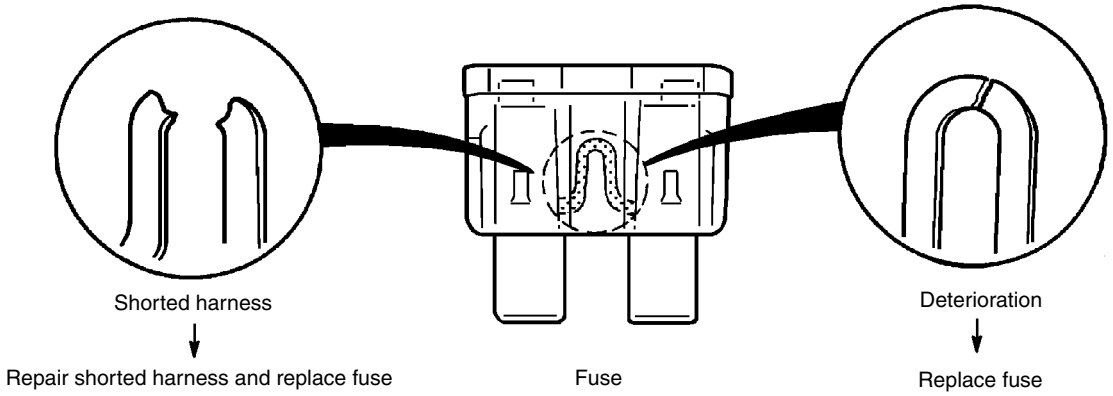
	Troubleshooting item		A/C relay (A/C control siganl) circuit malfunction	A/C magnetic clutch or related circuit malfunction	Cooling fan No.1 system malfunction	Clutch slippage	Air in power steering fuluid line	VSS or related circuit malfunction	Brake dragging	Loose parts	Improper balance of wheel or tires	Driveline malfunction	Suspension malfunction	Immobilizer system and/or circuit malfunction	Coolant heater system malfunction
1	Melting of main or other fuses														
2	MIL illuminates														
3	Will not crank													×	
4	Hard start/long crank/erratic start/erratic crank														
5	Engine stalls	After start/at idle	×	×										×	
6	Cranks normally but will not start													×	
7	Slow return to idle														
8	Engine runs rough/rolling idle		×	×	×										
9	Fast idle/runs on														
10	Low idle/stalls during deceleration		×	×											
11	Engine stalls/quits	Acceleration/cruise	×	×		×		×							
	Engine runs rough	Acceleration/cruise	×	×		×		×							
	Misses	Acceleration/cruise	×	×		×		×							
	Buck/jerk	Acceleration/cruise/ deceleration	×	×		×		×							
	Hesitation/stumble	Acceleration	×	×		×		×							
	Surges	Acceleration/cruise	×	×		×		×							
12	Lack/loss of power	Acceleration/cruise	×	×		×			×						
13	Knocking/pinging														
14	Poor fuel economy		×	×		×		×	×						×
15	Emissions compliance							×							
16	High oil consumption/leakage														
17	Cooling system concerns	Overheating	×	×	×										×
18	Cooling system concerns	Runs cold			×										×
19	Excessive black smoke														
20	Fuel odor (in engine compartment)														
21	Engine noise						×			×					
22	Vibration concerns (engine)									×	×	×	×		
23	A/C does not work sufficiently		×	×											
24	A/C always on or A/C compressor runs continuously		×	×											
25	A/C does not cut off under wide open throttle conditions														
26	Constant voltage														

NO.1 MELTING OF MAIN OR OTHER FUSES

A6E408018881203

1	Melting of main or other fuses

[TROUBLESHOOTING HINTS]
Inspect condition of fuse.



Damaged fuse	Related wiring harness
MAIN	**MAIN fuse** • BTN fuse • FAN fuse • AD FAN fuse • IG KEY 2 fuse
IG KEY 1	**IG KEY 1 fuse** • Engine switch — ENGINE fuse
FUEL PUMP	**FUEL PUMP fuse** • Fuel warmer • PCM control relay
BTN	**BTN fuse** • ROOM fuse
IG KEY 2	**IG KEY 2 fuse** • Engine switch
ROOM	**ROOM fuse** • DLC-2
ENGINE	**ENGINE fuse** • PCM
INJ	**INJ fuse** • PCM • IDM • MAF/IAT sensor • VSC solenoid valve • VBC solenoid valve • EGR control solenoid valve • EGR solenoid valve (vacuum) • EGR solenoid valve (vent) • Intake shutter solenoid valve (half) • Intake shutter solenoid valve (full)
GLOW	**GLOW fuse** • Glow plug relay — Glow plug — GLOW SIG
ENG+B	**ENG+B fuse** • PCM
FAN	**FAN fuse** • Cooling fan relay No.2
AD FAN	**AD FAN fuse** • Cooling fan relay No.1

F2

NO.2 MIL ILLUMINATES

A6E408018881204

2	MIL ILLUMINATES
DESCRIPTION	• MIL illuminates incorrectly.
POSSIBLE CAUSE	• PCM illuminates for emission-related concern (DTC is stored in PCM) • Instrument cluster malfunction **Note** • If MIL blinks at steady rate, misfire condition could possibly exist.

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect WDS or equivalent to DLC-2. 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:** • Inspect instrument cluster operation.
2	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.3 WILL NOT CRANK

A6E408018881205

3	WILL NOT CRANK
DESCRIPTION	• Starter does not work.
POSSIBLE CAUSE	• Open starter circuit between engine switch and starter • Starter malfunction • Seized/hydrolocked engine, flywheel • Immobilizer system (PATS) and/or circuit malfunction (if equipped) • Low or dead battery • Charging system malfunction

Diagnostic procedure

STEP	INSPECTION	RESULTS	ACTION
1	**Note** • The following test should be perform for vehicles with immobilizer system. Go to Step 10 for vehicles without immobilizer system. Connect WDS or equivalent to DLC-2. Do following conditions appear? • Engine is not completely started. • DTC B1681 is displayed.	Yes	**Both conditions appear:** Go to Step 4.
		No	**Either or other condition appears:** Go to next step.
2	Is coil connector securely connected to coil?	Yes	Go to next step.
		No	Connect coil connector securely. Return to Step 1.
3	Does security light illuminate?	Yes	Go to next step.
		No	Inspect instrument cluster and wiring harness.
4	Connect WDS or equivalent to DLC-2 and retrieve DTC. **DTC** **B1213, B1342, B1600, B1601, B1602, B1681, B2103, B2431**	Yes	Go to appropriate DTC test.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
5	Is there continuity between PCM GND terminals 65, 85, 103, 104 and GND?	Yes	Go to next step.
		No	Repair or replace wiring harness.
6	Measure voltage between PCM GND terminals 65, 85, 103, 104 and coil terminal C. Is the voltage **below 1.0?**	Yes	Go to next step.
		No	Repair or replace wiring harness.
7	Turn engine switch to ON. Access VPWR PID. Is VPWR PID okay? **Specification** **Battery voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
8	Disconnect coil connector. Turn engine switch to ON. Is there battery voltage at coil connector terminal D (harness-side)?	Yes	Inspect for following: • Open or short circuit between coil terminal A and PCM terminal 80 • Open or short circuit between coil terminal B and PCM terminal 28
		No	Repair or replace wiring harness between coil connector terminal D and fuse panel.
9	Is there continuity between PCM terminal 57 and starter relay?	Yes	Go to next step.
		No	Repair replace wiring harness.
10	Inspect following: • Battery connection • Battery condition • Fuses Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 10.
11	Is clicking sound heard from starter when engine switch is turned to START?	Yes	Go to Step 13.
		No	Go to next step.
12	Inspect starting system. Is starting system okay?	Yes	Inspect for seized/hydrolocked engine, flywheel.
		No	Repair or replace components as required.
13	Do any other electrical accessories work?	Yes	Go to next step.
		No	Inspect charging system.
14	Connect WDS or equivalent to DLC-2. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Inspect for following: • START circuit in engine switch • Open circuit between engine switch and starter
15	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.4 HARD START/LONG CRANK/ERRATIC START/ERRATIC CRANK

A6E408018881206

4	HARD START/LONG CRANK/ERRATIC START/ERRATIC CRANK
DESCRIPTION	• Starter cranks engine at normal speed but engine requires excessive cranking time before starting. • Battery is in normal condition.
POSSIBLE CAUSE	• Poor fuel quality • Intake-air system restriction or clogging • Starting system malfunction • Inadequate fuel pressure • Fuel pressure limiter malfunction (built-in common rail) • Suction control valve malfunction (built-in supply pump) • Engine overheating • Glow system malfunction • Fuel filter clogging or restriction • Fuel line clogging or restriction • Fuel leakage • Exhaust system and/or catalyst converter restriction or clogging • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Accelerator position sensor misadjustment • MAF/IAT sensor or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Supply pump malfunction • Fuel injector malfunction • Low engine compression • IDM or related circuit malfunction • EGR 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 injury 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: • Fuel quality (e.g.: include water contamination, winter/summer blend) • 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.17 COOLING SYSTEM CONCERNS-OVERHEATING".
		No	Go to next step.
3	Connect WDS or equivalent to DLC-2. 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 following: • Open circuit between PCM control relay and PCM terminal 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.

STEP	INSPECTION	RESULTS	ACTION
4	Does engine start normally after warm-up?	Yes	Inspect glow system operation. (See T–19 RELAY INSPECTION) Replace any malfunctioning part as necessary. If glow system is okay, go to next step.
		No	Go to next step.
5	Is there any restriction in exhaust system or catalyst converter?	Yes	Repair or replace as necessary.
		No	Go to next step.
6	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.
7	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
8	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
9	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
10	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
11	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
12	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
13	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		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.
14	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
15	Inspect EGR system operation. Is EGR system operation normal?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
16	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
17	Inspect starting system. Is starting system normal?	Yes	Inspect for loose connectors or poor terminal contact. If okay, remove and inspect supply pump and common rail.
		No	Repair or replace components as required.

STEP	INSPECTION	RESULTS	ACTION
18	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.5 ENGINE STALLS-AFTER START/AT IDLE

A6E408018881207

5	ENGINE STALLS-AFTER START/AT IDLE
DESCRIPTION	• Engine stops unexpectedly.
POSSIBLE CAUSE	• Poor fuel quality • Intake-air system restriction or clogging • Engine overheating • A/C system improper operation • Immobilizer system (PATS) and/or circuit malfunction (if equipped) • PCM control relay malfunction • Glow system malfunction • Inadequate fuel pressure • Fuel pressure sensor related circuit malfunction • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Fuel leakage • Fuel line clogging or restriction • Fuel filter clogging or restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Exhaust system and/or catalyst converter restriction or clogging • EGR system malfunction • ECT sensor or related circuit malfunction • Accelerator positions sensor or related circuit malfunction • Accelerator positions sensor misadjustment • MAF/IAT sensor or related circuit malfunction • V-reference voltage supply circuit malfunction • IDM or related circuit 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 injury 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** • The following test should be perform for vehicles with immobilizer system. Go to Step 10 for vehicles without immobilizer system. Connect WDS or equivalent to DLC-2. Do following conditions appear? • Engine is not completely started. • DTC B1681 is displayed.	Yes	**Both conditions appear:** Go to Step 4.
		No	**Either or other condition appears:** Go to next step.
2	Is coil connector securely connected to coil?	Yes	Go to next step.
		No	Connect coil connector securely. Return to Step 1.
3	Does security light illuminate?	Yes	Go to next step.
		No	Inspect instrument cluster and wiring harness.

STEP	INSPECTION	RESULTS	ACTION
4	Connect WDS or equivalent to DLC-2 and retrieve DTC. **DTC** **B1213, B1342, B1600, B1601, B1602, B1681, B2103, B2431**	Yes	Go to appropriate DTC test.
		No	Go to next step.
5	Is there continuity between PCM GND terminals 65, 85, 103, 104 and GND?	Yes	Go to next step.
		No	Repair or replace wiring harness.
6	Measure voltage between PCM GND terminals 65, 85, 103, 104 and coil terminal C. Is the voltage **below 1.0?**	Yes	Go to next step.
		No	Repair or replace wiring harness.
7	Turn engine switch to ON. Access VPWR PID. Is VPWR PID okay? **Specification** **Battery voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
8	Disconnect coil connector. Turn engine switch to ON. Is there battery voltage at coil connector terminal D (harness-side)?	Yes	Inspect for following: • Open or short circuit between coil terminal A and PCM terminal 80 • Open or short circuit between coil terminal B and PCM terminal 28
		No	Repair or replace wiring harness between coil connector terminal D and fuse panel.
9	Is there continuity between PCM terminal 57 and starter relay?	Yes	Go to next step.
		No	Repair replace wiring harness.
10	Inspect for following: • Fuel quality (e.g.: include water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Intake-air system restriction Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 10.
11	Is engine overheating?	Yes	Go to symptom troubleshooting “NO.17 COOLING SYSTEM CONCERNS-OVERHEATING”.
		No	Go to next step.
12	**Note** • Ignore DTC P0122, P0123, P0222 or P0223 while performing this test. Disconnect accelerator position sensor connector. Measure voltage at accelerator position sensor connector VREF terminal (terminal D) with engine switch ON. **Specification** **4.5—5.5 V** Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting “NO.26 CONSTANT VOLTAGE”.
13	Connect WDS or equivalent to DLC-2. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
14	Does engine start normally after warm-up?	Yes	Inspect glow system operation. (See T–19 RELAY INSPECTION) Replace any malfunctioning part as necessary. If glow system is okay, go to next step.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
15	Is there any restriction in exhaust system or catalyst converter?	Yes	Repair or replace as necessary.
		No	Go to next step.
16	Access RPM PID. Is RPM PID indicating engine speed during cranking engine?	Yes	Go to next step.
		No	Go to Step 19.
17	**Note** • The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalling, go to next step. • Go to next step for the vehicle without A/C system. Connect pressure gauge to A/C line. Turn blower and A/C switches on. Is pressure within specifications?	Yes	Go to next step.
		No	**A/C is always on:** Go to symptom troubleshooting “NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY”. **Other symptoms:** Inspect following: • Refrigerant charging amount • Cooling fan No.1 and/or cooling fan No.2 operation
18	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
19	Depress accelerator pedal slightly. Crank engine. Does engine start now?	Yes	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION)
		No	Go to next step.
20	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.
21	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
22	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
23	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
24	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
25	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
26	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
27	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.

STEP	INSPECTION	RESULTS	ACTION
28	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
29	Inspect EGR system operation. Is EGR system operation normal?	Yes	Remove and inspect supply pump and common rail.
		No	Repair or replace malfunctioning part according to EGR system operation results.
30	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.6 CRANKS NORMALLY BUT WILL NOT START

A6E408018881208

6	CRANKS NORMALLY BUT WILL NOT START
DESCRIPTION	• Starter cranks engine at normal speed but engine will not run. • Refer to symptom troubleshooting “No.5 Engine stalls” if this symptom appears after engine stall. • Fuel is in fuel tank. • Battery is in normal condition.
POSSIBLE CAUSE	• Poor fuel quality • Intake-air system restriction • Fuel line restriction • EGR system malfunction • Glow system malfunction • Fuel pressure sensor or related circuit malfunction • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Fuel leakage • Fuel filter clogging • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • V-reference supply circuit malfunction • ECT sensor or related circuit malfunction • Supply pump malfunction • Fuel injector malfunction • Immobilizer system (PATS) and/or circuit malfunction (if equipped) • Low engine compression • Improper valve timing • IDM or related circuit malfunction • PCM control repay 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 injury 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** • The following test should be perform for vehicles with immobilizer system. Go to Step 10 for vehicles without immobilizer system. Connect WDS or equivalent to DLC-2. Do following conditions appear? • Engine is not completely started. • DTC B1681 is displayed.	Yes	**Both conditions appear:** Go to Step 4.
		No	**Either or other condition appears:** Go to next step.
2	Is coil connector securely connected to coil?	Yes	Go to next step.
		No	Connect coil connector securely. Return to Step 1.

STEP	INSPECTION	RESULTS	ACTION
3	Does security light illuminate?	Yes	Go to next step.
		No	Inspect instrument cluster and wiring harness.
4	Connect WDS or equivalent to DLC-2 and retrieve DTC. **DTC** **B1213, B1342, B1600, B1601, B1602, B1681, B2103, B2431**	Yes	Go to appropriate DTC test.
		No	Go to next step.
5	Is there continuity between PCM GND terminals 65, 85, 103, 104 and GND?	Yes	Go to next step.
		No	Repair or replace wiring harness.
6	Measure voltage between PCM GND terminals 65, 85, 103, 104 and coil terminal C. Is the voltage **below 1.0?**	Yes	Go to next step.
		No	Repair or replace wiring harness.
7	Turn engine switch to ON. Access VPWR PID. Is VPWR PID okay? **Specification** **Battery voltage**	Yes	Go to next step.
		No	Repair or replace wiring harness.
8	Disconnect coil connector. Turn engine switch to ON. Is there battery voltage at coil connector terminal D (harness-side)?	Yes	Inspect for following: • Open or short circuit between coil terminal A and PCM terminal 80 • Open or short circuit between coil terminal B and PCM terminal 28
		No	Repair or replace wiring harness between coil connector terminal D and fuse panel.
9	Is there continuity between PCM terminal 57 and starter relay?	Yes	Go to next step.
		No	Repair replace wiring harness.
10	Inspect for following: • Fuel quality (e.g.: include water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Intake-air system restriction Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 10.
11	**Note** • Ignore DTC P0122, P0123, P0222 or P0223 while performing this test. Disconnect accelerator position sensor connector. Measure voltage at accelerator position sensor connector VREF terminal (terminal D) with engine switch ON. **Specification** **4.5—5.5 V** Is voltage okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting “NO.26 CONSTANT VOLTAGE”.
12	Connect WDS or equivalent to DLC-2. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.

STEP	INSPECTION	RESULTS	ACTION
13	Inspect glow system operation. (See T–19 RELAY INSPECTION) Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to glow system operation results.
14	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.
15	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
16	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
17	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
18	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
19	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
20	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
21	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
22	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
23	Inspect EGR system operation. Is EGR system operation normal?	Yes	Remove and inspect supply pump and common rail.
		No	Repair or replace malfunctioning part according to EGR system operation results.
24	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.7 SLOW RETURN TO IDLE

A6E408018881209

7	SLOW RETURN TO IDLE
DESCRIPTION	• Engine takes more time than normal to return to idle speed. • Engine speed continues at fast idle after warm-up.
POSSIBLE CAUSE	• Thermostat is stuck open • Fuel injection timing is incorrect • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Idle switch or related circuit malfunction • MAF/IAT sensor or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Incorrect adjustment accelerator pedal position sensor and/or idle switch • Incorrect idle speed • Excessive fuel pressure • Supply pump malfunction • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Fuel injector malfunction (incorrect fuel regulate pressure) • Neutral switch or related circuit malfunction • IDM or related circuit 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 injury 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-2. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
2	Access ECT PID. Start and warm-up engine to normal operating temperature. Is ECT PID reading between **82—112 °C {180—233 °F}**?	Yes	Go to next step.
		No	**ECT PID is higher than 112 °C {233 °F}:** Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS-OVERHEATING". **ECT PID is less than 82 °C {180 °F}:** Go to symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS-RUNS COLD".

STEP	INSPECTION	RESULTS	ACTION
3	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION) Is idle speed correct?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to idle speed inspection results.
4	Inspect cooling fan No.2 control system operation. Does cooling fan No.2 control operate properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to cooling fan No.2 control system operation inspection results.
5	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
6	Inspect adjustment of neutral switch. (See F2–69 NEUTRAL SWITCH INSPECTION) Is neutral switch adjusted correctly?	Yes	Go to next step.
		No	Adjust neutral switch correctly.
7	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
8	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
9	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
10	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
11	Remove thermostat and inspect operation. (See E–9 THERMOSTAT REMOVAL/INSTALLATION) (See E–10 THERMOSTAT INSPECTION) Is thermostat okay?	Yes	Go to next step.
		No	Replace thermostat.
12	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
13	Inspect fuel injector relief pressure. Is fuel injector relief pressure okay?	Yes	Remove and inspect supply pump and common rail.
		No	Replace fuel injector.
14	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.8 ENGINE RUNS ROUGH/ROLLING IDLE

A6E408018881210

8	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 • Cooling fan No.1 system malfunction • A/C system improper operation • EGR system improper operation • EGR water cooler malfunction • Fuel leakage • Inadequate fuel pressure • Fuel pressure sensor or related circuit malfunction • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Fuel filter clogging • Fuel line restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Idle switch misadjustment • Idle switch or related circuit malfunction • Accelerator position sensor misadjustment • Accelerator position sensor or related circuit malfunction • MAF/IAT sensor malfunction • Neutral switch or related circuit malfunction • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Engine compression excessive unbalance for each cylinder • Unbalanced fuel injection amount for each cylinder • IDM or related circuit 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 injury 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: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging • Loose bands on intake-air system • Cracks on intake-air system parts • Intake-air system restriction • Vacuum leakage • Cooling fan No.1 system operation 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.17 COOLING SYSTEM CONCERNS—OVERHEATING."
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
3	Connect WDS or equivalent to DLC-2. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	**Note** • The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalling, go to next step. • Go to next step for the vehicle without A/C system. Connect pressure gauge to A/C line. Turn blower and A/C switches on. Is pressure within specifications?	Yes	Go to next step.
		No	**A/C is always on:** Go to symptom troubleshooting “NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY”. **Other symptoms:** Inspect for following: • Refrigerant charging amount • Cooling fan No.1 and/or cooling fan No.2 operation
5	Depress accelerator pedal slightly. Crank engine. Does engine start now?	Yes	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION)
		No	Go to next step.
6	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
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	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
9	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
10	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
11	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
12	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)

STEP	INSPECTION	RESULTS	ACTION
13	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
14	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
15	Inspect EGR system operation. Is EGR system operation normal?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
16	Inspect EGR water cooler for following: • Coolant passage clogging/restriction • Exhaust gas clogging/restriction Is EGR water cooler okay?	Yes	Go to next step.
		No	Service as necessary.
17	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Remove and inspect supply pump and common rail.
		No	Repair or replace as necessary.
18	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.9 FAST IDLE/RUNS ON

A6E408018881211

9	RUNS IDLE/RUNS ON
DESCRIPTION	• Engine speed continues at fast idle after warm-up. • Engine runs after engine key turned off.
POSSIBLE CAUSE	• ECT sensor or related circuit malfunction • Incorrect adjustment accelerator position sensor and/or idle switch • Suction control valve (built-in supply pump) • Fuel injector malfunction • IDM or related circuit malfunction • Vacuum leakage **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 injury 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.**

F2

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Connect WDS or equivalent to DLC-2. Access ECT PID. Start and warm-up engine to normal operating temperature. Is ECT PID reading between **82—112 °C {180—233 °F}**?	Yes	Go to next step.
		No	**ECT PID is higher than 112 °C{233 °F}:** Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS—OVERHEATING". **ECT PID is less than 82 °C{180 °F}:** Go to symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS—RUNS COLD".
2	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
3	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
4	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Replace fuel injector. (See F2–55 FUEL INJECTOR REMOVAL/INSTALLATION)
5	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Inspect vacuum leakage.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
6	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.10 LOW IDLE/STALLS DURING DECELERATION

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10	LOW IDLE/STALLS DURING DECELERATION
DESCRIPTION	• Engine stops unexpectedly at beginning of deceleration or recovery from deceleration.
POSSIBLE CAUSE	• Intake-air system restriction or clogging • Poor fuel quality • A/C system improper operation • Inadequate fuel pressure • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Fuel leakage • Fuel line restriction or clogging • Fuel filter restriction or clogging • Incorrect fuel injection timing • Incorrect idle speed • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Glow system malfunction • EGR system malfunction • MAF/IAT sensor or related circuit malfunction • ECT sensor or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Neutral switch malfunction or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Idle switch or related circuit malfunction • Incorrect adjustment accelerator position sensor and/or idle switch • IDM or related circuit 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 injury 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	Does engine idle rough?	Yes	Go to symptom troubleshooting "NO.8 ENGINE RUNS ROUGH/ROLLING IDLE".
		No	Go to next step.
2	Inspect for following: • Fuel line/fuel filter clogging or restriction • Intake-air system restriction or clogging • Fuel quality (e.g.: include water contamination, winter/summer blend) Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 2.
3	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION) Is idle speed correct?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to idle speed inspection results.

STEP	INSPECTION	RESULTS	ACTION
5	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
6	Measure voltage PCM terminal 33 and 56. Is voltage okay?	Yes	Go to next step.
		No	**PCM terminal 33 does not specified:** Inspect clutch switch and related harness. **PCM terminal 56 does not specified:** Inspect neutral switch and related harness.
7	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
8	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
9	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
10	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
11	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
12	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
13	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
14	**Note** • The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalling, go to next step. • Go to next step for the vehicle without A/C system. Connect pressure gauge to A/C line. Turn blower and A/C switches on. Is pressure within specifications?	Yes	Go to next step.
		No	**A/C is always on:** Go to symptom troubleshooting “NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY”. **Other symptoms:** Inspect following: • Refrigerant charging amount • Cooling fan No.1 and/or cooling fan No.2 operation
15	Inspect EGR system operation. Is EGR system operation normal?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
16	Inspect glow system operation. (See T–19 RELAY INSPECTION) Is glow system operation normal?	Yes	Go to next step.
		No	Service as necessary.

STEP	INSPECTION	RESULTS	ACTION
17	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Remove and inspect supply pump and common rail.
		No	Repair or replace as necessary.
18	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.11 ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES

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11	ENGINE STALLS/QUITS, ENGINE RUNS ROUGH, MISSES, BUCK/JERK, HESITATION/STUMBLE, SURGES
DESCRIPTION	• Engine stops unexpectedly at beginning of acceleration or during cruise. • Engine stops unexpectedly while cruising. • Engine speed fluctuates during acceleration or cruising. • Engine misses during acceleration or cruising. • Vehicle bucks/jerks during acceleration, during 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 • Intake-air system restriction or clogging • Engine overheating • A/C system improper operation • Turbocharger malfunction • Variable swirl control (VSC) system malfunction • EGR system malfunction • Neutral switch or related circuit malfunction • Cooling fan No.1 or cooling fan No.2 seat are improper • Fuel line clogging or restriction • Fuel filter clogging or restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Idle switch or related circuit malfunction • MAF/IAT sensor or related circuit malfunction • IAT sensor No.2 or related circuit malfunction • VSS or related circuit malfunction • Incorrect adjustment accelerator position sensor and/or idle switch • Incorrect idle speed • Inadequate fuel pressure • Fuel pressure sensor or related circuit malfunction • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Exhaust system and/or catalyst converter restriction • Clutch slippage • IDM or related circuit 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 injury 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 idle speed stable?	Yes	Go to next step.
		No	Go to symptom troubleshooting “NO.8 ENGINE RUNS ROUGH/ROLLING IDLE”.
2	Is engine overheating?	Yes	Go to symptom troubleshooting “NO.17 COOLING SYSTEM CONCERNS—OVERHEATING”.
		No	Go to next step.
3	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	Inspect for following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging and/or restriction • Intake-air system restriction or clogging • Exhaust system and/or catalyst converter restriction • Cooling fan No.1 or cooling fan No.2 seat Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 4.
5	Does engine run normal after warm-up?	Yes	Inspect glow system operation. (See T–19 RELAY INSPECTION) Replace any malfunctioning part as necessary. If glow system is okay, go to next step.
		No	Go to next step.
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 stalling, go to next step. • Go to next step for the vehicle without A/C system. Connect pressure gauge to A/C line. Turn blower and A/C switches on. Is pressure within specifications?	Yes	Go to next step.
		No	**A/C is always on:** Go to symptom troubleshooting “NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUITY”. **Other symptoms:** Inspect following: • Refrigerant charging amount • Cooling fan No.1 and/or cooling fan No.2 operation
7	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	Go to next step.
8	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. Is guide blade actuator okay?	Yes	Turbocharger is okay. Go to next step.
		No	Repair or replace as necessary. If concern is resolved, complete inspection. If concern still exists, turbocharger is okay. Go to next step.
9	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
10	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION) Is idle speed correct?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to idle speed inspection results.

STEP	INSPECTION	RESULTS	ACTION
11	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
12	Inspect adjustment of neutral switch. (See F2–69 NEUTRAL SWITCH INSPECTION) Is neutral switch adjusted correctly?	Yes	Go to next step.
		No	Adjust neutral switch correctly.
13	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
14	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
15	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
16	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
17	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
18	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
19	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
20	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
21	Inspect timing belt for following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is timing belt okay?	Yes	Inspect following: • Clutch slippage • CKP sensor • VSS If okay, remove and inspect supply pump and common rail.
		No	If timing is incorrect, adjust valve timing. If timing belt is not okay, replace timing belt.
22	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.12 LACK/LOSS OF POWER-ACCELERATION/CRUISE

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12	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 or clogging • Engine overheating • A/C system improper operation • Improper operation of A/C cut-off control • Variable boost control (VBC) system malfunction • Variable swirl control (VSC) system malfunction • EGR system malfunction • Vacuum leakage • Clutch slippage • Exhaust system and/or catalyst converter restriction • Fuel line or clogging or restriction • Fuel filter clogging or restriction • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Idle switch or related circuit malfunction • MAF/IAT sensor or related circuit malfunction • IAT sensor No.2 or related circuit malfunction • Incorrect adjustment accelerator position sensor and/or idle switch • Incorrect idle speed • Inadequate fuel pressure • Fuel pressure sensor or related circuit malfunction • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Supply pump malfunction • Fuel injector malfunction • Low engine compression • Improper valve timing • Cooling fan No.1 or cooling fan No.2 seat are improper • Turbocharger malfunction • Charge air cooler malfunction • Brake system dragging • Intake shutter valve malfunction • Guide blade valve malfunction • IDM or related circuit 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 injury 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 idle speed stable?	Yes	Go to next step.
		No	Go to symptom troubleshooting "NO.8 ENGINE RUNS ROUGH/ROLLING IDLE".
2	Is engine overheating?	Yes	Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS—OVERHEATING".
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
3	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	Inspect for following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging and/or restriction • Intake-air system restriction • Exhaust system and/or catalyst converter restriction • Charge air cooler condition (restriction or damaged) • Vacuum leakage • Cooling fan No.1 and cooling fan No.2 seat Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 4.
5	Inspect intake shutter valve and VSC valve operations. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
6	Inspect guide blade valve operation. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
7	Inspect A/C cut-off operation. Does A/C cut-off work properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to A/C cut-off system inspection results.
8	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	Go to next step.
9	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is actuator okay?	Yes	Go to next step.
		No	Repair or replace as necessary. If concern is resolved, complete inspection. If concern still exists, turbocharger is okay. Go to next step.
10	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.
11	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.
12	Inspect if turbocharger compressor wheel by hand. Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.

STEP	INSPECTION	RESULTS	ACTION
13	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.
14	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 off of vehicle, then go to next step.
		No	Go to next step.
15	Is any engine oil found inside turbocharger compressor hosing?	Yes	Wipe oil off of vehicle and install all removed parts in Step 10. Then, go to next step.
		No	Turbocharger is okay. Install all parts removed in Step10. Then, go to next step.
16	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
17	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION) Is idle speed correct?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to idle speed inspection results.
18	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
19	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
20	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
21	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • MAP • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
22	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
23	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)

STEP	INSPECTION	RESULTS	ACTION
24	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
25	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
26	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
27	Inspect timing belt for following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is timing belt okay?	Yes	Inspect following: • Clutch slippage • CKP sensor • Boost sensor and related circuit • Brake system for dragging If okay, remove and inspect supply pump and common rail.
		No	If valve timing is incorrect, adjust valve timing. If timing belt is not okay, replace timing belt.
28	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.13 KNOCKING/PINGING

A6E408018881215

13	KNOCKING/PINGING
DESCRIPTION	• Excessive shrilly knocking sound from engine.
POSSIBLE CAUSE	• Poor fuel quality • Air leakage from intake-air system • Intake-air system restriction or clogging • Variable swirl control (VSC) system malfunction • Variable boost control (VBC) system malfunction • Intake shutter valve stuck close • VSC valve stuck close • Glow system malfunction • Low engine compression • Improper valve timing • Low coolant temperature • Incorrect fuel injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • MAF/IAT sensor or related circuit malfunction • IAT sensor No.2 or related circuit malfunction • Boost sensor or related malfunction • Fuel pressure sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Excessive fuel pressure • Fuel return line clogging or restriction • EGR system malfunction • Exhaust system and/or catalyst converter restriction • Turbocharger malfunction • Charge air cooler malfunction • Suction control valve malfunction (built-in supply pump) **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 injury 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	Does engine run cold?	Yes	Go to symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS—RUNS COLD".
		No	Go to next step.
2	Inspect for following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel return line clogging and/or restriction • Intake-air system restriction or clogging • Exhaust system and/or catalyst converter restriction or clogging • Charge air cooler condition (restriction or damaged) Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 2.
3	Connect WDS or equivalent to DLC-2. Access ECT PID. Verify ECT PID is **above 80 °C {176 °F}**?	Yes	Go to next step.
		No	Inspect ECT PID.

F2

STEP	INSPECTION	RESULTS	ACTION
4	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
5	Inspect intake shutter valve and VSC valve operations. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
6	Inspect guide blade valve operation. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
7	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	Go to next step.
8	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is actuator okay?	Yes	Go to next step.
		No	Repair or replace as necessary. If concern is resolved, complete inspection. If concern still exists, turbocharger is okay. Go to next step.
9	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 F2–38 TURBOCHARGER INSPECTION) Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.
10	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.
11	Inspect turbocharger compressor wheel by hand. Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
12	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.
13	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 off of vehicle, then go to next step.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
14	Is any engine oil found inside turbocharger compressor hosing?	Yes	Wipe oil off of vehicle and install all removed parts in Step 10. Then, go to next step.
		No	Turbocharger is okay. Install all parts removed in Step10. Then, go to next step.
15	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
16	Inspect glow system operation. (See T–19 RELAY INSPECTION) Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to glow system operation results.
17	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
18	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
19	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • MAP • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
20	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
21	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Inspect following: • Boost sensor • MAF/IAT sensor • IAT sensor No.2 • Fuel pressure sensor • Accelerator position sensor
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
22	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.14 POOR FUEL ECONOMY

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14	POOR FUEL ECONOMY
DESCRIPTION	• Fuel economy is unsatisfactory.
POSSIBLE CAUSE	• Incorrect idle speed • A/C system improper operation • Intake -air system clogging or restriction • Engine cooling system malfunction • Poor fuel quality • Improper coolant level • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Fuel pressure sensor or related circuit malfunction • ECT sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • Incorrect adjustment idle switch • MAF/IAT sensor or related circuit malfunction • IAT sensor No .2 or related circuit malfunction • VSS or related circuit malfunction • Turbocharger malfunction • Charge air cooler malfunction • Low engine compression • Improper valve timing • Exhaust system and/or catalyst converter clogging • Incorrect fuel injection timing • Fuel injector malfunction • Supply pump malfunction • Fuel leakage • Fuel line clogging or restriction • Fuel filter clogging or restriction • Brake dragging • EGR system malfunction • Vacuum leakage • Clutch slippage • Variable boost control (VBC) system malfunction • Coolant heater 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 injury 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: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel line/fuel filter clogging and/or restriction • Fuel line leakage • Intake-air system restriction • Exhaust system and/or catalyst converter restriction • Charge air cooler condition (restriction or damaged) • Vacuum leakage Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	Is brake system functioning properly?	Yes	Go to next step.
		No	Inspect for cause.

STEP	INSPECTION	RESULTS	ACTION
3	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	**Note** • The following test should be performed on the vehicles with A/C system. If the following test cannot be performed due to engine stalling, go to next step. • Go to next step for the vehicle without A/C system. Connect pressure gauge to A/C line. Turn blower and A/C switches on. Is pressure within specifications?	Yes	Go to next step
		No	**A/C is always on:** Go to symptom troubleshooting “NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY”. **Other symptoms:** Inspect following: • Refrigerant charging amount • Cooling fan No.1 and/or cooling fan No.2 operation.
5	Access ECT PID. Drive vehicle while monitoring PID. Is PID within specification?	Yes	Go to next step.
		No	Inspect for coolant leakage, cooling fan No.1 and cooling fan No.2 operations or thermostat operation.
6	Inspect idle speed. (See F2–34 IDLE SPEED INSPECTION) Is idle speed okay?	Yes	Go to next step.
		No	Go to symptom troubleshooting “NO.7 SLOW RETURN TO IDLE”.
7	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
8	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
9	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
10	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
11	Perform turbocharger inspection. (See F2–38 TURBOCHARGER INSPECTION) Is turbocharger okay?	Yes	Go to next step.
		No	Replace turbocharger.
12	Inspect guide blade valve operation. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
13	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.

STEP	INSPECTION	RESULTS	ACTION
14	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
15	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • MAP • RPM • VSS If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
16	Inspect timing belt for following: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is timing belt okay?	Yes	Inspect following: • Clutch slippage • CKP sensor • Boost sensor and related circuit • Brake system for dragging • Coolant heater system • Glow system If okay, remove and inspect supply pump.
		No	If timing is incorrect, adjust valve timing. If timing belt is not okay, replace timing belt.
17	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.15 EMISSION COMPLIANCE

A6E408018881217

15	EMISSION COMPLIANCE
DESCRIPTION	• Fails emissions test.
POSSIBLE CAUSE	• Poor fuel quality • Vacuum leakage • Air leakage from intake-air system • Intake-air system restriction or clogging • Variable swirl control (VSC) system malfunction • Variable boost control (VBC) system malfunction • Intake shutter valve stuck close • VSC valve stuck close • Turbocharger malfunction • Guide blade valve malfunction • Charge air cooler malfunction • Glow system malfunction • EGR system malfunction • EGR water cooler malfunction • Low coolant temperature • Engine overheating • Inadequate fuel pressure • Fuel pressure limiter malfunction (built-in common rail) • Suction control valve inspection (built-in supply pump) • ECT sensor or related circuit malfunction • MAF/IAT sensor related circuit malfunction • IAT sensor No.2 or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Incorrect adjustment accelerator position sensor and/or idle switch • Accelerator position sensor or related circuit malfunction • Idle switch or related circuit malfunction • Fuel line rclogging or restriction • Supply pump malfunction • Fuel injector malfunction • Incorrect fuel injection timing • Incorrect idle speed • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Boost sensor or related circuit malfunction • Neutral switch or related circuit malfunction • VSS or related circuit malfunction • Low engine compression • Improper valve timing • Base engine malfunction • Exhaust system and/or catalyst converter restriction • Catalyst converter malfunction • IDM or related circuit 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 injury 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 engine overheating?	Yes	Go to symptom troubleshooting "NO.17 COOLING SYSTEM CONCERNS—OVERHEATING".
		No	Go to next step.
2	Does engine run cold?	Yes	Go to symptom troubleshooting "NO.18 COOLING SYSTEM CONCERNS—RUNS COLD".
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
3	Connect WDS or equivalent to DLC-2. Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	Inspect for following: • Fuel quality (e.g.: including water contamination, winter/summer blend) • Fuel return line clogging and/or restriction • Charge air cooler condition (restriction or damaged) • Intake-air system restriction • Exhaust system and/or catalyst converter restriction • Vacuum leakage Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 4.
5	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
6	Inspect adjustment of neutral switch. (See F2–69 NEUTRAL SWITCH INSPECTION) Is neutral switch adjusted correctly?	Yes	Go to next step.
		No	Adjust neutral switch correctly.
7	Inspect intake shutter valve and VSC valve operations. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
8	Inspect guide blade valve operation. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
9	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	Go to next step.
10	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is actuator okay?	Yes	Go to next step.
		No	Repair or replace as necessary. If concern is resolved, complete inspection. If concern still exists, turbocharger is okay. Go to next step.
11	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 F2–38 TURBOCHARGER INSPECTION) Is there any problem?	Yes	Replace turbocharger.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
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	Inspect 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. **Note** • Inspect all fins on each turbine wheel. 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 off of vehicle, then go to next step.
		No	Go to next step.
16	Is any engine oil found inside turbocharger compressor hosing?	Yes	Wipe oil off of vehicle and install all removed parts in Step 10. Then, go to next step.
		No	Turbocharger is okay. Install all parts removed in Step10. Then, go to next step.
17	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
18	Inspect EGR water cooler for following: • Coolant passage clogging/restriction • Exhaust gas clogging/restriction Is EGR water cooler okay?	Yes	Go to next step.
		No	Service as necessary.
19	Inspect glow system operation. (See T–19 RELAY INSPECTION) Is glow system operation normal?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to glow system operation results.
20	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
21	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
22	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • MAP • RPM • VSS If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
23	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Replace common rail.
24	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)

STEP	INSPECTION	RESULTS	ACTION
25	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
26	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
27	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
28	Inspect timing belt for followings: • Chipping of gear teeth • Low tension • Breakage damage or cracks Is timing belt okay?	Yes	Inspect following: • ECT sensor • Boost sensor • MAF/IAT sensor • Catalyst converter If okay, remove and inspect supply pump and common rail.
		No	If timing is incorrect, adjust valve timing. If timing belt is not okay, replace timing belt.
29	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.16 HIGH OIL CONSUMPTION/LEAKAGE

A6E408018881218

16	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	RESULTS	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	Remove to necessary to inspect turbocharger. **Note** • 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 off 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 off of vehicle, then go to next step.
		No	Go to next step.
8	Is any engine oil found around oil pipes attached on turbocharger center 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 off.
		No	Turbocharger is okay. Install all parts removed in Step 2. Then go to next step.
10	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	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 additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.17 COOLING SYSTEM CONCERNS-OVERHEATING

A6E408018881219

17	COOLING SYSTEM CONCERNS-OVERHEATING
DESCRIPTION	• Engine runs at higher than normal temperature/overheats.
POSSIBLE CAUSE	• Cooling fan No.2 malfunction • Cooling fan No.1 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 • Coolant heater system malfunction

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Inspect following: • Engine coolant level • Coolant leakage (around heater unit in passenger compartment, coolant hoses and/ or radiator, and around coolant heater unit.) • Water and anti-freeze mixture • Radiator condition • Collapsed or restricted radiator hoses • Radiator pressure cap • Drive belt tension • Drive belt • Fan rotational direction Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.

STEP	INSPECTION	RESULTS	ACTION
3	**Note** • The following test should be performed on the vehicles with A/C system. Go to next step for vehicles without A/C system Start engine and run it at idle speed. Turn A/C switch off. Does A/C compressor disengaged?	Yes	Go to next step.
		No	Go to symptom troubleshooting “NO.24 A/C 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 cooling fan No.1 and/or cooling fan No.2 operate?	Yes	Go to next step.
		No	**Cooling fan No.1 does not operate:** Inspect for following: • Cooling fan relay No.1 is stuck open • Cooling fan motor No.1 malfunction • Cooling fan motor No.1 GND open • Open circuit between cooling fan motor No.1 and relay • Open circuit between cooling fan relay No.1 and PCM terminal 102 • Open battery power circuit of cooling fan relay No.1 **Cooling fan No.2 does not operate:** Inspect for following: • Cooling fan relay No.2 is stuck open • Cooling fan motor No.2 malfunction • Cooling fan motor No.2 GND open • Open circuit between Cooling fan motor No.2 and relay • Open circuit between Cooling fan relay No.2 and PCM terminal 76 • Open battery power circuit of Cooling fan relay No.2
5	Is drive belt okay?	Yes	Go to next step.
		No	Replace drive belt.
6	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
7	Perform coolant heater system inspection. (See E–10 THERMOSTAT INSPECTION) Is coolant heater system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to coolant heater system operation results.
8	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.
9	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.18 COOLING SYSTEM CONCERNS-RUNS COLD

A6E408018881220

18	COOLING SYSTEM CONCERNS-RUNS COLD
DESCRIPTION	• Engine takes excessive period for reaching normal operating temperature.
POSSIBLE CAUSE	• Thermostat malfunction • Cooling fan No.2 system malfunction • Cooling fan No.1 system malfunction • Coolant heater system malfunction

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is customer complaint “Lack of passenger compartment heat”?	Yes	Inspect A/C heater system.
		No	Go to next step.
2	Does engine speed continue at fast idle?	Yes	Go to symptom troubleshooting “NO.7 SLOW RETURN TO IDLE”.
		No	Go to next step.
3	Connect WDS or equivalent to DLC-2. Access ECT PID. Inspect for both ECT PID and temperature gauge on instrument cluster readings. Is ECT PID same as temperature gauge reading?	Yes	Go to next step.
		No	If temperature gauge on instrument cluster indicates normal range but ECT PID is not same as temperature gauge reading, inspect ECT sensor. If temperature gauge on instrument cluster indicates cold range but ECT PID is normal, inspect temperature gauge and heat gauge unit.
4	Remove thermostat and inspect operation. (See E–9 THERMOSTAT REMOVAL/INSTALLATION) (See E–10 THERMOSTAT INSPECTION) Is thermostat okay?	Yes	Go to next step.
		No	Replace thermostat.
5	Inspect cooling fan No.1 and cooling fan No.2 operations. If both or either fan operate normally, inspect for following: • Cooling fan relay No.2 is stuck closed • Short to GND between cooling fan relay No.2 and PCM terminal 76 • Circuit between cooling fan relay No.2 and fan motor short to battery supply line • Cooling fan relay No.1 is stuck closed • Short to GND between cooling fan relay No.1 and PCM terminal 102 • Circuit between cooling fan relay No.1 and fan motor short to battery supply line • Short to GND between A/C switch and PCM terminal 84 Are all circuits okay?	Yes	Perform coolant heater system inspection. Repair or replace malfunctioning part according to coolant heater system operation results.
		No	Repair or replace as necessary.
6	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.19 EXCESSIVE BLACK SMOKE

A6E408018881221

19	EXCESSIVE BLACK SMOKE
DESCRIPTION	• Excessive black smoke is observed in exhaust gas.
POSSIBLE CAUSE	• Intake-air system clogging or restriction • Air leakage from Intake-air system • Incorrect fuel injection timing • Erratic signal from CKP sensor • Fuel pressure sensor or related circuit malfunction • Boost sensor or related circuit malfunction • IAT sensor No.2 or related circuit malfunction • Fuel injector malfunction • Excessive fuel pressure • Suction control valve malfunction (built-in supply pump) • Fuel line clogging or restriction • Fuel pressure limiter malfunction (built-in common rail) • Low engine compression • Improper valve timing • Base engine malfunction • EGR system malfunction • Variable boost control (VBC) system malfunction • Vacuum leakage • Turbocharger malfunction • Charge air cooler malfunction • Intake shutter valve malfunction • Variable swirl control (VSC) system malfunction • VSC valve malfunction • IDM or related circuit malfunction • Exhaust system and/or catalyst converter restriction or clogging **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 injury 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: • Intake-air system clogging or restriction • Exhaust system and/or catalyst converter restriction or clogging • Charge air cooler condition (restriction or damaged) Are all items okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 1.
2	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
3	Does any other symptom exist?	Yes	Go to appropriate flowchart.
		No	Go to next step.
4	Inspect for air cleaner element for clogging. Is air cleaner element okay?	Yes	Go to next step.
		No	Repair or replace air cleaner element.

STEP	INSPECTION	RESULTS	ACTION
5	Inspect intake shutter valve and VSC valve operations. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
6	Inspect guide blade valve operation. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is there any problem?	Yes	Repair or replace as necessary.
		No	Go to next step.
7	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
8	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
9	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • IAT • MAP • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
10	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
11	Inspect VSC system operation. Does VSC system operate properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to VSC system operation inspection results.
12	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	Go to next step.
13	Inspect for improper operation, kinks, clogging or disconnection on guide blade actuator. (See F2–229 ENGINE CONTROL SYSTEM OPERATION INSPECTION) Is actuator okay?	Yes	Go to next step.
		No	Repair or replace as necessary. If concern is resolved, complete inspection. If concern still exists, turbocharger is okay. Go to next step.
14	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.

STEP	INSPECTION	RESULTS	ACTION
15	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.
16	Inspect if turbocharger compressor wheel by hand. Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
17	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.
18	Is any engine oil found inside turbocharger compressor housing?	Yes	Wipe oil off of vehicle and install all removed parts in Step 15. Then, go to next step.
		No	Turbocharger is okay. Install all parts removed is Step 15. Then, go to next step.
19	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
20	Is engine compression correct? (See B2–8 COMPRESSION INSPECTION)	Yes	Go to next step.
		No	Inspect for following: • Damaged valve seat • Worn valve stem and valve guide • Worn or stuck piston ring • Worn piston, piston ring or cylinder • Improper valve timing Service as necessary.
21	Inspect IDM. (See F2–84 INJECTOR DRIVER MODULE (IDM) INSPECTION) Is IDM okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
22	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Inspect following: • Boost sensor • Fuel pressure limiter (built-in common rail) • Fuel pressure sensor • Fuel return line restriction or clogging Service as necessary.
		No	Repair or replace as necessary.
23	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

F2

NO.20 FUEL ODOR (IN ENGINE COMPARTMENT)

A6E408018881222

20	FUEL ODOR (IN ENGINE COMPARTMENT)
DESCRIPTION	• Fuel smell or visible leakage.
POSSIBLE CAUSE	• Excessive fuel pressure • Suction control valve malfunction (built-in supply pump) • Fuel pressure limiter malfunction (built-in common rail) • Fuel pressure sensor or related circuit malfunction • Fuel leakage **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 injury 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 fuel leakage at fuel injector and fuel line. Is there any fuel leakage?	Yes	Service as necessary.
		No	Go to next step.
2	Visually inspect for damaged or cracked fuel filter. Is fuel filter okay?	Yes	Go to next step.
		No	Replace fuel filter.
3	Inspect fuel pressure sensor. (See F2–79 FUEL PRESSURE SENSOR INSPECTION) Is fuel pressure okay?	Yes	Go to next step.
		No	Repair or replace as necessary.
4	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
5	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Remove and inspect common rail.
6	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.21 ENGINE NOISE

A6E408018881223

21	ENGINE NOISE
DESCRIPTION	• Engine noise under hood.
POSSIBLE CAUSE	• Engine internal damage • Timing belt displacement • Fuel injector malfunction • Loose attaching bolts or worn parts • Improper drive belt tension • Air leakage from intake-air system • Incorrect injection timing • Erratic signal from CKP sensor • Erratic signal from CMP sensor • Fuel pressure sensor or related circuit malfunction • Boost sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • MAF/IAT sensor or related circuit malfunction • ECT sensor or related circuit malfunction • EGR system or malfunction • IAT sensor No.2 or related circuit malfunction • Vacuum leakage • Suction control valve malfunction (built-in supply pump) • Air leakage from intake-air system • Air in power steering fluid line • Turbocharger operating noise • Solenoid valve operating noise **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 injury 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.** **Note** • PCM checks fuel injection amount during a set interval while idling, and automatically corrects it to maintain engine efficiency. It is normal that engine noise and vibration might be a little louder during this process.

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Is squeal, click or chirp sound present?	Yes	Inspect engine oil level, solenoid valves installation or drive belt.
		No	Go to next step.
2	Is rumble or grind sound present?	Yes	Inspect drive belt tension or power steering system fluid level. If okay, perform power steering fluid line air bleed.
		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 and intake-air system leakage.
		No	Go to next step.
5	Is rap or roar sound present?	Yes	Inspect exhaust system or loose parts.
		No	Go to next step.

STEP	INSPECTION	RESULTS	ACTION
6	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to appropriate DTC test.
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	Visually inspect CKP sensor and teeth of pulse wheel. Are CKP sensor and teeth of pulse wheel okay?	Yes	Go to next step.
		No	Replace malfunctioning parts.
10	Measure gap between CKP sensor and teeth of pulse wheel. **Specification** **1.5—2.5 mm {0.059—0.098 in}** Is gap within specification?	Yes	Go to next step.
		No	Adjust CKP sensor position.
11	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • MAP • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
12	Perform EGR system inspection. Is EGR system okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to EGR system operation results.
13	Remove parts necessary to inspect turbocharger. **Note** • 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.

STEP	INSPECTION	RESULTS	ACTION
14	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.
15	Turn turbocharger compressor wheel by hand. Does wheel turn easily and smoothly?	Yes	Go to next step.
		No	Replace turbocharger.
16	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.
17	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 off of vehicle, then go to next step.
		No	Go to next step.
18	Is any engine oil found inside turbocharger compressor housing?	Yes	Wipe oil off of vehicle, then go to next step.
		No	Go to next step.
19	Is any exhaust gas leakage found around location where turbocharger is attached to exhaust manifold?	Yes	Remove turbocharger. Inspect for cracks on center housing inlet surface. If cracks are found, replace turbocharger.
		No	Go to next step.
20	Are any center housing and turbine housing attaching bolts loose?	Yes	Retighten loose bolts. If a bolt is found to be missing, attach appropriate new bolts.
		No	Turbocharger is okay. Install all parts removed in Step 13. Go to next step.
21	Inspect suction control valve. (See F2–54 SUCTION CONTROL VALVE INSPECTION) Is suction control valve okay?	Yes	Go to next step.
		No	Repair supply pump. (See F2–54 SUPPLY PUMP INSPECTION)
22	Inspect fuel injector and fuel injector gasket. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Inspect for following: • Metal flow • Bent connecting rod • Damaged valve seat • Incorrect valve clearance
		No	Repair or replace as necessary.
23	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.22 VIBRATION CONCERNS (ENGINE)

A6E408018881224

22	VIBRATION CONCERNS (ENGINE)
DESCRIPTION	• Vibration from under hood or driveline.
POSSIBLE CAUSE	• Loose attaching bolts or worn parts • Cooling fan No.1 or cooling fan No.2 seat are improper • Engine or transaxle mounts are improperly installed • Components malfunction such as worn parts • Erratic signal from CMP sensor • ECT sensor or related circuit malfunction • Accelerator position sensor or related circuit malfunction • MAF/IAT sensor or related circuit malfunction • Idle switch or related circuit malfunction • Incorrect adjustment of accelerator position sensor and/or idle switch • Fuel injector malfunction • Vacuum leakage • Improper tension or damaged drive belts • Improper balance of wheels or tires • Driveline malfunction • Suspension 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 injury 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 following components for loose attaching bolts or worn parts: • Cooling fan No.1 • Cooling fan No.2 • Cooling fan No.1 and cooling fan No.2 seat • Drive belt and pulley • Engine mounts • Exhaust system Are all items okay?	Yes	Go to next step.
		No	Readjust or retighten engine mount installation position. Service as necessary for other parts.
2	Inspect vacuum leakage. Are vacuum hoses okay?	Yes	Go to next step.
		No	Service as necessary. Repeat Step 2.

STEP	INSPECTION	RESULTS	ACTION
3	Connect WDS or equivalent to DLC-2. 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 following: • Open circuit between PCM control relay and PCM terminal 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to next step.
4	Inspect adjustment of accelerator position sensor and idle switch. (See F2–72 ACCELERATOR POSITION SENSOR INSPECTION) (See F2–70 IDLE SWITCH INSPECTION) Are accelerator position sensor and idle switch adjusted correctly?	Yes	Go to next step.
		No	Adjust accelerator position sensor and idle switch correctly. (See F2–73 ACCELERATOR POSITION SENSOR ADJUSTMENT) (See F2–71 IDLE SWITCH ADJUSTMENT)
5	Inspect adjustment of neutral switch. (See F2–69 NEUTRAL SWITCH INSPECTION) Is neutral switch adjusted correctly?	Yes	Go to next step.
		No	Adjust neutral switch correctly.
6	Visually inspect CMP sensor and teeth of pulse wheel. Are CMP sensor and teeth of pulse wheel okay?	Yes	Inspect following PIDs: (See F2–65 PCM INSPECTION) • ECT • IAT • MAF • RPM If PID value is not as specified, repair or replace malfunctioning parts. If PID value is okay, go to next step.
		No	Replace malfunctioning parts.
7	Inspect fuel injector. (See F2–56 FUEL INJECTOR INSPECTION) Is fuel injector okay?	Yes	Inspect following systems: • Wheels • Transaxle and mounts • Driveline • Suspension Service as necessary.
		No	Repair or replace as necessary.
8	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.23 A/C DOES NOT WORK SUFFICIENTLY

A6E408018881225

23	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 charge amount • Open A/C switch magnetic clutch • Open circuit between A/C relay and A/C magnetic clutch • Poor GND of A/C magnetic clutch • Improper A/C magnetic clutch clearance • Refrigerant pressure switch is stuck open • A/C relay is stuck open • Improper A/C cut-off control • Open circuit between A/C switch and PCM through both refrigerant pressure switch and A/C amplifier

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		Yes	**No DTC is displayed:** Go to appropriate DTC test.
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	Disconnect refrigerant pressure switch connector. Connect jumper wire between terminals of refrigerant pressure switch connector. Turn engine switch to ON. Turn A/C switch on and set blower fan at any speed. Measure PCM terminal 84 voltage. Is voltage **below 1.0 V**?	Yes	Inspect refrigerant pressure switch operation. If switch is okay, go to next step.
		No	Inspect for following: • A/C switch is stuck open • Open circuit between refrigerant pressure switch and PCM terminal 84 • Open circuit of blower motor fan switch and resistor (if blower motor does not operate) • Evaporator temperature sensor and A/C amplifier
4	Inspect A/C cut-off operation. Does A/C cut-off work properly?	Yes	Go to next step.
		No	Repair or replace malfunctioning part according to A/C cut-off system inspection results.
5	Remove jumper wire from switch connector. Reconnect connector to refrigerant pressure switch. Start engine and turn A/C switch on. Does fan operate?	Yes	Inspect for stuck open A/C relay. Replace if necessary.
		No	Inspect following and repair or replace as necessary: • Refrigerant charging amount • Seized A/C compressor
6	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY

A6E408018881226

24	A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY
DESCRIPTION	• A/C compressor magnetic clutch does not disengage.
POSSIBLE CAUSE	• A/C compressor magnetic clutch stuck engagement • A/C relay is stuck closed • Improper A/C compressor magnetic clutch clearance • Short to GND circuit 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	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Go to appropriate DTC test.
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 73 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	Start engine and turn A/C switch on. Measure PCM terminal 84 voltage while disconnecting refrigerant pressure switch connector. **Note** • PCM terminal 84 voltage should read B+ when disconnecting connector. If PCM terminal 84 voltage reading remains below 1.0 V, short to GND circuit may be present. Is voltage **B+**?	Yes	Inspect for short to GND circuit between refrigerant pressure switch and PCM terminal 84.
		No	Go to next step.
4	Reconnect refrigerant pressure switch connector.Measure PCM terminal 84 voltage while turning off A/C switch. **Note** • PCM terminal 84 voltage should read B+ when turning A/C switch off. If PCM terminal 84 voltage reading remains below 1.0 V, short to GND circuit maybe present. Does voltage remain **B+**?	Yes	Inspect for 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. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

F2

NO.25 A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS

A6E408018881227

25	A/C DOES NOT CUT OFF UNDER WIDE OPEN THROTTLE CONDITIONS
DESCRIPTION	• A/C compressor magnetic clutch does not disengage under wide open throttle.
POSSIBLE CAUSE	• Accelerator position sensor malfunction • Accelerator position sensor misadjustment • Loosely installed accelerator position sensor

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.24 A/C ALWAYS ON OR A/C COMPRESSOR RUNS CONTINUOUSLY”.
2	Perform self-test function using WDS or equivalent. 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 53 or 79 • Open circuit PCM control relay and PCM terminal 69 • PCM control relay stuck open. • Open or poor GND circuit (PCM terminal 65, 85, 103 or 104) • Poor connection vehicle body GND
		No	**No DTC is displayed:** Inspect adjustment of accelerator position sensor. If accelerator position sensor adjustment is not correct, adjust accelerator position sensor.
3	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

NO.26 CONSTANT VOLTAGE

A6E408018881228

26	CONSTANT VOLTAGE
DESCRIPTION	• Incorrect constant voltage.
POSSIBLE CAUSE	• Constant voltage circuit malfunction • Accelerator positions sensor or related circuit malfunction • Fuel pressure sensor or related circuit malfunction • Boost sensor or related circuit malfunction • ECT sensor GND circuit malfunction • MAF/IAT sensor GND circuit malfunction • IAT sensor No.2 GND circuit malfunction • Fuel temperature sensor GND circuit malfunction **Note** • Accelerator position sensor, fuel pressure sensor and boost sensor use constant voltage.

F2

Diagnostic Procedure

STEP	INSPECTION	RESULTS	ACTION
1	Disconnect appropriate sensor connectors (accelerator position sensor, boost sensor and fuel pressure sensor) where constant voltage circuits inspection failed. Turn engine switch to ON position. Measure voltage between following appropriate 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. Leave appropriate sensor connectors disconnected where constant voltage inspection failed. Measure voltage between positive terminal 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 8.
4	**Note** • Purpose of this step is to determine if WDS or equivalent is communicating with PCM. Turn engine switch to ON. Attempt to access ECT PID. Can ECT PID be accessed?	Yes	Go to Step 7.
		No	Go to next step.
5	Turn engine switch to OFF. Disconnect accelerator position sensor and PCM connectors. Turn engine switch to ON. Measure voltage between PCM connector terminals 104 and 53/79. Is voltage **greater than 10.5 V**?	Yes	Go to next step.
		No	Repair open circuit between PCM terminal 53/79 and PCM control relay.
6	Leave accelerator position sensor and PCM connectors disconnected. Measure resistance between PCM connector terminals 104 and 90. Is resistance **greater than 10,000 ohms**?	Yes	Inspect sensor connector for constant voltage again.
		No	Repair constant voltage circuit short to GND.
7	Turn engine switch to OFF. Leave accelerator position sensor disconnected.Disconnect PCM connector. Measure resistance between PCM connector 90 and constant voltage circuit at appropriate sensor connector. Is resistance **less than 5.0 ohms**?	Yes	Inspect sensor connector for constant voltage again.
		No	Repair open constant voltage circuit.

STEP	INSPECTION	RESULTS	ACTION
8	**Note** • Purpose of this step is to determine if WDS or equivalent is communicating with PCM. Reconnect appropriate sensor connector. Turn engine switch to ON. Attempt to access ECT PID. Can ECT PID be accessed?	Yes	Go to next step.
		No	Go to Step 11.
9	Are DTCs present for two or more sensors connected to PCM terminal 91? Sensor connected to PCM terminal 91: • Accelerator position sensor. (P0122, P0123, P0222, P0223). • ECT sensor (P0117, P0118) • Fuel pressure sensor (P0192, P0193) • Fuel temperature sensor (P0182, P0183) • MAF/IAT sensor (P0102, P0103, P0112, P0113) • IAT sensor No.2 (P0097, P0098)	Yes	Go to next step.
		No	Repair open GND circuit to sensor where constant voltage circuit inspection failed.
10	Turn engine switch to OFF. Disconnect WDS or equivalent from DLC-2. Disconnect PCM connector. Measure resistance between GND circuit at appropriate sensor connector and PCM connector terminal 91. Is resistance **less than 5.0 ohms**?	Yes	Reconnect sensor connector. Go to appropriate DTC test.
		No	Repair open GND circuit.
11	Turn engine switch OFF. Disconnect PCM connector. Measure resistance between battery negative terminal and PCM terminals 65, 85, 103 and 104. Is each resistance **less than 5.0 ohms**?	Yes	Go to next step.
		No	Repair open GND circuit.
12	Turn engine switch to OFF. Measure resistance between GND circuit at following sensor connector and GND: • Accelerator position sensor • ECT sensor • BARO sensor • Fuel pressure sensor • Fuel temperature sensor • MAF/IAT sensor • IAT sensor No.2 Is resistance **below 5.0 ohms**?	Yes	GND circuits are okay. Inspect sensor connector for constant voltage again.
		No	Inspect for open GND circuit.
13	Turn engine switch to OFF. Disconnect accelerator position sensor. Turn engine switch to ON. Measure voltage between constant voltage circuit at accelerator position sensor and battery negative terminal. Is voltage **less than 0.5V**?	Yes	Inspect sensor connector for constant voltage again.
		No	Repair constant voltage circuit shorted power in harness.
14	Verify test results. • If okay, return to diagnostic index to service any additional symptoms. • If malfunction remains, replace PCM. (See F2–64 PCM REMOVAL/INSTALLATION)		

INTERMITTENT CONCERN TROUBLESHOOTING

A6E408018881229

Vibration Method

1. If a malfunction occurs or becomes worse while driving on a rough road, or due to engine vibration, 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.

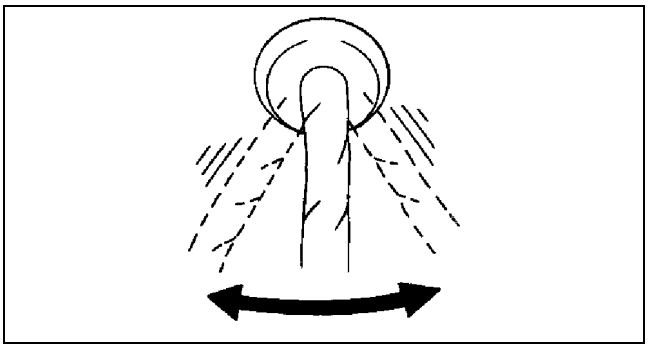
Inspection Method for Switch Connectors or Wires

1. Connect the WDS or equivalent to the DLC-2.
2. Turn the 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 the PID value is unstable, check for poor connection.



A6E40802001

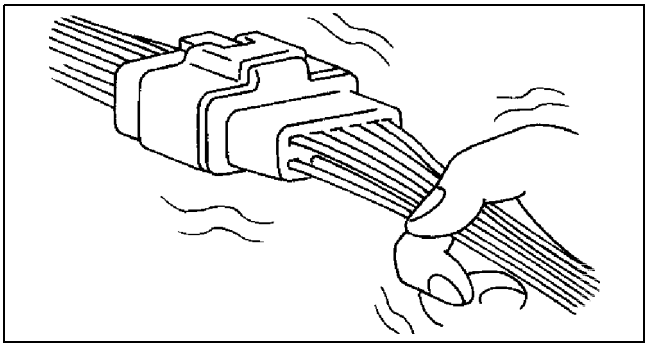
Inspection Method for Sensor Connectors or Wires

1. Connect the WDS or equivalent to the DLC-2.
2. Turn the 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 the PID value is unstable, check for poor connection.



A6E40802002

Inspection Method for Sensors

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

Note
- If the 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 the PID value is unstable or malfunction occurs, check for poor connection and/or poorly mounted sensor.

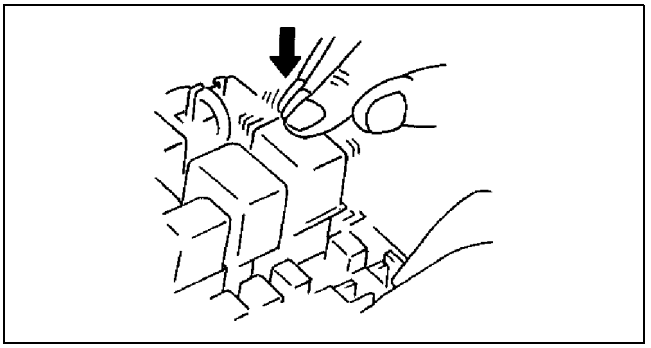
Inspection Method for Actuators or Relays

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

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

3. Prepare the Output State Control for actuators or relays that you are inspecting.
4. Vibrate the actuator or relay with your finger for 3 seconds after Output State Control is activated.
   - If a variable click sound is heard, check for poor connection and/or poorly mounted actuator or relay.

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



A6E40802003

Water Sprinkling Method

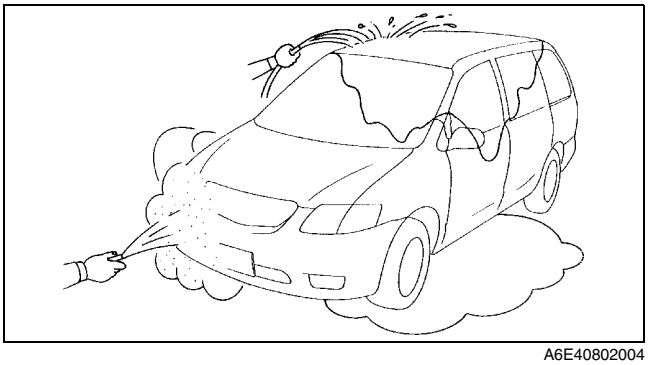
Caution
- **Indirectly change the temperature and humidity by spraying water onto the front of the radiator.**
- **If a vehicle is subject to water leakage, the leakage may damage the control module. When testing a vehicle with a water leakage problem, special caution must be used.**

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

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

Note
- If the 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 a switch, turn it on manually.
5. Spray water onto the vehicle or run it through a car wash.
   - If the PID value is unstable or malfunction occurs, repair or replace part as necessary.



A6E40802004

ENGINE CONTROL SYSTEM OPERATION INSPECTION

A6E408018881230

Intake Shutter Valve Operation Inspection

1. Start the engine and warm up completely.
2. Turn off the A/C switch.
3. Connect the WDS or equivalent to the DLC-2.
4. Monitor the following PIDs using the WDS or equivalent.
   — If not as specified, inspect each sensor and related harness.

ECT PID
Above 60 °C {140 °F}
MAF PID
1.7—1.9 V
RPM PID
725—825 rpm

Note
- The position of the shutter valve, VSC shutter valve and EGR valve may not be as specified when idle speed is maintained for several minutes. If this occurs, briefly increase engine speed to 1,500 rpm and then re-check the position at idle speed.

5. Increase the engine speed and inspect that the intake shutter valve position changes as specified.
   - If not as specified, inspect the following.
     — Vacuum hose
     — Intake shutter solenoid valve actuator
     — Intake shutter solenoid valve and related harness.

Specification

Engine speed (rpm)	Intake shutter valve position
775	Halfway open
1,800	Fully open
2,500	Fully open
Above 3,400	Fully open

Guide Blade Actuator Operation Inspection

1. Start the engine and warm up completely.
2. Verify that the A/C switch is off.
3. Connect the WDS or equivalent to the DLC-2.
4. Monitor the following PIDs using the WDS or equivalent.
   — If not as specified, inspect each sensor and related harness.

ECT PID
Above 60 °C {140 °F}
MAF PID
1.7—1.9 V
RPM PID
725—825 rpm
ACSW PID
OFF

5. Inspect that the guide blade actuator position changes as specified.
   - If not as specified, inspect the following.
     — Vacuum hose
     — Guide blade actuator
     — VBC solenoid valve and related harness.

Specification

Engine switch position	Engine speed (rpm)	Guide blade actuator position
ON	775	Closed
OFF*1	0*3	Closed
OFF*2	0	Open

*1 : Just after turning engine switch off
*2 : 0 to 5 seconds after turning engine switch to OFF
*3 : Guide blade actuator begins to pull back

Cooling Fan No.1/Cooling Fan No.2 Control System Inspection
Cooling fan No.1/cooling fan No.2 system operation

Engine condition	Cooling fan relay No.2	Cooling fan relay No.1
ECT below 100°C {212°F}	OFF	OFF
ECT above 100°C {212°F} (until below 97°C {207°F})	ON	OFF
ECT above 108°C {228°F} (until below 105°C {230°F})	ON	ON
A/C and fan switches are on.	ON	ON
ECT sensor malfunction	ON	ON

Cooling fan relay No.2

1. Connect the WDS or equivalent to DLC-2.
2. Verify that ECT PID is below main fan operating temperature.
3. Verify that A/C switch and fan switch are off.
4. Turn the engine switch to ON.
5. Verify that the cooling fan No.2 is not operating.
   - If the cooling fan No.2 is operating:

   (1) Select FAN PID.
   (2) Send OFF and verify the cooling fan No.2 is off.
      - If the cooling fan No.2 is on, inspect the following.
        — Cooling fan relay No.2 stuck in closed position
        — Short to GND circuit between cooling fan relay No.2 and PCM terminal 76
        — Short to power in circuit at cooling fan relay No.2
        — DTC for ECT sensor (P0117, P0118)
      - If the cooling fan relay No.2 is off, inspect the following.
        — Short to GND circuit between refrigerant pressure switch and PCM terminal 84
        — DTC for ECT sensor (P0117, P0118)
6. Start the engine.
7. Verify that the cooling fan No.2 is operating when engine is hot.
   - If the cooling fan No.2 does not operate, perform the following.
     1. Connect WDS or equivalent to the DLC-2.
     2. Select FAN PID.
     3. Operate cooling fan No.2 by sending ON command.
     4. Inspect if the operation sound is heard from the cooling fan relay No.2.
        - If the operation sound is heard, inspect the wiring harness, connectors and cooling fan motor No.2.
        - If the operation sound is not heard, inspect cooling fan relay No.2 and open circuit wiring harness and connectors.
8. Turn the A/C switch and fan switch on.
9. Verify that cooling fan No.2 is operating.
   - If fan does not operate, inspect A/C system.

Cooling fan relay No.1

1. Verify that A/C switch and fan switch are off.
2. Start the engine and let it idle.
3. Verify that the cooling fan No.1 is not operating.
   - If cooling fan No.1 is operating, inspect for the following.
     — Cooling fan relay No.1 is stuck in closed position.
     — Short to power in circuit between cooling fan relay No.1 and cooling fan No.1
     — Short to GND in circuit between refrigerant pressure switch and PCM terminal 84
     — Short to GND circuit between cooling fan relay No.1 and PCM terminal 102
4. Turn the A/C switch and fan switch on.
5. Verify that the cooling fan No.1 is operating and operation sound of A/C compressor magnetic clutch is heard.

6. Turn the A/C switch and fan switch off.
   - If the cooling fan No.1 does not operate but operation sound of A/C compressor magnetic clutch is heard, inspect for the following.
     — Open circuit between ignition switch and cooling fan relay No.1
     — Open circuit between battery and cooling fan relay No.1
     — Open circuit between cooling fan relay No.1 and PCM terminal 102
     — Open circuit between cooling fan relay No.1 and cooling fan motor No.1 or fan motor GND
     — Cooling fan relay No.1 is stuck open.
     — Cooling fan motor No.1
   - If both additional fan and A/C compressor do not operate, inspect the following.
     — A/C system

ENGINE ELECTRICAL SYSTEM

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E470202000201

- The construction and operation of the engine electrical system for the new Mazda6 (GG, GY) MZR-CD (RF Turbo) engine model is the same as the current Mazda 323 (BJ) RF engine model. (European specs.) (See Mazda 323 Training Manual 3324-10-98E.)
- The construction and operation of the engine electrical system for the new Mazda6 (GG, GY) L8, LF, and L3 engine models is the same as the current Mazda6 (GG) L8, LF, and L3 engine models. (See Mazda6 Training Manual 3359-1*-02C, Mazda6 Workshop Manual 1730-1*-02C.)

SPECIFICATIONS

A6E470202000203

Gasoline engine

Item			Specification					
			New Mazda6 (GG, GY)	**Current Mazda6 (GG)**	**New Mazda6 (GG, GY)**	**Current Mazda6 (GG)**	**New Mazda6 (GG, GY)**	**Current Mazda6 (GG)**
			L8		**LF**		**L3**	
Battery	Type and capacity (5-hour rate)		50D20L (40), 75D26L (52) *		50D20L (40), 75D26L (52) *		50D20L (40), 80D26L (55)*	
	Voltage	(V)	12					
Generator	Output	(V-A)	12-90					
	Regulated voltage		Controlled by PCM					
	Self-diagnosis function							
Ignition system	Type		DEI (Double Electronic Ignition)					
	Spark advance		Electronic					
	Firing order		1—3—4—2					
Spark plug	Type	NGK	ITR6F-13					
Starter	Type		Coaxial reduction					
	Output	(kW)	1.0				1.4	

* : Cold area or intensely hot area

Diesel engine

Item			Specification	
			New Mazda6 (GG, GY)	**Current Mazda 323 (BJ)**
			MZR-CD (RF Turbo)	**RF**
Battery	Type and capacity (5-hour rate)		95D31L (64), 115D31L (70)*	
	Voltage	(V)	12	
Generator	Output	(V-A)	12-90	12-80
	Regulated voltage		14.1—14.7	
	Self-diagnosis function		Equipped	
Starter	Type		Coaxial reduction	
	Output	(kW)	2.2	

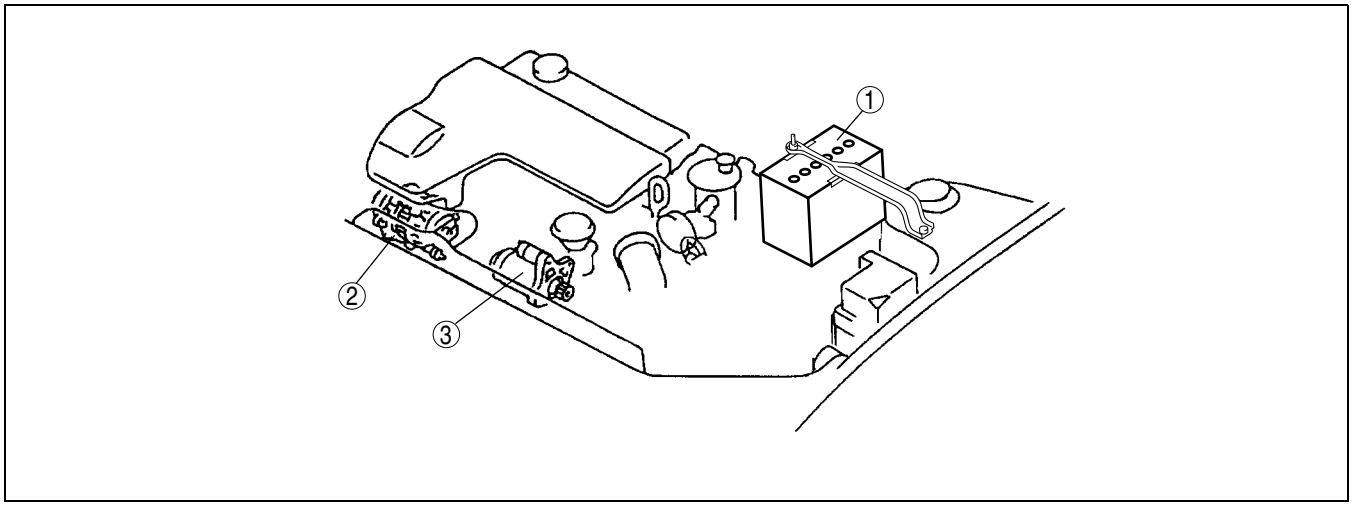
Bold frames:New specifications

* : Cold area

STRUCTURAL VIEW

A6E470202000205

MZR-CD (RF Turbo)



A6E4702W100

1	Battery
2	Generator
3	Starter

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E470202000204

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Battery

- Removal/Installation procedure has been added. (MZR-CD (RF Turbo) engine model)
- Inspection procedure has been added. (MZR-CD (RF Turbo) engine model)
- Recharging procedure has been added. (MZR-CD (RF Turbo) engine model)

Generator

- Removal/Installation procedure has been added. (MZR-CD (RF Turbo) engine model)
- Inspection procedure has been added. (MZR-CD (RF Turbo) engine model)

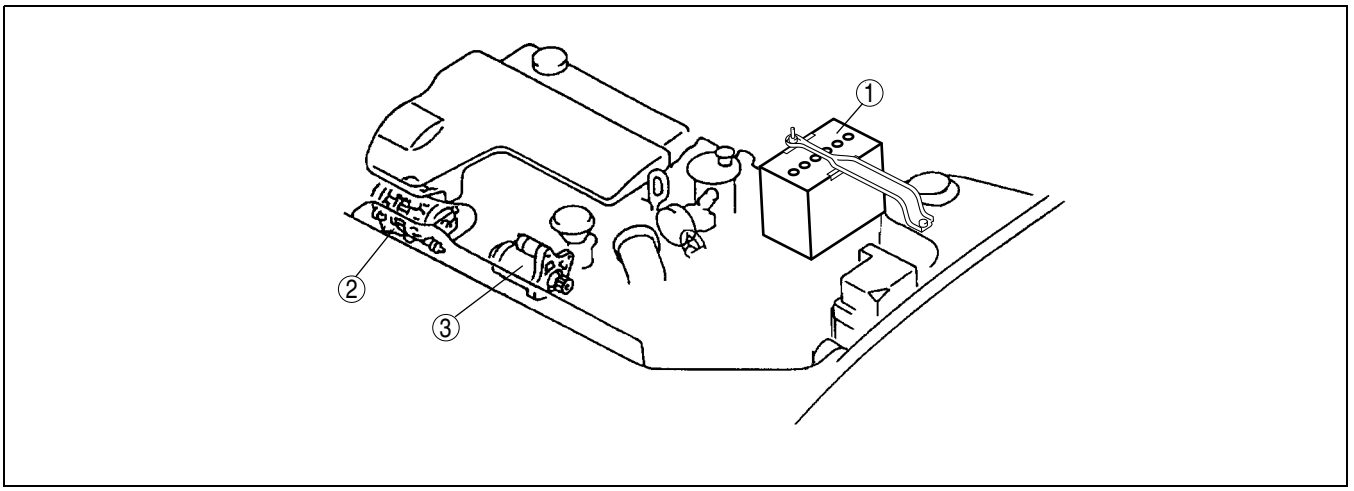
Starter

- Removal/Installation procedure has been added.
- Inspection procedure has been added. (MZR-CD (RF Turbo) engine model)

LOCATION INDEX

A6E470202000206

MZR-CD (RF Turbo)



A6E4702W100

1	Battery (See G–5 BATTERY REMOVAL/INSTALLATION) (See G–6 BATTERY INSPECTION) (See G–6 BATTERY RECHARGING)
2	Generator (See G–7 GENERATOR REMOVAL/INSTALLATION) (See G–7 GENERATOR INSPECTION)
3	Starter (See G–9 STARTER REMOVAL/INSTALLATION) (See G–11 STARTER INSPECTION)

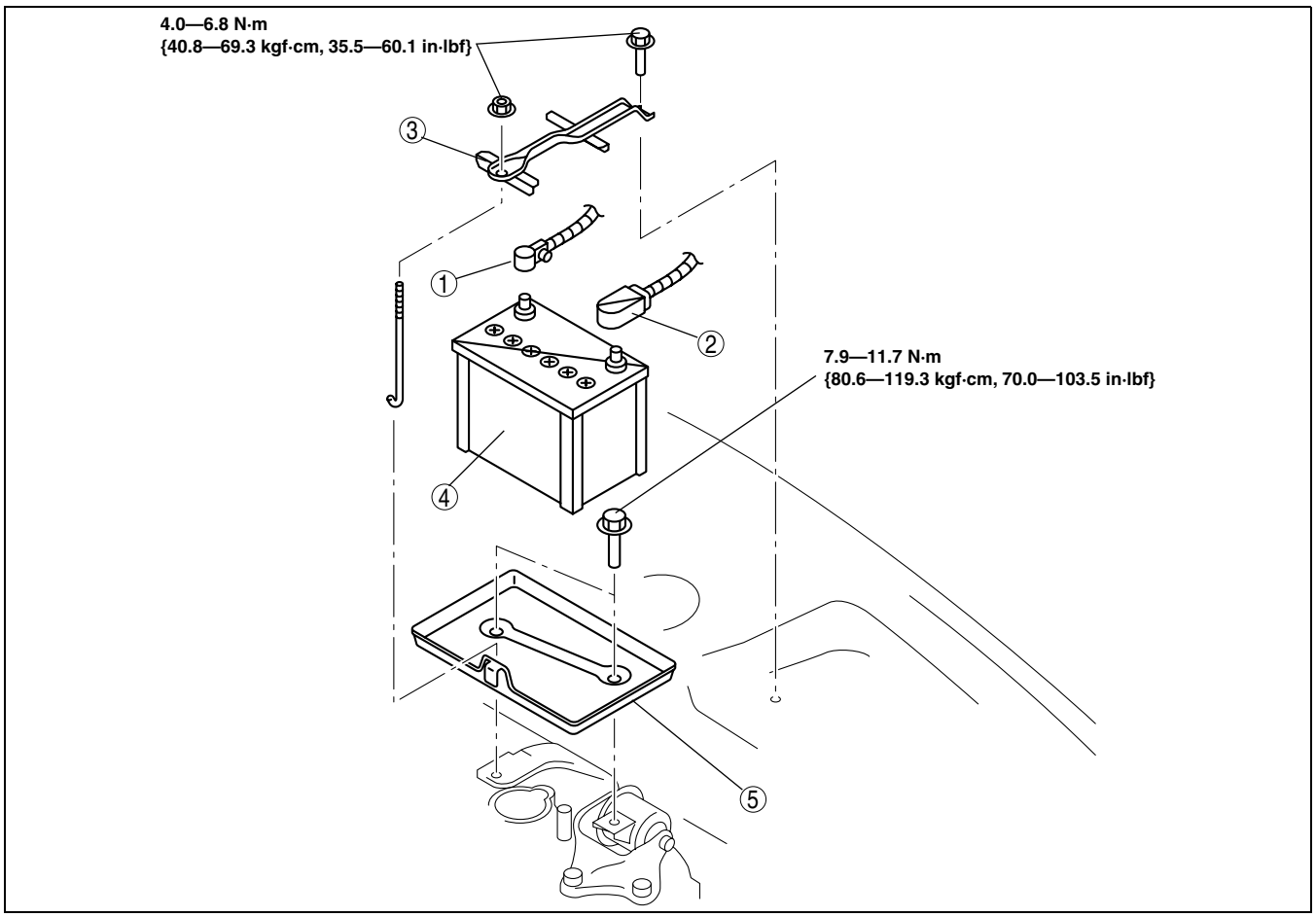
CHARGING SYSTEM

BATTERY REMOVAL/INSTALLATION

A6E471018520201

MZR-CD (RF Turbo)

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



A6E4710W103

1	Negative battery cable
2	Positive battery cable
3	Battery clamp

4	Battery
5	Battery tray

BATTERY INSPECTION

A6E471018520202

MZR-CD (RF Turbo)

Battery

1. Inspect the battery with the following procedure.

Step	Inspection	Result	Action
1	Measure open circuit voltage of battery.	Above 12.4 V	Go to Step 3.
		Below 12.4 V	Go to next step.
2	Quick-charge for 30 min. and recheck voltage.	Above 12.4 V	Go to next step.
		Below 12.4 V	Replace battery.
3	Apply load test (see load test chart) to battery using a battery load tester and record battery voltage after 15 s. Is voltage more than specification?	Yes	Battery okay.
		No	Replace battery.

Load test chart

Battery	Load (A)
95D31L (64)	250
115D31L (70)	320

Battery positive voltage with load

Approximate battery temp.	Minimum voltage (V)
21°C {70°F}	9.6
15°C {60°F}	9.5
10°C {50°F}	9.4
4°C {40°F}	9.3
–1°C {30°F}	9.1
–7°C {20°F}	8.9
–12°C {10°F}	8.7
–18°C {0°F}	8.5

Back-up Current

1. Verify that the engine switch is off and that the engine key has been removed.
2. Disconnect the negative battery cable.

Caution

- **Operating electrical loads while measuring the back-up current can damage the circuit tester.**

3. Measure the back-up current between the negative battery terminal and the negative battery cable.
   (1) If the current exceeds the maximum, remove the fuses in the main fuse block and the fuse block one by one while measuring the back-up current.
   (2) Inspect and repair harnesses and connectors on the fuse where the current has been reduced.

Back-up current
20 mA max.

BATTERY RECHARGING

A6E471018520203

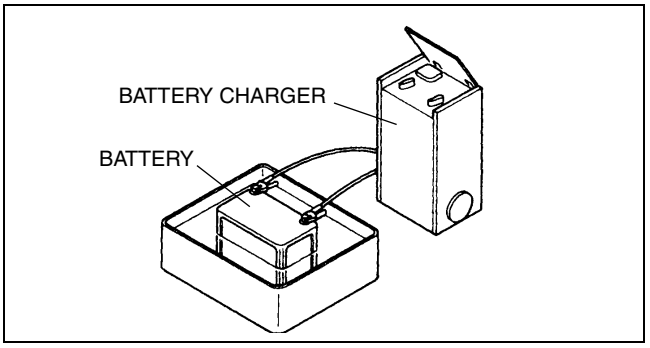
MZR-CD (RF Turbo)

Caution

- **To avoid damage to the battery, do not quick charge for over 30 min.**
- **When disconnecting the battery, remove the negative cable first and install it last to prevent damage to electrical components or the battery.**
- **To avoid deformation or damage to the battery, remove the battery plugs while charging the battery.**

1. Remove the battery from vehicle and place it in a pan of water.
2. Connect a battery charger to the battery.
3. Adjust the charging current as follows.

Battery type (5-hour rate)	Slow-charge (A)	Quick-charge (A/30 min)
95D31L (64)	6.5—8.0	40
115D31L (70)	7.0—8.5	45



A6E4710W100

4. After the battery has been recharged, measure the battery positive voltage and verify that the battery keeps specified voltage for more than **1 h**.
   - If not as specified, replace the battery.

Specification
Above 12.4 V

GENERATOR REMOVAL/INSTALLATION

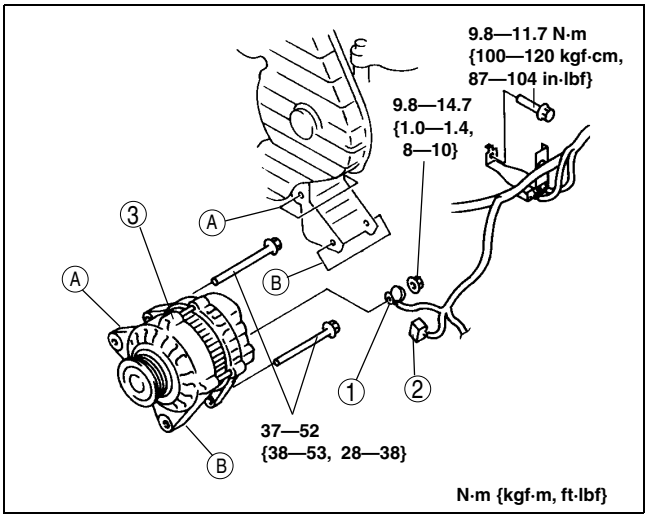
A6E471018300202

MZR-CD (RF Turbo)

Warning
- **When the battery cables are connected, touching the vehicle body with generator terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the battery before performing the following operation.**

1. Disconnect the negative battery cable.
2. Remove the radiator.
3. Remove the drive belt. (See B2–4 DRIVE BELT REPLACEMENT.)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.

1	Terminal B wire
2	Connector
3	Generator



A6E4710W101

GENERATOR INSPECTION

A6E471018300203

MZR-CD (RF Turbo)
Generator Warning Light

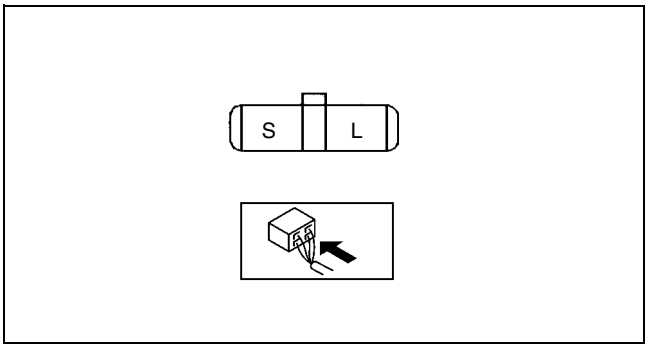
1. Verify that the battery is fully charged.
   - Charge if necessary. (See G–6 BATTERY RECHARGING.)
2. Verify that the drive belt deflection/tension is correct. (See B2–4 DRIVE BELT INSPECTION.)
   - Replace if necessary. (See B2–4 DRIVE BELT REPLACEMENT.)
3. Turn the engine switch ON position and verify that the generator warning light turns on.
   - If not, inspect the generator warning light, and the wiring harnesses between the battery, generator warning light, and generator terminal L.
4. Verify that the generator warning light goes out after the engine is started.
   - If not, inspect the generator.

Generator
Voltage

1. Verify that the battery is fully charged.
   - Charge if necessary. (See G–6 BATTERY RECHARGING.)
2. Inspect the drive belt deflection/tension. (See B2–4 DRIVE BELT INSPECTION.)
   - Replace if necessary. (See B2–4 DRIVE BELT REPLACEMENT.)
3. Turn off all electrical loads.
4. Turn the engine switch to start the engine and verify that the generator rotates smoothly without any noise while the engine is running.
5. Measure the voltage at the terminals shown in the table.
   - If not as specified, repair or replace the generator if necessary.

Standard voltage

Terminal	Engine switch ON (V)	Idle (V) [20°C {68°F}]
B	B+	14.1—14.7
L	Approx. 1	
S	B+	



A6E4710W102

Current

1. Verify that the battery is fully charged.
   - Charge if necessary. (See G–6 BATTERY RECHARGING.)
2. Verify that the drive belt deflection/tension is correct. (See B2–4 DRIVE BELT INSPECTION.)
   - Replace if necessary. (See B2–4 DRIVE BELT REPLACEMENT.)
3. Disconnect the negative battery cable.
4. Connect an ammeter, capable of reading **120 A** or more, between generator terminal B and the wiring harness.
5. Connect the negative battery cable.
6. Turn off all electrical loads.
7. Start the engine and increase the engine speed to **2,000—2,500 rpm**.
8. Turn the following electrical loads on and verify that the current reading increases.
   (1) Headlights
   (2) Blower motor
   (3) Rear window defroster

Note
- Current required for generating power varies with electrical loads applied.

Standard current (reference)

Measuring conditions
Room temperature: 20°C {68°F}
Voltage: 13.5 V
Engine hot

Engine speed (rpm)	Terminal B current (A)*
1,000	0—80
2,000	0—90

* : Must not be 0 A.

STARTING SYSTEM

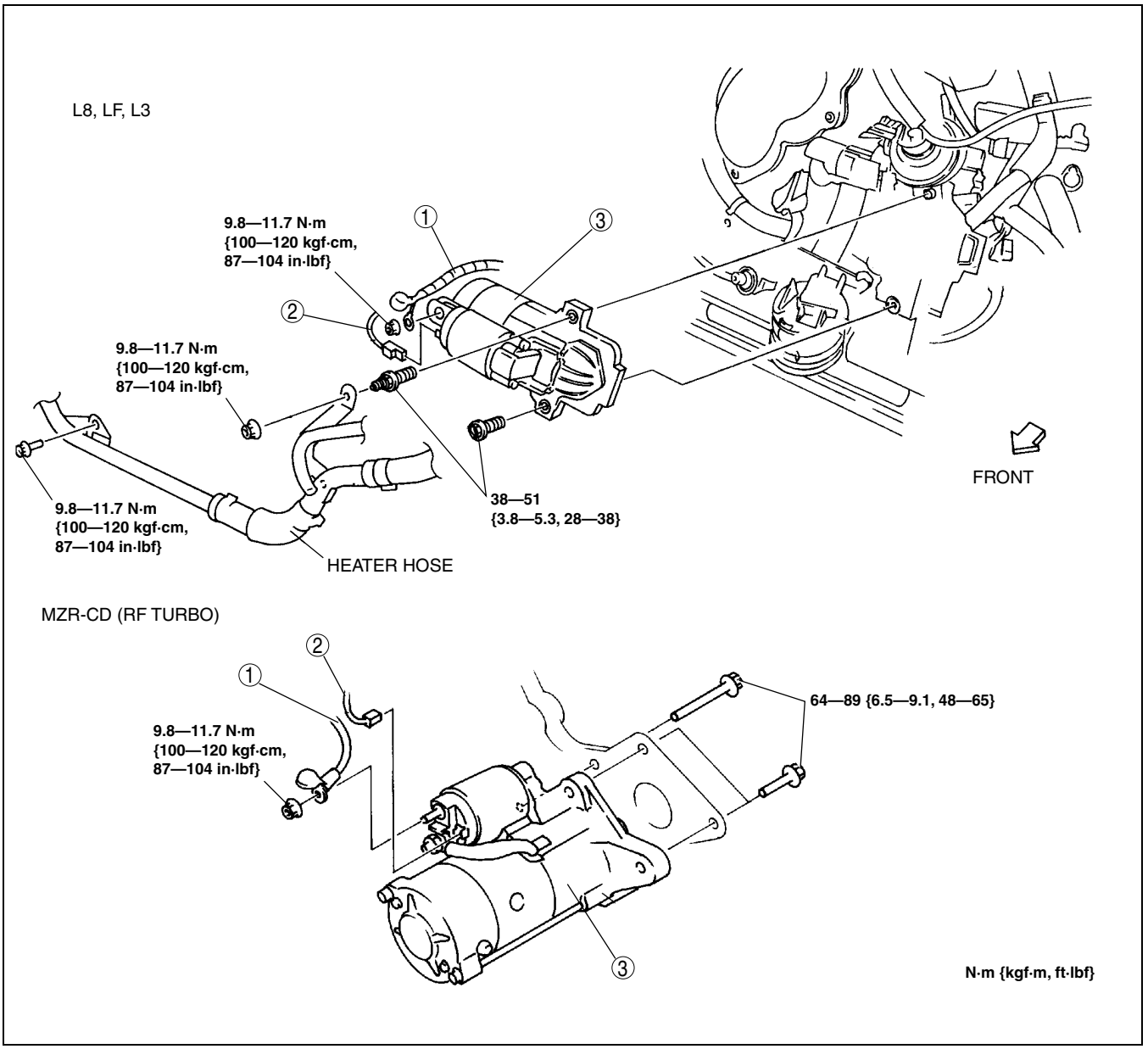
STARTER REMOVAL/INSTALLATION

A6E471418400202

Warning

- **When the battery cables are connected, touching the vehicle body with starter terminal B will generate sparks. This can cause personal injury, fire, and damage to the electrical components. Always disconnect the battery negative cables before performing the following operation.**

1. Disconnect the negative battery cable.
2. Remove the plug hole plate. (L8, LF, and L3 engine models)
3. Remove the engine cover. (MZR-CD (RF Turbo) engine model) (See B2–9 TIMING BELT REMOVAL/INSTALLATION.)
4. Remove the air cleaner assembly. (L8, LF, and L3 engine models).
5. Remove the under cover.
6. Remove the oil filter and oil cooler component with the cooling hose connected. Position the oil filter and oil cooler component so that it is out of the way. (L3 engine model (4WD))
7. Remove the solenoid valve assembly with the vacuum hose and the connector connected. Position the solenoid valve assembly so that it is out of the way. (MZR-CD (RF Turbo) engine model)
8. Remove the release cylinder with the oil pipe connected. Position the release cylinder so that it is out of the way. (MTX)
9. Remove in the order indicated in the table.
10. Install in the reverse order of removal.



A6E4714W100

1	Terminal B wire
2	Terminal S wire
3	Starter (See G–10 Starter Removal Note (MZR-CD (RF Turbo)))

Starter Removal Note (MZR-CD (RF Turbo))

1. Remove the starter from above.

STARTER INSPECTION

A6E471418400203

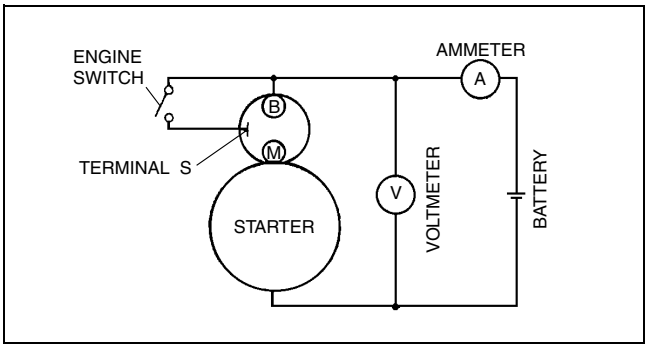
MZR-CD (RF Turbo)

On-vehicle Inspection

1. Verify that the battery is fully charged.
   - Charge if necessary. (See G–6 BATTERY RECHARGING.)
2. Crank the engine and verify that the starter rotates smoothly without any noise.
   - If not as specified, inspect the following:
     — Remove the starter, and inspect the magnetic switch and the starter.
     — Inspect the related wiring harness and the engine switch.

No Load Test

1. Verify that the battery is fully charged.
   - Charge if necessary. (See G–6 BATTERY RECHARGING.)
2. Connect the starter, battery, voltmeter and ammeter as shown.
3. Operate the starter and verify that it rotates smoothly.
4. Measure the voltage and current while the starter is operating.
   - If not as specified, replace the starter.



A6E4714W101

Specification

Voltage (V)	11
Current (A)	Below 130

CLUTCH

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E490216003201

- The construction and operation of the clutch is essentially carried over from that of the current MPV (LW) models, except for the following features. (See Mazda MPV Training Manual 3340-1*-99F.)

FEATURES

A6E490216003202

Adoption of the A65M-R manual transaxle models

- The specifications for the A65M-R manual transaxle models have been added.

Increased torque transmission capacity

- Increased clutch cover set load.

Reduced noise

- The flywheel with a damper has been adopted for the A65M-R manual transaxle model.

SPECIFICATIONS

A6E490216003203

Item			New Mazda6 (GG, GY)	Current MPV (LW)
Engine			**MZR-CD (RF Turbo)**	
Manual transaxle type			**A65M-R**	
Clutch control			Hydraulic	
Clutch cover	Spring type		Diaphragm	
	Set load	(N {kgf, lbf})	6,550 {668, 1,472}	
Clutch disc	Outer diameter	(mm {in})	239 {9.41}	
	Inner diameter	(mm {in})	160 {6.30}	
Clutch pedal	Type		Suspended	
	Pedal ratio		5.9	6.41
	Full stroke	(mm {in})	140 {5.51}	148 {5.83}
Clutch master cylinder inner diameter		(mm {in})	15.87 {0.625}	
Clutch release cylinder inner diameter		(mm {in})	19.05 {0.750}	
Clutch fluid type			SAE J1703, FMVSS116 DOT-3 or DOT-4	

Bold frames:New specifications

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E490216003204

- The following changes have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

CLUTCH RELEASE CYLINDER

- Removal/installation procedure has been modified.
- Disassembly/assembly procedure has been modified.

CLUTCH UNIT

- Removal/installation procedure has been modified.
- Clutch cover inspection procedure has been modified.

FLYWHEEL

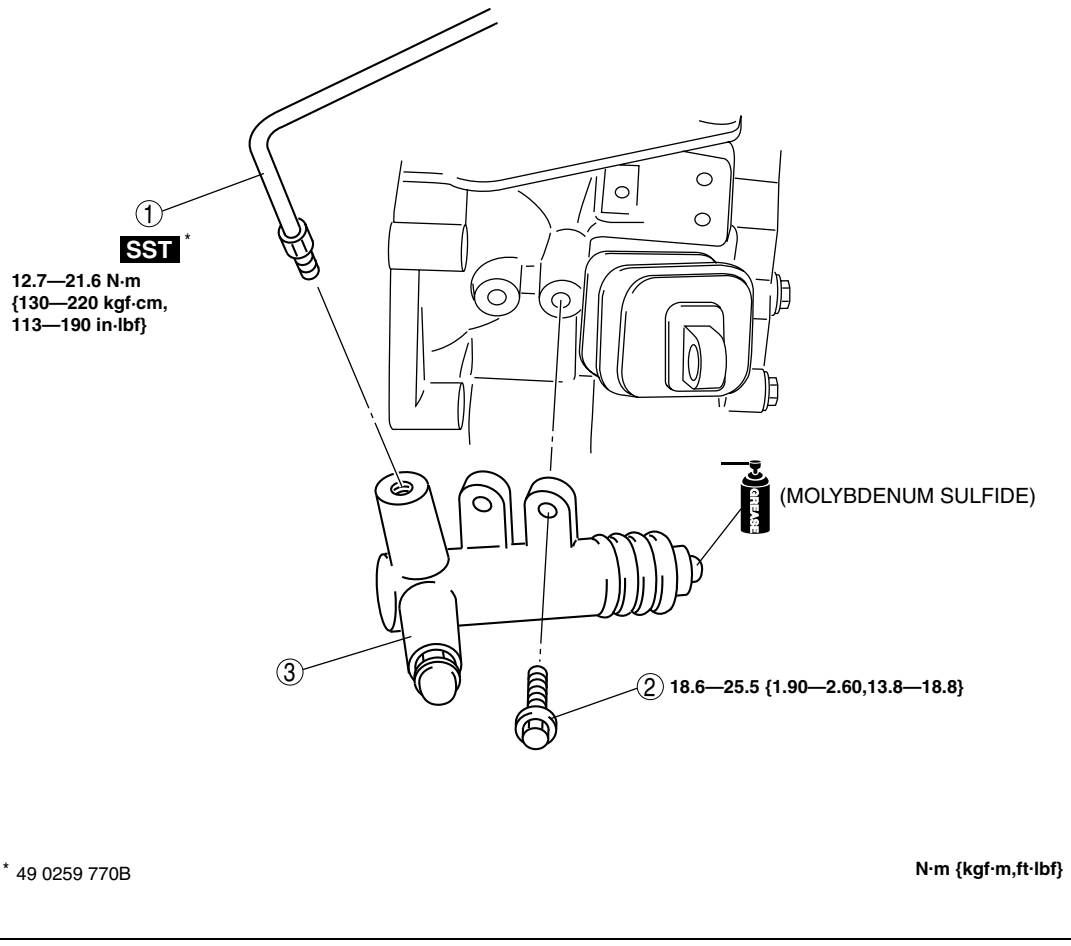
- Flywheel inspection procedure has been modified.

CLUTCH RELEASE CYLINDER

CLUTCH RELEASE CYLINDER REMOVAL/INSTALLATION (A65M-R MANUAL TRANSAXLE MODELS)

A6E491841920201

1. Remove the under cover.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



A6E4918W010

1	Clutch pipe
2	Bolt

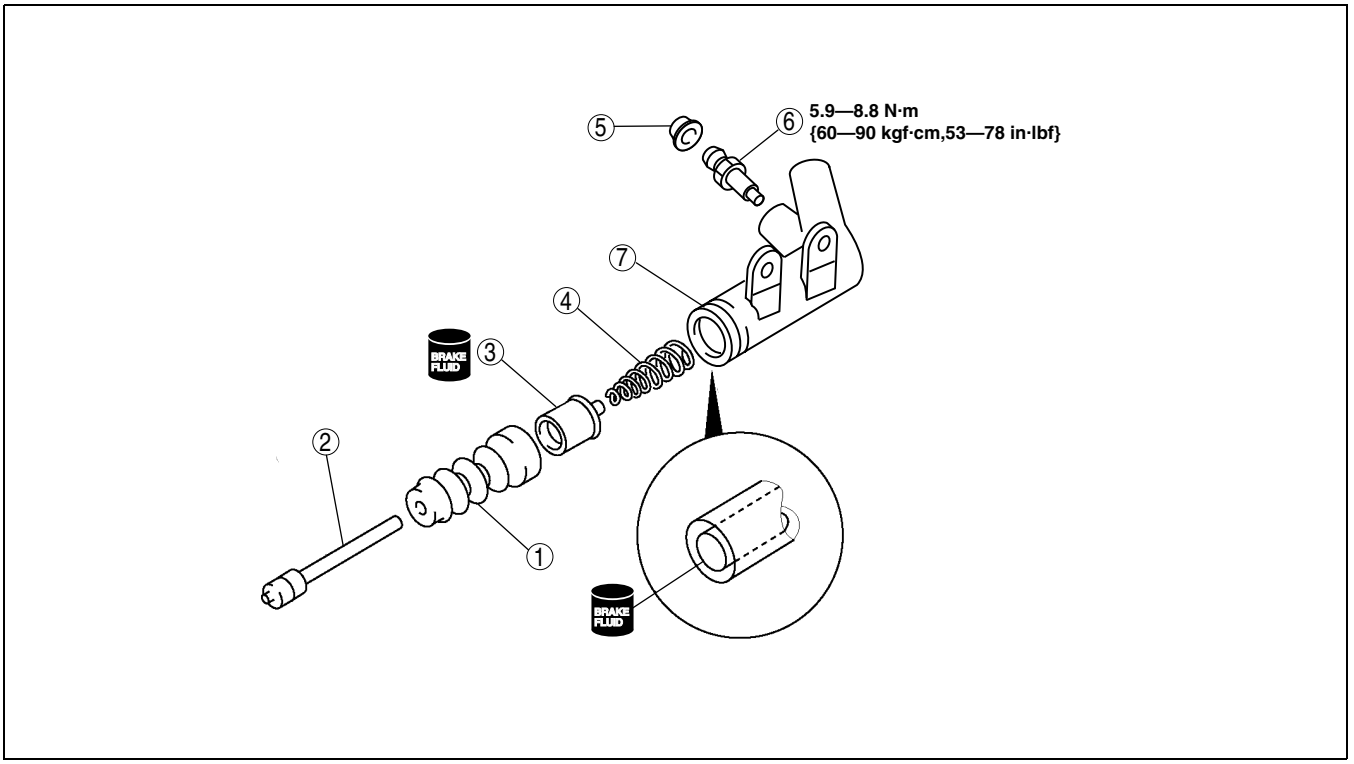
3	Clutch release cylinder

H

CLUTCH RELEASE CYLINDER DISASSEMBLY/ASSEMBLY (A65M-R MANUAL TRANSAXLE MODELS)

A6E491841920202

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



A6E4918W011

1	Boot
2	Push rod
3	Piston and cap
4	Return spring

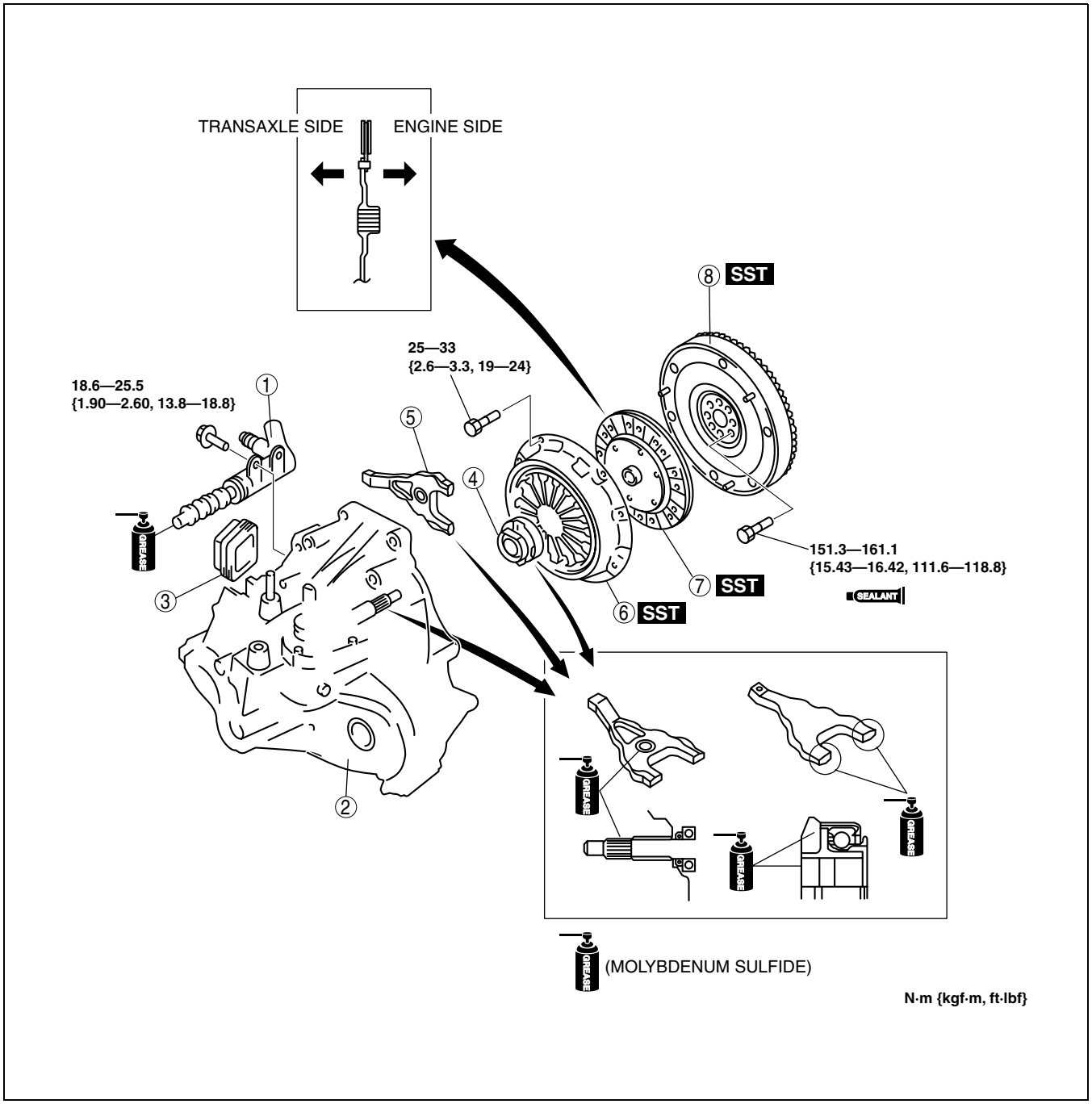
5	Bleeder cap
6	Bleeder screw
7	Release cylinder body

CLUTCH UNIT

CLUTCH UNIT REMOVAL/INSTALLATION (A65M-R MANUAL TRANSAXLE MODELS)

A6E492016000201

1. Remove in the order indicated in the table.
2. Install in the reverse order oremoval.



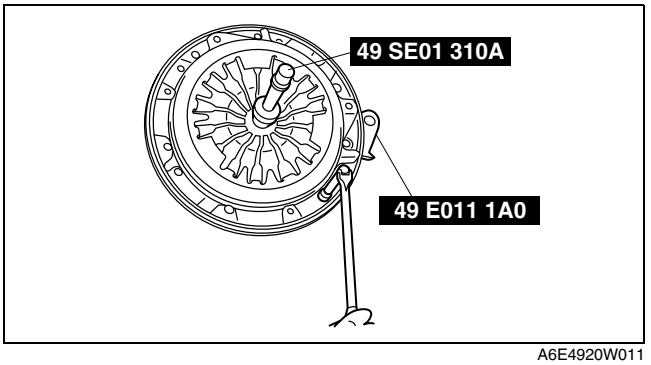
A6E4920W010

1	Clutch release cylinder
2	Manual transaxle (See J2–7 MANUAL TRANSAXLE REMOVAL/ INSTALLATION)
3	Boot
4	Clutch release collar
5	Clutch release fork

6	Clutch cover (See H–6 Clutch Cover and Disc Removal Note) (See H–7 Clutch Cover Installation Note)
7	Clutch disc (See H–6 Clutch Cover and Disc Removal Note) (See H–7 Clutch Disc Installation Note)
8	Flywheel (See H–6 Flywheel Removal Note) (See H–6 Flywheel Installation Note)

Clutch Cover and Disc Removal Note

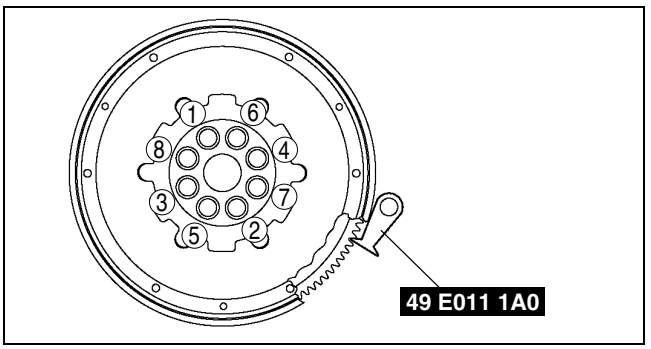
1. Install the **SSTs**.
2. Loosen each bolt one turn at a time in a crisscross pattern until spring tension is released.
3. Remove the clutch cover and disc.



A6E4920W011

Flywheel Removal Note

1. Hold the flywheel using the **SST**.
2. Remove the bolts evenly and gradually in a crisscross pattern.
3. Remove the flywheel.



A6E4920W012

Flywheel Installation Note

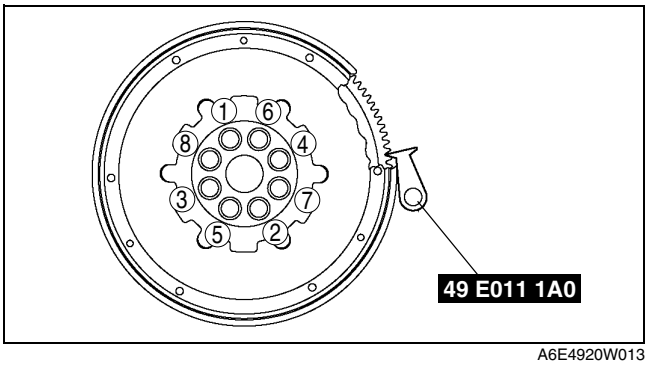
1. Install the flywheel to the crankshaft.
2. When reusing the bolts, clean threads and hole, then apply locking compound to the threads.

Note

- No locking compound is needed when using new bolts.

3. Hand-tighten the flywheel lock bolts.
4. Install the **SST** to the flywheel.
5. Gradually tighten the flywheel lock bolts in a crisscross pattern.

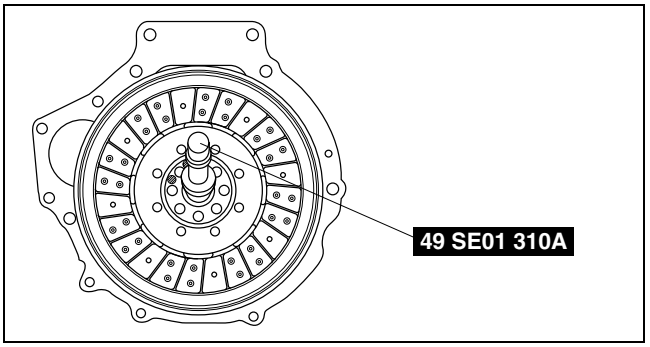
Tightning torque
151.3—161.1 N·m
{15.43—16.42 kgf·m, 111.6—118.8 ft·lbf}



A6E4920W013

Clutch Disc Installation Note

1. Hold the clutch disc position using the **SST**.

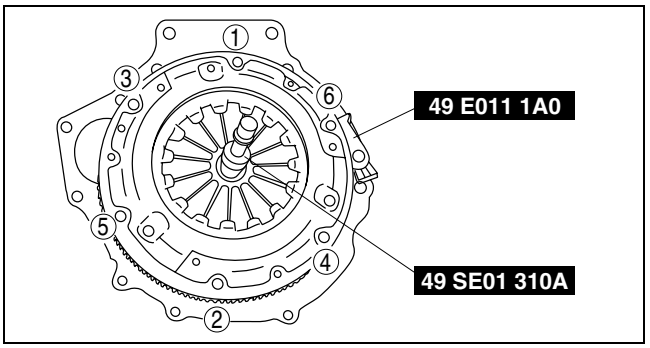


A6E4920W014

Clutch Cover Installation Note

1. Install the **SSTs**.
2. Tighten the bolts evenly and gradually in a crisscross pattern.

   Tightening torque
   25—33 N·m {2.6—3.3 kgf·m, 19—24 ft·lbf}



A6E4920W015

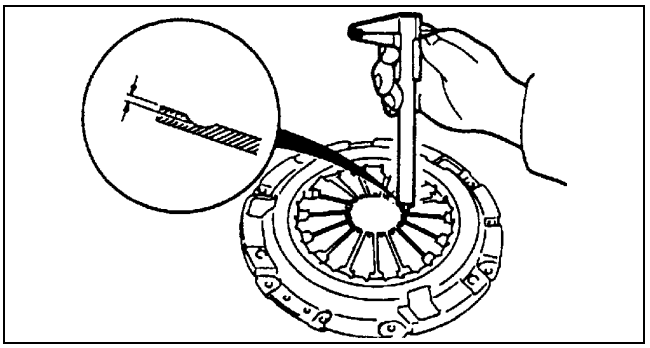
H

CLUTCH COVER INSPECTION (A65M-R MANUAL TRANSAXLE MODELS)

A6E492016410201

1. Measure the wear of the diaphragm spring fingers.
   - If not as specified, replace the clutch cover.

   Depth
   0.6 mm {0.024 in} max.

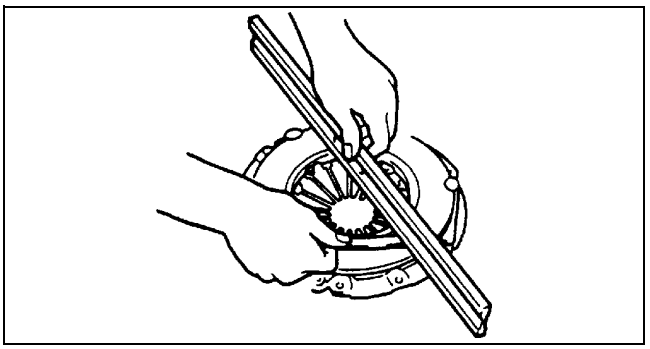


XME4920W010

2. Measure the flatness of the pressure plate with a straight edge and a feeler gauge.
   - If not as specified, replace the clutch cover.

   Maximum clearance
   0.3 mm {0.012 in}

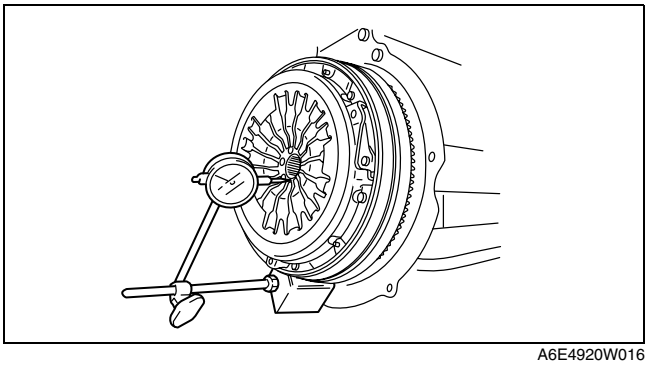
3. When checking the diaphragm spring fingers, mount a dial indicator on the cylinder block.



XME4920W011

4. Rotate the flywheel and check for misaligned diaphragm spring fingers.
   - If not as specified, replace the clutch cover.

   Misalignment
   0.6 mm {0.024 in} max.



A6E4920W016

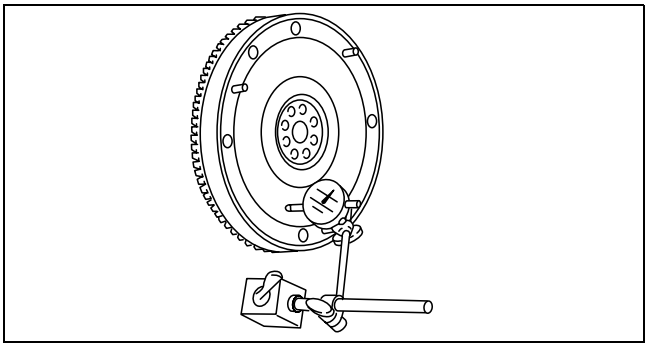
FLYWHEEL

FLYWHEEL INSPECTION (A65M-R MANUAL TRANSAXLE MODELS)

A6E492211500201

1. Install a dial gauge on the cylinder block.
2. Measure the flywheel runout using a dial indicator.
   - If the runout is excessive, replace the flywheel.

   Runout
   0.3 mm {0.012 in} max.



A6E4922W001

MANUAL TRANSAXLE [A65M-R]

FEATURES

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- OUTLINE OF CONSTRUCTION J2-2
- FEATURES J2-2
- SPECIFICATIONS J2-2

SERVICE

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MANUAL TRANSAXLE J2-4
- TRANSAXLE OIL INSPECTION J2-4
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- NEUTRAL SWITCH INSPECTION J2-6
- NEUTRAL SWITCH REMOVAL/INSTALLATION J2-7
- MANUAL TRANSAXLE REMOVAL/INSTALLATION J2-7

SHIFT MECHANISM J2-12
- SHIFT MECHANISM REMOVAL/INSTALLATION J2-12

OUTLINE

OUTLINE OF CONSTRUCTION

A6E520201025203

- The construction and operation of the manual transaxle is the same as those of the current A65M-R type manual transaxle, except for the following features. (See MPV Workshop Manual supplement 1737-1*-02D.)

FEATURES

A6E520201025201

Improved drivability

- The gear ratio has been changed.

SPECIFICATIONS

A6E520201025202

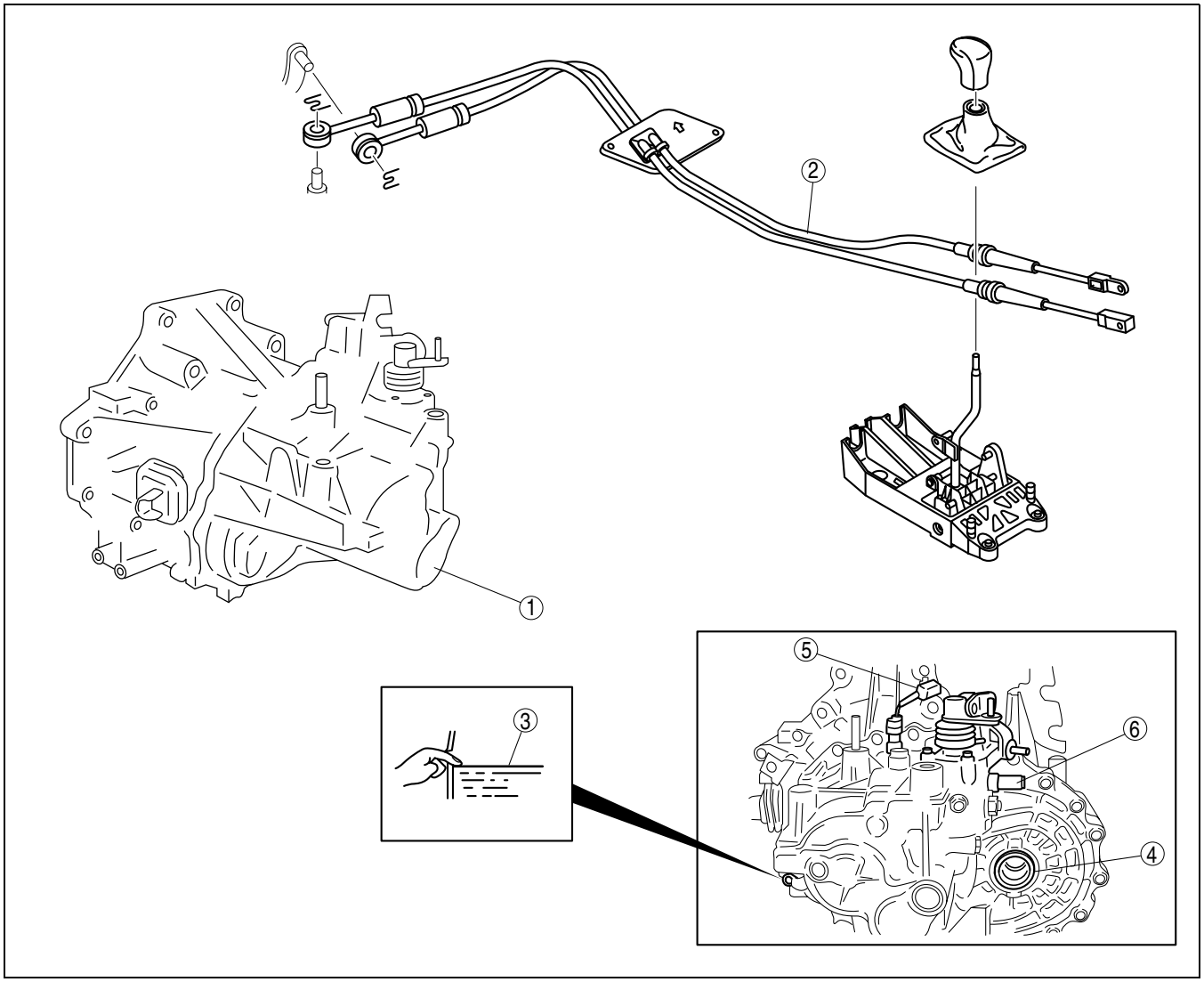
Item		New Mazda6 (GG, GY)	Current MPV (LW)
Transaxle type		A65M-R	
Transaxle control		Floor-shift	
Operation system		Cable	
Shift assist	Forward	Synchromesh	
	Reverse		
Gear ratio	1st	3.416	
	2nd	1.944	1.789
	3rd	1.258	1.193
	4th	0.902	
	5th	0.659	
	Reverse	3.252	
Final gear ratio		3.588	4.133
Oil	Grade	API service GL-4 or GL-5	
	Viscosity (All season)	SAE 75W-90	
	Capacity (approximate quantity) (L {US qt, Imp qt})	2.30 {2.40, 2.00}	

Bold frames:New specifications

LOCATION INDEX

MANUAL TRANSAXLE LOCATION INDEX

A6E520001036201



A6E5200W001

1	Manual transaxle (See J2–7 MANUAL TRANSAXLE REMOVAL/ INSTALLATION)
2	Shift mechanism (See J2–12 SHIFT MECHANISM REMOVAL/ INSTALLATION)
3	Transaxle oil (See J2–4 TRANSAXLE OIL INSPECTION) (See J2–4 TRANSAXLE OIL REPLACEMENT)

4	Oil seal (differential) (See J2–5 OIL SEAL (DIFFERENTIAL) REPLACEMENT)
5	Reverse switch (See J2–5 REVERSE SWITCH INSPECTION) (See J2–6 REVERSE SWITCH REMOVAL/ INSTALLATION)
6	Neutral switch (See J2–6 NEUTRAL SWITCH INSPECTION) (See J2–7 NEUTRAL SWITCH REMOVAL/ INSTALLATION)

MANUAL TRANSAXLE

TRANSAXLE OIL INSPECTION

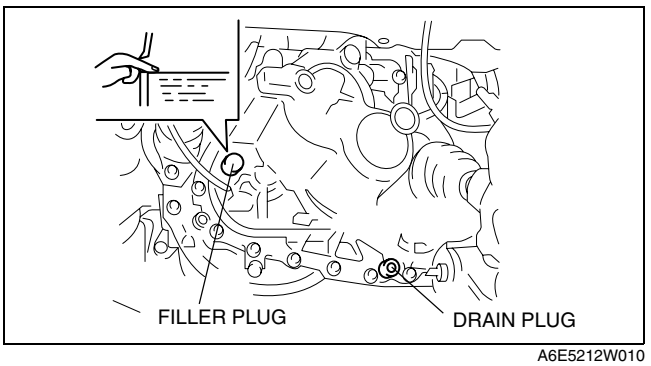
A6E521227001201

1. Park the vehicle on level ground.
2. Remove the filler plug and gasket.
3. Verify that the oil is near the brim of the plug port.
   - If the oil level is low, add the specified amount and type of oil through the filler plug hole.

Specified oil grade
API Service GL-4 or GL-5
Specified oil viscosity
SAE 75W-90

4. Install a new gasket and the filler plug.

Tightening torque
30.0—39.0 N·m
{3.06—3.98 kgf·m, 22.1—28.8 in·lbf}



A6E5212W010

TRANSAXLE OIL REPLACEMENT

A6E521227001202

1. Remove the drain plug with the gasket.
2. Drain the oil into a suitable container.
3. Install a new gasket and the drain plug.

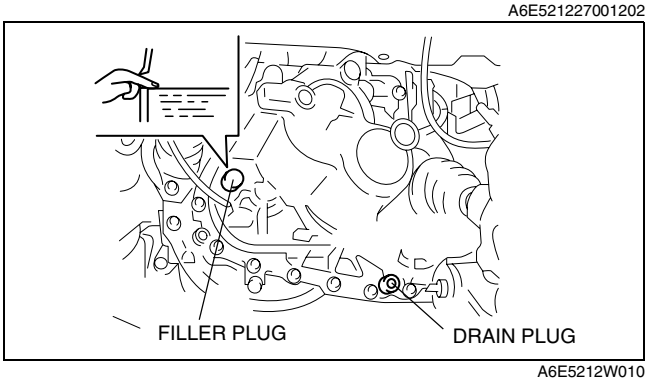
Tightening torque
30.0—39.0 N·m
{3.06—3.98 kgf·m, 22.1—28.8 in·lbf}

4. Remove the filler plug with gasket and add the specified amount and type of oil through the filler plug hole until the level reaches the bottom of the filler plug hole.

Specified oil grade
API Service GL-4 or GL-5
Specified oil viscosity
SAE 75W-90
Capacity (approximate quantity)
2.30 L {2.40 US qt, 2.00 Imp qt}

5. Install a new gasket and the filler plug.

Tightening torque
30.0—39.0 N·m
{3.06—3.98 kgf·m, 22.1—28.8 in·lbf}

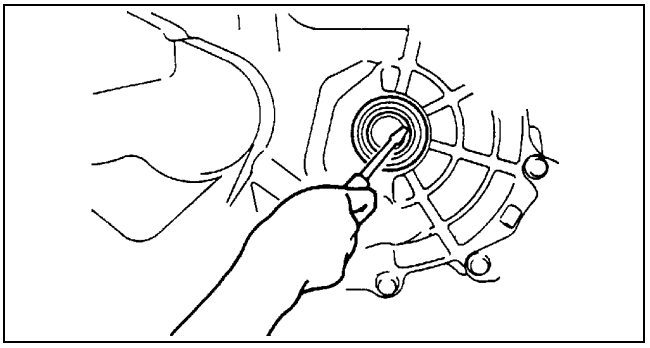


A6E5212W010

OIL SEAL (DIFFERENTIAL) REPLACEMENT

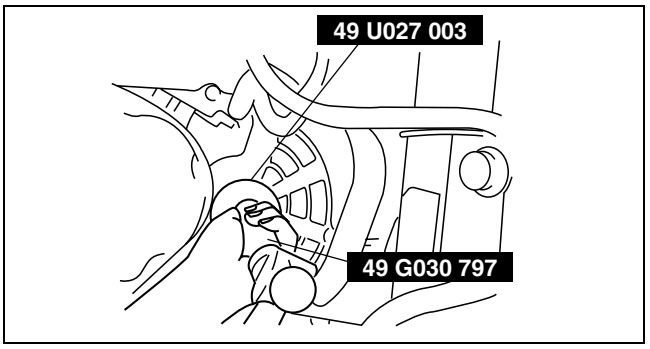
A6E521219240201

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Drain the oil from the transaxle.
3. Remove the front wheels and splash shields.
4. Separate the drive shaft and joint shaft from the transaxle. (See Section M.)
5. Remove the oil seals using a screwdriver.



AME5212W005

6. Using the **SSTs** and a hammer, tap each new oil seal in evenly until the **SSTs** contact the transaxle case.
7. Coat the lip of each oil seal with transaxle oil.
8. Insert the drive shaft and joint shaft into the transaxle. (See Section M.)
9. Install the wheels and splash shields.
10. Add the specified amount and type of oil. (See J2–4 TRANSAXLE OIL REPLACEMENT.)

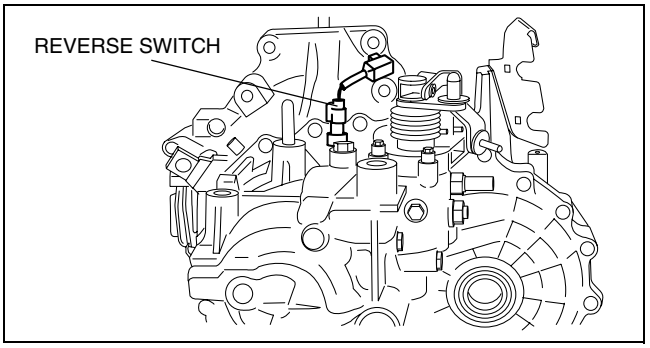


A6E5212W011

REVERSE SWITCH INSPECTION

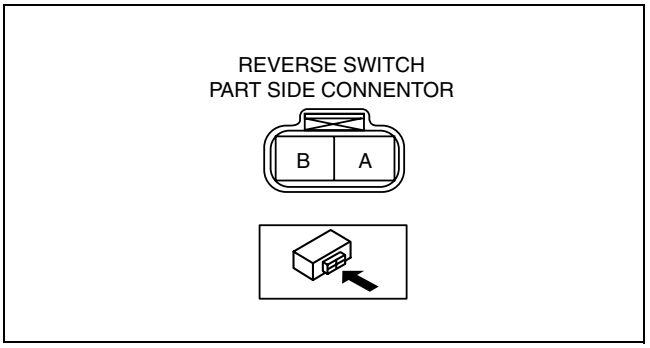
A6E521219010201

1. Disconnect the reverse switch connector.



A6E5212W012

2. Shift the shift lever to each position, and inspect for continuity between terminals A and B.
   - If not as specified, replace the reverse switch. (See J2–6 REVERSE SWITCH REMOVAL/INSTALLATION.)



A6E5212W013

○——○ : Continuity

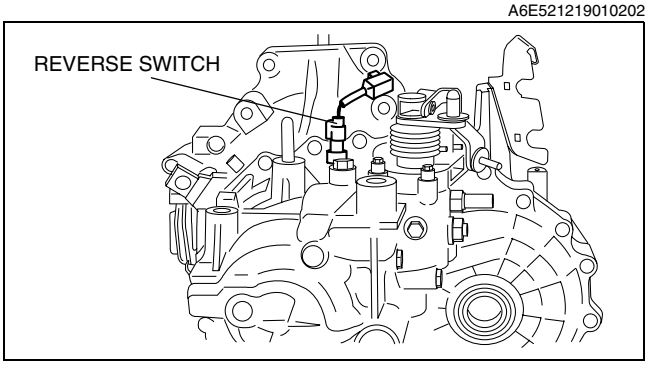
Shift position	Connector terminal	
	A	B
Reverse	○	○
Others		

A6E5212W014

3. Connect the reverse switch connector.

REVERSE SWITCH REMOVAL/INSTALLATION

A6E521219010202



A6E5212W012

1. Remove the reverse switch.
2. Apply a light coat of silicone sealant to the screw of the reverse switch.

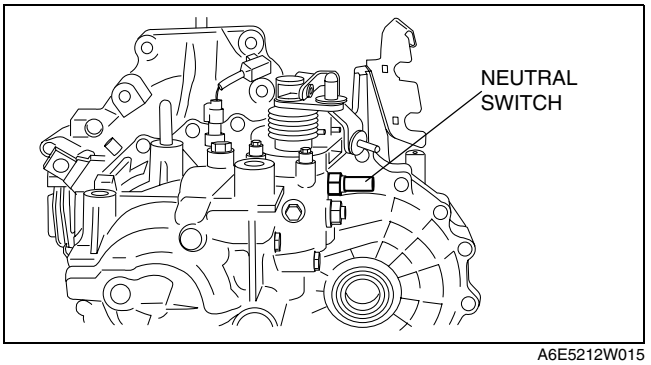
   Sealant
   Three Bond product: TB1215

3. Install the reverse switch to the transaxle case.

   Tightening torque
   22.5—33.3 N·m
   {2.29—3.40 kgf·m, 16.6—24.6 ft·lbf}

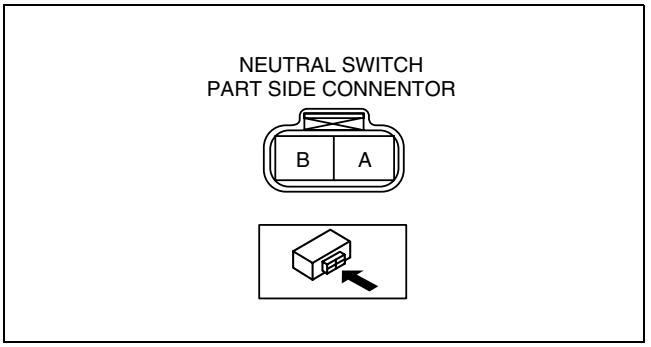
NEUTRAL SWITCH INSPECTION

A6E521219010203



A6E5212W015

1. Disconnect the neutral switch connector.
2. Shift the shift lever to each position and neutral, and inspect for continuity between the terminals A and B.
   - If not as specified, replace the neutral switch. (See J2–7 NEUTRAL SWITCH REMOVAL/INSTALLATION.)



A6E5212W016

○——○ : Continuity

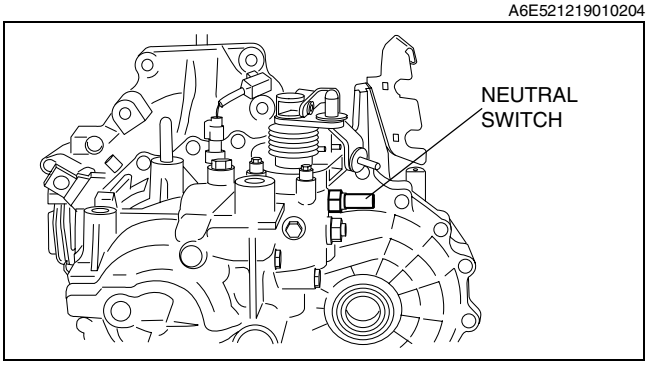
Shift position	Connector terminal	
	A	B
Neutral	○———	———○
Others		

A6E5212W017

3. Connect the neutral switch connector.

NEUTRAL SWITCH REMOVAL/INSTALLATION

A6E521219010204



A6E5212W015

1. Remove the neutral switch.
2. Apply a light coat of silicone sealant to the screw of the neutral switch.

   Sealant
   Three Bond product: TB1215

3. Install the neutral switch to the transaxle case.

   Tightening torque
   22.5—33.3 N·m
   {2.29—3.40 kgf·m, 16.6—24.6 ft·lbf}

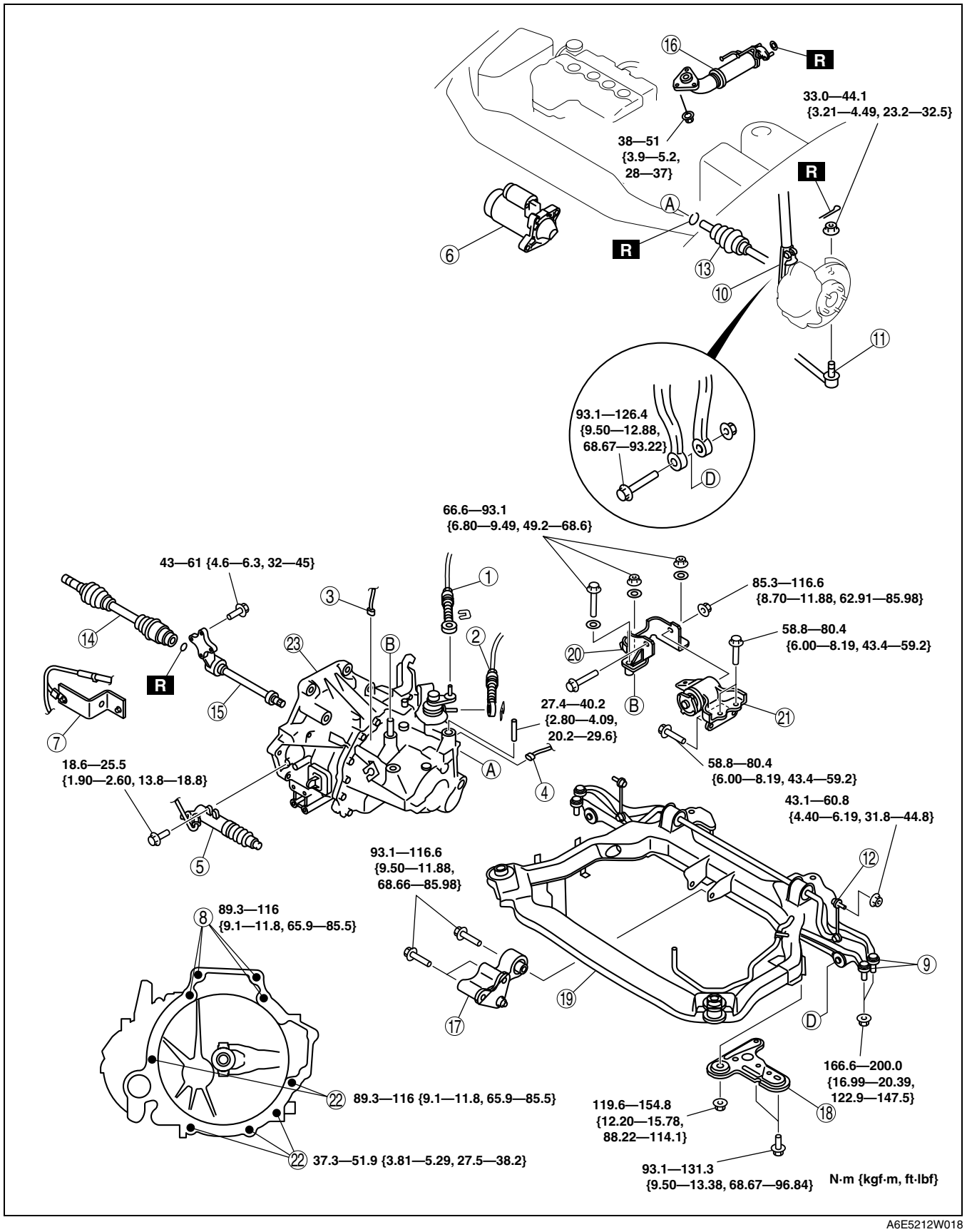
MANUAL TRANSAXLE REMOVAL/INSTALLATION

A6E521201029201

1. Remove the battery and battery tray.
2. Remove the air cleaner compornent. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
3. Remove the air hose above the transaxle. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
4. Remove the air pipe above the transaxle. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
5. Remove the solenoid bracket.
6. Remove the wheels, tires and splash shields.
7. Remove the under cover.
8. Separate the steering hose.
9. Remove the steering gear and linkage, and pipe assembly installation bolts from the front crossmember, then suspend the steering gear and linkage with a cable. (See N–8 STEERING GEAR AND LINKAGE (MZR-CD (RF Turbo)) REMOVAL/INSTALLATION.)

   Tightening torque
   - **Pipe assembly: 7.8—10.8 N·m {79.6—110.0 kgf·cm, 69.1—95.5 in·lbf}**

10. Remove the front auto leveling sensor. (See Section T.)
11. Drain the transaxle oil into a suitable container.
12. Remove in the order indicated in the table.
13. Install in the reverse order of removal.
14. Adjust the headlight zeroset. (See Section T.)
15. Add the specified amount of specified transaxle oil. (See J2–4 TRANSAXLE OIL REPLACEMENT.)
16. Warm up the engine and transaxle, inspect for oil leakage, and inspect the transaxle operation.



A6E5212W018

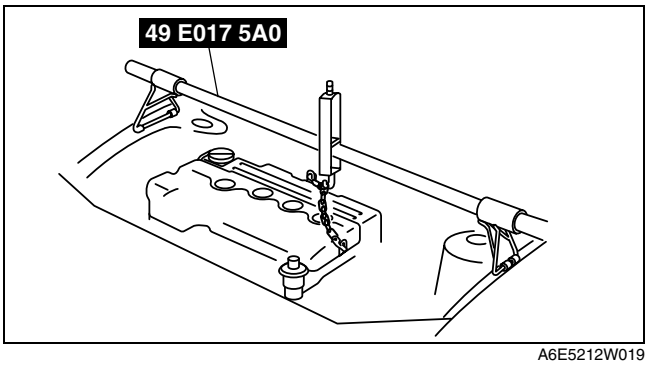
1	Shift cable
2	Select cable
3	Reverse switch connector
4	Neutral switch connector
5	Clutch release cylinder

6	Starter (See G–9 STARTER REMOVAL/INSTALLATION)
7	GND harness, harness bracket
8	Transaxle mounting bolt (upper side)

9	Lower arm (front, rear) ball joint (See Section R)
10	Damper fork
11	Tie-rod end ball joint (See N–8 STEERING GEAR AND LINKAGE (MZR-CD (RF Turbo)) REMOVAL/INSTALLATION)
12	Stabilizer control link
13	Drive shaft (left side) (SeeSection M)
14	Drive shaft (right side) (SeeSection M)
15	Joint shaft (SeeSection M)
16	Flexible pipe (See F2–57 EXHAUST SYSTEM REMOVAL/INSTALLATION)
17	No.1 engine mount (See J2–9 No.1 Engine Mount Bracket Removal Note) (See J2–11 No.1 Engine Mount Installation Note)
18	Crossmember bracket
19	Crossmember, steering pipe (See Section R)
20	No.4 engine mount bracket (See J2–10 No.4 Engine Mount Installation Note)
21	No.4 engine mount rubber (See J2–10 No.4 Engine Mount Installation Note)
22	Transaxle mounting bolt (lower side)
23	Manual transaxle (See J2–9 Manual Transaxle Removal Note) (See J2–10 Manual Transaxle Installation Note)

No.1 Engine Mount Bracket Removal Note

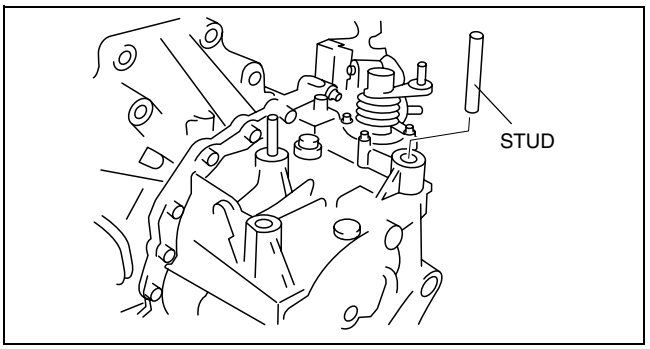
1. Separate the fuel pipe nearby engine hanger.
2. Support the engine using the **SST** before removing the No.1 engine mount.
3. Remove the No.1 engine mount.



A6E5212W019

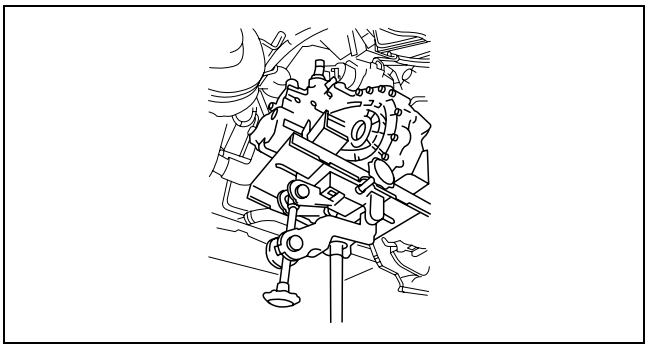
Manual Transaxle Removal Note

1. Remove the stud of the No.4 engine mount.
2. Loosen the **SST** (49 E017 5A0)and lean the engine toward the transaxle.



A6E5212W020

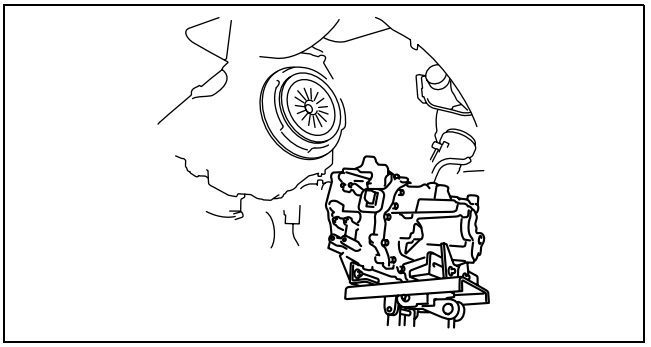
3. Support the transaxle on a jack.
4. Remove the transaxle mounting bolts.
5. Remove the transaxle.



A6E5212W021

Manual Transaxle Installation Note

1. Set the transaxle on a jack and lift into place.
2. Install the transaxle mounting bolts.

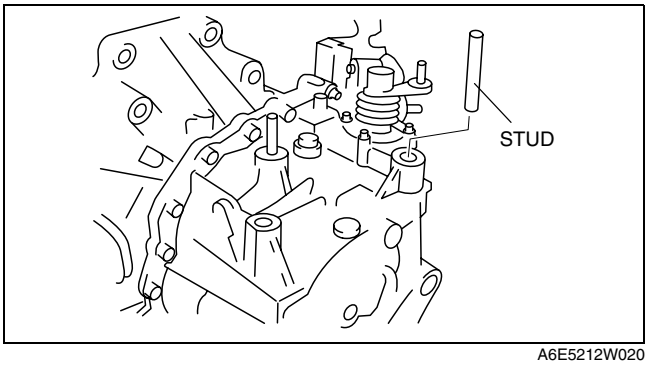


A6E5212W022

3. Install the stud of the No.4 engine mount.

   Tightening torque
   27.4—40.2 N·m
   {2.80—4.09 kgf·m, 20.2—29.6 ft·lbf}

4. Tighten the **SST** (49 E017 5A0)so that the engine is located at the specified position.



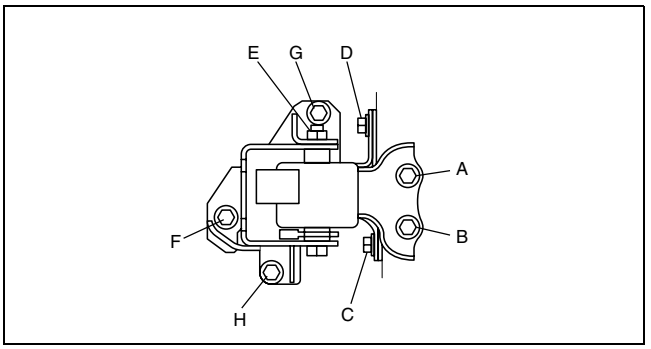
A6E5212W020

No.4 Engine Mount Installation Note

1. Verify that the No.4 engine mount rubber is installed as shown.
2. Lightly tighten the bolt A and B.
3. Align the contacted area to front frame of the bolt C to the front frame.
4. Tighten the bolt A, then bolt B.
5. Tighten the bolt C, then bolt D.

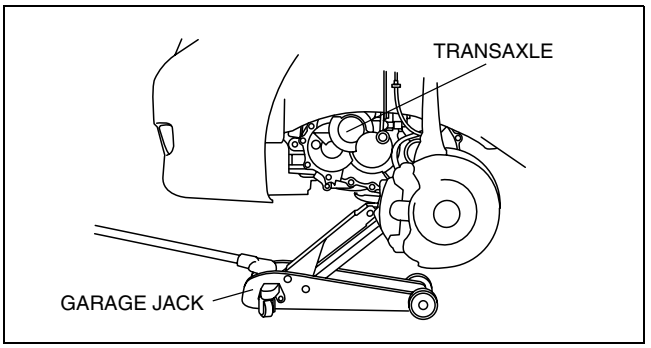
   Tightening torque
   A,B,C,D: 58.8—80.4 N·m
   {6.00—8.19 kgf·m, 43.4—59.2 ft·lbf}

6. Verify that the No.4 engine mount bracket is installed as shown.
7. Lightly tighten the bolt E.



A6E5212W024

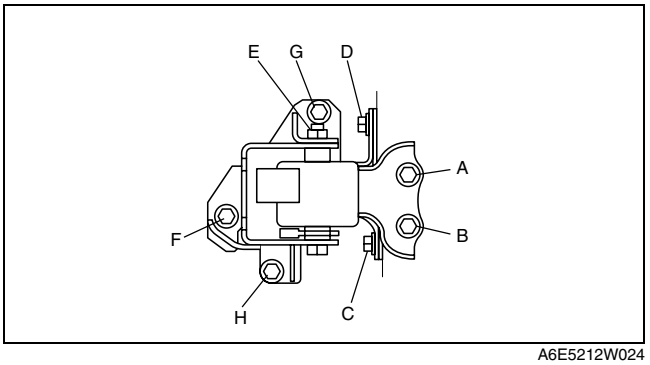
8. Set the transaxle on a garage jack and lift it.
9. Align the hole of the No.4 engine mount bracket with the stud bolts of transaxle.
10. Lightly tighten the nut F, G and bolt H.
11. Tighten the nut F, G in order of F→G, then bolt H.



A6E5212W023

12. Tighten the bolt E.

Tightening torque
E: 85.3—116.6 N·m
{8.70—11.88 kgf·m, 62.91—85.98 ft·lbf}
F,G,H: 66.6—93.1 N·m
{6.80—9.49 kgf·m, 49.2—68.6 ft·lbf}



A6E5212W024

No.1 Engine Mount Installation Note

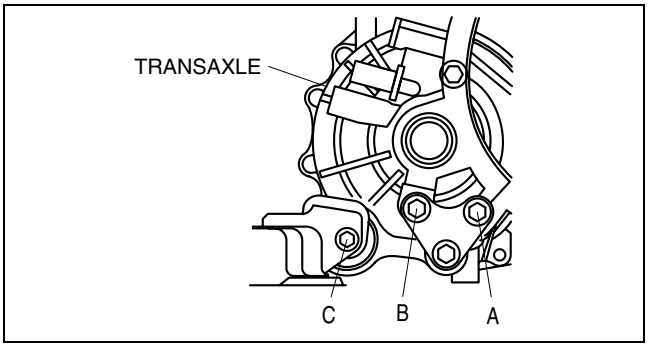
1. Tighten the bolt A, then bolt B.

Tightening torque
93.1—116.6 N·m
{9.50—11.88 kgf·m, 68.66—85.98 ft·lbf}

2. Align the hole of the No.1 engine mount rubber with the crossmember.
3. Lightly tighten the bolt C, then tighen the bolt C.

Tightening torque
93.1—116.6 N·m
{9.50—11.88 kgf·m, 68.66—85.98 ft·lbf}

4. Remove the **SST** (49 E017 5A0).



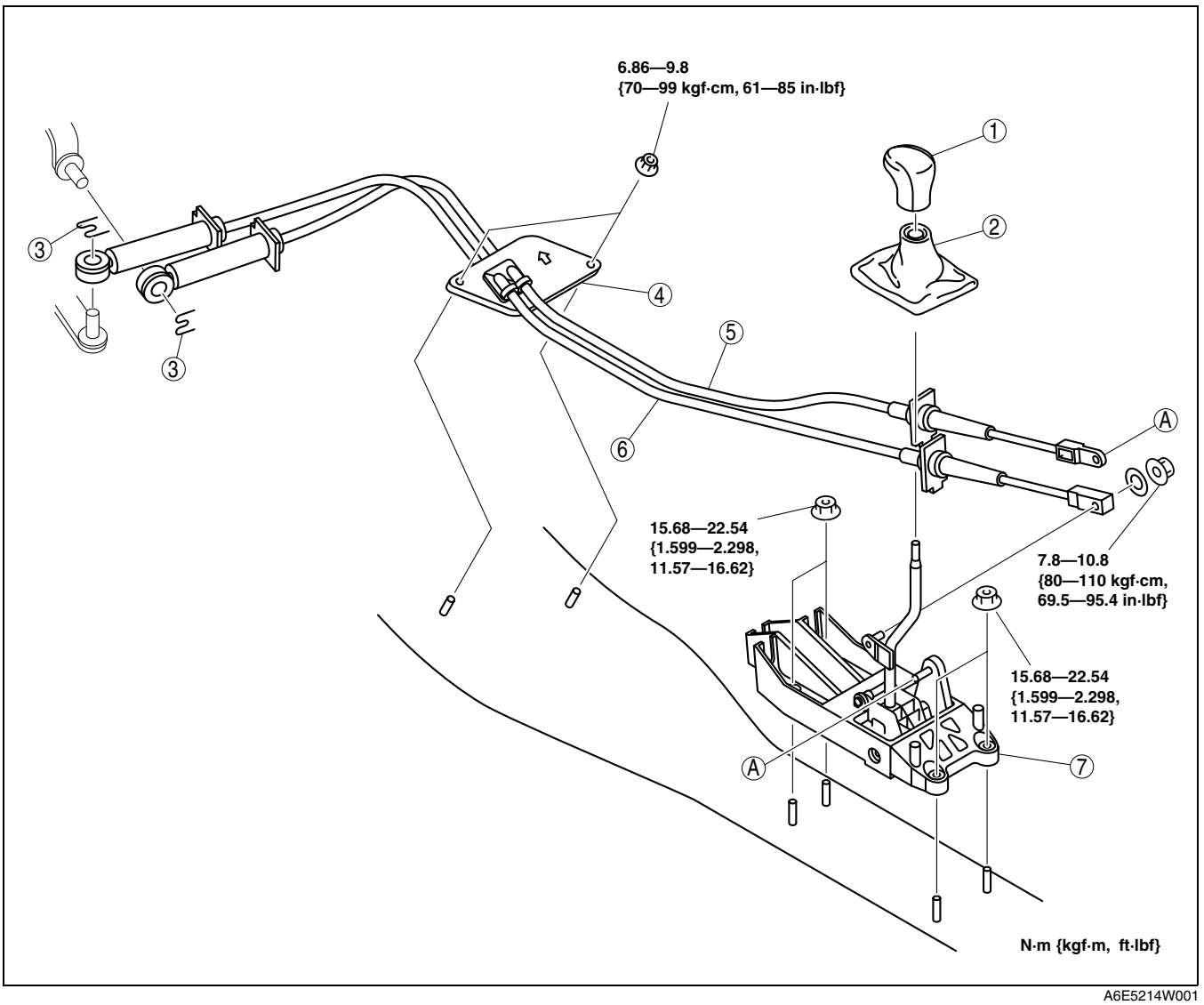
A6E5212W025

SHIFT MECHANISM

SHIFT MECHANISM REMOVAL/INSTALLATION

A6E521446010201

1. Remove the battery and battery tray.
2. Remove the air cleaner component. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
3. Remove the dashboard compleat. (See Section S.)
4. Remove the SAS control module. (See Section T.)
5. Remove the climate control unit. (See Section U.)
6. Remove the rear heat duct. (See Section U.)
7. Remove in the order indicated in the table.
8. Install in the reverse order of removal.
9. After installation, verify that the shift lever can be shifted smoothly into each position.



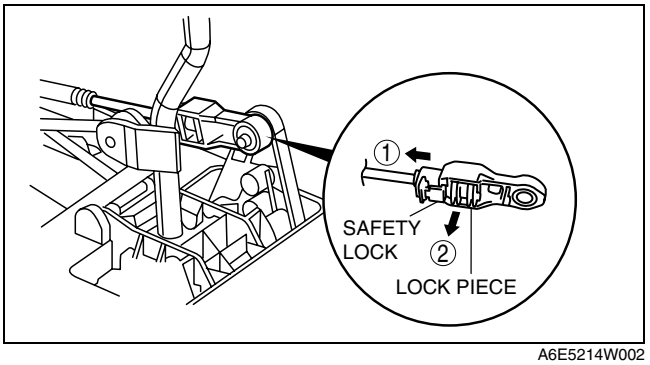
A6E5214W001

1	Shift lever knob
2	Boot panel
3	Clip
4	Seal plate

5	Select cable (See J2–13 Select Cable Installation Note)
6	Shift cable
7	Sift lever component

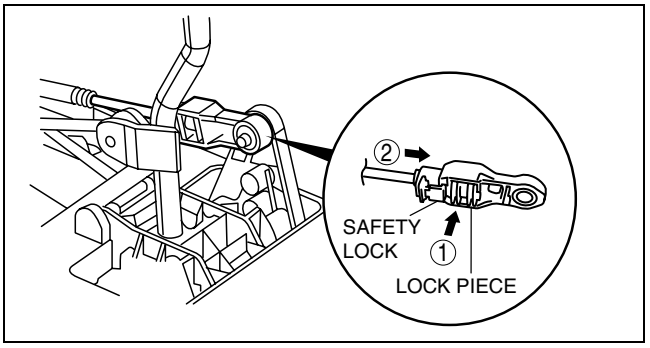
Select Cable Installation Note

1. Remove the center console.
2. Make sure that the shift lever (transaxle side) is in neutral.
3. Unlock the lock pice of the select cable (shift lever side) in the order shown in the figure.
4. Shift the sift lever to neutral.



A6E5214W002

5. Lock the lock pice of the selector cable (shift cable side) in the order shown in the figure.
6. Install the center console.
7. Shift the shift lever from neutral to other position, and make sure that there are no other components in that area to interfere with the lever.



A6E5214W003

AUTOMATIC TRANSAXLE [JA5AX-EL]

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OUTLINE

FEATURES

A6E570201030201

ATX

Improved marketability

- New JA5AX-EL automatic transaxle for 4WD is used with on L3 engine.

Improved shift quality

- Five speed automatic transaxle has been adopted.
- The feedback control system has been adopted.
- The centrifugal balance clutch chambers have been adopted.
- A plate-type clutch pack replaces the band brake in the 2-4 brake.

High efficiency, compactness, and light weight

- Miniature trochoid gear type oil pump with torque converter direct drive has been adopted.

SPECIFICATIONS

A6E570201030202

Item		New Mazda6 (GY)	Current MPV (LW)	
		–	For General (R.H.D.) specs.	Except for General (R.H.D.) specs.
Transaxle type		JA5AX-EL	JA5A-EL	
Gear ratio	1GR	3.801		
	2GR	2.131		
	3GR	1.364		
	4GR	0.935		
	5GR (O/D)	0.685		
	Reverse	2.970		
Final gear ratio		3.491	3.290	3.491
ATF	Type	ATF M-III or equivalent (e.g. Dexron®III)		
	Capacity (approximate quantity) (L {US qt, Imp qt})	8.3 {8.8, 7.3}	9.7 {10.3, 8.5}	
Torque converter stall torque ratio		1.86:1		
Hydraulic system (Number of drive/driven plates)	Low clutch	6/6	7/7	
	2-4 brake	3/4		
	High clutch	5/5		
	Direct clutch	3/5	4/4	
	Reverse clutch	2/2		
	Low and reverse brake	6/5		
Band servo (mm {in})	Reduction accumulator piston outer dia./reduction band servo piston outer dia.	49.66/57.64		
Number of front planetary gear teeth	Ring gear	74		
	Sun gear	34		
	Pinion gear	20		
Number of rear planetary gear teeth	Ring gear	75		
	Sun gear	42		
	Pinion gear	17		
Number of reduction planetary gear teeth	Ring gear	85		
	Sun gear	31		
	Pinion gear	27		
Number of output gear teeth		41		
Number of idler gear teeth		47		
Number of reduction gear teeth		22	23	22
Number of ring gear teeth		67	66	67
Transfer oil	Type	SAE 80W-90 API Service GL-5	–	
	Capacity (approximate quantity) (L {US qt, Imp qt})	0.62 {0.66, 0.55}	–	

Bold frames:New specifications

AUTOMATIC TRANSAXLE

OUTLINE

A6E571401030201

- Adopted new JA5AX-EL automatic transaxle.
- Newly designed FF type five-speed automatic transaxle.
  — Use of 3 sets of planetary gears, and a wider gear ratio setting realizes improvement of acceleration-from-standing-start performance, fuel economy, and quietness. Also, by placement of two sets of planetary gears in parallel with one set, the automatic transaxle is more compact.
- Adopted 2-4 brake clutch.
  — Adopted a wet-type, multi-plate 2-4 brake clutch instead of the 2-4 brake band used in the past, for smoother gear switching performance.
- Adopted centrifugal balance clutch
  — The newly adopted centrifugal balance clutch pushes the clutch piston forcefully to low and high clutch by centrifugal hydraulic pressure for smoother gear switching with batter response.
- Adopted controller area network (CAN)
  — By adopting CAN, The TCM is always in contact with other computers in the car and controls the automatic transaxle properly. This has also made troubleshooting diagnosis easier for the entire vehicle.
- Solenoid, sensor
  — Adoption of four duty-type solenoids, five ON-OFF type solenoids, and three revolving sensors realizes finer, more expedient control of gear shifting performance.
- Adoption of revers inhibit control
  — If the reverse position is selected by mistake while driving in forward motion, the reverse inhibit control system will cancel the operation electronically and set the position to neutral as a safety enhancement.

Outline of Operation

- The operation of the electronic automatic transaxle is classified into three systems: the electronic control system, the hydraulic pressure control system, and the powertrain system (includes the torque converter system.)

  Electronic control system
  - According to the signals from the switches and sensors in the input system, the TCM outputs the signal which matches the present driving condition to the ON/OFF type solenoids and the duty-cycle type solenoids in the hydraulic pressure control system.

  Hydraulic pressure control system
  - According to the signals from the TCM, each solenoid operates to switch the hydraulic passages in the control valve body and controls the clutch engagement pressure.
  - The line pressure is adjusted by the duty-cycle type pressure control solenoid. The hydraulic passages are switched by the ON/OFF type solenoids and the clutch engagement pressure is controlled by the duty-cycle type solenoids.

  Powertrain system
  - The driving force from the engine is transmitted through the torque converter to the transaxle.
  - The transmitted driving force operates each clutch and brake according to the clutch engagement pressure from the duty-cycle type solenoid, and the planetary gears change the gear ratio to the optimal driving force. The changed driving force is transmitted through the differential to the axle shaft and then the tires.

EC-AT Operation Chart

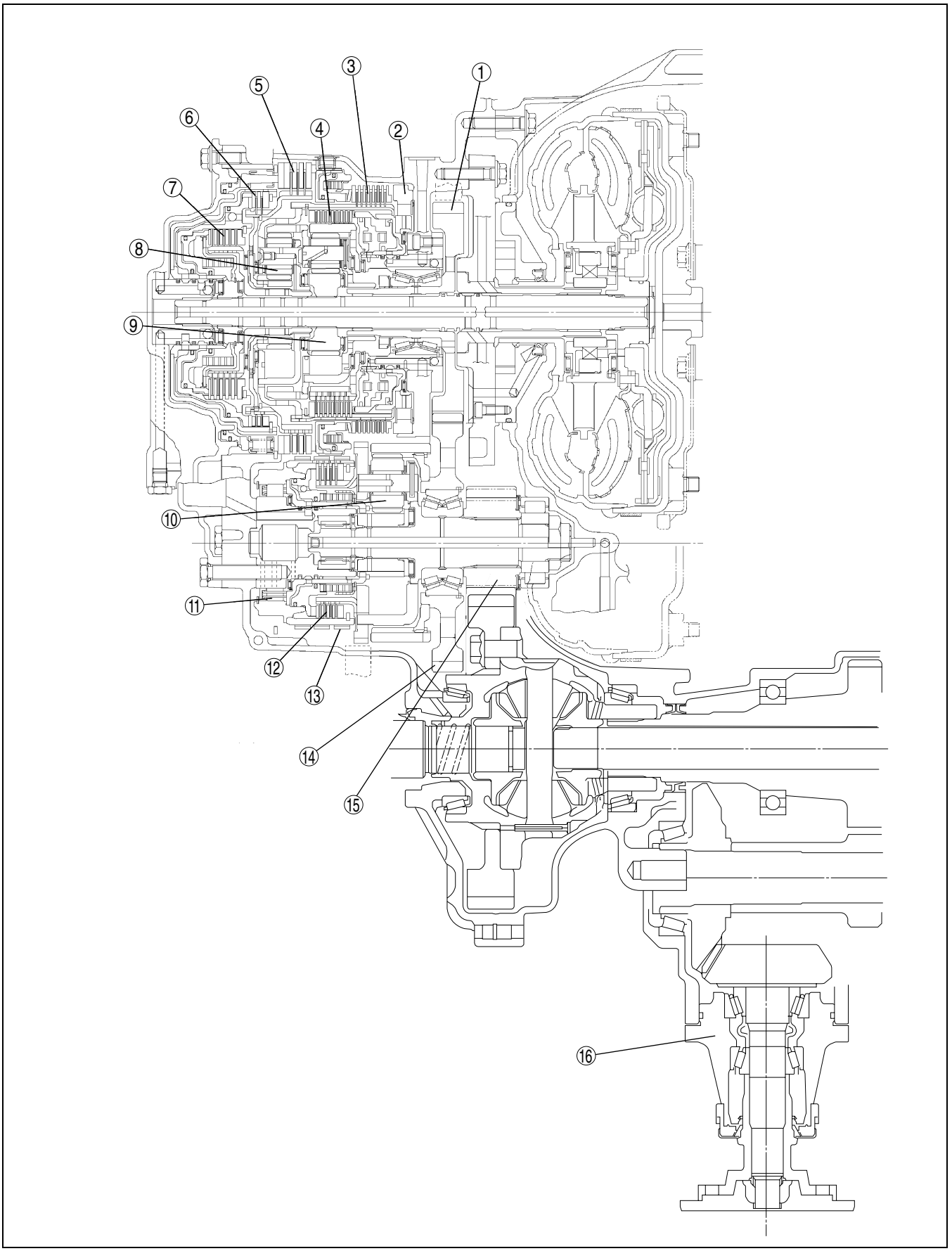
Position/Renge	Mode	Gear position	Engine braking effect	Low clutch	2-4 brake	High clutch	Reveres clutch	Low and reverse brake	Reduction brake	Direct clutch	Low one-way clutch	Reduction one-way clutch	Solenoid valve				
													Shift solenoid A	Shift solenoid B	Shift solenoid C	Reduction timing solenoid	Neutral shift solenoid
P	—	—							○				○	○	○		
R	—	—	○				○	○	○				○	○	○		
	R INH	—					○		○				○	○	○		○
N	—	—							○				○	○	○		
D	—	1GR		○							●	●	○	○	○	○	
		2GR		○	○							●	○	○		○	
		3GR		○		○						●		○		○	
		4GR			○	○						●			○	○	
		5GR	○		○	○				○			○		○	○	
M	—	1GR	○	○					○		●		○	○	○		
		2GR	○	○	○				○				○	○			
		3GR	○	○		○			○					○			
		4GR	○		○	○			○						○		
		5GR	○		○	○				○			○		○	○	

○ : Operation
● : Transmits the torque only when driving

A6E5714W009

CROSS-SECTIONAL VIEW

A6E571401030202



A6E5714W006

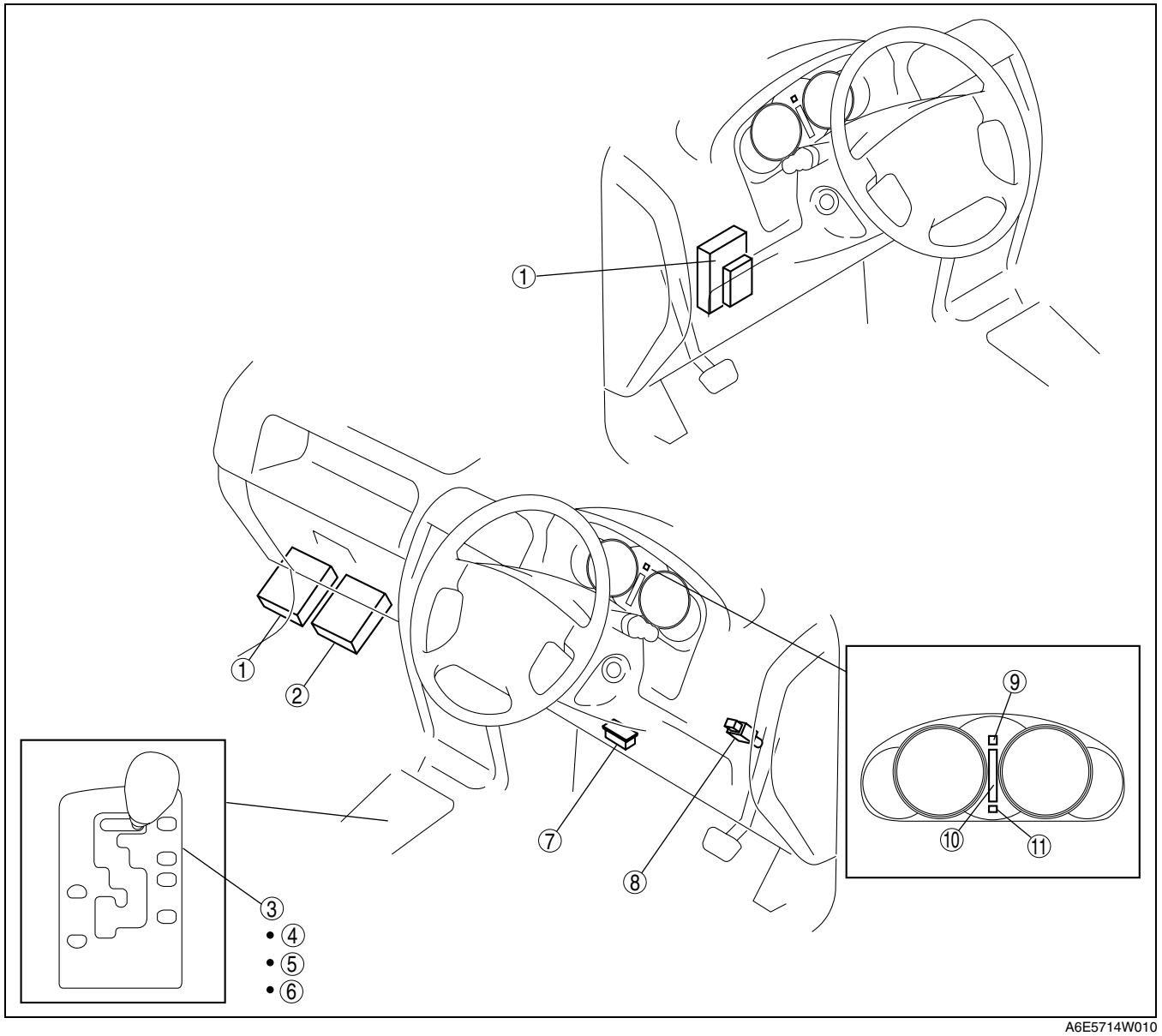
1	Output gear
2	Low one-way clutch
3	Low and reverse brake
4	Low clutch
5	2-4 brake
6	Reverse clutch
7	High clutch
8	Front planetary gear

9	Rear planetary gear
10	Reduction planetary gear
11	Reduction one-way clutch
12	Direct clutch
13	Reduction brake
14	Idler gear
15	Reduction gear
16	Transfer

ELECTRONIC CONTROL SYSTEM STRUCTURAL VIEW

A6E571401030203

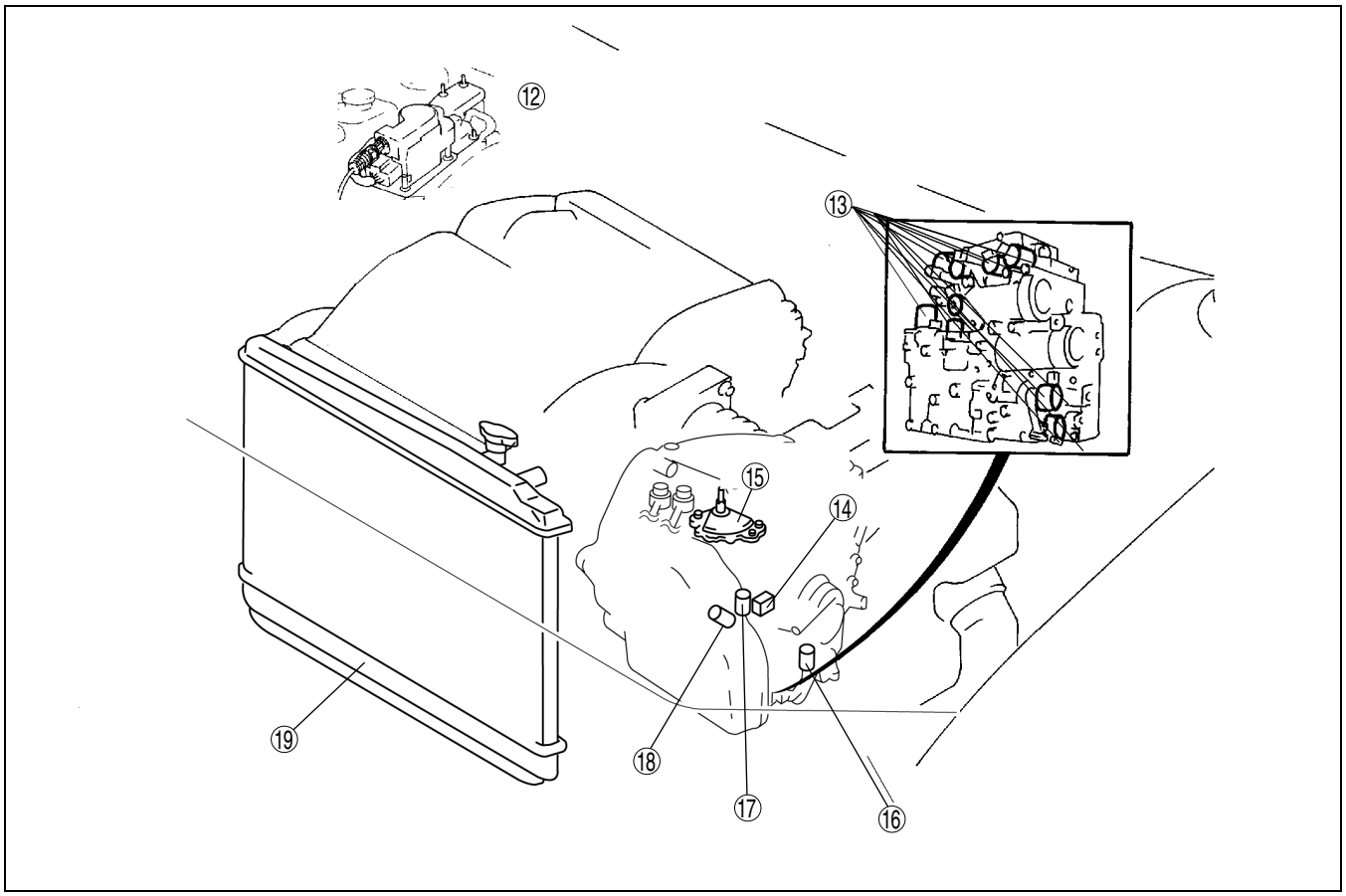
- The TCM control the automatic transaxle operations. The TCM outputs a control signal to the transaxle according to the signal from other sensors and/or switches.



A6E5714W010

1	TCM
2	PCM
3	Selector lever
4	M range switch
5	Up switch
6	Down switch

7	DLC-2
8	Brake light switch
9	AT warning light
10	Selector indicator light
11	Gear position indicator light



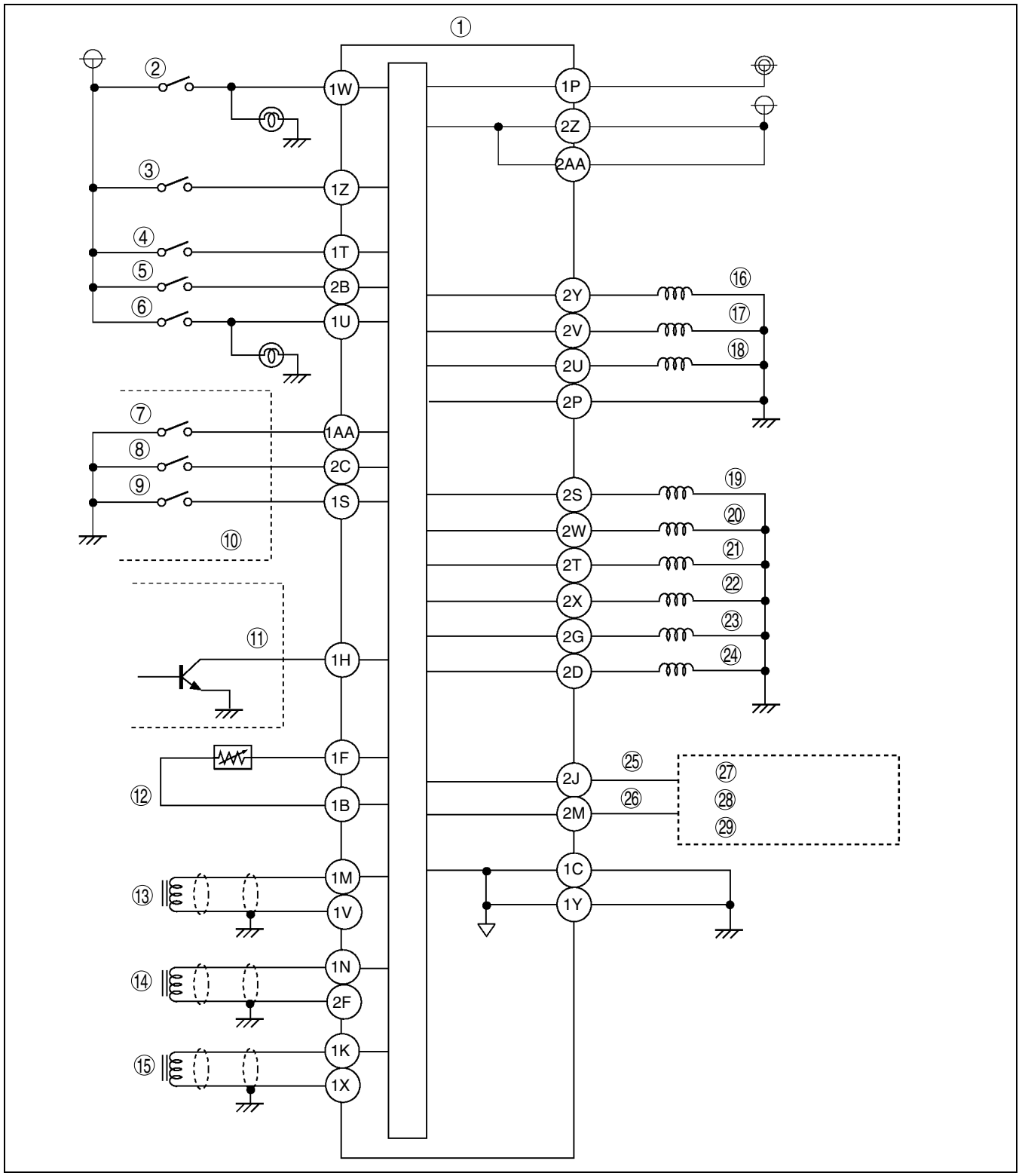
A6E5714W011

12	Cruise control module (In cluise actuator)
13	Solenoid valve
14	TFT sensor
15	TR switch

16	Input/turbine speed sensor
17	Intermediate sensor
18	VSS
19	Oil cooler

AUTOMATIC TRANSAXLE CONTROL SYSTEM WIRING DIAGRAM

A6E571401030204



A6E5714W008

1	TCM
2	R position (TR switch)
3	D range (TR switch)
4	N position (TR switch)
5	P position (TR switch)
6	Brake switch
7	M range switch
8	Up switch

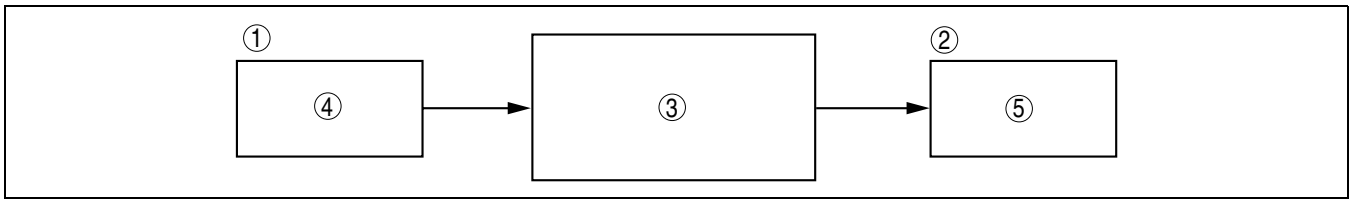
9	Down switch
10	Selector lever
11	Cruise control module (In cruise actuator)
12	TFT sensor
13	VSS
14	Input/turbine speed sensor
15	Intermediate sensor
16	Pressure control solenoid

17	2-4 brake solenoid valve
18	High clutch solenoid valve
19	TCC solenoid valve
20	Shift solenoid A
21	Shift solenoid B
22	Shift solenoid C
23	Reduction timing solenoid valve

24	Neutral shift solenoid valve
25	CAN_L
26	CAN_H
27	Instrument cluster
28	PCM
29	ABS HU/CM or DSC HU/CM

AUTOMATIC TRANSAXLE BLOCK DIAGRAM

A6E571401030205



A6E5714W012

1	Input
2	Output
3	TCM
4	PCM
	ABS HU/CM or DSC HU/CM
	TFT sensor
	Input/turbine speed sensor
	Intermediate sensor
	VSS
	TR switch
	M range switch
	Up switch
	Down switch
	Brake switch
	Cruise control module

5	Pressure control solenoid
	2-4 brake solenoid valve
	High clutch solenoid valve
	TCC solenoid valve
	Shift solenoid A
	Shift solenoid B
	Shift solenoid C
	Reduction timing solenoid valve
	Neutral shift solenoid valve
	AT warning light

Electronic Control Item and Control

Control item	Contents
Shift control	• Detects engine load condition and vehicle speed. Shifts to the best gear position according to the programmed automatic shift diagram.
Line pressure control	• Generates line pressure matching the engine load condition and driving conditions. Optimizes line pressure for each shift. When the ATF temperature is low, automatically optimizes line pressure for quick clutch engagement.
Revers inhibition control	• When the shift lever is shifted to R position while the vehicle is running forward at approx. 30 km/h{19 mph} or more, the TCM turns the neutral shift solenoid valve on and drains the low and reverse brake hydraulic pressure. Due to this, the transaxle shifts to neutral.
Shift transient control	• Adjusts transient hydraulic pressure according to engine load and vehicle driving conditions when shifting using the pressure control solenoid, 2-4 brake solenoid valve, the high clutch solenoid valve, and each accumulator control valve. • Temporarily lowers engine torque during shift (up and down) to improve shift feel • The lock timing for the reduction brake band is controlled by the control of the reduction timing solenoid valve ON/OFF timing. • The lock timing for the clutch brake is controlled by the control of shift solenoid A, B, and C ON/OFF timing.
Feedback control	• Corrects clutch engagement pressure and timing on drain side to compensate for changes in engine performance and changes in transaxle
TCC control	• Controls TCC according to the programmed TCC points
N-D select control	• When a driving range is selected from P/N, the fuel injection amount is controlled to prevent fluctuation in engine speed.
Slope mode control	• Changes the shift point to prevent frequent shifting up/down when climbing hills
OBD system	• Detects and/or memorizes failure of input/output part and transaxle condition

Component Description (Electronic Control)

Part name			Function
Input system	TR switch		• Detects selector lever ranges/positions
	Input/turbine speed sensor		• Detects reverse clutch drum revolution speed
	Intermediate sensor		• Detects output gear revolution speed
	Vehicle speedometer sensor		• Detects parking gear revolution speed
	TFT sensor		• Detects the ATF temperature
	Brake switch		• Detects the brake pedal depressed
	Cruise control module (in cruise actuator)		• When the cruise control is in use, the signal detects when the difference between the target speed and actual speed exceeds specification
	M range switch		• Detects selector lever shifted M range
	Up switch		• Detects up shift in M range
	Down switch		• Detects down shift in M range
	CAN signal	Throttle position signal	• Input throttle opening angle from PCM
		Engine torque signal (without torque down)	• Input engine torque from PCM
		Engine torque signal (with torque down)	• Input engine torque from PCM
		Engine torque signal (loss torque)	• Input engine loss torque from PCM
		Torque reduced signal	• Detects signals indicating torque down availability
		Engine coolant temperature signal	• Input engine coolant temperature from PCM
		Engine speed signal	• Input engine speed from PCM
		Battery OFF signal	• Detect negative battery cable disconnected
		4 wheel speed signal	• Input wheel speed from ABS HU/CM or DSC HU/CM

Part name			Function
Output system	ON/OFF type	Shift solenoid A	• Switches ON and OFF based on electric signals from the TCM, changes hydraulic circuit to control shifting
		Shift solenoid B	• Switches ON and OFF based on electric signals from the TCM, changes hydraulic circuit to control shifting
		Shift solenoid C	• Switches ON and OFF based on electric signals from the TCM, changes hydraulic circuit to control shifting
		Reduction timing solenoid valve	• Switches ON and OFF based on electric signals from the TCM, changes hydraulic circuit to control shifting
		Neutral shift solenoid valve	• Switches ON and OFF based on electric signals from the TCM, changes hydraulic circuit to control shifting
	Duty type	Pressure control solenoid	• Switches ON and OFF based on electric signal (duty signals) from the TCM adjusts line pressure to match driving conditions
		2-4 brake solenoid valve	• Switches ON and OFF based on electric signal (duty signals) from the TCM adjusts line pressure to match driving conditions
		High clutch solenoid valve	• Switch ON and OFF based on electric signal (duty signals) from the TCM adjusts line pressure to match driving conditions
		TCC solenoid valve	• Switch ON and OFF based on electric signal (duty signals) from the TCM to control TCC
	CAN signal	Reduce torque signal	• Sends signals to the PCM during shifting
		Range signal	• Output transaxle load condition to PCM
		Turbine speed signal	• Output turbine speed to PCM
		ATF temperature signal	• Output ATF high temperature signal to PCM
		TCC signal	• Output TCC signal to PCM
		Racing select signal	• Requests fuel cut when selector lever is shifted during racing
		MIL indicate request signal	• Requests MIL illumination when failure is detected by diagnosis function
		AT warning light request signal	• Requests AT warning light indication when failure is detected by diagnosis function for ATX

AUTOMATIC TRANSAXLE DEVICE RELATIONSHIP CHART

A6E571401030206

Component	Control item								
	Shift control	Line pressure control	Reverse inhibition control	Shift transient control	Feedback control	TCC control	N-D select control	Slope mode control	OBD system
Input									
TR switch	X	X	X	X	X	X	X		X
Input/turbine speed sensor		X		X	X	X	X	X	X
Intermediate sensor		X		X	X				X
Vehicle speedometer sensor	X	X	X	X	X	X	X	X	X
TFT sensor	X	X		X	X	X	X		X
Brake switch	X					X		X	
Cruise control module (4GR inhibit signal)	X			X					
M range switch	X					X			
Up switch	X					X			
Down switch	X					X			

Component		Control item								
		Shift control	**Line pressure control**	**Reverse inhibition control**	**Shift transient control**	**Feedback control**	**TCC control**	**N-D select control**	**Slope mode control**	**OBD system**
CAN signal	Throttle position signal	X	X		X	X	X	X	X	X
	Engine torque signal (without torque down)		X		X	X		X	X	X
	Engine torque signal (with torque down)		X		X	X		X		X
	Engine torque signal (loss torque)		X		X	X		X	X	X
	Engine coolant temperature signal	X								X
	Engine speed signal	X			X	X	X		X	X
	Torque reduce signal		X		X	X		X		X
	Battery OFF signal					X				X
Output										
ON/OFF type	Shift solenoid A	X			X					X
	Shift solenoid B	X			X					X
	Shift solenoid C	X			X					X
	Reduction timing solenoid valve		X		X					X
	Neutral shift solenoid valve	X	X	X	X					X

Component		Control item								
		Shift control	Line pressure control	Reverse inhibition control	Shift transient control	Feedback control	TCC control	N-D select control	Slope mode control	OBD system
Duty type	Pressure control solenoid	X	X		X	X				X
	2-4 brake solenoid valve	X	X		X	X				X
	High clutch solenoid valve	X	X		X	X				X
	TCC solenoid valve		X				X			X
CAN signal	Reduce torque signal					X		X		X
	Range signal									X
	Turbine speed signal									X
	ATF temperature signal									X
	TCC signal						X			X
	Racing select signal									X
	MIL indicate request signal									X
	AT warning light request signal									X

X : Available

POWERTRAIN DESCRIPTION

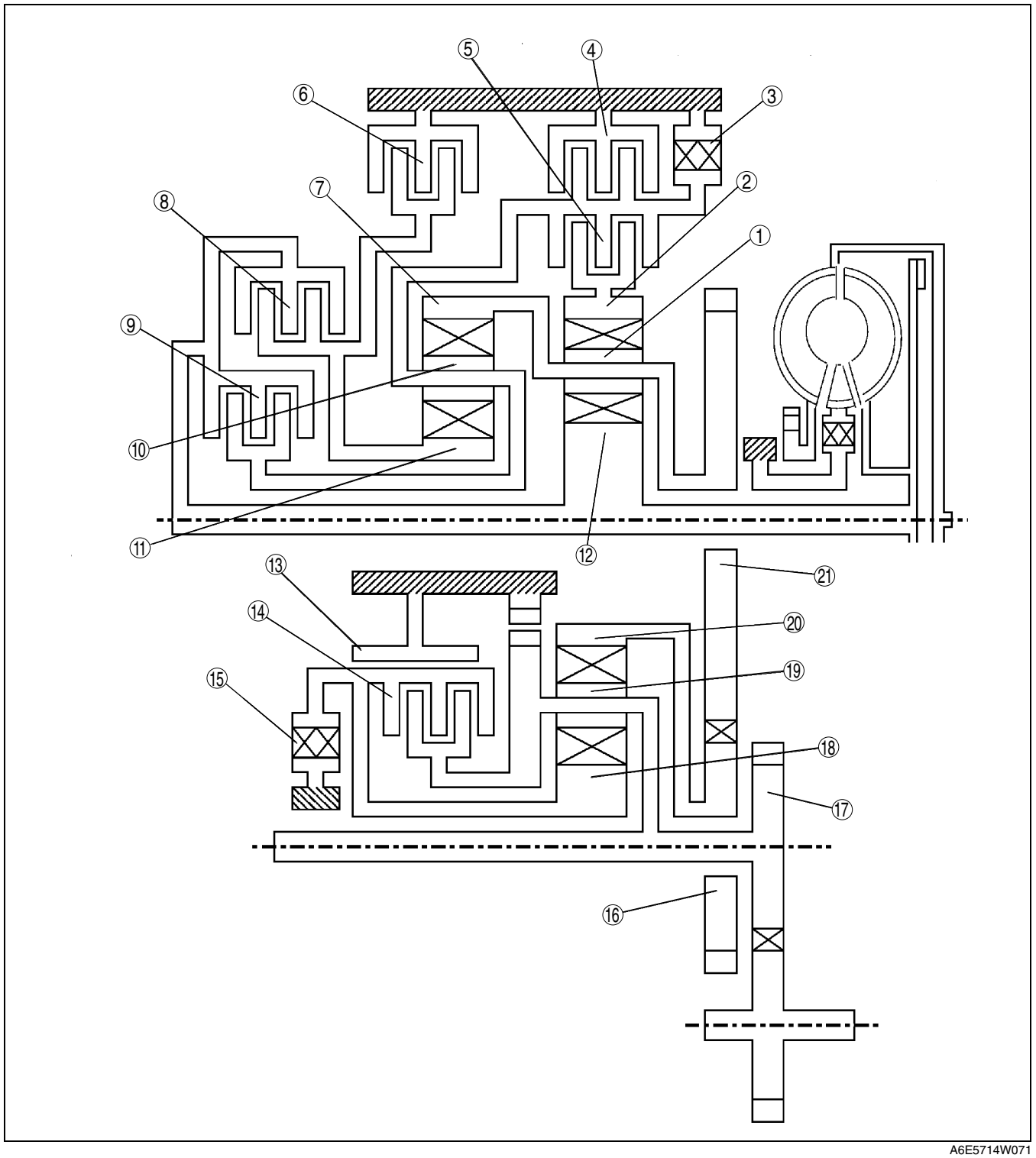
A6E571401030207

Outline

- In the powertrain system, the hydraulic pressure transported by the control valve operates the clutch, and brake, and the planetary gear changes the gear ratio according to the driving conditions.

Structure

- The powertrain system consists of seven pairs of clutches, brake, brake band, two pairs of one-way clutches, and simple type planetary gears.



A6E5714W071

1	Rear pinion gear
2	Rear internal gear
3	Low one-way clutch
4	Low and reverse brake
5	Low clutch
6	2-4 brake
7	Front internal gear
8	Reverse clutch
9	High clutch
10	Front pinion gear
11	Front sun gear

12	Rear sun gear
13	Reduction brake
14	Direct clutch
15	Reduction one-way clutch
16	Idler gear
17	Reduction gear
18	Reduction sun gear
19	Reduction pinion gear
20	Reduction internal gear
21	Output gear

Operation

Note
- All rotation are viewed from the side cover.

