

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 technicians or technicians without the proper tools and equipment may not be able to properly perform the services described in this manual.

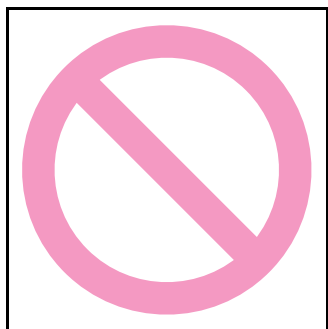
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

⚠ WARNING

For vehicles equipped with a Supplemental Restraint or 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, that is air bag or inflator modules, SDM and/or seat belt with pretensioner, beforehand to avoid component damage or unintended activation.
-

The circle with a slash in this manual means “Don’t do this” or “Don’t let this happen”.



FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to SWIFT (RS413/RS415) SERVICE MANUAL. It has been prepared exclusively for the following applicable model.

Applicable model:

SWIFT with Z13DT diesel engine (RS413D)

This supplementary service manual describes only different service information of the above applicable model as compared with SWIFT (RS413/RS415) SERVICE MANUAL. Therefore, whenever servicing the above applicable models, consult this supplement first. And for any section, item or description not found in this supplement, refer to the related manual below.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials 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.

Related Manuals:

Manual Name	Manual No.
SWIFT (RS413/RS415) SERVICE MANUAL	99500U62J00-01E

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RECOMMENDATION OF GENUINE SUZUKI PARTS AND ACCESSORIES USE

SUZUKI strongly recommends the use of genuine SUZUKI parts* and accessories. Genuine SUZUKI parts and accessories are built to the highest standards of quality and performance, and are designed to fit the vehicle's exact specifications.

A wide variety of non-genuine replacement parts and accessories for SUZUKI vehicles are currently available in the market. Using these parts and accessories can affect the vehicle performance and shorten its useful life. Therefore, installation of non-genuine SUZUKI parts and accessories is not covered under warranty.

Non-Genuine SUZUKI Parts and Accessories

Some parts and accessories may be approved by certain authorities in your country.

Some parts and accessories are sold as SUZUKI authorized replacement parts and accessories. Some genuine SUZUKI parts and accessories are sold as re-use parts and accessories. These parts and accessories are non-genuine Suzuki parts and accessories and use of these parts are not covered under warranty.

Re-use of Genuine SUZUKI Parts and Accessories

The resale or re-use of the following items which could give rise to safety hazards for users is expressly forbidden:

- 1) Air bag components and all other pyrotechnic items, including their components (e.g. cushion, control devices and sensors)
- 2) Seatbelt system, including their components (e.g. webbing, buckles, and retractors)

The air bag and seat belt pretensioner components contain explosive chemicals. These components should be removed and disposed of properly by SUZUKI authorized service shop or scrap yard to avoid unintended explosion before scrapping.

*The parts remanufactured under SUZUKI's approval can be used as genuine SUZUKI parts in Europe.

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Section 00

00

Precautions

CONTENTS

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Precautions

Precautions

General Precautions

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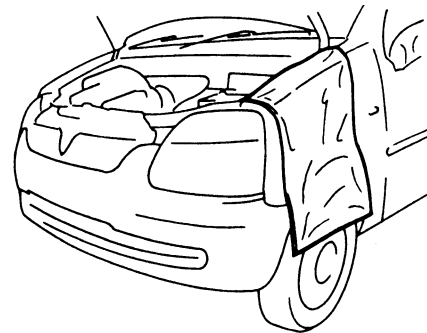
The WARNING and CAUTION describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures, and they will not necessarily be repeated with each procedure to which they apply.

▲ WARNING

- Whenever raising a vehicle for service, be sure to follow the instructions under “Vehicle Lifting Points: in Section 0A”.
- When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.
- When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.
- Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.
- To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tail pipe, muffler, etc.
- New and used engine oil can be hazardous. Children and pets may be harmed by swallowing new or used oil. Keep new and used oil and used engine oil filters away from children and pets. Continuous contact with used engine oil has been found to cause [skin] cancer in laboratory animals. Brief contact with used oil may irritate skin. To minimize your exposure to used engine oil, wear a long-sleeve shirt and moisture-proof gloves (such as dish washing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil, recycle or properly dispose of used oil and filters.

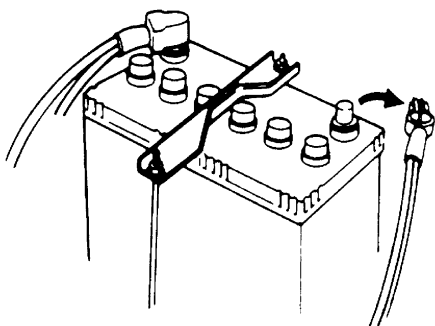
- Be sure to observe following instructions when handling service materials such as fuel, oil, fluid, coolant, grease, sealant, thread lock cement, etc. Otherwise, your health may be ruined.
 - Whenever handling any of these service materials, wear safety glasses to protect your eyes. If it gets into your eye, it may cause inflammation.
 - Whenever handling any of these service materials, wear moisture-proof gloves to protect your skin. If it adheres to your skin, it may cause inflammation.
 - Do not swallow any of these service materials. It would cause diarrhea or nausea.
 - Keep all these materials out of children’s reach.
- Make sure the bonnet is fully closed and latched before driving. If it is not, it can fly up unexpectedly during driving, obstructing your view and resulting in an accident.

- Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g., buttons) may cause damage to the vehicle’s finish.



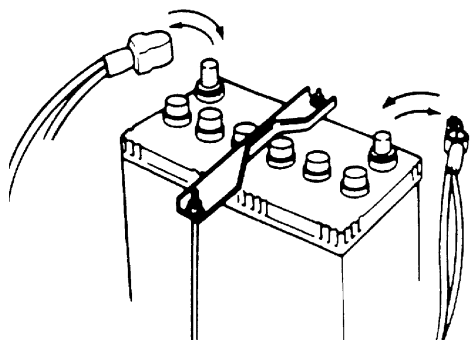
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- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.
- When disconnecting the negative cable from the battery, be careful to the following.
 - Check and record DTCs in ECM, PS control module and/or immobilizer control module if necessary before disconnecting.
 - Record displayed contents of the clock and/or audio system, etc. before disconnecting and reset it as before after connecting.



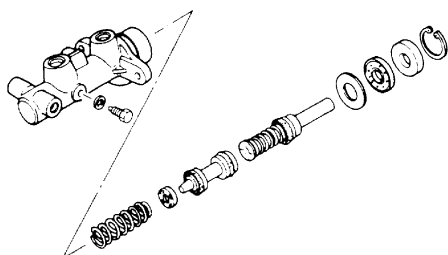
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- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.



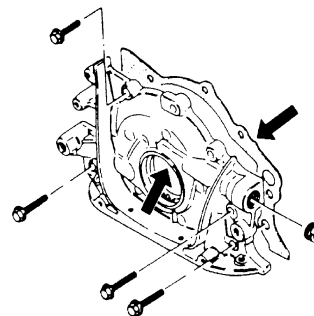
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- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.



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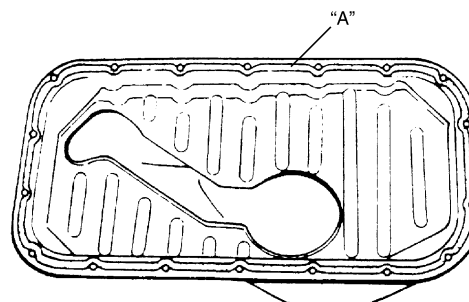
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.



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- Make sure that all parts used in reassembly are perfectly clean. When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

“A”: Water tight sealant 99000–31250



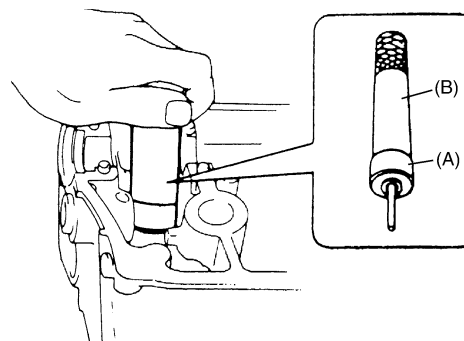
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- Be sure to use special tools when instructed.

Special tool

(A): 09917-98221

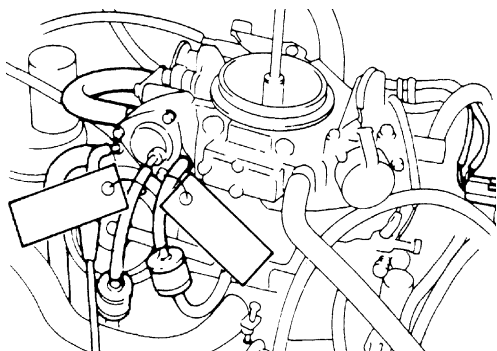
(B): 09916-58210



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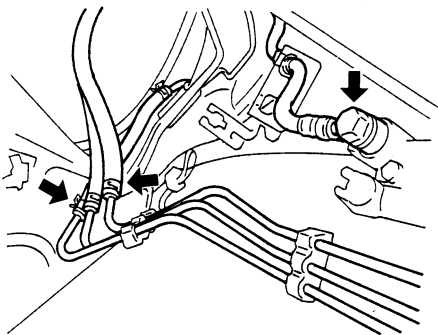
00-3 Precautions:

- When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.



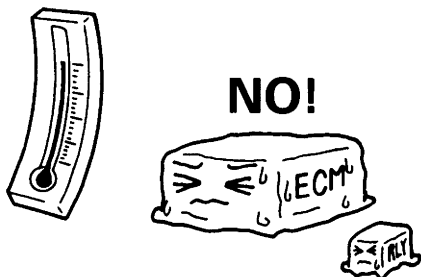
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- After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.



I2RH01010033-01

- For vehicles equipped with diesel engine, never disconnect fuel line within 60 sec. after ignition switch turned to OFF position, or fuel can be sprayed out under pressure.
- When performing a work that produces a heat exceeding 80 °C (176 °F) in the vicinity of the electrical parts, remove the heat sensitive electrical part(s) beforehand.



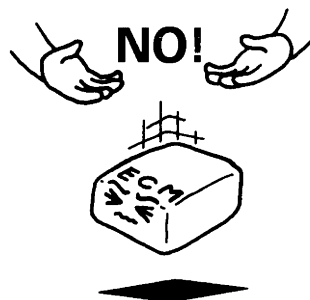
I2RH01010034-01

- Use care not to expose connectors and electrical parts to water which will be a cause of a trouble.



I2RH01010035-01

- Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.



I2RH01010036-01

Section 0

General Information

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NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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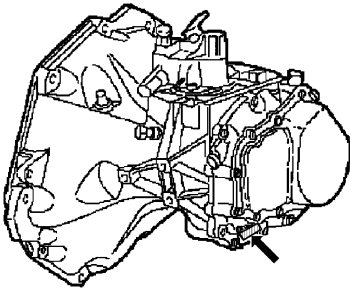
General Information

General Description

Transmission Identification Number

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The manual transmission identification number is located on transmission case.



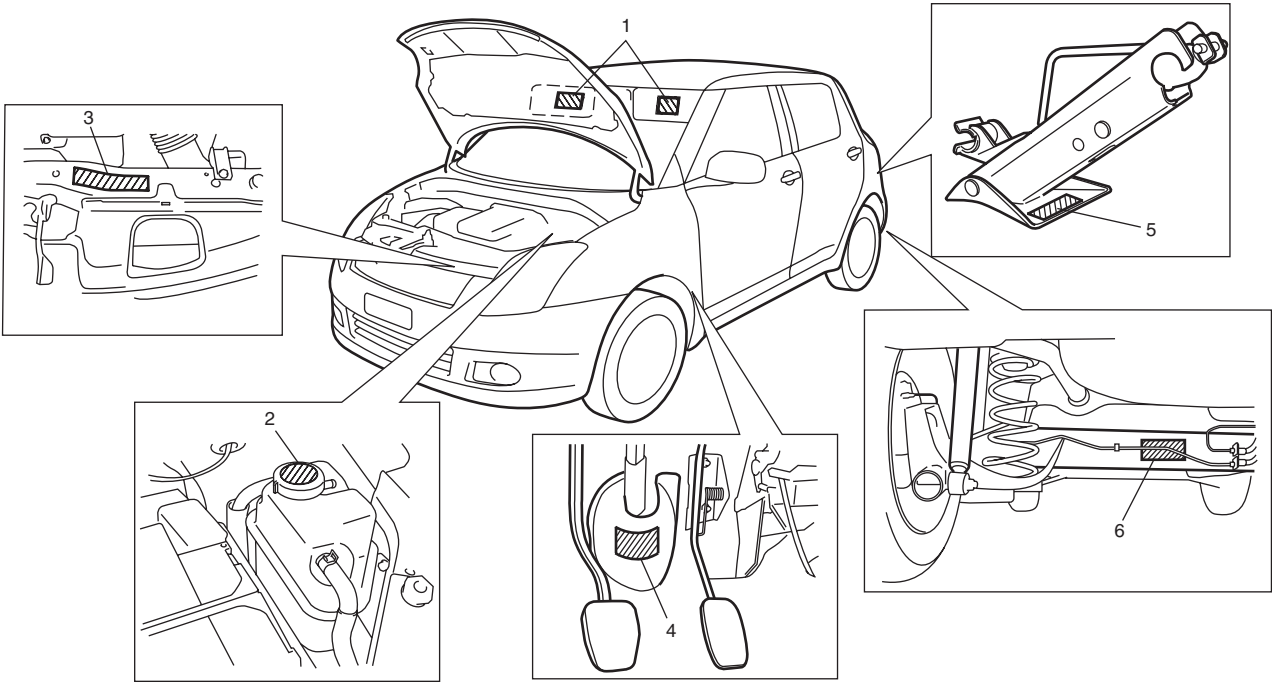
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Component Location

Warning, Caution and Information Labels Location

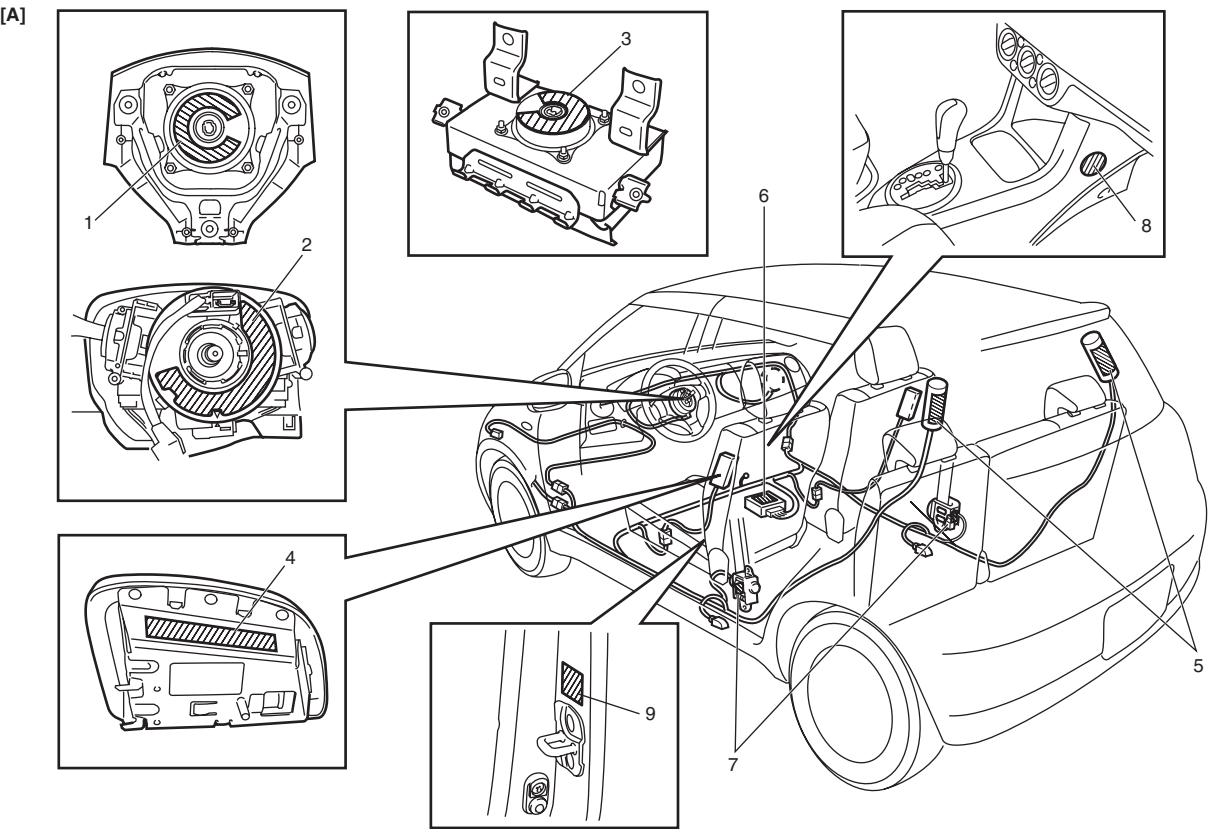
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The figure shows main labels among others that are attached to vehicle component parts. When servicing and handling parts, refer to WARNING / CAUTION instructions printed on labels. If any WARNING / CAUTION label is found stained or damaged, clean or replace it as necessary.



I5RS0B010002-01

1. Air bag label on sun visor (if equipped)	4. Steering shaft joint cover label (if equipped)
2. Degassing tank cap label	5. Jack label
3. Engine cooling fan label	6. Rear beam label



I5RS0B010003-01

1. Air bag label on driver air bag (inflator) module	6. Air bag label on SDM
2. Air bag label on contact coil assembly	7. Pretensioner label on seat belt retractor
3. Air bag label on passenger air bag (inflator) module	8. Child seat label (if equipped)
4. Air bag label on side air bag (inflator) module	9. Side/Curtain air bag label on pillar (both right and left sides)
5. Air bag label on curtain air bag (inflator) module	[A]: These labels are attached on vehicle equipped with air bag system only.

Maintenance and Lubrication

Scheduled Maintenance

Maintenance Schedule under Normal Driving Conditions

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NOTE

- This interval should be judged by odometer reading or months, whichever comes first.
- This table includes service as scheduled up to 90,000 km (54,000 miles) mileage. Beyond 90,000 km (54,000 miles), carry out the same services at the same intervals respectively.

Interval		Km (x 1,000)	15	30	45	60	75	90
		Miles (x 1,000)	9	18	27	36	45	54
		Months	12	24	36	48	60	72
Engine								
Engine accessory drive belt and tensioner (I: ⌚)			—	I	—	I	—	I
Engine accessory drive belt (R: ⌚)			Replace every 150,000 km (90,000 miles) or 120 months.					
Engine oil and oil filter (R: ⌚)	With a synthetic engine oil of oil grade: ACEA B3, and oil viscosity: SAE 0W-30, 0W-40, 5W-30, 5W-40		R	R	R	R	R	R
	With engine oils other than specified synthetic engine oils		Replace every 7,500 km (4,500 miles) or 6 months.					
Engine coolant (R: ⌚)			—	—	R	—	—	R
Exhaust system (I: ⌚)			—	I	—	I	—	I
Fuel system								
Air cleaner filter (R: ⌚)		Paved-road	—	—	R	—	—	R
		Dusty condition	Refer to “Maintenance Recommended under Severe Driving Conditions: ”.					
Fuel lines and connections (I: ⌚)			—	I	—	I	—	I
Fuel filter (R: ⌚, Drain: ⌚)			—	R	—	R	—	R
			Drain water every 15,000 km (9,000 miles) or 12 months.					
Fuel tank (I: ⌚)			—	—	I	—	—	I
Brake								
Brake discs and pads (thickness, wear, damage) (I: ⌚)			I	I	I	I	I	I
Brake drums and shoes (wear, damage) (I: ⌚)			—	I	—	I	—	I
Brake hoses and pipes (leakage, damage, clamp) (I: ⌚)			—	I	—	I	—	I
Brake fluid (R: ⌚)			—	R	—	R	—	R
Brake lever and cable (damage, stroke, operation) (I: ⌚)			Inspect at first 15,000 km (9,000 miles only)					
Chassis and body								
Clutch (fluid leakage, level) (I: ⌚)			—	I	—	I	—	I
Tires (wear, damage, rotation) / wheels (damage) (I: ⌚ / ⌚)			I	I	I	I	I	I
Suspension system (tightness, damage, rattle, breakage) (I: ⌚)			—	I	—	I	—	I
Steering system (tightness, damage, breakage, rattle) (I: ⌚)			—	I	—	I	—	I
Drive shaft (axle) boots (I: ⌚)			—	—	I	—	—	I
All latches, hinges and locks (I: ⌚)			—	I	—	I	—	I
Air conditioning filter (if equipped) (I: ⌚) (R: ⌚)			—	I	R	—	I	R

NOTE

- “R”: Replace or change
- “I”: Inspect and correct, replace or lubricate if necessary
- Some maintenance items are required to be serviced at times other than the regular maintenance times shown at the top of above table. These items can be serviced at an earlier service opportunity according to customer’s maintenance convenience. Their next maintenance service should be done within the specified period.

Maintenance Recommended under Severe Driving Conditions

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, IT IS RECOMMENDED that applicable maintenance operation be performed at the particular interval as shown in the following table.

Severe condition code:

A: Repeated short trips

B: Driving on rough and/or muddy roads

C: Driving on dusty roads

D: Driving in extremely cold weather and/or salted roads

E: Repeated short trips in extremely cold weather

F: Leaded fuel use

G: — — — — —

H: Towing a trailer (if admitted)

Severe condition code	Maintenance	Maintenance operation	Maintenance interval
– B C D – — —	Engine accessory drive belt	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months
A – C D E – — H	Engine oil and oil filter	☞ R	Every 7,500 km (4,500 miles) or 6 months
– — C – — — —	Air cleaner filter *1	☞ I	Every 2,500 km (1,500 miles)
		☞ R	Every 30,000 km (18,000 miles) or 24 months
– B C D – — — H	Wheel bearings	☞ I	Every 15,000 km (9,000 miles) or 12 months
– B – D E – — H	Drive shaft boots	☞ I	Every 15,000 km (9,000 miles) or 12 months
– — C D – — —	Air conditioning filter (if equipped) *2	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months

NOTE

- “I”: Inspect and correct or replace if necessary
- “R”: Replace or change
- *1: Inspect or replace more frequently if the vehicle is used under dusty conditions.
- *2: Clean or replace more frequently if the air from the air conditioning decreases.

Repair Instructions

Engine accessory Drive Belt and Tensioner Inspection

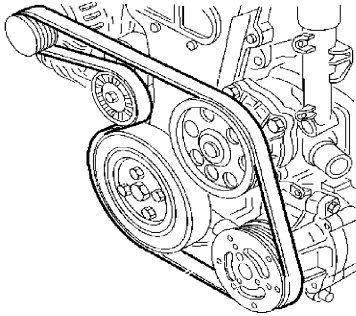
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▲ WARNING

All inspection and replacement are to be performed with **ENGINE NOT RUNNING**.

Water Pump / Generator Drive Belt

Inspect belt for cracks, cuts, deformation, wear, tension and cleanliness referring to "Water Pump / Generator Drive Belt Tension Inspection: in Section 1F". If any defect exists, replace.



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Engine accessory Drive Belt Replacement

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Water Pump and Generator Drive Belt

Replace belt with new one referring to "Water Pump / Generator Drive Belt Removal and Installation: in Section 1F".

Engine Oil and Filter Change

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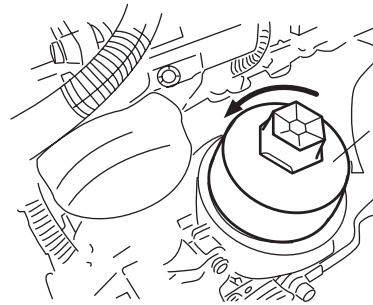
▲ WARNING

- New and used engine oil can be hazardous.
Be sure to read "WARNING" in "General Precautions: in Section 00" and observe what is written there.
- Step 1) – 6) outlined below must be performed with **ENGINE NOT RUNNING**. For Step 7), be sure to have adequate ventilation while engine is running.

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

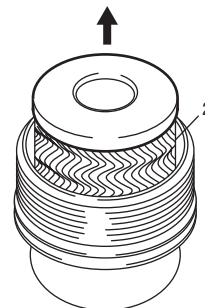
1) Remove oil filter element.

- Place oil collecting basin under filter.
- Loosen and remove oil filter housing cover (1).



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c) Pull out oil filter element (2) from cover.

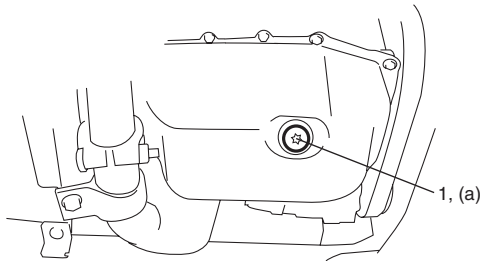


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- 2) Drain engine oil by removing drain plug (1).
- 3) After draining oil, wipe drain plug clean and replace seal ring with a new one. Reinstall drain plug, and tighten it securely as specified below.

Tightening torque

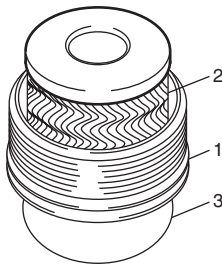
Engine oil drain plug (a): 20 N·m (2.0 kgf-m, 14.5 lb-ft)



I5RS0B020001-01

- 4) Install oil filter element.

- a) Replace seal ring (1) of oil filter housing cover (3) with new one and apply engine oil to seal ring.
- b) Install new oil filter element (2) to cover.

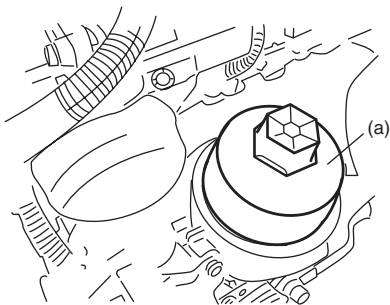


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- c) Install oil filter housing cover with element.

Tightening torque

Oil filter housing cover (a): 25 N·m (2.5 kgf-m, 18.5 lb-ft)



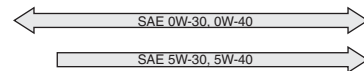
I3RM0B020006-01

- 5) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 3.2 liters (5.6 Imp pt.)) The filler inlet is by the engine oil filter. Use specified engine oil. Select the appropriate oil viscosity according to the proper engine oil viscosity chart [A].

NOTE

Note that the amount of oil required when actually changing oil may somewhat differ from the data depending on various conditions (temperature, viscosity, etc.)

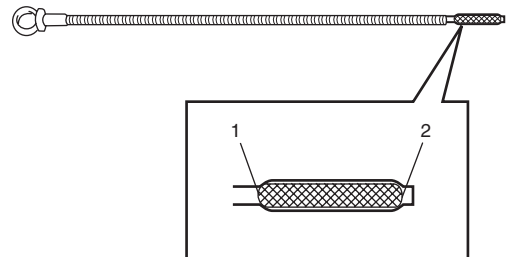
[A]



°C	-30	-20	-10	0	10	20	30	40
°F	-22	-4	14	32	50	68	86	104

I3RM0B020007-01

- 6) Check oil filter and drain plug for oil leakage.
- 7) Start engine and run it for 3 minutes. Stop it and wait 5 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (1) on dipstick.



I3RM0B020008-01

2. Low level mark

Engine Coolant Change

S5RS0B0206005

⚠ 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.

⚠ CAUTION

When changing engine coolant, use mixture of 50% specified water and 50% ANTIFREEZE / ANTICORROSION COOLANT for the purpose of corrosion protection and lubrication.

Change engine coolant with new one referring to "Cooling System Flush and Refill: in Section 1F".

Air Cleaner Filter Inspection

S5RS0B0206008

Check air cleaner filter for dirt, damage or clogging referring to "Air Cleaner Filter Inspection and Cleaning: in Section 1D".

Clean or replace if necessary.

Air Cleaner Filter Replacement

S5RS0B0206009

Replace air cleaner filter with new one referring to "Air Cleaner Filter Removal and Installation: in Section 1D".

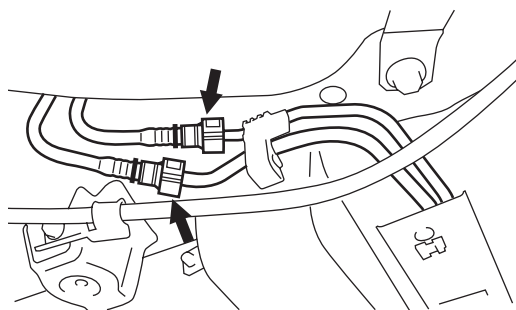
Fuel Lines and Connections Inspection

S5RS0B0206010

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking and damage. Make sure all clamps are secure.

Repair leaky joints, if any.

Replace hoses that are suspected of being cracked.



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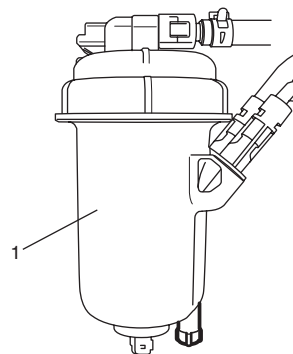
Fuel Filter Replacement

S5RS0B0206011

⚠ WARNING

This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

Replace fuel filter element in fuel filter assembly (1) with new one referring to "Fuel Filter Element Removal and Installation: in Section 1G".



I5RS0B020003-01

Water Draining of Fuel Filter

S5RS0B0206036

Bleed fuel filter of water referring to "Water Draining of Fuel Filter: in Section 1G".

Specifications

Tightening Torque Specifications

S5RS0B0207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Engine oil drain plug	20	2.0	14.5	⌚
Oil filter housing cover	25	2.5	18.5	⌚

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Fluids and Lubricants

S5RS0B0208001

Engine oil	Refer to “Engine Oil and Filter Change: ” for engine oil grade and viscosity.
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	DOT 4 or SAE J1704
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

Section 1

Engine

CONTENTS

NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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Precautions

Precautions

Precautions for Engine

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Air Bag Warning

Refer to “Air Bag Warning: in Section 00”.

Precautions on Engine Service

Refer to “Precautions on Engine Service: in Section 1A”.

Precautions in Diagnosing Trouble

Refer to “Precautions in Diagnosing Trouble: in Section 1A”.

Precautions on Fuel System Service

Refer to “Precautions on Fuel System Service: in Section 1G”.

Precaution for CAN Communication System

Refer to “Precaution for CAN Communication System: in Section 00”.

Precautions for Catalytic Converter

Refer to “Precautions for Catalytic Converter: in Section 00”.

Precautions for Electrical Circuit Service

Refer to “Precautions for Electrical Circuit Service: in Section 00”.

Engine General Information and Diagnosis

Precautions

Precautions on Engine Service

S5RS0B1100001

⚠ CAUTION

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, turbocharger, 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.

Precautions in Diagnosing Trouble

S5RS0B1100002

- 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. 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 00" 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 1C".
- Fuel injector calibration code registration
If fuel injector is replaced, register fuel injector calibration code into ECM by performing procedure described in "ECM Registration: in Section 1C". Otherwise, it has an adverse effect on engine.

General Description

Statement on Cleanliness and Care

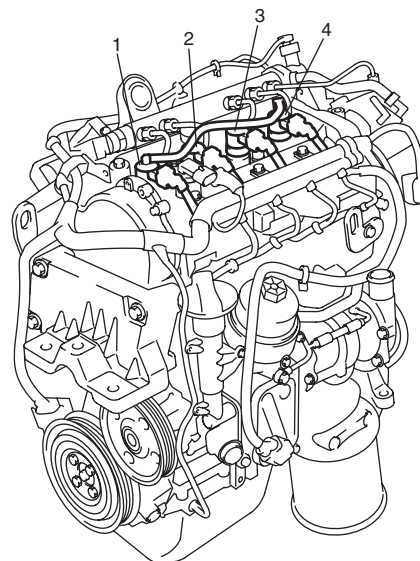
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An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of an inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. 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 surfaces 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.

- 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 to flywheel side.



I5RS0B110001-01

Engine Diagnosis General Description

S5RS0B1101002

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 localization 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.

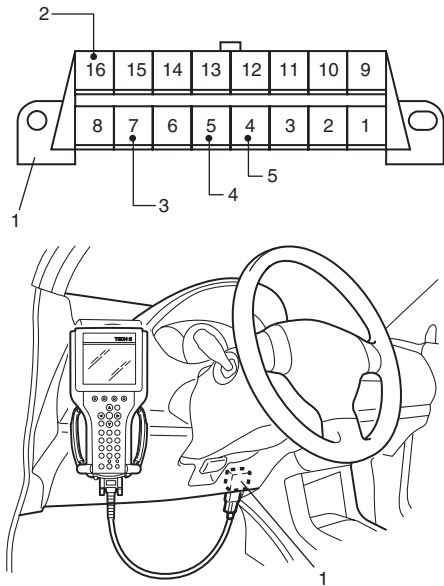
“A: Engine Diagnostic System Check: ” of this checking procedure follows that diagnostic path. Diagnosis of an electronic system according to the above described concept always starts with this main check.

The instructions described in “A: Engine Diagnostic System Check: ” 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 (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 “A: Engine Diagnostic System Check: ”.

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

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 to communication with ECM, ABS control module, EPS control module, SDM, BCM and immobilizer control module.



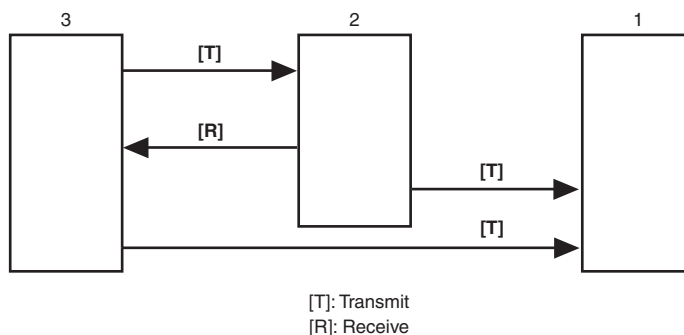
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2. B+	5. Body ground
4. ECM ground	

CAN Communication System Description

S5RS0B1101004

Communication of ECM (3), BCM (2) and combination meter (1), is established by CAN (Controller Area Network).



I5RS0B110002-01

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates with each control module about the following information.

Data which ECM transmits to combination meter

- Engine revolution speed signal
- Engine coolant temperature signal
- Vehicle speed signal
- Service Vehicle Soon (SVS) lamp control signal
- Glow indicator lamp control signal
- Engine oil pressure warning light control signal

Data which ECM transmits to BCM

- Engine revolution speed signal
- Engine coolant temperature signal
- Vehicle speed signal
- Fuel consumption signal (Distance kilometers per liter of fuel) for information display
- Stop lamp switch signal for supplementary heater controller
- Fuel heater signal for supplementary heater controller

Data which ECM receives from BCM

- A/C switch ON signal

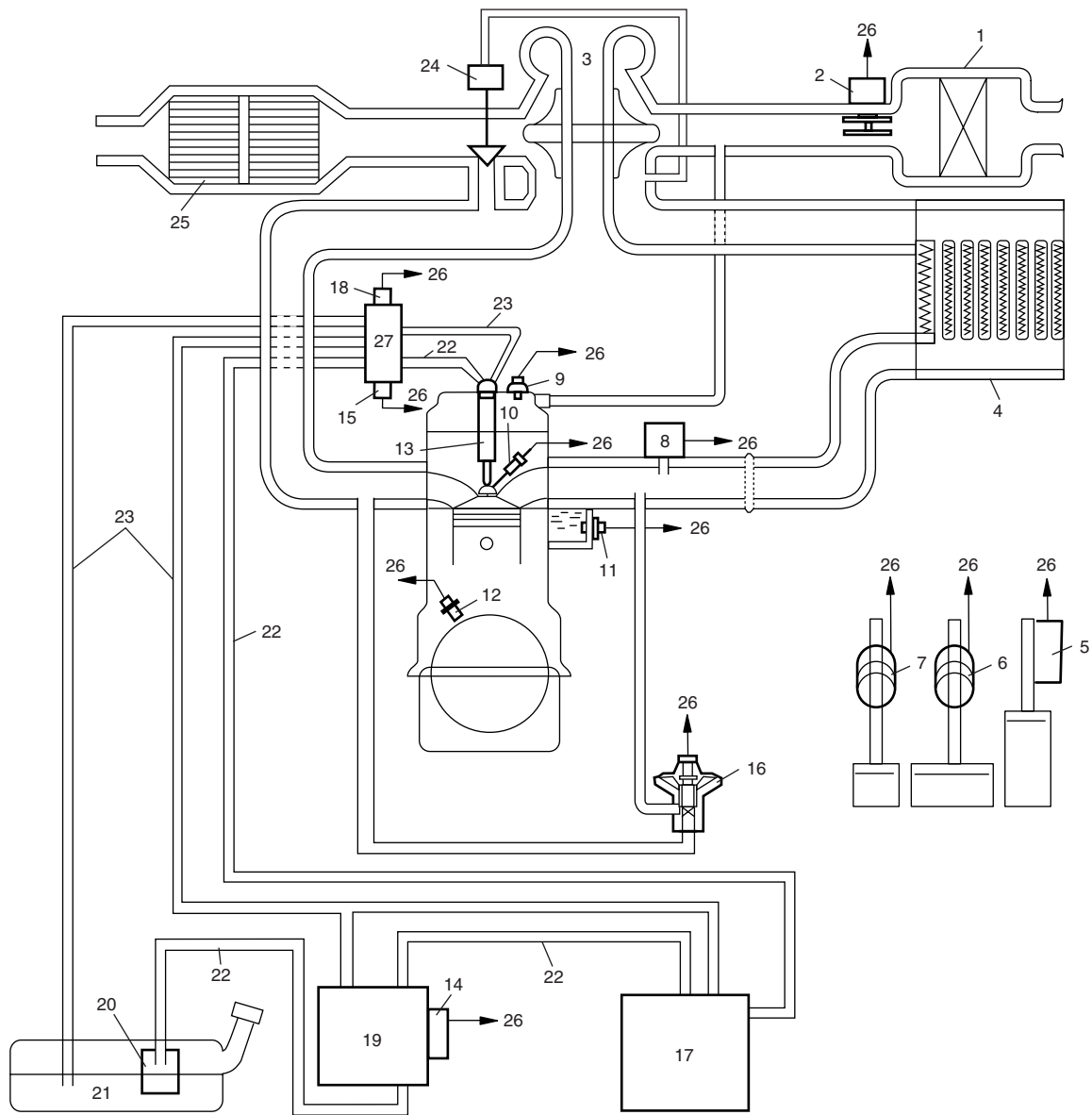
NOTE

In communication between ECM and combination meter, data is transmitted only from ECM to combination meter (Combination meter does not transmit data to ECM).

Electronic Control System Description

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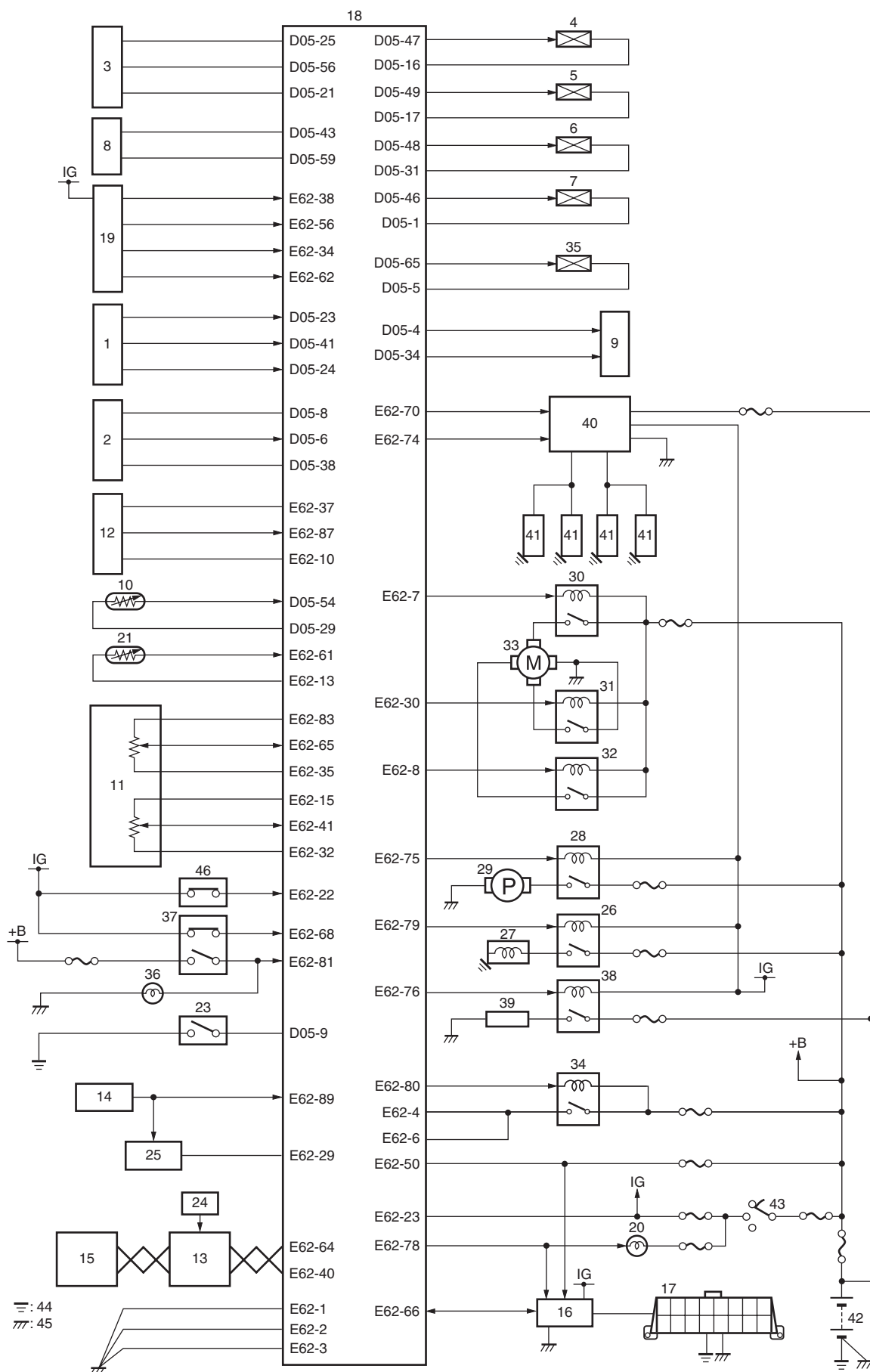
System Diagram



I3RMOB112003-01

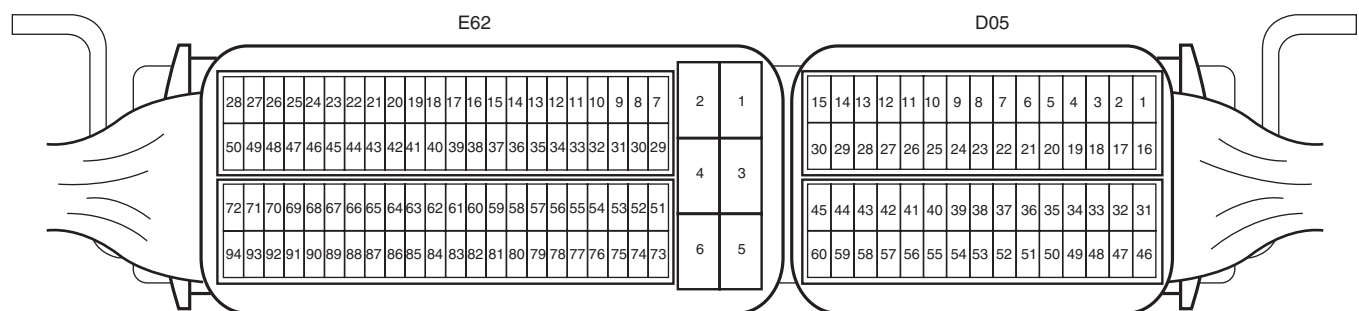
1. Air cleaner	10. Glow plug	19. Fuel filter
2. MAF and IAT sensor	11. ECT sensor	20. Fuel pump
3. Turbocharger	12. CKP sensor (Engine speed sensor)	21. Fuel tank
4. Intercooler	13. Fuel injector	22. Fuel feed line
5. PPS (APP sensor)	14. Fuel heater and temperature sensor	23. Fuel return line
6. Brake 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)

System Wiring Circuit Diagram



1. Boost pressure sensor	13. BCM	25. EPS control module	37. Brake switch
2. Fuel pressure sensor	14. ABS control module	26. Compressor relay (if equipped)	38. Fuel heating relay
3. CMP sensor	15. Combination meter	27. A/C compressor (if equipped)	39. Fuel heater
4. Fuel injector No.1	16. Immobilizer control module	28. Fuel pump relay	40. Glow controller
5. Fuel injector No.2	17. Data link connector	29. Fuel pump	41. Glow plug
6. Fuel injector No.3	18. ECM	30. Radiator fan relay 1	42. Battery
7. Fuel injector No.4	19. MAF and IAT sensor	31. Radiator fan relay 2	43. Ignition switch
8. CKP sensor	20. Malfunction indicator lamp	32. Radiator fan relay 3	44. Engine ground
9. Fuel pressure regulator	21. Fuel temperature sensor	33. Radiator cooling fan motor	45. Vehicle body ground
10. ECT sensor	22. Glow indicator lamp	34. Main relay	46. Clutch switch
11. Accelerator pedal position (APP) sensor	23. Oil pressure switch	35. EGR valve	
12. A/C pressure sensor (if equipped)	24. A/C switch (if equipped)	36. Brake lamp	

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



I5RS0B110004-01

Connector: D05

Terminal	Circuit	Terminal	Circuit
1	Fuel injector No.4 output (low side)	31	Fuel injector No.3 output (low side)
2	—	32	—
3	—	33	—
4	Output of 12 V power source for fuel pressure regulator	34	Fuel pressure regulator signal
5	Output of 12V power source for EGR valve	35	—
6	Fuel pressure sensor signal	36	—
7	—	37	—
8	Output of 5 V power source for fuel pressure sensor	38	Ground for fuel pressure sensor
9	Oil pressure switch signal	39	—
10	—	40	—
11	—	41	Boost pressure sensor signal
12	—	42	—
13	—	43	CKP sensor signal (+)
14	—	44	—
15	EGR valve output	45	—
16	Fuel injector No.1 output (low side)	46	Fuel injector No.4 output (high side)
17	Fuel injector No.2 output (low side)	47	Fuel injector No.1 output (high side)
18	—	48	Fuel injector No.3 output (high side)
19	—	49	Fuel injector No.2 output (high side)
20	—	50	—
21	Ground for CMP sensor	51	—
22	—	52	—
23	Output of 5 V power source for boost pressure sensor	53	—
24	Ground for boost pressure sensor	54	ECT sensor signal
25	Output of 5 V power source for CMP sensor	55	—
26	—	56	CMP sensor signal
27	—	57	—

1A-7 Engine General Information and Diagnosis:

Terminal	Circuit	Terminal	Circuit
28	—	58	—
29	Ground for ECT sensor	59	CKP sensor signal (—)
30	—	60	—

Connector: E62

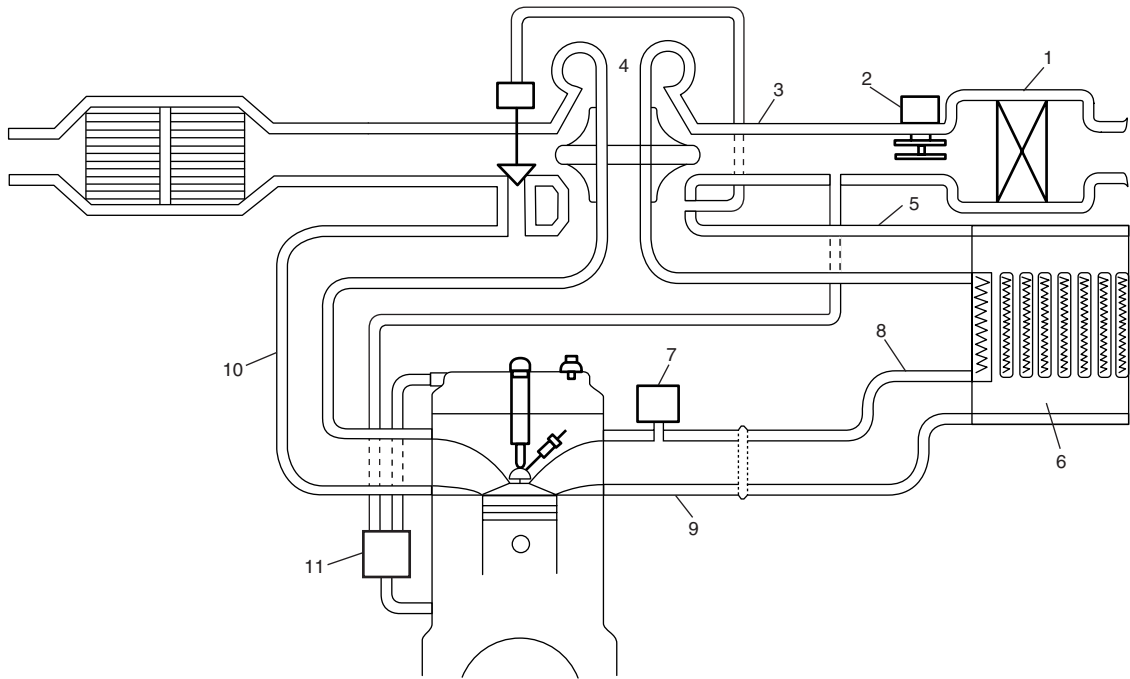
Terminal	Circuit	Terminal	Circuit
1	Ground for ECM	48	—
2	Ground for ECM	49	—
3	Ground for ECM	50	Power source for ECM
4	Main power supply	51	—
5	—	52	—
6	Main power supply	53	—
7	Radiator fan relay 1 output	54	—
8	Radiator fan relay 2 output	55	—
9	—	56	MAF sensor signal
10	Ground for A/C pressure sensor	57	—
11	—	58	—
12	—	59	—
13	Ground for fuel temperature sensor	60	—
14	—	61	Fuel temperature sensor signal
15	Output of 5 V power source for APP sensor (sensor 2)	62	IAT sensor signal
16	—	63	—
17	—	64	CAN communication line (active high signal)
18	—	65	APP sensor (sensor 1) signal
19	—	66	To immobilizer control module
20	—	67	—
21	—	68	Brake switch 2 signal
22	Clutch switch signal	69	—
23	Ignition switch signal	70	Glow controller input signal
24	—	71	—
25	—	72	—
26	—	73	—
27	—	74	Glow controller output signal
28	—	75	Fuel pump relay output
29	To EPS control module	76	Fuel heating relay output
30	Radiator fan relay 3 output	77	—
31	—	78	Malfunction indicator lamp
32	Ground for APP sensor (sensor 2)	79	A/C compressor relay output
33	—	80	Main power supply relay output
34	Ground for MAT and IAT sensor	81	Brake switch signal for brake lamp
35	Ground for APP sensor (sensor 1)	82	—
36	—	83	Output of 5 V power source for APP sensor (sensor 1)
37	Output of 5 V power source for A/C pressure sensor	84	—
38	Output of 5 V power source for MAF and IAT sensor	85	—
39	—	86	—
40	CAN communication line (active low signal)	87	A/C pressure sensor signal
41	APP sensor (sensor 2) signal	88	—
42	—	89	Vehicle speed signal input from ABS hydraulic unit / control module
43	—	90	—
44	—	91	—
45	—	92	—
46	—	93	—

Terminal	Circuit	Terminal	Circuit
47	—	94	—

Schematic and Routing Diagram

Air Intake System Diagram

S5RS0B1102001



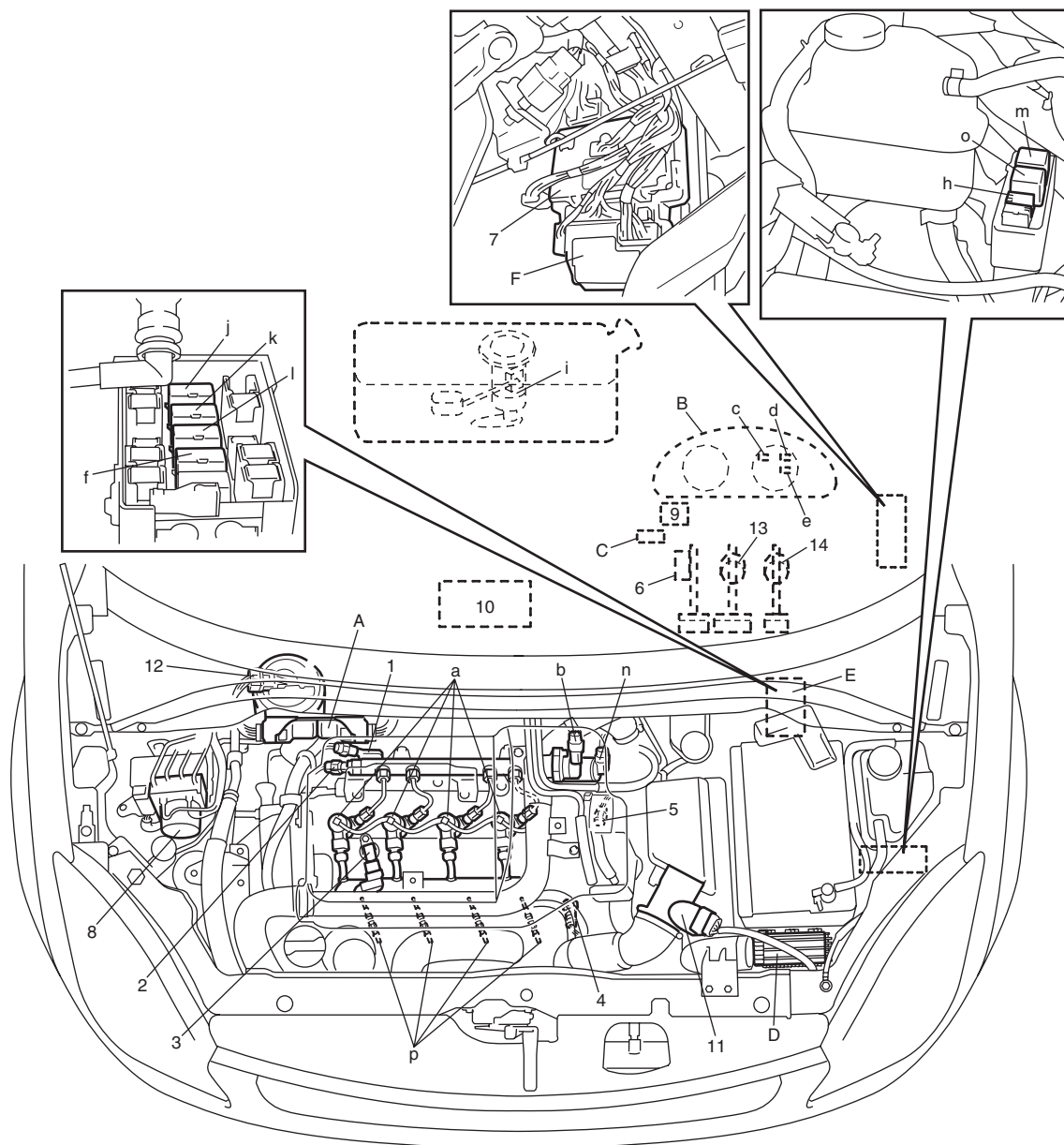
I3RM0B112006-01

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	

Component Location

Electronic Control System Components Location

S5RS0B1103001



I5RS0B110005-03

Information sensors	Control devices	Others
1. Boost pressure sensor	a: Fuel injector	A: ECM
2. Fuel pressure sensor	b: Fuel pressure regulator	B: Combination meter
3. CMP sensor	c: Malfunction indicator lamp	C: Data link connector
4. CKP sensor	d: Service vehicle soon lamp	D: Glow controller
5. ECT sensor	e: Glow indicator lamp	E: Main fuse box
6. APP sensor	f: A/C compressor relay (if equipped)	F: Circuit fuse box
7. BCM	h: Fuel pump relay	
8. ABS hydraulic unit / control module	i: Fuel pump	
9. Immobilizer control module	j: Radiator fan relay 1	
10. HVAC control module	k: Radiator fan relay 2	
11. MAF and IAT sensor	l: Radiator fan relay 3	
12. Fuel heater and temperature sensor	m: Main relay	
13. Brake switch	n: EGR valve	
14. Clutch switch	o: Fuel heating relay	
	p: Glow plug	

Diagnostic Information and Procedures

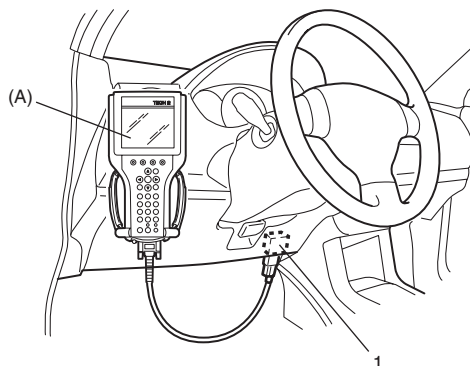
DTC Check

S5RS0B1104001

- 1) Prepare SUZUKI scan tool.
- 2) With ignition switch OFF, 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



I4RS0B110026-01

- 3) Turn ignition switch ON and confirm that MIL and SVS lamp light.
- 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, referring 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.

DTC Clearance

S5RS0B1104002

- 1) Connect 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: Engine 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: T10
T02	System Operation as Designed	System okay?
	Check if the customer complaint is a normal system behavior and if the customer operates the system properly.	
	Yes: T03	No: T04
T03	Inform the Customer	
	Inform the customer, that the system behavior 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. - 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 modules 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, should be checked for short circuit to ground.	
T05	Yes: T05	No: –
	Connect Scan Tool and Establish Communication	
	Before connecting the scan tool, observe the instructions of the scan tool operator's manual. - Connect scan tool, select concerned Electronic System, establish communication and verify, that the correct control module is installed: Refer to "B-03, Connect Scan Tool and Establish Communication: ". - Verify programming of the control module: Refer to "B-16, Programming: ". After successful test / fault repair proceed to the next test step.	
	Yes: T07	No: –

Test	Work order description	Nominal value
T06	DTC Check	
	NOTE	
	DTCs are only a reference on faults in a subgroup of the system. DTCs are not a direct reference on a defective component.	
	• Read and record DTCs. • Delete DTCs. • Operate the vehicle over an appropriate distance at various engine speed / load conditions. • If a DTC is stored: Refer to "B-01, DTC Table: ". 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 "B-04, 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 "B-05, No Matching Customer Complaint: ". After successful test / fault repair proceed to the next test step.	
	Yes: T09	No: –
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 DTCs.	
	NOTE	
	Read the DTCs again after the test drive and check for symptoms / customer complaints. If a complaint still exists, restart the diagnostic session for a second time.	
	Yes: –	No: –

1A-13 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
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 DTCs or the snapshot function of the scan tool in combination with the following tests: Perform the following evaluation: Refer to "B-18, Check: Intermittent Faults: ". After successful test / fault repair proceed to the next test step. Yes: T09	
		No: –

B-01, DTC Table

S5RS0B1104004

DTC No.	Detecting Item	Detecting Condition (DTC will set when detecting:)	MIL	SVS	Referring Table
P0090	Fuel Pressure Regulator Control Circuit	- Fuel pressure regulator signal circuit open or short - Poor performance of fuel pressure regulator	—	1 driving cycle	☞ C-19
P0093	Fuel System Leak Detected - Large Leak	Fuel high pressure circuit problem	—	1 driving cycle	☞ B-34
P0100	Mass Air Flow Circuit	- MAF signal circuit open or short - Poor performance of MAF sensor	3 driving cycles	—	☞ B-23
P0106	Manifold Absolute Pressure Range / Performance	Difference between boost pressure sensor and barometric pressure sensor value higher than specification or lower than specification	3 driving cycles	—	☞ B-28
P0107	Manifold Absolute Pressure Circuit Low Input		—	1 driving cycle	☞ B-24
P0108	Manifold Absolute Pressure Circuit High Input		3 driving cycles	—	☞ B-25
P0110	Intake Air Temperature Sensor Circuit	IAT sensor signal circuit open or short	3 driving cycles	—	☞ C-13
P0115	Engine Coolant Temperature Circuit	- ECT sensor signal circuit open or short - Poor performance of ECT sensor	—	1 driving cycle	☞ C-15
P0168	Fuel Temperature Too High	High fuel temperature (No fault present on the system)	—	—	☞ B-29
P0180	Fuel Temperature Sensor Circuit	Fuel temperature sensor signal higher than specification or lower than specification	—	1 driving cycle	☞ C-16
P0190	Fuel Rail Pressure Sensor Circuit	- 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 / Open - Cylinder 1	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	☞ C-24
P0202	Injector Circuit / Open - Cylinder 2	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	☞ C-25
P0203	Injector Circuit / Open - Cylinder 3	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	☞ C-26
P0204	Injector Circuit / Open - Cylinder 4	- Fuel injector signal circuit open or short - Poor performance of fuel injector	—	1 driving cycle	☞ C-27
P0217	Engine Coolant Over Temperature Condition	High engine coolant temperature (No fault present on the system)	—	—	☞ B-29
P0230	Fuel Pump Primary Circuit	Fuel pump relay signal circuit open or short	—	1 driving cycle	☞ C-06
P0235	Turbo Charger Boost Sensor Circuit	Boost pressure sensor circuit open or short	—	1 driving cycle	☞ C-12
P0335	Crankshaft Position Sensor Circuit	Crankshaft position sensor signal no inputted	—	1 driving cycle	☞ C-05

DTC No.	Detecting Item	Detecting Condition (DTC will set when detecting:)	MIL	SVS	Referring Table
P0340	Camshaft Position Sensor Circuit	Camshaft position sensor signal no inputted	—	—	☞ C-20
P0380	Glow Plug Circuit	Glow plug signal circuit open or short	—	1 driving cycle	☞ C-33
P0400	Exhaust Gas Recirculation Flow	Poor performance of EGR valve	3 driving cycles	—	☞ B-38
		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	Incorrect vehicle speed signal inputted	—	1 driving cycle	☞ B-27
P0504	Brake Switch Correlation	Incorrect signal from brake light switch	—	—	☞ C-21
P0520	Engine Oil Pressure Switch Circuit	Oil pressure switch signal circuit open or short	—	—	☞ C-30
P0530	A/C Refrigerant Pressure Sensor Circuit	A/C pressure sensor signal circuit open or short	—	—	☞ C-29
P0560	System Voltage	Power supply circuit low or high input	—	—	☞ C-03
P0571	Brake Switch Circuit	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	Internal Control Module Keep Alive Memory (KAN) Error	Engine control module internal faulty (system error)	—	1 driving cycle	☞ C-02
P0604	Internal Control Module Random Access Memory (RAM) Error	Engine control module internal faulty (system error)	—	1 driving cycle	☞ C-02
P0605	Internal Control Module Read Only Memory (ROM) Error	Engine control module internal faulty (system error)	—	1 driving cycle	☞ C-02
P0606	ECM Processor	Engine control module internal faulty (system error)	—	1 driving cycle	☞ C-02
P0650	Malfunction Indicator Lamp (MIL) Control Circuit	Malfunction Indicator Lamp (MIL) control signal circuit open or short	1 driving cycle	—	☞ C-36
P0683	Glow Plug Control Module to ECM Communication Circuit	Glow plug circuit open or short	—	1 driving cycle	☞ C-33
P0685	ECM Power Relay Control Circuit / Open	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-35
P1105	Barometric Pressure Sensor Circuit Malfunction	Poor performance of ECM	3 driving cycles	—	☞ C-11
P1120	Accelerator Pedal Position Sensor 1 Circuit Malfunction	- Accelerator pedal position sensor 1 circuit open or short - Poor performance of accelerator pedal position sensor 1	—	1 driving cycle	☞ C-10
P1122	Accelerator Pedal Position Sensor 2 Circuit Malfunction	Accelerator 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 Range / Performance	Mechanical problem in fuel high pressure section or fuel low pressure section	—	1 driving cycle	☞ B-36

1A-15 Engine General Information and Diagnosis:

DTC No.	Detecting Item	Detecting Condition (DTC will set when detecting:)	MIL	SVS	Referring Table
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
P1483	Radiator Fan Output 3 Circuit Malfunction	Radiator fan output 3 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 "DTC Table: in Section 10C".			
P1611	Password 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
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
P1660	Shut Off Valve	Mechanical problem in fuel shut off valve	—	1 driving cycle	☞ B-37
P2146	Fuel Injector Supply Voltage Circuit / Open	Fuel injector control signal low or high input	—	1 driving cycle	☞ C-23
U2103	Control Module Communication Bus Off	Transmission error that is inconsistent between transmission data and transmission monitor	—	—	☞ C-34
U2104	Control Module Communication Repeated Bus Off	Transmission error that is inconsistent between transmission data and transmission monitor	—	—	☞ C-34
U2107	Lost Communication with BCM	Reception error of communication data for BCM	—	—	☞ C-34

NOTE

“—” mark in MIL or SVS column indicates that indicator light does not light.

B-02, Data List

As the data values 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 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	11.0 – 13.5 V greater than 8.0 V 12.0 – 15.0 V
	• Ignition ON • Engine OFF • All consumers turned off • Engine starting • Engine running at idle speed, operating temperature Concerned Terminals: “E62-1”, “E62-2”, “E62-3”, “E62-50”	
	Yes: T02	No: C-03 
T02	Tester Display – Ignition Switch	ON 12 V OFF 0 V
	• Ignition ON • Engine running at idle speed • Engine OFF NOTE The ECM switches itself off 10 seconds after the ignition is switched off.	
	Concerned Terminals: “E62-1”, “E62-2”, “E62-3”, “E62-23”, “E62-50” Yes: T03	No: C-01 
T03	Tester Display – Main Relay	OFF ON
	• Ignition OFF • Ignition ON • Engine OFF • All consumers turned off Concerned Terminals: “E62-4”, “E62-6”, “E62-80” Yes: T04	
T04	Tester Display – Fuel Pump	Inactive Active
	• Ignition ON • Engine OFF • All consumers turned off • Wait at least 20 s • Engine running at idle speed, operating temperature Concerned Terminals: “E62-75”	
	Yes: T05	No: C-06 
T05	Tester Display – APP sensor 1 Voltage	greater than 3.80 V less than 1.00 V greater than 1.00 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: “E62-15”, “E62-32”, “E62-35”, “E62-41”, “E62-65”, “E62-83”	
	Yes: T06	No: C-10 

1A-17 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T06	Tester Display – APP sensor 2 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: “E62-15”, “E62-32”, “E62-35”, “E62-41”, “E62-65”, “E62-83”	greater than 1.8 V less than 0.50 V greater than 0.50 V
	Yes: T07	No: C-10 
T07	Tester Display – Calculated Pedal Position	
	- Ignition ON - Engine OFF - All consumers turned off - Accelerator pedal actuated to full load stop - Accelerator pedal not actuated Concerned Terminals: “E62-15”, “E62-32”, “E62-35”, “E62-41”, “E62-65”, “E62-83”	greater than 95% less than 5%
	Yes: T08	No: C-10 
T08	Tester Display – Closed Throttle Position	
	- Ignition ON - Engine OFF - All consumers turned off - Accelerator pedal actuated to full load stop - Accelerator pedal not actuated Concerned Terminals: “E62-15”, “E62-32”, “E62-35”, “E62-41”, “E62-65”, “E62-83”	OFF ON
	Yes: T09	No: C-10 
T09	Tester Display – Desired Idle	
	- Engine running at idle speed, operating temperature - All consumers turned off - Accelerator pedal not actuated Concerned Terminals: “D05-43”, “D05-59”	800 RPM
	Yes: T10	No: C-05 
T10	Tester Display – 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: “D05-43”, “D05-59”	greater than 60 RPM 720 – 880 RPM 850 – 5000 RPM Scan tool display depending on engine speed
	Yes: T11	No: C-05 
T11	Tester Display – Idle Speed Modified	
	- Engine running at idle speed, operating temperature - All consumers turned off NOTE Default value after reset of programmed desired idle speed.	800 RPM
	Accelerator pedal not actuated Concerned Terminals: “D05-43”, “D05-59”	
	Yes: T12	No: B-16 

Test	Work order description	Nominal value
T12	Tester Display – Coolant Temperature	80 – 110 °C (176 – 230 °F) 2.50 – 0.40 V Scan tool display depending on engine condition
	• Engine running at idle speed, operating temperature • All consumers turned off Concerned Terminals: “D05-29”, “D05-54”	
	Yes: T13	No: C-15 
T13	Tester Display – Fuel Temperature	–25 – 90 °C (– 13 – 194 °F)
	• Ignition ON • Engine OFF • All consumers turned off Concerned Terminals: “E62-13”, “E62-61”	
	Yes: T14	No: C-16 
T14	Tester Display – Intake Air Temperature	Scan tool display converges to engine temperature Scan tool display converges to outside temperature
	• Ignition ON • Engine OFF • All consumers turned off • Engine running at idle speed, operating temperature Concerned Terminals: “E62-56”, “E62-62”	
	Yes: T15	No: C-13 
T15	Tester Display – MAF / MAF sensor voltage	greater than 20 kg/h greater than 1.70 V 10 – 22 kg/h 1.00 – 2.25 V 25 – 35 kg/h 1.90 – 2.90 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: “E62-34”, “E62-38”, “E62-56”	
	Yes: T16	No: B-26 
T16	Tester Display – Barometric Pressure / Barometric Sensor Voltage	75 – 110 kPa 2.0 – 4.5 V Scan tool display is nearly identical to outside-air pressure
	• Ignition ON • Engine OFF • All consumers turned off • Compare displayed pressure with outside-air pressure NOTE <u>This parameter is an internal value of the ECM.</u>	
	Concerned Terminals: –	
	Yes: T17	No: C-11 
T17	Tester Display – Turbo Pressure / Turbo Pressure Voltage	75 – 110 kPa 1.0 – 2.0 V Scan tool display is nearly identical to outside-air pressure 75 – 110 kPa 1.0 – 2.0 V greater than 110 kPa greater than 2.0 V
	• 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: “D05-23”, “D05-24”, “D05-41”	
	Yes: T18	No: C-12 

1A-19 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T18	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: "D05-5", "D05-15"	OFF ON OFF
	Yes: T19	No: C-28 
T19	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 - Accelerator pedal not actuated - Wait at least 70 s Concerned Terminals: "D05-5", "D05-15"	less than 20% greater than 20 – 70% Value changing briefly less than 10%
	Yes: T20	No: C-28 
T20	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 Concerned Terminals: "D05-6", "D05-8", "D05-38"	23.00 – 29.00 MPa greater than 26.00 MPa Value changing briefly
	Yes: T21	No: C-17 
T21	Tester Display – Fuel Rail Pressure	
	- 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: "D05-6", "D05-8", "D05-38"	greater than 20 MPa 23.00 – 29.00 MPa 1.00 – 1.80 V greater than 25.00 MPa greater than 1.80 V
	Yes: T22	No: C-17 
T22	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 Concerned Terminals: "D05-4", "D05-34"	15 – 20% Value changing briefly
	Yes: T23	No: C-19 

Test	Work order description	Nominal value
T23	Tester Display – A/C Switch	OFF ON
	NOTE	
	This data list parameter is only valid if the concerned component is installed.	
	• Ignition ON • Engine OFF • All consumers turned off • Engine running at idle speed, operating temperature • Air conditioning system is switched on. Concerned Terminals: “E62-40”, “E62-64”	
	Yes: T24	No: C-34 
T24	Tester Display – A/C Pressure	300 – 1200 kPa 0.5 – 1.8 V greater than 700 kPa greater than 0.8 V
	NOTE	
	This data list parameter is only valid if the concerned component is installed.	
	• Engine running at idle speed, operating temperature • All consumers turned off • Air conditioning system is switched on. Concerned Terminals: “E62-10”, “E62-37”, “E62-87”	
	Yes: T25	No: C-29 
T25	Tester Display – A/C Magnet Clutch	OFF ON
	NOTE	
	This data list parameter is only valid if the concerned component is installed.	
	• Engine running at idle speed, operating temperature • All consumers turned off • Air conditioning system is switched on. Concerned Terminals: “E62-79”	
	Yes: T26	No: C-31 
T26	Tester Display – A/C Cutoff Mode	System OK
	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 Concerned Terminals: “E62-79”	
	Yes: T27	No: C-31 
T27	Tester Display – Glow Relay	OFF
	• Ignition ON • Engine OFF • All consumers turned off • Wait at least 10 s Concerned Terminals: “E62-70”, “E62-74”	
	Yes: T28	
		No: C-33 

1A-21 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T28	Tester Display – Brake Switch	
	• Ignition ON • Engine OFF • All consumers turned off • Brake pedal actuated Concerned Terminals: “E62-68”, “E62-81”	OFF ON
	Yes: T29	No: C-21 
T29	Tester Display – Brake Switch 2	
	• Ignition ON • Engine OFF • All consumers turned off • Brake pedal actuated Concerned Terminals: “E62-68”, “E62-81”	OFF ON
	Yes: T30	No: C-21 
T30	Tester Display – CCP Sw / PNP Sw	
	• Ignition ON • Engine OFF • All consumers turned off • Clutch pedal actuated Concerned Terminals: “E62-22”	OFF ON
	Yes: T31	No: C-22 
T31	Tester Display – Vehicle Speed	
	• Ignition ON • Engine OFF • All consumers turned off • Vehicle travelling (constant speed, approximately 30 km/h (19 mph) Concerned Terminals: “E62-89”	0 km/h (0 mph) 30 km/h (19 mph) Scan tool display converges to speedometer display
	Yes: T32	No: C-37 
T32	Tester Display – Service Vehicle Soon (SVS) Indicator Lamp	
	• Ignition ON • Engine OFF • All consumers turned off • Wait at least 5 s Concerned Terminals: “E62-40”, “E62-64”	ON OFF
	Yes: T33	No: C-34 
T33	Tester Display – Glow Indicator Lamp	
	• Ignition ON • Engine OFF • All consumers turned off • Wait at least 10 s Concerned Terminals: “E62-40”, “E62-64”	The indicator is briefly ON. Off 12V
	Yes: –	No: C-34 

B-03, Connect Scan Tool and Establish Communication

S5RS0B1104006

Update the diagnostic software for SUZUKI scan tool referring to "Tech2 Programing 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, Symptom Chart / Customer Complaints

S5RS0B1104012

Test	Work order description	Nominal value
T01	Check: Symptom / Customer Complaint Match	
	Select the suitable symptom group, which fits the complaint.	
	• Refer to "B-06, Complaint: Engine Start: ". • Refer to "B-07, Complaint: Engine Idling: ". • Refer to "B-08, Complaint: Engine Behavior Under Normal Driving Conditions: ". • Refer to "B-09, Complaint: Engine Performance: ". • Refer to "B-10, Complaint: Exhaust Gas: ". • Refer to "B-11, Complaint: Oil / Coolant / Fuel-System: ". • Refer to "B-12, Complaint: Engine Mechanic: ". • Refer to "B-13, Check: Functionality of Adjacent Systems: ".	
	Yes: –	No: –

B-05, No Matching Customer Complaint

S5RS0B1104011

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.	
	DTCs • Read and record DTCs. • Check for history DTC. If a history DTC 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 "B-01, DTC Table: ". • 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 "B-02, Data List: ". Refer to "B-14, Actuator Test: ". • Check Additional Information Refer to "B-15, Additional Functions: ". After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-06, Complaint: Engine Start

S5RS0B1104013

Customer complaint	Remedy
Engine does not start, starter slow / does not turn	Perform the following test step: Refer to "C-43, Starter Circuit: "
Engine does not start, starter runs normal	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. - Refer to "T01: Battery Voltage" in "B-02, Data List: " - Refer to "B-21, Fuel System: " - Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: " - Refer to "T10: Engine Speed" in "B-02, Data List: " The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). - Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: "
Engine starts poorly, starter runs normal	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. - Refer to "T01: Battery Voltage" in "B-02, Data List: " - Refer to "B-21, Fuel System: " - Refer to "B-22, Intake-Air System: " - Refer to "T12: Coolant Temperature" in "B-02, Data List: " - Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: " - Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: " - Refer to "T10: Engine Speed" in "B-02, Data List: " The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). - Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: "

B-07, Complaint: Engine Idling

S5RS0B1104014

Customer complaint	Remedy
Engine stalls at idle speed, no restart possible	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. - Refer to "T01: Battery Voltage" in "B-02, Data List: " - Refer to "B-21, Fuel System: " - Refer to "B-22, Intake-Air System: " - Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: " - Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: " - Refer to "T10: Engine Speed" in "B-02, Data List: " - Check compression.
Engine stalls during operation, restart possible	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. - Refer to "T01: Battery Voltage" in "B-02, Data List: " - Refer to "B-21, Fuel System: " - Refer to "B-22, Intake-Air System: " - Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: " - Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: " - Refer to "T10: Engine Speed" in "B-02, Data List: "
Engine does not react on accelerator pedal actuation	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. - Refer to "T05: APP sensor 1" in "B-02, Data List: " - Refer to "T06: APP sensor 2" in "B-02, Data List: "

Customer complaint	Remedy
Engine idle speed is increased	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T09: Desired Idle" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ". • Refer to "T11: Idle Speed Modified" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ".
Idle speed too low	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T09: Desired Idle" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ". • Refer to "T11: Idle Speed Modified" in "B-02, Data List: ". • Refer to "B-21, Fuel System: ".
Surging / shaking while idling	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. • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T02: Injector Cutoff Teat" in "B-17, ECU Control: ". • Refer to "B-21, Fuel System: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T09: Desired Idle" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ". The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: ".
Abnormal combustion sound, engine knocking	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. • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: ". • Refer to "T02: Injector Cutoff Teat" in "B-17, ECU Control: ". • Refer to "B-21, Fuel System: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ".

B-08, Complaint: Engine Behavior Under Normal Driving Conditions

Customer complaint	Remedy
Engine stalls during operation, no restart possible	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "B-21, Fuel System: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ".
Engine stalls during operation, restart possible	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T28: Brake Switch" in "B-02, Data List: ". • Refer to "T29: Brake Switch 2" in "B-02, Data List: ". • Refer to "T30: Clutch Switch" in "B-02, Data List: ". • Refer to "B-21, Fuel System: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ". The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to "T09: Fuel Heater Relay Control" in "B-14, Actuator Test: ".
Erratic engine operation, reproducible misfire	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T28: Brake Switch" in "B-02, Data List: ". • Refer to "T29: Brake Switch 2" in "B-02, Data List: ". • Refer to "T30: Clutch Switch" in "B-02, Data List: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T02: Injector Cutoff Test" in "B-17, ECU Control: ". • Refer to "B-21, Fuel System: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "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 "T04: Glow Plug Control Test" in "B-14, Actuator Test: ". • Refer to "T09: Fuel Heater Relay Control" in "B-14, Actuator Test: ".

Customer complaint	Remedy
Jerky engine operation	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T30: Clutch Switch" in "B-02, Data List: ". • Refer to "T28: Brake Switch" in "B-02, Data List: ". • Refer to "T29: Brake Switch 2" in "B-02, Data List: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "B-21, Fuel System: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ". The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to "T09: Fuel Heater Relay Control" in "B-14, Actuator Test: ".

B-09, Complaint: Engine Performance

Customer complaint	Remedy
Reduced cut-off speed	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T02: Injector Cutoff Teat" in "B-17, ECU Control: ". • Refer to "B-22, Intake-Air System: ". • Refer to "B-21, Fuel System: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ".
Erratic engine operation, reproducible misfire	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T30: Clutch Switch" in "B-02, Data List: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T02: Injector Cutoff Teat" in "B-17, ECU Control: ". • Refer to "B-21, Fuel System: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "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 "T04: Glow Time Relay Test" in "B-14, Actuator Test: ".

Customer complaint	Remedy
Poor engine response	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T02: Injector Cutoff Teat" in "B-17, ECU Control: ". • Refer to "B-21, Fuel System: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ".
Reduced engine performance in all operating conditions	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "B-22, Intake-Air System: ". • Refer to "B-21, Fuel System: ". • Refer to "T05: APP sensor 1" in "B-02, Data List: ". • Refer to "T06: APP sensor 2" in "B-02, Data List: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ".

B-10, Complaint: Exhaust Gas

Customer complaint	Remedy
Excessive white smoke	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. • Checking the following system / signal for proper operation: Engine cooling • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "B-33, Check: Injectors: ". • Refer to "B-21, Fuel System: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "B-22, Intake-Air System: ". • Check compression. The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: ".
Excessive black / grey smoke	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. • Check engine oil level. • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". • Refer to "T02: Injector Cutoff Test" in "B-17, ECU Control: ". • Refer to "B-33, Check: Injectors: ". • Refer to "B-21, Fuel System: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: ".

Customer complaint	Remedy
Excessive blue smoke	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. The following tests must be performed in the given order: • Check engine oil level. • Refer to "B-21, Fuel System: ". • Refer to "B-22, Intake-Air System: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Refer to "T14: Intake Air Temperature" in "B-02, Data List: ". • Refer to "T20: Desired Rail Pressure" in "B-02, Data List: ". • Refer to "T21: Fuel Rail Pressure" in "B-02, Data List: ". • Refer to "T22: Rail Pressure Regulator" in "B-02, Data List: ". The check of the following system is only necessary, if the outside temperature is less than 0 °C (32 °F). • Refer to "T04: Glow Plug Control Test" in "B-14, Actuator Test: ".

B-11, Complaint: Oil / Coolant / Fuel-System

S5RS0B1104018

Customer complaint	Remedy
Engine overheated	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. • Check the following system / signal for proper operation: Engine cooling • Refer to "T05: Radiator Fan Control (High or Low)" in "B-14, Actuator Test: ". • Refer to "B-21, Fuel System: ". • Refer to "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "B-22, Intake-Air System: ". • Check engine oil level.
Rising engine oil level	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. • Check the following system / signal for proper operation: Engine cooling • Check engine oil level. • Engine oil pressure • Refer to "B-21, Fuel System: ".
Leaks in fuel system	Perform the following test step: • Refer to "B-21, Fuel System: ".

B-12, Complaint: Engine Mechanic

S5RS0B1104019

Customer complaint	Remedy
Mechanical engine problem	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. • Check engine oil level. • Engine oil pressure • Refer to "B-21, Fuel System: ". • Check compression • Engine valve gear

B-13, Check: Functionality of Adjacent Systems

S5RS0B1104020

Customer complaint	Remedy
Engine can not be switched off with the ignition lock	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Check intake system for contamination by oil. • Check engine oil level. • Refer to "B-21, Fuel System: ".
Speedometer display defective	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T31: Vehicle Speed" in "B-02, Data List: ".
No speed signal recognized	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T10: Engine Speed" in "B-02, Data List: ".
Glow time telltale defective	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. • Refer to "T01: Battery Voltage" in "B-02, Data List: ". • Refer to "T08: Glow Indicator Lamp Control" in "B-14, Actuator Test: ".

B-14, Actuator Test

Test	Work order description	Nominal value
T01	Tester Display – Fuel Pump Control	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: “E62-75”	
	Yes: T02	No: C-06 
T02	Tester Display – EGR Solenoid Valve Control	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: “D05-5”, “D05-15”	
	Yes: T03	No: C-28 
T03	Tester Display – A/C Relay Control	Noise check: Clicking noise from the relay
	Vehicle with air conditioning system • Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Test 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: “DE62-79”	
	Yes: T04	No: C-31 

1A-33 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T04	Tester Display – Glow Plug Control	Active 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: “E62-70”, “E62-74”	
	Yes: T05	
T05	Tester Display – Radiator Fan Control (High or Low)	Cooling fan is switched off. Cooling fan is switched on.
	• 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: “E62-7”, “E62-8”, “E62-30”	
	Yes: T06	
T06	Tester Display – MIL Control	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 • Press YES key ON Concerned Terminals: “E62-78”	
	Yes: T07	
		No: C-33 
		No: C-32 
		No: C-36 

Test	Work order description	Nominal value
T07	Tester Display – SVS Lamp Control	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	
	• Press YES key ON Concerned Terminals: “E62-40”, “E62-64”	
	Yes: T08	No: C-34 
T08	Tester Display – Glow Indicator Lamp Control	Inactive 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: “E62-40”, “E62-64”	
	Yes: T09	No: C-34 
T09	Tester Display – Fuel Heater Relay Control	Noise check: Clicking noise from the relay
	• Ignition ON • Engine OFF • Press corresponding key in the system main menu to select Output Test 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: “E62-76”	
	Yes: –	No: C-35 

B-15, Additional Functions

S5RS0B1104008

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 Vehicle variant registration under ECM setting (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 10C”.	
	Yes: –	No: C-02 

B-16, Programming

S5RS0B1104009

Test	Work order description	Nominal value
T01	Tester Display Registration (Immobilizer System)	Programming okay?
	Refer to “Registration Procedure of Immobilizer Control System Components: in Section 10C”.	
	Yes: T02	No: C-02 
T02	Tester Display – Vehicle Variant Registration (ECM Setting under MISC. Test)	Programming okay?
	Refer to “ECM Registration: in Section 1C”.	
	Yes: T03	No: C-02 
T03	Tester Display – Injector Calibration Code (ECM Setting under MISC. Test)	Programming okay?
	Refer to “ECM Registration: in Section 1C”.	
	Yes: –	No: C-02 

B-17, 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. 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: T02	No: C-02 
T02	Tester Display – Fuel Injector Cutoff	Concerned fuel injectors are switched off.
	• Engine idling • Press corresponding key in the system main menu to select Output Test under Misc. Test, select the desired test and confirm with ENTER. Follow the instructions in the scan tool display. • Press corresponding key to turn off the selected fuel injector for 30 seconds NOTE This test helps to analyze engine compression. All fuel injectors are cut-off one after another. Each time an fuel injector is cut-off, the engine must move the corresponding piston against the compression pressure. This leads to a reduction in torque and performance, and the engine speed drops accordingly. The engine speed reduction should be identical for each injector, since the compression of all cylinders is nearly the same as long as the system is working properly.	
	Concerned Terminals: –	
	Yes: –	No: C-23 

B-18, Check: Intermittent Faults

Test	Work order description	Nominal value
T01	Intermittent System Operation	
	NOTE Refer to “Intermittent and Poor Connection Inspection: in Section 00” for further 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. DTCs • Read and record DTCs. • Check for history DTC. If a history DTC is stored this may indicate the circuit which has the intermittent condition. History DTC is leading to an intermittent problem. This DTCs 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 “B-01, DTC Table: ”. 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 DTC 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 DTC is set. • 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 “B-01, DTC Table: ”. Refer to “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.	

Test	Work order description	Nominal value
T01	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 "B-04, 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

S5RS0B1104022

Test	Work order description	Nominal value
T01	Programming The following tests must be performed in the given order: - The following programing function has to be performed to program the fuel injector calibration code. Refer to "T03: Injector Calibration Code" in "B-16, Programming: ". - After programming successfully, check if the system malfunction is still present. - If the malfunction is still present, continue with the following tests: - With DTC P0602 recognized: Refer to "C-02, Control Unit Hard- and Software: ". - After successful test / fault repair proceed to the next test step. Yes: –	
		No: –

B-20, Immobilizer Check

S5RS0B1104023

Test	Work order description	Nominal value
T01	Programming - Verify programming of the control unit: Refer to "T01: Registration (Immobilizer System)" in "B-16, Programming: ". - After successful test/fault repair proceed to the next test step. Yes: –	
		No: –

B-21, Fuel System

S5RS0B1104024

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 10 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-39 
T02	Check: Fault Location	
	• Perform quick check actuator test: Refer to "T01: Fuel Pump Control" in "B-14, Actuator Test: ". • After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-22, Intake-Air System

S5RS0B1104025

Test	Work order description	Nominal value
T01	Preliminary Diagnostic Check (Visual Inspection)	Test okay?
	• Check the following component for tightness and proper conditions: Oil level gauge Oil filler cap • 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 turbocharger Exhaust system	
	Yes: T02	No: C-38 

Test	Work order description	Nominal value
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 "T15: MAF / MAF Sensor Voltage" in "B-02, Data List: ". • Perform quick check actuator test: Refer to "T02: EGR Solenoid Valve Control" in "B-14, Actuator Test: ". • Perform quick check data list: Refer to "T17: Turbo Pressure / Turbo Pressure Voltage" in "B-02, Data List: ". • After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-23, Check: Intake-Air System

S5RS0B1104026

Test	Work order description	Nominal value
T01	Check: Function-Group Intake-Air System / Charge-Air System	
	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 the following quick checks: Refer to "B-22, Intake-Air System: ". • If no defect has been found in previous test steps: Refer to "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

S5RS0B1104027

Test	Work order description	Nominal value
T01	Check: Function-Group Intake-Air System / Charge-Air System	
	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. • Verify mechanical system functions / components: – Exhaust-gas turbocharger – 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 "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "T17: Turbo Pressure / Turbo Pressure Voltage" in "B-02, Data List: ". • If no defect has been found in previous test steps: Refer to "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

S5RS0B1104028

Test	Work order description	Nominal value
T01	Check: Function-Group Charge-Air System	
	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. - Verify mechanical system functions / components: - Exhaust-gas turbocharger - Exhaust system - Perform quick check data list: Refer to "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". Refer to "T17: Turbo Pressure / Turbo Pressure Voltage" in "B-02, Data List: ". - If no defect has been found in previous test steps: Refer to "C-12, Boost Pressure Sensor Circuit: ". - After successful test / fault repair proceed to the next test step. Yes: –	
		No: –

B-26, Check: Exhaust System

S5RS0B1104089

Test	Work order description	Nominal value
T01	Check: Preliminary Diagnostic Check (Visual Inspection)	Test okay?
	- Check the following component for tightness and proper connections: Oil level gauge Oil filler cap - 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 MAF sensor for fouling. - Verify mechanical system functions / components: Exhaust-gas turbocharger Exhaust system Yes: T02	
		No: C-38 
T02	Check: Fault Location	Test okay?
	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. - Check the following data list parameters: Refer to "T18: EGR Valve" in "B-02, Data List: ". Refer to "T19: EGR Solenoid Duty Cycle" in "B-02, Data List: ". - Select and enable scan tool actuator test: Refer to "T02: EGR Solenoid Valve Control" in "B-14, Actuator Test: ". - Perform the following troubleshooting: Refer to "C-15, Engine Coolant Temperature Sensor Circuit: ". After successful test / fault repair proceed to the next test step. Yes: –	
		No: –

B-27, Check: Distance Signal

S5RS0B1104029

Test	Work order description	Nominal value
T01	Vehicle Speed Information Check	
	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. • Connect scan tool, select concerned Electronic System, establish communication and verify, that the correct control unit is installed: Refer to "DTC Check: in Section 4E". Refer to "B-03, Connect Scan Tool and Establish Communication: ". • Read and record DTCs. • If a DTC is stored: Refer to "DTC Table: in Section 4E". Refer to "B-01, DTC Table: ". • Perform quick check data list: Refer to "T31: Vehicle Speed" in "B-02, Data List: ". • Perform the following troubleshooting: Refer to "DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring: in Section 4E". Refer to "C-37, Vehicle Speed Sensor Circuit: ". After successful test / fault repair proceed to the next test step. Yes: –	
		No: –

B-28, Check: Pressure Sensor Signal

S5RS0B1104030

Test	Work order description	Nominal value
T01	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 "T16: Barometric Pressure / Barometric Sensor Voltage" in "B-02, Data List: ". • Refer to "T17: Turbo Pressure / Turbo Pressure Voltage" in "B-02, Data List: ". • Perform the following troubleshooting: Refer to "C-12, Boost Pressure Sensor Circuit: ". After successful test / fault repair proceed to the next test step. Yes: –	
		No: –

B-29, Complaint: Engine Temperature

S5RS0B1104031

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-39
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 "T12: Coolant Temperature" in "B-02, Data List: ". • Refer to "T13: Fuel Temperature" in "B-02, Data List: ". • Perform the following troubleshooting: Refer to "C-44, System Status Information: ". After successful test / fault repair proceed to the next test step. Yes: –	
		No: –

B-30, Check: High Pressure Area

S5RS0B1104032

⚠ WARNING

Refer to “Precautions on Fuel System Service: in Section 1G” before servicing fuel system.

⚠ 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.

Test	Work order description	Nominal value
T01	Preliminary Diagnostic Check (Visual Inspection)	System okay?
	• Check fuel tank for correct fuel sort content. • The fuel reserve must be greater than 10 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-42 ⚡
T02	Check: Mechanics and/or Hydraulics	Test okay?
	• Check injector	
	Yes: –	No: C-42 ⚡

B-31, Check: Low and High Pressure Section

S5RS0B1104033

⚠ WARNING

Refer to "Precautions on Fuel System Service: in Section 1G" before servicing fuel system.

⚠ 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.

Test	Work order description	Nominal value
T01	Preliminary Diagnostic Check (Visual Inspection)	System okay?
	• Check fuel tank for correct fuel sort content. • The fuel reserve must be greater than 10 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-41 
T02	Actuator Test	
	• Perform quick check actuator test: Refer to "T01: Fuel Pump Control" in "B-14, Actuator 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	
	Yes: –	No: C-41 

B-32, Check: Low Pressure Section

S5RS0B1104034

⚠ 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.

Test	Work order description	Nominal value
T01	Preliminary Diagnostic Check (Visual Inspection)	System okay?
	• Check fuel tank for correct fuel sort content. • The fuel reserve must be greater than 10 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-40 
T02	Actuator Test	
	• Perform quick check actuator test: Refer to "T01: Fuel Pump Control" in "B-14, Actuator Test: ". • After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-33, Check: Injectors

S5RS0B1104090

▲ WARNING

Refer to "Precautions on Fuel System Service: in Section 1G" before servicing fuel system.

Test	Work order description	Nominal value
T01	Check: Mechanic and/or Hydraulics	Test okay?
	• Check injectors for condition referring to "Fuel Injector On-Vehicle Inspection: in Section 1G".	
	Yes: –	No: C-39 

B-34, Trouble Codes: Check 1

S5RS0B1104035

Test	Work order description	Nominal value
T01	Check: Function-Group High Pressure Area	
	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 the following quick checks: Refer to "B-30, Check: High Pressure Area: ". Refer to "B-32, Check: Low Pressure Section: ".	
	• Perform the following troubleshooting: Refer to "C-42, Function-Group High Pressure Area: ". • After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-35, Trouble Codes: Check 2

S5RS0B1104036

Test	Work order description	Nominal value
T01	Check: Fuel Pipes and Fuel Filter	
	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 the following quick checks: Refer to "B-32, Check: Low Pressure Section: ".	
	• Perform the following troubleshooting: Refer to "C-40, Function-Group Low Pressure Section: ". • After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-36, Trouble Codes: Check 3

S5RS0B1104037

Test	Work order description	Nominal value
T01	Check: DTC stored	No: T02
	• Is the DTC P0201 stored?	
	Yes: C-24 	
T02	Check: DTC stored	No: T03
	• Is the DTC P0202 stored?	
	Yes: C-25 	
T03	Check: DTC stored	No: T04
	• Is the DTC P0203 stored?	
	Yes: C-26 	
T04	Check: DTC stored	No: T05
	• Is the DTC P0204 stored?	
	Yes: C-27 	
T05	Check: Function-Group High Pressure Area	
	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 the following quick checks: Refer to "B-31, Check: Low and High Pressure Section: ".	
	• Perform the following troubleshooting: Refer to "C-41, Function-Group Low and High Pressure Section: ".	
	• After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-37, Trouble Codes: Check 4

S5RS0B1104038

Test	Work order description	Nominal value
T01	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 actuator test: Refer to "T01: Fuel Pump Control" in "B-14, Actuator Test: ".	
	• Perform the following troubleshooting: Refer to "C-39, Function-Group Fuel System: ".	
	• After successful test / fault repair proceed to the next test step.	
	Yes: –	No: –

B-38, Trouble Codes: Check 5

S5RS0B1104039

Test	Work order description	Nominal value
T01	Preliminary Diagnostic Check (Visual Inspection)	
	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 the following quick checks: Refer to "B-22, Intake-Air System: ".	
	• Perform the following troubleshooting: Refer to "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

S5RS0B1104040

Test Table

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 “G20-16” & 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 “E62”) • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-50” & Ground	
	Yes: T03	No: T20
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 “E62-23” & Ground	
	Yes: T04	No: T06
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• 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 “G24-5” & ECM – Wiring harness connector (wiring harness side) terminal “E62-66”	
	Yes: T05	No: E03
T05	Check: Circuit Interruption of Ground Circuit	less than 5 Ω
	• Measure resistance between the following terminals: Data Link Connector – Wiring harness connector (wiring harness side) terminal “G20-4” & 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 “G21-4” & Ground	
	Yes: E05	No: T09
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: E06	No: E07
T11	Check: Short to Ground of Voltage Supply Circuit	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: 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 “G21-5” & Battery voltage • Check the following component for proper operation: – Fuse of the fused jumper wire	
	Yes: T13	No: E12

1A-49 Engine General Information and Diagnosis:

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 “G21-6” & 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 “G21-1” & 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 color “C57-1” • Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-2” & 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 – Brake (Stop) Lamp Switch – Clutch Switch – MAF and IAT Sensor – Fuel Heating Relay – Compressor Relay – Fuel Pump Relay	
	Yes: E14	
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	
T19	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E17	
T20	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: T21	
T21	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E16	
T22	Check: Short to Ground of Voltage Supply Circuit	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	

1A-51 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T23	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Disconnect wiring harness connector from: – Immobilizer Control Module • 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: E18	No: E19
T24	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: E20	No: T25
T25	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: – Combination Meter – Interior light – Information Display – BCM	
	Yes: E14	No: E21

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – ECM
E02	• Circuit interruption between: - Data Link Connector – Wiring harness connector (wiring harness side) terminal “G20-4” & - Ground
E03	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-66” & - Immobilizer Control Module – Wiring harness connector (wiring harness side) terminal “G24-5”
E04	• Circuit interruption between: - Circuit Fuse – Output contact & - ECM – Wiring harness connector (wiring harness side) terminal “E62-23”

Result	Cause of fault
E05	• Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-6” & Circuit Fuse – Input contact or • Defective component: – Ignition Switch
E06	• Circuit interruption between: Circuit Fuse – Output contact & Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-4”
E07	• Circuit interruption between: Battery - Positive (+) terminal & Circuit Fuse – Input contact or • Defective component: – Main Fuse Box
E08	• Defective component: – Ignition Switch
E09	• Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-2” & Circuit Fuse – Input contact
E10	• Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-1” & Circuit Fuses – Input contact
E11	• Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-6” & Circuit Fuses – Input contact
E12	• Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-5” & Circuit Fuses – Input contact
E13	• Short circuit to ground between: Circuit Fuse – Output contact & Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-4”
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.
E15	• Short circuit to ground between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal “E62-23” & Wiring harness connector terminals of all components (wiring harness side), which were disconnected from the wiring harness during this troubleshooting session
E16	• Circuit interruption between: Circuit Fuse – Output contact & ECM – Wiring harness connector (wiring harness side) terminal “E62-50”
E17	• Circuit interruption between: Circuit Fuse – Output contact & Data Link Connector – Wiring harness connector (wiring harness side) terminal “G20-16”

1A-53 Engine General Information and Diagnosis:

Result	Cause of fault
E18	- Defective component: – Immobilizer Control Module
E19	- Short circuit to ground between: - Circuit Fuse – Output contact & - ECM – Wiring harness connector (wiring harness side) terminal “E62-50”
E20	- Defective component: – Scan Tool
E21	- Short circuit to ground between: - Circuit Fuse – Output contact & - Radio – Wiring harness connector (wiring harness side) terminal “G12-1” & - BCM – Wiring harness connector (wiring harness side) terminal “G37-16” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-32” & - Data Link Connector – Wiring harness connector (wiring harness side) terminal “G20-16” & - Interior Light – Wiring harness connector (Wiring harness side) terminal “K02-2” & - Information Display – Wiring harness connector (Wiring harness side) terminal “G14-1”

C-02, Control Unit Hard- and Software

S5RS0B1104041

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 ECM	
	Yes: T02	No: E03
T02	Check: Registrating	Programming okay?
	- Ignition ON - Repeat registrating	
	Yes: E01	No: E02

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	Previous programming was faulty
E02	- Defective component: – ECM
E03	- The following system / component is faulty: – Ground connection of the control unit case

C-03, System Voltage Circuit**Test Table**

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 “E62-50” & 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 “E62-1”, “E62-2”, “E62-3”	
	Yes: E01	No: E02

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to "ECM Registration: in Section 1C".

