

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING**, **CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:

Indicates a potential hazard that could result in death or injury.

CAUTION:

Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

WARNING:

This service manual is intended for authorized Suzuki dealers and qualified service technicians only. Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual.

Improper repair may result in injury to the mechanic and may render the vehicle unsafe for the driver and passengers.

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all **WARNINGS** and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow **WARNINGS** could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.
- Do not modify the steering wheel, instrument panel or any other air bag system component (on or around air bag system components or wiring). Modifications can adversely affect air bag system performance and lead to injury.
- If the vehicle will be exposed to temperatures over 93°C (200°F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended activation.

The circle with a slash in this manual means “Do not do this” or “Do not let this happen”.



Foreword

This SUPPLEMENTARY SERVICE MANUAL is a supplement to IGNIS (RM413) SERVICE MANUAL and Wagon R+ (RB310/413) SERVICE MANUAL. It has been prepared exclusively for the following applicable model.

Applicable model: IGNIS with Z13DT diesel engine (RM413D) and Wagon R+ with Z13DT diesel engine (RB413D)

It describes only service information for the Z13DT diesel engine, M/T and clutch of the above applicable model. For any section other than the engine, the transmission and clutch, refer to the related service manual below.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricant, sealants, etc.) as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others.

Therefore, note that illustrations may differ from the vehicle being actually serviced.

The right is reserved to make changes at any time without notice.

NOTE:

“SUZUKI Dealers” means Authorized SUZUKI Service Workshop (in Europe)

RELATED MANUAL:

For IGNIS (RM413D)

Manual Name	Manual No.
IGNIS (RM413) SERVICE MANUAL	99500U86G00-01E
IGNIS (RM415/RM413D) SUPPLEMENTARY SERVICE MANUAL	99501U86G10-01E
IGNIS (RM413/RM415/RM413D) WIRING DIAGRAM MANUAL	99512U86G20-669

For Wagon R+ (RB413D)

Manual Name	Manual No.
RB413 SERVICE MANUAL	99500-83E00-01E
Wagon R+ (RB413) SUPPLEMENTARY SERVICE MANUAL	99501U83E00-01E
RB310 SERVICE MANUAL	99500U83E10-01E
Wagon R+ (RB310/RB413) SUPPLEMENTARY SERVICE MANUAL	99501U83E10-01E
Wagon R+ (RB310/RB413) SUPPLEMENTARY SERVICE MANUAL	99501U83E20-01E
Wagon R+ (RB310/RB413/RB413D) SUPPLEMENTARY SERVICE MANUAL	99501U83E30-01E
Wagon R+ (RB310/RB413/RB413D) WIRING DIAGRAM MANUAL	99512U83E40-669

MAGYAR SUZUKI CORPORATION

TABLE OF CONTENTS

ENGINE	
ENGINE GENERAL INFORMATION AND DIAGNOSIS (Z13DT ENGINE)	6-3
ENGINE MECHANICAL (Z13DT ENGINE)	6A3
ENGINE COOLING (Z13DT ENGINE)	6B3
ENGINE FUEL (Z13DT ENGINE)	6C3
ENGINE AND EMISSION CONTROL SYSTEM (Z13DT ENGINE)	6E3
CRANKING SYSTEM (Z13DT ENGINE)	6G3
CHARGING SYSTEM (Z13DT ENGINE)	6H3
EXHAUST SYSTEM (Z13DT ENGINE)	6K3

TRANSAXLE AND CLUTCH	
MANUAL TRANSAXLE (Z13DT ENGINE MODEL)	7A3
CLUTCH (Z13DT ENGINE MODEL)	7C3

6-3	7A3
6A3	7C3
6B3	
6C3	
6E3	
6G3	
6H3	
6K3	

SECTION 6-3

ENGINE GENERAL INFORMATION AND DIAGNOSIS (Z13DT ENGINE)

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

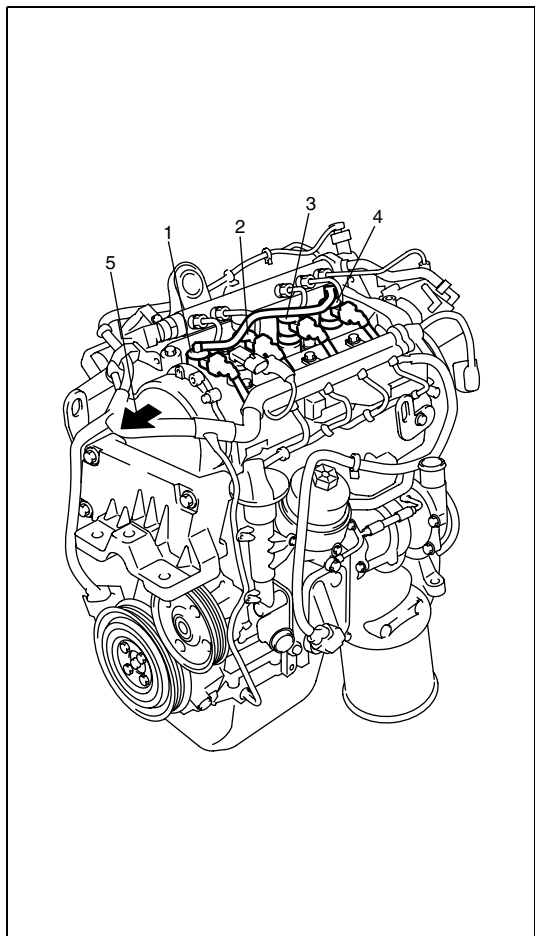
CONTENTS

General Information	6-3-3	B-12, Complaint: Engine Behaviour Under Normal Driving Conditions	6-3-36
Statement of Cleanliness and Care	6-3-3	B-13, Complaint: Engine Performance	6-3-38
General Information on Engine Service	6-3-3	B-14, Complaint: Exhaust Gas.....	6-3-40
Precaution on fuel system service.....	6-3-4	B-15, Complaint:	
Fuel pressure relief procedure	6-3-4	Oil/Coolant/Fuel-System	6-3-42
Fuel leakage check procedure	6-3-4	B-16, Complaint: Engine Mechanic.....	6-3-43
Engine Diagnosis	6-3-5	B-17, Check: Functionality of Adjacent Systems	6-3-44
General Description	6-3-5	B-18, Check: Intermittent Faults	6-3-45
Precaution in Diagnosing Trouble	6-3-6	B-19, Programming ECM.....	6-3-47
Diagnostic Trouble Code (DTC) Check.....	6-3-7	B-20, Immobilizer Check.....	6-3-48
Diagnostic Trouble Code (DTC) Clearance	6-3-7	B-21, Fuel System	6-3-49
A, Diagnostic System Check.....	6-3-8	B-22, Intake-Air System	6-3-50
B-01, Diagnostic Trouble Code	6-3-11	B-23, Check: Intake-Air System.....	6-3-51
B-03, Connect Scan Tool and Establish Communication	6-3-23	B-24, Check: Intake-Air System/Charge-Air System.....	6-3-52
B-04, Actuator Test	6-3-24	B-25, Check: Charge-Air System	6-3-53
B-05, Additional Functions	6-3-28	B-26, Check: Distance Signal	6-3-54
B-06, Programming	6-3-29	B-27, Check: Pressure Sensor Signal	6-3-55
B-07, ECU Control	6-3-30	B-28, Complaint: Engine Temperature	6-3-56
B-08, No Matching Customer Complaint	6-3-31	B-29, Check: High Pressure Area.....	6-3-57
B-09, Symptom Chart/Customer Complaints	6-3-32	B-30, Check: Low and High Pressure Section	6-3-58
B-10, Complaint: Engine Start.....	6-3-33	B-31, Check: Low Pressure Section	6-3-59
B-11, Complaint: Engine Idling.....	6-3-34		

B-32, Trouble Codes: Check 1	6-3-60	C-25, Cylinder 2 Injector Circuit	6-3-213
B-33, Trouble Codes: Check 2	6-3-61	C-26, Cylinder 3 Injector Circuit	6-3-219
B-34, Trouble Codes: Check 3	6-3-62	C-27, Cylinder 4 Injector Circuit	6-3-225
B-35, Trouble Codes: Check 4	6-3-63	C-28, Exhaust Gas Recirculation	
B-36, Trouble Codes: Check 5	6-3-64	Valve Circuit	6-3-231
C-01, No Communication between		C-29, Air Conditioning System	
Scan Tool and Control Unit	6-3-65	Refrigerant Pressure Sensor	6-3-239
C-02, Control Unit Hard- and Software	6-3-81	C-30, Air Conditioning System	
C-03, System Voltage Circuit	6-3-82	Switch Circuit	6-3-247
C-04, Control Unit Main Relay Circuit	6-3-86	C-31, Air Conditioning System	
C-05, Crankshaft Sensor Circuit	6-3-98	Relay Circuit	6-3-254
C-06, Fuel Pump Relay Circuit	6-3-102	C-32, Fan Circuit	6-3-264
C-07, 5V Circuit 1	6-3-108	C-33, Glow Time Relay Circuit	6-3-281
C-08, 5V Circuit 2	6-3-114	C-34, Glow Time Telltale Circuit	6-3-291
C-09, 5V Circuit 3	6-3-120	C-35, Filterheating Circuit	6-3-295
C-10, Pedal Position Sensor Circuit	6-3-128	C-36, Malfunction Indication	
C11, Barometer Sensor Circuit	6-3-140	Lamp (MIL) Circuit	6-3-305
C-12, Boost Pressure Sensor Circuit	6-3-141	C-37, Service Telltale Circuit	6-3-309
C-13, Intake Air Temperature Sensor		C-38, Oil Level Telltale Circuit	6-3-313
Circuit	6-3-147	C-39, Engine Oil Level Circuit	6-3-317
C-14, Mass or Volume Air Flow Circuit	6-3-151	C-40, Vehicle Speed Sensor	
C-15, Engine Coolant Temperature		Circuit	6-3-321
Sensor Circuit	6-3-159	C-41, Function-Group Intake Air System ..	6-3-322
C-16, Fuel Temperature Sensor		C-42, Function-Group Fuel System	6-3-323
Circuit	6-3-163	C-43, Function-Group Low	
C-17, Fuel Rail Pressure Sensor		Pressure Section	6-3-324
Circuit	6-3-167	C-44, Function-Group Low and	
C-18, Rail Oil Pressure Sensor		High Pressure Section	6-3-325
Circuit	6-3-175	C-45, Function-Group High	
C-19, Fuel Rail Pressure Control		Pressure Area	6-3-326
Valve Circuit	6-3-176	C-46, Starter Circuit	6-3-327
C-20, Camshaft Position Sensor		C-47, System Status Information	6-3-335
Circuit	6-3-182	C-48, Engine Coolant Temperature	
C-21, Brake Switch Circuit	6-3-188	Circuit	6-3-336
C-22, Clutch Switch Circuit	6-3-202	C-49, Engine Speed Input Signal	
C-23, Injector Circuit	6-3-206	Circuit	6-3-340
C-24, Cylinder 1 Injector Circuit	6-3-207	Special Tool	6-3-344

General Information

Statement of Cleanliness and Care



An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surface on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings and crankshaft journal bearings are removed for service, they should be retained in order. At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- Throughout this manual, the four cylinders of the engine are identified by numbers: No.1 (1), No.2 (2), No.3 (3) and No.4 (4) as counted from crankshaft pulley side (5) to flywheel side.

General Information on Engine Service

The following information on engine service should be noted carefully, as it is important in preventing damage, and in contributing to reliable engine performance.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits. When performing any work where electrical terminals could possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, air cleaner outlet hose, turbo-charger, intercooler, intercooler outlet hose or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.

Precaution on fuel system service

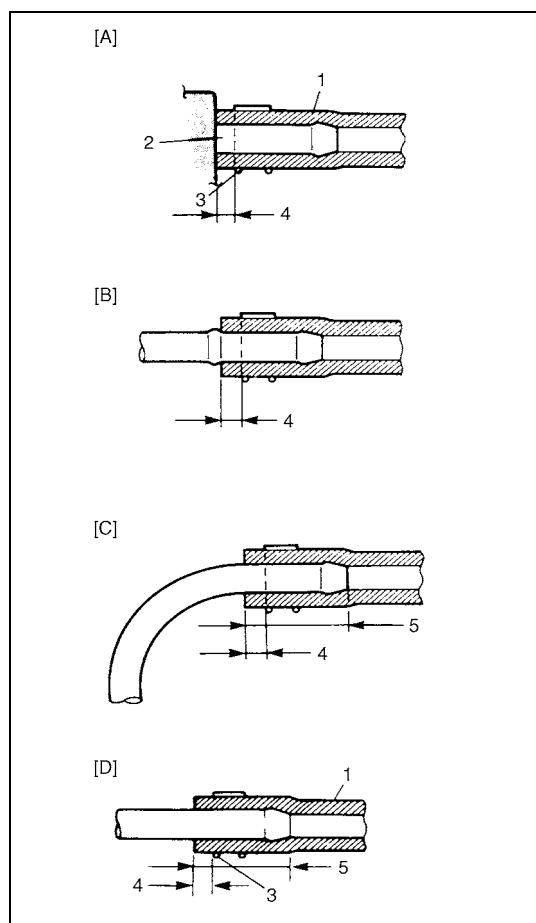
- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- A small amount of fuel may be released after fuel line is disconnected.

In order to reduce the chance of personal injury, cover fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.

- Never run engine with main relay disconnected when engine and exhaust system are hot.

- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to the figure.

After connecting, make sure that it has no twist or kink.



[A]:	With short pipe, fit hose as far as it reaches pipe joint as shown.
[B]:	With following type pipe, fit hose as far as its peripheral projection as shown.
[C]:	With bent pipe, fit hose as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose.
[D]:	With straight pipe, fit hose till pipe is, about 20 to 30 mm (0.79 – 1.18 in.) into the hose.
1.	Hose
2.	Pipe
3.	Clamp
4.	Clamp securely at a position 3 to 7 mm (0.12 – 0.27 in.) from hose end.
5.	20 to 30 mm (0.79 – 1.18 in.)

- When installing fuel filter union bolt or plug bolt, always use new gasket and tighten it to specified torque.
- When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O-ring with spindle oil or fuel.
- When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque, using back-up wrench.

Fuel pressure relief procedure

Refer to “Precautions” under “Fuel Delivery System” in Section 6E3.

Fuel leakage check procedure

Refer to “Fuel leakage check” under “Fuel Delivery System” in Section 6E3.

Engine Diagnosis

General Description

The main purpose of a vehicle diagnostic concept is locating and eliminating faults in the shortest time possible. Therefore, the following diagnostic strategy has been developed as a guideline that leads technicians straight to the source fault:

Starting point is the vehicle that contains a certain number of electronic systems, e.g. engine management system.

Each of these electronic systems consists of so - called “functional groups” that are functionally related to each other. A Coolant Temperature Sensor Circuit for example represents such a functional group.

Each of the functional groups consists of several components, such as switches, sensors, wires etc. A Coolant Temperature Sensor Circuit for example is made up of a sensor, a wiring harness, a control unit, and the software of the control unit.

Based on this structure, the first diagnostic step should be the identification and localisation of the defective electronic system, next comes the diagnosis of the corresponding defective functional group, and finally, locate and repair of the defective component within that group.

The Diagnostic System Check (described in table A, Diagnostic System Check) of this checking procedure follows that diagnostic path. Diagnosis of an electronic system according to the above described concept always starts with this Main Check.

The instructions described in the table “A, Diagnostic System Check” section must be followed closely. Every time a test or test step is passed without fault, the Diagnostic System Check continues with the next step. Some of the tests include references to related functional groups (tables B-x). When there is a fault, the corresponding functional group tests are performed in order to detect the defective functional group. When that group has been identified, the troubleshooting tables (C-x) are used to locate the faulty component. After repair of the fault, the affected functional group (tables B-x) must be rechecked to continue after this test at the appropriate position of the Diagnostic System Check (table A).

When all test steps of the Diagnostic System Check have been completed successfully, the system is fully operational.

NOTE:

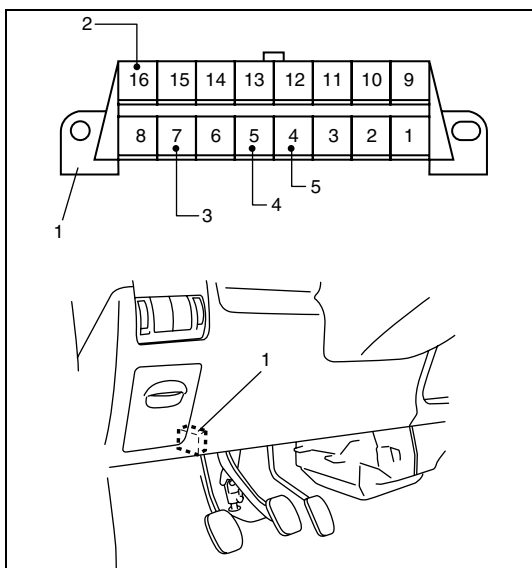
For the connector number and the terminal number discribed in diagnostic flow, refer to “Wiring Diagram Manual” discribed in “Foreword” of this manual.

Data Link Connector (DLC)

DLC (1) in compliance with SAE J1962 in its installation position, the shape of connector and pin assignment.

K (4) line of ISO 9141 is used for SUZUKI scan tool or generic scan tool to communication with ECM, ABS control module, EPS controller, SDM and immobilizer control module.

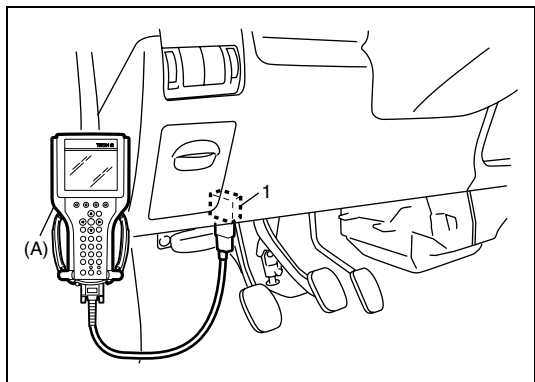
2.	B+
4.	ECM ground
5.	Body ground



Precaution in Diagnosing Trouble

- Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information stored in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool or generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service" in Section 0A before inspection and observe what is written there.
- ECM registration
If ECM is replaced, register vehicle specification (fuel injector calibration code, vehicle variant, password for immobilizer system and secret key code for immobilizer system) into ECM referring to "ECM registration" in Section 6E3.
- Fuel injector calibration code registration
If fuel injector is replaced, register fuel injector calibration code into ECM by performing procedure described in "ECM registration" of Section 6E3.
Otherwise, it has an adverse effect on engine.

Diagnostic Trouble Code (DTC) Check



- 1) Prepare generic scan tool or SUZUKI scan tool.
- 2) Connect it to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool

(A): SUZUKI scan tool

- 3) Turn ignition switch ON and confirm that MIL and SVS lamp lights.
- 4) Read DTC, according to instructions displayed on scan tool and print them or write them down. Refer to Scan Tool Operator's Manual for further details.

If communication between scan tool and ECM is not possible, refer to "C-01, No Communication between Scan Tool and Control Unit".

- 5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

Diagnostic Trouble Code (DTC) Clearance

- 1) Connect generic scan tool or SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
- 2) Turn ignition switch OFF and then ON (but engine at stop).
- 3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to Scan Tool Operator's Manual for further details.

NOTE:

When DTC clear command is executed using Suzuki mode of SUZUKI scan tool with engine run, DTC can not be cleared from ECM memory.

- 4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

A, Diagnostic System Check

A, Diagnostic System Check

Test	Work Order Description	Nominal Value
T01	Customer Complaint Validation	Is the malfunction reproducible?
	- Record customer complaint for later use - Verify and validate the recorded customer complaint	
	Yes: T02	No: T11
T02	System Operation as Designed	System okay?
	Check if the customer complaint is a normal system behaviour and if the customer operates the system properly.	
	Yes: T03	No: T04
T03	Inform the Customer	
	Inform the customer, that the system behaviour is normal respectively how to operate the system correctly.	
	Yes: –	No: –
T04	Preliminary Diagnostic Check (Visual Inspection)	
	Perform a visual check of all accessible components of the concerned system using the recorded customer complaint (this should take a maximum of 2 minutes) - All consumers turned off - Verify battery condition - Check the fuses for proper operation - Check if all ground connections are clean, tight and installed properly - Check if all connections and plugs of the concerned system are clean, tight/correctly installed and have no damages. - Check vacuum hoses for splits, kinks, leaks and proper connections. - Check hose connectors and fittings on intake system/vacuum system - After successful test/fault repair proceed to the next test step NOTE: The battery must not be disconnected at this point of the Diagnostic System Check, as the control units of the vehicle could otherwise lose stored diagnostic information. If the system operates correctly after replacing a defective fuse, the switched circuits, which are supplied by this fuse, should be checked for short circuit to ground.	
	Yes: T05	No: –

Test	Work Order Description	Nominal Value
T05	Connect Scan Tool and Establish Communication	
	Before connecting the scan tool, observe the instructions of the scan tool operators manual	
	• Connect scan tool, select concerned Electronic System, establish communication and verify, that the correct control unit is installed: Refer to Table B-03, Connect Scan Tool and Establish Communication • Verify programming of the control unit: Refer to Table B-06, Programming • After successful test/fault repair proceed to the next test step	
	Yes: T07	No: –
T06	Diagnostic Trouble Codes	
	NOTE: Trouble codes are only a reference on faults in a subgroup of the system. Trouble codes are not a direct reference on a defective component. • Read and record diagnostic trouble codes • Delete trouble codes • Operate the vehicle over an appropriate distance at various engine speed/load conditions • If a trouble code is stored: Refer to Table B-01, Diagnostic Trouble Code • After successful test/fault repair proceed to the next test step	
	Yes: T07	No: –
T07	Check: Symptom/Customer Complaint Match	
	If a defect has been found in previous test steps, the following test can be skipped (follow result “YES”).	
	• Evaluate customer complaint: Refer to Table B-09, Symptom Chart/Customer Complaints • After successful test/fault repair proceed to the next test step	
	Yes: T08	No: –
T08	No Matching Customer Complaint	
	If a defect has been found in previous test steps, the following test can be skipped (follow result “YES”).	
	• Perform the following evaluation: Refer to Table B-08, No Matching Customer Complaint • After successful test/fault repair proceed to the next test step	
	Yes: T09	No: –

Test	Work Order Description	Nominal Value
T09	System/Function End Test	
	- Check if the customer complaint is repaired and the concerned system is fully operational. NOTE: Drive the vehicle in different driving conditions (engine speed and engine load conditions) over a considerable distance. Pay attention to unusual noise and other system irregularities. - Turn ignition OFF and ON - Delete trouble codes NOTE: Read the trouble codes again after the test drive and check for symptoms/customer complaints. If a complaint still exists, restart the diagnostic session for a second time. If the problem can not be solved in the second diagnostic session, contact the local support centre.	
	Yes: –	No: –
T10	Intermittent System Operation	
	Most intermittent problems are caused by faulty electrical connectors, faulty ground connections, broken wiring, temperature problems or radio interference. Intermittent faults can be traced either by using history trouble codes or the snapshot function of the scan tool in combination with the following tests: - Perform the following evaluation: Refer to Table B-18, Check: Intermittent Faults - After successful test/fault repair proceed to the next test step	
	Yes: T09	No: –

B-01, Diagnostic Trouble Code

DTC NO.	Detecting Item	Detecting Condition (DTC will set when detecting:)	MIL	SVS	Referring Table
P0090	Rail Pressure Regulator Valve Circuit Malfunction	- Rail pressure regulator signal circuit open or short - Poor performance of rail pressure regulator	—	1 driving cycle	C-19
P0093	High Pressure Fuel Circuit Leakage	Fuel high pressure circuit problem	—	1 driving cycle	B-32
P0100	Mass Air Flow Circuit Malfunction	- MAF signal circuit open or short - Poor performance of MAF sensor	3 driving cycles	—	B-23
P0106	Manifold Absolute Pressure Range/Performance Problem	Poor performance of MAP sensor	3 driving cycles	—	B-27
P0107	Manifold Absolute Pressure Circuit Low Input	Manifold absolute pressure sensor signal lower than specification	—	1 driving cycle	B-24
P0108	Manifold Absolute Pressure Circuit High Input	Manifold absolute pressure sensor signal higher than specification	3 driving cycles	—	B-25
P0110	Intake Air Temperature Circuit Malfunction	Intake air temperature sensor signal open or short	3 driving cycles	—	C-13
P0115	Engine Coolant temperature Circuit Malfunction	- Engine coolant temperature sensor signal circuit open or short - Poor performance of engine coolant temperature sensor	—	1 driving cycle	C-15
P0168	Fuel Temperature Too High	High fuel temperature (No fault present on the system)	—	—	B-28
P0180	Fuel Temperature Sensor Circuit Malfunction	Fuel temperature sensor signal higher than specification or lower than specification	—	1 driving cycle	C-16
P0190	Fuel Rail Pressure Sensor Circuit Malfunction	- Fuel rail pressure sensor signal low or high input - Poor performance of fuel rail pressure sensor	2 or 3 driving cycles	—	C-17
P0201	Injector Circuit Malfunction Cylinder – 1	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	C-24
P0202	Injector Circuit Malfunction Cylinder – 2	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	C-25
P0203	Injector Circuit Malfunction Cylinder – 3	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	C-26
P0204	Injector Circuit Malfunction Cylinder – 4	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	C-27
P0217	Coolant Temperature Too High	High engine coolant temperature (No fault present on the system)	—	—	B-28
P0230	Fuel Pump Relay Circuit Malfunction	Fuel pump relay signal circuit open or short	—	1 driving cycle	C-06
P0235	Turbo Pressure Sensor Circuit Malfunction	Turbo pressure sensor circuit open or short	—	1 driving cycle	C-12

DTC NO.	Detecting Item	Detecting Condition (DTC will set when detecting:)	MIL	SVS	Referring Table
P0335	Crankshaft Position Sensor Circuit Malfunction	Crankshaft Position Sensor signal no inputted	—	1 driving cycle	C-05
P0340	Camshaft Position Sensor Circuit Malfunction	Camshaft position sensor signal no inputted	—	—	C-20
P0380	Glow Plug Control Circuit Malfunction	Glow plug signal circuit open or short	—	1 driving cycle	C-33
P0381	Glow Indicator Lamp Circuit Malfunction	Glow indicator lamp signal circuit open or short	—	—	C-34
P0400	Exhaust Gas Recirculation Flow Malfunction	Poor performance of EGR valve	3 driving cycles	—	B-36
		Mechanical problem on EGR valve	—	1 driving cycle	
P0403	Exhaust Gas Recirculation Control Circuit	EGR valve control signal circuit open or short	3 driving cycles	—	C-28
P0500	Vehicle Speed Sensor Circuit Malfunction	Incorrect signal from vehicle speed sensor	—	1 driving cycle	B-26
P0504	Brake Switch Circuit Malfunction	Incorrect signal from brake light switch	—	—	C-21
P0530	A/C Pressure Sensor Circuit Malfunction	A/C pressure sensor signal circuit open or short	—	—	C-29
P0560	Power Supply Circuit Malfunction	Power supply circuit low or high input	—	—	C-03
P0571	Brake Switch Circuit Open	Brake lamp switch signal is no inputted	—	—	C-21
P0602	Control Module Program Error	Not registered of vehicle information (fuel injector calibration code, vehicle variant (specification) or security access)	—	1 driving cycle	B-19
P0603	Control Module Internal Fail	Engine control module internal faulty (system error)	—	1 driving cycle	C-02
P0604	Control Module Internal Fail	Engine control module internal faulty (system error)	—	1 driving cycle	C-02
P0605	Control Module Internal Fail	Engine control module internal faulty (system error)	—	1 driving cycle	C-02
P0606	Control Module Internal Fail	Engine control module internal faulty (system error)	—	1 driving cycle	C-02
P0650	Malfunction Indicator Lamp (MIL) Circuit Malfunction	Malfunction Indicator Lamp (MIL) control signal circuit open or short	1 driving cycle	—	C-36
P0683	Glow Plug Feed Back Circuit	Glow plug circuit open or short	—	1 driving cycle	C-33
P0685	Main Relay Circuit Malfunction	Main relay signal circuit open or short	—	1 driving cycle	C-04
P1093	Low Pressure Fuel Circuit Leakage	Fuel low pressure circuit problem	—	1 driving cycle	B-33
P1105	Barometric Pressure Sensor Circuit Malfunction	Poor performance of ECM	3 driving cycles	—	C-11
P1120	Pedal Position Sensor 1 Circuit Malfunction	- Pedal position sensor 1 circuit open or short - Poor performance of pedal position sensor 1	—	1 driving cycle	C-10

DTC NO.	Detecting Item	Detecting Condition (DTC will set when detecting:)	MIL	SVS	Referring Table
P1122	Pedal Position Sensor 2 Circuit Malfunction	Pedal position sensor 2 circuit open or short	—	1 driving cycle	C-10
P1180	Fuel Filter Heater Circuit Malfunction	Fuel heater circuit open or short	—	—	C-35
P1190	Fuel Pressure Regulator Flow	Poor performance of fuel pressure regulator	—	1 driving cycle	C-18
P1191	Fuel Pressure Regulator Circuit Malfunction	Mechanical problem in fuel high pressure section or fuel low pressure section	—	1 driving cycle	B-34
P1192	Rail Pressure Higher Than Maximum	Measured fuel rail pressure is higher than specification	—	1 driving cycle	C-18
P1481	Radiator Fan Output 1 Circuit Malfunction	Radiator fan output 1 circuit open or short	—	1 driving cycle	C-32
P1482	Radiator Fan Output 2 Circuit Malfunction	Radiator fan output 2 circuit open or short	—	1 driving cycle	C-32
P1530	A/C Compressor Signal Circuit Malfunction	A/C relay signal circuit open or short	—	—	C-31
P1600	A/D Converter Malfunction	Engine control module internal faulty (system error)	—	1 driving cycle	C-02
P1610	Secret key/Password Not Program	Refer to "Diagnostic Trouble Code (DTC) Table" in Section 8G3.			
P1611	P assword is Not Matched				
P1612	No Signal From Immobilizer Control Module				
P1613	Immobilizer System Malfunction				
P1614	Incorrect Signal From Immobilizer Control Module				
P1620	Sensor Supply Circuit 1 Fail	Sensor power supply 1 low or high input	—	1 driving cycle	C-07
P1625	Main Relay Circuit Malfunction	Main relay signal circuit open or short	—	1 driving cycle	C-04
P1635	Sensor Supply Circuit 2 Fail	Sensor power supply 2 low or high input	—	1 driving cycle	C-08
P1639	Sensor Supply Circuit 3 Fail	Sensor power supply 3 low or high input	—	1 driving cycle	C-09
P1657	Oil Level Lamp Circuit Malfunction	Oil level lamp control signal circuit open or short	—	—	—
P1660	Shut Off Valve	Mechanical problem in fuel shut off valve	—	1 driving cycle	B-35
P1680	Coolant Temperature Signal	Engine coolant temperature meter signal open or short	—	—	C-48
P1690	Warning Lamp Defect	Service vehicle soon (SVS) lamp control signal circuit open or short	—	—	C-37
P1725	Engine Speed Signal Circuit Malfunction	Tachometer signal circuit open or short	—	—	C-49
P2146	Injector Power Supply Circuit Malfunction	Fuel injector control signal low or high input	—	1 driving cycle	C-23

NOTE:

- “–” mark in MIL or SVS column indicates that indicator light does not light.
- Ignore DTC P1657 because any repair of circuit is not necessary even when it is detected by ECM.

B-02, Data List

As the data values given below are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.

Also, conditions in the table below that can be checked by the scan tool are those detected by ECM and output from ECM as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool.

Test	Work Order Description	Nominal Value
T01	Tester Display – Battery Voltage	
	• Ignition ON • Engine OFF • All consumers turned off • Engine starting • Engine running at idle speed, operating temperature Concerned Terminals: E27-1, E27-2, E27-3, E27-50 (For RM413D) G88-1, G88-2, G88-3, G88-50 (For RB413D)	11.0 ... 13.5 V greater than 8.0 V 12.0 ... 15.0 V
	Yes: T02	No: C-03
T02	Tester Display – Main Relay	
	• Ignition OFF • Ignition ON • Engine OFF • All consumers turned off Concerned Terminals: E27-4, E27-5, E27-6, E27-80 (For RM413D) G88-4, G88-5, G88-6, G88-80 (For RB413D)	OFF ON
	Yes: T03	No: C-04
T03	Tester Display – Fuel Pump	
	• Ignition ON • Engine OFF • All consumers turned off • Wait at least 20 s • Engine running at idle speed, operating temperature Concerned Terminals: E27-75 (For RM413D) G88-75 (For RB413D)	OFF ON
	Yes: T04	No: C-06
T04	Tester Display – PPS 1 Voltage	
	• Ignition ON • Engine OFF • All consumers turned off • Accelerator pedal actuated to full load stop • Accelerator pedal not actuated • Accelerator pedal slightly actuated Concerned Terminals: E27-15, E27-32, E27-35, E27-41, E27-65, E27-83 (For RM413D) G88-15, G88-32, G88-35, G88-41, G88-65, G88-83 (For RB413D)	greater than 3.80 V less than 1.00 V greater than 1.00 V
	Yes: T05	No: C-10

Test	Work Order Description	Nominal Value
T05	Tester Display – PPS 2 Voltage	greater than 1.8 V less than 0.50 V greater than 0.50 V
	• Ignition ON • Engine OFF • All consumers turned off • Accelerator pedal actuated to full load stop • Accelerator pedal not actuated • Accelerator pedal slightly actuated Concerned Terminals: E27-15, E27-32, E27-35, E27-41, E27-65, E27-83 (For RM413D) G88-15, G88-32, G88-35, G88-41, G88-65, G88-83 (For RB413D)	
	Yes: T06	No: C-10
T06	Tester Display – Calculated Pedal Position	greater than 99 % less than 1 %
	• Ignition ON • Engine OFF • All consumers turned off • Accelerator pedal actuated to full load stop • Accelerator pedal not actuated Concerned Terminals: E27-15, E27-32, E27-35, E27-41, E27-65, E27-83 (For RM413D) G88-15, G88-32, G88-35, G88-41, G88-65, G88-83 (For RB413D)	
	Yes: T07	No: C-10
T07	Tester Display – Closed Throttle Position	Inactive Active
	• Ignition ON • Engine OFF • All consumers turned off • Accelerator pedal actuated to full load stop • Accelerator pedal not actuated Concerned Terminals: E27-15, E27-32, E27-35, E27-41, E27-65, E27-83 (For RM413D) G88-15, G88-32, G88-35, G88-41, G88-65, G88-83 (For RB413D)	
	Yes: T08	No: C-10
T08	Tester Display – Desired Idle	780 ... 900 RPM.
	• Engine running at idle speed, operating temperature • All consumers turned off • Accelerator pedal not actuated Concerned Terminals: C66-43, C66-59 (For RM413D) D26-43, D26-59 (For RB413D)	
	Yes: T09	No: C-05

Test	Work Order Description	Nominal Value
T09	Tester Display – Engine Speed	greater than 60 RPM. 780 ... 900 RPM. 850 ... 5000 RPM. Scan tool display depend- ing on engine speed
	• Ignition ON • Engine starting • Engine running at idle speed, operating temperature • All consumers turned off • Accelerator pedal not actuated • Accelerator pedal briefly actuated to full load stop Concerned Terminals: C66-43, C66-59 (For RM413D) D26-43, D26-59 (For RB413D)	
	Yes: T10	No: C-05
T10	Tester Display – Coolant Temperature	80 ... 110 °C 176 ... 230 °F 2.50 ... 0.40 V Scan tool display depend- ing on engine condition
	• Engine running at idle speed, operating temperature • All consumers turned off Concerned Terminals: C66-29, C66-54 (For RM413D) D26-29, D26-54 (For RB413D)	
	Yes: T11	No: C-15
T11	Tester Display – Fuel Temperature	–10 ... 80 °C 14 ... 176 °F
	• Ignition ON • Engine OFF • All consumers turned off Concerned Terminals: E27-13, E27-61 (For RM413D) G88-13, G88-61 (For RB413D)	
	Yes: T12	No: C-16
T12	Tester Display – Intake Air Temperature	Scan tool display con- verges to outside tempera- ture
	• Engine running at idle speed, operating temperature • All consumers turned off Concerned Terminals: C66-10, C66-27 (For RM413D) D26-10, D26-27 (For RB413D)	
	Yes: T13	No: C-13
T13	Tester Display – MAF/MAF sensor voltage	greater than 20 kg/h greater than 1.70 V 2.8 ... 5.5 g/sec 1.00 ... 2.20 V 5.5 ... 8.3 g/sec 1.70 ... 2.5 V
	• Engine running • All consumers turned off • Accelerator pedal slightly actuated • Engine running at idle speed, operating temperature • Accelerator pedal not actuated • Wait at least 70 s Concerned Terminals: C66-14, C66-27, C66-40 (For RM413D) D26-14, D26-27, D26-40 (For RB413D)	
	Yes: T14	No: C-14

Test	Work Order Description	Nominal Value
T14	Tester Display – Barometric Pressure/Barometric Sensor Voltage	
	- Ignition ON - Engine OFF - All consumers turned off - Compare displayed pressure with outside-air pressure NOTE: This parameter is an internal value of the control unit. Concerned Terminals: –	90 ... 110 kPa 3.5 ... 4.5 V Scan tool display is nearly identical to outside-air pressure
	Yes: T15	No: C-11
T15	Tester Display – Turbo Pressure /Turbo Pressure Voltage	
	- Ignition ON - Engine OFF - All consumers turned off - Compare displayed pressure with outside-air pressure - Engine running at idle speed, operating temperature - Increase engine speed to 3500 rpm Concerned Terminals: C66-23, C66-24, C66-41 (For RM413D) D26-23, D26-24, D26-41 (For RB413D)	90 ... 110 kPa 1.5 ... 2.0 V Scan tool display is nearly identical to outside-air pressure 90 ... 110 kPa 1.5 ... 2.0 V greater than 110 kPa greater than 2.0 V
	Yes: T16	No: C-12
T16	Tester Display – EGR Valve (Exhaust-Gas Recirculation)	
	- Ignition ON - Engine OFF - All consumers turned off - Engine running at idle speed, operating temperature - Accelerator pedal briefly actuated to full load stop - Accelerator pedal not actuated - Wait at least 70 s Concerned Terminals: C66-5, C66-15 (For RM413D) D26-5, D26-15 (For RB413D)	OFF ON OFF
	Yes: T17	No: C-28

Test	Work Order Description	Nominal Value
T17	Tester Display – EGR Solenoid Duty Cycle	
	- Engine running at idle speed, operating temperature - All consumers turned off - Accelerator pedal briefly actuated to full load stop	less than 10 %
	- Accelerator pedal not actuated - Wait at least 70 s Concerned Terminals: C66-5, C66-15 (For RM413D) D26-5, D26-15 (For RB413D)	greater than 40 % Value changing briefly less than 10 %
	Yes: T18	No: C-28
T18	Tester Display – Desired Rail Pressure	
	- Engine running at idle speed, operating temperature - All consumers turned off - Accelerator pedal not actuated - Accelerator pedal briefly actuated to full load stop	23.00 ... 29.00 MPa
	Concerned Terminals: C66-6, C66-8, C66-38 (For RM413D) D26-6, D26-8, D26-38 (For RB413D)	greater than 26.00 MPa Value changing briefly
	Yes: T19	No: C-17
T19	Tester Display – Fuel Rail Pressure	
	- Engine running at idle speed, operating temperature - All consumers turned off - Accelerator pedal not actuated - Accelerator pedal briefly actuated to full load stop	23.00 ... 29.00 MPa 1.00 ... 1.80 V
	Concerned Terminals: C66-6, C66-8, C66-38 (For RM413D) D26-6, D26-8, D26-38 (For RB413D)	greater than 25.00 MPa greater than 1.80 V
	Yes: T20	No: C-17
T20	Tester Display – Rail Pressure Regulator	
	- Engine running at idle speed, operating temperature - All consumers turned off - Accelerator pedal not actuated - Accelerator pedal briefly actuated to full load stop	greater than 25 %
	Concerned Terminals: C66-4, C66-34, E27-5 (For RM413D) D26-4, D26-34, G88-5 (For RB413D)	Value changing briefly
	Yes: T21	No: C-19
T21	Tester Display – Fuel Quantity	
	- Engine running at idle speed, operating temperature - All consumers turned off - Accelerator pedal not actuated - Accelerator pedal slightly actuated	3.0 ... 6.0 mm ³ /str
	Concerned Terminals: –	greater than 6.0 mm ³ /str
	Yes: T22	No: C-23

Test	Work Order Description	Nominal Value
T22	Tester Display – SOI	-1.0 ... 3.0 °CA
	• Engine running at idle speed, operating temperature • All consumers turned off • Accelerator pedal not actuated Concerned Terminals: –	
	Yes: T23	No: C-23
T23	Tester Display – A/C Switch	OFF
	• Ignition ON • Engine OFF • All consumers turned off NOTE: This data list parameter is only valid if the concerned component is installed.	
	• Engine running at idle speed, operating temperature • Air conditioning system is switched on. NOTE: This data list parameter is only valid if the concerned component is installed. Concerned Terminals: E27-28 (For RM413D) G88-28 (For RB413D)	ON
	Yes: T24	No: C-30
T24	Tester Display – A/C Pressure	300...1200 kPa 0.5...1.8 V greater than 700 kPa greater than 0.8 V
	• Engine running at idle speed, operating temperature • All consumers turned off NOTE: This data list parameter is only valid if the concerned component is installed.	
	• Air conditioning system is switched on. NOTE: This data list parameter is only valid if the concerned component is installed. Concerned Terminals: E27-10, E27-37, E27-87 (For RM413D) G88-10, G88-37, G88-87 (For RB413D)	
	Yes: T25	No: C-29

Test	Work Order Description	Nominal Value
T25	Tester Display – A/C Magnet Clutch	OFF
	- Engine running at idle speed, operating temperature - All consumers turned off NOTE: This data list parameter is only valid if the concerned component is installed.	
	Air conditioning system is switched on. NOTE: This data list parameter is only valid if the concerned component is installed. Concerned Terminals: E27-79 (For RM413D) G88-79 (For RB413D)	ON
	Yes: T26	No: C-31
T26	Tester Display – Radiator Fan	OFF
	- Engine running - All consumers turned off - Coolant temperature is less than 98 °C (208 °F) - Coolant temperature is greater than 97 °C (207 °F) Concerned Terminals: E27-7, E27-8 (For RM413D) G88-7, G88-8 (For RB413D)	
	Yes: T27	LOW
	Yes: T27	No: C-32
T27	Tester Display – Glow Relay	ON
	- Ignition ON - Engine OFF - All consumers turned off - Wait at least 10 s Concerned Terminals: E27-70, E27-74 (For RM413D) G88-70, G88-74 (For RB413D)	
	Yes: T28	OFF
	Yes: T28	No: C-33
T28	Tester Display – Brake Switch	OFF
	- Ignition ON - Engine OFF - All consumers turned off - Brake pedal actuated Concerned Terminals: E27-68, E27-81 (For RM413D) G88-68, G88-81 (For RB413D)	
	Yes: T29	ON
	Yes: T29	No: C-21

Test	Work Order Description	Nominal Value
T29	Tester Display – Vehicle Speed	
	- Ignition ON - Engine OFF - All consumers turned off - Vehicle travelling (constant speed, approximately 30 km/h (19 mph)) Concerned Terminals: E27-89 (For RM413D) G88-89 (For RB413D)	0 km/h 0 mph 30 km/h 19 mph Diagnostic tester display converges to speedometer display
	Yes: T30	No: C-40
T30	Tester Display – Service Vehicle Soon (SVS) Indicator Lamp	
	- Ignition ON - Engine OFF - All consumers turned off - Wait at least 5 s Concerned Terminals: E27-77 (For RM413D) G88-77 (For RB413D)	ON OFF
	Yes: T31	No: C-37
T31	Tester Display – Glow Indicator Lamp	
	- Ignition ON - Engine OFF - All consumers turned off - Wait at least 10 s Concerned Terminals: E27-52 (For RM413D) G88-52 (For RB413D)	The telltale is briefly ON. Off 12V
	Yes: T32	No: C-34
T32	Tester Display – Oil Level Warning	
	- Ignition ON - Engine OFF - All consumers turned off Concerned Terminals: E27-26 (For RM413D) G88-26 (For RB413D)	OFF
	Yes: –	No: C-39

B-03, Connect Scan Tool and Establish Communication

Update the diagnostic software for SUZUKI scan tool referring to “Tech2 Programming Manual” in case that the diagnosis can not be performed due to the old diagnostic software. In case that the diagnosis can not be performed even though the diagnostic software whose version is appropriate, is used, go to “C-01, No Communication between Scan Tool and Control Unit”.

B-04, Actuator Test

Test	Work Order Description	Nominal Value
T01	Tester Display – Fuel Pump Relay Test	The fuel pump is not running Noise check: Clicking noise from the relay and Is the fuel pump running?
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. • After the test is started, the corresponding component can be actuated using the YES/NO keys. • Press NO key OFF • Press YES key ON Concerned Terminals: E27-75 (For RM413D) G88-75 (For RB413D)	
	Yes: T02	No: C-06
T02	Tester Display – EGR Solenoid Test	Noise check: Clicking noise from the actuator
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. • After the test is started, the corresponding component can be actuated using the YES/NO keys. • Press NO key OFF • Press YES key ON Concerned Terminals: C66-5, C66-15 (For RM413D) D26-5, D26-15 (For RB413D)	
	Yes: T03	No: C-28

Test	Work Order Description	Nominal Value
T03	Tester Display – Glow plug control	Diagnosis Glow Controller Active Diagnosis Glow Controller Inactive
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. • After the test is started, the corresponding component can be actuated using the YES/NO keys. • Press YES key ON • Press NO key OFF Concerned Terminals: E27-70, E27-74 (For RM413D) G88-70, G88-74 (For RB413D)	
	Yes: T04	No: C-33
T04	Tester Display – Radiator Fan Test	All cooling fans are switched off The blower speed is increased stepwise. The following component is switched on: Radiator Fan Motor
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. • After the test is started, the corresponding component can be actuated using the YES/NO keys. • Press NO key OFF • Press YES key ON Concerned Terminals: E27-7, E27-8 (For RM413D) G88-7, G88-8 (For RB413D)	
	Yes: T05	No: C-32

Test	Work Order Description	Nominal Value
T05	Tester Display – Malfunction Indicator Lamp (MIL) Test	The following component is switched off: Malfunction indicator lamp (MIL) The following component is switched on: Malfunction indicator lamp (MIL)
	- Ignition ON - Engine OFF - Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. - After the test is started, the corresponding component can be actuated using the YES/NO keys. - Press NO key OFF	
	Concerned Terminals: E27-78 (For RM413D) G88-78 (For RB413D)	
	Yes: T06	No: C-36
T06	Tester Display – Service Vehicle Soon (SVS) Lamp Test	The following component is switched off: Service vehicle soon (SVS) lamp The following component is switched on: Service vehicle soon (SVS) lamp
	- Ignition ON - Engine OFF - Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. - After the test is started, the corresponding component can be actuated using the YES/NO keys. - Press NO key OFF	
	Concerned Terminals: E27-77 (For RM413D) G88-77 (For RB413D)	
	Yes: T07	No: C-37

Test	Work Order Description	Nominal Value
T07	Tester Display – Glow Indicator Lamp Test	The following component is switched off: Glow indicator lamp The following component is switched on: Glow indicator lamp
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. • After the test is started, the corresponding component can be actuated using the YES/NO keys. • Press NO key OFF	
	• Press YES key ON Concerned Terminals: E27-52 (For RM413D) G88-52 (For RB413D)	
	Yes: –	No: C-34

B-05, Additional Functions

Test	Work Order Description	Nominal Value
T01	Tester Display – Read ECM Identification	Displayed value okay?
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Data List of ECM Registration under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. NOTE: This test can be used to monitor various different system specific data. Concerned Terminals: –	
	Yes: T02	No: C-02
T02	Tester Display – Display Immobilizer Status	
	Check immobilizer control system status referring to “Scan Tool Data” in Section 8G3.	
	Yes: –	No: C-02

B-06, Programming

Test	Work Order Description	Nominal Value
T01	Tester Display Registration (Immobilizer System)	Programming okay?
	Refer to "Registration Procedure of Immobilizer System Components" in Section 8G3.	
	Yes: T02	No: C-02
T02	Tester Display ECM Setting	Programming okay?
	Refer to "ECM registration" in Section 6E3.	
	Yes: T03	No: C-02
T03	Tester Display Replace Injector	Programming okay?
	Refer to "ECM registration" in Section 6E3.	
	Yes: –	No: C-02

B-07, ECU Control

Test	Work Order Description	Nominal Value
T01	Tester Display – RPM Control	Engine Speed between 800 rpm and 3000 rpm
	• Engine idling • Press corresponding key in the system main menu to select Output Tests under Misc Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. Engine Speed (RPM) Control • After the test is started, the corresponding component can be actuated using the YES/NO keys. • The YES/NO keys can be used to change engine speed in the range from approximately 800 rpm to 3000 rpm. Concerned Terminals: –	
	Yes: –	No: C-02

B-08, No Matching Customer Complaint

Test	Work Order Description	Nominal Value
T01	No Matching Customer Complaint	
	The following test steps may or may not be helpful, they are only a proposal. Diagnostic Trouble Codes • Read and record diagnostic trouble codes • Check for history trouble code. If a history trouble code is stored this may indicate the circuit which has the intermittent condition. • Use the following table to obtain the concerned functional group and perform the following additional test steps, while performing the troubleshooting in the C-x tables. Refer to Table B-01, Diagnostic Trouble Code • Move the related connectors, wiring harness and components in order to find the failure. Switch on all electric consumers by turns, because this can cause an electromagnetic interference in a circuit. Use the oscilloscope to observe the wiring harness for disturbances. Operate the system under different conditions over a considerable time. Quick Check • Perform the following evaluation: Refer to Table B-02, Data List Refer to Table B-04, Actuator Test • Check Additional Information Refer to Table B-05, Additional Functions • After successful test/fault repair proceed to the next test step	
	Yes: –	
		No: –

B-09, Symptom Chart/Customer Complaints

Test	Work Order Description	Nominal Value
T01	Check: Symptom/Customer Complaint Match	
	Select the suitable symptom group, which fits the complaint. • Refer to Table B-10, Complaint: Engine Start • Refer to Table B-11, Complaint: Engine Idling • Refer to Table B-12, Complaint: Engine Behaviour Under Normal Driving Conditions • Refer to Table B-13, Complaint: Engine Performance • Refer to Table B-14, Complaint: Exhaust Gas • Refer to Table B-15, Complaint: Oil/Coolant/Fuel-System • Refer to Table B-16, Complaint: Engine Mechanic • Refer to Table B-17, Check: Functionality of Adjacent Systems	
	Yes: –	No: –

B-10, Complaint: Engine Start

Customer complaint	Remedy
Engine does not start, starter slow/does not turn	Perform the following test step: • Refer to Table C-46, Starter Circuit
Engine does not start, starter runs normal	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-21, Fuel System • Refer to Table B-02, Data List "T18" Desired Rail Pressure • Refer to Table B-02, Data List "T19" Fuel Rail Pressure • Refer to Table B-02, Data List "T20" Rail Pressure Regulator • Refer to Table B-02, Data List "T21" Fuel Quantity • Refer to Table B-02, Data List "T22" SOI • Refer to Table B-02, Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Plug Control Test • Refer to Table C-35, Filterheating Circuit
Engine starts poorly, starter runs normal	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-21, Fuel System • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Plug Control Test • Refer to Table C-35, Filterheating Circuit

B-11, Complaint: Engine Idling

Customer complaint	Remedy
Engine stalls at idle speed, no restart possible	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed • Check compression
Engine stalls during operation, restart possible	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T09" Engine Speed
Engine does not react on accelerator pedal actuation	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI
Engine idle speed is increased	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-02 Data List "T08" Desired Idle • Refer to Table B-02 Data List "T09" Engine Speed • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI

Customer complaint	Remedy
Idle speed too low	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-06 Programming "T03" Replace Injector • Refer to Table B-02 Data List "T08" Desired Idle • Refer to Table B-02 Data List "T09" Engine Speed • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI
Surging /shaking while idling	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-06 Programming "T03" Replace Injector • Refer to Table B-21, Fuel System • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T08" Desired Idle • Refer to Table B-02 Data List "T09" Engine Speed Check compression pressure The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Plug control Test
Abnormal combustion sound, engine knocking	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System • Refer to Table B-04 Actuator Test "T03" Glow Plug Control Test • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI

B-12, Complaint: Engine Behaviour Under Normal Driving Conditions

Customer complaint	Remedy
Engine stalls during operation, no restart possible	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-21, Fuel System • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table C-35, Filterheating Circuit
Engine stalls during operation, restart possible	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to B-21, Fuel System • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table C-35, Filterheating Circuit
Erratic engine operation, reproducible misfire	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-06 PROGRAMMING "T03" Replace Injector • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System Check compression pressure The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Plug Control Test • Refer to Table C-35, Filterheating Circuit

Customer complaint	Remedy
Jerky engine operation	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T28" Brake Switch • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-06 Programming "T03" Replace Injector • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table C-35, Filterheating Circuit

B-13, Complaint: Engine Performance

Customer complaint	Remedy
Reduced cut-off speed	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-22, Intake-Air System • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table C-35, Filterheating Circuit
Erratic engine operation, reproducible misfire	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-06 Programming "T03" Replace Injector • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Time Relay Test • Refer to Table C-35, Filterheating Circuit

Customer complaint	Remedy
Poor engine response	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-06 Programming "T03" Replace Injector • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table C-35, Filterheating Circuit
Reduced engine performance in all operating conditions	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-06 Programming "T03" Replace Injector • Refer to Table B-22, Intake-Air System • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T04" PPS 1 • Refer to Table B-02 Data List "T05" PPS 2 • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table C-35, Filterheating Circuit

B-14, Complaint: Exhaust Gas

Customer complaint	Remedy
Excessive white smoke	The following tests must be performed in the given order: • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Plug Control Test • Refer to Table C-35, Filterheating Circuit
Excessive black/grey smoke	The following tests must be performed in the given order: • Check Engine Oil Level • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T09" Engine Speed

Customer complaint	Remedy
Excessive blue smoke	Perform the following tests in the given order until a defect is found. The following tests must be performed in the given order: • Check Engine Oil Level • Refer to Table B-21, Fuel System • Refer to Table B-22, Intake-Air System • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T12" Intake Air Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-02 Data List "T18" Desired Rail Pressure • Refer to Table B-02 Data List "T19" Fuel Rail Pressure • Refer to Table B-02 Data List "T20" Rail Pressure Regulator • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI • Refer to Table B-02 Data List "T09" Engine Speed The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to Table B-04 Actuator Test "T03" Glow Plug Control Test

B-15, Complaint: Oil/Coolant/Fuel-System

Customer complaint	Remedy
Engine overheated	The following tests must be performed in the given order: • Check the following system/signal for proper operation: Engine Cooling • Refer to Table B-04 Actuator Test "T04" Radiator Fan Test • Refer to Table B-21, Fuel System • Refer to Table B-02 Data List "T01" Battery Voltage • Refer to Table B-02 Data List "T10" Coolant Temperature • Refer to Table B-02 Data List "T11" Fuel Temperature • Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage • Refer to Table B-22, Intake-Air System • Check Engine Oil Level • Refer to Table B-02 Data List "T21" Fuel Quantity • Refer to Table B-02 Data List "T22" SOI
Rising engine oil level	The following tests must be performed in the given order: • Check Engine Oil Level • Engine oil pressure • Refer to B-21, Fuel System • Refer to Table B-02 Data List "T21" Fuel Quantity
Leaks in fuel system	Perform the following test step: • Refer to B-21, Fuel System

B-16, Complaint: Engine Mechanic

Customer complaint	Remedy
Mechanical engine problem	The following tests must be performed in the given order: • Check Engine Oil Level • Engine oil pressure • Refer to B-21, Fuel System • Check compression • Engine valve gear

B-17, Check: Functionality of Adjacent Systems

Customer complaint	Remedy
Engine can not be switched off with the ignition lock	The following tests must be performed in the given order: • Refer to Table B-02 Data List “T01” Battery Voltage • Refer to Table B-21, Fuel System • Check Engine Oil Level
Speedometer display defective	The following tests must be performed in the given order: • Refer to Table B-02 Data List “T01” Battery Voltage • Refer to Table B-02 Data List “T29” Vehicle Speed
No speed signal recognized	The following tests must be performed in the given order: • Refer to Table B-02 Data List “T01” Battery Voltage • Refer to Table B-02 Data List “T09” Engine Speed
Glow time telltale defective	The following tests must be performed in the given order: • Refer to Table B-02 Data List “T01” Battery Voltage • Refer to Table B-04 Actuator Test “T07” Glow Indicator Lamp Test

B-18, Check: Intermittent Faults

Test	Work Order Description	Nominal Value
T01	Intermittent System Operation NOTE: Refer to “Intermittent and Poor Connections Inspection” in Section 0A for farther details. Preliminary diagnostic check (visual inspection) • Check all sensors, actuators and the wiring harness of the system for corrosion and damages. • Check all connectors of the system for corrosion and for damaged terminals. • Check all ground connections of the system for corrosion and damages • Check if the fault was recognized in an area of strong electromagnetic sources e.g. near radio stations Diagnostic Trouble Codes • Read and record trouble codes • Check for history trouble code. If a history trouble code is stored this may indicate the circuit which has the intermittent condition. History trouble code is leading to an intermittent problem. This trouble codes refer to a related functional group. To find the defective component the following test steps may be helpful. • Use the following table to obtain the concerned functional group and perform the following additional test steps, while performing the troubleshooting in the C-x tables. Refer to Table B-01, Diagnostic Trouble Code Move the related connectors, wiring harness and components in order to find the failure. Switch on all electric consumers by turns, because this can cause an electromagnetic interference in a circuit. Use the oscilloscope to observe the wiring harness for disturbances. Operate the system under different conditions over a considerable time. Snapshot function of the Scan tool • Select the snapshot function of the Scan Tool. Set the Scan Tool to trigger by Any DTC and try to recreate the conditions that may cause the trouble code to be set. Use the Scan tool application to analyse the related data list parameters. The disturbances in the signal can be observed at the trigger point where the trouble code is set.	

Test	Work Order Description	Nominal Value
T01	- Use the following table to obtain the concerned functional group and perform the following additional test steps, while performing the troubleshooting in the C-x tables. Refer to Table B-01, Diagnostic Trouble Code Refer to Table B-02, Data List Move the related connectors, wiring harness and components in order to find the failure. Switch on all electric consumers by turns, because this can cause an electromagnetic interference in a circuit. Use an oscilloscope to observe the wiring harness for disturbances. Operate the system under different conditions over a considerable time. Symptoms/Customer Complaints - Check if one of the symptoms in the following table match the previously recorded customer complaint and perform the following additional test steps, while performing the troubleshooting in the C-x tables. Refer to Table B-09, Symptom Chart/Customer Complaints Move the related connectors, wiring harness and components in order to find the failure. Switch on all electric consumers by turns, because this can cause an electromagnetic interference in a circuit. Use the oscilloscope to observe the wiring harness for disturbances. Operate the system under different conditions over a considerable time. After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-19, Programming ECM

Test	Work Order Description	Nominal Value
T01	Programming	
	The following tests must be performed in the given order: • The following programming function has to be performed to program the fuel injector calibration code. – Refer to Table B-06 Programming “T03” Replace Injector • After programming successfully, check if the system malfunction is still present. • If the malfunction is still present, continue with the following tests: • With trouble code P0602 recognized: Refer to Table C-02, Control Unit Hard- and Software • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-20, Immobilizer Check

Test	Work Order Description	Nominal Value
T01	Programming	
	• Verify programming of the control unit: Refer to Table B-06 Programming “T01” Registration (Immobilizer System) • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-21, Fuel System

Test	Work Order Description	Nominal Value
T01	Check: Fuel Pipes and Fuel Filter	System okay?
	CAUTION: The fuel system is very sensitive. Work should be done with high cleanliness and care. Air in the fuel system can cause damage to the high-pressure fuel pump. That's why the vehicle must never be driven till the fuel tank is empty. • Check fuel tank for correct fuel sort content • The fuel reserve must be greater than 5 L • Check connected hoses and tubes for kinks, damage etc. • Check the correct fitting of the connections and sealing. (use only sealing, that is approved by the vehicle manufacturer) • Check fuel filter • Check for pressure decrease in the fuel supply section. (leakage, blockage) • Check for pressure decrease in the high pressure section. (leakage, blockage)	
	Yes: T02	No: C-42
T02	Check: Fault Location	
	• Perform quick check actuator test: Refer to Table B-04 Actuator Test "T01" Fuel Pump Relay Test • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-22, Intake-Air System

Test	Work Order Description	Nominal Value
T01	Preliminary Diagnostic Check (Visual Inspection)	Test okay?
	• Verify mechanical system functions/components Intake system • Check intake system/charge air hoses for leaks (secondary air, porosity and blockages) • Check the hose clamps at the intake-air system/charge-air system for correct fitting. • Check connected hoses and tubes for kinks, damage etc. • Check air filter for fouling and correct mounting. • Check mass air flow sensor for fouling. • Verify mechanical system functions/components Exhaust-gas turbo charger Exhaust system	
	Yes: T02	No: C-41
T02	Check: Fault Location	
	The following test steps must be performed in the given order. If a fault is found in one test step, the subsequent test steps can be skipped. • Perform quick check data list: Refer to Table B-02 Data List "T13" MAF/MAF Sensor Voltage • Perform quick check actuator test: Refer to Table B-04 Actuator Test "T02" EGR Solenoid Test • Perform quick check data list: Refer to Table B-02 Data List "T15" Turbo Pressure/Turbo Pressure Voltage • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-23, Check: Intake-Air System

Test	Work Order Description	Nominal Value
T01	Check: Function-Group Intake-Air System/Charge-Air System	
	Perform the following tests in the given order until a defect is found. • Perform the following quick checks: Refer to Table B-22, Intake-Air System • If no defect has been found in previous test steps: Refer to Table C-14, Mass or Volume Air Flow Circuit • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-24, Check: Intake-Air System/Charge-Air System

Test	Work Order Description	Nominal Value
T01	Check: Function-Group Intake-Air System/Charge-Air System	
	Perform the following tests in the given order until a defect is found. • Verify mechanical system functions/components Exhaust-gas turbo charger Exhaust system • Check air filter for fouling and correct mounting. • Check mass air flow sensor for fouling. • Check intake system/charge air hoses for leaks (secondary air, porosity and blockages) • Check connected hoses and tubes for kinks, damage etc. • Perform quick check data list: Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage Refer to Table B-02 Data List "T15" Turbo Pressure/Turbo Pressure Voltage • If no defect has been found in previous test steps: Refer to Table C-12, Boost Pressure Sensor Circuit • After successful test/fault repair proceed to the next test step	
	Yes: —	No: —

B-25, Check: Charge-Air System

Test	Work Order Description	Nominal Value
T01	Check: Function-Group Charge-Air System	
	Perform the following tests in the given order until a defect is found. • Verify mechanical system functions/components - Exhaust-gas turbo charger - Exhaust system • Perform quick check data list: - Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage - Refer to Table B-02 Data List "T15" Turbo Pressure/Turbo Pressure Voltage • If no defect has been found in previous test steps: - Refer to Table C-12, Boost Pressure Sensor Circuit • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-26, Check: Distance Signal

Test	Work Order Description	Nominal Value
T01	Vehicle Speed Information Check	
	Perform the following tests in the given order until a defect is found. • Connect scan tool, select concerned Electronic System, establish communication and verify, that the correct control unit is installed: Refer to Table B-03, Connect Scan Tool and Establish Communication • Read and record diagnostic trouble codes • If a trouble code is stored: Refer to Table B-01, Diagnostic Trouble Code • Perform quick check data list: Refer to Table B-02 Data List "T29" Vehicle Speed • If no defect has been found in previous test steps: Refer to Table C-40, Vehicle Speed Sensor Circuit • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-27, Check: Pressure Sensor Signal

Test	Work Order Description	Nominal Value
T01	Check: Datalist Parameter	
	Perform the following tests in the given order until a defect is found. • Perform quick check data list: Refer to Table B-02 Data List "T14" Barometric Pressure/Barometric Sensor Voltage Refer to Table B-02 Data List "T15" Turbo Pressure/Turbo Pressure Voltage • If no defect has been found in previous test steps: Refer to Table C-12, Boost Pressure Sensor Circuit • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-28, Complaint: Engine Temperature

Test	Work Order Description	Nominal Value
T01	Check: Adjacent System	System okay?
	Check the following system for proper operation: Engine cooling system Fuel cooling system	
	Yes: T02	No: C-42
T02	Check: Datalist Parameter	
	The following test steps must be performed in the given order. If a fault is found in one test step, the subsequent test steps can be skipped. - Perform quick check data list: Refer to Table B-02 Data List "T10" Coolant Temperature Refer to Table B-02 Data List "T11" Fuel Temperature - If no defect has been found in previous test steps: Refer to Table C-47, System Status Information - After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-29, Check: High Pressure Area

Test	Work Order Description	Nominal Value
T01	Preliminary Diagnostic Check (Visual Inspection)	System okay?
	CAUTION: The fuel system is very sensitive. Work should be done with high cleanliness and care. Air in the fuel system can cause damage to the high-pressure fuel pump. That's why the vehicle must never be driven till the fuel tank is empty. • Check fuel tank for correct fuel sort content The fuel reserve must be greater than 5 L • Check connected hoses and tubes for kinks, damage etc. • Check the correct fitting of the connections and sealing. (use only sealing, that is approved by the vehicle manufacturer) • Check for pressure decrease in the high pressure section. (leakage, blockage) • Perform a visual check of the following components: High-pressure fuel pump Common Rail Fuel Pressure Sensor Fuel Pressure Regulator Injector - Cylinder 1 Injector - Cylinder 2 Injector - Cylinder 3 Injector - Cylinder 4	
	Yes: T02	No: C-45
T02	Check: Mechanics and/or Hydraulics	Test okay?
	• Check injector NOTE: Refer to “Precautions” under “Fuel Delivery System” in Section 6E3 before servicing fuel system.	
	Yes: –	No: C-45

B-30, Check: Low and High Pressure Section

Test	Work Order Description	Nominal Value
T01	Preliminary Diagnostic Check (Visual Inspection)	System okay?
	CAUTION: The fuel system is very sensitive. Work should be done with high cleanliness and care. Air in the fuel system can cause damage to the high-pressure fuel pump. That's why the vehicle must never be driven till the fuel tank is empty. • Check fuel tank for correct fuel sort content The fuel reserve must be greater than 5 L • Check connected hoses and tubes for kinks, damage etc. • Check the correct fitting of the connections and sealing. (use only sealing, that is approved by the vehicle manufacturer) • Check fuel filter • Check for pressure decrease in the fuel supply section. (leakage, blockage) • Check for pressure decrease in the high pressure section. (leakage, blockage)	
	Yes: T02	No: C-44
T02	Actuator Test	
	• Perform quick check actuator test: Refer to Table B-04 Actuator Test "T01" Fuel Pump Relay Test • After successful test/fault repair proceed to the next test step	
	Yes: T03	No: –
T03	Check: Mechanics and/or Hydraulics	Test okay?
	• Check injector NOTE: Refer to "Precautions" under "Fuel Delivery System" in Section 6E3 before servicing fuel system.	
	Yes: –	No: C-44

B-31, Check: Low Pressure Section

Test	Work Order Description	Nominal Value
T01	Preliminary Diagnostic Check (Visual Inspection)	System okay?
	CAUTION: The fuel system is very sensitive. Work should be done with high cleanliness and care. Air in the fuel system can cause damage to the high-pressure fuel pump. That's why the vehicle must never be driven till the fuel tank is empty. • Check fuel tank for correct fuel sort content The fuel reserve must be greater than 5 L • Check connected hoses and tubes for kinks, damage etc. • Check fuel filter • Check for pressure decrease in the fuel supply section. (leakage, blockage)	
	Yes: T02	No: C-43
T02	Actuator Test	
	• Perform quick check actuator test: Refer to Table B-04 Actuator Test "T01" Fuel Pump Relay Test • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-32, Trouble Codes: Check 1

Test	Work Order Description	Nominal Value
T01	Check: Function-Group High Pressure Area	
	Perform the following tests in the given order until a defect is found. • Perform the following quick checks: Refer to Table B-29, Check: High Pressure Area Refer to Table B-31, Check: Low Pressure Section • If no defect has been found in previous test steps: Refer to Table C-45, Function-Group High Pressure Area • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-33, Trouble Codes: Check 2

Test	Work Order Description	Nominal Value
T01	Check: Fuel Pipes and Fuel Filter	
	Perform the following tests in the given order until a defect is found.	
	• Perform the following quick checks: Refer to Table B-31, Check: Low Pressure Section • If no defect has been found in previous test steps: Refer to Table C-43, Function-Group Low Pressure Section • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-34, Trouble Codes: Check 3

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	• Is the trouble code P0201 stored?	
	Yes: C-24	No: T02
T02	Check: Diagnostic Trouble Code stored	
	• Is the trouble code P0202 stored?	
	Yes: C-25	No: T03
T03	Check: Diagnostic Trouble Code stored	
	• Is the trouble code P0203 stored?	
	Yes: C-26	No: T04
T04	Check: Diagnostic Trouble Code stored	
	• Is the trouble code P0204 stored?	
	Yes: C-27	No: T05
T05	Check: Function-Group High Pressure Area	
	Perform the following tests in the given order until a defect is found.	
	- Perform the following quick checks: Refer to Table B-30, Check: Low and High Pressure Section - If no defect has been found in previous test steps: Refer to Table C-44, Function-Group Low and High Pressure Section - After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-35, Trouble Codes: Check 4

Test	Work Order Description	Nominal Value
T01	Check: Fault Location	
	Perform the following tests in the given order until a defect is found. • Perform quick check actuator test: Refer to Table B-04 Actuator Test "T01" Fuel Pump Relay Test • If no defect has been found in previous test steps: Refer to Table C-42, Function-Group Fuel System • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

B-36, Trouble Codes: Check 5

Test	Work Order Description	Nominal Value
T01	Preliminary Diagnostic Check (Visual Inspection)	
	Perform the following tests in the given order until a defect is found. • Perform the following quick checks: Refer to Table B-22, Intake-Air System • If no defect has been found in previous test steps: Refer to Table C-28, Exhaust Gas Recirculation Valve Circuit • After successful test/fault repair proceed to the next test step	
	Yes: –	No: –

C-01, No Communication between Scan Tool and Control Unit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - All consumers turned off - Measure voltage between the following terminals: Data Link Connector – Wiring harness connector (wiring harness side) terminal G56-16 & Ground	
	Yes: T02	No: T18
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-50 & Ground	
	Yes: T03	No: E16
T03	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition ON - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-23 & Ground	
	Yes: T04	No: T06
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	- Ignition OFF - Disconnect wiring harness connector from: Immobilizer Control Module - Measure resistance between the following terminals: Immobilizer Control Module – Wiring harness connector (wiring harness side) terminal G50-7 & ECM – Wiring harness connector (wiring harness side) terminal E27-88	
	Yes: T05	No: E03
T05	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	Measure resistance between the following terminals: Data Link Connector – Wiring harness connector (wiring harness side) terminal G56-4 & Ground	
	Yes: E01	No: E02

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Fuse - Check the following component for proper operation: Circuit Fuse	
	Yes: T07	No: T16
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E04	No: T08
T08	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Ignition Switch - Measure voltage between the following terminals: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-5 & Ground	
	Yes: E05	No: T09
T09	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Main Fuse - Check the following component for proper operation: Circuit Main Fuse	
	Yes: T10	No: T11
T10	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E06	No: E07
T11	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Connect fused jumper wire to: Circuit Main Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T12	No: E13

Test	Work Order Description	Nominal Value
T12	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-4 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T13	No: E12
T13	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-2 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T14	No: E11
T14	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-1 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T15	No: E10
T15	Check: Component	Test okay?
	- Remove fused jumper wire - Disconnect wiring harness connector from: Starting Motor – Wiring harness connector (wiring harness side) wiring colour C46-1 - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-3 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E08	No: E09

Test	Work Order Description	Nominal Value
T16	Check: Component	Test okay?
	• Connect fused jumper wire to: Circuit Fuse – Output contact & Battery voltage • Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E01	No: T17
T17	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Disconnect wiring harness connector from: Glow Controller • Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation. • Disconnect each of the following components/control units from the wiring harness consecutively and check the fuse of the fused jumper wire for proper operation each time: – ECM – Immobilizer Control Module – Clutch Switch – MAF and IAT Sensor – Fuel Heating Relay – Compressor Relay – Fuel Pump Relay – Radiator Fan Relay No.1, No.2, No.3	
	Yes: E14	No: E15
T18	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T19	No: T25
T19	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E17	No: T20
T20	Check: Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Main Fuse • Check the following component for proper operation: Circuit Main Fuse	
	Yes: T21	No: T24
T21	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E18	No: T22

Test	Work Order Description	Nominal Value
T22	Check: Component	Test okay?
	- Remove electrical component from socket: System Main Fuse - Check the following component for proper operation: System Main Fuse	
	Yes: T23	No: E21
T23	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: System Main Fuse – Input contact & Ground	
	Yes: E19	No: E20
T24	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Connect fused jumper wire to: Circuit Main Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E18	No: E22
T25	Check: Component	Test okay?
	- Connect fused jumper wire to: Circuit Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E23	No: T26
T26	Check: Component	Test okay?
	- Remove electrical component from socket: Radio - Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation. - Disconnect each of the following components/control units from the wiring harness consecutively and check the fuse of the fused jumper wire for proper operation each time: ECM (Wiring Harness Connector E27) Combination Meter Interior light Information Display Clock	
	Yes: E14	No: E24

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: Data Link Connector – Wiring harness connector (wiring harness side) terminal G56-4 & Ground
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-88 & Immobilizer Control Module – Wiring harness connector (wiring harness side) terminal G50-7
E04	Circuit interruption between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-23
E05	- Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-2 & Circuit Fuse – Input contact or - Defective component: Ignition Switch
E06	Circuit interruption between: Circuit Main Fuse – Output contact & Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-5
E07	Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E08	Defective component: Ignition Switch or Starting Motor
E09	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-3 & Starting Motor – Wiring harness connector (wiring harness side) terminal C46-1
E10	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-1 & Circuit Fuses – Input contact

Result	Cause Of Fault
E11	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-2 & Circuit Fuses – Input contact
E12	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-4 & Circuit Fuses – Input contact
E13	Short circuit to ground between: Circuit Main Fuse – Output contact & Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-5
E14	If the nominal value is reached during one of the measurements, the component/control unit that has been disconnected immediately before that measurement is defective. NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E15	Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-23 & Wiring harness connector terminals of all components (wiring harness side), which were disconnected from the wiring harness during this trouble shooting session
E16	Circuit interruption between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-50
E17	Circuit interruption between: Circuit Fuse – Output contact & Data Link Connector – Wiring harness connector (wiring harness side) terminal G56-16
E18	Circuit interruption between: Circuit Main Fuse – Output contact & Circuit Fuse – Input contact
E19	Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E20	- Circuit interruption between: Battery – Positive (+) terminal & System Main Fuse – Input contact or - Defective component: Battery

Result	Cause Of Fault
E21	• Short circuit to ground between: System Main Fuse – Output contact & Generator – Wiring harness connector (wiring harness side) terminal C47-1 & Circuit Main Fuses – Input contact or • Defective component: Generator
E22	• Short circuit to ground between: Circuit Main Fuse – Output contact & Circuit Fuses – Input contact
E23	• Defective component: Scan Tool
E24	• Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-50 & Radio – Wiring harness connector (wiring harness side) terminal G28-8 & Clock – Wiring harness connector (wiring harness side) terminal G30-1 & Information Display – Wiring harness connector (wiring harness side) terminal G25-8 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-12 & Data Link Connector – Wiring harness connector (wiring harness side) terminal G56-16 & Interior Light – Wiring harness connector (Wiring harness side) terminal K02-2 & Interior Light – Wiring harness connector (Wiring harness side) terminal O01-2 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • All consumers turned off • Measure voltage between the following terminals: Data Link Connector – Wiring harness connector (wiring harness side) terminal G09-16 & Ground	
	Yes: T02	No: T18
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-50 & Ground	
	Yes: T03	No: E16
T03	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-23 & Ground	
	Yes: T04	No: T06
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Ignition OFF • Disconnect wiring harness connector from: Immobilizer Control Module • Measure resistance between the following terminals: Immobilizer Control Module – Wiring harness connector (wiring harness side) terminal G17-7 & ECM – Wiring harness connector (wiring harness side) terminal G88-88	
	Yes: T05	No: E03
T05	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Measure resistance between the following terminals: Data Link Connector – Wiring harness connector (wiring harness side) terminal G09-4 & Ground	
	Yes: E01	No: E02
T06	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T07	No: T16

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E04	No: T08
T08	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Ignition Switch - Measure voltage between the following terminals: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-5 & Ground	
	Yes: E05	No: T09
T09	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Main Fuse - Check the following component for proper operation: Circuit Main Fuse	
	Yes: T10	No: T11
T10	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E06	No: E07
T11	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Connect fused jumper wire to: Circuit Main Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T12	No: E13
T12	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-4 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T13	No: E12

Test	Work Order Description	Nominal Value
T13	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-2 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T14	No: E11
T14	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-1 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T15	No: E10
T15	Check: Component	Test okay?
	- Remove fused jumper wire - Disconnect wiring harness connector from: Starting Motor – Wiring harness connector (wiring harness side) wiring colour C06-1 - Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-3 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E08	No: E09
T16	Check: Component	Test okay?
	- Connect fused jumper wire to: Circuit Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E01	No: T17

Test	Work Order Description	Nominal Value
T17	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Disconnect wiring harness connector from: Glow Controller • Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation. • Disconnect each of the following components/control units from the wiring harness consecutively and check the fuse of the fused jumper wire for proper operation each time: – ECM – Immobilizer Control Module – Clutch Switch – MAF and IAT Sensor – Fuel Heating Relay – Compressor Relay – Fuel Pump Relay	
	Yes: E14	No: E15
T18	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T19	No: T25
T19	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E17	No: T20
T20	Check: Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Main Fuse • Check the following component for proper operation: Circuit Main Fuse	
	Yes: T21	No: T24
T21	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E18	No: T22
T22	Check: Component	Test okay?
	• Remove electrical component from socket: System Main Fuse • Check the following component for proper operation: System Main Fuse	
	Yes: T23	No: E21

Test	Work Order Description	Nominal Value
T23	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: System Main Fuse – Input contact & Ground	
	Yes: E19	No: E20
T24	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Connect fused jumper wire to: Circuit Main Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E18	No: E22
T25	Check: Component	Test okay?
	- Connect fused jumper wire to: Circuit Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E23	No: T26
T26	Check: Component	Test okay?
	- Remove electrical component from socket: Radio - Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation. - Disconnect each of the following components/control units from the wiring harness consecutively and check the fuse of the fused jumper wire for proper operation each time: - ECM (Wiring Harness Connector G88) - Combination Meter - Interior light - Clock	
	Yes: E14	No: E24

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: Data Link Connector – Wiring harness connector (wiring harness side) terminal G09-4 & Ground
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-88 & Immobilizer Control Module – Wiring harness connector (wiring harness side) terminal G17-7
E04	Circuit interruption between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal G88-23
E05	- Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-2 & Circuit Fuse – Input contact or - Defective component: Ignition Switch
E06	Circuit interruption between: Circuit Main Fuse – Output contact & Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-5
E07	Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E08	Defective component: Ignition Switch or Starting Motor
E09	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-3 & Starting Motor – Wiring harness connector (wiring harness side) terminal C06-1
E10	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-1 & Circuit Fuses – Input contact

Result	Cause Of Fault
E11	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-2 & Circuit Fuses – Input contact
E12	Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-4 & Circuit Fuses – Input contact
E13	Short circuit to ground between: Circuit Main Fuse – Output contact & Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-5
E14	If the nominal value is reached during one of the measurements, the component/control unit that has been disconnected immediately before that measurement is defective. NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E15	Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal G88-23 & Wiring harness connector terminals of all components (wiring harness side), which were disconnected from the wiring harness during this trouble shooting session
E16	Circuit interruption between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal G88-50
E17	Circuit interruption between: Circuit Fuse – Output contact & Data Link Connector – Wiring harness connector (wiring harness side) terminal G09-16
E18	Circuit interruption between: Circuit Main Fuse – Output contact & Circuit Fuse – Input contact
E19	Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E20	- Circuit interruption between: Battery – Positive (+) terminal & System Main Fuse – Input contact or - Defective component: Battery

Result	Cause Of Fault
E21	• Short circuit to ground between: System Main Fuse – Output contact & Generator – Wiring harness connector (wiring harness side) terminal C08-1 & Circuit Main Fuses – Input contact or • Defective component: Generator
E22	• Short circuit to ground between: Circuit Main Fuse – Output contact & Circuit Fuses – Input contact
E23	• Defective component: Scan Tool
E24	• Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal G88-50 & Radio – Wiring harness connector (wiring harness side) terminal G64-4 & Clock – Wiring harness connector (wiring harness side) terminal G29-1 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-32 & Data Link Connector – Wiring harness connector (wiring harness side) terminal G09-16 & Interior Light – Wiring harness connector (Wiring harness side) terminal K02-2 & Interior Light – Wiring harness connector (Wiring harness side) terminal K06-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-02, Control Unit Hard- and Software

Test Table

Test	Work Order Description	Nominal Value
T01	Result: High Transition Resistance	Test okay?
	Check the following circuit for proper operation: Ground connection of the control unit case	
	Yes: T02	No: E03
T02	Check: Programming	Programming okay?
	- Ignition ON - Repeat programming	
	Yes: E01	No: E02

Result table

Result	Cause Of Fault
E01	Previous programming was faulty
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Following system/component is faulty: Ground connection of the control unit case

C-03, System Voltage Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	13 ... 15 V
	- Engine running - Increase engine speed to 3000 rpm - Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T02	No: E05
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T03	No: E04
T03	Check Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Disconnect wiring harness connector from: ECM - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-50 & Ground	
	Yes: T04	No: E06
T04	Check: Transition Resistance of Voltage Supply Circuit	greater than 11 V
	- All consumers turned off - Disconnect wiring harness connector from: ECM - Ignition ON - Connect test lamp (10 W) and multimeter in parallel and measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-50 & Ground	
	Yes: T04	No: E03
T05	Check: Transition Resistance of Voltage Supply Circuit	greater than 11 V
	Connect test lamp (10 W) and multimeter in parallel and measure voltage between the following terminals: Battery Positive (+) terminal & ECM – Wiring harness connector (wiring harness side) terminal E27-1, E27-2, E27-3	
	Yes: E01	No: E02

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	High transition resistance between: Ground & ECM – Wiring harness connector (wiring harness side) terminal E27-1, E27-2, E27-3
E03	High transition resistance between: Battery – Positive (+) terminal & ECM – Wiring harness connector (wiring harness side) terminal E27-50
E04	- Check the following component for proper operation: Battery and/or Generator and/or Starting Motor and/or - Check the following circuit for proper operation: Terminal C47-1, C59-1 and system main fuse
E05	Defective component: Generator
E06	- Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-50 & Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-1, E36-4 - Circuit interruption between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-50 or Defective component: Brake Light Switch

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	13 ... 15 V
	• Engine running • Increase engine speed to 3000 rpm • Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T02	No: E05
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T03	No: E04
T03	Check: Transition Resistance of Voltage Supply Circuit	greater than 11 V
	• All consumers turned off • Disconnect wiring harness connector from: ECM • Ignition ON • Connect test lamp (10 W) and multimeter in parallel and measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-50 & Ground	
	Yes: T04	No: E03
T04	Check: Transition Resistance of Voltage Supply Circuit	greater than 11 V
	• Connect test lamp (10 W) and multimeter in parallel and measure voltage between the following terminals: Battery Positive (+) terminal & ECM – Wiring harness connector (wiring harness side) terminal G88-1, G88-2, G88-3	
	Yes: E01	No: E02

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	High transition resistance between: Ground & ECM – Wiring harness connector (wiring harness side) terminal G88-1, G88-2, G88-3
E03	High transition resistance between: Battery – Positive (+) terminal & ECM – Wiring harness connector (wiring harness side) terminal E27-50
E04	- Check the following component for proper operation: Battery and/or Generator and/or Starting Motor and/or - Check the following circuit for proper operation: Terminal C02-1, C08-1 and system main fuse
E05	Defective component: Generator

C-04, Control Unit Main Relay Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Main Relay - Measure voltage between the following terminals: Main Relay – Socket Terminal E58-2 & Ground	
	Yes: T02	No: T12
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Main Relay – Socket Terminal E58-1 & Ground	
	Yes: T03	No: E10
T03	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	- Disconnect wiring harness connector from: ECM - Ignition ON - Measure voltage between the following terminals: Main Relay – Socket Terminal E58-4 & Ground	
	Yes: T04	No: T11
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	Measure voltage between the following terminals: Main Relay – Socket Terminal E58-3 & Ground	
	Yes: T05	No: E07
T05	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Connect fused jumper wire to: Main Relay – Socket Terminal E58-4 & Battery positive (+) terminal - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-6 & Ground	
	Yes: T06	No: E06

Test	Work Order Description	Nominal Value
T06	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-4 & Ground	
	Yes: T07	No: E05
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-5 & Ground	
	Yes: T08	No: T19
T08	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal C66-5 & Ground	
	Yes: T09	No: E04
T09	Check: Component	greater than 11 V
	- Remove fused jumper wire - Insert electrical component in socket: Main Relay - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-80 & Ground	
	Yes: T10	No: E03
T10	Check: Component	greater than 11 V
	- Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-80 & Ground - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-5 & Ground	
	Yes: E01	No: E02
T11	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	- Remove electrical component from socket: Circuit Fuse - Measure voltage between the following terminals: Main Relay – Socket Terminal E58-4 & Ground	
	Yes: E08	No: E09

Test	Work Order Description	Nominal Value
T12	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Main Fuse - Check the following component for proper operation: Circuit Main Fuse	
	Yes: T12	No: T14
T13	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E11	No: T13
T14	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: System Main Fuse - Check the following component for proper operation: System Main Fuse	
	Yes: E12	No: E13
T15	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Connect fused jumper wire to: Circuit Main Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T15	No: T17
T16	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Main Relay – Socket Terminal E58-3 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E02	No: T16
T17	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Disconnect wiring harness connector from: ECM - Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation.	
	Yes: E01	No: E14
T18	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Fuel pump relay - Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation.	
	Yes: E15	No: E16

Test	Work Order Description	Nominal Value
T19	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Fuse - Check the following component for proper operation: Circuit Fuse	
	Yes: T20	No: T21
T20	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E17	No: E18
T21	Check: Short to Ground of Voltage Supply Circuit	greater than 500 kOhm
	- Remove fused jumper wire - Disconnect wiring harness connector from: EGR Valve - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-5 & Ground	
	Yes: T22	No: E19
T22	Check: Component	Test okay?
	- Connect wiring harness connector to: EGR Valve - Connect fused jumper wire to: Circuit Fuse – Output contact & Battery positive (+) terminal - Check the following component for proper operation Fuse of the fused jumper wire	
	Yes: E01	No: E20

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Main Relay
E03	- Short circuit to ground/interruption of circuit between: Main Relay – Socket Terminal E58-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-80 or - Defective component: Main Relay
E04	Circuit interruption between: Main Relay – Socket Terminal E58-4 & ECM – harness connector (wiring harness side) terminal C66-5
E05	Circuit interruption between: Main Relay – Socket Terminal E58-4 & ECM – Wiring harness connector (wiring harness side) terminal E27-4
E06	Circuit interruption between: Main Relay – Socket Terminal E58-4 & ECM – Wiring harness connector (wiring harness side) terminal E27-6
E07	Short circuit to voltage between: Main Relay – Socket Terminal E58-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-80
E08	- Short circuit to voltage between: Circuit Fuse – Output contact & EGR Valve – Wiring harness connector (wiring harness side) terminal C70-1 & ECM – Wiring harness connector (wiring harness side) terminal E27-5, C66-5 or - Defective component: EGR Valve
E09	Short circuit to voltage between: Circuit Fuse – Input contact & ECM – Wiring harness connector (wiring harness side) terminal E27-4, E27-6
E10	Circuit interruption between: Circuit Main Fuse – Output contact & Main Relay – Socket Terminal E58-1

Result	Cause Of Fault
E11	• Circuit interruption between: Circuit Main Fuse – Output contact & Main Relay – Socket Terminal E58-2
E12	• Defective component: Battery or • Circuit interruption between: Battery – Positive (+) terminal & System Main Fuse – Input contact
E13	• Defective component: Alternator or • Short circuit to ground between: System Main Fuse – Output contact & Alternator – Wiring harness connector (wiring harness side) terminal C47-1 & Circuit Main Fuses – Input contact
E14	• Short circuit to ground between: Main Relay – Socket Terminal E58-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-80
E15	• Short circuit to ground between: Fuel Pump Relay – Socket terminal C53-4 & Fuel Pump and Gauge Unit – Wiring harness connector (Wiring harness side) terminal L71-3 or - Defective component: Fuel Pump
E16	• Short circuit to ground between: Circuit Main Fuse – Output contact & Fuel Pump Relay – Socket terminal C53-3
E17	• Circuit interruption between: Main Relay – Socket terminal E58-4 & Circuit Fuse – Input contact
E18	• Circuit interruption between Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-5
E19	• Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal E27-5, C66-5
E20	• Defective component: EGR Valve

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Main Relay - Measure voltage between the following terminals: Main Relay – Socket Terminal E75-2 & Ground	
	Yes: T02	No: T12
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Main Relay – Socket Terminal E75-1 & Ground	
	Yes: T03	No: E10
T03	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	- Disconnect wiring harness connector from: ECM - Ignition ON - Measure voltage between the following terminals: Main Relay – Socket Terminal E75-4 & Ground	
	Yes: T04	No: T11
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	Measure voltage between the following terminals: Main Relay – Socket Terminal E75-3 & Ground	
	Yes: T05	No: E07
T05	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Connect fused jumper wire to: Main Relay – Socket Terminal E75-4 & Battery positive (+) terminal - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-6 & Ground	
	Yes: T06	No: E06
T06	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-4 & Ground	
	Yes: T07	No: E05

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-5 & Ground	
	Yes: T08	No: T19
T08	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal D26-5 & Ground	
	Yes: T09	No: E04
T09	Check: Component	greater than 11 V
	- Remove fused jumper wire - Insert electrical component in socket: Main Relay - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-80 & Ground	
	Yes: T10	No: E03
T10	Check: Component	greater than 11 V
	- Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-80 & Ground - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-5 & Ground	
	Yes: E01	No: E02
T11	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	- Remove electrical component from socket: Circuit Fuse - Measure voltage between the following terminals: Main Relay – Socket Terminal E75-4 & Ground	
	Yes: E08	No: E09
T12	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Main Fuse - Check the following component for proper operation: Circuit Main Fuse	
	Yes: T13	No: T15

Test	Work Order Description	Nominal Value
T13	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E11	No: T14
T14	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: System Main Fuse - Check the following component for proper operation: System Main Fuse	
	Yes: E12	No: E13
T15	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Connect fused jumper wire to: Circuit Main Fuse – Output contact & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T16	No: T18
T16	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Main Relay – Socket Terminal E75-3 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E02	No: T17
T17	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Disconnect wiring harness connector from: ECM - Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation.	
	Yes: E01	No: E14
T18	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Fuel pump relay - Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation.	
	Yes: E15	No: E16
T19	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Fuse - Check the following component for proper operation: Circuit Fuse	
	Yes: T20	No: T21

Test	Work Order Description	Nominal Value
T20	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E17	No: E18
T21	Check: Short to Ground of Voltage Supply Circuit	greater than 500 kOhm
	- Remove fused jumper wire - Disconnect wiring harness connector from: EGR Valve - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-5 & Ground	
	Yes: T22	No: E19
T22	Check: Component	Test okay?
	- Connect wiring harness connector to: EGR Valve - Connect fused jumper wire to: Circuit Fuse – Output contact & Battery positive (+) terminal - Check the following component for proper operation Fuse of the fused jumper wire	
	Yes: E01	No: E20

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Main Relay
E03	- Short circuit to ground/interruption of circuit between: Main Relay – Socket Terminal E75-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-80 or - Defective component: Main Relay
E04	Circuit interruption between: Main Relay – Socket Terminal E75-4 & ECM – harness connector (wiring harness side) terminal D26-5
E05	Circuit interruption between: Main Relay – Socket Terminal E75-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-4
E06	Circuit interruption between: Main Relay – Socket Terminal E75-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-6
E07	Short circuit to voltage between: Main Relay – Socket Terminal E75-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-80
E08	- Short circuit to voltage between: Circuit Fuse – Output contact & EGR Valve – Wiring harness connector (wiring harness side) terminal D31-6 & ECM – Wiring harness connector (wiring harness side) terminal G88-5, D26-5 or - Defective component: EGR Valve
E09	Short circuit to voltage between: Circuit Fuse – Input contact & ECM – Wiring harness connector (wiring harness side) terminal G88-4, G88-6
E10	Circuit interruption between: Circuit Main Fuse – Output contact & Main Relay – Socket Terminal E75-1

Result	Cause Of Fault
E11	• Circuit interruption between: Circuit Main Fuse – Output contact & Main Relay – Socket Terminal E75-2
E12	• Defective component: Battery or • Circuit interruption between: Battery – Positive (+) terminal & System Main Fuse – Input contact
E13	• Defective component: Alternator or • Short circuit to ground between: System Main Fuse – Output contact & Alternator – Wiring harness connector (wiring harness side) terminal C47-1 & Circuit Main Fuses – Input contact
E14	• Short circuit to ground between: Main Relay – Socket Terminal E75-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-80
E15	• Short circuit to ground between: Fuel Pump Relay – Socket terminal E52-3 & Fuel Pump and Gauge Unit – Wiring harness connector (Wiring harness side) terminal R02-3 or - Defective component: Fuel Pump
E16	• Short circuit to ground between: Circuit Main Fuse – Output contact & Fuel Pump Relay – Socket terminal E52-4
E17	• Circuit interruption between: Main Relay – Socket terminal E75-4 & Circuit Fuse – Input contact
E18	• Circuit interruption between Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal G88-5
E19	• Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal G88-5, D26-5
E20	• Defective component: EGR Valve.

C-05, Crankshaft Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	1.2 ... 1.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Crankshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C78-1 & Ground	
	Yes: T02	No: E05
T02	Check: Interruption of Voltage Supply Circuit	2.2 ... 2.8 V
	• Measure voltage between the following terminals: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C78-2 & Ground	
	Yes: T03	No: E04
T03	Check: Adjustment	Test okay?
	• Check the following system for proper operation: Crankshaft Position Sensor (intermittent problems, missing teeth, wrong reference point, incorrect gap position, etc.)	
	Yes: T04	No: E03
T04	Check: Component	greater than 0.2 V Alternating-current voltage
	• Connect wiring harness connector to: Crankshaft Position Sensor • Disconnect wiring harness connector from: ECM • Switch multimeter to alternating-current voltage measurement. • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal C66-43 & ECM – Wiring harness connector (wiring harness side) terminal C66-59 • Engine cranking	
	Yes: E01	No: E02

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Crankshaft Position Sensor
E03	Refer to “Crankshaft position (CKP) sensor (engine speed sensor) inspection” in Section 6E3.
E04	- Short to voltage/ground/interruption of circuit between: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C78-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-59 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short to voltage/ground/interruption of circuit between: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C78-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-43 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	1.2 ... 1.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Crankshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D45-1 & Ground	
	Yes: T02	No: E05
T02	Check: Interruption of Voltage Supply Circuit	2.2 ... 2.8 V
	• Measure voltage between the following terminals: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D45-2 & Ground	
	Yes: T03	No: E04
T03	Check: Adjustment	Test okay?
	• Check the following system for proper operation: Crankshaft Position Sensor (intermittent problems, missing teeth, wrong reference point, incorrect gap position, etc.)	
	Yes: T04	No: E03
T04	Check: Component	greater than 0.2 V Alternating-current voltage
	• Connect wiring harness connector to: Crankshaft Position Sensor • Disconnect wiring harness connector from: ECM • Switch multimeter to alternating-current voltage measurement. • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal D26-43 & ECM – Wiring harness connector (wiring harness side) terminal D26-59 • Engine cranking	
	Yes: E01	No: E02

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Crankshaft Position Sensor
E03	Refer to “Crankshaft position (CKP) sensor (engine speed sensor) inspection”.
E04	- Short to voltage/ground/interruption of circuit between: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D45-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-59 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short to voltage/ground/interruption of circuit between: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D45-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-43 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-06, Fuel Pump Relay Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Signal Circuit	greater than 11 V
	- Remove electrical component from socket: Fuel Pump Relay - Ignition ON - Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal C53-2 & Ground	
	Yes: T02	No: E11
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal C53-3 & Ground	
	Yes: T03	No: E10
T03	Check: Short to Voltage/Ground/Interruption of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) - Ignition ON - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Ground	
	Yes: T04	No: E09
T04	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Ground	
	Yes: T05	No: E08
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Fuel Pump Relay – Socket C53-1	
	Yes: T06	No: E07
T06	Check: Short to Voltage of Ground Circuit	less than 0.3 V
	- Ignition ON - Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal C53-4 & Ground	
	Yes: T07	No: E06

Test	Work Order Description	Nominal Value
T07	Check: Component	Is the fuel pump running?
	• Ignition OFF • Connect fused jumper wire to: Fuel Pump Relay – Socket terminal C53-3 & Fuel Pump Relay – Socket terminal C53-4	
	Yes: T08	No: T09
T08	Check: Component	Is the fuel pump running?
	• Insert electrical component in socket: Fuel Pump Relay • Ignition ON • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Ground	
	Yes: E01	No: E02
T09	Check: Interruption of Signal Circuit	greater than 11 V
	• Disconnect wiring harness connector from: Fuel Pump • Measure voltage between the following terminals: Fuel Pump – Wiring harness connector (wiring harness side) terminal L71-3 & Ground	
	Yes: T10	No: E05
T10	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Measure resistance between the following terminals: Fuel Pump – Wiring harness connector (wiring harness side) terminal L71-4 & Ground	
	Yes: E03	No: E04

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Fuel Pump Relay
E03	Defective component: Fuel Pump
E04	Circuit interruption between: Fuel Pump – Wiring harness connector (wiring harness side) terminal L71-4 & Ground
E05	Circuit interruption between: Fuel pump Relay – Socket terminal C53-4 & Fuel Pump – Wiring harness connector (wiring harness side) terminal L71-3
E06	- Short circuit to voltage between: Fuel Pump Relay – Socket terminal C53-4 & Fuel Pump – Wiring harness connector (wiring harness side) terminal L71-3 or - Defective component: Fuel Pump
E07	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Fuel Pump Relay – Socket terminal C53-1
E08	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Fuel Pump Relay – Socket terminal C53-1
E09	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-75 & Fuel Pump Relay – Socket terminal C53-1
E10	Circuit interruption between: Circuit Main Fuse – Output contact & Fuel Pump Relay – Socket terminal C53-3
E11	Circuit interruption between: Circuit Fuse – Output contact & Fuel Pump Relay – Socket terminal C53-2

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Signal Circuit	greater than 11 V
	- Remove electrical component from socket: Fuel Pump Relay - Ignition ON - Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal E52-2 & Ground	
	Yes: T02	No: E11
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal E52-4 & Ground	
	Yes: T03	No: E10
T03	Check: Short to Voltage/Ground/Interruption of Signal Circuit	less than 0.3 V
	- Ignition OFF Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) - Ignition ON - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Ground	
	Yes: T04	No: E09
T04	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Ground	
	Yes: T05	No: E08
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Fuel Pump Relay – Socket E52-1	
	Yes: T06	No: E07
T06	Check: Short to Voltage of Ground Circuit	less than 0.3 V
	- Ignition ON - Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal E52-3 & Ground	
	Yes: T07	No: E06

Test	Work Order Description	Nominal Value
T07	Check: Component	Is the fuel pump running?
	- Ignition OFF - Connect fused jumper wire to: Fuel Pump Relay – Socket terminal E52-4 & Fuel Pump Relay – Socket terminal E52-3	
	Yes: T08	No: T09
T08	Check: Component	Is the fuel pump running?
	- Insert electrical component in socket: Fuel Pump Relay - Ignition ON - Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Ground	
	Yes: E01	No: E02
T09	Check: Interruption of Signal Circuit	greater than 11 V
	- Disconnect wiring harness connector from: Fuel Pump - Measure voltage between the following terminals: Fuel Pump – Wiring harness connector (wiring harness side) terminal R02-3 & Ground	
	Yes: T10	No: E05
T10	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	Measure resistance between the following terminals: Fuel Pump – Wiring harness connector (wiring harness side) terminal R02-4 & Ground	
	Yes: E03	No: E04

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration in Section 6E3.
E02	Defective component: Fuel Pump Relay
E03	Defective component: Fuel Pump
E04	Circuit interruption between: Fuel Pump – Wiring harness connector (wiring harness side) terminal R02-4 & Ground
E05	Circuit interruption between: Fuel pump Relay – Socket terminal E52-3 & Fuel Pump – Wiring harness connector (wiring harness side) terminal R02-3
E06	- Short circuit to voltage between: Fuel Pump Relay – Socket terminal E52-3 & Fuel Pump – Wiring harness connector (wiring harness side) terminal R02-3 or - Defective component: Fuel Pump
E07	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Fuel Pump Relay – Socket terminal E52-1
E08	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Fuel Pump Relay – Socket terminal E52-1
E09	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-75 & Fuel Pump Relay – Socket terminal E52-1
E10	Circuit interruption between: Circuit Main Fuse – Output contact & Fuel Pump Relay – Socket terminal E52-4
E11	Circuit interruption between: Circuit Fuse – Output contact & Fuel Pump Relay – Socket terminal E52-2

C-07, 5V Circuit 1**Test Table (For RM413D)**

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Ground	
	Yes: T02	No: T03
T02	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-2	
	Yes: E01	No: E02
T03	Check: Short to Voltage/Ground/Interruption of Voltage Supply	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Ground	
	Yes: T04	No: T05
T04	Check: Short to Ground of Voltage Supply Circuit	greater than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Ground	
	Yes: E03	No: E04

Test	Work Order Description	Nominal Value
T05	Check: Short to Voltage of Voltage Supply Circuit	less than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Ground	
	Yes: E03	No: E05

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Boost Pressure Sensor
E02	- Short circuit to voltage/interruption of circuit between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-24 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Defective component: Fuel Pressure Sensor
E04	- Short circuit to ground/interruption of circuit between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-23 or Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-8 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-23 or Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-8 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Ground	
	Yes: T02	No: T03
T02	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-2	
	Yes: E01	No: E02
T03	Check: Short to Voltage/Ground/Interruption of Voltage Supply	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Ground	
	Yes: T04	No: T05
T04	Check: Short to Ground of Voltage Supply Circuit	greater than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Ground	
	Yes: E03	No: E04

Test	Work Order Description	Nominal Value
T05	Check: Short to Voltage of Voltage Supply Circuit	less than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Ground	
	Yes: E03	No: E05

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Boost Pressure Sensor
E02	- Short circuit to voltage/interruption of circuit between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-24 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Defective component: Fuel Pressure Sensor
E04	- Short circuit to ground/interruption of circuit between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-23 or Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-8 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-23 or Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-8 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-08, 5V Circuit 2**Test Table (For RM413D)**

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Interruption of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & Ground	
	Yes: E01	No: T02
T02	Check: Short to Voltage/Interruption of Voltage Supply Circuit	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & Ground	
	Yes: T03	No: T04
T03	Check: Short to Ground/Interruption of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Camshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & Ground • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: Pedal Position Sensor	
	Yes: E02	No: E03

Test	Work Order Description	Nominal Value
T04	Check: Short to Voltage of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Camshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & Ground • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: Pedal Position Sensor	
	Yes: E02	No: E04

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: MAF and IAT Sensor
E02	If the nominal value is reached during one of the measurements, the component/control unit that has been disconnected immediately before that measurement is defective.
E03	- Short circuit to ground/interruption of circuit between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & ECM – Wiring harness connector (wiring harness side) terminal C66-40 or Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-25 or Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & ECM – Wiring harness connector (wiring harness side) terminal E27-83 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to voltage between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & ECM – Wiring harness connector (wiring harness side) terminal C66-40 or Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & ECM – Wiring harness connector (wiring harness side) terminal E27-83 or Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-25 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Interruption of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & Ground	
	Yes: E01	No: T02
T02	Check: Short to Voltage/Interruption of Voltage Supply Circuit	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & Ground	
	Yes: T03	No: T04
T03	Check: Short to Ground/Interruption of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Camshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & Ground • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: Pedal Position Sensor	
	Yes: E02	No: E03

Test	Work Order Description	Nominal Value
T04	Check: Short to Voltage of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Camshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & Ground • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: Pedal Position Sensor	
	Yes: E02	No: E04

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: MAF and IAT Sensor
E02	If the nominal value is reached during one of the measurements, the component/control unit that has been disconnected immediately before that measurement is defective.
E03	- Short circuit to ground/interruption of circuit between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & ECM – Wiring harness connector (wiring harness side) terminal D26-40 or Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-25 or Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & ECM – Wiring harness connector (wiring harness side) terminal G88-83 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to voltage between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & ECM – Wiring harness connector (wiring harness side) terminal D26-40 or Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & ECM – Wiring harness connector (wiring harness side) terminal G88-83 or Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-25 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-09, 5V Circuit 3**Test Table (For RM413D)**

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Ground	
	Yes: T02	No: T03
T02	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-2	
	Yes: E01	No: E02
T03	Check: Short to Voltage/Ground/Interruption of Voltage Supply	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Ground	
	Yes: T04	No: T06
T04	Check: Vehicle Configuration	
	Is the following information correct for the actual vehicle? Air Conditioning	
	Yes: T05	No: E05
T05	Check: Short to Ground of Voltage Supply Circuit	greater than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Ground	
	Yes: E03	No: E04

Test	Work Order Description	Nominal Value
T06	Check: Vehicle Configuration	
	Is the following information correct for the actual vehicle? Air Conditioning	
	Yes: T07	No: E08
T07	Check: Short to Voltage of Voltage Supply Circuit	less than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Ground	
	Yes: E06	No: E07

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Pedal Position Sensor
E02	- Short to voltage/ground/interruption of circuit between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-2 & ECM – Wiring harness connector (wiring harness side) terminal E27-32 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Defective component: A/C Pressure Sensor
E04	- Short circuit to ground/interruption of circuit between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & ECM – Wiring harness connector (wiring harness side) terminal E27-15 or A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 & ECM – Wiring harness connector (wiring harness side) terminal E27-37 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to ground/interruption of circuit between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & ECM – Wiring harness connector (wiring harness side) terminal E27-15 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	Defective component: A/C Pressure Sensor

Result	Cause Of Fault
E07	• Short circuit to voltage between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & ECM – Wiring harness connector (wiring harness side) terminal E27-15 or A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 & ECM – Wiring harness connector (wiring harness side) terminal E27-37 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Short circuit to voltage between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & ECM – Wiring harness connector (wiring harness side) terminal E27-15 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Ground	
	Yes: T02	No: T03
T02	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-2	
	Yes: E01	No: E02
T03	Check: Short to Voltage/Ground/Interruption of Voltage Supply	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Ground	
	Yes: T04	No: T06
T04	Check: Vehicle Configuration	
	Is the following information correct for the actual vehicle? Air Conditioning	
	Yes: T05	No: E05
T05	Check: Short to Ground of Voltage Supply Circuit	greater than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Ground	
	Yes: E03	No: E04

Test	Work Order Description	Nominal Value
T06	Check: Vehicle Configuration	
	Is the following information correct for the actual vehicle? Air Conditioning	
	Yes: T07	No: E08
T07	Check: Short to Voltage of Voltage Supply Circuit	less than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Ground	
	Yes: E06	No: E07

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Pedal Position Sensor
E02	- Short to voltage/ground/interruption of circuit between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-2 & ECM – Wiring harness connector (wiring harness side) terminal G88-32 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Defective component: A/C Pressure Sensor
E04	- Short circuit to ground/interruption of circuit between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & ECM – Wiring harness connector (wiring harness side) terminal G88-15 or A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-37 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to ground/interruption of circuit between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & ECM – Wiring harness connector (wiring harness side) terminal G88-15 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	Defective component: A/C Pressure Sensor

Result	Cause Of Fault
E07	• Short circuit to voltage between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & ECM – Wiring harness connector (wiring harness side) terminal G88-15 or A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-37 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Short circuit to voltage between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & ECM – Wiring harness connector (wiring harness side) terminal G88-15 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-10, Pedal Position Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	- Ignition OFF - Disconnect wiring harness connector from: Pedal Position Sensor - Ignition ON - Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & Ground	
	Yes: T02	No: T10
T02	Check: Circuit Interruption of Ground Circuit	greater than 4.8 V
	Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-3	
	Yes: T03	No: E09
T03	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	- Ignition OFF - Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-4 - Ignition ON - Scan Tool Data List Parameter PPS 1 (Pedal Position Sensor)	
	Yes: T04	No: T09
T04	Check: Short to Voltage of Signal Circuit	4.8 ... 5.2 V
	Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Ground	
	Yes: T05	No: T08
T05	Check: Short to Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-2	
	Yes: T06	No: E04

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground of Signal Circuit	2.4 ... 2.6 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-1 • Ignition ON • Scan Tool Data List Parameter PPS 2 (Pedal Position Sensor)	
	Yes: E01	No: T07
T07	Check: Short to Ground of Signal Circuit	greater than 2.6 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-1 • Ignition ON • Scan Tool Data List Parameter PPS 2 (Pedal Position Sensor)	
	Yes: E02	No: E03
T08	Check: Short to Voltage of Signal Circuit	greater than 5.2 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 & Ground	
	Yes: E05	No: E06
T09	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-4 • Ignition ON • Scan Tool Data List Parameter PPS 1 (Pedal Position Sensor)	
	Yes: E07	No: E08

Test	Work Order Description	Nominal Value
T10	Check: Short to Voltage/Ground/Interruption of Voltage Supply	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 & Ground	
	Yes: E10	No: E11

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Pedal Position Sensor
E02	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-41 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-1
E03	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-41 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-32 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-15 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6
E06	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-15 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-6 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E07	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-65 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-4 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-65 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-4 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E09	• Circuit interruption between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-35 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E10	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-83 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E11	• Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-83 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal E25-5 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & Ground	
	Yes: T02	No: T10
T02	Check: Circuit Interruption of Ground Circuit	greater than 4.8 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-3	
	Yes: T03	No: E09
T03	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-4 • Ignition ON • Scan Tool Data List Parameter PPS 1 (Pedal Position Sensor)	
	Yes: T04	No: T09
T04	Check: Short to Voltage of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Ground	
	Yes: T05	No: T08
T05	Check: Short to Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-2	
	Yes: T06	No: E04

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground of Signal Circuit	2.4 ... 2.6 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-1 • Ignition ON • Scan Tool Data List Parameter PPS 2 (Pedal Position Sensor)	
	Yes: E01	No: T07
T07	Check: Short to Ground of Signal Circuit	greater than 2.6 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-1 • Ignition ON • Scan Tool Data List Parameter PPS 2 (Pedal Position Sensor)	
	Yes: E02	No: E03
T08	Check: Short to Voltage of Signal Circuit	greater than 5.2 V
	• Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 & Ground	
	Yes: E05	No: E06
T09	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Connect fused jumper wire to: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-4 • Ignition ON • Scan Tool Data List Parameter PPS 1 (Pedal Position Sensor)	
	Yes: E07	No: E08

Test	Work Order Description	Nominal Value
T10	Check: Short to Voltage/Ground/Interruption of Voltage Supply	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Pedal Position Sensor • Ignition ON • Measure voltage between the following terminals: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 & Ground	
	Yes: E10	No: E11

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Pedal Position Sensor
E02	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-41 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-1
E03	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-41 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-32 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-15 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6
E06	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-15 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-6 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E07	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-65 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-4 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-65 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-4 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E09	• Circuit interruption between: Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-35 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E10	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-83 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E11	• Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-83 & Pedal Position Sensor – Wiring harness connector (wiring harness side) terminal G82-5 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C11, Barometer Sensor Circuit

Result Table

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-12, Boost Pressure Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Circuit Interruption of Ground Circuit	4.8 ... 5.2 V
	- Ignition OFF - Disconnect wiring harness connector from: Boost Pressure Sensor - Ignition ON - Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-2	
	Yes: T02	No: T05
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) - Ignition ON - Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-3 & Ground	
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-41	
	Yes: T04	No: E03
T04	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	Measure resistance between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-3 & Ground	
	Yes: E01	No: E02

Test	Work Order Description	Nominal Value
T05	Check: Circuit Interruption of Ground Circuit	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-1 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-2	
	Yes: E05	No: E06

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Boost Pressure Sensor or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Short circuit to ground between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-41
E03	Circuit interruption between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-41
E04	- Short circuit to voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-41 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Circuit interruption between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-24 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-24 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal C48-2

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Circuit Interruption of Ground Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-2	
	Yes: T02	No: T05
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-1 & Ground	
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-41	
	Yes: T04	No: E03
T04	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Measure resistance between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-1 & Ground	
	Yes: E01	No: E02

Test	Work Order Description	Nominal Value
T05	Check: Circuit Interruption of Ground Circuit	less than 4.8 V
	• Ignition OFF • Disconnect wiring harness connector from: Boost Pressure Sensor • Ignition ON • Measure voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-3 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-2	
	Yes: E05	No: E06

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Boost Pressure Sensor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Short circuit to ground between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-41
E03	Circuit interruption between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-41
E04	- Short circuit to voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-41 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Circuit interruption between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-24 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-24 & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal D29-2

C-13, Intake Air Temperature Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-1 & Ground	
	Yes: T02	No: T04
T02	Check: Component	greater than 4.8 V
	• Scan Tool Data List Parameter Intake Air Temperature	
	Yes: T03	No: E03
T03	Check: Circuit Interruption of Ground Circuit	less than 0.3 V
	• Connect fused jumper wire to: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-1 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-3 • Scan Tool Data List Parameter Intake Air Temperature	
	Yes: E01	No: E02
T04	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-1 & Ground	
	Yes: E04	No: E05

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: MAF and IAT Sensor
E02	- Short circuit to voltage/interruption of circuit between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-27 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-10 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal C66-10 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-1 & Ground	
	Yes: T02	No: T04
T02	Check: Component	greater than 4.8 V
	• Scan Tool Data List Parameter Intake Air Temperature	
	Yes: T03	No: E03
T03	Check: Circuit Interruption of Ground Circuit	less than 0.3 V
	• Connect fused jumper wire to: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-1 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-3 • Scan Tool Data List Parameter Intake Air Temperature	
	Yes: E01	No: E02
T04	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-1 & Ground	
	Yes: E04	No: E05

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: MAF and IAT Sensor
E02	- Short circuit to voltage/interruption of circuit between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-24 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-10 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal D26-10 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-14, Mass or Volume Air Flow Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-2 & Ground	
	Yes: T02	No: E08
T02	Check: Short to Voltage/Interruption of Ground Circuit	greater than 11 V
	• Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-2 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-3	
	Yes: T03	No: T07
T03	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4 & Ground	
	Yes: T04	No: E05
T04	Check: Short to Voltage/Ground/Interruption of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-5 & Ground	
	Yes: T05	No: E04
T05	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Measure resistance between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-5 & Ground	
	Yes: T06	No: E03

Test	Work Order Description	Nominal Value
T06	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-5 & ECM – Wiring harness connector (wiring harness side) terminal C66-14	
	Yes: E01	No: E02
T07	Check: Short to Voltage of Ground Circuit	less than 0.3 V
	Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-3 & Ground	
	Yes: E06	No: E07

Result table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: MAF and IAT Sensor or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-14 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-5
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal C66-14 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-5
E04	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-14 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-5
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-40 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-4
E06	- Circuit interruption between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-3 & ECM – Wiring harness connector (wiring harness side) terminal C66-27 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-27 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-3 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E08	• Circuit interruption between: Circuit Fuse – Output contact & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal C79-2

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: MAF and IAT Sensor • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-2 & Ground	
	Yes: T02	No: E08
T02	Check: Short to Voltage/Interruption of Ground Circuit	greater than 11 V
	• Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-2 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-3	
	Yes: T03	No: T07
T03	Check: Short to Voltage/Ground/Interruption of Voltage Supply	4.8 ... 5.2 V
	• Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4 & Ground	
	Yes: T04	No: E05
T04	Check: Short to Voltage/Ground/Interruption of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-5 & Ground	
	Yes: T05	No: E04
T05	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Measure resistance between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-5 & Ground	
	Yes: T06	No: E03

Test	Work Order Description	Nominal Value
T06	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-5 & ECM – Wiring harness connector (wiring harness side) terminal D26-14	
	Yes: E01	No: E02
T07	Check: Short to Voltage of Ground Circuit	less than 0.3 V
	Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-3 & Ground	
	Yes: E06	No: E07

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: MAF and IAT Sensor or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-14 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-5
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal D26-14 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-5
E04	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-14 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-5
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-40 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-4
E06	- Circuit interruption between: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-27 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-27 & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-3 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E08	• Circuit interruption between: Circuit Fuse – Output contact & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal D42-2

C-15, Engine Coolant Temperature Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	- Ignition OFF - Disconnect wiring harness connector from: ECT Sensor - Ignition ON - Measure voltage between the following terminals: ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-1 & Ground	
	Yes: T02	No: T05
T02	Check: Circuit Interruption of Ground Circuit	4.8 ... 5.2 V
	Measure voltage between the following terminals: ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-2 & ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-1	
	Yes: T03	No: E03
T03	Check: Component	greater than 4.8 V
	Scan Tool Data List Parameter Coolant Temperature	
	Yes: T04	No: E02
T04	Check: Component	less than 0.3 V
	- Ignition OFF - Connect fused jumper wire to: ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-2 & ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-1 - Ignition ON - Scan Tool Data List Parameter Coolant Temperature	
	Yes: E01	No: E02
T05	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	- Ignition OFF - Disconnect wiring harness connector from: ECT Sensor - Ignition ON - Measure voltage between the following terminals: ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-1 & Ground	
	Yes: E04	No: E05

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECT Sensor
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	- Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal C66-29 & ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-54 & ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal C66-54 & ECT Sensor – Wiring harness connector (wiring harness side) terminal C19-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: ECT Sensor • Ignition ON • Measure voltage between the following terminals: ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-1 & Ground	
	Yes: T02	No: T05
T02	Check: Circuit Interruption of Ground Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-2 & ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-1	
	Yes: T03	No: E03
T03	Check: Component	greater than 4.8 V
	• Scan Tool Data List Parameter Coolant Temperature	
	Yes: T04	No: E02
T04	Check: Component	less than 0.3 V
	• Ignition OFF • Connect fused jumper wire to: ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-2 & ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-1 • Ignition ON • Scan Tool Data List Parameter Coolant Temperature	
	Yes: E01	No: E02
T05	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: ECT Sensor • Ignition ON • Measure voltage between the following terminals: ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-1 & Ground	
	Yes: E04	No: E05

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECT Sensor
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	- Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal D26-29 & ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-54 & ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal D26-54 & ECT Sensor – Wiring harness connector (wiring harness side) terminal D44-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-16, Fuel Temperature Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Ignition ON - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-13 & Ground	
	Yes: T02	No: E05
T02	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-13 & Ground	
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit	less than 5 Ohm
	- Disconnect wiring harness connector from: Fuel Heater and Temperature Sensor - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-4	
	Yes: T04	No: E03
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-3	
	Yes: E01	No: E02

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Fuel Heater and Temperature Sensor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-3
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-4
E04	- Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-1 or ECM – Wiring harness connector (wiring harness side) terminal E27-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-3 or - Defective component: Fuel Heater and Temperature Sensor
E05	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-13 & Fuel Heater and Temperature Sensor Wiring harness connector (wiring harness side) terminal E50-4 or ECM – Wiring harness connector (wiring harness side) terminal E27-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-3 or - Defective component: Fuel Heater and Temperature Sensor

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-13 & Ground	
	Yes: T02	No: E05
T02	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-13 & Ground	
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Fuel Heater and Temperature Sensor • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-4	
	Yes: T04	No: E03
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-3	
	Yes: E01	No: E02

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Fuel Heater and Temperature Sensor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-3
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-4
E04	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-4 or ECM – Wiring harness connector (wiring harness side) terminal G88-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-3 or Defective component: Fuel Heater and Temperature Sensor
E05	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-13 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-4 or ECM – Wiring harness connector (wiring harness side) terminal G88-61 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-3 or Defective component: Fuel Heater and Temperature Sensor

C-17, Fuel Rail Pressure Sensor Circuit

NOTE:

Before starting diagnosis, check the value of the fuel rail pressure by using scan tool.