Component description

Component	Function
Low clutch	• Transmits rotation of low clutch drum to rear internal gear • Operates in 1GR, 2GR, or 3GR position
2-4 brake	• Prevents rotation of front sun gear • Operates in 2GR, 4GR, or 5GR position
High clutch	• Transmits rotation of high clutch drum to front planetary carrier • Operates in 3GR, 4GR, or 5GR position
Reverse clutch	• Transmits rotation of reverse clutch drum to front sun gear • Operates when vehicle is reversing
Reduction brake	• Prevents rotation of direct clutch drum and prevents rotation of reduction sun gear
Low and reverse brake	• Prevents rotation of low and reverse brake hub
Direct clutch	• Transmits rotation of reduction planetary carrier to reduction sun gear • Operates in 5GR position
Low one-way clutch	• Locks clockwise rotation of front planetary carrier
Reduction one-way clutch	• Locks counter clockwise rotation of reduction sun gear

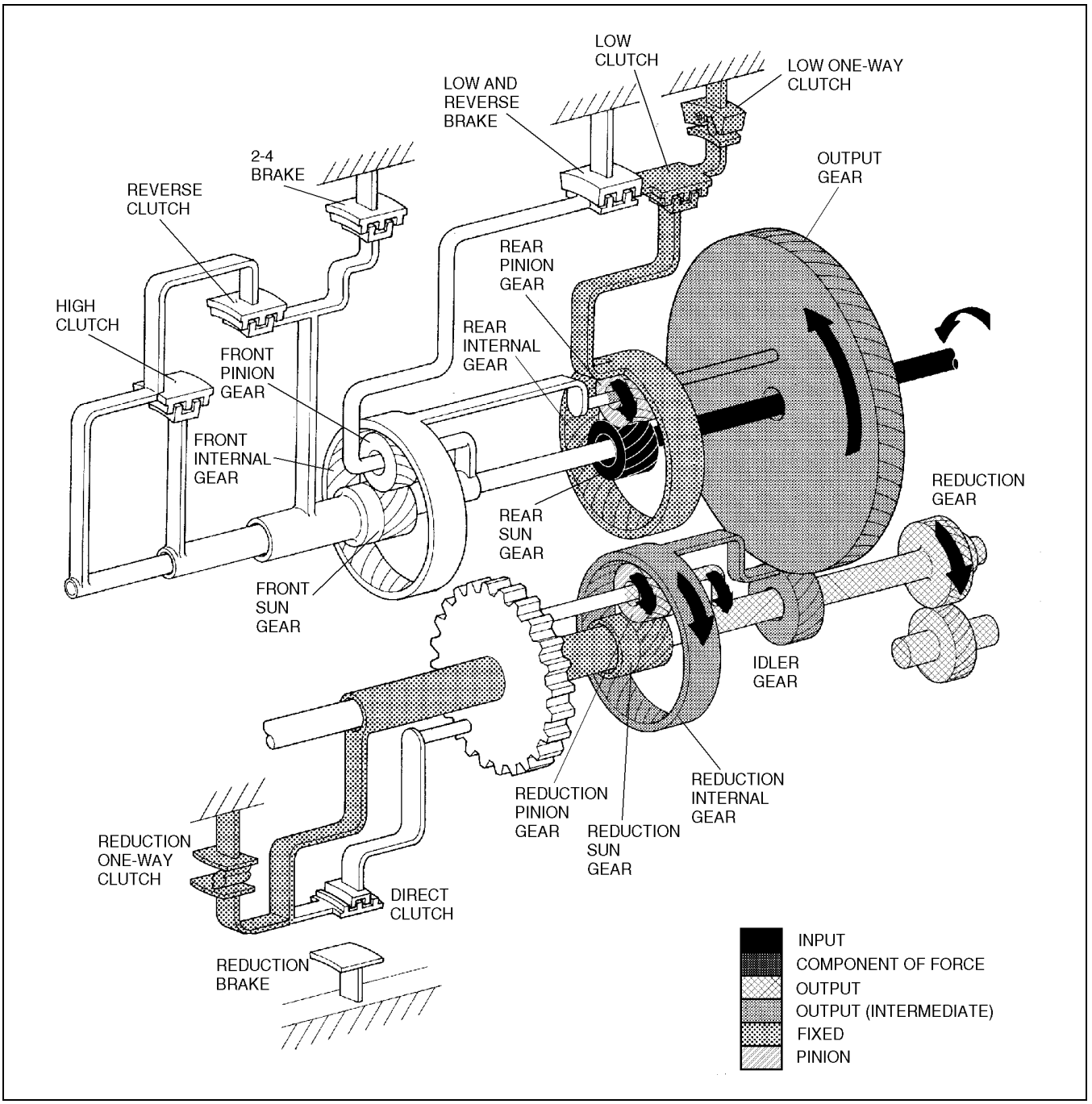
Gear Position and Operation of Featured Parts

Range	Gear position	Gear ratio	Shift	TCC operation	Engine brake
P	—	—	—		
R	—	2.970			○
N	—	—	—		
D	1GR	3.801	▲▼		
	2GR	2.131	▲▼		
	3GR	1.364	▲▼		
	4GR	0.935	▲▼	○	
	5GR	0.685	▼	○	○
M	1GR	3.801	▲		○
	2GR	2.131	▲▼		○
	3GR	1.364	▲▼		○
	4GR	0.935	▲▼		○
	5GR	0.685	▼	○	○

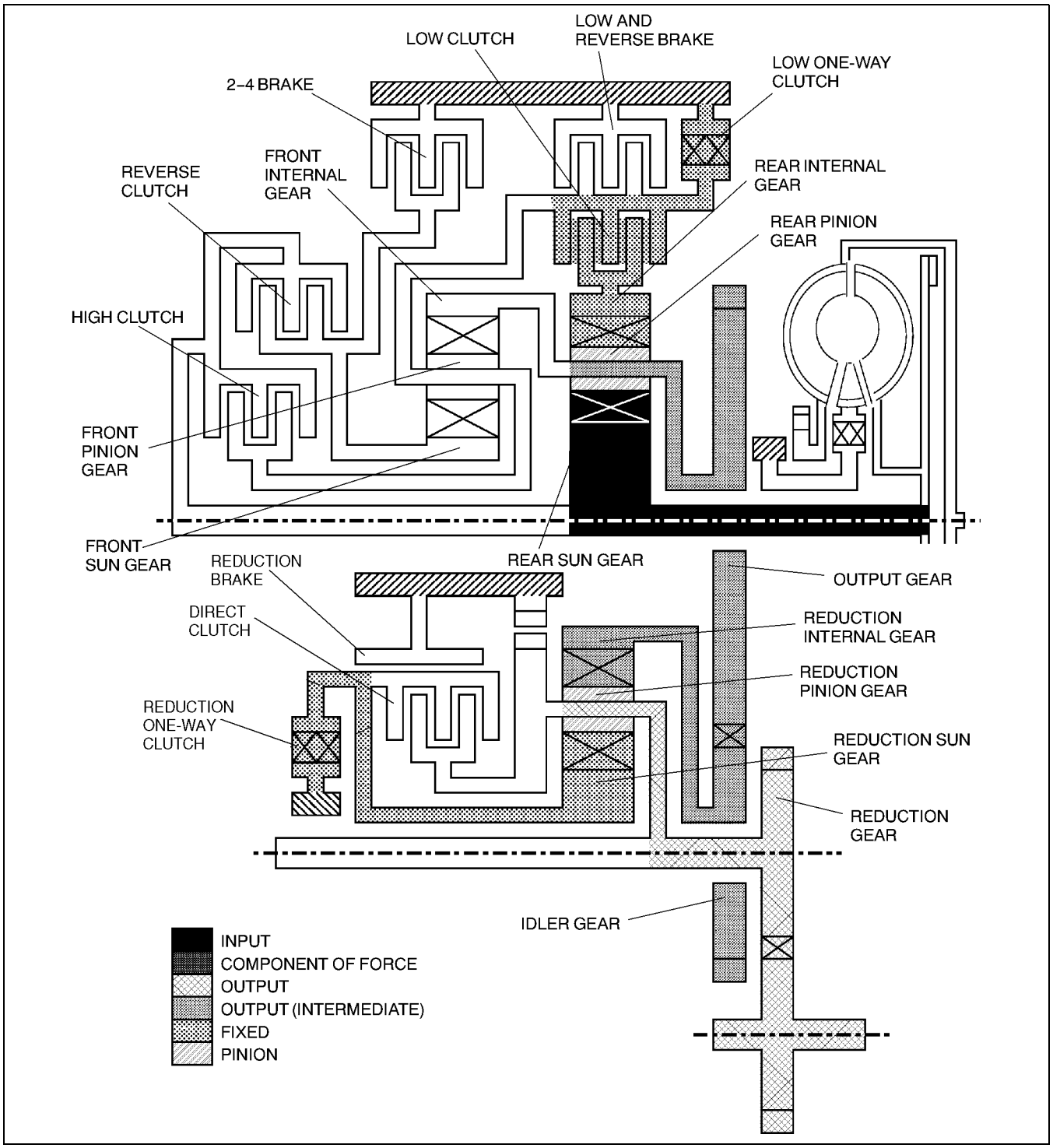
○ : TCC or engine braking is available

A6E5714W013

1GR (D range)



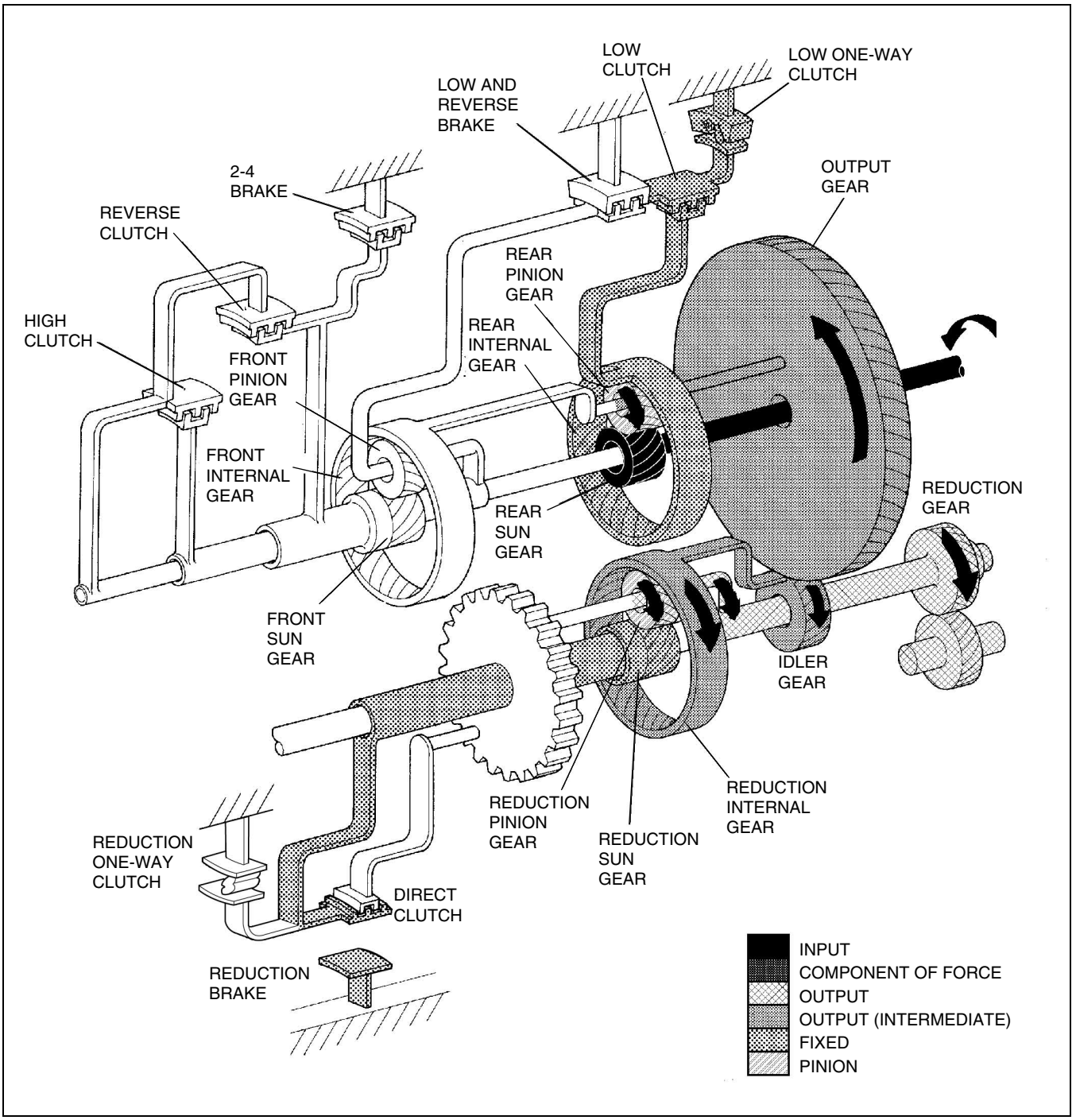
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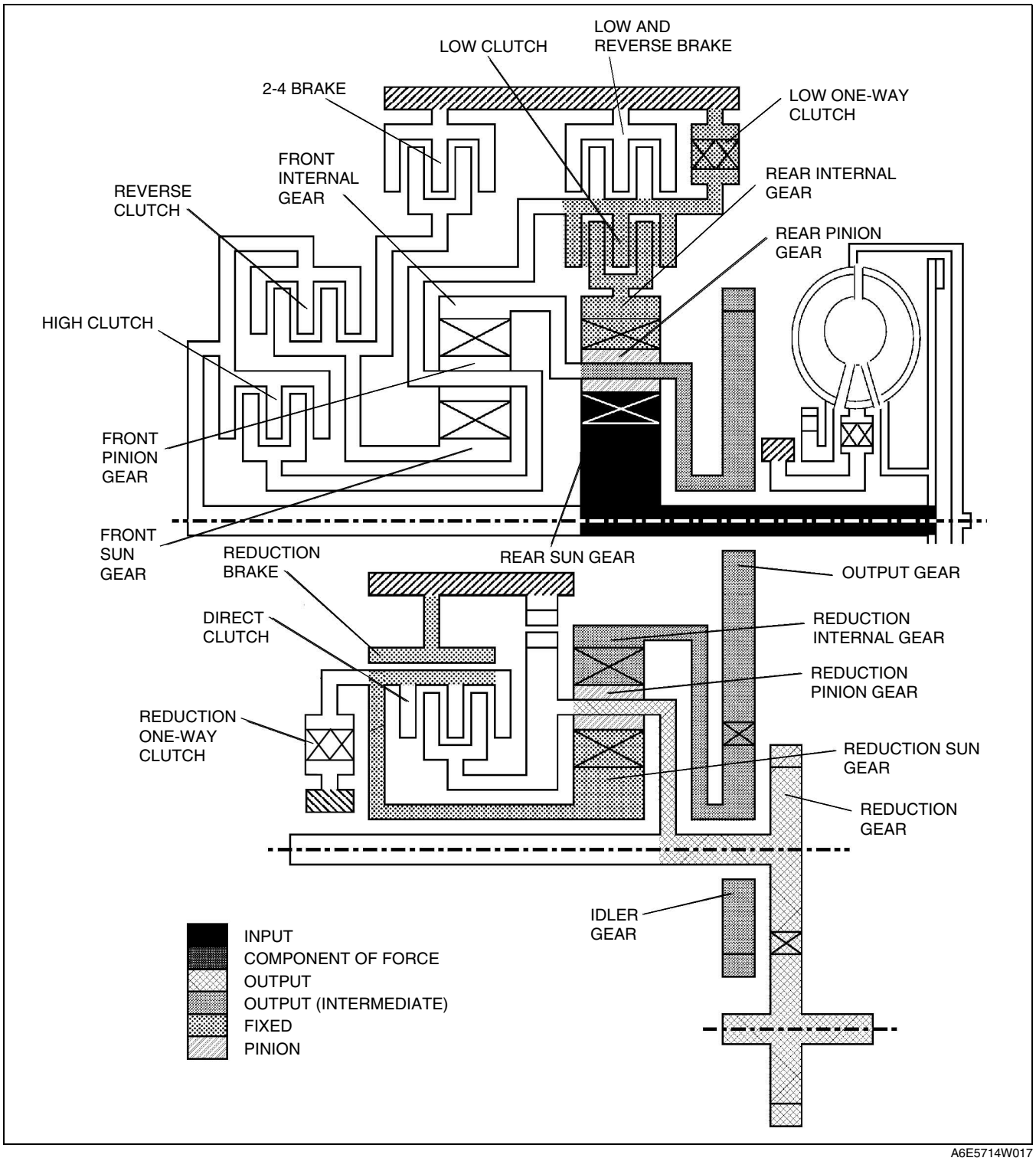
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K2

1GR (M range)

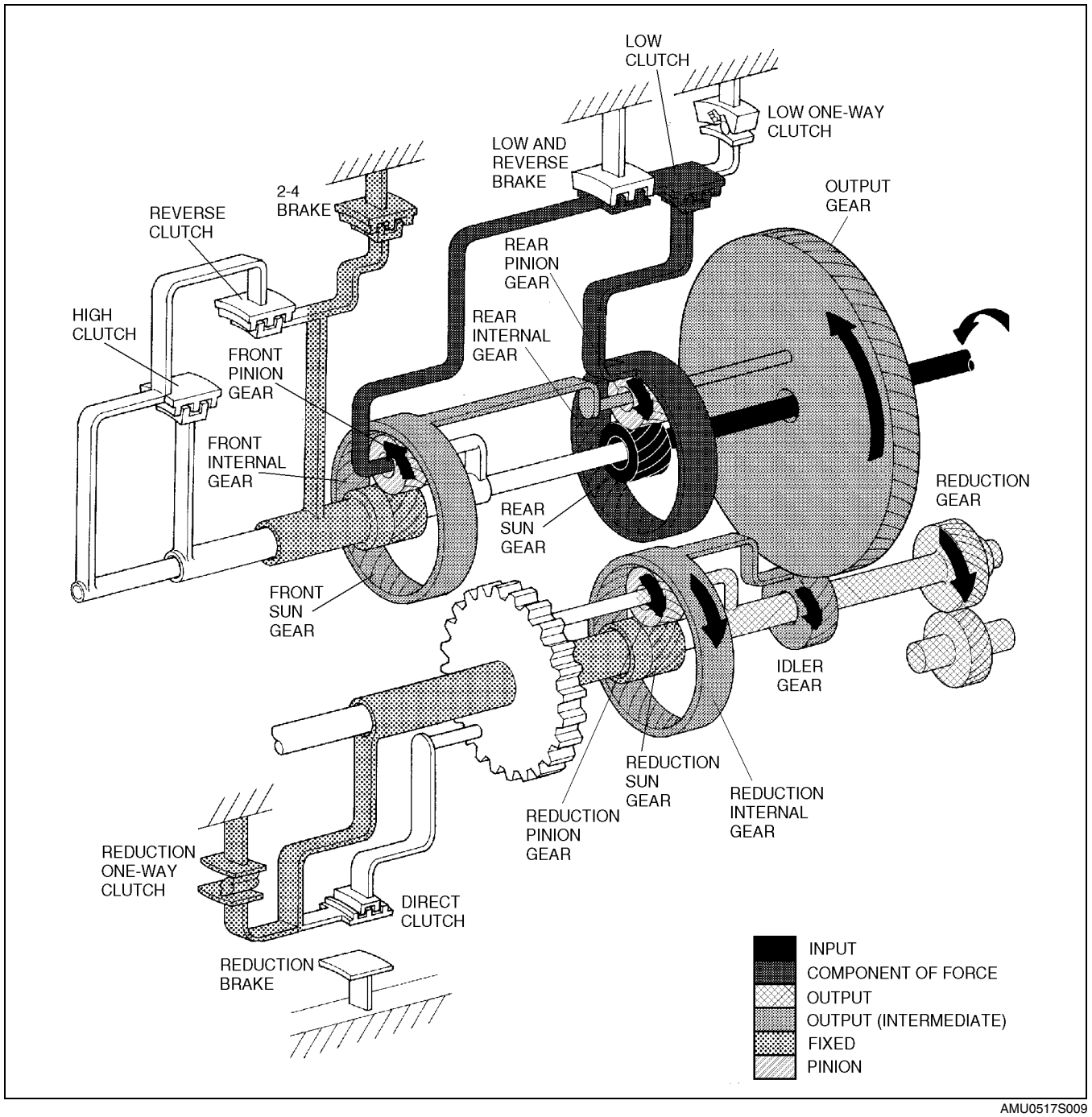


A6E5714W016

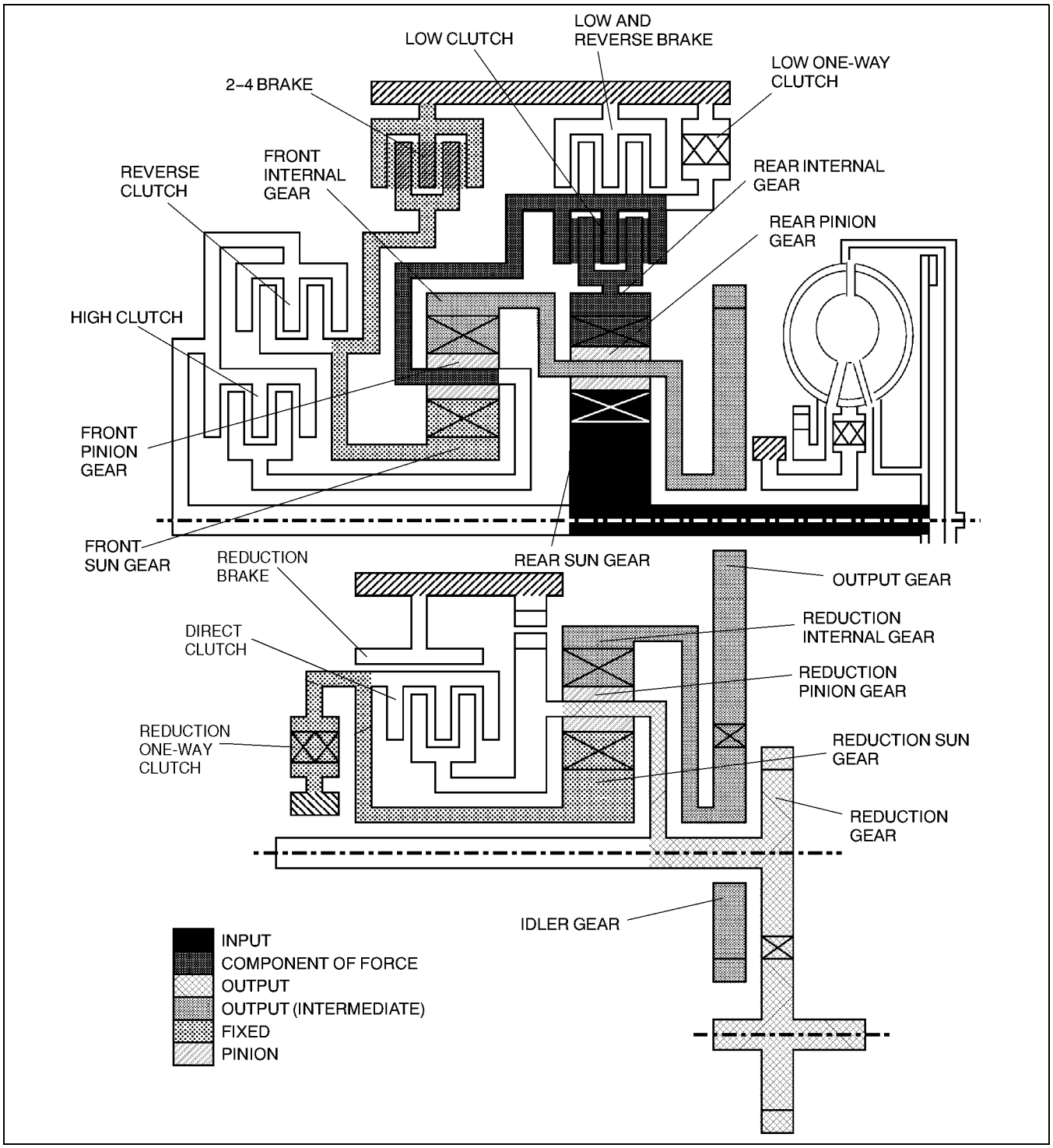


A6E5714W017

2GR (D range)



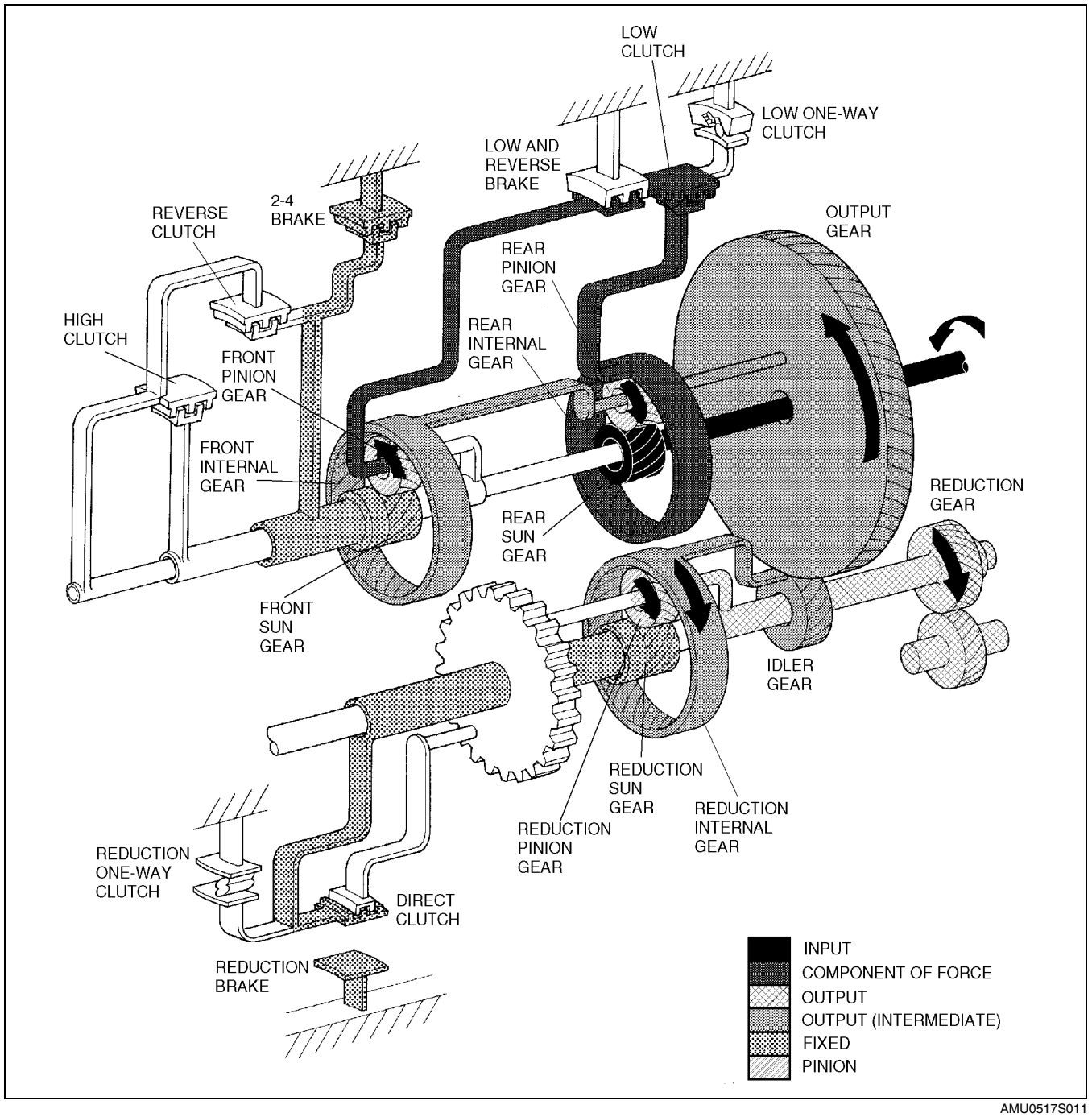
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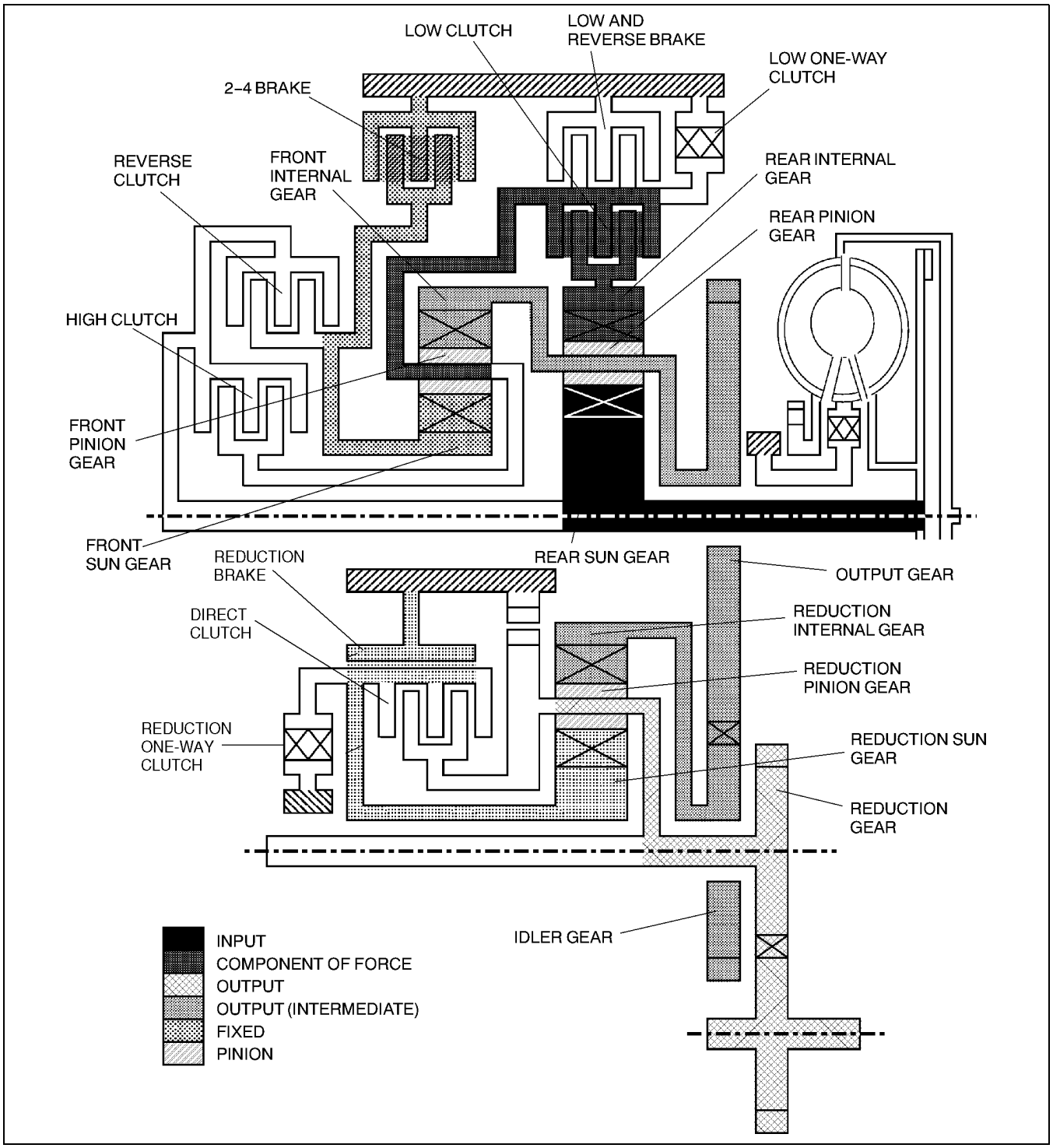
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K2

2GR (M range)



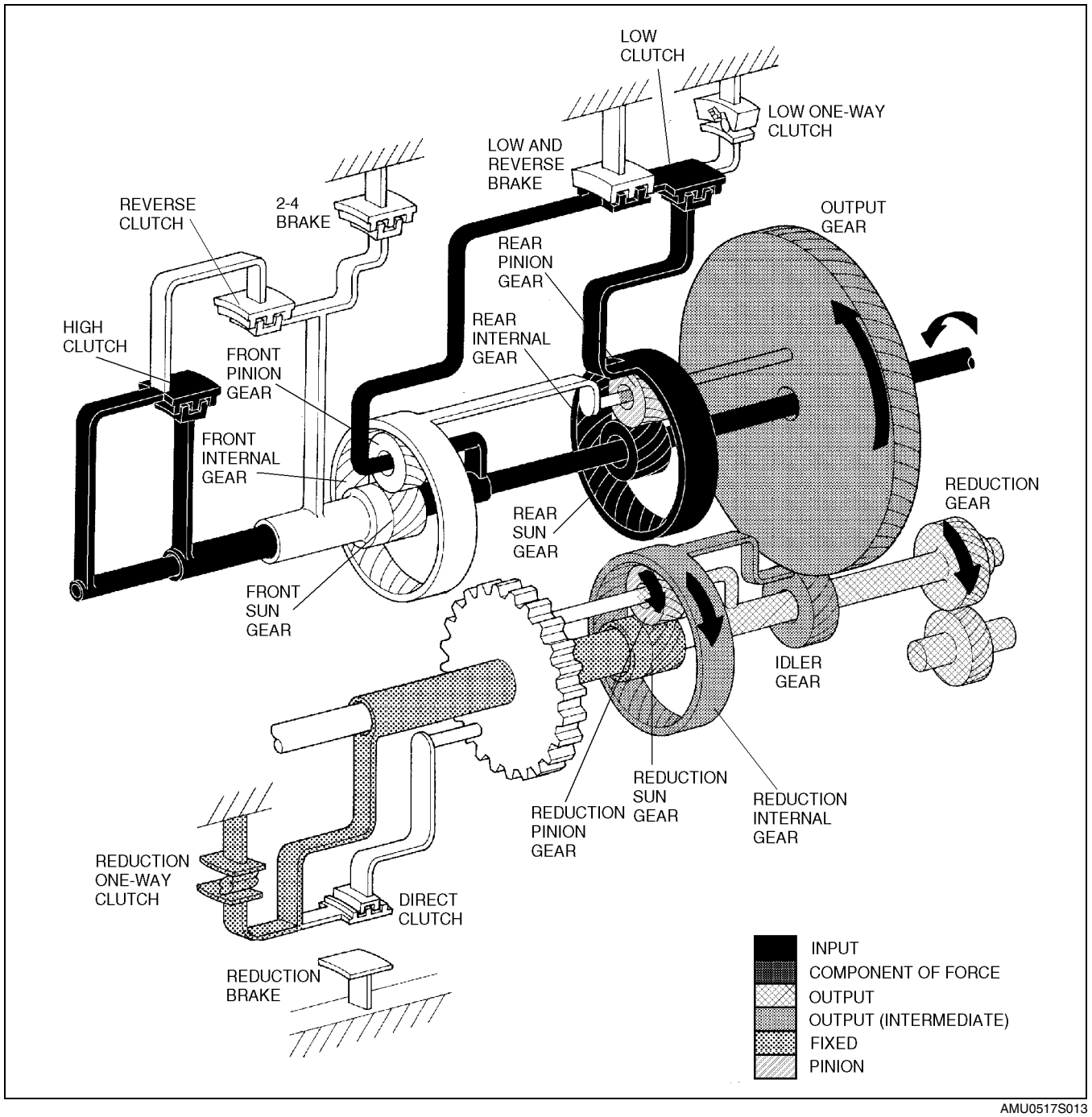
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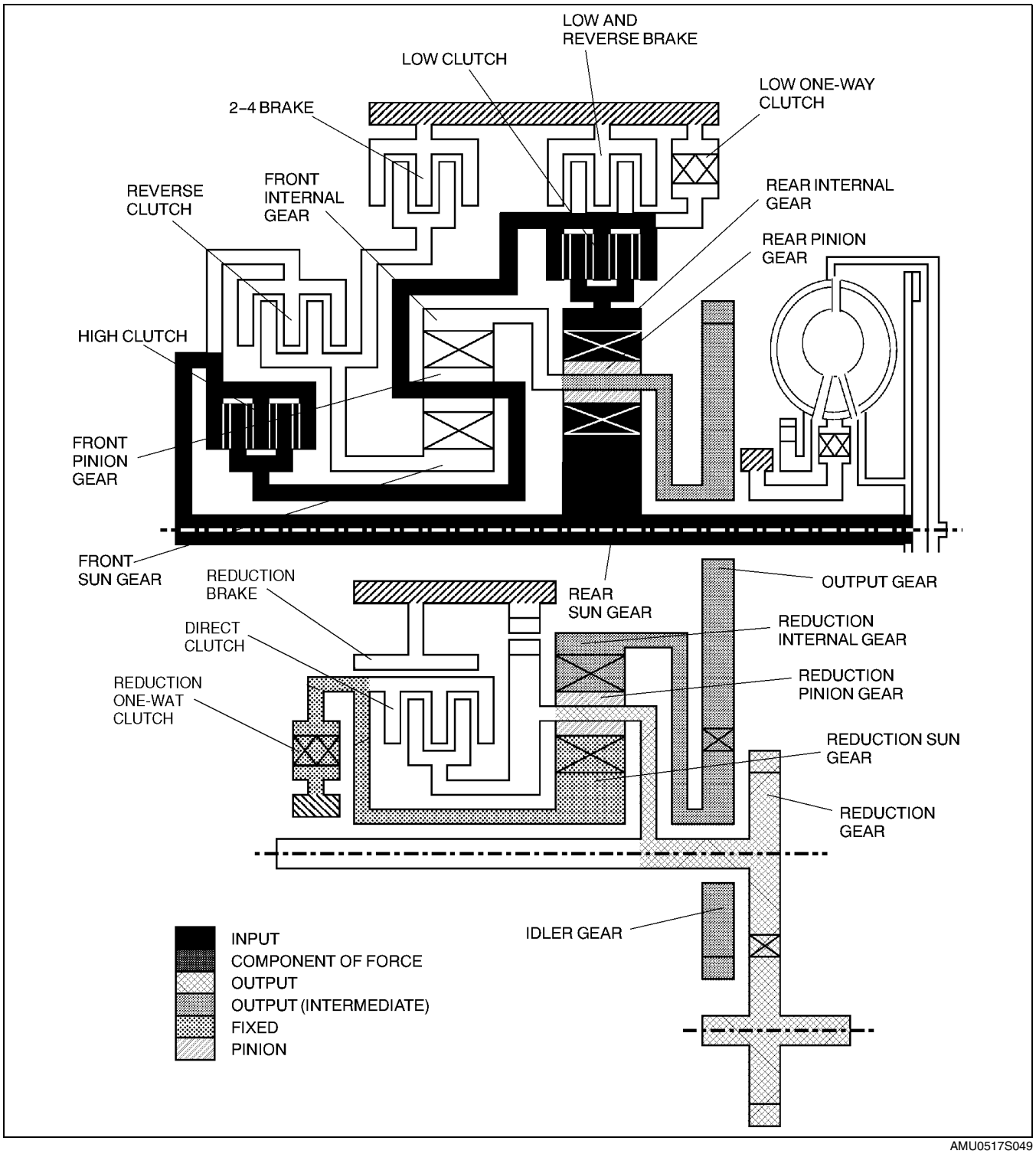
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K2

3GR (D range)



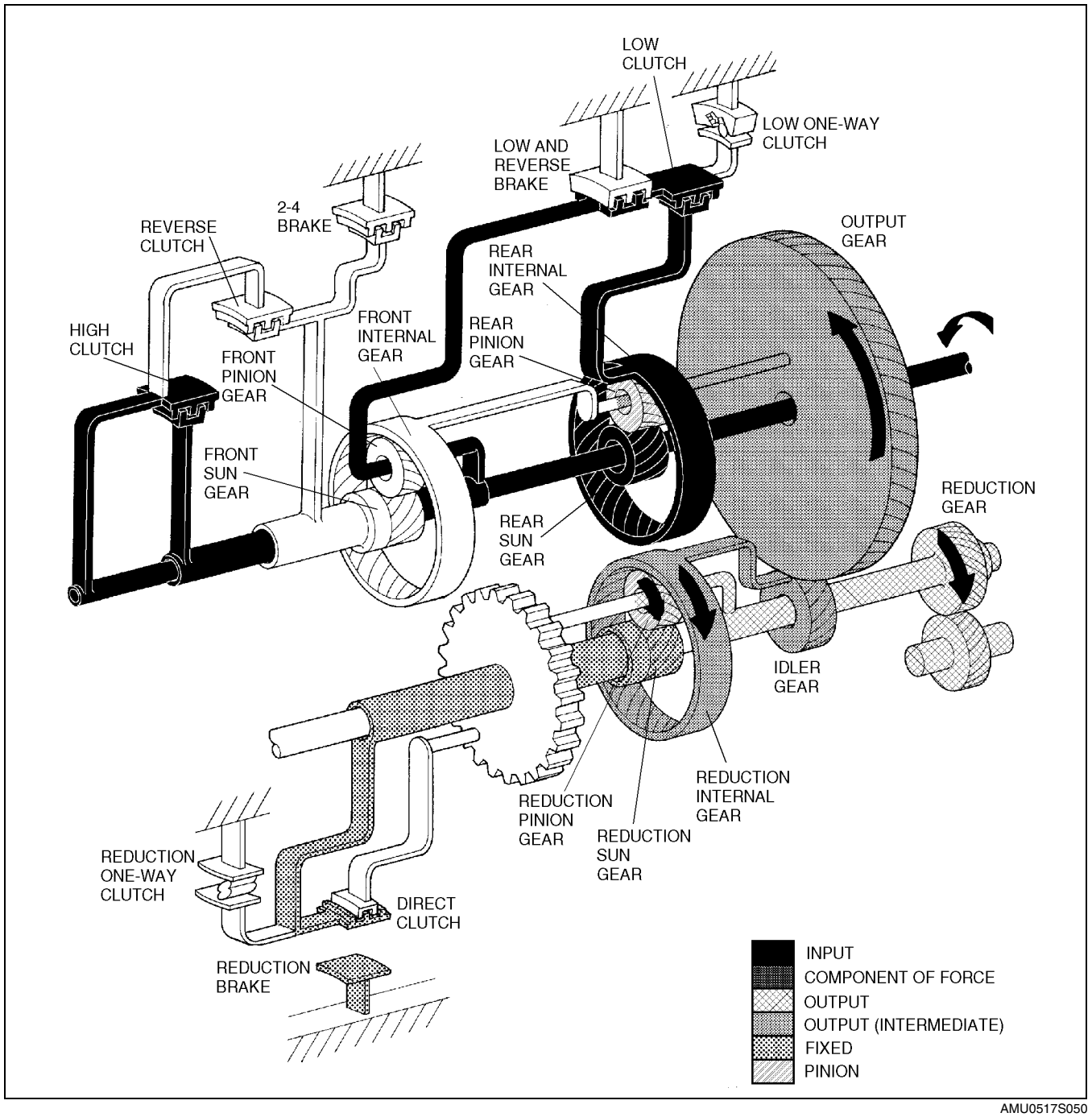
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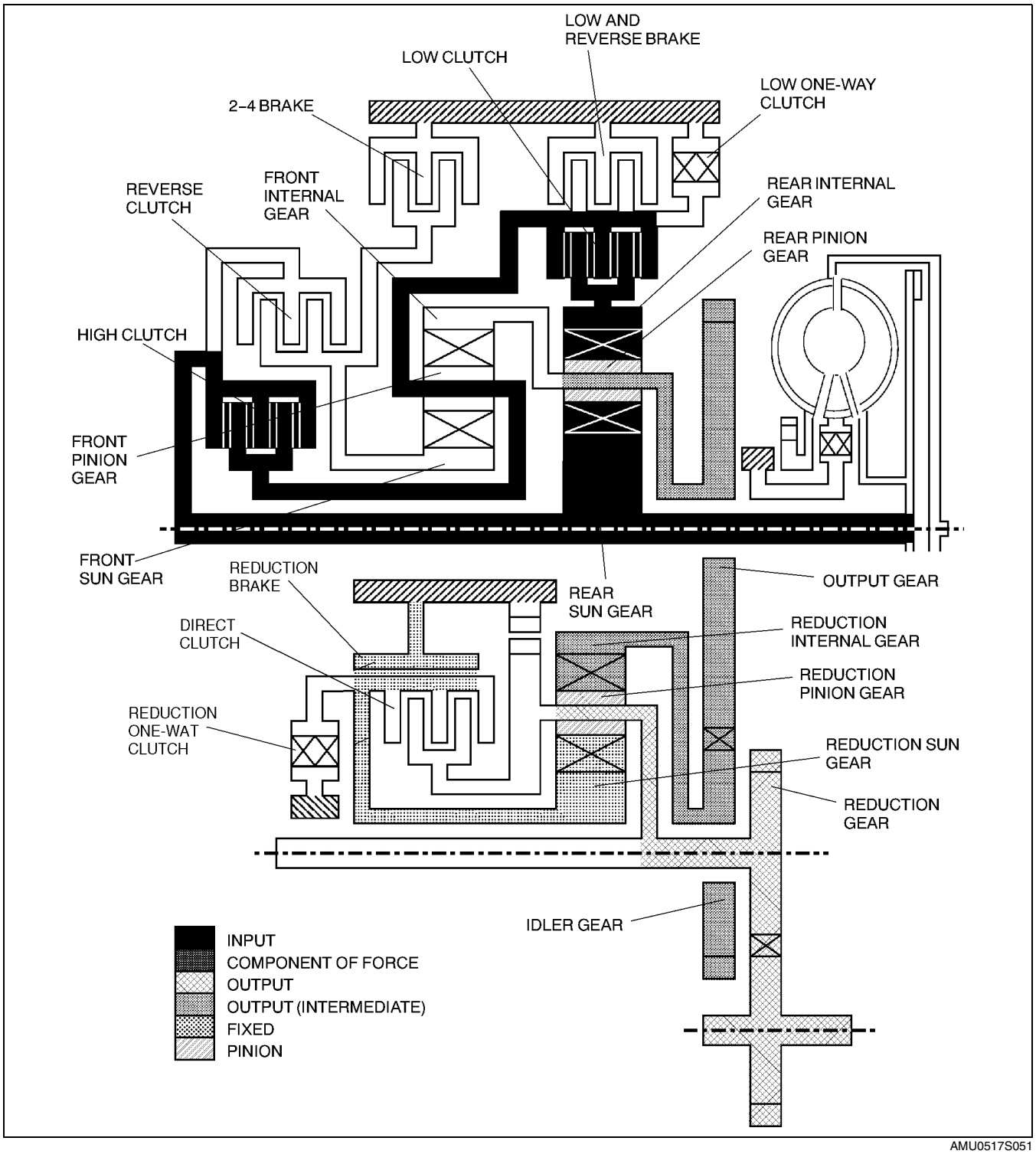
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K2

3GR (M range)



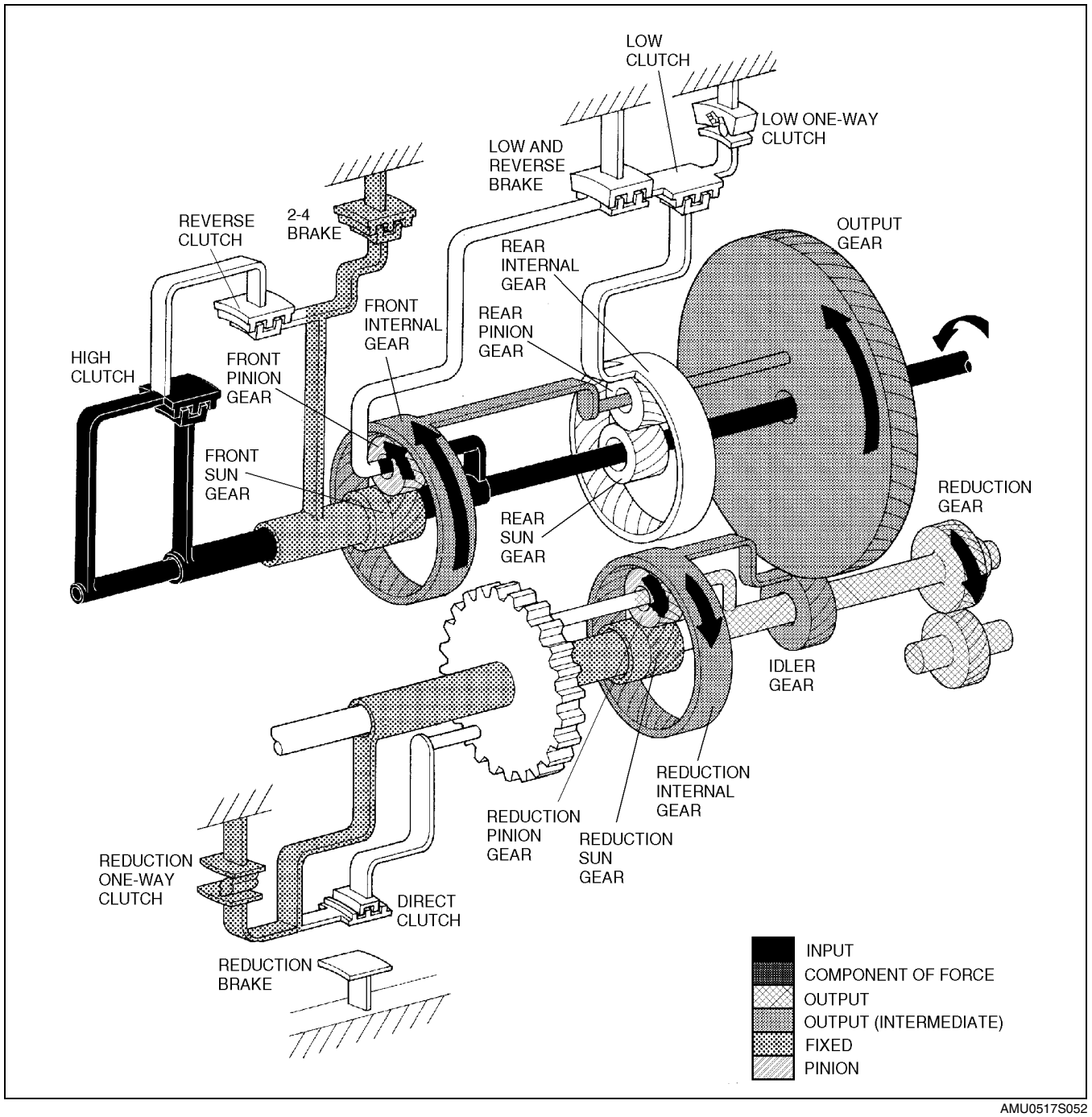
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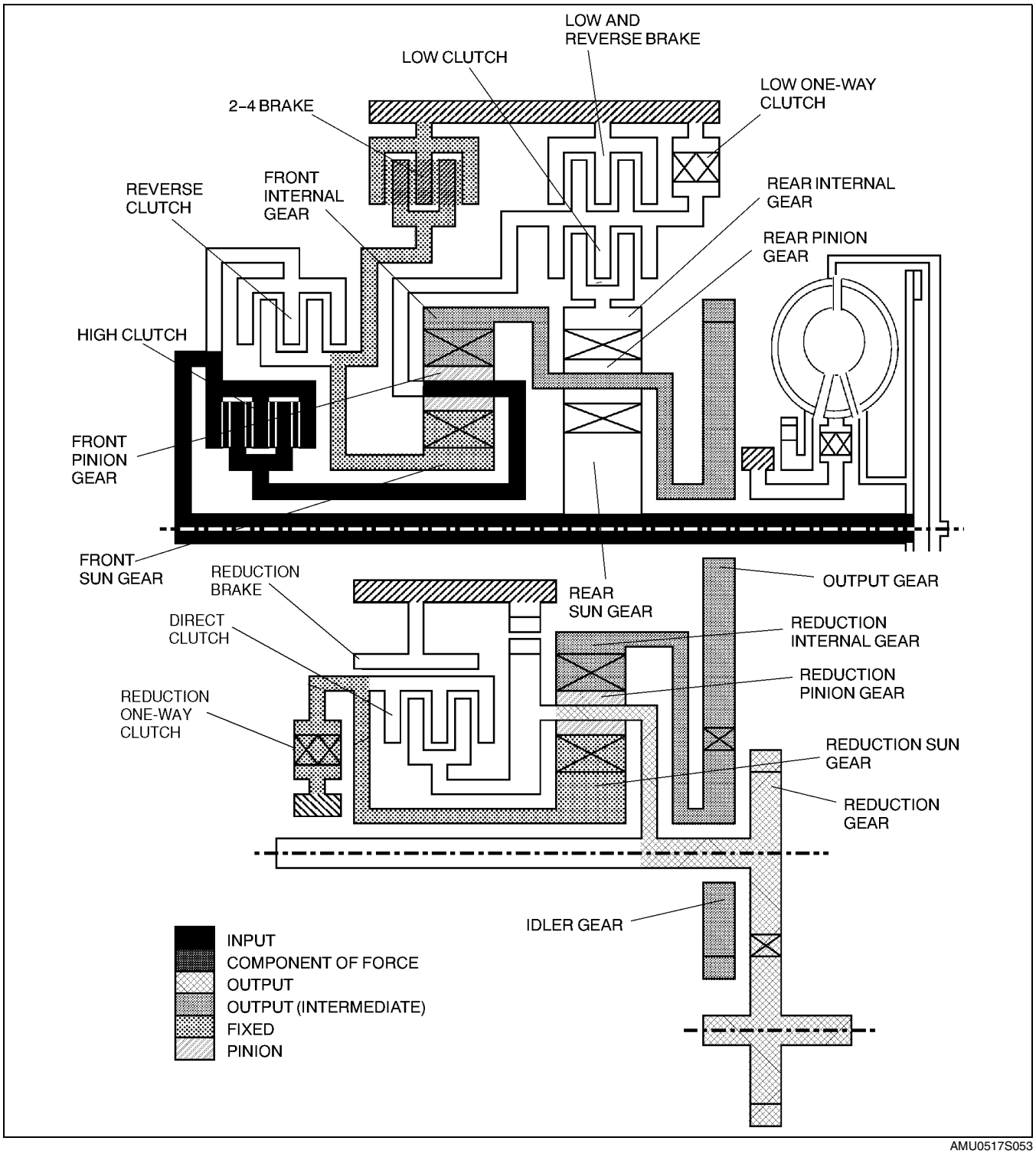
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K2

4GR (D range)



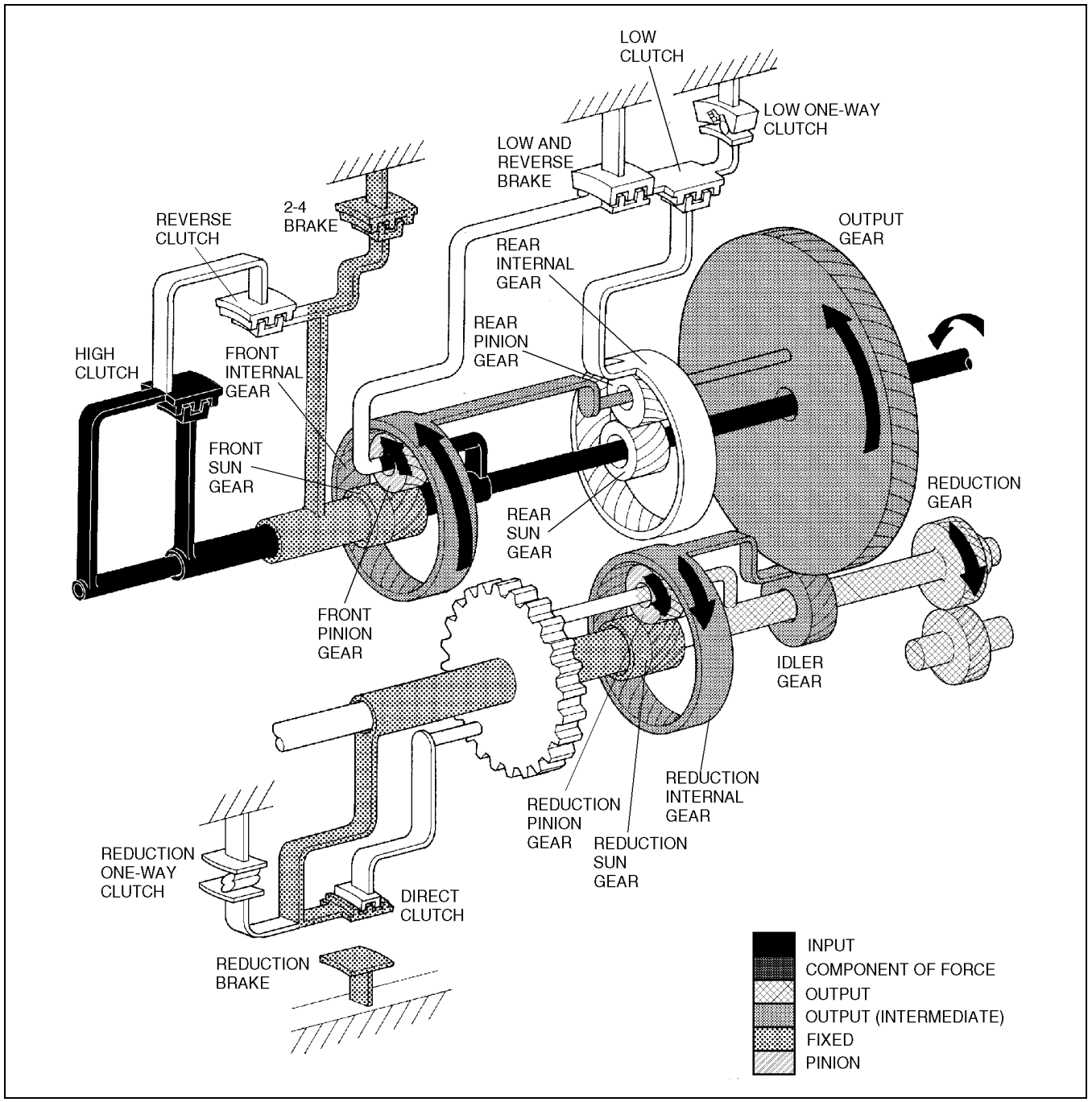
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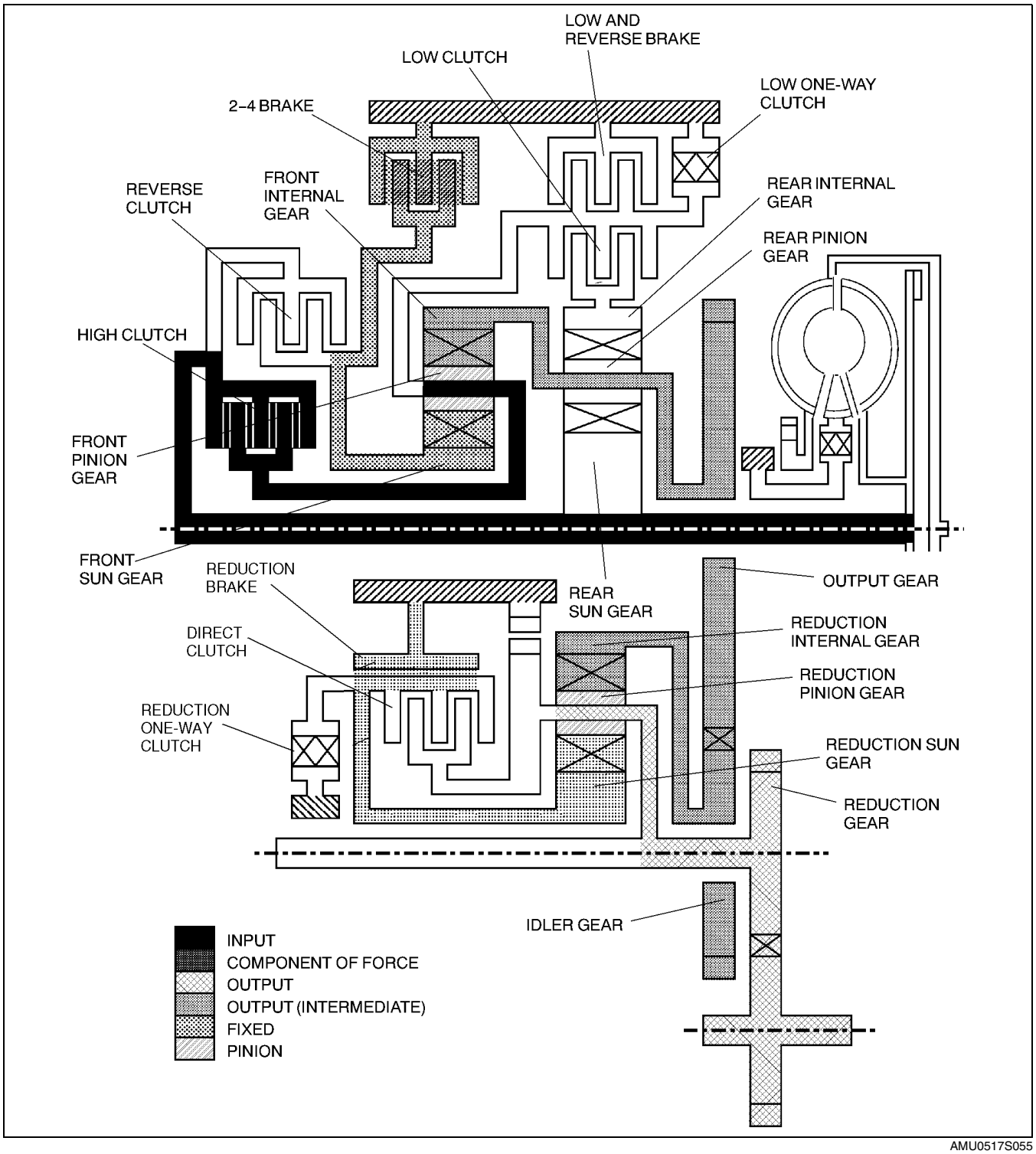
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4GR (M range)



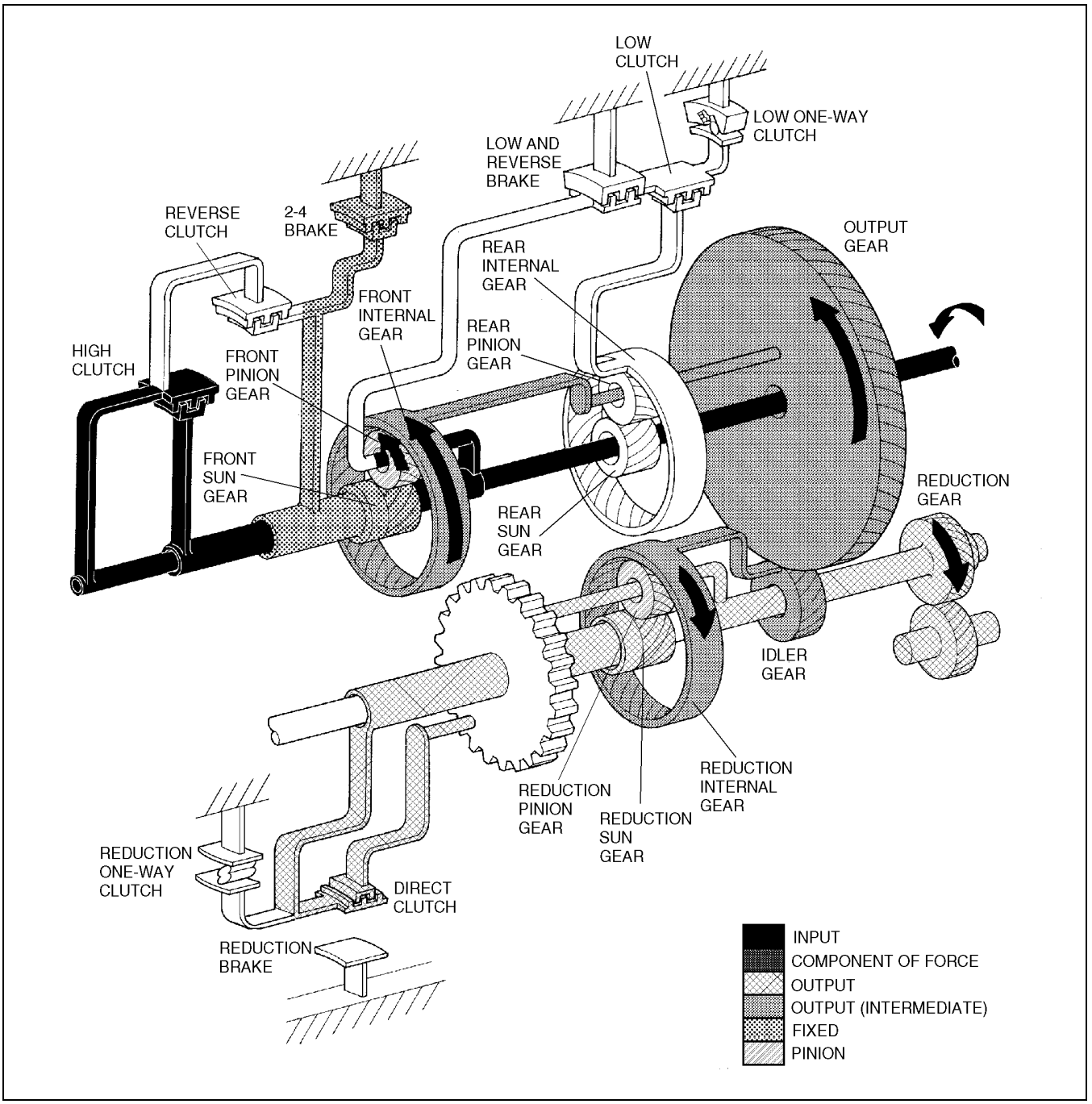
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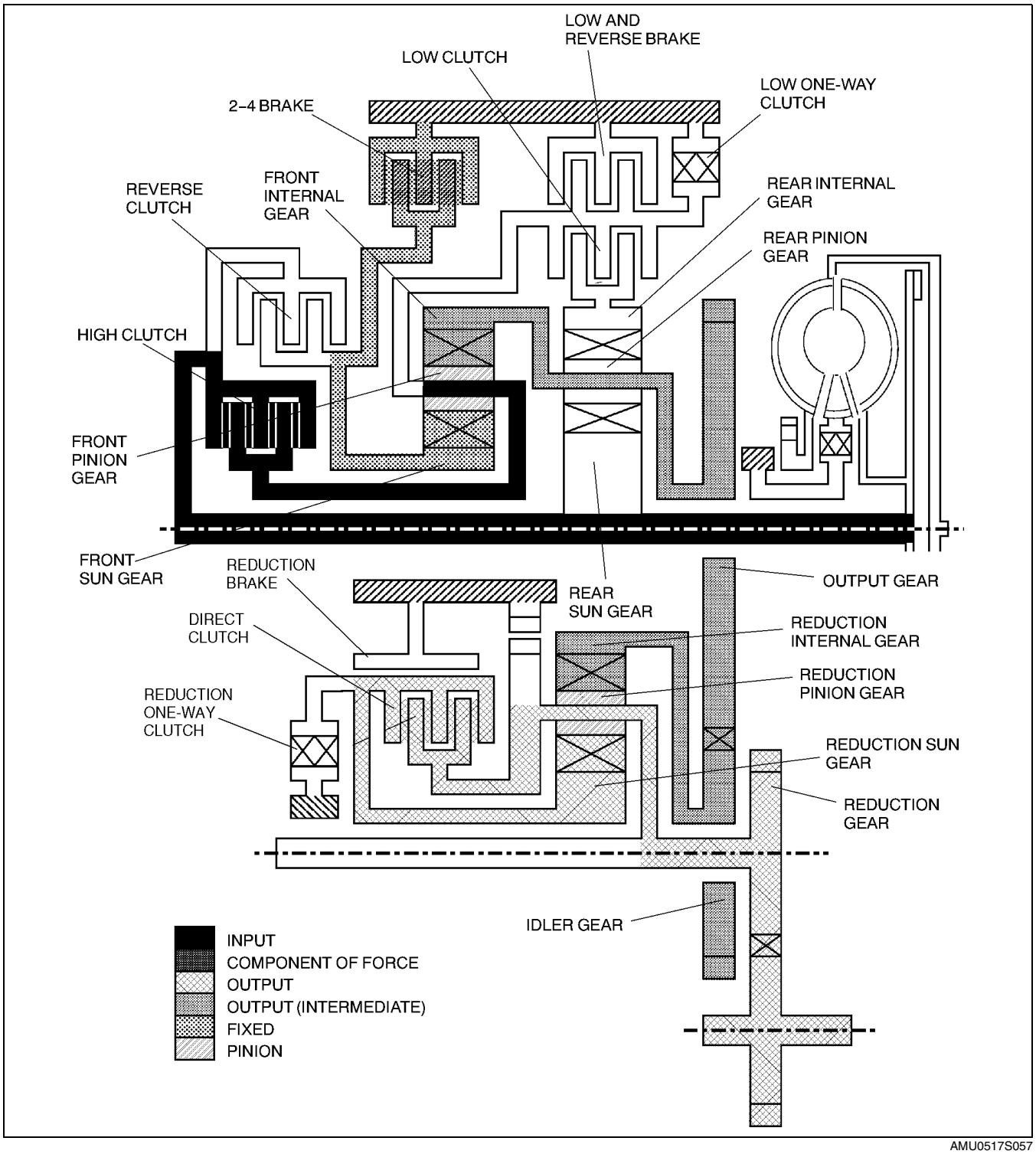
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5GR



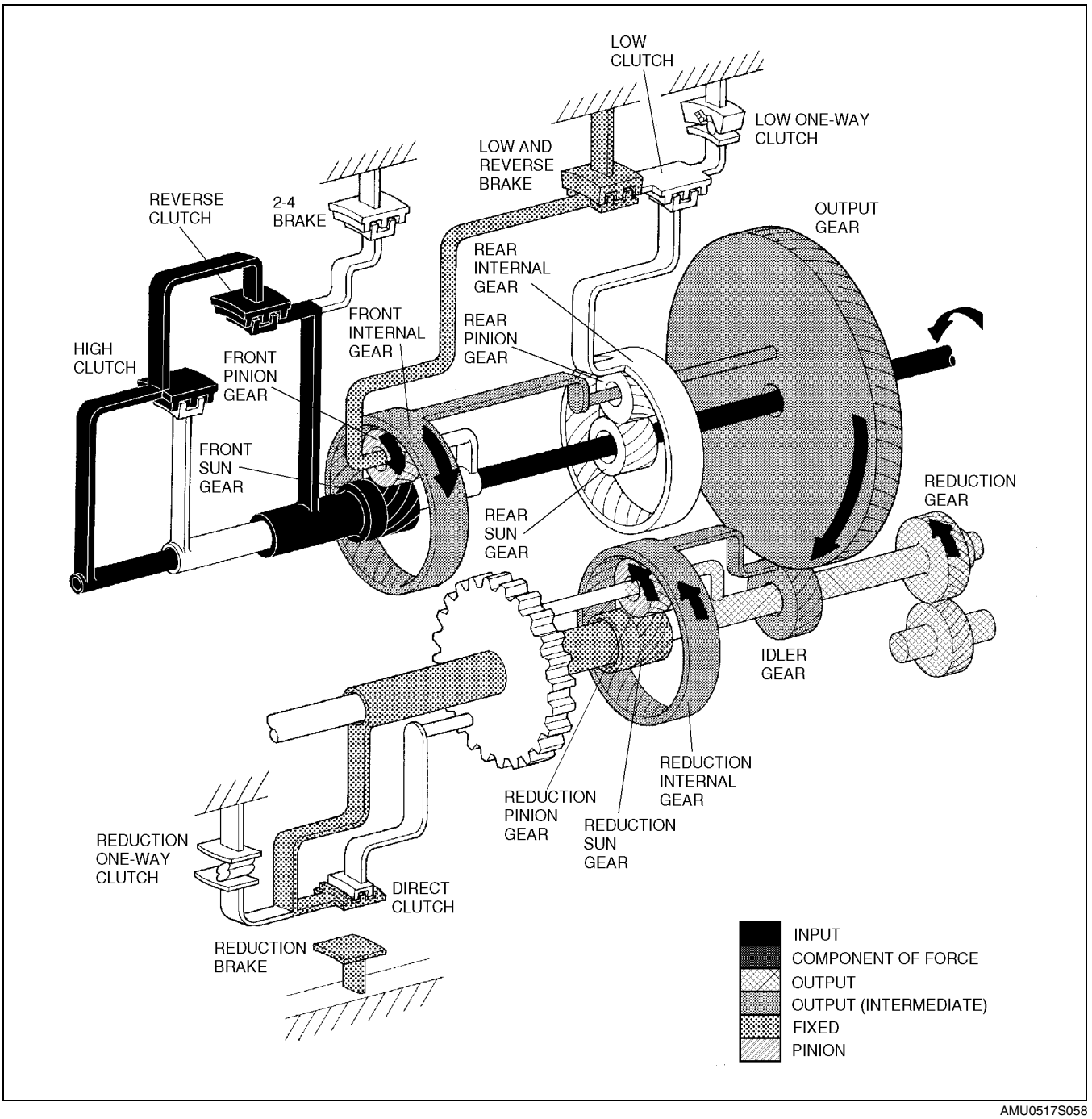
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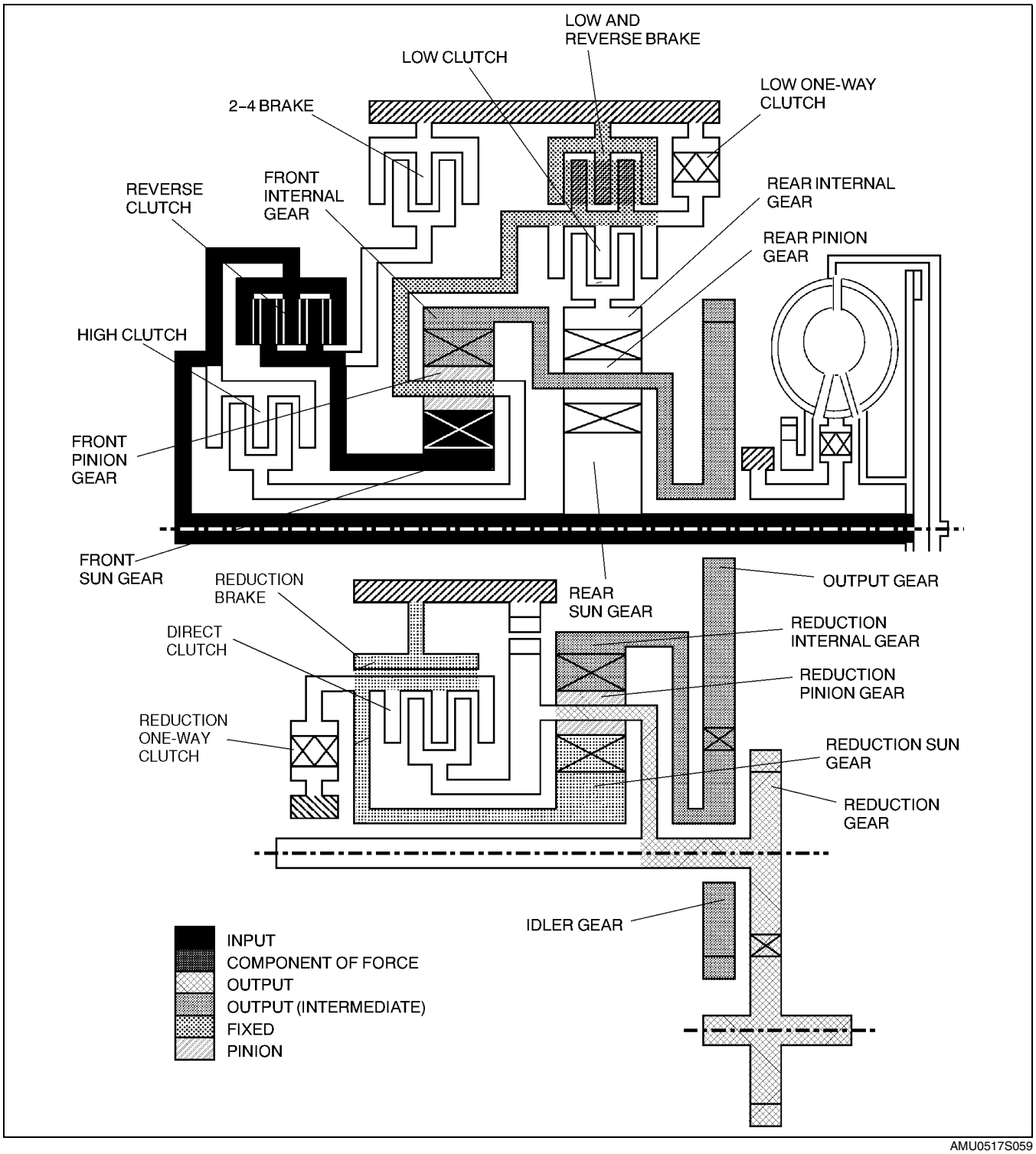
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K2

R position



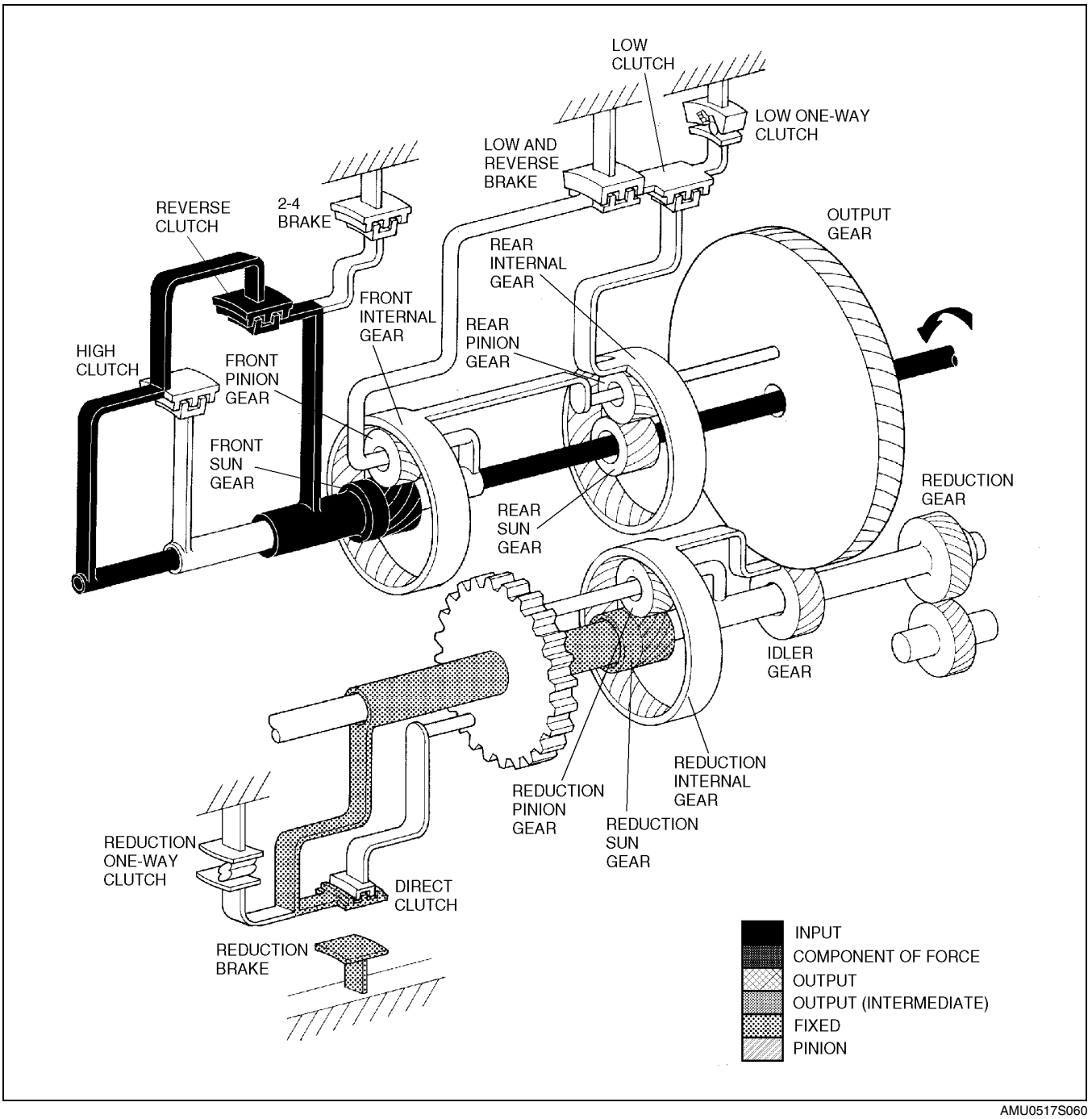
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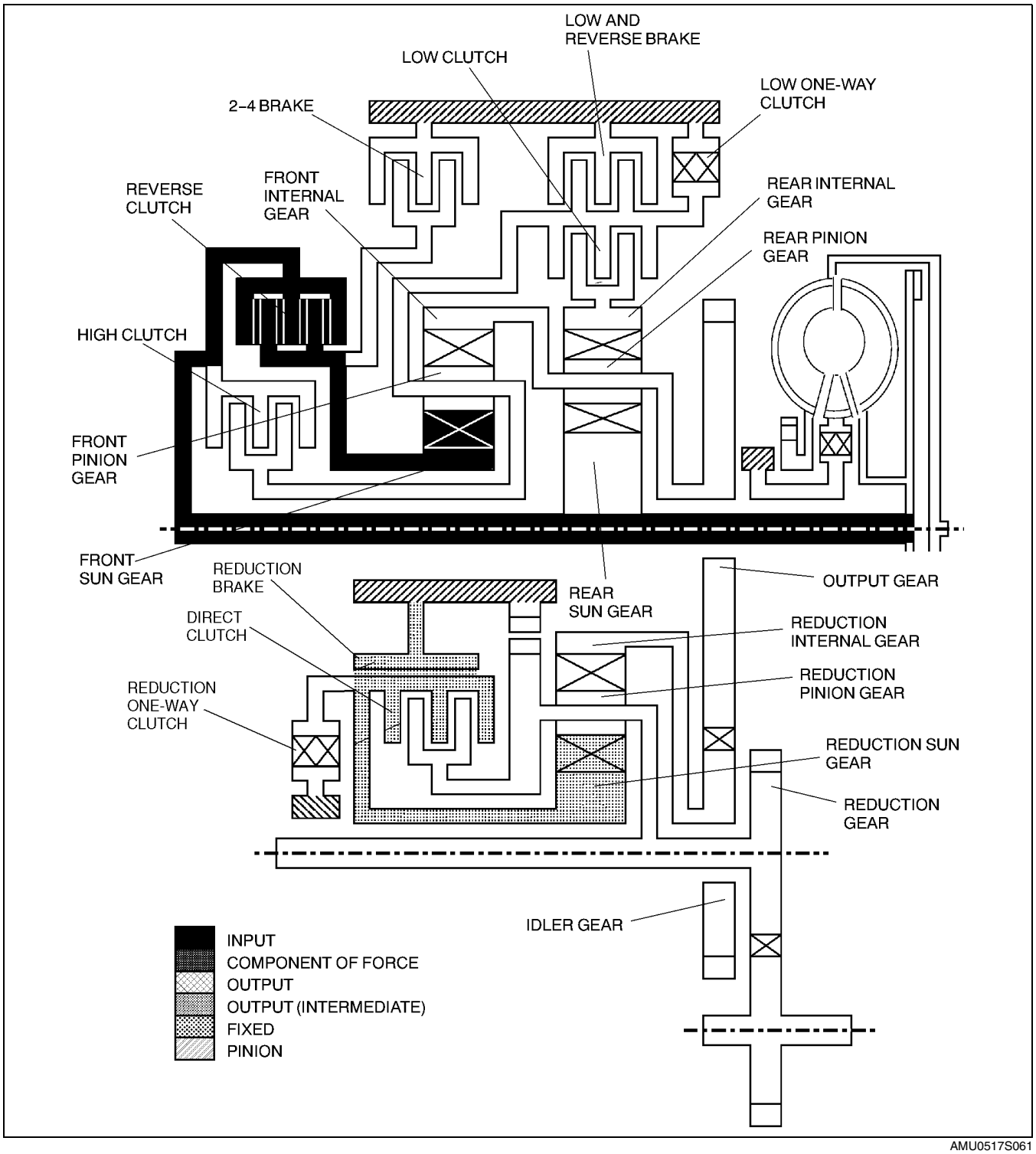
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R position (Reverse inhibition control)



AMU0517S060



AMU0517S061

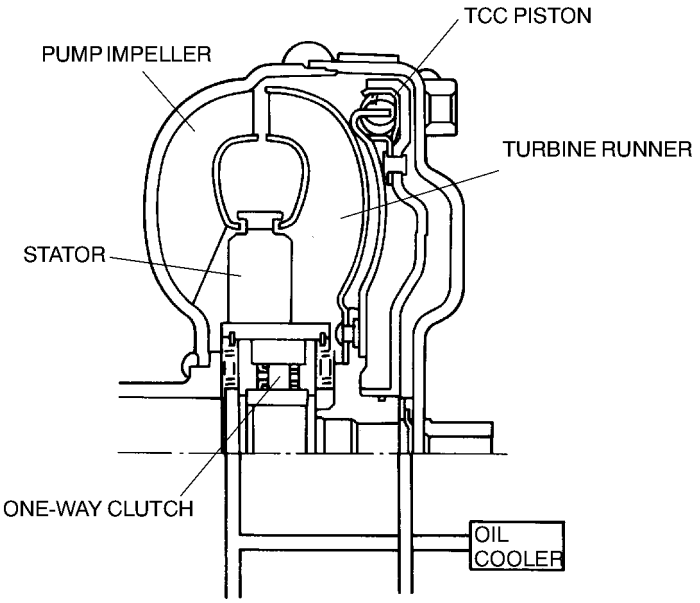
K2

TORQUE CONVERTER DESCRIPTION

A6E571419100201

Outline

- The JA5AX-EL uses a three-element, single-gear, two-phase torque converter with torque converter clutch (TCC) mechanism.
- The torque converter efficiently matches the output characteristic of AJ engine.
- By matching the output characteristics of the engine in order to optimize the configuration of the impellers, the torque converter increases the capacity coefficient in the practical range, thereby improving drivability and fuel economy.
- The TCC mechanism under certain conditions transmits the drive force by automatically connecting the pump impeller with the turbine runner as opposed to using fluid. Therefore it prevents the torque converter from slipping.



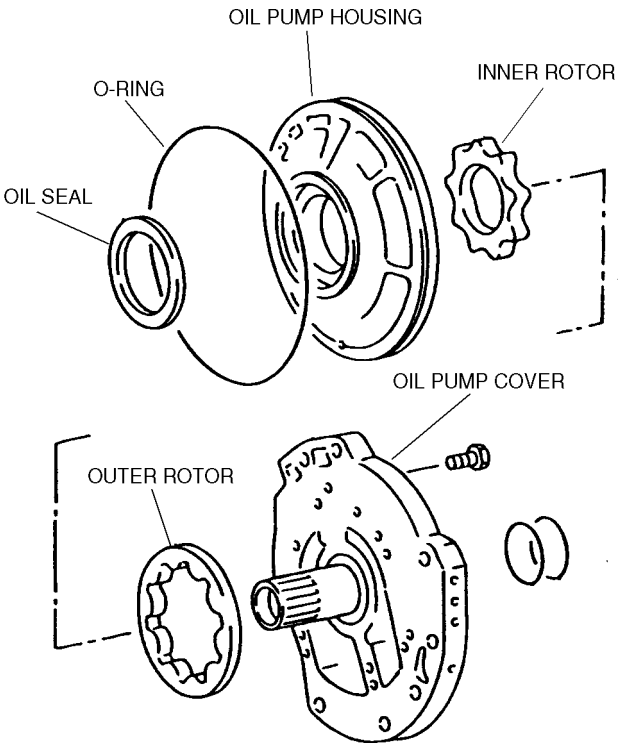
AMU0517S014

OIL PUMP DESCRIPTION

A6E571419220201

Outline

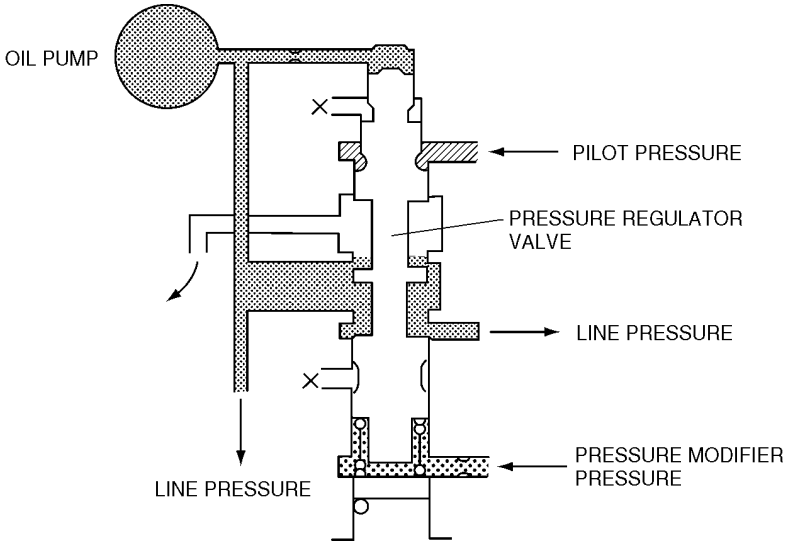
- The light-weight, compact, and quiet trochoid type oil pump reduces pump driving torque.
- The direct drive type oil pump is placed behind the torque converter.



AMU0517S015

Structure/Operation

- The outer rotor and inner rotor are installed in the oil pump housing.
- The inner rotor in the oil pump housing is driven by the torque converter.
- When the inner rotor in the oil pump rotates, the ATF is drawn to the oil pump. The discharge amount is proportional to the rotating speed of the torque converter.



AMU0517S016

CENTRIFUGAL BALANCE CLUTCH DESCRIPTION

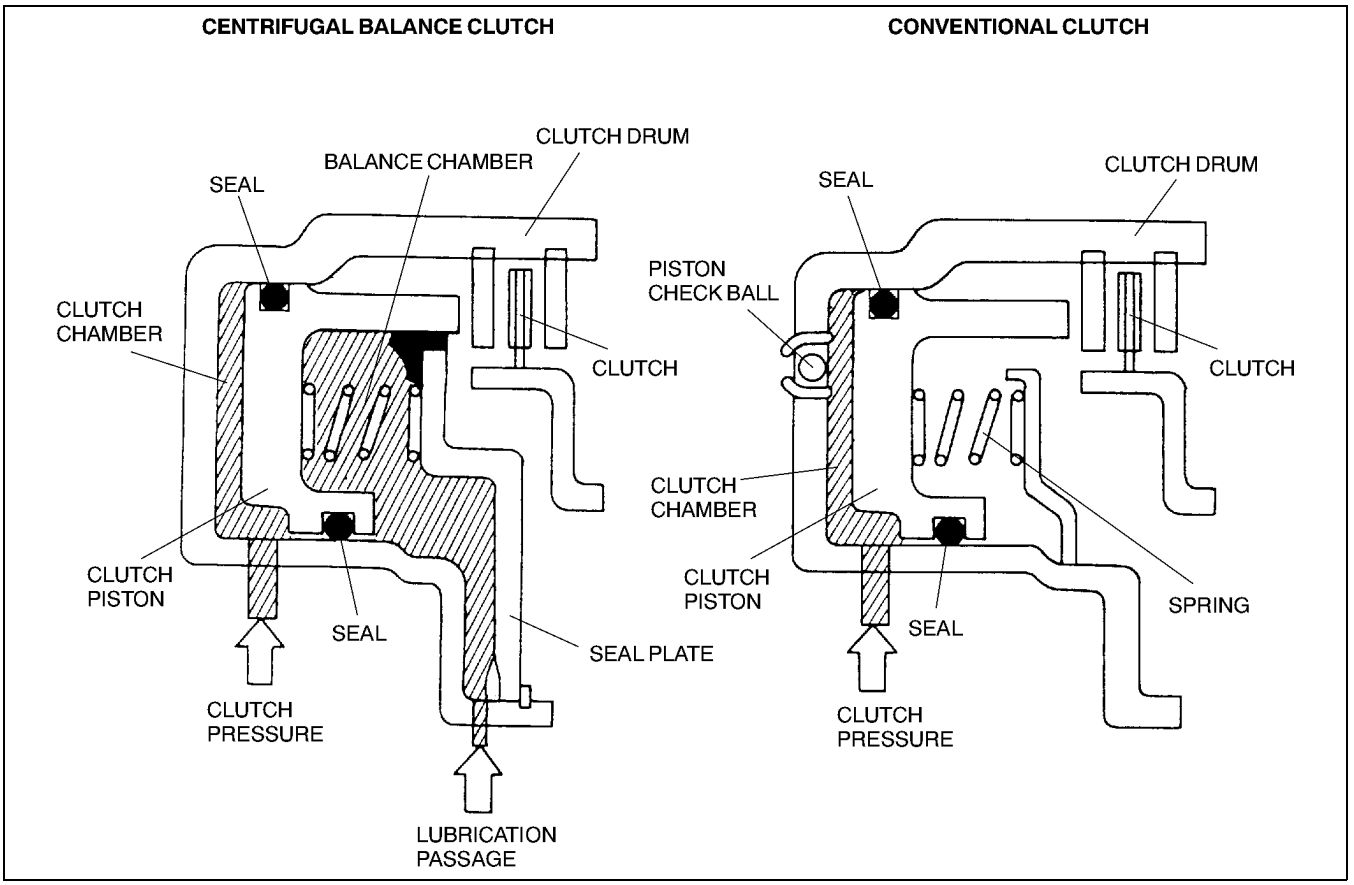
A6E571401030208

Function

- The centrifugal balance clutch, which replaces the conventional piston check ball, cancels centrifugal oil pressure generated during clutch drum rotation to prevent the clutch drag-engagement and to stabilize piston pressure during full rotation.

Construction/Operation

- Centrifugal balance clutch chambers are installed opposite the clutch chambers in the low and high clutches. The centrifugal balance clutch chambers are constantly filled with ATF from the exclusive hydraulic passage of the oil pump.



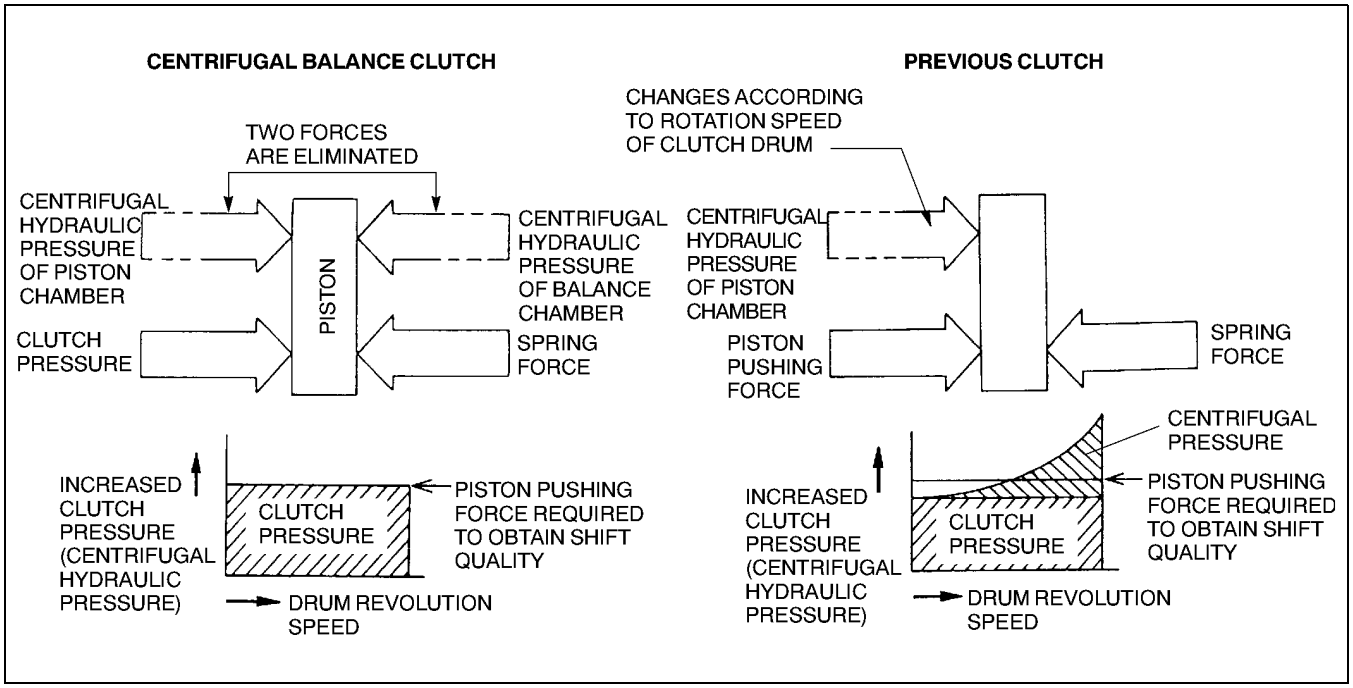
AMU0517S018

When the clutch pressure is not applied

- When the clutch drum rotates, centrifugal force acts on the residual ATF in the clutch chamber to push against the piston. However, centrifugal force also acts on the ATF filled in the centrifugal balance clutch chamber to push back the piston. As a result, the two forces are eliminated and the piston remains stationary, thus preventing clutch engagement.

When the clutch pressure is applied

- When clutch pressure is applied to the clutch chamber, the clutch pressure overcomes the oil pressure and the spring force in the opposite centrifugal balance clutch chamber, and pushes the piston to engage the clutches. Because the centrifugal force acting on the clutch pressure in the clutch chamber is canceled by another centrifugal force acting on the ATF filled in the centrifugal balance clutch chamber, the influence of the centrifugal force created by the clutch drum revolution speed is eliminated. As a result, stable piston pushing force is obtained in all rotation ranges, and smoother shifts can be made.



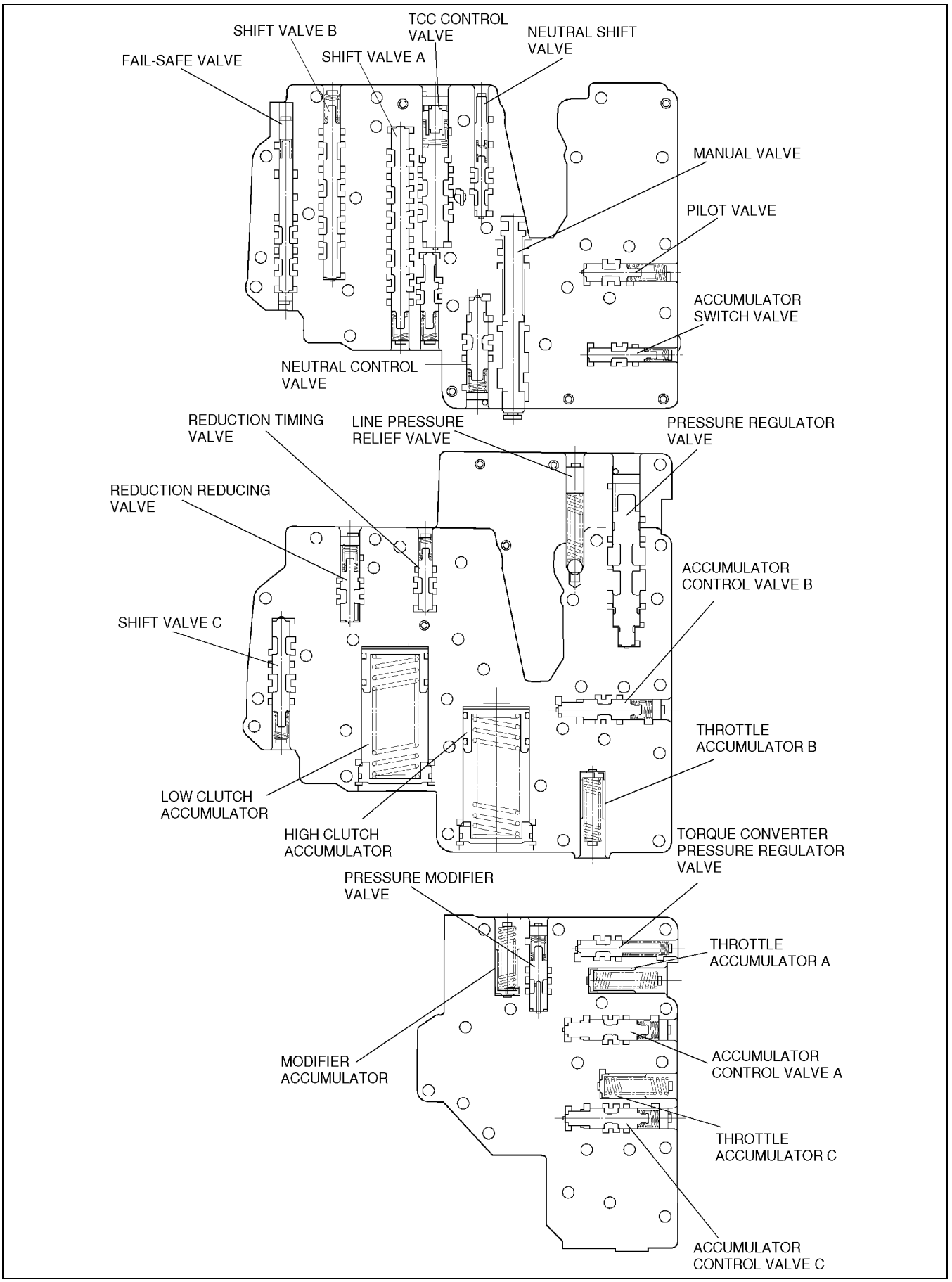
AMU0517S019

CONTROL VALVE BODY DESCRIPTION

A6E571421100201

Outline

- The control valve body is composed of four bodies: the sub lower body, lower body, internal body, and the upper body.
- To minimize the component in the control valve body, clutch engagement is electronically controlled, hydraulic circuits were simplified and the valve types reduced.



AMU0517S064

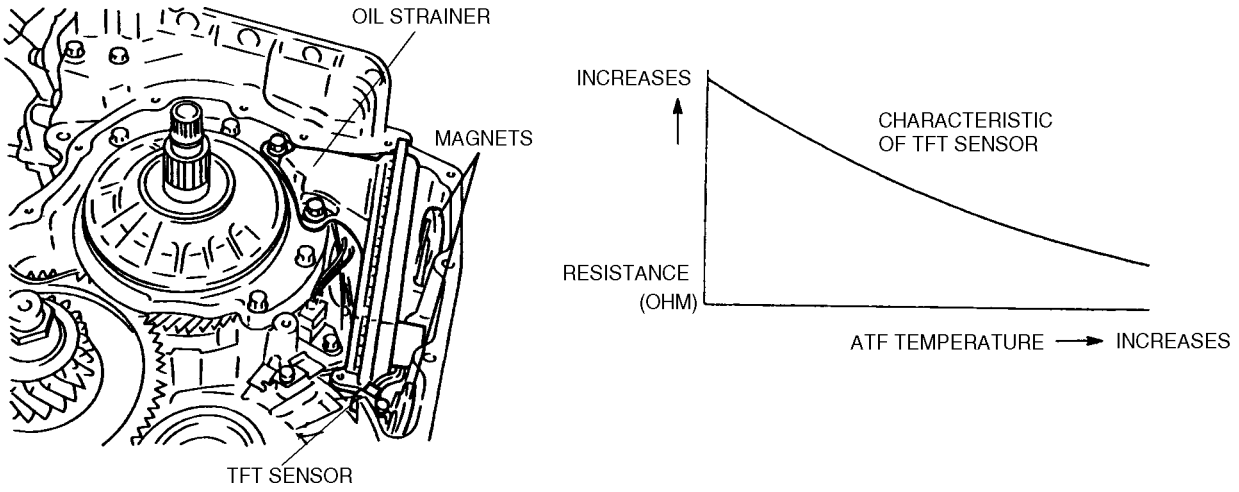
TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR DESCRIPTION

A6E571419010201

- The TFT sensor, which is installed in the transaxle case, detects the ATF temperature in the transaxle case, and sends the control signal to the TCM. The TCM controls the driving pattern and the torque converter clutch based on the signal from the TFT sensor.

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.
- The TFT sensor is integrated with the connector.



AMU0517S020

INPUT/TURBINE SPEED SENSOR DESCRIPTION

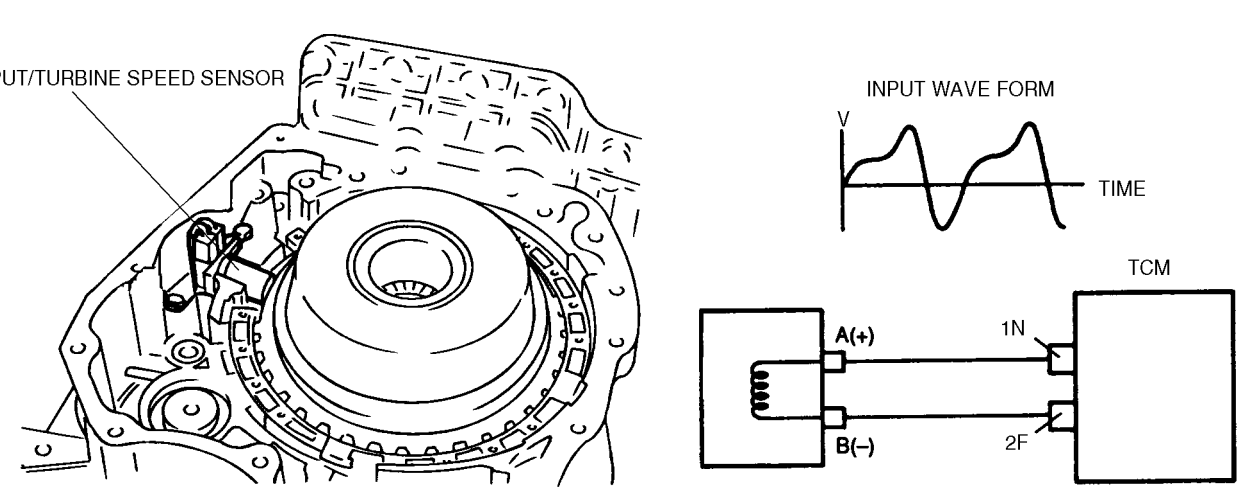
A6E571421550201

Function

- A input/turbine speed sensor is located in the transaxle case and detects the rotating speed of the reverse clutch drum.

Construction/Operation

- The magnetic pickup type of input/turbine speed sensor is mounted in the transaxle case, next to the reverse clutch drum. It generates a 36-pulse signal for each rotation of the reverse clutch drum, and sends this signal to the TCM.



AMU0517S021

INTERMEDIATE SENSOR DESCRIPTION

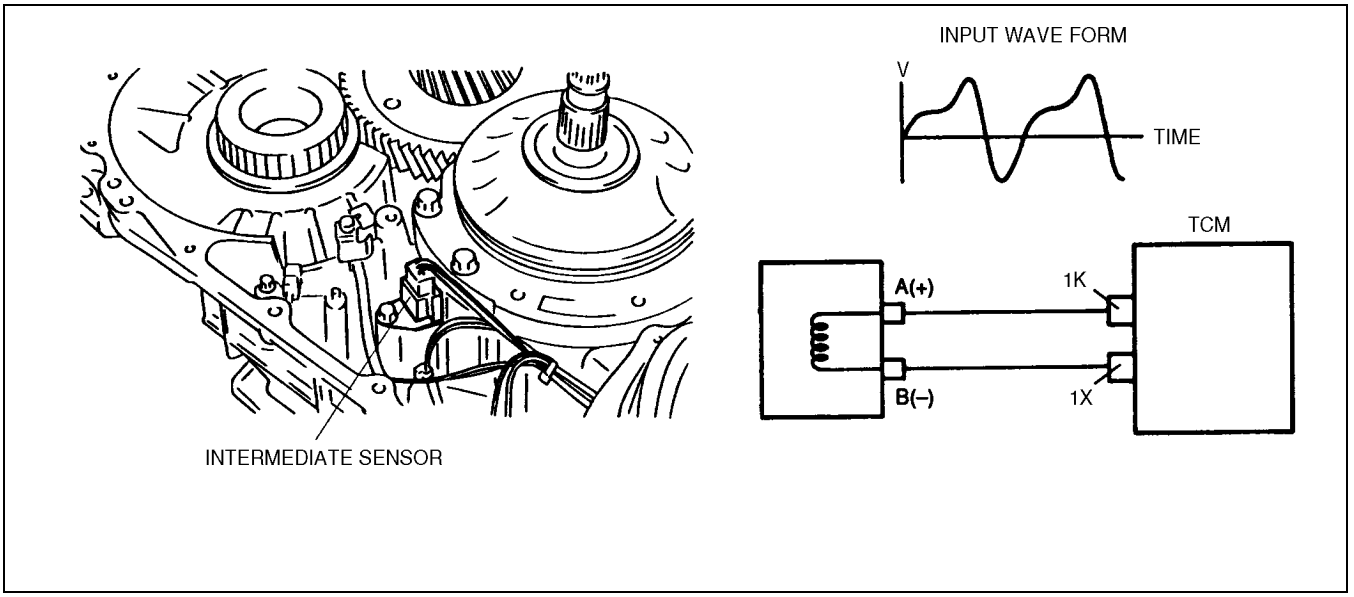
A6E571419550201

Function

- A intermediate sensor is located in the transaxle case and detects the rotating speed of the output gear.

Construction/Operation

- The magnetic pickup type of intermediate sensor is mounted in the transaxle case, next to the output gear. It generates a 54-pulse signal for each rotation of the output gear, and sends this signal to the TCM.



AMU0517S022

VEHICLE SPEEDOMETER SENSOR DESCRIPTION

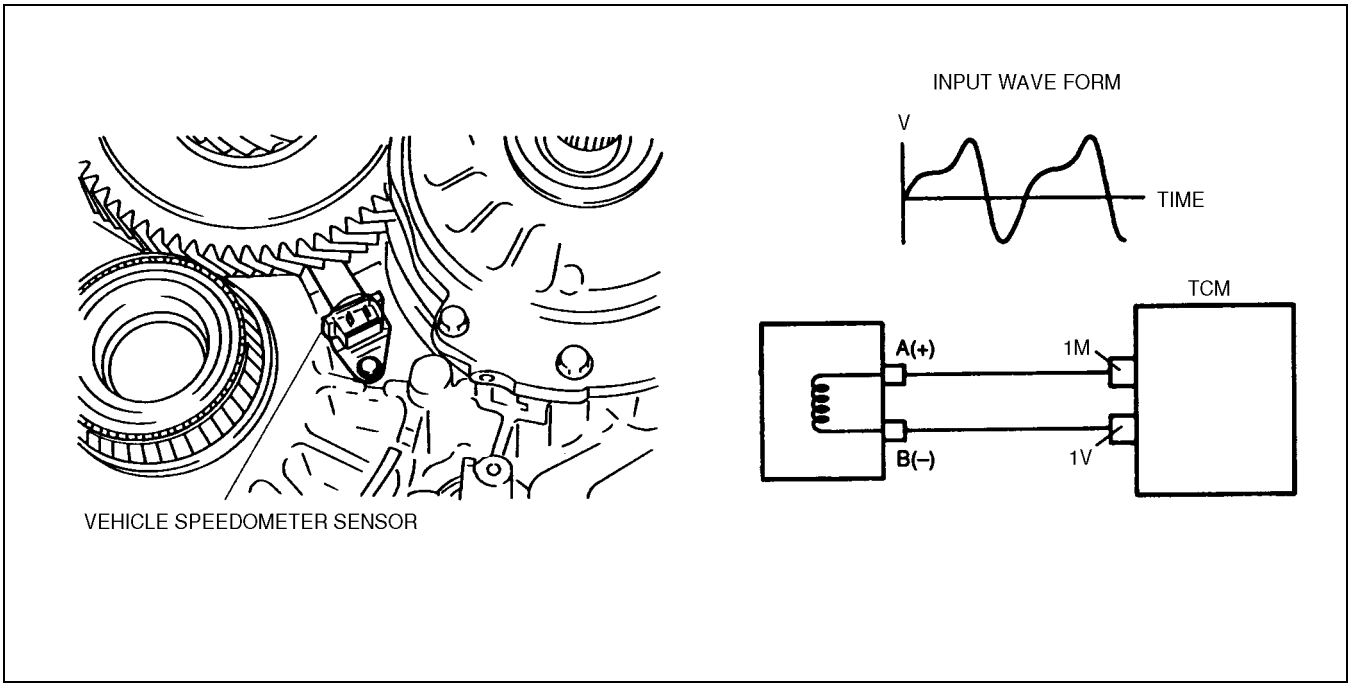
A6E571417400201

Function

- A vehicle speedometer sensor is located in the transaxle case and detects the rotating speed of the parking gear.

Construction/Operation

- The magnetic pickup type of vehicle speedometer sensor is mounted in the transaxle case, next to the parking gear. It generates a 18-pulse signal for each rotation of the parking gear, and sends this signal to the TCM.

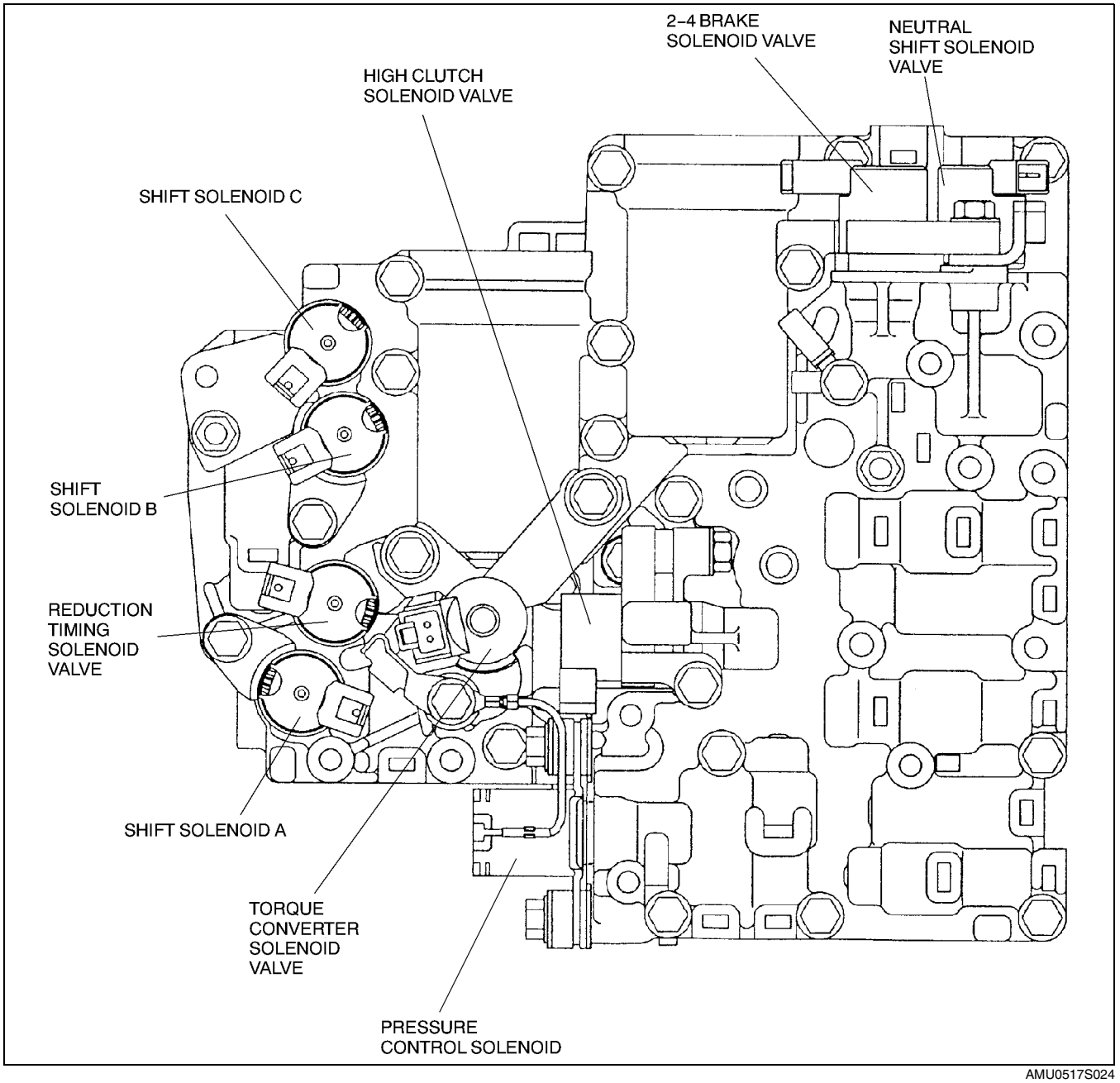


AMU0517S023

SOLENOID VALVE DESCRIPTION

A6E571421280201

Function



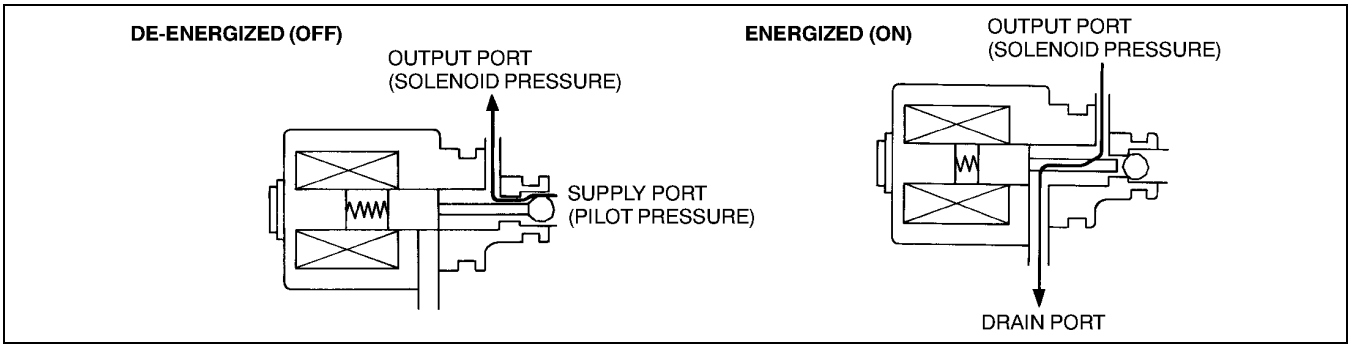
AMU0517S024

Function chart

Solenoid	Type	Characteristics	Function
Pressure control solenoid	Repeats ON and OFF at 50 Hz (20 ms cycle); duty cycle type (three-way type)	Normal high	Controls pressure regulator valve, regulates line pressure
Torque converter clutch (TCC) solenoid valve		Normal low	Controls TCC engagement and disengagement
2-4 brake solenoid valve		Normal high	Control 2-4 brake engagement and disengagement
High clutch solenoid valve			Control high clutch engagement and disengagement
Shift solenoid A	ON/OFF (three-way type)	Normal low	Control shift valve A
Shift solenoid B			Control shift valve B
Shift solenoid C			Control shift valve C
Reduction timing solenoid valve	ON/OFF (two-way type)		Control reduction reducing valve
Neutral shift solenoid			Control neutral shift valve and reverse inhibitor valve

Construction/Operation
Duty type
Normal high

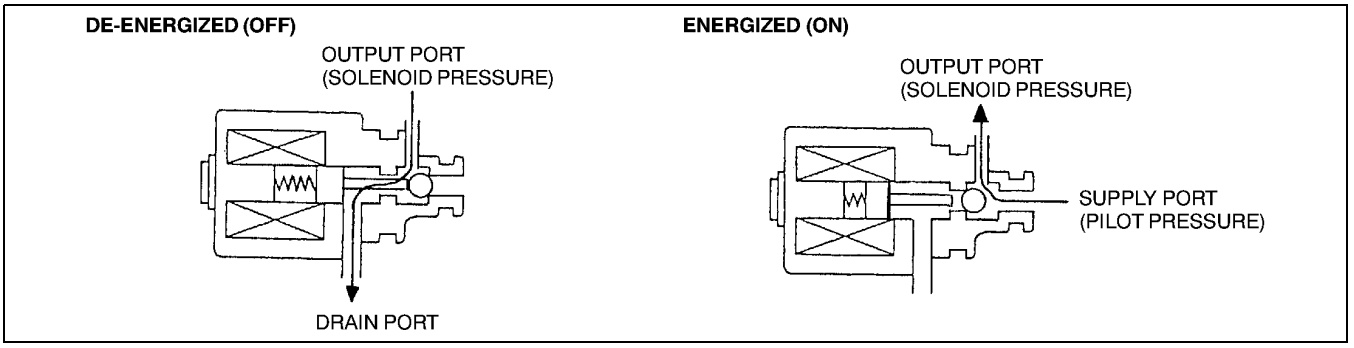
- De-energized (OFF) or duty 0%
  - — Because the output port (solenoid pressure) and supply port (pilot pressure) connect in the solenoid, the solenoid pressure supplied to the output port.
- Energized (ON) or duty 100%
  - — Because the output port (solenoid pressure) and the drain port connect, solenoid pressure is drained.



AMU0517S025

Normal low

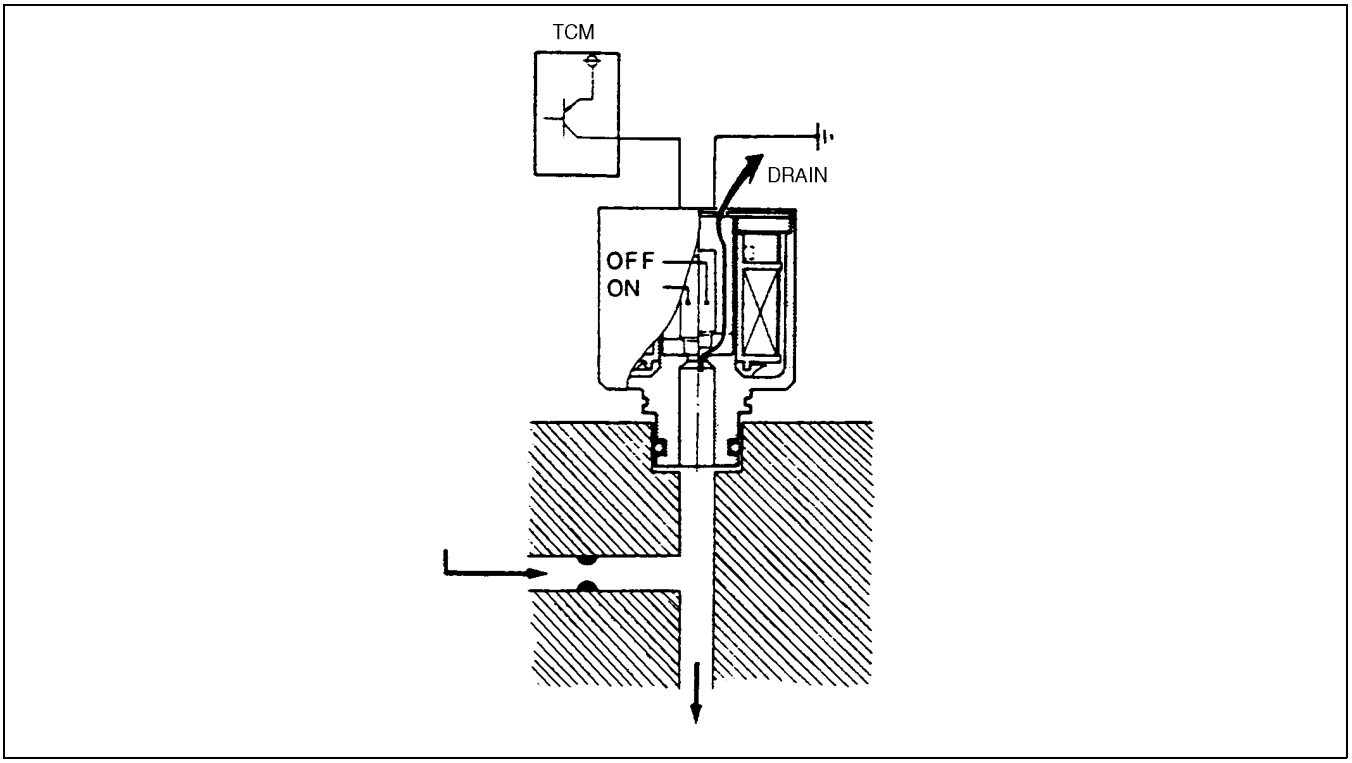
- De-energized (OFF) or duty 0%
  - — Because the output port (solenoid pressure) and the drain port connect in the solenoid, the solenoid pressure is drained.
- Energized (ON) or duty 100%
  - — Because the output port (solenoid pressure) and the supply port (pilot pressure) connect in the solenoid, the solenoid pressure supplied to the output port.



AMU0517S026

ON/OFF type (two-way)
Normal low

- De-energized (OFF)
  — The TCM does not apply an electric current to the solenoid valves. The rod moves upward by hydraulic pressure and the drain port opens.
- Energized (ON)
  — The TCM applies an electric current to the solenoid valves. This excites the coil and forces the rod to move downward to retain hydraulic pressure.



AMU0517S027

CONTROLLER AREA NETWORK (CAN) DESCRIPTION

A6E571418901201

Outline

- The TCM transmits/receives information using the CAN system. See Section T for detailed information regarding the CAN system.

Structure/Operation

- The PCM inputs throttle opening angle, engine speed, engine torque, engine coolant temperature. to the TCM.
- The TCM operates shift and TCC controls based on the throttle opening angle, and controls line pressure and other based on the throttle opening angle and the engine torque.
- The TCM outputs reduce torque signal, range signal, turbine speed, ATF temperature signal, and TCC signal to the PCM.
- If there is an open or short circuit in the CAN wiring, the system determines that the CAN is abnormal and switches to fail-safe mode.

Input

- Throttle position
- Engine torque (without torque down)
- Engine torque (with torque down)
- Engine torque (loss torque)
- Torque reduction request
- ECT
- Engine speed
- Buttery reconnection

Output

- Range position
- Turbine speed
- ATF temperature
- TCC
- Racing select
- Gear position
- Desired torque
- Desired gear position
- Upper torque limit
- Traveled distance
- MIL indicate request
- AT warning light indicate request

TRANSAXLE CONTROL MODULE (TCM) DESCRIPTION

A6E571418901202

Outline

- The TCM controls the automatic transaxle operations. The TCM outputs a control signal to the transaxle according to the signal from other sensors and/or switches.
- In driving mode, there are three mode selections: NORMAL, high temp, and SLOPE. The TCM automatically selects the proper mode according to driving condition.

SHIFT CONTROL DESCRIPTION

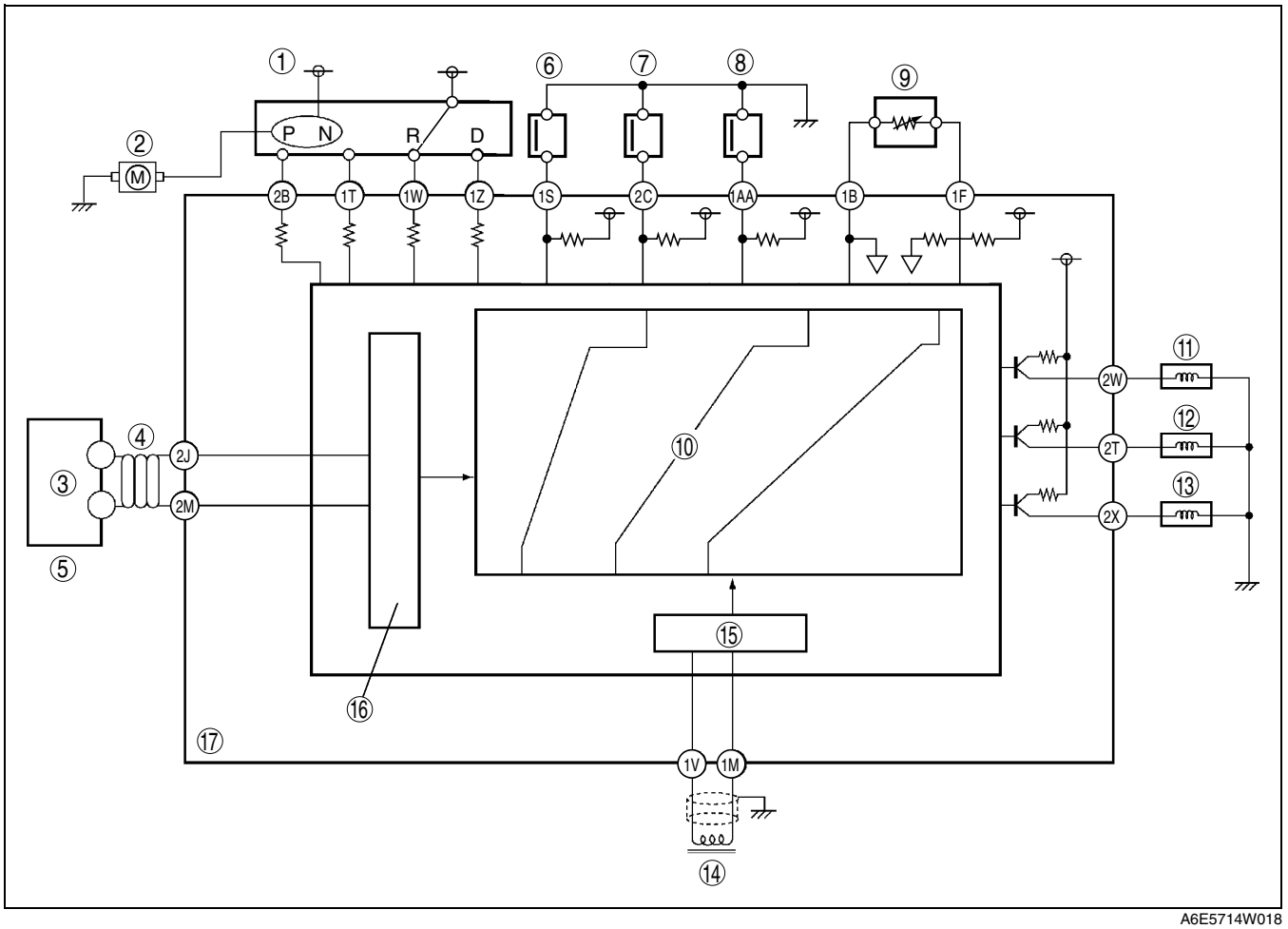
A6E571418901203

Outline

Features

- The TCM selects and determines the shift diagram based on the results of the range and driving mode judgements. 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 VSS signal and the throttle opening signal, to perform shifting.

Construction (system diagram)



A6E5714W018

1	TR switch
2	Starter
3	PCM
4	CAN
5	Throttle opening signal
6	Down switch
7	Up switch
8	M range switch
9	TFT sensor

10	Shift diagram
11	Shift solenoid A
12	Shift solenoid B
13	Shift solenoid C
14	VSS
15	Vehicle speed
16	Throttle opening angle
17	TCM

K2

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 position switch
  R position switch
  N position switch
  D range switch

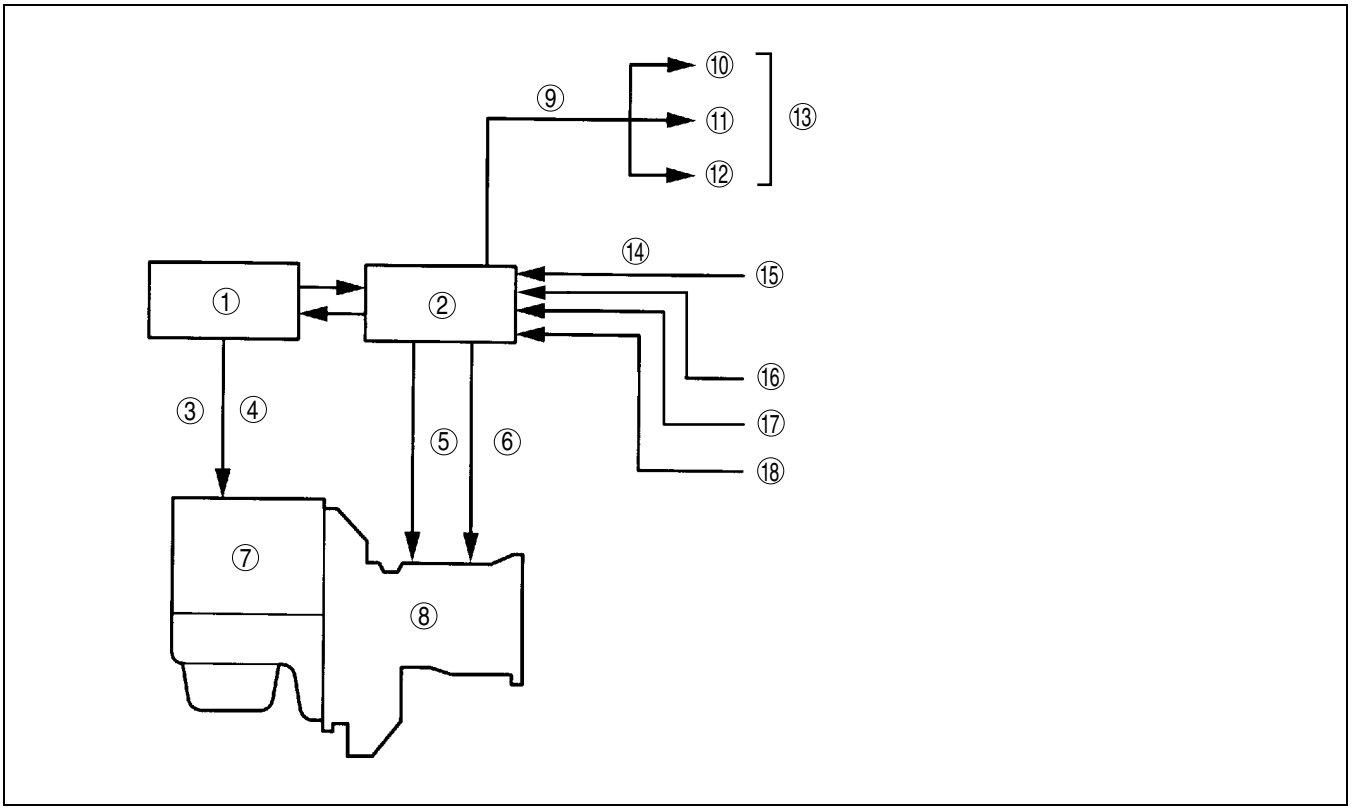
MANUAL MODE SHIFT CONTROL DESCRIPTION

A6E571418901204

Outline
Features

- The manual mode shift control is activated by moving the selector lever from the D to M range position (selector lever is shifted over toward front passenger side).
- Manual mode shift control with a manual shifting system allowing selection of gear positions by manual operation of the selector lever forward (-) and back (+) has been adopted. Moreover, engine braking for all gears in manual mode according to the gear ratio is available.
  — Shifting between 1GR and 2GR when the vehicle is stopped is possible.
  — When shifting from the D to M range while driving, the same gear position is maintained.
  — Consecutive shifting in the M range has been adopted. When shifting down from M range 4GR or 3GR, one gear can be skipped over by rapidly tapping the selector lever two times in the down-shift (-) direction.
- Specialized manual mode selector lever position and gear position indicator lights, built into the instrument cluster, have been adopted. The gear position indicator light displays the selected gear position while in manual mode.
  — The selector indicator light includes a selector lever position indicator that displays selector lever positions and, in M range, a gear position indicator light that displays gear positions.

Construction (system diagram)



A6E5714W065

1	PCM
2	TCM
3	Output
4	Ignition timing signal
5	Line pressure control signal
6	Clutch pressure control signal

7	Engine
8	ATX
9	Indication
10	Selector indicator light
11	Gear position indicator light
12	AT warning light

13	Instrument cluster
14	Input

15	Selector lever component
	-M range switch
	-Up switch
	-Down switch
16	TR switch
17	ABS HU/CM or DSC HU/CM
18	TFT sensor

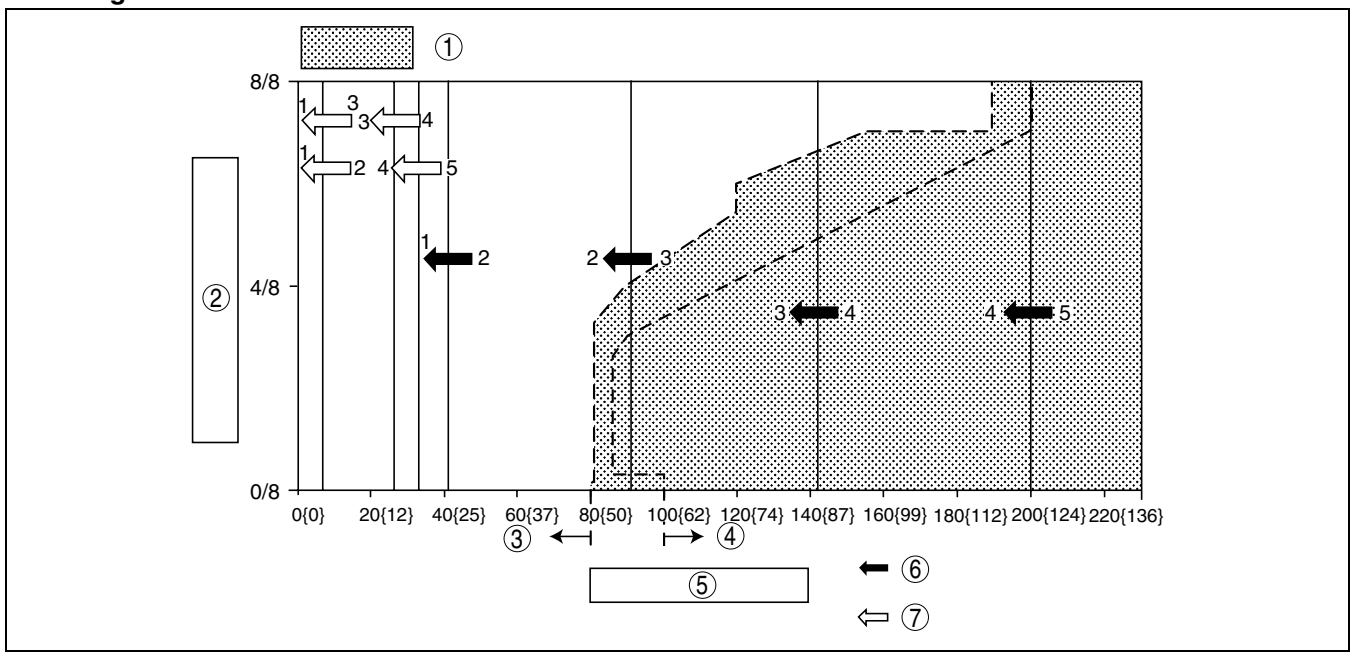
Operation

Manual mode shift

- When the selector lever is shifted over from the D to M range position, the M range switch in the selector lever component turns on, sending a manual mode command signal to the PCM which activates the manual mode shift control.
- When in manual mode and the selector lever is operated in the back (+) direction, the up switch in the selector lever component is turned on and an up-shift command signal is inputted to the PCM.
  - — The PCM, triggered by the up-shift command signal, carries out shifting by outputting an operation signal to the shift solenoid if the ATF temperature is not low (for 3GR only), vehicle speed is higher than the set speed and the gear position is 3GR or lower.
- Conversely, when the selector lever is operated in the forward (-) direction, the down switch in the selector lever component turns on, and a down-shift command signal is inputted to the PCM.
  - — The PCM, triggered by the down-shift command signal, carries out shifting by outputting an operation signal to the shift solenoid if the vehicle speed is less than the set speed and the gear position is 2GR or above.
- The PCM utilizes a specialized M range automatic shift diagram when down shifting. This restriction of manual downshifting is carried out to reduce load on the ATX and prevent engine over-revving.

Condition	Shift control	Note
2GR→3GR up-shift command at low speed	• To reduce load on the ATX, upshifting is inhibited until vehicle reaches speed possible for upshifting	—
3GR→4GR up-shift command at low speed		
3GR→4GR up-shift command, low ATF temperature	• To reduce load on the ATX, upshifting to 4GR is inhibited	
4GR→3GR down-shift command, above set speed	• To prevent engine over-rev, downshifting is inhibited until vehicle reaches speed possible for downshifting	• Selector indicator “M” light and gear position indicator light flash to alert driver
3GR→2GR down-shift command, above set speed		
2GR→1GR down-shift command, above set speed		
In 4GR deceleration, speed goes below coast-down set speed (deceleration down-shift)	• To assure drive stability, automatically downshifts from 4GR to 3GR	—
In 3GR deceleration, speed goes below coast-down set speed (deceleration down-shift)	• To assure drive stability, automatically downshifts from 3GR to 1GR	
In 2GR deceleration, speed goes below coast-down set speed (deceleration down-shift)	• To assure driving stability, automatically downshifts from 2GR to 1GR	

Shift diagram



A6E5714W070

1	TCC operation available
2	Throttle opening
3	TCC operation OFF
4	TCC operation ON

5	Vehicle speed (km/h {mph})
6	Down shifting is inhibited until vehicle reaches speed possible for downshifting
7	When decelerating below set vehicle speed, executes automatic downshifting

LINE PRESSURE CONTROL DESCRIPTION

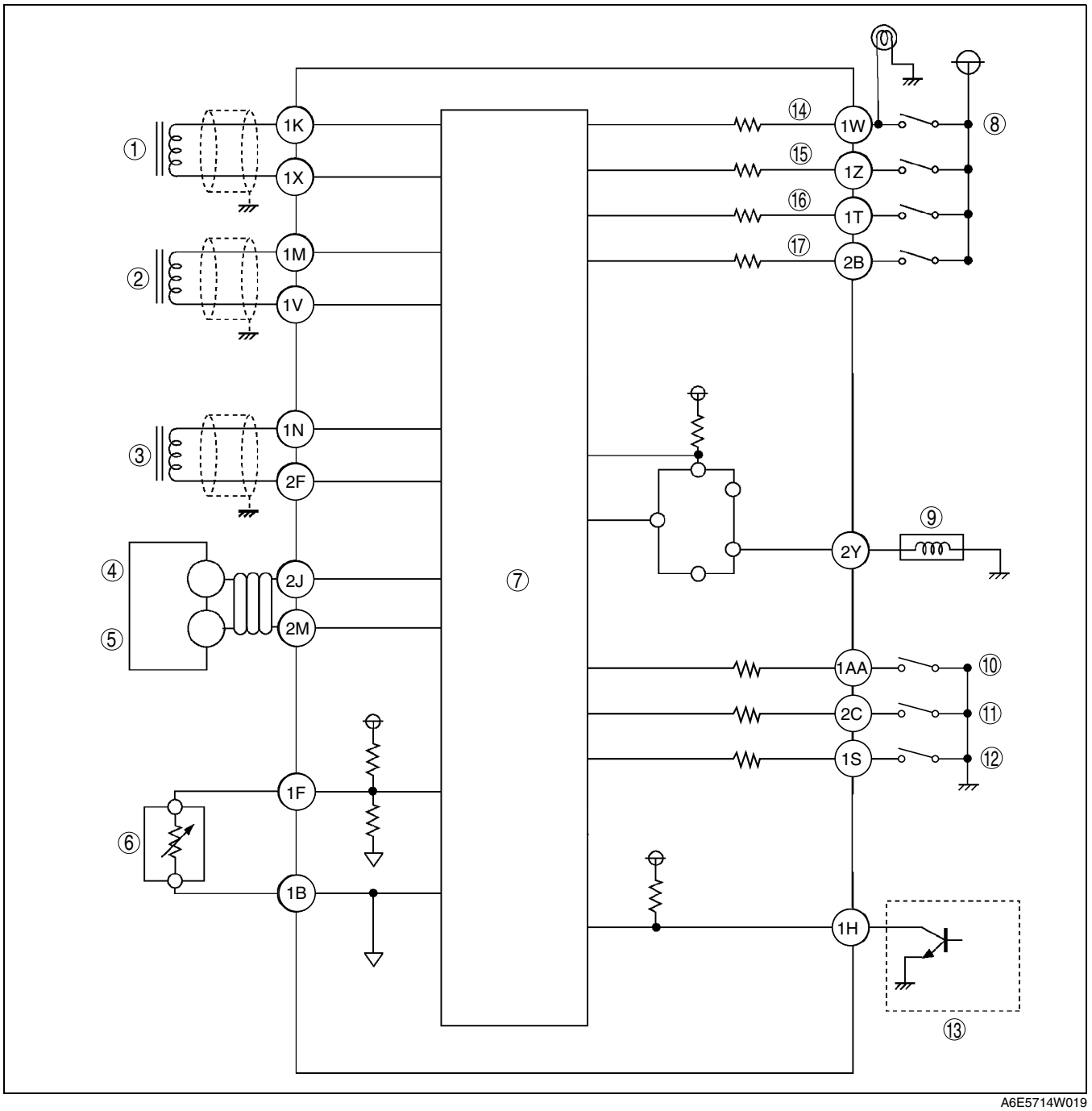
A6E571418901205

Outline

Features

- Line pressure is hydraulic pressure for operating friction elements such as the multiple disc clutches, multiple disc brakes, and the brake band.
- To adjust to optimal line pressure according to engine load conditions and vehicle driving conditions, continuous variable line pressure control from the pressure control solenoid is used.
- The line pressure control includes the basic control, line pressure control when shifting, backup control, and other.

Construction (System diagram)



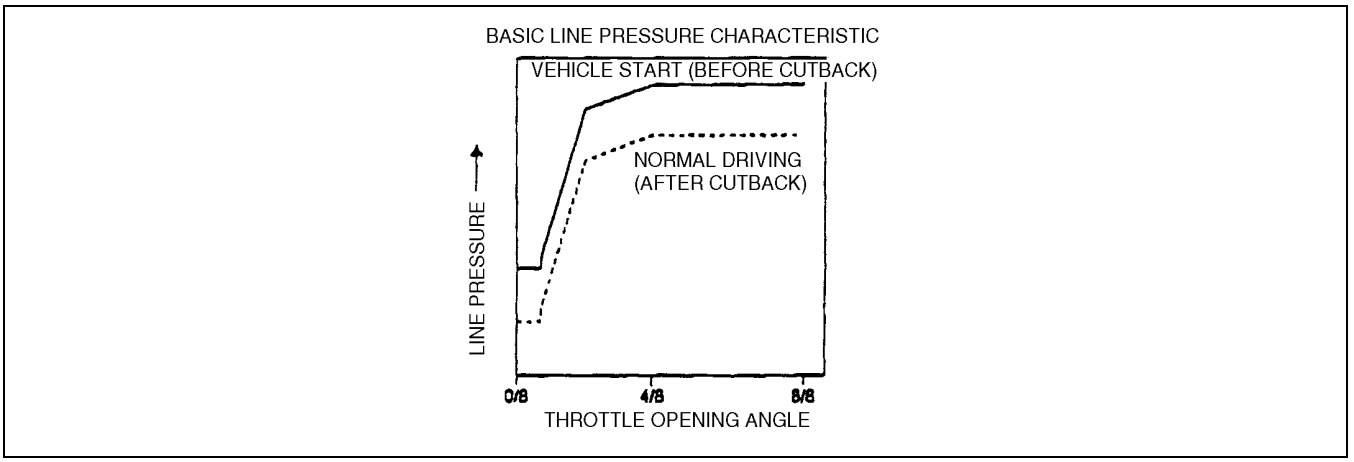
A6E5714W019

1	Intermediate sensor
2	VSS
3	Input/turbine speed sensor
4	Throttle position signal
5	Engine torque signal
6	TFT sensor
7	TCM

8	TR switch
9	Pressure control solenoid
10	M range switch
11	Up switch
12	Down switch
13	Cruise control module

Basic Line Pressure Control

- Control at vehicle-start or during normal driving. The pressure control solenoid is controlled so that the line pressure is optimal according to the throttle opening angle.
  The pressure characteristic is as shown in the graph at below. During normal driving (only in shift ranges for forward travel), the line pressure is set lower than that of at vehicle-start; this is called “cutback.”

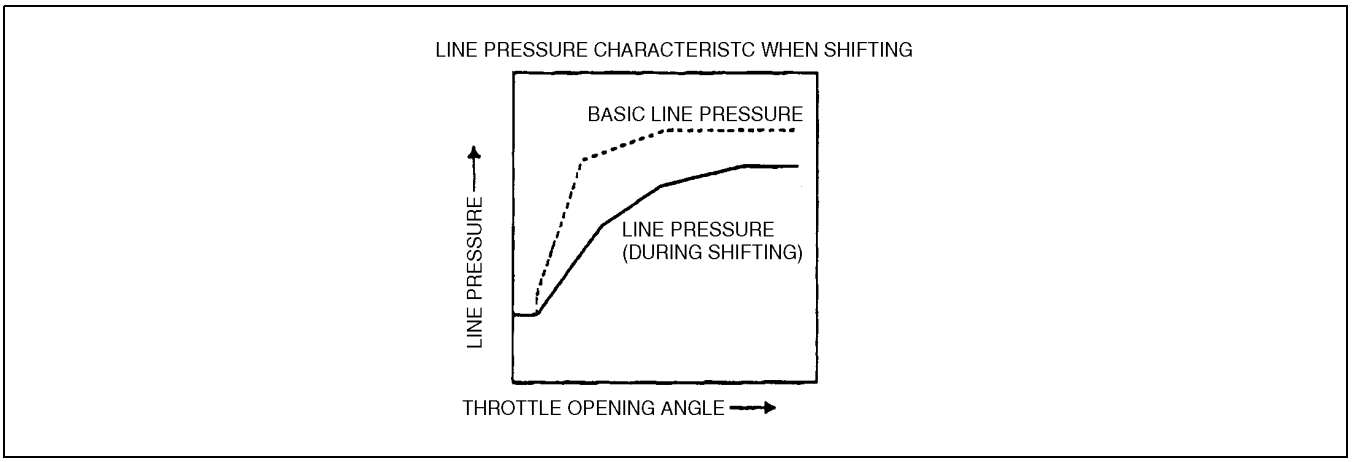


AMU0517S065

- Though the cutback control is selected in each driving pattern, it is not operated in the fail-safe mode. In the fail-safe mode, the pressure before the cutback is retained and so the pressure is higher than that during normal driving.

Line Pressure Control When Shifting

- Line pressure is controlled when shifting the transaxle to reduce shift shock. Line pressure is adjusted only during shifting so that it is optimal at each shifting according to the driving conditions. During the control, engine output torque is also reduced.



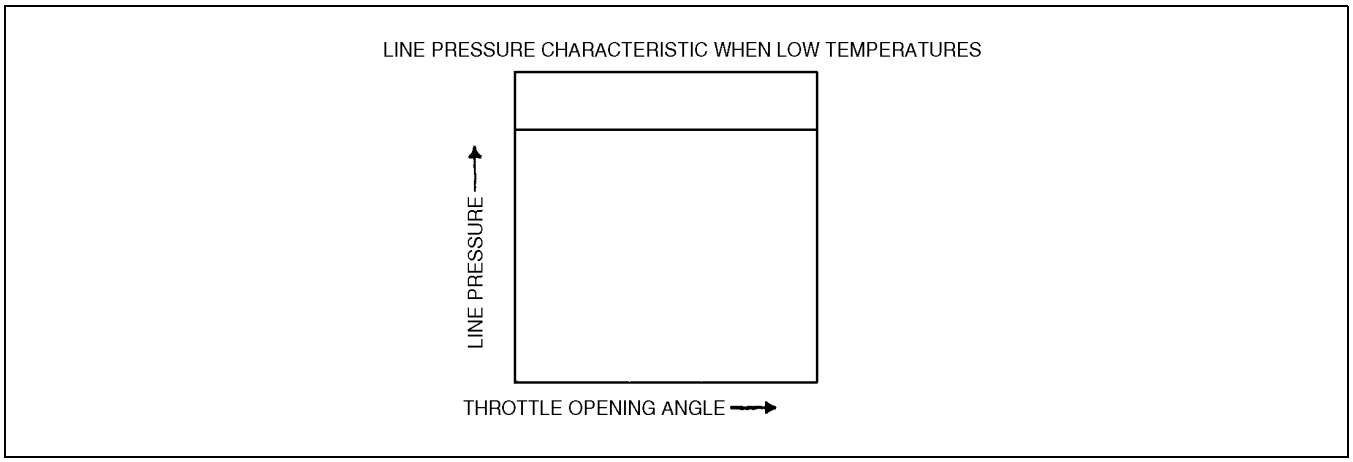
AMU0517S032

Backup Control

- When shifting down to employ engine braking during high-speed driving, line pressure is gradually increased, thus increasing clutch capacity.
  The backup control is operated regardless of the driving range when the engine brake is operated in 1GR or when shifting down to 2GR-4GR.

Line Pressure Control at Extremely Low Temperatures

- When the ATF temperature is approximately –30 °C {–22 °F} or below, the period when the pressure control solenoid is ON (duty ratio) is set at 3 % to maintain line pressure at maximum regardless of the throttle opening angle. Thus delay in clutch or brake operation due to high viscosity of ATF is prevented when the ATF temperature is extremely low.



AMU0517S034

Pressure Control Solenoid Stop Control

- When the vehicle is stopped and the accelerator pedal is released, the operation (duty ratio) of the pressure control solenoid is set at 3 %, regardless of the driving range. Due to this, AT noise is reduced when the vehicle is stopped.

FEEDBACK CONTROL DESCRIPTION

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K2

Outline

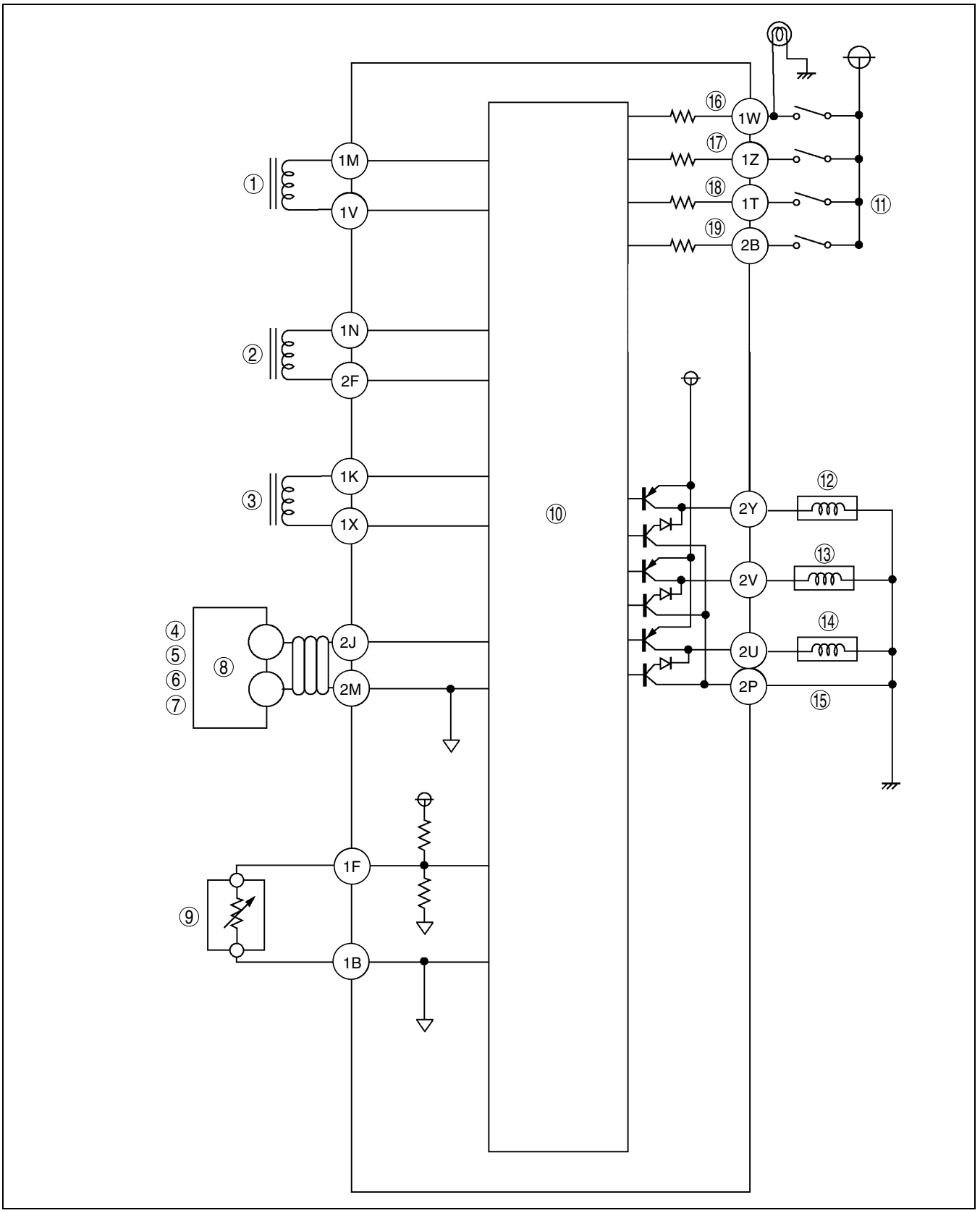
Features

- During shift up with the accelerator pedal depressed, feedback control regulates the clutch pressure on the engagement and release sides, according to the throttle opening angle and vehicle speed. It also uses past gearshifts to optimize clutch pressure.

Note

- If the battery terminal is disconnected, feedback memory in the TCM will be erased, and thus gearshift shock may increase. The shock, however, will decrease gradually as the vehicle is driven.

Construction (system diagram)



A6E5714W020

1	VSS
2	Input/turbine speed sensor
3	Intermediate sensor
4	Input

5	Throttle position signal
	Torque reduce signal
	Engine torque signal
6	Output
7	Reduce torque signal

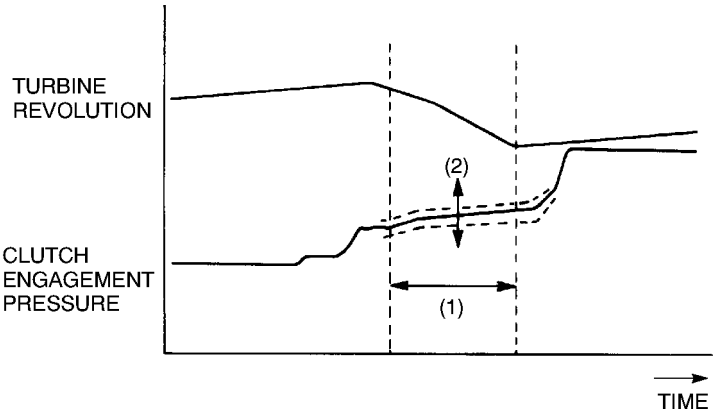
8	PCM
9	TFT sensor
10	TCM
11	TR switch
12	Pressure control solenoid
13	2-4 brake solenoid valve

14	High clutch solenoid valve
15	GND return
16	R
17	D
18	N
19	P

Operation

Upshift clutch engagement pressure feedback

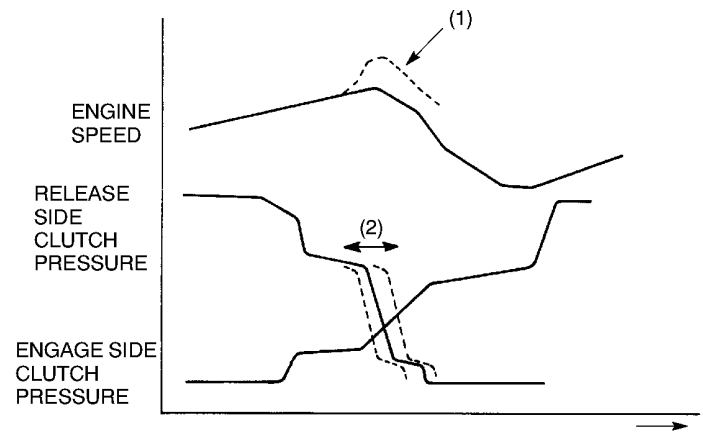
- Clutch pressure (2) is learned so that gear shift time (1) becomes a predetermined target value, and thus changes in performance and changes in the transaxle over time are minimized based on past gear shift results.



AMU0517S038

Upshift timing feedback (release-side clutch pressure)

- Clutch pressure release timing on the release side (2) is learned so that the change in engine speed (1) is optimized, and thus clutch pressures on the engagement and release sides are optimized.



AMU0517S039

N-D SELECT CONTROL DESCRIPTION

A6E571418901207

- When the selector lever is switched from the P or N position to the driving ranges, or vice versa, the engine speed change is minimized by regulating fuel injection volume in order to improve select feel.
- Range signals are output to the PCM in the following instances:
  When the selector lever is switched from the P or N position to the driving ranges, or vice versa, and the specified time has elapsed.
- The PCM regulates fuel injection volume based on inhibitor signals prevent change in engine speed.

TORQUE CONVERTER CLUTCH (TCC) CONTROL DESCRIPTION

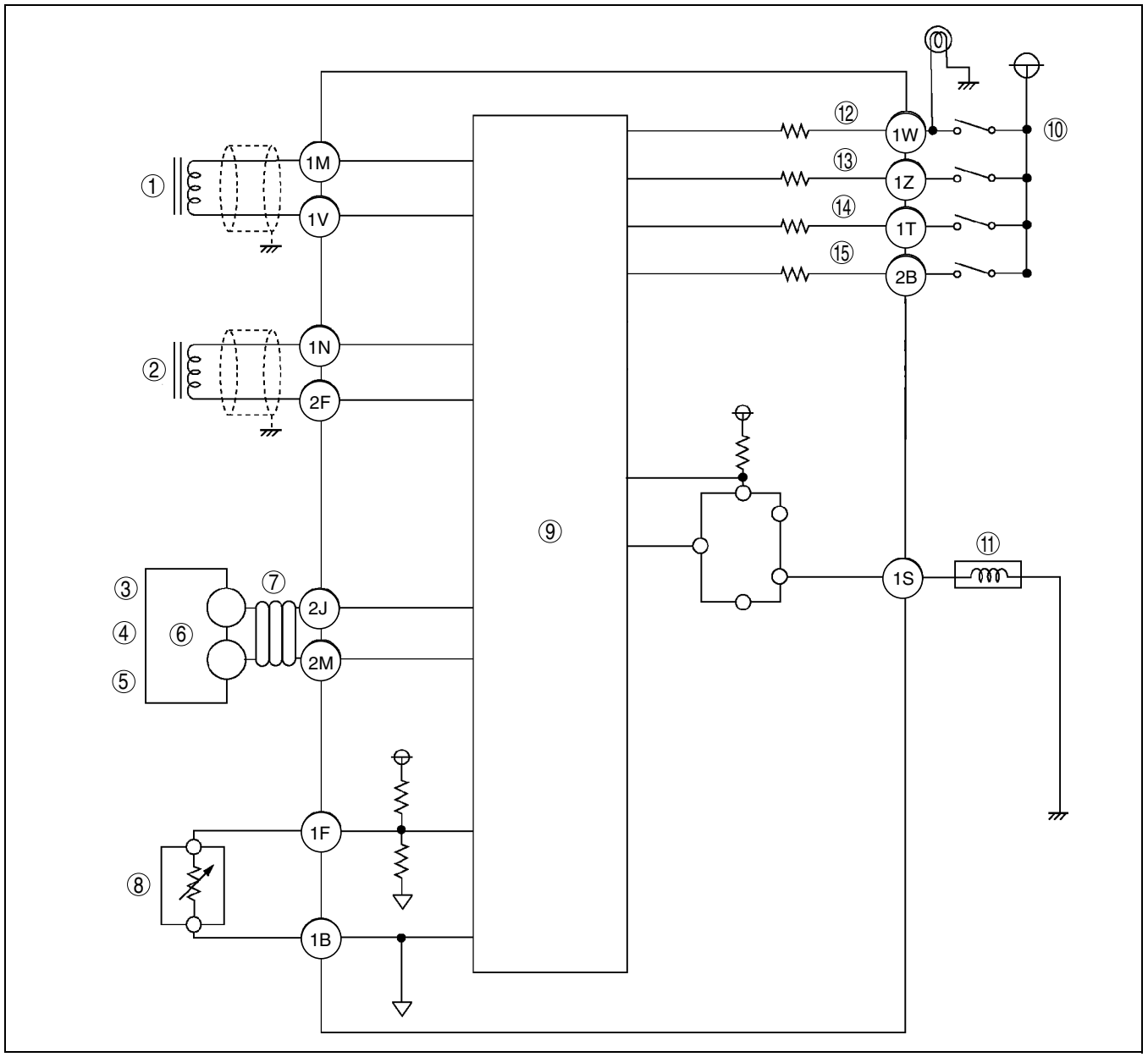
A6E571418901208

Outline

Features

- The TCM selects the TCC schedule according to the gear selected by the transaxle. 50 Hz (20 ms cycle) on/off signals are relayed from the TCC schedule and speed sensor and throttle opening angle to the duty cycle TCC solenoid valve to control TCC.

Construction (system diagram)



A6E5714W021

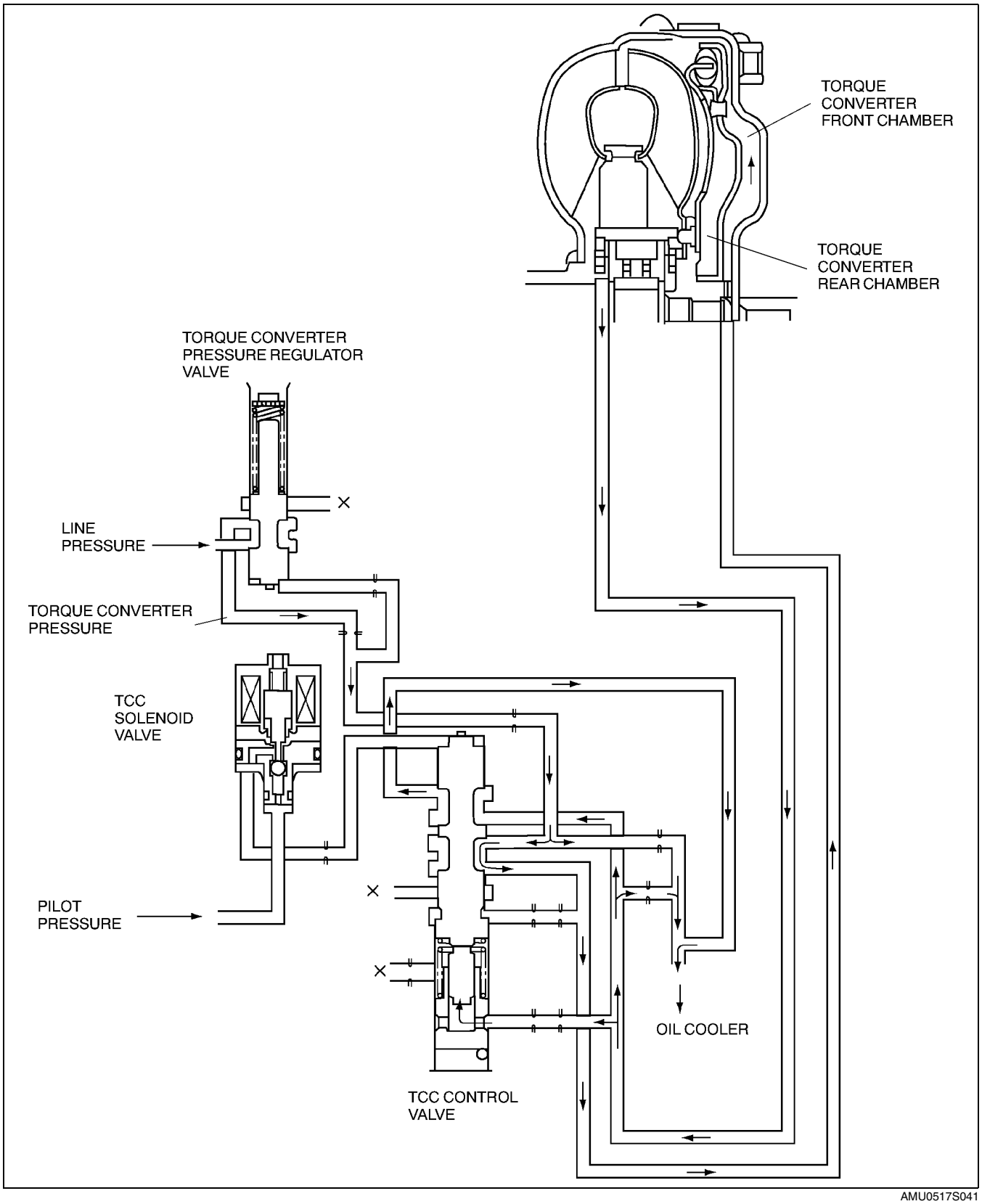
1	VSS
2	Input/turbine speed sensor
3	Engine speed signal
4	Throttle position signal
5	TCC signal
6	PCM
7	CAN
8	TFT sensor

9	TCM
10	TR switch
11	TCC solenoid valve
12	R
13	D
14	N
15	P

Operation

Torque converter clutch (TCC) release operation

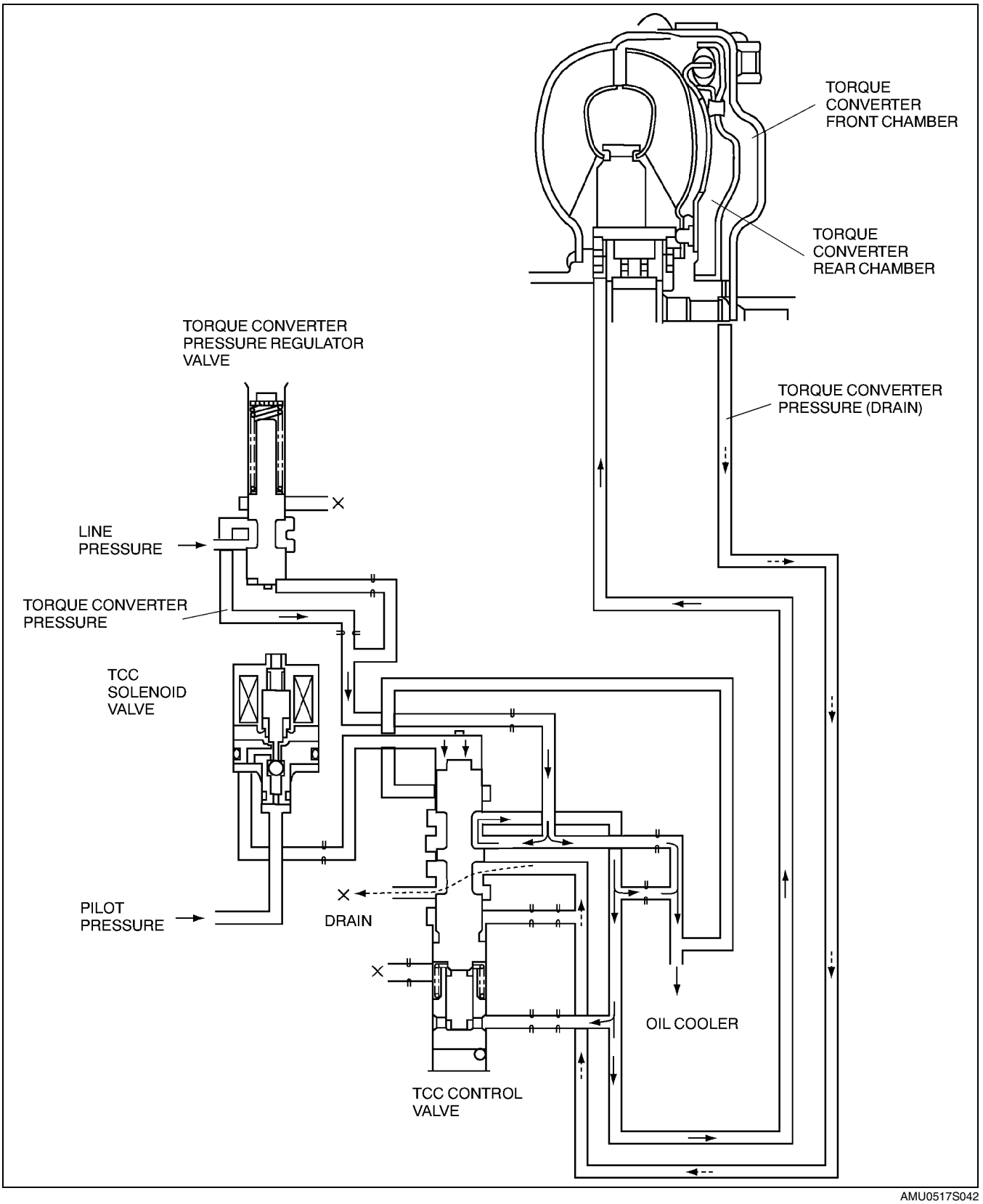
- The TCM sends an OFF signal to TCC solenoid valve to release the TCC. In this condition, the TCC control valve is pushed to the up side by spring force and line pressure, and torque converter pressure acts on the torque converter front chamber, releasing the TCC from the converter cover.



AMU0517S041

Torque converter clutch (TCC) engaging operation

- The TCM determines smooth TCC operation. It sends an ON signal to the TCC solenoid valve to push the TCC control valve to the down side. Consequently, the hydraulic pressure applied to the torque converter front chamber is drained through the TCC control valve, engaging torque converter clutch.



AMU0517S042

Coast TCC

- Even when the accelerator pedal is released in the TCC range at high speeds, the TCC remains engaged to prevent repetition of TCC engagement/release by depressing/releasing the accelerator pedal, as well as reducing shock during the operation.

Determination of Torque Converter Clutch (TCC) Cancellation

The TCC control is canceled when any of the following condition are met:

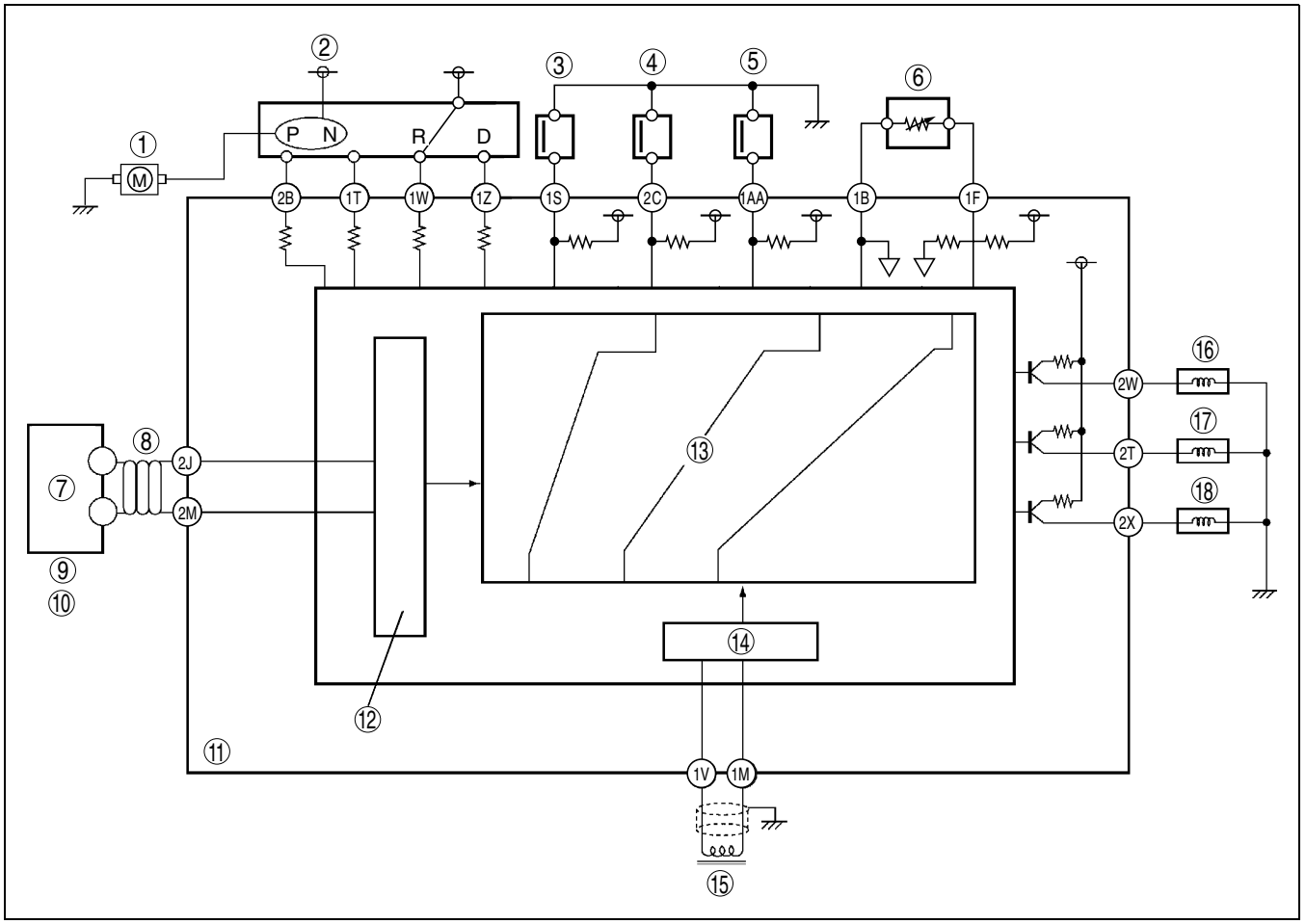
- Engine coolant temperature is low.
- ATF temperature is low.
- Brake switch is on (when depressing the brake pedal).
- Accelerator depressing speed and accelerator opening angle are above the set value.
- Engine speed signal is below the set value.
- Failure is in the TCC control system detected by diagnosis function.

SLOPE MODE CONTROL DESCRIPTION

A6E571418901209

- Climbing and the appropriate gear is determined by engine load and the vehicle acceleration.

Slope Mode Control Block Diagram



A6E5714W022

1	Starter
2	TR switch
3	Down switch
4	Up switch
5	M range switch
6	TFT sensor
7	PCM
8	CAN
9	Input

10	Throttle position signal
	Engine speed signal
	Engine torque signal
11	TCM
12	Throttle opening angle
13	Shift diagram
14	Vehicle speed
15	VSS
16	Shift solenoid A
17	Shift solenoid B
18	Shift solenoid C

When climbing hill

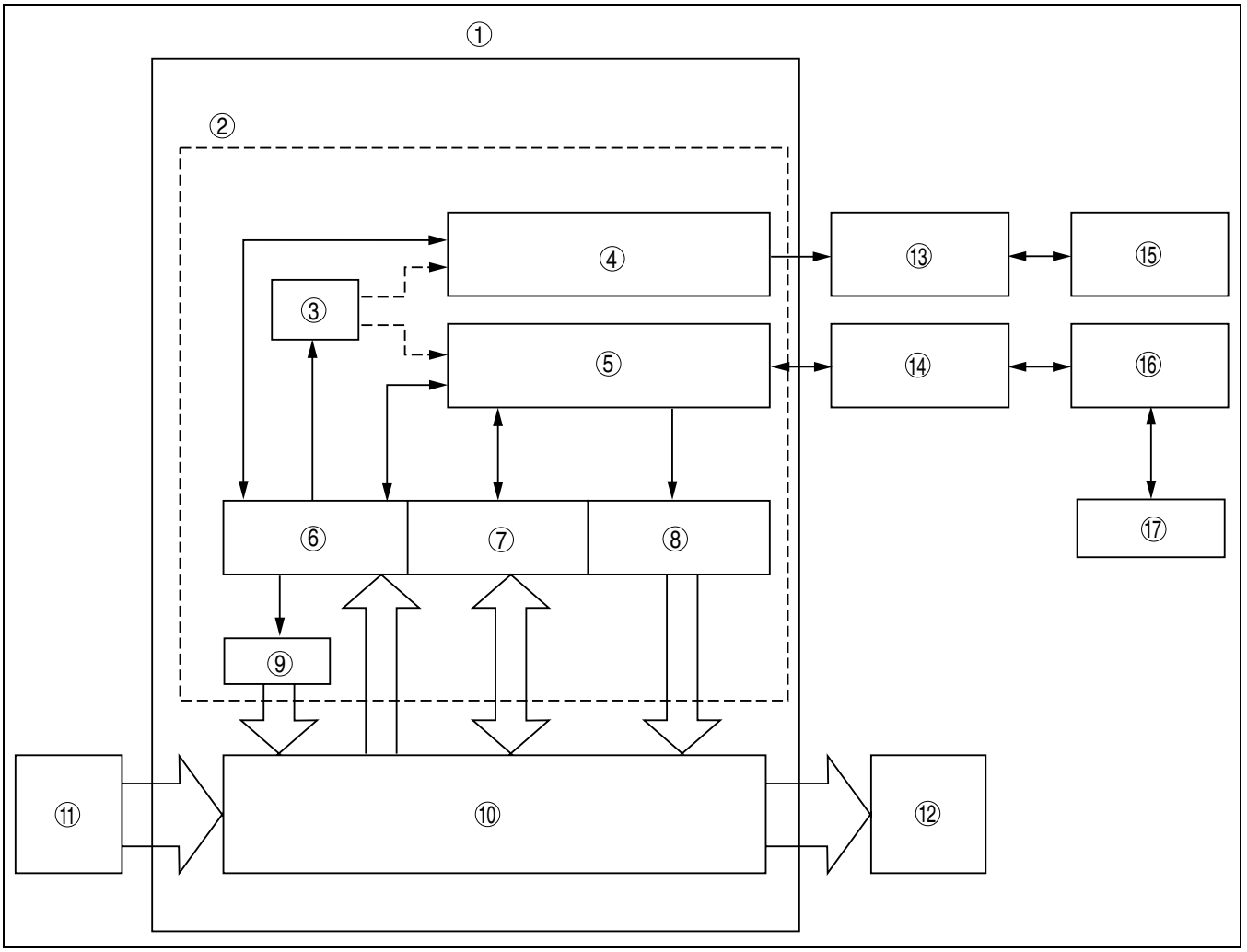
- When the hill is steeper than a certain grade, unnecessary up shift is prevented by holding an appropriate gear.

ON-BOARD DIAGNOSTIC (OBD) SYSTEM DESCRIPTION

A6E571418901210

- The OBD system has the following functions:
  - — Failure detection function: detects failure of the input/output devices and system components of the ATX.
  - — Memory function: stores the DTC when a failure is detected.
  - — Fail-safe function: fixes the output device function and input value of the sensors/switches to ensure minimum vehicle drivability when a failure is detected.
  - — PID data monitoring function: monitors the input/output signal and calculated value of the TCM and sends the monitoring data to the scan tool.

Block Diagram



A6E5714W023

1	TCM
2	OBD system
3	Memory function
4	Failure indication function
5	Serial communication
6	Failure detection function
7	PID data monitoring function
8	Simulation function
9	Fail-safe function

10	Transaxle control system
11	Input devices
12	Output devices
13	Instrument cluster
14	PCM
15	AT warning light
16	DLC-2
17	WDS or equivalent

Failure Detection Function

- In the failure detection function, the TCM detects malfunctions in the automatic transaxle while driving.
- When vehicle driving conditions correspond with a preset failure detection condition, the TCM determines that the automatic transaxle has a malfunction and stores the corresponding DTC.
- When a malfunction is detected, stored DTCs can be retrieved using the WDS connected to the DLC-2.

Memory Function

- The memory function stores failure information detected in the failure detection function. Once failure information is stored, the memory will not be cleared even when the ignition switch is turned off (LOCK position) or the malfunction is repaired.
- The stored memory (failure information) can be cleared by using the WDS or disconnecting the negative battery cable.

Failure Indication Function

- The failure indication function illuminates the AT warning lights when the failure detection function determines there is a malfunction.

DTC Table

DTC No.	On-board diagnostic function	MIL	AT warning light indication	DC	Monitor item	Memory function
P0705	TR switch circuit malfunction (Power short circuit)	X	X	2	CCM	X
P0706	TR switch circuit malfunction (Open/ground short circuit)	X	X	2	CCM	X
P0711	TFT sensor malfunction (Stuck)	X	–	2	CCM	X
P0712	TFT sensor circuit malfunction (Short circuit)	X	X	2	CCM	X
P0713	TFT sensor circuit malfunction (Open circuit)	X	X	2	CCM	X
P0715	Input/turbine speed sensor circuit malfunction	X	X	2	CCM	X
P0720	Vehicle speedometer sensor circuit malfunction	X	X	2	CCM	X
P0740	TCC system	X	–	2	CCM	X
P0743	TCC solenoid valve malfunction (Open/short)	X	X	1	CCM	X
P0748	Pressure control solenoid malfunction (Open/short)	–	X	–	CCM	X
P0751	Shift solenoid A malfunction (Stuck off)	X	–	2	CCM	X
P0752	Shift solenoid A malfunction (Stuck on)	X	–	2	CCM	X
P0753	Shift solenoid A malfunction (Open/short)	X	X	1	CCM	X
P0756	Shift solenoid B malfunction (Stuck off)	X	–	2	CCM	X
P0757	Shift solenoid B malfunction (Stuck on)	X	–	2	CCM	X
P0758	Shift solenoid B malfunction (Open/short)	X	X	1	CCM	X
P0761	Shift solenoid C malfunction (Stuck off)	X	–	2	CCM	X
P0762	Shift solenoid C malfunction (Stuck on)	X	–	2	CCM	X
P0763	Shift solenoid C malfunction (Open/short)	X	X	1	CCM	X
P0768	Reduction timing solenoid malfunction (Open/short)	–	X	–	CCM	X
P0773	Neutral shift solenoid malfunction (Open/short)	–	X	–	CCM	X
P0778	2-4 brake solenoid malfunction (Open/short)	–	X	–	CCM	X
P0791	Intermediate sensor malfunction (Open/short)	X	X	2	CCM	X
P0798	High clutch solenoid malfunction (Open/short)	–	X	–	CCM	X
P1710	GND return malfunction	–	–	–	Other	X
U0073	CAN BUS OFF	X	X	1	CCM	X
U0100	TCM cannot receive any signals from PCM	X	X	1	CCM	X

X : Available
CCM:Continuous monitor

Fail-safe Function

- In the fail-safe function, minimum vehicle drivability is obtained by changing the signals that are determined as malfunctions by the failure detection function to the preset values, and limiting the TCM control.

DTC No.	On-board diagnostic function	Detection condition	Fail-safe	TCC
P0705	Transaxle range (TR) switch circuit malfunction (power short circuit)	• Two or more range signals are inputted from TR switch for 5 seconds or more	• TR switch priority D > N > P > R • Inhibits feedback control, SLOPE mode, torque reduction control	Available
P0706	Transaxle range (TR) switch circuit malfunction (open/ground short circuit)	• No range signal is inputted from TR switch for 100 seconds or more	• Inhibits feedback control, SLOPE mode, torque reduction control	Available

DTC No.	On-board diagnostic function	Detection condition	Fail-safe	TCC
P0711	Transaxle fluid temperature (TFT) sensor malfunction (stuck)	• TFT sensor signal stays outside normal temperature range for 10 minute or more	—	Available
P0712	Transaxle fluid temperature (TFT) sensor circuit malfunction (short circuit)	• Signals form TFT sensor are 155 °C {311 °F} or greater for 10 min.	• Inhibits feedback control • Engine coolant temperature signal are used for shifting.	Available
P0713	Transaxle fluid temperature (TFT) sensor circuit malfunction (open circuit)	• Vehicle speed is 20 km/h {12.4 mph} or greater, and signals from TFT sensor are –30 °C {–22 °F} or less for 150 seconds or more		Available
P0715	Input/turbine speed sensor circuit malfunction	• Input/turbine speed sensor is 600 rpm or less while engine speed is 1500 rpm or greater and vehicle speed is 40 km/h {24.8 mph} or greater in D ranges.	• Inhibits shift control	Available
P0720	Vehicle speedometer sensor circuit malfunction	• Parking gear rotation detected by VSS is 150 rpm or less while intermediate sensor 1400 rpm or greater in D range for 2 second or more.	• Inhibits SLOPE mode, feedback control, torque reduction control	Available
P0740	Torque converter clutch (TCC) system	• RPM difference between crankshaft (engine speed signal) and reverse clutch drum (input/turbine speed sensor signal) exceeds the pre-programmed value	—	Available
P0743	Torque converter clutch (TCC) solenoid valve malfunction (open/short)	• Open or short in torque converter clutch solenoid valve circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving of TCC solenoid valve (OFF)	Inhibition
P0748	Pressure control solenoid malfunction (open/short)	• Open or short in pressure control solenoid circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving of pressure control solenoid, 2-4 brake solenoid valve, and high clutch solenoid valve (OFF) • Inhibit feedback control.	Available
P0751	Shift solenoid A malfunction (stuck off)	• Difference between actual gear ratio and gear ratio set in TCM is large	—	Available
P0752	Shift solenoid A malfunction (stuck on)	• Difference between actual gear ratio and gear ratio set in TCM is large	—	Available
P0753	Shift solenoid A malfunction (open/short)	• Open or short in shift solenoid A circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving all ON/OFF type solenoids (OFF) and TCC solenoid valve (OFF)	Inhibition
P0756	Shift solenoid B malfunction (stuck off)	• Difference between actual gear ratio and gear ratio set in TCM is large	—	Available
P0757	Shift solenoid B malfunction (stuck on)	• Difference between actual gear ratio and gear ratio set in TCM is large	—	Available

DTC No.	On-board diagnostic function	Detection condition	Fail-safe	TCC
P0758	Shift solenoid B malfunction (open/short)	• Open or short in shift solenoid B circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving all ON/OFF type solenoids (OFF) and TCC solenoid valve (OFF)	Inhibition
P0761	Shift solenoid C malfunction (stuck off)	• Difference between actual gear ratio and gear ratio set in TCM is large	—	Available
P0762	Shift solenoid C malfunction (stuck on)	• Difference between actual gear ratio and gear ratio set in TCM is large	—	Available
P0763	Shift solenoid C malfunction (open/short)	• Open or short in shift solenoid C circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving all ON/OFF type solenoids (OFF) and TCC solenoid valve (OFF)	Inhibition
P0768	Reduction timing solenoid valve malfunction (open/short)	• Open or short in reduction timing solenoid valve circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving of reduction timing solenoid valve (OFF)	Available
P0773	Neutral shift solenoid valve malfunction (open/short)	• Open or short in neutral shift solenoid valve circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving of neutral shift solenoid valve (OFF)	Available
P0778	2-4 brake solenoid valve malfunction (open/short)	• Open or short in 2-4 brake solenoid valve circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving of pressure control solenoid, 2-4 brake solenoid valve, and high clutch solenoid valve (OFF) • Inhibit feedback control.	Available
P0791	Intermediate sensor malfunction (open/short)	• Rotation speed of output gear (intermediate sensor) is low when vehicle speed and engine speed exceed the pre programmed value	• Inhibit feedback control • Inhibits torque reduction control	Available
P0798	High clutch solenoid valve malfunction (open/short)	• Open or short in high clutch solenoid valve circuit (Voltage different from on/off signal relayed by CPU in TCM is detected while TCM is monitoring solenoid output voltage.)	• Stops driving of pressure control solenoid, 2-4 brake solenoid valve, and high clutch solenoid valve (OFF) • Inhibit feedback control.	Available
P1710	GND return malfunction	• TCM detects open in GND return signal of solenoid.	—	Available
U0073	CAN BUS OFF	• CAN controller damaged.	• Throttle valve opening angle is fixed (4/8) at the time in order to determine shift • Maximizes line pressure	Inhibition
U0100	TCM cannot receive any signals from PCM	• TCM cannot receive any signals from PCM		

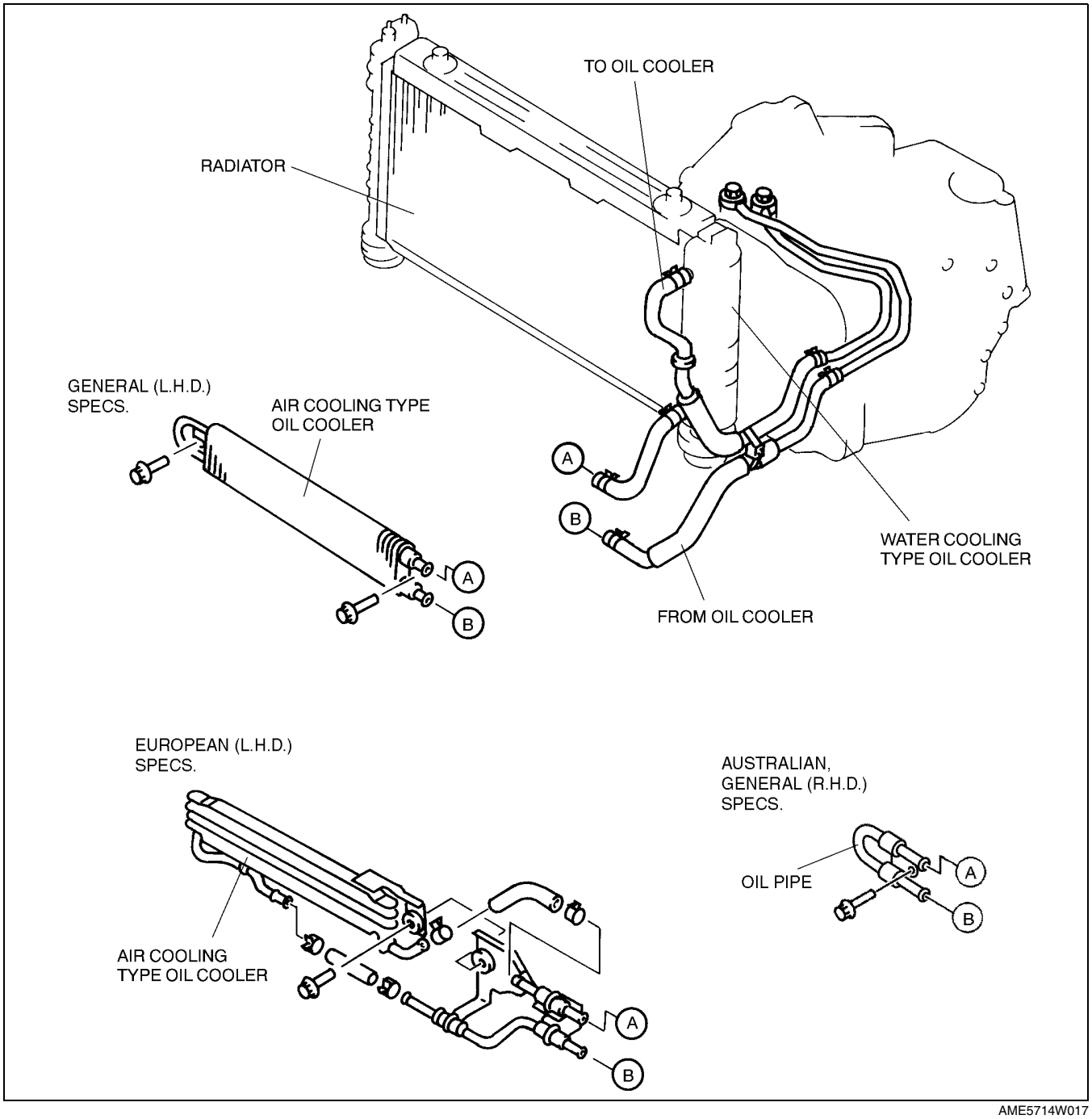
Parameter Identification (PID) Access
Monitor item table

Display on the tester	Definition	Unit/ Condition	TCM terminal
2-4 B Duty	2-4 brake solenoid valve control signal in TCM	ON/OFF	2V
BOO	Brake switch	ON/OFF	1U
DWN_SW	Down switch	ON/OFF	1S
GEAR	Calculated gear range in TCM	1ST/2ND/ 3RD/4TH/5TH	–
H/C Duty	High clutch solenoid valve control signal in TCM	%	2U
LPS	Pressure control solenoid control signal in TCM	%	2Y
MNL_SW	M range switch	ON/OFF	1AA
NSFT TIM	Neutral shift solenoid valve control signal in TCM	ON/OFF	2D
OSS	Intermediate sensor	rpm	1K, 1X
PNP	TR switch (P/N position switch)	ON/OFF	–
RDCN TIM	Reduction timing solenoid valve control signal in TCM	ON/OFF	2G
RPM	Engine speed	rpm	–
SSA/SS1	Shift solenoid A control signal in TCM	ON/OFF	–
SSB/SS2	Shift solenoid B control signal in TCM	ON/OFF	–
SSC/SS3	Shift solenoid C control signal in TCM	ON/OFF	–
TCCC	TCC solenoid valve control signal in TCM	%	2S
TCIL	AT warning light control signal in TCM	ON/OFF	1E
TFT	ATF temperature	°C	1B, 1F
TFTV	ATF temperature signal voltage	V	1B, 1F
THOP	Throttle position	%	–
TRD	Tr switch (D range switch)	ON/OFF	1Z
TRR	TR switch (R position switch)	ON/OFF	1W
TSS	Input/turbine speed sensor	rpm	1N, 2F
UP_SW	Up switch	ON/OFF	2C
VPWR	Battery voltage	V	1P
VSS	Vehicle speed	km/h	1V, 1M

COOLING SYSTEM DESCRIPTION

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Outline

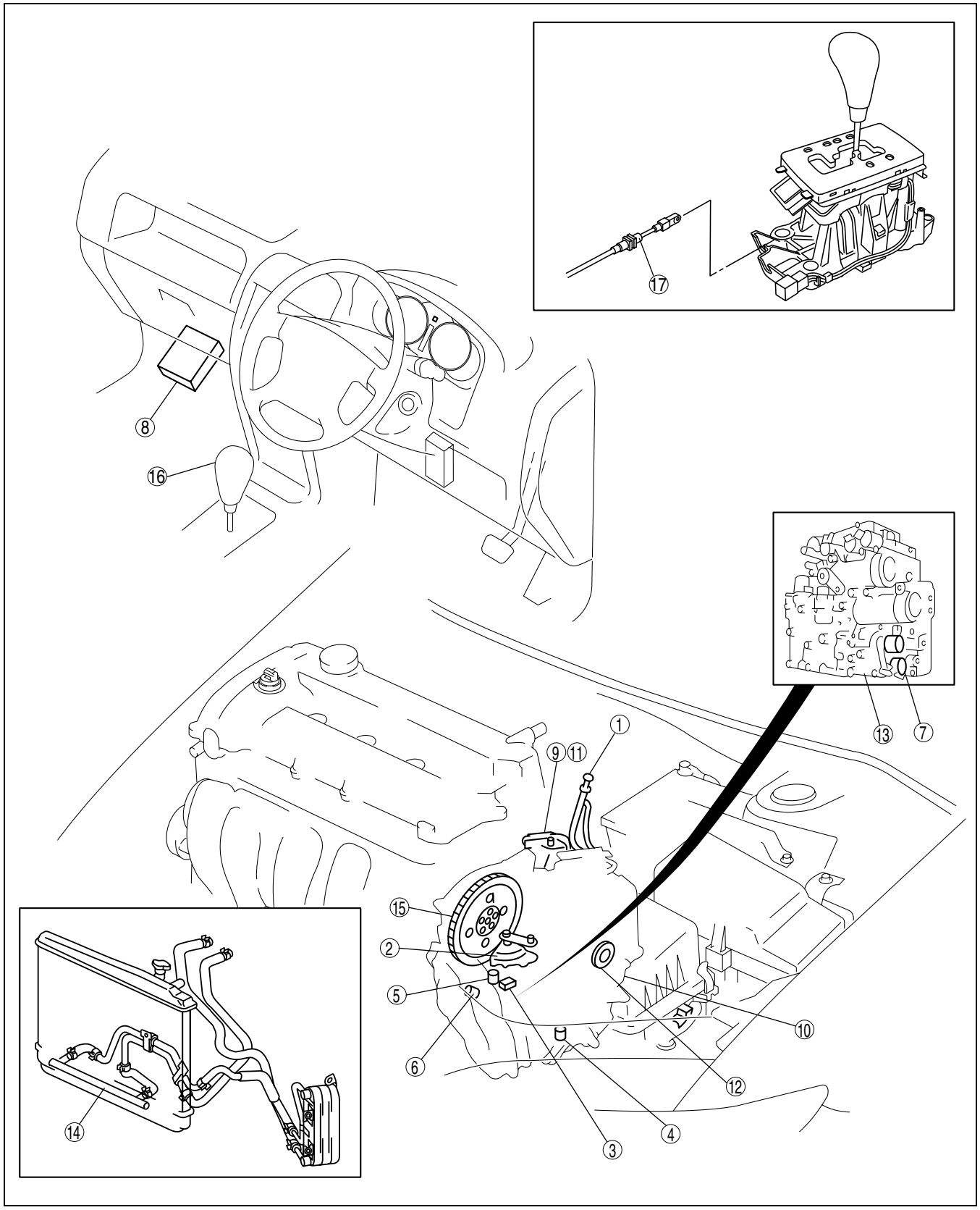


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LOCATION INDEX

AUTOMATIC TRANSAXLE LOCATION INDEX

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1	Automatic transaxle fluid (ATF) (See K2–78 AUTOMATIC TRANSAXLE FLUID (ATF) INSPECTION) (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT)
2	Transaxle range (TR) switch (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION) (See K2–81 TRANSAXLE RANGE (TR) SWITCH REMOVAL/INSTALLATION) (See K2–83 TRANSAXLE RANGE (TR) SWITCH ADJUSTMENT)
3	Transaxle fluid temperature (TFT) sensor (See K2–84 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR INSPECTION) (See K2–85 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR REMOVAL/INSTALLATION)
4	Input/turbine speed sensor (See K2–85 INPUT/TURBINE SPEED SENSOR INSPECTION) (See K2–86 INPUT/TURBINE SPEED SENSOR REMOVAL/INSTALLATION)
5	Intermediate sensor (See K2–86 INTERMEDIATE SENSOR INSPECTION) (See K2–86 INTERMEDIATE SENSOR REMOVAL/INSTALLATION)
6	Vehicle speedometer sensor (VSS) (See K2–87 VEHICLE SPEEDOMETER SENSOR (VSS) INSPECTION) (See K2–87 VEHICLE SPEEDOMETER SENSOR (VSS) REMOVAL/INSTALLATION)
7	Solenoid valve (See K2–88 SOLENOID VALVE INSPECTION) (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION)
8	TCM (See K2–90 TCM INSPECTION) (See K2–96 TCM REMOVAL/INSTALLATION)
9	Transfer oil (See K2–114 TRANSFER OIL INSPECTION) (See K2–114 TRANSFER OIL REPLACEMENT)
10	Automatic transaxle (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION)
11	Transfer (See K2–115 TRANSFER REMOVAL/INSTALLATION) (See K2–116 BREATHER PLUG REMOVAL/INSTALLATION)
12	Oil seal (See K2–104 OIL SEAL REMOVAL/INSTALLATION)
13	Control valve body (See K2–105 CONTROL VALVE BODY REMOVAL/INSTALLATION)
14	Oil cooler (See K2–106 OIL COOLER FLUSHING) (See K2–108 OIL COOLER REMOVAL/INSTALLATION) (See K2–110 OIL COOLER DISASSEMBLY/ASSEMBLY)
15	Drive plate (See K2–112 DRIVE PLATE REMOVAL/INSTALLATION)
16	Selector lever (See K2–117 SELECTOR LEVER INSPECTION) (See K2–117 SELECTOR LEVER COMPONENT INSPECTION) (See K2–119 SELECTOR LEVER REMOVAL/INSTALLATION) (See K2–122 SELECTOR LEVER DISASSEMBLY/ASSEMBLY)
17	Selector cable (See K2–118 SELECTOR CABLE ADJUSTMENT)

AUTOMATIC TRANSAXLE

MECHANICAL SYSTEM TEST

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Mechanical System Test Preparation

1. Apply the parking brake and use wheel chocks at the front and rear of the wheels.
2. Inspect the engine coolant. (See Section E.)
3. Inspect the engine oil. (See D–8 ENGINE OIL INSPECTION.)
4. Inspect the ATF levels. (See K2–79 Automatic Transaxle Fluid (ATF) Level Inspection.)
5. Inspect the idle speed and ignition timing in P position. (See F1–22 IDLE SPEED INSPECTION (4WD).)

Line Pressure Test

Note

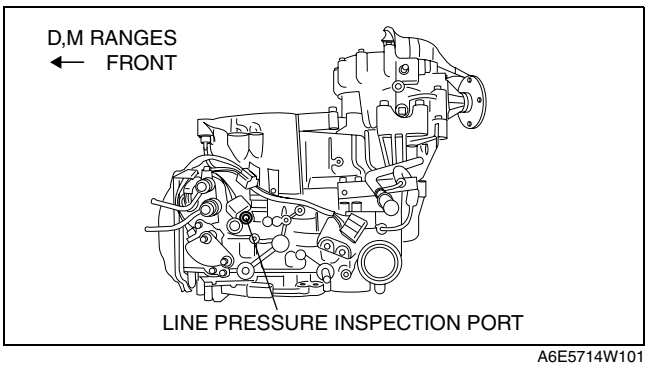
- Line pressure cannot be measured on the JA5AX-EL automatic transaxle. Measure the low clutch pressure in place of D and M range line pressures. Measure the reverse clutch pressure in place of R position line pressure.

1. Engine idling.
   (1) Perform mechanical system test preparation. (See K2–72 Mechanical System Test Preparation.)

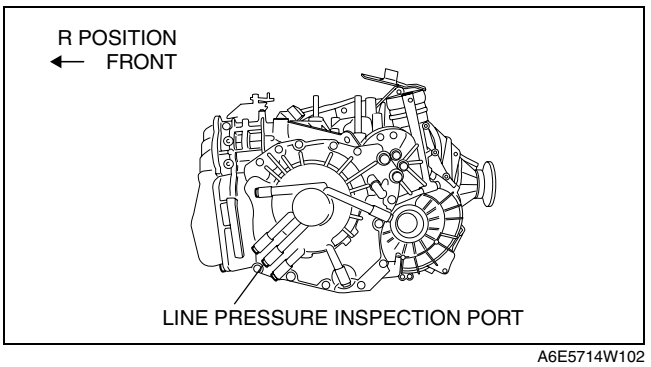
Warning

- **Removing the 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) Remove the plug and O-ring shown in the figure.

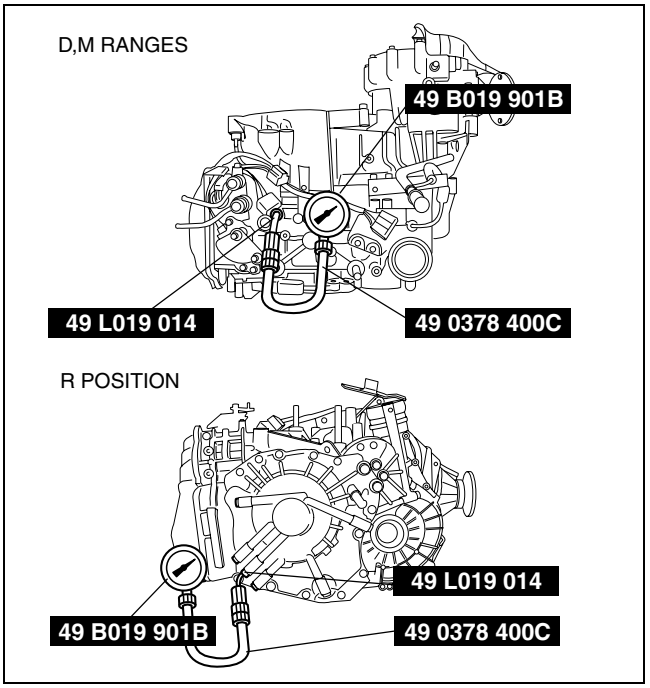


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A6E5714W102

(3) Connect the **SSTs** (49 L019 014, 49 B019 901B, and 49 0378 400C) to the low clutch pressure inspection port (D and M range line pressures) or reverse clutch pressure inspection port (R position line pressure).
(4) Start the engine and warm it up until the ATF reaches 60—70 °C {140—158 °F}.
(5) Shift the selector lever to D range.
(6) Read the line pressure at idle for the remaining ranges in the same manner.
- M range (1GR, 2GR)
- R range



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ATF temperature
60—70 °C {140—158 °F}
Turn off all electrical loads

Position/ Range	Line pressure (kPa {kgf/cm^2, psi})
	Idle
D, M (2GR)	290—490 {3.0—5.0, 42—71}
M (1GR), R	550—750 {5.6—7.6, 80—109}

(7) Turn the engine off.

2. Engine stall speed.

Caution
- **Perform the line pressure test at engine idling prior to performing the test at engine stall. If line pressure is low at idle, do not perform the test at engine stall or further transaxle damage will occur.**

(1) Replace the **SST** (49 B019 901B) with the gauge of the **SST** (49 0378 400C).
(2) Start the engine.

Caution
- **Do not maintain WOT in any gear range for more than 5 seconds or transaxle damage will occur.**

(3) Firmly depress the brake pedal with the left foot, and then gradually depress the accelerator pedal to the floor (WOT) with the right.
(4) When the engine speed no longer increases, quickly read the line pressure and release the accelerator pedal.
(5) Shift the selector lever to N position and let the engine idle for 1 minute or more to cool the ATF.
(6) Read the line pressure at the engine stall speed for the remaining ranges in the same manner.
- M range (1GR, 2GR)
- R range

ATF temperature
60—70 °C {140—158 °F}
Turn off all electrical loads

Position/ Range	Line pressure (kPa {kgf/cm^2, psi})
	Stall
D, M (2GR)	1,550—1,750 {15.8—17.8, 225—254}
M (1GR), R	1,550—1,750 {15.8—17.8, 225—254}

(7) Shift the selector lever to P position.
(8) Turn off the engine.
(9) Remove the **SSTs** and install a new square head plug and O-ring in the line pressure inspection port.

Tightening torque
4.91—9.80 N·m {50—100 kgf·cm, 43.4—86.7 in·lbf}

Evaluation of line pressure test

Condition			Possible cause
Idle	Below specification	Low pressure in all ranges	Worn oil pump Poor operation of each solenoid Fluid leaking from oil strainer, oil pump, pressure regulator valve, torque converter relief valve, and/or pressure relief valve Pressure regulator valve or pilot valve sticking Damaged pressure regulator valve spring or pilot valve spring
		Low pressure in D and M range	Fluid leaking from hydraulic circuit of low clutch
		Low pressure in R position only	Fluid leaking from hydraulic circuit of reverse clutch Fluid leaking from hydraulic circuit of low and reverse brake clutch
	Above specification	High pressure in all ranges	Throttle position sensor out of adjustment TFT sensor malfunction Poor operation of shift solenoid Pilot valve sticking Pressure reducing valve or plug sticking
Stall	Below specification	Low pressure in all ranges	Throttle position sensor out of adjustment Pressure control solenoid malfunction Poor operation of shift solenoid Pilot valve sticking Pressure reducing valve or plug sticking

Stall Speed Test

1. Perform mechanical system test preparation. (See K2–72 Mechanical System Test Preparation.)
2. Connect a tachometer.
3. Start the engine.
4. Shift the selector lever to D range.

Caution

- **Do not maintain WOT in any gear range for more than 5 seconds or transaxle damage will occur.**
- **If engine speed recorded by the tachometer exceeds maximum specified rpm, release the accelerator pedal immediately. Clutch or band slippage is indicator.**

5. Firmly depress the brake pedal with the left foot, and gently depress the accelerator pedal to the floor (WOT) with the right.
6. When the engine speed no longer increases, quickly read the engine speed and release the accelerator pedal.
7. Shift the selector the to N position and let the engine idle for 1 minute or more to cool the ATF.
8. Perform stall tests for the remaining ranges and position in the same manner.
   - R position
   - Mrange (1GR, 2GR)

Engine stall speed
ATF temperature : 60—70 °C {140—158 °F}
Turn off all electrical loads
2,200—2,600 rpm

9. Turn off the engine.

Evaluation of stall test

Condition		Possible cause
Above specification	In all forward ranges and R position	Insufficient line pressure Worm oil pump Poor operation of low clutch Poor adjustment or malfunction of TR switch Oil leaking from oil pump, control valve, and/or transmission case Pressure regulator valve or pilot valve sticking
	In all forward ranges	Low clutch slippage Low one-way clutch slippage Reduction one-way clutch slippage
	In R position	Low and reverse brake slippage Reverse clutch slippage Reduction brake slippage
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 K2–72 Mechanical System Test Preparation.)
2. Start the engine.
3. Warm up the engine until the ATF temperature reaches **60—70°C {140—158°F}**. Shift the selector lever from N position to D range.
4. Use a stopwatch to measure the time it takes from shifting until engagement is felt. Take three measurements for each test and average the results using the following formula.

   Formula
   Average time lag = (Time 1 + Time 2 + Time 3) / 3

5. Perform the test for the following shifts in the same manner.
   - N position → P position

   Time lag
   N → D range ... approx. 0.5—1.0 second
   N → R position ... approx. 0.6— 1.0 second

Evaluation of time lag test

Condition		Possible Cause
Above specification	N → D shift	Insufficient line pressure in all forward ranges Low clutch slippage Low one-way clutch slippage Reduction one-way clutch slippage
	N → R shift	Insufficient line pressure in R position Low and reverse brake slippage Reverse clutch slippage Reduction brake slippage

K2

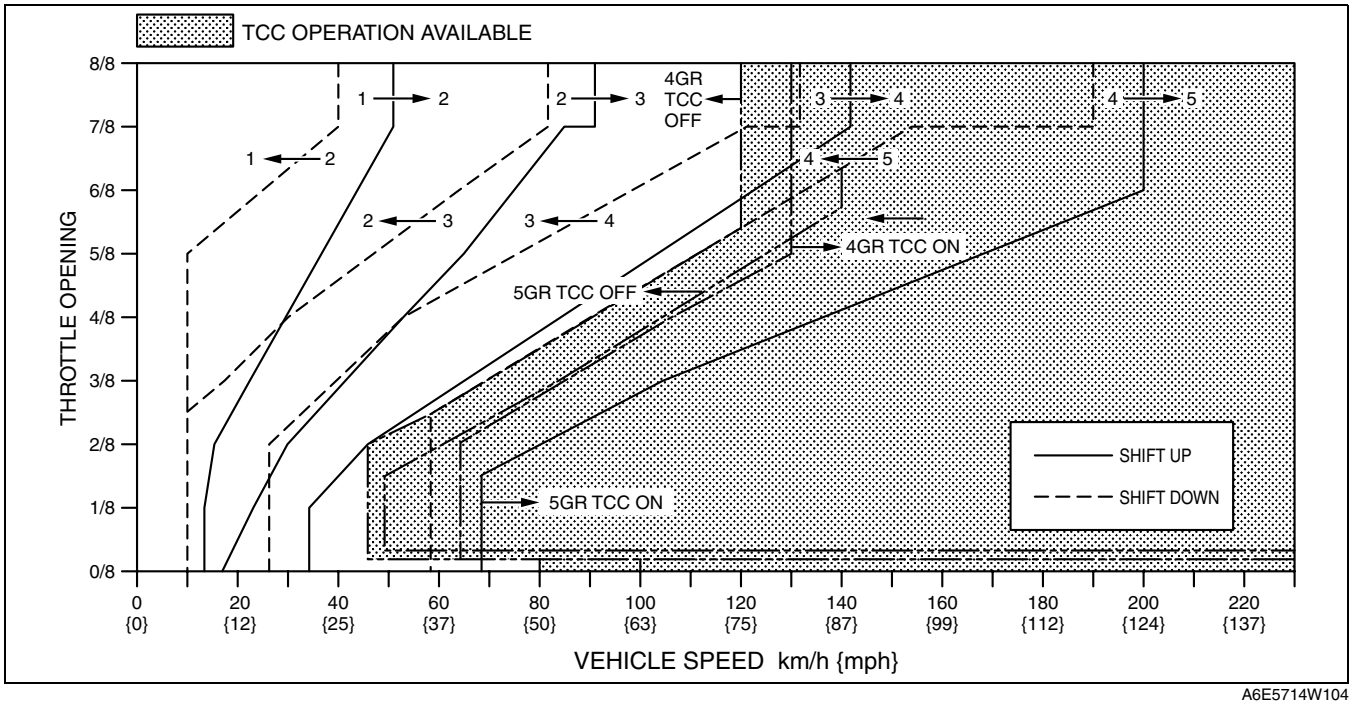
ROAD TEST

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Road Test Preparation

1. Inspect the engine coolant. (See Section E.)
2. Inspect the engine oil. (See D–8 ENGINE OIL INSPECTION.)
3. Inspect the ATF levels. (See K2–78 AUTOMATIC TRANSAXLE FLUID (ATF) INSPECTION.)
4. Inspect the idle speed and ignition timing in P position. (See F1–22 IDLE SPEED INSPECTION (4WD).)
5. Bring up the engine and transaxle to normal operating temperature.

Shift Diagram
D range (normal mode)



A6E5714W104

D Range Test

Note
- The NORMAL mode and SLOPE mode are automatically selected by the TCM in D range. The TCM shifts to SLOPE mode when the upgrade is approx. 5 % or more, and shifts to NORMAL mode when the upgrade is approx. 3 % or less.

1. Perform road test preparation. (See K2–75 Road Test Preparation.)
2. Shift the selector lever to D range.
3. Accelerate the vehicle with half and WOT, then verify that 1→2, 2→3, 3→4, and 4→5 upshifts and downshifts are obtained. The shift points must be as shown in the table below.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)
4. Drive the vehicle in 5GR, 4GR, 3GR, and 2GR and verify that kickdown occurs for 5→4, 4→3, 3→2, and 2→1 downshifts, and that the shift points are as shown in the table below.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)
5. Decelerate the vehicle and verify that engine braking effect is felt in 5GR.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)
6. Drive the vehicle and verify that TCC operation is obtained. The operation points must be as shown in the table below.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)

Note
- The shift solenoid electrical ON-OFF pattern is this chart describes the stabilized condition before and after shift control. The pattern may oscillate between ON and OFF momentarily while shifting-up or down. This is normal.