Result	Cause of fault
E01	- Defective component: - ECM
E02	- High transition resistance between: - Ground & - ECM – Wiring harness connector (wiring harness side) terminal "E62-1", "E62-2", "E62-3"
E03	- High transition resistance between: - Battery – Wiring & - ECM – Wiring harness connector (wiring harness side) terminal "E62-50"
E04	- Defective component: - Battery
E05	- Defective component: - Generator

C-04, Control Unit Main Relay Circuit

S5RS0B1104043

Test Table

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 "E72-2" & - Ground	
	Yes: T02	No: T08
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Measure voltage between the following terminals: - Main Relay – Socket Terminal "E72-1" & - 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 "E72-4" & - Ground	
	Yes: T04	No: E09
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Measure voltage between the following terminals: - Main Relay – Socket Terminal "E72-3" & - Ground	
	Yes: T05	No: E07

Test	Work order description	Nominal value
T05	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Connect fused jumper wire to: Main Relay – Socket Terminal “E72-4” & Battery positive (+) terminal - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-6” & 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 “E62-4” & Ground	
	Yes: T07	No: E05
T07	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 “E62-80” & Ground	
	Yes: E01	No: E03
T08	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: T09	No: T11
T09	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: T10
T10	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
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: E04

1A-57 Engine General Information and Diagnosis:

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: Main Relay – Socket Terminal “E72-3” & Battery voltage - Check the following component for proper operation: – Fuse of the fused jumper wire	
	Yes: E02	No: T13
T13	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: E08

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	Defective component: – ECM
E02	Defective component: – Main Relay
E03	- Short circuit to ground / interruption of circuit between: Main Relay – Socket Terminal “E72-3” & ECM – Wiring harness connector (wiring harness side) terminal “E62-80” or - Defective component: – Main Relay
E04	Short circuit to ground between: Circuit Main Fuse – Output contact & Main relay – Socket Terminal
E05	Circuit interruption between: Main Relay – Socket Terminal “E72-4” & ECM – Wiring harness connector (wiring harness side) terminal “E62-4”
E06	Circuit interruption between: Main Relay – Socket Terminal “E72-4” & ECM – Wiring harness connector (wiring harness side) terminal “E62-6”
E07	Short circuit to voltage between: Main Relay – Socket Terminal “E72-3” & ECM – Wiring harness connector (wiring harness side) terminal “E62-80”
E08	Short circuit to ground between: Main Relay – Socket Terminal “E72-3” & ECM – Wiring harness connector (wiring harness side) terminal “E62-80”

Result	Cause of fault
E09	• Short circuit to voltage between: Circuit Fuse – Input contact & ECM – Wiring harness connector (wiring harness side) terminal “E62-4”, “E62-6”
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Main Relay – Socket Terminal “E72-1”
E11	• Circuit interruption between: Circuit Main Fuse – Output contact & Main Relay – Socket Terminal “E72-2”
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 “C59-1” & Circuit Main Fuses – Input contact

C-05, Crankshaft Sensor Circuit**Test Table**

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 “D09-1” & Ground	
	Yes: T02	No: E04
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 “D09-2” & Ground	
	Yes: T03	No: E03
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: E02
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 “D05-43” & ECM – Wiring harness connector (wiring harness side) terminal “D05-59” • Engine cranking	
	Yes: E01	No: E02

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – ECM
E02	- Defective component: – Crankshaft Position Sensor
E03	- Short to voltage / ground / interruption of circuit between: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D09-2” & ECM – Wiring harness connector (wiring harness side) terminal “D05-59” or - Defective component: – ECM
E04	- Short to voltage / ground / interruption of circuit between: Crankshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D09-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-43” or - Defective component: – ECM

C-06, Fuel Pump Relay Circuit

S5RS0B1104045

Test Table

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 “E35-3” & Ground	
	Yes: T02	
T02	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Fuel Pump Relay – Socket terminal “E35-2” & Ground	
	Yes: T03	
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 “E62”) - Ignition ON - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-75” & Ground	
	Yes: T04	
	No: E11	No: E10
	No: E09	

1A-61 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T04	Check: Short to Ground / Interruption of Signal Circuit	greater than 500 k Ω
	- Ignition OFF - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-75” & Ground	
	Yes: T05	No: E08
T05	Check: Interruption of Signal Circuit	less than 5 Ω
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-75” & Fuel Pump Relay – Socket “E35-5”	
	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 “E35-1” & Ground	
	Yes: T07	No: E06
T07	Check: Component	Is the fuel pump running?
	- Ignition OFF - Connect fused jumper wire to: Fuel Pump Relay – Socket terminal “E35-2” & Fuel Pump Relay – Socket terminal “E35-1”	
	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 “E62-75” & 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 “R02-1” & Ground	
	Yes: T10	No: E05
T10	Check: Circuit Interruption of Ground Circuit	less than 5 Ω
	Measure resistance between the following terminals: Fuel Pump – Wiring harness connector (wiring harness side) terminal “R02-2” & Ground	
	Yes: E03	No: E04

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – ECM
E02	- Defective component: – Fuel Pump Relay
E03	- Defective component: – Fuel Pump
E04	- Circuit interruption between: - Fuel Pump – Wiring harness connector (wiring harness side) terminal “R02-2” & - Ground
E05	- Circuit interruption between: - Fuel pump Relay – Socket terminal “E35-1” & - Fuel Pump – Wiring harness connector (wiring harness side) terminal “R02-1”
E06	- Short circuit to voltage between: - Fuel Pump Relay – Socket terminal “E35-1” & - Fuel Pump – Wiring harness connector (wiring harness side) terminal “R02-1” - or - Defective component: – Fuel Pump
E07	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-75” & - Fuel Pump Relay – Socket terminal “E35-5”
E08	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-75” & - Fuel Pump Relay – Socket terminal E35-5”
E09	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-75” & - Fuel Pump Relay – Socket terminal “E35-5”
E10	- Circuit interruption between: - Circuit Main Fuse – Output contact & - Fuel Pump Relay – Socket terminal “E35-2”
E11	- Circuit interruption between: - Circuit Fuse – Output contact & - Fuel Pump Relay – Socket terminal “E35-3”

C-07, 5 V Circuit 1

S5RS0B1104046

Test Table

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 “D06-1” & 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 “D06-1” & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D06-2”	
	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 “D06-1” & 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 “D06-1” & Ground	
	Yes: E03	No: E04
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 “D06-1” & Ground	
	Yes: E03	No: E05

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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 “D06-2” & ECM – Wiring harness connector (wiring harness side) terminal “D05-24” or - Defective component: – ECM
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 “D06-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-23” or Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-8” or - Defective component: – ECM
E05	- Short circuit to voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D06-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-23” or Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-8” or - Defective component: – ECM

C-08, 5 V Circuit 2

S5RS0B1104047

Test Table

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 “E68-4” & 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 “E68-4” & 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 “E68-4” & Ground • Disconnect each of the following components / control units consecutively from the wiring harness and repeat the measurement each time: – APP 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 “E68-4” & Ground - Disconnect each of the following components / control units consecutively from the wiring harness and repeat the measurement each time: - APP Sensor	
	Yes: E02	No: E04

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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 “E68-4” & ECM – Wiring harness connector (wiring harness side) terminal “E62-38” or Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-25” or APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & ECM – Wiring harness connector (wiring harness side) terminal “E62-83” or - Defective component: - ECM

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Result	Cause of fault
E04	- Short circuit to voltage between: - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-4” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-38” or - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-83” or - Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-3” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-25” - Defective component: - ECM

C-09, 5 V Circuit 3

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Test Table

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: – APP Sensor • Ignition ON • Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & 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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-2”	
	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: – APP Sensor • Ignition ON • Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & Ground	
	Yes: T04	No: T06
T04	Check: Vehicle Configuration	
	Is the following information correct for the actual vehicle? • Air Conditioning	
	Yes: T05	No: E05

Test	Work order description	Nominal value
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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & Ground	
	Yes: E03	
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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & Ground	
	Yes: E06	
	No: E07	

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – APP Sensor
E02	- Short to voltage / ground / interruption of circuit between: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-2” & ECM – Wiring harness connector (wiring harness side) terminal “E62-32” or - Defective component: – ECM
E03	- Defective component: – A/C Pressure Sensor
E04	- Short circuit to ground / interruption of circuit between: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & ECM – Wiring harness connector (wiring harness side) terminal “E62-15” or A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-1” & ECM – Wiring harness connector (wiring harness side) terminal “E62-37” or - Defective component: – ECM
E05	- Short circuit to ground / interruption of circuit between: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & ECM – Wiring harness connector (wiring harness side) terminal “E62-15” or - Defective component: – ECM
E06	- Defective component: – A/C Pressure Sensor
E07	- Short circuit to voltage between: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & ECM – Wiring harness connector (wiring harness side) terminal “E62-15” or A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-1” & ECM – Wiring harness connector (wiring harness side) terminal “E62-37” or - Defective component: – ECM
E08	- Short circuit to voltage between: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & ECM – Wiring harness connector (wiring harness side) terminal “E62-15” or - Defective component: – ECM

C-10, Accelerator Pedal Position (APP) Sensor Circuit**Test Table**

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: – APP Sensor • Ignition ON • Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & Ground	
	Yes: T02	No: T10
T02	Check: Circuit Interruption of Ground Circuit	greater than 4.8 V
	• Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-3”	
	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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-4” • Ignition ON • Scan Tool Data List Parameter: – APP Sensor 1	
	Yes: T04	No: T09
T04	Check: Short to Voltage of Signal Circuit	4.8 – 5.2 V
	• Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & 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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-2”	
	Yes: T06	No: E04

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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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-1” • Ignition ON • Scan Tool Data List Parameter: – APP Sensor 2	
	Yes: E01	No: T07
T07	Check: Short to Ground of Signal Circuit	greater than 2.6 V
	• Ignition OFF • Connect fused jumper wire to: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-1” • Ignition ON • Scan Tool Data List Parameter: – APP Sensor 2	
	Yes: E02	No: E03
T08	Check: Short to Voltage of Signal Circuit	greater than 5.2 V
	• Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” & 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: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-4” • Ignition ON • Scan Tool Data List Parameter – APP Sensor 1	
	Yes: E07	No: E08
T10	Check: Short to Voltage / Ground / Interruption of Voltage Supply	greater than 5.2 V
	• Ignition OFF • Disconnect wiring harness connector from: – APP Sensor • Ignition ON • Measure voltage between the following terminals: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” & Ground	
	Yes: E10	No: E11

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – APP Sensor
E02	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-41” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-1”
E03	- Short circuit to ground / interruption of circuit between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-41” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-1” - or - Defective component: – ECM
E04	- Short circuit to ground / interruption of circuit between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-32” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-2” - or - Defective component: – ECM
E05	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-15” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6”
E06	- Short circuit to ground / interruption of circuit between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-15” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-6” - or - Defective component: – ECM
E07	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-65” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-4” - or - Defective component: – ECM
E08	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-65” & - APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-4” - or - Defective component: – ECM

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Result	Cause of fault
E09	• Circuit interruption between: APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-3” & ECM – Wiring harness connector (wiring harness side) terminal “E62-35” or • Defective component: – ECM
E10	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “E62-83” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” or • Defective component: – ECM
E11	• Short circuit to ground / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “E62-83” & APP Sensor – Wiring harness connector (wiring harness side) terminal “E61-5” or • Defective component: – ECM

C-11, Barometer Sensor Circuit

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Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – ECM

C-12, Boost Pressure Sensor Circuit**Test Table**

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 “D03-1” & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2”	
	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 “D05”) • Ignition ON • Measure voltage between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & Ground	
	Yes: T03	No: E04
T03	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-41”	
	Yes: T04	No: E03
T04	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Measure resistance between the following terminals: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & Ground	
	Yes: E01	No: E02
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 “D03-1” & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2”	
	Yes: E05	No: E06

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	Short circuit to ground between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-41”
E03	Circuit interruption between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-41”
E04	- Short circuit to voltage between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” & ECM – Wiring harness connector (wiring harness side) terminal “D05-41” or - Defective component: - ECM
E05	- Circuit interruption between: Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2” & ECM – Wiring harness connector (wiring harness side) terminal “D05-24” or - Defective component: - ECM
E06	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “D05-24” & Boost Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2”

C-13, Intake Air Temperature Sensor Circuit**Test Table**

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 “E68-1” & 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 “E68-1” & MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-3” • 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 “E68-1” & Ground	
	Yes: E04	No: E05

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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 “E68-3” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-34” - or - Defective component: – ECM
E03	- Defective component: – ECM
E04	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-62” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-1” - or - Defective component: – ECM
E05	- Short circuit to ground / interruption of circuit between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-62” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-1” - or - Defective component: – ECM

C-14, Mass or Volume Air Flow Circuit

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Test Table

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 “E68-2” & - 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 “E68-2” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-3”	
	Yes: T03	No: T07

Test	Work order description	Nominal value
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 “E68-4” & 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 “E62”) - Ignition ON - Measure voltage between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-5” & Ground	
	Yes: T05	No: E04
T05	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	Measure resistance between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-5” & Ground	
	Yes: T06	No: E03
T06	Check: Interruption of Signal Circuit	less than 5 Ω
	Measure resistance between the following terminals: MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-5” & ECM – Wiring harness connector (wiring harness side) terminal “E62-56”	
	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 “E68-3” & Ground	
	Yes: E06	No: E07

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-56” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-5”
E03	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-56” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-5”
E04	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-56” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-5”
E05	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-38” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-4”
E06	- Circuit interruption between: - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-3” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-34” - or - Defective component: - ECM
E07	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-34” & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-3” - or - Defective component: - ECM
E08	- Circuit interruption between: - Circuit Fuse – Output contact & - MAF and IAT Sensor – Wiring harness connector (wiring harness side) terminal “E68-2”

C-15, Engine Coolant Temperature Sensor Circuit**Test Table**

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 “D01-1” & 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 “D01-2” & ECT Sensor – Wiring harness connector (wiring harness side) terminal “D01-1”	
	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 “D01-2” & ECT Sensor – Wiring harness connector (wiring harness side) terminal “D01-1” • 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 “D01-1” & Ground	
	Yes: E04	No: E05

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: - ECT Sensor
E02	- Defective component: - ECM
E03	- Short circuit to voltage / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “D05-54” & ECT Sensor – Wiring harness connector (wiring harness side) terminal “D01-1” or - Defective component: - ECM
E04	- Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “D05-54” & ECT Sensor – Wiring harness connector (wiring harness side) terminal “D01-1” or - Defective component: - ECM
E05	- Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “D05-54” & ECT Sensor – Wiring harness connector (wiring harness side) terminal “D01-1” or - Defective component: - ECM

C-16, Fuel Temperature Sensor Circuit**Test Table**

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 “E62-13” & Ground	
	Yes: T02	
T02	Check: Short to Ground of Signal Circuit	greater than 500 kΩ
	• Ignition OFF • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-13” & Ground	
	Yes: T03	
T03	Check: Interruption of Signal Circuit	less than 5 Ω
	• Disconnect wiring harness connector from: – Fuel Heater and Temperature Sensor • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-13” & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-4”	
	Yes: T04	
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-61” & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-3”	
	Yes: E01	
		No: E02

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-61” & - Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-3”
E03	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-13” & - Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-4”
E04	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-13” & - Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-1” - or - ECM – Wiring harness connector (wiring harness side) terminal “E62-61” & - Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-3” - or - Defective component: - Fuel Heater and Temperature Sensor
E05	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-13” & - Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-4” - or - ECM – Wiring harness connector (wiring harness side) terminal “E62-61” & - Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-3” - 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: ".

If the value is less than 0.15 V or more than 4.85 V, go to the following table. If not, go to "C-18, Rail Oil Pressure Sensor Circuit: ".

Test Table

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 "D03-3" & 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 "D03-3" & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal "D03-1"	
	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 "D05") • Ignition ON • Measure voltage between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal "D03-2" & Ground	
	Yes: T04	No: E04
T04	Check: Short to Ground / Interruption of Signal Circuit	greater than 500 k Ω
	• Ignition OFF • Measure resistance between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal "D03-2" & Ground	
	Yes: T05	No: E03
T05	Check: Interruption in Wiring Harness	less than 5 Ω
	• Measure resistance between the following terminals: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal "D03-2" & ECM – Wiring harness connector (wiring harness side) terminal "D05-38"	
	Yes: E01	No: E02

1A-85 Engine General Information and Diagnosis:

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 “D03-3” & Ground	
	Yes: E06	No: E07

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “D05-6” & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2”
E03	• Short circuit to ground between: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2” & ECM – Wiring harness connector (wiring harness side) terminal “D05-6”
E04	• Short circuit to voltage between: Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-2” & ECM – Wiring harness connector (wiring harness side) terminal “D05-6”
E05	• Short circuit to voltage / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “D05-6” & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-1” or • Defective component: – ECM
E06	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “D05-8” & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” or • Defective component: – ECM

Result	Cause of fault
E07	- Short circuit to ground / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “D05-8” & Fuel Pressure Sensor – Wiring harness connector (wiring harness side) terminal “D03-3” or - Defective component: – ECM

C-18, Rail Oil Pressure Sensor Circuit

S5RS0B1104057

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored	No: T02
	Is the following DTC stored?	
	P1190: Fuel Pressure Regulator Range / Performance	
	Yes: E01	
T02	Check: DTC stored	No: E02
	Is the following DTC stored?	
	P1192: Rail Pressure Higher Than Maximum	
	Yes: E01	

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

S5RS0B1104058

Test Table

▲ WARNING

Refer to “Precautions on Fuel System Service: in Section 1G” before servicing fuel system.

Test	Work order description	Nominal value
T01	Check: Component and/or Hydraulics	Check okay?
	• Check for pressure decrease in the high pressure section. (leakage, blockage) • Perform a visual check of the following components: Strainer in fuel pressure regulator Injection pump Common rail	
	Yes: T02	No: E08
T02	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 “D02-1” & Ground	
	Yes: T03	No: T06
T03	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 “D02-1” & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal “D02-2”	
	Yes: E01	No: T04
T04	Check: Short to Ground of Signal Circuit	greater than 500 kΩ
	• Ignition OFF • Disconnect wiring harness connector from: – ECM (Wiring Harness Connector “D05”) • Measure resistance between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal “D02-2” & Ground	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “D05-34” & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal “D02-2”	
	Yes: E02	No: E03

Test	Work order description	Nominal value
T06	Check: Short to Ground of Signal Circuit	greater than 500 kΩ
	- Ignition OFF - Disconnect wiring harness connector from: - ECM (Wiring Harness Connector "D05") - Measure resistance between the following terminals: Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal "D02-1" & Ground	
	Yes: T07	No: E07
T07	Check: Short to Ground of Signal Circuit	less than 5 kΩ
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal "D05-4" & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal "D02-1"	
	Yes: T08	No: E06
T08	Check: Interruption of Signal Circuit	greater than 11 V
	- Disconnect wiring harness connector from: - ECM (Wiring Harness Connector "E62") - Connect fused jumper wire to: ECM – Wiring harness connector (wiring harness side) terminal "E62-80" & Ground - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal "E62-4", "E62-6" & Ground	
	Yes: E02	No: E05

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to "ECM Registration: in Section 1C".

Result	Cause of fault
E01	Defective component: Fuel Pressure Regulator
E02	Defective component: ECM
E03	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal "D05-34" & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal "D02-2"
E04	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal "D05-34" & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal "D02-2"
E05	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal "E62-4", "E62-6" & Main Relay – Socket Terminal "E72-4"

1A-89 Engine General Information and Diagnosis:

Result	Cause of fault
E06	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “D05-4” & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal “D02-1”
E07	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “D05-4” & Fuel Pressure Regulator – Wiring harness connector (wiring harness side) terminal “D02-1”
E08	Defective component: Component that is recognized as defective.

C-20, Camshaft Position Sensor Circuit

S5RS0B1104059

Test Table

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 “D07-3” & 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 “D07-1” & Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-3”	
	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 “D07-2” & 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 “D07-2” & Ground	
	Yes: E03	No: E04

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	Repair the concerned circuit / component.
E03	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-56” & - Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-2” - or - Defective component: – ECM
E04	- Short circuit to ground / interruption of circuit between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-56” & - Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-2” - or - Defective component: – ECM
E05	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-21” & - Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-1” - or - Defective component: – ECM
E06	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-25” & - Camshaft Position Sensor – Wiring harness connector (wiring harness side) terminal “D07-3” - or - Defective component: - ECM

C-21, Brake Switch Circuit

Test Table

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 “E47-2” & Ground	
	Yes: T02	No: T10
T02	Check: Short to Ground / Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition ON - Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-4” & Ground	
	Yes: T03	No: E08
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	Measure voltage between the following terminals: Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-3” & 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 “E47-1” & 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 “E47-1” & 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 side) terminal “E62-68” & 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 “E47-3” & Battery voltage • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-68” & 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 “E47-1” & 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
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

1A-93 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
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 “E47-2” & 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 “E47-3” & 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 “E47-1” & Battery voltage • Check the following component for proper operation: – Fuse of the fused jumper wire	
	Yes: E11	No: T15
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

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	- Circuit interruption between: - Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-3” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-68”
E03	- Short circuit to voltage between: - Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-3” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-68”
E04	- Circuit interruption between: - Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-1” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-81” - or - Defective component: – ECM
E05	If the nominal value is reached during one of the measurements, the component / control module 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 “E47-1” & - ABS Control Module – Wiring harness connector (wiring harness side) terminal “E03-3” & - ECM – Wiring harness connector (wiring harness side) terminal “E62-81” & - Rear Combination Lamp (Left) – Wiring harness connector (wiring harness side) terminal “L43-2” & - Rear Combination Lamp (Right) – Wiring harness connector (wiring harness side) terminal “L20-2” & - High Mount Stop Light – Wiring harness connector (wiring harness side) terminal “L17-2”
E07	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-68” & - Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-3” - or - Defective component: – ECM
E08	- Circuit interruption between: - Circuit Fuse – Output contact & - Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-4”
E09	- Circuit interruption between: - Circuit Fuse – Output contact & - Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-2”

1A-95 Engine General Information and Diagnosis:

Result	Cause of fault
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 “E47-1” & ABS Control Module – Wiring harness connector (wiring harness side) terminal “E03-3” & ECM – Wiring harness connector (wiring harness side) terminal “E62-81” & Rear Combination Lamp (Left) – Wiring harness connector (wiring harness side) terminal “L43-2” & Rear Combination Lamp (Right) – Wiring harness connector (wiring harness side) terminal “L20-2” & High Mount Stop Light – Wiring harness connector (wiring harness side) terminal “L17-2”
E13	• Short circuit to ground between: Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-3” & ECM – Wiring harness connector (wiring harness side) terminal “E62-68” - or • Defective component: – ECM
E14	• Short circuit to ground between: Circuit Fuse – Output contact & Brake Light Switch – Wiring harness connector (wiring harness side) terminal “E47-2”

C-22, Clutch Switch Circuit**Test Table**

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 “E74-2” & 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 “E62-22” & 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 “E74-1” & Clutch Switch – Wiring harness connector (wiring harness side) terminal “E74-2” • Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-22” & Ground	
	Yes: E01	No: E02

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	Circuit interruption between: Clutch Switch – Wiring harness connector (wiring harness side) terminal “E74-1” & ECM – Wiring harness connector (wiring harness side) terminal “E62-22”
E03	- Short circuit to voltage between: Clutch Switch – Wiring harness connector (wiring harness side) terminal “E74-1” & ECM – Wiring harness connector (wiring harness side) terminal “E62-22” or - Defective component: - ECM
E04	Circuit interruption between: Circuit Fuse – Output contact & Clutch Switch – Wiring harness connector (wiring harness side) terminal “E74-2”

C-23, Injector Circuit

S5RS0B1104062

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: - ECM

C-24, Cylinder 1 Injector Circuit

S5RS0B1104063

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored	
	Is the following DTC stored?	
	P0201 – Injector Circuit / Open Cylinder 1	
	Yes: E01	No: T02

Test	Work order description	Nominal value
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: – ECM (Wiring Harness Connector “D05”) • Ignition ON • Measure voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-47” & - Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Ignition OFF • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-47” & - Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• Disconnect wiring harness connector from: – Cylinder 1 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-16” & - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-2”	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-47” & - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-1”	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ω
	• Measure resistance between: - Cylinder 1 Injector – Wiring harness connector (component side) terminal “D14-1” & - Cylinder 1 Injector – Wiring harness connector (component side) terminal “D14-2”	
	Yes: E02	No: E01
T07	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Disconnect wiring harness connector from: – Cylinder 1 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-47” & - Ground	
	Yes: E05	No: E06

Result Table

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 1C”.
- If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – Cylinder 1 Injector
E02	• Defective component: – ECM
E03	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-47” & - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-1”
E04	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-16” & - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-2”
E05	• Short circuit to ground between: - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-16” - or • Defective component: – Cylinder 1 Injector
E06	• Short circuit to ground between: - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-47”
E07	• Short circuit to voltage between: - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-47” - or • Short circuit to voltage between: - Cylinder 1 Injector – Wiring harness connector (wiring harness side) terminal “D14-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-16”

C-25, Cylinder 2 Injector Circuit

S5RS0B1104064

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored	
	Is the following DTC stored?	
	P0202 – Injector Circuit / Open Cylinder 2	
	Yes: E01	No: T02

Test	Work order description	Nominal value
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: – ECM (Wiring Harness Connector “D05”) • Ignition ON • Measure voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-49” & - Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Ignition OFF • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-49” & - Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• Disconnect wiring harness connector from: – Cylinder 2 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-17” & - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-2”	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-49” & - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-1”	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ω
	• Measure resistance between: - Cylinder 2 Injector – Wiring harness connector (component side) terminal “D15-1” & - Cylinder 2 Injector – Wiring harness connector (component side) terminal “D15-2”	
	Yes: E02	No: E01
T07	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Disconnect wiring harness connector from: – Cylinder 2 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-49” & - Ground	
	Yes: E05	No: E06

Result Table

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 1C”.
- If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – Cylinder 2 Injector
E02	• Defective component: – ECM
E03	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-49” & - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-1”
E04	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-17” & - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-2”
E05	• Short circuit to ground between: - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-17” - or • Defective component: – Cylinder 2 Injector
E06	• Short circuit to ground between: - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-49”
E07	• Short circuit to voltage between: - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-49” - or • Short circuit to voltage between: - Cylinder 2 Injector – Wiring harness connector (wiring harness side) terminal “D15-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-17”

C-26, Cylinder 3 Injector Circuit

S5RS0B1104065

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored	
	Is the following DTC stored?	
	P0203 – Injector Circuit / Open Cylinder 3	
	Yes: E01	No: T02

Test	Work order description	Nominal value
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: – ECM (Wiring Harness Connector “D05”) • Ignition ON • Measure voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-48” & - Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Ignition OFF • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-48” & - Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• Disconnect wiring harness connector from: – Cylinder 3 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-31” & - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-2”	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-48” & - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-1”	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ω
	• Measure resistance between: - Cylinder 3 Injector – Wiring harness connector (component side) terminal “D16-1” & - Cylinder 3 Injector – Wiring harness connector (component side) terminal “D16-2”	
	Yes: E02	No: E01
T07	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Disconnect wiring harness connector from: – Cylinder 3 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-48” & - Ground	
	Yes: E05	No: E06

Result Table

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 1C”.
- If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – Cylinder 3 Injector
E02	• Defective component: – ECM
E03	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-48” & - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-1”
E04	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-31” & - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-2”
E05	• Short circuit to ground between: - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-31” - or • Defective component: – Cylinder 3 Injector
E06	• Short circuit to ground between: - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-48”
E07	• Short circuit to voltage between: - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-48” - or • Short circuit to voltage between: - Cylinder 3 Injector – Wiring harness connector (wiring harness side) terminal “D16-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-31”

C-27, Cylinder 4 Injector Circuit

S5RS0B1104066

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored	
	Is the following DTC stored?	
	P0204 – Injector Circuit / Open Cylinder 4	
	Yes: E01	No: T02

Test	Work order description	Nominal value
T02	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: – ECM (Wiring Harness Connector “D05”) • Ignition ON • Measure voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-46” & - Ground	
	Yes: T03	No: E07
T03	Check: Short to Ground of Signal Circuit	greater than 500 kΩ
	• Ignition OFF • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-46” & - Ground	
	Yes: T04	No: T07
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• Disconnect wiring harness connector from: – Cylinder 4 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-1” & - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-2”	
	Yes: T05	No: E04
T05	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-46” & - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-1”	
	Yes: T06	No: E03
T06	Check: Component	less than 3 Ω
	• Measure resistance between: - Cylinder 4 Injector – Wiring harness connector (component side) terminal “D17-1” & - Cylinder 4 Injector – Wiring harness connector (component side) terminal “D17-2”	
	Yes: E02	No: E01
T07	Check: Short to Ground of Signal Circuit	greater than 500 kΩ
	• Disconnect wiring harness connector from: – Cylinder 4 Injector • Measure resistance between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-46” & - Ground	
	Yes: E05	No: E06

Result Table

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 1C”.
- If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – Cylinder 4 Injector
E02	• Defective component: – ECM
E03	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-46” & - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-1”
E04	• Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “D05-1” & - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-2”
E05	• Short circuit to ground between: - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-1” - or • Defective component: – Cylinder 4 Injector
E06	• Short circuit to ground between: - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-46”
E07	• Short circuit to voltage between: - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-1” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-46” - or • Short circuit to voltage between: - Cylinder 4 Injector – Wiring harness connector (wiring harness side) terminal “D17-2” & - ECM – Wiring harness connector (wiring harness side) terminal “D05-1”

C-28, Exhaust Gas Recirculation Valve Circuit**Test Table**

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 “D05”) • Ignition ON • Measure voltage between the following terminals: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-1” & 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 “D08-5” & Ground	
	Yes: T03	No: E04
T03	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	• Ignition OFF • Measure resistance between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-5” & Ground	
	Yes: T04	No: E03
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between: Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-5” & ECM – Wiring harness connector (wiring harness side) terminal “D05-15”	
	Yes: E01	No: E02
T05	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between: DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-9” & Ground	
	Yes: T06	No: T08
T06	Check: Short to Voltage of Voltage Supply Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: DRL Controller • Ignition ON • Measure voltage between the following terminals: DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-9” & Ground	
	Yes: T07	No: E05

1A-107 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T07	Check: Short to Ground / Interruption of Voltage Supply Circuit	greater than 500 kΩ
	- Ignition OFF - Measure resistance between: DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-9” & Ground	
	Yes: E07	No: E06
T08	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: T09	No: T10
T09	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E08	No: E09
T10	Check: Interruption of Voltage Supply Circuit	Test okay?
	Insert new fuse circuit and then check the fuse for proper operation.	
	Yes: E10	No: E11

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “D05-15” & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-5”
E03	Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “D05-15” & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-5”
E04	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “D05-15” & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-5”
E05	Short circuit to voltage between: DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-9” & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-1”
E06	Short circuit to ground between: DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-9” & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-1”

Result	Cause of fault
E07	Circuit interruption between: DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-9” & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-1”
E08	Circuit interruption between: Circuit Fuse – Output contact & DRL Controller – Wiring harness connector (wiring harness side) terminal “G39-4”
E09	Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-1” & Circuit Fuse – Input contact
E10	Defective component: – Exhaust Gas Recirculation Valve
E11	- Short circuit to ground between: Circuit Fuse – Output contact & Exhaust Gas Recirculation Valve – Wiring harness connector (wiring harness side) terminal “D08-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-5” - or - Defective component: – ECM

C-29, Air Conditioning System Refrigerant Pressure Sensor

S5RS0B1104068

Test Table

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 “E04-1” & 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 “E04-1” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-2”	
	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 “E04-3” & Ground	
	Yes: T04	No: E03

1A-109 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T04	Check: Short to Ground / Interruption of Signal Circuit	greater than 500 k Ω
	• Ignition OFF • Disconnect wiring harness connector from: – ECM (Wiring Harness Connector “E62”) • Measure resistance between: A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-3” & 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 “E04-1” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-2”	
	Yes: E04	No: E05
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 “E04-1” & Ground	
	Yes: E06	No: E07

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “E62-87” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-3” or • Defective component: – A/C Pressure Sensor
E02	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “E62-87” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-3”
E03	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “E62-87” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-3” or • Defective component: – ECM
E04	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “E62-10” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-2” or • Defective component: – ECM
E05	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “E62-10” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-2” or • Defective component: – ECM
E06	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “E62-37” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-1” or • Defective component: – ECM
E07	• Short circuit to ground / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “E62-37” & A/C Pressure Sensor – Wiring harness connector (wiring harness side) terminal “E04-1” or • Defective component: – ECM

C-30, Engine Oil Pressure Switch Circuit

S5RS0B1104069

Test Table

Test	Work order description	Nominal value
T01	Check: Interruption of Signal Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: – Oil Pressure Switch • Ignition ON • Measure voltage between the following terminals: Oil Pressure Switch – Wiring harness connector (wiring harness side) terminal “D04-1” & Ground	
	Yes: E01	No: T02
T02	Check: Short to Ground of Signal Circuit	less than 0.3 V
	• Ignition OFF • Disconnect wiring harness connector from: – ECM • Ignition ON • Measure voltage between the following terminals: Oil Pressure Switch – Wiring harness connector (wiring harness side) terminal “D04-1” & Ground	
	Yes: T03	No: E02
T03	Check: Short to Voltage / Interruption of Signal Circuit	greater than 500 kΩ
	• Ignition OFF • Measure resistance between the following terminals: Oil Pressure Switch- Wiring harness connector (wiring harness side) terminal “D04-1” & Ground	
	Yes: E03	No: E04

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: – Oil Pressure Switch
E02	• Short circuit to voltage between: Oil Pressure Switch – Wiring harness connector (wiring harness side) terminal “D04-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-9”
E03	• Short circuit to ground between: Oil Pressure Switch – Wiring harness connector (wiring harness side) terminal “D04-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-9” or • Defective component: – ECM

Result	Cause of fault
E04	Circuit interruption between: Oil Pressure Switch – Wiring harness connector (wiring harness side) terminal “D04-1” & ECM – Wiring harness connector (wiring harness side) terminal “D05-9”

C-31, Air Conditioning System Relay Circuit

S5RS0B1104070

Test Table

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 “E36-2” & Ground	
	Yes: T02	
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 “E36-1” & Ground	
	Yes: T03	
T03	Check: Short to Ground / Interruption of Voltage Supply Circuit	greater than 11 V
	Measure voltage between the following terminals: Compressor Relay – Socket terminal “E36-3” & Ground	
	Yes: T04	
T04	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: - ECM (Wiring Harness Connector “E62”) - Ignition ON - Measure voltage between the following terminals: Compressor Relay – Socket terminal “E36-5” & Ground	
	Yes: T05	
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 “E62-79” & Ground	
	Yes: T06	
	No: T09	
	No: E08	
	No: E07	
	No: E06	
	No: E05	

1A-113 Engine General Information and Diagnosis:

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 “E62-79” & Ground • Ignition ON • Measure voltage between the following terminals: A/C Compressor – Wiring harness connector (wiring harness side) terminal “D11-2” & Ground	
	Yes: T07	No: E04
T07	Check: Circuit Interruption of Ground Circuit	less than 5 Ω
	• Ignition OFF • Remove fused jumper wire. • Measure resistance between the following terminals: A/C compressor – Wiring harness connector (wiring harness side) terminal “D11-1” & 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 “E36-1” & Battery voltage • Clicking noise from the 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
T11	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Connect fused jumper wire to: Compressor Relay – Socket terminal “E36-1” & Battery voltage • Check the following component for proper operation: – Fuse of the fused jumper wire	
	Yes: E11	No: E12

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – ECM
E02	- Defective component: – A/C Compressor
E03	Circuit interruption between: A/C Compressor – Wiring harness connector (wiring harness side) terminal “D11-1” & Ground
E04	- Circuit interruption between: Compressor Relay – Socket terminal “E36-1” & A/C Compressor – Wiring harness connector (wiring harness side) terminal “D11-2” or - Defective component: – Compressor Relay
E05	- Circuit interruption between: Compressor Relay – Socket terminal “E36-5” & ECM – Wiring harness connector (wiring harness side) terminal “E62-79” or - Defective component: – Compressor Relay
E06	Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “E62-79” & Compressor Relay – Socket terminal “E36-5”
E07	Circuit interruption between: Circuit Fuse – Output contact & Compressor Relay – Socket terminal “E36-3”
E08	- Short circuit to voltage between: Compressor Relay – Socket terminal “E36-1” & A/C compressor – Wiring harness connector (wiring harness side) terminal “D11-2” or - Defective component: – A/C Compressor
E09	Circuit interruption between: Circuit Main Fuse – Output contact & Compressor Relay – Socket terminal “E36-2”
E10	Circuit interruption between: System Main Fuse – Output contact & Circuit Main Fuse – Input contact

1A-115 Engine General Information and Diagnosis:

Result	Cause of fault
E11	- Short circuit to ground between: Circuit Main Fuse – Output contact & Compressor Relay – Socket terminal “E36-2” - or - Defective component: – Compressor Relay
E12	- Short circuit to ground between: Compressor Relay – Socket terminal “E36-1” & A/C compressor – Wiring harness connector (wiring harness side) terminal “D11-2” - or - Defective component: – A/C compressor

C-32, Fan Circuit

S5RS0B1104071

▲ 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.

Test Table

Test	Work order description	Nominal value
T01	Check: Component	Radiator fan is switched off.
	- Ignition ON - Scan Tool MISC Test – Radiator Fan Low Control - Press NO key	
	Yes: T02	No: T25
T02	Check: Component	Is radiator fan running at low speed?
	- Ignition ON - Scan Tool MISC Test – Radiator Fan Low Control - Press YES key	
	Yes: T03	No: T14
T03	Check: Component	Is radiator fan running at high speed?
	- Ignition ON - Scan Tool MISC Test – Radiator Fan High Control - Press YES key	
	Yes: E01	No: T04
T04	Check: Short to Ground / Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Remove electrical component from socket Radiator Fan Relay No.3 - Measure voltage between the following terminals: Radiator Fan Relay No.3 – Socket terminal “E30-3” & Ground	
	Yes: T05	No: E06

Test	Work order description	Nominal value
T05	Check: Short to Voltage / Interruption of Signal Circuit	Test light ON?
	• Connect test light (20 to 40 Ω) to: Radiator Fan Relay No.3 – Socket terminal “E30-3” & Radiator Fan Relay No.3 – Socket terminal “E30-5” • Ignition ON • Scan Tool MISC Test – Radiator Fan high Control Press YES key	
	Yes: T06	No: E05
T06	Check: Interruption of Signal Circuit	Is radiator cooling fan running at high speed?
	• Ignition OFF • Remove test light • Connect fused jumper wire to: Radiator Fan Relay No.3 – Socket terminal “E30-1” & Radiator Fan Relay No.3 – Socket terminal “E30-2” • Ignition ON • Scan Tool MISC Test – Radiator Fan high Control Press YES key	
	Yes: E02	No: T07
T07	Check: Circuit Interruption of Ground Circuit	Is radiator cooling fan running at high speed?
	• Ignition OFF • Remove fused jumper wire • Connect fused jumper wire to: Radiator Fan Relay No.3 – Socket terminal “E30-1” & Ground • Ignition ON • Scan Tool MISC Test – Radiator Fan high Control Press YES key	
	Yes: E03	No: T08
T08	Check: Circuit Interruption of Ground Circuit	less than 5 Ω
	• Ignition OFF • Remove fused jumper wire • Disconnect wiring harness connector from: Radiator Fan Motor • Measure resistance between the following terminals: Radiator Fan Relay No.3 – Socket terminal “E30-1” & Radiator Fan Motor – Wiring harness connector “E17-4”	
	Yes: T09	No: E04
T09	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Connect wiring harness connector to: Radiator Fan Motor • Install electrical component to socket: Radiator Fan Relay No.3 • Remove electrical component from socket: Radiator Fan Relay No.2 • Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal “E29-3” & Ground	
	Yes: T10	No: E22

1A-117 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T10	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	- Ignition OFF - Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal “E30-2” & Ground	
	Yes: T11	No: E10
T11	Check: Short to Voltage / Interruption of Signal Circuit	Test light ON?
	- Connect test light (20 to 40 Ω) to: Radiator Fan Relay No.2 – Socket terminal “E29-3” & Radiator Fan Relay No.2 – Socket terminal “E29-5” - Ignition ON - Scan Tool MISC Test – Radiator Fan high Control Press YES key	
	Yes: T12	No: E09
T12	Check: Interruption of Signal Circuit	Is radiator cooling fan running at high speed?
	- Ignition OFF - Remove test light - Connect fused jumper wire to: Radiator Fan Relay No.2 – Socket terminal “E29-1” & Radiator Fan Relay No.2 – Socket terminal “E29-2” - Ignition ON - Scan Tool MISC Test - Radiator Fan high Control Press YES key	
	Yes: E07	No: T13
T13	Check: Circuit Interruption of Ground Circuit	less than 5 Ω
	- Ignition OFF - Remove fused jumper wire - Disconnect wiring harness connector from: Radiator Fan Motor - Measure resistance between the following terminals: Radiator Fan Relay No.2 – Socket terminal “E29-1” & Radiator Fan Motor – Wiring harness connector “E17-2”	
	Yes: E12	No: E08
T14	Check: Short to Ground / Interruption of Voltage Supply Circuit	greater than 11V
	- 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 “E28-3” & Ground	
	Yes: T15	No: T20
T15	Check: Short to Ground / Interruption of Voltage Supply Circuit	greater than 11V
	- Ignition OFF - Measure voltage between the following terminals: Radiator Fan Relay No.1 – Socket terminal “E28-2” & Ground	
	Yes: T16	No: E23

Test	Work order description	Nominal value
T16	Check: Short to Voltage / Interruption of Signal Circuit	Test light ON?
	• Connect test light (20 to 40 Ω) to: Radiator Fan Relay No.1 – Socket terminal “E28-3” & Radiator Fan Relay No.1 – Socket terminal “E28-5” • Ignition ON • Scan Tool MISC Test – Radiator Fan high Control Press YES key	
	Yes: T17	No: E15
T17	Check: Interruption of Signal Circuit	Is radiator cooling fan running at low speed?
	• Remove test light • Connect jumper wire to: Radiator Fan Relay No.1 – Socket terminal “E28-1” & Radiator Fan Relay No.1 – Socket terminal “E28-2”	
	Yes: E11	No: T18
T18	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Ignition OFF • Disconnect wiring harness connector from: Radiator Fan Motor • Connect jumper wire to: Radiator Fan Relay No.1 – Socket terminal “E28-1” & Radiator Fan Relay No.1 – Socket terminal “E28-2” • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector “E17-1” & Ground	
	Yes: T19	No: E14
T19	Check: Circuit Interruption of Ground Circuit	less than 5 Ω
	• Remove fused jumper wire • Measure voltage between the following terminals: Radiator Fan Motor – Wiring harness connector “E17-3” & Ground	
	Yes: E12	No: E13
T20	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: T21	No: T22
T21	Check: Interruption of Voltage Supply Circuit	greater than 11 V
	• Measure voltage between the following terminals: Circuit Fuse – Input contact & Ground	
	Yes: E16	No: E17
T22	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Ignition switch OFF • Remove electrical component from socket: Radiator Fan Relay No.2, No.3 • Insert new circuit fuse and then check the fuse for proper operation.	
	Yes: T23	No: E24

1A-119 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T23	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Install electrical component from socket: Radiator Fan Relay No.3	
	• Insert new circuit fuse and then check the fuse for proper operation.	
	Yes: T24	No: E02
T24	Check: Short to Ground of Voltage Supply Circuit	Test okay?
	• Install electrical component from socket: Radiator Fan Relay No.2	
	• Insert new circuit fuse and then check the fuse for proper operation.	
	Yes: E11	No: E07
T25	Check: Short to Voltage of Voltage Supply Circuit	Radiator fan is switched off.
	• Ignition OFF	
	• Remove electrical component from socket: Radiator Fan Relay No.1	
	Yes: T26	No: T27
T26	Check: Short to Ground of Signal Circuit	Test light OFF
	• Connect test light (20 to 40 Ω) to: Radiator Fan Relay No.1 – Socket terminal “E28-3” & Radiator Fan Relay No.1 – Socket terminal “E28-5”	
	Yes: E11	No: E18
T27	Check: Short to Voltage of Voltage Supply Circuit	Radiator fan is switched off.
	• Remove electrical component from socket: Radiator Fan Relay No.2	
	Yes: T28	No: T29
T28	Check: Short to Ground of Signal Circuit	Test light OFF
	• Connect test light (20 to 40 Ω) to: Radiator Fan Relay No.2 – Socket terminal “E29-3” & Radiator Fan Relay No.2 – Socket terminal “E29-5”	
	Yes: E07	No: E19
T29	Check: Short Voltage of Radiator Fan Control Circuit	less than 0.3 V
	• Disconnect wiring harness connector from: Radiator Fan Motor	
	• Measure voltage between the following terminals: Radiator Fan Relay No.2 – Socket terminal “E29-1” & Ground	
	Yes: E21	No: E20

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Defective component: ECM
E02	• Defective component: Radiator Fan Relay No.3
E03	• Circuit interruption between: Radiator Fan Relay No.3 – Socket Terminal “E30-2” & Ground
	or • Defective component: Radiator Fan Relay No.3

Result	Cause of fault
E04	Circuit interruption between: Radiator Fan Relay No.3 – Socket Terminal “E30-1” & Radiator Fan Motor – Wiring harness connector “E17-4”
E05	- Circuit interruption between: Radiator Fan Relay No.3 – Socket Terminal “E30-5” & ECM – Wiring harness connector (wiring harness side) Terminal “E62-30” - or - Defective component: ECM
E06	Circuit interruption between: Circuit fuse – Output contact & Radiator Fan Relay No.3 – Socket Terminal “E30-3”
E07	Defective component: Radiator Fan Relay No.2
E08	Circuit interruption between: Radiator Fan Relay No.2 – Socket Terminal “E29-1” & Radiator Fan Motor – Wiring harness connector “E17-2”
E09	- Circuit interruption between: Radiator Fan Relay No.2 – Socket Terminal “E29-5” & ECM – Wiring harness connector (wiring harness side) Terminal “E62-8” - or - Defective component: ECM
E10	Circuit interruption between: Circuit fuse – Output contact & Radiator Fan Relay No.2 – Socket Terminal “E29-2”
E11	Defective component: Radiator Fan Relay No.1
E12	Defective component: Radiator Fan Motor
E13	Circuit interruption between: Radiator Fan Motor – Wiring harness connector “E17-3” & Ground
E14	Circuit interruption between: Radiator Fan Relay No.1 – Socket Terminal “E28-1” & Radiator Fan Motor – Wiring harness connector “E17-1”
E15	- Circuit interruption between: Radiator Fan Relay No.1 – Socket Terminal “E28-5” & ECM – Wiring harness connector (wiring harness side) Terminal “E62-7” - or - Defective component: ECM
E16	Circuit interruption between: Circuit fuse – Output contact & Radiator Fan Relay No.1 – Socket Terminal “E28-3”

1A-121 Engine General Information and Diagnosis:

Result	Cause of fault
E17	• Circuit interruption between: Main fuse – Output contact & Circuit fuse – Input contact
E18	• Short circuit to ground between: Radiator Fan Relay No.1 – Socket Terminal “E28-5” & ECM – Wiring harness connector (wiring harness side) Terminal “E62-7” - or • Defective component: ECM
E19	• Short circuit to ground between: Radiator Fan Relay No.2 – Socket Terminal “E29-5” & ECM – Wiring harness connector (wiring harness side) Terminal “E62-8” - or • Defective component: ECM
E20	• Short circuit to voltage between: Radiator Fan Relay No.2 – Socket Terminal “E29-1” & Radiator Fan Motor – Wiring harness connector “E17-2”
E21	• Short circuit to voltage between: Radiator Fan Relay No.1 – Socket Terminal “E28-1” & Radiator Fan Motor – Wiring harness connector “E17-1”
E22	• Circuit interruption between: Circuit fuse – Output contact & Radiator Fan Relay No.2 – Socket Terminal “E29-3”
E23	• Circuit interruption between: Circuit fuse – Output contact & Radiator Fan Relay No.1 – Socket Terminal “E28-2”
E24	• Short circuit to ground between: Circuit fuse – Output contact & Radiator Fan Relay No.1 – Socket Terminal “E28-2”, “E28-3” - or • Circuit fuse – Output contact & Radiator Fan Relay No.2 – Socket Terminal “E29-2”, “E29-3” - or • Circuit fuse – Output contact & Radiator Fan Relay No.3 – Socket Terminal “E30-3”

C-33, Glow Time Relay Circuit**Test Table**

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 “E73-7” & 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 “E73-7” & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-6”	
	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 “E73-1” & 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 “E73-3” & Ground - Ignition ON - Data List Parameter: - Glow Relay	
	Yes: T07	No: E06

1A-123 Engine General Information and Diagnosis:

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 “E73-8” & Battery voltage	
	Yes: T08	No: E05
T08	Check: Short to Voltage of Signal Circuit	greater than 500 kΩ
	- Ignition OFF - Disconnect wiring harness connector from: - ECM - Measure resistance between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-8” & 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 “D18-1”, “D19-1”, “D20-1”, “D21-1” & Ground	
	Yes: T10	No: E03
T10	Check: Short to Ground / Interruption of Signal Circuit	greater than 500 kΩ
	- Ignition OFF - Measure resistance between the following terminals: Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-4”, “E73-5” & 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
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

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	• Circuit interruption between: Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-4”, “E73-5” & Glow Plugs – Wiring harness connector (wiring harness side) terminal “D18-1”, “D19-1”, “D20-1”, “D21-1” - or • Defective component: – Glow Controller
E02	• Short circuit to ground between: Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-4”, “E73-5” & Glow Plugs – Wiring harness connector (wiring harness side) terminal “D18-1”, “D19-1”, “D20-1”, “D21-1”
E03	• Short circuit to voltage between: Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-4”, “E73-5” & Glow Plugs – Wiring harness connector (wiring harness side) terminal “D18-1”, “D19-1”, “D20-1”, “D21-1” - or • Defective component: – Glow Controller
E04	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “E62-74” & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-8”
E05	• Short circuit to voltage / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “E62-74” & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-8” - or • Defective component: – ECM
E06	• Short circuit to voltage / interruption of circuit between: ECM – Wiring harness connector (wiring harness side) terminal “E62-70” & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-3” - or • Defective component: – ECM
E07	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “E62-70” & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-3” - or • Defective component: – ECM
E08	• Circuit interruption between: Circuit Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-1”

1A-125 Engine General Information and Diagnosis:

Result	Cause of fault
E09	• Circuit interruption between: Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-6” & Ground
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Glow Controller – Wiring harness connector (wiring harness side) terminal “E73-7”
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 “E73-7”
E13	• Defective component: – Glow Plugs

C-34, CAN Communication Circuit

S5RS0B1104073

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored for BCM	
	• Is the following DTC stored? Refer to “DTC Check: in Section 10B” U1073 – Control Module Communication Bus Off and/or • U1100 – Lost Communication with ECM	
	Yes: T02	No: T17
T02	Check: Combination Meter	
	• Ignition OFF • Disconnect wiring harness connector from: – Combination Meter • Ignition ON • Is the following DTC stored? U2103 – Control Module Communication Bus Off U2104 – Control Module Communication Repeated Bus Off and/or • U2107 – Lost Communication with BCM	
	Yes: T03	No: E01
T03	Check: Short to Ground of CAN Communication Circuit	greater than 500 kΩ
	• Ignition OFF • Disconnect wiring harness connector from: – BCM • Measure resistance between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-4” & Ground	
	Yes: T04	No: E02

Test	Work order description	Nominal value
T04	Check: Short to Voltage of CAN Communication Circuit	less than 0.3 V
	- Ignition ON - Measure voltage between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-4” & Ground	
	Yes: T05	No: E03
T05	Check: Interruption of CAN Communication Circuit	less than 5 Ω
	- Ignition OFF - Measure resistance between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-4” & Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-8”	
	Yes: T06	No: E04
T06	Check: Short to Ground of CAN Communication Circuit	greater than 500 k Ω
	Measure resistance between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & Ground	
	Yes: T07	No: E05
T07	Check: Short to Voltage of CAN Communication Circuit	less than 0.3 V
	- Ignition ON - Measure voltage between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & Ground	
	Yes: T08	No: E06
T08	Check: Interruption of CAN Communication Circuit	less than 5 Ω
	- Ignition OFF - Measure resistance between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-10”	
	Yes: T09	No: E07
T09	Check: Short to Between High Signal Line and Low Signal Line of CAN Communication Circuits	greater than 500 k Ω
	Measure resistance between the following terminals: BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & BCM – Wiring harness connector (wiring harness side) terminal “G37-4”	
	Yes: T10	No: E08
T10	Check: Short to Ground of CAN Communication Circuit	greater than 500 k Ω
	- Disconnect wiring harness connector from: – ECM - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & Ground	
	Yes: T11	No: E09

1A-127 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T11	Check: Short to Voltage of CAN Communication Circuit	less than 0.3 V
	• Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & Ground	
	Yes: T12	No: E10
T12	Check: Interruption of CAN Communication Circuit	less than 5 Ω
	• Ignition OFF • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & BCM – Wiring harness connector (wiring harness side) terminal “E46-1”	
	Yes: T13	No: E11
T13	Check: Short to Ground of CAN Communication Circuit	greater than 500 k Ω
	• Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-40” & Ground	
	Yes: T14	No: E12
T14	Check: Short to Voltage of CAN Communication Circuit	less than 0.3 V
	• Ignition ON • Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-40” & Ground	
	Yes: T15	No: E13
T15	Check: Interruption of CAN Communication Circuit	less than 5 Ω
	• Ignition OFF • Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-40” & BCM – Wiring harness connector (wiring harness side) terminal “E46-2”	
	Yes: T16	No: E14
T16	Check: Short to Between High Signal Line and Low Signal Line of CAN Communication Circuits	greater than 500 k Ω
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & ECM – Wiring harness connector (wiring harness side) terminal “E62-40”	
	Yes: T17	No: E15
T17	Check: Combination Meter Operation	Test okay?
	• Connect wiring harness connector from: – BCM – Combination Meter • Ignition ON • Check the following component for proper operation: Seat Belt Warning Lamp – OFF (when fastening driver side seat belt) Seat Belt Warning Lamp – ON (when unfastening driver side seat belt)	
	Yes: E16	No: E17

Result Table

NOTE

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: - Combination Meter
E02	- Short circuit to ground between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-4” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-8”
E03	- Short circuit to voltage between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-4” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-8”
E04	- Circuit interruption between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-4” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-8”
E05	- Short circuit to ground between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-10”
E06	- Short circuit to voltage between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-10”
E07	- Circuit interruption between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-10”
E08	- Short circuit between: - BCM – Wiring harness connector (wiring harness side) terminal “G37-2” & - BCM – Wiring harness connector (wiring harness side) terminal “G37-4”
E09	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & - BCM – Wiring harness connector (wiring harness side) terminal “E46-1”
E10	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & - BCM – Wiring harness connector (wiring harness side) terminal “E46-1”
E11	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & - BCM – Wiring harness connector (wiring harness side) terminal “E46-1”
E12	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-40” & - BCM – Wiring harness connector (wiring harness side) terminal “E46-2”
E13	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-40” & - BCM – Wiring harness connector (wiring harness side) terminal “E46-2”

1A-129 Engine General Information and Diagnosis:

Result	Cause of fault
E14	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “E62-40” & BCM – Wiring harness connector (wiring harness side) terminal “E46-2”
E15	• Short circuit between: ECM – Wiring harness connector (wiring harness side) terminal “E62-64” & ECM – Wiring harness connector (wiring harness side) terminal “E62-40”
E16	• Defective component: – ECM
E17	• Defective component: – BCM

C-35, Filter heating Circuit

S5RS0B1104074

Test Table

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 “E71-2” & 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 “E71-4” & 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 “E71-5” & 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 “E62”) • Ignition ON • Measure voltage between the following terminals: Fuel Heating Relay – Socket Terminal “E71-1” & Ground	
	Yes: T05	No: E07
T05	Check: Short to Ground of Signal Circuit	greater than 500 kΩ
	• Ignition OFF • Measure resistance between the following terminals: Fuel Heating Relay – Socket Terminal “E71-1” & Ground	
	Yes: T06	No: E06

Test	Work order description	Nominal value
T06	Check: Interruption of Signal Circuit	less than 5 Ω
	• Measure resistance between: ECM – Wiring harness connector (wiring harness side) terminal “E62-76” & Fuel Heating Relay – Socket Terminal “E71-1”	
	Yes: T07	No: E05
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 “E71-2” & Fuel Heating Relay – Socket Terminal “E71-5” • Measure voltage between the following terminals: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-2” & 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 “E64-2” & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-1”	
	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 “E62-76” & 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 “E62-76” & Ground • Ignition ON • Measure voltage between the following terminals: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-2” & Ground	
	Yes: E01	No: E02

1A-131 Engine General Information and Diagnosis:

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 “E71-5” & 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 “E71-5” & Battery voltage	
	Yes: E02	No: E12

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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.
E02	• Defective component: – Fuel Heating Relay
E03	• Circuit interruption between: Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-1” & Ground
E04	• Circuit interruption between: Fuel Heating Relay – Socket Terminal “E71-5” & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-2”

Result	Cause of fault
E05	• Circuit interruption between: ECM – Wiring harness connector (wiring harness side) terminal “E62-76” & Fuel Heating Relay – Socket Terminal “E71-1”
E06	• Short circuit to ground between: ECM – Wiring harness connector (wiring harness side) terminal “E62-76” & Fuel Heating Relay – Socket Terminal “E71-1”
E07	• Short circuit to voltage between: ECM – Wiring harness connector (wiring harness side) terminal “E62-76” & Fuel Heating Relay – Socket Terminal “E71-1”
E08	• Short circuit to voltage between: Fuel Heating Relay – Socket Terminal “E71-5” & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-2”
E09	• Circuit interruption between: Circuit Fuse – Output contact & Fuel Heating Relay – Socket Terminal “E71-4”
E10	• Circuit interruption between: Circuit Main Fuse – Output contact & Fuel Heating Relay – Socket Terminal “E71-2”
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 “E71-5” & Fuel Heater and Temperature Sensor – Wiring harness connector (wiring harness side) terminal “E64-2” or • Defective component: – Fuel Heater and Temperature Sensor
E13	• Short circuit to ground between: Circuit Main Fuse – Output contact & Fuel Heating Relay – Socket Terminal “E71-2”

C-36, Malfunction Indicator Lamp (MIL) Circuit

S5RS0B1104075

Test Table

Test	Work order description	Nominal value
T01	Check: Component	Test okay?
	• Ignition OFF • Ignition ON • Is at least one of the following indicator ON? – Brake 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 “E62”) • 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 “E62-78” & - 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 “G28-20” & - Ground	
	Yes: E01	No: E02
T05	Check: Component	greater than 500 k Ω
	• Ignition OFF • Disconnect wiring harness connector from: – Combination meter • Measure resistance between the following terminals: - ECM – Wiring harness connector (wiring harness side) terminal “E62-78” & - Ground	
	Yes: E01	No: E04

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – ECM
E02	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-78” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-20”
E03	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-78” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-20” - or - Defective component: – Combination Meter
E04	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-78” & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-20” - or - Defective component: – Combination Meter
E05	- Circuit interruption between: - Circuit Fuse – Output contact & - Combination Meter – Wiring harness connector (wiring harness side) terminal “G28-32” - or - Defective component: – Combination Meter

C-37, Vehicle Speed Sensor Circuit

S5RS0B1104079

Test Table

Test	Work order description	Nominal value
T01	Check: Vehicle Speed Output Signal	Test okay?
	Perform vehicle speed output signal check: Refer to "Vehicle Speed Output Signal Inspection: in Section 4E"	
	Yes: T02	No: E01
T02	Check: EPS Control Module	
	- Ignition OFF - Disconnect wiring harness connector from: - EPS Control Module - Ignition ON - Is the following DTC stored? P0500 – Vehicle Speed Sensor	
	Yes: T03	No: E02
T03	Check: Short to Voltage of Signal Circuit	less than 0.3 V
	- Ignition OFF - Disconnect wiring harness connector from: - ECM - ABS Hydraulic Unit / Control Module Assembly - Ignition ON - Measure voltage between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal "E62-89" & Ground	
	Yes: T04	No: E03
T04	Check: Interruption of Signal Circuit	less than 5 Ω
	- Ignition OFF - Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal "E62-89" & ABS Hydraulic Unit / Control Module Assembly – Wiring harness connector (wiring harness side) terminal "E03-12"	
	Yes: T05	No: E04
T05	Check: Short to Ground of Signal Circuit	greater than 500 k Ω
	Measure resistance between the following terminals: ECM – Wiring harness connector (wiring harness side) terminal "E62-89" & Ground	
	Yes: E06	No: E05

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – ABS Hydraulic Unit / Control Module Assembly
E02	- Defective component: – EPS Control Module
E03	- Short circuit to voltage between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-89” & - ABS Hydraulic Unit / Control Module Assembly – Wiring harness connector (wiring harness side) terminal “E03-12”
E04	- Circuit interruption between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-89” & - ABS Hydraulic Unit / Control Module Assembly – Wiring harness connector (wiring harness side) terminal “E03-12”
E05	- Short circuit to ground between: - ECM – Wiring harness connector (wiring harness side) terminal “E62-89” & - ABS Hydraulic Unit / Control Module Assembly – Wiring harness connector (wiring harness side) terminal “E03-12”
E06	- Defective component: – ECM

C-38, Function-Group Intake Air System

S5RS0B1104080

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

Result	Cause of fault
E01	- Defective component: – Component, that is recognized as defective

C-39, Function-Group Fuel System

S5RS0B1104081

Test Table

Test	Work order description	Nominal value
T01	Check: DTC stored	
	Is the following DTC stored?	
	P1660 – Shut Off Valve	
	Yes: E01	No: E02

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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 (Injection 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

C-40, Function-Group Low Pressure Section

S5RS0B1104082

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 (Injection pump) - or - Defective component: - Component, that is recognized as defective

C-41, Function-Group Low and High Pressure Section

S5RS0B1104083

Result Table**NOTE**

If ECM is replaced, register vehicle specification into ECM referring to “ECM Registration: in Section 1C”.

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 (Injection pump) – The high pressure fuel pump delivery rate is too low - or • Defective component: – Component, that is recognized as defective

C-42, Function-Group High Pressure Area

S5RS0B1104084

Result Table**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 1C”.

Result	Cause of fault
E01	• The fuel reserve is too low - or • Mechanical fault in the high pressure section • Check all mechanical components of the concerned system. - or • Defective component: – Component, that is recognized as defective

C-43, Starter Circuit

Test Table

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 the following lead: – Starting Motor – Terminal “C56-1” • 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 – “C59-1” & Ground • Engine running • Increase engine speed to 3000 rpm	
	Yes: T06	No: T09
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

Test	Work order description	Nominal value
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 the 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 "C21-1" - Wiring harness to generator terminal "C59-1" - 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 the following lead: - Starting Motor – Terminal "C56-1" - 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
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: T25

1A-141 Engine General Information and Diagnosis:

Test	Work order description	Nominal value
T15	Check: Component	greater than 11 V
	- Measure voltage between the following terminals: Starting Motor – Wiring harness connector (wiring harness side) terminal “C57-1” & Ground - Turn ignition switch to ST position.	
	Yes: T11	No: T16
T16	Check: Component	Test okay?
	Check the following component for proper operation: – Starting Motor Control relay	
	Yes: T17	No: E11
T17	Check: Short to Voltage of Starting Motor Control Circuit	greater than 11 V
	Measure voltage between the following terminals: Starting Motor Control Relay – Socket terminal “E31-1” & Ground	
	Yes: T19	No: T18
T18	Check: Short to Ground / Interruption of Starting Motor Control Circuit	Test okay?
	- Remove electrical component from socket: – Circuit Fuse - Check the following component for proper operation: – Circuit Fuse	
	Yes: E12	No: E13
T19	Check: Interruption of Starting Motor Control Circuit	less than 5 Ω
	Measure resistance between the following terminals: Starting Motor Control Relay – Socket terminal “E31-2” & Starting Motor – Wiring harness connector (wiring harness side) terminal “C57-1”	
	Yes: T20	No: E14
T20	Check: Short to Ground of Starting Motor Control Circuit	greater than 500 k Ω
	Measure resistance between the following terminals: Starting Motor Control Relay – Socket terminal “E31-2” & Ground	
	Yes: T21	No: E15
T21	Check: Short to Ground / Interruption of Starting Motor Control Circuit	Test okay?
	- Remove electrical component from socket: – Circuit Fuse - Check the following component for proper operation: – Circuit Fuse	
	Yes: T22	No: E16
T22	Check: Short to Ground of Starting Motor Control Circuit	Test okay?
	- Connect fused jumper wire to: Ignition Switch – Wiring harness connector (wiring harness side) “G21-2” & Battery voltage - Check the following component for proper operation: – Fuse of the fused jumper wire	
	Yes: T23	No: E17

Test	Work order description	Nominal value
T23	Check: Interruption of Starting Motor Control Circuit	less than 5 Ω
	• Ignition OFF • Remove fused jumper wire • Measure resistance between the following terminals: Circuit Fuse – Output contact & Starting Motor Control Relay – Socket terminal “E31-3”	
	Yes: T24	No: E18
T24	Check: Interruption of Ground Circuit	less than 5 Ω
	• Measure resistance between the following terminals: Starting Motor Control Relay – Socket terminal “E31-5” & Ground	
	Yes: E19	No: E20
T25	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

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 “C21-1” - or - Wiring harness to generator terminal “C59-1” - or - Bad ground connection
E06	• Circuit interruption between: - Battery – Positive (+) terminal & - Starting Motor – Wiring harness connector (wiring harness side) terminal “C56-1” - or • Defective component: – Starting Motor
E07	• Mechanical engine problem
E08	• Repair / clean wiring harness and connectors to battery / starting motor

1A-143 Engine General Information and Diagnosis:

Result	Cause of fault
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	• Defective component: – Starting Motor Control Relay
E12	• Circuit interruption between: Circuit Fuse – Output contact & Starting Motor Control Relay – Socket terminal “E31-1”
E13	• Short circuit to ground between: Circuit Fuse – Output contact & Starting Motor Control Relay – Socket terminal “E31-1”
E14	• Circuit interruption between: Starting Motor Control Relay – Socket terminal “E31-2” & Starting Motor – Wiring harness connector (wiring harness side) terminal “C57-1”
E15	• Short circuit to ground between: Starting Motor Control Relay – Socket terminal “E31-2” & Starting Motor – Wiring harness connector (wiring harness side) terminal “C57-1”
E16	• Short circuit to ground between: Circuit Fuse – Output contact & Starting Motor Control Relay – Socket terminal “E31-3”
E17	• Short circuit to ground between: Ignition Switch – Wiring harness connector (wiring harness side) “G21-2” & Circuit Fuse – Input contact
E18	• Circuit interruption between: Circuit Fuse – Output contact & Starting Motor Control Relay – Socket terminal “E31-3”
E19	• Circuit interruption between: Ignition Switch – Wiring harness connector (wiring harness side) terminal “G21-2” & Circuit Fuse – Input contact or • Defective component: – Ignition Switch
E20	• Circuit interruption between: Starting Motor Control Relay – Socket terminal “E31-5” & Ground

C-44, System Status Information

S5RS0B1104086

Result Table

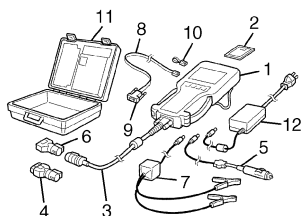
Result	Cause of fault
E01	- This trouble code indicates an invalid operating condition. Operation mode with high load and high coolant temperature or Operation mode with high load and low fuel reserve - Inform the customer, that the system behavior is normal respectively how to operate the system correctly.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

Special Tools and Equipment**Special Tool**

S5RS0B1108001

SUZUKI scan tool

—
This kit includes 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 loop back connector, 11. Storage case, 12. Power supply



Aux. Emission Control Devices

Repair Instructions

Vacuum Pump Removal and Installation

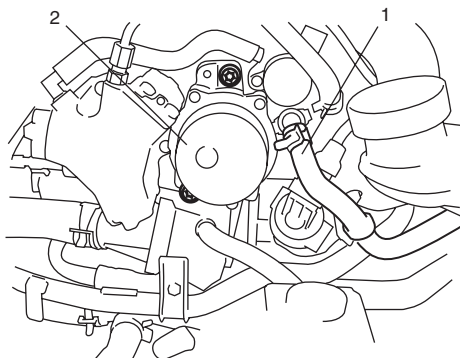
S5RS0B1206001

⚠ CAUTION

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

Removal

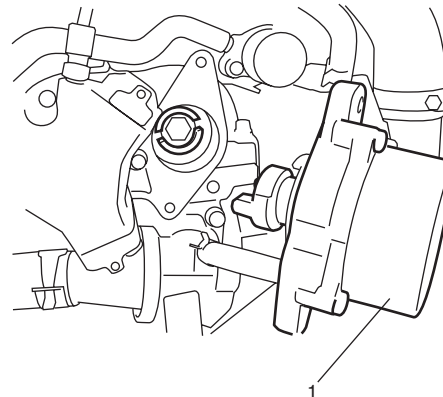
- 1) Disconnect negative cable from battery.
- 2) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 3) Disconnect brake booster hose (1) from vacuum pump.
- 4) Remove vacuum pump (2) from camshaft housing.



I5RS0B120001-01

Installation

- 1) Install new gasket to vacuum pump.
- 2) Install vacuum pump (1) to camshaft housing.
Fit the dogs of vacuum pump coupling into the slot of camshaft.



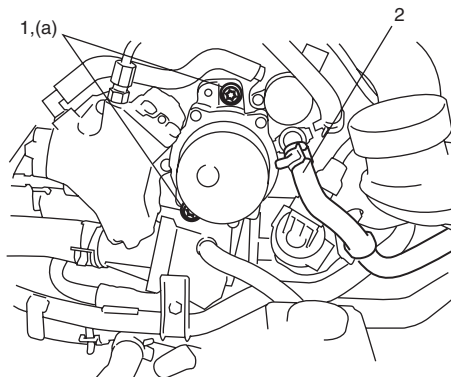
I5RS0B120002-01

- 3) Tighten vacuum pump bolts (1) as follows.
 - a) Tighten vacuum pump bolts to 5 N·m (0.5 kgf-m, 4.0 lb-ft)
 - b) Tighten vacuum pump bolts to 20 N·m (2.0 kgf-m, 14.5 lb-ft)

Tightening torque

Vacuum pump bolt (a): 5 N·m (0.5 kgf-m, 4.0 lb-ft) and then 20 N·m (2.0 kgf-m, 14.5 lb-ft)

- 4) Connect brake booster hose (2) to vacuum pump.

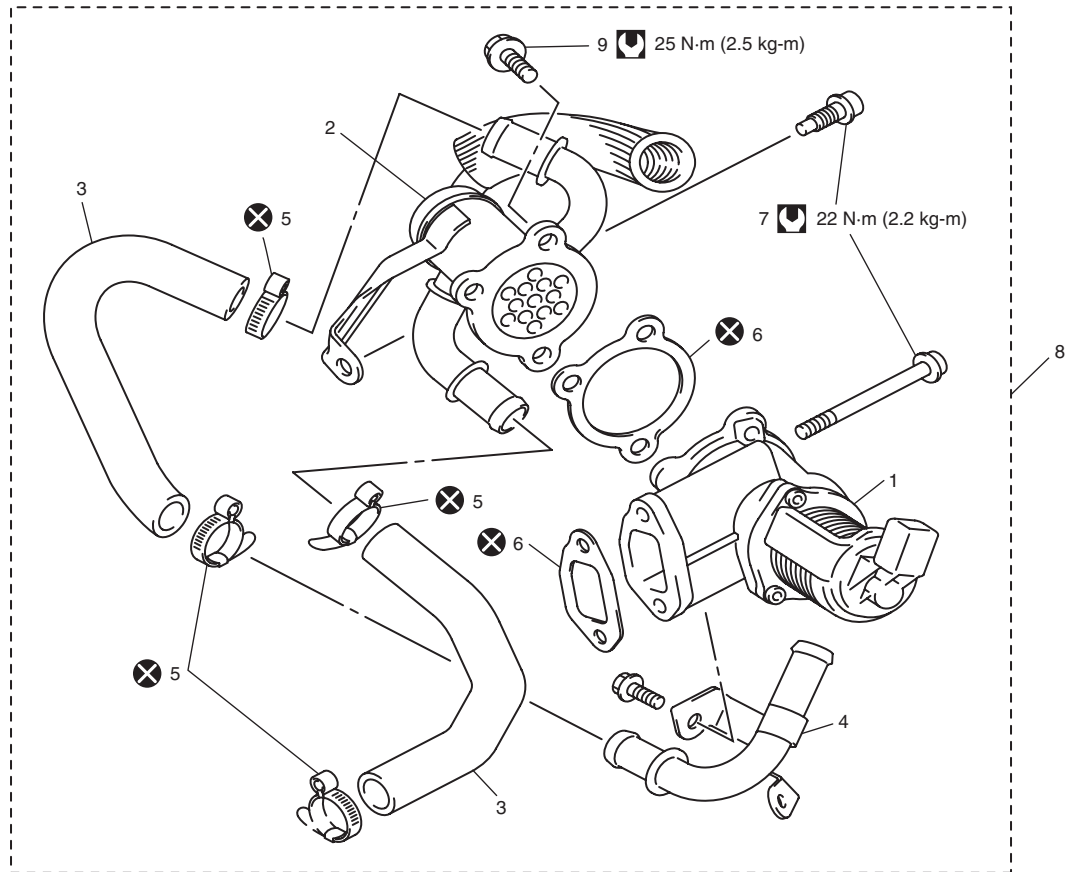


I5RS0B120003-01

- 5) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 6) Connect negative cable to battery.

EGR Valve Assembly Components

S5RS0B1206002



I3RB0A123006-01

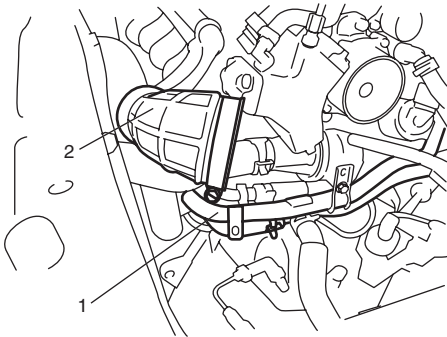
1. EGR valve	4. EGR cooler pipe	7. EGR valve assembly mounting bolt	: Tightening torque
2. EGR cooler	5. Clamp	8. EGR valve assembly	: Do not reuse.
3. EGR cooler hose	6. Gasket	9. EGR cooler bolt	

EGR Valve Assembly Removal and Installation

S5RS0B1206003

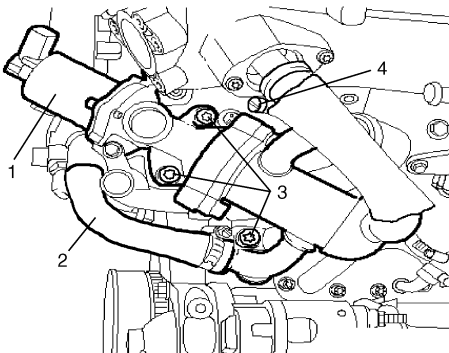
Removal

- 1) Remove battery and battery tray from vehicle.
- 2) Drain cooling system.
- 3) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 4) Remove ECM from cowl top panel referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
- 5) Remove cowl top panel referring to "Cowl Top Components: in Section 9K".
- 6) Disconnect inter cooler inlet hose from turbo charger.
- 7) Disconnect shift and select cables from selector lever assembly.
- 8) Remove air cleaner outlet hose (2) from turbo charger.
- 9) Remove heater outlet pipe (1).



I5RS0B120004-01

- 10) Disconnect connector and hoses from EGR valve.
- 11) Remove EGR valve assembly (1) from cylinder head by removing 3 bolts (3) and clamp (4).



I3RM0B122008-01

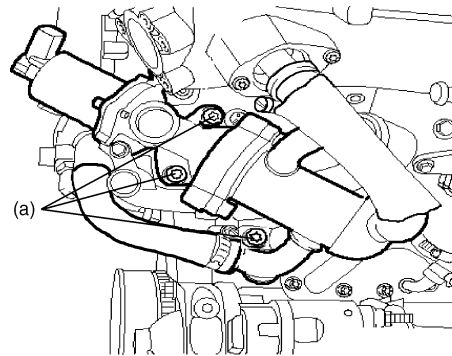
Installation

Reverse removal procedure noting the following.

- 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 kgf-m, 16.0 lb-ft)

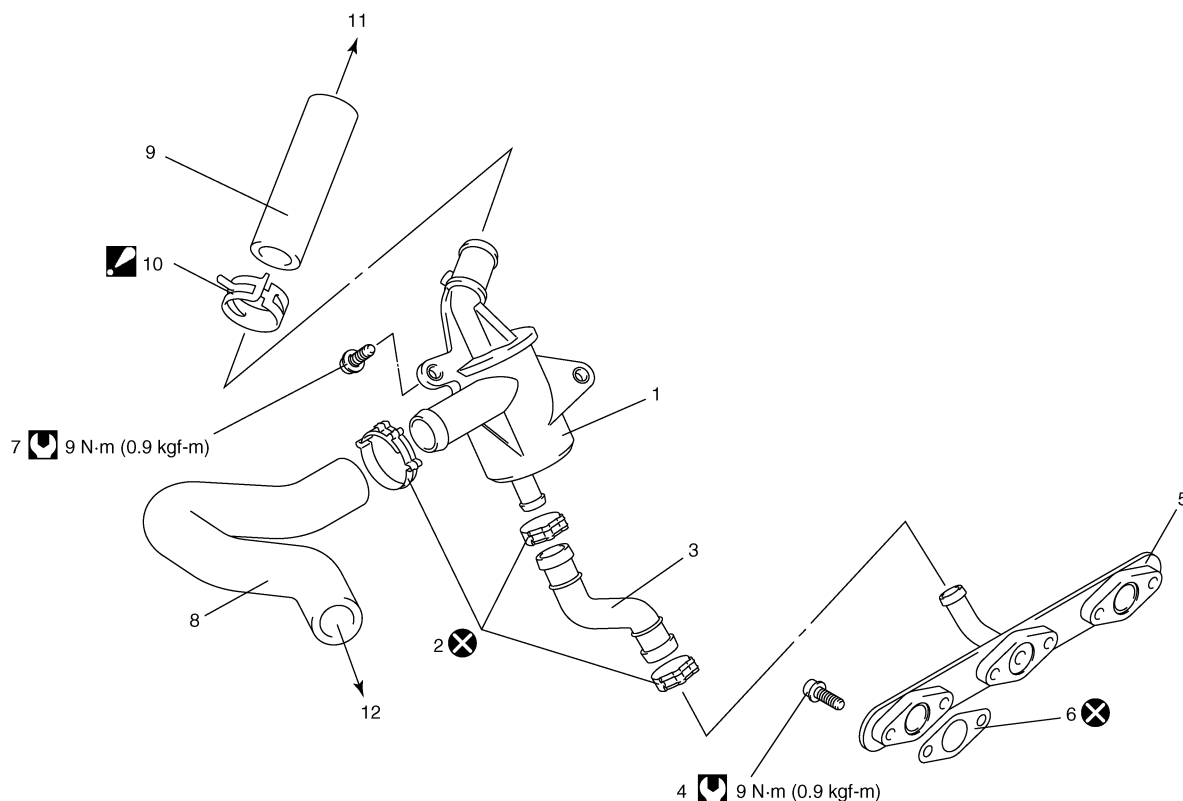


I3RM0B122009-01

- Use new hose clamps.
- Refill cooling system referring to "Cooling System Flush and Refill: in Section 1F".
- Check cooling system leakage referring to "Engine Cooling System Inspection and Cleaning: in Section 1F".

Crankcase Ventilation System Component

S5RS0B1206004



I5RS0B120005-01

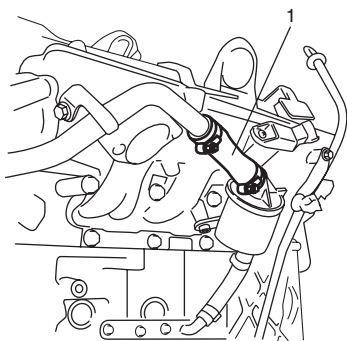
1. Oil separator	6. Gasket	11. To breather pipe
2. Clamp	7. Oil separator mounting bolt	12. To connector
3. Ventilation hose No.1	8. Ventilation hose No.2	: Tightening torque
4. Crankcase ventilation cover mounting bolt	9. Breather hose	: Do not reuse.
5. Crankcase ventilation cover	10. Breather hose clip: Be sure to position clip in specified direction as shown in the figure.	

Oil Separator and Crankcase Ventilation Cover Removal and Installation

S5RS0B1206005

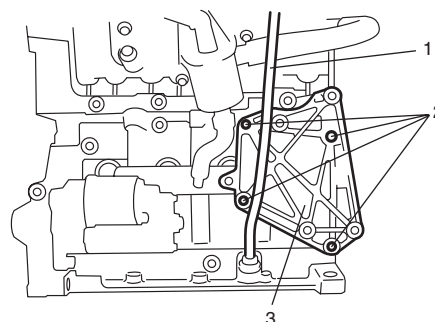
Removal

- 1) Disconnect negative cable at battery.
- 2) Remove ECM from cowl top panel referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
- 3) Remove cowl top panel referring to "Cowl Top Components: in Section 9K".
- 4) Disconnect breather hose (1) from oil separator.



I3RB0A123002-01

- 5) Remove generator assembly referring to "Generator Dismounting and Remounting: in Section 1J".
- 6) Remove generator bracket (3) from cylinder block by removing generator bracket mounting bolts (2).

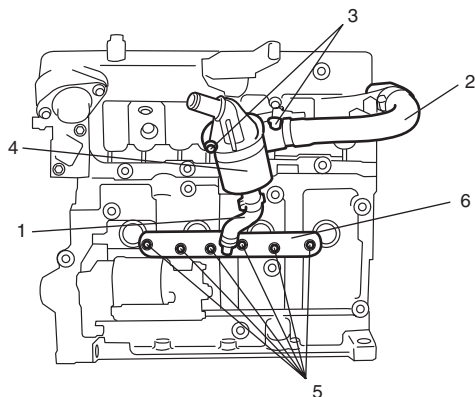


I3RB0A123003-01

1. Oil lever gauge

1B-5 Aux. Emission Control Devices:

- 7) Disconnect ventilation hose No.2 (2) from oil separator.
- 8) Loosen ventilation hose No.1 clamp at oil separator side.
- 9) Remove oil separator mounting bolts (3).
- 10) Remove oil separator (4) by disconnecting ventilation hose No.1 (1).
- 11) Remove crankcase ventilation cover (6) with ventilation hose No.1 by removing crankcase ventilation cover mounting bolts (5).



I3RB0A123004-01

Installation

Reverse removal procedure for installation noting the followings.

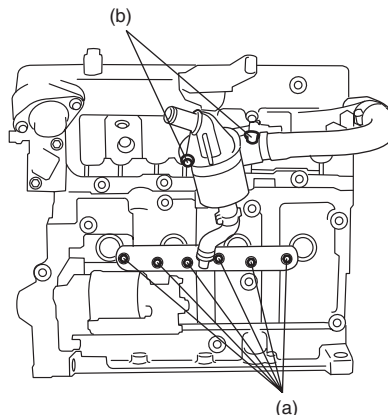
- Clean mating surfaces of crankcase ventilation cover and cylinder block.
- Use new crankcase ventilation cover gaskets and ventilation hose clamps.
- Tighten crankcase ventilation cover mounting bolts, oil separator mounting bolts and generator bracket mounting bolts to specified torque.

Tightening torque

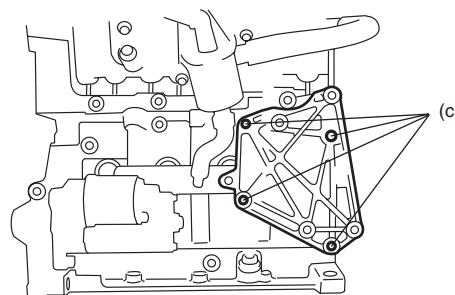
Crankcase ventilation cover mounting bolt (a): 9 N·m (0.9 kgf-m, 6.5 lb-ft)

Oil separator mounting bolt (b): 9 N·m (0.9 kgf-m, 6.5 lb-ft)

Generator bracket mounting bolt (c): 22 N·m (2.2 kgf-m, 16.0 lb-ft)



(a)



I3RB0A123005-01

- Install generator referring to "Generator Dismounting and Remounting: in Section 1J".

Specifications

Tightening Torque Specifications

S5RS0B1207001

Fastening part	Tightening torque			Note
	N-m	kgf-m	lb-ft	
Vacuum pump bolt (a)	5 N·m (0.5 kgf-m, 4.0 lb-ft) and then 20 N·m (2.0 kgf-m, 14.5 lb-ft)			☞
EGR valve assembly mounting bolt	22	2.2	16.0	☞
Crankcase ventilation cover mounting bolt	9	0.9	6.5	☞
Oil separator mounting bolt	9	0.9	6.5	☞
Generator bracket mounting bolt	22	2.2	16.0	☞

NOTE

The specified tightening torque is also described in the following.

"EGR Valve Assembly Components: "

"Crankcase Ventilation System Component: "

Reference:

For the tightening torque of fastener not specified in this section, refer to "Fasteners Information: in Section 0A".

Engine Electrical Devices

Repair Instructions

Idle Speed Inspection

S5RS0B1306001

- 1) Shift transaxle 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-07, Complaint: Engine Idling: in Section 1A".

Engine Control Module (ECM) Removal and Installation

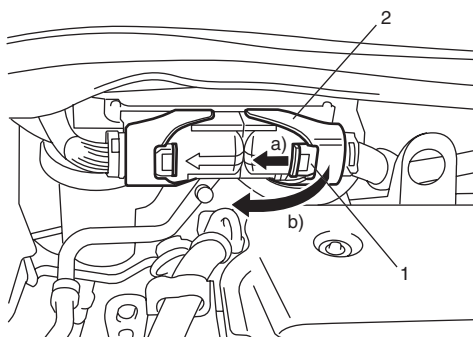
S5RS0B1306002

CAUTION

As ECM consists of precision parts, be careful not to expose it to excessive shock.

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connectors from ECM as follows.
 - a) Pull out lock slider (1) to release locking of lock lever
 - b) Pull up the lock lever (2)



I5RS0B130001-01

- 3) Remove ECM from cowl top panel by removing 4 bolts.

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: " and "Procedure after ECM Replacement: in Section 10C".

Reverse removal procedure for installation.

ECM Registration

S5RS0B1306003

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: ".

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: ".

Registration Data Check

S5RS0B1306004

- 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:" when it does not correspond.
- 5) Push "EXIT" button of SUZUKI scan tool.

Mass Air Flow (MAF) and Intake Air Temperature Sensor Removal and Installation

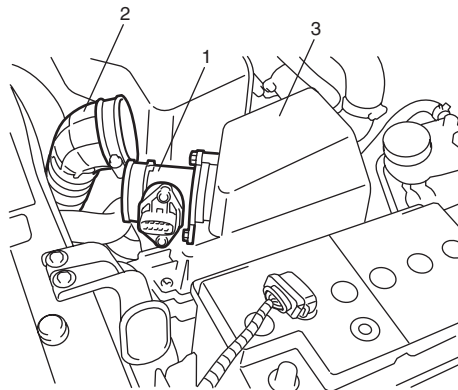
S5RS0B1306005

⚠ 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).

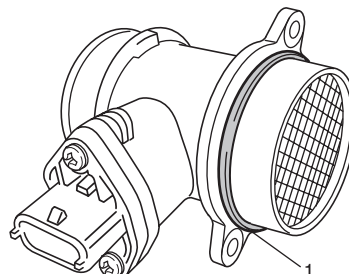


I5RS0B130002-01

Installation

Reverse removal procedure noting the following.

- Check MAF and IAT sensor O-ring (1) for deterioration and damage. If malfunction is found, replace O-ring.



I5RS0B130003-01

- Connect connector securely.

Glow Plug Removal and Installation

S5RS0B1306006

Removal

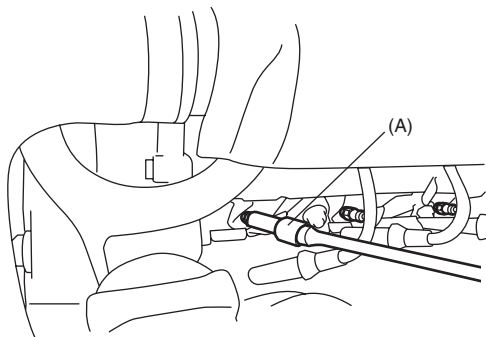
⚠ CAUTION

- 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.
- 3) Using special tool, remove glow plugs from cylinder head.

Special tool

(A): 09911–78610



I5RS0B130004-01

Installation

For installation, reverse removal procedure noting the following.

- Using special tool, tightening glow plug to specified torque.

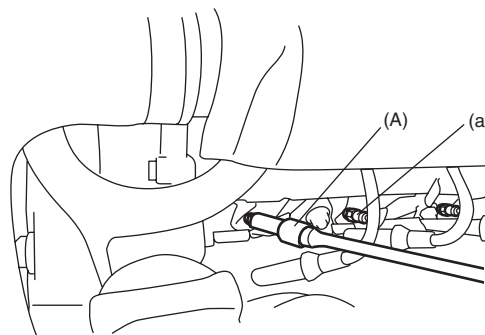
Special tool

(A): 09911–78610

Tightening torque

Glow plug (a): 10 N·m (1.0 kgf-m, 7.0 lb-ft)

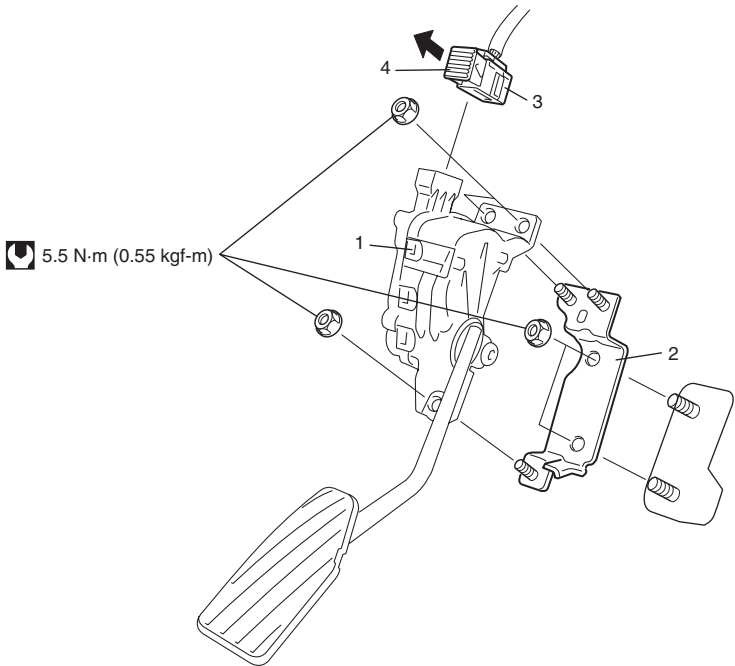
- Connect glow plug wires securely.



I5RS0B130005-02

Accelerator Pedal Position (APP) Sensor Components

S5RS0B1306007



I5RS0B130006-01

1. Accelerator pedal assembly	3. APP sensor connector	: Tightening torque
2. Accelerator pedal bracket	4. APP sensor connector lock lever	

Accelerator Pedal Position (APP) Sensor Removal and Installation

S5RS0B1306008

Removal

- 1) Disconnect battery negative cable at battery.
- 2) Disconnect connector from APP sensor by pull off the lock lever.
- 3) Remove accelerator pedal assembly from vehicle body.

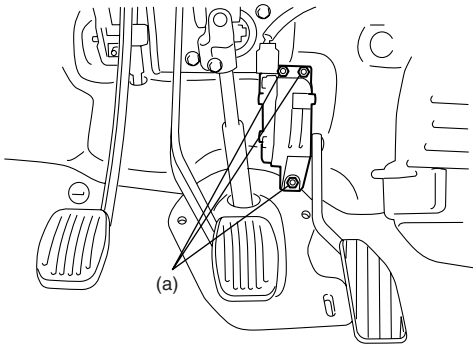
Installation

Reverse removal procedure for installation noting the followings.

- Connect APP sensor connector securely.
- Tighten accelerator pedal assembly mounting nuts to specified torque.

Tightening torque

Accelerator pedal mounting nut (a): 5.5 N·m (0.55 kgf-m, 4.0 lb-ft)



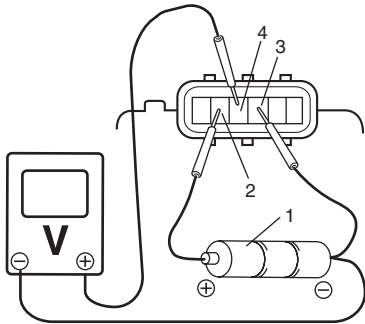
I3RM0B132007-01

Accelerator Pedal Position (APP) Sensor Inspection

S5RS0B1306018

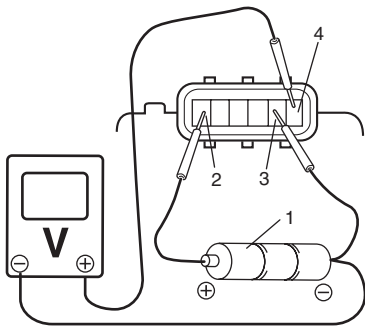
Check accelerator pedal position (APP) sensor (main and sub) output voltage as following steps.

- 1) For accelerator pedal position (APP) sensor (main), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.7 – 5.0 V) and connect its positive terminal to “Vin 1” terminal (2) and negative terminal to “Ground 1” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 1” terminal (4) of sensor and negative terminal to battery.



I5RS0B130007-01

- 2) For accelerator pedal position (APP) sensor (sub), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.7 – 5.0 V) and connect its positive terminal to “Vin 2” terminal (2) and negative terminal to “Ground 2” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 2” terminal (4) of sensor and negative terminal to battery.



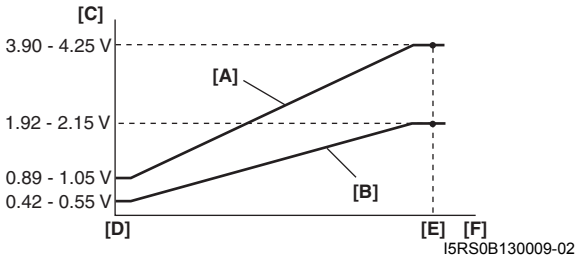
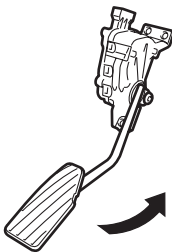
I5RS0B130008-01

- 3) Measure output voltage variation while accelerator pedal is no depressed and fully depressed as following specification.

If sensor voltage is out of specified value or does not vary linearly as the following graph, replace accelerator pedal position (APP) sensor assembly.

Accelerator pedal position (APP) sensor output voltage

Accelerator pedal position (APP) sensor (main) output voltage [A]: 0.89 – 4.25 V, varying according to depressed extent of accelerator pedal
Accelerator pedal position (APP) sensor (sub) output voltage [B]: 0.42 – 2.15 V, varying according to depressed extent of accelerator pedal



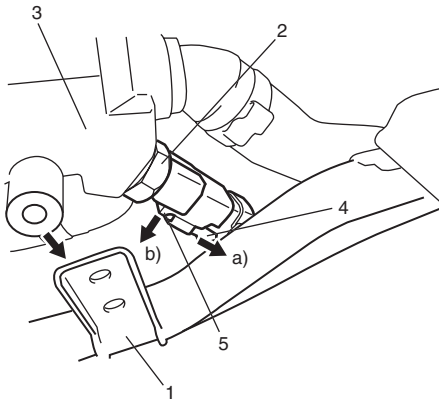
[C]:	Sensor output voltage
[D]:	Idle position of accelerator pedal
[E]:	Fully depressed position of accelerator pedal
[F]:	Pedal stroke

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S5RS0B1306009

Removal

- 1) Remove battery from vehicle.
- 2) Drain cooling system.
- 3) Remove air cleaner assembly from vehicle referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 4) Move heater outlet pipe (1) in arrow direction as shown in figure after removing its fixing bolt.
- 5) Disconnect connector from ECT sensor as follows.
 - a) Move connector lock pin (4) in arrow direction as shown in figure.
 - b) Raise connector lock lever (5) and remove ECT sensor connector.
- 6) Remove ECT sensor (2) from thermostat housing (3).



I5RS0B130010-01

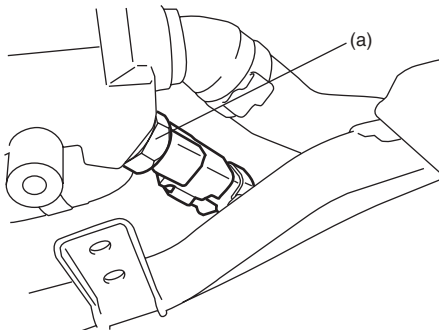
Installation

Reverse removal procedure noting the following.

- Tighten ECT sensor to specified torque.

Tightening torque

ECT sensor (a): 34 N·m (3.4 kgf-m, 24.5 lb-ft)



I5RS0B130011-01

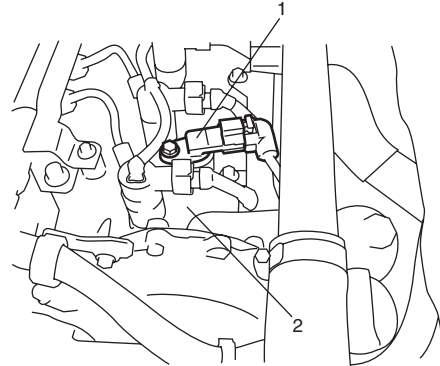
- Refill cooling system referring to "Cooling System Flush and Refill: in Section 1F".
- Check cooling system leakage referring to "Engine Cooling System Inspection and Cleaning: in Section 1F".

Camshaft Position (CMP) Sensor Removal and Installation

S5RS0B1306011

Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect CMP sensor connector.
- 3) Remove CMP sensor (1) from camshaft housing (2).



I5RS0B130012-01

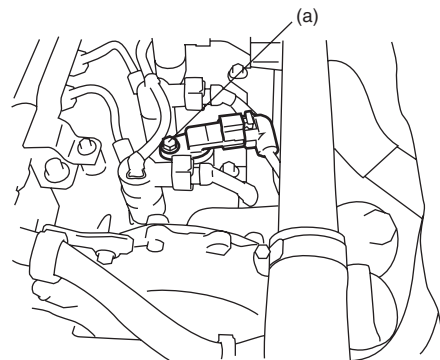
Installation

Reverse removal procedure noting the following.

- Tighten CMP sensor bolt to specified torque.

Tightening torque

CMP sensor bolt (a): 7 N·m (0.7 kgf-m, 5.0 lb-ft)



I5RS0B130013-01

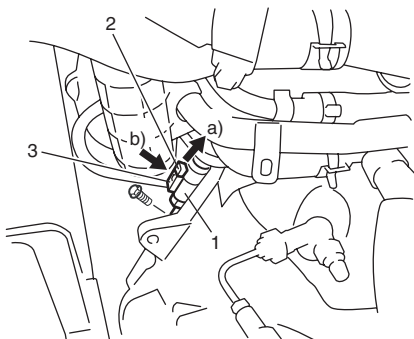
- Connect CMP sensor connector securely.

Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation

S5RS0B1306012

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner assembly from vehicle referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 3) Disconnect connector from CKP sensor as follows.
 - a) Move connector lock pin (2) in arrow direction as shown in figure.
 - b) Push connector lock lever (3) and remove CKP sensor connector.
- 4) Remove CKP sensor (1) from cylinder block.



I5RS0B130014-02

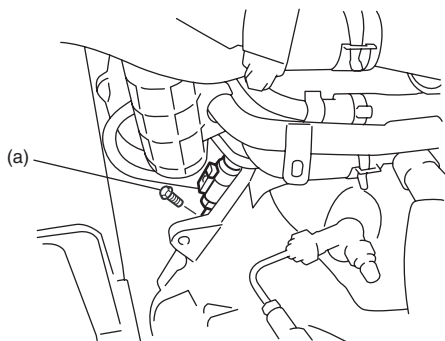
Installation

Reverse removal procedure for installation noting the following.

- Clean CKP sensor and sensor rotor teeth before installation.
- Tighten CKP sensor bolt to specified torque.

Tightening torque

CKP sensor bolt (a): 9 N·m (0.9 kgf-m, 6.5 lb-ft)



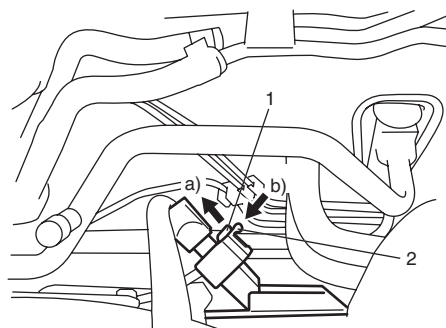
I5RS0B130015-01

Boost Pressure Sensor Removal and Installation

S5RS0B1306014

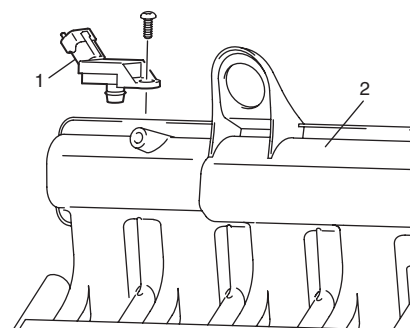
Removal

- 1) Disconnect negative cable at battery.
- 2) Disconnect connector from boost pressure sensor as follows.
 - a) Move connector lock pin (1) in arrow direction as shown in figure.
 - b) Push connector lock lever (2) and remove boost pressure sensor connector.



I5RS0B130016-01

- 3) Remove boost pressure sensor (1) from intake manifold (2).



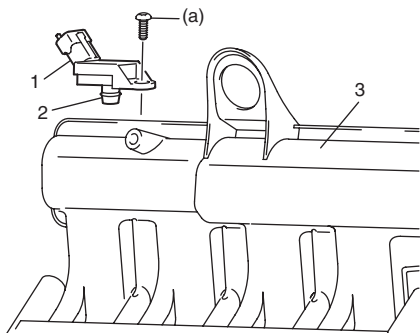
I3RM0B132016-01

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 kgf·m, 6.5 lb·ft)



I3RM0B132017-01

- 3) Connect connector to boost pressure sensor securely.
- 4) Connect negative cable at battery.

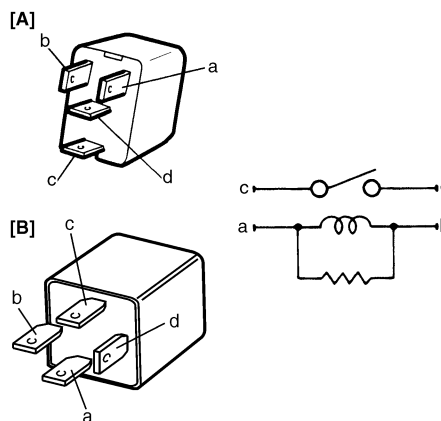
Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heating Relay Inspection

S5RS0B1306016

NOTE

Check for installation position of each relay referring to "Connector Layout Diagram: in Section 9A".

- 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.



I5RS0B130017-01

[A]: Fuel pump relay, Starting motor control relay

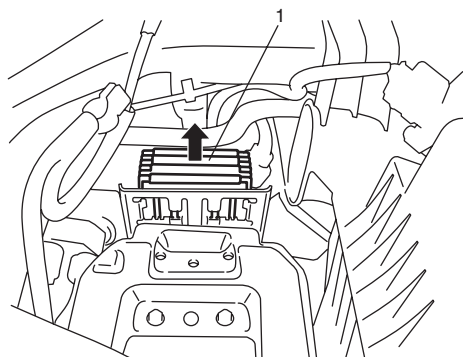
[B]: Main relay, Fuel heating relay

Glow Controller Removal and Installation

S5RS0B1306017

Removal

- 1) Remove battery from vehicle.
- 2) Remove glow controller (1) from bracket.



I5RS0B130018-01

- 3) Disconnect connector from glow controller.

Installation

Reverse removal procedure for installation.

Specifications

Tightening Torque Specifications

S5RS0B1307001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Glow plug	10	1.0	7.0	🔧
Accelerator pedal mounting nut	5.5	0.55	4.0	🔧
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	🔧

NOTE

The specified tightening torque is also described in the following.

“Accelerator Pedal Position (APP) Sensor Components: ”

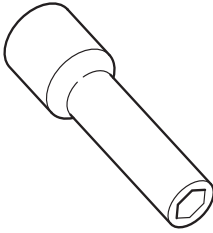
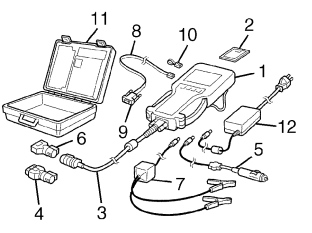
Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S5RS0B1308001

09911-78610 Glow plug wrench 🔧 / 🔧 	SUZUKI scan tool — This kit includes 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 loop back connector, 11. Storage case, 12. Power supply 🔧 
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Engine Mechanical

Diagnostic Information and Procedures

Compression Check

S5RS0B1404001

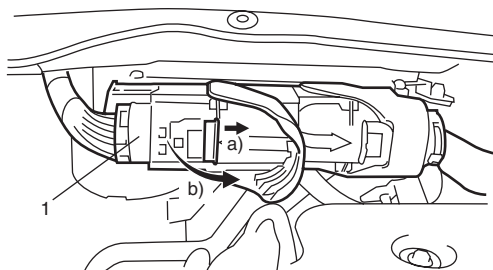
Check compression pressure on all 4 cylinders as follows:

- 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 1C".
- 5) Remove all glow plugs referring to "Glow Plug Removal and Installation: in Section 1C".
- 6) Disconnect connectors from ECM (1) as follows.
 - a) Pull out lock slider to release locking of lock lever.
 - b) Pull up the lock lever.



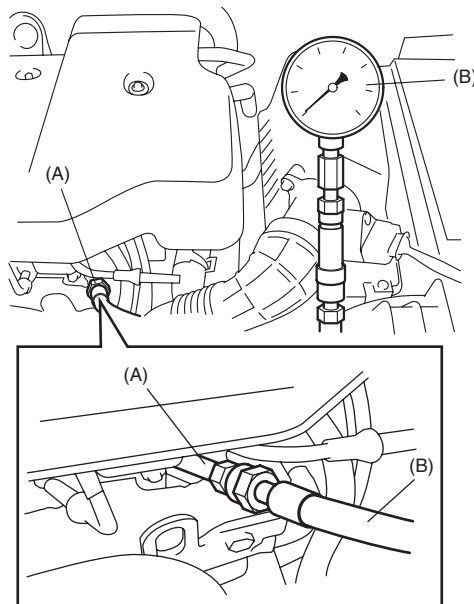
I5RS0B140001-01

- 7) Install special tools into glow plug hole.

Special tool

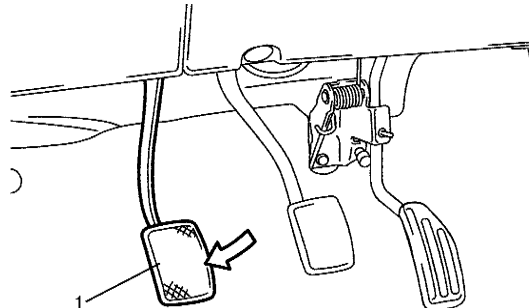
(A): 09915–68610

(B): 09912–57821



I5RS0B140002-01

- 8) Connect negative (–) cable at battery.
- 9) Disengage clutch (1) in order to lighten starting load on engine.



I3RB0A143003-01

- 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 obtain 4 readings.

NOTE

- For measuring compression pressure, crank engine at least 200 r/min. 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

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

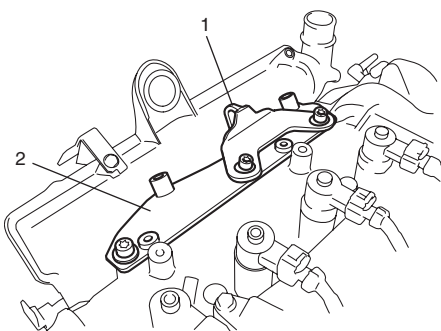
- 12) Disconnect negative (–) cable at battery.
- 13) After checking, install glow plugs referring to “Glow Plug Removal and Installation: in Section 1C”.
- 14) Connect ECM connector.
- 15) Connect glow controller connector referring to “Glow Controller Removal and Installation: in Section 1C”.
- 16) Connect negative (–) cable at battery.