For checking the value, refer to “B-02, Data List” in this section.

If the value is less than 0.15 V or more than 4.85 V, go to “C-17, Fuel Rail Pressure Sensor Circuit”. If not, go to “C-18, Rail Oil Pressure Sensor Circuit”.

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 & Ground	
	Yes: T02	No: T06
T02	Check: Short to Voltage/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-1	
	Yes: T03	No: E05
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between the following terminal: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-2 & Ground	
	Yes: T04	No: E04
T04	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between the following terminal: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-2 & Ground	
	Yes: T05	No: E03

Test	Work Order Description	Nominal Value
T05	Check: Interruption in Wiring Harness	less than 5 Ohm
	• Measure resistance between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-38	
	Yes: E01	No: E02
T06	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 & Ground	
	Yes: E06	No: E07

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Fuel Pressure Sensor or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-38 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-2
E03	Short circuit to ground between: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-38
E04	Short circuit to voltage between: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-38
E05	- Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal C66-6 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal E50-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-8 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E07	• Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal C66-8 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal C40-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 & Ground	
	Yes: T02	No: T06
T02	Check: Short to Voltage/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-2	
	Yes: T03	No: E05
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-3 & Ground	
	Yes: T04	No: E04
T04	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-3 & Ground	
	Yes: T05	No: E03
T05	Check: Interruption in Wiring Harness	less than 5 Ohm
	• Measure resistance between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-38	
	Yes: E01	No: E02

Test	Work Order Description	Nominal Value
T06	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Sensor • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 & Ground	
	Yes: E06	No: E07

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Fuel Pressure Sensor or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-38 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-3
E03	Short circuit to ground between: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-38
E04	Short circuit to voltage between: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-3 & ECM – Wiring harness connector (wiring harness side) terminal D26-38
E05	- Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal D26-6 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-8 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E07	• Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal D26-8 & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal D28-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-18, Rail Oil Pressure Sensor Circuit

Test Table

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored?	
	P1192 Rail Pressure Higher Than Maximum	
	Yes: E01	No: T02
T02	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored?	
	P1190 Fuel Pressure Regulator Flow	
	Yes: E01	No: E02

Result Table

Result	Cause Of Fault
E01	Defective component: Fuel Pressure Sensor or Fuel Pressure Regulator NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement.
E02	Defective component: Fuel Pressure Sensor

C-19, Fuel Rail Pressure Control Valve Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Fuel Pressure Regulator - Ignition ON - Measure voltage between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-1 & Ground	
	Yes: T02	No: T05
T02	Check: Short to Voltage of Signal Circuit	greater than 11 V
	Measure voltage between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-1 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-2	
	Yes: E01	No: T03
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) - Measure resistance between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-2 & Ground	
	Yes: T04	No: E04
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal C66-34 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-2	
	Yes: E02	No: E03
T05	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) - Measure resistance between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-1 & Ground	
	Yes: T06	No: E07

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground of Signal Circuit	less than 5 kOhm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal C66-4 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-1	
	Yes: T07	No: E06
T07	Check: Interruption of Signal Circuit	greater than 11 V
	- Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) - Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-80 & Ground - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-5 & Ground	
	Yes: E02	No: E05

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Fuel Pressure Regulator
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-34 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-2
E04	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal C66-34 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-2
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-5 & Main Relay – Socket Terminal E58-4
E06	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-4 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-1
E07	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal C66-4 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal C20-1

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Pressure Regulator • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-1 & Ground	
	Yes: T02	No: T05
T02	Check: Short to Voltage of Signal Circuit	greater than 11 V
	• Measure voltage between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-1 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-2	
	Yes: E01	No: T03
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Measure resistance between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-2 & Ground	
	Yes: T04	No: E04
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal D26-34 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-2	
	Yes: E02	No: E03
T05	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Measure resistance between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-1 & Ground	
	Yes: T06	No: E07

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground of Signal Circuit	less than 5 kOhm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal D26-4 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-1	
	Yes: T07	No: E06
T07	Check: Interruption of Signal Circuit	greater than 11 V
	- Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) - Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-80 & Ground - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-5 & Ground	
	Yes: E02	No: E05

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Fuel Pressure Regulator
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-34 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-2
E04	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal D26-34 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-2
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-5 & Main Relay – Socket Terminal E75-4
E06	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-4 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-1
E07	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal D26-4 & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal D30-1

C-20, Camshaft Position Sensor Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Signal Circuit	4.8 ... 5.2 V
	- Ignition OFF - Disconnect wiring harness connector from: Camshaft Position Sensor - Ignition ON - Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-3 & Ground	
	Yes: T02	No: E06
T02	Check: Interruption of Signal Circuit	4.8 ... 5.2 V
	Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-3 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-1	
	Yes: T03	No: E05
T03	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-2 & Ground	
	Yes: T04	No: T05
T04	Check: Adjustment	Test okay?
	Check the following component for proper operation: Camshaft Position Sensor (intermittent problems, missing teeth, wrong reference point, incorrect gap position, etc.)	
	Yes: E01	No: E02
T05	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-2 & Ground	
	Yes: E03	No: E04

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Camshaft Position Sensor or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Repair the concerned circuit/component.
E03	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-56 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal C66-56 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-21 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-1 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E06	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-25 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal C69-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Signal Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: Camshaft Position Sensor • Ignition ON • Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-1 & Ground	
	Yes: T02	No: E06
T02	Check: Interruption of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-1 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-3	
	Yes: T03	No: E05
T03	Check: Short to Voltage/Ground/Interruption of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-2 & Ground	
	Yes: T04	No: T05
T04	Check: Adjustment	Test okay?
	• Check the following component for proper operation: Camshaft Position Sensor (intermittent problems, missing teeth, wrong reference point, incorrect gap position, etc.)	
	Yes: E01	No: E02
T05	Check: Short to Voltage/Ground/Interruption of Signal Circuit	greater than 5.2 V
	• Measure voltage between the following terminals: Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-2 & Ground	
	Yes: E03	No: E04

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Camshaft Position Sensor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Repair the concerned circuit/component.
E03	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-56 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	- Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal D26-56 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-2 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	- Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-21 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-3 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E06	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-25 & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal D33-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-21, Brake Switch Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Brake Light Switch - Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-1 & Ground	
	Yes: T02	No: T10
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-4 & Ground	
	Yes: T03	No: E08
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition ON - Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 & Ground	
	Yes: T04	No: E07
T04	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & Ground	
	Yes: T05	No: T09
T05	Check: Component	OFF
	Scan Tool Data List Parameter Brake Switch	
	Yes: T06	No: E03
T06	Check: Interruption of Signal Circuit	ON
	- Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & Battery voltage - Scan Tool Data List Parameter Brake Switch	
	Yes: T07	No: E04

Test	Work Order Description	Nominal Value
T07	Check: Component	less than 0.3 V
	• Remove fused jumper wire • Ignition OFF • Disconnect harness connector from: ECM • Ignition ON • Measure voltage between the following terminals • ECM – Wiring harness connector (wiring harness connector side) terminal E27-68 & Ground	
	Yes: T08	No: E03
T08	Check: Interruption of Signal Circuit	greater than 11 V
	• Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 & Battery voltage • Measure voltage between the following terminals • ECM – Wiring harness connector (wiring harness side) terminal E27-68 & Ground	
	Yes: E01	No: E02
T09	Check: Component	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM • Ignition ON • Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & Ground • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: – ABS Control Module – Rear Combination Lamp (Left) – Rear Combination Lamp (Right) – High Mount Stop Light	
	Yes: E05	No: E06
T10	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T11	No: T12

Test	Work Order Description	Nominal Value
T11	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E09	No: E10
T12	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Disconnect wiring harness connector from: ECM - Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-1 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T13	No: E14
T13	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect wiring harness connector to: ECM - Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T14	No: E13
T14	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	- Remove fused jumper wire - Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & Battery voltage - Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E11	No: T15

Test	Work Order Description	Nominal Value
T15	Check: Component	Test okay?
	• Disconnect wiring harness connector from: Rear Combination Lamp (Left) • Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: – Rear Combination Lamp (Right) – ABS Control Module – ECM – High Mount Stop Lamp	
	Yes: E05	No: E12

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Brake Light Switch or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-68
E03	Short circuit to voltage between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-68
E04	- Circuit interruption between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & ECM – Wiring harness connector (wiring harness side) terminal E27-81 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	If the nominal value is reached during one of the measurements, the component/control unit that has been disconnected immediately before that measurement is defective.
E06	Short circuit to voltage between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & ABS Control Module – Wiring harness connector (wiring harness side) terminal E43-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-81 & Rear Combination Lamp (Left) – Wiring harness connector (wiring harness side) terminal L02-4 & Rear Combination Lamp (Right) – Wiring harness connector (wiring harness side) terminal L01-4 & High Mount Stop Light – Wiring harness connector (wiring harness side) terminal O02-1

Result	Cause Of Fault
E07	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-68 & Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Circuit interruption between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-4
E09	• Circuit interruption between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-1
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Circuit Fuse – Input contact
E11	• Defective component: Brake Light Switch
E12	• Short circuit to ground between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-2 & ABS Control Module – Wiring harness connector (wiring harness side) terminal E43-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-81 & Rear Combination Lamp (Left) – Wiring harness connector (wiring harness side) terminal L02-4 & Rear Combination Lamp (Right) – Wiring harness connector (wiring harness side) terminal L01-4 & High Mount Stop Light – Wiring harness connector (wiring harness side) terminal O02-1
E13	• Short circuit to ground between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-68 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E14	• Short circuit to ground between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal E36-1, E36-4 & ECM – Wiring harness connector (wiring harness side) terminal E27-50

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Brake Light Switch • Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-1 & Ground	
	Yes: T02	No: T10
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-2 & Ground	
	Yes: T03	No: E08
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition ON • Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 & Ground	
	Yes: T04	No: E07
T04	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	• Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & Ground	
	Yes: T05	No: T09
T05	Check: Component	OFF
	• Scan Tool Data List Parameter Brake Switch	
	Yes: T06	No: E03
T06	Check: Interruption of Signal Circuit	ON
	• Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & Battery voltage • Scan Tool Data List Parameter Brake Switch	
	Yes: T07	No: E04

Test	Work Order Description	Nominal Value
T07	Check: Component	less than 0.3 V
	• Remove fused jumper wire • Ignition OFF • Disconnect harness connector from: ECM • Ignition ON • Measure voltage between the following terminals • ECM – Wiring harness connector (wiring harness connector side) terminal G88-68 & Ground	
	Yes: T08	No: E03
T08	Check: Interruption of Signal Circuit	greater than 11 V
	• Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 & Battery voltage • Measure voltage between the following terminals • ECM – Wiring harness connector (wiring harness side) terminal G88-68 & Ground	
	Yes: E01	No: E02
T09	Check: Component	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM • Ignition ON • Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & Ground • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: – ABS Control Module – Rear Combination Lamp (Left) – Rear Combination Lamp (Right) – High Mount Stop Light	
	Yes: E05	No: E06
T10	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T11	No: T12

Test	Work Order Description	Nominal Value
T11	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E09	No: E10
T12	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Disconnect wiring harness connector from: ECM • Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-1 & Battery voltage • Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T13	No: E14
T13	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Remove fused jumper wire • Connect wiring harness connector to: ECM • Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 & Battery voltage • Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: T14	No: E13
T14	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Remove fused jumper wire • Connect fused jumper wire to: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & Battery voltage • Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E11	No: T15

Test	Work Order Description	Nominal Value
T15	Check: Component	Test okay?
	• Disconnect wiring harness connector from: Rear Combination Lamp (Left) • Insert new fuse into the socket of the fused jumper wire and then check this fuse for proper operation • Disconnect each of the following components/control units consecutively from the wiring harness and repeat the measurement each time: – Rear Combination Lamp (Right) – ABS Control Module – ECM – High Mount Stop Lamp	
	Yes: E05	No: E12

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Brake Light Switch or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-68
E03	Short circuit to voltage between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-68
E04	- Circuit interruption between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-81 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	If the nominal value is reached during one of the measurements, the component/control unit that has been disconnected immediately before that measurement is defective.
E06	Short circuit to voltage between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & ABS Control Module – Wiring harness connector (wiring harness side) terminal E20-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-81 & Rear Combination Lamp (Left) – Wiring harness connector (wiring harness side) terminal L12-6 & Rear Combination Lamp (Right) – Wiring harness connector (wiring harness side) terminal L01-6 & High Mount Stop Light – Wiring harness connector (wiring harness side) terminal O03-1 (door-mounted) or O08-1 (spoiler built-in)

Result	Cause Of Fault
E07	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-68 & Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Circuit interruption between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-2
E09	• Circuit interruption between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-1
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Circuit Fuse – Input contact
E11	• Defective component: Brake Light Switch
E12	• Short circuit to ground between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-3 & ABS Control Module – Wiring harness connector (wiring harness side) terminal E20-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-81 & Rear Combination Lamp (Left) – Wiring harness connector (wiring harness side) terminal L12-6 & Rear Combination Lamp (Right) – Wiring harness connector (wiring harness side) terminal L01-6 & High Mount Stop Light – Wiring harness connector (wiring harness side) terminal O03-1 (door-mounted) or O08-1 (spoiler built-in)
E13	• Short circuit to ground between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-68 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E14	• Short circuit to ground between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal G15-1, G15-2

C-22, Clutch Switch Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Clutch Switch • Ignition ON • Measure voltage between the following terminals: Clutch Switch – Wiring harness connector (wiring harness side) terminal E48-2 & Ground	
	Yes: T02	No: E04
T02	Check: Short to Ground of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect harness connector from: ECM • Ignition ON • Measure voltage between the following terminals ECM – Wiring harness connector (wiring harness side) terminal E27-22 & Ground	
	Yes: T03	No: E03
T03	Check: Short to Voltage/Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Connect fused jumper wire to: Clutch Switch – Wiring harness connector (wiring harness side) terminal E48-1 & Clutch Switch – Wiring harness connector (wiring harness side) terminal E48-2 • Ignition ON • Measure voltage between the following terminals ECM – Wiring harness connector (wiring harness side) terminal E27-22 & Ground	
	Yes: E01	No: E02

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Clutch Switch or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: Clutch Switch – Wiring harness connector (wiring harness side) terminal E48-1 & ECM – Wiring harness connector (wiring harness side) terminal E27-22
E03	- Short circuit to voltage between: Clutch Switch – Wiring harness connector (wiring harness side) terminal E48-1 & ECM – Wiring harness connector (wiring harness side) terminal E27-22 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	Circuit interruption between: Circuit Fuse – Output contact & Clutch Switch – Wiring harness connector (wiring harness side) terminal E48-2

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Clutch Switch • Ignition ON • Measure voltage between the following terminals: Clutch Switch – Wiring harness connector (wiring harness side) terminal G85-2 & Ground	
	Yes: T02	No: E04
T02	Check: Short to Ground of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect harness connector from: ECM • Ignition ON • Measure voltage between the following terminals ECM – Wiring harness connector (wiring harness side) terminal G88-22 & Ground	
	Yes: T03	No: E03
T03	Check: Short to Voltage/Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Connect fused jumper wire to: Clutch Switch – Wiring harness connector (wiring harness side) terminal G85-1 & Clutch Switch – Wiring harness connector (wiring harness side) terminal G85-2 • Ignition ON • Measure voltage between the following terminals ECM – Wiring harness connector (wiring harness side) terminal G88-22 & Ground	
	Yes: E01	No: E02

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Clutch Switch or ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: Clutch Switch – Wiring harness connector (wiring harness side) terminal G85-1 & ECM – Wiring harness connector (wiring harness side) terminal G85-22
E03	- Short circuit to voltage between: Clutch Switch – Wiring harness connector (wiring harness side) terminal G85-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-22 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	Circuit interruption between: Circuit Fuse – Output contact & Clutch Switch – Wiring harness connector (wiring harness side) terminal G85-2

C-23, Injector Circuit

Result Table

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-24, Cylinder 1 Injector Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored? P0201 – Injector Circuit Malfunction Cylinder-1	
	Yes: E01	
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-47 & Ground	
	Yes: T03	
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-47 & Ground	
	Yes: T04	
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 1 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-16 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-2	
	Yes: T05	
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-47 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-1	
	Yes: T06	
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 1 Injector – Wiring harness connector (component side) terminal C93-1 & Cylinder 1 Injector – Wiring harness connector (component side) terminal C93-2	
	Yes: E02	
		No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 1 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-47 & Ground	
	Yes: E05	No: E06

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 1 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-47 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-16 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-2
E05	- Short circuit to ground between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-16 or - Defective component: Cylinder 1 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-47
E07	- Short circuit to voltage between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-47 or - Short circuit to voltage between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal C93-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-16

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored?	
	P0201 – Injector Circuit Malfunction Cylinder-1	
	Yes: E01	No: T02
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-47 & Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-47 & Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 1 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-16 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-2	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-47 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-1	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 1 Injector – Wiring harness connector (component side) terminal D38-1 & Cylinder 1 Injector – Wiring harness connector (component side) terminal D38-2	
	Yes: E02	No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 1 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-47 & Ground	
	Yes: E05	No: E06

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 1 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-47 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-16 & Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-2
E05	- Short circuit to ground between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-16 or - Defective component: Cylinder 1 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-47
E07	- Short circuit to voltage between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-47 or - Short circuit to voltage between: Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal D38-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-16

C-25, Cylinder 2 Injector Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored? P0202 – Injector Circuit Malfunction Cylinder-2	
	Yes: E01	
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-49 & Ground	
	Yes: T03	
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-49 & Ground	
	Yes: T04	
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 2 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-17 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-2	
	Yes: T05	
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-49 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-1	
	Yes: T06	
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 2 Injector – Wiring harness connector (component side) terminal C94-1 & Cylinder 2 Injector – Wiring harness connector (component side) terminal C94-2	
	Yes: E02	
		No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 2 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-49 & Ground	
	Yes: E05	No: E06

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 2 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-49 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-17 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-2
E05	- Short circuit to ground between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-17 or - Defective component: Cylinder 2 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-49
E07	- Short circuit to voltage between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-49 or - Short circuit to voltage between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal C94-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-17

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored?	
	P0202 – Injector Circuit Malfunction Cylinder-2	
	Yes: E01	No: T02
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-49 & Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-49 & Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 2 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-17 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-2	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-49 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-1	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 2 Injector – Wiring harness connector (component side) terminal D39-1 & Cylinder 2 Injector – Wiring harness connector (component side) terminal D39-2	
	Yes: E02	No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 2 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-49 & Ground	
	Yes: E05	No: E06

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 2 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-49 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-17 & Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-2
E05	- Short circuit to ground between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-17 or - Defective component: Cylinder 2 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-49
E07	- Short circuit to voltage between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-49 or - Short circuit to voltage between: Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal D39-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-17

C-26, Cylinder 3 Injector Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored? P0203 – Injector Circuit Malfunction Cylinder-3	
	Yes: E01	
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-48 & Ground	
	Yes: T03	
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-48 & Ground	
	Yes: T04	
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 3 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-31 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-2	
	Yes: T05	
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-48 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-1	
	Yes: T06	
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 3 Injector – Wiring harness connector (component side) terminal C95-1 & Cylinder 3 Injector – Wiring harness connector (component side) terminal C95-2	
	Yes: E02	
		No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 3 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-48 & Ground	
	Yes: E05	No: E06

Result Table (RM413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 3 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-48 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-31 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-2
E05	- Short circuit to ground between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-31 or - Defective component: Cylinder 3 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-48
E07	- Short circuit to voltage between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-48 or - Short circuit to voltage between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal C95-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-31

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored? P0203 – Injector Circuit Malfunction Cylinder-3	
	Yes: E01	
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-48 & Ground	
	Yes: T03	
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-48 & Ground	
	Yes: T04	
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 3 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-31 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-2	
	Yes: T05	
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-48 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-1	
	Yes: T06	
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 3 Injector – Wiring harness connector (component side) terminal D40-1 & Cylinder 3 Injector – Wiring harness connector (component side) terminal D40-2	
	Yes: E02	
		No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 3 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-48 & Ground	
	Yes: E05	No: E06

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 3 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-48 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-31 & Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-2
E05	- Short circuit to ground between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-31 or - Defective component: Cylinder 3 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-48
E07	- Short circuit to voltage between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-48 or - Short circuit to voltage between: Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal D40-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-31

C-27, Cylinder 4 Injector Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored? P0204 – Injector Circuit Malfunction Cylinder-4	
	Yes: E01	No: T02
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-46 & Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-46 & Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 4 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-1 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-2	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-46 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-1	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 4 Injector – Wiring harness connector (component side) terminal C96-1 & Cylinder 4 Injector – Wiring harness connector (component side) terminal C96-2	
	Yes: E02	No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 4 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal C66-46 & Ground	
	Yes: E05	No: E06

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 4 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-46 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-1 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-2
E05	- Short circuit to ground between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-1 or - Defective component: Cylinder 4 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-46
E07	- Short circuit to voltage between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-46 or - Short circuit to voltage between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal C96-2 & ECM – Wiring harness connector (wiring harness side) terminal C66-1

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored?	
	P0204 – Injector Circuit Malfunction Cylinder-4	
	Yes: E01	No: T02
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector D26) • Ignition ON • Measure voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-46 & Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-46 & Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Disconnect wiring harness connector from: Cylinder 4 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-1 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-2	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-46 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-1	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ohm
	• Measure resistance between: Cylinder 4 Injector – Wiring harness connector (component side) terminal D41-1 & Cylinder 4 Injector – Wiring harness connector (component side) terminal D41-2	
	Yes: E02	No: E01

Test	Work Order Description	Nominal Value
T07	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Disconnect wiring harness connector from: Cylinder 4 Injector • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal D26-46 & Ground	
	Yes: E05	No: E06

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Cylinder 4 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E02	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-46 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-1
E04	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-1 & Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-2
E05	- Short circuit to ground between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-1 or - Defective component: Cylinder 4 Injector NOTE: If an injector has been replaced, the fuel injector calibration code of the new injector must be programmed to the ECM referring to “ECM registration” in Section 6E3.
E06	Short circuit to ground between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-46
E07	- Short circuit to voltage between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-1 & ECM – Wiring harness connector (wiring harness side) terminal D26-46 or - Short circuit to voltage between: Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal D41-2 & ECM – Wiring harness connector (wiring harness side) terminal D26-1

C-28, Exhaust Gas Recirculation Valve Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Exhaust Gas Recirculation Valve and ECM (Wiring Harness Connector C66) • Ignition ON • Measure voltage between the following terminals: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-1 & Ground	
	Yes: T02	No: T05
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	less than 0.3 V
	• Measure voltage between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-5 & Ground	
	Yes: T03	No: E04
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-5 & Ground	
	Yes: T04	No: E03
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Measure resistance between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-5 & ECM – Wiring harness connector (wiring harness side) terminal C66-15	
	Yes: E01	No: E02
T05	Check: Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T06	No: T07

Test	Work Order Description	Nominal Value
T06	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E05	No: E06
T07	Check: Interruption of Voltage Supply Circuit	Test okay?
	• Insert new fuse circuit and then check the fuse for proper operation.	
	Yes: E07	No: E08

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Exhaust Gas Recirculation Valve or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal C66-15 & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-5
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal C66-15 & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-5
E04	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal C66-15 & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-5
E05	Circuit interruption between: Circuit Fuse – Output contact & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-1
E06	Circuit interruption between: Main Relay – Socket Terminal E58-4 & Circuit Fuse – Input contact
E07	Defective component: Exhaust Gas Recirculation Valve

Result	Cause Of Fault
E08	• Short circuit to ground between: Circuit Fuse – Output contact & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal C70-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-5 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Exhaust Gas Recirculation Valve and ECM (Wiring Harness Connector D26) - Ignition ON - Measure voltage between the following terminals: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-6 & Ground	
	Yes: T02	No: T05
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	less than 0.3 V
	Measure voltage between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-4 & Ground	
	Yes: T03	No: E04
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-4 & Ground	
	Yes: T04	No: E03
T04	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-4 & ECM – Wiring harness connector (wiring harness side) terminal D26-15	
	Yes: E01	No: E02
T05	Check: Interruption of Voltage Supply Circuit	Test okay?
	- Remove electrical component from socket: Circuit Fuse - Check the following component for proper operation: Circuit Fuse	
	Yes: T06	No: T07
T06	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E05	No: E06

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Voltage Supply Circuit	Test okay?
	• Insert new fuse circuit and then check the fuse for proper operation.	
	Yes: E07	No: E08

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Exhaust Gas Recirculation Valve or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal D26-15 & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-4
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal D26-15 & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-4
E04	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal D26-15 & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-4
E05	Circuit interruption between: Circuit Fuse – Output contact & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-6
E06	Circuit interruption between: Main Relay – Socket Terminal E75-4 & Circuit Fuse – Input contact
E07	Defective component: Exhaust Gas Recirculation Valve

Result	Cause Of Fault
E08	• Short circuit to ground between: Circuit Fuse – Output contact & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal D31-6 & ECM – Wiring harness connector (wiring harness side) terminal D26-5 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-29, Air Conditioning System Refrigerant Pressure Sensor

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage of Voltage Supply Circuit	4.8 ... 5.2 V
	- Ignition OFF - Disconnect wiring harness connector from: A/C Pressure Sensor - Ignition ON - Measure voltage between the following terminals: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 & Ground	
	Yes: T02	No: T06
T02	Check: Short to Voltage of Signal Circuit	4.8 ... 5.2 V
	Measure voltage between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-2	
	Yes: T03	No: T05
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	Measure voltage between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-3 & Ground	
	Yes: T04	No: E03
T04	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) - Measure resistance between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-3 & Ground	
	Yes: E01	No: E02
T05	Check: Short to Voltage of Signal Circuit	less than 4.8 V
	Measure voltage between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-2	
	Yes: E04	No: E05

Test	Work Order Description	Nominal Value
T06	Check: Short to Voltage of Voltage Supply Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 & Ground	
	Yes: E06	No: E07

Result Table (For RM413D)

Result	Cause Of Fault
E01	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-87 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-3 or • Defective component: A/C Pressure Sensor
E02	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-87 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-3
E03	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-87 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-10 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-2 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-10 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-2 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E06	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-37 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	• Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-37 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E26-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage of Voltage Supply Circuit	4.8 ... 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 & Ground	
	Yes: T02	No: T06
T02	Check: Short to Voltage of Signal Circuit	4.8 ... 5.2 V
	• Measure voltage between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-2	
	Yes: T03	No: T05
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Measure voltage between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-3 & Ground	
	Yes: T04	No: E03
T04	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Measure resistance between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-3 & Ground	
	Yes: E01	No: E02
T05	Check: Short to Voltage of Signal Circuit	less than 4.8 V
	• Measure voltage between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-2	
	Yes: E04	No: E05

Test	Work Order Description	Nominal Value
T06	Check: Short to Voltage of Voltage Supply Circuit	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Pressure Sensor • Ignition ON • Measure voltage between the following terminals: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 & Ground	
	Yes: E06	No: E07

Result Table (For RM413D)

Result	Cause Of Fault
E01	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-87 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-3 or • Defective component: A/C Pressure Sensor
E02	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-87 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-3
E03	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-87 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-10 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-2 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E05	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-10 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-2 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E06	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-37 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	• Short circuit to ground/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-37 & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal E66-1 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-30, Air Conditioning System Switch Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness from: A/C Switch • Ignition ON • Measure voltage between the following terminals: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-7 & Ground	
	Yes: T02	No: E01
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness from: A/C Relay • Ignition ON • Measure voltage between the following terminals: A/C Relay – Socket terminal G40-3 & Ground	
	Yes: T03	No: E02
T03	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: A/C Relay – Socket terminal G40-4 & Ground	
	Yes: T04	No: E03
T04	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-6 & Ground	
	Yes: T05	No: E04

Test	Work Order Description	Nominal Value
T05	Check: Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness from: ECM • Connect fused jumper wire to: A/C Relay – Socket terminal G40-1 & Ground • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-28 & Ground	
	Yes: T06	No: E05
T06	Check: Short to Voltage of Signal Circuit	OFF
	• Ignition OFF • Remove fused jumper wire • Connect wiring harness connector to: ECM • Scan Tool Data List Parameter A/C Switch	
	Yes: T07	No: E06
T07	Check: Interruption of Signal Circuit	ON
	• Connect fused jumper wire to: A/C Relay – Wiring harness connector (wiring harness side) terminal G40-4 & A/C Relay – Wiring harness connector (wiring harness side) terminal G40-5 • Scan Tool Data List Parameter A/C Switch	
	Yes: T08	No: E06
T08	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Remove fused jumper wire • Disconnect wiring harness connector from: Heater Blower Fan Switch • Measure resistance between the following terminals: Heater Blower Fan Switch – Wiring harness connector (wiring harness side) terminal G32-5 & Ground	
	Yes: T09	No: E07

Test	Work Order Description	Nominal Value
T09	Check: Interruption of Signal Circuit	greater than 11 V
	• Install electrical component to socket: A/C Relay • Connect wiring harness connector to: A/C Switch • Ignition ON • A/C Switch ON • Measure resistance between the following terminals: Heater Blower Fan Switch – Wiring harness connector (wiring harness side) terminal G32-5 & Ground	
	Yes: T10	No: E08
T10	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Measure resistance between the following terminals: Heater Blower Fan Switch – Wiring harness connector (wiring harness side) terminal G32-1 & Ground	
	Yes: E09	No: E10

Result Table (For RM413D)

Result	Cause Of Fault
E01	Circuit interruption between: Circuit Fuse – Output contact & A/C switch – Wiring harness connector (wiring harness side) terminal G31-7
E02	Circuit interruption between: Circuit Fuse – Output contact & A/C Relay – Wiring harness connector (wiring harness side) terminal G40-3
E03	Circuit interruption between Circuit Fuse – Output contact & A/C Relay – Wiring harness connector (wiring harness side) terminal G40-4
E04	- Circuit interruption between: A/C Relay – Wiring harness connector (wiring harness side) terminal G40-1 & A/C Switch – Wiring harness connector (wiring harness side) terminal G31-6 or - Defective component: A/C Relay
E05	- Circuit interruption between: A/C Relay – Wiring harness connector (wiring harness side) terminal G40-5 & ECM – Wiring harness connector (wiring harness side) terminal E27-28 or - Defective component: A/C Relay
E06	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	Circuit interruption between: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-8 & Heater Blower Fan Switch – Wiring harness connector (wiring harness side) terminal G32-5
E08	- Short circuit to ground between: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-8 & Heater Blower Fan Switch – Wiring harness connector (wiring harness side) terminal G32-5 - Defective component: A/C Switch
E09	Defective component: Heater Blower Fan Switch
E10	Circuit interruption between: Heater blower Fan Switch – Wiring harness connector (wiring harness side) terminal G32-1 & Ground

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Switch • Ignition ON • Measure voltage between the following terminals: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-1 & Ground	
	Yes: T02	No: E01
T02	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Ignition OFF • Disconnect wiring harness connector from: ECM and Blower Motor Relay • Measure resistance between the following terminals: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-28	
	Yes: T03	No: E02
T03	Check: Shorted to Voltage of Signal Circuit	less than 0.3 V
	• Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-28 & Ground	
	Yes: T04	No: E03
T04	Check: Shorted to Ground	greater than 500 kOhm
	• Ignition OFF • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-28 & Ground	
	Yes: T05	No: E04
T05	Check: Component	greater than 11 V
	• Connect wiring harness connector to: A/C Switch • A/C Switch ON • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-28 & Ground	
	Yes: T06	No: E05

Test	Work Order Description	Nominal Value
T06	Check: Interruption of Signal Circuit	greater than 11 V
	• Measure voltage between the following terminals: Blower Motor Relay – Socket terminal G52-5 & Ground	
	Yes: T07	No: E06
T07	Check: Interruption of Ground Circuit	less than 5 Ohm
	• Ignition OFF • Measure resistance between the following terminals: Blower Motor Relay – Socket terminal G52-3 & Ground	
	Yes: E07	No: E08

Result Table (For RB413D)

Result	Cause Of Fault
E01	Circuit interruption between: Circuit Fuse – Output contact & A/C Switch – Wiring harness connector (wiring harness side) terminal G31-7
E02	Circuit interruption between: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-28
E03	Shorted circuit to voltage between: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-28 or Blower Motor Relay – Socket terminal G52-5 & ECM – Wiring harness connector (wiring harness side) terminal G88-28
E04	Shorted circuit to ground between: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-4 & ECM – Wiring harness connector (wiring harness side) terminal G88-28 or Blower Motor Relay – Socket terminal G52-5 & ECM – Wiring harness connector (wiring harness side) terminal G88-28
E05	Defective component: A/C Switch
E06	Circuit interruption between: A/C Switch – Wiring harness connector (wiring harness side) terminal G31-4 & Blower Motor Relay – Socket terminal G52-5
E07	- Defective component: Blower Motor Relay or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	Circuit interruption between: Blower Motor Relay – Socket terminal G52-3 & Ground

C-31, Air Conditioning System Relay Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Compressor Relay - Measure voltage between the following terminals: Compressor Relay – Socket terminal C51-3 & Ground	
	Yes: T02	No: T09
T02	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	- Ignition ON - Measure voltage between the following terminals: Compressor Relay – Socket terminal C51-4 & Ground	
	Yes: T03	No: E08
T03	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Compressor Relay – Socket terminal C51-2 & Ground	
	Yes: T04	No: E07
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) - Ignition ON - Measure voltage between the following terminals: Compressor Relay – Socket terminal C51-1 & Ground	
	Yes: T05	No: E06
T05	Check: Short to Ground/Interruption of Signal Circuit	greater than 11 V
	- Ignition OFF - Install electrical component to socket: Compressor Relay - Ignition ON - Measure Voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-79 & Ground	
	Yes: T06	No: E05

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Compressor • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-79 & Ground • Ignition ON • Measure voltage between the following terminals A/C Compressor – Wiring harness connector (wiring harness side) terminal C80-2 & Ground	
	Yes: T07	No: E04
T07	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Ignition OFF • Remove fused jumper wire • Measure resistance between the following terminals A/C compressor – Wiring harness connector (wiring harness side) terminal C80-1 & Ground	
	Yes: T08	No: E03
T08	Check: Component	Test okay?
	• Connect wiring harness connector to: A/C Compressor • Connect fused jumper wire to: Compressor Relay – Socket terminal C51-4 & Battery voltage • Clicking noise from following component: A/C Compressor	
	Yes: E01	No: T02
T09	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Main Fuse • Check the following component for proper operation: Circuit Main Fuse	
	Yes: T10	No: T11
T10	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E09	No: E10

Test	Work Order Description	Nominal Value
T11	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Connect fused jumper wire to: Compressor Relay – Socket terminal C51-4 & Battery voltage • Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E11	No: E12

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: A/C Compressor
E03	Circuit interruption between: A/C Compressor – Wiring harness connector (wiring harness side) terminal C80-1 & Ground
E04	- Circuit interruption between: Compressor Relay – Socket terminal C51-4 & A/C Compressor – Wiring harness connector (wiring harness side) terminal C80-2 or - Defective component: Compressor Relay
E05	- Circuit interruption between: Compressor Relay – Socket terminal C51-1 & ECM – Wiring harness connector (wiring harness side) terminal E27-79 or - Defective component: Compressor Relay
E06	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-79 & Compressor Relay – Socket terminal C51-1
E07	Circuit interruption between: Circuit Fuse – Output contact & Compressor Relay – Socket terminal C51-2
E08	- Short circuit to voltage between: Compressor Relay – Socket terminal C51-4 & A/C compressor – Wiring harness connector (wiring harness side) terminal C80-2 or - Defective component: A/C compressor
E09	Circuit interruption between: Circuit Main Fuse – Output contact & Compressor Relay – Socket terminal C51-3

Result	Cause Of Fault
E10	• Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E11	• Short circuit to ground between: Circuit Main Fuse – Output contact & Compressor Relay – Socket terminal C51-3 or • Defective component: Compressor Relay
E12	• Short circuit to ground between: Compressor Relay – Socket terminal C51-4 & A/C compressor – Wiring harness connector (wiring harness side) terminal C80-2 or • Defective component: A/C compressor

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Remove electrical component from socket: Compressor Relay • Measure voltage between the following terminals: Compressor Relay – Socket terminal E55-4 & Ground	
	Yes: T02	No: T09
T02	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	• Ignition ON • Measure voltage between the following terminals: Compressor Relay – Socket terminal E55-3 & Ground	
	Yes: T03	No: E08
T03	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Compressor Relay – Socket terminal E55-2 & Ground	
	Yes: T04	No: E07
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Ignition ON • Measure voltage between the following terminals: Compressor Relay – Socket terminal E55-1 & Ground	
	Yes: T05	No: E06
T05	Check: Short to Ground/Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Install electrical component to socket: Compressor Relay • Ignition ON • Measure Voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-79 & Ground	
	Yes: T06	No: E05

Test	Work Order Description	Nominal Value
T06	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: A/C Compressor • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-79 & Ground • Ignition ON • Measure voltage between the following terminals A/C Compressor – Wiring harness connector (wiring harness side) terminal D32-1 & Ground	
	Yes: T07	No: E04
T07	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Ignition OFF • Remove fused jumper wire • Measure resistance between the following terminals A/C compressor – Wiring harness connector (wiring harness side) terminal D32-2 & Ground	
	Yes: T08	No: E03
T08	Check: Component	Test okay?
	• Connect wiring harness connector to: A/C Compressor • Connect fused jumper wire to: Compressor Relay – Socket terminal E55-3 & Battery voltage • Clicking noise from following component: A/C Compressor	
	Yes: E01	No: T02
T09	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Fuse • Check the following component for proper operation: Circuit Fuse	
	Yes: T10	No: T11
T10	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E09	No: E10

Test	Work Order Description	Nominal Value
T11	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Connect fused jumper wire to: Compressor Relay – Socket terminal E55-3 & Battery voltage • Check the following component for proper operation: Fuse of the fused jumper wire	
	Yes: E11	No: E12

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: A/C Compressor
E03	Circuit interruption between: A/C Compressor – Wiring harness connector (wiring harness side) terminal D32-2 & Ground
E04	- Circuit interruption between: Compressor Relay – Socket terminal E55-3 & A/C Compressor – Wiring harness connector (wiring harness side) terminal D32-1 or - Defective component: Compressor Relay
E05	- Circuit interruption between: Compressor Relay – Socket terminal E55-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-79 or - Defective component: Compressor Relay
E06	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-79 & Compressor Relay – Socket terminal E55-1
E07	Circuit interruption between: Circuit Fuse – Output contact & Compressor Relay – Socket terminal E55-2
E08	- Short circuit to voltage between: Compressor Relay – Socket terminal E55-3 & COMPRESSOR – Wiring harness connector (wiring harness side) terminal D32-1 or - Defective component: COMPRESSOR
E09	Circuit interruption between: Circuit Main Fuse – Output contact & Compressor Relay – Socket terminal E55-4

Result	Cause Of Fault
E10	• Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E11	• Short circuit to ground between: Circuit Main Fuse – Output contact & Compressor Relay – Socket terminal E55-4 or • Defective component: Compressor Relay
E12	• Short circuit to ground between: Compressor Relay – Socket terminal E55-3 & COMPRESSOR – Wiring harness connector (wiring harness side) terminal D32-1 or • Defective component: COMPRESSOR

C-32, Fan Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Radiator fan is switched off
	- Ignition ON - Scan Tool MISC Test – Radiator Fan Test - Press NO key	
	Yes: T02	No: T11
T02	Check: Component	Is radiator fan running at low speed?
	- Ignition ON - Scan Tool MISC Test – Radiator Fan Test - Press YES key	
	Yes: T03	No: T18
T03	Check: Interruption of Signal Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Radiator Fan Relay No.1 - Ignition ON - Measure voltage between the following terminals: Radiator Fan Relay No.1 – Socket terminal C52-1 & Ground	
	Yes: T04	No: E01
T04	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Radiator Fan Relay No.1 – Socket terminal C52-3 & Ground	
	Yes: T05	No: E02
T05	Check: Interruption of Signal Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Radiator Fan Relay No.3 - Ignition ON - Measure voltage between the following terminals: Radiator Fan Relay No.3 – Socket terminal E60-4 & Ground	
	Yes: T06	No: E03

Test	Work Order Description	Nominal Value
T06	Check: Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Install electrical component to socket: Radiator Fan Relay No.1 • Disconnect wiring harness connector from: ECM • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-8 & Ground	
	Yes: T07	No: E04
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Radiator Fan Motor • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-8 & Ground • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-4 & Ground	
	Yes: T08	No: E05
T08	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Connect wiring harness connector to: Radiator Fan Motor • Ignition ON • Measure voltage between the following terminals: Radiator Fan Relay No.3 – Socket terminal E60-2 & Ground	
	Yes: T09	No: E06
T09	Check: Interruption of Voltage Supply Circuit	greater than 11V
	• Ignition OFF • Remove fused jumper wire • Remove electrical component from socket: Radiator Fan Relay No.1 • Install electrical component to socket: Radiator Fan Relay No.3 • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-8 & Ground	
	Yes: T10	No: E07

Test	Work Order Description	Nominal Value
T10	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	- Ignition OFF - Remove electrical component from socket: Radiator Fan Relay No.3 - Measure resistance between the following terminals: Radiator Fan Relay No.3 – Socket terminal E60-1 & Ground	
	Yes: E09	No: E08
T11	Check: Short to Ground of Signal Circuit	Radiator cooling fan is switched off
	- Ignition OFF - Remove electrical component from socket: Radiator Fan Relay No.2 - Ignition ON	
	Yes: T12	No: T14
T12	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-7 & Ground	
	Yes: T13	No: E10
T13	Check: Component	less than 0.3 V
	- Disconnect wiring harness connector from: Radiator Fan Motor - Install electrical component to socket: Radiator Fan Relay No.2 - Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-2 & Ground	
	Yes: E09	No: E11
T14	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: Radiator Fan Motor - Ignition ON - Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-2 & Ground	
	Yes: T15	No: E13

Test	Work Order Description	Nominal Value
T15	Check: Short to Ground of Signal Circuit	Radiator cooling fan is switched off
	• Ignition OFF • Install electrical component to socket: Radiator Fan Relay No.2 • Remove electrical component from socket: Radiator Fan Relay No.1 - Ignition ON	
	Yes: T16	No: E09
T16	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Remove electrical component from socket: Radiator Fan Relay No.3 • Disconnect wiring harness connector from: ECM • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-8 & Ground	
	Yes: T17	No: E14
T17	Check: Component	Radiator cooling fan is switched off
	• Install electrical component to socket: Radiator Fan Relay No.1 and No.3 • Ignition ON	
	Yes: E15	No: E12
T18	Check: Short to Ground/Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Remove electrical component from socket: Radiator Fan Relay No.2 • Ignition ON • Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal C62-1 & Ground	
	Yes: T19	No: E16
T19	Check: Short to Ground/Interruption of Signal Circuit	greater than 11 V
	• Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal C62-3 & Ground	
	Yes: T20	No: E17
T20	Check: Interruption of Signal Circuit	less than 5 Ohm
	• Ignition OFF • Disconnect wiring harness connector from: ECM • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-7 & Radiator Fan Relay No.2 – Socket terminal C62-2	
	Yes: T21	No: E18

Test	Work Order Description	Nominal Value
T21	Check: Interruption of Signal Circuit	greater than 11 V
	• Disconnect wiring harness connector from: Radiator Fan Motor • Connect fused jumper wire to: Radiator Fan Relay No.2 – Socket terminal C62-3 & Radiator Fan Relay No.2 – Socket terminal C62-4 • Ignition ON • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-2 & Ground	
	Yes: T22	No: E19
T22	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Ignition OFF • Remove fused jumper wire • Measure resistance between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-1 & Ground	
	Yes: T23	No: E20
T23	Check: Component	greater than 11 V
	• Install electrical component to socket: Radiator Fan Relay No.2 • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-7 & Ground	
	Yes: T24	No: E11
T24	Check: Component	greater than 11 V
	• Ignition OFF • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-7 & Ground • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-2 & Ground	
	Yes: T25	No: E11

Test	Work Order Description	Nominal Value
T25	Check: Component	Is radiator fan running at low speed?
	• Ignition OFF • Connect wiring harness connector to: Radiator Fan Motor • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-7 & Ground • Ignition ON	
	Yes: E15	No: E12

Result Table (For RM413D)

Result	Cause of Fault
E01	• Circuit interruption between: Radiator Fan Relay No.1 – Socket terminal C52-1 & Circuit fuse – Output contact
E02	• Circuit interruption between Radiator Fan Relay No.1 – Socket terminal C52-3 & Circuit main fuse – Output contact
E03	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E60-4 & Circuit fuse – Output contact
E04	• Circuit interruption between Radiator Fan Relay No.1 – Socket terminal C52-2 & ECM – Wiring harness connector (wiring harness side) terminal E27-8 or • Defective component Radiator Fan Relay No.1
E05	• Circuit interruption between Radiator Fan Relay No.1 – Socket terminal C52-4 & Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-4 or • Defective component Radiator Fan Relay No.1
E06	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E60-2 & Radiator fan motor – Wiring harness connector (wiring harness side) terminal E31-3 or • Defective component Radiator Fan Motor
E07	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E60-3 & ECM – Wiring harness connector (wiring harness side) terminal E27-8 or • Defective component Radiator Fan Relay No.3
E08	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E60-1 & Ground

Result	Cause of Fault
E09	- Defective component: Radiator Fan Motor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E10	Short circuit to ground between Radiator Fan Relay No.2 – Socket terminal C62-2 & ECM – Wiring harness connector (wiring harness side) terminal E27-7
E11	Defective component: Radiator Fan Relay No.2
E12	Defective component: Radiator Fan Motor
E13	Short circuit to voltage between Radiator Fan Relay No.2 – Socket terminal C62-4 & Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-2
E14	Short circuit to ground between: Radiator Fan Relay No.1 – Socket terminal C52-2 & ECM – Wiring harness connector (wiring harness side) terminal E27-8 & Radiator Fan Relay No.3 – Socket terminal E60-3
E15	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E16	- Circuit interruption between Circuit Fuse – Output contact & Radiator Fan Relay No.2 – Socket terminal C62-1 or - Short circuit to ground between Circuit Fuse – Output contact & Radiator Fan Relay No.2 – Socket terminal C62-1 & Radiator Fan Relay No.1 – Socket terminal C52-1 & Radiator Fan Relay No.3 – Socket terminal E60-4 or - Defective component: Circuit Fuse

Result	Cause of Fault
E17	• Circuit interruption between Circuit Main Fuse – Output contact & Radiator Fan Relay No.2 – Socket terminal C62-3 or • Short circuit to ground between Circuit Main Fuse – Output contact & Radiator Fan Relay No.2 – Socket terminal C62-3 & Radiator Fan Relay No.1 – Socket terminal C52-3 • Defective component: Circuit Main Fuse
E18	• Circuit interruption between Radiator Fan Relay No.2 – Socket terminal C62-2 & ECM – Wiring harness connector (wiring harness side) terminal E27-7 • Defective component: Radiator Fan Relay No.2
E19	• Circuit interruption between Radiator Fan Relay No.2 – Socket terminal C62-4 & Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-2
E20	• Circuit interruption between Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E31-1 & Ground

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Radiator fan is switched off
	- Ignition ON - Scan Tool MISC Test – Radiator Fan Test - Press NO key	
	Yes: T02	No: T11
T02	Check: Component	Is radiator fan running at low speed?
	- Ignition ON - Scan Tool MISC Test – Radiator Fan Test - Press YES key	
	Yes: T03	No: T18
T03	Check: Interruption of Signal Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Radiator Fan Relay No.2 - Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal E69-2 & Ground	
	Yes: T04	No: E01
T04	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal E69-4 & Ground	
	Yes: T05	No: E02
T05	Check: Interruption of Signal Circuit	greater than 11 V
	- Remove electrical component from socket: Radiator Fan Relay No.3 - Measure voltage between the following terminals: Radiator Fan Relay No.3 – Socket terminal E73-4 & Ground	
	Yes: T06	No: E03
T06	Check: Interruption of Signal Circuit	greater than 11 V
	- Install electrical component to socket: Radiator Fan Relay No.2 - Disconnect wiring harness connector from: ECM - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-8 & Ground	
	Yes: T07	No: E04

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Disconnect wiring harness connector from: Radiator Fan Motor • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-8 & Ground • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-4 & Ground	
	Yes: T08	No: E05
T08	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Connect wiring harness connector to: Radiator Fan Motor • Measure voltage between the following terminals: Radiator Fan Relay No.3 – Socket terminal E73-2 & Ground	
	Yes: T09	No: E06
T09	Check: Interruption of Voltage Supply Circuit	greater than 11V
	• Remove fused jumper wire • Remove electrical component from socket: Radiator Fan Relay No.2 • Install electrical component to socket: Radiator Fan Relay No.3 • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-8 & Ground	
	Yes: T10	No: E07
T10	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	• Remove electrical component from socket: Radiator Fan Relay No.3 • Measure resistance between the following terminals: Radiator Fan Relay No.3 – Socket terminal E73-1 & Ground	
	Yes: E09	No: E08
T11	Check: Short to Ground of Signal Circuit	Radiator cooling fan is switched off
	• Ignition OFF • Remove electrical component from socket: Radiator Fan Relay No.1 • Ignition ON	
	Yes: T12	No: T14

Test	Work Order Description	Nominal Value
T12	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Disconnect wiring harness connector from: ECM • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-7 & Ground	
	Yes: T13	No: E10
T13	Check: Component	less than 0.3 V
	• Disconnect wiring harness connector from: Radiator Fan Motor • Install electrical component to socket: Radiator Fan Relay No.1 • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-2 & Ground	
	Yes: E09	No: E11
T14	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: Radiator Fan Motor • Ignition ON • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-2 & Ground	
	Yes: T15	No: E13
T15	Check: Short to Ground of Signal Circuit	Radiator cooling fan is switched off
	• Ignition OFF • Install electrical component to socket: Radiator Fan Relay No.1 • Remove electrical component from socket: Radiator Fan Relay No.2 - Ignition ON	
	Yes: T16	No: E09
T16	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Remove electrical component from socket: Radiator Fan Relay No.3 • Disconnect wiring harness connector from: ECM • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-8 & Ground	
	Yes: T17	No: E14

Test	Work Order Description	Nominal Value
T17	Check: Component	Radiator cooling fan is switched off
	- Install electrical component to socket: Radiator Fan Relay No.2 and No.3 - Ignition ON	
	Yes: E15	No: E12
T18	Check: Short to Ground/Interruption of Signal Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Radiator Fan Relay No.1 - Measure voltage between the following terminals: Radiator Fan Relay No.1 – Socket terminal E53-2 & Ground	
	Yes: T19	No: E16
T19	Check: Short to Ground/Interruption of Signal Circuit	greater than 11 V
	Measure voltage between the following terminals: Radiator Fan Relay No.1 – Socket terminal E53-4 & Ground	
	Yes: T20	No: E17
T20	Check: Interruption of Signal Circuit	less than 5 Ohm
	- Disconnect wiring harness connector from: ECM - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-7 & Radiator Fan Relay No.1 – Socket terminal E53-1	
	Yes: T21	No: E18
T21	Check: Interruption of Signal Circuit	greater than 11 V
	- Disconnect wiring harness connector from: Radiator Fan Motor - Connect fused jumper wire to: Radiator Fan Relay No.1 – Socket terminal E53-4 & Radiator Fan Relay No.1 – Socket terminal E53-3 - Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-2 & Ground	
	Yes: T22	No: E19
T22	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	- Remove fused jumper wire - Measure resistance between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-1 & Ground	
	Yes: T23	No: E20

Test	Work Order Description	Nominal Value
T23	Check: Component	greater than 11 V
	• Install electrical component to socket: Radiator Fan Relay No.1 • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-7 & Ground	
	Yes: T24	No: E11
T24	Check: Component	greater than 11 V
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-7 & Ground • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-2 & Ground	
	Yes: T25	No: E11
T25	Check: Component	Is radiator fan running at low speed?
	• Connect wiring harness connector to: Radiator Fan Motor • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-7 & Ground • Ignition ON	
	Yes: E15	No: E12

Result Table (For RB413D)

Result	Cause of Fault
E01	• Circuit interruption between: Radiator Fan Relay No.2 – Socket terminal E69-2 & Circuit Main Fuse – Output contact
E02	• Circuit interruption between Radiator Fan Relay No.2 – Socket terminal E69-4 & Circuit Main Fuse – Output contact
E03	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E73-4 & Circuit Main Fuse – Output contact
E04	• Circuit interruption between Radiator Fan Relay No.2 – Socket terminal E69-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-8 or • Defective component Radiator Fan Relay No.2
E05	• Circuit interruption between Radiator Fan Relay No.2 – Socket terminal E69-3 & Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-4 or • Defective component Radiator Fan Relay No.2
E06	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E73-2 & • Radiator fan motor – Wiring harness connector (wiring harness side) terminal E44-3 or • Defective component Radiator Fan Motor
E07	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E73-3 & ECM – Wiring harness connector (wiring harness side) terminal G88-8 or • Defective component Radiator Fan Relay No.3
E08	• Circuit interruption between Radiator Fan Relay No.3 – Socket terminal E73-1 & Ground

Result	Cause of Fault
E09	- Defective component: Radiator Fan Motor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E10	Short circuit to ground between Radiator Fan Relay No.1 – Socket terminal E53-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-7
E11	Defective component: Radiator Fan Relay No.1
E12	Defective component: Radiator Fan Motor
E13	Short circuit to voltage between Radiator Fan Relay No.1 – Socket terminal E53-3 & Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-2
E14	Short circuit to ground between: Radiator Fan Relay No.2 – Socket terminal E69-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-8 & Radiator Fan Relay No.3 – Socket terminal E73-3
E15	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E16	- Circuit interruption between Circuit Main Fuse – Output contact & Radiator Fan Relay No.1 – Socket terminal E53-2 or - Short circuit to ground between Circuit Main Fuse – Output contact & Radiator Fan Relay No.1 – Socket terminal E53-2 & Radiator Fan Relay No.2 – Socket terminal E69-2 & Radiator Fan Relay No.3 – Socket terminal E73-4 or - Defective component: Circuit Main Fuse

Result	Cause of Fault
E17	• Circuit interruption between Circuit Main Fuse – Output contact & Radiator Fan Relay No.1 – Socket terminal E53-4 or • Short circuit to ground between Circuit Main Fuse – Output contact & Radiator Fan Relay No.1 – Socket terminal E53-4 & Radiator Fan Relay No.2 – Socket terminal E69-4 • Defective component: Circuit Main Fuse
E18	• Circuit interruption between Radiator Fan Relay No.1 – Socket terminal E53-1 & ECM – Wiring harness connector (wiring harness side) terminal G88-7 • Defective component: Radiator Fan Relay No.1
E19	• Circuit interruption between Radiator Fan Relay No.1 – Socket terminal E53-3 Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-2
E20	• Circuit interruption between Radiator Fan Motor – Wiring harness connector (wiring harness side) terminal E44-1 & Ground

C-33, Glow Time Relay Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Inspection okay?
	Check the following component for proper operation: Glow Plug	
	Yes: T02	No: E13
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Glow Controller - Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-7 & Ground	
	Yes: T03	No: T11
T03	Check: Circuit Interruption of Ground Circuit	greater than 11 V
	Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-7 & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-6	
	Yes: T04	No: E09
T04	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition ON - Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-1 & Ground	
	Yes: T05	No: E08
T05	Check: Short to Voltage of Signal Circuit	ON
	Data List Parameter Glow Relay	
	Yes: T06	No: E07
T06	Check: Short to Ground/Interruption of Signal Circuit	OFF
	- Ignition OFF - Connect fused jumper wire to: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-3 & Ground - Ignition ON - Data List Parameter Glow Relay	
	Yes: T07	No: E06

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Signal Circuit	greater than 11 V
	- Remove fused jumper wire - Scan Tool MISC test: Glow plug control - Press YES key Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-8 & Battery voltage	
	Yes: T08	No: E05
T08	Check: Short to Voltage of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Measure resistance between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-8 & Ground	
	Yes: T09	No: E04
T09	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Disconnect wiring harness connector from: Glow Plugs - Ignition ON - Measure voltage between: Glow Plugs – Wiring harness connector (wiring harness side) terminal C97-1, C98-1, C99-1, C100-1 & Ground	
	Yes: T10	No: E03
T10	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-4, E29-5 & Ground	
	Yes: E01	No: E02
T11	Check: Component	Test okay?
	- Remove electrical component from socket: Circuit Main Fuse - Check the following component for proper operation: Circuit Main Fuse	
	Yes: T12	No: E12

Test	Work Order Description	Nominal Value
T12	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E10	No: E11

Result Table (For RM413D)

Result	Cause Of Fault
E01	• Circuit interruption between: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-4, E29-5 & Glow Plugs – Wiring harness connector (wiring harness side) terminal C97-1, C98-1, C99-1, C100-1 or • Defective component: Glow Controller
E02	• Short circuit to ground between: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-4, E29-5 & Glow Plugs – Wiring harness connector (wiring harness side) terminal C97-1, C98-1, C99-1, C100-1
E03	• Short circuit to voltage between: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-4, E29-5 & Glow Plugs – Wiring harness connector (wiring harness side) terminal C97-1, C98-1, C99-1, C100-1 or • Defective component: Glow Controller
E04	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-74 & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-8
E05	• Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-74 & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-8 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	• Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal E27-70 & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E07	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-70 & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Circuit interruption between: Circuit Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-1
E09	• Circuit interruption between: Glow Controller – Wiring harness connector (wiring harness side) terminal E29-6 & Ground
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-7
E11	• Circuit interruption between: Battery positive (+) terminal & Circuit Main Fuse – Input contact
E12	• Short circuit to ground between: Circuit Main Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal E29-7
E13	• Defective component: Glow Plugs

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Inspection okay?
	Check the following component for proper operation: Glow Plug	
	Yes: T02	No: E13
T02	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Disconnect wiring harness connector from: Glow Controller - Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-7 & Ground	
	Yes: T03	No: T11
T03	Check: Circuit Interruption of Ground Circuit	greater than 11 V
	Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-7 & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-6	
	Yes: T04	No: E09
T04	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition ON - Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-1 & Ground	
	Yes: T05	No: E08
T05	Check: Short to Voltage of Signal Circuit	ON
	Data List Parameter Glow Relay	
	Yes: T06	No: E07
T06	Check: Short to Ground/Interruption of Signal Circuit	OFF
	- Ignition OFF - Connect fused jumper wire to: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-3 & Ground - Ignition ON - Data List Parameter Glow Relay	
	Yes: T07	No: E06

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Signal Circuit	greater than 11 V
	- Remove fused jumper wire - Scan Tool MISC test: Glow plug control - Press YES key ON Measure voltage between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-8 & Battery voltage	
	Yes: T08	No: E05
T08	Check: Short to Voltage of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Measure resistance between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-8 & Ground	
	Yes: T09	No: E04
T09	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Disconnect wiring harness connector from: Glow Plugs - Ignition ON - Measure voltage between: Glow Plugs – Wiring harness connector (wiring harness side) terminal D34-1, D35-1, D36-1, D37-1 & Ground	
	Yes: T10	No: E03
T10	Check: Short to Ground/Interruption of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-4, E72-5 & Ground	
	Yes: E01	No: E02
T11	Check: Component	Test okay?
	- Remove electrical component from socket: Circuit Main Fuse - Check the following component for proper operation: Circuit Main Fuse	
	Yes: T12	No: E12

Test	Work Order Description	Nominal Value
T12	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E10	No: E11

Result Table (For RB413D)

Result	Cause Of Fault
E01	• Circuit interruption between: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-4, E72-5 & Glow Plugs – Wiring harness connector (wiring harness side) terminal D34-1, D35-1, D36-1, D37-1 or • Defective component: Glow Controller
E02	• Short circuit to ground between: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-4, E72-5 & Glow Plugs – Wiring harness connector (wiring harness side) terminal D34-1, D35-1, D36-1, D37-1
E03	• Short circuit to voltage between: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-4, E72-5 & Glow Plugs – Wiring harness connector (wiring harness side) terminal D34-1, D35-1, D36-1, D37-1 or • Defective component: Glow Controller
E04	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-74 & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-8
E05	• Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-74 & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-8 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E06	• Short circuit to voltage/interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal G88-70 & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result	Cause Of Fault
E07	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-70 & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-3 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E08	• Circuit interruption between: Circuit Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-1
E09	• Circuit interruption between: Glow Controller – Wiring harness connector (wiring harness side) terminal E72-6 & Ground
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-7
E11	• Circuit interruption between: Battery positive (+) terminal & Circuit Main Fuse – Input contact
E12	• Short circuit to ground between: Circuit Main Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal E72-7
E13	• Defective component: Glow Plugs

C-34, Glow Time Telltale Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Component • Ignition OFF • Ignition ON • Is at least one of the following indicator ON? – Charge Indicator Lamp – ABS warning Lamp – AIR BAG warning Lamp	Test okay?
	Yes: T02	No: E05
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit • Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) • Ignition ON • Is the following indicator OFF? - Glow indicator Lamp	Test okay?
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-52 & Ground • Is the following indicator ON? - Glow indicator Lamp	Test okay?
	Yes: T04	No: E03
T04	Check: Short to Voltage of Signal Circuit • Ignition OFF • Remove fused jumper wire • Disconnect wiring harness connector from: Combination Meter • Ignition ON • Measure voltage between the following terminals: - Combination Meter – Wiring harness connector (wiring harness side) terminal G22-10 & - Ground	less than 0.3 V
	Yes: E01	No: E02

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-52 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-10
E03	- Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-52 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-10 or - Defective component: Combination Meter
E04	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-52 & Combination Meter – Wiring harness connector (wiring harness side) terminal E22-10
E05	- Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-11 or - Defective component: Combination Meter

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicator ON? – Charge Indicator Lamp – ABS warning Lamp – AIR BAG warning Lamp	
	Yes: T02	No: E05
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Test okay?
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Ignition ON • Is the following telltale OFF? Glow indicator Lamp	
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit	Test okay?
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-52 & Ground • Is the following telltale ON? Glow indicator Lamp	
	Yes: T04	No: E03
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Remove fused jumper wire • Disconnect wiring harness connector from: Combination Meter • Ignition ON • Measure voltage between the following terminals: Combination Meter – Wiring harness connector (wiring harness side) terminal G25-5 & Ground	
	Yes: E01	No: E02

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-52 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-5
E03	- Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-52 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-5 or - Defective component: Combination Meter
E04	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-52 & Combination Meter – Wiring harness connector (wiring harness side) terminal E25-5
E05	- Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-15 or - Defective component: Combination Meter

C-35, Filterheating Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Fuel Heating Relay - Measure voltage between: Fuel Heating Relay – Socket Terminal E59-2 & Ground	
	Yes: T02	No: T12
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition ON - Measure voltage between: Fuel Heating Relay – Socket Terminal E59-4 & Ground	
	Yes: T03	No: E09
T03	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	Measure voltage between: Fuel Heating Relay – Socket Terminal E59-5 & Ground	
	Yes: T04	No: T11
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) - Ignition ON - Measure voltage between: Fuel Heating Relay – Socket Terminal E59-1 & Ground	
	Yes: T05	No: E07
T05	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between: Fuel Heating Relay – Socket Terminal E59-1 & Ground	
	Yes: T06	No: E06
T06	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal E27-76 & Fuel Heating Relay – Socket Terminal E59-1	
	Yes: T07	No: E05

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Disconnect wiring harness connector from: Fuel Heater and Temperature Sensor • Connect fused jumper wire to: Fuel Heating Relay – Socket Terminal E59-2 & Fuel Heating Relay – Socket Terminal E59-5 • Measure voltage between: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-2 & Ground	
	Yes: T08	No: E04
T08	Check: Circuit Interruption of Ground Circuit	greater than 11 V
	• Measure voltage between: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-2 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-1	
	Yes: T09	No: E03
T09	Check: Component	greater than 11 V
	• Ignition OFF • Insert electrical component in socket: Fuel Heating Relay • Ignition ON • Measure voltage between the following terminals ECM – Wiring harness connector (wiring harness side) terminal E27-76 & Ground	
	Yes: T10	No: E02
T10	Check: Component	greater than 11 V
	• Ignition OFF • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-76 & Ground • Ignition ON • Measure voltage between the following terminals Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-2 & Ground	
	Yes: E01	No: E02

Test	Work Order Description	Nominal Value
T11	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Heater and Temperature Sensor • Ignition ON • Measure voltage between: Fuel Heating Relay – Socket Terminal E59-5 & Ground	
	Yes: E01	No: E08
T12	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Main Fuse • Check the following component for proper operation: Circuit Main Fuse	
	Yes: T13	No: T14
T13	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between: Circuit Main Fuse – Input contact & Ground	
	Yes: E10	No: E11
T14	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Insert new fuse and then check the fuse for proper operation.	
	Yes: T15	No: E13
T15	Check: Short to Ground of Voltage Supply Circuit	less than 0.3 V
	• Measure voltage between: Fuel Heating Relay – Socket Terminal E59-5 & Battery voltage	
	Yes: E02	No: E12

Result Table (For RM413D)

Result	Cause Of Fault
E01	- Defective component: Fuel Heater and Temperature Sensor or ECM NOTE: The replacement of the components must be done in the listed order: The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Fuel Heating Relay
E03	Circuit interruption between: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-1 & Ground
E04	Circuit interruption between: Fuel Heating Relay – Socket Terminal E59-5 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-2
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-76 & Fuel Heating Relay – Socket Terminal E59-1
E06	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-76 & Fuel Heating Relay – Socket Terminal E59-1
E07	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-76 & Fuel Heating Relay – Socket Terminal E59-1
E08	Short circuit to voltage between: Fuel Heating Relay – Socket Terminal E59-5 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-2
E09	Circuit interruption between: Circuit Fuse – Output contact & Fuel Heating Relay – Socket Terminal E59-4
E10	Circuit interruption between: Circuit Main Fuse – Output contact & fuel Heating Relay – Socket Terminal E59-2

E11	• Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E12	• Short circuit to ground between: Fuel Heating Relay – Socket Terminal E59-5 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E50-2 or • Defective component: Fuel Heater and Temperature Sensor
E13	• Short circuit to ground between: Circuit Main Fuse – Output contact & Fuel Heating Relay – Socket Terminal E59-2

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Ground/Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket: Fuel Heating Relay - Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal E74-2 & Ground	
	Yes: T02	No: T12
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition ON - Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal E74-4 & Ground	
	Yes: T03	No: E09
T03	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal E74-5 & Ground	
	Yes: T04	No: T11
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) - Ignition ON - Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal E74-1 & Ground	
	Yes: T05	No: E07
T05	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: Fuel Heating Relay – Socket Terminal E74-1 & Ground	
	Yes: T06	No: E06
T06	Check: Interruption of Signal Circuit	less than 5 Ohm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-76 & Fuel Heating Relay – Socket Terminal E74-1	
	Yes: T07	No: E05

Test	Work Order Description	Nominal Value
T07	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Disconnect wiring harness connector from: Fuel Heater and Temperature Sensor • Connect fused jumper wire to: Fuel Heating Relay – Socket Terminal E74-2 & Fuel Heating Relay – Socket Terminal E74-5 • Measure voltage between the following terminals: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-2 & Ground	
	Yes: T08	No: E04
T08	Check: Circuit Interruption of Ground Circuit	greater than 11 V
	• Measure voltage between the following terminals: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-2 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-1	
	Yes: T09	No: E03
T09	Check: Component	greater than 11 V
	• Ignition OFF • Insert electrical component in socket: Fuel Heating Relay • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-76 & Ground	
	Yes: T10	No: E02
T10	Check: Component	greater than 11 V
	• Ignition OFF • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-76 & Ground • Ignition ON • Measure voltage between the following terminals: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-2 & Ground	
	Yes: E01	No: E02

Test	Work Order Description	Nominal Value
T11	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: Fuel Heater and Temperature Sensor • Ignition ON • Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal E74-5 & Ground	
	Yes: E01	No: E08
T12	Check: Short to Ground/Interruption of Voltage Supply Circuit	Test okay?
	• Remove electrical component from socket: Circuit Main Fuse • Check the following component for proper operation: Circuit Main Fuse	
	Yes: T13	No: T14
T13	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Main Fuse – Input contact & Ground	
	Yes: E10	No: E11
T14	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Insert new fuse and then check the fuse for proper operation.	
	Yes: T15	No: E13
T15	Check: Short to Ground of Voltage Supply Circuit	less than 0.3 V
	• Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal E74-5 & Battery voltage	
	Yes: E02	No: E12

Result Table (For RB413D)

Result	Cause Of Fault
E01	- Defective component: Fuel Heater and Temperature Sensor or ECM NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Defective component: Fuel Heating Relay
E03	Circuit interruption between: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-1 & Ground
E04	Circuit interruption between: Fuel Heating Relay – Socket Terminal E74-5 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-2
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-76 & Fuel Heating Relay – Socket Terminal E74-1
E06	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-76 & Fuel Heating Relay – Socket Terminal E74-1
E07	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-76 & Fuel Heating Relay – Socket Terminal E74-1
E08	Short circuit to voltage between: Fuel Heating Relay – Socket Terminal E74-5 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-2
E09	Circuit interruption between: Circuit Fuse – Output contact & Fuel Heating Relay – Socket Terminal E74-4
E10	Circuit interruption between: Circuit Main Fuse – Output contact & Fuel Heating Relay – Socket Terminal E74-2

E11	• Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact
E12	• Short circuit to ground between: Fuel Heating Relay – Socket Terminal E74-5 & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal E67-2 or • Defective component: Fuel Heater and Temperature Sensor
E13	• Short circuit to ground between: Circuit Main Fuse – Output contact & Fuel Heating Relay – Socket Terminal E74-2

C-36, Malfunction Indication Lamp (MIL) Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Component • Ignition OFF • Ignition ON • Is at least one of the following indicator ON? Charge Indicator Lamp ABS Warning Lamp Air Bag Warning Lamp	Test okay?
	Yes: T02	No: E05
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit • Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) • Ignition ON • Is the following indicator OFF? Malfunction Indicator Lamp	Test okay?
	Yes: T03	No: T05
T03	Check: Interruption of Signal Circuit • Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-78 & Ground • Is the following indicator ON? Malfunction Indicator Lamp	Test okay?
	Yes: T04	No: E03
T04	Check: Short to Voltage of Signal Circuit • Ignition OFF • Remove fused jumper wire • Disconnect wiring harness connector from: Combination meter • Ignition ON • Measure voltage between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G22-19 & Ground	less than 0.3 V
	Yes: E01	No: E02
T05	Check: Component • Ignition OFF • Disconnect wiring harness connector from: Combination meter • Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal E27-78 & Ground	greater than 500 kOhm
	Yes: E01	No: E04

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-78 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-19
E03	- Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-78 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-19 or - Defective component: Combination Meter
E04	- Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-78 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-19 or - Defective component: Combination Meter
E05	- Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-11 or - Defective component: Combination Meter

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicator ON? – Charge Indicator Lamp – ABS Warning Lamp – Air Bag Warning Lamp	
	Yes: T02	No: E05
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Test okay?
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Ignition ON • Is the following indicator OFF? Malfunction Indicator Lamp	
	Yes: T03	No: T05
T03	Check: Interruption of Signal Circuit	Test okay?
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-78 & Ground • Is the following indicator ON? Malfunction Indicator Lamp	
	Yes: T04	No: E03
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Remove fused jumper wire • Disconnect wiring harness connector from: Combination meter • Ignition ON • Measure voltage between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G25-23 & Ground	
	Yes: E01	No: E02
T05	Check: Component	greater than 500 kOhm
	• Ignition OFF • Disconnect wiring harness connector from: Combination meter • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-78 & Ground	
	Yes: E01	No: E04

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-78 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-23
E03	- Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-78 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-23 or - Defective component: Combination Meter
E04	- Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-78 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-23 or - Defective component: Combination Meter
E05	- Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-15 or - Defective component: Combination Meter

C-37, Service Telltale Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicators ON? – Charge Indicator Lamp – ABS Warning Lamp – Air Bag Warning Lamp	
	Yes: T02	No: E04
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Test okay?
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) • Ignition ON • Is the following indicator OFF? SVS Lamp	
	Yes: T03	No: E03
T03	Check: Interruption of Signal Circuit	Test okay?
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-77 & Ground • Is the following indicator ON? SVS Lamp	
	Yes: E01	No: E02

Result Table (RM413D)

Result	Cause Of Fault
E01	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-77 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-21 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-77 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-21 or • Defective component: Combination Meter
E03	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-77 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-21 or • Defective component: Combination Meter
E04	• Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-11 or • Defective component: Combination Meter

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicators ON? – Charge Indicator Lamp – ABS Warning Lamp – Air Bag Warning Lamp	
	Yes: T02	No: E04
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Test okay?
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Ignition ON • Is the following indicator OFF? SVS Lamp	
	Yes: T03	No: E03
T03	Check: Interruption of Signal Circuit	Test okay?
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-77 & Ground • Is the following indicator ON? SVS Lamp	
	Yes: E01	No: E02

Result Table (RB413D)

Result	Cause Of Fault
E01	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-77 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-8 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-77 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-8 or • Defective component: Combination Meter
E03	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-77 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-8 or • Defective component: Combination Meter
E04	• Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-15 or • Defective component: Combination Meter

C-38, Oil Level Telltale Circuit

NOTE:

The following test table is applied only for vehicle with wire harness for low engine oil level warning light.

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicators ON? – Charge Indicator Lamp – ABS Warning Lamp – Air Bag Warning Lamp	
	Yes: T02	No: E04
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Test okay?
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector E27) • Ignition ON • Is the following indicator OFF? Oil Level Warning Lamp	
	Yes: T03	No: E03
T03	Check: Interruption of Signal Circuit	Test okay?
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal E27-51 & Ground • Is the following indicator ON? Oil Level Warning Lamp	
	Yes: E01	No: E02

Result Table (For RM413D)

Result	Cause Of Fault
E01	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-51 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-20 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-51 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-20 or • Defective component: Combination Meter
E03	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-51 & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-20 or • Defective component: Combination Meter
E04	• Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G22-11 or • Defective component: Combination Meter

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicators ON? – Charge Indicator Lamp – ABS Warning Lamp – Air Bag Warning Lamp	
	Yes: T02	No: E04
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Test okay?
	• Ignition OFF • Disconnect wiring harness connector from: ECM (Wiring Harness Connector G88) • Ignition ON • Is the following telltale OFF? Oil Level Warning Lamp	
	Yes: T03	No: E03
T03	Check: Interruption of Signal Circuit	Test okay?
	• Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal G88-51 & Ground • Is the following telltale ON? Oil Level Warning Lamp	
	Yes: E01	No: E02

Result Table (For RB413D)

Result	Cause Of Fault
E01	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-51 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-27 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E02	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-51 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-27 or • Defective component: Combination Meter
E03	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-51 & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-27 or • Defective component: Combination Meter
E04	• Circuit interruption between: Circuit Fuse – Output contact & Combination Meter – Wiring harness connector (wiring harness side) terminal G25-15 or • Defective component: Combination Meter

C-39, Engine Oil Level Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Mechanical Function	Is the oil level too low?
	Check Engine Oil Level	
	Yes: E01	No: T02
T02	Check: Interruption of signal Circuit	less than 5 Ohm
	- Ignition OFF - Disconnect wiring harness connector from: ECM and Oil Level Switch - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-1	
	Yes: T03	No: E02
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-26 & Ground	
	Yes: T04	No: E03
T04	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	Measure resistance between the following terminals: Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-2 & Ground	
	Yes: T05	No: E04
T05	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	Measure voltage between the following terminals: Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-1 & Ground	
	Yes: T06	No: E05
T06	Check: Component	less than 5 Ohm
	- Connect wiring harness connector to: Oil Level Switch - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal E27-26 & Ground	
	Yes: E06	No: E07

Result Table (For RM413D)

Result	Cause Of Fault
E01	Correct engine oil level.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal E27-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-1
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal E27-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-1
E04	Circuit interruption between: Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-2 & Ground
E05	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal E27-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C33-1
E06	Defective component ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	Defective component Oil Level Switch

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Mechanical Function	Is the oil level too low?
	Check Engine Oil Level	
	Yes: E01	No: T02
T02	Check: Interruption of signal Circuit	less than 5 Ohm
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Disconnect wiring harness connector from: Oil Level Switch - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-1	
	Yes: T03	No: E02
T03	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-26 & Ground	
	Yes: T04	No: E03
T04	Check: Circuit Interruption of Ground Circuit	less than 5 Ohm
	Measure resistance between the following terminals: Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-2 & Ground	
	Yes: T05	No: E04
T05	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	Measure voltage between the following terminals: Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-1 & Ground	
	Yes: T06	No: E05
T06	Check: Component	less than 5 Ohm
	- Connect wiring harness connector to: Oil Level Switch - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal G88-26 & Ground	
	Yes: E06	No: E07

Result Table (For RB413D)

Result	Cause Of Fault
E01	Correct engine oil level.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal G88-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-1
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal G88-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-1
E04	Circuit interruption between: Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-2 & Ground
E05	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal G88-26 & Oil Level Switch – Wiring harness connector (wiring harness side) terminal C32-1
E06	Defective component ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E07	Defective component Oil Level Switch

C-40, Vehicle Speed Sensor Circuit

Result Table (For RM413D)

Result	Cause Of Fault
E01	• Circuit interruption between: Combination Meter – Wiring harness connector (wiring harness side) terminal G21-15 & ECM – Wiring harness connector (wiring harness side) terminal E27-89 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Result Table (For RB413D)

Result	Cause Of Fault
E01	• Circuit interruption between: Combination Meter – Wiring harness connector (wiring harness side) terminal G25-2 & ECM – Wiring harness connector (wiring harness side) terminal G88-89 or • Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-41, Function-Group Intake Air System

Result Table

Result	Cause Of Fault
E01	Defective component: component, that is recognized as defective NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-42, Function-Group Fuel System

Test Table

Test	Work Order Description	Nominal Value
T01	Check: Diagnostic Trouble Code stored	
	Is the following Diagnostic Trouble Code stored? P1660 – Shut Off Valve	
	Yes: E01	No: E02

Result Table

Result	Cause Of Fault
E01	- Mechanical fault in the low-pressure section - Check the following mechanical fault sources: - The low pressure fuel pump delivery rate is too low - Shut-off valve in high pressure fuel pump or - Defective component: - Fuel Pump - or - High-pressure fuel pump NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement.
E02	- Defective component: - component, that is recognized as defective NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-43, Function-Group Low Pressure Section

Result Table

Result	Cause Of Fault
E01	• Mechanical fault in the low-pressure section • Check the following mechanical fault sources: – Screen in fuel tank – Pressure relief valve in fuel tank – The low pressure fuel pump delivery rate is too low – Overflow valve in fuel filter – Shut-off valve in high pressure fuel pump or • Defective component: component, that is recognized as defective

C-44, Function-Group Low and High Pressure Section

Result Table

Result	Cause Of Fault
E01	• Mechanical fault in the low-pressure section or • Mechanical fault in the high pressure section • Check the following mechanical fault sources: – Screen in fuel tank – Pressure relief valve in fuel tank – The low pressure fuel pump delivery rate is too low – Overflow valve in fuel filter – Shut-off valve in high pressure fuel pump – The high pressure fuel pump delivery rate is too low or • Defective component: component, that is recognized as defective NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-45, Function-Group High Pressure Area

Result Table

Result	Cause Of Fault
E01	• Mechanical fault in the high pressure section • Check all mechanical components of the concerned system. - or • Defective component: component, that is recognized as defective NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-46, Starter Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Starter	Does the starter crank?
	- Check the following component for proper operation: Starting Motor - Turn ignition switch to ST position	
	Yes: T02	No: T14
T02	Check: Battery Voltage	greater than 11 V
	- Verify battery condition - Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T03	No: T13
T03	Load Simulation	less than 400 A and Battery voltage is less than 8 V
	- Check battery condition under load simulation Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground - Check current consumption with current probe Connect current probe to following lead: Starting Motor – Terminal C45-1 - Turn ignition switch to ST position - Check current consumption and battery voltage both at the same time	
	Yes: T04	No: T10
T04	Check: Engine Start	Does the engine start?
	- Charge or replace battery or - Connect loaded battery parallel to the battery in the vehicle - Try to start engine once more	
	Yes: T05	No: T10
T05	Check: Component	13.4 ... 14.5 V Engine running at idle speed, operating temperature All consumers turned off
	- Check charge by generator Measure voltage between: Generator – C47-1 & Ground - Engine running - Increase engine speed to 3000 rpm	
	Yes: T06	No: T09

Test	Work Order Description	Nominal Value
T06	Check: Component	Stall current greater than 50 mA?
	• Check stall current • Measure current between the following terminals: Battery – Positive (+) terminal & Battery – Wiring harness NOTE: All vehicle systems must be switched OFF during these tests. Doors must be closed, engine compartment lighting must be disconnected.	
	Yes: T07	No: E03
T07	Check: Component	Does the stall current change to a value less than 50 mA after removing a fuse?
	• Check stall current Remove consecutively all fuses from the fuse-boxes.	
	Yes: T08	No: E02
T08	Check: Component	Does the stall current change to a value less than 50 mA after removing a component?
	• Check stall current • Install following component: Last removed fuse • Disconnect consecutively all components which are connected to the circuit behind this fuse.	
	Yes: E01	No: E02
T09	Check: Component	Test okay?
	• Check the following circuit for proper operation: Wiring harness to generator terminal C42-1 Wiring harness to generator terminal C47-1 Check all ground connections	
	Yes: E04	No: E05
T10	Load Simulation	Less than 400 A and more than 8 V? Go to YES More than 400 A and less than 8 V? Go to NO
	• Check battery condition under load simulation Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground • Check current consumption with current probe Connect current probe to following lead: Starting Motor – Terminal C45-1 • Turn ignition switch to ST position • Check current consumption and battery voltage both at the same time	
	Yes: T11	No: E09
T11	Check: Component	Connectors okay? Is the ground connection okay?
	• Check wiring harness and connectors to battery and starter	
	Yes: T12	No: E08

Test	Work Order Description	Nominal Value
T12	Check: Component	Mechanical function check okay?
	• Verify mechanical system functions/components – Check engine mechanic – Check freedom of motion on crankshaft	
	Yes: E06	No: E07
T13	Check: Component	greater than 11 V
	• Charge or replace battery • Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T10	No: E10
T14	Check: Battery Voltage	greater than 11 V
	• Verify battery condition • Ignition ON • Turn all electrical consumers ON • Measure voltage between: Battery – Positive (+) terminal & Ground	
	Yes: T15	No: T17
T15	Check: Component	greater than 11 V
	• Check terminal G05-3 to ignition switch Measure voltage between: Starting Motor – Wiring harness connector (wiring harness side) terminal C46-1 & Ground • Turn ignition switch to ST position	
	Yes: T11	No: T16
T16	Check: Component	Test okay?
	• Check the following component for proper operation: Ignition Switch – Terminal G05-3	
	Yes: E11	No: E12
T17	Check: Engine Start	Does the starter crank?
	• Charge or replace battery or • Connect loaded battery parallel to the battery in the vehicle • Try to start engine once more	
	Yes: T05	No: T15

Result Table (For RM413D)

Result	Cause Of Fault
E01	Defective component: Last disconnected component
E02	Fault in wiring harness NOTE: During fault searching in the wiring harness, the sections of the wiring harness can be separated at the assigned connectors. When the stall current changes to the permissible value after separating a section, the fault is located in the concerning section of the wiring harness.
E03	- Battery discharged - Cell shorted - Corroded Contacts - Bad ground connection
E04	Defective component: Generator
E05	Fault in wiring harness Wiring harness to generator terminal C42-1 or Wiring harness to generator terminal C47-1 or Bad ground connection
E06	- Circuit interruption between: Battery – Positive (+) terminal & Starting Motor – Wiring harness connector (wiring harness side) terminal C45-1 or - Defective component: Starting Motor
E07	Mechanical engine problem
E08	Repair/clean wiring harness and connectors to battery/starting motor
E09	Mechanical engine problem or Defective component: Starting Motor NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement.
E10	Defective component: Battery
E11	Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G05-3 & Starting Motor – Wiring harness connector (wiring harness side) terminal C46-1
E12	Defective component: Ignition Switch

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Starter	Does the starter crank?
	- Check the following component for proper operation: Starting Motor - Turn ignition switch to ST position	
	Yes: T02	No: T14
T02	Check: Battery Voltage	greater than 11 V
	- Verify battery condition - Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T03	No: T13
T03	Load Simulation	less than 400 A and Battery voltage is less than 8 V
	- Check battery condition under load simulation Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground - Check current consumption with current probe Connect current probe to following lead: Starting Motor – Terminal C05-1 - Turn ignition switch to ST position - Check current consumption and battery voltage both at the same time	
	Yes: T04	No: T10
T04	Check: Engine Start	Does the engine start?
	- Charge or replace battery or - Connect loaded battery parallel to the battery in the vehicle - Try to start engine once more	
	Yes: T05	No: T10
T05	Check: Component	13.4 ... 14.5 V Engine running at idle speed, operating temperature All consumers turned off
	- Check charge by generator Measure voltage between the following terminals: Generator – C08-1 & Ground - Engine running - Increase engine speed to 3000 rpm	
	Yes: T06	No: T09

Test	Work Order Description	Nominal Value
T06	Check: Component	Stall current greater than 50 mA?
	• Check stall current • Measure current between the following terminals: Battery – Positive (+) terminal & Battery – Positive (+) terminal Wiring harness NOTE: All vehicle systems must be switched OFF during these tests. Doors must be closed, engine compartment lighting must be disconnected.	
	Yes: T07	No: E03
T07	Check: Component	Does the stall current change to a value less than 50 mA after removing a fuse?
	• Check stall current Remove consecutively all fuses from the fuse-boxes.	
	Yes: T08	No: E02
T08	Check: Component	Does the stall current change to a value less than 50 mA after removing a component?
	• Check stall current • Install following component: Last removed fuse • Disconnect consecutively all components which are connected to the circuit behind this fuse.	
	Yes: E01	No: E02
T09	Check: Component	Test okay?
	• Check the following circuit for proper operation: Wiring harness to generator terminal C07-1 Wiring harness to generator terminal C08-1 Check all ground connections	
	Yes: E04	No: E05
T10	Load Simulation	Less than 400 A and more than 8 V? Go to YES More than 400 A and less than 8 V? Go to NO
	• Check battery condition under load simulation Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground • Check current consumption with current probe Connect current probe to following lead: Starting Motor – Terminal C05-1 • Turn ignition switch to ST position • Check current consumption and battery voltage both at the same time	
	Yes: T11	No: E09
T11	Check: Component	Connectors okay? Is the ground connection okay?
	• Check wiring harness and connectors to battery and starter	
	Yes: T12	No: E08

Test	Work Order Description	Nominal Value
T12	Check: Component	Mechanical function check okay?
	• Verify mechanical system functions/components – Check engine mechanic – Check freedom of motion on crankshaft	
	Yes: E06	No: E07
T13	Check: Component	greater than 11 V
	• Charge or replace battery • Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T10	No: E10
T14	Check: Battery Voltage	greater than 11 V
	• Verify battery condition • Ignition ON • Turn all electrical consumers ON • Measure voltage between the following terminals: Battery – Positive (+) terminal & Ground	
	Yes: T15	No: T17
T15	Check: Component	greater than 11 V
	• Check terminal G24-3 to ignition switch Measure voltage between the following terminals: Starting Motor – Wiring harness connector (wiring harness side) terminal C06-1 & Ground • Turn ignition switch to ST position	
	Yes: T11	No: T16
T16	Check: Component	Test okay?
	• Check the following component for proper operation: Ignition Switch – Terminal G24-3	
	Yes: E11	No: E12
T17	Check: Engine Start	Does the starter crank?
	• Charge or replace battery or • Connect loaded battery parallel to the battery in the vehicle • Try to start engine once more	
	Yes: T05	No: T15

Result Table (For RB413D)

Result	Cause Of Fault
E01	Defective component: Last disconnected component
E02	Fault in wiring harness NOTE: During fault searching in the wiring harness, the sections of the wiring harness can be separated at the assigned connectors. When the stall current changes to the permissible value after separating a section, the fault is located in the concerning section of the wiring harness.
E03	- Battery discharged - Cell shorted - Corroded Contacts - Bad ground connection
E04	Defective component: Generator
E05	Fault in wiring harness Wiring harness to generator terminal C07-1 or Wiring harness to generator terminal C08-1 or Bad ground connection
E06	- Circuit interruption between: Battery – Positive (+) terminal & Starting Motor – Wiring harness connector (wiring harness side) terminal C05-1 or - Defective component: Starting Motor
E07	Mechanical engine problem
E08	Repair/clean wiring harness and connectors to battery/starting motor
E09	Mechanical engine problem or Defective component: Starting Motor NOTE: The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement.
E10	Defective component: Battery
E11	Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal G24-3 & Starting Motor – Wiring harness connector (wiring harness side) terminal C06-1
E12	Defective component: Ignition Switch

C-47, System Status Information

Result	Cause Of Fault
E01	• This trouble code indicates an invalid operating condition. Operation mode with high load and high coolant temperature or Operation mode with high load and low fuel reserve • Inform the customer, that the system behaviour is normal respectively how to operate the system correctly. NOTE: This trouble code is set when an engine protection function is activated. (overheating protection)

C-48, Engine Coolant Temperature Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage of Signal Circuit	less than 0.3V
	• Ignition OFF • Disconnect wiring harness connector from: Combination meter and ECM • Ignition ON • Measure voltage between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G21-1 & Ground	
	Yes: T02	No: E01
T02	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G21-1 & Ground	
	Yes: T03	No: E02
T03	Check: Short to Interruption of Signal Circuit	less than 5 Ohm
	• Ignition OFF • Measure resistance between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G21-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-45	
	Yes: E04	No: E03

Result Table (For RM413D)

Result	Cause of Fault
E01	• Short circuit to voltage between: Combination meter – Wiring harness connector (wiring harness side) terminal G21-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-45
E02	• Short circuit to ground between: Combination meter – Wiring harness connector (wiring harness side) terminal G21-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-45
E03	• Circuit interruption between: Combination meter – Wiring harness connector (wiring harness side) terminal G21-1 & ECM – Wiring harness connector (wiring harness side) terminal C66-45
E04	• Defective component: Combination meter or • Defective component: ECM NOTE: • The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. • If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage of Signal Circuit	less than 0.3V
	• Ignition OFF • Disconnect wiring harness connector from: Combination meter and ECM • Ignition ON • Measure voltage between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G25-21 & Ground	
	Yes: T02	No: E01
T02	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	• Ignition OFF • Measure resistance between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G25-21 & Ground	
	Yes: T03	No: E02
T03	Check: Short to Interruption of Signal Circuit	less than 5 Ohm
	• Ignition OFF • Measure resistance between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G25-21 & ECM – Wiring harness connector (wiring harness side) terminal D26-45	
	Yes: E04	No: E03

Result Table (For RB413D)

Result	Cause of Fault
E01	Short circuit to voltage between: Combination meter – Wiring harness connector (wiring harness side) terminal G25-21 & ECM – Wiring harness connector (wiring harness side) terminal D26-45
E02	Short circuit to ground between: Combination meter – Wiring harness connector (wiring harness side) terminal G25-21 & ECM – Wiring harness connector (wiring harness side) terminal D26-45
E03	Circuit interruption between: Combination meter – Wiring harness connector (wiring harness side) terminal G25-21 & ECM – Wiring harness connector (wiring harness side) terminal D26-45
E04	- Defective component: Combination meter or - Defective component: ECM NOTE: - The replacement of the components must be done in the listed order. The system must be checked for proper operation after every replacement. - If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.

C-49, Engine Speed Input Signal Circuit

Test Table (For RM413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Is engine speed displayed on scan tool?
	- Ignition OFF - Disconnect wiring harness connector from: EPS control module (Wiring Harness Connector G13) - Ignition ON - Engine running at idle speed Scan Tool display Data List Parameter Engine Speed	
	Yes: E01	No: T02
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Is engine speed displayed on revolution meter?
	- Ignition OFF - Disconnect wiring harness connector from: Combination meter - Ignition ON - Engine running at idle speed - Connect revolution indicator to: Combination meter – Wiring Harness Connector (wiring harness side) terminal G21-6 & Ground NOTE: Revolution meter setting: 4 cylinder, 4 stroke	
	Yes: E02	No: T03
T03	Check: Short to Voltage of Signal Circuit	less than 0.3V
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Ignition ON - Measure voltage between the following terminals: Combination meter – Wiring Harness Connector (wiring harness side) terminal G21-6 & Ground	
	Yes: T04	No: E05
T04	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G21-6 & Ground	
	Yes: E03	No: E04

Result Table (For RM413D)

Result	Cause of Fault
E01	Defective component: EPS control module
E02	Defective component: Combination meter
E03	Circuit interruption between: Combination meter – Wiring harness connector (wiring harness side) terminal G21-16 & ECM – Wiring harness connector (wiring harness side) terminal E27-89 or Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	Short circuit to ground between: Combination meter – Wiring harness connector (wiring harness side) terminal G21-16 & ECM – Wiring harness connector (wiring harness side) terminal E27-89 & Wiring harness connector terminal of all components (wiring harness side), which were disconnected from the wiring harness during this trouble shooting session
E05	Short circuit to voltage between: Combination meter – Wiring harness connector (wiring harness side) terminal G21-16 & ECM – Wiring harness connector (wiring harness side) terminal E27-89 & Wiring harness connector terminal of all components (wiring harness side), which were disconnected from the wiring harness during this trouble shooting session

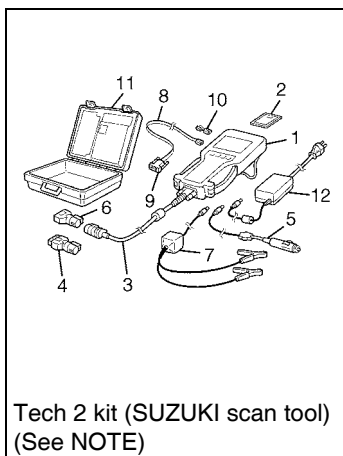
Test Table (For RB413D)

Test	Work Order Description	Nominal Value
T01	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Is engine speed displayed on scan tool?
	- Ignition OFF - Disconnect wiring harness connector from: PTC control module (Wiring Harness Connector G92) - Ignition ON - Engine running at idle speed Scan Tool display Data List Parameter Engine Speed	
	Yes: E01	No: T02
T02	Check: Short to Voltage/Ground/Interruption of Signal Circuit	Is engine speed displayed on revolution meter?
	- Ignition OFF - Disconnect wiring harness connector from: Combination meter - Ignition ON - Engine running at idle speed - Connect revolution meter to: Combination meter – Wiring Harness Connector (wiring harness side) terminal G25-18 & Ground NOTE: Revolution meter setting: 4 cylinder, 4 stroke	
	Yes: E02	No: T03
T03	Check: Short to Voltage of Signal Circuit	less than 0.3V
	- Ignition OFF - Disconnect wiring harness connector from: ECM - Ignition ON - Measure voltage between the following terminals: Combination meter – Wiring Harness Connector (wiring harness side) terminal G25-18 & Ground	
	Yes: T04	No: E05
T04	Check: Short to Ground of Signal Circuit	greater than 500 kOhm
	- Ignition OFF - Measure resistance between the following terminals: Combination meter – Wiring harness connector (wiring harness side) terminal G25-18 & Ground	
	Yes: E03	No: E04

Result Table (For RB413D)

Result	Cause of Fault
E01	Defective component: PTC control module
E02	Defective component: Combination meter
E03	- Circuit interruption between: Combination meter – Wiring harness connector (wiring harness side) terminal G25-18 & ECM – Wiring harness connector (wiring harness side) terminal G88-29 or - Defective component: ECM NOTE: If ECM is replaced, register vehicle specification into ECM by performing procedure described in “ECM registration” in Section 6E3.
E04	Short circuit to ground between: Combination meter – Wiring harness connector (wiring harness side) terminal G25-18 & ECM - Wiring harness connector (wiring harness side) terminal G88-29 & Wiring harness connector terminal of all components (wiring harness side), which were disconnected from the wiring harness during this trouble shooting session
E05	Short circuit to voltage between: Combination meter – Wiring harness connector (wiring harness side) terminal G25-18 & ECM - Wiring harness connector (wiring harness side) terminal G88-29 & Wiring harness connector terminal of all components (wiring harness side), which were disconnected from the wiring harness during this trouble shooting session

Special Tool



NOTE:

This kit includes the following items.

1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable,
6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter,
10. RS232 loopback connector, 11. Storage case, 12. Power supply

SECTION 6A3

ENGINE MECHANICAL (Z13DT ENGINE)

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CAUTION:

Be sure to read “Precautions” in Section 6E3 before disconnecting fuel line or removing fuel system part(s). Failure to follow “Precautions” could result in unneeded fuel system repairs.

CONTENTS

Diagnosis.....	6A3-3	Oil Pressure Switch Removal and	
Compression Check.....	6A3-3	Installation.....	6A3-20
Oil Pressure Check	6A3-4	Oil Cooler Components.....	6A3-21
On-Vehicle Service	6A3-6	Oil Cooler Removal and Installation.....	6A3-21
Air Cleaner Components.....	6A3-6	Oil Pan Components.....	6A3-24
Air Cleaner Filter Removal and		Oil Pan Removal and Installation.....	6A3-24
Installation.....	6A3-7	Unit Repair Overhaul	6A3-27
Air Cleaner Filter Inspection and		Engine Assembly Removal and	
Cleaning.....	6A3-7	Installation.....	6A3-27
Air Cleaner Assembly Removal and		Timing Chain Cover and Timing Chain	
Installation.....	6A3-7	Components.....	6A3-31
Inter Cooler Components	6A3-8	Timing Chain Cover and Timing Chain	
Inter Cooler Removal and Installation	6A3-9	Removal and Installation.....	6A3-32
Turbocharger Components	6A3-10	Timing Chain Cover and Timing Chain	
Turbocharger Removal and Installation	6A3-11	Inspection.....	6A3-40
Turbocharger Inspection	6A3-15	Oil Pump / Oil Pump Strainer	
Intake Manifold Components	6A3-16	Components.....	6A3-42
Intake Manifold Removal and		Oil Pump / Oil Pump Strainer Removal	
Installation.....	6A3-16	and Installation.....	6A3-42
Exhaust Manifold Components	6A3-18	Oil Pump Strainer Cleaning	6A3-43
Exhaust Manifold Removal and		Oil Pump Inspection.....	6A3-43
Installation.....	6A3-18	Camshaft Housing Components	6A3-44
Vacuum Pump Removal and		Camshaft Housing Assembly Removal	
Installation.....	6A3-20	and Installation.....	6A3-45

Camshaft Housing Assembly Disassembly and Reassembly	6A3-47
Camshaft Inspection	6A3-50
Valves and Cylinder Head Components.....	6A3-53
Valves and Cylinder Head Assembly Removal and Installation.....	6A3-54
Valves and Cylinder Head Assembly Disassembly and Reassembly	6A3-58
Valves and Cylinder Head Components Inspection.....	6A3-60
Pistons, Piston Rings, Connecting Rods and Cylinder Components.....	6A3-62
Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation.....	6A3-62

Pistons, Piston Rings, Connecting Rods and Cylinder Disassembly and Reassembly	6A3-65
Pistons, Piston Rings, Connecting Rods and Cylinder Inspection	6A3-66
Main Bearings, Crankshaft and Cylinder Block Components.....	6A3-71
Main Bearings, Crankshaft and Cylinder Block Removal and Installation.....	6A3-71
Main Bearings, Crankshaft and Cylinder Block Inspection.....	6A3-77
Special Tool.....	6A3-79
Tightening Torque Specifications.....	6A3-80
Required Service Material.....	6A3-82

Diagnosis

Compression Check

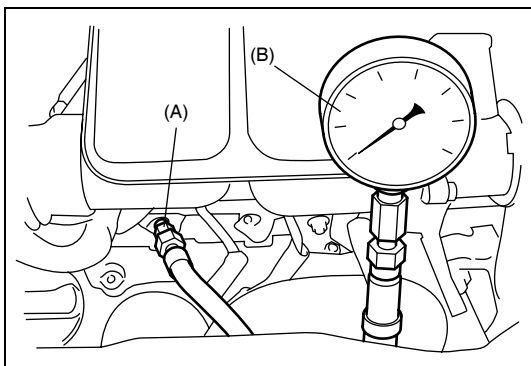
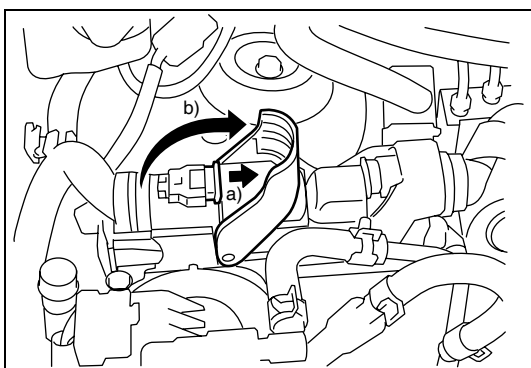
Check compression pressure on all 4 cylinders as follows:

- 1) Warm up engine.
- 2) Stop engine after warming up.

NOTE:

After warming up engine, place transmission gear shift lever in "Neutral" and set parking brake and block drive wheels.

- 3) Disconnect negative (–) cable at battery.
- 4) Disconnect glow controller connector referring to "Glow controller removal and installation" in Section 6E3.
- 5) Remove all glow plugs referring to "Glow plug removal and installation" in Section 6E3.
- 6) Disconnect connectors from ECM as follows.
 - a) Pull out lock slider to release locking of lock lever.
 - b) Pull up the lock lever.



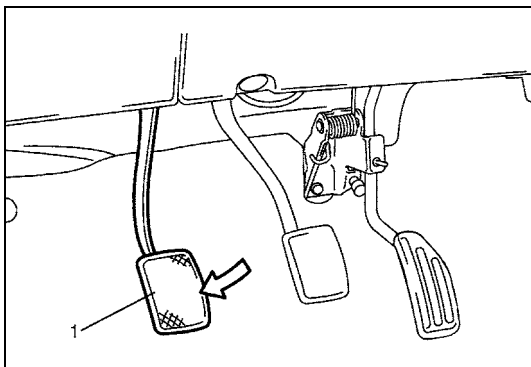
- 7) Install special tools into glow plug hole.

Special tool

(A): 09915-68610

(B): 09912-57821

- 8) Connect negative (–) cable at battery.



- 9) Disengage clutch (1) in order to lighten starting load on engine.

- 10) Crank engine with fully charged battery and read highest pressure on compression gauge.
- 11) Carry out steps 7) to 10) on each cylinder in order to obtain 4 readings.

NOTE:

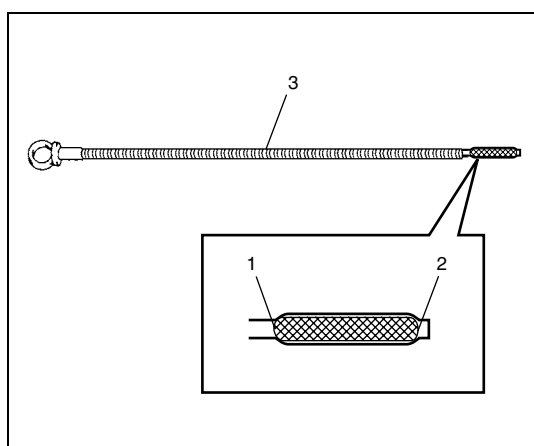
- For measuring compression pressure, crank engine at least 200 rpm by using fully charged battery.
- If measured compression pressure is excessively low at one of 4 cylinder, check installation condition of special tool. If it is properly installed, possibility is compression pressure leakage from where piston ring, valve contact and cylinder head gasket.

Compression pressure specification**Max. difference between any two cylinders:****150 kPa (1.5 kg/cm², 21.3 psi)**

- 12) Disconnect negative (–) cable at battery.
- 13) After checking, install glow plugs referring to “Glow plug removal and installation” in Section 6E3.
- 14) Connect ECM connector.
- 15) Connect glow controller connector referring to “Glow controller removal and installation” in Section 6E3.
- 16) Connect negative (–) cable at battery.

Oil Pressure Check**WARNING:**

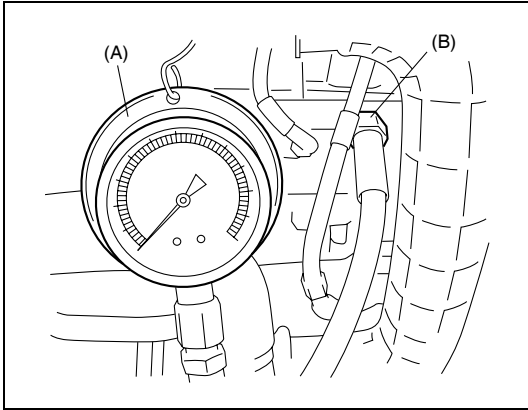
To avoid danger of being burned, do not touch exhaust manifold when exhaust system is hot.



- 1) Prior to checking oil pressure, check the following items.
 - Oil level in oil pan.
If oil level is low, add oil up to full level mark (1) on oil level gauge (3).
 - Oil quality.
If oil is discolored or deteriorated, change it. For particular oil to be used, refer to “Engine Oil and Oil Filter Replacement (Z13DT)” in Section 0B.
 - Oil leaks.
If leak is found, repair it.

2. Low level mark

- 2) Disconnect oil pressure switch referring to “Oil Pressure Switch Removal and Installation” in this section.



- 3) Install special tools to vacated threaded hole.

CAUTION:

Be careful not to make special tool touch exhaust manifold when installing because exhaust manifold becomes very hot.

Special tool

(A): 09915-77311

(B): 09919-46010

- 4) Start engine and warm it up to normal operating temperature.

NOTE:

Be sure to place transmission gear shift lever in “Neutral” and set parking brake and block drive wheels.

- 5) After warming up, measure oil pressure at specified idle speed.

NOTE:

For specified idle speed, refer to “Idle Speed Inspection” in Section 6E3.