Vehicle speed at shift point table

Range	Mode	Throttle condition	Shift	Vehicle speed (km/h {mph})	Turbine speed (rpm)
D	NORMAL	Wide open throttle	$D_1 \rightarrow D_2$	50—56 {31—34}	5,800—6,450
			$D_2 \rightarrow D_3$	89—97 {56—60}	5,800—6,250
			$D_3 \rightarrow D_4$	139—149 {87—92}	5,800—6,150
			TCC ON (D_4)	127—137 {79—84}	3,650—3,850
			$D_4 \rightarrow D_5$	195—205 {121—127}	5,550—5,800
			TCC ON (D_5)	195—205 {121—127}	4,100—4,250
		Half throttle	$D_1 \rightarrow D_2$	25—34 {16—21}	2,850—3,950
			$D_2 \rightarrow D_3$	45—62 {28—38}	2,900—4,000
			$D_3 \rightarrow D_4$	72—99 {45—61}	3,000—4,100
			TCC ON (D_4)	93—121 {58—75}	2,650—3,450
			$D_4 \rightarrow D_5$	124—149 {77—92}	3,550—4,200
			TCC ON (D_5)	124—149 {77—92}	2,600—3,100
		Closed throttle position	$D_5 \rightarrow D_4$	55—61 {35—37}	1,1500—1,250
			$D_4 \rightarrow D_3$	23—29 {15—17}	700—800
			$D_3 \rightarrow D_1$	7—13 {5—8}	300—500
		Kickdown	$D_5 \rightarrow D_4$	185—195 {115—120}	3,850—4,050
			$D_4 \rightarrow D_3$	127—137 {79—84}	3,650—3,850
			$D_3 \rightarrow D_2$	77—85 {48—52}	3,200—3,500
			$D_2 \rightarrow D_1$	37—43 {23—26}	2,400—2,750

M Range Test

1. Perform road test preparation. (See K2–75 Road Test Preparation.)
2. Shift the selector lever to M range.
3. Verify that 1→2, 2→3, 3→4, and 4→5 upshifts and 5→4, 4→3, 3→2, and 2→1 downshifts are obtained by manual shifting of the selector lever forward and back. The shift points must be as shown in the table below.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)
4. Decelerate the vehicle and verify that 5→4, 4→3, 3→1, and 2→1 downshifts are obtained. The shift points must be as shown in the table below.
   - If not as specified, inspect the TCM and ATX.(See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)
5. Decelerate the vehicle and verify that engine braking effect is felt in all gears.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)
6. Drive the vehicle and verify that TCC operation is obtained in 5GR. The operation points must be as shown in the table below.
   - If not as specified, inspect the TCM and ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)

Vehicle speed at shift point table

Range	Mode	Throttle condition	Shift	Vehicle speed (km/h {mph})	Turbine speed (rpm)
M	**Manual**	Half throttle	TCC ON (M_5)	106—129 {66—79}	2,200—2,600
		All round	M_5→M_4	30—36 {19—22}	650—700
			M_4→M_3	23—29 {15—17}	650—800
			M_2→M_1	4—10 {3—6}	300—600
			M_3→M_1	4—10 {3—6}	200—400

Noise and Vibration Test

1. Drive the vehicle and listen closely for any noise or vibration. The torque converter, drive shaft, and differential can be sources of noise and vibration if they are not functioning properly. Inspect these when searching for sources of noise and vibration.

P Position Test

1. Shift into P position on a gentle slope. Release the brake, and verify that the vehicle does not roll.
   - If the vehicle rolls, inspect the ATX. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)

Evaluation

Condition	Possible Cause
No 1-2 up- or downshift	Stuck shift solenoid C Stuck shift valve C Wore 2-4 brake Trouble intermediate sensor
No 2-3 up- or downshift	Stuck shift solenoid A Stuck shift valve A Wore high clutch
No 3-4 up- or downshift	Stuck shift solenoid B Stuck shift valve B Wore 2-4 brake
No 4-5 up- or downshift	Stuck shift solenoid A Stuck shift valve A Wore direct clutch Trouble TFT
TCC non operation shift	Stuck TCC solenoid valve Stuck TCC valve
Incorrect shift point	Trouble VSS output signal Trouble TR switch Trouble TP signal and engine torque signal
Excessive shift shock slippage	Stuck pressure control solenoid Stuck pressure regulator valve Stuck pressure modifier valve Stuck accumulator valve A, B, or C Stuck 2-4 brake solenoid valve Stuck high clutch solenoid valve Stuck low clutch accumulator Stuck 2-4 brake accumlator Stuck high clutch accumlator Stuck direct clutch accumlator Stuck reduction accumlator Trouble VSS
No Engine braking effect	Wore reduction brake band Stuck reduction reducing valve Stuck reduction timing valve Stuck reduction timing solenoid valve

AUTOMATIC TRANSAXLE FLUID (ATF) INSPECTION

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Automatic Transaxle Fluid (ATF) Condition Inspection

1. One way of determining whether the transaxle should be replaced is by noting:

- If the ATF is muddy or varnished.
- If the ATF smells strange or unusual.

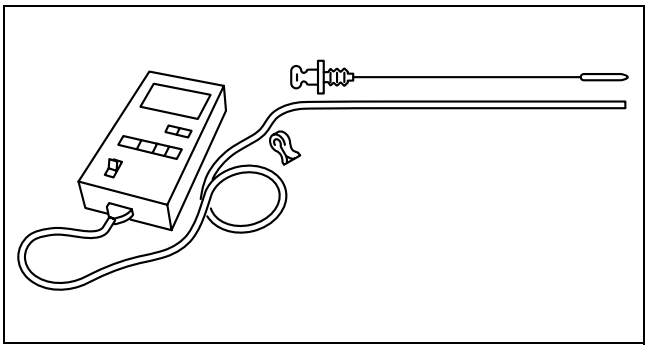
ATF Condition

Condition			Possible cause
Clear dark red		Normal	—
Light red (pink)		Contaminated with water	• Broken oil cooler inside of radiator • Poor filler tube installation: Problem could be occurring to parts inside the transaxle by water contamination. If necessary, exchange transaxle.
Reddish brown	Has burnt smell and metal specs are found	Deteriorated ATF	Defect powertrain components inside of transaxle: Specks cause wide range of problems by plugging up in oil pipe, control valve body and oil cooler in radiator. • When large amount of metal specks are found. Exchange transaxle if necessary. • Implement flushing operation as there is a possibility to have specks plugging up oil pipe and/ or oil cooler inside of radiator.
	Has no burnt smell	Normal	• Discoloration by oxidation

Automatic Transaxle Fluid (ATF) Level Inspection

Caution
- **The ATF amount varies according to ATF's temperature. Therefore, when checking 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 transaxle by performing stalls. 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.

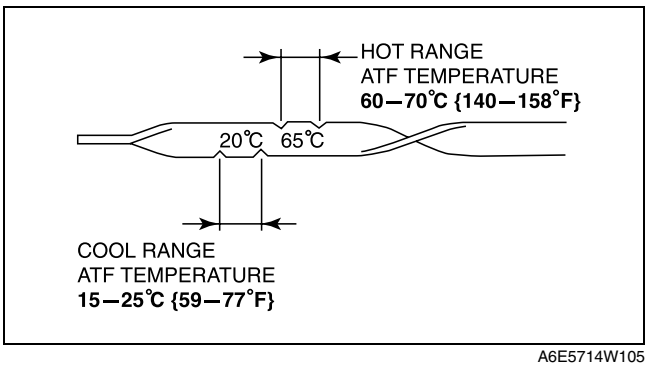
6. While depressing the brake pedal, shift the selector lever to each range (P—M), pausing momentarily in each range.
7. Shift back to P position.

Note
- If the ATF level is too high or too low in hot condition, the following problems may be the cause.

ATF level	Condition	Possible cause
Too low	Line pressure is lower than the specification	Air in transaxle oil passage due to slipping or damaged clutch mechanism
Too high	ATF is hot	ATF deteriorated due to 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 ATF specified type of, if necessary. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)

ATF type
ATF M-III or equivalent (e.g. Dexron®III)
Capacity (Approximate quantity)
8.3 L {8.8 US qt, 7.3 Imp qt}



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AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT

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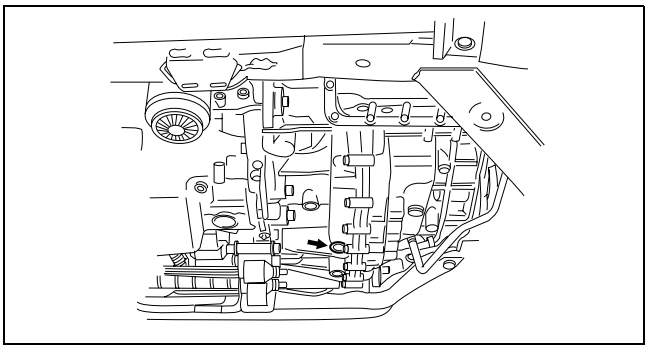
Warning
- **When the transaxle and ATF are hot, they can badly burn you. Turn off the engine and wait until they are cool before changing the ATF.**

1. Remove the oil dipstick.
2. Remove the oil drain plug and washer.
3. Drain the ATF into a container.
4. Install a new washer and the drain plug.

Tightening torque
39—54 N·m {3.9—5.6 kgf·m, 29—40 ft·lbf}

5. 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 (Approximate quantity)
8.3 L {8.8 US qt, 7.3 Imp qt}



A6E5714W106

6. Verify that the ATF level is in the HOT (**65 °C {149 °F}**) range.
   - Add ATF to the specified level as necessary.

TRANSAXLE RANGE (TR) SWITCH INSPECTION

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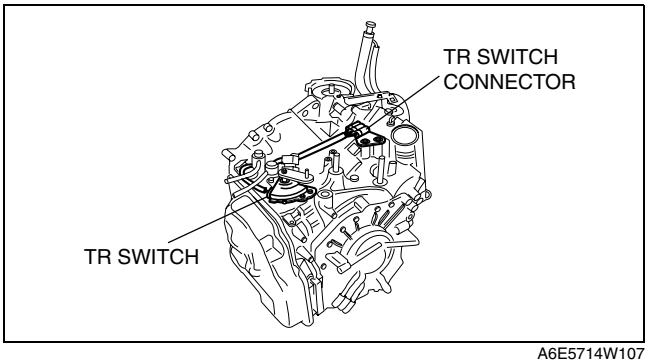
Note
- Input signals of the TR switch can be inspected with a WDS or equivalent. (See K2–90 TCM INSPECTION.)

Inspection of Operation

1. Verify that the starter operates only with the ignition switch at the START position and the selector lever in P and N positions.
   - If not as specified, inspect for continuity at the TR switch. (See K2–80 Inspection of Continuity.)
2. Verify that the back-up lights illuminate when shifted to R position with the ignition switch at the ON position.
   - If not as specified, inspect for continuity at the TR switch.

Inspection of Continuity

1. Disconnect the TR switch connector.
2. Inspect for continuity at the TR switch.
   - If not as specified, adjust the TR switch, then reinspect the TR switch. (See K2–83 TRANSAXLE RANGE (TR) SWITCH ADJUSTMENT.)



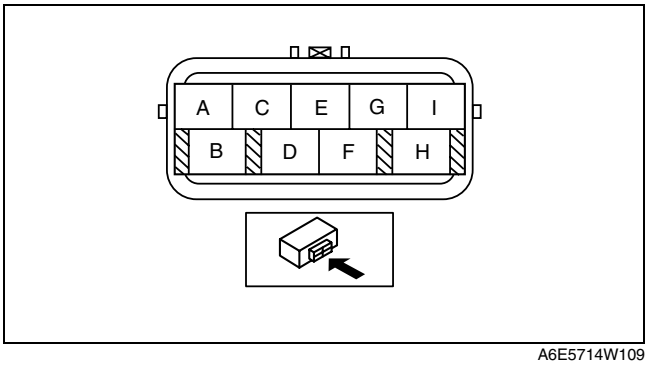
A6E5714W107

○——○: Continuity

Position/ Range	Connector terminal								
	H	B	C	A	E	D	G	I	F
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○					○	

A6E5714W108

3. Connect the TR switch connector.



A6E5714W109

TRANSAXLE RANGE (TR) SWITCH REMOVAL/INSTALLATION

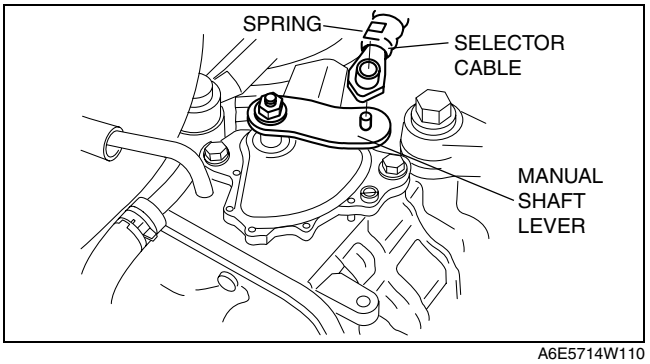
A6E571419440202

1. Disconnect the negative battery cable.
2. Remove the air cleaner component. (See Section F.)

Caution
- **Water or foreign objects entering the connector can cause a poor connection or corrosion. Be sure not to drop water or foreign objects on the connector when disconnecting it.**

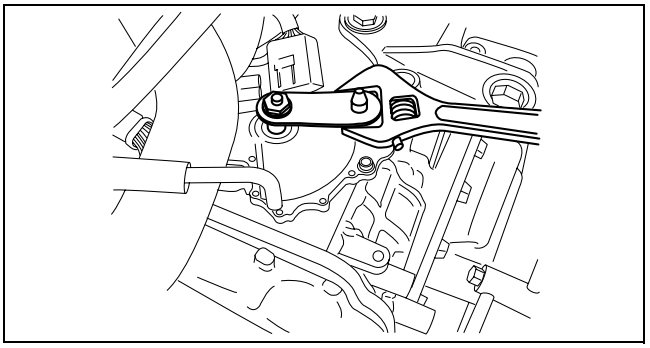
3. Disconnect the TR switch connector.
4. Remove the spring and disconnect the selector cable.
5. Rotate the manual shaft to the N position.

Caution
- **Do not use an impact wrench. Hold the manual shaft lever when removing the manual shaft nut, or the transaxle may be damaged.**



A6E5714W110

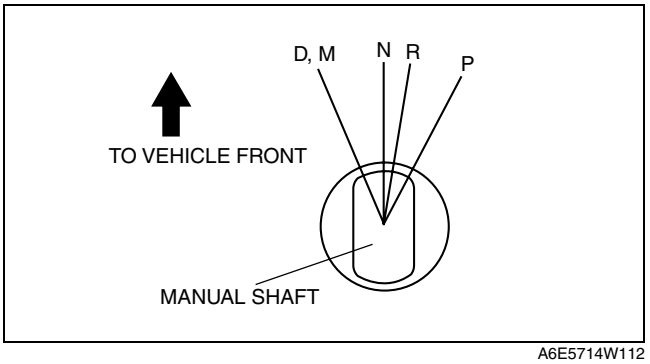
6. Set the adjustable wrench as shown to hold the manual shaft lever.
7. Remove the manual shaft nut and washer.
8. Remove the manual shaft lever.
9. Remove the TR switch.



A6E5714W111

10. Rotate the manual shaft to the right fully, them return 2 notches to set the N position.

Caution
- **Improper adjustment of the TR switch will cause abnormal operation of the automatic transaxle. Be sure to use the SST to adjust the TR switch correctly.**

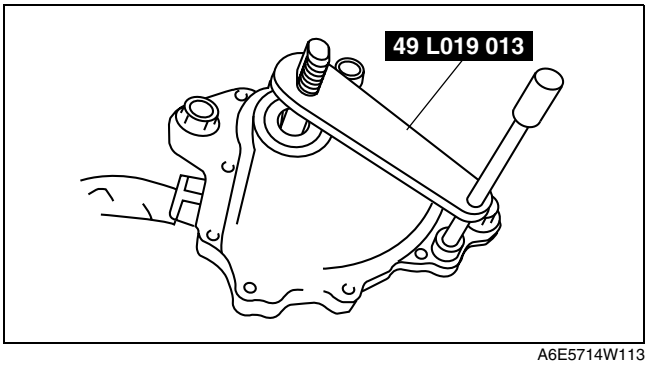


A6E5714W112

K2

11. Using the **SST** and by turning the TR switch, adjust the positions of the manual shaft and the TR switch neutral hole.
12. Tighten the TR switch mounting bolts.

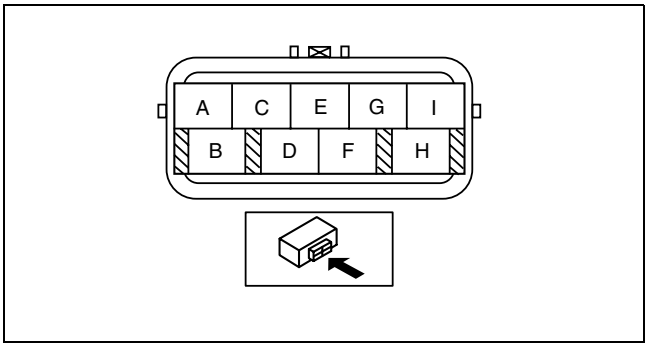
Tightening torque
4.9—6.9 N·m
{50—70 kgf·cm, 44—61 in·lbf}



A6E5714W113

13. Inspect for continuity at the TR switch between terminals C and D.
14. Remove the **SST**.
15. Install the manual shaft lever and washer.

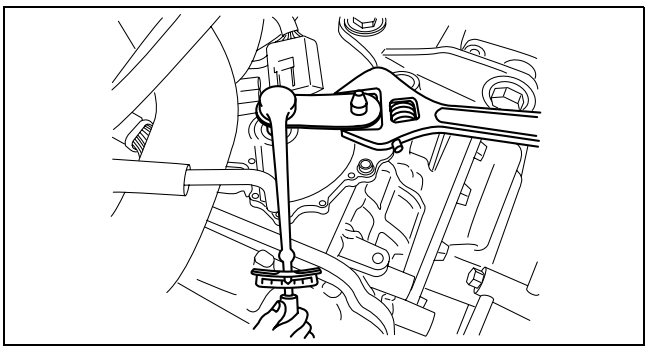
Caution
- **Do not use an impact wrench. Hold the manual shaft lever when tightening the manual shaft nut, or the transaxle may be damaged.**



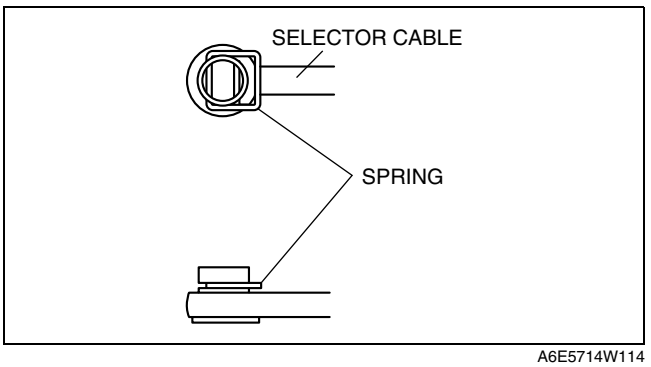
A6E5714W109

16. Set the adjustable wrench as shown to hold the manual shaft lever.
17. Tighten the manual shaft nut using a torque wrench.

Tightening torque
31.36—46.06 N·m
{3.198—4.696 kgf·m, 23.13—33.96 ft·lbf}

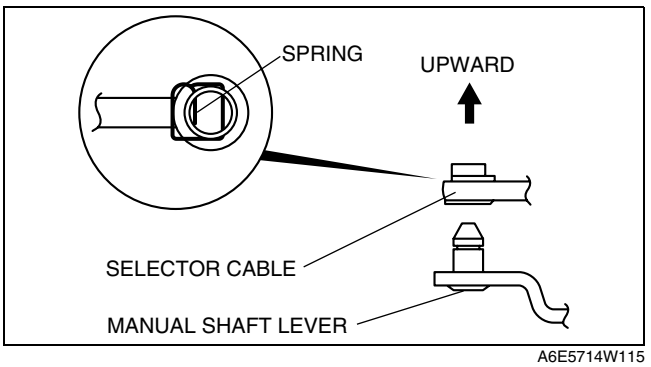

A6E5714W150

18. Install the spring as shown in the figure.
    - If it is bend, replace a new spring.



A6E5714W114

19. Verify that the selector lever range position and TR switch are aligned, then connect the selector cable.
20. Inspect for continuity at the TR switch. (See K2–80 Inspection of Continuity.)
21. Connect the TR switch connector.
22. Install the air cleaner component. (See Section F.)
23. Connect the negative battery cable.
24. Inspect operation of the TR switch. (See K2–80 Inspection of Operation.)



A6E5714W115

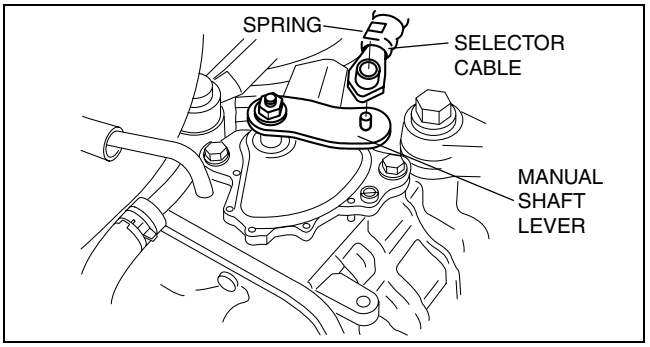
TRANSAXLE RANGE (TR) SWITCH ADJUSTMENT

A6E571419440203

Caution
- **Water or foreign objects entering the connector can cause a poor connection or corrosion. Be sure not to drop water or foreign objects on the connector when disconnecting it.**

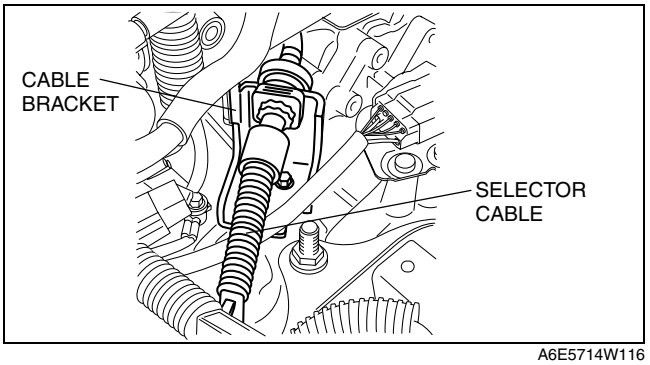
1. Disconnect the TR switch connector.
2. Remove the spring and disconnect the selector cable.

Note
- Do not reuse the clip when any of the hooks are deformed.



A6E5714W110

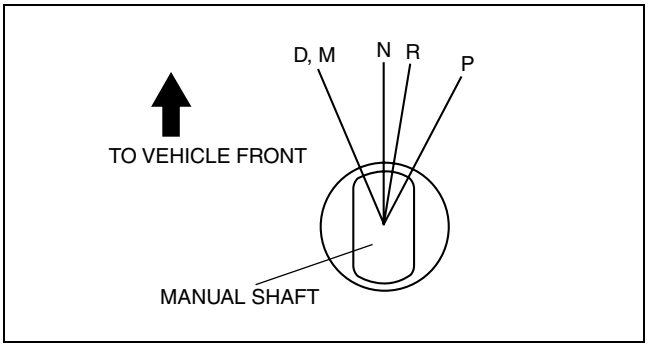
3. Remove the selector cable from the cable bracket.



A6E5714W116

4. Rotate the manual shaft to the right fully, then return 2 notches to set the N position.
5. Loosen the TR switch mounting bolts.

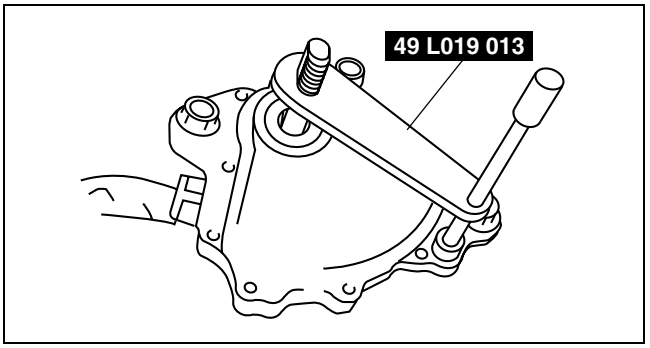
Caution
- **Improper adjustment of the TR switch will cause abnormal operation of the automatic transaxle. Be sure to use the SST to adjust the TR switch correctly.**



A6E5714W112

6. Using the SST and by turning the TR switch, adjust the positions of the manual shaft and the TR switch neutral hole.
7. Tighten the TR switch mounting bolts.

Tightening torque
4.9—6.9 N·m
{50—70 kgf·cm, 44—61 in·lbf}



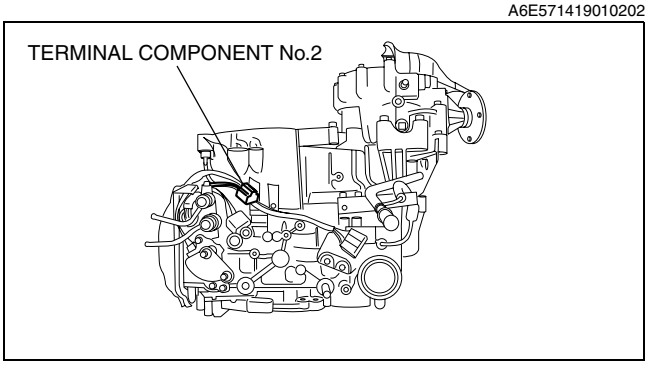
A6E5714W113

8. Remove the SST.
9. Inspect for continuity at the TR switch. (See K2–80 Inspection of Continuity.)
10. Connect the TR switch connector.
11. Connect the selector cable and install a spring.
12. Inspect operation of the TR switch. (See K2–80 Inspection of Operation.)

TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR INSPECTION

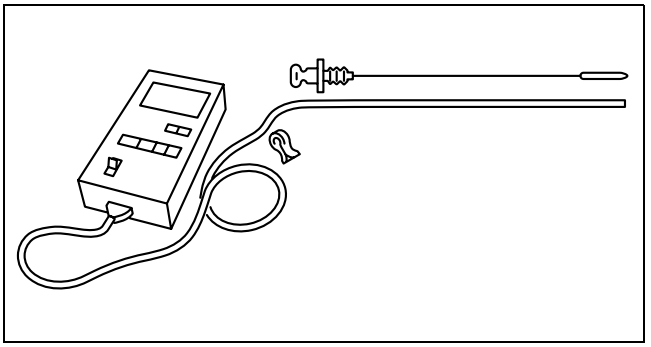
A6E571419010202

1. Disconnect the terminal component No.2 connector.
2. Remove the oil dipstick.



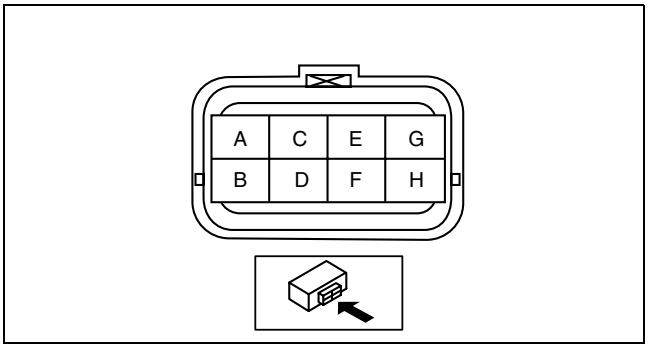
A6E5714W117

3. Insert the thermistor probe into the filler tube.
4. Start the engine.



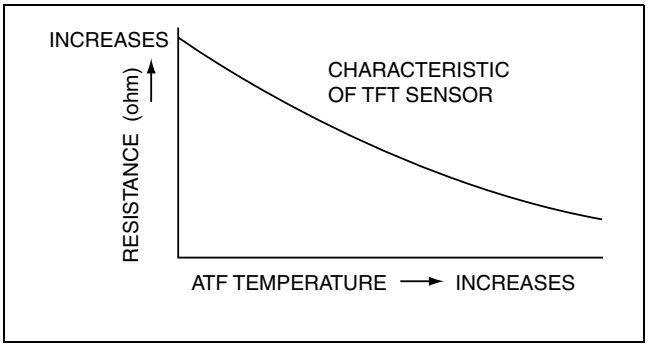
A6E5614W003

5. Measure resistance between the terminals G and H.



A6E5714W118

- If not as specified, replace the TFT sensor. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.) (See Automatic Transaxle Workshop Manual JA5A-EL.)



A6E5714W119

ATF temperature (°C {°F})	Resistance (kilohm)
-20 {-4}	15.87—17.54
0 {32}	5.73—6.33
20 {68}	2.38—2.63
40 {104}	1.10—1.22
60 {140}	0.56—0.62
80 {176}	0.31—0.34
100 {212}	0.18—0.20
120 {248}	0.11—0.12
130 {266}	0.09—0.10

6. Connect the terminal component No.2 connector.

TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR REMOVAL/INSTALLATION

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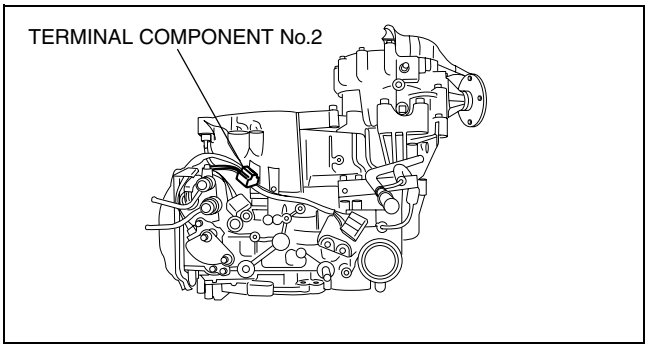
1. Remove the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
2. Disassemble the automatic transaxle, and then remove the TFT sensor. (See Automatic Transaxle Workshop Manual JA5A-EL)
3. Install a TFT sensor, and then assemble the automatic transaxle. (See Automatic Transaxle Workshop Manual JA5A-EL)
4. Remove the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
5. Carry out the line pressure test. (See K2–72 Line Pressure Test.)
6. Inspect the operation of the TR switch. (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION.)
7. Inspect the operation of the selector lever. (See K2–117 SELECTOR LEVER INSPECTION.)
8. Carry out the mechanical system test. (See K2–72 MECHANICAL SYSTEM TEST.)
9. Carry out the road test. (See K2–75 ROAD TEST.)

INPUT/TURBINE SPEED SENSOR INSPECTION

A6E571421550202

On-Vehicle Inspection

1. Disconnect the terminal component No.2 connector.

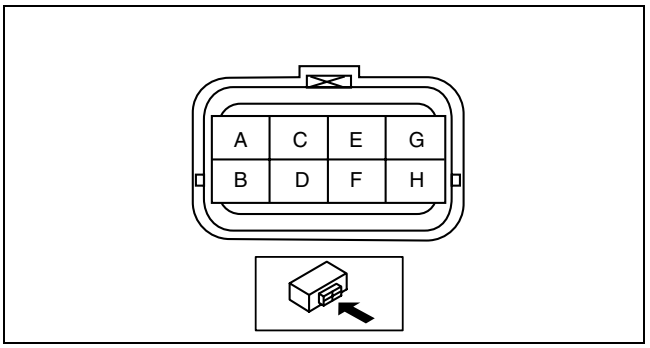


A6E5714W117

2. Measure resistance between the terminals E and F.
   - If not as specified, inspect the input/turbine speed sensor. (See K2–85 Inspection of Individual Part.)

   Resistance (ATF temperature: 20 °C {68 °F})
   513—627 ohms

3. Connect the terminal component No.2 connector.



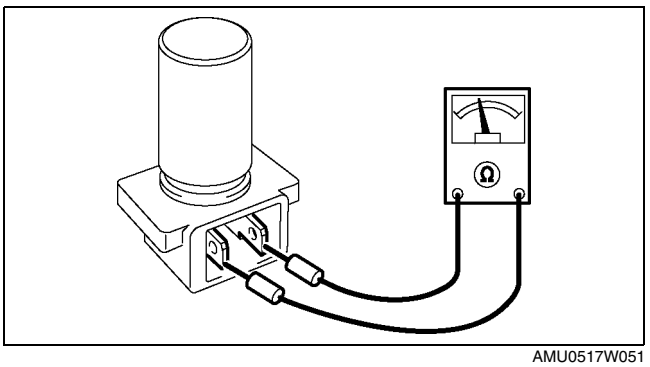
A6E5714W118

Inspection of Individual Part

1. Remove the input/turbine speed sensor. (See K2–86 INPUT/TURBINE SPEED SENSOR REMOVAL/INSTALLATION.)
2. Measure resistance between the terminals of the input/turbine speed sensor.
   - If not as specified, replace the input/turbine speed sensor.
   - If it is normal, replace the harness.

   Resistance (ATF temperature: 20 °C {68 °F})
   513—627 ohms

3. Install the input/turbine sensor. (See K2–86 INPUT/TURBINE SPEED SENSOR REMOVAL/INSTALLATION.)



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INPUT/TURBINE SPEED SENSOR REMOVAL/INSTALLATION

A6E571421550203

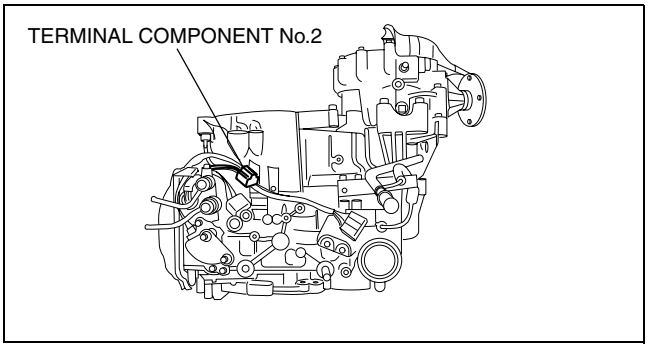
1. Remove the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
2. Remove the input/turbine speed sensor. (See Automatic Transaxle Workshop Manual JA5A-EL.)
3. Install the input/turbine speed sensor. (See Automatic Transaxle Workshop Manual JA5A-EL.)
4. Install the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)

INTERMEDIATE SENSOR INSPECTION

A6E571417400202

On-Vehicle Inspection

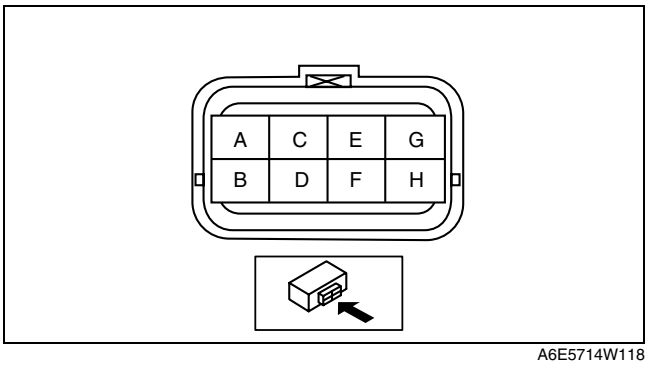
1. Disconnect the terminal component No.2 connector.



A6E5714W117

2. Measure resistance between the terminals C and D.
   - If not as specified, inspect the intermediate sensor. (See K2–86 Inspection of Individual Part.)

   Resistance (ATF temperature: 20 °C {68 °F})
   513—627 ohms



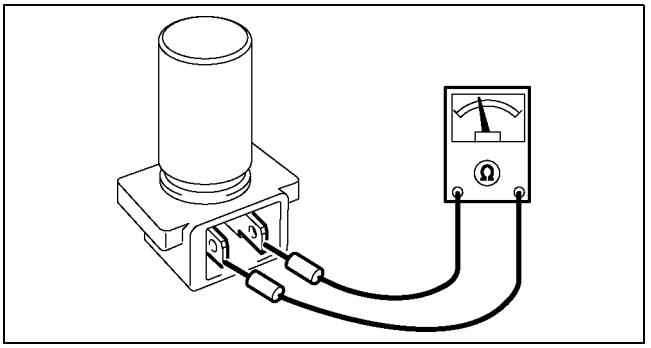
A6E5714W118

3. Connect the terminal component No.2 connector.

Inspection of Individual Part

1. Remove the intermediate sensor. (See K2–86 INTERMEDIATE SENSOR REMOVAL/INSTALLATION.)
2. Measure resistance between the terminals of the intermediate speed sensor.
   - If not as specified, replace the intermediate sensor.
   - If it is normal, replace the harness.

   Resistance (ATF temperature: 20 °C {68 °F})
   513—627 ohms



AMU0517W051

3. Install the intermediate sensor. (See K2–86 INTERMEDIATE SENSOR REMOVAL/INSTALLATION.)

INTERMEDIATE SENSOR REMOVAL/INSTALLATION

A6E571417400203

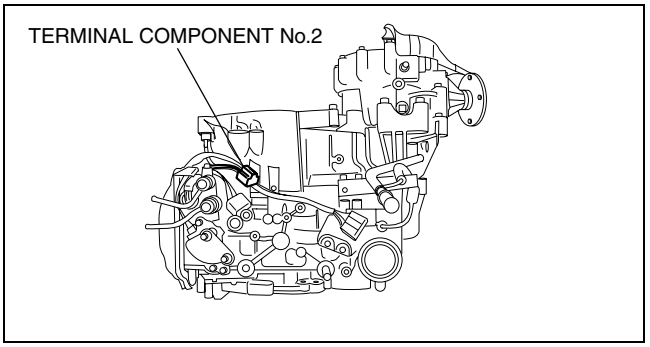
1. Remove the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
2. Remove the intermediate sensor. (See Automatic Transaxle Workshop Manual JA5A-EL.)
3. Install the intermediate sensor. (See Automatic Transaxle Workshop Manual JA5A-EL.)
4. Install the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)

VEHICLE SPEEDOMETER SENSOR (VSS) INSPECTION

A6E571417400204

On-Vehicle Inspection

1. Disconnect the terminal component No.2 connector.

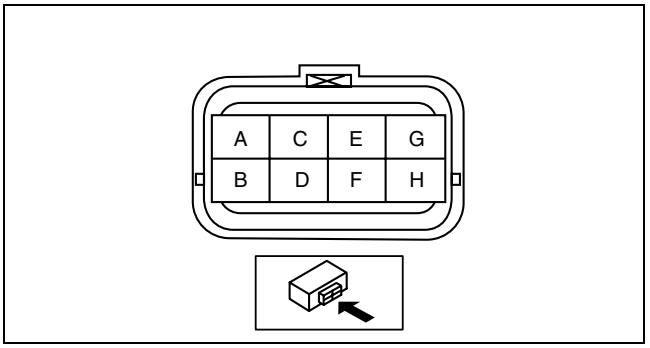


A6E5714W117

2. Measure resistance between the terminals A and B.
   - If not as specified, inspect the VSS sensor. (See K2–87 Inspection of Individual Part.)

   Resistance (ATF temperature: 20 °C {68 °F})
   513—627 ohms

3. Connect the terminal component No.2 connector.



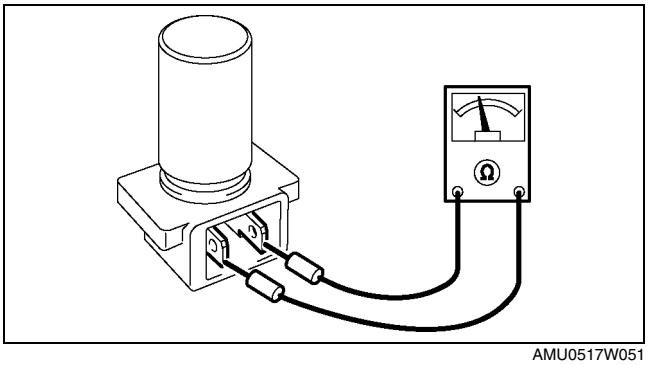
A6E5714W118

Inspection of Individual Part

1. Remove the VSS sensor. (See K2–87 VEHICLE SPEEDOMETER SENSOR (VSS) REMOVAL/INSTALLATION.)
2. Measure resistance between the terminals of the VSS speed sensor.
   - If not as specified, replace the VSS sensor.
   - If it is normal, replace the harness.

   Resistance (ATF temperature: 20 °C {68 °F})
   513—627 ohms

3. Install the VSS sensor. (See K2–87 VEHICLE SPEEDOMETER SENSOR (VSS) REMOVAL/INSTALLATION.)



AMU0517W051

VEHICLE SPEEDOMETER SENSOR (VSS) REMOVAL/INSTALLATION

A6E571417400205

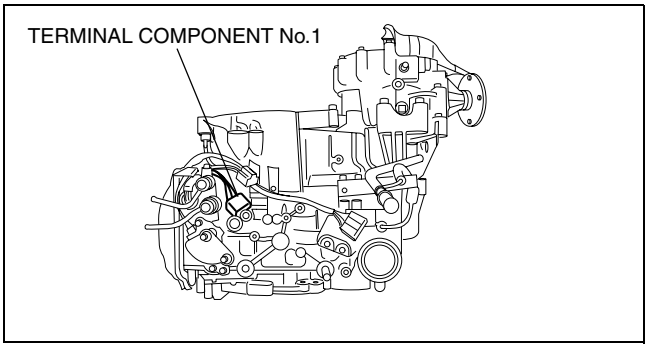
1. Remove the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
2. Remove the VSS sensor. (See Automatic Transaxle Workshop Manual JA5A-EL.)
3. Install the VSS sensor. (See Automatic Transaxle Workshop Manual JA5A-EL.)
4. Install the automatic transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)

SOLENOID VALVE INSPECTION

A6E571421280202

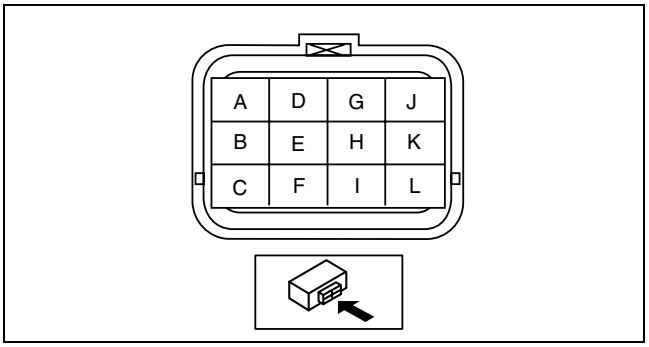
Resistance Inspection (On-Vehicle)

1. Disconnect the negative battery cable.
2. Disconnect the terminal component No.1 connector.



A6E5714W120

3. Measure the resistance between the following terminals.
   - If not as specified, inspect each solenoid valve. (See K2–89 Resistance Inspection (Off-Vehicle).)



A6E5714W121

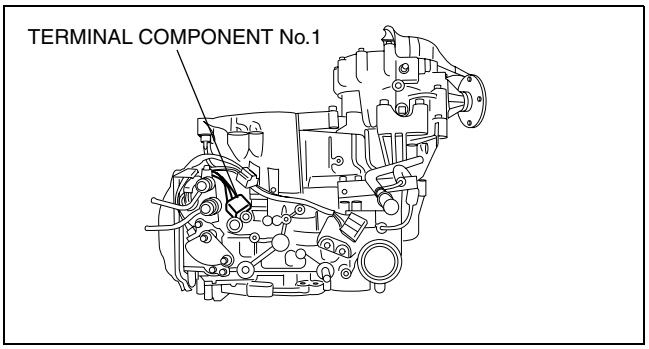
ATF temperature: 20 °C {68 °F}

Terminals	Solenoid valve	Resistance (ohm)
A—J	2-4 brake solenoid valve	2.6—3.2
B—J	TCC solenoid valve	12.0—13.2
C—J	High clutch solenoid valve	2.6—3.2
D—J	Pressure control solenoid	2.6—3.2
E—J	Reduction timing solenoid valve	14—18
F—J	Shift solenoid C	14—18
G—J	Shift solenoid B	14—18
H—J	Neutral shift solenoid valve	14—18
I—J	Shift solenoid A	14—18

4. Connect the terminal component No.1 connector.
5. Connect the negative battery cable.

Operating Inspection (On-Vehicle)

1. Disconnect the terminal component No.1 connector.



A6E5714W120

Caution

- **Do not apply battery positive voltage to terminals for more than three seconds.**

Note

- Because the operation sound of the valves is small, inspect in a quiet place.

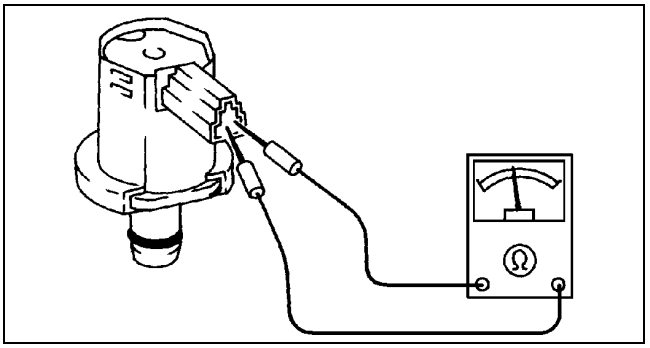
2. Apply battery positive voltage to terminals A, B, C, D, E, F, G, H, I and battery negative voltage to GND, and verify that operating sound is heard from solenoid.
   - If the “click” is not heard, inspect the transaxle harness.
     - — If the transaxle harness is okay, perform the resistance inspection (off-vehicle inspection).
     - — If there is a problem, repair or replace the transaxle harness.
3. Connect the terminal component No.1 connector.

Resistance Inspection (Off-Vehicle)

1. Remove each solenoid valve. (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
2. Measure the resistance of each solenoid valve individually.
   - If not specified, replace the solenoid valve.
   - If it is normal, replace the harness.

Pressure control solenoid, 2-4 brake solenoid valve, and high clutch solenoid valve

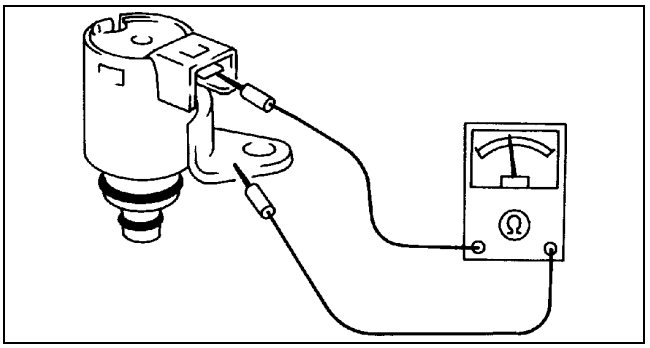
Resistance: 2.6—3.2 ohms (20 °C {68 °F})



AMU0517W034

Shift solenoid A, B, C, neutral shift solenoid valve, and reduction timing solenoid valve

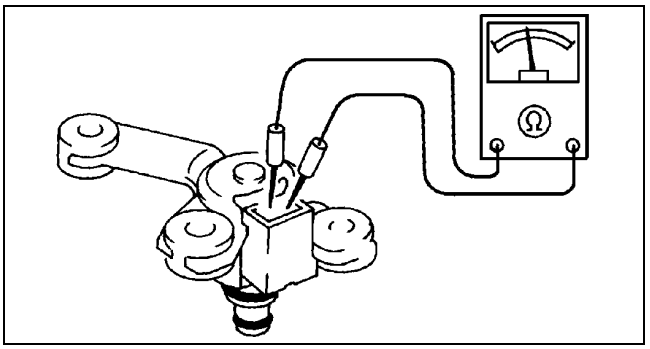
Resistance: 14—18 ohms (20 °C {68 °F})



AMU0517W035

TCC solenoid valve

Resistance: 12—13.2 ohms (20 °C {68 °F})



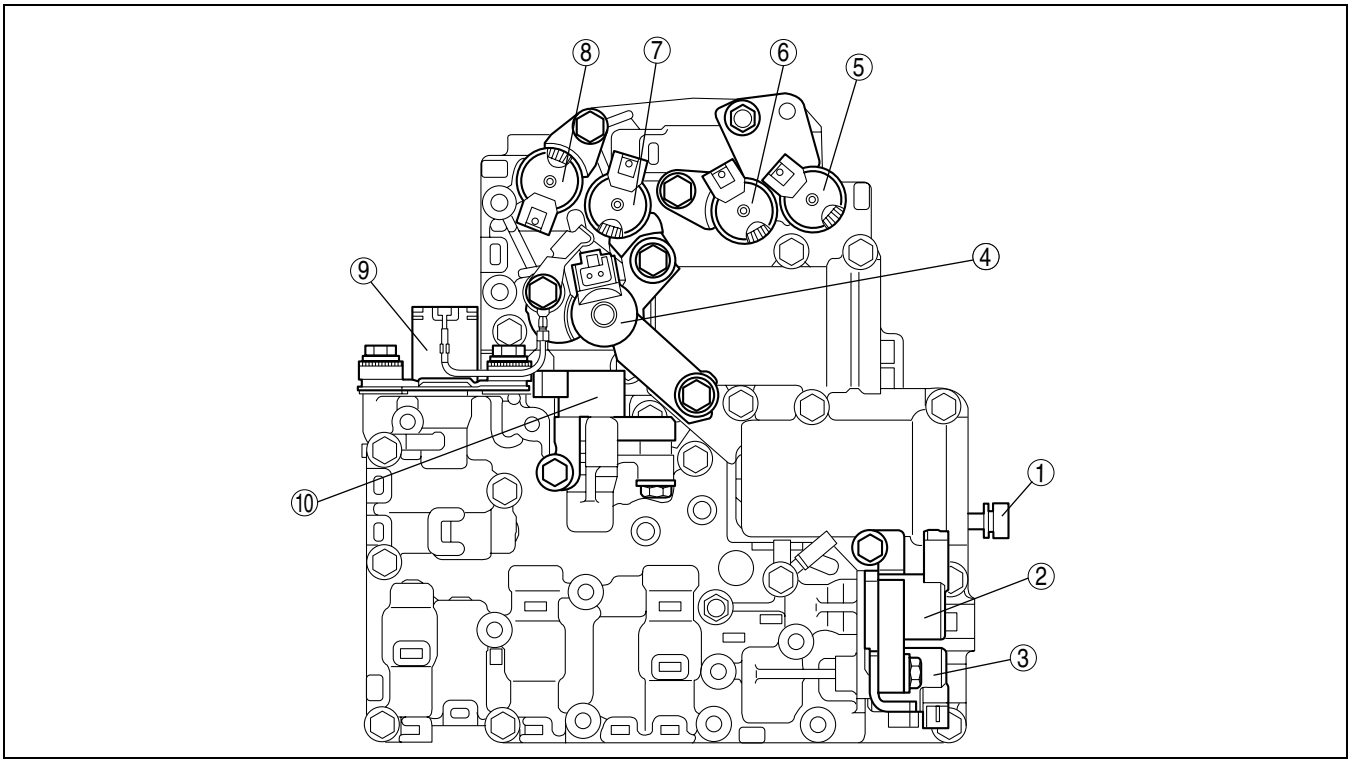
AMU0517W036

3. Install each solenoid valve. (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)

SOLENOID VALVE REMOVAL/INSTALLATION

A6E571421280203

1. Remove the control valve body. (See K2–105 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
2. Remove the solenoid valves and manual valve.



A6E5714W122

1	Manual valve
2	2-4 brake solenoid valve
3	Neutral shift solenoid valve
4	TCC solenoid valve
5	Shift solenoid C

6	Shift solenoid B
7	Reduction timing solenoid valve
8	Shift solenoid A
9	Pressure control solenoid
10	High clutch solenoid valve

3. Apply ATF to a new O-ring and install it on the solenoid valve.
4. Install the solenoid valve and manual valve in the control valve body.

Tightening torque
8.34—10.30 N·m
{85.0—105.0 kgf·cm, 73.78—91.13 in·lbf}

5. Install the control valve body. (See K2–105 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
6. Add the ATF while the engine is idling, and inspect the ATF level and leakage. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.) (See K2–79 Automatic Transaxle Fluid (ATF) Level Inspection.)
7. Carry out the time lag test and line pressure test. (See K2–72 MECHANICAL SYSTEM TEST.)
8. Carry out the road test. (See K2–75 ROAD TEST.)

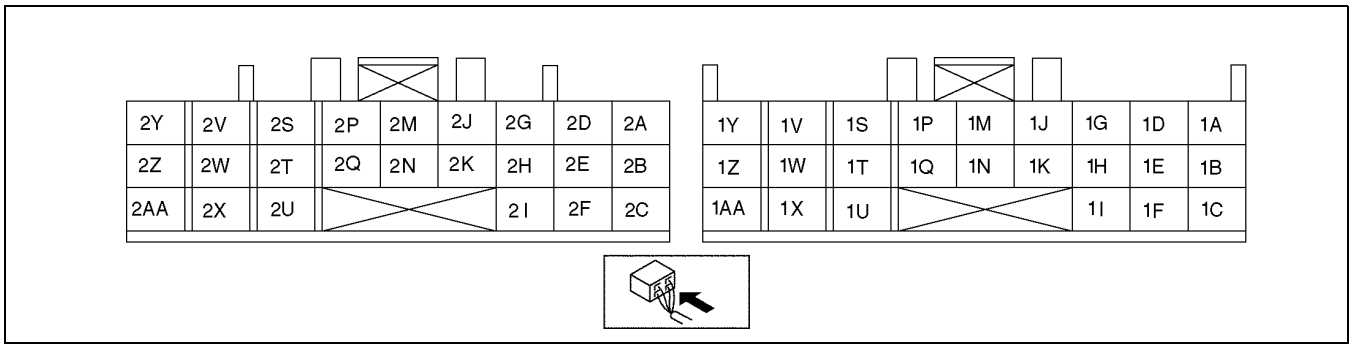
TCM INSPECTION

A6E571418901211

Terminal Voltage Table (Reference)

Note

- Use the ground of terminal 1C and 1Y of the TCM when measuring terminal voltage, as an error may occur when connecting the negative circuit tester to ground.



AMJ5814W078

Terminal	Signal	Connected to	Test Condition	Voltage (V)	Action
1A	—	—	—	—	—
1B	TFT sensor (GND)	TFT sensor	Constant	Continuity	• Inspect TFT sensor (See K2–84 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR INSPECTION) • Inspect related harness
1C	GND	GND	Constant	Below 1.0	• Inspect related harness
1D	—	—	—	—	—
1E	—	—	—	—	—
1F	TFT sensor	TFT sensor	ATF temperature 20 °C {68 °F}	Approx. 1.55	• Inspect TFT sensor (See K2–84 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR INSPECTION) • Inspect related harness
			ATF temperature 60 °C {140 °F}	Approx. 0.7	
1G	K-LINE	PCM	Because this terminal is for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to DTCs.	—	• Inspect related harness
1H	Cruise control switch	Cruise control switch	Cruise control switch ON	B+	• Inspect cruise control switch (See section T) • Inspect related harness
			Cruise control switch OFF	0	
1I	—	—	—	—	—
1J	—	—	—	—	—
1K	Intermediate sensor	Intermediate sensor	Vehicle stop	0	• Inspect Intermediate sensor (See K2–86 INTERMEDIATE SENSOR INSPECTION) • Inspect related harness
			Vehicle speed at 20 km/h {12.4 mph} or more	Above 1.0	
1M	VSS	VSS	Vehicle stop	0	• Inspect VSS (See K2–87 VEHICLE SPEEDOMETER SENSOR (VSS) INSPECTION) • Inspect related harness
			Vehicle speed at 20 km/h {12.4 mph} or more	Above 1.0	
1N	Input/turbine speed sensor	Input/turbine speed sensor	Vehicle stop	0	• Inspect Input/turbine speed sensor (See K2–85 INPUT/ TURBINE SPEED SENSOR INSPECTION) • Inspect related harness
			Vehicle speed at 20 km/h {12.4 mph} or more	Above 1.0	

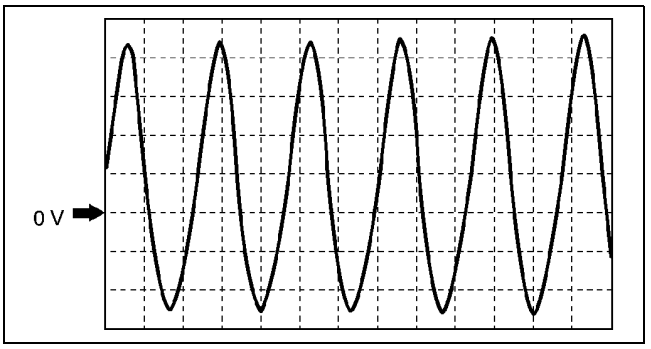
Terminal	Signal	Connected to	Test Condition	Voltage (V)	Action
1P	Back-up power supply	Battery	Constant	B+	• Inspect battery (See G–6 BATTERY INSPECTION) • Inspect related harness
1Q	—	—	—	—	—
1S	Down switch	Down switch	Down shift at M range	0	• Inspect selector lever component (See K2–117 SELECTOR LEVER COMPONENT INSPECTION)
			Other	B+	
1T	TR switch (N position)	TR switch	N position	B+	• Inspect TR switch (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION) • Inspect related harness
			Other positions, all ranges	0	
1U	Brake switch	Brake switch	Brake pedal depressed	B+	• Inspect Brake switch (See Section P.) • Inspect related harness
			Brake pedal released	0	
1V	VSS (GND)	VSS	Constant	Below 1.0	• Inspect related harness
1W	TR switch (R range)	TR switch	R range	B+	• Inspect TR switch (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION) • Inspect related harness
			Other ranges, all positions	0	
1X	Intermediate sensor (GND)	Intermediate sensor	Constant	Below 1.0	• Inspect Intermediate sensor (See K2–86 INTERMEDIATE SENSOR INSPECTION) • Inspect related harness
1Y	GND	GND	Constant	Below 1.0	• Inspect related harness
1Z	TR switch (D range)	TR switch	D range	B+	• Inspect TR switch (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION) • Inspect related harness
			Other ranges, all positions	0	
1AA	M range switch	M range switch	M range	0	• Inspect selector lever component (See K2–117 SELECTOR LEVER COMPONENT INSPECTION)
			Other	B+	
2A	—	—	—	—	—
2B	TR switch (P position)	TR switch	P position	B+	• Inspect TR switch (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION) • Inspect related harness
			Other positions, all ranges	0	
2C	Up switch	Up switch	Up shift at M range	0	• Inspect selector lever component (See K2–117 SELECTOR LEVER COMPONENT INSPECTION)
			Other	B+	
2D	Neutral shift solenoid valve	Neutral shift solenoid valve	N position	0	• Inspect neutral shift solenoid valve (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			R position	B+	

Terminal	Signal	Connected to	Test Condition	Voltage (V)	Action
2E	—	—	—	—	—
2F	Input/turbine speed sensor (GND)	Input/turbine speed sensor	Constant	0	• Inspect Input/turbine speed sensor (See K2–85 INPUT/ TURBINE SPEED SENSOR INSPECTION) • Inspect related harness
2G	Reduction timing solenoid valve	Reduction timing solenoid valve	N position	0	• Inspect reduction timing solenoid valve (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			D range	B+	
2H	—	—	—	—	—
2I	—	—	—	—	—
2J	CAN L	PCM	Because this terminal is for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to DTCs.	—	• Inspect related harness
2K	—	—	—	—	—
2M	CAN H	PCM	Because this terminal is for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to DTCs.	—	• Inspect related harness
2N	—	—	—	—	—
2P	GND return (solenoid ground)	Solenoid valve	Constant	Continuity	• Inspect related harness
2Q	—	—	—	—	—
2S	TCC solenoid valve control	TCC solenoid valve	D range TCC ON (60 km/h {37 mph} or more)	B+	• Inspect TCC solenoid valve (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			TCC released (M range, 1GR—4GR)	0	
2T	Shift solenoid B control	Shift solenoid B	N position	B+	• Inspect shift solenoid B (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			D range, 4GR gear	0	
2U	High clutch solenoid valve	High clutch solenoid valve	N position	0	• Inspect high clutch duty solenoid valve (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			When shifting 1-2 in D range	B+	
2V	2-4 Brake solenoid valve	2-4 Brake duty solenoid valve	N position	B+	• Inspect 2-4 Brake solenoid valve (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			D position stall	0	
2W	Shift solenoid A	Shift solenoid A	N position	B+	• Inspect shift solenoid A (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			D range, 3GR gear	0	
2X	Shift solenoid C control	Shift solenoid C	N position	B+	• Inspect shift solenoid C (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			D range	0	

Terminal	Signal	Connected to	Test Condition	Voltage (V)	Action
2Y	Pressure control solenoid control	Pressure control solenoid	N position	B+	• Inspect pressure control solenoid (See K2–88 SOLENOID VALVE INSPECTION) • Inspect related harness
			D position stall	0	
2Z	Power supply	Main relay	Ignition switch ON	B+	• Inspect main relay (See T–19 Relay Type) • Inspect related harness
			Ignition switch OFF	0	
2AA	Power supply	Main relay	Ignition switch ON	B+	• Inspect main relay (See T–19 Relay Type) • Inspect related harness
			Ignition switch OFF	0	

Inspection Using An Oscilloscope (Reference)
Input/turbine speed sensor signal

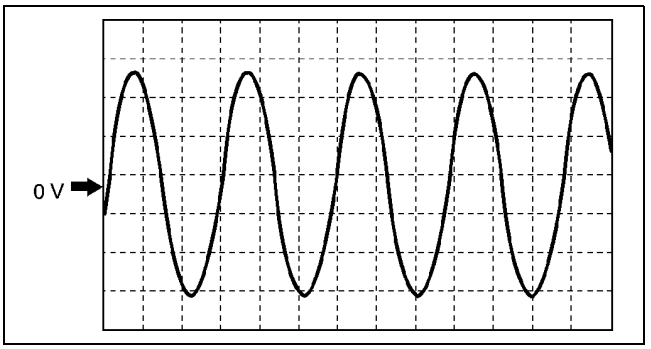
- TCM terminal: 1N (+)—2F (–)
- Oscilloscope setting: 1 V/DIV (Y) 1 ms/DIV (X)
- Measuring condition: Turbine speed at 700 rpm, N position



AMU0517W045

Intermediate sensor signal

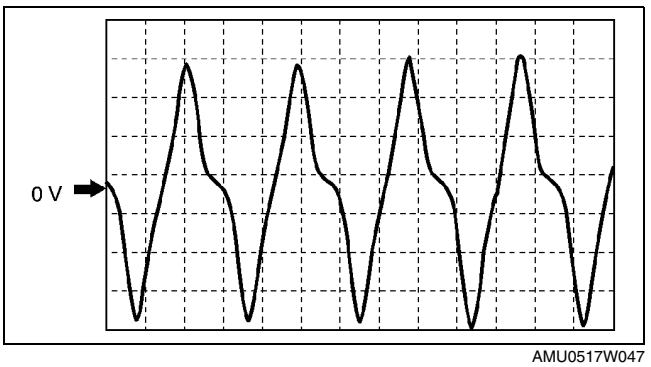
- TCM terminal: 1K (+)—1X (–)
- Oscilloscope setting: 4 V/DIV (Y) 0.2 ms/DIV (X)
- Measuring condition: Vehicle speed at 40 km/h {25 mph}, 4GR



AMU0517W046

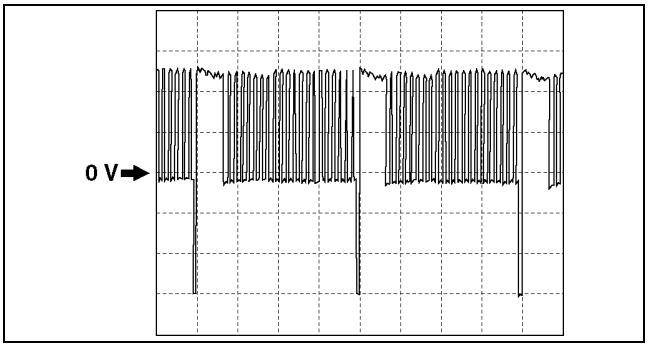
Vehicle speedometer sensor signal

- TCM terminal: 1M (+)—1V (–)
- Oscilloscope setting: 4 V/DIV (Y) 1 ms/DIV (X)
- Measuring condition: Vehicle speed at 40 km/h {25 mph}



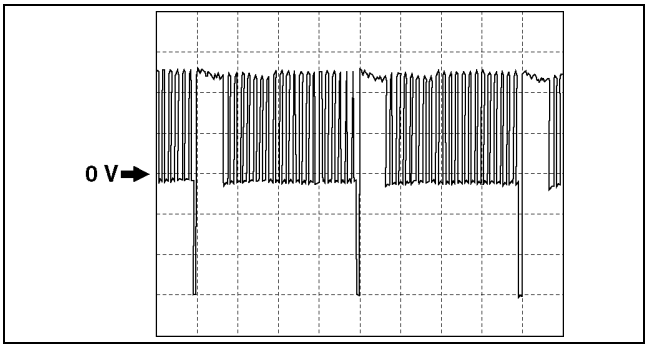
AMU0517W047

Pressure control solenoid signal
- TCM terminal: 2Y (+)—2P (–)
- Oscilloscope setting: 5 V/DIV (Y) 5 ms/DIV (X)
- Measuring condition: Idle after warm-up



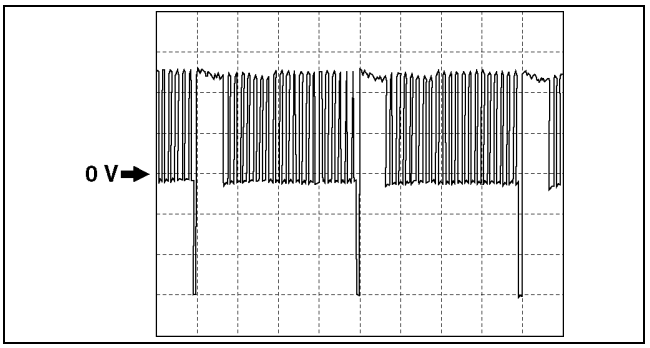
AMU0517W060

2-4 brake solenoid valve signal
- TCM terminal: 2V (+)—2P (–)
- Oscilloscope setting: 5 V/DIV (Y) 5 ms/DIV (X)
- Measuring condition: Idle after warm-up



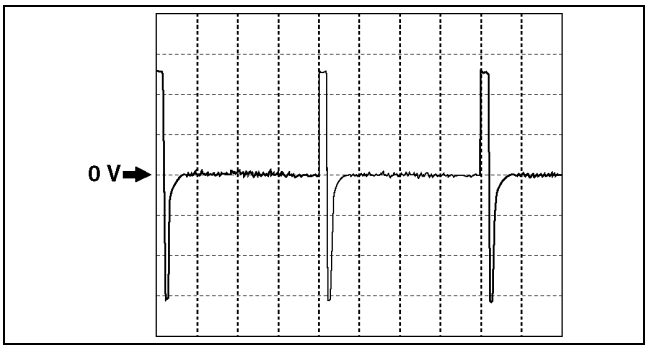
AMU0517W060

High clutch solenoid valve signal
- TCM terminal: 2U (+)—2P (–)
- Oscilloscope setting: 5 V/DIV (Y) 5 ms/DIV (X)
- Measuring condition: Idle after warm-up



AMU0517W060

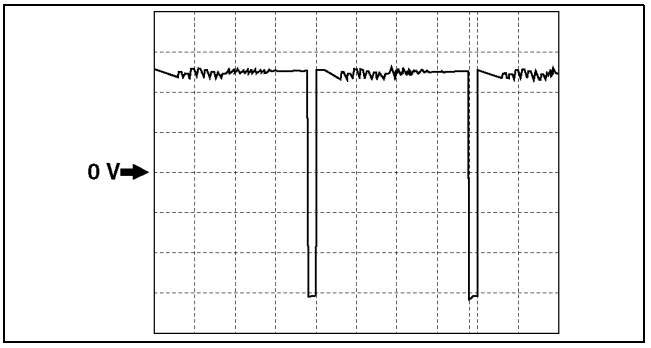
TCC solenoid valve signal (lock up off)
- TCM terminal: 2S (+)—2P (–)
- Oscilloscope setting: 5 V/DIV (Y) 5 ms/DIV (X)
- Measuring condition: Idle after warm-up



AMU0517W058

TCC solenoid valve signal (lock up on)

- TCM terminal: 2S (+)—2P (–)
- Oscilloscope setting: 5 V/DIV (Y) 5 ms/DIV (X)
- Measuring condition: Drive the vehicle with lock up



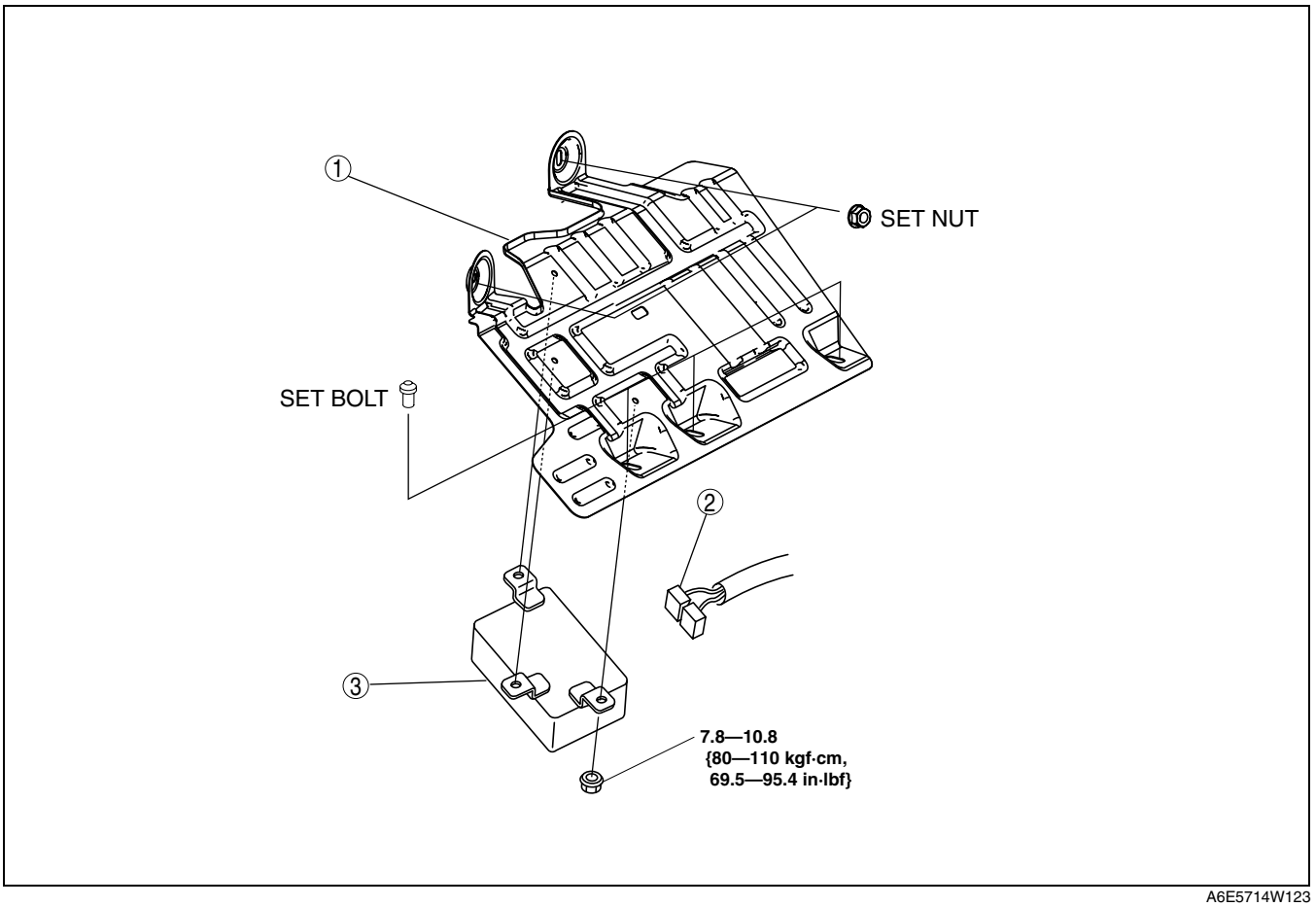
AMU0517W059

TCM REMOVAL/INSTALLATION

A6E571418901212

1. Disconnect the negative battery cable.
2. For R.H.D., perform the following procedures.
   (1) Remove the front side trim (left-side).
   (2) Partially peel back the flower covering.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.

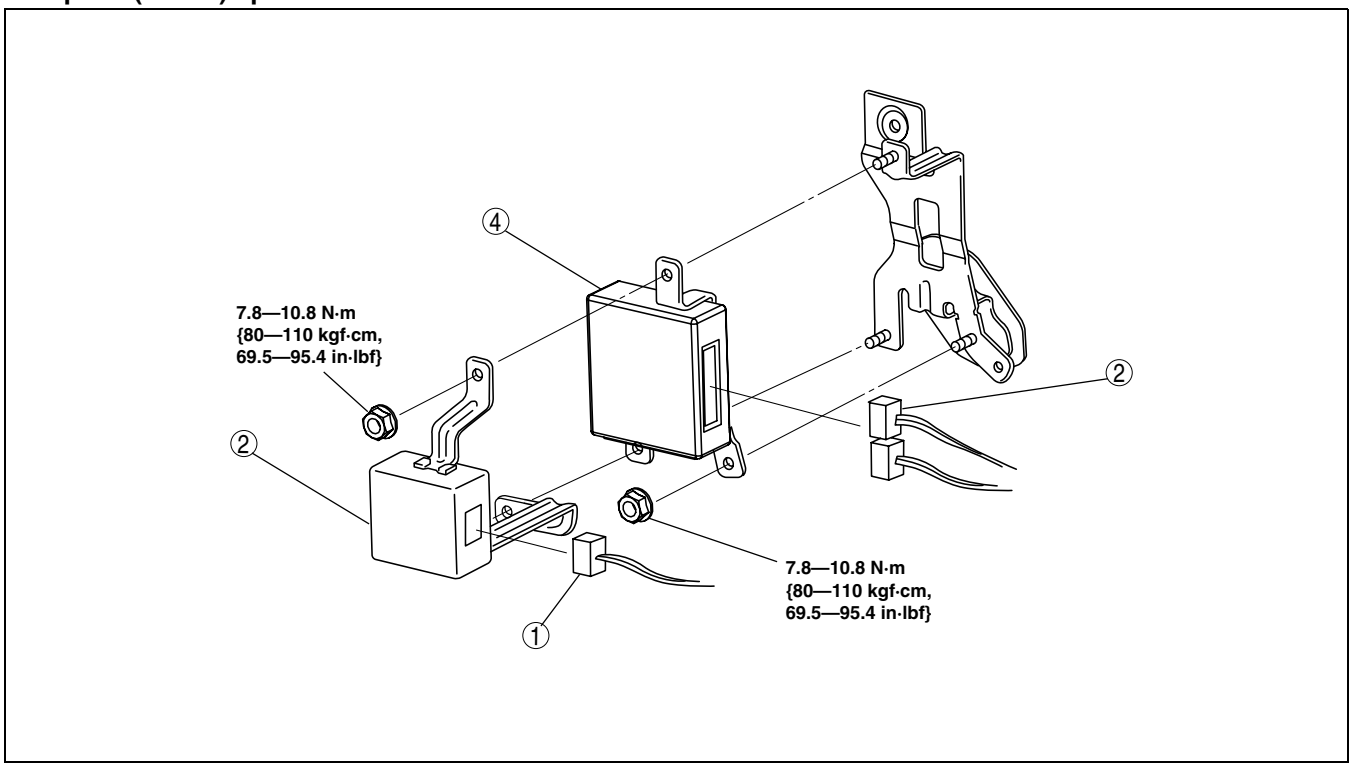
U.K. specs.



A6E5714W123

1	Control unit bracket
2	TCM connector
3	TCM

European (L.H.D.) specs.



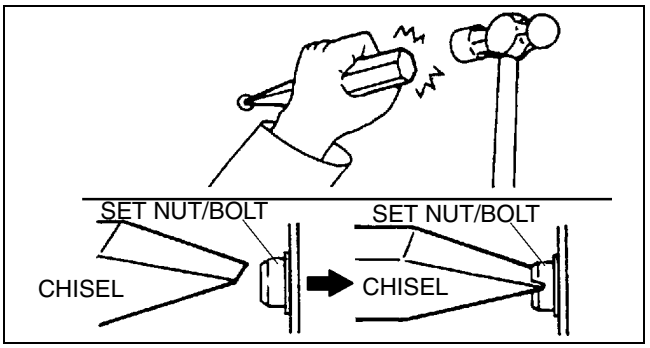
A6E5714W124

1	4WD control module connector
2	TCM connector

3	4WD control module
4	TCM

Set Nut/bolt Removal Note

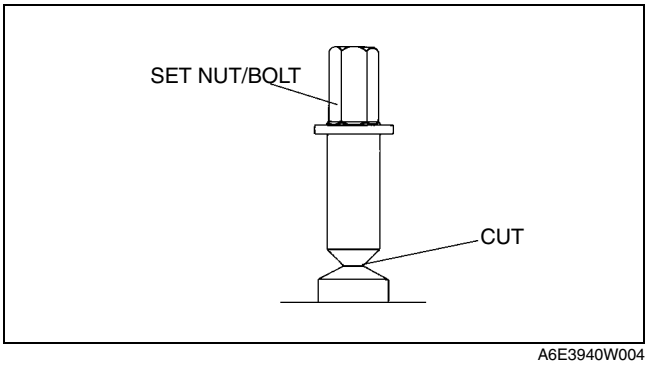
1. Using a chisel and hammer, cut a groove on the head of the set nut/bolt so that a screwdriver can be inserted.
2. Loose the set nut/bolt using an impact screwdriver or pliers.



A6E3940W003

Set Nut/bolt Installation Note

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



A6E3940W004

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AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION

A6E571419090201

1. Disconnect the negative battery cable.
2. Remove the battery and battery tray.
3. Remove the aircleaner component. (See Sectin F.)
4. Remove the front tires and splash shield.
5. Remove the under cover.
6. Separate the steering shaft and steering hose. (See N–13 STEERING GEAR AND LINKAGE (4WD) REMOVAL/INSTALLATION.)
7. Remove the front auto leveling sensor. (See Section T.)
8. Drain the ATF. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)

Warning

- **Improperly jacking a transaxle is dangerous. It can slip off the jack and may cause serious injury.**

Caution

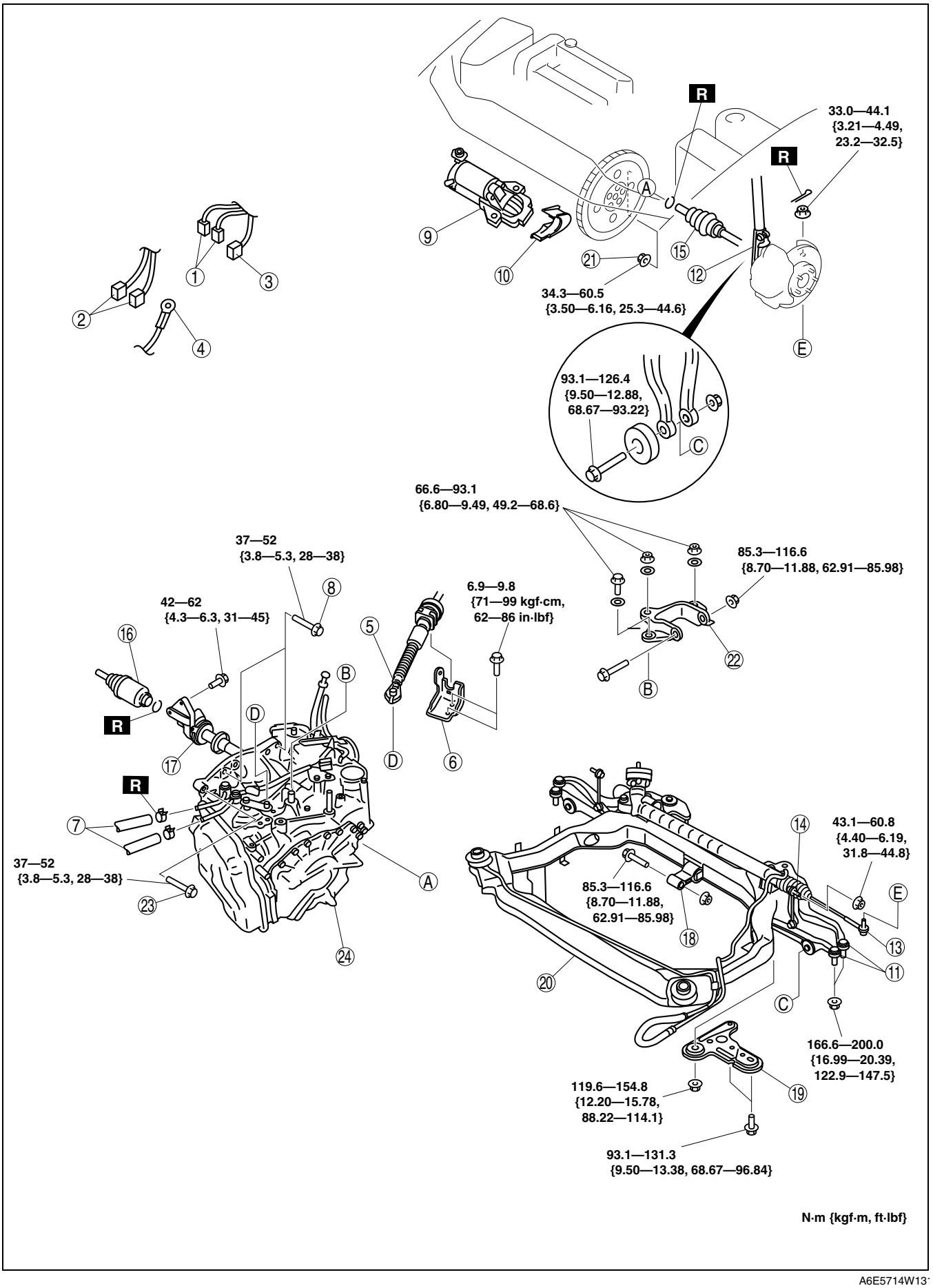
- **To prevent the torque converter and transaxle from separating, remove the transaxle without tilting it toward the torque converter.**

9. Remove in the order shown in the figure.
10. Install in the reverse order of removal.
11. Adjust the headlight zeroset. (See Section T.)
12. Add ATF to the specified level. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
13. Carry out the mechanical system test. (See K2–72 MECHANICAL SYSTEM TEST.)

Service item	Test item		
	Line pressure test	Stall test	Time lag test
ATX replacement	×		
ATX overhaul	×	×	×
Torque converter replacement	×	×	
Oil pump replacement	×		
Clutch system replacement	×		×

× : Test to be performed after the service work

14. Carry out the road test. (See K2–75 ROAD TEST.)


R
33.0—44.1
{3.21—4.49,
23.2—32.5}
R
A
9
10
21
15
12
E
34.3—60.5
{3.50—6.16, 25.3—44.6}
1
2
3
4
93.1—126.4
{9.50—12.88,
68.67—93.22}
C
66.6—93.1
{6.80—9.49, 49.2—68.6}
85.3—116.6
{8.70—11.88, 62.91—85.98}
37—52
{3.8—5.3, 28—38}
8
42—62
{4.3—6.3, 31—45}
16
6.9—9.8
{71—99 kgf·cm,
62—86 in·lbf}
5
B
22
B
D
R
17
D
6
R
7
37—52
{3.8—5.3, 28—38}
23
A
24
14
43.1—60.8
{4.40—6.19,
31.8—44.8}
85.3—116.6
{8.70—11.88,
62.91—85.98}
18
E
13
11
20
C
166.6—200.0
{16.99—20.39,
122.9—147.5}
119.6—154.8
{12.20—15.78,
88.22—114.1}
19
93.1—131.3
{9.50—13.38, 68.67—96.84}
N·m {kgf·m, ft·lbf}

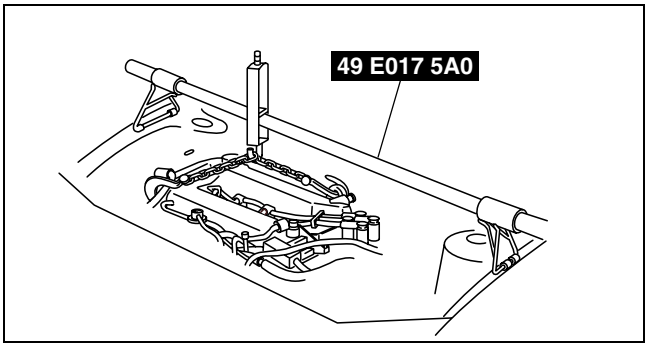
A6E5714W13

1	O_2 sensor connector
2	Terminal component No.1, No.2 connector
3	TR switch connector
4	GND harness
5	Selector cable (See K2–104 Selector Cable Installation Note)
6	Cable bracket
7	Oil hose
8	Transaxle mounting bolt (upper side)
9	Starter (See Section G)
10	Endplate cover
11	Lower arm (front, rear) ball joint (See Section R)
12	Damper fork
13	Tie-rod end ball joint (See N–13 STEERING GEAR AND LINKAGE (4WD) REMOVAL/INSTALLATION)
14	Stabilizer control link
15	Drive shaft (left side) (See Section M)

16	Drive shaft (right side) (See Section M)
17	Joint shaft (See Section M)
18	No.1 engine mount (See K2–101 No.1 Engine Mount Bracket Removal Note) (See K2–103 No.1 Engine Mount Installation Note)
19	Crossmember bracket
20	Crossmember, steering gear (See Section R)
21	Torque converter installation nuts (See K2–102 Torque Converter Nuts Removal Note) (See (SeeK2–102 Torque Converter Nuts Installation Note)
22	No.4 engine mount (See K2–103 No.4 Engine Mount Installation Note)
23	Transaxle mounting bolt (lower side)
24	Transaxle (See K2–101 Transaxle Removal Note) (See K2–102 Transaxle Installation Note)

No.1 Engine Mount Bracket Removal Note

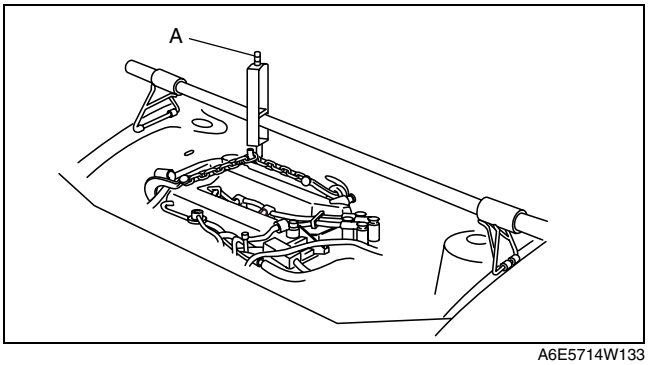
1. Support the engine using the **SST** before removing the No.1 engine mount.
2. Remove the No.1 engine mount.



A6E5714W132

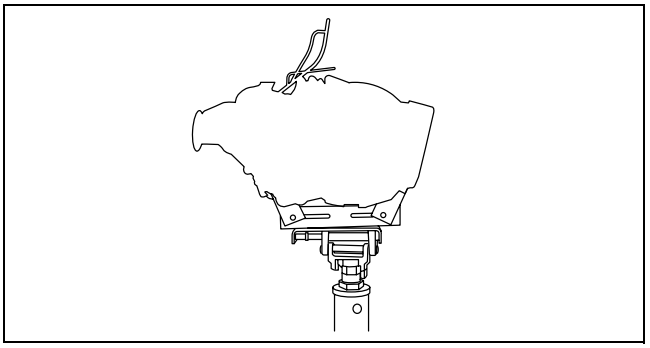
Transaxle Removal Note

1. Loosen the part marked A and lean the engine toward the transaxle.
2. Support the transaxle on a jack.
3. Remove the transaxle mounting bolts.



A6E5714W133

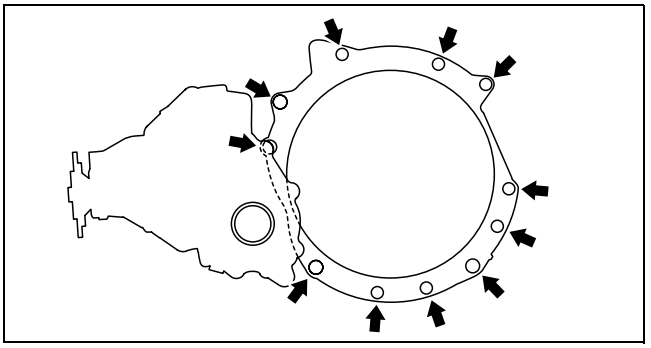
4. Remove the transaxle.


A6E5714W134

Transaxle Installation Note

1. Set the transaxle on a jack and lift it.
2. Install the transaxle mounting bolts.

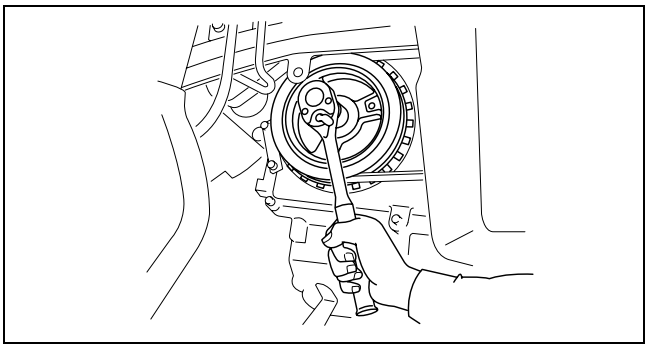
Tightening torque
37—52 N·m {3.8—5.3 kgf·m, 28—38 ft·lbf}



A6E5714W135

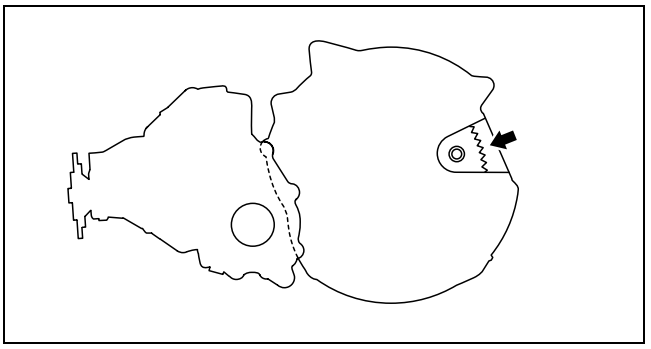
Torque Converter Nuts Removal Note

1. Hold the cankshaft pulley to prevent drive plate from rotating.



A6E5614W091

2. Remove the torque converter nuts from the starter installation hole.

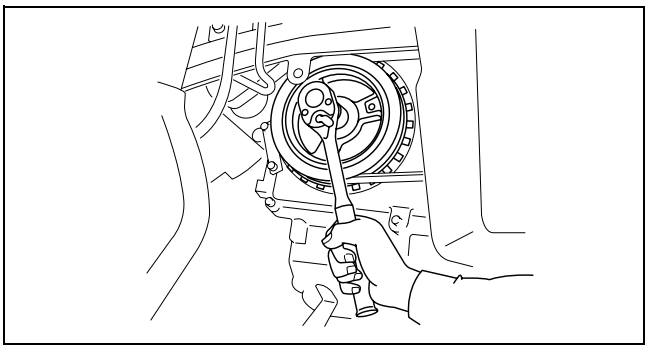


A6E5714W136

Torque Converter Nuts Installation Note

1. Hold the cankshaft pulley to prevent drive plate from rotating.

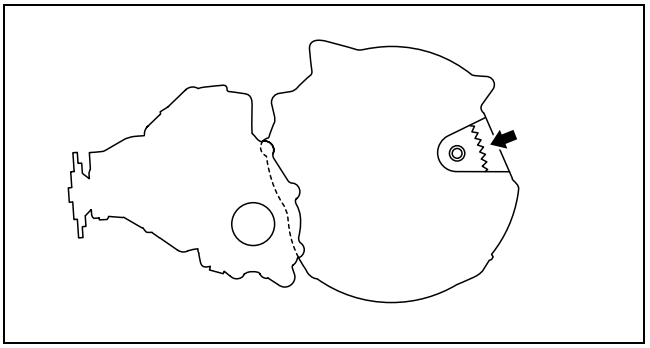
Caution
- **Loosely and equally tighten the torque converter nuts, then further tighten them to the specified tightening torque.**



A6E5614W091

2. Tighten the torque converter mounting nuts.

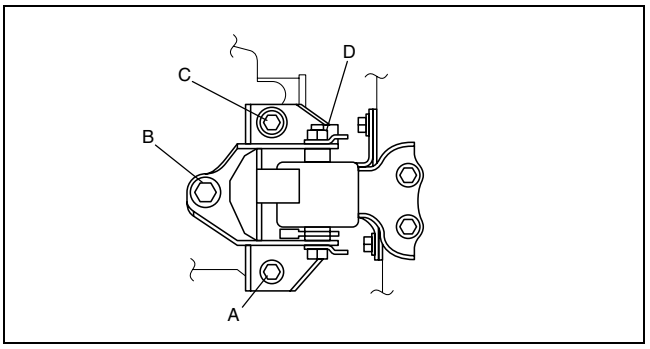
Tightening torque
34.3—60.5 N·m
{3.50—6.16 kgf·m, 25.3—44.6 ft·lbf}



A6E5714W136

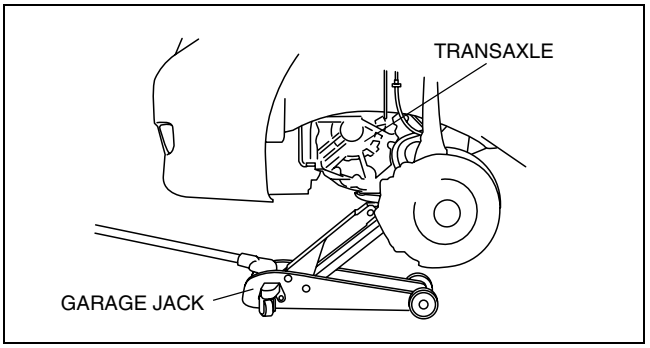
No.4 Engine Mount Installation Note

1. Verify that the No.4 engine mount bracket are installed as shown.
2. Lightly tighten the bolt D.



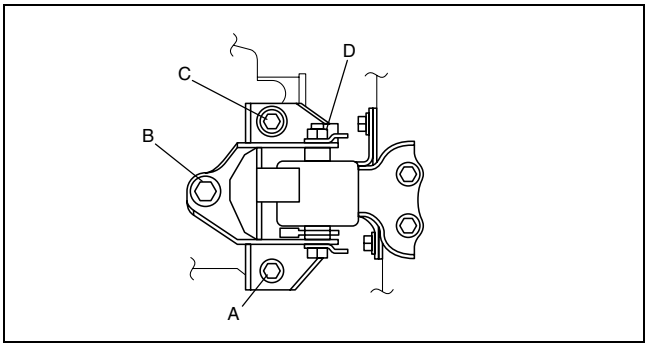
A6E5112W005

3. Set the transaxle on a garage jack and lift it.
4. Align the hole of the No.4 engine mount bracket with the stud bolts of transaxle.
5. Lightly tighten the bolt A and the nut B, C.
6. Tighten the nut B, C in order of B→C, then bolt A.
7. Tighten the bolt D.



A6E5714W139

Tightening torque
A, B, C: 66.6—93.1 N·m
{6.80—9.49 kgf·m, 49.2—68.6 ft·lbf}
D: 85.3—116.6 N·m
{8.70—11.88 kgf·m, 62.91—85.98 ft·lbf}



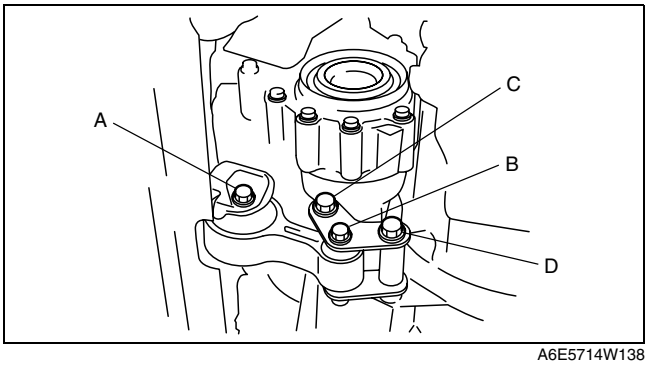
A6E5112W005

No.1 Engine Mount Installation Note

1. Loosen the bolt A.
2. Align the hole of the No.1 engine mount rubber with the bracket of transaxle.
3. Lightly tighten the bolt B, then tighten the bolt B.

4. Tighten the bolt A.

Tightening torque
A: 93.1—116.6 N·m
{9.50—11.88 kgf·m, 68.66—85.98 ft·lbf}
B: 85.3—116.6 N·m
{8.70—11.88 kgf·m, 62.91—85.98 ft·lbf}



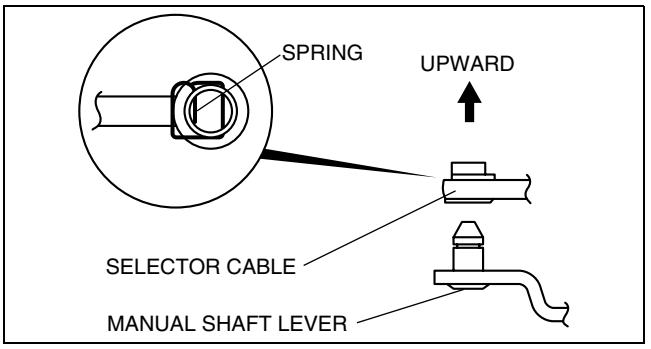
A6E5714W138

Selector Cable Installation Note

1. Install the selector lever to the manual shaft lever in such a way that the selector cable does not bear a load.

Note
- Install the selector lever to the manual shaft lever with the spring side of the selector cable end facing the upward of the vehicle.

2. Confirm that the end of the manual shaft lever sticks out of the end of the selector cable.



A6E5714W115

OIL SEAL REMOVAL/INSTALLATION

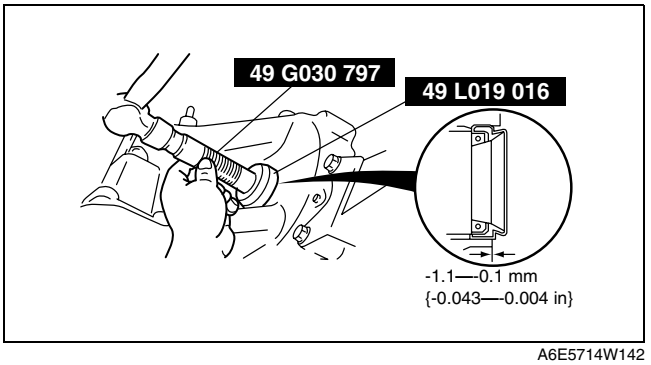
A6E571419240201

Differential side

1. Drain the ATF. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
2. Remove the drive shaft. (See Section M.)
3. Remove and discard the oil seal using a screwdriver.
4. Using the **SSTs** and a hammer, tap a new oil seal in evenly until the **SSTs** contacts the transaxle case.
5. Coat the lip of the oil seal with ATF.

Caution
- **The oil seal is easily damaged by the sharp edges of the drive shaft splines. Do not let the splines contact the oil seal.**

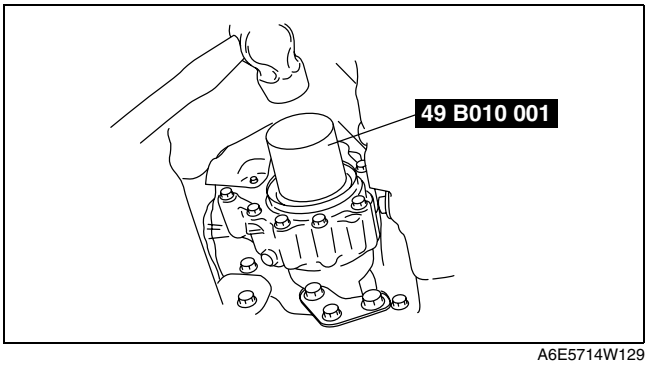
6. Install the drive shaft. (See Section M.)
7. Add ATF to the specified level. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
8. Carry out the mechanical system test. (See K2–72 MECHANICAL SYSTEM TEST.)



A6E5714W142

Transfer side

1. Remove the drive shaft and joint shaft. (See Section M.)
2. Remove and discard the oil seal using a screwdriver.
3. Using the **SST** and a hammer, tap a new oil seal in evenly until the **SST** contacts the transfer case.

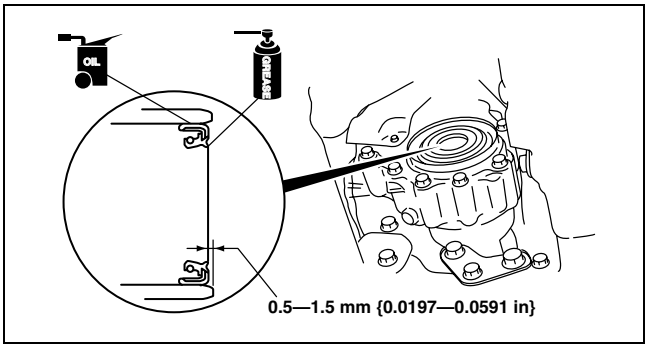


A6E5714W129

4. Coat the oil seal with transfer oil and grease as shown in the figure.

Caution
- **The oil seal is easily damaged by the sharp edges of the drive shaft splines. Do not let the splines contact the oil seal.**

5. Install the drive shaft and joint shaft. (See Section M.)



A6E5714W130

CONTROL VALVE BODY REMOVAL/INSTALLATION

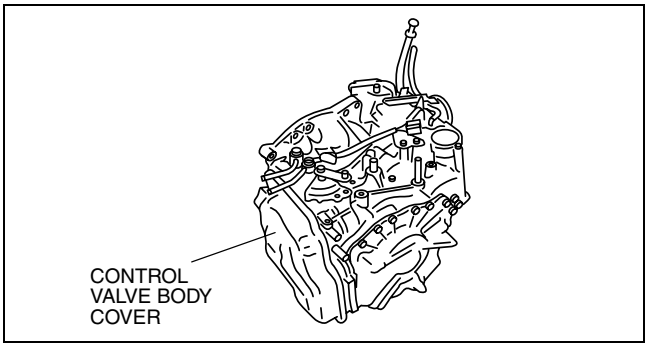
A6E571421100202

On-Vehicle Removal

Warning
- **Hot transaxle and ATF can cause severe burns. Turn off the engine and wait until it ATF have cooled before removing the control valve body.**
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eyes whenever using compressed air.**

Caution
- **Clean the transaxle exterior throughly with a stream cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transaxle during installation of the oil pan, trouble may occur in the transaxle case and oil pan. Clean with cleaning fluids.**

1. Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents.
2. Disconnect the negative battery cable.
3. Remove the front bumper. (See Section S.)
4. Remove the shroud panel. (See Section S.)
5. Drain the ATF into separate containers.
6. Remove the radiator. (See Section E.)
7. Remove the oil hose. (See K2–108 OIL COOLER REMOVAL/INSTALLATION.)
8. Remove the control valve body cover.
9. Disconnect the solenoid valve connectors, then remove harness clips.
10. Remove the control valve body.



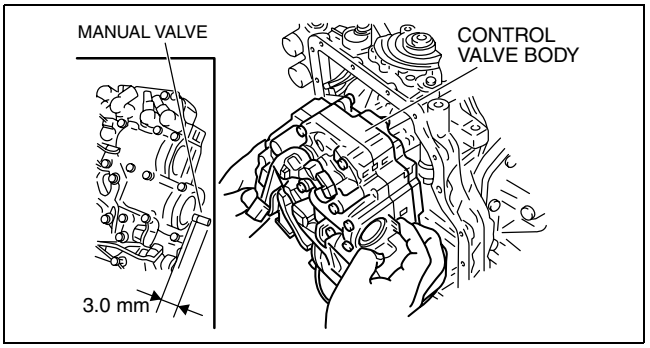
A6E5714W143

On-Vehicle Installation

1. Position the manual valve so that it protrudes from the control valve body end by 3.0 mm.
2. Install the control valve body while holding the manual valve in the position.

Tightening torque
6.9—8.8 N·m
{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}

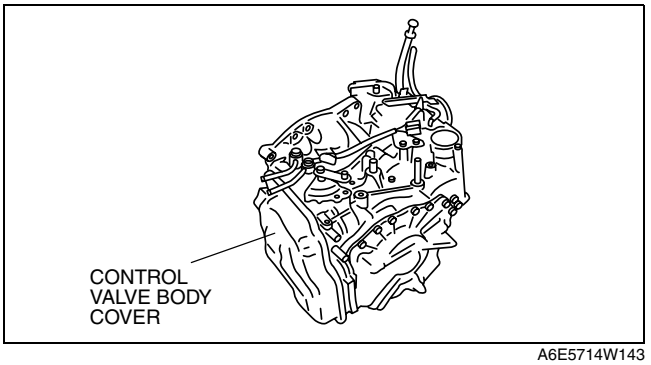
3. Connect the solenoid connectors, then install harness clips.
4. Apply a light coat of silicon sealant to the contact surfaces of the control valve body cover and transaxle case.



A6E5714W144

5. Install the control valve body cover.

Tightening torque
6.9—8.8 N·m
{0.70—0.90 kgf·m, 5.1—6.5 ft·lbf}



A6E5714W143

6. Install the oil hose and oil pipe. (See K2–108 OIL COOLER REMOVAL/INSTALLATION.)
7. Install the radiator. (See Section E.)
8. Install the shroud panel. (See Section S.)
9. Install the front bumper. (See Section S.)
10. Connect the negative battery cable.
11. Fill the transaxle with the specified ATF. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
12. Inspect for leakage of ATF from the oil pan or the oil hose connecting points.
13. Carry out the mechanical system test. (See K2–72 MECHANICAL SYSTEM TEST.)
14. Carry out the road test. (See K2–75 ROAD TEST.)

OIL COOLER FLUSHING

A6E571419900202

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
- The contaminated cooler line (oil pipes and hoses) and auxiliary cooler (if equipped) must be flushed completely when ATX is overhauled or replaced.
- Performing back and reverse power flushing two times each does not work because debris or particles flow out from the feed pipe side of ATX.

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 & clamps
1. Be sure to inspect the lines (hoses/pipes) for cuts, crimps (pinched), cracks or any other damage before reusing them. If any problem exists replace it.

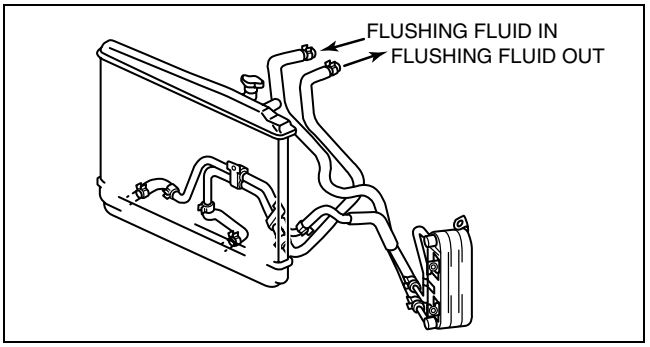
Caution
- **Always use new clamps when replacing hoses.**

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

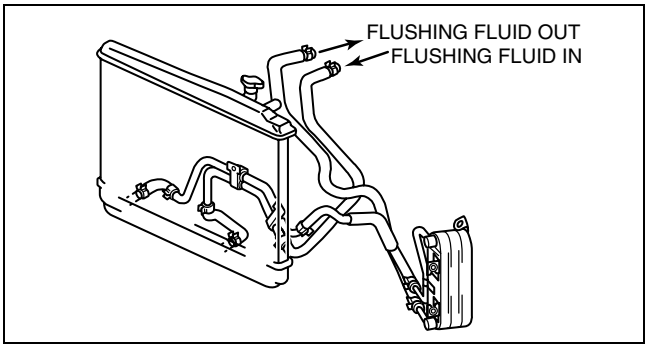
- **If the cooler can not be properly flushed using recommended equipment, send the radiator out for sublet cleaning or replace.**



A6E5714W145

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 discharge fluid is clean.

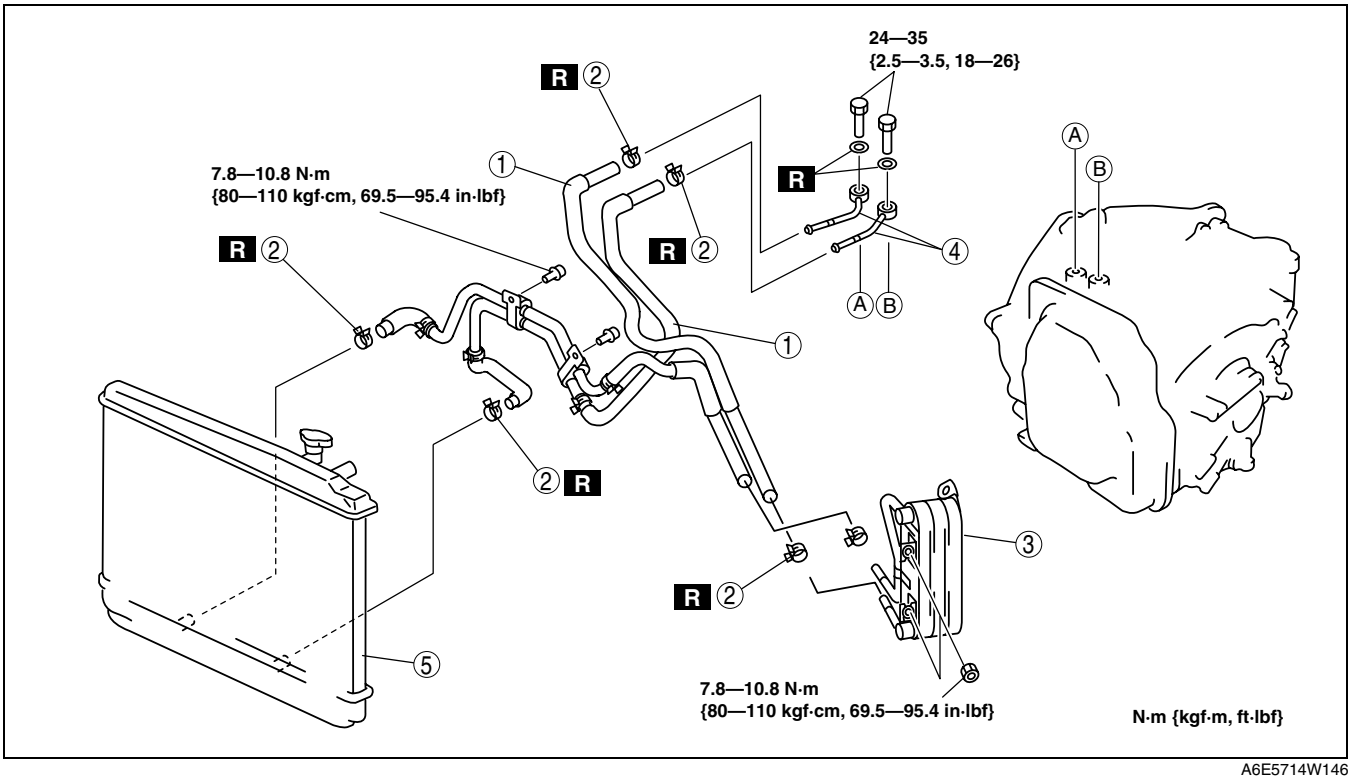


A6E5714W147

OIL COOLER REMOVAL/INSTALLATION

A6E571419900203

1. Disconnect the negative battery cable.
2. Drain the ATF into a container. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
3. Remove the radiator. (See Section E.)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Add ATF to the specified level. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
7. Connect the negative battery cable.
8. Inspect for oil leakage from the oil pipes and oil hoses.
9. Inspect for coolant from the hoses.
10. Inspect the ATF level and condition. (See K2–78 AUTOMATIC TRANSAXLE FLUID (ATF) INSPECTION.)
11. Carry out the line pressure test. (See K2–72 MECHANICAL SYSTEM TEST.)
12. Carry out the road test. (See K2–75 ROAD TEST.)



A6E5714W146

1	Oil hose (See K2–109 Oil Pipe, Hose Clamp, Oil Hose Installation Note)
2	Hose clamp (See K2–109 Oil Pipe, Hose Clamp, Oil Hose Installation Note)
3	Oil cooler

4	Oil pipe (See K2–109 Oil Pipe, Hose Clamp, Oil Hose Installation Note)
5	Radiator (in tank oil cooler) (See K2–108 Radiator (In Tank Oil Cooler) Installation Note)

Radiator (In Tank Oil Cooler) Installation Note

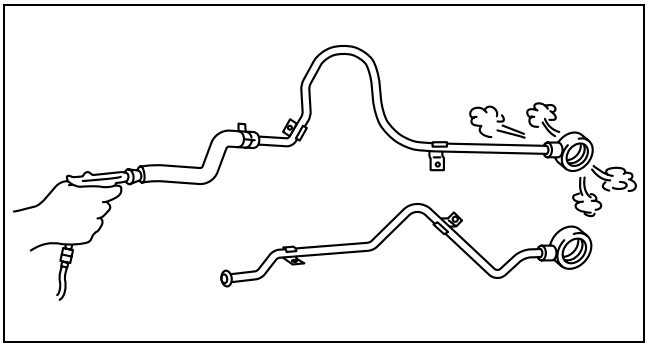
1. The automatic transaxle oil cooler flushing must be performed whenever a transaxle is removed for service because the existing fluid may be contaminated, and to prevent contamination of new fluid.

   Note
   - The flushing must be performed after installation of the overhauled or replacing transaxle.

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 no **less than one minute**.

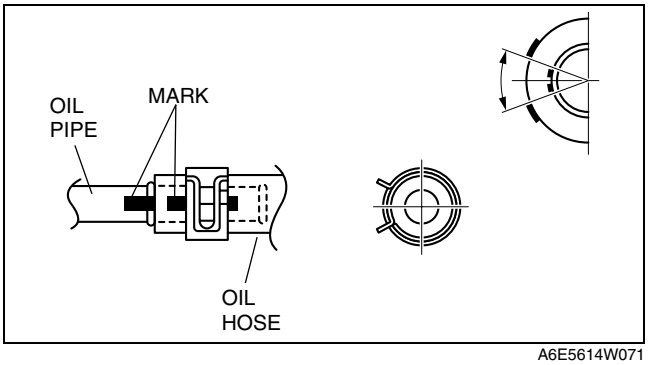


A6E5614W070

2. Align the marks, and slide the oil hose onto the oil pipe until it is fully seated as shown.

   Note
   - If reusing the hose, install the new hose clamp exactly on the mark left by the previous hose camp.Then apply force to the hose clamp in the direction of the arrow in order to fit the clamp in the place.

3. Install the new hose clamp onto the hose.
4. Verify that the hose clamp does not interfere with any other components.

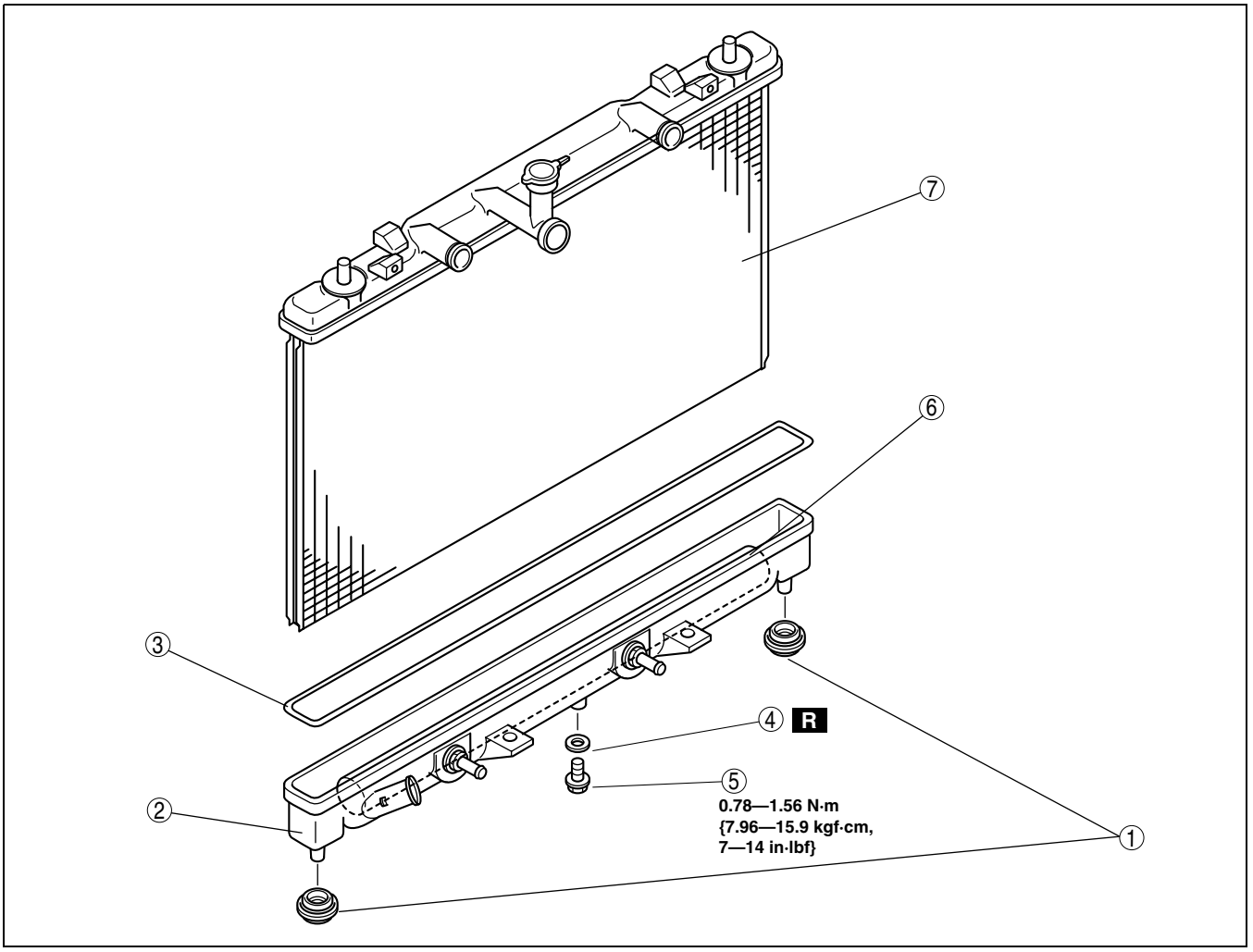


A6E5614W071

OIL COOLER DISASSEMBLY/ASSEMBLY

A6E571419900204

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



A6E5614W072

1	Mount rubber
2	Radiator outer tank (in tank oil cooler) (See K2–110 Radiator Outer Tank (In Tank Oil Cooler) Removal Note.) (See K2–111 Radiator Outer Tank (In Tank Oil Cooler) Installation Note.)
3	O-ring
4	Washer

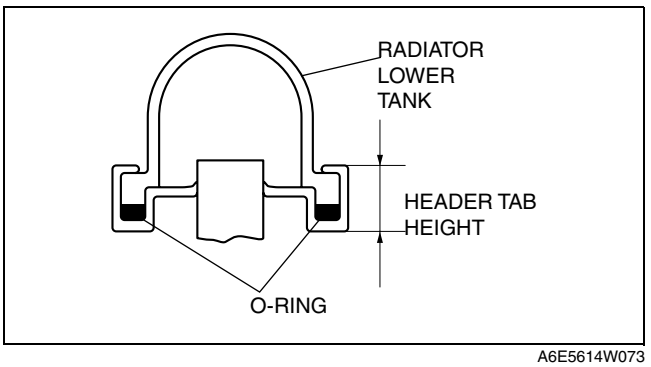
5	Drain cock
6	ATF cooler
7	Radiator

Radiator Outer Tank (In Tank Oil Cooler) Removal 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.

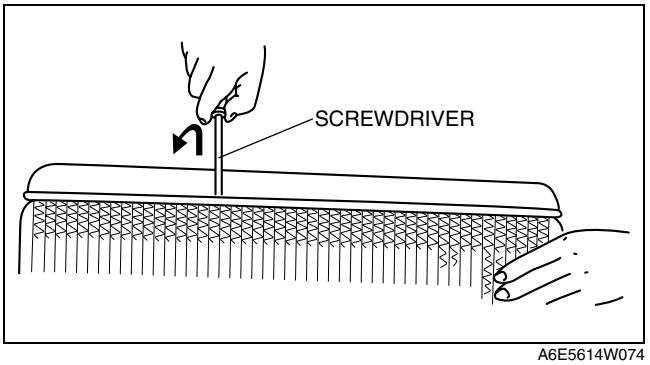


A6E5614W073

3. Pivot the screwdriver to pry the tab away from the tank and repeat the procedure for each tab.
4. Remove the radiator outer tank and O-ring (gasket) from the core header when all of the tabs are opened.

Note
- If any header tabs are missing from the core, replace the radiator.

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 radiator tank.



A6E5614W074

Radiator Outer Tank (In Tank Oil Cooler) Installation Note

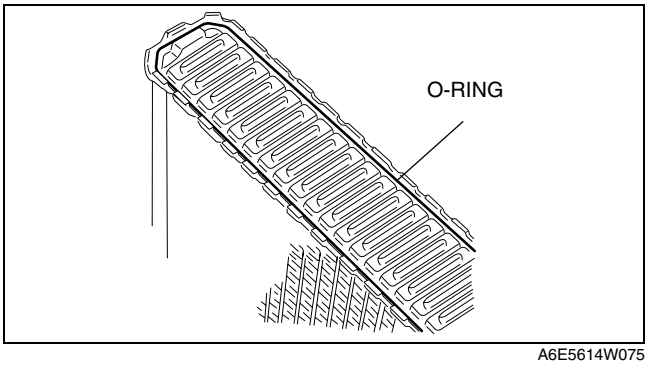
1. Install a new O-ring and ensure it is not twisted.

Note
- The old O-ring must be replaced.

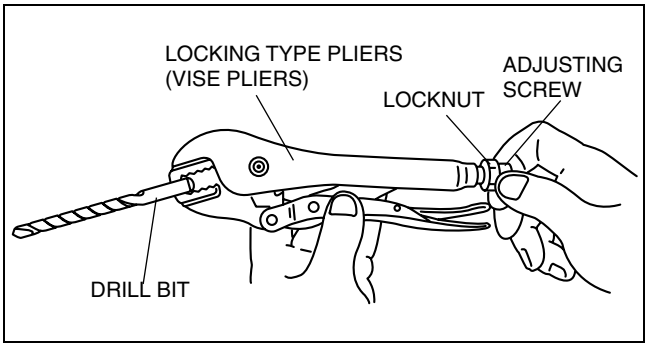
2. Position the radiator tank in the original direction to the core using care not to scratch the tank sealing surface with the header tabs.

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.



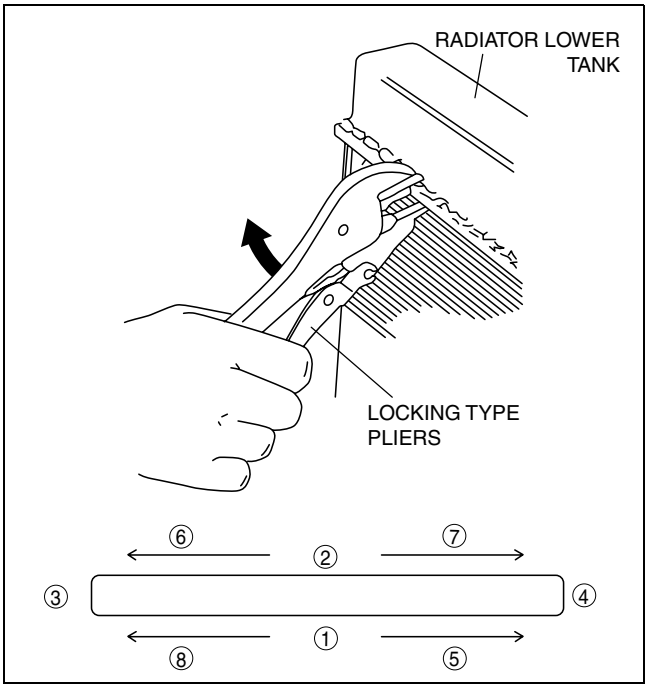
A6E5614W075



A6E5614W093

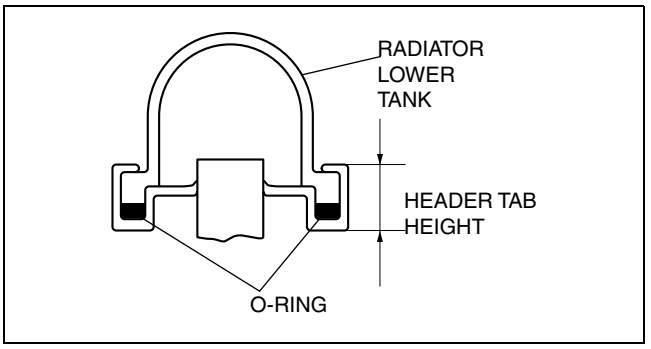
K2

4. Squeeze the header tabs down in order as shown against the lip of radiator outer tank base with locking-type pliers while rotating the pliers toward the tank.



A6E5614W076

5. Verify the height of the header tabs is same as the height before removal.
6. Inspect for leakage from radiator. (See E–8 ENGINE COOLANT LEAKAGE INSPECTION.)



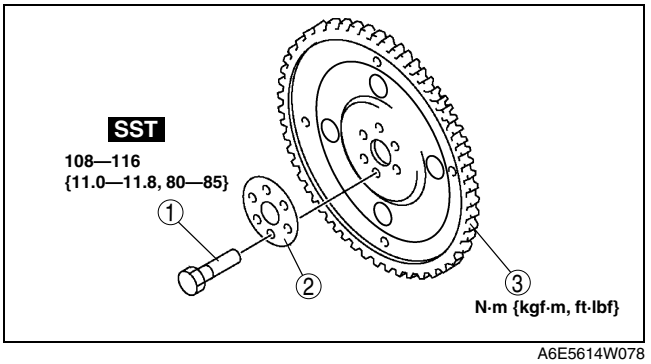
A6E5614W073

DRIVE PLATE REMOVAL/INSTALLATION

A6E571419020201

1. Remove the transaxle.(See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the figure.
3. Install in the reverse order of removal.

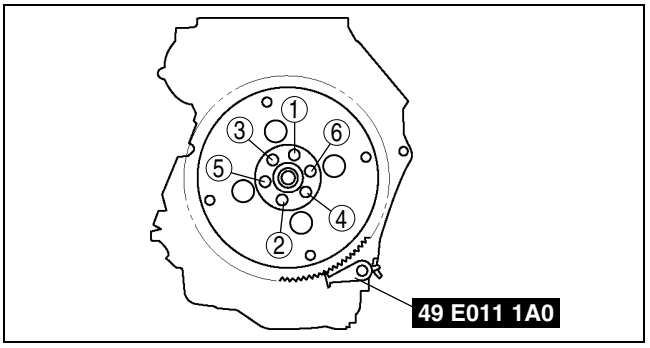
1	Drive plate mounting bolts (See K2–113 Drive Plate Mounting Bolts Removal Note.)
2	Adapter
3	Drive plate (See K2–113 Drive Plate Installation Note.)



A6E5614W078

Drive Plate Mounting Bolts Removal Note

1. Set the **SST** or equivalent against the drive plate.
2. Remove the bolts and the drive plate.



A6E5614W079

Drive Plate Installation Note

Caution

- **If the bolts are reused, remove the oil sealant from the bolt threads. Tightening a bolt that has old sealant on it can cause thread damage.**

1. Remove the sealant from the bolts hole in the crankshaft and from the drive plate mounting bolts.

Note

- If all the previous sealant cannot be removed from a bolt, replace the bolts.
- Do not apply sealant if a new bolts is used.

2. Install the drive plate.
3. Install the adapter.
4. Apply sealant to the drive plate mounting bolts and install them.
5. Set the **SST** or equivalent against the drive plate.

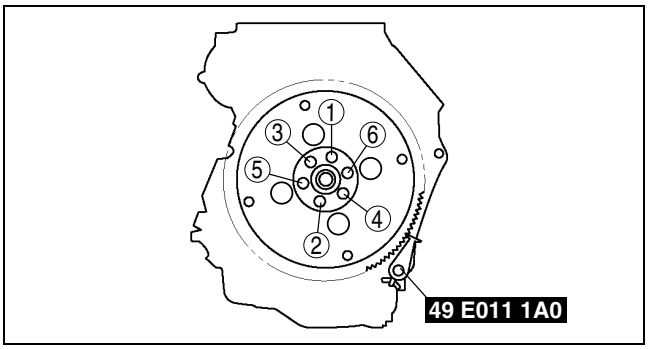
Caution

- **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 or the sealant.**

6. Tighten the drive plate mounting bolts in two or three steps in the order shown.

Tightening torque
108—1116 N·m
{11.0—11.8 kgf·m, 80—85 ft·lbf}

7. Install the transaxle. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/ INSTALLATION.)



A6E5614W081

TRANSFER

TRANSFER OIL INSPECTION

A6E571817001201

1. Park the vehicle on level ground.
2. Remove the PTO heat shield.
3. Remove the filler plug.
4. Verify that the oil is near the brim of the plug port.
   - If the oil level is low, add the specified amount and type of oil through the filler plug hole.

   Specified oil grade
   API Service GL-5
   Specified oil viscosity
   SAE 80W-90

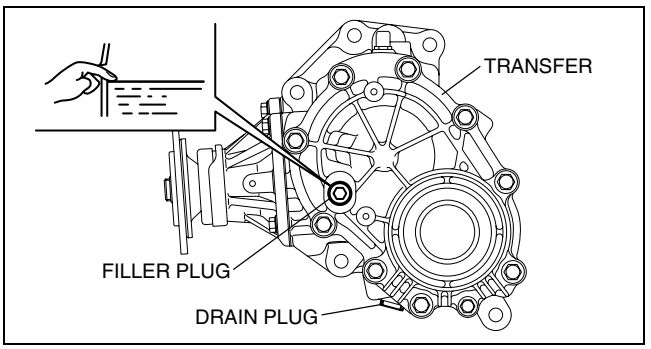
5. Apply a sealant to the thread area of filler plug.

   Specified sealant
   TB1215

6. Install the filler plug.

   Tightening torque
   9.8—19.6 N·m
   {100—199 kgf·cm, 116—175 in·lbf}

7. Install the PTO heat shield. (See K2–116 PTO Heat Shield Installation Note.)



A6E5718W101

TRANSFER OIL REPLACEMENT

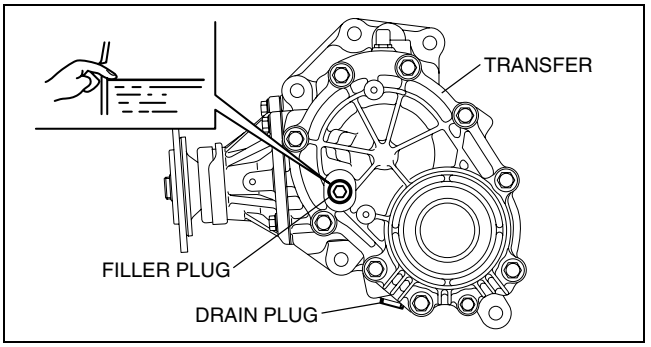
A6E571817001202

1. Remove the drain plug.
2. Drain the oil into a suitable container.
3. Apply a sealant to the thread area of drain plug.

   Specified sealant
   TB1215

4. Install the drain plug.

   Tightening torque
   9.8—19.6 N·m
   {100—199 kgf·cm, 116—175 in·lbf}



A6E5718W101

5. Remove the PTO heat shield.
6. Remove the filler plug and add the specified amount and type of oil through the filler plug hole until the level reaches the bottom of the filler plug hole.

   Specified oil grade
   API Service GL-5
   Specified oil viscosity
   SAE 80W-90
   Capacity (approximate quantity)
   0.62 L {0.65 US qt, 0.54 Imp qt}

7. Apply a sealant to the thread area of filler plug.

   Specified sealant
   TB1215

8. Install the filler plug.

   Tightening torque
   9.8—19.6 N·m
   {100—199 kgf·cm, 116—175 in·lbf}

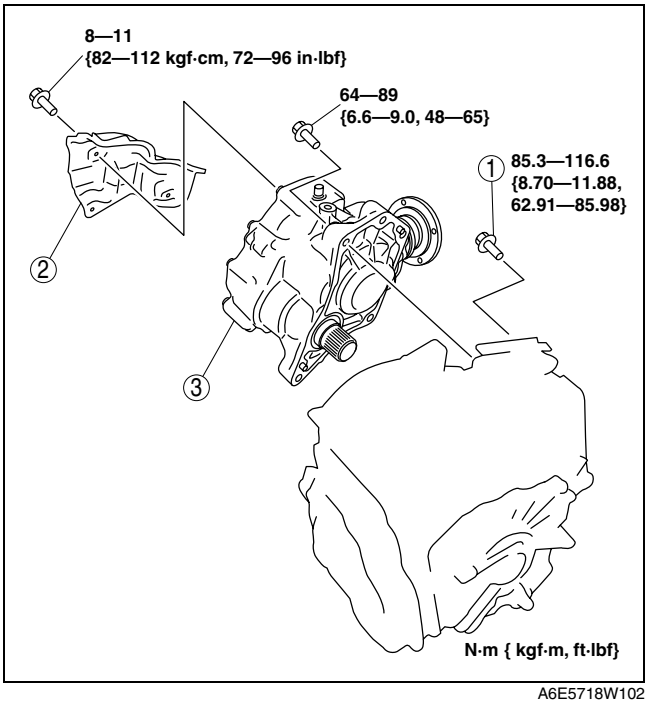
9. Install the PTO heat shield. (See K2–116 PTO Heat Shield Installation Note.)

TRANSFER REMOVAL/INSTALLATION

A6E571817001204

1. Disconnect the negative battery cable.
2. Remove the propeller shaft. (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION.)
3. Remove the TWC. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
4. Remove the front tires and splash shield of right side.
5. Remove the under cover.
6. Remove the drive shaft of right side. (See Section M.)
7. Remove the joint shaft. (See Section M.)
8. Remove the exhaust manifold insulator. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
9. Remove the exhaust manifold. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
10. Remove in the order shown in the figure.
11. Install in the reverse order of removal.

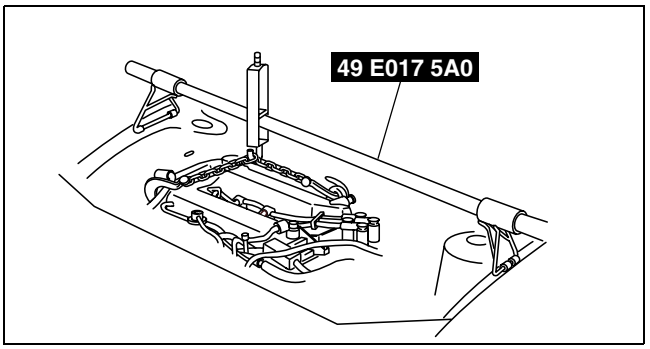
1	No.1 engine mount installation bolt (See K2–115 No.1 Engine Mount Installation Bolt Removal Note) (See K2–116 No.1 Engine Mount Installation Bolt Installation Note)
2	PTO heat shield (See K2–116 PTO Heat Shield Installation Note)
3	Transfer



A6E5718W102

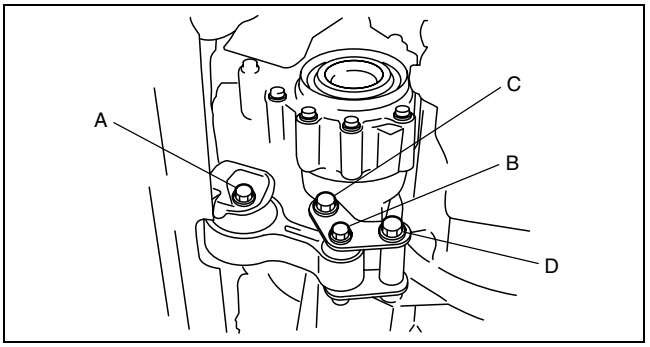
No.1 Engine Mount Installation Bolt Removal Note

1. Support the engine using the **SST** before removing the No.1 engine mount.
2. Loosen the bolt A.
3. Remove the bolt B.



A6E5714W132

4. Remove the bolt C and D.

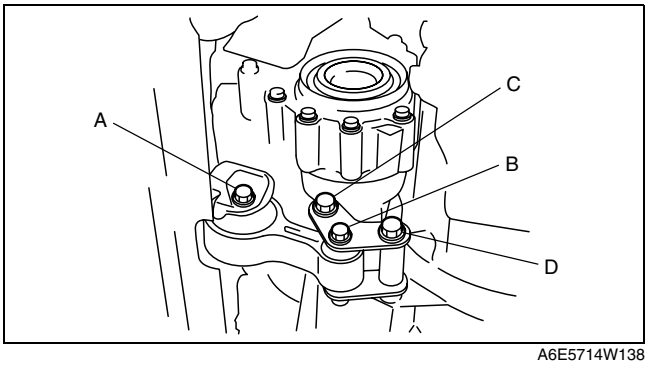


A6E5714W138

No.1 Engine Mount Installation Bolt Installation Note

1. Tighten the bolt C and D.
2. Lightly tighten the bolt B, then bolt A.
3. Tighten the bolt B and A.

Tightening torque
A, C, D: 93.1—116.6 N·m
{9.50—11.88 kgf·m, 68.66—85.98 ft·lbf}
B: 85.3—116.6 N·m
{8.70—11.88 kgf·m, 62.91—85.98 ft·lbf}

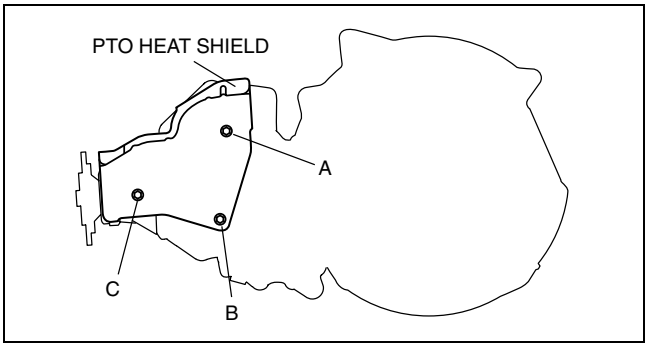


A6E5714W138

PTO Heat Shield Installation Note

1. Lightly tighten the bolt A.
2. Tighten the bolt B, then bolt C.
3. Tighten the bolt A.

Tightening torque
8—11 N·m
{82—112 kgf·cm, 72—97 in·lbf}



A6E5718W104

BREATHER PLUG REMOVAL/INSTALLATION

A6E571817001203

1. Remove the PTO heat shield.
2. Remove the breather plug.

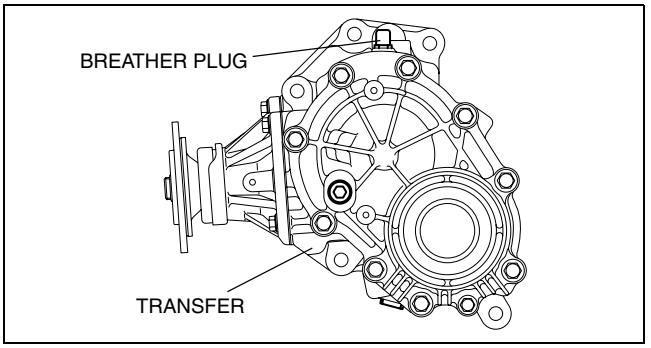
Caution
- **Allowing the breather hole to the close during apply a sealant can affect the transfer operation.**

3. Apply a sealant to the thread area of filler plug.

Specified sealant
TB1215

4. Install the filler plug.

Tightening torque
7.9—11.7 N·m
{81—119 kgf·cm, 71—103 in·lbf}



A6E5718W105

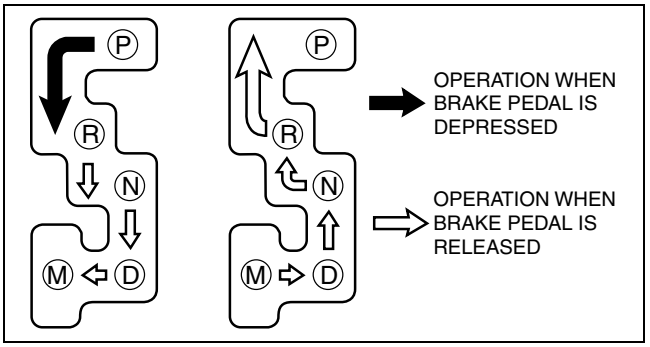
5. Install the PTO heat shield. (See K2–116 PTO Heat Shield Installation Note.)

AUTOMATIC TRANSAXLE SHIFT MECHANISM

SELECTOR LEVER INSPECTION

A6E571646102201

1. Turn the ignition switch to the ON position (engine off).
2. With the brake pedal depressed, verify that a “click” sound is heard at each range when shifted in the pattern shown.
3. Verify that the selector lever can only be shifted as shown.
4. Verify that the position of the selector lever and the selector indicator light correspond.
   - If not as specified, adjust the TR switch. (See K2–83 TRANSAXLE RANGE (TR) SWITCH ADJUSTMENT.)
5. Verify that the vehicle operates in each selected range.



A6E5716W101

SELECTOR LEVER COMPONENT INSPECTION

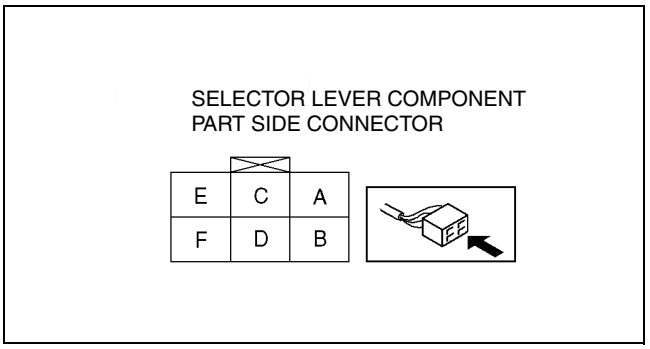
A6E571646102204

1. Disconnect the negative battery cable.
2. Remove the console.
3. Remove the dashboard completely. (See section S.)
4. Disconnect the selector lever component connector.
5. Inspect for continuity at the selector lever component.
   - If not as specified, adjust the selector cable. (See K2–118 SELECTOR CABLE ADJUSTMENT.)

○——○: Continuity

Selector lever position/range		Connector terminal					
		A	B	C	D	E	F
M range	Up switch	○			○		
	Down switch		○	○	○		
	Other			○	○		
Other							

A6A5616W012



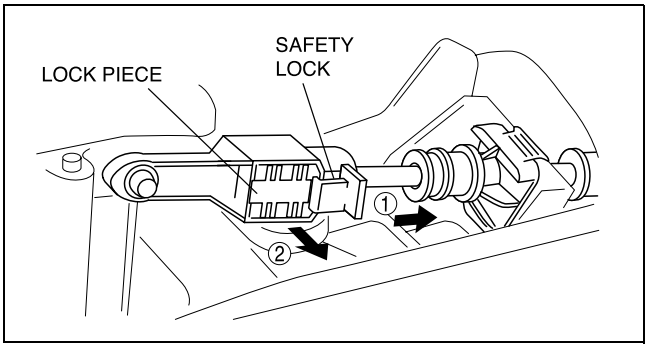
A6A5616W013

K2

SELECTOR CABLE ADJUSTMENT

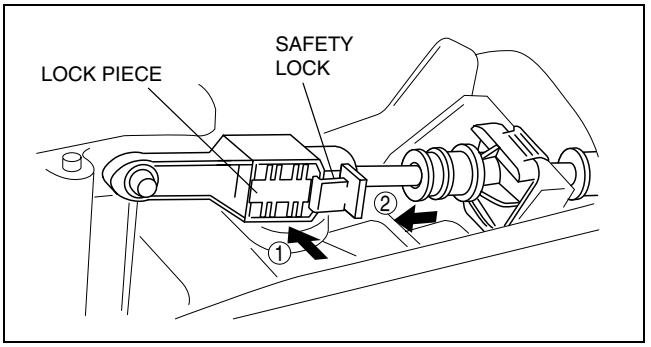
A6E571646500201

1. Remove the center console.
2. Shift the selector lever to P position.
3. Unlock the lock piece of the selector cable (selector lever side) in the order shown in the figure.
4. Verify that the manual shaft is in P position.



A6E5716W102

5. Lock the lock piece of the selector cable (selector lever side) in the order shown in the figure.
6. Install the center console.
7. Shift the selector lever from P position to M range, and make sure that there are no other components in that area to interfere with the lever.

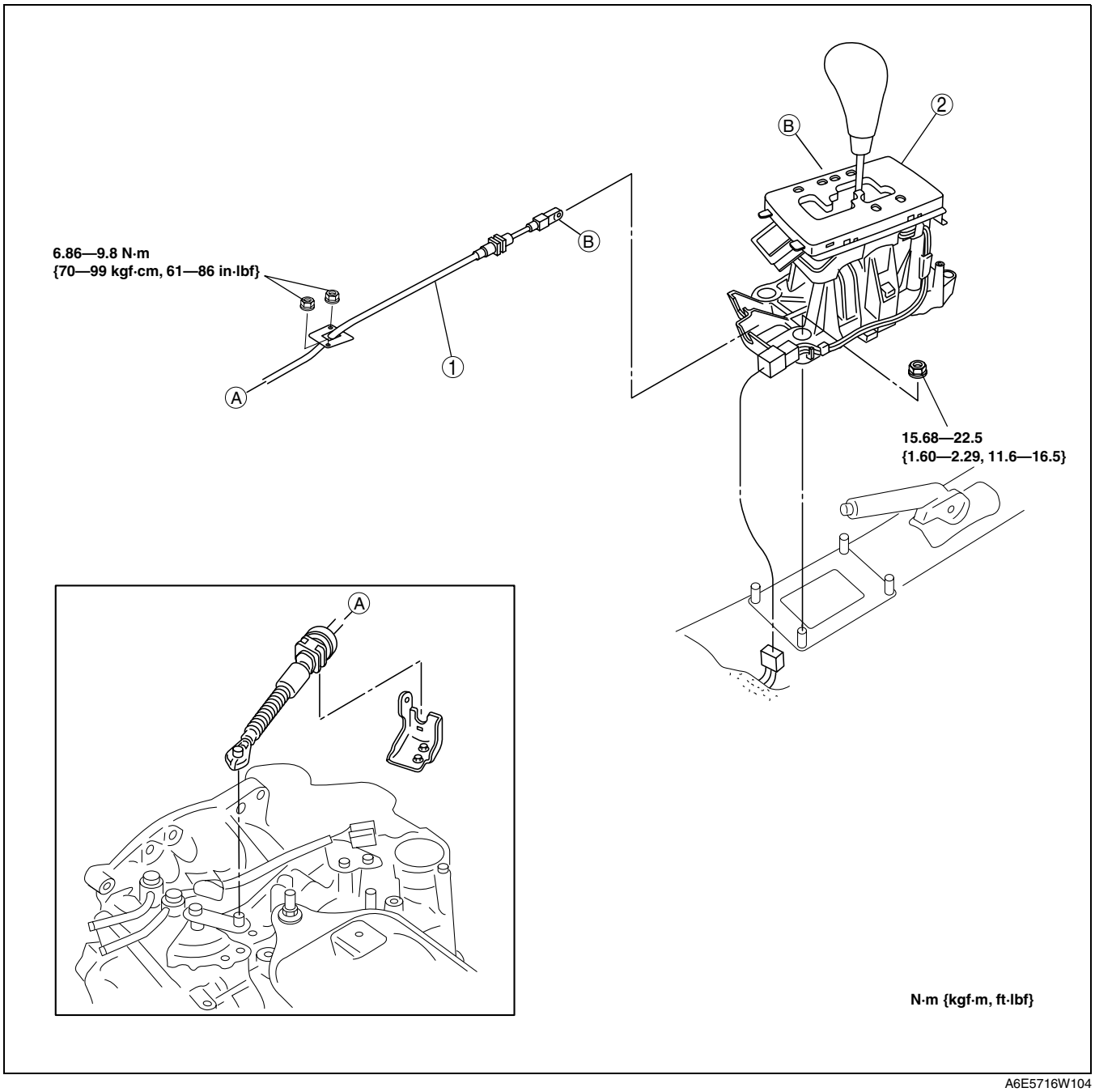


A6E5716W103

SELECTOR LEVER REMOVAL/INSTALLATION

A6E571646102202

1. Disconnect the negative battery cable.
2. Remove the battery and battery tray.
3. Remove the air cleaner compornent. (See Section F.)
4. Remove the console.
5. Remove the dashboard compleat. (See Section S.)
6. Remove the SAS control module. (See Section T.)
7. Remove the climate control unit. (See Section U.)
8. Remove the rear heat duct. (See Section U.)
9. Remove in the order shown in the figure.
10. Install in the reverse order of removal.

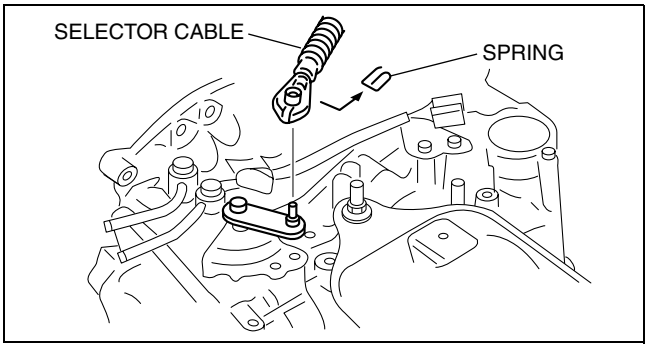


A6E5716W104

1	Selector cable (See K2–120 Selector Cable Removal Note.) (See K2–120 Selector Cable Installation Note.)
2	Selector lever

Selector Cable Removal Note

1. Remove the spring.
2. Remove the selector cable.



A6E5716W105

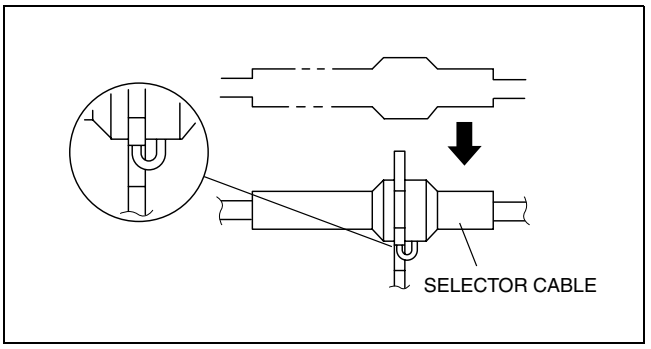
Selector Cable Installation Note

1. Install the selector cable to the selector lever certainly.
2. Install the selector cable to the bracket certainly.

Note

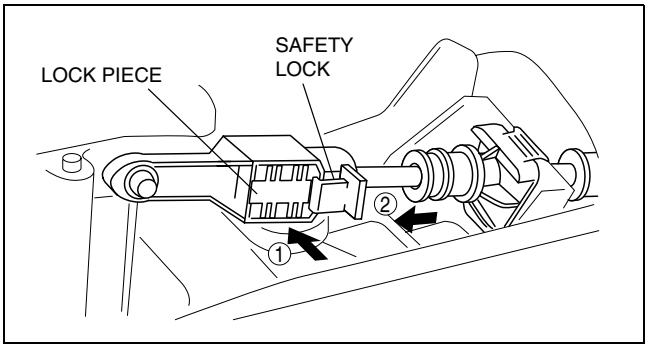
- Step 3, 4 is for the selector cable replacement only.

3. Verify that the selector lever is in P position.



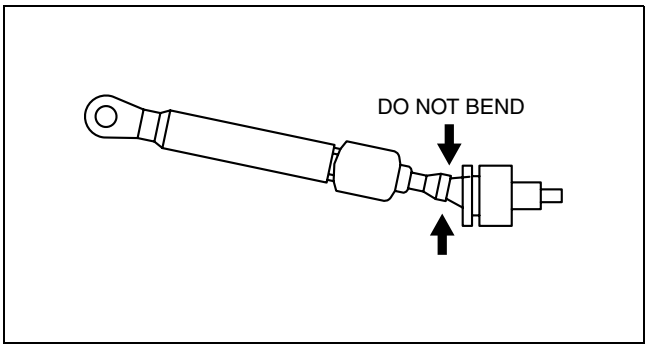
A6E5616W020

4. Lock the lock piece of the selector cable (selector lever side) in the order shown in the figure.



A6E5716W103

5. Verify that the manual shaft is in P position.



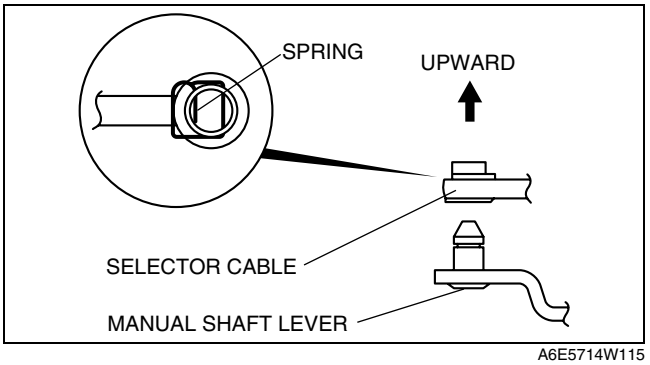
A6E5616W007

Caution

- **Bending the selector cable in the manner shown in the figure will damage the cable and it may become loose when shifted. When installing the selector cable, hold it straight.**

Note

- Install the selector lever to the manual shaft lever with the spring side of the selector cable end facing the upward of the vehicle.



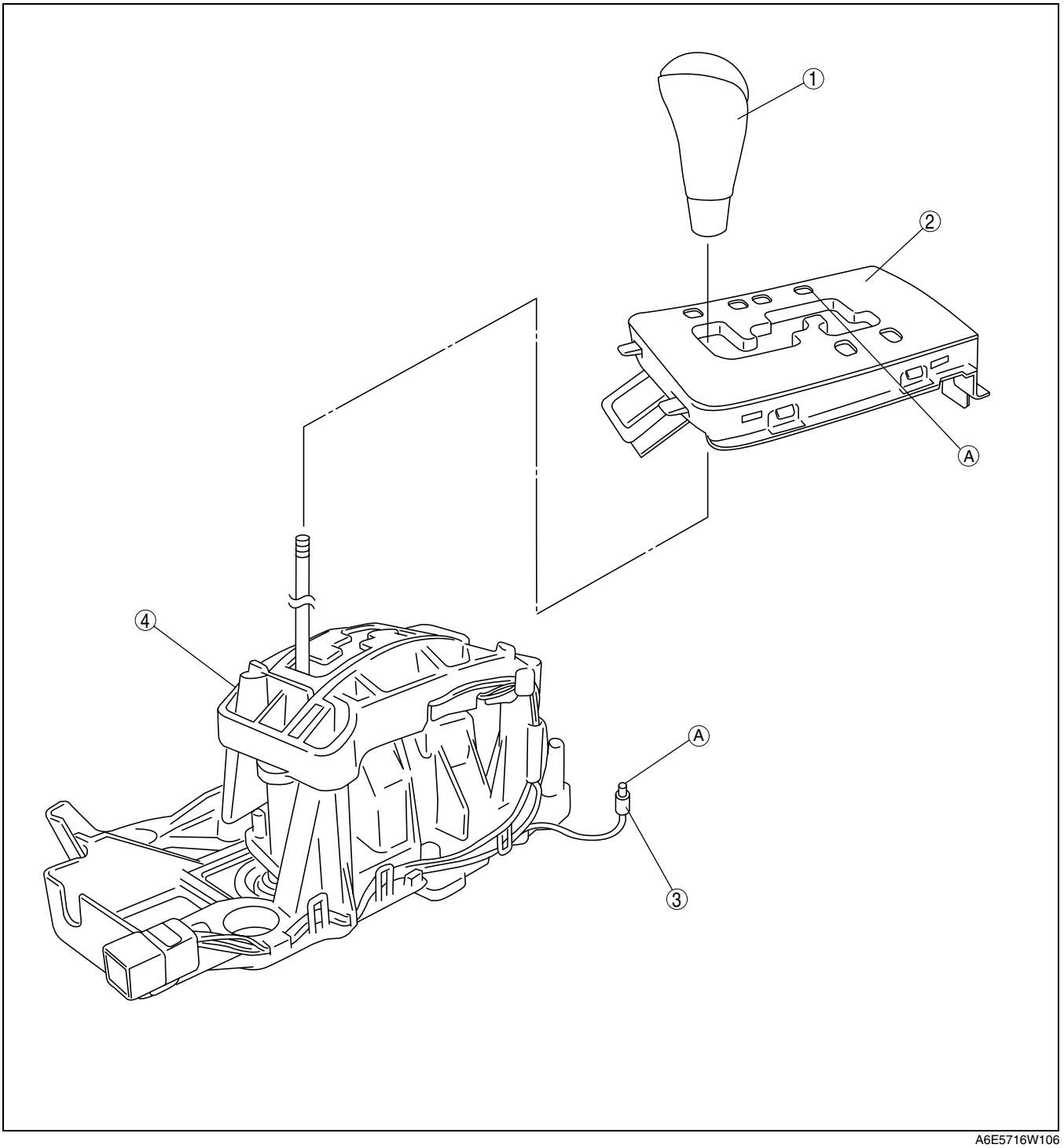
A6E5714W115

6. Install the selector lever to the manual shaft lever in such a way that the selector cable does not bear a load.
7. Confirm that the end of the manual shift lever sticks out of the end of the selector cable.
8. Install the selector cable to the selector cable securely bracket.

SELECTOR LEVER DISASSEMBLY/ASSEMBLY

A6E571646102203

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



A6E5716W106

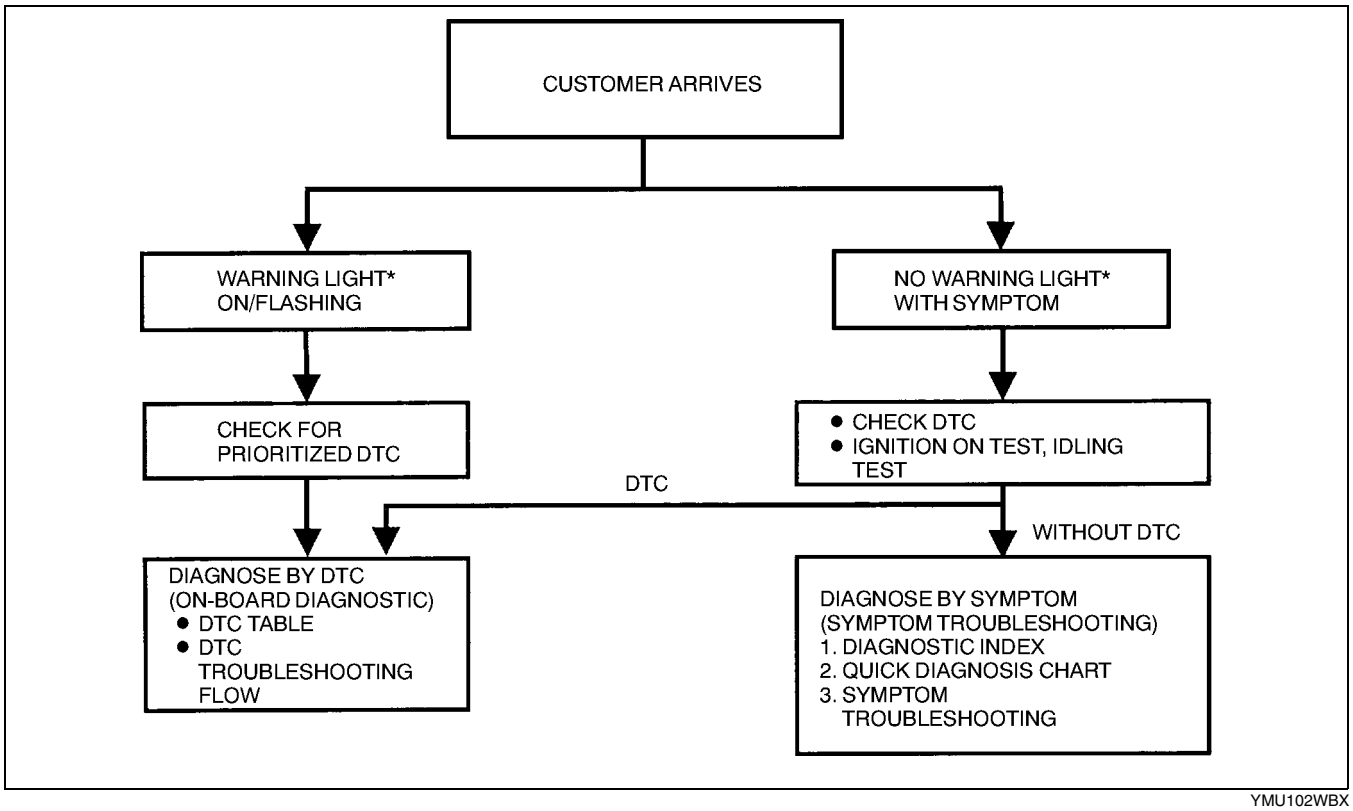
1	Selector lever knob	3	Selector illumination light
2	Indicator panel	4	Selector lever

ON-BOARD DIAGNOSTIC

FOREWORD

A6E577018901201

- When the customer reports vehicle malfunction, check the malfunction indicator lamp (MIL) indication, AT warning indication, and diagnostic trouble code (DTC), then diagnose the malfunction according to following flowchart.
  - — If the DTC exists, diagnose the applicable DTC inspection. (See K2–126 DTC TABLE.)
  - — If the DTC does not exist, the MIL and AT warning light does not illuminate, diagnose the applicable symptom troubleshooting. (See K2–183 AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING.)



YMU102WBX

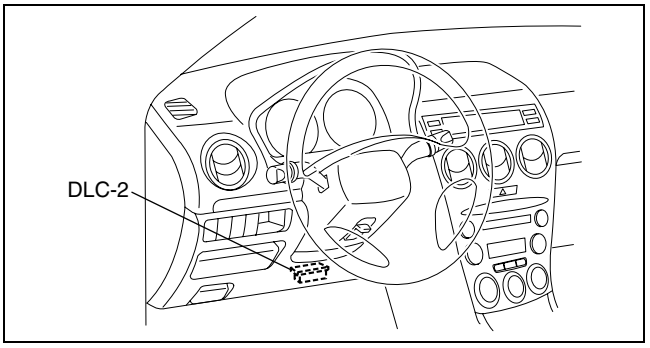
*:Malfunction Indicator lamp (MIL), AT warning light

AUTOMATIC TRANSAXLE ON-BOARD DIAGNOSTIC FUNCTION

A6E577018901202

DTC Reading Procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect **SST** (WDS or equivalent) to the vehicle DLC-2 16-pin connector located the left side of the center console.
3. Retrieve DTCs by **SST** (WDS or equivalent).



A6E3970W002

AFTER REPAIR PROCEDURE

A6E577018901203

Caution
- **After repairing a malfunction, perform this procedure to verify that the malfunction has been corrected.**
- **When this procedure is carried out, be sure to drive the vehicle at lawful speed and pay attention to the other vehicles.**

1. Connect the **SST** (WDS or equivalent) to the DLC-2.
2. Turn the ignition key to ON (engine OFF).
3. Select the clear code function and clear the DTC.
4. Perform the following trouble code inspections to ensure that the DTC has been resolved:
   - For P0705
     i. Start the engine.
     ii. Warm up the engine to normal operating temperature.
     iii. Depress the brake pedal, and shift the selector lever between P to D for **5 seconds or more**.
     iv. Go to Step 5.
   - For P0706
     i. Start the engine.
     ii. Warm up the engine to normal operating temperature.
     iii. Depress the brake pedal, and shift the selector lever between P to D for **100 seconds or more**.
     iv. Go to Step 5.
   - For P0711
     i. Decrease ATF temperature to **20 °C {68 °F} or below**.
     ii. Start the engine.
     iii. Drive the vehicle in D range for **10 minutes or more**.
     iv. Go to Step 5
   - For P0712
     i. Start the engine.
     ii. Warm up the engine to normal operating temperature.
     iii. Drive the vehicle in D range for **20 seconds or more**.
     iv. Go to Step 5.
   - For P0713
     i. Start the engine.
     ii. Warm up the engine to normal operating temperature.
     iii. Drive the vehicle in D range at **20 km/h {12mph} or above** for **300 seconds or more**.
     iv. Go to Step 5.
   - For P0715; P0791
     i. Start the engine.
     ii. Drive the vehicle under the following conditions for **2 seconds or more**.
        — Vehicle speed (VSS PID): **40 km/h {25 mph} or above**
        — Engine speed (RPM PID): **1,500 rpm or above**.
        — Selector lever position: D range
     iii. Repeat Step ii again.
     iv. Turn the IG switch to OFF.
     v. Start the engine.
     vi. Drive vehicle under the following conditions for **2 second or more**.
        — Vehicle speed (VSS PID): **40 km/h {25 mph} or above**
        — Engine speed (RPM PID): **1,500 rpm or above**.
        — Selector lever position: D range
     vii. Go to Step 5.
   - For P0720
     i. Start the engine.
     ii. Warm up the engine and ATX.
     iii. Drive vehicle under the following conditions for **2 seconds or more**.
        — Selector lever position: D range
        — Vehicle speed (VSS PID): **40 km/h {25 mph}**
        — Engine speed (RPM PID): **1,500 rpm or above**.
     iv. Go to Step 5.

- For P0740
  i. Start the engine.
  ii. Warm up the engine and ATX.
  iii. Drive vehicle under the following conditions for **10 seconds or more**.
    — Vehicle speed (VSS PID): **76 km/h {47 mph}**
    — Selector lever position: D range
    — TCC operating
  iv. Go to Step 5.
- For P0743
  i. Start the engine.
  ii. Warm up the engine and ATX.
  iii. Drive the vehicle in D range and make sure that the gears shift smoothly from 1GR to 5GR and TCC is operated.
  iv. Go to Step 5.
- For P0748, P0751, P0752, P0753, P0756, P0757, P0758, P0761, P0762, P0763, P0768, P0773, P0778, P0798, P1710, PC073, PC100
  i. Start the engine.
  ii. Warm up the engine and ATX.
  iii. Drive the vehicle in D range and make sure that the gears shift smoothly from 1GR to 5GR.
  iv. Go to Step 5.

5. Gradually slow down and stop the vehicle.
6. Make sure that the repaired DTC does not recur.

DTC TABLE

A6E577018901204

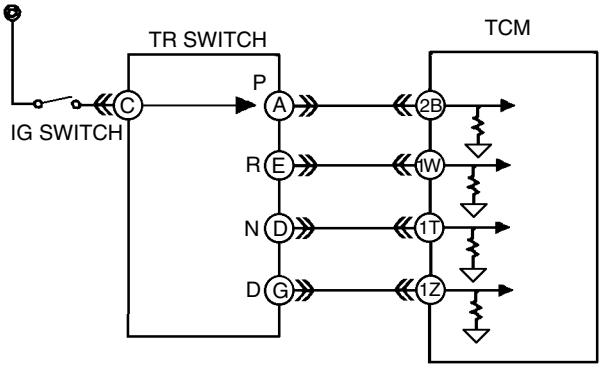
DTC No.	Condition	MIL	AT warning light	DC	*Monitor item	Memory function	Page
P0705	Transaxle range (TR) switch circuit malfunction (power short circuit)	X	X	2	CCM	X	(See K2–127 DTC P0705)
P0706	Transaxle range (TR) switch circuit malfunction (Open/ground short circuit)	X	X	2	CCM	X	(See K2–129 DTC P0706)
P0711	Transaxle fluid temperature (TFT) sensor malfunction (Stuck)	X	NO	2	CCM	X	(See K2–132 DTC P0711)
P0712	Transaxle fluid temperature (TFT) sensor circuit malfunction (short circuit)	X	X	2	CCM	X	(See K2–133 DTC P0712)
P0713	Transaxle fluid temperature (TFT) sensor circuit malfunction (open circuit)	X	X	2	CCM	X	(See K2–135 DTC P0713)
P0715	Input/turbine speed sensor circuit malfunction	X	X	2	CCM	X	(See K2–137 DTC P0715)
P0720	Vehicle speedometer sensor (VSS) circuit malfunction	X	X	2	CCM	X	(See K2–139 DTC P0720)
P0740	Torque converter clutch (TCC) system malfunction	X	–	2	CCM	X	(See K2–142 DTC P0740)
P0743	Torque converter clutch (TCC) solenoid valve circuit malfunction	X	X	1	CCM	X	(See K2–144 DTC P0743)
P0748	Pressure control solenoid circuit malfunction	–	X	–	CCM	X	(See K2–146 DTC P0748)
P0751	Shift solenoid A malfunction (stuck off)	X	–	2	CCM	X	(See K2–149 DTC P0751)
P0752	Shift solenoid A malfunction (stuck on)	X	–	2	CCM	X	(See K2–150 DTC P0752)
P0753	Shift solenoid A circuit malfunction (open/short)	X	X	1	CCM	X	(See K2–151 DTC P0753)
P0756	Shift solenoid B malfunction (stuck off)	X	–	2	CCM	X	(See K2–153 DTC P0756)
P0757	Shift solenoid B malfunction (stuck on)	X	–	2	CCM	X	(See K2–154 DTC P0757)
P0758	Shift solenoid B circuit malfunction (open/short)	X	X	1	CCM	X	(See K2–155 DTC P0758)
P0761	Shift solenoid C malfunction (stuck off)	X	–	2	CCM	X	(See K2–158 DTC P0761)
P0762	Shift solenoid C malfunction (stuck on)	X	–	2	CCM	X	(See K2–159 DTC P0762)
P0763	Shift solenoid C circuit malfunction (open/short)	X	X	1	CCM	X	(See K2–160 DTC P0763)
P0768	Reduction timing solenoid valve circuit malfunction (open/short)	–	X	–	CCM	X	(See K2–163 DTC P0768)
P0773	Neutral shift solenoid valve circuit malfunction (open/short)	–	X	–	CCM	X	(See K2–166 DTC P0773)
P0778	2-4 brake solenoid valve circuit malfunction (open/short)	–	X	–	CCM	X	(See K2–169 DTC P0778)
P0791	Intermediate sensor circuit malfunction (open/short)	X	X	2	CCM	X	(See K2–172 DTC P0791)
P0798	High clutch solenoid valve circuit malfunction (open/short)	–	X	–	CCM	X	(See K2–175 DTC P0798)
P1710	GND return circuit malfunction	–	–	–	Other	X	(See K2–178 DTC P1710)
U0073	CAN BUS OFF	(See T–41 DTC TABLE)					
U0100	TCM cannot receive any signals from PCM	(See T–41 DTC TABLE)					

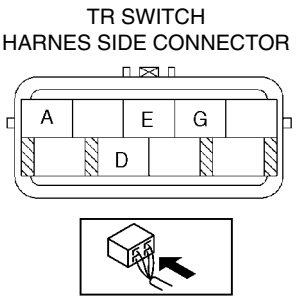
* : Indicates the applicable item in On-Board System Readiness Test defined by CARB.

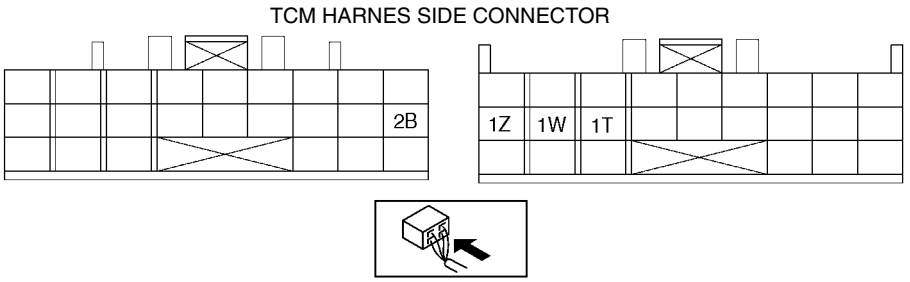
DTC P0705

A6E577018901205

DTC P0705	Transaxle range (TR) switch circuit malfunction (short circuit)
DETECTION CONDITION	• Two or more range signals are input from TR switch for **5 seconds or more**. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available above malfunction condition during first drive cycle. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• TCM malfunction. • Short to power between TR switch terminal A and TCM terminal 2B • Short to power between TR switch terminal E and TCM terminal 1W • Short to power between TR switch terminal D and TCM terminal 1T • Short to power between TR switch terminal G and TCM terminal 1Z • Damaged connector between TR switch and TCM • TR switch malfunction







Diagnostic procedure

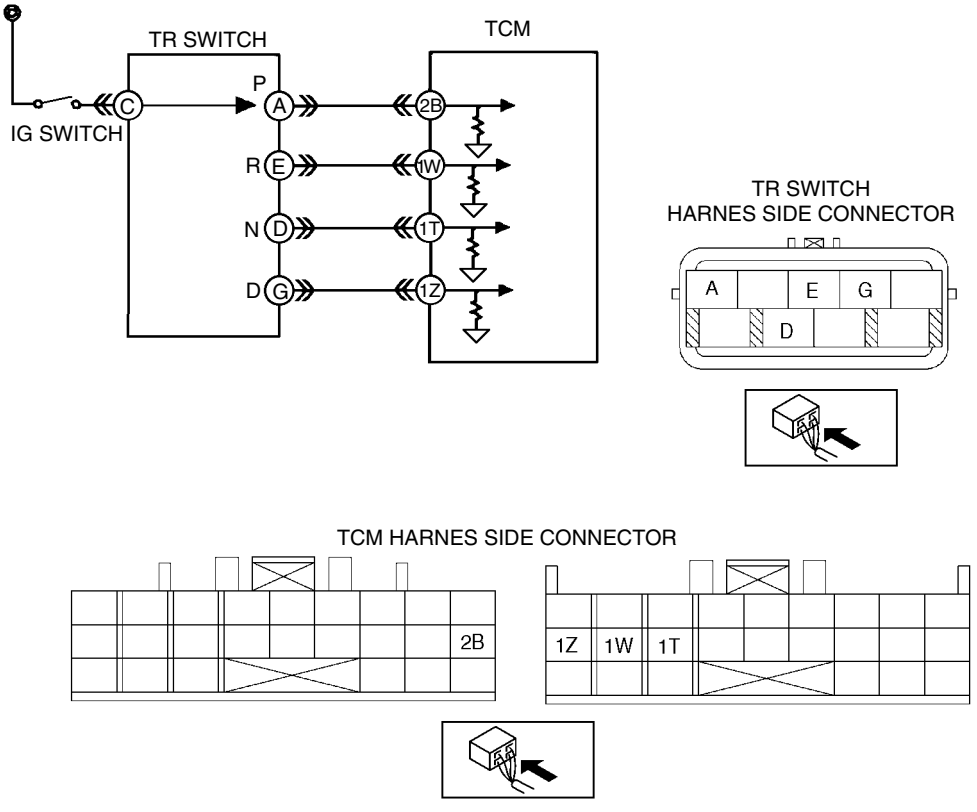
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.

STEP	INSPECTION		ACTION
3	**VERIFY CURRENT INPUT SIGNAL STATUS-IS CONCERN INTERMITTENT OR CONSTANT?** • Connect volt meter to TCM. • Turn ignition key to ON (engine OFF). • Inspect TCM terminal voltages. (See K2–90 TCM INSPECTION.) — TCM terminal 2B • P position: B+ • Other positions and all ranges: 0V — TCM terminal 1W • R position: B+ • Other positions and all ranges: 0V — TCM terminal 1T — N position: B+ — Other positions and all ranges: 0V — TCM terminal 1Z • D range: B+ • Other ranges and all positions: 0V • Are two or more of following terminal voltage at the same time when shifting selector lever from P position to D range?	Yes	Go to next step.
		No	Go to intermittent concern troubleshooting procedure. (See section F1.)
4	**INSPECT TR SWITCH CONNECTOR** • Turn ignition key OFF. • Disconnect TR switch connector. • Inspect bent terminals of pins using mirror. • Are TR switch terminals okay?	Yes	Go to next step.
		No	Repair terminals or replace TR switch, then go to Step 8. (See K2–81 TRANSAXLE RANGE (TR) SWITCH REMOVAL/INSTALLATION.)
5	**INSPECT TR SWITCH CIRCUIT MALFUNCTION** • Connect voltmeter to TCM. • Turn ignition key to ON (engine OFF). • Does TCM terminal voltage change from B+ to 0V when TR switch connector is disconnected?	Yes	Go to next step.
		No	Go to Step 7.
6	**INSPECT TR SWITCH CONTINUITY** • Turn ignition key to OFF. • Disconnect TR switch connector. • Inspect TR switch for continuity in positions/ranges failed in Step 4. • Is there continuity between TR switch terminals (part side)? (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION.)	Yes	Go to Step 8.
		No	Replace TR switch, then go to Step 8. (See K2–81 TRANSAXLE RANGE (TR) SWITCH REMOVAL/INSTALLATION.)
7	**INSPECT TR SWITCH CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Measure voltage at TR switch terminal A, E, D, G, I, and F (harness-side). • Is there **0 V** at TR switch harness side connector?	Yes	Go to next step.
		No	Repair or replace wiring, then go to next step.
8	**VERIFY TROUBLESHOOTING OF DTC P0705 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Turn ignition key to on (engine off). • Drive vehicle in each range (P, R, N, and D) for **5 seconds or more**. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0706

A6E577018901206

DTC P0706	Transaxle range (TR) switch circuit malfunction (open/ground short circuit)
DETECTION CONDITION	• No range signal is input from TR switch for **100 seconds or more**. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• TR switch malfunction. • TR switch misadjustment • Short to ground between TR switch terminal A and TCM terminal 2B • Short to ground between TR switch terminal E and TCM terminal 1W • Short to ground between TR switch terminal D and TCM terminal 1T • Short to ground between TR switch terminal G and TCM terminal 1Z • Open circuit between TR switch terminal A and TCM terminal 2B • Open circuit between TR switch terminal E and TCM terminal 1W • Open circuit between TR switch terminal D and TCM terminal 1T • Open circuit between TR switch terminal G and TCM terminal 1Z • Open circuit between TR switch terminal C and IG key (ACC) • Short to ground between TR switch terminal C and IG key (ACC) • Damaged connector between TR switch and TCM. • TCM malfunction.



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.

STEP	INSPECTION		ACTION
2	**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.
3	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Check for poor connection (damaged pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
4	**INSPECT TR SWITCH CIRCUIT** • Connect voltmeter to TCM. • Inspect TCM terminal voltage. — TCM terminal 2B • P position: B+ • Other positions and all ranges: 0V — TCM terminal 1W • R position: B+ • Other position and all ranges: 0V — TCM terminal 1T • N position: B+ • Other position and all range: 0V — TCM terminal 1Z • D range: B+ • Other ranges and all positions: 0V • Are any of following terminal voltage turned on for even a moment while shifting selector lever slowly from P position to D range?	Yes	Adjust TR switch, then go to Step 12. (See K2–83 TRANSAXLE RANGE (TR) SWITCH ADJUSTMENT.)
		No	Go to next step.
5	**INSPECT TR SWITCH CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Check for poor connection (damaged pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
6	**INSPECT TR SWITCH CIRCUIT** • Disconnect TR switch connector. • Connect voltmeter to TCM. • Turn ignition key to ON (engine OFF). • Connect harness side connector power line and signal line using jumper wire — P position: C and A — R position: C and E — N position: C and D — D range: C and G • Inspect if terminal voltage changes. — 0V to B+ • Does terminal voltage change?	Yes	Go to next step.
		No	Go to Step 9.
7	**INSPECT TR SWITCH FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Inspect continuity between TR switch terminals (part side). — P position: C and A — R position: C and E — N position: C and D — D range: C and G • Is there continuity between TR switch terminals (part side)? (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION.)	Yes	Go to Step 12.
		No	Replace TR switch, then go to Step 12. (See K2–81 TRANSAXLE RANGE (TR) SWITCH REMOVAL/INSTALLATION.)
8	**INSPECT TR SWITCH POWER CIRCUIT FOR OPEN CIRCUIT** • Check voltage at TR switch terminal C (harness-side). • Is there **B+** at TR switch terminal C (harness-side)?	Yes	Go to next step.
		No	Inspect main fuse. • If okay, repair or replace wiring, then go to Step 12.

STEP	INSPECTION		ACTION
9	**INSPECT PCM CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Check for poor connection (damaged pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
10	**INSPECT TR SWITCH SIGNAL CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TR switch terminals (harness-side) and TCM terminals (harness-side). — P position: A and 2B — R position: E and 1W — N position: D and 1T — D range: G and 1Z • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
11	**INSPECT TR SWITCH CIRCUIT FOR SHORT TO GROUND** • Check continuity between TCM terminals (harness-side) and body ground. — P position: 2B and body ground — R position: 1W and body ground — N position: 1T and body ground — D range: 1Z and body ground • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0706 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in each range (P, R, N, and D) for **100 seconds or more**. • Is there pending code present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0711

A6E577018901207

DTC P0711	Transaxle fluid temperature (TFT) sensor malfunction (stuck)
DETECTION CONDITION	• TFT sensor signal stays outside normal temperature range for **10 minute or more**. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• TFT sensor malfunction. • Connector corrosion. • TCM malfunction.

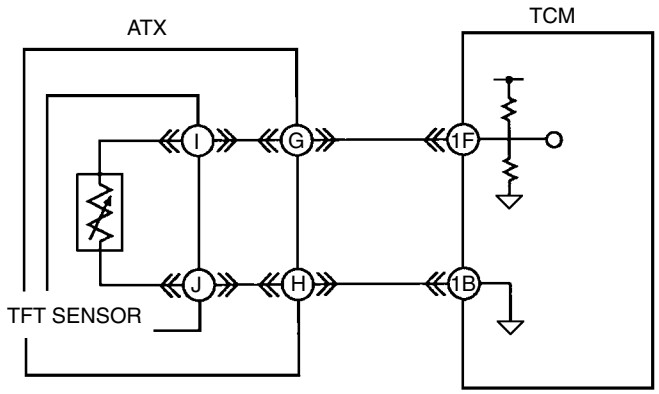
Diagnostic procedure

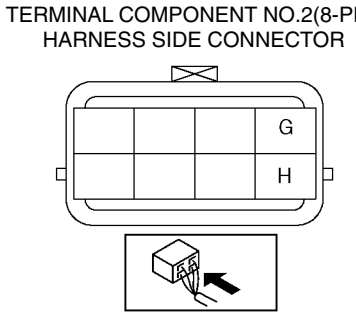
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**INSPECT TFT SENSOR VOLTAGE** • Connect voltmeter to TCM terminal 1F. • Turn ignition key to ON (engine OFF). • Is TCM terminal voltage **1.55 V**?	Yes	Go to next step.
		No	Go to Step 6.
4	**VERIFY CURRENT INPUT SIGNAL STATUS - IS CONCERN INTERMITTENT OR CONSTANT?** • Start engine. • Drive vehicle at **60 km/h {37 mph} or above** for **10 minutes or more**. — ATF **20 °C {68 °F}**: **1.55 V** — ATF **60 °C {140 °F}**: **0.7 V** • Does TCM terminal voltage change?	Yes	Go to Step 6.
		No	Go to next step.
5	**INSPECT TERMINAL CONDITION** • Turn ignition key to OFF. • Disconnect terminal component No.2 (8-pin). • Inspect terminals for corrosion. • Are terminals okay?	Yes	Replace TFT sensor, then go to next step.
		No	Repair or replace terminals, then go to next step.
6	**VERIFY TROUBLESHOOTING OF DTC P0711 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Decrease ATF temperature to **20 °C {68 °F} or below**. • Drive vehicle at **60 km/h {37 mph} or above** for **10 minutes or more**. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

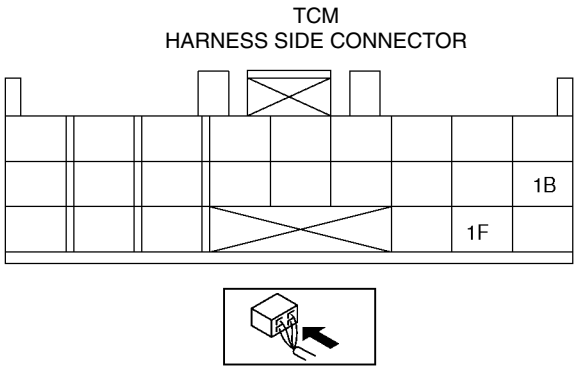
DTC P0712

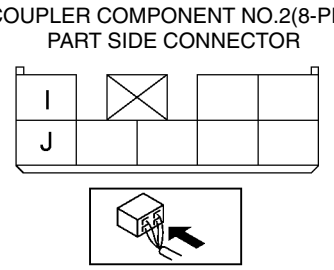
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DTC P0712	Transaxle fluid temperature (TFT) sensor circuit malfunction (short to ground)
DETECTION CONDITION	• Signal from TFT sensor is **0.088 V or less** for **20 seconds or more**. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• TFT sensor malfunction. • Open circuit between TFT sensor and TCM terminal 1F • Open circuit between TFT sensor and TCM terminal 1B • Damaged connectors between TFT sensor and TCM • TCM malfunction









Diagnostic procedure

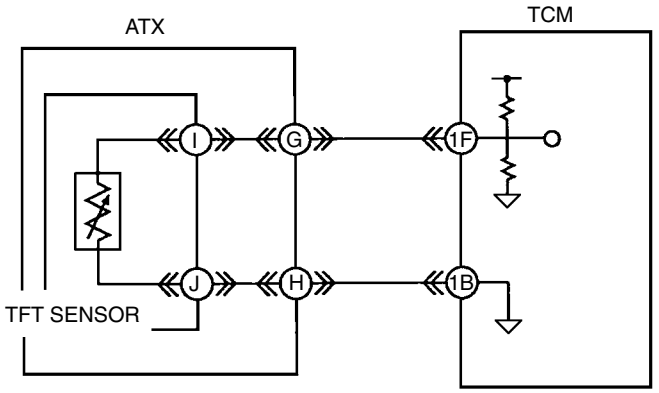
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**VERIFY CURRENT INPUT SIGNAL STATUS - IS CONCERN INTERMITTENT OR CONSTANT?** • Turn ignition key to OFF. • Connect voltmeter to TCM terminal 1F. • Turn ignition key to ON (engine OFF). • Are TCM terminal voltage **within 0.2—4.9 V**?	Yes	Go to intermittent concern troubleshooting procedure. (See section F1.)
		No	Go to next step.

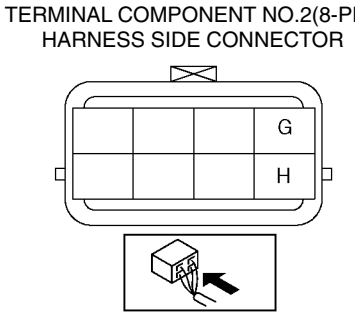
STEP	INSPECTION		ACTION
4	**INSPECT TERMINAL CONDITION** • Turn ignition key to OFF. • Disconnect terminal component No.2. • Inspect bent terminals. • Is there any malfunction?	Yes	Repair or replace terminals, then go to Step 9. • If terminals cannot be repaired, replace harness, then go to Step 9.
		No	Go to next step.
5	**INSPECT TFT SENSOR CIRCUIT** • Turn ignition key to ON (engine OFF). • Verify if TCM terminal voltage changes to **4.9 V or above** when terminal component No.2 disconnected. • Does TCM terminal voltage change?	Yes	Go to next step.
		No	Go to Step 8.
6	**INSPECT COUPLER COMPONENT (8-PIN) TERMINALS CONDITION** • Turn ignition key to OFF. • Disconnect coupler component (8-pin) connector. • Inspect bent coupler component (8-pin) terminals. • Is there any malfunction?	Yes	Repair or replace connector and/or terminal.
		No	Go to next step.
7	**INSPECT COUPLER COMPONENT (8-PIN) CIRCUIT FOR SHORT TO GROUND** • Check continuity between coupler component (8-pin) terminals (part-side) and body ground. — I and body ground — J and body ground • Is there any continuity?	Yes	Replace TFT sensor, then go to Step 9.
		No	Repair or replace coupler component, then go to Step 9.
8	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between terminal component No.2 terminal G (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0712 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle under following condition for **150 seconds or more**. — Vehicle speed (VSS PID): **20 km/h {12 mph}** • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

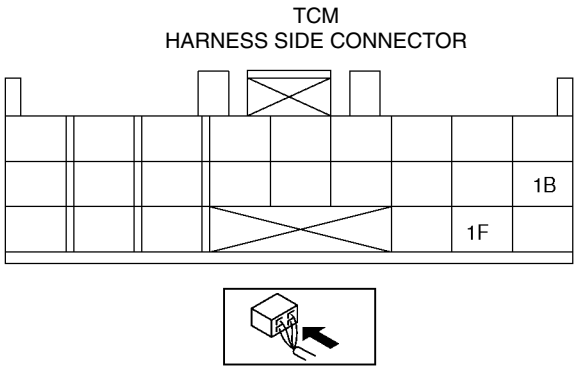
DTC P0713

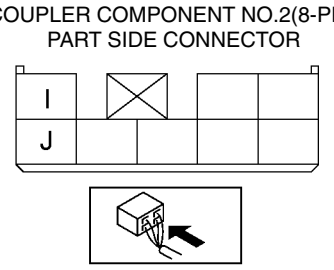
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DTC P0713	Transaxle fluid temperature (TFT) sensor circuit malfunction (open circuit)
DETECTION CONDITION	• Vehicle speed is **20 km/h {12.4 mph} or greater**, and signal from TFT sensor is **2.4 V or above** for **300 seconds or more**. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• TFT sensor malfunction. • Open circuit between TFT sensor and TCM terminal 1F • Open circuit between TFT sensor and TCM terminal 1B • Damaged connectors between TFT sensor and TCM • TCM malfunction









Diagnostic procedure

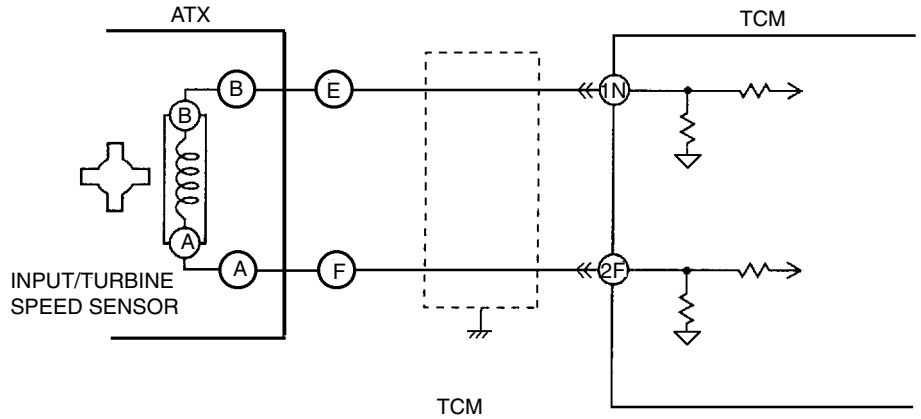
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**VERIFY CURRENT INPUT SIGNAL STATUS - IS CONCERN INTERMITTENT OR CONSTANT?** • Turn ignition key to OFF. • Connect voltmeter to TCM terminal 1F • Turn ignition key to ON (engine OFF). • Are TCM terminal voltage **within 0.2—4.9 V**?	Yes	Go to intermittent concern troubleshooting procedure. (See section F1.)
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Inspect terminal component No.2 (8-pin) connection. • Disconnect terminal component No.2 (8-pin). • Check for poor connection (damaged, pulled-out terminals, corrosion etc.). • Are connector and terminals okay?	Yes	Go to next step.
		No	Repair or replace connector and/or terminal, then go to Step 11.
5	**INSPECT TFT SENSOR CIRCUIT** • Connect voltmeter to TCM terminal 1F. • Turn ignition key to ON (engine OFF). • Connect between terminal component No.2 (8-pin) terminal H and G (harness-side) using jumper wire. • Verify if TCM terminal voltage changes to **0.2 V or below**. • Does TCM terminal voltage change?	Yes	Go to next step.
		No	Go to Step 8.
6	**INSPECT COUPLER COMPONENT CONNECTOR CONNECTION FOR POOR CONNECTION** • Turn ignition key to OFF. • Remove control valve body cover. • Disconnect coupler component connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace connector and/or terminal, then go to Step 11.
7	**INSPECT COUPLER COMPONENT CIRCUIT FOR OPEN CIRCUIT** • Check continuity between coupler component (8-pin) terminals I and J (part-side). • Is there continuity?	Yes	Repair or replace terminal component No.2 (8-pin).
		No	Replace TFT sensor, then go to Step 11. (See K2–85 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR REMOVAL/INSTALLATION.)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 11.
9	**INSPECT HARNESS FOR OPEN CIRCUIT** • Disconnect terminal component No.2 (8-pin) • Connect the TCM connector. • Turn ignition key to ON (engine OFF). • Inspect voltage at terminal component No.2 (8-pin) terminal G (harness-side). • Is voltage **5 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 11.
10	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Check continuity between terminal component No.2 (8-pin) terminal H (harness-side) and body ground. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to next step.
11	**VERIFY TROUBLESHOOTING OF DTC P0713 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle for **150 seconds or more**. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
12	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

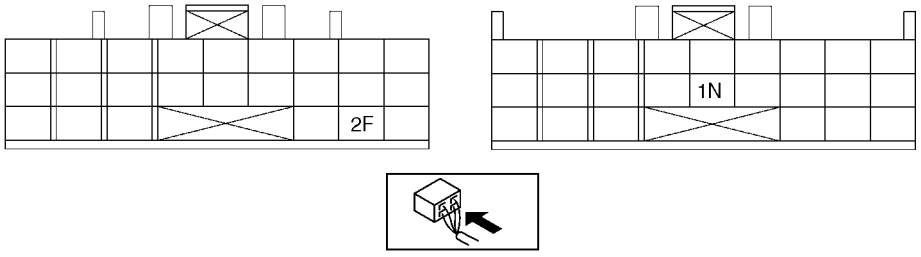
DTC P0715

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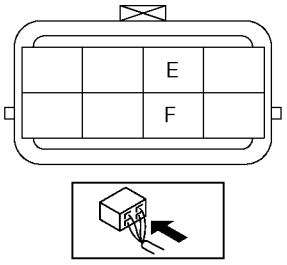
DTC P0715	Input/turbine speed sensor circuit malfunction
DETECTION CONDITION	• The following condition is detected twice: — Input/turbine speed sensor signal is **600 rpm or less** while engine speed is **1,500 rpm or greater** and vehicle speed is **40 km/h {24.8 mph} or greater** in D range. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Input/turbine speed sensor malfunction. • Short to ground between input/turbine speed sensor terminal B and TCM terminal 1N • Short to ground between input/turbine speed sensor terminal A and TCM terminal 2F • Open circuit between input/turbine speed sensor terminal B and TCM terminal 1N • Open circuit between input/turbine speed sensor terminal A and TCM terminal 2F • Damaged connectors between input/turbine speed sensor and TCM. • TCM malfunction.



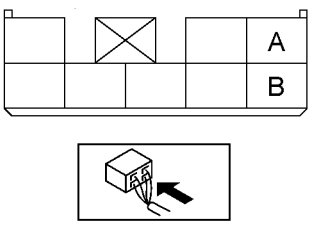
TCM
HARNESS SIDE CONNECTOR



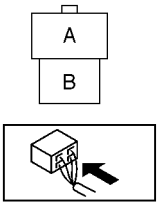
TERMINAL COMPONENT
NO.2(8-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(8-PIN)
PART SIDE CONNECTOR



INPUT/TURBINE
SPEED SENSOR
HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal component No.2 (8-pin) connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.
4	**INSPECT INPUT/TURBINE SPEED SENSOR RESISTANCE** • Measure resistance between terminal component No.2 (8-pin) (transaxle case side). • Is resistance **within 513—627 ohms** between terminal component No.2 (8-pin) terminal E and F (transaxle case side)?	Yes	Go to next step.
		No	Go to Step 8
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
6	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR OPEN** • Check terminal component No.2 (8-pin) terminals (harness-side) and TCM terminals (harness-side). — F and 2F — E and 1N • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
7	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR SHORT TO GROUND** • Check terminal component No.2 (8-pin) terminal (harness-side) and body ground. — F and body ground — E and body ground • Is there any continuity?	Yes	Repair or replace harness, then go to Step 12.
		No	Go to Step 12.
8	**INSPECT COUPLER COMPONENT (8-PIN) CONNECTOR FOR POOR CONNECTION** • Disassemble the control valve body cover. • Disconnect coupler component (8-pin) connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT INPUT/TURBINE SPEED SENSOR RESISTANCE** • Measure resistance between coupler component (8-pin) (transaxle case side). • Is resistance **within 513—527 ohms** between coupler component (8-pin) terminal B and A (part side)?	Yes	Repair or replace terminal component, then go to Step 12.
		No	Go to next step.

STEP	INSPECTION		ACTION
10	**INSPECT INPUT/TURBINE SPEED SENSOR CONNECTOR FOR POOR CONNECTION** • Disassemble the transaxle. • Disconnect input/turbine speed sensor connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
11	**INSPECT INPUT/TURBINE SPEED SENSOR RESISTANCE** • Measure resistance between input/turbine speed sensor. • Is resistance **within 513—627 ohms** between input/turbine speed sensor connector terminal A and B (part side)?	Yes	Repair or replace coupler component, then go to next step.
		No	Replace input/turbine speed sensor, then go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0715 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle with vehicle speed **40 km/h {25 mph} or above** and engine speed **1,500 rpm or above** for **2 second or more** • Repeat Step ii two times. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

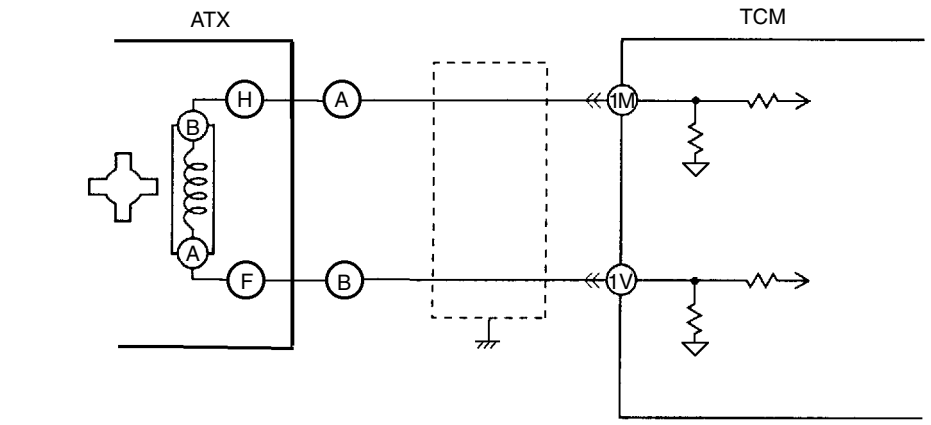
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DTC P0720

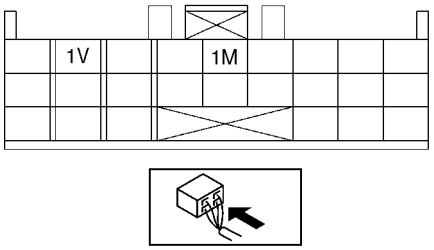
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DTC P0720	Vehicle speedometer sensor (VSS) malfunction (open/short)
DETECTION CONDITION	• Parking gear rotation detected by VSS is **150 rpm (Vehicle speed: 5—6 km/h) or less** while intermediate sensor signal is **1,400 rpm or greater** in D range for **2 second or more**. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between vehicle speedometer sensor terminal B and TCM terminal 1M • Open circuit between vehicle speedometer sensor terminal A and TCM terminal 1V • Short to ground between vehicle speedometer sensor terminal B and TCM terminal 1M • Short to ground between vehicle speedometer sensor terminal A and TCM terminal 1V • Vehicle speedometer sensor malfunction • Damaged connectors between vehicle speedometer sensor to TCM • TCM malfunction

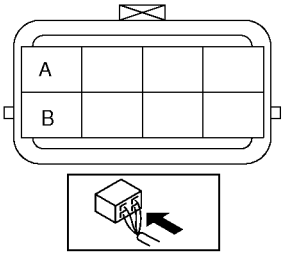
DTC P0720	Vehicle speedometer sensor (VSS) malfunction (open/short)



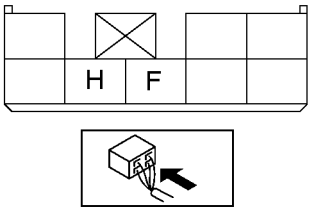
TCM
HARNESS SIDE CONNECTOR



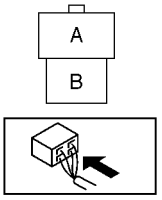
TERMINAL COMPONENT
NO.2(8-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(8-PIN)
PART SIDE CONNECTOR



VSS
HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal component No.2 (8-pin) connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.

STEP	INSPECTION		ACTION
4	**INSPECT VEHICLE SPEEDOMETER SENSOR RESISTANCE** • Measure resistance between terminal component No.2 (8-pin) (transaxle case side). • Is resistance **within 513—627 ohms** between terminal component No.2 (8-pin) terminal A and B (transaxle case side)?	Yes	Go to next step.
		No	Go to Step 8
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
6	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR OPEN** • Check terminal component No.2 (8-pin) terminals (harness-side) and TCM terminals (harness-side). — A and 1M — B and 1V • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
7	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR SHORT TO GROUND** • Check terminal component No.2 (8-pin) terminal (harness-side) and body ground. — A and body ground — B and body ground • Is there any continuity?	Yes	Repair or replace harness, then go to Step 12.
		No	Go to Step 12.
8	**INSPECT COUPLER COMPONENT (8-PIN) CONNECTOR FOR POOR CONNECTION** • Disassemble the control valve body cover. • Disconnect coupler component (8-pin) connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT VEHICLE SPEEDOMETER SENSOR RESISTANCE** • Measure resistance between coupler component (8-pin) (transaxle case side). • Is resistance **within 513—627 ohms** between coupler component (8-pin) terminal H and F (part side)?	Yes	Repair or replace terminal component, then go to Step 12.
		No	Go to next step.
10	**INSPECT VEHICLE SPEEDOMETER SENSOR CONNECTOR FOR POOR CONNECTION** • Disassemble the transaxle. • Disconnect vehicle speedometer sensor connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
11	**INSPECT VEHICLE SPEEDOMETER SENSOR RESISTANCE** • Measure resistance between vehicle speedometer sensor. • Is resistance **within 513—627 ohms** between vehicle speedometer sensor connector terminal A and B (part side)?	Yes	Repair or replace coupler component, then go to next step.
		No	Replace vehicle speedometer sensor, then go to next step.

STEP	INSPECTION		ACTION
12	**VERIFY TROUBLESHOOTING OF DTC P0720 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle with vehicle speed **40 km/h {25 mph} or above** for **2 second or more** • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0740

A6E577018901212

DTC P0740	TCC system malfunction
DETECTION CONDITION	• RPM difference between crankshaft (engine speed signal) and reverse clutch drum (input/turbine speed sensor signal) exceeds the pre-programmed value. **Diagnostic support note:** • This is continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions in two consecutive drive cycles. • PENDING CODE is available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• ATF level low. • Deteriorated ATF. • TCC solenoid valve and pressure control solenoid stuck. • Line pressure low. • Oil pump malfunction. • Control valve stuck • Torque convert clutch malfunction • TCM malfunction.

Diagnostic procedure

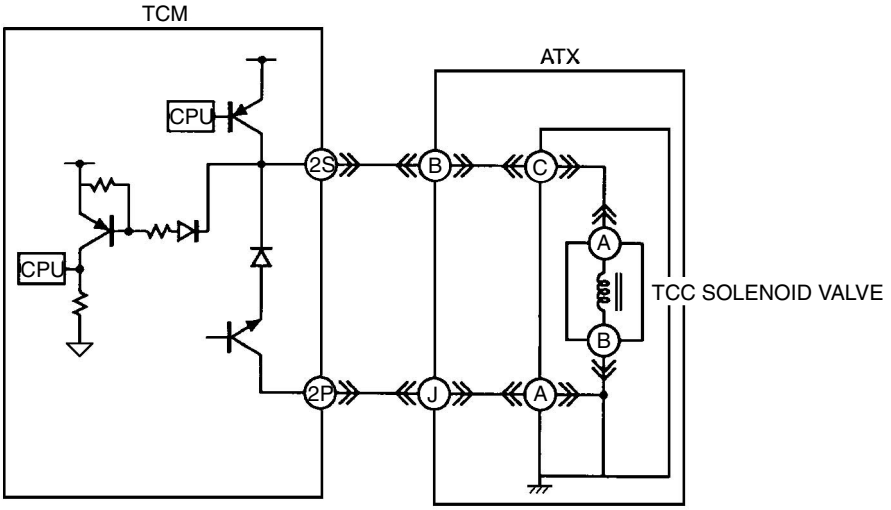
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Clear red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	Go to next step.
		No	If ATF color milky or reddish brown, replace ATF, then go to Step 5. (See K2–80 AUTOMATIC TRANSAXLE FLUID (ATF) REPLACEMENT.)
4	**CHECK ATF LEVEL** • Start engine. • Warm up ATX. • Is ATF level within specification? (See K2–79 Automatic Transaxle Fluid (ATF) Level Inspection.)	Yes	Go to next step.
		No	Adjust ATF level, then go to Step 9. (See K2–79 Automatic Transaxle Fluid (ATF) Level Inspection.)

STEP	INSPECTION		ACTION
5	**INSPECT LINE PRESSURE** • Start engine. • Measure line pressure. **Specification** — D range, M (2GR) range Idle: **290—490 kPa {3.0—4.9 kgf/cm^2, 43—69 psi}** Stall: **1,550—1,750 kPa {15.8—17.8 kgf/cm^2, 225—254 psi}** — M (1GR) range, R position Idle:**550—750 kPa {5.6—7.6 kgf/cm^2, 80—109 psi}** Stall: **1,550—1,750 kPa {15.8—17.8 kgf/cm^2, 225—254 psi}** • Is line pressure within specification? (See K2–72 Line Pressure Test.)	Yes	Go to next step.
		No	All ranges: Replace or overhaul oil pump or control valve body, then go to Step 10. Any ranges: Replace or overhaul automatic transaxle, then go to Step 10. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.)
6	**CLICK TEST OF SOLENOID VALVES** • Turn ignition key to OFF. • Disconnect terminal component No.1(12-pin). • Apply battery voltage to terminal component No.1 (12-pin) terminals (transaxle case side). — TCC solenoid vale: B — Pressure control solenoid: D • Verify the click sounds of TCC solenoid valve and pressure control solenoid. • Are there click sounds?	Yes	Go to next step.
		No	Replace TCC solenoid valve or pressure control solenoid, then go to Step 10. (See K2–105 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
7	**INSPECT DIFFERENCE BETWEEN ENGINE SPEED AND TURBINE SPEED** • Inspect difference between engine speed and turbine speed during TCC operation in 5GR • Drive vehicle under following condition — TR switch position: D range — Gear position: 5GR — TCC solenoid valve: ON • Is difference between engine speed (RPM PID) and turbine speed okay? Difference **Below 99 rpm**	Yes	Go to Step
		No	Go to next step.
8	**INSPECT OPERATION OF EACH VALVE AND EACH SPRING** • Remove control valve body. • Disassemble control valve body. • Is each valve operation okay and is return spring okay?	Yes	Replace torque converter, then go to next step.
		No	Replace control valve body, then go to next step. (See K2–105 CONTROL VALVE BODY REMOVAL/INSTALLATION.)
9	**VERIFY TROUBLESHOOTING OF DTC P0740 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle under following condition for 10 seconds or more. — Vehicle speed (VSS PID): **Within 10—87 km/h {6—54 mph}** — Gear position: 5GR — TR switch position: D range — TCC solenoid valve: ON • Is there pending code present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

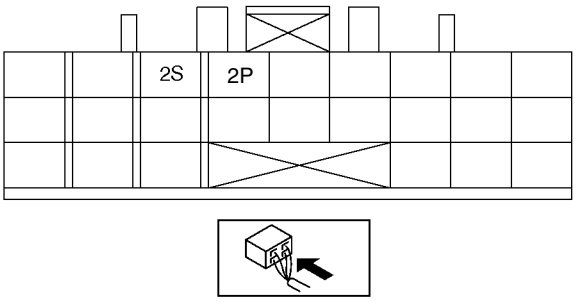
DTC P0743

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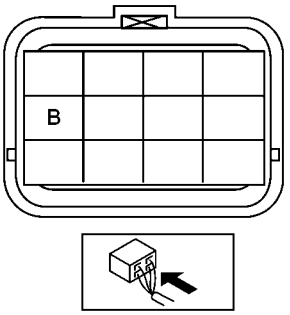
DTC P0743	Torque converter clutch (TCC) solenoid valve circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in TCC solenoid signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition during first drive cycle. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between TCC solenoid valve terminal A and TCM terminal 2S • Short to ground between TCC solenoid valve terminal A and TCM terminal 2S • Short to power between TCC solenoid valve terminal A and TCM terminal 2S • TCC solenoid valve malfunction • Damage connector between TCC solenoid valve and TCM • TCM malfunction



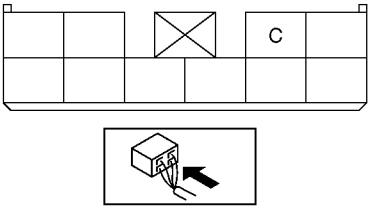
TCM
HARNESS SIDE CONNECTOR



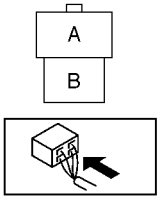
TERMINAL COMPONENT
NO.1(12-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(10-PIN)
PART SIDE CONNECTOR



TCC SOLENOID VALVE
HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal componentNo.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 13.
4	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal H (transaxle case side) and body ground. • Is resistance **within 12—13.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 9.
		No	Go to next step.
5	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
6	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal C (part side) and body ground. • Is resistance **within 12—13.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 13.
		No	Go to next step.
7	**INSPECT TCC SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Disconnect TCC solenoid valve connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
8	**INSPECT RESISTANCE** • Check resistance between TCC solenoid valve connector (part side) terminal A and body ground. • Is resistance **within 12—13.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 13.
		No	Verify TCC solenoid valve installation. • If TCC solenoid valve is installed correctly, replace TCC solenoid valve, then go to Step 13. (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
9	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 13.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2S (harness-side) and terminal component No.1 (12-pin) terminal H (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.