Timing Check

S5RS0B1404002

Check timing between camshafts and crankshaft as follows.

- 1) Disconnect negative (–) cable at battery.
- 2) Remove right side engine under cover.
- 3) Remove common rail referring to “Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G”.
- 4) Remove engine hook (1) and common rail bracket (2) from camshaft housing.

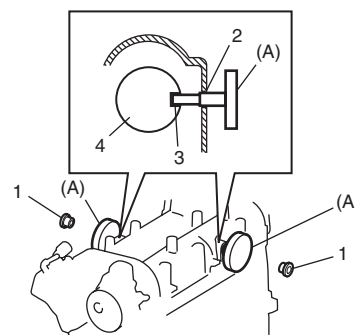


I3RB0A143007-01

- 5) Disconnect wiring harness connector of injectors, CMP sensor and glow plugs.
- 6) Remove camshaft housing plugs (1).
- 7) Align camshaft housing plug hole (2) with camshaft gap (3) turning crankshaft pulley clockwise as shown in the figure.
- 8) Lock camshafts (4) inserting special tools (A) to plug holes.

Special tool

(A): 09917–68610



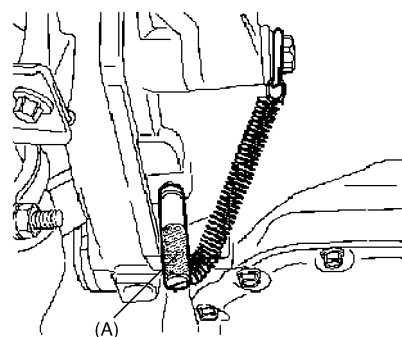
I3RB0A143010-01

- 9) Insert special tool to hole of transaxle case (1) with lightly swing crankshaft pulley by hand. And, confirm whether special tool is inserted in proper position as shown in the figure.

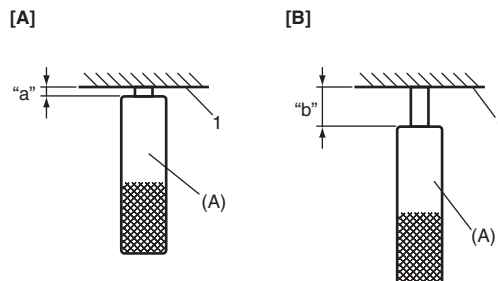
Special tool

(A): 09912–46310

If not adjust timing by reinstalling timing chain referring to “Timing Chain Cover and Timing Chain Removal and Installation: ”.



I5RS0B140003-01



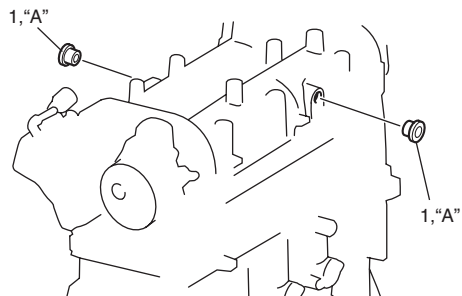
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[A]: Proper position	“a”: 2 mm (0.079 in.)
[B]: Improper position	“b”: 10 mm (0.394 in.)

1D-3 Engine Mechanical:

- 10) After checking, remove all special tools inserted in Step 8) and 9).
- 11) Apply thread lock compound to thread part of camshaft housing plugs (1), and install them.

“A”: Loctite omnifit 100M spezial® (Loctite omnifit 100M spezial®)

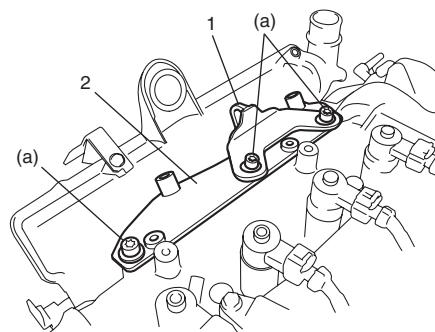


I3RB0A143031-01

- 12) Connect wiring harness connector of injectors, CMP sensor and glow plugs.
- 13) 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 kgf-m, 18.0 lb-ft)



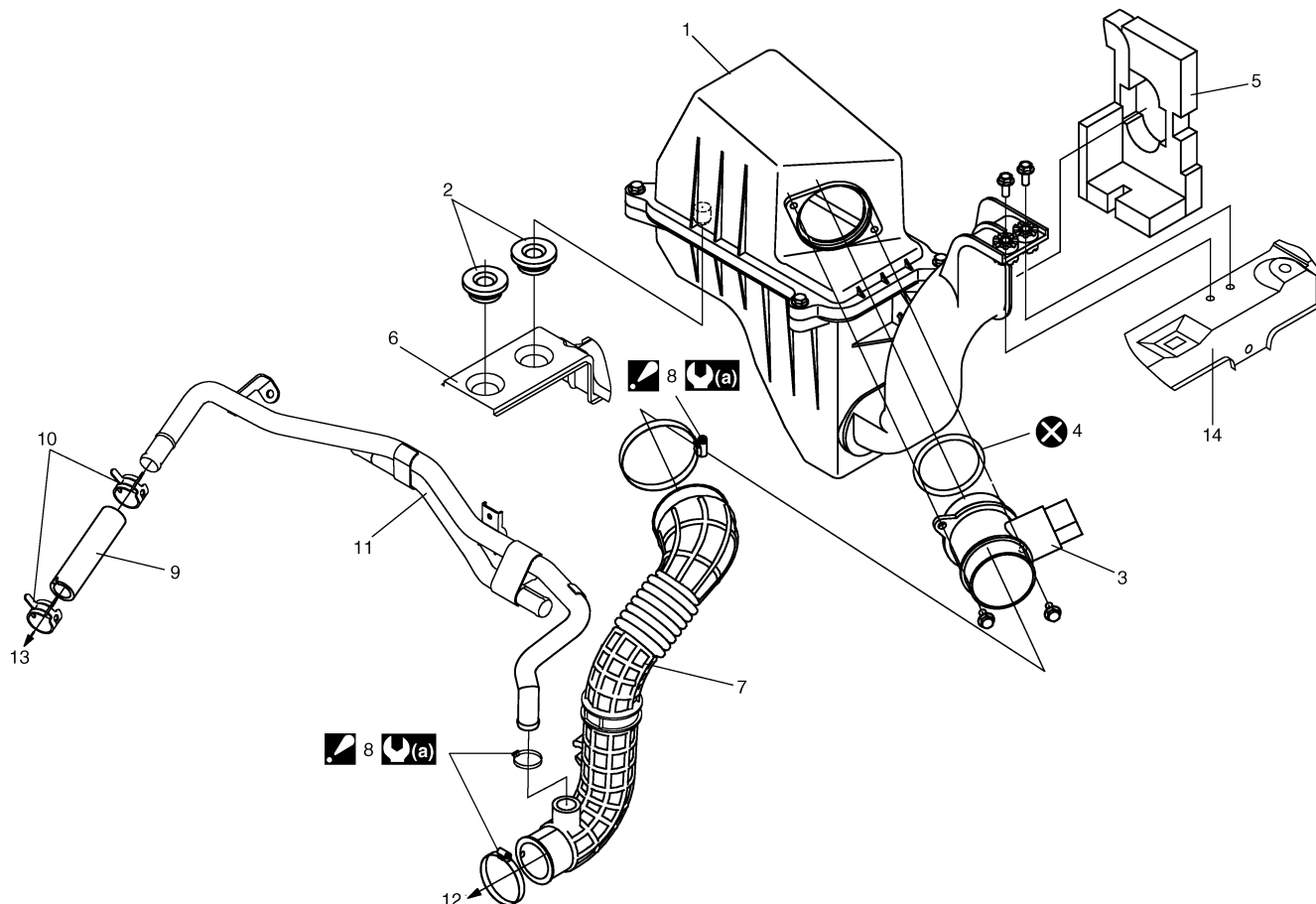
I3RB0A143034-01

- 14) Install common rail referring to “Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G”.
- 15) Install right side engine under cover.
- 16) Connect negative (–) cable at battery.

Repair Instructions

Air Cleaner Components

S5RS0B1406001



I5RS0B140005-01

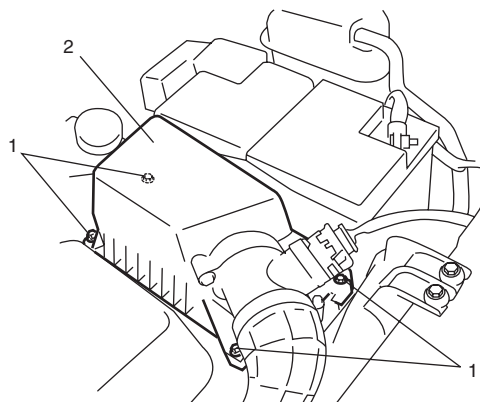
1. Air cleaner assembly	7. Air cleaner outlet hose	13. To engine
2. Air cleaner grommet	8. Hose clamp Be sure to position clamp screw in specified place as shown in the figure.	14. Upper member
3. MAF sensor assembly	9. Breather hose	⌚(a) : 4 N·m (0.4 kg-m, 3.0 lb-ft)
4. MAF sensor O-ring	10. Breather hose clip Be sure to position clip in specified direction as shown in the figure.	⊗ : Do not reuse.
5. Air cleaner suction protector	11. Breather pipe	
6. Battery tray	12. To turbocharger	

Air Cleaner Filter Removal and Installation

S5RS0B1406002

Removal

- 1) Loosen air cleaner assembly bolts.
- 2) Open air cleaner assembly (1).



I5RS0B140006-01

- 3) Remove air cleaner filter from air cleaner assembly.

Installation

Reverse removal procedure for installation.

Air Cleaner Filter Inspection and Cleaning

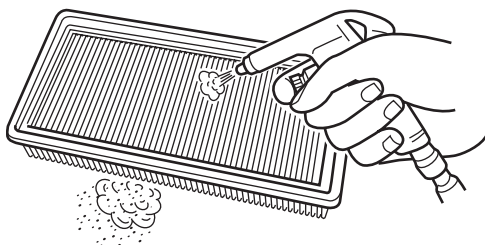
S5RS0B1406003

Inspection

Check air cleaner filter for dirt. Replace excessive dirty filter.

Cleaning

Blow off dust by compressed air from air outlet side of filter.



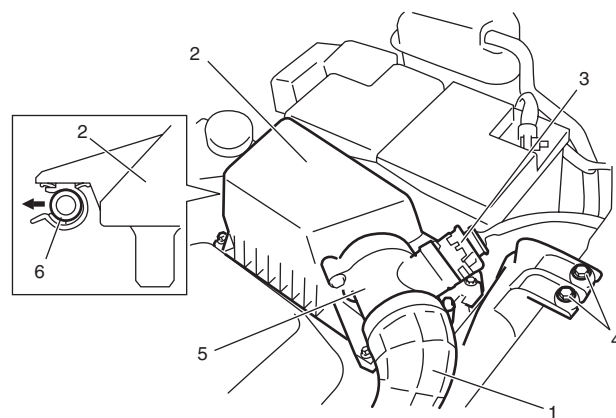
I5RS0B140007-01

Air Cleaner Assembly Removal and Installation

S5RS0B1406004

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Disconnect air cleaner outlet hose (1) from air cleaner assembly (2).
- 3) Disconnect MAF sensor connector (3) from MAF sensor assembly (5).
- 4) Remove air cleaner mounting bolts (4) from air cleaner assembly (2).
- 5) Disconnect water engine outlet hose (6), and remove air cleaner assembly (2).



I5RS0B140008-01

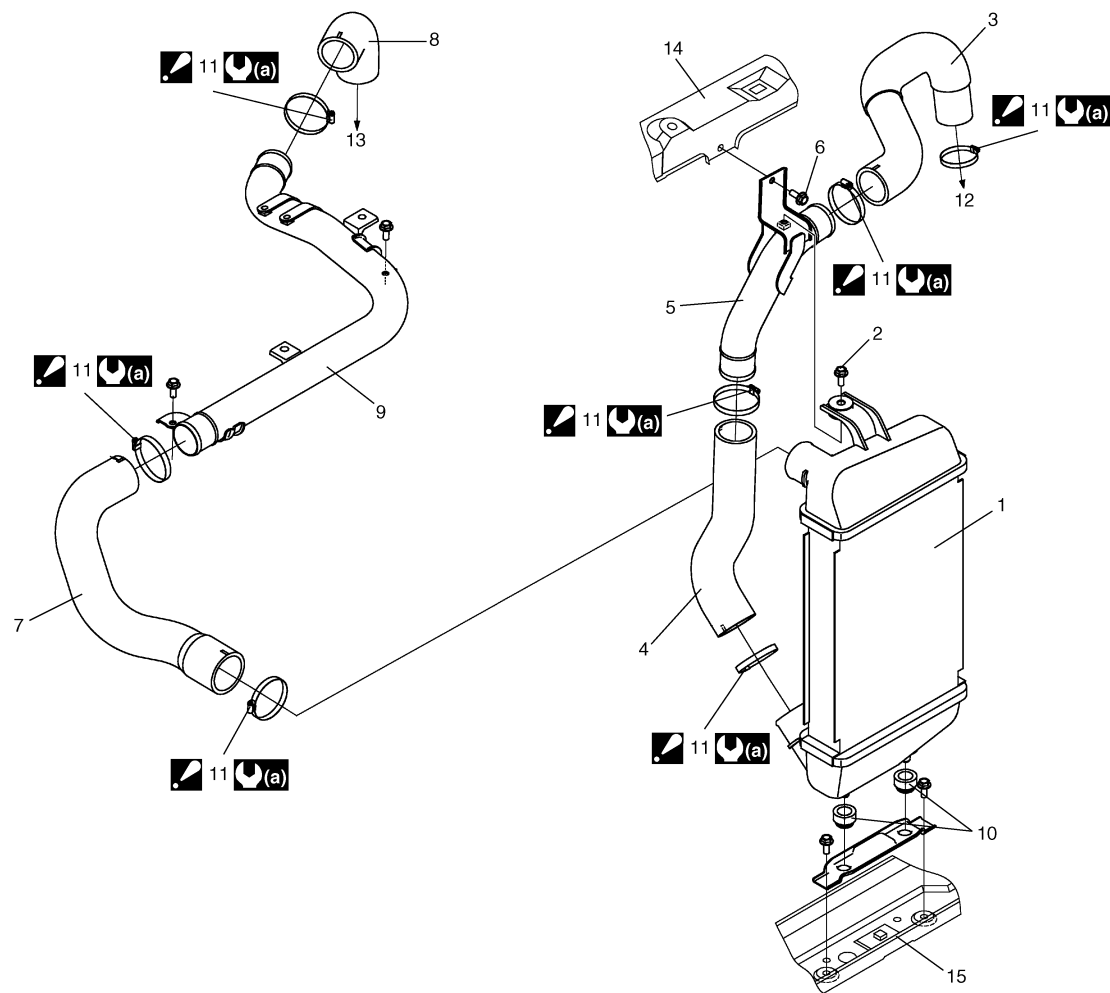
Installation

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: ”.

Intercooler Components

S5RS0B1406005



I5RS0B140009-01

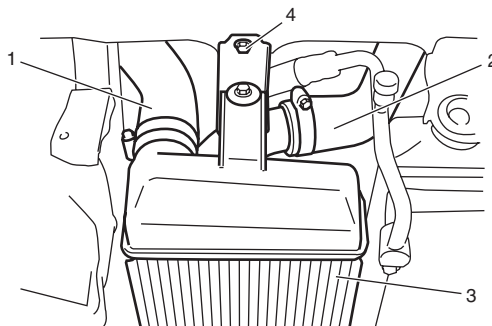
1. Intercooler	7. Intercooler outlet No.1 hose	13. To air intake joint
2. Intercooler bolt	8. Intercooler outlet No.2 hose	14. Upper member
3. Intercooler inlet No. 1 hose	9. Intercooler outlet pipe	15. Lower member
4. Intercooler inlet No. 2 hose	10. Intercooler mounting	11 (a) : 4 N·m (0.4 kg·m, 3.0 lb·ft)
5. Intercooler inlet pipe	11. Hose clamp Be sure to position clamp screw in specified place as shown in the figure	⊗ : Do not reuse.
6. Intercooler inlet pipe bolt	12. To turbocharger	

Intercooler Removal and Installation

S5RS0B1406006

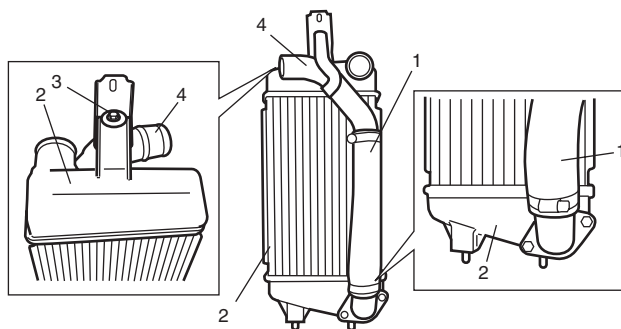
Removal

- 1) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
- 2) Disconnect intercooler outlet No.1 hose (1) and inlet No.1 hose (2) from intercooler assembly (3).
- 3) Remove intercooler inlet pipe bolt (4) and intercooler assembly from vehicle.



I5RS0B140010-01

- 4) Remove intercooler inert No. 2 hose (1) from intercooler (2), if necessary.
- 5) Remove intercooler bolt (3) and intercooler inert pipe (4) from intercooler (2), if necessary.



I5RS0B140011-01

Installation

Reverse removal procedure for installation noting the following.

- Tighten hose clamps (1) to specified torque referring to “Intercooler Components: ”.

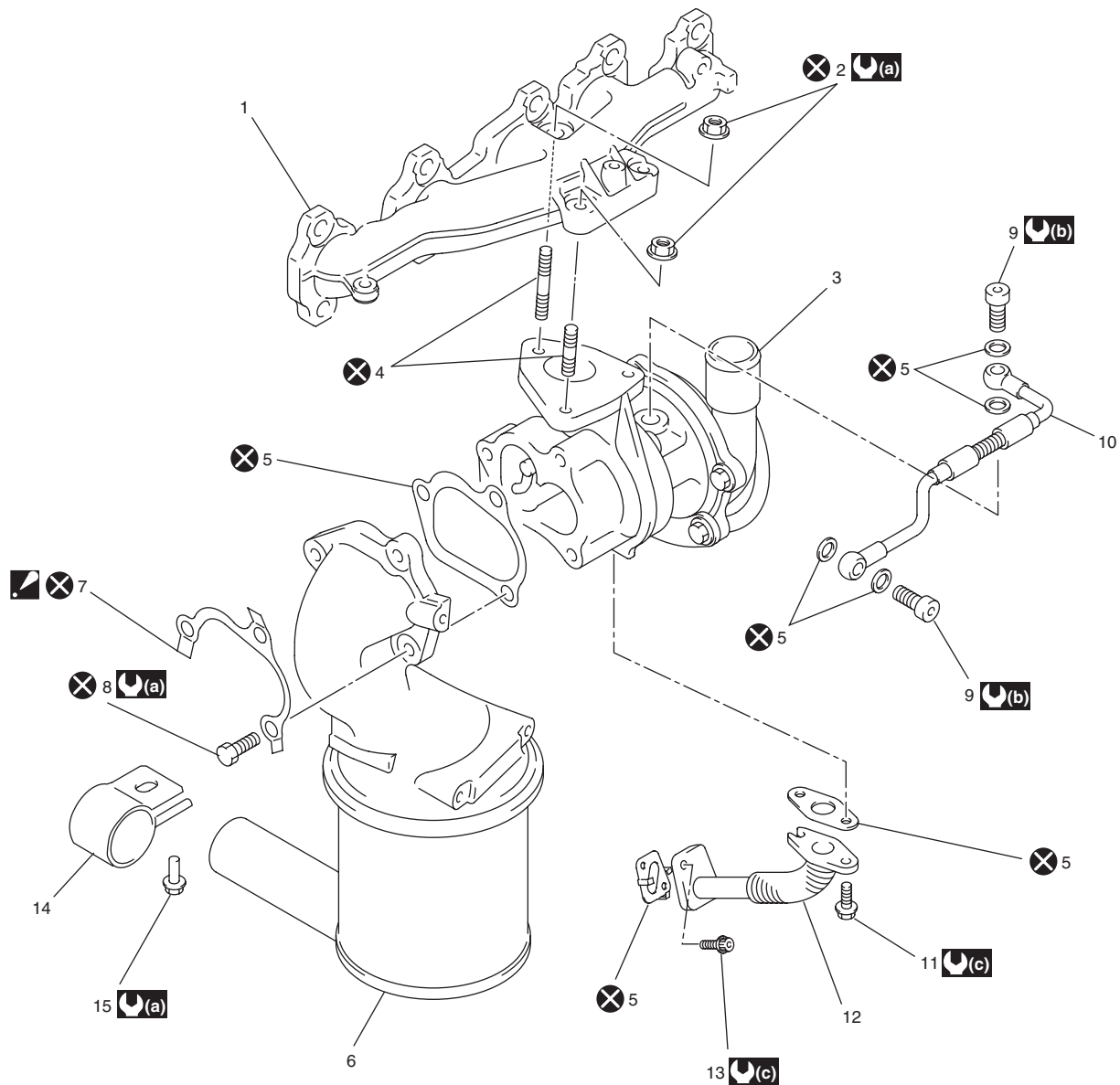
Tightening torque

Intercooler hose clamp (a): 4 N·m (0.4 kgf-m, 3.0 lb-ft)

- Install front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.

Turbocharger Components

S5RS0B1406007



I5RS0B140012-03

1. Exhaust manifold	8. Catalytic converter bolt	15. Catalytic converter mounting bolt
2. Turbocharger nut	9. Union bolt	⚙️(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
3. Turbocharger	10. Turbocharger lubrication pipe	⚙️(b) : 12 N·m (1.2 kg-m, 9.0 lb-ft)
4. Stud bolt	11. Oil return pipe bolt	⚙️(c) : 9 N·m (0.9 kg-m, 6.5 lb-ft)
5. Gasket	12. Oil return pipe	⊗ : Do not reuse.
6. Catalytic converter	13. Oil return pipe bolt	
7. Lock plate :Bend lock part of lock plate to prevent catalytic converter bolt from loosening.	14. Catalytic converter mount	

Turbocharger Removal and Installation

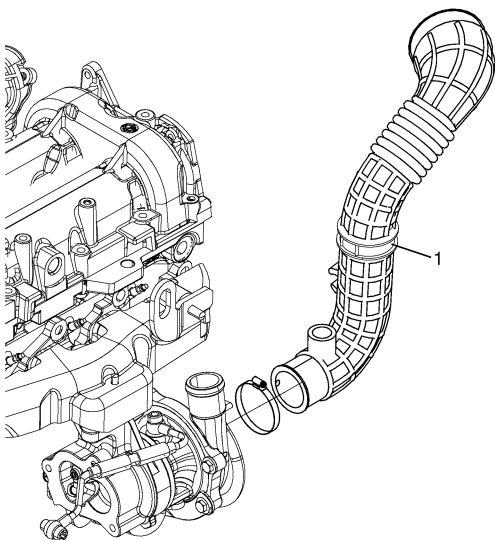
S5RS0B1406008

Removal

▲ WARNING

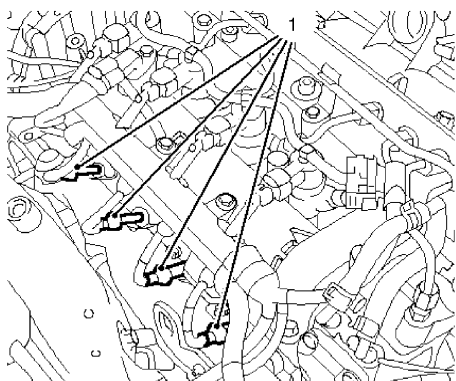
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

- 1) Disconnect negative (–) cable at battery.
- 2) Remove engine cover from engine assembly.
- 3) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation: ”.
- 4) Remove intercooler referring to “Intercooler Removal and Installation: ”.
- 5) Remove air cleaner outlet hose (1) from turbocharger.



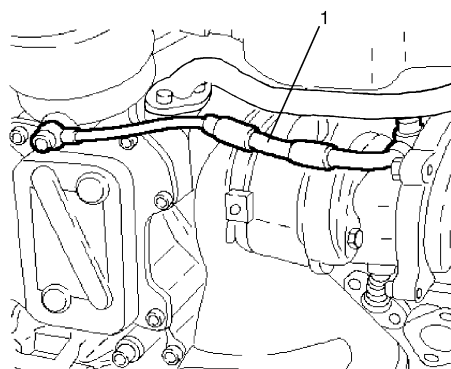
I5RS0B140013-01

- 6) Remove exhaust manifold side engine hanger referring to “Exhaust Manifold Components: in Section 1K”.
- 7) Disconnect glow plug connectors (1).



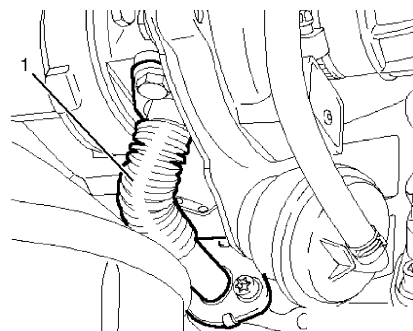
I3RM0B142012-01

- 8) Remove lubrication pipe (1).



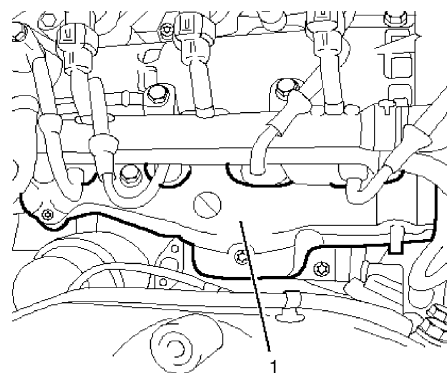
I3RM0B142013-01

- 9) Disconnect oil return pipe (1) from cylinder block.



I3RM0B142014-01

- 10) Remove exhaust manifold cover (1) from exhaust manifold.

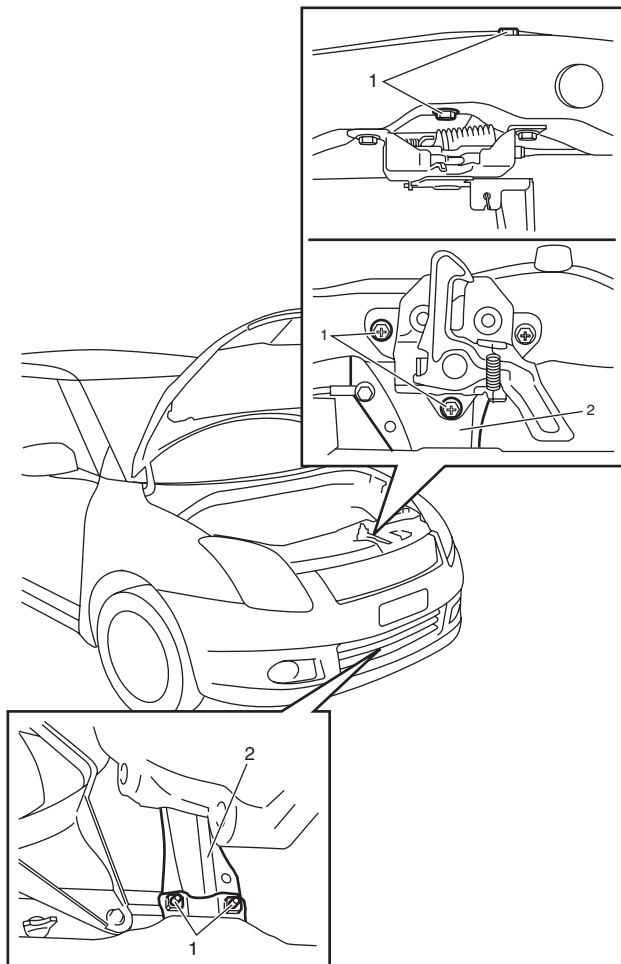


I3RM0B142015-01

1D-9 Engine Mechanical:

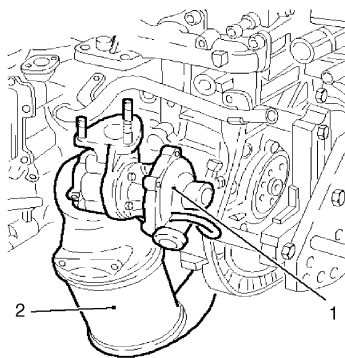
11) Remove exhaust pipe No.1 referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".

12) Remove bolts (1) and hood lock brace (2).



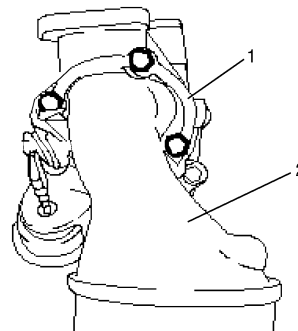
I5RS0B140014-01

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



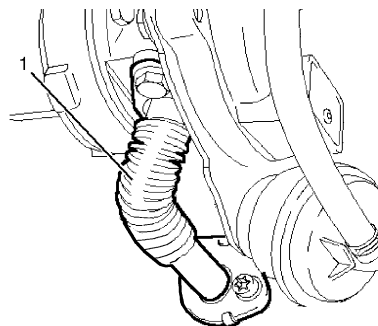
I5RS0B140015-01

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



I3RM0B142017-01

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



I3RM0B142036-01

Installation

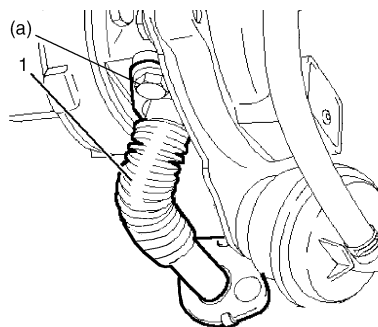
NOTE

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 kgf-m, 6.5 lb-ft)

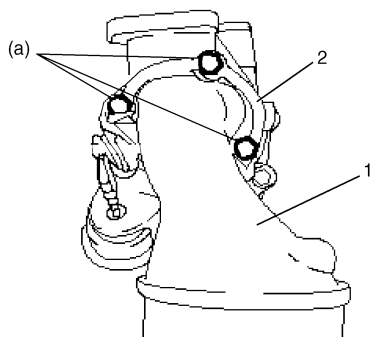


I3RM0B142018-01

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

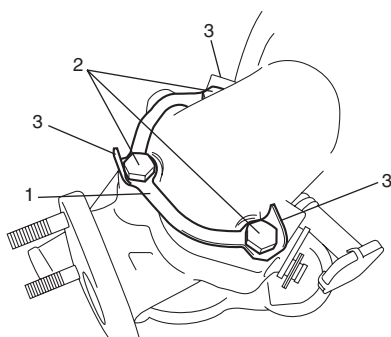
Tightening torque

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



I3RM0B142019-01

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



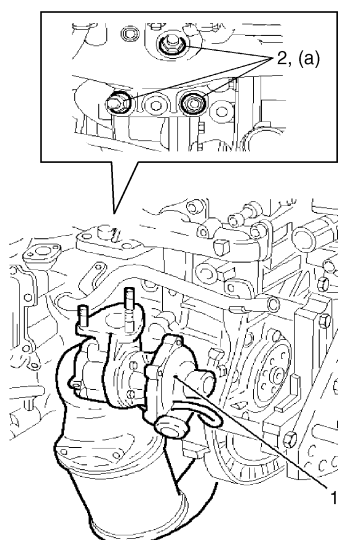
I3RM0B142020-01

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

Tightening torque

Turbocharger nut (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

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



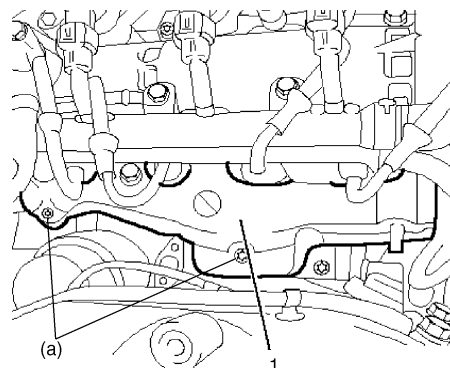
I5RS0B140016-01

- 5) Install hood lock brace and adjust hood latch referring to "Hood Inspection and Adjustment: in Section 9J".

- 6) Install exhaust manifold cover (1).

Tightening torque

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



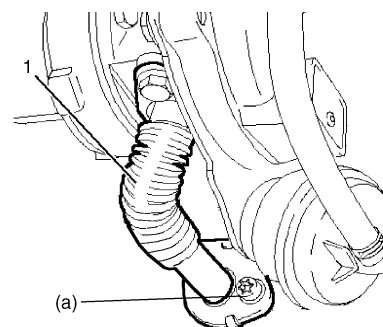
I3RM0B142022-01

- 7) Install exhaust pipe No.1 referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".

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

Tightening torque

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



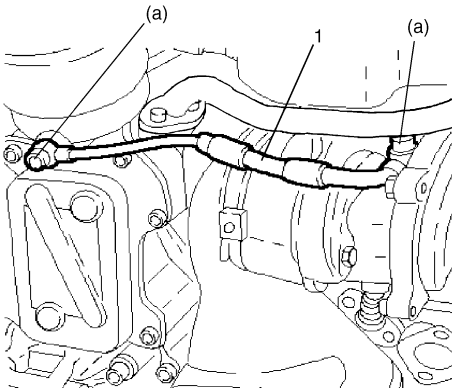
I3RM0B142023-01

1D-11 Engine Mechanical:

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

Tightening torque

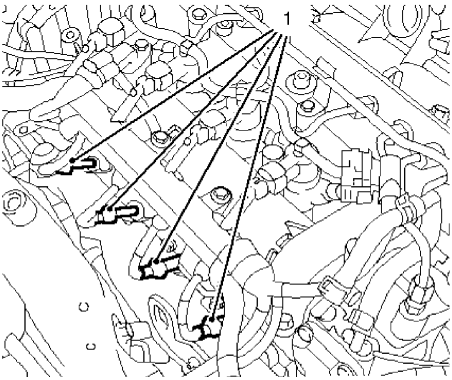
Lubrication pipe union bolt (a): 12 N·m (1.2 kgf-m, 9.0 lb-ft)



I3RM0B142024-01

- 10) Install exhaust manifold side engine hanger of referring to "Exhaust Manifold Components: in Section 1K".

- 11) Connect glow plug connectors (1).

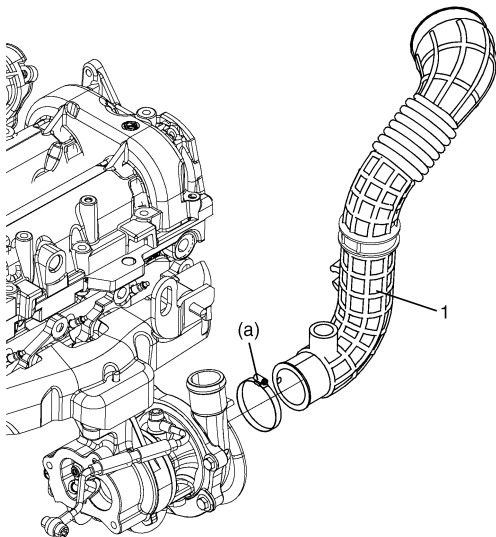


I3RM0B142012-01

- 12) 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 N·m (0.3 kgf-m, 2.5 lb-ft)



I5RS0B140017-01

- 13) Install intercooler referring to "Intercooler Removal and Installation: ".

- 14) Install air cleaner assembly with MAF sensor assembly, referring to "Air Cleaner Assembly Removal and Installation: ".

- 15) Install engine cover to engine assembly.

Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

- 16) Connect negative (-) cable at battery.

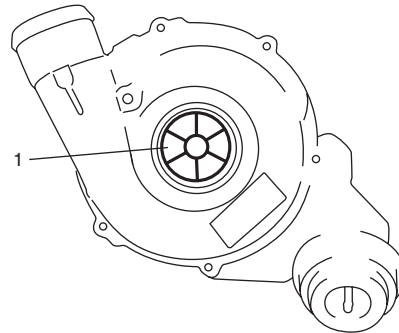
- 17) Check to make sure that there is no oil leakage and exhaust gas leakage at each connection.

Turbocharger Inspection

S5RS0B1406009

Rotate turbine shaft (1) by hand and verify that it turns smoothly without any abnormal noise and excessive runout.

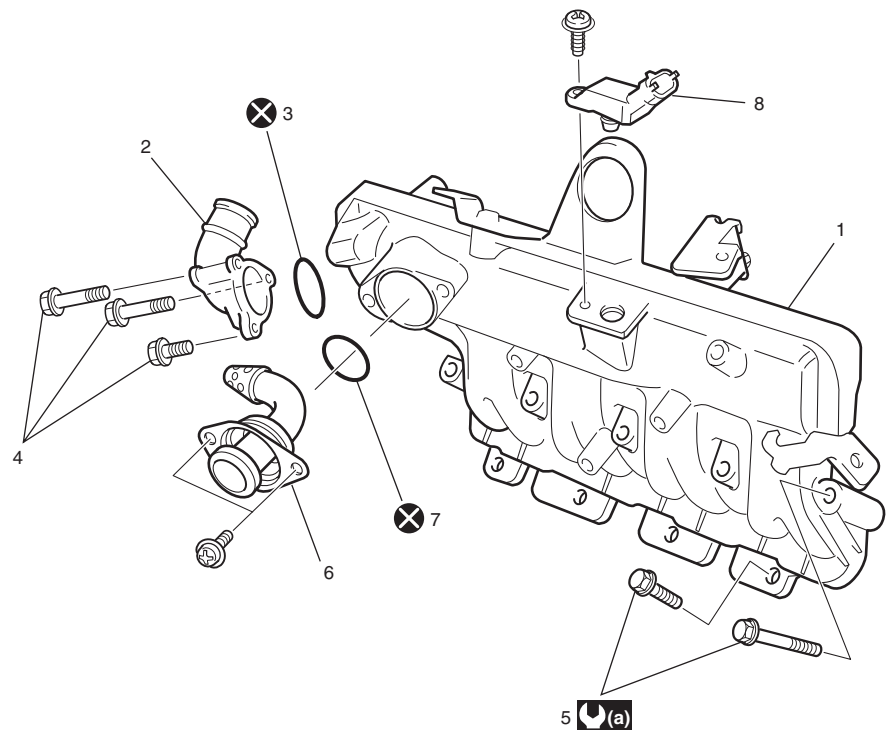
If a malfunction is found, replace the turbocharger.



I3RM0B142026-01

Intake Manifold Components

S5RS0B1406010



I5RS0B140018-01

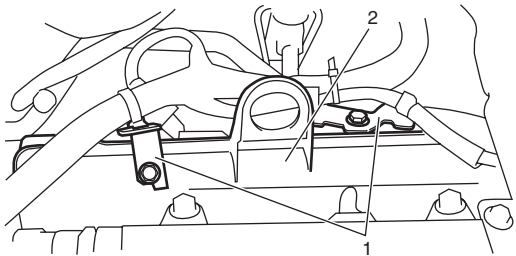
1. Intake manifold	5. Intake manifold bolt	(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
2. Air intake joint	6. EGR pipe	: Do not reuse.
3. Air intake joint gasket	7. EGR pipe gasket	
4. Air intake bolt	8. MAP sensor	

Intake Manifold Removal and Installation

S5RS0B1406011

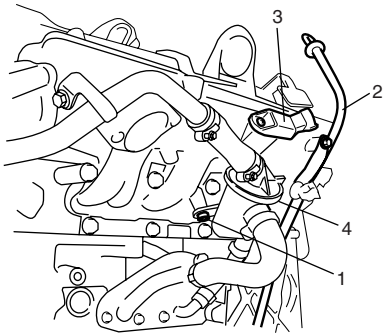
Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
- 3) Remove cowl top cover and cowl top panel referring to “Cowl Top Components: in Section 9K”.
- 4) Remove engine cover from engine assembly.
- 5) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation: ”.
- 6) Remove intercooler outlet pipe and outlet No.2 hose referring to “Intercooler Components: ”.
- 7) Remove EGR valve assembly referring to “EGR Valve Assembly Removal and Installation: in Section 1B”.
- 8) Remove harness clamp (1) with wire harness from intake manifold (2).



I5RS0B140019-01

- 9) Remove oil separator bolt (1) from intake manifold.
- 10) Remove oil level gauge guide (2) with level gauge.
- 11) Disconnect connector from MAP sensor (3).

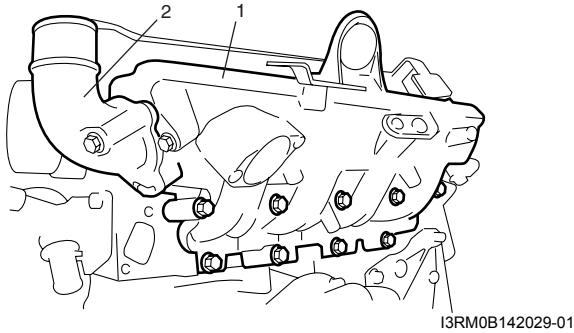


I3RM0B142028-01

4. Oil separator

1D-13 Engine Mechanical:

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



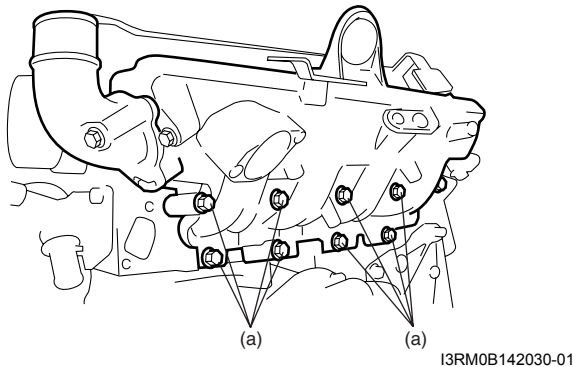
Installation

Reverse removal procedure for installation noting the followings.

- 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

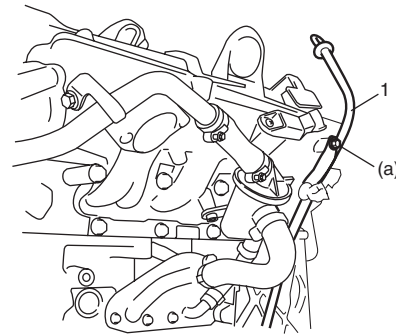
Intake manifold bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



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

Tightening torque

Oil level gauge guide mounting bolt (a): 9 N·m (0.9 kgf-m, 6.5 lb-ft)



- Install EGR valve assembly referring to “EGR Valve Assembly Removal and Installation: in Section 1B”.
- Connect negative (–) cable at battery.
- Install engine cover to engine assembly.

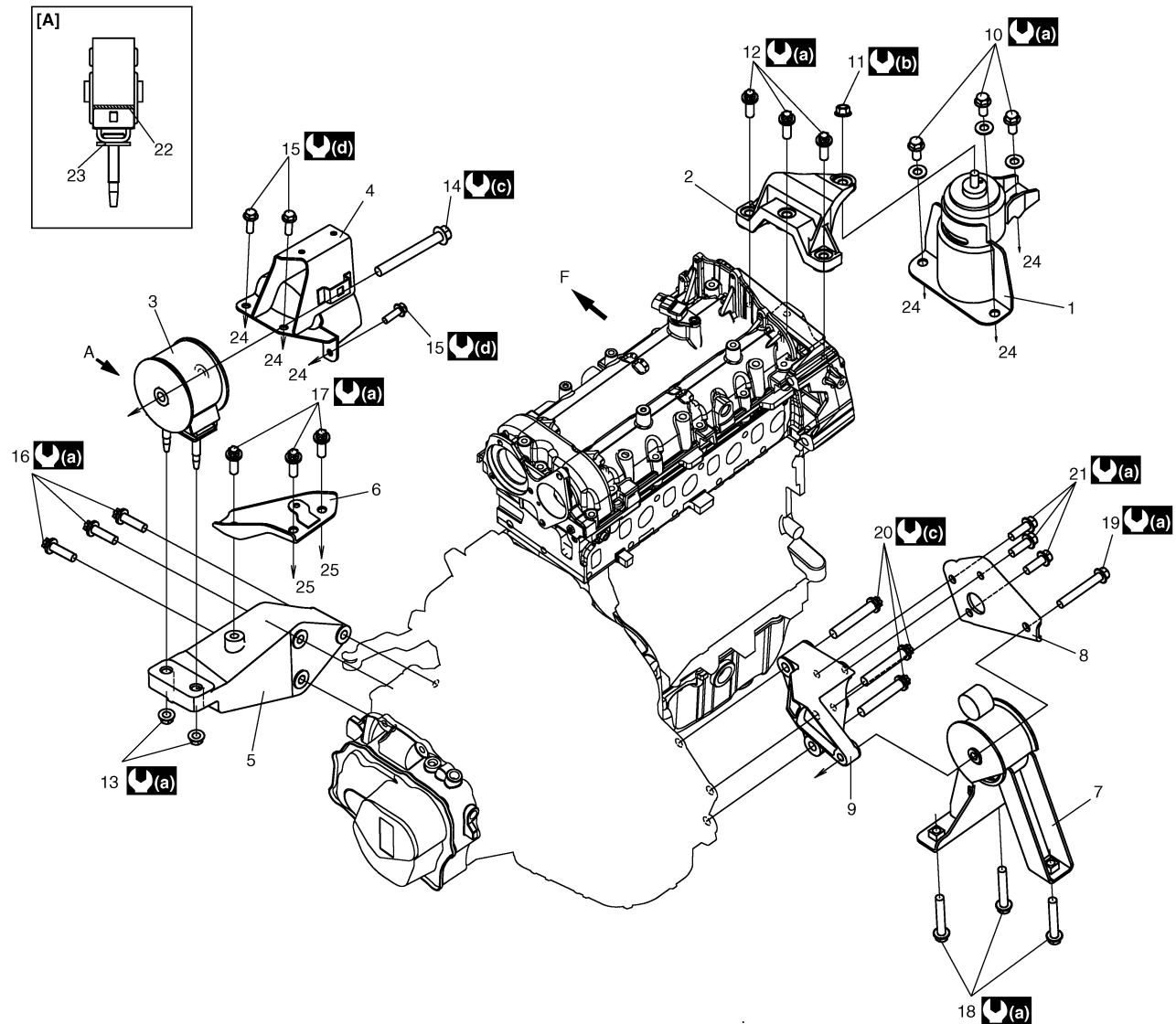
Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

- Check to ensure that all removed parts are back in place.
Reinstall any necessary parts which have not been reinstalled.

Engine Mounting Components

S5RS0B1406031



S5RS0B140020-01

[A]: View A	10. Engine right mounting bolt	21. Engine rear mounting No. 2 bracket bolt
F: Vehicle front	11. Engine right mounting nut	22. Yellow mark
1. Engine right mounting	12. Engine right mounting bracket bolt	23. Front mark
2. Engine right mounting bracket	13. Engine left mounting nut	24. To vehicle body
3. Engine left mounting	14. Engine left mounting bush bolt	25. To transaxle
4. Engine left mounting No. 1 bracket	15. Engine left mounting No. 1 bracket bolt	(a) : 55 N-m (5.5 kg-m, 40.0 lb-ft)
5. Engine left mounting No. 2 bracket	16. Engine left mounting No. 2 bracket bolt	(b) : 65 N-m (6.5 kg-m, 47.0 lb-ft)
6. Engine left mounting stiffener	17. Engine left mounting stiffener bolt	(c) : 85 N-m (8.5 kg-m, 61.5 lb-ft)
7. Engine rear mounting	18. Engine rear mounting bolt	(d) : 25 N-m (2.5 kg-m, 18.0 lb-ft)
8. Engine rear mounting No. 1 bracket	19. Engine rear mounting bush bolt	
9. Engine rear mounting No. 2 bracket	20. Engine rear mounting No. 1 bracket bolt	

Engine Assembly Removal and Installation

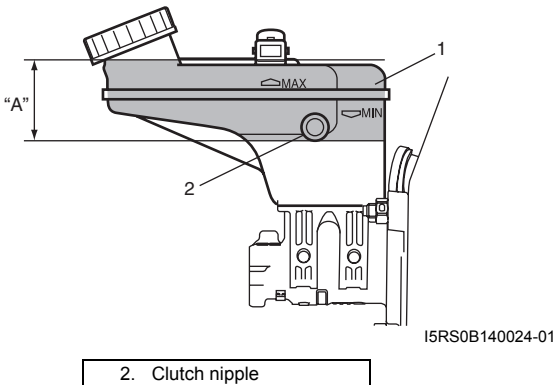
S5RS0B1406012

Removal

- 1) Disconnect negative (–) and positive (+) cable at battery.
- 2) Remove battery and battery tray.
- 3) Remove engine hood after disconnecting windshield washer hose.
- 4) Remove engine cover.
- 5) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation: ”.
- 6) Remove intercooler referring to “Intercooler Removal and Installation: ”.
- 7) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: in Section 1F”.
- 8) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: in Section 1C”.
- 9) Remove cowl top cover and cowl top panel referring to “Cowl Top Components: in Section 9K”.
- 10) Drain engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
- 11) Drain transaxle oil referring to “Manual Transaxle Oil Change: in Section 5B”.
- 12) Drain coolant by referring to “Cooling System Draining: in Section 1F”.
- 13) Take out clutch fluid from brake master cylinder reservoir (1) in space “A” as shown in the figure with syringe or such.

⚠ CAUTION

Do not allow fluid to get on painted surface. It may cause painted surface damage.



- 14) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation: in Section 7B”.

⚠ CAUTION

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

- 15) Disconnect the following pipes and hoses:

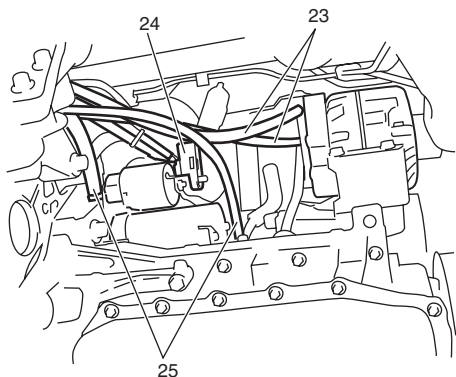
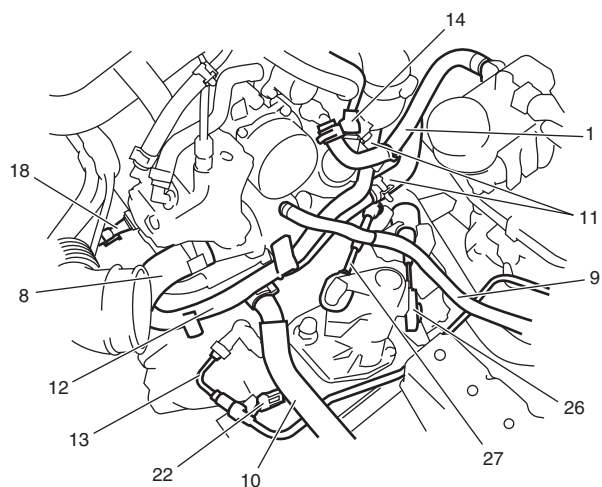
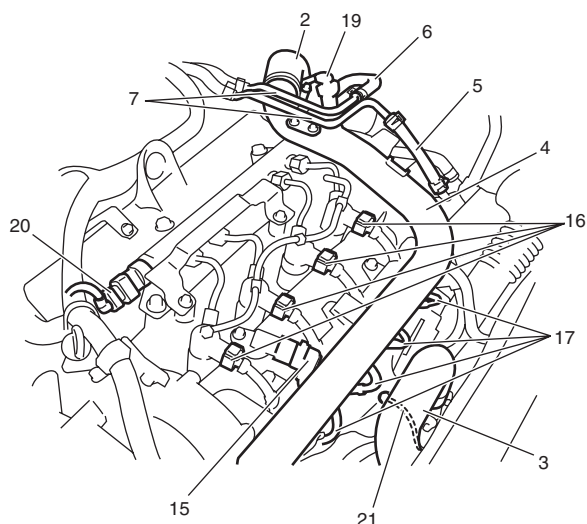
- Brake booster hose (1)
- Intercooler outlet No. 1 hose and No. 2 hose (2)
- Intercooler inlet No. 1 hose (3)
- Intercooler outlet pipe (4)
- Fuel feed hose (5)
- Fuel return hose (6)
- Fuel No. 2 pipe (7)
- Radiator inlet hose (8) and outlet hose
- Water engine outlet hose (9)
- Degassing tank outlet hose (10)
- Heater inlet and outlet hoses (11)
- Heater outlet pipe (12)
- Clutch hose and pipe (13)

- 16) Disconnect the following electric wires:

- MAP sensor
- ECT sensor
- EGR valve (14)
- CMP sensor (15)
- Injector (16)
- Glow plug (17)
- Oil pressure switch (18)
- CKP sensor
- Fuel pressure regulator (19)
- Fuel pressure sensor (20)
- Ground terminal from exhaust manifold (21)
- Back-up light switch (22)
- Magnet clutch switch of A/C compressor (if equipped)
- Generator (23)
- Starting motor (24)
- Engine ground (25)
- Each wire harness clamps

17) Disconnect the following cables from transaxle:

- Gear select control cable (26)
- Gear shift control cable (27)



I5RS0B140021-01

18) Remove right and left side engine under covers.

19) Remove exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".

20) Disconnect right and left drive shaft joints from differential gear referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".

NOTE

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

21) Support engine assemble by using chain hoist.

CAUTION

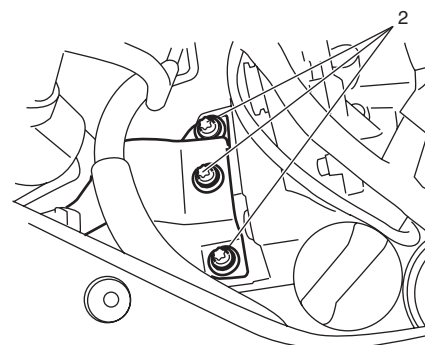
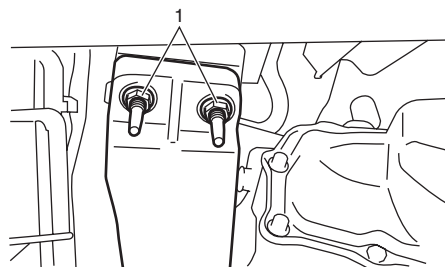
Be sure to remove / disconnect part(s) which interfere with chain hoist, if necessary. Failure to follow this CAUTION could result in damage by chain hoist.

22) Remove suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".

23) Remove engine rear mounting from engine rear mounting No.1 bracket.

24) Support engine and transaxle with jack, and then remove chain hoist.

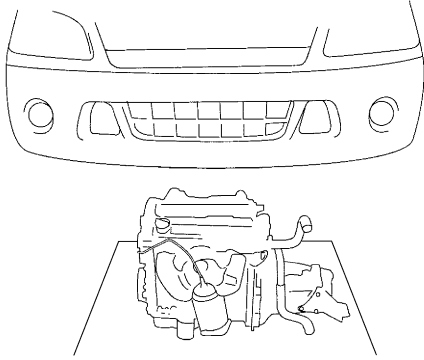
25) Remove engine left mounting bracket nuts (1) and engine right mounting bracket bolts (2).



I5RS0B140022-01

1D-17 Engine Mechanical:

- 26) Before removing engine with transaxle from engine compartment, recheck to make sure all hoses, pipes, electric wires and cables are disconnected from engine and transaxle.
- 27) Lower engine with transaxle from engine compartment.



I4RS0A140009-01

- 28) Disconnect transaxle from engine referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
- 29) Remove clutch cover and clutch disk referring to "Clutch Cover and Clutch Disc Removal and Installation: in Section 5C".

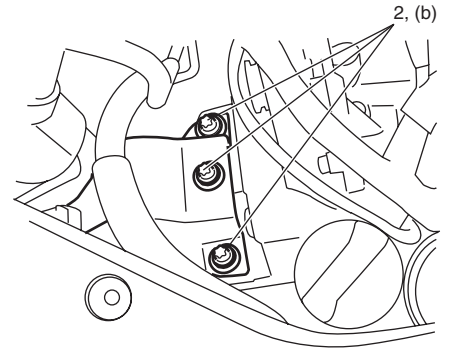
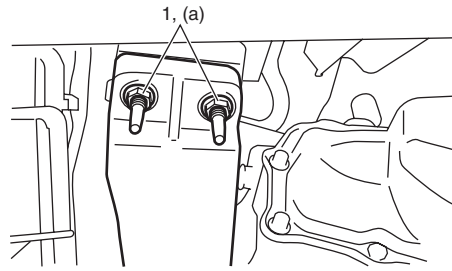
Installation

- 1) Install clutch cover and clutch disk referring to "Clutch Cover and Clutch Disc Removal and Installation: in Section 5C".
- 2) Connect transaxle to engine referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
- 3) Lift engine with transaxle into engine compartment using jack.
- 4) Install engine left mounting bracket nuts (1) and engine right mounting bracket bolts (2). Tighten these nuts to specified torque.

Tightening torque

Engine left mounting bracket nut (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

Engine right mounting bracket bolt (b): 55 N·m (5.5 kgf-m, 40.0 lb-ft)



I5RS0B140023-01

- 5) Support engine assembly by using chain hoist.
- 6) Install engine rear mounting to engine rear mounting No.1 bracket.

Tightening torque

Engine rear mounting bush bolt: 55 N·m (5.5 kgf-m, 40.0 lb-ft)

- 7) Install suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
- 8) Remove chain hoist.
- 9) Install exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
- 10) Connect drive shaft joints referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
- 11) Reverse disconnected hoses, pipes, cables and electric wires for connection in removal procedure.
- 12) Install A/C compressor to its bracket (if equipped) referring to "Compressor Assembly Removal and Installation: in Section 7B".
- 13) Install cowl top cover and cowl top panel referring to "Cowl Top Components: in Section 9K".
- 14) Install ECM referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
- 15) Install water pump / generator drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation: in Section 1F".
- 16) Adjust water pump / generator drive belt referring to "Water Pump / Generator Drive Belt Tension Inspection: in Section 1F".
- 17) Install intercooler referring to "Intercooler Removal and Installation: ".

18) Install air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: ".

19) Install engine cover.

Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

20) Refill engine with engine oil referring to "Engine Oil and Filter Change: in Section 0B".

21) Refill transaxle with transaxle oil referring to "Manual Transaxle Oil Change: in Section 5B".

22) Refill cooling system with coolant referring to "Cooling System Flush and Refill: in Section 1F".

23) Refill clutch fluid and bleed air from system referring to "Air Bleeding of Clutch System: in Section 5C".

24) Install engine hood and connect windshield washer hose.

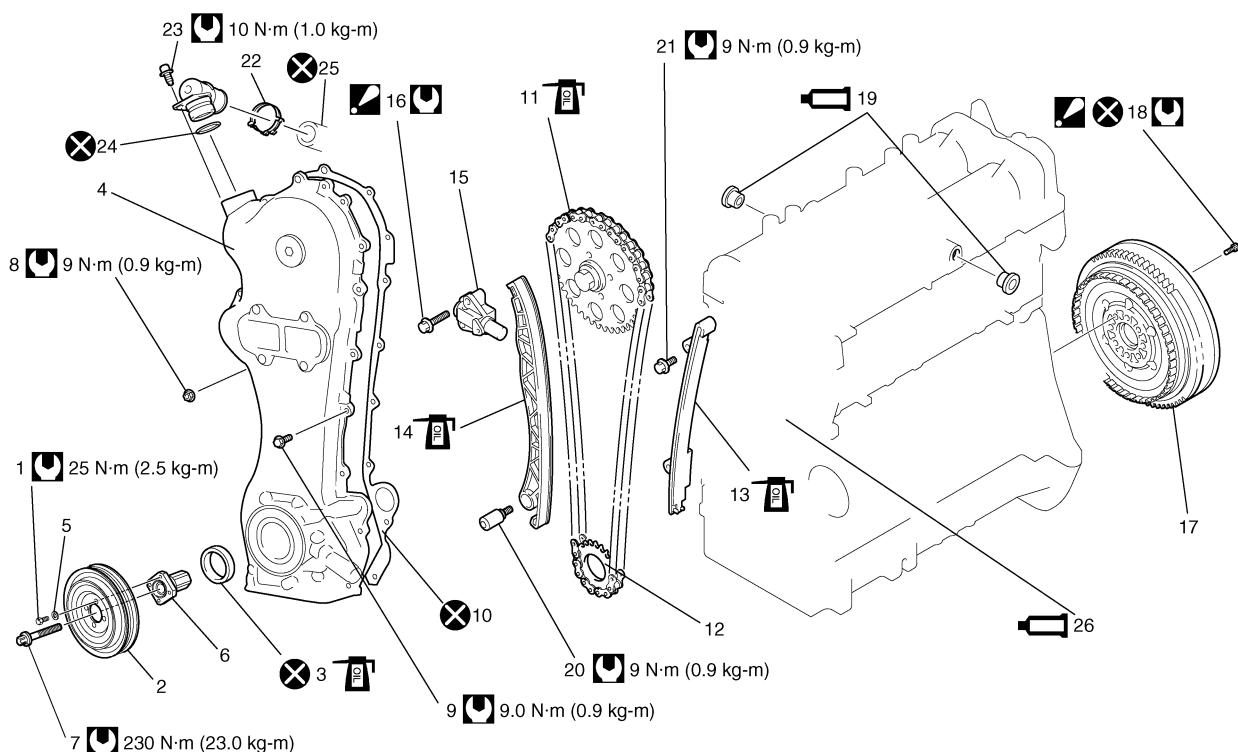
25) Install battery and battery tray.

26) Connect negative (–) and positive (+) cable at battery.

27) 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

S5RS0B1406013



I3RB0A143005-01

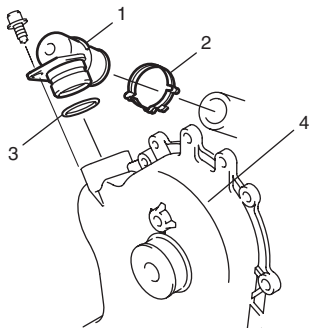
1. Crankshaft pulley bolt	11. Timing chain : Apply engine oil.	21. Chain guide mounting bolt
2. Crankshaft pulley	12. Crankshaft timing sprocket	22. Ventilation connector
3. Crankshaft pulley side crankshaft oil seal : Apply engine oil to oil seal lip.	13. Timing chain guide: Apply engine oil to sliding 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 kgf-m, 6.5 lb-ft) by the specified procedure	26. Camshaft housing / cylinder head / cylinder block : Apply Loctite 5900R to mating surfaces between camshaft housing / cylinder head / cylinder block and timing chain cover gasket.
7. Crankshaft pulley flange bolt	17. Flywheel	: Tightening torque
8. Timing chain cover nut	18. Flywheel bolt : Tighten 44 N·m (4.4 kgf-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

S5RS0B1406014

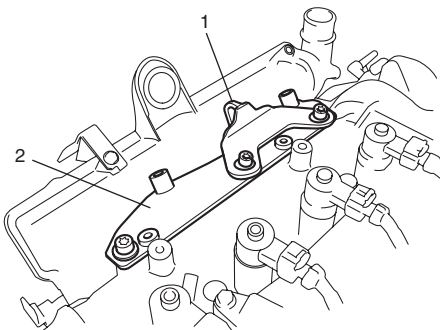
Removal

- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation: ".
- 2) Remove oil pan referring to "Oil Pan Removal and Installation: in Section 1E".
- 3) Remove ventilation connector (1), hose clamp (2) and O-ring(3) from timing chain cover (4).



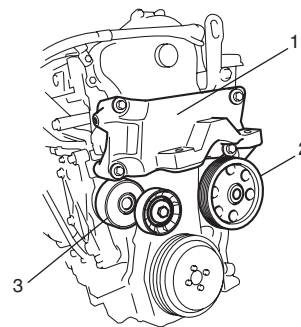
I3RB0A143006-01

- 4) Remove common rail referring to "Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G".
- 5) Remove engine hook (1) and common rail bracket (2) from camshaft housing.



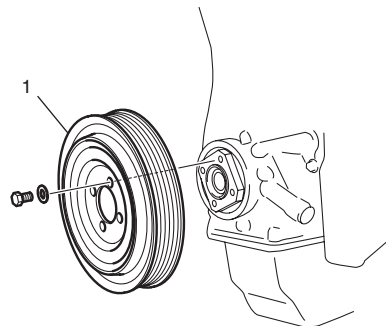
I3RB0A143007-01

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



I3RB0A143008-01

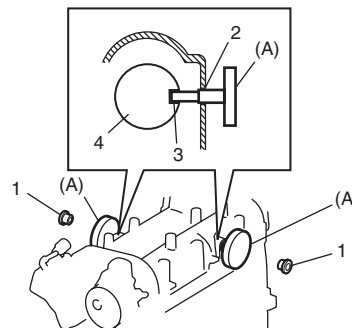
- 9) Remove crankshaft pulley (1).



I3RB0A143009-01

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

Special tool
(A): 09917-68610

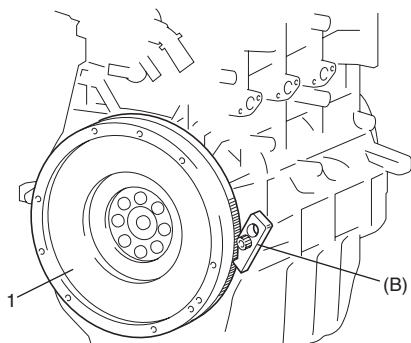


I3RB0A143010-01

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

Special tool

(B): 09916-98610



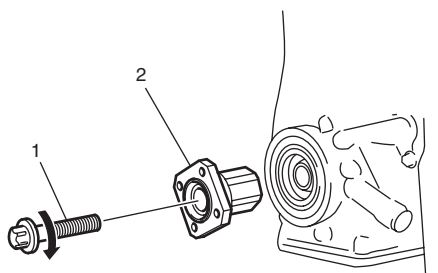
I3RB0A143011-01

- 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

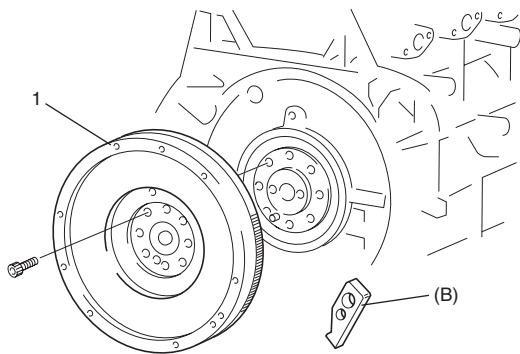
Be sure to turn crankshaft pulley flange bolt clockwise in order to loosen it.



I3RB0A143012-01

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

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



I3RB0A143013-01

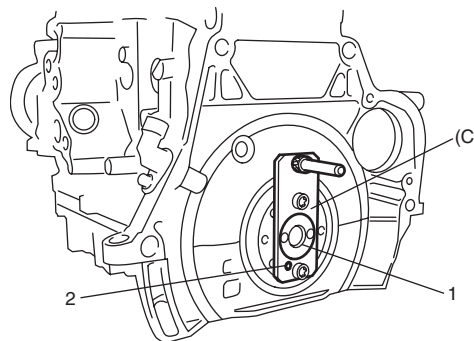
- 18) Lock crankshaft (1) installing special tool (C) as shown in the figure.

NOTE

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

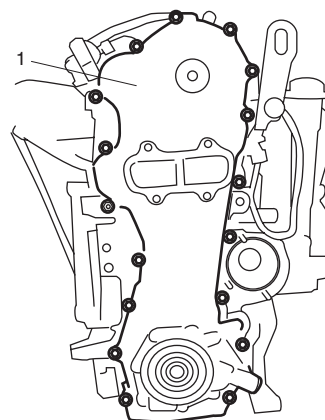
Special tool

(C): 09912-38300



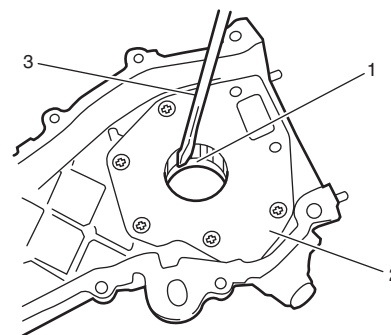
I3RB0A143014-01

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



I3RB0A143015-01

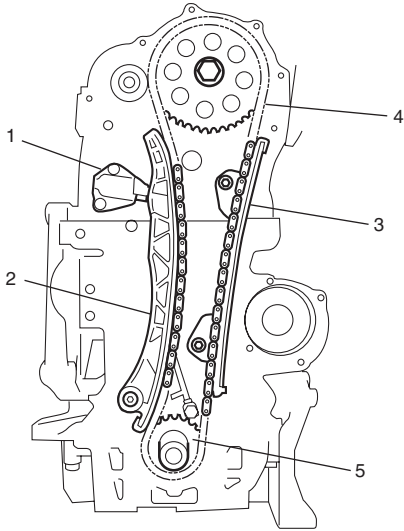
- 20) Remove crankshaft pulley side crankshaft oil seal (1) from timing chain cover (2) using flat head screw driver (3) or the like, if necessary.



I3RB0A143016-01

1D-21 Engine Mechanical:

- 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).



I3RB0A143017-01

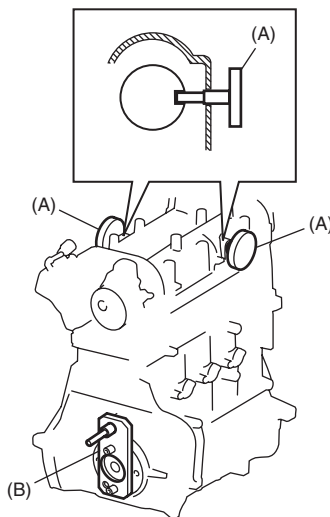
Installation

- 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: " or "Camshaft Housing Assembly Disassembly and Reassembly: ".

Special tool

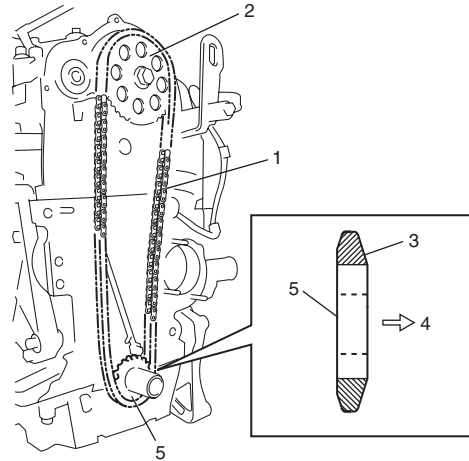
(A): 09917-68610

(B): 09912-38300



I3RB0A143018-01

- 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 the figure.

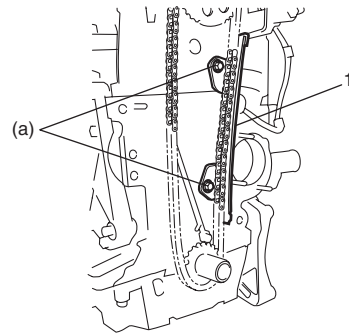


I3RB0A143019-01

- 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 kgf-m, 6.5 lb-ft)

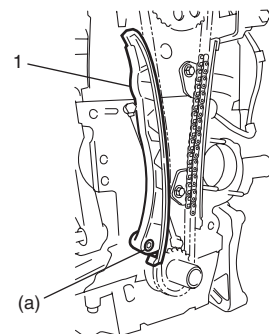


I3RB0A143020-01

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

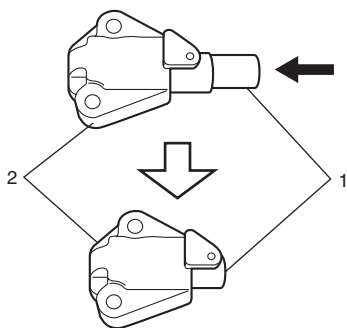
Tightening torque

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



I3RB0A143021-01

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



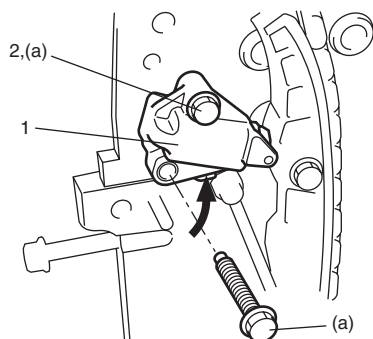
I3RB0A143022-01

- 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 the figure, and then tighten tensioner adjuster bolts to specified torque.

Tightening torque

Chain tensioner adjuster bolt (a): Tighten 9 N·m (0.9 kgf-m, 6.5 lb-ft) by the specified procedure.



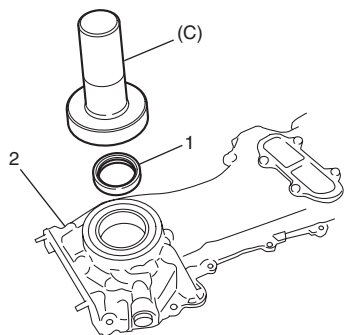
I3RB0A143025-01

- 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 the figure, if removed.

Special tool

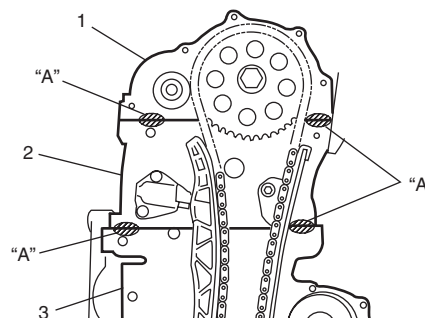
(C): 09913-75510



I3RB0A143023-01

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

"A": Loctite 5900® (Loctite 5900®)



I3RB0A143024-01

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

- 13) Install timing chain cover (1) as follows.

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

NOTE

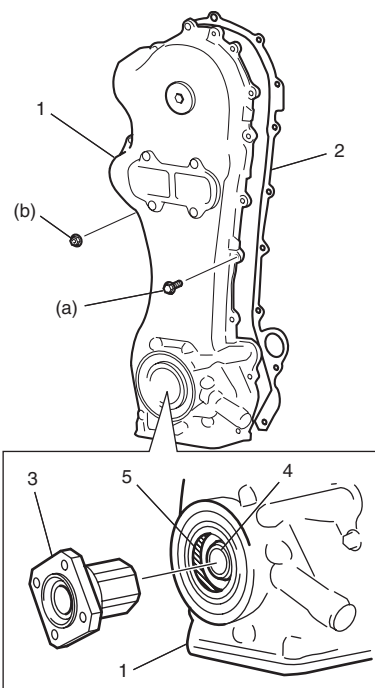
When inserting crankshaft pulley flange, be careful not to damage to oil seal (5) installed in timing chain cover.

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

Tightening torque

Timing chain cover bolt (a): 9.0 N·m (0.9 kgf-m, 6.5 lb-ft)

Timing chain cover nut (b): 9.0 N·m (0.9 kgf-m, 6.5 lb-ft)



I3RB0A143026-01

1D-23 Engine Mechanical:

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).

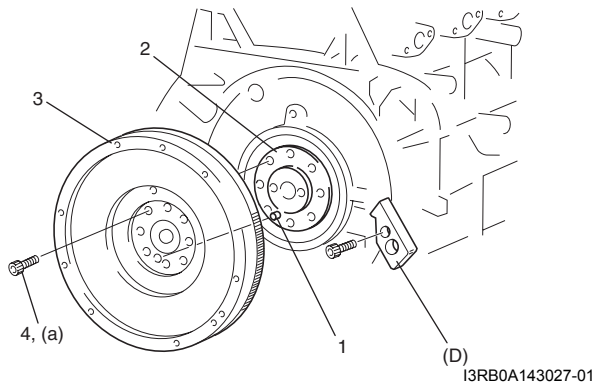
Special tool

(D): 09916-98610

- Tighten new flywheel bolts to specified torque.

Tightening torque

Flywheel bolts (a): Tighten 44 N·m (4.4 kgf-m, 32.0 lb-ft) by the specified procedure.

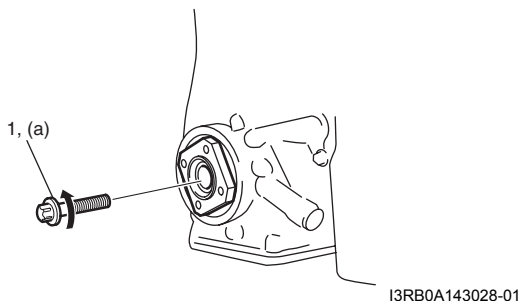


17) Remove special tools (A) confirmed at step 2).

18) Tighten crankshaft pulley flange bolt (1) turning it counterclockwise.

Tightening torque

Crankshaft pulley flange bolt (a): 230 N·m (23.0 kgf-m, 166.5 lb-ft)



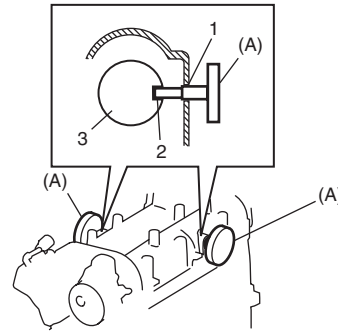
19) Remove special tool (D) installed at step 16).

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 the figure.

Special tool

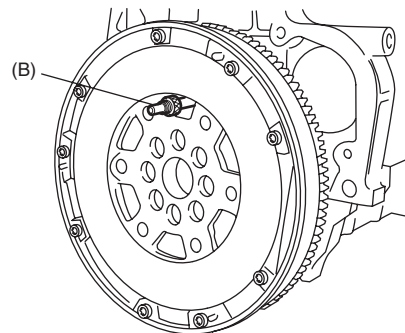
(A): 09917-68610



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

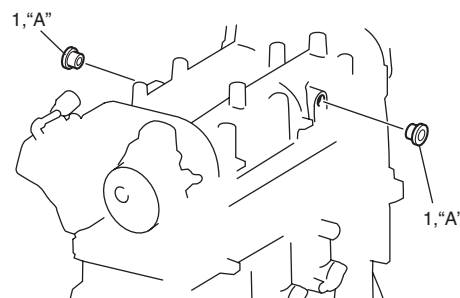
(B): 09912-38300



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.

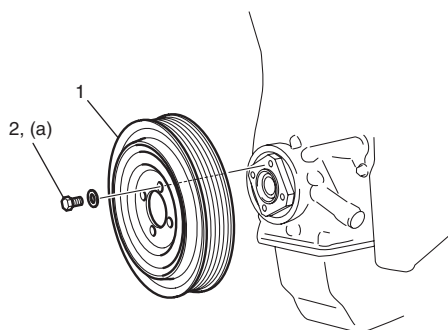
“A”: Loctite omnifit 100M spezial® (Loctite omnifit 100M spezial®)



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

Tightening torque

Crankshaft pulley bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



I3RB0A143032-01

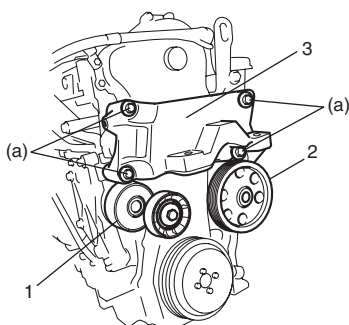
- 26) Install water pump / generator drive belt tensioner (1) referring to "Water Pump / Generator Drive Belt Tensioner Assembly Removal and Installation: in Section 1F".

- 27) Install water pump assembly (2) referring to "Water Pump Removal and Installation: in Section 1F".

- 28) Install engine right mounting bracket (3).

Tightening torque

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



I3RB0A143033-01

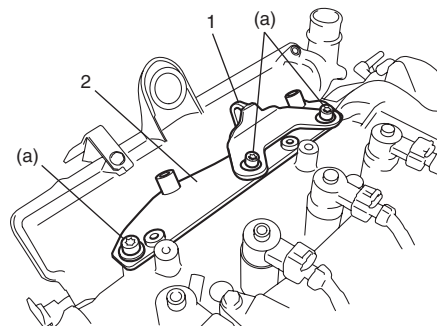
- 29) Install oil pan referring to "Oil Pan Removal and Installation: in Section 1E".

- 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 kgf-m, 18.0 lb-ft)



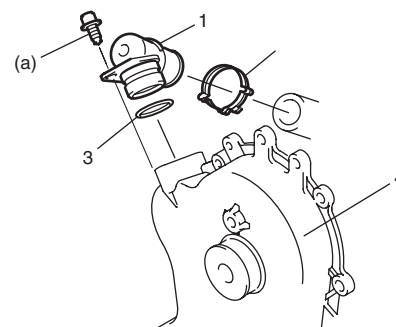
I3RB0A143034-01

- 31) Install common rail referring to "Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: in Section 1G".

- 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 kgf-m, 7.5 lb-ft)



I3RB0A143035-01

- 33) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: ".

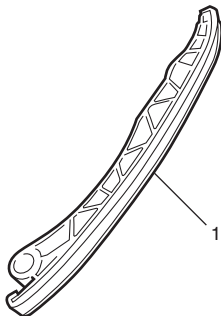
Timing Chain Cover and Timing Chain Inspection

S5RS0B1406015

Timing Chain Tensioner

Check shoe (1) for wear or damage.

If any malcondition is found, replace timing chain tensioner.

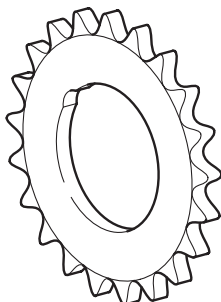


I3RB0A143036-01

Crankshaft Timing Sprocket

Check teeth of sprocket for wear or damage.

If any malcondition is found, replace crankshaft timing sprocket.

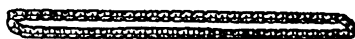


I3RB0A143037-01

Timing Chain

Check timing chain for wear or damage.

If any malcondition is found, replace timing chain.

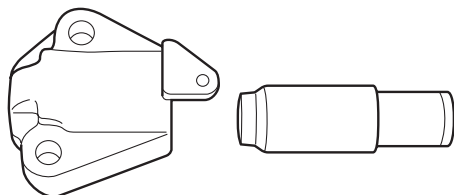


I3RB0A143038-01

Timing Chain Tensioner Adjuster

Check that sliding surfaces are free from damage.

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

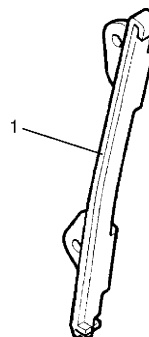


I3RB0A143039-01

Timing Chain Guide

Check shoe (1) for wear or damage.

If any malcondition is found, replace timing chain guide.



I3RB0A143040-01

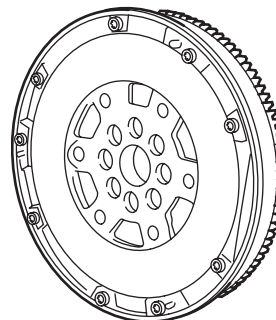
Flywheel

- 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.

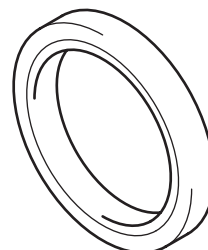


I3RB0A143041-01

Crankshaft Pulley Side Crankshaft Oil Seal

Check oil seal lip for fault or damage.

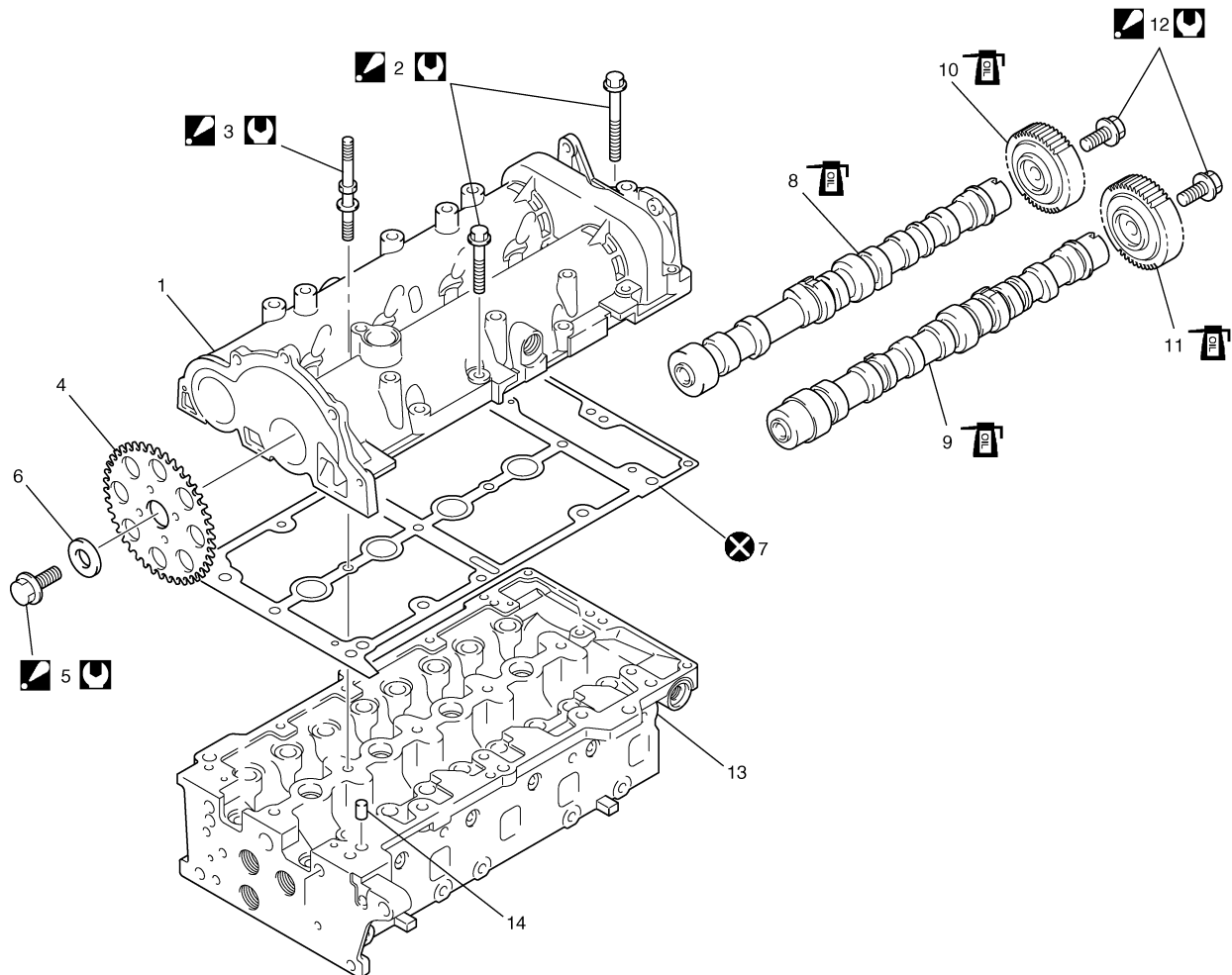
Replace as necessary.



I3RB0A143042-01

Camshaft Housing Components

S5RS0B1406016



I3RB0A143043-01

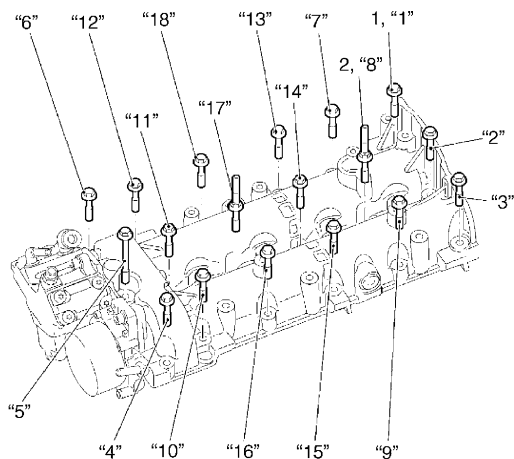
1. Camshaft housing	7. Camshaft housing gasket	13. Cylinder head
2. Camshaft housing bolt : Tighten 18 N·m (1.8 kgf-m, 13.0 lb-ft) by the specified procedure	8. Intake manifold side camshaft : Apply engine oil to sliding surface	14. Knock pin
3. Camshaft housing stud bolt : Tighten 25 N·m (2.5 kgf-m, 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 kgf-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 kgf-m, 87.0 lb-ft) by the specified procedure	

Camshaft Housing Assembly Removal and Installation

S5RS0B1406017

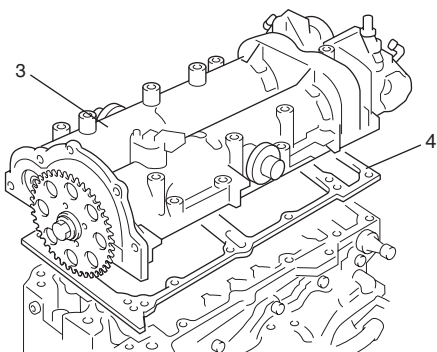
Removal

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



I3RB0A143044-01

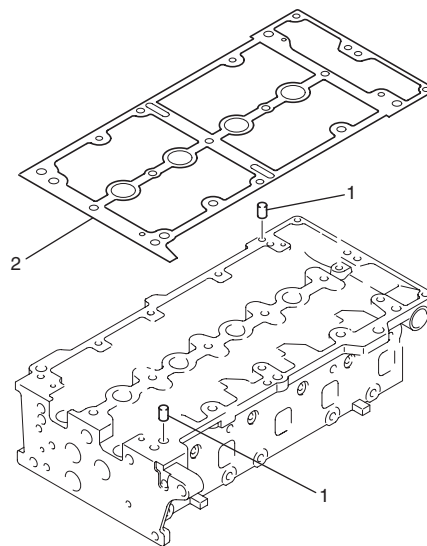
- 5) Remove camshaft housing assembly (3) and camshaft housing gasket (4).



I3RB0A143045-01

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.



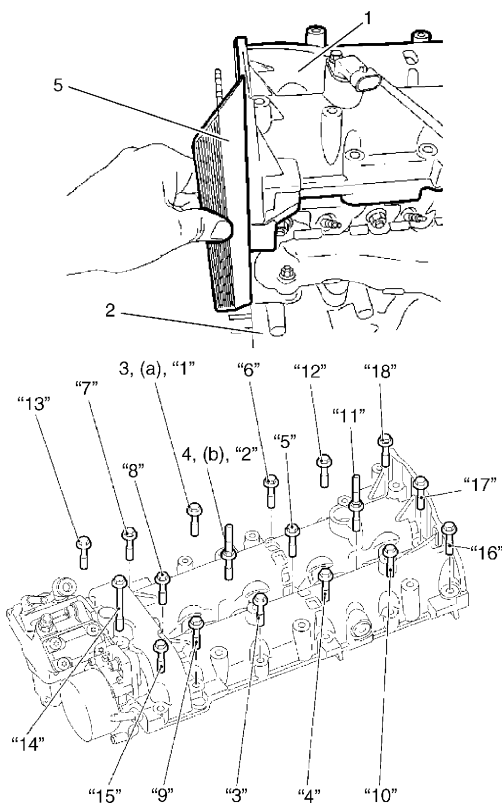
I3RB0A143046-01

- 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 the figure.

Tightening torque

Camshaft housing bolt (a): 18 N·m (1.8 kgf-m, 13.0 lb-ft) by the specified procedure.

Camshaft housing stud bolt (b): 25 N·m (2.5 kgf-m, 18.0 lb-ft) by the specified procedure.



I3RB0A143047-01

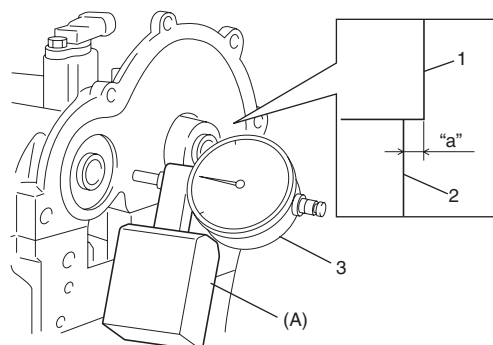
- 5) Measure bump "a" between camshaft housing (1) and cylinder head (2) (flatness) using dial gauge (3) and special tool (A) as shown in the figure. If it is out of specification, remove camshaft housing and return to step 4).

Special tool

(A): 09910-26510 /OUT0000005

Bump between camshaft housing and cylinder head (flatness)

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



I3RB0A143048-01

- 6) Install fuel injector referring to "Fuel Injector Removal and Installation: in Section 1G".
- 7) Install timing chain and timing chain cover referring to "Timing Chain Cover and Timing Chain Removal and Installation: ".
- 8) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: ".

Camshaft Housing Assembly Disassembly and Reassembly

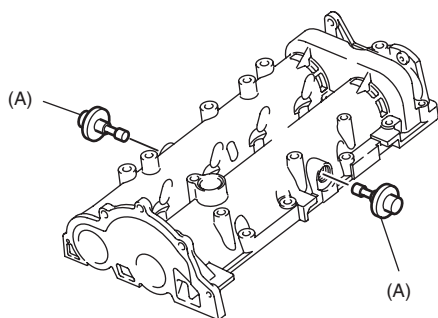
S5RS0B1406018

Disassembly

- 1) Remove camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation: ".
- 2) Remove vacuum pump referring to "Vacuum Pump Removal and Installation: in Section 1B".
- 3) Remove injection pump referring to "Injection Pump Removal and Installation: in Section 1G".
- 4) Remove CMP sensor referring to "Camshaft Position (CMP) Sensor Removal and Installation: in Section 1C".
- 5) Remove special tools from camshaft housing.

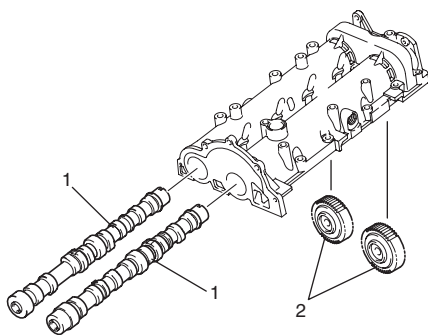
Special tool

(A): 09917-68610



I3RB0A143049-01

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



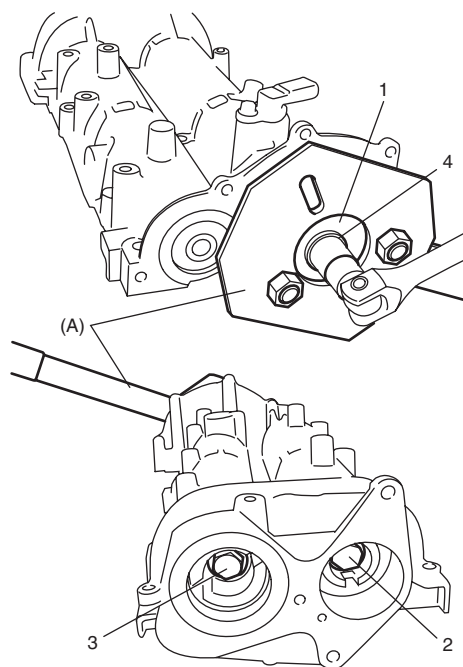
I3RB0A143050-01

- 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).



I3RB0A143051-01

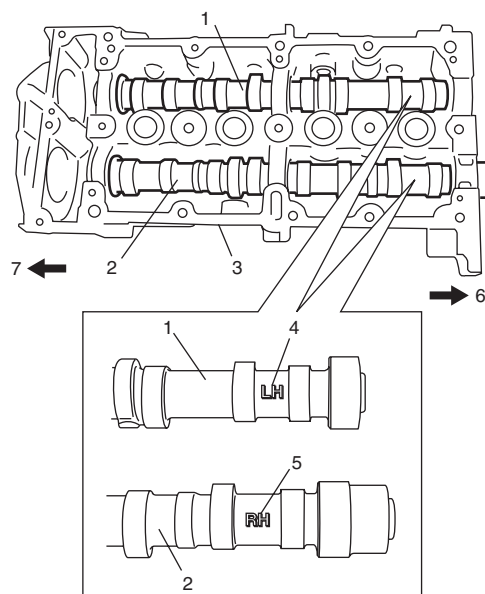
- e) Remove camshafts and camshaft gears.

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 the figure.



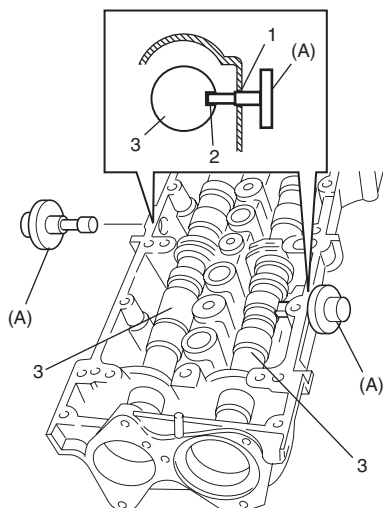
I3RB0A143052-01

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

2) Install special tools (A) as follows.

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

Special tool
(A): 09917-68610

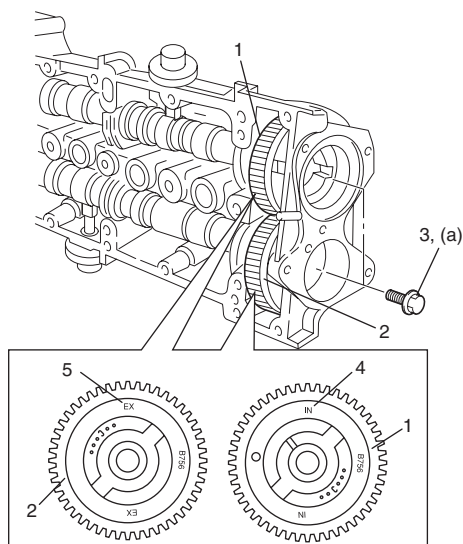


I3RB0A143053-01

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 the figure.



I3RB0A143054-01

4. "IN" mark

5. "EX" mark

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

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

Special tool
(A): 09917-68221

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

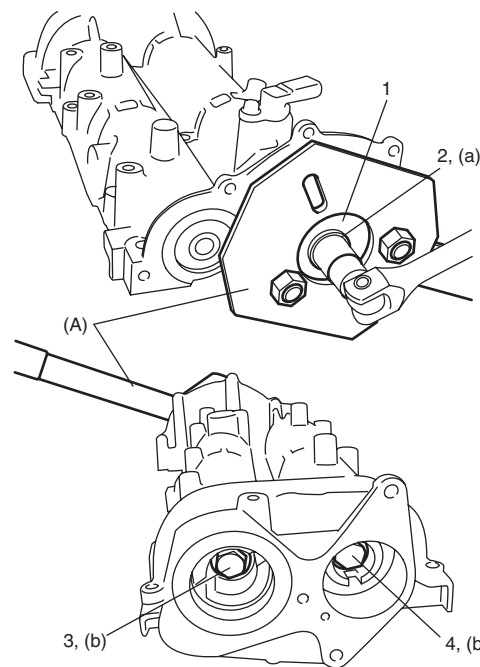
Tightening torque

Camshaft timing sprocket bolt (a): 120 N·m (12.0 kgf-m, 87.0 lb-ft) by the specified procedure.

- 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 kgf-m, 87.0 lb-ft) by the specified procedure.



I3RB0A143055-01

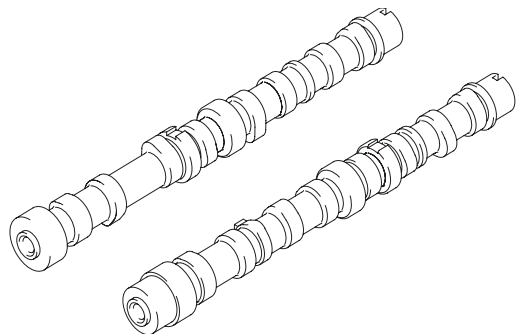
- 5) Install CMP sensor referring to "Camshaft Position (CMP) Sensor Removal and Installation: in Section 1C".
- 6) Install injection pump referring to "Injection Pump Removal and Installation: in Section 1G".
- 7) Install vacuum pump referring to "Vacuum Pump Removal and Installation: in Section 1B".
- 8) Install camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation: ".
- 9) Install timing chain and timing chain cover referring to "Timing Chain Cover and Timing Chain Removal and Installation: ".
- 10) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: ".

Camshaft Inspection

S5RS0B1406019

Camshaft

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



I3RB0A143056-01

Cam Wear

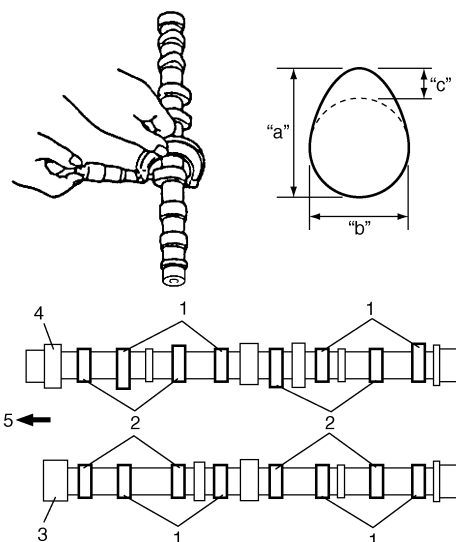
- 1) Using micrometer, measure cam height "a" and cam width "b".
- 2) Calculate valve lift "c" using the following formula.

$$"c" = "a" - "b"$$
- 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.)



I3RB0A143057-01

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.

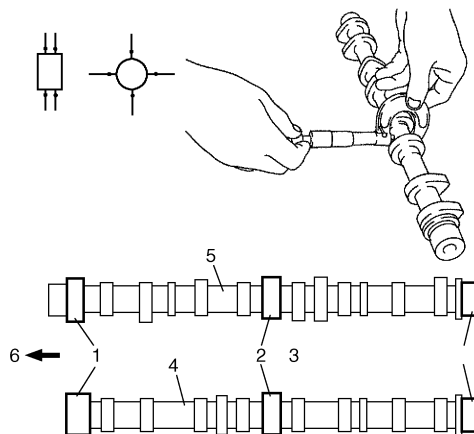
If measured diameter is out of specification, replace camshaft.

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.)

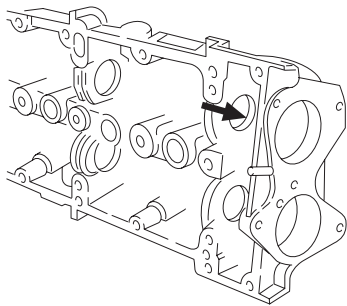


I3RB0A143127-01

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.



I3RB0A143058-01

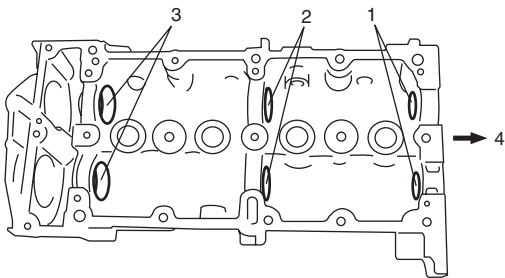
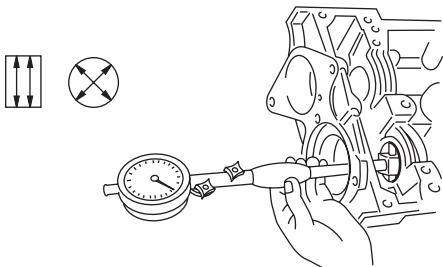
- Check camshaft journal bore diameter using bore gauge.
If measured diameter is out of specification, replace camshaft housing.

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.)

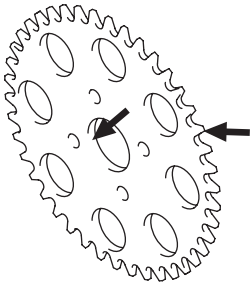


I3RB0A143059-01

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

Camshaft Timing Sprocket

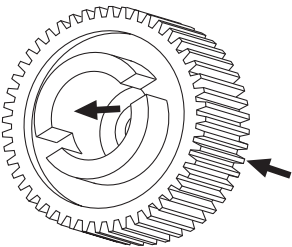
Check camshaft timing sprocket for pitting, scratches or damage.
If any malcondition is found, replace camshaft timing sprocket.