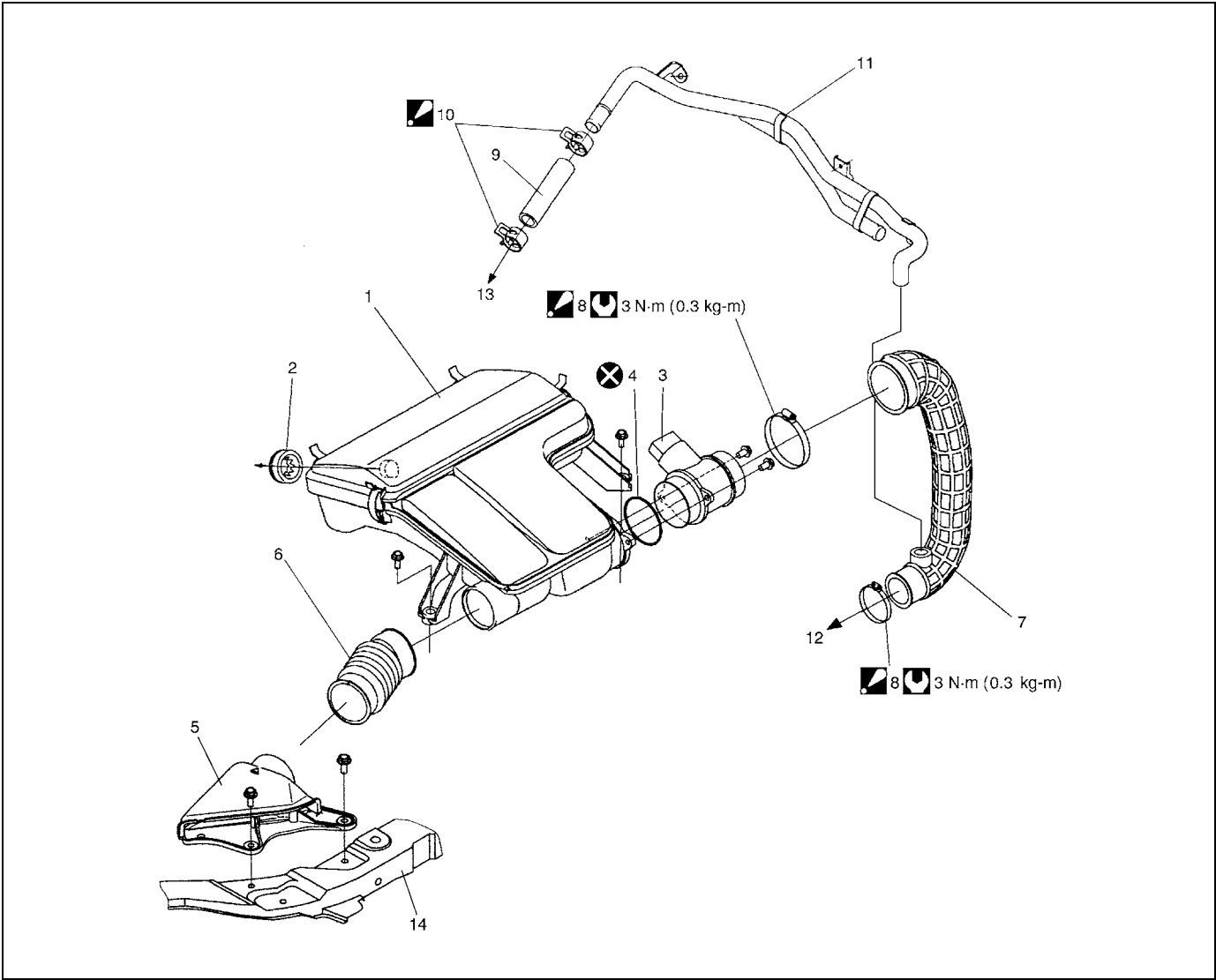
Oil pressure specification:

Approx. 140 kPa (1.4 kg/cm 20.0 psi) at specified idle speed

- 6) Stop engine and remove oil pressure gauge and attachment.
 7) Install oil pressure switch referring to “Oil Pressure Switch Removal and Installation” in this section.
 8) Start engine and check oil pressure switch for oil leakage.
 If oil leakage is found, repair it.

On-Vehicle Service

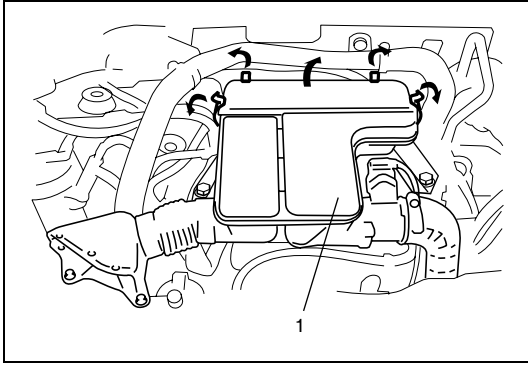
Air Cleaner Components



1. Air cleaner assembly	7. Air cleaner outlet hose	13. To engine
2. Air cleaner grommet	 8. Hose clamp Be sure to position clamp screw in specified place as shown in figure.	14. Upper member
3. MAF sensor assembly	9. Breather hose	 Tightening torque
4. MAF sensor O-ring	 10. Breather hose clip Be sure to position clip in specified direction as shown in figure.	 Do not reuse.
5. Air cleaner suction pipe	11. Breather pipe	
6. Air suction hose	12. To turbocharger	

Air Cleaner Filter Removal and Installation

Removal



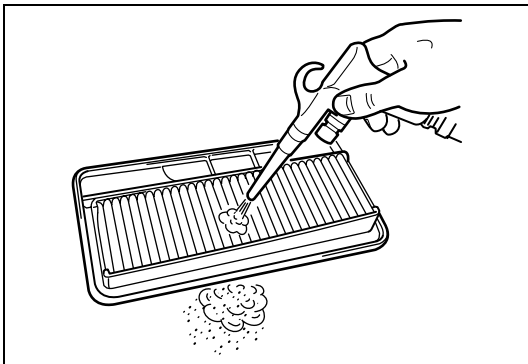
- 1) Unhook air cleaner assembly (1) clamps.
- 2) Open air cleaner assembly.
- 3) Remove air cleaner filter from air cleaner assembly.

Installation

Reverse removal procedure for installation.

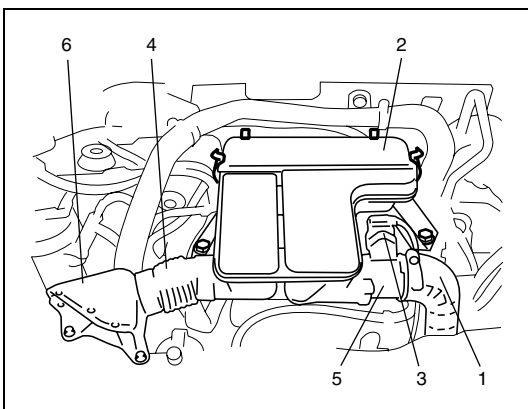
Air Cleaner Filter Inspection and Cleaning

- Check air cleaner filter for dirt. Replace excessively dirty filter.
- Blow off dust by compressed air from air outlet side of filter.



Air Cleaner Assembly Removal and Installation

Removal



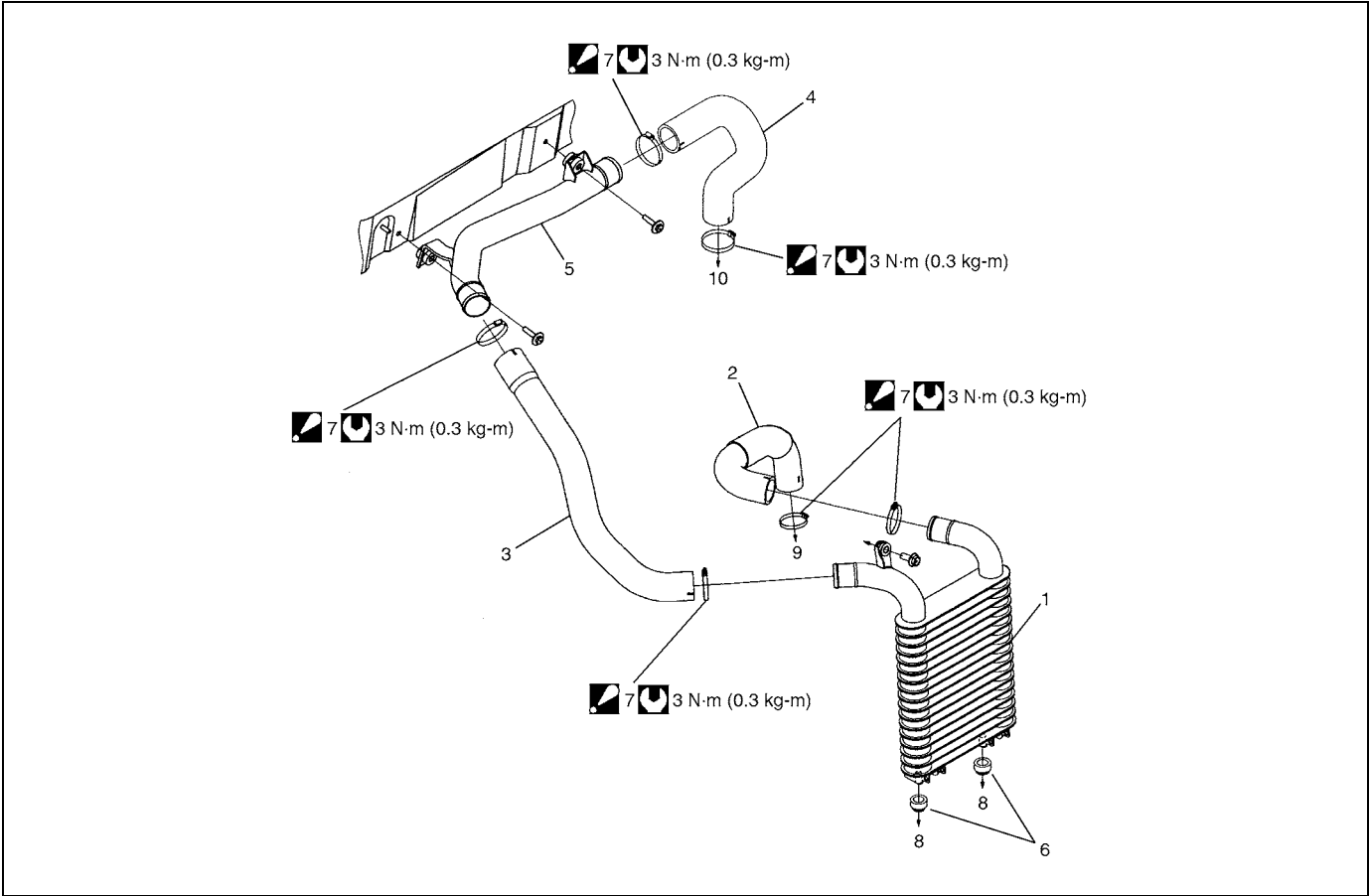
- 1) Disconnect air cleaner outlet hose (1) from air cleaner assembly (2).
- 2) Disconnect MAF sensor connector (3) from MAF sensor assembly (5).
- 3) Remove air suction hose (4) with air cleaner suction pipe (6) from air cleaner assembly (2).
- 4) Remove air cleaner assembly (2).

Installation

Reverse removal procedure for installation noting the following.

- Clamp each hose securely.
- Tighten air cleaner outlet hose clamp to specified torque referring to “Air Cleaner Components” in this section.

Inter Cooler Components

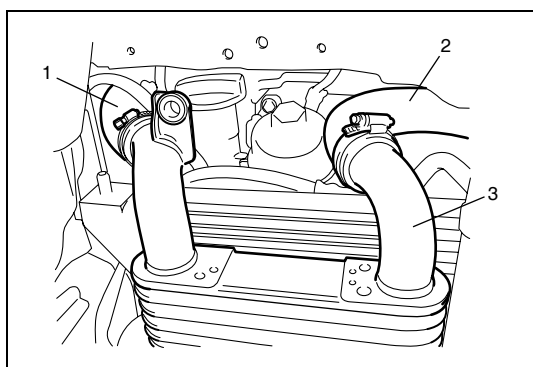
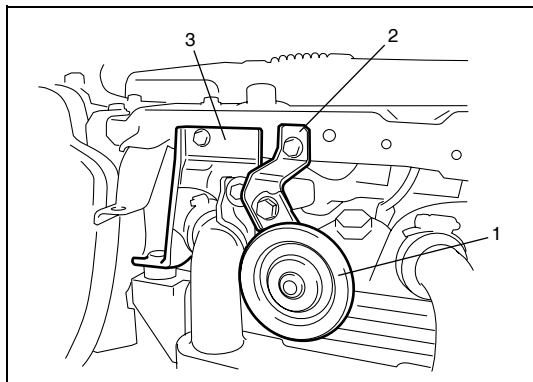


1. Inter cooler	5. Inter cooler outlet pipe	9. To turbocharger
2. Inter cooler inlet hose	6. Inter cooler mount	10. To air intake joint
3. Inter cooler outlet No.1 hose	 7. Hose clamp Be sure to position clamp screw in specified place as shown in figure.	 Tightening torque
4. Inter cooler outlet No.2 hose	8. To lower member	

Inter Cooler Removal and Installation

Removal

- 1) Remove front bumper referring to “Front Bumper and Rear Bumper Removal and Installation” for RM413D or “Front Bumper and Rear Bumper” for RB413D in Section 9.
- 2) Remove horn (1) with its bracket (2) and radiator right side bracket (3).



- 3) Disconnect inter cooler outlet No.1 hose (1) and inlet hose (2) from inter cooler (3).
- 4) Remove inter cooler from vehicle.

Installation

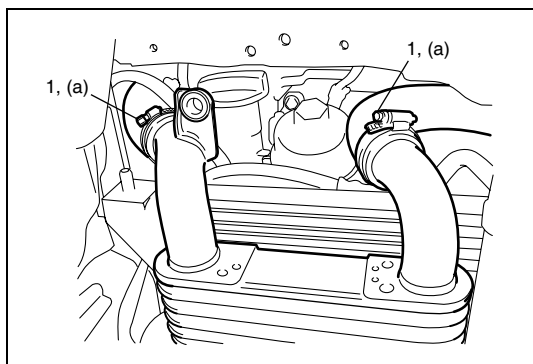
Reverse removal procedure for installation noting the following.

- Tighten hose clamps (1) to specified torque.

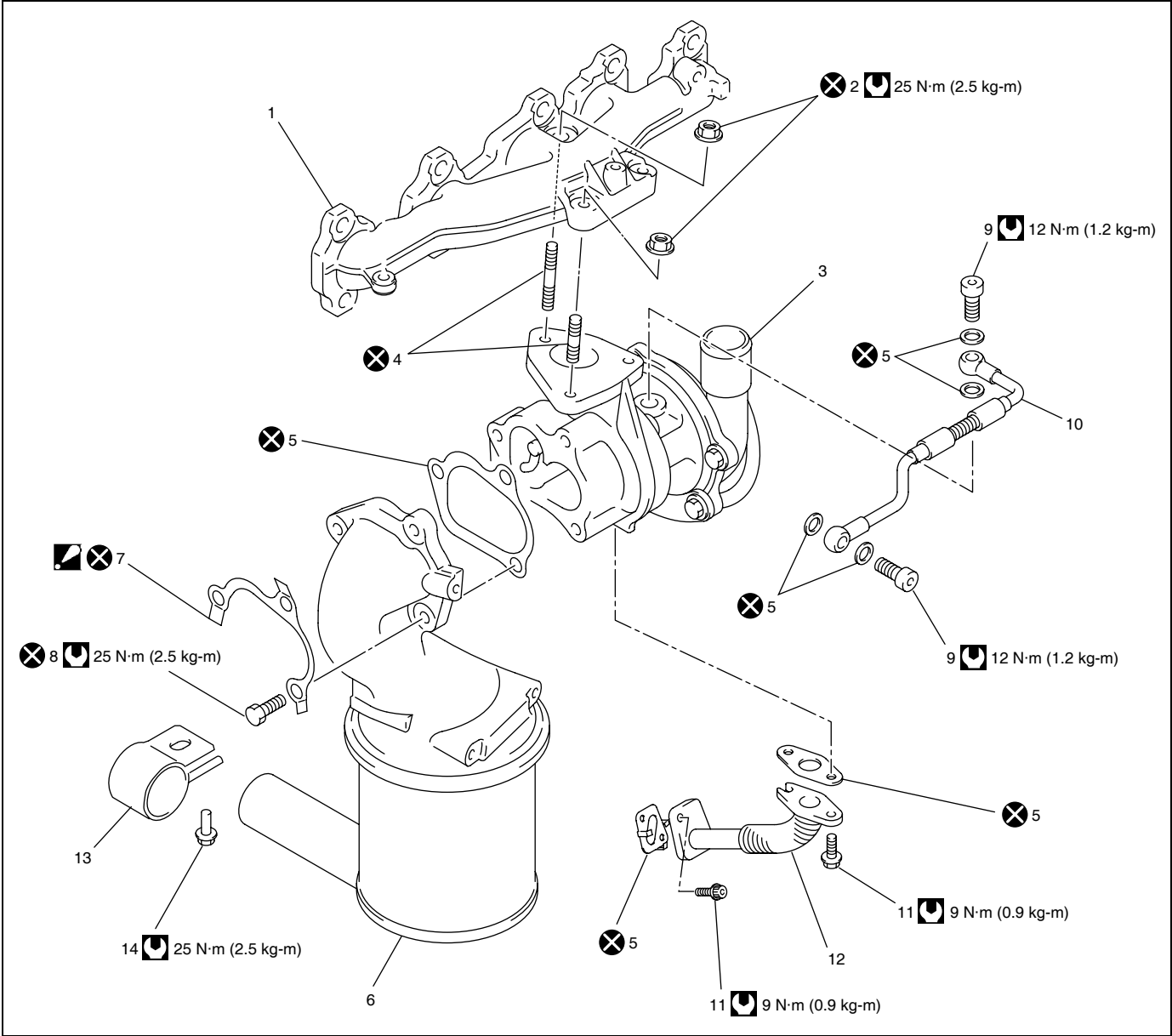
Tightening torque

Inter cooler hose clamp (a): 3 N·m (0.3 kg-m, 2.5 lb-ft)

- Install front bumper referring to “Front Bumper and Rear Bumper Removal and Installation” for RM413D or “Front Bumper and Rear Bumper” for RB413D in Section 9.



Turbocharger Components



1. Exhaust manifold	7. Lock plate : Bend lock part of lock plate to prevent cata- lytic converter bolt from loosening.	13. Catalytic converter mount
2. Turbocharger nut	8. Catalytic converter bolt	14. Catalytic converter mounting bolt
3. Turbocharger	9. Union bolt	 Tightening torque
4. Stud bolt	10. Turbocharger lubrication pipe	 Do not reuse.
5. Gasket	11. Oil return pipe bolt	
6. Catalytic converter	12. Oil return pipe	

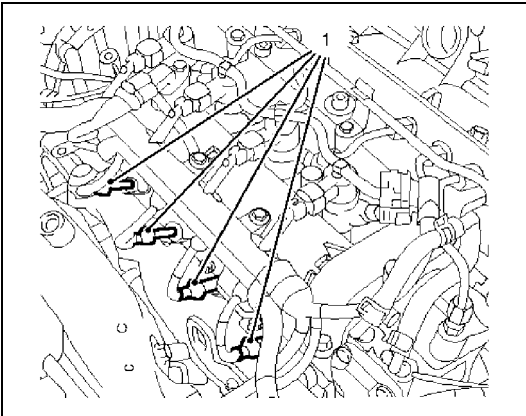
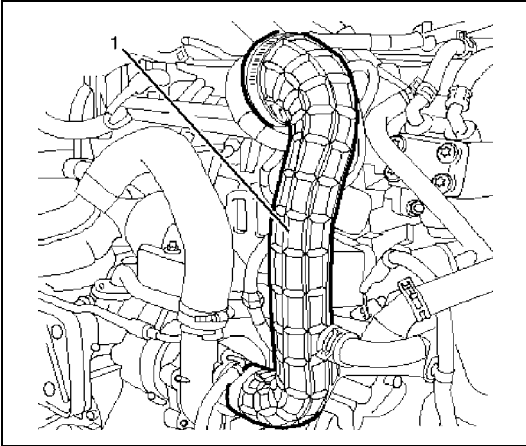
Turbocharger Removal and Installation

Removal

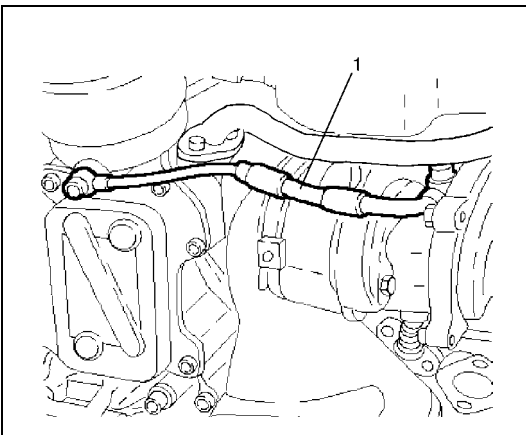
WARNING:

To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

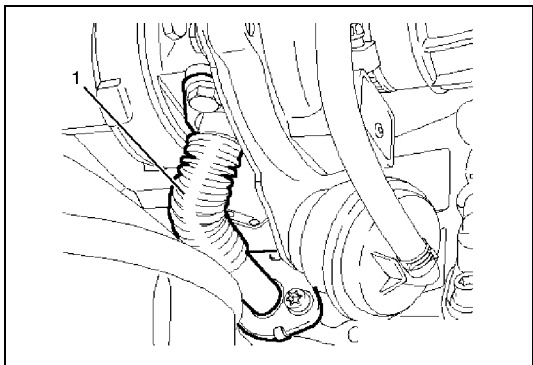
- 1) Disconnect negative (–) cable at battery.
- 2) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation” in this section.
- 3) Remove air cleaner outlet hose (1) from turbocharger.
- 4) Remove inter cooler inlet hose referring to “Inter Cooler Removal and Installation” in this section.
- 5) Remove exhaust manifold side engine hanger referring to “Exhaust Manifold Components” in this section.



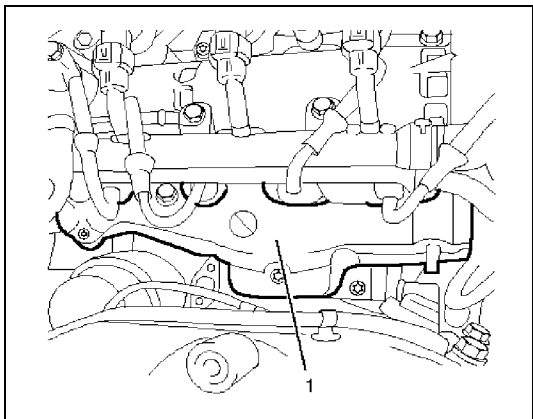
- 6) Disconnect glow plug connectors (1).



- 7) Remove lubrication pipe (1).



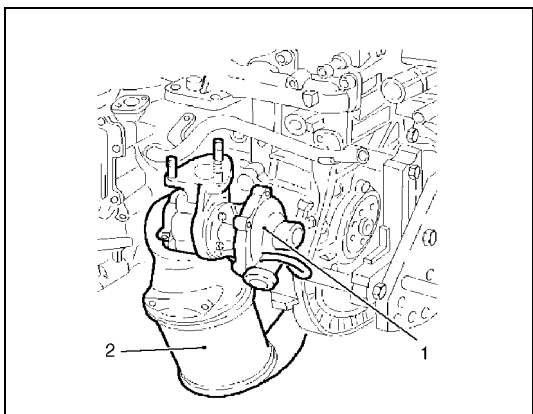
8) Disconnect oil return pipe (1) from cylinder block.



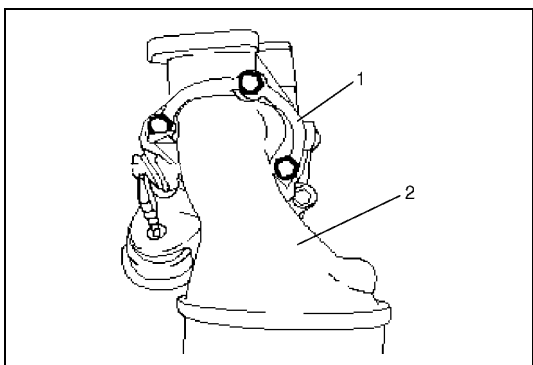
9) Remove exhaust manifold cover (1) from exhaust manifold.

10) Remove exhaust pipe No.1 referring to "Exhaust Pipe Removal and Installation" in Section 6K3.

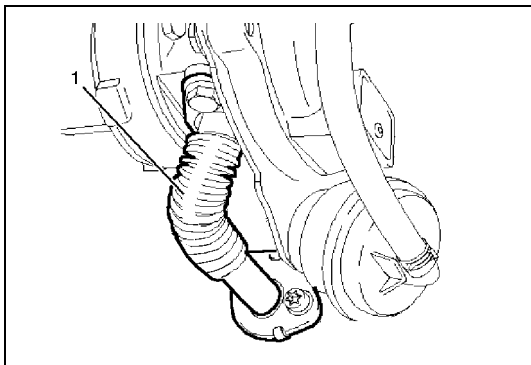
11) Disconnect stabilizer from cross member referring to "Stabilizer Bar and Bushings Removal and Installation" for RM413D or "Stabilizer Bar and Bushings" for RB413D in Section 3D.



12) Remove turbocharger (1) with catalytic converter (2).



13) Remove catalytic converter (2) from turbocharger after unbending lock plate (1) and loosening bolts.

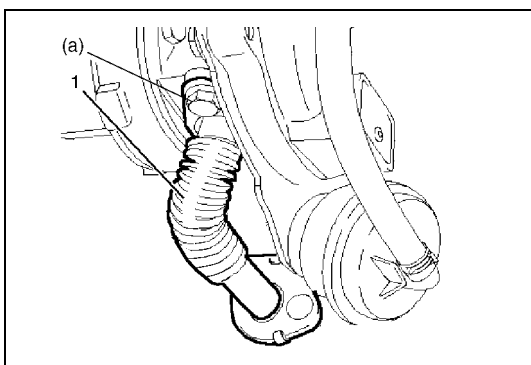


14) Remove oil return pipe (1) from turbocharger.

Installation

NOTE:

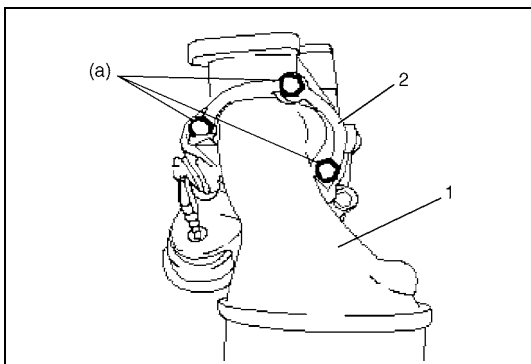
Clean mating surfaces of turbocharger, catalytic converter and exhaust manifold.



1) Install oil return pipe (1) with new gasket to turbocharger.

Tightening torque

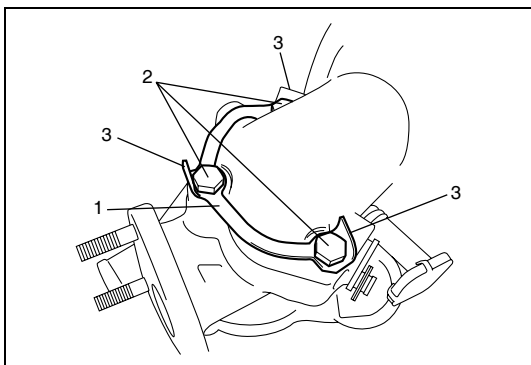
Oil return pipe bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



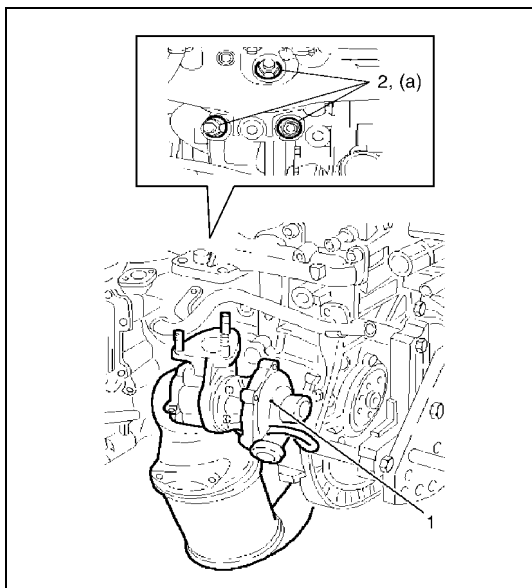
2) Install new gasket, catalytic converter (1) and new lock plate (2) to turbocharger.

Tightening torque

Catalytic converter bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



3) Bend claws (3) of lock plate (1) to prevent catalytic converter bolt (2) from loosening.



- 4) Install turbocharger with catalytic converter (1) using new turbocharger nuts (2).

Tightening torque

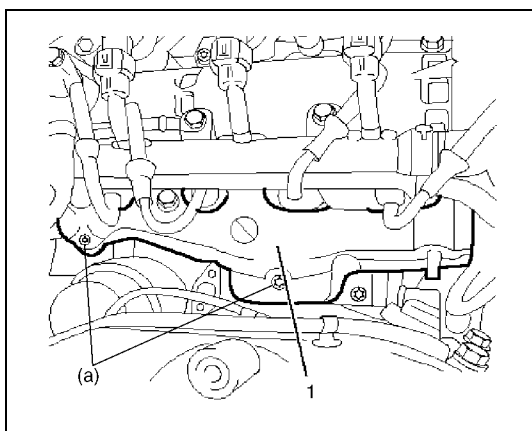
Turbocharger nut

(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

Catalytic converter mounting bolt

: 25 N·m (2.5 kg-m, 18.0 lb-ft)

- 5) Connect stabilizer to cross member referring to “Stabilizer Bar and Bushings Removal and Installation” for RM413D or “Stabilizer Bar and Bushings” for RB413D in Section 3D.

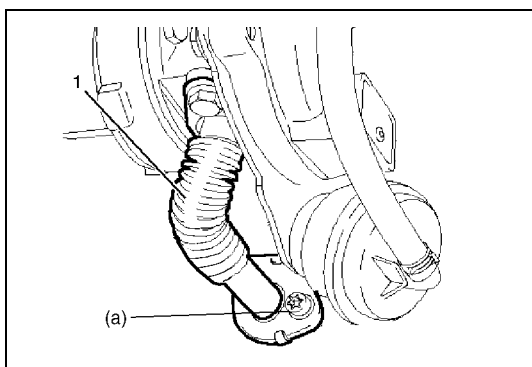


- 6) Install exhaust manifold cover (1).

Tightening torque

Exhaust manifold cover nut (a): 9 N·m (0.9 kg-m, 7.0 lb-ft)

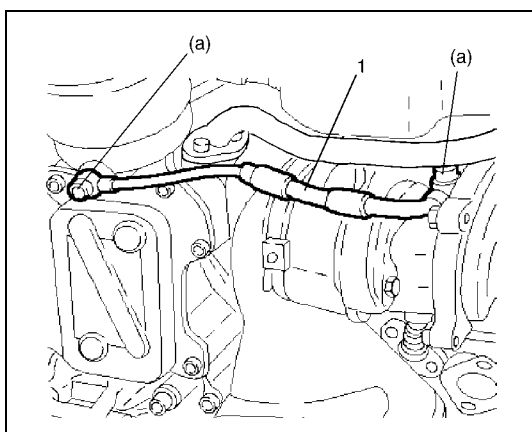
- 7) Install exhaust pipe No.1 referring to “Exhaust Pipe Removal and Installation” in Section 6K3.



- 8) Connect return pipe (1) to cylinder block with new gasket.

Tightening torque

Oil return pipe bolt (a): 9 N·m (0.9 kg-m, 7.0 lb-ft)

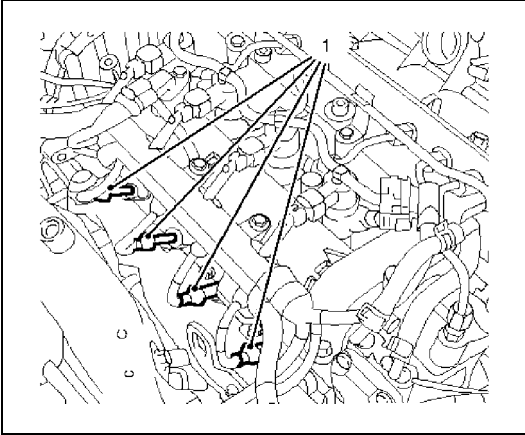


- 9) Install lubrication pipe (1) with new gasket.

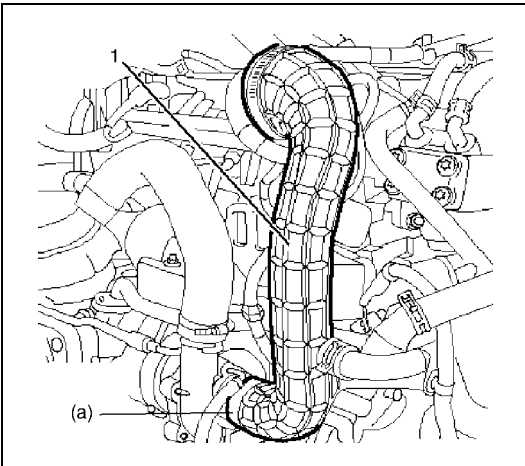
Tightening torque

Lubrication pipe union bolt (a): 12 N·m (1.2 kg-m, 9.0 lb-ft)

- 10) Install exhaust manifold side engine hanger of referring to “Exhaust Manifold Components” in this section.



- 11) Connect glow plug connectors (1).
- 12) Install inter cooler inlet hose referring to "Inter Cooler Removal and Installation" in this section.



- 13) Install air cleaner outlet hose (1) to turbocharger and then tighten its clamp to specified torque.

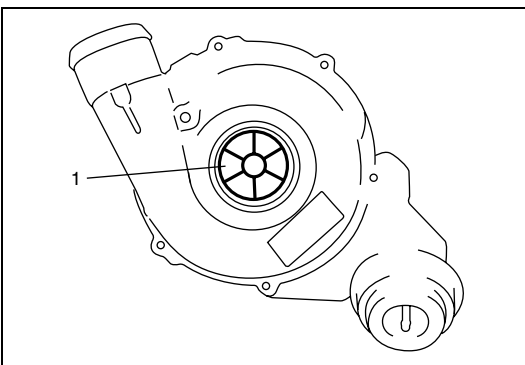
Tightening torque

Air cleaner outlet hose clamp

(a): 3.1 N·m (0.31 kg-m, 2.5 lb-ft)

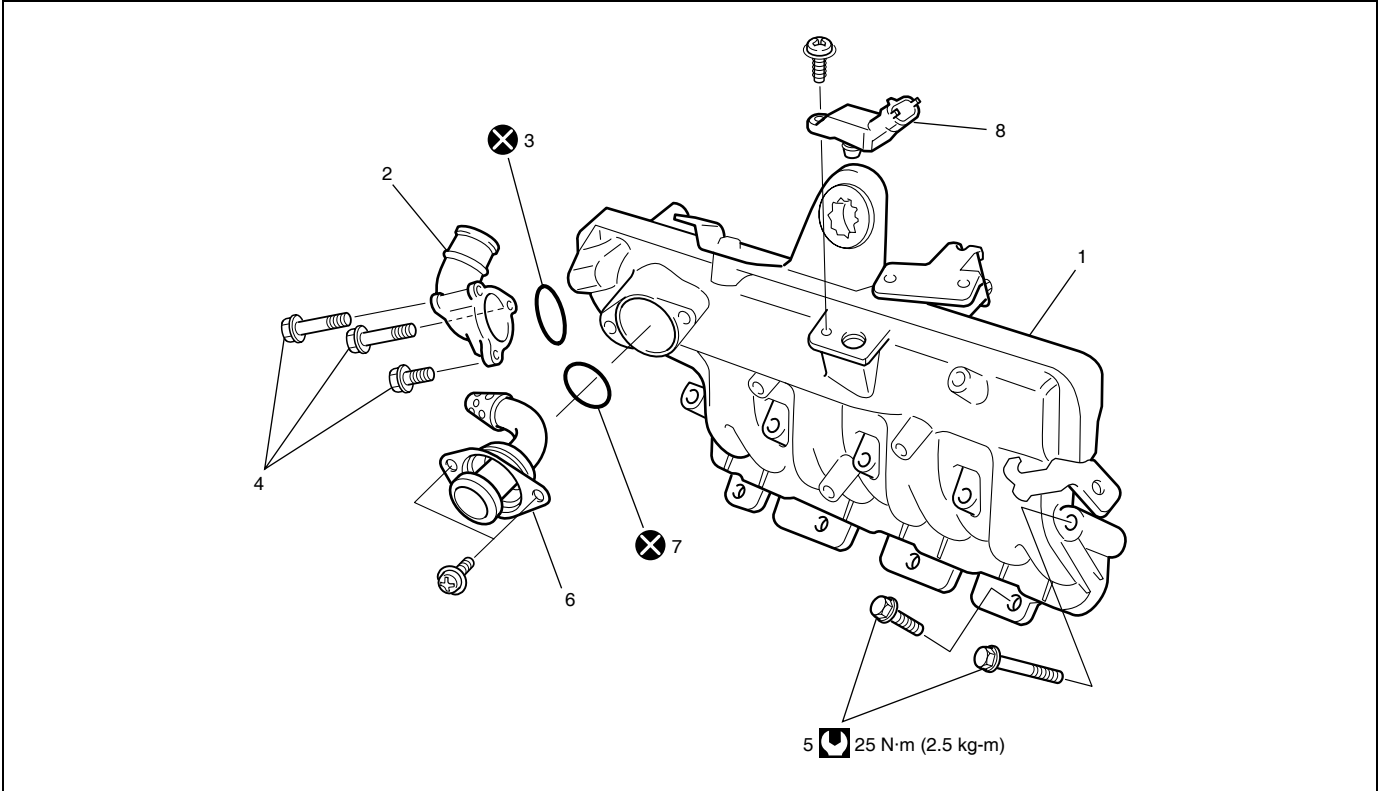
- 14) Install air cleaner assembly with MAF sensor assembly, referring to "Air Cleaner Assembly Removal and Installation" in this section.
- 15) Connect negative (–) cable at battery.
- 16) Check to make sure that there is no oil leakage and exhaust gas leakage at each connection.

Turbocharger Inspection



Rotate turbine shaft (1) by hand and verify that it turns smoothly without any abnormal noise and excessive runout. If a malfunction is found, replace the turbocharger.

Intake Manifold Components

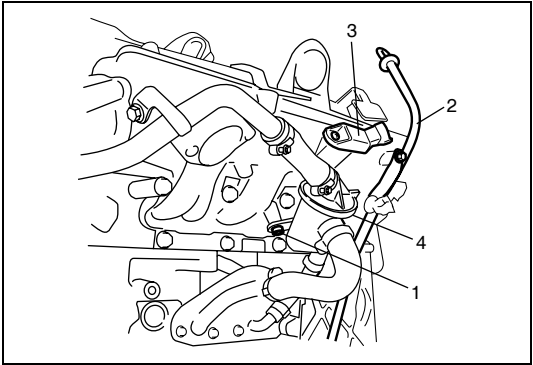


1. Intake manifold	4. Air intake bolt	7. EGR pipe gasket	Tightening torque
2. Air intake joint	5. Intake manifold bolt	8. MAP sensor	Do not reuse.
3. Air intake joint gasket	6. EGR pipe		

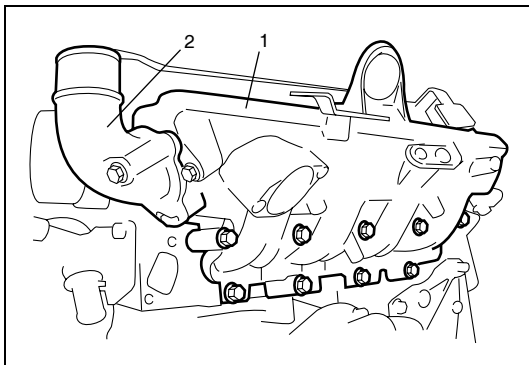
Intake Manifold Removal and Installation

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation” in this section.
- 3) Remove inter cooler outlet No.2 hose referring to “Inter Cooler Components” in this section.
- 4) Remove EGR valve assembly referring to “EGR valve assembly removal and installation” in Section 6E3.
- 5) Remove oil separator bolt (1) from intake manifold.
- 6) Remove oil level gauge guide (2) with level gauge.
- 7) Disconnect connector from MAP sensor (3).



4. Oil separator



- 8) Remove intake manifold (1) and gasket from cylinder head.
- 9) Remove EGR pipe and air intake joint (2) from intake manifold.

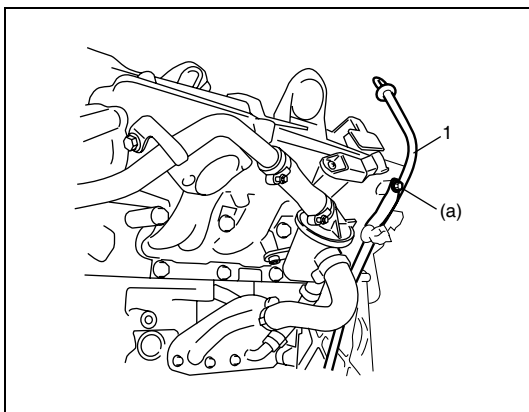
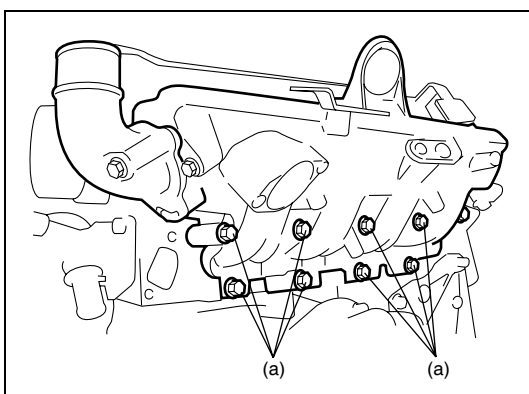
Installation

Reverse removal procedure for installation noting the following.

- Clean mating surfaces of intake manifold and cylinder head.
- Use new gasket for intake manifold, air intake joint and EGR pipe.
- Tighten intake manifold bolts to specified torque.

Tightening torque

Intake manifold bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



- Install oil level gauge guide (1) with level gauge.

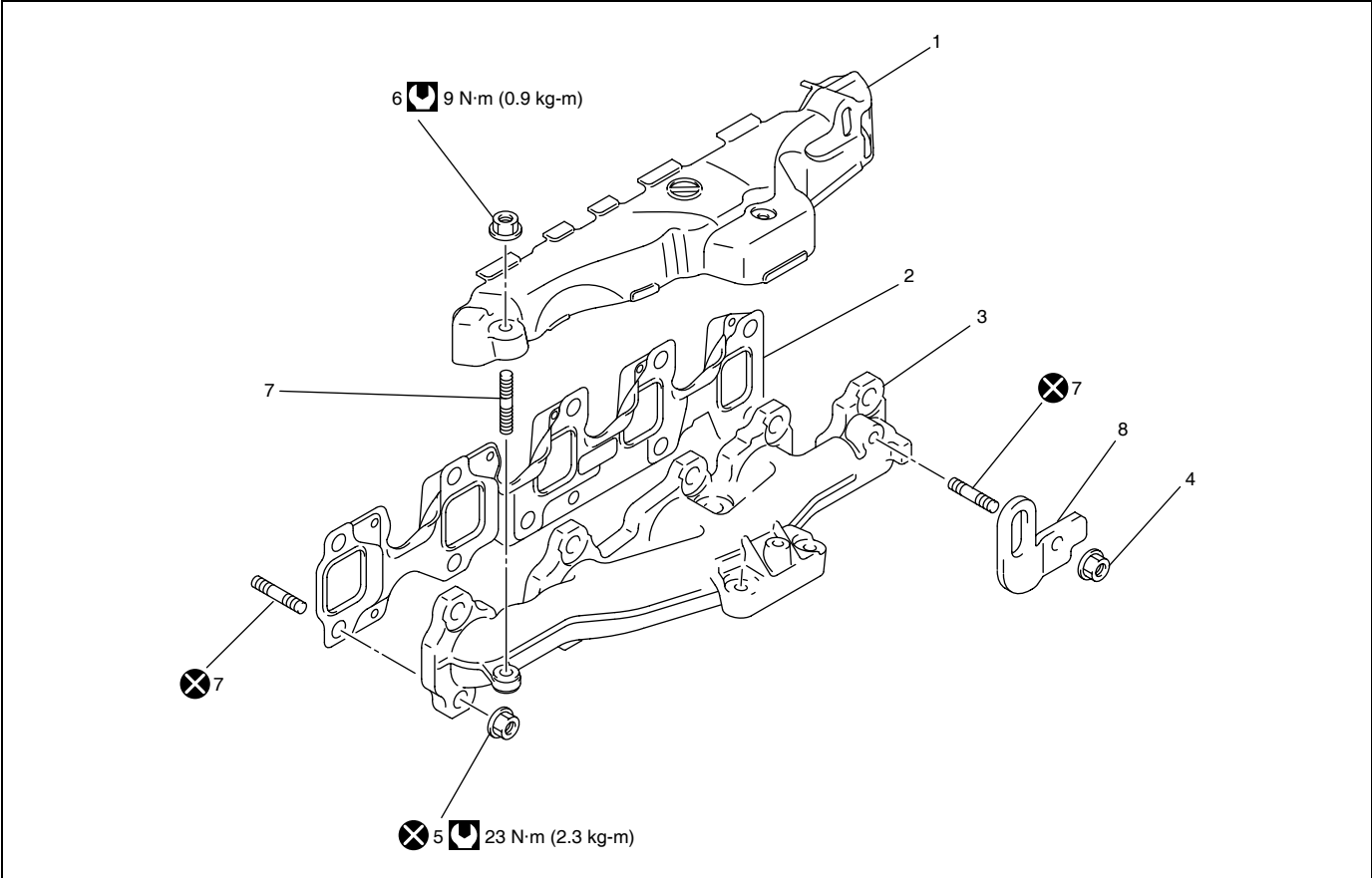
Tightening torque

Oil level gauge guide mounting bolt

(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

- Install EGR valve assembly referring to “EGR valve assembly removal and installation” in Section 6E3.
- Connect negative (–) cable at battery.
- Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.

Exhaust Manifold Components



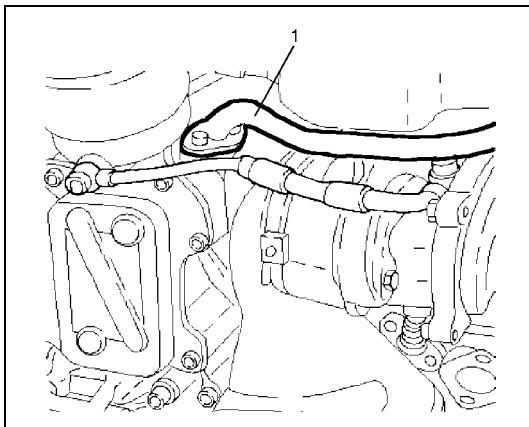
1. Exhaust manifold cover	4. Engine hanger nut	7. Stud bolt	Tightening torque
2. Exhaust manifold gasket	5. Exhaust manifold nut	8. Engine hanger	Do not reuse.
3. Exhaust manifold	6. Exhaust manifold cover nut		

Exhaust Manifold Removal and Installation

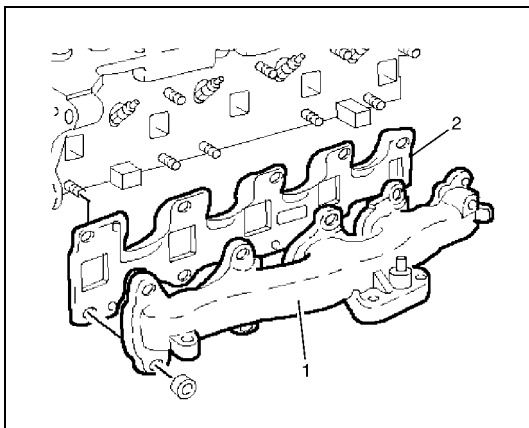
Removal

WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

- 1) Disconnect negative (–) cable at battery.
- 2) Drain engine coolant referring to “Cooling System Flush and Refill” in Section 6B3.
- 3) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation” in this section.
- 4) Remove turbocharger referring to “Turbocharger Removal and Installation” in this section.

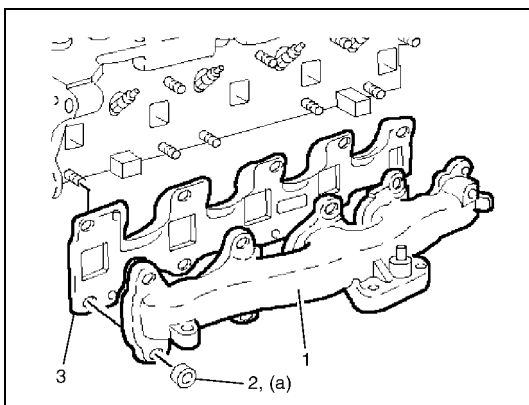


5) Remove coolant feed pipe (1).



6) Remove exhaust manifold (1) and exhaust manifold gasket (2).

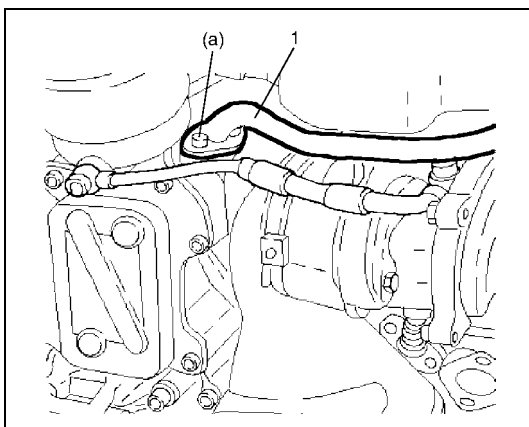
Installation



1) Install exhaust manifold (1) with new gasket (3) using new nut (2).

Tightening torque

Exhaust manifold nut (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



2) Install coolant feed pipe (1).

Tightening torque

Coolant feed pipe bolt (a): 9 N·m (0.9 kg-m, 7.0 lb-ft)

- 3) Install turbocharger referring to "Turbocharger Removal and Installation" in this section.
- 4) Install air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation" in this section.
- 5) Refill cooling system referring to "Cooling System Flush and Refill" in Section 6B3.
- 6) Connect negative (–) cable at battery.
- 7) Check to make sure that there is no oil leakage, coolant leakage and exhaust gas leakage at each connection.

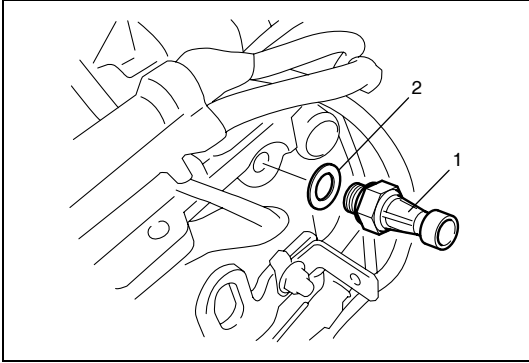
Vacuum Pump Removal and Installation

Refer to "Vacuum pump removal and installation" in Section 6E3 for removal and installation procedure.

Oil Pressure Switch Removal and Installation

Removal

- 1) Remove air cleaner outlet hose.
- 2) Disconnect oil pressure switch connector.
- 3) Remove oil pressure switch (1) and gasket (2) from cylinder head.



Installation

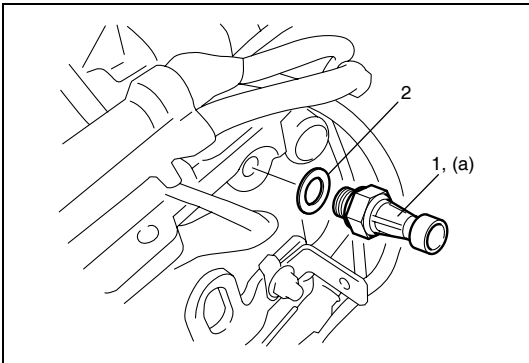
Reverse removal procedure for installation noting the following.

- Use a new gasket (2).
- Tighten oil pressure switch (1) to specified torque.

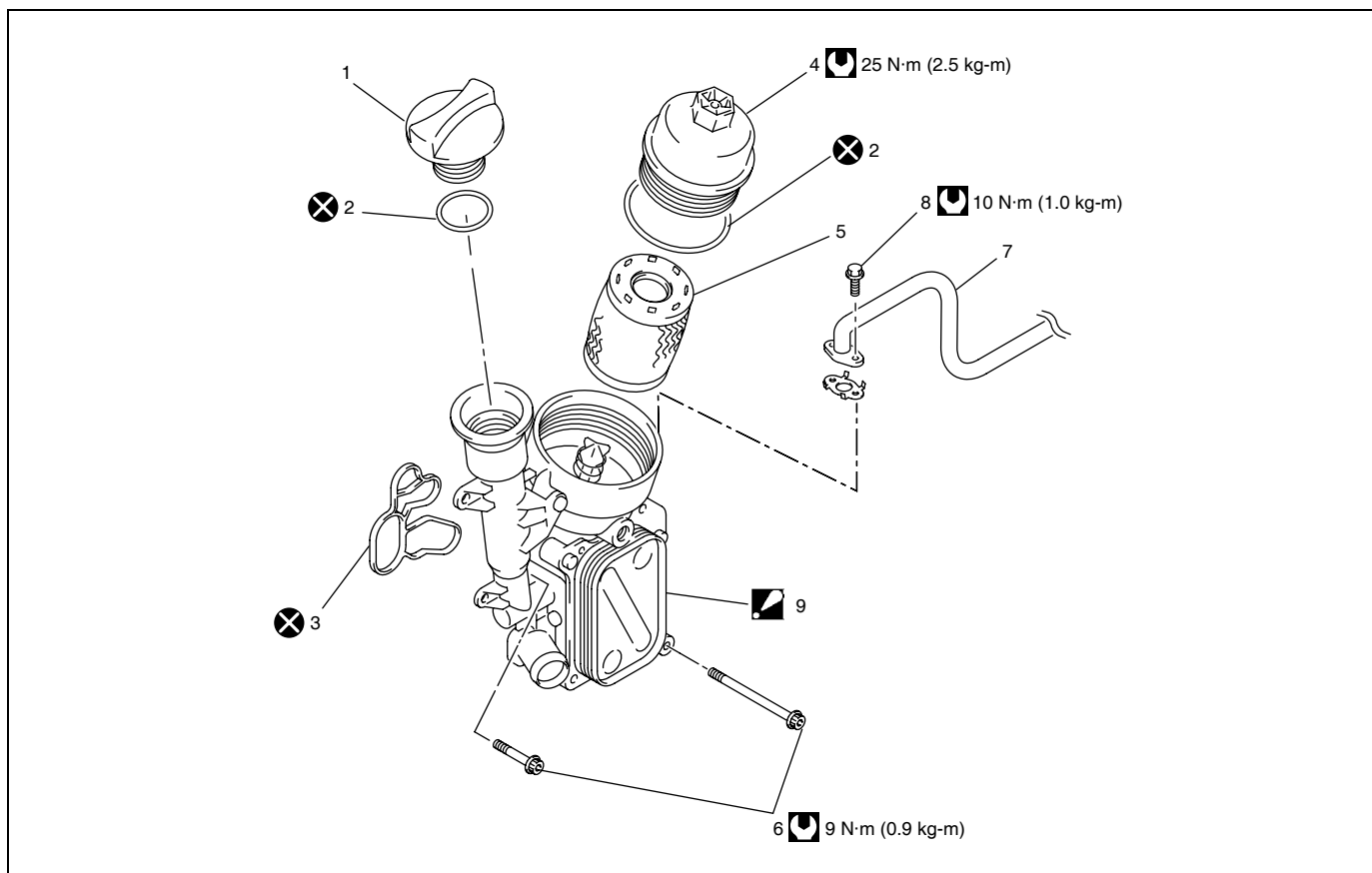
Tightening torque

Oil pressure switch (a): 32 N·m (3.2 kg-m, 23.5 lb-ft)

- Check to make sure that there is no engine oil leakage.



Oil Cooler Components



1. Filler cap	4. Oil filter housing cover	7. Coolant feed pipe	 Tightening torque
2. O-ring	5. Oil filter	8. Coolant feed pipe bolt	 Do not reuse.
3. Gasket	6. Oil cooler bolt	 9. Oil cooler assembly : Never disassemble oil cooler assembly.	

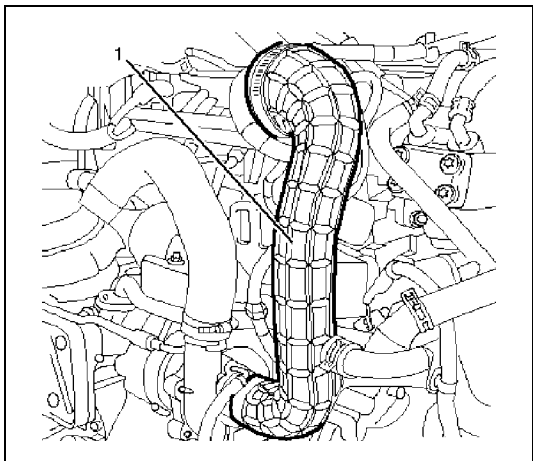
Oil Cooler Removal and Installation

CAUTION:

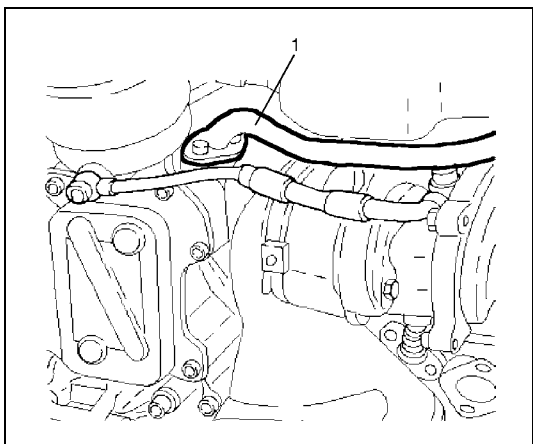
**Never disassemble oil cooler assembly.
Disassembly will spoil its original function.
If faulty condition is found, replace it with new one.**

Removal

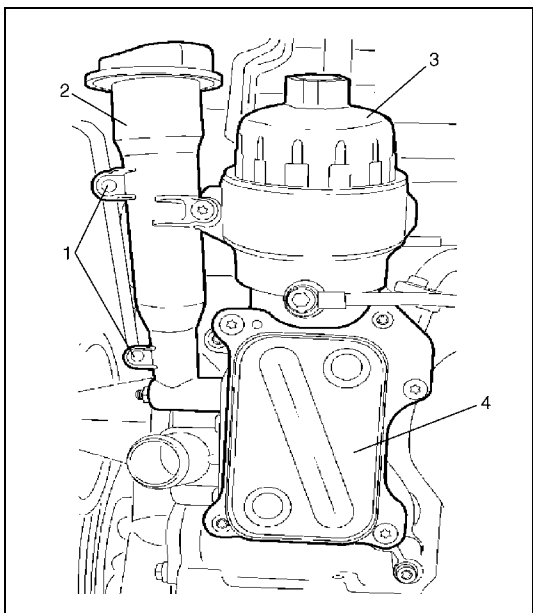
- 1) Disconnect negative (–) cable at battery.
- 2) Drain engine coolant referring to “Cooling System Flush and Refill” in Section 6B3.
- 3) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation” in this section.



- 4) Remove air cleaner outlet hose (1).
- 5) Remove inter cooler inlet hose and outlet No.1 hose referring to "Inter Cooler Removal and Installation" in this section.
- 6) Remove lubrication pipe referring to "Turbocharger Removal and Installation" in this section.

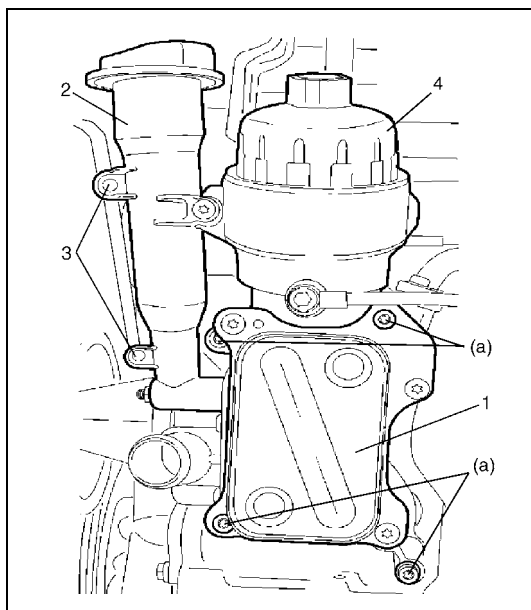


- 7) Remove coolant feed pipe (1) and radiator outlet hose.



- 8) Disconnect wire harness clamps (1) from filler port (2).
- 9) Remove oil filter housing cover (3) and oil filter.
- 10) Remove oil cooler assembly (4).

Installation

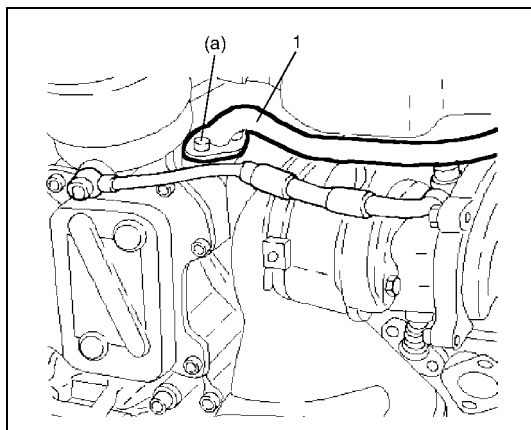


- 1) Install oil cooler assembly (1) using new gasket.

Tightening torque

Oil cooler bolt (a): 9 N·m (0.9 kg-m, 7.0 lb-ft)

- 2) Connect wire harness clamp (3) to filler port (2).
- 3) Install oil filter, oil filter housing cover (4) with new O-ring referring to "Engine Oil and Filter Replacement" in Section 0B.

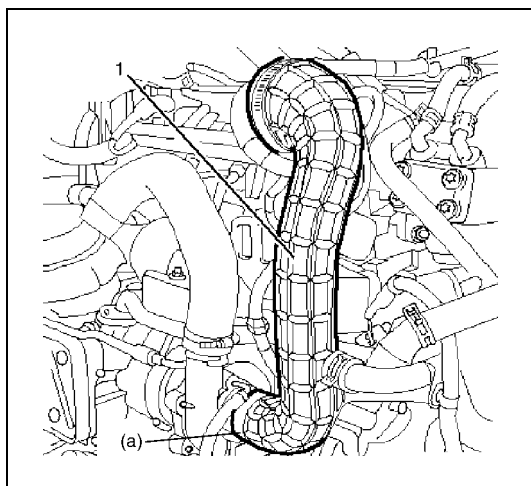


- 4) Install coolant feed pipe (1) and lower hose.

Tightening torque

Coolant feed pipe bolt (a): 10 N·m (1.0 kg-m, 6.5 lb-ft)

- 5) Install lubrication pipe referring to "Turbocharger Removal and Installation" in this section.
- 6) Install inter cooler inlet hose and outlet No.1 hose referring to "Inter Cooler Removal and Installation" in this section.



- 7) Install air cleaner outlet hose (1) to turbocharger.

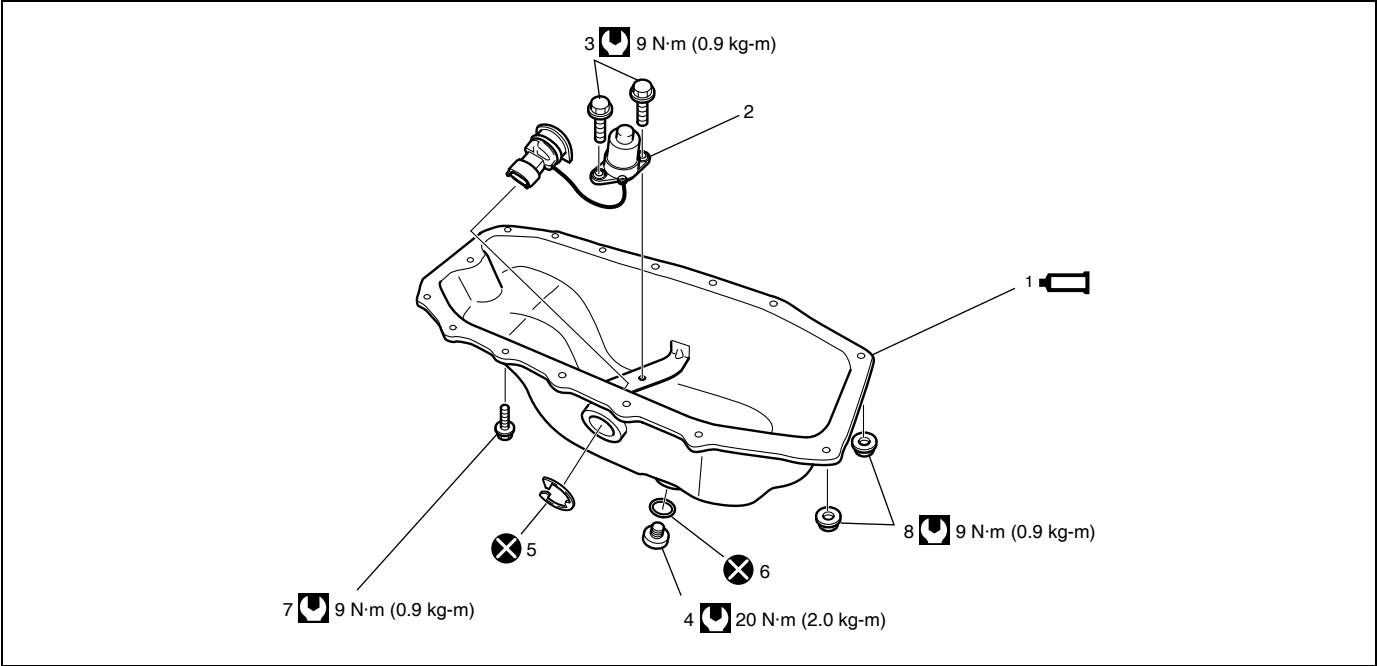
Tightening torque

Air cleaner outlet hose clamp

(a): 3.1 N·m (0.31 kg-m, 2.5 lb-ft)

- 8) Install air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation" in this section.
- 9) Refill cooling system referring to "Cooling System Flush and Refill" in Section 6B3.
- 10) Connect negative (–) cable at battery.
- 11) Check to make sure that there is no oil leakage and coolant leakage at each connection.

Oil Pan Components

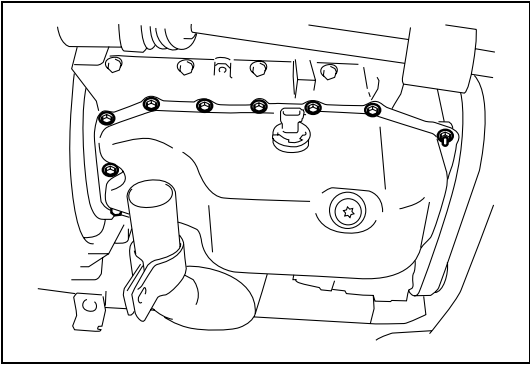
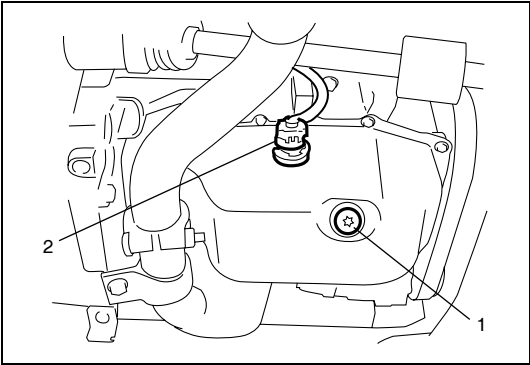


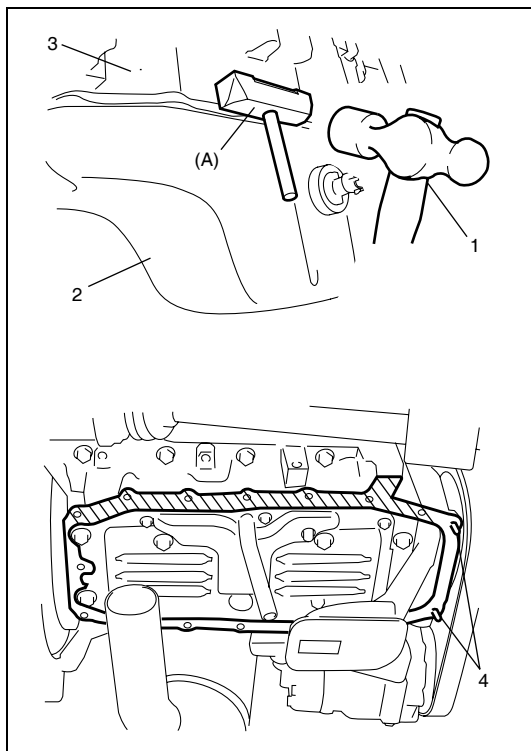
	1. Oil pan :Apply Loctite 5900® to mating surface.	4. Drain plug	7. Oil pan bolt	 Tightening torque
	2. Oil level switch (if equipped)	5. Clip	8. Oil pan nut	 Do not reuse.
	3. Oil level switch bolt	6. O-ring		

Oil Pan Removal and Installation

Removal

- 1) Remove oil level gauge.
- 2) Hoist vehicle.
- 3) Drain engine oil by removing drain plug (1).
- 4) Disconnect oil level switch connector (2).
- 5) Remove exhaust No.1 pipe referring to “Exhaust Pipe Removal and Installation” in Section 6K3.
- 6) Remove transaxle stiffener referring to “Transaxle Unit Dis-mounting and Remounting” in Section 7A3.
- 7) Remove oil pan bolts and nuts.





- 8) Cut sealant at hatched part shown in figure using special tool and hammer (1).

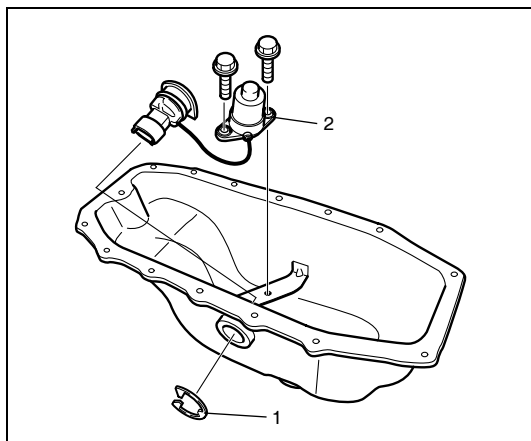
Special tool

(A): 09921-96510

NOTE:

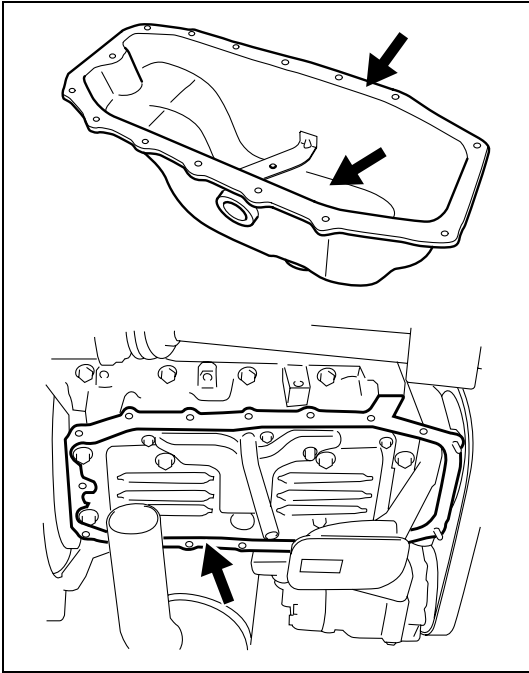
Be careful not to damage stud bolt (4) between oil pan and crankcase when cutting sealant.

- 9) Remove oil pan (2) from lower crankcase (3).

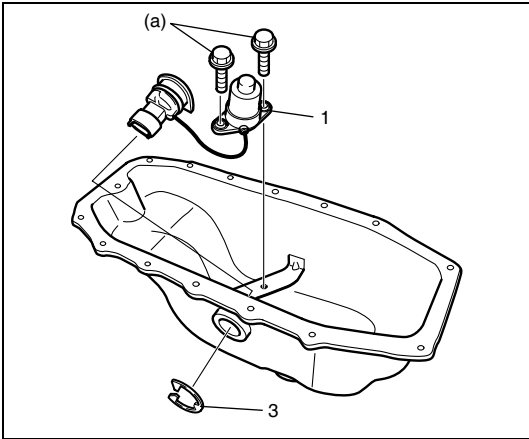


- 10) Remove clip (1) and oil level switch (2) from oil pan, if necessary.

Installation



- 1) Clean mating surfaces of oil pan and lower crankcase.

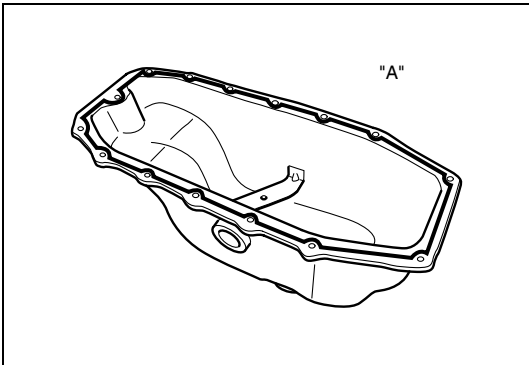


- 2) Install oil level switch (1) to oil pan, if removed.

Tightening torque

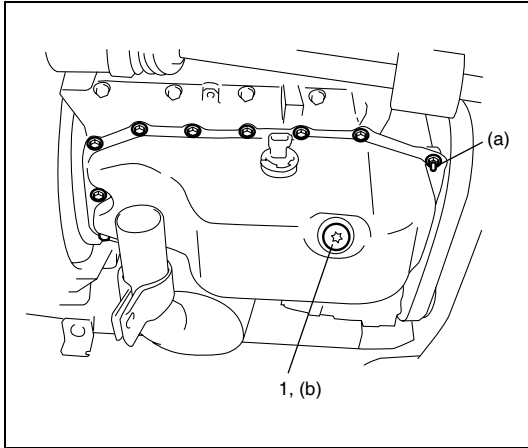
Oil level switch bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

- 3) Install new clip (3) to oil level switch connector securely.



- 4) Apply sealant to oil pan mating surface continuously as shown in the figure.

“A”: Loctite 5900



- 5) After fitting oil pan to lower crankcase, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.

Tighten oil pan bolts and nuts to specified torque.

Tightening torque

Oil pan bolt and nut (a): 9 N·m (0.9 kg-m, 7.0 lb-ft)

- 6) Install new O-ring and drain plug (1) to oil pan.

Tighten drain plug to specified torque.

Tightening torque

Drain plug (b): 20 N·m (2.0 kg-m, 14.5 lb-ft)

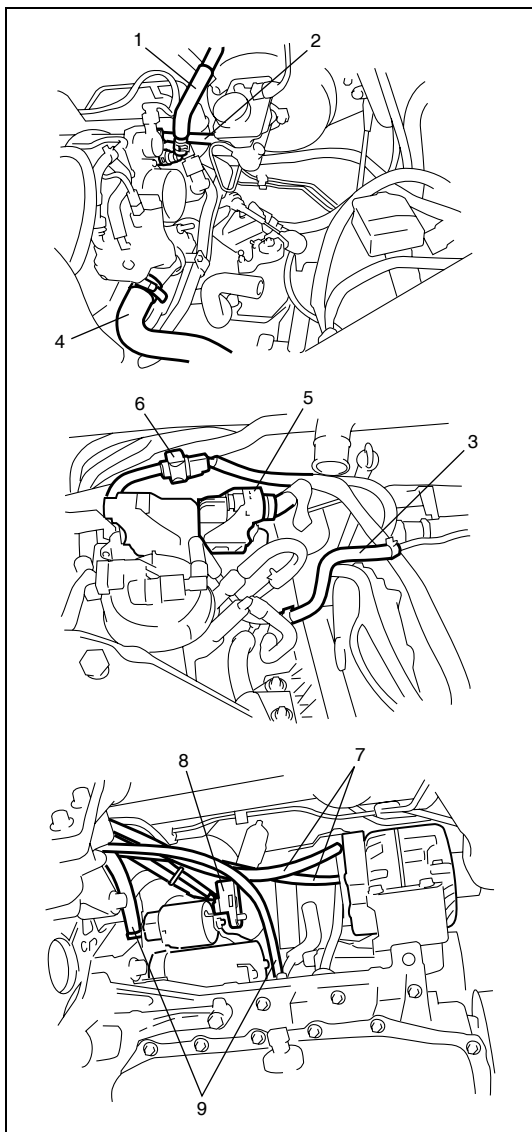
- 7) Install transaxle stiffener referring to “Transaxle Unit Dis-mounting and Remounting” in Section 7A3.
- 8) Install exhaust No.1 pipe referring to “Exhaust Pipe Removal and Installation” in Section 6K3.
- 9) Connect oil level switch connector.
- 10) Install oil level gauge.
- 11) Refill engine with engine oil referring to “Engine Oil and Oil Filter Replacement” in Section 0B.
- 12) Check to make sure that there is no engine oil leakage and exhaust gas leakage at each connection.

Unit Repair Overhaul

Engine Assembly Removal and Installation

Removal

- 1) Relieve fuel pressure referring to “Fuel Pressure Relief Procedure” in Section 6E3.
- 2) Disconnect negative cable at battery.
- 3) Remove engine hood after disconnecting windshield washer hose.
- 4) Drain coolant referring to “Cooling System Flush and Refill” in Section 6B3.
- 5) For RB413D, remove battery tray with degassing tank.
- 6) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation” in this section.
- 7) Remove inter cooler inlet hose and inter cooler outlet No.1 and No.2 hoses referring to “Inter Cooler Components” in this section.
- 8) Disconnect the following cables from transaxle.
 - Clutch cable
 - Gear select control cable
 - Gear shift control cable



- 9) Disconnect the following hoses.
 - Brake booster hose (1)
 - Fuel return hose (2)
 - Fuel feed hose (3)
 - Radiator inlet (4) and outlet hoses
 - Heater inlet and outlet hoses
 - Reservoir hoses (for RM413D)
- 10) Disconnect the following electric lead wires.
 - ECM (5)
 - Injector harness to instrument panel harness (6)
 - Injector harness to main harness
 - Back up light switch
 - Magnet clutch switch of A/C compressor (if equipped)
 - Generator (7)
 - Starting motor (8)
 - Engine oil level sensor
 - Engine ground (9)
 - Each wire harness clamps
- 11) Remove right and left side engine under covers.
- 12) Remove water pump and generator drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation" in Section 6B3.
- 13) With hose connected, detach A/C compressor from its bracket. (if equipped)

NOTE:

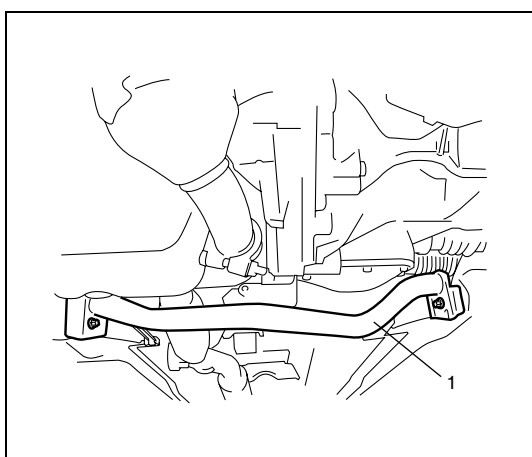
Suspend removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

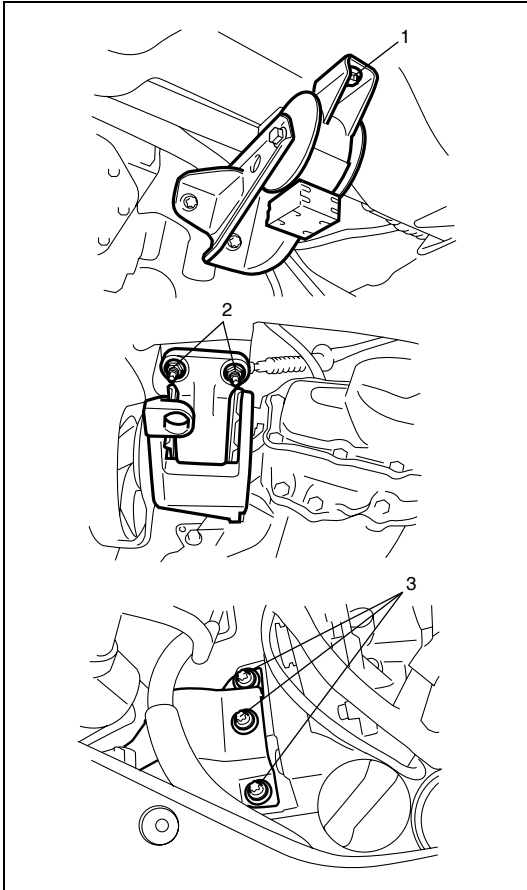
- 14) Drain engine oil referring to "Engine Oil and Oil Filter Replacement" in Section 0B.
- 15) Drain transaxle oil referring to "Manual Transaxle Oil Change" in Section 7A3.
- 16) For RM413D, remove cross member (1).
- 17) Remove exhaust No.1 pipe referring to "Exhaust Pipe Removal and Installation" in Section 6K3.
- 18) Remove stabilizer bar referring to "Stabilizer Bar and Bushings Removal and Installation" for RM413D or "Stabilizer Bar and Bushings" for RB413D in Section 3D.
- 19) Disconnect right and left drive shaft joints from differential gear referring to "Front Drive Shaft Assembly Removal and Installation" in Section 4A for RM413D or "Front Drive Shaft Assembly Removal and Installation" in Section 4A2 for RB413D.

NOTE:

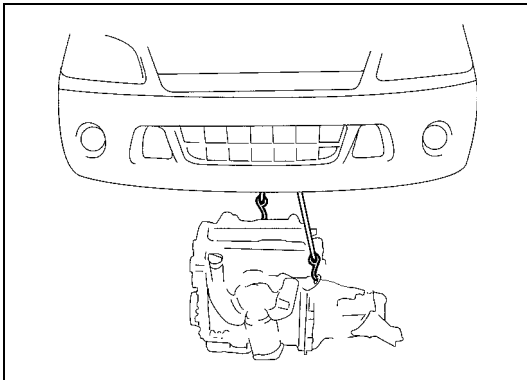
For engine and transaxle removal, it is not necessary to remove drive shafts from steering knuckle.

- 20) Support engine with lifting device.





- 21) Remove engine rear mounting bolts (1), engine left mounting nuts (2) and engine right mounting bracket bolts (3).
- 22) Before removing engine with transaxle from vehicle, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transaxle.



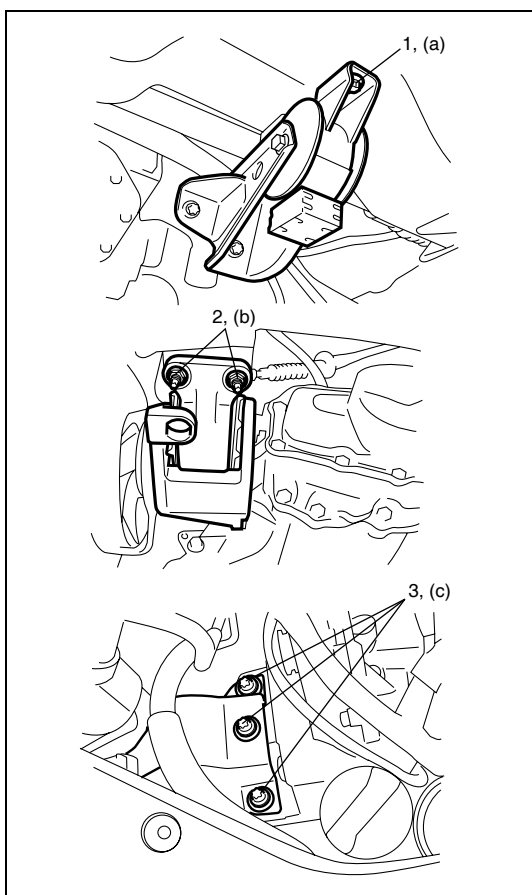
- 23) Lower engine with transaxle from vehicle.

NOTE:

Before lowering engine, to avoid damage to A/C compressor, raise it through clearance made on engine crankshaft pulley side. At this time, use care so that no excessive force is applied to hoses.

- 24) Disconnect transaxle from engine referring to "Transaxle Unit Dismounting and Remounting" in Section 7A3.
- 25) Remove clutch cover and clutch disc referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation" in Section 7C3.

Installation



- 1) Install clutch cover and clutch disc referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation" in Section 7C3.
- 2) Connect transaxle to engine referring to "Transaxle Unit Dismounting and Remounting" in Section 7A3.
- 3) Lift engine with transaxle into engine compartment, but do not remove lifting device.
- 4) Install engine rear mounting bolts (1), engine left mounting nuts (2) and engine right mounting bracket bolts (3). Tighten these bolts and nuts to specified torque.

Tightening torque

Engine rear mounting bolt

(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)

Engine left mounting nut

(b): 55 N·m (5.5 kg-m, 40.0 lb-ft)

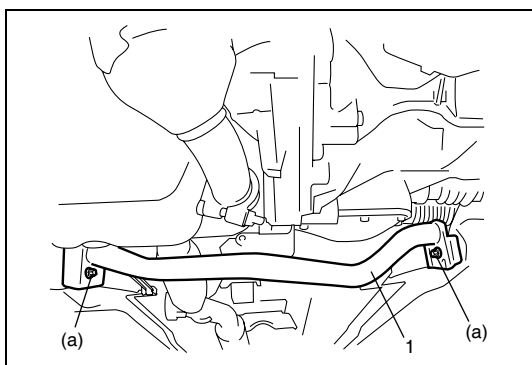
Engine right mounting bracket bolt

(c): 55 N·m (5.5 kg-m, 40.0 lb-ft)

- 5) Remove lifting device.
- 6) Connect right and left drive shaft joints to differential gear referring to "Front Drive Shaft Assembly Removal and Installation" in Section 4A for RM413D or "Front Drive Shaft Assembly Removal and Installation" in Section 4A2 for RB413D.
- 7) Install stabilizer bar referring to "Stabilizer Bar and Bushings Removal and Installation" in Section 3D.
- 8) Install exhaust No.1 pipe referring to "Exhaust Pipe Removal and Installation" in Section 6K3.
- 9) For RM413D, install cross member (1). Tighten cross member bolts to specified torque.

Tightening torque

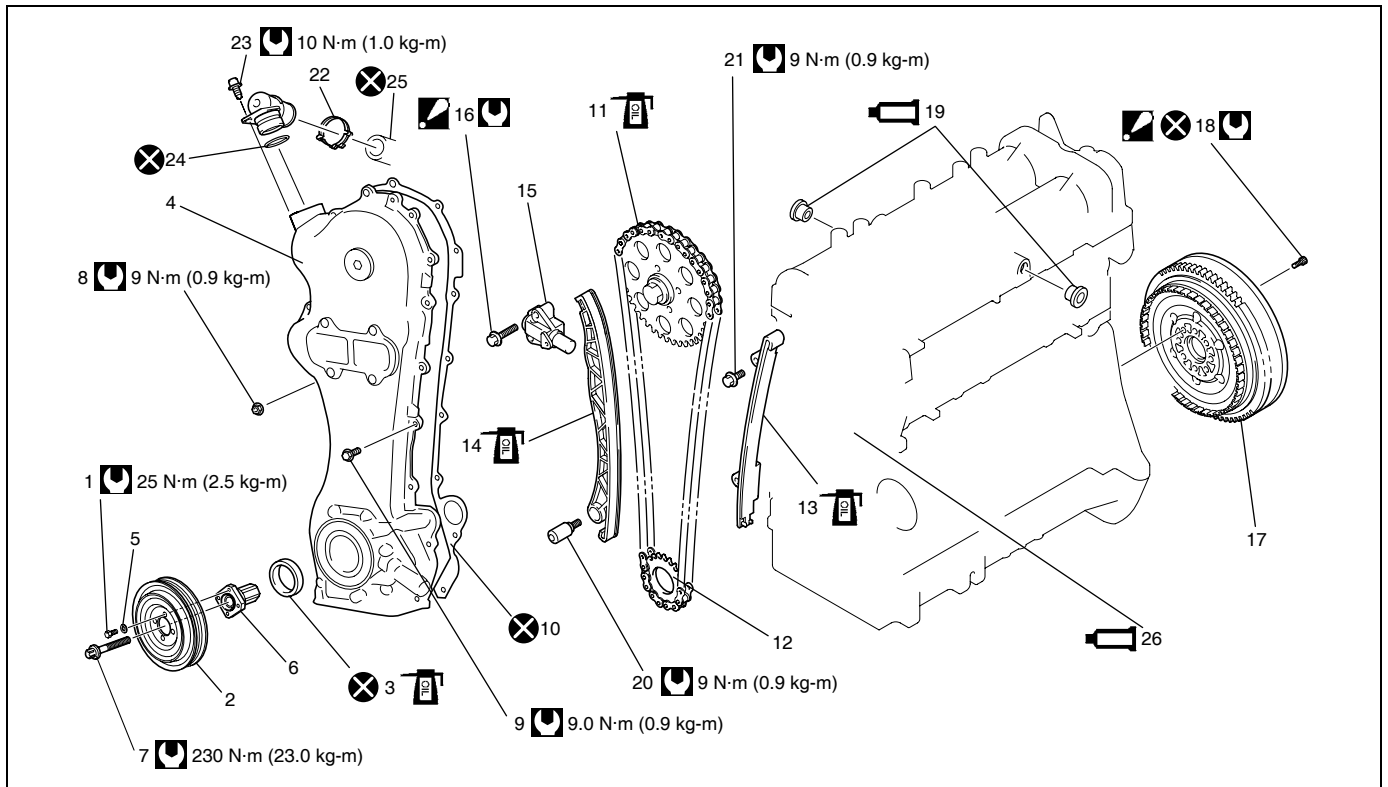
Cross member bolt (a): 60 N·m (6.0 kg-m, 43.0 lb-ft)



- 10) Install A/C compressor to its bracket. (if equipped)
- 11) Adjust water pump and generator drive belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection" in Section 6B3.
- 12) Connect hoses, cables and electric wires disconnected in removal procedure.
- 13) Install inter cooler inlet hose and inter cooler outlet No.1 and No.2 hoses referring to "Inter Cooler Components" in this section.
- 14) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in this section.
- 15) For RB413D, install battery tray with degassing tank.
- 16) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
- 17) Refill engine oil referring to "Engine Oil and Oil Filter Replacement" in Section 0B.

- 18) Refill transaxle oil referring to “Manual Transaxle Oil Change” in Section 7A3.
- 19) Refill coolant referring to “Cooling System Flush and Refill” in Section 6B3.
- 20) Connect negative cable to battery.
- 21) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Timing Chain Cover and Timing Chain Components

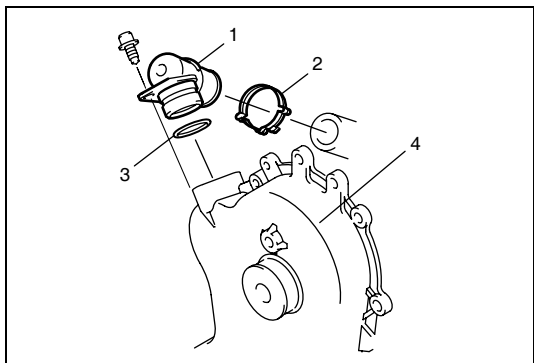


1. Crankshaft pulley bolt	 11. Timing chain : Apply engine oil.	21. Chain guide mounting bolt
2. Crankshaft pulley	12. Crankshaft timing sprocket	22. Ventilation connector
 3. Crankshaft pulley side crankshaft oil seal : Apply engine oil to oil seal lip.	 13. Timing chain guide : Apply engine oil to sliding surface.	23. Ventilation connector bolt
4. Timing chain cover	 14. Timing chain tensioner : Apply engine oil to sliding surface.	24. O-ring
5. Washer	15. Timing chain tensioner adjuster	25. Hose clamp
6. Crankshaft pulley flange	 16. Chain tensioner adjuster bolt : Tighten 9 N·m (0.9 kg-m, 6.5 lb-ft) by the specified procedure	 26. Camshaft housing / cylinder head / cylinder block : Apply Loctite 5900® to mating surfaces between camshaft housing / cylinder head / cylinder block and timing chain cover gas- ket.
7. Crankshaft pulley flange bolt	17. Flywheel	 Tightening torque
8. Timing chain cover nut	 18. Flywheel bolt : Tighten 44 N·m (4.4 kg-m, 32.0 lb-ft) by the specified procedure	 Do not reuse.
9. Timing chain cover bolt	 19. Camshaft housing plug : Apply Loctite omnifit 100M spezial® to thread parts of plug.	
10. Timing chain cover gasket	20. Chain tensioner mounting bolt	

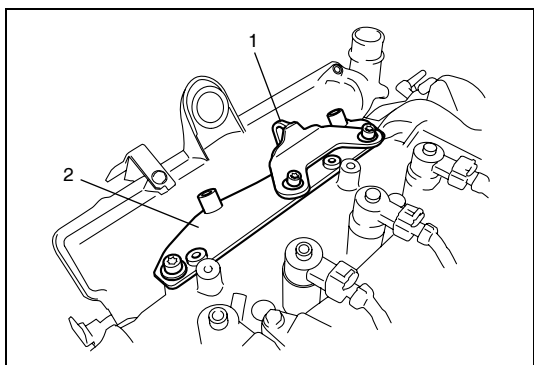
Timing Chain Cover and Timing Chain Removal and Installation

Removal

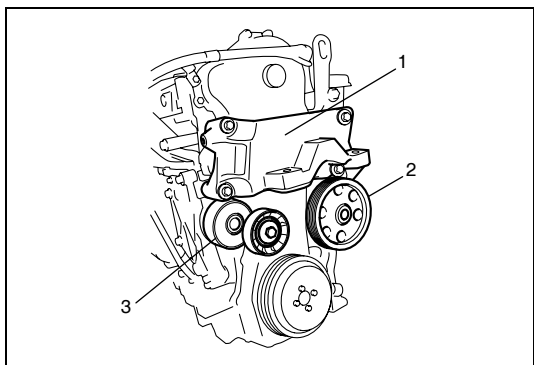
- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation" in this section.
- 2) Remove oil pan referring to "Oil Pan Removal and Installation" in this section.
- 3) Remove ventilation connector (1), hose clamp (2) and O-ring (3) from timing chain cover (4).
- 4) Remove common rail referring to "Common rail (High pressure fuel injection rail) removal and installation" in Section 6E3.



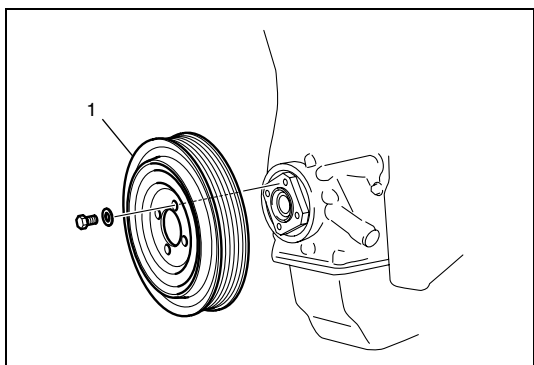
- 5) Remove engine hook (1) and common rail bracket (2) from camshaft housing.

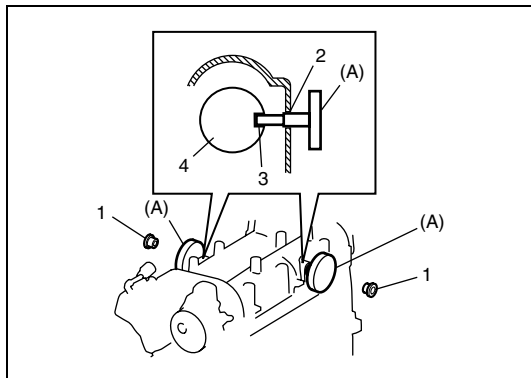


- 6) Remove engine right mounting bracket (1).
- 7) Remove water pump assembly (2) referring to "Water Pump Removal and Installation" in section 6B3.
- 8) Remove water pump / generator drive belt tensioner (3) referring to "Water Pump / Generator Drive Belt Tensioner Assembly Removal and Installation" in section 6B3.



- 9) Remove crankshaft pulley (1).

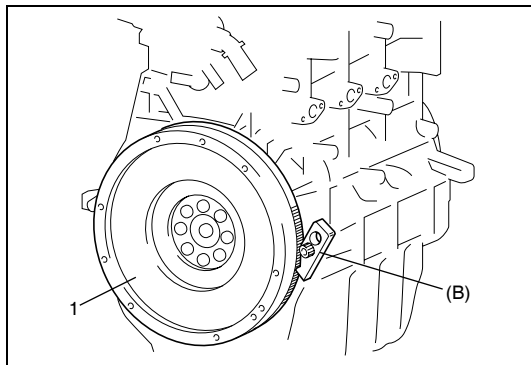




- 10) Remove camshaft housing plugs (1).
- 11) Align camshaft housing plug hole (2) with camshaft gap (3) turning crankshaft pulley clockwise as shown in figure.
- 12) Lock camshafts (4) inserting special tools (A) to plug holes.

Special tool

(A): 09917-68610

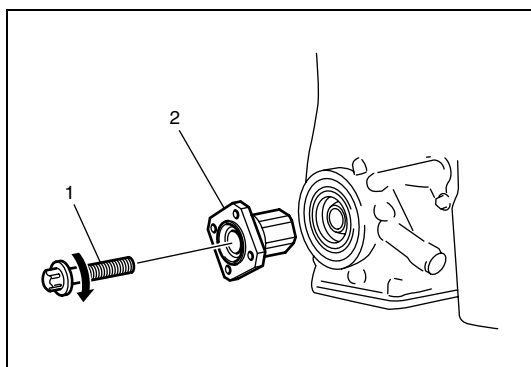


- 13) Lock flywheel (1) using special tool (B).

Special tool

(B): 09916-98610

- 14) Remove special tools (A) installed at step 12).

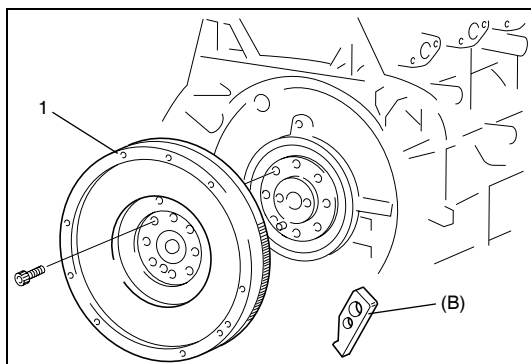


- 15) Loosen crankshaft pulley flange bolt (1) turning it clockwise, and remove crankshaft pulley flange (2).

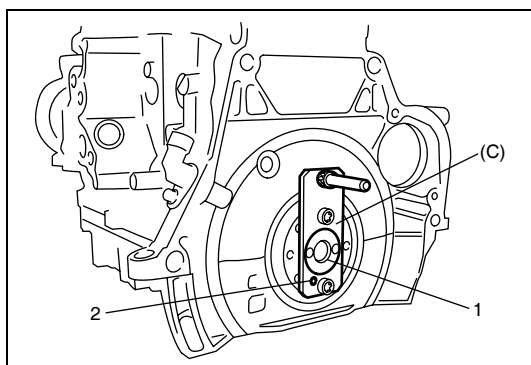
NOTE:

Be sure to turn crankshaft pulley flange bolt clockwise in order to loosen it.

- 16) Reinstall special tools (A) removed at step 14).



- 17) Remove flywheel (1), and then special tool (B) installed at step 13).



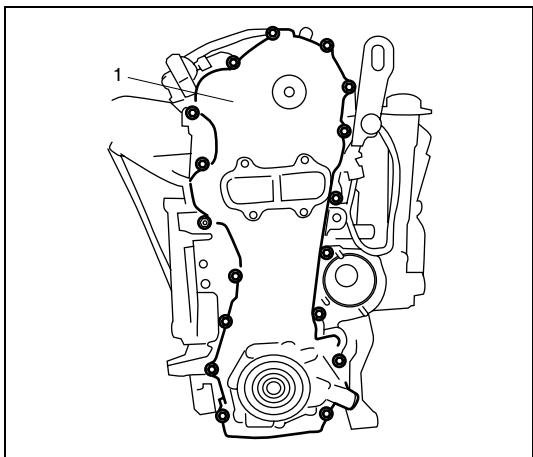
- 18) Lock crankshaft (1) installing special tool (C) as shown in figure.

NOTE:

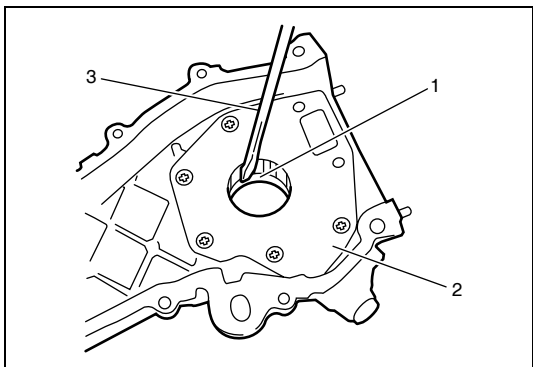
Be sure to align hole (2) of special tool with knock pin securely.

Special tool

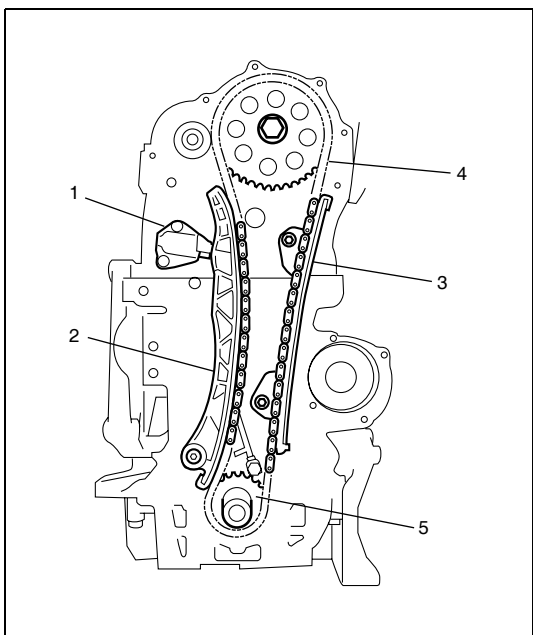
(C): 09912-38300



19) Remove timing chain cover (1) and its gasket.



20) Remove crankshaft pulley side crankshaft oil seal (1) from timing chain cover (2) using flat head screw driver (3) or the like, if necessary.



21) Remove timing chain tensioner adjuster assembly (1).

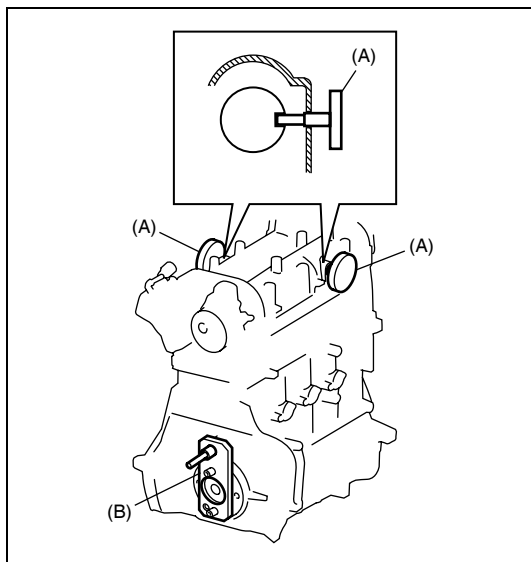
22) Remove timing chain tensioner (2).

23) Remove timing chain guide (3).

24) Remove timing chain (4) with crankshaft timing sprocket (5).

Installation

- 1) Clean mating surface on timing chain cover, cylinder block, cylinder head, camshaft housing and flywheel.



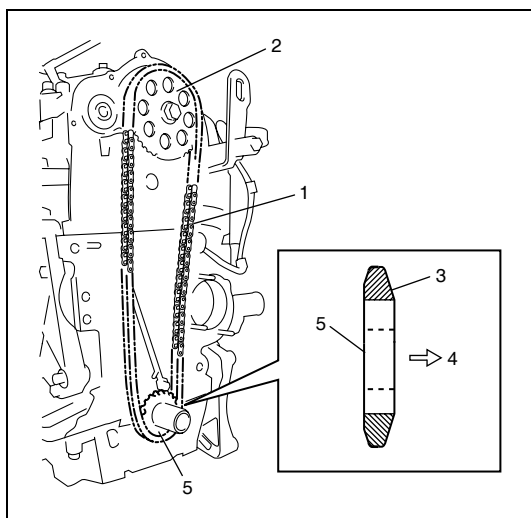
- 2) Confirm that special tools (A) and (B) are installed.

If special tool(s) is removed, install special tool(s) referring to “Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation” in this section or “Camshaft Housing Assembly Disassembly and Reassembly” in this section.

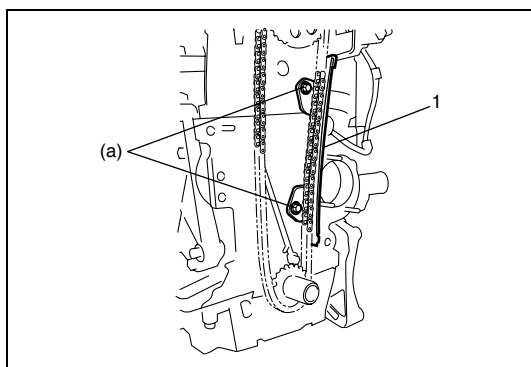
Special tool

(A): 09917-68610

(B): 09912-38300



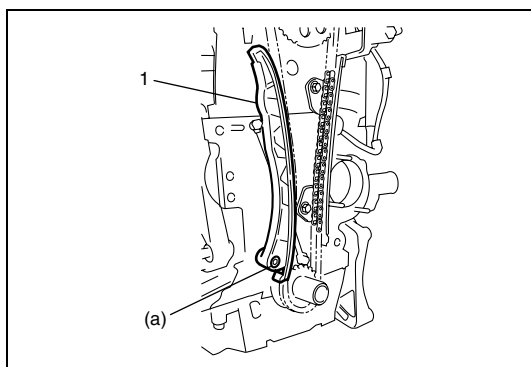
- 3) Install timing chain (1) to camshaft timing sprocket (2).
 4) Install crankshaft timing sprocket (5) to timing chain with its long taper side (3) faced to outside (4) as shown in figure.
 5) Insert crankshaft timing sprocket with timing chain to crankshaft.



- 6) Apply engine oil to sliding surface of timing chain guide (1), and install it.

Tightening torque

Chain guide mounting bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

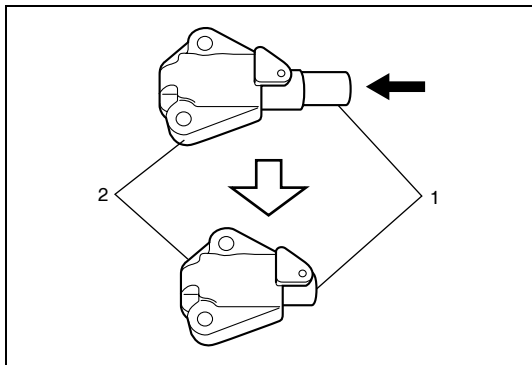


- 7) Apply engine oil to sliding surface of timing chain tensioner (1), and install it.

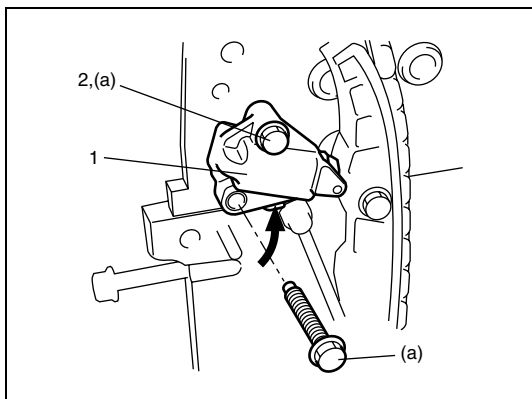
Tightening torque

Chain tensioner mounting bolt

(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



- 8) Push plunger (1) in timing chain tensioner adjuster body (2) till plunger is held in place as shown in figure.



- 9) Install timing chain tensioner adjuster assembly (1) as follows.

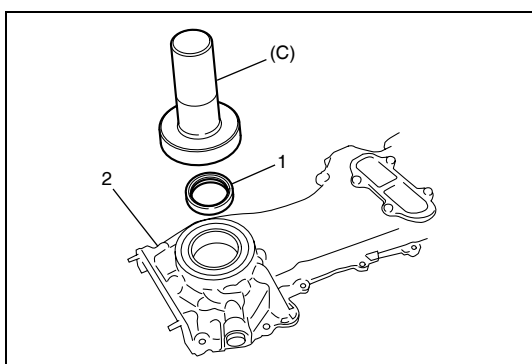
- Tighten upper chain tensioner adjuster mounting bolt (2) by hand.
- Push tensioner adjuster assembly in arrow direction shown in figure, and then tighten tensioner adjuster bolts to specified torque.

Tightening torque

Chain tensioner adjuster bolt

(a): Tighten 9 N·m (0.9 kg-m, 6.5 lb-ft) by the specified procedure.

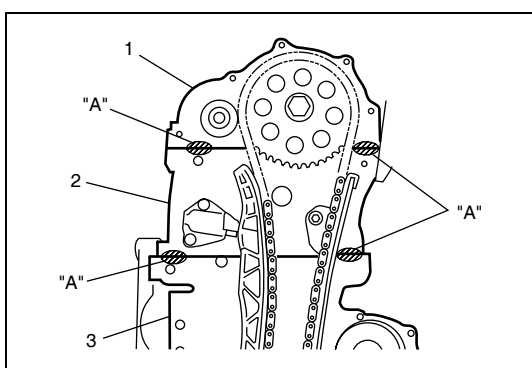
- 10) Apply engine oil to timing chain.



- 11) Install crankshaft pulley side crankshaft oil seal (1) to timing chain cover (2) using special tool (C) as shown in figure, if removed.

Special tool

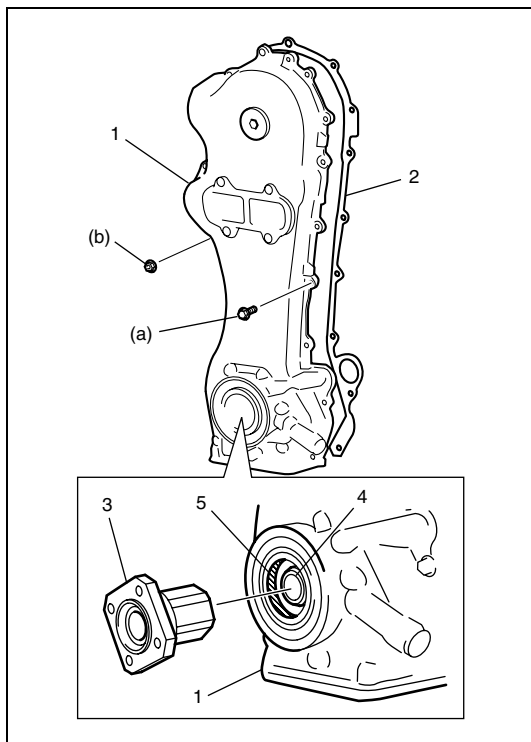
(C): 09913-75510



- 12) Apply sealant to camshaft housing / cylinder head / cylinder block as shown in figure.

“A”: Loctite 5900®

1.	Camshaft housing
2.	Cylinder head
3.	Cylinder block



- 13) Install timing chain cover (1) as follows.
- Fit timing chain cover and new gasket (2).
 - Install crankshaft pulley flange (3).

NOTE:

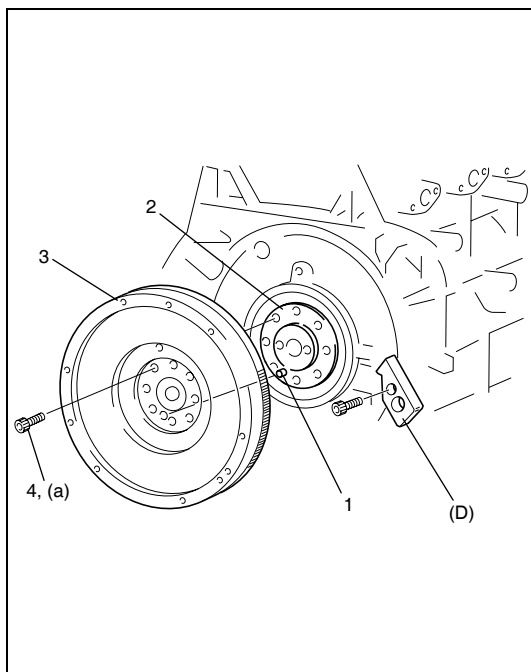
When inserting crankshaft pulley flange, be careful not to damage to oil seal (5) installed in timing chain cover.

- Tighten timing chain cover bolts and nuts to specified torque.

Tightening torque

Timing chain cover bolt (a): 9.0 N·m (9.0 kg-m, 6.5 lb-ft)

Timing chain cover nut (b): 9.0 N·m (9.0 kg-m, 6.5 lb-ft)



- 14) Install knock pin (1) to crankshaft (2), if removed.

NOTE:

Be sure to install knock pin to ϕ 6.75 mm (0.266 in.) hole of crankshaft.