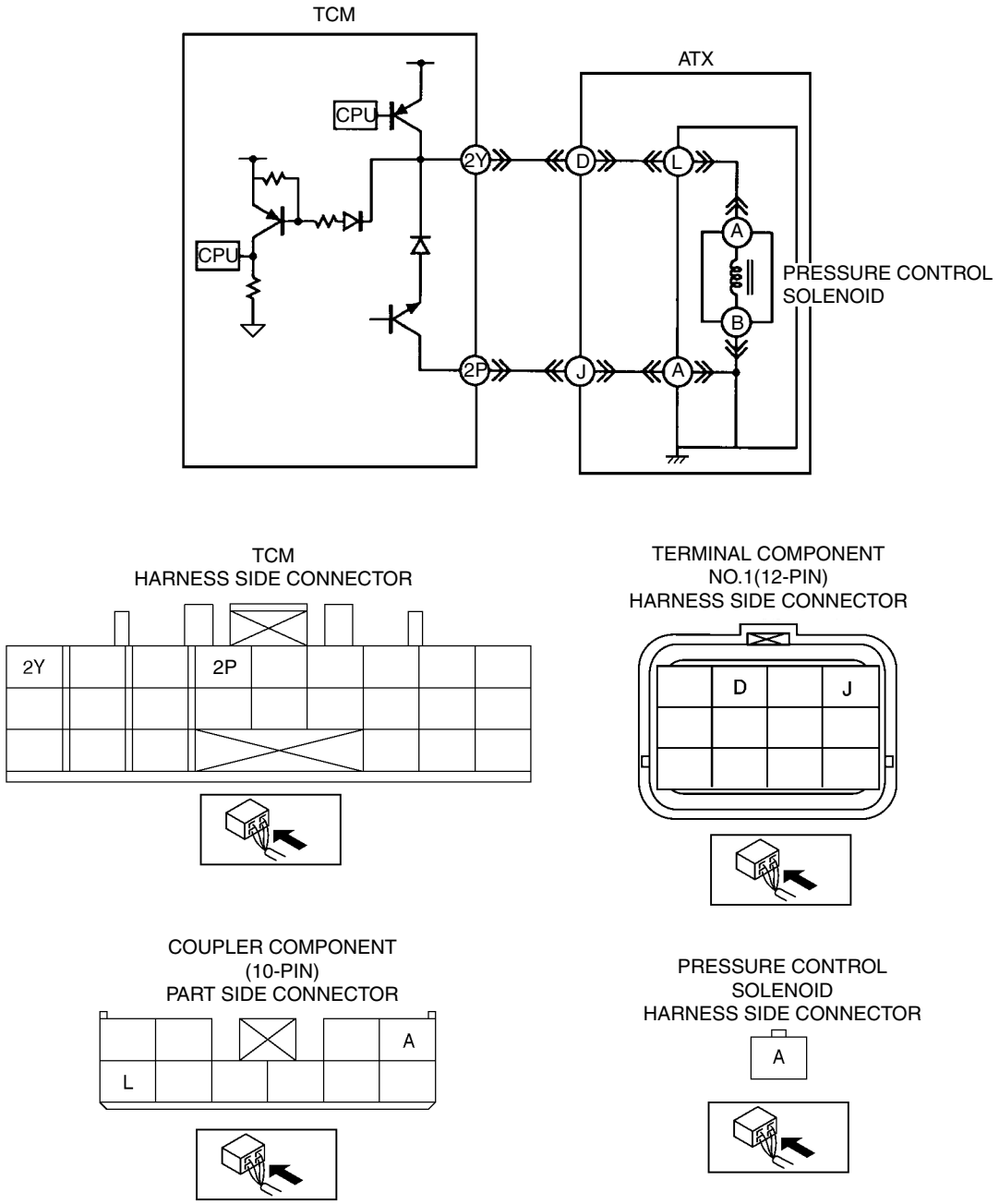
STEP	INSPECTION		ACTION
11	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal H (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.
12	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2S (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
13	**VERIFY TROUBLESHOOTING OF DTC P0743 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0748

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DTC P0748	Pressure control solenoid circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in pressure control solenoid signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL does not illuminate. • PENDING CODE is not available. • FREEZE FRAME DATA is not available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between pressure control solenoid terminal A and TCM terminal 2Y • Short to ground between pressure control solenoid terminal A and TCM terminal 2Y • Short to power between pressure control solenoid terminal A and TCM terminal 2Y • Pressure control solenoid malfunction • Damaged connector between pressure control solenoid valve and TCM • TCM malfunction

DTC P0748	Pressure control solenoid circuit malfunction (open/short)



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 TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal componentNo.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.

STEP	INSPECTION		ACTION
3	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal D (transaxle case side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 8.
		No	Go to next step.
4	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
5	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal L (part side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 12.
		No	Go to next step.
6	**INSPECT PRESSURE CONTROL SOLENOID CONNECTOR FOR POOR CONNECTION** • Disconnect pressure control solenoid connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
7	**INSPECT RESISTANCE** • Check resistance between pressure control solenoid connector (part side) terminal A and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 12.
		No	Verify pressure control solenoid installation. • If pressure control solenoid is installed correctly, replace pressure control solenoid, then go to Step 12 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2Y (harness-side) and terminal component No.1 (12-pin) terminal D (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal D (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
11	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2Y (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0748 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.

STEP	INSPECTION		ACTION
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0751

A6E577018901215

DTC P0751	Shift solenoid A malfunction (stuck off)
DETECTION CONDITION	• Difference between actual gear ratio and gear ratio set in TCM is large. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Shift solenoid A malfunction • Shift valve A stuck • TCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**CHECK FOR DTC** • Turn ignition key to ON (engine OFF). • Inspect DTC. • Is DTC outputted?	Yes	Follow applicable DTC inspection procedure.
		No	Go to next step.
4	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Transparent red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	replace control valve body, then go to next step.
		No	If ATF color milky or reddish brown, reaper or replace ATX, then go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0751 COMPLETED.** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0752

A6E577018901216

DTC P0752	Shift solenoid A malfunction (stuck on)
DETECTION CONDITION	• Difference between actual gear ratio and gear ratio set in TCM is large. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Shift solenoid A malfunction • Shift valve A stuck • TCM malfunction

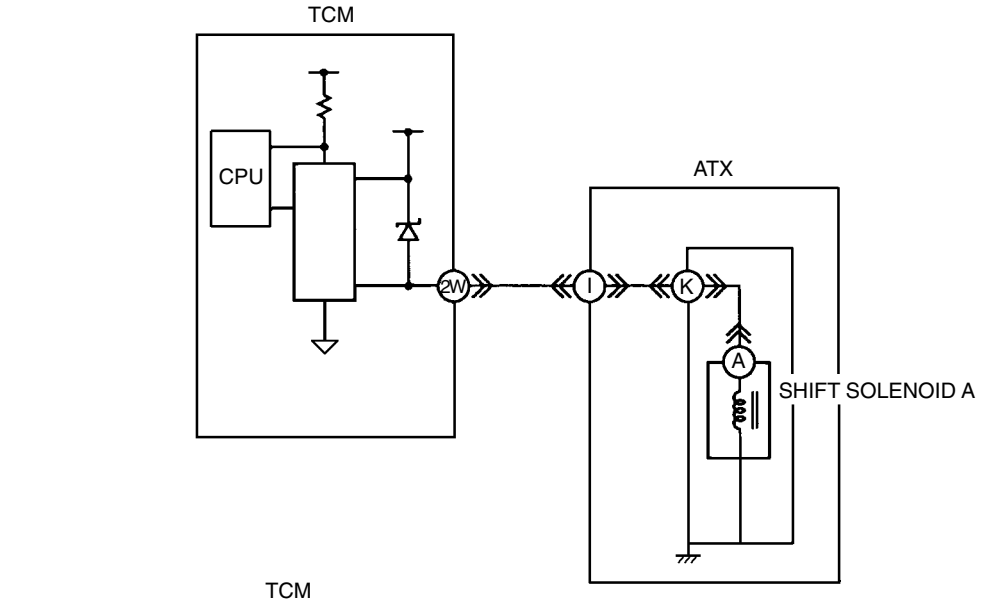
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**CHECK FOR DTC** • Turn ignition key to ON (engine OFF). • Inspect DTC. • Is DTC outputted?	Yes	Follow applicable DTC inspection procedure.
		No	Go to next step.
4	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Transparent red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	replace control valve body, then go to next step.
		No	If ATF color milky or reddish brown, reaper or replace ATX, then go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0752 COMPLETED.** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

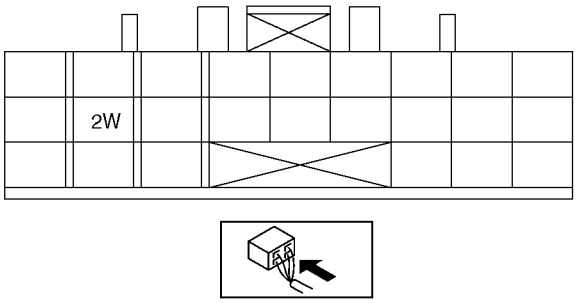
DTC P0753

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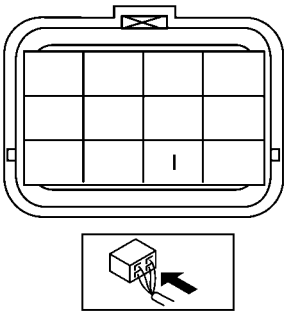
DTC P0753	Shift solenoid A circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in shift solenoid A signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition during first drive cycle. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between shift solenoid A terminal A and TCM terminal 2W • Short to ground between shift solenoid A terminal A and TCM terminal 2W • Short to power between shift solenoid A terminal A and TCM terminal 2W • Shift solenoid A malfunction • Damage connector between shift solenoid A and TCM • TCM malfunction



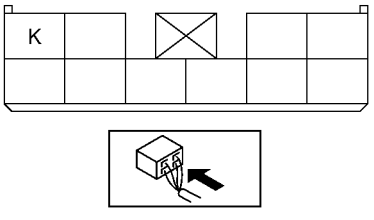
TCM
HARNESS SIDE CONNECTOR



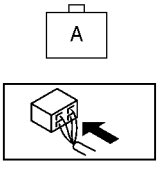
TERMINAL COMPONENT
NO.1(12-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(10-PIN)
PART SIDE CONNECTOR



SHIFT SOLENOID A
HARNESS SIDE CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal componentNo.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 13.
4	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal I (transaxle case side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 9.
		No	Go to next step.
5	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
6	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal K (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 13.
		No	Go to next step.
7	**INSPECT SHIFT SOLENOID A CONNECTOR FOR POOR CONNECTION** • Disconnect shift solenoid A connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
8	**INSPECT RESISTANCE** • Check resistance between shift solenoid A connector terminal A (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 13.
		No	Verify shift solenoid A installation. • If shift solenoid A is installed correctly, replace shift solenoid A, then go to Step 13 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
9	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 13.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2W (harness-side) and terminal component No.1 (12-pin) terminal I (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.

STEP	INSPECTION		ACTION
11	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal I (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.
12	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2W (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
13	**VERIFY TROUBLESHOOTING OF DTC P0753 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0756

A6E577018901218

DTC P0756	Shift solenoid B malfunction (stuck off)
DETECTION CONDITION	• Difference between actual gear ratio and gear ratio set in TCM is large. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Shift solenoid B malfunction. • Shift valve B stuck • TCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**CHECK FOR DTC** • Turn ignition key to ON (engine OFF). • Inspect DTC. • Is DTC outputted?	Yes	Follow applicable DTC inspection procedure.
		No	Go to next step.

STEP	INSPECTION		ACTION
4	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Transparent red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	replace control valve body, then go to next step.
		No	If ATF color milky or reddish brown, reaper or replace ATX, then go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0756 COMPLETED.** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0757

A6E577018901219

DTC P0757	Shift solenoid B malfunction (stuck on)
DETECTION CONDITION	• Difference between actual gear ratio and gear ratio set in TCM is large. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Shift solenoid B malfunction. • Shift valve B stuck • TCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**CHECK FOR DTC** • Turn ignition key to ON (engine OFF). • Inspect DTC. • Is DTC outputted?	Yes	Follow applicable DTC inspection procedure.
		No	Go to next step.
4	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Transparent red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	replace control valve body, then go to next step.
		No	If ATF color milky or reddish brown, reaper or replace ATX, then go to next step.

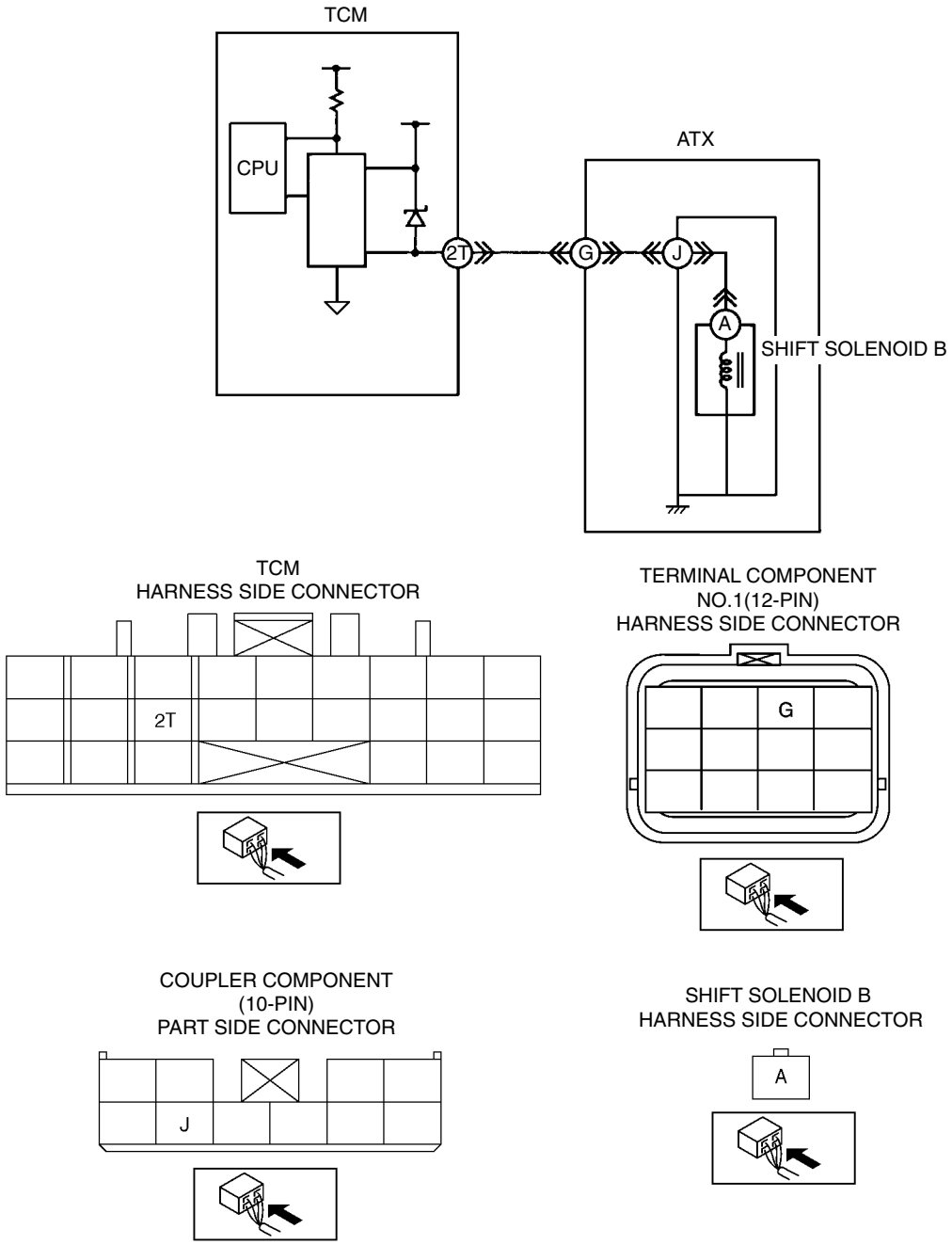
STEP	INSPECTION		ACTION
5	**VERIFY TROUBLESHOOTING OF DTC P0757 COMPLETED.** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0758

A6E577018901220

DTC P0758	Shift solenoid B circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in shift solenoid B signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction conditions during first drive cycle. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between shift solenoid B terminal A and TCM terminal 2T • Short to ground between shift solenoid B terminal A and TCM terminal 2T • Short to power between shift solenoid B terminal A and TCM terminal 2T • Shift solenoid B malfunction • Damage connector between shift solenoid B and TCM • TCM malfunction

DTC P0758	Shift solenoid B circuit malfunction (open/short)



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.

STEP	INSPECTION		ACTION
3	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal component No.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 13.
4	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal G (transaxle case side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 9.
		No	Go to next step.
5	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
6	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal J (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 13.
		No	Go to next step.
7	**INSPECT SHIFT SOLENOID B CONNECTOR FOR POOR CONNECTION** • Disconnect shift solenoid B connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
8	**INSPECT RESISTANCE** • Check resistance between shift solenoid B connector terminal A (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 13.
		No	Verify shift solenoid B installation. • If shift solenoid B is installed correctly, replace shift solenoid B, then go to Step 13 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
9	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 13.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2T (harness-side) and terminal component No.1 (12-pin) terminal G (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.
11	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal G (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.
12	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2T (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.

STEP	INSPECTION		ACTION
13	**VERIFY TROUBLESHOOTING OF DTC P0758 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0761

A6E577018901221

DTC P0761	Shift solenoid C malfunction (stuck off)
DETECTION CONDITION	• Difference between actual gear ratio and gear ratio set in TCM is large. **Diagnostic support note:** • This is a continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Shift solenoid C malfunction • Shift valve C stuck • TCM malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**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.
3	**CHECK FOR DTC** • Turn ignition key to ON (engine OFF). • Inspect DTC. • Is DTC outputted?	Yes	Follow applicable DTC inspection procedure.
		No	Go to next step.
4	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Transparent red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	replace control valve body, then go to next step.
		No	If ATF color milky or reddish brown, reaper or replace ATX, then go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0761 COMPLETED.** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.

STEP	INSPECTION		ACTION
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P0762

A6E577018901222

DTC P0762	Shift solenoid C malfunction (stuck on)
DETECTION CONDITION	• Difference between actual gear ratio and gear ratio set in TCM is large. **Diagnostic support note:** • This is continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Shift solenoid C malfunction • Shift valve C stuck • TCM malfunction

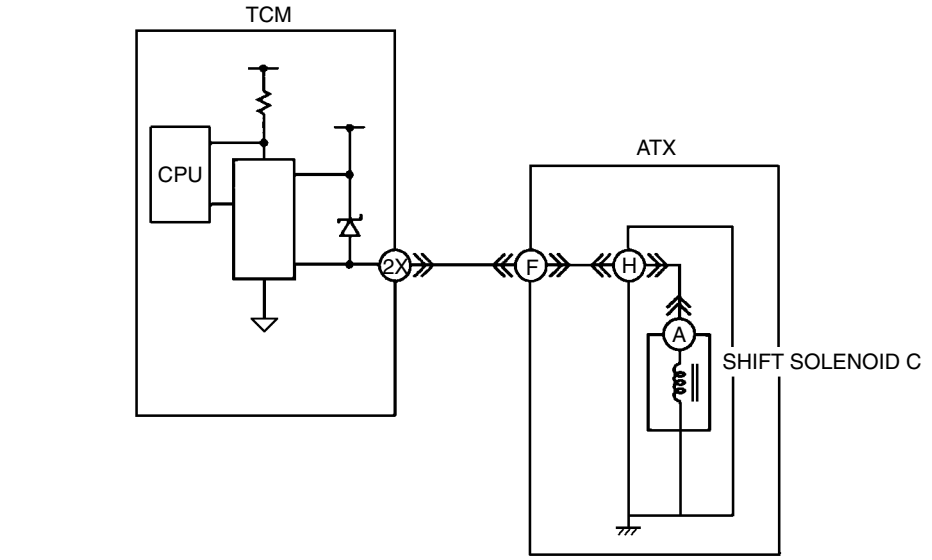
Diagnostic procedure

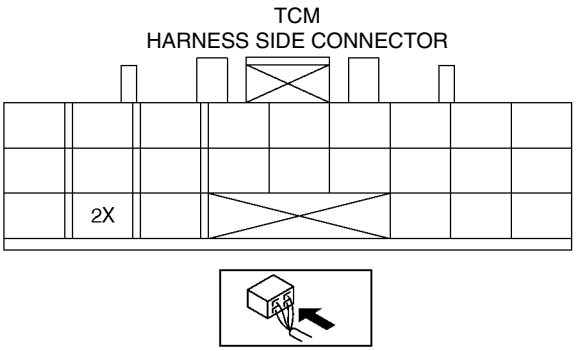
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**CHECK FOR DTC** • Turn ignition key to ON (engine OFF). • Inspect DTC. • Is DTC outputted?	Yes	Follow applicable DTC inspection procedure.
		No	Go to next step.
4	**CHECK ATF CONDITION** • Turn ignition key to OFF. • Check ATF condition. — Transparent red: Normal — Milky: Water mixed in fluid — Reddish brown: Deteriorated ATF • Is it okay? (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.)	Yes	replace control valve body, then go to next step.
		No	If ATF color milky or reddish brown, reaper or replace ATX, then go to next step.
5	**VERIFY TROUBLESHOOTING OF DTC P0762 COMPLETED.** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Start engine. • Warm up ATX. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

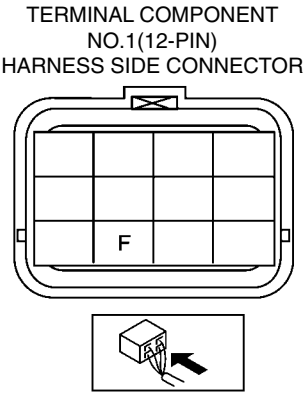
DTC P0763

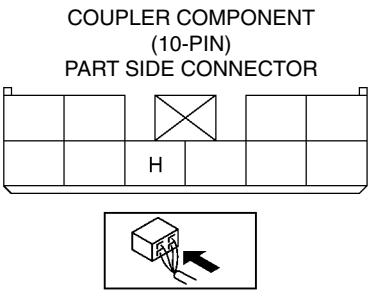
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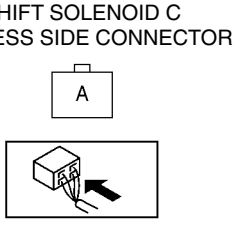
DTC P0763	Shift solenoid C circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in shift solenoid C signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition during first drive cycle. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between shift solenoid C terminal A and TCM terminal 2X • Short to ground between shift solenoid C terminal A and TCM terminal 2X • Short to power between shift solenoid C terminal A and TCM terminal 2X • Shift solenoid C malfunction • Damaged connector between shift solenoid C and TCM • TCM malfunction











Diagnostic procedure

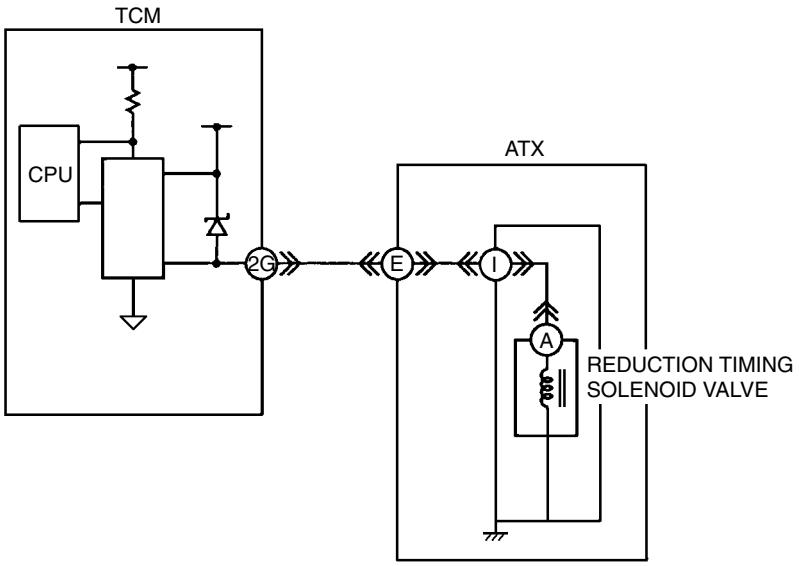
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal componentNo.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 13.
4	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal F (transaxle case side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 9.
		No	Go to next step.
5	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
6	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal H (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 13.
		No	Go to next step.
7	**INSPECT SHIFT SOLENOID C CONNECTOR FOR POOR CONNECTION** • Disconnect shift solenoid C connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 13.
8	**INSPECT RESISTANCE** • Check resistance between shift solenoid C connector terminal A (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 13.
		No	Verify shift solenoid C installation. • If shift solenoid C is installed correctly, replace pressure control solenoid, then go to Step 13 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
9	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 13.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2X (harness-side) and terminal component No.1 (12-pin) terminal F (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.

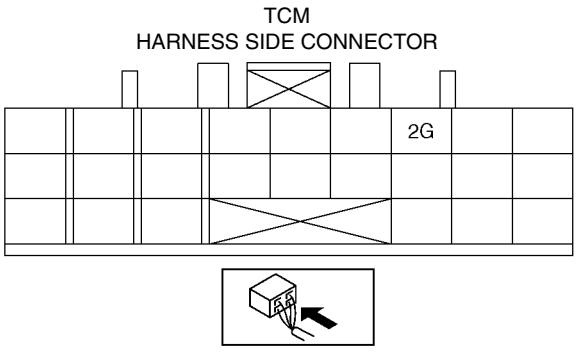
STEP	INSPECTION		ACTION
11	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal F (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 13.
12	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2X (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
13	**VERIFY TROUBLESHOOTING OF DTC P0763 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
14	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

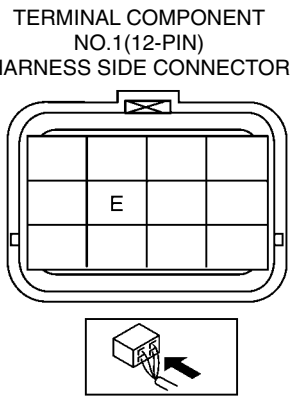
DTC P0768

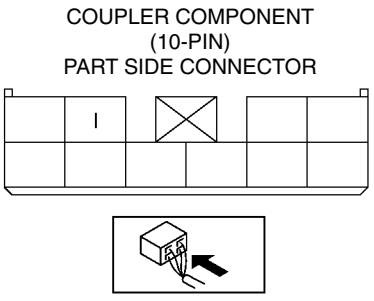
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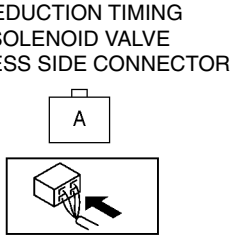
DTC P0768	Reduction timing solenoid valve circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in reduction timing solenoid signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected.) **Diagnostic support note:** • This is continuous monitor (CCM). • MIL does not illuminate • PENDING CODE is not available. • FREEZE FRAME DATA is not available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between reduction timing solenoid valve terminal A and TCM terminal 2G • Short to ground between reduction timing solenoid valve terminal A and TCM terminal 2G • Short to power between reduction timing solenoid valve terminal A and TCM terminal 2G • Reduction timing solenoid valve malfunction • Damaged connector between reduction timing solenoid and TCM • TCM malfunction











Diagnostic procedure

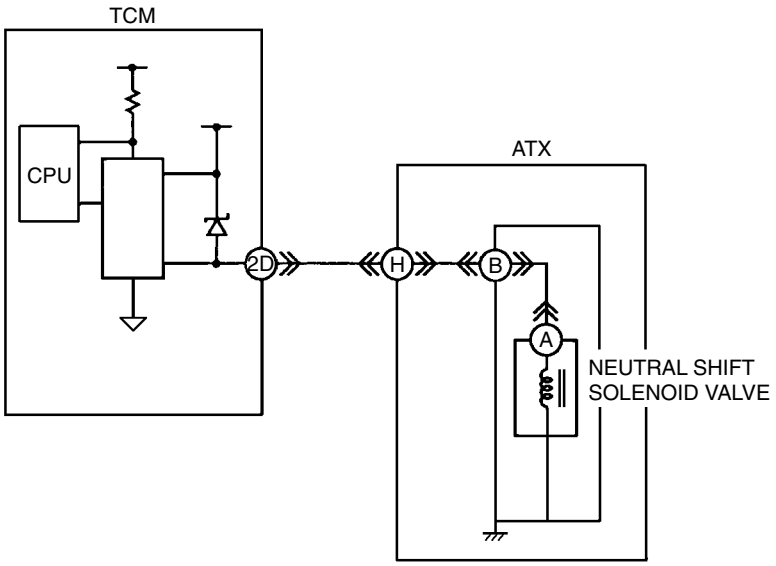
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins and/or on-line repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal componentNo.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.
3	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal E (transaxle case side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 8.
		No	Go to next step.
4	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
5	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal I (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 12.
		No	Go to next step.
6	**INSPECT REDUCTION TIMING SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Disconnect reduction timing solenoid valve connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
7	**INSPECT RESISTANCE** • Check resistance between reduction timing solenoid valve connector terminal A (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 12.
		No	Verify reduction timing solenoid valve installation. • If reduction timing solenoid valve is installed correctly, replace reduction timing solenoid valve, then go to Step 12 (See K2–90 SOLENOID VALVE REMOVAL/ INSTALLATION.)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2G (harness-side) and terminal component No.1 (12-pin) terminal E (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal E (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.

STEP	INSPECTION		ACTION
11	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2G (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0763 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

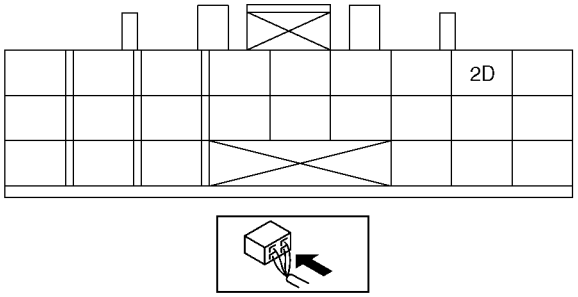
DTC P0773

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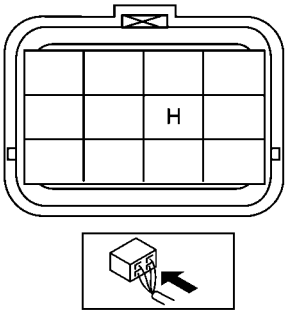
DTC P0773	Neutral shift solenoid valve circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in neutral shift solenoid signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is continuous monitor (CCM). • MIL does not illuminate. • PENDING CODE is not available. • FREEZE FRAME DATA is not available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between neutral shift solenoid valve terminal A and TCM terminal 2D • Short to ground between neutral shift solenoid valve terminal A and TCM terminal 2D • Short to power between neutral shift solenoid vale terminal A and TCM terminal 2D • Neutral shift solenoid valve malfunction • Damaged connector between neutral shift solenoid valve and TCM • TCM malfunction



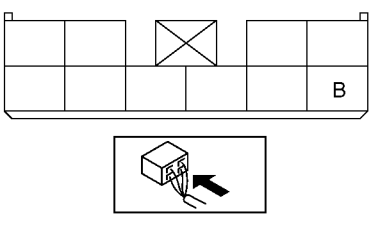
TCM
HARNESS SIDE CONNECTOR



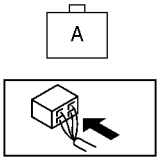
TERMINAL COMPONENT
NO.1(12-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(10-PIN)
PART SIDE CONNECTOR



NEUTRAL SHIFT
SOLENOID VALVE
HARNESS SIDE CONNECTOR



Diagnostic procedure

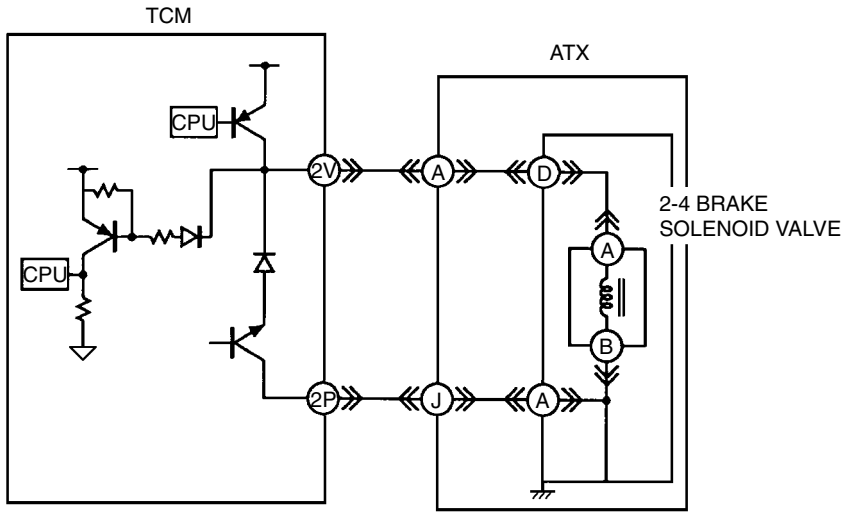
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins and/or on-line repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal component No.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.
3	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal H (transaxle case side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 8.
		No	Go to next step.
4	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
5	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal B (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 12.
		No	Go to next step.
6	**INSPECT NEUTRAL SHIFT SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Disconnect neutral shift solenoid valve connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
7	**INSPECT RESISTANCE** • Check resistance between neutral shift solenoid valve connector terminal A (part side) and body ground. • Is resistance **within 14—18 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 12.
		No	Verify neutral shift solenoid valve installation. • If neutral shift solenoid valve is installed correctly, replace neutral shift solenoid valve, then go to Step 12 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2D (harness-side) and terminal component No.1 (12-pin) terminal H (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal H (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.

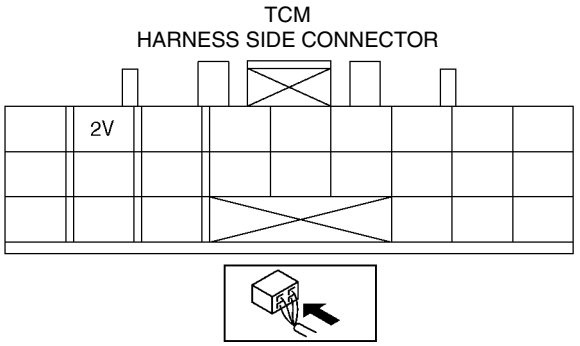
STEP	INSPECTION		ACTION
11	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2D (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0773 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

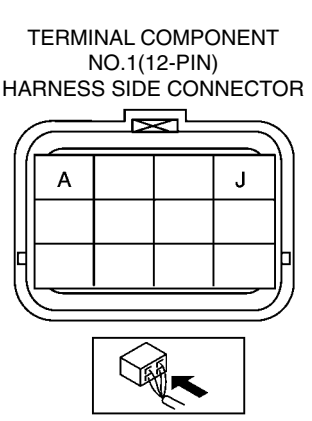
DTC P0778

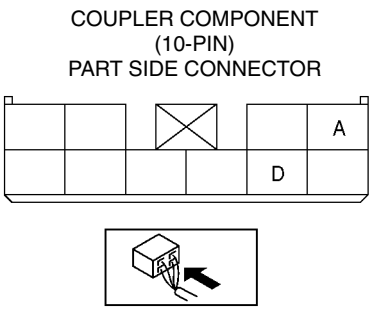
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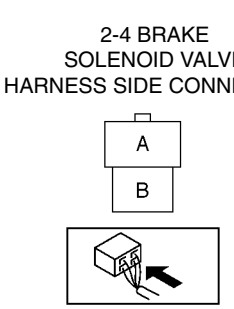
DTC P0778	2-4 brake solenoid valve circuit malfunction (open/short)
DETECTION CONDITION	• Open or short in 2-4 brake solenoid signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is continuous monitor (CCM). • MIL does not illuminates. • PENDING CODE is not available. • FREEZE FRAME DATA is not available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between 2-4 brake solenoid valve terminal A and TCM terminal 2V • Short to ground between 2-4 brake solenoid valve terminal A and TCM terminal 2V • Short to power between 2-4 brake solenoid valve terminal A and TCM terminal 2V • 2-4 brake solenoid valve malfunction • Damaged connector between 2-4 brake solenoid valve and TCM • TCM malfunction











Diagnostic procedure

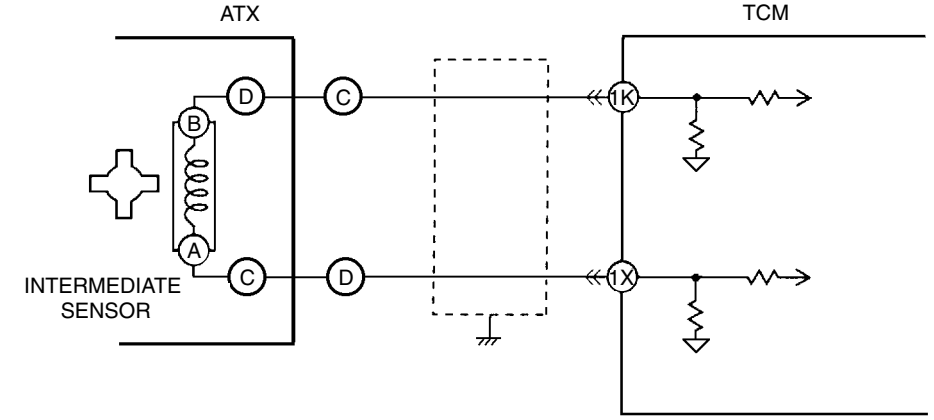
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins and/or on-line repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal component No.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.
3	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal A (transaxle case side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 8.
		No	Go to next step.
4	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
5	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal D (part side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace terminal component No.1 (12-pin), then go to Step 12.
		No	Go to next step.
6	**INSPECT 2-4 BRAKE SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Disconnect 2-4 brake solenoid vale connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
7	**INSPECT RESISTANCE** • Check resistance between 2-4 brake solenoid valve connector terminal A (part side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 12.
		No	Verify 2-4 brake solenoid valve installation. • If 2-4 brake solenoid valve is installed correctly, replace 2-4 brake solenoid valve, then go to Step 12 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2V (harness-side) and terminal component No.1 (12-pin) terminal A (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal A (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.

STEP	INSPECTION		ACTION
11	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2V (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0778 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

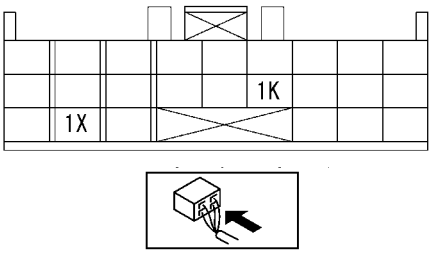
DTC P0791

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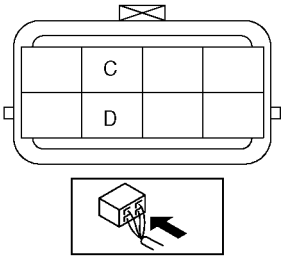
DTC P0791	Intermediate sensor circuit malfunction (open/short)
DETECTION CONDITION	• Rotation speed of output gear (intermediate sensor) is low when vehicle speed and engine speed exceed the preprogrammed value. **Diagnostic support note:** • This is continuous monitor (CCM). • MIL illuminates if TCM detects the above malfunction condition. • PENDING CODE is not available. • FREEZE FRAME DATA is available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Intermediate sensor malfunction. • Short to ground between intermediate sensor terminal B and TCM terminal 1K • Short to ground between intermediate sensor terminal A and TCM terminal 1X • Open circuit between intermediate sensor terminal B and TCM terminal 1K • Open circuit between intermediate sensor terminal A and TCM terminal 1X • Damaged connectors between intermediate sensor and TCM. • TCM malfunction.



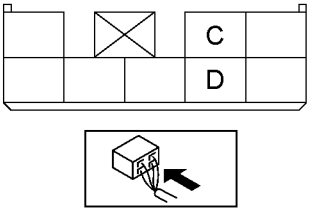
TCM
HARNESS SIDE CONNECTOR



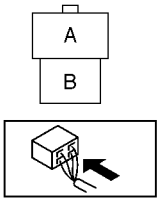
TERMINAL COMPONENT
NO.2(8-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(8-PIN)
PART SIDE CONNECTOR



INTERMEDIATE SENSOR
HARNESS SIDE CONNECTOR



Diagnostic procedure

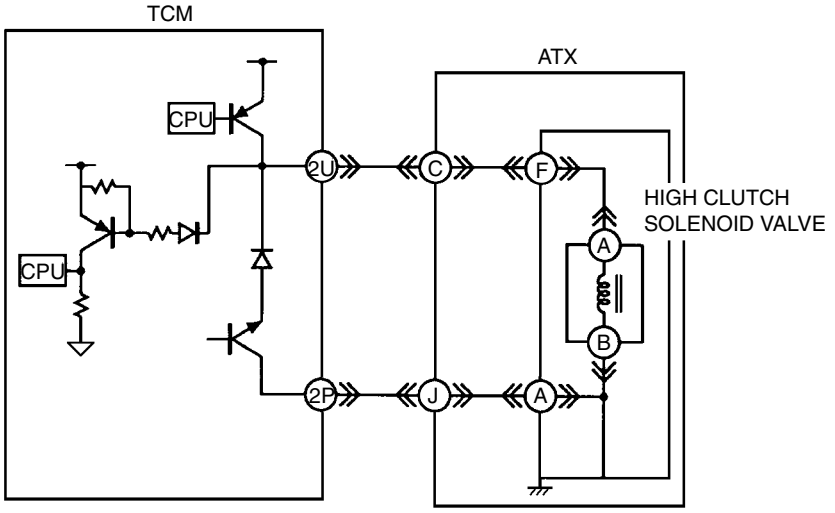
STEP	INSPECTION		ACTION
1	**VERIFY FREEZE FRAME DATA HAS BEEN RECORDED** • Has FREEZE FRAME PID DATA been recorded?	Yes	Go to next step.
		No	Record FREEZE FRAME PID DATA on repair order, then go to next step.
2	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins 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.
3	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal component No.2 (8-pin) connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.
4	**INSPECT INTERMEDIATE SENSOR RESISTANCE** • Measure resistance between terminal component No.2 (8-pin) (transaxle case side). • Is resistance **within 513—627 ohms** between terminal component No.2 (8-pin) terminal C and D (transaxle case side)?	Yes	Go to next step.
		No	Go to Step 8
5	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
6	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR OPEN** • Check terminal component No.2 (8-pin) terminals (harness-side) and TCM terminals (harness-side). — C and 1K — D and 1X • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
7	**INSPECT TERMINAL COMPONENT NO.2 (8-PIN) CIRCUIT FOR SHORT TO GROUND** • Check terminal component No.2 (8-pin) terminal (harness-side) and body ground. — C and body ground — D and body ground • Is there any continuity?	Yes	Repair or replace harness, then go to Step 12.
		No	Go to Step 12.
8	**INSPECT COUPLER COMPONENT (8-PIN) CONNECTOR FOR POOR CONNECTION** • Disassemble the control valve body cover. • Disconnect coupler component (8-pin) connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT INTERMEDIATE SENSOR RESISTANCE** • Measure resistance between coupler component (8-pin). • Is resistance **within 513—627 ohms** between coupler component (8-pin) terminal D and C (part side)?	Yes	Repair or replace coupler component, then go to Step 12.
		No	Go to next step.

STEP	INSPECTION		ACTION
10	**INSPECT INTERMEDIATE SENSOR CONNECTOR FOR POOR CONNECTION** • Disassemble the transaxle. • Disconnect intermediate sensor connector. • Check for poor connection (damaged, pulled-out terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
11	**INSPECT INTERMEDIATE SENSOR RESISTANCE** • Measure resistance between intermediate sensor. • Is resistance **within 513—627 ohms** between intermediate sensor connector terminal A and B (part side)?	Yes	Repair or replace coupler component, then go to next step.
		No	Replace intermediate sensor, then go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0715 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle with vehicle speed **40 km/h {25 mph} or above** and engine speed 1500 rpm or above for **2 second or more** • Repeat Step ii two times. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

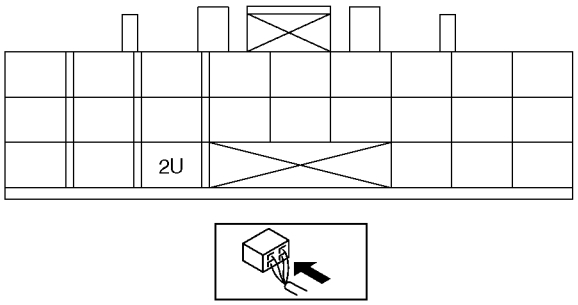
DTC P0798

A6E577018901228

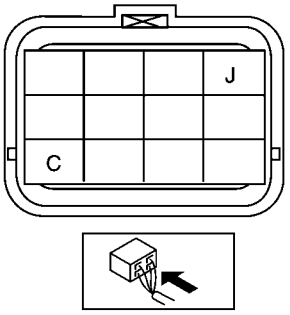
DTC P0798	High clutch solenoid valve circuit malfunction (open/short)
DETECTION CONDITION	• Open or short is high clutch solenoid signal system (while TCM monitors solenoid output voltage, the voltage that differs from the ON/OFF signal output by CPU in TCM is detected). **Diagnostic support note:** • This is continuous monitor (CCM). • MIL does not illuminate. • PENDING CODE is not available. • FREEZE FRAME DATA is not available. • AT warning light indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between high clutch solenoid valve terminal A and TCM terminal 2U • Short to ground between high clutch solenoid valve terminal A and TCM terminal 2U • Short to power between high clutch solenoid valve terminal A and TCM terminal 2U • high clutch solenoid valve malfunction • Damaged connector between high clutch solenoid valve and TCM • TCM malfunction



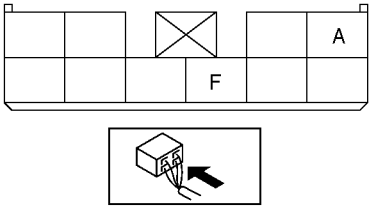
TCM
HARNESS SIDE CONNECTOR



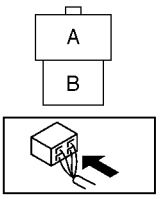
TERMINAL COMPONENT
NO.1(12-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(10-PIN)
PART SIDE CONNECTOR



HIGH CLUTCH SOLENOID VALVE
HARNESS SIDE CONNECTOR



K2

Diagnostic procedure

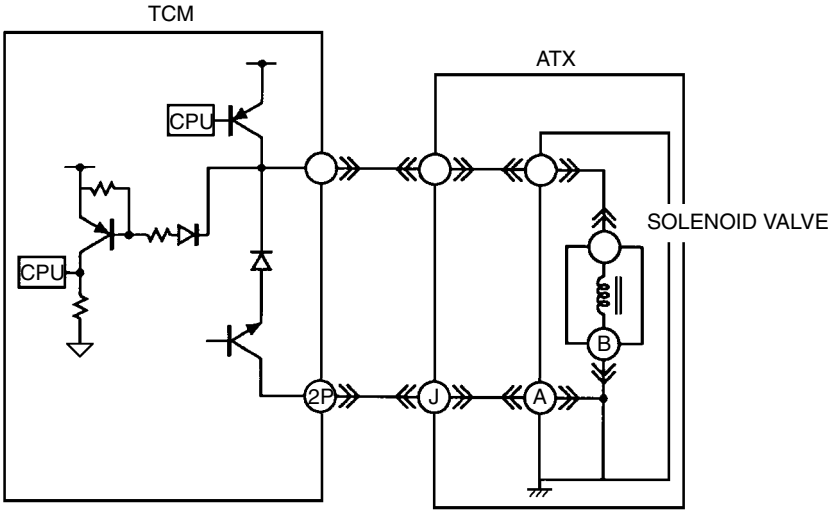
STEP	INSPECTION		ACTION
1	**VERIFY RELATED REPAIR INFORMATION AVAILABILITY** • Check for related Service Bulletins and/or on-line repair information availability. • Is any related repair information available?	Yes	Perform repair or diagnosis according to available repair information. • If vehicle is not repaired, go to next step.
		No	Go to next step.
2	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect terminal componentNo.1 (12-pin). • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 12.
3	**INSPECT RESISTANCE** • Check resistance between terminal component No.1 (12-pin) terminal C (transaxle case side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Go to Step 8.
		No	Go to next step.
4	**INSPECT COUPLER COMPONENT (10-PIN) FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
5	**INSPECT RESISTANCE** • Check resistance between coupler component (10-pin) terminal F (part side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component No.1 (12-pin), then go to Step 12.
		No	Go to next step.
6	**INSPECT HIGH CLUTCH SOLENOID VALVE CONNECTOR FOR POOR CONNECTION** • Disconnect high clutch solenoid valve connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Is terminal okay?	Yes	Go to next step.
		No	Repair or replace terminal, then go to Step 12.
7	**INSPECT RESISTANCE** • Check resistance between high clutch solenoid valve connector terminal A (part side) and body ground. • Is resistance **within 2.6—3.2 ohms**? (See K2–88 SOLENOID VALVE INSPECTION.)	Yes	Repair or replace coupler component (10-pin), then go to Step 12.
		No	Verify high clutch solenoid valve installation. • If high clutch solenoid valve is installed correctly, replace high clutch solenoid, then go to Step 13 (See K2–90 SOLENOID VALVE REMOVAL/INSTALLATION.)
8	**INSPECT TCM CONNECTOR FOR POOR CONNECTION** • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair terminals, then go to Step 12.
9	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR OPEN CIRCUIT** • Check continuity between TCM terminal 2U (harness-side) and terminal component No.1 (12-pin) terminal C (harness-side). • Is there continuity between terminals?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.
10	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Check voltage at terminal component No.1 (12-pin) terminal C (harness-side). • Is voltage **0 V**?	Yes	Go to next step.
		No	Repair or replace harness, then go to Step 12.

STEP	INSPECTION		ACTION
11	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Check continuity between TCM terminal 2U (harness-side) and body ground. • Is there any continuity?	Yes	Repair or replace harness, then go to next step.
		No	Go to next step.
12	**VERIFY TROUBLESHOOTING OF DTC P0798 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.
13	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

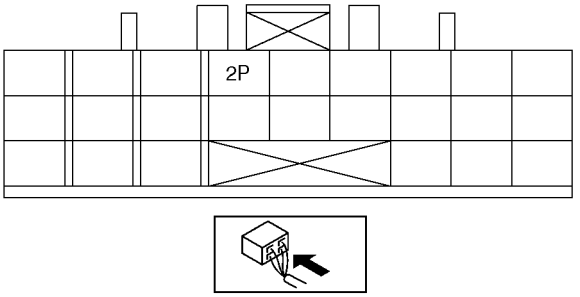
DTC P1710

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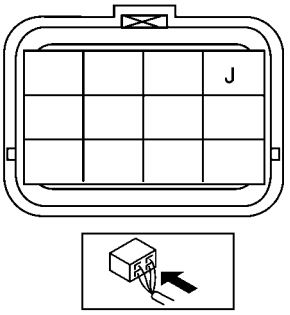
DTC P1710	GND return circuit malfunction
DETECTION CONDITION	• TCM detects open circuit in GND return signal line from solenoid valve. **Diagnostic support note:** • This is a diagnostic support DTC (monitored one per key cycle). • MIL does not illuminate. • PENDING CODE is not available. • FREEZE FRAME DATA is not available. • AT warning light does not indication. • DTC is stored in TCM memory.
POSSIBLE CAUSE	• Open circuit between duty type solenoid valves terminal and TCM terminal 2P • Damaged connector between solenoid valve and TCM • TCM malfunction



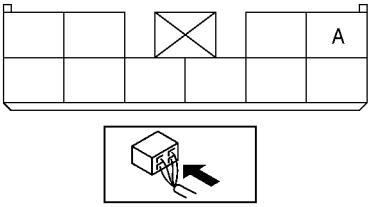
TCM
HARNESS SIDE CONNECTOR



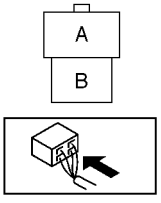
TERMINAL COMPONENT
NO.1(12-PIN)
HARNESS SIDE CONNECTOR



COUPLER COMPONENT
(10-PIN)
PART SIDE CONNECTOR



SOLENOID VALVE
HARNESS SIDE CONNECTOR



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 TCM CONNECTOR FOR POOR CONNECTION** • Turn ignition key to OFF. • Disconnect TCM connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 9.
3	**INSPECT TCM CIRCUIT FOR SHORT TO GROUND** • Verify that TCM connector is disconnected. • Check continuity between TCM harness connector terminal 2P and ground. • Is there continuity?	Yes	Go to next step.
		No	Go to Step 5.
4	**INSPECT TCM INTERNAL CIRCUIT FOR OPEN** • Verify that TCM connector is disconnected. • Check continuity between TCM terminal 2P and TCM body. • Is there any continuity?	Yes	Go to Step 9.
		No	Replace TCM, then go to Step 9.
5	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CONNECTOR FOR POOR CONNECTION** • Disconnect terminal component No.1 (12-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 9.
6	**INSPECT TERMINAL COMPONENT NO.1 (12-PIN) CIRCUIT FOR SHORT TO GROUND** • Verify that terminal component No.1 (12-pin) connector is disconnected. • Check continuity between terminal component No.1 (12-pin) connector terminal J (transaxle case side) and ground. • Is there continuity?	Yes	Repair or replace TCM harness, then go to Step 9.
		No	Go to next step.
7	**INSPECT COUPLER COMPONENT (10-PIN) CONNECTOR FOR POOR CONNECTION** • Disconnect coupler component (10-pin) connector. • Check for poor connection (damaged, pulled-out, terminals, corrosion, etc.). • Are terminals okay?	Yes	Go to next step.
		No	Repair or replace terminals, then go to Step 9.
8	**INSPECT COUPLER COMPONENT (10-PIN) CIRCUIT FOR SHORT TO GROUND** • Verify that coupler component (10-pin) connector is disconnected. • Check continuity between coupler component (10-pin) connector terminal A (part side) and ground. • Is there continuity?	Yes	Repair or replace terminal component, then go to next step.
		No	Repair or replace coupler component, then go to next step.
9	**VERIFY TROUBLESHOOTING OF DTC P0763 COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory using WDS or equivalent. • Drive vehicle in D range and make sure that gears shift smoothly from 1GR to 5GR. • Is same DTC present?	Yes	Replace TCM, then go to next step. (See K2–96 TCM REMOVAL/INSTALLATION.)
		No	Go to next step.

STEP	INSPECTION		ACTION
10	**VERIFY AFTER REPAIR PROCEDURE** • Perform “After Repair Procedure”. (See K2–124 AFTER REPAIR PROCEDURE.) • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

PID/DATA MONITOR INSPECTION

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1. Connect the **SSTs** (WDS or equivalent) to the DLC-2.
2. Turn the ignition switch to ON.
3. Measure the PID value.

Note

- Perform part inspection for the output device after TCM inspection.
- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the TCM. Therefore, if a monitored value of an output device is out of specification, it is necessary to inspect the monitored value of the input device related to the output device control. Since an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device, it is necessary to inspect the output device individually using the simulation function, etc.

PID/DATA MONITOR AND RECORD function table

Monitor item (Definition)	Unit/ Condition	Condition/Specification	Action	TCM terminal
2-4 B Duty (2-4 brake solenoid vale)	ON/OFF	N position: ON M range (1GR) stall: OFF	Inspect 2-4 brake solenoid valve. (See K2–88 SOLENOID VALVE INSPECTION.)	2V
BOO (Brake switch)	ON/OFF	Brake pedal depressed: ON Other: OFF	Inspect brake switch.	1U
DWN_SW (Down switch)	ON/OFF	Down sift at M range: ON Other: OFF	Inspect selector lever component.	1S
GEAR (Calculated gear range in TCM)	1ST/2ND/ 3RD/4TH/ 5TH	1GR: 1ST 2GR: 2ND 3GR: 3RD 4GR: 4TH 5GR: 5TH	Inspect following PIDs: THOP, TSS	–
H/C Duty (High clutch solenoid valve)	%	N position: OFF D range 1GR to 2GR shifting: ON	Inspect high clutch solenoid valve. (See K2–88 SOLENOID VALVE INSPECTION.)	2U
LPS (Pressure control solenoid)	%	Ignition switch ON: 0% Idle: 0—100%	Inspect pressure control solenoid. (See K2–88 SOLENOID VALVE INSPECTION.)	2Y
MNL_SW (M range switch)	ON/OFF	M range: ON Other: OFF	Inspect selector lever component.	1AA
NSFT TIM (Neutral shift solenoid valve)	ON/OFF	N position: OFF R position inhibition control: ON	Inspect main relay. (See T–19 RELAY INSPECTION.) Inspect battery. (See G–6 BATTERY INSPECTION.)	2D
OSS (Intermediate sensor	rpm	Ignition switch ON: 0 rpm Idle: 700—800 rpm	Inspect intermediate sensor. (See K2–86 INTERMEDIATE SENSOR INSPECTION.)	1K, 1X
PNP (TR switch (P/ N position switch))	ON/OFF	P or N position: ON R position and all ranges: OFF	Inspect TR switch. (See K2–88 SOLENOID VALVE INSPECTION.)	–
RDCN TIM (Reduction timing solenoid valve)	ON/OFF	N position: OFF D range: ON	Inspect reduction timing solenoid valve. (See K2–88 SOLENOID VALVE INSPECTION.)	2G
RPM (Engine speed)	rpm	Ignition switch ON: 0 rpm Idle: 700—800 rpm	Inspect TCM. (See K2–90 TCM INSPECTION.)	–
SSA/SS1 (Shift solenoid A)	ON/OFF	N position: ON D range 3GR: OFF	Inspect shift solenoid A. (See K2–88 SOLENOID VALVE INSPECTION.)	–

Monitor item (Definition)	Unit/ Condition	Condition/Specification	Action	TCM terminal
SSB/SS2 (Shift solenoid B)	ON/OFF	N position: ON D range 4GR: OFF	Inspect shift solenoid B. (See K2–88 SOLENOID VALVE INSPECTION.)	–
SSC/SS3 (Shift solenoid C)	ON/OFF	N position: ON D range 2GR: OFF	Inspect shift solenoid C. (See K2–88 SOLENOID VALVE INSPECTION.)	–
TCCC (TCC solenoid valve)	%	TCC operating: ON TCC non operating: OFF	Inspect TCC solenoid valve. (See K2–88 SOLENOID VALVE INSPECTION.)	2S
TFT (ATF temperature)	°C	ATF 20 °C {68 °F}: 20 °C {68 °F} ATF 60 °C {140 °F}: 60 °C {140 °F}	Inspect TFT sensor. (See K2–84 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR INSPECTION.)	1B, 1F
TFTV (ATF temperature signal voltage)	V	ATF 20 °C {68 °F}: 1.55 V ATF 60°C {140 °F}: 0.7 V	Inspect TFT sensor. (See K2–84 TRANSAXLE FLUID TEMPERATURE (TFT) SENSOR INSPECTION.)	1B, 1F
THOP (Throttle position)	%	CTP:0% WOT: 100%	Inspect TCM. (See K2–90 TCM INSPECTION.)	–
TRD (TR switch [D range])	ON/OFF	D range: ON Other ranges and all positions: OFF	Inspect TR switch. (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION.)	1Z
TRR (TR switch [R position])	ON/OFF	R position: ON Other positions and all ranges: OFF	Inspect TR switch. (See K2–80 TRANSAXLE RANGE (TR) SWITCH INSPECTION.)	1W
TSS (Input/turbine speed sensor)	rpm	Ignition switch ON: 0 rpm Idle: 700—800 rpm	Inspect input/turbine speed sensor. (See K2–85 INPUT/TURBINE SPEED SENSOR INSPECTION.)	1N, 2F
UP_SW (Up switch)	ON/OFF	Up sift at M range: ON Other: OFF	Inspect selector lever component.	2C
VPWR (Battery voltage)	V	IG ON: B+ Idle: 13—14 V	Inspect main relay.	1P
VSS (Vehicle speed)	km/h	Vehicle speed 20 km/h {12.5 mph}: 20 km/h {12.5 mph} Vehicle speed 40 km/h {25 mph}: 40 km/h {25 mph}	Inspect vehicle speedometer sensor. (See K2–87 VEHICLE SPEEDOMETER SENSOR (VSS) INSPECTION.)	1V, 1M

TROUBLESHOOTING

FOREWORD

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- Refer to Section GI and thoroughly read and understand the basic flow of troubleshooting in order to properly perform the procedure.

AUTOMATIC TRANSAXLE BASIC INSPECTION

A6E578001030202

STEP	INSPECTION		ACTION
1	• Turn ignition switch to ON. • Does gear position indicator light (illuminate/go out) corresponding to selector lever position?	Yes	Go to next step.
		No	Perform symptom troubleshooting No.27 “Gear position indicator light does not illuminate in M range” No.28 “Gear position indicator light illuminates in D range or P, N, R positions”.
2	• Turn ignition switch to ON. • When selector lever is moved, are selector lever position and indicator aligned? Also, when other ranges are selected from N or P during idling, does vehicle creep **within 1 — 2 seconds**?	Yes	Go to next step.
		No	Inspect selector lever. (See K2–117 SELECTOR LEVER INSPECTION.) Repair or replace defected areas.
3	• Inspect ATF color and condition. (See K2–78 Automatic Transaxle Fluid (ATF) Condition Inspection.) • Are ATF color and odor normal?	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection result. Flush ATX and cooler line as necessary.
4	• Perform line pressure test. (See K2–72 Line Pressure Test.) • Is line pressure okay?	Yes	Go to next step.
		No	Adjust accelerator cable as necessary. Repair or replace any defective parts according to inspection result.
5	• Perform stall test. (SeeK2–74 Stall Speed Test.) • Is stall speed okay?	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection result.
6	• Inspect value at following PIDs using WDS or equivalent. (See K2–90 TCM INSPECTION.) — TFT — VPWR — TRD — RPM — TRR — THOP — CPP/PNP — TSS — VSS — OSS — MNL_SW — DWN_SW — UP_SW • Are PID values okay?	Yes	Perform symptom troubleshooting and follow procedures.
		No	Repair or replace any defective parts according to inspection result.

AUTOMATIC TRANSAXLE SYMPTOM TROUBLESHOOTING

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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 range, or in R position	• Vehicle does not move when accelerator pedal depressed.	(See K2–188 NO.1 VEHICLE DOES NOT MOVE IN D RANGE, OR IN R POSITION.)
2	• Vehicle moves in N position	• Vehicle creeps in N position. • Vehicle creeps if brake pedal not depressed in N position.	(See K2–188 NO.2 VEHICLE MOVES IN N POSITION.)
3	• Vehicle moves in P position, or parking gear does not disengage when P is disengaged	• 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 range, and R position when accelerator pedal depressed, and engine remains in stall condition.	(See K2–189 NO.3 VEHICLE MOVES IN P POSITION, OR PARKING GEAR DOES NOT DISENGAGE WHEN P IS DISENGAGED.)
4	• Excessive creep	• Vehicle accelerates in D range, and R position without depressing accelerator pedal.	(See K2–189 NO.4 EXCESSIVE CREEP.)
5	• No creep at all	• Vehicle does not move in D range, or R position when idling on flat paved road.	(See K2–189 NO.5 NO CREEP AT ALL.)
6	• Low maximum speed and poor acceleration	• Vehicle acceleration poor at start. • Delayed acceleration when accelerator pedal depressed while driving.	(See K2–190 NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION.)
7	• No shifting	• Single shift range only. • Sometimes it shifts correctly.	(See K2–191 NO.7 NO SHIFTING.)
8	• Does not shift to fifth gear (5GR)	• Vehicle does not upshift from 4GR to 5GR even though vehicle speed increased. • Vehicle does not shift to 5GR even though accelerator pedal released in D range at **60 km/h {37 mph}**.	(See K2–192 NO.8 DOES NOT SHIFT TO FIFTH GEAR (5GR).)
9	• Abnormal shifting	• Shifts incorrectly (incorrect shift pattern).	(See K2–193 NO.9 ABNORMAL SHIFTING.)
10	• Frequent shifting	• Downshifting occurs immediately even when accelerator pedal depressed slightly in D range.	(See K2–193 NO.10 FREQUENT SHIFTING.)
11	• Shift point is high or low	• Shift point considerably different from automatic shift diagram. • Shift delays when accelerating. • Shift occurs quickly when accelerating and engine speed does not increase.	(See K2–194 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 K2–194 NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION.)
13	• No kickdown	• Does not downshift when accelerator pedal fully depressed within kickdown range.	(See K2–195 NO.13 NO KICKDOWN.)
14	• Engine flares up or slips when upshifting or downshifting	• 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 speed does not increase.	(See K2–195 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 depressed for upshifting. • Engine flares up suddenly when accelerator pedal depressed for downshifting.	(See K2–196 NO.15 ENGINE FLARES UP OR SLIPS WHEN ACCELERATING VEHICLE.)
16	• Judder upon torque converter clutch (TCC) operation	• Vehicle jolts when TCC engaged.	(See K2–196 NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION.)

No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
17	• Excessive shift shock from N to D or N to R position/range	• Strong shock felt when shifting from N to D or N to R position/range at idle.	(See K2–196 NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE.)
18	• Excessive shift shock is given when upshifting and downshifting	• Excessive shift shock felt when depressing accelerator pedal to accelerate at upshifting. • During cruising, excessive shift shock felt when depressing accelerator pedal at downshifting.	(See K2–197 NO.18 EXCESSIVE SHIFT SHOCK IS GIVEN WHEN UPSHIFTING AND DOWNSHIFTING.)
19	• Excessive shift shock on torque converter clutch (TCC)	• Strong shock felt when TCC engaged.	(See K2–197 NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC).)
20	• Noise occurs at idle when vehicle is stopped in all positions/ranges	• Transaxle noisy in all positions and ranges when vehicle idling.	(See K2–198 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 range, or in R position	• Transaxle noisy in driving ranges when vehicle idling.	(See K2–198 NO.21 NOISE OCCURS AT IDLE WHEN VEHICLE IS STOPPED IN D RANGE, OR IN R POSITION.)
22	• No engine braking in 1GR position of M range	• 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 M range (1GR) at low vehicle speed.	(See K2–198 NO.22 NO ENGINE BRAKING IN 1GR POSITION OF M RANGE.)
23	• Transaxle overheats	• Burnt smell emitted from transaxle. • Smoke emitted from transaxle.	(See K2–199 NO.23 TRANSAXLE OVERHEATS.)
24	• Engine stalls when shifted to D range, or in R position	• Engine stalls when shifting from N or P position to D range or R position at idle.	(See K2–199 NO.24 ENGINE STALLS WHEN SHIFTED TO D RANGE, OR IN R POSITION.)
25	• Engine stalls when driving at slow speeds or stopping	• Engine stalls when brake pedal depressed while driving at low speed or stopping.	(See K2–200 NO.25 ENGINE STALLS WHEN DRIVING AT SLOW SPEED OR STOPPING.)
26	• Starter does not work	• Starter does not work even when P or N position selected.	(See K2–200 NO.26 STARTER DOES NOT WORK.)
27	• Gear position indicator light does not illuminate in M range	• Gear position indicator light in instrument cluster does not illuminate in M range and ignition switch at on.	(See K2–200 NO.27 GEAR POSITION INDICATOR LIGHT DOES NOT ILLUMINATE IN M RANGE.)
28	• Gear position indicator light illuminates in D range or P, N, R positions	• Gear position indicator light in instrument cluster illuminates in D range or P, N, R positions and ignition switch at on.	(See K2–201 NO.28 GEAR POSITION INDICATOR LIGHT ILLUMINATES IN D RANGE OR IN P, N, R POSITIONS.)
29	• Does not shift up in M range	• Gear position indicator light in instrument cluster illuminates but vehicle does not upshift when selector lever is pushed to “+” side.	(See K2–201 NO.29 DOES NOT SHIFT UP IN M RANGE.)
30	• Does not shift down in M range	• Gear position indicator light in instrument cluster illuminates but vehicle does not downshift when selector lever is pushed to “-” side.	(See K2–201 NO.30 DOES NOT SHIFT DOWN IN M RANGE.)

Quick Diagnosis Chart

	Symptom item / Cause of trouble	Selector lever is misadjisted	Not within line pressure specification	Idle speed is misadjusted	IG timing is misadjusted	TR switch is misadjusted	Electrical system components: Engine speed signal: CAN signal	Engine speed signal: Open/short	Vehicle speedometer sensor: Signal is not inputed	Vehicle speedometer sensor: Abnormal signal is inputed	Input/turbine speed sensor: Signal is not inputed	Input/turbine speed sensor: Abnormal signal is inputed	Intermediate sensor: Signal is not inputed	Intermediate sensor: Abnormal signal is inputed	ATX outer parts: D range switch: Signal is not inputed	D range switch: Abnormal signal is inputed	M range switch: Signal is not inputed	M range switch: Abnormal signal is inputed	Up switch: Signal is not inputed	Up switch: Abnormal signal is inputed	Down switch: Signal is not inputed	Down switch: Abnormal signal is inputed	Throttle opening: CAN signal	Throttle opening: Abnormal signal is inputed
1	Vehicle dose not move in D range, or in R position	X	X																					
2	Vehicle moves in N position	X																						
3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged	X																						
4	Excessive creep			X	X																			
5	No creep at all		X												X									
6	Low maximum speed and poor acceleration		X		X	X			X						X									X
7	No shifting														X									X
8	Does not shift to fifth gear (5GR)	X													X						X			
9	Abnormal shifting	X							X															X
10	Frequent shifting								X															X
11	Shift point is high or low							X	X															X
12	Torque converter clutch (TCC) non-operation						X								X									
13	No kickdown								X															X
14	Engine flares up or slips when upshifting or downshifting		X						X	X	X	X	X											X
15	Engine flares up or slip when accelerating vehicle		X						X															X
16	Judder upon torque converter clutch (TCC) operation		X				X		X	X	X	X	X											X
17	Excessive shift shock from N to D or N to R position/range	X	X	X		X	X			X	X	X	X	X	X									X
18	Excessive shift shock is given when upshifting and downshifting		X		X				X	X	X	X	X											X
19	Excessive shift shock on torque converter clutch (TCC)		X		X		X		X	X	X	X	X											X
20	Noise occurs at idle when vehicle is stopped in all positions/ranges		X	X		X																		X
21	Noise occurs at idle when vehicle is stopped in D range, or in R position		X																					
22	No engine braking in 1GR position of M range																							
23	Transaxle overheats		X																					
24	Engine stalls when shifted to D range, or in R position		X	X	X																			
25	Engine stalls when driving at slow speeds or stopping			X		X																		
26	Starter does not work					X																		
27	Gear position indicator light does not illuminate in M range																X							
28	Gear position indicator light illuminates in D range or P, N, R positions																	X						
29	Does not shift up in M range																X		X	X				
30	Does not shift down in M range																X				X	X		

A6E5780W001

	Symptom item / Cause of trouble	CAN signal	N-D select	Transaxle range switch	Power supply, GND	TFT sensor	Malfunction signal is inputed	Pressure control solenoid	TCC solenoid valve	High clutch solenoid valve	2-4 brake solenoid valve	Shift solenoid A	Shift solenoid B	Shift solenoid C	Neutral shift solenoid valve	Reducation timing solenoid	GND return line	ATF amount	Control valve spool is not operating properly	Low clutch solenoid accumulator is not operating properly	2-4 brake accumulator is not operating properly	High clutch accumulator is not operating properly	Direct clutch accumulator is not operating properly
		ATX outer parts				ATX inner parts												Control valve body					
		Electrical system components																Hydraulic system components					
		Signal is inputed	Open/short	Open/short	Open/short	Open/short	Malfunction signal is inputed	Open/short	Open/short	Open/short	Open/short	Open/short	Open/short	Open/short	Open/short	Open/short	Open/short	ATF amount	Control valve spool is not operating properly	Low clutch solenoid accumulator is not operating properly	2-4 brake accumulator is not operating properly	High clutch accumulator is not operating properly	Direct clutch accumulator is not operating properly
1	Vehicle dose not move in D range, or in R position																	X					
2	Vehicle moves in N position																						
3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged																						
4	Excessive creep																						
5	No creep at all											X	X			X	X	X					
6	Low maximum speed and poor acceleration			X			X	X			X	X	X			X		X					
7	No shifting			X												X		X					
8	Does not shift to fifth gear (5GR)				X	X																	
9	Abnormal shifting		X	X				X			X	X	X			X		X					
10	Frequent shifting			X																			
11	Shift point is high or low		X																X				
12	Torque converter clutch (TCC) non-operation				X	X		X											X				
13	No kickdown			X							X	X	X			X			X				
14	Engine flares up or slips when upshifting or downshifting		X	X		X	X				X	X	X			X	X	X					
15	Engine flares up or slip when accelerating vehicle			X			X	X			X	X	X			X	X	X					
16	Judder upon torque converter clutch (TCC) operation			X			X	X											X				
17	Excessive shift shock from N to D or N to R position/range	X	X	X	X	X	X									X			X	X		X	
18	Excessive shift shock is given when upshifting and downshifting		X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X
19	Excessive shift shock on torque converter clutch (TCC)		X	X		X	X	X											X				
20	Noise occurs at idle when vehicle is stopped in all positions/ranges						X	X	X	X													
21	Noise occurs at idle when vehicle is stopped in D range, or in R position																	X					
22	No engine braking in 1GR position of M range		X	X											X				X				
23	Transaxle overheats																	X	X				
24	Engine stalls when shifted to D range, or in R position							X											X				
25	Engine stalls when driving at slow speeds or stopping							X										X	X				
26	Starter does not work																						
27	Gear position indicator light does not illuminate in M range																						
28	Gear position indicator light illuminates in D range or P, N, R positions																						
29	Does not shift up in M range																						
30	Does not shift down in M range																						

A6E5780W002

	Symptom item / Cause of trouble	Reduction accumulator is not operating properly	Clogging	Pressure control solenoid hydraulic circuit	Clogging	TCC solenoid valve hydraulic circuit	Clogging	High clutch solenoid valve hydraulic circuit	Clogging	2-4 brake solenoid valve hydraulic circuit	Clogging	Shift solenoid A hydraulic circuit	Clogging	Shift solenoid B hydraulic circuit	Clogging	Shift solenoid C hydraulic circuit	Clogging	Neutral shift solenoid valve	Clogging	Reducation timing solenoid valve	Oil cooler is not operating properly	Slipping (clutch, brake)	Burned (clutch, brake)	Torque converter is not operating properly	TCC piston is cracking or peeling	TCC piston is not operating properly
		Hydraulic system components																				Powertrain				
		Control valve body																								
1	Vehicle dose not move in D range, or in R position																				X	X	X	X		
2	Vehicle moves in N position																					X				
3	Vehicle moves in P position, or parking gear does not disengage when P is disengaged																									
4	Excessive creep																									
5	No creep at all												X	X							X	X	X	X		
6	Low maximum speed and poor acceleration											X	X	X							X	X	X			
7	No shifting																		X		X	X				
8	Does not shift to fifth gear (5GR)																		X							
9	Abnormal shifting											X	X	X							X	X				
10	Frequent shifting																									
11	Shift point is high or low																									
12	Torque converter clutch (TCC) non-operation																							X	X	X
13	No kickdown											X	X	X												
14	Engine flares up or slips when upshifting or downshifting											X	X	X							X	X				
15	Engine flares up or slip when accelerating vehicle																				X				X	
16	Judder upon torque converter clutch (TCC) operation																							X	X	X
17	Excessive shift shock from N to D or N to R position/range			X	X																	X				
18	Excessive shift shock is given when upshifting and downshifting	X	X	X	X	X	X	X	X			X							X		X	X				
19	Excessive shift shock on torque converter clutch (TCC)																								X	X
20	Noise occurs at idle when vehicle is stopped in all positions/ranges																									
21	Noise occurs at idle when vehicle is stopped in D range, or in R position																									
22	No engine braking in 1GR position of M range																		X		X					
23	Transaxle overheats																			X	X	X	X	X	X	X
24	Engine stalls when shifted to D range, or in R position				X															X				X		X
25	Engine stalls when driving at slow speeds or stopping				X															X				X		X
26	Starter does not work																									
27	Gear position indicator light does not illuminate in M range																									
28	Gear position indicator light illuminates in D range or P, N, R positions																									
29	Does not shift up in M range																									
30	Does not shift down in M range																									

A6E5780W003

NO.1 VEHICLE DOES NOT MOVE IN D RANGE, OR IN R POSITION

A6E578001030204

1	Vehicle does not move in D range, or in R position
DESCRIPTION	• Vehicle does not move when accelerator pedal depressed.
POSSIBLE CAUSE	• If vehicle does not move in D range or R position, basically, malfunction is in ATX. (Vehicle will move even with a malfunction in TCM.) Since a malfunction in sensor circuit or output circuit is cause of malfunction in ATX, inspect sensors, output circuit, and related harnesses. — Clutch slipped, worn (D range-Low clutch, Low one-way clutch, Reduction one-way clutch, R position-Reverse clutch, Low and reverse brake, Reduction brake) • Line pressure low • Malfunction of shift solenoid A, B, or C • Malfunction of sensor ground • Malfunction of body ground • Malfunction of control valve body — Malfunction of selector lever — Parking mechanism not properly operated — Malfunction of torque converter **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• With vehicle stopped on a flat, paved road and engine off, does vehicle move when pushed? (in D ranges or N, R positions and brake released)	Yes	Go to next step.
		No	Inspect for parking mechanism. (See ATX Workshop Manual.)
2	• Start engine. • Does vehicle move when selector lever in between N position and D range?	Yes	Inspect or adjust selector lever. (See K2–117 SELECTOR LEVER INSPECTION.) (See K2–118 SELECTOR CABLE ADJUSTMENT.)
		No	Go to next step.
3	• Stop engine. • Inspect pressure control solenoid circuit. • Is it okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual.) — If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.) (See ATX workshop Manual.)
		No	• Inspect for pressure control solenoid mechanical stuck. (See K2–88 SOLENOID VALVE INSPECTION.) — If pressure control solenoid okay, inspect for open or short circuit between TCM connector terminal 2Y and pressure control solenoid connector terminal D.
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.2 VEHICLE MOVES IN N POSITION

A6E578001030205

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 ATX. Since a malfunction in sensor circuit or output circuit is cause of malfunction in ATX, 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 Transaxle On-Board Diagnostic and Automatic Transaxle 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 ATX Workshop Manual.) — If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.) (See ATX Workshop Manual.)
		No	Inspect and adjust selector lever. (See K2–117 SELECTOR LEVER INSPECTION.) (See K2–118 SELECTOR CABLE ADJUSTMENT.)
2	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations 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 P IS DISENGAGED

A6E578001030206

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 range, 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 transaxle) • 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.4 EXCESSIVE CREEP

A6E578001030207

4	**Excessive creep**
DESCRIPTION	• Vehicle accelerates in D range, and R position without depressing accelerator pedal.
POSSIBLE CAUSE	• Engine idle speed high (transaxle system is not cause of problem) • Go to symptom troubleshooting No.9 “Fast idle/runs on” (See Section F.) **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.5 NO CREEP AT ALL

A6E578001030208

5	**No creep at all**
DESCRIPTION	• Vehicle does not move in D range, 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, or C • Malfunction of body ground • Malfunction of control valve body — Transaxle fixed in 4GR (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 Transaxle On-Board Diagnostic and Automatic Transaxle 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 K2–117 SELECTOR LEVER INSPECTION.) (See K2–118 SELECTOR CABLE 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 K2–88 SOLENOID VALVE INSPECTION.) — If pressure control solenoid okay, inspect for open or short circuit between TCM connector terminal 2Y and pressure control solenoid connector terminal D.
3	• Remove torque converter. • Inspect torque converter. (See ATX Workshop Manual.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual.) — If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.) (See ATX 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 Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.6 LOW MAXIMUM SPEED AND POOR ACCELERATION

A6E578001030209

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 4GR, malfunction is in engine circuit. — Clutch slipped, burned • Line pressure low • Incorrect throttle position signal • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of shift solenoids A, B, or C • Malfunction of body ground • Malfunction of control valve body — Transaxle fixed in 4GR (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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• With ignition switch at ON, does gear position indicator light indication correspond to selector lever position?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.27 “Gear position indicator light does not illuminate in M range”, or No.28 “Gear position indicator light illuminates in D range or P, N, R position”.
2	• Go to symptom troubleshooting No.12 “Lack/loss of power-acceleration/cruise”. (See Section F.) • Does engine control system okay?	Yes	Go to next step.
		No	Repair or replace any defective parts according to inspection results.

STEP	INSPECTION		ACTION
3	• Stop engine. • Inspect shift solenoid A, B, or C. • Are they okay?	Yes	Go to next step.
		No	• Inspect for shift solenoid mechanical stuck. (See K2–88 SOLENOID VALVE INSPECTION.) — If shift solenoids okay, inspect for open or short circuit between TCM connector terminals 2W, 2T, 2X and pressure control solenoid connector terminals I, G, or F.
4	• Remove torque converter. • Inspect torque converter. (See ATX Workshop Manual.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual.) — If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.) (See ATX 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 Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.7 NO SHIFTING

A6E578001030210

7	No shifting
DESCRIPTION	• Single shift range only. • Sometimes it shifts correctly.
POSSIBLE CAUSE	• When gear position is fixed in 4GR due to the fail-safe operation, malfunction is in the ATX. • Perform malfunction diagnosis according to No.6 “Low maximum speed and poor acceleration”. — Clutch burned • Line pressure low • Incorrect throttle position signal • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B or C • Malfunction of control valve body — 4GR 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.8 DOES NOT SHIFT TO FIFTH GEAR (5GR)

A6E578001030211

8	Does not shift to fifth gear (5GR)
DESCRIPTION	• Vehicle does not upshift from 4GR to 5GR even though vehicle speed increased. • Vehicle does not shift to 5GR 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 D range 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 throttle position signal • Malfunction of ECT sensor • Malfunction of VSS • Malfunction of input/turbine speed 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 valve • Short or open circuit in wiring • Poor connection of connector • Solenoid valve stuck — Malfunction of M range switch — Malfunction of torque converter — Malfunction of control valve body **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn ignition switch to ON. • Does gear position indicator light indication correspond to selector lever position?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.27 “Gear position indicator light does not illuminate in M range” or No.28 “Gear position indicator light illuminates in D range or P, N, R positions”.
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 — 4–5 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 K2–88 SOLENOID VALVE INSPECTION.)
4	• Remove torque converter. • Inspect torque converter. (See ATX Workshop.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual.) — If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See K2–99 AUTOMATIC TRANSAXLE AND TRANSFER REMOVAL/INSTALLATION.) (See ATX Workshop Manual.)
		No	Replace torque converter.

STEP	INSPECTION	ACTION
5	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations 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

A6E578001030212

9	Abnormal shifting
DESCRIPTION	• Shift incorrectly (incorrect shift pattern).
POSSIBLE CAUSE	• There is a malfunction in signal circuit which controls shifting (Throttle position signal, input/turbine speed sensor, VSS), control valve is stuck, or clutch circuit is stuck. — Clutch slipped, burned • Line pressure low • Incorrect throttle position signal • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B, or C • Malfunction of TCC solenoid valve • 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect continuity between TCM connector terminals C and Y and transaxle 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 ATX for bend, damage, corrosion or looseness. • Inspect for shift solenoid mechanical stuck. (See K2–88 SOLENOID VALVE INSPECTION.) — If shift solenoids okay, inspect for open or short circuit between TCM connector terminals 2W, 2T, 2X and coupler component terminals I, G, or F.
3	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations 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

A6E578001030213

10	Frequent shifting
DESCRIPTION	• Downshifting occurs immediately even when accelerator pedal depressed slightly in D range.
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 TP sensor, input/turbine speed 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.11 SHIFT POINT IS HIGH OR LOW

A6E578001030214

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 transaxle does not shift abnormally, there is a malfunction of input signal to TP sensor, input/turbine speed sensor, or VSS. • If engine speed is high or low regardless that shifting is normal, inspect tachometer. • Verify that output signal of TP sensor changes linearly. **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.12 TORQUE CONVERTER CLUTCH (TCC) NON-OPERATION

A6E578001030215

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 D and/or M ranges 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 throttle position signal • Input/turbine speed sensor malfunction • TFT sensor malfunction • Sensor ground malfunction • VSS malfunction • Malfunction of output solenoid valve system (Sticking) • TCC solenoid valve malfunction • Malfunction of control valve body system (Poor operation, sticking) • TCC piston hydraulic pressure system malfunction • Malfunction of TP sensor (Not operating linearly) • Malfunction of input/turbine speed sensor or VSS **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Turn ignition switch to ON. • Does gear position lamp indication correspond to selector lever position?	Yes	Go to next step.
		No	Go to symptom troubleshooting No.27 “Gear position indicator light does not illuminate in M range”, or No.28 “Gear position indicator light illuminates in D range or P, N, R positions”.
2	• Disconnect TCM. • Is resistance between ground terminals 1C, 1Y 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 ATX Workshop Manual.) • Is torque converter okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual.) • If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See ATX 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 Informations 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

A6E578001030216

13	No kickdown
DESCRIPTION	• Does not downshift when accelerator pedal fully depressed within kickdown range.
POSSIBLE CAUSE	• If transaxle does not downshift though shifting is normal, malfunction is in TP sensor circuit (including sensor ground, sensor harness and connector). **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.14 ENGINE FLARES UP OR SLIPS WHEN UPSHIFTING OR DOWNSHIFTING

A6E578001030217

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 throttle position signal • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of shift solenoid A, B, or C • Malfunction of TCC solenoid valve • Malfunction of body ground • Misadjustment of throttle 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Is line pressure okay? (See K2–72 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 K2–75 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 ATX Workshop Manual.) • If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See ATX Workshop Manual.)
		No	• Inspect for shift solenoid mechanical stuck. (See K2–88 SOLENOID VALVE INSPECTION.)
4	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations 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

A6E578001030218

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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.16 JUDDER UPON TORQUE CONVERTER CLUTCH (TCC) OPERATION

A6E578001030219

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 throttle position signal • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of TCC solenoid valve • Malfunction of control valve body — Malfunction of torque converter **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.17 EXCESSIVE SHIFT SHOCK FROM N TO D OR N TO R POSITION/RANGE

A6E578001030220

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 throttle position signal • Malfunction of TFT sensor • Malfunction of sensor ground • Misadjustment of throttle 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 Transaxle On-Board Diagnostic and Automatic Transaxle 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.

STEP	INSPECTION		ACTION
3	• Is line pressure okay? (See K2–72 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 K2–74 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.
6	• Stop engine and turn ignition switch on. • Inspect pressure control solenoid circuit. • Is it okay?	Yes	• Overhaul control valve body and repair or replace any defective parts. (See ATX Workshop Manual.) • If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See ATX Workshop Manual.)
		No	• Inspect for pressure control solenoid mechanical stuck. (See K2–88 SOLENOID VALVE INSPECTION.)
7	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations 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 GIVEN WHEN UPSHIFTING AND DOWNSHIFTING

A6E578001030221

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 TP sensor, input/turbine speed sensor, or VSS signal malfunctions. — Clutch slipped, burned • Line pressure low, high • Incorrect throttle position signal • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of TFT sensor • Malfunction of shift solenoid A, B, or C • Malfunction of TCC solenoid valve • Misadjustment of throttle 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.19 EXCESSIVE SHIFT SHOCK ON TORQUE CONVERTER CLUTCH (TCC)

A6E578001030222

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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.20 NOISE OCCURS AT IDLE WHEN VEHICLE IS STOPPED IN ALL POSITIONS/RANGES

A6E578001030223

20	Noise occurs at idle when vehicle is stopped in all positions/ranges
DESCRIPTION	• Transaxle 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 transaxle 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 Transaxle On-Board Diagnostic and Automatic Transaxle 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. (See F1–57 ENGINE 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 Informations 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 RANGE, OR IN R POSITION

A6E578001030224

21	Noise occurs at idle when vehicle is stopped in D range, or in R position
DESCRIPTION	• Transaxle 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.22 NO ENGINE BRAKING IN 1GR POSITION OF M RANGE

A6E578001030225

22	No engine braking in 1GR position of M 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 M range (1GR) at low vehicle speed.
POSSIBLE CAUSE	• Clutch slipped, burned (Reduction brake) — Line pressure low • Malfunction of VSS • Malfunction of input/turbine speed sensor • Malfunction of sensor ground • Malfunction of control valve body — M range switch on not judged by TCM (short, or open circuit, poor operation) • Malfunction of M range switch signal **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect TR switch adjustment. • Does TR switch adjusted properly? • Select PNP PID. • Is PNP PID reading okay when selecting range?	Yes	Go to next step.
		No	Adjust TR switch as necessary. (See K2–83 TRANSAXLE RANGE (TR) SWITCH ADJUSTMENT.) Inspect TR switch. Repair or replace any defective parts.

STEP	INSPECTION		ACTION
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 Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.23 TRANSAXLE OVERHEATS

A6E578001030226

23	Transaxle Overheat
DESCRIPTION	• Burnt smell emitted from transaxle. • Smoke emitted from transaxle.
POSSIBLE CAUSE	• Malfunction is restricted to hindrance of coolant at oil cooler. In addition, overheating of transaxle may be caused by a malfunction of TFT sensor. — Line pressure low • ATF level low • Incorrect throttle position signal • Misadjustment of throttle 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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Is line pressure okay? (See K2–72 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 K2–74 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 K2–88 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 ATX Workshop Manual.) • If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See ATX 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 Informations 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 RANGE, OR IN R POSITION

A6E578001030227

24	Engine stalls when shifted to D range, or in R position
DESCRIPTION	• Engine stalls when shifting from N or P position to D range or R position at idle.
POSSIBLE CAUSE	• Malfunction is on the engine control side (e.g. IAC system). Otherwise, malfunction is in input/turbine speed sensor (engine sometimes starts) or TCC piston circuit (engine always stalls). • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Go to symptom troubleshooting No.4 “Engine stalls-after start/at idle”. (See Section F.) • 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 ATX 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 ATX Workshop Manual.) • If problem remains, replace or overhaul transaxle and repair or replace any defective parts. (See ATX 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 Informations 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 SPEED OR STOPPING

A6E578001030228

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 Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Go to symptom troubleshooting No.10 “Low idle/stalls during deceleration”. (See Section F.) • Is engine control system okay?	Yes	Go to symptom troubleshooting No.24 “Engine stalls when shifted to D range, 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 Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.26 STARTER DOES NOT WORK

A6E578001030229

26	Starter does not work
DESCRIPTION	• Starter does not work even when P or N position.
POSSIBLE CAUSE	• Selector lever misadjustment. • TR switch misadjustment. • Open or short circuit in TR switch.

NO.27 GEAR POSITION INDICATOR LIGHT DOES NOT ILLUMINATE IN M RANGE

A6E578001030230

27	Gear position indicator light does not illuminate in M range
DESCRIPTION	• Gear position indicator light in instrument cluster does not illuminate in M range and ignition switch at on.
POSSIBLE CAUSE	• M range switch, gear position indicator light or related wiring harness malfunction. **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle 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.

STEP	INSPECTION		ACTION
2	• Inspect MNL SW PID value using WDS or equivalent. • Are these PIDs okay?	Yes	Inspect instrument cluster.
		No	Inspect M range switch. If M range switch is okay, inspect for continuity between M range switch and TCM terminal 1AA.
3	• Verify test results. — If okay, return to diagnostic index to service any additional symptoms. — If malfunction remains, inspect related Service Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.28 GEAR POSITION INDICATOR LIGHT ILLUMINATES IN D RANGE OR IN P, N, R POSITIONS

A6E578001030231

28	Gear position indicator light illuminates when D range or P, N, R positions
DESCRIPTION	• Gear position indicator light in instrument cluster illuminates in D range or P, N, R positions and ignition switch at on.
POSSIBLE CAUSE	• M range switch or related wiring harness malfunction. **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

Diagnostic procedure

STEP	INSPECTION		ACTION
1	• Inspect MNL SW PID value using WDS or equivalent. • Are these PIDs okay?	Yes	Inspect instrument cluster.
		No	Inspect M range switch. If M range switch is okay, inspect for continuity between M range switch 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 Informations and perform repair or diagnosis. — If vehicle repaired, troubleshooting completed. — If vehicle not repaired or additional diagnostic information not available, replace TCM.		

NO.29 DOES NOT SHIFT UP IN M RANGE

A6E578001030232

29	Does not shift up in M range
DESCRIPTION	• Gear position indicator light in instrument cluster illuminates, but vehicle does not upshift when selector lever is pushed to “+” side.
POSSIBLE CAUSE	• Up switch or related harness malfunction **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

NO.30 DOES NOT SHIFT DOWN IN M RANGE

A6E578001030233

30	Does not shift up in M range
DESCRIPTION	• Gear position indicator light in instrument cluster illuminates, but vehicle does not downshift when selector is pushed lever to “–” side.
POSSIBLE CAUSE	• Down switch or related harness malfunction **Note** • Before following troubleshooting steps, make sure that Automatic Transaxle On-Board Diagnostic and Automatic Transaxle Basic Inspection are conducted.

PROPELLER SHAFT

FEATURES

OUTLINE L-2
OUTLINE OF CONSTRUCTION L-2
FEATURES L-2
SPECIFICATIONS L-2

SERVICE

LOCATION INDEX L-3
PROPELLER SHAFT INDEX L-3
PROPELLER SHAFT L-4
PROPELLER SHAFT INSPECTION ON VEHICLE L-4
PROPELLER SHAFT REMOVAL/INSTALLATION L-5
PROPELLER SHAFT DISASSEMBLY/ASSEMBLY L-7
PROPELLER SHAFT INSPECTION L-14

OUTLINE

OUTLINE OF CONSTRUCTION

A6E610225002201

- The Mazda6 4WD model has been adopted for European specs.

FEATURES

A6E610225002203

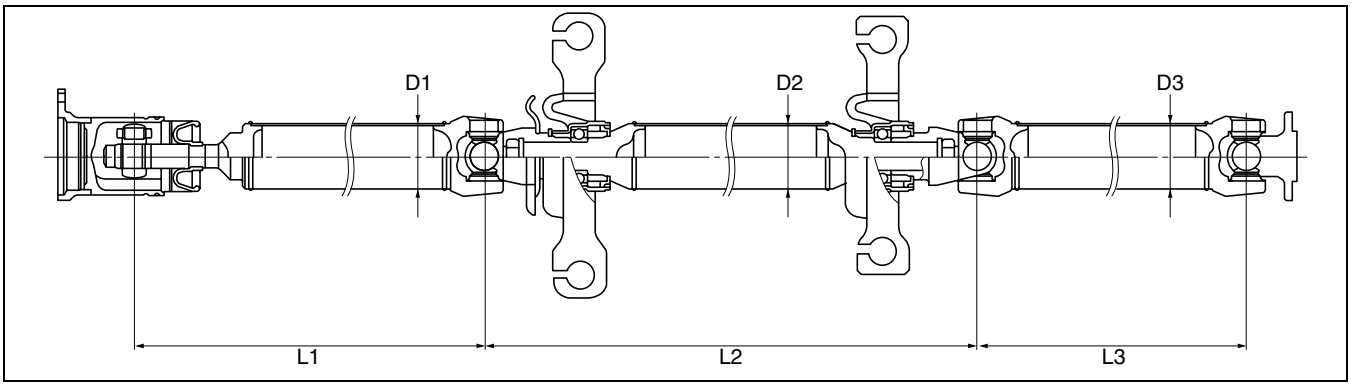
Reduced noise and vibration

- The four-joint type propeller shaft with two bearing support has been adopted for the Mazda6 4WD model.

SPECIFICATIONS

A6E610225002202

Item			Specification
Length	(mm)	L1	720.5
		L2	735.0
		L3	503.0
Outer diameter	(mm)	D1	57.0
		D2	57.0
		D3	57.0
Joint type			Tripod joint, Universal joint
Tripod joint			Double offset joint

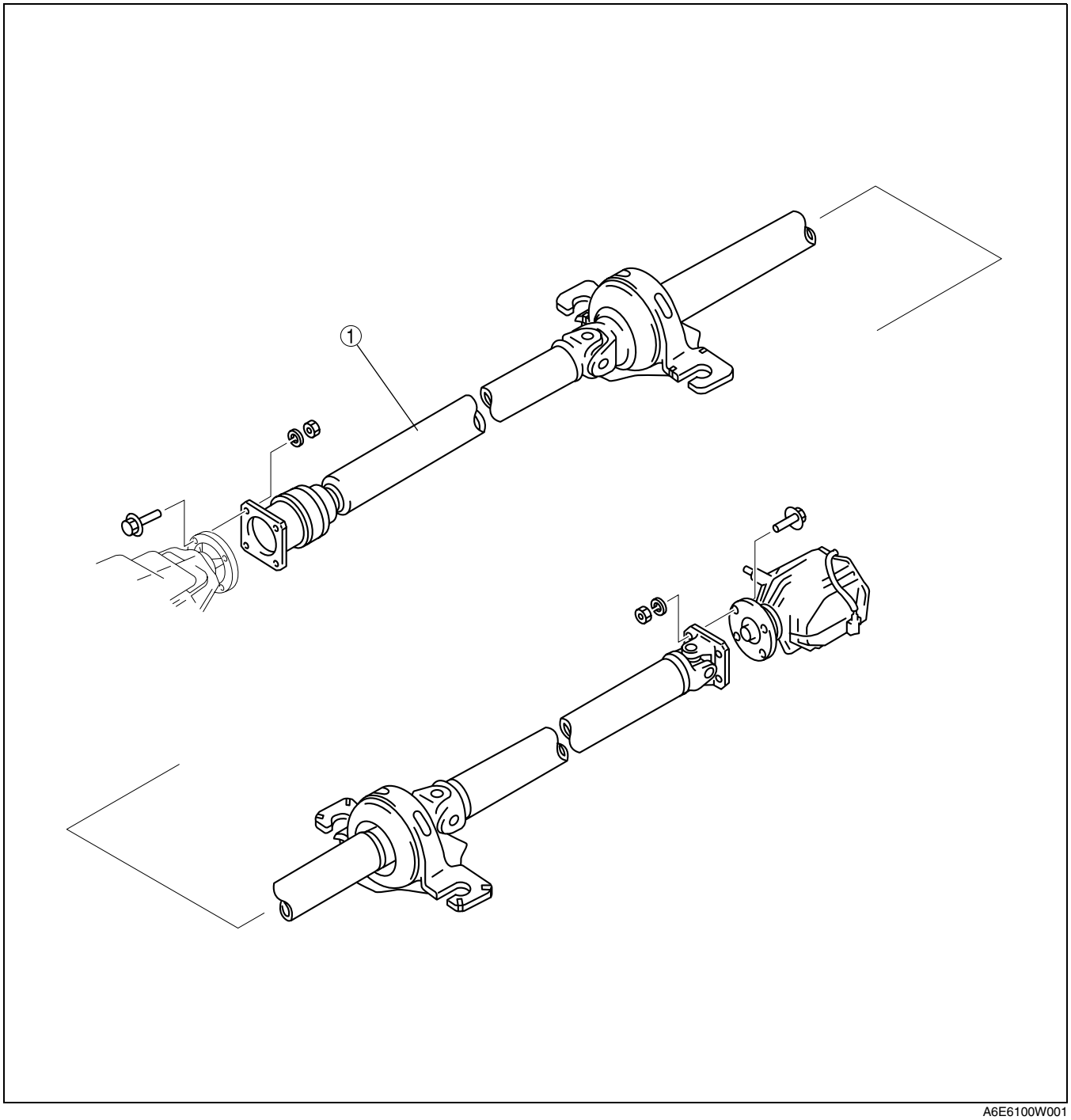


A6J6110W001

LOCATION INDEX

PROPELLER SHAFT INDEX

A6E610001036201



A6E6100W001

1	Propeller shaft (See L–4 PROPELLER SHAFT INSPECTION ON VEHICLE) (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION) (See L–7 PROPELLER SHAFT DISASSEMBLY/ASSEMBLY) (See L–14 PROPELLER SHAFT INSPECTION)

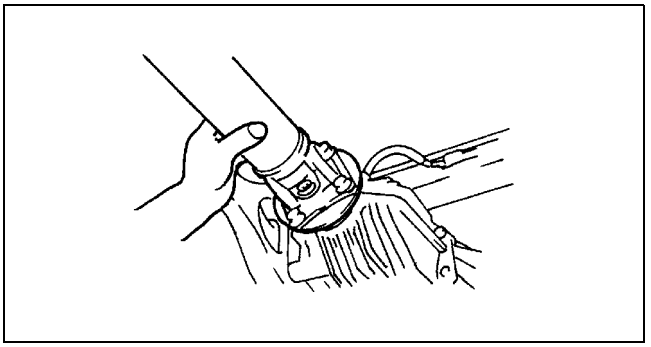
PROPELLER SHAFT

PROPELLER SHAFT INSPECTION ON VEHICLE

A6E611025002204

Joint Play Inspection

1. Move the joint shaft by hand, and verify that there is no play.
   If there is play, perform the following service operations.
   - Yoke : Universal joint replacement (See L–7 PROPELLER SHAFT DISASSEMBLY/ASSEMBLY.)
   - Constant velocity joint : Propeller shaft replacement (See L–7 PROPELLER SHAFT DISASSEMBLY/ASSEMBLY.)



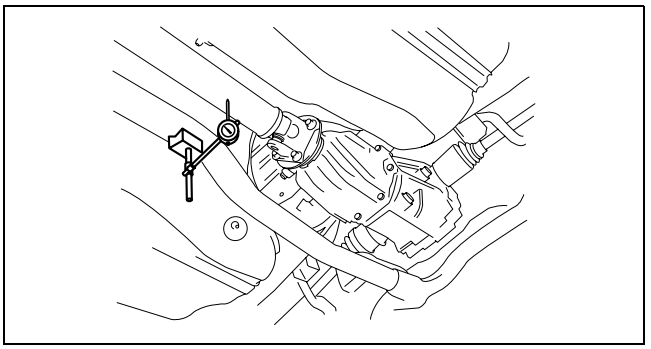
A6J6110W002

Propeller Shaft Runout Inspection

Caution

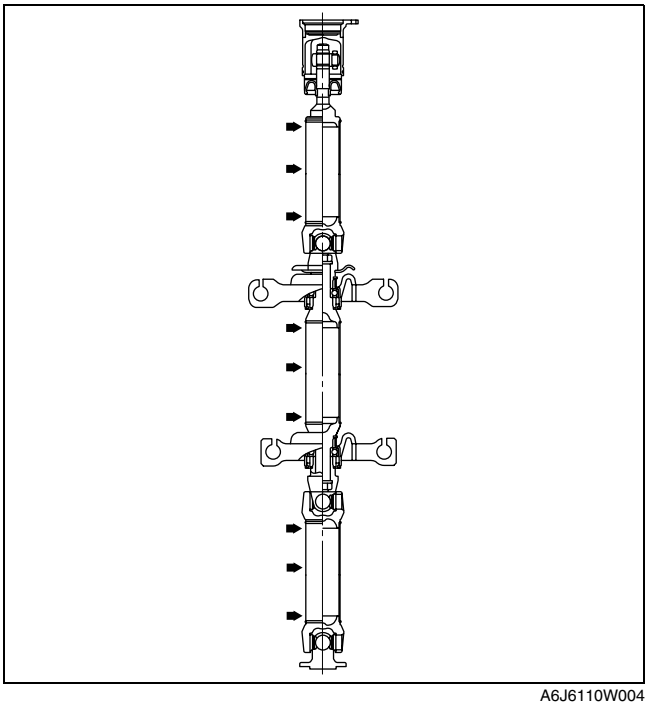
- **Do not rotate the propeller shaft by starting the engine.**

1. Shift the select lever to N position and release the parking brake.
2. Rotate the rear wheel by hand, and measure the propeller shaft runout at 9 points as shown in the figure.



A6J6110W003

Limit
0.4 mm {0.02 in}

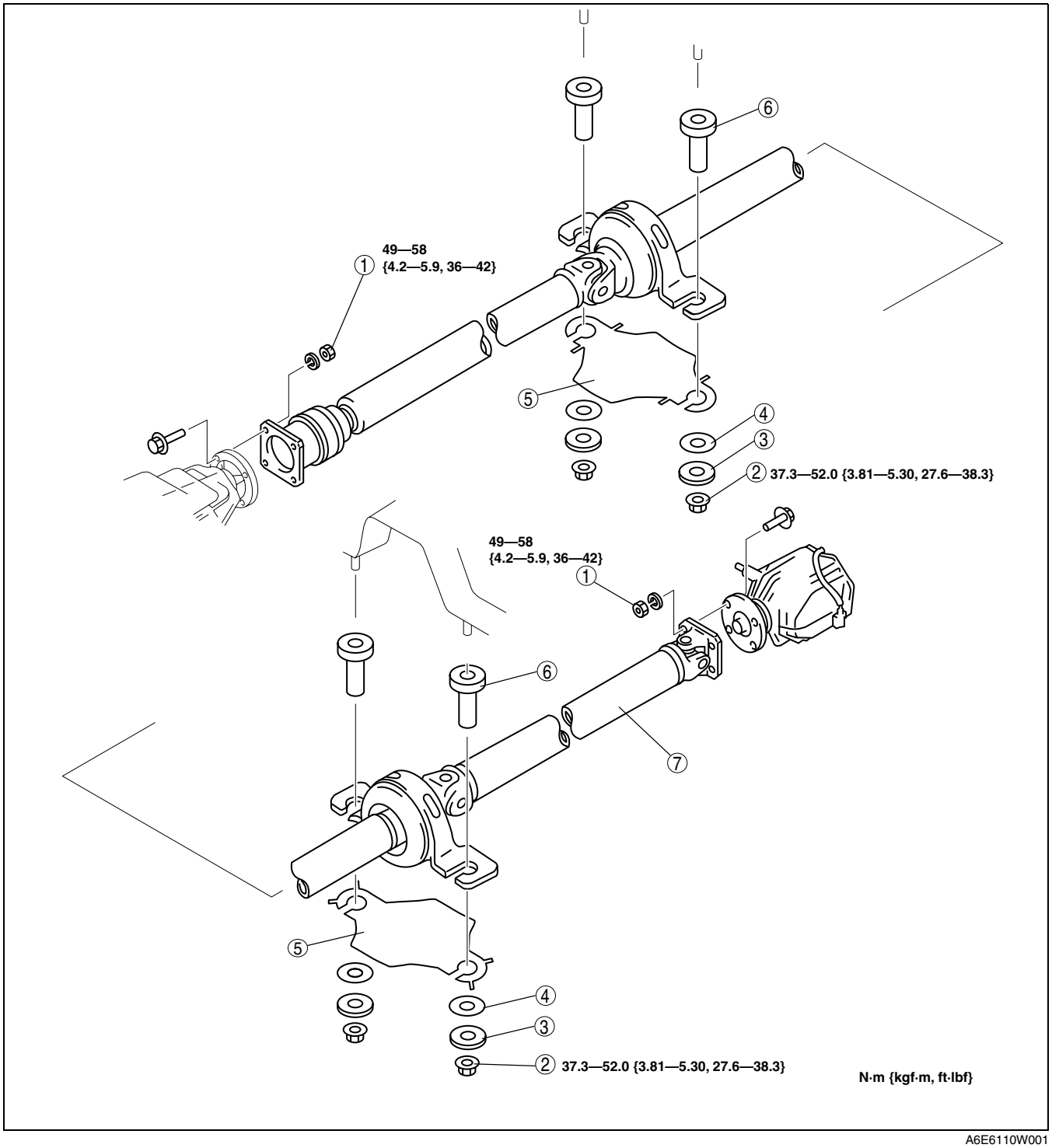


A6J6110W004

PROPELLER SHAFT REMOVAL/INSTALLATION

A6E611025002201

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



A6E6110W001

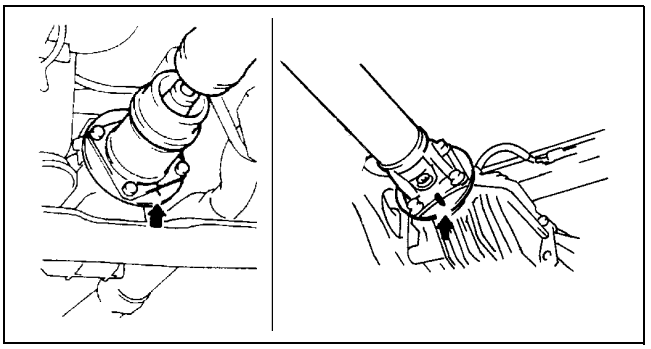
1	Nut (See L–6 Nut Removal Note)
2	Nut
3	Bush, Spacer
4	Washer

5	Propeller shaft heat shield (See L–6 Propeller Shaft Heat Shield Installation Note)
6	Bush, Spacer
7	Propeller shaft (See L–7 Propeller Shaft Installation Note)

Nut Removal Note

Caution
- **Do not mark with the ponch to prevent unbalance.**

1. Before removing the nut, put marks on the front companion flange, tripod joint and the rear companion flange, rear universal joint yoke for proper reinstallation.

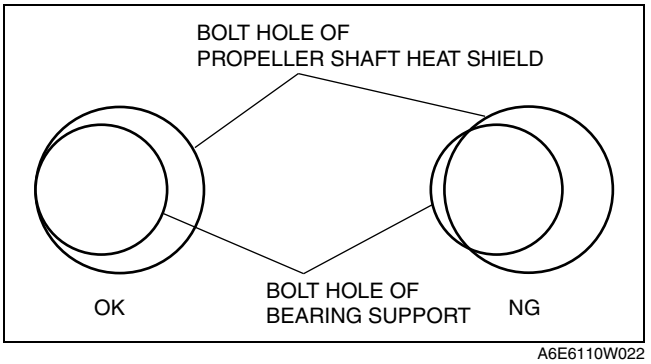


A6J6110W006

Propeller Shaft Heat Shield Installation Note

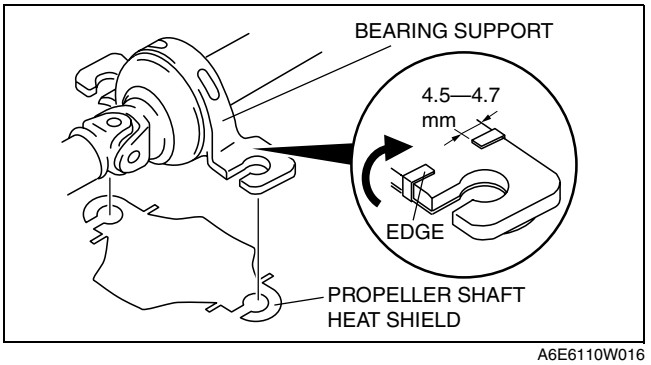
Caution
- **When assembling the propeller shaft heat shield to the bearing support, narrowing the bolt hole inner diameter can lower serviceability. Align the bolt hole edge of the propeller shaft heat shield with the bolt hole inner side of the bearing support to assemble.**

1. Set the propeller shaft heat shield to the bearing support.



A6E6110W022

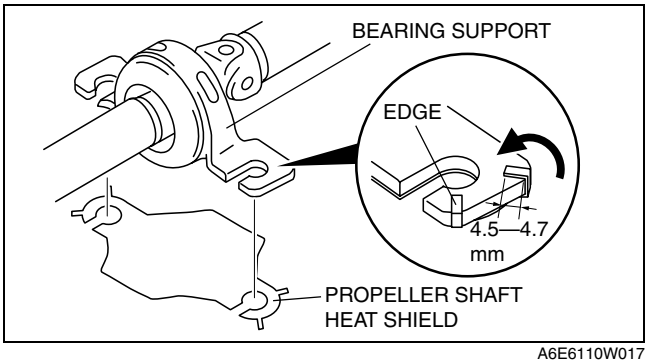
Front side



A6E6110W016

Rear side

2. Bend the edges of the propeller shaft heat shield toward the bearing support as shown.

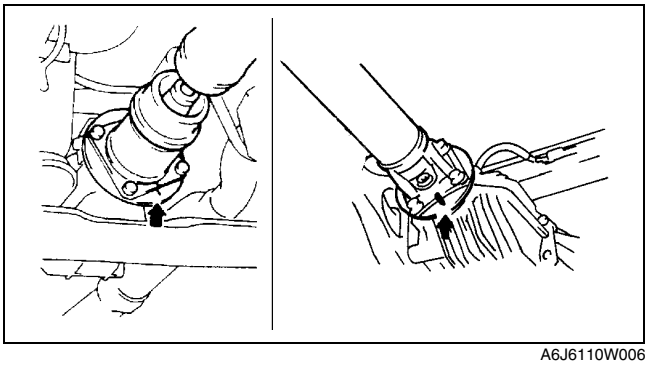


A6E6110W017

Propeller Shaft Installation Note

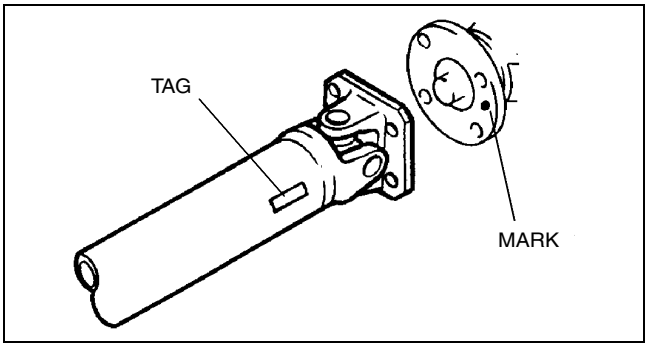
1. Align the mark made during removal, and install the propeller shaft.

Front side



A6J6110W006

2. Installing a new propeller shaft, align the differential companion flange precast marking with the tag on the propeller shaft.



A6E6110W002

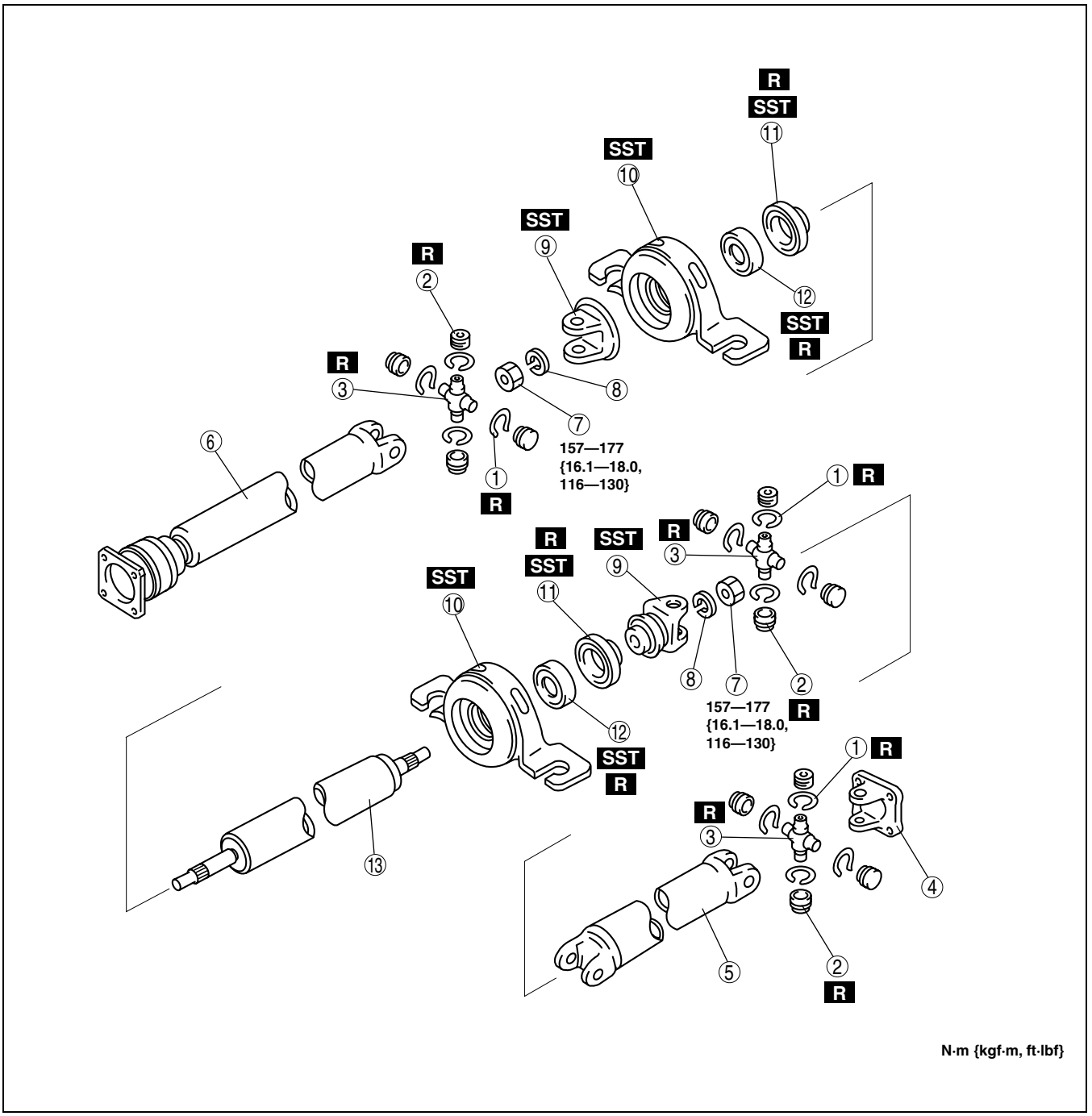
PROPELLER SHAFT DISASSEMBLY/ASSEMBLY

A6E611025002202

Caution

- **To prevent damage to parts when using a clamp, be sure to place an aluminum plate between parts and the clamp.**

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



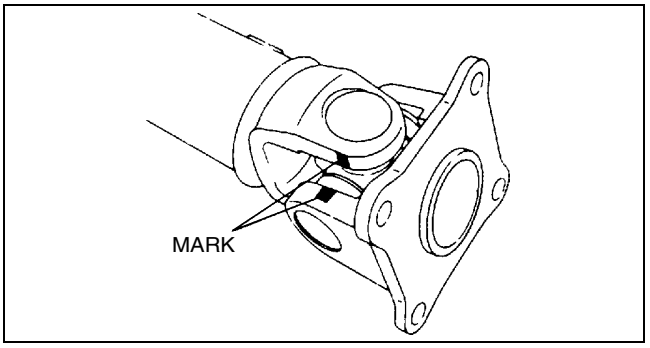
A6E6110W003

1	Snap ring (See L–9 Snap Ring Disassembly Note) (See L–12 Bearing Cup and Snap Ring Assembly Note)
2	Bearing cup (See L–9 Bearing Cup Disassembly Note) (See L–12 Bearing Cup and Snap Ring Assembly Note)
3	Spider
4	Flange yoke
5	Rear propeller shaft
6	Front propeller shaft
7	Locknut (See L–9 Locknut Disassembly Note) (See L–12 Locknut Assembly Note)
8	Spring washer

9	Center yoke (See L–10 Center Yoke Disassembly Note)
10	Bearing support (See L–10 Bearing support Disassembly Note) (See L–11 Bearing Support Assembly Note)
11	Dust cover (See L–10 Dust Cover and Bearing Disassembly Note) (See L–11 Dust Cover Assembly Note)
12	Bearing (See L–10 Dust Cover and Bearing Disassembly Note) (See L–11 Bearing Assembly Note)
13	Center propeller shaft

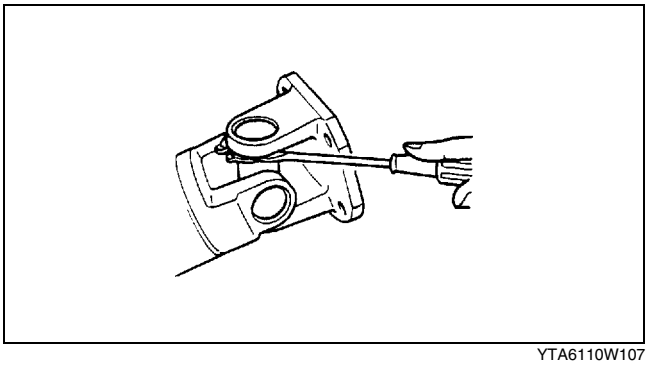
Snap Ring Disassembly Note

1. Mark the yoke and flont propeller shaft or york and rear propeller shaft for proper reassembly.
2. Clamp the propeller shaft in a vise.



A6E6110W004

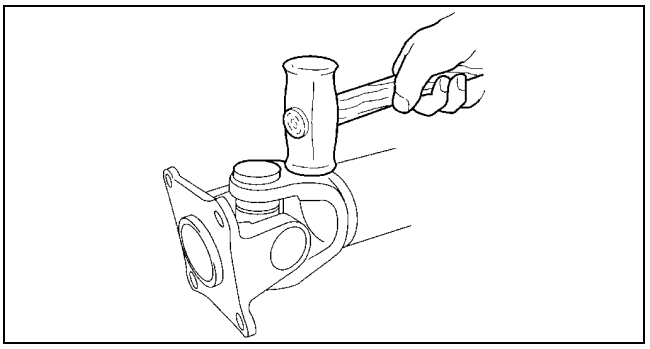
3. Remove the snap ring using a screwdriver.



YTA6110W107

Bearing Cup Disassembly Note

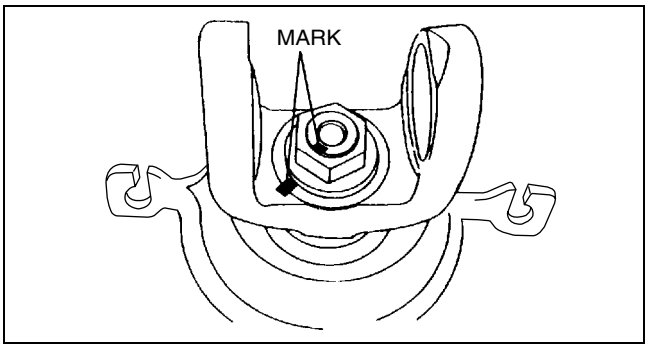
1. Use a copper hammer to loosen the propeller shaft bearing cup, then remove the bearing cup.
2. Remove the opposite bearing cup in the same manner.
3. Separate the propeller shaft and yoke.
4. Clamp the yoke in a vise.
5. Remove the bearing cups and the spider from the yoke as in Step 1 and 2.



YTA6110W108

Locknut Disassembly Note

1. Mark the center yoke and center propeller shaft for proper reassembly.
2. Clamp the center yoke in a vice.
3. Remove the locknut and spring washer.

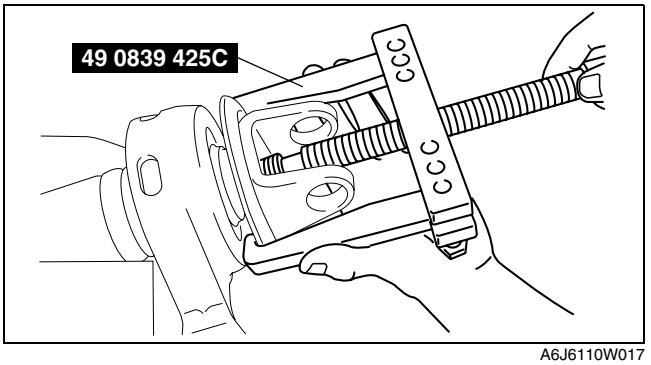


A6E6110W005

Center Yoke Disassembly Note

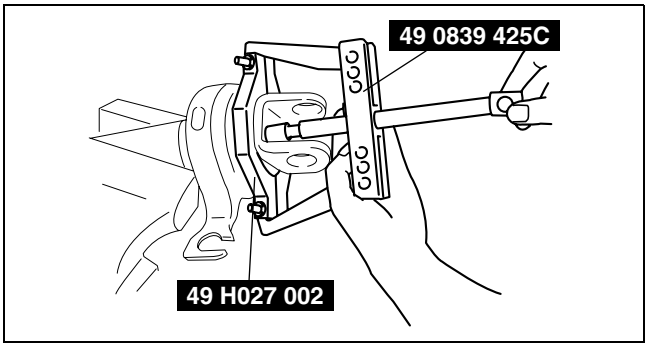
1. Remove the center yoke using the **SST**.

Center yoke (front side)



A6J6110W017

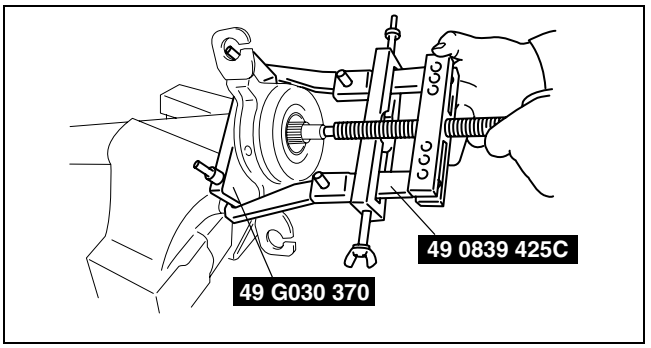
Center yoke (rear side)



A6J6110W011

Bearing support Disassembly Note

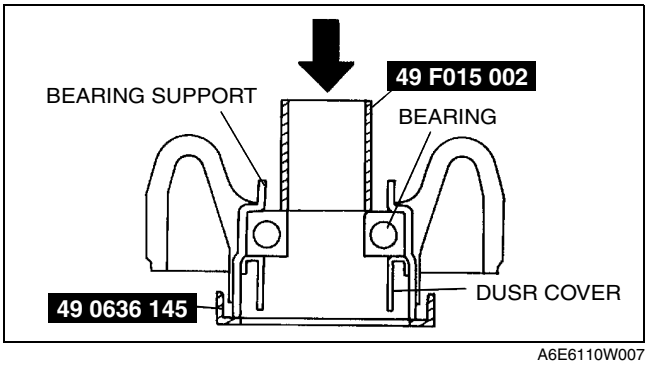
1. Remove the bearing support using the **SST**.



A6J6110W012

Dust Cover and Bearing Disassembly Note

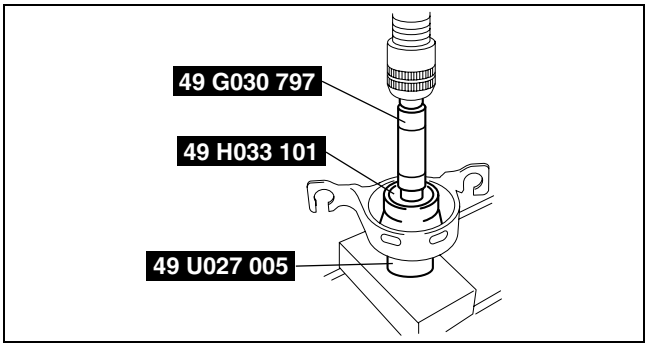
1. Remove the dust cover and bearing from bearing support using the **SST** and a press.



A6E6110W007

Bearing Assembly Note

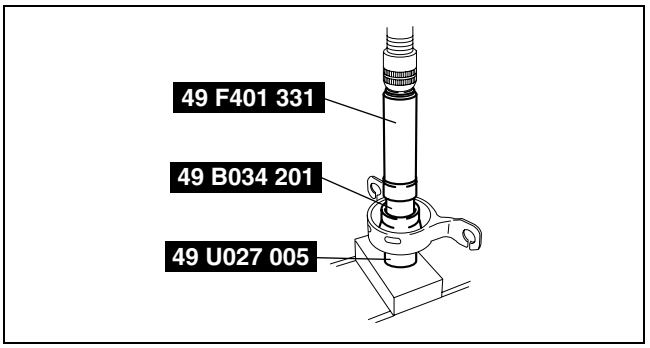
1. Install the bearing onto the bearing support using the **SST** and a press.



A6J6110W014

Dust Cover Assembly Note

1. Install the dust cover onto the bearing support using the **SST** and a press.

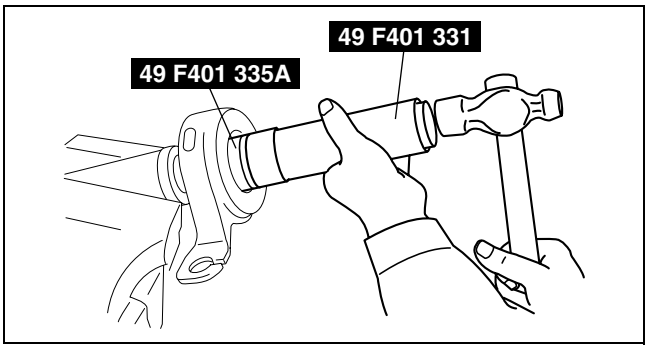


A6J6110W015

Bearing Support Assembly Note

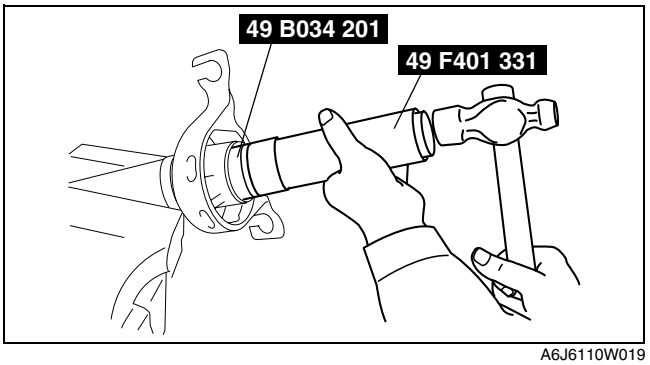
1. Install the bearing support using the **SST**.

Bearing side (front side)



A6J6110W018

Bearing support (rear side)

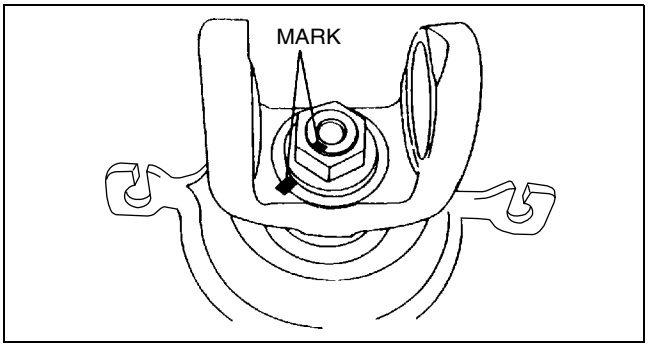


A6J6110W019

Locknut Assembly Note

1. Align the mark on the center yoke and shaft, and install the center yoke.

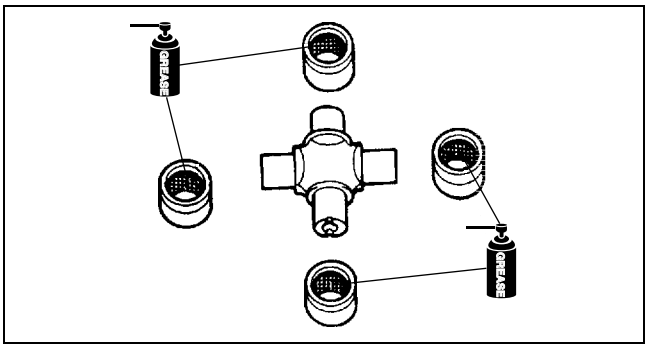
   Tightening torque
   137—177 N·m
   {16.1—18.0 kgf·m, 116—130 ft·lbf}



A6E6110W005

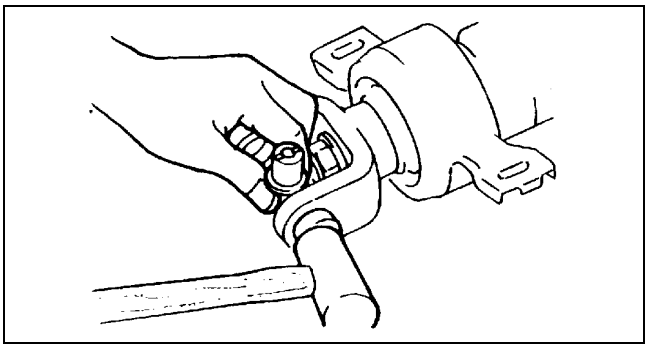
Bearing Cup and Snap Ring Assembly Note

1. Apply the grease to the bearing rollers inside the bearing cups.



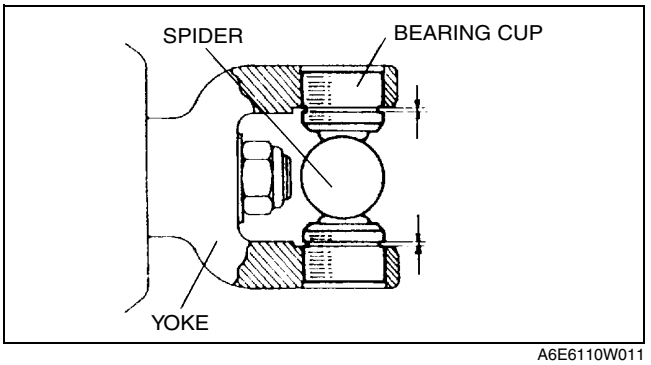
A6J6110W016

2. Set the new spider to the yoke, and assemble the new bearing cup as the snap ring groove comes out.
3. Assemble the opposite bearing cup in the same.


A6E6110W010

4. Insert the bearing cup to the yoke as the snap ring groove width of bearing cup widens most and both grooves width are same.

   Caution
   - **Use a snap ring that thickness is same for both sides.**



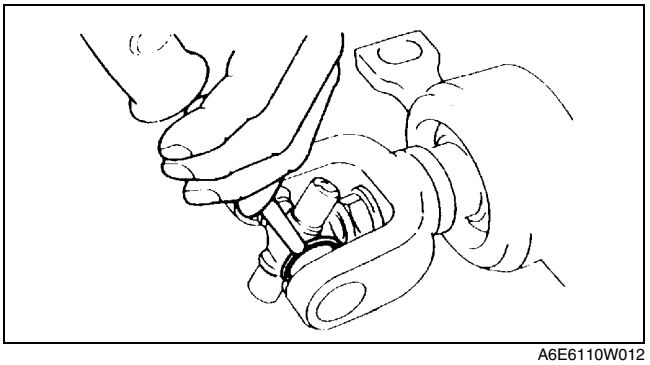
A6E6110W011

5. Measure the bearing cup groove width, and select a new snap ring that thickness is same as the groove to install.

Snap ring thickness

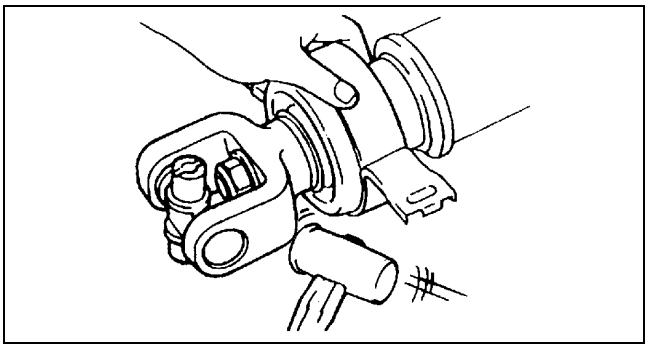
mm {in}

Snap ring	
Part number	**Thickness**
T010 25 071	1.21 {0.0476}
T010 25 071B	1.22 {0.0480}
T010 25 072	1.23 {0.0484}
T010 25 072B	1.24 {0.0488}
T010 25 073	1.25 {0.0492}
T010 25 073B	1.26 {0.0496}
T010 25 074	1.27 {0.0500}
T010 25 074B	1.28 {0.0504}
T010 25 075	1.29 {0.0508}
T010 25 075B	1.30 {0.0512}
T010 25 076	1.31 {0.0516}
T010 25 076B	1.32 {0.0520}
T010 25 077	1.33 {0.0524}
T010 25 077B	1.34 {0.0528}
T010 25 078	1.35 {0.0532
T010 25 078B	1.36 {0.0535}
T010 25 079	1.37 {0.0539}
T010 25 079B	1.38 {0.0543}
T010 25 081	1.39 {0.0547}



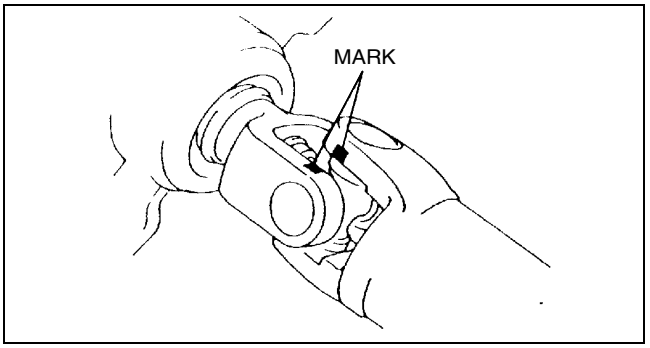
A6E6110W012

6. Fit the snap ring to the yoke by lightly tapping around the yoke with a copper hammer.
7. Verify that there is no play in the spider.



A6E6110W013

8. Align the mark made during disassembly, and assemble the propeller shaft and yoke.
9. Install the bearing cup and snap ring to the yoke as step 1 through 6.
10. Improve the fit by lightly tapping around the universal joint with a plastic hammer.
11. Inspect the universal joint play and movement. (See L–14 PROPELLER SHAFT INSPECTION.)



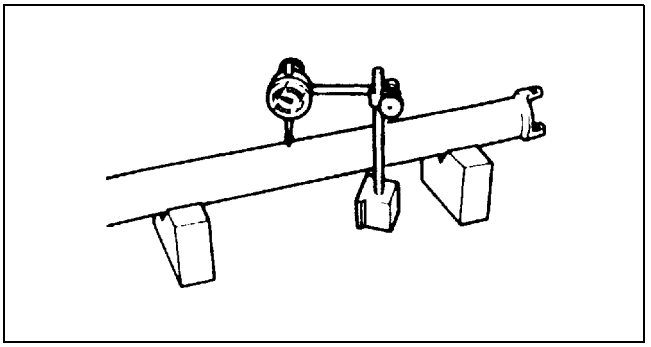
A6E6110W014

PROPELLER SHAFT INSPECTION

A6E611025002203

1. Disassemble the propeller shaft.
2. Measure the propeller shaft runout with a dial indicator.
   - If the runout is excessive, replace the propeller shaft.

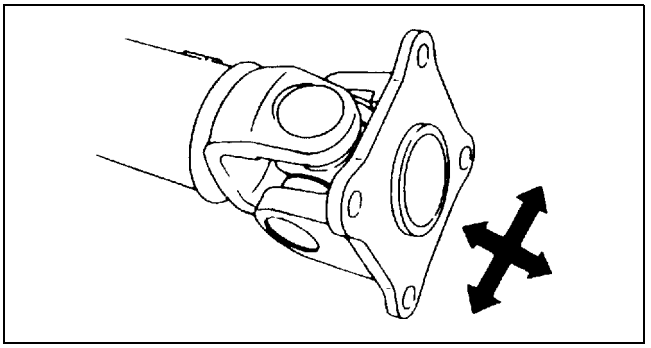
   Runout limit
   0.3 mm {0.01 in}



A6E6110W015

3. Move the universal joint in the direction shown, and inspect joint play.
   - If the joint play is not within the specification, adjust the universal joint using snap rings.

   Starting torque
   0.29—0.78 N·m {3.0—7.9 kgf·cm}



YTA6110W120

FRONT AND REAR AXLES

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E630201018201

- The construction and operation of the front and rear axles is the same as that of the current Mazda6 (GG) model, except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)

FEATURES

A6E630201018202

Improved rigidity, reduced noise and vibration

- Concurrent with the MZR-CD (RF Turbo) engine, the configuration of the front drive shaft and the joint shaft has been optimized.
- Concurrent with the 4WD system, the configuration of the rear axle, the front/rear drive shafts and the joint shaft has been optimized.

Improved handling stability and marketability

- An electronic 4WD control system has been adopted.

SPECIFICATIONS

A6E630201018203

2WD

Item			Specification				
			New Mazda6 (GG)(4SD, 5HB), New Mazda6 (GY)(Wagon 2WD)			**Current Mazda6 (GG)(4SD, 5HB)**	
Engine			**L8, LF, L3**		**MZR-CD (RF Turbo)**	**L8, LF, L3**	
Transaxle			**MTX**	**ATX**	**MTX**	**MTX**	**ATX**
Front axle	Bearing type		Angular ball bearing				
Rear axle	Bearing type		Angular ball bearing				
Drive shaft	Joint type	Wheel side	Bell joint				
		Differential side	Double offset joint	Tripod joint (With free ring)	Double offset joint	Double offset joint	Tripod joint (With free ring)
	Shaft diameter (mm {in})		24.5 {0.96}	24.0 {0.94}	24.0 {0.94}	24.5 {0.96}	24.0 {0.94}
Joint shaft	Shaft diameter (mm {in})		26.0 {1.02}		29.0 {1.14}	26.0 {1.02}	

Bold frames:New specifications

4WD

Item				Specification
				New Mazda6 (GY)(Wagon 4WD)
Engine				**L3**
Transaxle				**ATX**
Front axle	Bearing type			Angular ball bearing
Rear axle	Bearing type			Angular ball bearing
Front drive shaft	Joint type	Wheel side		Bell joint
		Differential side		Tripod joint (With free ring)
	Shaft diameter		(mm {in})	24.0 {0.94}
Joint shaft	Shaft diameter		(mm {in})	29.0 {1.14}
Rear drive shaft	Joint type	Wheel side		Bell joint
		Differential side		Double offset joint
	Shaft diameter		(mm {in})	22.0 {0.87}
Rear and front wheel torque distribution unit				Electronic control coupling
Rear differential	Reduction gear			Hypoid gear
	Differential gear			Straight bevel gear
	Ring gear size		(Inches)	6.5
	Final gear ratio			2.928
	Gears: Number of teeth		Drive pinion	14
			Ring gear	41
Differential oil	Type		Grade	API service GL-5
			Viscosity	Above –18°C {0°F}: SAE 90 Below –18°C {0°F}: SAE 80
	Amount (Approximate quantity)		(L {US qt, Imp qt})	1.0 {1.1, 0.9}

Bold frames:New specifications

M

REAR AXLE

REAR AXLE OUTLINE

A6E631401018201

Features

Improved drivability

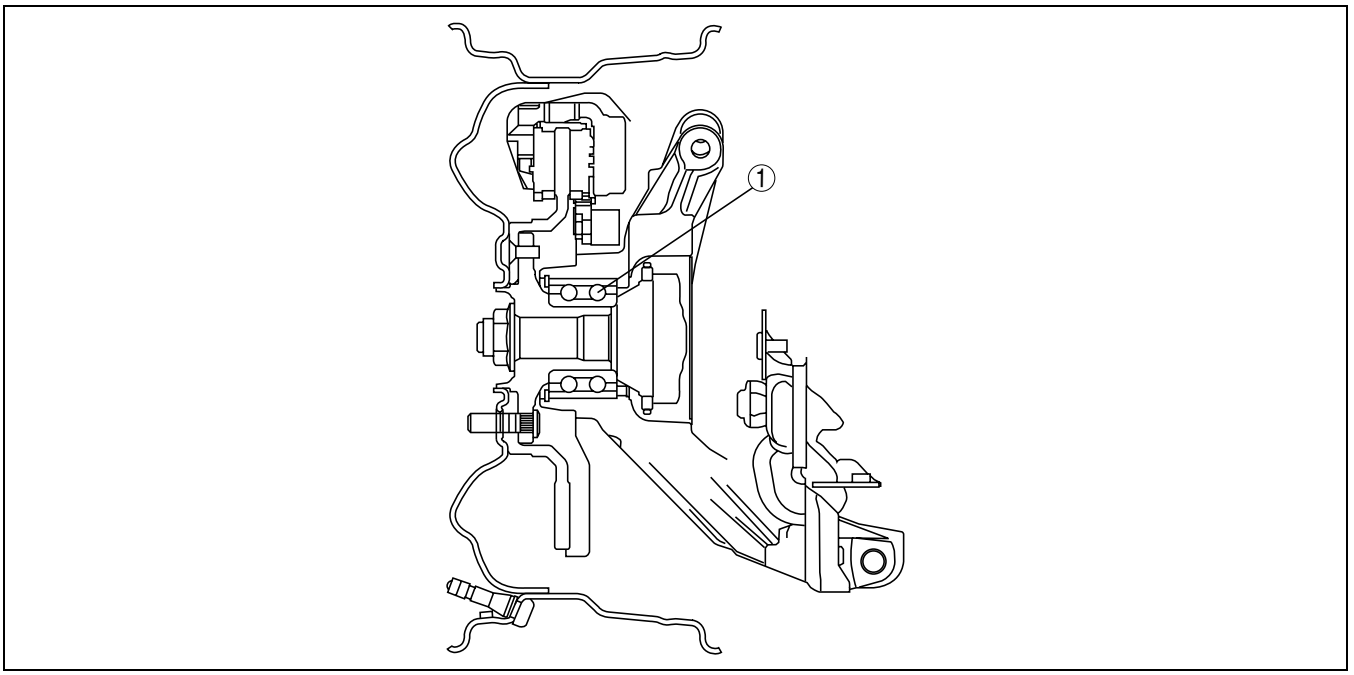
- An angular ball bearing, with a low rotational resistance, has been adopted.

Improved serviceability

- A unit bearing that does not require pre-load setting has been adopted.

CROSS-SECTIONAL VIEW

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A6E63142001

1	Angular ball bearing

DRIVE SHAFT

DRIVE SHAFT OUTLINE

A6E631625500201

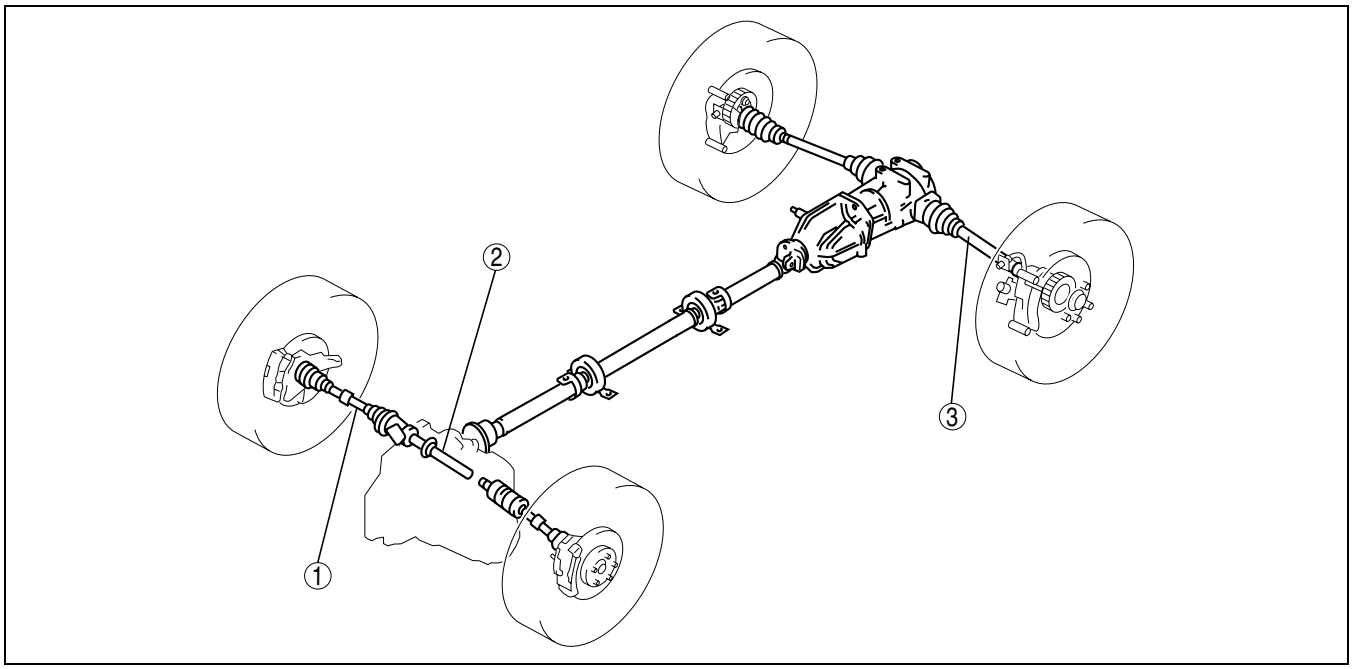
Features

Improved drivability, reduced noise and vibration

- Concurrent with the MZR-CD (RF Turbo) engine and 4WD system, the configuration of the front drive shaft and the joint shaft has been optimized.
- For 4WD models, a constant velocity joint system has been adopted for the rear drive shaft.

STRUCTURAL VIEW

A6E631625500202



A6E63162101

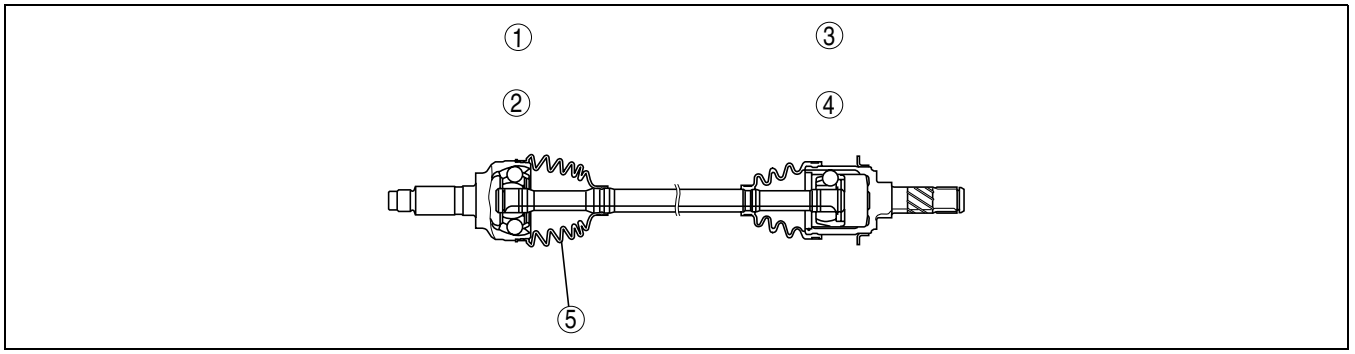
1	Front drive shaft
2	Joint shaft
3	Rear drive shaft

REAR DRIVE SHAFT

A6E631625500203

Structure

- Engine noise and vibration have been reduced due to adoption of a bell joint on the wheel side of the constant velocity joint.
- A low noise and vibration double offset joint with low slide resistance has been adopted for the differential side of the constant velocity joint. Due to this booming resonance at high speed is reduced.
- An extremely durable plastic has been adopted for the wheel side boot.



A6E63162102

1	Wheel side
2	Bell joint
3	Differential side
4	Double offset joint
5	Plastic boot

REAR DIFFERENTIAL

REAR DIFFERENTIAL OUTLINE

A6E631927100201

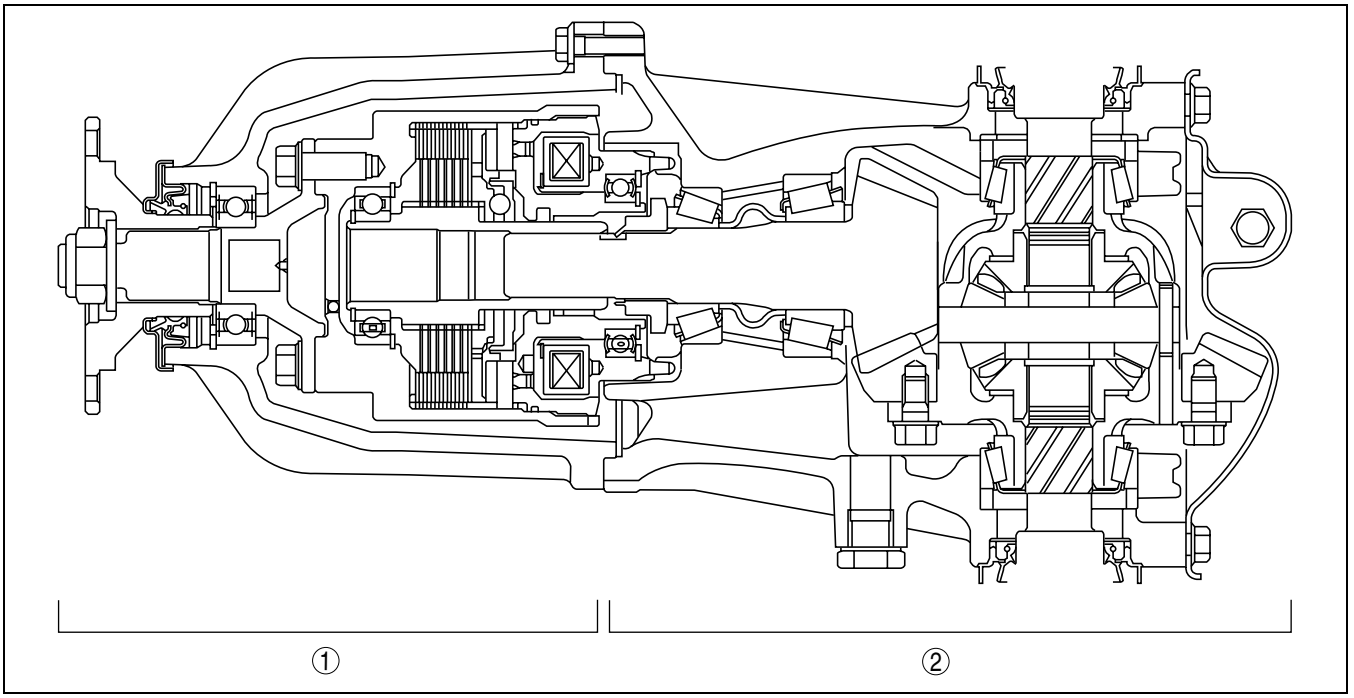
Features

Size and weight reduction

- A rear differential with an integrated coupling component has been adopted.
- An aluminum differential carrier has been adopted.

CROSS-SECTIONAL VIEW

A6E631927100202



A6E63192001

1	Coupling component section
2	Rear differential section

ELECTRONIC 4WD CONTROL SYSTEM

OUTLINE

A6E632227100201

Features

Improved off-road mobility, handling stability, operability, fuel economy and marketability

- An electronic 4WD control system, which automatically optimizes traction distribution to the front and rear wheels, has been adopted.

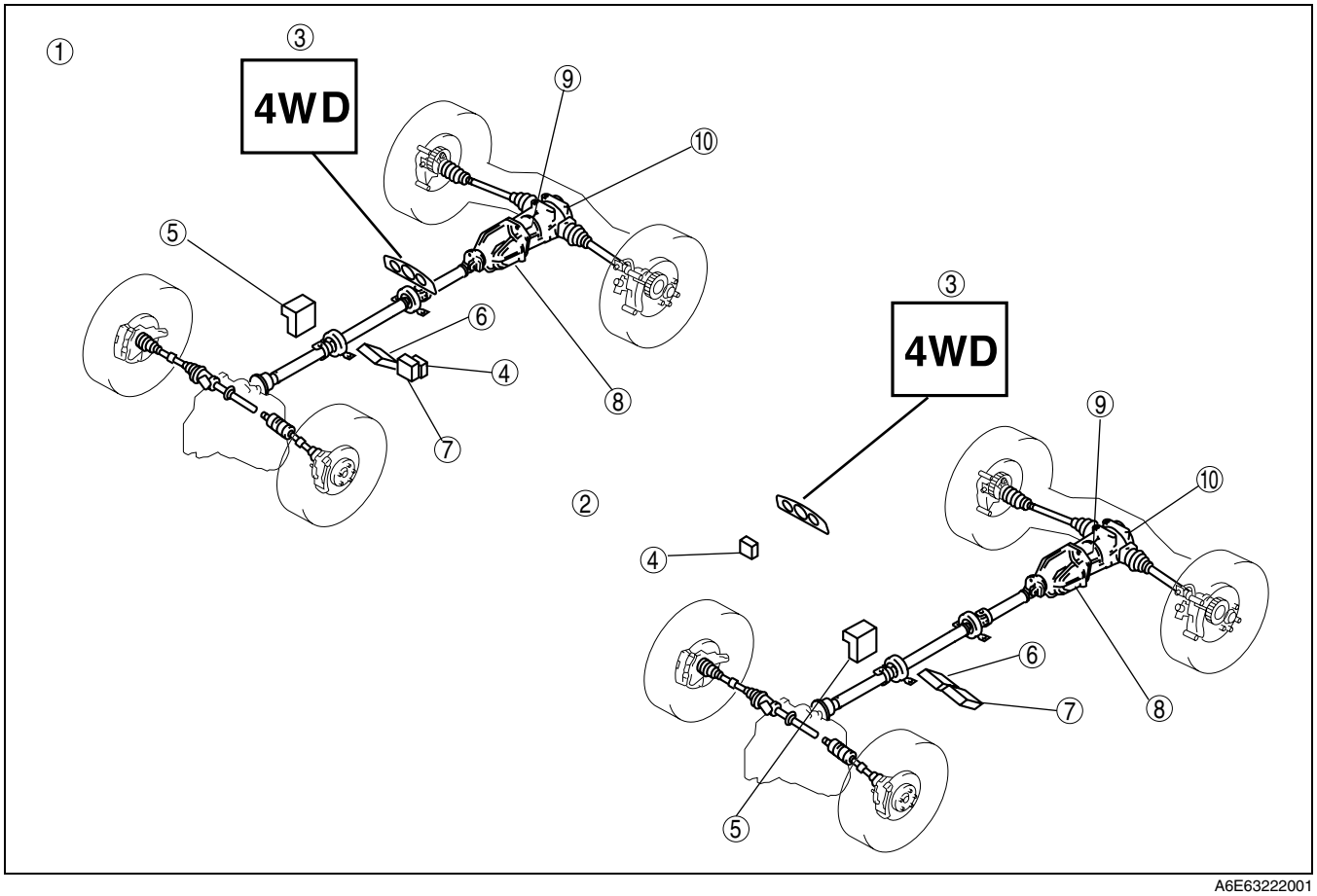
Improved serviceability

- A self-diagnostic function has been adopted for the electronic 4WD control system.

Electronic 4WD control system outline

- The newly adopted electronic 4WD control system automatically and optimally controls drive torque distribution for the front and rear wheels. Due to this off-road mobility, driving stability and fuel economy are improved.
- Based on the input signals from each sensor, the 4WD control modure (4WD CM) determines vehicle driving and road conditions, and controls output current to the electronic control coupling (4WD solenoid) inside the rear differential. This control allows for optimal distribution of the drive torque from the engine to the rear wheels.
- Also, the 4WD CM automatically controls the 4WD, greatly reducing the load on the driver and improving operability.

Structural view



A6E63222001

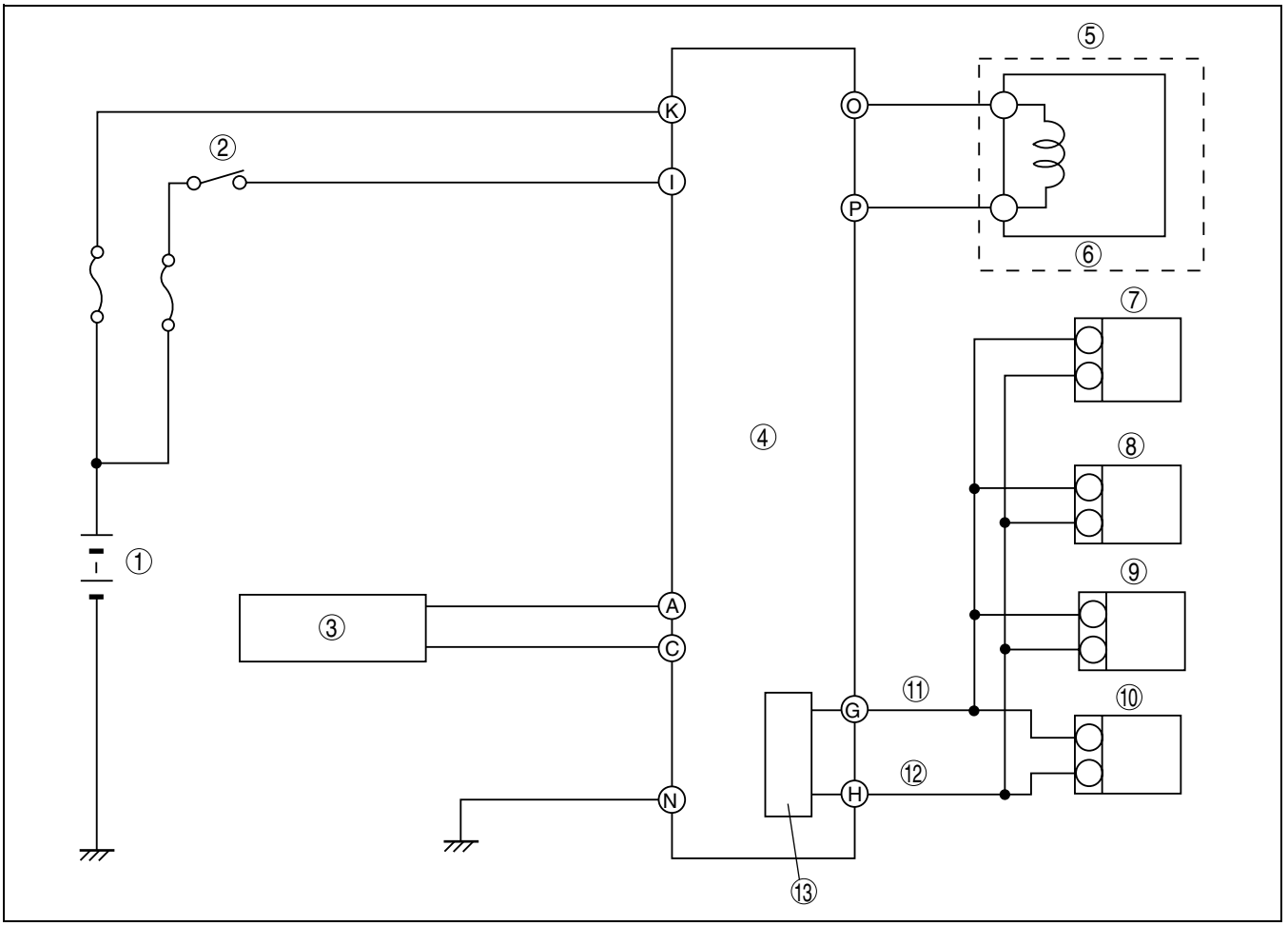
1	L.H.D.
2	R.H.D.
3	4WD warning light
4	4WD control modure
5	DSC HU/CM

6	PCM
7	TCM
8	Electronic control coupling (4WD solenoid)
9	Differential oil temperature sensor
10	Rear differential

Components and Functions

Part name	Function
Electronic control coupling (4WD solenoid)	• Based on a signal from the 4WD CM, it operates the electromagnetic clutch and transmits drive torque to the rear wheels.
Differential oil temperature sensor	• Informs the 4WD CM of the rear differential oil temperature.
4WD CM	• Controls operation of the electronic control coupling (4WD solenoid) based on signals input from the throttle opening angle, speed, differential oil temperature and other sensors. • Outputs coupling control condition and 4WD warning control information as a CAN signal. • Controls the on-board diagnostic system and the fail-safe system if there is a malfunction in the 4WD system.
4WD warning light	• Illuminates or flashes to alert driver of a malfunction or control failure in the 4WD system.
PCM	• Sends the throttle opening angle and engine speed signals, as CAN signals, to the 4WD CM.
TCM	• Sends the selector lever position and gear position signals, as CAN signals, to the 4WD CM.
DSC HU/CM	• Sends the four-wheel speed and DSC operating condition signals, as CAN signals, to the 4WD CM. • Sends the coupling torque request signal, as a CAN signal, to the 4WD CM.

System Diagram



A6E63222002

1	Battery
2	Ignition switch
3	Differential oil temperature sensor
4	4WD control modure (4WD CM)
5	Electronic control coupling
6	4WD solenoid
7	Instrument cluster

8	DSC HU/CM
9	TCM
10	PCM
11	CAN-H
12	CAN-L
13	CAN driver

ELECTRONIC CONTROL COUPLING

A6E632227100202

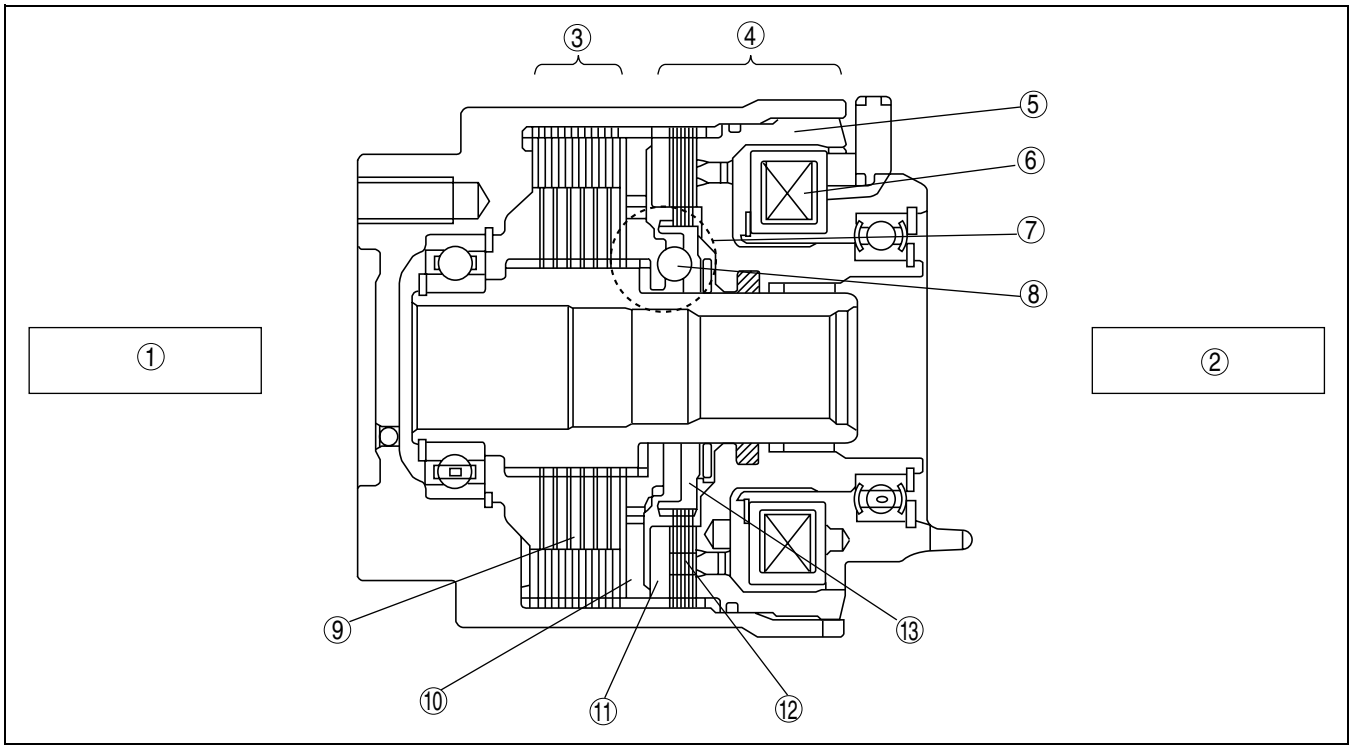
Outline

Features

- An electromagnetic clutch, which operates smoothly due to the lack influence from the front and rear wheel traction force, has been adopted for the electronic control coupling system.
- The construction of the coupling enables the torque formed by the pilot clutch to be amplified by the cam mechanism, thus allowing the main clutch to obtain a high degree of torque. Due to this, size and weight reduction of the component parts has been achieved.

Construction

- The electronic control coupling basically consists of an electromagnetic clutch, a cam mechanism and a torque transmission system.
- The electromagnetic clutch consists of a 4WD solenoid (electromagnetic coil), rear-housing that forms a magnetic path, pilot clutch, and armature. The cam mechanism consists of a pilot cam, balls, and main cam. The torque transmission system consists of a main clutch and hydraulic oil (ATF).



A6E63222003

1	Front wheel side
2	Rear wheel side
3	Torque transmission system
4	Electromagnetic clutch
5	Rear housing
6	4WD solenoid (Electromagnetic coil)
7	Cam mechanism

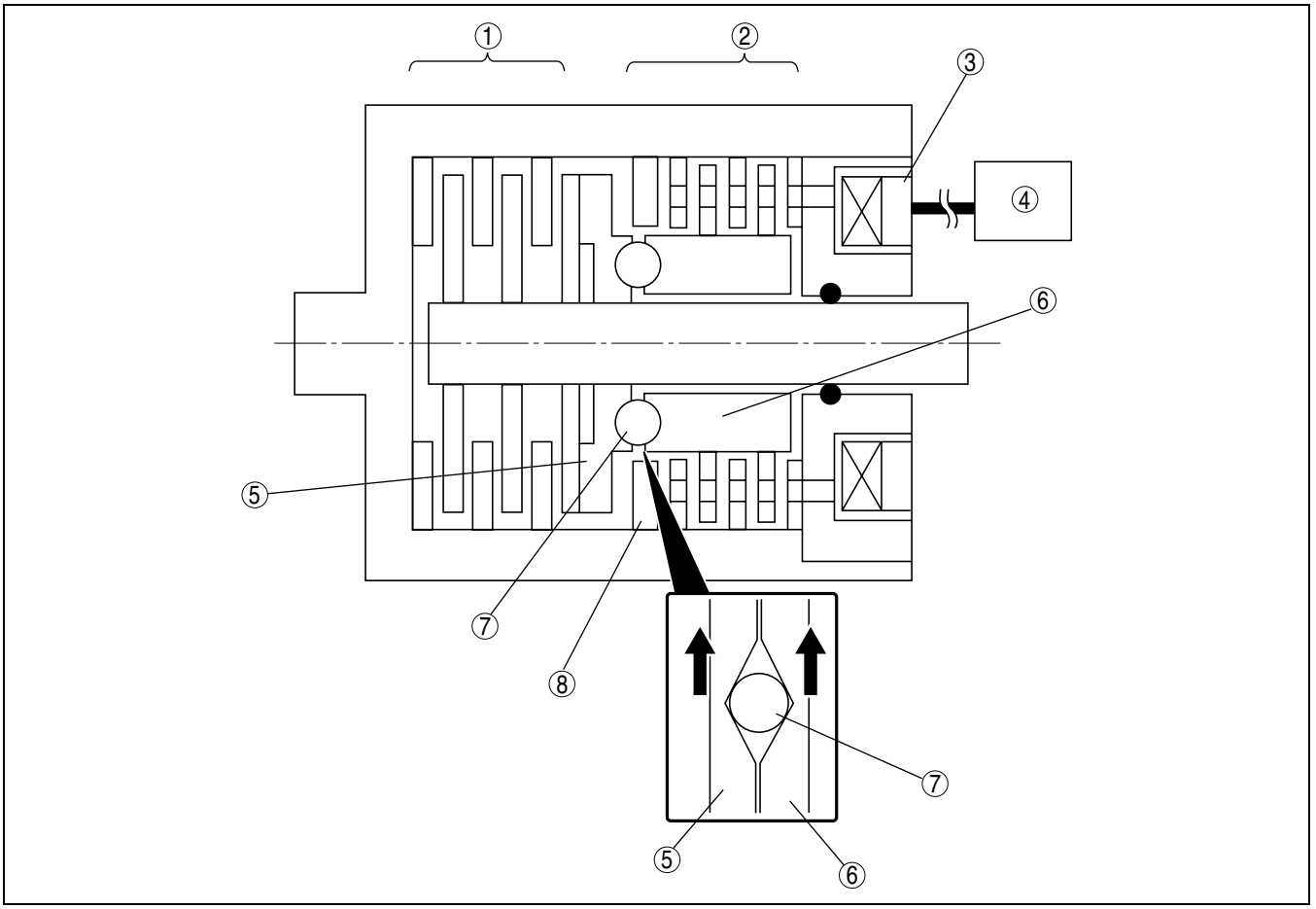
8	Ball
9	Main clutch
10	Main cam
11	Armature
12	Pilot clutch
13	Pilot cam

M

Operation

4WD solenoid control current is OFF

- When the 4WD solenoid control current is OFF, no torque is generated in the pilot clutch because there is no current flowing to the 4WD solenoid. At the same time, the pilot cam and the main cam rotate in the same direction via the balls, and the main cam does not exert any push force on the main clutch side. Therefore, the traction from the front wheels is not transmitted to the rear wheels.



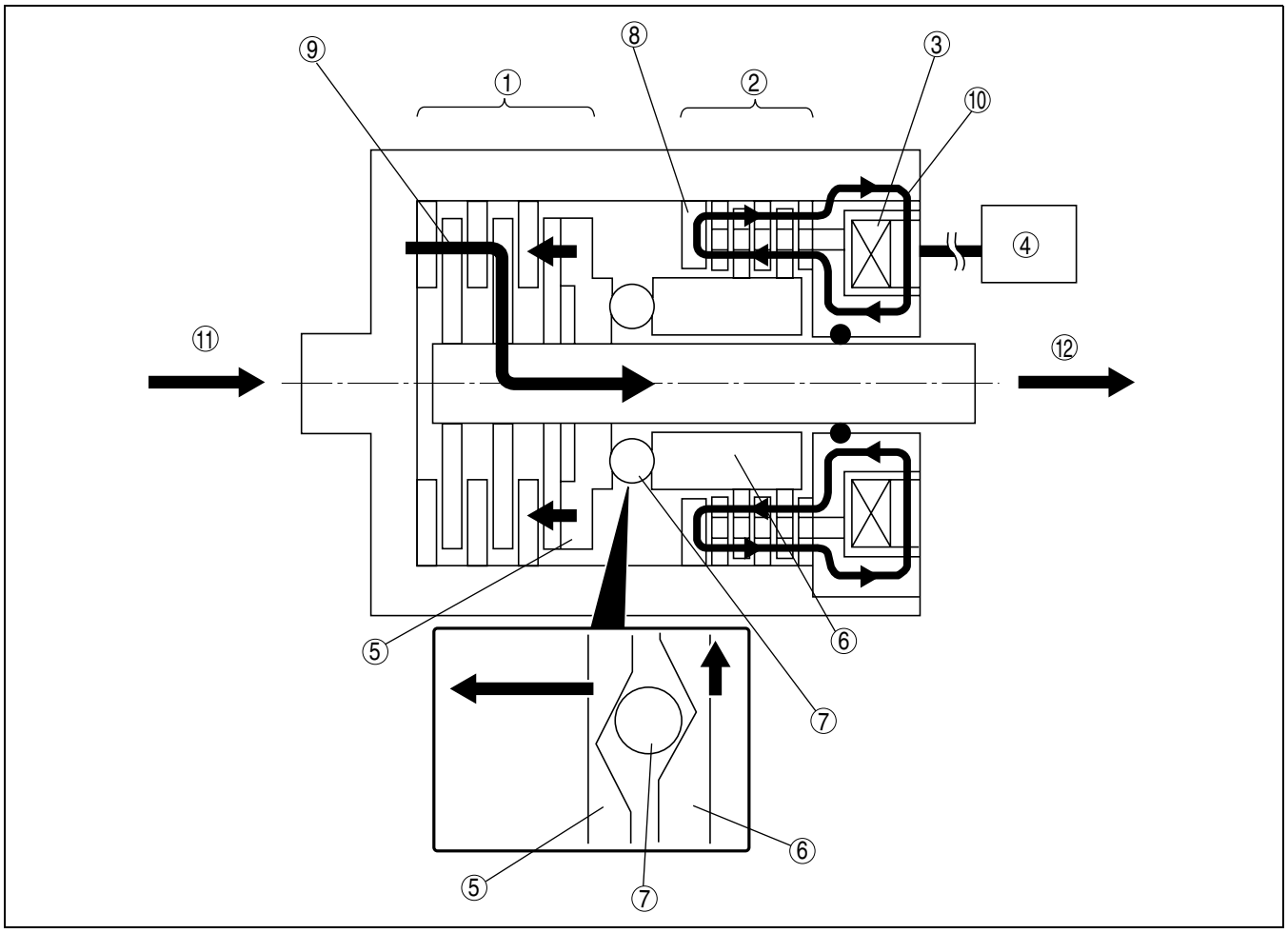
A6E63222004

1	Main clutch
2	Pilot clutch
3	4WD solenoid (Electromagnetic coil)
4	4WD control modure (4WD CM)

5	Main cam
6	Pilot cam
7	Ball
8	Armature

4WD solenoid control current is ON

- When the 4WD solenoid control current is ON, current flows from the 4WD CM to the 4WD solenoid, and the coupling operates in the following manner.
  1. Magnetic flux forms at the electromagnetic coil of the 4WD solenoid.
  2. Due to the magnetic flux in the armature, the pilot clutch is suctioned towards the magnetic coil side and made to engage. This causes frictional torque to generate in the pilot clutch.
  3. The torque is transmitted to the pilot cam, which is engaged with the pilot clutch.
  4. A rotational difference is created between the pilot cam and the main cam. Due to this relative torsion, the cam mechanism operates, transmitting torque from the pilot cam to the ball and then to the main cam. In this way, the push force exerted on the main clutch is amplified.
  5. As the main clutch engages, the drive torque from the front wheels is transmitted to the rear wheels.
- The amount of push force exerted on the main clutch by the main cam (that is, the strength of the drive torque transmitted to the rear wheels) changes in accordance with the proportion of the force acting upon the pilot cam, engaged with the pilot clutch. Therefore, by changing the periodicity of the electric current from the 4WD CM to the 4WD solenoid (ON/OFF rate of the 4WD solenoid = force acting on the pilot cam), the module controls the transmission of drive torque to the rear wheels.



A6E63222005

1	Main clutch
2	Pilot clutch
3	4WD solenoid (Electromagnetic coil)
4	4WD control modure (4WD CM)
5	Main cam
6	Pilot cam

7	Ball
8	Armature
9	Drive torque
10	Magnetic flux
11	Input
12	Output

M

DIFFERENTIAL OIL TEMPERATURE SENSOR

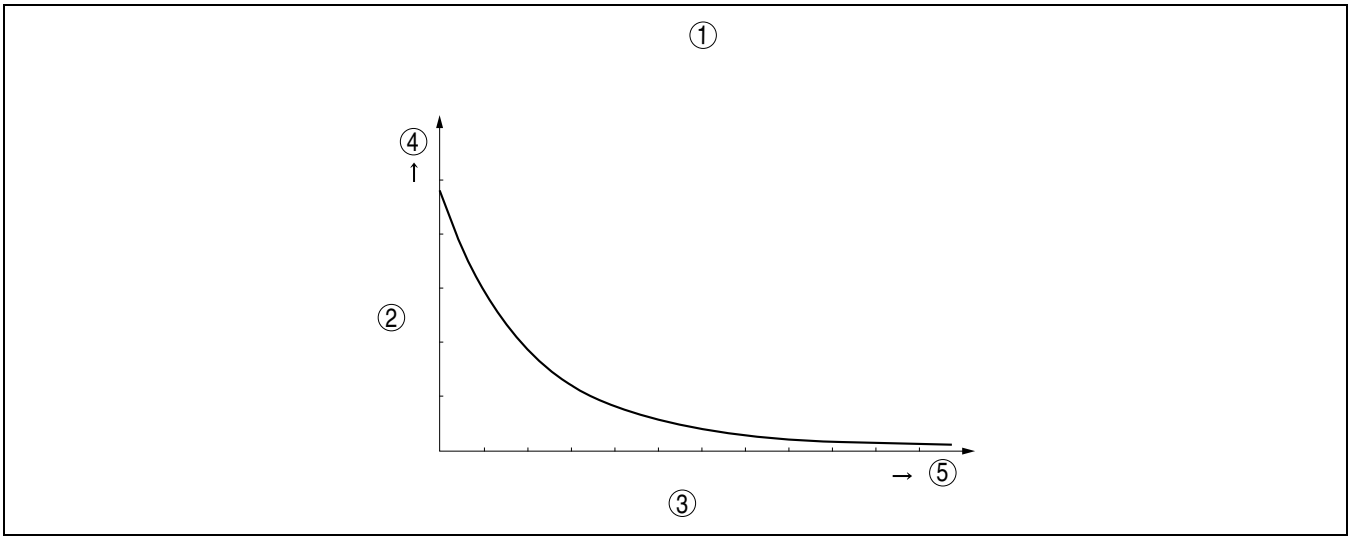
A6E632227100203

Function

- The differential oil temperature sensor detects the rear differential oil temperature based on the resistance of the thermistor, and inputs it to the 4WD control modure (4WD CM).

Construction/Operation

- The differential oil temperature sensor is installed in the rear differential carrier.
- The differential oil temperature sensor uses a thermistor whose resistance changes according to changes in the rear differential oil temperature.
- The resistance grows smaller as the oil temperature rises and vice-versa, as shown.



A6E63222006

1	Differential oil temperature sensor characteristic
2	Resistance (ohm)
3	Temperature (°C {°F})

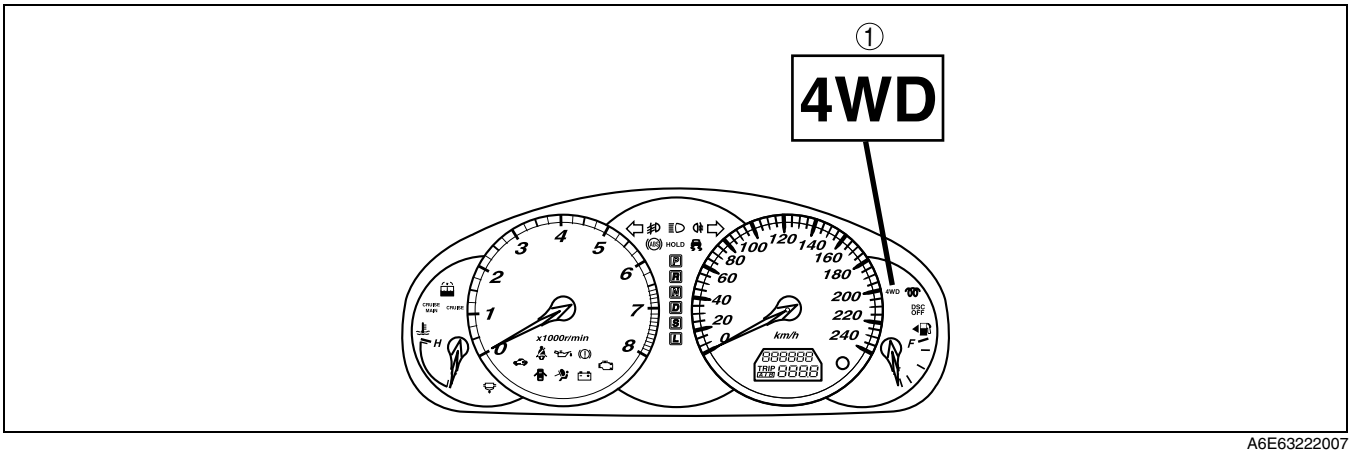
4	Larger
5	Higher

4WD WARNING LIGHT

A6E632227100204

Construction

- The 4WD warning light is built into the instrument cluster.
- If the self-diagnostic function stores a DTC, the warning light illuminates to alert the driver of the malfunction. If system control is temporarily suspended due to the rear differential oil temperature becoming abnormally hot or similar cause, the warning light flashes to alert the driver.
- The 4WD CM controls the operation of the warning light.



A6E63222007

1	4WD warning light

4WD CONTROL MODURE

A6E632227100205

Function

- The 4WD control modure (4WD CM) calculates the optimal amount of torque distribution for the rear wheels and outputs a corresponding electric current to the electronic control coupling (4WD solenoid). This calculation is based on the throttle angle, four-wheel speed, engine speed, selector lever position, and other related input signals, matched with the vehicle driving and road surface conditions.

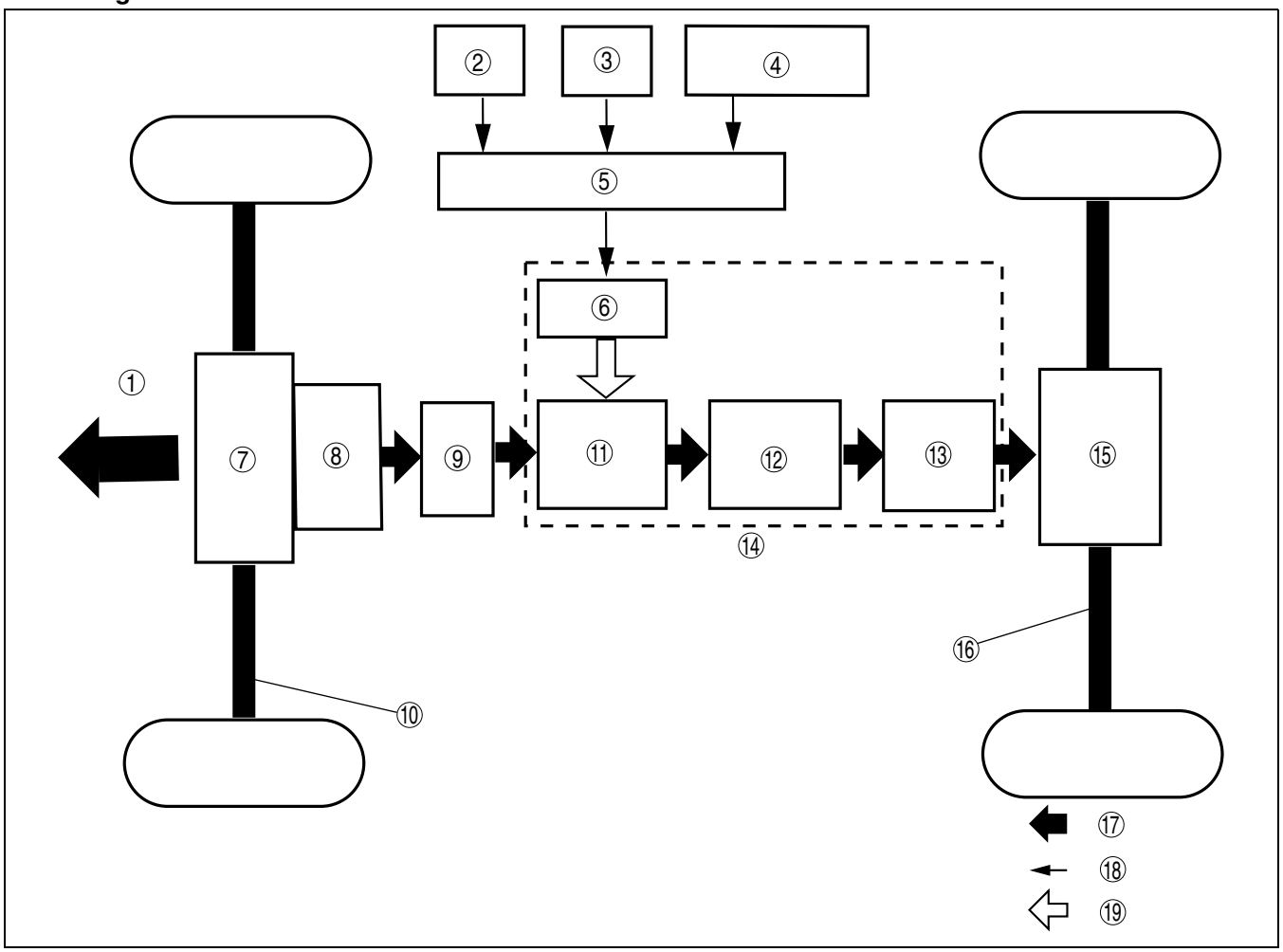
Functions

Function name	Contents
4WD system control function	• Based on each input signal, the electronic control current sent to the electronic control coupling (4WD solenoid) is optimally controlled.
Diagnostic system	• If the self-diagnostic system detects a malfunction, the 4WD warning light illuminates to alert the driver, and at the same time the system suspends control or performs other measures to prevent a loss of driving stability and protect the system. • The detected malfunction is stored as a DTC in the 4WD CM.

Construction

- The 4WD CM is installed to the left of the brake pedal (clutch pedal position).

Block diagram



A6E63222008

1	Front
2	PCM
3	TCM
4	DSC HU/CM
5	4WD control modure (4WD CM)
6	4WD solenoid
7	Transaxle
8	Transfer
9	Propeller shaft
10	Front drive shaft

11	Pilot clutch/pilot cam
12	Ball/main cam
13	Main clutch
14	Electronic control coupling
15	Rear differential
16	Rear drive shaft
17	Torque transmission path
18	Electric signal path
19	Solenoid activation

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4WD SYSTEM CONTROL

A6E632227100206

Outline

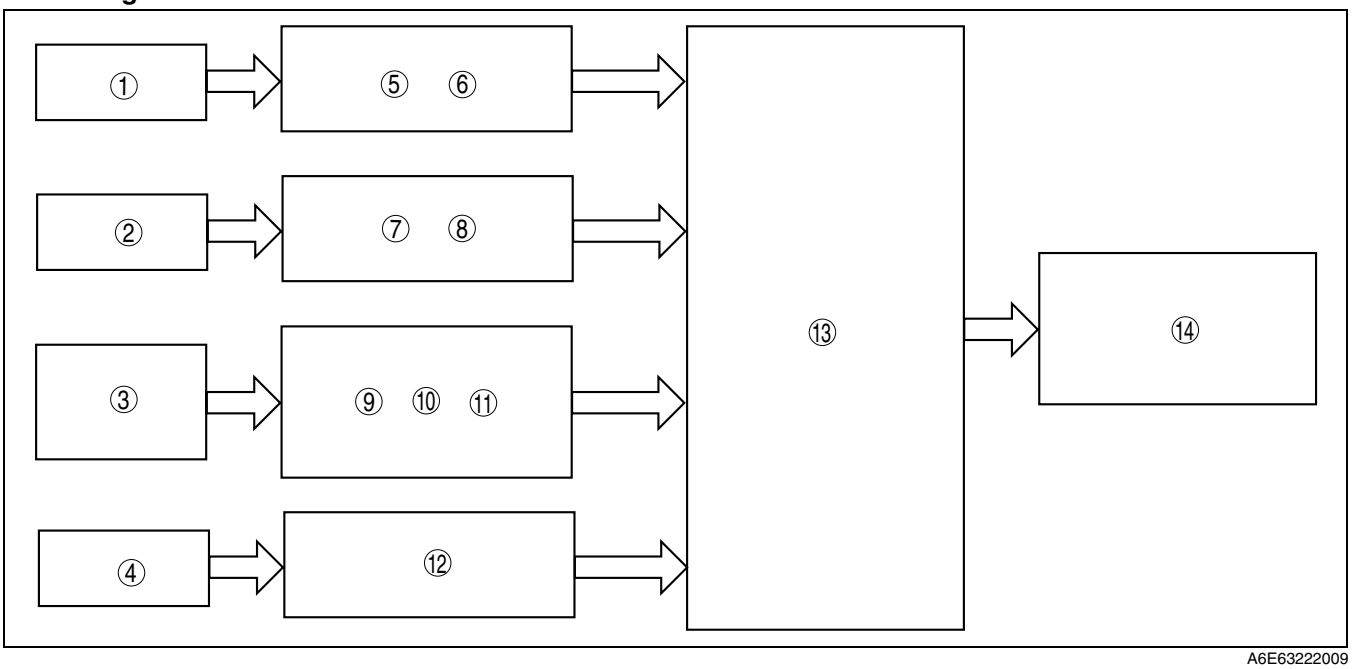
Features

- Based on the inputted signals listed below, the 4WD CM calculates the optimal amount of torque distribution for the rear wheels and outputs a corresponding electric control current to the electronic control coupling (4WD solenoid).
- The module controls the current outputted to the 4WD solenoid by changing the rate of the ON/OFF timing.

Signal output part	Signal name	Note
PCM	Throttle opening angle Engine speed	Transmitted as a CAN signal
TCM	Selector lever position Gear position	
DSC HU/CM	Four-wheel speed DSC operating condition Coupling torque request (DSC equipped vehicles)	
Differential oil temperature sensor	Rear differential oil temperature	—

Construction

Block diagram



A6E63222009

1	PCM
2	TCM
3	DSC HU/CM
4	Differential oil temperature sensor
5	Throttle opening angle
6	Engine speed
7	Selector lever position

8	Gear position
9	Four-wheel speed
10	DSC operating condition
11	Coupling torque request (DSC equipped vehicles)
12	Rear differential oil temperature
13	4WD control modure (4WD CM)
14	Electronic control coupling (4WD solenoid)

Operation
Normal control
- When starting off or accelerating during straight-ahead driving, torque transmitted to the rear wheels is optimally controlled to ensure sufficient acceleration performance. Due to this, standing-start and acceleration performance is improved.
- Also, in order to improve fuel economy when driving at a stable, consistent speed, torque transmitted to the rear wheels is damped, and rear-wheel drive is controlled to maintain it close to that of the front wheels.

Tight cornering control
- When the 4WD CM determines, based on the four-wheel speed signal, that the vehicle is in tight cornering, it reduces the torque transmitted to the rear wheels to avoid tight corner braking characteristics.

Integrated DSC control
- If a signal from the DSC HU/CM input to the 4WD CM indicates that ABS control is activated, the module controls the torque transmitted to the rear wheels to prevent undue influence on ABS control.
- Also, when a coupling torque request signal is received from the DSC HU/CM, the module controls the torque transmitted to the rear wheels to match the amount of requested torque.

Other control
- In case the rear differential oil temperature exceeds the specified amount, or when there is an unusually large variation in the rotation speed of the front and rear wheels (ex. when trying to get unstuck), control is temporarily suspended in order to protect the 4WD system. When this occurs the 4WD warning light flashes to indicate the situation to the driver.

CONTROLLER AREA NETWORK (CAN)

A6E632227100207

Outline
- The 4WD CM transmits/receives information using the CAN system. See Section T for detailed information regarding the CAN system.

Operation
Transmitted information
- Coupling torque
- 4WD system operating condition (warning light information)

Received information
- Four-wheel speed
- Throttle opening angle
- Engine speed
- ABS/DSC operating condition
- Gear position
- Selector lever position
- Coupling torque request

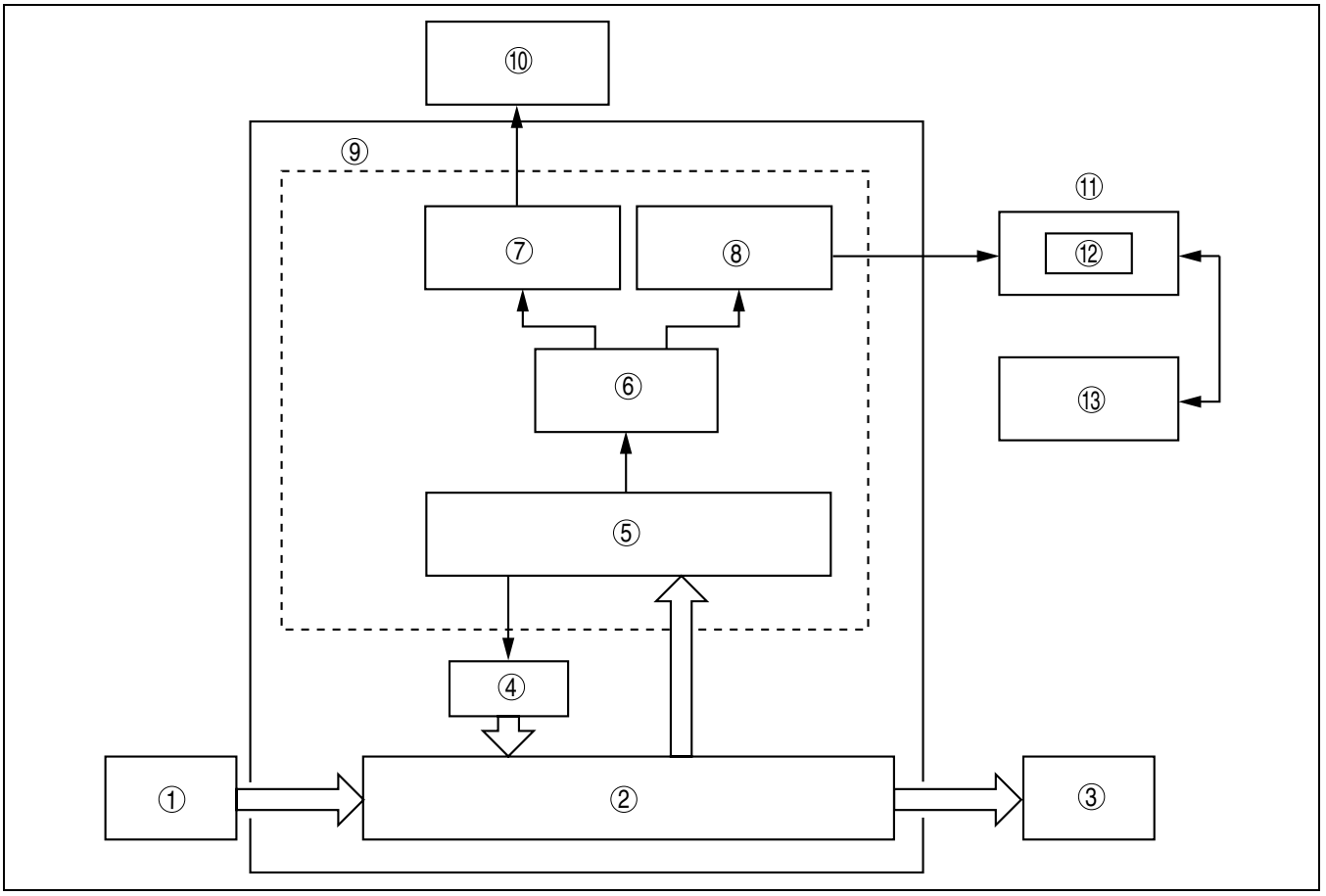
ON-BOARD DIAGNOSTIC

A6E632227100208

Outline

- The on-board diagnostic function allows for detecting malfunctions in the input/output signals when the ignition key is at the ON position.
- The DLC-2, which combines the failure detection and detection maintenance connectors, has been adopted to improve serviceability. By connecting a WDS or equivalent to the DLC-2, malfunction diagnosis can be carried out.
- Using a WDS or equivalent DTCs can be retrieved or erased, depending on the screen display, thus improving serviceability.

Block diagram



A6E63222010

1	Input part
2	Regular control area
3	Output part
4	Fail-safe function
5	Failure detection function
6	Memory function
7	Failure display function

8	External tester communication function
9	Failure diagnosis function
10	4WD warning light
11	DLC-2
12	CAN
13	WDS or equivalent

Self-diagnostic function

Failure detection function

- The failure detection function detects malfunctions in the input/output signal systems of the 4WD CM and displays them when the ignition key is at the ON position.
- When the ignition key is turned to the ON position, the 4WD CM system begins operation, and the 4WD warning light illuminates for 3 seconds while the function checks for open circuits. At the same time the function monitors the condition of the power supply voltage and checks for internal malfunctions.
- Then, once the system is running, the function checks the operating conditions of the 4WD solenoid and the differential oil temperature sensor at regular intervals to determine whether there is any malfunction.
- If any malfunction is detected during these diagnostic tests, the warning light illuminates according to the malfunction to alert the driver. Also, a DTC is output to DLC-2 via the CAN line. Also, at the same time the failure detection result is sent to the memory and fail-safe functions.

Memory function

- This function stores DTCs for malfunctions of the input/output signal systems as determined by the failure detection function. Once a DTC is stored, it is not cleared even if the input/output signal system malfunction returns to normal when the ignition key is turned to the LOCK position (engine OFF).
- Since DTCs are stored in the non-volatile memory inside the 4WD CM, they are not cleared even if the battery is disconnected. Therefore, it is necessary to clear the memory when maintenance has been completed. For clearing DTCs, refer to the procedures in the Workshop Manual.
- When inspecting DTCs using a WDS or equivalent, only one memory stored DTC at a time can be displayed. Therefore, when multiple DTCs have been stored, it is necessary to inspect for DTCs again after repairing and clearing the present DTC to ensure that there are no more DTCs present in the memory.

Fail-safe function

- When the failure detection function determines that there is a malfunction, the 4WD warning light illuminates to alert the driver. At this time, the fail-safe function suspends control or takes other measures to ensure that driving stability is not lost.

X:Available

DTC	Malfunction location	4WD warning lightcondition	DTC stored in memory	Control condition
P1887	System wiring	Illuminated	X	Stop
P1888	Differential oil temperature sensor	Illuminated	X	Stop
U0100	PCM communication system	Illuminated	X	Stop
U0101	TCM communication system	Illuminated	X	Stop
U0121	DSC communication system	Illuminated*1	X	Stop*2

*1 : Does not illuminate when only the coupling torque request signal from the DSC HU/CM cannot be received.
*2 : Only integrated DSC control is prohibited when only the coupling torque request signal from the DSC HU/CM cannot be received.

External tester communication function

- This function allows for the storing and clearing of DTCs due to a communication link between the 4WD CM and an external tester.

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OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E630201018204

- The following additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Rear wheel hub bolt
- Replacement procedure has been added.

Wheel hub, knuckle
- Removal/installation procedure has been added.

Joint shaft (MZR-CD (RF Turbo))
- Disassembly/assembly procedure has been added.

Joint shaft (4WD)
- Disassembly/assembly procedure has been added.

Front drive shaft (MZR-CD (RF Turbo))
- Disassembly/assembly procedure has been added.

Front drive shaft (4WD)
- Disassembly/assembly procedure has been added.

Rear drive shaft
- Inspection procedure has been added.
- Removal/installation procedure has been added.
- Disassembly/assembly procedure has been added.

Differential oil
- Inspection procedure has been added.
- Replacement procedure has been added.

Oil seal (side gear)
- Replacement procedure has been added.

Oil seal (companion flange)
- Replacement procedure has been added.

Rear differential
- Removal/installation procedure has been added.
- Disassembly procedure has been added.
- Assembly procedure has been added.

Differential oil temperature sensor
- Inspection procedure has been added.
- Removal/installation procedure has been added.

4WD solenoid
- Inspection procedure has been added.

Coupling component
- Removal/installation procedure has been added.
- Disassembly procedure has been added.
- Assembly procedure has been added.

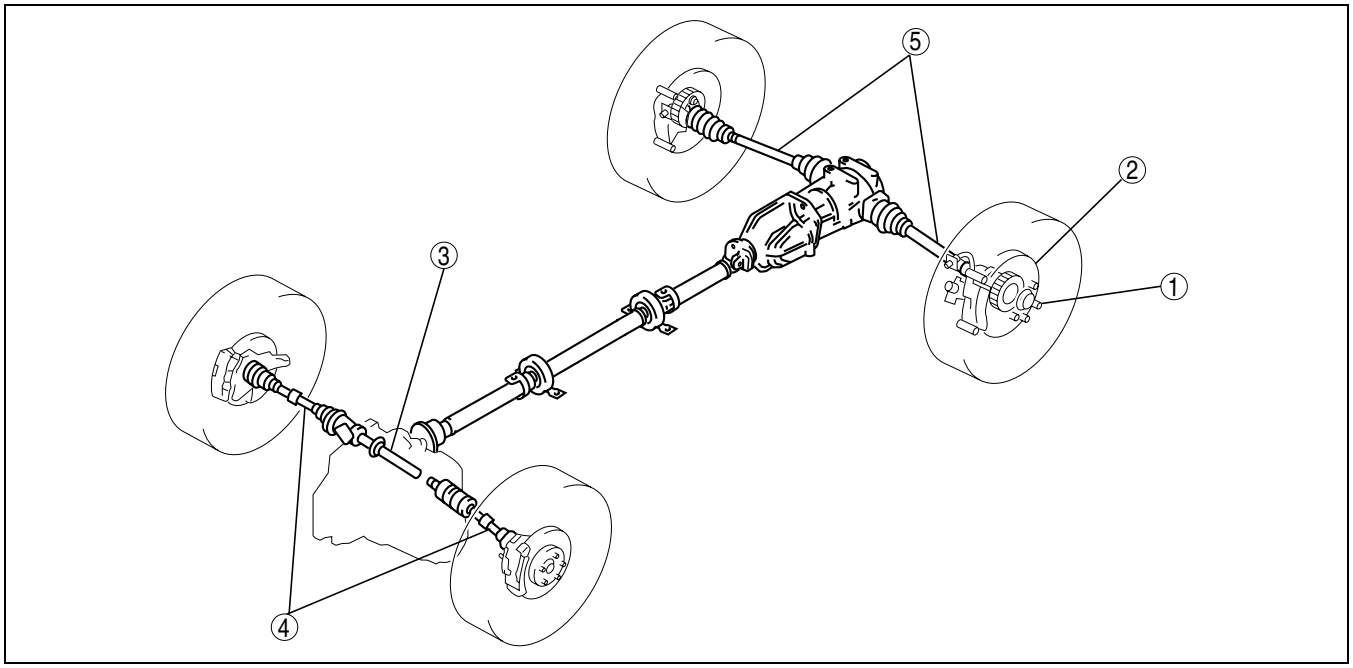
On-board diagnostic
- Electronic 4WD control system have been added.

Troubleshooting
- Electronic 4WD control system have been added.