I3RB0A143060-01

Intake Manifold Side Camshaft Gear and Exhaust Manifold Side Camshaft Gear

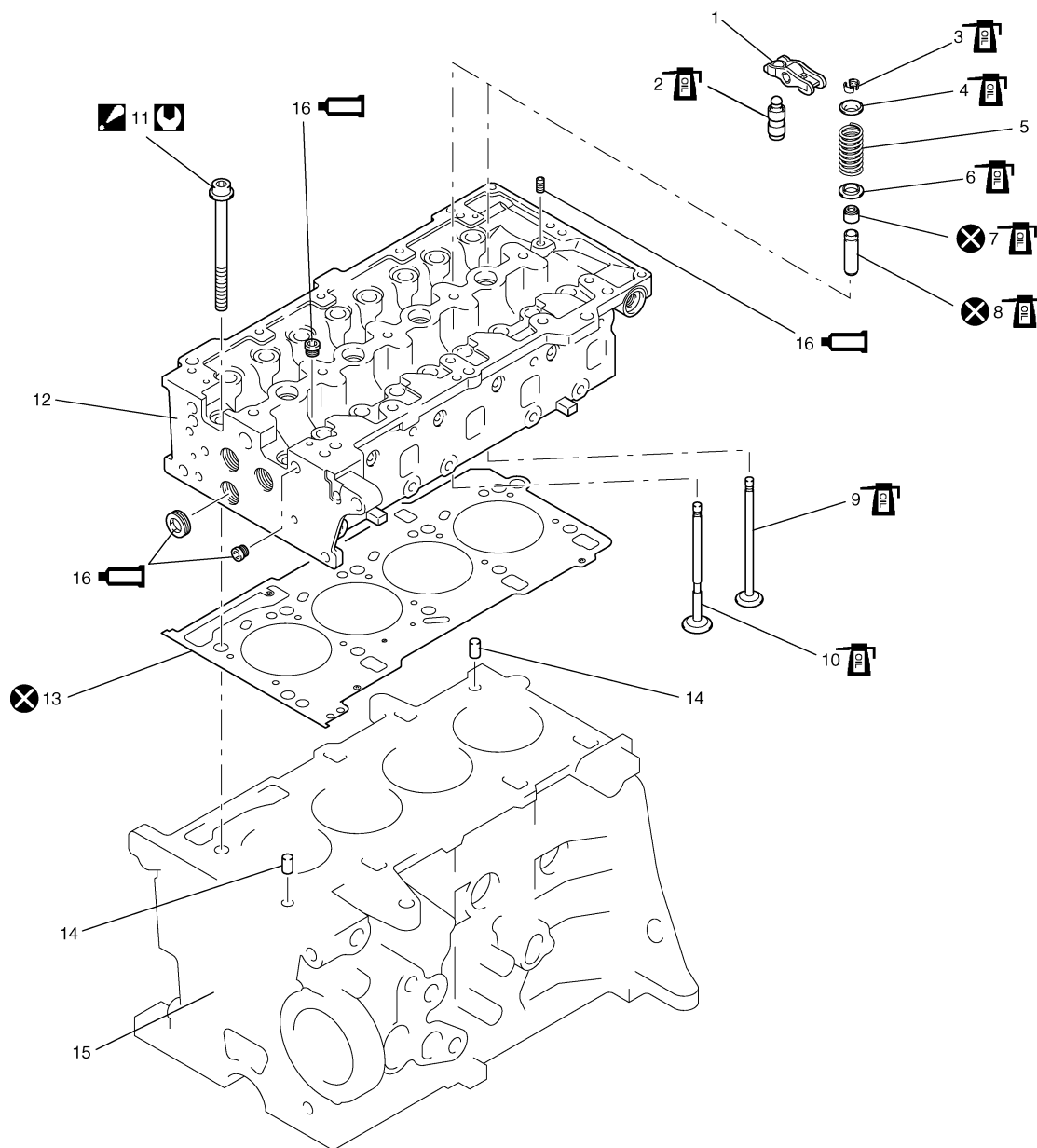
Check intake manifold side and exhaust manifold side camshaft gears for pitting, scratches or damage.
If any malcondition is found, replace intake manifold side and/or exhaust manifold side camshaft gear.



I3RB0A143061-01

Valves and Cylinder Head Components

S5RS0B1406020



I3RB0A143062-01

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 kgf·m, 14.5 lb-ft), 40 N·m (4.0 kgf·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

S5RS0B1406021

⚠ CAUTION

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

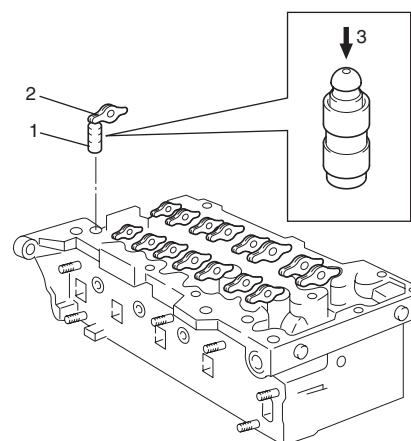
If each valve rocker arm or hydraulic valve lash adjuster is not installed to original position, engine will spoil its original performance.

Removal

- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation: ".
- 2) Remove camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation: ".
- 3) Remove exhaust manifold to "Exhaust Manifold Removal and Installation: in Section 1K".
- 4) Remove thermostat case assembly referring to "Thermostat Case Assembly Removal and Installation: in Section 1F".
- 5) Remove oil separator referring to "Oil Separator and Crankcase Ventilation Cover Removal and Installation: in Section 1B".
- 6) Remove intake manifold referring to "Intake Manifold Removal and Installation: ".
- 7) Remove oil pressure switch referring to "Oil Pressure Switch Removal and Installation: in Section 1E".
- 8) Remove glow plugs referring to "Glow Plug Removal and Installation: in Section 1C".
- 9) Remove hydraulic valve lash adjuster (1) with valve rocker arm (2).

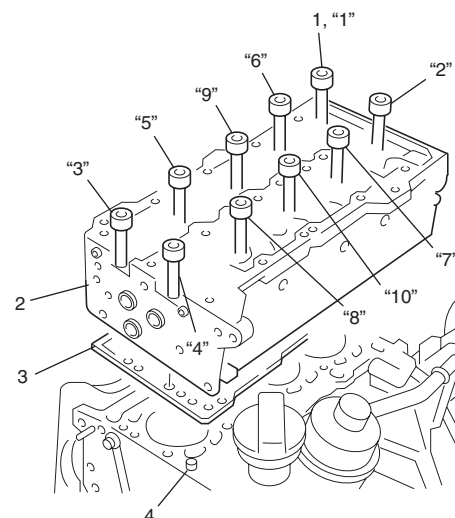
NOTE

- **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.**



I3RB0A143063-01

- 10) Loosen cylinder head bolts (1) according to numerical order as shown in the 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.

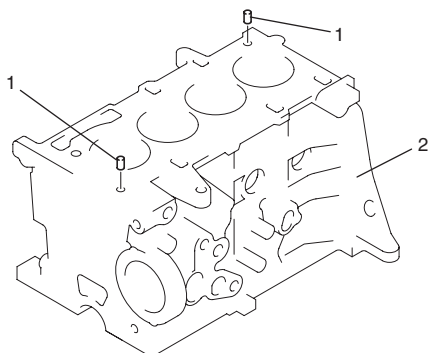


I3RB0A143064-01

- 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.

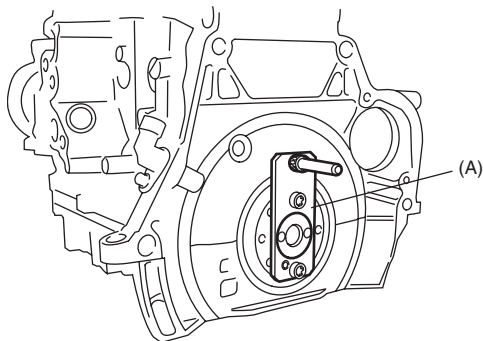


I3RB0A143065-01

- 3) Select and install new cylinder head gasket as follows.

- a) Remove special tool (A).

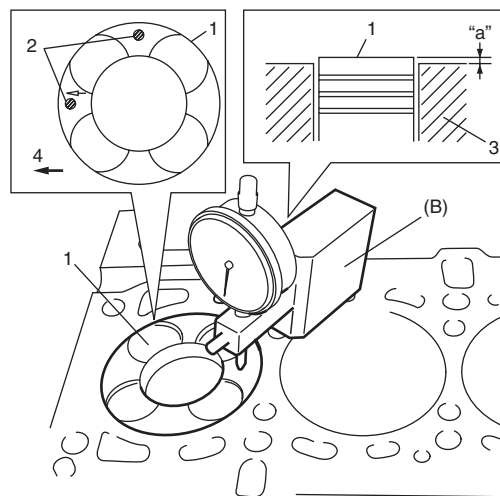
Special tool
(A): 09912-38300



I3RB0A143066-01

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

Special tool
(B): 09910-26510 /OUT0000005



I3RB0A143067-01

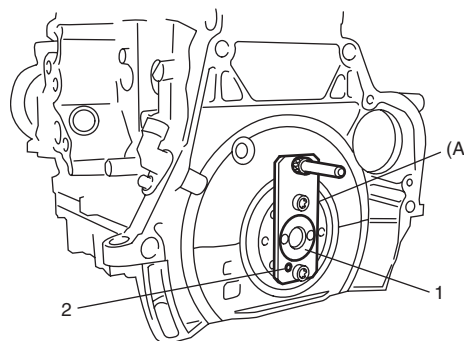
3. Cylinder block	4. Crankshaft pulley side
-------------------	---------------------------

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

NOTE

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

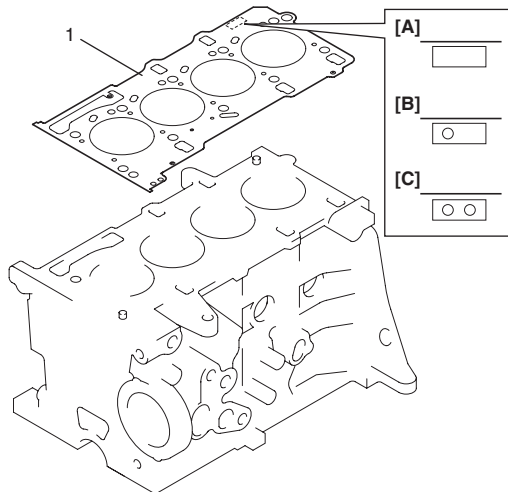
Special tool
(A): 09912-38300



I3RB0A143068-01

- 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.)



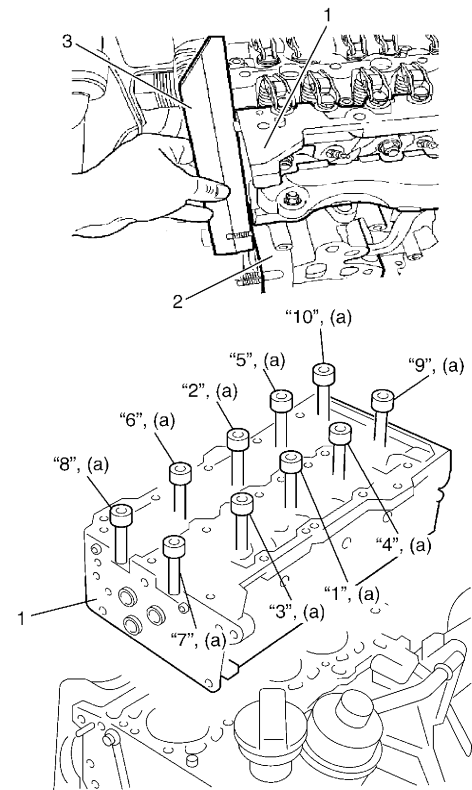
I3RB0A143069-01

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

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

Tightening torque

Cylinder head bolt (a): Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft), 40 N·m (4.0 kgf-m, 29.0 lb-ft), 90° and 90° by the specified procedure.



I3RB0A143070-01

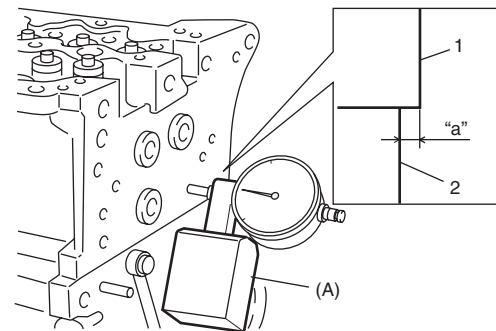
- 5) Measure bump "a" between cylinder head (1) and cylinder block (2) (flatness) using dial gauge and special tool as shown in the figure. If measured notch is out of specification, remove cylinder head and return to step 4).

Special tool

(A): 09910-26510 /OUT0000005

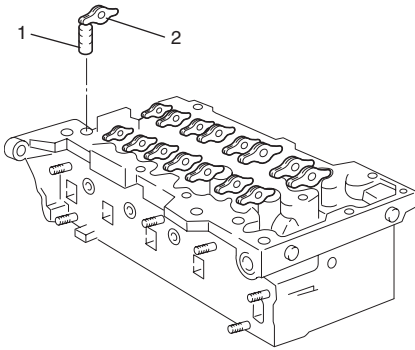
Notch between cylinder head and cylinder block (flatness)

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



I3RB0A143071-01

- 6) Apply engine oil around hydraulic valve lash adjuster (1) and valve rocker arm (2), and install them to cylinder head.



I3RB0A143072-01

- 7) Install glow plugs referring to "Glow Plug Removal and Installation: in Section 1C".
- 8) Install oil pressure switch referring to "Oil Pressure Switch Removal and Installation: in Section 1E".
- 9) Install intake manifold referring to "Intake Manifold Removal and Installation: ".
- 10) Install oil separator referring to "Oil Separator and Crankcase Ventilation Cover Removal and Installation: in Section 1B".
- 11) Install thermostat case assembly referring to "Thermostat Case Assembly Removal and Installation: in Section 1F".
- 12) Install exhaust manifold to "Exhaust Manifold Removal and Installation: in Section 1K".
- 13) Install camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation: ".
- 14) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: ".

Valves and Cylinder Head Assembly Disassembly and Reassembly

S5RS0B1406022

⚠ 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

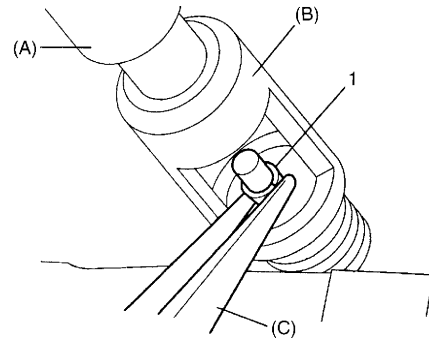
- 1) Using special tool (A) and (B), compress valve springs and then remove valve cotter (1) using special tool (C).

Special tool

(A): 09916-14510

(B): 09916-14521

(C): 09916-84511

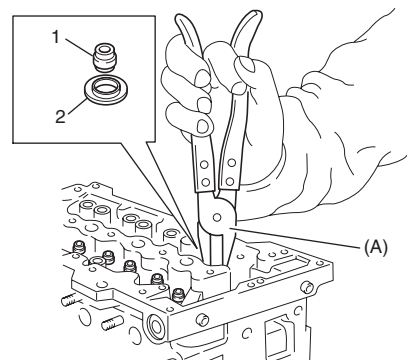


I3RB0A143073-01

- 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



I3RB0A143074-01

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.

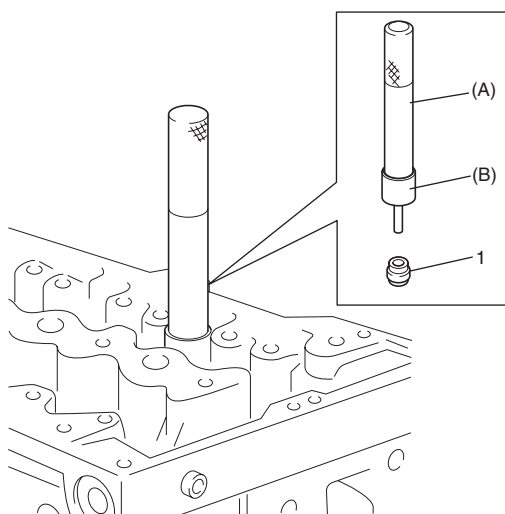
NOTE

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

Special tool

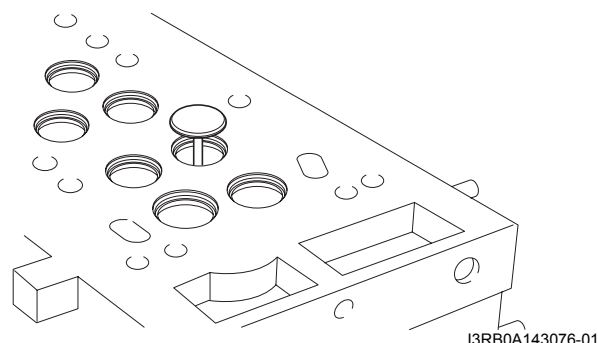
(A): 09916-58210

(B): 09917-98221



I3RB0A143075-01

- 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.



I3RB0A143076-01

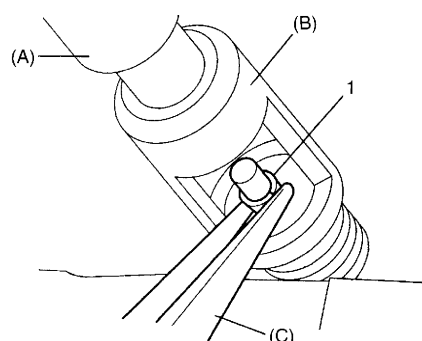
- 5) Using special tool (A) and (B), compress valve spring. And, fit two valve cotter pins (1) into groove in valve stem using special tool (C).

Special tool

(A): 09916-14510

(B): 09916-14521

(C): 09916-84511



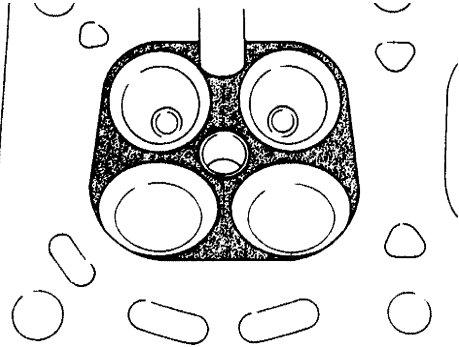
I3RB0A143077-01

Valves and Cylinder Head Components Inspection

S5RS0B1406023

Cylinder Head

- Remove all carbon deposits from combustion chambers.



I3RB0A143078-01

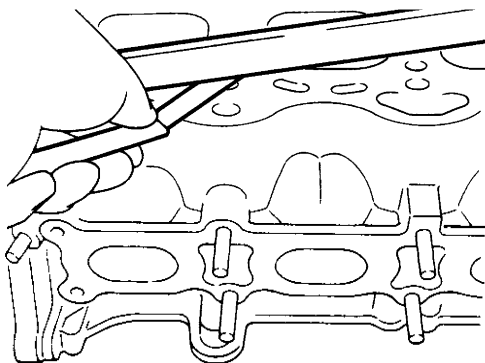
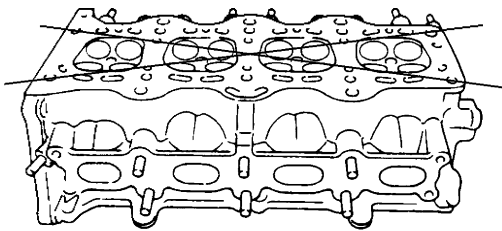
NOTE

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.)



I3RB0A143079-01

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.

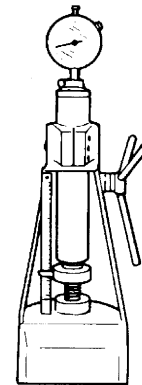
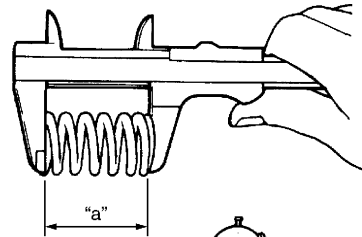
Valve spring free length (In and Ex) "a":

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.)

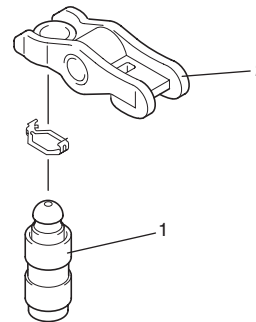


I3RB0A143080-01

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 malfunction is found, replace them.



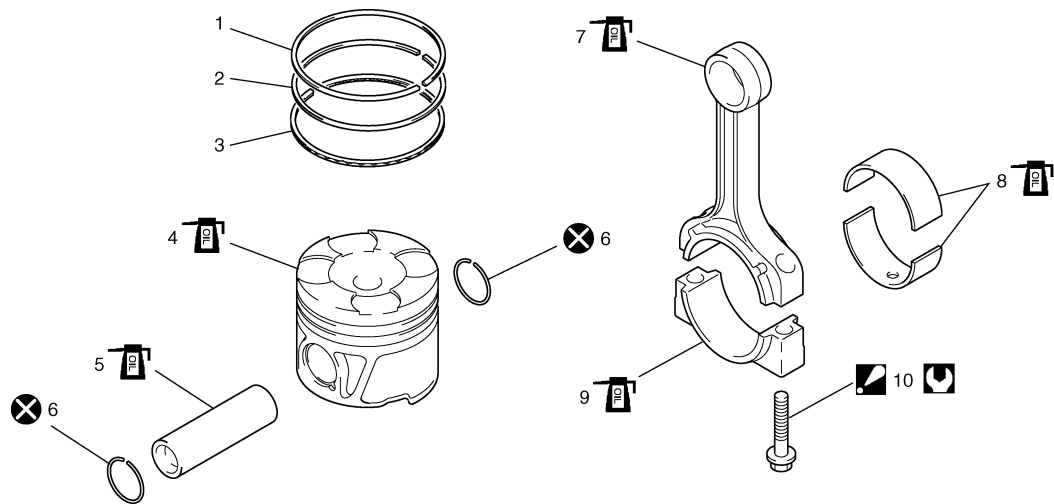
I3RB0A143081-01

Pistons, Piston Rings, Connecting Rods and Cylinder Components

S5RS0B1406024

⚠ 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.



I3RB0A143082-01

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 kgf-m, 14.5 lb-ft) and 40° by the specified.	

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

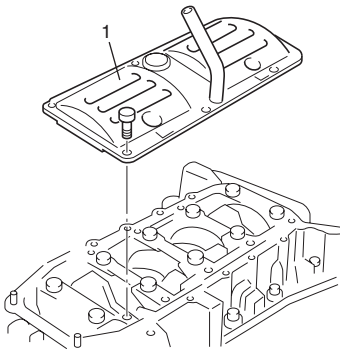
S5RS0B1406025

⚠ 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: ".
- 2) Remove cylinder head referring to "Valves and Cylinder Head Assembly Removal and Installation: ".
- 3) Remove oil pan baffle plate (1) from lower crankcase.

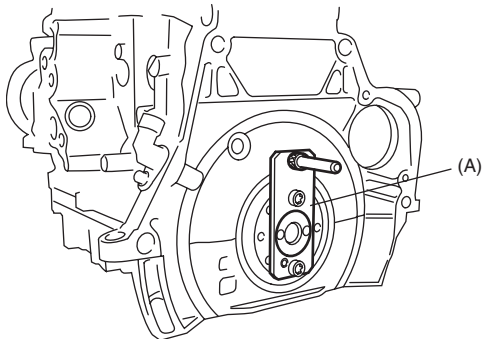


I3RB0A143083-01

- 4) Remove special tool (A).

Special tool

(A): 09912-38300



I3RB0A143084-01

- 5) Mark cylinder number on all pistons using silver pencil or quick drying paint for installation.
- 6) Remove connecting rod bearing caps (1).



I3RB0A143085-01

- 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.

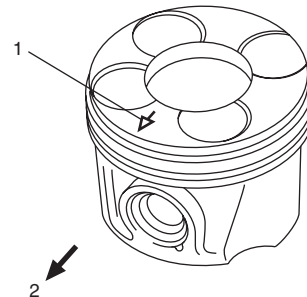
Installation

- 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).



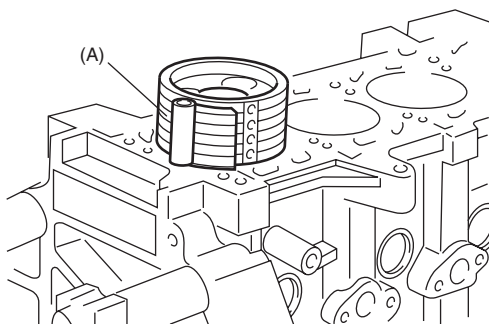
I3RB0A143086-01

- 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



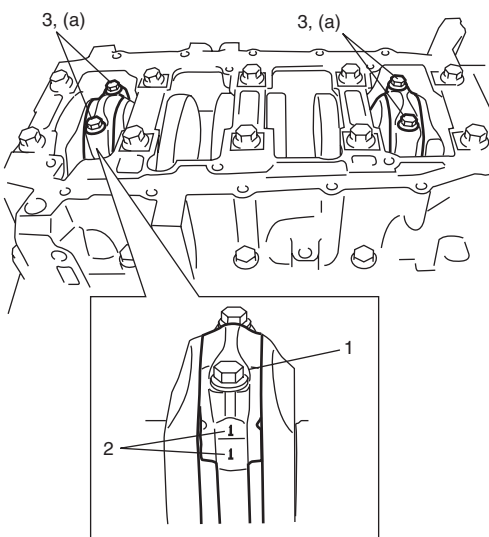
I3RB0A143087-01

- 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 kgf-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 kgf-m, 14.5 lb-ft) and 40° by the specified procedure.



I3RB0A143088-01

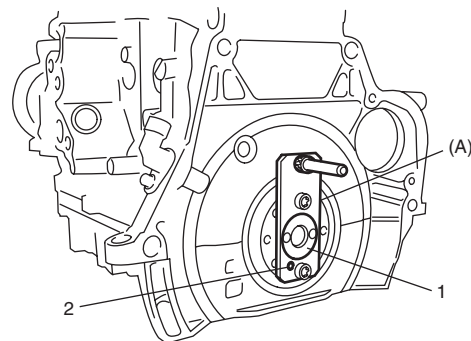
- 5) Lock crankshaft (1) using special tool.

NOTE

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

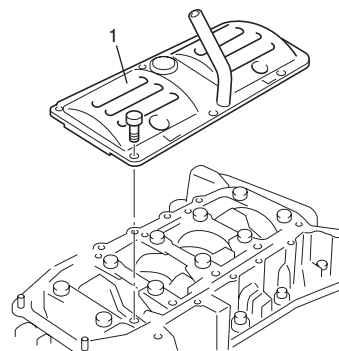
Special tool

(A): 09912-38300



I3RB0A143089-01

- 6) Install oil pan baffle plate (1) to lower crankcase.



I3RB0A143090-01

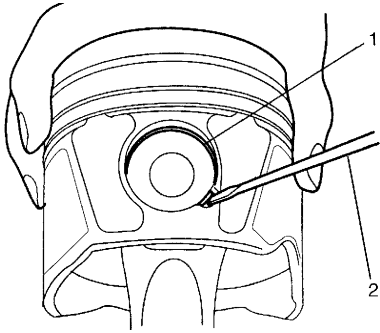
- Install cylinder head referring to "Valves and Cylinder Head Assembly Removal and Installation: ".
- Install camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation: ".
- Install timing chain and timing chain cover referring to "Timing Chain Cover and Timing Chain Removal and Installation: ".
- Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: ".

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

S5RS0B1406026

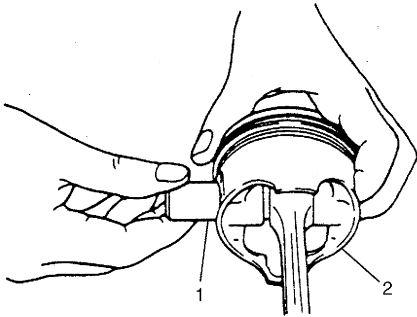
Disassembly

- 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).



I3RB0A143091-01

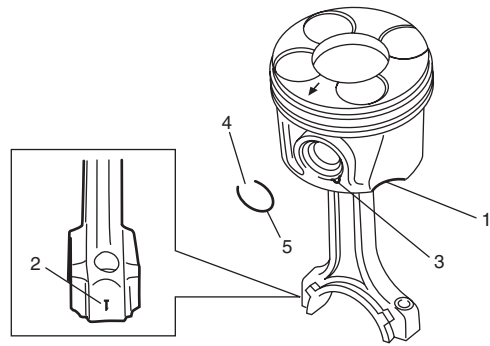
- b) Remove piston pin (1) from piston (2).



I3RB0A143092-01

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).

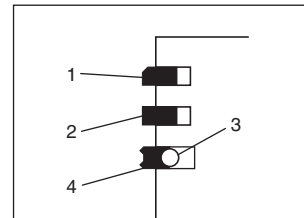
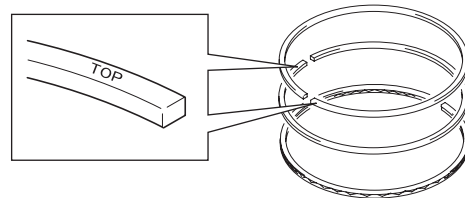


I3RB0A143093-01

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

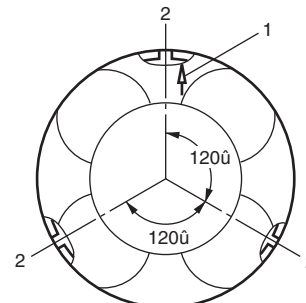
NOTE

- As indicated in the 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 the figure.
- When installing oil ring, install spiral ring (3) first and then rail (4).



I3RB0A143094-01

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



I3RB0A143095-01

1. Arrow mark	2. Ring end gap
---------------	-----------------

Pistons, Piston Rings, Connecting Rods and Cylinder Inspection

S5RS0B1406027

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 the figure.

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

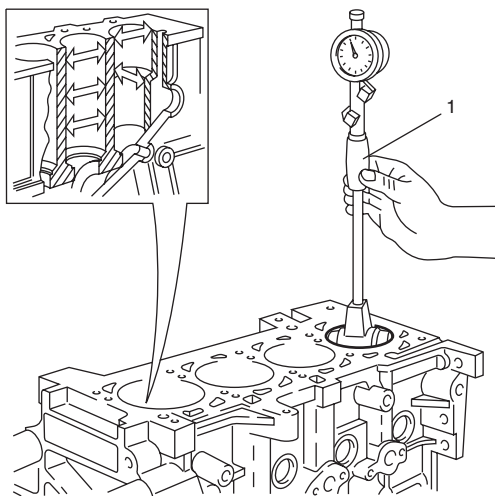
- Difference of measurements at two positions exceeds taper limit.
- Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder taper difference

Limit: 0.010 mm (0.00039 in.)

Out-of-round difference

Limit: 0.005 mm (0.00020 in.)



I3RB0A143096-01

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.

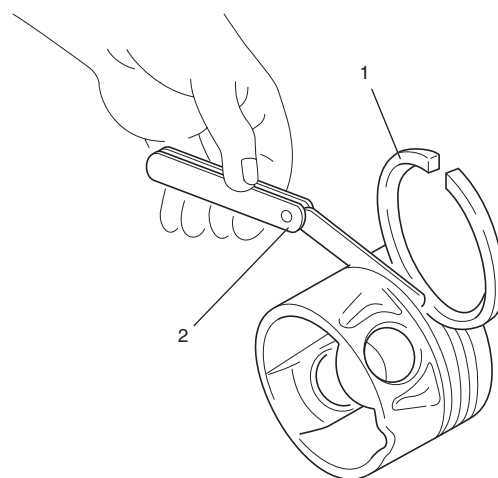
Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using thickness gauge (2). If clearance is out of specification, replace piston ring and/or piston.

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 (0.0019 – 0.00275 in.)



I3RB0A143097-01

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

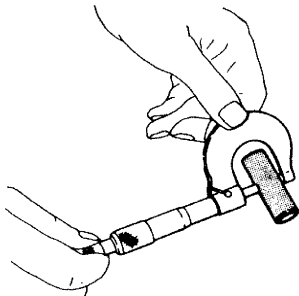
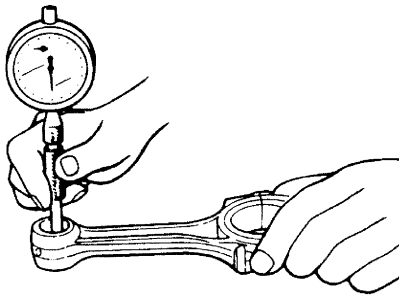
22.982 – 22.987 mm (0.90481 – 0.90500 in.)

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.)



I3RB0A143098-01

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

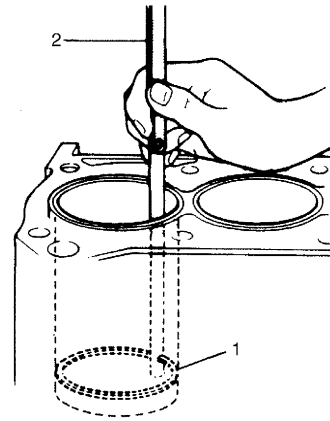
Decarbonize and clean top of cylinder bore before inserting piston ring.

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.)



I3RB0A143099-01

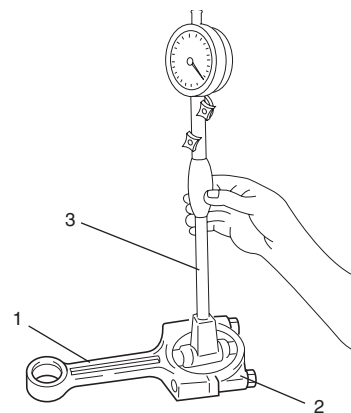
Connecting Rod

- Connecting rod big end bore and length.
 - a. Install bearing cap (2) to connecting rod (1).
 - b. 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.)

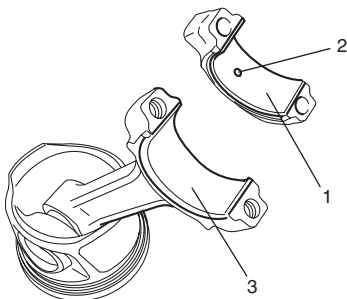


I3RB0A143100-01

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 the figure.
Install this half with oil hole to connecting rod bearing cap.
- Connecting rod side connecting rod bearing (3) does not have oil hole.



I3RB0A143101-01

Connecting rod bearing visual inspection

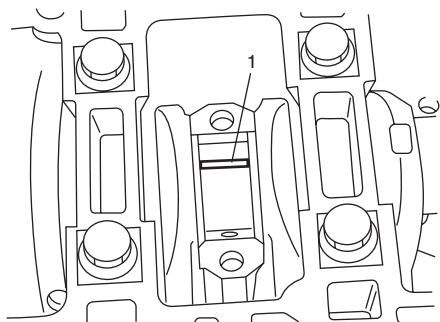
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting rod bearing clearance

NOTE

Do not rotate crankshaft while gauging plastic is installed.

- Before checking bearing clearance, clean bearing and crank pin.
- Install bearing in connecting rod and bearing cap.
- Place a piece of gaging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.

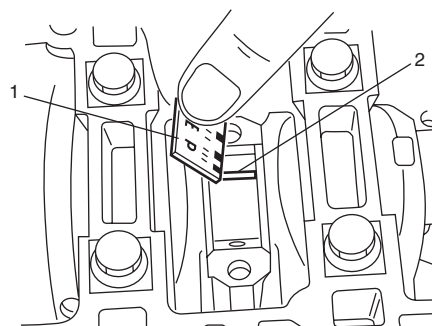


I3RB0A143102-01

- Install connecting rod and bearing cap referring to "Pistons, Piston Rings, Connecting Rods and Cylinder Components: ".
- 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.)



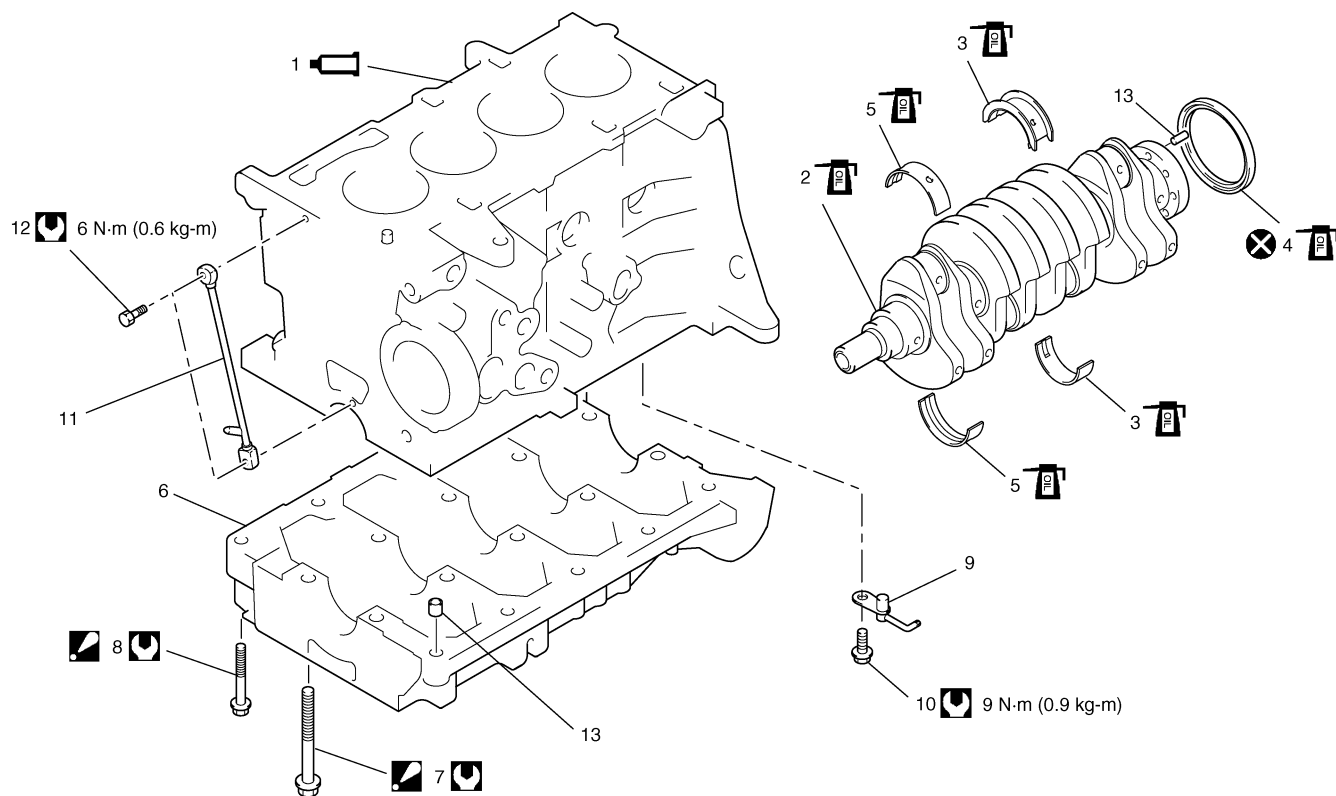
I3RB0A143103-01

Main Bearings, Crankshaft and Cylinder Block Components

S5RS0B1406028

⚠ 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.



I3RB0A143104-01

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 kgf·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 kgf·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

S5RS0B1406029

⚠ CAUTION

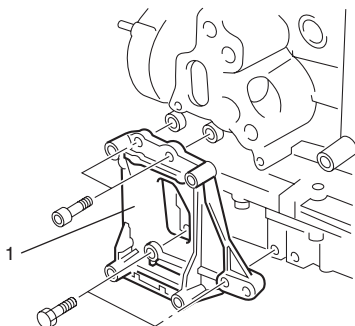
Note original position in which each main bearing were installed, and install them to original position.
If each main bearing is not installed to original position, engine will spoil its original performance.

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.

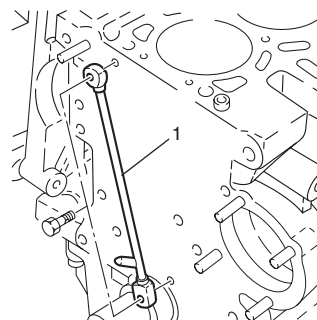
Removal

- 1) Remove engine assembly from engine compartment referring to "Engine Assembly Removal and Installation: ".
- 2) Remove cylinder head assembly referring to "Valves and Cylinder Head Assembly Removal and Installation: ".
- 3) Remove CKP sensor referring to "Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: in Section 1C".
- 4) Remove heater outlet pipe referring to "Cooling System Components: in Section 1F".
- 5) Remove oil cooler assembly referring to "Oil Cooler Removal and Installation: in Section 1E".
- 6) Remove generator referring to "Generator Dismounting and Remounting: in Section 1J".
- 7) Remove starting motor referring to "Starting Motor Dismounting and Remounting: in Section 1I".
- 8) Remove A/C compressor bracket (1), if equipped.



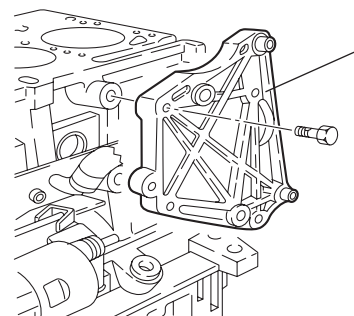
I3RB0A143105-01

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



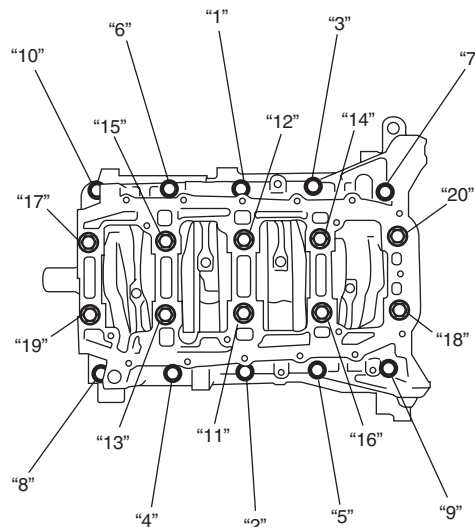
I3RB0A143106-01

- 10) Remove generator bracket (1) from cylinder block.



I3RB0A143107-01

- 11) Remove crank ventilation cover from cylinder block referring to "Oil Separator and Crankcase Ventilation Cover Removal and Installation: in Section 1B".
- 12) Remove piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation: "
- 13) Loosen crankcase bolt (M10) and crankcase bolt (M8) in numerical order as shown in the figure a little at a time, and remove them.

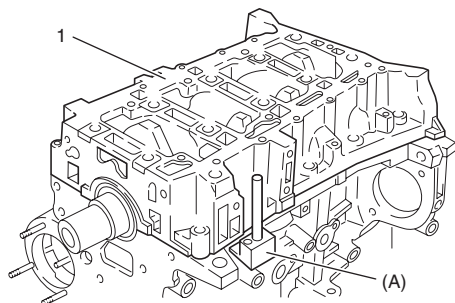


I3RB0A143108-01

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

Special tool

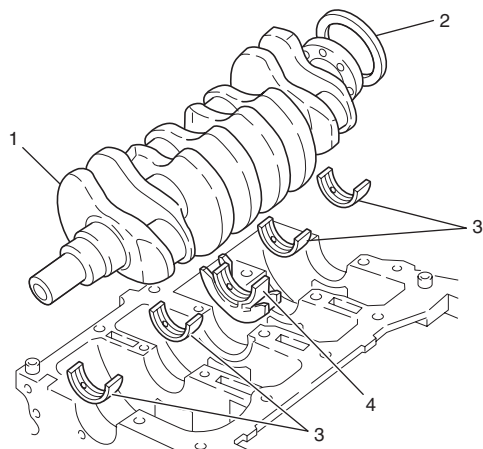
(A): 09921-96510



I3RB0A143109-01

- 15) Remove crankshaft (1) and flywheel side crankshaft oil seal (2) from cylinder block.

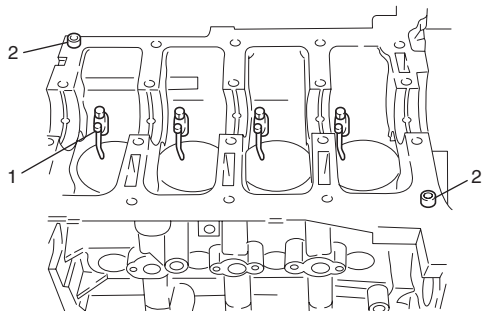
- 16) Remove main bearings (3) and main bearing (with thrust bearing) (4) from cylinder block and lower crankcase.



I3RB0A143110-01

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

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



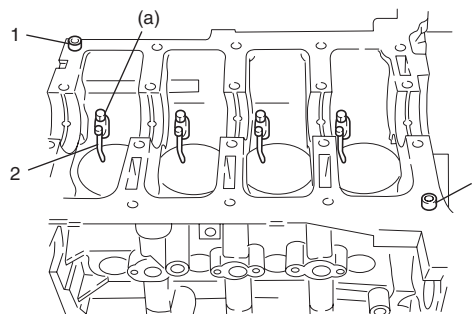
I3RB0A143111-01

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 kgf-m, 6.5 lb-ft)



I3RB0A143112-01

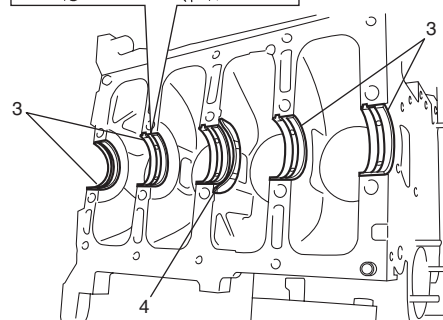
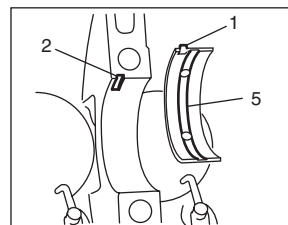
- 3) Install main bearings (3) and main bearings (with thrust bearing) (4) to cylinder block and lower crankcase aligning tab (1) with gap (2).

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.

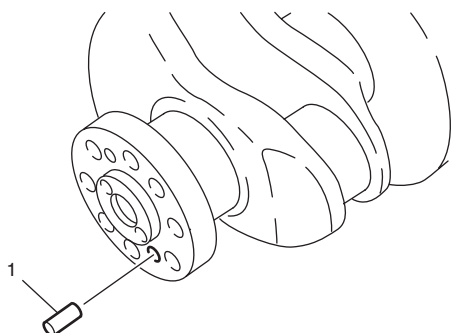


I3RB0A143113-01

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

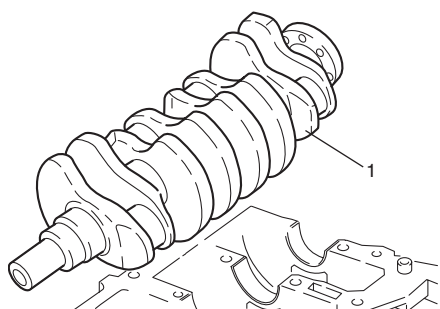
NOTE

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



I3RB0A143114-01

- 5) Install crankshaft (1) to cylinder block.

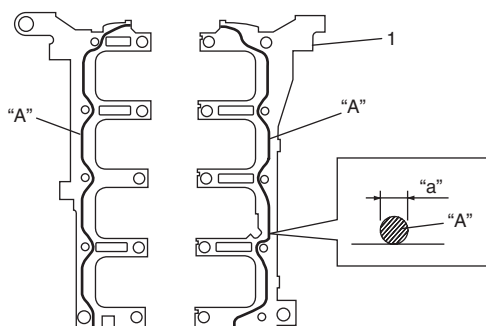


I3RB0A143115-01

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

“A”: Loctite 5900® (Loctite 5900®)

- 7) Install lower crankcase to cylinder block.



I3RB0A143116-01

“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 the figure in this procedure.

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

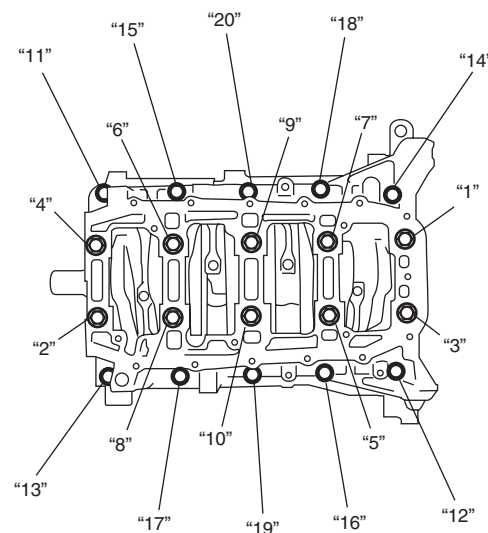
Tightening torque

Crankcase bolt (M10): Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 80° by the specified procedure.

Crankcase bolt (M8): Tighten 30 N·m (3.0 kgf-m, 22.0 lb-ft) by the specified procedure

NOTE

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

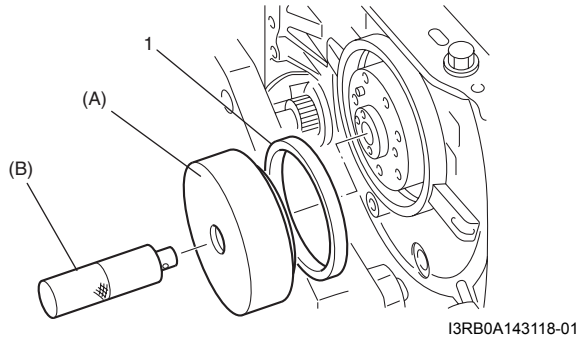


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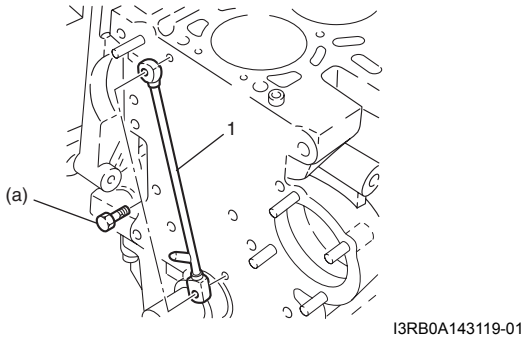
- 9) Using special tools, install flywheel side crankshaft oil seal (1) as follows.

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).

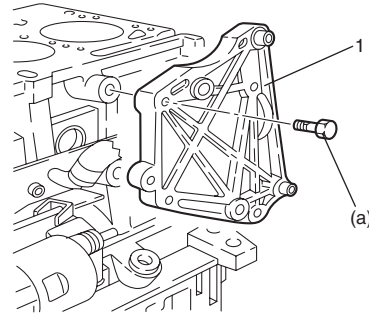


- 10) Install timing chain oil jet (1) to cylinder block.

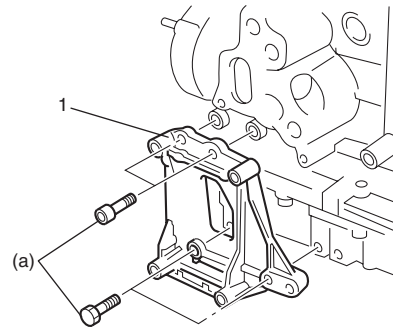
Tightening torque**Oil jet union bolt (a): 6 N·m (0.6 kgf-m, 4.5 lb-ft)**

- 11) Install piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation: ".
- 12) Install crank ventilation cover to cylinder block referring to "Oil Separator and Crankcase Ventilation Cover Removal and Installation: in Section 1B".

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

Tightening torque**Generator bracket bolt (a): 25 N·m (2.5 kgf-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 kgf-m, 14.5 lb-ft)**

- 15) Install starting motor referring to "Starting Motor Dismounting and Remounting: in Section 1I".
- 16) Install generator referring to "Generator Dismounting and Remounting: in Section 1J".
- 17) Install oil cooler assembly referring to "Oil Cooler Removal and Installation: in Section 1E".
- 18) Install heater outlet pipe referring to "Cooling System Components: in Section 1F".
- 19) Install CKP sensor referring to "Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: in Section 1C".
- 20) Install cylinder head assembly referring to "Valves and Cylinder Head Assembly Removal and Installation: ".
- 21) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: ".

Main Bearings, Crankshaft and Cylinder Block Inspection

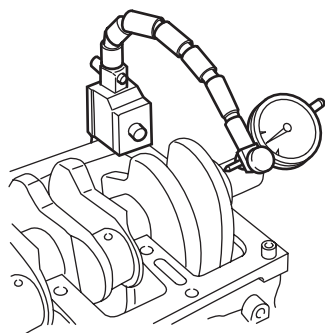
S5RS0B1406030

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: ".
- 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.)

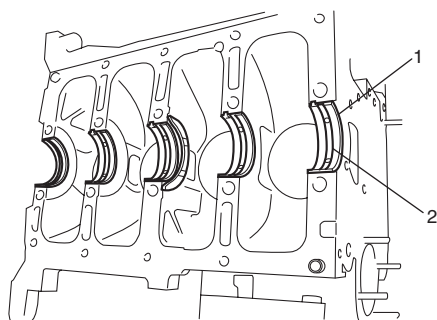


I3RB0A143122-01

Main Bearing

General information

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



I3RB0A143123-01

Visual inspection

Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves.

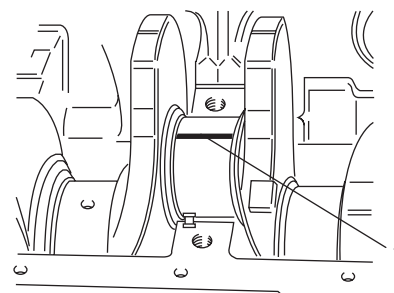
Never replace either half without replacing the other half.

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: "
- 3) Place a piece of gauging plastic (1) to full width of crankshaft journal as contacted by bearing (parallel to crankshaft), avoiding oil hole.

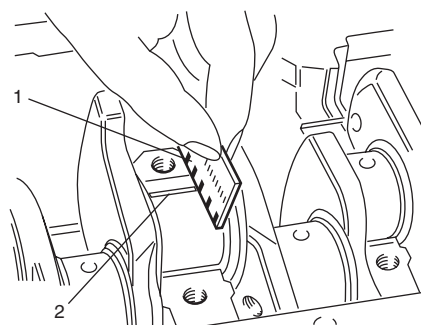


I3RB0A143124-01

- 4) Install lower crankcase referring to "Main Bearings, Crankshaft and Cylinder Block Removal and Installation: ".
- 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.)

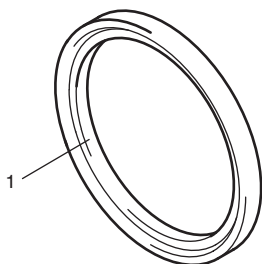


I3RB0A143125-01

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.



I3RB0A143126-01

Specifications**Tightening Torque Specifications**

S5RS0B1407001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Common rail bracket bolt	25	2.5	18.0	🔧 / 🔧
Intercooler hose clamp	4	0.4	3.0	🔧
Oil return pipe bolt	9	0.9	6.5	🔧
Catalytic converter bolt	25	2.5	18.0	🔧
Turbocharger nut	25	2.5	18.0	🔧
Catalytic converter mounting bolt	25	2.5	18.0	🔧
Exhaust manifold cover nut	9	0.9	7.0	🔧
Oil return pipe bolt	9	0.9	7.0	🔧
Lubrication pipe union bolt	12	1.2	9.0	🔧
Air cleaner outlet hose clamp	3	0.3	2.5	🔧
Engine cover bolt	8	0.8	6.0	🔧 / 🔧 / 🔧
Intake manifold bolt	25	2.5	18.0	🔧
Oil level gauge guide mounting bolt	9	0.9	6.5	🔧
Engine left mounting bracket nut	55	5.5	40.0	🔧
Engine right mounting bracket bolt	55	5.5	40.0	🔧
Engine rear mounting bush bolt	55	5.5	40.0	🔧
Chain guide mounting bolt	9	0.9	6.5	🔧
Chain tensioner mounting bolt	9	0.9	6.5	🔧
Chain tensioner adjuster bolt	Tighten 9 N·m (0.9 kgf·m, 6.5 lb·ft) by the specified procedure.			🔧
Timing chain cover bolt	9.0	0.9	6.5	🔧
Timing chain cover nut	9.0	0.9	6.5	🔧
Flywheel bolts	Tighten 44 N·m (4.4 kgf·m, 32.0 lb·ft) by the specified procedure.			🔧
Crankshaft pulley flange bolt	230	23.0	166.5	🔧
Crankshaft pulley bolt	25	2.5	18.0	🔧
Engine right mounting bracket No.2 bolt	60	6.0	43.5	🔧
Ventilation connector bolt	10	1.0	7.5	🔧
Camshaft housing bolt	18 N·m (1.8 kgf·m, 13.0 lb·ft) by the specified procedure.			🔧
Camshaft housing stud bolt	25 N·m (2.5 kgf·m, 18.0 lb·ft) by the specified procedure.			🔧
Camshaft timing sprocket bolt	120 N·m (12.0 kgf·m, 87.0 lb·ft) by the specified procedure.			🔧
Camshaft gear bolt	120 N·m (12.0 kgf·m, 87.0 lb·ft) by the specified procedure.			🔧
Cylinder head bolt	Tighten 20 N·m (2.0 kgf·m, 14.5 lb·ft), 40 N·m (4.0 kgf·m, 29.0 lb·ft), 90° and 90° by the specified procedure.			🔧

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Connecting rod bearing cap bolt	Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 40° by the specified procedure.			☞
Oil jet bolt	9	0.9	6.5	☞
Crankcase bolt	Tighten 20 N·m (2.0 kgf-m, 14.5 lb-ft) and 80° by the specified procedure.			☞
Crankcase bolt	Tighten 30 N·m (3.0 kgf-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	☞

NOTE

The specified tightening torque is also described in the following.

“Air Cleaner Components: ”

“Intercooler Components: ”

“Turbocharger Components: ”

“Intake Manifold Components: ”

“Engine Mounting Components: ”

“Timing Chain Cover and Timing Chain Components: ”

“Camshaft Housing Components: ”

“Valves and Cylinder Head Components: ”

“Pistons, Piston Rings, Connecting Rods and Cylinder Components: ”

“Main Bearings, Crankshaft and Cylinder Block Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B1408001

Material	SUZUKI recommended product or Specification	Note
Loctite 5900®	Loctite 5900	—
Loctite omnifit 100M spezial®	Loctite omnifit 100M spezial	—

NOTE

Required service material is also described in the following.

“Timing Chain Cover and Timing Chain Components: ”

“Camshaft Housing Components: ”

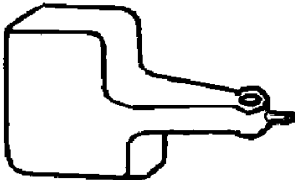
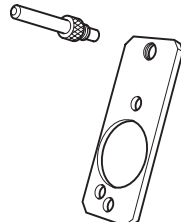
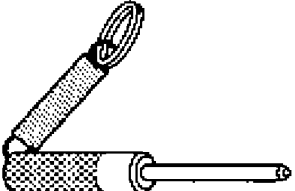
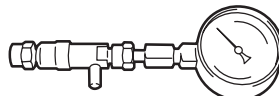
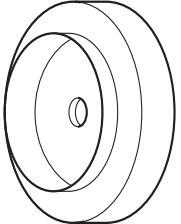
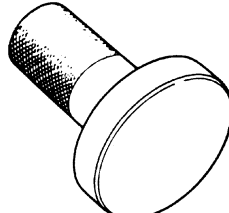
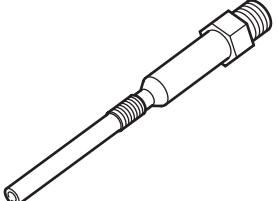
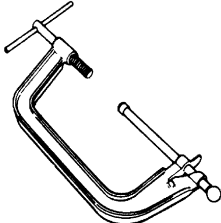
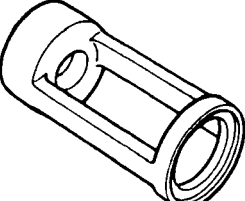
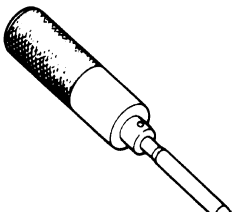
“Valves and Cylinder Head Components: ”

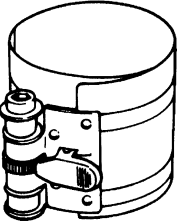
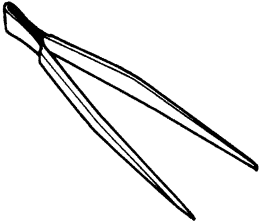
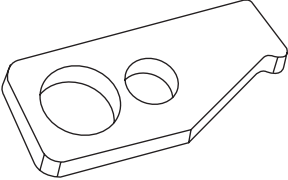
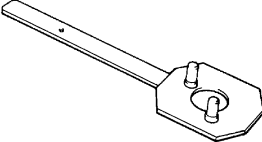
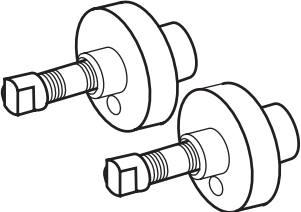
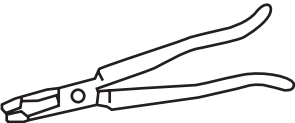
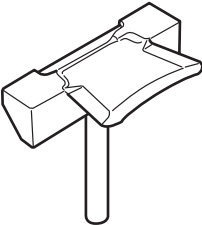
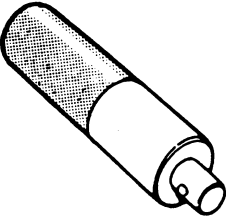
“Pistons, Piston Rings, Connecting Rods and Cylinder Components: ”

“Main Bearings, Crankshaft and Cylinder Block Components: ”

Special Tool

S5RS0B1408002

09910-26510 Dial gauge support OUT 0000005  /  / 		09912-38300 Crankshaft locking tool  /  /  /  /  /  / 	
09912-46310 TDP definition pin EN-46785 		09912-57821 Compression gauge 	
09913-58620 Oil seal installer 		09913-75510 Bearing installer 	
09915-68610 Dummy heater plug 		09916-14510 Valve lifter  / 	
09916-14521 Valve spring compressor attachment  / 		09916-58210 Valve guide installer handle 	

09916-77310 Piston ring compressor (50-125 mm) 🔧 	09916-84511 Forceps 🔧 / 🔧 
09916-98610 Flywheel locking tool KM-652 🔧 / 🔧 	09917-68221 Camshaft pulley holder 🔧 / 🔧 
09917-68610 Camshaft locking tool EN-46781 🔧 / 🔧 / 🔧 / 🔧 / 🔧 / 🔧 	09917-98221 Valve guide stem attachment 🔧 
09917-98610 Valve stem seal pliers KM-840 🔧 	09921-96510 Oil pan seal cutter 🔧 
09924-74510 Bearing and oil seal handle 🔧 	

Engine Lubrication System

Diagnostic Information and Procedures

Oil Pressure Check

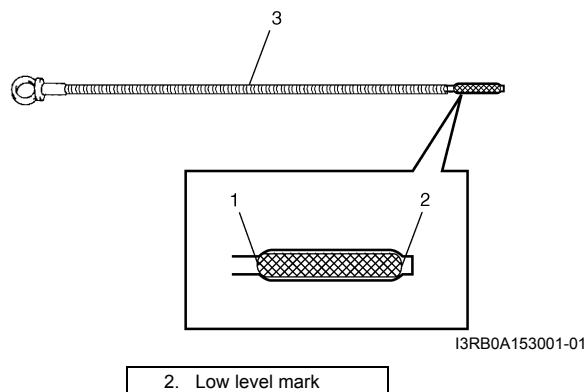
S5RS0B1504001

⚠ 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 Filter Change: in Section 0B".
- Oil leaks.
If leak is found, repair it.



2) Disconnect oil pressure switch referring to "Oil Pressure Switch Removal and Installation: ".

3) Install special tools to vacated threaded hole.

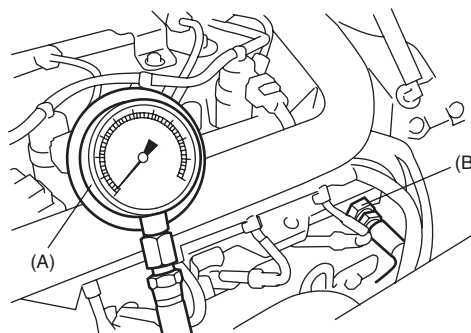
⚠ CAUTION

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 1C".

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: ".

8) Start engine and check oil pressure switch for oil leakage.
If oil leakage is found, repair it.

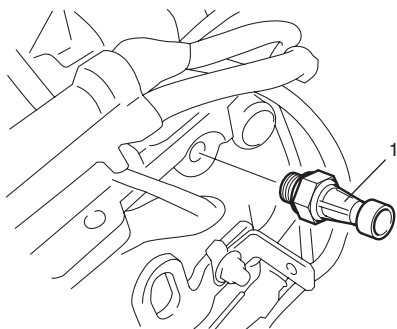
Repair Instructions

Oil Pressure Switch Removal and Installation

S5RS0B1506001

Removal

- 1) Remove engine cover.
- 2) Disconnect oil pressure switch connector.
- 3) Remove oil pressure switch (1) and gasket (2) from cylinder head.



I5RS0B150002-01

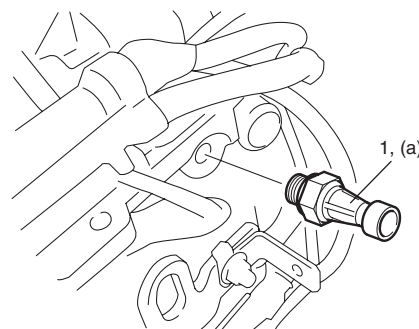
Installation

Reverse removal procedure for installation noting the following.

- Tighten oil pressure switch (1) to specified torque.

Tightening torque

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



I5RS0B150003-01

- Install engine cover.

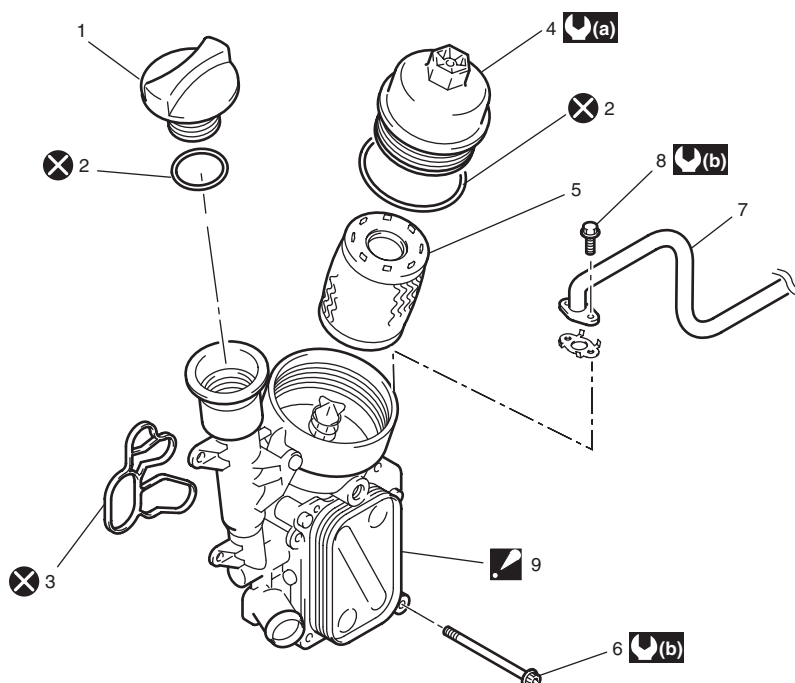
Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

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

Oil Cooler Components

S5RS0B1506002



I5RS0B150004-01

1. Filler cap	4. Oil filter housing cover	7. Coolant feed pipe	: 25 N·m (2.5 kg-m, 18.0 lb-ft)
2. O-ring	5. Oil filter	8. Coolant feed pipe bolt	: 9 N·m (0.9 kg-m, 6.5 lb-ft)
3. Gasket	6. Oil cooler bolt	9. Oil cooler assembly :Never disassemble oil cooler assembly.	: Do not reuse.

Oil Cooler Removal and Installation

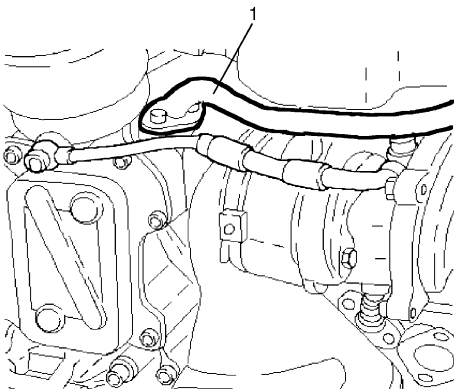
S5RS0B1506003

⚠ CAUTION

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

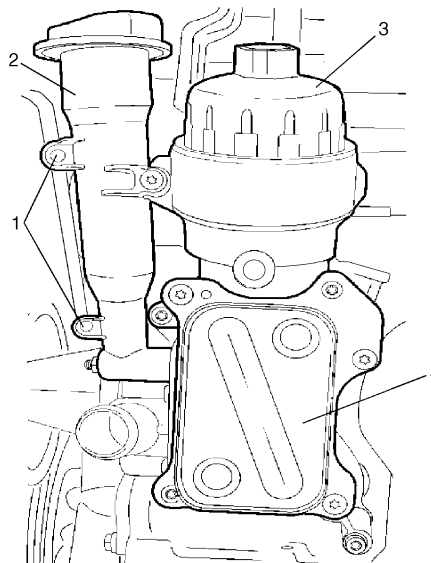
Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Drain engine coolant referring to “Cooling System Flush and Refill: in Section 1F”.
- 3) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation: in Section 1D”.
- 4) Remove intercooler referring to “Intercooler Removal and Installation: in Section 1D”.
- 5) Remove lubrication pipe referring to “Turbocharger Removal and Installation: in Section 1D”.
- 6) Remove coolant feed pipe (1) and radiator outlet hose.



I3RM0B152005-01

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



I5RS0B150005-01

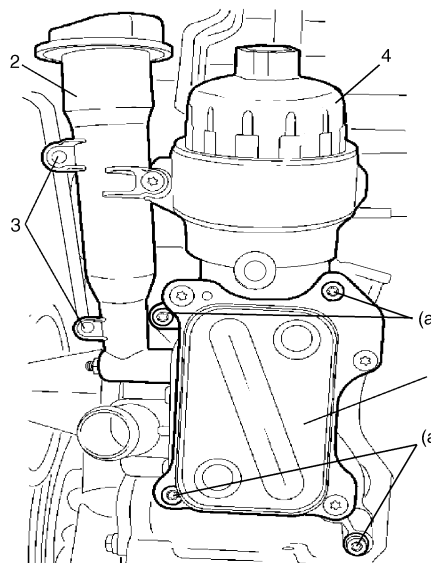
Installation

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

Tightening torque

Oil cooler bolt (a): 9 N·m (0.9 kgf-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 Change: in Section 0B”.

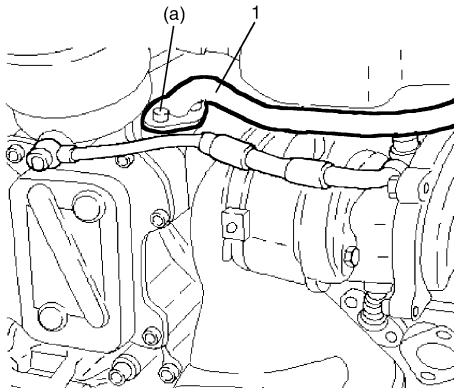


I5RS0B150006-01

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

Tightening torque

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

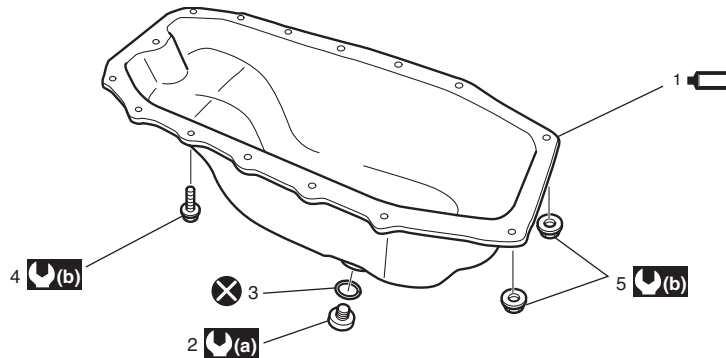


I3RM0B152018-01

- 5) Install lubrication pipe referring to "Turbocharger Removal and Installation: in Section 1D".
- 6) Install intercooler referring to "Intercooler Removal and Installation: in Section 1D".
- 7) Install air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 8) Refill cooling system referring to "Cooling System Flush and Refill: in Section 1F".
- 9) Connect negative (–) cable at battery.
- 10) Check to make sure that there is no oil leakage and coolant leakage at each connection.

Oil Pan Components

S5RS0B1506004



I5RS0B150007-01

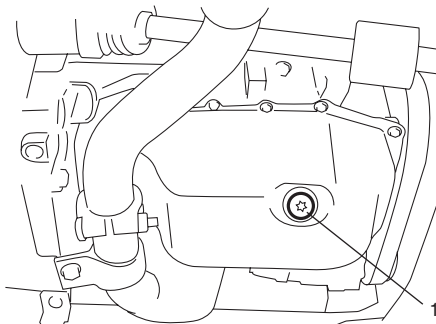
	1. Oil pan : Apply locktite 5900 to mating surface.	4. Oil pan bolt	 : 9 N·m (0.9 kg-m, 6.5 lb-ft)
	2. Drain plug	5. Oil pan nut	 : Do not reuse.
	3. O-ring	 : 20 N·m (2.0 kg-m, 14.5 lb-ft)	

Oil Pan Removal and Installation

S5RS0B1506005

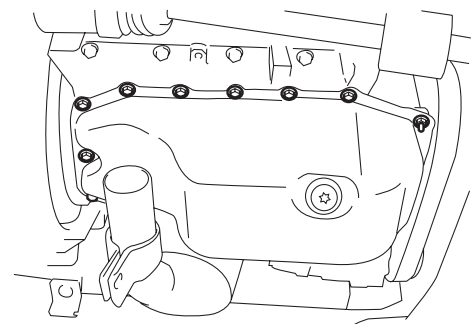
Removal

- 1) Remove oil level gauge.
- 2) Hoist vehicle.
- 3) Drain engine oil by removing drain plug (1).



I5RS0B150008-01

- 4) Remove exhaust No.1 pipe referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
- 5) Remove transaxle stiffener referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
- 6) Remove oil pan bolts and nuts.



I5RS0B150009-01

1E-5 Engine Lubrication System:

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

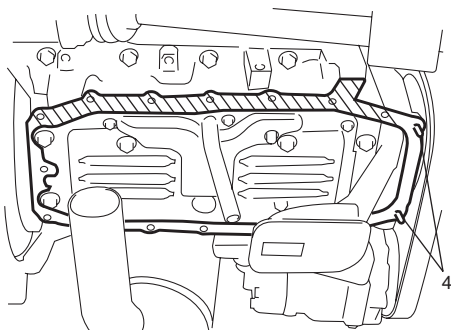
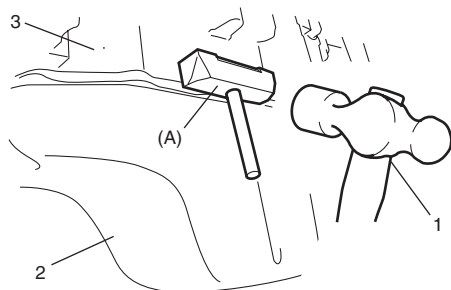
Special tool

(A): 09921-96510

NOTE

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

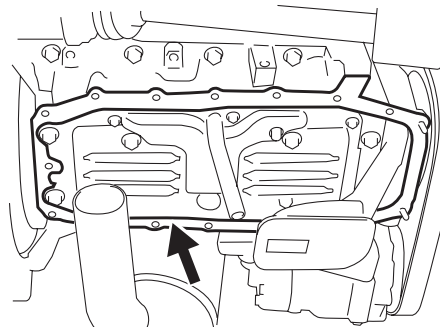
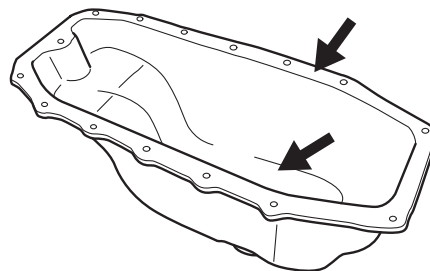
- 8) Remove oil pan (2) from lower crankcase (3).



I5RS0B150010-01

Installation

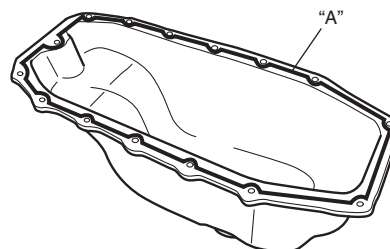
- 1) Clean mating surfaces of oil pan and lower crankcase.



I5RS0B150011-01

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

“A”: Loctite 5900® (Loctite 5900®)



I5RS0B150012-01

- 3) 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.

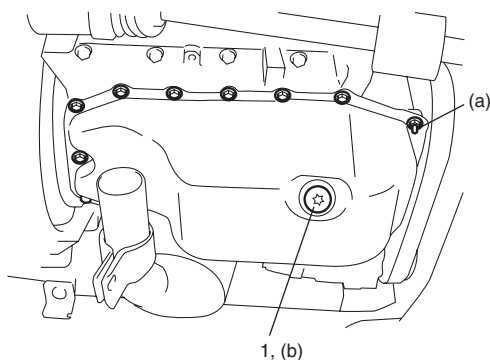
Tightening torque

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

- 4) 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 kgf-m, 14.5 lb-ft)



I5RS0B150013-01

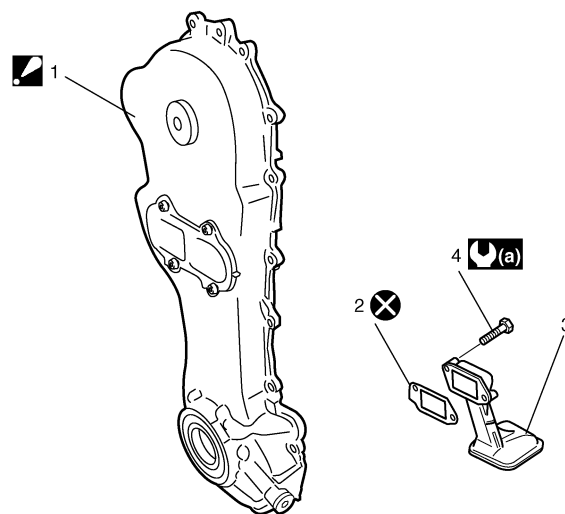
- 5) Install transaxle stiffener referring to “Manual Transaxle Unit Dismounting and Remounting: in Section 5B”.
- 6) Install exhaust No.1 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: in Section 1K”.
- 7) Connect oil level switch connector.
- 8) Install oil level gauge.
- 9) Refill engine with engine oil referring to “Engine Oil and Filter Change: in Section 0B”.
- 10) Check to make sure that there is no engine oil leakage and exhaust gas leakage at each connection.

Oil Pump / Oil Pump Strainer Components

S5RS0B1506008

⚠ 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.



I5RS0B150014-02

1. Timing chain cover : Oil pump is incorporated with timing chain cover.	4. Oil strainer bolt
2. Oil pump strainer gasket	⚙(a) : 6 N·m (0.6 kg-m, 4.5 lb-ft)
3. Oil pump strainer	⊗ : Do not reuse.

Oil Pump / Oil Pump Strainer Removal and Installation

S5RS0B1506009

⚠ CAUTION

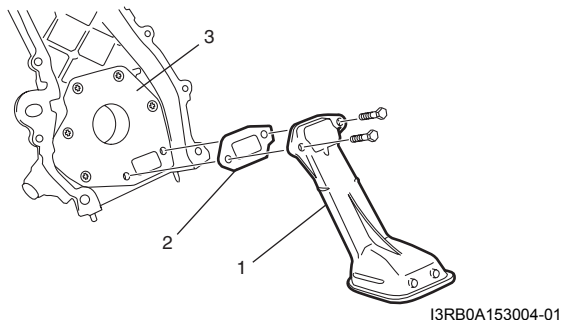
Do not disassemble oil pump from timing chain cover. Disassembly will spoil its original function. If any malfunction is found in oil pump, replace timing chain cover.

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



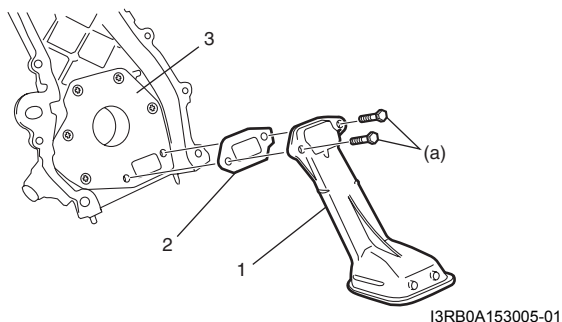
Installation

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

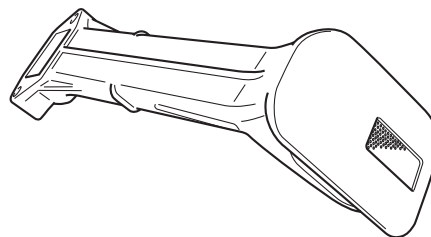
Oil strainer bolt (a): 6 N·m (0.6 kgf-m, 4.5 lb-ft)



Oil Pump Strainer Cleaning

S5RS0B1506010

Clean oil pump strainer screen.



Oil Pump Inspection

S5RS0B1506011

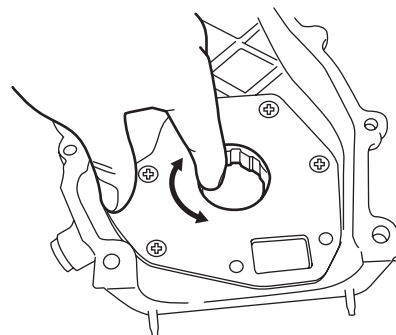
Oil Seal

Refer to “Timing Chain Cover and Timing Chain Inspection: in Section 1D”.

Oil Pump

Check rotor turn smoothly by hand.

If rotors is not smoothly, replace timing chain cover.



Specifications

Tightening Torque Specifications

S5RS0B1507001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Oil pressure switch	32	3.2	23.5	🔧
Engine cover bolt	8	0.8	6.0	🔧
Oil cooler bolt	9	0.9	7.0	🔧
Coolant feed pipe bolt	9	0.9	7.0	🔧
Oil pan bolt and nut	9	0.9	7.0	🔧
Drain plug	20	2.0	14.5	🔧
Oil strainer bolt	6	0.6	4.5	🔧

NOTE

The specified tightening torque is also described in the following.

“Oil Cooler Components: ”

“Oil Pan Components: ”

“Oil Pump / Oil Pump Strainer Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B1508001

Material	SUZUKI recommended product or Specification		Note
Loctite 5900®	Loctite 5900®	—	🔧

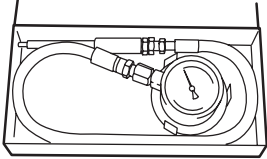
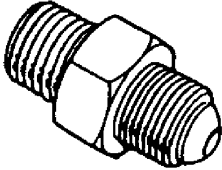
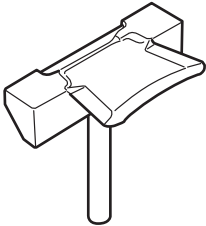
NOTE

Required service material is also described in the following.

“Oil Pan Components: ”

Special Tool

S5RS0B1508002

09915-77311 Oil pressure gauge 	09919-46010 Fuel pressure hose attachment 
09921-96510 Oil pan seal cutter 	

Engine Cooling System

General Description

Cooling System Description

S5RS0B1601001

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

Coolant Description

S5RS0B1601002

⚠ 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.
- Check to make sure that engine coolant temperature is cold before removing any part of cooling system.
- Also be sure to disconnect negative cable from battery terminal before removing any part.

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).

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.

Anti-freeze proportioning table

Freezing temperature	$^{\circ}\text{C}$	-36
	$^{\circ}\text{F}$	-33
Anti-freeze / Anti-corrosion coolant concentration	%	50
Ratio of compound to cooling water	ltr.	2.95/2.95
	US pt.	6.23/6.23
	Imp pt.	5.19/5.19

Coolant capacity

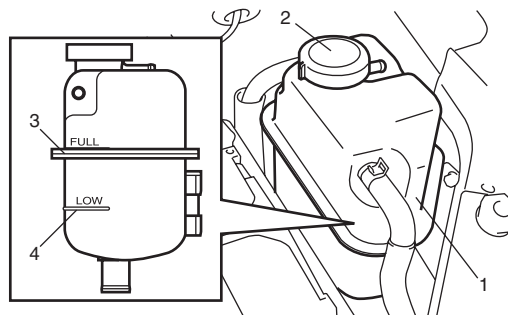
Engine, radiator, heater and degassing tank etc.: 5.9 liters (12.47/10.38 US/Imp pt.)

Coolant Degassing Tank Description

S5RS0B1601003

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.

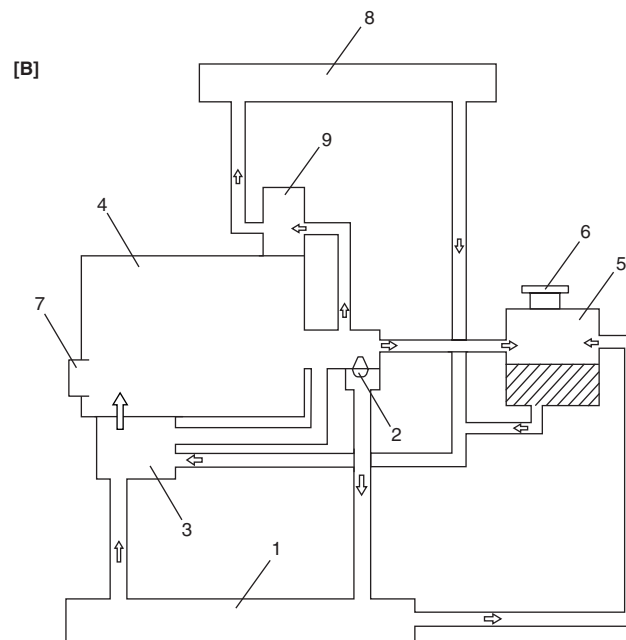
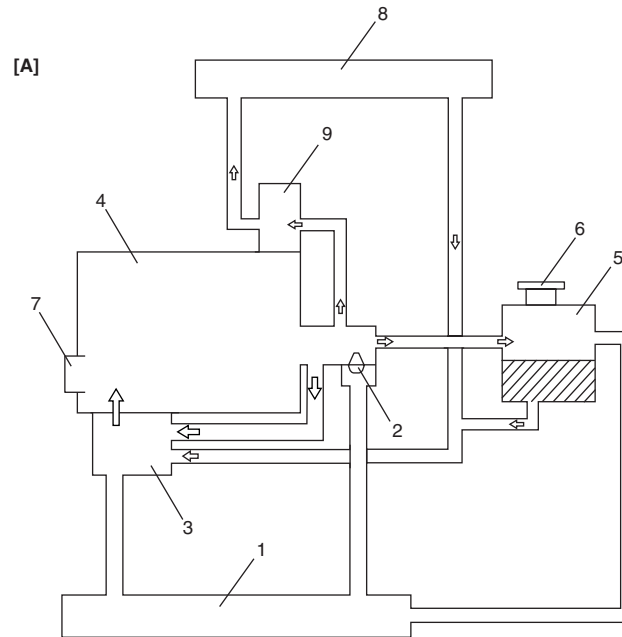


I5RS0B160001-01

Schematic and Routing Diagram

Coolant Circulation

S5RS0B1602001



I3RM0B162002-01

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

Diagnostic Information and Procedures

Engine Cooling Symptom Diagnosis

S5RS0B1604001

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

Radiator Fan Control System Inspection

S5RS0B1604002

▲ WARNING

Keep hand, 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.

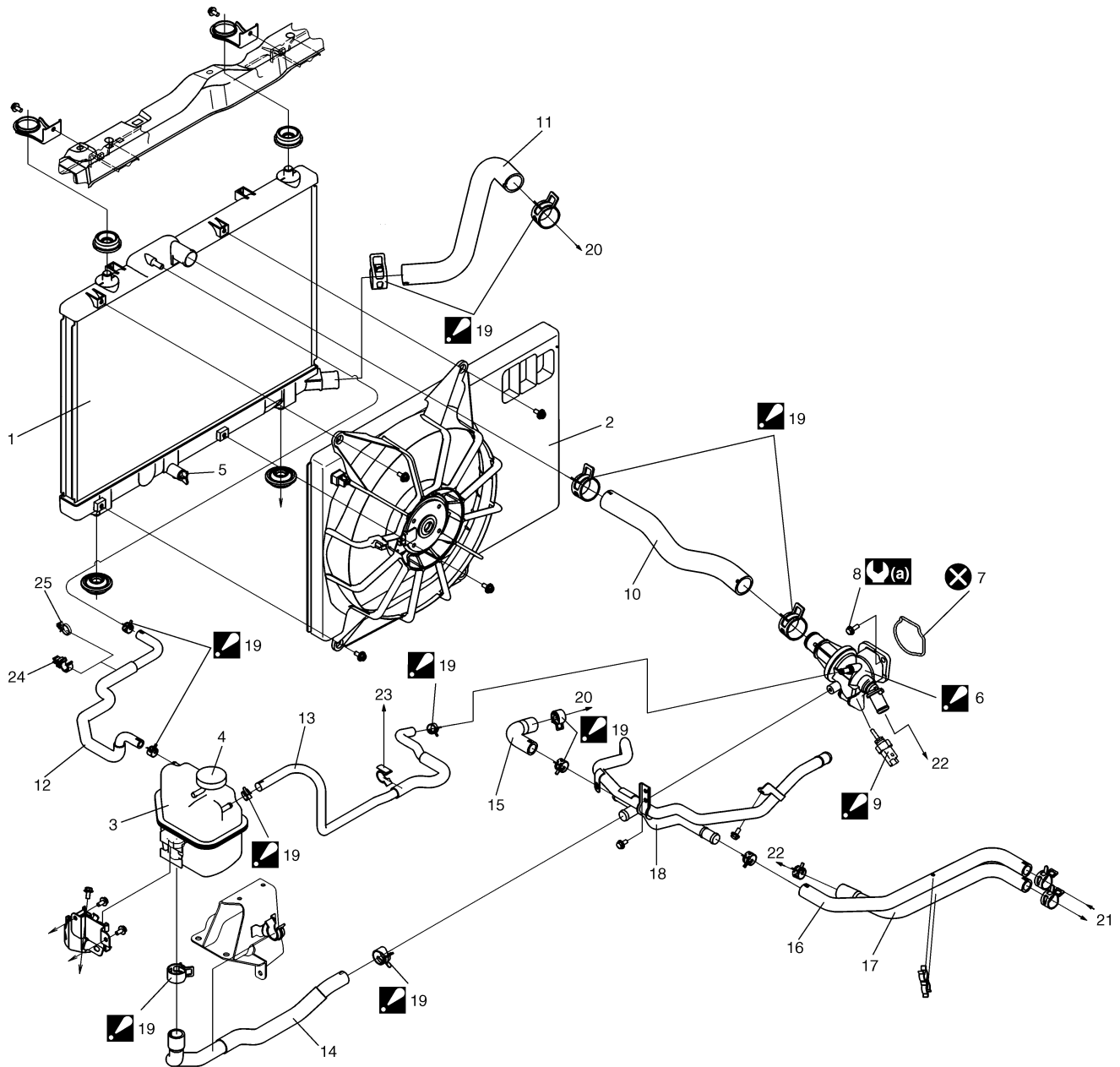
Check system for operation referring to "C-32, Fan Circuit: in Section 1A".

If radiator fan fails to operate properly, check relay, radiator fan and electrical circuit.

Repair Instructions

Cooling System Components

S5RS0B1606001



I5RS0B160002-01

1. Radiator	10. Radiator inlet hose	19. Hose clip : Be sure to position clip in specified direction as shown in the figure.
2. Radiator cooling fan assembly	11. Radiator outlet hose	20. To engine side
3. Degassing tank	12. Radiator to degassing tank hose	21. To heater core
4. Degassing tank cap	13. Water engine outlet hose	22. To EGR cooler
5. Drain plug	14. Degassing tank outlet hose	23. To air cleaner assembly
6. Thermostat case assembly :Do not disassemble.	15. Heater outlet No.2 hose	24. Hose clamp (for LH steering vehicle)
7. O-ring	16. Heater outlet No.1 hose	25. Hose clamp (for RH steering vehicle)
8. Thermostat case bolt	17. Heater inlet hose	(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
9. ECT sensor :For detail of servicing, refer to "Engine Coolant Temperature (ECT) Sensor Removal and Installation: in Section 1C" and "C-15, Engine Coolant Temperature Sensor Circuit: in Section 1A".	18. Heater outlet pipe	⊗ : Do not reuse.

Coolant Level Check

S5RS0B1606002

⚠ 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.

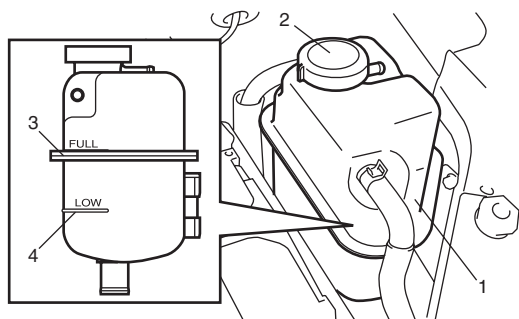
When engine is cool, check coolant level in degassing tank.

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 (4) and add recommended coolant to tank to bring coolant level up to FULL mark. Then, install degassing tank cap turning it clockwise up to stop.

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.



I5RS0B160001-01

Engine Cooling System Inspection and Cleaning

S5RS0B1606003

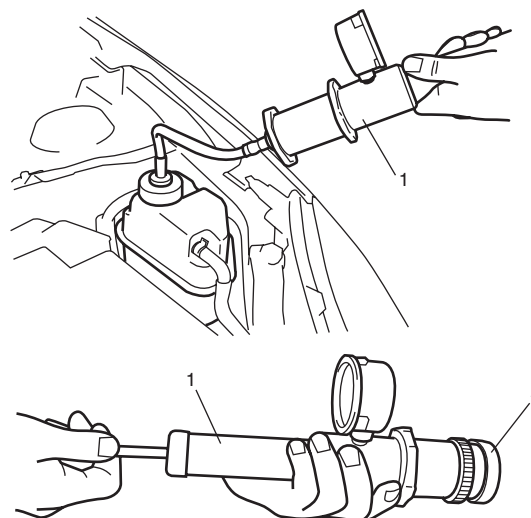
⚠ WARNING

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 a proper cap for this vehicle.

Cooling system and degassing tank cap holding pressure (for inspection)
140 kPa (1.4 kg/cm², 19.9 psi)



I5RS0B160003-01

- 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.

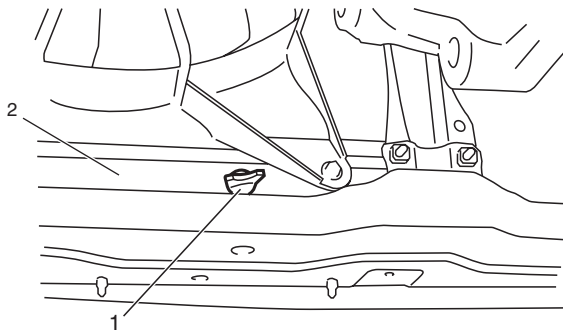
Cooling System Draining

S5RS0B1606004

▲ 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 by turning it counterclockwise slowly in order to release any pressure.
- 2) Loosen drain plug (1) on radiator (2) to drain coolant.
- 3) After draining coolant, be sure to tighten drain plug (1) securely.

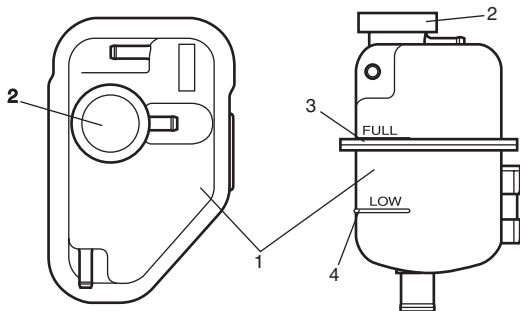


I5RS0B160004-01

Cooling System Refill

S5RS0B1606005

- 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.



I5RS0B160005-01

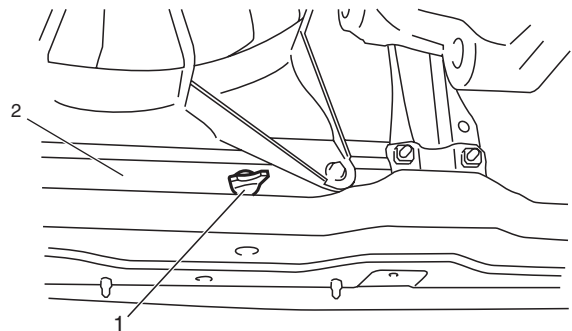
Cooling System Flush and Refill

S5RS0B1606006

▲ 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 (1) by turning it counterclockwise slowly in order to release any pressure.
- 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 radiator 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.

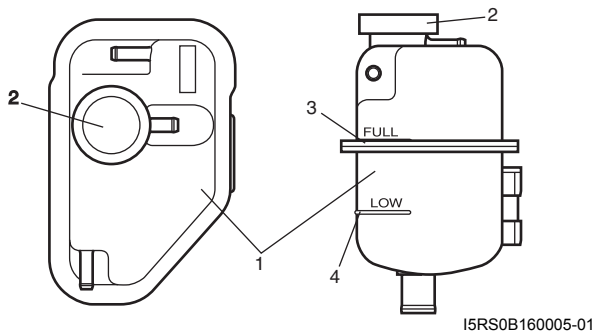


I5RS0B160004-01

2. Radiator

1F-7 Engine Cooling System:

- 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) 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.
- 9) Connect hose to thermostat case.
- 10) Run engine, with degassing tank cap (2) removed, until radiator inlet hose is hot.
- 11) 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.



Cooling Water Pipes or Hoses Removal and Installation

S5RS0B1606007

Removal

- 1) Drain coolant referring to "Cooling System Draining: ".
- 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 Components: ".
- Refill cooling system referring to "Cooling System Flush and Refill: ".

Thermostat Case Assembly Removal and Installation

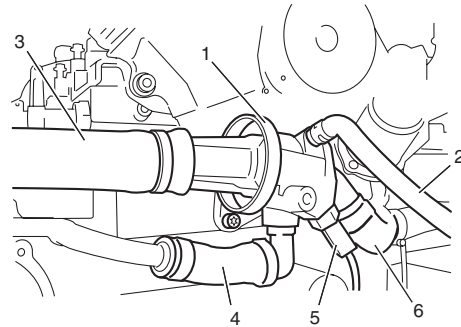
S5RS0B1606008

⚠ 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: ".
- 2) Remove air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 3) Remove heater outlet pipe referring to "Cooling System Components: ".
- 4) Disconnect engine outlet hose (2), radiator inlet hose (3), coolant feed hose (4), ECT sensor connector (5) and EGR cooler hose (6) from thermostat case.
- 5) Remove thermostat case (1).



Installation

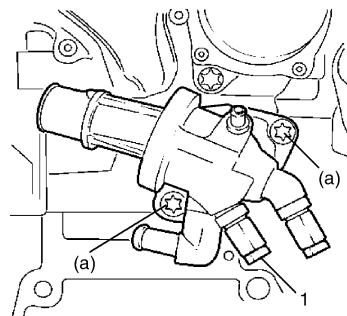
Reverse removal procedure for installation noting the following points.

- Use new O-ring when installing.
- Tighten thermostat case bolt to specified torque.

Tightening torque

Thermostat case bolt (a): 25 N·m (2.5 kgf-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 (ECT) Sensor Removal and Installation: in Section 1C".



- Refill cooling system referring to "Cooling System Flush and Refill: ".
- Verify that there is no coolant leakage at each connection.

Radiator Cooling Fan Assembly On-Vehicle Inspection

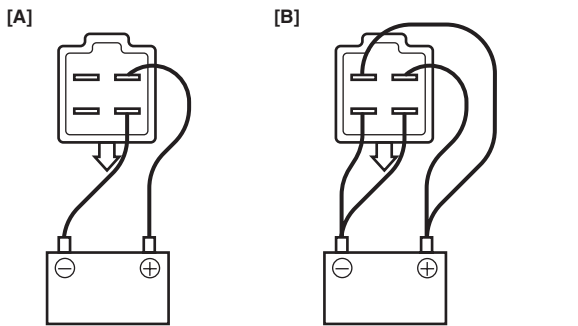
S5RS0B1606009

- 1) Check low speed operation of radiator cooling fan as follows.
 - a) Connect battery to fan motor coupler as shown in the figure.
 - b) Check that radiator cooling fan rotates smoothly. If any abnormality is found, replace fan assembly.
- 2) Check high speed operation of radiator cooling fan as follows.
 - a) Connect battery to fan motor coupler as shown in the figure.
 - b) Check that radiator cooling fan rotates smoothly and its rotational speed is faster than low speed operation. If any abnormality is found, replace fan assembly.

Reference: Fan motor specified current at 12 V

Low speed operation: 9.3 – 14.3 A

High speed operation: 13.3 – 18.3 A



I5RS0B160007-01

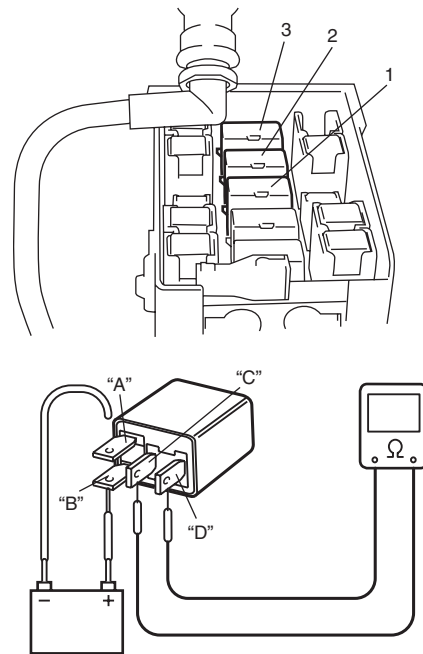
[A]: Low speed operation

[B]: High speed operation

Radiator Cooling Fan Relay Inspection

S5RS0B1606018

- 1) Disconnect negative (–) and positive (+) cable at battery.
- 2) Remove battery.
- 3) Remove radiator cooling fan relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
- 4) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
- 5) Connect battery positive (+) terminal to terminal “B” of relay.
- 6) Connect battery negative (–) terminal “A” of relay.
- 7) Check continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.



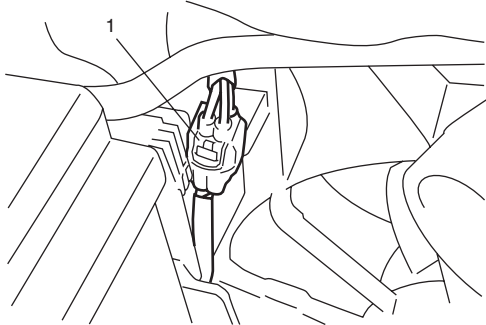
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Radiator Cooling Fan Assembly Removal and Installation

S5RS0B1606010

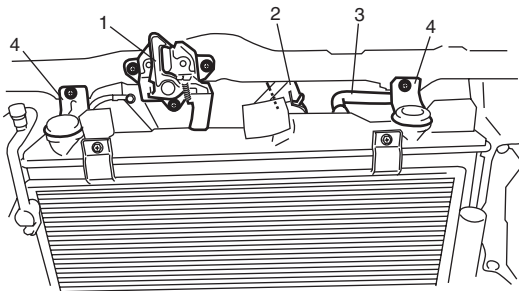
Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Drain coolant referring to “Cooling System Draining: ”.
- 3) Remove air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation: in Section 1D”.
- 4) Disconnect connector (1) of cooling fan motor.