- 15) Remove special tool (B) confirmed at step 2).
- 16) Install flywheel (3) as follows.
- Tighten new flywheel mounting bolts (4) by hand.
 - Lock flywheel using special tool (D).

Special tool

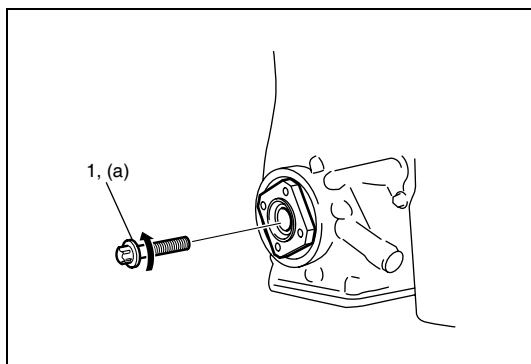
(D): 09916-98610

- Tighten new flywheel bolts to specified torque.

Tightening torque

Flywheel bolts

(a): Tighten 44 N·m (4.4 kg-m, 32.0 lb-ft) by the specified procedure



- 17) Remove special tools (A) confirmed at step 2).

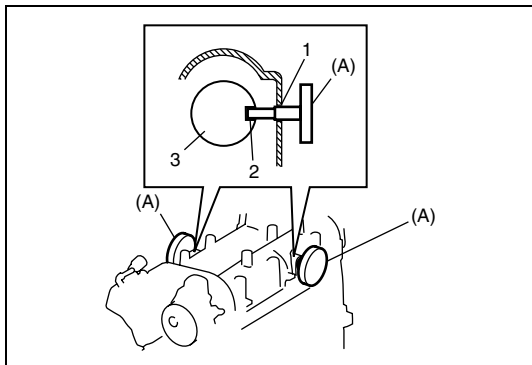
- 18) Tighten crankshaft pulley flange bolt (1) turning it counter-clockwise.

Tightening torque

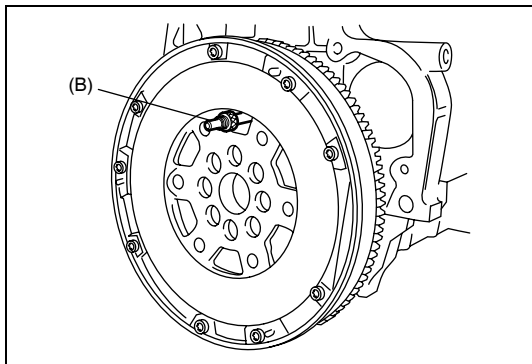
Crankshaft pulley flange bolt

(a): 230 N·m (23.0 kg-m, 166.5 lb-ft)

- 19) Remove special tool (D) installed at step 16).



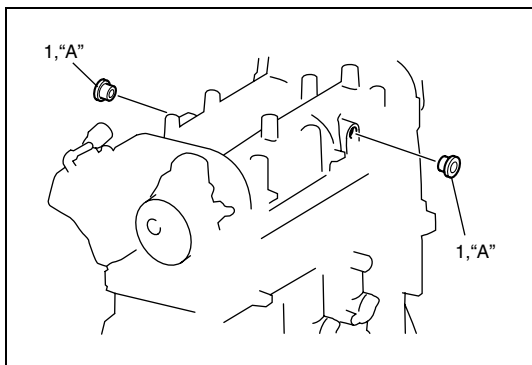
- 20) Turn crankshaft two revolutions clockwise.
 21) Lock camshafts (3) inserting special tools (A) to camshaft housing plug holes after aligning camshaft housing plug hole (1) with camshaft gap (2) as shown in figure.

Special tool**(A): 09917-68610**

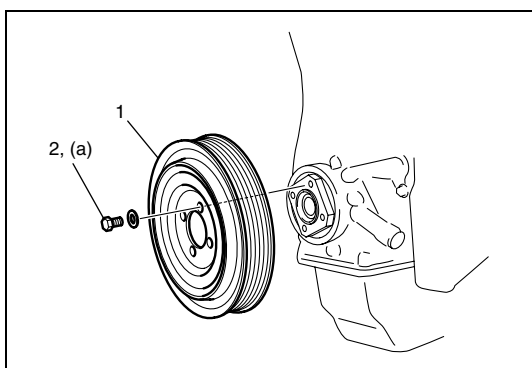
- 22) Check that special tool (B) can be inserted in holes of flywheel and cylinder block smoothly.
 If not, remove timing chain and flywheel and repeat step 2) to 21).

Special tool**(B): 09912-38300**

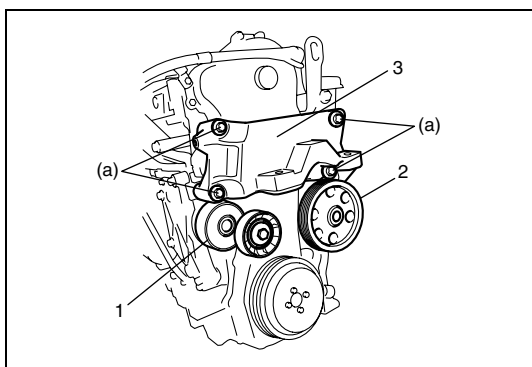
- 23) Remove special tools (A) installed at step 21) and (B) installed at step 22).



- 24) Apply thread lock compound to thread part of camshaft housing plugs (1), and install them.

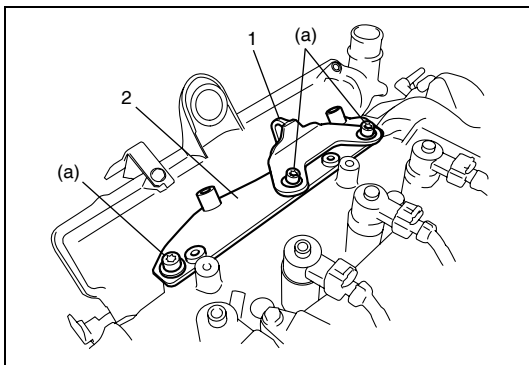
“A”: Loctite omnifit 100M spezial®

- 25) Install crankshaft pulley (1), and tighten crankshaft pulley bolts (2) to specified torque.

Special tool**Crankshaft pulley bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)**

- 26) Install water pump / generator drive belt tensioner (1) referring to “Water Pump / Generator Drive Belt Tensioner Assembly Removal and Installation” in section 6B3.
 27) Install water pump assembly (2) referring to “Water Pump Removal and Installation” in section 6B3.
 28) Install engine right mounting bracket (3).

Tightening torque**Engine right mounting bracket No.2 bolt****(a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**



29) Install oil pan referring to “Oil Pan Removal and Installation” in this section.

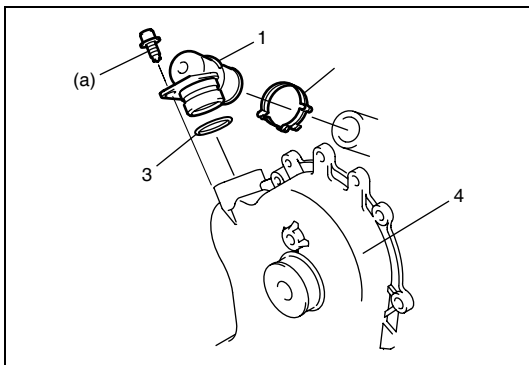
30) Install common rail bracket (2) and engine hook (1) to camshaft housing.

Tighten common rail bracket bolts to specified torque.

Tightening torque

Common rail bracket bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

31) Install common rail referring to “Common rail (High pressure fuel injection rail) removal and installation” in Section 6E3.



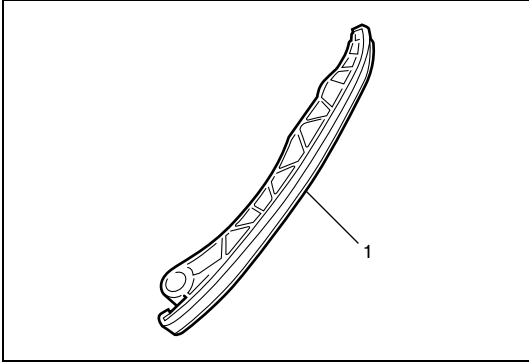
32) Install ventilation connector (1), new hose clamp (2) and new O-ring (3) to timing chain cover (4).

Tightening torque

Ventilation connector bolt (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

33) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation” in this section.

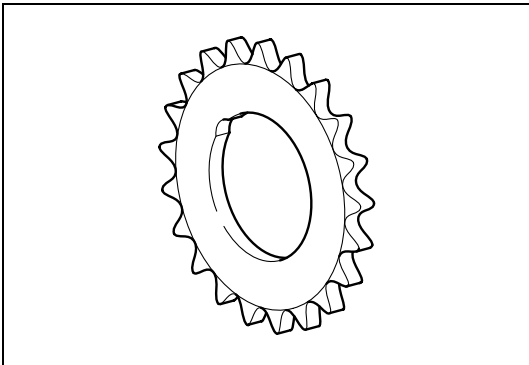
Timing Chain Cover and Timing Chain Inspection



Timing Chain Tensioner

Check shoe (1) for wear or damage.

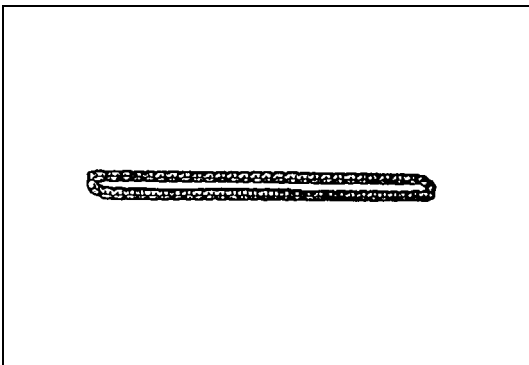
If any malcondition is found, replace timing chain tensioner.



Crankshaft Timing Sprocket

Check teeth of sprocket for wear or damage.

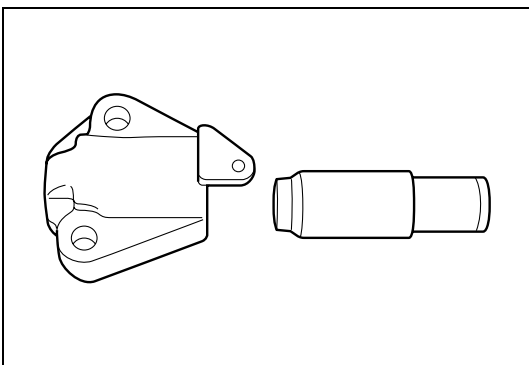
If any malcondition is found, replace crankshaft timing sprocket.



Timing Chain

Check timing chain for wear or damage.

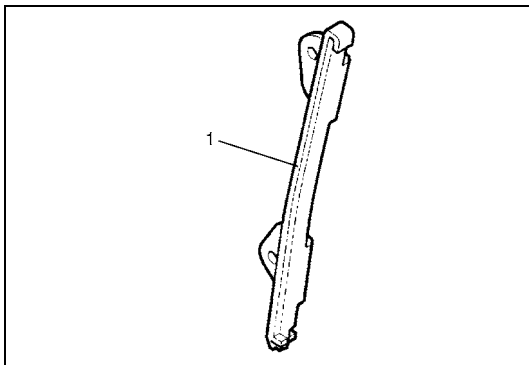
If any malcondition is found, replace timing chain.



Timing Chain Tensioner Adjuster

Check that sliding surfaces are free from damage.

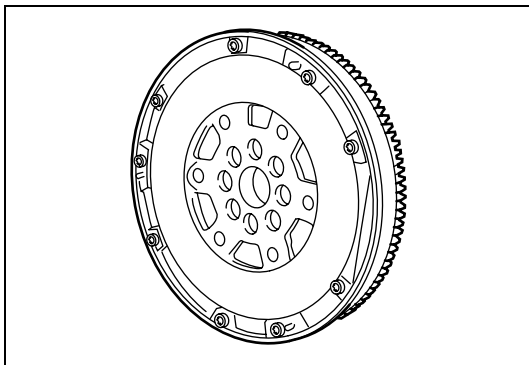
If any malcondition is found, replace timing chain tensioner adjuster.



Timing Chain Guide

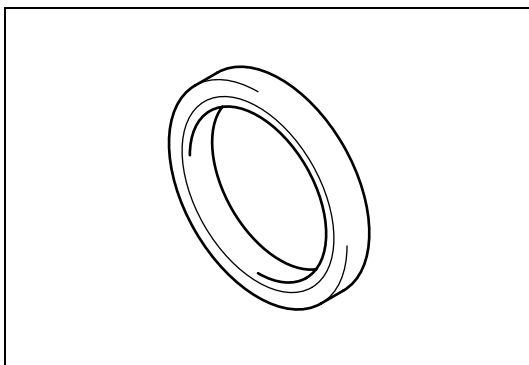
Check shoe (1) for wear or damage.

If any malcondition is found, replace timing chain guide.



Flywheel

- Check gear for crack or wear.
If malcondition is found, replace flywheel.
- Check surface for damage or excessively wear.
If malcondition is found, replace flywheel.



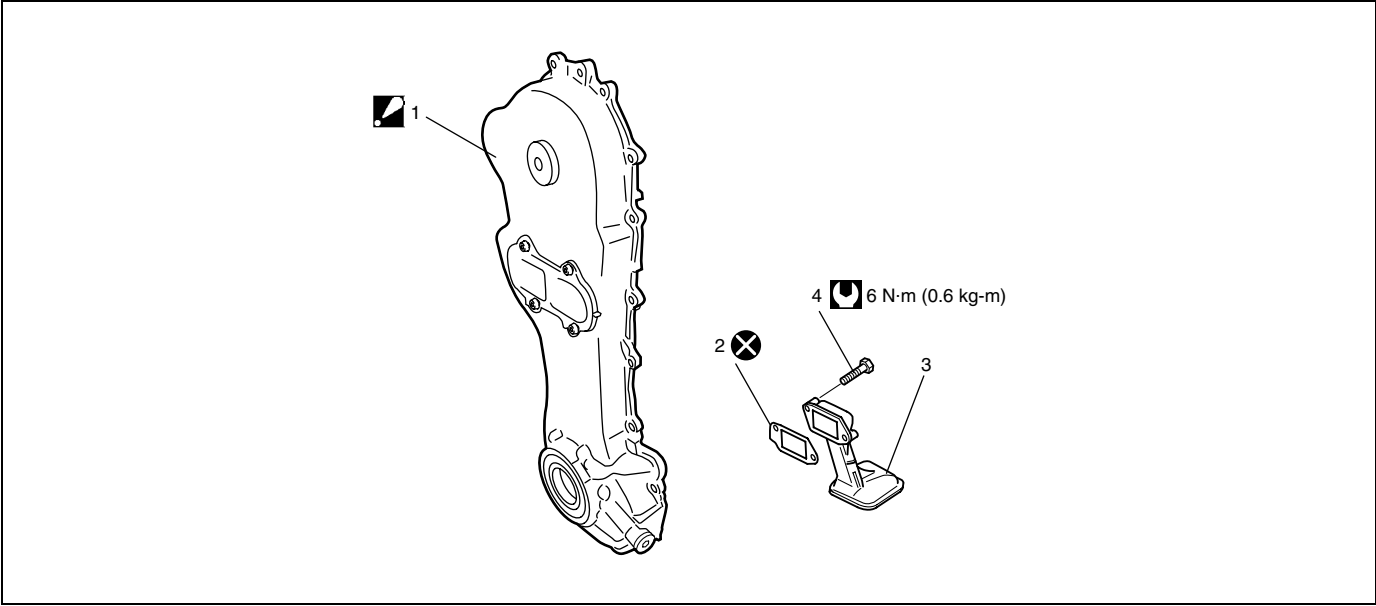
Crankshaft Pulley Side Crankshaft Oil Seal

Check oil seal lip for fault or damage.

Replace as necessary.

Oil Pump / Oil Pump Strainer Components

CAUTION:
Do not disassemble oil pump from timing chain cover. Disassembly will spoil its original function. If any malfunction is found in oil pump, replace timing chain cover.



 1. Timing chain cover : Oil pump is incorporated with timing chain cover.	3. Oil pump strainer	 Tightening torque
2. Oil pump strainer gasket	4. Oil strainer bolt	 Do not reuse.

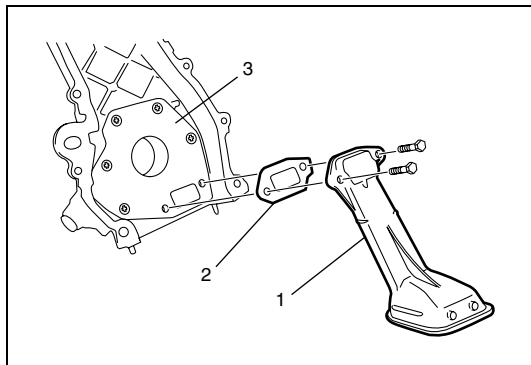
Oil Pump / Oil Pump Strainer Removal and Installation

CAUTION:
Do not disassemble oil pump from timing chain cover. Disassembly will spoil its original function. If any malfunction is found in oil pump, replace timing chain cover.

NOTE:
Oil pump is incorporated with timing chain cover.

Removal

- 1) Remove timing chain cover referring to “Timing Chain Cover and Timing Chain Removal and Installation” in this section.



- 2) Remove oil pump strainer (1) and gasket (2) from timing chain cover (3).

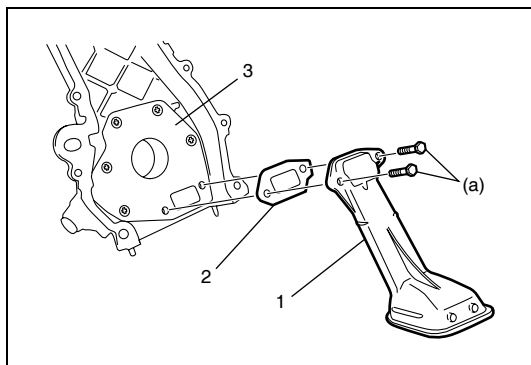
Installation

Reverse removal procedure for installation noting the following.

- Clean mating surfaces of timing chain cover (3) and oil pump strainer (1).
- Install oil pump strainer with new gasket (2) to timing chain cover.

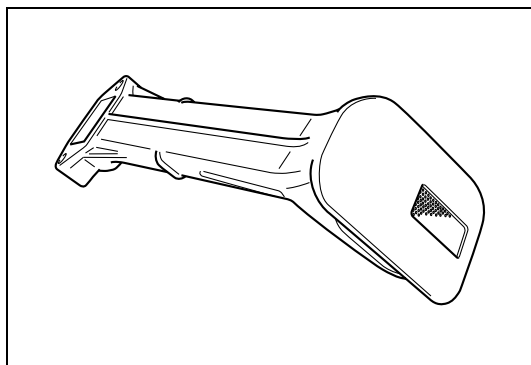
Tightening torque

Oil strainer bolt (a): 6 N·m (0.6 kg-m, 4.5 lb-ft)



Oil Pump Strainer Cleaning

Clean oil pump strainer screen.

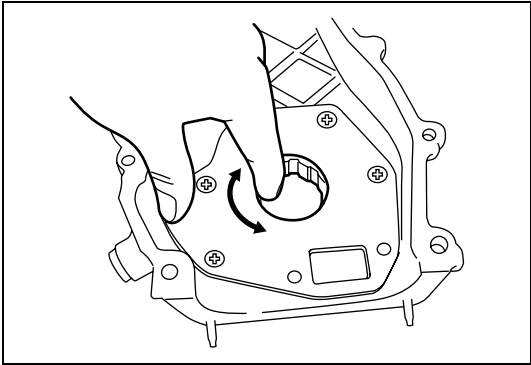


Oil Pump Inspection

Oil Seal

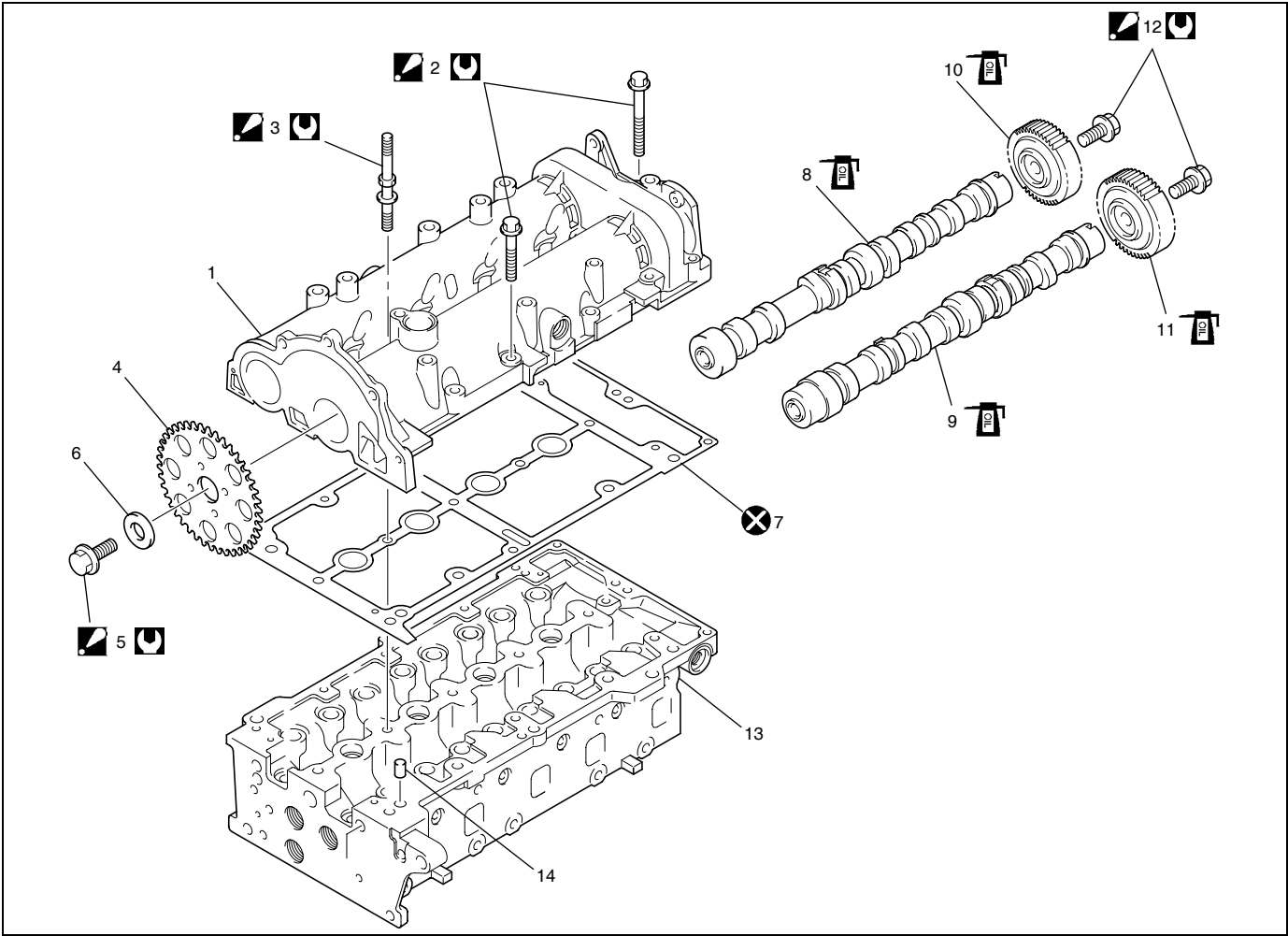
Refer to "Timing Chain Cover and Timing Chain Removal and Installation" in this section.

Oil Pump



Check rotor turn smoothly by hand.
If rotors is not smoothly, replace timing chain cover.

Camshaft Housing Components

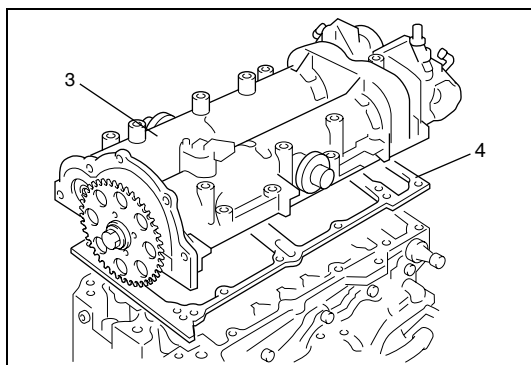
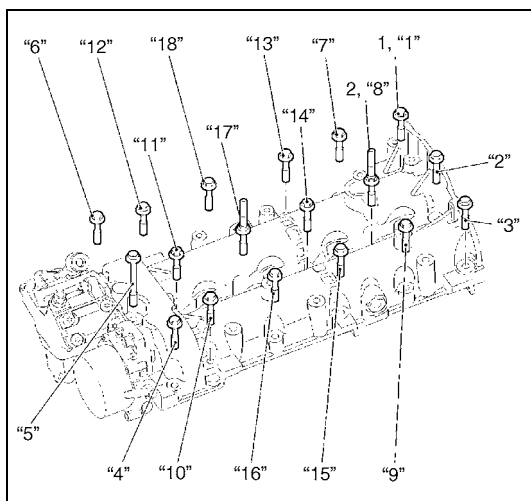


1. Camshaft housing	7. Camshaft housing gasket	13. Cylinder head
 2. Camshaft housing bolt : Tighten 18 N·m (1.8 kg-m, 13.0 lb-ft) by the specified procedure	 8. Intake manifold side camshaft : Apply engine oil to sliding surface	14. Knock pin
 3. Camshaft housing stud bolt : Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft) by the specified procedure	 9. Exhaust manifold side camshaft : Apply engine oil to sliding surface	 Tightening torque
4. Camshaft timing sprocket	 10. Intake manifold side camshaft gear : Apply engine oil to gear	 Do not reuse.
 5. Camshaft timing sprocket bolt : Tighten 120 N·m (12.0 kg-m, 87.0 lb-ft) by the specified procedure	 11. Exhaust manifold side camshaft gear : Apply engine oil to gear	
6. Washer	 12. Camshaft gear bolt : Tighten 120 N·m (12.0 kg-m, 87.0 lb-ft) by the specified procedure	

Camshaft Housing Assembly Removal and Installation

Removal

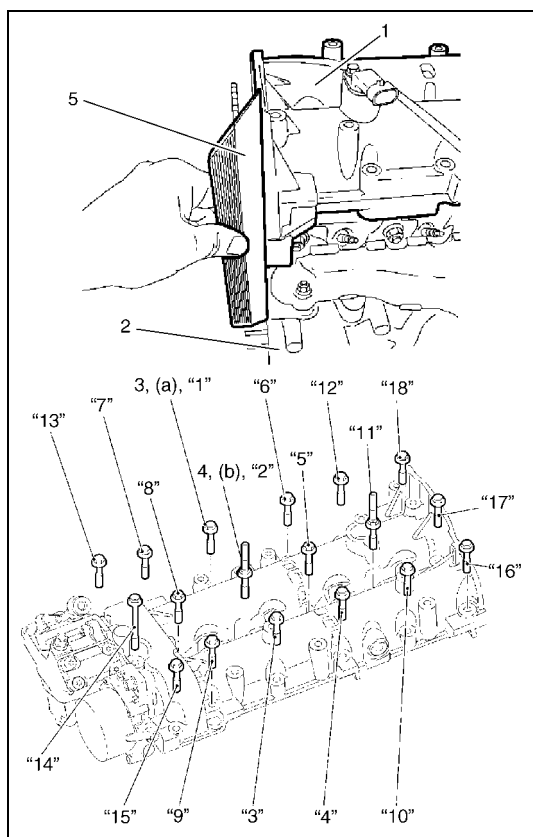
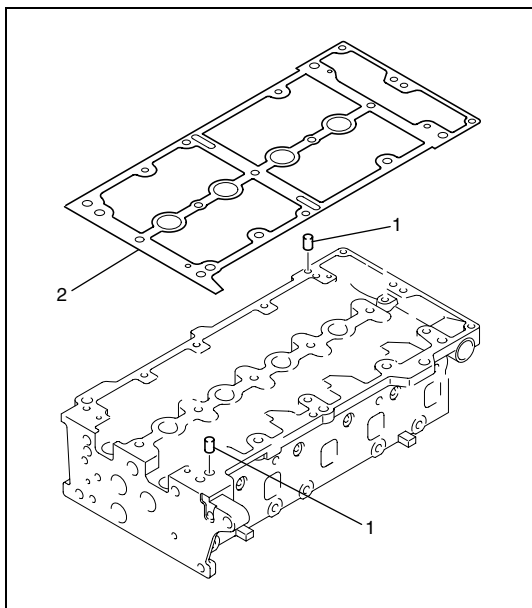
- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation" in this section.
- 2) Remove timing chain referring to "Timing Chain Cover and Timing Chain Removal and Installation" in this section.
- 3) Remove fuel injector referring to "Fuel injector removal and installation" in section 6E3.
- 4) Loosen camshaft housing bolt (1) and camshaft housing stud bolt (2) in numerical order as shown in figure, a little at a time, and remove them.



- 5) Remove camshaft housing assembly (3) and camshaft housing gasket (4).

Installation

- 1) Clean mating surface of camshaft housing and cylinder head.
- 2) Install knock pins (1) to cylinder head, if removed.
- 3) Install new camshaft housing gasket (2) to cylinder head.



- 4) Install camshaft housing assembly (1) to cylinder head (2) as follows.
 - a) Install camshaft housing assembly, and tighten camshaft housing bolt (3) and camshaft housing stud bolt (4) by hand.
 - b) Be flush with end faces of camshaft housing assembly (1) and cylinder head (2) using straightedge (5).
 - c) Tighten camshaft housing bolt (3) and camshaft housing stud bolt (4) to specified torque according to numerical order as shown in figure.

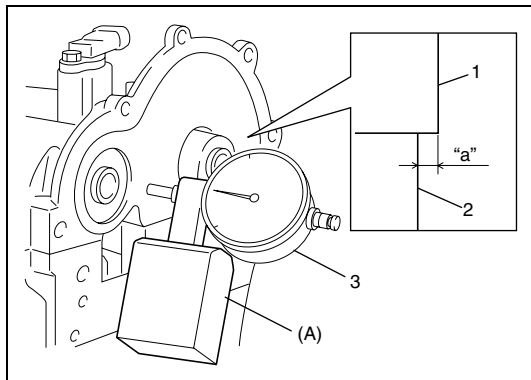
Tightening torque

Camshaft housing bolt

(a): 18 N·m (1.8 kg-m, 13.0 lb-ft) by the specified procedure

Camshaft housing stud bolt

(b): 25 N·m (2.5 kg-m, 18.0 lb-ft) by the specified procedure



- 5) Measure bump "a" between camshaft housing (1) and cylinder head (2) (flatness) using dial gauge (3) and special tool (A) as shown in figure.

If it is out of specification, remove camshaft housing and return to step 4).

Special tool

(A): 09910-26510 (OUT 0000005)

Bump between camshaft housing and cylinder head (flatness)

"a": -0.1 to 0.1 mm (-0.0039 to 0.0039 in.)

- 6) Install fuel injector referring to "Fuel injector removal and installation" in section 6E3.
- 7) Install timing chain and timing chain cover referring to "Timing Chain Cover and Timing Chain Removal and Installation" in this section.
- 8) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation" in this section.

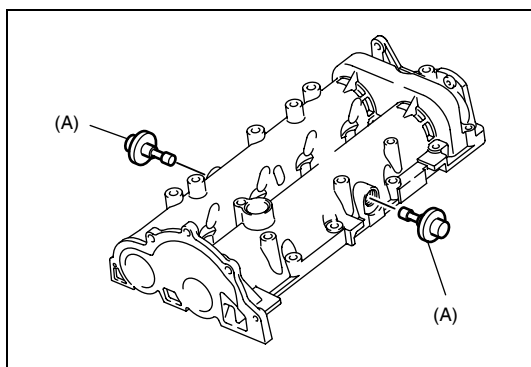
Camshaft Housing Assembly Disassembly and Reassembly

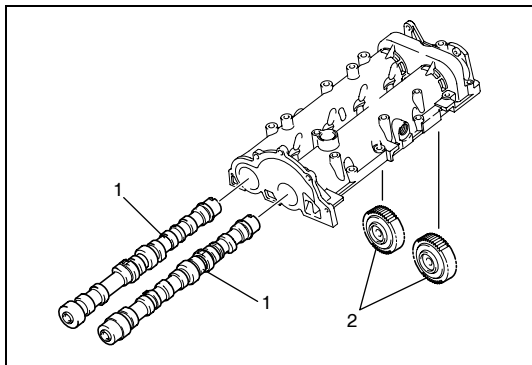
Disassembly

- 1) Remove camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation" in this section.
- 2) Remove vacuum pump referring to "Vacuum Pump Removal and Installation" in this section.
- 3) Remove injection pump referring to "Injection pump removal and installation" in Section 6E3.
- 4) Remove CMP sensor referring to "Camshaft position sensor (CMP sensor) removal and installation" in Section 6E3.
- 5) Remove special tools from camshaft housing.

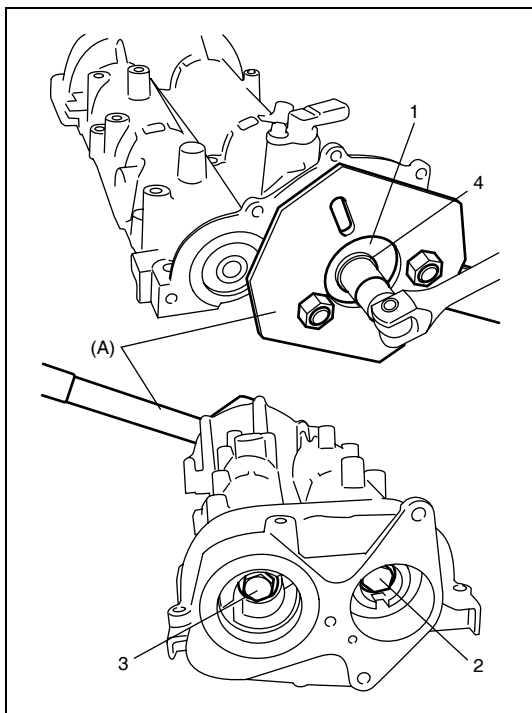
Special tool

(A): 09917-68610





- 6) Remove camshafts (1) and camshaft gears (2) from camshaft housing as follows.



- a) Lock camshaft timing sprocket (1) using special tool.

Special tool

(A): 09917-68221

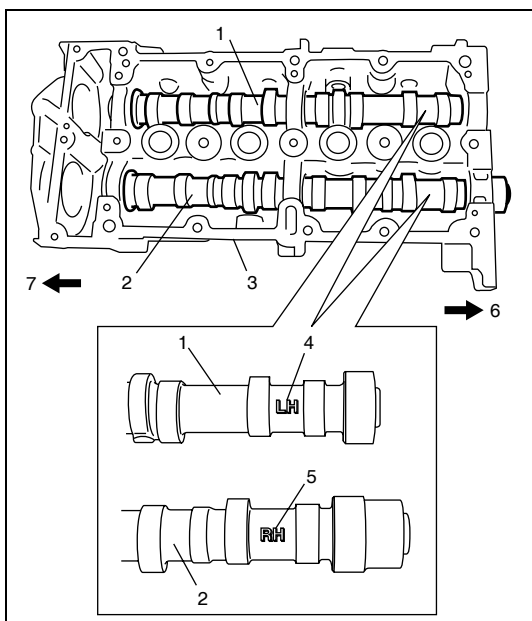
- b) Loosen camshaft gear bolt (2) of intake manifold side.
 c) Loosen camshaft gear bolt (3) of exhaust manifold side.
 d) Loosen camshaft timing sprocket bolt (4), and remove camshaft timing sprocket (1).
 e) Remove camshafts and camshaft gears.

Reassembly

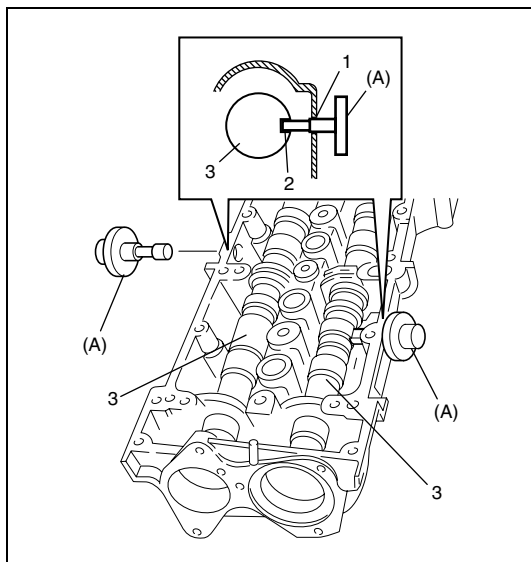
- 1) Apply engine oil to sliding surface of each camshaft and camshaft housing, and then install intake manifold side camshaft (1) and exhaust manifold side camshaft (2) to camshaft housing (3).

NOTE:

Be sure to differentiate intake side and exhaust side camshafts by marks shown in figure.



- | |
|---------------------------|
| 4. "LH" mark |
| 5. "RH" mark |
| 6. Crankshaft pulley side |
| 7. Flywheel side |

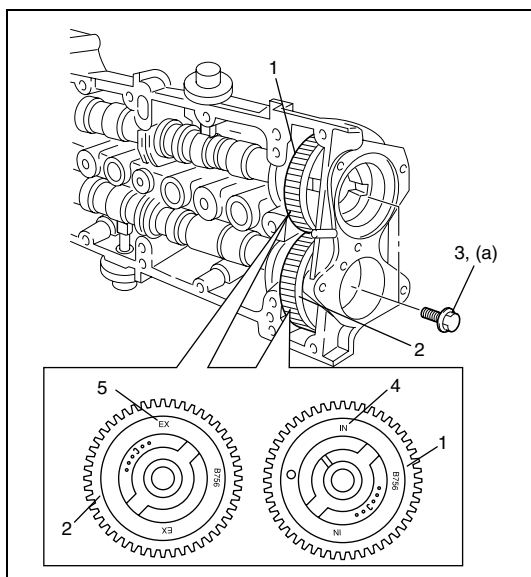


2) Install special tools (A) as follows.

- a) Align camshaft housing plug hole (1) with camshaft gap (2) turning intake manifold side and exhaust manifold side camshaft as shown in figure.
- b) Lock camshafts (3) inserting special tools (A) to plug holes.

Special tool

(A): 09917-68610

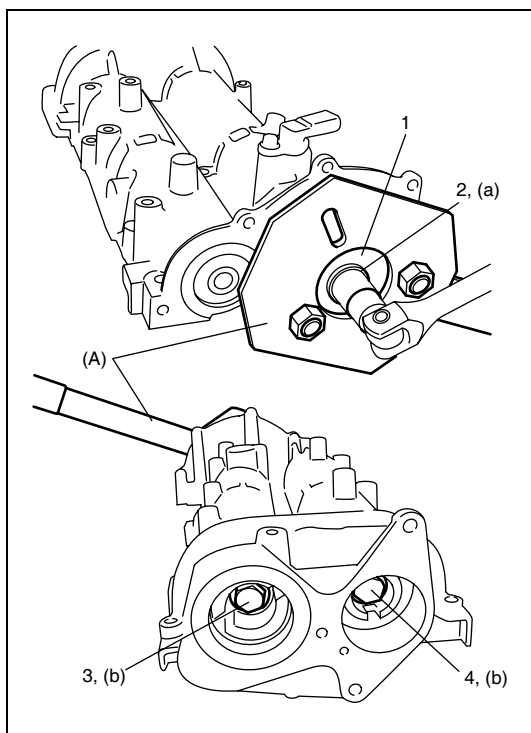


3) Install intake manifold side camshaft gear (1) and exhaust manifold side camshaft gear (2) to camshaft housing, and tighten camshaft gear bolts (3) by hand.

NOTE:

Be sure to differentiate intake and exhaust side camshaft gears by punched marks shown in figure.

4. "IN" mark
5. "EX" mark



4) Tighten camshaft timing sprocket bolt and camshaft gear bolts as follows.

- a) Lock camshaft timing sprocket (1) using special tool.

Special tool

(A): 09917-68221

- b) Install camshaft timing sprocket (1) and tighten camshaft timing sprocket bolt (2) to specified torque.

Tightening torque

Camshaft timing sprocket bolt

(a): 120 N·m (12.0 kg-m, 87.0 lb-ft) by the specified procedure

- c) Tighten exhaust manifold side camshaft gear bolt (3) then intake manifold side camshaft gear bolt (4).

Tightening torque

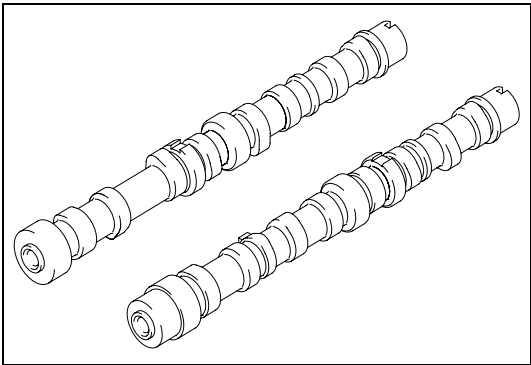
Camshaft gear bolt

(b): 120 N·m (12.0 kg-m, 87.0 lb-ft) by the specified procedure

- 5) Install CMP sensor referring to “Camshaft position sensor (CMP sensor) removal and installation” in section 6E3.
- 6) Install injection pump referring to “Injection pump removal and installation” in Section 6E3.
- 7) Install vacuum pump referring to “Vacuum Pump Removal and Installation” in this section.
- 8) Install camshaft housing assembly referring to “Camshaft Housing Assembly Removal and Installation” in this section.
- 9) Install timing chain and timing chain cover referring to “Timing Chain Cover and Timing Chain Removal and Installation” in this section.
- 10) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation” in this section.

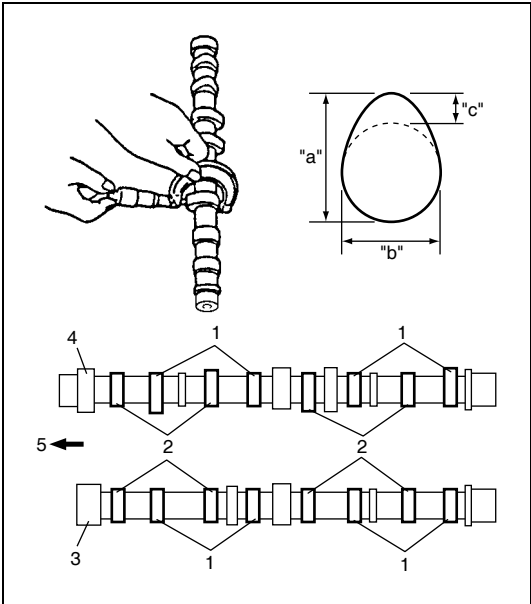
Camshaft Inspection

Camshaft



Check journals and cam faces for wear or damage.
If any malcondition is found, replace camshaft.

Cam Wear



- 1) Using micrometer, measure cam height “a” and cam width “b”.
- 2) Calculate valve lift “c” using the following formula.
“c” = “a” – “b”
- 3) If valve lift “c” is below its specification, replace camshaft.

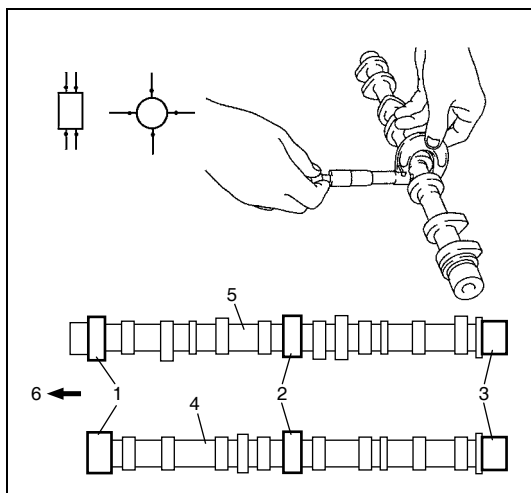
Valve lift “c”

Intake cam: 6.4 mm (0.252 in.)

Exhaust cam: 7.5 mm (0.295 in.)

1. Intake cam	4. Exhaust manifold side camshaft
2. Exhaust cam	5. Crankshaft pulley side
3. Intake manifold side camshaft	

Camshaft Journal



Check camshaft journal outside diameter using micrometer.
If measured diameter is out of specification, replace camshaft.

Camshaft journal outside diameter

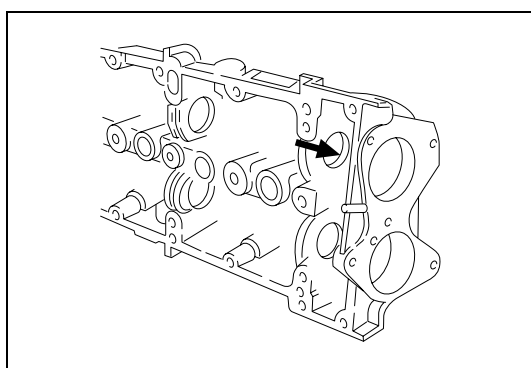
No.1: 38.500 – 38.515 mm (1.5158 – 1.5163 in.)

No.2: 38.000 – 38.015 mm (1.4961 – 1.4966 in.)

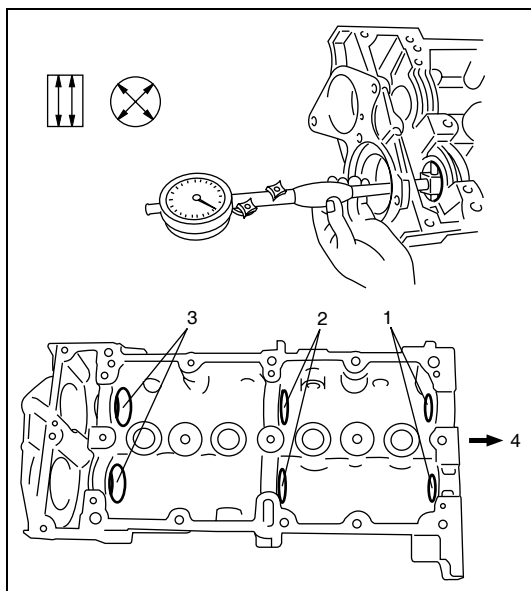
No.3: 30.000 – 30.015 mm (1.1811 – 1.1816 in.)

1. Camshaft journal No.1	4. Intake manifold side camshaft
2. Camshaft journal No.2	5. Exhaust manifold side camshaft
3. Camshaft journal No.3	6. Crankshaft pulley side

Camshaft Housing



- Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
If any malcondition is found, replace camshaft housing.



- Check camshaft journal bore diameter using bore gauge.
If measured diameter is out of specification, replace camshaft housing.

Camshaft journal bore diameter

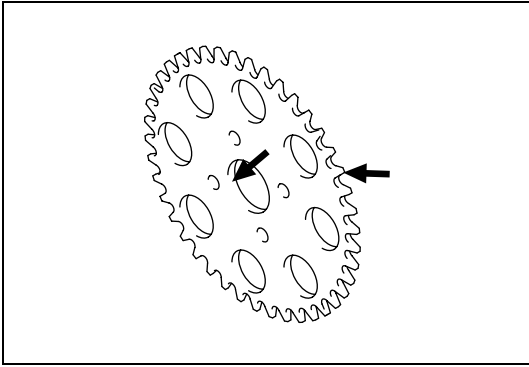
No.1: 38.545 – 38.570 mm (1.5176 – 1.5185 in.)

No.2: 38.045 – 38.070 mm (1.4979 – 1.4988 in.)

No.3: 30.045 – 30.070 mm (1.1829 – 1.1838 in.)

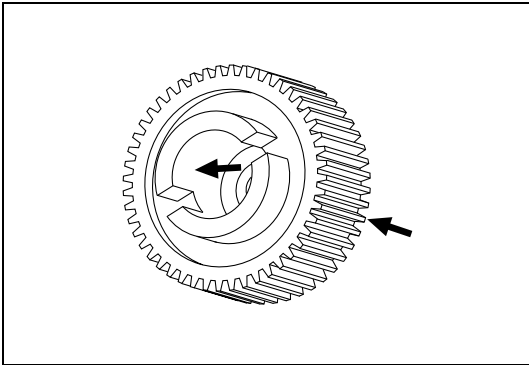
1. Camshaft journal bore No.1
2. Camshaft journal bore No.2
3. Camshaft journal bore No.3
4. Crankshaft pulley side

Camshaft Timing Sprocket



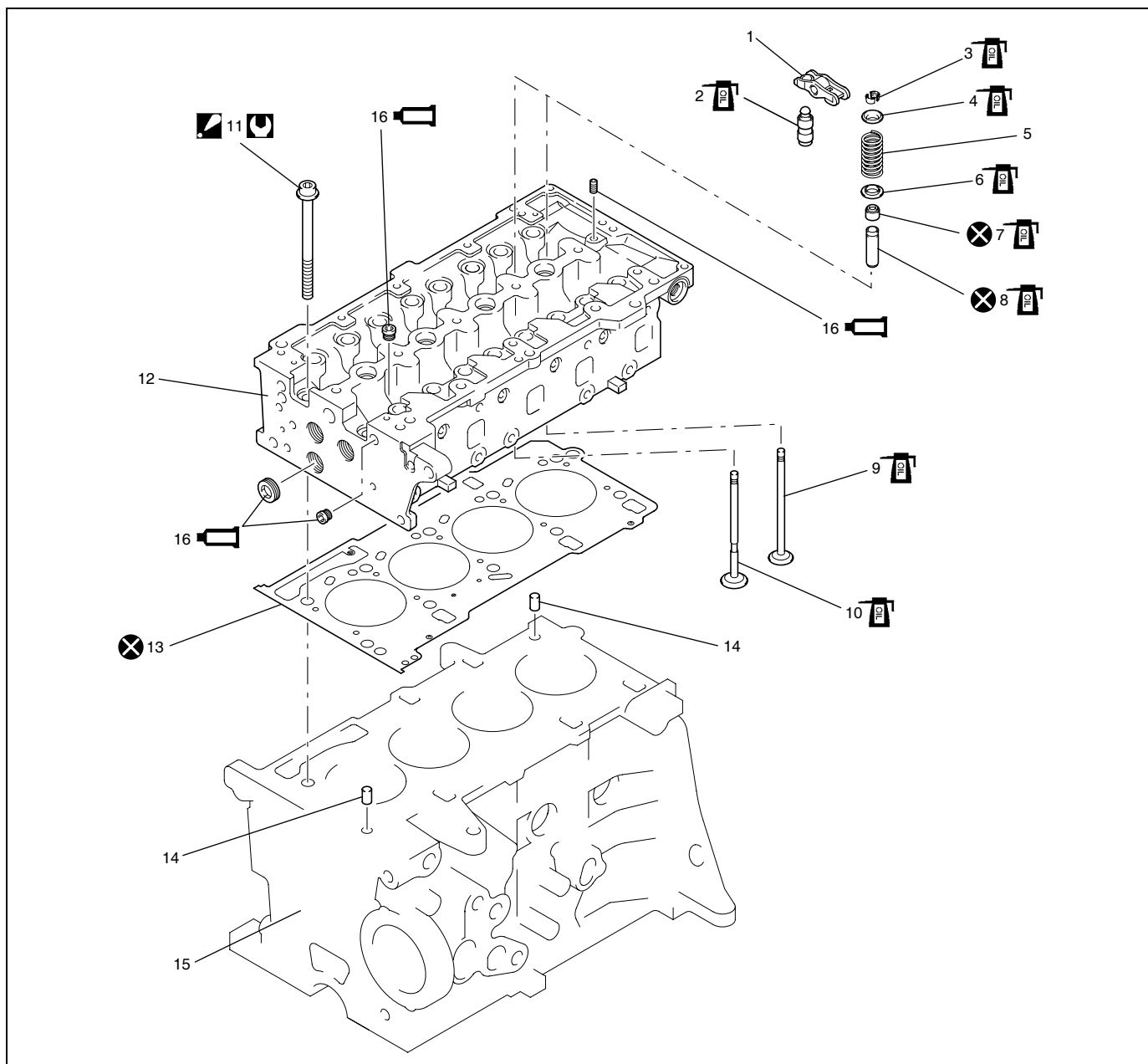
Check camshaft timing sprocket for pitting, scratches or damage.
If any malcondition is found, replace camshaft timing sprocket.

Intake Manifold Side Camshaft Gear and Exhaust Manifold Side Camshaft Gear



Check intake manifold side and exhaust manifold side camshaft gears for pitting, scratches or damage.
If any malcondition is found, replace intake manifold side and/or exhaust manifold side camshaft gear.

Valves and Cylinder Head Components



1. Valve rocker arm	8. Valve guide	15. Cylinder block
2. Hydraulic valve lash adjuster	9. Intake valve	16. Plug : Apply sealant 99000-85E00 to all around thread part of plug.
3. Valve cotter	10. Exhaust valve	Tightening Torque
4. Valve spring retainer	11. Cylinder head bolt : Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft), 90° and 90° by the specified procedure	Apply engine oil to sliding surface.
5. Valve spring	12. Cylinder head	Do not reuse.
6. Valve spring seat	13. Cylinder head gasket	
7. Valve stem seal	14. Knock pin	

Valves and Cylinder Head Assembly Removal and Installation

CAUTION:

Note original position in which each valve rocker arms and hydraulic valve lash adjuster were installed, and then install them to original position.

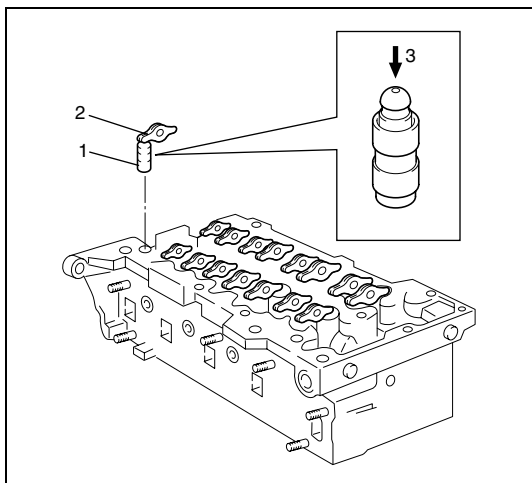
If each valve rocker arm or hydraulic valve lash adjuster is not installed to original position, engine will spoil its original performance.

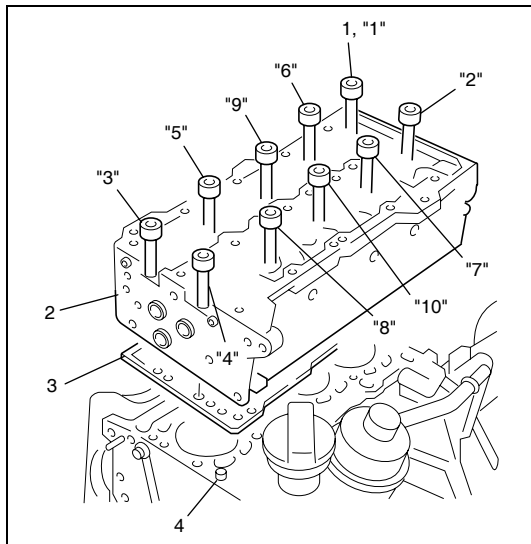
Removal

- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation" in this section.
- 2) Remove camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation" in this section.
- 3) Remove exhaust manifold to "Exhaust Manifold Removal and Installation" in this section.
- 4) Remove thermostat case assembly referring to "Thermostat Case Assembly Removal and Installation" in Section 6B3.
- 5) Remove oil separator referring to "Oil separator and crankcase ventilation cover removal and installation" in Section 6E3.
- 6) Remove intake manifold referring to "Intake Manifold Removal and Installation" in this section.
- 7) Remove oil pressure switch referring to "Oil Pressure Switch Removal and Installation" in this section.
- 8) Remove glow plugs referring to "Glow plug removal and installation" in Section 6E3.
- 9) Remove hydraulic valve lash adjuster (1) with valve rocker arm (2).

NOTE:

- Never disassemble hydraulic valve lash adjuster.
- Don't apply force (3) to body of hydraulic valve lash adjuster. It will leak oil in high pressure chamber.
- Immerse removed hydraulic valve lash adjuster in clean engine oil and keep it there till reinstalling it so as to prevent oil leakage.

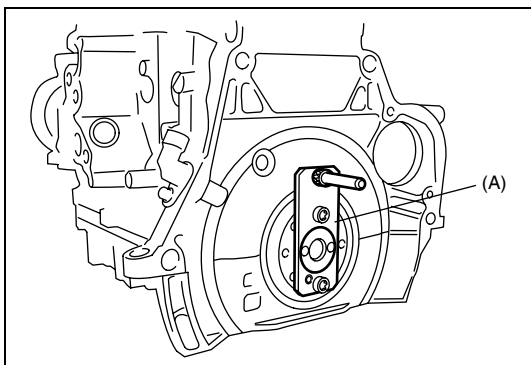
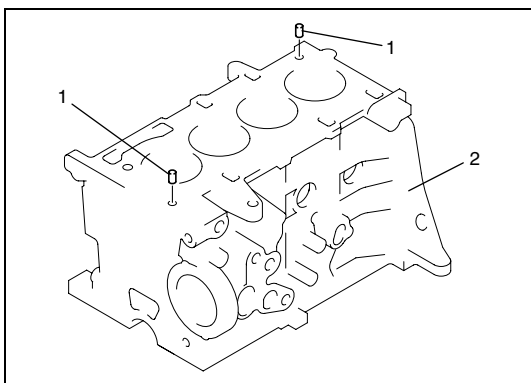




- 10) Loosen cylinder head bolts (1) according to numerical order as shown in figure a little at a time, and remove them.
- 11) Remove cylinder head (2) and cylinder head gasket (3).
- 12) Remove knock pins (4), if necessary.
- 13) Check all around cylinder head for any other parts required to be removed or disconnected.

Installation

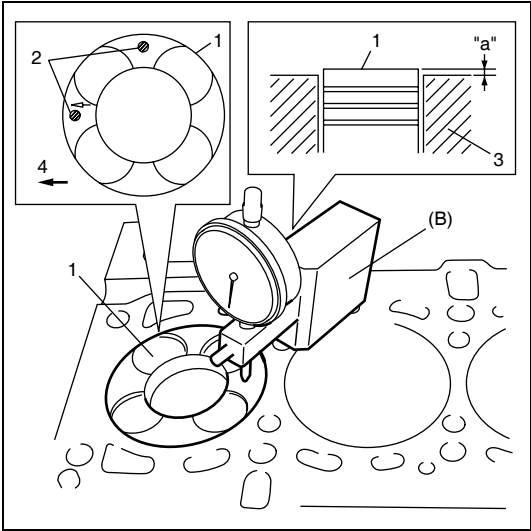
- 1) Clean mating surface of cylinder head and cylinder block.
- 2) Install knock pins (1) to cylinder block (2), if removed.



- 3) Select and install new cylinder head gasket as follows.
 - a) Remove special tool (A).

Special tool

(A): 09912-38300

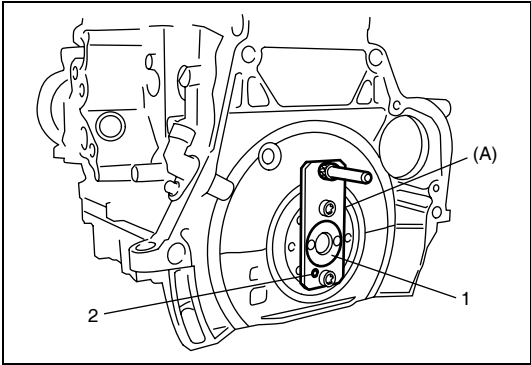


b) Using special tool and dial gauge, measure piston protrusion “a” at specified measurement positions (2) of TDC position as shown in figure. Repeat this procedure in all pistons (1).

Special tool

(B): 09910-26510 (OUT 0000005)

3. Cylinder block
4. Crankshaft pulley side



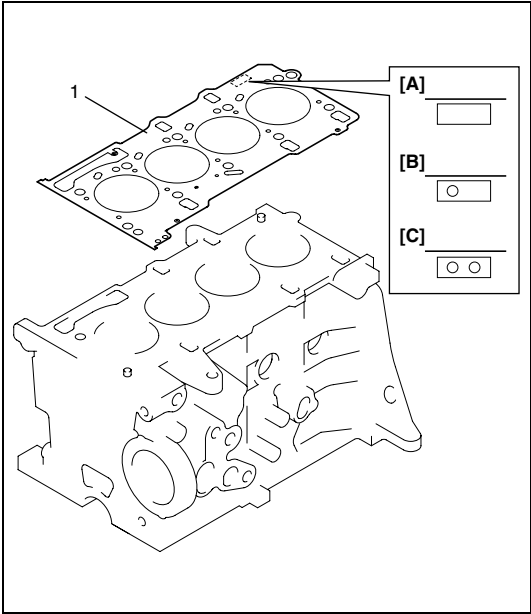
c) Lock crankshaft (1) using special tool.

NOTE:

Be sure to align hole (2) of special tool with knock pin securely.

Special tool

(A): 09912-38300

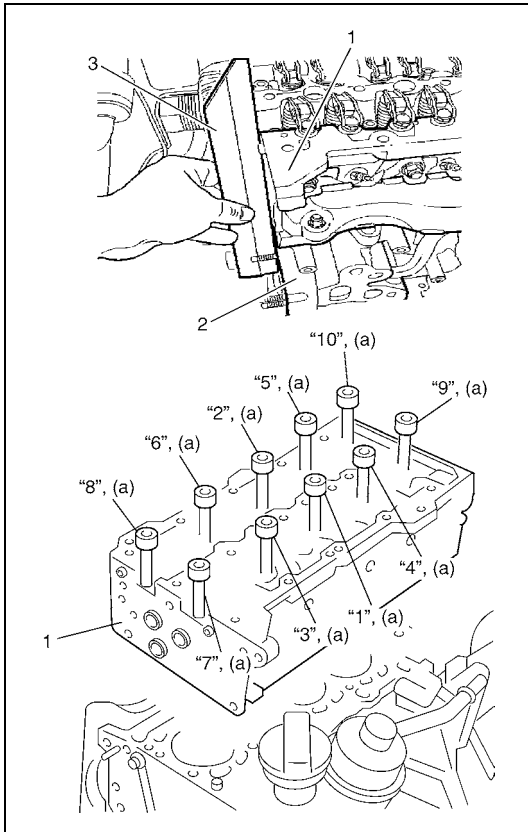


d) Select cylinder head gasket according to maximum value of protrusion “a” measured at step b).

	Gasket thickness	Available piston protrusion
Type A	0.67 – 0.77 mm (0.0264 – 0.0303 in.)	0.028 – 0.127 mm (0.00111 – 0.00500 in)
Type B	0.77 – 0.87 mm (0.0304 – 0.0342 in.)	0.128 – 0.227 mm (0.00501 – 0.00893 in.)
Type C	0.87 – 0.97 mm (0.343 – 0.0381 in.)	0.228 – 0.327 mm (0.00894 – 0.01287 in.)

[A]: Type A (without hole)
[B]: Type B (with one hole)
[C]: Type C (with two holes)

e) Install new cylinder head gasket (1) to cylinder block.

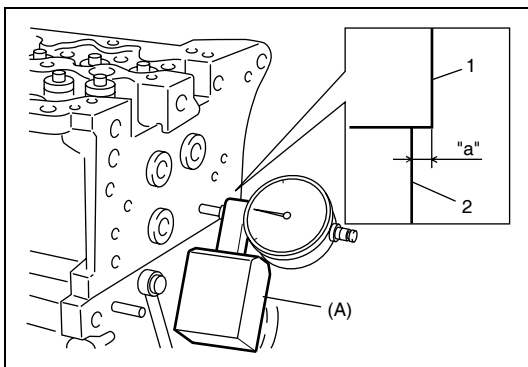


- 4) Install cylinder head (1) to cylinder block (2) as follows.
 - a) Install cylinder head, and tighten cylinder head bolts by hand.
 - b) Be flush with end faces of cylinder head (1) and cylinder block (2) using straightedge (5).
 - c) Tighten all bolts to 20 N·m (2.0 kg-m, 14.5 lb-ft) according to numerical order in figure.
 - d) In the same manner as in Step c), tighten them to 40 N·m (4.0 kg-m, 29.0 lb-ft).
 - e) Retighten all bolts 90° according to numerical order in figure.
 - f) Repeat Step e).

Tightening torque

Cylinder head bolt (a):

Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft), 40 N·m (4.0 kg-m, 29.0 lb-ft), 90° and 90° by the specified procedure



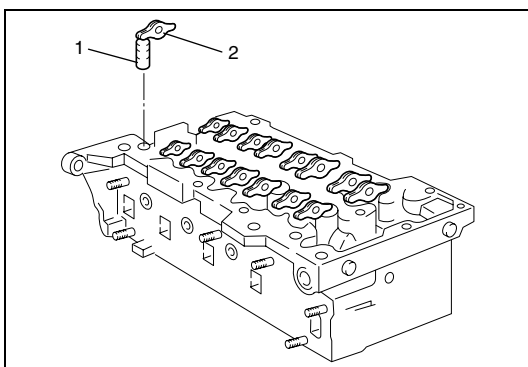
- 5) Measure bump "a" between cylinder head (1) and cylinder block (2) (flatness) using dial gauge and special tool as shown in figure.
If measured notch is out of specification, remove cylinder head and return to step 4).

Special tool

(A): 09910-26510 (OUT 0000005)

Notch between cylinder head and cylinder block (flatness)

"a": -0.1 to 0.1 mm (-0.0039 to 0.0039 in.)



- 6) Apply engine oil around hydraulic valve lash adjuster (1) and valve rocker arm (2), and install them to cylinder head.
- 7) Install glow plugs referring to "Glow plug removal and installation" in Section 6E3.
- 8) Install oil pressure switch referring to "Oil Pressure Switch Removal and Installation" in this section.
- 9) Install intake manifold referring to "Intake Manifold Removal and Installation" in this section.
- 10) Install oil separator referring to "Oil separator and crankcase ventilation cover removal and installation" in Section 6E3, if removed.
- 11) Install thermostat case assembly referring to "Thermostat Case Assembly Removal and Installation" in Section 6B3.
- 12) Install exhaust manifold to "Exhaust Manifold Removal and Installation" in this section.

- 13) Install camshaft housing assembly referring to “Camshaft Housing Assembly Removal and Installation” in this section.
- 14) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation” in this section.

Valves and Cylinder Head Assembly Disassembly and Reassembly

CAUTION:

Note original position in which each valve and valve spring seat were installed, and then install them to original position.

If each valve or valve spring seat is not installed to original position, engine will spoil its original performance.

Disassembly

- 1) Using special tool (A) and (B), compress valve springs and then remove valve cotters (1) using special tool (C).

Special tool

(A): 09916-14510

(B): 09916-14521

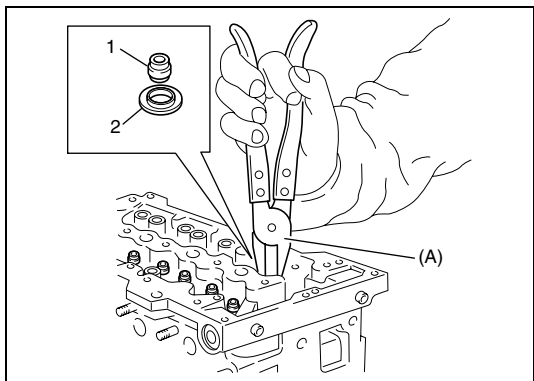
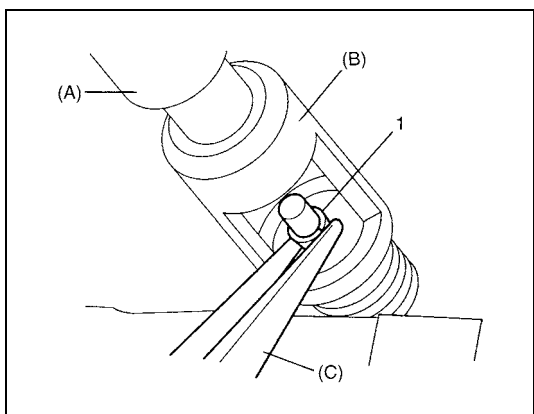
(C): 09916-84511

- 2) Release special tool, and remove valve spring retainer and valve spring.
- 3) Remove valve from combustion chamber side.

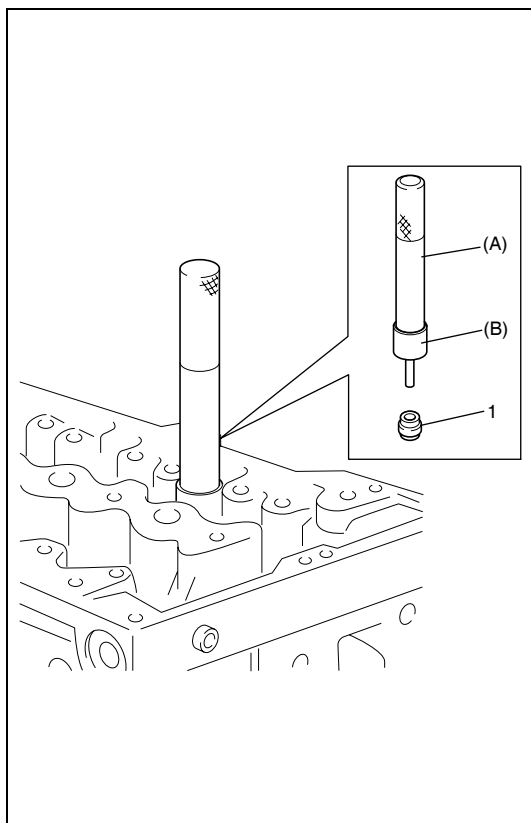
- 4) Remove valve stem seal (1) from valve guide using special tool, and then remove valve spring seat (2).

Special tool

(A): 09917-98610



Reassembly



- 1) Install valve spring seats to cylinder head.
- 2) Install new valve stem seal (1) to valve guide.
After applying engine oil to seal and spindle of special tool (valve guide installer handle), fit stem seal to spindle, and then install seal to valve guide by pushing special tool by hand.
After installing, check to be sure that seal is properly fixed to valve guide.

CAUTION:

When installing, never tap or hit special tool with a hammer or the like. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.

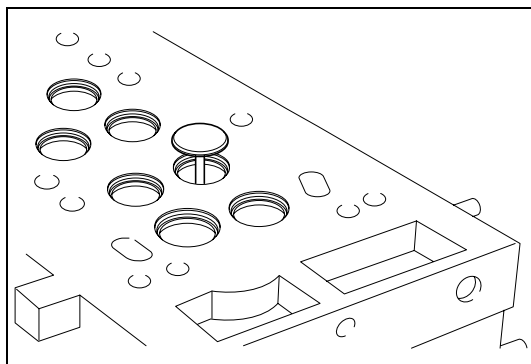
NOTE:

Do not reuse once-disassembled seal. Be sure to install new seal.

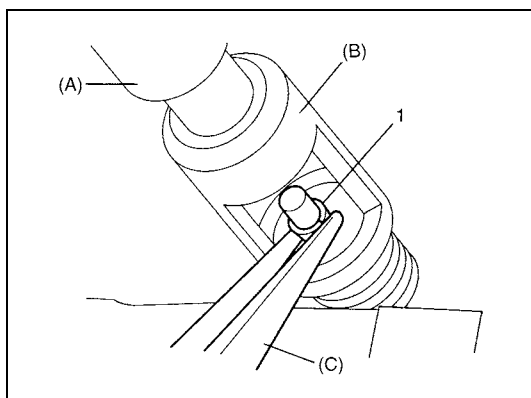
Special tool

(A): 09916-58210

(B): 09917-98221



- 3) Apply engine oil to stem seal, valve guide bore and valve stem, and then install valve to valve guide.
- 4) Install valve spring and valve spring retainer.



- 5) Using special tool (A) and (B), compress valve spring. And, fit two valve cotters (1) into groove in valve stem using special tool (C).

Special tool

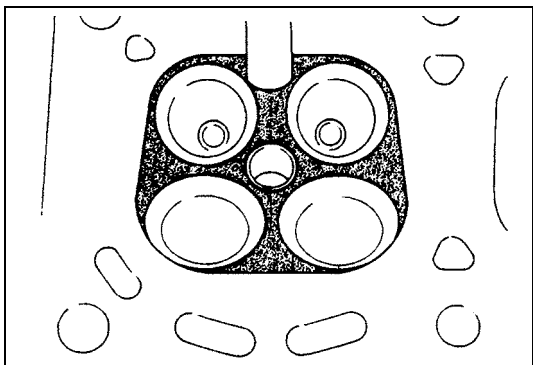
(A): 09916-14510

(B): 09916-14521

(C): 09916-84511

Valves and Cylinder Head Components Inspection

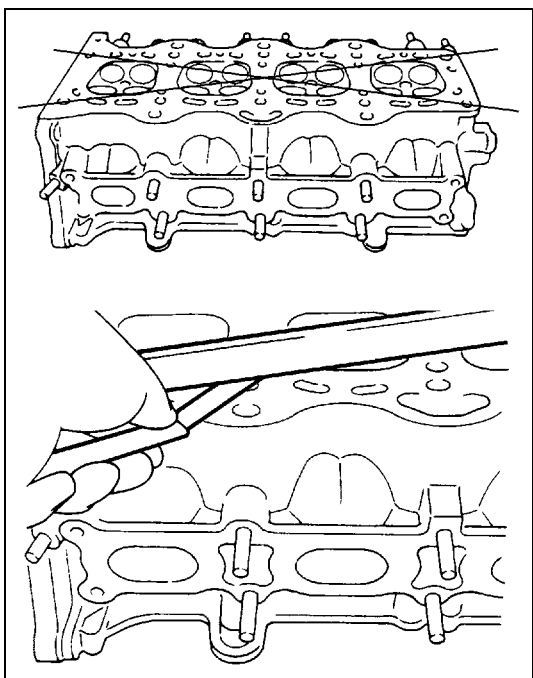
Cylinder Head



- Remove all carbon deposits from combustion chambers.

NOTE:

Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when decarboning. The same applies to valves and valve seats, too.



- Check cylinder head for cracks on intake and exhaust ports, combustion chambers, and head surface.
Using a straightedge and thickness gauge, check flatness of gasketed surface at a total of 2 locations. If distortion limit, given below, is exceeded, replace cylinder head.

**Limit of distortion for surface of cylinder head piston side:
0.10 mm (0.00394 in.)**

Valve Springs

Referring to data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

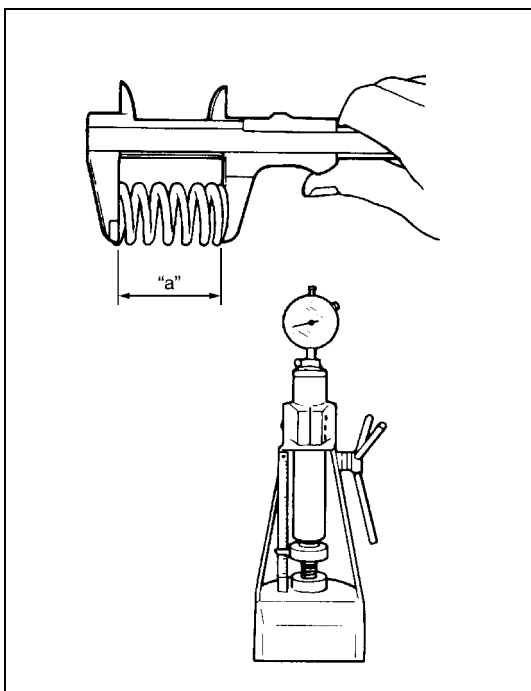
Valve spring free length (In and Ex) "a":

37.9 mm (1.492 in.)

Valve spring preload (In and Ex):

162 – 180 N (16.2 – 18.0 kg) for 31.0 mm (35.7 – 39.7 lb/1.220 in)

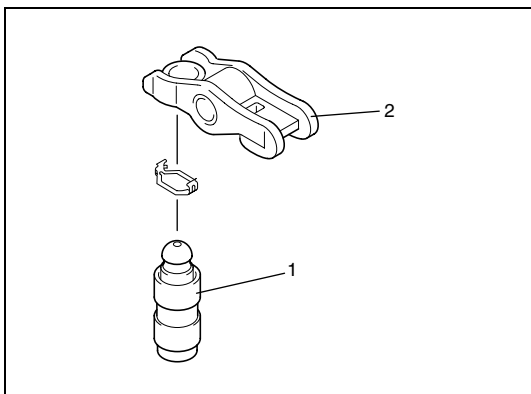
361 – 395 N (36.1 – 39.5 kg) for 23.5 mm (79.6 – 87.1 lb/0.925 in)



Hydraulic Valve Lash Adjuster and Valve Rocker Arm

Check hydraulic valve lash adjuster (1) and valve rocker arm (2) for pitting, scratches, wear or damage.

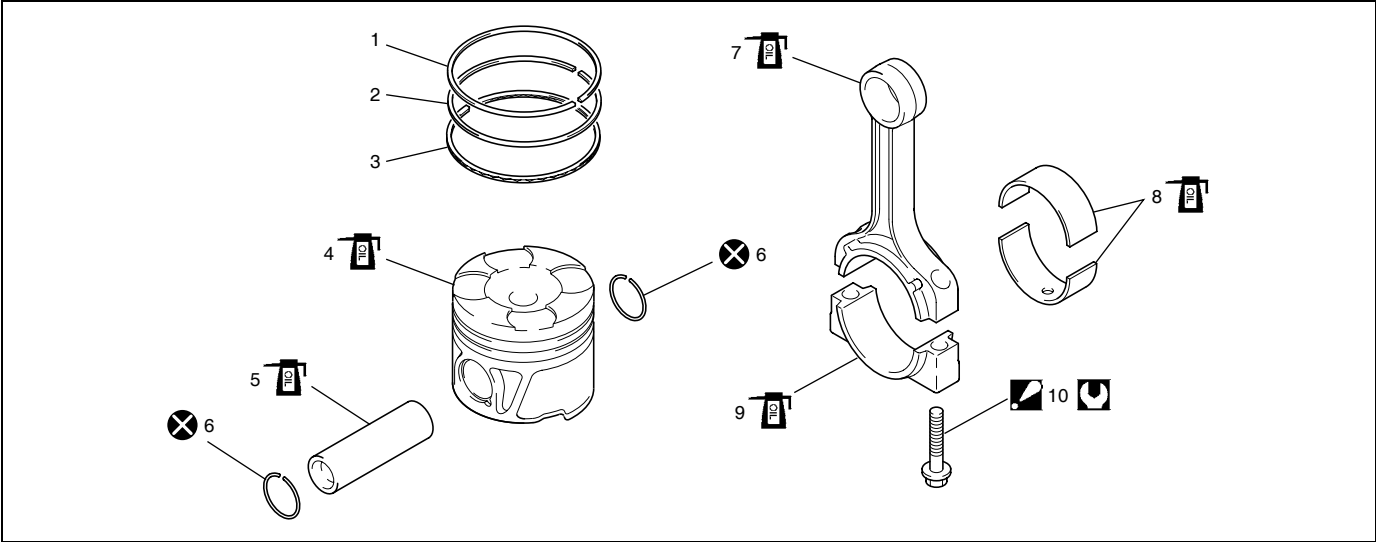
If any malcondition is found, replace them.



Pistons, Piston Rings, Connecting Rods and Cylinder Components

CAUTION:

- Connecting rod and connecting rod bearing cap must be replaced as a set when either replacement becomes necessary.
- Note original position in which each piston, piston ring, connecting rod and connecting rod bearing cap were installed, and install them to original position.
If each piston, piston ring, connecting rod and connecting rod bearing cap is not installed to original position, engine will spoil its original performance.



1. Top ring	6. Piston pin circlip	Tightening Torque
2. 2nd ring	7. Connecting rod	Apply engine oil to sliding surface
3. Oil ring	8. Connecting rod bearing	Do not reuse.
4. Piston	9. Connecting rod bearing cap	
5. Piston pin	10. Connecting rod bearing cap bolt : Tighten 20 N·m (20 kg-m, 14.5 lb-ft) and 40° by the specified.	

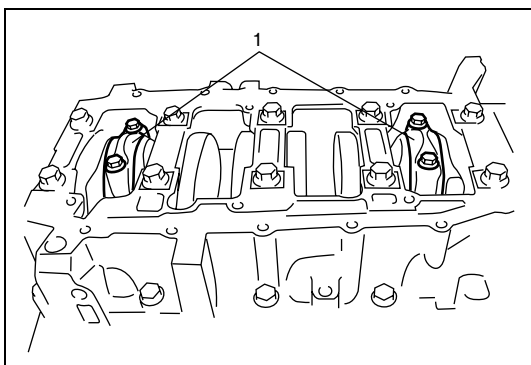
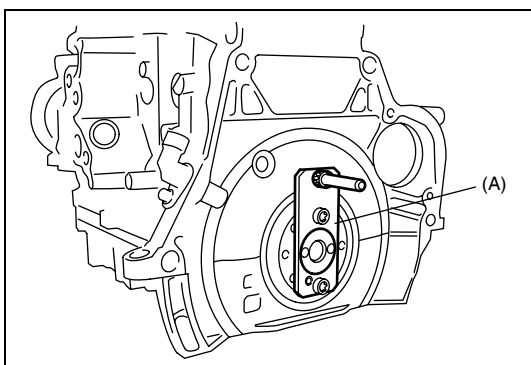
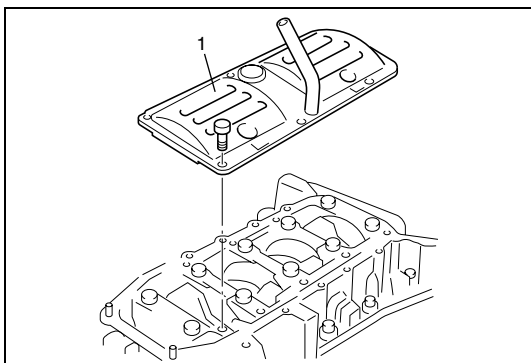
Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation

CAUTION:

- Connecting rod and connecting rod bearing cap must be replaced as a set when either replacement becomes necessary.
- Note original position in which each piston, piston ring, connecting rod and connecting rod bearing cap were installed, and install them to original position.
If each piston, piston ring, connecting rod and connecting rod bearing cap is not installed to original position, engine will spoil its original performance.

Removal

- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation" in this section.
- 2) Remove cylinder head referring to "Valves and Cylinder Head Assembly Removal and Installation" in this section.
- 3) Remove oil pan baffle plate (1) from lower crankcase.



- 4) Remove special tool (A).

Special tool

(A): 09912-38300

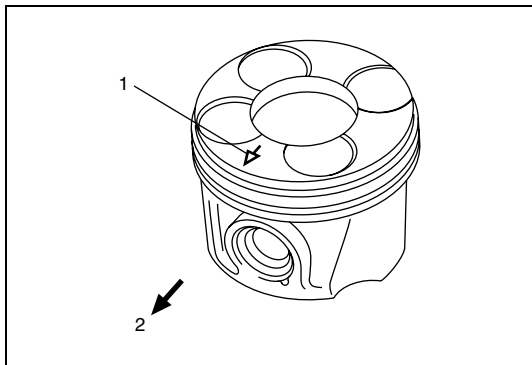
- 5) Mark cylinder number on all pistons using silver pencil or quick drying paint for installation.
- 6) Remove connecting rod bearing caps (1).
- 7) Decarbonize top of cylinder bore before removing piston from cylinder.
- 8) Push piston and connecting rod assembly out through the top of cylinder bore.

Installation

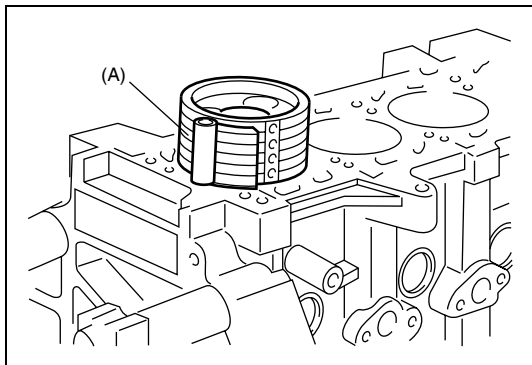
- 1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.

NOTE:

Do not apply oil between connecting rod and bearing or between bearing cap and bearing.



- 2) When installing piston and connecting rod assembly into cylinder bore, point arrow mark (1) on piston head to crankshaft pulley side (2).

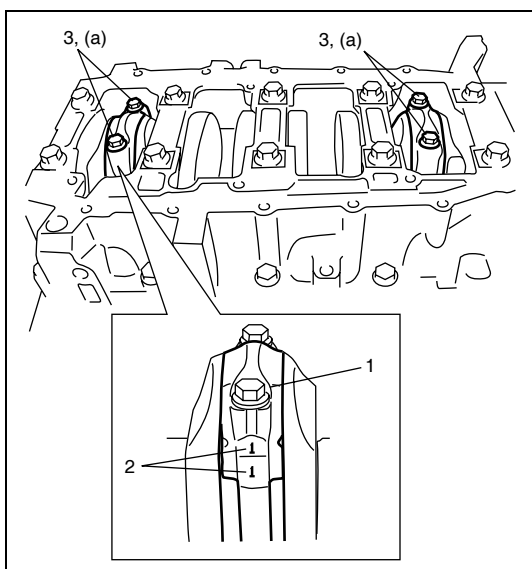


- 3) Install piston and connecting rod assembly into cylinder bore matching cylinder number marked in removal. Use special tool (piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.

Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special tool

(A): 09916-77310



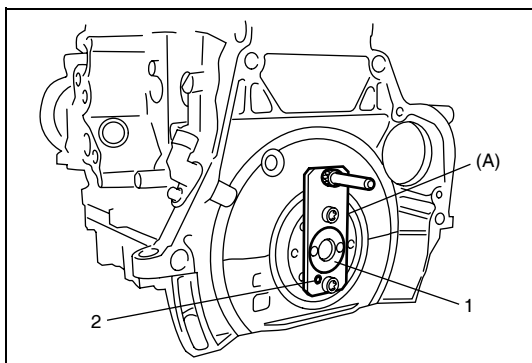
- 4) Install bearing cap (1) to applicable cylinder matching cylinder number (2) on bearing cap and connecting rod, and then tighten bearing cap bolts as follows.

- Tighten all connecting rod bearing cap bolts (3) to 20 N·m (2.0 kg-m, 14.5 lb-ft).
- Retighten them by turning through 40°.

Tightening torque

Connecting rod bearing cap bolt (a):

Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft) and 40° by the specified procedure



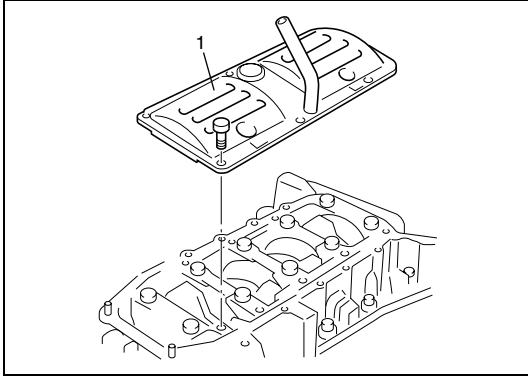
- 5) Lock crankshaft (1) using special tool.

NOTE:

Be sure to align hole (2) of special tool with knock pin securely.

Special tool

(A): 09912-38300

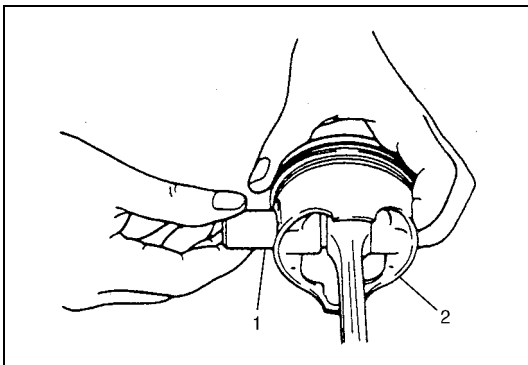
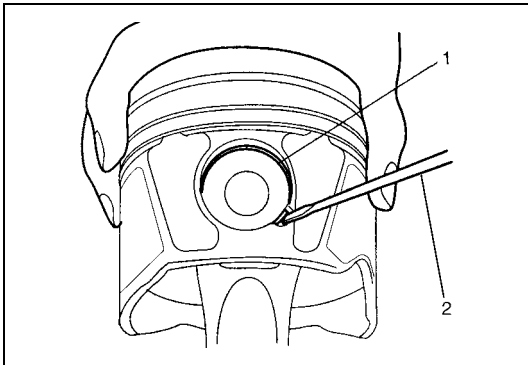


- 6) Install oil pan baffle plate (1) to lower crankcase.
- 7) Install cylinder head referring to "Valves and Cylinder Head Assembly Removal and Installation" in this section.
- 8) Install camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation" in this section.
- 9) Install timing chain and timing chain cover referring to "Timing Chain Cover and Timing Chain Removal and Installation" in this section.
- 10) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation" in this section.

Pistons, Piston Rings, Connecting Rods and Cylinder Disassembly and Reassembly

Disassembly

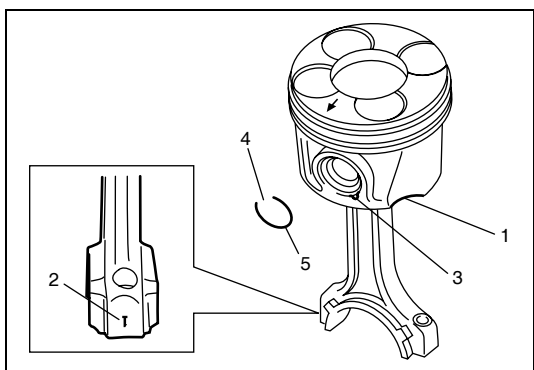
- 1) Using piston ring expander, remove top and 2nd compression rings and oil ring from piston.
- 2) Remove piston pin from connecting rod as follows.
 - a) Using flat head screw driver (2) or the like, remove piston pin circlips (1).



- b) Remove piston pin (1) from piston (2).

Reassembly

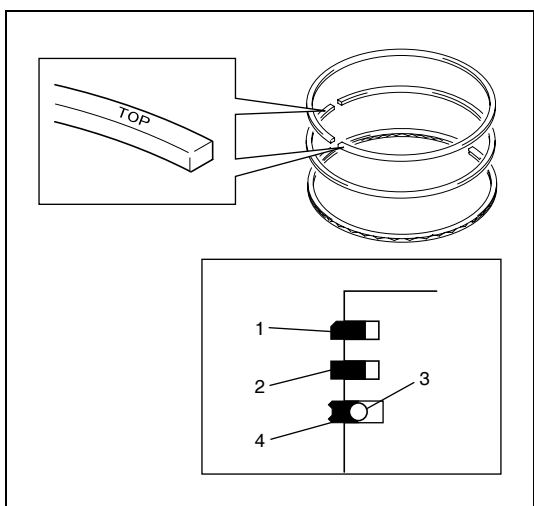
- 1) Clean carbon from piston head and ring grooves using a suitable tool.
- 2) Install piston pin to piston and connecting rod as follows.
 - a) After applying engine oil to piston pin, piston pin holes in piston and connecting rod, fit connecting rod to piston so that cylinder number (2) of connecting rod bearing and chip of piston skirt (1) come on the opposite side, and insert piston pin to piston and connecting rod.
 - b) Install piston pin circlips (5).
 - c) Position opening (4) of piston pin circlip to opposite side of removal and fitting channel (3).



- 3) Install piston rings to piston noting the following.

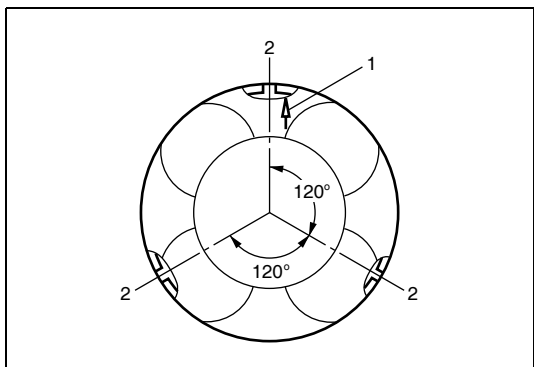
NOTE:

- As indicated in figure, 1st and 2nd rings have “TOP” mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
- 1st ring (1) differs from 2nd ring (2) in thickness and shape. Distinguish 1st ring from 2nd ring by referring to figure.
- When installing oil ring, install spiral ring (3) first and then rail (4).



- 4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in figure.

1. Arrow mark
2. Ring end gap



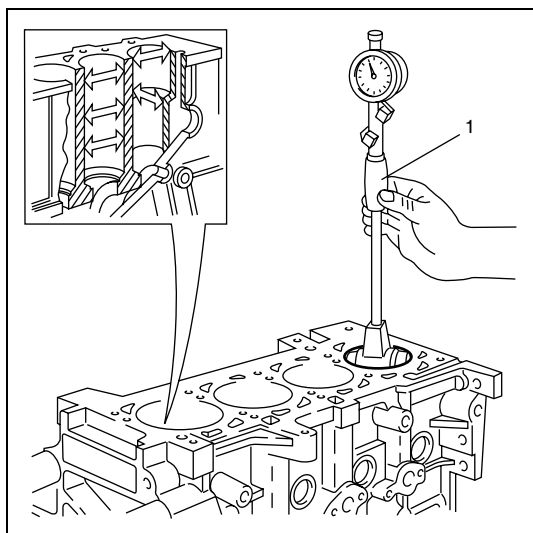
Pistons, Piston Rings, Connecting Rods and Cylinder Inspection

Cylinder

Visual inspection

Inspect cylinder walls for scratches, roughness or ridges which indicate excessive wear. If cylinder bore is very rough, deeply scratched or ridged, rebore cylinder and use oversize piston.

Cylinder bore diameter, taper and out-of-round



Using a cylinder gauge (1), measure cylinder bore in thrust and axial directions at any positions as shown in figure.

If any of the following conditions is noted, replace cylinder block.

- Difference of measurements at two positions exceeds taper limit.
- Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder taper difference

Limit: 0.010 mm (0.00039 in.)

Out-of-round difference

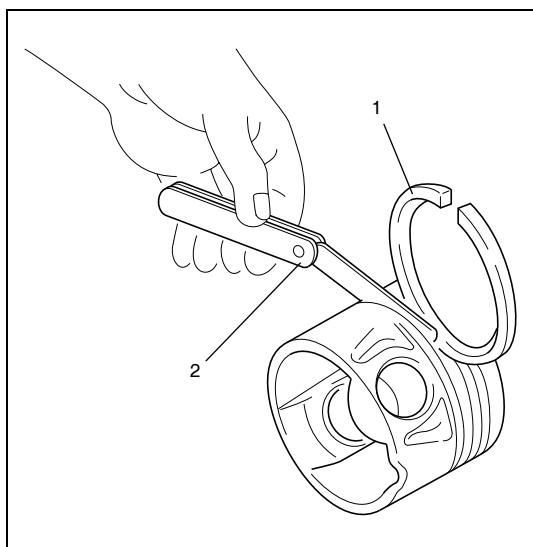
Limit: 0.005 mm (0.00020 in.)

Pistons

Visual inspection

Inspect piston for faults, cracks or other damaged.

Damaged or faulty piston should be replaced.



Ring groove clearance

Before checking, piston grooves must be clean, dry and free of carbon deposits.

Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using thickness gauge (2). If clearance is out of specification, replace piston ring and/or piston.

Ring groove clearance

Top ring:

0.09 – 0.13 mm (0.0036 – 0.0051 in.)

2nd ring:

0.04 – 0.08 mm (0.0016 – 0.0031 in.)

Oil ring:

0.030 – 0.070 mm (0.00119 – 0.00275 in.)

Piston Pin

- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod and/or piston.
- Piston pin diameter:
Measure piston pin diameter, connecting rod small end bore and piston bore.
If it is out of specification, replace piston, piston pin and/or connecting rod.

Piston pin diameter

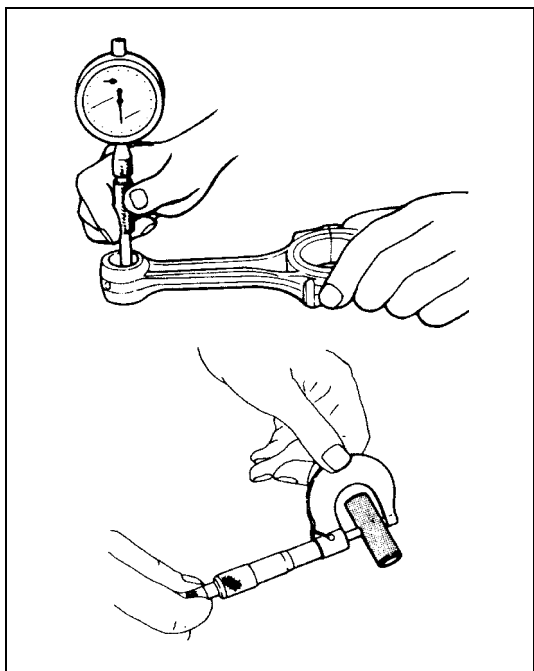
22.982 – 22.987 mm (0.90481 – 0.90500 in.)

Connecting rod small-end bore

22.990 – 22.996 mm (0.90512 – 0.90535 in.)

Piston bore

23.006 – 23.012 mm (0.90575 – 0.90598 in.)



Piston Rings

Piston ring end gap

To measure end gap, insert piston ring (1) into cylinder bore and then measure the gap by using thickness gauge (2).
If measured gap is out of specification, replace ring.

NOTE:

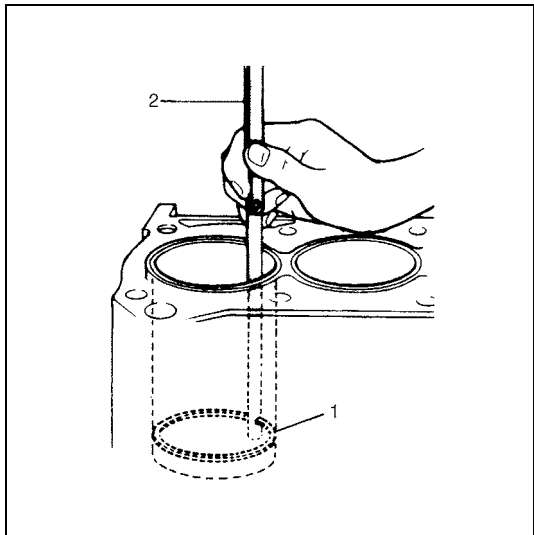
Decarbonize and clean top of cylinder bore before inserting piston ring.

Piston ring end gap

Top ring: 0.20 – 0.30 mm (0.0079 – 0.0118 in.)

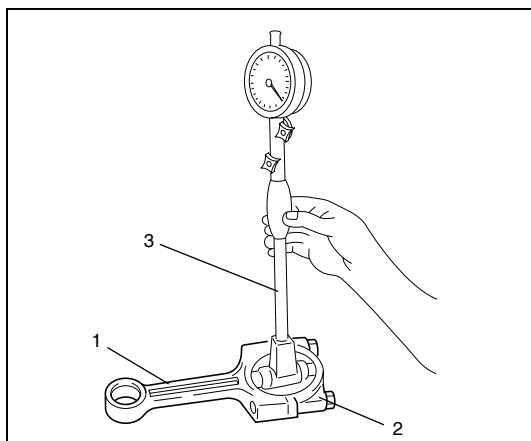
2nd ring: 1.00 – 1.50 mm (0.0394 – 0.0590 in.)

Oil ring: 0.25 – 0.50 mm (0.0099 – 0.0196 in.)



Connecting Rod

- Connecting rod big end bore and length.



- Install bearing cap (2) to connecting rod (1).
- Measure connecting rod big end bore by using bore gauge (3).

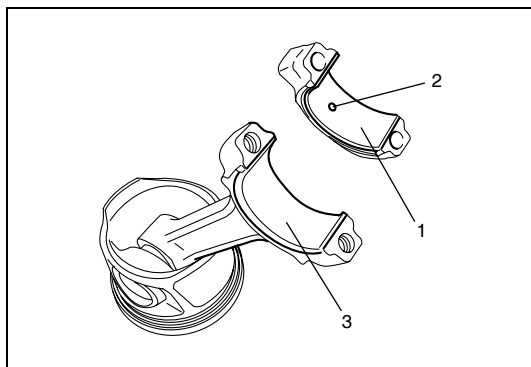
If measured bore is out of specification, replace connecting rod and bearing cap as a set.

Big end bore:

45.734 – 45.744 mm (1.80056 – 1.80094 in.)

Crank Pin and Connecting Rod Bearings

Connecting rod bearing general information



- Connecting rod bearing of cap side (1) has oil hole (2) as shown in figure.
Install this half with oil hole to connecting rod bearing cap.
- Connecting rod side connecting rod bearing (3) does not have oil hole.

Connecting rod bearing visual inspection

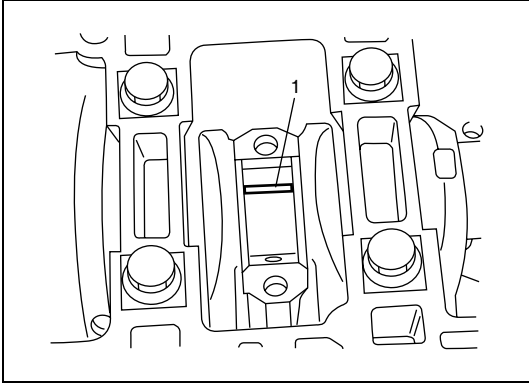
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting rod bearing clearance

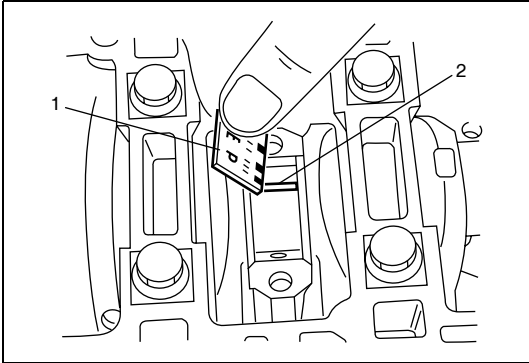
NOTE:

Do not rotate crankshaft while gauging plastic is installed.

- 1) Before checking bearing clearance, clean bearing and crank pin.
- 2) Install bearing in connecting rod and bearing cap.



- 3) Place a piece of gaging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.
- 4) Install connecting rod and bearing cap referring to "Pistons, Piston Rings, Connecting Rods and Cylinder Components" in this section.



- 5) Using a scale (1) on gauging plastic (2) envelope, measure gauging plastic width at the widest point (clearance) after removing cap.
If clearance exceed its specification, replace connecting rod bearing and/or crankshaft.
After replacing new bearing, recheck clearance.

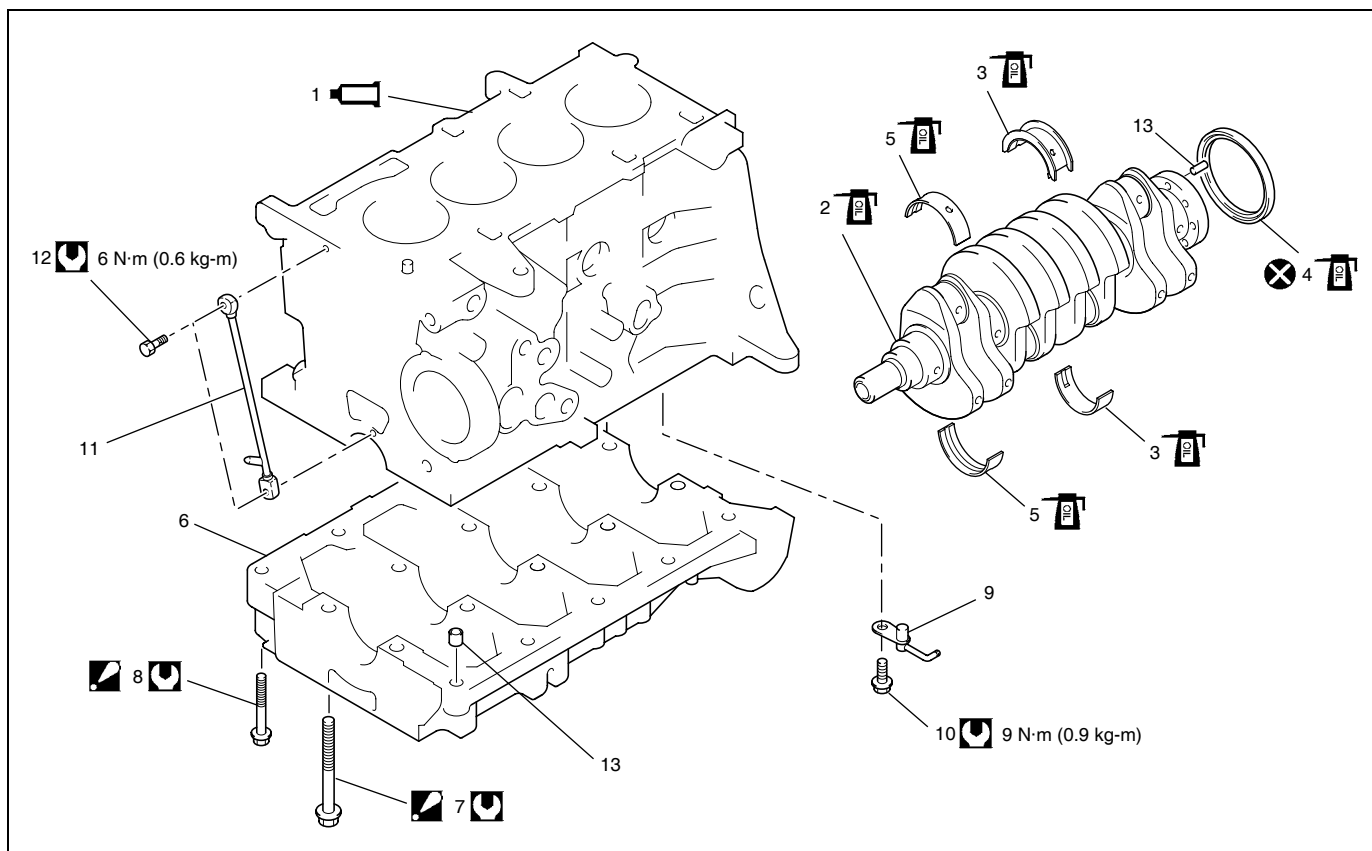
Connecting rod bearing clearance:

0.030 – 0.062 mm (0.00119 – 0.00244 in.)

Main Bearings, Crankshaft and Cylinder Block Components

CAUTION:

Note original position in which each main bearing were installed, and install them to original position.
If each main bearing is not installed to original position, engine will spoil its original performance.



	1. Cylinder block : Apply Loctite 5900® referring to "Main Bearings, Crankshaft and Cylinder Block Removal and Installation".	6. Lower crankcase	11. Timing chain oil jet
	2. Crankshaft : Apply engine oil to sliding surface.	 7. Crankcase bolt (M10) : Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft) and 80° by the specified procedure.	12. Oil jet union bolt
	3. Main bearing (with thrust bearing) : Apply engine oil to sliding surface.	 8. Crankcase bolt (M8) : Tighten 31 N·m (3.1 kg-m, 22.5 lb-ft) by the specified procedure.	13. Knock pin
	4. Flywheel side crankshaft oil seal : Apply engine oil to oil seal lip.	9. Oil jet	 Tightening Torque
	5. Main bearing : Apply engine oil to bearing inside surfaces.	10. Oil jet bolt	 Do not reuse.

Main Bearings, Crankshaft and Cylinder Block Removal and Installation

CAUTION:

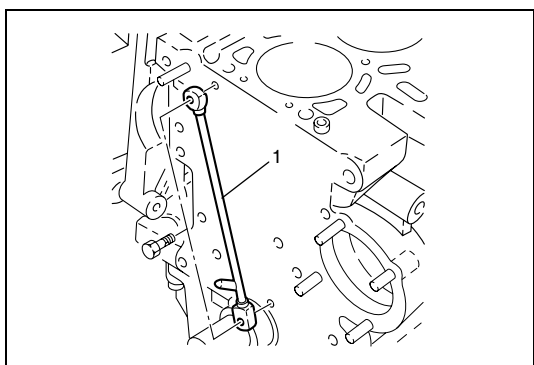
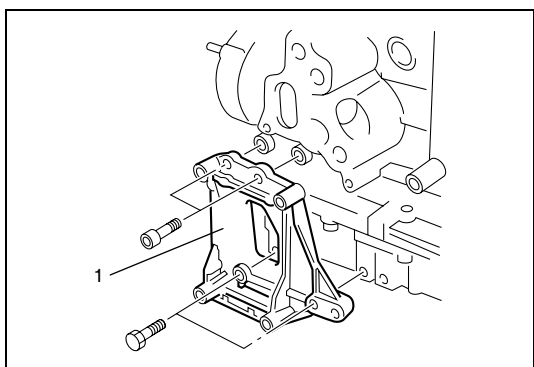
Note original position in which each main bearing were installed, and install them to original position.
If each main bearing is not installed to original position, engine will spoil its original performance.

NOTE:

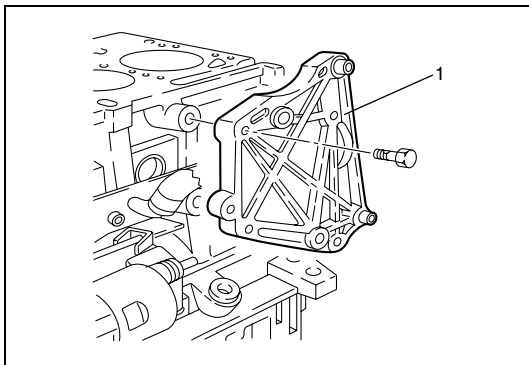
- All parts to be installed must be perfectly clean.
- Be sure to apply oil to crankshaft journals, main bearings, main bearing (with thrust bearing), crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.

Removal

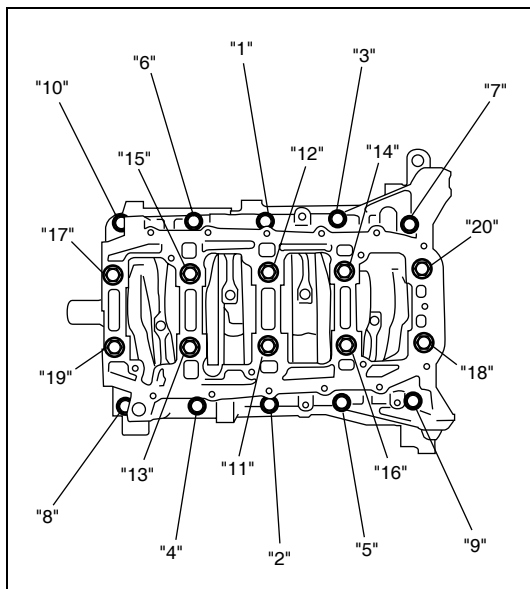
- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation" in this section.
- 2) Remove cylinder head assembly referring to "Valves and Cylinder Head Assembly Removal and Installation" in this section.
- 3) Remove CKP sensor referring to "Crankshaft position (CKP) sensor (engine speed sensor) removal and installation" in Section 6E3.
- 4) Remove heater outlet pipe referring to "Cooling System Component" in Section 6B3.
- 5) Remove oil cooler assembly referring to "Oil Cooler Removal and Installation" in this section.
- 6) Remove generator referring to "Generator Dismounting and Remounting" in Section 6H3.
- 7) Remove starting motor referring to "Starting Motor Dismounting and Remounting" in Section 6G3.
- 8) Remove A/C compressor bracket (1), if equipped.



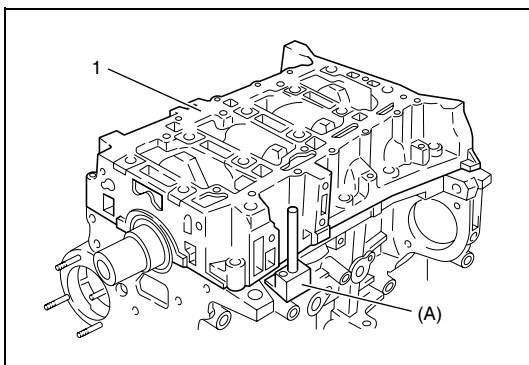
- 9) Remove timing chain oil jet (1) from cylinder block.



- 10) Remove generator bracket (1) from cylinder block.
- 11) Remove crank ventilation cover from cylinder block referring to "Oil separator and crankcase ventilation cover removal and installation" in Section 6E3.
- 12) Remove piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation" in this section.

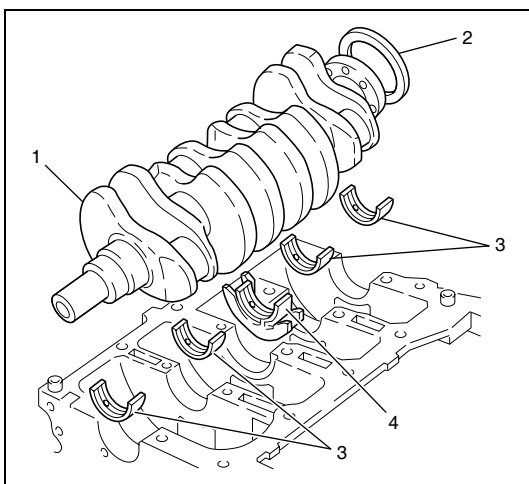


- 13) Loosen crankcase bolt (M10) and crankcase bolt (M8) in numerical order as shown in figure a little at a time, and remove them.