LOCATION INDEX

AXLE/DRIVE SHAFT LOCATION INDEX

A6E630025500201



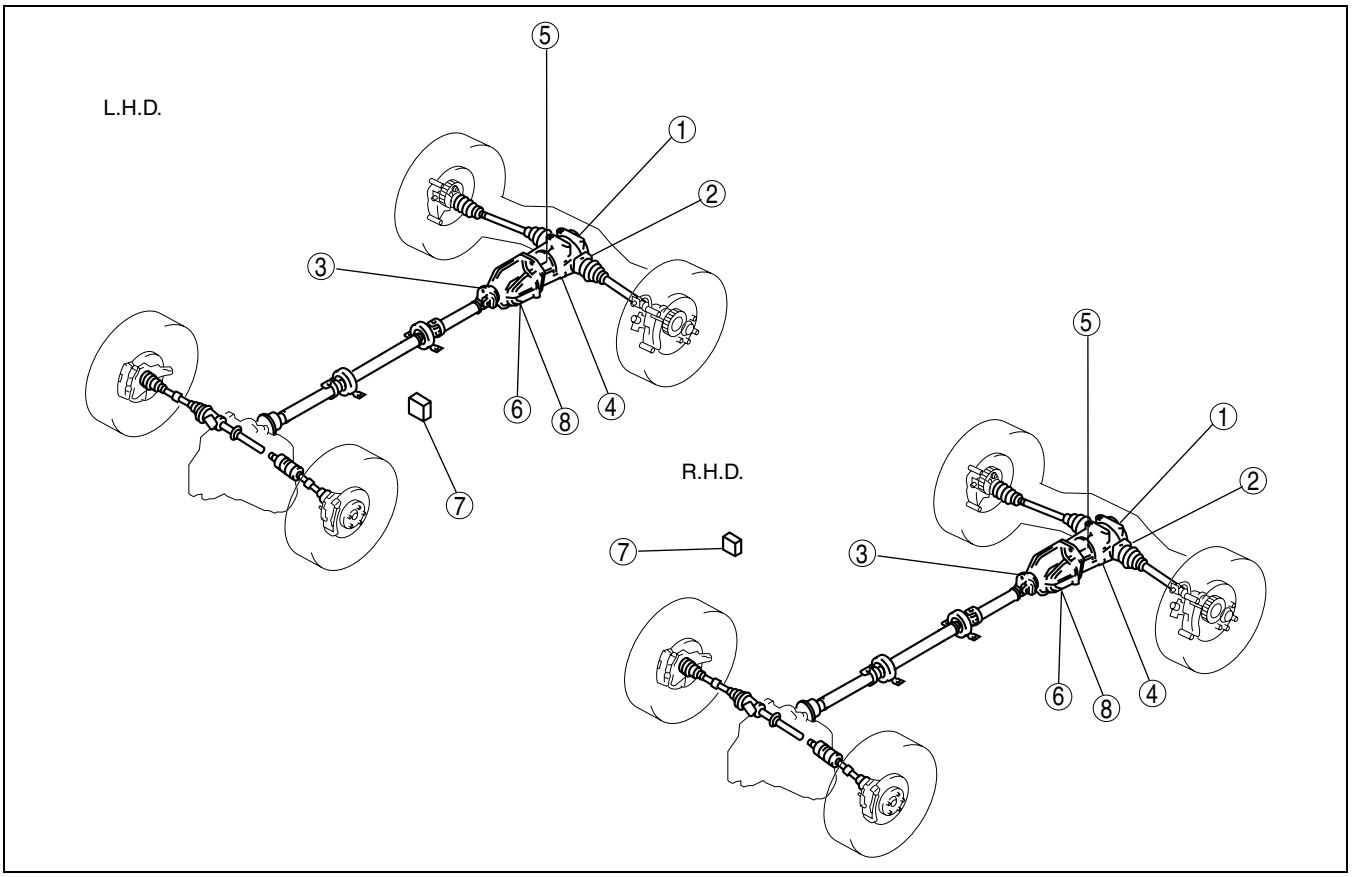
A6J63002001

1	Wheel hub bolt (See M–22 WHEEL HUB BOLT REPLACEMENT)
2	Wheel hub, knuckle (See M–22 WHEEL HUB, KNUCKLE REMOVAL/ INSTALLATION)
3	Joint shaft (See M–29 JOINT SHAFT (MZR-CD (RF Turbo)) DISASSEMBLY/ASSEMBLY) (See M–31 JOINT SHAFT (4WD) DISASSEMBLY/ ASSEMBLY)
4	Front drive shaft (See M–34 FRONT DRIVE SHAFT (MZR-CD (RF Turbo)) DISASSEMBLY/ASSEMBLY) (See M–39 FRONT DRIVE SHAFT (4WD) DISASSEMBLY/ASSEMBLY)
5	Rear drive shaft (See M–42 REAR DRIVE SHAFT PRE-INSPECTION) (See M–43 REAR DRIVE SHAFT REMOVAL/ INSTALLATION) (See M–45 REAR DRIVE SHAFT DISASSEMBLY/ ASSEMBLY)

M

REAR DIFFERENTIAL/ELECTRONIC 4WD CONTROL SYSTEM LOCATION INDEX

A6E630027100201



A6J63002002

1	Differential oil (See M–48 DIFFERENTIAL OIL INSPECTION) (See M–48 DIFFERENTIAL OIL REPLACEMENT)
2	Oil seal (side gear) (See M–49 OIL SEAL (SIDE GEAR) REPLACEMENT)
3	Oil seal (companion flange) (See M–49 OIL SEAL (COMPANION FLANGE) REPLACEMENT)
4	Rear differential (See M–51 REAR DIFFERENTIAL REMOVAL/ INSTALLATION) (See M–52 REAR DIFFERENTIAL DISASSEMBLY) (See M–56 REAR DIFFERENTIAL ASSEMBLY)

5	Differential oil temperature sensor (See M–65 DIFFERENTIAL OIL TEMPERATURE SENSOR INSPECTION) (See M–65 DIFFERENTIAL OIL TEMPERATURE SENSOR REMOVAL/INSTALLATION)
6	4WD solenoid (See M–66 4WD SOLENOID INSPECTION)
7	4WD control module (See M–66 4WD CONTROL MODURE INSPECTION) (See M–67 4WD CONTROL MODURE REMOVAL/ INSTALLATION)
8	Coupling component (See M–68 COUPLING COMPONENT REMOVAL/ INSTALLATION) (See M–69 COUPLING COMPONENT DISASSEMBLY) (See M–72 COUPLING COMPONENT ASSEMBLY)

GENERAL PROCEDURES

PRECAUTION (FRONT AND REAR AXLE)

A6E631001018201

Wheel and Tire Removal/Installation

1. The removal and installation procedures for the wheels and tires are not mentioned in this section. When a wheel is removed, tighten it to **88—118 N·m {9.0—12.0 kgf·m, 65.0—87.0 ft·lbf}**

Brake Line Disconnection/Connection

Caution

- **Brake fluid will damage painted surfaces. If brake fluid gets on a painted surface, wipe it off immediately.**

1. Tighten the brake pipe flare nut using the **SST** (49 0259 770B). Be sure to modify the brake pipe flare nut tightening torque to allow for use of a torque wrench-**SST** combination.
2. If any brake line has been disconnected any time during the procedure, add brake fluid, bleed the brakes, and inspect for leakage after the procedure has been completed.

Suspension Arm Removal/Installation

1. Tighten any part of the suspension that uses rubber bushings only after vehicle has been lowered and unloaded.

Note

- Unloaded: Fuel tank is full. Engine coolant and engine oil are at specified level. Spare tire, jack, and tools are in designated position.

Connector Disconnection

1. Disconnect the negative (-) battery cable before disconnecting connectors.

Electronic Control 4WD System Parts

1. After servicing the electronic control 4WD system parts, verify that no DTC has been stored. Clear any DTCs remaining in the memory.

REAR AXLE

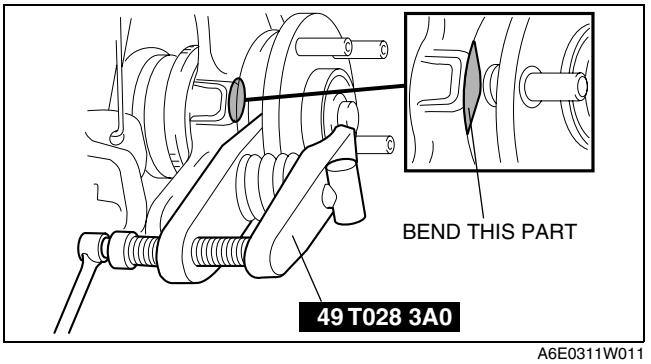
WHEEL HUB BOLT REPLACEMENT

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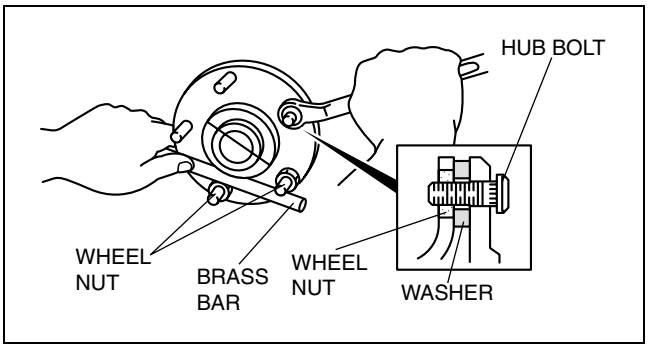
1. Remove the brake caliper component and the disc plate.
2. Remove the wheel hub bolt using the **SST** as shown in the figure.

Note
- If the dust cover interferes with the wheel hub bolt and the wheel hub bolt cannot be removed, tap the part shown in the figure with a chisel lightly and bend the process back to the knuckle side.

3. Install a new wheel hub bolt into the wheel hub and install a washer and hub nut on the hub bolt.
4. Tighten the hub nut while holding the wheel hub using a brass bar.



A6E0311W011



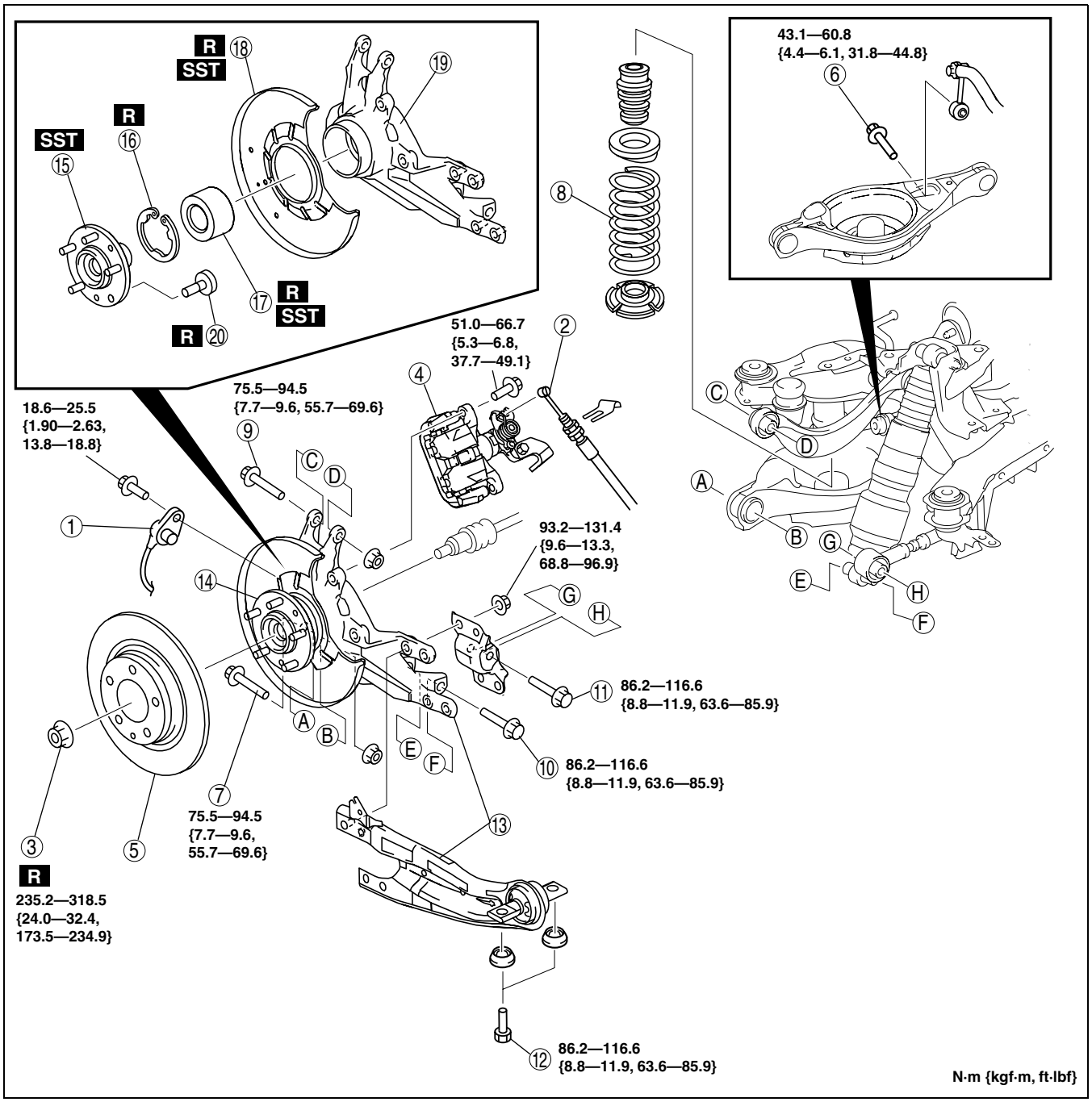
A6E0311W012

WHEEL HUB, KNUCKLE REMOVAL/INSTALLATION

A6E631405000202

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 (wheel 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.



A6E63142101

1	ABS wheel-speed sensor
2	Parking brake cable
3	Locknut (See M–24 Locknut Removal Note) (See M–28 Locknut Installation Note)
4	Brake caliper component
5	Disc plate
6	Bolt (stabilizer control link (lower))
7	Bolt (rear lower arm (outer)) (See M–24 Bolt (Rear Lower Arm (Outer)) Removal Note
8	Rear coil spring (See M–28 Rear Coil Spring Installation Note)
9	Bolt (rear upper arm (outer))
10	Bolt (shock absorber (lower)) (See M–24 Bolt (Shock Absorber (Lower)) Removal Note)

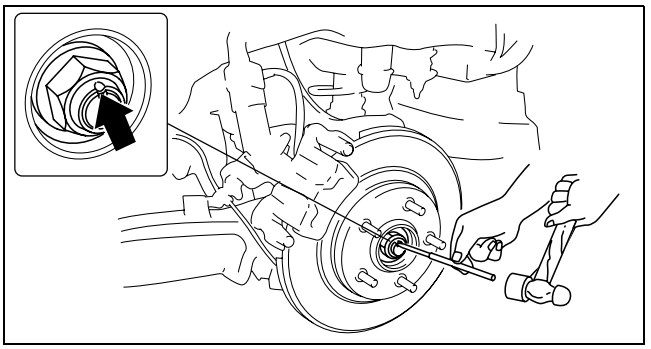
11	Bolt (lateral link (outer)) (See M–24 Bolt (Lateral Link (Outer)) Removal Note)
12	Bolt (trailing link (front)) (See M–25 Bolt (Trailing Link (Front)) Removal Note) (See M–28 Bolt (Trailing Link (Front)) Installation Note)
13	Trailing link, knuckle component
14	Wheel hub, knuckle component
15	Wheel hub (See M–25 Wheel Hub Removal Note) (See M–27 Wheel Hub Installation Note)
16	Snap ring
17	Wheel bearing (See M–25 Wheel Bearing Removal Note) (See M–27 Wheel Bearing Installation Note)

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18	Dust cover (See M–26 Dust Cover Removal Note) (See M–27 Dust Cover Installation Note)
19	Knuckle
20	Wheel hub bolt (See M–26 Wheel Hub Bolt Removal Note) (See M–26 Wheel Hub Bolt Installation Note)

Locknut Removal Note

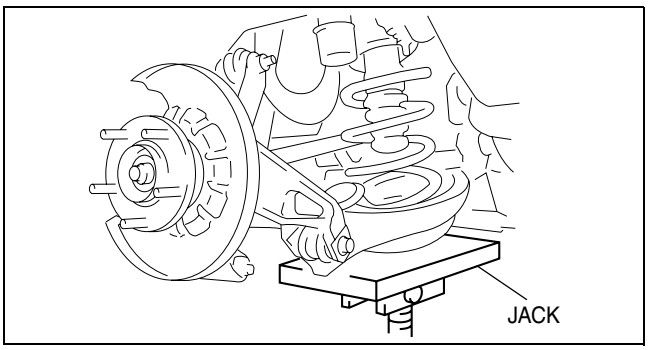
1. Knock the crimped portion of the locknut outward using a small chisel and a hammer.
2. Lock the hub by applying the brakes.
3. Remove the locknut.



A6E0312W021

Bolt (Rear Lower Arm (Outer)) Removal Note

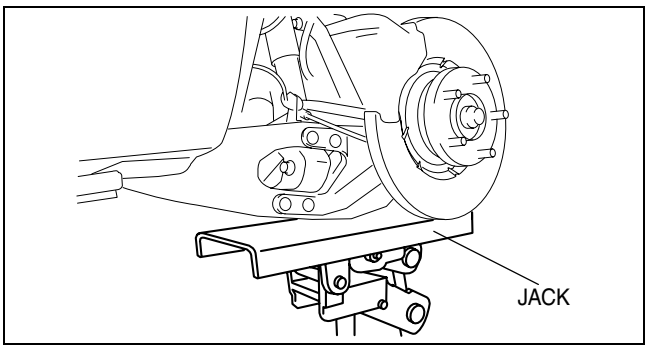
1. Support the lower arm with a jack.
2. Loosen the lower arm bolts (inner).
3. Remove the lower arm bolts (outer).
4. Gradually lower the jack and separate the lower arm (outer) from the knuckle.



A6E63142102

Bolt (Shock Absorber (Lower)) Removal Note

1. Support the trailing link and the knuckle component with a jack.
2. Remove the lower shock absorber bolts.



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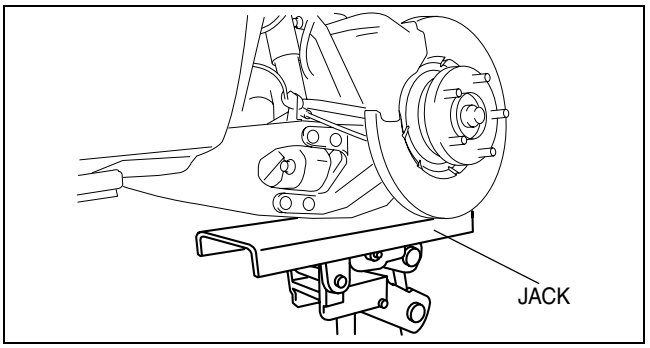
Bolt (Lateral Link (Outer)) Removal Note

1. Loosen the lateral link bolts (inner).
2. Remove the lateral link bolts (outer), and remove the lateral link (outer) from the knuckle.

Bolt (Trailing Link (Front)) Removal Note

Warning
- **Be sure that the trailing link and the knuckle component are supported securely with a jack. Otherwise, the trailing link and/or the knuckle component may fall, causing death or injury, or vehicle damage.**

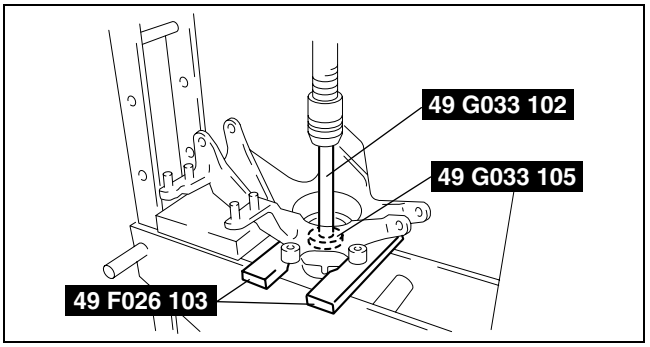
1. Verify that the trailing link and the knuckle component are supported securely with a jack, and remove the bolts at the trailing link front.



A6E63142103

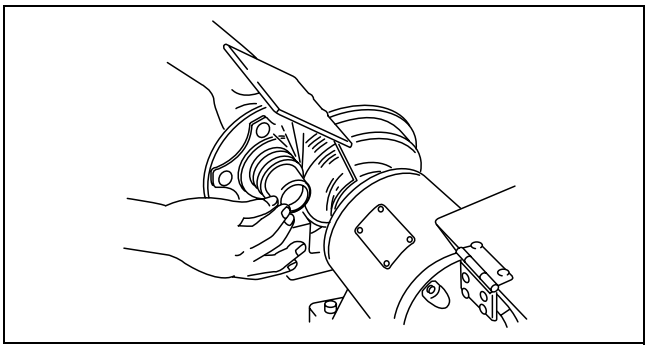
Wheel Hub Removal Note

1. Remove the wheel hub from the knuckle using the **SSTs**.



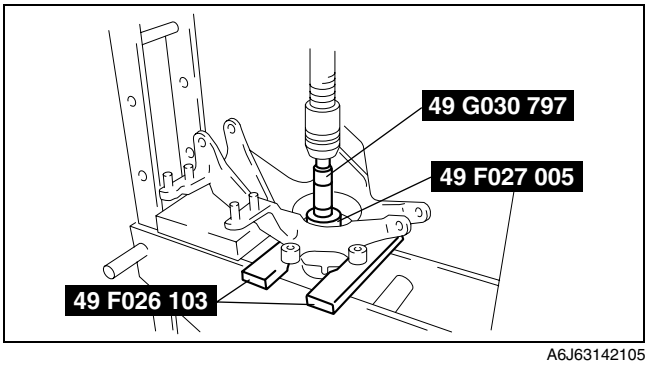
A6J63142104

2. If the bearing inner race remains on the wheel hub, grind a section of the bearing inner race until **approx. 0.5 mm {0.02 in}** remains. Then remove it using a chisel.


A6E6312W002

Wheel Bearing Removal Note

1. Remove the wheel bearing from the knuckle using the **SSTs**.



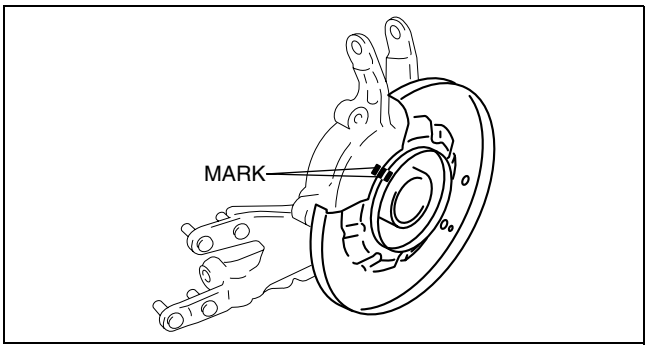
A6J63142105

M

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 knuckle for proper installation.
2. Remove the dust cover from the knuckle using a chisel.

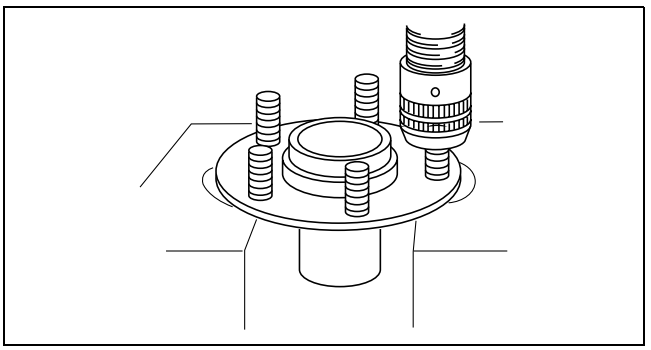


A6E63142104

Wheel Hub Bolt Removal Note

Note
- The wheel hub bolts do not need to be removed unless they are being replaced.

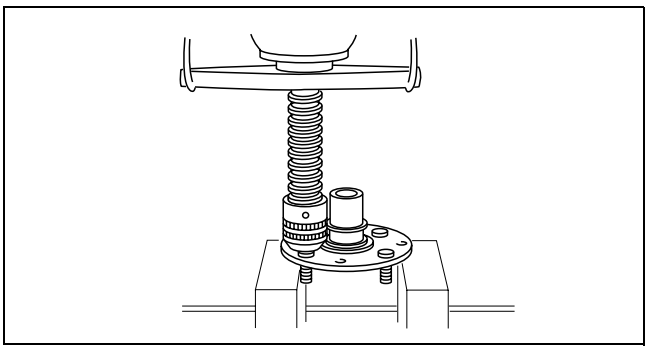
1. Remove the wheel hub bolts from the wheel hub using a press.



A6E6312W003

Wheel Hub Bolt Installation Note

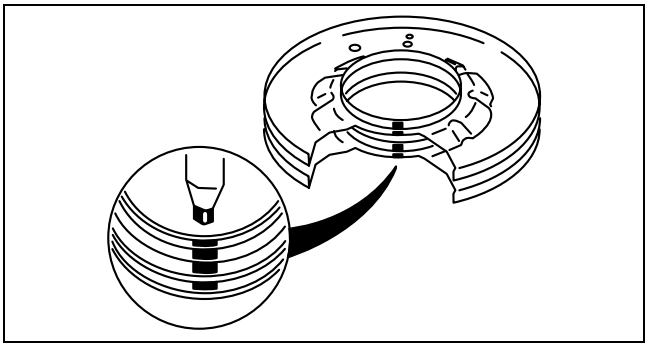
1. Install the new wheel hub bolts to the wheel hub using a press.



A6E6312W004

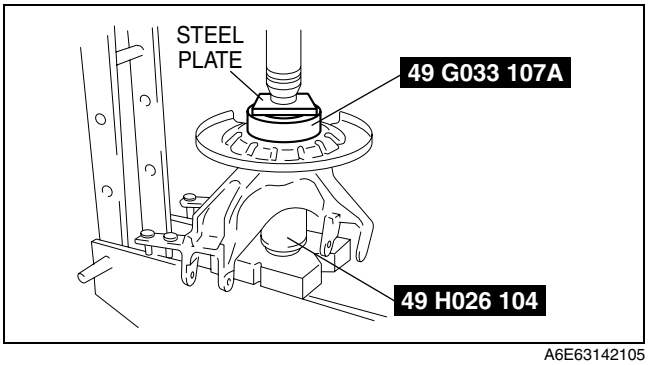
Dust Cover Installation Note

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.



A6J63142107

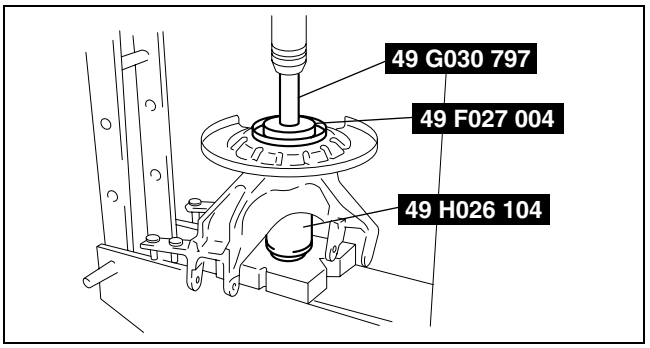
3. Install the new dust cover to the knuckle using the **SSTs**.



A6E63142105

Wheel Bearing Installation Note

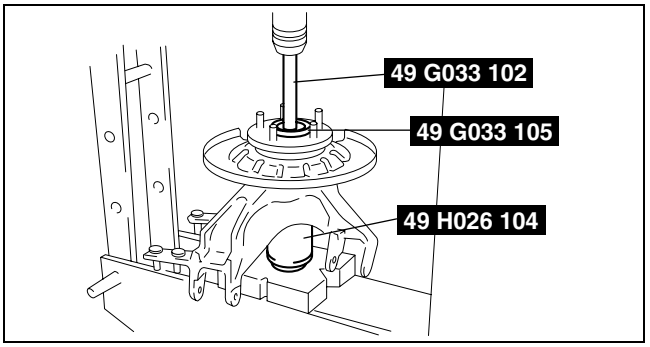
1. Install the new wheel bearing to the knuckle using the **SSTs**.



A6J63142109

Wheel Hub Installation Note

1. Install the wheel hub to the knuckle using the **SSTs**.

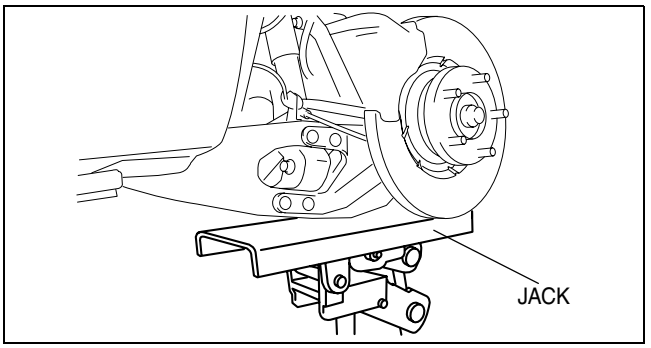


A6J63142110

Bolt (Trailing Link (Front)) Installation Note

Warning
- **Be sure that the trailing link and the knuckle component are supported securely with a jack. Otherwise, the trailing link and/or the knuckle component may fall, causing death or injury, or vehicle damage.**

1. Support the trailing link and the knuckle component with a jack.
2. Tighten the bolts at the trailing link (front).

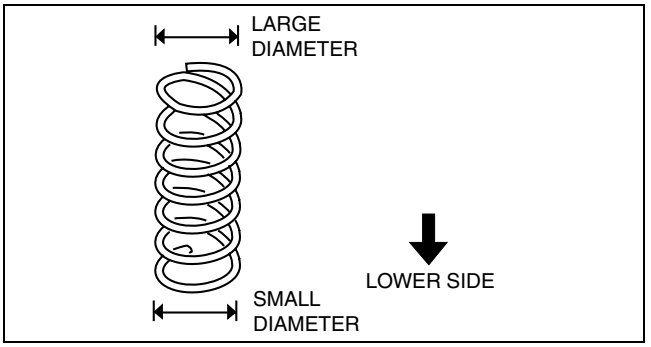


A6E63142103

Rear Coil Spring Installation Note
1. Install the coil spring so that its small diameter end points downward.
2. Set a jack to the bottom of the lower arm, and jack it up gradually.

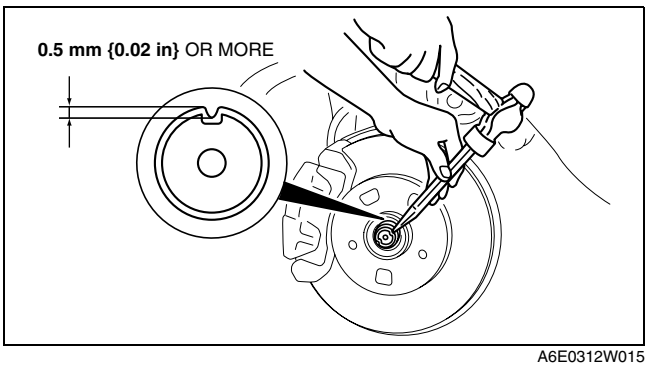
Warning
- **Be careful when installing the coil spring, as it may fly out by spring force, causing death or injury, or vehicle damage.**

3. Install the lower arm bolts (outer).



A6E63142106

Locknut Installation Note
1. Install a new locknut and stake it as shown.



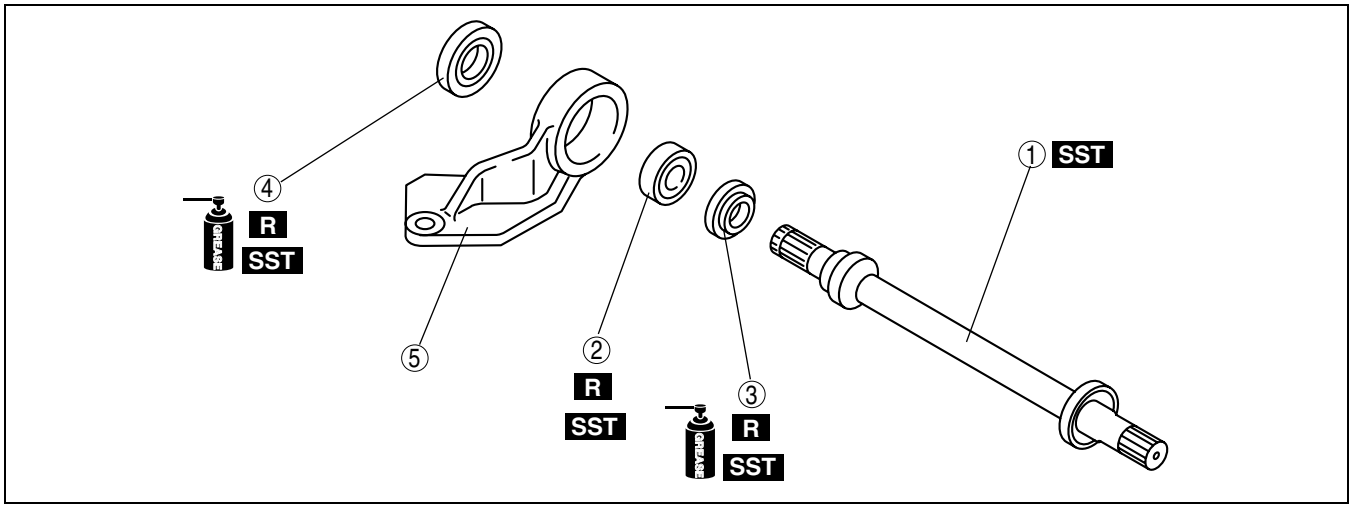
A6E0312W015

FRONT DRIVE SHAFT

JOINT SHAFT (MZR-CD (RF TURBO)) DISASSEMBLY/ASSEMBLY

A6E631525700201

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



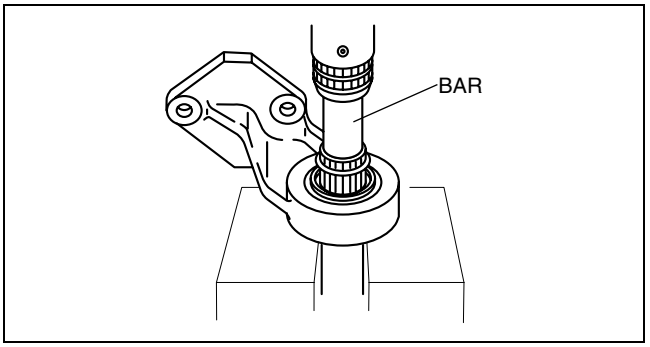
A6E63152001

1	Joint shaft (See M–29 Joint Shaft Disassembly Note) (See M–30 Joint Shaft Assembly Note)
2	Bearing (See M–29 Bearing Disassembly Note) (See M–30 Bearing Assembly Note)
3	Dust seal (Left) (See M–30 Dust Seal (Differential Side) Assembly Note)
4	Dust seal (Right) (See M–30 Dust Seal (Wheel Side) Assembly Note)
5	Bracket

M

Joint Shaft Disassembly Note

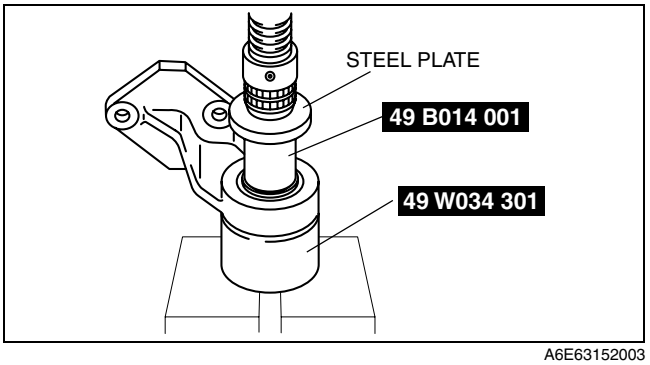
1. Disassemble the joint shaft using the **SST**.



A6E63152002

Bearing Disassembly Note

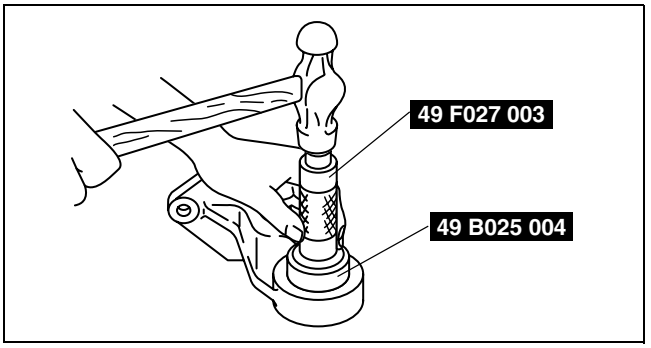
1. Remove the bearing and the dust seal (both differential side and wheel side) using the **SSTs**.



A6E63152003

Dust Seal (Wheel Side) Assembly Note

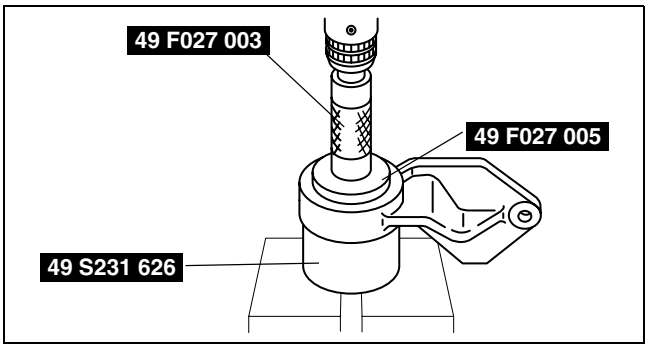
1. Apply grease to the new dust seal lip.
2. Install the new dust seal (wheel side) using the **SSTs**.



A6E63152004

Bearing Assembly Note

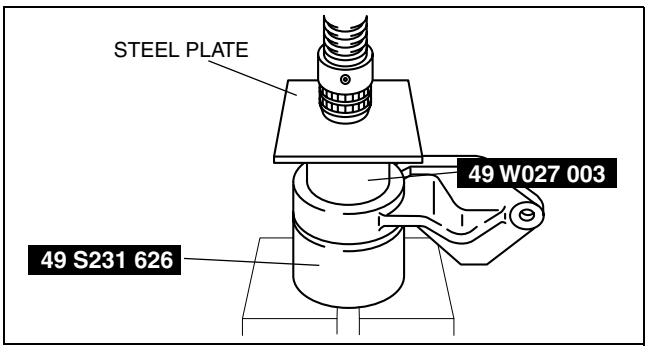
1. Install the new bearing using the **SSTs**.



A6E63152005

Dust Seal (Differential Side) Assembly Note

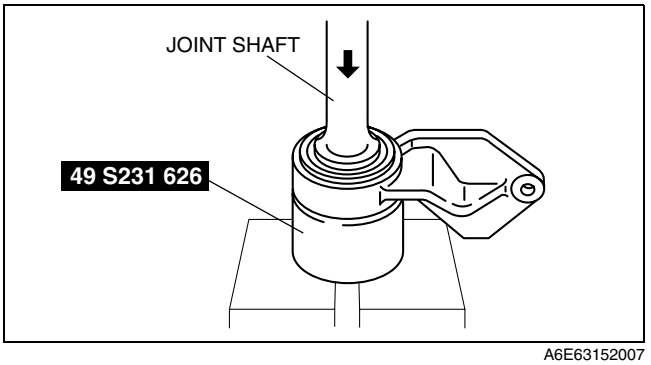
1. Apply grease to the new dust seal lip.
2. Install the new dust seal (differential side) using a steel plate and the **SSTs**.



A6E63152006

Joint Shaft Assembly Note

1. Assemble the joint shaft using a press and the **SST**.

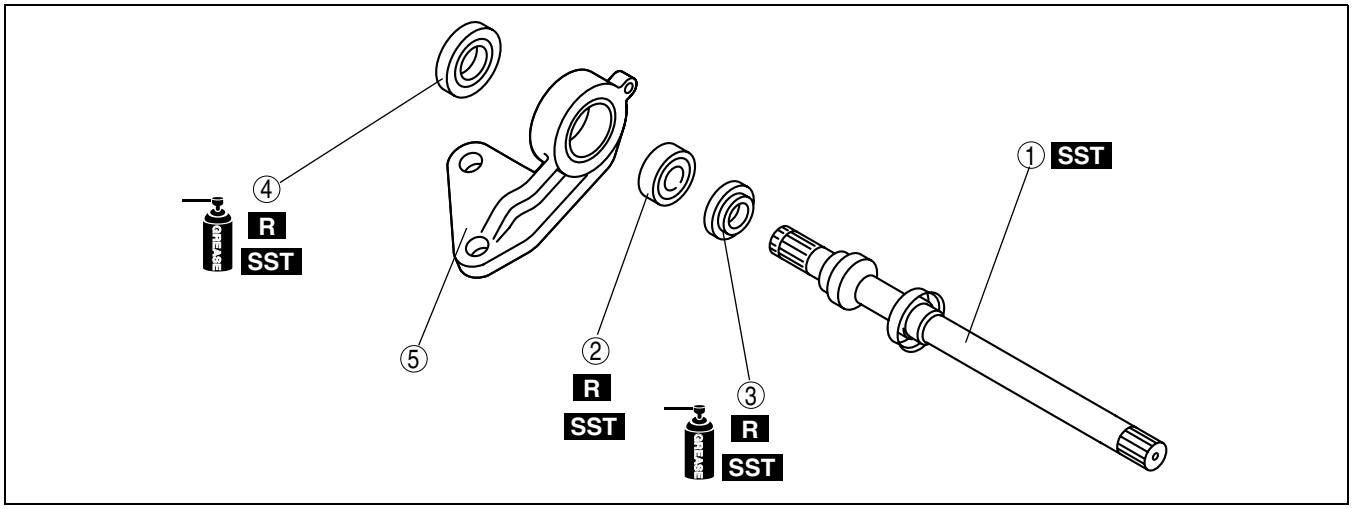


A6E63152007

JOINT SHAFT (4WD) DISASSEMBLY/ASSEMBLY

A6E631525700202

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

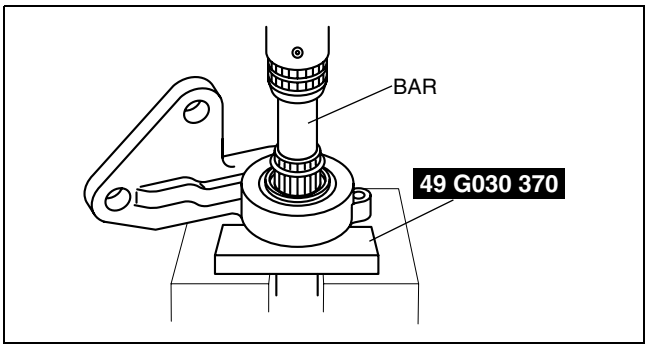


A6J63152001

1	Joint shaft (See M–31 Joint Shaft Disassembly Note) (See M–33 Joint Shaft Assembly Note)
2	Bearing (See M–31 Bearing Disassembly Note) (See M–32 Bearing Assembly Note)
3	Dust seal (Differential side) (See M–32 Dust Seal (Differential Side) Assembly Note)
4	Dust seal (Wheel side) (See M–32 Dust Seal (Wheel Side) Assembly Note)
5	Bracket

Joint Shaft Disassembly Note

1. Disassemble the joint shaft using the **SST**.

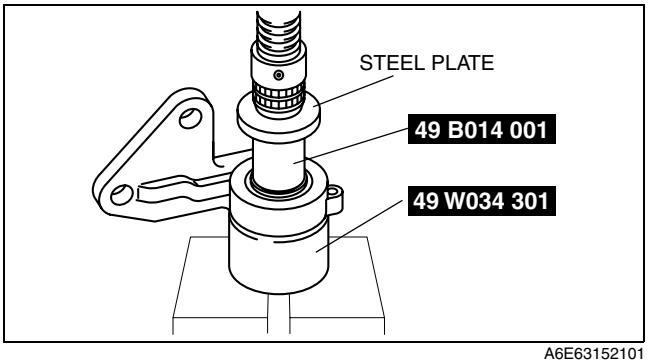


A6E63152102

Bearing Disassembly Note

When the bearing remains on the bracket

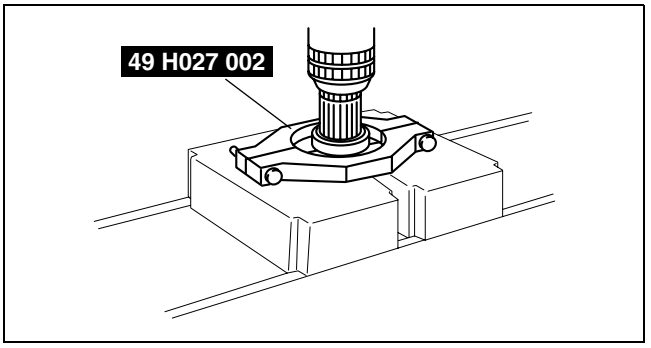
1. Remove the bearing and the dust seals (both differential side and wheel side) using the **SSTs**.



A6E63152101

When the bearing remains on the shaft

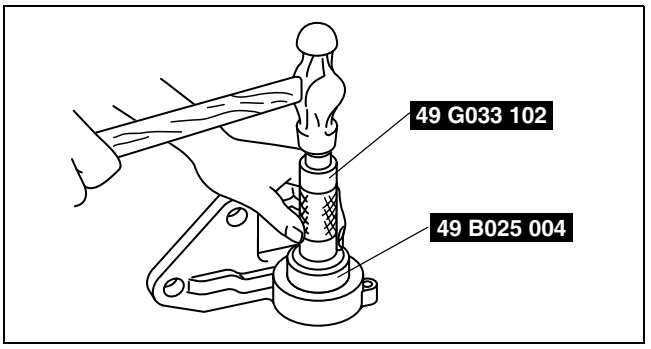
1. Remove the bearing from the joint shaft using the **SST**.



A6J63152003

Dust Seal (Wheel Side) Assembly Note

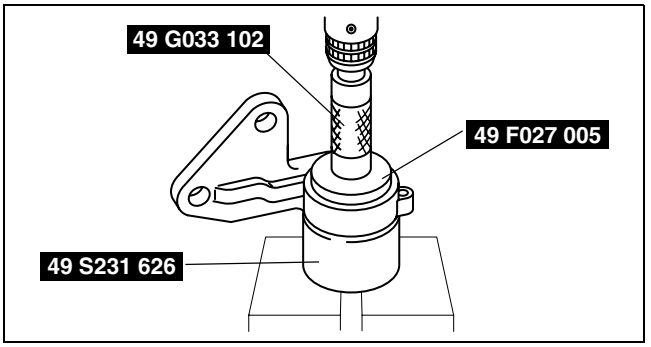
1. Apply grease to the new dust seal lip.
2. Install the new dust seal (wheel side) using the **SSTs**.



A6E0313W028

Bearing Assembly Note

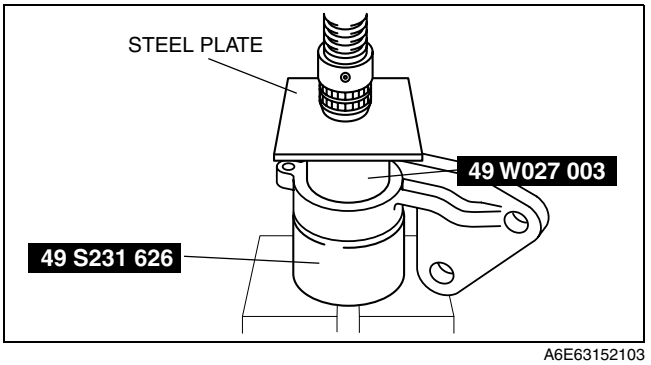
1. Install the new bearing using the **SSTs**.



A6E0313W027

Dust Seal (Differential Side) Assembly Note

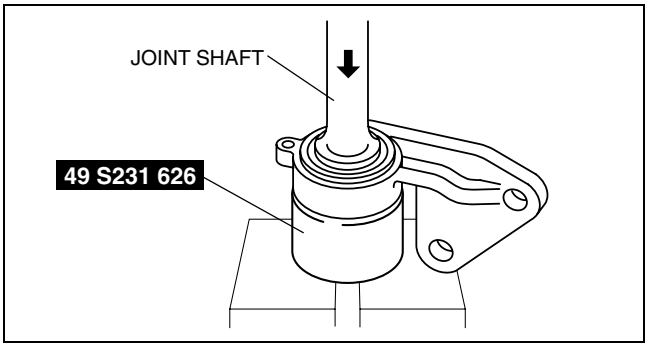
1. Apply grease to the new dust seal lip.
2. Install the new dust seal (differential side) using a steel plate and the **SSTs**.



A6E63152103

Joint Shaft Assembly Note

1. Assemble the joint shaft using a press and the **SST**.

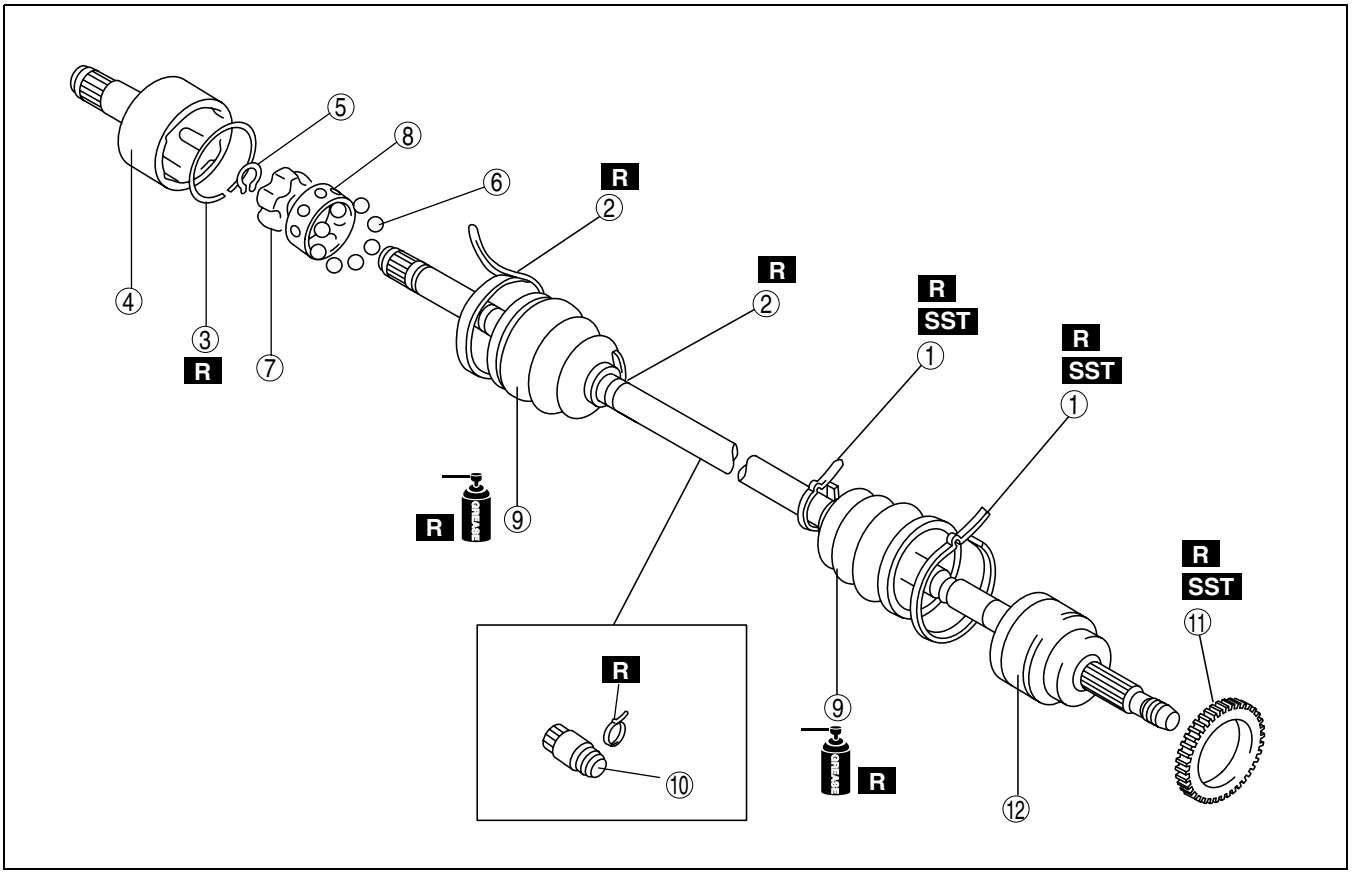


A6E0313W029

FRONT DRIVE SHAFT (MZR-CD (RF TURBO)) DISASSEMBLY/ASSEMBLY

A6E631525500201

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



A6E6316W009

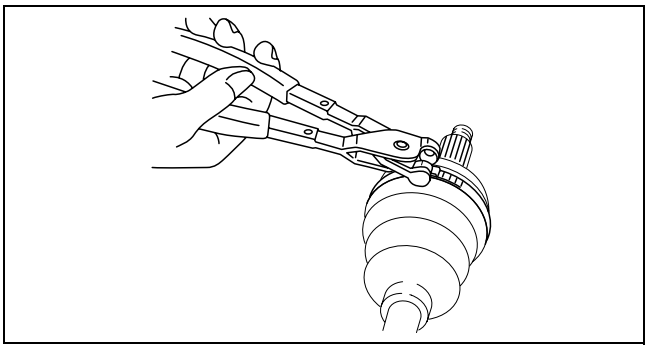
1	Boot band (wheel side) (See M–35 Boot Band (Wheel Side) Disassembly Note) (See M–38 Boot Band (Wheel Side) Assembly Note)
2	Boot band (transaxle side) (See M–35 Boot Band (Transaxle Side) Disassembly Note) (See M–38 Boot Band (Transaxle Side) Assembly Note)
3	Clip (See M–35 Clip Disassembly Note) (See M–37 Outer Ring, Clip Assembly Note)
4	Outer ring (See M–37 Outer Ring, Clip Assembly Note)
5	Snap ring (See M–37 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
6	Balls (See M–36 Balls, Inner Ring, Cage Disassembly Note) (See M–37 Cage, Inner Ring, Balls, Snap Ring Assembly Note)

7	Inner Ring (See M–36 Balls, Inner Ring, Cage Disassembly Note) (See M–37 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
8	Cage (See M–36 Balls, Inner Ring, Cage Disassembly Note) (See M–37 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
9	Boot (See M–37 Boot Assembly Note)
10	Dynamic damper (See M–37 Dynamic Damper Assembly Note)
11	ABS sensor rotor (See M–36 ABS Sensor Rotor (With ABS) Disassembly Note) (See M–36 ABS Sensor Rotor (With ABS) Assembly Note)
12	Shaft and ball joint component

Boot Band (Wheel Side) Disassembly Note

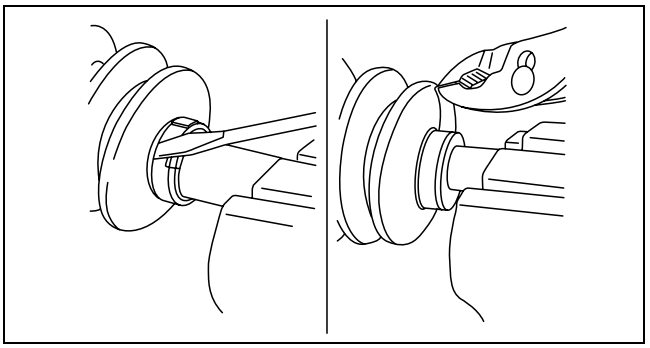
Note
- The boot band does not need to be removed unless it is being replaced.

1. Remove the boot clamp with end clamp pliers as shown and discard the clamp.



A6E6316W004

Boot Band (Transaxle Side) Disassembly Note
1. Pry up the locking clips using a screwdriver.
2. Pull back the end of the band.

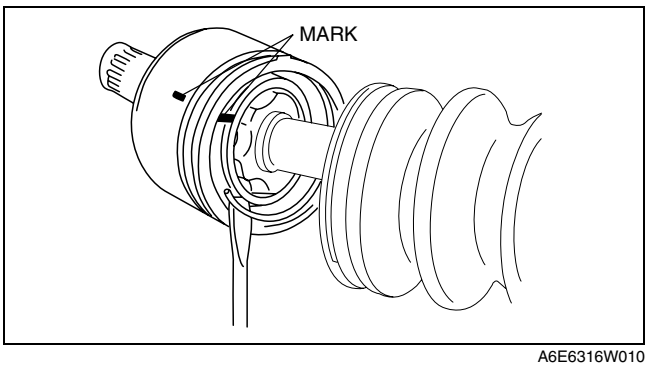


A6E6316W005

Clip Disassembly Note
1. Mark the drive shaft and outer ring for proper assembly.

Caution
- **Mark with paint; do not use a punch.**

2. Remove the clip.



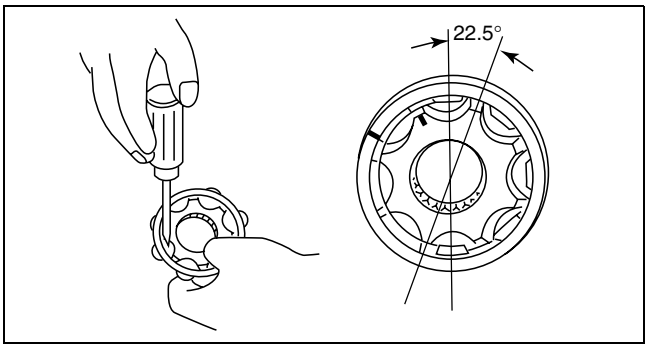
A6E6316W010

Balls, Inner Ring, Cage Disassembly Note

1. Mark the inner ring and cage.

Caution
- **Mark with paint; do not use a punch.**

2. Remove the snap ring using snap-ring pliers.
3. Turn the cage **approximately 22.5 degree** and pull the cage and balls away from the inner ring.

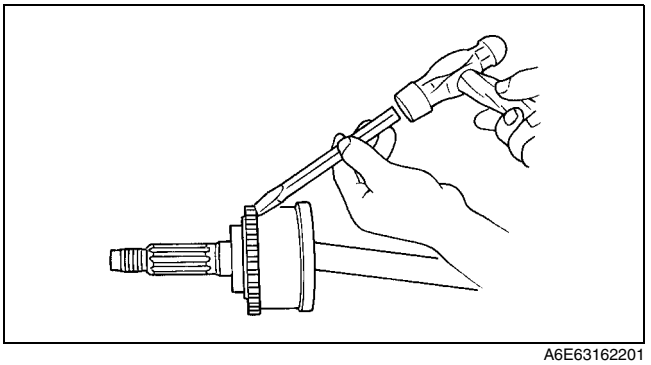


A6E6316W015

ABS Sensor Rotor (With ABS) Disassembly Note

Caution
- **Do not remove the sensor rotor unless it is necessary.**
- **Do not reuse the sensor rotor if removed.**

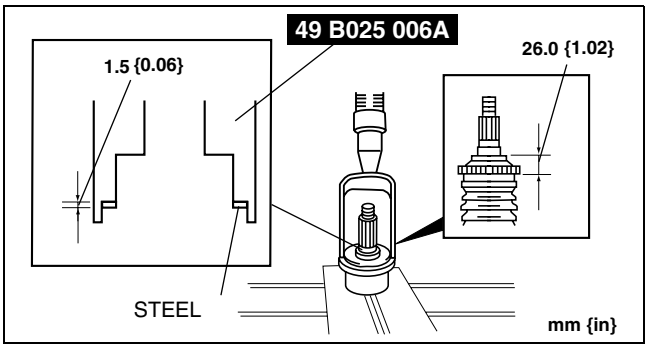
1. Tap the ABS sensor rotor off the drive shaft using a chisel.



A6E63162201

ABS Sensor Rotor (With ABS) Assembly Note

1. Set a new ABS sensor rotor on the drive shaft and press it on using the **SSTs**.



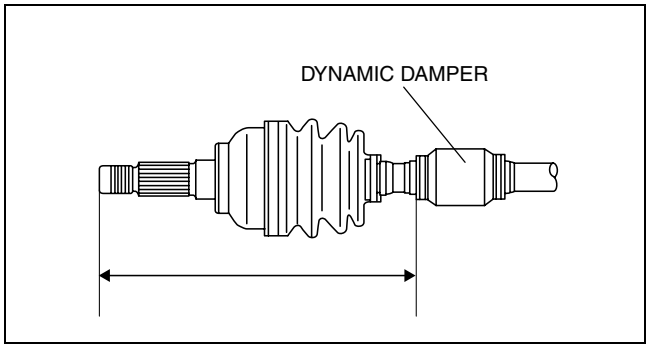
A6E0313W050

Dynamic Damper Assembly Note

1. Install the dynamic damper as shown in the figure.

   Standard length
   334.7—340.7 mm {13.2—13.4 in}

2. Install the new boot band onto the dynamic damper.



A6E6316W006

Boot Assembly Note

Note
- The wheel side and transaxle side boots are different.

1. Fill the boot (wheel side) with the specified grease.

   Caution
   - **Do not touch grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

   Grease amount
   105—125 g {3.71—4.40 oz}

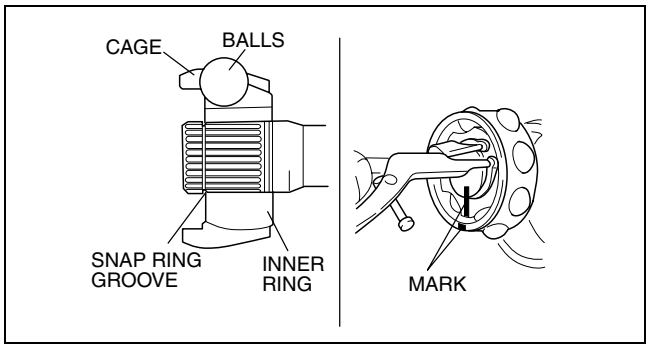
2. With the splines of the shaft still wrapped in tape from disassembly, install the boot.
3. Remove the tape.

Cage, Inner Ring, Balls, Snap Ring Assembly Note

1. Align the marks and install the balls and cage to the inner ring in the direction shown in the figure.

   Caution
   - **Install the cage with the offset facing the snap ring groove. If incorrectly installed, the drive shaft may become disengaged.**

2. Install a new snap ring.



A6E6316W011

Outer Ring, Clip Assembly Note

1. Fill the outer ring and boot (transaxle side) with the specified grease.

   Caution
   - **Do not touch grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

   Grease amount
   120—140 g {4.24—4.93 oz}

2. Align the marks, and install the outer ring on to the shaft.
3. Install a new clip.
4. Install the boot.
5. Set the drive shaft to the standard length.

Standard length

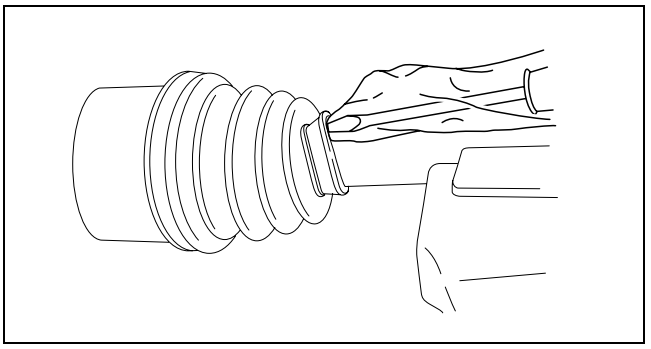
mm {in}

Left side	Right side
666.3—676.3 {26.24—26.62}	615.6—625.6 {24.24—24.62}

6. Release any trapped air from the boots by carefully lifting up the small end of each boot with a cloth wrapped screwdriver.

   Caution
   - **Be careful not to allow the grease to leak.**
   - **Do not damage the boot.**

7. Verify that the drive shaft length is within the specification.
   - If not, repeat from Step 5.

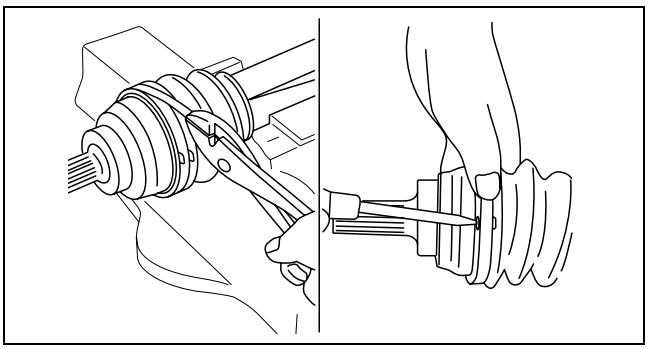


A6E6316W007

Boot Band (Transaxle Side) Assembly Note

1. Fold the band in the direction opposite to the forward revolving direction of the drive shaft and use pliers to pull it tight.
2. Lock the end of the band by bending the locking clips.

   Caution
   - **Install the band into the groove securely.**

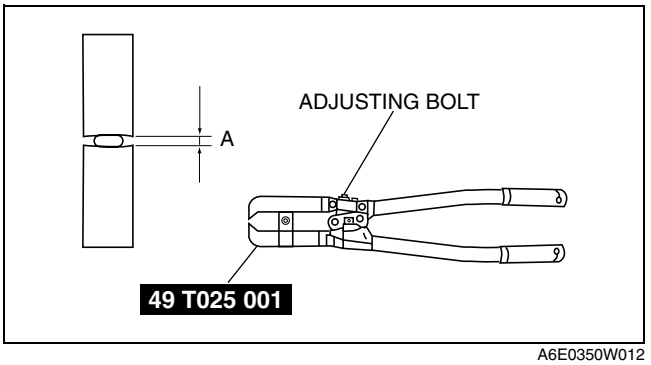


A6E6316W008

Boot Band (Wheel Side) Assembly Note

1. Adjust clearance A by turning the adjusting bolt of the **SST**.

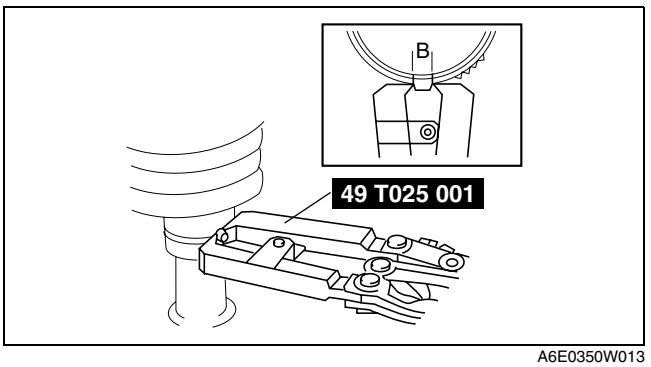
   Clearance A
   2.9 mm {0.11 in}



A6E0350W012

2. Crimp the wheel side small boot band using the **SST**. Verify that clearance B is within the specification.
   - If clearance B is more than the specification, reduce clearance A of the **SST** and crimp the boot again.
   - If clearance B is less than the specification, replace the boot band, increase clearance A of the **SST**, and crimp the new boot.

   Clearance B
   2.4—2.8 mm {0.095—0.110 in}



A6E0350W013

3. Verify that the boot band does not protrude from the boot band installation area.
   - If it does, replace the boot band and repeat Steps 2 and 3.

4. Fill the boot with the repair kit grease.
5. Adjust clearance A by turning the adjusting bolt of the **SST**.

Clearance A
3.2 mm {0.13 in}

6. Crimp the wheel side big boot band using the **SST**.
7. Verify that clearance B is within the specification.
   - If clearance B is more than the specification, reduce clearance A of the **SST** and crimp the boot again.
   - If clearance B is less than the specification, replace the boot band, increase clearance A of the **SST** and crimp the new boot.

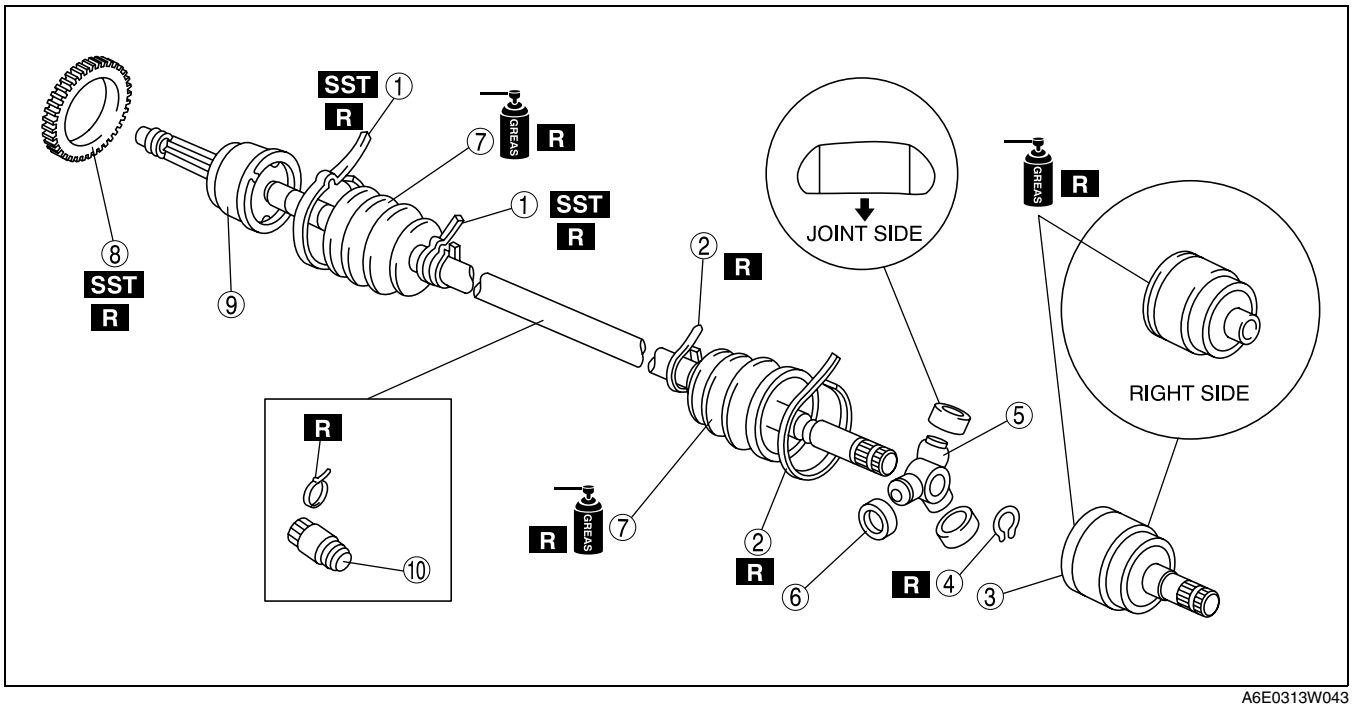
Clearance B
2.4—2.8 mm {0.095—0.110 in}

8. Verify that the boot band does not protrude from the boot band installation area.
   - If it does, replace the boot band and repeat Steps 7 and 8.

FRONT DRIVE SHAFT (4WD) DISASSEMBLY/ASSEMBLY

A6E631525500202

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



A6E0313W043

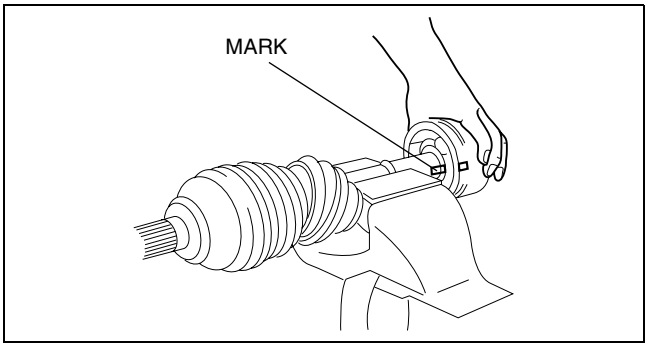
1	Boot band (wheel side) (See M–35 Boot Band (Wheel Side) Disassembly Note) (See M–38 Boot Band (Wheel Side) Assembly Note)
2	Boot band (transaxle side) (See M–35 Boot Band (Transaxle Side) Disassembly Note) (See M–38 Boot Band (Transaxle Side) Assembly Note)
3	Outer ring (See M–40 Outer Ring Disassembly Note) (See M–41 Outer Ring Assembly Note)
4	Snap ring (See M–40 Snap Ring, Tripod Joint Disassembly Note) (See M–41 Tripod Joint, Snap Ring Assembly Note)

5	Tripod joint (See M–40 Snap Ring, Tripod Joint Disassembly Note) (See M–41 Tripod Joint, Snap Ring Assembly Note)
6	Free ring
7	Boot (See M–40 Boot Disassembly Note) (See M–41 Boot Assembly Note)
8	ABS sensor rotor (with ABS) (See M–36 ABS Sensor Rotor (With ABS) Disassembly Note) (See M–36 ABS Sensor Rotor (With ABS) Assembly Note)
9	Shaft and ball joint component
10	Dynamic damper (See M–41 Dynamic Damper Assembly Note)

M

Outer Ring Disassembly Note

1. Mark the outer ring and the shaft for proper assembly.
2. Remove the outer ring.



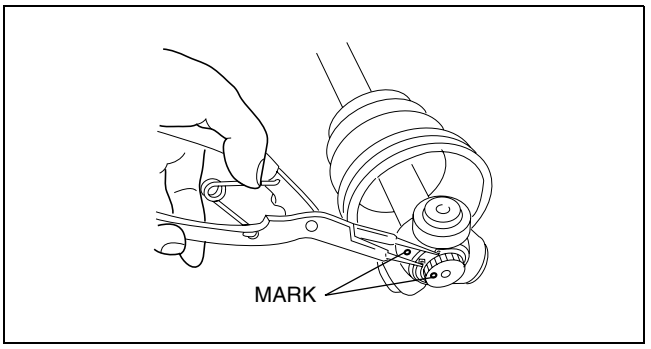
A6E0313W046

Snap Ring, Tripod Joint Disassembly Note

1. Mark the shaft and tripod joint for proper assembly.
2. Remove the snap ring using snap-ring pliers.
3. Remove the tripod joint from the shaft.

Caution

- **Do not tap the tripod joint with a hammer.**



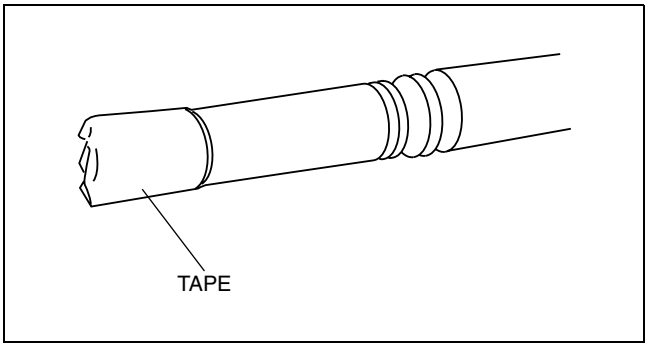
A6E0313W047

Boot Disassembly Note

Note

- The wheel side boot does not need to be removed unless replacing it or the ball joint and shaft component.
- Do not strip the tape until the boot is assembled.

1. Wrap the shaft splines with tape.
2. Remove the boot.



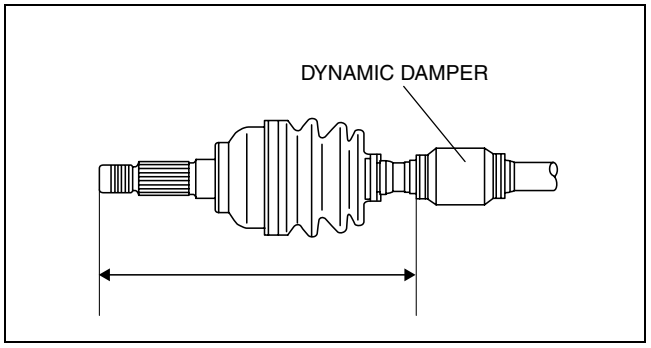
A6E0313W048

Dynamic Damper Assembly Note

1. Install the dynamic damper as shown in the figure.

   Standard length
   Left side: 281.7—287.7 mm {11.10—11.32 in}
   Right side: 334.7—340.7 mm {13.2—13.4 in}

2. Install a new boot band onto the dynamic damper.



A6E6316W006

Boot Assembly Note

Note
- The wheel side and transaxle side boots are different.

1. Fill the boot (wheel side) with the specified grease.

   Caution
   - **Do not touch grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

   Grease amount
   90—110 g {3.18—3.88 oz}

2. With the splines of the shaft still wrapped in tape from disassembly, install the boot.
3. Remove the tape.

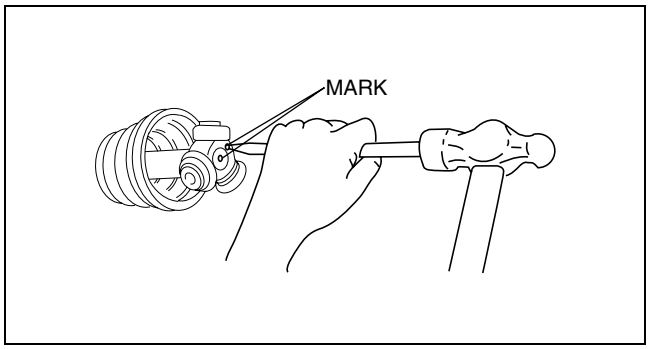
Tripod Joint, Snap Ring Assembly Note

1. Align the marks and install the tripod joint using a bar and a hammer.

   Caution
   - **Do not damage the roller.**

2. Install the new snap ring using snap-ring pliers.

   Caution
   - **Be sure the snap ring engages correctly in the groove of the shaft.**



A6E0313W051

Outer Ring Assembly Note

1. Fill the outer ring and boot (transaxle side) with the specified grease.

   Caution
   - **Do not touch grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

   Grease amount
   Left side: 185—205 g {6.53—7.23 oz}
   Right side: 195—215 g {6.88—7.58 oz}

2. Install the outer ring.
3. Set the drive shaft to the standard length.

Standard length

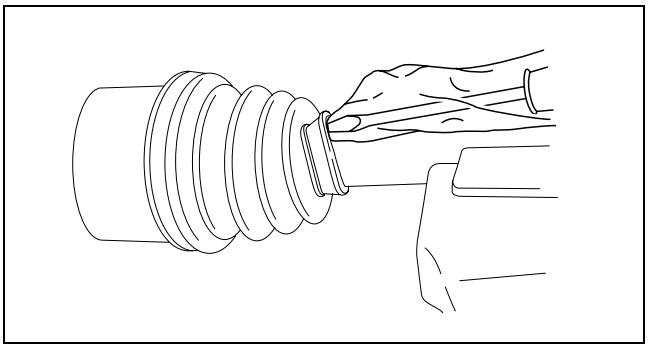
mm {in}

Left side	Right side
667—677 {26.26—26.65}	631—641 {24.85—25.23}

4. Release any trapped air from the boots by carefully lifting up the small end of each boot with a cloth wrapped screwdriver.

   Caution
   - **Do not let grease leak.**
   - **Do not damage the boot.**

5. Verify that the drive shaft length is within the standard.
   - If not, repeat from Step 3.



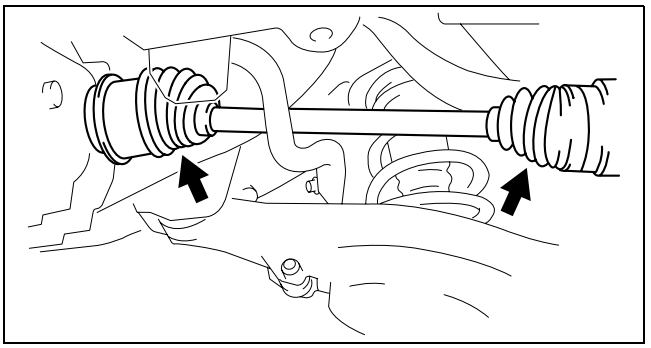
A6E6316W007

REAR DRIVE SHAFT

REAR DRIVE SHAFT PRE-INSPECTION

A6E631725500201

1. Inspect each connecting part for looseness.
   - Tighten or replace parts if necessary.
2. Inspect the dust boot on the drive shaft for cracks, damage, leaking grease, and looseness in the boot band.
3. Inspect the drive shaft for bends, cracks, and wear in the joints or splines.
   - Repair or replace the drive shaft or boot band if necessary.



A6J63172101

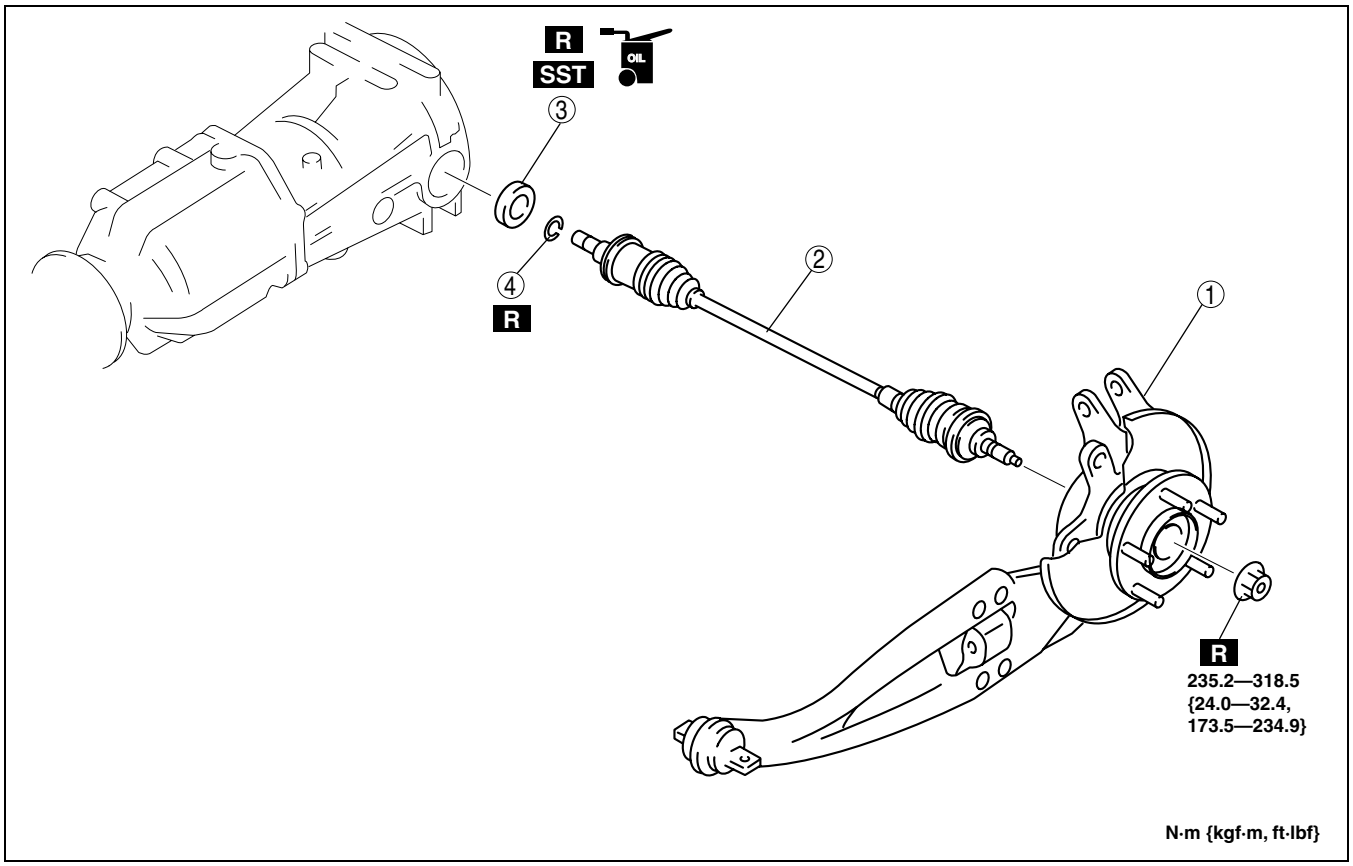
REAR DRIVE SHAFT REMOVAL/INSTALLATION

A6E631725500202

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 (wheel side) and fix it to an appropriate place where the sensor will not be pulled by mistake while the vehicle is being serviced.**

1. Drain the rear differential oil into a container. (See M–48 DIFFERENTIAL OIL REPLACEMENT.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



A6J63172001

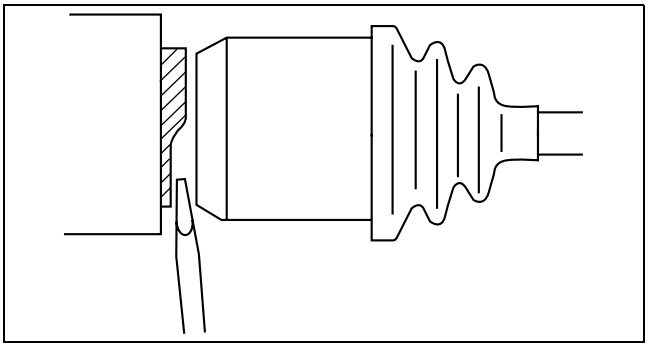
1	Trailing link, knuckle component (See M–22 WHEEL HUB, KNUCKLE REMOVAL/INSTALLATION)
2	Rear drive shaft (See M–44 Rear Drive Shaft Removal Note)
3	Oil seal (See M–49 OIL SEAL (SIDE GEAR) REPLACEMENT)
4	Clip (See M–44 Clip Installation Note)

Rear Drive Shaft Removal Note

1. Deform the metal cover of the oil seal using a bar, and disengage the drive shaft.

Note

- Oil seal cannot be reused. Always replace the oil seal with a new one.

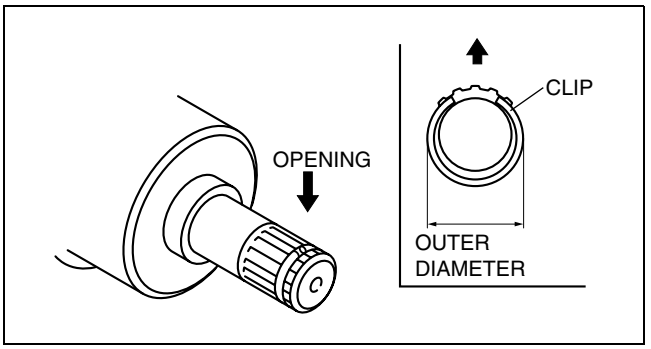


A6J63172201

Clip Installation Note

1. Install a new clip onto the joint shaft with the opening facing upward. Ensure that the diameter of the clip does not exceed the specification on installation.
2. After installation, measure the outer diameter. If it exceeds the specification, repeat Steps 1—2 using a new clip.

Outer diameter specification
26.0 mm {1.02 in} max.

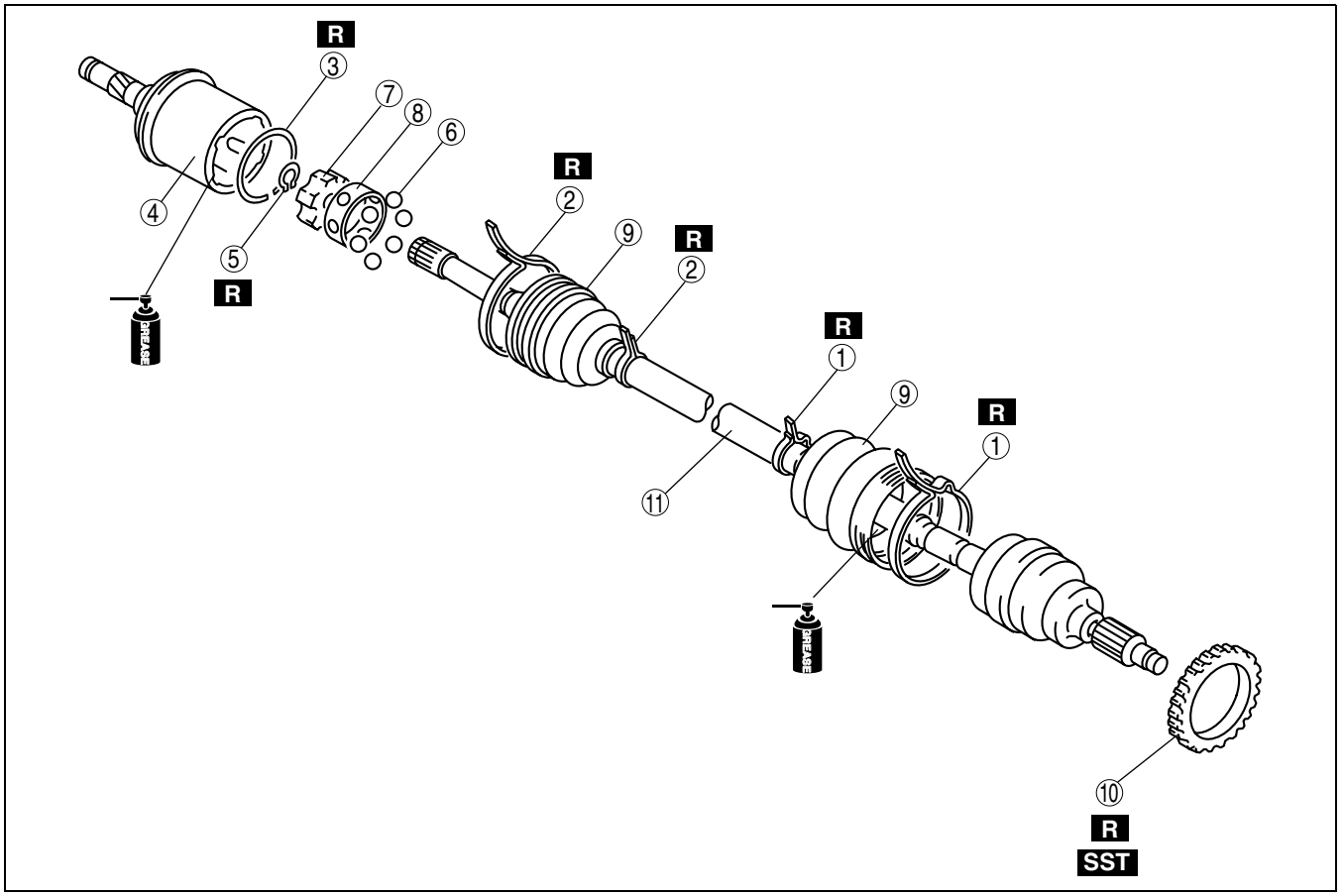


A6E0313W021

REAR DRIVE SHAFT DISASSEMBLY/ASSEMBLY

A6E631725500203

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



A6J63172003

1	Boot band (wheel side) (See M–35 Boot Band (Wheel Side) Disassembly Note) (See M–38 Boot Band (Wheel Side) Assembly Note)
2	Boot band (differential side) (See M–35 Boot Band (Transaxle Side) Disassembly Note) (See M–38 Boot Band (Transaxle Side) Assembly Note)
3	Clip See M–46 Clip Disassembly Note See M–47 Outer Ring, Clip Assembly Note
4	Outer ring (See M–47 Outer Ring, Clip Assembly Note)
5	Snap ring (See M–46 Snap Ring Disassembly Note) (See M–47 Cage, Inner Ring, Balls, Snap Ring Assembly Note)

6	Balls (See M–46 Balls, Inner Ring, Cage Disassembly Note) (See M–47 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
7	Inner Ring (See M–46 Balls, Inner Ring, Cage Disassembly Note) (See M–47 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
8	Cage (See M–46 Balls, Inner Ring, Cage Disassembly Note) (See M–47 Cage, Inner Ring, Balls, Snap Ring Assembly Note)
9	Boot (See M–47 Boot Assembly Note)
10	ABS sensor rotor (See M–36 ABS Sensor Rotor (With ABS) Disassembly Note) (See M–46 ABS Sensor Rotor Assembly Note)
11	Drive shaft, joint component

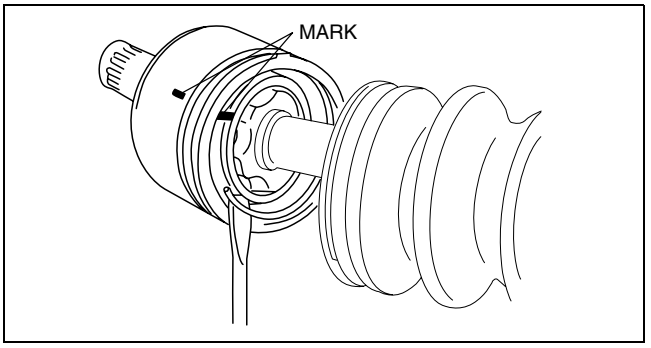
M

Clip Disassembly Note

1. Mark the drive shaft and outer ring for proper assembly.

   Caution
   - **Mark with paint; do not use a punch.**

2. Remove the clip.



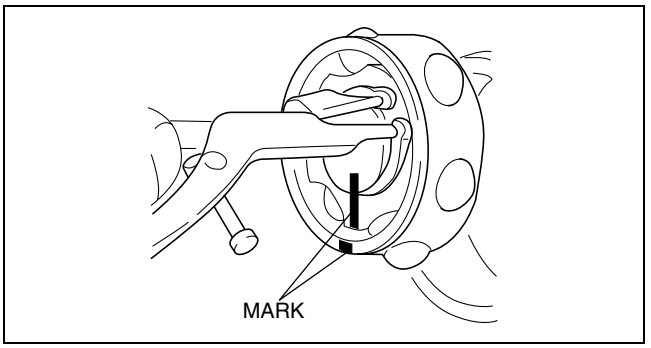
A6E6316W010

Snap Ring Disassembly Note

1. Mark the drive shaft end and inner ring for proper reassembly.

   Caution
   - **Mark with paint; do not use a punch.**

2. Remove the snap ring using snap-ring pliers.



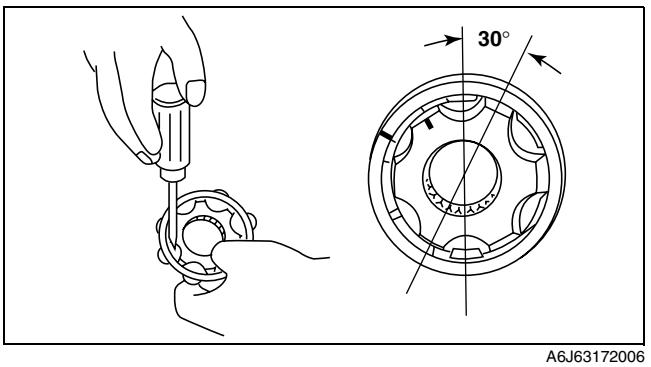
A6E63172005

Balls, Inner Ring, Cage Disassembly Note

1. Mark the inner ring and cage for proper reassembly.

   Caution
   - **Mark with paint; do not use a punch.**

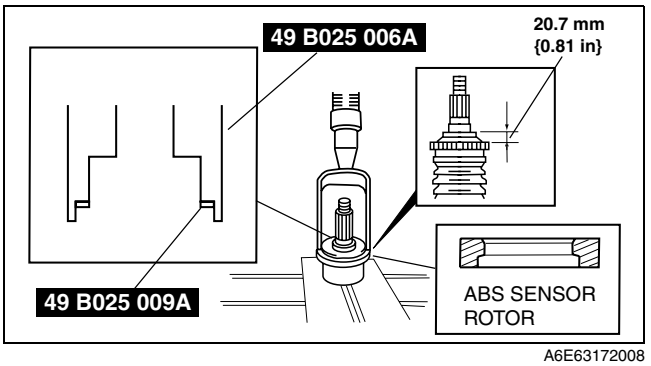
2. Turn the cage **approximately 30 degrees** and pull the cage and balls from the inner ring.



A6J63172006

ABS Sensor Rotor Assembly Note

1. Install the ABS sensor rotor to the drive shaft using the **SSTs**.



A6E63172008

Boot Assembly Note

Note
- The wheel side and differential side boots are different.

1. Fill the wheel side boot with the specified grease.

Caution
- **Do not touch grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

Grease amount
75—95 g {2.65—3.35 oz}

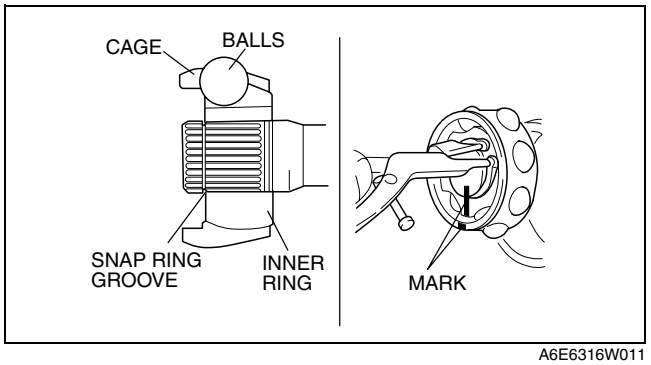
2. With the splines of the shaft wrapped in tape, install the boot.
3. Remove the tape.

Cage, Inner Ring, Balls, Snap Ring Assembly Note

1. Align the marks and install the balls and cage to the inner ring in the direction shown in the figure.

Caution
- **Install the cage so that the major diameter is at the same side as the snap ring groove. If incorrectly installed, the drive shaft may become disengaged.**

2. Align the marks and install the inner ring to the shaft.
3. Install a new snap ring.



A6E6316W011

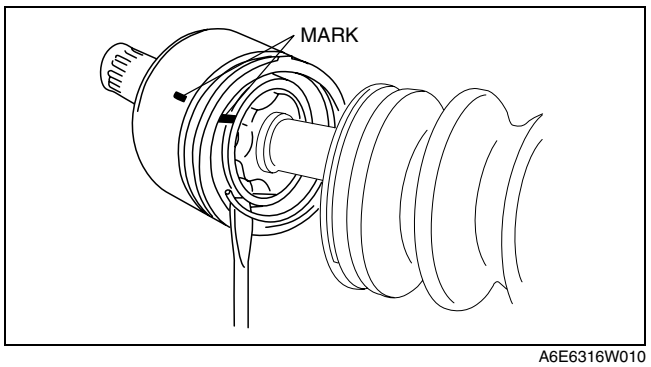
Outer Ring, Clip Assembly Note

1. Fill the outer ring and boot (differential side) with the specified grease.

Caution
- **Do not touch grease with your hand. Apply it from the tube to prevent foreign matter from entering the boot.**

Grease amount
65—85 g {2.30—2.99 oz}

2. Align the marks, and install the outer ring on to the shaft.
3. Install a new clip to the outer ring clip groove.
4. Install the boot.



A6E6316W010

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5. Release any trapped air from the boots by carefully lifting up the small end of each boot with a cloth wrapped screwdriver.

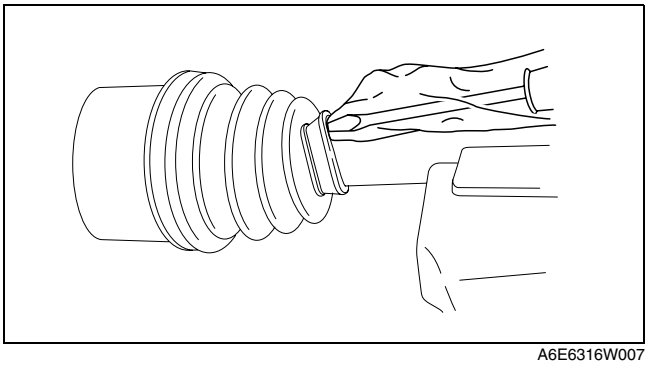
   Caution
   - **Do not let grease leak.**
   - **Do not damage the boot.**

6. Set the drive shaft to the standard length.

Standard length

mm {in}

Left side	Right side
805.4—815.4 {31.71—32.10}	852.4—862.4 {33.56—33.95}



A6E6316W007

7. Verify that the drive shaft length is within the standard.
   - If not, repeat from Step 5.

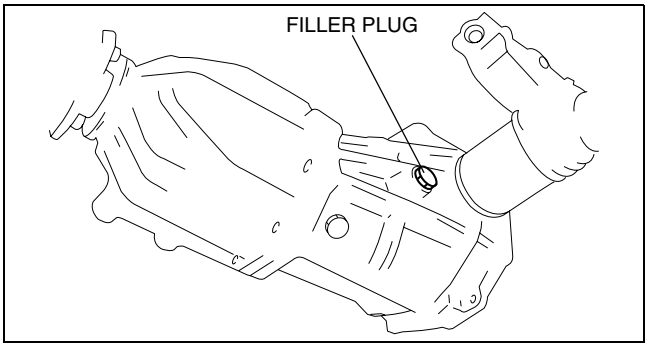
REAR DIFFERENTIAL

DIFFERENTIAL OIL INSPECTION

A6E631927100203

1. Place the vehicle on level ground.
2. Remove the filler plug and washer.
3. Verify that the oil is at the brim of the filler plug hole.
4. If it is low, add the specified oil.
5. Install a new washer and the filler plug, and tighten.

   Tightening torque
   39.2—53.9 N·m {4.0—5.4 kgf·m, 29.0—39.7 ft·lbf}



A6E63192101

DIFFERENTIAL OIL REPLACEMENT

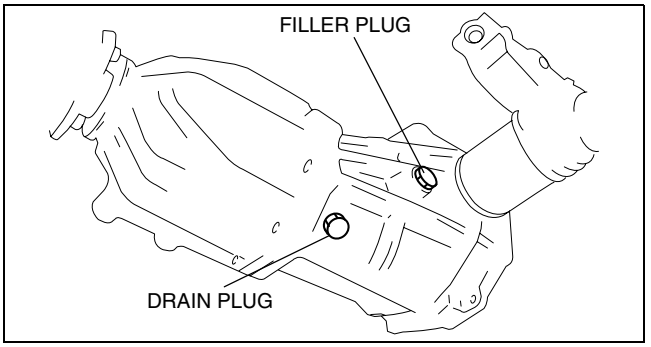
A6E631927100204

1. Place the vehicle on level ground.
2. Remove the filler plug.
3. Remove the drain plug and drain the differential oil into a container.
4. Install a new washer and the drain plug, and tighten.

   Tightening torque
   39—53 N·m {4.0—5.4 kgf·m, 29—39 ft·lbf}

5. Add the specified differential oil from the filler plug until the level reaches the brim of the plug hole.

   Specified oil
   Type (API service GL-5)
   Above -18°C {0°F}: SAE 90
   Below -18°C {0°F}: SAE 80
   Capacity (Approximate quantity):
   1.00 L {1.06 US qt, 0.88 Imp qt}



A6E63192102

6. After filling with differential oil, perform oil level inspection.
7. Install a new washer and the drain plug, and tighten.

   Tightening torque
   39.2—53.9 N·m {4.0—5.4 kgf·m, 29.0—39.7 ft·lbf}

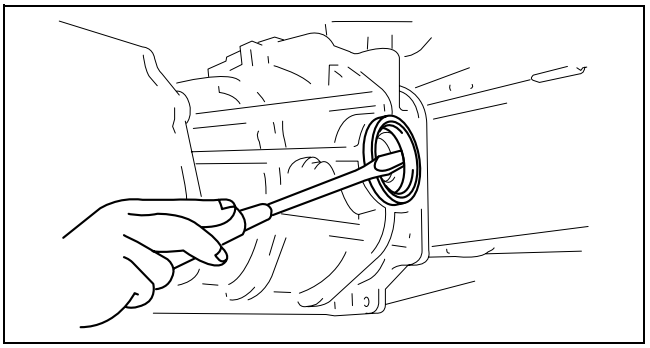
OIL SEAL (SIDE GEAR) REPLACEMENT

A6E631927100205

1. Remove the drain plug and the drain differential oil into a container.
2. Install a new washer and the drain plug, and tighten.
3. Remove the rear drive shaft. (See M–43 REAR DRIVE SHAFT REMOVAL/INSTALLATION.)
4. Remove the clip from the drive shaft.

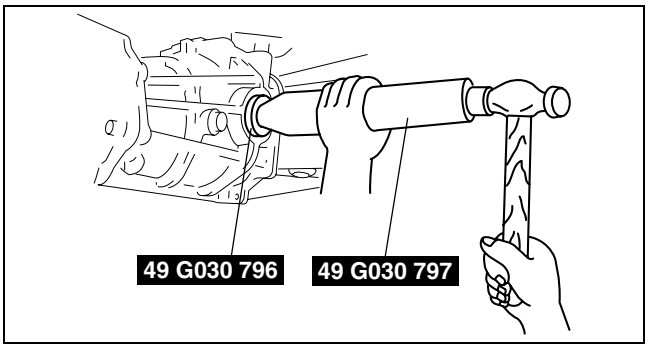
Caution
- **Wrap the end of a screwdriver with cloth to prevent scratches to the inside of the differential casing.**

5. Remove the oil seal from the differential casing using a screwdriver.
6. Apply differential oil to the new oil seal lip.



A6A63192003

7. Install the new oil seal to the differential carrier using the **SSTs**.
8. After installing the new clip onto the drive shaft, insert the drive shaft into the differential. (See M–43 REAR DRIVE SHAFT REMOVAL/INSTALLATION.)
9. Verify that the drive shaft cannot be pulled out.
10. Add the specified differential oil.
11. fter adding the oil, perform an oil level inspection. (See M–48 DIFFERENTIAL OIL INSPECTION.)
12. Install a new washer and the oil filler plug, and tighten.



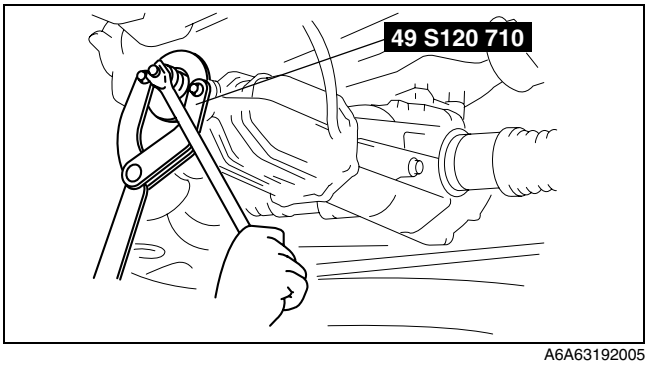
A6A63192004

Tightening torque
39.2—53.9 N·m {4.0—5.4 kgf·m, 29.0—39.7 ft·lbf}

OIL SEAL (COMPANION FLANGE) REPLACEMENT

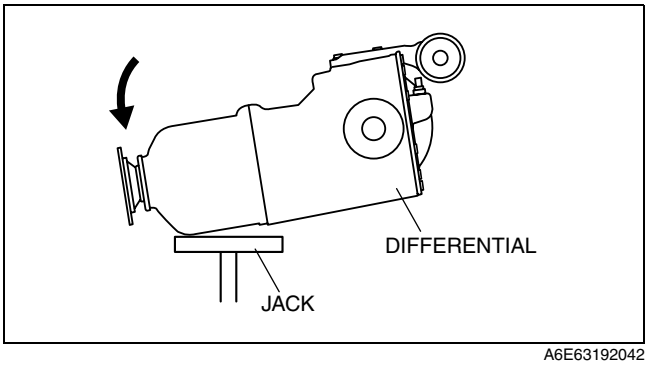
A6E631927100206

1. Drain the differential oil into a container.
2. Remove the propeller shaft. (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION.)
3. Remove the locknut using the **SST**.
4. Support the differential using a jack.



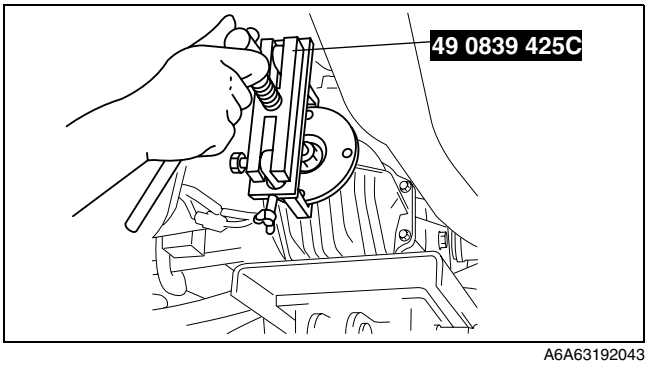
A6A63192005

5. After removing the front side of the differential mount, gradually lower the jack and tilt the front side of the differential downward.



A6E63192042

6. Pull the companion flange off using the **SST**.
7. Remove the oil seal from the differential carrier using a screwdriver or similar tool.
8. Apply differential oil to the new oil seal lip.

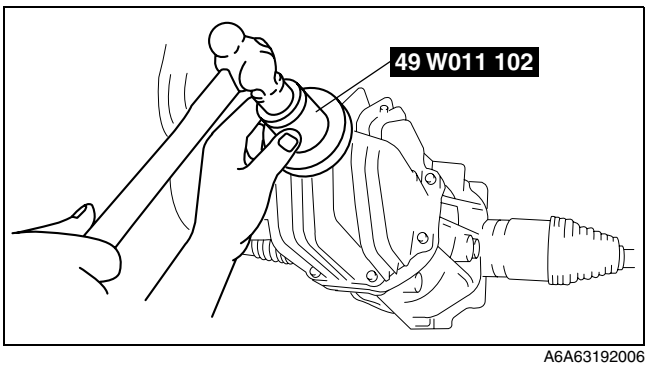


A6A63192043

9. Install the new oil seal to the differential carrier using the **SST**.
10. Install the companion flange to the drive pinion.
11. Jack up the differential and install the front side of the differential mount.

    Tightening torque
    74.5—104.9 N·m {7.6—10.7 kgf·m, 55.0—77.3 ft·lbf}

12. Install the washer and a new locknut.

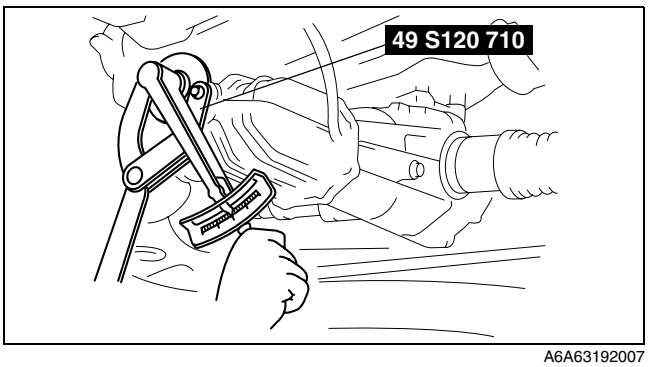


A6A63192006

13. Tighten the locknut to the specified torque using the SST.

    Tightening torque
    167—226 N·m {17.1—23.0 kgf·m, 124—166 ft·lbf}

14. Install the propeller shaft. (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION)
15. Add the specified differential oil from the filler plug. (See M–48 DIFFERENTIAL OIL REPLACEMENT)

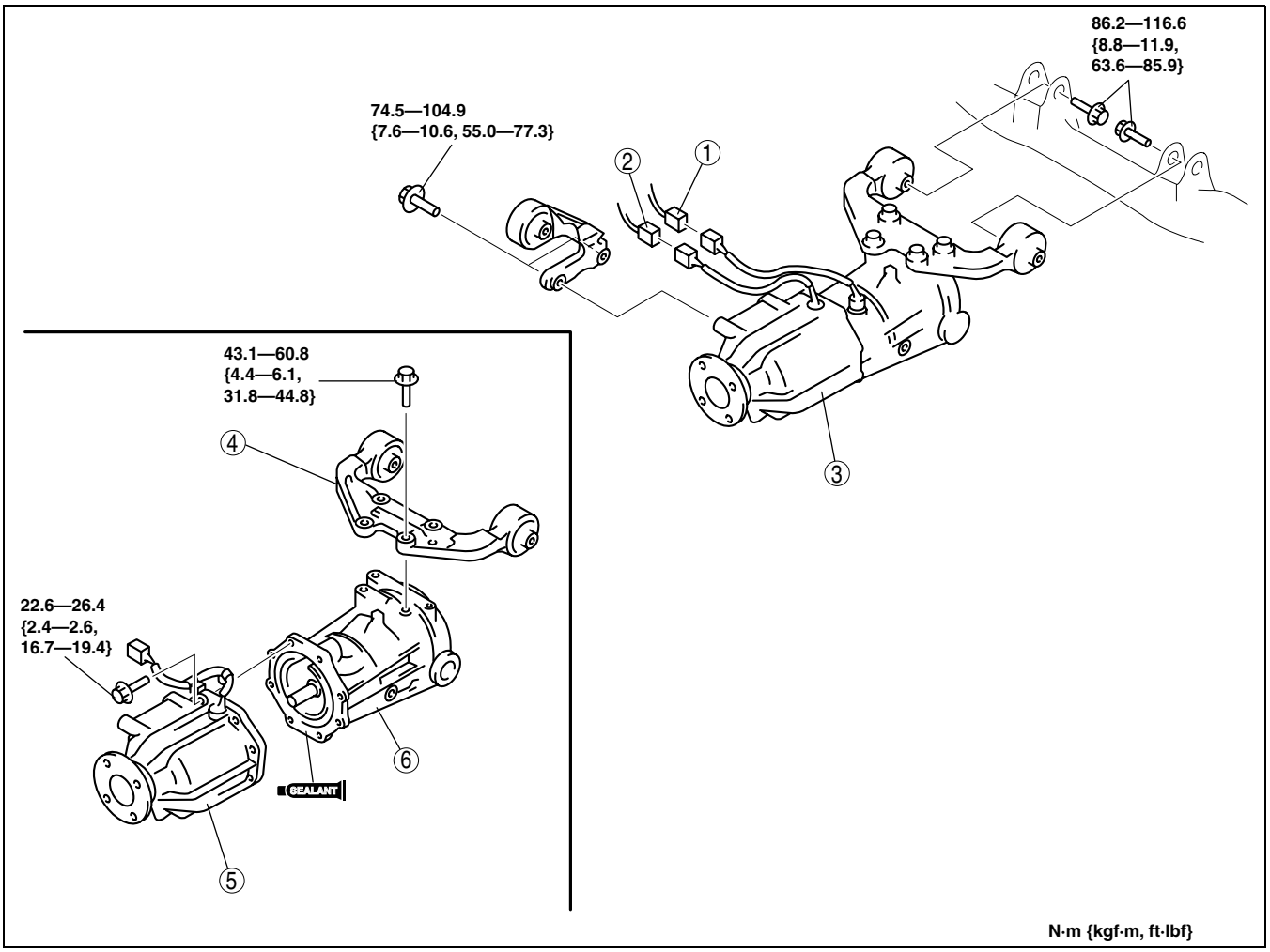


A6A63192007

REAR DIFFERENTIAL REMOVAL/INSTALLATION

A6E631927100207

1. Drain the rear differential oil into a container.
2. Remove the after silencer, presilencer, and catalytic converter. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
3. Remove the propeller shaft. (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION.)
4. Remove the rear drive shaft. (See M–43 REAR DRIVE SHAFT REMOVAL/INSTALLATION.)
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Add the specified rear differential oil.



A6E63192201

1	Differential oil temperature sensor connector
2	4WD solenoid connector
3	Coupling component and rear differential component (See M–52 Coupling Component and Rear Differential Component Removal/installation Note)
4	Rear differential bracket

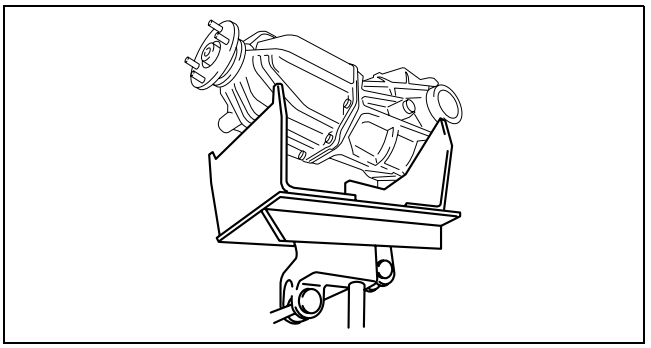
5	Coupling component (See M–68 COUPLING COMPONENT REMOVAL/INSTALLATION)
6	Rear differential

M

Coupling Component and Rear Differential Component Removal/installation Note

Warning
- **Make sure that the coupling component and rear differential component are securely supported by the jack. If the coupling component and rear differential component fall, it could cause death, serious injury, or vehicle damage.**

1. Make sure that the coupling component and rear differential component are securely supported by the jack, and remove/install the component by operating the jack gradually.



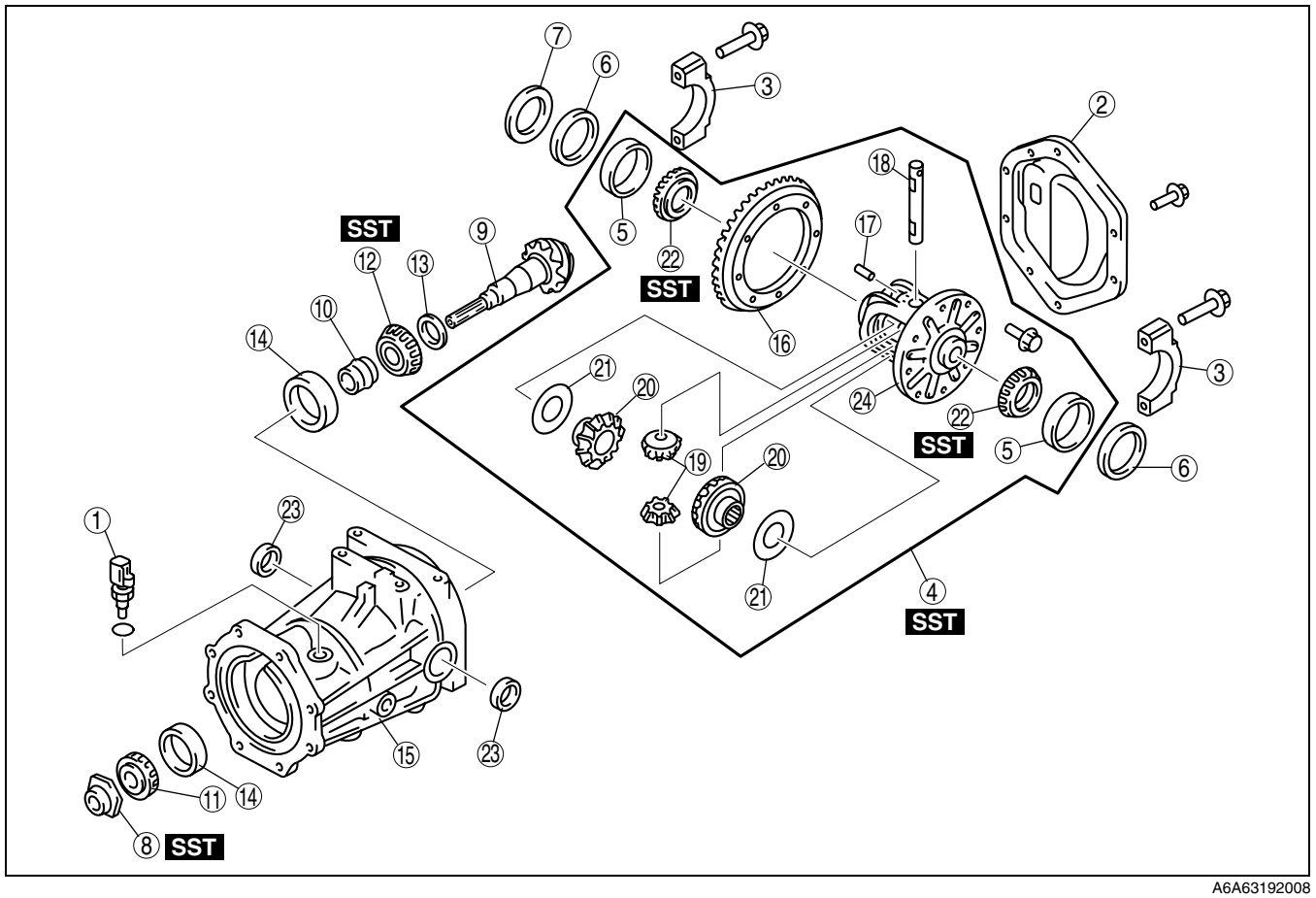
A6J63192202

REAR DIFFERENTIAL DISASSEMBLY

A6E631927100208

Warning
- **The engine stand is equipped with a self-lock mechanism, however, if the rear differential is in a tilted condition, the self-lock mechanism could become inoperative. If the rear differential unexpectedly rotates it could cause injury, therefore do not maintain the rear differential in a tilted condition. When turning the rear differential, grasp the rotation handle firmly.**

1. Disassemble in the order indicated in the table.

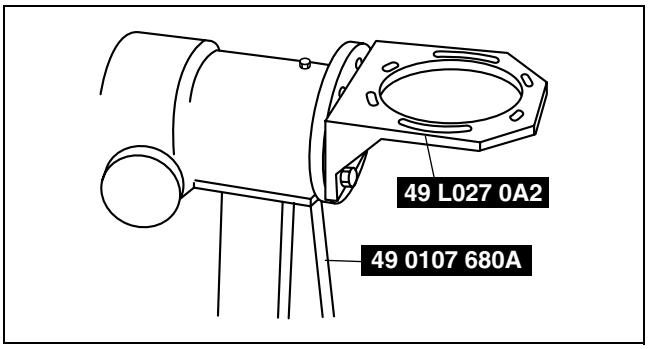


A6A63192008

1	Differential oil temperature sensor
2	Rear cover (See M–53 Rear Cover Disassembly Note)
3	Bearing cap (See M–53 Bearing Cap Disassembly Note)
4	Rear differential component (See M–54 Rear Differential Component Disassembly Note)
5	Side bearing outer race
6	Adjusting shim
7	Spacer
8	Locknut (See M–54 Locknut Disassembly Note)
9	Drive pinion (See M–54 Drive Pinion Disassembly Note)
10	Collapsible spacer
11	Bearing inner race (front bearing)
12	Bearing inner race (rear bearing) (See M–54 Bearing Inner Race (Rear Bearing) Disassembly Note)
13	Spacer
14	Bearing outer race (See M–55 Bearing Outer Race Disassembly Note)
15	Differential carrier
16	Ring gear (See M–55 Ring Gear Disassembly Note)
17	Knock pin
18	Pinion shaft
19	Pinion gear
20	Side gear
21	Thrust washer
22	Side bearing inner race (See M–55 Side Bearing Inner Race Disassembly Note)
23	Oil seal
24	Gear case

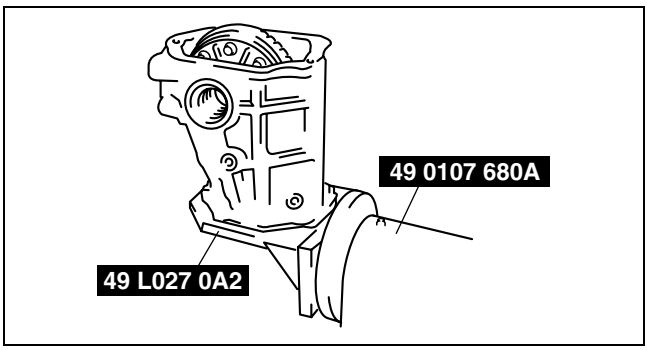
Rear Cover Disassembly Note

1. Install the **SSTs** to the engine stand.



A6A63192009

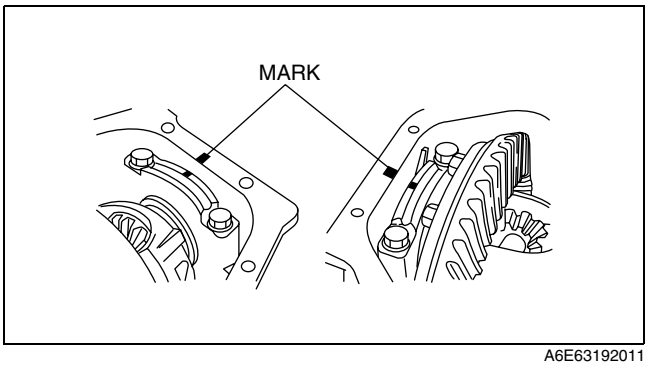
2. Install the rear differential to the **SSTs**.
3. Remove the rear cover using an oil seal cutter.



A6A63192010

Bearing Cap Disassembly Note

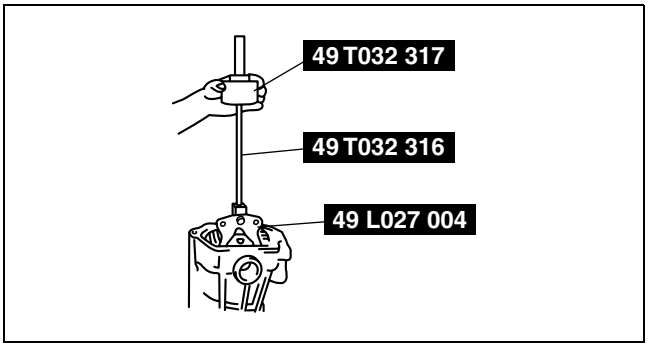
1. Place alignment marks on the bearing cap and carrier.



A6E63192011

Rear Differential Component Disassembly Note

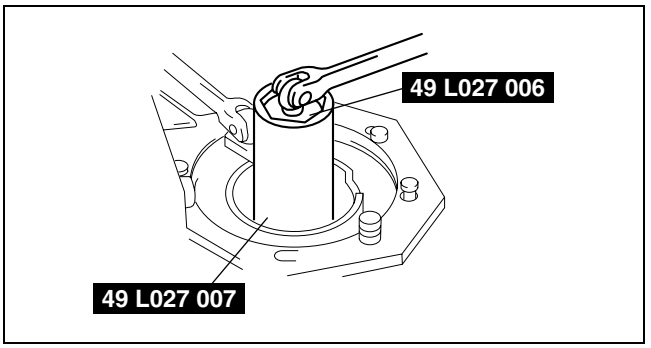
1. Remove the rear differential component using the **SSTs**.
2. Mark or otherwise distinguish between the removed left and right adjusting shims, spacers and side bearing outer races so that they are not mixed up at the time of reassembly.



A6A63192012

Locknut Disassembly Note

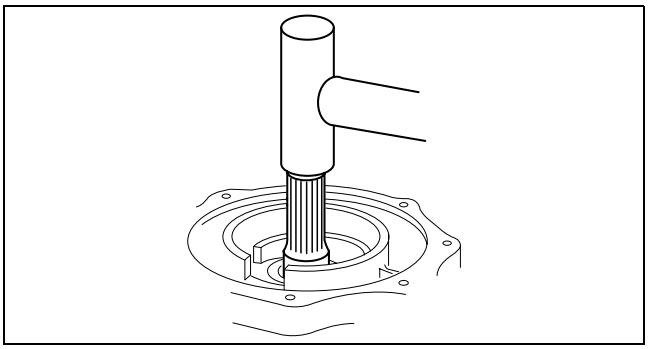
1. Remove the locknut using the **SSTs**.



A6A63192013

Drive Pinion Disassembly Note

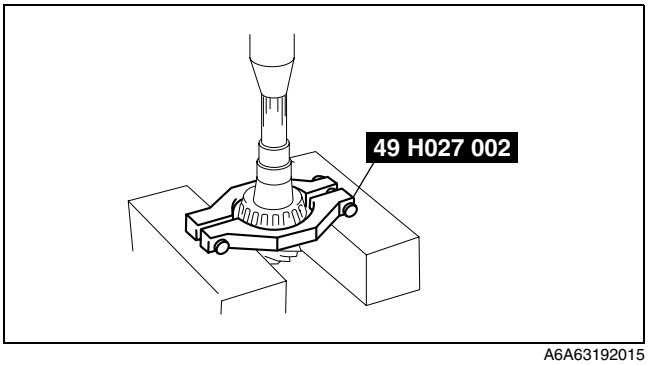
1. Remove the drive pinion by lightly tapping with a copper hammer.



A6A63192014

Bearing Inner Race (Rear Bearing) Disassembly Note

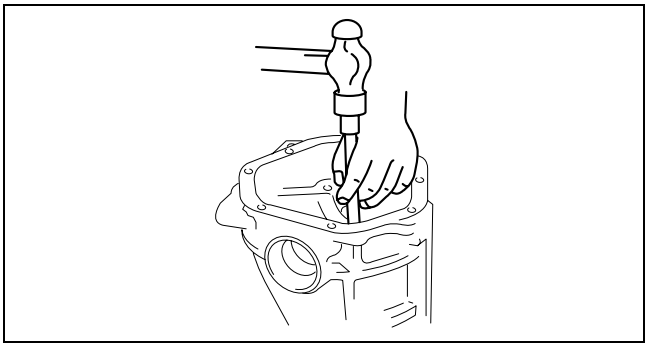
1. Remove the bearing inner races (rear bearing) using the **SST** and a press.



A6A63192015

Bearing Outer Race Disassembly Note

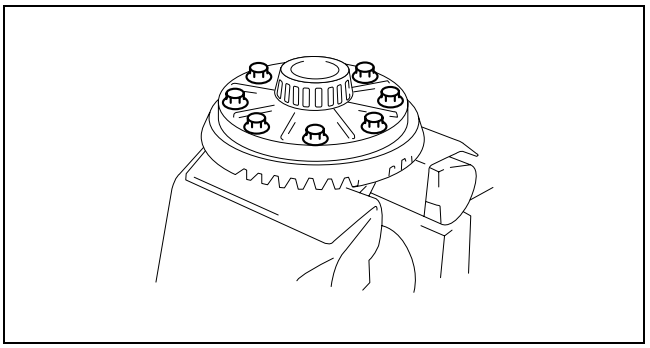
1. Remove the bearing outer races using the 2 grooves in the carrier and alternately tapping the sides of the races with a brass bar.



A6A63192016

Ring Gear Disassembly Note

1. Secure the gear case in a vice and remove the bolts.
2. Lightly tap around the ring gear using a plastic hammer to remove the ring gear from the gear case.



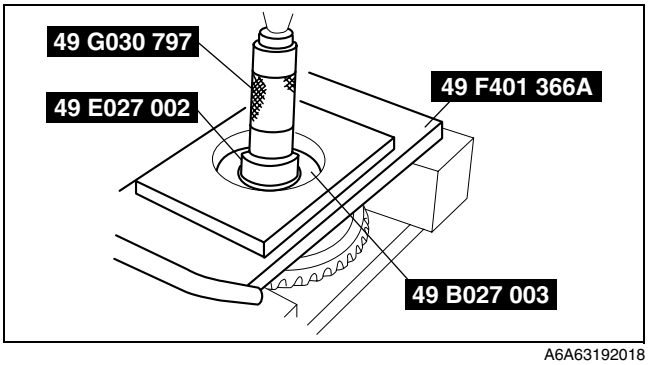
A6A63192017

Side Bearing Inner Race Disassembly Note

Note

- Mark or otherwise distinguish between the left and right side bearings so that they are not mixed up at the time of reassembly.

1. Remove the side bearing inner races from the gear case using the **SST** and a press.



A6A63192018

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REAR DIFFERENTIAL ASSEMBLY

A6E631927100209

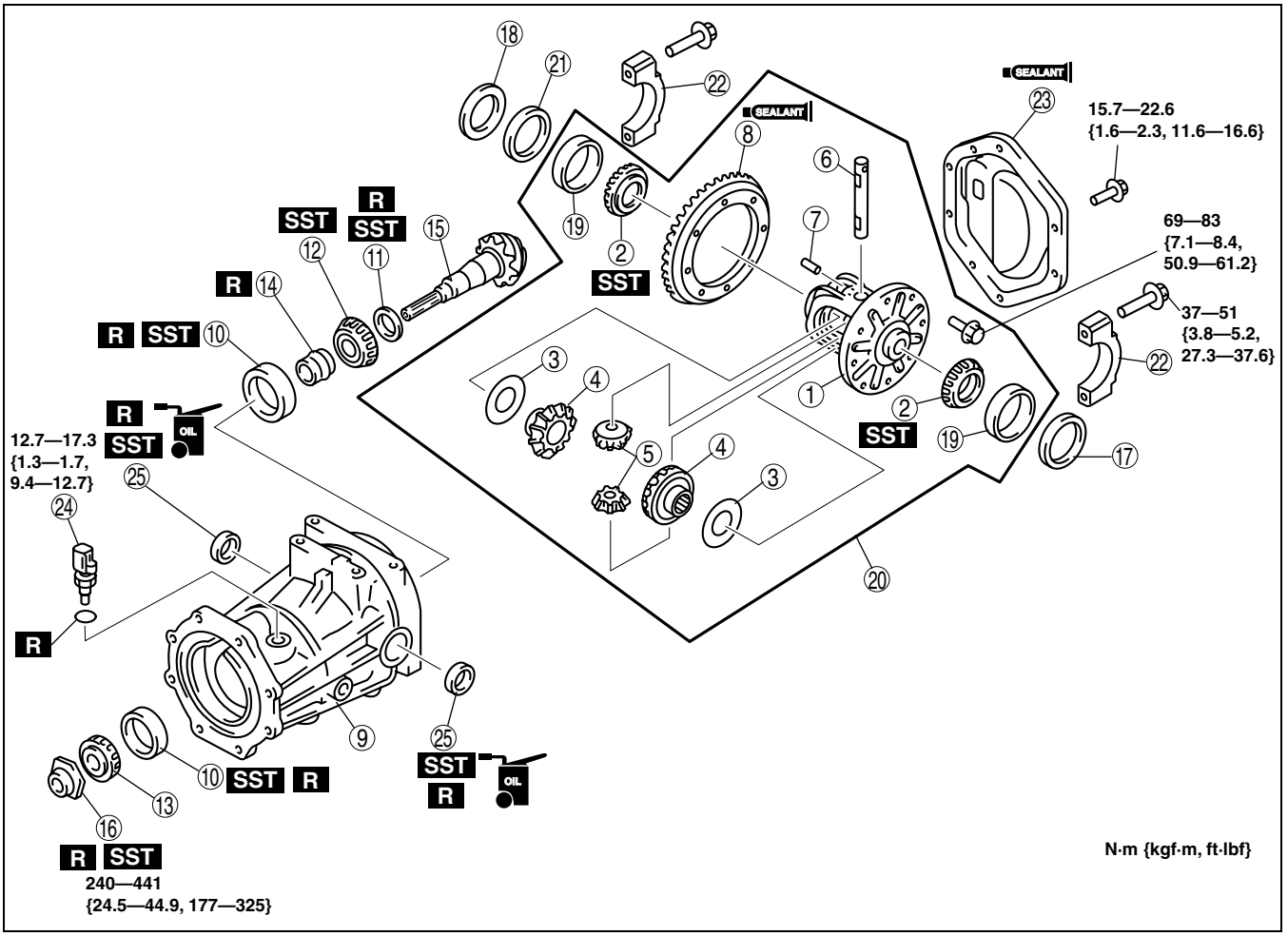
Warning

- **The engine stand is equipped with a self-lock mechanism, however, if the rear differential is in a tilted condition, the self-lock mechanism could become inoperative. If the rear differential unexpectedly rotates it could cause injury, therefore do not maintain the rear differential in a tilted condition. When turning the rear differential, grasp the rotation handle firmly.**

Note

- Clean away the old sealant before applying the new sealant.
- Install the rear cover within **10 minutes** after applying sealant.
- Allow the sealant to set at least **30 minutes** after installation before filling the differential with the specified oil.

1. Assemble in the order indicated in the table.



A6E63192019

1	Gear case
2	Side bearing inner race (See M–57 Side Bearing Inner Race Assembly Note)
3	Thrust washer (See M–57 Thrust washer assembly note)
4	Side gear
5	Pinion gear
6	Pinion shaft
7	Knock pin
8	Ring gear (See M–58 Ring Gear Assembly Note)
9	Differential carrier

10	Bearing outer race (See M–58 Bearing Outer Race Assembly Note)
11	Spacer (See M–59 Spacer, Bearing Inner Race Assembly Note)
12	Bearing inner race (rear bearing) (See M–59 Spacer, Bearing Inner Race Assembly Note)
13	Bearing inner race (front bearing) (See M–59 Spacer, Bearing Inner Race Assembly Note)
14	Collapsible spacer
15	Drive pinion
16	Locknut (See M–61 Locknut Assembly Note)

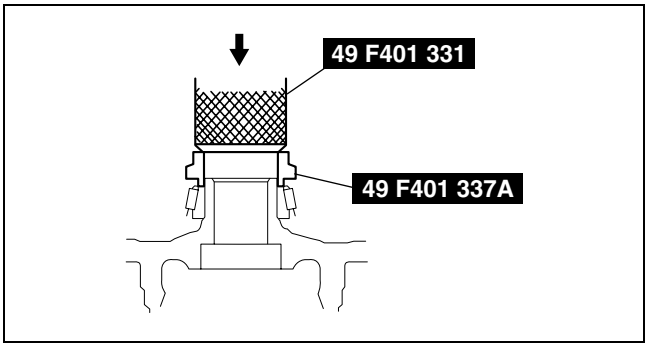
17	Adjusting shim (L) (See M–61 Adjusting Shim Assembly Note)
18	Spacer
19	Side bearing outer race
20	Rear differential component
21	Adjusting shim (R)

22	Bearing cap (See M–63 Bearing Cap Assembly Note)
23	Rear cover (See M–64 Rear Cover Assembly Note)
24	Differential oil temperature sensor
25	Oil seal (See M–64 Oil Seal Assembly Note)

Side Bearing Inner Race Assembly Note

Caution
- **Do not mix up the left and right side bearing inner races.**

1. Press the side bearing inner races into the gear case using the **SSTs**.

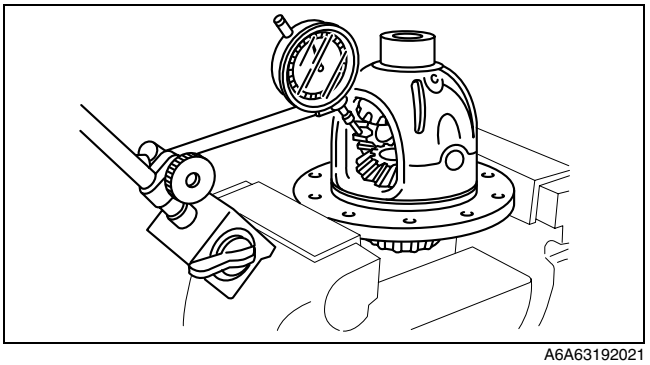


A6A63192020

Thrust washer assembly note

1. Assemble the side gears, thrust washers and pinion gears to the gear case, then assemble the knock pin.
2. After assembling the knock pin, make a crimp so that the pin will not come out of the gear case.
3. Set a dial gauge to the pinion gear as indicated in the figure.
4. Secure one of the side gears.
5. Move the pinion gear and measure the backlash at the end of the pinion gear.
   - If the backlash exceeds the standard, use the thrust washers to adjust.

Standard backlash
0.1 mm {0.004 in} or less


A6A63192021

Thrust washer thickness

mm {in}

Identification mark	Thickness
F001 27 252	2.0 {0.079}
F001 27 253	2.1 {0.083}
F001 27 254	2.2 {0.086}

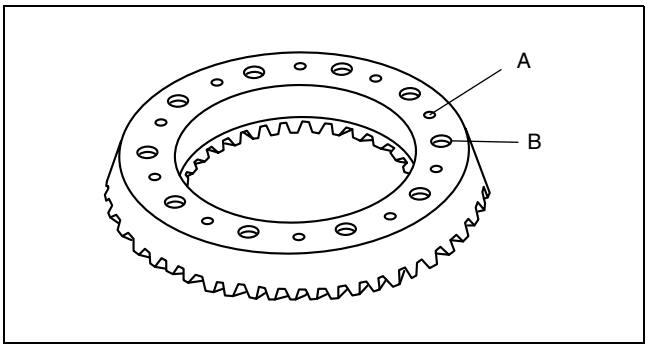
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Ring Gear Assembly Note

Caution
- **The differential gear and ring gear could be damaged if the ring gear is installed with old thread-locking compound remaining on the bolt threads. Before installing the ring gear, completely remove the old thread-locking compound from the bolt threads.**

1. Apply a small amount of thread-locking compound to each of points A on the back of the ring gear, and bolt thread areas B (around the entire ring).

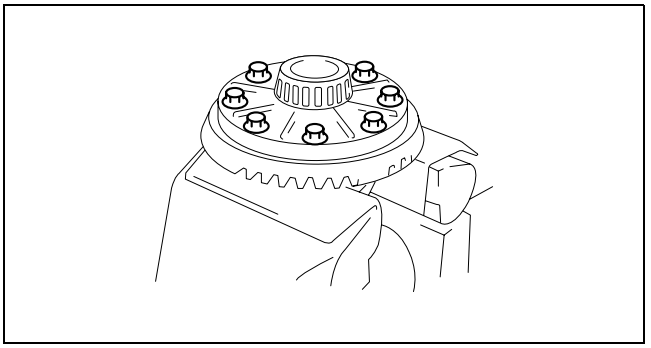
   Application amount
   Back of ring gear:
   Approx. 0.32 ml {0.32 cc, 0.02 cu in}
   Ring gear bolt thread points:
   Approx. 0.32 ml {0.32 cc, 0.02 cu in}
   (0.04 ml {0.04 cc, 0.002 cu in}
   to each point)



A6A63192022

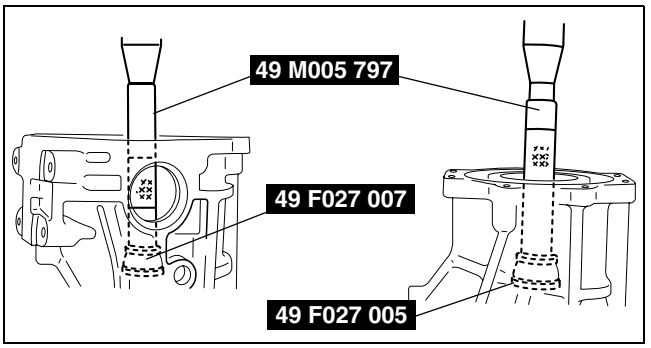
2. Align the marks placed on the ring gear case at the time of disassembly and tighten the bolts in diagonal order.

   Tightening torque
   69—83 N·m {7.1—8.4 kgf·m, 50.9—61.2 ft·lbf}


A6A63192023

Bearing Outer Race Assembly Note

1. Press in the bearing outer race using the **SSTs** and a press.

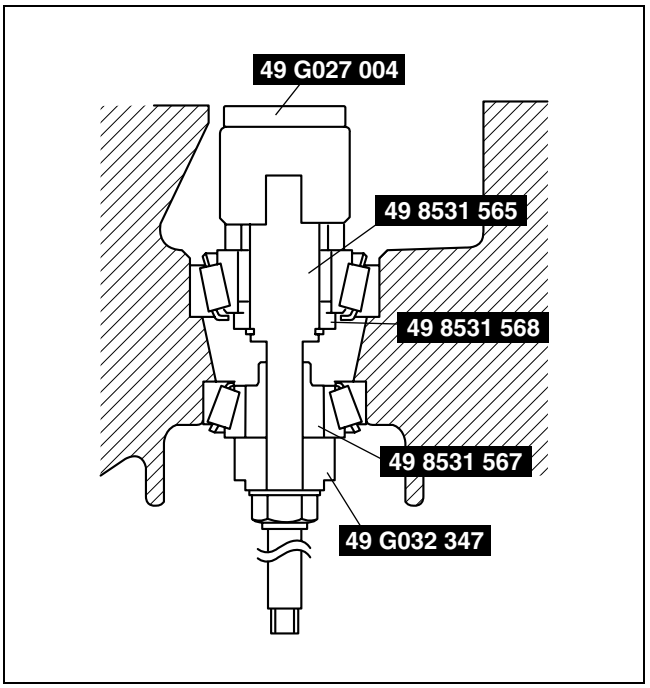


A6A63192024

Spacer, Bearing Inner Race Assembly Note
Pinion height adjustment

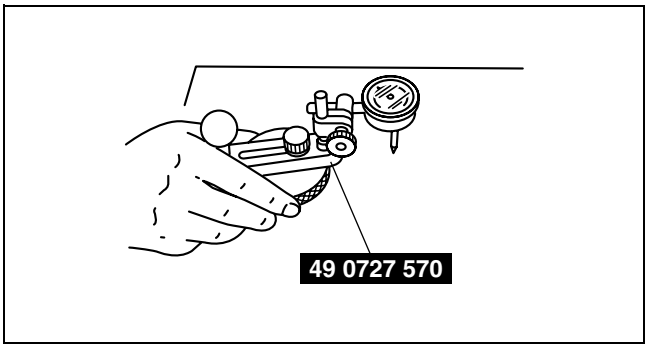
Note
- Use the same spacer.
- Install the spacer with the chamfer on the **SST** side.

1. Assemble the spacer, the bearing inner race (rear bearing), and the **SST** O-ring to the **SST** (49 8531 565) as shown in the figure.
2. Insert the set assembled in Step 1 to the differential gear from the rear.
3. Assemble the bearing inner race (front bearing), **SST** (49 8531 567), companion flange, washer, and locknut from the front of the differential gear.
4. Tighten the locknut to the extent that the **SST** (49 8531 565) can be turned by hand.
5. Place the **SST** (49 G027 004) on top of the **SST** (49 8531 565).



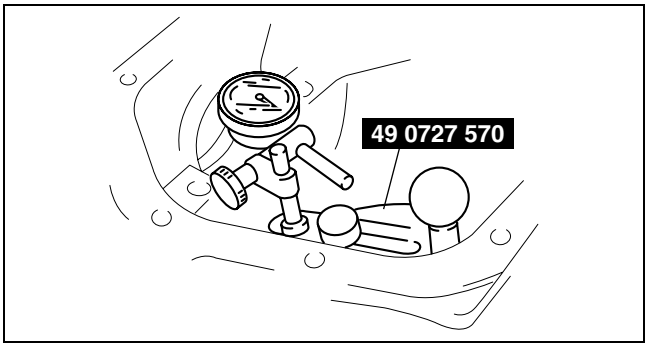
A6A63192025

6. Place the **SST** on the surface plate and set the dial indicator to zero.



A6A63192026

7. Set the **SST** as shown in the figure.
8. Place the measuring probe of the dial indicator so that it contacts the place where the side bearing is installed in the carrier. Then measure the left and right side of the lower position.



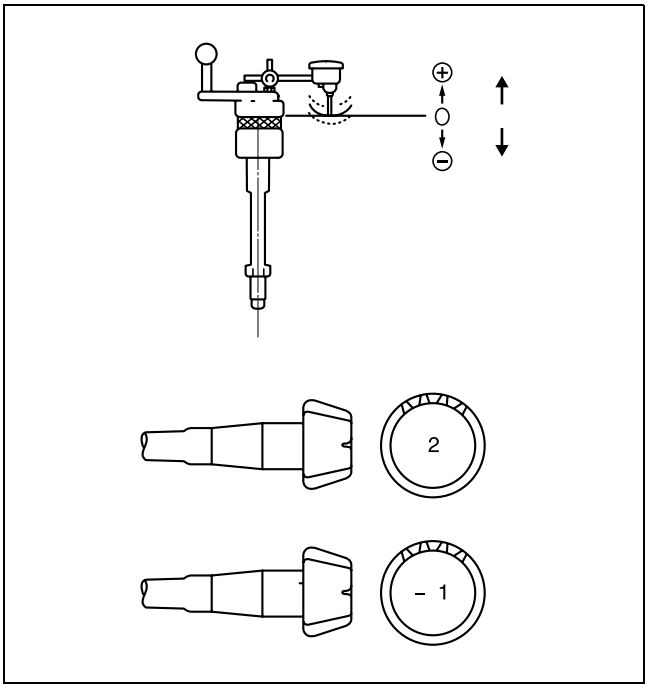
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9. Add the two (left and right) values obtained by the measurements taken in Step 8 and then divide the total by 2. From this result, subtract the result obtained by dividing the number inscribed on the end surface of the drive pinion by 100. (If there is no figure inscribed, use 0.) This is the pinion height adjustment value.

   Pinion height
   –0.025—0.025 mm {–0.001—0.001 in}

   Note
   - For example, the measured results obtained at Step 8 and 9 are 0.06 mm {0.003 in} and 0.04 mm {0.002 in}, and the figure inscribed on the end of the drive pinion is 2:
     ((0.06 mm {0.003 in}+ 0.04 mm {0.002 in}) / 2) – (2/100) = 0.03 mm {0.001 in} (pinion height adjustment value)
     Replace with a spacer 0.03 mm {0.001 in} thicker than the currently used one. Spacer thickness is set at 0.015 mm {0.0006 in} increments, therefore select the closest spacer thickness and assemble.
   - Install the spacer with the chamfer on the **SST** side.

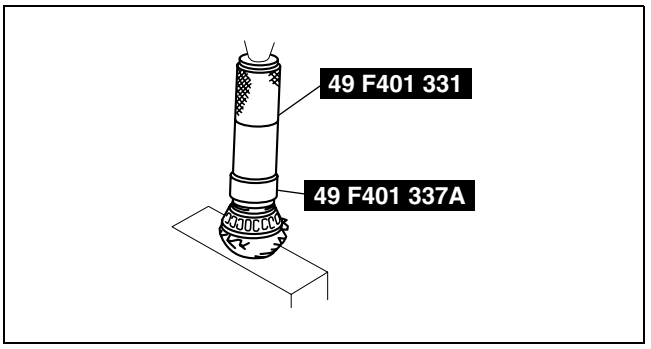


A6A63192028

Spacer thickness

Identification mark	Thickness (mm {in})	Identification mark	Thickness (mm {in})
08	3.08 {0.1213}	29	3.29 {0.1295}
09	3.095 {0.1219}	30	3.305 {0.1301}
11	3.11 {0.1224}	32	3.32 {0.1307}
12	3.125 {0.1230}	33	3.335 {0.1313}
14	3.14 {0.1236}	35	3.35 {0.1319}
15	3.155 {0.1242}	36	3.365 {0.1325}
17	3.17 {0.1248}	38	3.38 {0.1331}
18	3.185 {0.1254}	39	3.395 {0.1337}
20	3.20 {0.1260}	41	3.41 {0.1343}
21	3.215 {0.1266}	42	3.425 {0.1348}
23	3.23 {0.1272}	44	3.44 {0.1354}
24	3.245 {0.1278}	45	3.455 {0.1360}
26	3.26 {0.1283}	47	3.47 {0.1366}
27	3.275 {0.1289}	—	—

10. Assemble the spacer selected for the pinion height adjustment to the drive pinion.
11. Press the bearing inner race (rear bearing) into the drive pinion using the **SSTs** and a press.

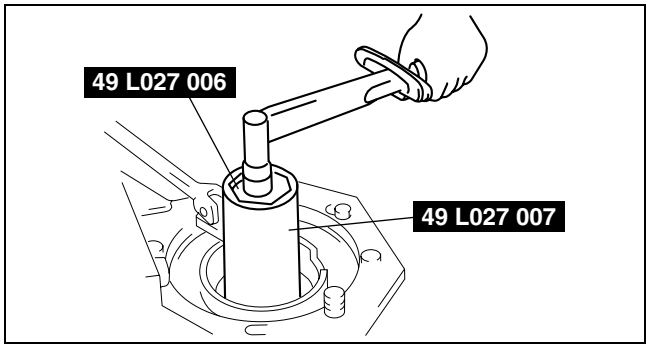


A6A63192029

Locknut Assembly Note
Drive pinion preload adjustment

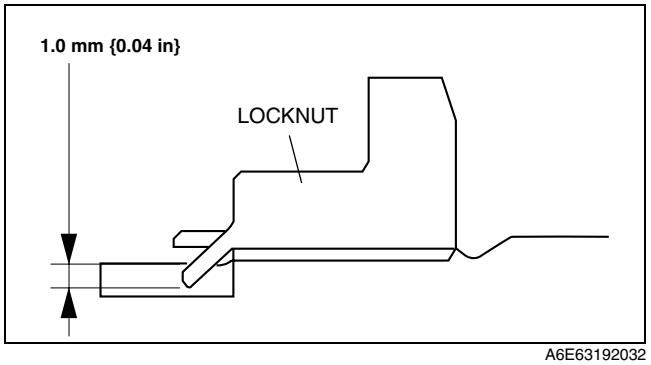
1. Apply differential oil to a new locknut.
2. Assemble a new collapsible spacer, bearing inner race (front bearing), and locknut to the drive pinion, and temporarily tighten the locknut.
3. Turn the serrated part of the drive pinion by hand to seat the bearing.
4. Tighten the locknut temporarily tightened in Step 1 from the lower limit of the specified tightening torque using the **SSTs**, and make this the specified preload.
   - If the specified preload cannot be obtained within the specified tightening torque, replace the collapsible spacer and inspect again.

   Tightening torque
   240—441 N·m {24.5—44.9 kgf·m, 177—325 ft·lbf}
   Drive pinion preload
   1.3—1.8 N·m {13.3—18.3 kgf·cm, 11.5—15.9 in·lbf}



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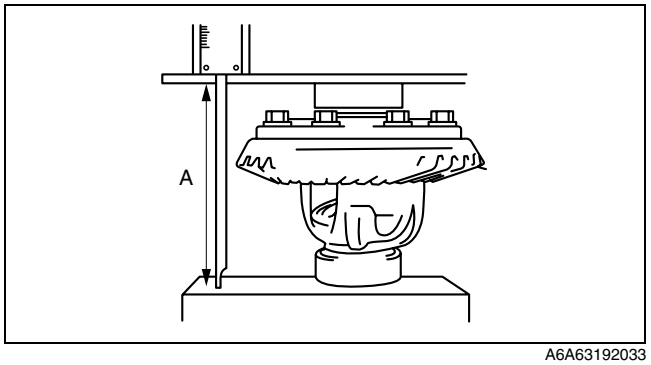
5. Crimp the locknut using a chisel and hammer.



A6E63192032

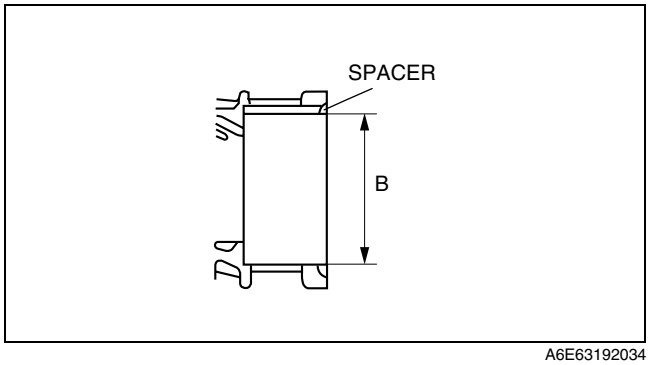
Adjusting Shim Assembly Note

1. Assemble the differential carrier to the **SSTs**.
2. Assemble the spacer to the differential carrier.
3. Stack the side bearing outer race and gear case component on the surface plate as indicated in the figure, and measure the height using a caliper and a ruler. This is value A.



A6A63192033

4. Measure the width of the installed differential in the differential carrier with the spacer installed. This is value B.
5. The combined thickness of the left and right adjusting shims is obtained by the following formula.
   C_1 = B – A + 0.15 mm {0.006 in}
   C_2 = B – A + 0.44 mm {0.017 in}
6. If the combined thickness of the previously installed adjusting shims is between C1 and C2, use the shims as they are.
7. If the combined thickness of the previously installed adjusting shims is not between C1 and C2, or if the adjusting shims have to be replaced, select two appropriate adjusting shims from the table below.



A6E63192034

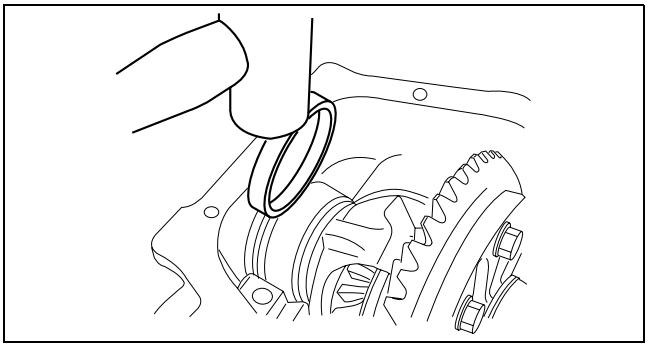
M

Adjusting shim thickness

Identification mark	Thickness (mm {in})	Identification mark	Thickness (mm {in})
700	7.00 {0.276}	750	7.50 {0.295}
705	7.05 {0.278}	755	7.55 {0.297}
710	7.10 {0.279}	760	7.60 {0.299}
715	7.15 {0.281}	765	7.65 {0.301}
720	7.20 {0.283}	770	7.70 {0.303}
725	7.25 {0.285}	775	7.75 {0.305}
730	7.30 {0.287}	780	7.80 {0.307}
735	7.35 {0.289}	785	7.85 {0.309}
740	7.40 {0.291}	790	7.90 {0.311}
745	7.45 {0.293}	—	—

Caution
- **If adjusting shims are to be reused, do not mix up the left and right shims.**
- **Do not mix up the left and right side bearing outer races and spacers.**

8. Assemble the selected adjusting shims to the differential carrier ring gear side, and the spacer to the opposite side.
9. Assemble the differential and bearing outer race to the differential carrier.
10. Tap the selected adjusting shim between the spacer and the bearing race with a plastic hammer as shown in the figure.
11. Align the bearing cap alignment marks to assemble the bearing cap, and temporarily tighten the bolts.
12. Place the dial indicator so that the measuring probe contacts the top surface of one of the ring gear teeth perpendicularly.
13. Secure the drive pinion and measure the backlash from when the ring gear moved.



A6A63192035

Specification
Backlash:
0.09—0.11 mm {0.003—0.004}
Minimum value:
0.05 mm {0.002 in}

Note
- Measure the backlash at 4 locations around the ring gear. Make sure one of the 4 locations is within specification, and the minimum value for the 4 locations is **0.5 mm {0.002 in}**or less.

14. If the backlash is not within the specification, adjust the gear case component by moving it in the axial direction.

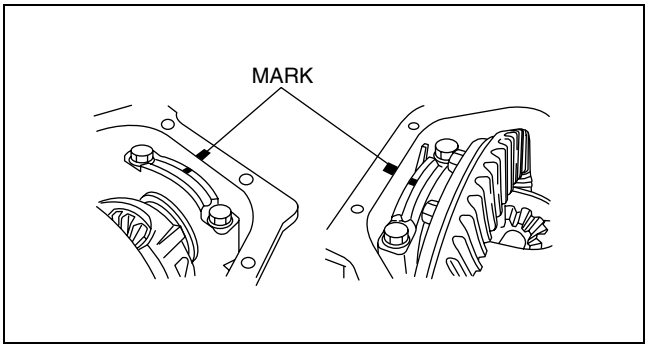
Note
- When moving the gear case component in the axial direction, replace the adjusting shims. If the adjusting shim on the right side is replaced with one that is **0.05 mm {0.002 in}** thicker, replace the one on the left with one that is **0.05 mm {0.002 in}** thinner.

Bearing Cap Assembly Note

1. Align the bearing cap alignment marks to assemble the bearing cap.

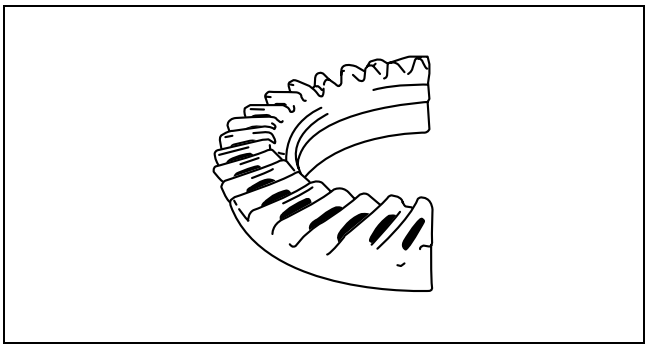
   Tightening torque
   37—51 N·m {3.8—5.2 kgf·m, 28—37 ft·lbf}

2. Inspect the drive pinion and ring gear teeth contact points.



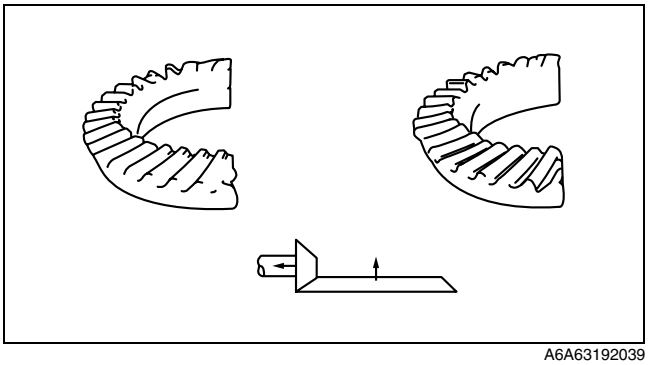
A6E63192037

   (1) Coat both surfaces of the ring gear uniformly with a thin red lead coating.
   (2) While rotating the ring gear back and forth by hand, rotate the drive pinion several times and inspect the tooth contact.
   (3) Inspect the tooth contacts in four locations around the ring gear, and check that the tooth contacts showing the red lead coating are the same as the pattern indicated in the figure.
      - If the tooth contact is good, wipe off the red lead coating.
      - If it is not good, adjust the pinion height, then adjust the backlash.



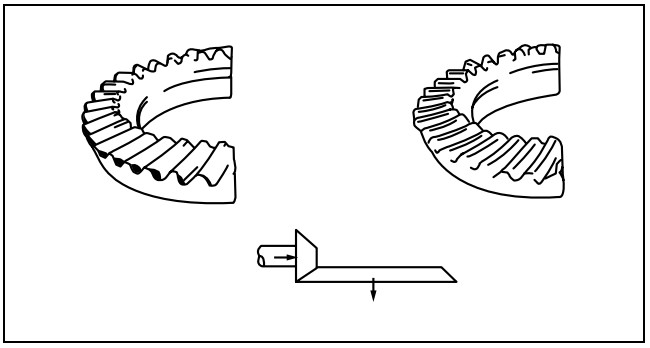
A6A63192038

   (4) If toe and flank contact appears as shown in the figure, replace the spacer with a thinner one, and move the drive pinion outward.



A6A63192039

   (5) If heel and face contact appears as indicated in the figure, replace the spacer with a thicker one and move the drive the pinion inward.



A6A63192040

M

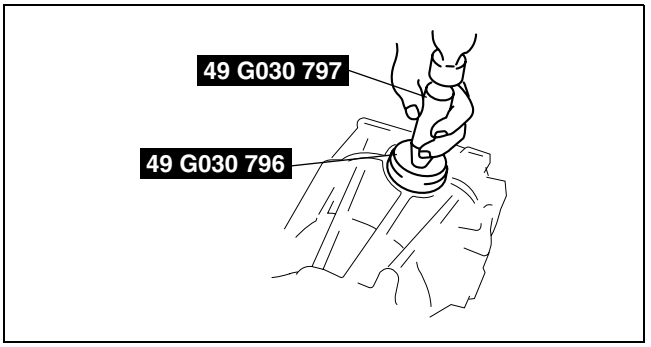
Rear Cover Assembly Note

Caution
- **Clean away the old sealant before applying the new sealant.**
- **Install the rear differential within 10 minutes after applying sealant.**
- **Allow the sealant to set at least 30 minutes after installation before filling the differential with the specified oil.**

1. Clean the alignment surface of the carrier and rear cover, and apply a thin coat of sealant.
2. Install the rear cover.

Tightening torque
15.7—22.6 N·m {1.6—2.3 kgf·m, 11.6—16.6 ft·lbf}

Oil Seal Assembly Note
1. Apply differential oil to the new oil seal lip.
2. Assemble the oil seal using the **SSTs**.



A6A63192041

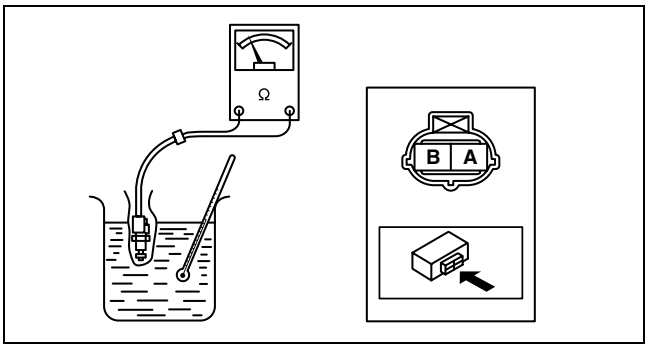
ELECTRONIC 4WD CONTROL SYSTEM

DIFFERENTIAL OIL TEMPERATURE SENSOR INSPECTION

A6E632227100209

Warning
- **Hot differential oil may cause severe burns. Do not perform maintenance while differential oil is hot.**

1. Disconnect the negative (-) battery cable.
2. Disconnect the differential oil temperature sensor connector and remove the differential oil temperature sensor.
3. Wrap the differential oil temperature sensor with plastic wrap and immerse it into a beaker filled with water. Gradually raise the water temperature, and measure resistance between differential oil temperature sensor terminals A and B.
   - If not as specified, inspect the harness for continuity. If there is normal continuity between the terminals, replace the differential oil temperature sensor.



A6J63222101

Specification

Water temperature (°C {°F})	Resistance (kirohm)
0 {32}	91—100
10 {50}	56—61
20 {68}	35—39
30 {86}	23—25
40 {104}	14—17
50 {122}	10—11
60 {140}	7.1—7.9
70 {158}	5.0—5.6
80 {176}	3.6—4.0

4. Install the differential oil temperature sensor and connect the connector.
5. Connect the negative (-) battery cable.

DIFFERENTIAL OIL TEMPERATURE SENSOR REMOVAL/INSTALLATION

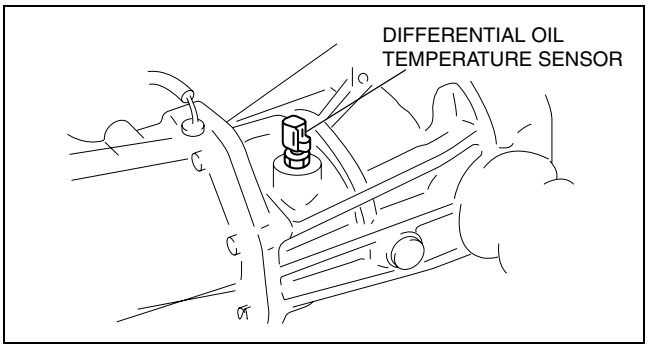
A6E632227100210

Warning
- **Hot differential oil may cause severe burns. Do not perform maintenance while differential oil is hot.**

1. Disconnect the negative (-) battery cable.
2. Disconnect the differential oil temperature sensor connector.
3. Remove the differential oil temperature sensor.
4. Apply differential oil to the O-ring.
5. Install the differential oil temperature sensor.

Tightening torque
12.7—17.3 N·m {1.3—1.7 kgf·m, 9.4—12.7 ft·lbf}

6. Connect the differential oil temperature sensor connector.
7. Connect the negative (-) battery cable.



A6E63222102

M

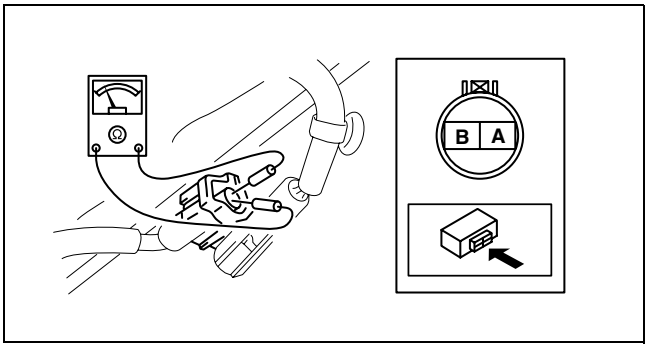
4WD SOLENOID INSPECTION

A6E632227100211

1. Disconnect the negative (-) battery cable.
2. Disconnect the 4WD solenoid connector.
3. Measure resistance between 4WD solenoid connector terminals A and B.
   - If the resistance is not within the specification, replace the coupling unit.

   Resistance
   1.5—2.0 ohms
   (Rear differential oil temperature at 20°C {68°F})

4. Connect the 4WD solenoid connector.
5. Connect the negative (-) battery cable.



A6J63222103

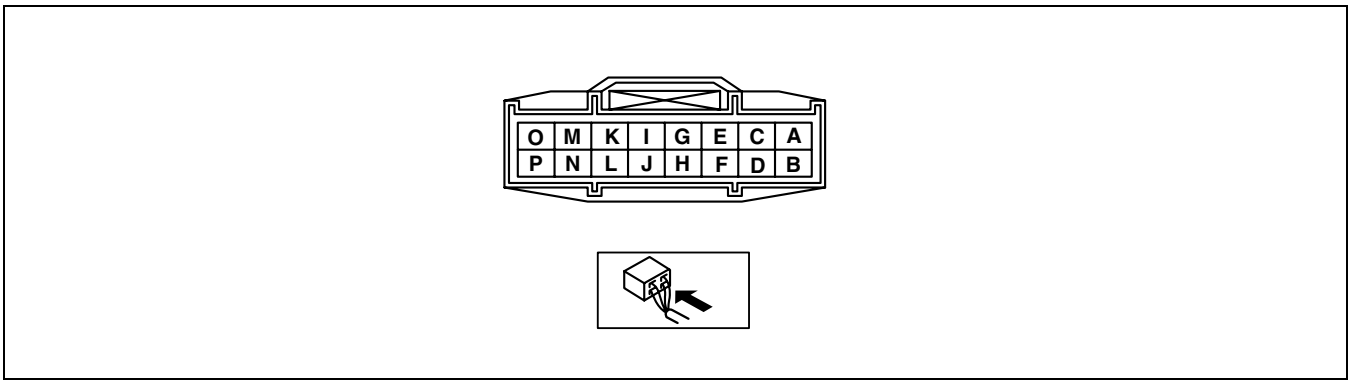
4WD CONTROL MODURE INSPECTION

A6E632227100212

Note
- 4WD CM terminal voltage can vary depending on measuring conditions and vehicle aging, resulting in misdiagnosis. Therefore, it is necessary to perform an overall inspection of the input/output systems and 4WD CM to determine which part is malfunctioning.
- With the 4WD CM connector connected, measure voltage by connecting the voltmeter negative (-) lead to the body ground and positive (+) lead to each 4WD CM terminal.

1. Measure voltage or resistance at each 4WD CM terminal using a voltmeter and an ohmmeter.
   - If not as specified, replace the 4WD CM.

Terminal Voltage List (Reference)



A6J63222104

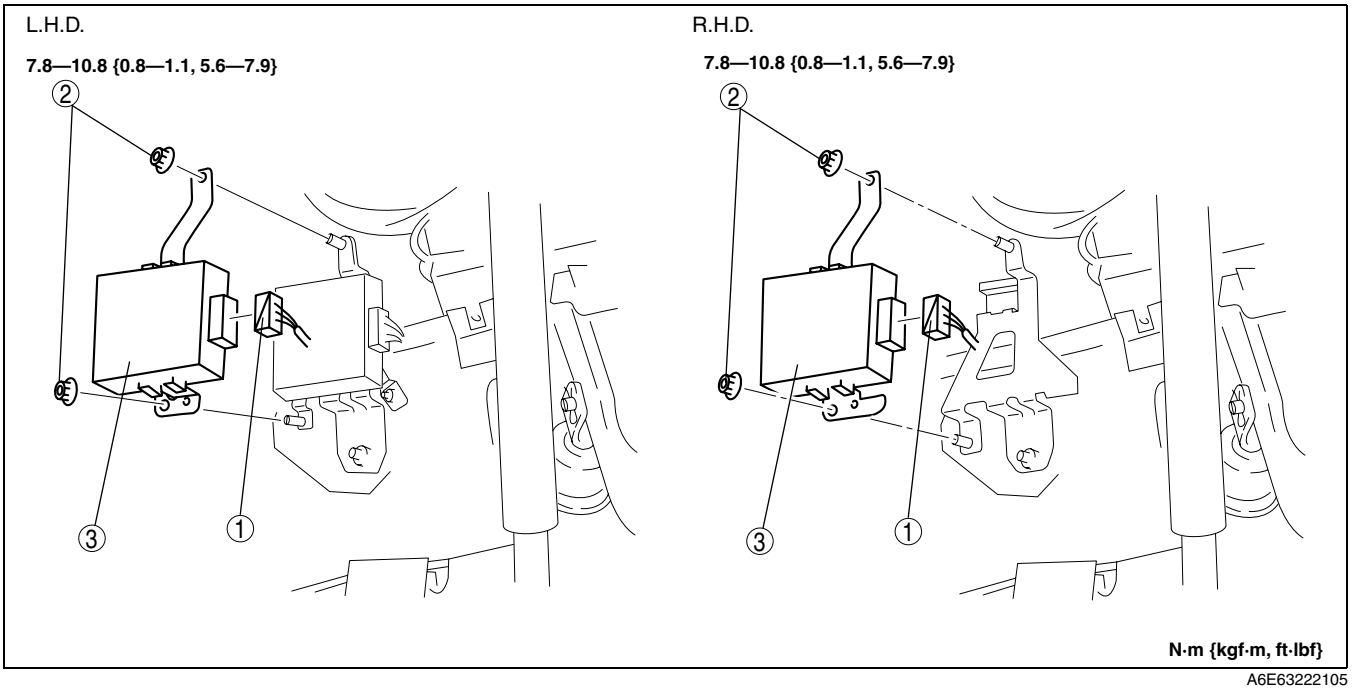
Terminal	Signal	Input/ output	Connected to	Measuring item	Test condition		Voltage (V)/ Continuity	Inspection location in case of failure
A	Differential oil temperature sensor signal	Input	Differential oil temperature sensor	Voltage	Ignition key ON	Differential oil temperature 20°C {68°F}	3.0	• Inspect differential oil temperature sensor • Inspect related harness
						Differential oil temperature 60°C {140°F}	1.4	
B	—	—	—	—	—	—	—	—
C	Differential oil temperature sensor GND	—	Differential oil temperature sensor	Continuity	Any condition		Yes	• Inspect related harness
D	—	—	—	—	—	—	—	—
E	—	—	—	—	—	—	—	—
F	—	—	—	—	—	—	—	—
G	CAN-H	Input/ output	—	Perform measurement during DTC inspection.				—
H	CAN-L	Input/ output	—	Perform measurement during DTC inspection.				—

Terminal	Signal	Input/ output	Connected to	Measuring item	Test condition	Voltage (V)/ Continuity	Inspection location in case of failure
I	Power supply (Ignition switch)	Input	Ignition key	Voltage	Ignition key ON	B+	• Inspect fuse • Inspect related harness
					Ignition key OFF	1.0 or below	
J	—	—	—	—	— —	—	—
K	Power supply (Main)	Input	Battery	Voltage	Any condition	B+	• Inspect fuse • Inspect related harness
L	—	—	—	—	— —	—	—
M	—	—	—	—	— —	—	—
N	Ground	—	Ground	Voltage	Any condition	0	• Inspect related harness
O	4WD solenoid (+)	Output	4WD solenoid	Voltage	Ignition key ON	B+	• 4WD solenoid • Inspect related harness
					Ignition key OFF	1.0 or below	
P	4WD solenoid (-)	Output	4WD solenoid	Voltage	Ignition key ON	B+	• 4WD solenoid • Inspect related harness
					Ignition key OFF	1.0 or below	

4WD CONTROL MODURE REMOVAL/INSTALLATION

A6E632227100213

1. Disconnect the negative (-) battery cable.
2. Remove the lower panel.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



A6E63222105

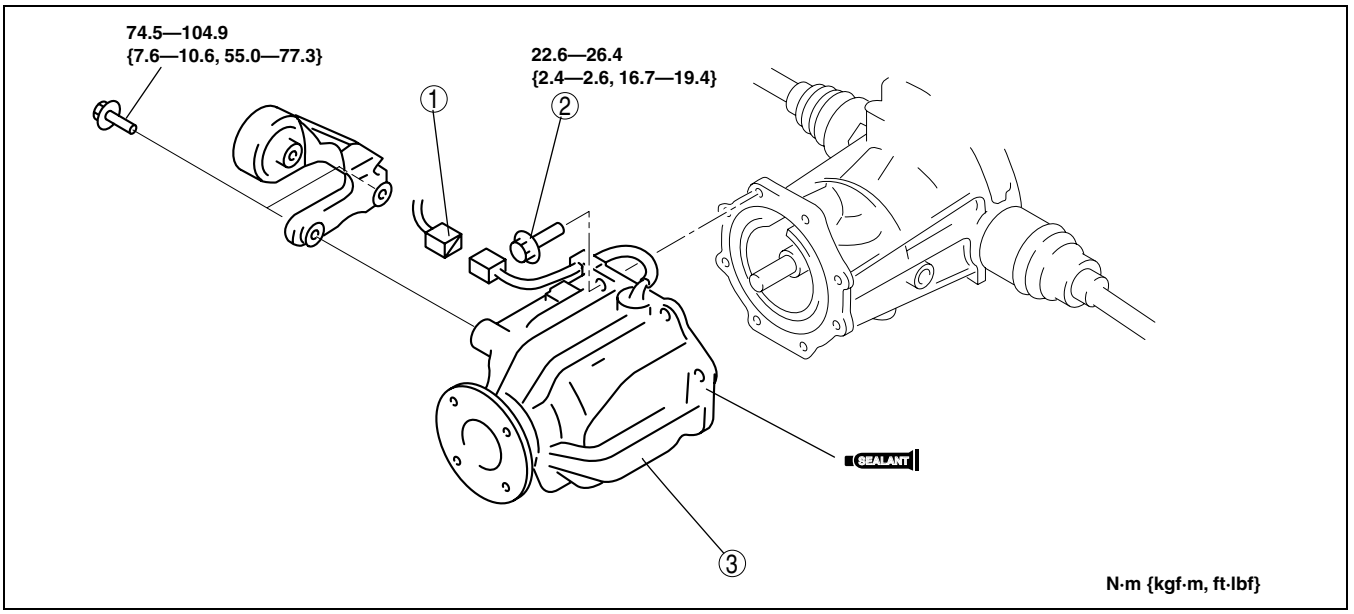
1	Connector
2	Nut

3	4WD CM

COUPLING COMPONENT REMOVAL/INSTALLATION

A6E632227100214

1. Drain the differential oil into a container.
2. Remove the after silencer, presilencer, and the catalytic converter. (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
3. Remove the propeller shaft. (See L–5 PROPELLER SHAFT REMOVAL/INSTALLATION.)
4. Remove in the order indicated in the table.
5. Install in the reverse order of removal.
6. Add differential oil.



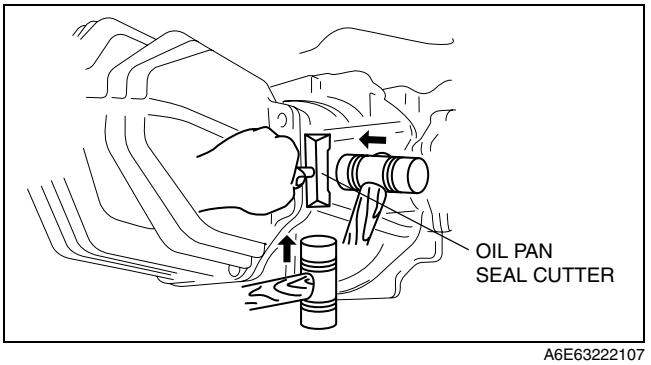
A6E63222106

1	4WD solenoid connector
2	Bolt

3	Coupling component (See M–68 Coupling Component Removal Note) (See M–68 Coupling Component Installation Note)

Coupling Component Removal Note

1. Support the coupling unit with a transmission jack.
2. Cut away the coupling unit using an oil pan seal cutter.



A6E63222107

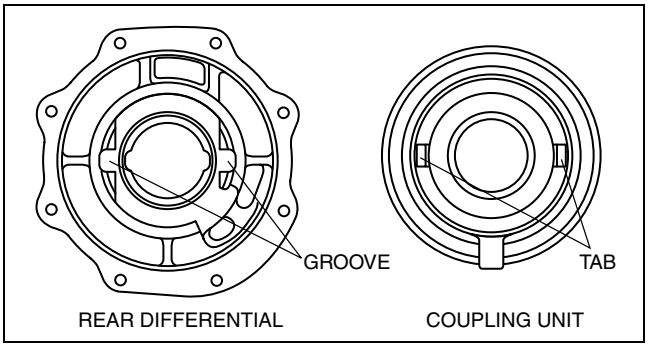
Coupling Component Installation Note

Note

- Clean away the old sealant before applying the new sealant.
- Install the coupling unit within **10 minutes** after applying sealant.
- Allow the sealant to set at least **30 minutes** after installation before filling the differential with the specified oil.

1. Apply sealant to the coupling case surface that contacts the rear differential case.
2. Install the coupling unit to the rear differential so that the two tabs on the coupling unit engage the rear differential grooves (two locations).

Tightening torque
22.6—26.4 N·m {2.4—2.6 kgf·m, 16.7—19.4 ft·lbf}

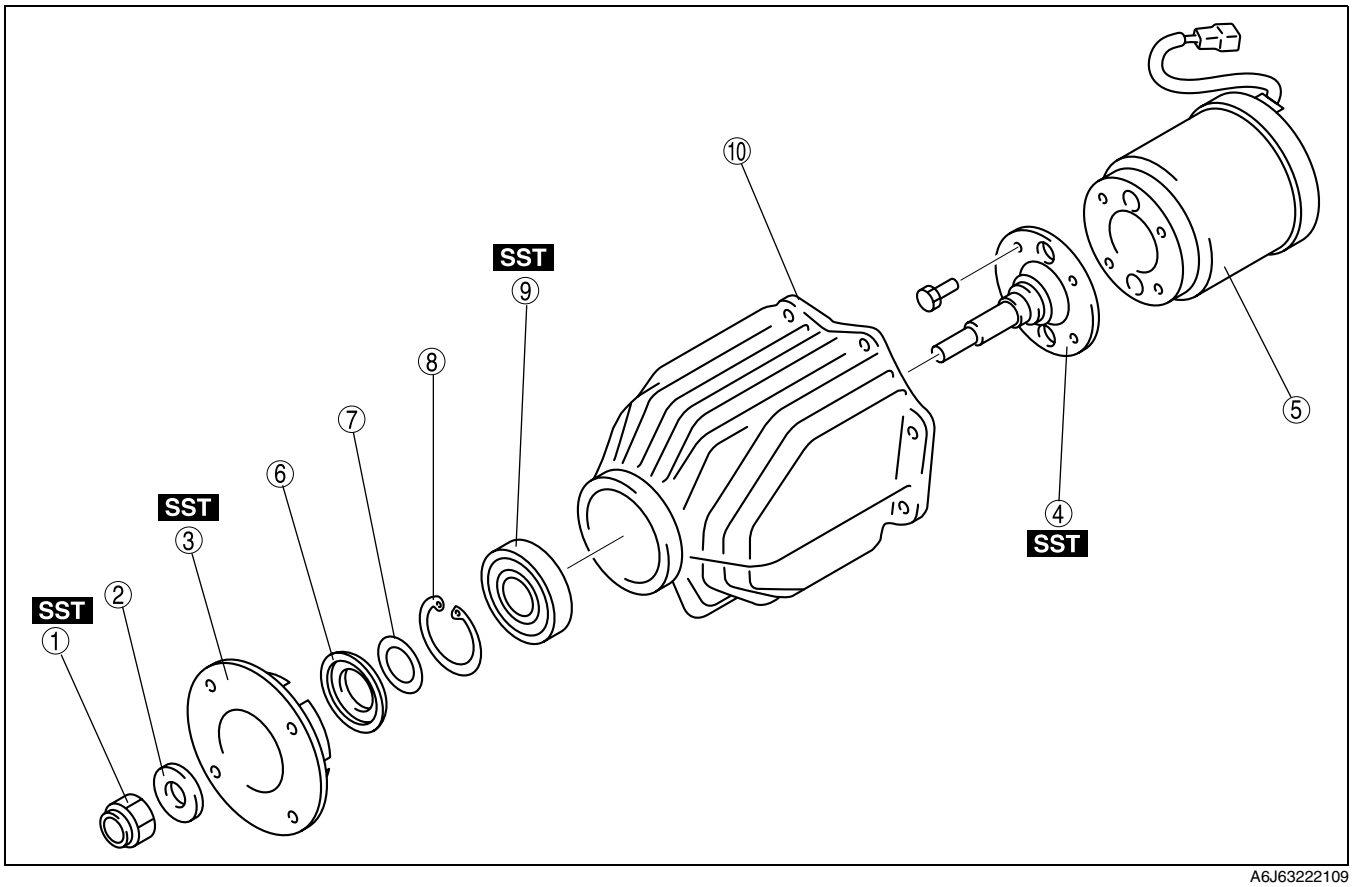


A6E63222108

COUPLING COMPONENT DISASSEMBLY

A6E632227100215

Warning
- **The engine stand is equipped with a self-lock mechanism, however, if the coupling unit is in a tilted condition, the self-lock mechanism could become inoperative. If the coupling unit unexpectedly rotates it could cause injury, therefore do not maintain the coupling unit in a tilted condition. When turning the coupling unit, grasp the rotation handle firmly.**



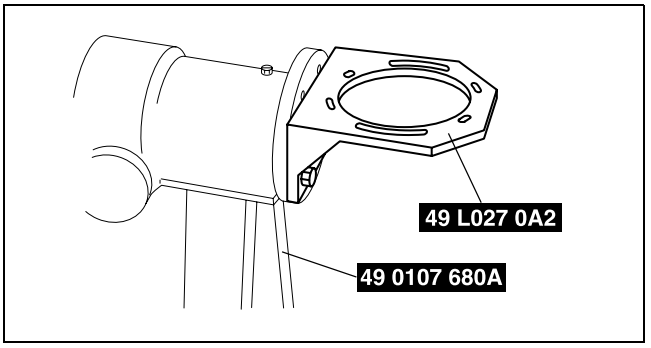
A6J63222109

1	Locknut (See M–70 Locknut Disassembly Note)
2	Washer
3	Companion flange (See M–70 Companion Flange Disassembly Note)
4	Output shaft (See M–71 Output Shaft Disassembly Note)

5	Coupling component
6	Oil seal
7	Shim
8	Retaining ring
9	Bearing (See M–71 Bearing Disassembly Note)
10	Coupling case

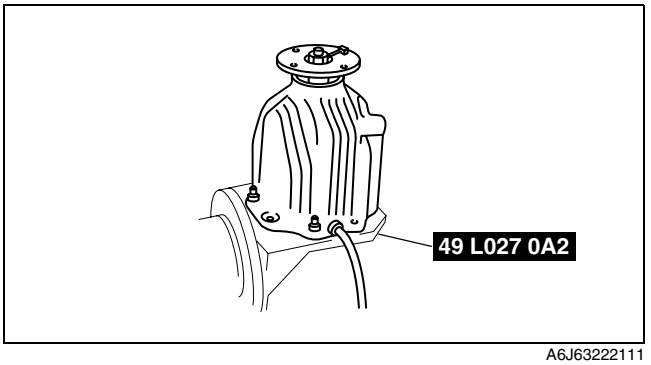
Locknut Disassembly Note

1. Assemble the **SSTs** to the engine stand.



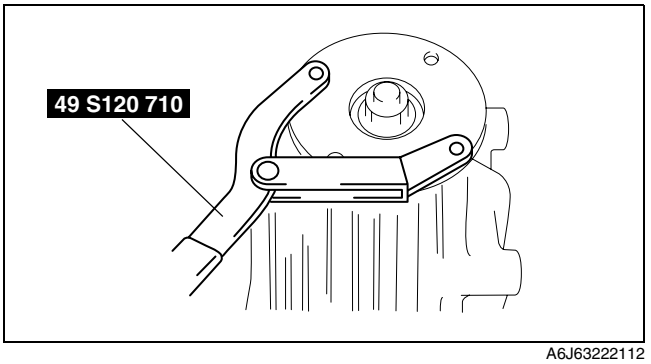
A6J63222110

2. Install the coupling unit to the **SSTs** as shown.



A6J63222111

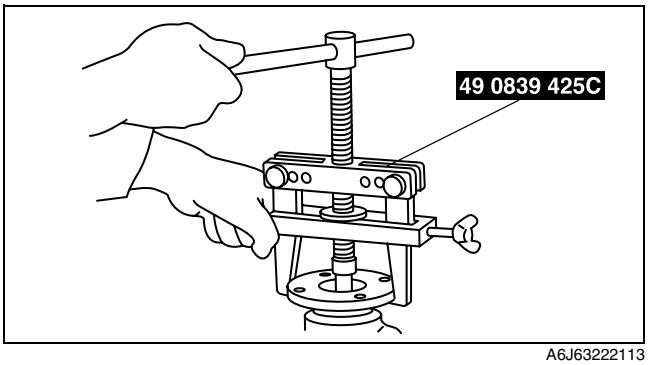
3. Secure the companion flange using the **SST**, and remove the locknut.



A6J63222112

Companion Flange Disassembly Note

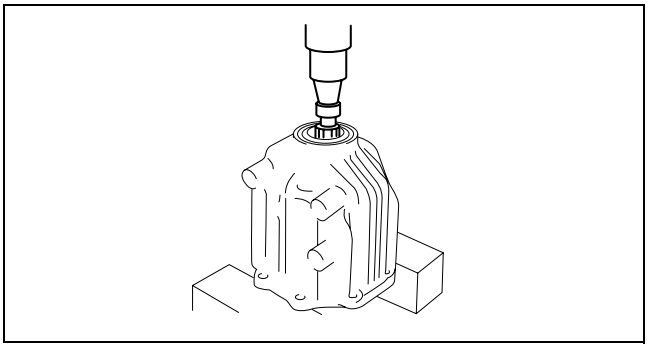
1. Remove the companion flange using the **SST**.



A6J63222113

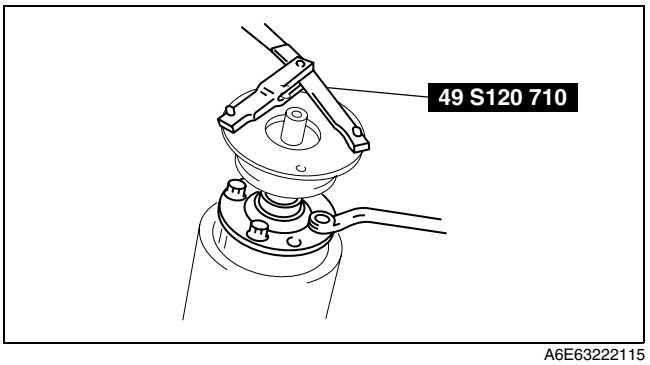
Output Shaft Disassembly Note

1. Remove the coupling unit from the **SST**.
2. Install the coupling unit to the press as shown, and remove the output shaft together with the coupling unit.
3. Install the companion flange to the output shaft.



A6J63222114

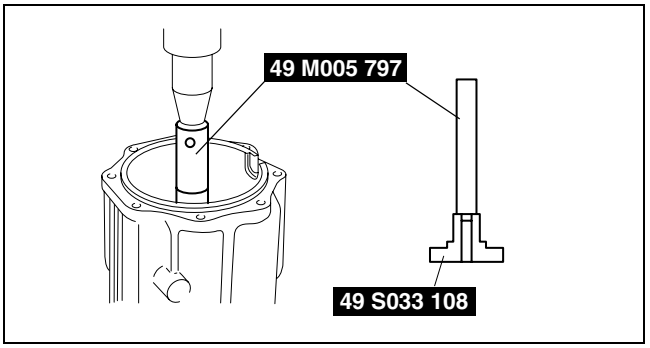
4. Secure the companion flange using the **SST**, and remove the bolts.
5. Remove the output shaft.



A6E63222115

Bearing Disassembly Note

1. Remove the bearing using the **SSTs** and a press.



A6J63222116

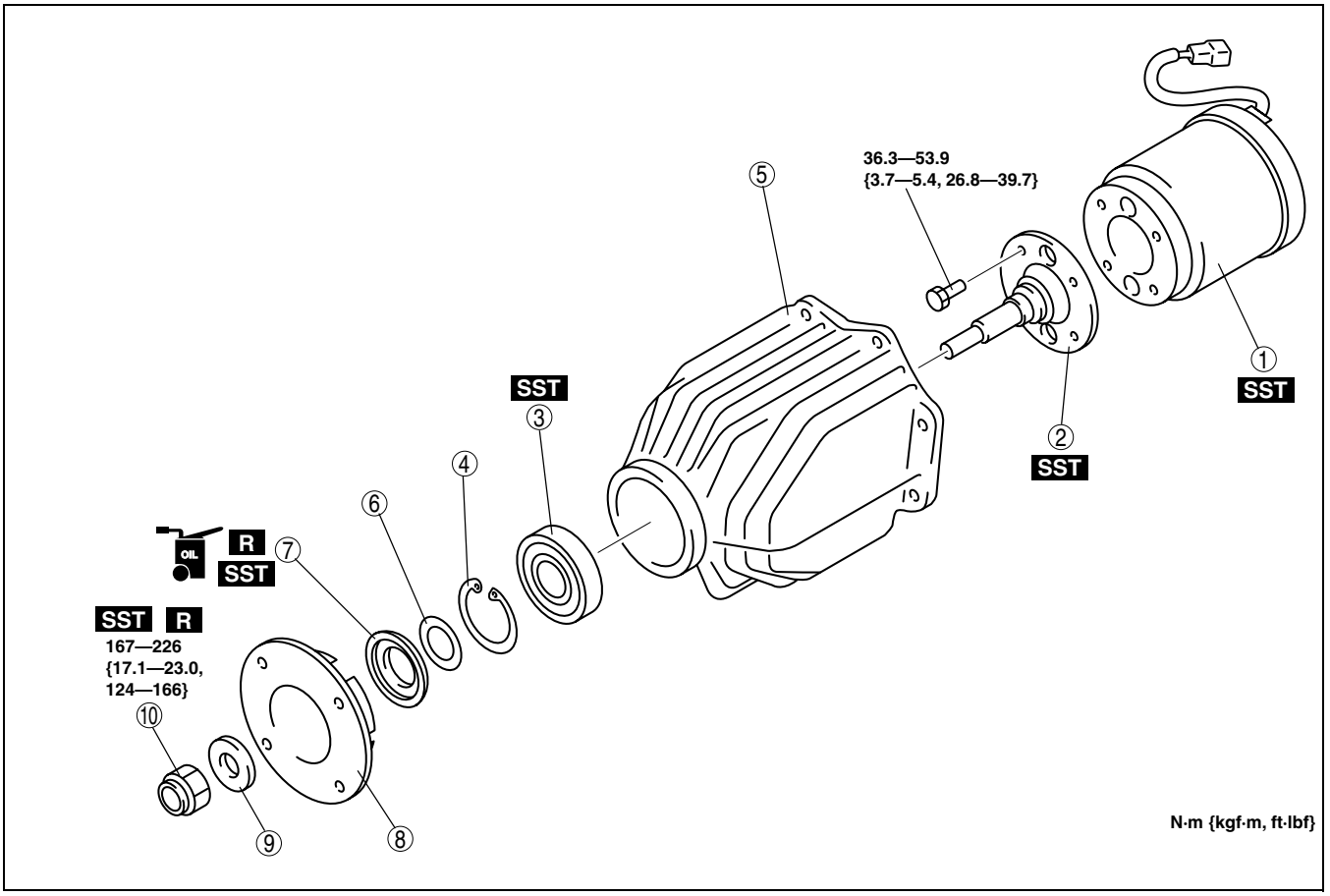
M

COUPLING COMPONENT ASSEMBLY

A6E632227100216

Warning

- **The engine stand is equipped with a self-lock mechanism, however, if the coupling unit is in a tilted condition, the self-lock mechanism could become inoperative. If the coupling unit unexpectedly rotates it could cause injury, therefore do not maintain the coupling unit in a tilted condition. When turning the coupling unit, grasp the rotation handle firmly.**



A6E63222117

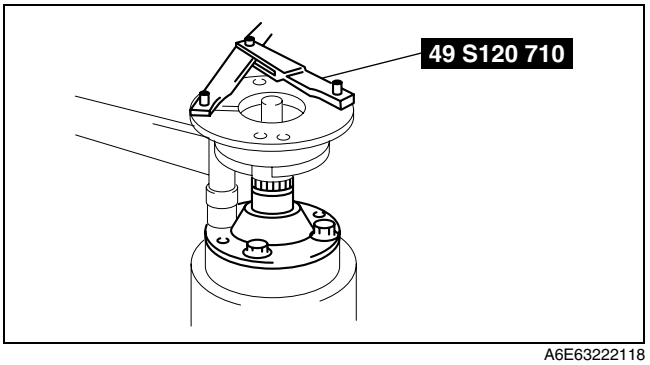
1	Coupling component
2	Output shaft (See M–73 Output Shaft Assembly Note)
3	Bearing (See M–73 Bearing Assembly Note)
4	Retaining ring
5	Coupling case (See M–73 Coupling Case Assembly Note)

6	Shim
7	Oil seal (See M–74 Oil Seal Assembly Note)
8	Companion flange (See M–74 Companion Flange Assembly Note)
9	Washer
10	Locknut (See M–74 Locknut Assembly Note)

Output Shaft Assembly Note

1. Install the output shaft to the coupling unit and partially tighten the bolts.
2. Install the companion flange to the output shaft.
3. Secure the companion flange using the **SST**, and tighten the bolts.

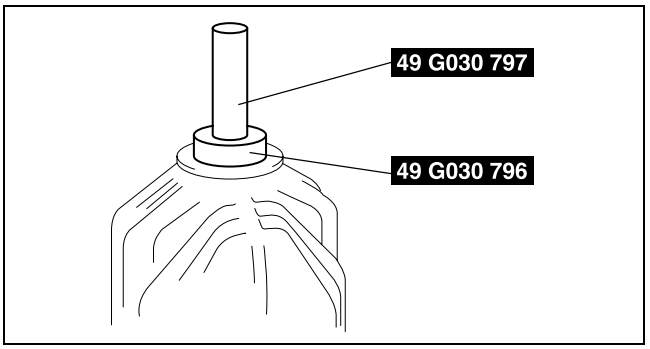
Tightening torque
36.3—53.9 N·m {3.7—5.4 kgf·m, 26.8—39.7 ft·lbf}



A6E63222118

Bearing Assembly Note

1. Assemble the bearing to the coupling case using the **SSTs**.

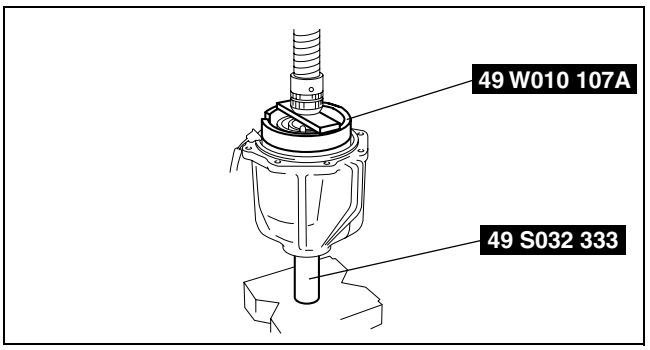


A6J63222119

Coupling Case Assembly Note

Caution
- **The coupling unit will be damaged if it is pressed directly by a press. Always press the coupling unit into the coupling case using the SST.**

1. Assemble the coupling unit to the coupling case using the **SSTs** and a press.

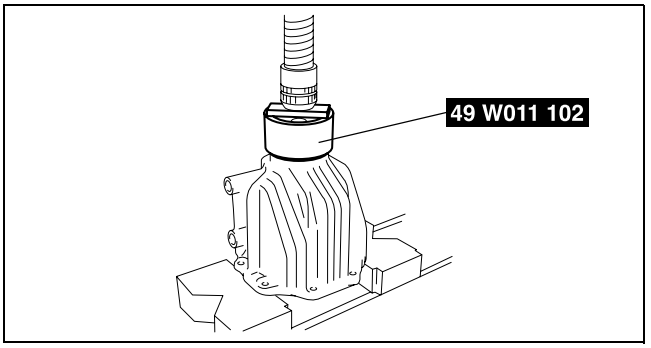


A6J63222120

M

Oil Seal Assembly Note

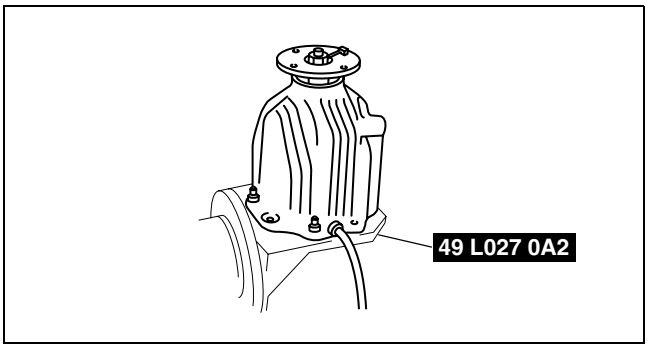
1. Apply the specified oil to a new oil seal lip.
2. Install the oil seal to the coupling case using the **SST**.



A6J63222121

Companion Flange Assembly Note

1. Install the coupling case to the **SSTs** as shown.
2. Install the companion flange.

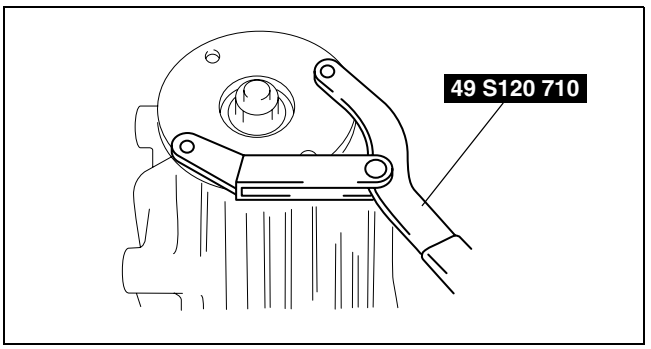


A6J63222111

Locknut Assembly Note

1. Secure the companion flange using the **SST**, and tighten a new locknut.

   Tightening torque
   167—226 N·m {17.1—23.0 kgf·m, 124—166 ft·lbf}

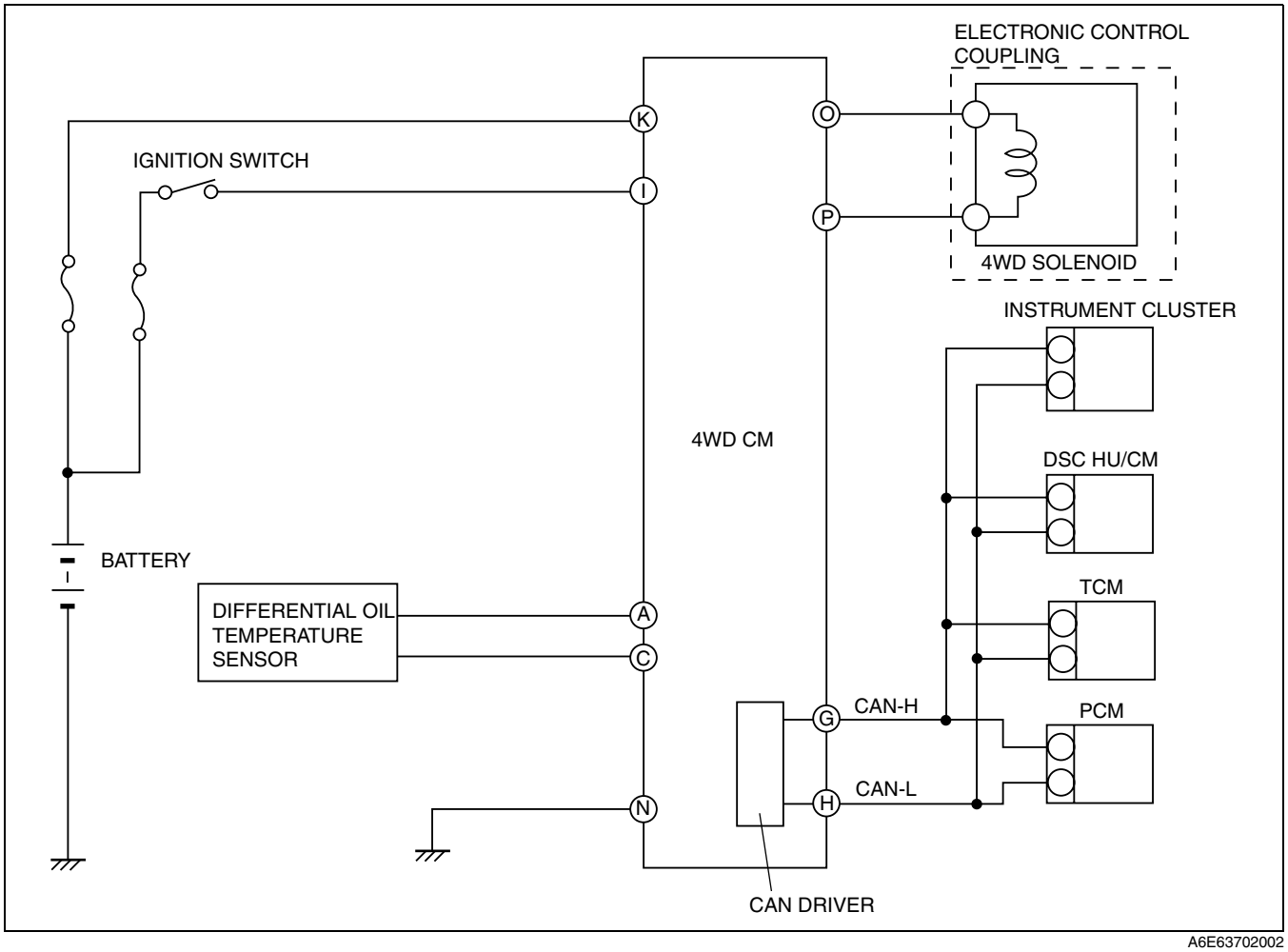


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ON-BOARD DIAGNOSTIC

WIRING DIAGRAM

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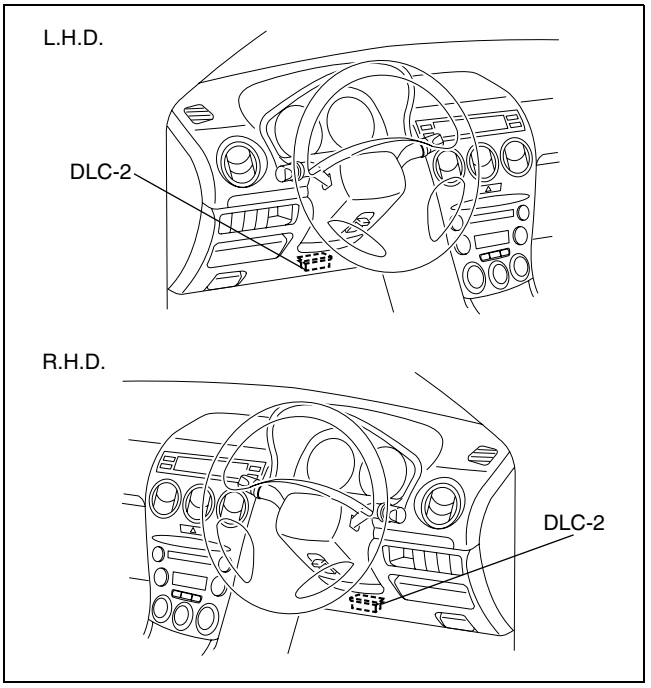
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ELECTRONIC 4WD CONTROL SYSTEM ON-BOARD DIAGNOSIS

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Reading DTCs Procedure

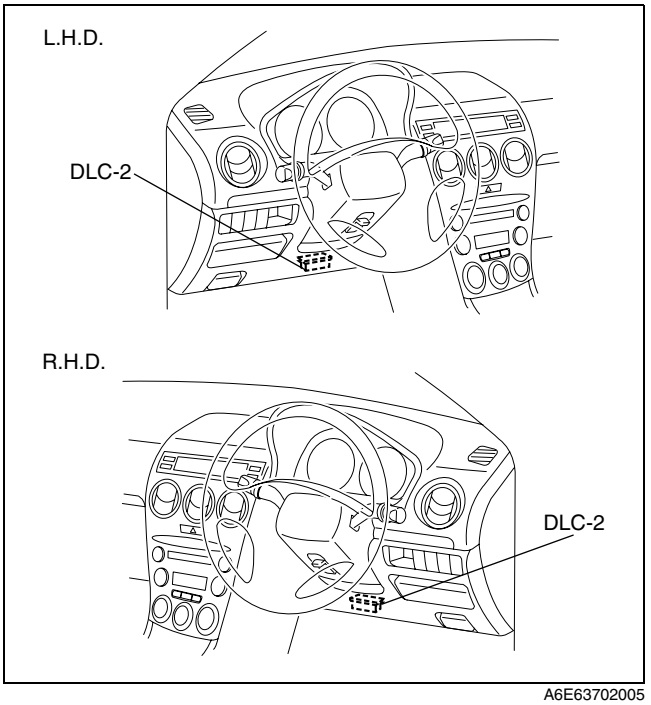
1. Connect WDS or equivalent to the vehicle DLC-2 16-pin connector.
2. Retrieve DTC by WDS or equivalent.
   - If a DTC is displayed, proceed with inspection steps for that DTC.
3. After repair, clear DTCs stored in the 4WD CM by referring to the Clearing DTCs Procedure.



A6E63702005

Clearing DTCs Procedures

1. Connect WDS or equivalent to the vehicle DLC-2 16-pin connector.
2. Clear DTCs by WDS or equivalent.
3. Turn the ignition key to OFF.
4. Perform the DTC inspection again, and verify that no DTC appears.
5. Disconnect the WDS or equivalent.



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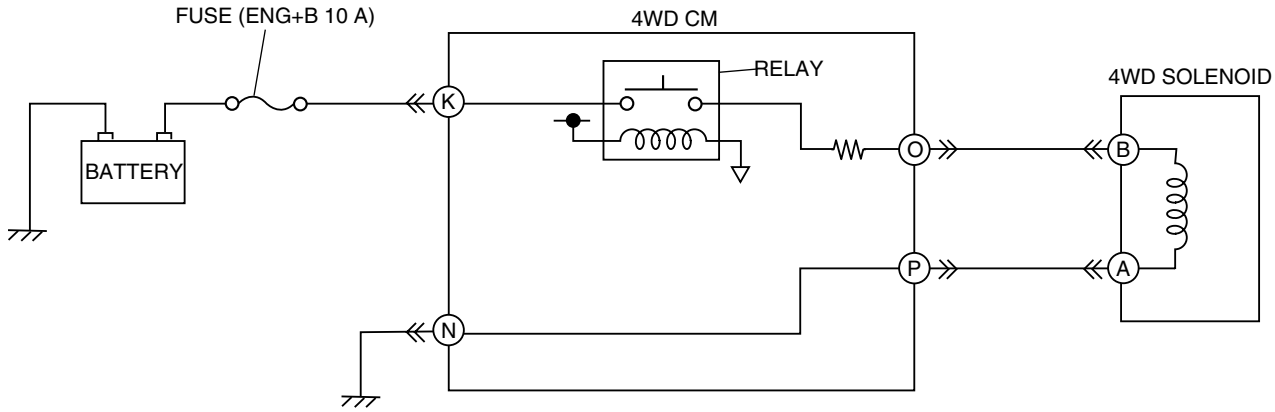
DTC Table

DTC WDS or equivalent	Diagnosis system component	Page
P1887	System wiring	(See M–77 DTC P1887)
P1888	Differential oil temperature sensor	(See M–79 DTC P1888)
U0100	PCM communication	(See M–80 DTC U0100)
U0101	TCM communication	(See M–80 DTC U0101)
U0121	ABS/DSC communication	(See M–80 DTC U0121)

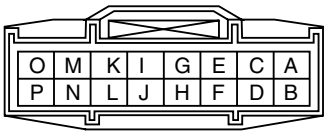
DTC P1887

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DTC P1887	System wiring
DETECTION CONDITION	• Current detection circuit in 4WD CM detects current above specification for more than specified period. • 4WD CM detects that 4WD solenoid control signal differs from current detected at current detection circuit for more than specified period. • Relay voltage detection circuit detects that voltage does not concur with relay ON/OFF signal for more than specified period.
POSSIBLE CAUSE	• Open circuit or short to GND in harness between battery and 4WD CM terminal K • Open circuit or short to GND between 4WD CM terminal O and 4WD solenoid terminal B • Open circuit between 4WD CM terminal P and 4WD solenoid terminal A • Open circuit between 4WD CM terminal N and body GND • Open or short circuit in 4WD CM internal circuit • ENG+B (10A) fuse malfunction • 4WD solenoid malfunction • 4WD CM malfunction • Poor connection of connectors (female terminals)

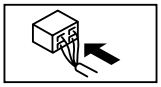


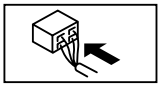
4WD CM CONNECTOR



4WD SOLENOID CONNECTOR







Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT 4WD SOLENOID CONDITION** • Turn ignition key to OFF. • Disconnect 4WD solenoid connector. • Inspect 4WD solenoid. (See M–66 4WD SOLENOID INSPECTION) • Is it okay?	Yes	Go to next step.
		No	Replace 4WD solenoid, then go to Step 9.
2	**INSPECT 4WD SOLENOID TO 4WD CM (POWER SUPPLY CIRCUIT) FOR OPEN CIRCUIT** • Disconnect 4WD CM connector. • Inspect for continuity between 4WD CM terminal O and 4WD solenoid terminal B. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between 4WD CM and 4WD solenoid, then go to Step 9.