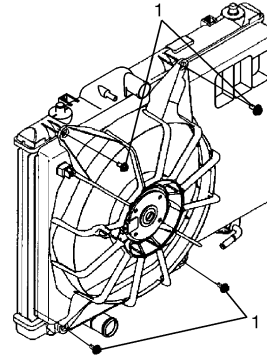
I5RS0B160009-01

- 5) Remove front bumper, front bumper upper absorber and upper member referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
- 6) Remove intercooler referring to “Intercooler Removal and Installation: in Section 1D”.
- 7) With wire connected, detach hood latch (1) to engine room upper member.
- 8) Remove radiator inlet hose (2) and reservoir hose (3).
- 9) Remove radiator brackets (4).



I5RS0B160010-01

- 10) Remove cooling fan mounting bolts (1).



I5RS0B160011-01

- 11) Slide condenser with radiator, and then remove radiator cooling fan assembly.

⚠ CAUTION

Be sure not to damage condenser outlet pipe while removing.

Installation

Reverse removal procedure for installation noting the following.

- Install and adjust hood latch referring to “Hood Inspection and Adjustment: in Section 9J”.
- Install intercooler referring to “Intercooler Removal and Installation: in Section 1D”.
- Install front bumper upper absorber, upper member and front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
- Install air cleaner assembly with MAF sensor assembly referring to “Air Cleaner Assembly Removal and Installation: in Section 1D”.
- Refill cooling system referring to “Cooling System Flush and Refill: ”.
- After installation, verify there is no coolant leakage at each connection.

Radiator On-Vehicle Inspection and Cleaning

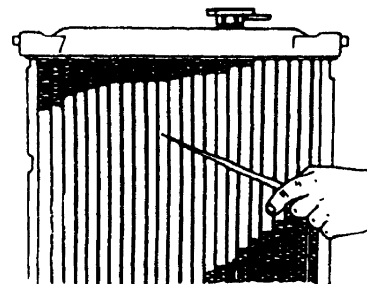
S5RS0B1606019

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean frontal area of radiator cores.



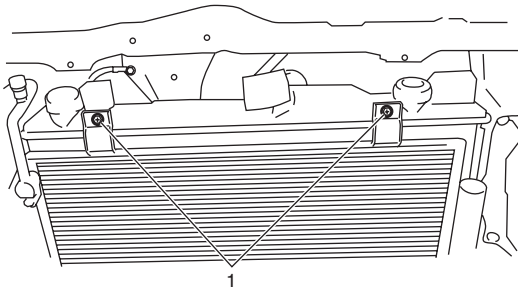
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Radiator Removal and Installation

S5RS0B1606012

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Drain coolant referring to “Cooling System Draining: ”.
- 3) Remove radiator cooling fan referring to “Radiator Cooling Fan Assembly Removal and Installation: ”.
- 4) Remove radiator outlet hose from radiator.
- 5) Remove condenser assembly mounting bolts (1).



I5RS0B160012-01

- 6) Remove radiator from vehicle.

Installation

Reverse removal procedures for installation noting the following.

- Install radiator cooling fan assembly referring to “Radiator Cooling Fan Assembly Removal and Installation: ”.
- Refill cooling system referring to “Cooling System Flush and Refill: ”.
- After installation, check each joint for leakage.

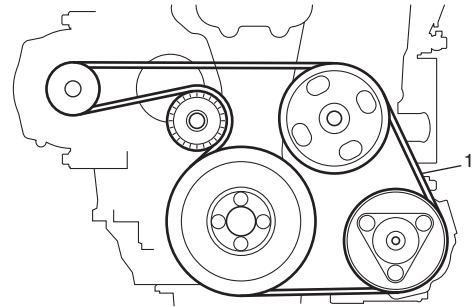
Water Pump / Generator Drive Belt Tension Inspection

S5RS0B1606013

⚠ 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 belt, refer to “Water Pump / Generator Drive Belt Removal and Installation: ”.



I3RM0B162015-01

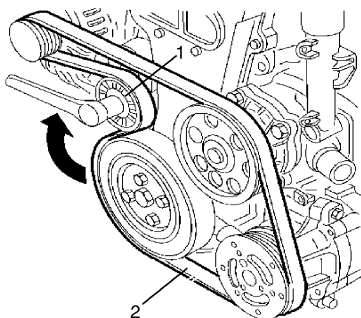
- 3) Connect negative (–) cable at battery.

Water Pump / Generator Drive Belt Removal and Installation

S5RS0B1606014

Removal

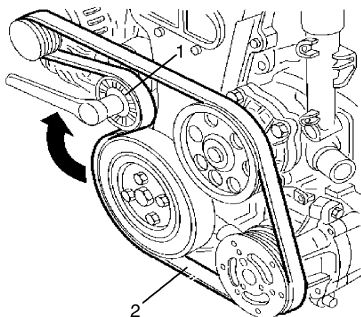
- 1) Remove drive belt (2) while turning tensioner (1) clockwise until stopping.



I3RM0B162016-01

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: ".



I3RM0B162016-01

Water Pump / Generator Drive Belt Tensioner Assembly Removal and Installation

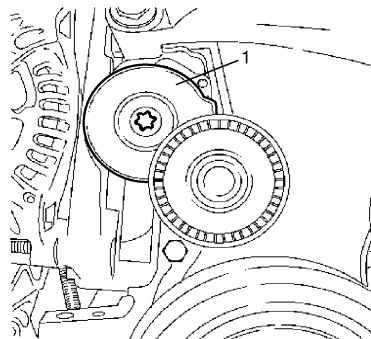
S5RS0B1606015

⚠ 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: ".
- 3) Remove tensioner (1).



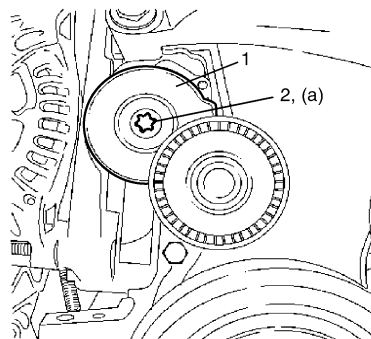
I3RM0B162017-01

Installation

- 1) Install tensioner (1).
Tighten tensioner bolt (2) to specified torque.

Tightening torque

Tensioner bolt (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)



I3RM0B162018-01

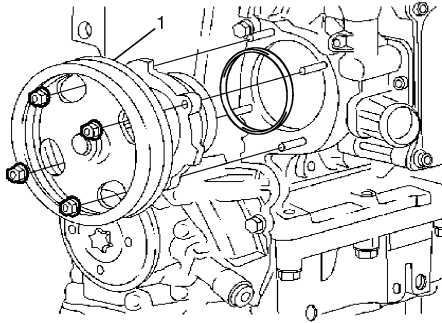
- 2) Install drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation: ".
- 3) Check belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection: ".

Water Pump Removal and Installation

S5RS0B1606016

Removal

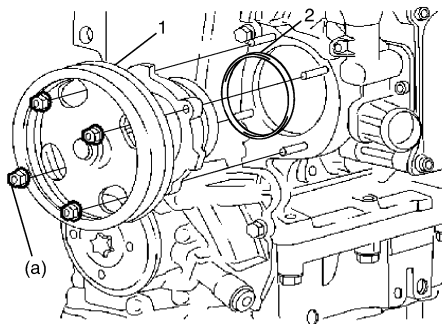
- 1) Disconnect negative (–) cable at battery.
- 2) Drain coolant referring to “Cooling System Draining: ”.
- 3) Hoist vehicle and remove front right wheel.
- 4) Remove right side engine under cover.
- 5) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: ”.
- 6) Remove water pump assembly (1).



I3RM0B162019-01

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 kgf-m, 6.5 lb-ft)**

I3RM0B162020-01

- 3) Install water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: ”.
- 4) Install right side engine under cover.
- 5) Install front right wheel and lower vehicle.
- 6) Refill cooling system referring to “Cooling System Flush and Refill: ”.
- 7) Connect negative (–) cable at battery.
- 8) Check each part for leakage.

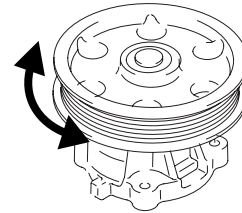
Water Pump Inspection

S5RS0B1606017

⚠ 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.



I3RM0B162021-01

Specifications

Tightening Torque Specifications

S5RS0B1607001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Thermostat case bolt	25	2.5	18.0	☞
Tensioner bolt	50	5.0	36.5	☞
Water pump nut	9	0.9	6.5	☞

NOTE

The specified tightening torque is also described in the following.
“Cooling System Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Fuel System

Precautions

Precautions on Fuel System Service

S5RS0B1700001

⚠ 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.
 - Never run engine with fuel main relay disconnected when engine and exhaust system are hot.
 - Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to “Fuel Hose Disconnecting and Reconnecting: ”. After connecting, make sure that it has no twist or kink.
 - 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.
 - 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.
 - When servicing the fuel tank, it should be treated with respect, with no contact with sharp edges or hot surfaces. In addition, the fuel tank should not be dropped since fuel tank, fuel pump and other components can be damaged by the impact. If dropped, all components should be replaced because there is a risk of damage.
 - The fuel tank is made of resin.
Be sure not to allow solvent (chemical article such as grease and sealant) to attach to the fuel tank as some chemical reaction may occur, causing the fuel tank to be swollen, hardened or distorted leakage and resulting in fuel leakage from the fuel tank.
 - 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 instructions.
-
- 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 Procedure: ”.
 - 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.

1G-2 Fuel System:

- 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 side) 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

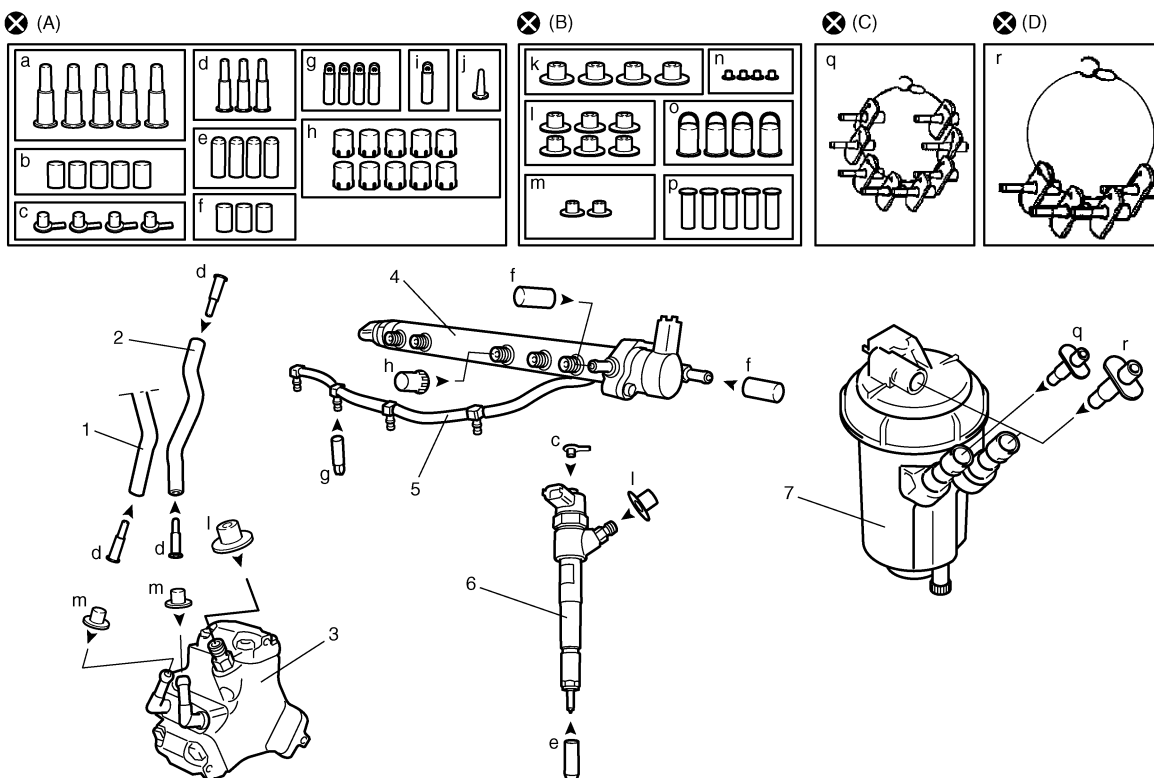
(B): 09916–50010

(C): 09919–48320

(D): 09919–48310

NOTE

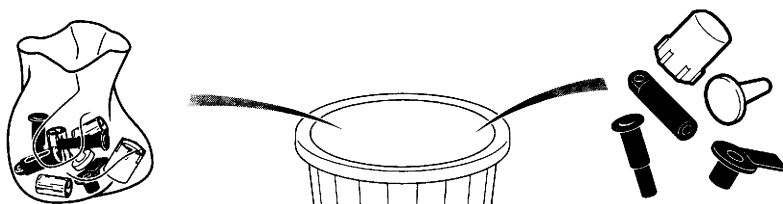
Do not use instructions included in special tools (A) and (B) because they are used for the other engines. Install special tools (A) and (B) referring to the below illustration.



I3RB0A173002-01

1. Fuel feed hose	3. Injection pump	5. Return hose	7. Fuel filter assembly
2. Fuel return hose	4. Common rail	6. Fuel injector	⊗ : Do not reuse.

- 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.



I3RB0A173003-01

- 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.

General Description

Fuel System Description

S5RS0B1701001

⚠ CAUTION

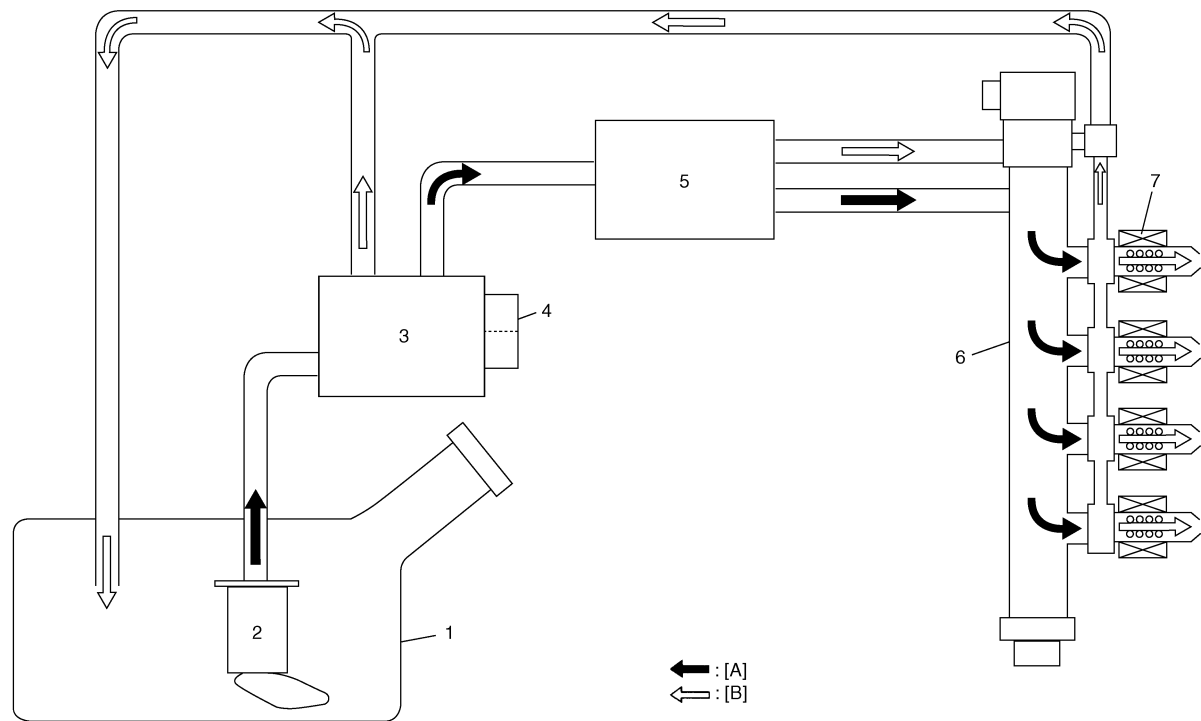
**The engine of this vehicle requires the use of unleaded fuel only.
Use of leaded and/or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.**

The main components of the fuel system are fuel tank, fuel pump, high pressure fuel pump, fuel filter, fuel level gauge and it includes fuel feed line, fuel return line.

Schematic and Routing Diagram

Fuel Delivery System Diagram

S5RS0B1702001



I3RM0B172002-01

[A]: Fuel feed line	2. Fuel pump	5. Injection pump
[B]: Fuel return line	3. Fuel filter	6. Common rail (High pressure fuel injection rail)
1. Fuel tank	4. Fuel heater and temperature sensor	7. Fuel injector

Repair Instructions

Fuel Hose Disconnecting and Reconnecting

S5RS0B1706028

⚠ WARNING

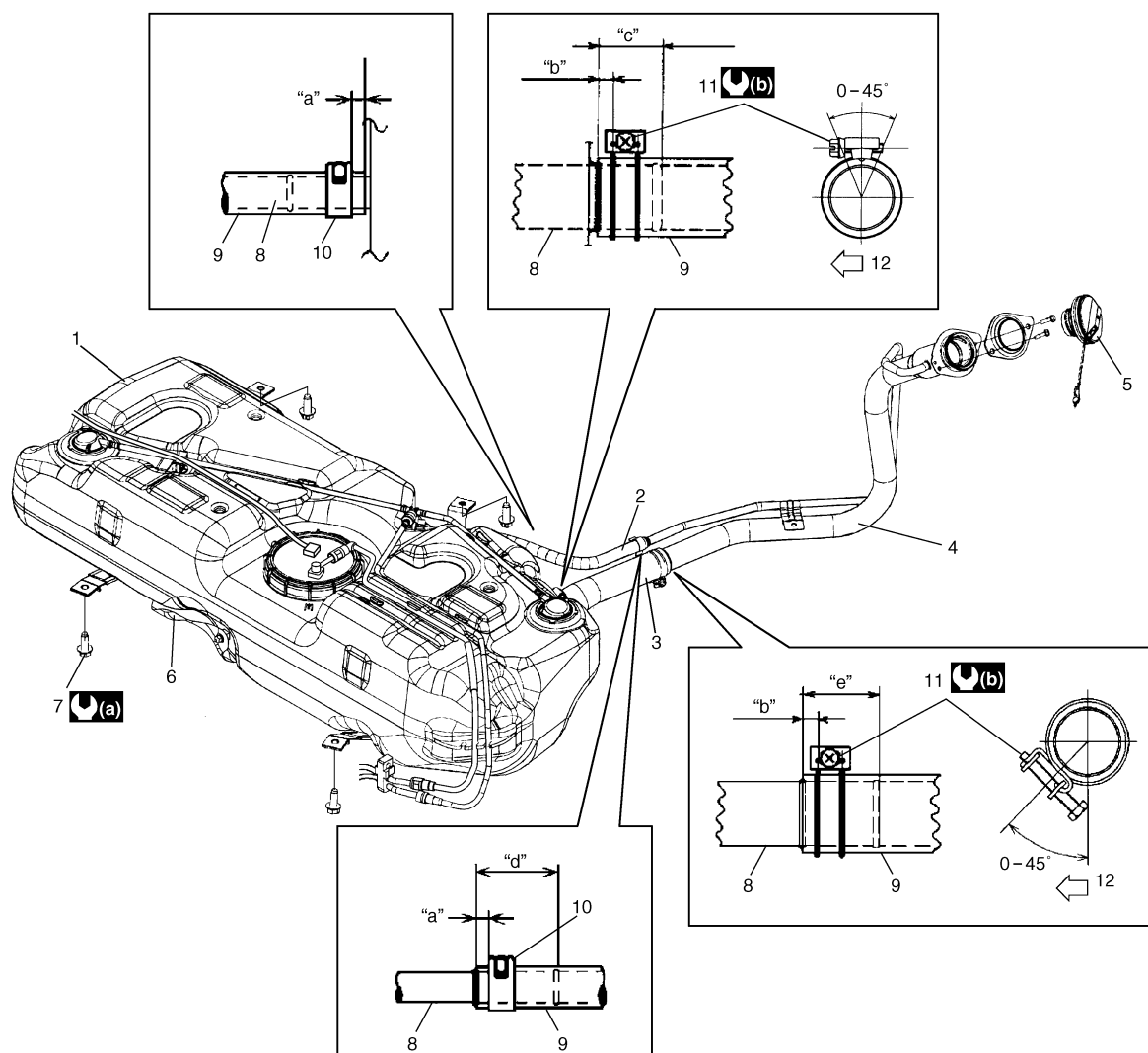
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

For Conventional Clamp

Fuel tank system

NOTE

Be sure to install hose to spool of pipe surely.

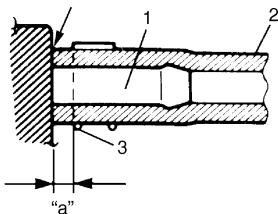


I5RS0B170002-03

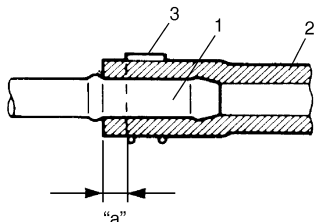
1. Fuel tank	6. Fuel tank protector	11. Fuel filler hose clamp screw	"d": 30 mm (1.18 in.)
2. Breather hose	7. Fuel tank bolt	12. Vehicle leftward	"e": 38 mm (1.50 in.)
3. Fuel tank filler hose	8. Pipe	"a": 3 – 7 mm (0.12 – 0.28 in.)	⚙(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)
4. Fuel filler neck	9. Hose	"b": 5 – 12 mm (0.20 – 0.48 in.)	⚙(b): 2 N·m (0.2 kg-m, 1.5 lb-ft)
5. Fuel filler cap	10. Clamp	"c": 33 mm (1.30 in.)	

The other than fuel tank system

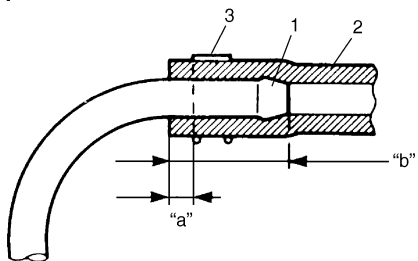
[A]



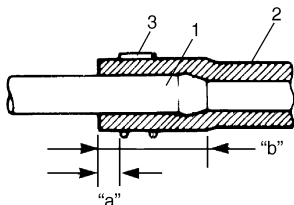
[B]



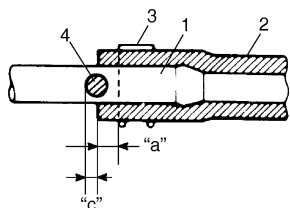
[C]



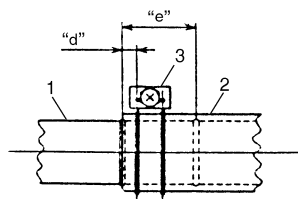
[D]



[E]



[F]



I3RM0A170001-01

[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 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.

"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.)

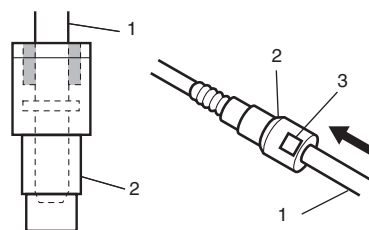
4. Red mark

For Quick Joint (Fuel Pipe)

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pipe) (2) by blowing compressed air.

2) Disconnect quick joint (fuel pipe) while pushing lock button.



I4RS0B170004-01

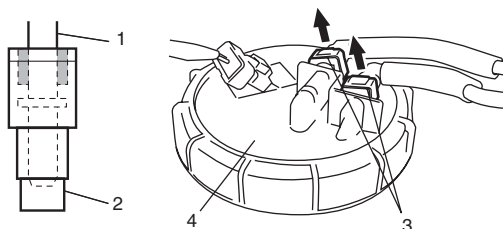
Reconnecting

Insert quick joint (fuel pipe) to fuel pipe until they lock securely (a click is heard), and confirm that quick joint (fuel pipe) is not disconnected by hand.

For Quick Joint (Fuel Pump)

Disconnecting

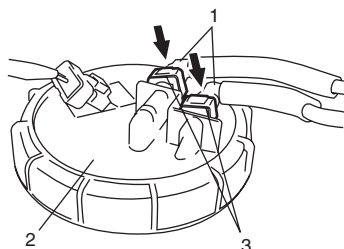
- 1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pump) (2) by blowing compressed air.
- 2) Release lock plate (3) completely in arrow direction, and then remove quick joint (fuel pump) (2) from fuel pump assembly (4).



I5RS0B170003-01

Reconnecting

- 1) Connect quick joint (fuel pump) (1) to fuel pump assembly (2), and then push lock plate (3) completely in arrow direction.



I5RS0B170004-01

- 2) Confirm that quick joint is not disconnected by hand.

Fuel Leakage Check Procedure

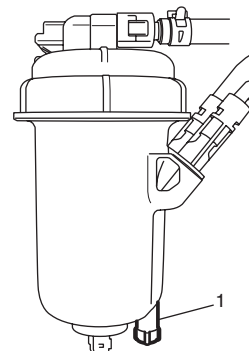
S5RS0B1706003

- 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.

Water Draining of Fuel Filter

S5RS0B1706004

- 1) Disconnect negative (–) cable at battery.
- 2) Hoist vehicle.
- 3) Place container under bleed screw (1), and drain fuel loosening it from lower side of engine.
- 4) Tighten bleed screw.



I3RM0B172004-01

- 5) Lower vehicle.
- 6) Connect negative (–) cable at battery.

Air Bleeding of Fuel System

S5RS0B1706005

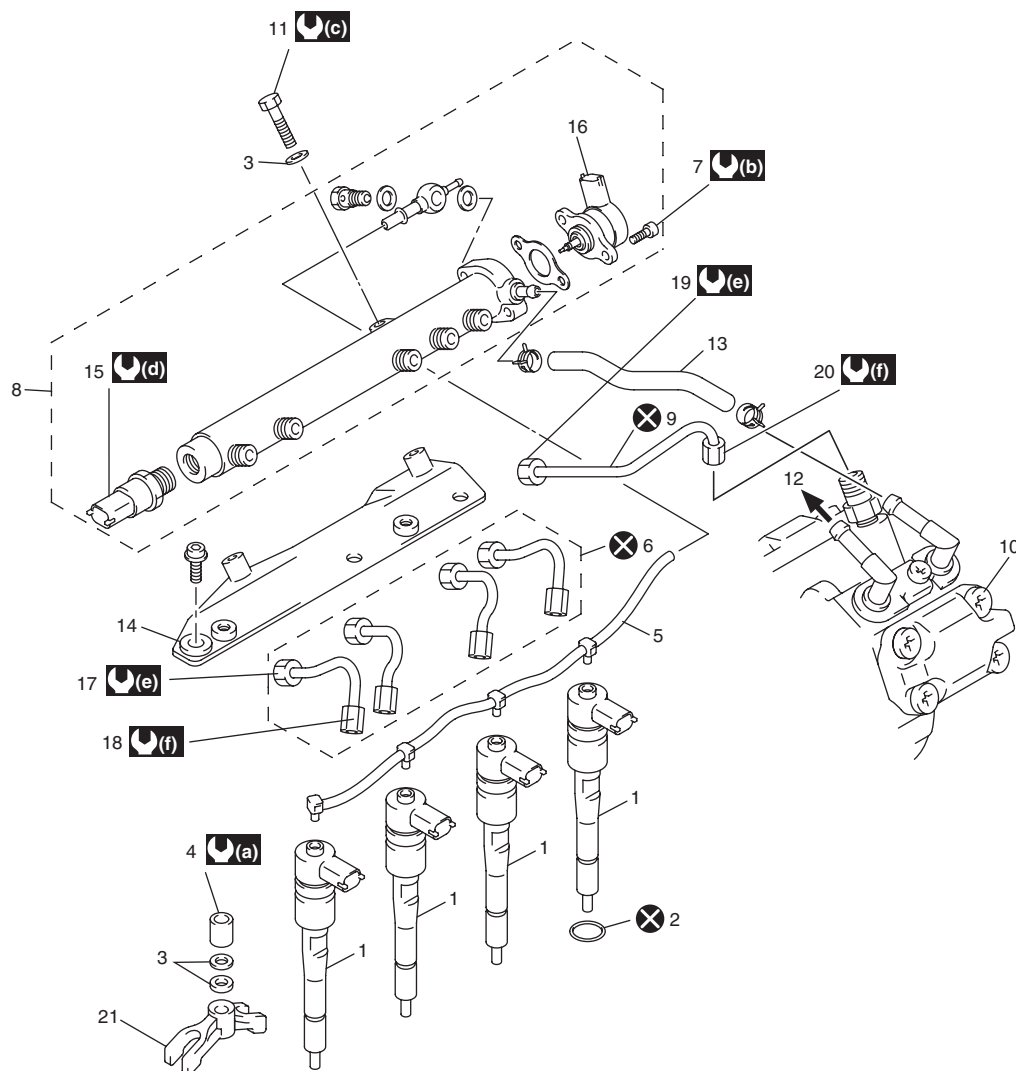
Air bleeding must be carried out when fuel system has been disassembled or when vehicle ran out of fuel. Turn ignition switch ON to operate fuel pump and after about 5 seconds turn it OFF. Repeat this 6 times and then check engine starts.

Fuel Delivery System (High Pressure) Components

S5RS0B1706002

⚠ WARNING

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: ” in order to reduce the risk of fire and personal injury.



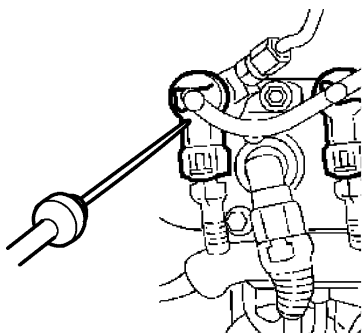
I5RS0B170005-02

1. Fuel injector	8. Common rail	15. Fuel pressure sensor	(a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)
2. Sealing ring	9. High pressure supply pipe	16. Fuel pressure regulator	(b) : 9 N·m (0.9 kg-m, 6.5 lb-ft)
3. Washer	10. Injection pump	17. High pressure pipe union nut (common rail side)	(c) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
4. Nut	11. Common rail bolt	18. High pressure pipe union nut (fuel injector side)	(d) : 70 N·m (7.0 kg-m, 51.0 lb-ft)
5. Return hose	12. To fuel feed pipe	19. High pressure supply pipe union nut (common rail side)	(e) : 28 N·m (2.8 kg-m, 20.5 lb-ft)
6. High pressure pipe	13. Fuel return hose	20. High pressure supply pipe union nut (injection pump side)	(f) : 24 N·m (2.4 kg-m, 17.5 lb-ft)
7. Fuel pressure regulator bolt	14. Common rail bracket	21. Fuel injector bracket	: Do not reuse.

Fuel Injector On-Vehicle Inspection

S5RS0B1706008

- 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, check result of each step is in good condition referring to "C-24, Cylinder 1 Injector Circuit: in Section 1A", "C-25, Cylinder 2 Injector Circuit: in Section 1A", "C-26, Cylinder 3 Injector Circuit: in Section 1A" or "C-27, Cylinder 4 Injector Circuit: in Section 1A".

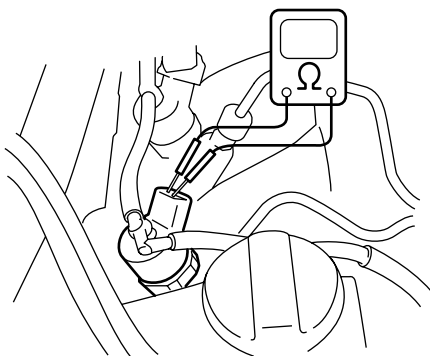


I3RM0B172008-01

- 2) Disconnect coupler from injector, connect ohmmeter between terminals of injector and check resistance. If resistance is out of specification, replace.

Resistance of fuel injector

About 0.5 Ω



I3RM0B172009-01

- 3) Connect coupler to injector securely.

Fuel Injector Removal and Installation

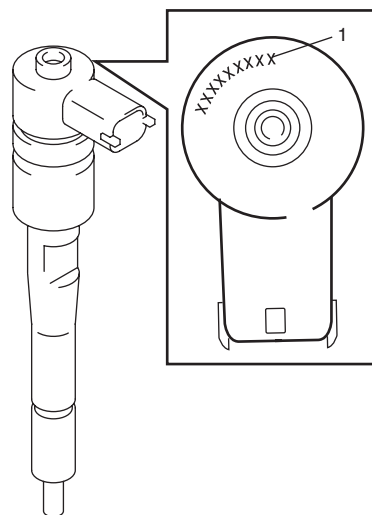
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⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

NOTE

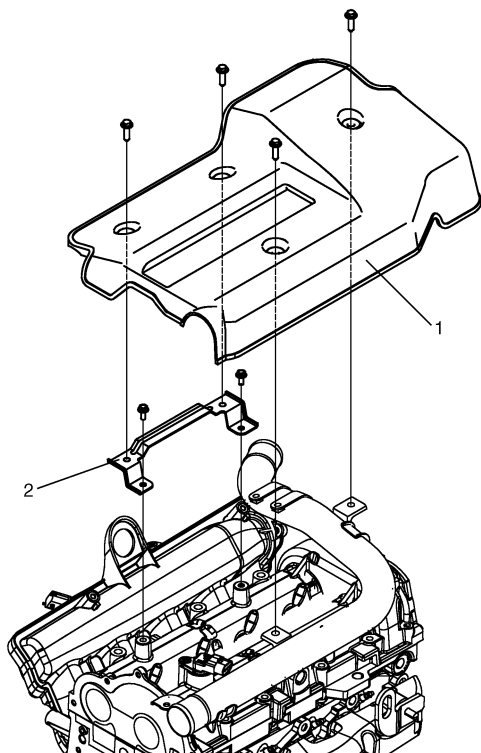
The calibration code (1) is the code that is given to each fuel injector, and it represents the performance characteristics of the fuel injector. It is registered in ECM, and ECM controls fuel injection according to the performance characteristics of the fuel injector. Therefore, after removing fuel 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 Section 1C". For your reference, it is possible to know what calibration codes are currently registered in ECM.



I3RM0B172010-01

Removal

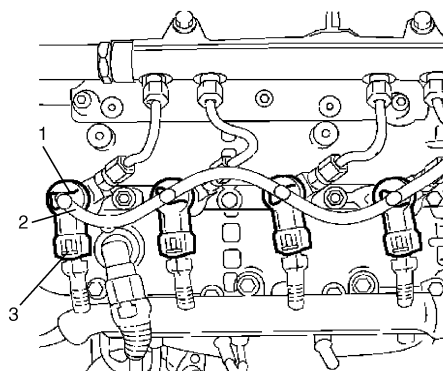
- 1) Disconnect negative (–) cable at battery.
- 2) Remove engine cover (1) and engine cover bracket (2).



I5RS0B170009-01

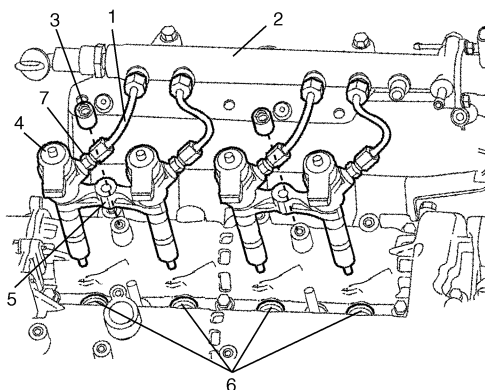
- 3) Remove clips (1), and then disconnect return hose (2) from fuel injectors.

- 4) Disconnect fuel injector connectors (3).



I3RM0B172011-01

- 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.



I3RM0B172012-01

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 kgf-m, 14.5 lb-ft)

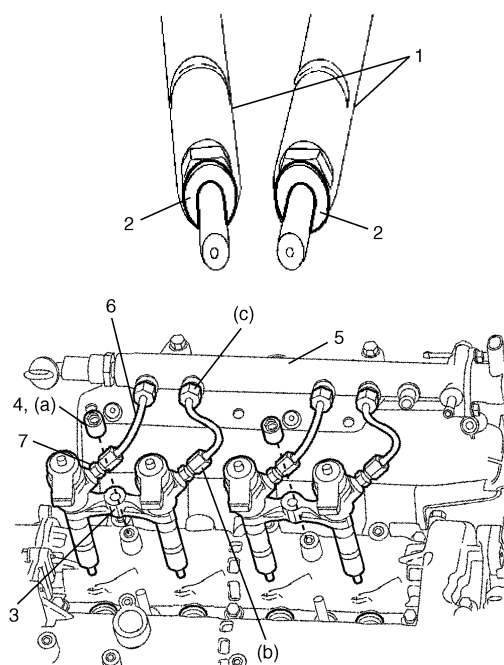
- 6) Tighten high pressure pipe union nuts to specified torque.

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 kgf-m, 17.5 lb-ft)

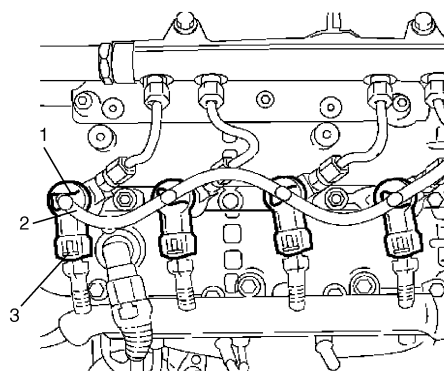
High pressure pipe union nut (common rail side) (c): 28 N·m (2.8 kgf-m, 20.5 lb-ft)



5. Common rail

I3RM0B172013-01

- 7) Connect return hose (2) to fuel injectors and then install clips (1) to fuel injectors.
- 8) Connect fuel injector connectors (3).



I3RM0B172014-01

- 9) Install engine cover and engine cover bracket.

Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

- 10) Connect negative (–) cable at battery.
In case that the fuel injector(s) was replaced, perform “ECM Registration: in Section 1C” to register the fuel injector calibration code into ECM.
- 11) Check fuel leakage referring to “Fuel Leakage Check Procedure: ”.

Common Rail (High Pressure Fuel Injection Rail) Removal and Installation

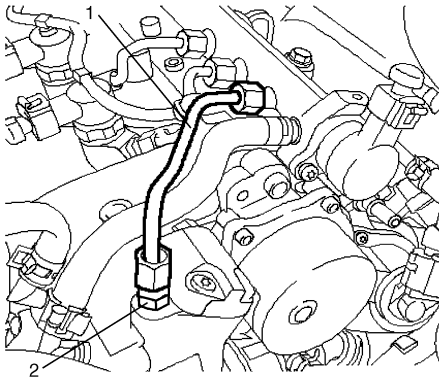
S5RS0B1706010

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

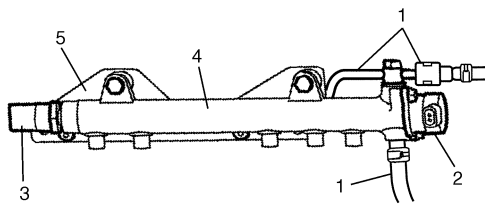
Removal

- 1) Disconnect negative (–) cable from battery.
- 2) Remove cover and engine cover bracket.
- 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.



I3RM0B172015-01

- 4) Remove high pressure pipes from fuel injectors and common rail referring to Step 5) of "Removal" under "Fuel Injector Removal and Installation: ".
- 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).



I3RM0B172016-01

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 kgf-m, 18.0 lb-ft)

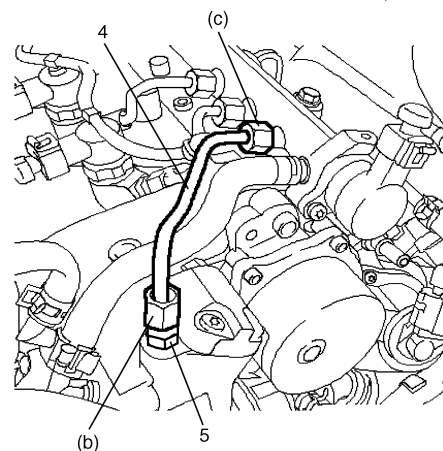
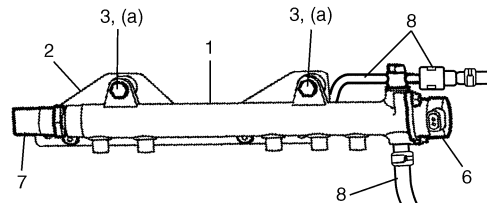
- 4) Tighten high pressure supply pipe union nuts to specified torque.
When tightening union nut of high pressure supply pipe, holding union nut (5) of injection pump with wrench.

Tightening torque

High pressure supply pipe union nut (injection pump side) (b): 24 N·m (2.4 kgf-m, 17.5 lb-ft)

High pressure supply pipe union nut (common rail side) (c): 28 N·m (2.8 kgf-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: ".
- 6) Connect connectors to fuel pressure regulator (6) and fuel pressure sensor (7).
- 7) Connect fuel return hoses (8) to common rail.



I3RM0B172017-01

- 8) Install engine cover and engine cover bracket.

Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

- 9) Connect negative (–) cable at battery.
- 10) Check fuel leakage referring to "Fuel Leakage Check Procedure: ".

Injection Pump Removal and Installation

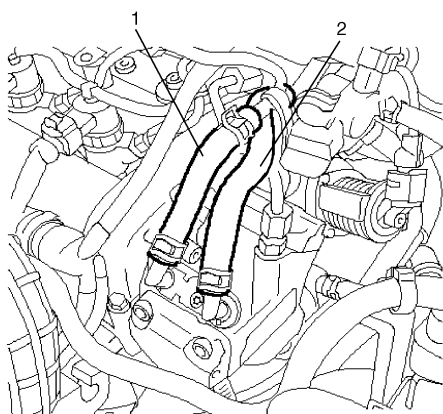
S5RS0B1706011

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

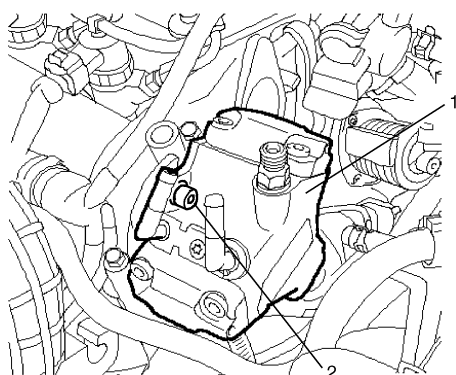
Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 3) Remove vacuum pump referring to "Vacuum Pump Removal and Installation: in Section 1B".
- 4) Remove high pressure supply pipe referring to Step 3) of "Removal" under "Common Rail (High Pressure Fuel Injection Rail) Removal and Installation: ".
- 5) Disconnect fuel feed hose (1) and fuel return hose (2) from injection pump.



I3RM0B172018-01

- 6) Remove injection pump (1) from camshaft housing by removing 3 bolts (2).



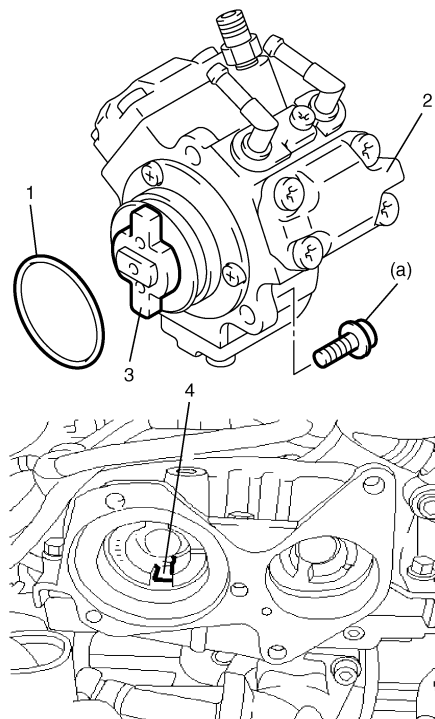
I3RM0B172019-01

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

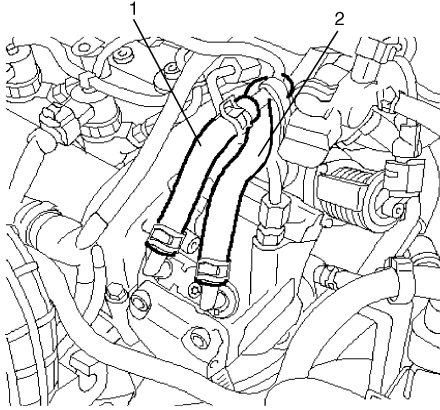
Injection pump bolt (a): 15 N·m (1.5 kgf-m, 11.0 lb-ft)



I3RM0B172020-01

1G-14 Fuel System:

- 5) Connect fuel feed hose (1) and fuel return hose (2) to injection pump.



I3RM0B172018-01

- 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: ".
- 7) Install vacuum pump referring to "Vacuum Pump Removal and Installation: in Section 1B".
- 8) Remove air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 9) Connect negative (–) cable to battery.
- 10) Check fuel leakage referring to "Fuel Leakage Check Procedure: ".

Fuel Pressure Sensor Removal and Installation

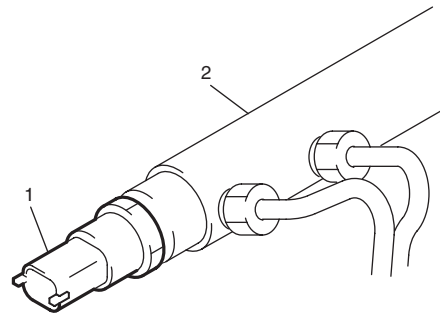
S5RS0B1706014

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove engine cover.
- 3) Disconnect fuel pressure sensor connector.
- 4) Remove fuel pressure sensor (1) from common rail (2).



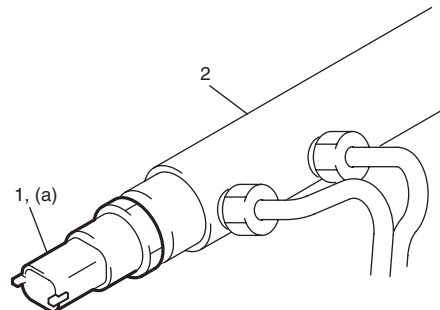
I3RM0B172022-01

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 kgf-m, 50.5 lb-ft)



I3RM0B172023-01

- 2) Connect fuel pressure sensor connector.
- 3) Install engine cover.

Tightening torque

Engine cover bolt (a): 8 N·m (0.8 kgf-m, 6.0 lb-ft)

- 4) Connect negative (–) cable at battery.
- 5) Check fuel leakage referring to "Fuel Leakage Check Procedure: ".

Fuel Pressure Regulator Removal and Installation

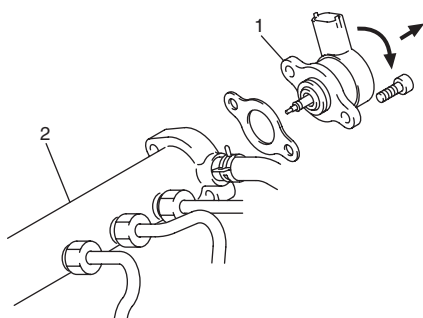
S5RS0B1706015

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove vacuum pump referring to "Vacuum Pump Removal and Installation: in Section 1B".
- 3) Disconnect fuel pressure regulator connector.
- 4) Pull out fuel pressure regulator (1) from common rail (2) with turning it counterclockwise by hand.



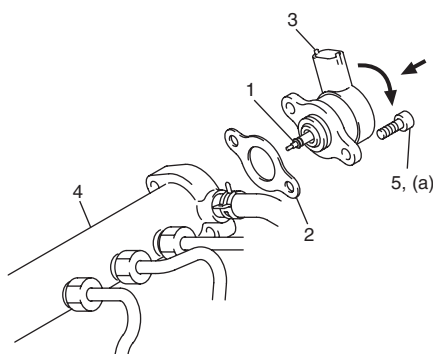
I3RM0B172024-01

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 kgf-m, 6.5 lb-ft)



I3RM0B172025-01

- 4) Install vacuum pump referring to "Vacuum Pump Removal and Installation: in Section 1B".
- 5) Connect negative (–) cable to battery.
- 6) Check fuel leakage referring to "Fuel Leakage Check Procedure: ".

Fuel Pressure Regulator Inspection

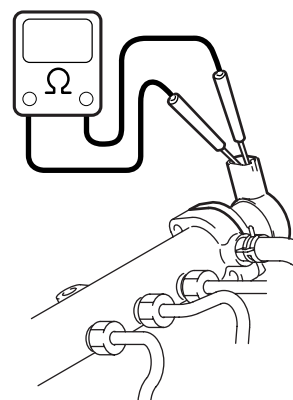
S5RS0B1706016

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: ".

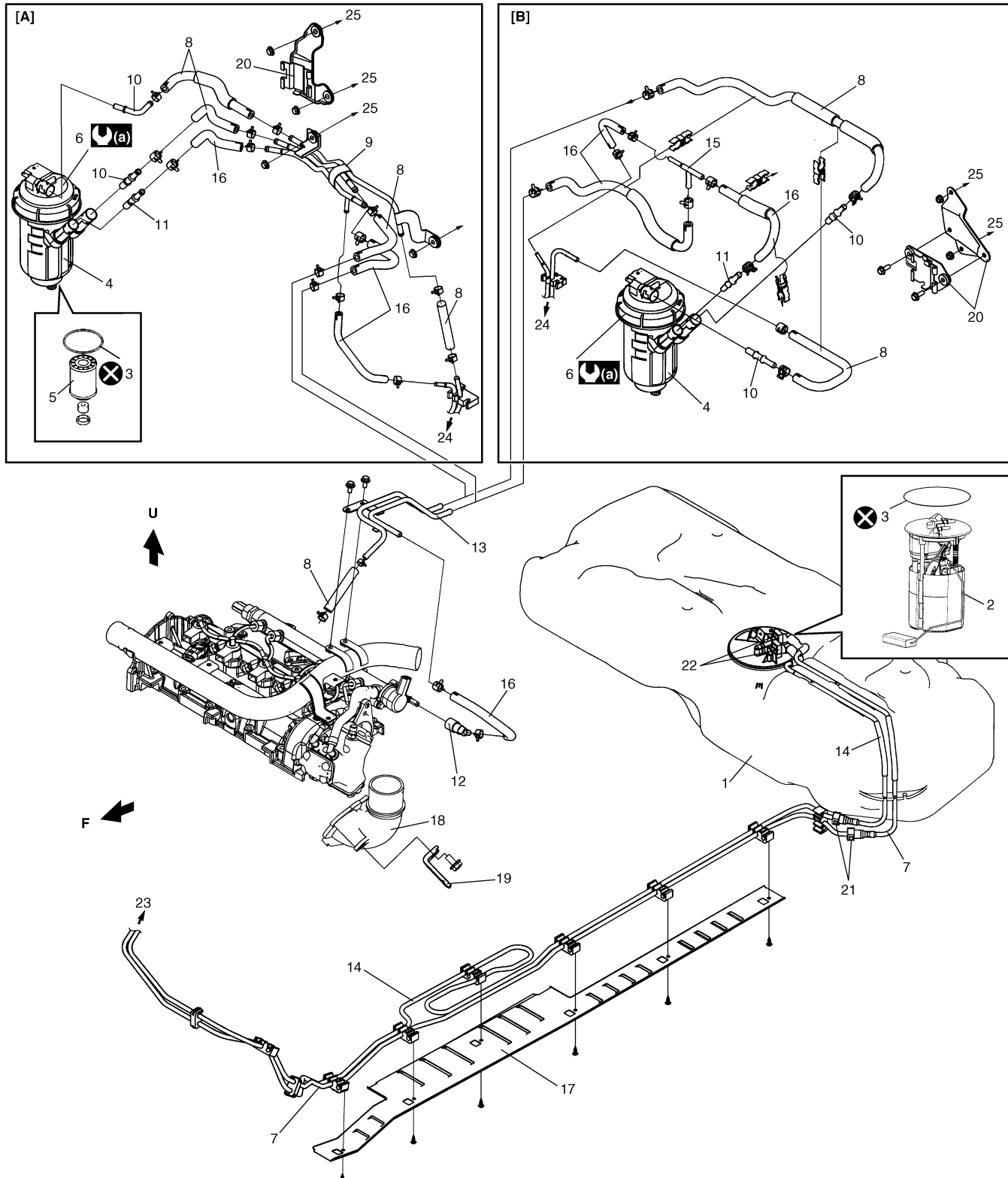
Fuel pressure regulator resistance

2.07 – 2.53 Ω at 20 °C, 68 °F



I3RM0B172038-01

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service:” in order to reduce the risk of fire and personal injury.



[A]: For LH steering vehicle	5. Fuel filter element	13. Fuel No. 2 pipe	21. Quick joint (fuel pipe)
[B]: For RH steering vehicle	6. Fuel filter fastener	14. Fuel return pipe	22. Quick joint (fuel pump)
F: Forward	7. Fuel feed pipe	15. Fuel 3 way return pipe	23. To fuel filter
U: Upward	8. Fuel feed hose	16. Fuel return hose	24. To fuel tank
1. Fuel tank	9. Fuel No. 1 pipe	17. Fuel pipe cover	25. To dash panel
2. Fuel pump assembly	10. Fuel filter joint	18. Air intake joint	 (a) : 30 N·m (3.0 kg-m, 22.0 lb-ft)
3. O-ring	11. Fuel filter return joint	19. Fuel hose clamp bracket	 : Do not reuse.
4. Fuel filter	12. Fuel return connector	20. Fuel filter bracket	

Fuel Lines On-Vehicle Inspection

S5RS0B1706006

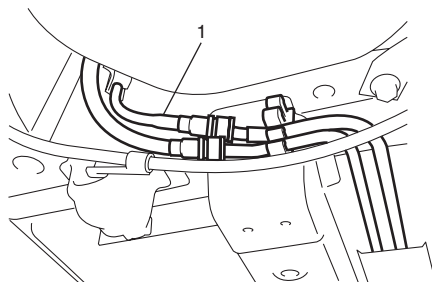
WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

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.



I5RS0B170006-01

Fuel Pipe Removal and Installation

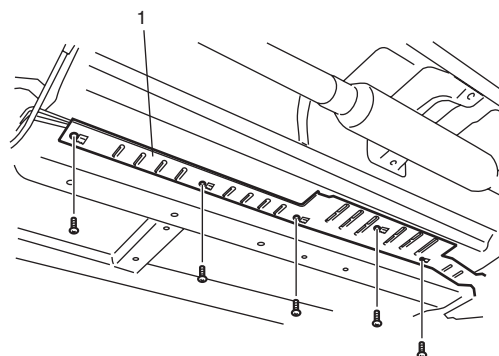
S5RS0B1706007

WARNING

- Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.
- A small amount of fuel may be released after fuel hose is disconnected. 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.

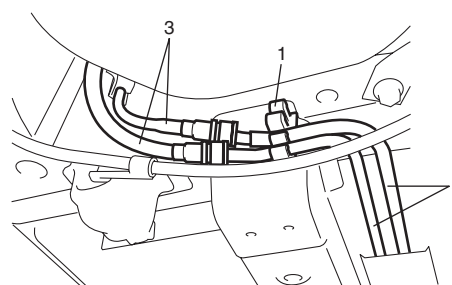
Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
- 3) Remove pipe cover (2) from vehicle.



I5RS0B170007-01

- 4) Disconnect fuel pipe joint and fuel hose (3) from fuel pipe (2) at the front and rear of each fuel pipe.
- 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).



I5RS0B170008-01

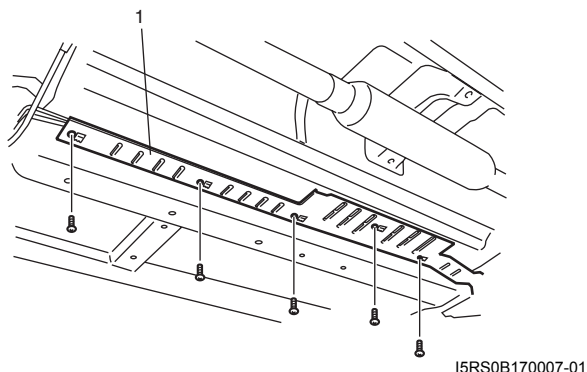
Installation

- 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 suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
- 6) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Filler Cap Inspection

S5RS0B1706017

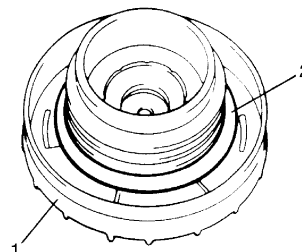
⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

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 fire and personal injury.



I2RH01170008-01

Fuel Tank Removal and Installation

S5RS0B1706020

Removal

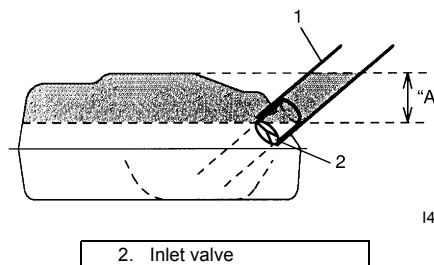
⚠ WARNING

- Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: ".
- 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) Remove fuel filler cap.
- 3) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" as shown in the figure.

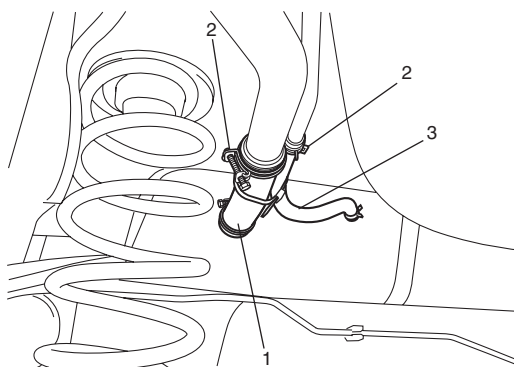
⚠ CAUTION

Do not force pump hose into fuel tank.



I4RS0B170022-01

- 4) Hoist vehicle, and remove clamp (2), fuel filler hose (1) and breather hose (3) from fuel tank.



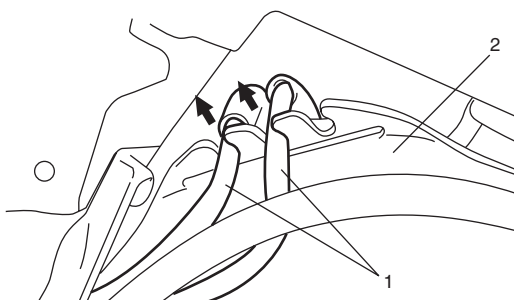
I4RS0B170010-01

- 5) Remove exhaust center pipe referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
- 6) 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

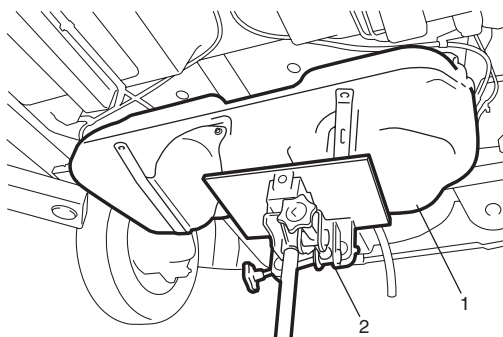
- Do not force pump hose into fuel tank.
- Never drain or store fuel in an open container due to possibility of fire or explosion.

- 7) Disconnect fuel pipes (1) from fuel tank (2).



I5RS0B170010-01

- 8) Support fuel tank (1) with jack (2) and remove its mounting bolts.

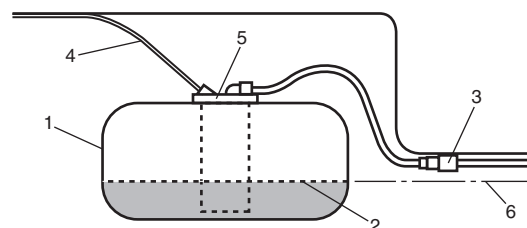


I5RS0B170011-01

- 9) Lower fuel tank (1) until fuel level (2) in fuel tank is lower than installation position of quick joint (fuel pipe) (3) in order to prevent fuel outflow after disconnecting quick joint (fuel pipe).

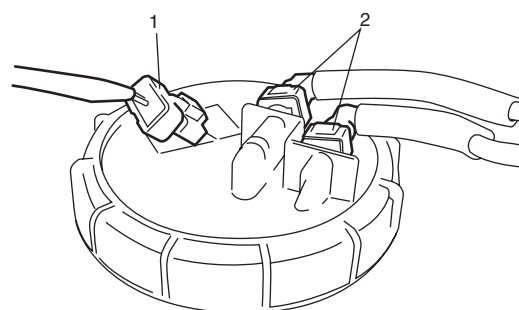
⚠ CAUTION

Be sure not to lower fuel tank (1) more than instructed level (6) due to wiring harness (4) of fuel pump (5) is still connected.



I5RS0B170012-02

- 10) Disconnect quick joint (fuel pipe) from fuel pipes.
- 11) Disconnect wire harness at connector (1) and fuel pipes (2) at fuel pump.



I5RS0B170013-01

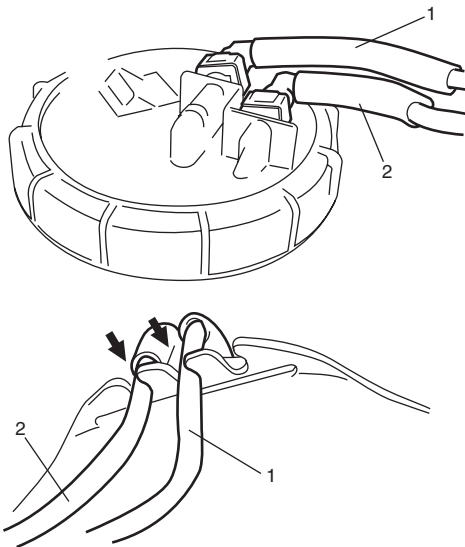
- 12) Remove fuel tank from vehicle.

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).

- 1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
- 2) Connect fuel feed pipe (1) and fuel return pipe (2) to fuel tank assembly.

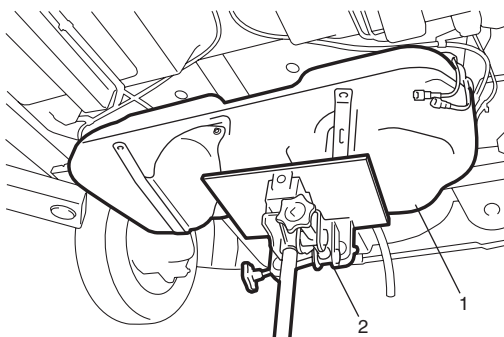


I5RS0B170014-01

- 3) Raise fuel tank (1) with jack and connect fuel pump and gauge and clamp wire harness.
- 4) Install fuel tank to vehicle.

Tightening torque

Fuel tank bolt (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)

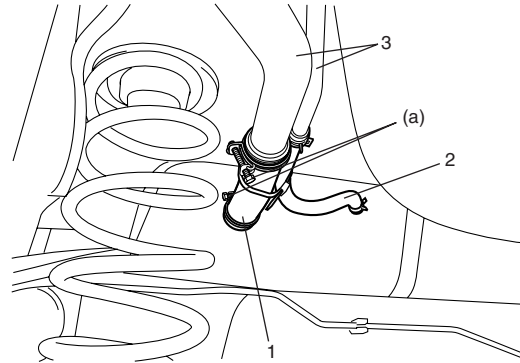


I4RS0B170012-01

- 5) Connect fuel filler hose (1) and breather hose (2) to filler neck (3) as shown in the figure and clamp them securely.

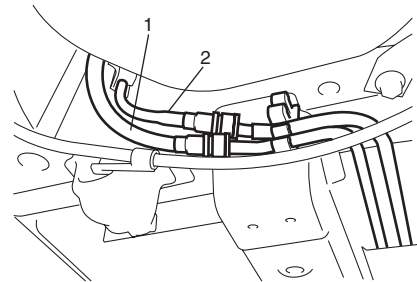
Tightening torque

Fuel filler hose clamp bolt (a): 2 N·m (0.2 kgf-m, 1.5 lb-ft)



I4RS0A170012-01

- 6) Connect fuel return hose (1) and fuel feed hose (2) to each pipe as shown in the figure and clamp them securely.



I5RS0B170015-01

- 7) Install exhaust center pipe referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
- 8) Connect negative (-) cable at battery. With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Tank Inspection

S5RS0B1706021

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

S5RS0B1706022

⚠ WARNING

- Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.
- 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.

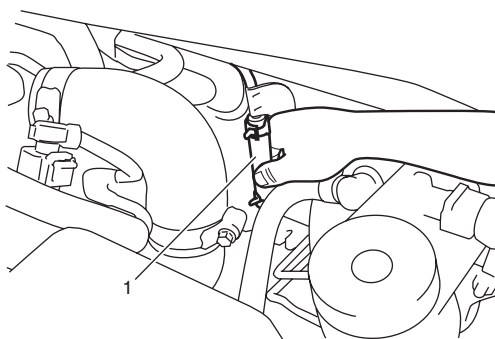
The following procedure are used for purging fuel tank.

- 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.
- 6) Be sure to dry fuel tank assembly thoroughly out of direct sunlight after washing.

Fuel Pump On-Vehicle Inspection

S5RS0B1706023

- 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 1A".
- 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.



I5RS0B170016-01

Fuel Pump Assembly Removal and Installation

S5RS0B1706024

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: ".

⚠ CAUTION

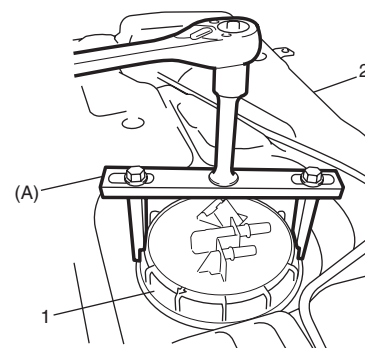
Do not disassemble fuel pump assembly. Disassembly will spoil its original performance.

Removal

- 1) Remove fuel tank from vehicle referring to "Fuel Tank Removal and Installation: ".
- 2) Remove fuel pump lock nut (1) from fuel tank (2) using special tool.

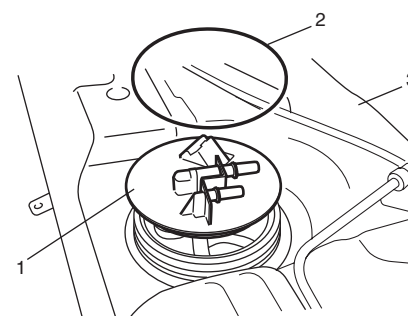
Special tool

(A): 09941-51010



I5RS0B170017-01

- 3) Remove fuel pump assembly (1) and O-ring (2) from fuel tank (3).



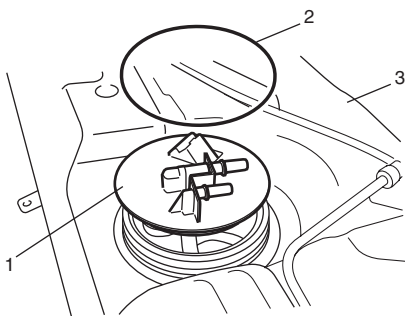
I5RS0B170018-01

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 fuel pump assembly (1) and new O-ring (2) to fuel tank (3).



I5RS0B170018-01

- 3) Install new fuel pump lock nut (1) to fuel tank (2) as follows.

a) Tighten new fuel pump lock nut (1) by hand.

NOTE

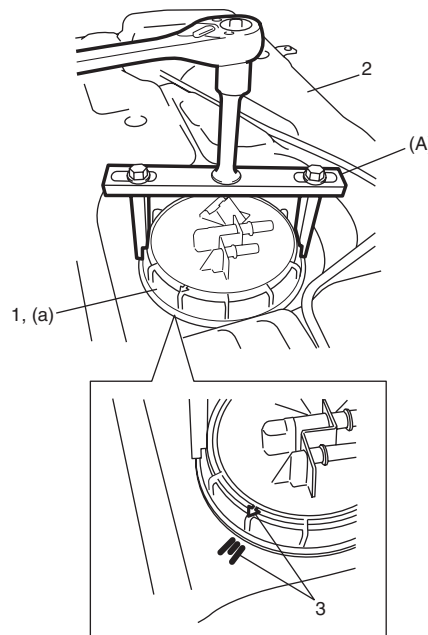
Tighten lock nut while pressing straight on it so that it will not tilt.

- b) Using special tool, tighten fuel pump lock nut (1) until indexes (3) of fuel pump lock nut and fuel tank are aligned.

NOTE

- Indexes are aligned when fuel pump lock nut is tightened by approx. 1 and 1/3 rotations.
- After tightening fuel pump lock nut, check for loosening and play.

Special tool
(A): 09941-51010



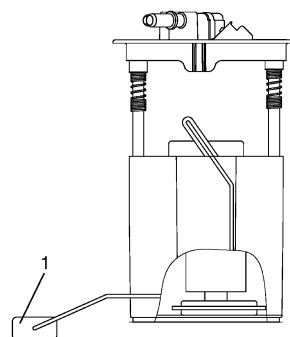
I5RS0B170019-01

- 4) Install fuel tank to vehicle referring to "Fuel Tank Removal and Installation: ".

Fuel Pump Inspection

S5RS0B1706025

- Check fuel pump assembly for damage.
- For inspection of fuel level gauge (1), refer to "Fuel Level Sensor Inspection: in Section 9C".



I5RS0B170020-01

Fuel Filter Element Removal and Installation

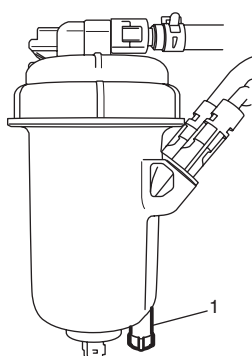
S5RS0B1706026

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Remove ECM referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
- 3) Remove cowl top cover and cowl top panel referring to "Cowl Top Components: in Section 9K".
- 4) Place container under bleed screw (1), and drain fuel loosening bleed screw.



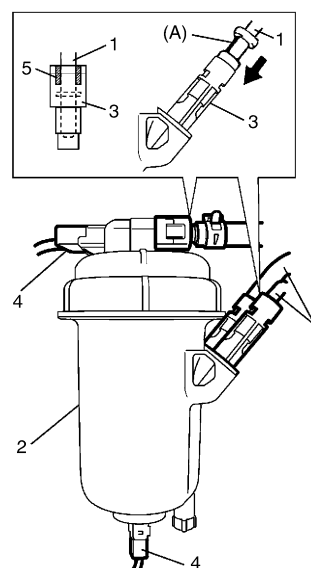
I3RM0B172004-01

- 5) 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.
- 6) Disconnect couplers (4) from fuel filter.



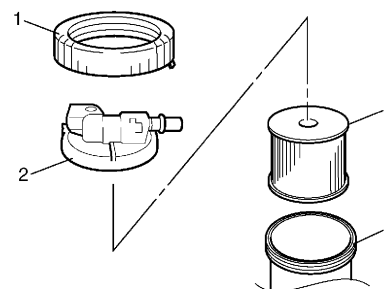
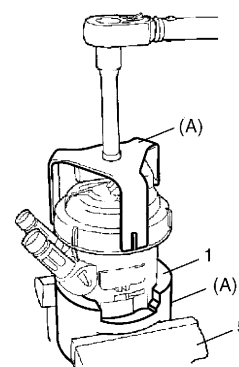
I3RM0B172034-01

- 7) 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

- 8) Remove fuel filter cap (2) and fuel filter element (3).



I3RM0B172035-01

1G-24 Fuel System:

Installation

Reverse removal procedure for installation noting the following.

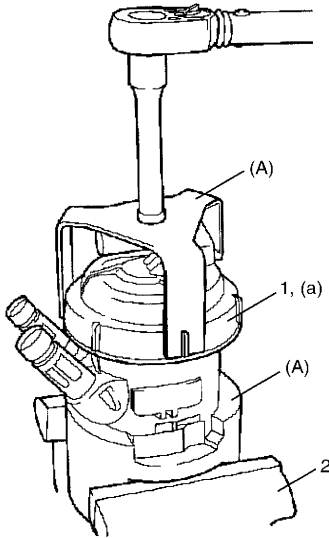
- Be sure to replace fuel filter element and O-ring as new one.
- Clean fuel filter case as follows.
 - a. Place container under bleed screw, and drain fuel loosing bleed screw.
 - b. Tighten bleed screw.
 - c. Remove fuel filter case.
 - d. Pour diesel substitute (kerdane, diltine or paraffin) into 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 kgf-m, 22.0 lb-ft)



I3RM0B172036-01

- Install cowl top cover and cowl top panel referring to "Cowl Top Components: in Section 9K".
- Install ECM referring to "Engine Control Module (ECM) Removal and Installation: in Section 1C".
- Bleed air in system referring to "Air Bleeding of Fuel System: ".
- Start engine and check that there are no fuel leakage.

Fuel Filter Assembly Removal and Installation

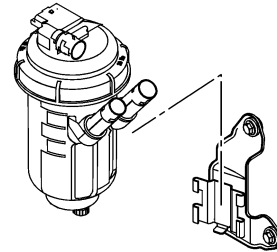
S5RS0B1706027

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: " in order to reduce the risk of fire and personal injury.

Removal

- 1) Disconnect fuel pipes in the same manner as Step 1) through 4) of "Removal" under "Fuel Filter Element Removal and Installation: ".
- 2) Remove fuel filter assembly.



I5RS0B170021-01

Installation

Reverse removal procedure for installation noting the following.

- Bleed air in system referring to "Air Bleeding of Fuel System: ".
- Start engine and check that there are no fuel leakage.

Fuel Heater and Temperature Sensor Removal and Installation

S5RS0B1706012

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: ".

Installation

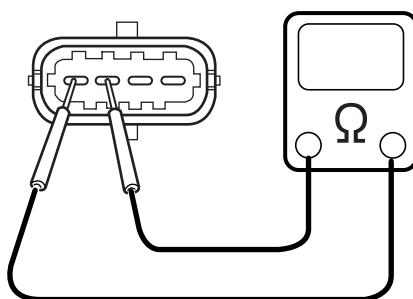
Reverse removal procedure for installation.

Fuel Temperature Sensor Inspection

- 1) Remove fuel temperature sensor referring to “Fuel Heater and Temperature Sensor Removal and Installation: ”.
- 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



I3RM0B172021-01

Specifications

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Fuel injector bracket nut	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	⌚
Engine cover bolt	8	0.8	6.0	⌚ / ⌚ / ⌚
Common rail bolt	25	2.5	18.0	⌚
High pressure supply pipe union nut (injection pump 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	⌚
Fuel pressure sensor	70	7.0	50.5	⌚
Fuel pressure regulator bolt	9	0.9	6.5	⌚
Fuel tank bolt	50	5.0	36.5	⌚
Fuel filler hose clamp bolt	2	0.2	1.5	⌚
Fuel filter fastener	30	3.0	22.0	⌚

NOTE

The specified tightening torque is also described in the following.

“Fuel Hose Disconnecting and Reconnecting: ”

“Fuel Delivery System (High Pressure) Components: ”

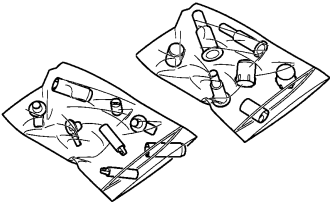
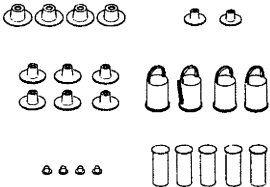
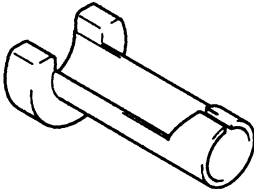
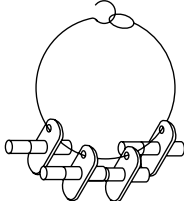
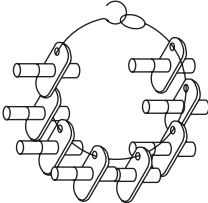
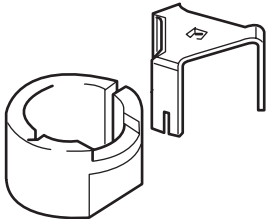
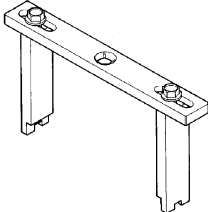
Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Special Tool

S5RS0B1708001

09914-65420 Plug cap for 8HY fuel system OUT0000173/9780.E1  	09916-50010 Fuel system, plug set  
09919-47020 Quick joint remover  	09919-48310 Plug kit KM-6015  
09919-48320 Plug kit KM-807  	09919-48610 Fuel filter locking tool (EN-46784)  /  
09941-51010 Lock ring wrench  /  	

Starting System

General Description

Cranking System Description

S5RS0B1901001

Cranking Circuit

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically.

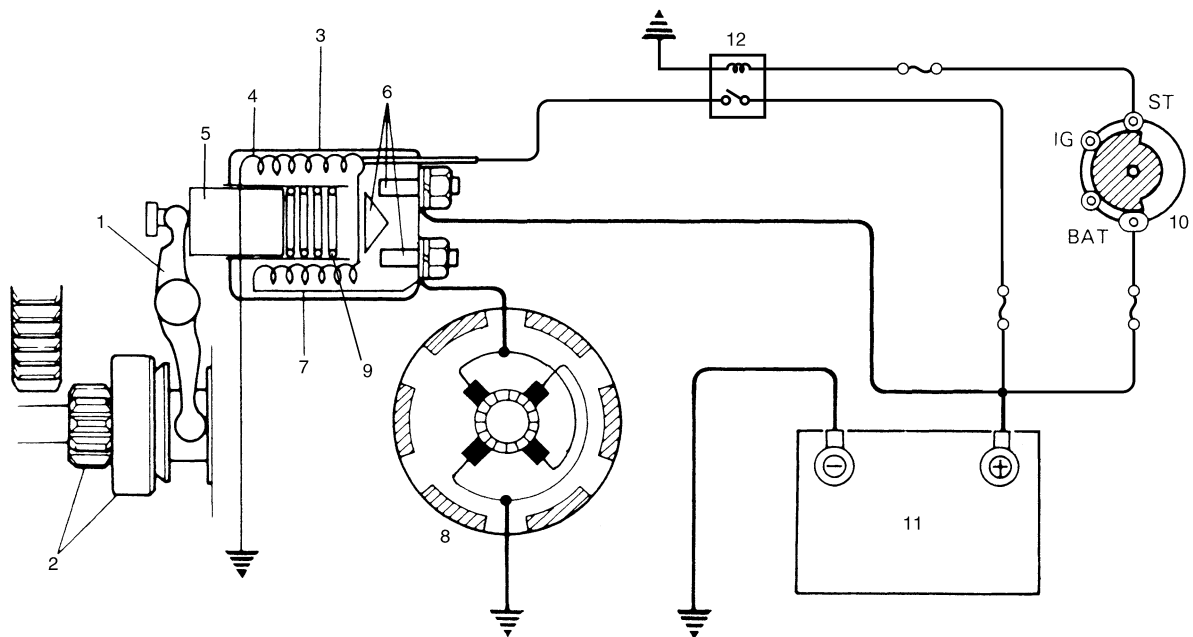
Starting Motor Circuit

In the circuit shown in "Cranking System Circuit Diagram: ", the magnetic switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion over-running clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

Schematic and Routing Diagram

Cranking System Circuit Diagram

S5RS0B1902001



I5RS0B190001-01

1. Pinion drive lever	4. Hold-in coil	7. Pull-in coil	10. Ignition & Starter switch
2. Pinion & Over-running clutch	5. Plunger	8. Starting motor	11. Battery
3. Magnetic switch	6. Magnetic switch contacts	9. Return spring	12. Relay

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

S5RS0B1904001

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
- Starting motor does not stop running

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 the 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 / Reference Item
Motor not running (No operating sound of magnetic switch)	Battery run down	<i>Recharge battery.</i>
	Battery voltage too low due to battery deterioration	<i>Replace battery.</i>
	Poor contact in battery terminal connection	<i>Retighten or replace.</i>
	Loose grounding cable connection	<i>Retighten.</i>
	Fuse set loose or blown off	<i>Tighten or replace.</i>
	Poor contacting action of ignition switch and magnetic switch	<i>Replace.</i>
	Lead wire coupler loose in place	<i>Retighten.</i>
	Open-circuit between ignition switch and magnetic switch	<i>Repair.</i>
	Open-circuit in pull-in coil	<i>Replace starting motor.</i>
	Brushes are seating poorly or worn down	<i>Replace starting motor.</i>
Motor not running (Operating sound of magnetic switch heard)	Poor sliding of plunger and/or pinion	<i>Replace starting motor.</i>
	Battery run down	<i>Recharge battery.</i>
	Battery voltage too low due to battery deterioration	<i>Replace battery.</i>
	Loose battery cable connections	<i>Retighten.</i>
	Burnt main contact point, or poor contacting action of magnetic switch	<i>Replace starting motor.</i>
	Brushes are seating poorly or worn down	<i>Replace starting motor.</i>
	Weakened brush spring	<i>Replace starting motor.</i>
	Burnt commutator	<i>Replace starting motor.</i>
	Layer short-circuit of armature	<i>Replace starting motor.</i>
	Crankshaft rotation obstructed	<i>Repair.</i>
Starting motor running but too slow (small torque) (If battery and wiring are satisfactory, inspect starting motor)	Insufficient contact of magnetic switch main contacts	<i>Replace starting motor.</i>
	Layer short-circuit of armature	<i>Replace starting motor.</i>
	Disconnected, burnt or worn commutator	<i>Replace starting motor.</i>
	Worn brushes	<i>Replace starting motor.</i>
	Weakened brush springs	<i>Replace starting motor.</i>
	Burnt or abnormally worn end bush	<i>Replace starting motor.</i>
Starting motor running, but not cranking engine	Worn pinion tip	<i>Replace starting motor.</i>
	Poor sliding of over-running clutch	<i>Replace starting motor.</i>
	Over-running clutch slipping	<i>Replace starting motor.</i>
	Worn teeth of ring gear	<i>Replace flywheel.</i>

Condition	Possible cause	Correction / Reference Item
Noise	Abnormally worn bush	<i>Replace starting motor.</i>
	Worn pinion or worn teeth of ring gear	<i>Replace starting motor or flywheel.</i>
	Poor sliding of pinion (failure in return movement)	<i>Replace starting motor.</i>
	Worn internal or planetary gear teeth	<i>Replace starting motor.</i>
	Lack of oil in each part	<i>Replace starting motor.</i>
Starting motor does not stop running	Fused contact points of magnetic switch	<i>Replace starting motor.</i>
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	<i>Replace starting motor.</i>
	Failure of returning action in ignition switch	<i>Replace.</i>

Cranking System Test

S5RS0B1904002

⚠ CAUTION

Never disassemble starting motor. Disassembly will spoil its original function. If faulty condition is found, replace it with new one as an assembly.

⚠ CAUTION

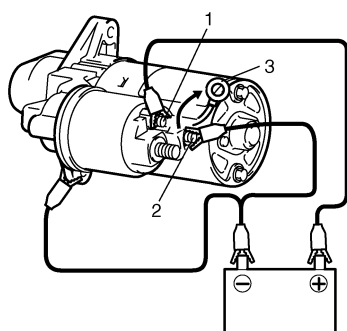
Each test must be performed within 3 – 5 seconds to avoid coil from burning.

Pull-In Test

Connect battery to the magnetic switch as shown. Check that plunger and pinion move outward. If plunger and pinion don't move, replace starting motor assembly.

NOTE

Before testing, disconnect lead wire (3) from terminal "M" (2).

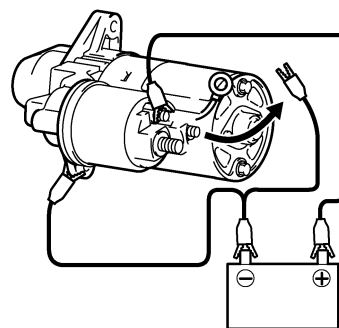


I5RS0B190002-01

1. Terminal "S"

Hold-In Test

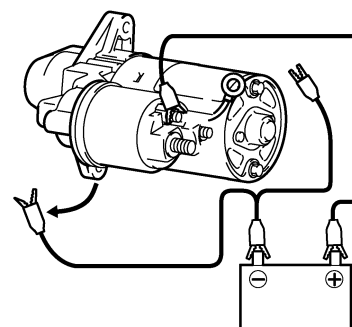
While connected as above with plunger out, disconnect negative lead from terminal "M". Check that plunger and pinion remain out. If plunger and pinion return inward, replace starting motor assembly.



I5RS0B190003-01

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 assembly.



I5RS0B190004-01

11-4 Starting System:

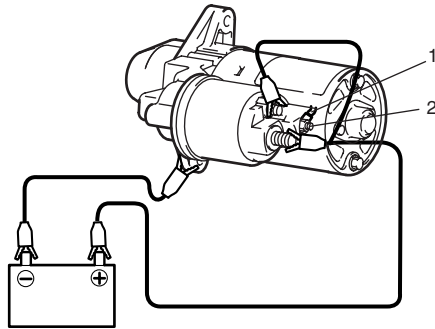
No-Load Performance Test

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 assembly.



I3RM0B190001-01

Repair Instructions

Starting Motor Dismounting and Remounting

S5RS0B1906001

Dismounting

⚠ CAUTION

Never disassemble starting motor.

Disassembly will spoil its original function. If faulty condition is found, replace it with new one as an assembly.

- 1) Disconnect negative cable at battery.
- 2) Remove battery and battery tray, if necessary.
- 3) Remove air cleaner assembly, if necessary referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 4) Pull out the rubber lid from transaxle case for removing starting motor mount bolt (4).
- 5) Remove starting motor mount bolt (upper side).

NOTE

Make sure that starting motor mount bolt (upper side) does not fall into transaxle case.

- 6) Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
- 7) Remove starting motor mount bolt (lower side).
- 8) Remove starting motor (1).

Remounting

Reverse the dismounting procedure noting the following.

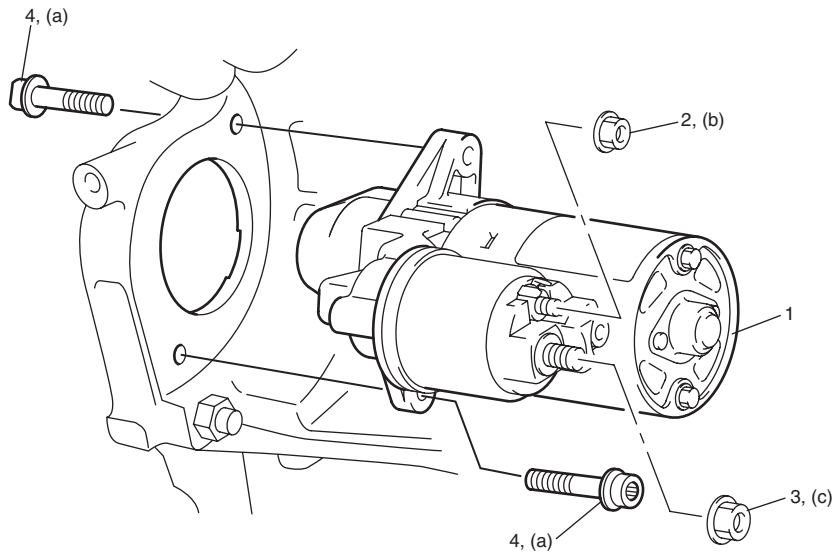
- Make sure that starting motor mount bolt (upper side) does not fall into transaxle case.
- Tighten starting motor mount bolts to specified torque.

Tightening torque

Starting motor mount bolt (a): 25 N·m (2.5 kgf-m, 18.0 lb-ft)

Magnetic switch lead wire nut (b): 7 N·m (0.7 kgf-m, 5.0 lb-ft)

Battery cable nut (c): 15 N·m (1.5 kgf-m, 11.0 lb-ft)



2. Magnetic switch lead wire nut	3. Battery cable nut
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I5RS0B190005-01

Specifications

Tightening Torque Specifications

S5RS0B1907001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lb-ft	
Starting motor mount bolt	25	2.5	18.0	⚙
Magnetic switch lead wire nut	7	0.7	5.0	⚙
Battery cable nut	15	1.5	11.0	⚙

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Charging System

General Description

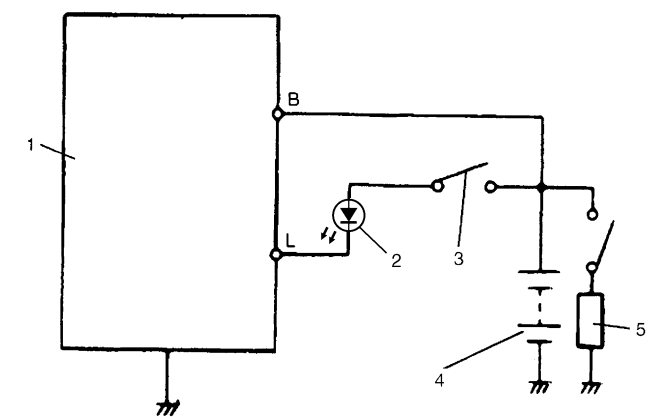
Generator Description

S5RS0B1A01002

The generator is a small and high performance type with an IC regulator incorporated.

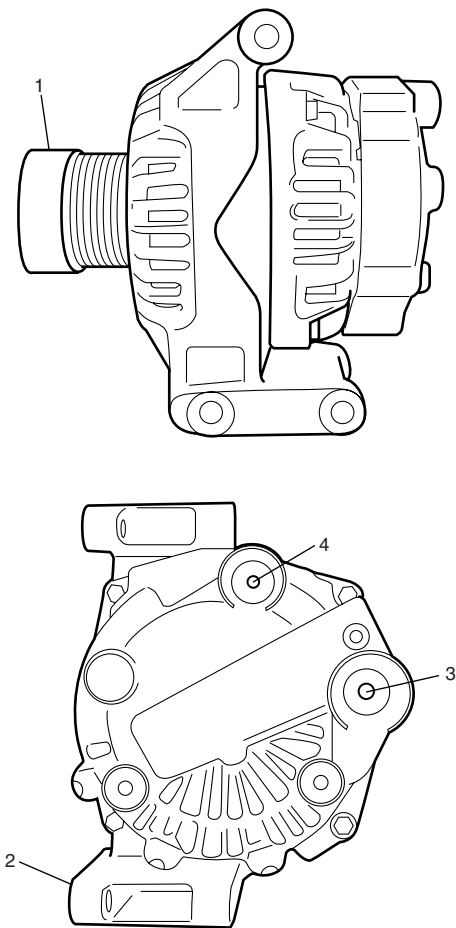
The generator features are as follows:

- 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.



I5RS0B1A0001-01

1. Generator with regulator assembly	4. Battery
2. Charge indicator light	5. Load
3. Ignition switch	



I3RM0B1A0001-01

1. Pulley	3. "B" terminal
2. Ground	4. "L" terminal

Diagnostic Information and Procedures

Battery Inspection

S5RS0B1A04001

Common Causes of Failure

A battery is not designed to last indefinitely; however, with proper care, it will provide many years of service. If the battery performs satisfactorily during test but fails to operate properly for no apparent reason, the following are some factors that may point to the cause of trouble:

- Accessories left on overnight or for an extended period without the generator operating.
- Slow average driving speeds for short periods.
- Electrical load exceeding generator output particularly with addition of aftermarket equipment.
- Defects in charging system such as high resistance, slipping drive belt, loose generator output terminal, faulty generator or voltage regulator. Refer to "Generator Symptom Diagnosis: ".
- Battery abuse, including failure to keep battery cable terminals clean and tight or loose battery hold down.
- Mechanical problems in electrical system such as shorted or pinched wires.

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.

Hydrometer Test

The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter and an expensive instrument used in the service shops, but not recommendable to the user of the vehicle.

At 20 °C of battery temperature (electrolyte temperature):

- The battery is in FULLY CHARGED STATE if the electrolyte S.G. is 1.280.
- The battery is in HALF CHARGED STATE if the S.G. is 1.220.
- The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.

As the S.G. varies with the temperature, if battery temperature is not at 20 °C (68 °F), you have to correct your S.G. reading (taken with your hydrometer) to the value at 20 °C (68 °F) and apply the corrected S.G. value to the three-point guide stated value.

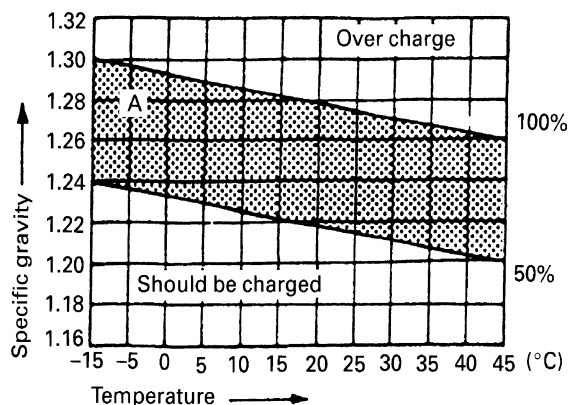
For the manner of correction, refer to the graph showing the relation between S.G. value and temperature.

How to use the temperature-corrected state-of-charge graph

Suppose your S.G. reading is 1.28 and the battery temperature is -5 °C (23 °F). Locate the intersection of the -5 °C line and the 1.28 S.G. line.

The intersection is within the "A" zone (shaded area in the graph) and that means CHARGED STATE.

To know how much the battery is charged, draw a line parallel to the zone demarcation line and extend it to the right till it meets with the percentage scale. In the present example, the line meets at about 85% point on the percentage scale. Therefore, the battery is charged up to the 85% level.



I2RH0B1A0003-01

Generator Symptom Diagnosis

S5RS0B1A04002

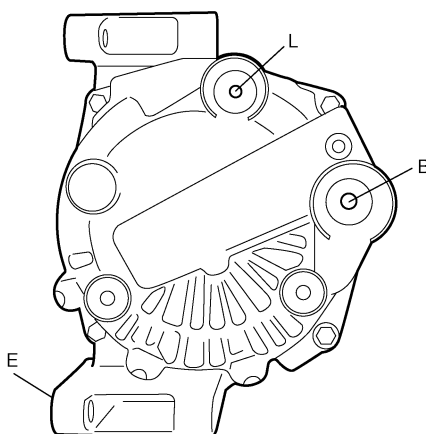
⚠ CAUTION

- Do not connect any load between “L” and “E” terminals.
- When connecting charger or booster battery to vehicle battery, refer to “Jump Starting in Case of Emergency: ”.

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.



I5RS0B1A0002-01

B: Generator output (Battery terminal)	L: Lamp terminal
E: Ground	

Charging Indicator Lamp Operation

Condition	Possible cause	Correction / Reference Item
Charge light does not light with ignition ON and engine off	Fuse blown	<i>Check fuse.</i>
	Light burned out	<i>Replace light.</i>
	Wiring connection loose	<i>Tighten loose connection.</i>
	IC regulator or field coil faulty	<i>Replace generator.</i>
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	<i>Adjust or replace drive belt.</i>
	IC regulator or generator faulty	<i>Check charging system.</i>
	Wiring faulty	<i>Repair wiring.</i>
Noise from radio	Condenser faulty	<i>Replace generator.</i>

Generator Test (Undercharged Battery Check)

S5RS0B1A04003

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. The following procedure also applies to vehicles with voltmeter and ammeter.

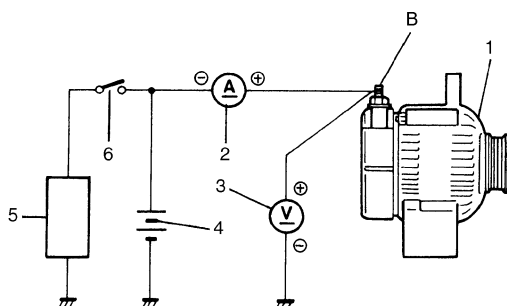
- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to "Battery Description: ".
- Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

No-Load Check

- 1) Connect voltmeter and ammeter as shown in the figure.

NOTE

Use fully charged battery.



I2RH011A0006-01

1. Generator
2. Ammeter (between generator "B" terminal and battery (+) terminal)
3. Voltmeter (between generator "B" terminal and ground)
4. Battery
5. Load
6. Switch

- 2) Run engine from idling up to 2,000 rpm with all accessories turned off and read meters. If voltage is out of standard value, replace generator.

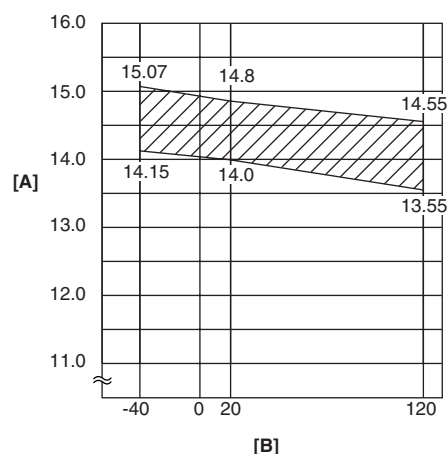
Specification for undercharged battery (No-load check)

Current: 10 A

Voltage: 14.0 – 14.8 V at Hi (H) (at 20 °C, 68 °F)

NOTE

Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in the figure.



I4RH0A1A0008-01

[A]: Regulated voltage (V)

[B]: Heatsink temperature (°C)

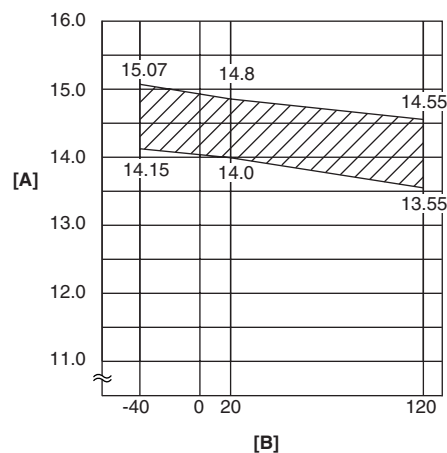
Load Check

- 1) Run engine at 2,000 rpm and turn on head light and heater motor.
- 2) Measure current and if it is less than 20 A, replace generator.

Generator Test (Overcharged Battery Check)

S5RS0B1A04004

- 1) To determine battery condition, refer to "Battery Description: ".
- 2) If obvious overcharged condition exists as evidenced by excessive spewing of electrolyte, measure generator "B" terminal voltage at engine 2,000 rpm.
- 3) If measured voltage is higher than upper limit value, replace generator.



I4RH0A1A0008-01

[A]: Regulated voltage (V)

[B]: Heatsink temperature (°C)

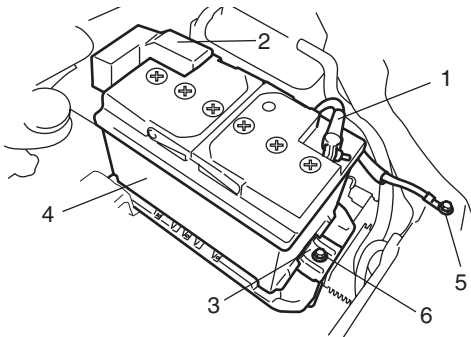
Repair Instructions

Battery Dismounting and Remounting

S5RS0B1A06002

Dismounting

- 1) Disconnect negative cable (1).
- 2) Disconnect positive cable (2).
- 3) Loosen retainer bolt (6) and the remove retainer (3).
- 4) Remove battery (4).



I5RS0B1A0003-01

5. Body ground bolt

Handling

When handling battery, the 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) Tighten battery cables securely.

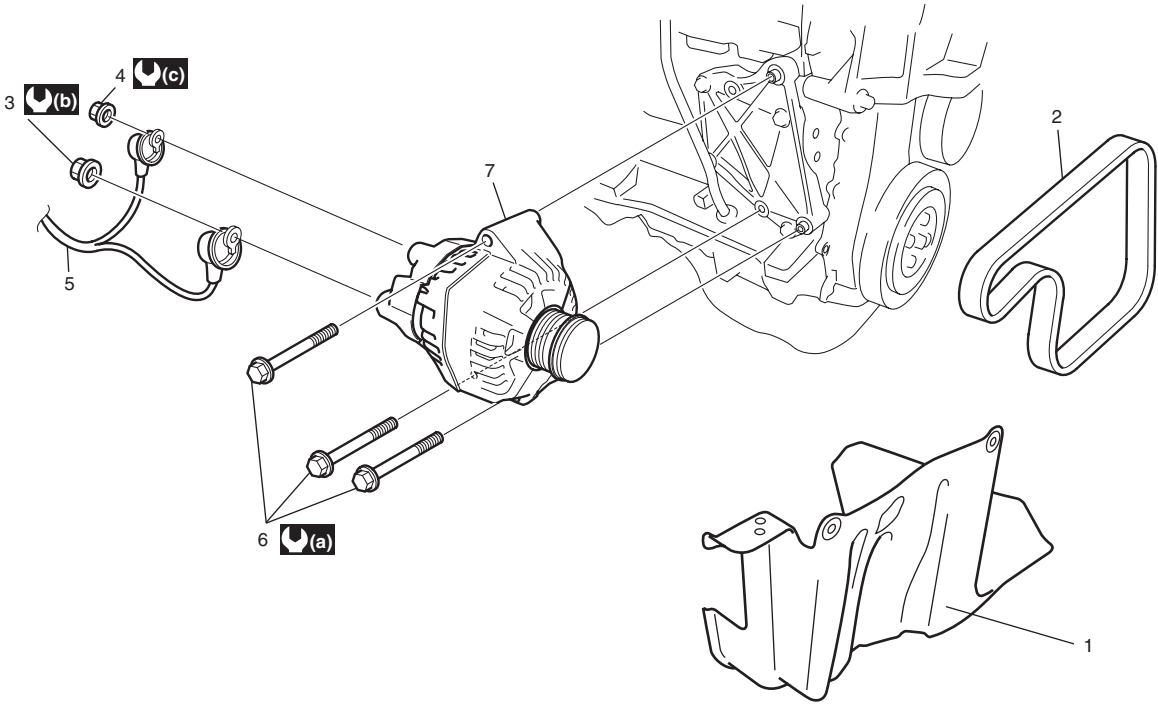
NOTE

Check to be sure that ground cable has enough clearance to hood panel by terminal.

Generator Dismounting and Remounting

S5RS0B1A06003

- 1) Disconnect negative cable at battery.
- 2) Dismount in order as shown in the figure.
- 3) Reverse dismounting procedure for remounting.



I5RS0B1A0004-03

1. Splash cover	4. "L" terminal nut	7. Generator	⚙️(c) : 4 N·m (0.4 kgf-m, 3.0 lb-ft)
2. Generator belt	5. "B" and "L" terminals wire	⚙️(a) : 19 N·m (1.9 kgf-m, 14.0 lb-ft)	
3. "B" terminal nut	6. Generator bolt	⚙️(b) : 9 N·m (0.9 kgf-m, 7.0 lb-ft)	

Specifications

Charging System Specifications

S5RS0B1A07001

Battery

Battery type	CCA 370 A
Nominal output	12 V
Rated capacity	60 Ah / 20 h
	46Ah / 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 Specifications

S5RS0B1A07002

NOTE

The specified tightening torque is also described in the following.
“Generator Dismounting and Remounting: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Exhaust System

General Description

Exhaust System Description

S5RS0B1B01001

The exhaust system consists of an exhaust manifold, three-way catalytic converter (TWC), a turbocharger, 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.

Diagnostic Information and Procedures

Exhaust System Check

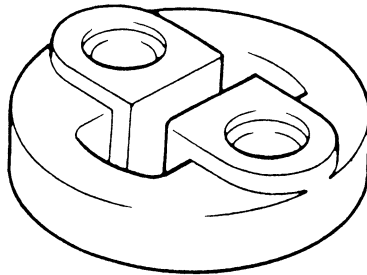
S5RS0B1B04001

⚠ 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 for damage, deterioration, and out of position.



IYSY011B0003-01

- 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: ”.
- 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.