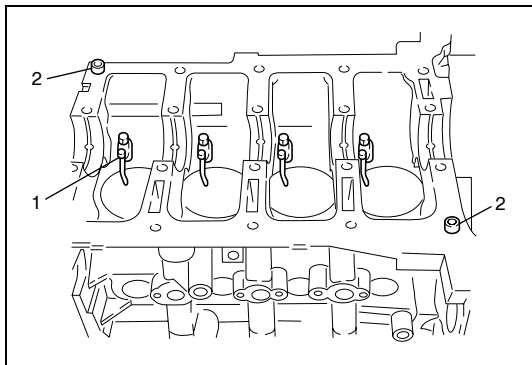


- 14) Remove lower crankcase (1) from cylinder block using special tool.

Special tool
(A): 0921-96510



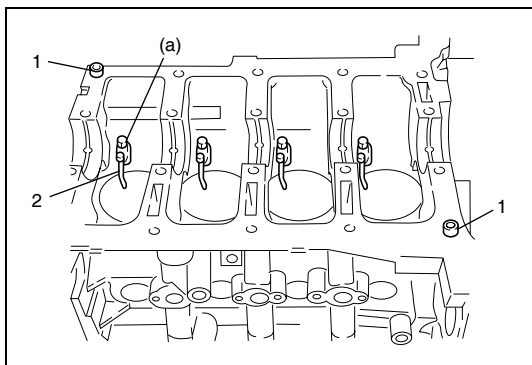
- 15) Remove crankshaft (1) and flywheel side crankshaft oil seal (2) from cylinder block.
- 16) Remove main bearings (3) and main bearing (with thrust bearing) (4) from cylinder block and lower crankcase.



17) Remove oil jet (1) from cylinder block, if necessary.

18) Remove knock pin (2) from cylinder block, if necessary.

Installation



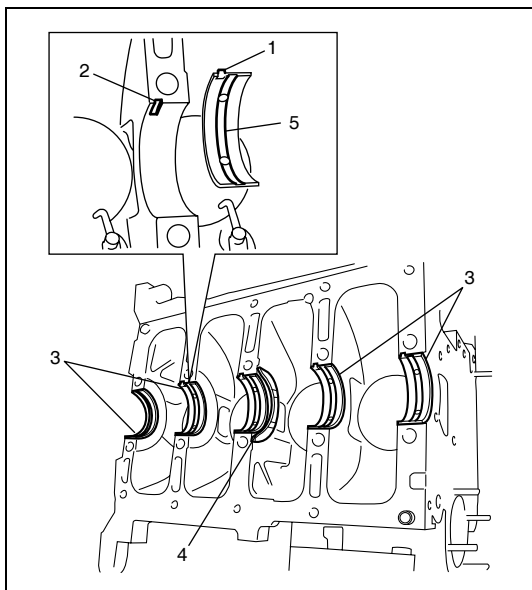
1) Install knock pin (1) to cylinder block, if removed.

2) Install oil jet (2) to cylinder block, if removed.

Tightening torque

Oil jet bolt

(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

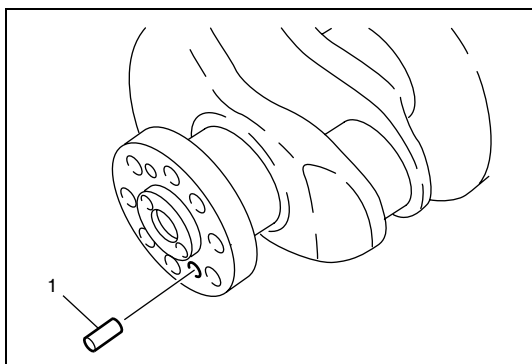


3) Install main bearings (3) and main bearings (with thrust bearing) (4) to cylinder block and lower crankcase aligning tab (1) with gap (2).

NOTE:

One of two halves of main bearing has an oil groove (5). Install it to cylinder block, and the other half without oil groove to lower crankcase.

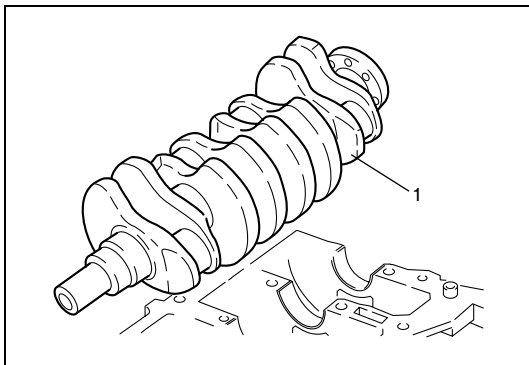
Make sure that two halves are painted in the same color.



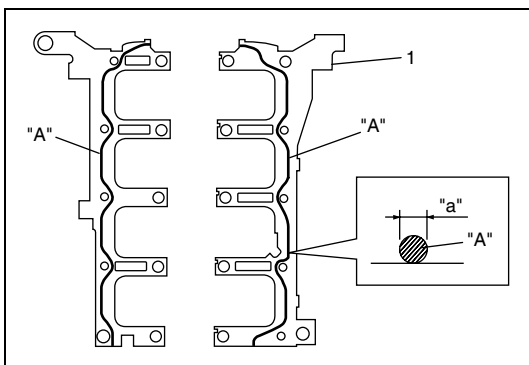
4) Install knock pin (1) to crankshaft, if removed.

NOTE:

Be sure to install knock pin to ϕ 6.75 mm (0.266 in.) hole of crankshaft.



5) Install crankshaft (1) to cylinder block.

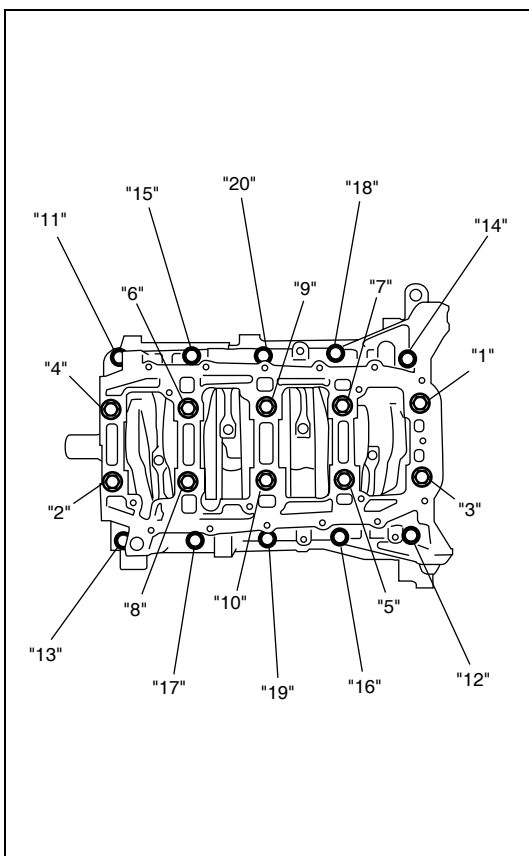


6) Apply sealant to cylinder block (1) as shown in figure.

"A": Loctite 5900®

7) Install lower crankcase to cylinder block.

"a": 3.0 mm (0.118 in.)



8) Tighten crankcase bolts (M10) ("1" – "10") and crankcase bolts (M8) ("11" – "20") as follows.

NOTE:

Tighten these bolts in numerical order as indicated in figure in this procedure.

- Tighten crankcase bolts (M10) to 20 N·m (2.0 kg-m, 14.5 lb-ft).
- Retighten by turning crankcase bolts (M10) to 80°.
- Tighten crankcase bolts (M8) to 30 N·m (3.0 kg-m, 22.0 lb-ft).

Tightening torque

crankcase bolt (M10):

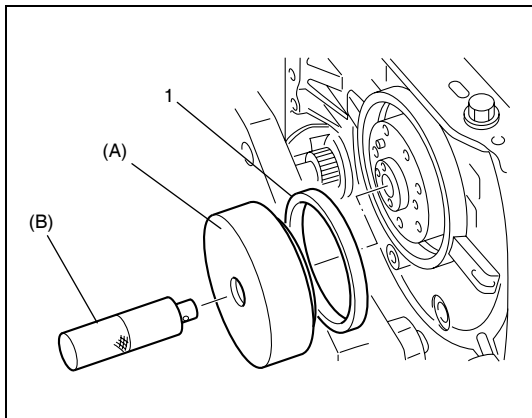
Tighten 20 N·m (2.0 kg-m, 14.5 lb-ft) and 80° by the specified procedure

crankcase bolt (M8):

Tighten 30 N·m (3.0 kg-m, 22.0 lb-ft) by the specified procedure

NOTE:

After tightening lower crankcase bolts, check to be sure that crankshaft rotates smoothly.



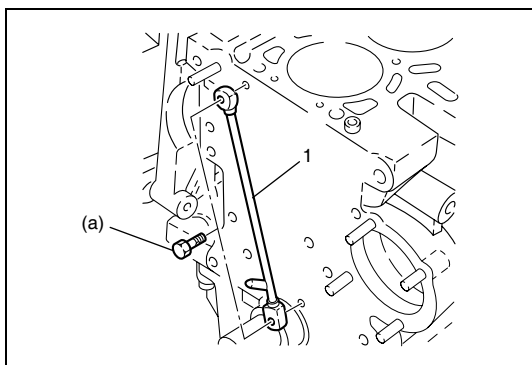
- 9) Using special tools, install flywheel side crankshaft oil seal (1) as follows.

Special tool

(A): 09913-58620

(B): 09924-74510

- Fit crankshaft oil seal to special tool (A).
- Install special tool (B) to special tool (A), and install crankshaft oil seal by tapping special tool (B) lightly with a plastic hammer.
- Remove special tool (A) and (B).



- 10) Install timing chain oil jet (1) to cylinder block.

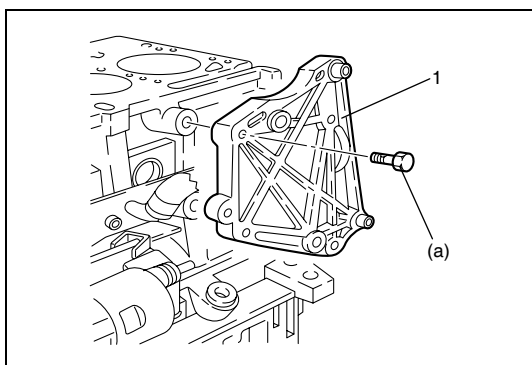
Tightening torque

Oil jet union bolt

(a): 6 N·m (0.6 kg-m, 4.5 lb-ft)

- 11) Install piston and connecting rod referring to “Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation” in this section.

- 12) Install crank ventilation cover to cylinder block referring to “Oil separator and crankcase ventilation cover removal and installation” in Section 6E3.

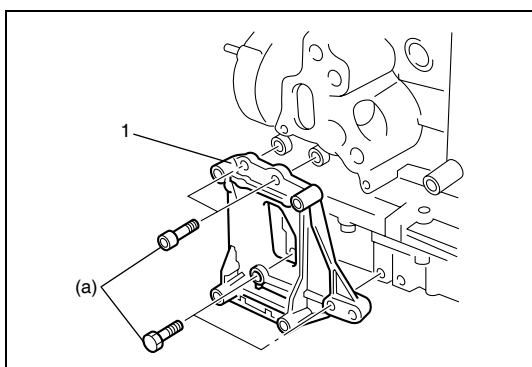


- 13) Install generator bracket (1) to cylinder block.

Tightening torque

Generator bracket bolt

(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)



- 14) Install A/C compressor bracket (1), if removed.

Tightening torque

A/C compressor bracket bolt

(a): 20 N·m (2.0 kg-m, 14.5 lb-ft)

- 15) Install starting motor referring to “Starting Motor Dismounting and Remounting” in Section 6G3.

- 16) Install generator referring to “Generator Dismounting and Remounting” in Section 6H3.

- 17) Install oil cooler assembly referring to “Oil Cooler Removal and Installation” in this section.

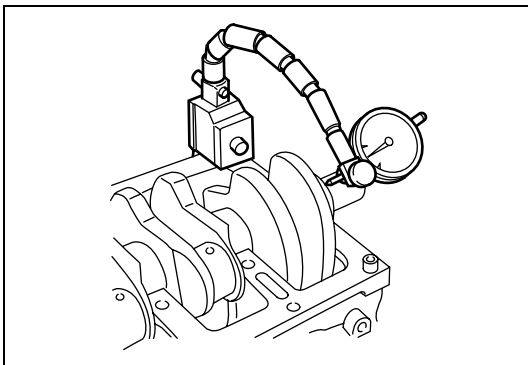
- 18) Install heater outlet pipe referring to “Cooling System Component” in Section 6B3.

- 19) Install CKP sensor referring to “Crankshaft position (CKP) sensor (engine speed sensor) removal and installation” in Section 6E3.
- 20) Install cylinder head assembly referring to “Valves and Cylinder Head Assembly Removal and Installation” in this section.
- 21) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation” in this section.

Main Bearings, Crankshaft and Cylinder Block Inspection

Crankshaft Thrust Play

- 1) Install main bearing, main bearing (with thrust bearing), crankshaft and lower crankcase referring to “Main Bearings, Crankshaft and Cylinder Block Removal and Installation” in this section.
- 2) Using a dial gauge, measure displacement in axial (thrust) direction of crankshaft.
If measured value is out of specification, replace main bearing (with thrust bearing).



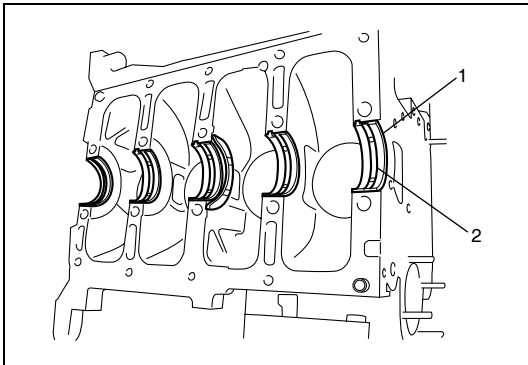
Crankshaft thrust play

0.055 – 0.265 mm (0.00217 – 0.01043 in.)

Main Bearing

General information

- Upper half of bearing (1) has oil groove (2) as shown in figure.
Install this half with oil groove to cylinder block.
- Lower half of bearing does not have oil groove.



Visual inspection

Check bearings for pitting, scratches, wear or damage.

If any malcondition is found, replace both upper and lower halves.

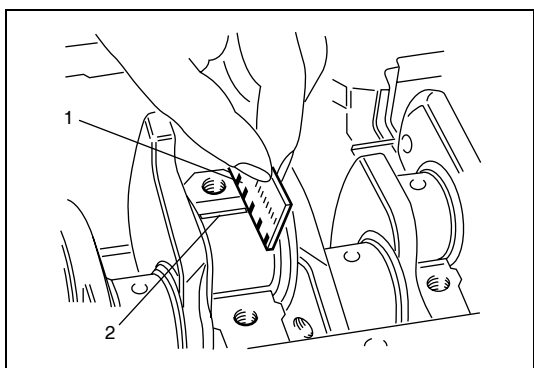
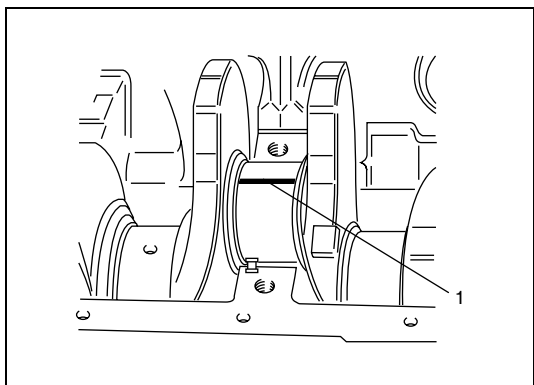
Never replace either half without replacing the other half.

Main bearing clearance

NOTE:

Do not rotate crankshaft while gauging plastic is installed.

- 1) Before checking bearing clearance, clean bearing and crankshaft journal.
- 2) Install bearing to cylinder block and main bearing cap referring to “Main Bearings, Crankshaft and Cylinder Block Removal and Installation” in this section.
- 3) Place a piece of gauging plastic (1) to full width of crankshaft journal as contacted by bearing (parallel to crankshaft), avoiding oil hole.
- 4) Install lower crankcase referring to “Main Bearings, Crankshaft and Cylinder Block Removal and Installation” in this section.



- 5) Remove cap and using a scale (1) on gauging plastic (2) envelope, measure gauging plastic width at the widest point (clearance).

If clearance is out of specification, replace bearing. Always replace both upper and lower bearing as a set.

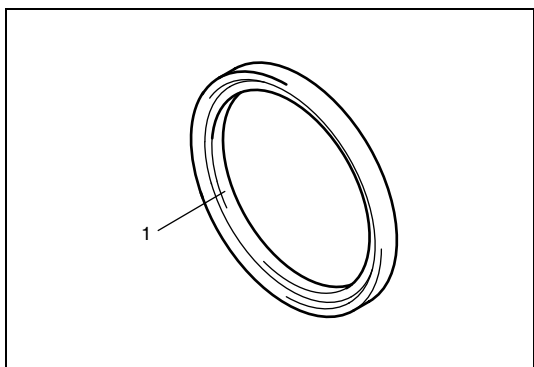
Main bearing clearance:

0.026 – 0.050 mm (0.00103 – 0.00196 in.)

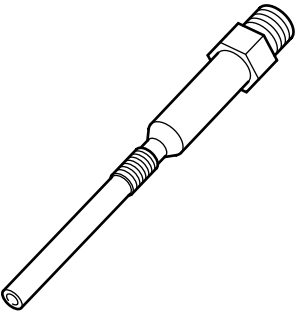
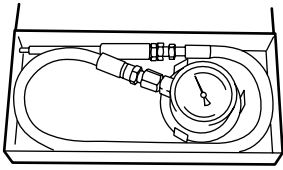
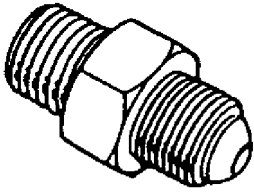
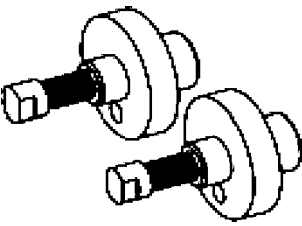
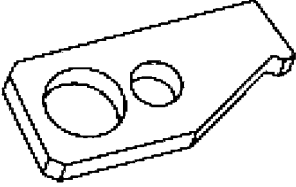
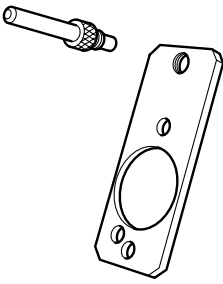
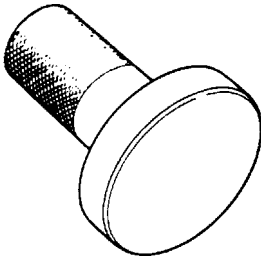
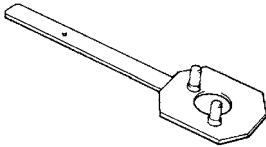
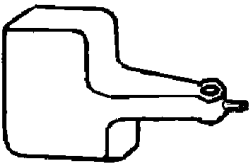
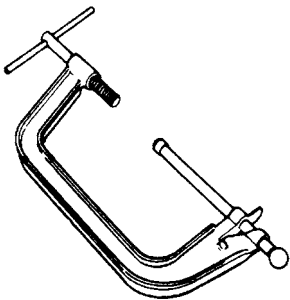
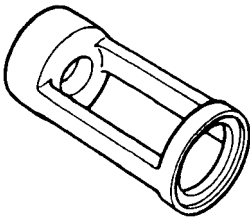
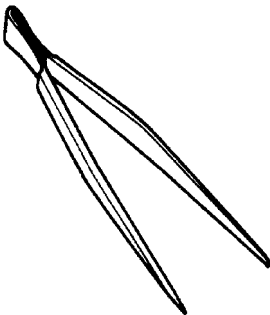
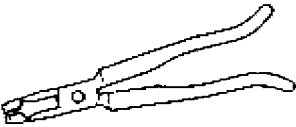
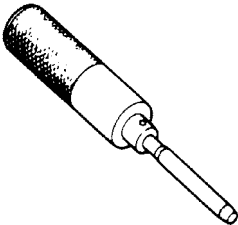
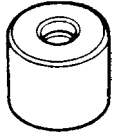
Flywheel side crankshaft oil seal

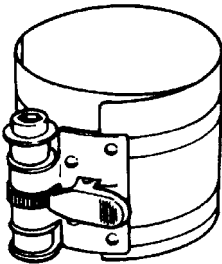
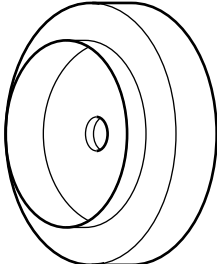
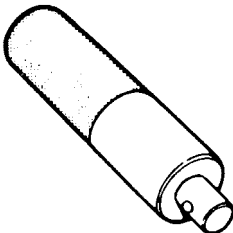
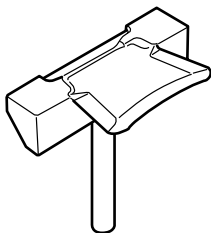
Carefully inspect flywheel side crankshaft oil seal (1) for wear or damage.

If its lip is worn or damaged, replace it.



Special Tool

 09915-68610 Dummy heater plug	 09912-57821 Compression gauge	 09915-77311 Oil pressure gauge	 09919-46010 Oil pressure gauge attachment
 09917-68610 (EN-46781) Camshaft locking tool	 09916-98610 (KM-652) Flywheel locking tool	 09912-38300 Crankshaft locking tool	 09913-75510 Oil seal installer
 09917-68221 Camshaft lock holder	 09910-26510 (OUT 0000005) Dial gauge support	 09916-14510 Valve lifter	 09916-14521 Valve lifter attachment
 09916-84511 Forceps	 09917-98610 (KM-840) Valve stem seal pliers	 09916-58210 Valve guide installer handle	 09917-98221 Valve stem seal installer

			
09916-77310 Piston ring compressor	09913-58620 Oil seal installer	09924-74510 Installer attachment	09921-96510 Oil pan seal cutter

Tightening Torque Specifications

Fastening part	Tightening torque		
	N·m	kg-m	lb-ft
Inter cooler hose clamp	3	0.3	2.5
Catalytic converter bolt	25	2.5	18.0
Catalytic converter mounting bolt	25	2.5	18.0
Turbocharger nut	25	2.5	18.0
Exhaust manifold cover nut	9	0.9	7.0
Vacuum pump bolt	Tighten 5 N·m (0.5 kg-m, 4.0 lb-ft) and 20 N·m (2.0 kg-m, 14.5 lb-ft) by the specified procedure		
Oil return pipe bolt	9	0.9	7.0
Lubrication pipe union bolt	12	1.2	9.0
Battery terminal nut	6	0.6	4.0
Intake manifold bolt	25	2.5	18.0
Oil level gauge guide mounting bolt	9	0.9	6.5
Exhaust manifold nut	23	2.3	17.0
Coolant feed pipe bolt	10	1.0	7.5
Common rail bracket bolt	25	2.5	18.0
Oil pump relief valve plug	20	2.0	14.5
Oil pressure switch	32	3.2	23.5
Oil filler port bolt	9	0.9	7.0
Oil cooler bolt	9	0.9	7.0
Oil pan bolt and nut	9	0.9	7.0
Oil level switch bolt	9	0.9	6.5
Drain plug	20	2.0	14.5
Engine rear mounting bolt	55	5.5	40.0
Engine left mounting nut	55	5.5	40.0
Engine right mounting bracket bolt	55	5.5	40.0
Cross member bolt	60	6.0	43.0
Chain guide mounting bolt	9	0.9	6.5
Chain tensioner mounting bolt	9	0.9	6.5
Chain tensioner adjuster bolt	Tighten 9.0 N·m (0.9 kg-m, 6.5 lb-ft) by the specified procedure		

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Timing chain cover bolt	9	0.9	6.5
Timing chain cover nut	9	0.9	6.5
Fly wheel bolt	Tighten 44 N•m (4.4 kg-m, 32.0 lb-ft) by the specified procedure		
Crankshaft pulley flange bolt	230	23.0	166.5
Crankshaft pulley bolt	26	2.6	19.0
Engine right mounting bracket No.2 bolt	60	6.0	43.5
Ventilation connector bolt	10	1.0	7.5
Oil strainer bolt	6	0.6	4.5
Camshaft housing bolt	Tighten 18 N•m (1.8 kg-m, 13.0 lb-ft) by the specified procedure		
Camshaft housing stud bolt	Tighten 25 N•m (2.5 kg-m, 18.0 lb-ft) by the specified procedure		
Camshaft timing sprocket bolt	Tighten 120 N•m (12.0 kg-m, 87.0 lb-ft) by the specified procedure		
Camshaft gear bolt	Tighten 120 N•m (12.0 kg-m, 87.0 lb-ft) by the specified procedure		
Cylinder head bolt	Tighten 20 N•m (2.0 kg-m, 14.5 lb-ft), 40 N•m (4.0 kg-m, 29.0 lb-ft) 90° and 90° by the specified procedure		
Connecting rod bearing cap bolt	Tighten 20 N•m (2.0 kg-m, 14.5 lb-ft) and 40° by the specified procedure		
Oil jet bolt	9	0.9	6.5
Crankcase bolt (M10)	Tighten 20 N•m (2.0 kg-m, 14.5 lb-ft) and 40° by the specified procedure		
Crankcase bolt (M8)	Tighten 30 N•m (3.0 kg-m, 22.0 lb-ft) by the specified procedure		
Oil jet union bolt	6	0.6	4.5
Generator bracket bolt	25	2.5	18.0
A/C compressor bracket bolt	20	2.0	14.5

Required Service Material

Recommended SUZUKI product or specification	Use
Loctite 5900®	• To apply mating surfaces between cylinder block and oil pan. • To apply mating surfaces between camshaft housing / cylinder head / cylinder block and timing chain cover gasket.
Loctite omnifit 100M spezial®	• To apply thread part of camshaft housing plug.
Locking Compound	• To apply all around thread part of part of plug.

SECTION 6B3

ENGINE COOLING (Z13DT ENGINE)

6B3

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

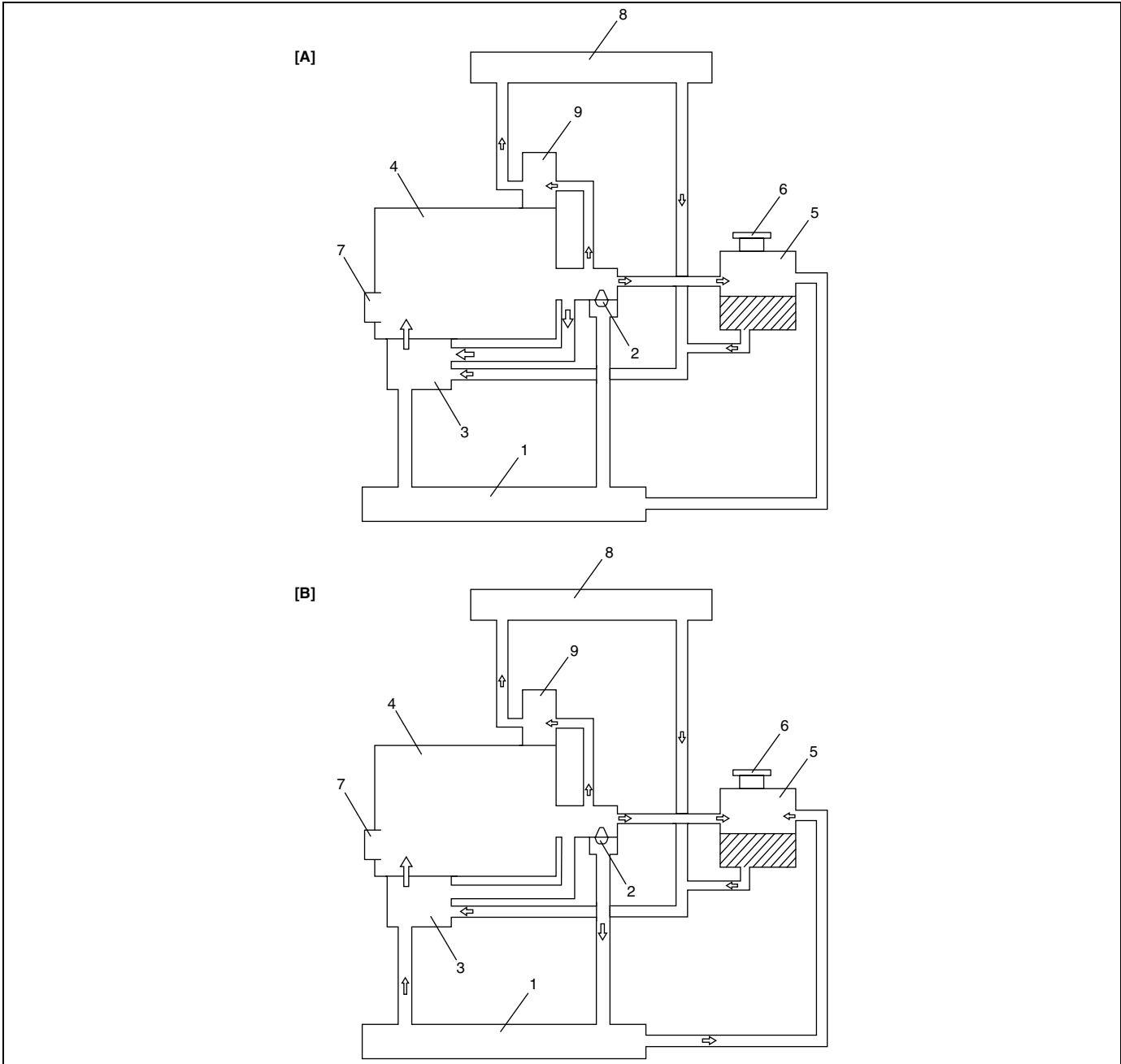
CONTENTS

General Description	6B3-2	Radiator Inspection	6B3-14
Cooling System Circulation	6B3-2	Radiator Cleaning	6B3-14
Coolant Degassing Tank	6B3-3	Radiator Cooling Fan Relay Inspection	6B3-14
Diagnosis	6B3-3	Radiator Cooling Fan Removal	
Diagnosis Table	6B3-3	and Installation	6B3-14
Coolant	6B3-4	Radiator Cooling Fan Inspection	6B3-15
Maintenance	6B3-4	Water Pump / Generator Drive Belt	
Coolant Level Check	6B3-5	Removal and Installation	6B3-15
Cooling System Inspection and Service	6B3-5	Water Pump / Generator Drive Belt	
Cooling System Flush and Refill	6B3-6	Tensioner Assembly Removal	
Water Pump / Generator Drive Belt		and Installation	6B3-16
Tension Inspection	6B3-7	Water Pump Removal and Installation	6B3-17
On-Vehicle Service	6B3-8	Water Pump Inspection	6B3-17
Cooling System Component	6B3-9	Engine Coolant Temperature Sensor	
Cooling System Draining	6B3-11	(ECT Sensor) Removal and Installation	6B3-18
Cooling System Refill	6B3-11	Engine Coolant Temperature Sensor	
Cooling Water Pipes or Hoses	6B3-11	(ECT Sensor) Inspection	6B3-18
Thermostat Case Assembly Removal		Required Service Material	6B3-18
and Installation	6B3-12	Tightening Torque Specification	6B3-18
Radiator Removal and Installation	6B3-13		

General Description

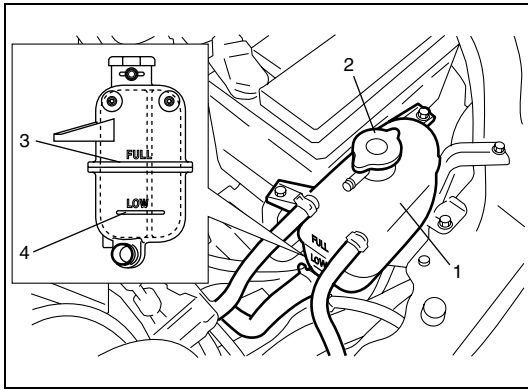
The cooling system consists of the degassing tank cap, radiator, degassing tank, hoses, water pump, cooling fan, thermostat. The radiator is of tube-and-fin type.

Cooling System Circulation



[A]: When thermostat is close	2. Thermostat	5. Degassing tank	8. Heater
[B]: When thermostat is open	3. Engine oil cooler	6. Degassing tank cap (Radiator cap)	9. EGR cooler
1. Radiator	4. Engine	7. Water pump	

Coolant Degassing Tank



The degassing tank (1) consists of a “see-through” plastic tank, a hose and a degassing tank cap (2).

During operation, inside of the degassing tank is under pressure. As the coolant warms up and expands, the coolant level in the degassing tank rises. On the other hand, it lowers as the coolant cools down and contracts. When the pressure applied to the inside of the degassing tank constantly exceeds the specified value, the pressure is relieved through the degassing tank cap. Therefore, cooling level should be between “FULL” (3) and “LOW” (4) marks on the degassing tank.

Diagnosis

Diagnosis Table

Condition	Possible Cause	Correction
Engine overheats (It is in case that radiator fan operates)	Loose or broken water pump belt	Adjust or replace.
	Not enough coolant	Check coolant level and add as necessary.
	Faulty thermostat	Replace.
	Faulty water pump	Replace.
	Dirty or bent radiator fins	Clean or remedy.
	Coolant leakage on cooling system	Repair.
	Clogged radiator	Check and replace radiator as necessary.
	Faulty degassing tank cap	Replace.
	Dragging brakes	Adjust brake.
	Slipping clutch	Adjust or replace.
	Poor charge battery	Check and replace as necessary.
	Poor generation generator	Check and repair.
	ECT sensor faulty	Check and replace as necessary.
	ECM faulty	Check and replace as necessary.
	Wiring or grounding faulty	Repair and necessary.
	Equipped with too much electric load part(s)	Dismount.
	Radiator cooling fan motor faulty	Check and replace as necessary.
Engine overheats (It is in case that radiator fan won't operate)	Fuse blown	Check 30A fuse of relay/fuse box and check for short circuit to ground.
	Radiator cooling fan relay	Check and replace as necessary.
	ECT sensor faulty	Check and replace as necessary.
	Radiator cooling fan motor faulty	Check and replace as necessary.
	Wiring or grounding faulty	Repair as necessary.
	ECM faulty	Check and replace as necessary.

Coolant

When the system cools down, the coolant is drawn back into the radiator.

The cooling system has been filled at the factory with a quality coolant that is a 50/50 mixture of water and ethylene glycol antifreeze.

This 50/50 mixture coolant solution provides freezing protection to -36°C (-33°F).

- Maintain cooling system freeze protection at -36°C (-33°F) to ensure protection against corrosion and loss of coolant from boiling.

This should be done even if freezing temperatures are not expected.

- Add ethylene glycol base coolant when coolant has to be added because of coolant loss or to provide added protection against freezing at temperature lower than -36°C (-33°F).

Anti-freeze proportioning chart

Freezing temperature	$^{\circ}\text{C}$	-36
	$^{\circ}\text{F}$	-33
Antifreeze/Anticorrosion coolant concentration	%	50
Ratio of compound to cooling water	ltr.	2.65/2.65
	US pt.	5.65/5.65
	Imp pt.	4.66/4.66

Coolant capacity

	Engine, radiator heater and degassing tank etc.
ltr. (US/Imp. pt.)	5.3 (11.30/9.33)

NOTE:

- Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.
- Coolant must be mixed with demineralized water or distilled water.

Maintenance

WARNING:

- Keep hands, tools and clothing away from radiator cooling fan to help prevent personal injury. This fan is electric and can turn on whether engine is running or not. The fan can start automatically in response to ECM with ignition switch turned on.
- To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot.
Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

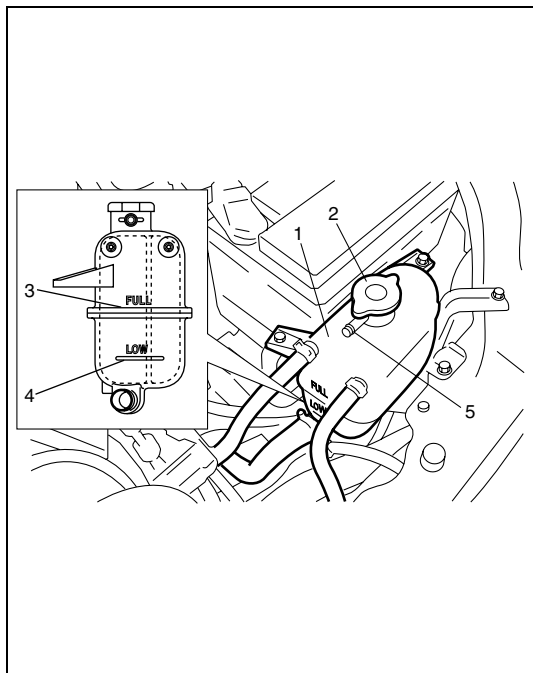
Coolant Level Check

Coolant Level

WARNING:

To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot.

Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.



To check level, lift hood and look at “see-through” degassing tank (1). It is not necessary to remove degassing tank cap (2) to check coolant level.

When engine is cool, check coolant level in degassing tank (1).

A normal coolant level should be between “FULL” mark (3) and “LOW” mark (4) on degassing tank (1).

If coolant level is below “LOW” mark, remove degassing tank cap and add recommended coolant to tank to bring coolant level up to “FULL” mark. Then, install degassing tank cap, making sure that the ear of cap lines up with degassing tank pipe (5).

NOTE:

- If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system.

They may be harmful to proper operation of system, and are unnecessary expense.

Cooling System Inspection and Service

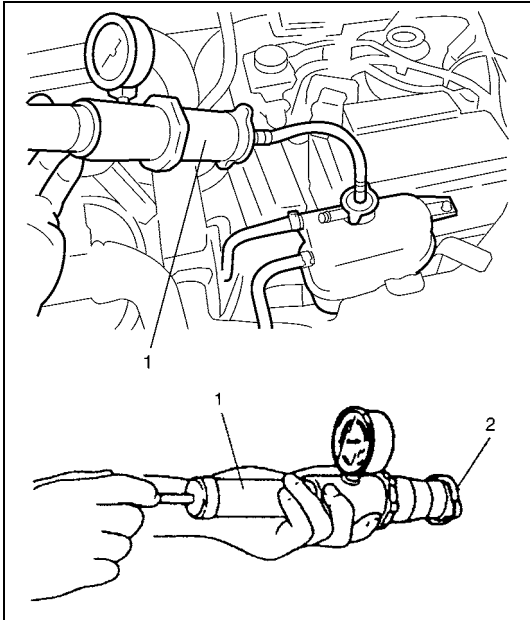
WARNING:

To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot.

Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

Cooling system should be serviced as follows.

- 1) Check cooling system for leakage or damage.
- 2) Wash degassing tank cap and filler neck with clean water by removing degassing tank cap when engine is cold.
- 3) Check coolant for proper level and freeze protection.



- 4) Using a pressure tester (1), check system and degassing tank cap (2) for proper pressure holding capacity. If replacement of cap is required, use proper cap specified for this vehicle.

Cooling system and degassing tank cap holding pressure (for inspection)

: 140 kpa (1.4 kg/cm², 19.9 psi)

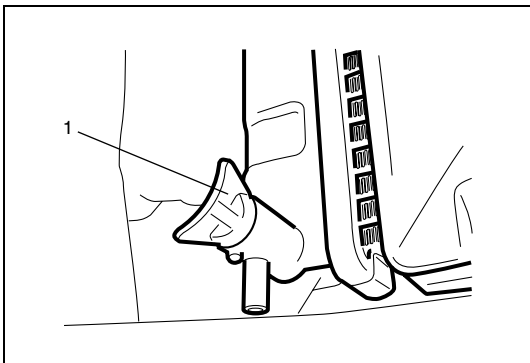
- 5) Install degassing tank cap to degassing tank turning it clockwise up to stop.
- 6) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
- 7) Clean frontal area of radiator core.

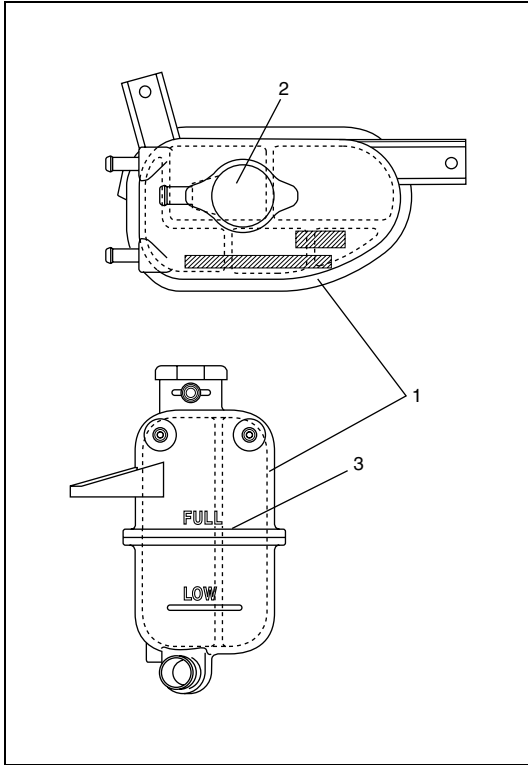
Cooling System Flush and Refill

WARNING:

To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

- 1) Remove degassing tank cap when engine is cool:
Turn cap 90° counterclockwise slowly.
Wait until pressure is relieved (indicated by a hissing sound) then continue to turn it counterclockwise.
- 2) With degassing tank cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
- 3) Stop engine and drain coolant.
- 4) Close drain plug (1). Add water until system is filled and run engine until upper radiator hose is hot again.
- 5) Repeat steps 3) and 4) several times until drained liquid is nearly colorless.
- 6) Drain system and then close radiator drain plug (1) tightly.



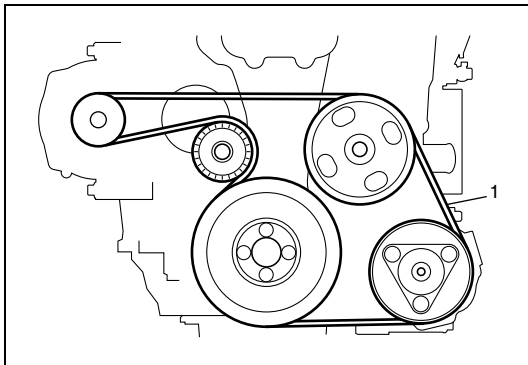


- 7) Disconnect coolant hose of upper side from thermostat case. If it is hard to disconnect it after removing clip, push to insert hose to pipe a little further in order to unstick hose from pipe and disconnect it.
- 8) Remove degassing tank cap (2) as follows.
 - a) Turn cap 90° counterclockwise slowly.
 - b) Wait till any pressure is released, then continue turning it counterclockwise.
- 9) Pour coolant (50/50 mixture of good quality ethylene glycol antifreeze and water) to degassing tank up to "FULL" mark (3). Put a shop cloth under disconnected hose end so that coolant is not spilled on engine and floor because a small amount of air bubbles and/or coolant may come out of it.
- 10) Connect hose to thermostat case.
- 11) Run engine, with degassing tank cap (2) removed, until radiator inlet hose is hot.
- 12) With engine idling, add coolant to degassing tank (1) until level reaches "FULL" mark (3).
Install degassing tank cap (2) turning it clockwise up to stop.

Water Pump / Generator Drive Belt Tension Inspection

WARNING:

To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.



- 1) Disconnect negative (–) cable at battery.
- 2) Inspect drive belt (1) for tension, cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation" in this section.
- 3) Connect negative (–) cable at battery.

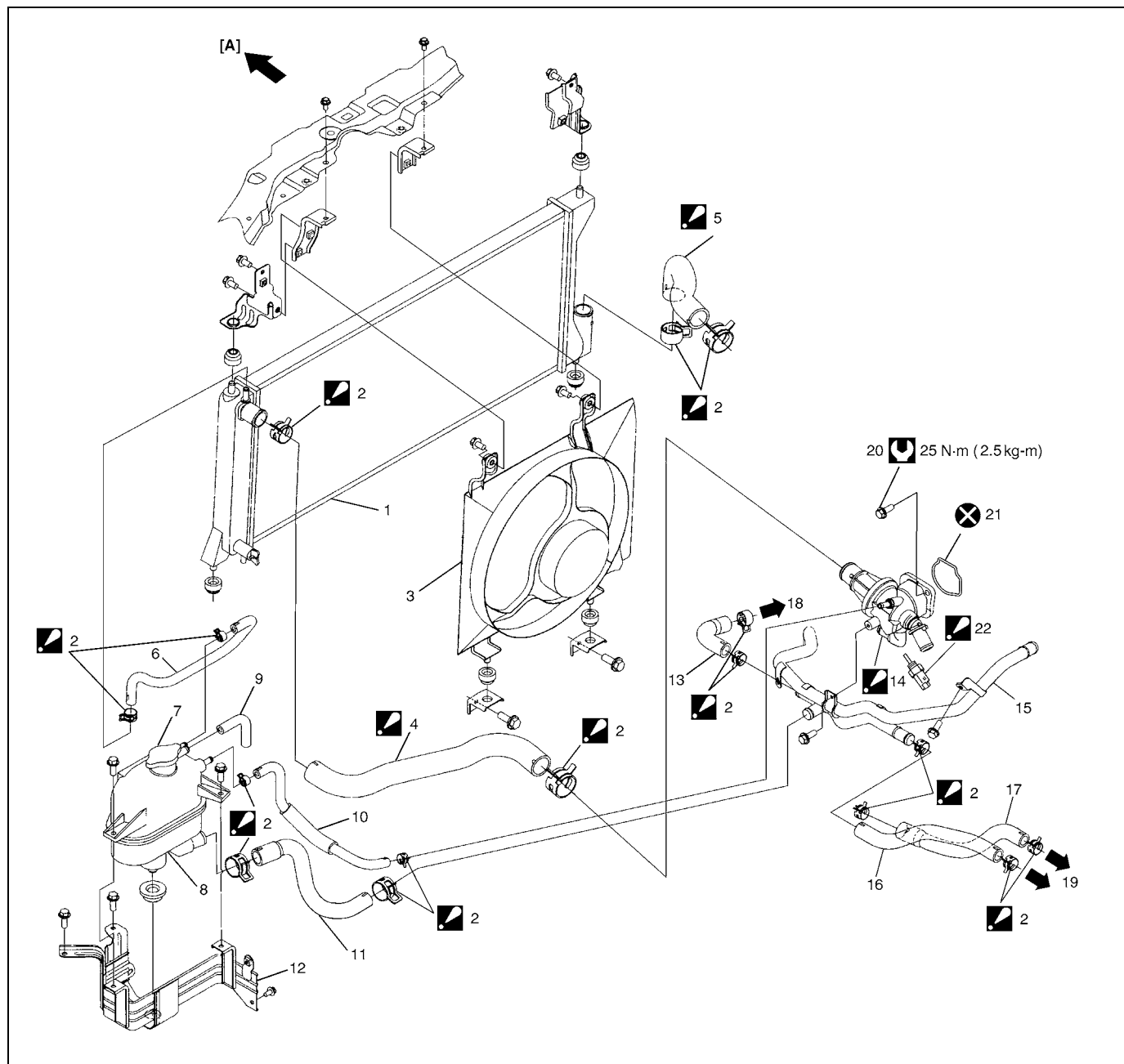
On-Vehicle Service

WARNING:

- Check to make sure that engine coolant temperature is cold before removing any part of cooling system.
- Also be sure to disconnect negative cord from battery terminal before removing any part.

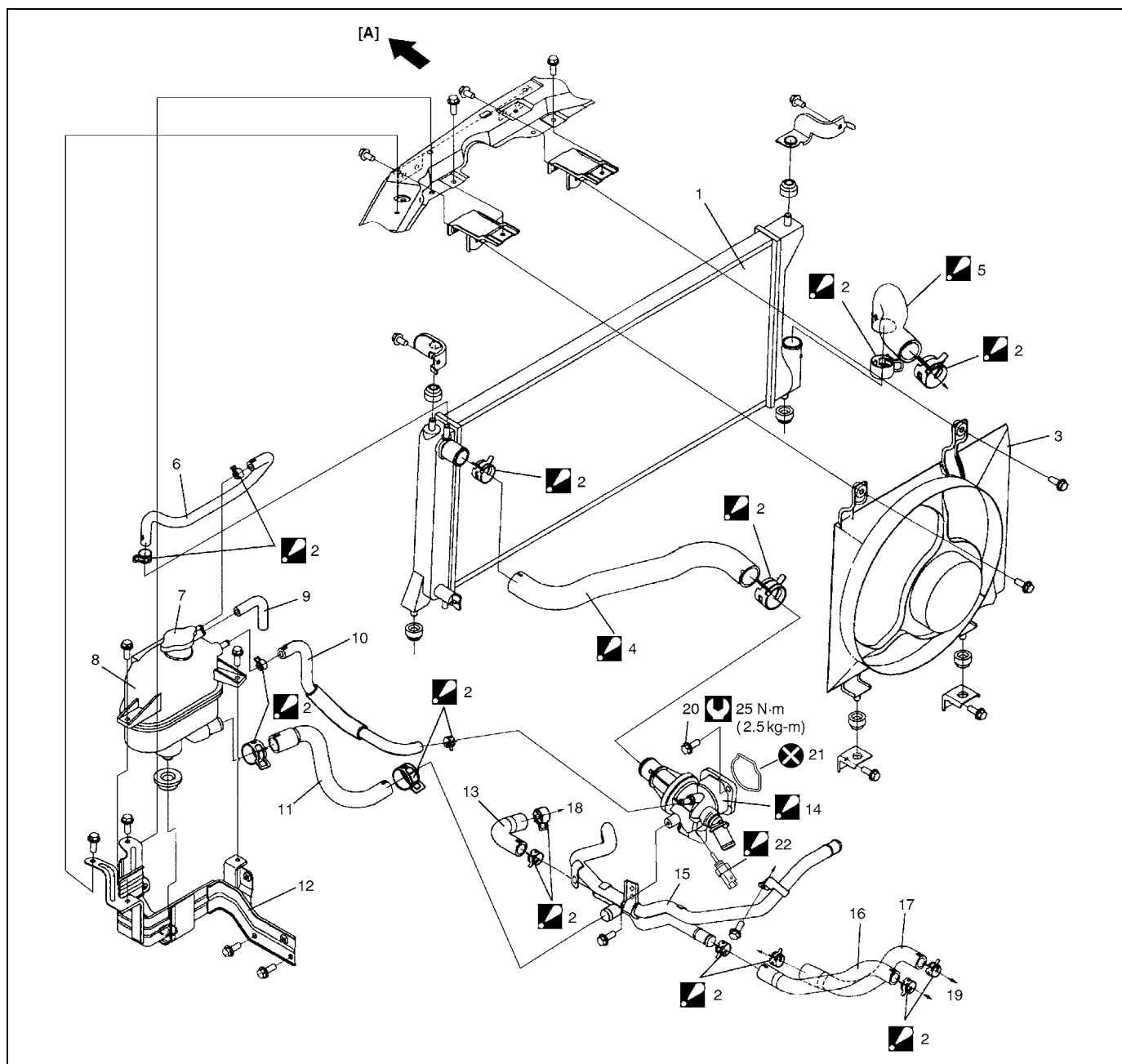
Cooling System Component

For RM413D



[A]: Forward		
1. Radiator assembly	9. Reservoir tank vent pipe hose	18. To engine side
2. Hose clip Be sure to position clip in specified direction as shown in figure.	10. Water engine outlet hose	19. To heater side
3. Radiator cooling fan assembly	11. Degassing tank outlet hose	20. Thermostat case bolt
4. Radiator inlet hose Be sure to connect hose aligning hose mark with stopper.	12. Degassing tank bracket	21. O-ring
5. Radiator outlet hose Be sure to connect hose aligning hose mark with stopper.	13. Heater outlet No.2 hose	22. ECT sensor For detail of servicing, refer to "Engine coolant temperature sensor (ECT sensor) removal and installation" and "Engine coolant temperature sensor (ECT sensor) inspection" in Section 6E3.
6. Radiator to degassing tank hose	14. Thermostat case assembly : Do not disassemble	Do not reuse.
7. Degassing tank cap	15. Heater outlet pipe	Tightening torque
8. Degassing tank	16. Heater outlet No.1 hose	
	17. Heater inlet hose	

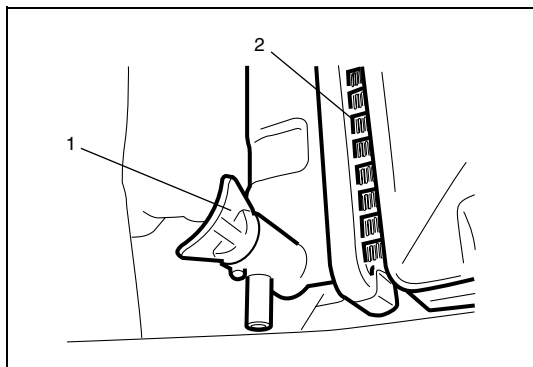
For RB413D



[A]: Forward	9. Reservoir tank vent pipe hose	18. To engine side
1. Radiator assembly	10. Water engine outlet hose	19. To heater side
 2. Hose clip Be sure to position clip in specified direction as shown in figure.	11. Degassing tank outlet hose	20. Thermostat case bolt
3. Radiator cooling fan assembly	12. Degassing tank bracket	21. O-ring
 4. Radiator inlet hose Be sure to connect hose aligning hose mark with stopper.	13. Heater outlet No.2 hose	 22. ECT sensor For detail of servicing, refer to "Engine coolant temperature sensor (ECT sensor) removal and installation" and "Engine coolant temperature sensor (ECT sensor) inspection" in Section 6E3.
 5. Radiator outlet hose Be sure to connect hose aligning hose mark with stopper.	 14. Thermostat case assembly : Do not disassemble	 Do not reuse.
6. Radiator to degassing tank hose	15. Heater outlet pipe	 Tightening torque
7. Degassing tank cap	16. Heater outlet No.1 hose	
8. Degassing tank	17. Heater inlet hose	

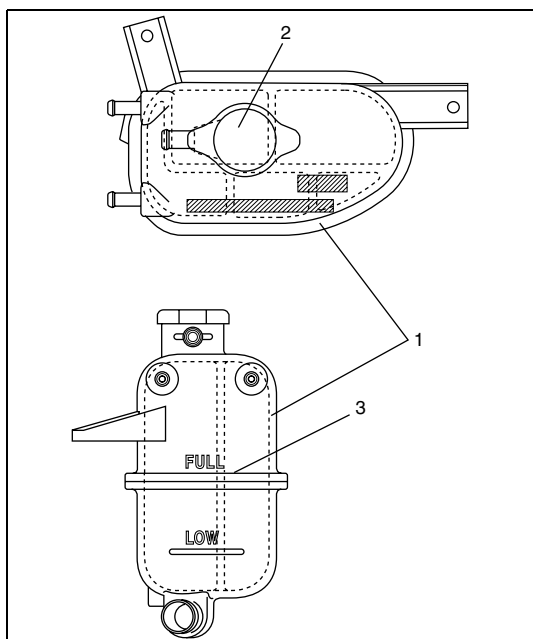
Cooling System Draining

- 1) Remove degassing tank cap.
- 2) Loosen drain plug (1) on radiator (2) to drain coolant.
- 3) After draining coolant, be sure to tighten drain plug securely.



Cooling System Refill

- 1) Add 50/50 mixture of good quality ethylene glycol antifreeze and water to degassing tank (1).
Fill to "FULL" mark (3).
- 2) Run engine, with degassing tank cap (2) removed, until radiator upper hose is hot.
- 3) With engine idling, add coolant to degassing tank (1) until level reaches "FULL" mark.
Install degassing tank cap (2) turning it clockwise up to stop.



Cooling Water Pipes or Hoses

Removal

- 1) Drain coolant referring to "Cooling System Draining" in this section.
- 2) To remove these pipes or hoses, loosen clip on each hose and pull hose end off.

Installation

Install removed parts in reverse order of removal procedure, noting the following.

- Connect each clip securely referring to "Cooling System Component" in this section.
- Refill cooling system with proper coolant referring to "Cooling System Refill" in this section.

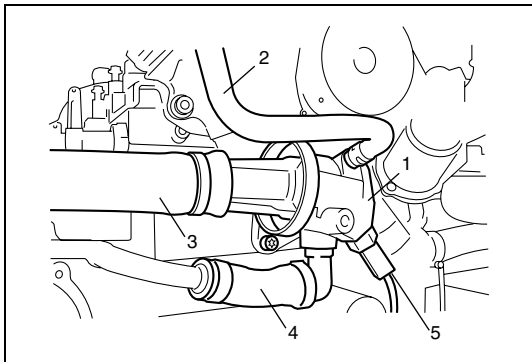
Thermostat Case Assembly Removal and Installation

CAUTION:

Do not disassemble thermostat case assembly. Disassembly will spoil its original function. If any malfunction is found in thermostat case assembly, replace it as assembly.

Removal

- 1) Drain coolant referring to "Cooling System Draining" in this section.
- 2) Disconnect engine outlet hose (2), radiator inlet hose (3), coolant feed hose (4), ECT sensor connector (5) and thermostat case hose from thermostat case.
- 3) Remove thermostat case (1).



Installation

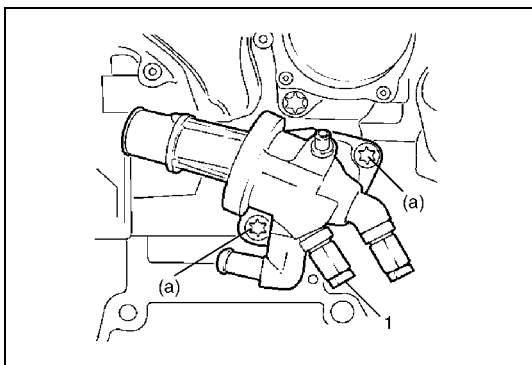
Reverse removal procedure for installation noting the following points.

- Use new O-ring when installing.
- Tighten thermostat case bolt to specified torque.

Tightening torque

Thermostat case bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

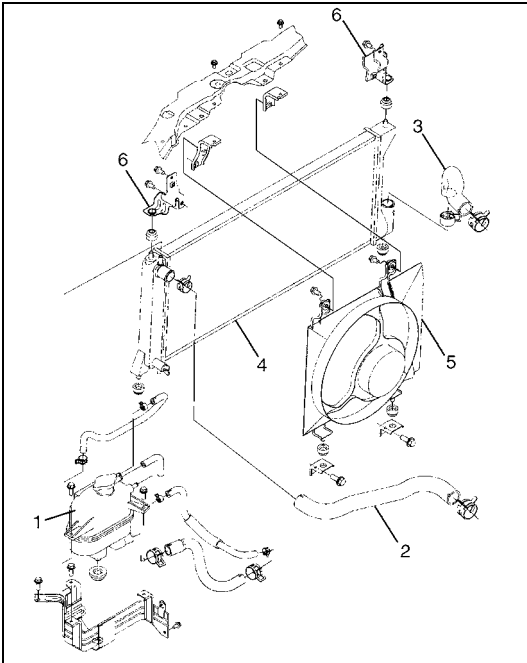
- If ECT sensor (1) has been removed, apply thread lock cement to ECT sensor and install ECT sensor to specified torque. For thread lock cement and tightening torque, refer to "Engine coolant temperature sensor (ECT sensor) removal and installation" in Section 6E3.
- Refill cooling system referring to "Cooling System Flush and Refill" in this section.
- Verify that there is no coolant leakage at each connection.



Radiator Removal and Installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Drain cooling system referring to "Cooling System Draining" in this section.
- 3) Recover refrigerant from A/C system referring to "Evacuation of A/C System" for RM413D or "Evacuating and Charging" for RB413D in Section 1B.
- 4) Disconnect connector of cooling fan motor.
- 5) Remove front bumper referring to "Front Bumper and Rear Bumper Removal and Installation" for RM413D or "Front Bumper and Rear Bumper" for RB413D in Section 9.
- 6) Remove condenser assembly referring to "Condenser Assembly Removal and Installation" for RM413D or "A/C Condenser Assembly" for RB413D in Section 1B.
- 7) Remove inter cooler referring to "Inter Cooler Removal and Installation" in Section 6A3.
- 8) Remove degassing tank (1).
- 9) Disconnect radiator inlet hose (2) and radiator outlet hose (3) from radiator assembly (4).
- 10) Remove engine cooling fan assembly (5) from radiator.
- 11) Remove radiator brackets (6) and then remove radiator.



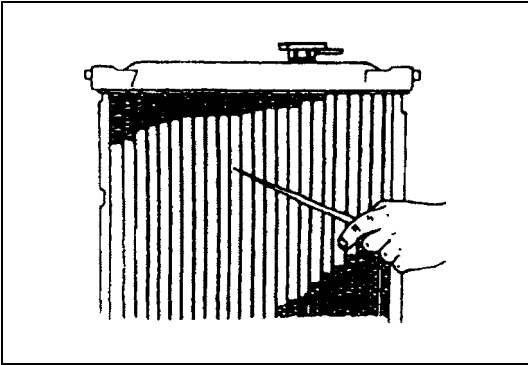
Installation

Reverse removal procedures for installation noting the followings.

- Refill cooling system referring to "Cooling System Refill" in this section.
- Refill A/C system referring to "Charge" for RM413D or "Evacuating and Charging" for RB413D in Section 1B.
- After installation, check each joint for leakage.

Radiator Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.



Radiator Cleaning

Clean frontal area of radiator cores.

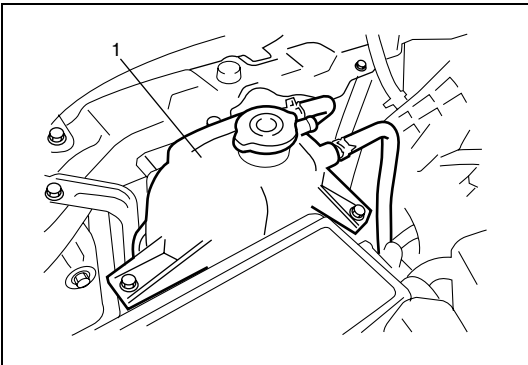
Radiator Cooling Fan Relay Inspection

Refer to "Fuel pump relay and radiator fan relay 1, 2, 3 inspection" in Section 6E3.

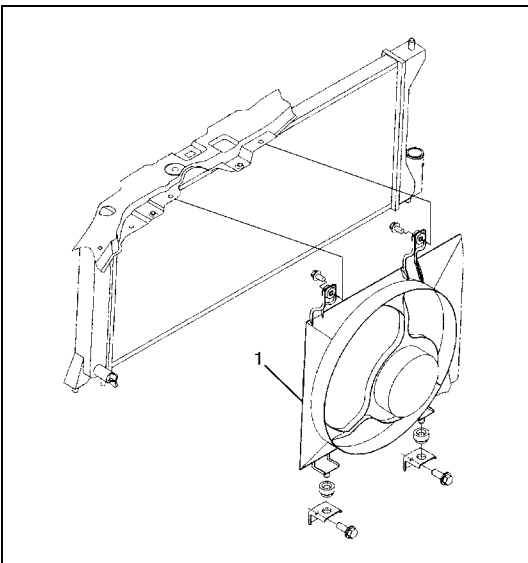
Radiator Cooling Fan Removal and Installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Drain coolant referring to "Cooling System Draining" in this section.
- 3) Remove degassing tank (1).
- 4) Disconnect cooling fan motor connector.
- 5) Remove radiator inlet hose from radiator.



- 6) Remove radiator cooling fan motor (1) from radiator.

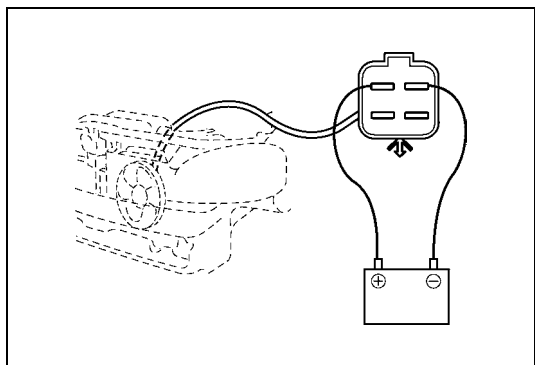


Installation

Reverse removal procedure for installation noting the following.

- Refill cooling system referring to “Cooling System Refill” in this section.
- After installation, verify there is no coolant leakage at each connection.

Radiator Cooling Fan Inspection

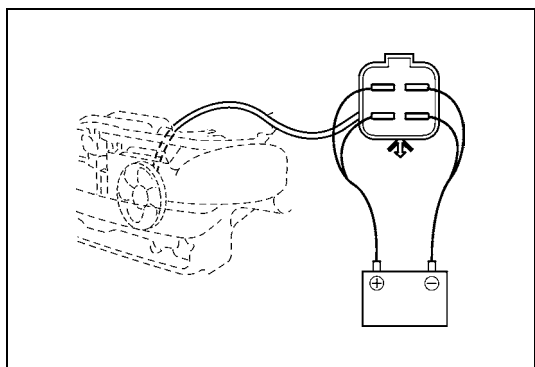


- 1) Check low speed operation of radiator cooling fan as follows.
 - a) Connect battery to fan motor coupler as shown in figure.
 - b) Check that radiator cooling fan rotates smoothly and ammeter indicates specified current.

If any abnormality is found, replace fan motor.

Fan motor specified current at 12 V

10.0 A maximum



- 2) Check high speed operation of radiator cooling fan as follows.

- a) Connect battery to fan motor coupler as shown in figure.
- b) Check that radiator cooling fan rotates smoothly and ammeter indicates specified current.

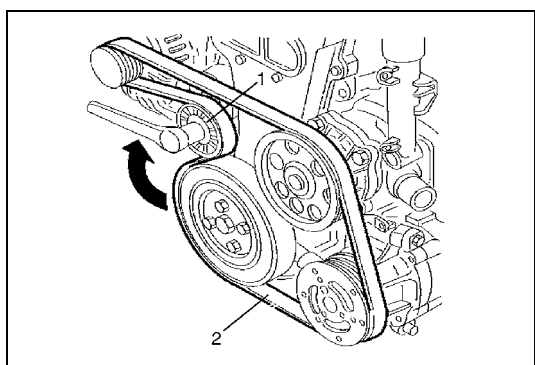
If any abnormality is found, replace fan motor.

Fan motor specified current at 12 V

15.0 A maximum

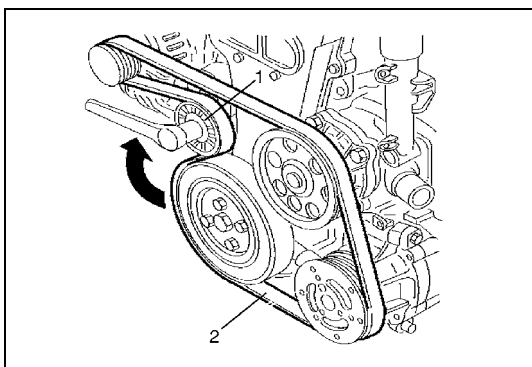
Water Pump / Generator Drive Belt Removal and Installation

Removal



- 1) Remove drive belt (2) while turning tensioner (1) clockwise until stopping.

Installation



- 1) Install drive belt (2) while turning tensioner (1) clockwise until stopping.
- 2) Check drive belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection” in this section.

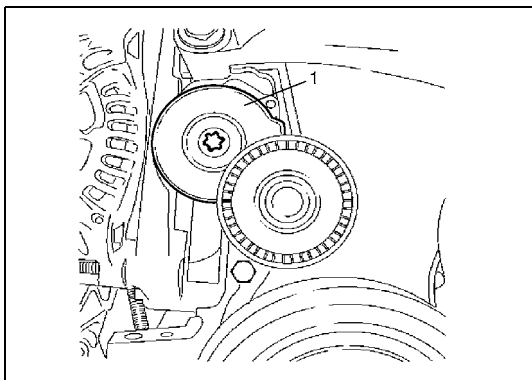
Water Pump / Generator Drive Belt Tensioner Assembly Removal and Installation

CAUTION:

Do not disassemble drive belt tensioner assembly. Disassembly will spoil its original function. If any malfunction is found in drive belt tensioner assembly, replace it as assembly.

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation” in this section.
- 3) Remove tensioner (1).



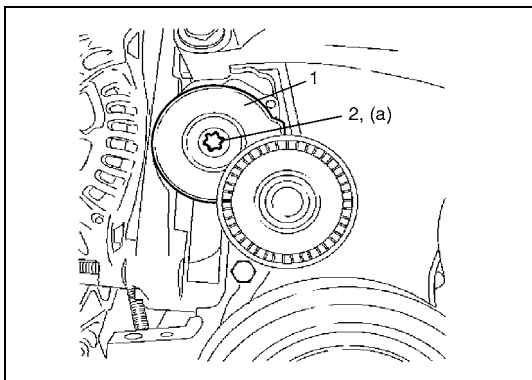
Installation

- 1) Install tensioner (1).
Tighten tensioner bolt (2) to specified torque.

Tightening torque

Tensioner bolt (a): 50 N·m (5.0 kg-m, 36.0 lb-ft)

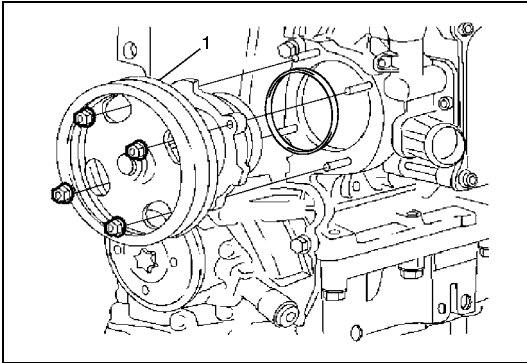
- 2) Install drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation” in this section.
- 3) Check belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection” in this section.



Water Pump Removal and Installation

Removal

- 1) Drain coolant referring to “Cooling System Draining” in this section.
- 2) Remove drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation” in this section.
- 3) Remove water pump assembly (1).



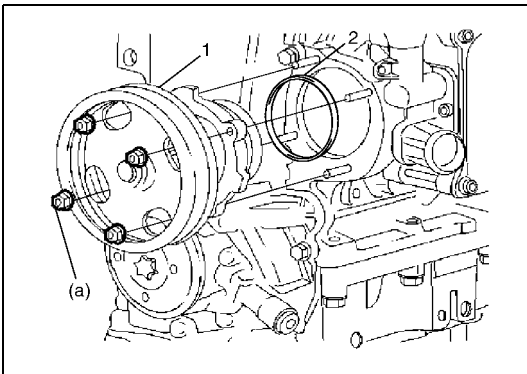
Installation

- 1) Install new O-ring (2) to water pump.
- 2) Install water pump assembly (1) to cylinder block and tighten nuts to specified torque.

Tightening torque

Water pump nut (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

- 3) Install drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation” in this Section.
- 4) Refill cooling system referring to “Cooling System Flush and Refill” in this section.
- 5) Check each part for leakage.



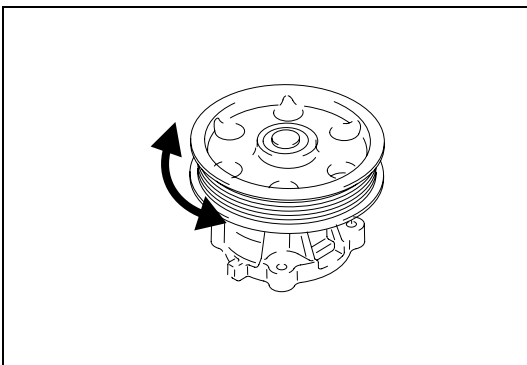
Water Pump Inspection

CAUTION:

Do not disassemble water pump.

If any repair is required on pump, replace it as assembly.

- Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



Engine Coolant Temperature Sensor (ECT Sensor) Removal and Installation

Refer to “Engine coolant temperature sensor (ECT sensor) removal and installation” in Section 6E3.

Engine Coolant Temperature Sensor (ECT Sensor) Inspection

Refer to “Engine coolant temperature sensor (ECT sensor) inspection” in Section 6E3.

Required Service Material

Material	Recommended SUZUKI product or specification (Part Number)	Use
Ethylene glycol base coolant (Anti-freeze/ Anti-corrosion coolant)	—	Additive to engine cooling system for improving cooling efficiency and for protection against rusting.

Tightening Torque Specification

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Thermostat case bolt	25	2.5	18.0
Water pump nut	9	0.9	6.5

SECTION 6C3

ENGINE FUEL
(Z13DT ENGINE)

6C3

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

General Description	6C3-1	Fuel Tank Removal and Installation.....	6C3-10
On-Vehicle Service	6C3-2	Fuel Tank Inspection.....	6C3-12
Fuel System Components	6C3-2	Fuel Tank Purging Procedure	6C3-13
Precautions	6C3-5	Fuel Pump Assembly Removal and	
Water Draining of Fuel Filter	6C3-6	Installation.....	6C3-13
Air Bleeding of Fuel System	6C3-6	Fuel Pump Inspection	6C3-15
Fuel Line Inspection	6C3-6	Fuel Filter Element Removal and	
Fuel Pipe Removal and Installation.....	6C3-6	Installation.....	6C3-15
Fuel Filler Cap Inspection	6C3-8	Fuel Filter Assembly Removal and	
Fuel Tank Inlet Valve Removal and		Installation.....	6C3-17
Installation	6C3-8	Special Tool.....	6C3-17
Fuel Tank Inlet Valve Inspection	6C3-10	Tightening Torque Specification	6C3-17

General Description

The main components of the fuel system are fuel tank, fuel pump, high pressure fuel pump, fuel filter and fuel level gauge and it includes fuel feed line, fuel return line.

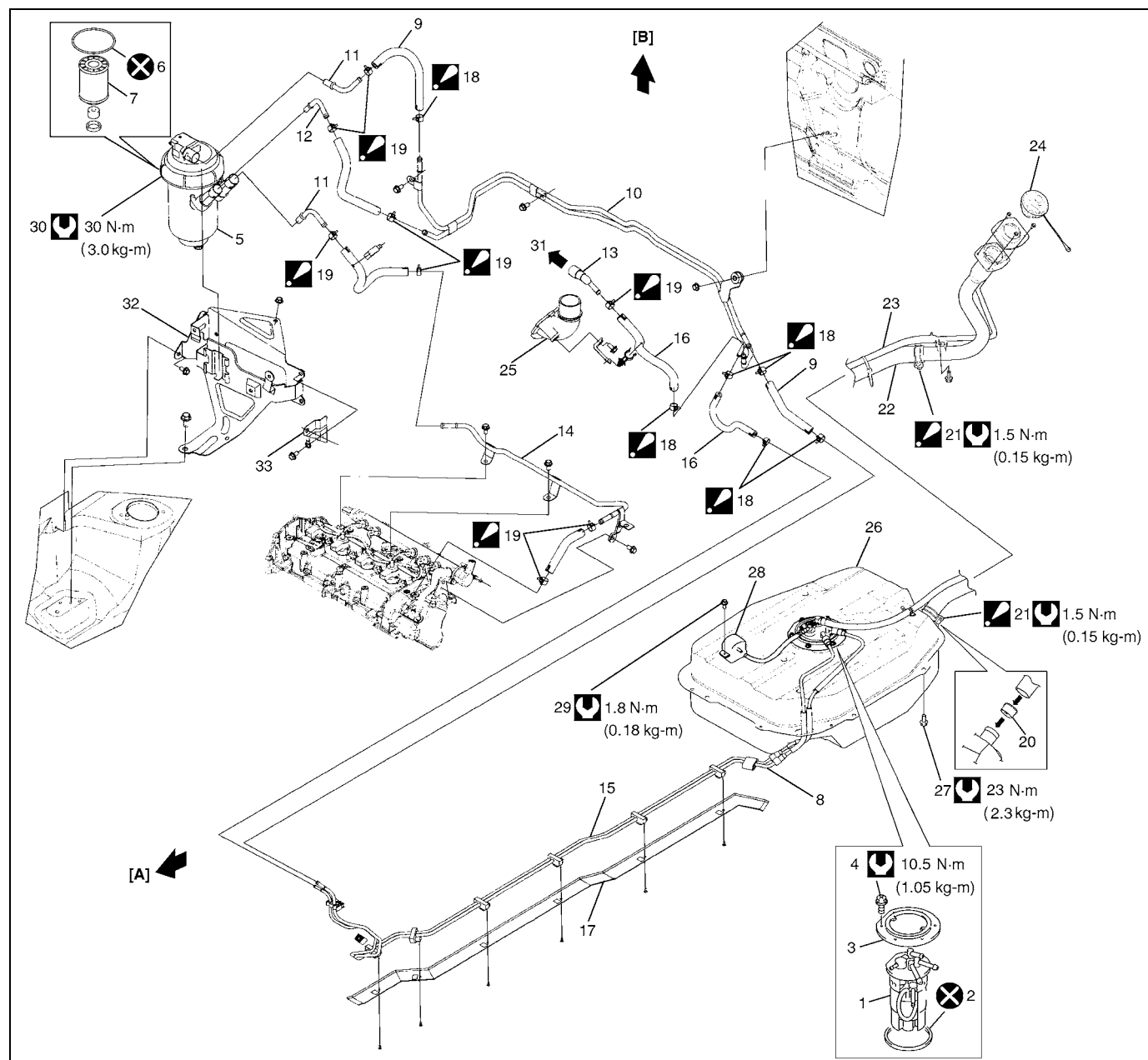
On-Vehicle Service

Fuel System Components

CAUTION:

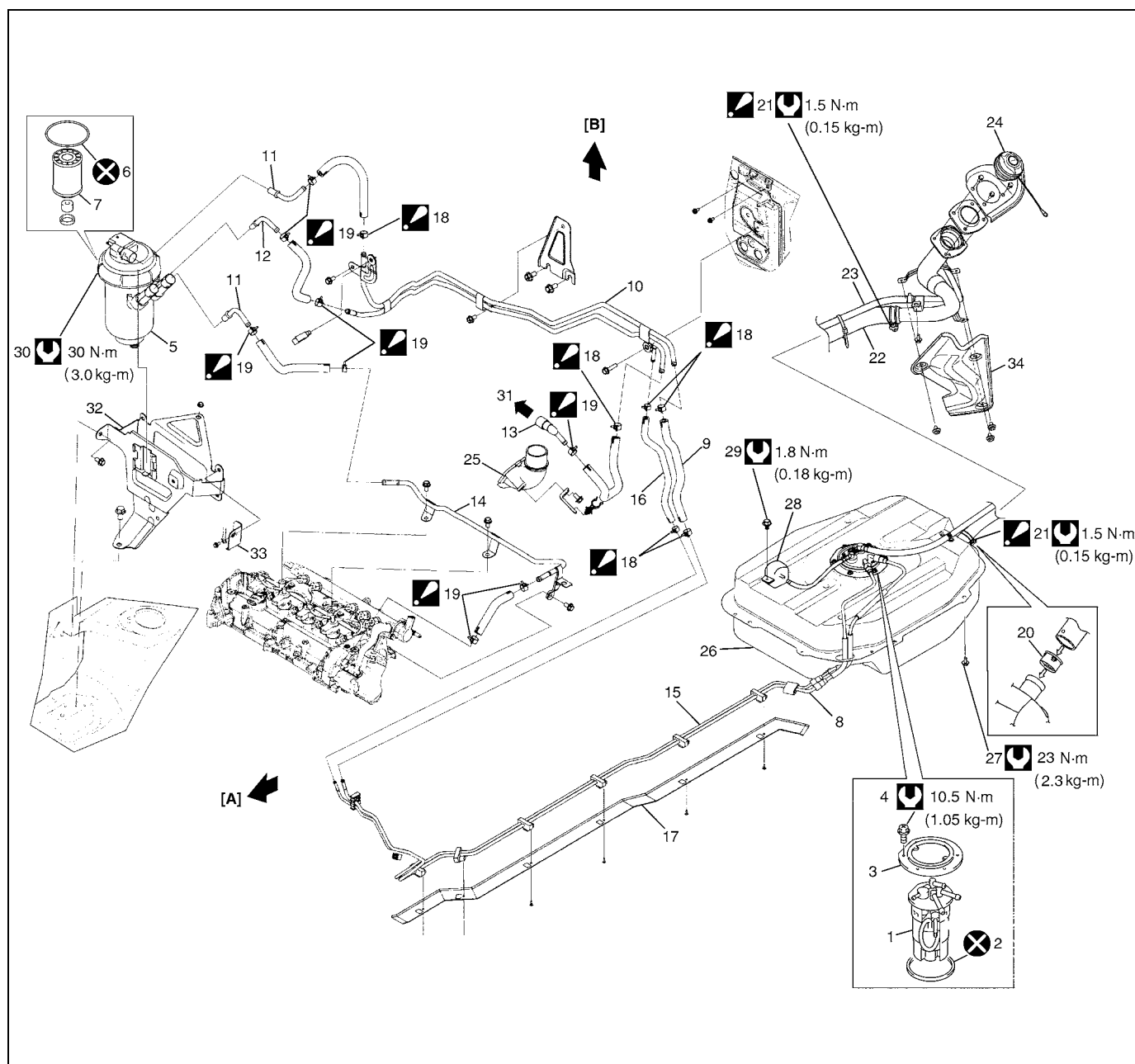
Do not expose removed fuel parts to dust. Keep them always clean.

For RM413D



[A]: Forward	12. Fuel filter return joint	25. Air intake joint
[B]: Upward	13. Fuel return connector	26. Fuel tank
1. Fuel pump	14. Fuel No.2 pipe	27. Fuel tank bolt
2. Fuel pump plate gasket	15. Fuel return pipe	28. Fuel and vapor separator
3. Fuel pump plate	16. Fuel return hose	29. Fuel and vapor separator bolt
4. Fuel pump bolt	17. Fuel pipe cover	30. Fuel filter fastener
5. Fuel filter	18. Clip Be sure to position clip open end in forward direction as shown in figure.	31. To common rail
6. O-ring	19. Clip Be sure to position clip open end in upward direction as shown in figure.	32. Fuel filter bracket
7. Fuel filter element	20. Fuel tank inlet valve	33. Harness clamp bracket
8. Fuel feed pipe	21. Fuel filter hose clamp Be sure to position clamp screw in specified place as shown in figure.	⊗ Do not reuse.
9. Fuel feed hose	22. Fuel tank filler hose	⤵ Tightening torque
10. Fuel No.1 pipe	23. Breather hose	
11. Fuel filter joint	24. Fuel tank cap	

For RB413D

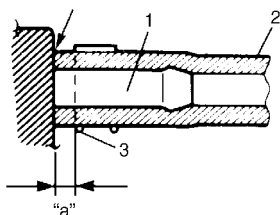


6C3-4 ENGINE FUEL (Z13DT ENGINE)

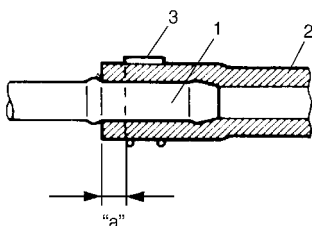
[A]: Forward	12. Fuel filter return joint	25. Air intake joint
[B]: Upward	13. Fuel return connector	26. Fuel tank
1. Fuel pump	14. Fuel No.2 pipe	27. Fuel tank bolt
2. Fuel pump plate gasket	15. Fuel return pipe	28. Fuel and vapor separator
3. Fuel pump plate	16. Fuel return hose	29. Fuel and vapor separator bolt
4. Fuel pump bolt	17. Fuel pipe cover	30. Fuel filter fastener
5. Fuel filter	 18. Clip Be sure to position clip open end in forward direction as shown in figure.	31. To common rail
6. O-ring	 19. Clip Be sure to position clip open end in upward direction as shown in figure.	32. Fuel filter bracket
7. Fuel filter element	20. Fuel tank inlet valve	33. Harness clamp bracket
8. Fuel feed pipe	 21. Fuel filler hose clamp Be sure to position clamp screw in specified place as shown in figure.	34. Fuel filler neck protector
9. Fuel feed hose	22. Fuel tank filler hose	 Do not reuse.
10. Fuel No.1 pipe	23. Breather hose	 Tightening torque
11. Fuel filter joint	24. Fuel tank cap	

Precautions

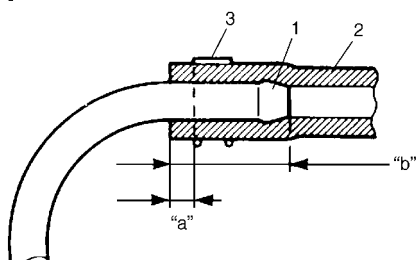
[A]



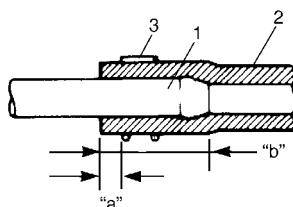
[B]



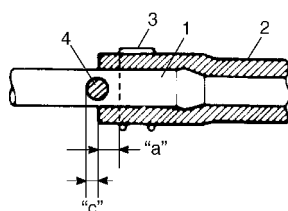
[C]



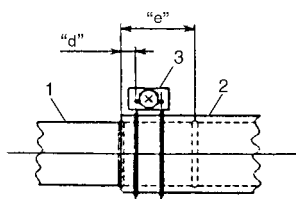
[D]



[E]



[F]



WARNING:

Before attempting service of any type on fuel system, the following should be always observed in order to reduce the risk of fire and personal injury.

- Disconnect negative cable at battery.
- Do not smoke, and place no smoking signs near work area.
- Be sure to have CO₂ fire extinguisher handy.
- Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).
- Wear safety glasses.
- To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.
- A small amount of fuel may be released after the fuel line is disconnected. In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.
- Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to the figure.
- Before disconnecting a fuel hose or pipe, wait 60 seconds or more after engine stop to release pressure in fuel system.
- Do not expose removed fuel system parts to dust. Keep them always clean.

[A]: With short pipe, fit hose as far as it reaches pipe joint as shown.

[B]: With the following type pipe, fit hose as far as its peripheral projection as shown.

[C]: With bent pipe, fit hose as far as its bent part as shown or till depth "b".

[D]: With straight pipe, fit hose till depth "b".

[E]: With red marked pipe, fit hose end reaches red mark on pipe.

[F]: For fuel tank filler hose, insert it to spool or welding-bead.

1. Pipe

2. Hose

3. Clamp

4. Red mark

"a": Clamp securely at a position 3 – 7 mm (0.12 – 0.27 in.) from hose end.

"b": 20 – 30 mm (0.79 – 1.18 in.)

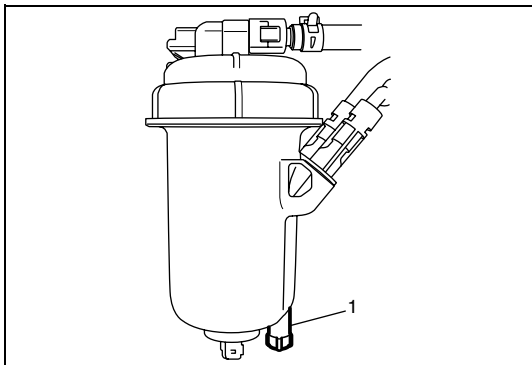
"c": 0 – 5 mm (0 – 0.19 in.)

"d": 5 – 12 mm (0.2 – 0.47 in.)

"e": 40 mm (1.57 in.)

Water Draining of Fuel Filter

- 1) Disconnect negative cable at battery.
- 2) Place container under bleed screw (1), and drain fuel loosening it.
- 3) Tighten bleed screw.
- 4) Connect negative cable at battery.

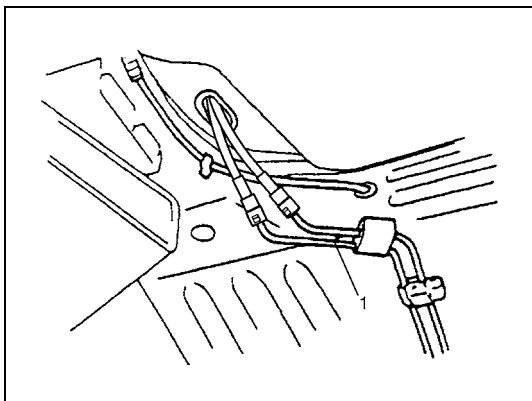


Air Bleeding of Fuel System

Air bleeding must be carried out when fuel system has been disassembled or when vehicle ran out of fuel.

Turn ignition switch ON to operate fuel pump and after about 5 seconds turn it OFF. Repeat this 6 times and then check engine starts.

Fuel Line Inspection



CAUTION:

Due to the fact that fuel feed line (1) is under high pressure, use special care when servicing it.

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration, or damage.

Make sure all clamps are secure.

Replace parts as needed.

Fuel Pipe Removal and Installation

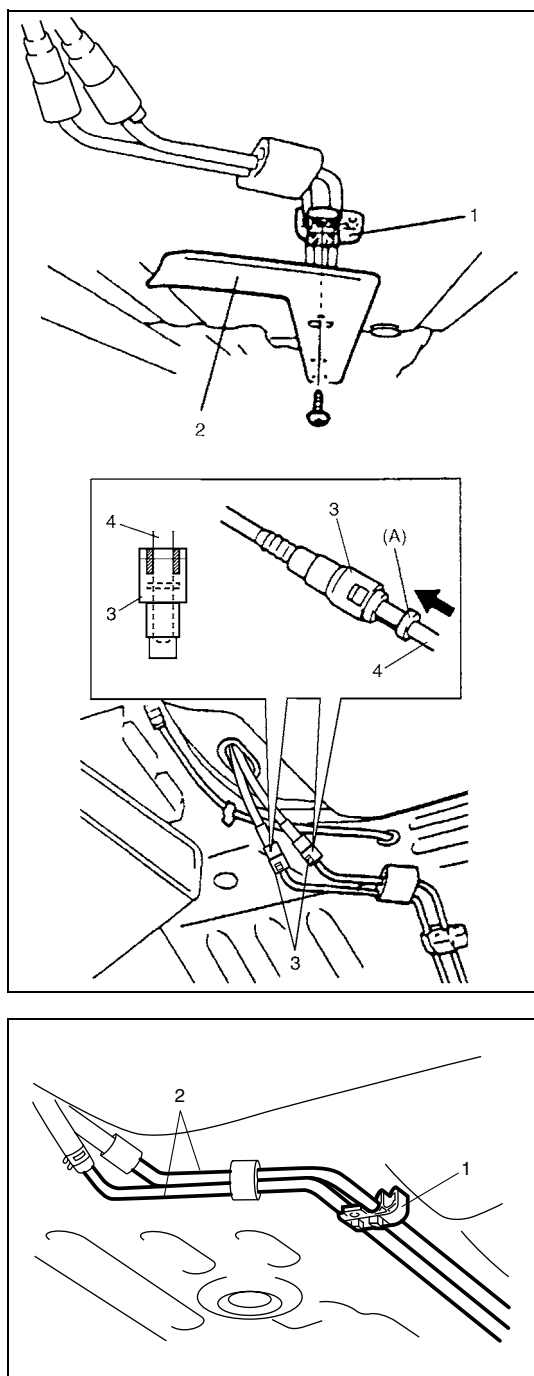
WARNING:

A small amount of fuel may be released after disconnecting fuel hose. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth.

Be sure to put that cloth in an approved container when disconnection is completed.

Removal

- 1) Disconnect negative cable at battery.



2) Remove steering gear case assembly. Refer to “Steering Gear Case Removal and Installation” for RM413D or “Manual Rack and Pinion Assembly (Steering Gear Case)” for RB413D in Section 3B.

3) Remove pipe cover (2) from vehicle.

4) Disconnect fuel pipe joint and fuel hose from fuel pipe at the front and rear of each fuel pipe.

For quick joint (3), disconnect it as follows:

- a) Remove mud, dust and/or foreign material between pipe (4) and joint by blowing compressed air.
- b) Unlock joint lock by inserting special tool between pipe and joint.

Special tool

(A): 09919-47020

c) Disconnect joint (3) from pipe (4).

1. Clamp

5) Mark the location of clamps (1) on fuel pipes (2), so that the clamps can be reinstalled to where they were.

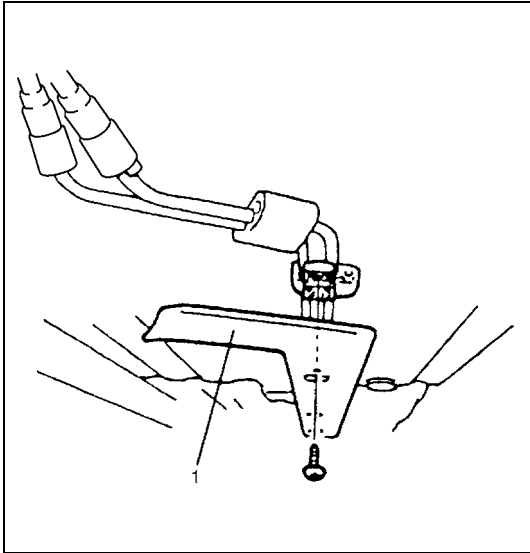
6) Remove pipes (2) with clamp (1) from vehicle.

7) Remove clamp (1) from pipes (2).

Installation

1) Install clamps to marked location on pipes. If clamp is deformed or its claw is bent or broken, replace it with new one.

2) Install pipes with pipe clamps to vehicle.



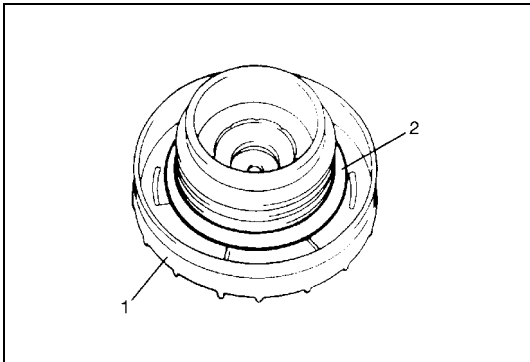
- 3) Connect fuel hoses and pipes to each pipe.

CAUTION:

When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

- 4) Install pipe cover (1) to vehicle.
- 5) Install steering gear case referring to "Steering Gear Case Removal and Installation" for RM413D or "Manual Rack and Pinion Assembly (Steering Gear Case)" for RB413D in Section 3B.
- 6) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Filler Cap Inspection



Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.

NOTE:

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in critical malfunction of system.

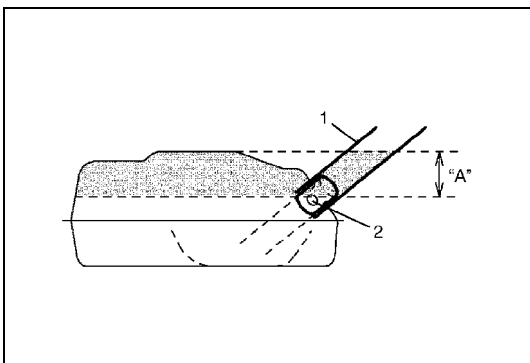
Fuel Tank Inlet Valve Removal and Installation

WARNING:

Before starting the following procedure, be sure to observe "Precautions" in this section.

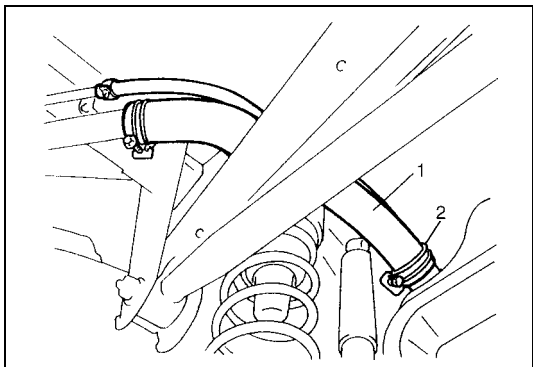
Removal

- 1) Remove fuel filler cap.
- 2) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" in the figure.

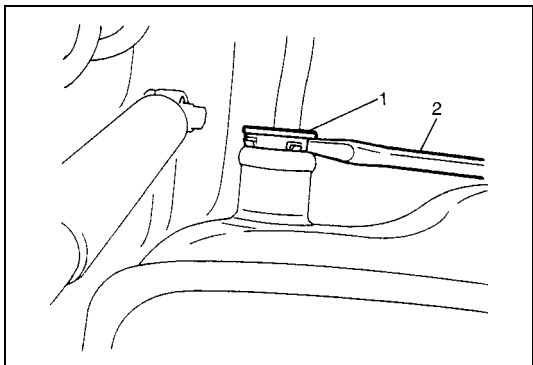


CAUTION:

Do not force pump hose into fuel tank, or pump hose may damage fuel tank inlet valve (2).



- 3) Hoist vehicle, and remove clamp (2) and fuel filler hose (1) from fuel tank.

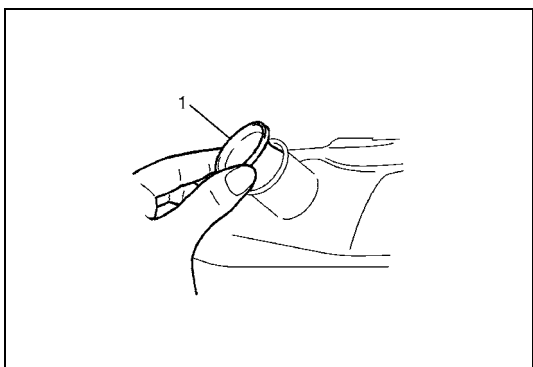


- 4) Remove fuel tank inlet valve (1) using flat head rod (2) or the like.

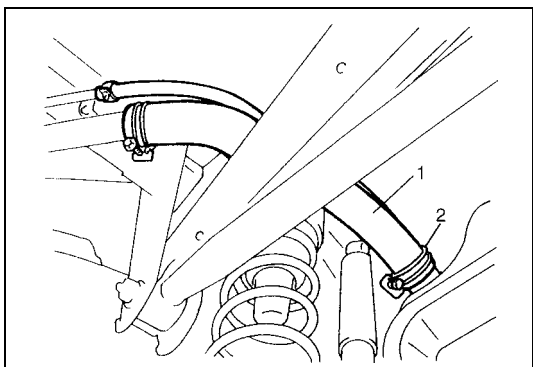
CAUTION:

Be careful not to damage fuel tank inlet valve (1) with flat head rod (2) or the like.

Installation

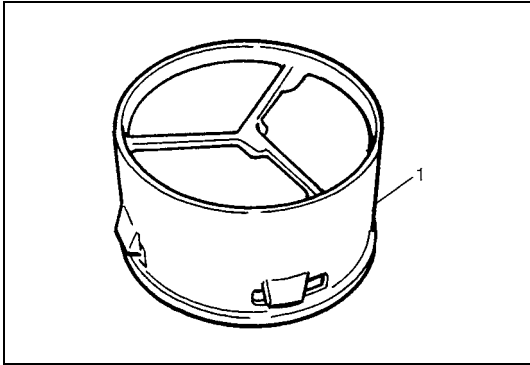


- 1) Install fuel tank inlet valve (1) to fuel tank.



- 2) Install fuel filler hose (1) to fuel tank and secure it with clamp (2).
For proper installation, refer to "Fuel System Components" in this section.
- 3) Lower vehicle and install fuel filler cap.

Fuel Tank Inlet Valve Inspection



Check fuel tank inlet valve (1) for the following.

- Damage
- Smooth opening and closing

If any damage or malfunction is found, replace.

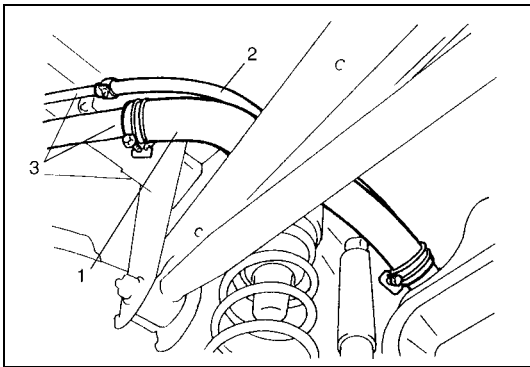
Fuel Tank Removal and Installation

Removal

WARNING:

- Before starting the following procedure, be sure to observe “Precautions” in this section.
- A small amount of fuel may be released after the fuel hose is disconnected. In order to reduce the chance of personal injury, cover the hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

- 1) Disconnect negative cable at battery.
- 2) Hoist vehicle.
- 3) Disconnect fuel filler hose (1) and breather hose (2) from filler neck (3).



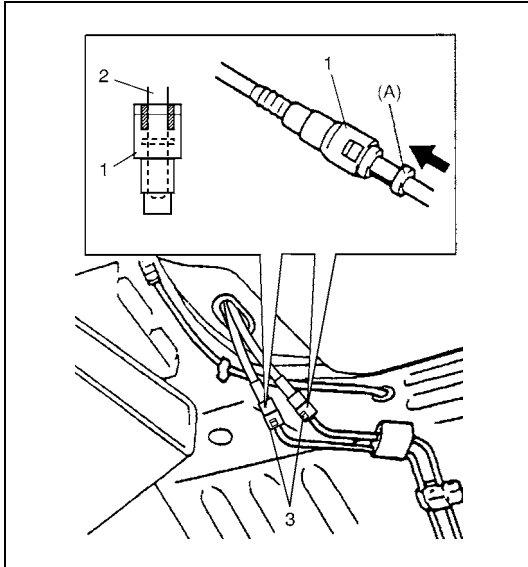
CAUTION:

Never disconnect fuel filler hose (1) from fuel tank inlet. If half or more of fuel is remaining to fuel tank, fuel over flows in this case and come out.

- 4) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler.
Use hand operated pump device to drain fuel tank.

CAUTION:

- Do not force pump hose into fuel tank, or pump hose may damage fuel tank inlet valve.
- Never drain or store fuel in an open container due to possibility of fire or explosion.



5) Disconnect fuel pipe joints from pipes.

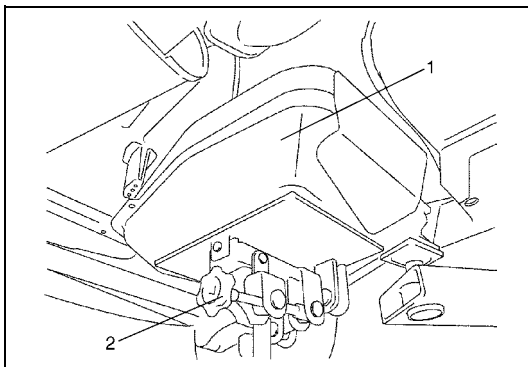
For quick joint (1), disconnect it as follows:

- Remove mud, dust and/or foreign material between pipe (2) and joint by blowing compressed air.
- Unlock joint (1) lock by inserting special tool between pipe (2) and joint (1).

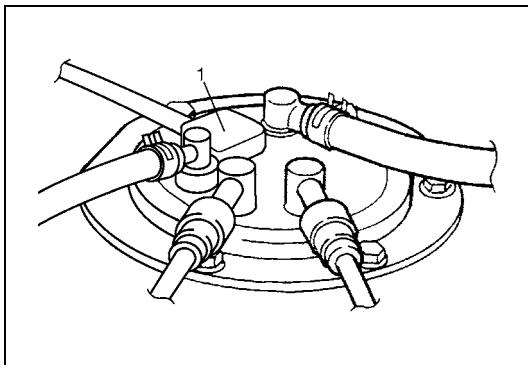
Special tool

(A): 09919-47020

- Disconnect joint from pipe.



6) Support fuel tank (1) with jack (2) and remove its mounting bolts.



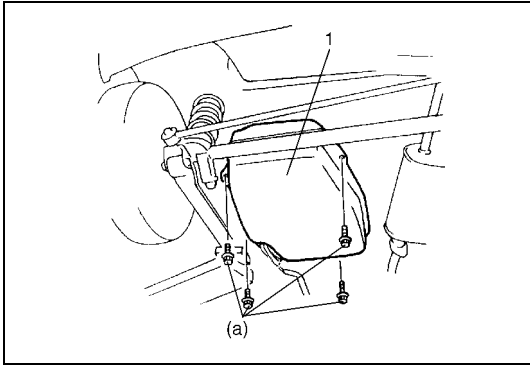
7) Lower fuel tank a little as to disconnect wire harness at connector (1), then remove fuel tank.

Installation

CAUTION:

- When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.
- Never let the fuel hoses touch the ABS sensor harness (if equipped).

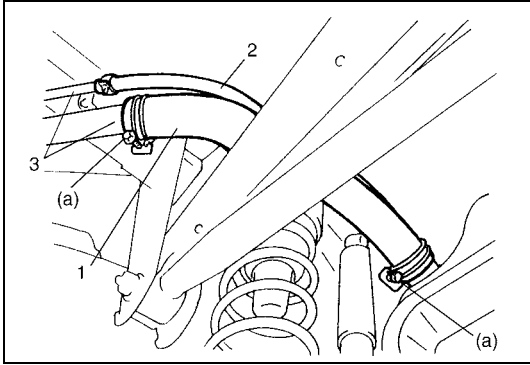
- If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.



- 2) Raise fuel tank (1) with jack and connect connector of fuel pump and gauge and clamp wire harness.
- 3) Install fuel tank (1) to vehicle.

Tightening torque

Fuel tank bolt (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

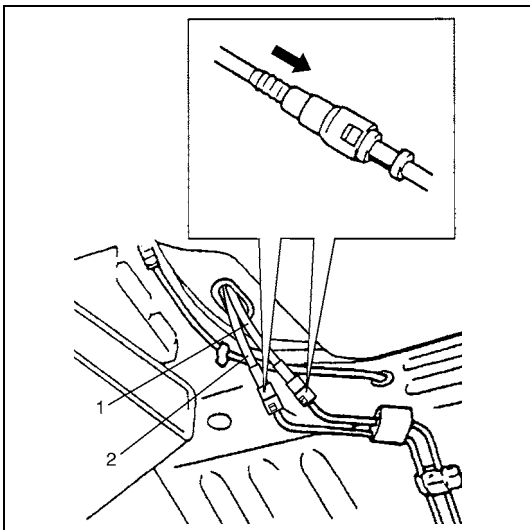


- 4) Connect fuel filler hose (1) and breather hose (2) to filler neck (3) as shown in figure and clamp them securely.

Tightening torque

Fuel filler hose clamp bolt

(a): 1.5 N·m (0.15 kg-m, 1.0 lb-ft)



- 5) Connect fuel return hose (1) and fuel feed hose (2) to each pipe as shown in figure and clamp them securely.
- 6) Connect negative cable at battery.
With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Tank Inspection

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.

Replace any damaged or malfunctioned parts.

Fuel Tank Purging Procedure

WARNING:

This purging procedure will not remove all fuel vapor. Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

CAUTION:

Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.

The following procedure are used for purging fuel tank.

- 1) After removing fuel tank, remove all hoses, pipes and fuel pump assembly from fuel tank.
- 2) Drain all remaining fuel from tank.
- 3) Place fuel tank to flushing area.
- 4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean. Replace tank if its inside is rusty.
- 5) Completely flush out remaining water after washing.

Fuel Pump Assembly Removal and Installation

WARNING:

Before starting the following procedure, be sure to observe "Precautions" in this section.

CAUTION:

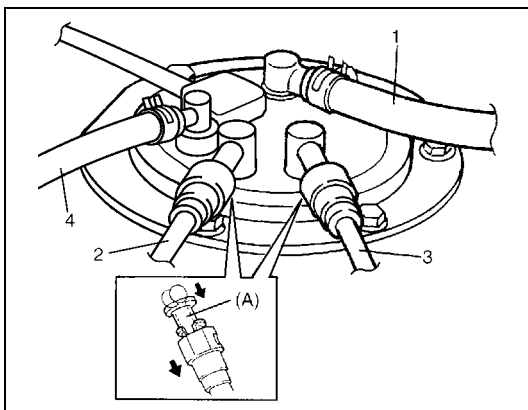
Do not disassemble fuel pump assembly. Disassembly will spoil its original performance.

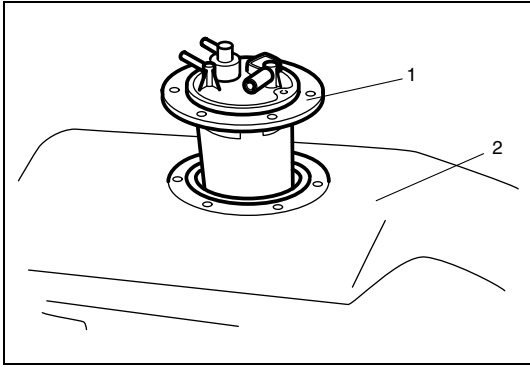
Removal

- 1) Remove fuel tank from vehicle referring to "Fuel Tank Removal and Installation" in this section.
- 2) Disconnect fuel breather hose (1), fuel return pipe (2), fuel feed pipe (3) and fuel vapor hose (4) from fuel pump assembly.
When disconnecting joints of fuel feed line from each pipe of fuel pump, unlock joint by inserting special tool between pipe and joint lock first.

Special tool

(A): 09919-47020



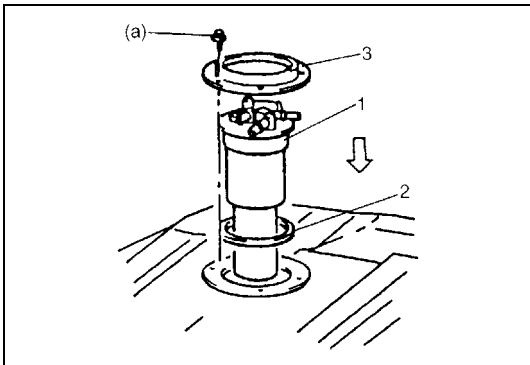


- 3) Remove fuel pump assembly (1) from fuel tank (2).

Installation

CAUTION:

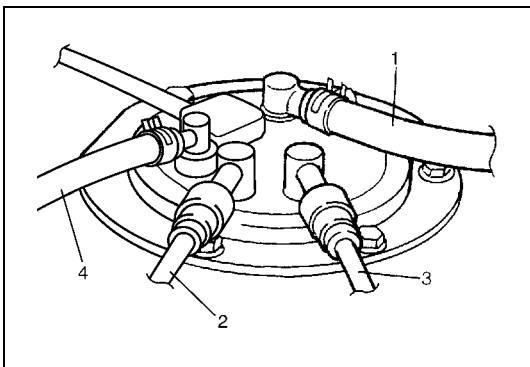
When connecting joint, clean outside surface of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.



- 1) Clean mating surfaces of fuel pump assembly (1) and fuel tank.
- 2) Install new gasket (2) and plate (3) to fuel pump assembly (1) then install fuel pump assembly to fuel tank.

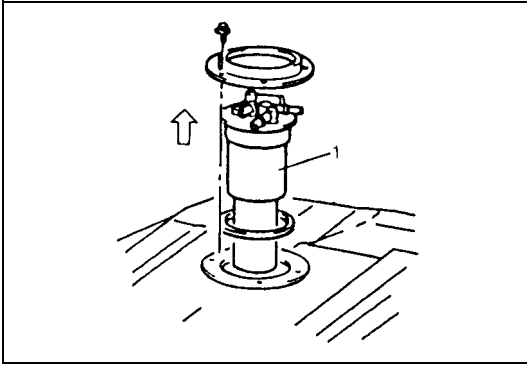
Tightening torque

Fuel pump bolt (a): 10.5 N·m (1.05 kg-m, 7.5 lb-ft)



- 3) Connect fuel breather hose (1), fuel return pipe (2) and fuel feed pipe (3) and fuel vapor hose (4) to fuel pump assembly.
- 4) Install fuel tank to vehicle referring to "Fuel Tank Removal and Installation" in this section.

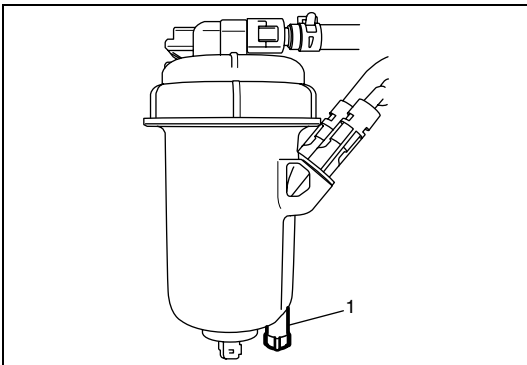
Fuel Pump Inspection



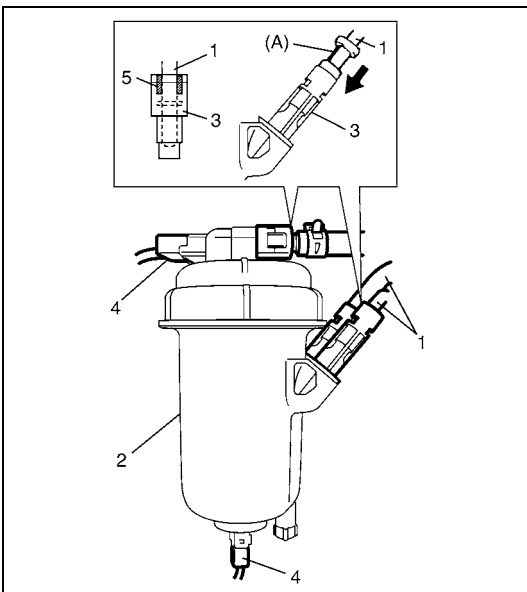
- Check fuel pump assembly for damage.
- Check fuel suction filter (1) for evidence of dirt and contamination.
If present, replace or clean and check for presence of dirt in fuel tank.
- For inspection of fuel level gauge, refer to "Fuel Level Sensor (Gauge Unit) Inspection" in Section 8C.

Fuel Filter Element Removal and Installation

Removal



- 1) Disconnect negative cable at battery.
- 2) Place container under bleed screw (1), and drain fuel loosening bleed screw.