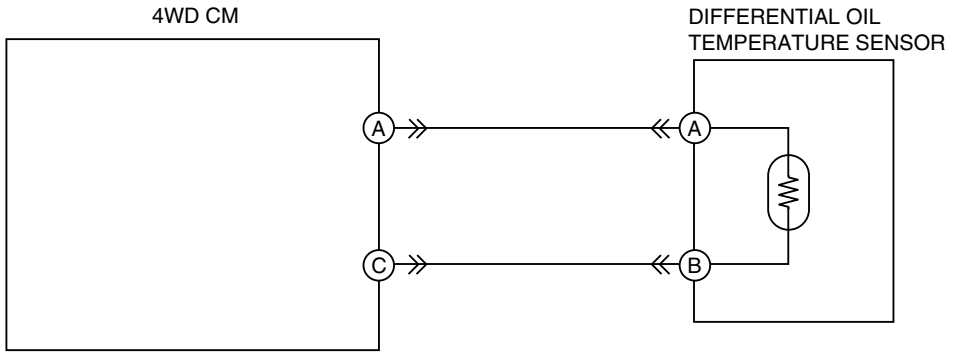
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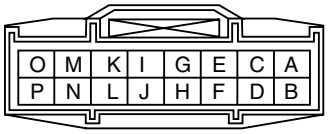
STEP	INSPECTION		ACTION
3	**INSPECT 4WD SOLENOID TO 4WD CM (POWER SUPPLY CIRCUIT) FOR SHORT TO GROUND** • Inspect for continuity between 4WD CM terminal O and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground between 4WD CM and 4WD solenoid, then go to Step 9.
		No	Go to next step.
4	**INSPECT 4WD SOLENOID TO 4WD CM (GROUND CIRCUIT) FOR OPEN CIRCUIT** • Inspect for continuity between 4WD CM terminal P and 4WD solenoid terminal A. • Is there continuity?	Yes	Replace 4WD CM, then go to next step.
		No	Repair or replace harness for open circuit between 4WD CM and 4WD solenoid, then go to Step 9.
5	**INSPECT 4WD CM POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Measure voltage between 4WD CM terminal K and ground. • Is voltage B+?	Yes	Replace 4WD CM, then go to Step 9.
		No	Go to next step.
6	**INSPECT 4WD CM TO BATTERY FOR OPEN CIRCUIT** • Disconnect 4WD CM connector and battery positive terminal. • Inspect for continuity between 4WD CM terminal K and battery positive terminal. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between 4WD CM and battery positive terminal, then go to Step 9.
7	**INSPECT 4WD CM TO BATTERY FOR SHORT TO GROUND** • Inspect for continuity between 4WD CM terminal K and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground between 4WD CM and battery positive terminal, then go to Step 9.
		No	Replace 4WD CM, then go to step 9.
8	**INSPECT FUSE CONDITION** • Turn ignition key to OFF. • Is ENG+B fuse (10A) okay?	Yes	Go to next step.
		No	Replace fuse, then go to Step 9.
9	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory. (See M–76 Clearing DTCs Procedures) • Drive vehicle. • Is the same DTC present?	Yes	Replace 4WD CM, then go to next step.
		No	Go to next step.
10	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC P1888

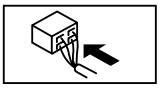
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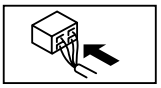
DTC P1888	Differential oil temperature sensor
DETECTION CONDITION	• Differential oil temperature sensor voltage monitor circuit detects abnormal input voltage.
POSSIBLE CAUSE	• Open circuit, or short to battery or GND between 4WD CM terminal A and differential oil temperature sensor terminal A • Open circuit or short to battery between 4WD CM terminal C and differential oil temperature sensor terminal B • Differential oil temperature sensor malfunction • 4WD CM malfunction • Poor connection of connectors (female terminals)











Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT DIFFERENTIAL OIL TEMPERATURE SENSOR CONDITION** • Turn ignition key to OFF. • Disconnect differential oil temperature sensor connector. • Is it okay?	Yes	Go to next step.
		No	Replace differential oil temperature sensor, then go to Step 7.
2	**INSPECT 4WD CM TO DIFFERENTIAL OIL TEMPERATURE SENSOR FOR OPEN CIRCUIT** • Disconnect 4WD CM connector. • Inspect for continuity between 4WD CM terminal A and differential oil temperature sensor terminal A. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between 4WD CM and differential oil temperature sensor, then go to Step 7.
3	**INSPECT 4WD CM TO DIFFERENTIAL OIL TEMPERATURE SENSOR FOR SHORT TO POWER** • Inspect voltage between 4WD CM terminal A and ground. • Is voltage B+?	Yes	Repair or replace harness for short to power between 4WD CM and differential oil temperature sensor, then go to Step 7.
		No	Go to next step.

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STEP	INSPECTION		ACTION
4	**INSPECT 4WD CM TO DIFFERENTIAL OIL TEMPERATURE SENSOR FOR SHORT TO GROUND** • Inspect for continuity between 4WD CM terminal A and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground between 4WD CM and differential oil temperature sensor, then go to Step 7.
		No	Go to next step.
5	**INSPECT 4WD CM TO DIFFERENTIAL OIL TEMPERATURE SENSOR FOR OPEN CIRCUIT** • Inspect for continuity between 4WD CM terminal C and differential oil temperature sensor terminal B. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between 4WD CM and differential oil temperature sensor, then go to Step 7.
6	**INSPECT 4WD CM TO DIFFERENTIAL OIL TEMPERATURE SENSOR FOR SHORT TO GROUND** • Inspect for continuity between 4WD CM terminal C and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground between 4WD CM and differential oil temperature sensor, then go to next step.
		No	Replace 4WD CM, then go to next step.
7	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory. (See M–76 Clearing DTCs Procedures) • Drive vehicle. • Is the same DTC present?	Yes	Replace 4WD CM, then go to next step.
		No	Go to next step.
8	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC U0100

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DTC U0100	PCM communication
DETECTION CONDITION	• 4WD CM detects that communication signals (throttle opening angle and engine speed signals) from PCM are abnormal.
POSSIBLE CAUSE	• PCM signals have communication error.

Diagnostic Procedure

- Inspect according to the diagnostic procedure in Section T. (See T–39 MULTIPLEX COMMUNICATION SYSTEM.)

DTC U0101

A6E637027100206

DTC U0101	TCM communication
DETECTION CONDITION	• 4WD CM detects that communication signals (selector lever position and gear position signals) from TCM are abnormal.
POSSIBLE CAUSE	• TCM signals have communication error.

Diagnostic Procedure

- Inspect according to the diagnostic procedure in Section T. (See T–39 MULTIPLEX COMMUNICATION SYSTEM.)

DTC U0121

A6E637027100207

DTC U0121	ABS/DSC communication
DETECTION CONDITION	• 4WD CM detects that communication signals (four-wheel speed, ABS/DSC operation condition, and coupling torque request signals) from DSC HU/CM are abnormal.
POSSIBLE CAUSE	• DSC HU/CM signals have communication error.

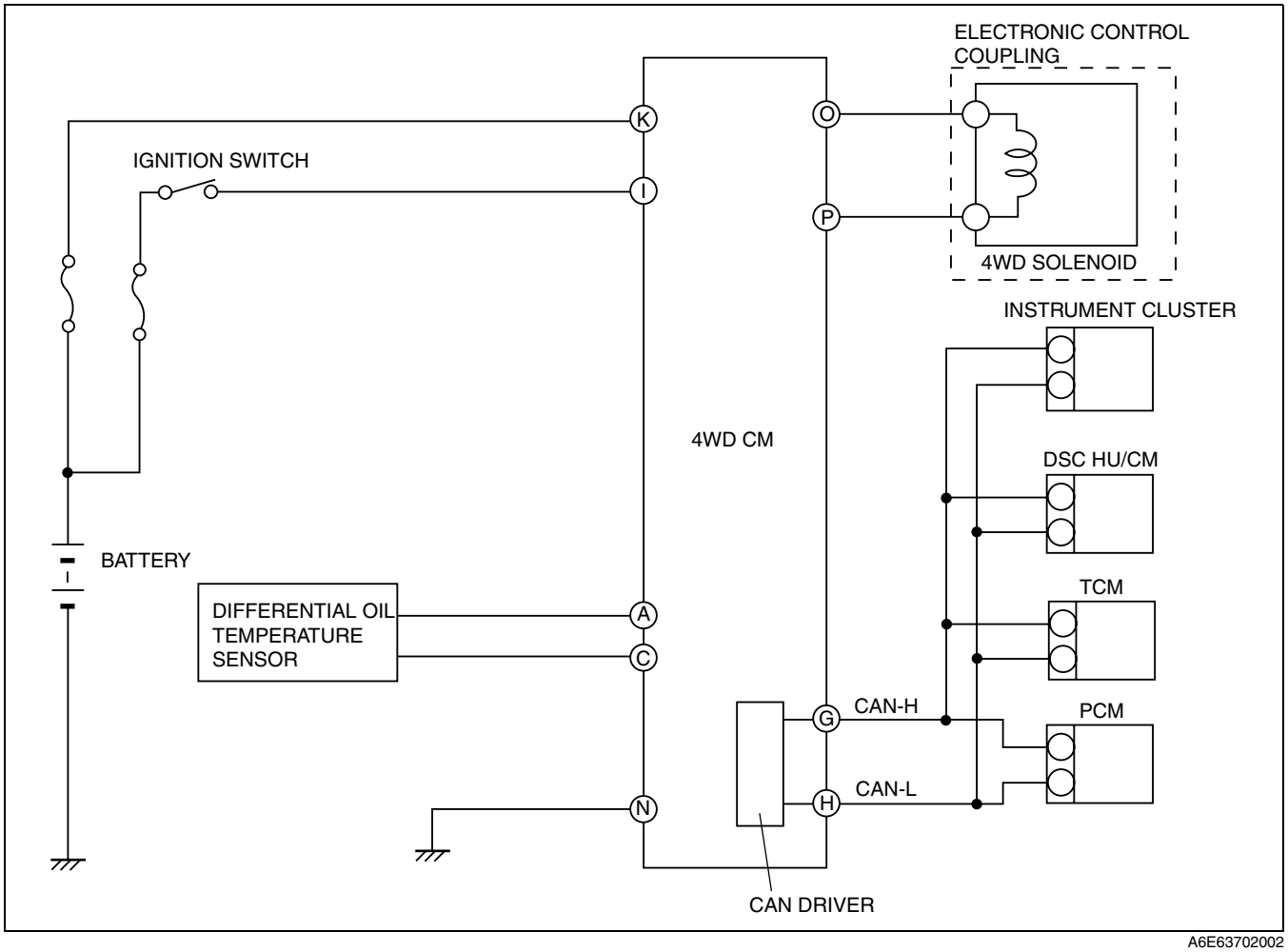
Diagnostic Procedure

- Inspect according to the diagnostic procedure in Section T. (See T–39 MULTIPLEX COMMUNICATION SYSTEM.)

TROUBLESHOOTING

SYSTEM WIRING DIAGRAM

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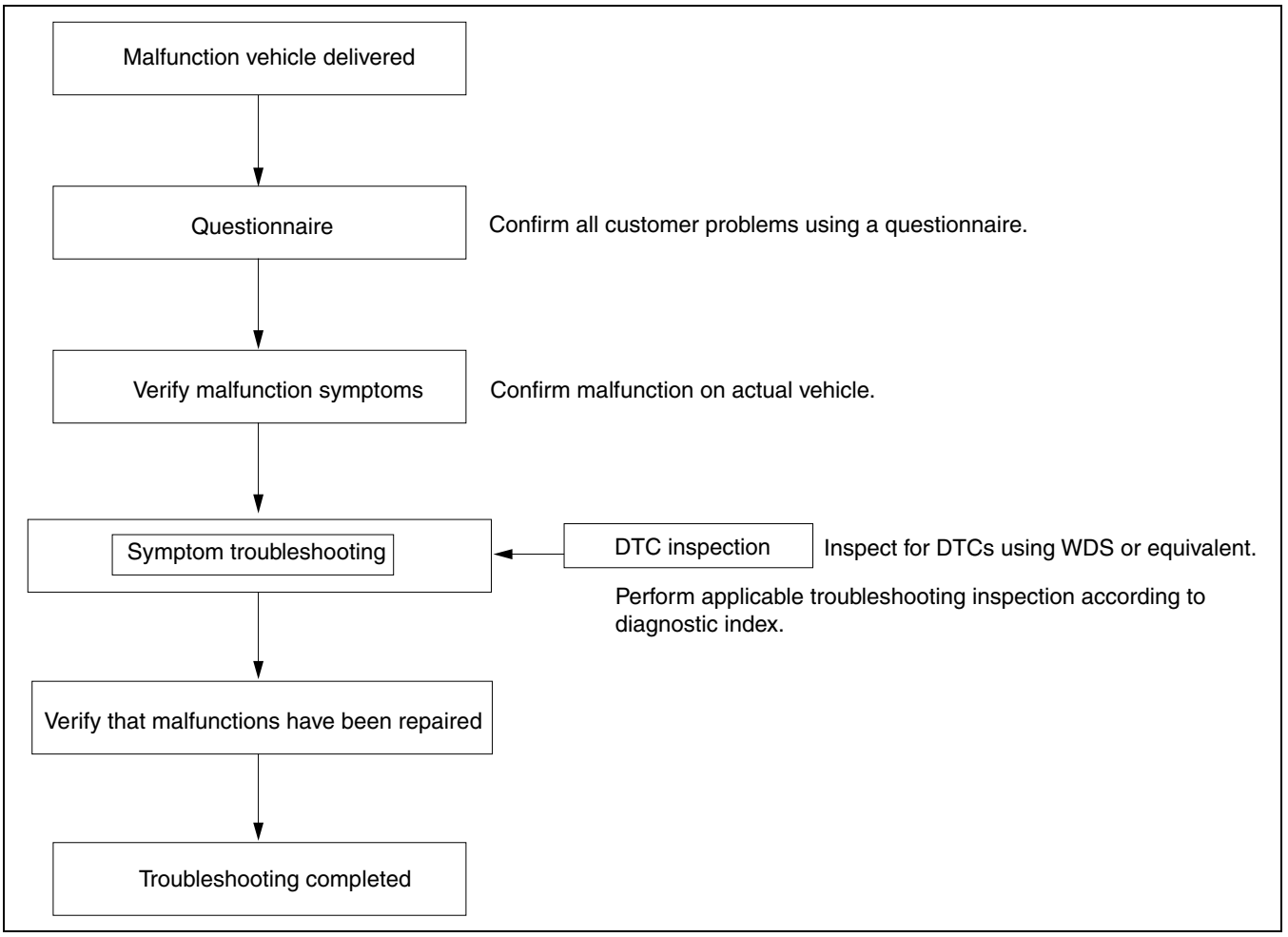


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FOREWORD

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A6E63802001

SYMPTOM TROUBLESHOOTING

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- Verify the symptoms, and perform troubleshooting according to the appropriate number.

No.	Symptom	Description
1	Frequent front wheel slip	Front wheels slip frequently during acceleration on low-friction road.
2	Tight corner braking effect	Brakes seem to be applied during tight cornering while driving very slowly on paved road.
3	Abnormal noise and/or vibration from coupling unit	There is abnormal noise and/or vibration from coupling unit during driving.

NO.1 FREQUENT FRONT WHEEL SLIP

A6E638027100204

1	Frequent front wheel slip

[TROUBLESHOOTING HINTS]

- **Tire traction performance is extremely poor for given road friction. (4WD system is normal.)**
- **Improper wheel alignment (4WD system is normal.)**
- **Rear differential oil temperature is extremely high (Fail-safe condition)**
- **Differential oil temperature sensor malfunction (Fail-safe condition)**
- **Compare slip frequency with another vehicle of the same model (under the same road conditions and tire traction performance).**
- **Replace tires with others of the same model and perform test under the same road conditions to determine if the malfunction was caused by tire traction performance.**
- **Coupling component malfunction**
- **4WD solenoid malfunction**

Warning

- **During simulation driving, vehicle stability may decrease extremely and cause an accident. Be sure to perform the simulation test driving in a safe area.**

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY DSC, PCM, TCM, AND 4WD SYSTEM DTCs** • Verify DSC, PCM, TCM, and 4WD system DTCs using WDS or equivalent. • Are there any DTCs present?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
2	**VERIFY TIRE AIR PRESSURE** • Inspect tire air pressure. • Is it within specification?	Yes	Go to next step.
		No	Adjust tire air pressure, then go to next step.
3	**COMPARE WITH SAME MODEL TIRES** • Install tires of the same model. • Perform simulation driving. • Does malfunction recur?	Yes	Go to next step.
		No	4WD system is okay.
4	**COMPARE WITH SAME MODEL VEHICLE** • Install tires of malfunctioning vehicle to another same model vehicle. • Perform simulation driving. • Does malfunction recur?	Yes	4WD system is okay.
		No	Go to next step.
5	**INSPECT 4WD SOLENOID** • Inspect 4WD solenoid. (See M–66 4WD SOLENOID INSPECTION) • Is coupling component solenoid okay?	Yes	Inspect harness between 4WD solenoid and 4WD CM, then go to next step.
		No	Replace coupling component.
6	**INSPECT WHEEL ALIGNMENT** • Inspect wheel alignment. • Is it okay?	Yes	Replace coupling component.
		No	Inspect wheel alignment, and adjust it if necessary.

NO.2 TIGHT CORNER BRAKING

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2	Tight corner braking

[TROUBLESHOOTING HINTS]

- **Because the coupling component locks up easily (similar to direct 4WD), rotational difference between the front and rear wheels cannot be absorbed and brake-like phenomenon occurs.**
- **Due to the coupling component construction, slight tight corner braking effect occurs during tight cornering on a paved road. (4WD system is okay. Compare with another same model vehicle to determine malfunction.)**
- **Coupling component malfunction**
- **4WD solenoid malfunction**

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Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY DSC, PCM, TCM, AND 4WD SYSTEM DTCS** • Verify DSC, PCM, TCM, and 4WD system DTCs using WDS or equivalent. • Are there any DTCs present?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
2	**VERIFY TIRE AIR PRESSURE** • Inspect tire air pressure. • Is it within specification?	Yes	Go to next step.
		No	Adjust tire air pressure, then go to next step.
3	**INSPECT ABS WHEEL-SPEED SENSOR** • Inspect ABS wheel-speed sensor. • Is it okay?	Yes	Go to next step.
		No	Repair or replace malfunctioning part.
4	**COMPARE WITH SAME MODEL VEHICLE** • Perform simulation driving with another same model vehicle. • Does malfunction recur on the same model vehicle?	Yes	4WD system is okay.
		No	Go to next step.
5	**PERFORM SIMULATION DRIVING WITH 4WD SOLENOID CONNECTOR DISCONNECTED** • Turn ignition key OFF. • Disconnect 4WD solenoid connector. • Perform simulation driving. (Clear DTC after simulation driving.) • Does malfunction recur?	Yes	Replace coupling component.
		No	Go to next step.

STEP	INSPECTION		ACTION
6	**INSPECT 4WD SOLENOID** • Inspect 4WD solenoid. (See M–66 4WD SOLENOID INSPECTION) • Is it okay?	Yes	Inspect harness between 4WD solenoid and 4WD CM, then go to next step.
		No	Replace coupling component.

NO.3 ABNORMAL NOISE AND/OR VIBRATION FROM COUPLING COMPONENT

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3	Abnormal noise and/or vibration from coupling component

[TROUBLESHOOTING HINTS]
- Abnormal noise and/or vibration from coupling component during driving
- Propeller shaft is malfunctioning or attached improperly.
- Engine mount or differential mount malfunction
- Resonance of rotating parts on vehicle (engine, propeller shaft, rear differential, tire, etc.)
- Resonance with engine vibration (mainly with exhaust system parts)
- Rear differential malfunction
- Coupling component malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY DSC, PCM, TCM, AND 4WD SYSTEM DTCS** • Verify DSC, PCM, TCM, and 4WD system DTCs using WDS or equivalent. • Are there any DTCs present?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
2	**VERIFY INSTALLATION CONDITION OF VEHICLE PARTS** • Verify installation condition for following: — Propeller shaft (including bending and joint operation) — Center bearing — Engine mount — Differential mount — Hub bearing — Exhaust system parts — ABS wheel-speed sensor • Are they properly installed?	Yes	Go to next step.
		No	Repair or replace malfunctioning part.
3	**DETERMINE IF MALFUNCTION IS CAUSED BY REAR DIFFERENTIAL** • Install tires of another brand. **Note** • When tires of another brand are installed, the same malfunction can occur due to conditions different from customer explanation. Be careful not to confuse it with customer complaint. • Perform simulation driving at the same engine speed, gear position, and vehicle speed that customer vehicle had malfunction. • Does the same malfunction occur?	Yes	Reinstall customer's vehicle tire. Go to next step.
		No	4WD system is okay. Reinstall customer's vehicle tire.
4	**INSPECT REAR DIFFERENTIAL** • Inspect rear differential for following: — Backlash — Teeth contact (See M–56 REAR DIFFERENTIAL ASSEMBLY) • Are they okay?	Yes	Replace coupling component.
		No	Inspect malfunctioning part and adjust it if necessary.

STEERING SYSTEM

FEATURES

OUTLINE N-2
- OUTLINE OF CONSTRUCTION N-2
- FEATURES N-2
- SPECIFICATIONS N-2
- STRUCTURAL VIEW N-3

SERVICE

OUTLINE N-5
- SUPPLEMENTAL SERVICE INFORMATION N-5

ENGINE SPEED SENSING POWER STEERING N-6
- POWER STEERING FLUID INSPECTION N-6
- STEERING GEAR AND LINKAGE (MZR-CD (RF TURBO)) REMOVAL/INSTALLATION N-8
- STEERING GEAR AND LINKAGE (4WD) REMOVAL/INSTALLATION N-13
- POWER STEERING OIL PUMP (MZR-CD (RF TURBO)) REMOVAL/INSTALLATION N-16
- POWER STEERING OIL PUMP (MZR-CD (RF TURBO)) DISASSEMBLY/ASSEMBLY N-17

OUTLINE

OUTLINE OF CONSTRUCTION

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- The construction and operation of the steering system is essentially carried over from that of the current Mazda6 (GG), except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)
- Due to the addition of the MZR-CD (RF Turbo) engine, a gear-driven power steering oil pump has been adopted. The operation of the oil pump is the same as that of the current Mazda6 (GG).
- The disassembly/assembly procedures for the steering gear and linkage of the newly equipped MZR-CD (RF Turbo) engine, wagon and 4WD models are the same as that of the current Mazda6 (GG).

FEATURES

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Improved Steering Feel

- The fluid pressure characteristics of the power steering system has been optimized (MZR-CD (RF Turbo) and 4WD models).

SPECIFICATIONS

A6E660201036203

Item			New Mazda6 (GG) (4SD, 5HB)	New Mazda6 (GY) (Wagon)		Current Mazda6 (GG) (4SD, 5HB)
Drive train			**2WD**		**4WD**	**2WD**
Steering wheel	Outer diameter (mm {in})		370 {14.6}			
	Lock-to-lock (turns)		2.75			
Steering gear and linkage	Type		Rack-and-pinion			
	Rack stroke (mm {in})		146.8—148.8 {5.78—5.85}			
Steering column and shaft	Shaft type		Collapsible			
	Joint type		2-cross joint			
	Amount of tilt (mm {in})		45 {1.8}			
	Amount of telescope (If equipped) (mm {in})		50 {2.0}			
Power steering system	Power assist type		Engine speed sensing			
	Power steering fluid	Type	M-**III** or equivalent (e.g. Dexron®**II**)			
		Fluid capacity* (approximate quantity) (L {US qt, Imp qt})	MTX (except MZR-CD (RF Turbo)): 0.80 {0.85, 0.70} ATX: 0.87 {0.92, 0.77} MZR-CD (RF Turbo): 0.86 {0.91, 0.76}	0.89 {0.94, 0.78}		MTX: 0.80 {0.85, 0.70} ATX: 0.87 {0.92, 0.77}

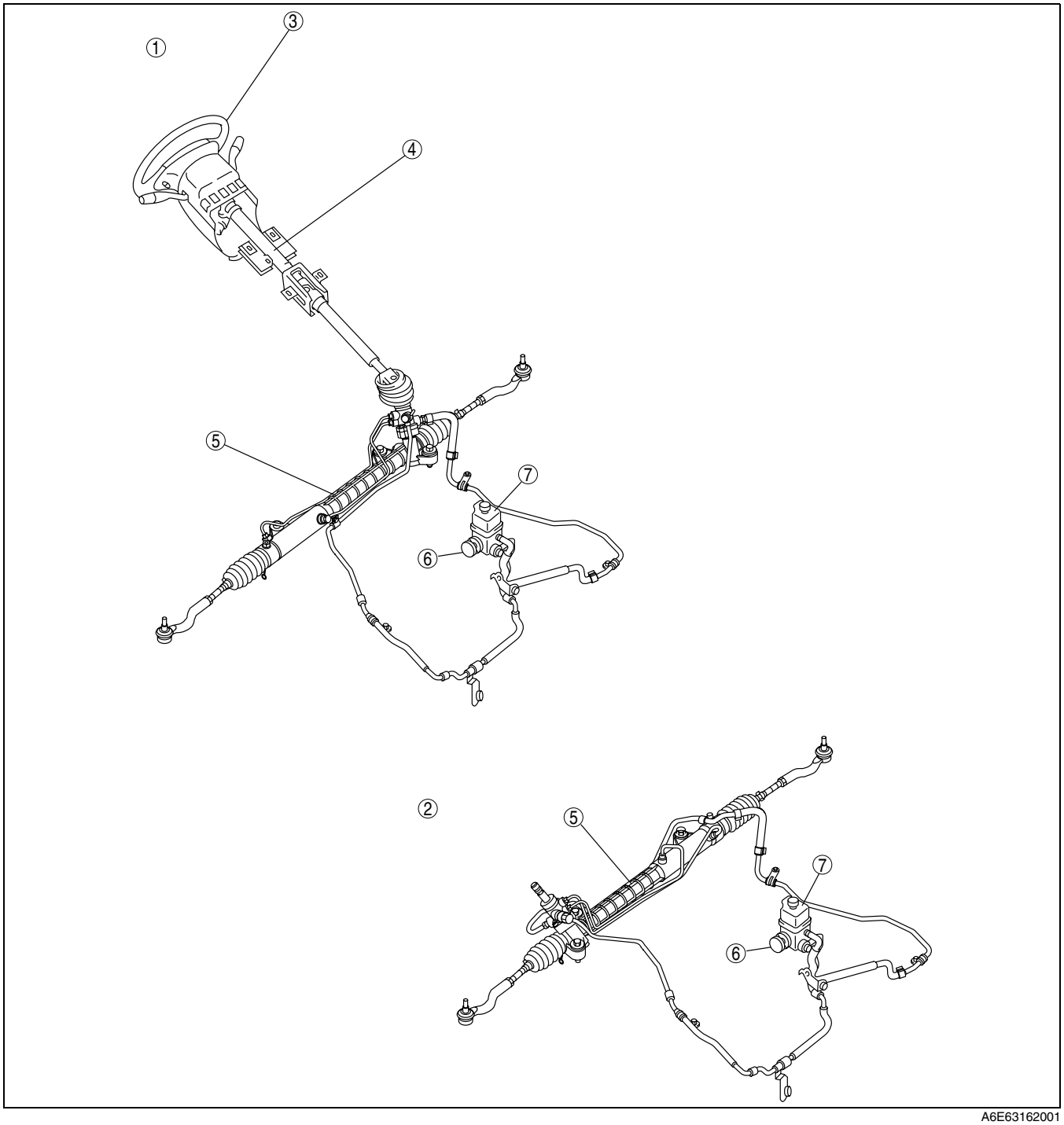
* : When reservoir tank is at maximum volume

Bold frame:New specifications

STRUCTURAL VIEW

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MZR-CD (RF Turbo)

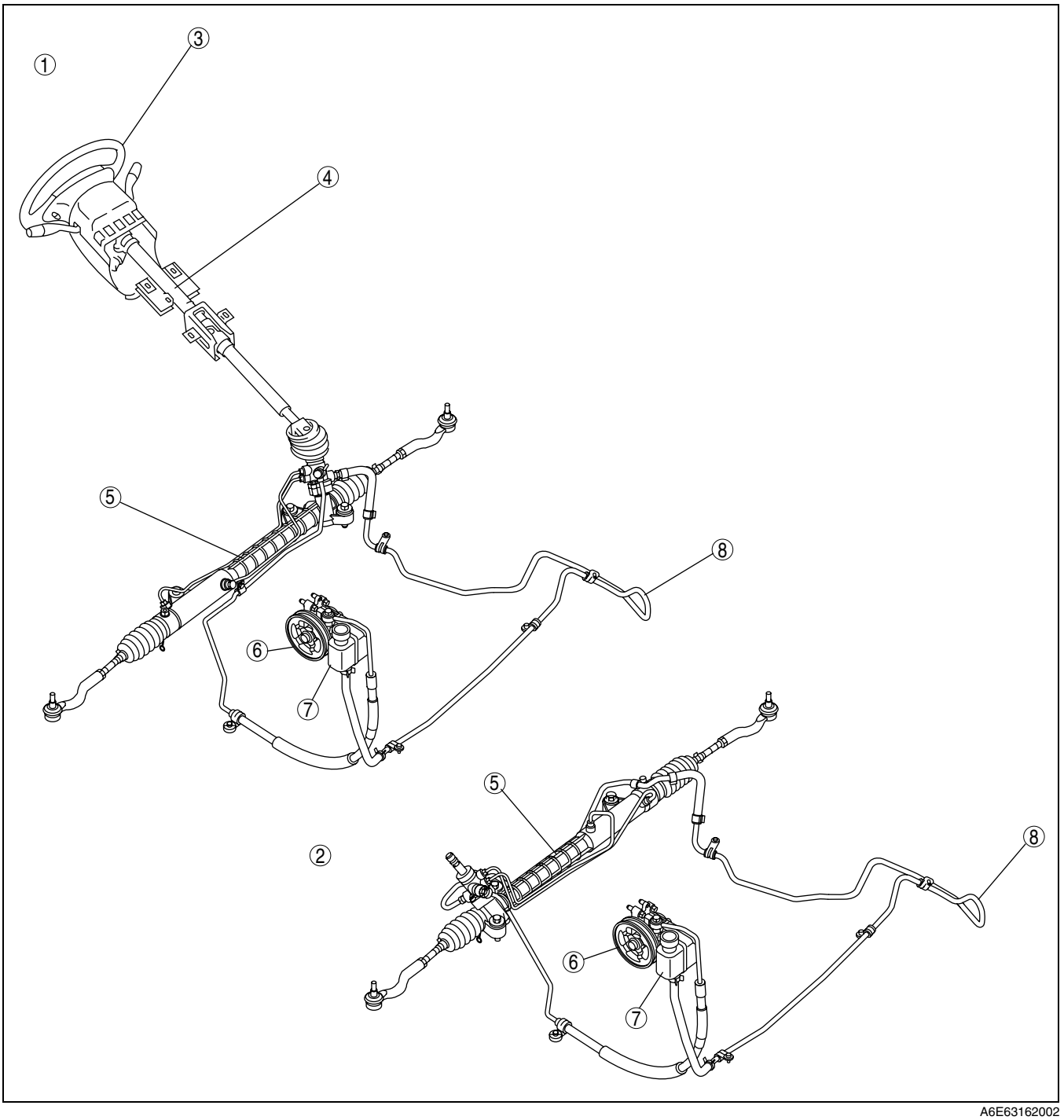


A6E63162001

1	L.H.D.
2	R.H.D.
3	Steering wheel
4	Steering column and shaft

5	Steering gear
6	Power steering oil pump
7	Fluid reservoir

4WD



A6E63162002

1	L.H.D.
2	R.H.D.
3	Steering wheel
4	Steering column and shaft

5	Steering gear
6	Power steering oil pump
7	Fluid reservoir
8	Cooling pipe

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E660201034201

- The following changes have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Power steering fluid

- Inspection procedure has been modified.

Steering gear and linkage (MZR-CD (RF Turbo))

- Removal/installation procedure has been added.

Steering gear and linkage (4WD)

- Removal/installation procedure has been added.

Power steering oil pump (MZR-CD (RF Turbo))

- Removal/installation procedure has been added.
- Disassembly/assembly procedure has been added.

ENGINE SPEED SENSING POWER STEERING

POWER STEERING FLUID INSPECTION

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Fluid Level Inspection

1. Inspect the power steering fluid level.
   - Add fluid to the specified level as necessary.

Fluid specification
ATF M-III or equivalent (e.g. Dexron®II)

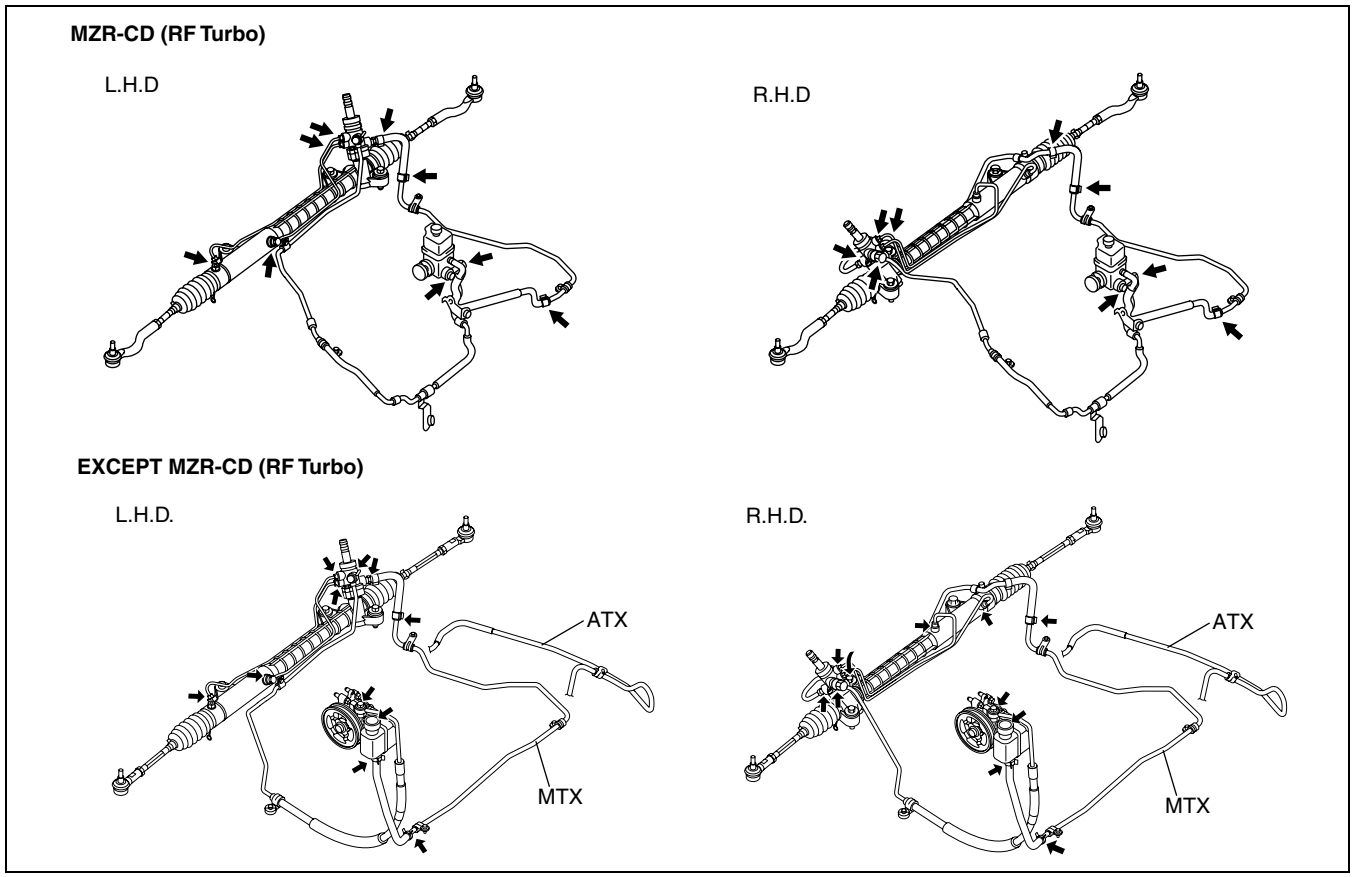
Fluid Leakage Inspection

Caution
- **If the steering wheel is kept in the fully turned position for more than 5 seconds, the fluid temperature will rise excessively and adversely affect the oil pump.**

1. Start the engine and let it idle.
2. Turn the steering wheel fully to the left and right to apply fluid pressure.

Note
- The points where fluid leakage may occur are indicated in the figure.

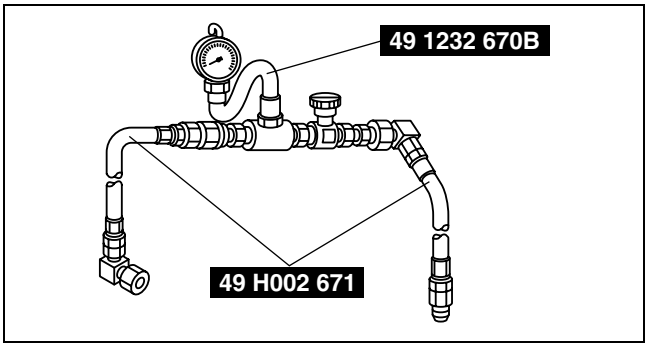
3. Inspect for fluid leakage.
   - If fluid leakage is found, replace the related pipe or hose.



A6E66142001

Fluid Pressure Inspection

1. Assemble the **SSTs** as shown in the figure.

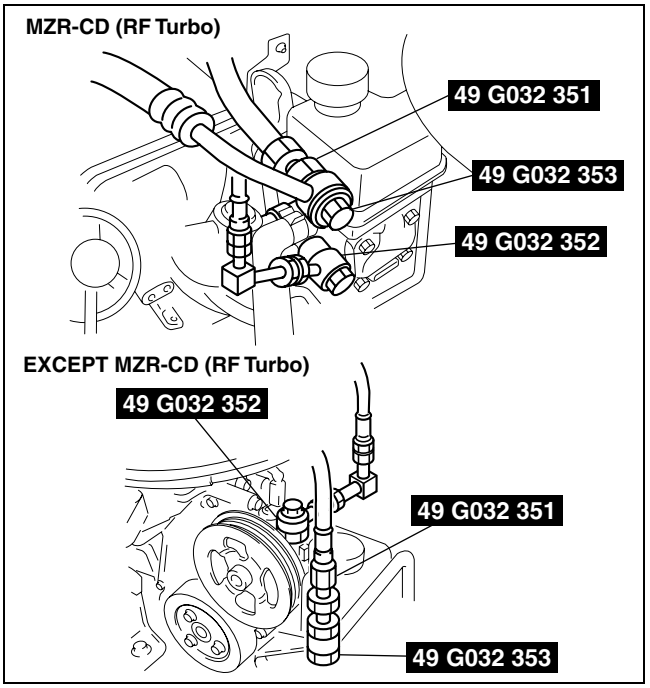


A6E0612W101

2. Disconnect the pressure pipe from the oil pump, and connect the **SSTs**.

   Tightening torque
   29.4—44.1 N·m {3.0—4.4 kgf·m, 22—32 ft·lbf}

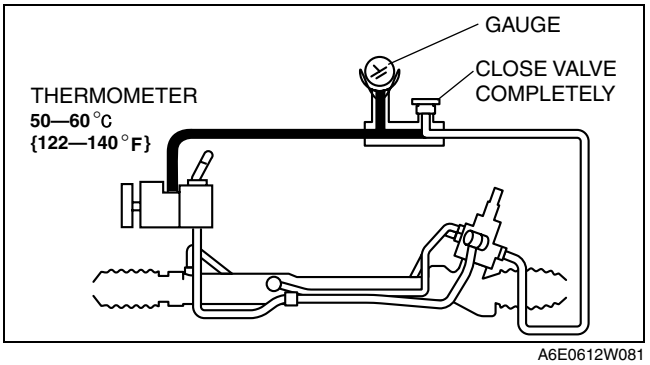
3. Bleed the air from the system.
4. Open the gauge valve fully.
5. Start the engine and turn the steering wheel fully left and right to raise the fluid temperature to **50—60 °C {122—140 °F}**.



A6E66142002

6. Close the gauge valve completely.
7. Increase the engine speed to **1,000—1,500 rpm** and measure the fluid pressure generated by the oil pump.
   - If the pressure is not within the specification, repair or replace the oil pump component.

   Caution
   - **If the valve is left closed for more than 5 seconds, the fluid temperature will rise excessively and adversely affect the oil pump.**



A6E0612W081

Oil pump fluid pressure

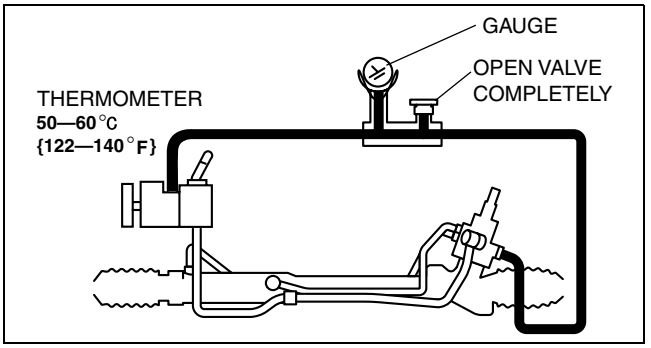
(MPa {kgf/cm^2, psi})

Type	Oil pump fluid pressure
2WD (Except MZR-CD (RF Turbo))	10.80—11.29 {110.2—115.1, 1,567—1637}
MZR-CD (RF Turbo)	11.31—11.80 {115.4—120.3, 1,641—1,711}
4WD	10.30—10.79 {105.1—110.0, 1,490—1,564}

N

8. Open the gauge valve fully and increase the engine speed to **1,000—1,500 rpm**.
9. Turn the steering wheel fully to the left and right, then measure the fluid pressure generated at the gear housing.
   - If the pressure is not within the specification, repair or replace the steering gear component.

Caution
- **If the steering wheel is kept in the fully turned position for more than 5 seconds, the fluid temperature will rise excessively and adversely affect the oil pump.**



A6E0612W080

Gear housing fluid pressure

(MPa {kgf/cm^2, psi})

Type	Oil pump fluid pressure
2WD (Except MZR-CD (RF Turbo))	10.80—11.29 {110.2—115.1, 1,567—1637}
MZR-CD (RF Turbo)	11.31—11.80 {115.4—120.3, 1,641—1,711}
4WD	10.30—10.79 {105.1—110.0, 1,490—1,564}

10. Remove the **SSTs**. Install and tighten the pressure pipe to the specified torque.

Tightening torque
29.4—44.1 N·m {3.0—4.4 kgf·m, 22—32 ft·lbf}

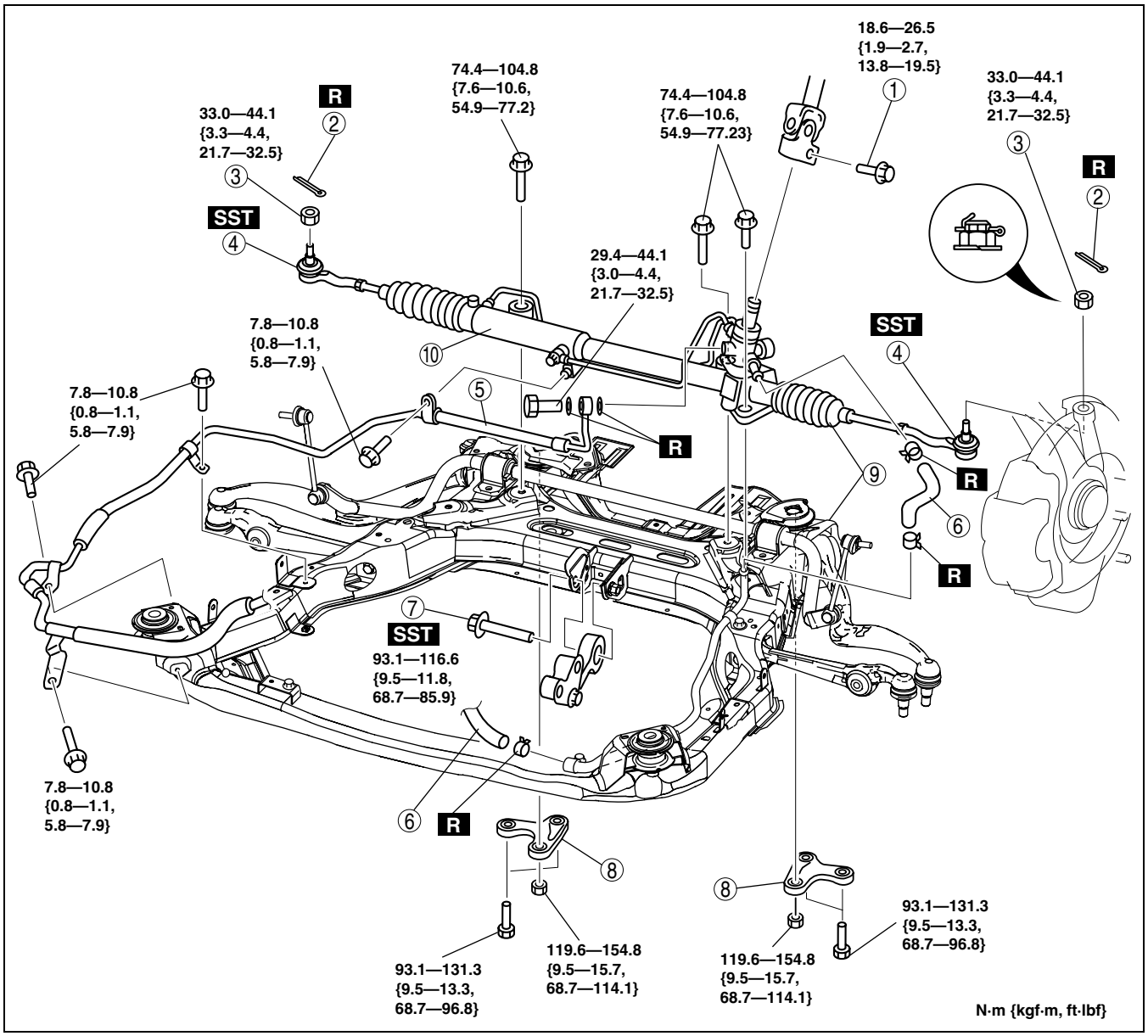
11. Bleed the air from the system.

STEERING GEAR AND LINKAGE (MZR-CD (RF TURBO)) REMOVAL/INSTALLATION

A6E661432960201

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 servicing the vehicle.**

L.H.D.
1. Remove the under cover and mud guard. (Left side)
2. Remove the front auto leveling sensor.
3. Separate the stabilizer control link. (shock absorber side)
4. Separate the front lower arm (front and rear) ball joint.
5. Remove the shock absorber bolt. (lower side)
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Inspect the toe-in.
9. Adjust the headlight zeroset.



A6E66142003

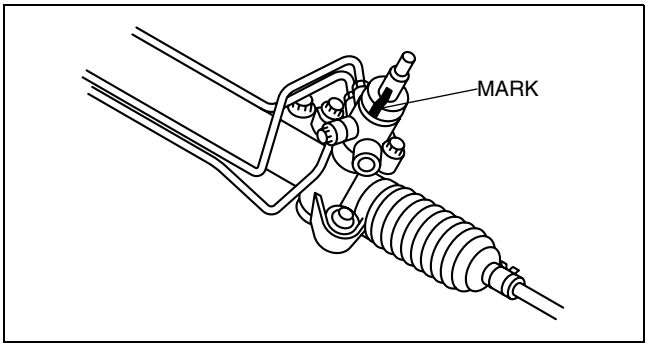
1	Bolt (intermediate shaft) (See N–10 Bolt (intermediate shaft) removal note) (See N–11 Bolt (intermediate shaft) installation note)
2	Cotter pin
3	Nut (tie-rod end ball joint)
4	Tie-rod end ball joint (See N–10 Tie-rod end ball joint removal note)
5	Pressure pipe
6	Return hose

7	No.1 engine mount center bolt (See N–10 No.1 engine mount center bolt removal note)
8	Crossmember bracket (See N–11 Crossmember bracket removal note)
9	Crossmember component, steering gear and linkage (See N–11 Crossmember component, steering gear and linkage removal note)
10	Steering gear and linkage (See N–11 Steering gear and linkage installation note)

N

Bolt (intermediate shaft) removal note

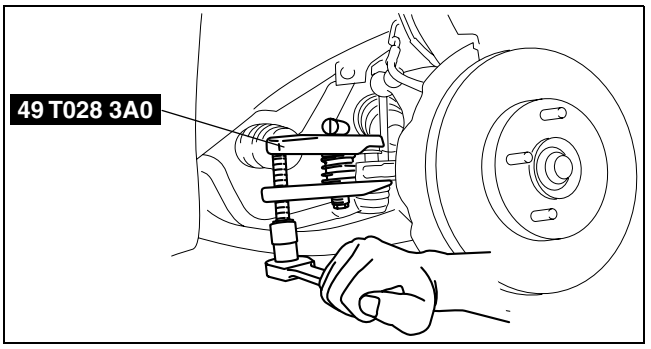
1. Mark the pinion shaft and gear housing for proper installation.



A6E0612W084

Tie-rod end ball joint removal note

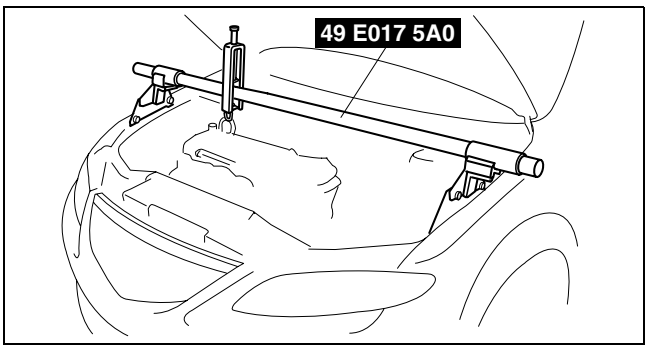
1. Remove the tie rod-nut.
2. Separate the tie-rod end from the steering knuckle using the **SSTs**.



A6E0612W085

No.1 engine mount center bolt removal note

1. Suspend the engine using the **SST**.
2. Remove the No.1 engine mount center bolt.

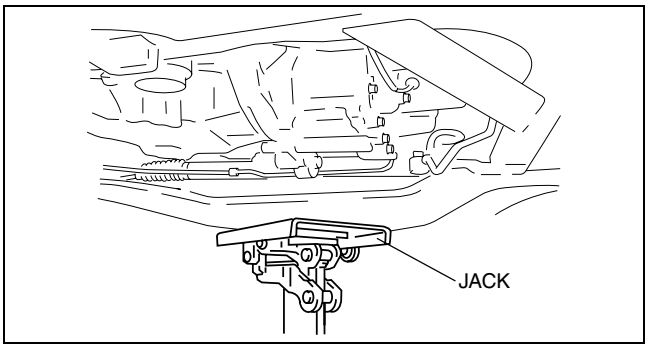


A6E2316W101

Crossmember bracket removal note

Warning
- **Removing the crossmember is dangerous. The crossmember component could fall and cause serious injury or death. Verify that the jack securely supports the crossmember component before removing the crossmember bracket.**

1. Support the crossmember component with a jack and remove the nuts.
2. Remove the crossmember bracket.



A6E7414W036

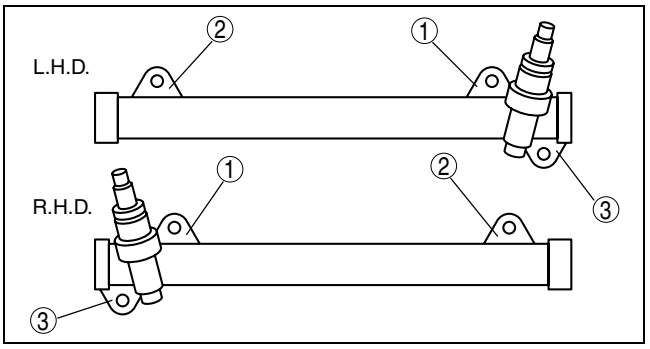
Crossmember component, steering gear and linkage removal note

Warning
- **Removing the crossmember is dangerous. The crossmember component could fall and cause serious injury or death. Verify that the jack securely supports the crossmember component before removing the crossmember bracket.**

1. Remove the crossmember component, steering gear and linkage.

Steering gear and linkage installation note
1. Loosely tighten bolts.
2. Tighten the mounting bracket bolts to the specified torque in the order shown.

Tightening torque
74.4—104.8 N·m
{7.6—10.6 kgf·m, 55—77 ft·lbf}



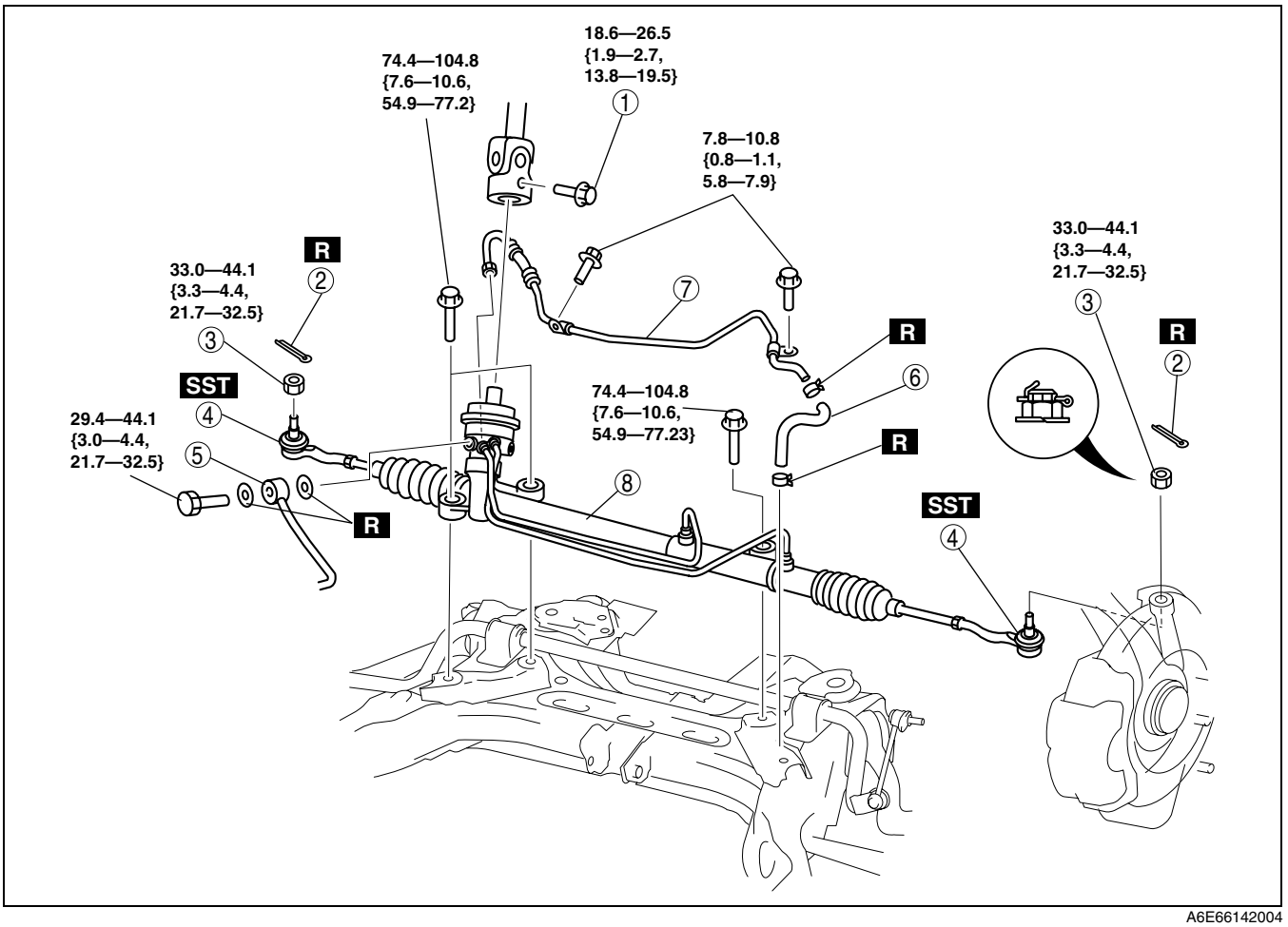
A6E0612W027

Bolt (intermediate shaft) installation note
1. Align the marks and install the intermediate shaft and bolt.

N

R.H.D.

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, inspect the toe-in.



A6E66142004

1	Bolt (intermediate shaft) (See N–10 Bolt (intermediate shaft) removal note) (See N–11 Bolt (intermediate shaft) installation note)
2	Cotter pin
3	Nut
4	Tie-rod end ball joint (See N–10 Tie-rod end ball joint removal note)

5	Pressure pipe
6	Return hose
7	Return pipe
8	Steering gear and linkage (See N–11 Steering gear and linkage installation note)

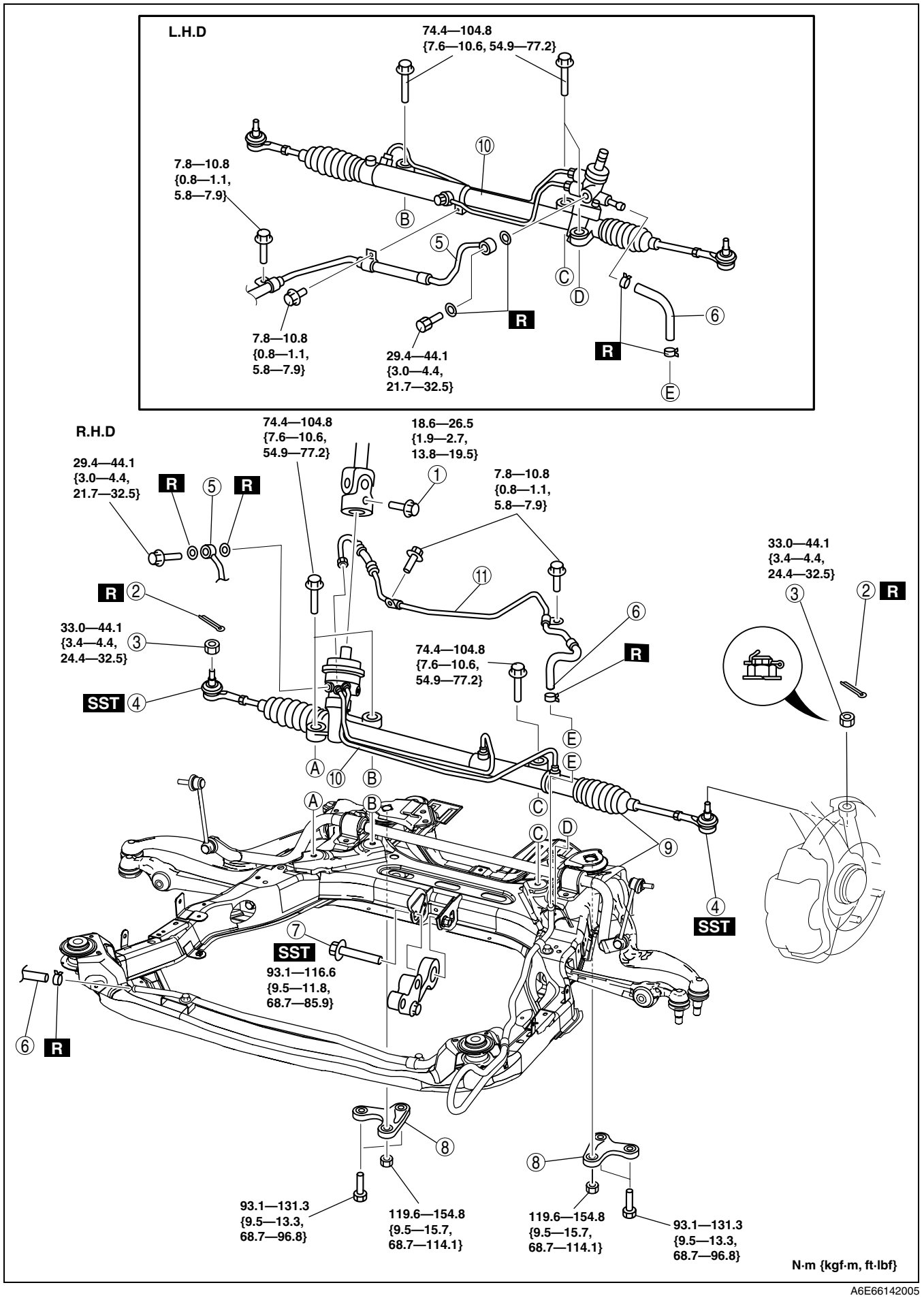
STEERING GEAR AND LINKAGE (4WD) REMOVAL/INSTALLATION

A6E661432960202

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 servicing the vehicle.**

1. Remove the under cover and mud guard. (Left side)
2. Remove the front auto leveling sensor.
3. Separate the stabilizer control link. (shock absorber side)
4. Separate the front lower arm (front and rear) ball joint.
5. Remove the shock absorber bolt. (lower side)
6. Remove in the order indicated in the table.
7. Install in the reverse order of removal.
8. Inspect the toe-in.
9. Adjust the headlight zeroset.

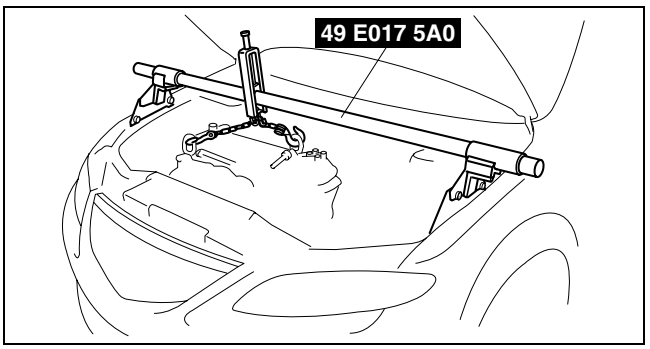


A6E66142005

1	Bolt (intermediate shaft) (See N–10 Bolt (intermediate shaft) removal note) (See N–11 Bolt (intermediate shaft) installation note)
2	Cotter pin
3	Nut (tie-rod end ball joint)
4	Tie-rod end ball joint (See N–10 Tie-rod end ball joint removal note)
5	Pressure pipe
6	Return hose
7	No.1 engine mount center bolt (See N–15 No.1 Engine Mount Center Bolt Removal Note)
8	Crossmember bracket (See N–11 Crossmember bracket removal note)
9	Crossmember component, steering gear and linkage (See N–11 Crossmember component, steering gear and linkage removal note)
10	Steering gear and linkage (See N–11 Steering gear and linkage installation note)

No.1 Engine Mount Center Bolt Removal Note

1. Suspend the engine using the **SST**.
2. Remove the No.1 engine mount center bolt.



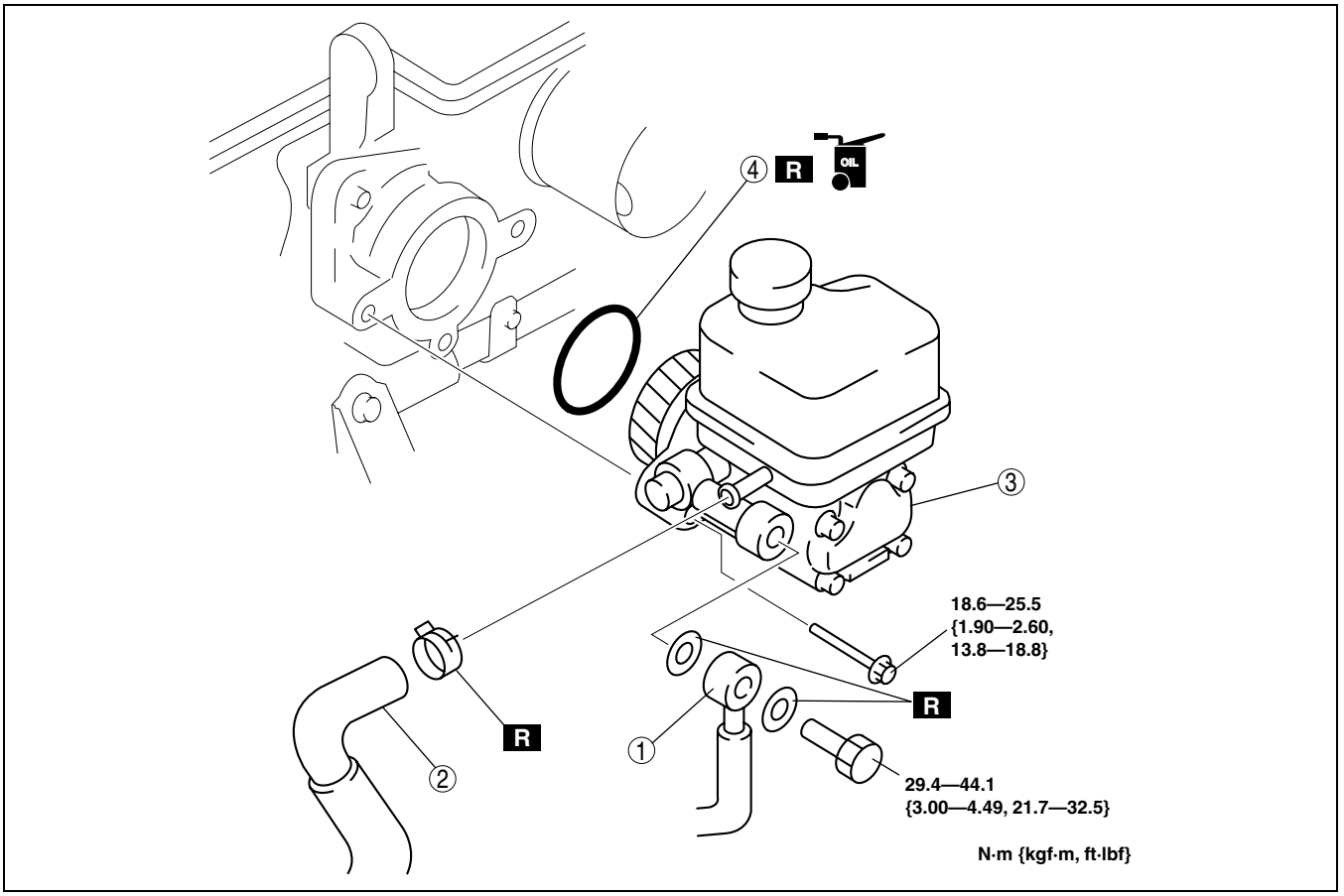
A6E7414W016

N

POWER STEERING OIL PUMP (MZR-CD (RF TURBO)) REMOVAL/INSTALLATION

A6E661432650201

1. Remove the air cleaner.
2. Remove the battery and battery tray.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.



A6E66142006

1	Pressure pipe	3	Power steering oil pump
2	Return hose	4	O-ring

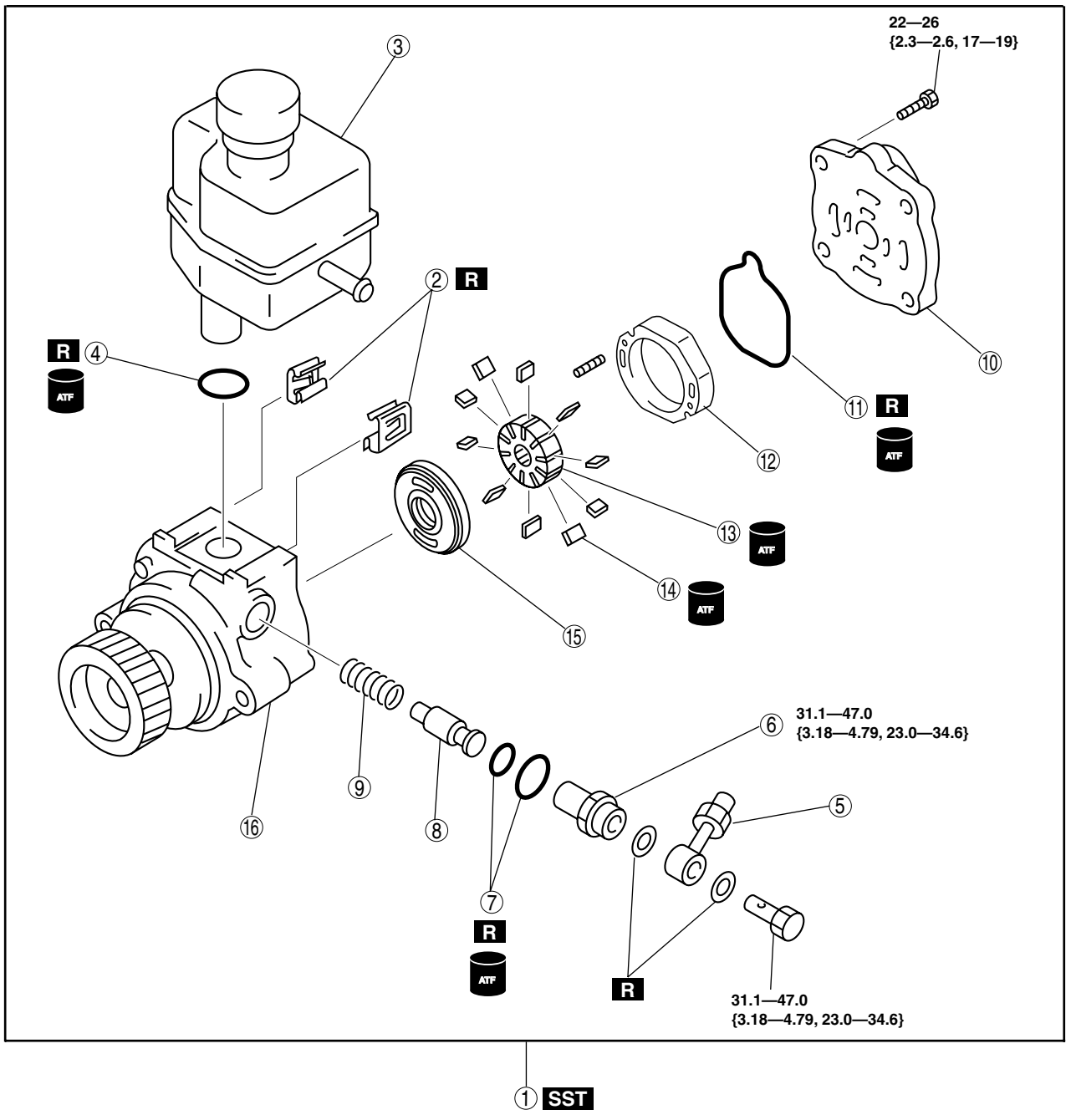
POWER STEERING OIL PUMP (MZR-CD (RF TURBO)) DISASSEMBLY/ASSEMBLY

A6E661432650202

Note

- The following procedure is for replacement of the O-ring and oil seal only. Replace the pump component if other repairs are necessary.

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



A6E66142007

1	Power steering oil pump component (See N–18 Power Steering Oil Pump Component Disassembly Note)
2	Clip (See N–18 Clip Disassembly Note) (See N–19 Clip Assembly Note)
3	Reservoir tank

4	O-ring
5	Joint
6	Connector
7	O-ring
8	Control valve
9	Spring

N

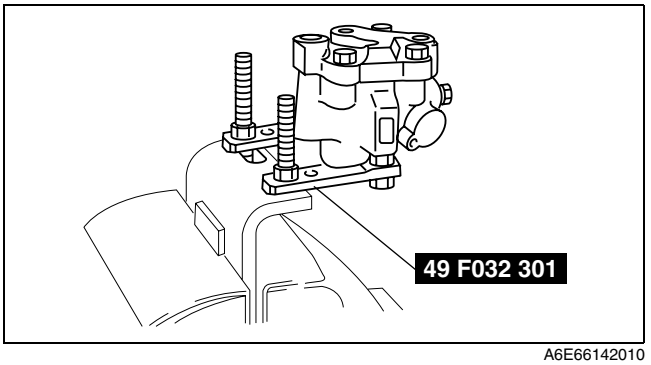
10	Rear pump body (See N–19 Rear Pump Body Assembly Note)
11	Gasket
12	Cam ring (See N–19 Cam Ring Assembly Note)
13	Rotor
14	Vane (See N–18 Vane Assembly Note)
15	Side plate
16	Power steering oil pump

Power Steering Oil Pump Component Disassembly Note

1. Secure the power pressure oil pump using the **SST**.

Caution

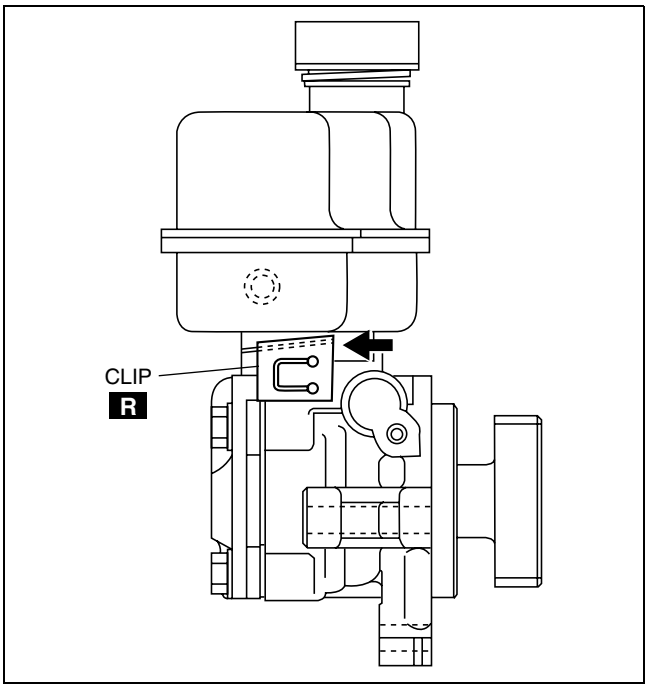
- **Use the SST to prevent damage to the pump when securing it in a vise.**



A6E66142010

Clip Disassembly Note

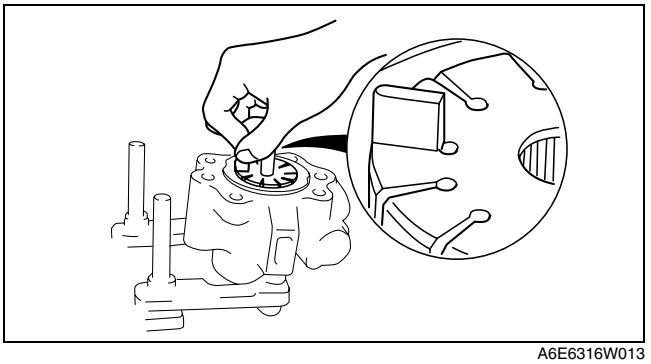
1. Lift up the clip tab using a flathead screwdriver.
2. Remove the clip by pushing it with a flathead screwdriver and a hammer as shown in the figure.



A6E66142008

Vane Assembly Note

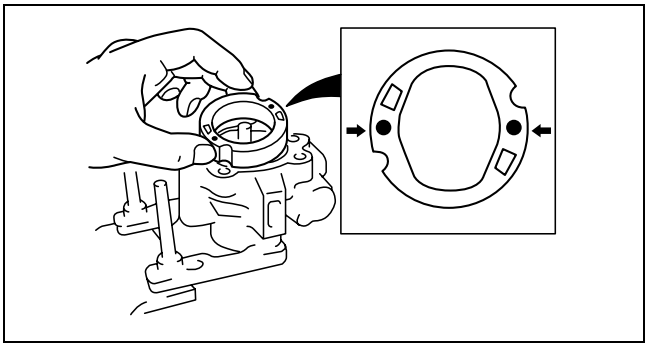
1. Place the vanes in the rotor with the rounded edges contacting the cam.



A6E6316W013

Cam Ring Assembly Note

1. Install the cam ring in the front pump body with the mark facing upward.



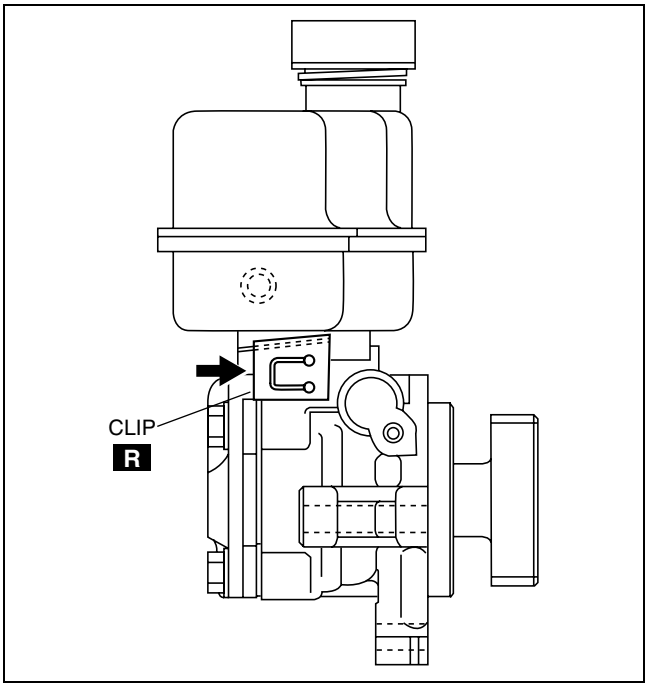
A6E6316W014

Rear Pump Body Assembly Note

1. After installing the rear body, manually turn the shaft to verify that it rotates smoothly.

Clip Assembly Note

1. Push the clip slowly in the direction shown in the figure.
2. Confirm that the clip tab is securely fastened.



A6E66142009

BRAKING SYSTEM

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E690201020201

- The construction and operation of the braking system is the same as that of the current Mazda6 (GG) L8, LF, L3 engine 2WD model, except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)

FEATURES

A6E690201020202

Modifications to match vehicle characteristics

- Due to the addition of the MZR-CD (RF Turbo) engine, the vacuum pump and vacuum switch have been added.
- Due to the addition of the 4WD model, DSC HU/CM uses the forward-G signal from combine sensor to control DSC.

SPECIFICATIONS

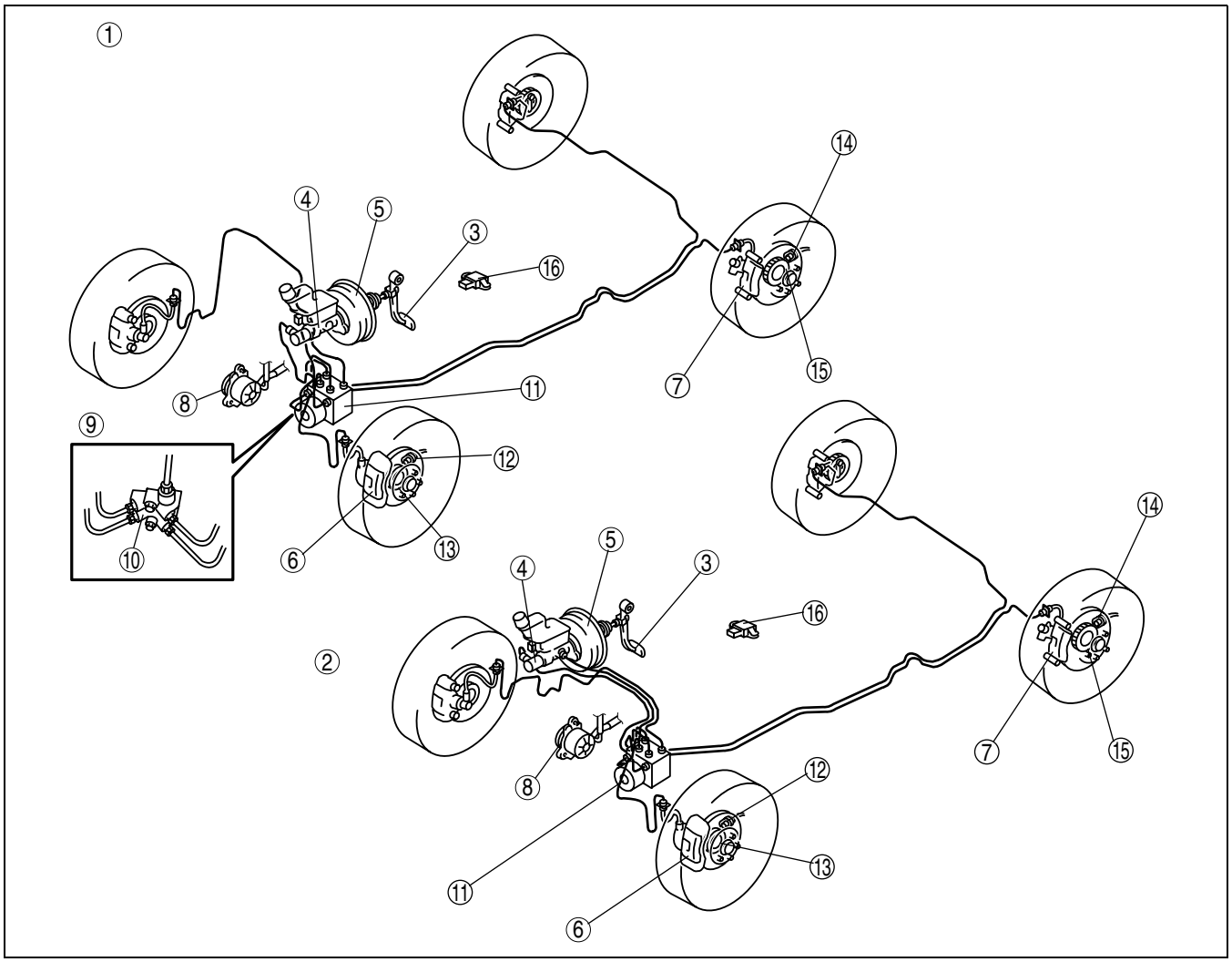
A6E690201020203

Item		Specification	
		New Mazda6 (GG, GW)	Current Mazda6 (GG)
Brake pedal	Type	Suspended	
	Pedal lever ratio	2.7	
	Max. stroke (mm {in})	128.5 {5.06}	
Master cylinder	Type	Tandem (with level sensor)	
	Cylinder diameter (mm {in})	20.64 {0.813}	
Front disc brake	Type	Ventilated disc	
	Cylinder bore (mm {in})	57.15 {2.250}	
	Pad dimensions (area × thickness) (mm^2 {in^2} × mm {in})	L8, LF (GCC specs.): 4,220 {6.75} × 10.0 {0.39} LF (European (L.H.D. U.K.) specs.), L3, MZR-CD (RF Turbo): 4,010 {6.42} × 12.0 {0.47}	L8, LF (GCC specs.): 4,220 {6.75} × 10.0 {0.39} LF (European (L.H.D. U.K.) specs.), L3: 4,010 {6.42} × 12.0 {0.47}
	Disc plate dimensions (outer diameter × thickness) (mm {in} × mm {in})	L8, LF (GCC specs.): 274 {10.8} × 24.0 {0.945} LF (European (L.H.D. U.K.) specs.), L3, MZR-CD (RF Turbo): 283 {11.1} × 25.0 {0.984}	L8, LF (GCC specs.): 274 {10.8} × 24.0 {0.945} LF (European (L.H.D. U.K.) specs.), L3: 283 {11.1} × 25.0 {0.984}
Rear brake (disc)	Type	Solid disc	
	Cylinder bore (mm {in})	34.93 {1.375}	
	Pad dimensions (area × thickness) (mm^2 {in^2} × mm {in})	2,810 {4.51} × 8.0 {0.31}	
	Disc plate dimensions (outer diameter × thickness) (mm {in})	280 {11.0} × 10.0 {0.39}	
Power brake unit	Type	Vacuum multiplier, single diaphragm	
	Diameter (mm {in})	279 {10.9}	
Braking force control device	Type	With ABS: EBD (Electronic Brakeforce Distribution) Without ABS: Dual proportioning valve	
Parking brake	Type	Mechanical two-rear-wheel control	
	Operation system	Center lever type	
Brake fluid	Type	European (L.H.D. U.K.) specs.: SAE J1703, FMVSS116 DOT3 OR DOT4 GCC specs.: SAE J1703, FMVSS116 DOT3	

Bold frames: New specifications

STRUCTURAL VIEW

A6E690201020204



A6E6902W201

1	L.H.D.
2	R.H.D.
3	Brake pedal
4	Master cylinder
5	Power brake unit
6	Front brake (disc)
7	Rear brake (disc)
8	Vacuum pump

9	Without ABS
10	Dual proportioning valve
11	ABS (ABS/TCS) or DSC HU/CM
12	ABS wheel-speed sensor (front)
13	ABS sensor rotor (front)
14	ABS wheel-speed sensor (rear)
15	ABS sensor rotor (rear)
16	Combine sensor

P

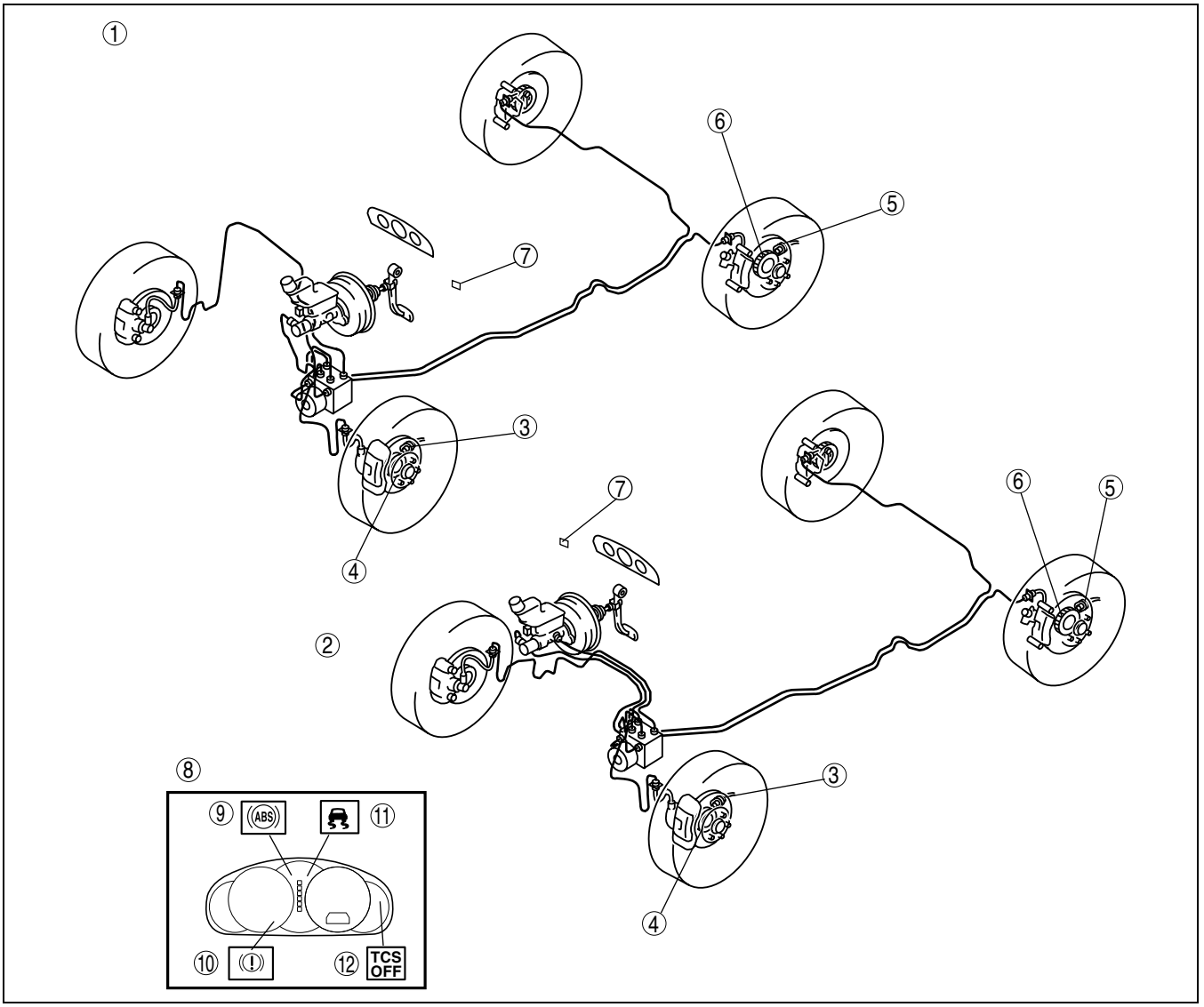
ABS/TCS

OUTLINE

A6E692146444201

- The construction and operation of ABS (ABS/TCS) is the same as that of the current Mazda6 (GG) L8, LF, L3 engine 2WD model, except for the following. (See Mazda6 Training Manual 3359-1*-02C.)
  — Due to adoption of TCM, ABS (ABS/TCS) HU/CM sends 4-wheel speed signal to the TCM through CAN.

Structural View

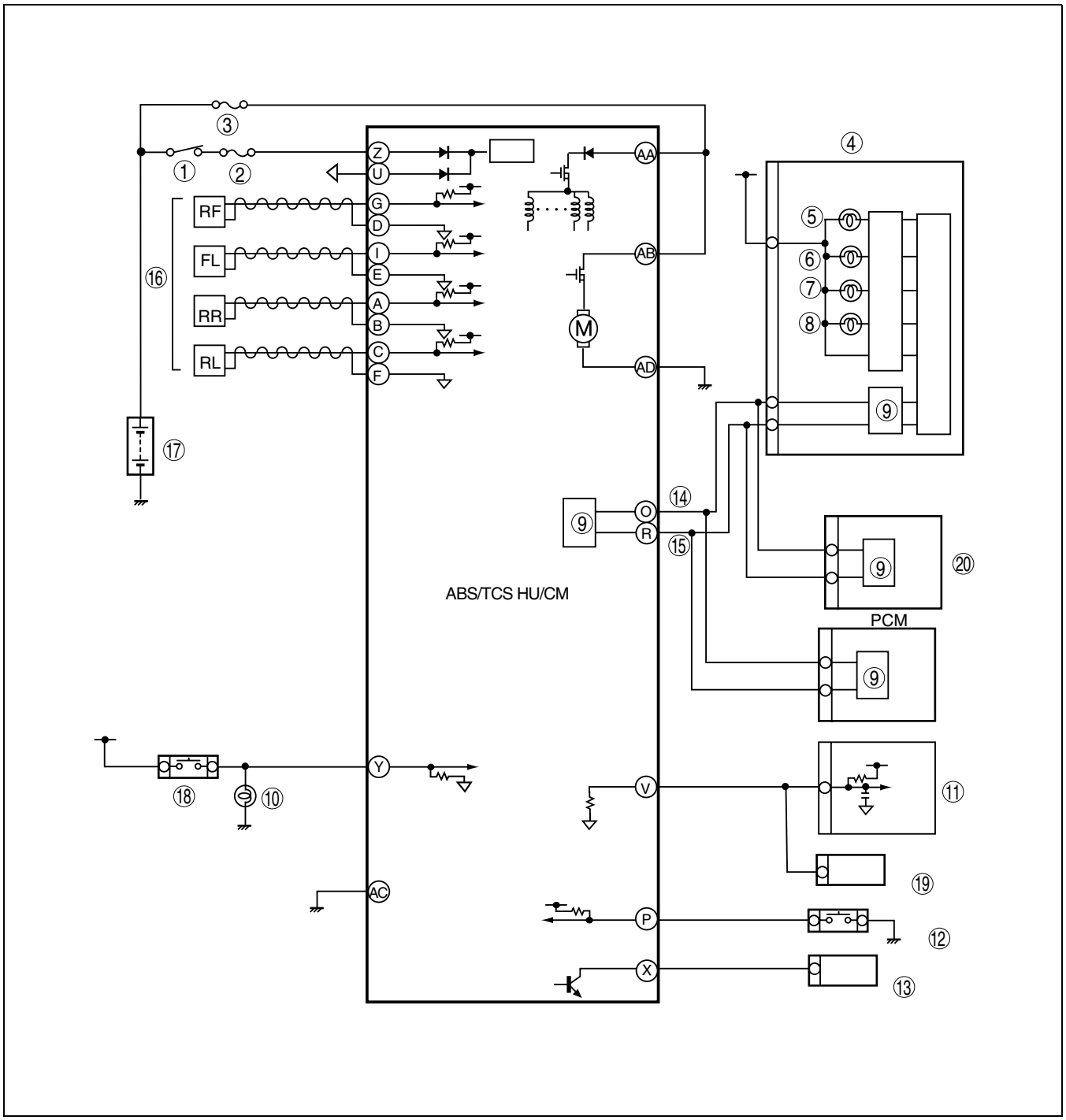


A6E6916W201

1	L.H.D.
2	R.H.D.
3	ABS wheel-speed sensor (front)
4	ABS sensor rotor (front)
5	ABS wheel-speed sensor (rear)
6	ABS sensor rotor (rear)

7	TCS OFF switch
8	Instrument cluster
9	ABS warning light
10	Brake system warning light
11	TCS indicator light
12	TCS OFF light

System Diagram



A6E6921W201

1	IG switch
2	SUS 15 A fuse
3	ABS 60 A fuse
4	Meter
5	ABS warning light
6	Brake system warning light
7	TCS OFF light
8	TCS indicator light
9	CAN driver
10	Brake light

11	Cruise actuator
12	TCS OFF switch
13	DLC-2
14	CAN-H
15	CAN-L
16	ABS Wheel-speed sensor
17	Battery
18	Brake switch
19	Audio unit, Wiper and washer switch, Car-navigation unit, Auto leveling control unit
20	TCM, 4WD CM

P

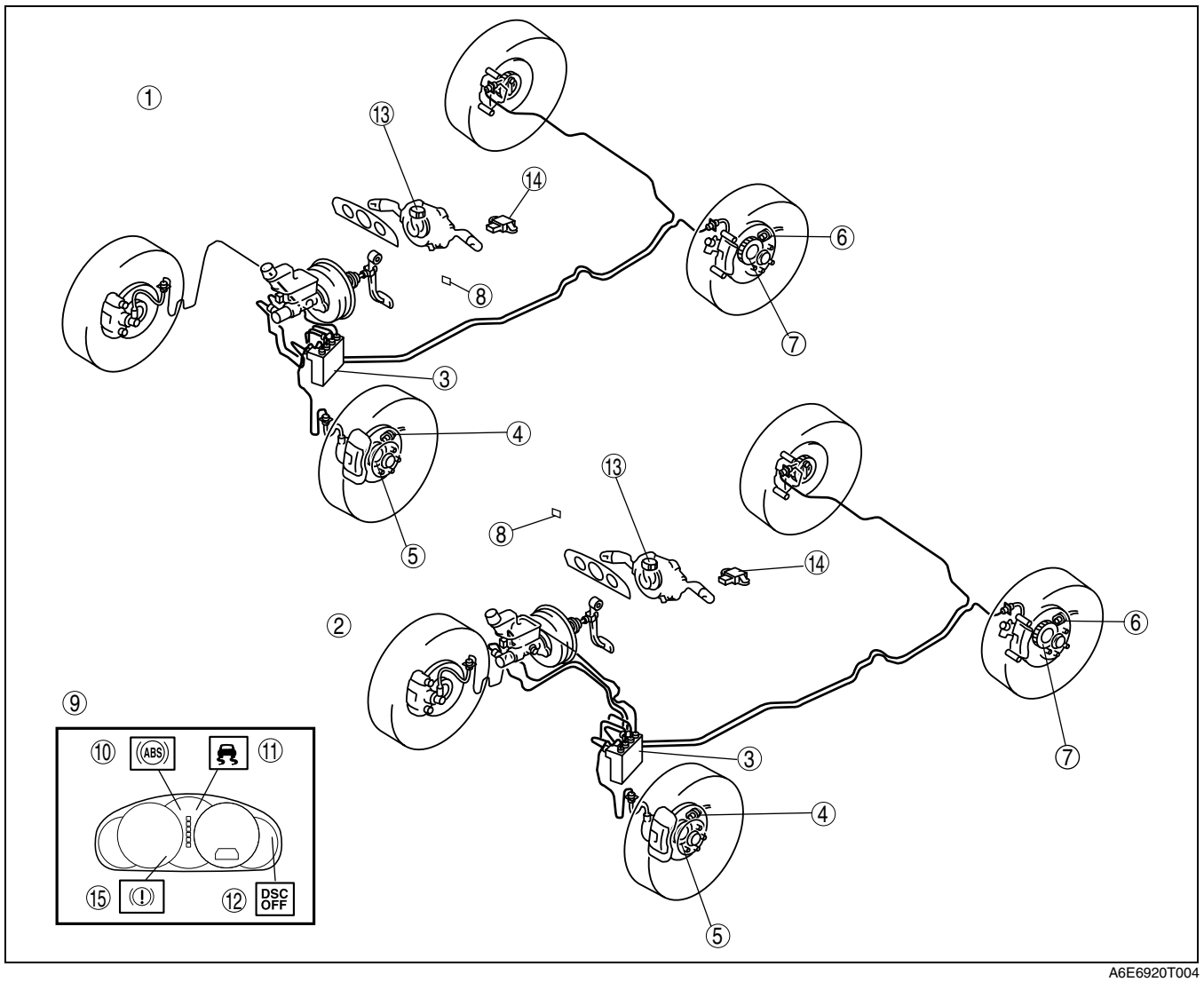
DYNAMIC STABILITY CONTROL

OUTLINE

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- The construction and operation of DSC is the same as that of the current Mazada6 2WD model, except for the following:
  - — Due to the addition the 4WD model, DSC HU/CM uses the foward-G signal from the combine sensor to control DSC.
  - — Due to adoption of the 4WD CM, DSC HU/CM sends a coupling torque request, a 4-wheel speed, and DSC operation condition signal to the 4WD CM through CAN.
  - — Due to the adoption of TCM, DSC HU/CM sends a 4-wheel speed signal to the TCM through CAN.

Structural view

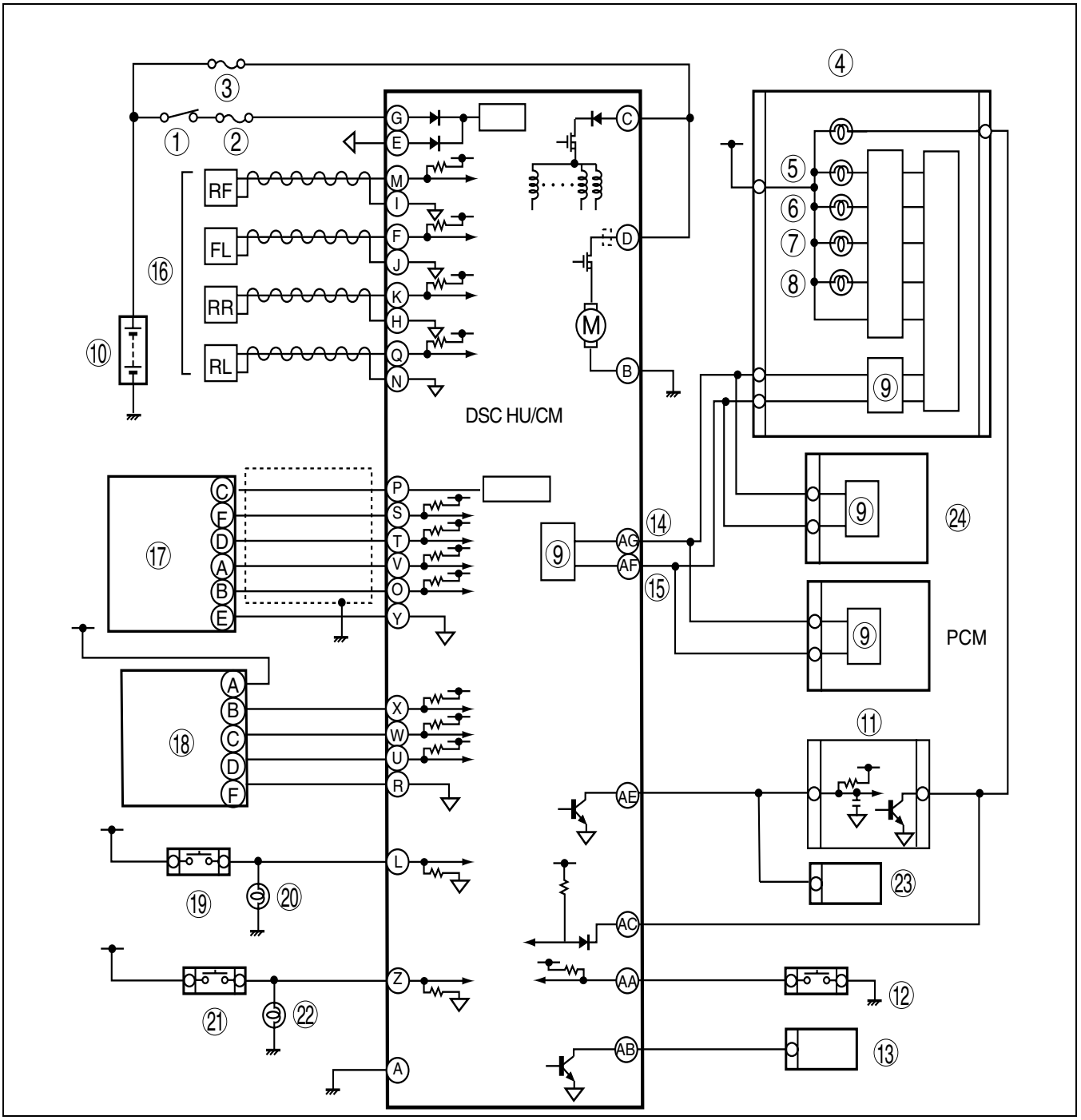


A6E6920T004

1	L.H.D.
2	R.H.D.
3	DSC HU/CM
4	Wheel-speed sensor (front)
5	Sensor rotor (front)
6	Wheel-speed sensor (rear)
7	Sensor rotor (rear)
8	DSC OFF switch

9	Instrument cluster
10	ABS warning light
11	DSC indicator light
12	DSC OFF light
13	Steering angle sensor
14	Combine sensor
15	Brake system warning light

Wiring Diagram



A6E6921W203

1	IG switch
2	SUS 15A fuse
3	ABS 60 A fuse
4	Meter
5	ABS warning light
6	Brake system warning light
7	DSC OFF light
8	DSC indicator light
9	CAN driver
10	Battery
11	Cruise actuator
12	DSC OFF switch

13	DLC-2
14	CAN-H
15	CAN-L
16	Wheel-speed sensor
17	Combine sensor
18	Steering angle sensor
19	Brake switch
20	Brake light
21	Back-up light switch (MTX only)
22	Back-up light (MTX only)
23	Audio unit, Wiper and washer switch, Car-navigation unit, Auto leveling control unit
24	TCM, 4WD CM

COMBINE SENSOR (FORWARD-G SENSOR)

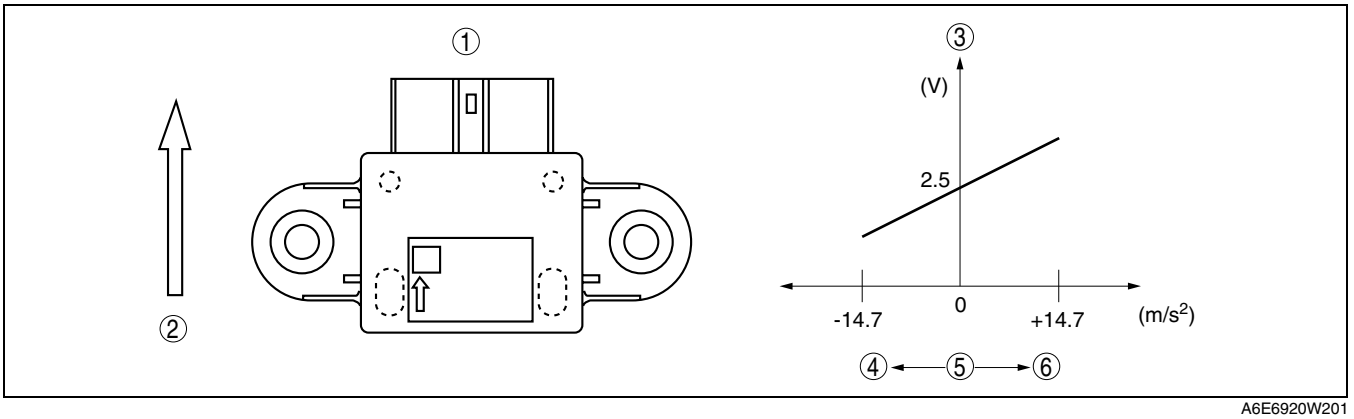
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Function

- The forward-G sensor is integrated with the combine sensor to detect and calculate the vehicle forward-G force and change in voltage to the DSC HU/CM.

Structure/Operation

- The drive train of 4WD vehicles delivers driving force to all four wheels, and due to this interlocking, the speed of all wheels during braking is the same. When driving on road surfaces with especially low m (friction coefficient), it is difficult to estimate the vehicle speed based on the wheel speed, and DSC braking becomes unreliable. (For 2WD vehicles, the front and rear wheels are independent, so it is possible to accurately estimate the vehicle speed by measuring the difference between the rotation speeds of the front and rear tires.) A forward-G sensor has been installed to overcome this situation. When braking, the change in G-force is detected, and the road surface m is judged (low m, high m), enabling a correction of the vehicle speed estimation.
- The output voltage characteristic for the combine sensor is 2.5 V when the vehicle is standing still, and changes accordingly as forward-G is formed.
- Forward-G is formed when the sensor detects an inertial force created by, and in proportion to, a G- force acting on a silicon detection component.



A6E6920W201

1	External view
2	Front of vehicle
3	Output voltage characteristic

4	Deceleration
5	Forward-G
6	Acceleration

CONTROLLER AREA NETWORK (CAN)

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- ABS (ABS/TCS) or DSC HU/CM transmit/receive information through CAN. Due to the addition of TCM, 4WD CM, and the MZR-CD (RF Turbo) engine model, the following information has been changed. For detailed information on CAN, see the “CONTROLLER AREA NETWORK.” (See T–3 OUTLINE.)

Transmitted Information

- Coupling torque request (to 4WD CM)
- DSC operating condition (to 4WD CM)

Received Information

- Coupling torque (from 4WD CM)
- Shift position (from TCM)
- Fuel injection information (only MZR-CD (RF Turbo), from PCM)

ON-BOARD DIAGNOSTIC

OUTLINE

A6E697043000201

- The operation of the on-board diagnostic system for ABS (ABS/TCS) or DSC is the same as that of the current Mazda6 (GG) L8, LF, L3 engine 2WD model, except for the following. (See Mazda6 Training Manual 3359-1*-02C.)
  - — Due to the addition of the 4WD model, DTCs and PID data monitor has been added.
  - — Due to the addition of the MZR-CD (RF Turbo) engine model, the DTC C1119 fail-safe function and the detection condition have been changed.

Fail-safe Function

Fail-safe function table

Malfunction location	DTC	Fail-safe function								
		Warning light illumination condition				Control condition				
	WDS or equivalent	ABS warning light	BRAKE system warning light (when parking brake is released)	DSC (TCS) OFF light	DSC (TCS) indicator light	ABS control	EBD control	TCS control	DSC control	Brake assist control
PCM and/or engine speed signal line	C1119	Not Illuminated	Not Illuminated	Not Illuminated *1	Illuminated	Available	Available	Available *2, *3, *4	Available *2, *5, *6	Available
Combine sensor (forward-G) line	C1949	Illuminated	Not Illuminated	Illuminated	Illuminated	Not available	Available	—	Not available	Not available
	C1950									
CAN line	U2511	Not Illuminated	Not Illuminated	Not Illuminated	Illuminated	Available	Available	—	Available	Available

*1 : When engine speed signal through CAN is out of specification, the light illuminates.
*2 : When engine speed signal through CAN is out of specification, the system is suspended.
*3 : When engine speed signal value through CAN is invalid, only brake TCS is available.
*4 : When fuel injection information through CAN is out of specification or invalid, only brake TCS is available.
*5 : When engine speed signal value through CAN is invalid, only brake DSC is available.
*6 : When the engine control system has a malfunction, only brake DSC is available.

P

PID/DATA Monitor Table

PID name	input/output part	Operation/unit
ACCLMTR	Accelerometer	ACCELERATION

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E690201020205

- The following changes have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Power brake unit
- Removal/installation procedure has been modified.

Vacuum switch (MZR-CD (RF Turbo))
- Inspection procedure has been added.
- Removal/installation procedure has been added.

Vacuum pump (MZR-CD (RF Turbo))
- Inspection procedure has been added.
- Removal/installation procedure has been added.

Front brake (disc)
- Inspection procedure has been modified.
- Removal/installation procedure has been modified.

Disc pad (front)
- Replacement procedure has been modified.

Parking brake (lever type)
- Adjustment procedure has been modified.

DSC HU/CM
- Inspection procedure has been modified.

Combine sensor (Forward-G sensor)
- Inspection procedure has been modified.

On-board diagnostic (ABS/TCS)
- 4WD and MZR-CD (RF Turbo) have been added.

GENERAL PROCEDURES

PRECAUTION (BRAKES)

A6E691001020201

Wheels and Tires Removal/Installation

1. The removal and installation procedures for the wheels and tires are not mentioned in this section. When a wheel is removed, tighten it to **88—118 N·m {9.0—12.0 kgf·m, 65.0—87.0 ft·lbf}**.

Brake Lines Disconnection/Connection

Caution
- **Brake fluid will damage painted surfaces. If brake fluid does get on a painted surface, wipe it off immediately.**

1. Tighten the brake pipe flare nut using the **SST** (49 0259 770B). Be sure to modify the brake pipe flare nut tightening torque to allow for use of a torque wrench-**SST** combination.
   - If any brake line has been disconnected anytime during the procedure, add brake fluid, bleed the brakes, and inspect for leakage after the procedure has been completed.

Connectors Disconnection

1. Disconnect the negative battery cable before doing any work that requires handling of connectors. Reconnect the negative battery cable only after the work is completed.

ABS, ABS/TCS, or DSC Components Operations

1. Make sure that there are no DTCs in the ABS, ABS/TCS, or DSC memory after working on ABS, ABS/TCS or DSC components.
   - If there are any DTCs in the memory, clear them.

CONVENTIONAL BRAKE SYSTEM

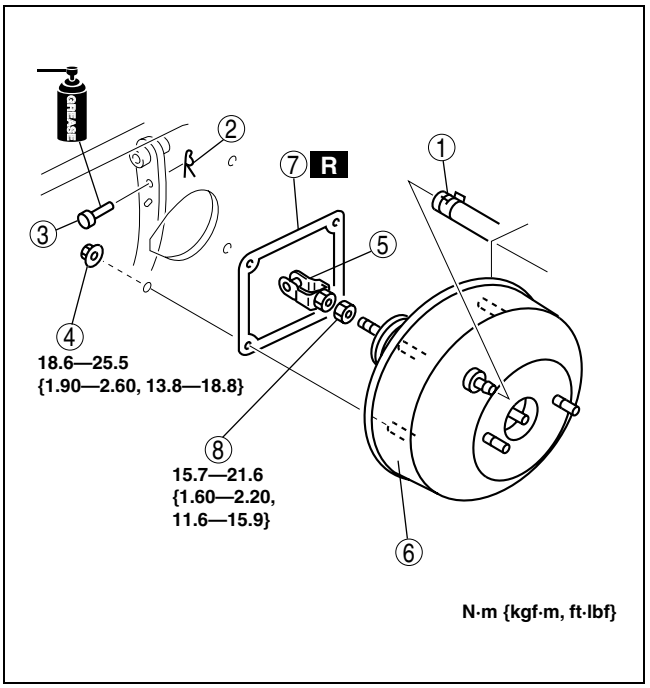
POWER BRAKE UNIT REMOVAL/INSTALLATION

A6E691243800201

1. Remove the master cylinder.
2. Remove the wiper arm.
3. Remove the cowl grille.
4. Remove the wiper motor.
5. Remove the cowl panel.
6. For L.H.D. and R.H.D. (MZR-CD (RF Turbo) only), remove the A/C bracket.
7. For L.H.D., remove the ABS (ABS/TCS) HU/CM or DSC HU/CM.
8. For R.H.D. (except MZR-CD (RF Turbo)), remove the alternator cover.
9. For R.H.D. (except MZR-CD (RF Turbo)), remove the insulator.
10. For R.H.D. (except MZR-CD (RF Turbo)), remove the vacuum pipe bracket.
11. Remove in the order indicated in the table.

1	Vacuum hose
2	Snap pin
3	Clevis pin
4	Nut
5	Fork
6	Power brake unit
7	Gasket
8	Nut

12. Install in the reverse order of removal.

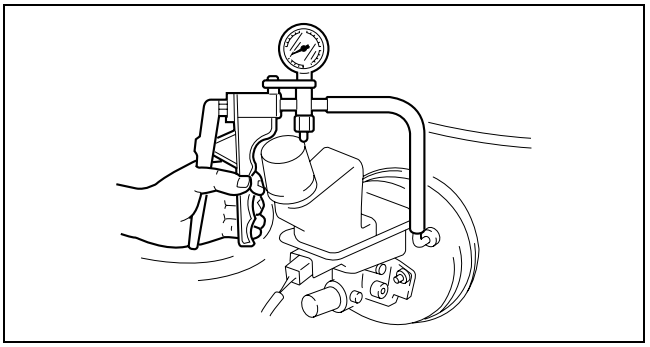


A6E6912W044

VACUUM SWITCH INSPECTION (MZR-CD (RF TURBO))

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1. Remove the vacuum hose from the power brake unit.
2. Set the vacuum pump (any commercially available model) onto the power brake unit as shown.
3. Turn the ignition switch to ON.
4. Release the parking brake.
5. Apply vacuum to the power brake unit using the vacuum pump (any commercially available model) and verify the operating condition of the brake warning light. The vacuum switch is functioning normally if it corresponds to the above specifications.
   - If not as specified, replace the vacuum switch.



A6E6912W204

Vacuum kPa {mm Hg, inHg}	Brake warning light
Below 10.7±2.7 {80±20, 3.1±0.8}	ON
Above 10.7±2.7 {80±20, 3.1±0.8}	OFF

P

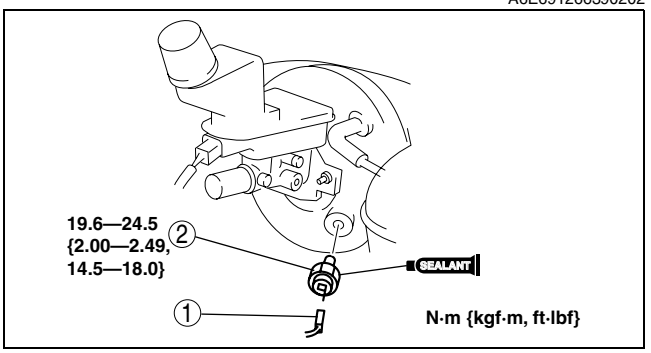
VACUUM SWITCH REMOVAL/INSTALLATION (MZR-CD (RF TURBO))

A6E691266390202

1. Remove in the order indicated in the table.

1	Connector
2	Vacuum switch (See P–12 Vacuum Switch Installation Note)

2. Install in the reverse order of removal.



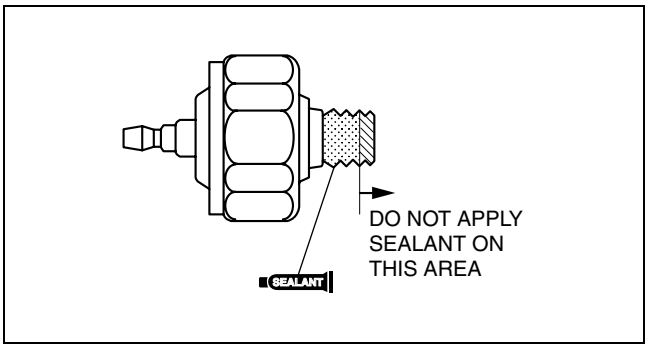
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Vacuum Switch Installation Note

Caution

- **Do not apply sealant to the lip of the vacuum switch as it may cause a malfunction to occur.**

1. Apply sealant to the new vacuum switch in the area shown in the figure.



A6E6912W206

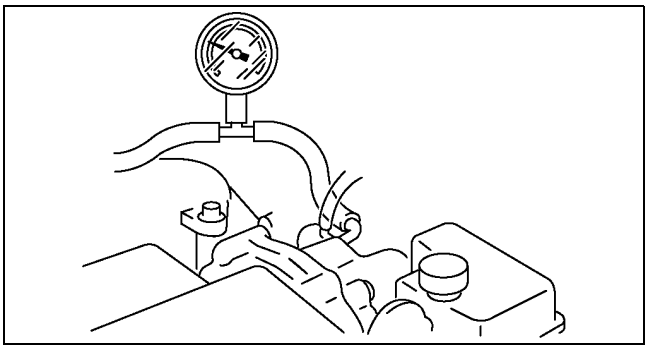
VACUUM PUMP INSPECTION (MZR-CD (RF TURBO))

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1. Warn up the engine.
2. Disconnect the vacuum hose from the vacuum pump and connect a vacuum gauge as shown in the figure, then check the vacuum.
   - If the pressure is less than the specification, inspect for the following.
     — Malfunction of the vacuum pump
     — Shortage of the lubrication oil pressure

Vacuum specification (In 8 seconds)
Engine speed 1,270 rpm:
66.6 kPa {500 mmHg, 19.7 inHg}

Maximum vacuum
Engine speed 2,450 rpm:
93.3 kPa {700 mmHg, 27.6 inHg}



AME6912W006

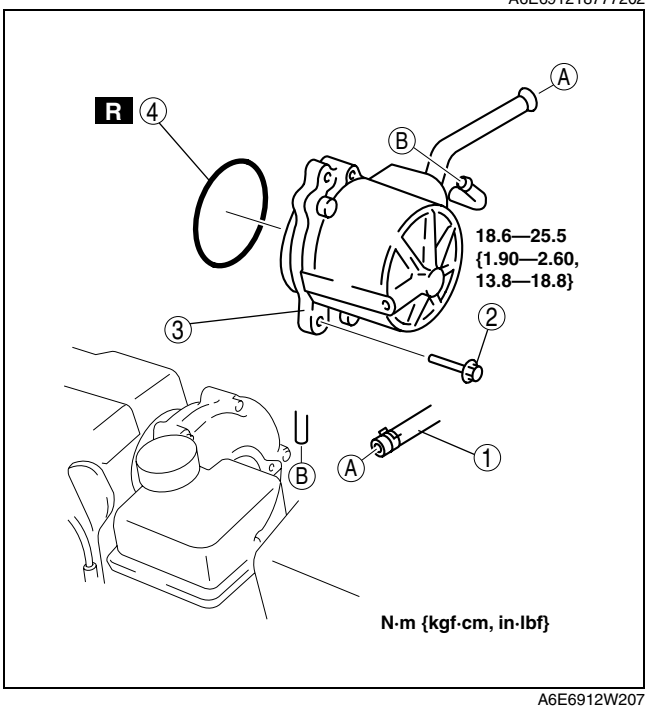
VACUUM PUMP REMOVAL/INSTALLATION (MZR-CD (RF TURBO))

A6E691218777202

1. Remove in the order indicated in the table.

1	Vacuum hose
2	Bolt
3	Vacuum pump (See P–13 Vacuum Pump Installation Note)
4	O-ring

2. Install in the reverse order of removal.



A6E6912W207

Vacuum Pump Installation Note

1. Be careful the O-ring is not pinched when installing the vacuum pump.

FRONT BRAKE (DISC) INSPECTION

A6E691233980201

Disc Plate Thickness Inspection

Caution

- **Excessive runout may result if the disc plate is removed from the vehicle then machined. Machine the disc plate while installed on the vehicle.**

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.

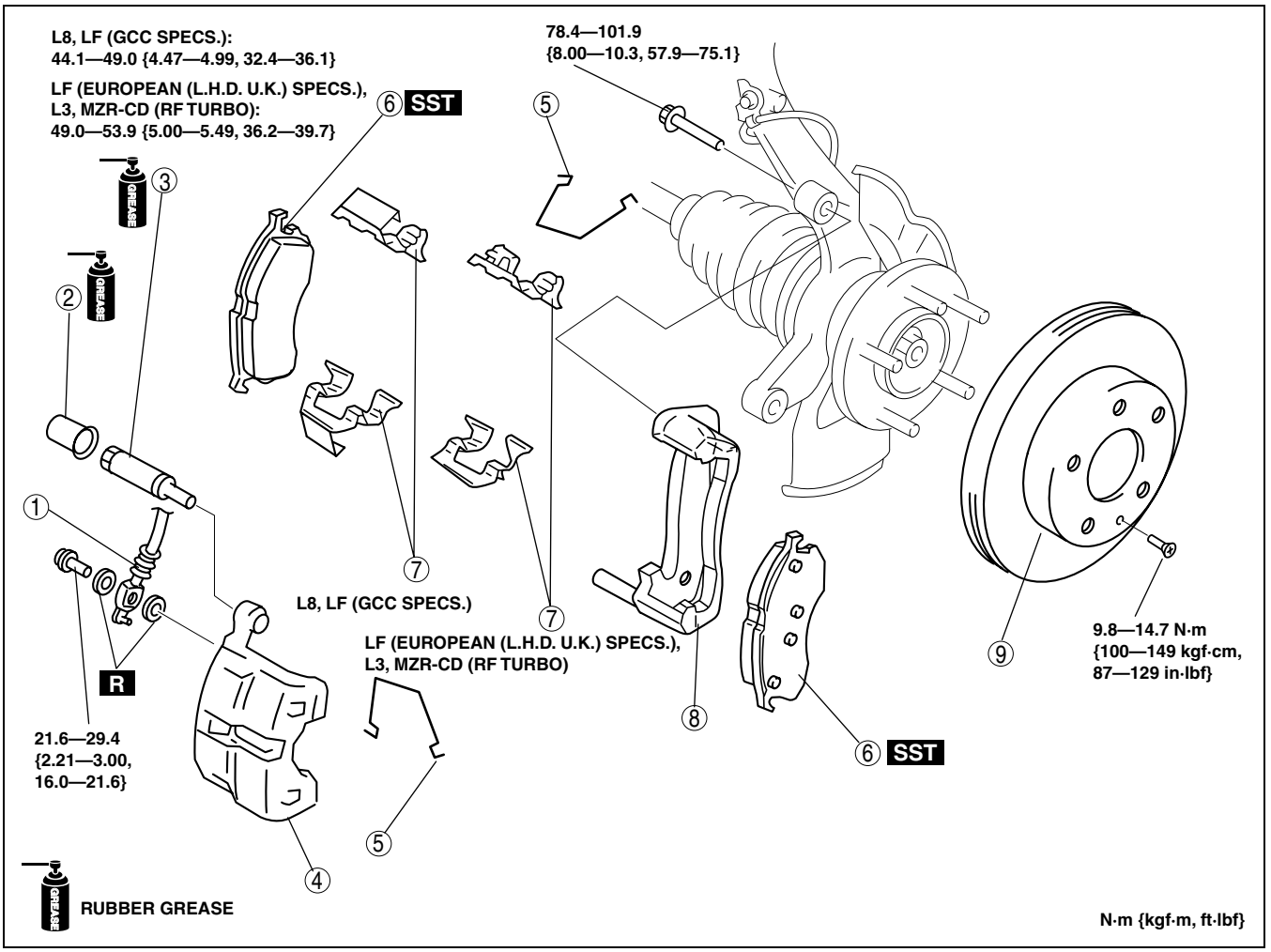
Minimum
L8, LF (GCC specs.):
22 mm {0.87 in}
LF (European (L.H.D. U.K.) specs.),
L3, MZR-CD (RF Turbo):
23 mm {0.91 in}
Minimum thickness after machining using a brake lathe on-vehicle
L8, LF (GCC specs.):
22.8 mm {0.90 in}
LF (European (L.H.D. U.K.) specs.),
L3, MZR-CD (RF Turbo):
23.8 mm {0.94 in}

P

FRONT BRAKE (DISC) REMOVAL/INSTALLATION

A6E691233980202

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.



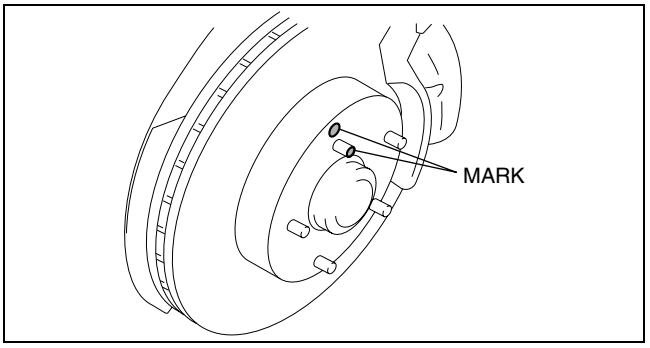
A6E6912W201

1	Flexible hose
2	Cap
3	Guide pin
4	Caliper
5	M-spring

6	Disc pad (See P–15 Disc Pad Installation Note)
7	Guide plate
8	Mounting support
9	Disc plate (See P–15 Disc Plate Removal Note) (See P–15 Disc Plate Installation Note)

Disc Plate Removal Note

1. Mark the wheel hub bolt and disc plate before removal for reference during installation.



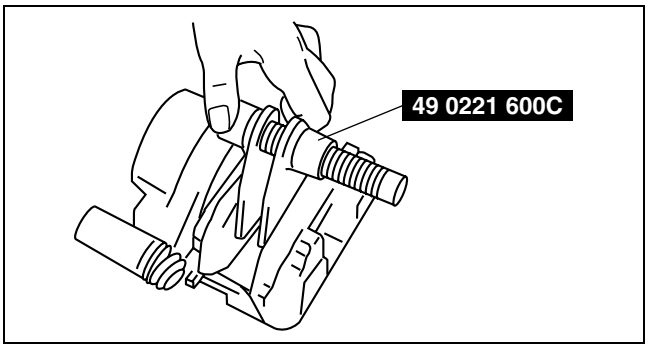
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Disc Plate Installation Note

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.

Disc Pad Installation Note

1. Push the piston fully inward using the **SST**.
2. Install the disc pad.



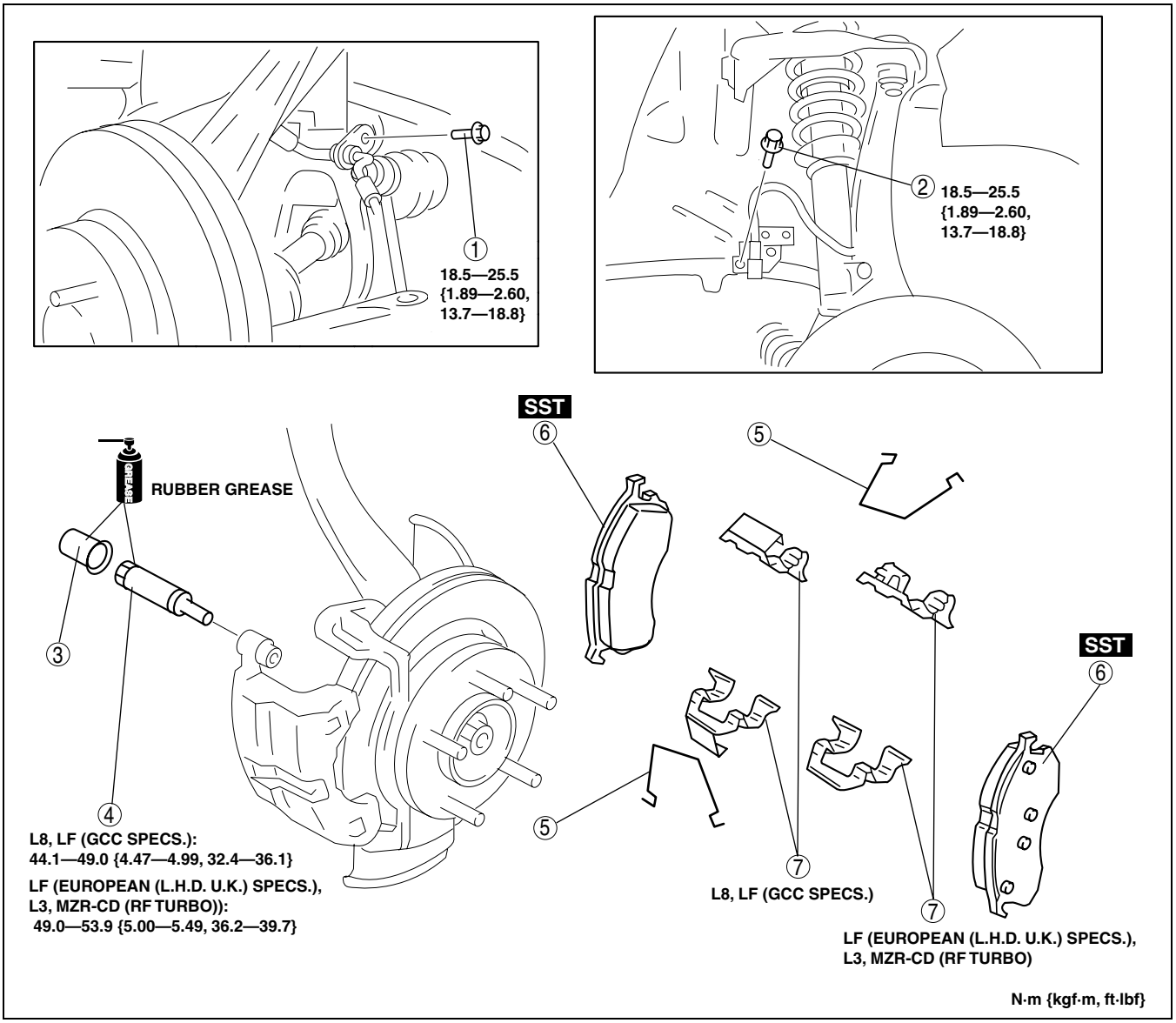
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P

DISC PAD (FRONT) REPLACEMENT

A6E691233630201

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



A6E6912W203

1	Bolt
2	Bolt
3	Cap
4	Guide pin

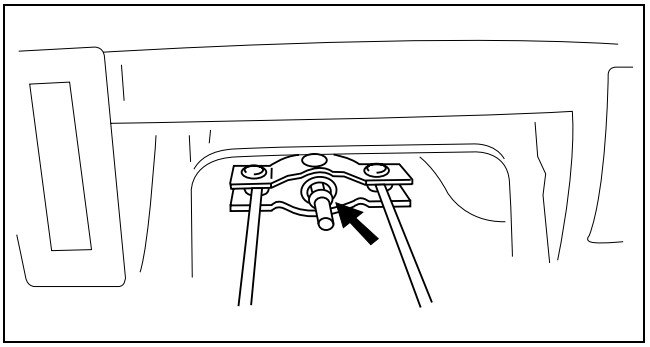
5	M-spring
6	Disc pad (See P–15 Disc Pad Installation Note)
7	Guide plate

PARKING BRAKE SYSTEM

PARKING BRAKE (LEVER TYPE) ADJUSTMENT

A6E691444000201

1. Start the engine and depress the brake pedal several times.
2. Stop the engine.
3. For the 2WD model, remove the rear ashtray case behind the center console
4. For the 4WD model, remove the 4 screws (back side) and pull up the rear of the center console, then remove the rear ashtray case.
5. Turn the adjusting nut as shown in the figure.
6. After adjustment, inspect the following points:
   (1) Turn the ignition switch to ON, pull the parking brake lever one notch, and verify that the parking brake warning light illuminates.
   (2) Verify that the rear brakes do not drag.



A6E6914W002

DYNAMIC STABILITY CONTROL

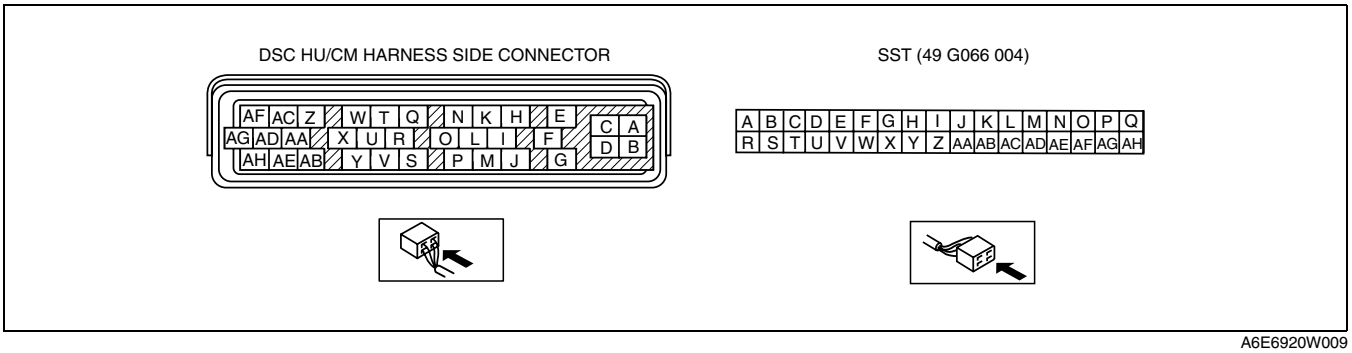
DSC HU/CM INSPECTION

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1. Remove the battery and battery bracket.
2. Disconnect the DSC HU/CM connector.
3. Connect the **SST** (49 G066 004) to the DSC HU/CM connector and harness side connector.
4. Inspect voltage referring the table below.

Terminal Voltage Table (reference value)

(Ignition switch is at ON, and connector is connected unless indicated otherwise)



A6E6920W009

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
A	Ground (1)	Ground part 1	—	Below 1.0	• Inspect related harness
B	Ground (2)	Ground part 2	—	Below 1.0	• Inspect related harness
C	Solenoid valve (power supply)	Battery	—	B+	• Inspect DSC HU/CM • Inspect related harness
D	Pump motor (power supply)	Battery	—	B+	• Inspect DSC HU/CM • Inspect related harness
E*	—	Check connector	—	No need to check	• Inspect related harness
F J	LF wheel-speed	LF wheel-speed sensor	Vehicle is stopped	0 (AC)	• Inspect related harness • Inspect wheel-speed sensor
			• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
K H	RR wheel-speed	RR wheel-speed sensor	Vehicle is stopped	0 (AC)	• Inspect related harness • Inspect wheel-speed sensor
			• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		
M I	RF wheel-speed	RF wheel-speed sensor	Vehicle is stopped	0 (AC)	• Inspect related harness • Inspect wheel-speed sensor
			• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		
Q N	LR wheel-speed	LR wheel-speed sensor	Vehicle is stopped	0 (AC)	• Inspect related harness • Inspect wheel-speed sensor
			• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		
G	Battery (IG)	Ignition switch	Ignition switch ON	B+	• Inspect related harness • Inspect ignition switch
L	Brake switch	Brake switch	When brake pedal is depressed	10—14	• Inspect related harness • Inspect brake switch
O	Lateral-G (lateral-G signal)	Combine sensor	Vehicle is stopped	2.2—2.8	• Inspect related harness • Inspect combine sensor
			Left cornering	Fluctuation between 2.5—4.0 V	
			Right cornering	Fluctuation between 1.0—2.5 V	
P	Combine sensor power output	Combine sensor	Ignition switch ON	4.75—5.25	• Inspect related harness • Inspect combine sensor
R	Steering angle (ground)	Steering angle sensor	—	Below 1.0	• Inspect related harness • Inspect steering angle sensor
S	Combine sensor	Combine sensor	—	3.5—5.0	• Inspect related harness • Inspect combine sensor
T	Yaw rate (yaw rate signal)	Combine sensor	Vehicle is stopped	2.2—2.8	• Inspect related harness • Inspect yaw rate sensor
			Right cornering	Fluctuation between 2.5—4.62 V	
			Left cornering	Fluctuation between 2.5—0.33 V	
U	Steering angle (neutral signal)	Steering angle sensor	Steering position: center position 25°—29°	Below 1.0	• Inspect related harness • Inspect steering angle sensor
			Except above condition	Approx. 4	
V	Forward-G (forward-G signal)	Combine sensor	Vehicle is stopped	2.2—2.8	• Inspect related harness • Inspect combine sensor
			Acceleration	Fluctuation between 2.5—4.0 V	
			Deceleration	Fluctuation between 1.0—2.5 V	
W	Steering angle (steering angle signal 2)	Steering angle sensor	• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		• Inspect related harness • Inspect steering angle sensor
X	Steering angle (steering angle signal 1)	Steering angle sensor	• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		• Inspect related harness • Inspect steering angle sensor
Y	Combine sensor (ground)	Combine sensor	—	Below 1.0	• Inspect related harness • Inspect combine sensor
AA	DSC OFF switch	DSC OFF switch	When switch is pressed	Below 1.0	• Inspect related harness • Inspect DSC OFF switch
			When switch is not pressed	B+	
AB	OBD	KLN terminal of DLC-2	It cannot be determined with terminal voltage whether the condition is good or bad because advanced function diagnostic output is performed with serial communication. Inspect with service codes.		• Inspect related harness • Inspect DSC HU/CM

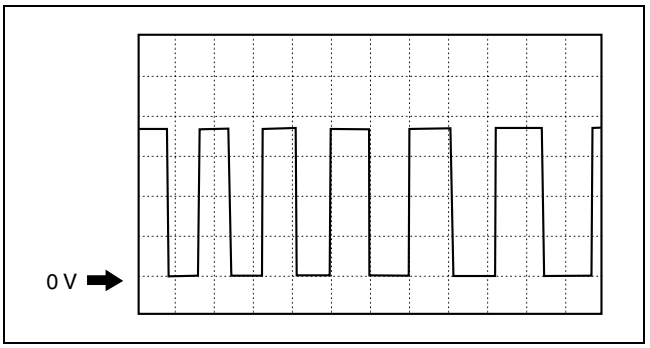
Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
AC	Auto cruise set signal output	Auto cruise unit	When auto cruise is ON	Below 1.0	• Inspect related harness • Inspect DSC HU/CM
			When auto cruise is OFF	B+	
AD	—	—	—	—	—
AE	Vehicle speed output	• Audio unit • Wiper and washer switch • Car-navigation unit • Auto leveling control unit • Cruise actuator	Vehicle is stopped	0	• Inspect related harness • Inspect front wheel-speed sensor
			• Inspect using the wave profile. (See P–19 Inspection Using An Oscilloscope (Reference))		
AF	CAN-L	—	—	No need to check	—
AG	CAN-H	—	—	No need to check	—
AH	—	—	—	—	—

* : Used for vehicle manufacturing, not used for DSC.

Inspection Using An Oscilloscope (Reference)
Steering angle (steering angle signal 1 and 2)

- DSC HU/CM terminal:
  Steering angle signal 2: W (+) — R (-)
  Steering angle signal 1: X (+) — R (-)
- Oscilloscope setting:
  1 V/DIV (Y), 25 ms/DIV (X), DC range
- Vehicle condition: Rotating steering wheel at one revolution per second

Note
- As steering wheel rotation speed increases, period of wave shortens.
- As for shape of steering angle signals 1 and 2, the phase is different.

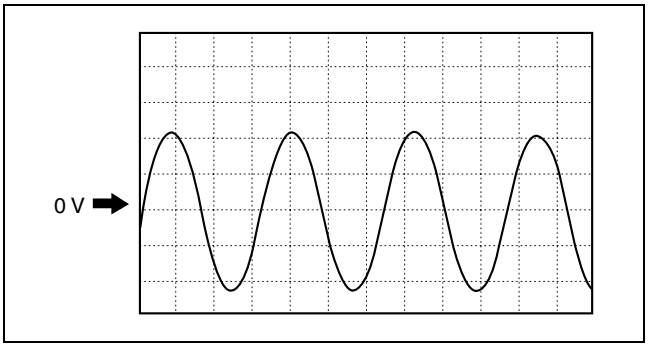


A6E6921W014

Wheel speed

- DSC HU/CM terminal:
  RF: M (+) — I (-)
  RR: K (+) — H (-)
  LF: F (+) — J (-)
  LR: Q (+) — N (-)
- Oscilloscope setting:
  1 V/DIV (Y), 2 ms/DIV (X), AC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.
- If there is malfunctioning in the sensor rotor, wave profile warps.



A6E6921W013

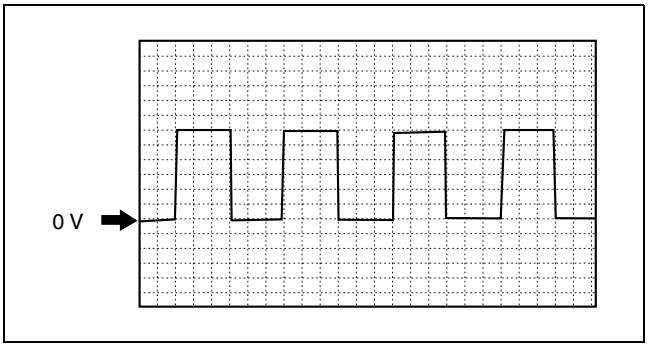
P

Vehicle speed output

- DSC HU/CM terminal: AE (+) — A(-)
- Oscilloscope setting:
  1 V/DIV (Y), 5 ms/DIV (X), DC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note

- As vehicle speed increases, period of wave shortens.



A6E6921W012

COMBINE SENSOR (FORWARD-G SENSOR) INSPECTION

A6E692067650205

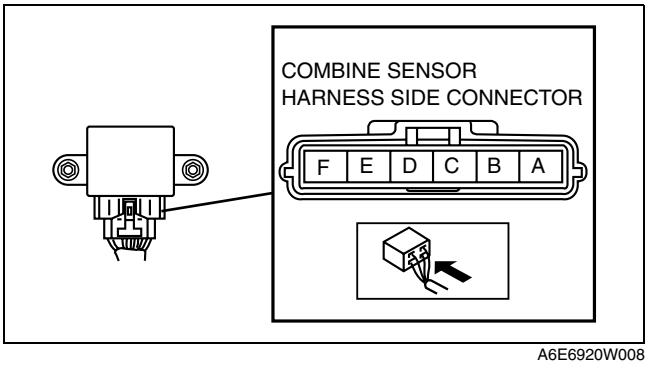
Caution

- **Be careful and do not allow the lateral-G sensor to fall. If by chance it is subjected to strong impact, replace it.**

1. Connect the connector.
2. Turn ignition switch on, verify the voltage between terminals A and E under the following conditions.
   - If not within the specification, replace the combine sensor.

(1) Horizontal

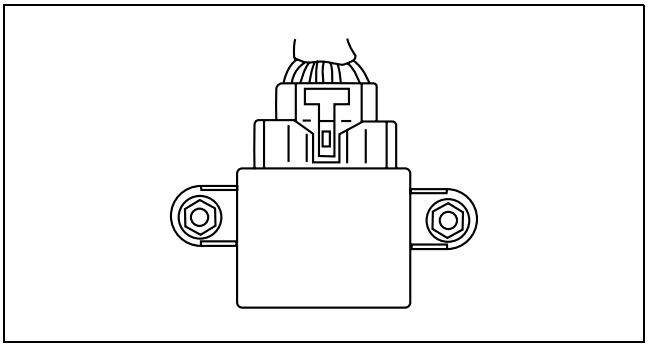
Voltage
2.2—2.8 V



A6E6920W008

(2) Acceleration (inclined **90**° from horizontal)

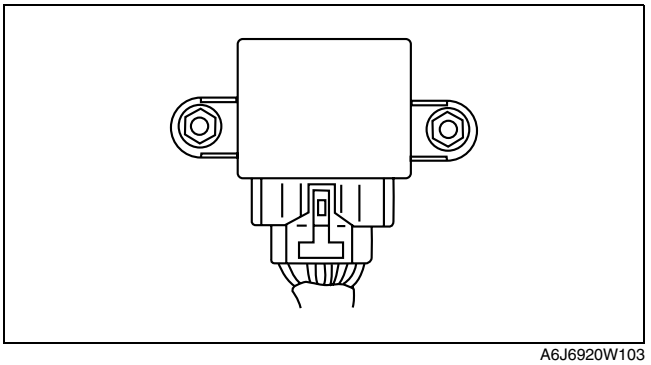
Voltage
3.1—3.9 V



A6J6920W104

(3) Deceleration (decline **90**° from horizontal)

Voltage
1.2—1.8 V



A6J6920W103

ON-BOARD DIAGNOSTIC

DSC ON-BOARD DIAGNOSIS

A6E697067650201

DTC Table

Note

- There is no change except for the code marked with an asterisk *

DTC WDS or equivalent	Diagnosis system component
B1318	DSC power supply
B1342	DSC HU/CM
B1483	Stop switch signal (with DSC only)
B1484	Stop switch signal (with DSC only)
B1486	Stop switch signal (with DSC only)
B1627	Reverse signal (with DSC only)
B2477	Module configuration (with DSC only)
C1095	Motor relay, pump motor
C1096	Motor relay, pump motor
C1119*	Engine control system
C1125	Brake fluid level sensor (with DSC only)
C1140	DSC HU (pump) (with DSC only)
C1145	Right front wheel-speed sensor
C1148	Right front wheel-speed sensor/sensor rotor
C1155	Left front wheel-speed sensor
C1158	Left front wheel-speed sensor/sensor rotor
C1165	Right rear wheel-speed sensor
C1168	Right rear wheel-speed sensor/sensor rotor
C1175	Left rear wheel-speed sensor
C1178	Left rear wheel-speed sensor/sensor rotor
C1186	Fail-safe relay
C1194	Left front pressure reduction solenoid valve
C1198	Left front pressure retention solenoid valve
C1210	Right front pressure reduction solenoid valve
C1214	Right front pressure retention solenoid valve
C1233	Left front wheel-speed sensor/sensor rotor
C1234	Right front wheel-speed sensor/sensor rotor
C1235	Right rear wheel-speed sensor/sensor rotor
C1236	Left rear wheel-speed sensor/sensor rotor
C1242	Left rear pressure reduction solenoid valve
C1246	Right rear pressure reduction solenoid valve
C1250	Left rear pressure retention solenoid valve
C1254	Right rear ABS pressure retention solenoid valve
C1266	Fail-safe relay
C1280	Combine sensor (with DSC only)
C1400	Right front traction switch solenoid valve (with DSC only)
C1410	Left front traction switch solenoid valve (with DSC only)
C1414	DSC HU/CM (with DSC only)
C1507	DSC control (with DSC only)
C1508	TCS control
C1510	Right front solenoid valve, motor or wheel-speed sensor/sensor rotor
C1511	Left front solenoid valve, motor or wheel-speed sensor/sensor rotor
C1512	Right rear solenoid valve, motor or wheel-speed sensor/sensor rotor
C1513	Left rear solenoid valve, motor or wheel-speed sensor/sensor rotor

DTC WDS or equivalent	Diagnosis system component
C1730	Combine sensor (with DSC only)
C1949*	Combine sensor (with DSC only)
C1950*	Combine sensor (with DSC only)
C1951	Combine sensor (with DSC only)
C1952	Combine sensor (with DSC only)
C1953	Brake fluid pressure sensor (with DSC only)
C1954	Brake fluid pressure sensor (with DSC only)
C1955	Steering angle sensor (with DSC only)
C1956	Steering angle sensor (with DSC only)
C1957	Right front DSC switch solenoid valve (with DSC only)
C1958	Left front DSC switch solenoid valve (with DSC only)
C1959	Combine sensor (with DSC only)
U1900	CAN communication
U2021	Invalid/fault data received
U2511*	CAN communication
U2516	CAN communication

PID/DATA Monitor Table

Note
- There is no change except for the PID marked with an asterisk *

PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS (ABS/ TCS) HU/CM or DSC HU/CM terminal
RPM (Engine speed signal input)	RPM	• Engine is stopped: 0 RPM • Engine is running: Indicates engine speed	Inspect PCM.	—
TRANSGR * (with DSC only) (Transaxle gear position)	FN4A-EL: R/N/D/S/L JA5AX-EL: R/N/D	• Selector lever position is displayed — R: R — N: N — D: D — S: S	Inspect PCM, TR switch, or DSC HU/ CM.	—
TRAC_SW (TCS OFF switch input)	ON/OFF	• TCS (DSC) OFF switch is depressed: ON • TCS (DSC) OFF switch is released: OFF	Inspect TCS (DSC) OFF switch.	AA
TC LVAL (with DSC only) (Traction switch solenoid valve (LF-RR))	ON/OFF	• Solenoid valve is activated: ON • Solenoid valve is deactivated: OFF	Internal fault of DSC HU/CM. Replace DSC HU/CM.	—
TC RVAL (with DSC only) (Traction switch solenoid valve (RF-LR))	ON/OFF	• Solenoid valve is activated: ON • Solenoid valve is deactivated: OFF	Internal fault of DSC HU/CM. Replace DSC HU/CM.	—
L_DSC O (with DSC only) (Stability control solenoid valve (LF-RR))	ON/OFF	• Solenoid valve is activated: ON • Solenoid valve is deactivated: OFF	Internal fault of DSC HU/CM. Replace DSC HU/CM.	—
R_DSC O (with DSC only) (Stability control solenoid valve (RF-LR))	ON/OFF	• Solenoid valve is activated: ON • Solenoid valve is deactivated: OFF	Internal fault of DSC HU/CM. Replace DSC HU/CM.	—
CCNTABS (Number of continuous codes)	—	DTC is detected: **1—255** DTC is not detected: **0**	Perform inspection using appropriate DTC.	—

PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS (ABS/ TCS) HU/CM or DSC HU/CM terminal
PMPSTAT (Pump motor output state)	ON/OFF	• Pump motor is activated: ON • Pump motor is deactivated: OFF	Inspect DSC HU/CM	—
BRK_FLUID (with DSC only) (Brake fluid level sensor input)	OK/LOW	• Brake fluid is above LOW: OK • Brake fluid is below LOW: LOW	Inspect brake fluid level. Inspect brake fluid level sensor.	—
BOO_ABS (Brake pedal switch input)	ON/OFF	• Brake pedal is depressed: ON • Brake pedal is released: OFF	Inspect brake switch.	ABS (ABS/ TCS): Y DSC: L
ABS_LAMP (ABS warning light driver output state)	ON/OFF	• ABS warning light is illuminated: ON • ABS warning light is not illuminated: OFF	Inspect ABS warning light.	—
BRAKE_LMP (BRAKE system warning light output state)	ON/OFF	• BRAKE system warning light is illuminated: ON • BRAKE system warning light is not illuminated: OFF	Inspect BRAKE system warning light.	—
ABSRR_O (Right rear ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS control: ON/ OFF (solenoid valve is activated/ deactivated) • Not ABS control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSLR_O (Left rear ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS or EBD control: ON/OFF (solenoid valve is activated/ deactivated) • Not ABS and EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSRF_O (Right front ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS control: ON/ OFF (solenoid valve is activated/ deactivated) • Not ABS control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSLF_O (Left front ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS control: ON/ OFF (solenoid valve is activated/ deactivated) • Not ABS control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSRR_I (Right rear ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS control: ON/ OFF (solenoid valve is activated/ deactivated) • Not ABS control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSLR_I (Left rear ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS or EBD control: ON/OFF (solenoid valve is activated/ deactivated) • Not ABS and EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—

PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS (ABS/ TCS) HU/CM or DSC HU/CM terminal
ABSRF_I (Right front ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS control: ON/ OFF (solenoid valve is activated/ deactivated) • Not ABS control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSLF_I (Left front ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS control: ON/ OFF (solenoid valve is activated/ deactivated) • Not ABS control: OFF (solenoid valve is deactivated)	Internal fault of ABS (ABS/TCS) or DSC HU/CM. Replace ABS (ABS/TCS) or DSC HU/CM.	—
ABSVLVRLY (Fail-safe relay output state)	ON/OFF	• Fail-safe relay is activated: ON • Fail-safe relay is deactivated: OFF	Inspect ABS (ABS/ TCS) or DSC HU/CM.	—
ABSPMPRLY (Motor relay output state)	ON/OFF	• Motor relay is activated: ON • Motor relay is deactivated: OFF	Inspect ABS (ABS/ TCS) or DSC HU/CM.	—
SWA POS (with DSC only) (Steering angle sensor input)	ANGLE	• Steering wheel is in neutral position: **0 DEG** • Steering wheel is turned to left: Changes **between 0 DEG and -1,638.40 DEG** • Steering wheel is turned to right: Changes **between 0 DEG and 1,638.35 DEG**	Inspect steering angle sensor.	R, U, W, X
LF_WSPD (Left front wheel-speed sensor input)	SPEED	• Vehicle is stopped: **0 KPH {0 MPH}** • Vehicle is driving: Indicates vehicle speed	Inspect wheel-speed sensor/sensor rotor.	ABS (ABS/ TCS): E, I DSC: F, J
RF_WSPD (Right front wheel-speed sensor input)	SPEED	• Vehicle is stopped: **0 KPH {0 MPH}** • Vehicle is driving: Indicates vehicle speed	Inspect wheel-speed sensor/sensor rotor.	ABS (ABS/ TCS): D, G DSC: I, M
LR_WSPD (Left rear wheel-speed sensor input)	SPEED	• Vehicle is stopped: **0 KPH {0 MPH}** • Vehicle is driving: Indicates vehicle speed	Inspect wheel-speed sensor/sensor rotor.	ABS (ABS/ TCS): C, F DSC: N, Q
RR_WSPD (Right rear wheel-speed sensor input)	SPEED	• Vehicle is stopped: **0 KPH {0 MPH}** • Vehicle is driving: Indicates vehicle speed	Inspect wheel-speed sensor/sensor rotor.	ABS (ABS/ TCS): A, B DSC: H, K
LAT ACC (with DSC only) (Lateral-G sensor input)	ACCELERATION	• Vehicle is stopped or driving straight: **0 G** • Cornering to left: Changes **between 0 G and 1.27 G** • Cornering to right: Changes **between 0 G and -1.28 G**	Inspect ABS wheel-speed sensor/sensor rotor.	O
YAW_RATE (with DSC only) (Yaw rate sensor input)	ACCELERATION	• Vehicle is stopped or driving straight: **0 DG/S** • Cornering to left: Changes **between 0 DG/S and 127 DG/S** • Cornering to right: Changes **between 0 DG/S and -128 DG/S**	Inspect combine sensor.	T
MCYLI P (with DSC only) (Brake fluid pressure sensor input)	PRESSURE	• Brake pedal is released: **0 MPa** • Brake pedal is depressed: Changes **between 0 MPa and 25.5 MPa**	Inspect DSC HU/CM.	—

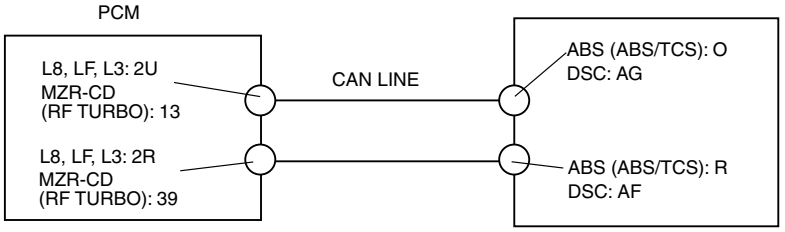
PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS (ABS/ TCS) HU/CM or DSC HU/CM terminal
TCSOUTD (Torque reduction request value)	PERCENTAGE	• Torque reduction is not requested: **0 %** • Torque reduction is requested: Changes **between 0 % and 100 %**	Inspect DSC HU/CM.	—
TPI (with DSC only) (Throttle position signal input)	PERCENTAGE	• Closed throttle position: **0** • Wide open throttle: Changes **between 1 and 7**	Inspect PCM and throttle position sensor.	—
ABS_VOLT (System battery voltage value)	VOLTAGE	• Ignition key at ON: **B+** • Idle: **Approx. 14—16 V**	Inspect power supply circuit.	ABS (ABS/ TCS): Z DSC: G
ACCLMTR* (Accelerometer)	ACCELERATION	• Vehicle is stopped or driving at a constant speed: **0 G.** • Vehicle is driving at a acceleration: Changes between **0— –1.28 G**. • Vehicle is driving at a deceleration: Changes between **0—1.27 G**.	Inspect combine sensor.	V

P

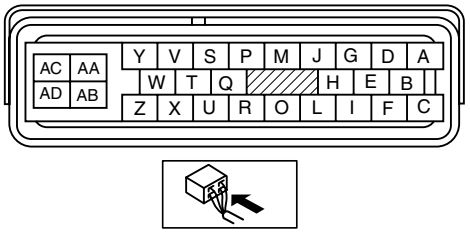
DTC C1119

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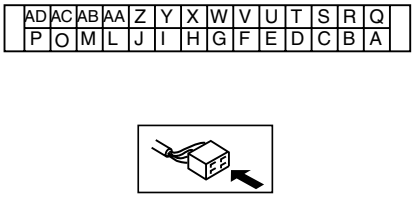
DTC C1119	Engine control system, torque reduction inhibit signal line
DETECTION CONDITION	• Engine RPM information through CAN is out of specification • Throttle information through CAN is out of specification • Fuel injection information through CAN is invalid or out of specification (for MZR-CD (RF Turbo) only). • Received control inhibition signal from PCM through CAN.
POSSIBLE CAUSE	• Malfunction of PCM • Malfunction of CAN



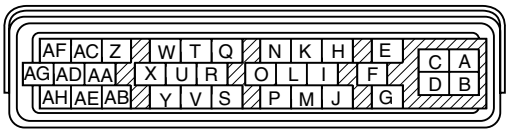
ABS (ABS/TCS) HU/CM HARNESS SIDE CONNECTOR



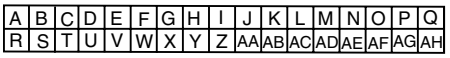
SST (49 G066 001) CONNECTOR



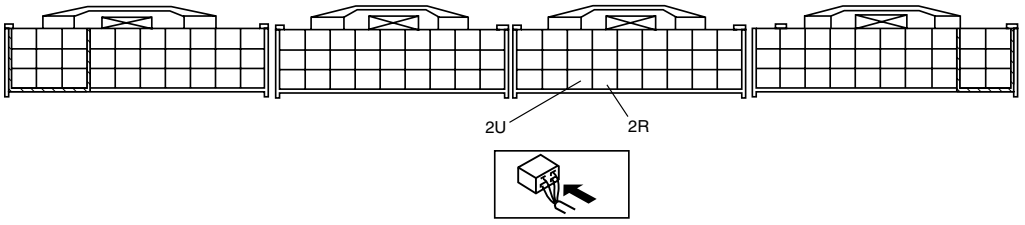
DSC HU/CU HARNESS SIDE CONNECTOR



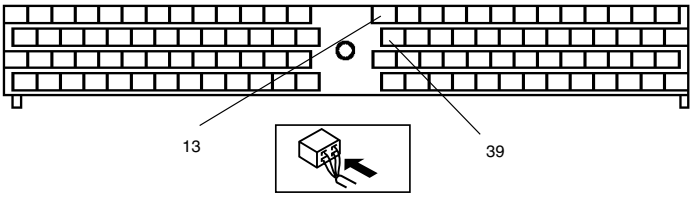
SST (49 G066 004) CONNECTOR



PCM HARNESS SIDE CONNECTOR (L3, L8, LF)



PCM HARNESS SIDE CONNECTOR (MZR-CD (RF TURBO))



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**CHECK FOR PCM FOR DTCs** • Turn ignition key to OFF. • Connect WDS or equivalent to DLC-2 • Turn ignition key to ON (engine OFF). • Is DTC for engine control system obtained?	Yes	Follow inspection procedures for engine control system.
		No	Go to next step.
2	**MONITOR CAN SIGNAL** • Access PID RPM and TP using WDS or equivalent. • Are engine speed and throttle position within specification?	Yes	Go to next step.
		No	Follow inspection procedures for engine control system.
3	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory. • Start engine. • Is same DTC present?	Yes	Replace DSC HU/CM, then go to next step.
		No	Troubleshooting completed.

DTC C1949, C1950

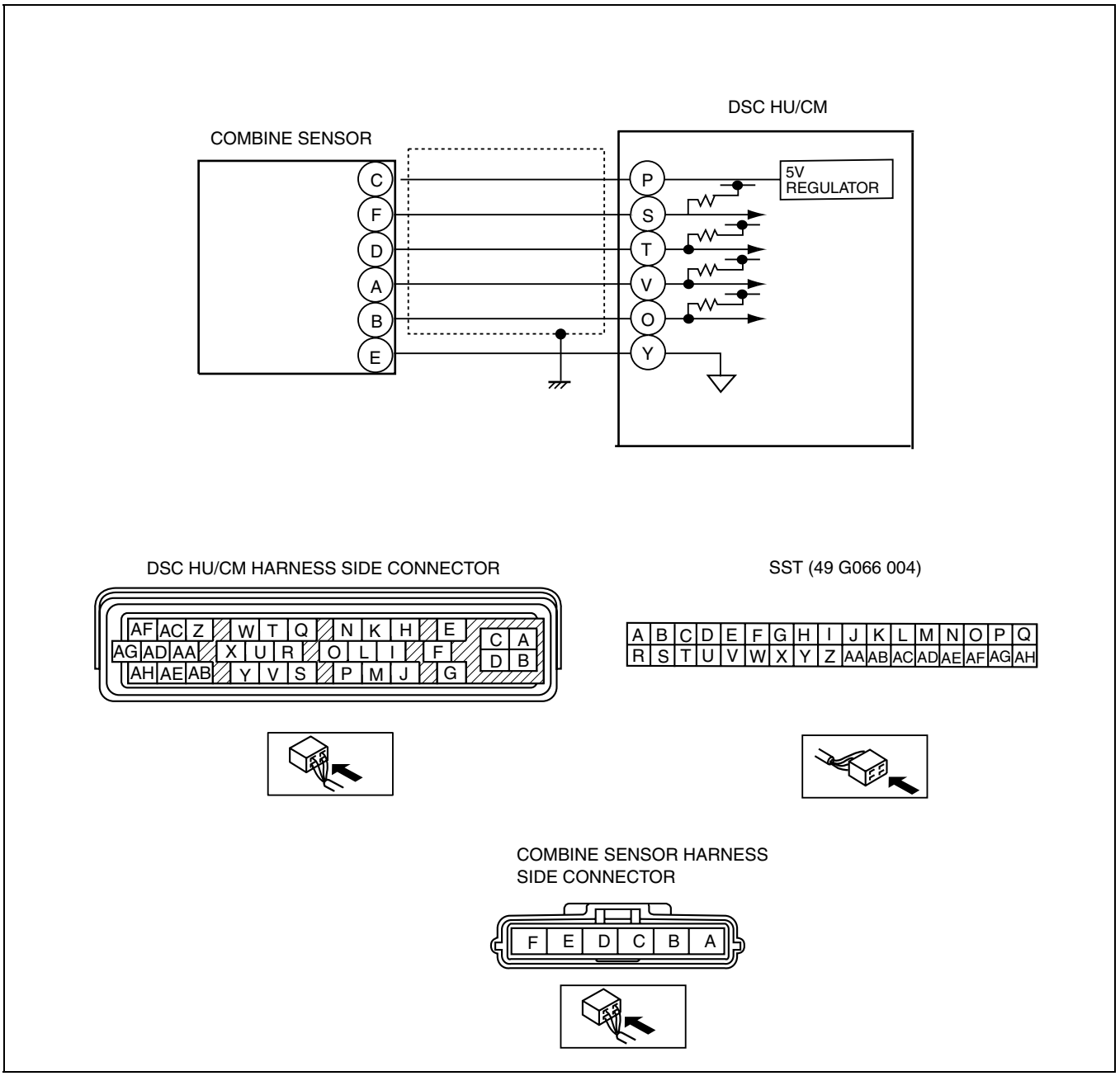
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Caution

- **When attaching the tester lead to the DSC HU/CM connector, the SST (49 G066 004) must be used.**

DTC C1949, C1950	Combine sensor (forward G-sensor)
DETECTION CONDITION	• C1949: — Monitor voltage of forward-G sensor is detected at **4.5 V or more**, or **0.5 V or less**. — Monitor voltage difference of **0.4 V or more** within 1 cycle is detected 8 times in **1 second**. • C1950: — Forward-G sensor 0-point correction value is default or more — Output voltage value from G sensor remains absolutely unchanged — Difference between estimated G-force calculated from 2 channels exceeds specification
POSSIBLE CAUSE	• Open circuit in harness between combine sensor terminal C and DSC HU/CM terminal P • Open circuit, short to power, or short to ground in harness between DSC HU/CM terminal V and combine sensor terminal A • Open circuit, short to power, or short to ground in harness between DSC HU/CM terminal S and combine sensor terminal F • Open circuit in harness between combine sensor terminal E and DSC HU/CM terminal Y • Malfunction of combine sensor

P



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT COMBINE SENSOR POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to ON (engine OFF). • Measure voltage between combine sensor terminal C (harness side) and ground. • Is voltage **4.5—5.5 V**?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between combine sensor terminal C and ignition switch, then go to Step 8.
2	**INSPECT COMBINE SENSOR GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Disconnect DSC HU/CM and combine sensor connectors. • Inspect continuity between DSC HU/CM terminal Y (harness side) and combine sensor terminal E (harness side). • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between DSC HU/CM terminal Y and combine sensor terminal E, then go to Step 8.

STEP	INSPECTION		ACTION
3	**INSPECT FORWARD-G SENSOR PART SIGNAL CIRCUIT FOR OPEN CIRCUIT** • Inspect continuity between DSC HU/CM terminal V (harness side) and combine sensor terminal A (harness side). • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between DSC HU/CM terminal V and combine sensor terminal A, then go to Step 8.
4	**INSPECT FORWARD-G SENSOR PART SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Inspect continuity between DSC HU/CM terminal V (harness side) and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground circuit between DSC HU/CM terminal V and combine sensor terminal A, then go to Step 8.
		No	Go to next step.
5	**INSPECT DIAGNOSIS SIGNAL CIRCUIT FOR SHORT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Inspect continuity between DSC HU/CM terminal S (harness side) and combine sensor terminal F. • Is there continuity?	Yes	Repair or replace harness for open circuit between DSC HU/CM terminal S and combine sensor terminal F, then go to Step 8.
		No	Go to next step.
6	**INSPECT DIAGNOSIS SIGNAL CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Inspect continuity between DSC HU/CM terminal S (harness side) and ground. • Is there continuity?	Yes	Repair or replace harness for short to ground circuit between DSC HU/CM terminal S and combine sensor terminal F, then go to Step 8.
		No	Go to next step.
7	**INSPECT COMBINE SENSOR** • Inspect combine sensor. • Is it okay?	Yes	Go to next step.
		No	Replace combine sensor, then go to next step.
8	**VERIFY TROUBLESHOOTING COMPLETED** • Clear DTC from memory. • Is same DTC present?	Yes	Replace DSC HU/CM, then go to next step.
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

P

DTC U2511

A6E697067650204

DTC U2511	CAN communication
DETECTION CONDITION	• Detects that the communication signals from 4WD CM is abnormal.
POSSIBLE CAUSE	• 4WD CM signals have communication error.

Diagnostic procedure

- Follow inspection procedures for CAN. (See T–39 MULTIPLEX COMMUNICATION SYSTEM.)

SUSPENSION

FEATURES

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E740201013201

- The construction and operation of suspension system is essentially carried over from that of the current Mazda6 (GG), except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)

FEATURES

A6E740201013202

Improved Handling Stability and Riding Comfort

- Wheel alignment has been set for WGN models.
- Rear stabilizer outer diameters are as follows:
  WGN (2WD): **18 mm {0.71 in}**
  WGN (4WD): **21 mm {0.83 in}**
- The suspension control system has been adopted as follows:
  WGN (2WD): as an option
  WGN (4WD): all models

SPECIFICATIONS

A6E740201013203

Item				Specification			
				New Mazda6			Current Mazda6
				GG (4SD, 5HB)	GY (WGN 2WD)	GY (WGN 4WD)	GG (4SD, 5HB)
Engine type				**LF, MZR-CD (RF Turbo)**	**L8, LF, L3, MZR-CD (RF Turbo)**	**L3**	**L8, LF, L3**
Front suspension	Type			High-mount double wishbone (with double-pivoted lower arm(s))			
	Spring type			Coil spring			
	Shock absorber type			Cylindrical, double-acting (Low-pressure gas charged with rebound spring)			
	Stabilizer	Type		Torsion bar			
		Diameter	(mm {in})	23 {0.91}			
	Wheel alignment (Unloaded)*1	Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}			
			(degree)	0°11′±0°22′			
		Maximum steering angle	inner	39°±3°			
			outer	31°±3°			
		Caster angle*2 (reference value)	normal	3°47′±1°	3°40′±1°	3°35′±1°	3°47′±1°
			elevated*3	3°42'±1°	3°35′±1°	—	3°42'±1°
		Camber angle*2 (reference value)	normal	–0°17′±1°	–0°15′±1°	–0°08′±1°	–0°17′±1°
			elevated*3	–0°10'±1°	–0°08′±1°	—	–0°10'±1°
		Steering axis inclination (reference value)	normal	5°28′	5°24′	5°16′	5°28′
			elevated*3	5°18'	5°16′	—	5°18'
Rear suspension	Type			E-type multi-link			
	Spring type			Coil spring			
	Stabilizer	Type		Torsion bar			
		Diameter	(mm {in})	4SD: 19 {0.75} 5HB: 18 {0.71}	18 {0.71}	21 {0.83}	4SD: 19 {0.75} 5HB: 18 {0.71}
	Shock absorber type			Cylindrical, double-acting (Low-pressure gas charged)	Cylindrical, double-acting (Low-pressure gas charged)/ (High-pressure gas charged)	Cylindrical, double-acting (High-pressure gas charged)	Cylindrical, double-acting (Low-pressure gas charged)
	Wheel alignment (Unloaded)*1	Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}			
			(degree)	0°11′±0°22′			
		Camber angle*2	normal	–1°13′±1°	–1°06′±1°	–1°03′±1°	–1°13′±1°
			elevated*3	–1°05′±1°	–0°58′±1°	—	–1°05′±1°
		Thrust angle	(degree)	0°±0°48′			

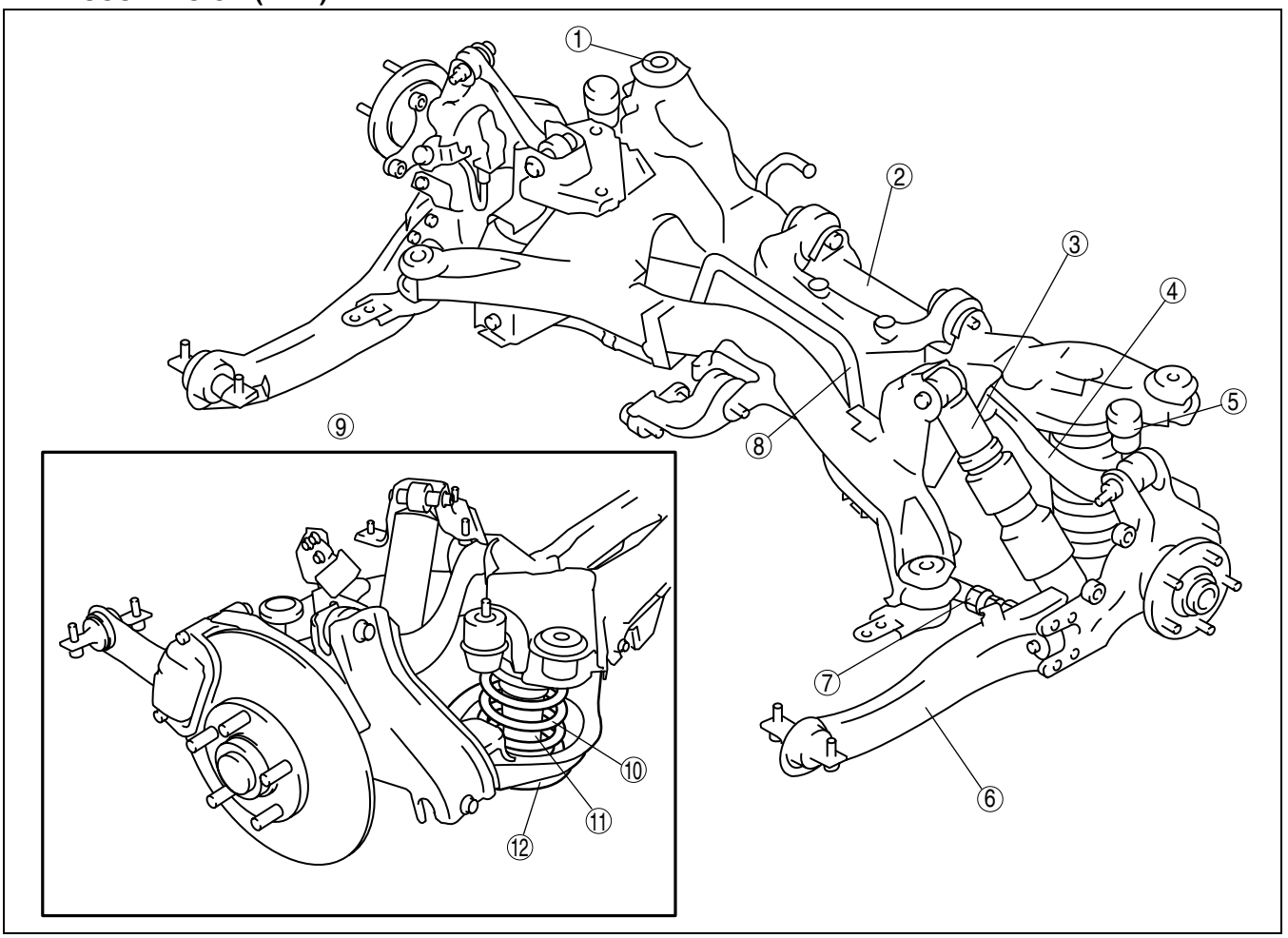
*1 : Engine coolant and engine oil are at specified level. Fuel is full. Spare tire, jack and tools are in designated position.
*2 : Difference between left and right must not exceed 1°30'.
*3 : Distance between wheel center and fender brim is following. 4SD and 5HB front: 402 mm {15.82 in} (reference value) 4SD and 5HB rear: 401 mm {15.78 in} (reference value), WGN (2WD) front: 405 mm {15.94 in} (reference value) WGN (2WD) rear: 407 mm {16.02 in} (reference value)
Bold frames: New specifications

R

STRUCTURAL VIEW

A6E740201013204

REAR SUSPENSION (4WD)



A6E74162013

1	Rear crossmember mounting bushing
2	Rear crossmember
3	Rear shock absorber
4	Rear upper arm
5	Bound stopper (body side)
6	Rear trailing arm

7	Rear lateral link
8	Rear stabilizer
9	View from vehicle rear side
10	Rear coil spring
11	Bound stopper (spring side)
12	Rear lower arm

REAR SUSPENSION

SUSPENSION CONTROL SYSTEM

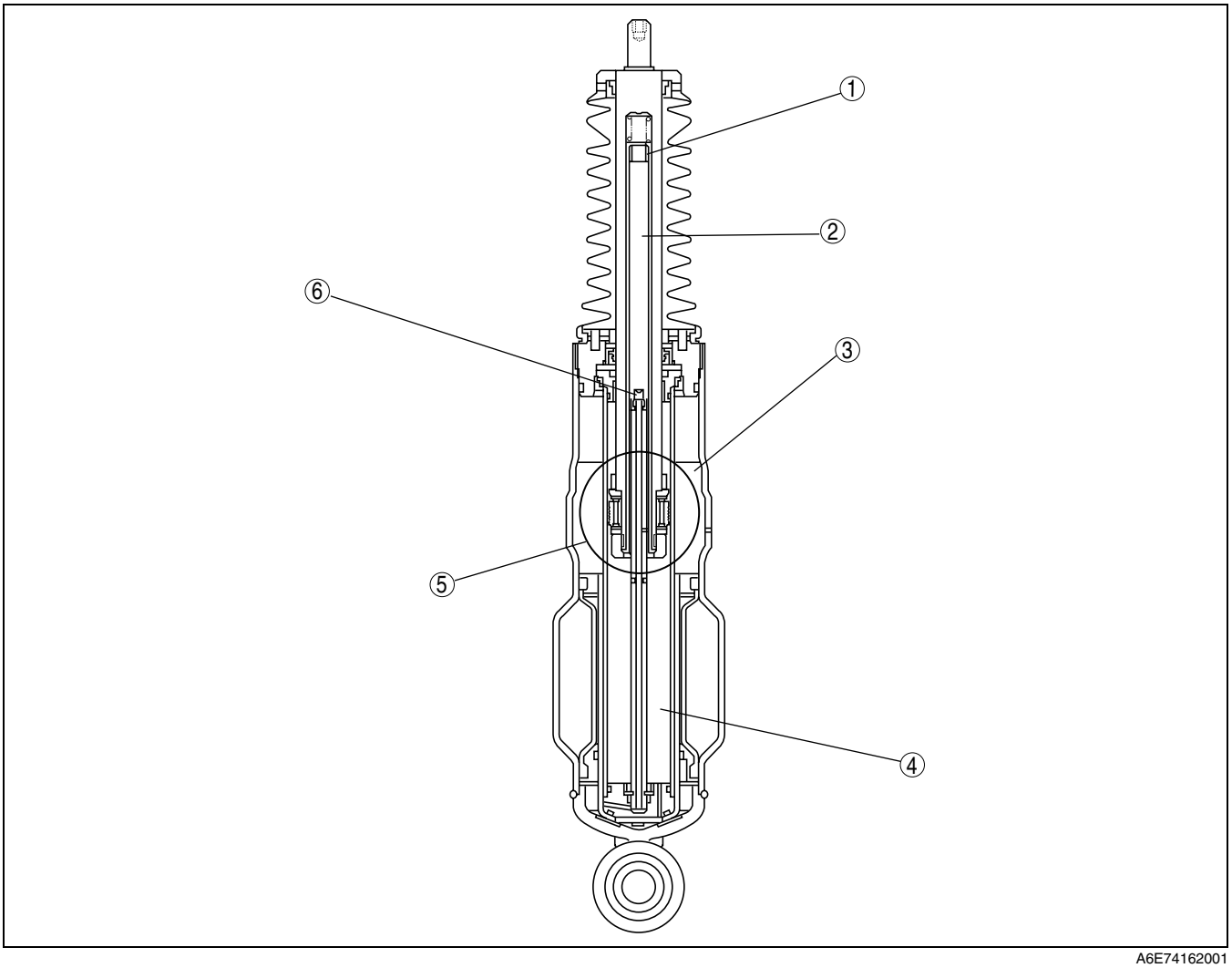
A6E741601013201

Outline

- The self-leveling suspension is a system that adjusts the vehicle height according the amount of vehicle load. This system will raise the rear of a vehicle, lowered due to a load placed on it, to the designated load level* after the vehicle has been driven a certain distance.
- The vehicle height adjustment is performed using a gas-pressurized pump function built into the rear shock absorber.
- For the vehicle height to return to the designated load level, the vehicle must be driven approx. **5—6 km {3.1—3.7 miles}** in city driving conditions. (Distance will vary due to load and road conditions.)
- A load amount of approx. **140—300 kg {308—660 lb}** at the rear axle will cause the vehicle height to be raised, and any weight over that will prevent the vehicle from returning to the designated load level.

*: Designated load level is defined as the level at which the vehicle is with: a full fuel tank; engine coolant and oil at specified levels; spare tire, jack and tools in designated positions; and four people, weighing **55 kg {121 lb}** each, riding in the vehicle.

Construction



A6E74162001

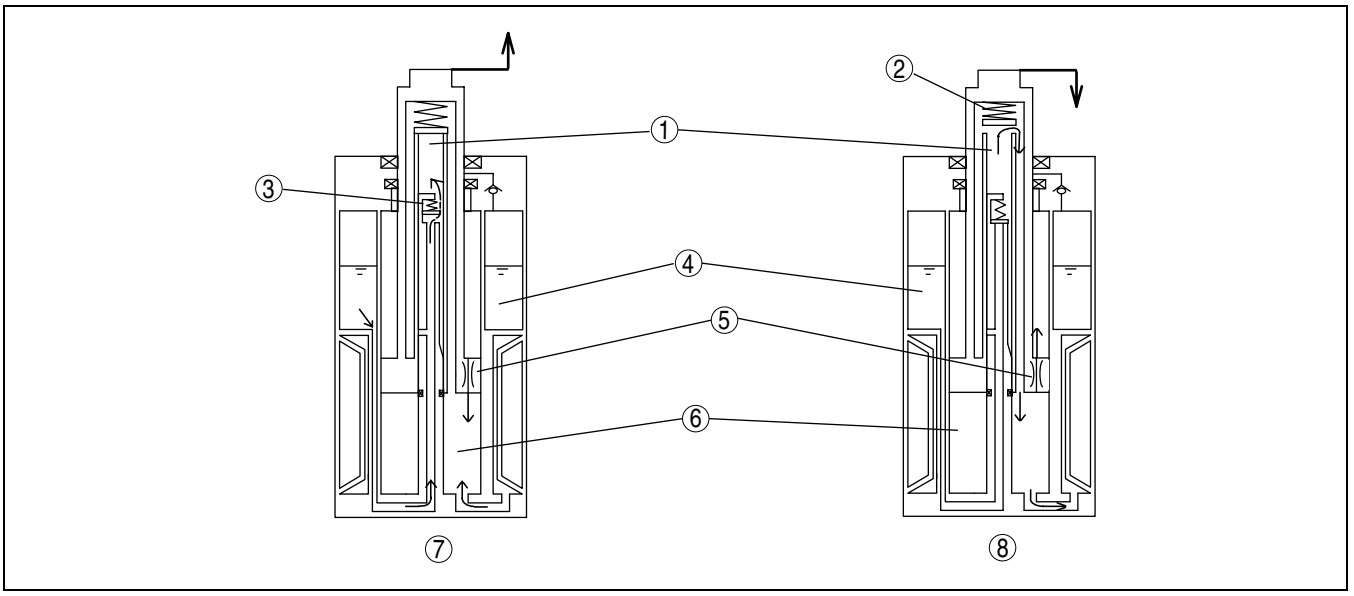
1	Outlet check valve
2	Pump chamber
3	Low-pressure chamber

4	High-pressure chamber
5	Piston
6	Inlet check valve

Operation

During leveling operation

- During shock absorber expansion, the inlet check valve opens due to negative pressure created in the pump chamber, and oil is drawn into the pump chamber from the low-pressure chamber. During shock absorber contraction, oil pressure in the pump chamber forces the outlet check valve to open, and oil in the pump chamber flows through the pump cylinder into the high-pressure chamber. Due to this expansion and contraction while driving, rod reaction force increases, and the vehicle height returns to the designated load level. Also, similar to a regular shock absorber, damping is performed while driving with the damping valve.



A6E74162002

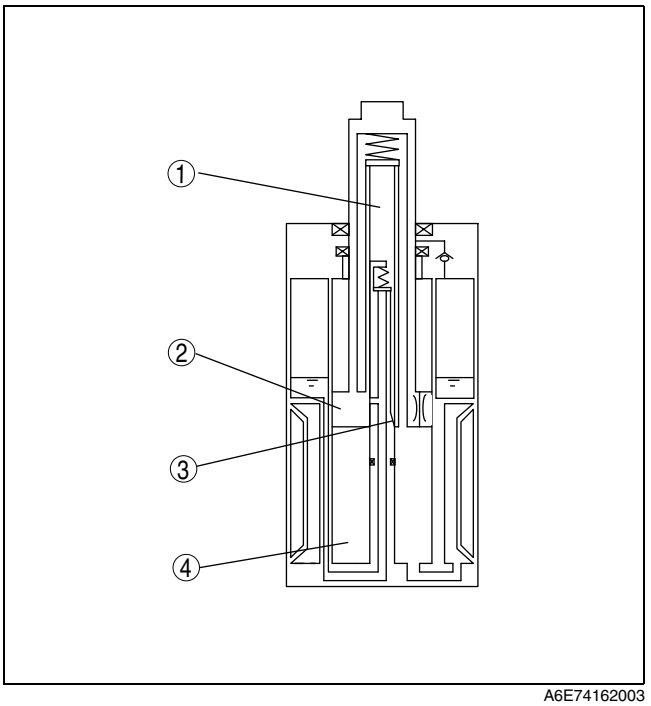
1	Pump chamber
2	Outlet check valve
3	Inlet check valve
4	Low-pressure chamber

5	Damping valve
6	High-pressure chamber
7	Leveling operation (expansion)
8	Leveling operation (contraction)

Leveling operation completed

- When the vehicle height returns to the designated load level, the volume of oil in the high-pressure chamber increases and the piston rises. This causes the pump chamber and the high-pressure chamber to be connected at the pump rod notch, and the expansion or contraction is completed.

1	Pump chamber
2	Piston
3	Pump rod notch
4	High-pressure chamber

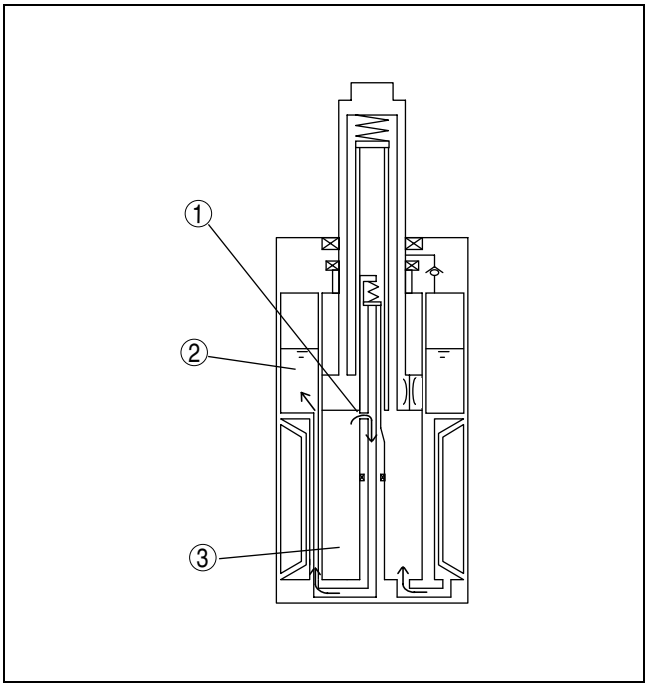


A6E74162003

During unloading of passengers and cargo

- When the vehicle height is higher than the designated load level, oil flows back into the low-pressure chamber from the high-pressure chamber via the pump rod leveling port. As a result, pressure in the high-pressure chamber decreases, rod reaction force is reduced, and the vehicle height returns to the designated load level.

1	Leveling port
2	Low-pressure chamber
3	High-pressure chamber



A6E74162004

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E740201013205

- The following changes have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Front wheel alignment (WGN)

- Specifications have been added.

Rear wheel alignment (WGN)

- Specifications have been added.

Suspension control system (WGN)

- On-vehicle inspection procedure has been added.

Rear shock absorber (WGN)

- Removal/installation procedure has been added.
- Disposal procedure has been added.

Rear stabilizer (4WD)

- Removal/installation procedure has been added.

Trailing link (4WD)

- Removal/installation procedure has been added.

Rear crossmember (4WD)

- Removal/installation procedure has been added.

WHEEL ALIGNMENT

FRONT WHEEL ALIGNMENT (WGN)

A6E741201015201

Specification (Unloaded)*1

2WD

Item		Fuel gauge indication				
		Empty	1/4	1/2	3/4	Full
Maximum steering angle	Inner	39°±3°				
	Outer	31°±3°				
Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
	(degree)	0°11′±0°22′				
Caster angle*2 (Reference value)	normal	3°30'±1°	3°32'±1°	3°34'±1°	3°37'±1°	3°40'±1°
	elevated*3	3°25'±1°	3°27'±1°	3°29'±1°	3°32'±1°	3°35'±1°
Camber angle*2 (Reference value)	normal	-0°14'±1°			-0°15'±1°	
	elevated*3	-0°07'±1°			-0°08'±1°	
Steering axis inclination (Reference value)	normal	5°24'				
	elevated*3	5°15'			5°16'	

*1 : 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 1°30'.
*3 : Distance between wheel center and fender brim is 405 mm {15.94 in} (reference value).

4WD

Item		Fuel gauge indication				
		Empty	1/4	1/2	3/4	Full
Maximum steering angle	Inner	39°±3°				
	Outer	31°±3°				
Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
	(degree)	0°11′±0°22′				
Caster angle*2 (reference value)		3°25'±1°	3°27'±1°	3°29'±1°	3°32'±1°	3°35'±1°
Camber angle*2(reference value)		-0°07'±1°			-0°08'±1°	
Steering axis inclination (reference value)		5°15'			5°16'	

*1 : 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 1°30'.

Maximum Steering Angle Adjustment

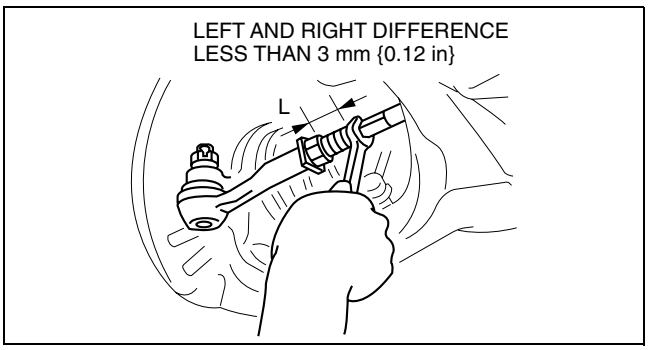
1. Loosen the tie-rod end locknuts.
2. Remove the steering gear boot clamp.
3. Turn the tie rods to equalize the length L.

   Maximum left/right difference
   3 mm {0.12 in}

4. Turn the tie rods equally to provide the correct maximum steering angle.
5. Tighten the tie-rod end locknuts.

   Tightening torque
   68.6—98.0 N·m {7.00—9.99 kgf·m, 50.6—72.2 ft·lbf}

6. Verify that the boot is not twisted, and install the boot clamp.
7. Adjust the toe-in after adjusting the steering angle.



A6E7412W002

Total Toe-in Adjustment

1. Center the steering wheel and confirm that the vehicle wheels/tires are pointing straight.
2. Loosen the left and right tie-rod end locknuts and turn the tie-rods equally. Both tie rods are right threaded, so turning the right tie-rod toward the front of the vehicle and the left toward the rear increases toe-in.

Note
- Turning both tie-rods one complete turn changes toe-in by **about 6 mm {0.24 in} (0°36')**.

3. Tighten the tie-rod end locknuts to the specified torque.

Tightening torque
68.6—98.0 N·m {7.00—9.99 kgf·m, 50.6—72.2 ft·lbf}

4. Verify that the boot is not twisted, and install the boot clamp.

REAR WHEEL ALIGNMENT (WGN)

A6E741201016201

Specification (Unloaded)*1

2WD

Item		Fuel gauge indication				
		Empty	1/4	1/2	3/4	Full
Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
	(degree)	0°11′±0°22′				
Camber angle*2	normal	–0°59′±1°	–1°00′±1°	–1°02′±1°	–1°04′±1°	–1°06′±1°
	elevated*3	–0°52′±1°	–0°53′±1°	–0°55′±1°	–0°56′±1°	–0°58′±1°
Thrust angle		0°±0°48′				

*1 : 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 1°30'.
*3 : Distance between wheel center and fender brim is 407 mm {16.02 in} (reference value).

4WD

Item		Fuel gauge indication				
		Empty	1/4	1/2	3/4	Full
Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
	(degree)	0°11′±0°22′				
Camber angle*2		–0°55′±1°	–0°57′±1°	–0°59′±1°	–1°01′±1°	–1°03′±1°
Thrust angle	(degree)	0°±0°48′				

*1 : 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 1°30'.

Note
- Adjust the toe-in after adjusting the camber.

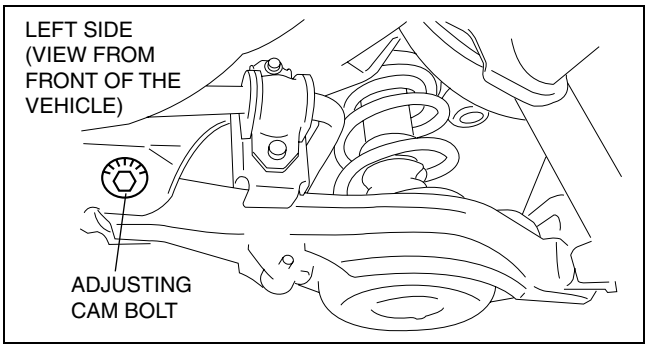
Camber Adjustment

1. Loosen the cam nut on the lower arm.
2. Turn the adjusting cam bolt to provide the correct camber angles as indicated.

	Left wheel	Right wheel
Positive direction	Clockwise	Counter-clockwise
Negative direction	Counter-clockwise	Clockwise

3. Tighten the cam nut.

Tightening torque
86.2—116.6 N·m {8.80—11.88 kgf·m, 63.58—85.99 ft·lbf}

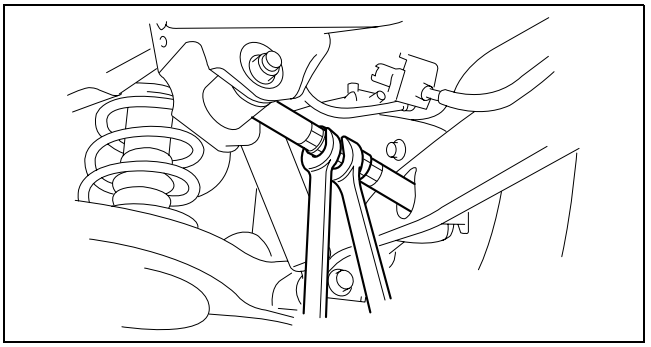


A6E7412W003

R

Total Toe-in Adjustment

1. Loosen the locknut of the lateral link.

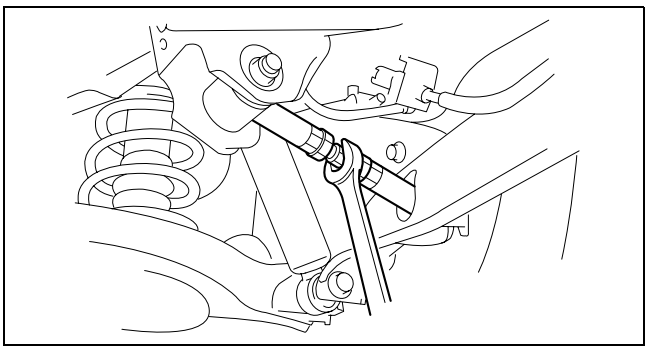


A6E7412W004

2. Adjust the toe-in turning the adjusting link.

Specification
Total Toe-in: 2±4 mm {0.08±0.16 in}

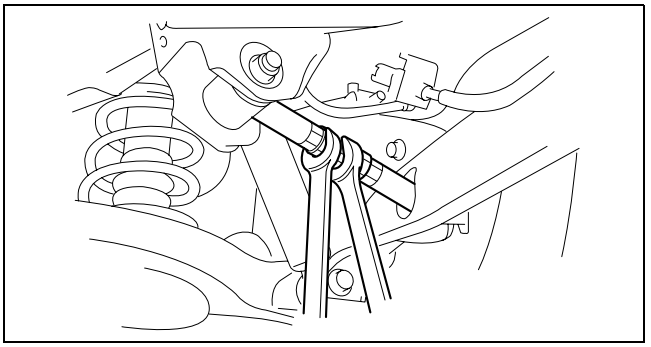
Note
- Toe change amount: 0°43′ / one rotation



A6E7412W005

3. Tighten the locknut.

Tightening torque
68.6—98.1 N·m {7.0—10.0 kgf·m, 50.6—72.3 ft·lbf}



A6E7412W004

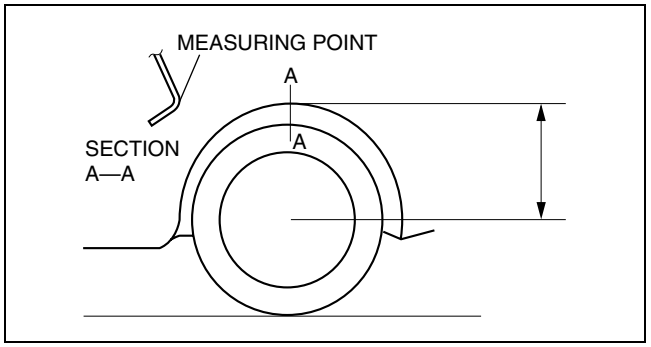
REAR SUSPENSION

SUSPENSION CONTROL SYSTEM ON-VEHICLE INSPECTION (WGN)

A6E741601013202

1. Pull up the dust boot and visually inspect the piston rod for oil leakage.
2. Remove all cargo and drive the vehicle, with only the driver aboard, for **1 km {0.62 miles}** or more. After driving, verify that the rear vehicle height (distance measured from the fender brim to the center of the wheel) is **360 mm {14.2 in}** or more*. If not as specified, replace the rear shock absorbers.
3. Place a load equivalent to five people riding in order to make the rear vehicle height to be **330 mm {13.0 in}** or less.
4. Immediately after driving the vehicle for **5 km {3.0 miles}** or more, under the same load conditions, verify that the rear vehicle height is **335 mm {13.2 in}** or more. If not as specified replace the rear shock absorbers.

*: Indicates rear vehicle height with fuel tank full. Height will vary **6—8 mm {0.24—0.31 in}** between a full and empty fuel tank.



A6E7412W001

REAR SHOCK ABSORBER REMOVAL/INSTALLATION (WGN)

A6E741628700201

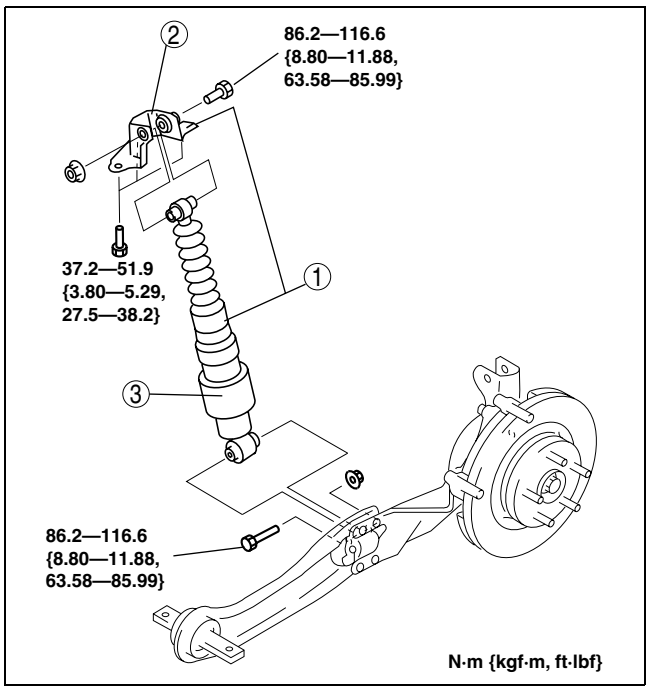
Caution

- **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 servicing the vehicle.**

1. Remove in the order indicated in the table.

1	Rear shock absorber and bracket
2	Bracket (See R–12 Bracket Installation Note)
3	Rear shock absorber

2. Install in the reverse order of removal.

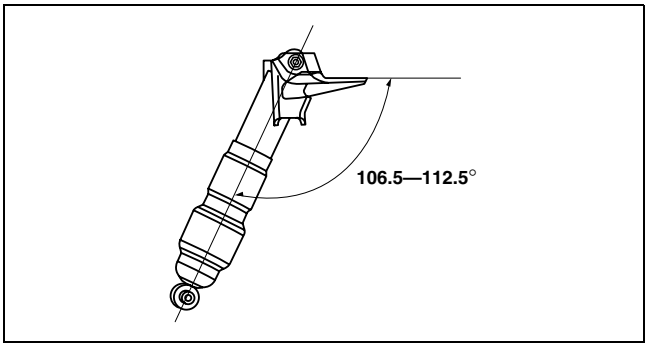


A6E74162006

R

Bracket Installation Note

1. Install the bracket as shown in the figure.



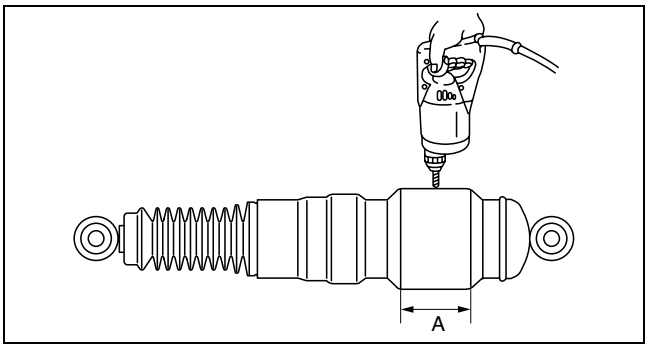
A6J74162006

REAR SHOCK ABSORBER DISPOSAL (WGN)

A6E741628700202

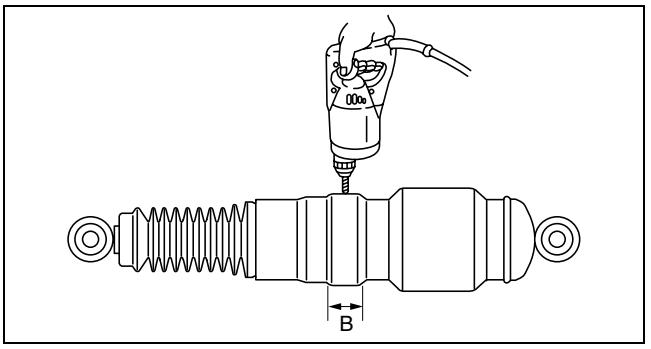
1. Lay the shock absorber on a level, horizontal surface.
2. Using a **2—3 mm {0.08—0.12 in}** drill bit, drill a hole in the high-pressure side (area indicated by A), and allow the gas to escape.

   Warning
   - **The oil in the shock absorber is pressurized and could spray out. Be sure to drill slowly and carefully.**



A6J74161003

3. Using a **2—3 mm {0.08—0.12 in}** drill bit, drill a hole in the low-pressure side (area indicated by B).
4. Place the shock absorber with the hole drilled in Step 3 turned downwards. Move the piston rod up and down several times to drain out the oil.
5. Cut the tube at the end of the shock absorber, and completely drain the oil out.
6. Properly dispose of the waste oil according to waste disposal laws.

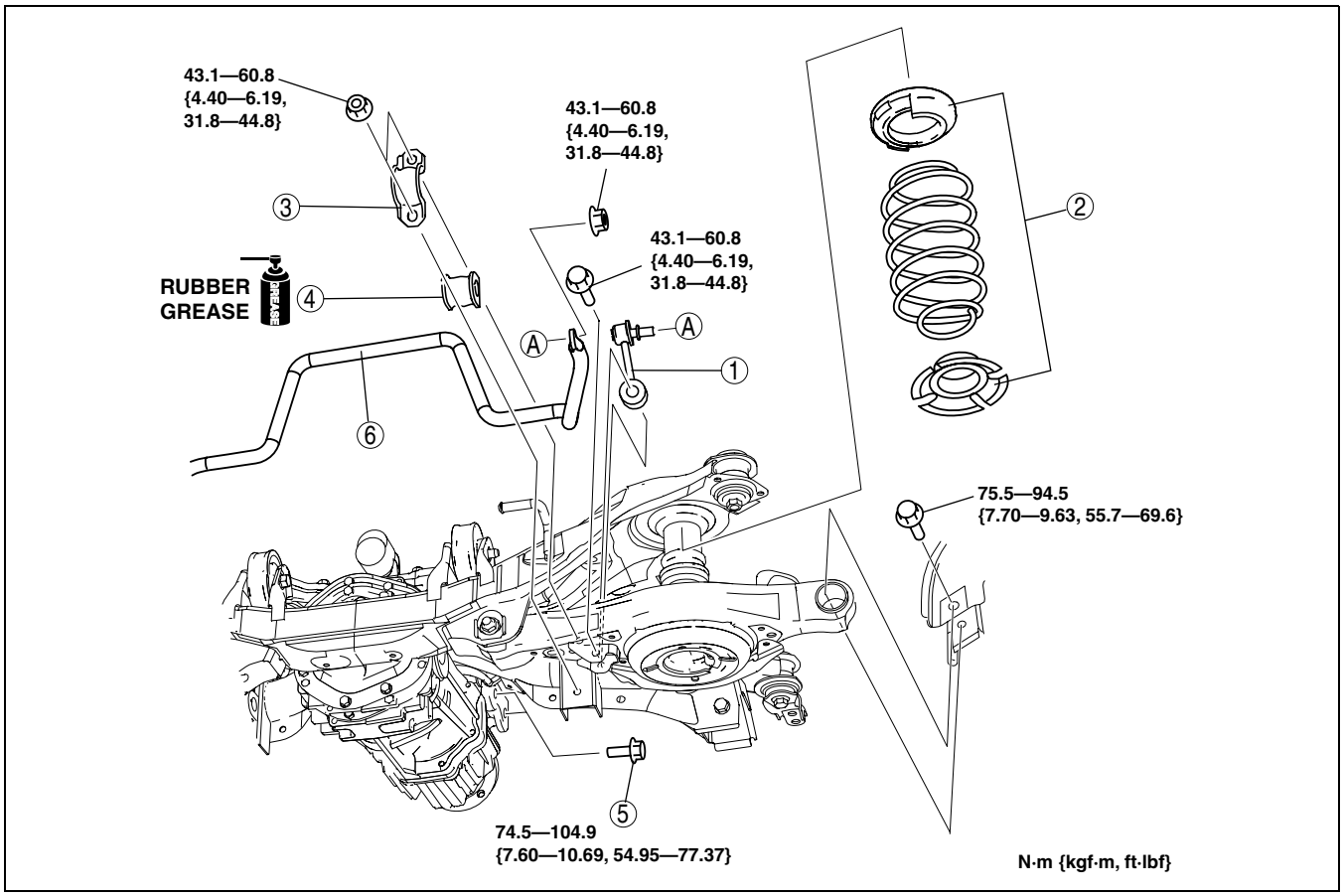


A6J74161006

REAR STABILIZER REMOVAL/INSTALLATION (4WD)

A6E741628100201

1. Remove the rear auto leveling sensor.
   (See T–20 REAR AUTO LEVELING SENSOR REMOVAL/INSTALLATION.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.
4. Adjust the headlight zeroset.



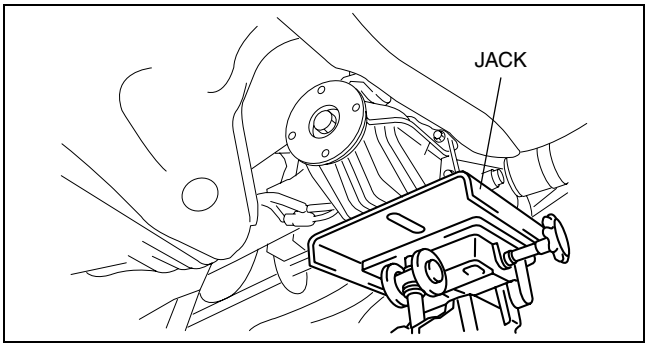
A6E74162007

1	Stabilizer control link
2	Coil spring component (One side only)
3	Stabilizer bracket
4	Bushing

5	Bolt (Differential front side) (See R–13 Bolt (Differential Front Side) Removal Note) (See R–14 Bolt (Differential Front Side) Installation Note)
6	Rear stabilizer

Bolt (Differential Front Side) Removal Note

1. Disconnect differential oil temperature sensor connector and 4WD solenoid connector.
2. Support the differential with a jack as shown in the figure.
3. Remove the bolt.