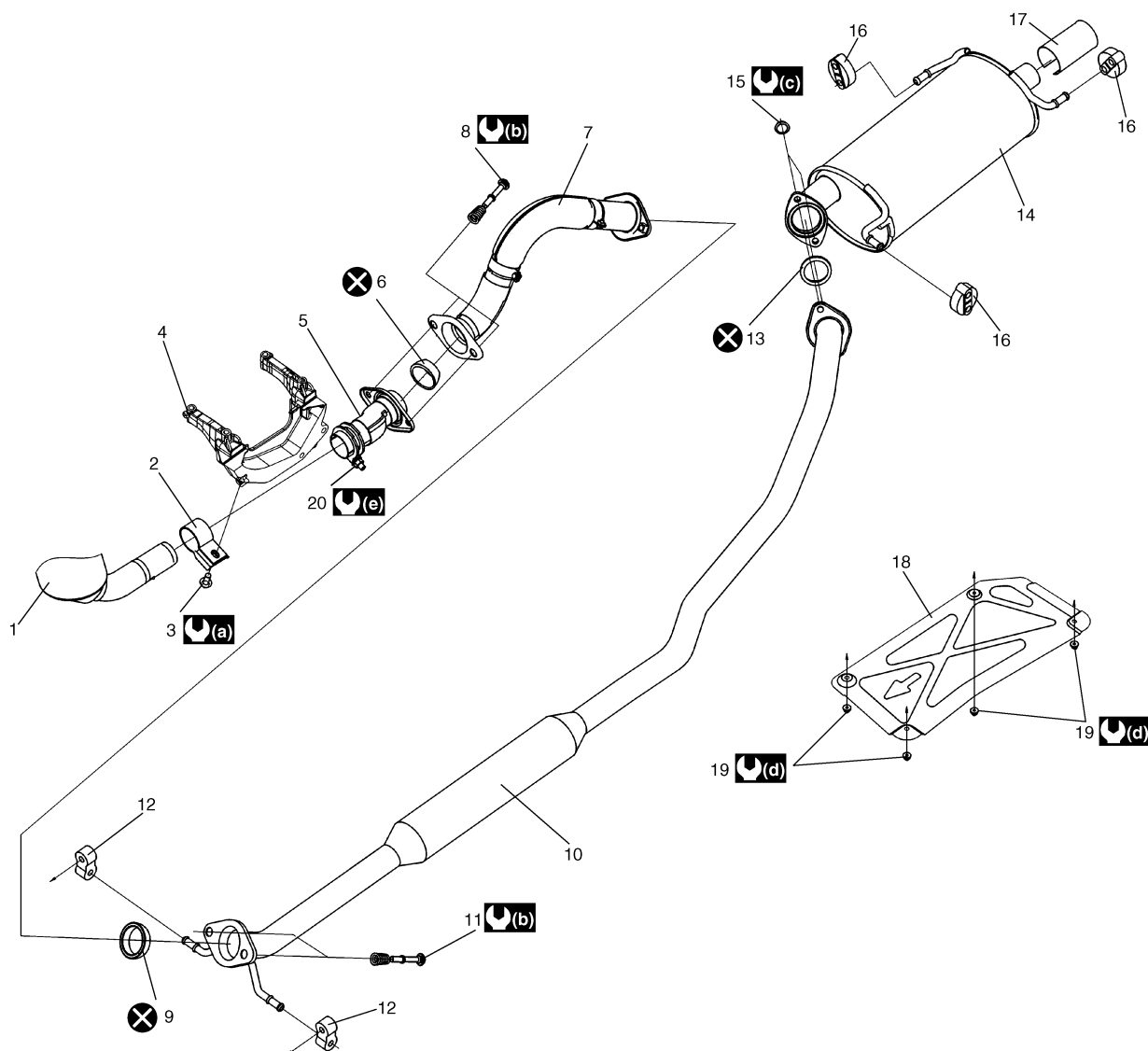
Repair Instructions

Exhaust System Components

S5RS0B1B06001

⚠ 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.

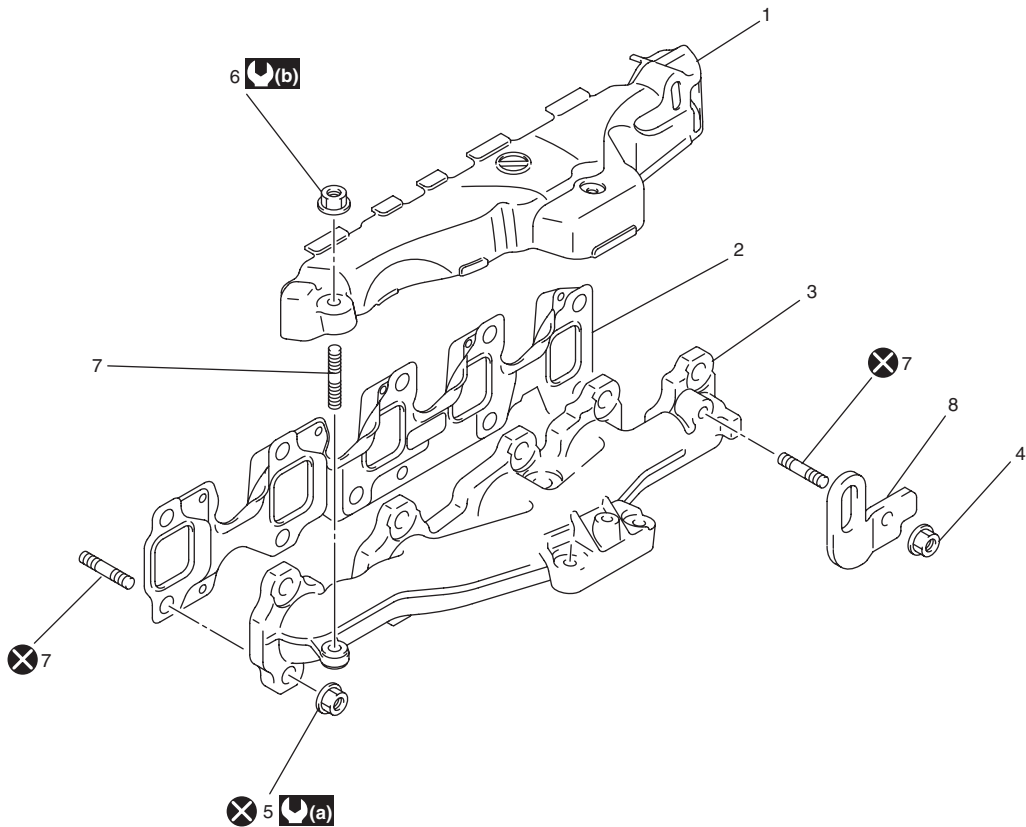


I5RS0B1B0001-02

1. Catalytic converter	10. Exhaust center pipe	19. Heat insulator nut
2. Catalytic converter bracket	11. Exhaust center pipe bolt	20. Exhaust No.1 pipe nut
3. Catalytic converter mounting bolt	12. Center pipe mounting	(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)
4. Transaxle stiffener	13. Exhaust pipe No.2 gasket	(b) : 43 N·m (4.3 kg-m, 31.0 lb-ft)
5. Exhaust No.1 pipe	14. Muffler	(c) : 60 N·m (6.0 kg-m, 43.5 lb-ft)
6. No.1 seal ring	15. Muffler nut	(d) : 3 N·m (0.3 kg-m, 2.5 lb-ft)
7. Exhaust No.2 pipe	16. Muffler mounting	(e) : 55 N·m (5.5 kg-m, 40.0 lb-ft)
8. Exhaust No.2 pipe bolt	17. Muffler tail pipe	⊗ : Do not reuse.
9. No.2 seal ring	18. Heat insulator	

Exhaust Manifold Components

S5RS0B1B06002



I5RS0B1B0002-01

1. Exhaust manifold cover	5. Exhaust manifold nut	⚙️(a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)
2. Exhaust manifold gasket	6. Exhaust manifold cover nut	⚙️(b) : 9 N·m (9.0 kg-m, 6.5 lb-ft)
3. Exhaust manifold	7. Stud bolt	⌘ : Do not reuse.
4. Engine hanger nut	8. Engine hanger	

Exhaust Manifold Removal and Installation

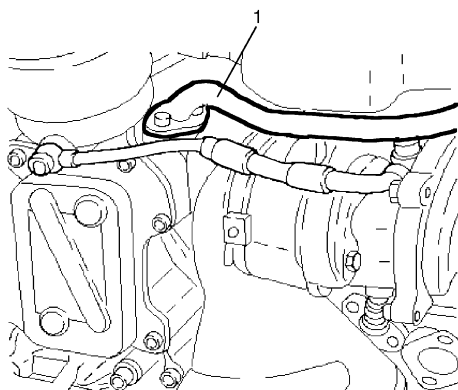
S5RS0B1B06003

Removal

▲ WARNING

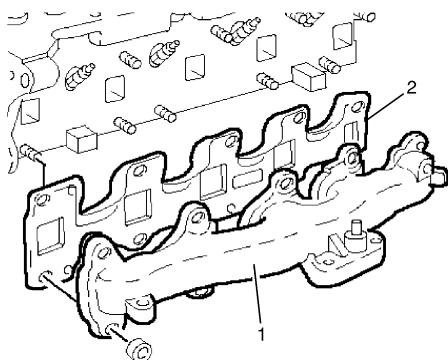
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

- 1) Disconnect negative cable at battery.
- 2) Drain engine coolant referring to "Cooling System Draining: in Section 1F".
- 3) Remove air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 4) Remove turbocharger referring to "Turbocharger Removal and Installation: in Section 1D".
- 5) Remove coolant feed pipe (1).



I3RM0B1B2003-01

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



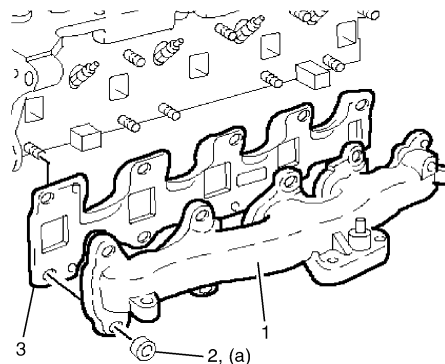
I3RM0B1B2004-01

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 kgf-m, 17.0 lb-ft)

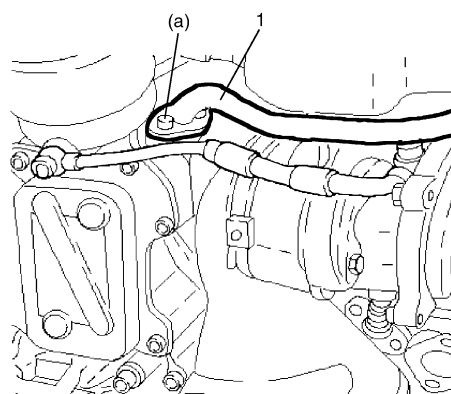


I3RM0B1B2005-01

- 2) Install coolant feed pipe (1).

Tightening torque

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



I3RM0B1B2006-01

- 3) Install turbocharger referring to "Turbocharger Removal and Installation: in Section 1D".
- 4) Install air cleaner assembly with MAF sensor assembly referring to "Air Cleaner Assembly Removal and Installation: in Section 1D".
- 5) Refill cooling system referring to "Cooling System Flush and Refill: in Section 1F" for equipped with A/C.
- 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.

1K-5 Exhaust System:

Exhaust Manifold Inspection

S5RS0B1B06004

Check gasket and seal for deterioration or damage.
Replace them as necessary.

Catalytic Converter Removal and Installation

S5RS0B1B06005

Refer to “Turbocharger Removal and Installation: in Section 1D”.

Exhaust Pipe and Muffler Removal and Installation

S5RS0B1B06006

For replacement of exhaust pipe, be sure to hoist vehicle and observe WARNING under “Exhaust System Components: ” 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. Refer to “Exhaust System Components: ”.
- After installation, start engine and check each joint of exhaust system for leakage.

Specifications

Tightening Torque Specifications

S5RS0B1B07001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Exhaust manifold nut	23	2.3	17.0	☞
Coolant feed pipe bolt	9	0.9	7.0	☞

NOTE

The specified tightening torque is also described in the following.

“Exhaust System Components: ”

“Exhaust Manifold Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Section 2

Suspension

CONTENTS

NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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General Balance Procedures	2D-*		

Front Suspension

Repair Instructions

Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation

S5RS0B2206015

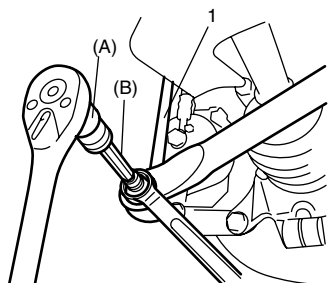
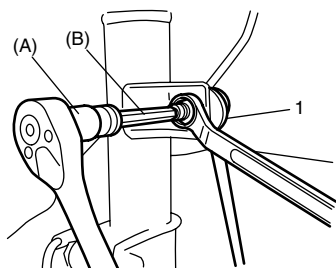
Removal

- 1) Hoist vehicle and remove wheels (right & left).
- 2) Remove suspension control arm referring to "Suspension Control Arm / Bushing Removal and Installation: ".
- 3) Remove stabilizer joints (1).
When loosening joint nut, hold stud with special tools.

Special tool

(A): 09900-00411 socket

(B): 09900-00413 5 mm



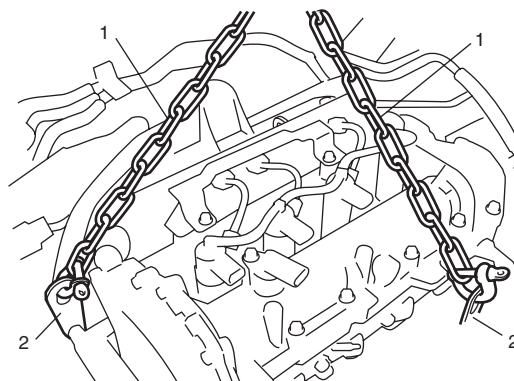
I4RS0A220038-01

- 4) Remove engine hood after disconnecting windshield washer hose.
- 5) Remove engine cover from engine assembly.
- 6) Remove intercooler outlet pipe referring to "Intercooler Components: in Section 1D"
- 7) Disconnect the following connectors, and then remove wire harness from engine.
 - Injector connectors
 - Glow plug connectors
- 8) Remove oil with level gauge and oil level gauge guide.

- 9) By using chain hoist (1), support engine assemble with engine hangers (2).

⚠ CAUTION

Be sure to remove / disconnect part(s) that interfere with chain hoist, if necessary. Failure to follow this CAUTION could result in damage them by chain hoist.

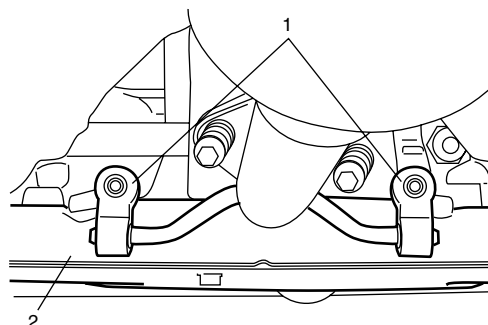


I5RS0B220001-01

- 10) Remove steering gear case from vehicle referring to "Steering Gear Case Assembly Removal and Installation: in Section 6C".
- 11) Disconnect center pipe mounting (1) from suspension frame (2).

⚠ WARNING

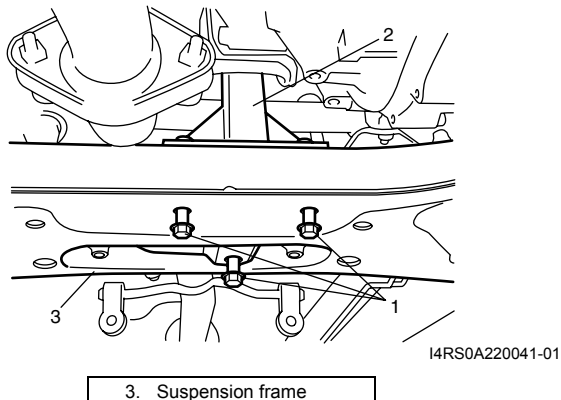
Do not touch exhaust system to avoid danger of being burned when it is still hot. Any service on exhaust system should be performed when it is cool.



I4RS0A220040-01

2B-2 Front Suspension:

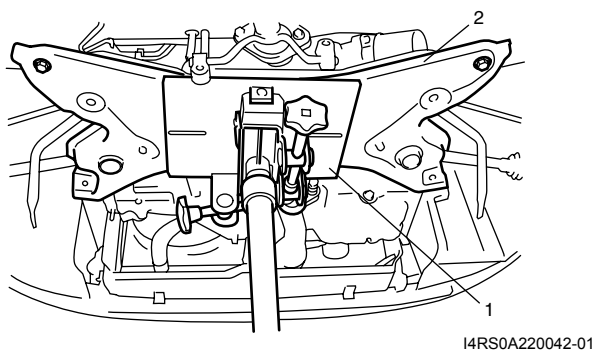
- 12) Remove engine rear mounting bolts (1) from engine rear mounting (2).



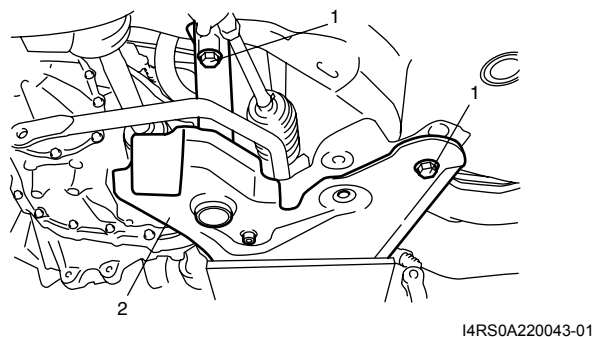
- 13) Support suspension frame by using mission jack (1) under suspension frame (2).

⚠ WARNING

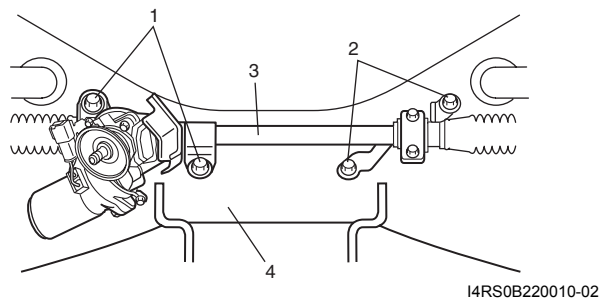
When removing suspension frame, be sure to apply some supporting equipment (such as mission jack) under it at well-balanced position in the center section so as to prevent from its drop.



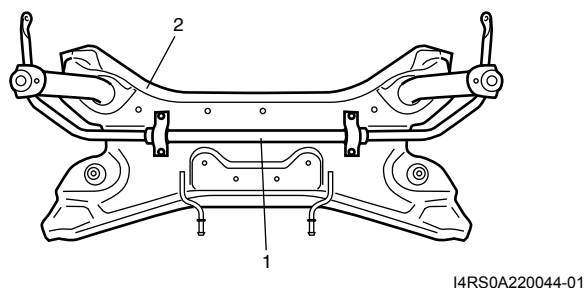
- 14) Remove suspension frame mounting bolts (1), and then lower mission jack and remove suspension frame (2) with stabilizer bar and steering gear case.



- 15) Remove steering gear case mounting No.1 bolts (1) and No.2 bolts (2), then remove gear case (3) from suspension frame (4).



- 16) Remove stabilizer bar (1) and bushing from suspension frame (2).



Installation

- 1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.
- 2) Install stabilizer bar (1), stabilizer bushing (2) and stabilizer mounting bracket (3) to suspension frame as shown in figure.

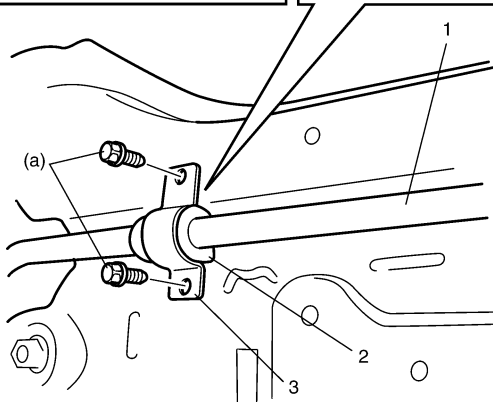
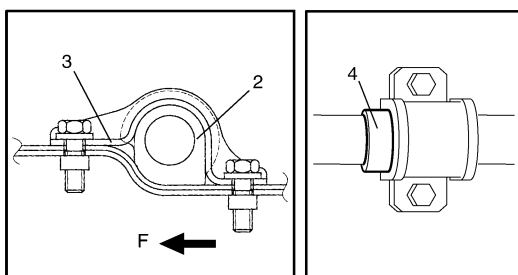
NOTE

For correct installation of stabilizer bar, side-to-side, be sure that stopper ring (4) on stabilizer bar aligns with mount bush, both right and left, as shown in figure.

- 3) Tighten stabilizer bar mounting bracket bolts to specified torque.

Tightening torque

Stabilizer bar mounting bracket bolt (a): 23 N·m (2.3 kgf-m, 17.0 lb-ft)



I4RS0A220055-01

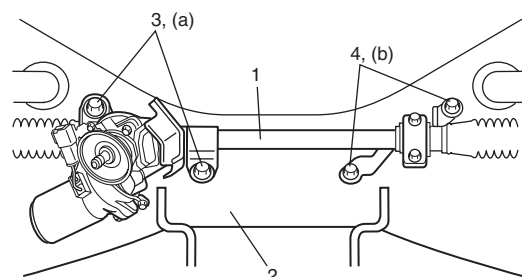
F: Forward

- 4) Mount steering gear case (1) to suspension frame (2) and tighten gear case mounting No.1 bolts (3) and No.2 bolts (4) to specified torque.

Tightening torque

Steering gear case mounting No.1 bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

Steering gear case mounting No.2 bolt (b): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

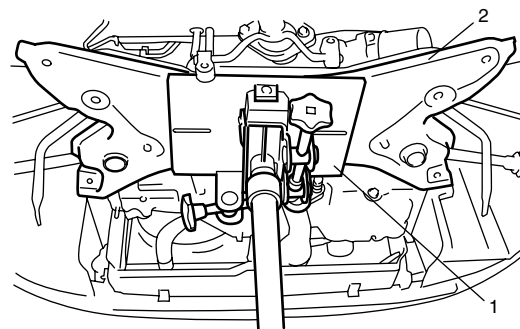


I4RS0B220011-02

- 5) Support suspension frame (2) with stabilizer bar by using mission jack (1), and jack up it.

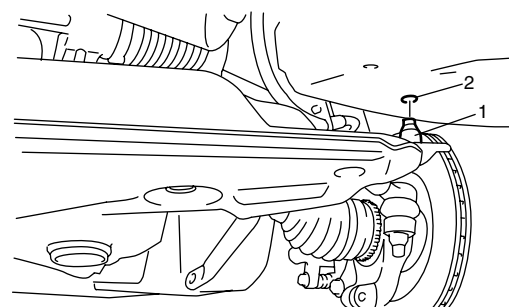
▲ WARNING

When mounting suspension frame, be sure to apply some supporting equipment (such as mission jack) under it at well-balanced position in the center section so as to prevent from its drop.



I4RS0A220046-01

- 6) Align lugs (1) (right and left) of suspension frame with holes (2) in vehicle body respectively.



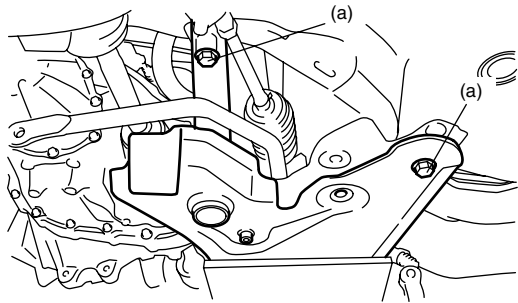
I4RS0A220047-01

2B-4 Front Suspension:

- 7) Tighten suspension frame mounting bolts (a) to specified torque.

Tightening torque

Suspension frame mounting bolt (a): 150 N·m (15.0 kgf-m, 108.5 lb-ft)



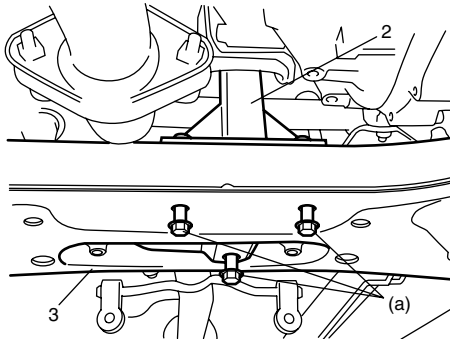
I4RS0A220048-01

- 8) Lower mission jack.

- 9) Tighten engine rear mounting bolts (a) to specified torque.

Tightening torque

Engine rear mounting bolt (a): 55 N·m (5.5 kgf-m, 40.0 lb-ft)

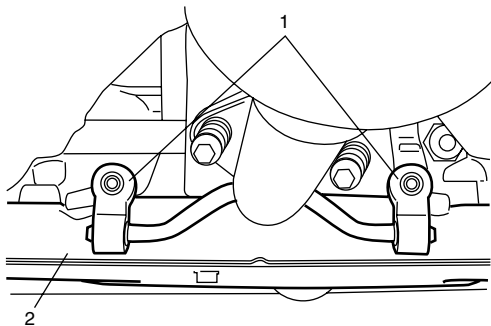


I4RS0A220049-01

2. Engine rear mounting

3. Suspension frame

- 10) Connect center pipe mounting (1) to suspension frame (2).



I4RS0A220040-01

- 11) Remove chain hoist from engine.

- 12) Install oil level gauge guide and oil level gauge.

- 13) Reverse disconnected electric wires and connectors for connection in removal procedure.

- 14) Install intercooler outlet pipe referring to "Intercooler Components: in Section 1D".

- 15) Install engine cover to engine assembly.

Tightening torque

Engine cover bolt: 8 N·m (0.8 kgf-m, 6.0 lb-ft)

- 16) Install engine hood and connect windshield washer hose.

- 17) Install steering gear case to vehicle referring to "Steering Gear Case Assembly Removal and Installation: in Section 6C".

- 18) Install stabilizer joints (1), and tighten nuts to specified torque.

When tightening, hold stud with special tools.

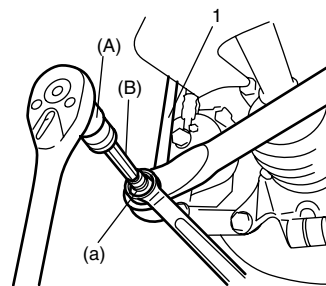
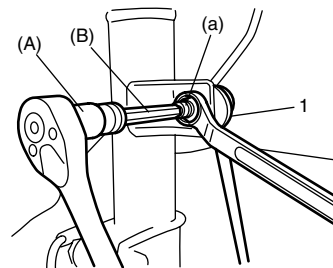
Special tool

(A): 09900-00411 socket

(B): 09900-00413 5 mm

Tightening torque

Stabilizer joint nut (a): 50 N·m (5.0 kgf-m, 36.5 lb-ft)



I4RS0A220051-01

- 19) Install suspension control arm referring to "Suspension Control Arm / Bushing Removal and Installation: ".

- 20) Install wheels (right & left) and lower hoist.

- 21) Confirm front wheel alignment referring to "Front Wheel Alignment Inspection and Adjustment: ".

Section 3

Driveline / Axle

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NOTE

For the items with asterisk (*) in the “CONTENTS” below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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		Support Disassembly and Assembly.....	3A-9
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Drive Shaft / Axle

General Description

Front Drive Shaft Construction

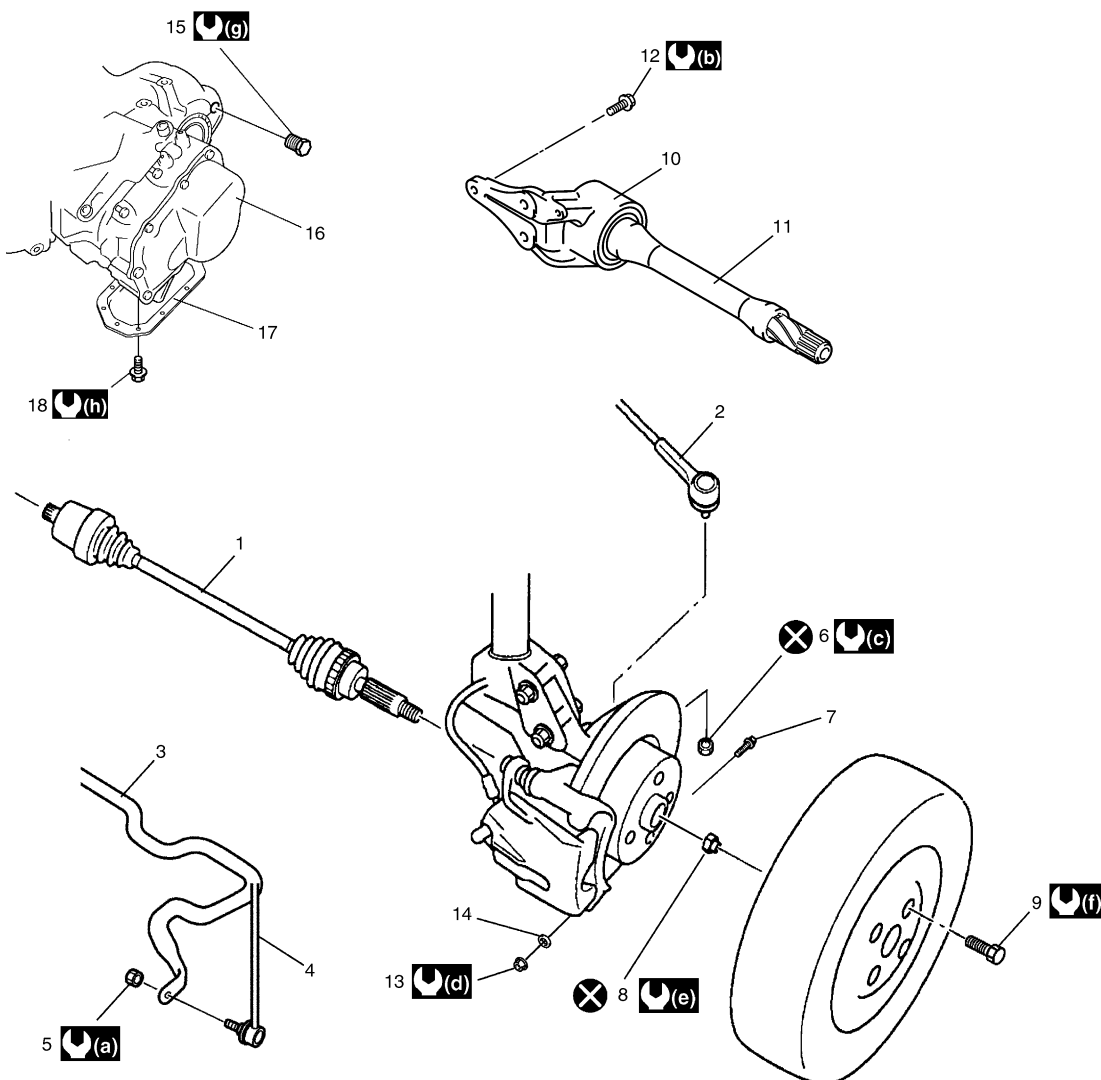
S5RS0B3101001

A constant velocity double offset joint (DOJ) is used on the differential side (or center shaft side) of both right and left side drive shaft assemblies. A constant velocity ball joint is used on the wheel side of both right and left side drive shaft assemblies. The drive shaft can slide through the double offset joint (DOJ) in the extension/contraction direction.

Component Location

Front Drive Shaft Assembly Components Location

S5RS0B3103001



I5RS0B310001-02

1. Drive shaft assembly	10. Center bearing support	: 50 N·m (5.0 kgf-m, 36.5 lb-ft)
2. Tie-rod end	11. Center shaft	: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
3. Stabilizer	12. Center bearing support bolts	: 45 N·m (4.5 kgf-m, 32.5 lb-ft)
4. Stabilizer joint	13. Ball stud nut	: 60 N·m (6.0 kgf-m, 43.5 lb-ft)
5. Stabilizer joint nut	14. Ball stud washer	: 175 N·m (17.5 kgf-m, 126.5 lb-ft)
6. Tie-rod end nut	15. Oil level / filler plug	: 85 N·m (8.5 kgf-m, 61.5 lb-ft)
7. Ball stud bolt	16. Transaxle	: 4 N·m (0.4 kgf-m, 3.0 lb-ft) + 45° to 180°
8. Drive shaft nut	17. Oil pan	: 18 N·m (1.8 kgf-m, 13.0 lb-ft)
9. Wheel bolt	18. Oil pan bolt	: Do not reuse.

Diagnostic Information and Procedures

Front Drive Shaft Symptom Diagnosis

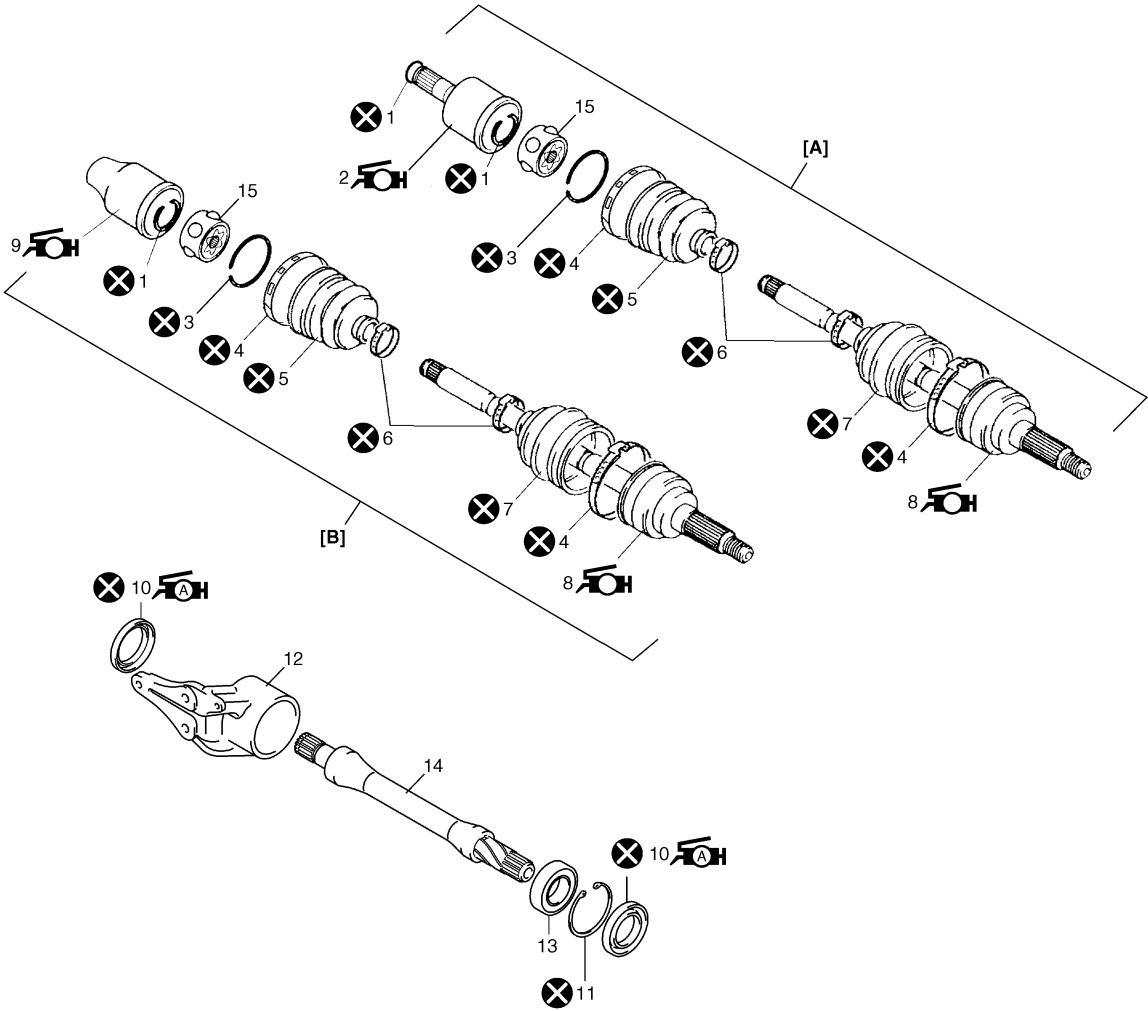
S5RS0B3104001

Condition	Possible cause	Correction / Reference Item
Abnormal noise	Worn or breakage of the drive shaft joint	Replace.
	Worn or breakage of the center bearing	Replace.

Repair Instructions

Front Drive Shaft Components

S5RS0B3106001



I5RS0B310002-02

[A]: Left side drive shaft assembly	8. Wheel side joint (Constant velocity ball joint) : Apply black grease included in spare part to joint.
[B]: Right side drive shaft assembly	9. Center shaft side joint (Constant velocity DOJ) : Apply dark gray grease included in spare part to joint.
1. Circlip	10. Oil seal : Apply grease 99000-25010 to oil seal lip. (2.0 – 3.0 g (0.07 – 0.11 oz))
2. Differential side joint (Constant velocity DOJ) : Apply dark gray grease included in spare part to joint.	11. Center bearing support circlip
3. Snap ring	12. Center bearing support
4. Boot band (Large)	13. Center bearing
5. Boot (Differential or center shaft side)	14. Center shaft
6. Boot band (Small)	15. Cage
7. Boot (Wheel side)	: Do not reuse.

Front Drive Shaft Assembly On-Vehicle Inspection

S5RS0B3106002

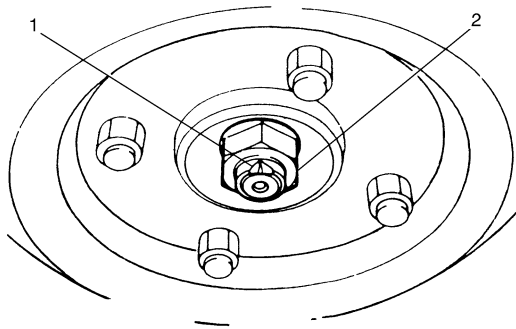
- Check boots for breakage or deterioration.
 - Check wheel side joint for rattle or smooth rotation.
 - Check differential side (or center shaft side) joint for smooth rotation.
- If any abnormality is found, replace.

Front Drive Shaft Assembly Removal and Installation

S5RS0B3106003

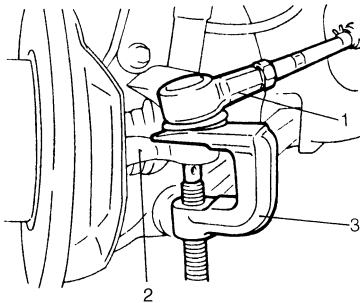
Removal

- 1) Undo caulking (1) and remove drive shaft nut (2).



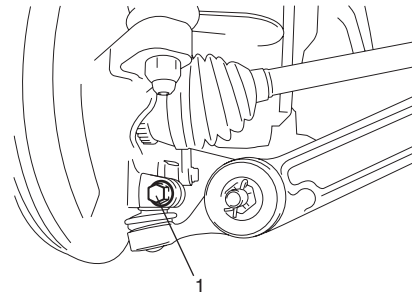
I4RS0A310003-01

- 2) Remove wheel.
3) Drain transaxle oil.
4) Disconnect tie-rod end (1) from steering knuckle (2) using puller (3).



I3RM0A310003-01

- 5) Remove stabilizer joint referring to "Front Suspension Frame, Stabilizer Bar and/or Bushings Removal and Installation: in Section 2B".
6) Remove brake hose mounting bolt.
7) Remove wheel speed sensor and suspension control arm ball joint bolt (1).



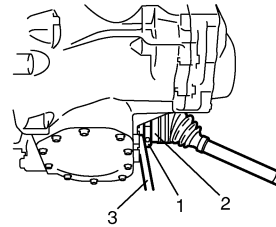
I4RS0A310004-01

- 8) Disconnect front suspension control arm ball joint stud from steering knuckle.

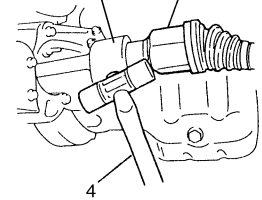
- 9) Pull out drive shaft joint as follows.

- For left side shaft:
Install used clamp (1) to differential side joint (2) and pull out drive shaft joint from transaxle by using tire lever (3).
- For right side shaft:
Using plastic hammer (4), drive out drive shaft joint (5) so as to release snap ring fitting of joint spline at center shaft (6).

[A]



[B]



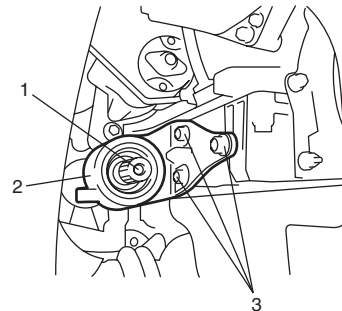
I5RS0B310003-01

[A]: Left side

[B]: Right side

- 10) Remove drive shaft assembly.

- 11) Remove center bearing support bolts (3) and remove center bearing support (2) with center shaft (1) from differential side gear, if equipped.



I5RS0B310004-01

Installation

⚠ CAUTION

- Be careful not to damage oil seals and boots when installing drive shaft.
- Do not hit joint boot with hammer. Inserting joint only by hands is allowed.
- Make sure that differential side joint is inserted fully and its snap ring is seated as it was.

Install drive shaft assembly by reversing removal procedure and noting the following points.

- Tighten each bolt and nut to the specified torque referring to "Front Drive Shaft Assembly Components Location: ".
- Tighten brake hose mounting bolt to specified torque.

Tightening torque

Brake hose mounting bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- Fill transaxle with oil as specified referring to "Manual Transaxle Oil Change: in Section 5B".
- Check toe setting referring to "Front Wheel Alignment Inspection and Adjustment: in Section 2B" and adjust as required.

Front Drive Shaft Disassembly and Assembly

S5RS0B3106004

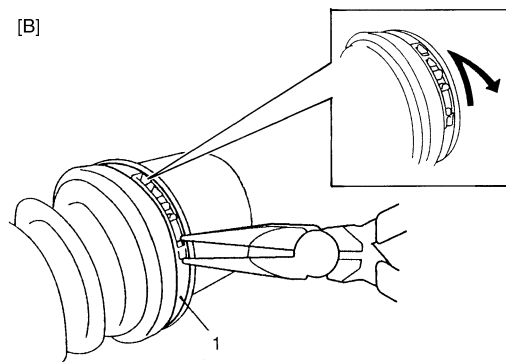
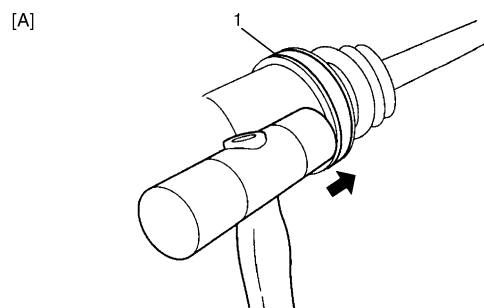
Disassembly

⚠ CAUTION

Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.

- 1) Remove differential side (or center shaft side) boot big band (1) as follows.

- For boot big band without joint:
Remove boot big band by tapping boot and band with plastic hammer. If it is hard to remove boot big band, cut it using a nipper or an iron saw with care not to damage joint housing.
- For boot big band with joint:
Draw hooks of boot big band together and remove band.



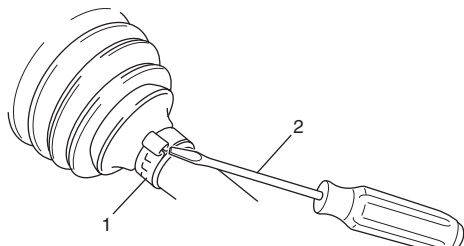
I4RH0A310004-01

[A]: For boot big band without joint

[B]: For boot big band with joint

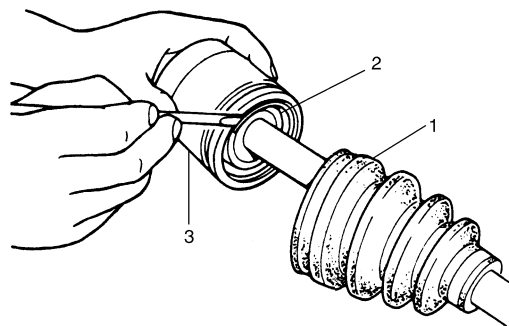
3A-5 Drive Shaft / Axle:

- 2) Remove differential side (or center shaft side) boot small band (1) using flat end rod (2) or the like.



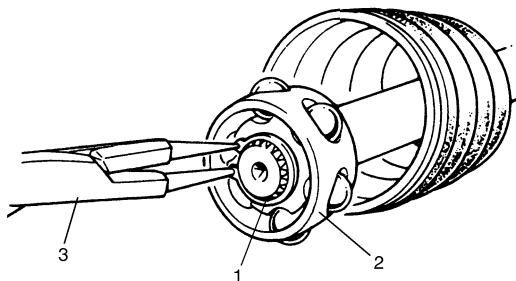
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- 3) Slide boot (1) toward the center of shaft and remove snap ring (2) from outer race, and then take shaft out of outer race (3).



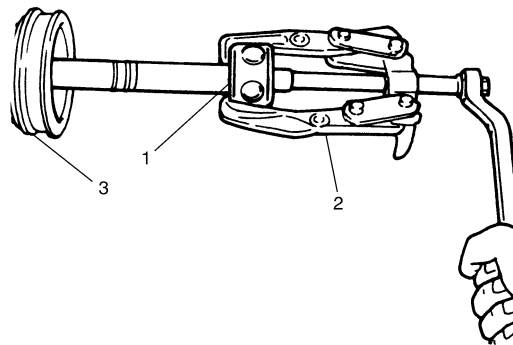
I2RH01310012-01

- 4) Wipe off grease and remove circlip (1) used to fix cage (2) by using snap ring plier (3).



I5RS0B310006-01

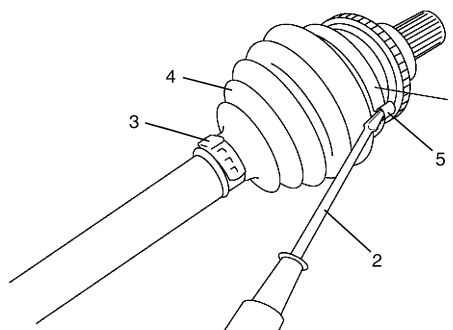
- 5) Draw away cage (1) by using bearing puller (2), and remove boot (3) from shaft.



I2RH01310014-01

- 6) Pull out differential side (or center shaft side) boot from shaft.

- 7) Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



I4RS0A310006-01

Assembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly.

Make sure that wheel side joint assembly and DOJ housing are washed thoroughly and air dried.

Replace boot(s) with new one(s).

⚠ CAUTION

- Do not wash boots in degreaser such as gasoline or kerosene. etc. Washing in degreaser causes deterioration of boot.
- To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint referring to the followings for identification of the grease.

- 1) Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
- 2) Clean boots with cloth.
- 3) Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set as a spare parts.

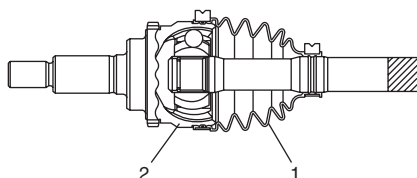
Grease color

: Black

Amount

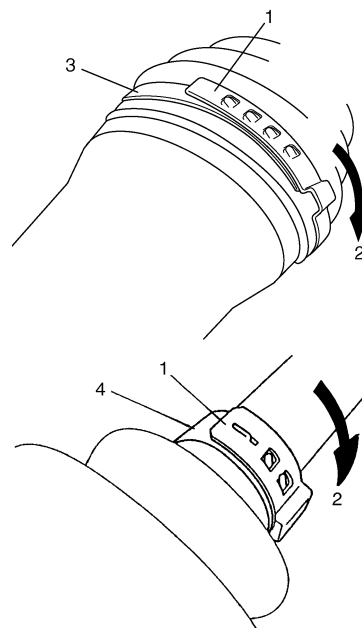
: 55 – 75 g (1.9 – 2.6 oz)

- 4) Install wheel side boot on shaft.
- 5) Fill up boot inside with specified grease.
- 6) Fit boot (1) to grooves of shaft and housing (2).
- 7) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.



I5RS0B310007-01

- 8) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I4RS0A310009-01

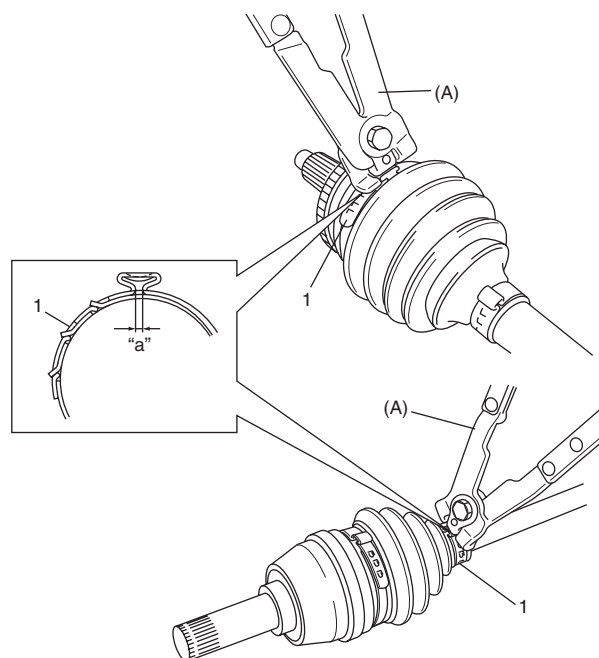
- 9) Fasten boot bands (1) until clearance "a" is 0 (zero) using special tool.

⚠ CAUTION

Do not squeeze or distort boot when fastening it with bands.
Distorted boot caused by squeezing air may reduce its durability.

Special tool

(A): 09943-57010



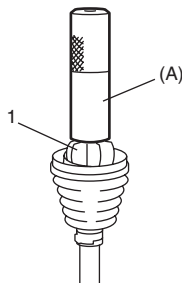
I5RS0B310008-01

3A-7 Drive Shaft / Axle:

- 10) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot on shaft temporarily.
- 11) Drive in the cage (1) by using special tool.

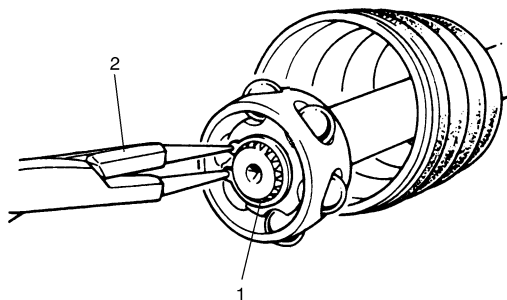
Special tool

(A): 09913-84510



I5RS0B310009-01

- 12) Install circlip (1) by using snap ring plier (2).

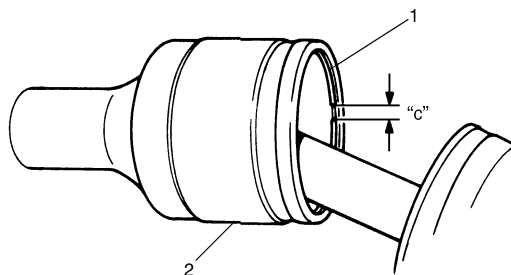


I5RS0B310010-01

- 13) Apply grease to entire surface of cage. Use specified grease in tube included in spare parts.
- 14) Insert cage into joint housing (2) and fit snap ring (1) into groove of joint housing (2).

⚠ CAUTION

Position opening of snap ring "c" so that it will not be lined up with a ball.



I2RH01310036-01

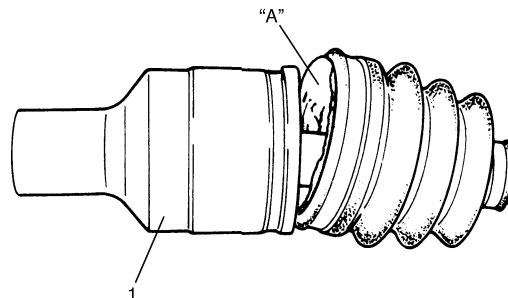
- 15) Apply grease (including in spare parts) to inside of joint housing (1).

Grease color

"A": Dark gray

Amount

"A": 85 – 105 g (3.0 – 3.7 oz)

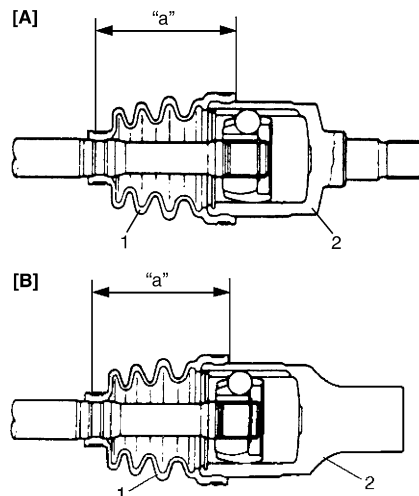


I5RS0B310011-02

- 16) Fit boot (1) to grooves of shaft and housing (2) adjust length to specification below.
- 17) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

Drive shaft boot fixing position (distance between boot end (housing side) and small boot band center)

Left side and right side drive shafts "a": 89.5 mm (3.52 in.)



I5RS0B310012-01

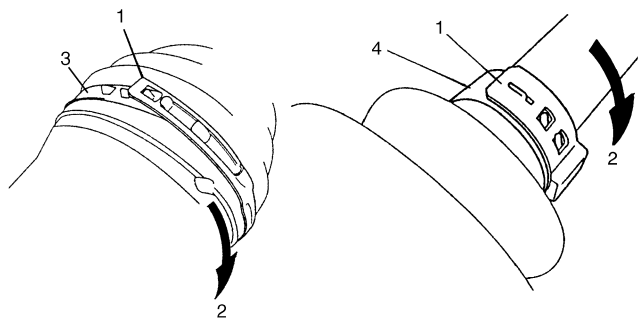
[A]: Drive shaft inserted into differential side

[B]: Drive shaft inserted into center shaft side

⚠ CAUTION

- Bend each boot band against forward rotation.
- Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.

- 18) Place differential side boot (or center shaft side) new big band (3) and new small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I5JB0A311006-01

- 19) Fasten differential side (or center shaft side) boot band.

- For differential side (or center shaft side) boot big band
Fasten band (1) by drawing hooks (2) with special tool and engage hooks (3) in slot and window (4).

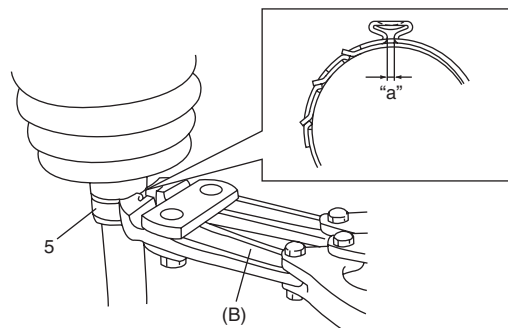
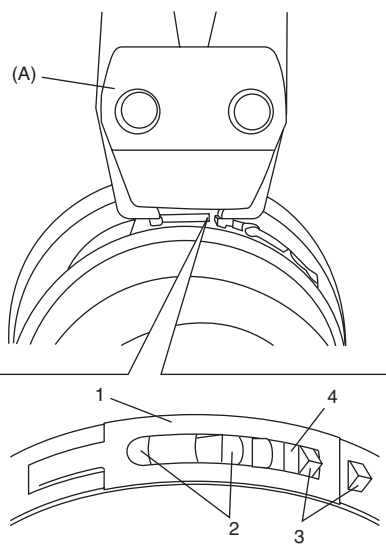
Special tool

(A): 09943-57020

- For differential side (or center shaft side) boot small band
Fasten band (5) until clearance "a" is 0 (zero) using special tool.

Special tool

(B): 09943-57010



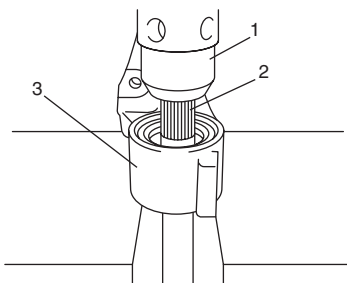
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Center Shaft and Center Bearing Support Disassembly and Assembly

S5RS0B3106005

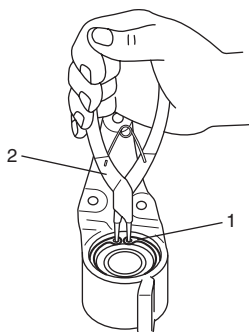
Disassembly

- 1) Using hydraulic press (1), draw out center shaft (2) from center bearing.
- 2) Remove oil seals from center bearing support (3).



I5RS0B310014-01

- 3) Remove bearing support circlip (1) using snap ring plier (2).



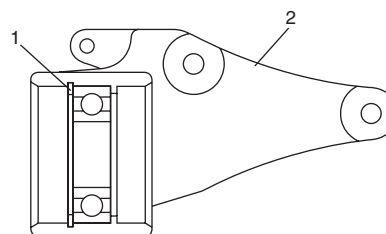
I5RS0B310015-01

- 4) Remove center bearing from center bearing support.

Assembly

Assemble center shaft and bearing support by reversing disassembly procedure and noting the following points.

- When installing bearing support circlip (1), make sure that it fits in circlip groove in center bearing support (2) securely as shown.



I5RS0B310016-01

- When installing left oil seal (1) and right oil seal (2) using special tool, use care so that oil seals in proper direction and position as shown in the figure.

Special tool
: 09925-15410

Distance

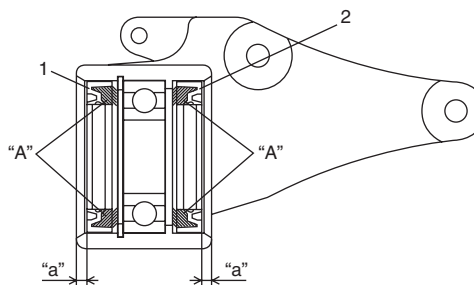
"a": 3.5 – 4.5 mm (0.14 – 0.17 in.)

- Be sure to apply grease to oil seal lip and bearing side space indicated in the figure.

"A": Grease 99000-25010 (SUZUKI Super Grease A)

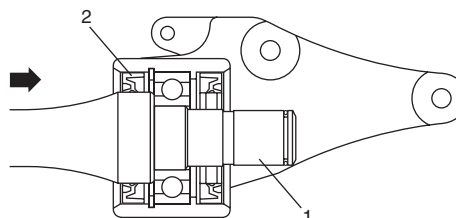
Grease amount

"A": 2.0 – 3.0 g (0.07 – 0.11 oz)



I5RS0B310017-01

- Press-fit center shaft (1) from left oil seal (2) side.



I5RS0B310018-01

Specifications

Tightening Torque Specifications

S5RS0B3107001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Brake hose mounting bolt	25	2.5	18.0	

NOTE

The specified tightening torque is also described in the following.

“Front Drive Shaft Assembly Components Location: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B3108001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	

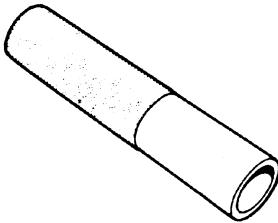
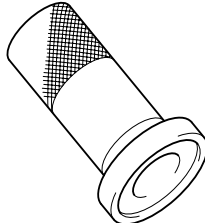
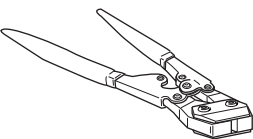
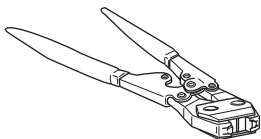
NOTE

Required service material is also described in the following.

“Front Drive Shaft Components: ”

Special Tool

S5RS0B3108002

09913–84510 Bearing installer 	09925–15410 Oil seal installer 
09943–57010 Band compressor 	09943–57020 Band compressor 

Section 4

Brakes

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NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring	4E-*		

ABS

General Description

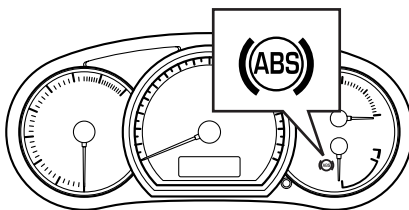
ABS Hydraulic Unit / Control Module Assembly Description

S5RS0B4501002

ABS control module is a component of ABS hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the ABS warning lamp as described.



I4RS0A450001-01

- When ignition switch is turned ON, ABS warning lamp lights for 2 seconds to check its circuit.
- When no abnormality has been detected (the system is in good condition), ABS warning lamp turns OFF after 2 seconds.
- When an abnormality in the system is detected, ABS warning lamp lights and the area where that abnormality lies is stored in the memory of EEPROM in ABS control module.

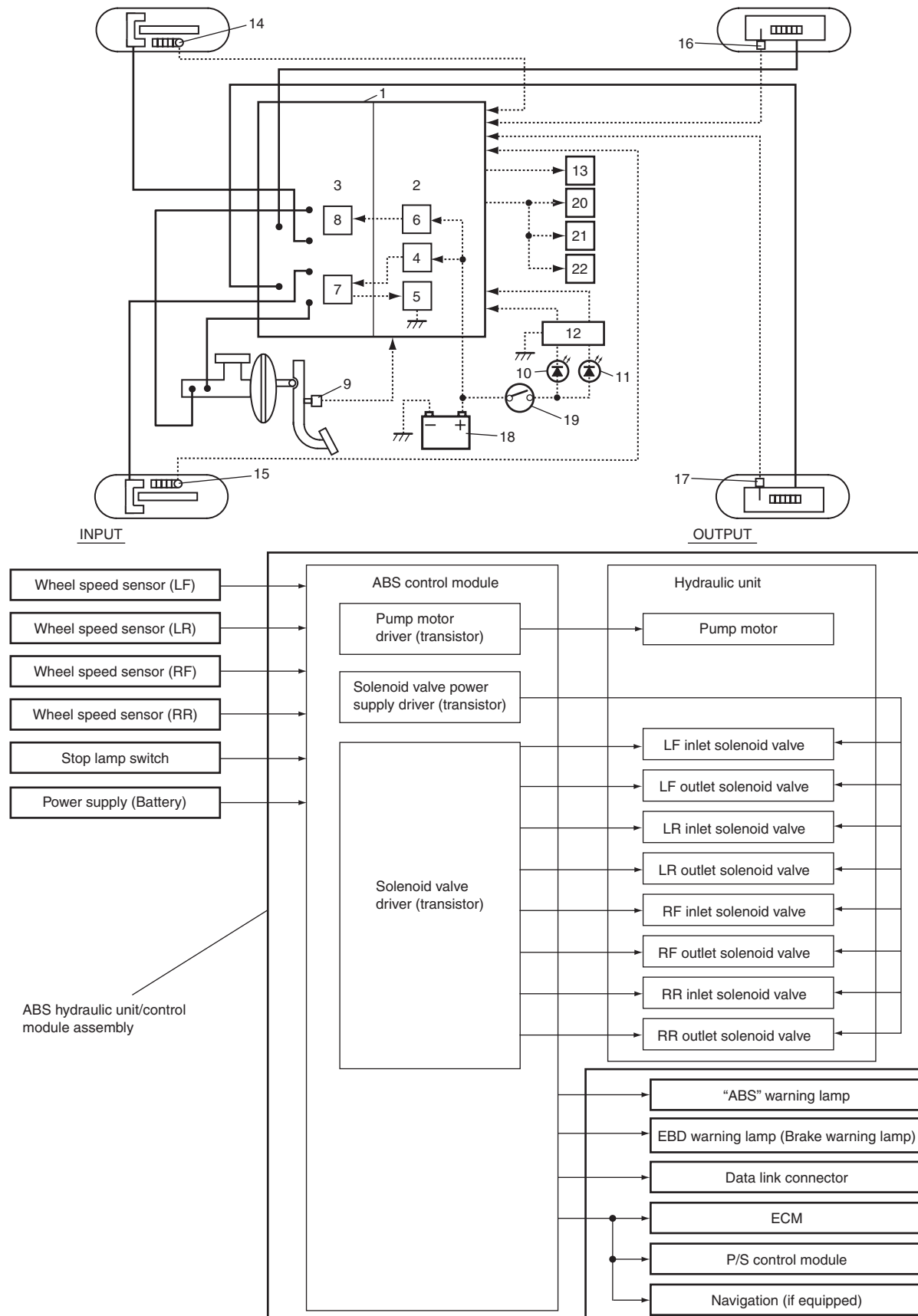
Vehicle Speed Signal Function

ABS control module transmits signal of right front vehicle speed sensor to other control modules.

Schematic and Routing Diagram

ABS Schematic

S5RS0B4502001



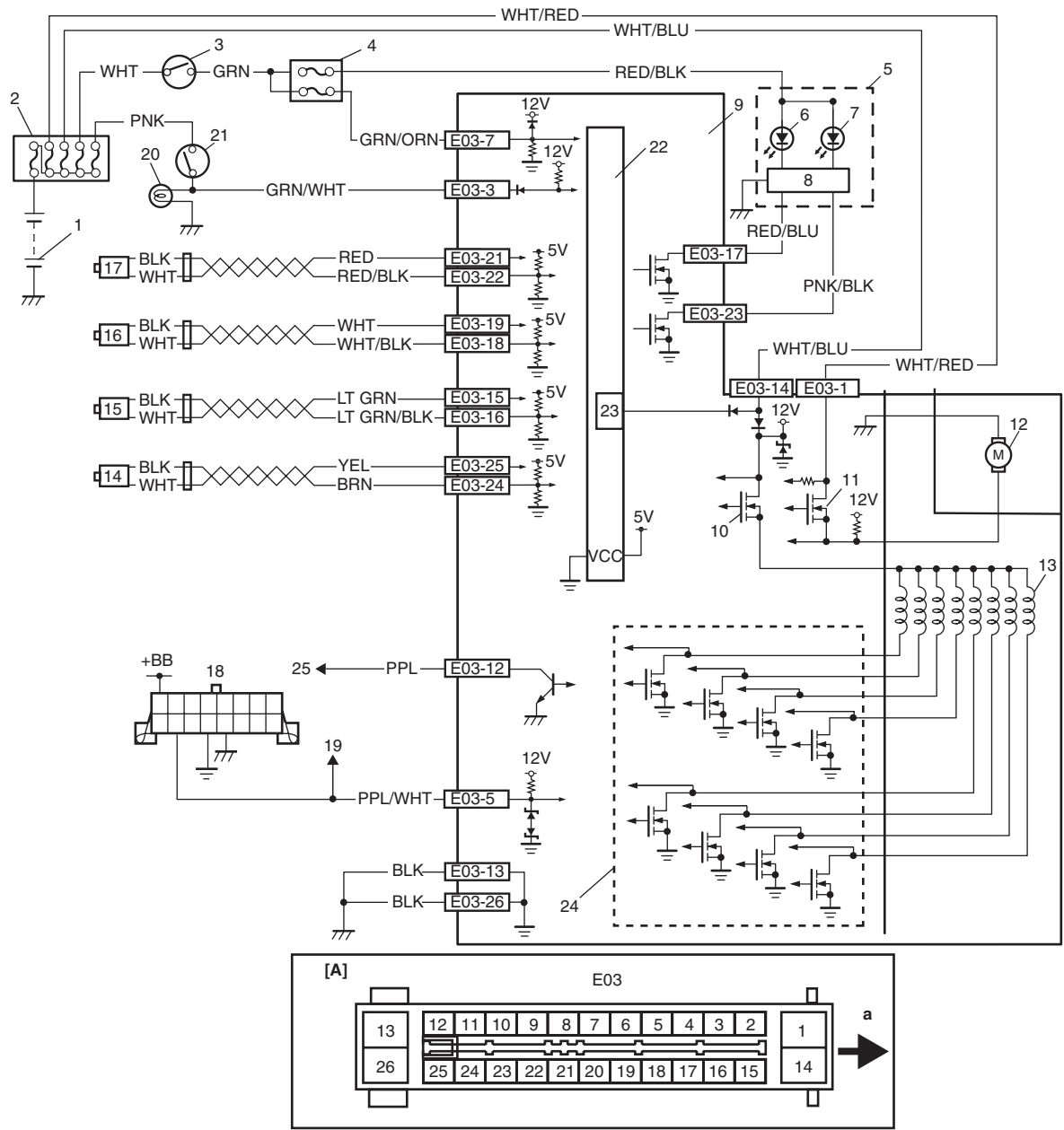
1. ABS hydraulic unit / control module assembly	9. Stop lamp switch	17. Wheel speed sensor (Left-rear)
2. ABS control module	10. ABS warning lamp	18. Battery
3. ABS hydraulic unit	11. EBD warning lamp (Brake warning lamp)	19. Ignition switch
4. Solenoid valve power supply driver (transistor)	12. Lamp driver module	20. ECM
5. Solenoid valve driver (transistor)	13. Data link connector	21. P/S control module
6. Pump motor driver (transistor)	14. Wheel speed sensor (Right-front)	22. Navigation (if equipped)
7. Solenoid valve	15. Wheel speed sensor (Left-front)	
8. Pump motor	16. Wheel speed sensor (Right-rear)	

ABS Wiring Circuit Diagram

S5RS0B4502002

NOTE

Molded numbers in ABS control module have no relation to the terminal numbers [A].



4E-4 ABS:

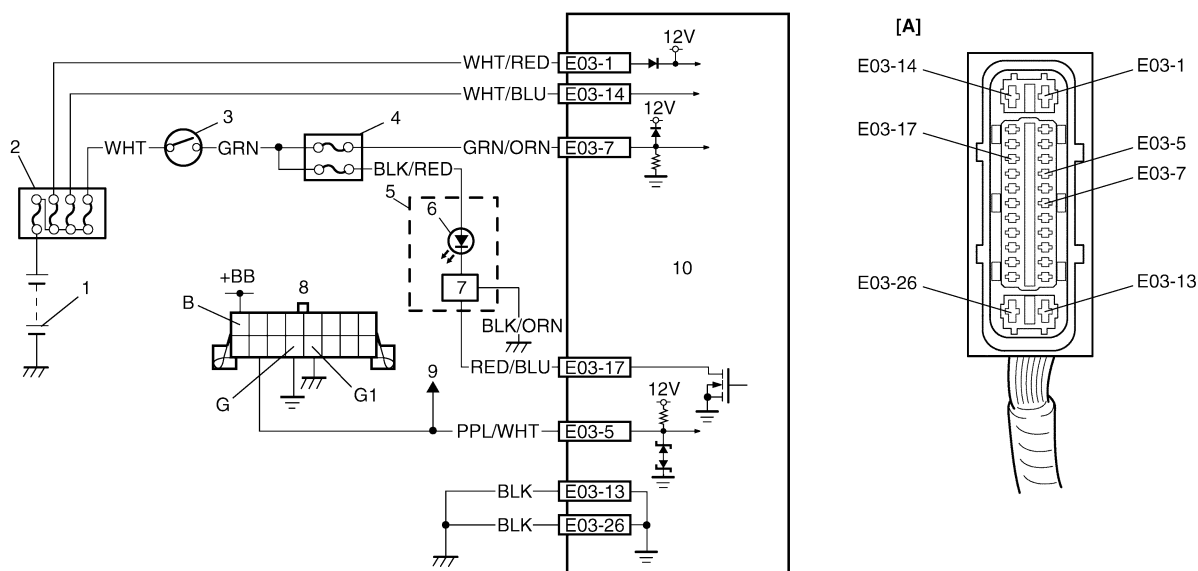
[A]: Terminal arrangement of ABS hydraulic unit / control module assembly	8. Lamp driver module	17. Left-front wheel speed sensor
a: Upside	9. ABS hydraulic unit / control module assembly	18. Data link connector
1. Battery	10. Solenoid valve power supply driver (transistor)	19. To ECM, TCM, SDM and BCM
2. Main fuse box	11. ABS pump motor driver (transistor)	20. Stop lamp
3. Ignition switch	12. Pump motor	21. Brake light switch
4. Circuit fuse box	13. Solenoid valves	22. Power control unit
5. Combination meter	14. Right-rear wheel speed sensor	23. Internal memory
6. ABS warning lamp	15. Left-rear wheel speed sensor	24. Solenoid valve driver (transistor)
7. EBD warning lamp (Brake warning lamp)	16. Right-front wheel speed sensor	25. To ECM, P/S control module and navigation (if equipped)

	Terminal	Wire color	Circuit
E03	1	WHT/RED	ABS pump motor driver (Transistor)
	2	—	—
	3	GRN/WHT	Brake light switch
	4	—	—
	5	PPL/WHT	Data link connector
	6	—	—
	7	GRN/ORN	Ignition switch
	8	—	—
	9	—	—
	10	—	—
	11	—	—
	12	PPL	Vehicle speed signal
	13	BLK	Ground
	14	WHT/BLU	Solenoid valve power supply driver (Transistor)
	15	LT GRN	Left-rear wheel speed sensor (+)
	16	LT GRN/BLK	Left-rear wheel speed sensor (–)
	17	RED/BLU	ABS warning lamp
	18	WHT/BLK	Right-front wheel speed sensor (–)
	19	WHT	Right-front wheel speed sensor (+)
	20	—	—
	21	RED	Left-front wheel speed sensor (+)
	22	RED/BLK	Left-front wheel speed sensor (–)
	23	PNK/BLK	EBD warning lamp (Brake warning lamp)
	24	BRN	Right-rear wheel speed sensor (–)
	25	YEL	Right-rear wheel speed sensor (+)
	26	BLK	Ground

Diagnostic Information and Procedures

Serial Data Link Circuit Check

S5RS0B4504012



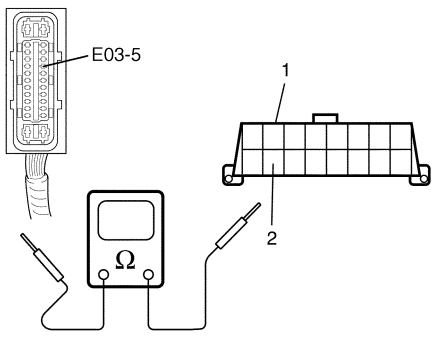
I5RS0B450003-01

[A]: ABS hydraulic unit / control module connector E03

1. Battery	4. Circuit fuse box	7. Lamp driver module	10. ABS hydraulic unit / control module assembly
2. Main fuse box	5. Combination meter	8. Data link connector (DLC)	
3. Ignition switch	6. ABS warning lamp	9. To ECM, TCM control module and SDM	

Inspection

Step	Action	Yes	No
1	1) Turn ignition switch to ON position. <i>Does ABS warning lamp come ON?</i>	Go to Step 2.	Go to Step 6.
2	1) Turn ignition switch to OFF position. <i>Are main fuses for ABS pump motor and ABS solenoid in good condition?</i>	Go to Step 3.	Replace fuse and check for short.
3	1) Disconnect ABS hydraulic unit / control module connector. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminal "E03-7". 3) If OK then turn ignition switch to ON position and measure voltage between terminal "E03-7" and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 4.	"GRN/ORN" wire circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-1" and "E03-14". 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of "E03-1", "E03-14" and vehicle body ground. <i>Are they 10 – 14 V?</i>	Go to Step 5.	"WHT/RED" and / or "WHT/BLU" wire circuit open.

Step	Action	Yes	No
5	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-13" and "E03-26". 3) If OK, measure resistance between each terminal of "E03-13", "E03-26" and vehicle body ground. <i>Are resistance less than 2 Ω?</i>	Go to Step 6.	Ground circuit for ABS hydraulic unit / control module open or high resistance.
6	1) Check if communication is possible by trying communication with other controller (ECM, TCM or SDM). <i>Is it possible to communicate with other controller?</i>	Go to Step 7.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
7	1) Turn ignition switch to ON position. 2) Measure voltage between terminal B of data link connector and vehicle body ground. <i>Is voltage 10 – 12 V?</i>	Go to step 8.	Terminal B circuit open or shorted to ground.
8	1) Turn ignition switch to OFF position. 2) Measure resistance between the following terminals; - Terminal G of data link connector and vehicle body ground. - Terminal G1 of data link connector and vehicle body ground. <i>Is each resistance 1 Ω or less?</i>	Go to step 9.	Terminal G and/or G1 circuit open or high resistance.
9	1) Turn ignition switch to OFF position. 2) Check proper connection at "E03-5" ("PPL/WHT" wire) terminal for serial data circuit. 3) If OK, then check resistance between "E03-5" ("PPL/WHT" wire) terminal and "PPL/WHT" wire terminal (2) for serial data circuit in DLC (1).  <i>Is resistance 1 Ω or less?</i>	Substitute a known-good ABS hydraulic unit / control module and recheck.	Repair high resistance or open in "PPL/WHT" wire circuit for anti lock brake system.

I4RS0A450013-02

Repair Instructions

Rear Wheel Speed Sensor Removal and Installation

S5RS0B4506009

Removal

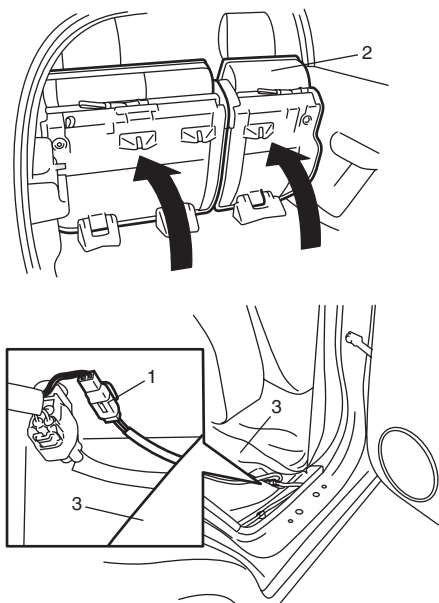
- 1) Disconnect negative cable from battery.
- 2) Disconnect rear wheel speed sensor connector as follows.

For 5door model

- a) Remove rear side sill scuff.
- b) Fold rear seat (2) up as shown, and then turn over floor carpet (3).
- c) Disconnect rear wheel speed sensor connector (1).

For 3door model

- a) Remove quarter inner trim referring to "Floor Carpet Removal and Installation: in Section 9H".
- b) Turn over floor carpet (3).
- c) Disconnect rear wheel speed sensor connector (1).



I4RS0B450007-01

- 3) Hoist vehicle.
- 4) Detach ABS wheel sensor wire harness (1).

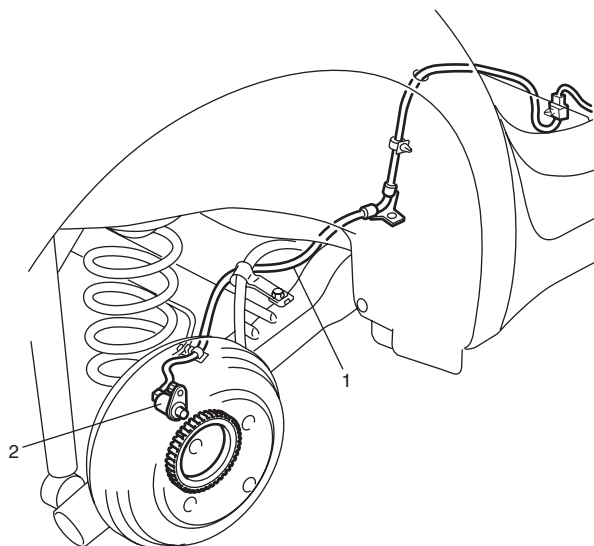
NOTE

Do not detach clip of rear wheel speed sensor connector from vehicle body unless replacement is necessary.

- 5) Remove rear wheel speed sensor (2) from brake back plate.

CAUTION

- Do not pull wire harness when removing rear wheel speed sensor.
- Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.

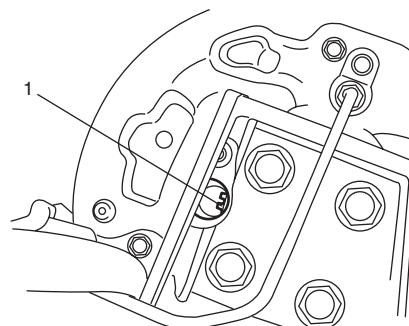


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Installation

Reverse removal procedure for installation noting the following.

- Check that no foreign material is attached to sensor and ring (1).



I4RS0B450009-01

4E-8 ABS:

- Be sure to install wheel speed sensor (2) and its bolt at the correct (upper) position as shown in figure. Tighten sensor bolt (1) and harness clamp bolts to specified torque.

Tightening torque

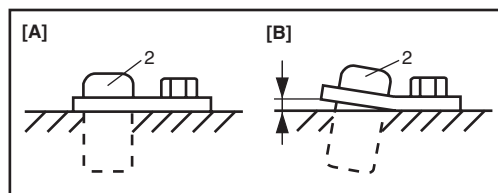
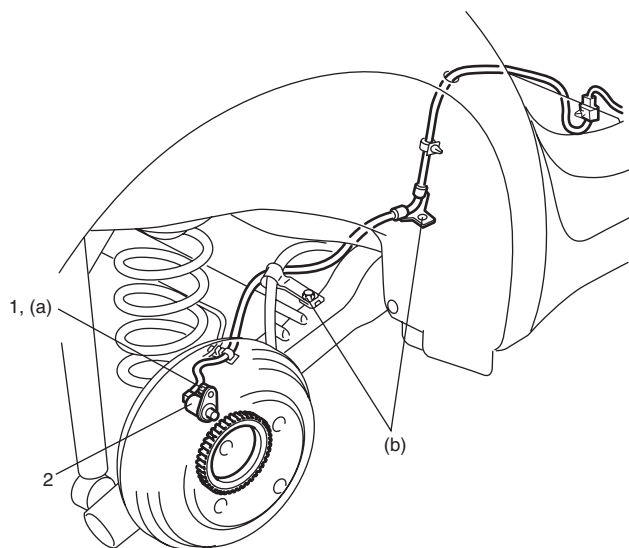
Rear wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

Rear wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kgf-m, 8.0 lb-ft)

⚠ CAUTION

Do not pull or twist wire harness more than necessary when installing rear wheel speed sensor.

- Check that there is no clearance between sensor and brake back plate.



I4RS0B450010-01

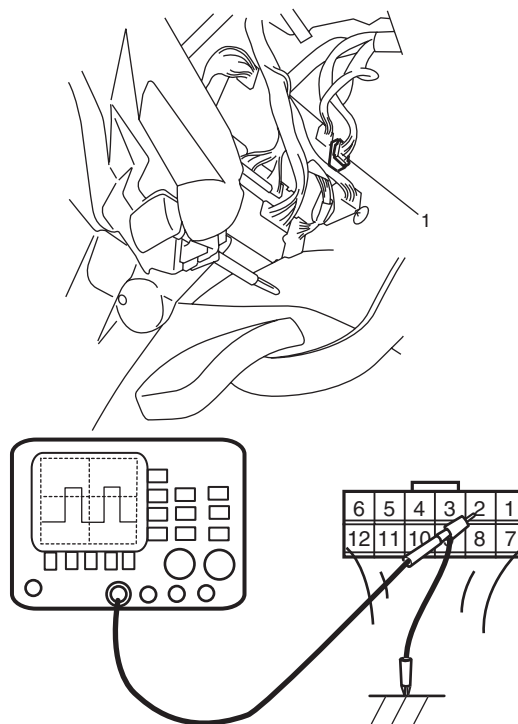
[A]: OK

[B]: NG

Vehicle Speed Output Signal Inspection

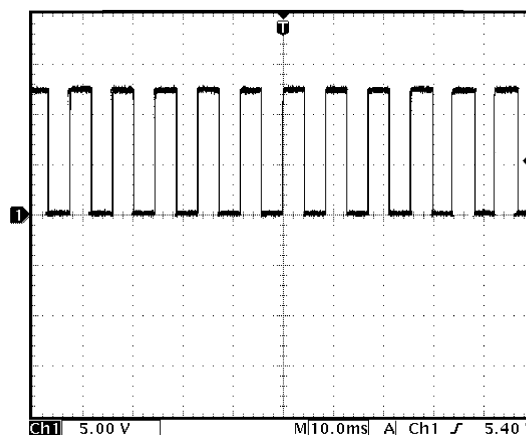
S5RS0B4506015

- Check DTC of ABS control module referring to "DTC Check: ".
If DTC is detected, inspection and repair DTC area referring to applicable DTC flow.
- Check vehicle speed output signal as follows.
 - Connect oscilloscope probe between terminal 2 of junction connector (1) and body ground.



I5RS0B450004-01

- Vehicle is running at 20 km/h (13 MPH).
- Check output waveform obtained as shown in figure.
If waveform is different, check wire and connector.
If they are OK, substitute a known-good ABS hydraulic unit / control module assembly and recheck.



I5RS0B450005-01

Section 5

Transmission / Transaxle

CONTENTS

NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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Manual Transmission

General Description

Manual Transaxle Construction and Servicing

S5RS0B5201001

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.

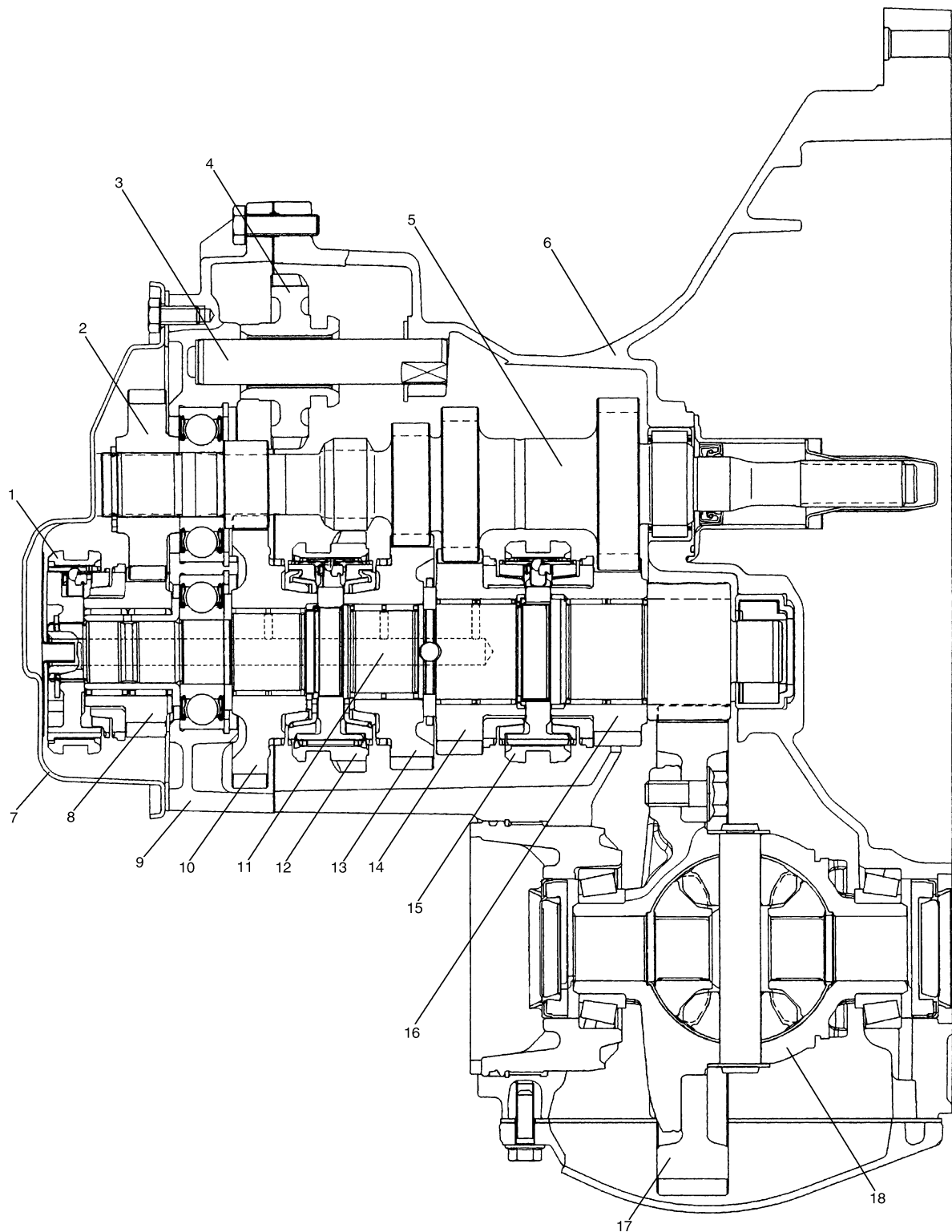
The 1st and 2nd speed synchronizer is mounted on main shaft and engaged with main shaft 1st gear or 2nd gear, also the 3rd and 4th speed synchronizer is done on main shaft and engaged with main shaft 3rd gear or 4th gear. The 5th speed synchronizer on main shaft is engaged with cluster 5th gear mounted 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.



I5RS0B520001-01

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

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

S5RS0B5204001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Gear shift / select control cables faulty	<i>Replace.</i>
	Worn gear selector rod	<i>Replace.</i>
	Worn gear selector fork or synchronizer sleeve	<i>Replace.</i>
	Worn bearings on transaxle cluster gear or transaxle main shaft	<i>Replace.</i>
	Worn chamfered tooth on sleeve and gear	<i>Replace sleeve and gear.</i>
Hard shifting	Gear shift / select control cables faulty	<i>Replace.</i>
	Inadequate or insufficient lubricant	<i>Replenish.</i>
	Improper clutch pedal free travel	<i>Bleed air or replace master cylinder.</i>
	Distorted or broken clutch disc	<i>Replace.</i>
	Damaged clutch pressure plate	<i>Replace clutch cover.</i>
	Worn synchronizer ring	<i>Replace.</i>
	Worn chamfered tooth on sleeve or gear	<i>Replace sleeve or gear.</i>
	Worn gear shift/select control cables joint	<i>Replace.</i>
	Distorted shift shaft	<i>Replace.</i>
Noise	Inadequate or insufficient lubricant	<i>Replenish.</i>
	Damaged or worn bearing(s)	<i>Replace.</i>
	Damaged or worn gear(s)	<i>Replace.</i>
	Damaged or worn synchronizer parts	<i>Replace.</i>
	Improper tooth contact in the mesh between bevel pinion and gear	<i>Replace.</i>

Repair Instructions

Manual Transaxle Oil Change

S5RS0B5206001

⚠ 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.

- 1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
- 2) With vehicle lifted up, check leakage.
If leakage exists, correct it.

NOTE

Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage.

- 3) Remove oil level plug (2) and then drain 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 kgf-m, 13.0 lb-ft)

- 5) Remove air cleaner, and then 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 kgf-m, 3.0 lb-ft) and 45° to 180° by the specified procedure
Breather plug (c): 4 N·m (0.4 kgf-m, 3.0 lb-ft) and 180° by the specified procedure

NOTE

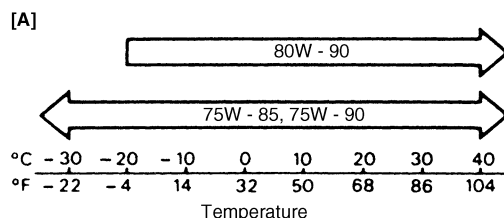
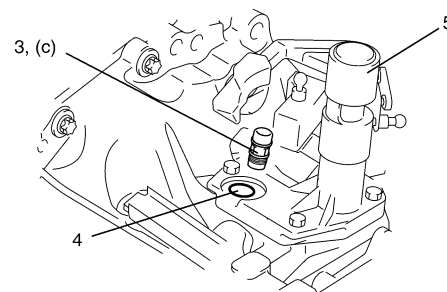
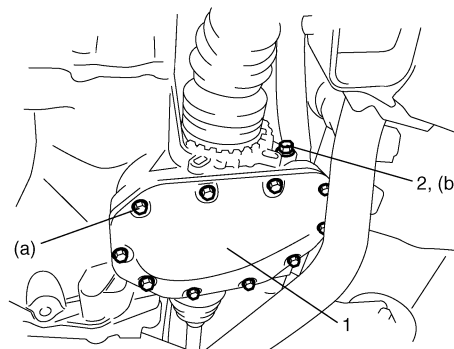
It is recommended to use API GL-4 75W-85 gear oil.

Transaxle oil specification

: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure)

Transaxle oil capacity (Reference)

: 1.6 liters (3.4/2.8 US/Imp. pt)



I5RS0B520002-01

5. Selector lever cover

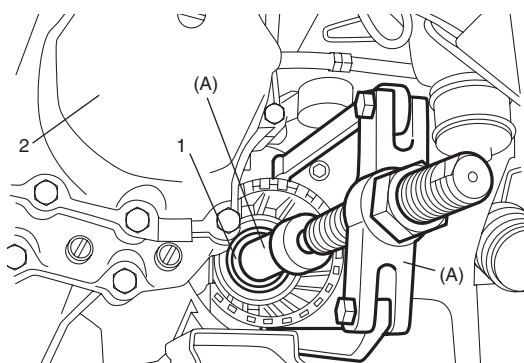
Differential Side Oil Seal Replacement

S5RS0B5206002

- 1) Lift up vehicle and drain transaxle oil referring to "Manual Transaxle Oil Change: ".
- 2) Remove left side drive shaft or center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
- 3) Remove oil seals (1) using special tool.

Special tool

(A): 09913-58610



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2. Extension case cover

- 4) Install new oil seals (1) using special tool and hammer.

NOTE

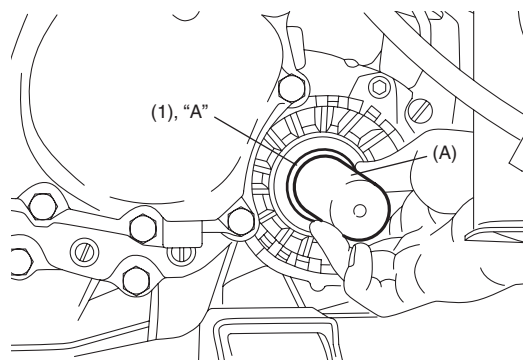
When installing oil seal, face its spring side inward.

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 (SUZUKI Super Grease A)

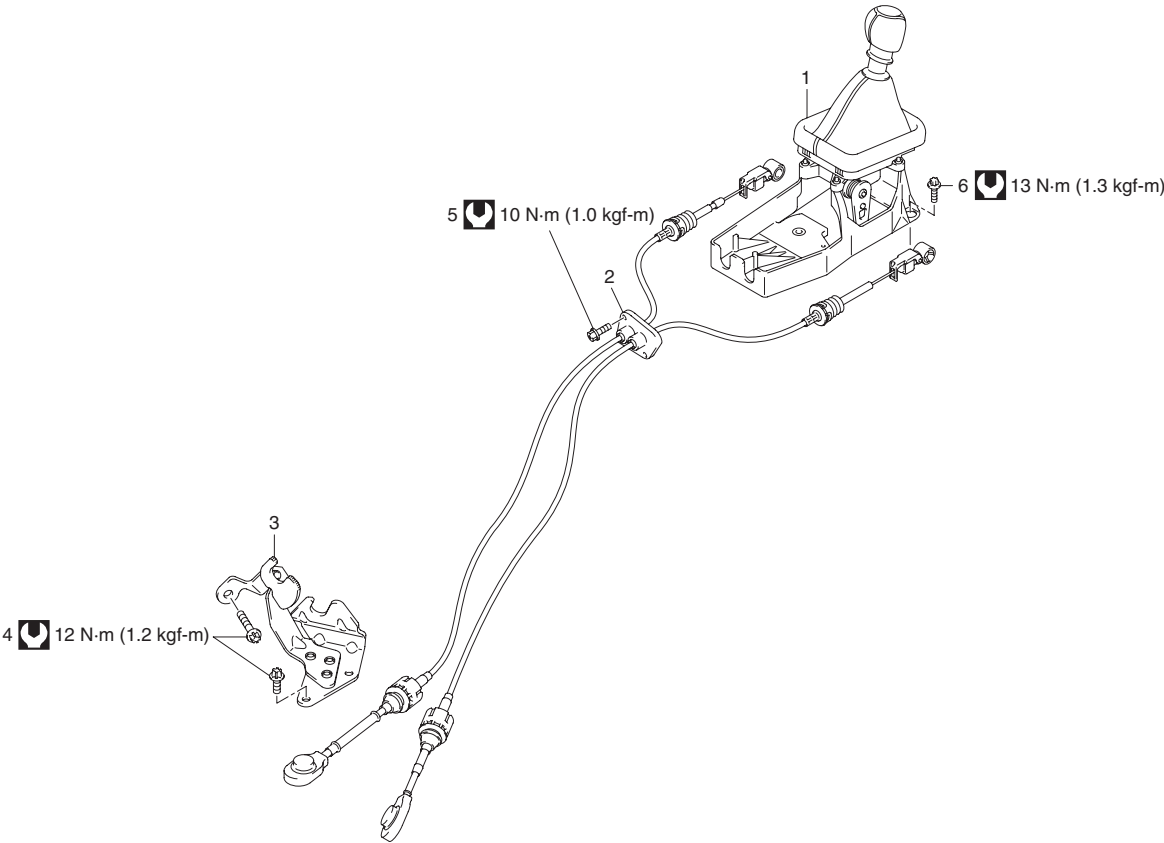


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- 6) Insert left side drive shaft or center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
- 7) Fill transaxle oil as specified referring to "Manual Transaxle Oil Change: ", and make sure that oil has been sealed with oil seal.

Gear Shift Control Lever and Cable Components

S5RS0B5206003



I5RS0B520003-01

1. Gear shift control lever assembly	4. Cable bracket bolt	⌚ : Tightening torque
2. Shift & select cable assembly	5. Cable grommet bolt	
3. Cable bracket	6. Gear shift control lever bolt	

Gear Shift Control Lever and Cable Removal and Installation

S5RS0B5206004

Removal

- 1) Remove console box.
- 2) Disconnect shift and select control 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 from vehicle body.
- 4) Disconnect shift and select cables 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 (1) to vehicle body and then tighten cable grommet bolt to specified torque.

Tightening torque

Cable grommet bolt: 10 N·m (1.0 kgf-m, 7.5 lb-ft)

- 2) Install shift and select cable to transaxle.
- 3) Install gear shift control lever assembly (2) to vehicle body and then tighten gear shift control lever bolt (3) to specified torque.

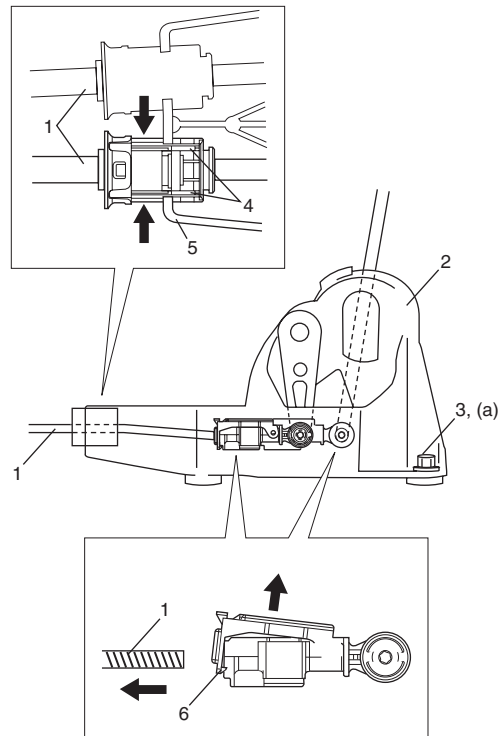
Tightening torque

Gear shift control lever bolt (a): 13 N·m (1.3 kgf-m, 9.5 lb-ft)

- 4) Attach shift and select cable assembly to bracket (5).
- 5) Install shift cable and select cable to each adjuster.

NOTE

Install the shift cable first.



I3RM0B522006-01

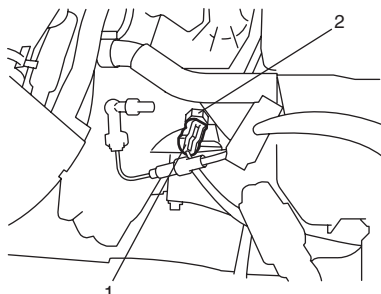
- 6) Install console box.
- 7) Confirm that it moves smoothly when shifting into each position.

Back Up Lamp Switch Removal and Installation

S5RS0B5206005

Removal

- 1) Disconnect negative cable at battery.
- 2) Remove air cleaner, and then disconnect back up lamp switch coupler (1).
- 3) Remove back up lamp switch (2).



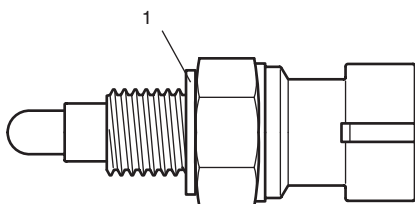
I5RS0B520004-01

Installation

- 1) Install back up lamp switch with new seal (1).

Tightening torque

Back up lamp switch: 20 N·m (2.0 kgf-m, 14.5 lb-ft)



I3RM0B522008-01

- 2) Connect back up lamp switch coupler, and then install air cleaner.
- 3) Connect negative cable at battery.
- 4) Confirm function of back up lamp switch in reverse position.

Back Up Lamp Switch Inspection

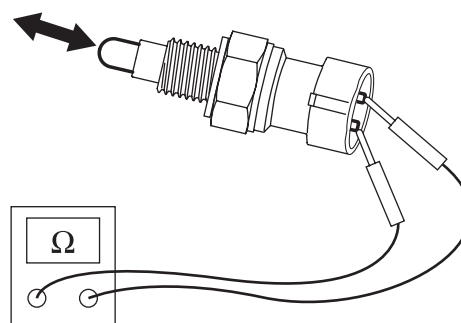
S5RS0B5206006

Check back up lamp switch for function using ohmmeter.

Back up lamp switch specification

Switch ON (Push): Continuity

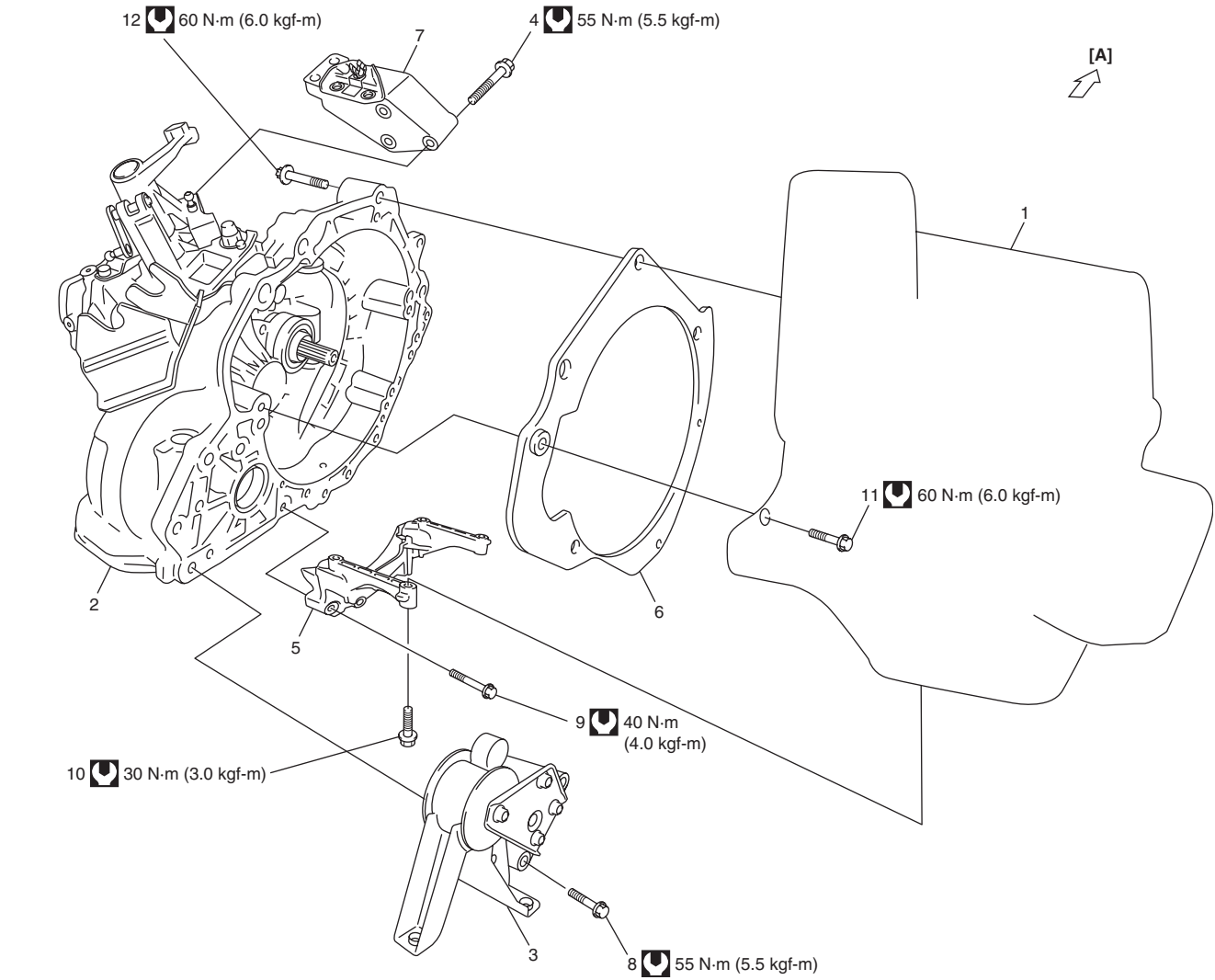
Switch OFF (Release): No continuity



I5RS0B520005-01

Manual Transaxle Unit Components

S5RS0B5206007



I5RS0B520006-01

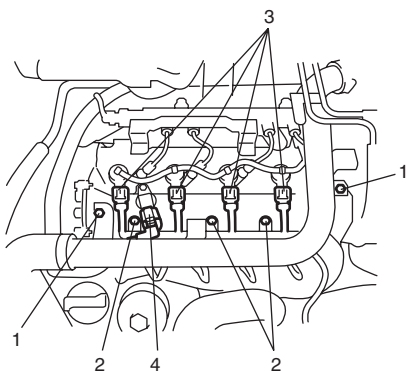
[A]: Forward	5. Transaxle to engine bracket	10. Transaxle to engine bracket No.2 bolt
1. Engine	6. Spacer	11. Transaxle to engine bolt
2. Transaxle	7. Engine left mounting	: Tightening torque
3. Engine rear mounting with bracket	8. Engine rear mounting bracket bolt	
4. Engine left mounting bolt	9. Transaxle to engine bracket No.1 bolt	

Manual Transaxle Unit Dismounting and Remounting

S5RS0B5206011

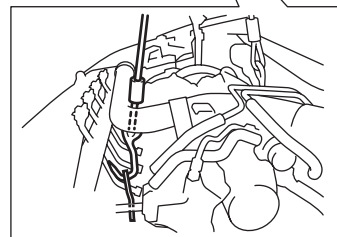
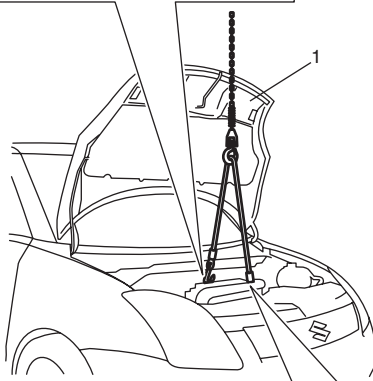
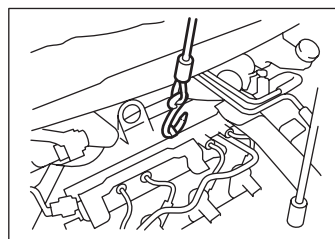
Dismounting

- 1) Remove battery and battery tray.
- 2) Remove air cleaner and resonator.
- 3) Remove clutch fluid pipe referring to "Clutch Fluid Pipe Removal and Installation: in Section 5C".
- 4) Disconnect shift and select cables from transaxle and then remove its bracket on transaxle.
- 5) Undo back up lamp connector and wiring harness clamp.
- 6) Support engine as follows.
 - a) Remove inter cooler pipe bolts (1) and harness cover bolts (2).
 - b) Disconnect injector connector (3) and CMP sensor connector (4).