- 3) Disconnect fuel filter joint (1) from fuel filter (2).

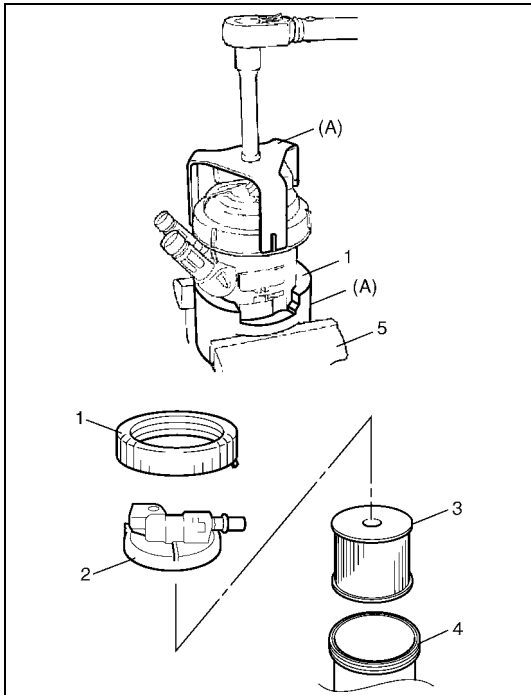
For quick joint (3), disconnect it as follows:

- a) Remove mud, dust and/or foreign material from clearance (5) between fuel filter joint (1) and quick joint by blowing compressed air.
- b) Unlock quick joint lock by inserting special tool between fuel filter joint and quick joint.

Special tool

(A): 09919-47020

- c) Disconnect fuel filter joint (1) from fuel filter.
- 4) Disconnect couplers (4) from fuel filter.



- 5) Turning fuel filter fastener (1) counterclockwise, remove fuel filter fastener (1) from fuel filter case (4) using special tool and vise (5).

Special tool

(A): 09919-48610

- 6) Remove fuel filter cap (2) and fuel filter element (3).

Installation

Reverse removal procedure for installation noting the following.

- Be sure to replace fuel filter element and O-ring as new one.
- Clean fuel filter case as follows.
 - a) Place container under bleed screw, and drain fuel losing bleed screw.
 - b) Tighten bleed screw.
 - c) Remove fuel filter case.
 - d) Pour diesel substitute (kardane, diltine or paraffin) into fuel filter case.
 - e) Clean fuel filter case with brush.
 - f) Dry and wipe out fuel filter case.
- Tighten fuel filter fastener (1) to specified torque using special tool and vise (2).

Special tool

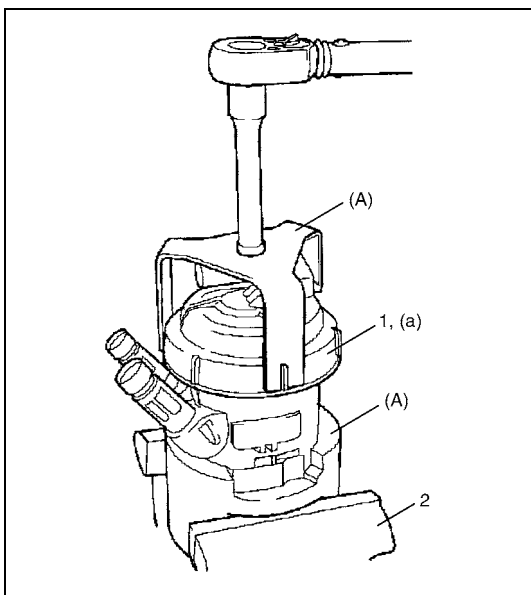
(A): 09919-48610

Tightening torque

Fuel filter fastener

(a): 30 N·m (3.0 kg-m, 22.0 lb-ft)

- Bleed air in system referring to “Air Bleeding of Fuel System” in this section.
- Start engine and check that there are no fuel leakage.



Fuel Filter Assembly Removal and Installation

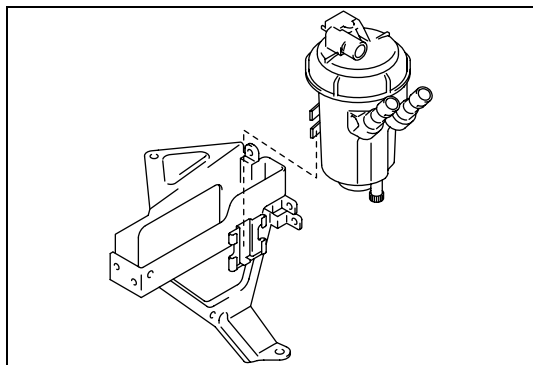
Removal

- 1) Disconnect fuel pipes in the same manner as step 1) through 4) of "Removal" under "Fuel Filter Element Removal and Installation" in this section.
- 2) Remove fuel filter assembly.

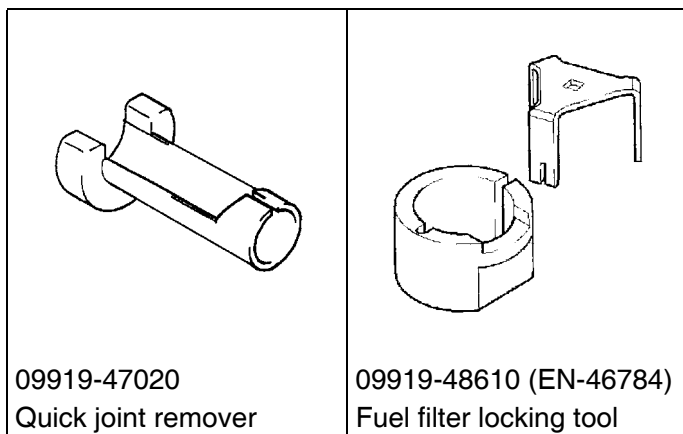
Installation

Reverse removal procedure for installation noting the following.

- Bleed air in system referring to "Air Bleeding of Fuel System" in this section.
- Start engine and check that there are no fuel leakage.



Special Tool



09919-47020

Quick joint remover

09919-48610 (EN-46784)

Fuel filter locking tool

Tightening Torque Specification

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Fuel pump bolt	10.5	1.05	7.5
Fuel tank bolt	23	2.3	17.0
Fuel filler hose clamp bolt	1.5	0.15	1.1
Separator screw	1.8	0.18	1.3

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Fuel filter fastener	30	3.0	21.5

SECTION 6E3

ENGINE AND EMISSION CONTROL SYSTEM (Z13DT ENGINE)

6E3

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “System Components and Wiring Location View and Connectors” under “General Description” in Section 10B in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in Section 10B before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

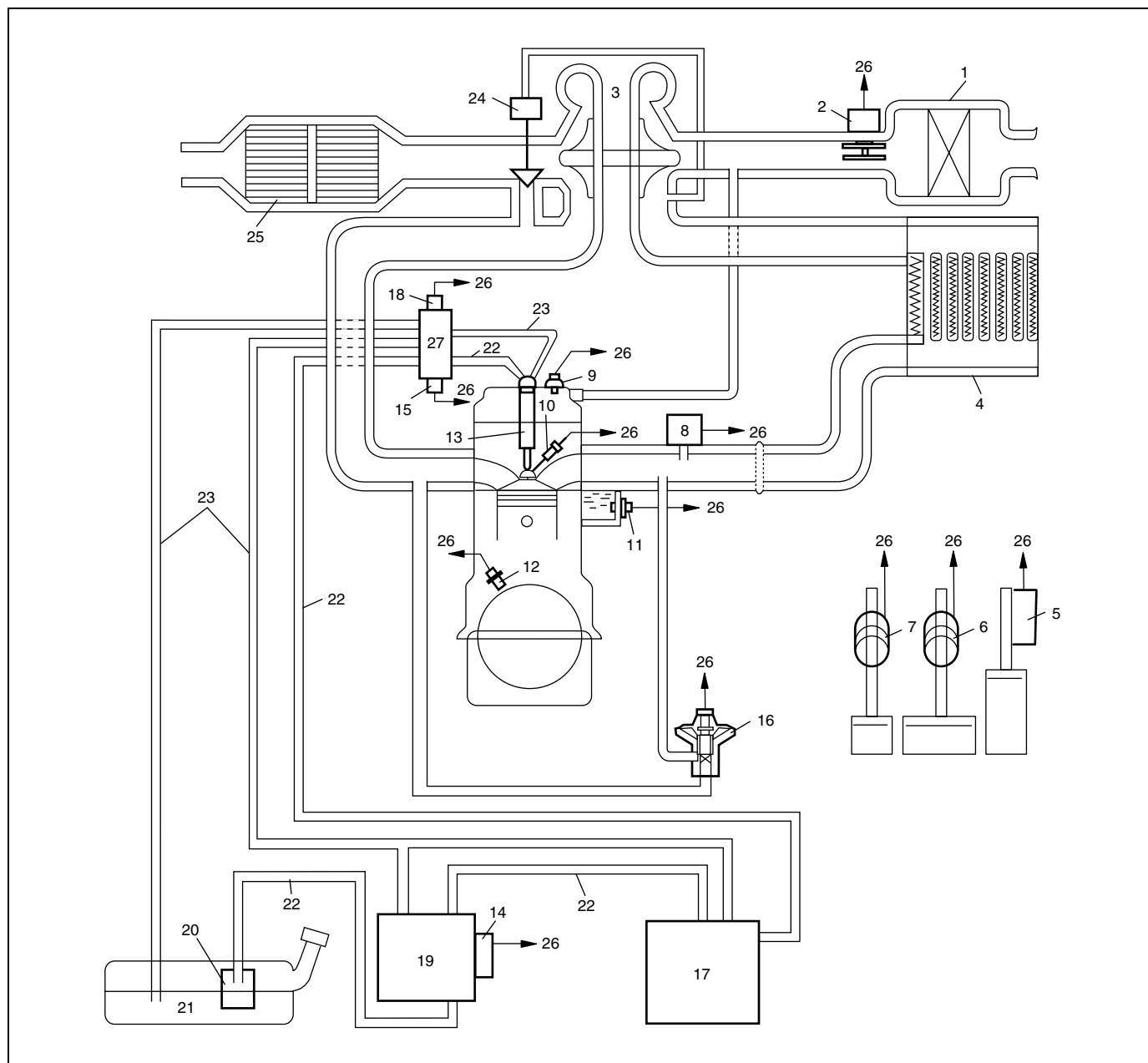
General Description	6E3-3		
System Diagram.....	6E3-3	Mass air flow (MAF) and intake air temperature (IAT) sensor removal and installation...	6E3-31
Electronic Control System	6E3-4	Glow plug removal and installation	6E3-32
System location diagram	6E3-4	Pedal position sensor removal and installation	6E3-33
System wiring diagram for RM413D.....	6E3-5	Fuel heater and temperature sensor removal and installation	6E3-34
System wiring diagram for RB413D	6E3-8	Fuel temperature sensor inspection.....	6E3-34
Air Intake System	6E3-11	Fuel pressure sensor removal and installation	6E3-34
Fuel Delivery System	6E3-12	Fuel pressure regulator removal and installation	6E3-35
On-Vehicle Service	6E3-13	Fuel pressure regulator inspection.....	6E3-36
Idle Speed Inspection.....	6E3-13	Engine coolant temperature sensor (ECT sensor) removal and installation .	6E3-36
Air Intake System	6E3-13	Engine coolant temperature sensor (ECT sensor) inspection	6E3-37
Vacuum pump removal and installation ..	6E3-13	Camshaft position sensor (CMP sensor) removal and installation	6E3-38
Fuel Delivery System	6E3-15	Crankshaft position (CKP) sensor (engine speed sensor) removal and installation	6E3-38
Precautions	6E3-15	Crankshaft position (CKP) sensor (engine speed sensor) inspection	6E3-39
Fuel delivery system components.....	6E3-18	Engine oil level switch removal and installation (If equipped)	6E3-40
Fuel leakage check	6E3-19	Engine oil level switch inspection (If equipped)	6E3-40
Fuel pump on-vehicle inspection.....	6E3-19	Boost pressure sensor removal and installation	6E3-41
Fuel pump removal and installation.....	6E3-19		
Fuel pump inspection	6E3-19		
Fuel injector on-vehicle inspection	6E3-20		
Fuel injector removal and installation...	6E3-20		
Common rail (High pressure fuel injection rail) removal and installation	6E3-23		
Injection pump removal and installation ..	6E3-25		
Electronic Control System	6E3-27		
Engine control module (ECM) removal and installation	6E3-27		
ECM registration.....	6E3-29		
Registration data check.....	6E3-30		

Radiator fan control system inspection	6E3-41
Fuel pump relay and radiator fan relay 1, 2, 3 inspection	6E3-42
Main relay and fuel heating relay inspection	6E3-42
Glow controller removal and installation ..	6E3-43
EGR System	6E3-44
EGR valve assembly component	6E3-44
EGR valve assembly removal and installation	6E3-45

Crankcase Ventilation System	6E3-47
Crankcase ventilation system component	6E3-47
Oil separator and crankcase ventilation cover removal and installation	6E3-48
Required Service Material.....	6E3-50
Tightening Torque Specification	6E3-50
Special Tool.....	6E3-51

General Description

System Diagram



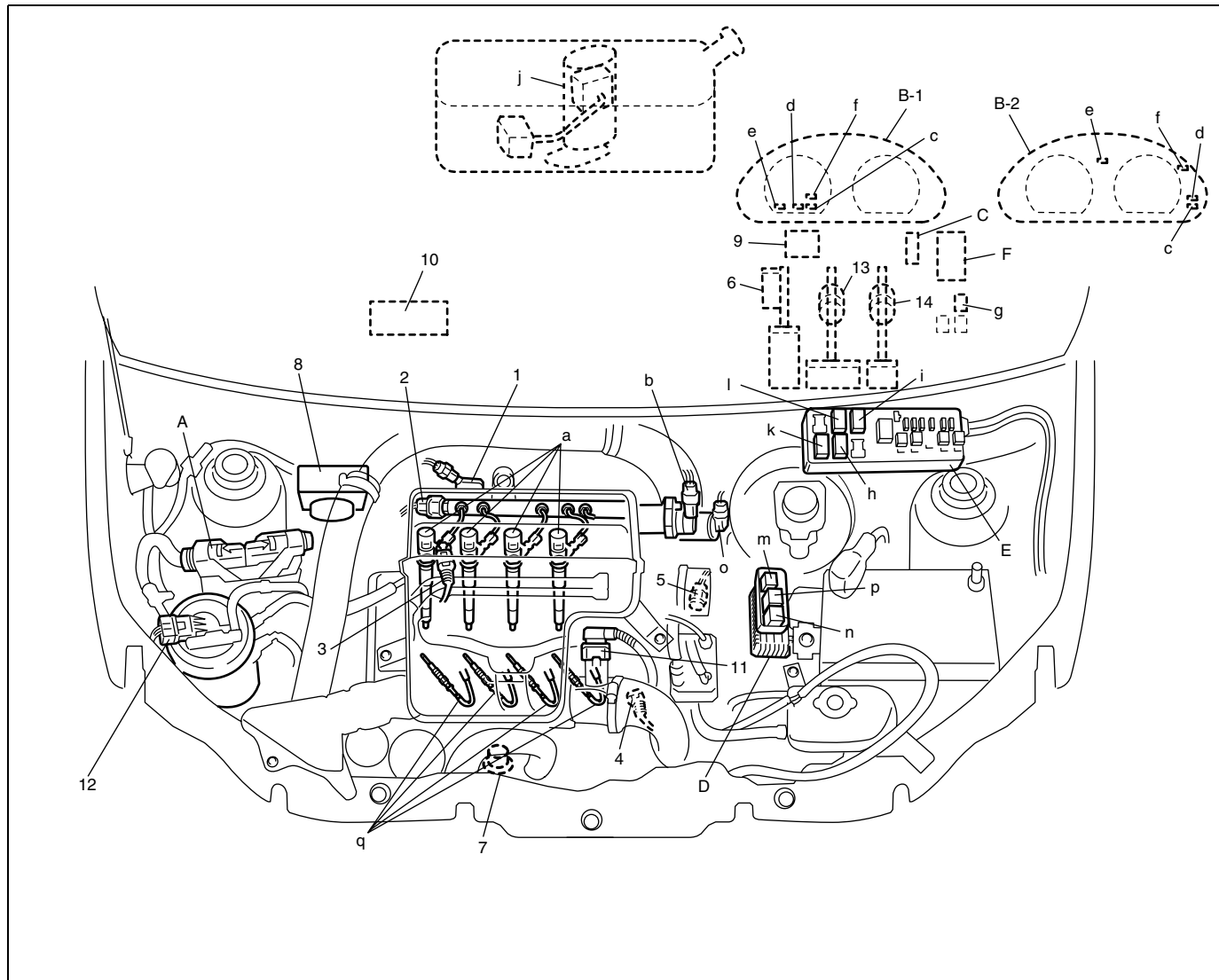
1. Air Cleaner	10. Glow plug	19. Fuel filter
2. MAF and IAT sensor	11. ECT sensor	20. Fuel pump
3. Turbocharger	12. CKP sensor (Engine speed sensor)	21. Fuel tank
4. Intercooler	13. Fuel injector	22. Fuel feed line
5. PPS (Pedal position sensor)	14. Fuel heater and temperature sensor	23. Fuel return line
6. Brake switch	15. Fuel pressure sensor	24. Waste gate actuator
7. Clutch switch	16. EGR valve	25. Catalytic converter
8. Boost pressure sensor	17. Injection pump	26. To ECM
9. CMP sensor	18. Fuel pressure regulator	27. Common rail (High pressure fuel injection rail)

Electronic Control System

System location diagram

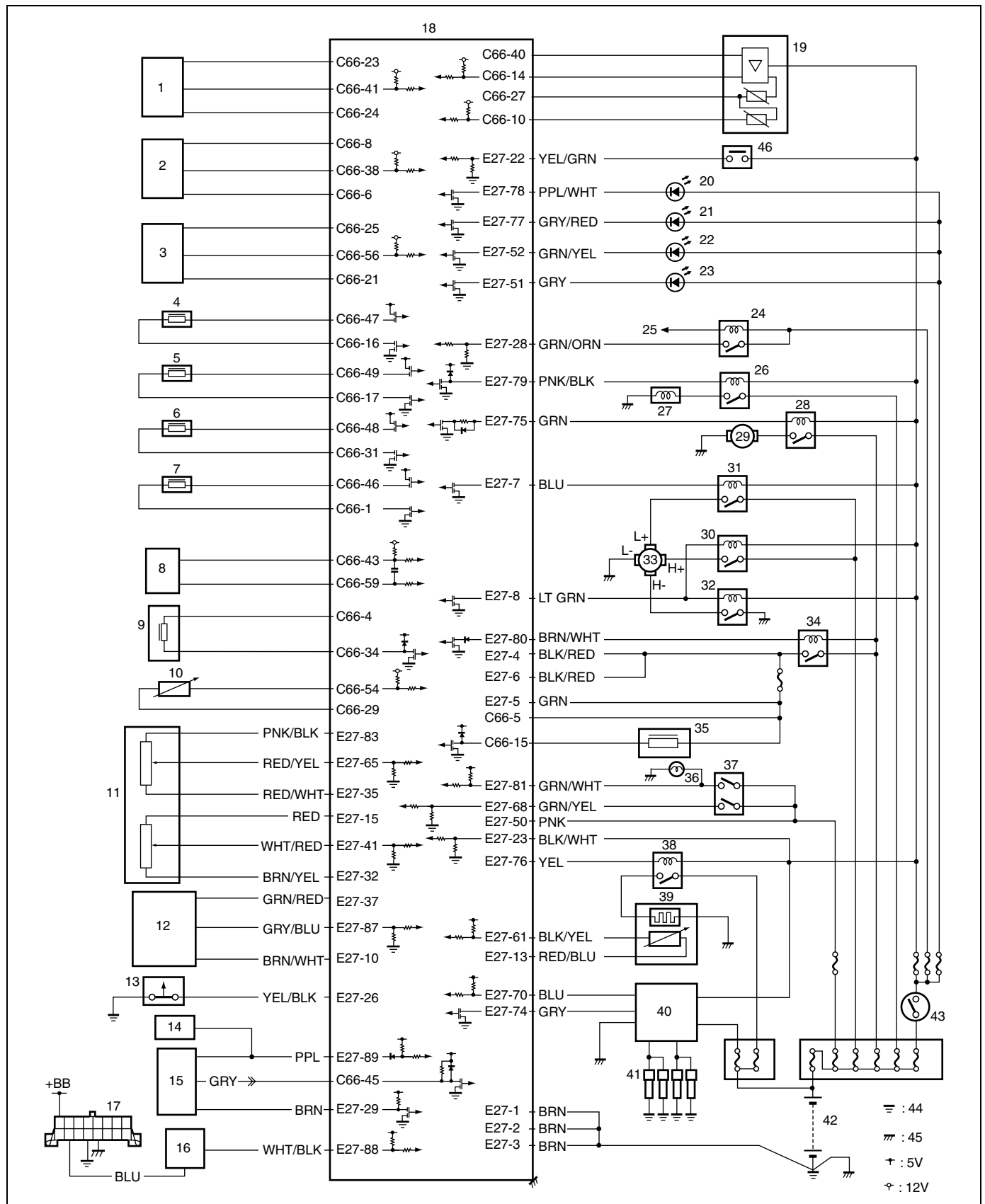
NOTE:

For RB413D, check for installation position of each relay referring to “Wiring Diagram Manual” described in “Foreword” of this manual.



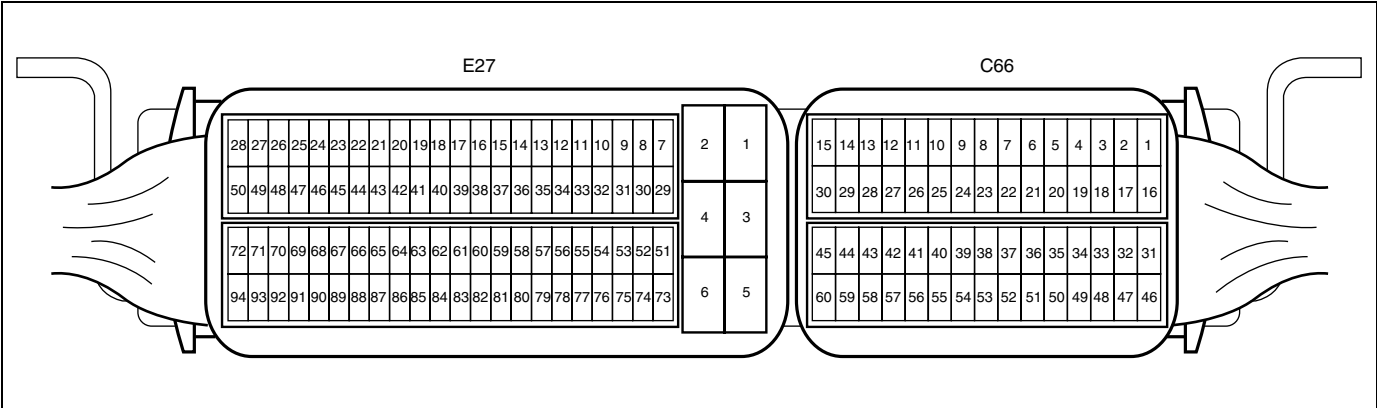
INFORMATION SENSORS	CONTROLLED DEVICES	OTHERS
1. Boost pressure sensor	a: Fuel injector	A: ECM
2. Fuel pressure sensor	b: Fuel pressure regulator	B-1: Combination meter for RM413D
3. CMP sensor	c: Malfunction indicator lamp	B-2: Combination meter for RB413D
4. CKP sensor	d: Service vehicle soon lamp	C: Data link connector
5. ECT sensor	e: Glow indicator lamp	D: Glow controller
6. Pedal position sensor	f: Oil level indicator lamp	E: Main fuse box
7. Oil level switch	g: A/C relay (if equipped) for RM413D	F: Circuit fuse box
8. ABS control module	h: A/C compressor relay (if equipped)	
9. Immobilizer control module	i: Fuel pump relay	
10. A/C control module	j: Fuel pump	
11. MAF and IAT sensor	k: Radiator fan relay 1	
12. Fuel heater and temperature sensor	l: Radiator fan relay 2	
13. Brake switch	m: Radiator fan relay 3	
14. Clutch switch	n: Main relay	
	o: EGR valve	
	p: Fuel heating relay	
	q: Glow plug	

System wiring diagram for RM413D



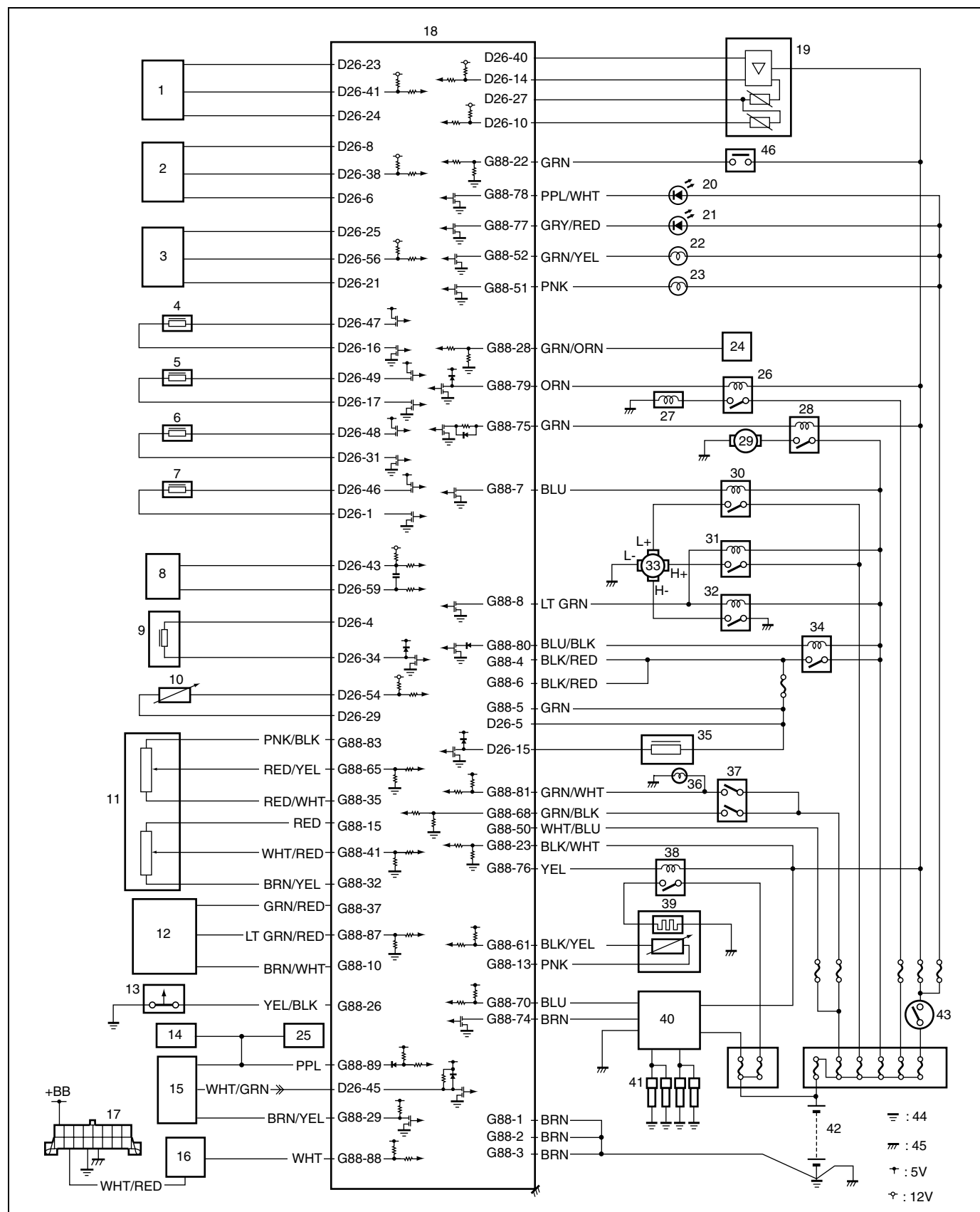
1. Boost pressure sensor	17. Data link connector	33. Radiator cooling fan motor
2. Fuel pressure sensor	18. ECM	34. Main relay
3. CMP sensor	19. MAF and IAT sensor	35. EGR valve
4. Fuel injector No.1	20. Malfunction indicator lamp	36. Brake lamp
5. Fuel injector No.2	21. Service vehicle soon lamp	37. Brake switch
6. Fuel injector No.3	22. Glow indicator lamp	38. Fuel heating relay
7. Fuel injector No.4	23. Oil level indicator lamp	39. Fuel heater and temperature sensor
8. CKP sensor	24. A/C relay (if equipped)	40. Glow controller
9. Fuel pressure regulator	25. To A/C switch (if equipped)	41. Glow plug
10. ECT sensor	26. Compressor relay (if equipped)	42. Battery
11. Pedal position sensor	27. A/C compressor (if equipped)	43. Ignition switch
12. A/C pressure sensor (if equipped)	28. Fuel pump relay	44. Engine ground
13. Oil level switch	29. Fuel pump	45. Vehicle body ground
14. ABS control module	30. Radiator fan relay 1	46. Clutch switch
15. Combination meter	31. Radiator fan relay 2	
16. Immobilizer control module	32. Radiator fan relay 3	

ECM Connector (Terminal Arrangement Viewed from Harness Side)



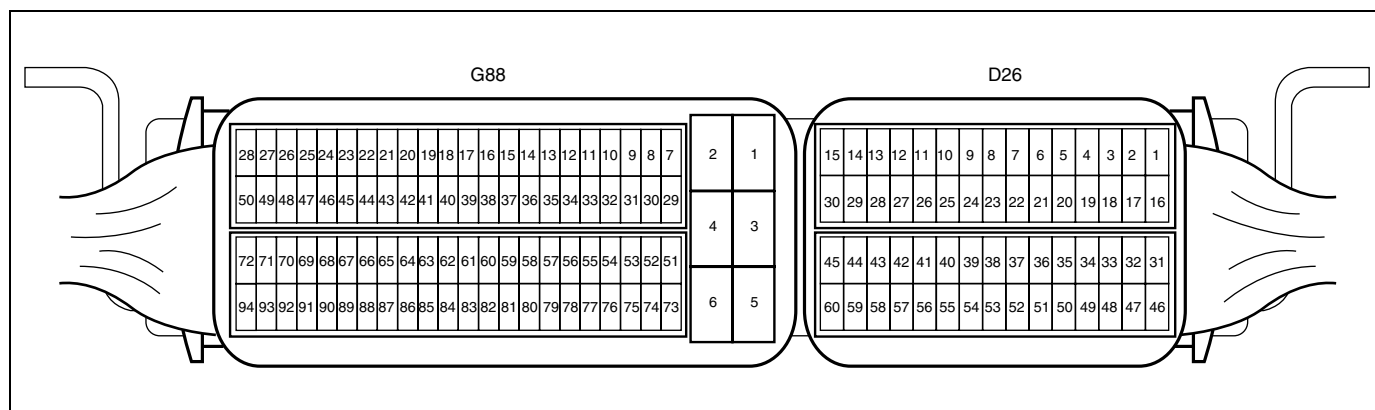
TERMINAL	CIRCUIT	TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
C66	1 Fuel injector No.4 output (low side)	C66	52 –	E27	45 –
	2 –		53 –		46 –
	3 –		54 ECT sensor signal		47 –
	4 Output of 12 V power source for fuel pressure regulator		55 –		48 –
	5 Main power supply		56 CMP sensor signal		49 –
	6 Ground for fuel pressure sensor		57 –		50 Power source for ECM
	7 –		58 –		51 Oil level indicator lamp
	8 Output of 5 V power source for fuel pressure sensor		59 CKP sensor signal (–)		52 Glow indicator lamp
	9 –		60 –		53 –
	10 Intake air temperature sensor signal	E27	1 Ground for ECM		54 –
	11 –		2 Ground for ECM		55 –
	12 –		3 Ground for ECM		56 –
	13 –		4 Main power supply		57 –
	14 MAF sensor signal		5 Main power supply		58 –
	15 EGR valve output		6 Main power supply		59 –
	16 Fuel injector No.1 output (low side)		7 Radiator fan relay 2 output		60 –
	17 Fuel injector No.2 output (low side)		8 Radiator fan relay 1 output		61 Fuel temperature sensor signal
	18 –		9 –		62 –
	19 –		10 Ground for A/C pressure sensor		63 –
	20 –		11 –		64 –
	21 Ground for CMP sensor		12 –		65 Pedal position sensor (PPS1) signal
	22 –		13 Ground for fuel temperature sensor		66 –
	23 Output of 5 V power source for boost pressure sensor		14 –		67 –
	24 Ground for boost pressure sensor		15 Output of 5 V power source for pedal position sensor (PPS2)		68 Brake switch signal
	25 Output of 5 V power source for CMP sensor		16 –		69 –
	26 –		17 –		70 Glow controller input signal
	27 Ground for MAF and IAT sensor		18 –		71 –
	28 –		19 –		72 –
	29 Ground for ECT sensor		20 –		73 –
	30 –		21 –		74 Glow controller output signal
	31 Fuel injector No.3 output (low side)		22 Clutch switch signal		75 Fuel pump relay output
	32 –		23 Ignition switch signal		76 Fuel heating relay output
	33 –		24 –		77 Service vehicle soon lamp
	34 Fuel pressure regulator signal		25 –		78 Malfunction indicator lamp
	35 –		26 Oil level switch signal		79 Compressor relay output
	36 –		27 –		80 Main power supply relay output
	37 –		28 A/C relay signal		81 Brake switch signal for brake lamp
	38 Fuel pressure sensor signal		29 Engine revolution signal for combination meter		82 –
	39 –		30 –		83 Output of 5 V power source for pedal position sensor (PPS1)
	40 Output of 5 V power source for MAF and IAT sensor		31 –		84 –
	41 Boost pressure sensor signal		32 Ground for pedal position sensor (PPS2)		85 –
	42 –		33 –		86 –
	43 CKP sensor signal (+)		34 –		87 A/C pressure sensor signal
	44 –		35 Ground for pedal position sensor (PPS1)		88 Serial communication line of data link connector 12 V
	45 Engine coolant temperature signal for combination meter		36 –		89 ABS control module signal (vehicle speed sensor signal)
	46 Fuel injector No.4 output (high side)		37 Output of 5 V power source for A/C pressure sensor		90 –
	47 Fuel injector No.1 output (high side)		38 –		91 –
	48 Fuel injector No.3 output (high side)		39 –		92 –
	49 Fuel injector No.2 output (high side)		40 –		93 –
	50 –		41 Pedal position sensor (PPS2) signal		94 –
	51 –		42 –		
			43 –		
			44 –		

System wiring diagram for RB413D



1. Boost pressure sensor	17. Data link connector	33. Radiator cooling fan motor
2. Fuel pressure sensor	18. ECM	34. Main relay
3. CMP sensor	19. MAF and IAT sensor	35. EGR valve
4. Fuel injector No.1	20. Malfunction indicator lamp	36. Brake lamp
5. Fuel injector No.2	21. Service vehicle soon lamp	37. Brake switch
6. Fuel injector No.3	22. Glow indicator lamp	38. Fuel heating relay
7. Fuel injector No.4	23. Oil level indicator lamp	39. Fuel heater and temperature sensor
8. CKP sensor	24. A/C switch (if equipped)	40. Glow controller
9. Fuel pressure regulator	25. EPS control module	41. Glow plug
10. ECT sensor	26. Compressor relay (if equipped)	42. Battery
11. Pedal position sensor	27. A/C compressor (if equipped)	43. Ignition switch
12. A/C pressure sensor (if equipped)	28. Fuel pump relay	44. Engine ground
13. Oil level switch	29. Fuel pump	45. Vehicle body ground
14. ABS control module	30. Radiator fan relay 1	46. Clutch switch
15. Combination meter	31. Radiator fan relay 2	
16. Immobilizer control module	32. Radiator fan relay 3	

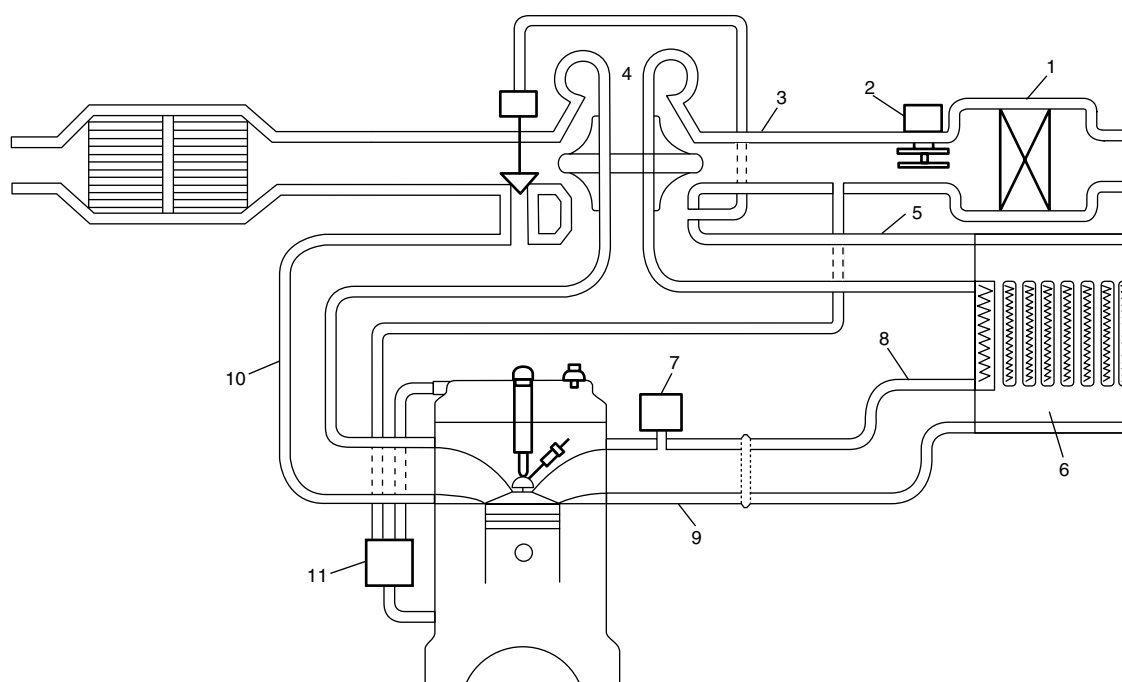
ECM Connector (Terminal Arrangement Viewed from Harness Side)



6E3-10 ENGINE AND EMISSION CONTROL SYSTEM (Z13DT ENGINE)

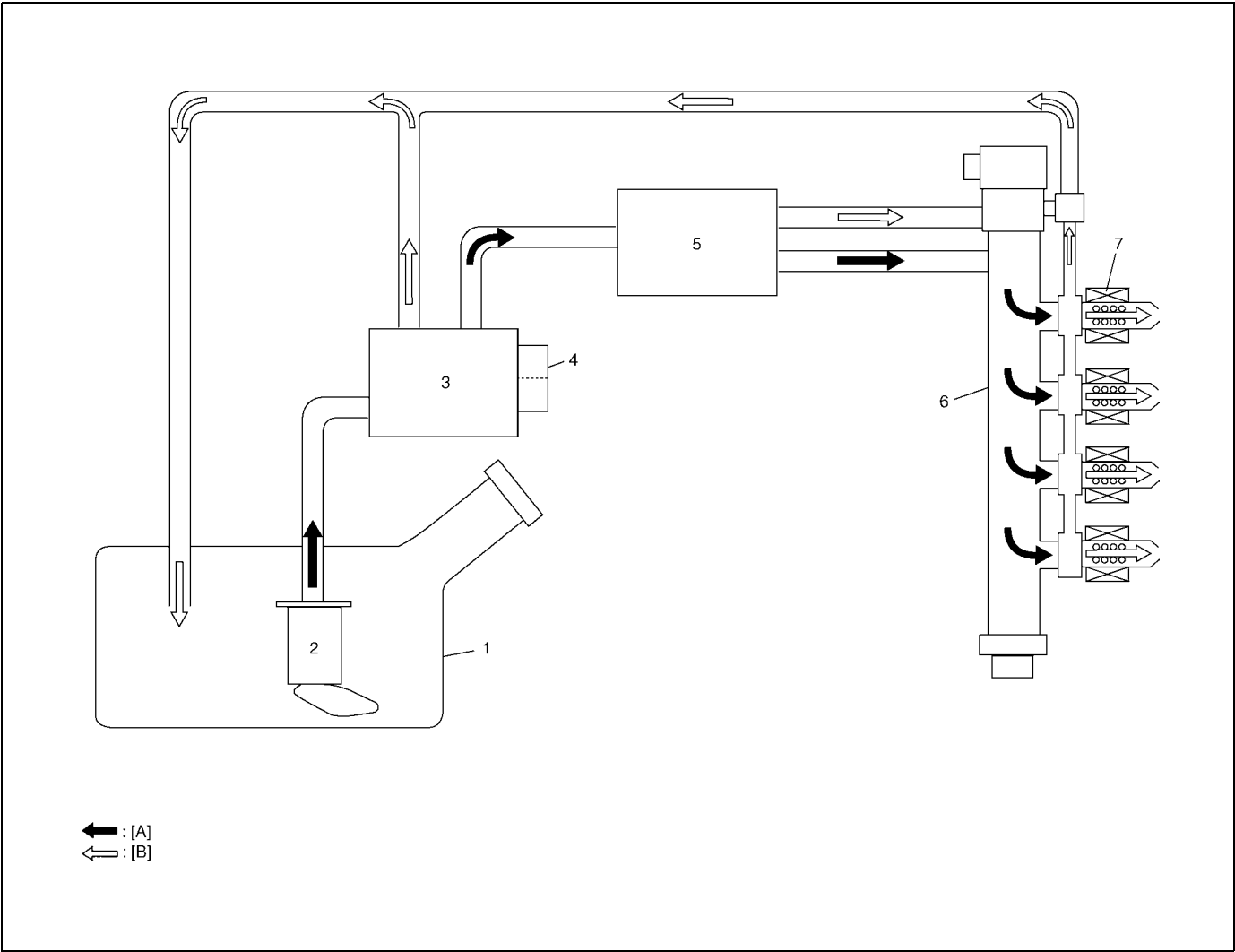
TERMINAL	CIRCUIT	TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
D26	1 Fuel injector No.4 output (low side)	D26	52 –	G88	45 –
	2 –		53 –		46 –
	3 –		54 ECT sensor signal		47 –
	4 Output of 12 V power source for fuel pressure regulator		55 –		48 –
	5 Main power supply		56 CMP sensor signal		49 –
	6 Ground for fuel pressure sensor		57 –		50 Power source for ECM
	7 –		58 –		51 Oil level indicator lamp
	8 Output of 5 V power source for fuel pressure sensor		59 CKP sensor signal (–)		52 Glow indicator lamp
	9 –		60 –		53 –
	10 Intake air temperature sensor signal	G88	1 Ground for ECM		54 –
	11 –		2 Ground for ECM		55 –
	12 –		3 Ground for ECM		56 –
	13 –		4 Main power supply		57 –
	14 MAF sensor signal		5 Main power supply		58 –
	15 EGR valve output		6 Main power supply		59 –
	16 Fuel injector No.1 output (low side)		7 Radiator fan relay 1 output		60 –
	17 Fuel injector No.2 output (low side)		8 Radiator fan relay 2 output		61 Fuel temperature sensor signal
	18 –		9 –		62 –
	19 –		10 Ground for A/C pressure sensor		63 –
	20 –		11 –		64 –
	21 Ground for CMP sensor		12 –		65 Pedal position sensor (PPS1) signal
	22 –		13 Ground for fuel temperature sensor		66 –
	23 Output of 5 V power source for boost pressure sensor		14 –		67 –
	24 Ground for boost pressure sensor		15 Output of 5 V power source for pedal position sensor (PPS2)		68 Brake switch signal
	25 Output of 5 V power source for CMP sensor		16 –		69 –
	26 –		17 –		70 Glow controller input signal
	27 Ground for MAF and IAT sensor		18 –		71 –
	28 –		19 –		72 –
	29 Ground for ECT sensor		20 –		73 –
	30 –		21 –		74 Glow controller output signal
	31 Fuel injector No.3 output (low side)		22 Clutch switch signal		75 Fuel pump relay output
	32 –		23 Ignition switch signal		76 Fuel heating relay output
	33 –		24 –		77 Service vehicle soon lamp
	34 Fuel pressure regulator signal		25 –		78 Malfunction indicator lamp
	35 –		26 Oil level switch signal		79 Compressor relay output
	36 –		27 –		80 Main power supply relay output
	37 –		28 A/C relay signal		81 Brake switch signal for brake lamp
	38 Fuel pressure sensor signal		29 Engine revolution signal for combination meter		82 –
	39 –		30 –		83 Output of 5 V power source for pedal position sensor (PPS1)
	40 Output of 5 V power source for MAF and IAT sensor		31 –		84 –
	41 Boost pressure sensor signal		32 Ground for pedal position sensor (PPS2)		85 –
	42 –		33 –		86 –
	43 CKP sensor signal (+)		34 –		87 A/C pressure sensor signal
	44 –		35 Ground for pedal position sensor (PPS1)		88 Serial communication line of data link connector 12 V
	45 Engine coolant temperature signal for combination meter		36 –		89 ABS control module signal (vehicle speed sensor signal)
	46 Fuel injector No.4 output (high side)		37 Output of 5 V power source for A/C pressure sensor		90 –
	47 Fuel injector No.1 output (high side)		38 –		91 –
	48 Fuel injector No.3 output (high side)		39 –		92 –
	49 Fuel injector No.2 output (high side)		40 –		93 –
	50 –		41 Pedal position sensor (PPS2) signal		94 –
	51 –		42 –		
			43 –		
			44 –		

Air Intake System



1. Air cleaner	5. Intercooler inlet hose	9. Intake manifold
2. MAF and IAT sensor	6. Intercooler	10. Exhaust manifold
3. Air cleaner outlet hose	7. Boost pressure sensor	11. Oil separator
4. Turbocharger	8. Intercooler outlet hose	

Fuel Delivery System



1. Fuel tank	5. Injection pump	[A]: Fuel feed line
2. Fuel pump	6. Common rail (High pressure fuel injection rail)	[B]: Fuel return line
3. Fuel filter	7. Fuel injector	
4. Fuel heater and temperature sensor		

On-Vehicle Service

Idle Speed Inspection

- 1) Shift transmission into Neutral.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn all electrical loads off.
- 4) Using SUZUKI scan tool, verify that idle speed is within specification.

Engine speed: 720 – 880 rpm

- 5) If not, refer to “B-11, Complaint: Engine Idling” in Section 6-3.

Air Intake System

Vacuum pump removal and installation

Removal

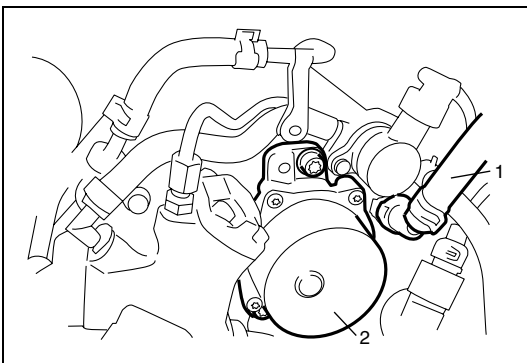
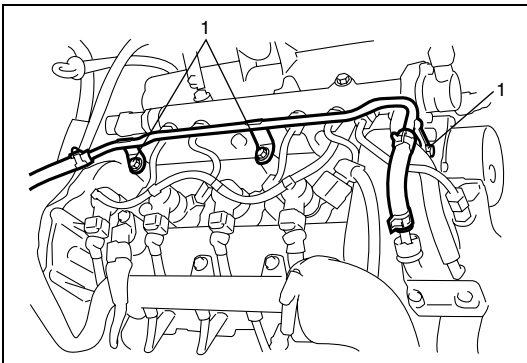
CAUTION:

Never disassemble vacuum pump.

Disassembly will spoil its original function.

If faulty condition is found, replace it with new one.

- 1) Disconnect negative cable from battery.
- 2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation” in Section 6A3.
- 3) Remove fuel feed pipe mounting bolts (1).



- 4) Disconnect brake booster hose (1) from vacuum pump.
- 5) Remove vacuum pump (2) from camshaft housing.

Installation

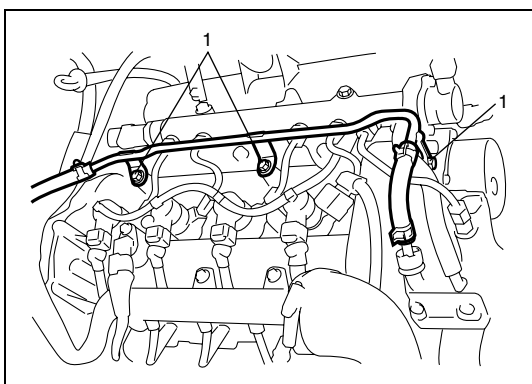
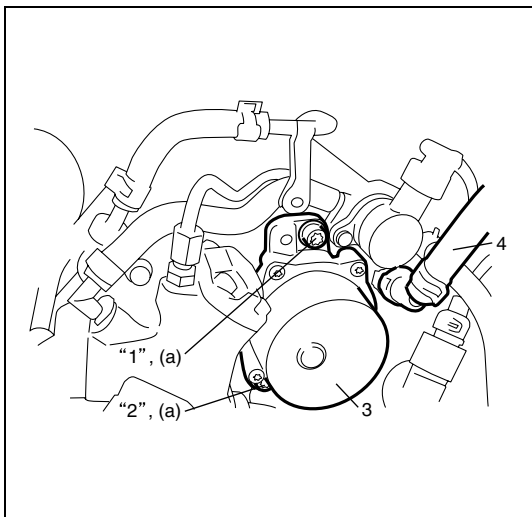
- 1) Install new gasket to vacuum pump.
- 2) Install vacuum pump (2) to camshaft housing.
Fit the dogs of vacuum pump coupling into the slot of camshaft.
- 3) Tighten vacuum pump bolt gradually as follows.
 - a) Tighten vacuum pump bolt to 5 N·m (0.5 kg-m, 4.0 lb-ft) according to numerical order in the figure.
 - b) In the same manner as Step a), tighten them to 20 N·m (2.0 kg-m, 14.5 lb-ft).

Tightening torque

Vacuum pump bolt (a):

Tighten 5 N·m (0.5 kg-m, 4.0 lb-ft) and 20 N·m (2.0 kg-m, 14.5 lb-ft) by the specified procedure

- 4) Connect brake booster hose (3) to vacuum pump.
- 5) Tighten fuel feed pipe mounting bolts (1).



- 6) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 7) Connect negative cable to battery.

Fuel Delivery System

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 leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage.
- Fuel can also irritate skin and eyes. To prevent this, always complete the following “Precautions”.

Precautions

- Before disconnecting a fuel hose or pipe, wait 60 seconds or more after ignition switch turned OFF to release pressure in fuel system.
- The fuel system must be checked for leaks after service work, refer to “Fuel leakage check” in this section.
- The fuel system is very sensitive to contamination. The risks caused by the introduction of contamination are:
 - damage or destruction of the high pressure injection system and the engine.
 - seizing or leaking of a component.
- When servicing on the high pressure direct injection system, must be performed under very clean conditions.

This means that no impurities (particles a few microns in size) get into the system during dismantling or into the circuits via the fuel unions.
- The cleanliness principle must be applied from the fuel filter to the injectors.
- Contamination is caused by:
 - metal or plastic chips,
 - paint,
 - fibres: boxes, brushes, paper, clothing, cloths,
 - foreign bodies such as hair,
 - ambient air,
 - etc.
- It is not possible to clean the engine using a high pressure washer because of the risk of damaging connections.

In addition, moisture may collect in the connectors and create electrical connection problems.
- The technician should wear clean overalls.
- Ensure that you have the plug caps (special tool) for the unions to be opened. Plug caps are to be used once only. After use, they must be thrown away (once used they are soiled and cleaning is not sufficient to make them reusable).

Unused plug caps must be thrown away, also.

Special tool

(A): 09914-65420

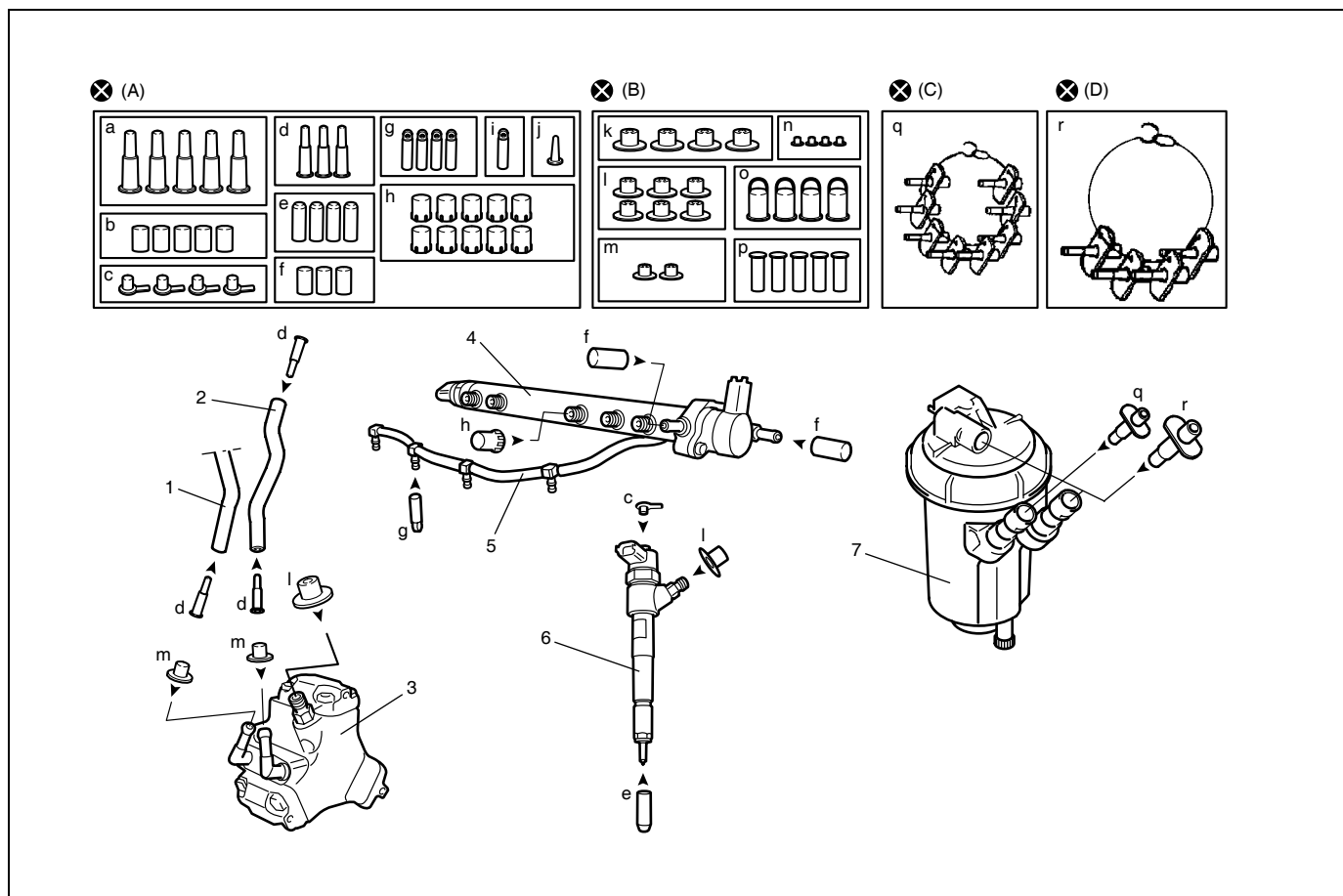
(B): 09916-50010

(C): 09919-48320

(D): 09919-48310

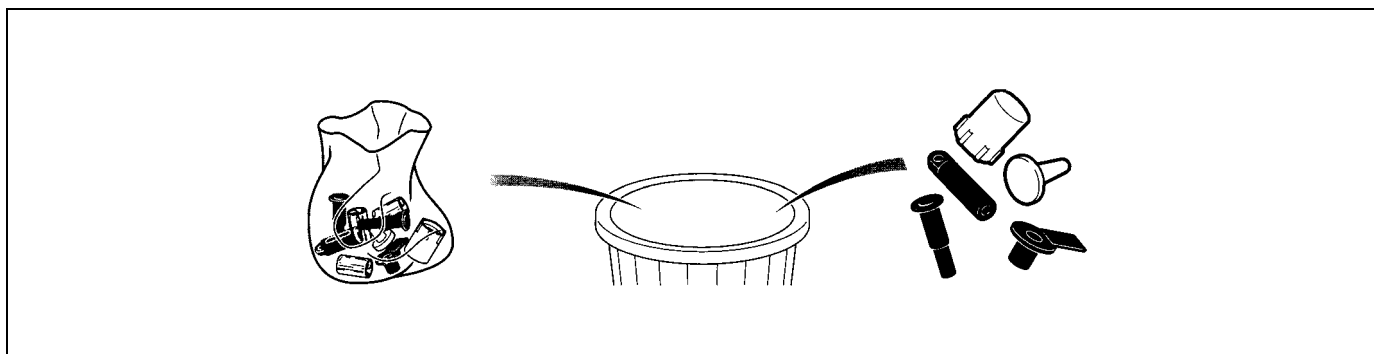
NOTE:

Do not use instructions included in special tools (A) and (B) because they are used for the other engines. Install special tools (A) and (B) referring to the below illustration.



1. Fuel feed hose	4. Common rail	7. Fuel filter assembly
2. Fuel return hose	5. Return hose	⊗ : Do not reuse.
3. Injection pump	6. Fuel injector	

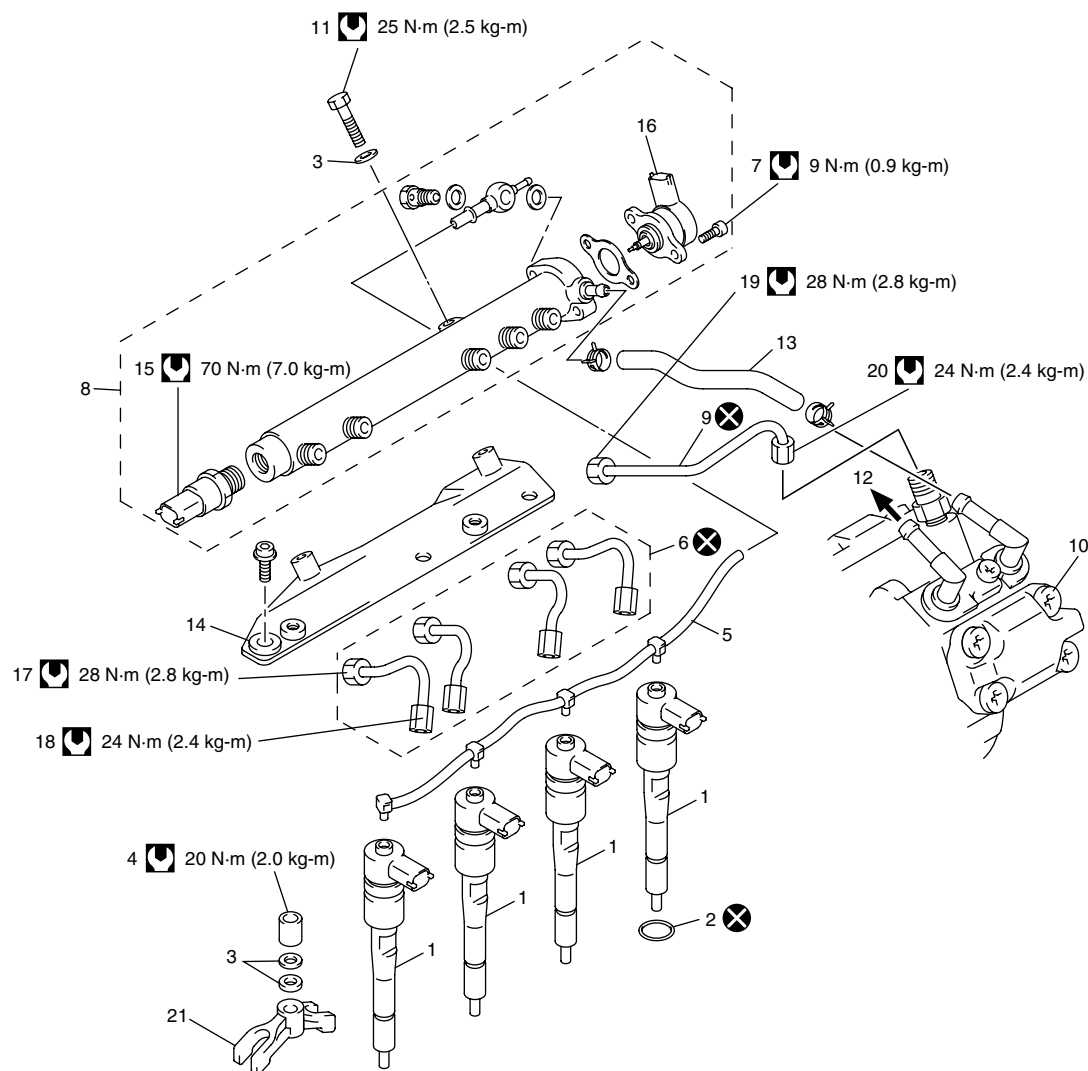
- Ensure that you have hermetically resalable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags must be used only once, and after use they must be thrown away.



- Make sure that lint-free towelettes. The use of a normal cloth or paper for cleaning purposes is forbidden. These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.
- Carry out any servicing as much as possible with the plug cap installed in order to prevent impurities from entering the system.
- Instructions to be followed before opening the fuel circuit.
 - For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.
 - For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).
 - Use a brush and thinners to clean the connections to be opened.

- Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone) Check that no bristles remain adhered.
- Wash your hands before and during the operation if necessary.
- When wearing leather protective gloves, cover these with latex gloves.
- Instructions to be followed during the operation.
 - As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system by using the plug cap. They must not, under any circumstances, be reused.
 - Close the hermetically sealed bag, even if it has to be reopened shortly afterwards.
Ambient air carries contamination.
 - All components of the injection system that are removed must be stored in a hermetically sealed plastic bag once the plugs have been inserted.
 - The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened.
These items are likely to allow impurities to enter the system.
 - A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.

Fuel delivery system components



1. Fuel injector	7. Fuel pressure regulator bolt	13. Fuel return hose	19. High pressure supply pipe union nut (common rail side)
2. Sealing ring	8. Common rail	14. Common rail bracket	20. High pressure supply pipe union nut (injection pump side)
3. Washer	9. High pressure supply pipe	15. Fuel pressure sensor	21. Fuel injector bracket
4. Nut	10. Injection pump	16. Fuel pressure regulator	 Tightening torque
5. Return hose	11. Common rail bolt	17. High pressure pipe union nut (common rail side)	 Do not reuse.
6. High pressure pipe	12. To fuel feed pipe	18. High pressure pipe union nut (fuel injector side)	

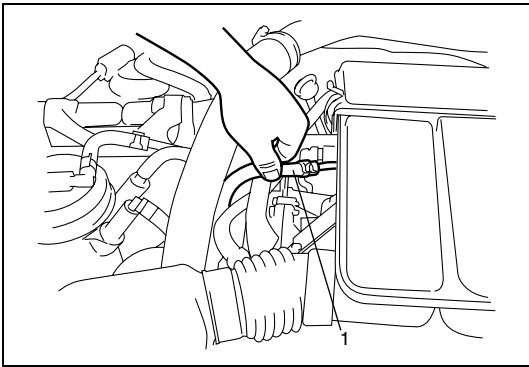
Fuel leakage check

- 1) Turn ignition switch to ON position.
- 2) Check for the fuel leakage in each part, which was serviced.
- 3) Start the engine, and then check for the fuel leakage in each part, which was serviced.
- 4) Run engine at 4000 r/min. for about 30 seconds and then stop engine.
- 5) Check for the fuel leakage in each part, which was serviced.

Fuel pump on-vehicle inspection

- 1) Check that fuel pump operating sound is heard from fuel pump for about 20 seconds and then stop when turning ignition switch to ON position.

If above check result is not satisfactory, confirm that check result of each step is in good condition referring to "C-06, Fuel Pump Relay Circuit" in Section 6-3.



- 2) Check that fuel pressure is felt at fuel feed hose (1) for about 20 seconds after ignition switch ON.

If fuel pressure is not felt, check fuel leakage from fuel line and clogged fuel line.

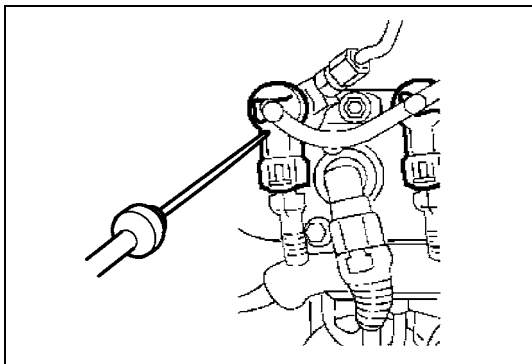
Fuel pump removal and installation

Refer to "Fuel Pump Assembly Removal and Installation" in Section 6C3.

Fuel pump inspection

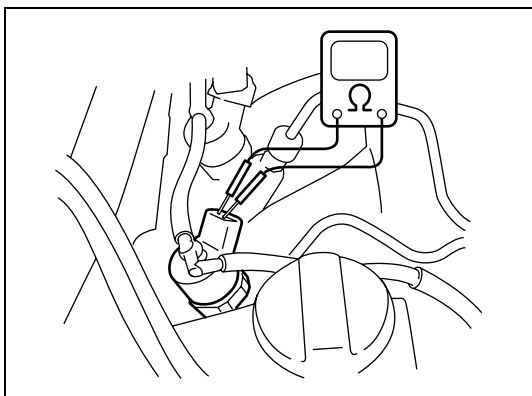
Refer to "Fuel Pump Inspection" in Section 6C3.

Fuel injector on-vehicle inspection



- 1) Using sound scope or such, check operating sound of injector when engine is running or cranking.
Cycle of operating sound should vary according to engine speed.

If no sound or an unusual sound is heard, confirm that check result of each step is in good condition referring to “C-24, Cylinder 1 Injector Circuit”, “C-25, Cylinder 2 Injector Circuit”, “C-26, Cylinder 3 Injector Circuit” or “C-27, Cylinder 4 Injector Circuit” in Section 6-3.



- 2) Disconnect coupler from injector, connect ohmmeter between terminals of injector and check resistance.

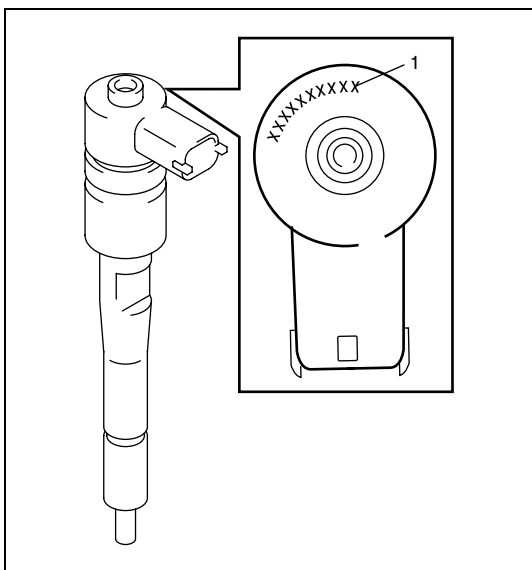
If resistance is out of specification, replace.

Resistance of injector

about 0.5 Ω

- 3) Connect coupler to injector securely.

Fuel injector removal and installation

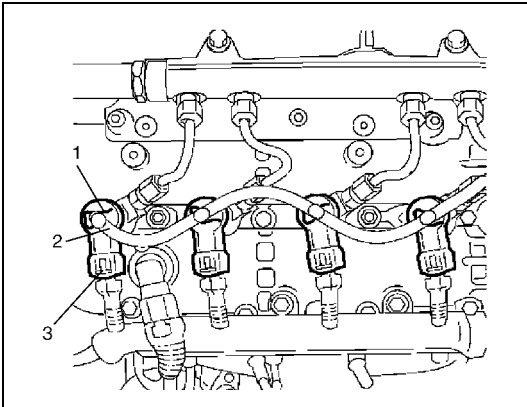


NOTE:

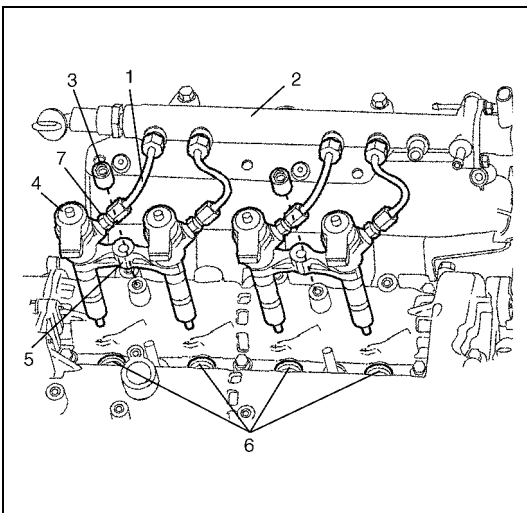
- The calibration code (1) is the code that is given to each fuel injector, and it represents the performance characteristics of the fuel injector. It is registered in ECM, and ECM controls fuel injection according to the performance characteristics of the fuel injector. Therefore, after removing fuel injectors, be sure to install them as they were. In case that the fuel injectors were replaced with new ones, be sure to register each calibration code in ECM referring to “ECM registration” in this section. For your reference, it is possible to know what calibration codes are currently registered in ECM.
- In case the calibration code (1) is indicated with 10 digits, only the first 9 digits should be registered with 10th digit ignored.

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation” in Section 6A3.
- 3) Remove clips (1), and then disconnect return hose (2) from fuel injectors.
- 4) Disconnect fuel injector connectors (3).

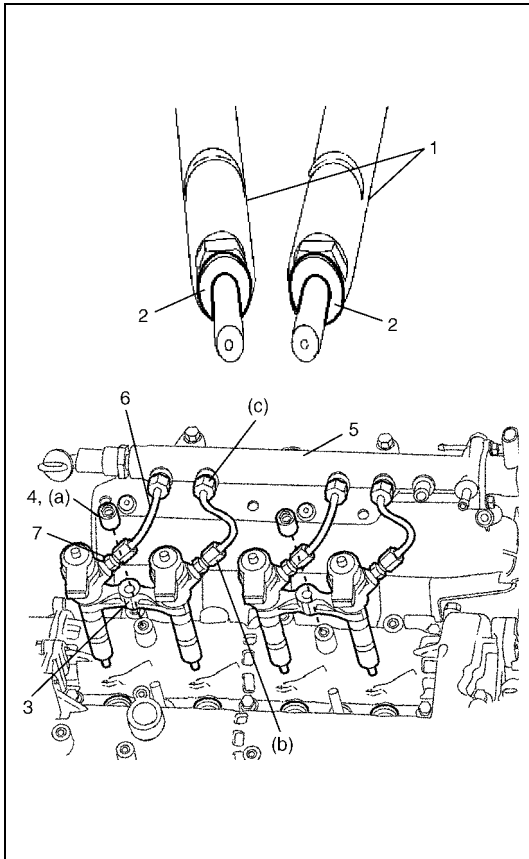


- 5) Remove high pressure pipes (1).
When loosening union nut of high pressure pipe, holding union nut (7) of fuel injector (4) with wrench.
- 6) Remove fuel injector bracket nut (3).
- 7) Remove fuel injectors with its bracket (5) from camshaft housing.
- 8) Remove sealing rings (6) from camshaft housing.



2. Common rail

Installation



- 1) Install new sealing rings (2) to fuel injectors (1).
- 2) Set fuel injector bracket (3) to fuel injectors.
- 3) Install fuel injectors to camshaft housing and tighten fuel injector bracket nut (4) temporarily by hand.
- 4) Install new high pressure pipes (6) and tighten each union nut temporarily by hand.
- 5) Tighten fuel injector bracket nut to specified torque.

Tightening torque

Fuel injector bracket nut

(a): 20 N·m (2.0 kg-m, 14.5 lb-ft)

- 6) Tighten high pressure pipe union nuts to specified torque.
When tightening union nut of high pressure pipe, holding union nut (7) of fuel injector with wrench.

Tightening torque

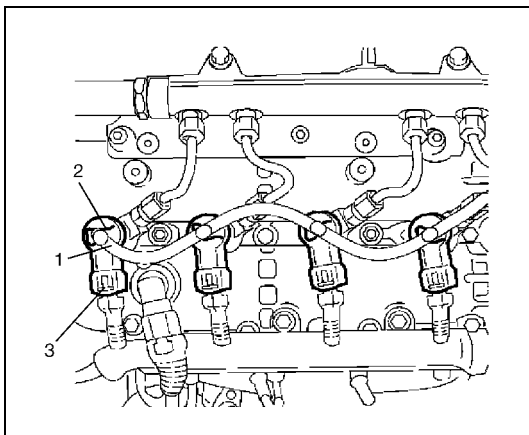
High pressure pipe union nut (fuel injector side)

(b): 24 N·m (2.4 kg-m, 17.5 lb-ft)

High pressure pipe union nut (common rail side)

(c): 28 N·m (2.8 kg-m, 20.5 lb-ft)

5. Common rail

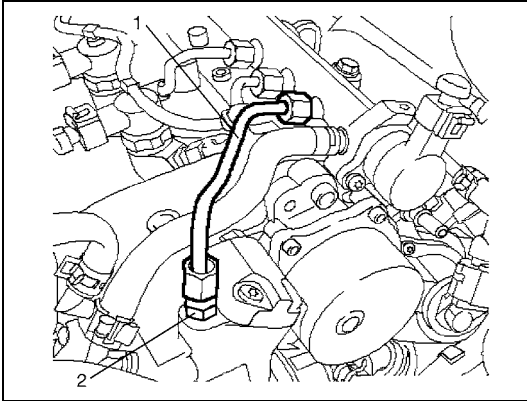


- 7) Connect return hose (1) to fuel injectors and then install clips (2) to fuel injectors.
- 8) Connect fuel injector connectors (3).
- 9) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 10) Connect negative (–) cable at battery.
In case that the fuel injector(s) was replaced, perform "ECM registration" in this section to register the fuel injector calibration code into ECM.
- 11) Check fuel leakage referring to "Fuel leakage check" in this section.

Common rail (High pressure fuel injection rail) removal and installation

Removal

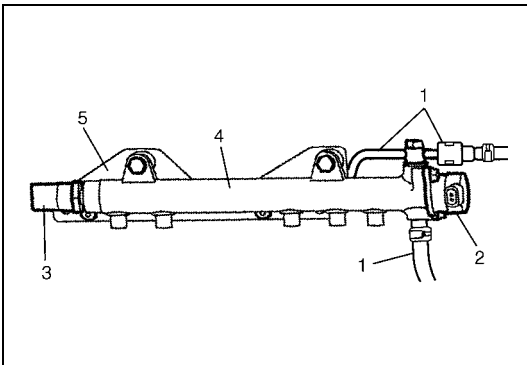
- 1) Disconnect negative cable from battery.
- 2) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.



- 3) Remove high pressure supply pipe (1) from injection pump and common rail.

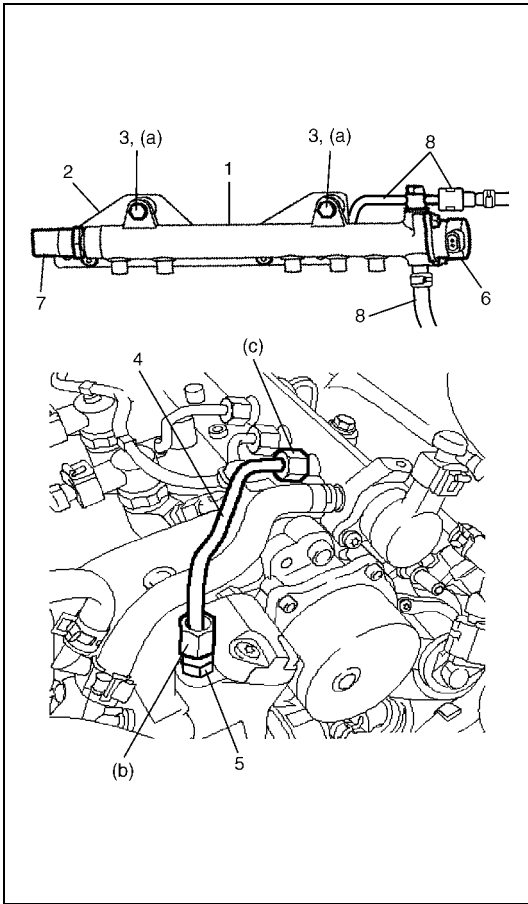
When loosening union nut of high pressure supply pipe, holding union nut (2) of injection pump with wrench.

- 4) Remove high pressure pipes from fuel injectors and common rail referring to Step 5) of "Removal" under "Fuel injector removal and installation" in this section.



- 5) Disconnect fuel return hoses (1) from common rail.
- 6) Disconnect connectors from fuel pressure regulator (2) and fuel pressure sensor (3).
- 7) Remove common rail (4) from its bracket (5).

Installation



- 1) Install common rail (1) to its bracket (2) and tighten common rail bolts (3) temporarily by hand.
- 2) Install new high pressure pipes for injectors and new high pressure supply pipe (4). Tighten each union nut temporarily by hand.
- 3) Tighten common rail bolts to specified torque.

Tightening torque

Common rail bolt (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

- 4) Tighten high pressure supply pipe union nuts to specified torque.

When tightening union nut of high pressure supply pipe, holding union nut (5) of injection pump with wrench.

Tightening torque

High pressure supply pipe union nut (injection pump side)

(b): 24 N·m (2.4 kg-m, 17.5 lb-ft)

High pressure supply pipe union nut (common rail side)

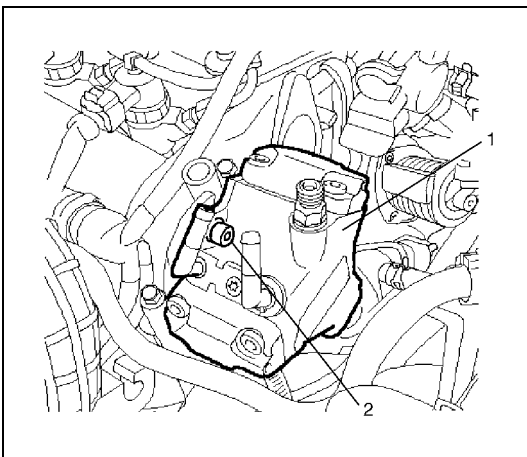
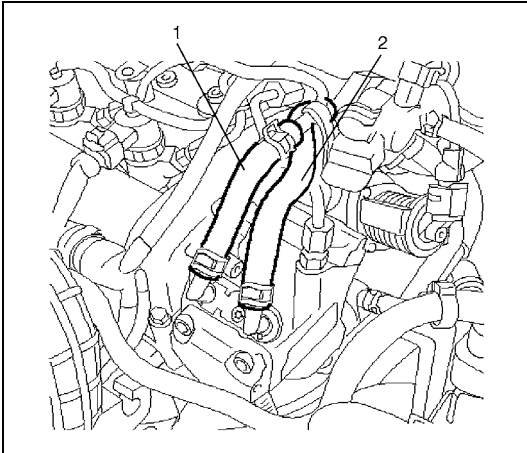
(c): 28 N·m (2.8 kg-m, 20.5 lb-ft)

- 5) Tighten high pressure pipe union nuts to specified torque referring to Step 6) of "Installation" under "Fuel injector removal and installation" in this section.
- 6) Connect connectors to fuel pressure regulator (6) and fuel pressure sensor (7).
- 7) Connect fuel return hoses (8) to common rail.
- 8) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 9) Connect negative cable to battery.
- 10) Check fuel leakage referring to "Fuel leakage check" in this section.

Injection pump removal and installation

Removal

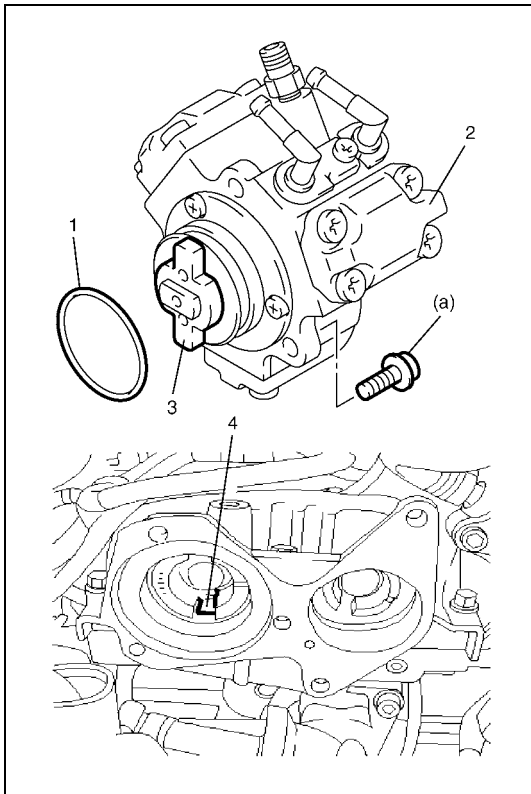
- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 3) Remove vacuum pump referring to "Vacuum pump removal and installation" in this section.
- 4) Remove high pressure supply pipe referring to Step 3) of "Removal" under "Common rail (High pressure fuel injection rail) removal and installation" in this section.
- 5) Disconnect fuel feed hose (1) and fuel return hose (2) from injection pump.



- 6) Remove injection pump (1) from camshaft housing by removing 3 bolts (2).

Installation

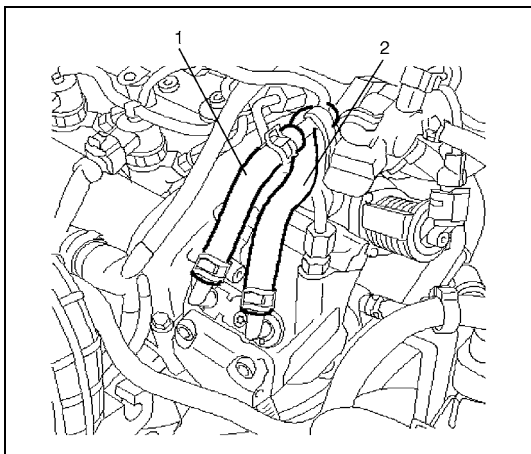
- 1) Clean mating surfaces of injection pump and camshaft housing.



- 2) Install new gasket (1) to injection pump.
- 3) Install injection pump (2) to camshaft housing.
Fit dogs (3) of injection pump coupling into the groove (4) of camshaft.
- 4) Tighten injection pump bolts to specified torque.

Tightening torque

Injection pump bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)



- 5) Connect fuel feed hose (1) and fuel return hose (2) to injection pump.

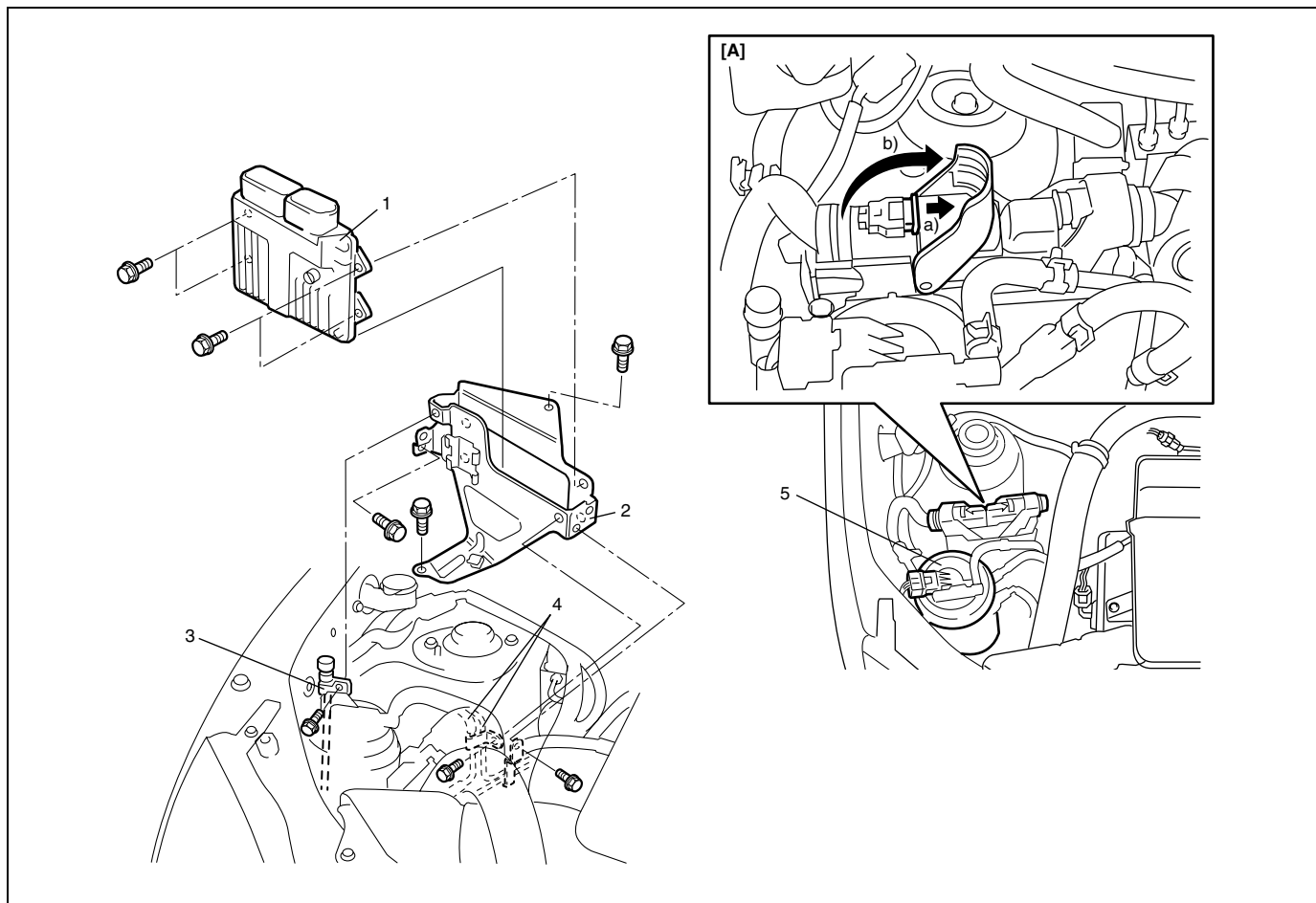
- 6) Install new high pressure supply pipe referring to Step 2) and 4) of "Installation" under "Common rail (High pressure fuel injection rail) removal and installation" in this section.
- 7) Install vacuum pump referring to "Vacuum pump removal and installation" in this section.
- 8) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 9) Connect negative cable to battery.
- 10) Check fuel leakage referring to "Fuel leakage check" in this section.

Electronic Control System

Engine control module (ECM) removal and installation

CAUTION:

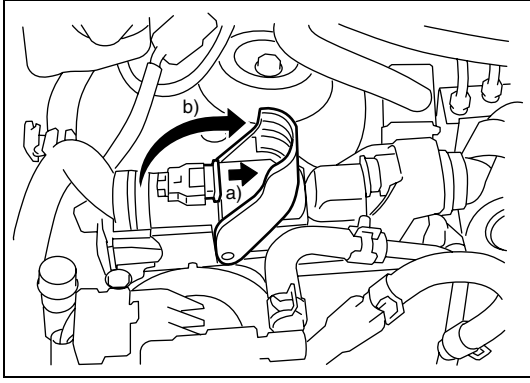
As ECM consists of precision parts, be careful not to expose it to excessive shock.



[A]: Disconnecting procedure for ECM connector	2. ECM bracket	4. Fuel pipe
1. ECM	3. A/C refrigerant pipe	5. Fuel filter assembly

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector from fuel filter assembly and then detach fuel filter assembly from ECM bracket.
- 3) Remove fuel pipe mounting bolts and A/C refrigerant pipe mounting bolt.



- 4) Disconnect connectors from ECM as follows.
 - a) Pull out lock slider to release locking of lock lever
 - b) Pull up the lock lever

- 5) Remove ECM with its bracket from vehicle body.
- 6) Remove ECM from ECM bracket.

Installation

NOTE:

If ECM is replaced, register vehicle specification (fuel injector calibration code, vehicle variant, password for immobilizer system and secret key code for immobilizer system) into ECM referring to “ECM registration” in this section and “Procedure after ECM replacement” in Section 8G3.

Reverse removal procedure for installation.

ECM registration

Procedure after ECM replacement

- 1) Connect SUZUKI scan tool to DLC.
- 2) Register the following information for ECM referring to “SUZUKI Scan Tool Operator’s Manual”.
 - Fuel injector calibration code
 - Vehicle variant (vehicle configuration (equipment such as ABS and A/C))
- 3) Using SUZUKI scan tool, register secret key code (SKC) and password for immobilizer system referring to “SUZUKI Scan Tool Operator’s Manual”.
- 4) Check for registration data referring to “Registration data check” in this section.

Procedure after fuel injector replacement

- 1) Connect SUZUKI scan tool to DLC.
- 2) Register the calibration code of the fuel injector, which is newly installed, for ECM referring to “SUZUKI Scan Tool Operator’s Manual”.
- 3) Check for registration data referring to “Registration data check” in this section.

Registration data check

- 1) Connect SUZUKI scan tool to data link connector (DLC) located on underside of instrument panel at driver's seat side.

Special tool

SUZUKI scan tool

- 2) Turn ignition switch to ON position.
- 3) Select "Data List" of "ECM registration" under "MISC Test" command in SELECT MODE menu of SUZUKI scan tool.
- 4) Confirm whether fuel injector calibration code and vehicle variant (vehicle configuration (equipment such as ABS and A/C)) installed on correspond to specification displayed on SUZUKI scan tool.

Register fuel injector calibration code and vehicle variant (vehicle configuration (equipment such as ABS and A/C)) into ECM referring to "ECM registration" in this section when it does not correspond.

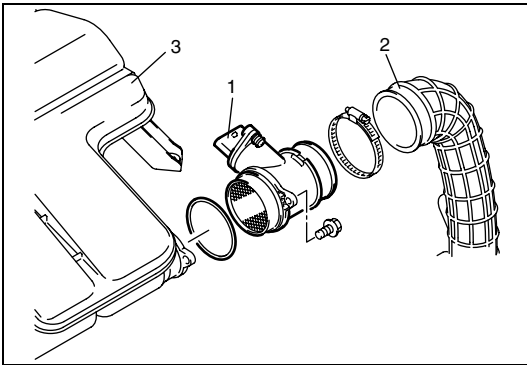
- 5) Push "EXIT" button of SUZUKI scan tool.

Mass air flow (MAF) and intake air temperature (IAT) sensor removal and installation

CAUTION:

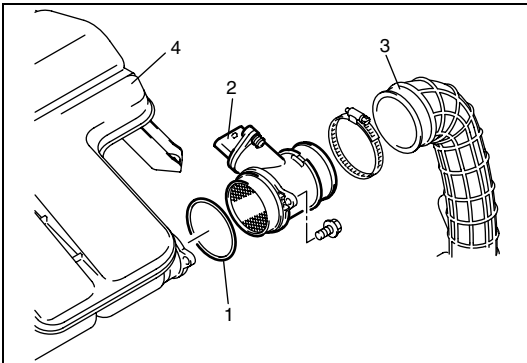
- Do not cleansing MAF and IAT sensor.
- If MAF and IAT sensor has been dropped it should be replaced.
- Don't disassemble MAF and IAT sensor.
- Do not expose MAF and IAT sensor to any shock.
- Do not blow compressed air by using air gun or the like.
- Do not put finger or any other object into MAF and IAT sensor. Malfunction may occur.

Removal



- 1) Disconnect negative cable at battery and coupler from MAF and IAT sensor (1).
- 2) Disconnect air cleaner outlet hose (2) from MAF and IAT sensor.
- 3) Remove MAF and IAT sensor from air cleaner case (3).

Installation



- 1) Check MAF and IAT sensor O-ring (1) for deterioration and damage.
If malfunction is found, replace O-ring.
- 2) Install MAF and IAT sensor (2) to air cleaner case (4).
- 3) Connect air cleaner outlet hose (3).
Tighten hose clamp to specified torque referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 4) Connect MAF sensor coupler securely.
- 5) Connect battery negative cable to battery.

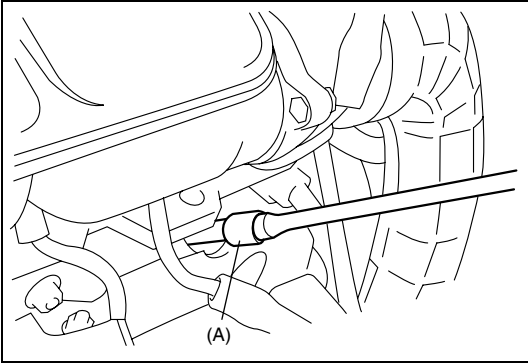
Glow plug removal and installation

Removal

CAUTION:

- Do not damage heating section of the glow plug.
- Do not use glow plug that has been dropped.
- When removing glow plug, first loosen it by using a tool so that one or more screw threads remain engaged, then loosen and remove by hand.

- 1) Disconnect negative (–) cable at battery.
- 2) Pull off glow plug wires (1).
- 3) Remove glow plugs (2) from cylinder head.

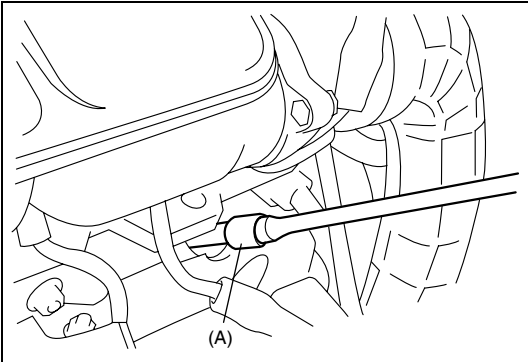
Special tool**(A): 09911-78610****Installation**

For installation, reverse removal procedure noting the following.

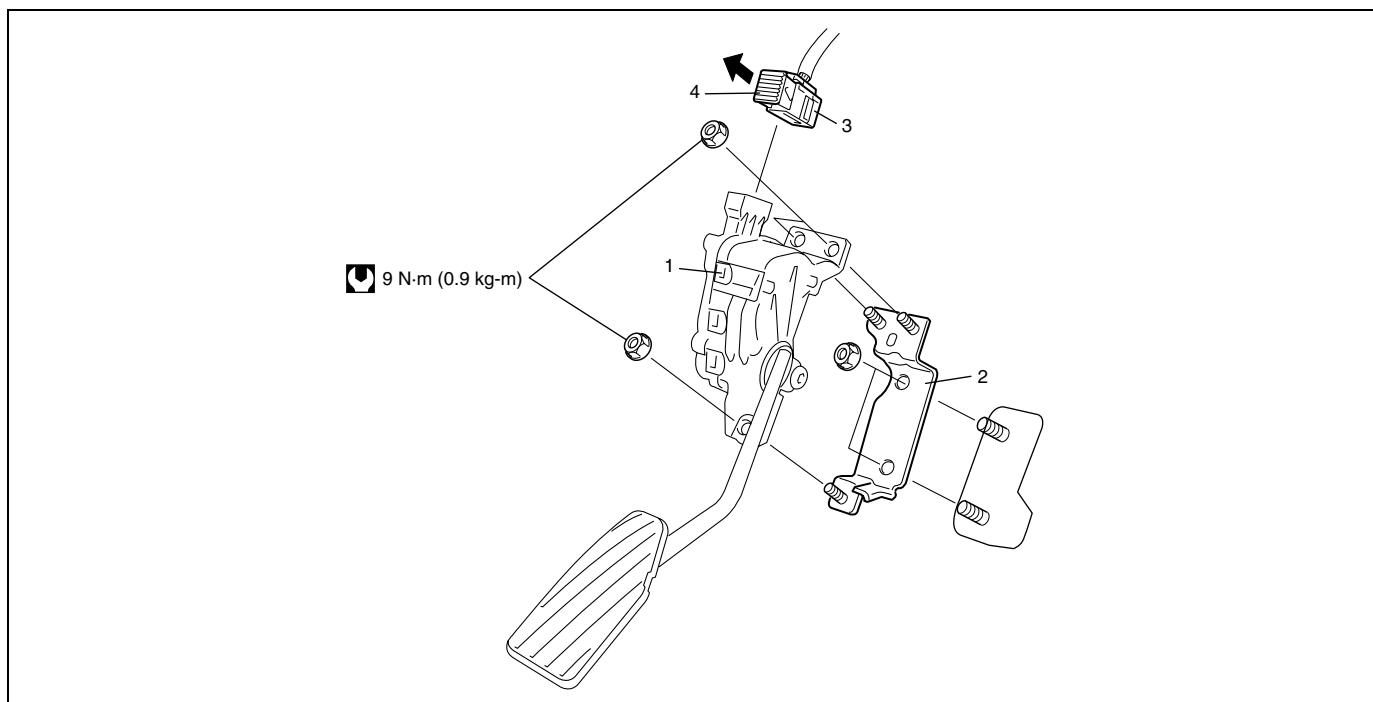
- Tightening glow plug (1) to specified torque.

Special tool**(A): 09911-78610****Tightening torque****Glow plug (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)**

- Connect glow plug wires (2) securely.



Pedal position sensor removal and installation



1. Accelerator pedal assembly	3. Pedal position sensor connector	: Tightening torque
2. Accelerator pedal bracket	4. Pedal position sensor connector lock lever	

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector from pedal position sensor by pull off the lock lever.
- 3) Remove accelerator pedal assembly from vehicle body.

Installation

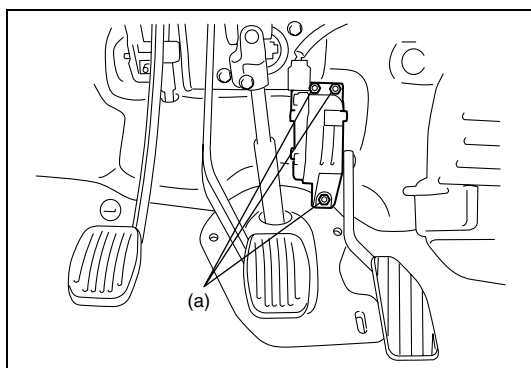
Reverse removal procedure for installation noting the followings.

- Connect pedal position sensor connector securely.
- Tighten accelerator pedal assembly mounting nuts to specified torque.

Tightening torque

Accelerator pedal mounting nut

(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



Fuel heater and temperature sensor removal and installation

Removal

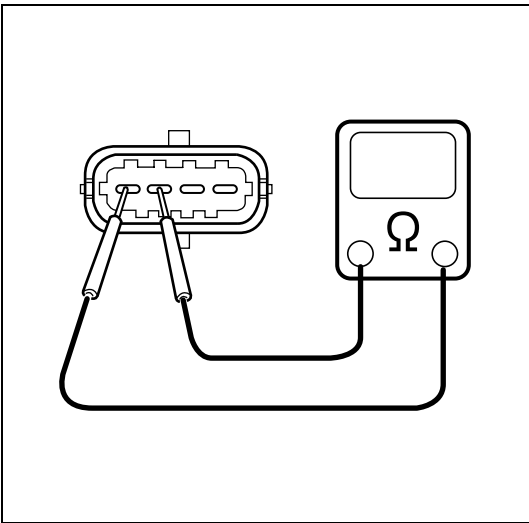
- 1) Disconnect negative cable at battery.
- 2) Remove fuel heater and temperature sensor (fuel filter cap) referring to “Fuel Filter Element Removal and Installation” in Section 6C3.

Installation

Reverse removal procedure for installation.

Fuel temperature sensor inspection

- 1) Remove fuel temperature sensor referring to “Fuel heater and temperature sensor removal and installation” in this section.
- 2) Check for resistance between fuel temperature sensor terminals.
If not as specified, replace fuel heater and temperature sensor.



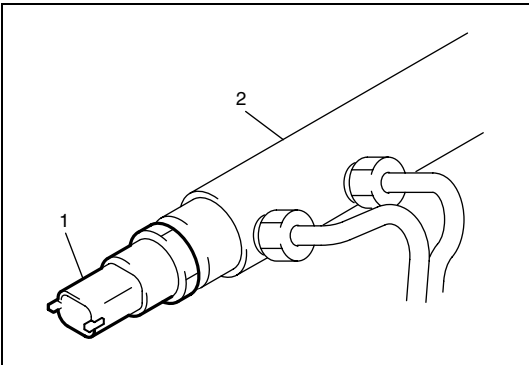
Fuel temperature sensor resistance

Water temperature °C (°F)	Resistance (kΩ)
0 (32)	5.97
20 (68)	2.50
40 (104)	1.15
60 (140)	0.58
80 (176)	0.31
100 (212)	0.18

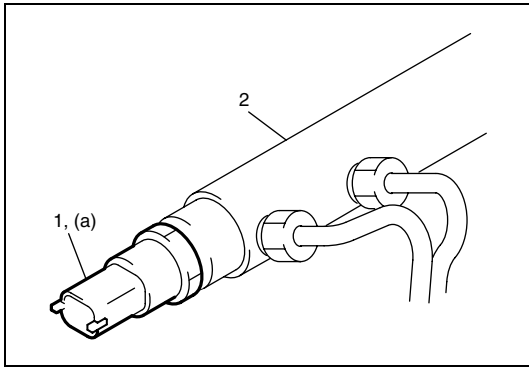
Fuel pressure sensor removal and installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation” in Section 6A3.
- 3) Disconnect fuel pressure sensor connector.
- 4) Remove fuel pressure sensor (1) from common rail (2).



Installation



- 1) Install fuel pressure sensor (1) to common rail (2).
Tighten fuel pressure sensor to specified torque.

Tightening torque

Fuel pressure sensor

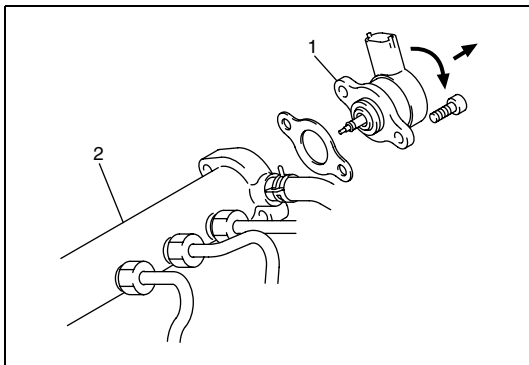
(a): 70 N·m (7.0 kg-m, 50.5 lb-ft)

- 2) Connect fuel pressure sensor connector.
- 3) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 4) Connect negative cable to battery.
- 5) Check fuel leakage referring to "Fuel leakage check" in this section.

Fuel pressure regulator removal and installation

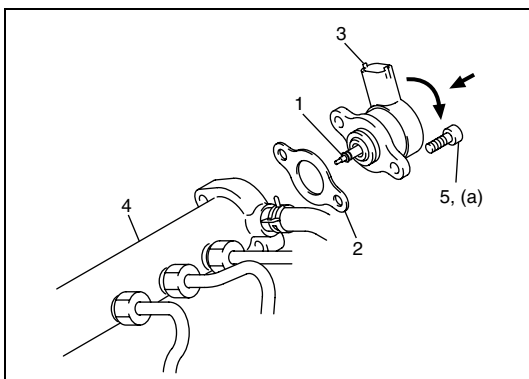
Removal

- 1) Disconnect negative cable at battery.
- 2) Remove vacuum pump referring to "Vacuum pump removal and installation" in this section.
- 3) Disconnect fuel pressure regulator connector.
- 4) Pull out fuel pressure regulator (1) from common rail (2) with turning it counterclockwise by hand.



Installation

- 1) Apply fuel to seal rings (1) of fuel pressure regulator.
- 2) Using new gasket (2), push fuel pressure regulator (3) to common rail (4) with turning it counterclockwise by hand.
- 3) Tighten fuel pressure regulator bolts (5) to specified torque.



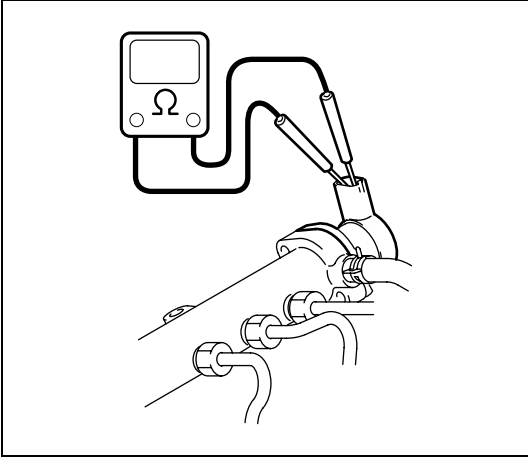
Tightening torque

Fuel pressure regulator bolt

(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

- 4) Install vacuum pump referring to “Vacuum pump removal and installation” in this section.
- 5) Connect negative cable to battery.
- 6) Check fuel leakage referring to “Fuel leakage check” in this section.

Fuel pressure regulator inspection



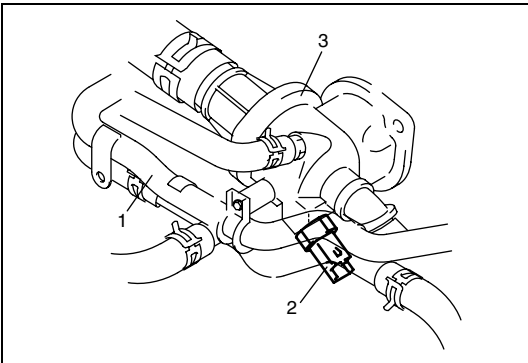
Check resistance between terminals of fuel pressure regulator. If resistance is out of specification, replace fuel pressure regulator referring to “Fuel pressure regulator removal and installation” in this section.

Fuel pressure regulator resistance
2.07 – 2.53 Ω at 20°C, 68°F

Engine coolant temperature sensor (ECT sensor) removal and installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Drain cooling system.
- 3) Detach heater outlet pipe (1).
- 4) Disconnect ECT sensor connector.
- 5) Remove ECT sensor (2) from thermostat housing (3).



Installation

- 1) Apply thread lock compound to thread part of ECT sensor.

: **Loctite omnifit 100 M spezial**

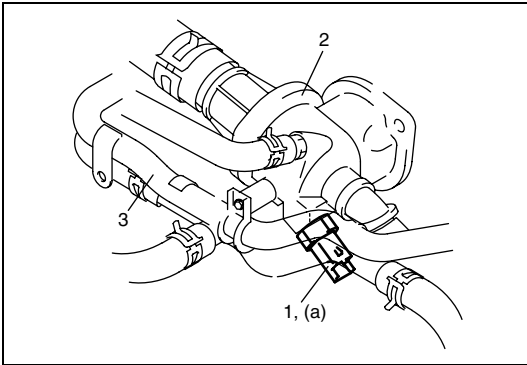
- 2) Install ECT sensor (1) to thermostat housing (2).
Tighten ECT sensor to specified torque.

Tightening torque

ECT sensor

(a): **34 N·m (3.4 kg-m, 24.5 lb-ft)**

- 3) Connect ECT sensor connector.
- 4) Install heater outlet pipe (3).



- 5) Refill cooling system referring to “Cooling System Flush and Refill” in Section 6B3.
- 6) Connect negative cable to battery.
- 7) Check cooling system leakage referring to “Cooling System Inspection and Service” in Section 6B3.

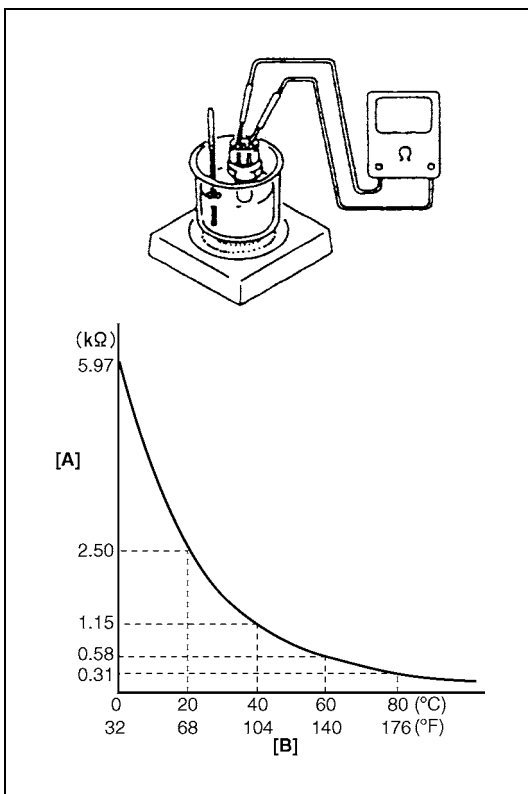
Engine coolant temperature sensor (ECT sensor) inspection

- 1) Remove ECT sensor referring to “Engine coolant temperature sensor (ECT sensor) removal and installation” in this section.
- 2) Immerse temperature sensing part of ECT sensor in water and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't shown such characteristic as shown, replace ECT sensor.

ECT sensor resistance

Water temperature °C (°F)	Resistance (kΩ)
0 (32)	5.97
20 (68)	2.50
40 (104)	1.15
60 (140)	0.58
80 (176)	0.31
100 (212)	0.18

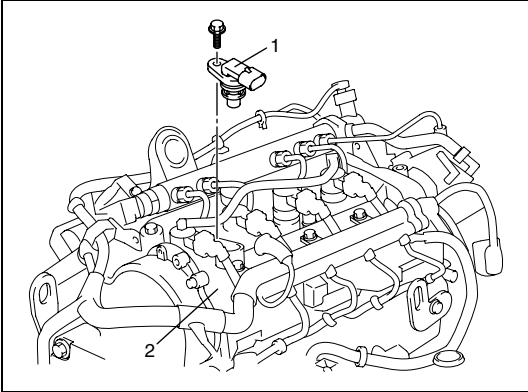
1. Resistance
2. Temperature



Camshaft position sensor (CMP sensor) removal and installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 3) Disconnect CMP sensor connector.
- 4) Remove CMP sensor (1) from camshaft housing (2).

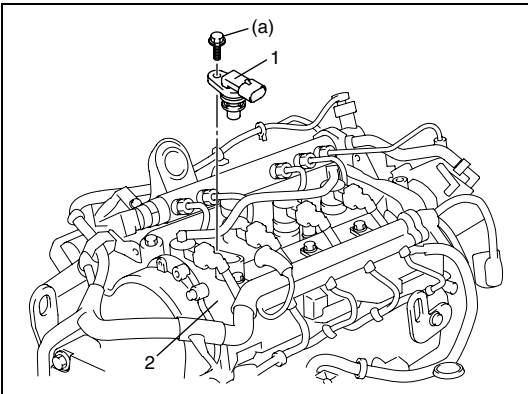


Installation

- 1) Install CMP sensor (1) to camshaft housing (2).
Tighten CMP sensor bolt to specified torque.

Tightening torque

CMP sensor bolt (a): 7 N·m (0.7 kg-m, 5.0 lb-ft)

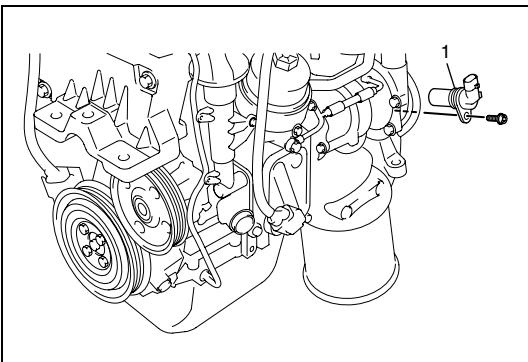


- 2) Connect CMP sensor connector.
- 3) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 4) Connect negative cable to battery.

Crankshaft position (CKP) sensor (engine speed sensor) removal and installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Hoist vehicle.
- 3) Disconnect CKP sensor connector.
- 4) Remove CKP sensor (1) from cylinder block.



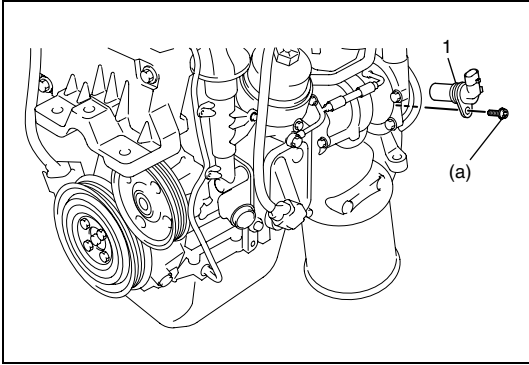
Installation

Reverse removal procedure for installation noting the following.

- Clean CKP sensor and sensor rotor teeth.
- Install CKP sensor (1) to cylinder block.