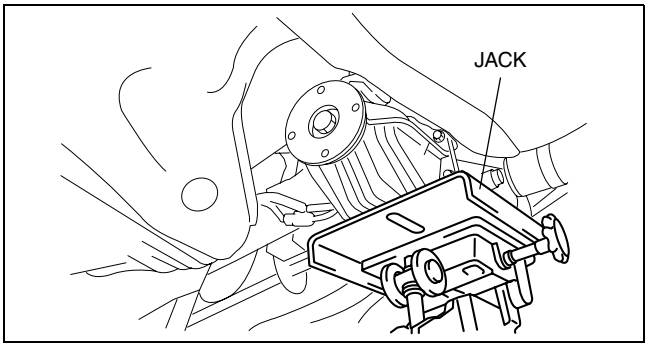


A6E74162011

R

Bolt (Differential Front Side) Installation Note

1. Support the differential with a jack, and then install the bolt.
2. Connect differential oil temperature sensor connector and 4WD solenoid connector.



A6E74162011

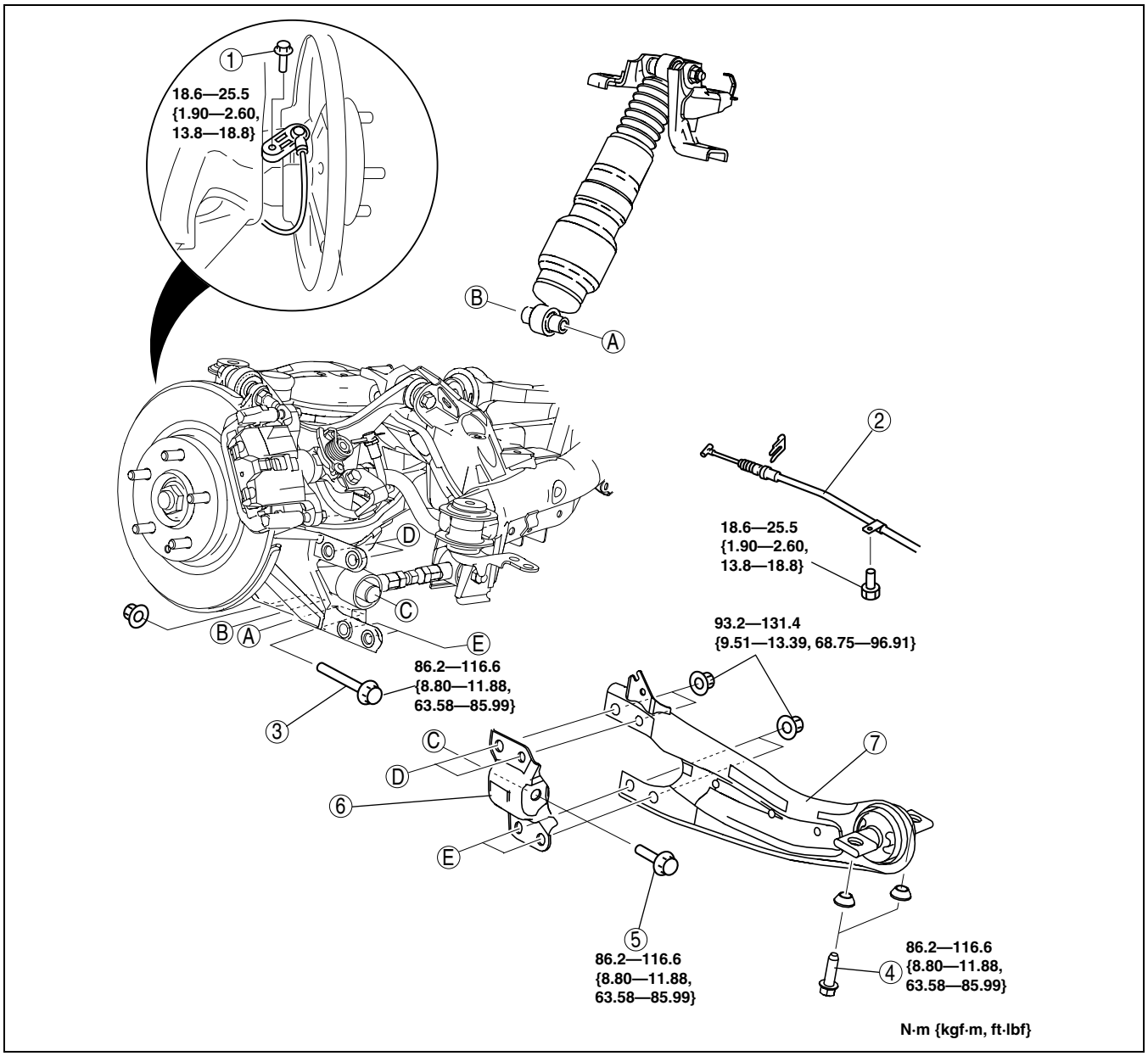
TRAILING LINK REMOVAL/INSTALLATION (4WD)

A6E741628200201

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 servicing the vehicle.**

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. Inspect the rear wheel alignment.
   (See R–9 REAR WHEEL ALIGNMENT (WGN).)



A6E74162008

1	ABS wheel-speed sensor
2	Parking brake cable
3	Bolt (shock absorber lower side)
4	Bolt (trailing link front side) (See R–16 Bolt (Trailing Link Front Side) Removal Note) (See R–16 Bolt (Trailing Link Front Side) Installation Note)

5	Bolt (Lateral link outer side) (See R–16 Bolt (Lateral Link Outer Side) Removal Note) (See R–16 Bolt (Lateral Link Outer Side) Installation Note)
6	Toe link bracket
7	Trailing link

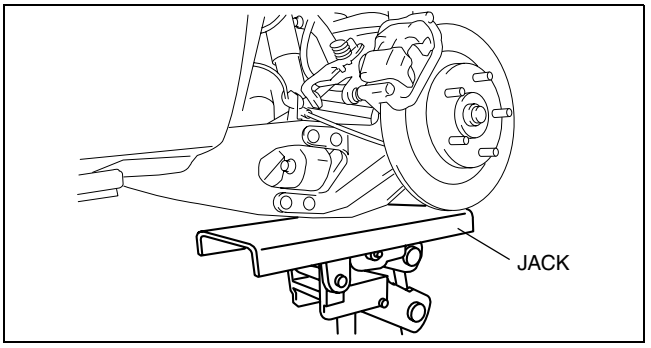
R

Bolt (Trailing Link Front Side) Removal Note

1. Support the trailing link with a jack.

   Caution
   - **Removing the trailing link is dangerous. The trailing link could fall and cause serious injury or death. Verify that the jack securely supports the trailing link.**

2. Remove the bolts (trailing link front side).



A6E74162010

Bolt (Lateral Link Outer Side) Removal Note

1. Loosen the bolt (lateral link inner side).
2. Remove the bolt (lateral link outer side).

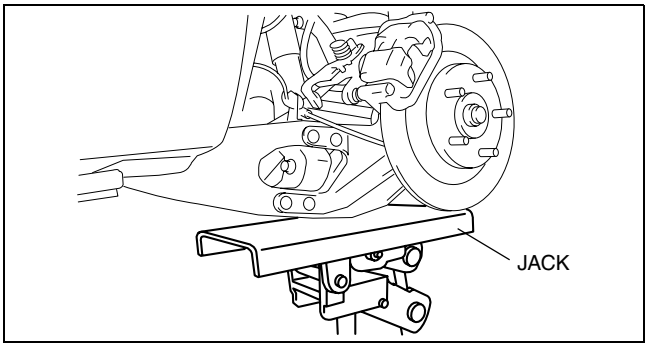
Bolt (Lateral Link Outer Side) Installation Note

1. Tighten the bolt (lateral link outer side).
2. Tighten the bolt (lateral link inner side).

   Tightening torque
   86.2—116.6 N·m {8.80—11.88 kgf·m, 63.58—85.99 ft·lbf}

Bolt (Trailing Link Front Side) Installation Note

1. Support the trailing link with a jack.
2. Tighten the bolts (trailing link front side).



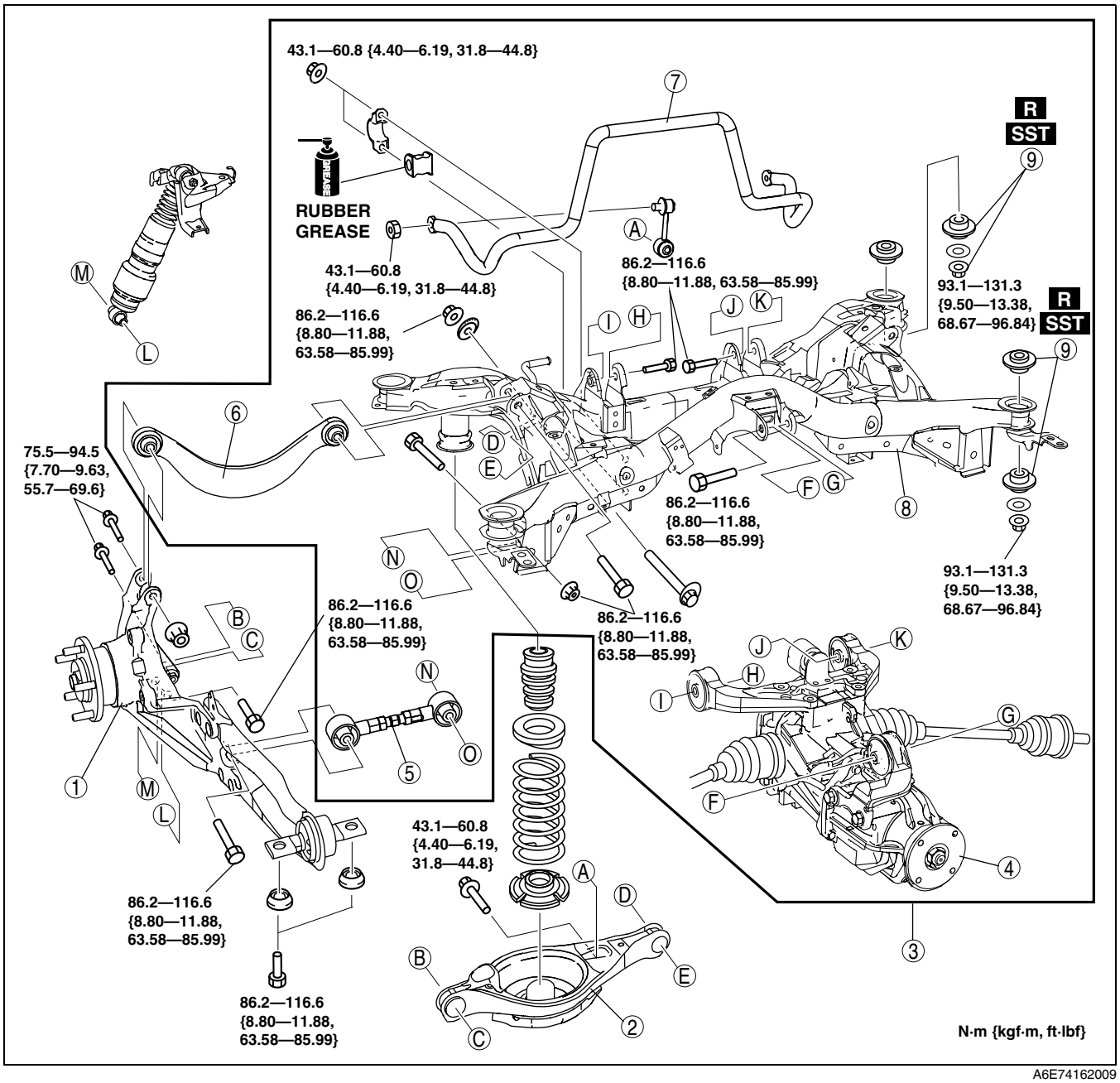
A6E74162010

REAR CROSSMEMBER REMOVAL/INSTALLATION (4WD)

A6E741628400201

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 servicing the vehicle.**

1. Remove the rear auto leveling sensor and harness.
   (See T–20 REAR AUTO LEVELING SENSOR REMOVAL/INSTALLATION.)
2. Remove the middle pipe.
   (See F1–30 EXHAUST SYSTEM REMOVAL/INSTALLATION.)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Adjust the headlight zeroset.
6. Inspect the rear wheel alignment.
   (See R–9 REAR WHEEL ALIGNMENT (WGN).)



A6E74162009

1	Trailing link, knuckle component (See M–22 WHEEL HUB, KNUCKLE REMOVAL/ INSTALLATION)
2	Rear lower arm
3	Crossmember component, differential and drive shaft (See R–18 Crossmember component, Differential And Drive Shaft Removal Note)
4	Differential and drive shaft

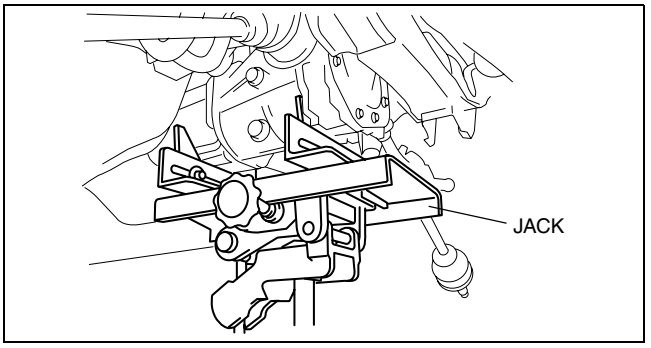
5	Rear lateral link
6	Rear upper arm
7	Rear stabilizer
8	Rear crossmember
9	Rear crossmember bushing (See R–18 Rear Crossmember Bushing Removal Note) (See R–18 Rear Crossmember Bushing Installation Note)

Crossmember component, Differential And Drive Shaft Removal Note

1. Support the differential with a jack, and remove the nut.

   Warning
   - **Removing the crossmember component, differential and drive shaft is dangerous. The crossmember component, differential and drive shaft could fall and cause serious injury or death. Verify that the jack securely supports the differential lower side.**

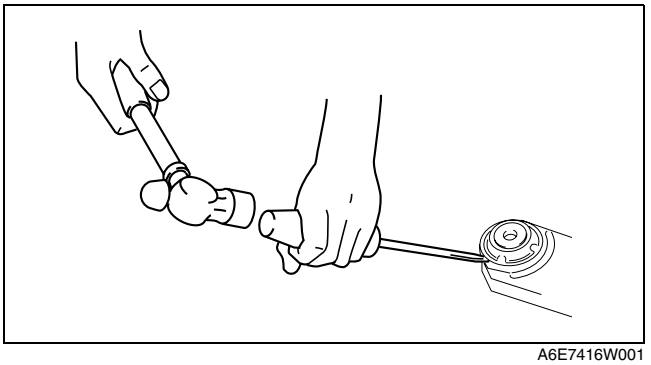
2. Remove the crossmember component, differential and drive shaft.



A6E74162012

Rear Crossmember Bushing Removal Note

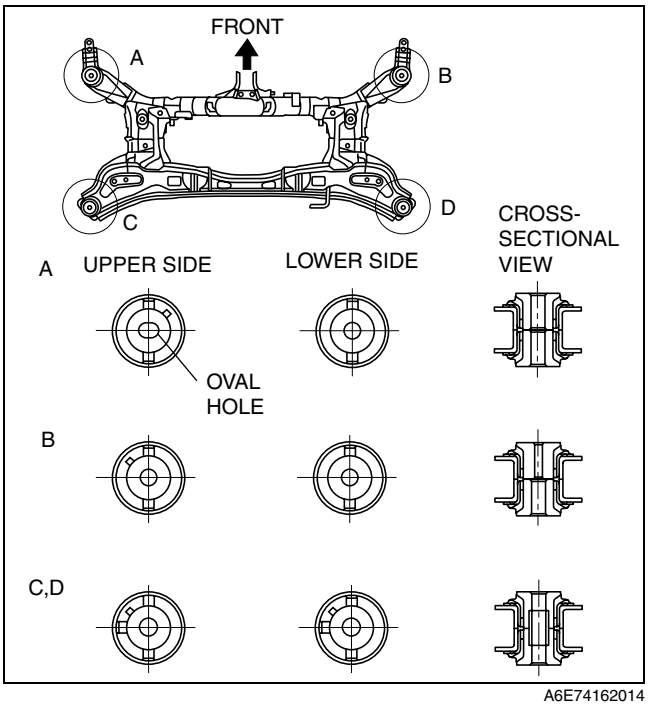
1. Remove the bushing using a screw driver (-), being careful not to damage the rear crossmember.



A6E7416W001

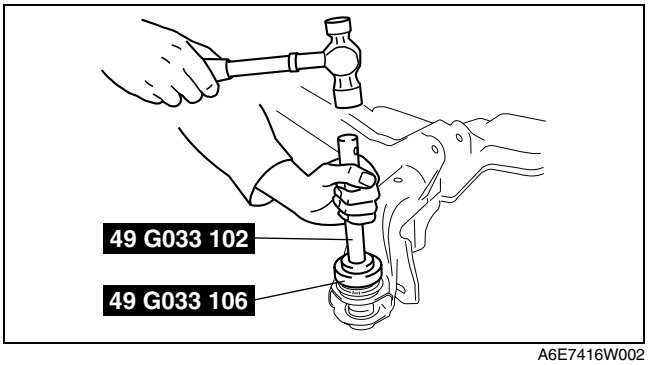
Rear Crossmember Bushing Installation Note

1. Set the bushings as shown in the figure.



A6E74162014

2. Tap the bushing onto the rear crossmember using the **SSTs**.



A6E7416W002

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E770201086201

- The construction and operation of the body system is essentially carried over from that of the current Mazda6 (GG) model, except for the following features. (See Mazda6 Training Manual 3359-1*-02C)

FEATURES

A6E770201086202

Improved Marketability

- A rear spoiler with a built in high-mount brake light has been adopted. (WGN)
- A roof rail has been adopted. (WGN)
- A tonneau cover with an attached net has been adopted. (WGN)
- A fixed rear seat cushion has been adopted. (4WD WGN)

EXTERIOR ATTACHMENT

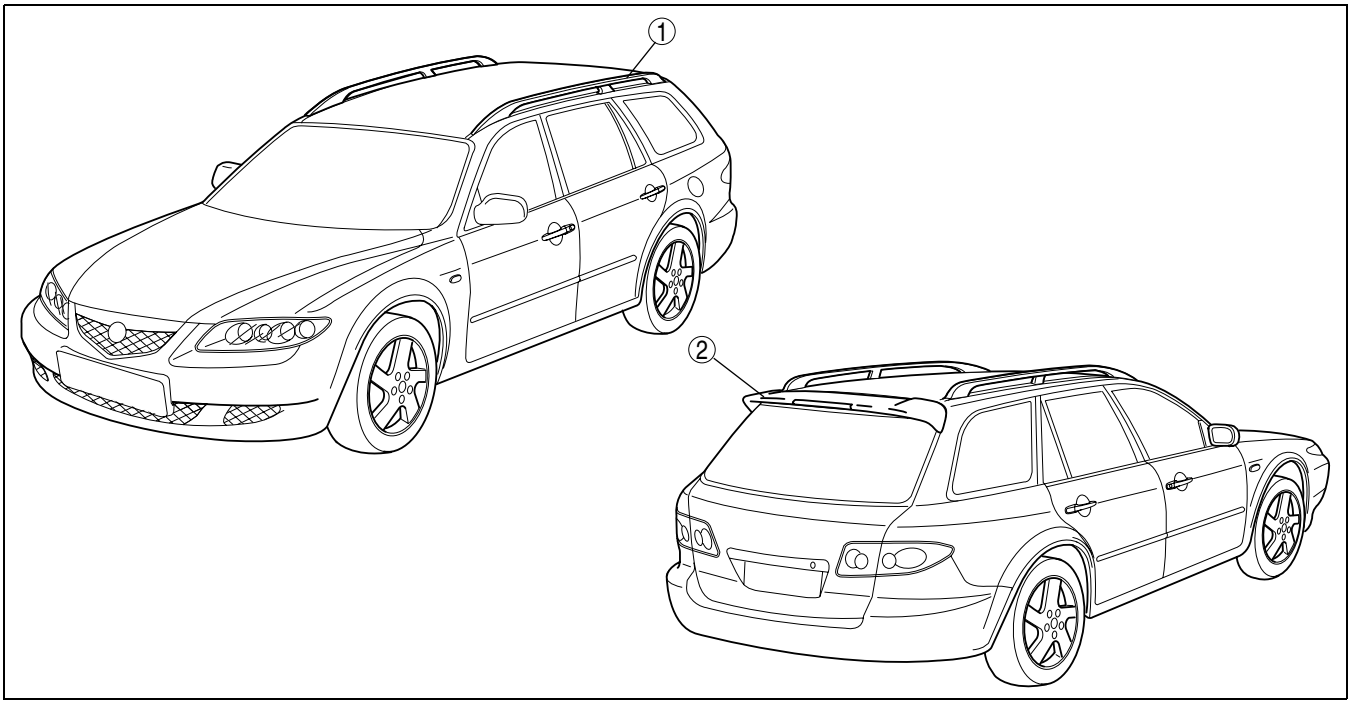
OUTLINE

A6E772801092201

- A rear spoiler with a built in high-mount brake light has been adopted.
- A roof rail has been adopted.

STRUCTURAL VIEW

A6E772801092202



A6E7728T101

1	Roof rail	2	Rear spoiler

TRIM

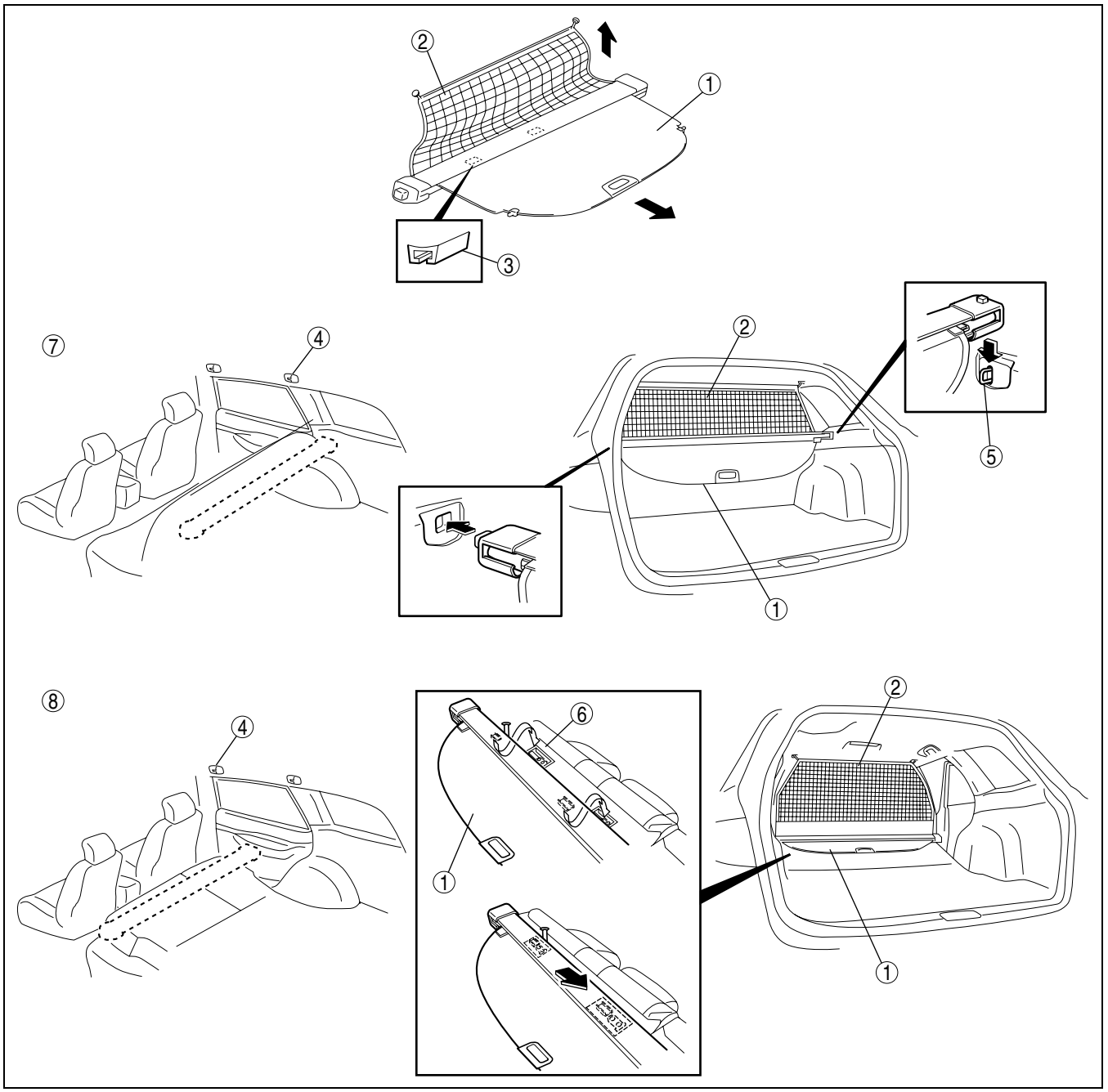
OUTLINE

A6E774468320202

- A tonneau cover with an attached net has been adopted. By extending this cover and net, the privacy of the cargo compartment can be maintained, the cargo and passenger compartments can be partioned, and cargo or luggage can be kept from falling into the passenger compartment.
- Fixing the net to the trunk side upper trim allows for partitioning of the rear seat and cargo compartment, and fixing the net to the rear seat back (folded down) allows for partitioning of the front seat and the cargo compartment.

STRUCTURAL VIEW

A6E774468320203



A6E7744T101

1	Tonneau cover
2	Net
3	Rear seat fixing bracket
4	Hook

5	Tonneau cover anchor
6	Rear seat
7	When fixed to the trunk side upper trim
8	When fixed to the rear seat

SEAT

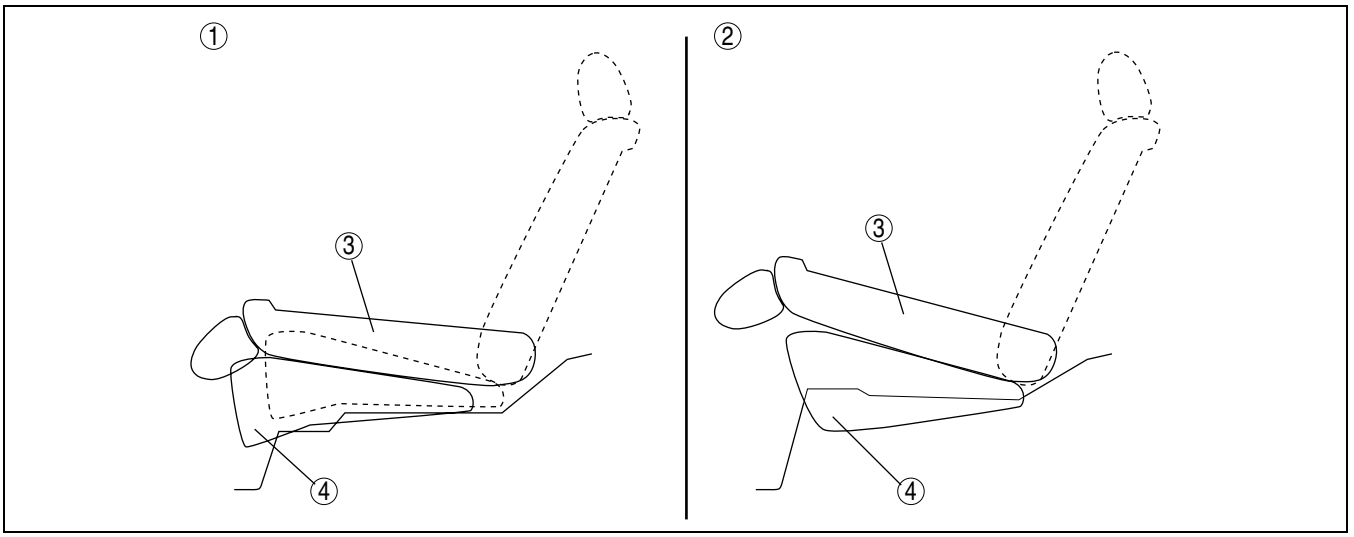
OUTLINE

A6E775257100201

- A fixed rear seat cushion has been adopted. (4WD WGN)

STRUCTURAL VIEW

A6E775257100202



A6E77521101

1	Full flat fold down function (except 4WD WGN)
2	Fold down function (4WD WGN)

3	Rear seat back
4	Rear seat cushion

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E770201086203

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Liftgate
- Removal/Installation procedure has been modified.
- Disassembly/Assembly procedure has been modified.
- Adjustment procedure has been modified.

Extractor chamber
- Removal/Installation procedure has been modified.

Roof rail
- Removal/Installation procedure has been added.

Rear spoiler
- Removal/Installation procedure has been modified.

Roof molding
- Removal procedure has been modified.
- 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 drain hose
- Removal procedure has been modified.

C-pillar trim
- Removal/Installation procedure has been modified.

D-pillar trim
- Removal/Installation procedure has been added.

Trunk side trim
- Removal/Installation procedure has been modified.

Trunk side upper trim
- Removal/Installation procedure has been modified.

Trunk end trim
- Removal/Installation procedure has been modified.

Liftgate upper trim
- Removal/Installation procedure has been modified.

Liftgate side trim
- Removal/Installation procedure has been modified.

Liftgate lower trim
- Removal/Installation procedure has been modified.

Tonneau cover anchor
- Removal/Installation procedure has been added.

Headliner
- Removal/Installation procedure has been modified.

Front floor covering
- Removal/Installation procedure has been modified.

Rear side seat belt
- Removal/Installation procedure has been modified.

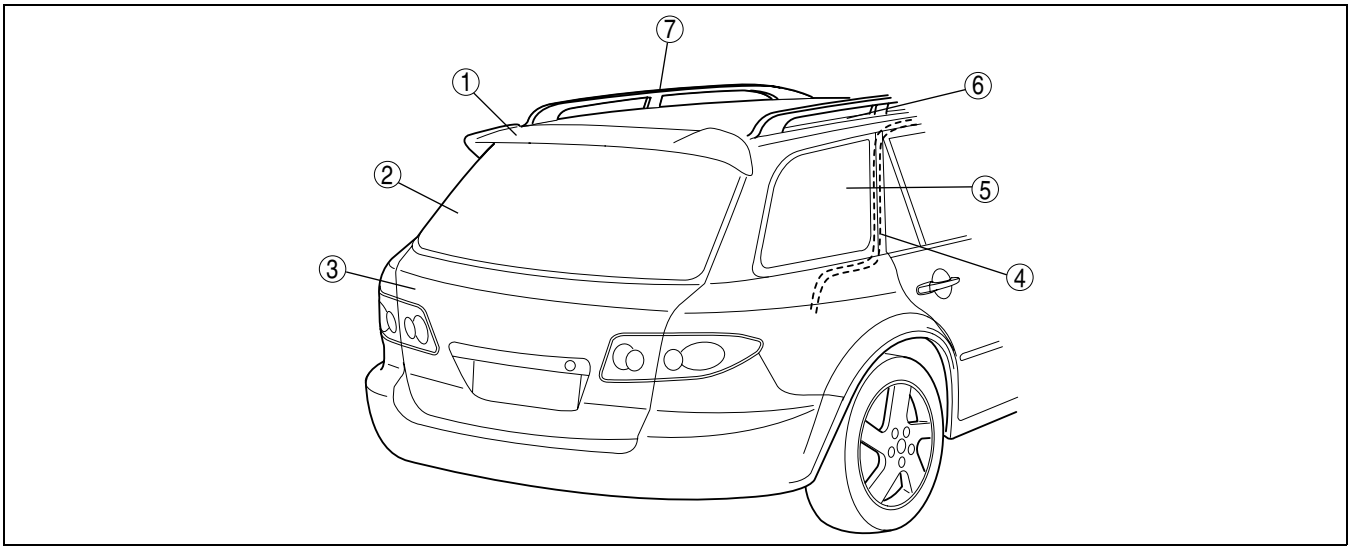
Rear center seat belt
- Removal/Installation procedure has been modified.

Rear seat
- Removal/Installation procedure has been modified.
- Disassembly/Assembly procedure has been modified.

LOCATION INDEX

EXTERIOR

A6E770001086201

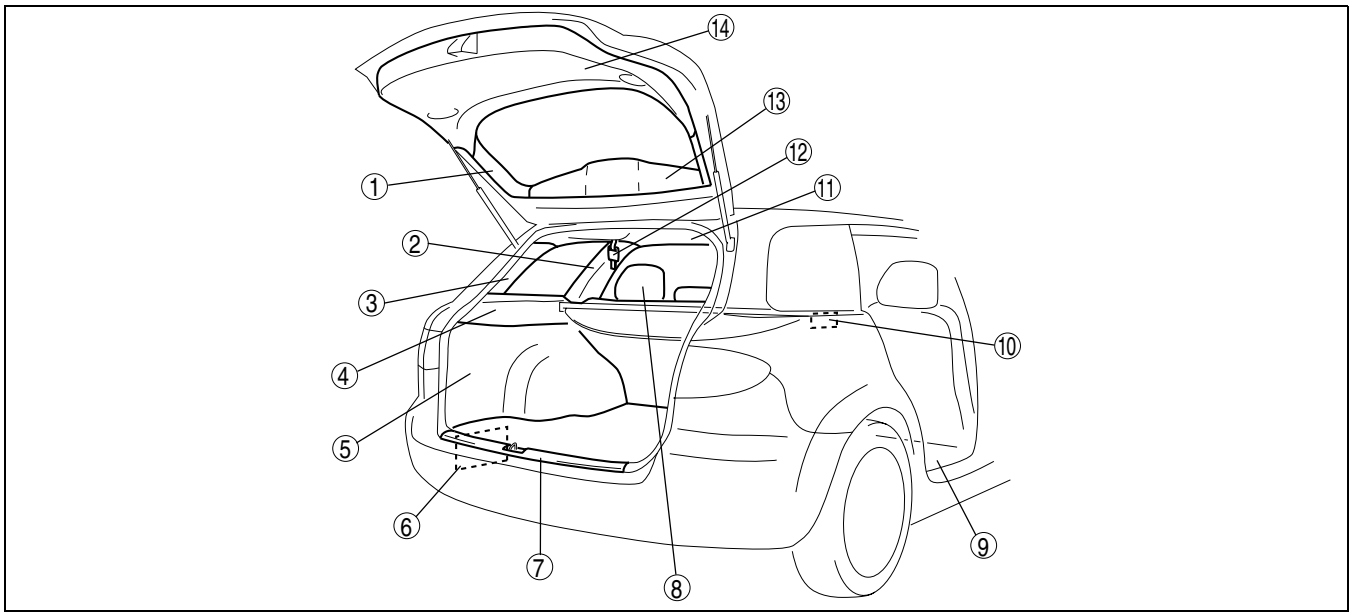


A6E77001102

1	Rear spoiler (See S–11 REAR SPOILER REMOVAL/ INSTALLATION)
2	Rear window glass (See S–16 REAR WINDOW GLASS REMOVAL) (See S–17 REAR WINDOW GLASS INSTALLATION)
3	Liftgate (See S–8 LIFTGATE REMOVAL/INSTALLATION) (See S–9 LIFTGATE DISASSEMBLY/ASSEMBLY) (See S–10 LIFTGATE ADJUSTMENT)
4	Rear drain hose (See S–20 REAR DRAIN HOSE REMOVAL)
5	Side window glass (See S–14 SIDE WINDOW GLASS REMOVAL) (See S–14 SIDE WINDOW GLASS INSTALLATION)
6	Roof molding (See S–12 ROOF MOLDING REMOVAL) (See S–12 ROOF MOLDING INSTALLATION)
7	Roof rail (See S–11 ROOF RAIL REMOVAL/ INSTALLATION)

INTERIOR

A6E770001086202



A6E77001104

1	Liftgate side trim (See S–24 LIFTGATE SIDE TRIM REMOVAL/ INSTALLATION)
2	C-pillar trim (See S–21 C-PILLAR TRIM REMOVAL/ INSTALLATION)
3	D-pillar trim (See S–21 D-PILLAR TRIM REMOVAL/ INSTALLATION)
4	Trunk side upper trim (See S–22 TRUNK SIDE UPPER TRIM REMOVAL/ INSTALLATION)
5	Trunk side trim (See S–21 TRUNK SIDE TRIM REMOVAL/ INSTALLATION)
6	Extractor chamber (See S–11 EXTRACTOR CHAMBER REMOVAL/ INSTALLATION)
7	Trunk end trim (See S–23 TRUNK END TRIM REMOVAL/ INSTALLATION)

8	Rear seat (See S–29 REAR SEAT REMOVAL/ INSTALLATION) (See S–30 REAR SEAT DISASSEMBLY/ ASSEMBLY)
9	Floor covering (See S–27 FRONT FLOOR COVERING REMOVAL/INSTALLATION)
10	Tonneau cover anchor (See S–25 TONNEAU COVER ANCHOR REMOVAL/INSTALLATION)
11	Headliner (See S–26 HEADLINER REMOVAL/ INSTALLATION)
12	Rear center seat belt (See S–28 REAR CENTER SEAT BELT REMOVAL/INSTALLATION)
13	Liftgate upper trim (See S–23 LIFTGATE UPPER TRIM REMOVAL/ INSTALLATION)
14	Liftgate lower trim (See S–24 LIFTGATE LOWER TRIM REMOVAL/ INSTALLATION)

LIFTGATE

LIFTGATE REMOVAL/INSTALLATION

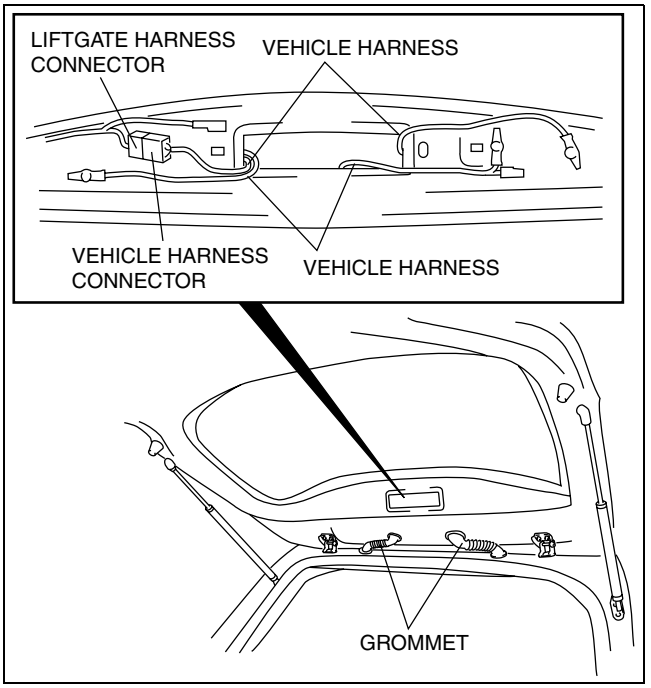
A6E772262010201

WGN

Warning

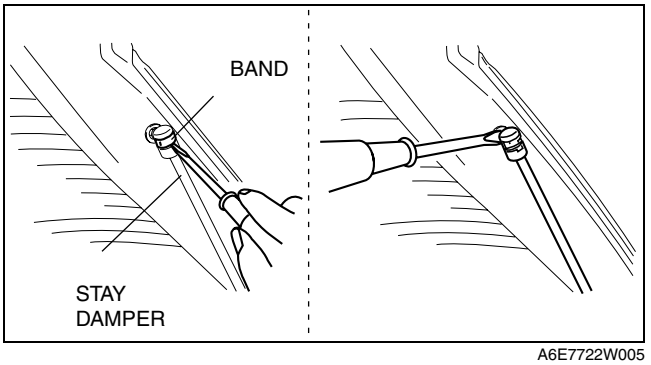
- **Removing the stay damper without supporting the liftgate can be dangerous. The liftgate may fall and injure you. Open the liftgate fully and support it before removing the stay damper.**

1. Disconnect the negative battery cable.
2. Remove the liftgate upper trim. (SeeS–23 LIFTGATE UPPER TRIM REMOVAL/INSTALLATION)
3. Disconnect the rear washer hose.
4. Disconnect the vehicle harness and the vehicle harness connector, attached to the liftgate, from the liftgate harness connector.



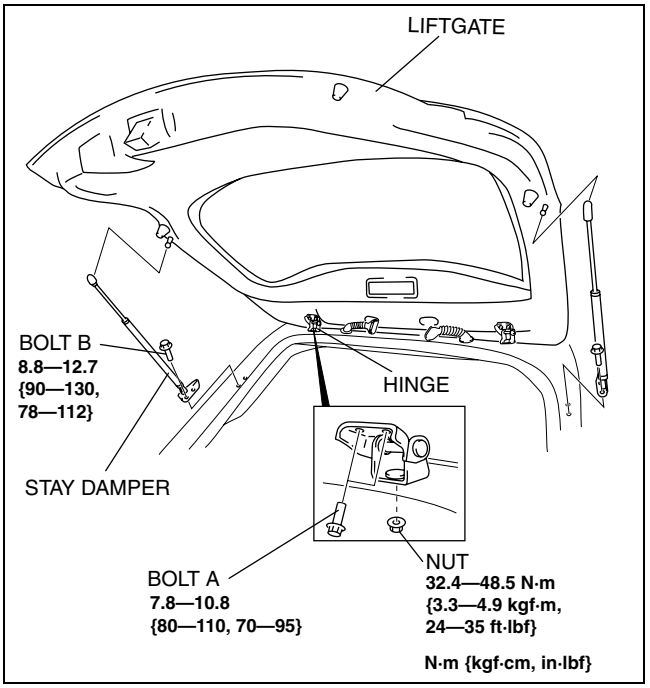
A6E77221101

5. Pry away the stay damper's band with a screwdriver.
6. Pry out the connecting part of the stay damper and the hinge with a screwdriver to disconnect them. Then remove the stay damper.
7. Remove the bolts A, then remove the liftgate.
8. To remove the hinge, remove the headliner and the nut.



A6E7722W005

9. To remove the stay damper, remove the bolt B.
10. Install in the reverse order of removal.



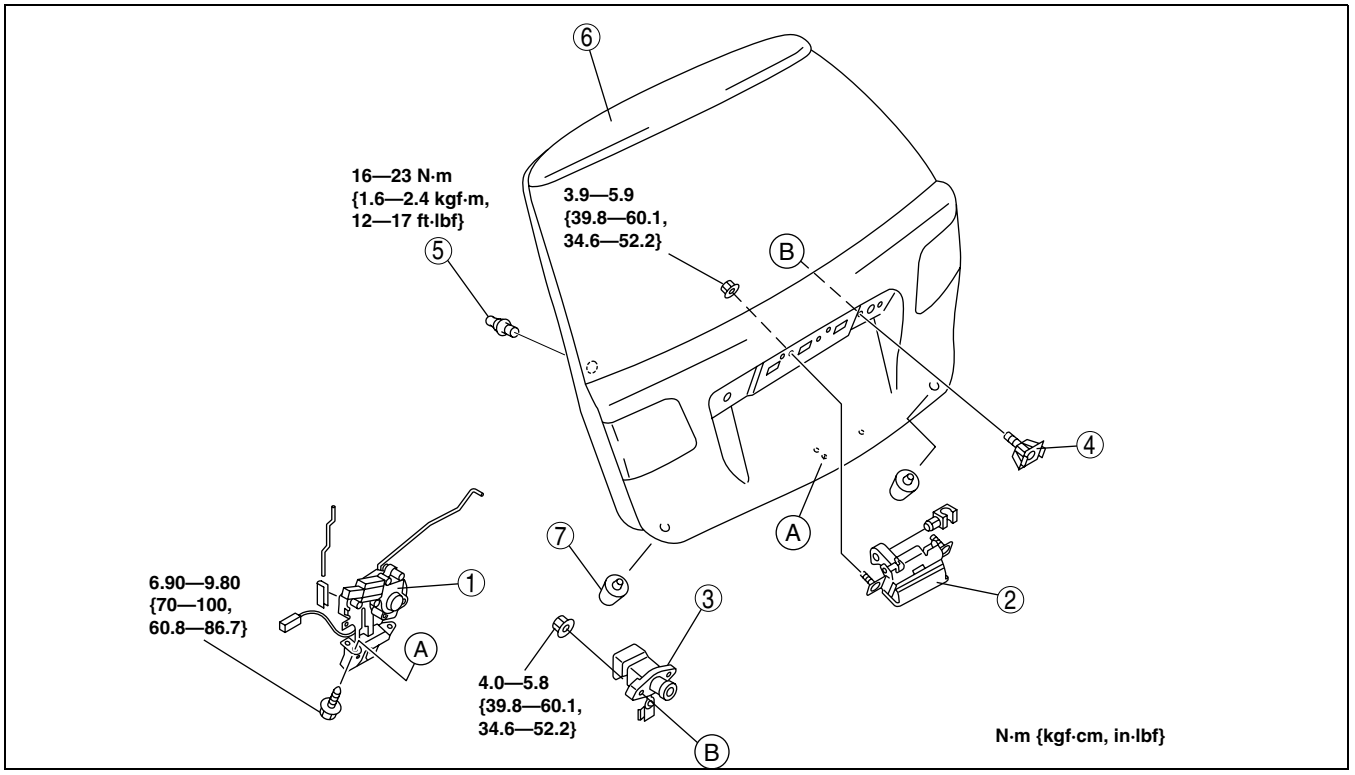
A6E77221102

LIFTGATE DISASSEMBLY/ASSEMBLY

A6E772262010202

WGN

1. Disconnect the negative battery cable.
2. Remove the liftgate lower trim.
3. To remove the liftgate outer handle and liftgate key cylinder, remove the rear finisher.
4. To remove the stud ball, separate the stud ball and the stay damper.
5. Disassemble in the order indicated in the table.
6. Assemble in the reverse order of disassembly.



A6A7722W103

1	Liftgate latch and lock actuator
2	Liftgate outer handle
3	Liftgate key cylinder
4	Clip

5	Stud ball
6	Liftgate
7	Stopper

LIFTGATE ADJUSTMENT

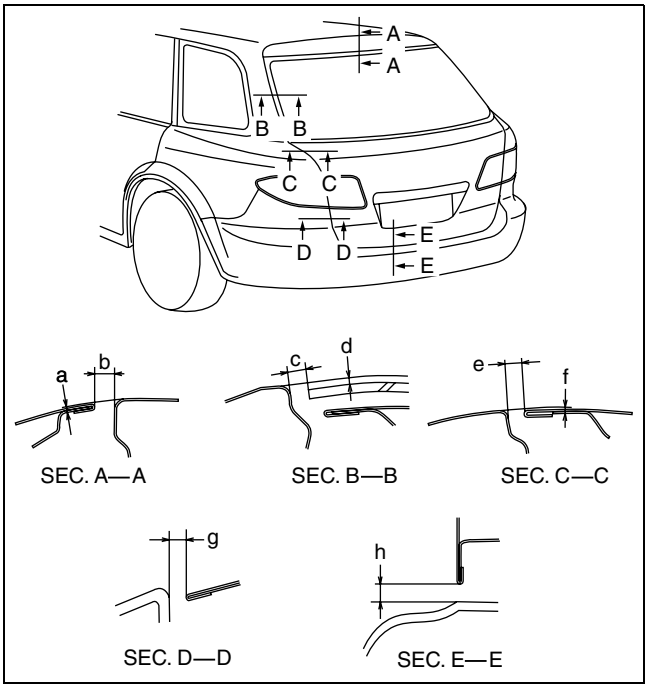
A6E772262010203

WGN

1. Measure the gap and height between the liftgate and the body.
2. If not as specified, loosen the liftgate hinge installation bolts or the liftgate striker installation screws, and reposition the liftgate.

   Clearance
   a: 0—2.0 mm {0—0.07 in}
   b: 4.8—6.8 mm {0.19—0.26 in}
   c: 3.5—7.5 mm {0.14—0.29 in}
   d: 1.2—3.2 mm {0.05—0.12 in}
   e: 2.8—5.2 mm {0.11—0.20 in}
   f: -0.7—1.7 mm {-0.02—0.06 in}
   g: 2.3—5.7 mm {0.10—0.22 in}
   h: 4.0—8.0 mm {0.16—0.31 in}

3. Tighten the bolts or screws.



A6A7722W104

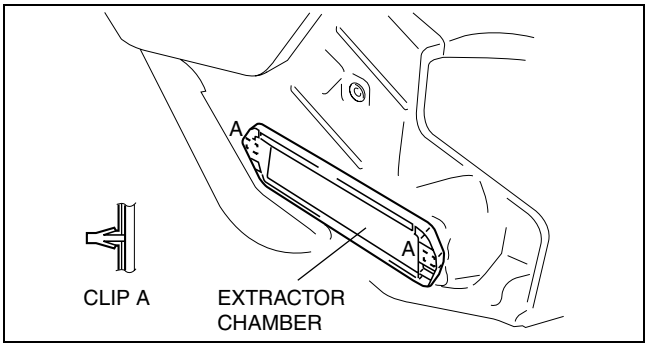
EXTERIOR ATTACHMENT

EXTRACTOR CHAMBER REMOVAL/INSTALLATION

A6E772851920201

WGN

1. Remove the rear bumper.
2. Remove the left side trunk side trim.
3. Squeeze the clips with your fingers and remove the extractor chamber from the vehicle side.
4. Install in the reverse order of removal.



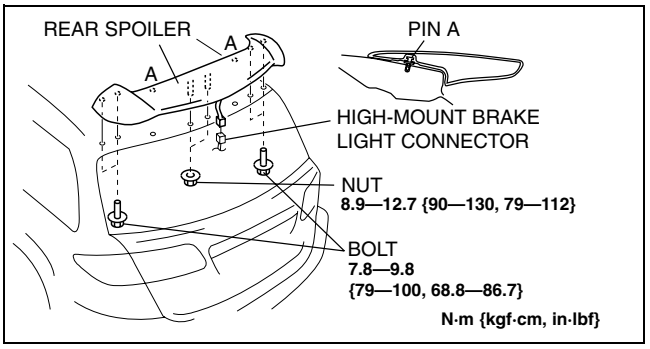
A6E77281103

REAR SPOILER REMOVAL/INSTALLATION

A6E772851920202

WGN

1. Disconnect the negative battery cable.
2. Remove the liftgate upper trim. (SeeS–23 LIFTGATE UPPER TRIM REMOVAL/INSTALLATION)
3. Remove the bolts and nuts.
4. Disconnect the high-mount brake light connector.
5. Disengage the pin A from the body, then remove the rear spoiler.
6. Install in the reverse order of removal.

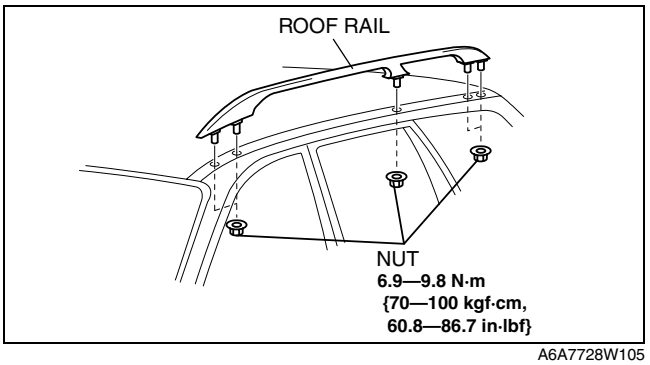


A6A7728W104

ROOF RAIL REMOVAL/INSTALLATION

A6E772851720201

1. Remove the headliner.
2. Remove the nuts.
3. Remove the roof rail.
4. Install in the reverse order of removal.



A6A7728W105

S

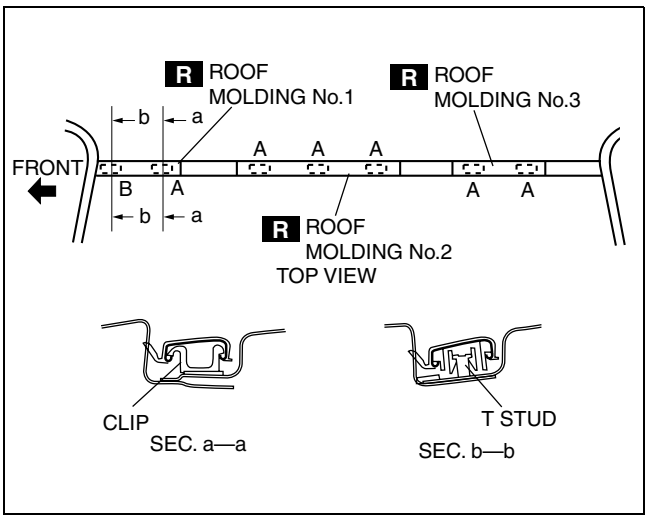
MOLDING

ROOF MOLDING REMOVAL

A6E773050620201

With Roof Rail

1. Remove the roof rail.
2. Detach the clips which secure A section of roof moldings, using a screwdriver or equivalent tool.
3. Remove the roof molding No.2 and No.3.
4. While pulling the roof molding No.1 up, detach the fit for the T stud of the B section and the roof molding No.1 and then remove the roof molding No.1.



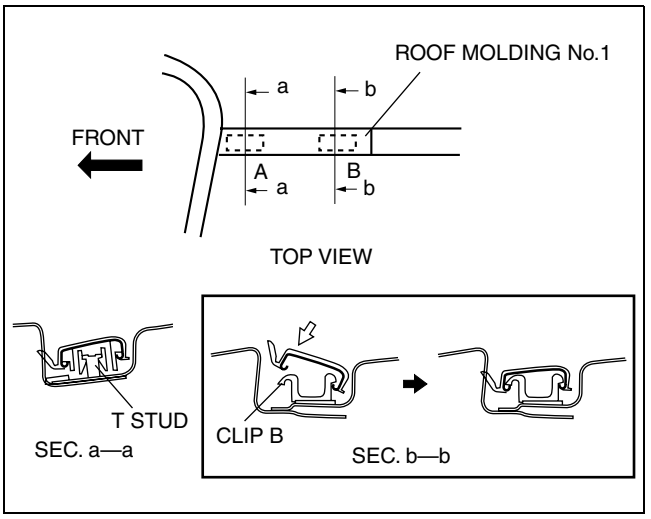
A6A7730W102

ROOF MOLDING INSTALLATION

A6E773050620202

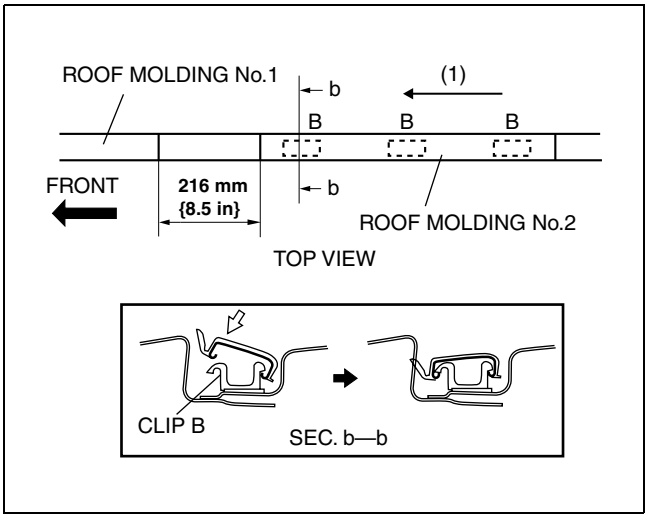
With Roof Rail

1. Attach the roof molding No.1 to the T stud at the A section.
2. Hook the roof molding No.1 to clip B at the B section, press it in, and attach the roof molding No.1 to clip B.



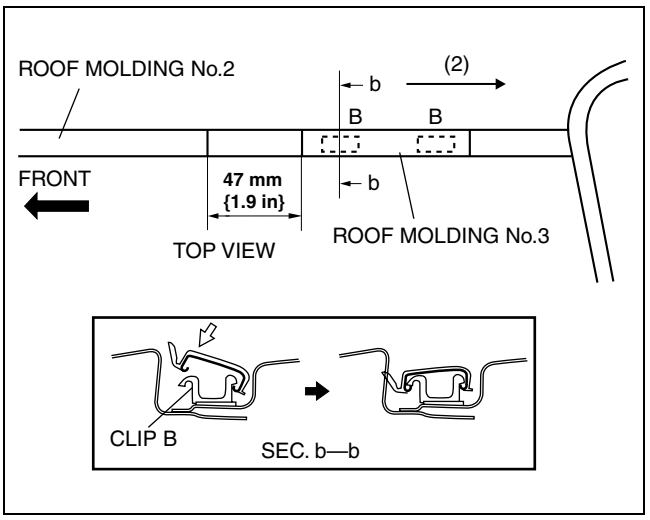
A6A7730W104

3. Align the front end-face of roof molding No.2 at a position **216 mm** {**8.5 in**} from the rear end-face of roof molding No.1.
4. Press in roof molding No.2 along the direction (1) shown in the figure and attach it to clips B at the B section.



A6A7730W105

5. Align the front end-face of roof molding No.3 at a position **47 mm** {**1.9 in**} from the rear end-face of roof molding No.2.
6. Press in roof molding No.3 along the direction (2) shown in the figure and attach it to clips B at the B section.



A6A7730W106

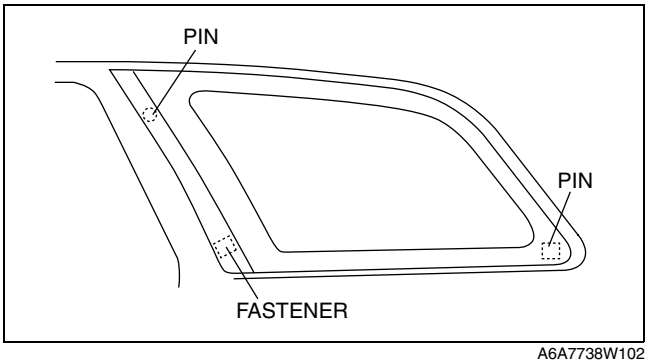
S

WINDOW GLASS

SIDE WINDOW GLASS REMOVAL

A6E773862580201

1. Apply protective tape along the edge of the body to protect it from damage.
2. Make a hole through the sealant, avoiding pins, from the inside of the vehicle using an awl.



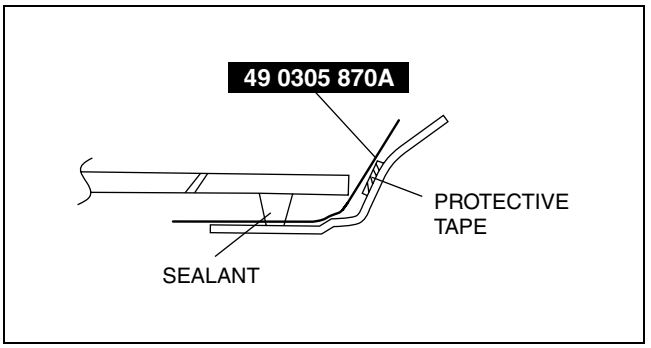
A6A7738W102

3. 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).**

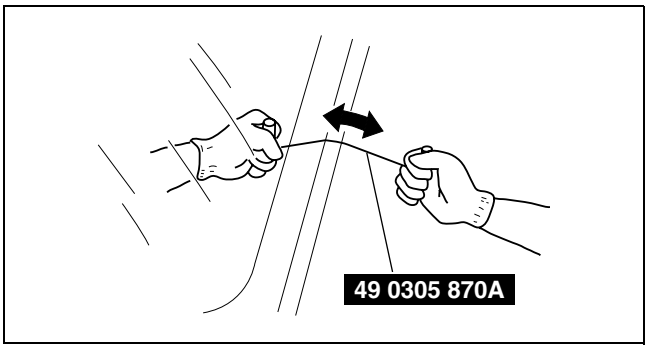
4. Wind each end of the **SST** (piano wire) around a bar.

Note
- Use a long sawing action to spread the work over the whole length of the **SST** (piano wire) to prevent it from breaking.



A6A7738W103

5. Working with another person, saw through the sealant around the edge of the glass.
6. Remove the side window glass.



A6E7738W021

SIDE WINDOW GLASS INSTALLATION

A6E773862580202

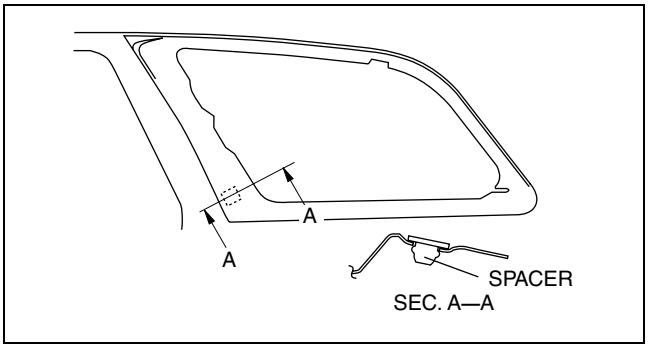
Caution
- **To prevent the sealant from cracking or the glass from being pushed out by air pressure if a door is closed, open all of the windows and leave them open until the sealant has hardened.**

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 **approximately 30 minutes** to dry. Then put on new sealant to create a **2 mm {0.08 in}** layer.
3. Clean and degrease an **approximately 50.0 mm {1.97 in}** wide strip around the circumference of the glass and the bonding area on the body.

4. Insert the spacer into the body.

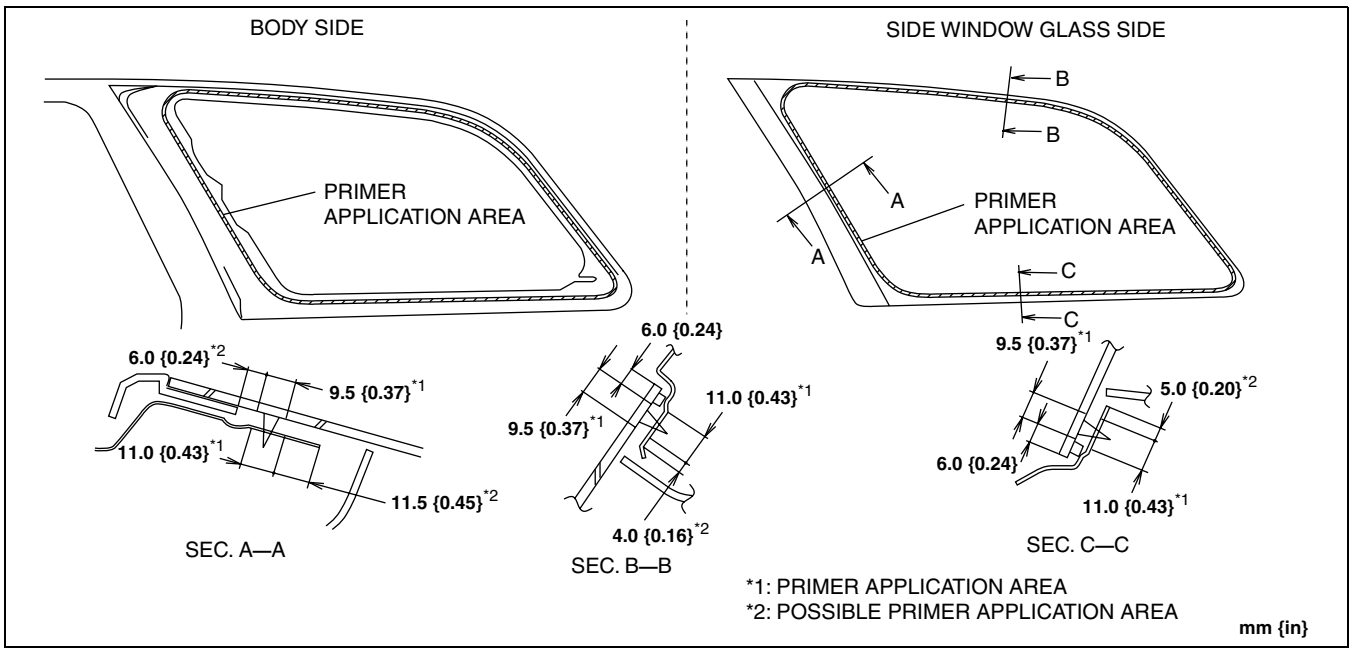


A6A7738W104

5. Use only glass primer on the glass, and body primer on the body and the molding. Allow it to dry for **approximately 30 minutes**.

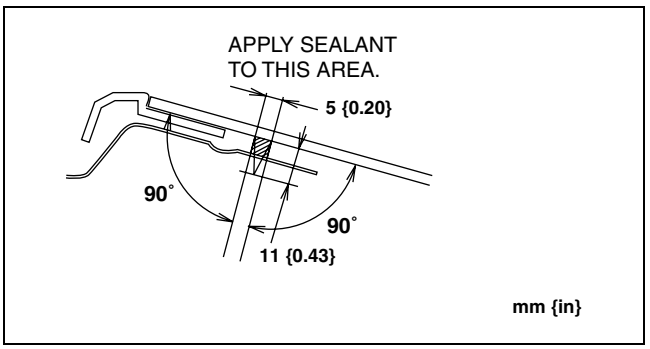
Caution

- **Keep the area free of dirt and grease, and do not touch the surface or the primer may not properly bond to the surface of the glass and body, which may cause leaks to occur.**



A6A7738W105

6. Apply sealant to the area of the glass surface as shown in the figure.

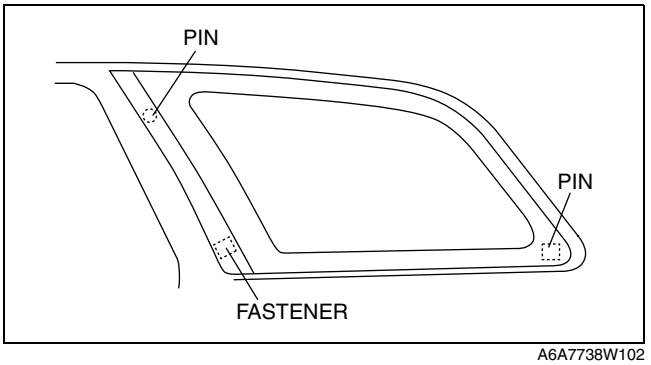


A6A7738W106

S

7. Set the side window glass in place and insert the pins and fastener into the body. Install the side window glass.
8. Allow the sealant to harden completely.

Sealant hardening time: 24 hours



A6A7738W102

REAR WINDOW GLASS REMOVAL

A6E773863931201

WGN

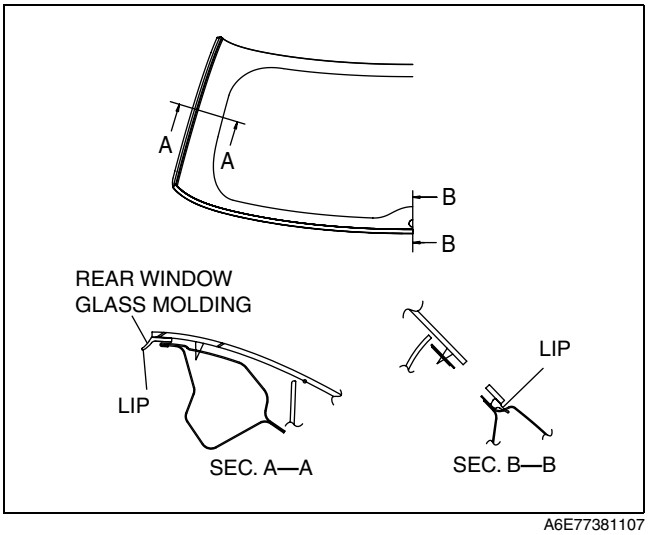
1. Remove the rear wiper motor.
2. Apply protective tape along the edge of the body to protect it from damage.
3. Cut the lip of the rear window molding using a razor.

Warning

- **Using a razor with bare hands can cause injury. Always wear gloves when using a razor.**

Note

- The rear window molding is a replacement part.



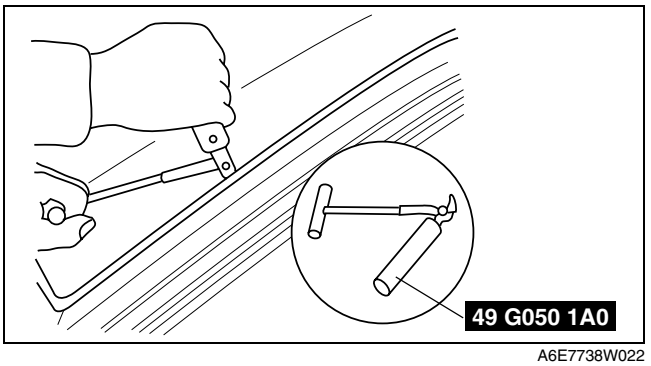
A6E77381107

Not Reusing Glass

Note

- For the areas of the sealant that are difficult to cut, use a **SST** (piano wire) and follow the procedure under "Reusing Glass."

1. Use a **SST**, and insert the blade into the sealant.
2. Pull through the sealant around the edge of the glass.
3. Remove the glass.

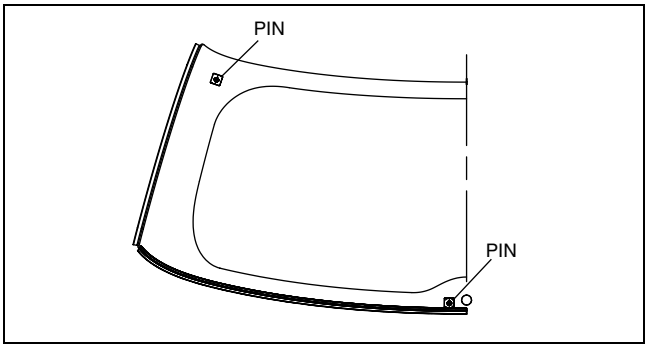


A6E7738W022

Reusing Glass

Note
- Before removing the rear window glass from the body, mark the position of the glass by affixing tape to the glass and body panel.

1. Make a hole through the sealant, avoiding pins, from the inside of the vehicle using an awl.



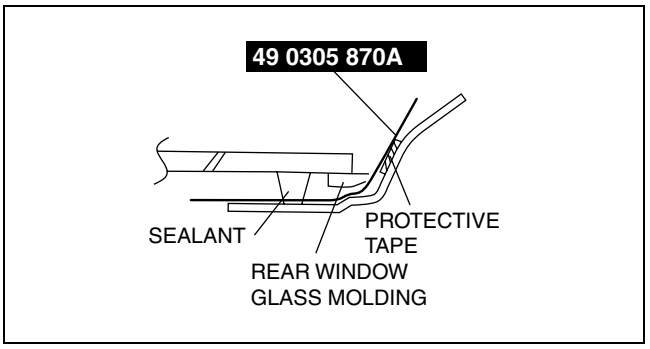
A6E77381108

2. 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).**

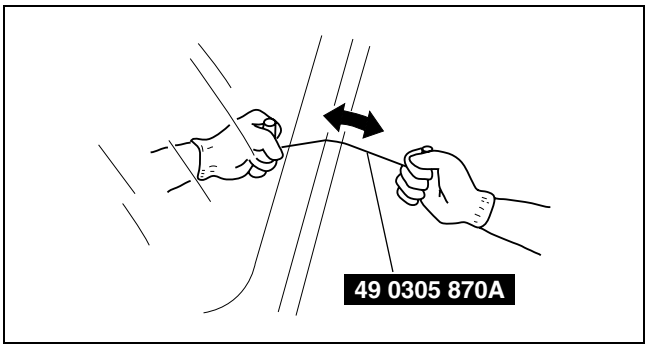
3. Wind each end of the **SST** (piano wire) around a bar.

Note
- Use a long sawing action to spread the work over the whole length of the **SST** (piano wire) to prevent it from breaking.



A6E77381109

4. Working with another person, saw through the sealant around the edge of the glass.
5. Remove the rear window glass.
6. Remove the pins from the glass.
7. Remove the rear window molding from the glass.



A6E7738W021

REAR WINDOW GLASS INSTALLATION

A6E773863931202

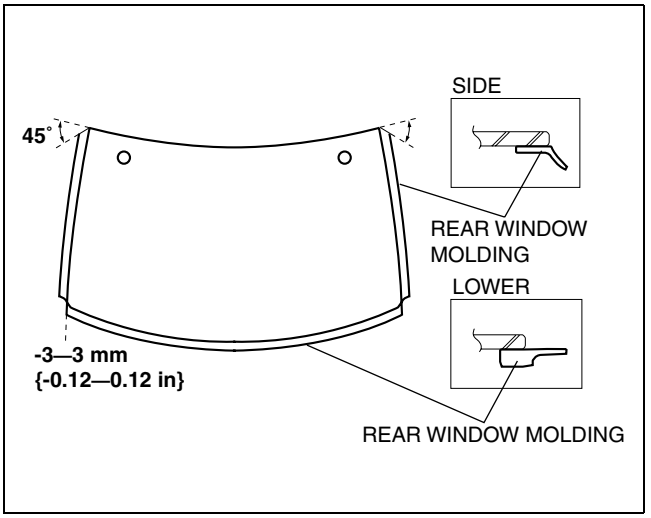
Caution
- **To prevent the sealant from cracking or the glass from being pushed out by air pressure if a door is closed, open all of the windows and leave them open until the sealant has hardened.**

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 **approximately 30 minutes** to dry. Then put on new sealant to create a **2 mm {0.08 in}** layer.
3. Clean and degrease an **approximately 50.0 mm {1.97 in}** wide strip around the circumference of the glass and the bonding area on the body.

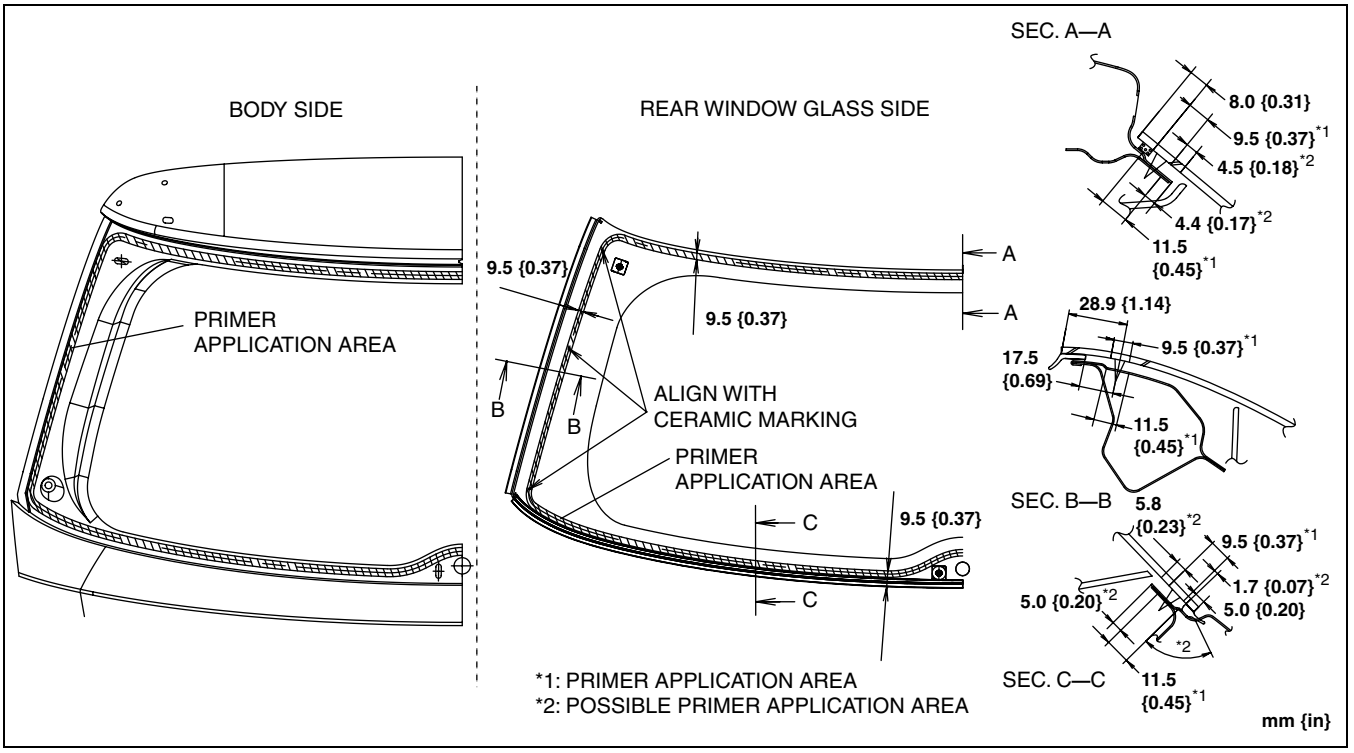
4. Install the molding as shown in the figure.



A6E77381110

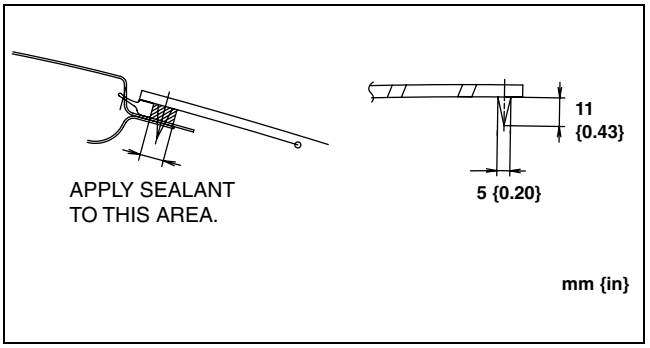
5. Use only glass primer on the glass, and body primer on the body and the molding. Allow it to dry for **approximately 30 minutes**.

Caution
- **Keep the area free of dirt and grease, and do not touch the surface or the primer may not properly bond to the surface of the glass and body, which may cause leaks to occur.**



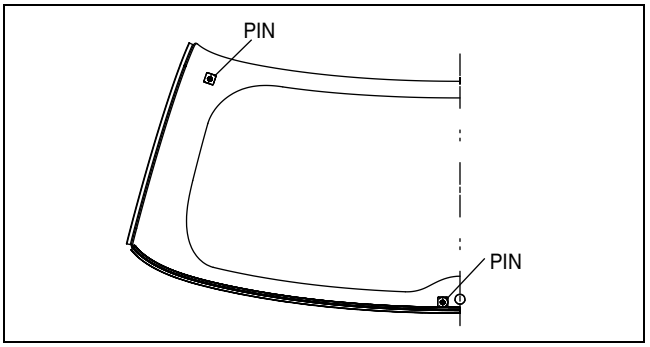
A6E77381112

6. Apply sealant to the area of the glass surface as shown in the figure.



A6A7738W113

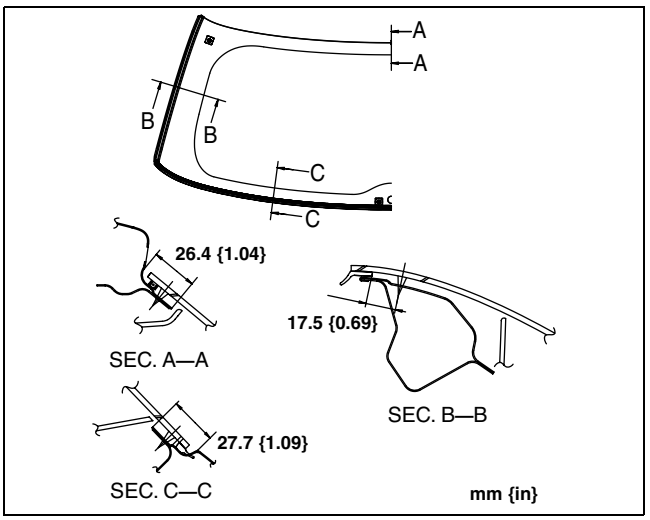
7. Set the position of the front windshield glass and insert a pin into the body. Install the glass.



A6E77381114

8. Keeping the measurement of the molding lip gap within specification, press completely along the perimeter of the glass.
9. Install the following points.
   (1) Install the rear wiper motor.
   (2) Install the liftgate lower trim.
   (3) Install the liftgate side trim.
   (4) Install the liftgate upper trim.
10. Allow the sealant to harden completely.

    Sealant hardening time: 24 hours



A6E77381115

S

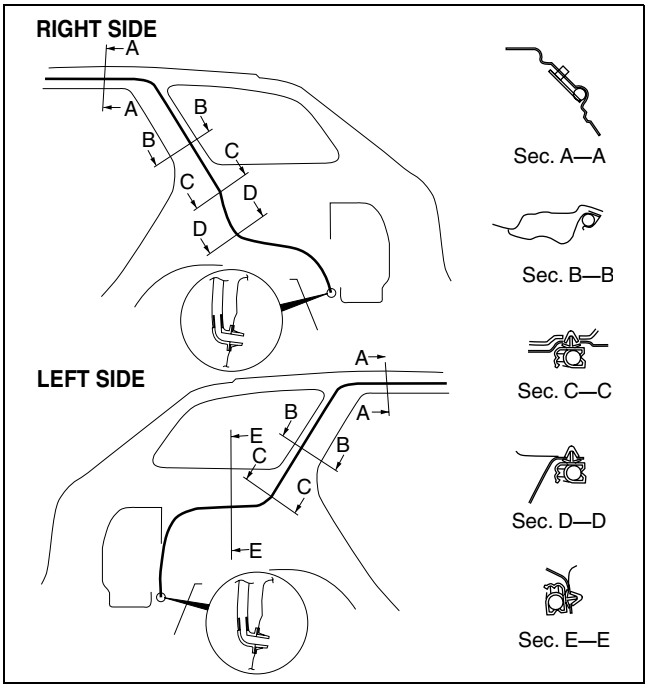
SLIDING SUNROOF

REAR DRAIN HOSE REMOVAL

A6E774069922201

WGN

1. Remove the headliner.
2. Remove the trunk side upper trim and trunk side trim.
3. Disconnect the rear drain hose from the sunroof frame.
4. Remove the rear drain hose from the clips.
5. Pull the rear drain hose into the room side.
6. Remove the rear drain hose.



A6E77401101

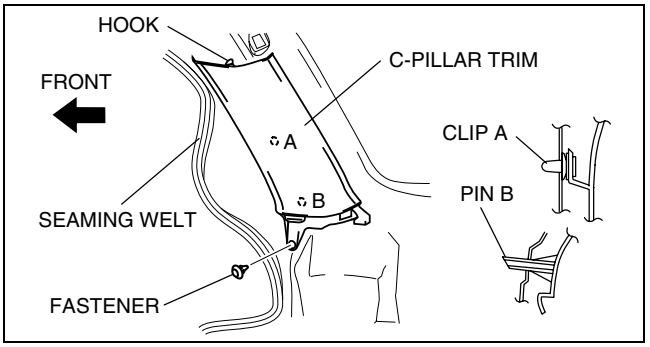
TRIM

C-PILLAR TRIM REMOVAL/INSTALLATION

A6E774468240201

WGN

1. Remove the trunk side upper trim.
2. Turn the seaming welt over.
3. Remove the fastener.
4. Pull the C-pillar trim forward, then disengage the clip A and pin B from the body.
5. Remove the hook from the body, then remove the C-pillar trim.
6. Install in the reverse order of removal.

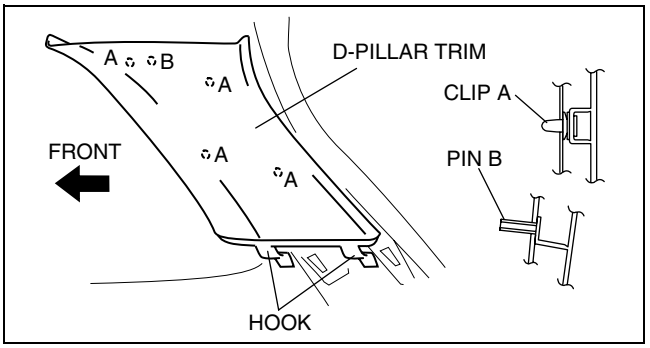


A6A7744W102

D-PILLAR TRIM REMOVAL/INSTALLATION

A6E774468280201

1. Remove the trunk side upper trim.
2. Pull the D-pillar trim forward, then disengage the clips A and pin B from the body.
3. Remove the hook from the body, then remove the D-pillar trim.
4. Install in the reverse order of removal.



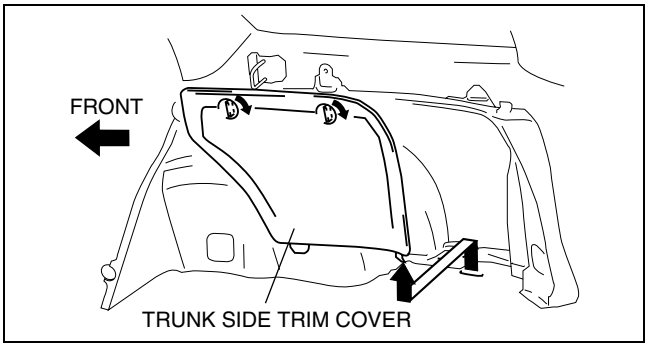
A6A7744W103

TRUNK SIDE TRIM REMOVAL/INSTALLATION

A6E774468860201

WGN

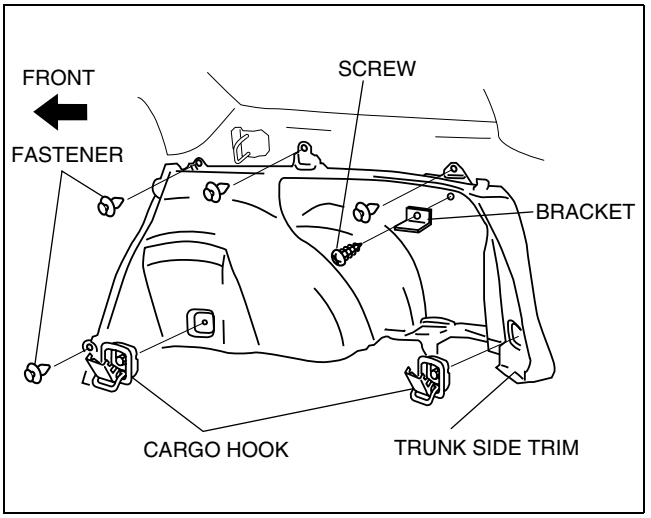
1. Remove the trunk side upper trim.
2. Remove the trunk side trim cover.



A6A7744W105

S

3. Remove the screw, then remove the bracket.
4. Remove the cargo hooks.
5. Remove the fasteners, then remove the trunk side trim.
6. Install in the reverse order of removal.



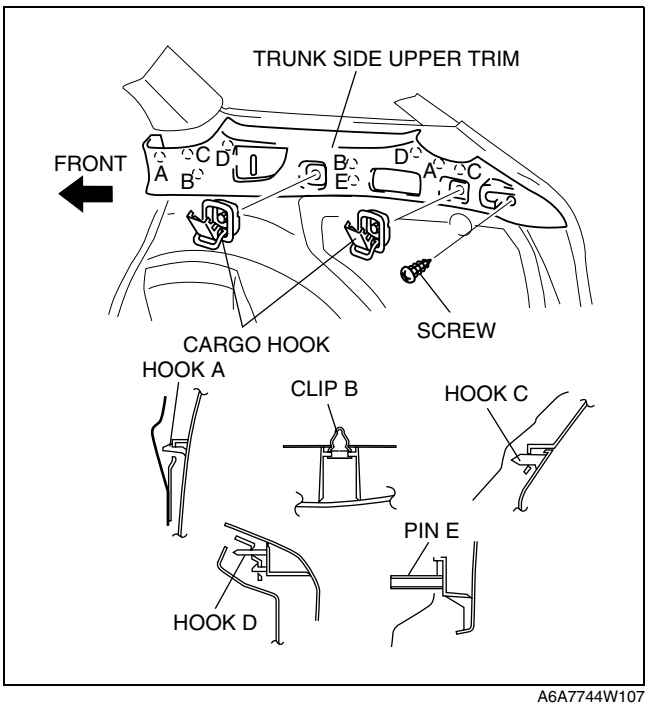
A6E77441106

TRUNK SIDE UPPER TRIM REMOVAL/INSTALLATION

A6E774468860202

WGN

1. Remove the tire house trim.
2. Remove the rear seat remote lever.
3. Remove the cargo hooks.
4. Remove the screw.
5. Pull the trunk side upper trim toward you, then remove the hooks A, C, D and clips B, pin E from the body.
6. Remove the trunk side upper trim.
7. Install in the reverse order of removal.



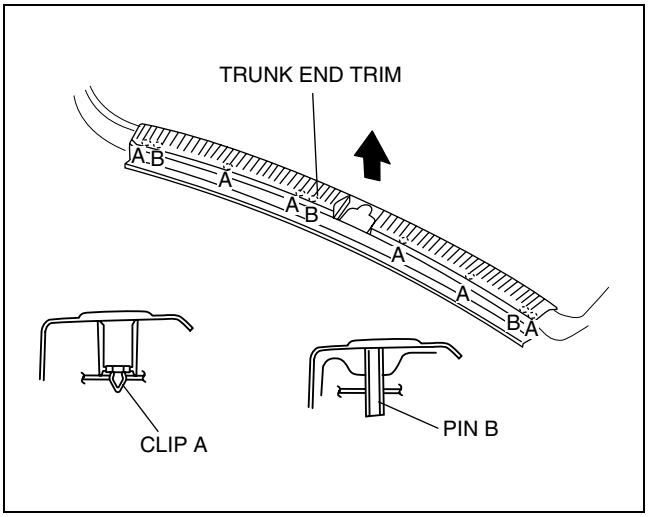
A6A7744W107

TRUNK END TRIM REMOVAL/INSTALLATION

A6E774468890201

WGN

1. Pull the trunk end trim upward, then disengage clips A and pins B from the body.
2. Remove the trunk end trim.
3. Install in the reverse order of removal.



A6A7744W108

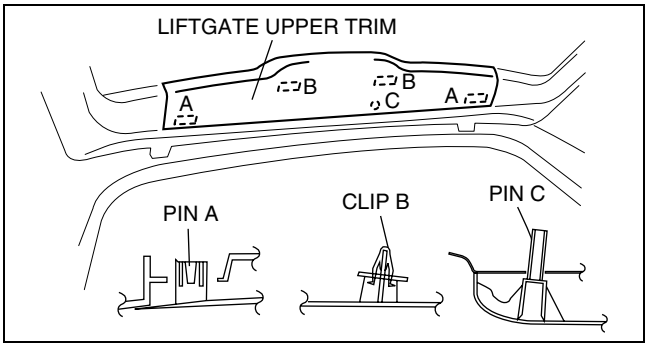
LIFTGATE UPPER TRIM REMOVAL/INSTALLATION

A6E774468930201

WGN
Without rear spoiler

Caution
- **Removing the liftgate upper trim by pulling on the middle section of the trim could damage the high-mount brake light. When removing the trim, be sure to pull on the side edges of the trim only.**

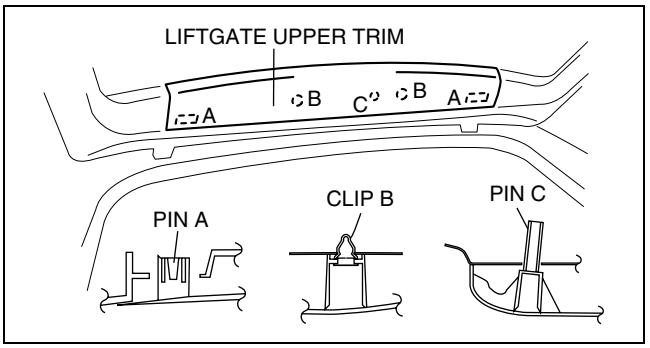
1. Pull the liftgate upper trim on the side edges towards you, then disengage pins A from the body.
2. Pull the middle section of the trim towards you and disengage clips B and pin C from the body.
3. Remove the liftgate upper trim.
4. Install in the reverse order of removal.



A6A7744W109

With rear spoiler

1. Pull the liftgate upper trim toward you, then disengage the pin A, C and clip B from the body.
2. Remove the liftgate upper trim.
3. Install in the reverse order of removal.



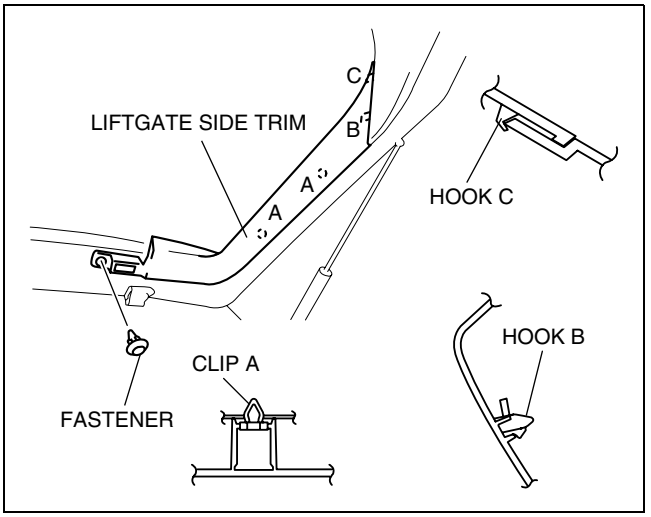
A6A7744W110

LIFTGATE SIDE TRIM REMOVAL/INSTALLATION

A6E774468940201

WGN

1. Remove the liftgate upper trim. (SeeS–23 LIFTGATE UPPER TRIM REMOVAL/INSTALLATION)
2. Remove the fastener.
3. Pull the liftgate side trim toward you, then disengage the clips A and hook B, C from the body.
4. Remove the liftgate side trim.
5. Install in the reverse order of removal.



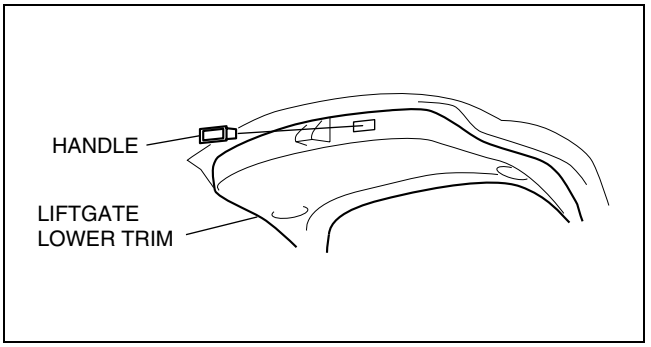
A6A7744W111

LIFTGATE LOWER TRIM REMOVAL/INSTALLATION

A6E774468960201

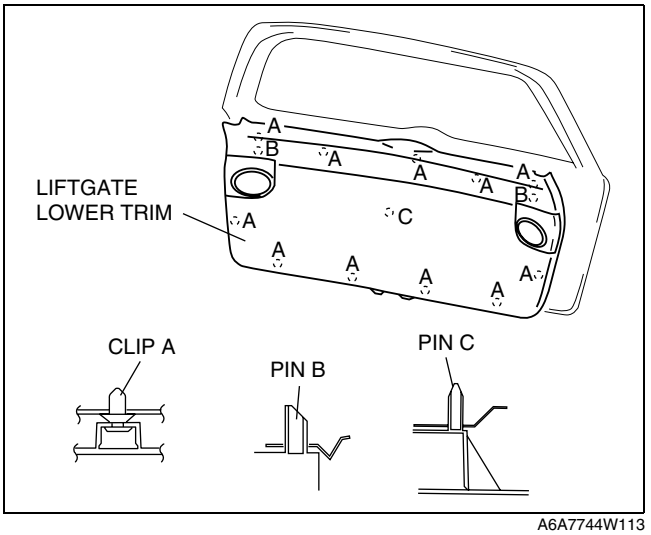
WGN

1. Remove the liftgate upper trim. (SeeS–23 LIFTGATE UPPER TRIM REMOVAL/INSTALLATION)
2. Remove the liftgate side trim.
3. Pull the handle toward you, then remove it.



A6A7744W112

4. Pull the liftgate lower trim toward you, then disengage the clips A and pins B, C from the body.
5. Remove the liftgate lower trim.
6. Install in the reverse order of removal.

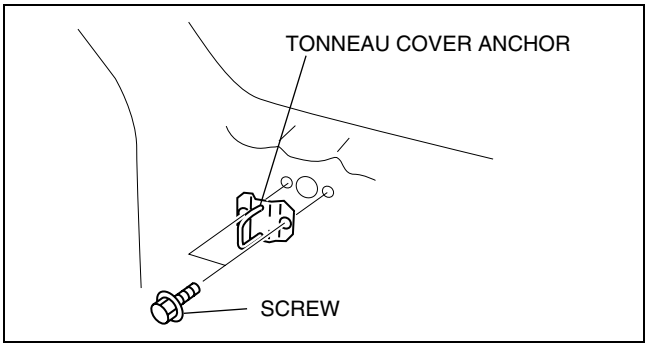


A6A7744W113

TONNEAU COVER ANCHOR REMOVAL/INSTALLATION

A6E774468320201

1. Remove the trunk side upper trim.
2. Remove the screws.
3. Remove the tonneau cover anchor.
4. Install in the reverse order of removal.



A6A7744W114

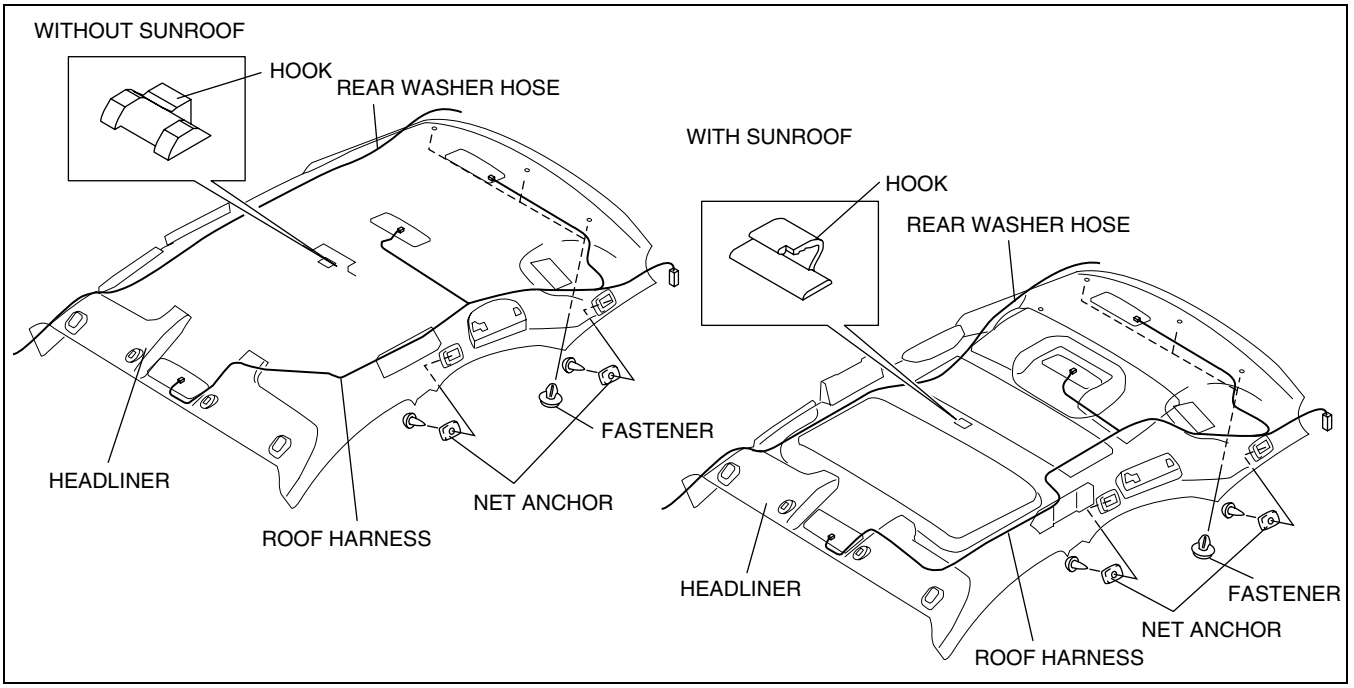
HEADLINER

HEADLINER REMOVAL/INSTALLATION

A6E774668030201

WGN

1. Disconnect the negative battery cable.
2. Turn the seaming welt and weatherstrip over.
3. Remove the sunroof seaming welt. (vehicles with sunroof only)
4. Remove the A-pillar trims.
5. Remove the B-pillar upper trims.
6. Remove the C-pillar trims.
7. Remove the D-pillar trims.
8. Remove the front and rear map light.
9. Remove the cargo compartment light. (See T–21 CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION.)
10. Remove the sunvisors.
11. Remove the assist handle.
12. Remove the net anchor.
13. Disconnect the roof harness connector, remove the clip, and remove the connector.
14. Disconnect the front and rear drain hose.
15. Disconnect the rear washer hose.
16. Place the rear center seat belt bezel out of the way of the headliner.
17. Remove the fasteners.
18. Remove the hook holding the roof panel and remove the headliner.



A6A7746W101

19. Take the headliner off from the liftgate opening.
20. Install in the reverse order of removal.

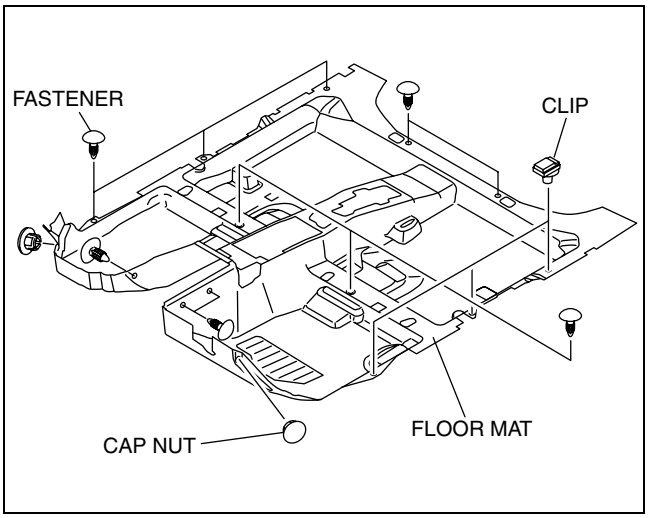
FLOOR COVERING

FRONT FLOOR COVERING REMOVAL/INSTALLATION

A6E774868670201

WGN

1. Disconnect the negative battery cable.
2. Remove the front seats.
3. Remove the rear seat. (SeeS–29 REAR SEAT REMOVAL/INSTALLATION)
4. Remove the front scuff plates.
5. Remove the rear scuff plates.
6. Remove the console.
7. Remove the front side trims.
8. Remove the B-pillar lower trims.
9. Remove the lower anchor of the front seat belt installation bolts.
10. Remove the tire house trim.
11. Remove the fuel-filler lid opener bezel.
12. Remove the fasteners.
13. Remove the cap nuts.
14. Remove the clips.
15. Take the front floor covering off from the passenger-side door opening.
16. Install in the reverse order of removal.



A6E77481101

S

SEAT BELT

REAR SIDE SEAT BELT REMOVAL/INSTALLATION

A6E775057730201

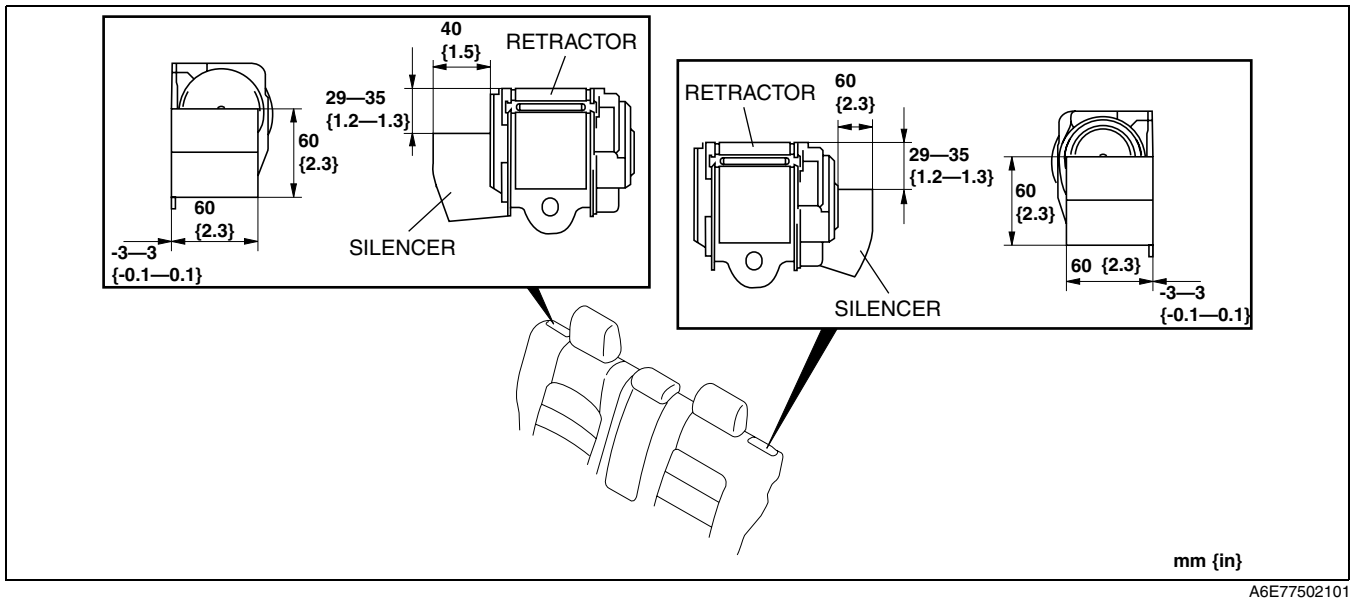
Caution

- **The rear side seat belt for 4WD models is equipped with a silencer to reduce abnormal noise while driving. If the silencer is not installed in the proper position, the push knob may not function properly. When attaching the silencer, be sure to attach it in the correct area as shown below.**

Note

- Rear side seat belts are built into the rear seat back. See rear seat disassembly/assembly, to remove/install the rear side seat belt.

1. Peel off the backing of the double-sided adhesive tape.
2. Attach double-sided adhesive tape to the silencer as shown.



A6E77502101

REAR CENTER SEAT BELT REMOVAL/INSTALLATION

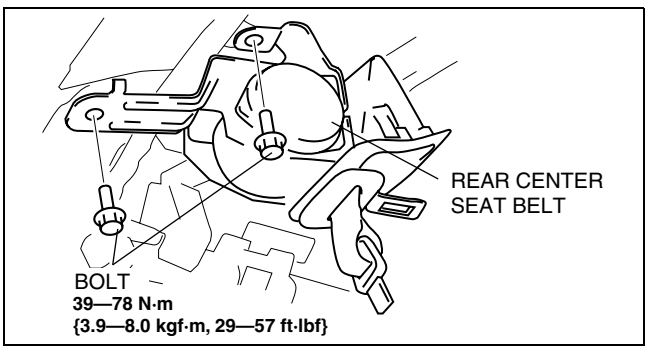
A6E775057730202

WGN

Caution

- **The ELR has a spring that will unwind if the retractor's 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 headliner.
2. Remove the bolts.
3. Remove the rear center seat belt.
4. Install in the reverse order of removal.



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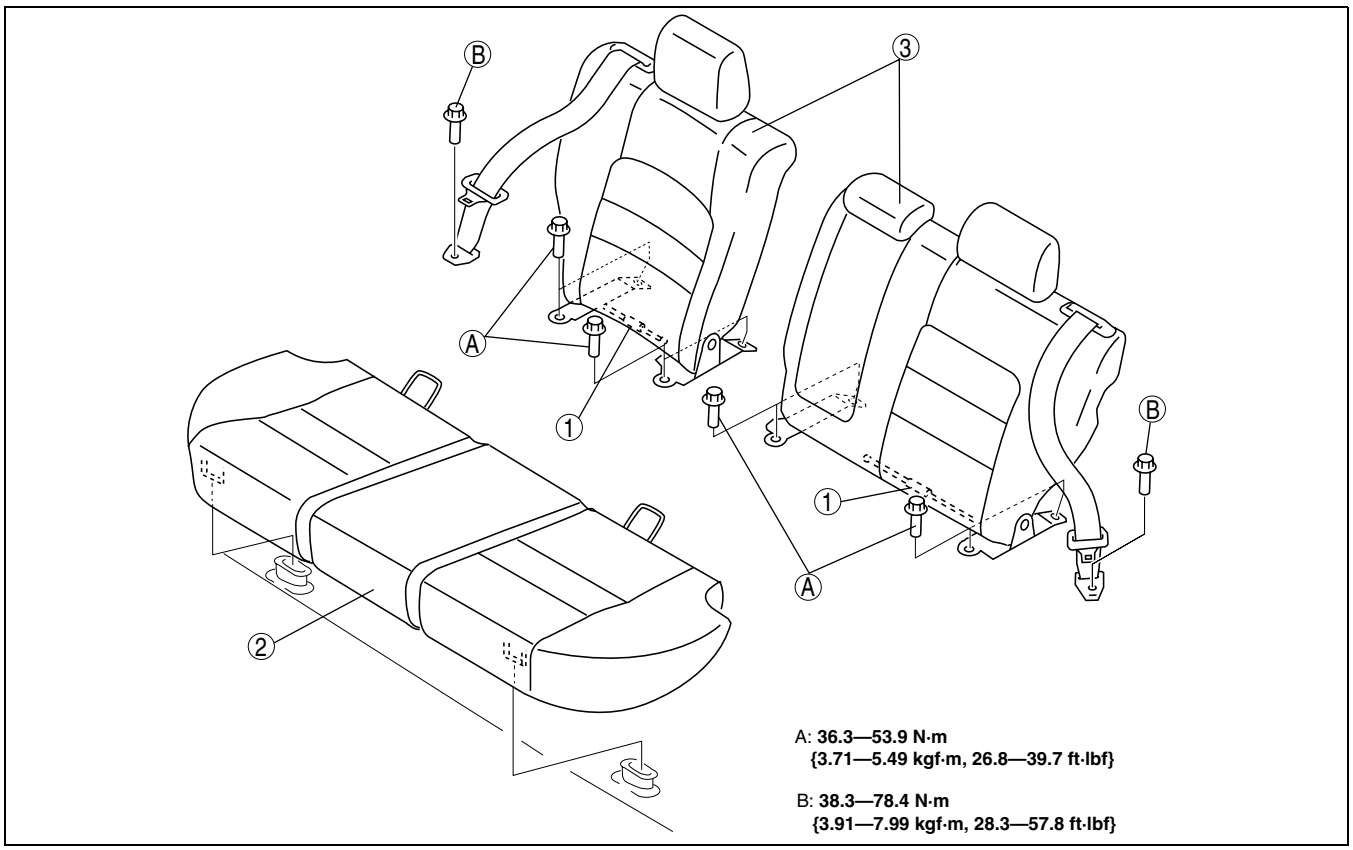
SEAT

REAR SEAT REMOVAL/INSTALLATION

A6E775257200201

4WD (WGN)

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



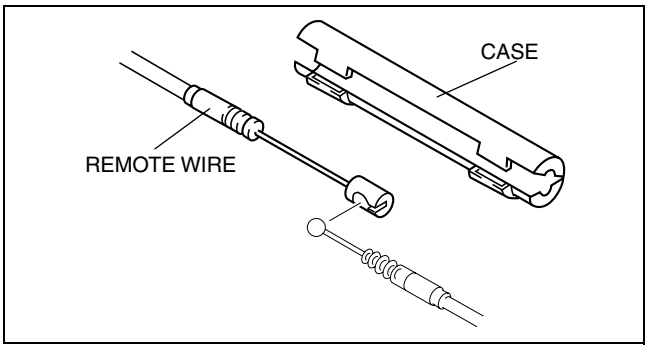
A6E77521102

1	Remote wire (See S–29 Remote wire removal note)
2	Rear seat cushion
3	Rear seat back

S

Remote wire removal note

1. Turn over the trunk floor mat.
2. Remove the case.
3. Remove the remote wire.



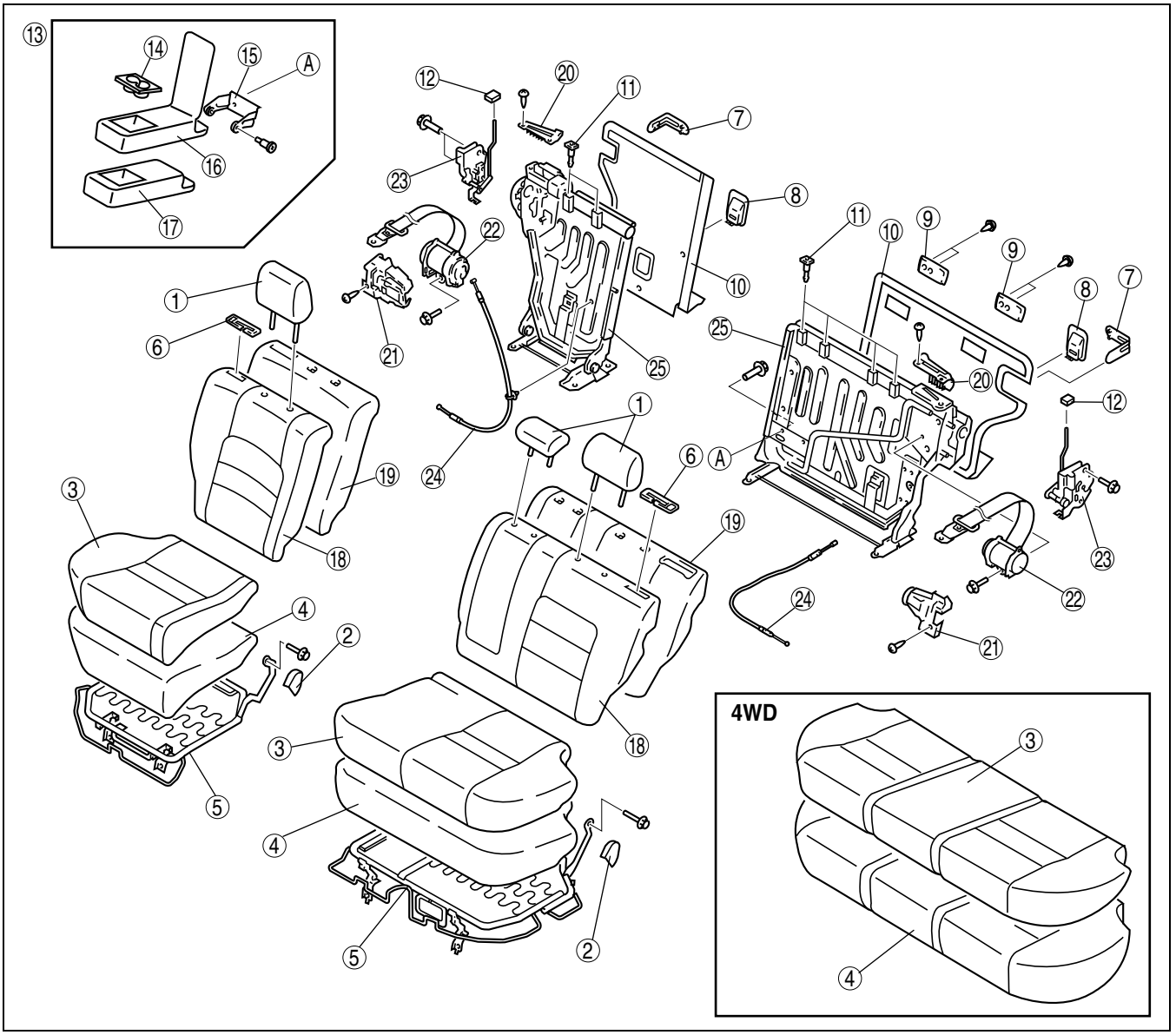
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REAR SEAT DISASSEMBLY/ASSEMBLY

A6E775257200202

WGN

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



A6E77521015

1	Headrest
2	Hinge cover (2WD)
3	Seat cushion trim
4	Seat cushion pad
5	Seat cushion frame (2WD)
6	Remote button cover
7	Seat back catch cover
8	Child seat anchor cover
9	Retainer bar anchor
10	Seat back board
11	Pole guide
12	Remote button
13	Armrest assembly

14	Cup holder
15	Armrest hinge
16	Armrest trim
17	Armrest pad
18	Seat back trim
19	Seat back pad
20	Seat belt guide
21	Retractor cover
22	Rear seat belt
23	Seat back catch
24	Remote wire
25	Seat back frame

BODY ELECTRICAL SYSTEM

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E810201088201

- The construction and operation of the body electrical system is essentially carried over from that of the current Mazda6 (GG) model, except for the following features. (See Mazda6 Training Manual 3359-1*-02C)

FEATURES

A6E810201088202

Improved Safety

- There are two types of high-mount brake lights. (WGN)

Improved Marketability

- A cargo compartment light has been adopted. (WGN)
- The installation positions of the rear wiper and washer components have been changed. (WGN)
- A fuel gauge sender sub-unit has been adopted. (4WD)
- A 4WD indicator light, glow indicator light and sedimentor warning light have been adopted.
- The installation positions of the condenser and the noise filter have been changed. (WGN)
- An antenna feeder has been adopted. (WGN)
- A rear auto leveling sensor especially for the 4WD has been adopted. (4WD)

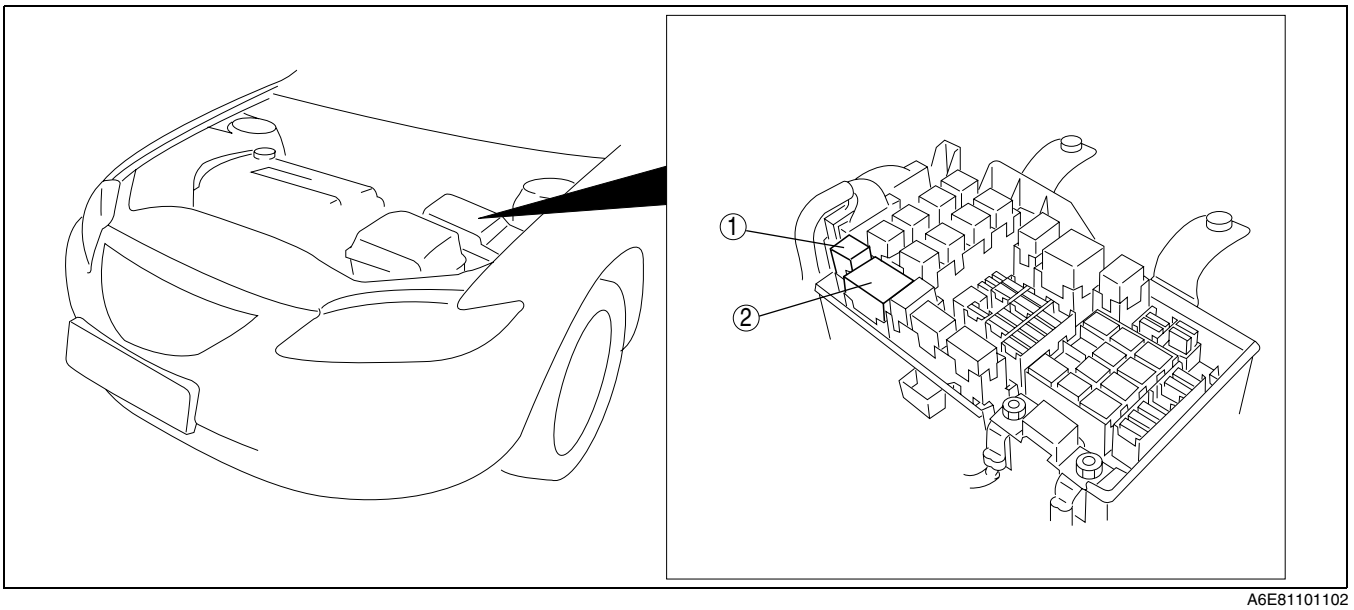
Improved Security

- A rear intruder sensor has been adopted. (WGN)

POWER SYSTEM

STRUCTURAL VIEW

A6E811067730201



A6E81101102

1	Seat warmer relay (with seat warmer)	2	Glow relay (MZR-CD (RF Turbo) only)

MULTIPLEX COMMUNICATION SYSTEM

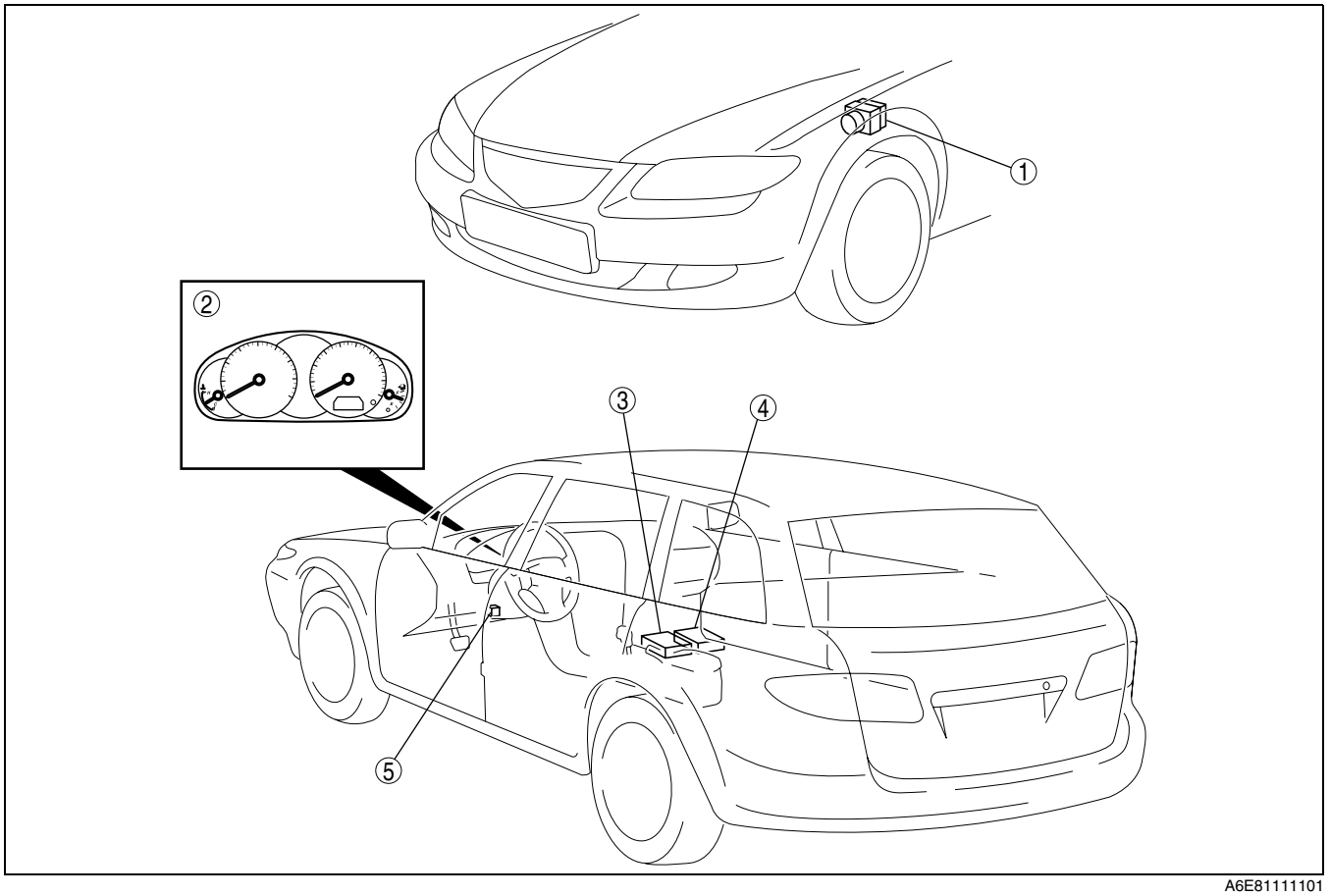
OUTLINE

A6E811155430201

- A TCM and a 4WD control module have been adopted for the CAN system-related module.

STRUCTRURAL VIEW

A6E811155430202



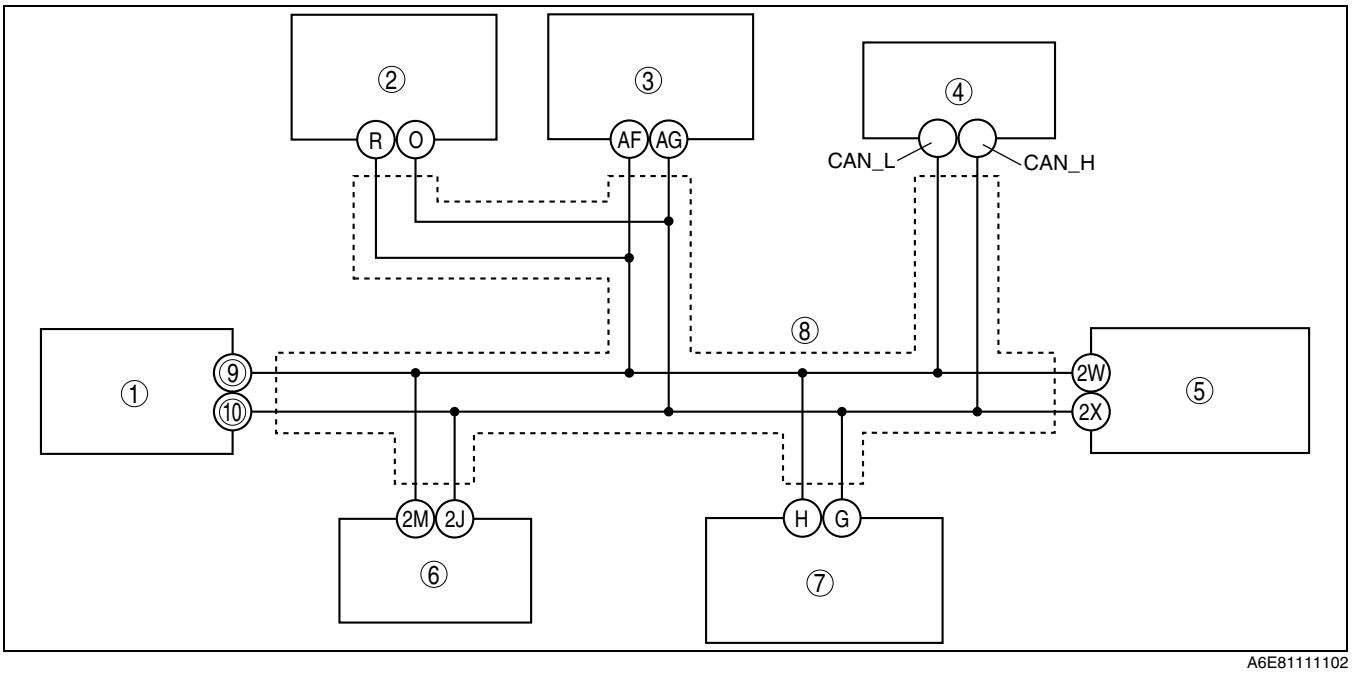
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1	ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS))		3	TCM
	DSC HU/CM (with DSC)		4	PCM
2	Instrument cluster		5	4WD control module

T

SYSTEM WIRING DIAGRAM

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A6E81111102

1	PCM
2	DSC HU/CM (with DSC)
3	ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS))
4	Data link connector-2
5	Instrument cluster
6	TCM (JA5AX-EL)

7	4WD control module (4WD)
8	Twist pair
9	2R (except MZR-CD (RF Turbo))
	39 (MZR-CD (RF Turbo))
10	2U (except MZR-CD (RF Turbo))
	13 (MZR-CD (RF Turbo))

CAN SIGNAL-CHART

A6E811155430204

OUT: Output (sends signal)
IN: Input (receives signal)

Signal		Multiplex module				
		PCM	TCM	ABS (ABS/TCS) HU/CM or DSC HU/CM	4WD control module	Instrument cluster
Accelerator pedal position (MZR-CD (RF Turbo))		OUT	IN	IN	–	IN
Air induction type		OUT	–	IN	–	–
ATF temperature		IN	OUT	–	–	–
AT warning light conditions (JA5AX-EL)		IN	OUT	–	–	IN
Battery reconnection (except MZR-CD (RF Turbo))		OUT	IN	–	–	–
Brake system configuration (EBD/ABS/TCS/DSC)		IN	–	OUT	–	IN
Brake system status	ABS	IN	–	OUT	–	–
	EBD/ABS/ TCS/DSC	–	–	OUT	IN	IN
Brake system warning light conditions (brake fluid level sensor)		–	–	IN	–	OUT
Country		OUT	–	IN	–	–
Coupling torque (with DSC)		–	–	IN	OUT	–
Coupling torque request (with DSC)		–	–	OUT	IN	–

Signal		Multiplex module				
		PCM	TCM	ABS (ABS/TCS) HU/CM or DSC HU/CM	4WD control module	Instrument cluster
Cruise main indicator light conditions (MZR-CD (RF Turbo))		OUT	–	–	–	IN
Cruise set indicator light conditions (MZR-CD (RF Turbo))		OUT	–	–	–	IN
Desired gear/ selector lever position	FN4A-EL	OUT	–	IN	–	IN
	JA5AX-EL	IN	OUT	IN	IN	IN
ECT		OUT	IN		–	IN
Engine control condition		OUT	–	IN	–	–
Engine displacement		OUT	–	IN	–	–
Engine loss torque (except MZR-CD (RF Turbo))		OUT	IN	–	–	–
Engine speed		OUT	IN	IN	IN	IN
Engine torque (except MZR-CD (RF Turbo))		OUT	IN	–	–	–
Fuel injection information		OUT	–	IN	–	–
Fuel type and delivery		OUT	–	IN	–	–
Gear position		IN	OUT	IN	IN	IN
Generator warning light conditions (except MZR-CD (RF Turbo))		OUT	–	–	–	IN
Glow indicator light condition (MZR-CD (RF Turbo))		OUT	–	–	–	IN
HOLD indicator light conditions (FN4A-EL)		OUT	–	–	–	IN
Idle speed up request		IN	OUT	–	–	–
MIL condition (except MZR-CD (RF Turbo))		OUT	–	–	–	IN
MIL indicate request		IN	OUT	–	–	–
Number of cylinders		OUT	–	IN	–	–
Racing select determination		IN	OUT	–	–	–
TCC condition		IN	OUT	–	–	–
Tire circumference (front/ rear)		OUT	–	IN	–	–
Torque reduction inhibit		OUT	IN	IN	–	–
TP		OUT	IN	IN	IN	–
Transmission/axle type		OUT	–	IN	–	–
Travelled distance		IN	–	OUT	–	–
		IN	OUT	–	–	IN
		OUT	–	–	–	IN
Torque reduction request	JA5AX-EL	IN	OUT	–	–	–
	except JA5AX-EL	IN	–	OUT	–	–
Turbine speed		IN	OUT	–	–	–
Upper torque limit		IN	OUT	–	–	–
Vehicle speed		OUT	–	–	–	IN
		IN	OUT	–	–	–
Wheel speed (front left/ front right/rear left/rear right)		IN	IN	OUT	IN	–
		OUT	–	–	–	IN
4WD system operating condition (warning light information)		–	–	–	OUT	IN

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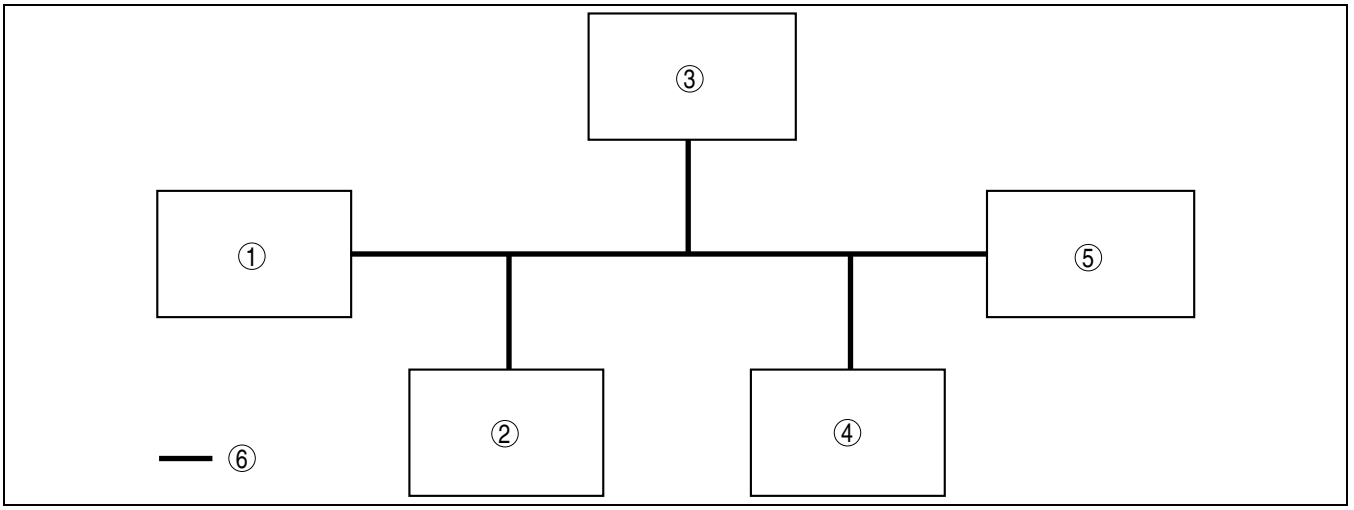
ON-BOARD DIAGNOSTIC FUNCTION

A6E811155430205

Outline

- The on-board diagnostic function is incorporated into the PCM, TCM, ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)), DSC HU/CM (with DSC), 4WD control module, and instrument cluster. This function can narrow down CAN system malfunction locations.
- Due to the adoption of the TCM and the 4WD CM, some DTCs and PID/data monitor items have been added. Other functions are the same as those of the current Mazda6 (GG) model.

Block Diagram



A6E81111103

1	PCM
2	TCM (JA5AX-EL)
3	ABS (ABS/TCS) HU/CM or DSC HU/CM
4	4WD control module (4WD)
5	Instrument cluster
6	Twist pair

Fail-Safe Function

- When the failure detection function detemines that there is a malfunction, the fail-safe function illuminates a warning light to advise the driver of the malfunction.

Module	Fail-safe function
PCM	• MIL illuminated
TCM	• AT warning light illuminated
• ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)) • DSC HU/CM (with DSC)	• ABS (ABS/TCS) suspended (with ABS (ABS/TCS)) • DSC suspended (with DSC) • ABS warning light illuminated • DSC/TCS indicator light illuminated • DSC OFF light illuminated • TCS OFF light illuminated
4WD control module	• 4WD indicator light illuminated
Instrument cluster	• Speedometer, tachometer, water temperature gauge: 0 displayed

Self-Malfunction Diagnostic Function

- The self-malfunction diagnostic function determines that there is a malfunction, and outputs a signal, as a DTC, to the DLC-2. The DTC can be read out using an SST (WDS or equivalent).

DTC table

DTC	Malfunction location	Related module
U0073	CAN system communication error	• PCM • TCM
U0100	Communication error to PCM	• TCM • 4WD control module
U0101	Communication error to TCM	• PCM • 4WD control module
U0121	Communication error to ABS (ABS/TCS) HU/CM or DSC HU/CM	
U0155	Communication error to instrument cluster	PCM
U1900	CAN system communication error	• ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)) • DSC HU/CM (with DSC) • Instrument cluster
U2511	Communication error to 4WD control module	• ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)) • DSC HU/CM (with DSC)
U2516	CAN system wiring harness open and short circuit	• ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)) • DSC HU/CM (with DSC) • Instrument cluster

PID/Data Monitoring Function

- The PID/data monitoring function is used to freely select and read out, in real time, the monitored items for the input/output signals of the TCM, ABS (ABS/TCS) HU/CM, DSC HU/CM and instrument cluster.
- An SST (WDS or equivalent) is used to read out the PID/data monitor information.

PID name (definition)	Condition	Specification	Related module	Terminal
PCM_MSG (Missing message from the PCM)	Present	Circuit in the PCM is normal	• TCM • ABS (ABS/TCS) HU/CM or DSC HU/CM • Instrument cluster	• TCM: 2J, 2M • ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)): O, R • DSC HU/CM (with DSC): AF, AG • Instrument cluster: 2W, 2X
	Not Present	Circuit in the PCM is abnormal		
TCM_MSG (Missing message from the TCM)	Present	Circuit in the TCM is normal	• ABS (ABS/TCS) HU/CM or DSC HU/CM • Instrument cluster	
	Not Present	Circuit in the TCM is abnormal		
ABS_MSG (Missing message from the ABS (ABS/TCS) HU/CM or DSC HU/CM)	Present	Circuit in the ABS (ABS/TCS) HU/CM or DSC HU/CM is normal	• TCM • Instrument cluster	
	Not Present	Circuit in the ABS (ABS/TCS) HU/CM or DSC HU/CM is abnormal		
AWD_MSG (Missing message from the 4WD control module)	Present	Circuit in the 4WD control module is normal	• TCM • ABS (ABS/TCS) HU/CM or DSC HU/CM • Instrument cluster	
	Not Present	Circuit in the 4WD control module is abnormal		
IC_MSG (Missing message from the instrument cluster)	Present	Circuit in the instrument cluster is normal	• TCM • ABS (ABS/TCS) HU/CM or DSC HU/CM	
	Not Present	Circuit in the instrument cluster is abnormal		

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EXTERIOR LIGHTING SYSTEM

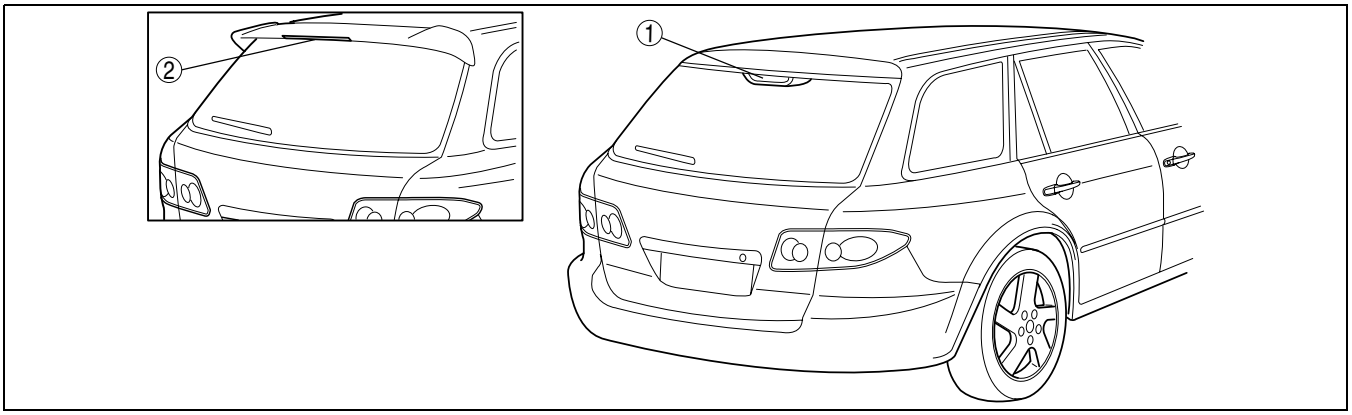
OUTLINE

A6E811201052201

- In-vehicle-type high-mount brake light and rear spoiler type high-mount brake light have been adopted. (WGN)

STRUCTURAL VIEW

A6E811201052202



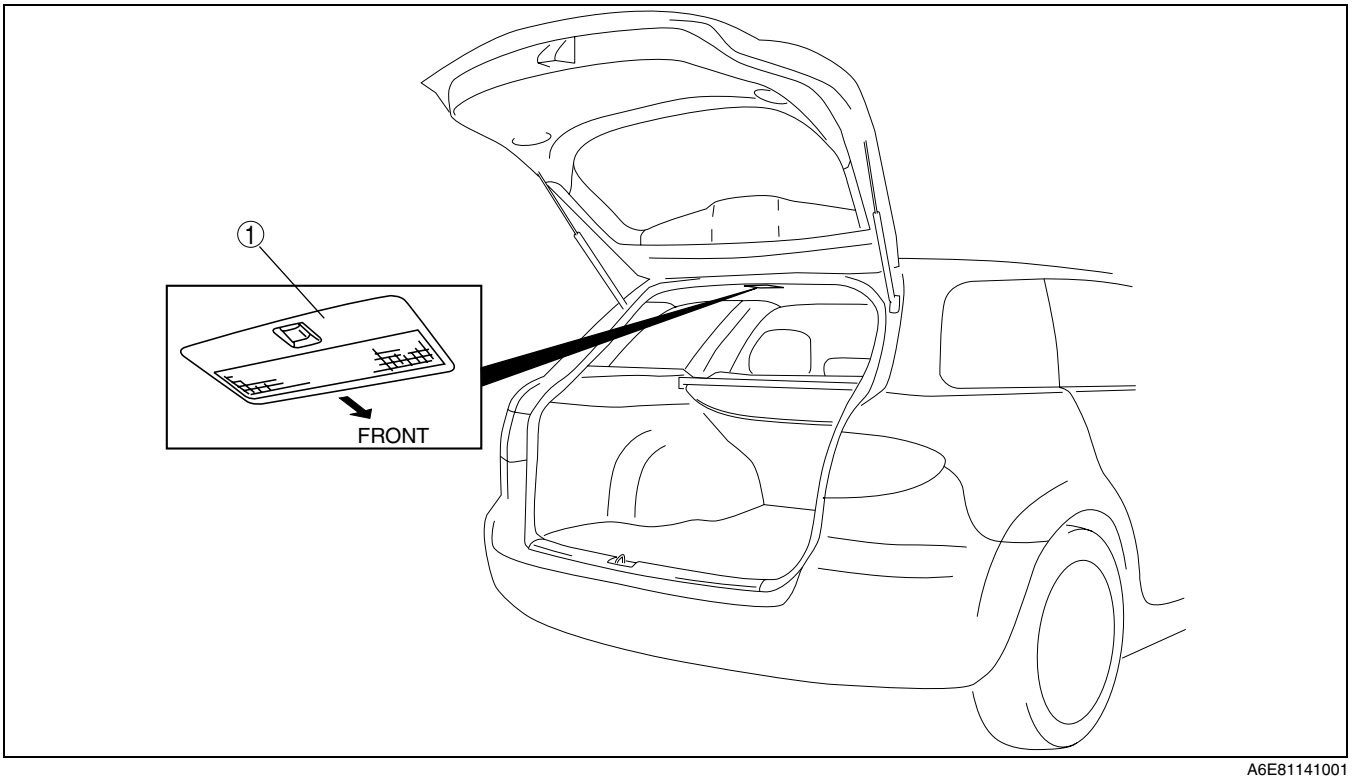
A6E8112T101

1	High-mount brake light (in-vehicle-type)	2	High-mount brake light (rear spoiler type)

INTERIOR LIGHTING SYSTEM

STRUCTURAL VIEW

A6E811401052201



A6E81141001

1	Cargo compartment light

WIPER AND WASHER

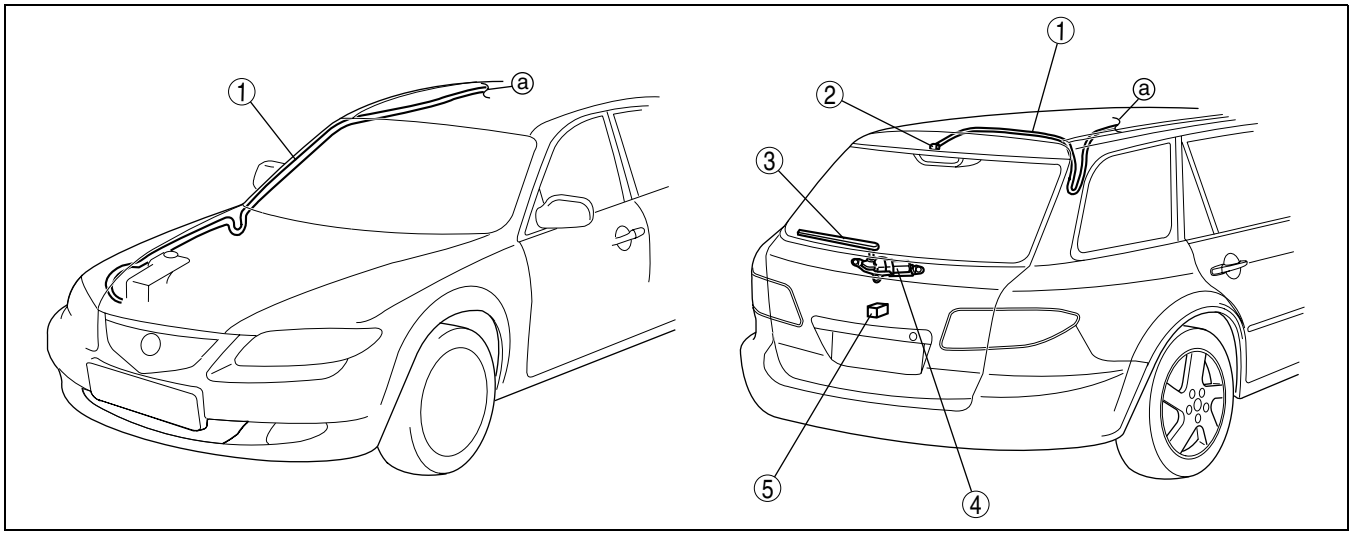
OUTLINE

A6E811601052201

- Due to the adoption of the WGN, the following have been changed:
  — Installation positions of the rear wiper arm and blade, rear wiper motor, rear washer nozzle and intermittent rear wiper relay
  — Rear washer hose routing

STRUCTURAL VIEW

A6E811601052202



A6E81161107

1	Rear washer hose
2	Rear washer nozzle
3	Rear wiper arm and blade

4	Rear wiper motor
5	Intermittent rear wiper relay

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WARNING AND INDICATOR SYSTEM

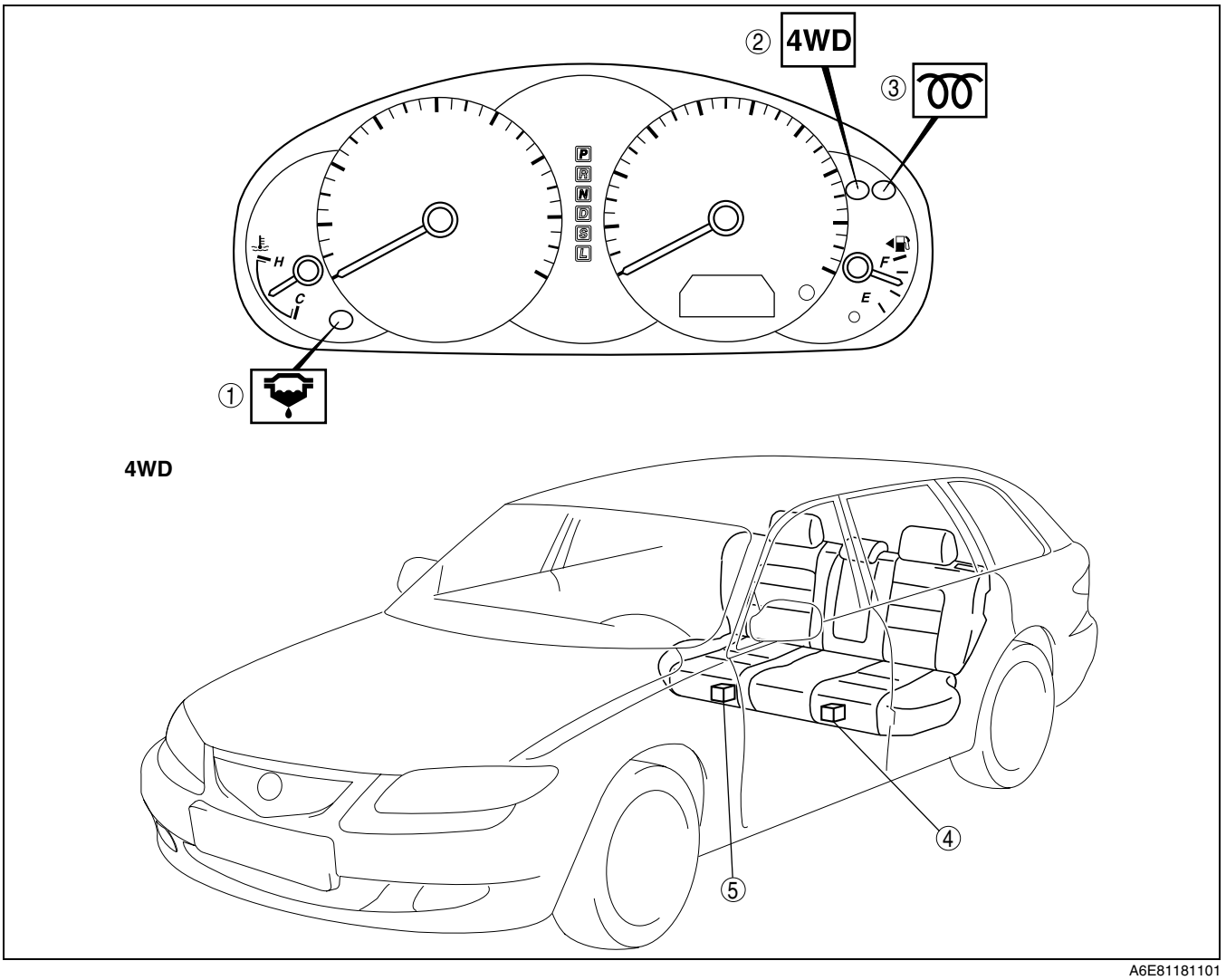
OUTLINE

A6E811801069201

- In accordance with the 4WD setting, the following indicator light has been added:
  — 4WD indicator light
- In accordance with the MZR-CD (RF Turbo) setting, the following indicator lights have been added:
  — Glow indicator light
  — Sedimentor warning light
- A fuel gauge sender sub-unit has been adopted. (4WD)

STRUCTURAL VIEW

A6E811801069202



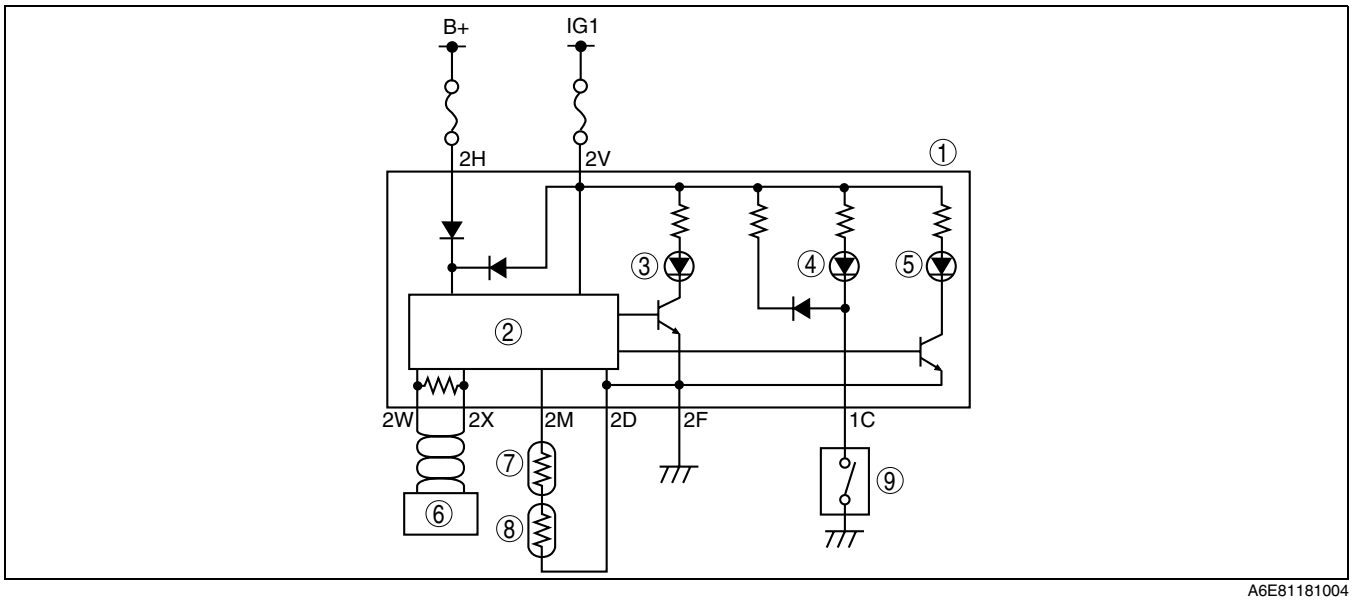
A6E81181101

1	Sedimentor warning light
2	4WD indicator light
3	Glow indicator light

4	Fuel gauge sender unit
5	Fuel gauge sender sub-unit

SYSTEM WIRING DIAGRAM

A6E811801069203



A6E81181004

1	Instrument cluster
2	Microcomputer
3	Glow indicator light
4	Sedimentor warning light
5	4WD indicator light

6	PCM, ABS (ABS/TCS) HU/CM or DSC HU/CM
7	Fuel gauge sender sub-unit (4WD)
8	Fuel gauge sender unit
9	Sedimentor switch

THEFT-DETERRENT SYSTEM

OUTLINE

A6E812050000201

- An intruder sensor has been adopted on the rear part of the roof. (WGN)
- The construction and operation of the theft-deterrent system is the same as that of the current Mazda6 (GG) model.

INTRUDER SENSOR

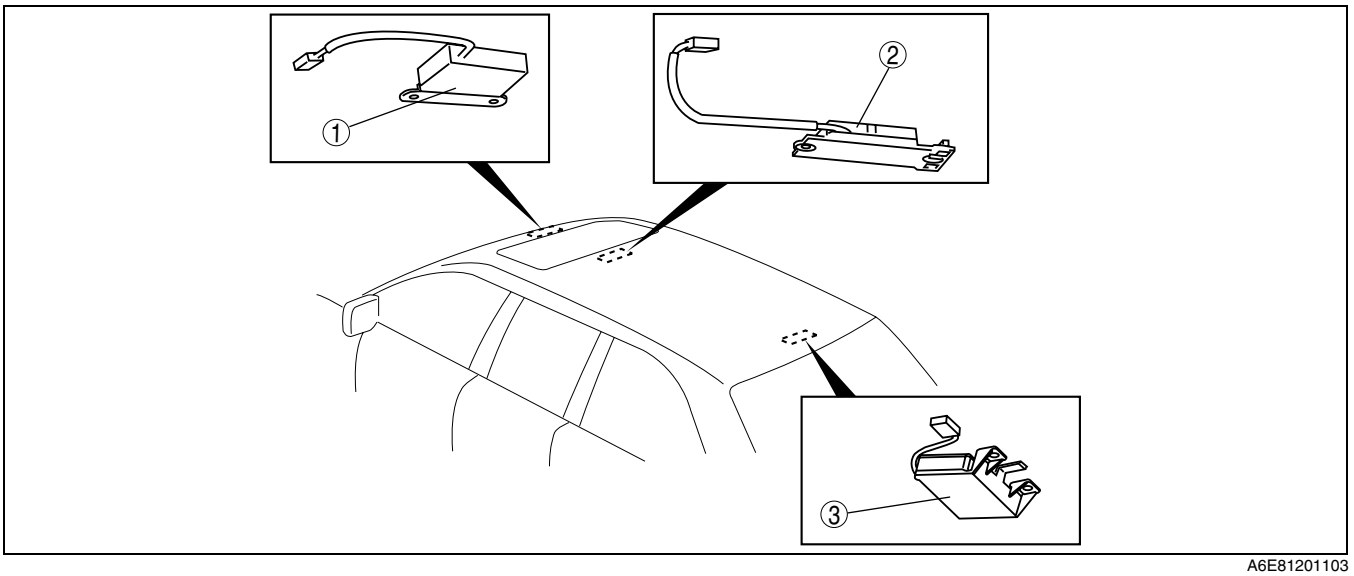
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Outline

- WGN models are equipped with intruder sensors in two places in the vehicle, due to the necessity of movement detection in the all around wider vehicle interior. The intruder sensors are located in the roof at the front (with sliding sunroof), or the center (without sliding sunroof), and the cargo space.
- The structure and operation of the rear intruder sensor is the same as that of the current front and center intruder sensors.

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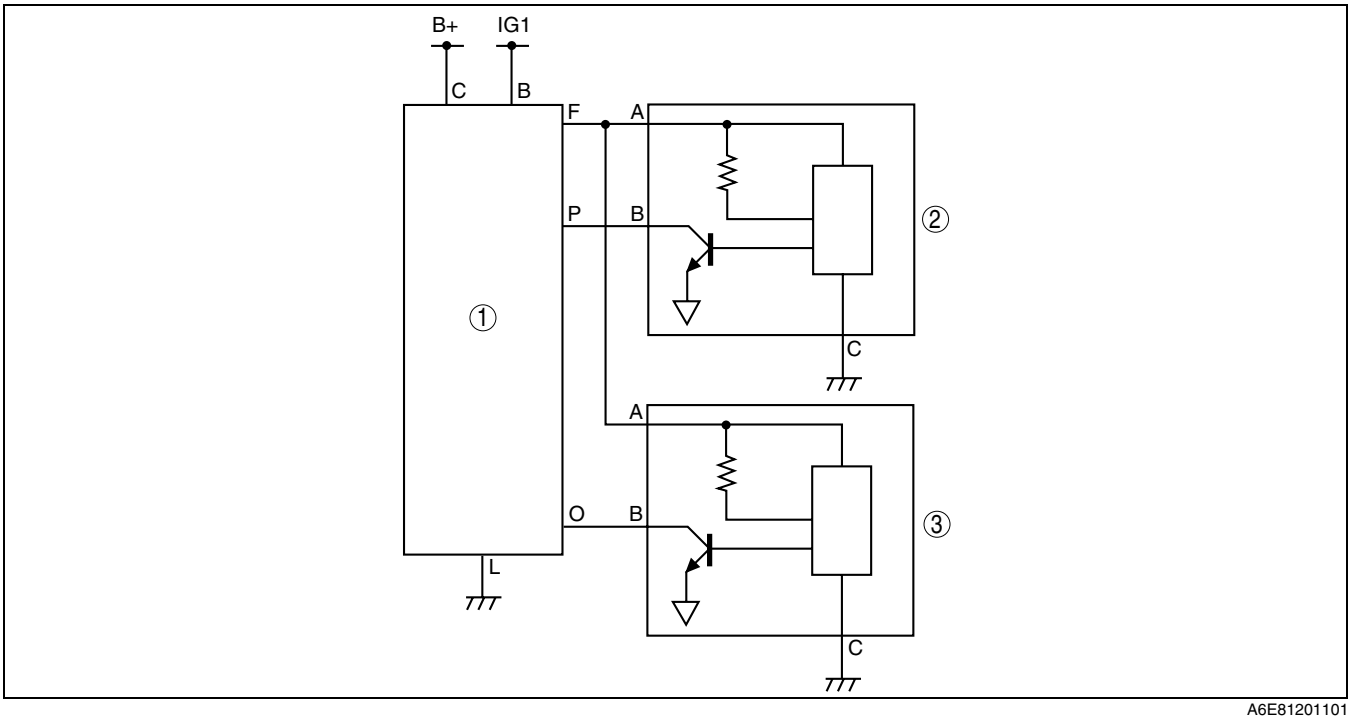
Structural View



A6E81201103

1	Front intruder sensor (with sliding sunroof)
2	Center intruder sensor (without sliding sunroof)
3	Rear intruder sensor (WGN)

System Wiring Diagram



A6E81201101

1	Theft-deterrent control module
2	Rear intruder sensor (WGN)
3	Front intruder sensor (with sliding sunroof)
	Center intruder sensor (without sliding sunroof)

AUDIO AND NAVIGATION SYSTEM

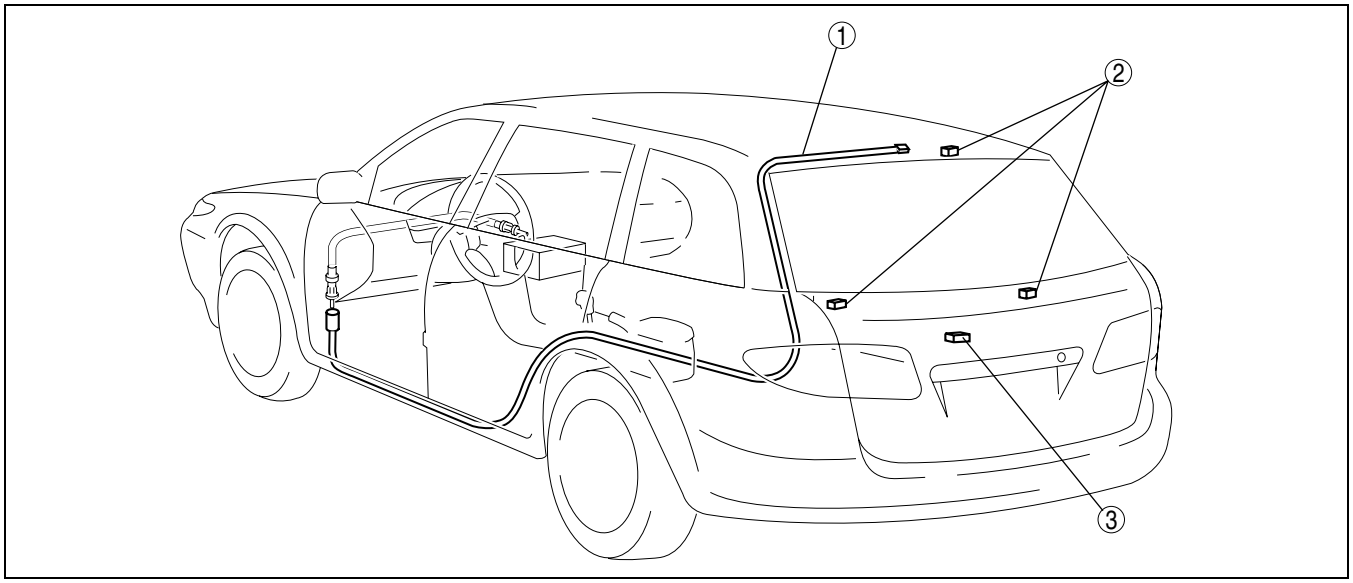
OUTLINE

A6E812401052201

- Due to the adoption of the WGN, the following have been changed:
  — Installation positions of the condenser and the noise filter
  — Antenna feeder routing

STRUCTURAL VIEW

A6E812401052202



A6E8124T101

1	Rear antenna feeder
2	Condenser

3	Noise filter

CRUISE CONTROL SYSTEM

OUTLINE

A6E812801052201

- The PCM controls the cruise control system. Refer to Section F for details regarding PCM control. (SeeF2–23 CRUISE CONTROL SYSTEM)

AIR BAG SYSTEM

OUTLINE

A6E813001046201

- Due to the adoption of the WGN, the shape of the curtain air bag module has been modified.

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E810201088203

- The following changes and/or additions have been made since publication of the Mazda6 Workshop Manual (1730-1*-02C).

Relay
- Location has been changed.
- Inspection procedure has been modified.

Rear auto leveling sensor
- Removal/Installation procedure has been modified.

High-mount brake light
- Removal/Installation procedure has been modified.

Cargo compartment light
- Removal/Installation procedure has been modified.
- Inspection procedure has been modified.

Rear wiper motor
- Removal/Installation procedure has been modified.
- Inspection procedure has been modified.

Rear wiper arm and blade
- Removal/Installation procedure has been modified.
- Adjustment procedure has been modified.

Rear washer nozzle
- Removal/Installation procedure has been modified.
- Adjustment procedure has been modified.

Rear washer hose
- Removal/Installation procedure has been modified.

Intermittent rear wiper relay
- Removal/Installation procedure has been modified.

Fuel gauge sender unit
- Removal/Installation procedure has been modified.
- Inspection procedure has been modified.

Intruder sensor
- Removal/Installation procedure has been modified.

Noise filter
- Removal/Installation procedure has been modified.

Condenser
- Removal/Installation procedure has been modified.

Antenna feeder
- Location has been changed.

Rear antenna feeder
- Inspection procedure has been modified.

Curtain air bag module
- Removal/Installation procedure has been added.

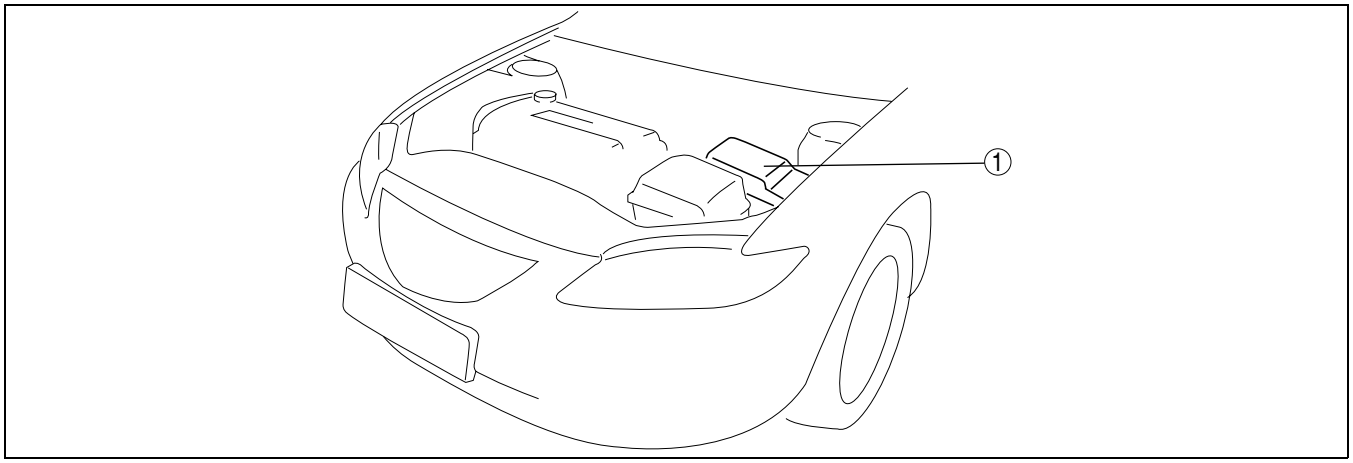
Air bag module and pre-tensioner seat belt
- Deployment procedure has been modified.

On-board diagnostic
- Multiplex communication system procedure has been modified.

LOCATION INDEX

POWER SYSTEM

A6E810001072201

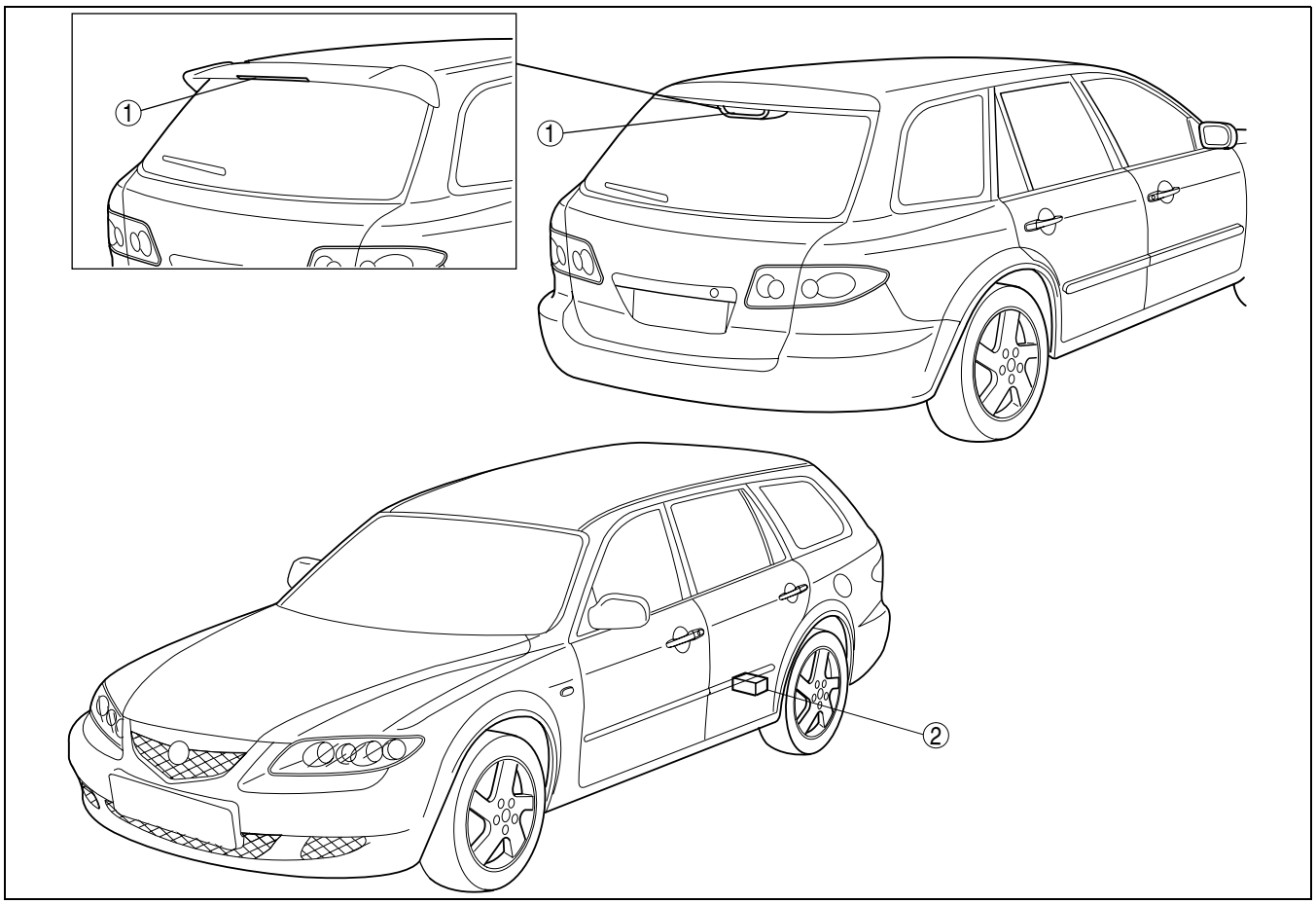


A6E81101124

1	Main fuse block (See T–19 RELAY LOCATION) (See T–19 RELAY INSPECTION)

EXTERIOR LIGHTING SYSTEM

A6E810001052201



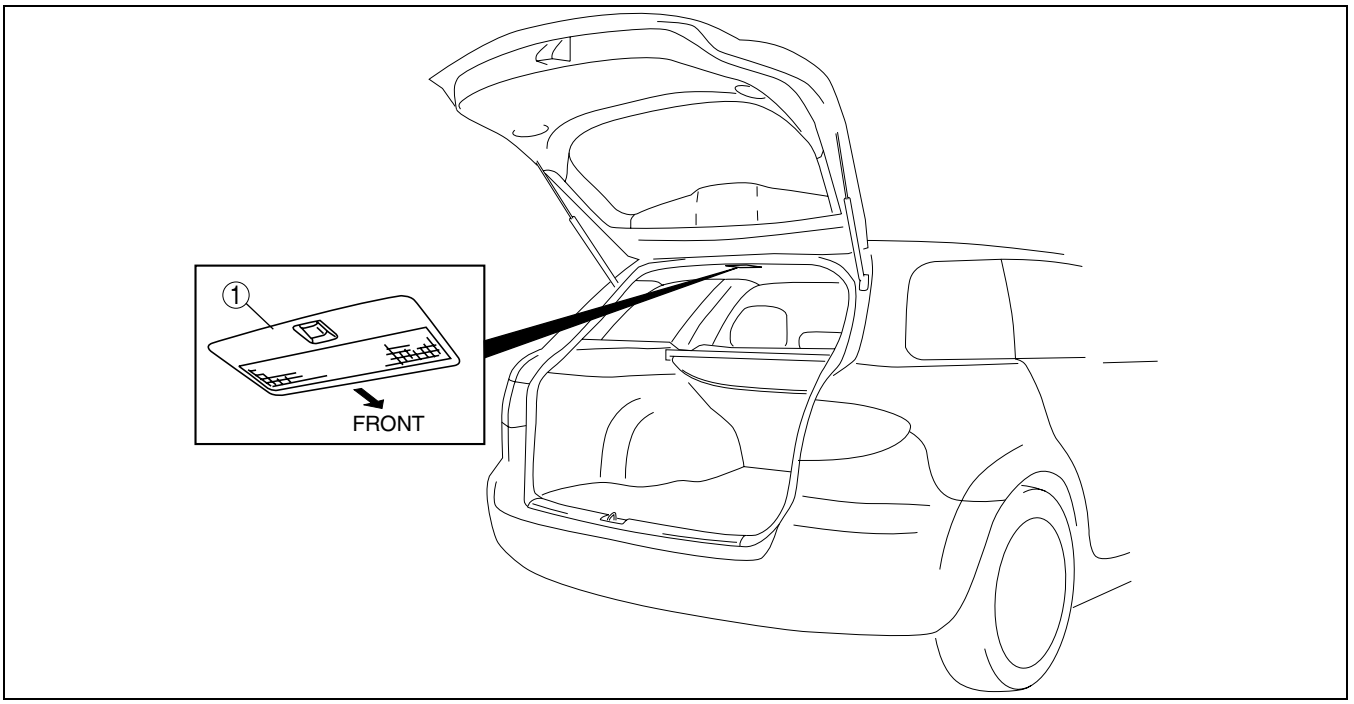
A6E81121162

1	High-mount brake light (See T–20 HIGH-MOUNT BRAKE LIGHT REMOVAL/INSTALLATION)

2	Rear auto leveling sensor (4WD) (See T–20 REAR AUTO LEVELING SENSOR REMOVAL/INSTALLATION)

INTERIOR LIGHTING SYSTEM

A6E810001052202

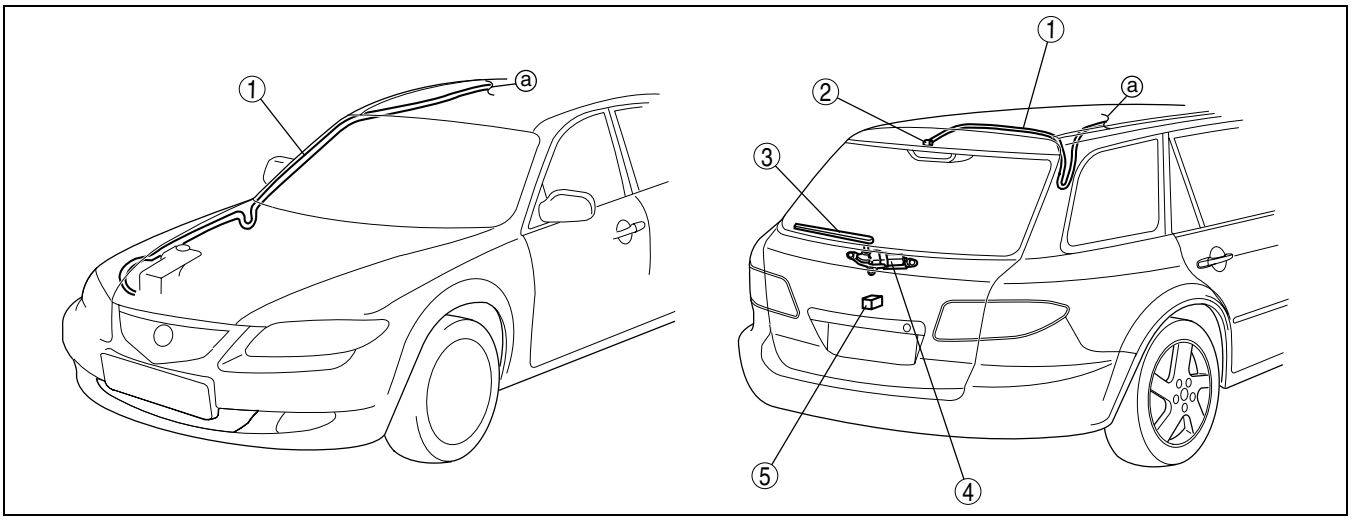


A6E81141130

1	Cargo compartment light (See T–21 CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION) (See T–22 CARGO COMPARTMENT LIGHT INSPECTION)

WIPER AND WASHER SYSTEM

A6E810001052203



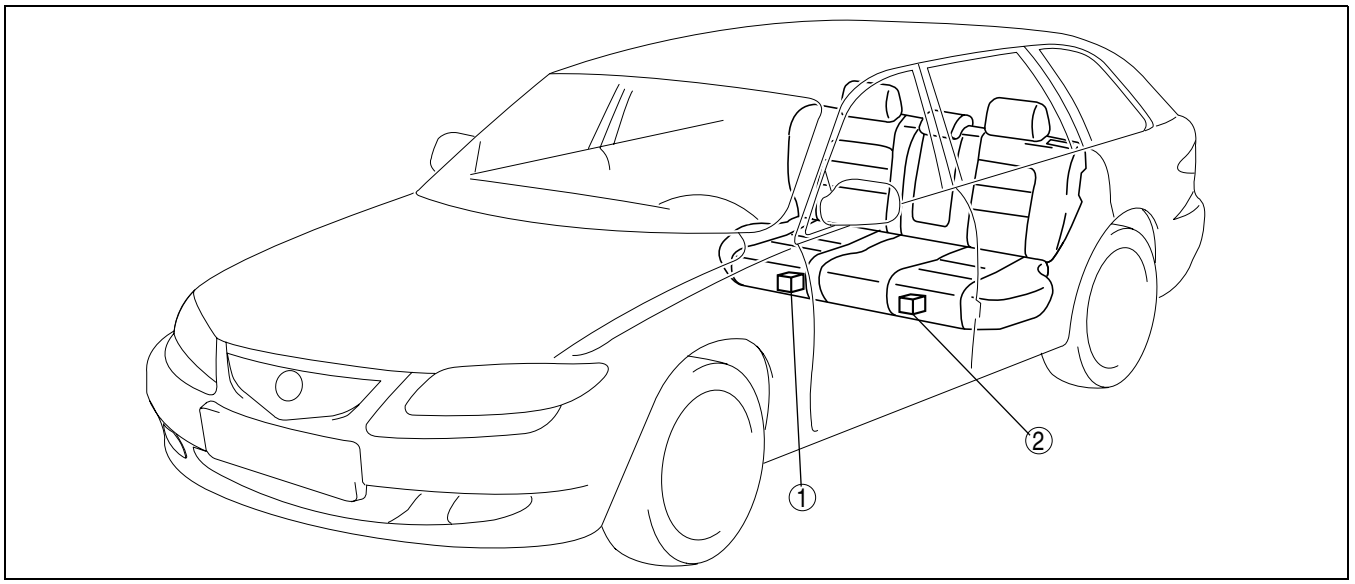
A6E81161107

1	Rear washer hose (See T–25 REAR WASHER HOSE REMOVAL/INSTALLATION)
2	Rear washer nozzle (See T–24 REAR WASHER NOZZLE REMOVAL/INSTALLATION) (See T–25 REAR WASHER NOZZLE ADJUSTMENT)

3	Rear wiper arm and blade T–23 REAR WIPER ARM AND BLADE REMOVAL/INSTALLATION) (See T–24 REAR WIPER ARM AND BLADE ADJUSTMENT)
4	Rear wiper motor (See T–22 REAR WIPER MOTOR REMOVAL/INSTALLATION) (See T–22 REAR WIPER MOTOR INSPECTION)
5	Intermittent rear wiper relay (See T–26 INTERMITTENT REAR WIPER RELAY REMOVAL/INSTALLATION)

WARNING AND INDICATOR SYSTEM

A6E810001067201



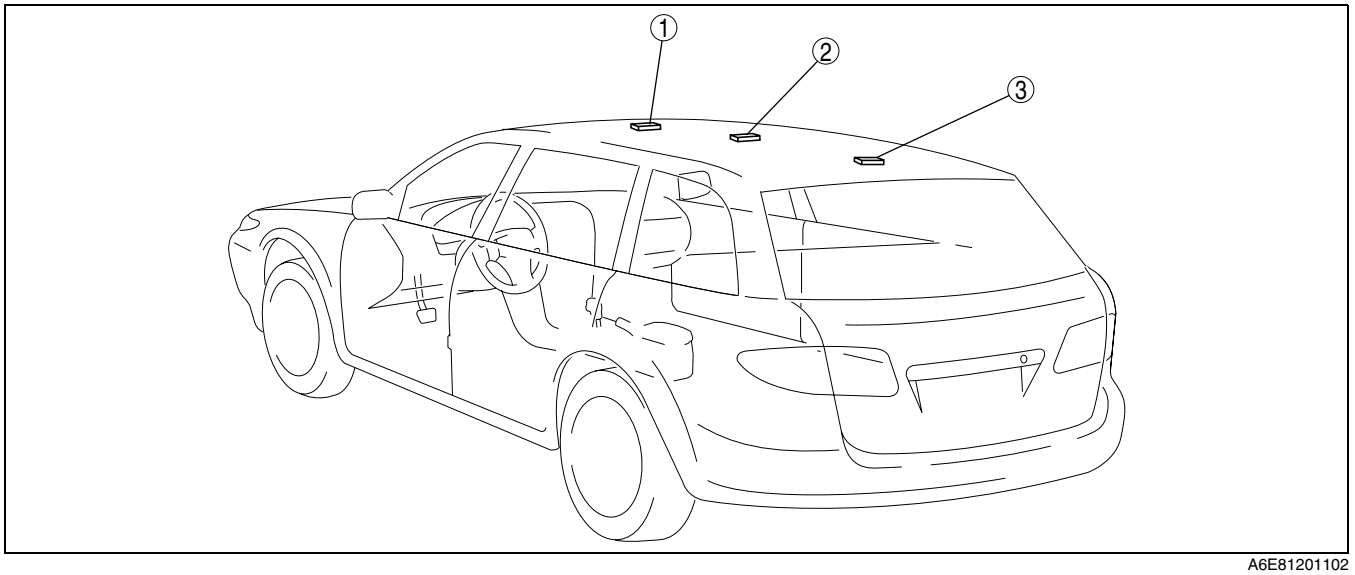
A6E81181112

1	Fuel gauge sender sub-unit (See T–27 FUEL GAUGE SENDER UNIT REMOVAL/INSTALLATION) (See T–28 FUEL GAUGE SENDER UNIT INSPECTION)

2	Fuel gauge sender unit (See T–27 FUEL GAUGE SENDER UNIT REMOVAL/INSTALLATION) (See T–28 FUEL GAUGE SENDER UNIT INSPECTION)

THEFT-DETERRENT SYSTEM

A6E810050000201



A6E81201102

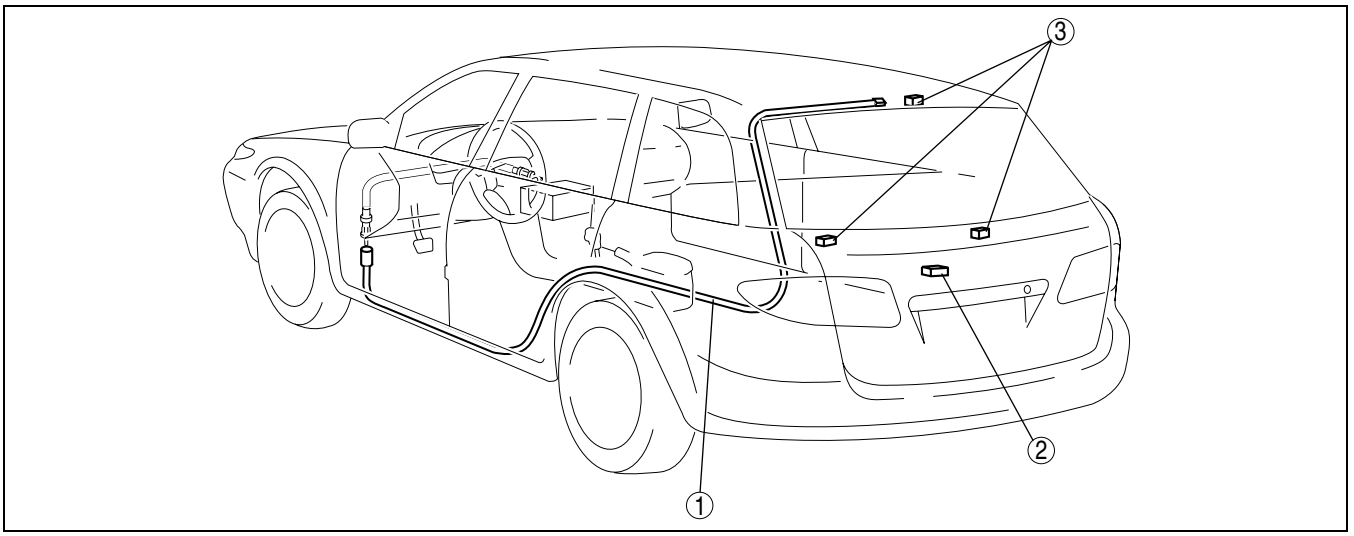
1	Front intruder sensor (with sliding sunroof)
2	Center intruder sensor (without sliding sunroof)

3	Rear intruder sensor (WGN)

T

AUDIO AND NAVIGATION SYSTEM

A6E810001066201



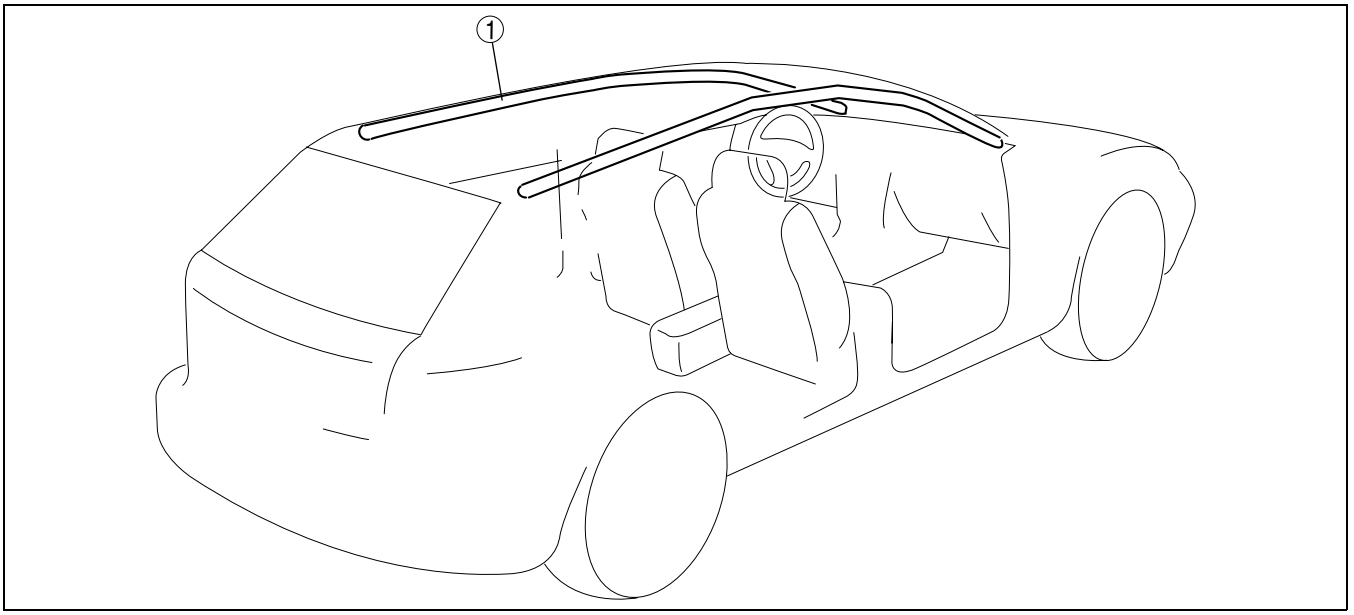
A6A8124W144

1	Antenna feeder (See T–31 ANTENNA FEEDER LOCATION) (See T–31 REAR ANTENNA FEEDER INSPECTION)

2	Noise filter (See T–30 NOISE FILTER REMOVAL/INSTALLATION)
3	Condenser (See T–30 CONDENSER REMOVAL/INSTALLATION)

AIR BAG SYSTEM

A6E810001046201



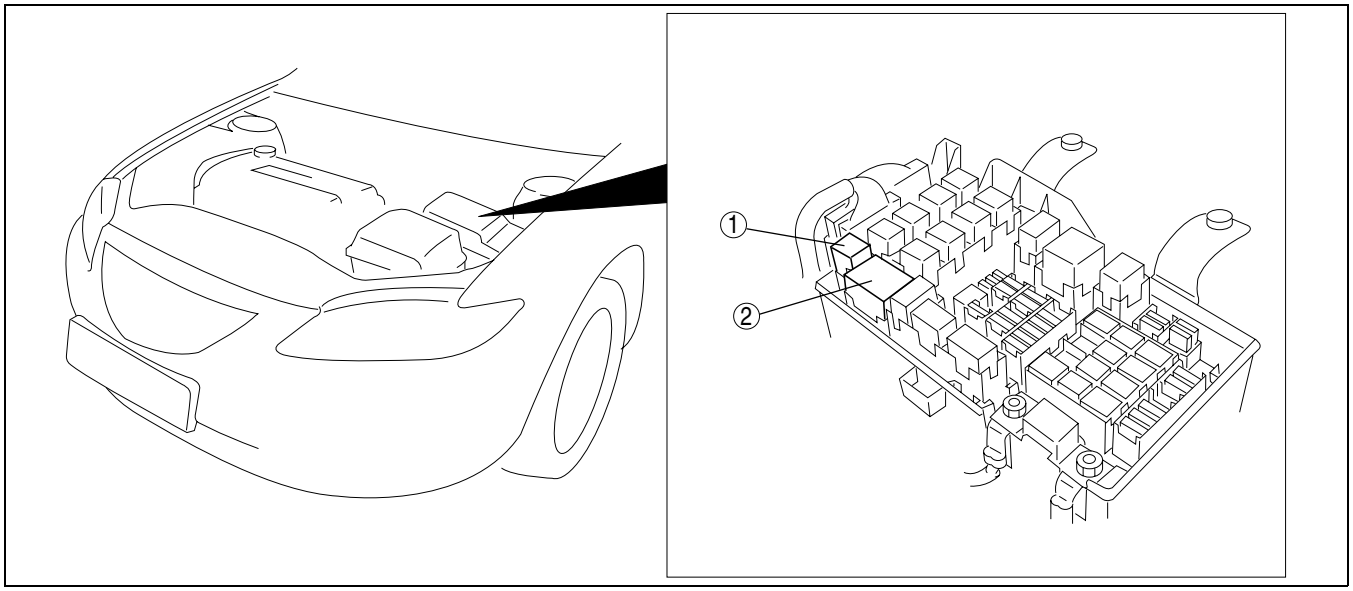
A6E81301150

1	Curtain air bag module (See T–35 CURTAIN AIR BAG MODULE REMOVAL/INSTALLATION) (See T–35 AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES)

POWER SYSTEM

RELAY LOCATION

A6E811067730202



A6E81101102

1	Seat warmer relay (with seat warmer)
2	Glow relay (MZR-CD (RF Turbo) only)

RELAY INSPECTION

Relay Type

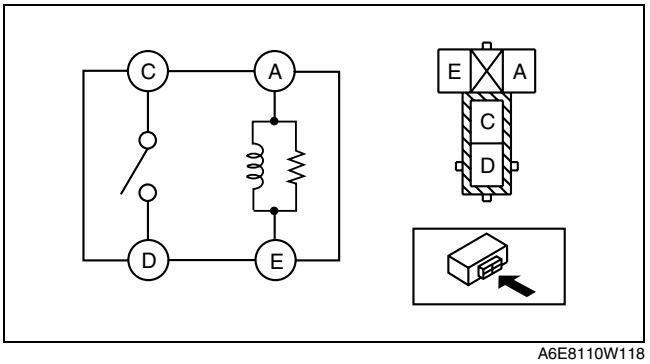
A6E811067730203

Terminal type		Part name
Four-terminal	Type A	• Seat warmer relay
	Type B	• Glow relay

Four-terminal

Type A

1. Remove the relay.
2. Inspect for continuity between the relay terminals using an ohmmeter.
   - If not as specified, replace the relay.



A6E8110W118

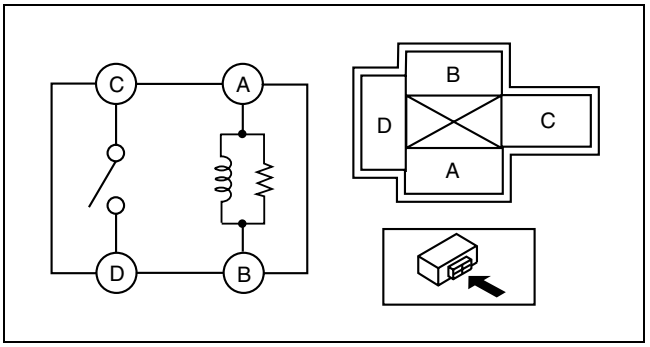
○—○ : Continuity

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

A6E8110W121

Type B

1. Remove the relay.
2. Inspect for continuity between the relay terminals using an ohmmeter.
   - If not as specified, replace the relay.



A6E8110W125

○—○ : Continuity

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

A6E8110W123

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EXTERIOR LIGHTING SYSTEM

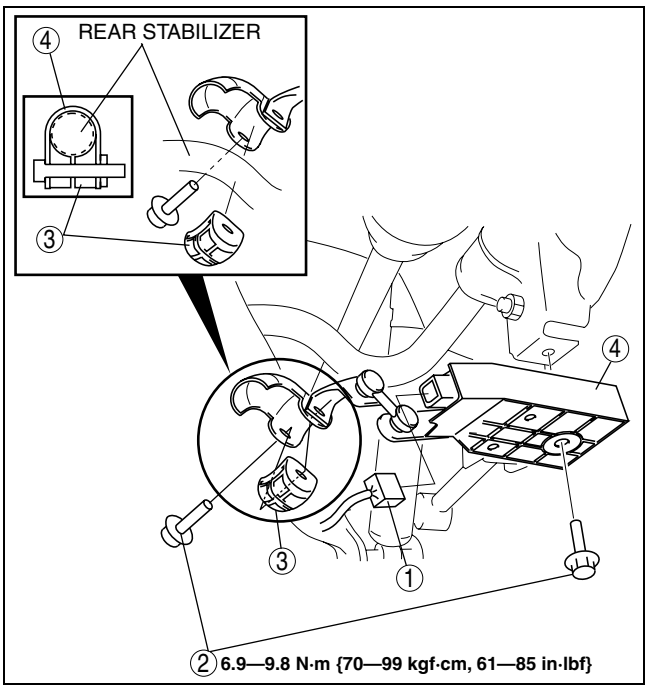
REAR AUTO LEVELING SENSOR REMOVAL/INSTALLATION

A6E811251030201

1. Disconnect the negative battery cable.
2. Jack up the vehicle.
3. Remove in the order indicated in the table.

1	Connector
2	Bolt
3	Bracket
4	Rear auto leveling sensor

4. Install in the reverse order of removal.
5. Adjust the headlight zeroset.



A6E81121158

HIGH-MOUNT BRAKE LIGHT REMOVAL/INSTALLATION

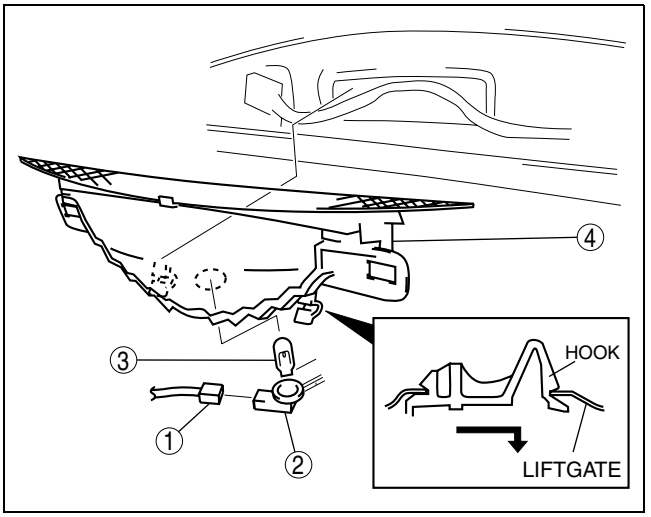
A6E811251580201

In-vehicle-type

1. Disconnect the negative battery cable.
2. Remove the liftgate upper trim.
3. Remove in the order indicated in the table.

1	Connector
2	Socket
3	High-mount brake light bulb
4	High-mount brake light

4. Install in the reverse order of removal.



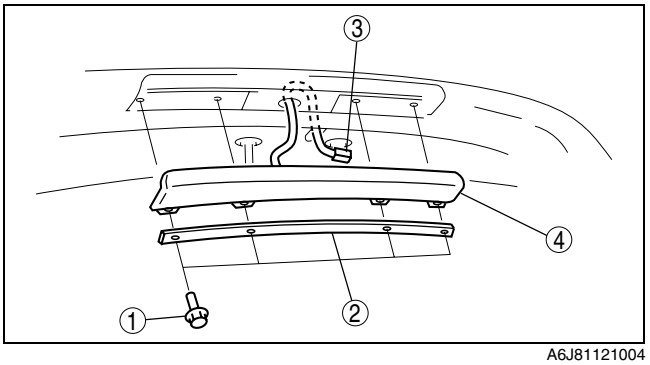
A6A8112W113

Rear spoiler type

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

1	Bolt
2	Cover
3	Connector
4	High-mount brake light

4. Install in the reverse order of removal.



A6J81121004

INTERIOR LIGHTING SYSTEM

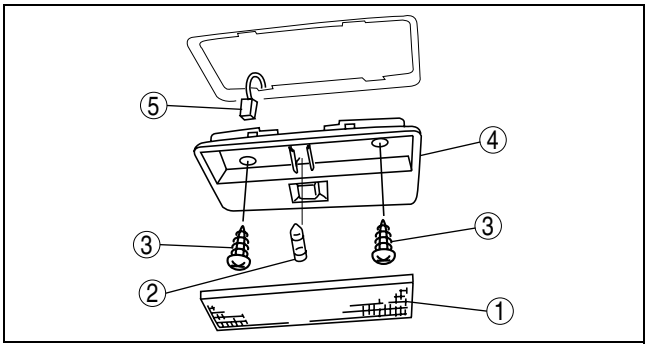
CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION

A6E811451441201

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

1	Lens (See T–21 Lens Removal Note)
2	Cargo compartment light bulb
3	Screw (if equipped)
4	Cargo compartment light
5	Connector

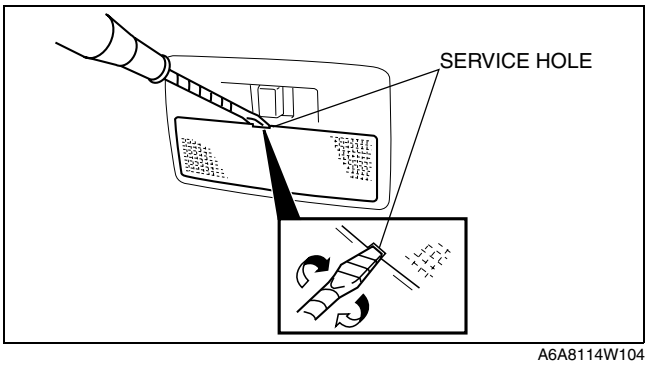
3. Install in the reverse order of removal.



A6J81141102

Lens Removal Note

1. Insert a tape-wrapped flathead screwdriver into the service hole.
2. Twist the flathead screwdriver as indicated by the arrow to remove the lens.



A6A8114W104

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CARGO COMPARTMENT LIGHT INSPECTION

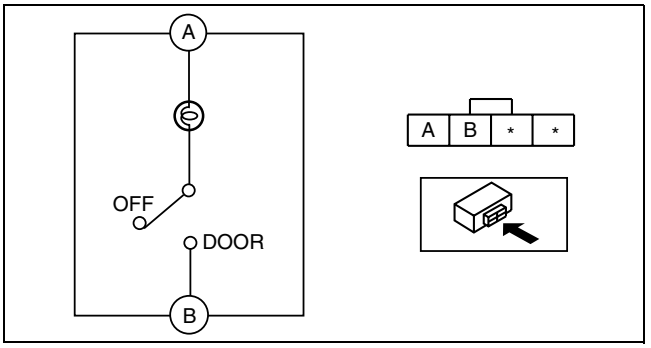
A6E811451441202

1. Remove the cargo compartment light. (See T–21 CARGO COMPARTMENT LIGHT REMOVAL/INSTALLATION)
2. Inspect for continuity between the cargo compartment light terminals using an ohmmeter.
   - If not as specified, replace the cargo compartment light.

: Bulb

Switch position	Terminal	
	A	B
DOOR	○—(●)—○	
OFF		

A6A81141119



A6J81141112

WIPER AND WASHER

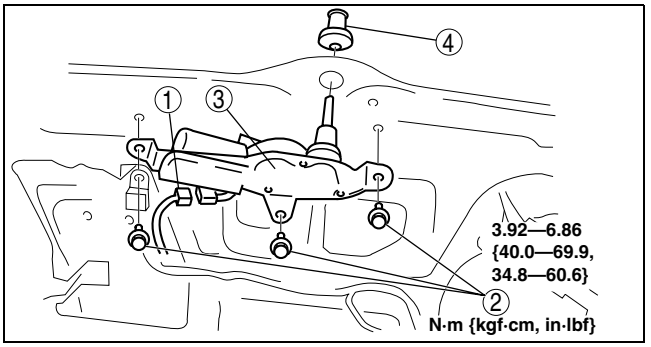
REAR WIPER MOTOR REMOVAL/INSTALLATION

A6E811667450201

1. Disconnect the negative battery cable.
2. Remove the rear wiper arm and blade. (See T–23 REAR WIPER ARM AND BLADE REMOVAL/INSTALLATION.)
3. Remove the liftgate lower trim. (See S–24 LIFTGATE LOWER TRIM REMOVAL/INSTALLATION)
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–24 REAR WIPER ARM AND BLADE ADJUSTMENT.)



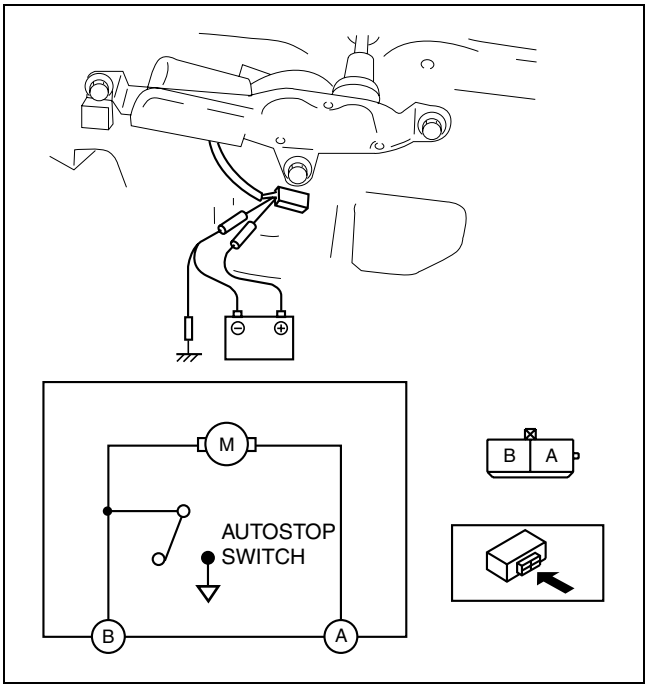
A6E81161110

REAR WIPER MOTOR INSPECTION

A6E811667450202

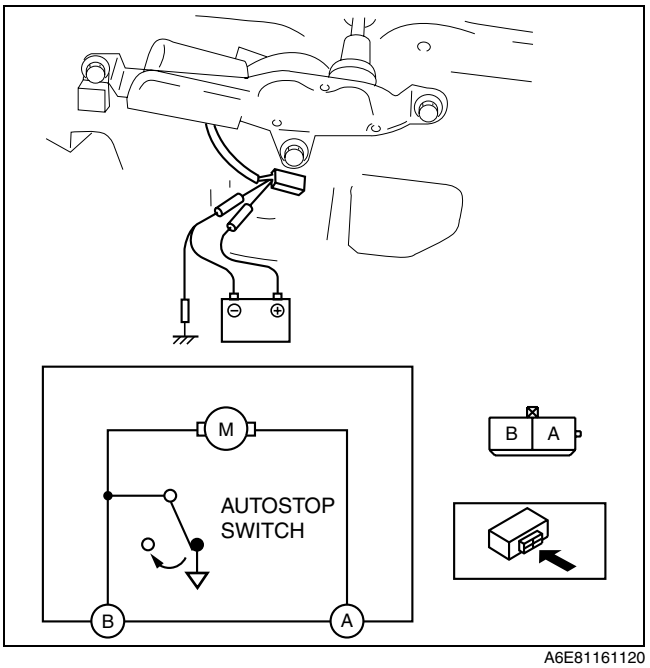
1. Disconnect the negative battery cable.
2. Remove the liftgate lower trim. (See S–24 LIFTGATE LOWER TRIM REMOVAL/INSTALLATION)
3. Disconnect the rear wiper motor connector.
4. Connect battery positive voltage to the rear wiper motor terminal A, and ground the rear wiper motor terminal B to a bare metal part of the vehicle.

5. Verify that the rear wiper motor operates.
6. Disconnect the ground to the terminal B while the rear wiper is operating.



A6E81161119

7. Verify that the rear wiper stops in the park position.
   - If not as specified, replace the rear wiper motor.



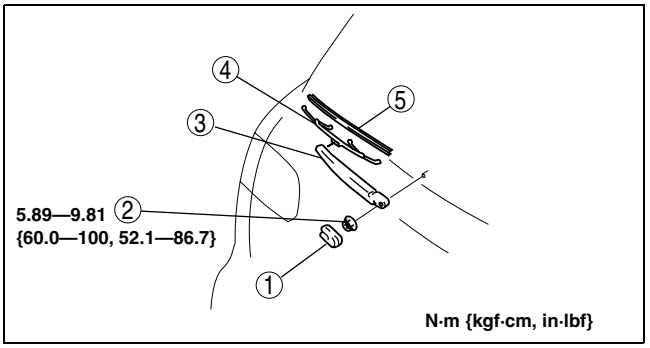
A6E81161120

REAR WIPER ARM AND BLADE REMOVAL/INSTALLATION

A6E811667420201

1. Remove in the order indicated in the table.

1	Cap
2	Nut
3	Rear wiper arm (See T–24 Rear Wiper Arm Installation Note)
4	Rear wiper blade
5	Rubber brush

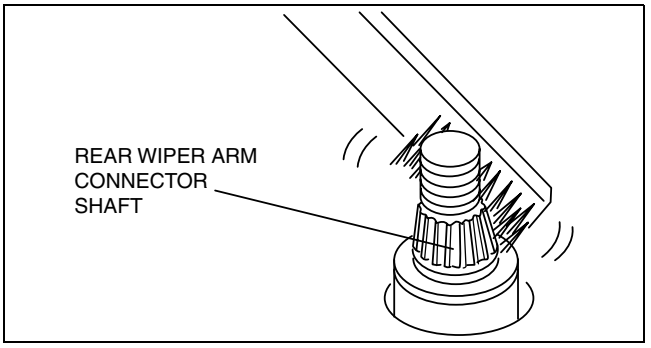


A6E81161112

2. Install in the reverse order of removal.
3. Adjust the rear wiper arm and blade. (See T–24 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.

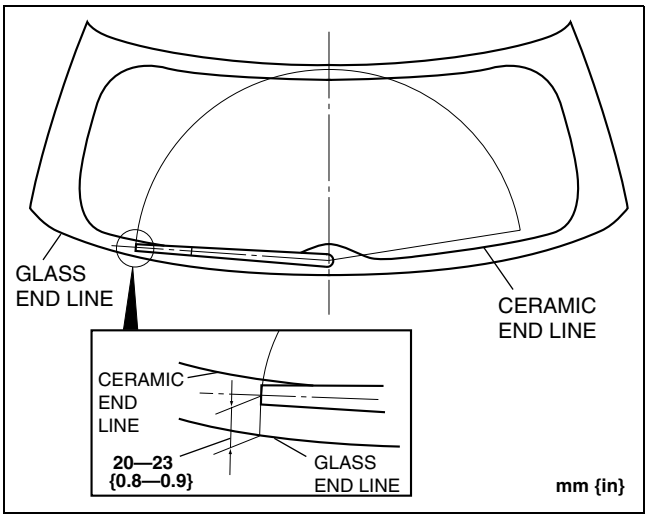


A6E81161103

REAR WIPER ARM AND BLADE ADJUSTMENT

A6E811667420202

1. Operate the rear wiper motor to set the wiper in the park position.
2. Set the rear wiper arm onto the ceramic end line.