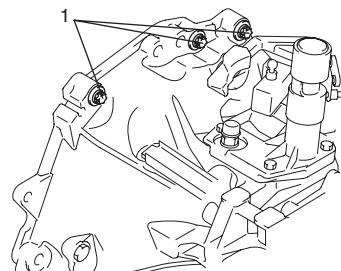
I5RS0B520007-01

- c) Remove food (1) if necessary.
- d) Support engine by lifting device as shown in figure.



I5RS0B520008-01

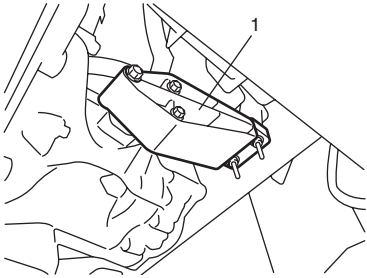
- 7) Remove transaxle to engine bolts (1). (upper side)



I3RM0B522015-01

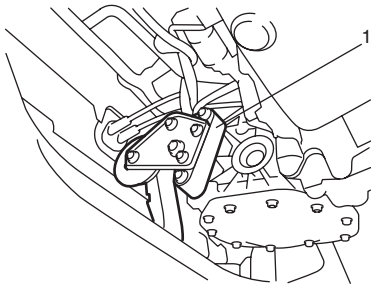
5B-11 Manual Transmission:

- 8) Drain transaxle oil.
- 9) Remove front drive shafts and center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
- 10) Remove exhaust pipe No.1 and No.2 referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
- 11) Remove transaxle to engine bracket.
- 12) Support transaxle with transmission jack.
- 13) Remove engine left mounting with bracket (1).



I5RS0B520009-01

- 14) Remove engine rear mounting with bracket (1).



I5RS0B520010-01

- 15) Remove transaxle to engine bolts. (lower side)
- 16) Remove other attached parts from transaxle, if any.
- 17) Pull transaxle out so as to disconnect cluster gear from clutch disc and then lower it.

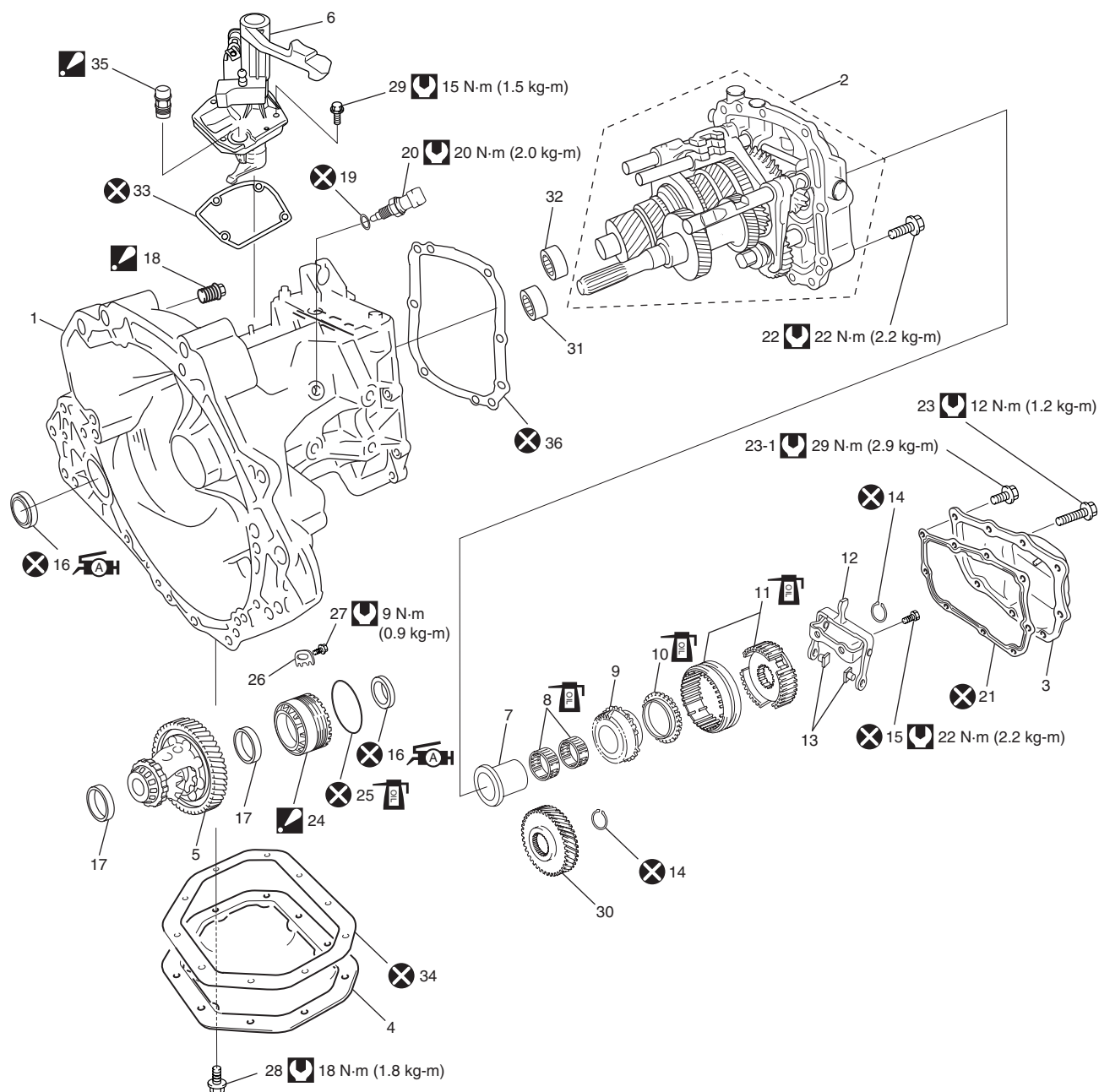
Remounting

For remounting, reverse dismounting procedure noting the following.

- Refer to "Manual Transaxle Unit Components: " for fastener specified torque.
- Install clutch fluid pipe referring to "Clutch Fluid Pipe Removal and Installation: in Section 5C".
- Install exhaust pipe No.1 and No.2 referring to "Exhaust Pipe and Muffler Removal and Installation: in Section 1K".
- Set each clamp for wiring securely.
- Install front drive shafts and center shaft referring to "Front Drive Shaft Assembly Removal and Installation: in Section 3A".
- Fill transaxle with oil as specified referring to "Manual Transaxle Oil Change: ".
- Connect battery and check function of engine, clutch and transaxle.

Manual Transaxle Assembly Components

S5RS0B5206020



I3RM0B522011-01

5B-13 Manual Transmission:

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 kgf-m) and 45° to 180° by the specified procedure.	31. Pinion needle bearing
5. Differential assembly	19. Back up lamp switch seal	32. Main shaft roller bearing
6. Selector lever cover	20. Back up 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 kgf-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 kgf-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

S5RS0B5206012

Removal

- 1) Remove selector lever bolt (1) and then selector lever assembly (2).

Installation

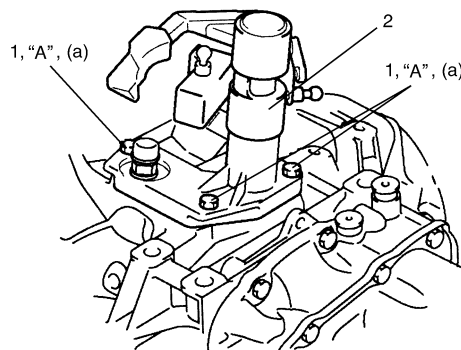
Reverse removal procedure for installation noting the following.

- Do not reuse selector lever cover gasket.
- Apply sealant to selector lever cover bolt.
Tighten cover bolt to specified torque.

“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque

Selector lever cover bolt (a): 15 N·m (1.5 kgf-m, 11.0 lb-ft)



I3RM0B522019-01

5th Gears Removal and Installation

S5RS0B5206013

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).

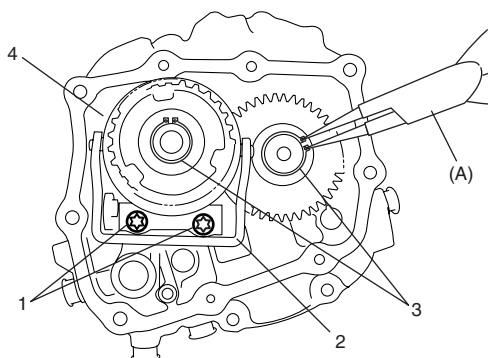
NOTE

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.

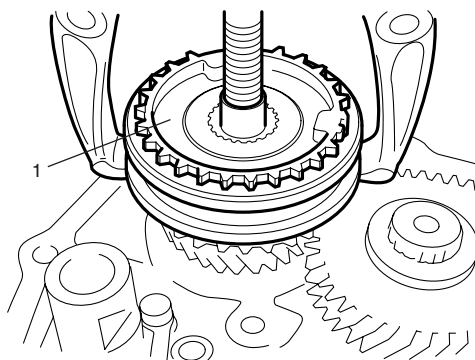
Special tool

(A): 09900-06107



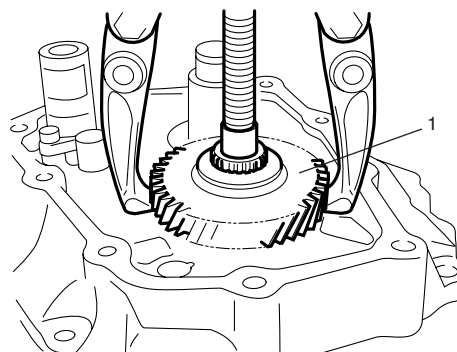
I3RM0B522018-01

- 4) Remove 5th gear hub assembly (1) from main shaft using gear puller.



I3RM0B522020-01

- 5) Remove 5th gear needle bearing from main shaft.
- 6) Remove cluster 5th gear (1) from cluster gear using gear puller.



I3RM0B522021-01

Installation

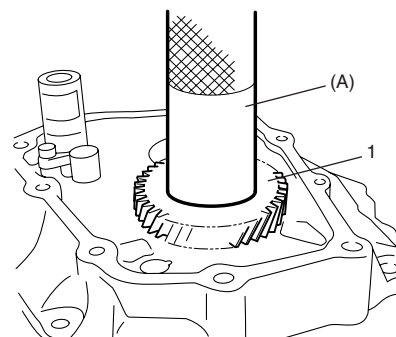
NOTE

Coat all parts with transaxle oil before assembly.

- 1) Install cluster 5th gear (1) to cluster gear using special tool.

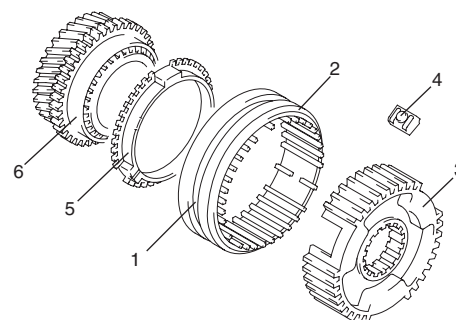
Special tool

(A): 09913-84510



I3RM0B522022-01

- 2) Assemble 5th gear hub assembly (hub (3), sleeve (1) and keys (4)) as shown in the figure.



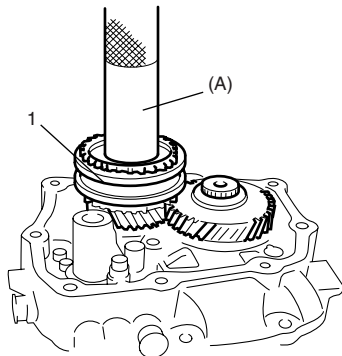
I3RM0B522023-01

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**

I3RM0B522024-01

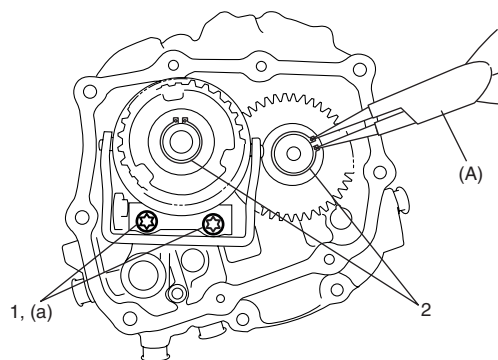
- 4) Install snap rings (2) and confirm that snap ring is installed in groove securely.

Special tool**(A): 09900-06107**

- 5) Install 5th gear selector fork and then tighten new bolts (1) to specified torque.

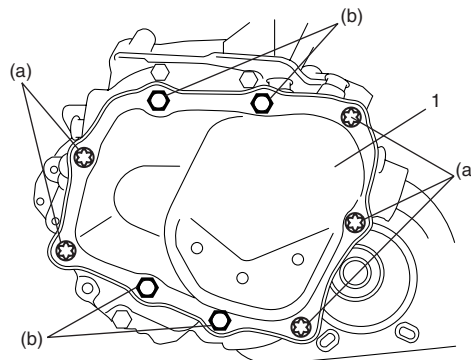
⚠ CAUTION

**Do not reuse 5th gear selector fork bolts (1).
Be sure to use new adhesive pre-coated bolts. Otherwise, bolts may loosen.**

Tightening torque**5th gear selector fork bolt (a): 22 N·m (2.2 kgf-m, 16.0 lb-ft)**

I3RM0B522025-01

- 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 kgf-m, 21.0 lb-ft)****Extension case cover bolt (b): 12 N·m (1.2 kgf-m, 8.5 lb-ft)**

I3RM0B522026-01

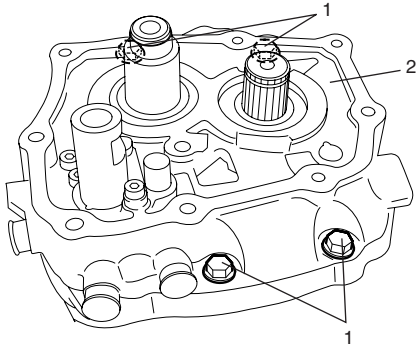
1. Extension bearing plate case	10. 3rd & 4th gear selector fork	19. Reverse gear shaft ball
2. Gear shift rod locking bush	11. Selector fork pin	20. Reverse gear shaft
3. Gear shift rod connector screw	12. 3rd & 4th gear selector rod	21. Reverse gear thrust washer
4. Gear shift rod connector	13. 1st & 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	

Gear Selector, Cluster Gear and Main Shaft Removal and Installation

S5RS0B5206014

Removal

- 1) Remove bearing plate case bolt (1) and then detach transmission end plate (2) from transaxle case.

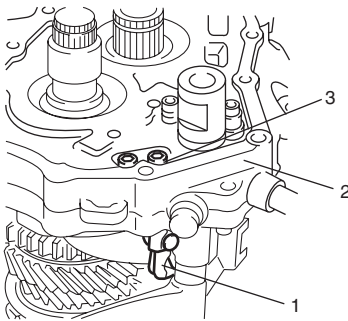


I3RM0B522027-01

- 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).



I3RM0B522028-01

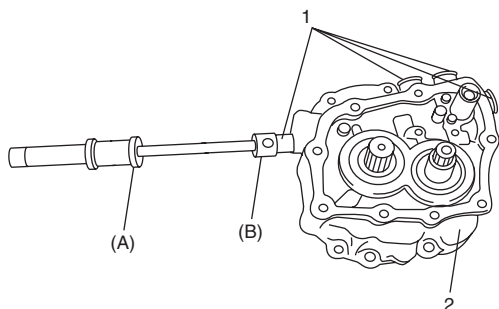
3. 5th gear pawl bolt

- 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

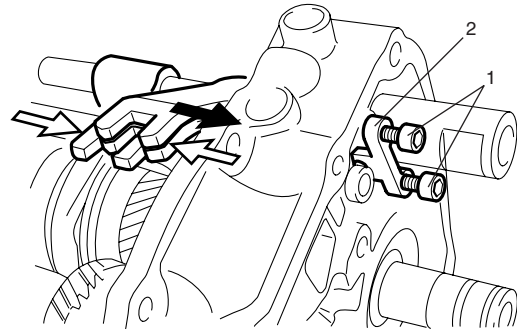


I3RM0B522029-01

- 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).



I3RM0B522030-01

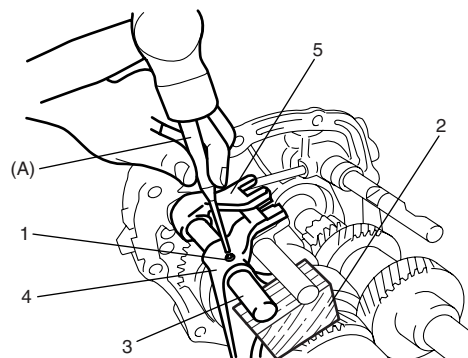
- 6) Remove 3rd & 4th selector fork pin (1) using special tool and then pull out 3rd & 4th gear selector rod (3), selector fork (4) and 5th gear shift rod fork (5).

⚠ 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.

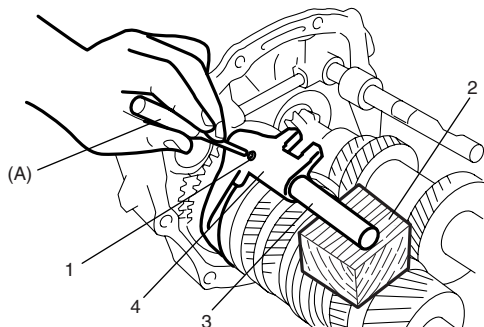
Special tool

(A): 09922-89810



I3RM0B522031-01

- 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**

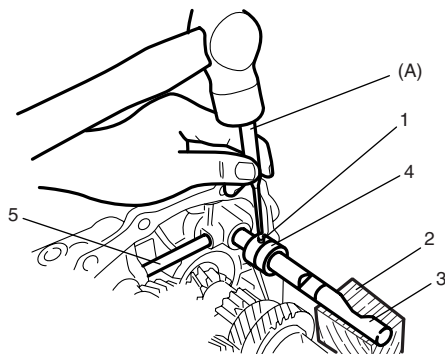
I3RM0B522032-01

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**

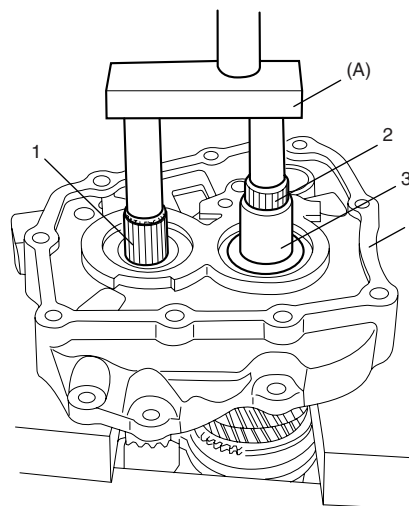
- 10) Remove gear shift rod detent pin No.2 (5).



I3RM0B522033-01

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**

I3RM0B522034-01

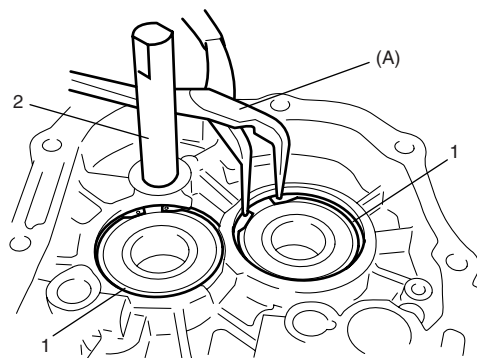
- 12) Remove circlips (1) using special tool.

Special tool**(A): 09900-06106**

- 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.

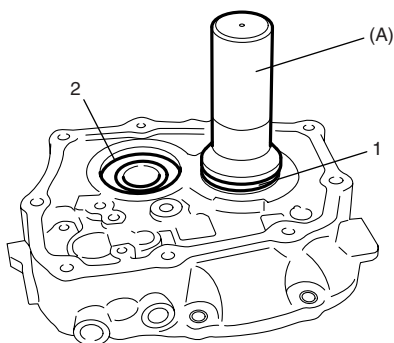


I3RM0B522035-01

- 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



I3RM0B522036-01

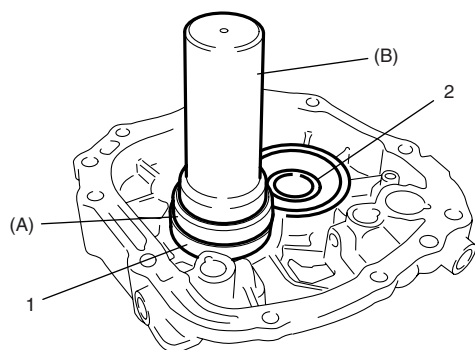
Installation

- 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

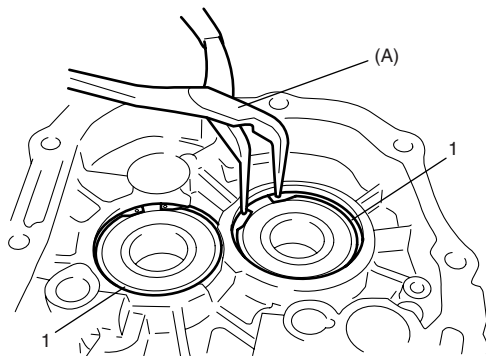


I3RM0B522037-01

- 2) Install new circlips (1) using special tool.

Special tool

(A): 09900-06105



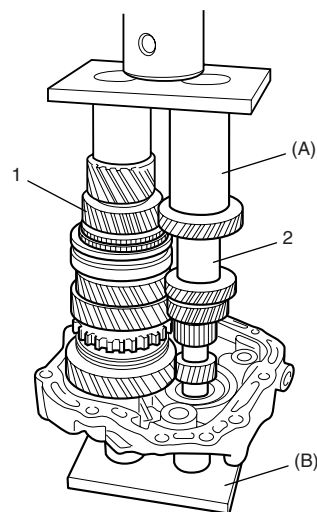
I3RM0B522038-01

- 3) Install main shaft (1) and cluster gear (2) using special tools and hydraulic press.

Special tool

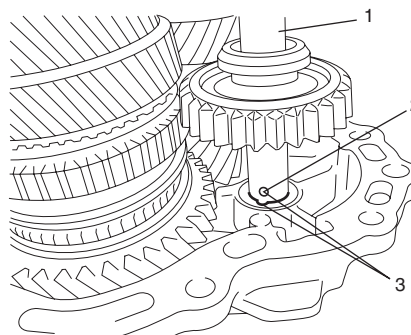
(A): 09922-58620

(B): 09922-58610



I3RM0B522039-01

- 4) Install reverse gear shaft (1) and ball (2) on a matched position (3) according to the figure by using hydraulic press.

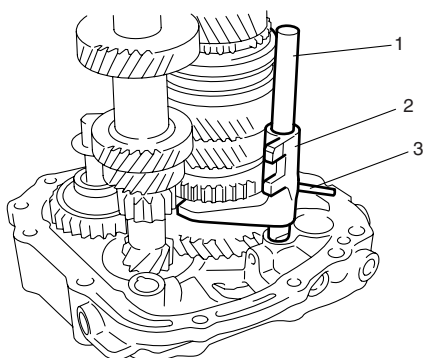


I3RM0B522040-01

- 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).

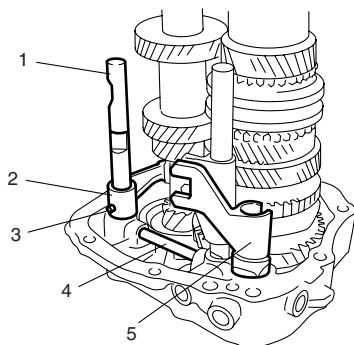
⚠ CAUTION

When installing selector fork pin, apply a piece of wood or the like to gear selector rod so as to protect it against damage.



I3RM0B522041-01

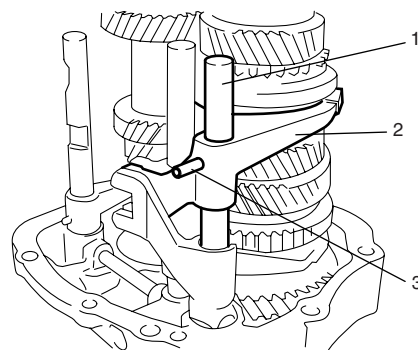
- 6) Install gear shift rod detent pin No.2 (4).
 7) Install reverse gear selector rod (1) and selector fork (2) in the same manner as Step 5).
 8) Install 5th gear shift rod fork (5).



I3RM0B522042-01

3. Selector fork pin

- 9) Install 3rd & 4th gear selector rod (1) and selector fork (2) in the same manner as Step 5).



I3RM0B522043-01

3. Selector fork pin

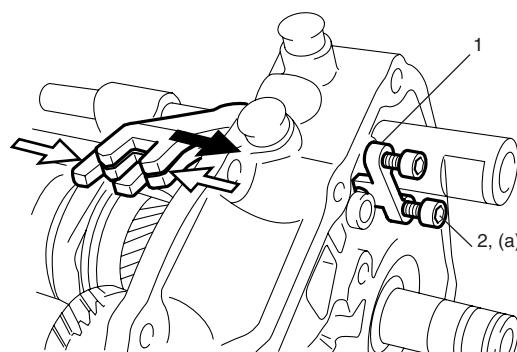
- 10) Install gear shift rod locking bushes using plastic hammer.
 11) Engage 2nd, 3rd and 5th gear and install gear shift rod connector (1) with specified torque.

⚠ CAUTION

Do not reuse gear shift rod connector bolt (2). Be sure to use new adhesive pre-coated bolts. Otherwise, bolts may loosen.

Tightening torque

Gear shift rod connector bolt (a): 7 N·m (0.7 kgf-m, 5.0 lb-ft)



I3RM0B522044-01

2. Gear shift rod connector bolt

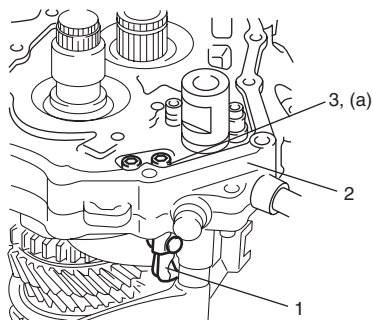
- 12) Install 5th gear pawl (1) to extension bearing plate case (2) and tighten bolts to specified torque.

⚠ CAUTION

Do not reuse 5th gear pawl bolt (3). Be sure to use new adhesive pre-coat bolts. Otherwise, bolts may loosen.

Tightening torque

5th gear pawl bolt (a): 7 N·m (0.7 kgf-m, 5.0 lb-ft)

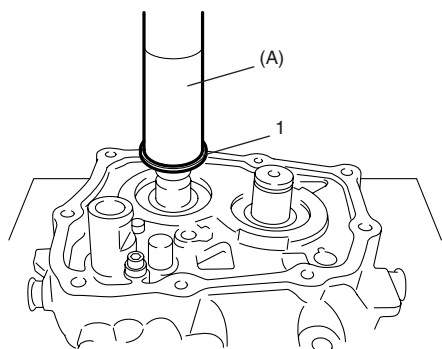


I3RM0B522045-01

- 13) Install 5th gear inner bearing ring to main shaft (1) using special tool.

Special tool

(A): 09913-84510

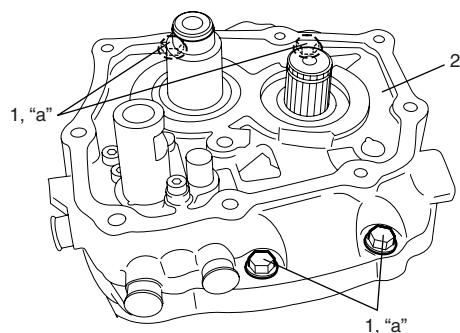


I3RM0B522046-01

- 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 kgf-m, 16.0 lb-ft)



I3RM0B522047-01

Transaxle Case Disassembly and Assembly

S5RS0B5206015

Disassembly

- 1) Remove pinion needle bearing (1) from transaxle case (3) using special tools.

Special tool

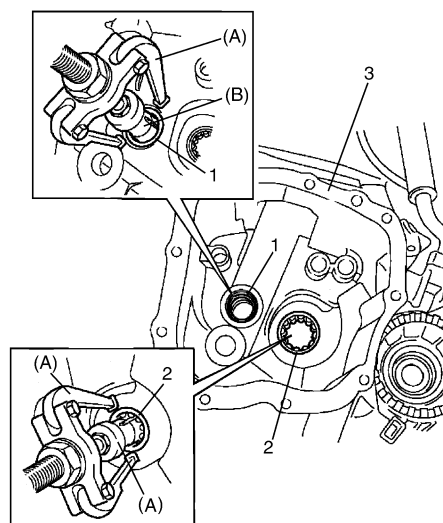
(A): 09925-08610

(B): 09926-58610

- 2) Remove main shaft roller bearing (2) from transaxle case (3) using special tools.

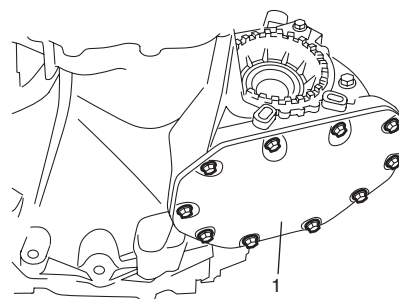
Special tool

(A): 09925-08610



I3RM0B522048-01

- 3) Remove differential cover (1) with gasket.

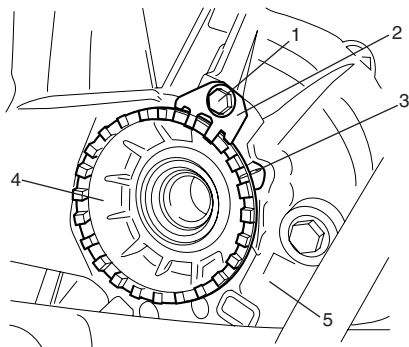


I3RM0B522049-01

- 4) Remove left and right side differential side oil seals referring to "Differential Side Oil Seal Replacement".
- 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).

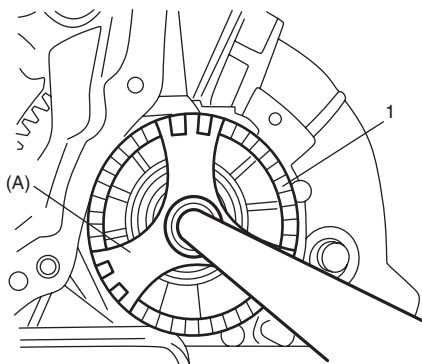


I3RM0B522050-01

- 6) Loosen differential bearing retaining ring (1) using special tool.

Special tool

(A): 09925-18610



I3RM0B522051-01

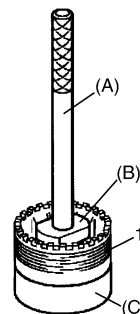
- 7) Remove differential assembly from lower side of transaxle case.
- 8) Remove differential bearing retaining ring, from transaxle case and remove O-ring from bearing retaining ring.
- 9) Remove differential side bearing outer race from differential bearing retaining ring (1) using special tools.

Special tool

(A): 09925-68630

(B): 09925-68610

(C): 09919-08610

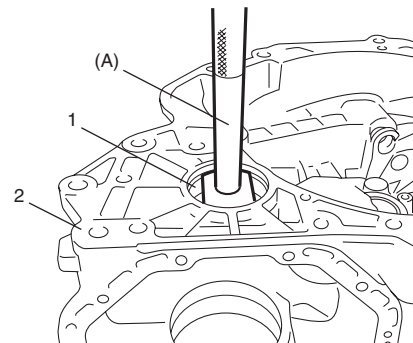


I3RM0B522053-01

- 10) Remove right side outer race (1) from transaxle case (2) using special tool.

Special tool

(A): 09925-68620



I3RM0B522052-01

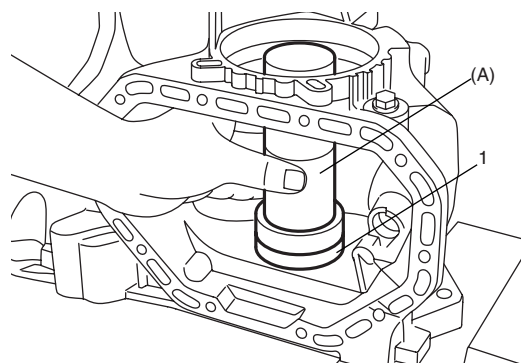
Assembly**NOTE**

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



I3RM0B522054-01

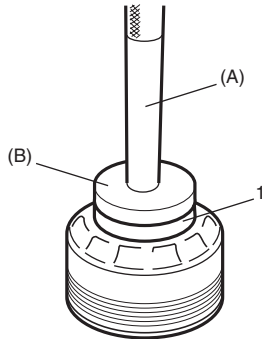
5B-23 Manual Transmission:

- 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

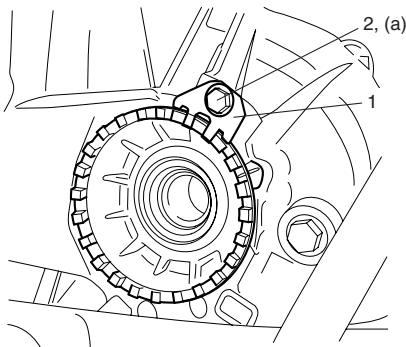


I3RM0B522055-01

- 4) Install differential assembly and then install differential bearing retaining ring with specified procedure according to "Differential Adjustment: ".
- 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 kgf-m, 6.5 lb-ft)

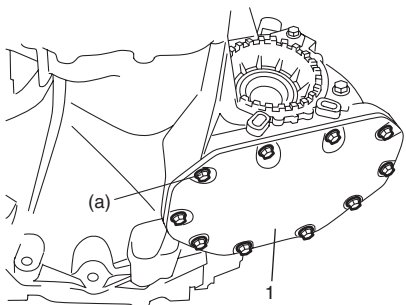


I3RM0B522056-01

- 6) Install differential cover (1) and new gasket to transaxle case.

Tightening torque

Differential cover bolt (a): 18 N·m (1.8 kgf-m, 13.0 lb-ft)



I3RM0B522057-01

- 7) Install left side oil seal referring to "Differential Side Oil Seal Replacement: ".
- 8) Install differential side oil seal referring to "Differential Side Oil Seal Replacement: ".
- 9) Install pinion needle bearing (1) to transaxle case using special tools.

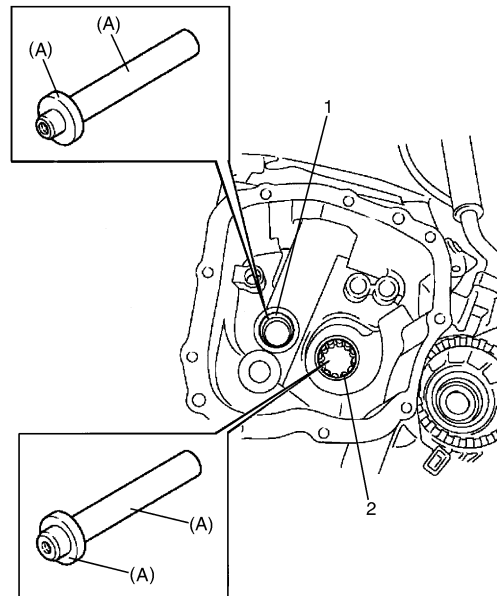
Special tool

(A): 09925-18620

- 10) Install main shaft roller bearing (2) to transaxle case using special tools.

Special tool

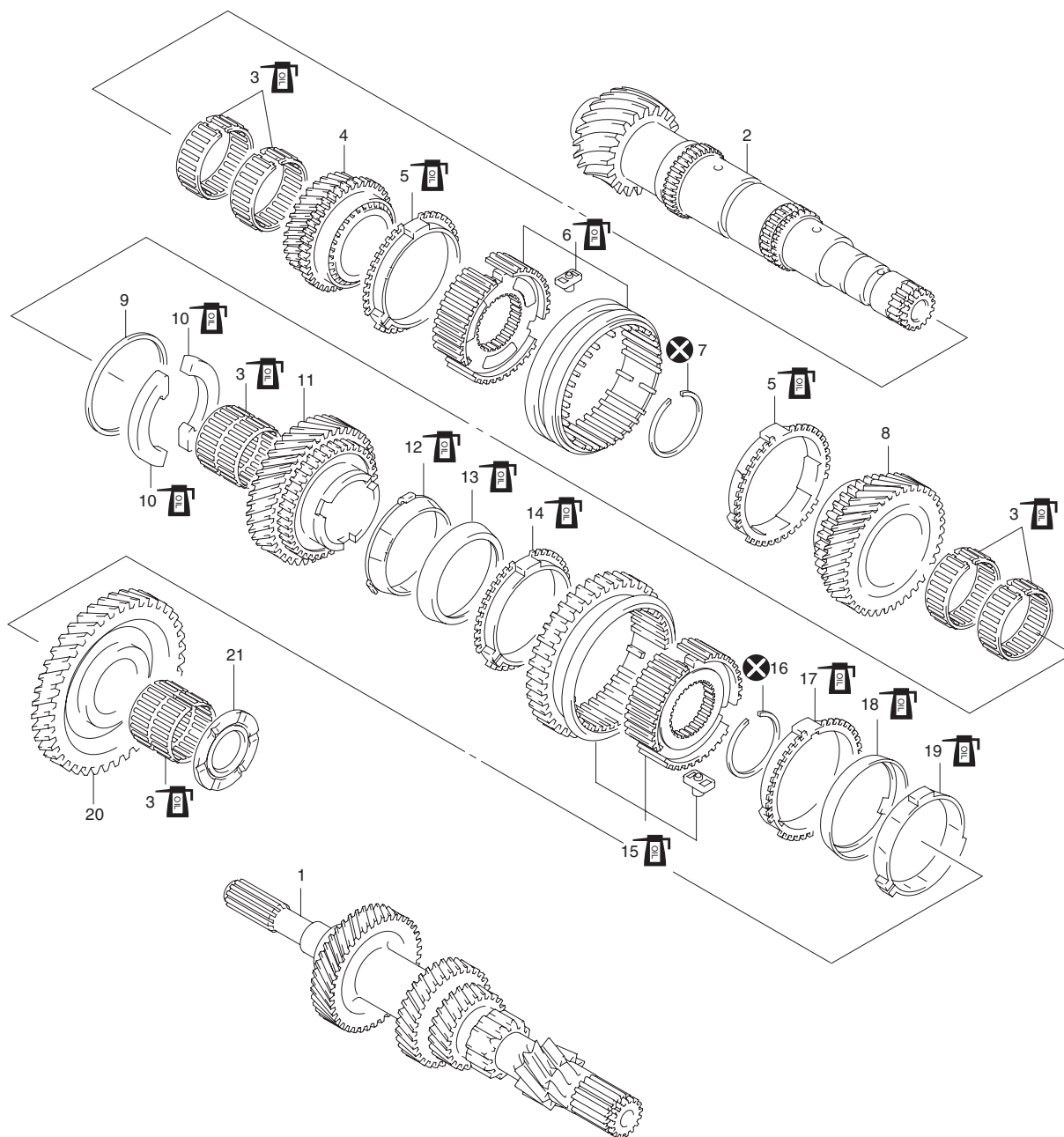
(A): 09925-18620



I3RM0B522058-01

Counter Gear and Main Shaft Components

S5RS0B5206009



I3RM0B522013-01

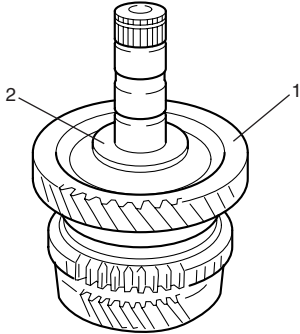
1. Transaxle cluster gear	9. 4th gear wear plate	17. 1st gear synchronizer outer ring
2. Transaxle main shaft	10. 2nd gear thrust washer	18. 1st gear synchronizer intermediate ring
3. Needle bearing	11. 2nd gear	19. 1st gear synchronizer inner ring
4. 4th gear	12. 2nd gear synchronizer inner ring	20. 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

S5RS0B5206016

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.

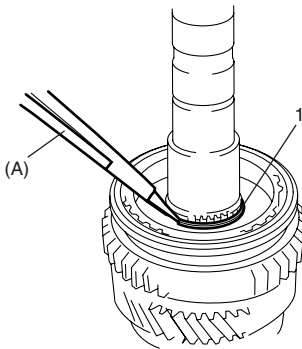


I3RM0B522059-01

- 2) Using special tool, remove 2nd gear snap ring (1).

Special tool

(A): 09900-06107

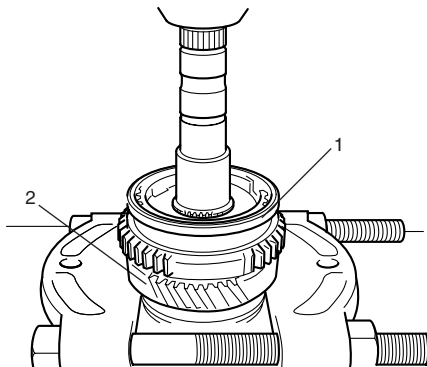


I3RM0B522060-01

- 3) Apply puller to 2nd gear and drive out 1st & 2nd gear hub assembly (1) with 2nd gear (2) using hydraulic press.

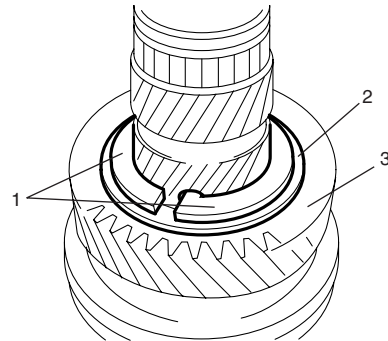
⚠ CAUTION

Make sure to use flat side of puller to avoid causing damage to 2nd gear tooth.



I3RM0B522061-01

- 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.

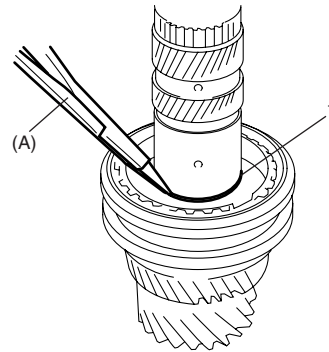


I3RM0B522062-01

- 7) Remove snap ring (1) using special tool.

Special tool

(A): 09900-06107

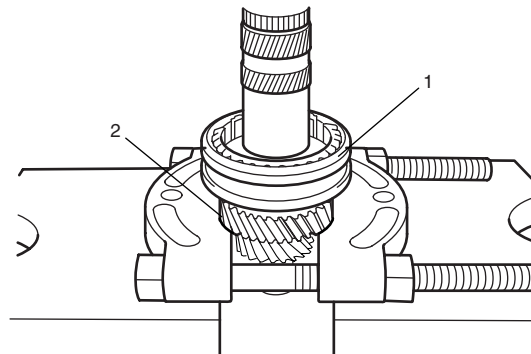


I3RM0B522063-01

- 8) Apply puller to 4th gear (2) and drive out 3rd & 4th gear hub assembly (1) with 4th gear by using hydraulic press.

⚠ CAUTION

Make sure to use flat side of puller to avoid causing damage to 4th gear tooth.

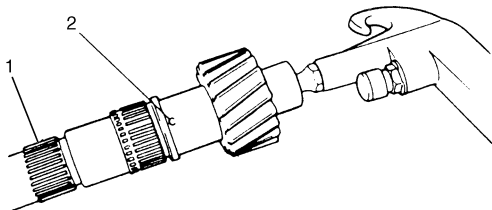


I3RM0B522064-01

- 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 of main shaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.

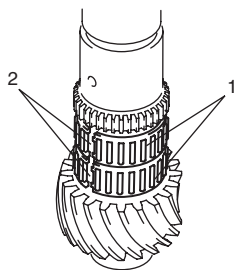


I2RH01520060-01

- 3) Install two pieces of needle bearings (1) for 4th gear onto main shaft.

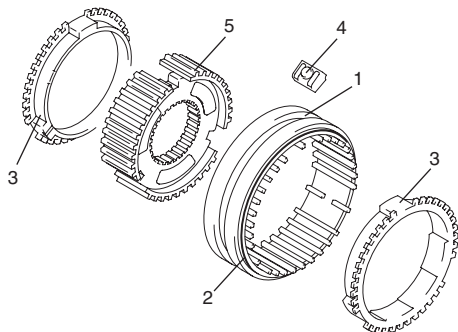
NOTE

Align each slot (2) of needle bearings.



I3RM0B522065-01

- 4) Assemble 3rd & 4th gear hub assembly (hub (5), sleeve (1) and keys (4)) as shown in the figure.



I3RM0B522066-01

- | |
|----------------------|
| 2. Groove of chamfer |
| 3. Synchronizer ring |

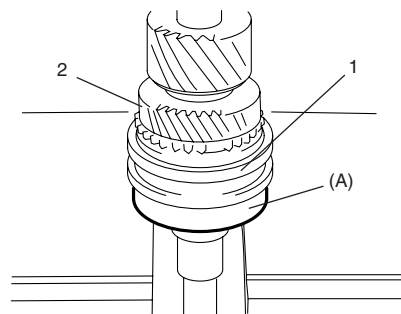
- 5) Install 4th gear (2) and synchronizer ring onto main shaft.
Press-fit 3rd & 4th gear hub assembly (1) onto main shaft facing groove of chamfer of sleeve to 3rd gear side, using special tool and hydraulic press.

NOTE

Check free rotation of 4th gear (2) after press-fitting 3rd & 4th gear hub assembly (1).

Special tool

(A): 09924-07710

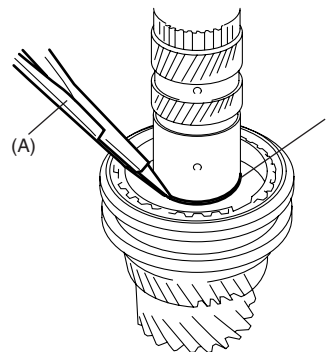


I3RM0B522067-01

- 6) Install new snap ring (1) using special tool.

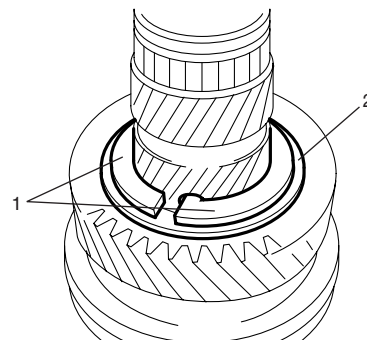
Special tool

(A): 09900-06107



I3RM0B522063-01

- 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).

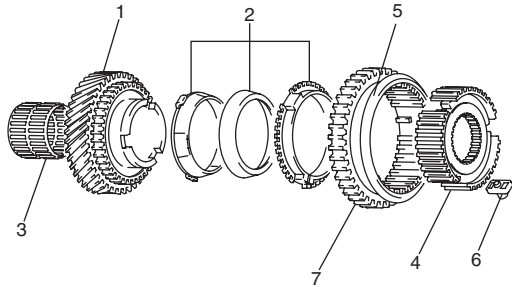


I3RM0B522068-01

- 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.



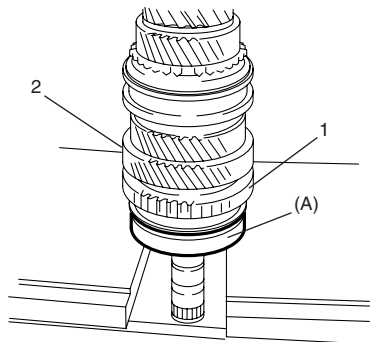
- 11) Press-fit the assembled parts in Step 12) onto main shaft using special tool and hydraulic press.

NOTE

Check free rotation of 2nd gear (2) after press-fitting 1st & 2nd gear hub assembly (1).

Special tool

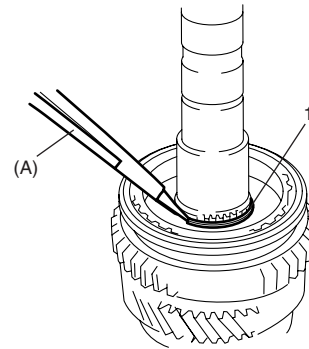
(A): 09924-07710



- 12) Install new 2nd gear snap ring (1) using special tool.

Special tool

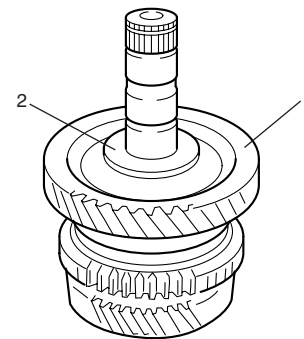
(A): 09900-06107



- 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).



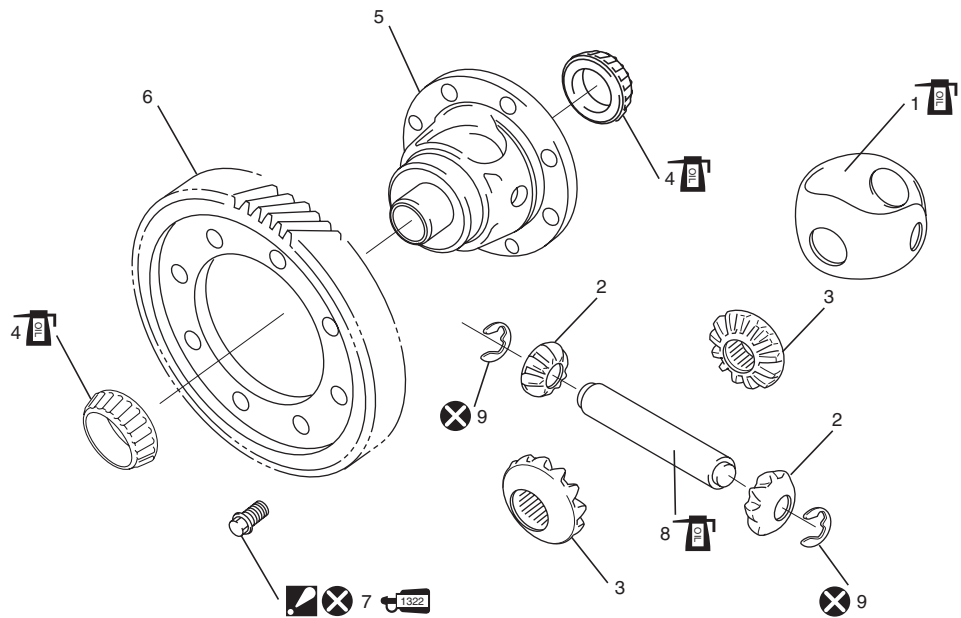
Cluster Gear and Main Shaft Inspection

S5RS0B5206017

- 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.

Differential Components

S5RS0B5206010



I3RM0B522014-03

1. Plastic cage	7. Final gear bolt : Tighten to 70 N·m (7.0 kgf-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

S5RS0B5206018

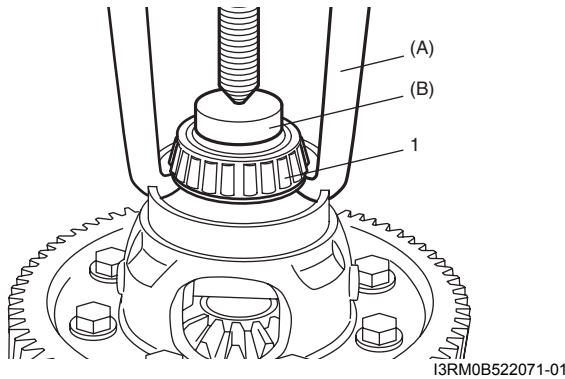
Disassembly

- 1) Remove oil seal referring to “Differential Side Oil Seal Replacement:”.
- 2) Remove differential assembly referring to “Transaxle Case Disassembly and Assembly:”.
- 3) Remove right side differential side bearing (1) using special tools.

Special tool

(A): 09913-65135

(B): 09925-88210

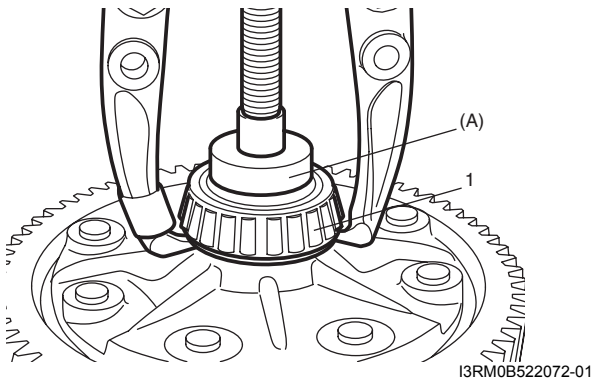


I3RM0B522071-01

- 4) Remove left side differential side bearing (1) using special tool and puller.

Special tool

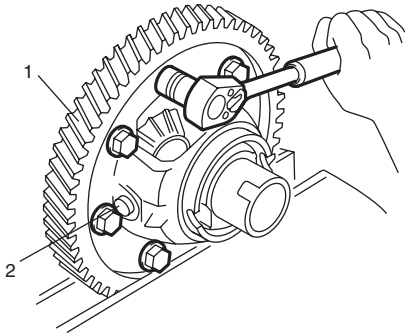
(A): 09925-88210



I3RM0B522072-01

5B-29 Manual Transmission:

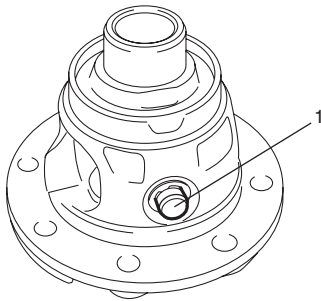
- 5) Hold differential gear assembly (1) with soft jawed vise. Remove final gear bolts and then take out final gear.
- 6) Remove pinion shaft washer from pinion shaft (2). Drive out pinion shaft and then disassemble component parts.



I3RM0B522073-01

Assembly

- 1) Assemble component parts.
- 2) Drive in pinion shaft (1) and then install new pinion shaft washer to pinion shaft.



I3RM0B522074-01

- 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.

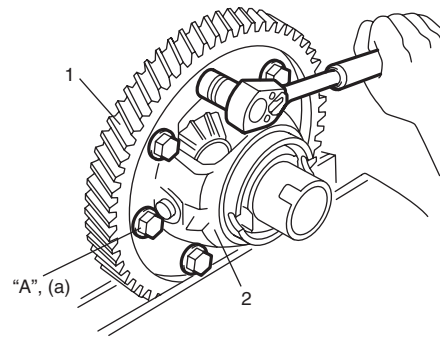
⚠ CAUTION

Main shaft and final gear must be replaced as a set when either replacement becomes necessary.

"A": Thread lock cement 99000-32110 (Thread Lock Cement Super 1322)

Tightening torque

Final gear bolt (a): 70 N·m (7.0 kgf-m, 51.0 lb-ft), 30° and 15° by the specified procedure.



I3RM0B522075-01

- 4) Press-fit differential side bearings (right and left) (1) using special tools and hydraulic press.

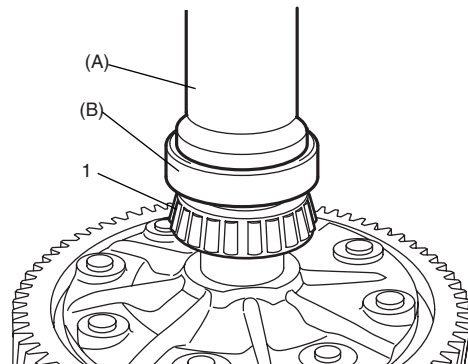
⚠ CAUTION

Do not mix differential side bearing outer races of left and right sides.

Special tool

(A): 09913-70123

(B): 09924-07730



I3RM0B522076-01

- 5) Install differential assembly and differential bearing retaining ring referring to "Transaxle Case Disassembly and Assembly: ".
- 6) Install oil seal referring to "Differential Side Oil Seal Replacement: ".

Differential Adjustment

Adjust differential rotating torque to specified value below by tightening or loosening differential bearing retaining ring (1), using special tools.

Maintain specified rotating torque at test speed of 1 revolution per second.

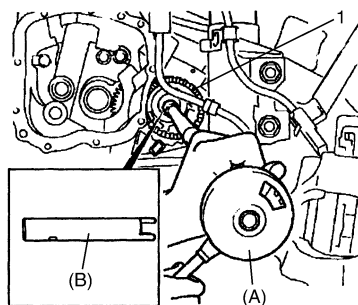
Special tool

(A): 09922-78610

(B): 09922-78620

Differential rotating torque

Repair case	Rotating torque (N-cm) (Set bearing ring to mark)
Reuse all removed parts.	60 – 100 (6 – 10 kg-cm, 5.25 – 8.65 lb-in)
Reusing bearing, replacement of differential retaining ring, differential assembly or transaxle case.	150 – 210 (15 – 21 kg-cm, 13.05 – 18.25 lb-in)



I3RM0B522077-01

Specifications

Tightening Torque Specifications

S5RS0B5207001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Differential cover bolt	18	1.8	13.0	👉 / 👉
Transaxle oil level plug	4 N·m (0.4 kgf·m, 3.0 lb·ft) and 45° to 180° by the specified procedure			👉
Breather plug	4 N·m (0.4 kgf·m, 3.0 lb·ft) and 180° by the specified procedure			👉
Cable grommet bolt	10	1.0	7.5	👉
Gear shift control lever bolt	13	1.3	9.5	👉
Back up lamp switch	20	2.0	14.5	👉
Selector lever cover bolt	15	1.5	11.0	👉
5th gear selector fork bolt	22	2.2	16.0	👉
Extension case cover bolt	29	2.9	21.0	👉
Extension case cover bolt	12	1.2	8.5	👉
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	👉
Final gear bolt	70 N·m (7.0 kgf·m, 51.0 lb·ft), 30° and 15° by the specified procedure.			👉

NOTE

The specified tightening torque is also described in the following.

“Gear Shift Control Lever and Cable Components: ”

“Manual Transaxle Unit Components: ”

“Manual Transaxle Assembly Components: ”

“Gear Selector, Cluster Gear and Main Shaft Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B5208001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000-25010	🔧
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000-32110	🔧 / 🔧

NOTE

Required service material is also described in the following.

“Manual Transaxle Assembly Components: ”

“Counter Gear and Main Shaft Components: ”

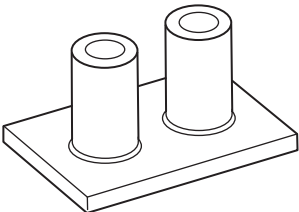
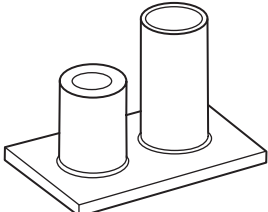
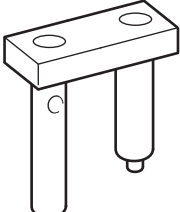
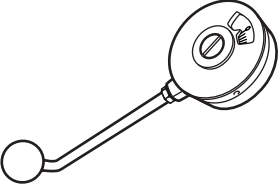
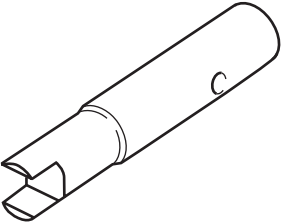
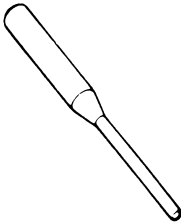
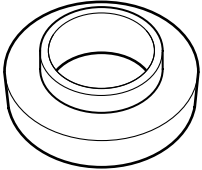
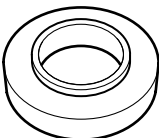
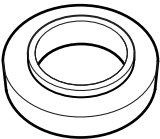
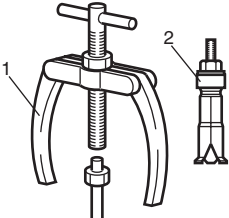
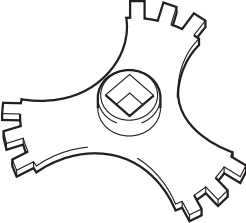
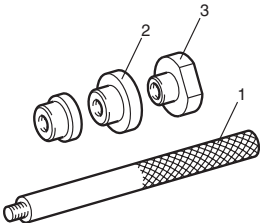
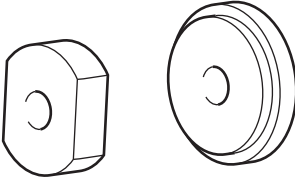
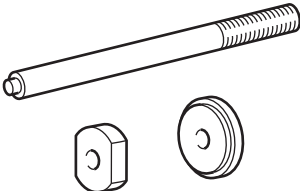
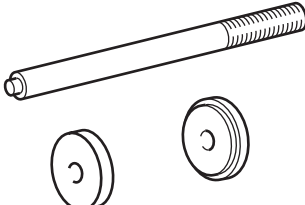
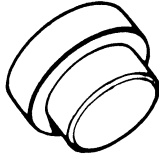
“Differential Components: ”

Special Tool

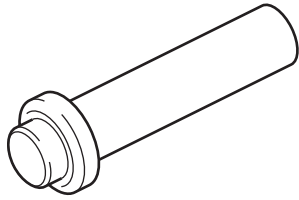
S5RS0B5208002

09900-06105 Snap ring pliers (closing type) 🔧		09900-06106 Snap ring pliers (closing type) 🔧	
09900-06107 Snap ring pliers (opening type) 🔧 / 🔧 / 🔧 / 🔧 / 🔧 / 🔧		09913-58610 Oil seal puller set MKM-557-A This kit includes the following items. 1.MKM-557-1 and MKM-557-2A. 🔧	
09913-65135 Bearing puller 🔧		09913-70123 Bearing installing tool 🔧 / 🔧	
09913-75810 Bearing installer 🔧 / 🔧		09913-84510 Bearing installer 🔧 / 🔧	
09913-85210 Bearing installer 🔧		09919-08610 Support base KM-303 🔧	
09922-48610 Locking bush remover KM-727 🔧		09922-48620 Locking bush remover KM-328-B 🔧	

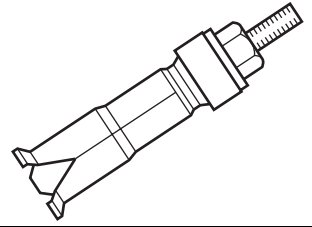
5B-33 Manual Transmission:

09922-58610 Transaxle shaft installer KM-6338  	09922-58620 Transaxle shaft installer KM-6337  
09922-68610 Transaxle shaft thrust piece KM-6335  	09922-78610 Friction coefficient meter MKM-536-A  
09922-78620 Adapter KM-6037  	09922-89810 Shifter lock pin remover (3.5 mm)  /  /  
09924-07710 Synchronizer hub installer  /  	09924-07720 Synchronizer hub installer  
09924-07730 Bearing installer  	09925-08610 Bearing puller set KM-556-A This kit includes the following items. 1. KM-556-A and 2. KM-556-2.  /  
09925-18610 Differential bearing retaining ring remover / installer KM-447  	09925-18620 Oil seal remover / installer KM-454 This kit includes the following items. 1. KM-454-4, 2. KM-454-2 and 3. KM-454-3.  /  
09925-68610 Outer race remover / installer KM-451  /  	09925-68620 Bearing remover / installer KM-305  /  
09925-68630 Bearing remover / installer KM-304  	09925-88210 Bearing puller attachment  /  

09926-28610
Oil seal installer
KM-446 



09926-58610
Bearing remover
MKM-599 



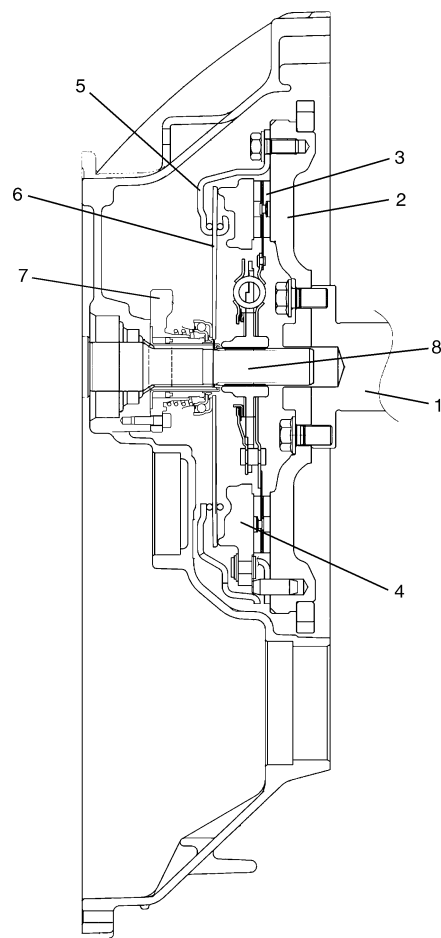
Clutch

General Description

Clutch (Hydraulic Type) Construction

S5RS0B5301001

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 four torsional coil springs, is positioned on the transaxle input shaft 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 (incorporated in clutch operating cylinder) is held back. This is the engaged condition of the clutch. Depressing the clutch pedal causes the release bearing (incorporated in clutch operating cylinder) 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 input shaft. Clutch fluid is supplied from brake fluid reservoir. Clutch fluid level can be checked by brake fluid level of brake fluid reservoir.



I5RS0B530001-02

1. Crankshaft	4. Pressure plate	7. Operating cylinder assembly
2. Flywheel	5. Clutch cover	8. Input shaft
3. Clutch disc	6. Diaphragm spring	

Diagnostic Information and Procedures

Clutch System Symptom Diagnosis

S5RS0B5304001

Condition	Possible cause	Correction / Reference Item
Slipping	Improper clutch pedal free travel	<i>Bleed air or replace master cylinder.</i>
	Worn or oily clutch disc facing	<i>Replace disc.</i>
	Warped disc, pressure plate or flywheel surface	<i>Replace disc, clutch cover or flywheel.</i>
	Weakened diaphragm spring	<i>Replace clutch cover.</i>
	Master cylinder piston or seal cup not returning	<i>Replace master cylinder.</i>
Dragging clutch	Improper clutch pedal free travel	<i>Bleed air or replace master cylinder.</i>
	Weakened diaphragm spring, or worn spring tip	<i>Replace clutch cover.</i>
	Rusted input shaft splines	<i>Lubricate.</i>
	Damaged or worn splines of transaxle input shaft	<i>Replace input shaft.</i>
	Excessively wobbly clutch disc	<i>Replace disc.</i>
	Clutch facings broken or dirty with oil	<i>Replace disc.</i>
	Fluid leakage	<i>Repair or replace.</i>
Clutch vibration	Glazed (glass-like) clutch facings	<i>Repair or replace disc.</i>
	Clutch facings dirty with oil	<i>Replace disc.</i>
	Release bearing slides unsmoothly	<i>Replace clutch operating cylinder assembly.</i>
	Wobbly clutch disc, or poor facing contact	<i>Replace disc.</i>
	Weakened torsion springs in clutch disc	<i>Replace disc.</i>
	Clutch disc rivets loose	<i>Replace disc.</i>
	Distorted pressure plate or flywheel surface	<i>Replace clutch cover or flywheel.</i>
	Weakened engine mounting	<i>Replace engine mounting.</i>
	Loosened engine mounting bolt or nut	<i>Retighten engine mounting bolt or nut.</i>
Noisy clutch	Worn or broken release bearing	<i>Replace clutch operating cylinder assembly.</i>
	Input shaft front bearing worn down	<i>Replace input shaft bearing.</i>
	Excessive rattle of clutch disc hub	<i>Replace disc.</i>
	Cracked clutch disc	<i>Replace disc.</i>
	Pressure plate and diaphragm spring rattling	<i>Replace clutch cover.</i>
Grabbing clutch	Clutch disc facings soaked with oil	<i>Replace disc.</i>
	Clutch disc facings excessively worn	<i>Replace disc.</i>
	Rivet heads showing out of facing	<i>Replace disc.</i>
	Weakened torsion springs	<i>Replace disc.</i>

Repair Instructions

Clutch Pedal Inspection

S5RS0B5306001

Cylinder Push Rod Play "A"

- 1) Press clutch pedal (1) gradually with finger, stop when slight increase of resistance is felt and measure how much pedal has moved (push rod play) as represented by "A" as shown.

Push rod play

"A": Max. 3 mm (0.12 in.)

- 2) If "A" is not within specification, replace master cylinder (3) or pedal arm (2).

Clutch Pedal Free Travel "B"

- 1) Depress clutch pedal (1), stop the moment clutch resistance is felt, and measure how much pedal has moved (clutch pedal free travel) as represented by "B" in the figure.

Clutch pedal free travel

"B": 2 – 8 mm (0.08 – 0.31 in.)

- 2) If "B" is not within specification, check pedal arm (2) and master cylinder (3) and replace defective part.

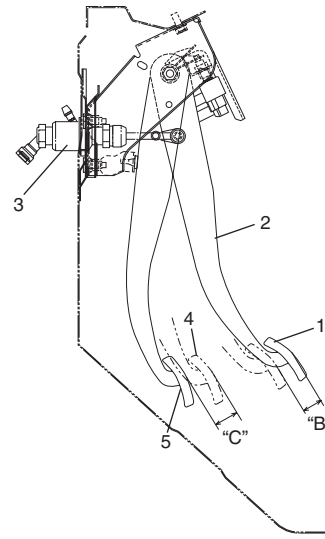
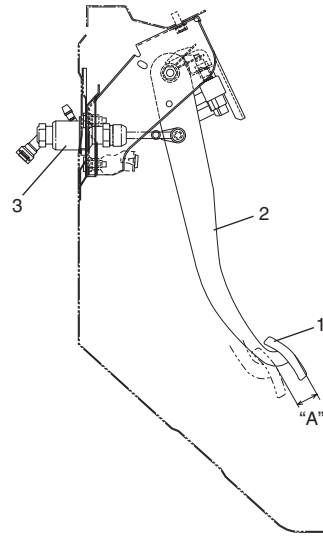
Clutch Release Margin "C"

- 1) Pull up parking brake fully and block wheels.
- 2) Start engine and keep engine at idle with neutral gear position.
- 3) Without clutch pedal (1) depressed, slightly push the shift lever to reverse position until transaxle emits gear contact noise. Do not shift the lever to reverse position.
- 4) With emitting gear contact noise, be slow to depress clutch pedal (1), and at gear contact noise died position (release point) stop depressing.
- 5) Measure distance between release point (4) and full stroke point (5) on clutch pedal (1) which is shown by "C" in the figure.

Clutch release margin

"C": 25 – 55 mm (0.98 – 2.17 in.)

- 6) If "C" is not within specification, it is possible that air is trapped in this system. If suspected so, bleed air referring to "Air Bleeding of Clutch System:". Upon completion of above inspection, start engine and check clutch for proper operation.



I4RS0B530001-01

Clutch Fluid Level Inspection

S5RS0B5306002

Refer to "Master Cylinder and Brake Fluid Level Inspection: in Section 4A".

Air Bleeding of Clutch System

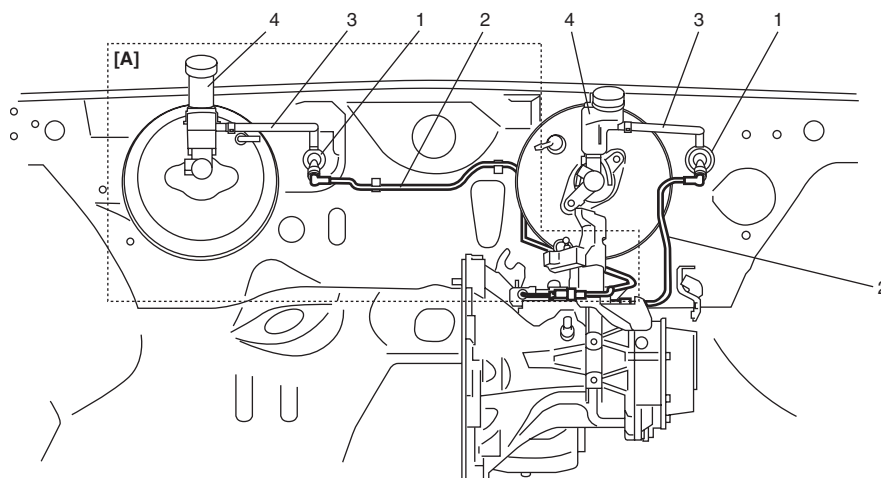
S5RS0B5306003

Bleed air from clutch system.

Refer to "Air Bleeding of Brake System: in Section 4A".

Clutch Fluid Pipe and Hose Location

S5RS0B5306004



I5RS0B530002-01

[A]: RH steering vehicle	3. Clutch reservoir hose
1. Master cylinder	4. Brake master cylinder reservoir
2. Clutch fluid pipe	

Clutch Fluid Pipe Removal and Installation

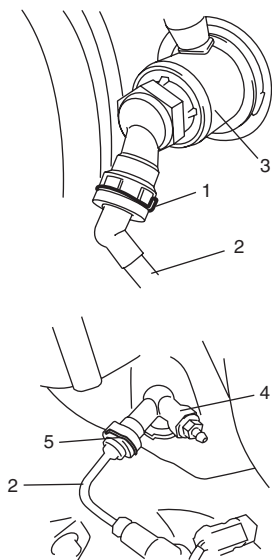
S5RS0B5306005

Removal

⚠ CAUTION

Do not allow fluid to get on painted surface. It may cause painted surface damage.

- 1) Remove dust and dirt from each joint of pipe to be disconnected and clean around brake master cylinder reservoir cap.
- 2) Take out fluid with syringe or such from brake master cylinder reservoir.
- 3) Pull clamp (1) of clutch master cylinder (3) and pull clamp (5) of fluid pipe joint (4), and then disconnect clutch fluid pipe (2).



I5RS0B530003-01

Installation

Reverse removal procedure for installation noting the following.

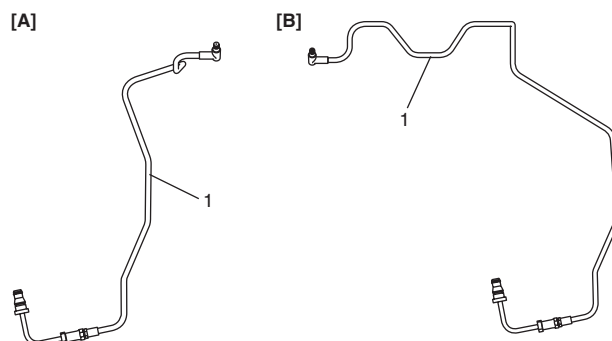
⚠ CAUTION

- Do not allow fluid to get on painted surface.
 - Do not allow pipe to contact hard against vehicle body or other parts.
-
- Install each clamp securely.
 - After installation, check clutch pedal free travel and bleed air from system referring to "Clutch Pedal Inspection: " and "Air Bleeding of Clutch System: ".
 - Check fluid leakage.
 - Add fluid to MAX level of reservoir.

Clutch Fluid Pipe Inspection

S5RS0B5306006

Check pipe (1) for dent, kink, crack, dirt and dust. Replace if check result is not satisfactory.



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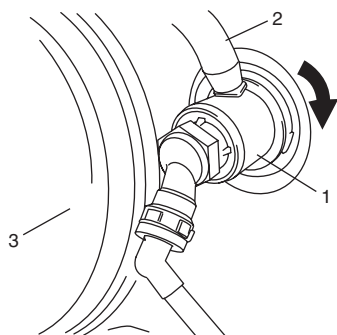
[A]: LH steering vehicle
[B]: RH steering vehicle

Clutch Master Cylinder Removal and Installation

S5RS0B5306007

Removal

- 1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
- 2) Disconnect clutch fluid pipe from clutch master cylinder (1) referring to "Clutch Fluid Pipe Removal and Installation: ".
- 3) Disconnect clutch reservoir hose (2).
- 4) Remove push rod from clutch pedal.
- 5) Turn clutch master cylinder (1) clockwise as shown in figure, and then remove it.



I4RS0B530005-01

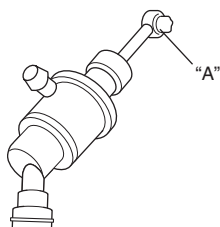
3. Brake booster

Installation

Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

"A": Grease 99000-25100 (SUZUKI Silicone Grease)



I4RS0B530006-01

Clutch Operating Cylinder Assembly Removal and Installation

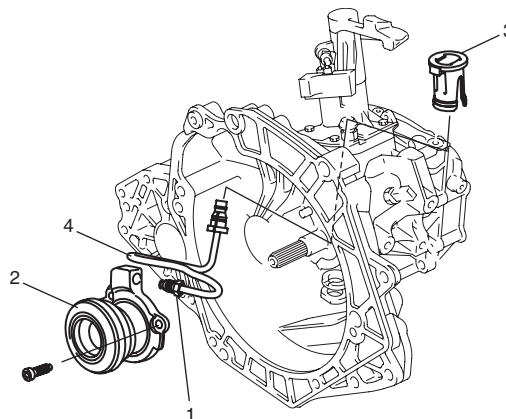
S5RS0B5306008

⚠ CAUTION

- **Do not allow fluid to get on painted surfaces. It may cause painted surface damage.**
- **Do not disassemble clutch operating cylinder assembly.**

Removal

- 1) Clean around reservoir cap of brake master cylinder and take out fluid with syringe or such.
- 2) Dismount transaxle assembly referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
- 3) Loosen clutch fluid pipe flare nut (1) of clutch operating cylinder assembly (2).
- 4) Remove clutch pipe joint sleeve (3) from transaxle front case and then remove clutch fluid pipe (4).
- 5) Remove clutch operating cylinder assembly from transaxle front case.



I5RS0B530005-02

Installation

- 1) Install clutch operating cylinder assembly (2) to transaxle front case. Tighten mounting bolts to specified torque.

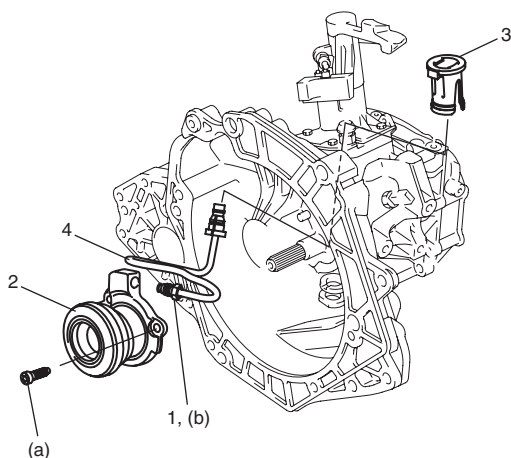
Tightening torque

Clutch operating cylinder assembly mounting bolt (a): 5 N·m (0.5 kgf-m, 4.0 lb-ft)

- 2) Connect clutch fluid pipe (4) to clutch operating cylinder assembly temporarily.
- 3) Install clutch pipe joint sleeve (3) to transaxle front case securely and then tighten clutch fluid pipe flare nut (1) to specified torque.

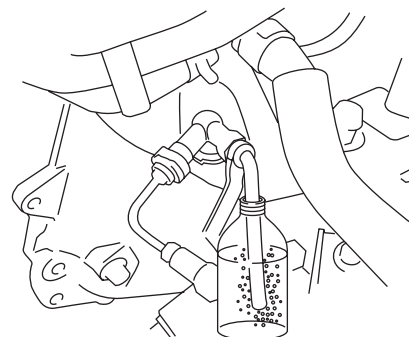
Tightening torque

Clutch fluid pipe flare nut (b): 16 N·m (1.6 kgf-m, 11.5 lb-ft)



I5RS0B530006-02

- 4) Remount transaxle assembly referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
- 5) Fill reservoir with specified brake fluid and check for fluid leakage.
- 6) Bleed air from system and check clutch pedal free travel. Refer to "Air Bleeding of Clutch System: " for air bleeding procedure.



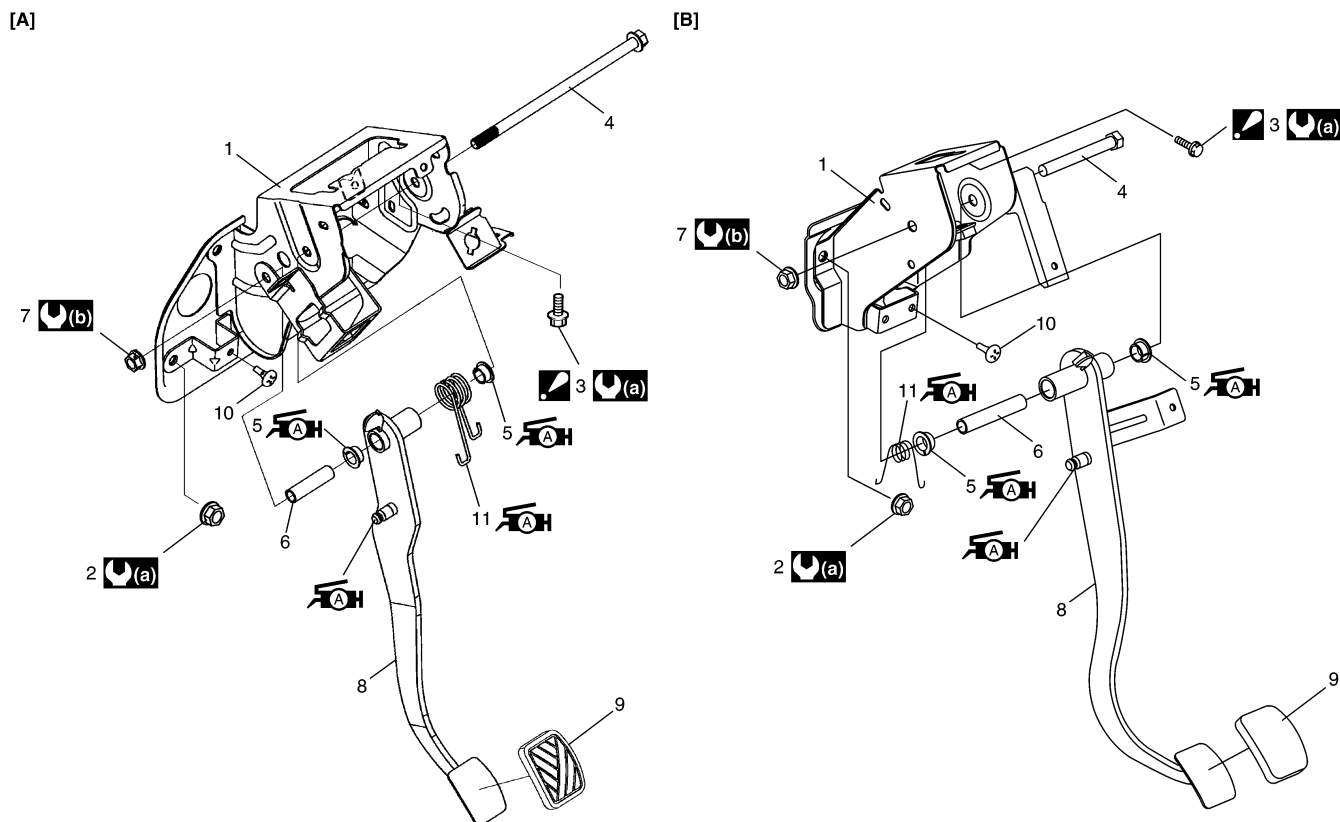
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Clutch Operating Cylinder Assembly Inspection

Check clutch fluid leakage, spring for damage and bearing for smooth rotation. If malfunction is found, replace clutch operating cylinder assembly.

Clutch Pedal and Clutch Pedal Bracket Components

S5RS0B5306009

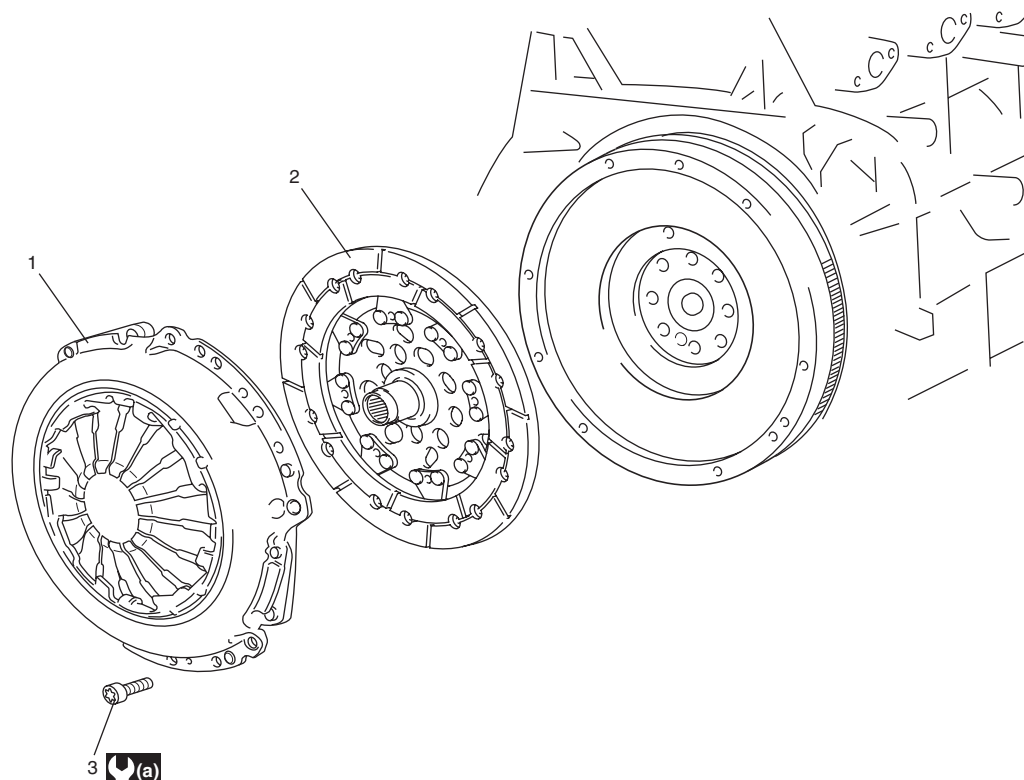


I5RS0B530010-02

[A]: LH steering vehicle	7. Pedal shaft nut
[B]: RH steering vehicle	8. Clutch pedal : Apply grease 99000-25010 to outside surface of pin.
1. Clutch pedal bracket	9. Pedal pad
2. Pedal bracket nut	10. Cushion
3. Pedal bracket bolt : Pedal bracket bolt must be tighten after pedal bracket nut.	11. Return spring : Apply grease 99000-25010 to inside of spring.
4. Pedal shaft bolt	: 13 N·m (1.3 kgf-m, 9.5 lb-ft)
5. Pedal bush : Apply grease 9900-25010 to outside of bush.	: 23 N·m (2.3 kgf-m, 17.0 lb-ft)
6. Pedal shaft spacer	

Clutch Cover and Clutch Disc Components

S5RS0B5306010



I5RS0B530008-02

1. Clutch cover	3. Clutch cover bolt
2. Clutch disc	(a) : 15 N·m (1.5 kgf-m, 11.0 lb-ft)

Clutch Cover and Clutch Disc Removal and Installation

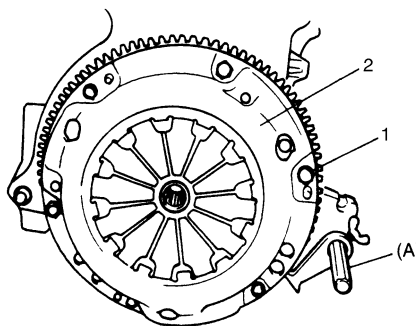
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Removal

- 1) Dismount manual transaxle assembly referring to "Manual Transaxle Unit Dismounting and Remounting: in Section 5B".
- 2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

Special tool

(A): 09924-17811



I4RS0A530014-01

Installation

NOTE

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

- 1) Aligning clutch disc to flywheel center using special tool, install clutch cover (1) and bolts (2). Then tighten bolts (2) to specification.

NOTE

- While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.
- Tighten cover bolts little by little evenly in diagonal order.

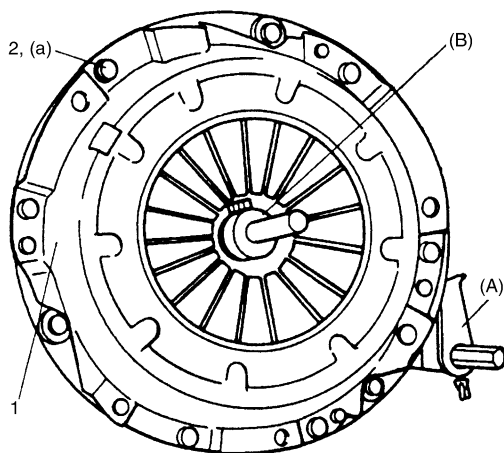
Special tool

(A): 09924-17811

(B): 09923-36320

Tightening torque

Clutch cover bolt (a): 15 N·m (1.5 kgf-m, 11.0 lb-ft)



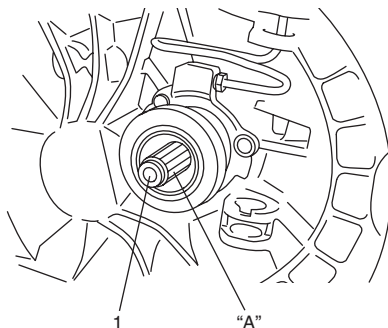
I4RS0A530017-01

- 2) Slightly apply grease to input shaft (1), then join manual transaxle assembly with engine referring to “Manual Transaxle Unit Dismounting and Remounting: in Section 5B”.

“A”: Grease 99000-25210 (SUZUKI Super Grease I)

NOTE

When inserting transaxle input shaft to clutch disc, turn crankshaft little by little to match the splines.



I5RS0B530009-02

Clutch Cover and Clutch Disc Inspection

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Clutch Disc

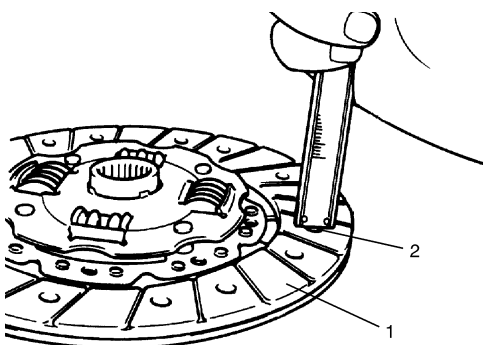
Measure depth of rivet head depression, i.e. distance between rivet head and facing surface.

If depression is found to have reached service limit at any of rivet holes (2), replace clutch disc assembly (1).

Rivet head depth

Standard: 1.65 – 2.25 mm (0.06 – 0.09 in.)

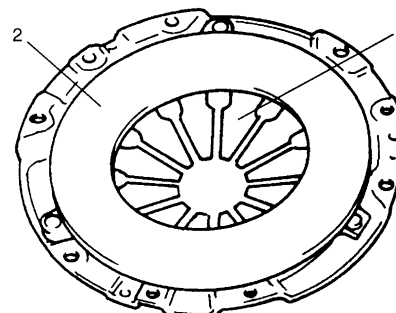
Limit: 0.5 mm (0.02 in.)



I4RS0A530019-01

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 and pressure plate.



I3RM0A530015-01

Specifications**Tightening Torque Specifications**

S5RS0B5307001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Clutch operating cylinder assembly mounting bolt	5	0.5	4.0	☞
Clutch fluid pipe flare nut	16	1.6	11.5	☞
Clutch cover bolt	15	1.5	11.0	☞

NOTE

The specified tightening torque is also described in the following.

“Clutch Pedal and Clutch Pedal Bracket Components: ”

“Clutch Cover and Clutch Disc Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B5308001

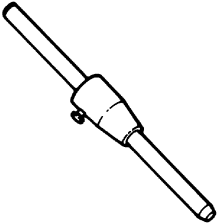
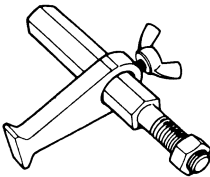
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Silicone Grease	P/No.: 99000-25100	🔧
	SUZUKI Super Grease I	P/No.: 99000-25210	🔧

NOTE

Required service material is also described in the following.
“Clutch Pedal and Clutch Pedal Bracket Components: ”

Special Tool

S5RS0B5308002

09923-36320 Clutch center guide (15 mm) 🔧		09924-17811 Flywheel holder 🔧 / 🔧	
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Section 6

Steering

CONTENTS

NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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Power Assisted Steering System

General Description

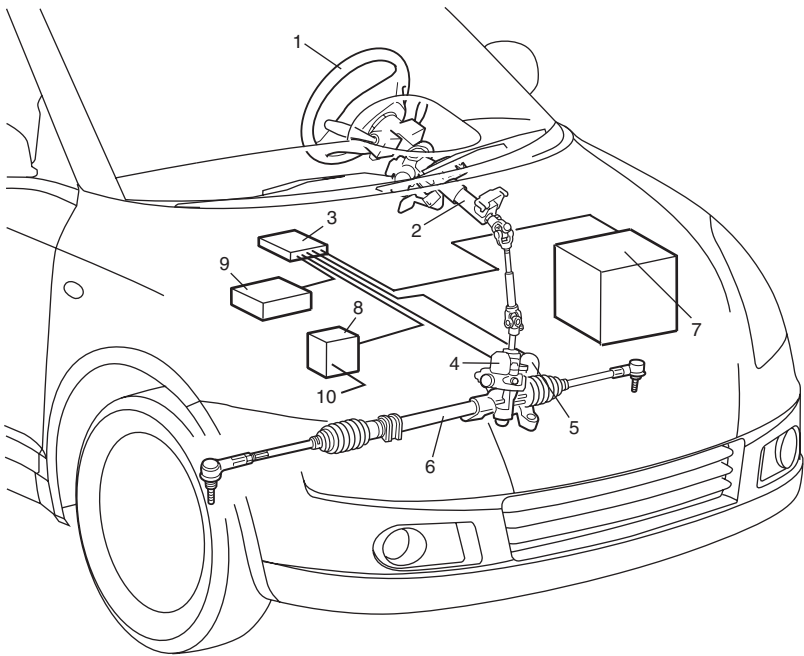
P/S System Description

S5RS0B6301001

This power steering (P/S) system consists of a P/S control module (3), a torque sensor (4), a motor (5). In this system, the P/S control module determines the level and direction of the assist force for the steering wheel (1) according to the signals from the torque sensor and the vehicle speed signal from ABS hydraulic unit / control module assembly (VSS) (right-front). The P/S control module runs the motor so as to assist the operation of the steering wheel.

The P/S control module diagnoses troubles which may occur in the area including the following components when the ignition switch is ON and the engine is running. When the P/S control module detects any malfunction, it stops the motor operation.

- Torque sensor
- Vehicle speed signal from ABS hydraulic unit / control module assembly (VSS)
- Engine speed signal circuit
- Motor
- P/S control module.



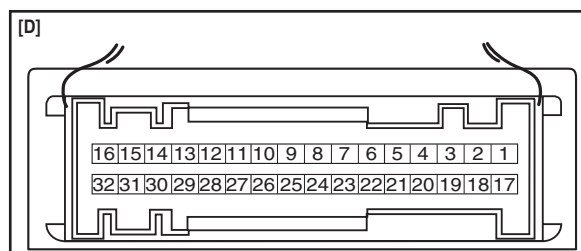
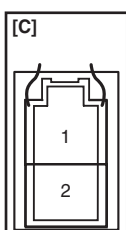
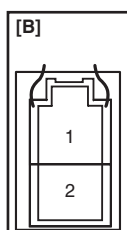
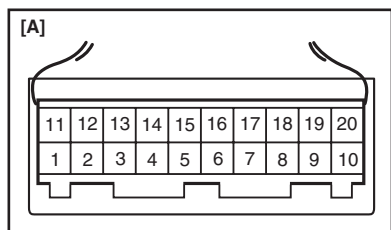
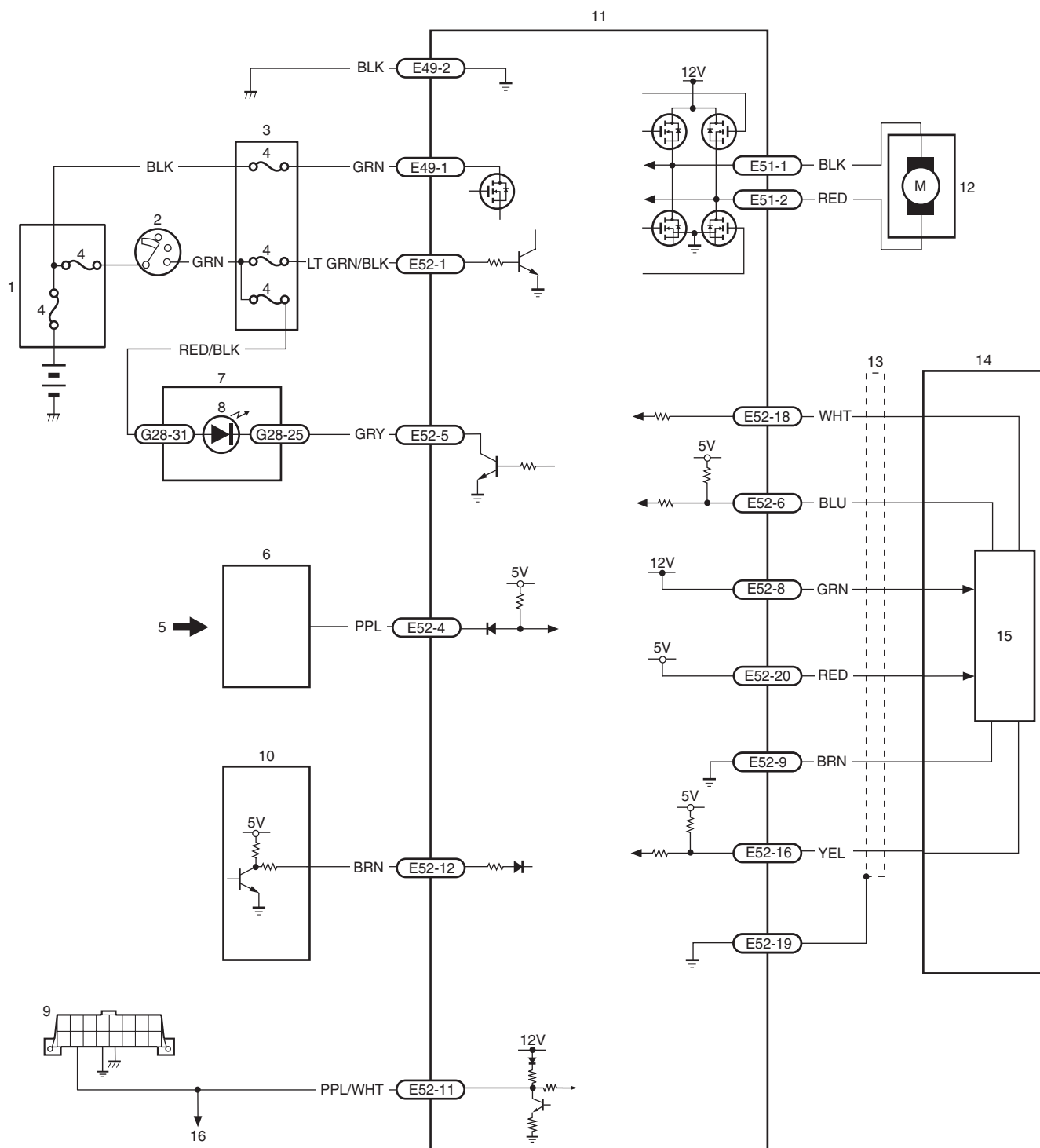
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2. Steering column	7. Battery	9. ECM
6. Steering gear case assembly	8. ABS hydraulic unit / control module assembly	10. To wheel speed sensor (right-front)

Schematic and Routing Diagram

EPS System Wiring Circuit Diagram

S5RS0B6302001



[A]: Connector "E52" (viewed from harness side)	4. Fuse	11. P/S control module
[B]: Connector "E49" (viewed from harness side)	5. Vehicle speed signal	12. P/S motor
[C]: Connector "E51" (viewed from harness side)	6. ABS hydraulic unit / control module assembly	13. Shield
[D]: Connector "G28" (viewed from harness side)	7. Combination meter	14. Torque sensor
1. Main fuse	8. "EPS" warning lamp	15. Torque sensor amplifier
2. Ignition switch	9. Data link connector (DLC)	16. To ECM, BCM, Air bag SDM, immobilizer control module and ABS hydraulic unit / control module assembly
3. Junction block assembly	10. ECM	

Diagnostic Information and Procedures

DTC Table

S5RS0B6304005

⚠ CAUTION

Be sure to perform the "EPS System Check: " before starting troubleshooting corresponding to each DTC.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
No CODES	Normal	—	—
☞ C1113	Torque sensor main and sub circuit voltage difference high	Difference between voltages from torque sensors at "E52-18" terminal and "E52-6" terminal exceeds specified voltage difference for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1114	Torque sensor 5 V power supply circuit failure	Voltage at "E52-20" terminal (5 V) differs from specified voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1117	Torque sensor failure (signal voltage low)	Voltage at "E52-16" terminal is lower than lower limit voltage for P/S control module diagnosis for specified period or longer after ignition SW is turned ON	1 driving cycle
☞ C1118	Torque sensor failure (signal voltage high)	Voltage at "E52-16" terminal is higher than upper limit voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1119	Torque sensor 12 V power supply circuit failure	Voltage at "E52-8" terminal (12 V) is lower than lower limit voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
☞ C1121	VSS circuit signal not input (60 seconds or more)	No vehicle speed signal is inputted to P/S control module in either one of the following two conditions 1. More than 60 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 60 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	1 driving cycle

6C-4 Power Assisted Steering System:

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	MIL
 C1122	Engine speed signal circuit failure	P/S control module detects all the following conditions for 20 seconds or more - Vehicle speed signal 50 km/h (31 mph) or more - Engine speed signal is less than 220 rpm	1 driving cycle
 C1123	VSS circuit signal not input (30 seconds or more)	No vehicle speed signal is inputted to P/S control module in either one of the following two conditions - More than 30 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start - More than 30 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	3 driving cycles
 C1124	VSS circuit failure (abnormal deceleration)	Vehicle speed is inputted to P/S control module as having decelerated by more than specified deceleration and lower than 5 km/h vehicle speed continued for 5 seconds after deceleration	1 driving cycle
 C1141	Motor circuit voltage abnormal	Voltage at "E51-1" terminal or "E51-2" terminal differs from specified voltage for P/S control module diagnosis for specified period or longer	1 driving cycle
 C1142	Motor circuit current high command with P/S control module target current	Measured value of motor circuit current is 10 A or more higher than specified value of motor circuit current from P/S control module	1 driving cycle
 C1143	Motor circuit current excessive	Measured value of motor circuit current is 50 A or more	1 driving cycle
 C1145	Motor circuit current low command with P/S control module target current	Measured value of motor circuit current is lower than specified value of motor circuit current from P/S control module	1 driving cycle
 C1153	P/S control module power supply circuit failure	Battery voltage is lower than lower limit voltage for P/S control module diagnosis	1 driving cycle
 C1155	P/S control module failure	Battery voltage is higher than upper limit voltage for P/S control module diagnosis or internal failure of controller	1 driving cycle

Scan Tool Data

S5RS0B6304006

Scan tool data	Normal condition
 Battery Voltage	10 – 14 V
 TQS Power Supply	7.5 – 10 V
 TQS Main Torque	0 N·m
 TQS Sub Torque	0 N·m
 Assist Torque	0 N·m
 Motor Volt	1.5 – 2 V
 Motor Control	0 A
 Motor Monitor	0 A
 Vehicle Speed	0 km/h
 Engine Speed	700 ± 50 rpm
 Ignition Switch	ON

Scan Tool Data Definitions**Battery Voltage**

Battery voltage is an analog input signal read by the ECU.