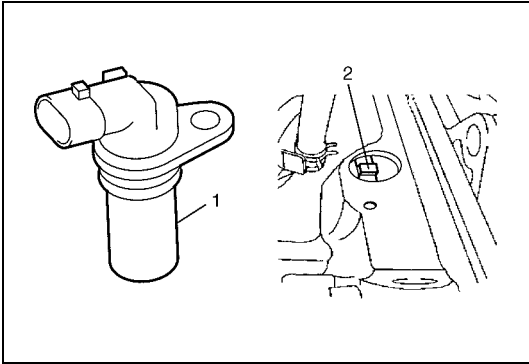
Tightening torque

CKP sensor bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



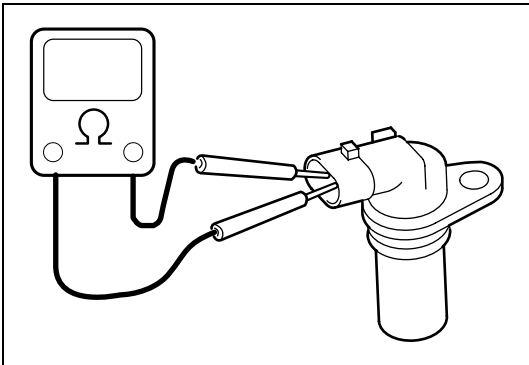
Crankshaft position (CKP) sensor (engine speed sensor) inspection

- 1) Remove CKP sensor referring to “Crankshaft position (CKP) sensor (engine speed sensor) removal and installation” in this section.
- 2) Check that CKP sensor (1) and sensor rotor tooth (2) is free from any metal particles and damage.



- 3) Check that resistance between terminals of CKP sensor is within specification.
If above check as not specified, replace CKP sensor.

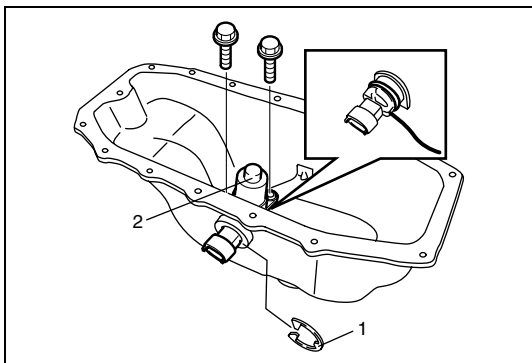
CKP sensor resistance: 632 – 948 Ω



Engine oil level switch removal and installation (If equipped)

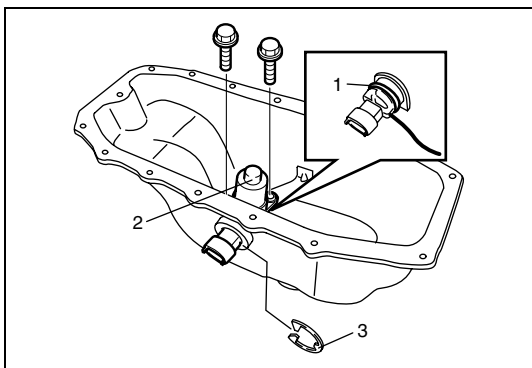
Removal

- 1) Disconnect negative cable at battery.
- 2) Remove oil pan referring to "Oil Pan Removal and Installation" in Section 6A3.
- 3) Remove clip (1).
- 4) Remove engine oil level switch (2) from oil pan.



Installation

- 1) Check O-ring (1) of engine oil level switch deformed or damaged.
If malfunction is found, replace engine oil level switch.
- 2) Install engine oil level switch (2) to oil pan.
- 3) Install clip (3) to engine oil level switch connector securely.



- 4) Install oil pan referring to "Oil Pan Removal and Installation" in Section 6A3.
- 5) Connect negative cable to battery.
- 6) Check to make sure that there is no engine oil leakage.

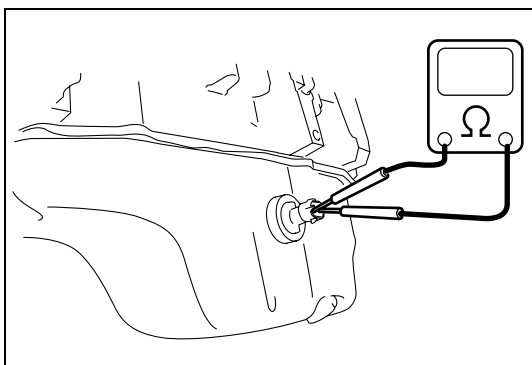
Engine oil level switch inspection (If equipped)

- 1) Disconnect negative cable at battery.
- 2) Hoist vehicle.
- 3) Check for continuity between terminals of engine oil level switch.
If found defective, replace engine oil level switch.

Engine oil level switch specification

When engine oil is filled up to specified level: Continuity

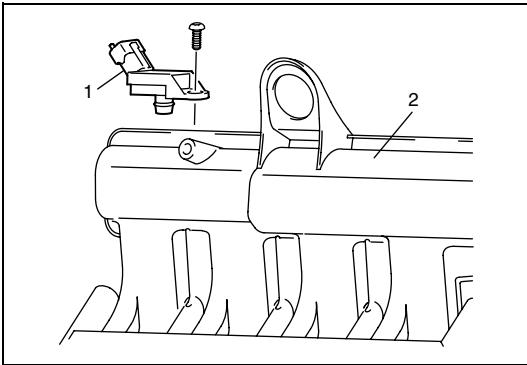
When engine oil is drained: No continuity



Boost pressure sensor removal and installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector from boost pressure sensor (1).
- 3) Remove boost pressure sensor from intake manifold.



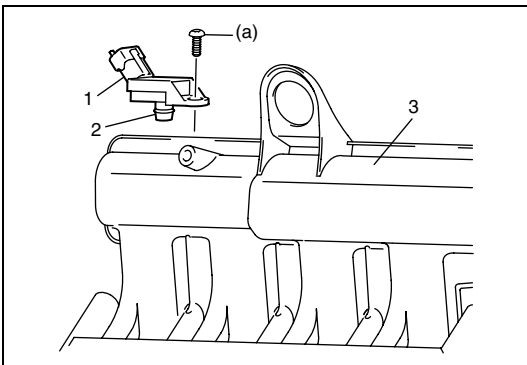
Installation

- 1) Check O-ring (2) of boost pressure sensor (1) deformed or damage.
If malfunction is found, replace boost pressure sensor.
- 2) Install boost pressure sensor (1) to intake manifold (3).
Tighten boost pressure sensor bolt to specified torque.

Tightening torque

Boost pressure sensor bolt

(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



- 3) Connect connector to boost pressure sensor securely.
- 4) Connect negative cable at battery.

Radiator fan control system inspection

WARNING:

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch in the "ON" position.

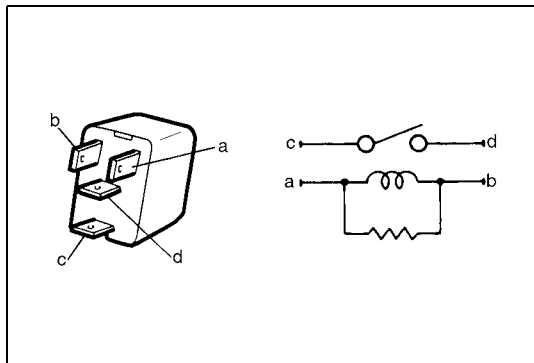
Check system for operation referring to "C-32, Fan Circuit" in Section 6-3.

If radiator fan fails to operate properly, check relay, radiator fan and electrical circuit.

Fuel pump relay and radiator fan relay 1, 2, 3 inspection

NOTE:

Check for installation position of each relay referring to “Wiring Diagram Manual” described in “Foreword” of this manual.

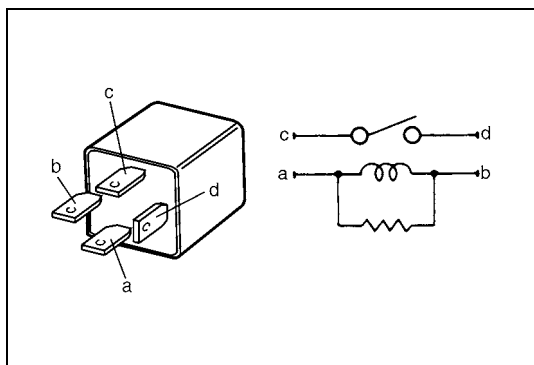


- 1) Check that there is no continuity between terminal “c” and “d”.
If there is continuity, replace relay.
- 2) Connect battery positive (+) terminal to terminal “b” of relay.
Connect battery negative (–) terminal “a” of relay.
Check continuity between terminal “c” and “d”.
If there is no continuity when relay is connected to the battery, replace relay.

Main relay and fuel heating relay inspection

NOTE:

Check for installation position of each relay referring to “Wiring Diagram Manual” described in “Foreword” of this manual.

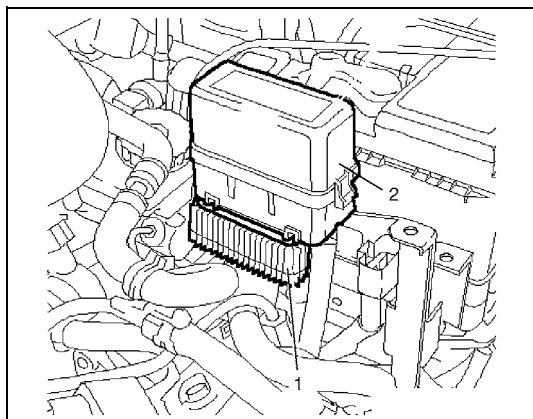


- 1) Check that there is no continuity between terminal “c” and “d”.
if there is continuity, replace relay.
- 2) Connect battery positive (+) terminal to terminal “b” of relay.
Connect battery negative (–) terminal “a” of relay.
Check continuity between terminal “c” and “d”.
If there is no continuity when relay is connected to the battery, replace relay.

Glow controller removal and installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Detach relay box (2) from bracket.
- 3) Remove glow controller (1) from bracket.



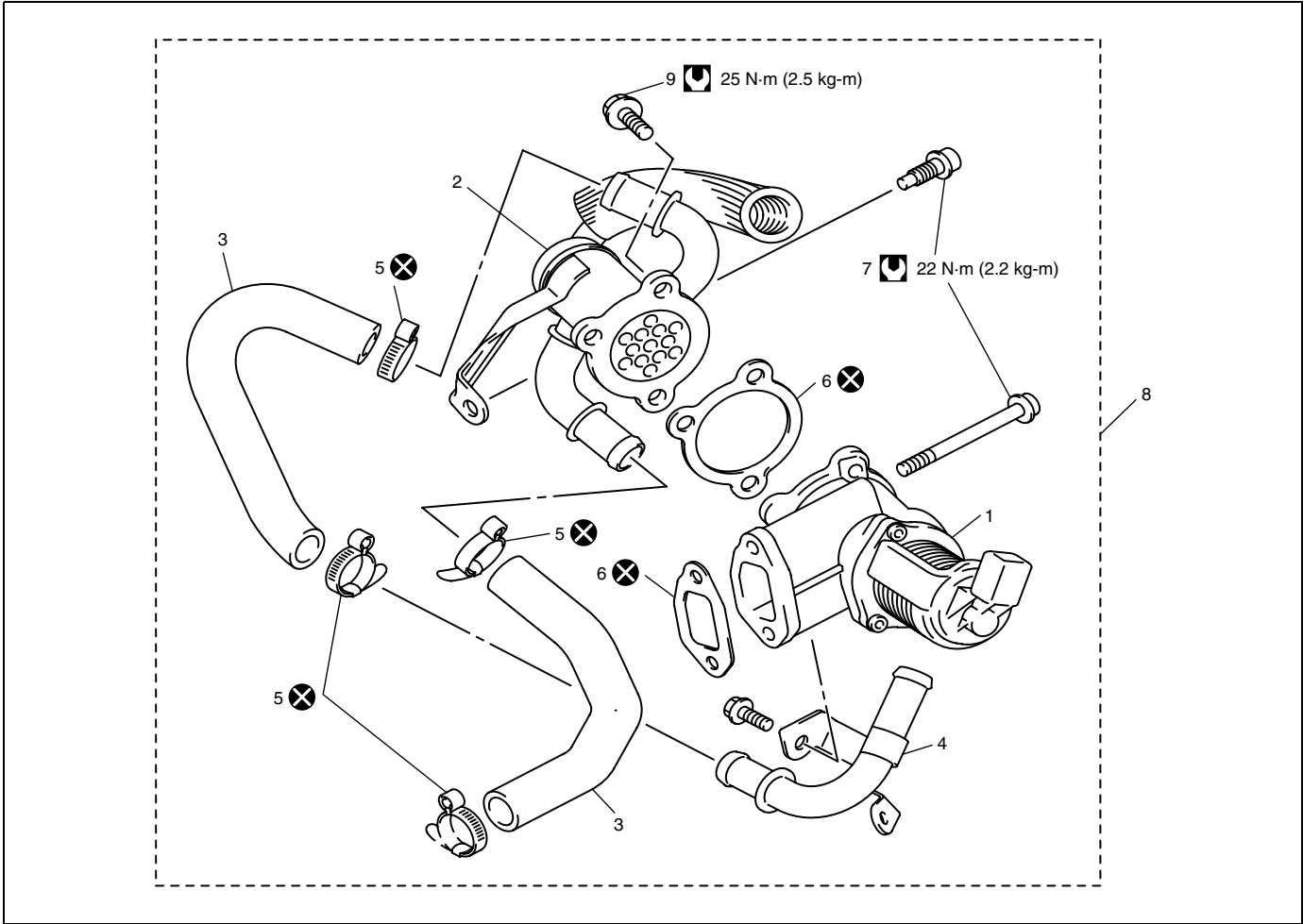
- 4) Disconnect connector from glow controller.

Installation

Reverse removal procedure for installation.

EGR System

EGR valve assembly component

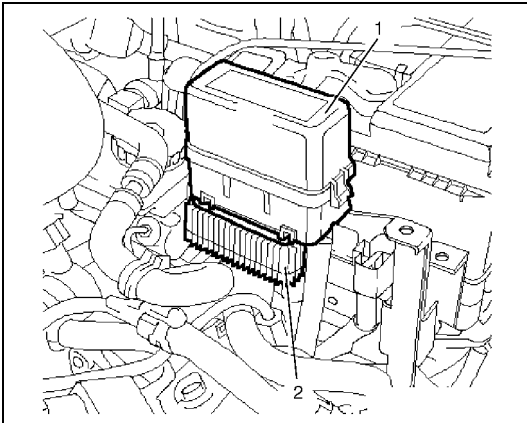


1. EGR valve	4. EGR cooler pipe	7. EGR valve assembly mounting bolt	: Tightening torque
2. EGR cooler	5. Clamp	8. EGR valve assembly	: Do not reuse
3. EGR cooler hose	6. Gasket	9. EGR cooler bolt	

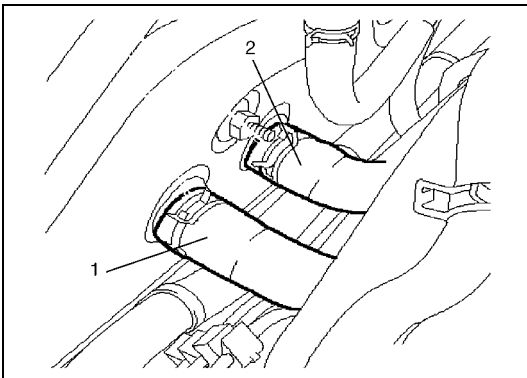
EGR valve assembly removal and installation

Removal

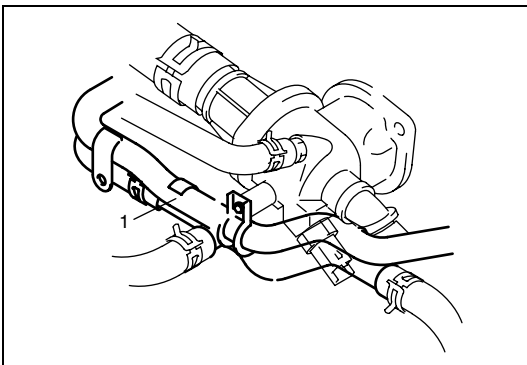
- 1) Disconnect negative cable at battery.
- 2) Drain cooling system.
- 3) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 4) Remove intercooler outlet No.2 hose referring to "Inter Cooler Components" in Section 6A3.
- 5) Remove air intake joint referring to "Intake Manifold Removal and Installation" in Section 6A3.
- 6) Disconnect fuel return hose from common rail.
- 7) Detach relay box (1) and glow controller (2) from bracket.



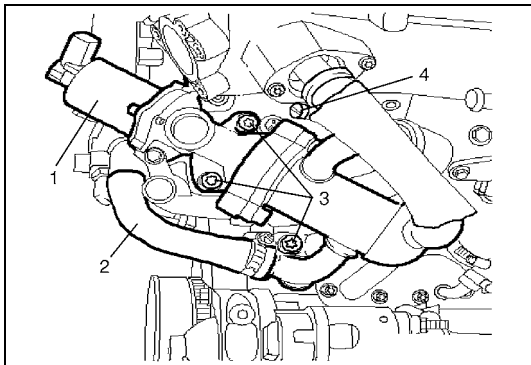
- 8) Remove heater inlet (1) and outlet No.2 hoses (2) from heater core.



- 9) Remove heater outlet pipe (1).



- 10) Disconnect connector from EGR valve.



- 11) Disconnect EGR cooler hose (2) from thermostat housing.
- 12) Remove EGR valve assembly (1) from cylinder head by removing 3 bolts (3) and clamp (4).

Installation

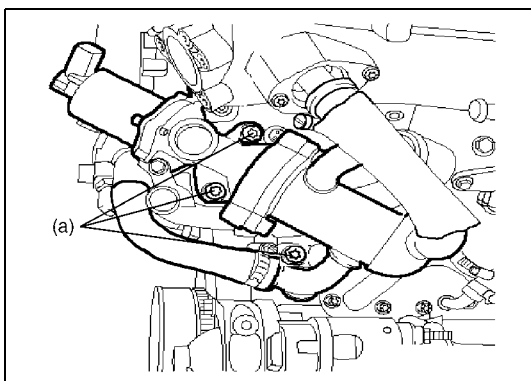
Reverse removal procedure for installation noting the followings.

- Clean mating surface of EGR valve assembly and cylinder head.
- Use new gaskets.
- Tighten EGR valve assembly mounting bolts to specified torque.

Tightening torque

EGR valve assembly mounting bolt

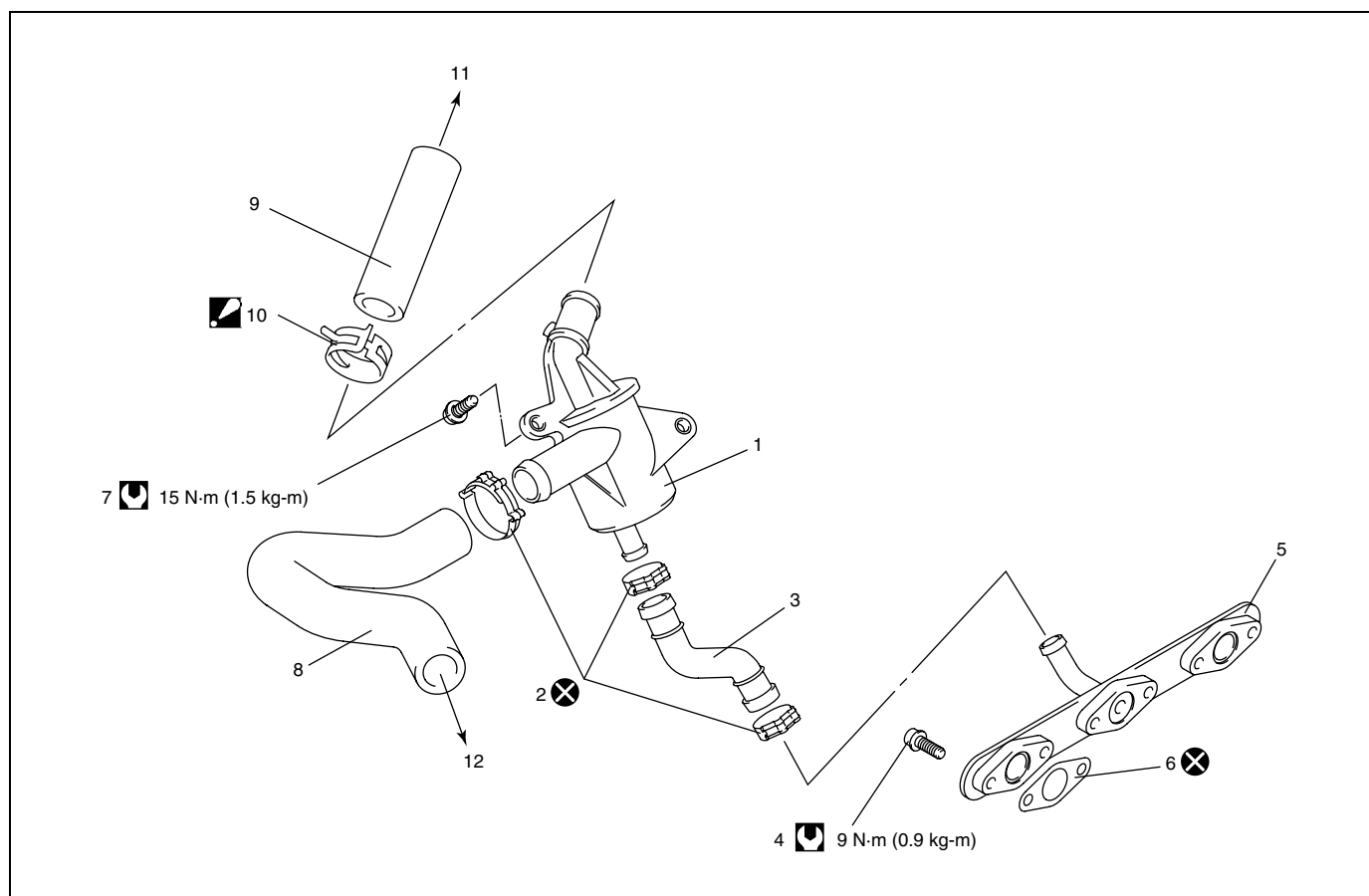
(a): 22 N·m (2.2 kg-m, 16.0 lb-ft)



- Use new cooler hose clamps.
- Install air intake joint referring to "Intake Manifold Removal and Installation" in Section 6A3.
- Install intercooler outlet No.2 hose referring to "Inter Cooler Components" in Section 6A3.
- Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- Refill cooling system referring to "Cooling System Flush and Refill" in Section 6B3.
- Check cooling system leakage referring to "Cooling System Inspection and Service" in Section 6B3.

Crankcase Ventilation System

Crankcase ventilation system component

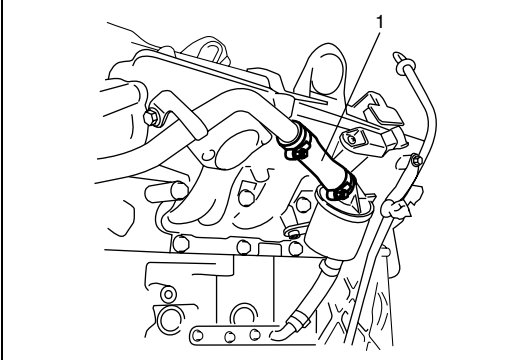


1. Oil separator	6. Gasket	11. To breather pipe
2. Clamp	7. Oil separator mounting bolt	12. To connector
3. Ventilation hose No.1	8. Ventilation hose No.2	 : Tightening torque
4. Crankcase ventilation cover mounting bolt	9. Breather hose	 : Do not reuse.
5. Crankcase ventilation cover	 10. Breather hose clip Be sure to position clip in specified direction as shown in figure.	

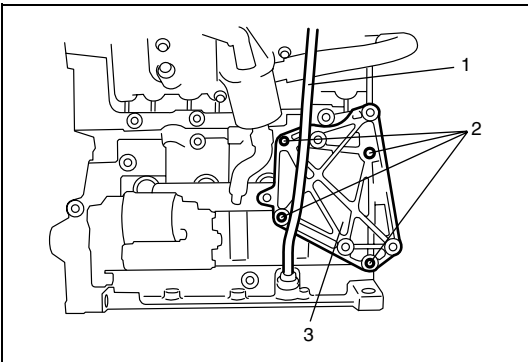
Oil separator and crankcase ventilation cover removal and installation

Removal

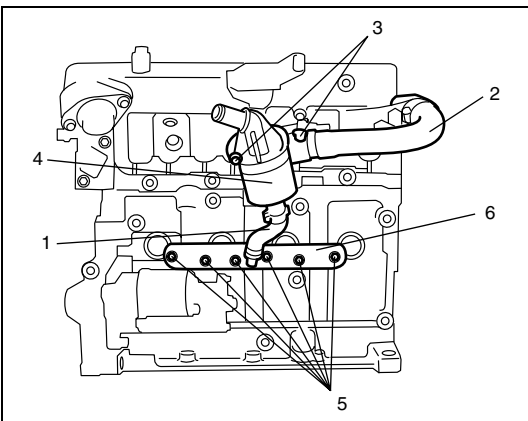
- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation" in Section 6A3.
- 3) Remove EGR valve assembly referring to "EGR valve assembly removal and installation" in this section.
- 4) Disconnect breather hose (1) from oil separator.



- 5) Remove generator assembly referring to "Generator Dismounting and Remounting" in Section 6H3.



- 6) Remove oil level gauge guide (1) with oil level gauge.
- 7) Remove generator bracket (3) from cylinder block by removing generator bracket mounting bolts (2).



- 8) Disconnect ventilation hose No.2 (2) from oil separator.
- 9) Loosen ventilation hose No.1 clamp at oil separator side.
- 10) Remove oil separator mounting bolts (3).
- 11) Remove oil separator (4) by disconnecting ventilation hose No.1 (1).
- 12) Remove crankcase ventilation cover (6) with ventilation hose No.1 by removing crankcase ventilation cover mounting bolts (5).

Installation

Reverse removal procedure for installation noting the followings.

- Clean mating surfaces of crankcase ventilation cover and cylinder block.
- Use new crankcase ventilation cover gaskets and ventilation hose clamps.
- Tighten crankcase ventilation cover mounting bolts, oil separator mounting bolts and generator bracket mounting bolts to specified torque.

Tightening torque

Crankcase ventilation cover mounting bolt

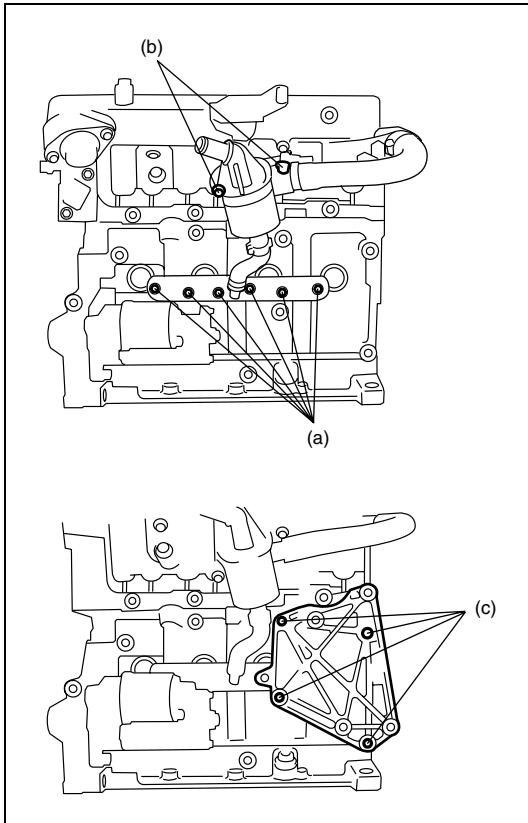
(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

Oil separator mounting bolt

(b): 15 N·m (1.5 kg-m, 10.8 lb-ft)

Generator bracket mounting bolt

(c): 25 N·m (2.5 kg-m, 18.0 lb-ft)



- Install generator referring to “Generator Dismounting and Remounting” in Section 6H3.
- Install EGR valve assembly referring to “EGR valve assembly removal and installation” in this section.
- Install air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation” in Section 6A3.

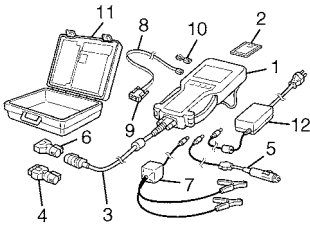
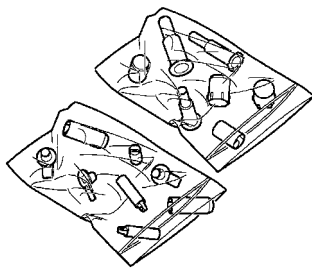
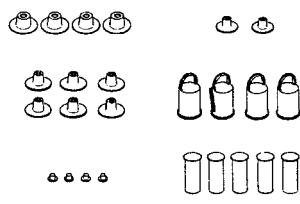
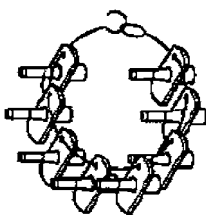
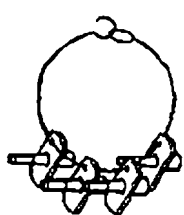
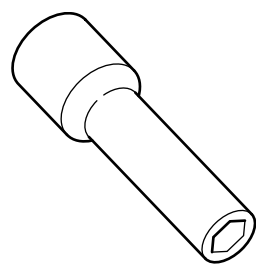
Required Service Material

Recommended SUZUKI Material or Specification	Use
Loctite omnifit 100M spezial	To apply to thread part of ECT sensor.

Tightening Torque Specification

Fastening part	Tightening torque		
	N·m	kg-m	lb-ft
Vacuum pump bolt	5 N·m (0.5 kg-m, 4.0 lb-ft) and then 20 N·m (2.0 kg-m, 14.5 lb-ft)		
Glow plug	10	1.0	7.5
Fuel injector bracket bolt	20	2.0	14.5
High pressure pipe union nut (fuel injector side)	24	2.4	17.5
High pressure pipe union nut (common rail side)	28	2.8	20.5
Common rail bolt	25	2.5	18.0
High pressure supply pipe union nut (fuel injector side)	24	2.4	17.5
High pressure supply pipe union nut (common rail side)	28	2.8	20.5
Injection pump bolt	15	1.5	11.0
Accelerator pedal mounting nut	9	0.9	6.5
Fuel pressure sensor	9	0.9	6.5
Fuel pressure regulator bolt	70	7.0	50.5
ECT sensor	34	3.4	24.5
CMP sensor bolt	7	0.7	5.0
CKP sensor bolt	9	0.9	6.5
Boost pressure sensor bolt	9	0.9	6.5
EGR valve assembly mounting bolt	22	2.2	16.0
Crankcase ventilation cover mounting bolt	9	0.9	6.5
Oil separator mounting bolt	15	1.5	10.8
Generator bracket mounting bolt	25	2.5	18.0
EGR cooler bolt	25	2.5	18.0

Special Tool

 Tech 2 kit (SUZUKI scan tool) (See NOTE)	 09914-65420 Plug cap for fuel system (OUT0000173/9780)	 09916-50010 Fuel system, plug set (OUT0000149)	 09919-48320 Plug kit (KM-807)
 09919-48310 Plug kit (KM-6015)	 09911-78610 Glowplug wrench		

NOTE:

This kit includes the following items.

1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable,
6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter,
10. RS232 loopback connector, 11. Storage case, 12. Power supply

SECTION 6G3

CRANKING SYSTEM (Z13DT ENGINE)

6G3

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

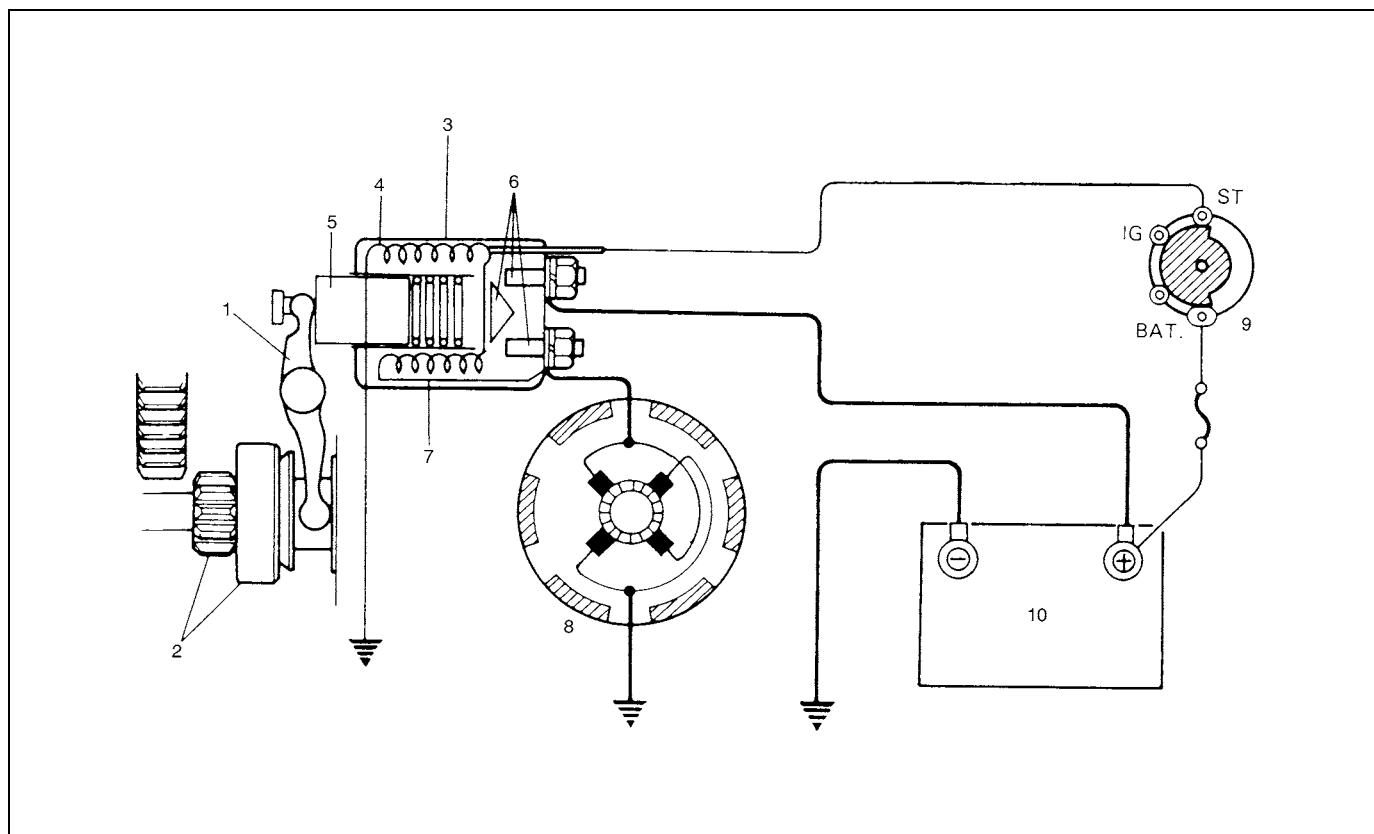
- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “System Components and Wiring Location View and Connections” under “General Description” in Section 10B in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in Section 10B before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

General Description	6G3-2	No-load performance test	6G3-5
Cranking System Circuit Diagram	6G3-2	ON-Vehicle Service	6G3-6
Diagnosis	6G3-2	Starting Motor Dismounting and	
Cranking System Symptom Diagnosis	6G3-2	Remounting	6G3-6
Cranking System Test	6G3-4	Dismounting	6G3-6
Pull-in test	6G3-4	Remounting	6G3-6
Hold-in test	6G3-4	Tightening Torque Specification	6G3-6
Plunger and pinion return test	6G3-4		

General Description

Cranking System Circuit Diagram



1. Pinion drive lever	5. Plunger	9. Ignition & Starter switch
2. Pinion & Over-running clutch	6. Magnetic switch contacts	10. Battery
3. Magnetic switch	7. Pull-in coil	
4. Hold-in coil	8. Starting motor	

Diagnosis

Cranking System Symptom Diagnosis

Possible symptoms due to starting system trouble would be as follows:

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies.....in battery, wiring harness, (including starting motor switch), starting motor or engine.

Do not remove motor just because starting motor does not run. Check following items and narrow down scope of possible causes.

- 1) Condition of trouble
- 2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
- 3) Discharge of battery
- 4) Mounting of starting motor

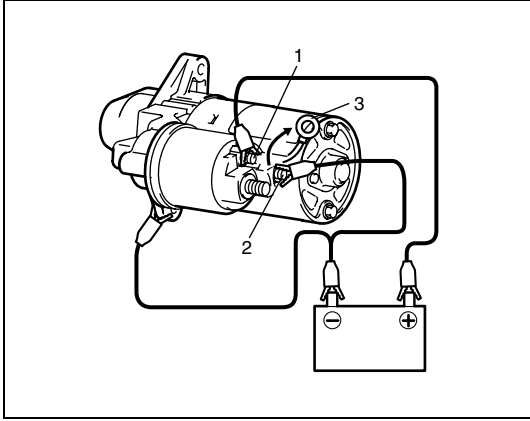
Condition	Possible Cause	Correction
Motor not running (No operating sound of magnetic switch)	Battery run down	Recharge battery.
	Battery voltage too low due to battery deterioration	Replace battery.
	Poor contact in battery terminal connection	Retighten or replace.
	Loose grounding cable connection	Retighten.
	Fuse set loose or blown off	Tighten or replace.
	Poor contacting action of ignition switch and magnetic switch	Replace.
	Lead wire coupler loose in place	Retighten.
	Open-circuit between ignition switch and magnetic switch	Repair.
	Open-circuit in pull-in coil	Replace starting motor.
	Brushes are seating poorly or worn down	Replace starting motor.
	Poor sliding of plunger and/or pinion	Replace starting motor.
Motor not running (Operating sound of magnetic switch heard)	Battery run down	Recharge battery.
	Battery voltage too low due to battery deterioration	Replace battery.
	Loose battery cable connections	Retighten.
	Burnt main contact point, or poor contacting action of magnetic switch	Replace starting motor.
	Brushes are seating poorly or worn down	Replace starting motor.
	Weakened brush spring	Replace starting motor.
	Burnt commutator	Replace starting motor.
	Layer short-circuit of armature	Replace starting motor.
	Crankshaft rotation obstructed	Repair.
Starting motor running but too slow (small torque) (If battery and wiring are satisfactory, inspect starting motor)	Insufficient contact of magnetic switch main contacts	Replace starting motor.
	Layer short-circuit of armature	Replace starting motor.
	Disconnected, burnt or worn commutator	Replace starting motor.
	Worn brushes	Replace starting motor.
	Weakened brush springs	Replace starting motor.
	Burnt or abnormally worn end bush	Replace starting motor.
Starting motor running, but not cranking engine	Worn pinion tip	Replace starting motor.
	Poor sliding of over-running clutch	Replace starting motor.
	Over-running clutch slipping	Replace starting motor.
	Worn teeth of ring gear	Replace flywheel.
Noise	Abnormally worn bush	Replace starting motor.
	Worn pinion or worn teeth of ring gear	Replace starting motor or flywheel.
	Poor sliding of pinion (failure in return movement)	Replace starting motor.
	Worn internal or planetary gear teeth	Replace starting motor.
	Lack of oil in each part	Replace starting motor.
Starting motor does not stop running	Fused contact points of magnetic switch	Replace starting motor.
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	Replace starting motor.
	Failure of returning action in ignition switch	Replace.

Cranking System Test

CAUTION:

Each test must be performed within 3 – 5 seconds to avoid coil from burning.

Pull-in test



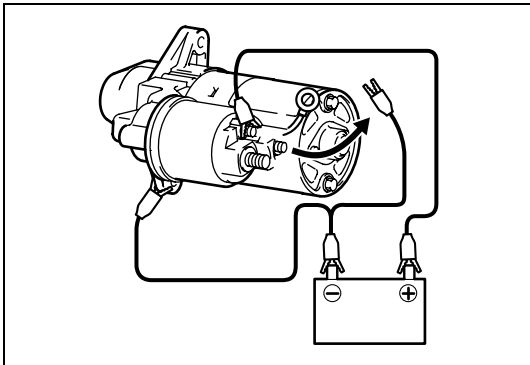
Connect battery to magnetic switch as shown.
Check that plunger and pinion move outward.
If plunger and pinion don't move, replace starting motor.

NOTE:

Before testing, disconnect lead wire (3) from terminal M (2).

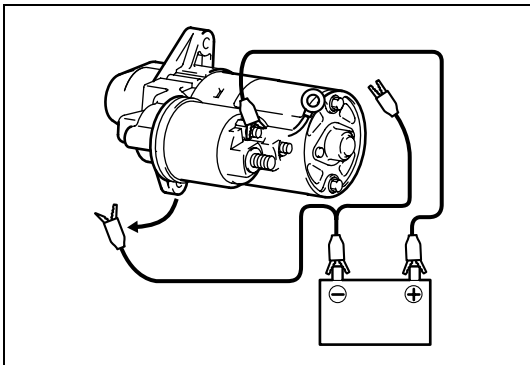
1. Terminal "S"

Hold-in test



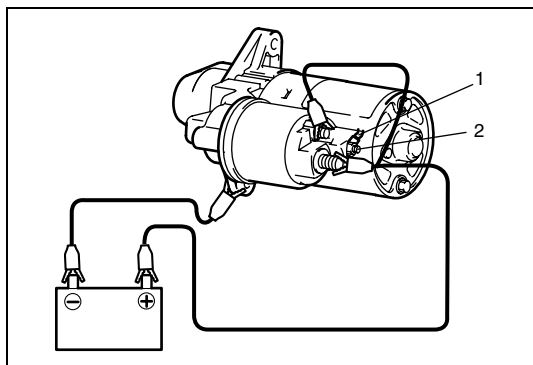
While connected as above with plunger out, disconnect negative lead from terminal "M".
Check that plunger and pinion remain out.
If plunger and pinion return inward, replace starting motor.

Plunger and pinion return test



Disconnect negative lead from starting motor body.
Check that plunger and pinion return inward.
If plunger and pinion don't return, replace starting motor.

No-load performance test



Connect lead wire (1) to terminal M (2).

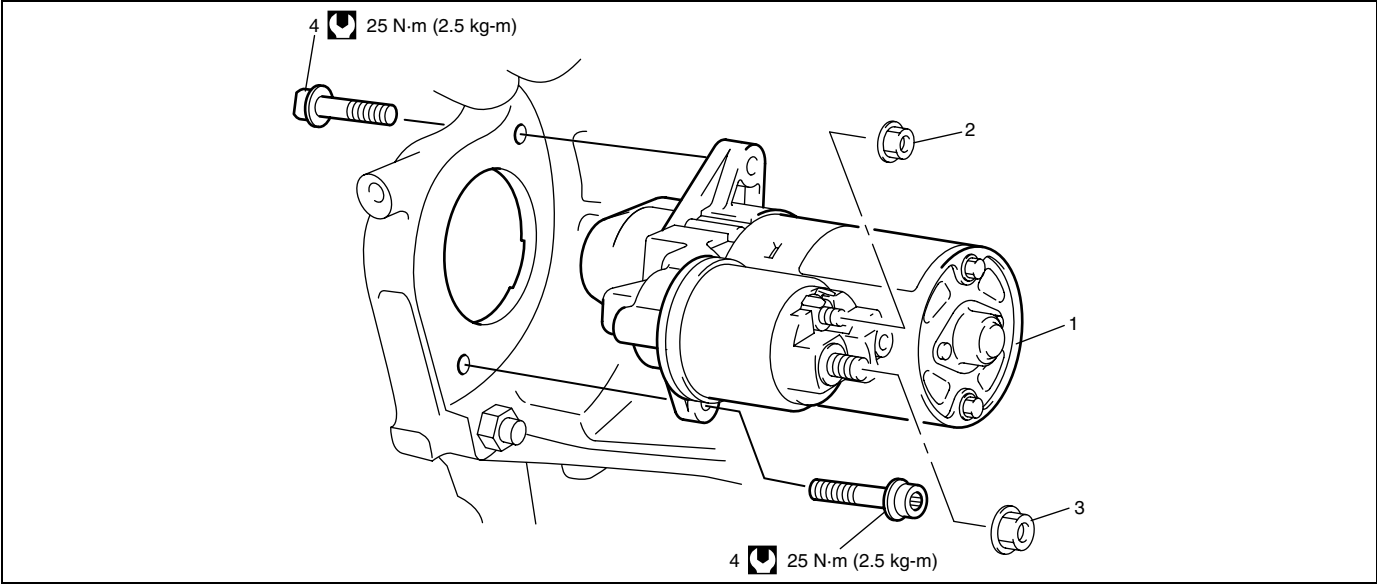
Connect battery to starting motor as shown.

Check that starting motor rotates smoothly and steadily with pinion moving out.

If check result is not satisfactory, replace starting motor.

ON-Vehicle Service

Starting Motor Dismounting and Remounting



1. Starting motor	3. Battery cable nut	Tightening torque
2. Magnetic switch lead wire nut	4. Starting motor mount bolt	

Dismounting

- 1) Disconnect negative cable at battery.
- 2) Remove battery and battery tray, if necessary.
- 3) Pull out the rubber lid from transmission case for removing starting motor mount bolt.
- 4) Remove starting motor mount bolt (upper side).

NOTE:

Make sure that starting motor mount bolt (upper side) does not fall into transmission case.

- 5) Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
- 6) Remove starting motor mount bolt (lower side).
- 7) Remove starting motor.

Remounting

Reverse the dismounting procedure noting the following.

- Make sure that starting motor mount bolt (upper side) does not fall into transmission case.
- Tighten starting motor mount bolts to specified torque.

Tightening torque

Starting motor mount bolt: 25 N·m (2.5 kg-m, 18.0 lb-ft)

Tightening Torque Specification

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Starting motor mount bolt	25	2.5	18.0

SECTION 6H3

CHARGING SYSTEM (Z13DT ENGINE)

6H3

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “System Components and Wiring Location View and Connectors” under “General Description” in Section 10B in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in Section 10B before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

General Description	6H3-2	On-Vehicle Service	6H3-7
Battery Description	6H3-2	Jump Starting in Case of Emergency	6H3-7
Carrier and hold-down	6H3-2	With auxiliary (booster) battery	6H3-7
Electrolyte freezing	6H3-2	With charging equipment	6H3-7
Sulfation	6H3-2	Battery Dismounting and Remounting	6H3-8
Built-in indicator (if equipped)	6H3-2	Dismounting	6H3-8
Care of battery	6H3-3	Handling	6H3-8
Generator Description	6H3-4	Remounting	6H3-8
Diagnosis	6H3-5	Generator belt Inspection	6H3-8
Battery Inspection	6H3-5	Generator Dismounting and Remounting ...	6H3-9
Visual inspection	6H3-5	Specification	6H3-10
Generator Symptom Diagnosis	6H3-5	Battery	6H3-10
Charging indicator lamp operation	6H3-5	Generator	6H3-10
Undercharged battery	6H3-6	Tightening Torque Specification	6H3-10

General Description

Battery Description

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

Carrier and hold-down

The battery carrier should be in good condition so that it will support the battery securely and keep it level.

Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.

To prevent the battery from shaking in its carrier, the hold-down bolts should be tight enough but not over-tightened.

Electrolyte freezing

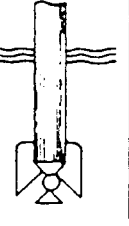
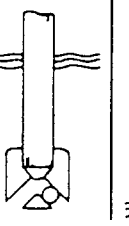
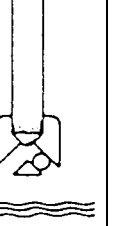
The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin a battery, it should be protected against freezing by keeping it in a fully charged condition. If a battery is frozen accidentally, it should not be charged until it is warmed.

Sulfation

If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. "Sulfation" means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but its capacity is lower than before.

Built-in indicator (if equipped)

The battery has a built-in temperature compensated indicator at the top of the battery. This indicator is to be used with the following diagnostic procedure. When checking the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.

D I A G N O S I S	OK	CHARGING NECESSARY	LOW LEVEL ELECTROLYTE REPLACE BATTERY
I N D I C A T O R	Green dot 	Dark 	Clear 
G R A V I T Y B A L L			

Three types of indication available under normal operation are as follows.

- **Green Dot**
Battery is sufficiently charged for testing.
- **Dark**
Battery must be charged before testing.
If there is a cranking complaint, battery should be tested as described in "Diagnosis" section. Charging and electrical systems should also be checked at this time.
- **Clear or Light Yellow**
This means that fluid level is below the bottom of hydrometer. Its possible cause is excessive or prolonged charging, a broken case, excessive tipping or normal battery deterioration. When the battery is found in such condition, it is possible that high charging voltage is caused by the faulty charging system and therefore, charging and electrical systems need to be checked. If there is a trouble in cranking and its cause lies in the battery, it should be replaced.

Care of battery

WARNING:

- **Never expose battery to open flame or electric spark because of battery generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surfaces as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Batteries should always be kept out of reach of children.**

1) The battery is a very reliable component, but needs periodical attentions.

- Keep the battery carrier clean
- Prevent rust formation on the terminal posts
- Keep the electrolyte up to the upper level uniformly in all cells.
- When keeping battery on vehicle over a long period of time, follow instructions given below.
 - Weekly, start the engine and run it until it reaches normal operating temperature with engine speed of 2000 to 3000 rpm. Make sure all electric switches are off before storing the vehicle.
 - Recharge the battery twice a month to prevent it from discharging excessively. This is especially important when ambient temperature is low.

The battery discharges even when it is not used, while vehicles are being stored. Battery electrolyte can freeze and battery case can crack at cold ambient condition if battery is not properly charged.

2) Keep the battery cable connections clean.

The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current.

Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

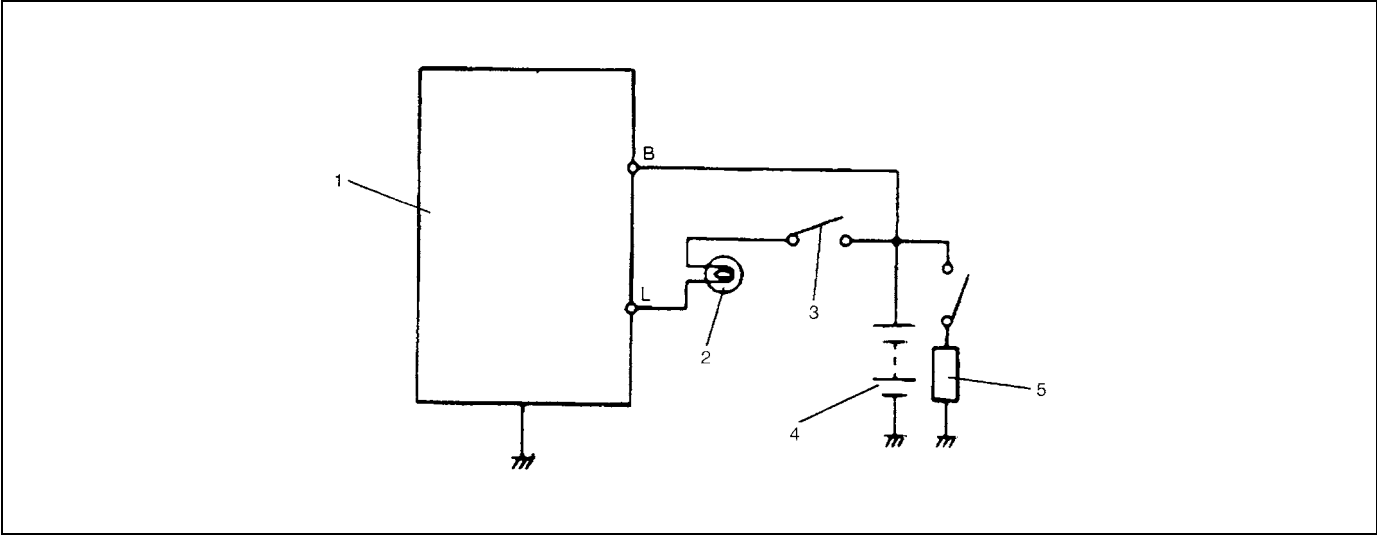
3) Be always in the know as to the state of charge of the battery. The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an instrument for measuring the specific gravity (S.G.) of the battery electrolyte. The S.G. of the electrolyte is indicative of the state of charge.

Generator Description

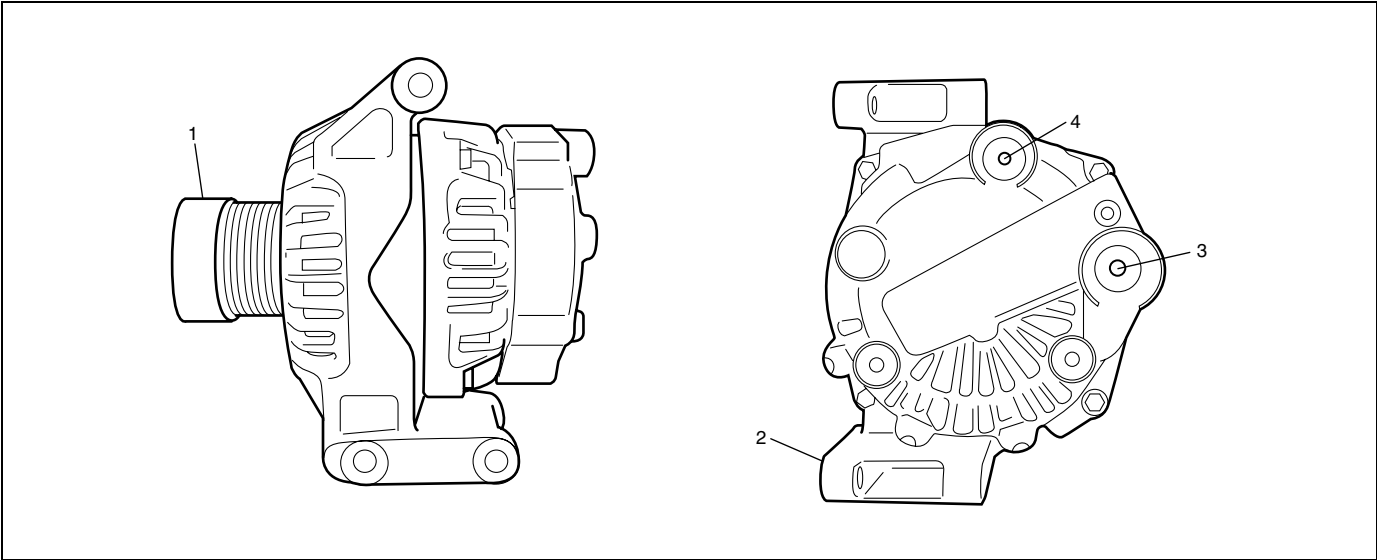
The generator is a small and high performance type with an IC regulator incorporated. The internal components are connected electrically as shown below figure.

The generator features are as follows:

- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear housing.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the voltage setting cannot be adjusted.
- The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.
- The stator windings are assembled on the inside of a laminated core that forms part of the generator frame.



1. Generator with regulator assembly	3. Ignition switch	5. Load
2. Charge indicator light	4. Battery	



1. Pulley	3. "B" terminal
2. Ground	4. "L" terminal

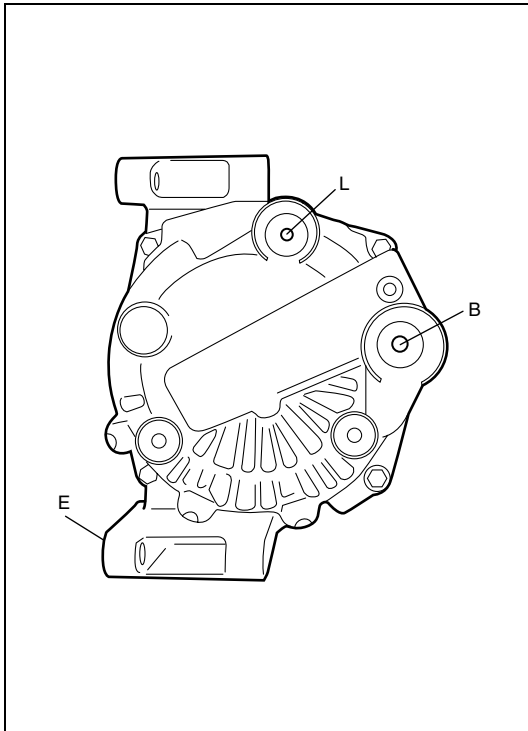
Diagnosis

Battery Inspection

Visual inspection

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Generator Symptom Diagnosis



CAUTION:

- Do not connect any load between L and E.
- When connecting charger or booster battery to vehicle battery, refer to “Jump Starting in Case of Emergency” in this section.

Trouble in charging system will show up as one or more of the following conditions:

- 1) Faulty indicator lamp operation.
- 2) An undercharged battery as evidenced by slow cranking or indicator dark.
- 3) An overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Noise from generator may be caused by loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.

B:	Generator output (Battery terminal)
E:	Ground
L:	Lamp terminal

Charging indicator lamp operation

Condition	Possible Cause	Correction
Charge light does not light with ignition ON and engine off	Fuse blown	Check fuse.
	Indicator lamp (LED) faulty for RM413D	Replace combination meter.
	Light burned out for RB413D	Replace light.
	Wiring connection loose	Tighten loose connection.
	IC regulator or field coil faulty	Replace generator.
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt.
	IC regulator or generator faulty	Check charging system.
	Wiring faulty	Repair wiring.
Noise from radio	Condenser faulty	Replace generator.

Undercharged battery

This condition, as evidenced by slow cranking or low specific gravity can be caused by one or more of the following conditions even though indicator lamp may be operating normal.

Following procedure also applies to cars with voltmeter and ammeter.

- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to "Battery Description" in this section.
- Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

On-Vehicle Service

Jump Starting in Case of Emergency

With auxiliary (booster) battery

CAUTION:

If vehicle is manual transmission model and has a catalytic converter, do not push or tow it to start. Damage to its emission system and/or to other parts may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow procedure outlined below, being careful not to cause sparks.

WARNING:

- Departure from these conditions or procedure described below could result in:
 - Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.
 - Damage to electronic components of either vehicle.
- Remove rings, watches, and other jewelry. Wear approved eye protection.
- Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.

WARNING:

Do not connect negative cable directly to negative terminal of dead battery.

- 1) Set parking brake and place NEUTRAL on manual transmission. Turn off ignition, turn off lights and all other electrical loads.
- 2) Check electrolyte level. If it is below low level line, add distilled water.
- 3) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
- 4) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
- 5) Start engine of vehicle with booster battery and turn off electrical accessories. Then Start engine of the vehicle with discharged battery.
- 6) Disconnect jumper cables in the exact reverse order.

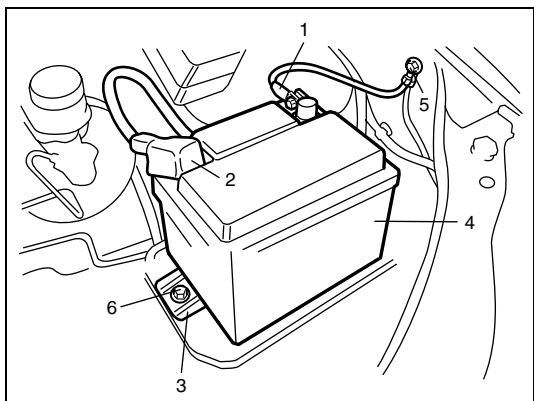
With charging equipment

CAUTION:

When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

Battery Dismounting and Remounting

Dismounting



- 1) Disconnect negative cable (1).
- 2) Disconnect positive cable (2).
- 3) Remove retainer (3).
- 4) Remove battery (4).

5. Body ground bolt
6. Retainer bolt

Handling

When handling battery, following safety precautions should be followed:

- Hydrogen gas is produced by battery. A flame or spark near battery may cause the gas to ignite.
- Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.

Remounting

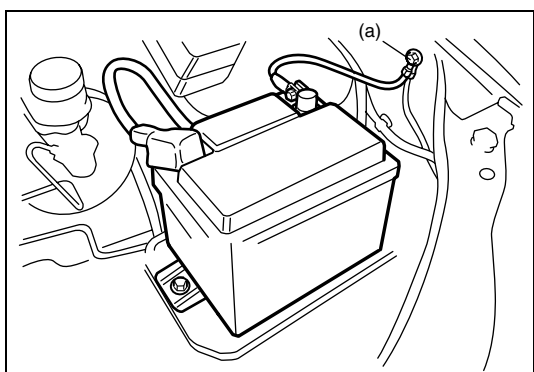
- 1) Reverse removal procedure.
- 2) Torque battery cables to specification.

NOTE:

Check to be sure that ground cable has enough clearance to hood panel by terminal.

Tightening torque

Body ground bolt (a): 8.0 N·m (0.8 kg-m, 6.0 lb-ft)

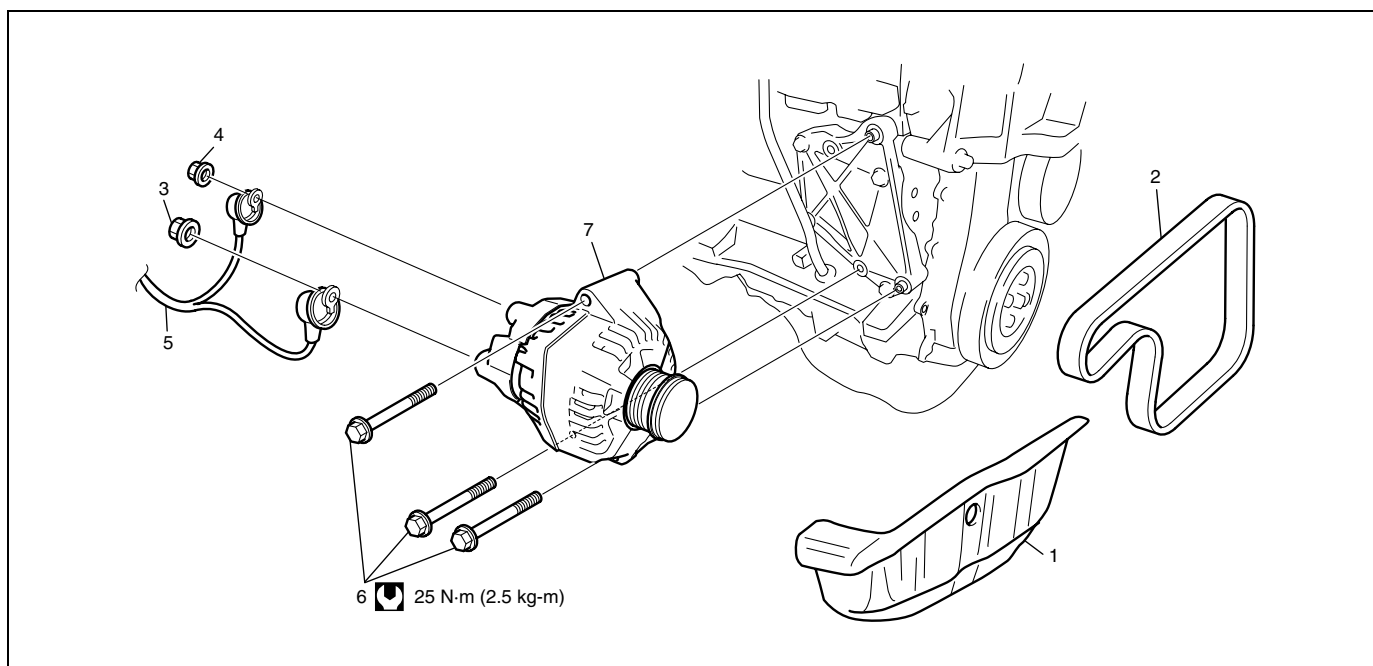


Generator belt Inspection

For removal, installation and inspection referring to “Water Pump / Generator Drive Belt Removal and Installation” and “Water Pump / Generator Drive Belt Tension Inspection” in Section 6B3.

Generator Dismounting and Remounting

- 1) Disconnect negative cable at battery.
- 2) Dismount in order as shown in the figure.
- 3) Reverse dismounting procedure for remounting.



1. Splash cover	3. "B" terminal nut	5. "B" and "L" terminals wire	7. Generator
2. Generator belt	4. "L" terminal nut	6. Generator bolt	 Tightening torque

Specification

Battery

Battery type	CCA 370A
Nominal output	12 V
Rated capacity	60 Ah/20 h
	46 Ah/5 h

Generator

Generator Type	90 A type
Rated voltage	12 V
Nominal output	90 A
Polarity	Negative ground
Rotation	Clockwise viewed from pulley side

Tightening Torque Specification

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Body ground bolt	8	0.8	6.0
Generator bolt	25	2.5	18.0

SECTION 6K3

EXHAUST SYSTEM (Z13DT ENGINE)

6K3

CONTENTS

General Description	6K3-2	Exhaust Manifold Inspection	6K3-5
Maintenance	6K3-2	Catalytic Converter Removal and Installation	6K3-5
On-Vehicle Service	6K3-3	Exhaust Pipe Removal and Installation	6K3-5
Exhaust System Components	6K3-3	Tightening Torque Specification	6K3-5
Exhaust Manifold Removal and Installation	6K3-5		

General Description

The exhaust system consists of an exhaust manifold, three-way catalytic converter (TWC), a turbo charger, exhaust pipe, a muffler and seal, gasket and etc.

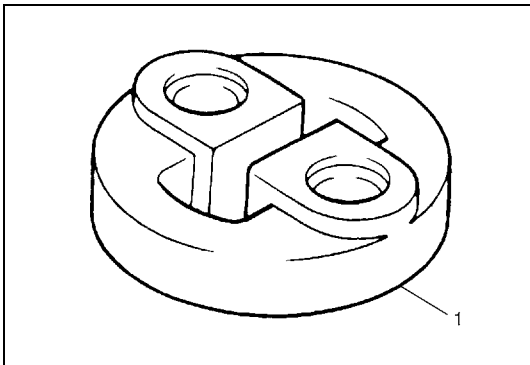
The three-way catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) pollutants in the exhaust gas.

Maintenance

WARNING:

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:



- Check rubber mountings (1) for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connection, dent and damage.
- If bolts or nuts are loosened, tighten them to specified torque referring to “Exhaust System Components” in this section.
- Check nearby body areas damaged, missing, or mispositioned part, open seam, hole connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

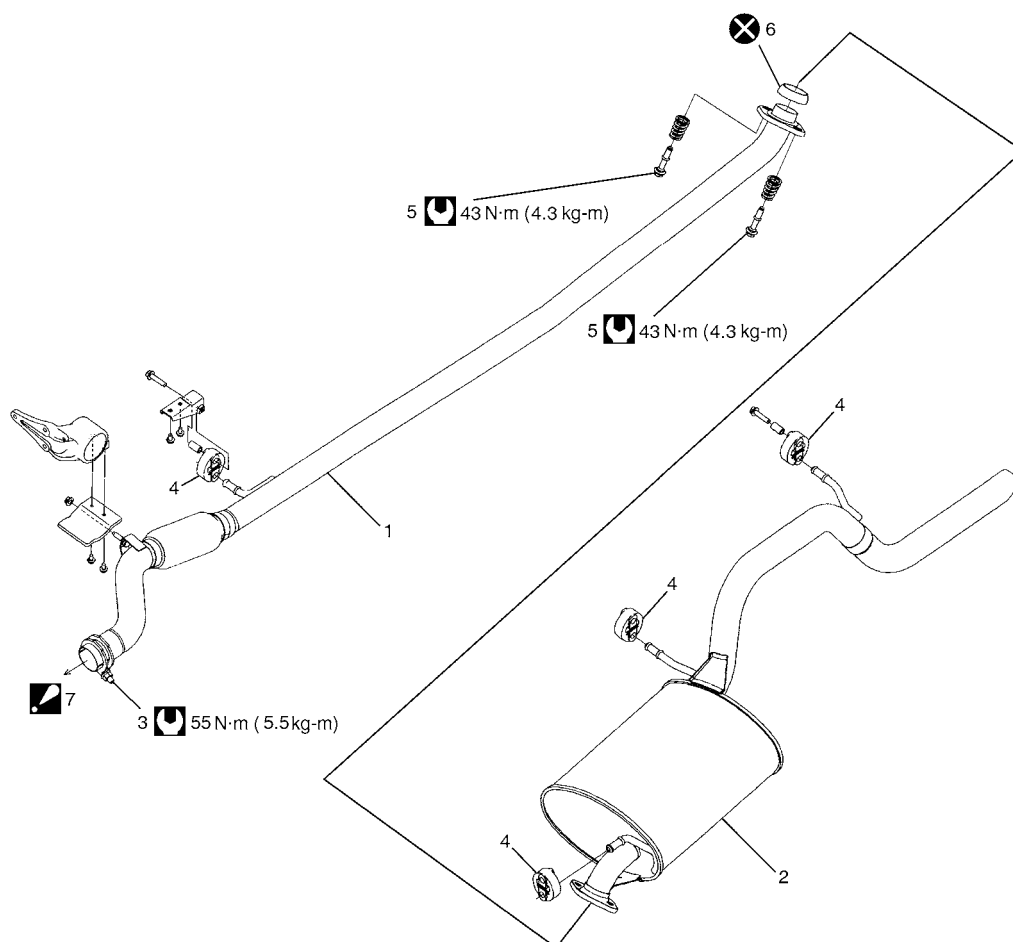
On-Vehicle Service

Exhaust System Components

WARNING:

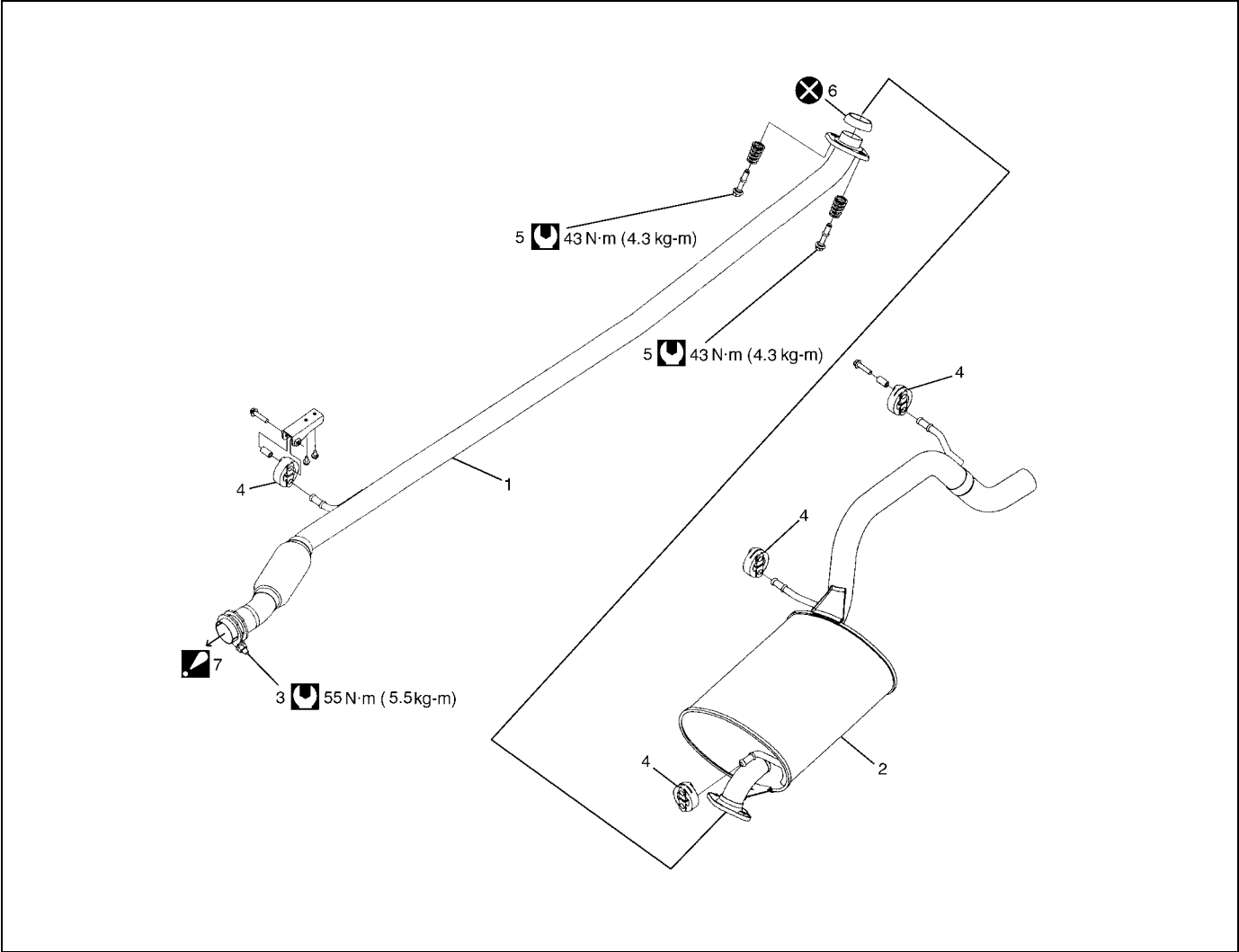
To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

For RM413D



1. Exhaust pipe	4. Mounting	7. To catalytic converter : For detail of service, refer to "Turbo-charger Removal and Installation" in Section 6A3.
2. Muffler	5. Exhaust pipe bolt	Tightening torque
3. Clamp bolt	6. Seal ring	Do not reuse.

For RB413D



1. Exhaust pipe	4. Mounting	 7. To catalytic converter : For detail of service, refer to "Turbo-charger Removal and Installation" in Sec-tion 6A3.
2. Muffler	5. Exhaust pipe bolt	 Tightening torque
3. Clamp bolt	6. Seal ring	 Do not reuse.

Exhaust Manifold Removal and Installation

Removal and installation

Refer to “Exhaust Manifold Removal and Installation” in Section 6A3.

Exhaust Manifold Inspection

Check gasket and seal for deterioration or damage.

Replace them as necessary.

Catalytic Converter Removal and Installation

Removal and installation

Refer to “Turbocharger Removal and Installation” in Section 6A3.

Exhaust Pipe Removal and Installation

Removal and installation

For replacement of exhaust pipe, be sure to hoist vehicle and observe “Warning” under “Maintenance” in this section and the following.

CAUTION:

Exhaust manifold have three way catalytic converter in it, it should not be exposed to any impulse. Be careful not to drop it or hit it against something.

- Tighten bolts and nuts to specified torque when reassembling referring to “Exhaust System Components” in this section.
- After installation, start engine and check each joint of exhaust system for leakage.

Tightening Torque Specification

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Exhaust No.1 pipe bolts	43	4.3	31.0
Clamp bolt	55	5.5	40.0
Catalytic converter bolt	25	2.5	18.0

SECTION 7A3

MANUAL TRANSAXLE (Z13DT ENGINE MODEL)

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

General Description	7A3-2	Transaxle Unit Components	7A3-13
Manual Transaxle Construction and		Selector Lever Assembly Removal and	
Servicing	7A3-2	Installation.....	7A3-14
Transaxle	7A3-3	5th Gears Removal and Installation.....	7A3-14
Diagnosis	7A3-4	Gear Selector, Cluster Gear and Main	
Manual Transaxle Symptom Diagnosis.....	7A3-4	Shaft Removal and Installation	7A3-17
On-Vehicle Service	7A3-5	Cluster Gear & Main Shaft Components...	7A3-24
Manual Transaxle Oil Change.....	7A3-5	Main Shaft Disassembly and Assembly....	7A3-25
Differential Side Oil Seal Replacement.....	7A3-6	Cluster Gear & Main Shaft Inspection.....	7A3-28
Gear Shift Control Lever and Cable		Transaxle Case Disassembly and	
Components.....	7A3-7	Assembly	7A3-29
Gear Shift Control Lever and Cable		Differential Components	7A3-32
Removal and Installation.....	7A3-8	Differential Disassembly and Assembly....	7A3-33
Reverse Lamp Switch Removal and		Differential Adjustment.....	7A3-35
Installation	7A3-9	Tightening Torque Specification	7A3-36
Reverse Lamp Switch Inspection.....	7A3-9	Required Service Material	7A3-36
Transaxle Unit Dismounting and		Special Tool.....	7A3-37
Remounting.....	7A3-10		

General Description

Manual Transaxle Construction and Servicing

The transaxle provides five forward speeds and one reverse speed by means of three synchronizers and three shafts-cluster gear (input shaft), main shaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

The 1st and 2nd speed synchronizer is mounted on main shaft and engaged with main shaft 1st gear or 2nd gear, also the 3rd and 4th speed synchronizer is done on main shaft and engaged with main shaft third gear or 4th gear.

The 5th speed synchronizer on main shaft is engaged with cluster 5th gear mounted on the cluster gear (input shaft).

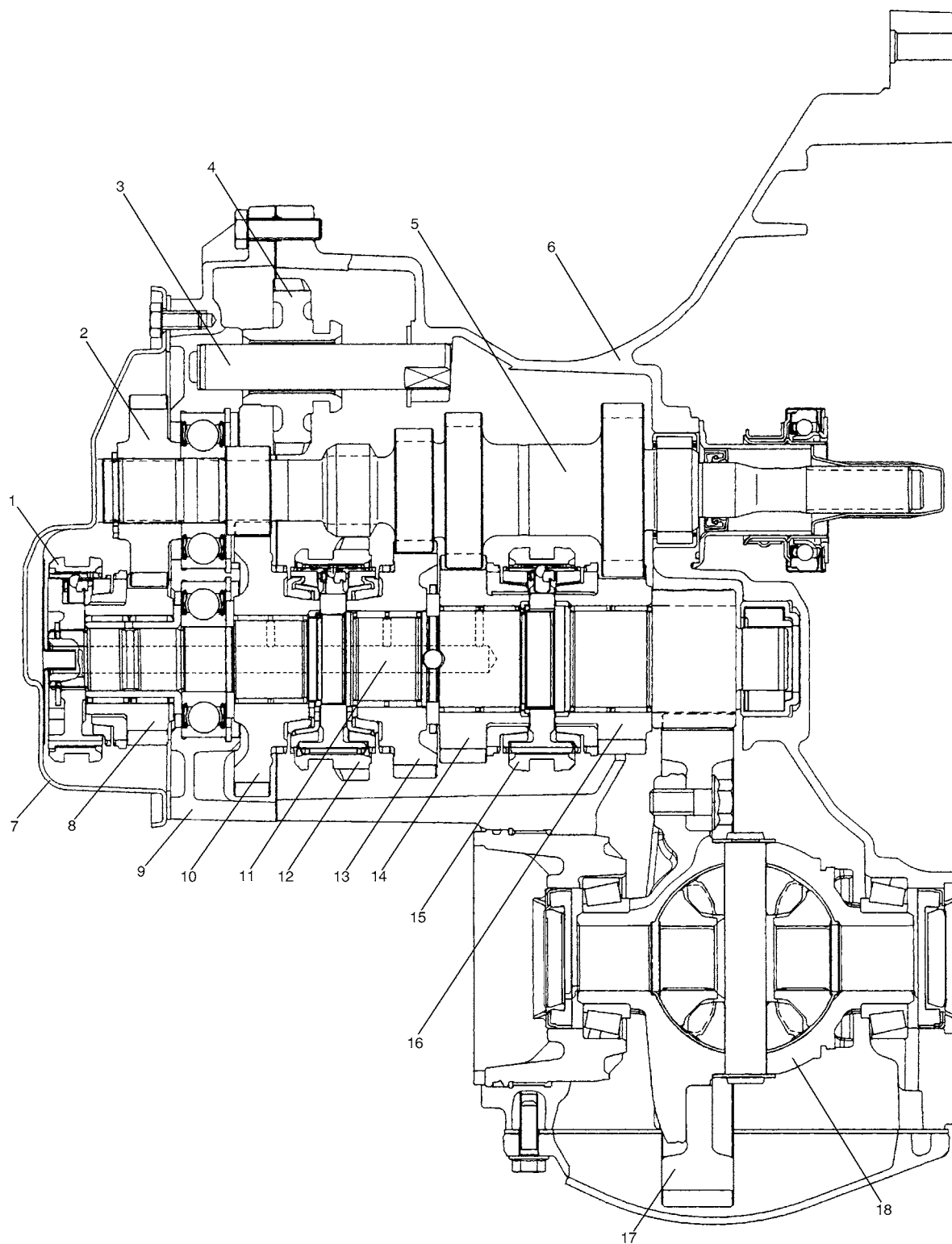
The double cone synchronizing mechanism are provided to 1st and 2nd gear synchromesh device for high performance of shifting to 1st and 2nd gear.

The main shaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.

Transaxle



1. 5th gear hub assembly	7. Extension case cover	13. 2nd gear
2. Cluster 5th speed gear	8. 5th gear	14. 3rd gear
3. Reverse gear shaft	9. Extension bearing plate case	15. 3rd & 4th gear hub assembly
4. Reverse gear	10. 1st gear	16. 4th gear
5. Transaxle cluster gear	11. Transaxle main shaft	17. Final gear
6. Transaxle case	12. 1st & 2nd gear hub assembly	18. Differential case

Diagnosis

Manual Transaxle Symptom Diagnosis

Condition	Possible Cause	Correction
Gears slipping out of mesh	Gear shift/select control cables faulty	Replace.
	Worn gear selector rod	Replace.
	Worn gear selector fork or synchronizer sleeve	Replace.
	Worn bearings on transaxle cluster gear or transaxle main shaft	Replace.
	Worn chamfered tooth on sleeve and gear	Replace sleeve and gear.
Hard shifting	Gear shift/select control cables faulty	Replace.
	Inadequate or insufficient lubricant	Replenish.
	Maladjusted clutch cable	Adjust clutch cable.
	Distorted or broken clutch disc	Replace.
	Damaged clutch pressure plate	Replace clutch cover.
	Worn synchronizer ring	Replace.
	Worn chamfered tooth on sleeve or gear	Replace sleeve or gear.
	Worn gear shift/select control cables joint	Replace.
	Distorted shift shaft	Replace.
Noise	Inadequate or insufficient lubricant	Replenish.
	Damaged or worn bearing(s)	Replace.
	Damaged or worn gear(s)	Replace.
	Damaged or worn synchronizer parts	Replace.
	Backlash between bevel pinion and gear faulty	Replace.
	Improper tooth contact in the mesh between bevel pinion and gear	Replace.

On-Vehicle Service

CAUTION:

Do not reuse circlip, spring pin, E-ring, oil seal, gasket, self locking nut and specified parts. Reuse of it can result in trouble.

Manual Transaxle Oil Change

- 1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
- 2) With vehicle lifted up, check oil level and leakage. If leakage exists, correct it.
- 3) Remove oil level plug (2) and then drain old oil by removing differential cover (1).
- 4) Install differential cover (1) with new gasket.

Tightening torque

Differential cover bolt (a): 18 N·m (1.8 kg-m, 13.0 lb-ft)

- 5) Remove breather plug (3).
- 6) Fill new specified oil from breather plug hole (4) by specified amount (up to level hole).
- 7) Tighten oil level plug (2) and breather plug as specified in the following.

Tightening torque

Transaxle oil level plug

(b): 4 N·m (0.4 kg-m, 3.0 lb-ft) and 45° to 180° by the specified procedure

Breather plug

(c): 4 N·m (0.4 kg-m, 3.0 lb-ft) and 180° by the specified procedure

NOTE:

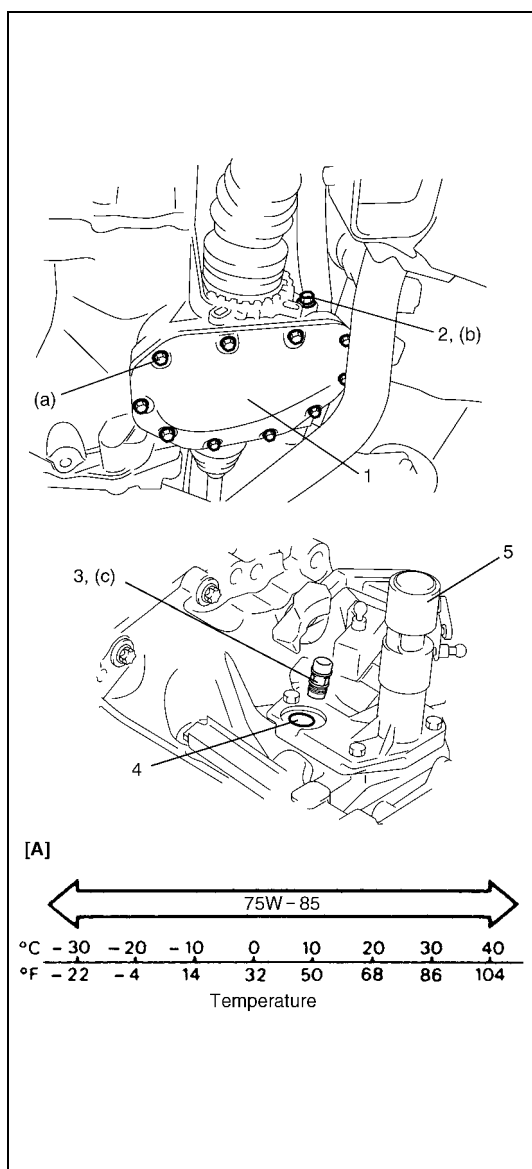
- It is recommended to use API GL-4 75W-85 gear oil.
- Whenever vehicle is hoisted for any service work other than oil change check for oil leakage.

Transaxle oil API GL-4 (For SAE classification refer to viscosity chart [A])

Transaxle oil capacity

1.6 liters (3.4/2.8 US/Imp-pt)

5. Selector lever cover



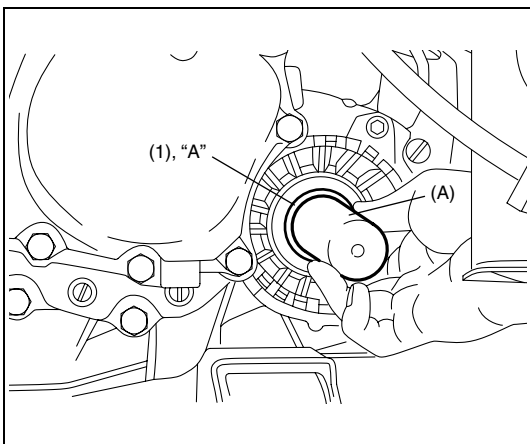
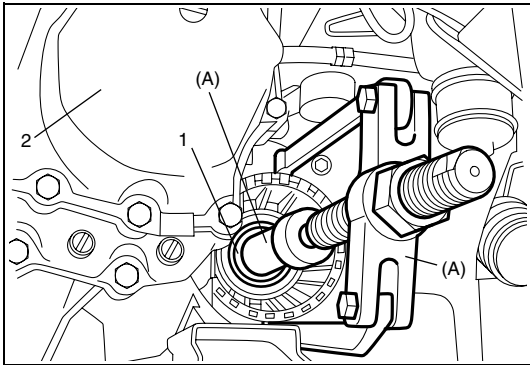
Differential Side Oil Seal Replacement

- 1) Drain transaxle oil referring to "Manual Transaxle Oil Change" in this section.
- 2) Remove front drive shafts referring to "Front Drive Shaft Assembly Removal and Installation" in Section 4A.
- 3) Remove oil seals (1) using special tool.

Special tool

(A): 09913-58610

2. Extension case cover



- 4) Install new oil seals (1) using special tool and hammer.

NOTE:

When installing oil seal, face its spring side inward.

Special tool

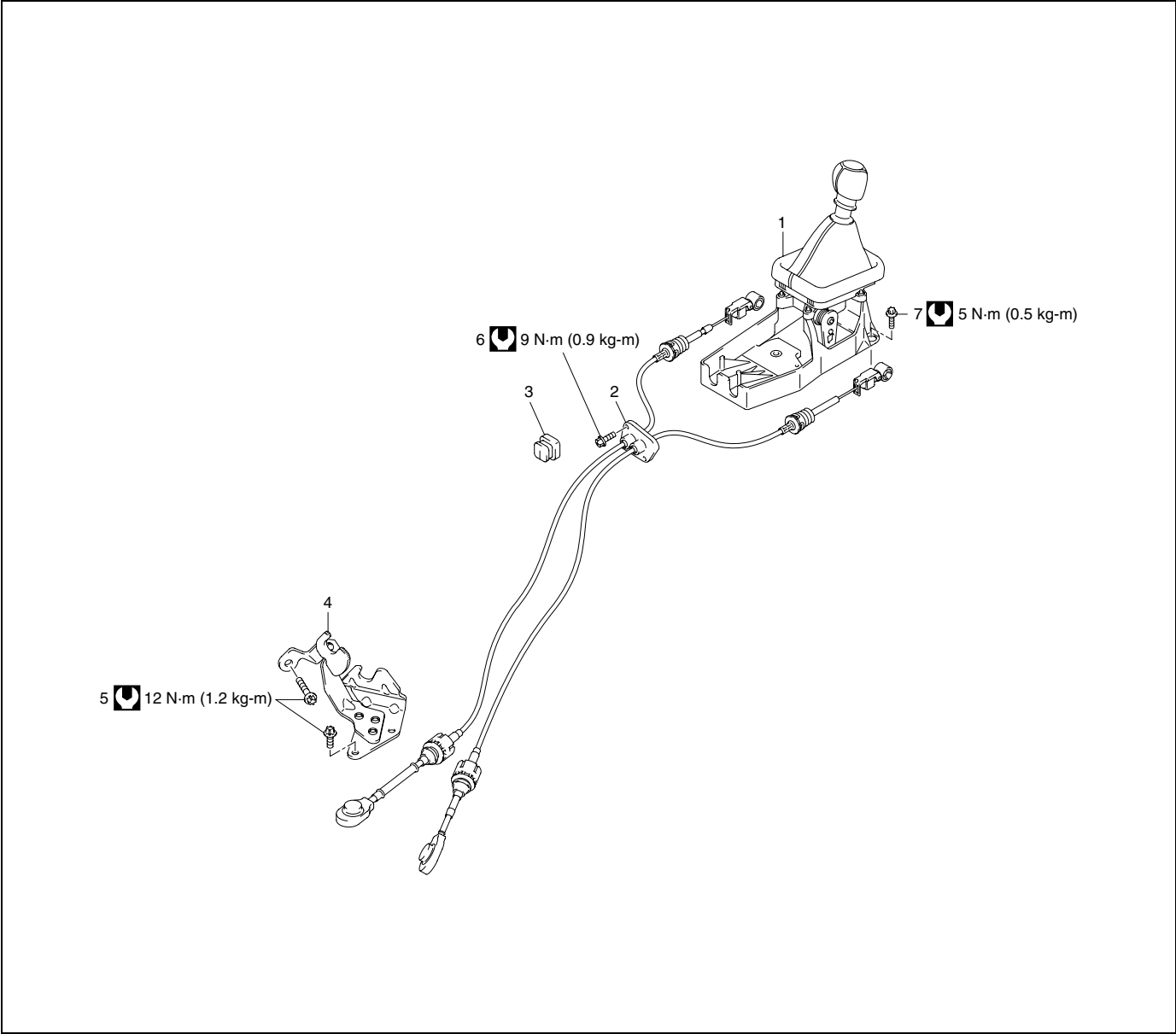
(A): 09926-28610

- 5) Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.

"A": Grease 99000-25010

- 6) Install front drive shafts referring to "Front Drive Shaft Assembly Removal and Installation" in Section 4A.
- 7) Fill transaxle oil as specified referring to "Manual Transaxle Oil Change" in this section, and make sure that oil has been sealed with oil seal.

Gear Shift Control Lever and Cable Components



1. Gear shift control lever assembly	4. Cable bracket	7. Gear shift control lever bolt
2. Shift & select cable assembly	5. Cable bracket bolt	 Tightening torque
3. Shift control cable seal	6. Cable grommet bolt	

Gear Shift Control Lever and Cable Removal and Installation

Removal

- 1) Remove console box.
- 2) Disconnect shift and select cables (1) from gear shift control lever assembly (2).
 - a) While pushing claw (4), disconnect cable assembly from bracket (5).
 - b) Push up claw (6) of adjuster and pull off cables (1).
- 3) Remove gear shift control lever bolts (3) and remove gear shift lever assembly (2) from vehicle body.
- 4) Disconnect shift and select cables (1) from transaxle.
- 5) After removing cable grommet bolt, take off shift and select cable together with grommet from vehicle body.

Installation

- 1) Install shift and select cable assembly to vehicle body and then tighten cable grommet bolt to specified torque.

Tightening torque

Cable grommet bolt: 9 N·m (0.9 kg-m, 6.5 lb-ft)

- 2) Install shift and select cable to transaxle.
- 3) Install gear shift control lever assembly to vehicle body and then tighten gear shift control lever bolt to specified torque.

Tightening torque

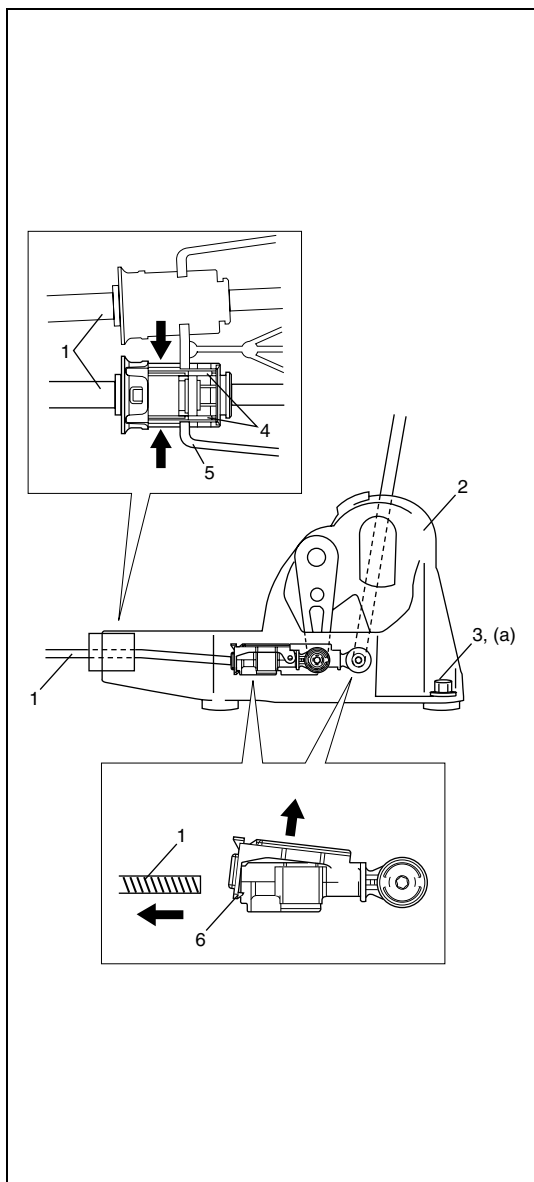
Gear shift control lever bolt: 5 N·m (0.5 kg-m, 3.5 lb-ft)

- 4) Attach shift and select cable assembly to bracket.
- 5) Install shift cable and select cable to each adjuster.

NOTE:

Install the shift cable first.

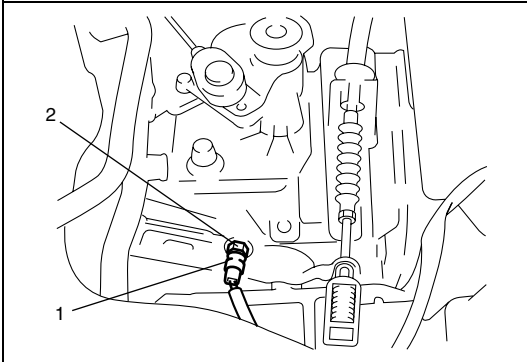
- 6) Install console box.
- 7) Confirm that it moves smoothly when shifting into each position.



Reverse Lamp Switch Removal and Installation

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect reverse lamp switch coupler (1).
- 3) Remove reverse lamp switch (2).



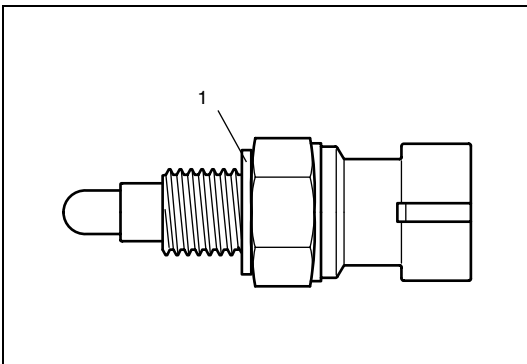
Installation

- 1) Install reverse lamp switch with new seal (1).

Tightening torque

Reverse lamp switch: 20 N·m (2.0 kg-m, 15.0 lb-ft)

- 2) Connect reverse lamp switch coupler.
- 3) Connect negative cable at battery.
- 4) Confirm function of back up lamp switch in reverse position by using ohmmeter.

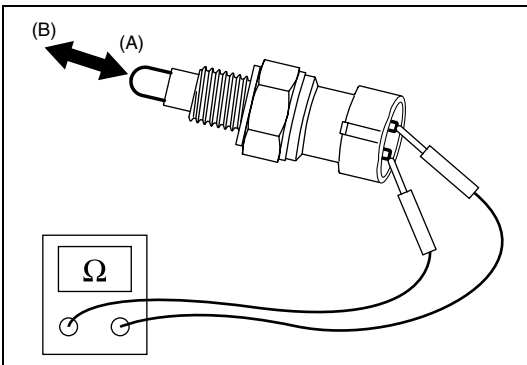


Reverse Lamp Switch Inspection

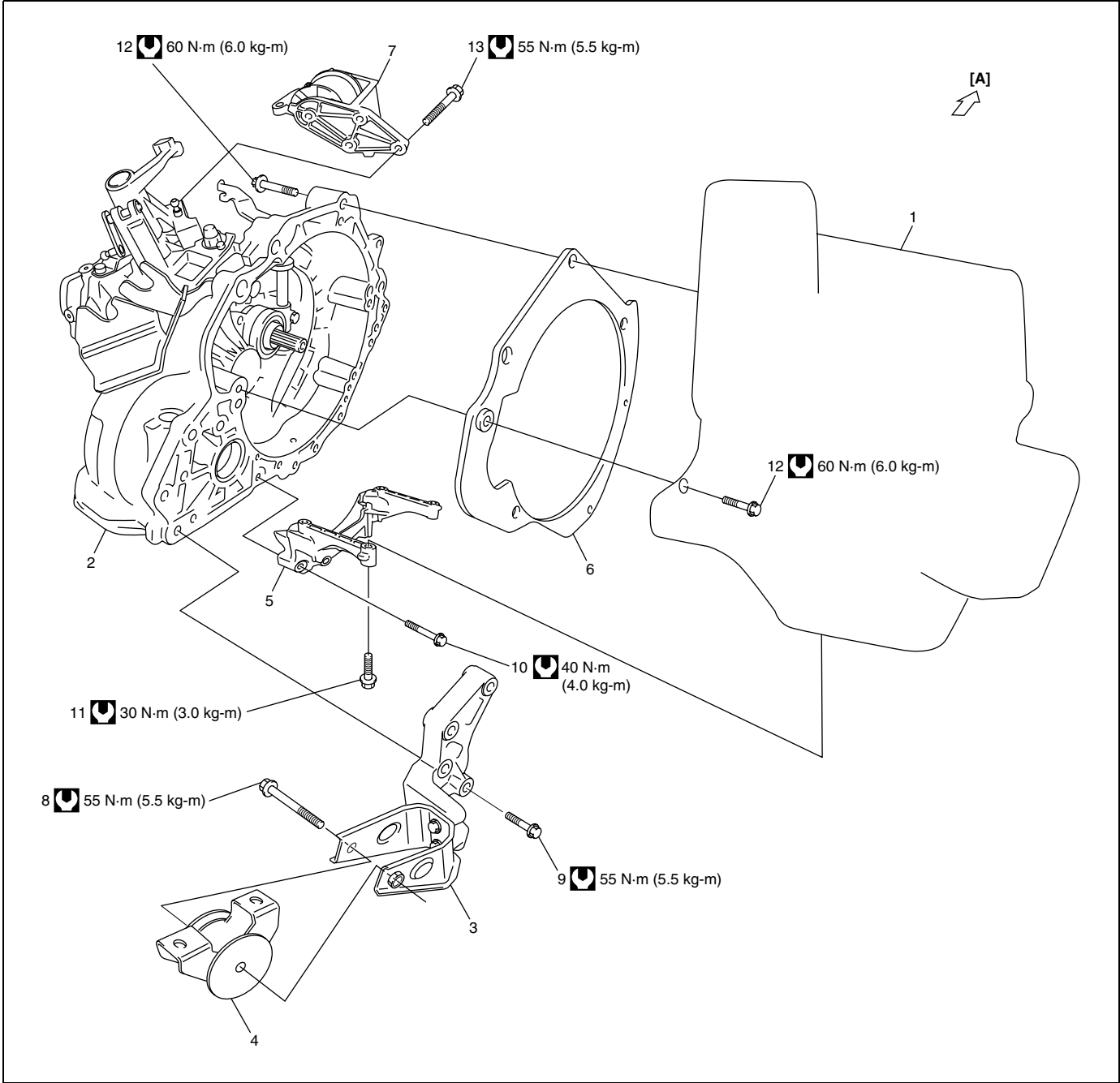
Check reverse lamp switch for function using ohmmeter.

Switch ON (A): Continuity

Switch OFF (B): No continuity



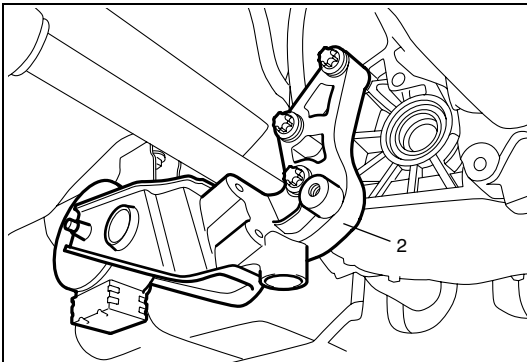
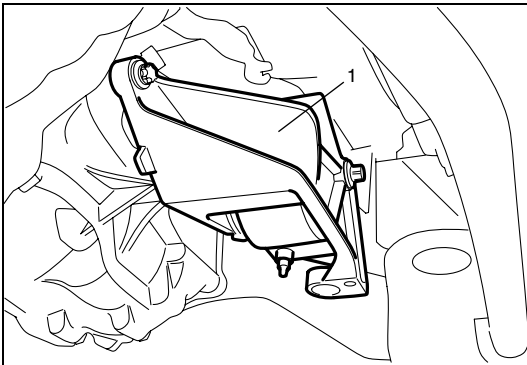
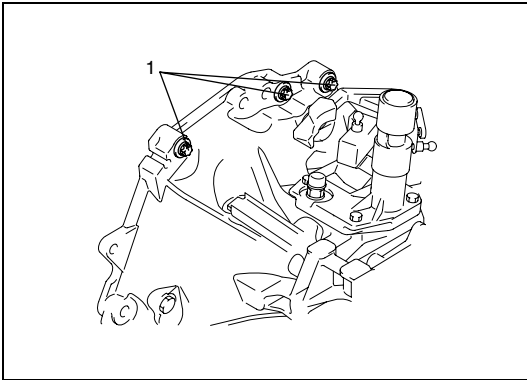
Transaxle Unit Dismounting and Remounting



[A]: Forward	5. Transaxle to engine bracket	10. Transaxle to engine bracket No.1 bolt
1. Engine	6. Spacer	11. Transaxle to engine bracket No.2 bolt
2. Transaxle	7. Engine left mounting	12. Transaxle to engine bolt
3. Engine rear mounting bracket	8. Engine rear mounting bolt	13. Engine left mounting bolt
4. Engine rear mounting	9. Engine rear mounting bracket bolt	Tightening torque

Dismounting

- 1) Disconnect negative cable at battery.
- 2) Remove battery tray with coolant reservoir.
- 3) Remove air cleaner and resonator.
- 4) Remove water pipe bracket and water hoses.
- 5) Disconnect clutch cable from clutch release shaft and bracket.
- 6) Disconnect shift and select cables from transaxle and then remove its bracket on transaxle.
- 7) Undo reverse lamp connector.
- 8) Support engine using engine hanger.
- 9) Remove transaxle to engine bolts (1). (upper side)
- 10) Drain transaxle oil referring to "Manual Transaxle Oil Change" in this section.
- 11) Remove front drive shafts referring to "Front Drive Shaft Assembly Removal and Installation" in Section 4A.
- 12) Remove exhaust pipe.
- 13) Remove lower member. (For RM413D)
- 14) Remove ground cable from transaxle.
- 15) Remove transaxle to engine bracket.
- 16) Support transaxle with transmission jack.



- 17) Remove engine left mounting with bracket (1).

- 18) Remove engine rear mounting with bracket (2).

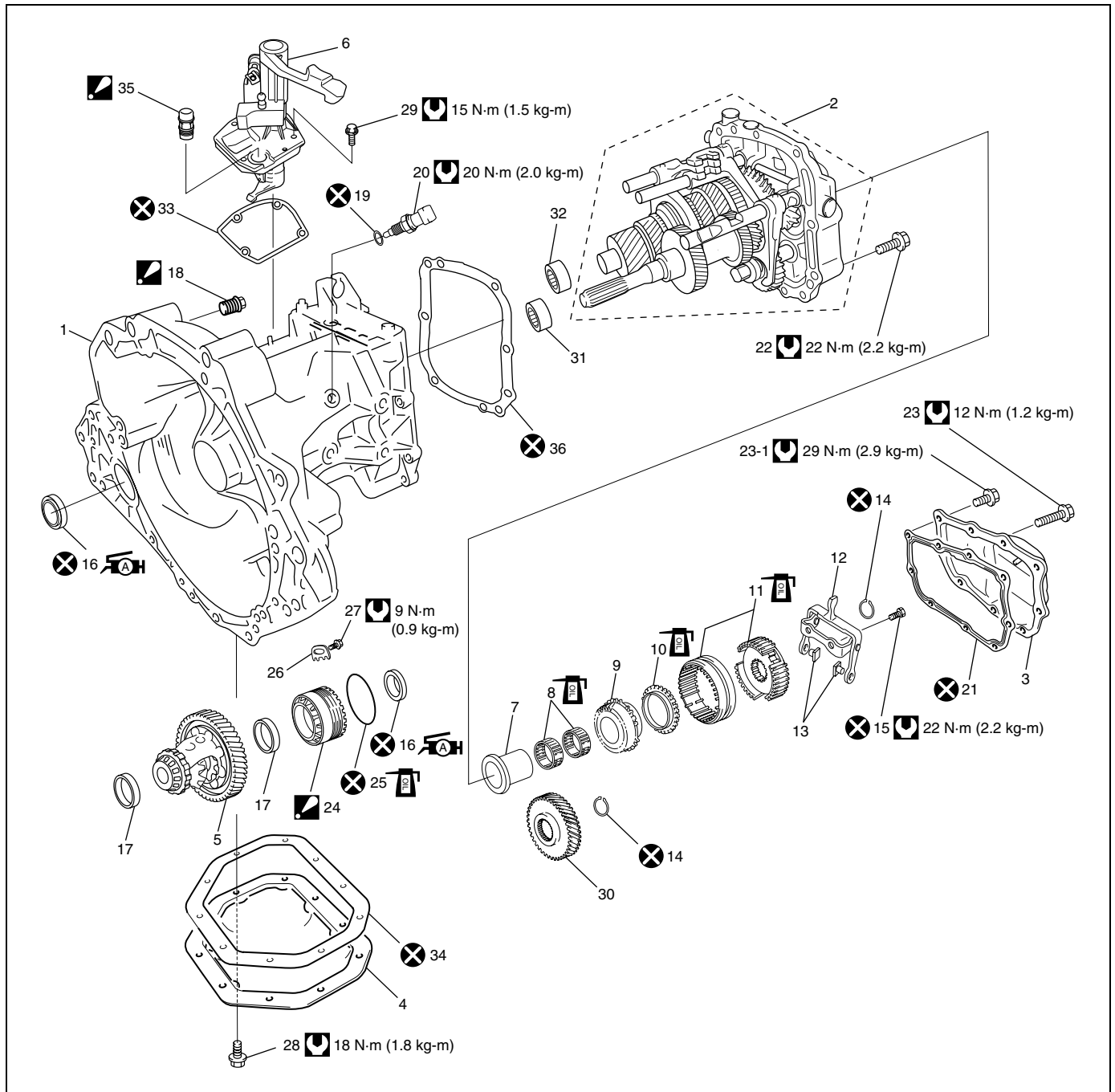
- 19) Remove transaxle to engine bolts. (lower side)
- 20) Pull transaxle out so as to disconnect cluster gear from clutch disc and then lower it.

Remounting

Reverse dismounting procedure for remounting noting the following.

- Refer to figure at the title of “Transaxle Unit Dismounting and Remounting” for fastener specified torque.
- Set each clamp for wiring securely.
- After connecting clutch cable, be sure to adjust clutch cable nut position referring to “Clutch Cable Adjustment” in Section 7C3.
- Install front drive shafts referring to “Front Drive Shaft Assembly Removal and Installation” in Section 4A.
- Fill transaxle with oil as specified referring to “Manual Transaxle Oil Change” in this section.
- Connect battery and check function of engine, clutch and transaxle.

Transaxle Unit Components



1. Transaxle case	15. 5th gear selector fork bolt	28. Differential cover bolt
2. Transmission end plate	 16. Oil seal : Apply grease 99000-25010 to oil seal lip.	29. Selector lever cover bolt
3. Extension case cover	17. Outer race	30. Cluster 5th speed gear
4. Differential cover	 18. Oil level plug : Tighten to 4 N·m (0.4 kg-m) and 45° to 180° by the specified procedure.	31. Pinion needle bearing
5. Differential assembly	19. Reverse lamp switch seal	32. Main shaft roller bearing
6. Selector lever cover	20. Reverse lamp switch	33. Cover gasket
7. 5th gear inner bearing ring	21. Transaxle case gasket	34. Differential cover gasket
8. 5th gear needle bearing	22. Bearing plate case bolt	 35. Breather plug : Tighten to 4 N·m (0.4 kg-m) and 180° by the specified procedure.
9. 5th speed gear	23. Extension case cover bolt	36. Cover gasket
10. 5th gear synchronizer cone	23-1. Extension case cover bolt (torx)	 Tightening torque
11. 5th gear hub assembly	 24. Differential bearing retaining ring : Tighten to 70 N·m (7.0 kg-m), 30° and 15° by the specified procedure.	 Do not reuse.
12. 5th gear selector fork	25. Differential bearing retaining ring seal	 Apply transaxle oil.
13. 5th gear selector slider	26. Retaining ring lock plate	
14. Snap ring	27. Lock plate bolt	

Selector Lever Assembly Removal and Installation

Removal

Remove selector lever bolt (1) and then selector lever assembly (2).

Installation

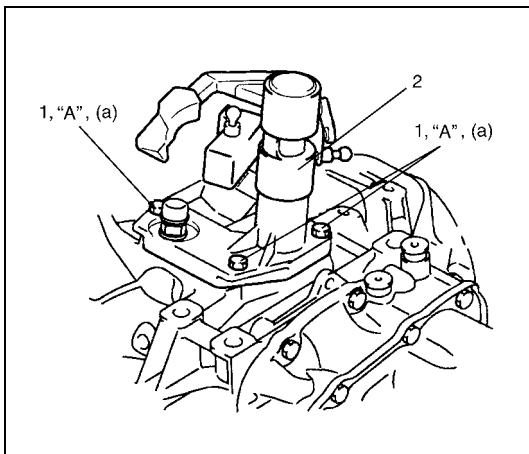
Reverse removal procedure for installation noting the following.

- Do not reuse select lever cover gasket.
- Apply sealant to selector lever cover bolt.
Tighten cover bolt to specified torque.

“A”: Thread lock cement 99000-32110

Tightening torque

Selector lever cover bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)



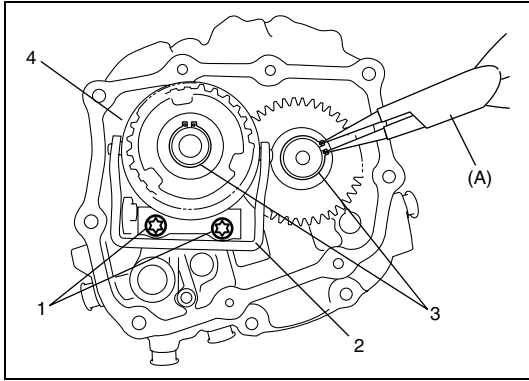
5th Gears Removal and Installation

Removal

- 1) Remove extension case cover bolts and take off extension case cover.

CAUTION:

Care should be taken not to distort extension case cover when it is removed from left case.



- 2) Remove 5th gear selector fork bolts (1) and then 5th gear selector fork (2).

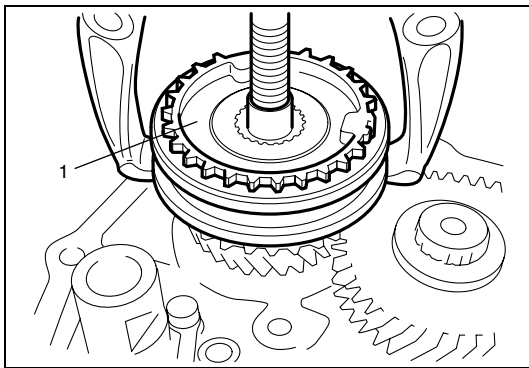
NOTE:

If fastening bolts are stiff, heat extension bearing plate case (4) with hot air dryer to approx. 80 °C (176 °F).

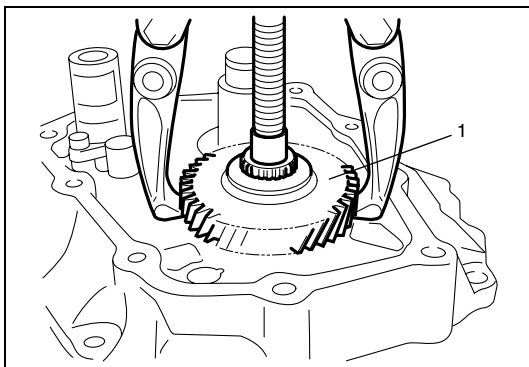
- 3) Remove snap rings (3) using special tool.