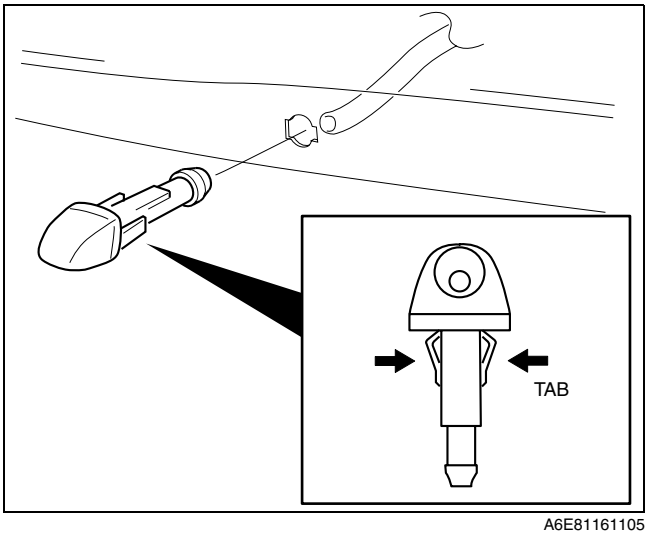


A6E81161129

REAR WASHER NOZZLE REMOVAL/INSTALLATION

A6E811667511201

1. Disconnect the negative battery cable.
2. Remove the liftgate upper trim. (See S–23 LIFTGATE UPPER TRIM REMOVAL/INSTALLATION)
3. Remove the high-mount brake light (In-vehicle-type).
4. Remove the rear washer hose from 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–25 REAR WASHER NOZZLE ADJUSTMENT.)

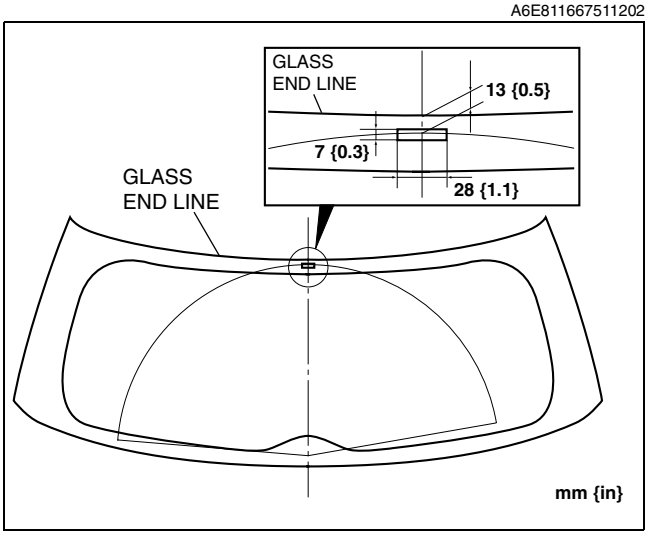


A6E81161105

REAR WASHER NOZZLE ADJUSTMENT

A6E811667511202

1. Insert a needle or an equivalent tool into the spray hole of the rear washer nozzle and adjust the nozzle direction as shown.

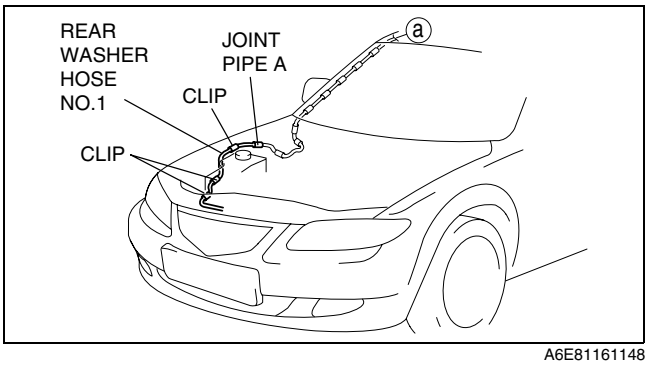


A6E81161118

REAR WASHER HOSE REMOVAL/INSTALLATION

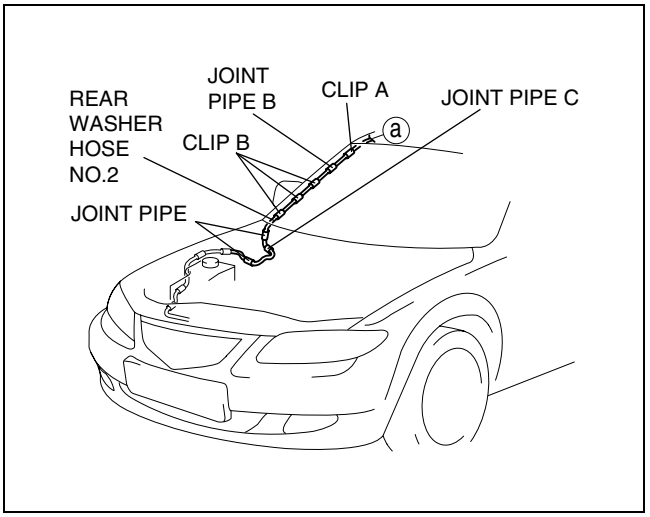
A6E811667470201

1. Disconnect the negative battery cable.
2. Remove the washer tank.
3. Partially peel off the right side mud guard.
4. Remove rear washer hose No.1 from the clips.
5. Remove rear washer hose No.1 and joint pipe A.
6. Remove joint pipe C from the body.
7. Remove the A-pillar trim.



A6E81161148

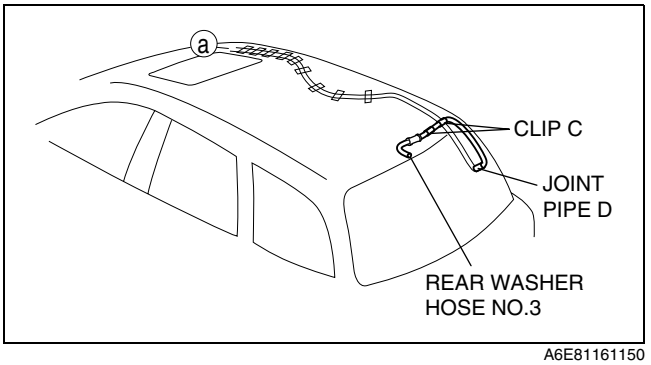
8. Remove rear washer hose No.2 from clip A.
9. Remove clips B from the body.
10. Remove rear washer hose No.2 and joint pipes B.
11. Remove the D-pillar trim.
12. Remove the liftgate upper trim. (See S–23 LIFTGATE UPPER TRIM REMOVAL/ INSTALLATION)



A6E81161149

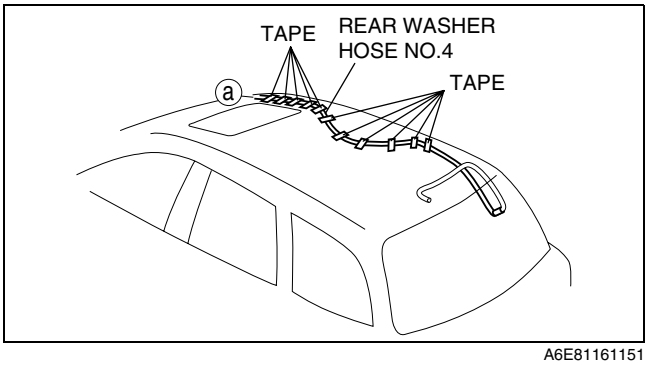
T

13. Remove rear washer hose No.3 from clip C.
14. Remove rear washer hose No.3 and joint pipe D.
15. Remove the headliner. (See S–26 HEADLINER REMOVAL/INSTALLATION)



A6E81161150

16. Remove the tape from rear washer hose No.4.
17. Install in the reverse order of removal.



A6E81161151

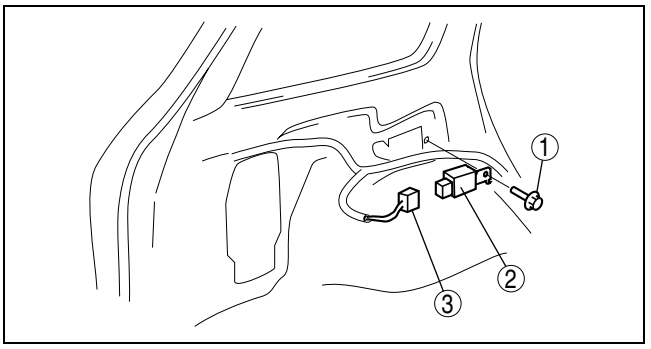
INTERMITTENT REAR WIPER RELAY REMOVAL/INSTALLATION

A6E811666810201

1. Disconnect the negative battery cable.
2. Remove the trunk side trim. (See S–21 TRUNK SIDE TRIM REMOVAL/INSTALLATION)
3. Remove in the order indicated in the table.

1	Bolt
2	Intermittent rear wiper relay
3	Connector

4. Install in the reverse order of removal.



A6J81161015

WARNING AND INDICATOR SYSTEM

FUEL GAUGE SENDER UNIT REMOVAL/INSTALLATION

A6E811860960201

Fuel Gauge Sender Unit

2WD

- There are no changes from the current fuel gauge sender unit removal/installation procedure.

4WD

1. Remove the fuel gauge sender unit. (See F1–26 FUEL PUMP UNIT REMOVAL/INSTALLATION.)
2. Install in the reverse order of removal.

Fuel Gauge Sender Sub-Unit

Warning

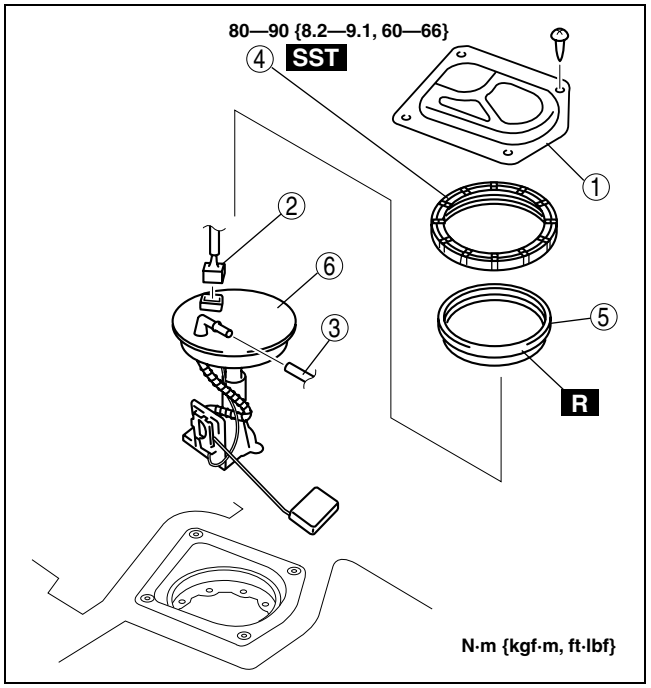
- **Fuel line spills and leakage are dangerous. Fuel can ignite and cause serious injuries or death and damage. Fuel can also irritate skin and eyes. To prevent this, do not damage the sealing surface of the fuel gauge sender sub-unit when removing or installing.**

Caution

- **Disconnecting/connecting the quick release connector without cleaning it may possibly cause damage to the fuel pipe and quick release connector. Always clean the quick release connector joint area before disconnecting/connecting using a cloth or soft brush, and make sure that it is free of foreign material.**

1. Complete the “BEFORE REPAIR PROCEDURE”.
2. Disconnect the negative battery cable.
3. Complete the following in order to the work area.
   (1) Loosen the bolt of the fuel tank strap.
   (2) Lower the fuel tank to a position where the **SST** can be attached from the service hole cover.
4. Remove the rear seat cushion.
5. Remove in the order indicated in the table.

1	Service hole cover
2	Connector
3	Plastic fuel hose (fuel tank side, transfer hose part) (See F1–29 FUEL HOSE (FUEL TANK SIDE, TRANSFER HOSE PART) REMOVAL/INSTALLATION)
4	Fuel gauge sender cap (See T–28 Fuel gauge sender cap removal note) (See T–28 Fuel Gauge Sender Cap Installation Note)
5	Packing
6	Fuel gauge sender sub-unit



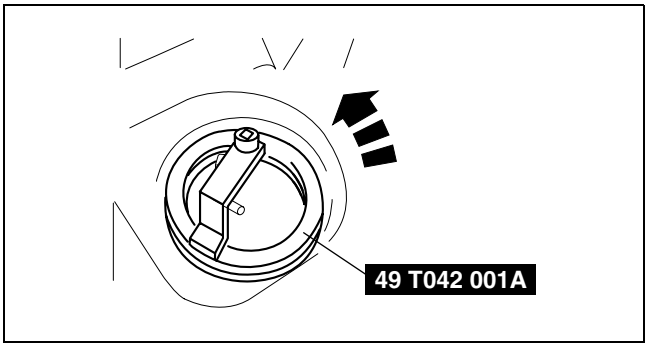
A6E81182001

6. Install in the reverse order of removal.
7. Complete the “AFTER REPAIR PROCEDURE”.
8. Complete the “Fuel leak inspection after fuel gauge sender sub-unit installation.“ (See T–28 Fuel leak inspection after fuel gauge sender sub-unit installation.)

T

Fuel gauge sender cap removal note

1. Using the **SST**, remove the fuel gauge sender cap.

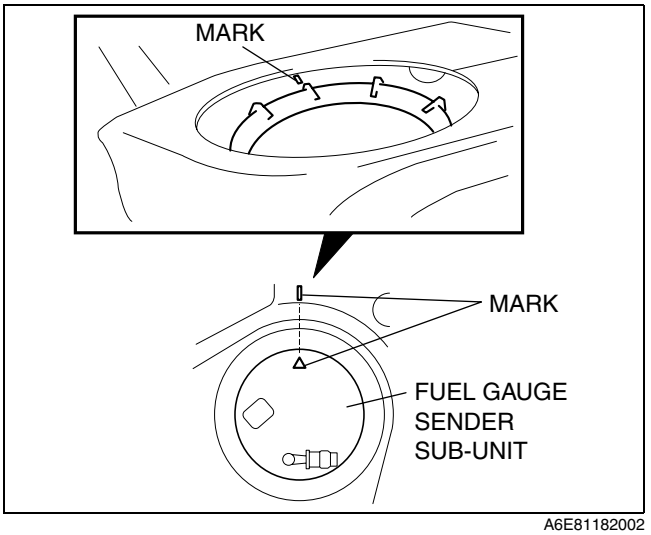


A6J81182105

Fuel Gauge Sender Cap Installation Note

1. Verify that the fuel tank mark is aligned with the fuel gauge sender sub-unit mark as shown.
2. Using the **SST**, tighten the fuel gauge sender cap without shifting the mark.

   Tightening torque
   80—90 N·m {8.2—9.1 kgf·m, 60—66 ft·lbf}



A6E81182002

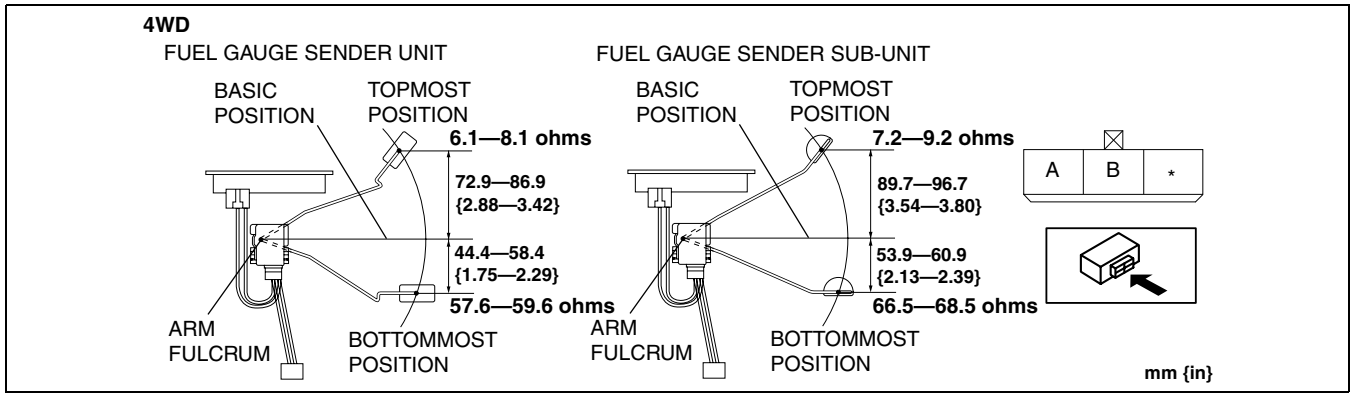
Fuel leak inspection after fuel gauge sender sub-unit installation

1. Drive the vehicle.
2. Perform a quick start and a hard brake **5—6 times**.
3. Stop the vehicle.
4. Verify that there is no fuel leakage near the fuel pump unit in the vehicle interior.

FUEL GAUGE SENDER UNIT INSPECTION

A6E811860960202

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.



A6E81181103

- If they are not as indicated, replace the fuel gauge sender unit.

THEFT-DETERRENT SYSTEM

INTRUDER SENSOR REMOVAL/INSTALLATION

A6E812000172201

Front Intruder Sensor (With Sliding Sunroof)

- There are no changes from the current front intruder sensor removal/installation procedure.

Center Intruder Sensor (Without Sliding Sunroof)

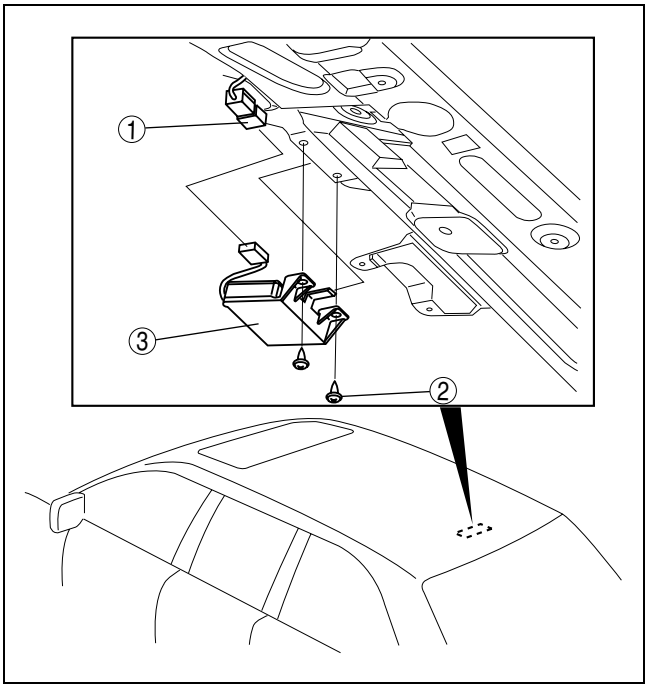
- There are no changes from the current center intruder sensor removal/installation procedure.

Rear Intruder Sensor (WGN)

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

1	Connector
2	Screw
3	Rear intruder sensor

4. Install in the reverse order of removal.



A6E81201105

T

AUDIO AND NAVIGATION SYSTEM

NOISE FILTER REMOVAL/INSTALLATION

A6E812466869201

Brake Light Noise Filter

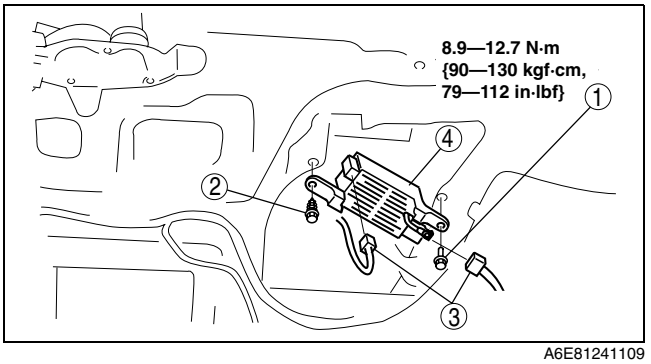
1. Remove the noise filter according to the NOISE FILTER REMOVAL/INSTALLATION procedure for the 4SD.
2. Install in the reverse order of removal.

Rear Window Defroster Noise Filter

1. Disconnect the negative battery cable.
2. Remove the liftgate lower trim.
3. Remove in the order indicated in the table.

1	Bolt
2	Screw
3	Connector
4	Noise filter

4. Install in the reverse order of removal.



A6E81241109

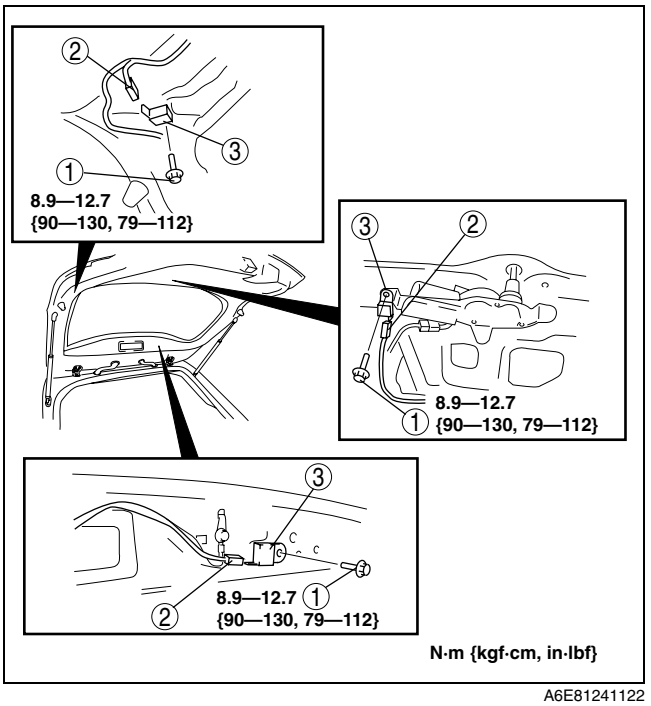
CONDENSER REMOVAL/INSTALLATION

A6E812466869202

1. Disconnect the negative battery cable.
2. Remove the liftgate lower trim.
3. Remove in the order indicated in the table.

1	Bolt
2	Connector
3	Condenser

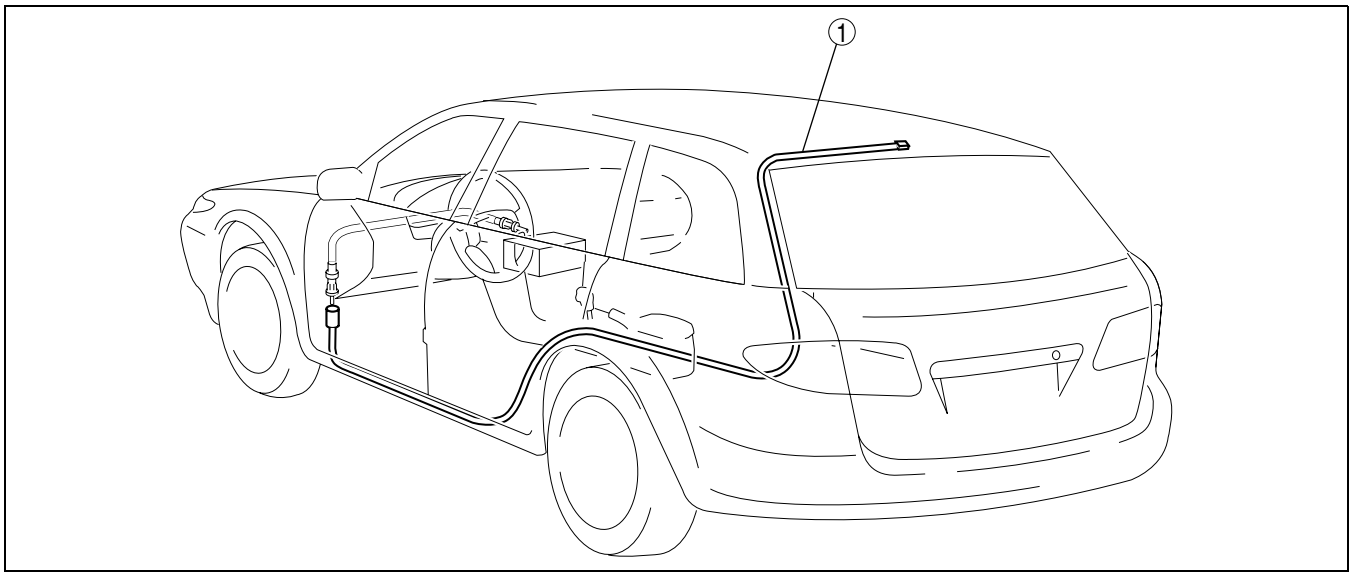
4. Install in the reverse order of removal.



A6E81241122

ANTENNA FEEDER LOCATION

A6E812466941201



A6E81241138

1	Rear antenna feeder

REAR ANTENNA FEEDER INSPECTION

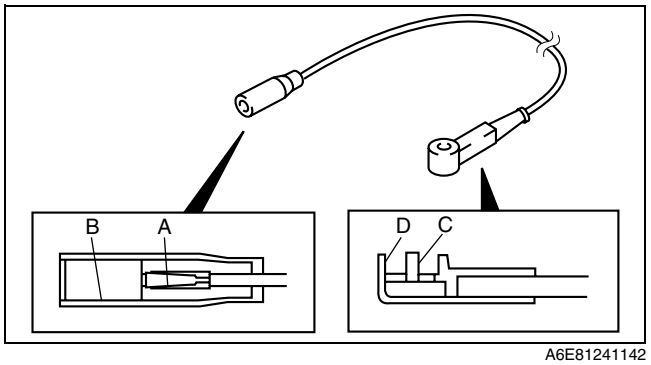
1. Verify that there is no continuity between antenna feeder terminals A and B using an ohmmeter.
2. Inspect for continuity between the antenna feeder terminals using an ohmmeter.
   - If not as specified, replace the rear harness.

○—○ : Continuity

Step	Terminal			
	A	B	C	D
1	○		○	
2		○		○

A6E81241147

A6E812466942201



A6E81241142

T

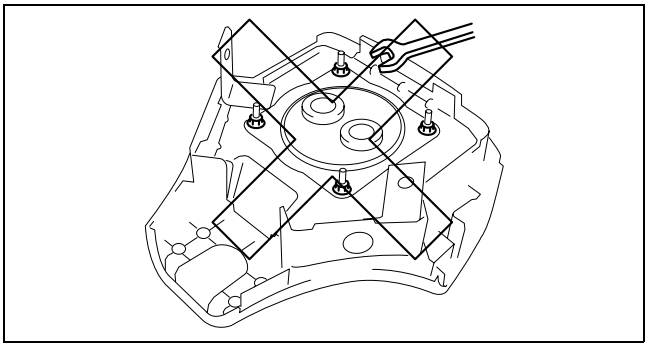
AIR BAG SYSTEM

SERVICE WARNINGS

A6E813001046202

Component Disassembly

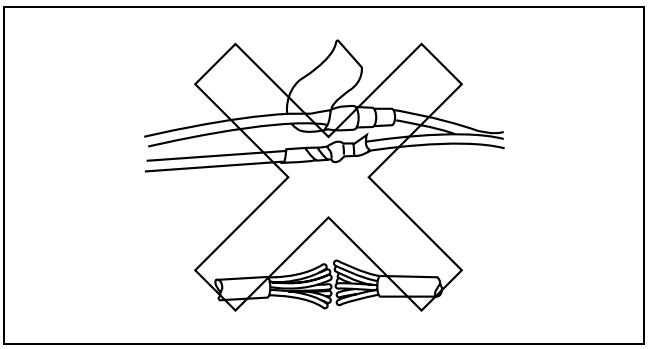
- **Disassembling and reassembling the components of the air bag system can render the system inoperative, which may result in serious injury or death in the event of an accident. Do not disassemble any air bag system components.**



A6E8130W044

Wiring Harness Repair

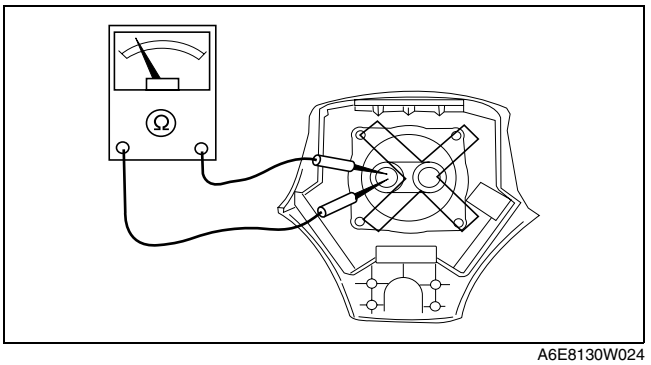
- **Incorrectly repairing an air bag system wiring harness can accidentally deploy the air bag module or pre-tensioner seat belt, which can cause serious injury. If a problem is found in the system wiring, replace the wiring harness. Do not try to repair it.**



A6E8130W045

Air Bag Module Inspection

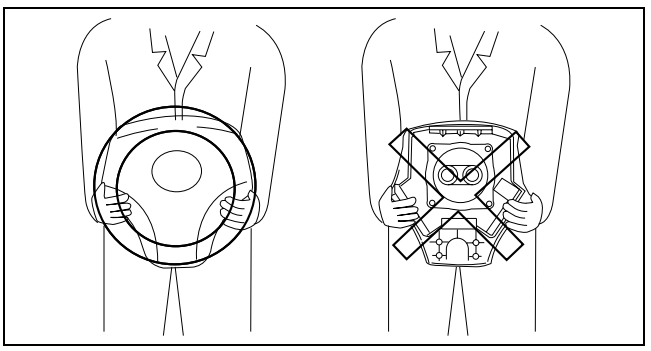
- **Inspecting an air bag module using an ohmmeter can deploy the air bag module, which may cause serious injury. Do not use an ohmmeter to inspect an air bag module. Always use the on-board diagnostic to diagnose the air bag module for malfunctions.**



A6E8130W024

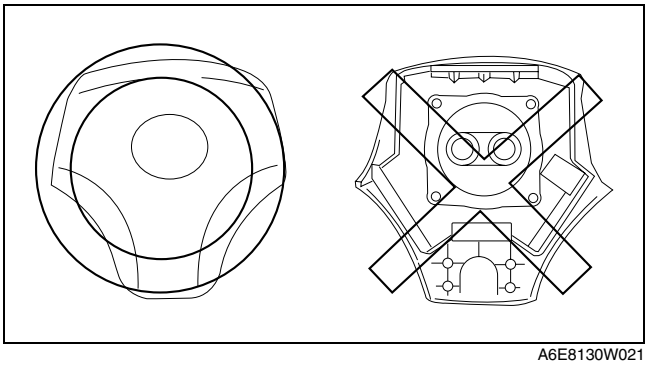
Air Bag Module Handling

- **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.**



A6E8130W022

- **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.**



A6E8130W021

Side Air Bag Module Handling

- **When the side air bag module deploys due to a collision, the interior of the seat back (pad, frame, etc.) may become damaged. If the seat back is reused and the side air bag module does not deploy properly, a serious accident may result. When the side air bag module deploys, always replace both the side air bag module and the seat back (pad, frame, trim) with new parts. After service, confirm that the seat operates normally and that the harness is positioned properly.**

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 control module 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 control module to the vehicle.**
- **For vehicles with a single point sensor, once an air bag module 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.**

Crash Zone Sensor Handling

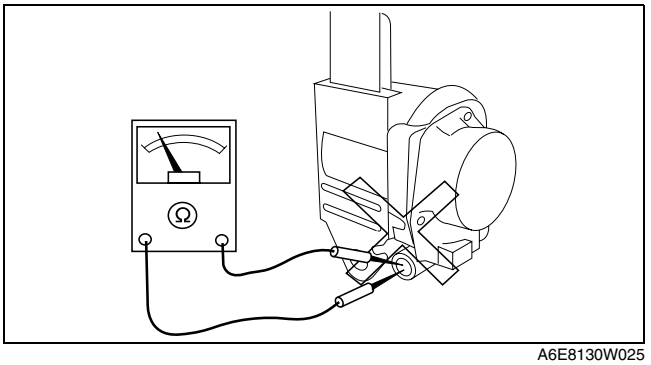
- **Disconnecting the crash zone sensor connector or removing the crash zone sensor with the ignition switch at ON position can cause the crash zone sensor to operate and the air bag modules and pre-tensioner seat belts to deploy, which may seriously injure you. Before disconnecting the crash zone sensor connector or removing the crash zone sensor, always 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 control module to deplete its stored power.**
- **If the crash zone sensor is subjected to shock or the sensor is disassembled, the air bag modules and pre-tensioner seat belts may operate (deploy) suddenly and cause injury, or it may fail to operate normally and cause a serious accident. Do not subject the crash zone sensor to shock or disassemble the sensor.**
- **Because a sensor is built into the crash zone sensor, when the air bag modules and pre-tensioner seat belts operates (deploys), there may be a problem, such as an internal malfunction, even if there is not any external damage or deformation. If the crash zone sensor is reused, the air bag modules and pre-tensioner seat belts may fail to operate normally and cause a serious injury. Always replace the crash zone sensor with a new part. The crash zone sensor cannot be bench-checked or self-checked.**

Side Air Bag Sensor Handling

- **Disconnecting the side air bag sensor connector or removing the side air bag sensor with the ignition switch at ON position can cause the side air bag sensor to operate and the side air bag module to deploy, which may seriously injure you. Before disconnecting the side air bag sensor connector or removing the side air bag sensor, always 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 control module to deplete its stored power.**
- **If the side air bag sensor is subjected to shock or the sensor is disassembled, the side air bag module may operate (deploy) suddenly and cause injury, or it may fail to operate normally and cause a serious accident. Do not subject the side air bag sensor to shock or disassemble the sensor.**
- **Because a sensor is built into the side air bag sensor, when the side air bag module operates (deploys), there may be a problem, such as an internal malfunction, even if there is not any external damage or deformation. If the side air bag sensor is reused, the side air bag module may fail to operate normally and cause a serious injury. Always replace the side air bag sensor with a new part. The side air bag sensor cannot be bench-checked or self-checked.**

Pre-tensioner Seat Belt Inspection

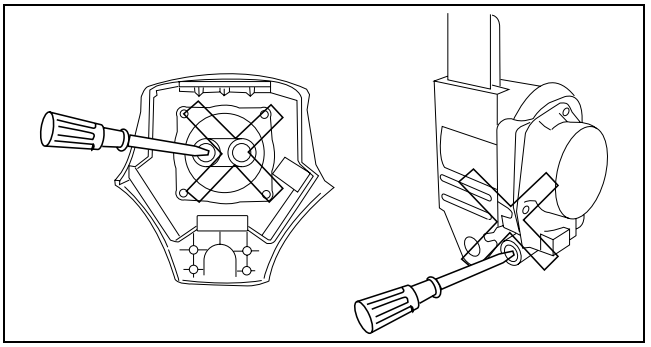
- **Inspecting a pre-tensioner seat belt using an ohmmeter can deploy the pre-tensioner seat belt, which can cause serious injury. Do not use an ohmmeter to inspect the pre-tensioner seat belt. Always use the on-board diagnostic to diagnose the pre-tensioner seat belt for malfunctions.**



A6E8130W025

Component Handling

- **Oil, grease, water, etc on components may cause the air bag modules and pre-tensioner seat belts to fall 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 or a pre-tensioner seat belt may damage the connector and cause the air bag module or the pre-tensioner seat belt to deploy improperly, which may cause serious injury. Do not insert any foreign objects into the connector.**



A6E8130W023

Component Reuse

- **Even if an air bag module or a pre-tensioner seat belt 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 or pre-tensioner seat belt to determine whether it can be reused.**

CURTAIN AIR BAG MODULE REMOVAL/INSTALLATION

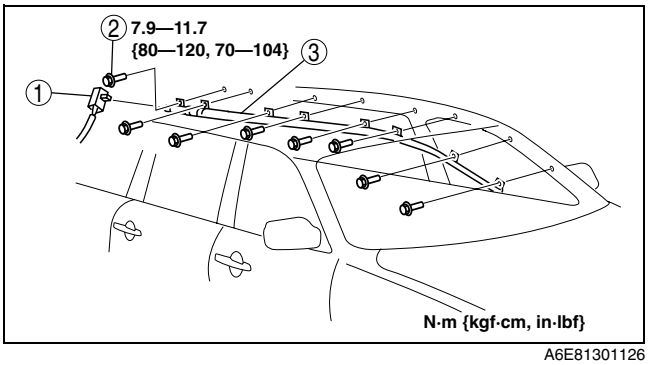
A6E813000171201

Warning

- **Handling the air bag module improperly can accidentally deploy the air bag module, which may seriously injure you. Read AIR BAG SYSTEM SERVICE WARNINGS before handling the air bag module. (See T–32 SERVICE WARNINGS.)**

1. Turn the ignition switch to LOCK position.
2. Disconnect the negative battery cable and wait for **more than 1 minute**.
3. Remove the headliner.
4. Remove in the order indicated in the table.

1	Connector (See T–35 Connector Removal Note)
2	Bolt
3	Curtain air bag module

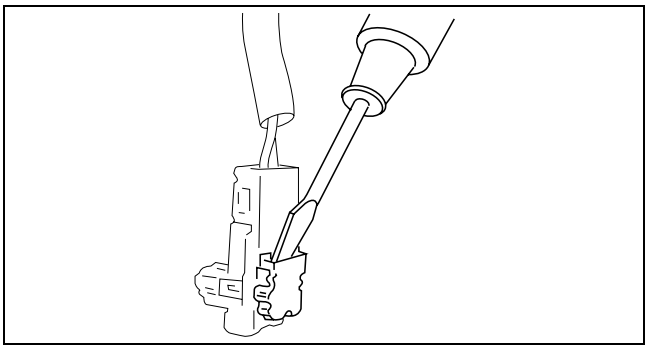


A6E81301126

5. Install in the reverse order of removal.
6. Turn the ignition switch to ON position.
7. Verify that the air bag system warning light illuminates for **approximately 6 seconds** and then goes off.
   - If the air bag system warning light does not operate in the manner described above, there are malfunctions in the system. Inspect the system using the on-board diagnostic.

Connector Removal Note

1. Using a flathead screwdriver, pry out the connector's stopper plate.
2. Disconnect the connector.



A6E8130W002

AIR BAG MODULE AND PRE-TENSIONER SEAT BELT DEPLOYMENT PROCEDURES

A6E813057000201

Warning

- **A live (undeployed) air bag module and pre-tensioner seat belt may accidentally deploy when it is disposed of and cause serious injury. Do not dispose of a live (undeployed) air bag module and pre-tensioner seat belt. If the SSTs (Deployment tool and Adapter harness) are not available, consult the nearest Mazda representative for assistance.**

Caution

- **Deploying the air bag modules and pre-tensioner seat belts inside the vehicle may cause damage to the vehicle interior. When the vehicle is not to be scrapped, always deploy the air bag modules and pre-tensioner seat belts outside the vehicle.**

- When the vehicle is to be scrapped, deploy the air bag modules and pre-tensioner seat belts inside the vehicle. (See T–36 Deployment Procedure for Inside of Vehicle (Only When Vehicle Is To Be Scrapped).)
- When the vehicle is not to be scrapped, deploy the air bag modules and pre-tensioner seat belts outside the vehicle. (See T–36 Deployment Procedure for Outside of Vehicle.)

Note

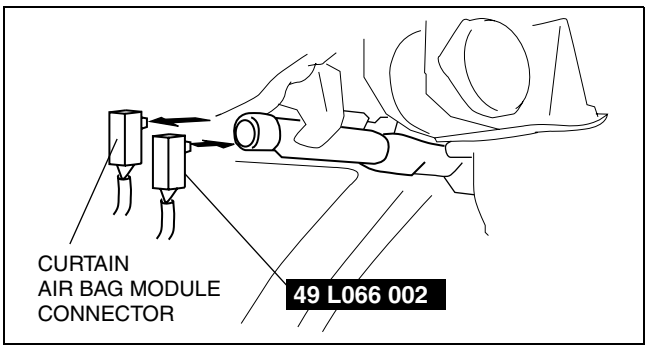
- When disposing of deployed air bag module and pre-tensioner seat belt, refer to the disposal procedure.
- The deployment procedures are the same as those of the current 4SD and 5HB models, except for the curtain air bag module.

Deployment Procedure for Inside of Vehicle (Only When Vehicle Is To Be Scrapped)

1. Inspect the **SST** (Deployment tool).
2. Move the vehicle to an open space, away from strong winds, and close all the doors and windows.
3. Turn the ignition switch to LOCK position.
4. Disconnect the negative battery cable and wait for **more than 1 minute**.
5. Follow the appropriate procedure for deploying the driver-side air bag module, passenger-side air bag module, side air bag module, curtain air bag module, or pre-tensioner seat belt.

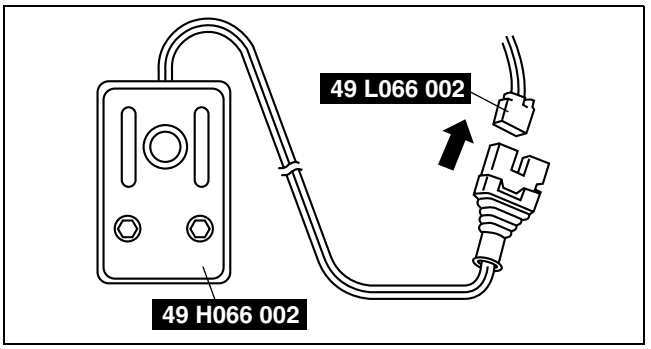
Curtain air bag module (WGN)

1. Remove the headliner.
2. Disconnect the curtain air bag module connector.
3. Connect the **SST** (Adapter harness) to the curtain air bag module.



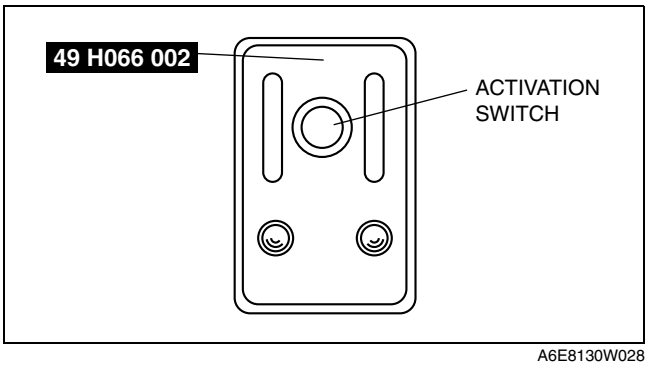
A6E81301112

4. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
5. Connect the red clip of the **SST** (Deployment tool) to the positive battery terminal and the black clip to the negative battery terminal.
6. Verify that the red light on the **SST** (Deployment tool) is illuminated.
7. Make sure all persons are standing **at least 6 m {20 ft}** from the vehicle.



A6E8130W151

8. Press the activation switch on the **SST** (Deployment tool) to deploy the curtain air bag module.



A6E8130W028

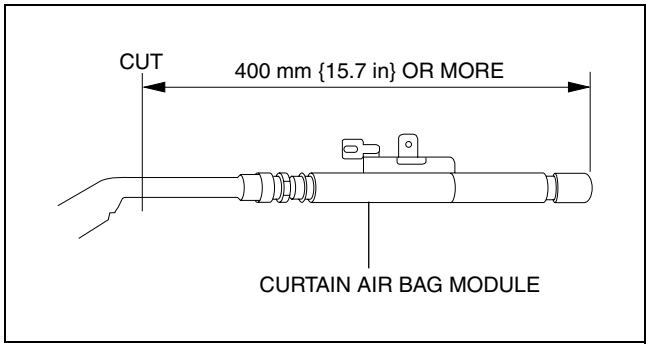
Deployment Procedure for Outside of Vehicle

1. Inspect the **SST** (Deployment tool).
2. Turn the ignition switch to LOCK position.
3. Disconnect the negative battery cable and wait for **more than 1 minute**.
4. Follow the appropriate procedure for deploying the driver-side air bag module, passenger-side air bag module, side air bag module, curtain air bag module, or pre-tensioner seat belt.

Curtain air bag module (WGN)

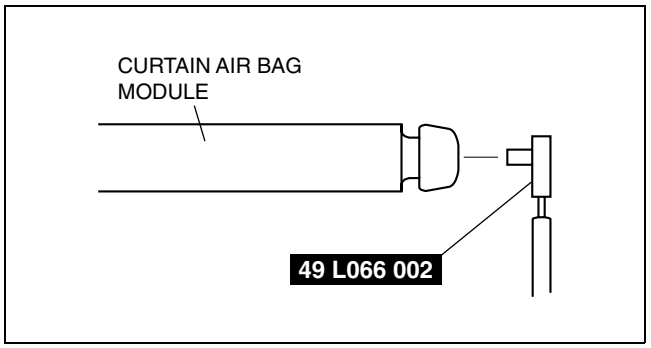
1. Remove the curtain air bag module. (See T–35 CURTAIN AIR BAG MODULE REMOVAL/INSTALLATION.)
2. Secure the curtain air bag module in a vise, and cut off the deployment section, as shown in the figure.

   Warning
   - **Be sure not to collapse the pipe on the side where it is cut. If it is collapsed, the interior pressure of the pipe will build up and can cause it to explode during air bag module deployment.**



A6E8130W013

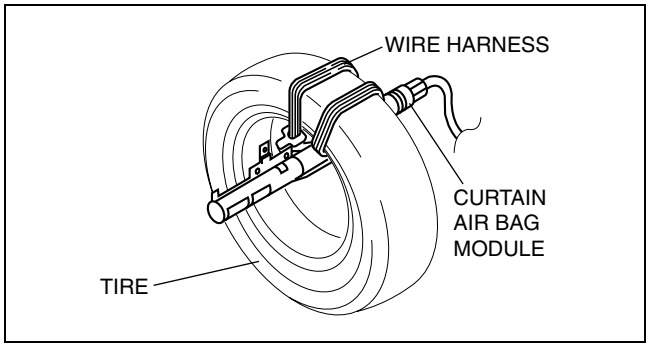
3. Connect the **SST** (Adapter harness) to the curtain air bag module as shown in the figure.



A6E8130W040

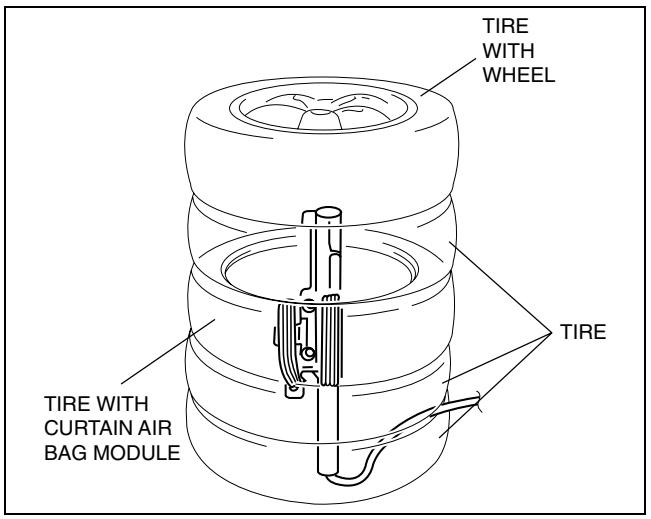
4. Tie the side air bag module to the tire with the module facing the center of the tire. Wrap the wire harness through the tire and around the bracket **at least four times**.

   Warning
   - **If the air bag module is not properly installed to the tire, serious injury may occur when the module is deployed. When installing the air bag module to the tire, make sure the module is facing the downward.**



A6E8130W018

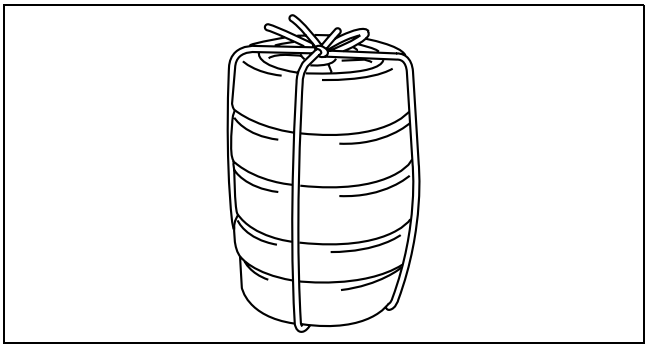
5. Stack the tire with the curtain air bag module on top of two tires. Stack a tire on top of three tires. Stack another tire that has a wheel on top of the four tires.



A6E8130W020

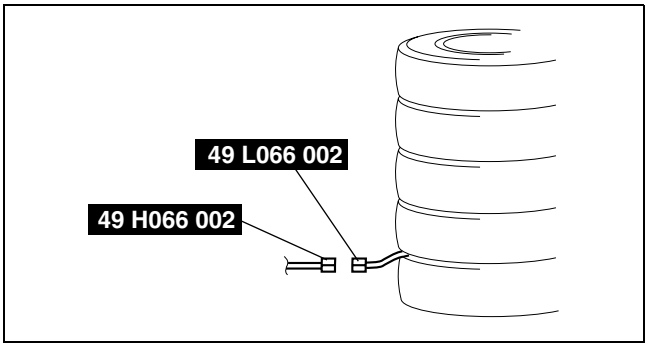
T

6. Tie all tires together with wire.



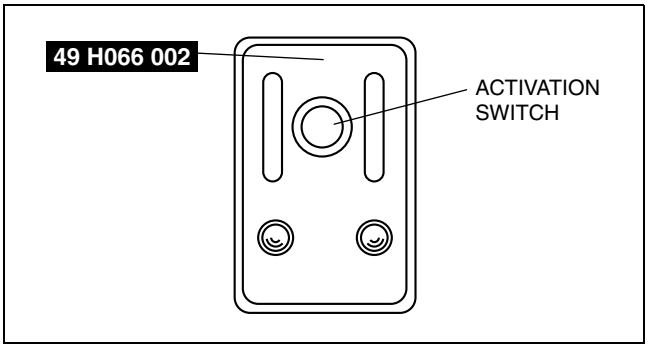
A6E8130W034

7. Connect the **SST** (Deployment tool) to the **SST** (Adapter harness).
8. Connect the red clip of the **SST** (Deployment tool) to the positive battery terminal and the black clip to the negative battery terminal.
9. Verify that the red light on the **SST** (Deployment tool) is illuminated.
10. Make sure all persons are standing **at least 6 m {20 ft}** from the vehicle.



A6E8130W155

11. Press the activation switch on the **SST** (Deployment tool) to deploy the curtain air bag module.



A6E8130W028

ON-BOARD DIAGNOSTIC [MULTIPLEX COMMUNICATION SYSTEM]

MULTIPLEX COMMUNICATION SYSTEM

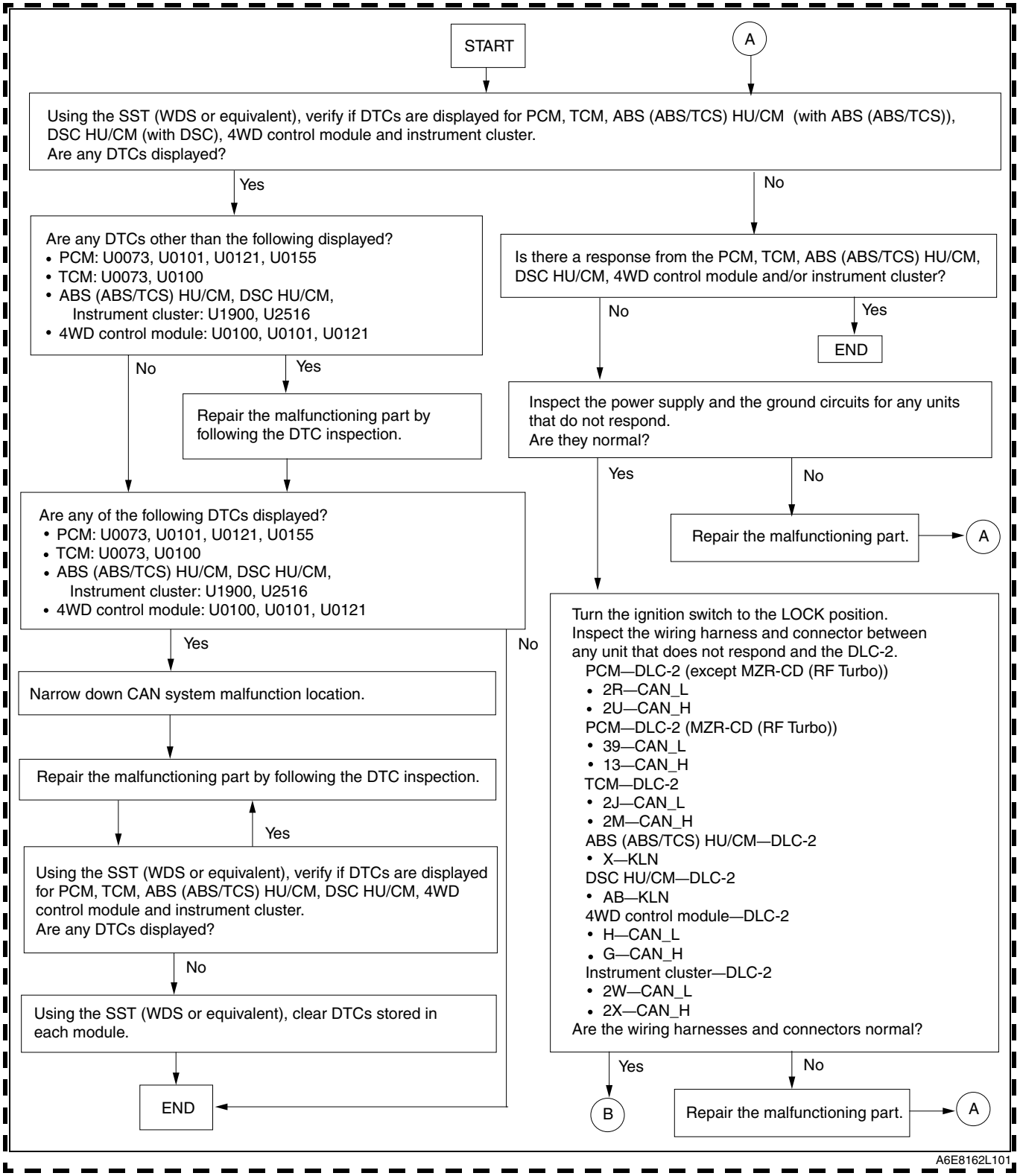
A6E816255430201

Outline

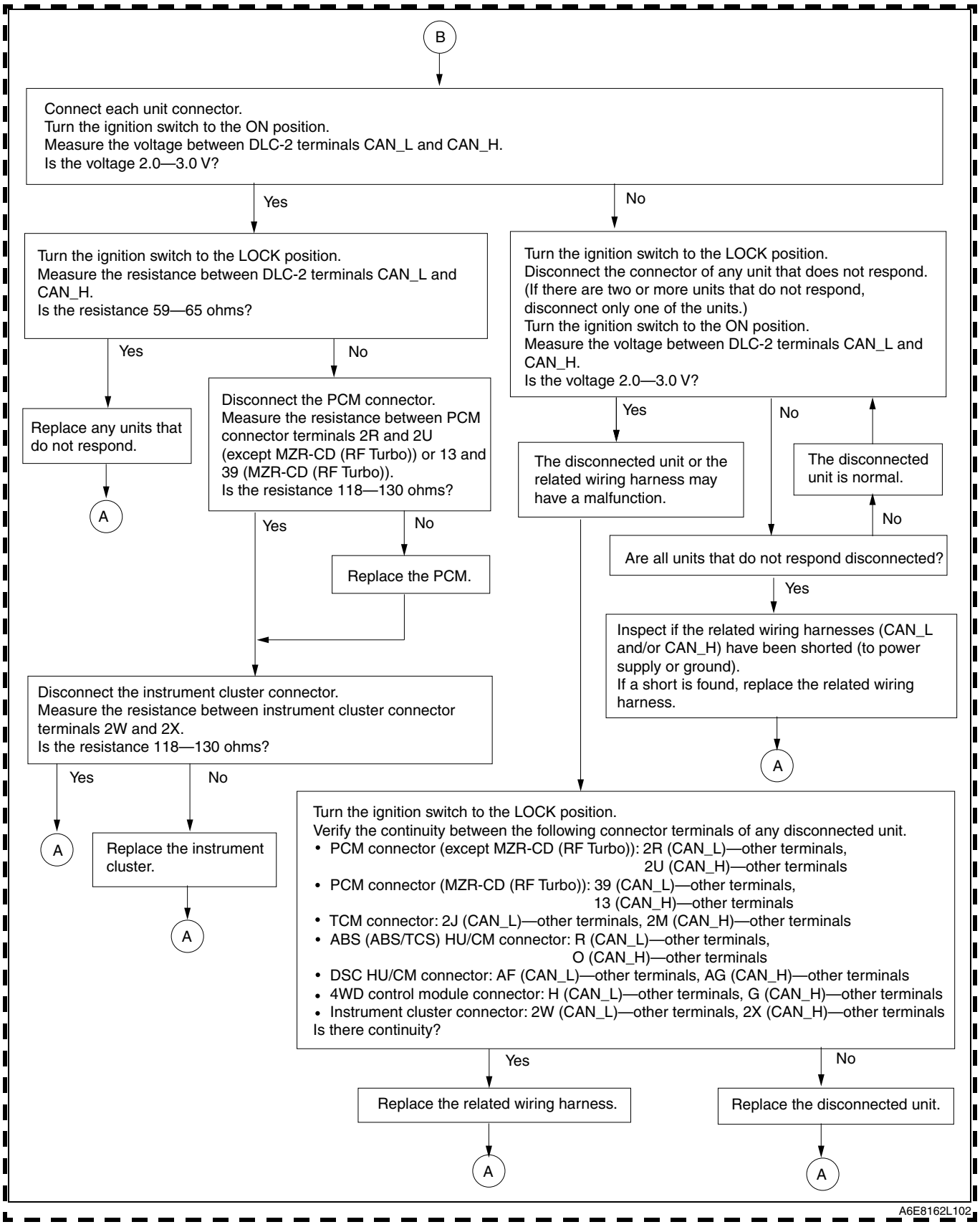
- If the controller area network (CAN) system is malfunctioning, read the DTCs of the following modules, using the **SST** (WDS or equivalent) to determine the malfunctioning system.
  - — PCM
  - — TCM
  - — ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS))
  - — DSC HU/CM (with DSC)
  - — 4WD control module
  - — Instrument cluster

Flowchart

- Use the following flowchart to verify the cause of the trouble.



A6E8162L101



A6E8162L102

T

DTC TABLE

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DTC	Malfunction location	Related module	Page
U0073	CAN system communication error	• PCM • TCM	(See T–45 DTC U0073, U1900, U2516)
U0100	Communication error to PCM	• TCM • 4WD control module	(See T–42 PROCEDURES FOR DETERMINING THE LOCATION OF A MALFUNCTION)
U0101	Communication error to TCM	• PCM • 4WD control module	
U0121	Communication error to ABS (ABS/TCS) HU/CM or DSC HU/CM		
U0155	Communication error to instrument cluster	• PCM	
U1900	CAN system communication error	• ABS (ABS/TCS) HU/CM (with ABS (ABS/TCS)) • DSC HU/CM (with DSC) • Instrument cluster	(See T–45 DTC U0073, U1900, U2516)
U2516	CAN system wiring harness open and short circuit		

PID/DATA MONITOR TABLE

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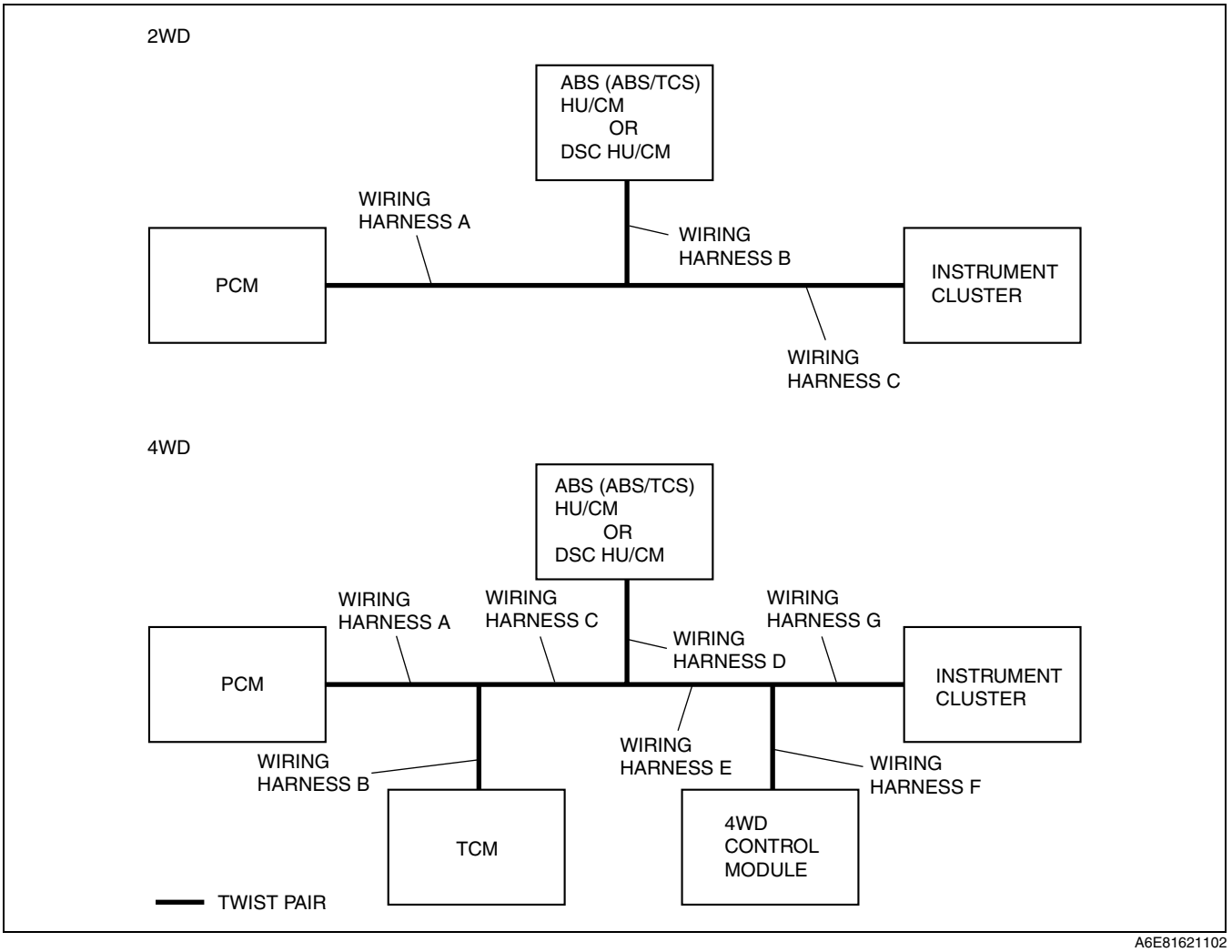
PID name (definition)	Condition	Specification	Related module	Terminal
PCM_MSG (Missing message from the PCM)	Present	Circuit in the PCM is normal.	• TCM • ABS (ABS/TCS) HU/CM or DSC HU/CM • Instrument cluster	• TCM: 2J, 2M • ABS (ABS/TCS) HU/CM: O, R • DSC HU/CM: AF, AG • Instrument cluster: 2W, 2X
	Not Present	Circuit in the PCM is abnormal.		
TCM_MSG (Missing message from the TCM)	Present	Circuit in the TCM is normal.	• ABS (ABS/TCS) HU/CM or DSC HU/CM • Instrument cluster	
	Not Present	Circuit in the TCM is abnormal.		
ABS_MSG (Missing message from the ABS (ABS/TCS) HU/CM or DSC HU/CM)	Present	Circuit in the ABS (ABS/TCS) HU/CM or DSC HU/CM is normal.	• TCM • Instrument cluster	
	Not Present	Circuit in the ABS (ABS/TCS) HU/CM or DSC HU/CM is abnormal.		
AWD_MSG (Missing message from the 4WD control module)	Present	Circuit in the 4WD control module is normal.	• TCM • ABS (ABS/TCS) HU/CM or DSC HU/CM • Instrument cluster	
	Not Present	Circuit in the 4WD control module is abnormal.		
IC_MSG (Missing message from the instrument cluster)	Present	Circuit in the instrument cluster is normal.	• TCM • ABS (ABS/TCS) HU/CM or DSC HU/CM	
	Not Present	Circuit in the instrument cluster is abnormal.		

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PROCEDURES FOR DETERMINING THE LOCATION OF A MALFUNCTION

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System Wiring Diagram



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PCM

1. Check the display of DTC U0101, U0121 and/or U0155, using the **SST** (WDS or equivalent). (See T–41 DTC TABLE.)
2. Referring to the following table, determine the malfunctioning part of the CAN system.

2WD

X: Normal
—: Communication error

Module	Communication status		Malfunction location
	ABS (ABS/TCS) HU/CM DSC HU/CM	Instrument cluster	
PCM	—	—	• Wiring harness A • PCM
	—	X	• Wiring harness B • ABS (ABS/TCS) HU/CM • DSC HU/CM
	X	—	• Wiring harness C • Instrument cluster

4WD

X: Normal
—: Communication error

Module	Communication status			Malfunction location
	TCM	ABS (ABS/TCS) HU/CM DSC HU/CM	Instrument cluster	
PCM	—	—	—	• Wiring harness A • PCM
	—	X	X	• Wiring harness B • TCM
	X	—	X	• Wiring harness D • ABS (ABS/TCS) HU/CM • DSC HU/CM
	X	X	—	• Wiring harness E • Wiring harness G • Instrument cluster
	X	—	—	• Wiring harness C

TCM

1. Access and monitor the “PCM_MSG”, “ABS_MSG”, “AWD_MSG” and “IC_MSG” of PID using the **SST** (WDS or equivalent).
2. Referring to the PID/DATA MONITOR, confirm the display status of the PID. (See T–41 PID/DATA MONITOR TABLE.)
3. Referring to the following table, determine the malfunctioning part of the CAN system.

X: Normal
—: Communication error

Module	Communication status				Malfunction location
	PCM	ABS (ABS/TCS) HU/CM DSC HU/CM	4WD control module	Instrument cluster	
TCM	—	—	—	—	• Wiring harness B • TCM
	—	X	X	X	• Wiring harness A • PCM
	X	—	X	X	• Wiring harness D • ABS (ABS/TCS) HU/CM • DSC HU/CM
	X	X	—	X	• Wiring harness F • 4WD control module
	X	X	X	—	• Wiring harness G • Instrument cluster
	X	—	—	—	• Wiring harness C
	X	X	—	—	• Wiring harness E

ABS (ABS/TCS) HU/CM or DSC HU/CM

1. Access and monitor the “PCM_MSG”, “TCM_MSG”, “AWD_MSG” and “IC_MSG” of PID using the **SST** (WDS or equivalent).
2. Referring to the PID/DATA MONITOR, confirm the display status of the PID. (See T–41 PID/DATA MONITOR TABLE.)
3. Referring to the following table, determine the malfunctioning part of the CAN system.

2WD

X: Normal
—: Communication error

Module	Communication status		Malfunction location
	PCM	Instrument cluster	
• ABS (ABS/TCS) HU/CM • DSC HU/CM	—	—	• Wiring harness B • ABS (ABS/TCS) HU/CM • DSC HU/CM
	—	X	• Wiring harness A • PCM
	X	—	• Wiring harness C • Instrument cluster

4WD

X: Normal
—: Communication error

Module	Communication status				Malfunction location
	PCM	TCM	4WD control module	Instrument cluster	
• ABS (ABS/TCS) HU/CM • DSC HU/CM	—	—	—	—	• Wiring harness D • ABS (ABS/TCS) HU/CM • DSC HU/CM
	—	X	X	X	• Wiring harness A • PCM
	X	—	X	X	• Wiring harness B • TCM
	X	X	—	X	• Wiring harness F • 4WD control module
	X	X	X	—	• Wiring harness G • Instrument cluster
	—	—	X	X	• Wiring harness C
	X	X	—	—	• Wiring harness E

4WD control module

1. Check the display of DTC U0100, U0101 and/or U0121, using the **SST** (WDS or equivalent). (See T–41 DTC TABLE.)
2. Referring to the following table, determine the malfunctioning part of the CAN system.

X: Normal
—: Communication error

Module	Communication status			Malfunction location
	PCM	TCM	ABS (ABS/TCS) HU/CM DSC HU/CM	
4WD control module	—	—	—	• Wiring harness E • Wiring harness F • 4WD control module
	—	X	X	• Wiring harness A • PCM
	X	—	X	• Wiring harness B • TCM
	X	X	—	• Wiring harness D • ABS (ABS/TCS) HU/CM • DSC HU/CM
	—	—	X	• Wiring harness C

Instrument Cluster

1. Access and monitor the “PCM_MSG”, “ABS_MSG”, “AWD_MSG” and “TCM_MSG” of PID using the **SST** (WDS or equivalent).
2. Referring to the PID/DATA MONITOR, confirm the display status of the PID. (See T–41 PID/DATA MONITOR TABLE.)
3. Referring to the following table, determine the malfunctioning part of the CAN system.

2WD

X: Normal
—: Communication error

Module	Communication status		Malfunction location
	PCM	ABS (ABS/TCS) HU/CM DSC HU/CM	
Instrument cluster	—	—	• Wiring harness C • Instrument cluster
	—	X	• Wiring harness A • PCM
	X	—	• Wiring harness B • ABS (ABS/TCS) HU/CM • DSC HU/CM

4WD

X: Normal
—: Communication error

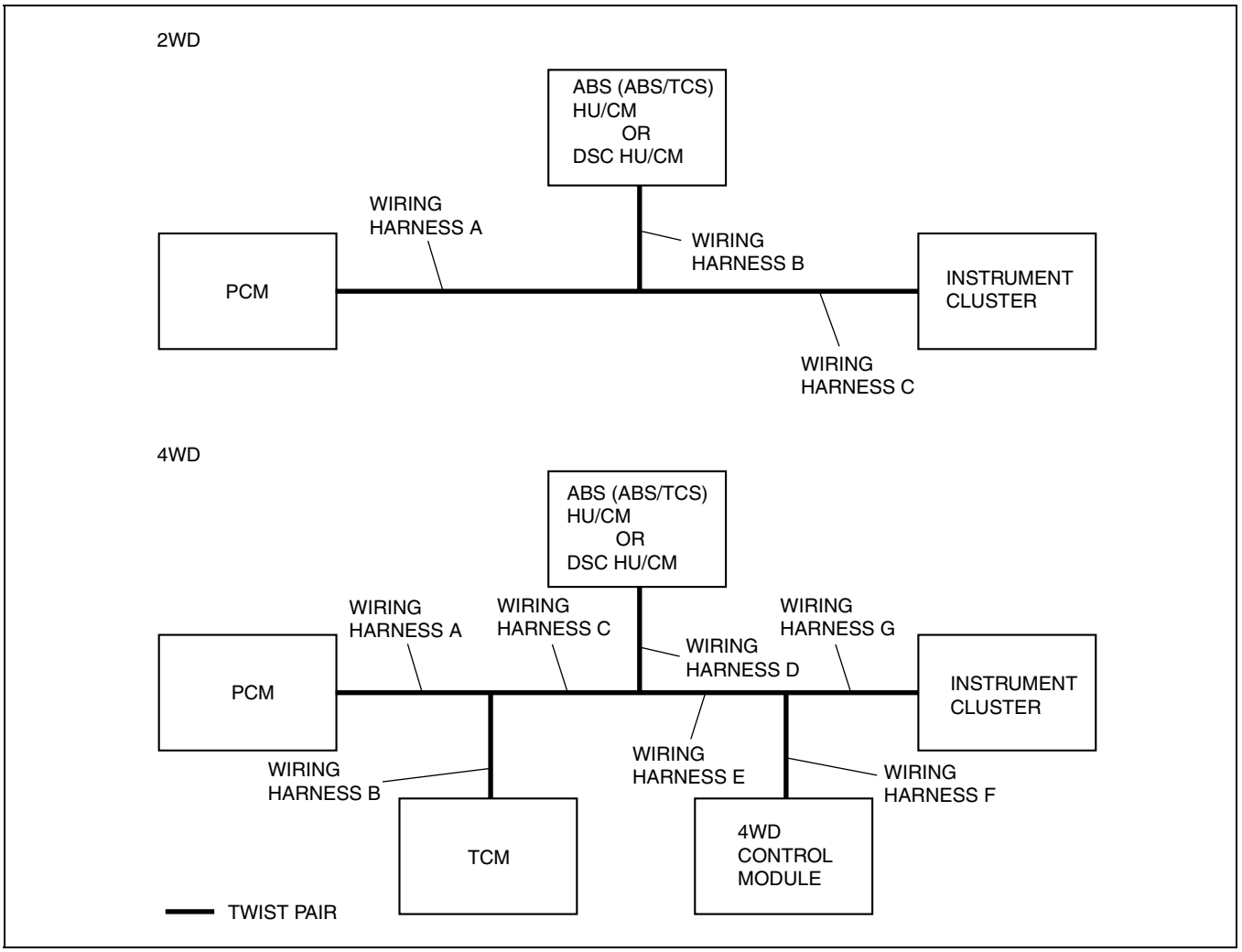
Module	Communication status				Malfunction location
	PCM	TCM	ABS (ABS/TCS) HU/CM DSC HU/CM	4WD control module	
Instrument cluster	—	—	—	—	• Wiring harness G • Instrument cluster
	—	X	X	X	• Wiring harness A • PCM
	X	—	X	X	• Wiring harness B • TCM
	X	X	—	X	• Wiring harness D • ABS (ABS/TCS) HU/CM • DSC HU/CM
	X	X	X	—	• Wiring harness F • 4WD control module
	—	—	X	X	• Wiring harness C
	—	—	—	X	• Wiring harness E

DTC U0073, U1900, U2516

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DTC	**U0073**	**CAN system communication error**
	U1900	
	U2516	**CAN system wiring harness open and short circuit**
DETECTION CONDITION		**Warning** • **Detection conditions are for understanding DTC outline before performing inspection. Performing inspection with only detection conditions may cause injury due to operating error or damage the system. When performing inspection, always follow inspection procedure.** • CAN system related harness malfunction • Related module communication error
POSSIBLE CAUSE		• Open or short circuit in wiring harness • Malfunction of connectors between PCM, TCM, ABS (ABS/TCS) HU/CM or DSC HU/CM, 4WD control module and Instrument cluster • PCM malfunction • TCM malfunction • ABS (ABS/TCS) HU/CM malfunction (with ABS (ABS/TCS)) • DSC HU/CM malfunction (with DSC) • 4WD control module malfunction • Instrument cluster malfunction

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Diagnostic procedure

STEP	INSPECTION		ACTION
1	Is inspected vehicle 2WD?	Yes	Go to next step.
		No	Go to Step 18.
2	**DETERMINING THE LOCATION OF A MALFUNCTION** • Determine the malfunctioning part of the CAN system. (See T–42 PROCEDURES FOR DETERMINING THE LOCATION OF A MALFUNCTION) • Is the malfunctioning part the wiring harness C or the instrument cluster?	Yes	Go to Step 5.
		No	Go to next step.
3	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness B or the ABS (ABS/TCS) HU/CM? (with ABS (ABS/TCS)) • Is the malfunctioning part the wiring harness B or the DSC HU/CM? (with DSC)	Yes	Go to Step 9.
		No	Go to next step.
4	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness A or the PCM?	Yes	Go to Step 13.
		No	Go to next step.

STEP	INSPECTION		ACTION
5	**INSPECT INSTRUMENT CLUSTER CONNECTOR** • Disconnect negative battery cable. • Disconnect instrument cluster connector. • Are poor connection detection bars of instrument cluster connector okay?	Yes	Go to next step.
		No	Replace wiring harness.
6	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 8.
7	**INSPECT WIRING HARNESS BETWEEN DSC HU/CM AND INSTRUMENT CLUSTER** • Disconnect DSC HU/CM connector. • Inspect the following wiring harness between DSC HU/CM and instrument cluster terminals for short to ground, short power supply, and open circuit: — AF—2W (CAN_L) — AG—2X (CAN_H) • Is wiring harness okay?	Yes	Replace instrument cluster, then go to Step 17.
		No	Replace wiring harness.
8	**INSPECT WIRING HARNESS BETWEEN ABS (ABS/TCS) HU/CM AND INSTRUMENT CLUSTER** • Disconnect ABS (ABS/TCS) HU/CM connector. • Inspect the following wiring harness between ABS (ABS/TCS) HU/CM and instrument cluster terminals for short to ground, short power supply, and open circuit: — R—2W (CAN_L) — O—2X (CAN_H) • Is wiring harness okay?	Yes	Replace instrument cluster, then go to Step 17.
		No	Replace wiring harness.
9	**INSPECT ABS (ABS/TCS) HU/CM OR DSC HU/CM CONNECTOR** • Disconnect negative battery cable. • Disconnect ABS (ABS/TCS) HU/CM or DSC HU/CM connector. • Is the connector for the ABS (ABS/TCS) HU/CM or DSC HU/CM connected correctly?	Yes	Go to next step.
		No	Replace wiring harness.
10	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 12.
11	**INSPECT WIRING HARNESS BETWEEN DSC HU/CM AND INSTRUMENT CLUSTER** • Disconnect DSC HU/CM connector. • Inspect the following wiring harness between DSC HU/CM and instrument cluster terminals for short to ground, short power supply, and open circuit: — AF—2W (CAN_L) — AG—2X (CAN_H) • Is wiring harness okay?	Yes	Replace DSC HU/CM, then go to Step 17.
		No	Replace wiring harness.
12	**INSPECT WIRING HARNESS BETWEEN ABS (ABS/TCS) HU/CM AND INSTRUMENT CLUSTER** • Disconnect ABS (ABS/TCS) HU/CM connector. • Inspect the following wiring harness between ABS (ABS/TCS) HU/CM and instrument cluster terminals for short to ground, short power supply, and open circuit: — R—2W (CAN_L) — O—2X (CAN_H) • Is wiring harness okay?	Yes	Replace ABS (ABS/TCS) HU/CM, then go to Step 17.
		No	Replace wiring harness.
13	**INSPECT PCM CONNECTOR** • Disconnect negative battery cable. • Disconnect TCM connector. • Is the connector for the TCM connected correctly?	Yes	Go to next step.
		No	Replace wiring harness.

STEP	INSPECTION		ACTION
14	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 16.
15	**INSPECT WIRING HARNESS BETWEEN PCM AND DSC HU/CM** • Disconnect DSC HU/CM connector. • Inspect the following wiring harness between PCM and DSC HU/CM terminals for short to ground, short power supply, and open circuit: **Except MZR-CD (RF Turbo)** — 2R—AF (CAN_L) — 2U—AG (CAN_H) **MZR-CD (RF Turbo)** — 39—AF (CAN_L) — 13—AG (CAN_H) • Is wiring harness okay?	Yes	Replace PCM, then go to Step 17.
		No	Replace wiring harness.
16	**INSPECT WIRING HARNESS BETWEEN PCM AND ABS (ABS/TCS) HU/CM** • Disconnect ABS (ABS/TCS) HU/CM connector. • Inspect the following wiring harness between PCM and ABS (ABS/TCS) HU/CM terminals for short to ground, short power supply, and open circuit: **Except MZR-CD (RF Turbo)** — 2R—R (CAN_L) — 2U—O (CAN_H) **MZR-CD (RF Turbo)** — 39—R (CAN_L) — 13—O (CAN_H) • Is wiring harness okay?	Yes	Replace PCM, then go to Step 28.
		No	Replace wiring harness.
17	**CHECK DTC INDICATE** • Connect PCM connector. • Connect ABS (ABS/TCS) HU/CM or DSC HU/CM connector. • Connect instrument cluster connector. • Clear DTC from module memory using **SST** (WDS or equivalent). • Perform KOEO/KOER self-test. • Are DTCs U0073, U1900 and/or U2516 indicated?	Yes	Repeat from Step 2.
		No	Troubleshooting completed.
18	**DETERMINING THE LOCATION OF A MALFUNCTION** • Determine the malfunctioning part of the CAN system. (See T–42 PROCEDURES FOR DETERMINING THE LOCATION OF A MALFUNCTION) • Is the malfunctioning part the wiring harness G or the instrument cluster?	Yes	Go to Step 25.
		No	Go to next step.
19	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness F or the 4WD control module?	Yes	Go to Step 27.
		No	Go to next step.
20	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness E?	Yes	Go to Step 29.
		No	Go to next step.
21	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness D or the ABS (ABS/TCS) HU/CM? (with ABS (ABS/TCS)) • Is the malfunctioning part the wiring harness D or the DSC HU/CM? (with DSC)	Yes	Go to Step 32.
		No	Go to next step.

STEP	INSPECTION		ACTION
22	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness C?	Yes	Go to Step 36.
		No	Go to next step.
23	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness B or the TCM?	Yes	Go to Step 39.
		No	Go to next step.
24	**DETERMINING THE LOCATION OF A MALFUNCTION** • Is the malfunctioning part the wiring harness A or the PCM?	Yes	Go to Step 43.
		No	Go to next step.
25	**INSPECT INSTRUMENT CLUSTER CONNECTOR** • Disconnect negative battery cable. • Disconnect instrument cluster connector. • Are poor connection detection bars of instrument cluster connector okay?	Yes	Go to next step.
		No	Replace wiring harness.
26	**INSPECT WIRING HARNESS BETWEEN INSTRUMENT CLUSTER AND 4WD CONTROL MODULE** • Disconnect 4WD control module connector. • Inspect the following wiring harness between 4WD control module and instrument cluster terminals for short to ground, short power supply, and open circuit: — H—2W (CAN_L) — G—2X (CAN_H) • Is wiring harness okay?	Yes	Replace instrument cluster, then go to Step 45.
		No	Replace wiring harness.
27	**INSPECT 4WD CONTROL MODULE CONNECTOR** • Disconnect negative battery cable. • Disconnect 4WD control module connector. • Is the connector for the 4WD control module connected correctly?	Yes	Go to next step.
		No	Replace wiring harness.
28	**INSPECT WIRING HARNESS BETWEEN 4WD CONTROL MODULE AND INSTRUMENT CLUSTER** • Disconnect instrument cluster connector. • Inspect the following wiring harness between 4WD control module and instrument cluster terminals for short to ground, short power supply, and open circuit: — H—2W (CAN_L) — G—2X (CAN_H) • Is wiring harness okay?	Yes	Replace 4WD control module, then go to Step 45.
		No	Replace wiring harness.
29	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 31.
30	**INSPECT WIRING HARNESS BETWEEN DSC HU/CM AND 4WD CONTROL MODULE** • Disconnect DSC HU/CM connector. • Inspect the following wiring harness between DSC HU/CM and 4WD control module terminals for short to ground, short power supply, and open circuit: — AF—H (CAN_L) — AG—G (CAN_H) • Is wiring harness okay?	Yes	Go to Step 45.
		No	Replace wiring harness.

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STEP	INSPECTION		ACTION
31	**INSPECT WIRING HARNESS BETWEEN ABS (ABS/TCS) HU/CM AND 4WD CONTROL MODULE** • Disconnect ABS (ABS/TCS) HU/CM connector. • Inspect the following wiring harness between ABS (ABS/TCS) HU/CM and 4WD control module terminals for short to ground, short power supply, and open circuit: — R—H (CAN_L) — O—G (CAN_H) • Is wiring harness okay?	Yes	Go to Step 45.
		No	Replace wiring harness.
32	**INSPECT ABS (ABS/TCS) HU/CM OR DSC HU/CM CONNECTOR** • Disconnect negative battery cable. • Disconnect ABS (ABS/TCS) HU/CM or DSC HU/CM connector. • Is the connector for the ABS (ABS/TCS) HU/CM or DSC HU/CM connected correctly?	Yes	Go to next step.
		No	Replace wiring harness.
33	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 35.
34	**INSPECT WIRING HARNESS BETWEEN DSC HU/CM AND 4WD CONTROL MODULE** • Disconnect DSC HU/CM connector. • Inspect the following wiring harness between DSC HU/CM and 4WD control module terminals for short to ground, short power supply, and open circuit: — AF—H (CAN_L) — AG—G (CAN_H) • Is wiring harness okay?	Yes	Replace DSC HU/CM, then go to Step 45.
		No	Replace wiring harness.
35	**INSPECT WIRING HARNESS BETWEEN ABS (ABS/TCS) HU/CM AND 4WD CONTROL MODULE** • Disconnect ABS (ABS/TCS) HU/CM connector. • Inspect the following wiring harness between ABS (ABS/TCS) HU/CM and 4WD control module terminals for short to ground, short power supply, and open circuit: — R—H (CAN_L) — O—G (CAN_H) • Is wiring harness okay?	Yes	Replace ABS (ABS/TCS) HU/CM, then go to Step 45.
		No	Replace wiring harness.
36	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 38.
37	**INSPECT WIRING HARNESS BETWEEN TCM AND DSC HU/CM** • Disconnect TCM connector. • Inspect the following wiring harness between TCM and DSC HU/CM terminals for short to ground, short power supply, and open circuit: — 2J—AF (CAN_L) — 2M—AG (CAN_H) • Is wiring harness okay?	Yes	Go to Step 45.
		No	Replace wiring harness.
38	**INSPECT WIRING HARNESS BETWEEN TCM AND ABS (ABS/TCS) HU/CM** • Disconnect TCM connector. • Inspect the following wiring harness between TCM and ABS (ABS/TCS) HU/CM terminals for short to ground, short power supply, and open circuit: — 2J—R (CAN_L) — 2M—O (CAN_H) • Is wiring harness okay?	Yes	Go to Step 45.
		No	Replace wiring harness.

STEP	INSPECTION		ACTION
39	**INSPECT TCM CONNECTOR** • Disconnect negative battery cable. • Disconnect TCM connector. • Is the connector for the TCM connected correctly?	Yes	Go to next step.
		No	Replace wiring harness.
40	• Is vehicle equipped with DSC?	Yes	Go to next step.
		No	Go to step 42.
41	**INSPECT WIRING HARNESS BETWEEN TCM AND DSC HU/CM** • Disconnect DSC HU/CM connector. • Inspect the following wiring harness between TCM and DSC HU/CM terminals for short to ground, short power supply, and open circuit: — 2J—AF (CAN_L) — 2M—AG (CAN_H) • Is wiring harness okay?	Yes	Replace TCM, then go to Step 45.
		No	Replace wiring harness.
42	**INSPECT WIRING HARNESS BETWEEN TCM AND ABS (ABS/TCS) HU/CM** • Disconnect ABS (ABS/TCS) HU/CM connector. • Inspect the following wiring harness between TCM and ABS (ABS/TCS) HU/CM terminals for short to ground, short power supply, and open circuit: — 2J—R (CAN_L) — 2M—O (CAN_H) • Is wiring harness okay?	Yes	Replace TCM, then go to Step 45.
		No	Replace wiring harness.
43	**INSPECT PCM CONNECTOR** • Disconnect negative battery cable. • Disconnect PCM connector. • Is the connector for the PCM connected correctly?	Yes	Go to next step.
		No	Replace wiring harness.
44	**INSPECT WIRING HARNESS BETWEEN TCM AND PCM** • Disconnect TCM connector. • Inspect the following wiring harness between TCM and PCM terminals for short to ground, short power supply, and open circuit: — 2J—2R (CAN_L) — 2M—2U (CAN_H) • Is wiring harness okay?	Yes	Replace PCM, then go to next step.
		No	Replace wiring harness.
45	**CHECK DTC INDICATE** • Connect PCM connector. • Connect TCM connector. • Connect ABS (ABS/TCS) HU/CM or DSC HU/CM connector. • Connect 4WD control module connector. • Connect instrument cluster connector. • Clear DTC from module memory using **SST** (WDS or equivalent). • Perform KOEO/KOER self-test. • Are DTC's U0073, U1900 and/or U2516 indicated?	Yes	Repeat from Step 18.
		No	Troubleshooting completed.

HEATER AND AIR CONDITIONER SYSTEMS

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OUTLINE

OUTLINE OF CONSTRUCTION

A6E850201038201

- The construction and operation of the air conditioner system is essentially carried over from that of the previous Mazda6 (GG) model, except for the following features. (See Mazda6 Training Manual 3359-1*-02C.)

FEATURES

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Improved Comfort

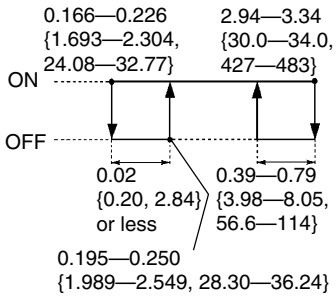
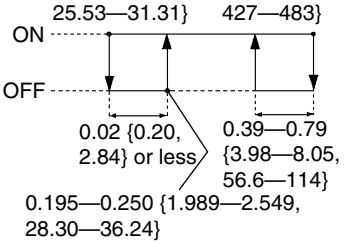
- The water heater system has been adopted. (For MZR-CD (RF Turbo) European (L.H.D.) specs.)

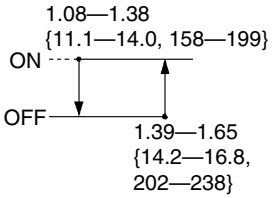
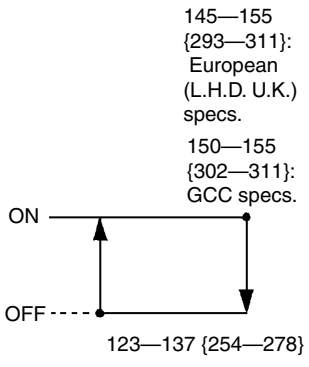
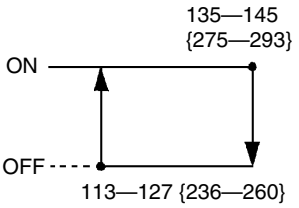
SPECIFICATIONS

A6E850201038203

Manual Air Conditioner

Item			Specification	
			L3, L8, LF	MZR-CD (RF Turbo)
Heating capacity		(kW {kcal/h})	4.400 {3,784}	4.400 {3,784} (L.H.D.) 5.120 {4,403} (R.H.D.)
Airflow volume (during heater operation)	Blower motor	(m^3/h)	310 (L.H.D.) 300 (R.H.D.)	
Electricity consumption (during heater operation)	Blower motor	(W)	184	
Cooling capacity		(kW {kcal/h})	4.200 {3,612}	
Airflow volume (during air conditioner operation)	Blower motor	(m^3/h)	460	
Electricity consumption (during air conditioner operation)	Blower motor	(W)	225	
	Magnetic clutch	(W)	46	45
Fan type	Blower motor		Sirocco fan	
Refrigerant	Type		R-134a	
	Regular amount (approximate quantity)	(g {oz})	470 {16.6} (L.H.D.) 430 {15.2} (R.H.D.)	
A/C compressor	Type		Vane-rotary	
	Discharge capacity	(ml {cc, fl oz})	120 {120, 4.06}	
	Max. allowable speed	(rpm)	6,400	
	Lube oil: Type		ATMOS GU10	
	Lube oil: Sealed volume (approximate quantity)	(ml {cc, fl oz})	120 {120, 4.06}	150 {150, 5.07}
	Magnetic clutch clearance	(mm {in})	0.3—0.5 {0.012—0.019}	
Condenser	Type		Multiflow (sub-cooling type)	
	Radiated heat	(kW {kcal/h})	4.69 {4,030}: European (L.H.D.) specs. 5.96 {5,130}: European (U.K.), GCC specs.	
	Receiver/drier capacity	(ml {cc, fl oz})	190 {190, 6.42}	
	Desiccant		Synthetic zeolite	
Expansion valve	Type		Block type	
Evaporator	Type		Double-tank drawn cup	

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="2">Specification</th></tr>
<tr><th>L3, L8, LF</th><th>MZR-CD (RF Turbo)</th></tr>
<tr><td rowspan="4">Refrigerant pressure switch</td><td>Type</td><td colspan="2">Dual-pressure: General area</td></tr>
<tr><td>Operating pressure
(MPa {kgf/cm^2, psi})</td><td colspan="2"> 
</td></tr>
<tr><td>Type</td><td>Triple-pressure: L3 engine, intensely hot area</td><td rowspan="2">–</td></tr>
<tr><td>Operating pressure
(MPa {kgf/cm^2, psi})</td><td>• HI and LO pressure switch
 

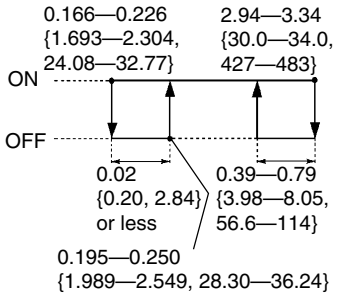
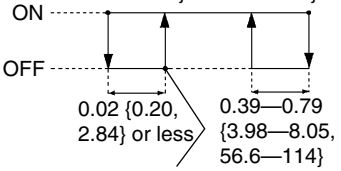
• Middle pressure switch
 
</td></tr>
<tr><td rowspan="2">Thermal protector</td><td>Type</td><td colspan="2">Bimetallic (Indirect sensing type)</td></tr>
<tr><td>Operating temperature
(°C {°F})</td><td> 
</td><td> 
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<tr><td colspan="2">Temperature control</td><td colspan="2">Reheat full air mix type</td></tr>
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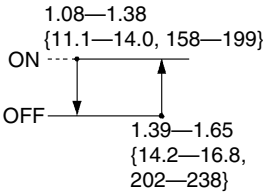
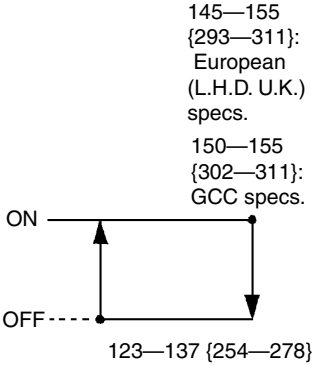
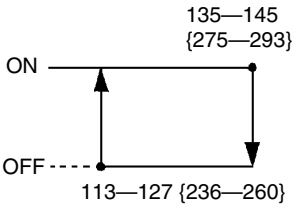
Bold frames: New specification

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Full-auto Air Conditioner

Item			Specification	
			L3, L8, LF	MZR-CD (RF Turbo)
Heating capacity		(kW {kcal/h})	4.400 {3,784}	4.400 {3,784} (L.H.D.) 5.120 {4,403} {R.H.D.)
Airflow volume (during heater operation)	Blower motor	(m^3/h)	310 (L.H.D.) 300 (R.H.D.)	
Electricity consumption (during heater operation)	Blower motor	(W)	184	
Cooling capacity		(kW {kcal/h})	4.200 {3,612}	
Airflow volume (during air conditioner operation)	Blower motor	(m^3/h)	460	
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	Magnetic clutch	(W)	46	45
Fan type	Blower motor		Sirocco fan	
Refrigerant	Type		R-134a	
	Regular amount (approximate quantity)	(g {oz})	470 {16.6} (L.H.D.) 430 {15.2} (R.H.D.)	
A/C compressor	Type		Vane-rotary	
	Discharge capacity	(ml {cc, fl oz})	120 {120, 4.06}	
	Max. allowable speed	(rpm)	6,400	
	Lube oil: Type		ATMOS GU10	
	Lube oil: Sealed volume (approximate quantity)	(ml {cc, fl oz})	120 {120, 4.06}	150 {150, 5.07}
	Magnetic clutch clearance	(mm {in})	0.3—0.5 {0.012—0.019}	
Condenser	Type		Multiflow (sub-cooling type)	
	Radiated heat	(kW {kcal/h})	4.69 {4,030}: European (L.H.D.) specs. 5.96 {5,130}: European (U.K.), GCC specs.	
	Receiver/drier capacity	(ml {cc, fl oz})	190 {190, 6.42}	
	Desiccant		Synthetic zeolite	
Expansion valve	Type		Block type	
Evaporator	Type		Double-tank drawn cup	

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• Middle pressure switch
 
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</td></tr>
<tr><td rowspan="5">Sensor</td><td>Solar radiation sensor</td><td colspan="2">Photodiode</td></tr>
<tr><td>Ambient temperature sensor</td><td colspan="2" rowspan="4">Thermistor</td></tr>
<tr><td>Cabin temperature sensor</td></tr>
<tr><td>Evaporator temperature sensor</td></tr>
<tr><td>Water temperature sensor</td></tr>
<tr><td rowspan="2">Actuator</td><td>Air intake actuator</td><td colspan="2">Sliding contact type</td></tr>
<tr><td>Air mix actuator, airflow mode actuator</td><td colspan="2">Potentiometer type</td></tr>
<tr><td colspan="2">Temperature control</td><td colspan="2">Reheat full air mix type</td></tr>
</table>

Bold frames: New specification

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CONTROL SYSTEM

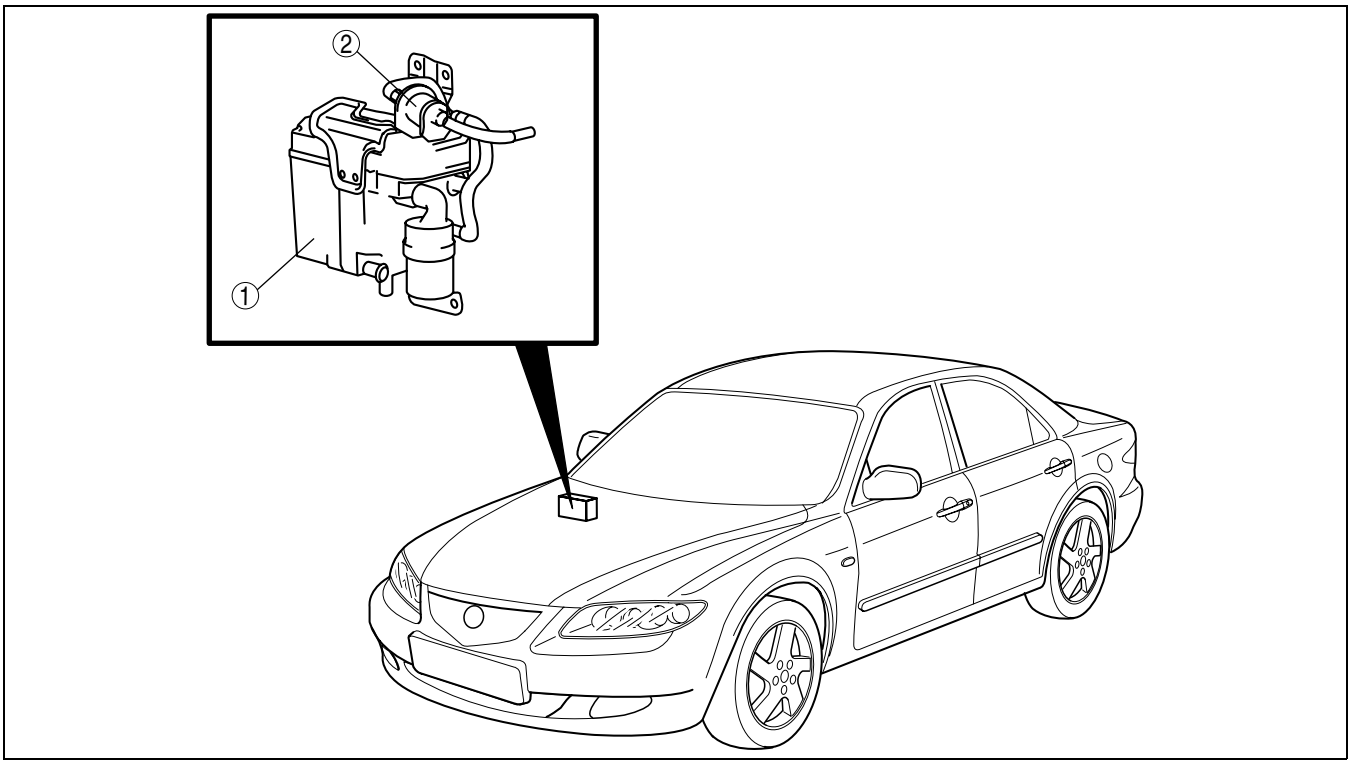
WATER HEATER SYSTEM

A6E854000169201

Outline

- The function, structure and operation of the water heater system is essentially carried over from that of the current MPV (LW) model, except for following:
  — Full/half switching temperature has been changed.

Structural View



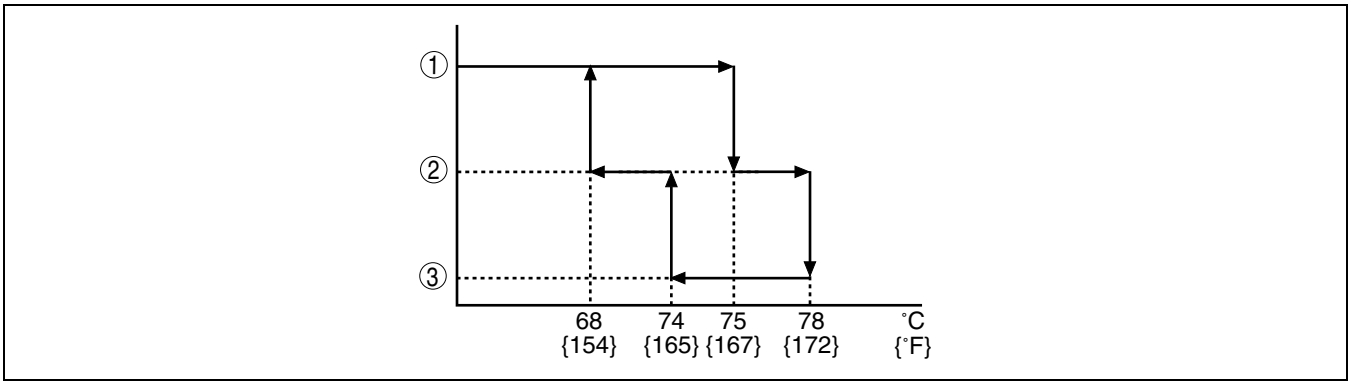
A6E85402002

1	Water heater unit
2	Fuel pump (water heater system)

Operation

Full/half switching

- Depending on the engine coolant temperature, the CPU sets the flame to either full or half strength settings.



A6E85402003

1	Full mode
2	Half mode
3	Idle mode

OUTLINE

SUPPLEMENTAL SERVICE INFORMATION

A6E850201038204

- The following additions have been made for the MZR-CD (RF Turbo) since the publication of the Mazda6 Workshop Manual (1730-1*-02C).

A/C unit
- Removal/installation procedure has been modified.

A/C compressor
- Removal/installation procedure has been modified.

Condenser
- Removal/installation procedure has been modified.

Refrigerant lines
- Removal/installation procedure has been modified.

Water heater unit
- Removal/installation procedure has been added.

Fuel pump (water heater system)
- Inspection procedure has been added.

Climate control unit
- Inspection procedure has been modified.

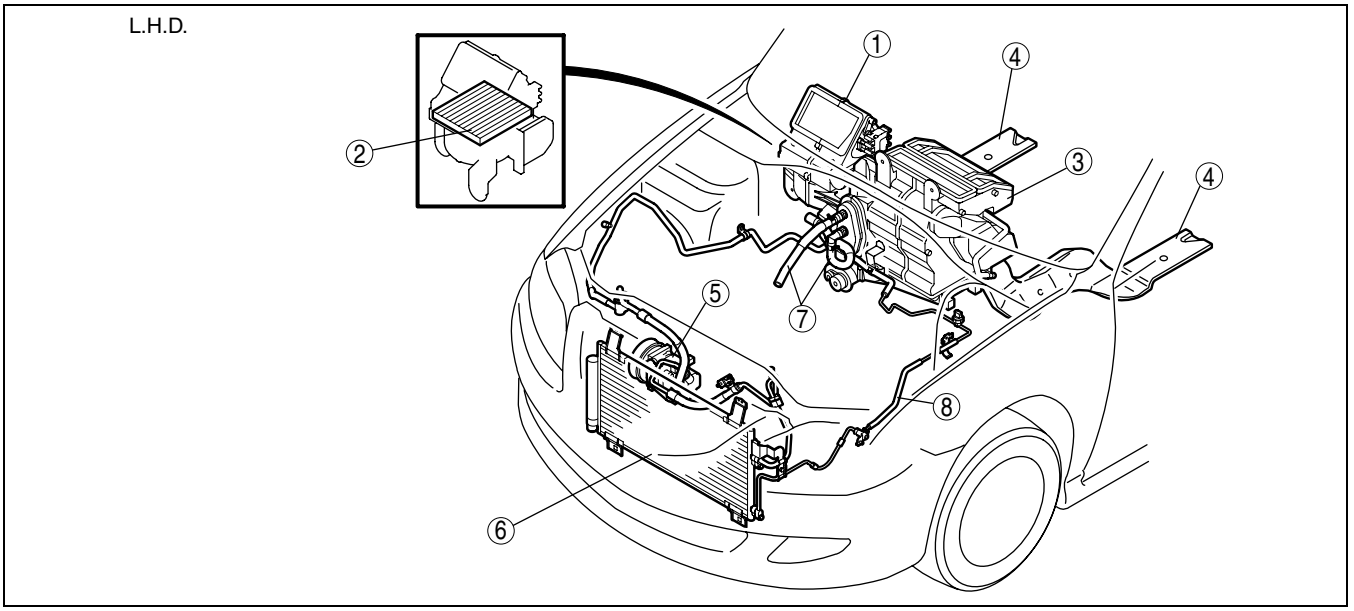
Water heater system
- On-board diagnostic system has been added.

LOCATION INDEX

BASIC SYSTEM

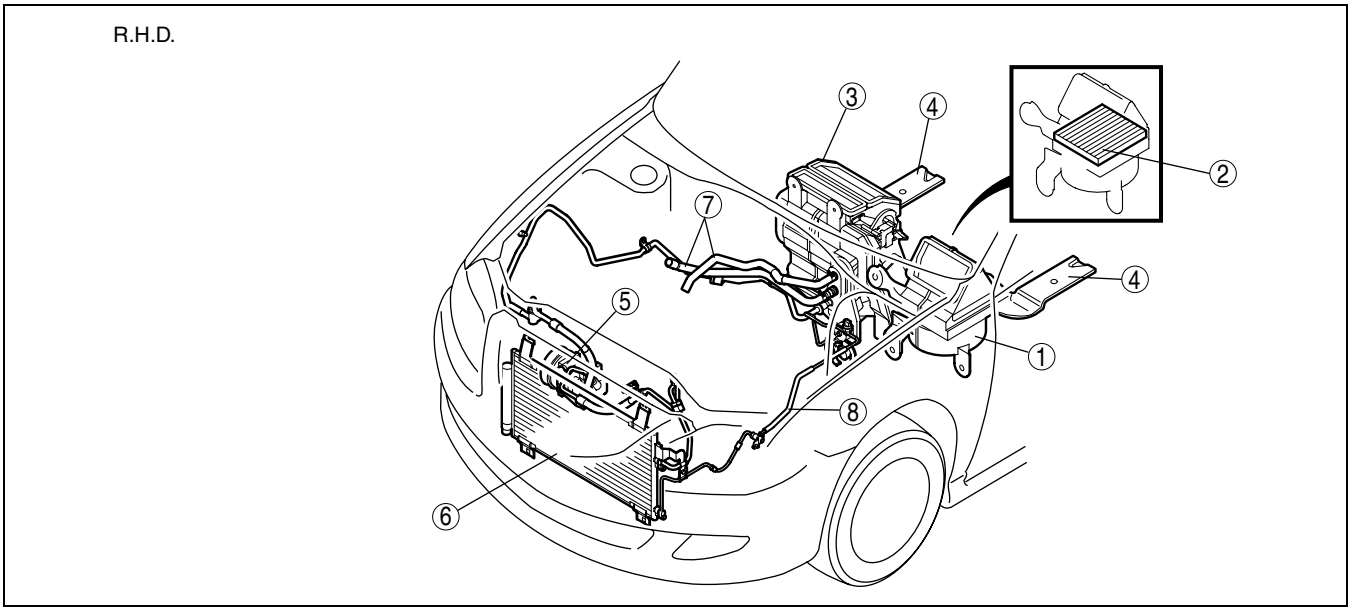
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L.H.D.



A6E85002001

R.H.D.



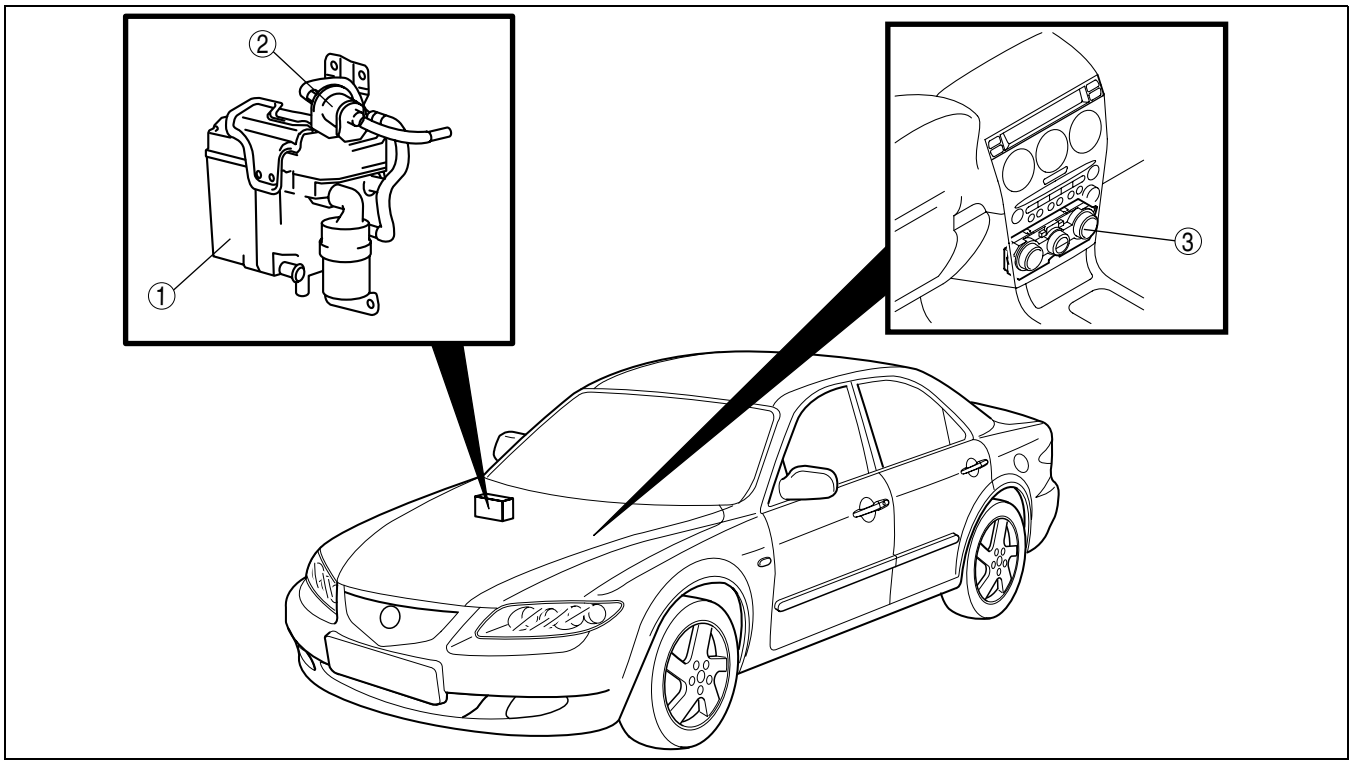
A6E85002002

1	Blower unit
2	Air filter
3	A/C unit (See U–10 A/C UNIT REMOVAL/INSTALLATION)
4	Rear heat duct
5	A/C compressor (See U–11 A/C COMPRESSOR REMOVAL/INSTALLATION)

6	Condenser (See U–12 CONDENSER REMOVAL/INSTALLATION)
7	Heater hose
8	Refrigerant lines (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION)

CONTROL SYSTEM

A6E850001040202



A6E85002003

1	Water heater unit (See U–15 WATER HEATER UNIT REMOVAL/ INSTALLATION)
2	Fuel pump (water heater system) (See U–16 FUEL PUMP (WATER HEATER SYSTEM) INSPECTION)

3	Climate control unit (See U–16 CLIMATE CONTROL UNIT INSPECTION)

BASIC SYSTEM

A/C UNIT REMOVAL/INSTALLATION

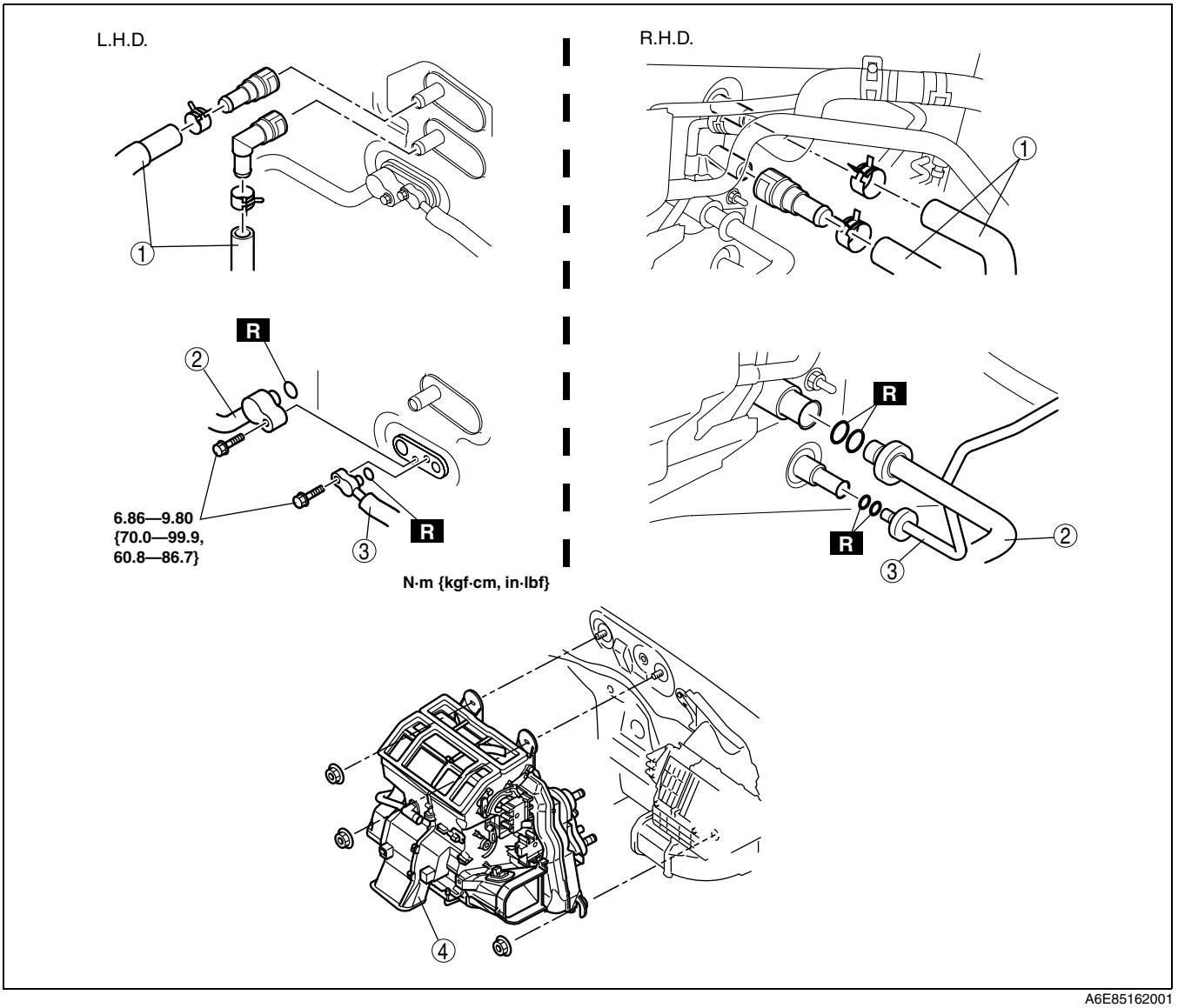
A6E851661130201

1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Drain the engine coolant.
4. Remove the dashboard.
5. Remove the theft-deterrent control module.

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. Do not allow compressor oil to spill.



A6E85162001

1	Heater hose
2	Cooler pipe No.4 (L.H.D.) or cooler pipe No.5 (R.H.D.) (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION) (R.H.D.) (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION)

3	Cooler pipe No.3 (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION) (R.H.D.) (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION)
4	A/C unit (See U–11 A/C Unit Installation Note)

7. Install in the reverse order of removal.
8. Perform the refrigerant system performance test.

A/C Unit Installation Note

1. When installing a new A/C unit or evaporator, add a supplemental amount of ATMOS GU10 compressor oil into the refrigerant cycle.

   Supplemental amount (approximate quantity)
   40 ml {40 cc, 1.4 fl oz}

A/C COMPRESSOR REMOVAL/INSTALLATION

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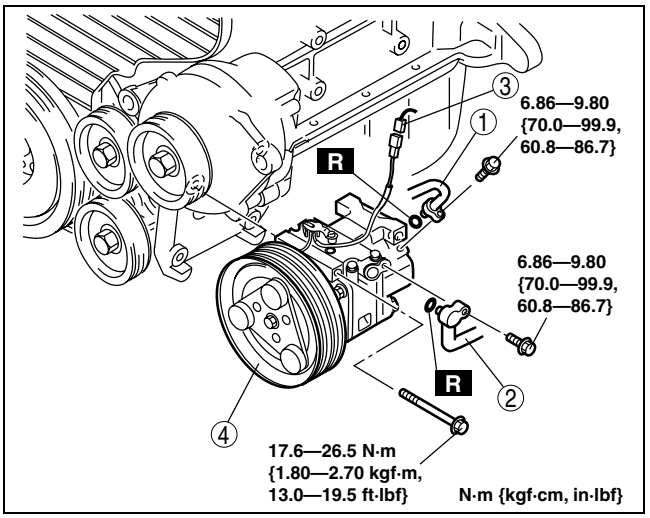
1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Remove the right side splash shield.
4. Loosen the drive belt and remove it.

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.**

5. Remove in the order indicated in the table. Do not allow compressor oil to spill.

1	Cooler hose (HI) (See U–13 REFRIGERANT LINES REMOVAL/ INSTALLATION)
2	Cooler hose (LO) (See U–13 REFRIGERANT LINES REMOVAL/ INSTALLATION)
3	Magnetic clutch connector
4	A/C compressor (See U–11 A/C Compressor Installation Note)



A6E85162005

6. Install in the reverse order of removal.
7. Adjust the drive belt.
8. 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)
   150 ml {150 cc, 5.07 fl oz} – [compressor oil from old A/C compressor + 15 ml {15 cc, 0.5 fl oz}]

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CONDENSER REMOVAL/INSTALLATION

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1. Disconnect the negative battery cable.
2. Discharge the refrigerant from the system.
3. Remove the shroud panel.

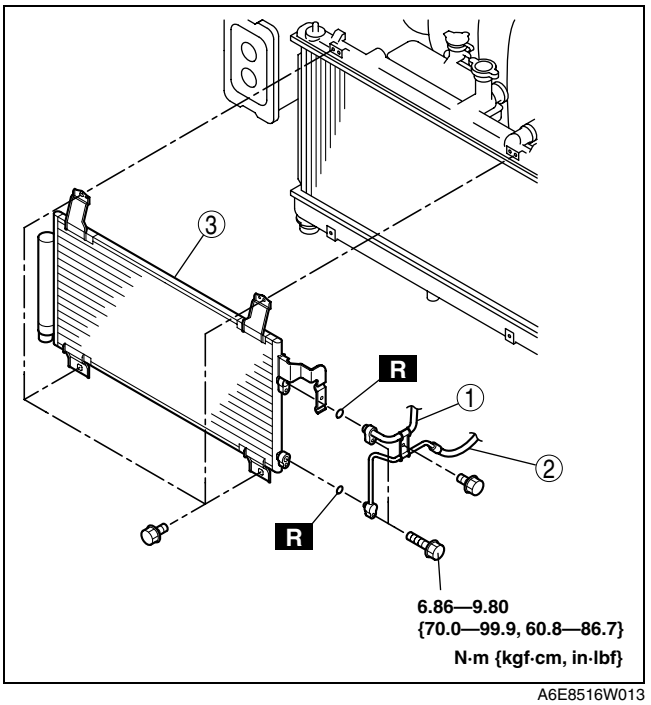
Caution

- **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.**

4. Remove in the order indicated in the table. Do not allow compressor oil to spill.

1	Cooler pipe No.1 (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION) (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION)
2	Cooler pipe No.2 (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION) (See U–13 REFRIGERANT LINES REMOVAL/INSTALLATION)
3	Condenser (See U–12 Condenser Installation Note)

5. Install in the reverse order of removal.
6. Perform the refrigerant system performance test.



A6E8516W013

Condenser Installation Note

1. When installing a new condenser, add a supplemental amount of ATMOS GU10 compressor oil inlet the refrigerant cycle.

Supplemental amount (approximate quantity)
35 ml {35 cc, 1.2 fl oz}

REFRIGERANT LINES REMOVAL/INSTALLATION

A6E851661460201

1. Remove the battery.
2. Discharge the refrigerant from the system.
3. Remove the washer tank.
4. Remove the air cleaner cover, air cleaner element and air cleaner case. (See F2–36 INTAKE-AIR SYSTEM REMOVAL/INSTALLATION.)
5. Remove the sedimentor.
6. Remove the No.3 engine mount.
7. Remove the water heater unit.
8. Remove the shroud panel.
9. Remove the right splash shield.

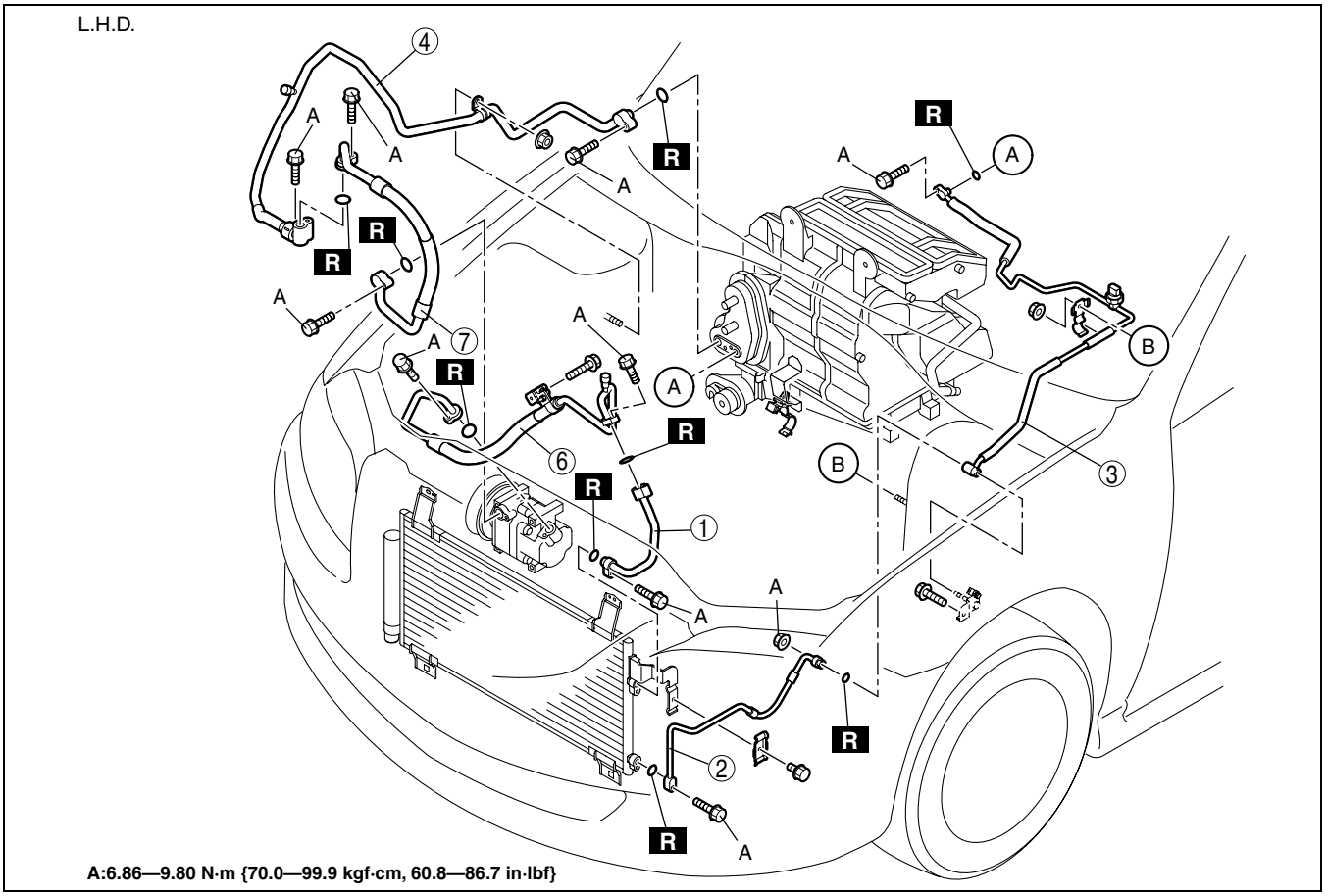
Caution

- **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.**

10. Remove in the order indicated in the table. Do not allow compressor oil to spill.
11. Install in the reverse order of removal.

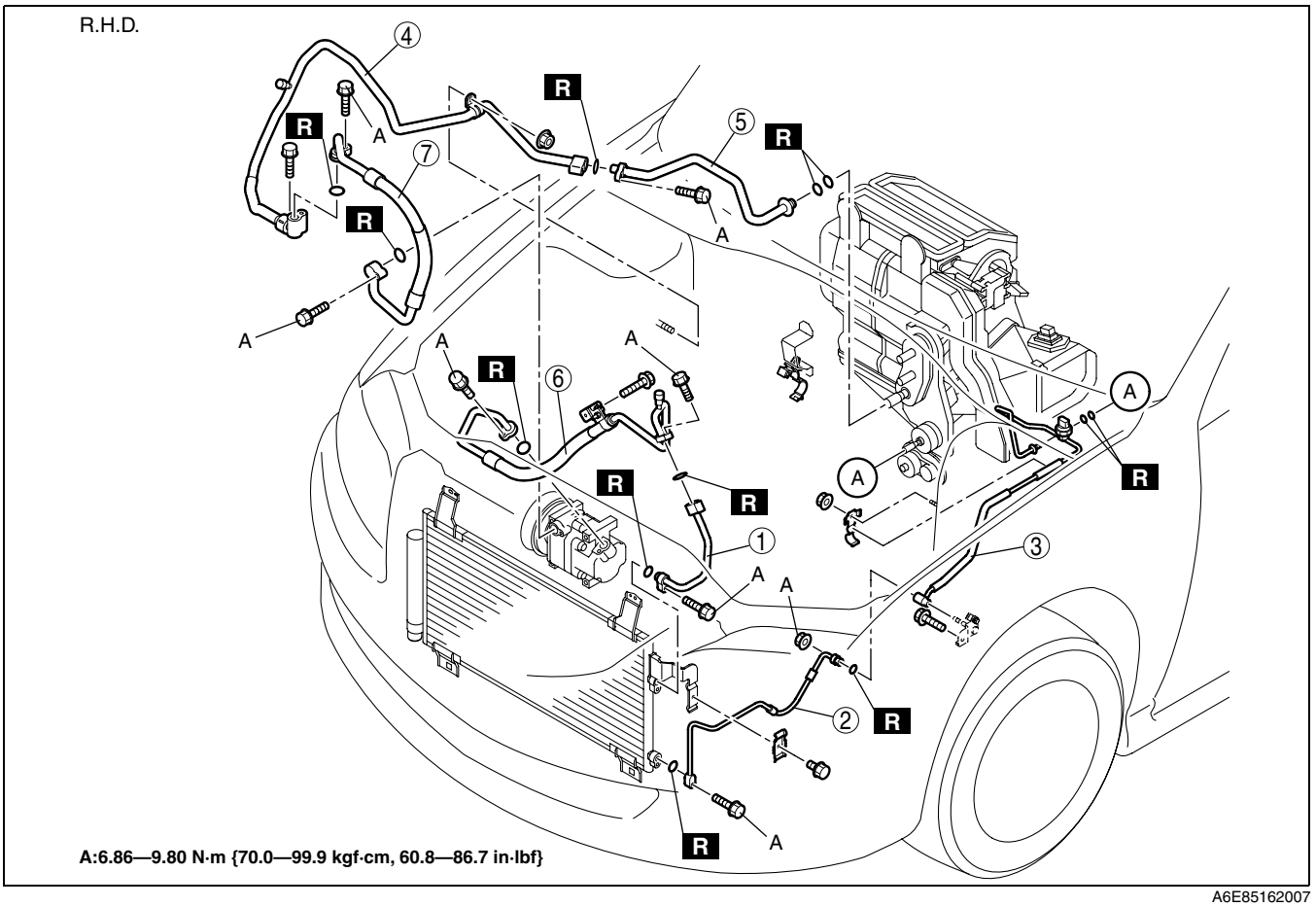
12. Perform the refrigerant system performance test.

L.H.D.



A6E85162006

R.H.D.



A6E85162007

1	Cooler pipe No.1
2	Cooler pipe No.2
3	Cooler pipe No.3
4	Cooler pipe No.4

5	Cooler pipe No.5 (R.H.D. only)
6	Cooler hose (HI)
7	Cooler hose (LO)

CONTROL SYSTEM

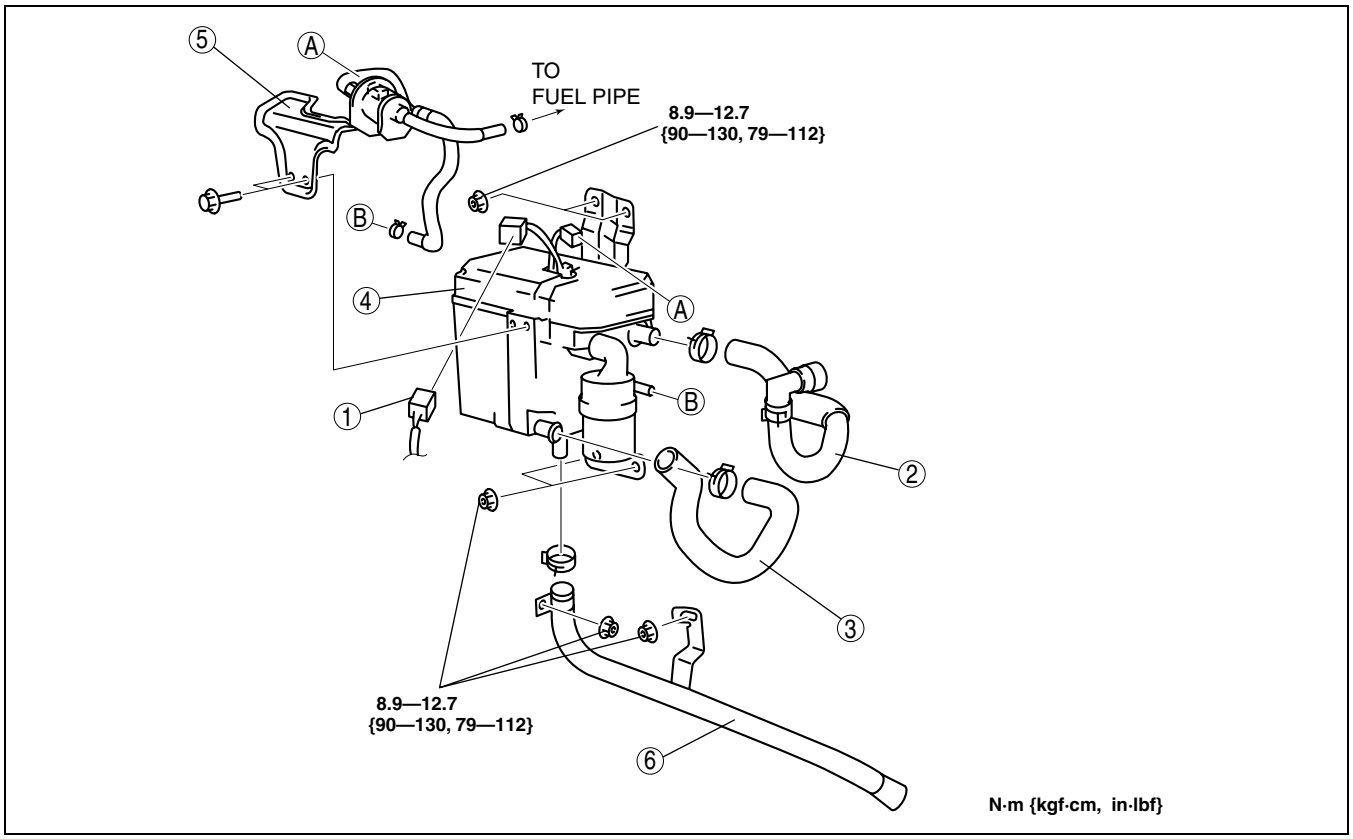
WATER HEATER UNIT REMOVAL/INSTALLATION

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Caution

- **If the negative battery cable is disconnected during the purge cycle of the water heater unit, the gas in the unit may not be properly scavenged, causing white smoke (unburnt gas) to emit from the exhaust pipe. Before disconnecting the negative battery cable, verify that the water heater unit is not operating (no blower fan operation noise).**

1. Complete the “BEFORE REPAIR PROCEDURE”. (See F2–45 BEFORE REPAIR PROCEDURE.)
2. Disconnect the negative battery cable.
3. Drain the engine coolant.
4. Remove the fuel filter with the pipes still connected, and fix the fuel filter using a rope so that it is out of the way.
5. Remove in the order indicated in the table.
6. Install in the reverse order of removal.
7. Complete the “AFTER REPAIR PROCEDURE”. (See F2–45 AFTER REPAIR PROCEDURE.)
8. Refill the engine coolant.



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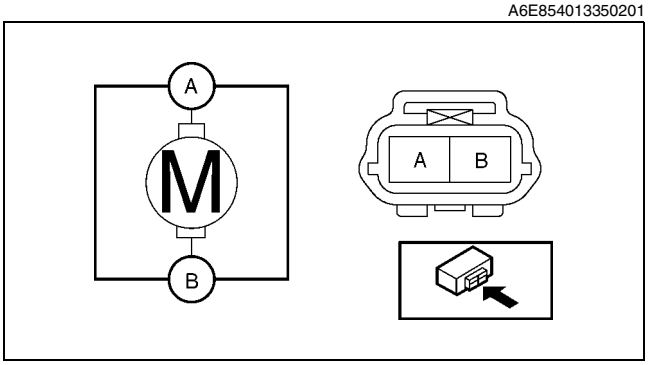
1	Connector
2	Heater hose No.1
3	Heater hose No.3

4	Water heater unit
5	Fuel pump (water heater system)
6	Exhaust pipe

FUEL PUMP (WATER HEATER SYSTEM) INSPECTION

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1. Inspect for continuity between fuel pump terminal A and B using an ohmmeter.
   - If not as specified, replace the fuel pump (water heater system).



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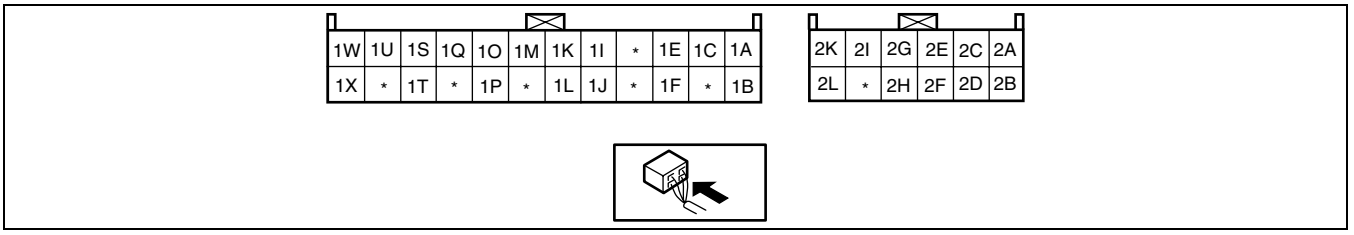
CLIMATE CONTROL UNIT INSPECTION

A6E854061190201

Full-auto Air Conditioner

1. Connect the all center panel connectors.
2. Turn the ignition switch to ON position.
3. Measure the voltage at each climate control unit terminal and refer to the terminal voltage list.
   - If not as specified, inspect the parts listed under “Action” and the related wiring harness.
     — If there is any malfunction, replace the climate control unit.

Terminal Voltage List (Reference)



A6E85402001

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
1A	Blower motor feedback signal	• Blower motor • Power MOS FET	Fan switch is OFF	12	1. Inspect for continuity or short circuit (Climate control unit—blower motor: 1A—B) (Climate control unit—power MOS FET: 1A—B, 1C—E) (Blower motor—blower relay: A—C) (Blower relay—fuse: D—BLOWER 40 A fuse) 2. Inspect for continuity (Power MOS FET—ground: A—GND) (Blower relay—ground: A—GND) 3. Inspect power MOS FET 4. Inspect blower motor 5. Inspect blower relay 6. Inspect BLOWER 40 A fuse 7. Replace power MOS FET
			Fan switch is at manual LO	7.8	
			Fan switch is at manual HI	0.2	

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
1B	+5 V	• Air mix actuator • Airflow mode actuator • Solar radiation sensor	Ignition switch at ON position	5.0	• Inspect for short circuit (Climate control unit— air mix actuator, airflow mode actuator, solar radiation sensor: 1B—B, B, A) • Inspect air mix actuator • Inspect airflow mode actuator • Inspect solar radiation sensor • Inspect terminal voltage of climate control unit connector (2H, 2L)
			Ignition switch at LOCK position	Below 1.0	• Replace climate control unit
1C	Blower motor control signal	Power MOS FET	Fan switch is OFF	Below 1.0	• Inspect terminal voltage of climate control unit (1A)
			Fan switch is at manual LO	4.1	
			Fan switch is at manual HI	7.9	
1D	—	—	—	—	—
1E	Rear window defroster SW signal	Rear window defroster relay	Rear window defroster switch is off	12	• Inspect for continuity or short circuit (Climate control unit—rear window defroster relay: 1E—E) • Inspect rear window defroster relay
			Rear window defroster switch is on	Below 1.0	• Inspect terminal voltage of climate control unit (2H, 2L) • Inspect center panel
1F	On-board diagnostic signal	A/C check connector	Terminal A of A/C check connector is shorted.	Below 1.0	• Inspect for continuity (Climate control unit—A/C check connector: 1F—A)
			Other	5.4	• Inspect short circuit (Climate control unit—A/C check connector: 1F—A) • Inspect terminal voltage of climate control unit (2H, 2L)
1G	—	—	—	—	—
1H	—	—	—	—	—
1I	GND	• Cabin temperature sensor • Evaporator temperature sensor • Ambient temperature sensor • Water temperature sensor • Air mix actuator • Airflow mode actuator	Under any condition	Below 1.0	• Inspect terminal voltage of climate control unit (2L)
1J	Water heater select	Ground	Under any condition	Below 1.0	• Inspect for continuity (Climate control unit—ground: 1J—GND) • Inspect center panel

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Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
1K	Ambient temperature sensor input	Ambient temperature sensor	Depends on temperature surrounding sensor	See Figure 2	• Inspect for continuity (Climate control unit—ambient temperature sensor: 1K—B, 1I—A) • Inspect for short circuit (Climate control unit—ambient temperature sensor: 1K—B) • Inspect ambient temperature sensor • Inspect terminal voltage of climate control unit (2H, 2L)
1L	MZR-CD (RF Turbo) select	Ground	Under any condition	Below 1.0	• Inspect for continuity (Climate control unit—ground: 1L—GND) • Inspect center panel
1M	Cabin temperature sensor input	Cabin temperature sensor	Depends on temperature surrounding sensor	See Figure 3	• Inspect for continuity (Climate control unit— cabin temperature sensor: 1M—B, 1I—A) • Inspect for short circuit (Climate control unit— cabin temperature sensor: 1M—B) • Inspect cabin temperature sensor • Inspect terminal voltage of climate control unit (2H, 2L)
1N	—	—	—	—	—
1O	Water temperature sensor input	Water temperature sensor	Depends on temperature surrounding sensor	See Figure 4	• Inspect for continuity (Climate control unit—water temperature sensor: 1O—A, 1I—B) • Inspect for short circuit (Climate control unit—water temperature sensor: 1O—A) • Inspect water temperature sensor • Inspect terminal voltage of climate control unit (2H, 2L)
1P	A/C	Refrigerant pressure switch	Fan switch at OFF	12	• Inspect for continuity or short circuit (Climate control unit—refrigerant pressure switch: 1P—A) (Refrigerant pressure switch—PCM: B—1AC (except MZR-CD (RF Turbo)), 84 (MZR-CD (RF Turbo))) • Inspect refrigerant pressure switch • Inspect PCM terminal voltage (1AC (except MZR-CD (RF Turbo)), 84 (MZR-CD (RF Turbo))) (See F1–33 PCM INSPECTION (4WD)) (See F2–65 PCM INSPECTION)
			Fan switch at 1st position, A/C switch ON	Below 1.0	• Inspect terminal voltage of climate control unit (2H, 2L)

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
1Q	Evaporator temperature sensor input signal	Evaporator temperature sensor	Depends on temperature surrounding sensor	See Figure 1	• Inspect for continuity (Climate control unit—evaporator temperature sensor: 1Q—B, 1I—A) • Inspect for short circuit (Climate control unit—evaporator temperature sensor: 1Q—B) • Inspect evaporator temperature sensor • Inspect terminal voltage of climate control unit (2H, 2L)
1R	—	—	—	—	—
1S	Solar radiation sensor input	Solar radiation sensor	Incandescent light (**60W**) shining on solar radiation sensor from distance of **approx. 100mm {3.9 in}**	4.0	• Inspect for continuity or short circuit (Climate control unit—solar radiation sensor: 1S—B, 1B—A) • Inspect terminal voltage of climate control unit (1B) • Inspect solar radiation sensor
			Light to solar radiation sensor block	Below 1.0	
1T	GND	Ground	Under any condition	Below 1.0	• Inspect for continuity (Climate control unit—ground: 1T—GND) • Inspect center panel
1U	Potentiometer signal	Air mix actuator	Set temperature at MAX COLD	0.6	• Inspect for continuity or short circuit (Climate control unit—air mix actuator: 1U—C) • Inspect air mix actuator • Inspect terminal voltage of climate control unit (1B)
			Set temperature at MAX HOT	4.3	
1V	—	—	—	—	—
1W	Potentiometer signal	Airflow mode actuator	VENT mode	4.3	• Inspect for continuity or short circuit (Climate control unit—airflow mode actuator: 1W—C) • Inspect airflow mode actuator • Inspect terminal voltage of climate control unit (1B)
			BI-LEVEL mode	3.3	
			HEAT mode	2.3	
			HEAT/DEF mode	1.5	
			DEFROSTER mode	0.6	
1X	Hazard warning SW signal	Hazard warning switch	Hazard warning switch is off	12	• Inspect for continuity or short circuit (Climate control unit—flasher unit: 1X—H) • Inspect flasher unit
			Hazard warning switch is on	Below 1.0	• Inspect terminal voltage of climate control unit (1T) • Inspect center panel
2A	Panel light control signal	Panel light control switch	Headlight switch ON and panel light control switch at max. illumination	0.2	• Inspect for continuity (Climate control unit— panel light control switch: 2A—C) (Panel light control switch—ground: C—GND) • Inspect panel light control switch
			Headlight switch ON and panel light control switch at min. illumination	10.2	• Inspect for short circuit (Climate control unit— panel light control switch: 2A—C)

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
2B	TNS signal	TNS relay	Headlight switch OFF	Below 1.0	• Inspect for short circuit (Climate control unit—TNS relay: 2B—D) • Inspect TNS relay • Inspect headlight switch
			Headlight switch ON	12	• Inspect for continuity or short circuit (Climate control unit—TNS relay: 2B—D) • Inspect TNS relay • Inspect headlight switch
2C	Motor drive signal	Air mix actuator	Moving to COLD	12	• Inspect for continuity or short circuit (Climate control unit—air mix actuator: 2D—D, 2C—F) • Inspect air mix actuator
			Moving to HOT	Below 1.0	
2D	Motor drive signal	Air mix actuator	Moving to HOT	12	• Inspect for continuity or short circuit (Climate control unit—air mix actuator: 2C—F, 2D—D) • Inspect air mix actuator
			Moving to COLD	Below 1.0	
2E	Motor drive signal	Airflow mode actuator	Moving to DEFROSTER	12	• Inspect for continuity or short circuit (Climate control unit—airflow mode actuator: 2E—F, 2G—D) • Inspect airflow mode actuator
			Moving to VENT	Below 1.0	
2F	Backup power supply	ROOM 15 A fuse	Under any condition	B+	• Inspect for continuity or short circuit (Climate control unit—fuse: 2F— ROOM 15 A fuse) • Inspect ROOM 15 A fuse
2G	Motor drive signal	Airflow mode actuator	Moving to VENT	12	• Inspect for continuity or short circuit (Climate control unit—airflow mode actuator: 2G—D, 2E—F) • Inspect airflow mode actuator
			Moving to DEFROSTER	Below 1.0	
2H	IG2	A/C 15 A fuse	Ignition switch at ON position	B+	• Inspect for continuity or short circuit (Climate control unit—fuse: 2H—A/C 15 A fuse) • Inspect A/C 15 A fuse
			Ignition switch at LOCK position	Below 1.0	• Inspect for short circuit (Climate control unit—fuse: 2H—A/C 15 A fuse)
2I	Motor drive signal	Air intake actuator	Moving to RECIRCULATE	12	• Inspect for continuity or short circuit (Climate control unit—air intake actuator: 2I—F, 2K—D) • Inspect air intake actuator
			Moving to FRESH	Below 1.0	
2J	—	—	—	—	—
2K	Motor drive signal	Air intake actuator	Moving to FRESH	12	• Inspect for continuity or short circuit (Climate control unit—air intake actuator: 2K—D, 2I—F) • Inspect air intake actuator
			Moving to RECIRCULATE	Below 1.0	
2L	GND	Ground	Under any condition	Below 1.0	• Inspect for continuity (Climate control unit—ground: 2L—GND)

Figure 1 (Evaporator temperature sensor)

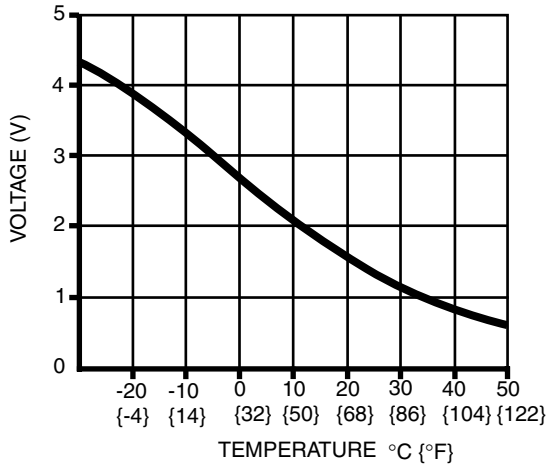


Figure 2 (Ambient temperature sensor)

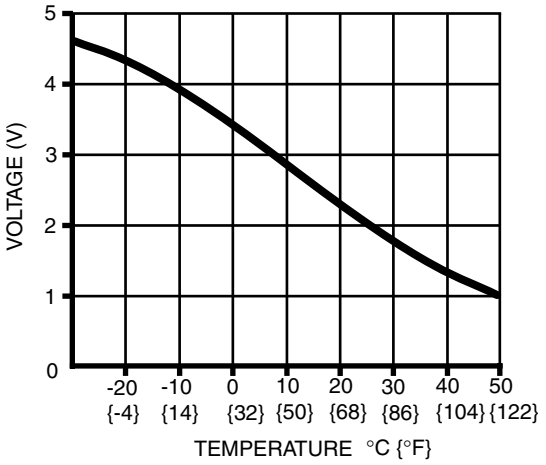


Figure 3 (Cabin temperature sensor)

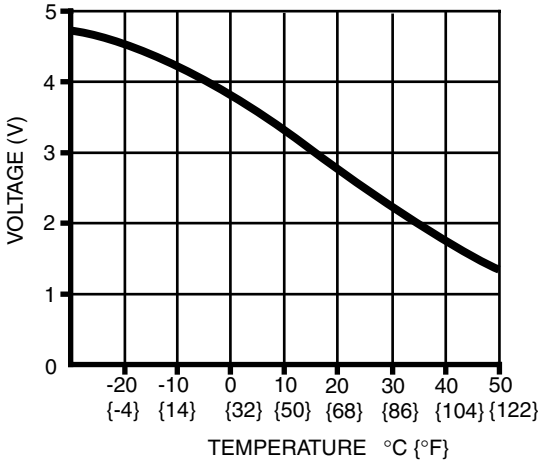
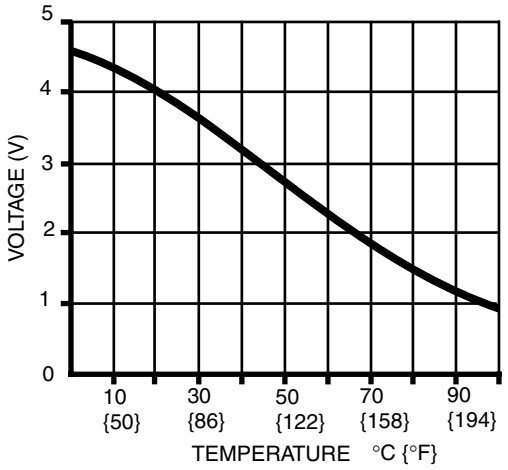


Figure 4 (Water temperature sensor)



U

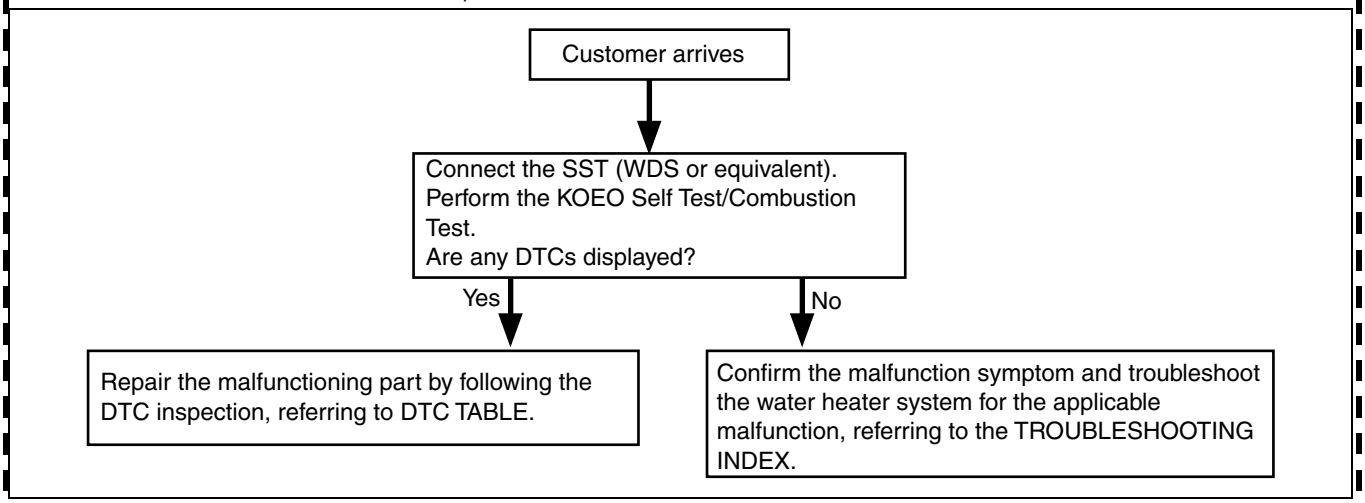
ON-BOARD DIAGNOSTIC

FOREWORD

A6E857001038201

Outline

- When the customer reports a vehicle malfunction, verify the DTC, then diagnose the malfunction according to following flowchart.
  - — If a DTC exists, diagnose according to the applicable DTC inspection (See U–22–2 DTC TABLE.)
  - — If a DTC exists, diagnose according to the applicable symptom troubleshooting (See U–26 TROUBLESHOOTING INDEX.)



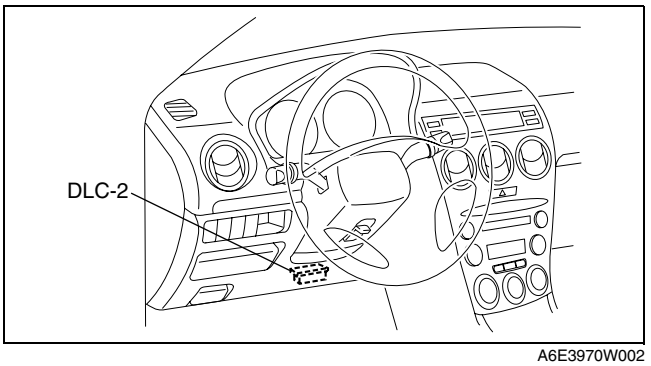
B6E0740TL01

Read/clear diagnostic results

- This function allows you to read or clear DTCs in the water heater unit.

DTCs Reading Procedure

1. Perform the necessary vehicle preparation and visual inspection.
2. Connect **SST** (WDS or equivalent) to the vehicle DLC-2 16-pin connector located as shown in the figure.
3. Retrieve DTCs using WDS or equivalent.



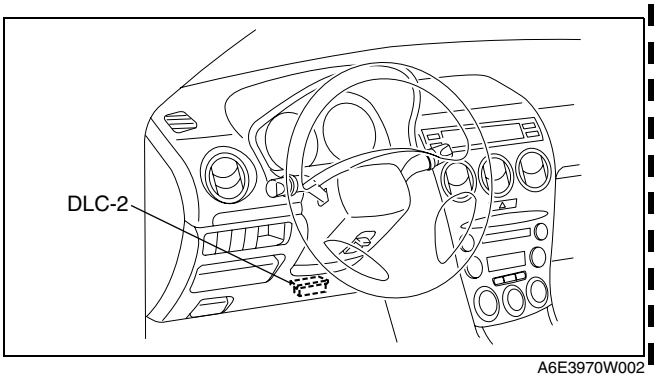
A6E3970W002

KOEO Self Test/Combustion Test

1. Connect the **SST** (WDS or equivalent) to the vehicle DLC-2 16-pin connector located as shown in the figure.
2. Select the “Supplemental Heater Test” in the “Supplemental Heater Menu” of the “Guided Diagnosis” function.
3. Perform the KOEO Self Test/Combustion Test.

Note

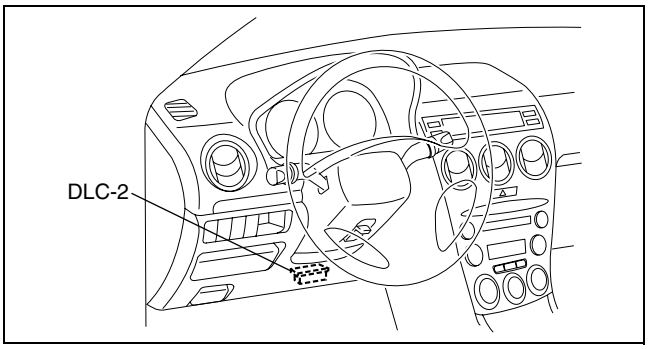
- If the water heater unit is operating, the water heater unit will reject the test command. Perform the DTC reading procedure after the water heater unit stops operating.



A6E3970W002

After Repair Procedure

1. Connect the **SST** (WDS or equivalent) to the vehicle DLC-2 16-pin connector located as shown in the figure.
2. Turn the ignition switch to the ON position.
3. Perform the DTCs reading procedure and record any DTCs that are retrieved.
4. Clear the DTCs using the **SST** (WDS or equivalent).
5. Verify that the customer's concern has been resolved.

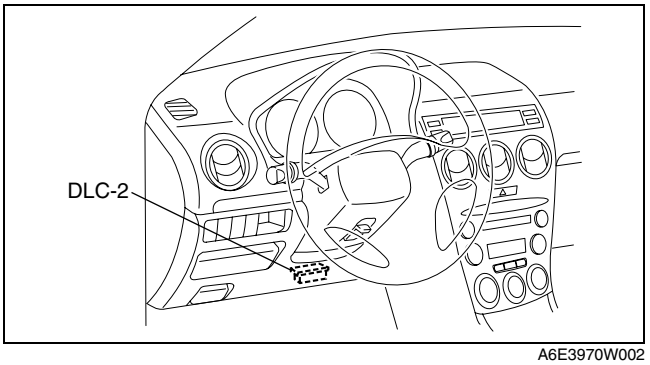


A6E3970W002

Lockout Reset

Using the SST (WDS or equivalent)

1. Connect the **SST** (WDS or equivalent) to the vehicle DLC-2 16-pin connector located as shown in the figure.
2. Select "CLR_LOCKOUT" and "LOCKOUT".
3. Turn "CLR_LOCKOUT" to ON using the simulation function.
4. Verify that the "LOCKOUT" reading changes to "Unlocked".



A6E3970W002

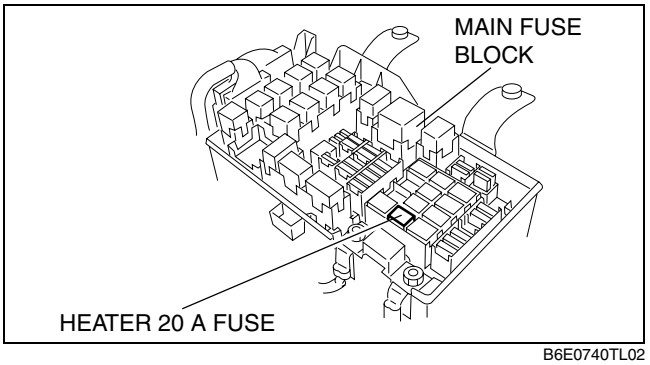
Not using the SST (WDS or equivalent)

For factory equipped water heater unit

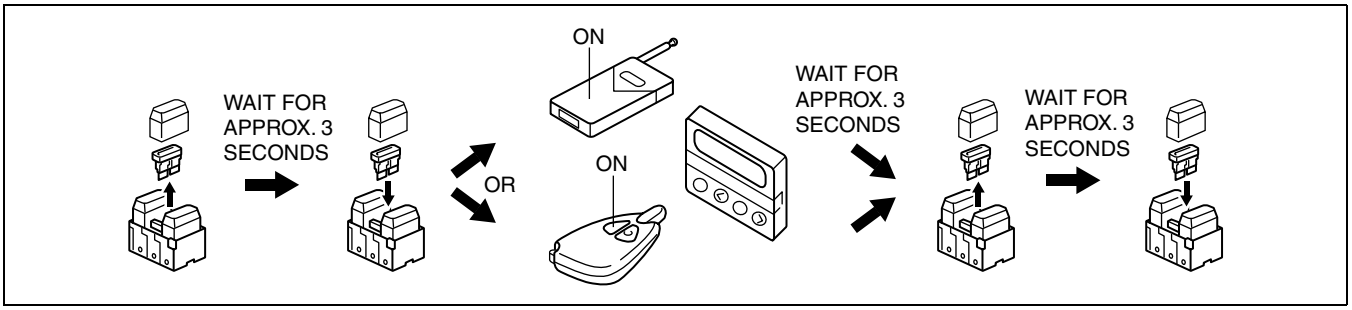
1. Turn the ignition switch to the OFF position.
2. Remove the HEATER 20 A fuse from the main fuse block for **more than 5 seconds**.
3. Re-install the HEATER 20 A fuse.

For vehicles with a transmitter or timer

1. Turn the ignition switch to the OFF position.
2. Remove the power supply 20 A fuse from the heater wiring harness for **approx. 3 seconds**.
3. Re-install the power supply 20 A fuse.
4. Press and hold down the ON switch of the transmitter or timer for **approx. 3 seconds**.
5. Remove the power supply 20 A fuse from the heater wiring harness for **approx. 3 seconds**.
6. Re-install the power supply 20 A fuse.



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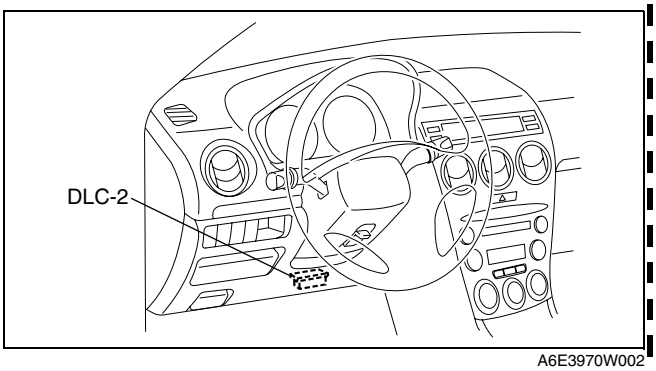


B6E0740TL03

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PID/Data Monitor and Record Procedure

1. Connect **SST** (WDS or equivalent) to the vehicle DLC-2 16-pin connector located as shown in the figure.
2. Access and monitor PIDs by WDS or equivalent.



A6E3970W002

DTC TABLE

A6E857001038202

DTC	Possible cause	Page
B1317	Input voltage high	(See U–22–3 DTC B1317)
B1318	Input voltage low	(See U–23 DTC B1318)
B1342	Malfunction in water heater unit	(See U–23 DTC B1342, B2463, B2537, B2538, B2547)
B2449	Glow plug circuit short to ground	(See U–24 DTC B2449, B2450)
B2450	Glow plug circuit open	(See U–24 DTC B2449, B2450)
B2451	Fuel pump circuit short to ground	(See U–24 DTC B2451, B2452)
B2452	Fuel pump circuit open	(See U–24 DTC B2451, B2452)
B2453	Blower fan circuit short to ground	(See U–25 DTC B2453, B2454)
B2454	Blower fan circuit open	(See U–25 DTC B2453, B2454)
B2463	Overheat	(See U–23 DTC B1342, B2463, B2537, B2538, B2547)
B2537	Water heater system does not start	(See U–23 DTC B1342, B2463, B2537, B2538, B2547)
B2538	Unstable flame	(See U–23 DTC B1342, B2463, B2537, B2538, B2547)
B2547	Flame prior to operation	(See U–23 DTC B1342, B2463, B2537, B2538, B2547)
B2548	Water heater lockout mode	(See U–25 DTC B2548)

* : If a DTC not listed above is detected, there is a water heater malfunction, and the water heater must be replaced.

PID/DATA MONITOR AND RECORD

A6E857001038209

PID Monitoring Item Table

PID Name (Definition)	Unit/ Condition		Condition/Specification (Reference)	Action	Water Heater Unit terminal
CCNTFFH (Number of continuous codes)	—		• DTC is detected: 1—255 • DTC is not detected: 0	Perform inspection using appropriate DTC.	—
ECT (Engine coolant temperature)	°C	°F	• ECT 20 °C {68 °F}: 20 °C {68 °F} • ECT 60 °C {140 °F}: 60 °C {140 °F}	—	—
VPWR_FFH (Module supply voltage)	V		• Ignition switch ON: B+	Inspect water heater unit power supply terminal.	A
VPWR_LMT (Low voltage threshold)	V		• Ignition switch ON: approx. 9.5 V	Inspect water heater unit power supply terminal.	A
FAN (Fan control)	%		• Blower fan is not operating: 0 % • Blower fan is operating: 0—100 %	—	—
GPD (Glow plug duty cycle)	%		• Water heater unit is not operating: 0 % • Water heater unit is operating: 0—100 %	—	—
BLOWRMTR (Blower motor)	On/Off		• Blower fan is not operating: Off • Blower fan is operating: On	—	—

PID Name (Definition)	Unit/ Condition	Condition/Specification (Reference)	Action	Water Heater Unit terminal
FP (Fuel pump)	On/Off	• Water heater unit is not operating: Off • Water heater unit is operating: On	—	—
WATER_PMP (Water pump)	On/Off	• Water heater unit is not operating: Off • Water heater unit is operating: On	—	—
GLOW PLUG (Glow plugs)	On/Off	• Water heater unit is not operating: Off • Water heater unit is operating: On	—	—
COMB_FAN (Combustion air fan)	On/Off	• Water heater unit is not operating: Off • Water heater unit is operating: On	—	—
LOCKOUT (Heater lockout)	Lock/ Unlock	• Water heater unit is not operating: Lock • Water heater unit is operating: Unlock	—	—
FS (Flame sensor)	On/Off	• Water heater unit is not operating: Off • Water heater unit is operating: On	—	—
HEATER (Heater status)	Inactive/ Active	• Water heater unit is not operating: Inactive • Water heater unit is operating: Active	—	—
HEATER_SW (Heater activation switch)	Inactive/ Active	• Water heater unit is not operating: Inactive • Water heater unit is operating: Active	—	—

Simulation Test Item Table

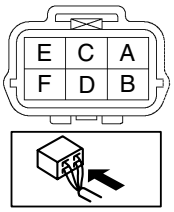
Item	Definition	Operation	Water Heater Unit terminal
CLR_LOCKOUT	Heater lockout mode clearing command	On/—	—
FUEL_PRIME	Fuel pump priming command (The fuel pump is activated for **5 seconds**.)	On/—	—

DTC B1317

A6E857001038203

DTC B1317	Input voltage high
DETECTION CONDITION	• Voltage detected at water heater unit terminals A is **more than 16 V**.
POSSIBLE CAUSE	• Short to power circuit between the generator and PCM • Generator malfunction • Battery malfunction

WATER HEATER UNIT CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT BATTERY VOLTAGE** • Measure the battery voltage. • Is the voltage **less than 16 V**?	Yes	Go to the next step.
		No	Inspect the charging system.
2	**INSPECT WATER HEATER UNIT** • Clear the DTC. • Perform the KOEO Self Test. (See U–22 KOEO Self Test/Combustion Test.) • Is the same DTC present?	Yes	Replace the water heater unit. (See U–15 WATER HEATER UNIT REMOVAL/ INSTALLATION)
		No	Go to the next step.
3	**VERIFY AFTER REPAIR PROCEDURE** • Perform the after repair procedure. (See U–22–1 After Repair Procedure.) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting.
		No	Troubleshooting completed.

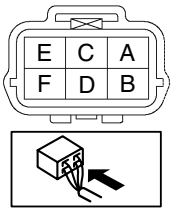
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DTC B1318

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DTC B1318	Input voltage low
DETECTION CONDITION	• Voltage detected at water heater unit terminals A is **less than 9 V**.
POSSIBLE CAUSE	• Generator malfunction • Battery malfunction

WATER HEATER UNIT CONNECTOR



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT BATTERY VOLTAGE** • Measure the battery voltage. • Is the voltage **more than 9 V**?	Yes	Go to the next step.
		No	The battery is weak. • Inspect the charging system.
2	**INSPECT WIRING HARNESS BETWEEN W.HEAT 40 A FUSE AND WATER HEATER UNIT** • Turn the ignition switch to the ON position. • Measure the voltage at water heater unit connector terminal A. • Is the voltage **more than 9 V**?	Yes	Go to the next step.
		No	Repair the wiring harness.
3	**INSPECT WATER HEATER UNIT** • Clear the DTC. • Perform the KOEO Self Test. (See U–22 KOEO Self Test/Combustion Test.) • Is the same DTC present?	Yes	Replace the water heater unit. (See U–15 WATER HEATER UNIT REMOVAL/ INSTALLATION)
		No	Go to the next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Perform the after repair procedure. (See U–22–1 After Repair Procedure.) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting.
		No	Troubleshooting completed.

DTC B1342, B2463, B2537, B2538, B2547

A6E857001038205

DTC	B1342	Malfunction in water heater unit
	B2463	Overheat
	B2537	Water heater system does not start
	B2538	Unstable flame
	B2547	Flame prior to operation
DETECTION CONDITION		• CPU detects malfunction in water heater unit
POSSIBLE CAUSE		• Water heater unit malfunction — CPU malfunction — Glow plug malfunction — Flame detection sensor malfunction

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT WATER HEATER UNIT** • Replace the water heater unit. (See U–15 WATER HEATER UNIT REMOVAL/ INSTALLATION) • Perform the Combustion Test. (See U–22 KOEO Self Test/Combustion Test.) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting.
		No	Troubleshooting completed.

DTC B2449, B2450

A6E857001038206

DTC	B2449	**Glow plug circuit short to ground**
	B2450	**Glow plug circuit open**
DETECTION CONDITION		• CPU detects malfunction in glow plug circuit
POSSIBLE CAUSE		• Water heater unit malfunction

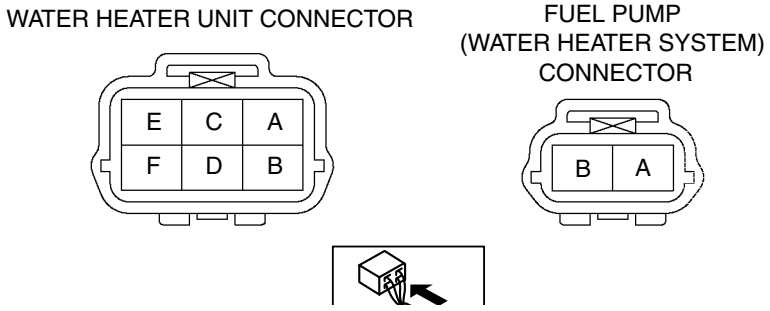
Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT WATER HEATER UNIT** • Replace the water heater unit. (See U–15 WATER HEATER UNIT REMOVAL/ INSTALLATION) • Perform the combustion Test. (See U–22 KOEO Self Test/Combustion Test.) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting.
		No	Troubleshooting completed.

DTC B2451, B2452

A6E857001038207

DTC	B2451	**Fuel pump (water heater system) circuit short to ground**
	B2452	**Fuel pump (water heater system) circuit open**
DETECTION CONDITION		• CPU detects malfunction in fuel pump (water heater system) circuit
POSSIBLE CAUSE		• Fuel pump (water heater system) malfunction • Water heater unit malfunction • Short to ground between water heater unit terminal B and fuel pump (water heater system) terminal A • Open circuit between water heater unit terminal B and fuel pump (water heater system) terminal A • Open circuit between fuel pump (water heater system) terminal B and GND



Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT WIRING HARNESS BETWEEN WATER HEATER UNIT AND FUEL PUMP (WATER HEATER SYSTEM) FOR CONTINUITY** • Start the engine. • Is the voltage at fuel pump (water heater system) connector terminal A **approximately 12 V**?	Yes	Go to the next step
		No	Repair the wiring harness.
2	**INSPECT FUEL PUMP (WATER HEATER SYSTEM)** • Inspect the fuel pump (water heater system). (See U–16 FUEL PUMP (WATER HEATER SYSTEM) INSPECTION) • Is the fuel pump (water heater system) okay?	Yes	Go to the next step
		No	Replace the fuel pump (water heater system). (See U–15 WATER HEATER UNIT REMOVAL/ INSTALLATION)
3	**INSPECT WIRING HARNESS BETWEEN FUEL PUMP (WATER HEATER SYSTEM) AND GROUND FOR CONTINUITY** • Is there continuity between the fuel pump (water heater system) connector terminal B and ground?	Yes	Go to the next step
		No	Repair the wiring harness.

STEP	INSPECTION		ACTION
4	**INSPECT WATER HEATER UNIT** • Clear the DTC. • Perform the KOEO Self Test. (See U–22 KOEO Self Test/Combustion Test.) • Is the same DTC present?	Yes	Replace the water heater unit. (See U–15 WATER HEATER UNIT REMOVAL/INSTALLATION)
		No	Go to the next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Perform after repair procedure. (See U–22–1 After Repair Procedure.) • Are any DTCs present?	Yes	Go to the applicable DTC troubleshooting.
		No	Troubleshooting completed.

DTC B2453, B2454

A6E857001038208

DTC	B2453	Blower fan circuit short to ground
	B2454	Blower fan circuit open
DETECTION CONDITION		• CPU detects Malfunction in blower fan circuit
POSSIBLE CAUSE		• Water heater unit malfunction

Diagnostic procedure

ACTION
• Replace the water heater unit. (See U–15 WATER HEATER UNIT REMOVAL/INSTALLATION)

DTC B2548

A6E857001038210

DTC	B2548	Water heater lockout mode
DETECTION CONDITION		• This DTC is stored if the water heater unit detects the same DTC three times and the water heater unit then suspends system operation for safety reasons.
POSSIBLE CAUSE		• Water heater unit malfunction • Fuel pump (water heater system) malfunction • Generator malfunction • Battery malfunction • Open or short circuit in related harness

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT WATER HEATER UNIT** • Perform the lockout reset. (See U–22–1 Lockout Reset.) • Read DTCs using the **SST** (WDS or equivalent) • Are any DTCs present?	Yes	Go to applicable DTC troubleshooting.
		No	Troubleshooting completed.

U

TROUBLESHOOTING

FOREWORD

A6E858001038201

- Confirm the symptom using the following troubleshooting index and carry out the appropriate action.

TROUBLESHOOTING INDEX

A6E858001038202

No.	TROUBLESHOOTING ITEM	ACTION
1	Fuel odor	• Inspect the water heater system in the vehicle fuel system. • Inspect the fuel line for leakage, kinks, or blockage. • If normal, there is an internal water heater leak. — Replace the water heater unit.
2	The heater does not achieve full load operation	• Replace the water heater unit.
3	Continuous white smoke during combustion operation	• Replace the water heater unit.
4	Loss of coolant (leakage). Heater develops smoke during combustion operation; smell of exhaust fumes extremely sweet	• Inspect the coolant hose for leakage, kinks, looseness, and loose hose clamps. • If normal, there is an internal water heater leak. — Replace the water heater unit.
5	Loss of fuel (leakage)	• Inspect the water heater system integration in the vehicle's fuel system. • Inspect the fuel line connections for leakage. • If normal, there is an internal water heater leak. — Replace the water heater unit.
6	The water heater unit does not communicate with the SST (WDS or equivalent)	• Refer to section T, ON-BOARD DIAGNOSTIC [MULTIPLEX COMMUNICATION SYSTEM].

TECHNICAL DATA

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LUBRICATION SYSTEM TD-2
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TECHNICAL DATA

ENGINE

A6E931001001201

Item			Specification Diesel engine MZR-CD (RF Turbo)
MECHANICAL			
Valve clearance [engine cold]	(mm {in})	IN	0.12—0.18 {0.005—0.007} (0.15±0.03 {0.006±0.0011})
		EX	0.32—0.38 {0.013—0.014} (0.35±0.03 {0.014±0.0011})
Compression pressure	(kPa {kgf/cm^2, psi}) [rpm]	Standard	3,500 {35.7, 507.7} [250]
		Minimum	3,100 {31.6, 449.4} [250]
		Maximum difference between cylinders	196.1 {1.999, 28.44}
Cylinder head bolt length	(mm {in})	Standard	159.7—160.3 {6.288—6.311}
		Maximum	161.0 {6.338}
Pushing distance of the front oil seal (from the edge of the oil pump body)	(mm {in})		0—0.5 {0—0.019}
Pushing distance of the rear oil seal (from the edge of the rear cover)	(mm {in})		0—0.5 {0—0.019}
Pushing distance of the camshaft oil seal (from the edge of the cylinder head)	(mm {in})		0.5—1.5 {0.020—0.059}
Timing belt auto tensioner rod projection (free length)	(mm {in})		12.9—14.6 {0.508—0.574}

LUBRICATION SYSTEM

A6E931001001202

Item		Specification Diesel engine MZR-CD (RF Turbo)
Oil pressure (approximate quantity) [oil temperature: 100°C {212°F}]	(kPa {kgf/cm^2, psi}) min [rpm]	147 {1.5, 21} [1,000], 343 {3.5, 50} [3,000]
Oil capacity (approximate quantity)	Total (dry engine) (L {US qt, Imp qt})	5.5 {5.8, 4.8}
	Oil replacement (L {US qt, Imp qt})	4.8 {5.1, 4.2}
	Oil and oil filter replacement (L {US qt, Imp qt})	5.0 {5.3, 4.4}

Recommended engine oil

Note
- The maintenance intervals on scheduled maintenance table (See GI–8 SCHEDULED MAINTENANCE TABLE) can only be supported with the use of following oils.

Item			Specification		
			Diesel engine		
			MZR-CD (RF Turbo)		
Engine oil	Grade	API	CF		CD, CE, CF-4
		ACEA	B1 or B3	B3	B3 or B4
	Viscosity (SAE)		5W-30	10W-40	5W-30, 10W-30
	Remarks		**Mazda genuine Dexelia oil e.g.**		—

COOLING SYSTEM

A6E931001001203

Item			Specification
			Diesel engine
			MZR-CD (RF Turbo)
Coolant capacity		(L {US qt, Imp qt})	9.0 {9.5, 7.9}
Radiator cap	Cap valve opening pressure	(kPa {kgf/cm^2, psi})	94—122 {0.96—1.24, 13.7—17.6}
Thermostat	Type		Wax, bottom-bypass
	Initial-opening temperature	(°C {°F})	80—84 {176—183}
	Full-opening temperature	(°C {°F})	95 {203}
	Full-open lift	(mm {in})	More than 8.5 {0.33}
Cooling fan	Motor	Current (A)	4.4—7.4 (Cooling fan motor No.1) 6.3—9.3 (Cooling fan motor No.2)

FUEL AND EMISSION CONTROL SYSTEM

A6E931001001204

Item		Engine
		L3 (4WD)
Idle speed*1	(rpm)	650—750 (700±50)

*1 : Excludes temporary idle speed drop just after the electrical loads are turned on.

Item			Engine
			MZR-CD (RF Turbo)
Idle speed		(rpm)	725—825 (775±50)
Idle-up speed	(rpm)	When A/C is operated	725—825 (775±50)
Boost relief pressure		(kPa {mmHg, inHg})	Approx. –14.5 {–108, –4.27}

TD

ENGINE ELECTRICAL SYSTEM

A6E931001001205

Item					Specification
					Diesel engine
					MZR-CD (RF Turbo)
Battery	Electrolyte gravity				1.27—1.29
	Back-up current*1 (mA)				Max.20
	Type				95D31L, 115D31L *3
	Test load chart (A)	Battery type	95D31L (64)		250
			115D31L (70) *3		320
	Slow-charge (A)	Battery type (5-hour rate)	95D31L (64)		6.5—8.0
			115D31L (70) *3		7.0—8.5
	Quick-charge (A/30 min)	Battery type (5-hour rate)	95D31L (64)		40
			115D31L (70) *3		45
Generator	Standard voltage (V)	Ignition switch ON	Terminal	B	B+
				L	Approx. 1
				S	B+
		Idle [20°C {68°F}]	Terminal	B	14.1—14.7
				L	
				S	
	Generated current* 2 (reference) (A)	Engine speed (rpm)		1,000	0—80
				2,000	0—90
Starter	No load test	Voltage (V)			11
		Current (A)			Below 130

*1 : Back-up current is the constant flow of current present (for the audio unit, clock, PCM, etc.) when the engine switch is off and with the key removed.
*2 : Must not be 0 A.
*3 : Cold area

CLUTCH

A6E931001024201

Item				Specification
Clutch cover	Diaphragm spring fingers	Depth	mm {in}	0.6 {0.024}
		Misalignment	mm {in}	0.6 {0.024}
	Maximum clearance of flatness of the pressure plate		mm {in}	0.3 {0.012}
Flywheel	Run out limit		mm {in}	0.3 {0.012}

MANUAL TRANSAXLE

A6E931001024202

Item		Specification
Manual transaxle type		A65M-R
Transaxle control		Floor-shift
Operation system		Cable
Shift assist		Synchromesh
Gear ratio	1st	3.416
	2nd	1.944
	3rd	1.258
	4th	0.902
	5th	0.659
	Reverse	3.252
Final gear ratio		3.588
Transaxle oil	Grade	API service GL-4 or GL-5
	Viscosity (All-season)	SAE 75W-90
	Capacity (approximate quantity) (L {US qt, Imp qt})	2.30 {2.40, 2.00}

AUTOMATIC TRANSAXLE

A6E931001024203

Item			Specification
Transaxle type			JA5AX-EL
Line pressure (kPa {kgf/cm^2, psi})	D range, M range (2GR)	Idle	290—490 {3.0—5.0, 42—71}
		Stall	1,550—1,750 {15.8—17.8, 225—254}
	M range (1GR), R position	Idle	550—750 {5.6—7.6, 80—109}
		Stall	1,550—1,750 {15.8—17.8, 225—254}
Engine stall speed (rpm)	D, M (1GR, 2GR), R		2,200—2,600
Time lag (second)	N-D		Approx. 0.5—1.0
	N-R		Approx. 0.6—1.0
Transaxle fluid temperature (TFT) sensor (kilohm)	-20 °C {–4 °F}		15.87—17.54
	0 °C {32 °F}		5.73—6.33
	20 °C {68 °F}		2.38—2.63
	40 °C {104 °F}		1.10—1.22
	60 °C {140 °F}		0.56—0.62
	80 °C {176 °F}		0.31—0.34
	100 °C {212 °F}		0.18—0.20
	120 °C {248 °F}		0.11—0.12
	130 °C {266 °F}		0.09—0.10
Input/turbine speed sensor (ohm)	ATF temperature: 20 °C {68 °F}		513—627
Intermediate sensor (ohm)	ATF temperature: 20 °C {68 °F}		513—627
Vehicle speedometer sensor (ohm)	ATF temperature: 20 °C {68 °F}		513—627
Solenoid valves (ohm)	Shift solenoid A		14—18
	Shift solenoid B		14—18
	Shift solenoid C		14—18
	Neutral shift solenoid valve		14—18
	Reduction timing solenoid valve		14—18
	TCC solenoid valve		12.0—13.2
	2-4 brake solenoid valve		2.6—3.2
	High clutch solenoid valve		2.6—3.2
	Pressure control solenoid		2.6—3.2
Automatic transaxle fluid (ATF)	Type		M-**III** or equivalent (e.g. Dexron ® **III**)
	Capacity (Approximate quantity)	(L {US qt, Imp qt})	8.3 {8.8, 7.3}
Transfer oil	Grade		API service GL-5
	Viscosity		SAE 80W-90
	Capacity (Approximate quantity)	(L {US qt, Imp qt})	0.62 {0.65, 0.54}

PROPELLER SHAFT

A6E931001024204

Item		Specification
Runout limit	mm {in}	0.3 {0.01}
Starting torque	N·m {kgf·cm}	0.29—0.78 {3.0—7.9}

FRONT AND REAR AXLE

A6E931001018201

Item			Specification
FRONT DRIVE SHAFT			
Shaft length (Air in boot at atmospheric pressure) (mm {in})		Left side	MZR-CD (RF Turbo): 666.1—676.1 {26.23—26.61} 4WD: 667—677 {26.26—26.65}
		Right side	MZR-CD (RF Turbo): 615.9—625.9 {24.25—24.64} 4WD: 631—641 {24.85—25.23}
REAR DRIVE SHAFT (4WD)			
Shaft length (Air in boot at atmospheric pressure) (mm {in})		Left side	805.4—815.4 {31.71—32.10}
		Right side	852.4—862.4 {33.56—33.95}
REAR DIFFERENTIAL (4WD)			
Pinion height (mm {in})			–0.025—0.025 {–0.001—0.001}
Backlash of side gear and differential pinion (mm {in})			0.1 {0.004} or less
Drive pinion preload (N·m kgf·cm, in·lbf)			1.3—1.8 {13.3—18.3, 11.5—15.9}
Backlash of drive pinion and ring gear (mm {in})		Standard	0.09—0.11 {0.0036—0.0043}
		Minimum	0.05 {0.002}
Differential oil	Grade		API service GL-5
	Viscosity		Above –18°C {0°F}: SAE 90 Below –18°C {0°F}: SAE 80
	Capacity (Approximate quantity) (L {US qt, Imp qt})		1.00 {1.06, 0.88}
ELECTRONIC 4WD CONTROL SYSTEM			
Differential oil temperature sensor (kilohm)		0°C {32°F}	91—100
		10°C {50°F}	56—61
		20°C {68°F}	35—39
		30°C {86°F}	23—25
		40°C {104°F}	14—17
		50°C {122°F}	10—11
		60°C {140°F}	7.1—7.9
		70°C {158°F}	5.0—5.6
		80°C {176°F}	3.6—4.0
4WD solenoid (Rear differential oil temperature at 20°C {68°F}) (ohm)			1.5—2.0

STEERING SYSTEM

A6E931001034201

Item		Specification
ENGINE SPEED SENSING POWER STEERING		
Power steering oil pump	Oil pump fluid pressure (MPa {kgf·cm^2, psi})	2WD (Except MZR-CD (RF Turbo)): 10.80—11.29 {110.2—115.1, 1,567—1,637} MZR-CD (RF Turbo): 11.31—11.80 {115.4—120.3, 1,641—1,711} 4WD: 10.30—10.79 {105.1—110.0, 1,490—1,564}
	Gear housing fluid pressure (MPa {kgf·cm^2, psi})	2WD (Except MZR-CD (RF Turbo)): 10.80—11.29 {110.2—115.1, 1,567—1,637} MZR-CD (RF Turbo): 11.31—11.80 {115.4—120.3, 1,641—1,711} 4WD: 10.30—10.79 {105.1—110.0, 1,490—1,564}
Power steering system	Fluid type	ATF M-**III** or equivalent (e.g. Dexron®**II**)
	Capacity (Approximate quantity) (L {US qt, Imp qt})	MTX (Except MZR-CD (RF Turbo)): 0.80 {0.85, 0.70} ATX (Except 4WD): 0.87 {0.92, 0.77} MZR-CD (RF Turbo): 0.86 {0.91, 0.76} 4WD: 0.89 {0.94, 0.78}

BRAKING SYSTEM

A6E931001020201

Item			Specification
CONVENTIONAL BRAKE SYSTEM			
Front disc brake	Minimum disc pad thickness	(mm {in})	L8, LF (GCC specs.): 22 mm {0.87 in} LF (European (L.H.D. U.K.) specs.), L3, MZR-CD (RF Turbo): 23 mm {0.91 in}
	Minimum disc plate thickness	(mm {in})	L8, LF (GCC specs.): 22.8 mm {0.90 in} LF (European (L.H.D. U.K.) specs.), L3, MZR-CD (RF Turbo): 23.8 mm {0.94 in}

SUSPENSION

A6E931001013201

Suspension

WGN (2WD)

Item			Fuel gauge indication				
			Empty	1/4	1/2	3/4	Full
Front wheel alignment (Unloaded)*1	Maximum steering angle	Inner	39°±3°				
		Outer	31°±3°				
	Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
		(degree)	0°11′±0°22′				
	Caster angle*2 (Reference value)	normal	3°30'±1°	3°32'±1°	3°34'±1°	3°37'±1°	3°40'±1°
		elevated*3	3°25'±1°	3°27'±1°	3°29'±1°	3°32'±1°	3°35'±1°
	Camber angle*2 (Reference value)	normal	–0°14'±1°			–0°15'±1°	
		elevated*3	–0°07'±1°			–0°08'±1°	
	Steering axis inclination (Reference value)	normal	5°24'				
		elevated*3	5°15'			5°16'	
Rear wheel alignment (Unloaded)*1	Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
		(degree)	0°11′±0°22′				
	Camber angle*2	normal	–0°59′±1°	–1°00′±1°	–1°02′±1°	–1°04′±1°	–1°06′±1°
		elevated*3	–0°52′±1°	–0°53′±1°	–0°55′±1°	–0°56′±1°	–0°58′±1°
	Thrust angle		0°±0°48′				

*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.
*2 : Difference between left and right must not exceed 1° 30′.
*3 : Distance between wheel center and fender brim is following. Front: 405 mm {15.94 in} (reference value) Rear: 407 mm {16.02 in} (reference value)

WGN (4WD)

Item			Fuel gauge indication				
			Empty	1/4	1/2	3/4	Full
Front wheel alignment (Unloaded)*1	Maximum steering angle	Inner	39°±3°				
		Outer	31°±3°				
	Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
		(degree)	0°11′±0°22′				
	Caster angle*2 (Reference value)		3°25'±1°	3°27'±1°	3°29'±1°	3°32'±1°	3°35'±1°
	Camber angle*2 (Reference value)		–0°07'±1°			–0°08'±1°	
	Steering axis inclination (Reference value)		5°15'			5°16'	
Rear wheel alignment (Unloaded)*1	Total toe-in	(mm {in})	Tire: 2±4 {0.08±0.16}, Rim inner: 1±3 {0.04±0.12}				
		(degree)	0°11′±0°22′				
	Camber angle*2		–0°55′±1°	–0°57′±1°	–0°59′±1°	–1°01′±1°	–1°03′±1°
	Thrust angle		0°±0°48′				

*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.
*2 : Difference between left and right must not exceed 1° 30′.

Wheel and Tires

Item				Specification			
Standard tire and wheel							
Wheel	Size			15 × 6JJ	16 × 7JJ	17 × 7JJ	
	Offset (mm {in})			50 {1.97}	55 {2.17}		
	Pitch circle diameter (mm {in})			114.3 {4.50}			
	Material			Steel	Aluminum alloy		
Tire	Size			195/65R15 91V	205/55R16 91V	215/45R17 87W	215/45R17 91W (reinforced)
	Air pressure (kPa {kgf/cm^2, psi})	Front	Up to 4 persons	220 {2.2, 32}			2WD: 230 {2.3, 33} 4WD: 250 {2.5, 36}
			Full load	240 {2.4, 35}			2WD: 240 {2.4, 35} 4WD: 250 {2.5, 36}
		Rear	Up to 4 persons	220 {2.2, 32}			2WD: 230 {2.3, 33} 4WD: 250 {2.5, 36}
			Full load	300 {3.1, 44}	270 {2.8, 39}		
	Remaining tread (mm {in})			1.6 {0.06}			
Wheel and tire	Wheel and tire runout (mm {in})		Radial direction	1.5 {0.06} max.			
			Lateral direction	2.5 {0.10} max.	2.0 {0.08} max.		
	Wheel imbalance (g {oz})			Knock-type*2: 9 {0.32} max.	Adhesive-type*1: 13 {0.46} max. Knock-type*2: 8 {0.28} max.	Adhesive-type*1: 11 {0.39} max. Knock-type*2: 7 {0.25} max.	
Temporary spare tire							
Wheel	Size			15×4T			
	Offset (mm {in})			40 {1.57}			
	Pitch circle diameter (mm {in})			114.3 {4.50}			
	Material			Steel			
Tire	Size			T115/70 D15		T135/90 D15	
	Air pressure (kPa {kgf/cm^2, psi})			420 {4.2, 60}			
Wheel and tire	Wheel and tire runout (mm {in})		Radial direction	2.0 {0.08} max.			
			Lateral direction	2.5 {0.10} max.			

*1 : Total weight exceeds 160 g {5.65 oz}.
*2 : One balance weight: 60 g {2.12 oz} max. If the total weight exceeds 100 g {3.53 oz} on one side, rebalance after moving the tire around on the rim. Do not use 3 or more balance weights.

BODY ELECTRICAL SYSTEM

A6E931001047201

Item					Specifications
Exterior light bulb capacity (W)		High-mount brake light	WGN	In-vehicle-type	18.4 × 1
				Rear spoiler type	4 × 1 (LED)
Interior light bulb capacity (W)		Cargo compartment light			10 × 1

HEATER AND AIR CONDITIONER SYSTEMS

A6E931001038201

Item			Specification
			MZR–CD (RF Turbo)
REFRIGERANT SYSTEM			
Refrigerant	Type		R–134a
	Regular amount (g {oz})	L.H.D.	470 {16.6}
		R.H.D.	430 {15.2}
BASIC SYSTEM			
A/C compressor	Lubricating oil	Type	ATMOS GU10
		Sealed volume (ml {cc, fl oz})	150 {150, 5.07}
CONTROL SYSTEM			
Magnetic clutch	Clearance (mm {in})		0.3—0.5 {0.012—0.019}

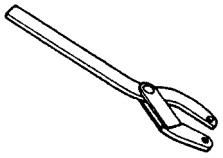
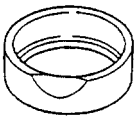
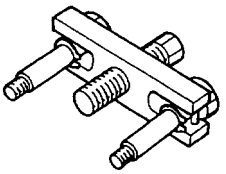
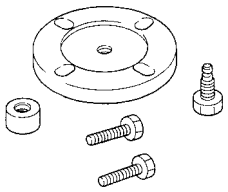
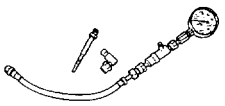
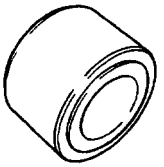
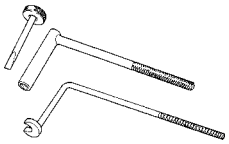
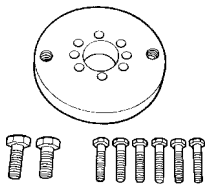
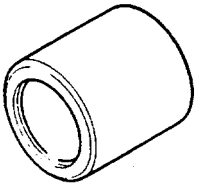
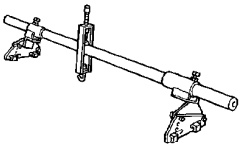
SPECIAL TOOLS

SPECIAL TOOLS ST-2
ENGINE ST-2
LUBRICATION SYSTEM ST-2
COOLING SYSTEM ST-2
FUEL AND EMISSION CONTROL SYSTEM ST-3
CLUTCH ST-3
MANUAL TRANSAXLE ST-3
AUTOMATIC TRANSAXLE ST-3
PROPELLER SHFT ST-4
FRONT AND REAR AXLE ST-4
STEERING SYSTEM ST-7
BRAKING SYSTEM ST-7
SUSPENSION ST-7
BODY ST-7
BODY ELECTRICAL SYSTEM ST-8

SPECIAL TOOLS

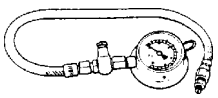
ENGINE

A6E941001001205

49 S120 710 Coupling flange holder 	49 G033 107A Dust cover installer 	49 S120 215B Pulley puller 
49 G011 106 Camshaft pulley puller 	49 S013 1A1 Compression gauge set 	49 B010 002 Oil seal installer 
49 G012 0A0 Tappet adjust wrench set 	49 G011 105 Crankshaft lock tool 	49 U027 003 Oil seal installer 
WDS 	49 E017 5A0 Engine support set 	—

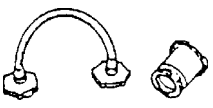
LUBRICATION SYSTEM

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49 0187 280A Oil pressure gauge 	—	—

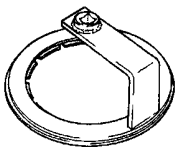
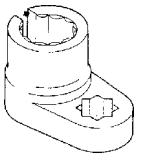
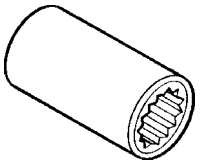
COOLING SYSTEM

A6E941001001207

49 9200 145 Radiator cap tester adapter set 	—	—

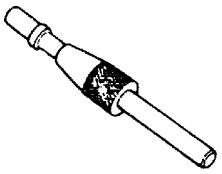
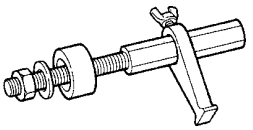
FUEL AND EMISSION CONTROL SYSTEM

A6E941001001204

WDS 	49 T042 001A Union wrench 	49 L018 001 O_2 sensor wrench 
49 D015 001 Box wrench 	-	-

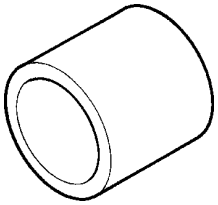
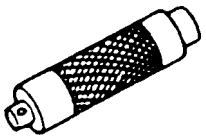
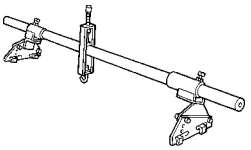
CLUTCH

A6E941001024201

49 0259 770B Flare Nut Wrench 	49 SE01 310A Clutch Disc Centering Tool 	49 E011 1A0 Ring Gear Brake Set 

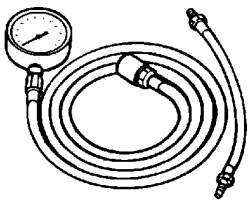
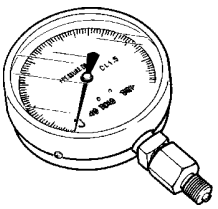
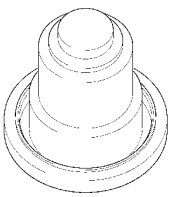
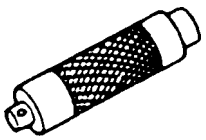
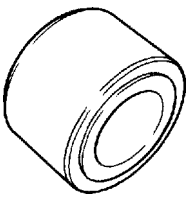
MANUAL TRANSAXLE

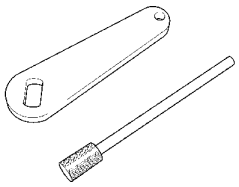
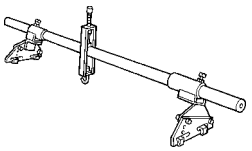
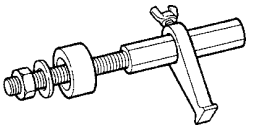
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49 U027 003 Oil Seal Installer 	49 G030 797 Handle 	49 E017 5A0 Engine Support Set 

AUTOMATIC TRANSAXLE

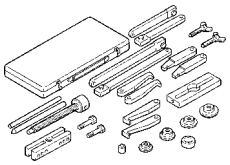
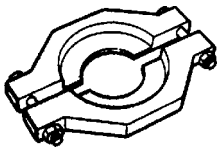
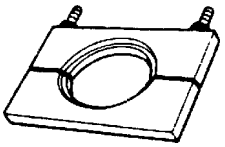
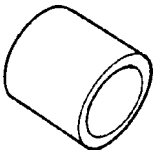
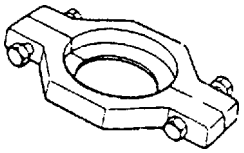
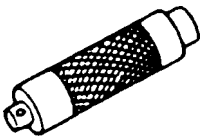
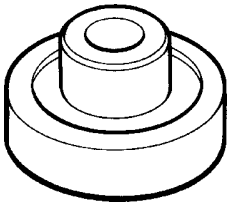
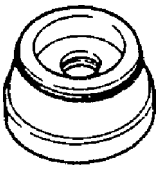
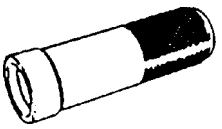
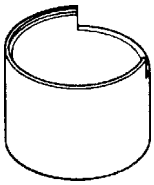
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49 0378 400C Oil pressure gauge set 	49 B019 901B Oil pressure gauge 	49 L019 014 Adapter 
49 L019 016 Installer 	49 G030 797 Handle 	49 B010 001 Oil Seal Installer 

49 L019 013 Adapter 	49 E017 5A0 Engine Support Set 	49 E011 1A0 Ring gear brake set 
WDS 	—	—

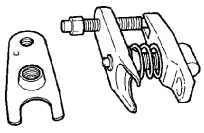
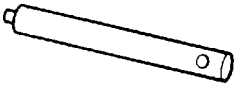
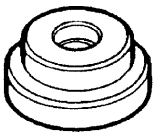
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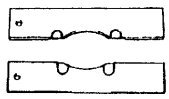
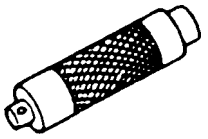
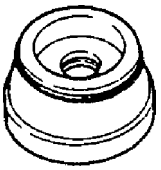
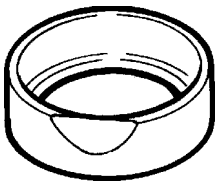
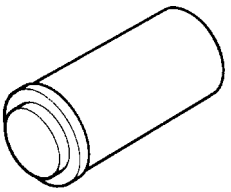
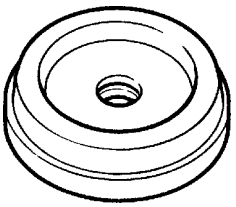
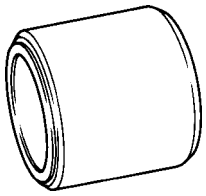
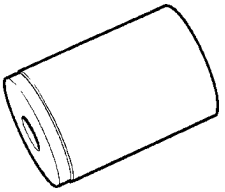
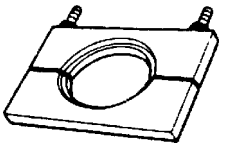
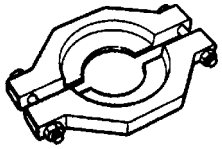
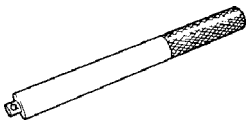
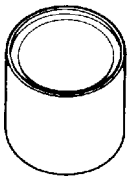
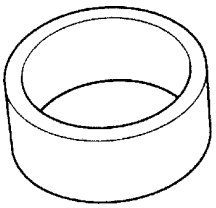
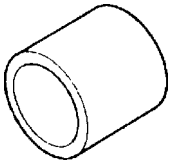
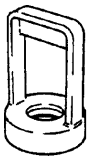
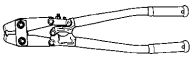
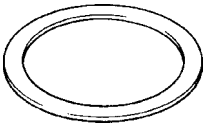
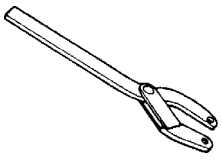
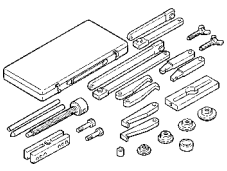
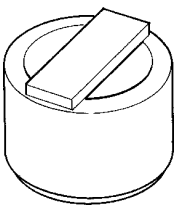
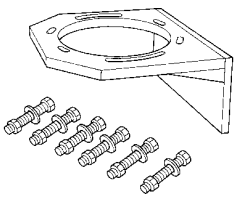
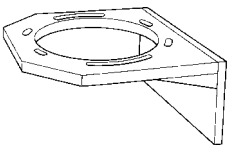
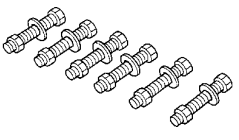
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49 0839 425C Bearing puller set 	49 H027 002 Bearing Remover 	49 G030 370 Removing Plate 
49 F015 002 Water seal installer 	49 0636 145 Water pump pulley boss puller 	49 G030 797 Handle 
49 H033 101 Bearing remover 	49 U027 005 Bearing installer 	49 F401 331 Body 
49 B034 201 Support block 	49 F401 335A Attachment A 	—

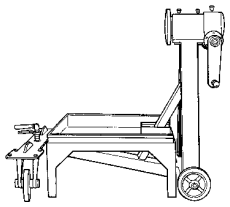
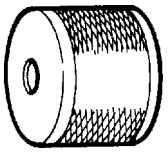
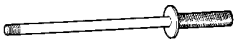
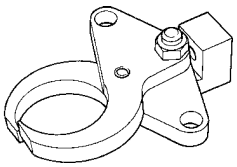
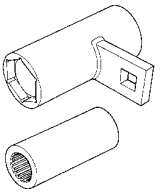
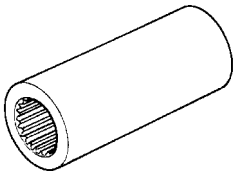
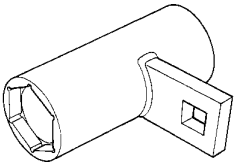
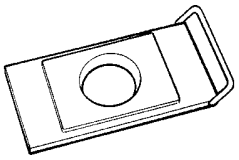
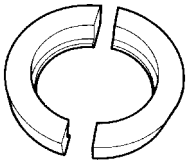
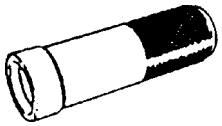
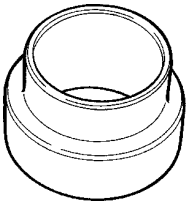
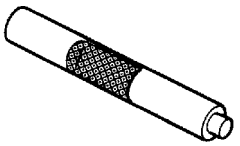
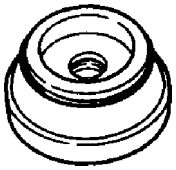
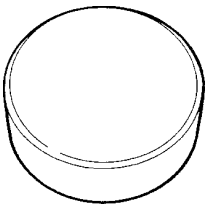
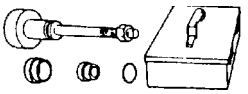
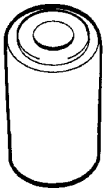
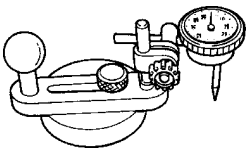
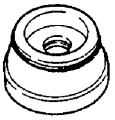
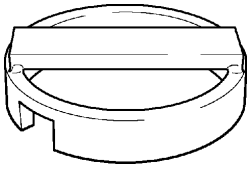
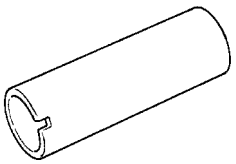
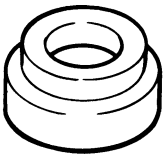
FRONT AND REAR AXLE

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49 T028 3A0 Ball joint puller set 	49 G033 102 Handle 	49 G033 105 Attachment 

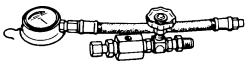
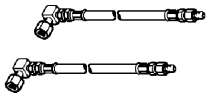
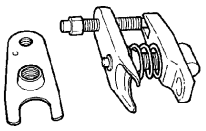
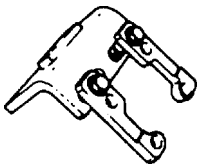
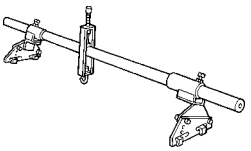
49 F026 103 Wheel hub puller 	49 G030 797 Handle 	49 F027 005 Attachment ϕ 62 
49 G033 107A Dust cover installer 	49 H026 104 Guide block 	49 F027 004 Attachment ϕ 80 
49 B014 001 Oil seal installer 	49 W034 301 Support block 	49 G030 370 Removing plate 
49 H027 002 Bearing remover 	49 F027 003 Handle 	49 B025 004 Dust seal installer 
49 S231 626 Support block 	49 W027 003 Bearing installer 	49 B025 006A Sensor rotor installer 
49 T025 001 Boot clamp crimper 	49 B025 009A Installer attachment 	49 G030 796 Body 
49 S120 710 Coupling flange holder 	49 0839 425C Bearing puller set 	49 W011 102 Oil seal installer 
49 L027 0A2 Diff hanger set 	49 L027 005 Diff hanger (Part of 49 L027 0A2) 	49 L027 011 Bolt set (Part of 49 L027 0A2) 

ST

49 0107 680A Engine stand 	49 T032 317 Weight 	49 T032 316 Shaft 
49 L027 004 Gear case remover 	49 L027 0A0 Locknut replacer set 	49 L027 006 Serrate socket (Part of 49 L027 0A0) 
49 L027 007 Hex socket (Part of 49 L027 0A0) 	49 F401 366A Plate 	49 B027 003 Attachment M 
49 F401 331 Body 	49 F401 337A Attachment C 	49 M005 797 Handle 
49 F027 007 Attachment ϕ 72 	49 G027 004 Gauge block 	49 8531 565 Drive pinion model 
49 8531 567 Collar A (Part of 49 8531 565) 	49 8531 568 Collar B (Part of 49 8531 565) 	49 G032 347 Oil seal installer 
49 0727 570 Pinion height gauge body 	49 S033 108 Bearing installer 	49 W010 107A Installer 
49 S032 333 Bearing installer 	49 E027 002 Attachment 	WDS 

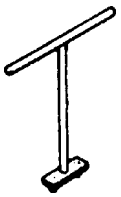
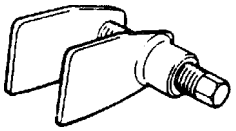
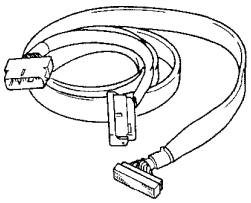
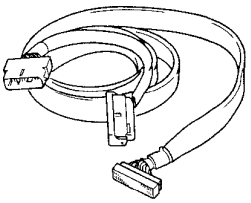
STEERING SYSTEM

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49 1232 670B Power steering gauge set 	49 H002 671 Adapter 	49 G032 3A4 Power steering gauge adapter set 
49 T028 3A0 Ball joint puller set 	49 F032 301 Power steering pump hanger 	49 E017 5A0 Engine support set 

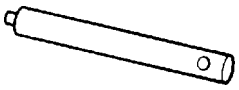
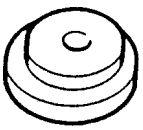
BRAKING SYSTEM

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49 0259 770B Flare nut wrench 	49 FA18 602 Disc brake piston wrench 	49 0221 600C Disc brake expand tool 
WDS 	49 G066 001 Adapter harness (with ABS) 	49 G066 004 Adapter harness (with DSC) 

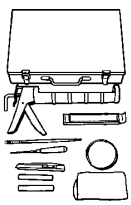
SUSPENSION

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49 G033 102 Handle 	49 G033 106 Attachment 	—

BODY

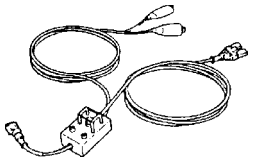
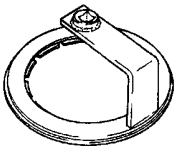
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49 0305 870A Window tool set 	49 G050 1A0 Sealant remover 	—

ST

BODY ELECTRICAL SYSTEM

A6E941001047202

49 H066 002 Deployment tool 	49 L066 002 Adapter harness 	WDS 
49 T042 001A Union wrench 	–	–