Special tool

(A): 09900-06107



- 4) Remove 5th gear hub assembly (1) from main shaft using gear puller.
5) Remove 5th gear needle bearing from main shaft.



- 6) Remove cluster 5th gear (1) from cluster gear using gear puller.

Installation

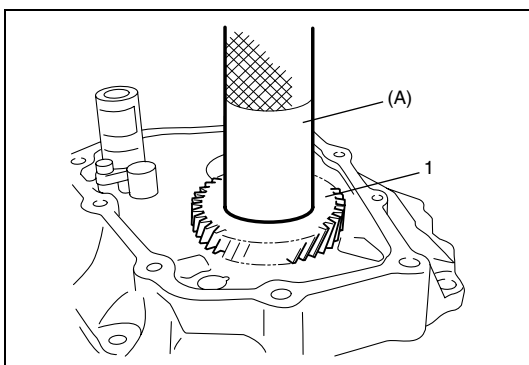
NOTE:

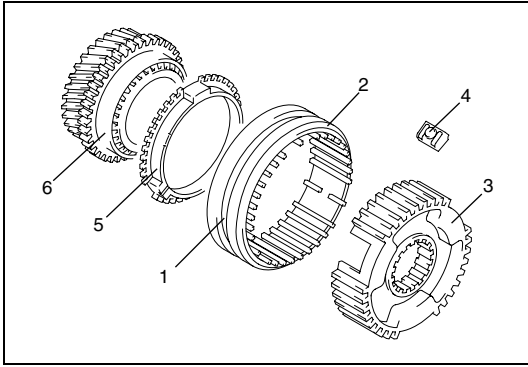
Coat all parts with transaxle oil before assembly.

- 1) Install cluster 5th gear (1) to cluster gear using special tool.

Special tool

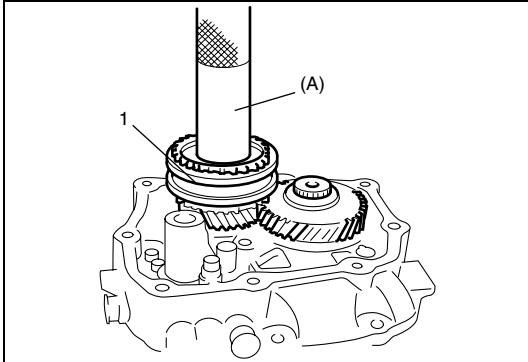
(A): 09913-84510





- 2) Assemble 5th gear hub assembly (hub (3), sleeve (1) and keys (4)) as shown in figure.

2. chamfer
5. Synchronizer ring
6. 5th gear

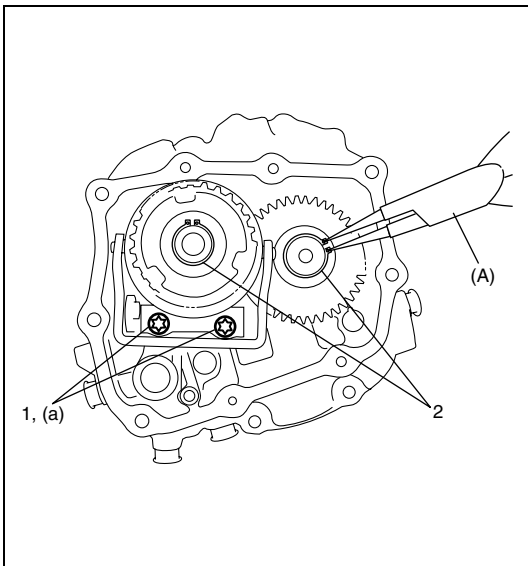


- 3) Install needle bearing, 5th gear and synchronizer ring onto main shaft.

Drive 5th gear assembly onto main shaft facing chamfer of sleeve to extension case cover side, using special tool and hammer.

Special tool

(A): 09913-70123



- 4) Install snap rings (2) and confirm that snap ring is installed in groove securely.

Special tool

(A): 09900-06107

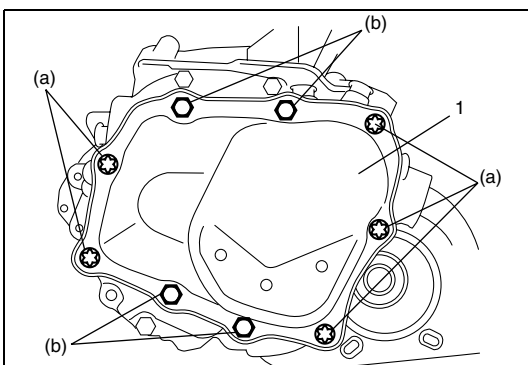
- 5) Install 5th gear selector fork and then tighten new bolts (1) to specified torque.

Tightening torque

5th gear selector fork bolt (a): 22 N·m (2.2 kg-m, 16.0 lb-ft)

CAUTION:

Do not reuse 5th gear selector fork bolts (1). Be sure to use new adhesive pre-coated bolts. Otherwise, bolts may loosen.



- 6) Install extension case cover (1) with new gasket and then tighten bolts to specified torque.

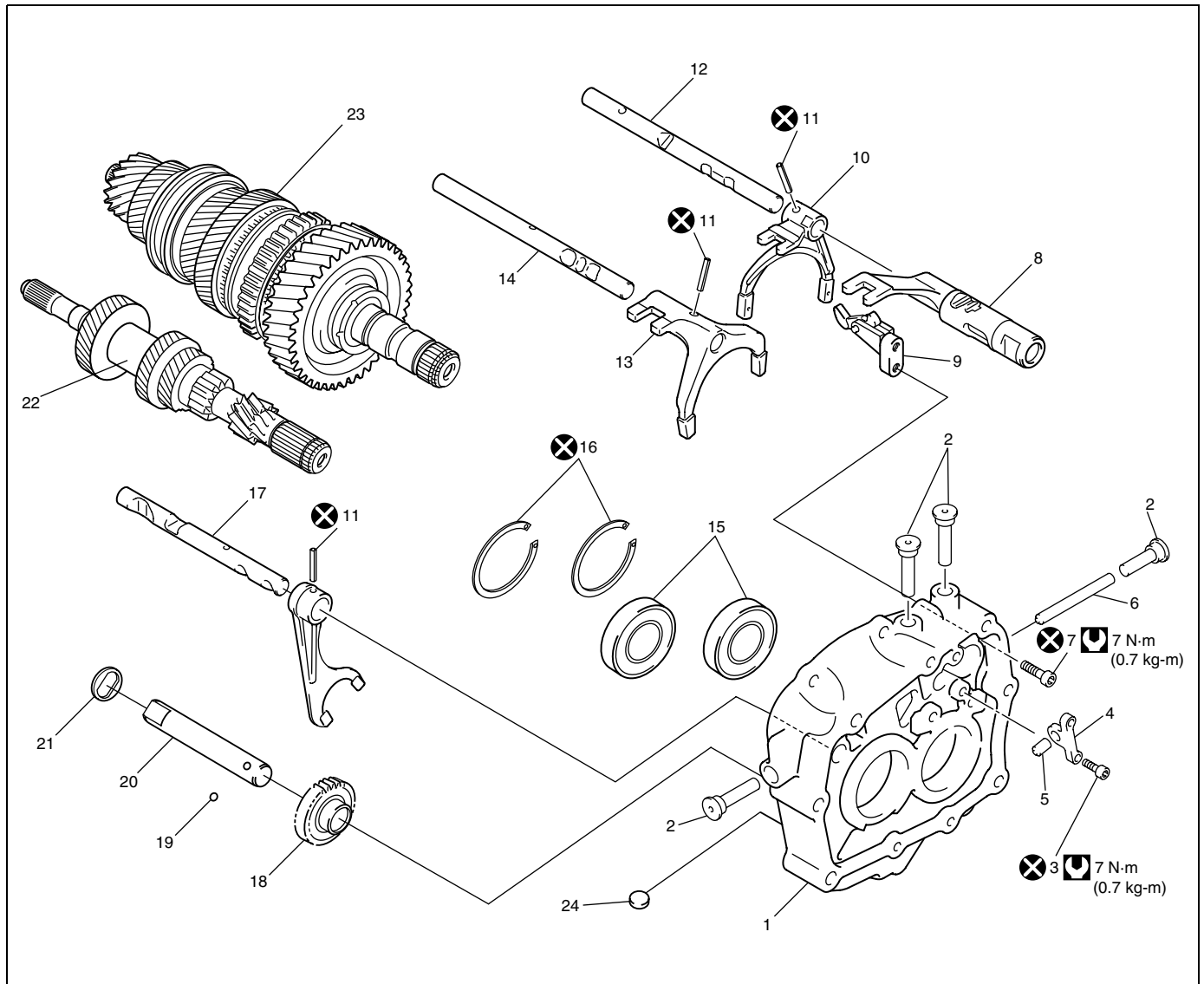
Tightening torque

Extension case cover bolt

(a): 29 N·m (2.9 kg-m, 21.0 lb-ft)

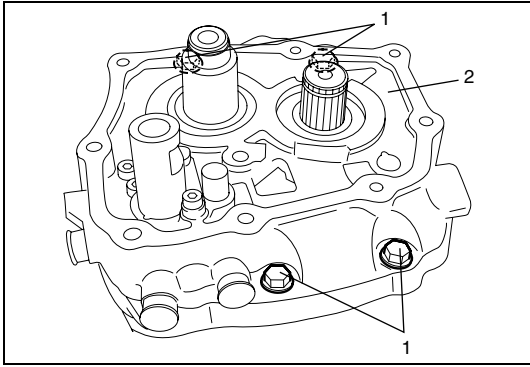
(b): 12 N·m (1.2 kg-m, 8.5 lb-ft)

Gear Selector, Cluster Gear and Main Shaft Removal and Installation

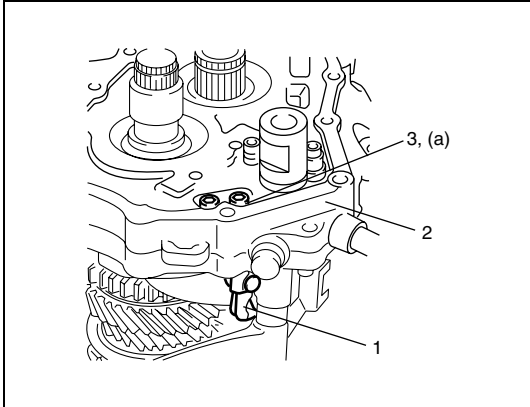


1. Extension bearing plate case	10. 3rd & 4th gear selector fork	19. Reverse gear shaft ball
2. Gear shift rod locking bush	11. Selector fork pin	20. Reverse gear shaft
3. Gear shift rod connector screw	12. 3rd & 4th gear selector rod	21. Reverse gear thrust washer
4. Gear shift rod connector	13. 1st & 2nd gear selector fork	22. Cluster gear
5. Gear shift rod detent pin No.1	14. 1st & 2nd gear selector rod	23. Main shaft assembly
6. Gear shift rod detent pin No.2	15. Ball bearing	24. Magnet
7. 5th gear pawl bolt	16. Extension case snap ring	Tightening torque
8. 5th gear shift rod fork	17. Reverse gear selector rod	Do not reuse.
9. 5th gear pawl	18. Reverse gear	

Removal



- 1) Remove bearing plate case bolt (1) and then detach transmission end plate (2) from transaxle case.

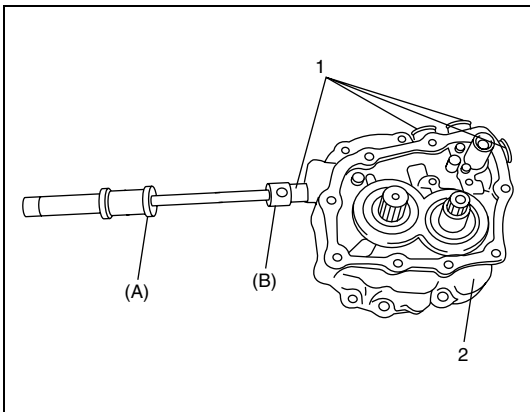


- 2) Remove 5th gear pawl (1) from extension bearing plate case (2).

NOTE:

If fastening bolts are stiff, heat extension bearing plate case with hot air dryer to approx. 80 °C (176 °F).

3. 5th gear pawl bolt

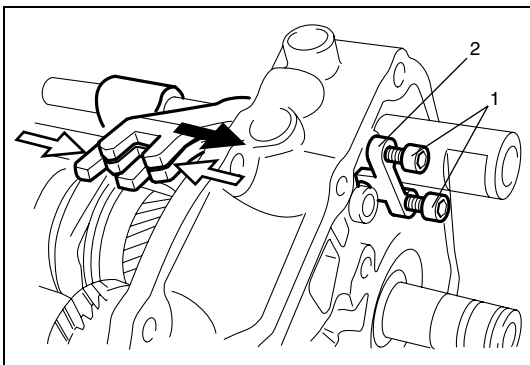


- 3) Remove gear shift rod locking bushes (1) from extension bearing plate case (2) using special tools.

Special tool

(A): 09922-48620

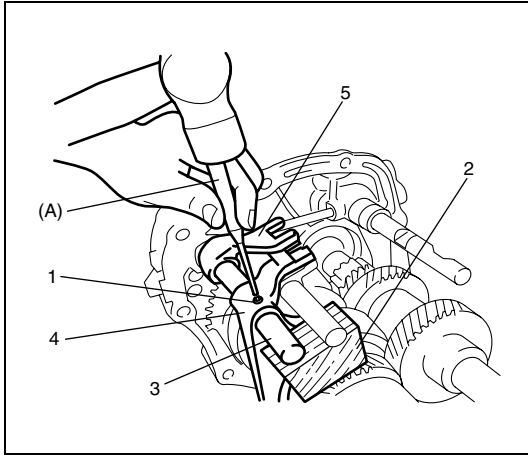
(B): 09922-48610



- 4) Remove gear shift rod connector bolt (1).
- 5) Engage 2nd, 3rd and 5th gear and then remove gear shift rod connector (2).

NOTE:

If fastening bolts are stiff, heat extension bearing plate case with hot air dryer to approx. 80 °C (176 °F).



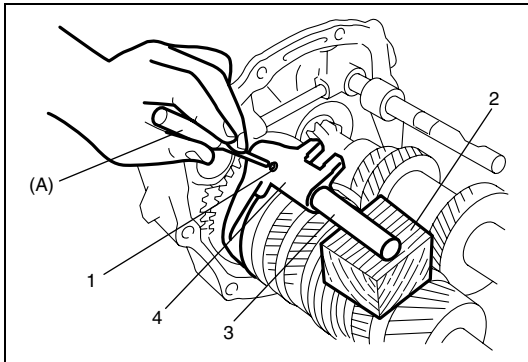
- 6) Remove 3rd & 4th selector fork pin (1) using special tool and then pull out 3rd & 4th gear selector rod (3), selector fork (4) and 5th gear shift rod fork (5).

Special tool

(A): 09922-89810

CAUTION:

When removing selector fork pin, apply a piece of wood (2) or the like to gear selector rod so as to protect it against damage.



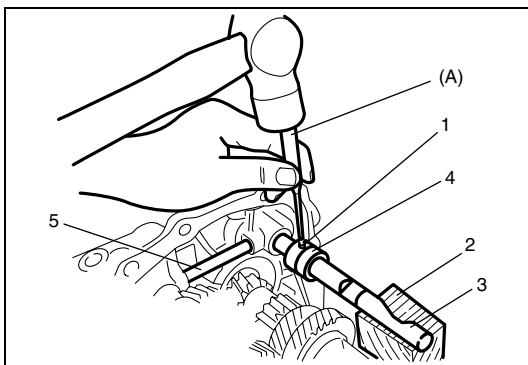
- 7) Remove 5th gear shift fork.

- 8) Remove 1st & 2nd selector fork pin (1), 1st & 2nd gear selector rod (3) and selector fork (4) in the same manner as step 6).

Special tool

(A): 09922-89810

2. A piece of wood



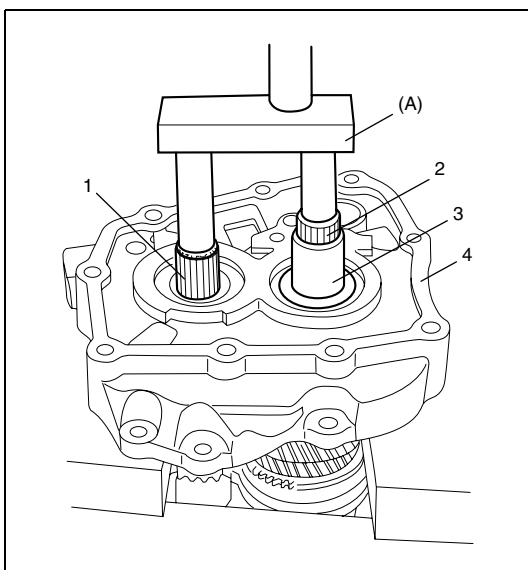
- 9) Remove reverse selector fork pin (1), reverse gear selector rod (3) and reverse gear selector fork (4) in the same manner as step 6).

Special tool

(A): 09922-89810

- 10) Remove gear shift rod detent pin No.2 (5).

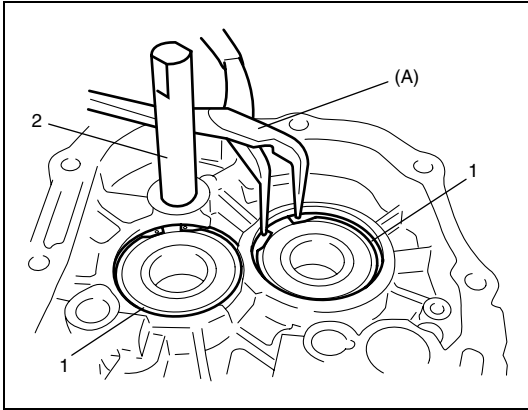
2. A piece of wood



- 11) Drive out cluster gear (1) and main shaft (2) from extension bearing plate case (4) using special tool and then take off 5th gear inner bearing ring (3).

Special tool

(A): 09922-68610



12) Remove circlips (1) using special tool.

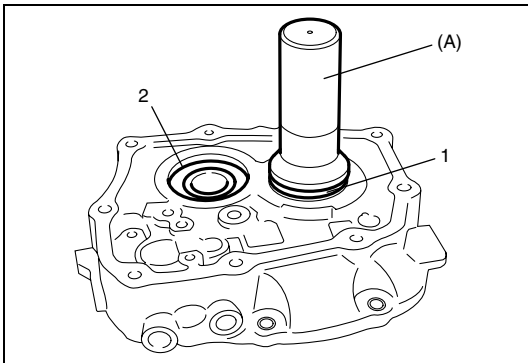
Special tool

(A): 09900-06105

13) Clamp reverse gear shaft (2) with soft jawed vise and remove reverse gear shaft and ball by tapping plate case with plastic hammer.

NOTE:

Do not tap mating face of extension bearing plate case.

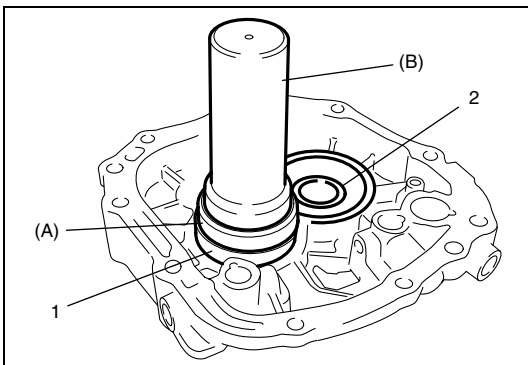


14) Remove cluster gear ball bearing (1) and main shaft ball bearing (2) from extension bearing plate case using special tool.

Special tool

(A): 09913-75810

Installation

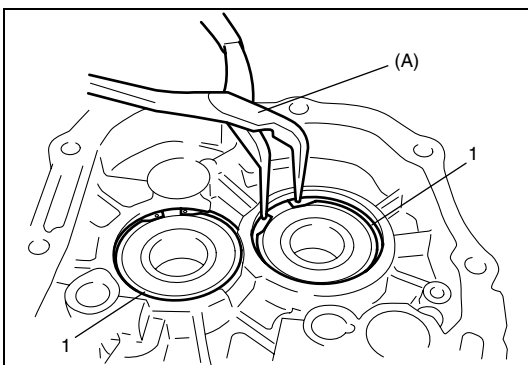


1) Install cluster gear ball bearing (1) and main shaft ball bearing (2) to extension bearing plate case using special tools.

Special tool

(A): 09924-07720

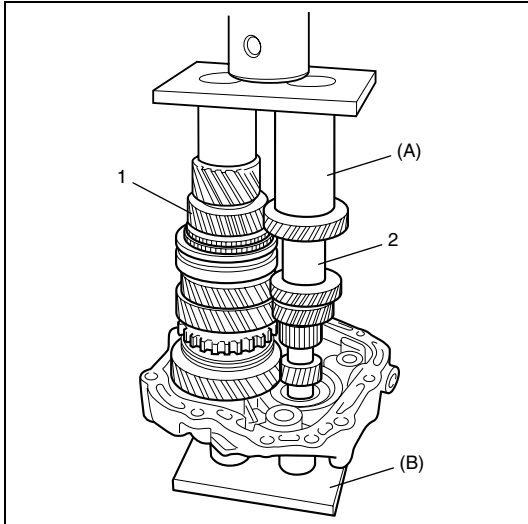
(B): 09913-75810



2) Install new circlips (1) using special tool.

Special tool

(A): 09900-06105

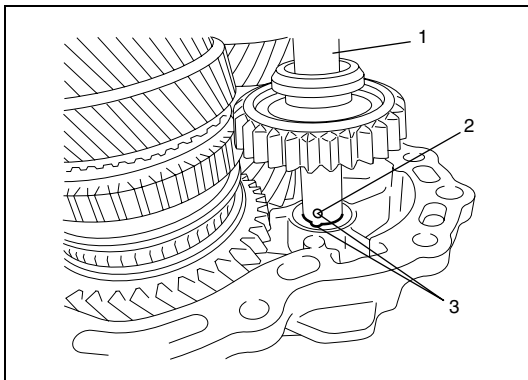


- 3) Install main shaft (1) and cluster gear (2) using special tools and hydraulic press.

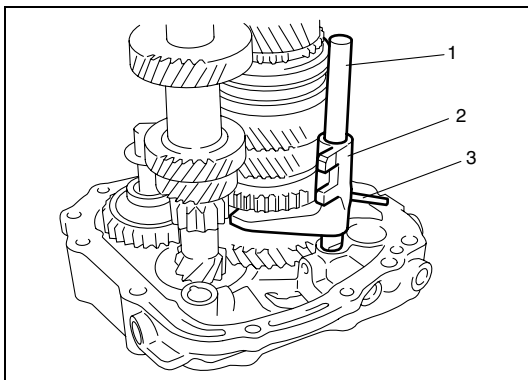
Special tool

(A): 09922-58620

(B): 09922-58610



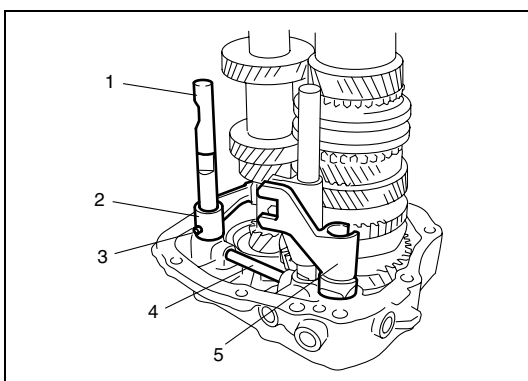
- 4) Install reverse gear shaft (1) and ball (2) on a matched position (3) according to figure by using hydraulic press.



- 5) Install 1st & 2nd gear selector rod (1) and selector fork (2) to extension bearing plate case and then drive in new selector fork pin (3).

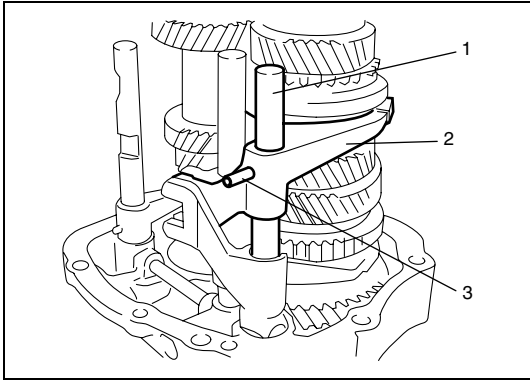
CAUTION:

When installing selector fork pin, apply a piece of wood or the like to gear selector rod so as to protect it against damage.



- 6) Install gear shift rod detent pin No.2 (4).
 7) Install reverse gear selector rod (1) and selector fork (2) in the same manner as step 5).
 8) Install 5th gear shift rod fork (5).

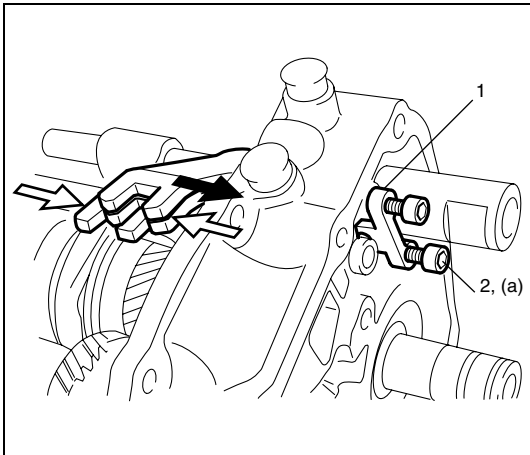
3. Selector fork pin



- 9) Install 3rd & 4th gear selector rod (1) and selector fork (2) in the same manner as step 5).

3. Selector fork pin

- 10) Install gear shift rod locking bushes using plastic hammer.



- 11) Engage 2nd, 3rd and 5th gear and install gear shift rod connector (1) with specified torque.

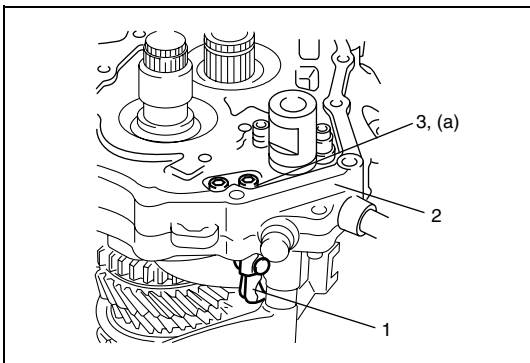
2. Gear shift rod connector bolt

Tightening torque

Gear shift rod connector bolt (a): 7 N·m (0.7 kg-m, 5.0 lb-ft)

CAUTION:

Do not reuse gear shift rod connector bolt (2). Be sure to use new adhesive pre-coated bolts. Otherwise, bolts may loosen.



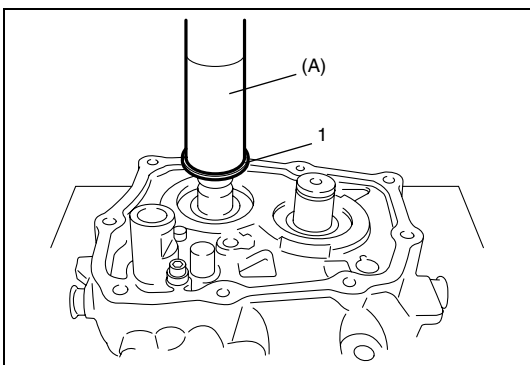
- 12) Install 5th gear pawl (1) to extension bearing plate case (2) and tighten bolts to specified torque.

Tightening torque

5th gear pawl bolt (a): 7 N·m (0.7 kg-m, 5.0 lb-ft)

CAUTION:

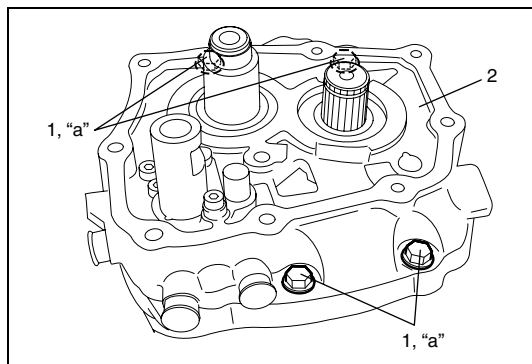
Do not reuse 5th gear pawl bolt (3). Be sure to use new adhesive pre-coat bolts. Otherwise, bolts may loosen.



- 13) Install 5th gear inner bearing ring to main shaft (1) using special tool.

Special tool

(A): 09913-84510

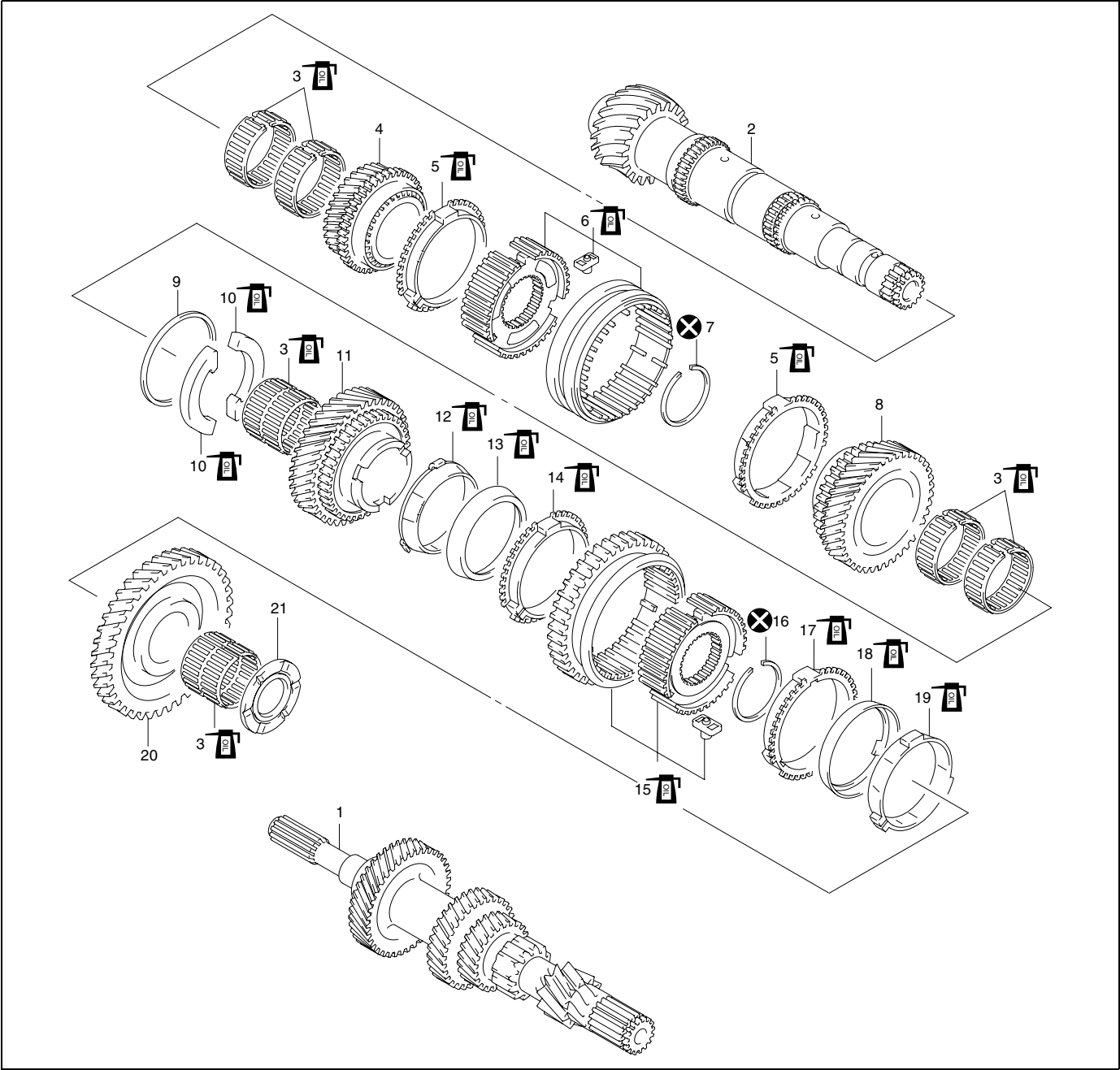


- 14) Install transmission end plate (2), and tighten bearing plate case bolt (1) with specified torque.

Tightening torque

Bearing plate case bolt (a): 22 N·m (2.2 kg-m, 16.0 lb-ft)

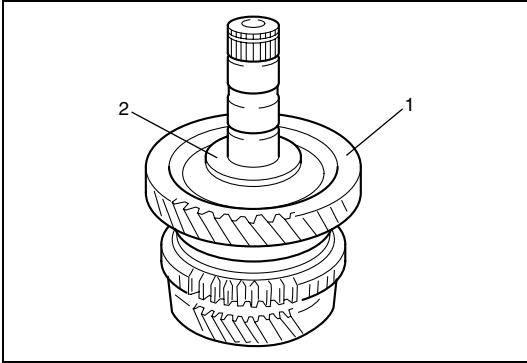
Cluster Gear & Main Shaft Components



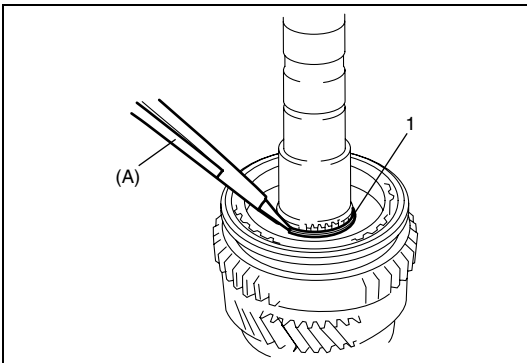
1. Transaxle cluster gear	9. 4th gear wear plate	17. 1st gear synchronizer outer ring
2. Transaxle main shaft	10. 2nd gear thrust washer	18. 1st gear synchronizer intermediate ring
3. Needle bearing	11. 2nd gear	19. 1st gear synchronizer inner ring
4. 4th gear	12. 2nd gear synchronizer inner ring	20. 1st gear
5. 3rd & 4th synchronizer ring	13. 2nd gear synchronizer intermediate ring	21. 1st gear wear plate
6. 3rd & 4th gear hub assembly	14. 2nd gear synchronizer outer ring	 Apply transaxle oil
7. Snap ring	15. 1st & 2nd gear hub assembly	 Do not reuse.
8. 3rd gear	16. 2nd gear snap ring	

Main Shaft Disassembly and Assembly

Disassembly



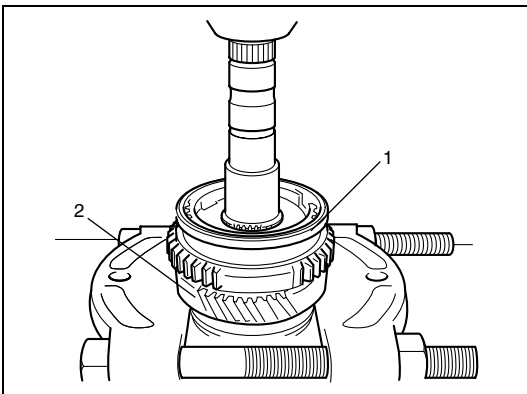
- 1) Remove 1st gear wear plate (2) and then take out 1st speed gear (1), 1st gear needle bearing and 1st gear synchronizer ring assembly.



- 2) Using special tool, remove 2nd gear snap ring (1).

Special tool

(A): 09900-06107

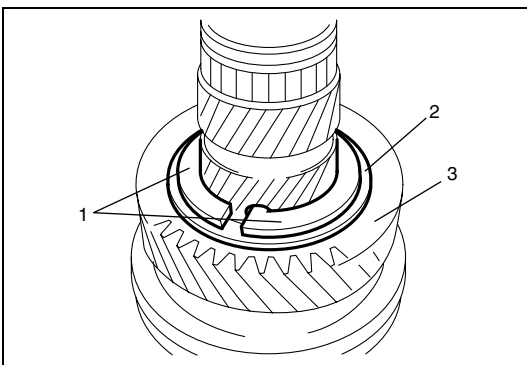


- 3) Apply puller to 2nd gear and drive out 1st & 2nd gear hub assembly (1) with 2nd gear (2) using hydraulic press.

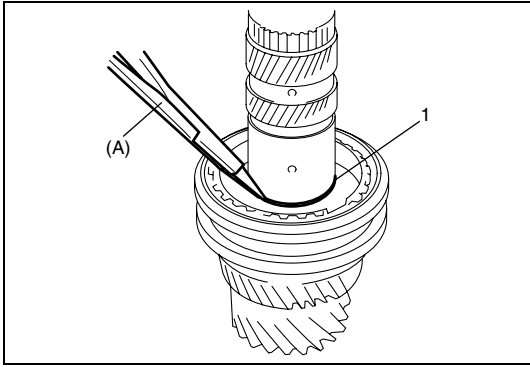
CAUTION:

Make sure to use flat side of puller to avoid causing damage to 2nd gear tooth.

- 4) Remove 2nd gear needle bearing.



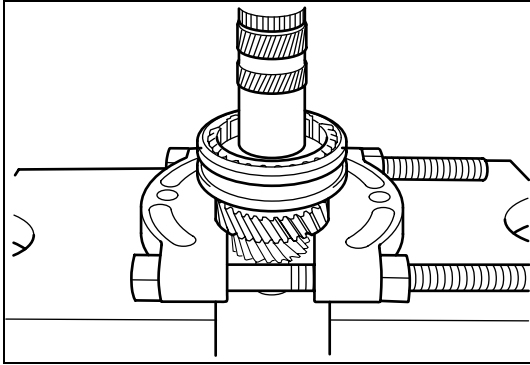
- 5) Remove 2nd gear thrust washer (1) and 4th gear wear plate (2).
- 6) Take out 3rd gear (3), 3rd gear needle bearing and 3rd & 4th synchronizer ring.



7) Remove snap ring (1) using special tool.

Special tool

(A): 09900-06107



8) Apply puller to 4th gear (2) and drive out 3rd & 4th gear hub assembly (1) with 4th gear using hydraulic press.

CAUTION:

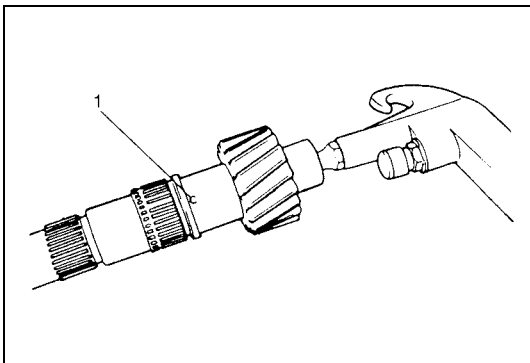
Make sure to use flat side of puller to avoid causing damage to 4th gear tooth.

9) Remove 4th gear needle bearing.

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.

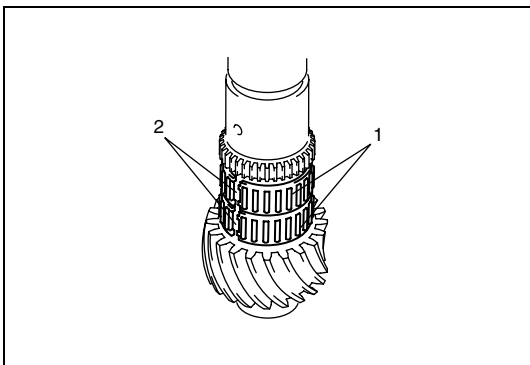
2) To ensure lubrication, air blow oil holes (1) and make sure that they are free from any obstruction.

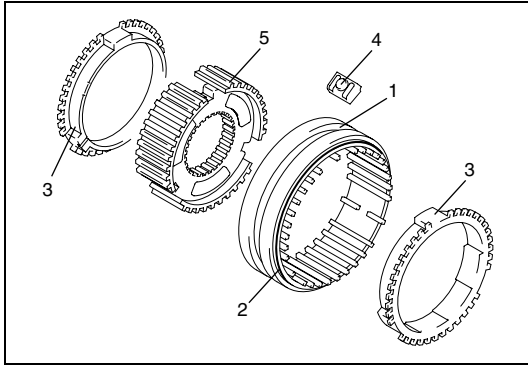


3) Install two pieces of needle bearings (1) for 4th gear onto main shaft.

NOTE:

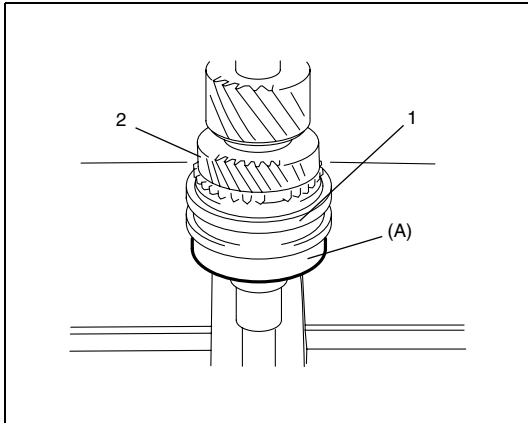
Align each slot (2) of needle bearings.





- 4) Assemble 3rd & 4th gear hub assembly (hub (5), sleeve (1) and keys (4)) as shown in figure.

- | |
|----------------------|
| 2. Groove of chamfer |
| 3. Synchronizer ring |



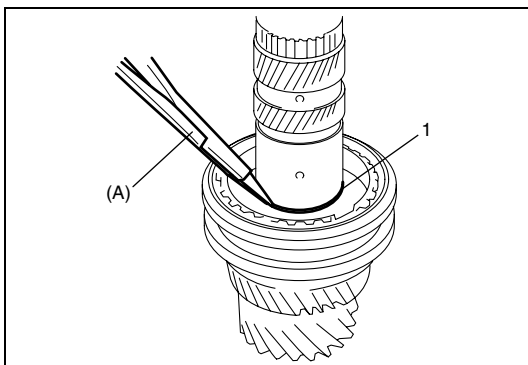
- 5) Install 4th gear (2) and synchronizer ring onto main shaft.
Press-fit 3rd & 4th gear hub assembly (1) onto main shaft facing groove of chamfer of sleeve to 3rd gear side, using special tool and hydraulic press.

Special tool

(A): 09924-07710

NOTE:

Check free rotation of 4th gear (2) after press-fitting 3rd & 4th gear hub assembly (1).

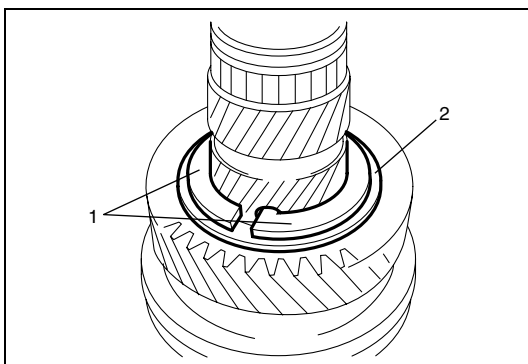


- 6) Install new snap ring (1) using special tool.

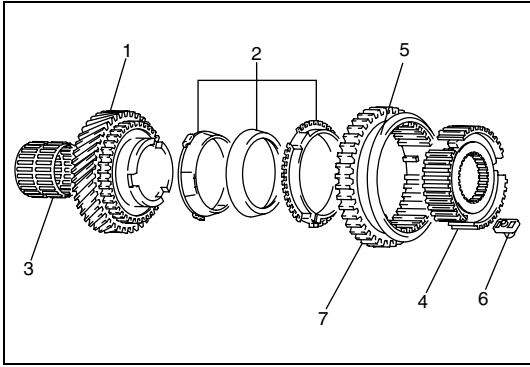
Special tool

(A): 09900-06107

- 7) Install 3rd gear needle bearing in the same manner as step 5).
8) Drive in 3rd gear.



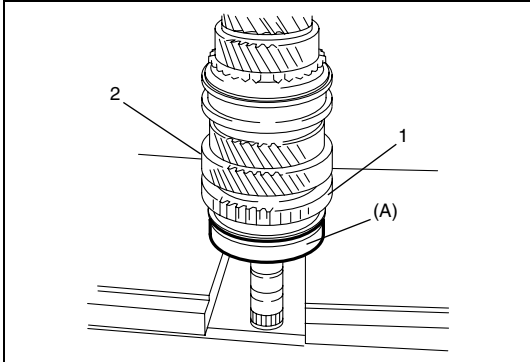
- 9) Install 2nd gear thrust washer (1) and 4th gear wear plate (2).



- 10) Assemble 2nd gear (1), 2nd gear synchronizer ring assembly (2), 2nd gear needle bearing (3) and 1st & 2nd gear hub assembly (hub (4), sleeve (5) and keys (6)).

NOTE:

Facing gear side of sleeve (7) to 2nd gear side.



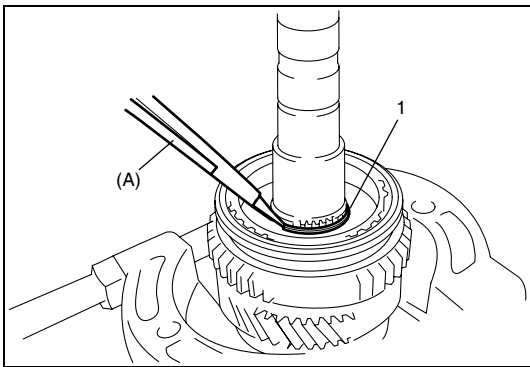
- 11) Press-fit the assembled parts in step 12) onto main shaft using special tool and hydraulic press.

Special tool

(A): 09924-07710

NOTE:

Check free rotation of 2nd gear (2) after press-fitting 1st & 2nd gear hub assembly (1).

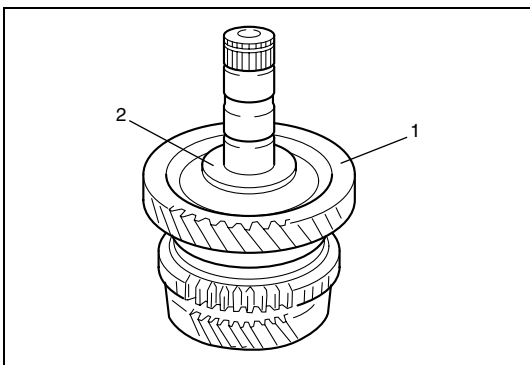


- 12) Install new 2nd gear snap ring (1) using special tool.

Special tool

(A): 09900-06107

- 13) Install 1st gear synchronizer ring assembly onto main shaft.
14) Install 1st gear needle bearing onto main shaft.



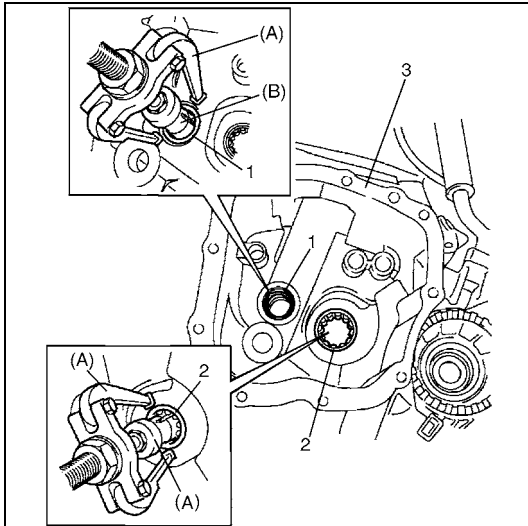
- 15) Drive in 1st gear (1) and then install 1st gear wear plate (2).

Cluster Gear & Main Shaft Inspection

- Check free rotation of all speed gears.
 - Inspect cluster gear & main shaft assembly for wear, distortion or damage.
- If any defect is found, replace defective part with new one.

Transaxle Case Disassembly and Assembly

Disassembly



- 1) Remove pinion needle bearing (1) from transaxle case (3) using special tools.

Special tool

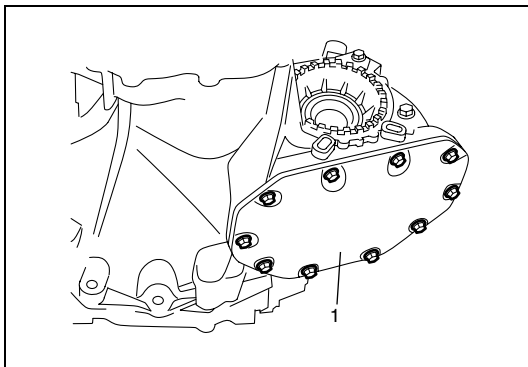
(A): 09925-08610

(B): 09926-58610

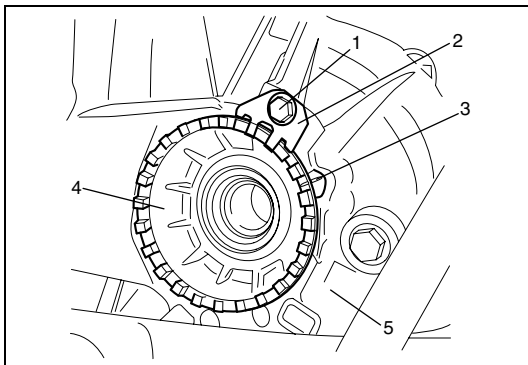
- 2) Remove main shaft roller bearing (2) from transaxle case (3) using special tools.

Special tool

(A): 09925-08610



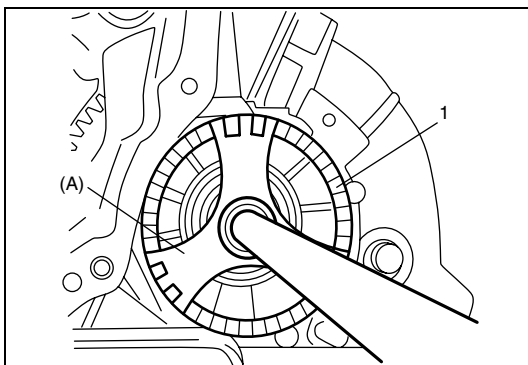
- 3) Remove differential cover (1) with gasket.
- 4) Remove left and right side differential side oil seals referring to "Differential Side Oil Seal Replacement" in this section.



- 5) Remove lock plate bolt (1) and then retaining ring lock plate (2).

NOTE:

Mark position (3) of differential bearing retaining ring (4) to transaxle case (5).

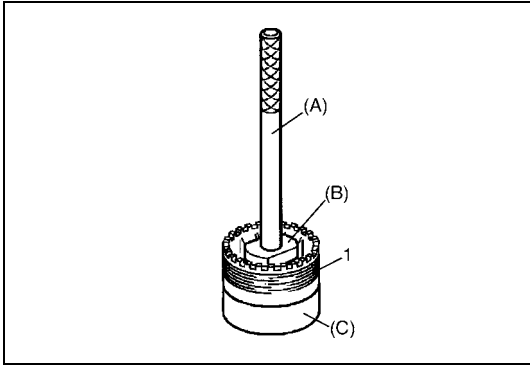


- 6) Loosen differential bearing retaining ring (1) using special tool.

Special tool

(A): 09925-18610

- 7) Remove differential assembly from lower side of transaxle case.
- 8) Remove differential bearing retaining ring, from transaxle case and remove O-ring from bearing retaining ring.



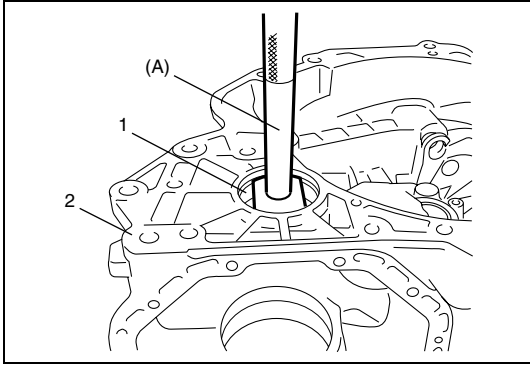
- 9) Remove differential side bearing outer race from differential bearing retaining ring (1) using special tools.

Special tool

(A): 09925-68620

(B): 09925-68610

(C): 09919-08610



- 10) Remove right side outer race (1) from transaxle case (2) using special tool.

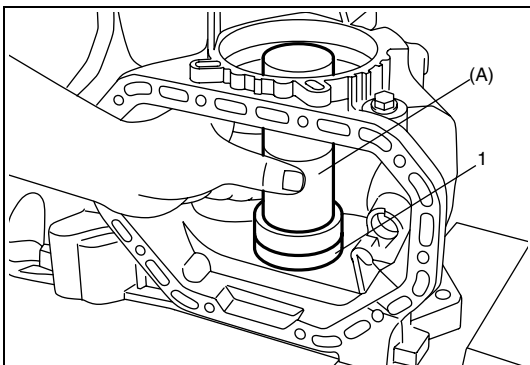
Special tool

(A): 09925-68620

Assembly

NOTE:

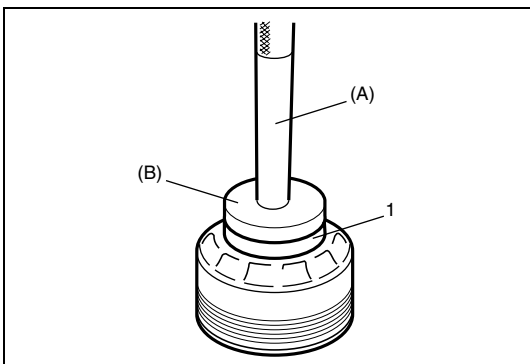
Before installation, wash each part and apply specified transaxle oil to sliding faces of bearing.



- 1) Install right side outer race (1) to transaxle case using special tool and hammer.

Special tool

(A): 09913-85210

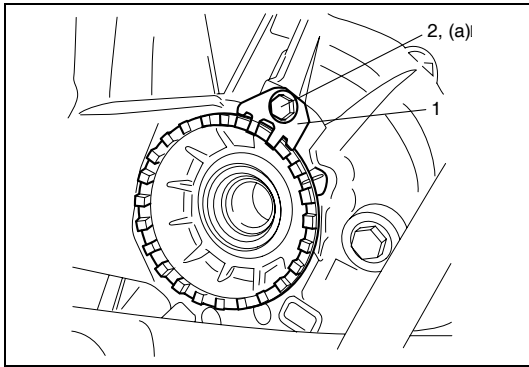


- 2) Apply transaxle oil to new O-ring and then install O-ring to groove of differential bearing retaining ring.
- 3) Install left side differential side bearing outer race (1) to bearing ring using special tools.

Special tool

(A): 09925-68620

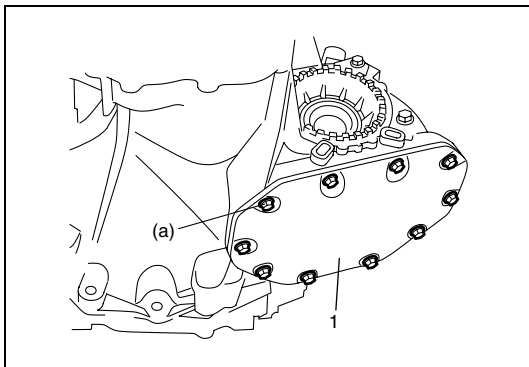
(B): 09925-68610



- 4) Install differential assembly and then install differential bearing retaining ring with specified procedure according to "Differential Adjustment" in this section.
- 5) Install retaining ring lock plate (1) and then tighten lock plate bolt (2) with specified torque.

Tightening torque

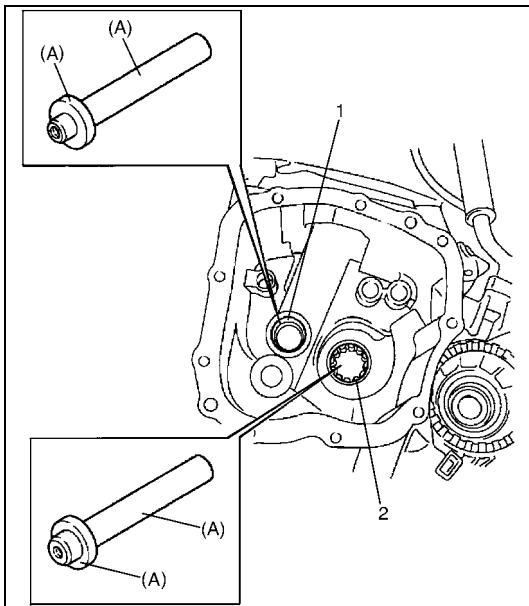
Lock plate bolt (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)



- 6) Install differential cover (1) and new gasket to transaxle case.

Tightening torque

Differential cover bolt (a): 18 N·m (1.8 kg-m, 13.0 lb-ft)



- 7) Install left side oil seal referring to "Differential Side Oil Seal Replacement" in this section.
- 8) Install differential side oil seal referring to "Differential Side Oil Seal Replacement" in this section.
- 9) Install pinion needle bearing (1) to transaxle case using special tools.

Special tool

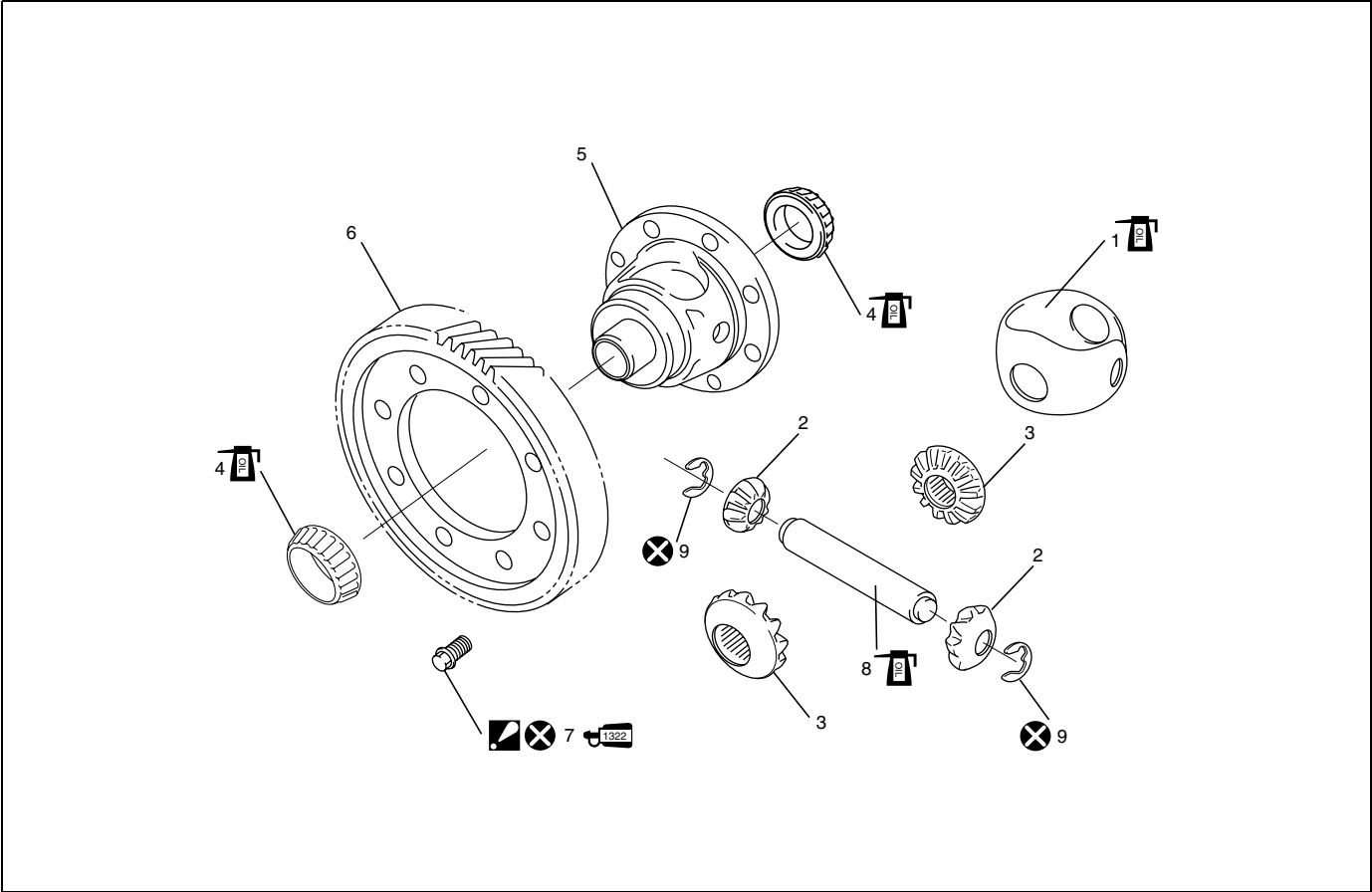
(A): 09925-18620

- 10) Install main shaft roller bearing (2) to transaxle case using special tools.

Special tool

(A): 09925-18620

Differential Components

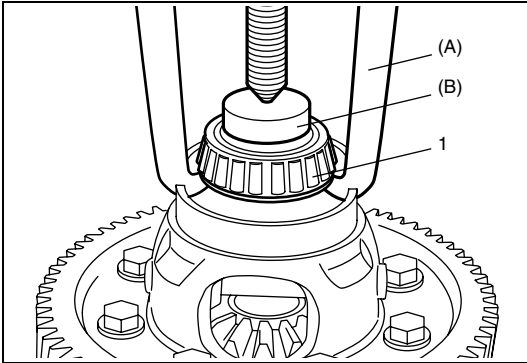


1. Plastic cage	  7. Final gear bolt : Tighten to 70 N·m (7.0 kg-m), 30° and 15° by the specified procedure. : Apply thread lock 99000-32110 to all around thread part of bolt.
2. Differential side pinion gear	8. Differential pinion shaft
3. Differential side gear	9. Differential pinion shaft washer
4. Differential side bearing	 Do not reuse.
5. Differential case	 Apply transaxle oil.
6. Final gear	

Differential Disassembly and Assembly

Disassembly

- 1) Remove oil seal referring to "Differential Side Oil Seal Replacement" in this section, if necessary.
- 2) Remove differential assembly referring to "Transaxle Case Disassembly and Assembly" in this section.

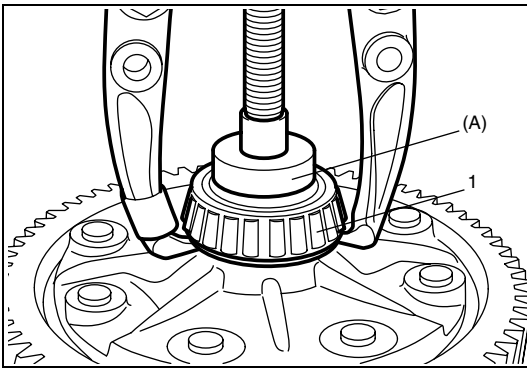


- 3) Remove right side differential side bearing (1) using special tools.

Special tool

(A): 09913-65135

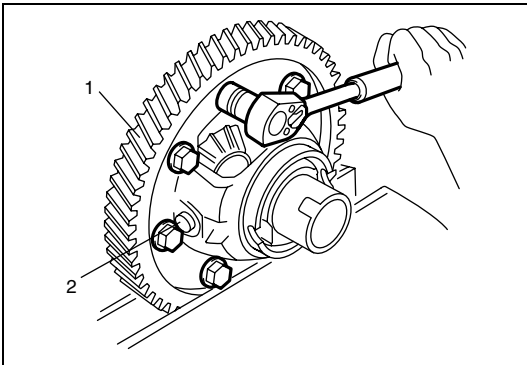
(B): 09925-88210



- 4) Remove left side differential side bearing (1) using special tool and puller.

Special tool

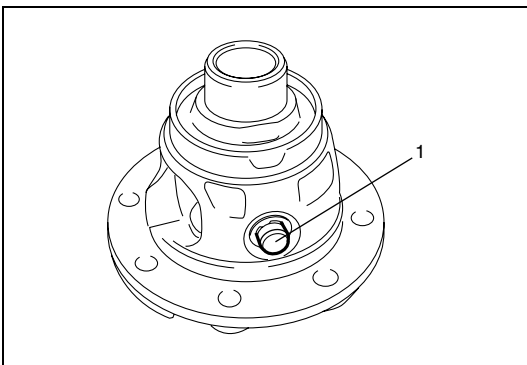
(A): 09925-88210

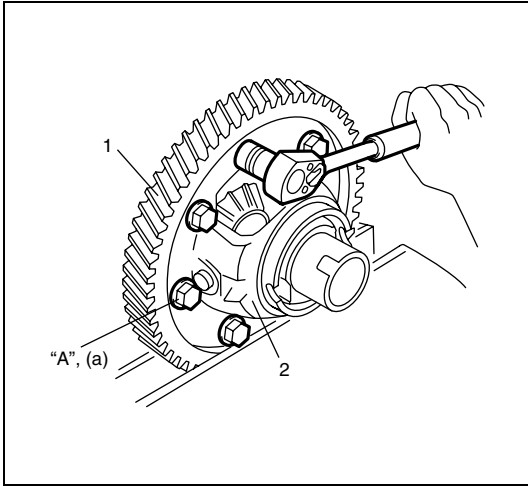


- 5) Hold differential gear assembly (1) with soft jawed vise. Remove final gear bolts and then take out final gear.
- 6) Remove pinion shaft washer from pinion shaft (2). Drive out pinion shaft and then disassemble component parts.

Assembly

- 1) Assemble component parts.
- 2) Drive in pinion shaft (1) and then install new pinion shaft washer to pinion shaft.





- 3) Hold final gear (1) with soft jawed vise, install differential case (2) and then tighten new bolts with thread lock cement applied to specified torque.

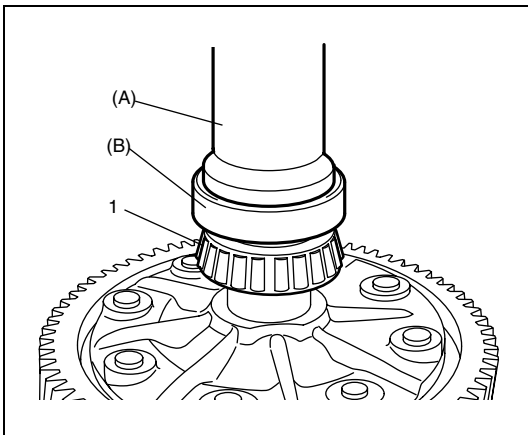
“A”: Thread lock cement 99000-32110

Tightening torque

Final gear bolt (a): 70 N·m (7.0 kg-m, 51.0 lb-ft), 30° and 15° by the specified procedure.

CAUTION:

Main shaft and final gear must be replaced as a set when either replacement becomes necessary.



- 4) Press-fit differential side bearings (right and left) (1) using special tools and hydraulic press.

Special tool

(A): 09913-70123

(B): 09924-07730

CAUTION:

Do not mix differential side bearing outer races of left and right sides.

- 5) Install differential assembly and differential bearing retaining ring referring to “Transaxle Case Disassembly and Assembly” in this section.
- 6) Install oil seal referring to “Differential Side Oil Seal Replacement” in this section.

Differential Adjustment

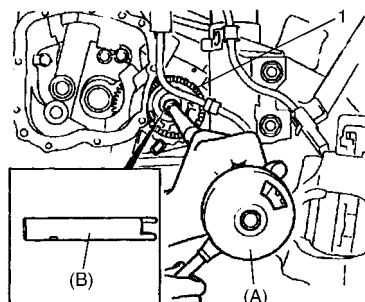
Adjust differential rotating torque to specified value below by tightening or loosening differential bearing retaining ring (1), using special tools.

Special tool

(A): 09922-78610

(B): 09922-78620

Maintain specified rotating torque at test speed of 1 revolution per second.



Repair case	Rotating torque (N·cm)
Reuse all removed parts.	(Set bearing ring to mark)
Reusing bearing, replacement of differential retaining ring, differential assembly or transaxle case.	60 – 100 (6 – 10 kg-cm, 5.25 – 8.65 lb-in)
Bearing as new part.	150 – 210 (15 – 21 kg-cm, 13.05 – 18.25 lb-in)

Tightening Torque Specification

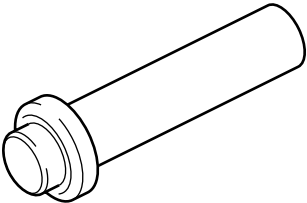
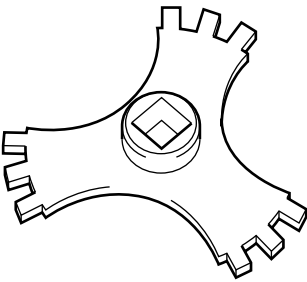
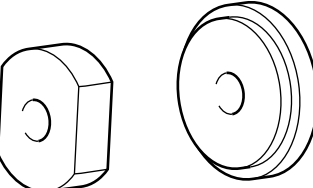
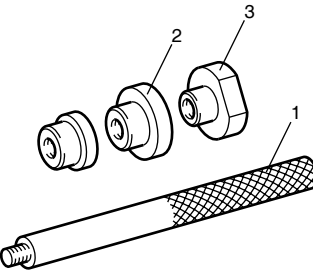
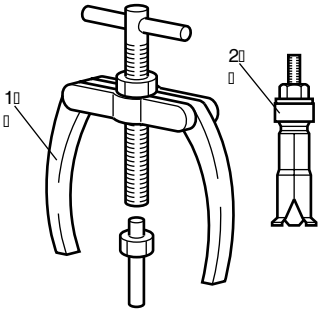
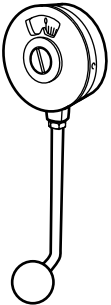
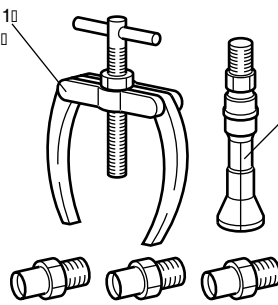
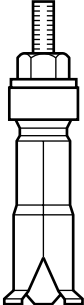
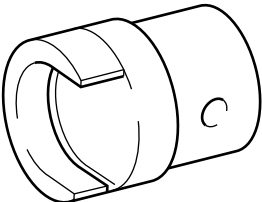
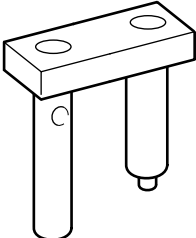
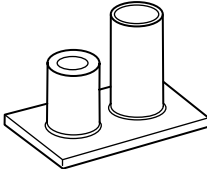
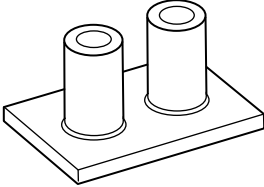
Fastening part	Tightening torque		
	N·m	kg-m	lb-ft
Differential cover bolt	18	1.8	13.0
Transaxle oil level plug	4 N·m (0.4 kg-m, 3.0 lb-ft) and 45° to 135° by the specified procedure.		
Breather plug	4 N·m (0.4 kg-m, 3.0 lb-ft) and 180° by the specified procedure.		
Gear shift control lever bolt	5	0.5	3.5
Reverse lamp switch	20	2.0	15.0
Selector lever cover bolt	15	1.5	11.0
5th gear selector fork bolt	22	2.2	16.0
Extension case cover bolt (torx)	29	2.9	21.0
Extension case cover bolt	12	1.2	8.5
Engine rear mounting bolt	55	5.5	40.0
Engine rear mounting bracket bolt	55	5.5	40.0
Transaxle to engine bracket No.1 bolt	40	4.0	30.0
Transaxle to engine bracket No.2 bolt	30	3.0	22.0
Transaxle case bolt	60	6.0	45.0
Engine left mounting bolt	55	5.5	40.0
Gear shift rod connector bolt	7	0.7	5.0
5th gear pawl bolt	7	0.7	5.0
Bearing plate case bolt	22	2.2	16.0
Lock plate bolt	9	0.9	6.5
Differential cover bolt	18	1.8	13.0
Final gear bolt	70 N·m (7.0 kg-m, 51.0 lb-ft), 30° and 15° by the specified procedure.		
Cable grommet bolt	9	0.9	6.5
Control bracket bolt	12	1.2	8.5

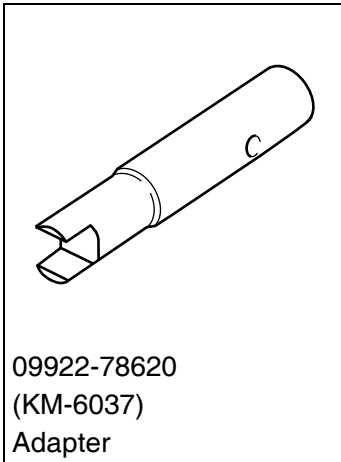
Required Service Material

Material	Recommended SUZUKI product or specification	Use
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Oil seal lips
Thread lock cement	THREAD LOCK 1322 (99000-32110)	• Select lever cover bolts • Final gear bolts

Special Tool

09900-06105 Snap ring pliers (closing type)	09900-06107 Snap ring pliers (Opening type)	09913-65135 Bearing puller	09913-70123 Bearing installer
09913-75810 Bearing installer	09913-84510 Bearing installer	09913-85210-000 Bearing pulling holder	09922-89810 Spring pin remover
09924-07710 Synchronizer hub installer	09924-07720 Synchronizer hub installer	09924-07730-000 Bearing installer	09925-88210 Bearing puller attachment
09919-08610 (KM-303) Support base	09925-68630 (KM-304) Bearing remover / installer	09925-68620 (KM-305) Bearing remover / installer	09922-48620 (KM-328-B) Locking bush remover

 09926-28610 (KM-446) Oil seal installer	 09925-18610 (KM-447) Differential bearing retaining ring remover / installer	 09925-68610 (KM-451) Outer race remover / installer	 09925-18620 (KM-454-B) Oil seal remover / installer (See NOTE "A")
 09925-08610 (KM-556-A) Bearing puller set (See NOTE "B")	 09922-78610 (MKM-536-A) Friction coefficient meter	 09913-58610 (KM-557-B) Oil seal puller set (See NOTE "C")	 09926-58610 (MKM-599) Bearing remover
 09922-48610 (KM-727) Locking bush remover	 09922-68610 (KM-6335) Transaxle shaft thrust piece	 09922-58620 (KM-6337) Transaxle shaft installer	 09922-58610 (KM-6338) Transaxle shaft installer

**NOTE:**

- “A”: Oil seal remover / installer 09925-18620 (KM-454) includes 1. KM-454-4, 2. KM-454-2 and 3. KM-454-3.
- “B”: Bearing puller set 09925-08610 (KM-556-A) includes 1. KM-556-A and 2. KM-556-2.
- “C”: Oil seal puller set 09913-58610 (MKM-557-A) includes 1. MKM-557-1 and 2. MKM-557-2A.

SECTION 7C3

CLUTCH

(Z13DT ENGINE MODEL)

WARNING:

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- Technical service work must be started at least 90 seconds after the ignition switch is turned to the “LOCK” position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

General Description	7C3-2	Clutch Cover and Clutch Disc Removal	
Diagnosis	7C3-2	and Installation.....	7C3-10
Diagnosis Table	7C3-2	Clutch Cover and Clutch Disc	
On-Vehicle Service	7C3-3	Inspection.....	7C3-11
Clutch Cable Components	7C3-3	Clutch cover	7C3-11
Clutch Cable Removal and Installation	7C3-4	Clutch Release Mechanism Removal	
Clutch Cable Inspection	7C3-6	and Installation.....	7C3-11
Clutch Cable Adjustment.....	7C3-6	Clutch Release Mechanism Inspection....	7C3-12
Clutch Pedal and Clutch Pedal Bracket		Clutch release shaft	7C3-12
Components.....	7C3-7	Tightening Torque Specification	7C3-13
Unit Repair Overhaul	7C3-9	Required Service Material	7C3-13
Clutch Cover and Clutch Disc		Special Tool.....	7C3-13
Components.....	7C3-9		

General Description

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.

The disc, carrying torsional spring, is positioned on the transaxle cluster gear with an involute spline fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back. This is the engaged condition of the clutch.

Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transaxle cluster gear.

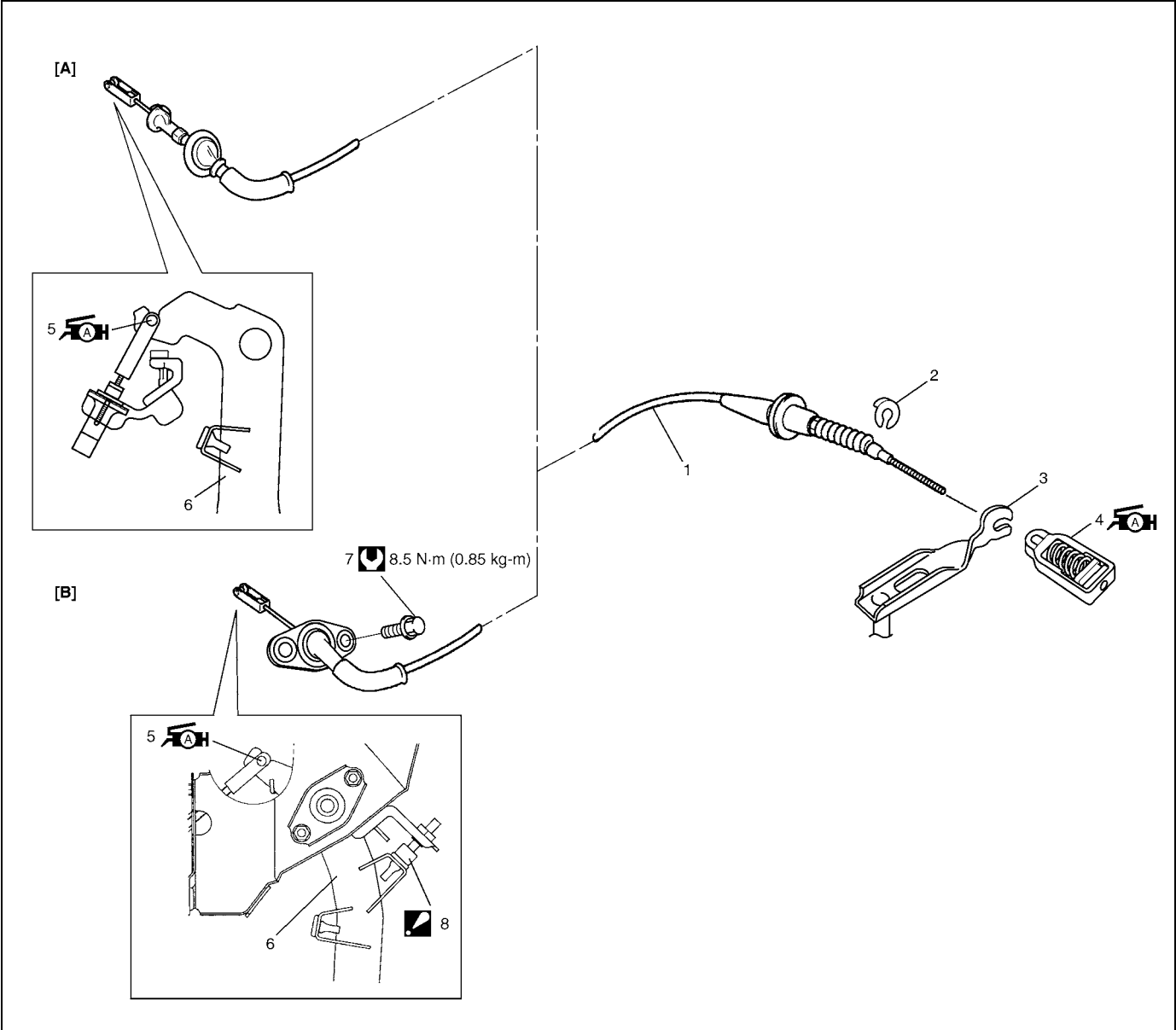
Diagnosis

Diagnosis Table

Condition	Possible Cause	Correction
Slipping	Maladjusted clutch cable	Adjust clutch cable.
	Worn or oily clutch disc facing	Replace disc.
	Warped disc, pressure plate or flywheel surface	Replace disc, clutch cover or flywheel.
	Weakened diaphragm spring	Replace clutch cover.
	Rusted clutch cable	Replace cable.
Dragging clutch	Maladjusted clutch cable	Adjust clutch cable.
	Weakened diaphragm spring, or worn spring tip	Replace clutch cover.
	Rusted cluster gear splines	Lubricate.
	Damaged or worn splines of cluster gear	Replace cluster gear.
	Excessively wobbly clutch disc	Replace disc.
	Clutch facings broken or dirty with oil	Replace disc.
Clutch vibration	Glazed (glass-like) clutch facings	Repair or replace disc.
	Clutch facings dirty with oil	Replace disc.
	Release bearing slides unsmoothly on cluster gear	Lubricate or replace cluster gear.
	Wobbly clutch disc, or poor facing contact	Replace disc.
	Weakened damper in flywheel	Replace flywheel.
	Clutch disc rivets loose	Replace disc.
	Distorted pressure plate or flywheel surface	Replace clutch cover or flywheel.
	Weakened engine mounting or loosened engine mounting bolt or nut	Retighten or replace mounting.
Noisy clutch	Worn or broken release bearing	Replace release bearing.
	Excessive rattle of clutch disc hub	Replace disc.
	Cracked clutch disc	Replace disc.
	Pressure plate and diaphragm spring rattling	Replace clutch cover.
Grabbing clutch	Clutch disc facings soaked with oil	Replace disc.
	Clutch disc facings excessively worn	Replace disc.
	Rivet heads showing out of facing	Replace disc.
	Weakened damper in flywheel	Replace flywheel.

On-Vehicle Service

Clutch Cable Components

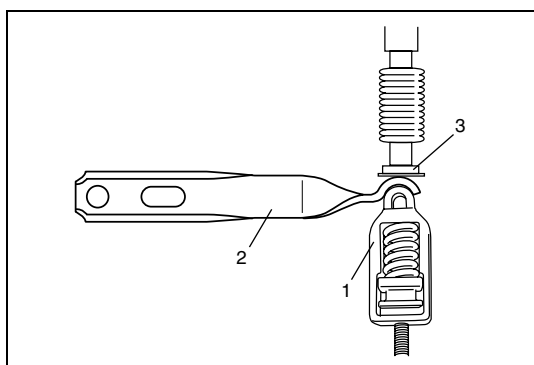


[A]: For RM413D	 4. Clutch cable nut : Apply grease 99000-25010 to clutch cable nut.
[B]: For RB413D	 5. Clutch cable hook : Apply grease 99000-25010 to cable hook.
1. Clutch cable	6. Clutch pedal
2. Joint washer	7. Clutch cable outer bolt
3. Clutch release shaft	 8. Clutch pedal stop bolt : Never loosen clutch pedal stop bolt.

Clutch Cable Removal and Installation

Removal

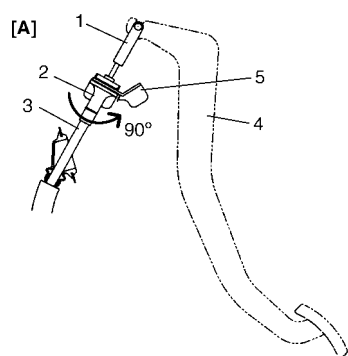
- 1) Disconnect negative cable at battery.
- 2) Remove joint washer (3) from clutch cable.
- 3) Loosen clutch cable nut (1) and remove clutch cable from clutch release shaft (2).
- 4) Detach clutch cable from clutch cable bracket.



- 5) Remove clutch cable as follows.

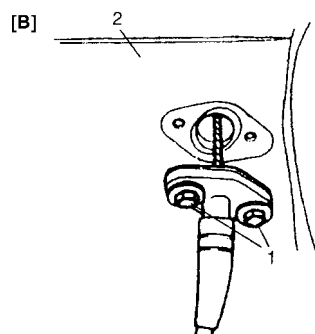
For RM413D [A]

- a) Disconnect cable hook (1) from clutch pedal (4).
- b) Remove clutch cable (3) from clutch pedal bracket (5) by turning cable cap (2) about 90° as shown.

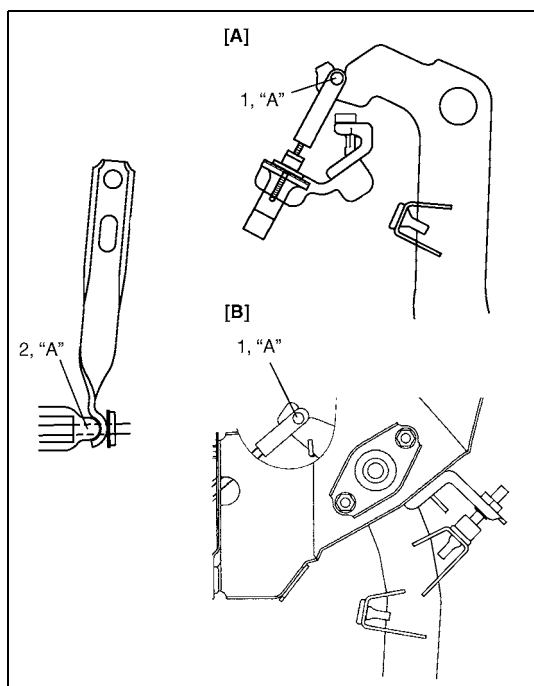


For RB413D [B]

- a) Remove clutch cable outer bolt (1) at dash panel (2) in engine room.
- b) Disconnect cable hook from clutch pedal, then take off cable.



Installation

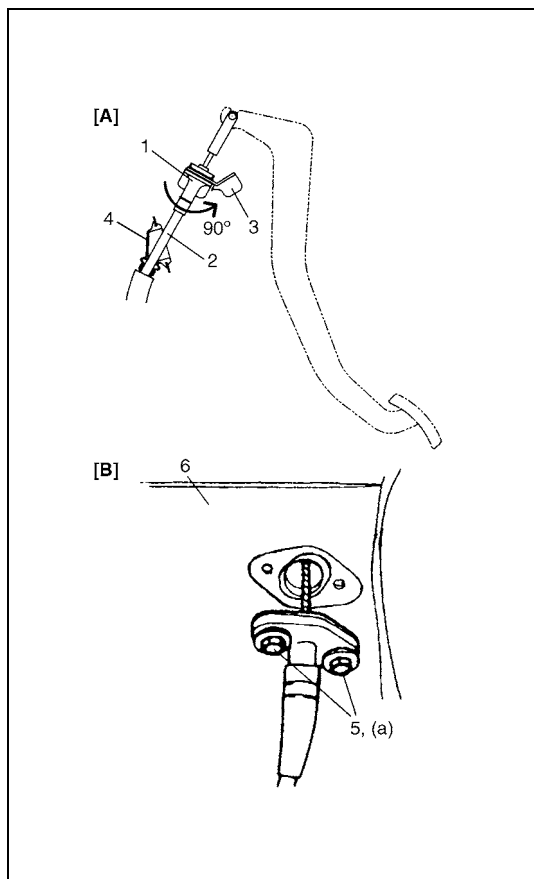


- 1) Apply grease to contact surfaces of clutch cable nut (2) and cable hook (1) before installing cable.

"A": Grease 99000-25010

- 2) Hook cable end with pedal using screwdriver or long nose pliers from cabin inside.

[A]: For RM413D
[B]: For RB413D



- 3) Install clutch cable as follows.

For RM413D [A]

- a) Install clutch cable (2) to clutch pedal bracket (3) by turning cable cap (1) about 90° as shown.

For RB413D [B]

- a) Fasten cable with 2 bolts (5) to dash panel (6).

Tightening torque

Clutch cable outer bolt

(a): 8.5 N·m (0.85 kg-m, 6.0 lb-ft)

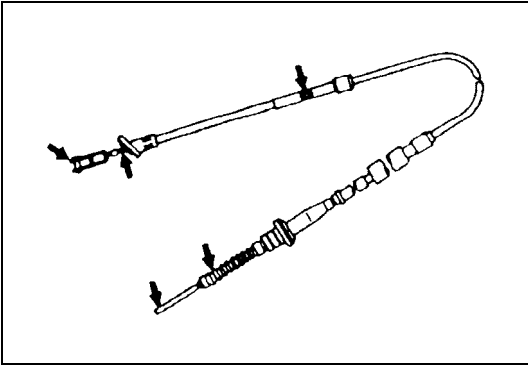
- 4) Install clutch cable to clutch cable bracket.
- 5) Join clutch cable to clutch cable nut, then install clutch cable nut to release shaft.
- 6) Screw in clutch cable nut and adjust clutch cable referring to "Clutch Cable Adjustment" in this section.

NOTE:

Take care that cable grommet (4) has specific installing direction as shown in the figure.

- 7) Connect negative cable at battery.
- 8) Check clutch for proper function with engine running.

Clutch Cable Inspection



Inspect clutch cable and replace it for any of the following conditions.

- Excessive cable friction
- Frayed cable
- Bent or kinked cable
- Broken boots
- Worn end

Clutch Cable Adjustment

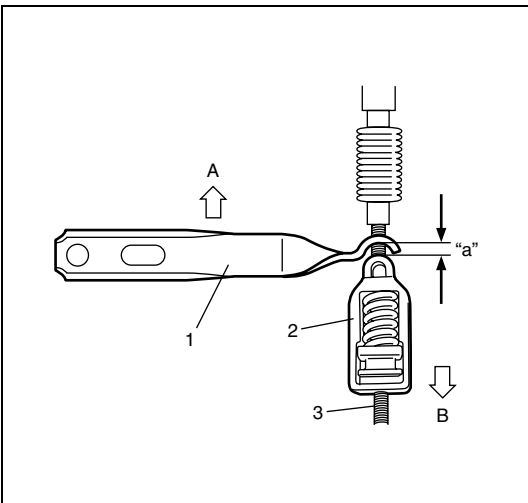
- 1) Remove joint washer from clutch cable.
- 2) Check clearance “a” under the condition a) and b), and adjust it to specified clearance turning cable nut (2) if it is out of the specification.
 - a) push release shaft (1) in the direction “A” until release shaft play disappears.
 - b) Pull at clutch cable (3) in the direction “B”.

Clearance (for used cable)

“a”: 4 – 6 mm (0.16 – 0.24 in.)

NOTE:

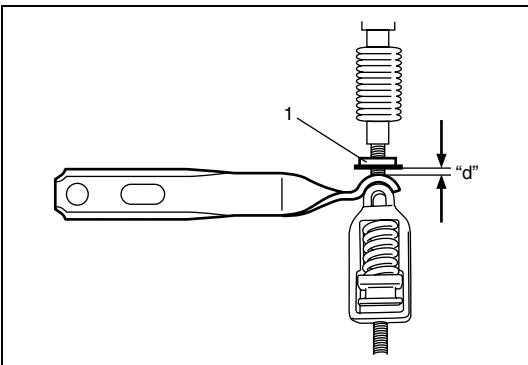
When replacing clutch cable with a new one, adjust clearance to 2 – 4 mm (0.08 – 0.16 in.).



- 3) Install joint washer (1) to the specified position.

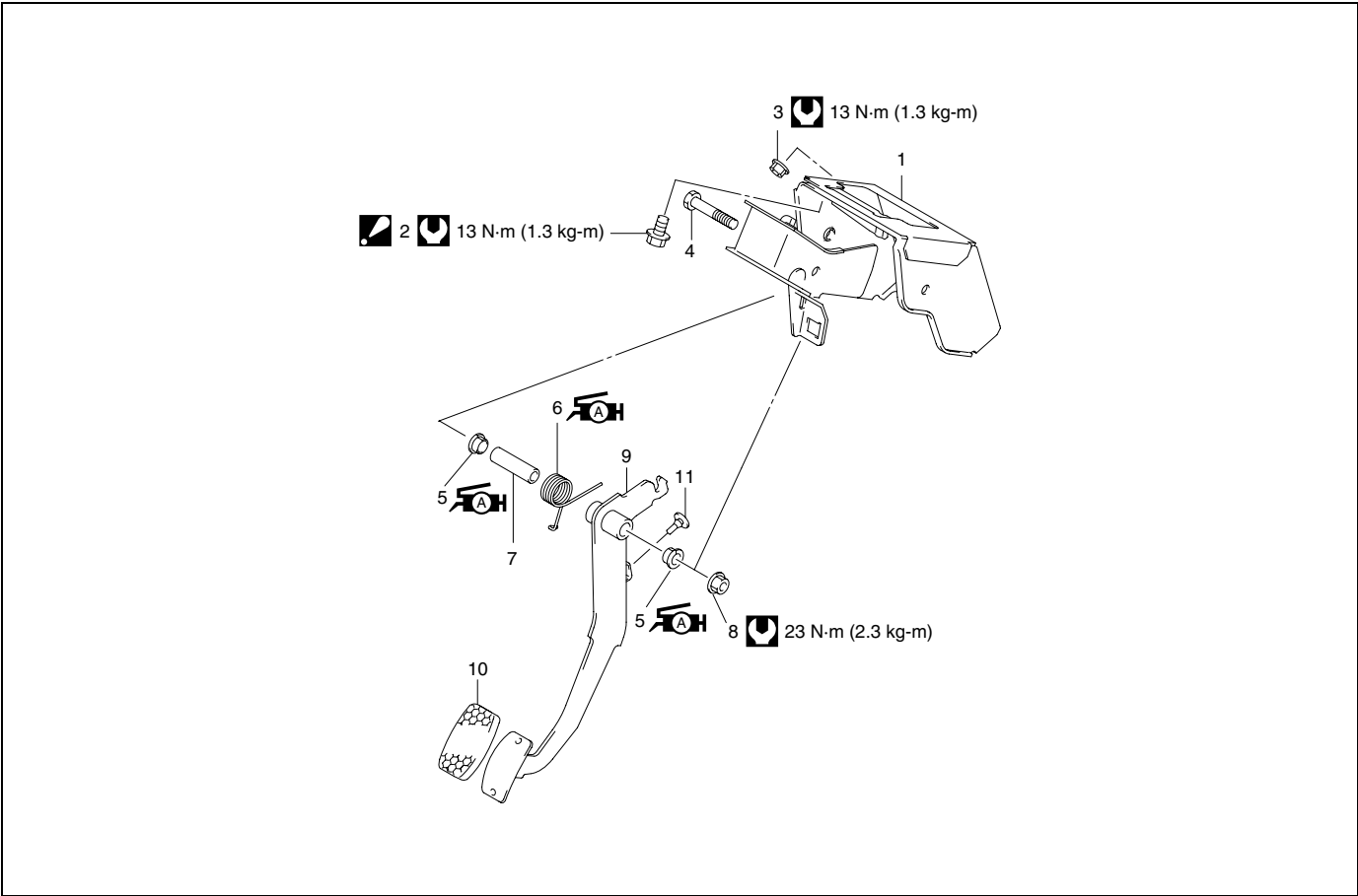
Joint washer installation position

“d”: 0 – 2 mm (0 – 0.08 in.)



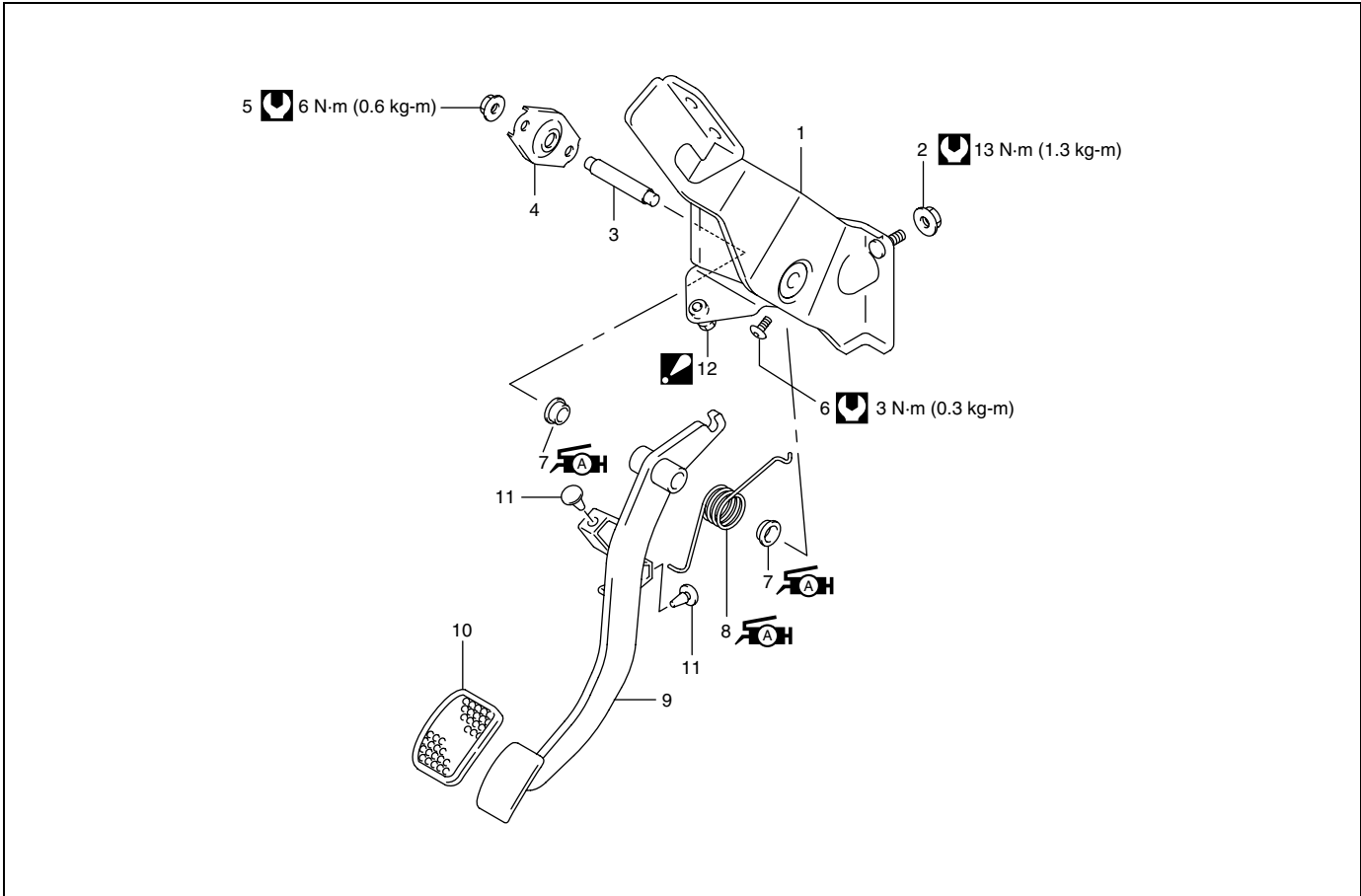
Clutch Pedal and Clutch Pedal Bracket Components

For RM413D



1. Clutch pedal bracket	7. Pedal spacer
 2. Pedal bracket bolt : Pedal bracket bolt must be tighten after pedal bracket nut.	8. Pedal shaft nut
3. Pedal bracket nut	9. Clutch pedal
4. Pedal shaft bolt	10. Pedal pad
 5. Pedal bush : Apply grease 99000-25010 to inside and outside surface of spacer.	11. Pedal cushion
 6. Pedal spring : Apply grease 99000-25010 to inside surface of spring.	 Tightening torque

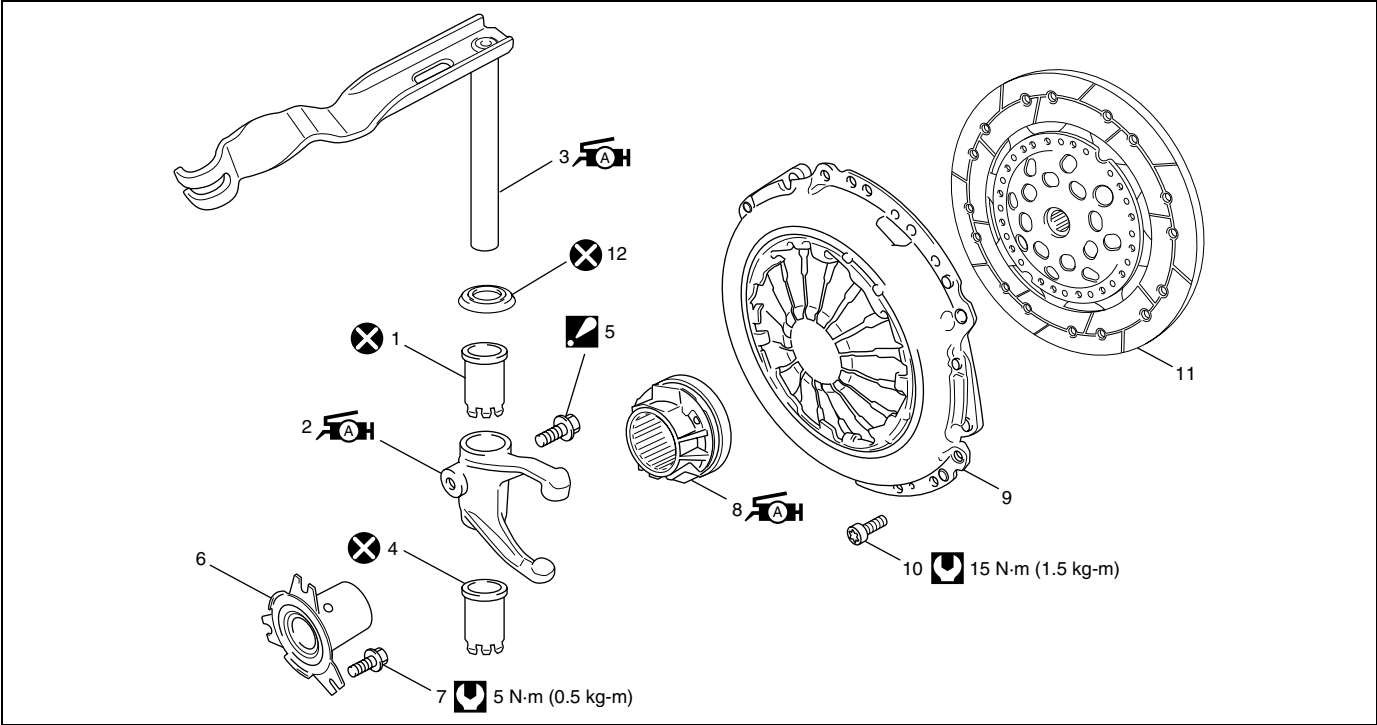
For RB413D



1. Clutch pedal bracket	 8. Pedal spring : Apply grease 99000-25010 to inside surface of spring.
2. Pedal bracket nut	9. Clutch pedal
3. Pedal shaft	10. Pedal pad
4. Pedal shaft bracket	11. Pedal cushion
5. Pedal shaft bracket nut	 12. Clutch pedal stop bolt : Never loosen clutch pedal stop bolt.
6. Bracket screw	 Tightening torque
 7. Pedal bush : Apply grease 99000-25010 to inside and outside surface of spacer.	

Unit Repair Overhaul

Clutch Cover and Clutch Disc Components



1. Clutch release shaft No.1 bush	 8. Release shaft bearing : Apply grease 99000-25010 to joint of bearing and release shaft and also bearing inside.
 2. Clutch release fork : Apply grease 99000-25010 to release fork end. (3 g (0.1 oz))	9. Clutch cover
 3. Clutch release shaft : Apply grease 99000-25010 to the end of release shaft. (0.12 – 0.36 g (0.004 – 0.010 oz))	10. Clutch cover bolt
4. Clutch release shaft No.2 bush	11. Clutch disc
 5. Clutch release fork bolt : Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft), 90° and 15° by the specified procedure.	12. Clutch release shaft collar
6. Cluster gear cover	 Tightening torque
7. Cluster gear cover bolt	 Do not reuse.

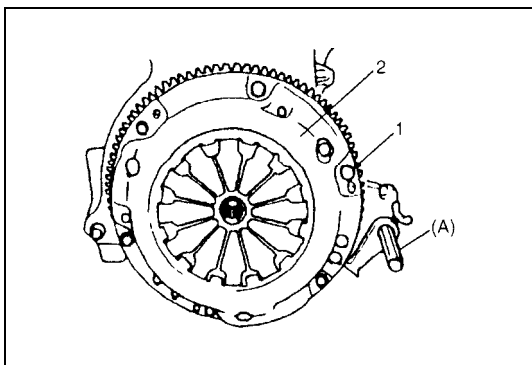
Clutch Cover and Clutch Disc Removal and Installation

Removal

- 1) Dismount transaxle assembly referring to “Transaxle Unit Dismounting and Remounting” in Section 7A3.
- 2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

Special tool

(A): 09924-17810



Installation

- 1) Aligning clutch disc to flywheel center using special tool, install clutch cover (1) and bolts. Then tighten bolts to specification.

NOTE:

- While tightening clutch cover bolts, compress clutch disc with special tool (B) by hand so that disc centered.
- Tighten cover bolts little by little evenly in diagonal order.

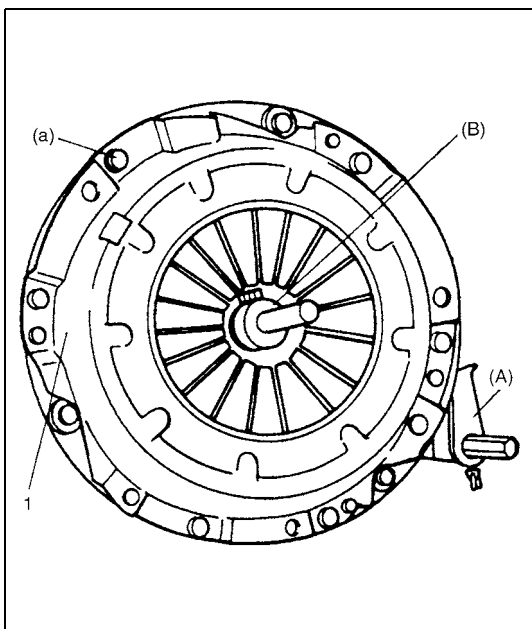
Special tool

(A): 09924-17810

(B): 09923-36320

Tightening torque

Clutch cover bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

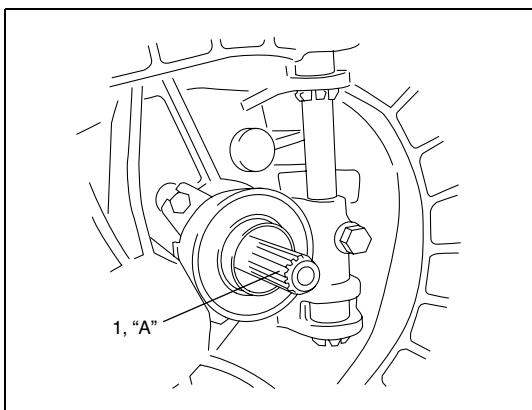


- 2) Slightly apply grease to cluster gear (1), then join transaxle assembly with engine referring to “Transaxle Unit Dismounting and Remounting” in Section 7A3.

“A”: Grease 99000-25210

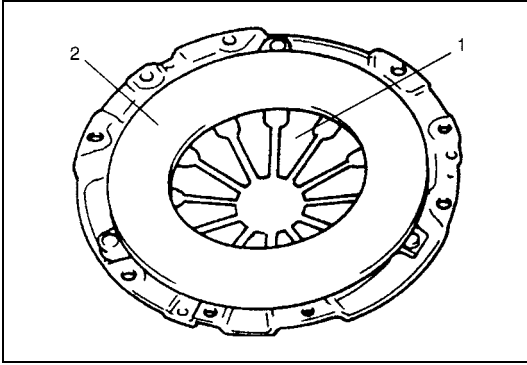
NOTE:

When inserting transaxle cluster gear to clutch disc, turn crankshaft little by little to match splines.



Clutch Cover Inspection

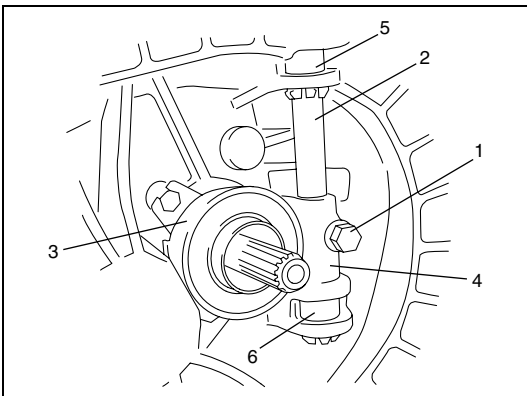
Clutch cover



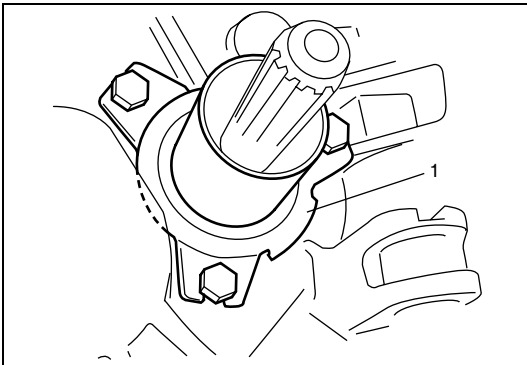
- 1) Check diaphragm spring (1) for abnormal wear or damage.
- 2) Inspect pressure plate (2) for wear or heat spots.
- 3) If abnormality is found, replace clutch cover. Do not disassemble it into diaphragm spring (1) and pressure plate (2).

Clutch Release Mechanism Removal and Installation

Removal

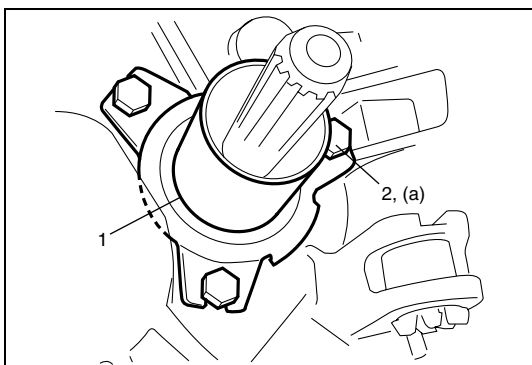


- 1) Remove clutch release fork bolt (1) and then drive out clutch release shaft (2).
- 2) Remove release shaft bearing (3) and clutch release fork (4).
- 3) Drive out clutch release shaft No.1 bush (5) and clutch release shaft No.2 bush (6) from transaxle case.



- 4) Remove cluster gear cover (1).

Installation

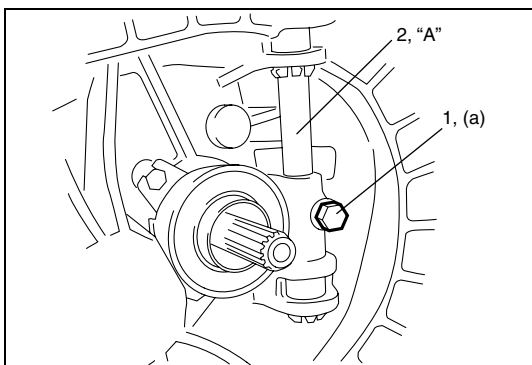


- 1) Install cluster gear cover (1) and tighten bolt (2) to specified torque.

Tightening torque

Cluster gear cover bolt (a): 5 N·m (0.5 kg-m, 3.5 lb-ft)

- 2) Drive in clutch release shaft No.1 and No.2 bushes into transaxle case.
- 3) Install release shaft bearing and release fork.



- 4) Apply grease to clutch release shaft (2) and then install clutch release shaft and tighten fork bolt (1) to specified torque.

“A”: Grease 99000-25010

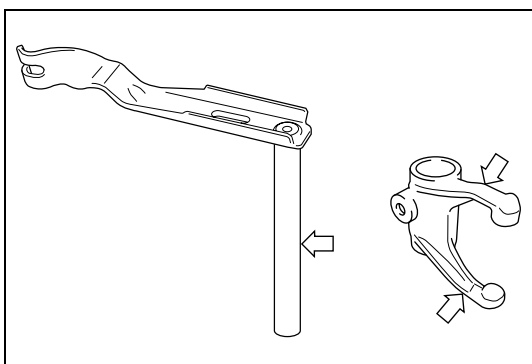
Tightening torque

Clutch release fork bolt

(a): Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft), 90° and 15° by the specified procedure.

Clutch Release Mechanism Inspection

Clutch release shaft



Check clutch release shaft and clutch release fork for deflection or damage.

If abnormality is found, replace it.

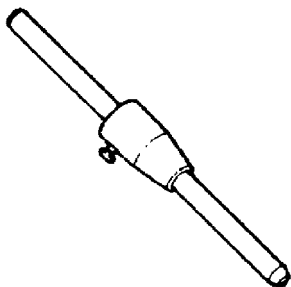
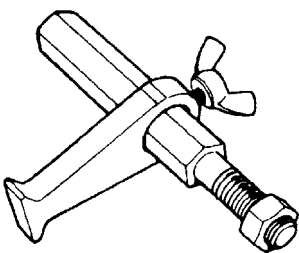
Tightening Torque Specification

Fastening part	Tightening torque		
	N·m	kg-m	lb-ft
Clutch cover bolt	15	1.5	11.0
Cluster gear cover bolt	5	0.5	3.5
Clutch release fork bolt	Tighten 25 N·m (2.5 kg-m, 18.0 lb-ft), 90° and 15° by the specified procedure.		
Pedal bracket bolt (for RM413D)	13	1.3	9.5
Pedal bracket nut	13	1.3	9.5
Pedal shaft nut (for RM413D)	23	2.3	16.5
Clutch cable outer bolt (for RB413D)	8.5	0.85	6.0
Pedal shaft bracket nut (for RB413D)	6	0.6	4.0
Bracket screw (for RB413D)	3	0.3	2.0

Required Service Material

Material	Recommended SUZUKI product (Part Number)	Use
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Cable hook and cable nut. • Release fork. • Release shaft. • Release bearing inside. • Pedal spring. • Pedal bush.
	SUZUKI SUPER GREASE I (99000-25210)	Cluster gear spline.

Special Tool

 09923-36320 Clutch center guide	 09924-17810 Flywheel holder
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1st Ed. August, 2004

Printed in Hungary

Printing:

594