TQS (Torque sensor) Power Supply

This parameter indicates the power supply voltage which the EPS controller supplies to the torque sensor.

TQS (Torque sensor) Main Torque

The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the main torque sensor is one of these.

TQS (Torque sensor) Sub Torque

The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the sub-torque sensor is one of these. Its output characteristics are compared with those of the main torque sensor.

Assist Torque

This parameter is an internal parameter of the EPS controller. It is obtained by computing the torque sensor input signal.

Motor Volt

This parameter indicates the voltage between motor terminals.

Motor Control

Based on the input signal, the EPS controller determines the assist amount and controls the current to the motor suitable for that assist amount. This parameter indicates that control value.

Motor Monitor

This parameter indicates the actually measured value of the current flowing to the motor. The motor circuit condition is diagnosed by comparing this parameter with “Motor Control” parameter described previously.

Vehicle Speed

The AC voltage signal produced by the vehicle speed signal from ABS hydraulic unit / control module assembly (VSS) is divided and adjusted by the speedometer and thus the vehicle speed signal is obtained. The EPS controller determines the amount of power assist based on this vehicle speed signal and the torque sensor signal.

Engine Speed

Engine speed signal is fed from the ECM so that it can be used for trouble diagnosis of the electric power steering system.

Ignition Switch

This parameter indicates the condition of the power supply through the ignition switch.

P/S System Symptom Diagnosis

S5RS0B6304007

This section describes trouble diagnosis of the P/S system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnostic function). When no malfunction is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those steering basic parts as described in “Steering Symptom Diagnosis: in Section 6A” are all in good condition, check the following power steering system parts which may be a possible cause for each symptom of the steering.

Condition	Possible cause	Correction / Reference Item
Steering wheel feels heavy (Perform “Steering Force Check: ” before diagnosis.)	Steering wheel installed improperly (twisted)	Install steering wheel correctly.
	Poor performance of torque sensor	Check torque sensor referring to “Torque Sensor Inspection: ”.
	Poor performance of motor	Check motor referring to “Motor Assembly Inspection: ”.
	Steering gear case assembly faulty	Replace.
	Poor performance of vehicle speed signal from ABS hydraulic unit / control module assembly (VSS)	Check vehicle speed signal circuit referring to “DTC C1121 / C1123 / C1124: VSS Circuit Failure: ”
Vehicle pulls to one side during straight driving	Poor performance of torque sensor	Check torque sensor referring to “Torque Sensor Inspection: ”.
Poor recovery after turns	Poor performance of torque sensor	Check torque sensor referring to “Torque Sensor Inspection: ”.
	Steering column faulty	Replace.

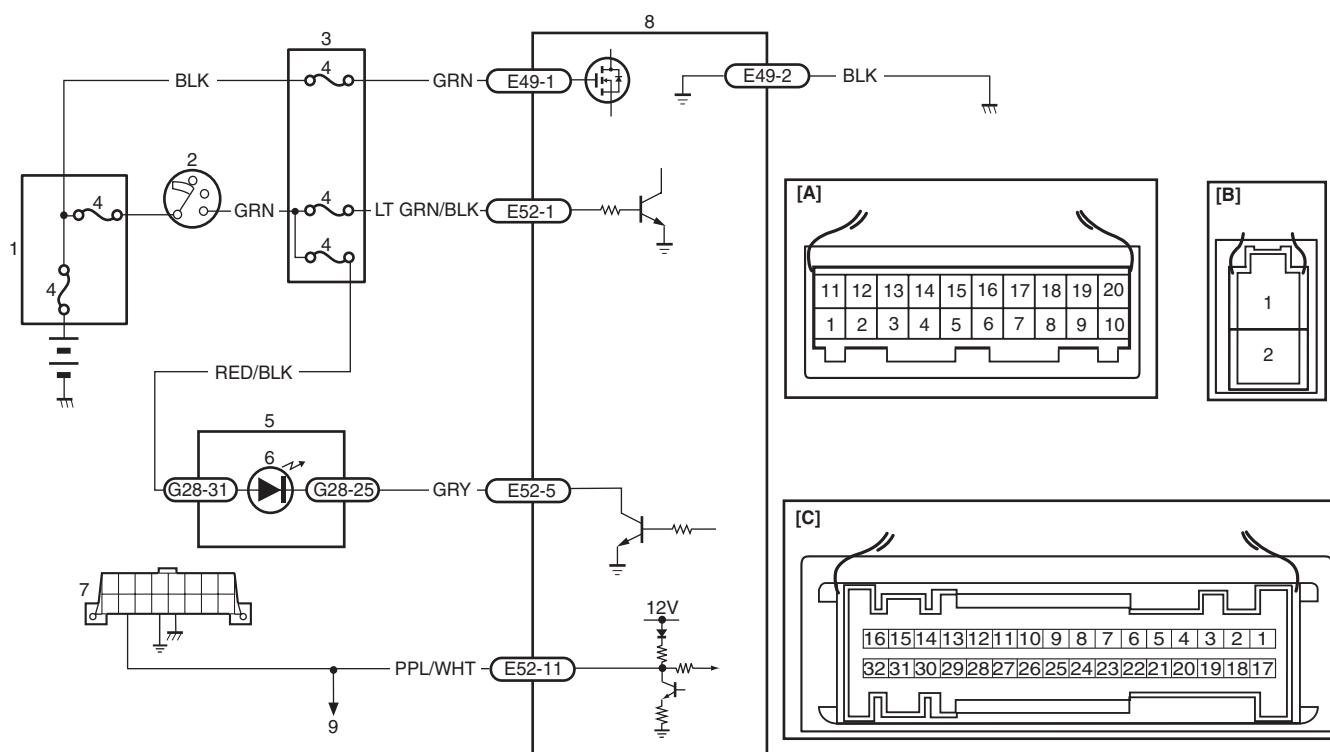
Serial Data Link Circuit Check

S5RS0B6304008

⚠ CAUTION

Be sure to perform “EPS System Check: ” before starting “Troubleshooting”.

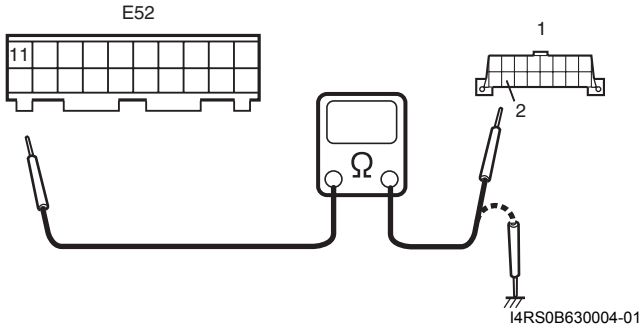
Wiring Diagram



I4RS0B630003-01

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	6. "EPS" warning lamp
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	7. Date link connector (DLC)
[C]: Connector "G28" (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	9. To ECM, BCM, Air bag SDM, immobilizer control module and ABS hydraulic unit / control module assembly

Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check: ".
2	1) Make sure that SUZUKI scan tool is free from malfunction and that correct program card (software) for P/S system is used. 2) Turn ignition switch to OFF position. 3) Check proper connection of SUZUKI scan tool to DLC. <i>Is connection in good condition?</i>	Go to Step 3.	Connect SUZUKI scan tool to DLC properly.
3	1) Check if communication is possible by making communication with other controllers (ECM, BCM, ABS hydraulic unit / control module assembly, immobilizer control module or SDM) or other vehicles. <i>Is it possible to communicate with the other controllers?</i>	Go to Step 4.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
4	1) With ignition switch at OFF position, disconnect "E52" connector from P/S control module. 2) Check proper connection at "E52-11" ("PPL/WHT" wire) terminal (2) for serial data circuit. 3) If OK, then check for high resistance, open or short to power circuit or ground in "PPL/WHT" wire circuit for P/S system.  <i>Is check result in good condition?</i>	Substitute a known-good P/S control module and recheck.	Repair "PPL/WHT" wire circuit for P/S system.

DTC C1121 / C1123 / C1124: VSS Circuit Failure

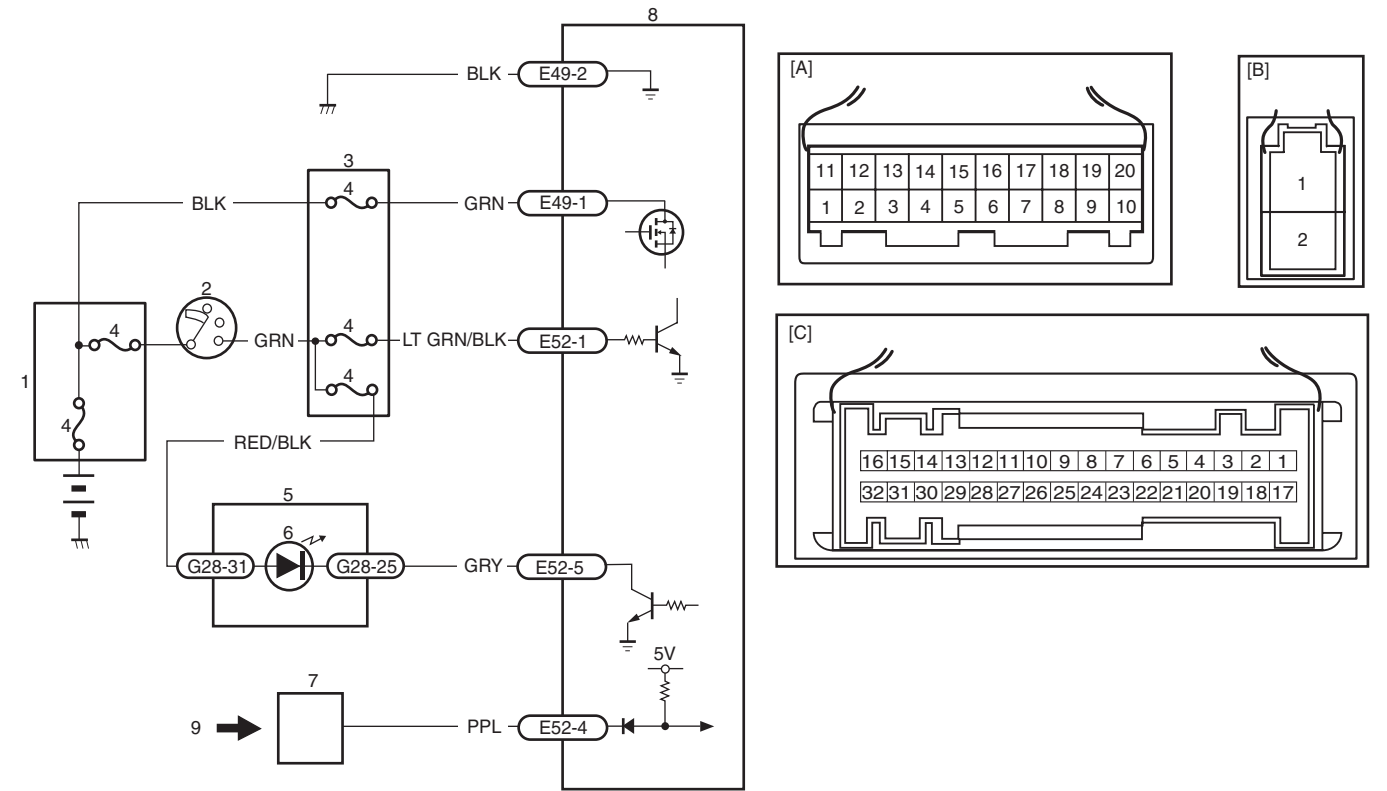
S5RS0B6304014

DTC C1121: VSS Circuit Signal Not Input (60 Seconds or More)

DTC C1123: VSS Circuit Signal Not Input (30 Seconds or More)

DTC C1124: VSS Circuit Failure (Abnormal Deceleration)

Wiring Diagram



I5RS0B630003-01

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	6. "EPS" warning lamp
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	7. ABS hydraulic unit / control module assembly
[C]: Connector "G28" (viewed from harness side)	4. Fuse	8. P/S control module
1. Main fuse	5. Combination meter	9. Vehicle speed signal

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1121: No vehicle speed signal is inputted to P/S control module in either one of the following two conditions (1 driving cycle detection logic) 1. More than 60 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 60 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	• High resistance, open or short in vehicle speed signal circuit • Wheel speed sensor • ABS hydraulic unit / control module assembly • ECM • P/S control module
DTC C1123: No vehicle speed signal is inputted to P/S control module in either one of the following two conditions (3 driving cycle detection logic) 1. More than 30 seconds pass at more than 4000 rpm engine speed before a lapse of 5 minutes from the engine start 2. More than 30 seconds pass at more than 2500 rpm engine speed after a lapse of 5 minutes from the engine start	
DTC C1124: Vehicle speed is inputted to P/S control module as having decelerated by more than specified deceleration and lower than 5 km/h vehicle speed continued for 5 seconds after deceleration (1 driving cycle detection logic)	

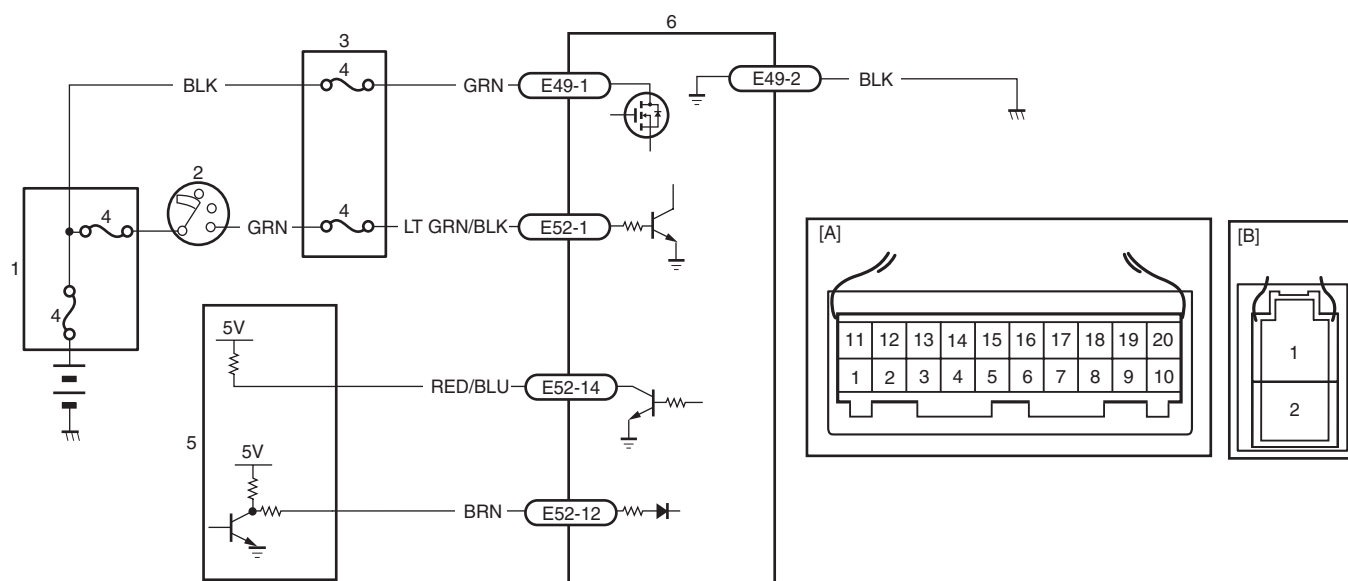
DTC Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check: ".
2	DTC Check for ABS hydraulic unit / control module assembly referring to "DTC Check: in Section 4E". Is DTC C1021 and / or C1022 detected?	Go to "DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring: in Section 4E".	Go to Step 3.
3	1) Check for proper connection to the P/S control module and ABS hydraulic unit / control module assembly at each "PPL" wire terminal (P/S control module side: "E52-4" terminal, ABS hydraulic unit / control module assembly side: Refer to "ABS Wiring Circuit Diagram: in Section 4E". 2) If they are OK, check for high resistance, open or short to power circuit or ground in "PPL" wire circuit. Is check result in good condition?	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair "PPL" wire circuit.

DTC C1122: Engine Speed Signal Circuit Failure

S5RS0B6304015

Wiring Diagram



I4RS0B630008-02

[A]: Connector "E52" (viewed from harness side)	2. Ignition switch	5. ECM
[B]: Connector "E49" (viewed from harness side)	3. Junction block assembly	6. P/S control module
1. Main fuse	4. Fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P/S control module detects all the following conditions for 20 seconds or more (1 driving cycle detection logic) - Vehicle speed signal 50 km/h (31 mph) or more - Engine speed signal is less than 220 rpm	- High resistance, open or short in engine speed circuit - ECM - P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	Was "EPS System Check" performed?	Go to Step 2.	Go to "EPS System Check: ".
2	1) Clear DTC(s) referring to "DTC Clearance: ". 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to "DTC Check: ". Is DTC C1122 still detected?	Go to Step 3.	Check intermittent trouble referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	DTC Check for ECM referring to "DTC Check: in Section 1A". Is DTC P0340 detected?	Go to "C-20, Camshaft Position Sensor Circuit: in Section 1A".	Go to Step 4.
4	1) Check for proper connection to the P/S control module and ECM at each "BRN" wire terminal (P/S control module side: "E52-12" terminal, ECM side: Refer to "ECM Input / Output Circuit diagram" under "Electronic Control System Description: in Section 1A". 2) If they are OK, check for high resistance, open or short to power circuit or ground in "BRN" wire circuit. Is check result in good condition?	Check P/S control module power and ground circuit. If OK, substitute the original P/S control module with a known-good P/S control module, and then recheck.	Repair "BRN" wire circuit.

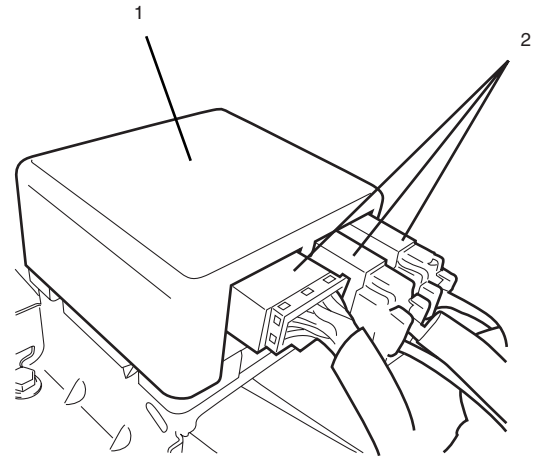
Inspection of P/S Control Module and Its Circuits

S5RS0B6304019

The P/S control module (1) and its circuits can be checked at the P/S control module wiring couplers (2) by measuring voltage and resistance.

⚠ CAUTION

P/S control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to the P/S control module with connectors disconnected from the P/S control module.



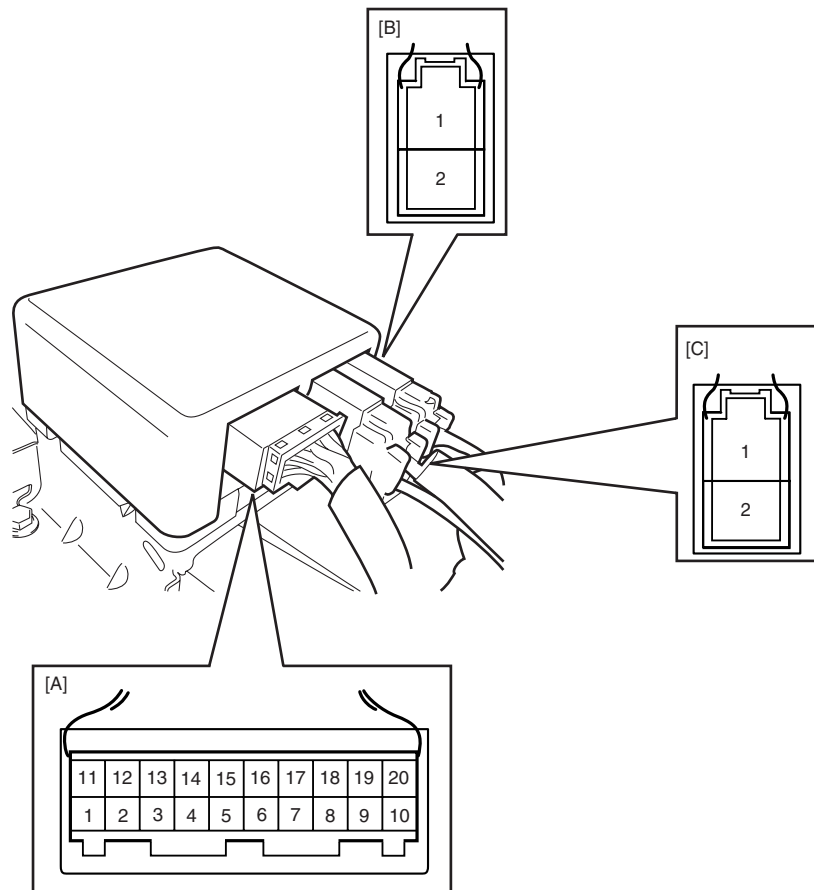
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Voltage Check

- 1) Remove console box.
- 2) Check for voltage at each terminal with connectors connected to the P/S control module.

NOTE

As each terminal voltage is affected by the battery voltage, confirm if the battery voltage is 11 V or more when ignition switch is ON.



[A]: Connector "E52" (viewed from harness side)

[B]: Connector "E51" (viewed from harness side)

[C]: Connector "E49" (viewed from harness side)

I4RS0A630024-01

6C-12 Power Assisted Steering System:

Terminal	Wire color	Circuit	Normal voltage	Condition
E49-1	GRN	P/S control module power supply from battery	10 – 14 V	—
E49-2	BLK	Ground	—	—
E51-1	BLK	Motor output 1	5 – 7 V	Engine idling and steering wheel at straight position
E51-2	RED	Motor output 2	5 – 7 V	Engine idling and steering wheel at straight position
E52-1	LT GRN/BLK	P/S control module power supply from ignition switch	10 – 14 V	Ignition switch ON
E52-2	—	—	—	—
E52-3	—	—	—	—
E52-4	PPL	Vehicle speed signal	*Indicator deflection repeated 0 – 1 V and 10 – 14 V	- Ignition switch ON - Front right tire turned quickly
E52-5	GRY	“EPS” Light	0 V	“EPS” warning lamp ON
E52-6	BLU	Torque sensor (Sub)	About 2.5 V	- Ignition switch ON and steering wheel at straight position - Check voltage between “E52-6” and “E52-9” terminals
E52-7	—	—	—	—
E52-8	GRN	12 V power supply for torque sensor	About 12 V	- Ignition switch ON - Check voltage between “E52-8” and “E52-9” terminals
E52-9	BRN	Torque sensor (GND)	0 V	—
E52-10	—	—	—	—
E52-11	PPL/WHT	Data link connector	—	—
E52-12	BRN	Engine speed signal	*Indicator deflection repeated 0 – 1 V and 6 – 10 V	Engine idling
E52-13	—	—	—	—
E52-14	—	—	—	—
E52-15	—	—	—	—
E52-16	YEL	Torque sensor failure signal	0 V	—
E52-17	—	—	—	—
E52-18	WHT	Torque sensor (Main)	About 2.5 V	- Ignition switch ON and steering wheel at straight position - Check voltage between “E52-18” and “E52-9” terminals
E52-19	—	Shield (GND)	—	—
E52-20	RED	5 V power supply for torque sensor	About 5 V	- Ignition switch ON - Check voltage between “E52-20” and “E52-9” terminals

NOTE

*: The voltage of this circuit may not be checked by voltmeter. If so, use oscilloscope.

Specifications

Tightening Torque Specifications

S5RS0B6307001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Tie-rod end nut	45	4.5	32.5	⌚ / ⌚
Tie-rod end lock nut	45	4.5	32.5	⌚ / ⌚
Wheel bolt	85	8.5	61.5	⌚ / ⌚
Steering gear case mounting No.1 bolt	55	5.5	40.0	⌚
Steering gear case mounting No.2 bolt	55	5.5	40.0	⌚
Engine rear mounting bracket bolt	55	5.5	40	⌚
Steering shaft joint bolt	25	2.5	18.5	⌚
Tie-rod	93	9.3	67.5	⌚
Rack damper screw	Tighten 25 N·m (2.5 kgf·m, 18.0 lb·ft) and loosen 180° and then tighten 3.9 N·m (0.39 kgf·m, 3.0 lb·ft) and turn it back by 10° or less by the specified procedure.			⌚
Rotation torquer of pinion	2.0	0.2	1.5	⌚
Rack damper screw lock nut	64	6.4	46.5	⌚
P/S control module mounting bolt	9	0.9	6.5	⌚

NOTE

The specified tightening torque is also described in the following.

“Steering Gear Case Assembly Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B6308001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease E	P/No.: 99000-25050	🔧
Silicone sealant	Silicone sealant	P/No.: 99000-31120	🔧
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000-32110	🔧

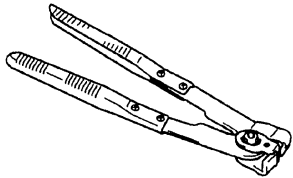
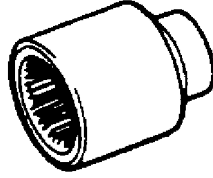
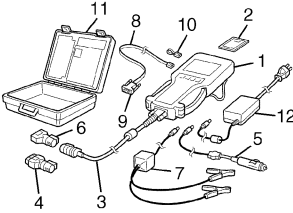
NOTE

Required service material is also described in the following.

“Steering Gear Case Assembly Components: ”

Special Tool

S5RS0B6308002

09943-55010 Boot clamp plier 	09944-18310 Pinion torque checking socket 
SUZUKI scan tool  This kit includes 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 loop back connector, 11. Storage case, 12. Power supply 🔧 / 🔧	

Section 7

HVAC

CONTENTS

NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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Heater and Ventilation

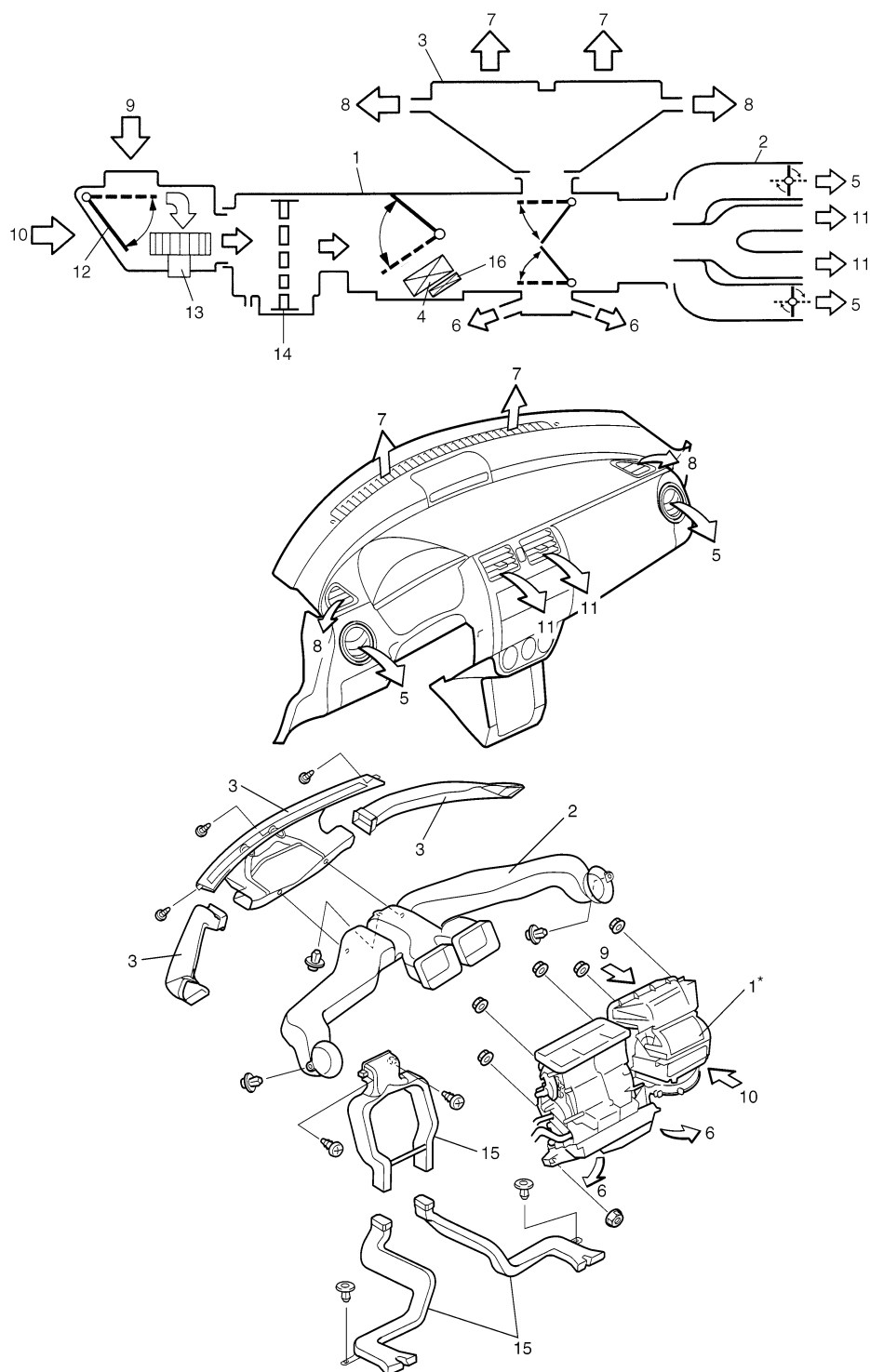
General Description

Heater and Ventilation Construction

S5RS0B7101001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



7A-2 Heater and Ventilation:

1. HVAC unit	5. Side ventilation air	9. Fresh air	13. Blower motor
2. Ventilator duct	6. Foot air	10. Recirculation air	14. Resistance board
3. Defroster nozzle	7. Front defroster air	11. Center ventilation air	15. Rear duct (if equipped)
4. Heater core	8. Side defroster air	12. Air intake door	16. Supplementary heater (if equipped)

Supplementary Heater System Description (If Equipped)

S5RS0B7101002

The heat of the engine coolant is used to warm up air through the heater core so that the warmed air is blown into the inside of the vehicle.

The engine coolant temperature increases slower in diesel engine; therefore, air through the heater core cannot be warmed up sufficiently.

Supplementary Heater System works when the engine coolant temperature is low after the engine is started. It makes the electric load applied to the engine larger, although within the specified range, so that the engine is warmed up in a shorter time.

The electric load applied to the engine is determined using the electric load data inputted to the supplementary heater controller and the electric load data sent from BCM.

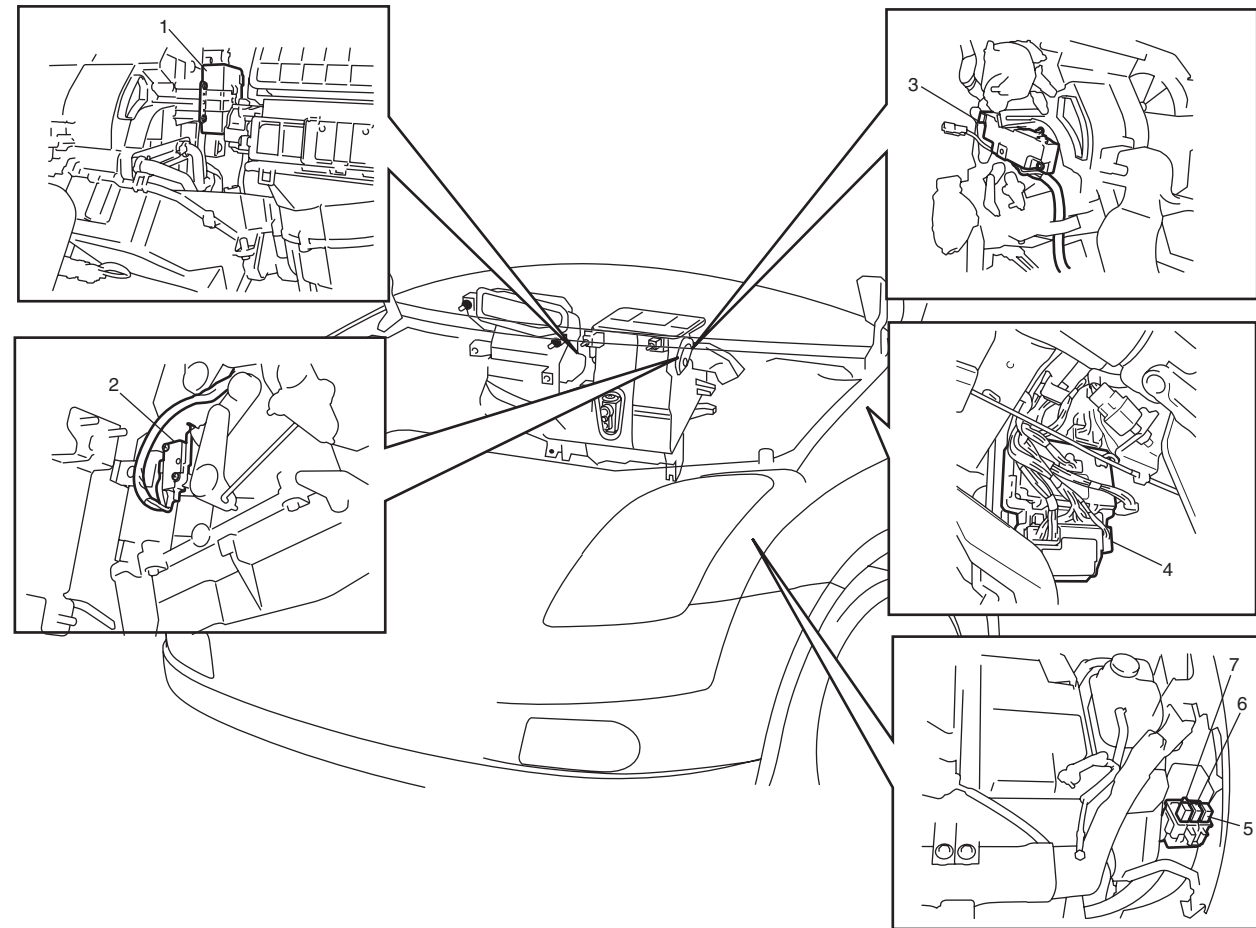
When the engine is cold and the electric load applied to the engine is judged to be less than the specified level, the supplementary heater controller causes the supplementary heater to turn on to increase the electric load applied to the engine within the specified range. While the supplementary heater is working, it generates heat which raises the temperature of the air coming out from the HVAC unit.

The supplementary heater works under following conditions:

- 20 seconds after engine is started
- Engine speed is 700 rpm or more
- Max hot switch is at ON position
- Battery voltage is 12 V or more
- Blower fan motor is turned on

Supplementary Heater System Components Location

S5RS0B7101003

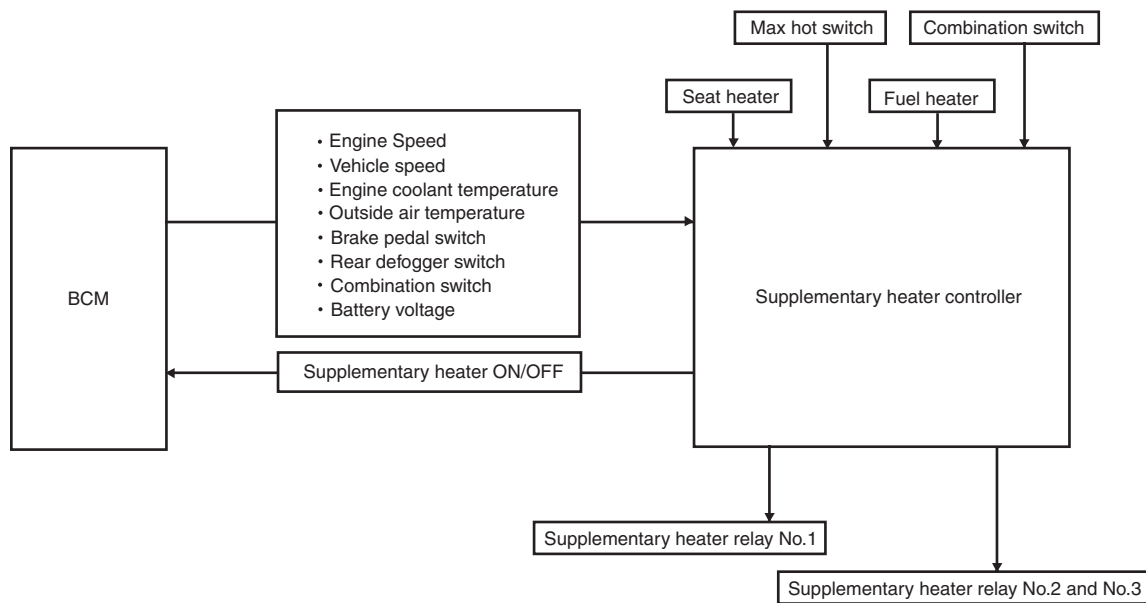


I5RS0B710003-02

1. Supplementary heater controller	4. BCM (included in junction block assembly)	7. Supplementary heater relay No.3
2. Max hot switch	5. Supplementary heater relay No.1	
3. Supplementary heater	6. Supplementary heater relay No.2	

Supplementary Heater System Electronic Input / Output Table

S5RS0B7101004



I5RS0B710004-02

On-Board Diagnostic System Description (Vehicle Equipped with Supplementary Heater)

S5RS0B7101005

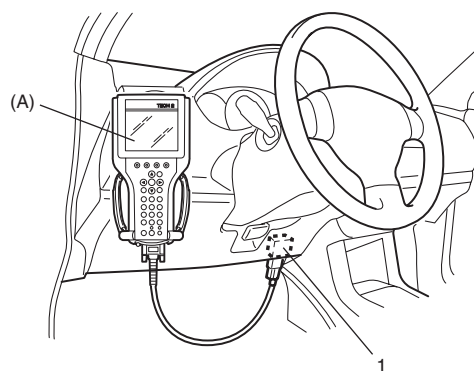
Supplementary heater controller detects malfunctions, which may occur in the following area.

- Supplementary heater relay
- Back-up power supply for supplementary heater controller
- Power supply for blower motor
- Serial communication line of BCM
- CAN communication line
- Engine speed signal data
- Vehicle speed signal data
- Ignition power supply voltage data
- Engine coolant temperature signal data
- Outside air temperature signal data

Supplementary heater controller monitors conditions of the system and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory in supplementary heater controller. DTC can be checked by SUZUKI scan tool connected to DLC (1).

Special tool

(A): SUZUKI scan tool

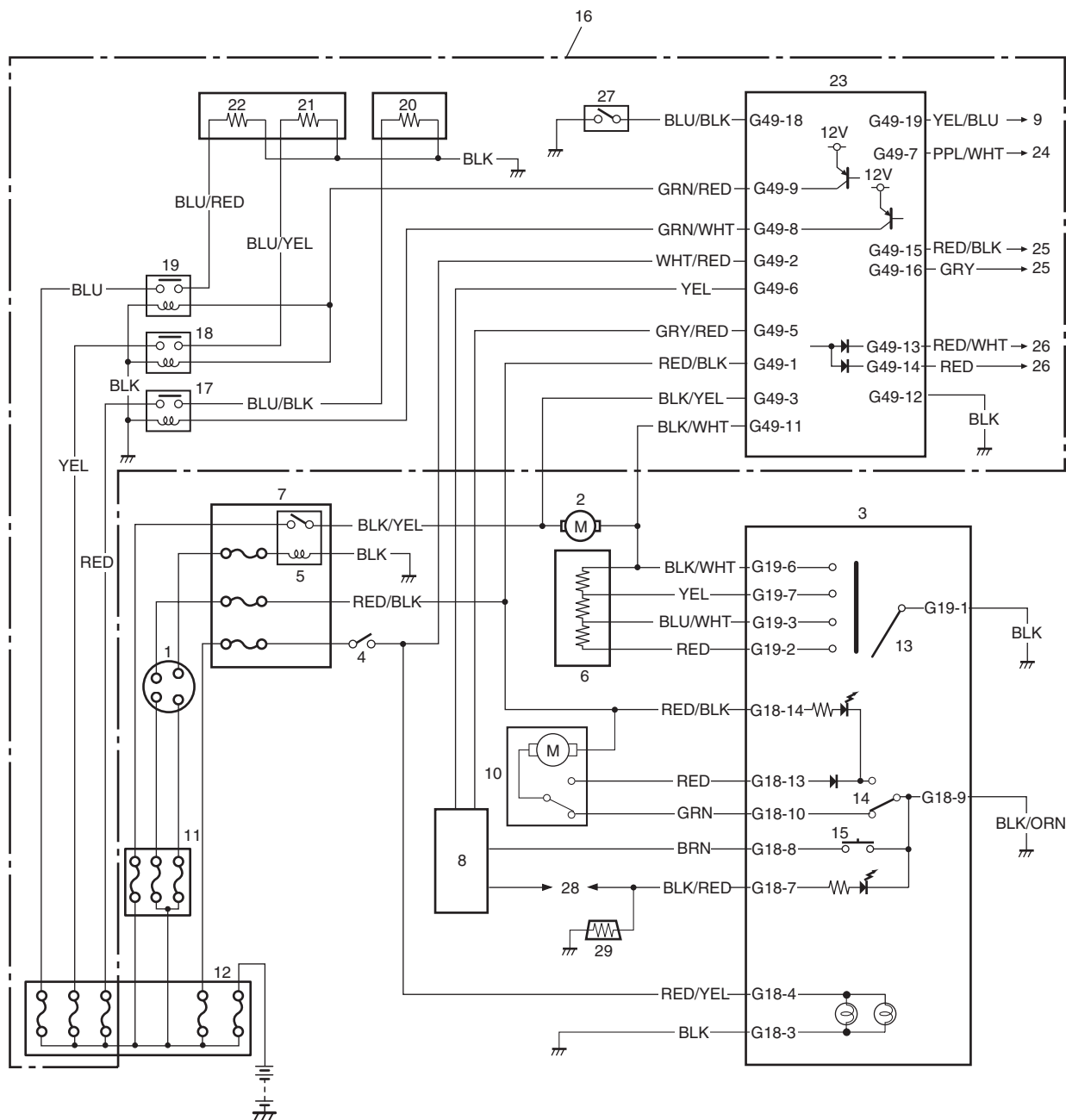


I5RS0B710005-01

Schematic and Routing Diagram

Heater and Ventilation Wiring Circuit Diagram

S5RS0B7102001



I5RS0B710002-03

1. Ignition switch	11. Relay box	21. Supplementary heater No.2
2. Blower motor	12. Battery fuse box	22. Supplementary heater No.3
3. HVAC control module	13. Blower speed selector	23. Supplementary heater controller
4. Lighting switch	14. Air intake selector	24. To DLC
5. Blower motor relay	15. Rear defogger switch	25. To seat heater switch
6. Blower motor resistor	16. Supplementary heater system circuit (if equipped)	26. To lighting switch
7. Junction block assembly	17. Supplementary heater relay No.1	27. Max hot switch
8. BCM	18. Supplementary heater relay No.2	28. To rear defogger relay
9. To fuel heater relay	19. Supplementary heater relay No.3	29. Rear defogger
10. Air intake control actuator	20. Supplementary heater No.1	

Diagnostic Information and Procedures

Heater and Ventilation Symptom Diagnosis

S5RS0B7104001

Condition	Possible cause	Correction / Reference Item
Blower motor does not operate with blower speed selector ON.	Fuse blown	Check related fuses, and then check for short circuit to ground.
	Blower motor relay faulty	Check blower motor relay referring to "Blower Motor Relay and Supplementary Heater Relay (If Equipped) Inspection: ".
	Blower motor resistor faulty	Check blower motor resistor referring to "Blower Motor Resistor Inspection: ".
	Blower speed selector faulty	Check blower speed selector referring to "Blower Speed Selector Inspection: ".
	Blower motor faulty	Check blower motor referring to "Blower Motor Inspection: ".
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature output	Temperature control cable broken or bent	Check temperature control cable.
	Temperature control lever faulty	Check temperature control lever.
	Incorrect installation of temperature control cable	Check position and adjust it as necessary.
	Temperature control door assembly broken	Repair temperature control door assembly.
	Air ducts clogged	Repair air ducts.
	Heater core leaked or clogged	Replace heater core.
	Heater hoses leaked or clogged	Replace heater hoses.
	Thermostat assembly faulty	Replace thermostat assembly.
	Fuse blown	Check supplementary heater fuses (if equipped).
	Supplementary heater faulty	Check supplementary heater (if equipped).
	Supplementary heater controller faulty	Check supplementary heater controller (if equipped).
	Supplementary heater relay faulty	Check supplementary heater relay (if equipped).
	Max hot switch faulty	Check max hot switch (if equipped).
Air outlet port does not change or does not agree with airflow selector's position even if airflow selector is changed.	Airflow control cable broken or bent	Check airflow control cable.
	Airflow control lever faulty	Check airflow control lever.
	Incorrect installation of airflow control cable	Check position and adjust it as necessary.
	Airflow control door assembly broken	Repair airflow control door assembly.
	Air ducts leaked or clogged	Repair air ducts.
Air intake door does not change even if air intake mode is changed.	Air intake door broken	Repair air intake door.
	Air intake control actuator faulty	Check air intake control actuator referring to "Air Intake Control Actuator Inspection: ".
	Air intake selector faulty	Check air intake selector referring to "Air Intake Selector Inspection: ".
	Wiring or grounding faulty	Repair as necessary.

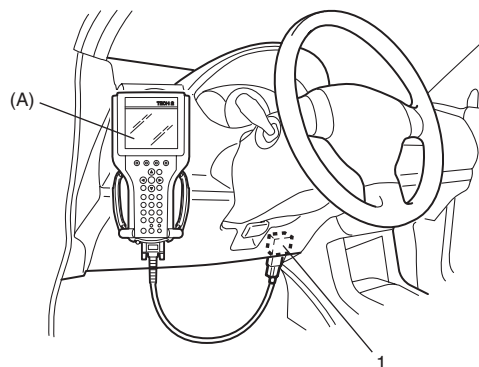
DTC Check for Supplementary Heater System

S5RS0B7104002

NOTE

When checking DTC after connecting battery cable, be sure to turn ignition switch from OFF to ON and from ON to OFF at least once, or DTC B1541 will be detected.

- 1) Turn ignition switch to OFF position.
- 2) Connect SUZUKI scan tool to DLC (1).

Special tool**(A): SUZUKI scan tool**

I5RS0B710005-01

- 3) Turn ignition switch to ON position.
- 4) Check DTC with SUZUKI scan tool and print them or write them down. Refer to SUZUKI scan tool operator's manual for further details.
- 5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Clearance for Supplementary Heater System

S5RS0B7104003

- 1) Connect SUZUKI scan tool to DLC in the same manner as when making this connection for DTC check.
- 2) Turn ignition switch to ON position and engine stops.
- 3) Erase DTC with SUZUKI scan tool. Refer to SUZUKI scan tool operator's manual for further details.
- 4) After completing the clearance, turn ignition switch OFF and disconnect SUZUKI scan tool from DLC.

DTC Table for Supplementary Heater System

S5RS0B7104004

NOTE

- **History DTC (*)** is such DTC which supplementary heater controller saves in its memory when it detects current DTC for 60 seconds or more continuously.
- **DTC B1541** is displayed as a current DTC only when a current malfunction is detected and no history DTC is displayed.
- When supplementary heater controller detects DTC B1536 and B1537, display the DTC both current DTC and history DTC at the same time.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
☞ B1536	Supplementary heater relay No.1 output malfunction	Output voltage of supplementary heater relay No.1 is lower than specified value continuously.
☞ B1537	Supplementary heater relay No.2 and No.3 output malfunction	Output voltage of supplementary heater relay No.2 and/or No.3 is lower than specified value continuously.
☞ B1541	Supplementary heater controller back-up power supply malfunction	Back-up power supply voltage is lower than specified value continuously.
☞ B1542	Blower motor power supply malfunction	Blower motor power supply voltage is lower than specified value for specified time continuously.
☞ B1551	Serial communication circuit malfunction	Serial communication signal is higher than or lower than specified value for specified time continuously.
☞ B1552	Serial communication data malfunction	Error data received from BCM continuously.
☞ B1553	CAN communication circuit malfunction	Error code received from BCM continuously.
☞ B1556	Engine speed data malfunction	Error code received from BCM continuously.
☞ B1557	Vehicle speed data malfunction	Error code received from BCM continuously.
☞ B1559	Ignition power supply voltage data malfunction	Error code received from BCM continuously.
☞ B1561	Engine coolant temperature data malfunction	Error code received from BCM continuously.
☞ B1562	Outside air temperature data malfunction	Error code received from BCM continuously.

Scan Tool Data

As the data values given in the following are standard values estimated on the basis of values obtained from the normally operation vehicles by using a scan tool, use them as reference values. Even when the vehicles are in good condition, there may be cases where the checked values do not fall within each specifies data range. Therefore, judgement as abnormal should not be made by checking with these data alone.

Scan Tool Data	Condition	Normal Condition / Reference Value
COOLANT TEMP	At specified idle speed after warming up.	80 °C – 100 °C (176 °F – 212 °F)
OUTSIDE AIR TEMP	Reference value is relative to outside air temperature.	–23.3 °C – 65.95 °C (–9.94 °F – 150.71 °F)
SUPPLEMENT HT1	Supplementary heater No.1 is ON	ON
	Supplementary heater No.1 is OFF	OFF
SUPPLEMENT HT2	Supplementary heater No.2 and No.3 are ON	ON
	Supplementary heater No.2 and No.3 are OFF	OFF
ENGINE SPEED	Engine running at idle after warmed up engine	800 RPM
VEHICLE SPEED	At stop.	0 km/h (0 mph)
BATTERY VOLTAGE	Ignition switch ON / engine at stop	10 – 14 V

Scan Tool Data Definitions

COOLANT TEMP (ENGINE COOLANT TEMPERATURE): Engine coolant temperature signal from BCM

OUTSIDE AIR TEMP (OUTSIDE AIR TEMPERATURE): Outside air temperature detected by outside air temperature sensor installed in front bumper member

SUPPLEMENTARY HT1 (SUPPLEMENTARY HEATER RELAY No.1 OUTPUT SIGNAL, ON or OFF): This parameter indicates the state of supplementary heater relay No.1

SUPPLEMENTARY HT2 (SUPPLEMENTARY HEATER RELAY No.2 and No.3 OUTPUT SIGNAL, ON or OFF): This parameter indicates the state of supplementary heater relay No.2 and No.3

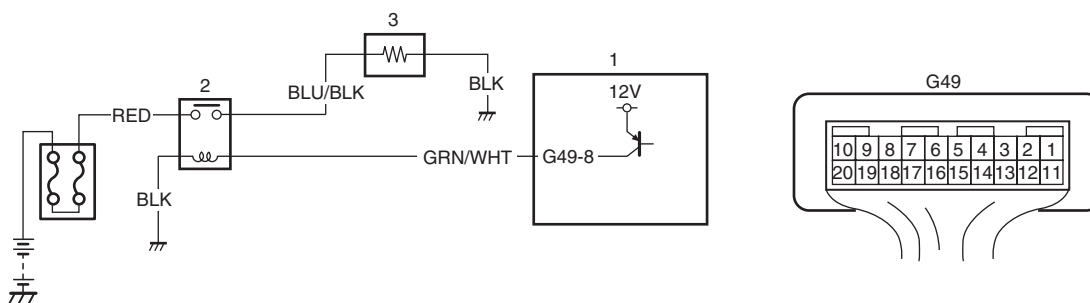
ENGINE SPEED: It is computed based on pulse signal from BCM

VEHICLE SPEED: It is computed based on pulse signal from wheel speed sensor (right front)

BATTERY VOLTAGE: This parameter indicates battery positive voltage input

DTC B1536: Supplementary Heater Relay No.1 Output Malfunction

S5RS0B7104006

Wiring Diagram

I5RS0B710006-01

1. Supplementary heater controller	2. Supplementary heater relay No.1	3. Supplementary heater No.1
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DTC Detecting Condition and Trouble Area

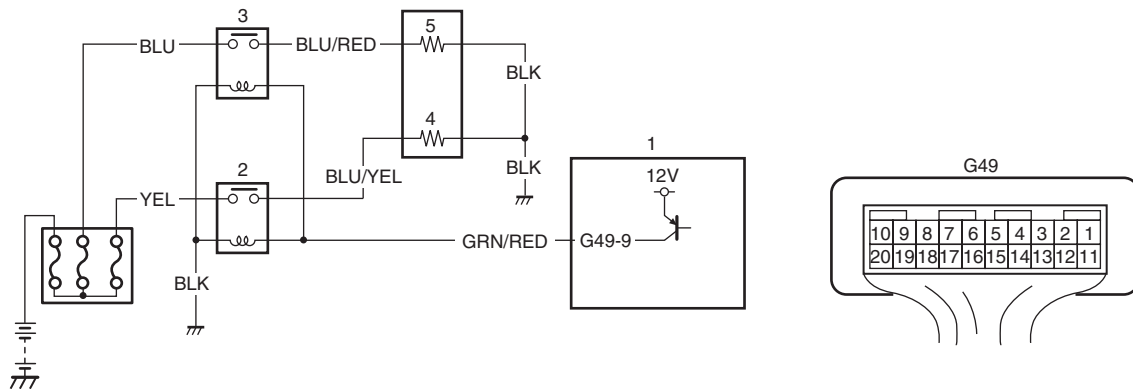
DTC Detecting Condition	Trouble Area
Output voltage of supplementary heater relay No.1 is lower than specified value continuously.	- Supplementary heater relay No.1 output circuit - Supplementary heater relay No.1 - Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	Supplementary heater relay No. 1 check - Remove front bumper referring to "Front Bumper and Rear Bumper Components: in Section 9K". - Remove left side headlight housing referring to "Headlight Housing Removal and Installation: in Section 9B". - Check supplementary heater relay No.1 referring to "Blower Motor Relay and Supplementary Heater Relay (If Equipped) Inspection: ". <i>Is it in good condition?</i>	Go to Step 2.	Replace supplementary heater relay No.1.
2	Wire harness check - Turn OFF ignition switch. - Disconnect supplementary heater controller connector referring to "Supplementary Heater Controller Removal and Installation (If Equipped): ". - Check for proper connection to supplementary heater relay No.1 connector at "GRN/WHT" wire terminal and supplementary heater controller connector at "G49-8" terminal. - If OK, measure resistance between "G49-8" terminal of supplementary heater controller connector and vehicle body ground. <i>Is resistance infinity?</i>	Substitute a known-good supplementary heater controller and recheck.	"GRN/WHT" wire shorted to ground circuit.

DTC B1537: Supplementary Heater Relay No.2 and No.3 Output Malfunction

S5RS0B7104007

Wiring Diagram

I5RS0B710007-01

1. Supplementary heater controller	3. Supplementary heater relay No.3	5. Supplementary heater No.3
2. Supplementary heater relay No.2	4. Supplementary heater No.2	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Output voltage of supplementary heater relay No.2 and/or No.3 is lower than specified value continuously.	- Supplementary heater relay No.2 and/or No.3 output circuit - Supplementary heater relay No.2 and/or No.3 - Supplementary heater controller

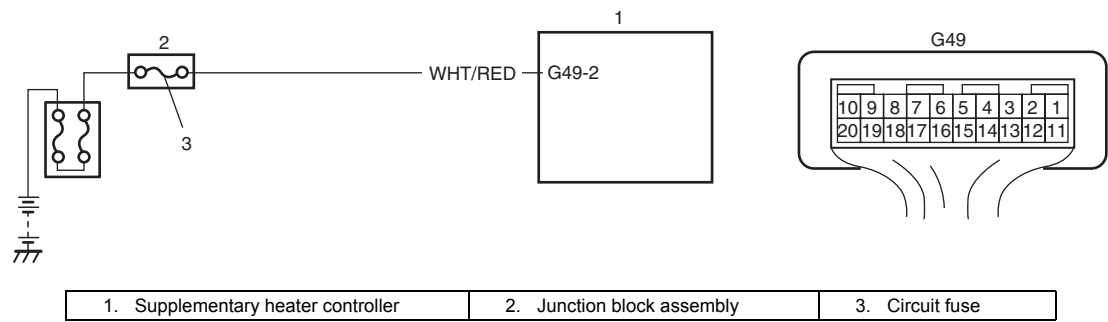
DTC Troubleshooting

Step	Action	Yes	No
1	Supplementary heater relay No.2 and No.3 check - Remove front bumper referring to "Front Bumper and Rear Bumper Components: in Section 9K". - Remove left side headlight housing referring to "Headlight Housing Removal and Installation: in Section 9B". - Check supplementary heater relay No.2 and No.3 referring to "Blower Motor Relay and Supplementary Heater Relay (If Equipped) Inspection: ". <i>Is it in good condition?</i>	Go to Step 2.	Replace supplementary heater relay No.2 and/or No.3.
2	Wire harness check - Turn OFF ignition switch. - Disconnect supplementary heater controller connector referring to "Supplementary Heater Controller Removal and Installation (If Equipped): ". - Check for proper connection to supplementary heater relay No.2 and No.3 connectors at "GRN/RED" wire terminal and supplementary heater controller connector at "G49-9" terminal. - If OK, measure resistance between "G49-9" terminal of supplementary heater controller connector and vehicle body ground. <i>Is resistance infinity?</i>	Substitute a known-good supplementary heater controller and recheck.	"GRN/RED" wire shorted to ground circuit.

DTC B1541: Supplementary Heater Controller Back-Up Power Supply Malfunction

S5RS0B7104008

Wiring Diagram



I5RS0B710008-01

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Back-up power supply voltage is lower than specified value continuously.	- Battery voltage supply circuit - Supplementary heater controller

NOTE

When checking DTC after connecting battery cable, be sure to turn ignition switch from OFF to ON and from ON to OFF at least once, or DTC B1541 will be detected.

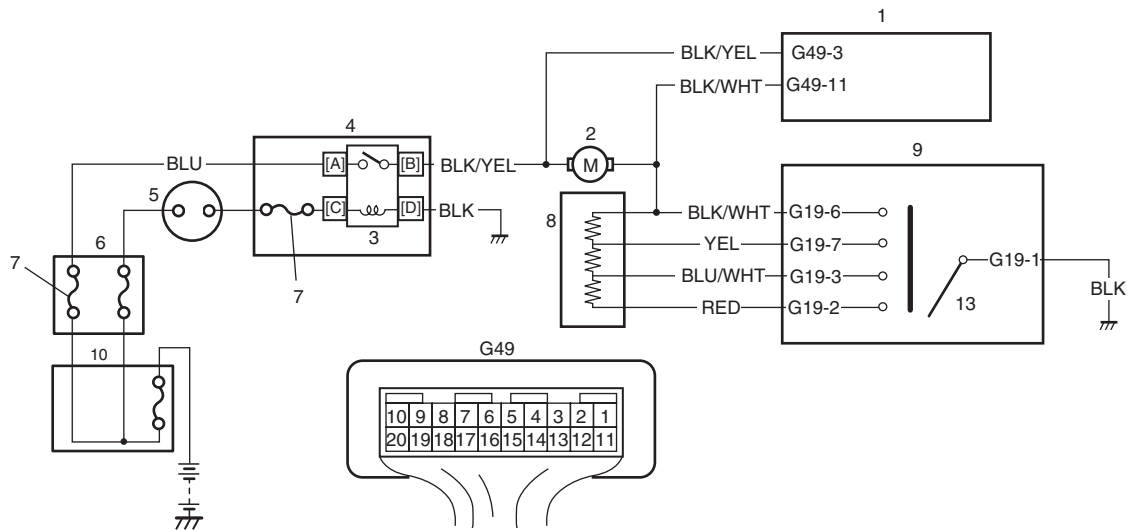
DTC Troubleshooting

Step	Action	Yes	No
1	Battery voltage supply circuit check - Turn OFF ignition switch. - Disconnect supplementary heater controller connector referring to “Supplementary Heater Controller Removal and Installation (If Equipped): ”. - Check for proper connection to supplementary heater controller connector at “G49-2” terminal. - If OK, measure voltage between “G49-2” terminal of supplementary heater controller connector and vehicle body ground. <i>Is voltage 10 – 14 V?</i>	Supplementary heater controller faulty.	Circuit fuse blown and/ or “WHT/RED” wire circuit open or short.

DTC B1542: Blower Motor Power Supply Malfunction

S5RS0B7104009

Wiring Diagram



I5RS0B710009-01

1. Supplementary heater controller	4. Junction block assembly	7. Circuit fuse	10. Battery fuse box
2. Blower motor	5. Ignition switch	8. Blower motor resistor	
3. Blower motor relay	6. Relay box	9. HVAC control module	

DTC Detecting Condition and Trouble Area

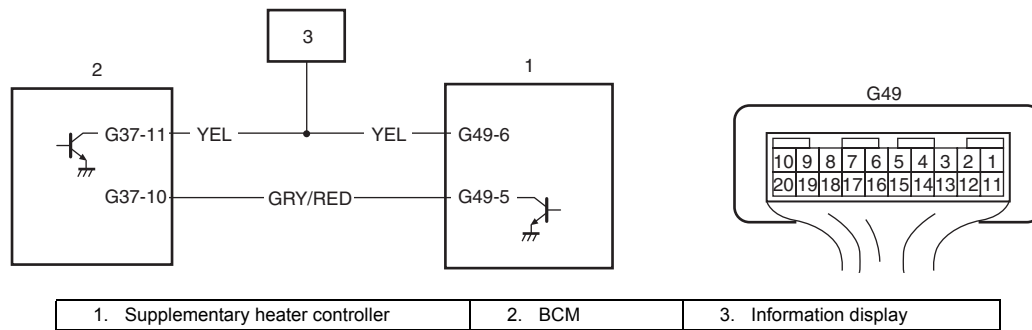
DTC Detecting Condition	Trouble Area
Blower motor power supply voltage is lower than specified value for specified time continuously.	- Blower motor power supply circuit - Blower motor - Blower motor relay - Supplementary heater controller

7A-12 Heater and Ventilation:**DTC Troubleshooting**

Step	Action	Yes	No
1	Wire harness check 1) Turn OFF ignition switch. 2) Disconnect supplementary heater controller connector referring to "Supplementary Heater Controller Removal and Installation (If Equipped)": ". 3) Check for proper connection to supplementary heater controller connector at "G49-3" terminal. 4) If OK, measure voltage between "G49-3" terminal of supplementary heater controller connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 10 – 14 V?</i>	Substitute a known-good supplementary heater controller and recheck.	Go to Step 2.
2	Wire harness check 1) Turn OFF ignition switch. 2) Disconnect connector from blower motor. 3) Measure voltage between "G49-3" terminal of supplementary heater controller connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 10 – 14 V?</i>	Replace blower motor.	Go to Step 3.
3	Wire harness check 1) Turn OFF ignition switch. 2) Disconnect blower motor relay from junction block assembly. 3) Measure voltage between [A] terminal of blower motor relay connector and vehicle body ground, between [C] terminal of blower motor relay connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 10 – 14 V?</i>	Go to Step 4.	Faulty between battery fuse box and junction block assembly circuit.
4	Wire harness check 1) Turn OFF ignition switch. 2) Disconnect blower motor relay from junction block assembly. 3) Measure resistance between [B] terminal of blower motor relay connector and "G49-3" terminal of supplementary heater controller connector. <i>Is resistance 0 – 1 Ω?</i>	Go to Step 5.	"BLK/YEL" wire circuit open or high resistance circuit.
5	Blower motor relay check 1) Check blower motor relay referring to "Blower Motor Relay and Supplementary Heater Relay (If Equipped) Inspection": ". <i>Is it in good condition?</i>	"BLK" wire circuit open or high resistance circuit.	Replace blower motor relay.

DTC B1551: Serial Communication Circuit Malfunction

S5RS0B7104010

Wiring Diagram

I5RS0B710010-03

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Serial communication signal is higher than or lower than specified value for specified time continuously.	- Serial communication line of BCM - BCM (included in junction block assembly) - Information display - Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	Wire harness check 1) Turn OFF ignition switch. 2) Disconnect connectors from BCM and supplementary heater controller. 3) Measure resistance between "G37-11" terminal of BCM connector and "G49-6" terminal of supplementary heater controller connector. <i>Is resistance below 5 Ω?</i>	Go to Step 2.	"YEL" wire open or high resistance circuit.
2	Wire harness check 1) Measure resistance between "G49-6" terminal of supplementary heater controller connector and vehicle body ground. <i>Is resistance infinity?</i>	Go to Step 3.	"YEL" wire shorted to ground circuit.
3	Wire harness check 1) Measure voltage between "G49-6" terminal of supplementary heater controller connector and vehicle body ground with ignition switch turned ON. <i>Is voltage 0 V?</i>	Go to Step 4.	"YEL" wire shorted to other circuit.
4	Serial communication signal check 1) Connect connectors to BCM and supplementary heater controller. 2) Using oscilloscope, check that serial communication signal is outputted referring to "Reference waveform No.6" of "Inspection of BCM and its Circuits: in Section 10B". <i>Is serial communication signal outputted at "G37-11" terminal of BCM connector?</i>	Supplementary heater controller faulty.	BCM (included in junction block assembly) faulty.

7A-14 Heater and Ventilation:

DTC B1552: Serial Communication Data Malfunction

S5RS0B7104011

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error data from BCM continuously.	• BCM (included in junction block assembly) • Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	Serial communication signal data check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Check "Engine Speed", "Vehicle Speed", "Coolant Temp", "Battery Voltage" and "Outside Air Temp" varies displayed on scan tool. <i>Is displayed each varies described varies in "Scan Tool Data: "?</i>	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".	Go to Step 2.
2	Serial communication signal check 1) Using oscilloscope, check that serial communication signal is outputted referring to "Reference waveform No.6" of "Inspection of BCM and its Circuits: in Section 10B". <i>Is serial communication signal outputted at "G37-11" terminal of BCM connector?</i>	Supplementary heater controller faulty.	BCM (included in junction block assembly) faulty.

DTC B1553: CAN Communication Circuit Malfunction

S5RS0B7104012

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error code from BCM continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM • Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. <i>Are there DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good BCM and recheck.

DTC B1556: Engine Speed Data Malfunction

S5RS0B7104013

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error code from BCM continuously.	- Engine speed signal from BCM - Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. <i>Are there DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good supplementary heater controller.

DTC B1557: Vehicle Speed Data Malfunction

S5RS0B7104014

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error code from BCM continuously.	- VSS signal from BCM - Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. <i>Are there DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good supplementary heater controller.

DTC B1559: Ignition Power Supply Voltage Data Malfunction

S5RS0B7104015

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error code from BCM continuously.	- Power supply circuit signal from BCM - Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check BCM for DTC. <i>Is there DTC?</i>	Go to applicable DTC diag. flow.	Substitute a known-good supplementary heater controller.

DTC B1561: Engine Coolant Temperature Data Malfunction

S5RS0B7104016

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error code from BCM continuously.	• Engine coolant temperature signal • Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. <i>Are there DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good supplementary heater controller and recheck.

DTC B1562: Outside Air Temperature Data Malfunction

S5RS0B7104017

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Supplementary heater controller receives error code from BCM continuously.	• Outside air temperature sensor circuit • Outside air temperature sensor • Supplementary heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	Information display check 1) Check whether outside air temperature is displayed of information display. <i>Is display correct?</i>	Substitute a known-good supplementary heater controller and recheck.	Go to Step 2.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check BCM for DTC. <i>Are there DTC B1141, B1142 or B1143?</i>	Go to applicable DTC diag. flow.	Substitute a known-good supplementary heater controller and recheck.

Inspection of Supplementary Heater Controller and Its Circuit (If Equipped)

S5RS0B7104018

Supplementary heater controller and its circuits can be checked at supplementary heater controller wiring couplers by measuring voltage.

⚠ CAUTION

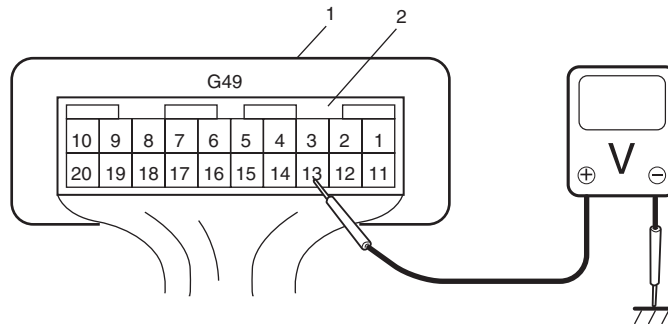
Supplementary heater controller can not be checked by itself. It is strictly prohibited to connect voltmeter to supplementary heater controller with connector disconnected from it.

Voltage Check

- 1) Remove supplementary heater controller referring to “Supplementary Heater Controller Removal and Installation (If Equipped): ”.
- 2) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.



I5RS0B710011-01

1. Supplementary heater controller	2. Supplementary heater controller connector (viewed from harness side)
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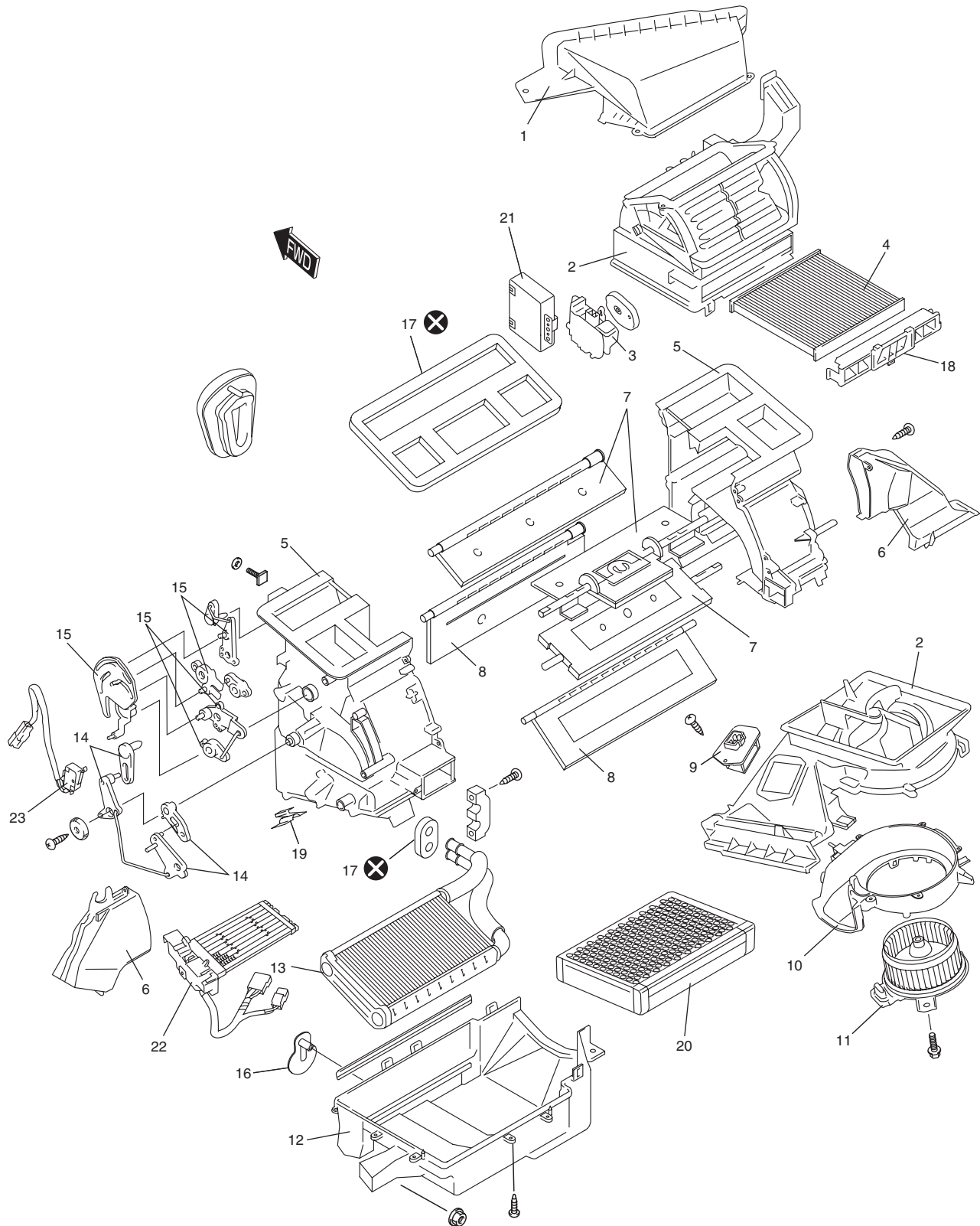
7A-18 Heater and Ventilation:

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G49-1	RED/BLK	Electric power source	10 – 14 V	Ignition switch turned ON
G49-2	WHT/RED	Electric power source for back-up	10 – 14 V	Constantly
G49-3	BLK/YEL	Blower motor input (+)	10 – 14 V	Ignition switch turned ON
G49-4	—	—	—	—
G49-5	GRY/RED	Serial communication line (output) of BCM	Refer to “Inspection of BCM and its Circuits: in Section 10B”.	
G49-6	YEL	Serial communication line (input) of BCM		
G49-7	PPL/WHT	Serial communication line of DLC	10 – 14 V	Ignition switch turned ON
G49-8	GRN/WHT	Supplementary heater relay No.1 output signal	10 – 14 V	Supplementary heater No.1 ON
G49-9	GRN/RED	Supplementary heater relay No.2 and No.3 output signal	10 – 14 V	Supplementary heater No.2 and No.3 ON
G49-10	—	—	—	—
G49-11	BLK/WHT	Blower motor input (–)	0 – 2 V	Ignition switch turned ON, blower speed selector between 1st and 4th position
G49-12	BLK	Ground for supplementary heater controller	—	—
G49-13	RED/WHT	Lighting switch input (low beam)	10 – 14 V	Ignition switch turned ON, lighting switch OFF position
			0 – 1 V	Ignition switch turned ON, lighting switch ON (low beam) position
G49-14	RED	Lighting switch input (high beam)	10 – 14 V	Ignition switch turned ON, lighting switch OFF position
			0 – 1 V	Ignition switch turned ON, lighting switch ON (high beam) position
G49-15	RED/BLK	Driver's seat heater input	10 – 14 V	Ignition switch turned ON, driver's seat heater switch ON position
G49-16	GRY	Passenger seat heater input	10 – 14 V	Ignition switch turned ON, passenger seat heater switch ON position
G49-17	—	—	—	—
G49-18	BLU/BLK	Max hot switch input	10 – 14 V	Ignition switch turned ON, temperature selector full hot position
G49-19	YEL/BLK	Fuel heater relay input	10 – 14 V	Ignition switch turned ON, fuel heater OFF
G49-20	—	—	—	—

Repair Instructions

HVAC Unit Components

S5RS0B7106001



15RS0B710012-01

7A-20 Heater and Ventilation:

1. Fresh air inlet duct	7. Airflow control door assembly	13. Heater core	19. Cable lock clamp
2. Blower upper case	8. Temperature control door assembly	14. Temperature control lever	20. Air resistance board
3. Air intake control actuator	9. Blower motor resistor	15. Airflow control lever	21. Supplementary heater controller (if equipped)
4. Air filter (if equipped)	10. Blower lower case	16. Drain hose	22. Supplementary heater (if equipped)
5. Heater unit upper case	11. Blower motor	17. Packing	23. Max hot switch (if equipped)
6. Foot duct	12. Heater unit lower case	18. Filter cover	⊗ : Do not reuse.

Blower Motor Resistor Inspection

S5RS0B7106006

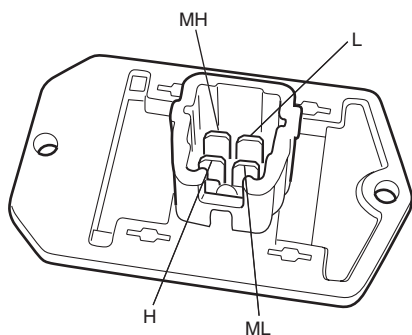
Measure each terminal-to-terminal resistance. If measured resistance is out of specification, replace blower motor resistor.

Blower motor resistor resistance

“H” – “MH”: Approximately 0.5Ω at $20 - 25^{\circ}\text{C}$ ($68 - 77^{\circ}\text{F}$)

“MH” – “ML”: Approximately 1.0Ω at $20 - 25^{\circ}\text{C}$ ($68 - 77^{\circ}\text{F}$)

“ML” – “L”: Approximately 3.4Ω at $20 - 25^{\circ}\text{C}$ ($68 - 77^{\circ}\text{F}$)



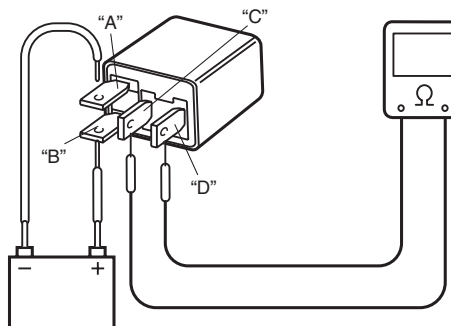
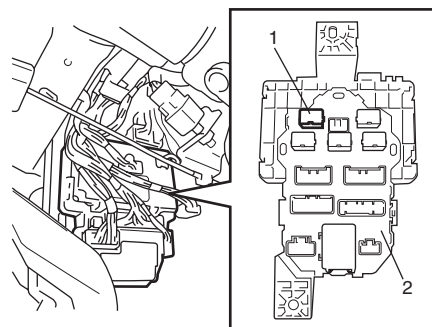
I4RS0B710024-01

Blower Motor Relay and Supplementary Heater Relay (If Equipped) Inspection

S5RS0B7106007

Blower Motor Relay

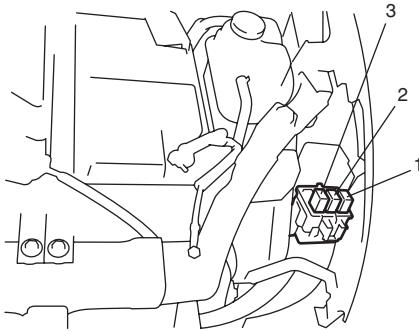
- 1) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation: in Section 10B”.
- 2) Disconnect blower motor relay (1) from junction block assembly (2).
- 3) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
- 4) 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.



I4RS0B710008-01

Supplementary Heater Relay

- 1) Remove front bumper referring to "Front Bumper and Rear Bumper Components: in Section 9K".
- 2) Remove left side headlight housing referring to "Headlight Housing Removal and Installation: in Section 9B".
- 3) Remove supplementary heater relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
- 4) Structure of supplementary heater relay is the same as that of blower motor relay. Check operation using the same procedure as that for blower motor relay. If found defective, replace relay.



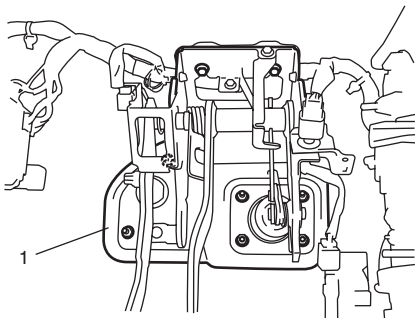
I5RS0B710013-01

Supplementary Heater Removal and Installation (If Equipped)

S5RS0B7106018

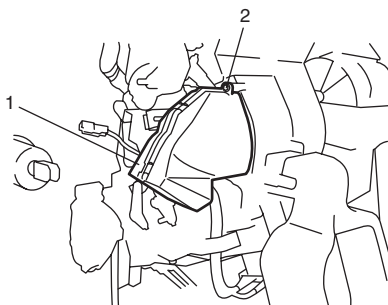
Removal

- 1) Remove instrument panel referring to "Instrument Panel Removal and Installation: in Section 9C".
- 2) Remove pedal bracket assembly (1).



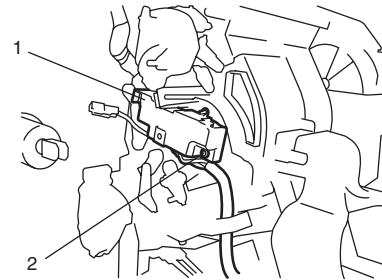
I5RS0B710014-01

- 3) Remove foot duct (1) from HVAC unit by removing screw (2).



I5RS0B710016-01

- 4) Disconnect connectors from supplementary heater.
- 5) Remove supplementary heater (1) from HVAC unit by removing screws (2).



I5RS0B710017-01

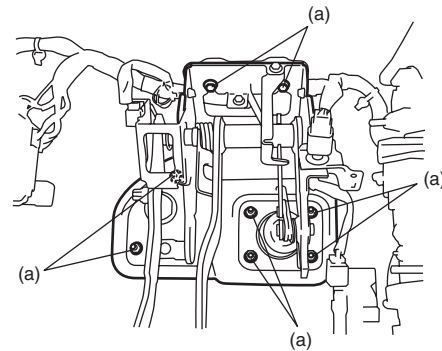
Installation

Reverse removal procedure noting the following instruction.

- Tighten pedal bracket mounting bolts and nuts to specified torque.

Tightening torque

Pedal bracket mounting bolt and nut (a): 13 N·m (1.3 kgf-m, 9.5 lb-ft)

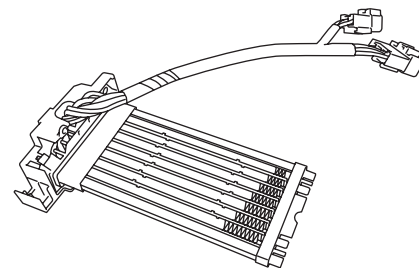


I5RS0B710015-01

Supplementary Heater Inspection (If Equipped)

S5RS0B7106019

- Check if there is continuity between supplementary heater terminals. If there is no continuity, replace supplementary heater.
- Check supplementary heater for crack or any other damage. Replace if needed.



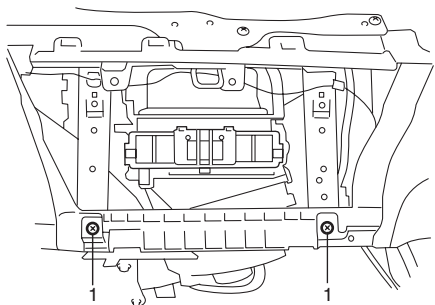
I5RS0B710018-01

Supplementary Heater Controller Removal and Installation (If Equipped)

S5RS0B7106020

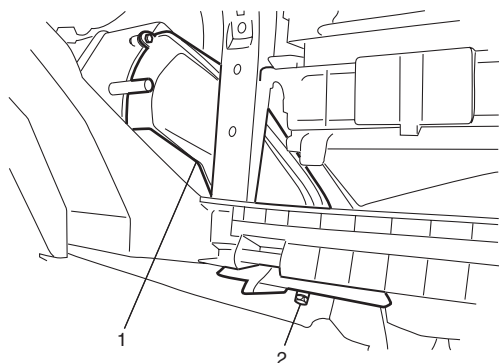
Removal

- 1) Disconnect negative (–) cable from battery.
- 2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
- 3) Remove glove box from instrument panel.
- 4) Remove bolts (1) from instrument panel.



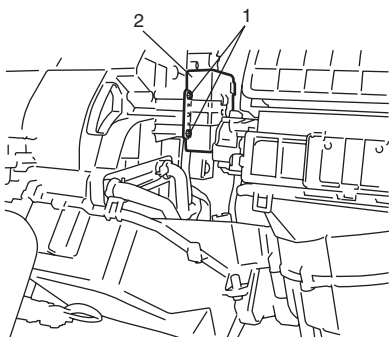
I4RS0B710006-01

- 5) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0B710007-01

- 6) Remove screws (1) and pull out supplementary heater controller (2).
- 7) Disconnect connector from supplementary heater controller.



I5RS0B710019-01

Installation

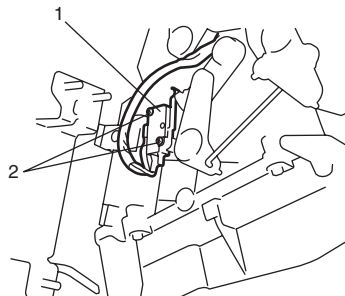
Reverse removal procedure for installation.

Max Hot Switch Removal and Installation (If Equipped)

S5RS0B7106021

Removal

- 1) Detach accelerator pedal with connector connected.
- 2) Remove Max hot switch (1) from HVAC unit by removing screws (2).



I5RS0B710020-01

Installation

Reverse removal procedure noting the following instruction.

- Tighten accelerator pedal mounting nuts to specified torque referring to “Accelerator Pedal Position (APP) Sensor Removal and Installation: in Section 1C”.

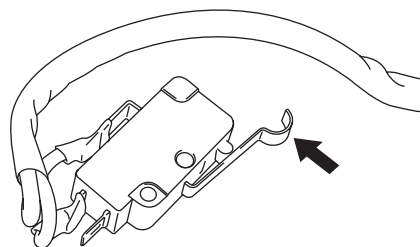
Max Hot Switch Inspection (If Equipped)

S5RS0B7106022

Push switch lever in arrow direction and release it to check if resistance between terminals is as specified below.

- When lever is pushed: Continuity
- When lever is released: Infinity

If check result not satisfactory replace with a new one.



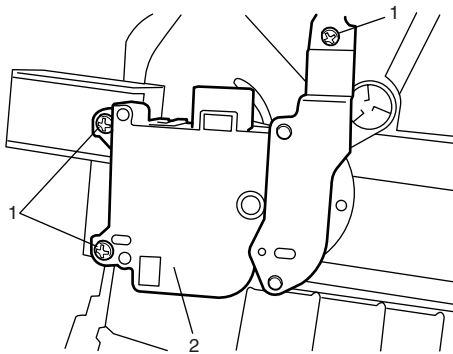
I5RS0B710021-01

Air Intake Control Actuator Removal and Installation

S5RS0B7106012

Removal

- 1) Remove instrument panel from vehicle body referring to "Instrument Panel Removal and Installation: in Section 9C".
- 2) Remove supplementary heater controller from HVAC unit. (if equipped)
- 3) Remove screws (1).
- 4) Remove air intake control actuator (2) from HVAC unit.

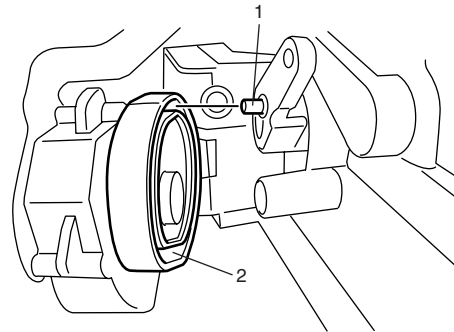


I4RS0A710021-01

Installation

Reverse removal procedure noting the following instruction.

- Be sure to insert the linkage pin (1) into the groove (2) of air intake control actuator.



I4RS0A710022-01

Specifications

Tightening Torque Specifications

S5RS0B7107001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Pedal bracket mounting bolt and nut	13	1.3	9.5	

Reference:

For the tightening torque of fastener not specified in this section, refer to "Fasteners Information: in Section 0A".

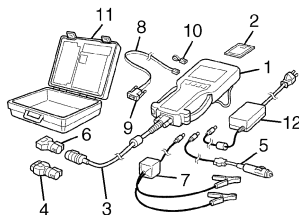
Special Tools and Equipment

Special Tool

S5RS0B7108001

SUZUKI scan tool

This kit includes 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 loop back connector, 11. Storage case, 12. Power supply



Air Conditioning System

Precautions

Precautions on Servicing A/C System

S5RS0B7200002

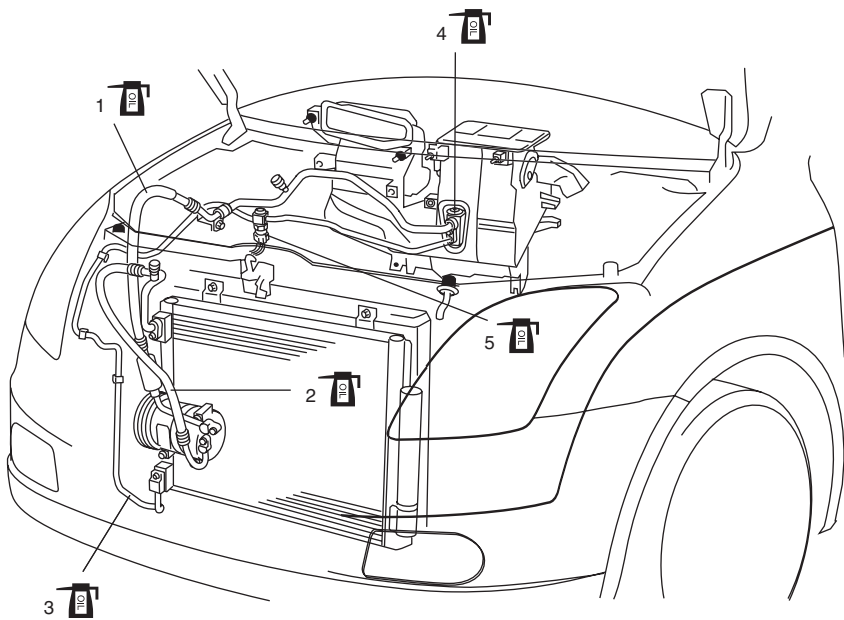
⚠ WARNING

- Should refrigerant HFC-134a (R-134a) is exposed to your eye(s), consult a doctor immediately.
- Do not use your hand to rub affected eye(s). Instead, use fresh cold water to splash it over affected area to thus gradually raise its temperature above the freezing point.
 - Obtain proper treatment as soon as possible from a doctor or eye specialist. Should liquid refrigerant HFC-134a (R-134a) is exposed to your skin, such affected part should be treated in the same manner as when skin is frostbitten or frozen.

Handling Refrigerant HFC-134a (R-134a)

- Always wear goggles to protect your eyes.
- Avoid direct contact to liquid refrigerant.
- Do not heat refrigerant container higher than 40 °C (104 °F).
- Do not discharge refrigerant into atmosphere.
- Do not expose bright metals to liquid refrigerant. Refrigerant combined with moisture is corrosive and tarnishes surfaces of bright metals including chrome.

Refrigerant Line



I5RS0B720001-01

1. Suction hose : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.	4. Expansion valve : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.
2. Discharge hose : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.	5. A/C refrigerant pressure sensor : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.
3. Liquid pipe : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.	

- Never use heat for bending pipes. When bending a pipe, try to make its bending angle as smooth as possible.
- Keep internal parts of air conditioning free from moisture and dirt. When disconnecting any line from system, install a blind plug or cap to the fitting immediately.
- When connecting hoses and pipes, apply a few drops of compressor oil (refrigerant oil) to O-ring.
- When tightening or loosening a fitting, use two wrenches, one for turning and the other for support.
- When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.

- Check local governmental regulations regarding working with refrigerator systems and its tooling.
- Route drain hose so that drained water does not make any contact to vehicle components.
- If pipes or hoses are replaced, replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.

Refrigerant Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

Refrigerant Charge

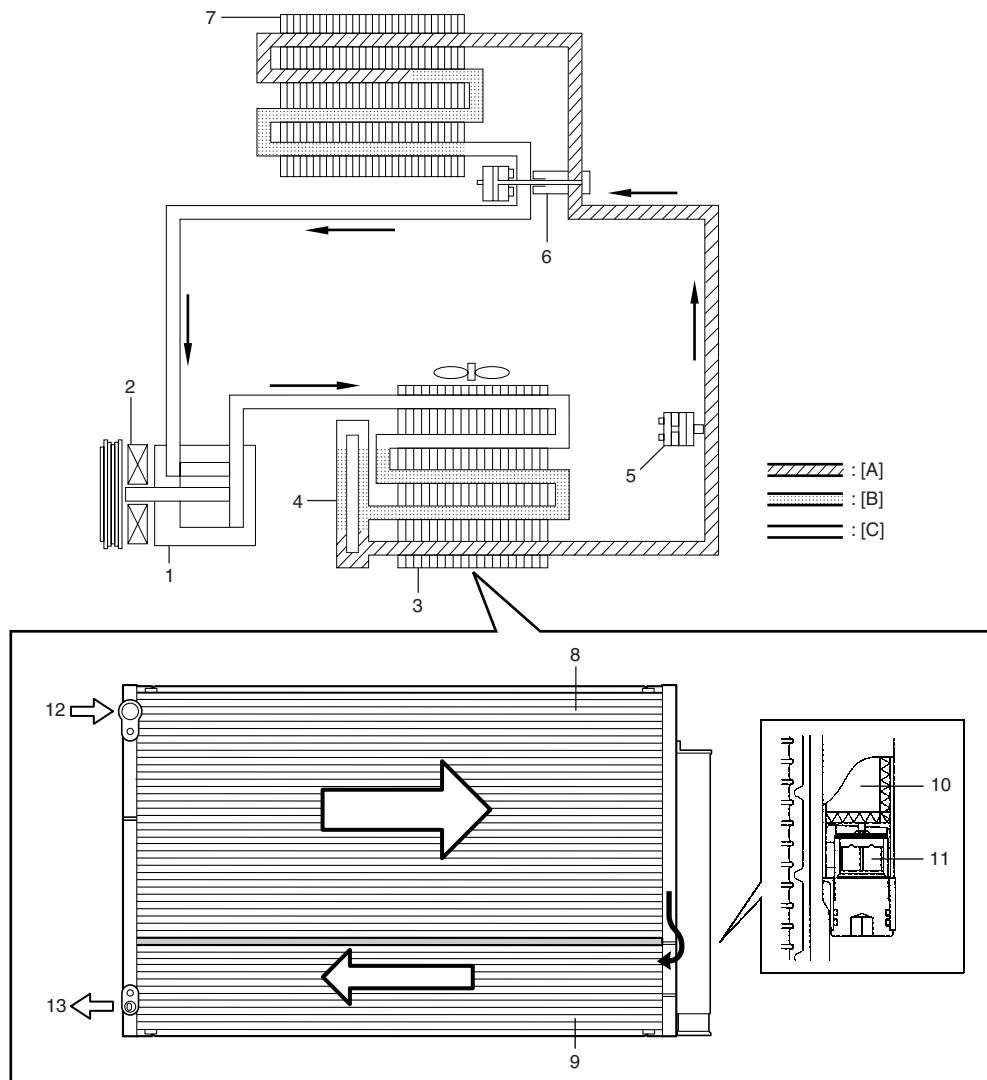
After performing compressor oil replenishment and evacuation, charge a proper amount of refrigerant to A/C system referring to “Charge” in “Operation Procedure for Refrigerant Charge: ”.

General Description

Sub-Cool A/C System Description

S5RS0B7201002

In the sub-cool A/C system (condenser integrated with receiver / dryer), the inside of the condenser is divided into the condensation part and the sub-cooler part, and the receiver / dryer is located between those. In the receiver / dryer, the refrigerant is separated into the vapor refrigerant and the liquid refrigerant. Only the liquid refrigerant is delivered to the sub-cooler part of the condenser. The refrigerant is supercooled by the sub-cooler part of the condenser.



7B-3 Air Conditioning System:

[A]: Liquid	2. Magnet clutch	6. Expansion valve	10. Desiccant
[B]: Vapor	3. Condenser	7. A/C evaporator	11. Cap with filter
[C]: Superheated vapor	4. Receiver/dryer (Modulator)	8. Condensation part	12. Vapor refrigerant
1. Compressor	5. Refrigerant pressure sensor	9. Sub-cooler part	13. Liquid refrigerant

A/C Operation Description

S5RS0B7201003

ECM controls the radiator fan relay and the compressor relay by following signals.

- ON/OFF signal of A/C switch
- A/C refrigerant pressure sensor
- ECT sensor

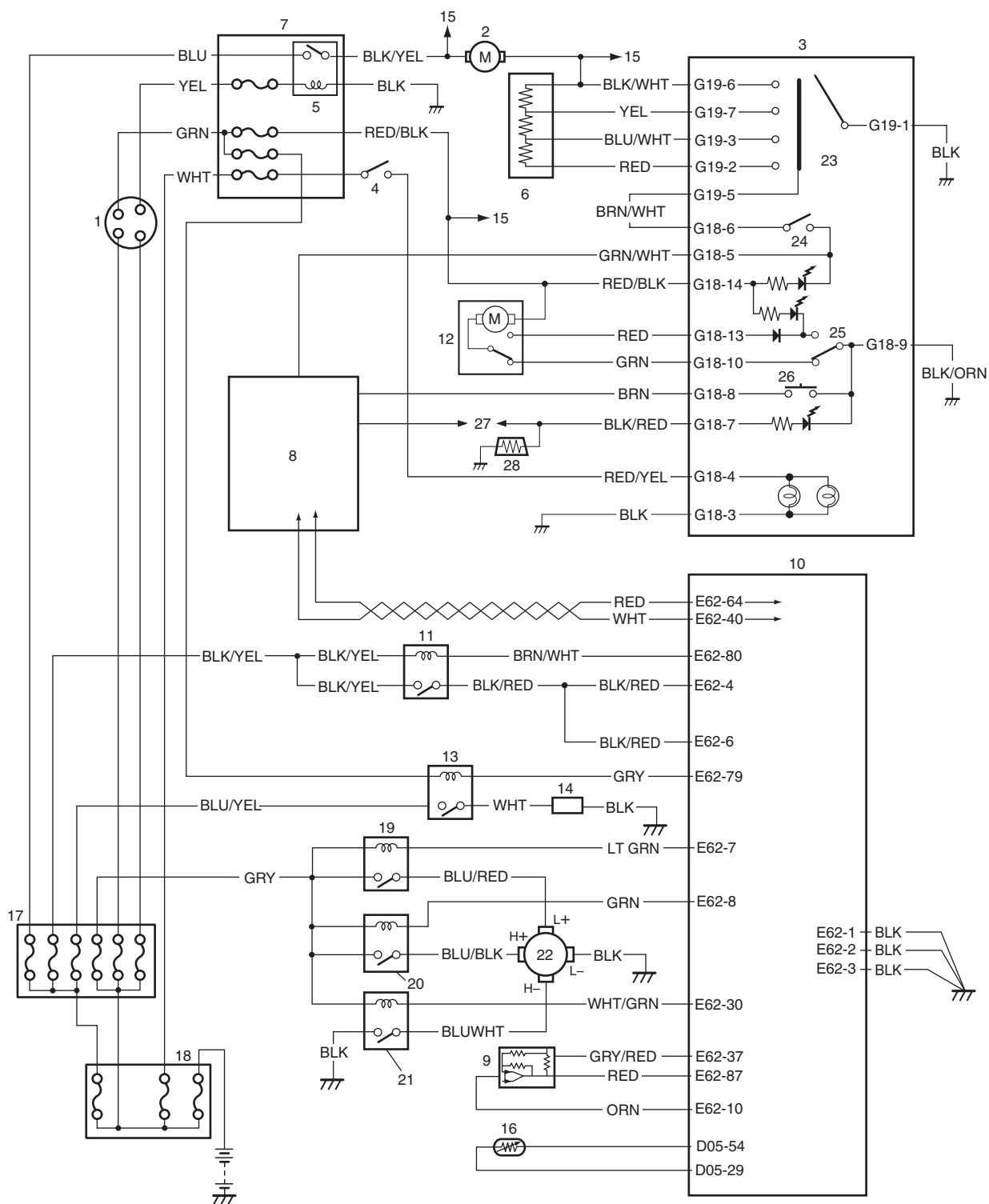
NOTE

The signal of A/C switch is fed from BCM to ECM using CAN communication system. For CAN communication system, refer to “CAN Communication System Description: in Section 1A”.

Schematic and Routing Diagram

A/C System Wiring Diagram

S5RS0B7202002



I5RS0B720002-02

1. Ignition switch	11. Main relay	21. Radiator cooling fan relay No.3
2. Blower motor	12. Air intake control actuator	22. Radiator cooling fan motor
3. HVAC control unit	13. Compressor relay	23. Blower speed selector
4. Lighting switch (vehicle not equipped with supplementary heater system)	14. Compressor	24. A/C switch
5. Blower motor relay	15. To supplementary heater controller (if equipped)	25. Air intake selector
6. Blower motor resistor	16. ECT sensor	26. Rear defogger switch
7. Junction block assembly	17. Relay box	27. Rear defogger relay
8. BCM	18. Battery fuse box	28. Rear defogger
9. A/C refrigerant pressure sensor	19. Radiator cooling fan relay No.1	
10. ECM	20. Radiator cooling fan relay No.2	

Diagnostic Information and Procedures

A/C System Symptom Diagnosis

S5RS0B7204001

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C system does not operate)	No refrigerant	Perform recovery, evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".
	Fuse blown	Check related fuses, and then check for short circuit to ground.
	A/C switch faulty	Check A/C switch referring to "A/C Switch Inspection: ".
	Blower speed selector faulty	Check blower speed selector referring to "Blower Speed Selector Inspection: in Section 7A".
	A/C refrigerant pressure sensor faulty	Check A/C refrigerant pressure sensor.
	Wiring or grounding faulty	Repair as necessary.
	ECM faulty	Check ECM.
	Magnet clutch faulty	Check magnet clutch referring to "Magnet Clutch Inspection: ".
	Compressor drive belt loosened or broken	Adjust or replace drive belt.
	Compressor faulty	Check compressor.
	Compressor relay faulty	Check compressor relay referring to "Compressor Relay Inspection: ".
	BCM faulty	Check BCM referring to "Inspection of BCM and its Circuits: in Section 10B".
No cool air comes out (radiator cooling fan motor does not operate)	Fuse blown	Check related fuses, and then check for short circuit to ground.
	Wiring or grounding faulty	Repair as necessary.
	Radiator cooling fan motor relay faulty	Check radiator cooling fan motor relay referring to "Radiator Cooling Fan Relay Inspection: in Section 1F".
	Radiator cooling fan motor faulty	Check radiator cooling fan motor referring to "Radiator Cooling Fan Assembly Removal and Installation: in Section 1F".
	ECM and/or its circuit faulty	Check ECM and/or its circuit.
No cool air comes out (blower motor does not operate)	Fuse blown	Check related fuses, and then check for short circuit to ground.
	Blower motor relay faulty	Check blower motor relay referring to "Blower Motor Relay and Supplementary Heater Relay (If Equipped) Inspection: in Section 7A".
	Blower motor resistor faulty	Check blower motor resistor referring to "Blower Motor Resistor Inspection: in Section 7A".
	Blower speed selector faulty	Check blower speed selector referring to "Blower Speed Selector Inspection: in Section 7A".
	Wiring or grounding faulty	Repair as necessary.
	Blower motor faulty	Check blower motor referring to "Blower Motor Inspection: in Section 7A".

Condition	Possible cause	Correction / Reference Item
Cool air does not come out or insufficient cooling (A/C system normal operation)	Insufficient or excessive charge of refrigerant	Check the amount of refrigerant and system for leaks.
	Condenser clogged	Check condenser referring to "Condenser Assembly On-Vehicle Inspection: ".
	A/C evaporator clogged or frosted	Check A/C evaporator referring to "Evaporator Inspection: ".
	Expansion valve faulty	Check expansion valve referring to "Expansion Valve Inspection: ".
	Desiccant clogged	Check desiccant.
	Compressor drive belt loosened or broken	Adjust or replace drive belt.
	Magnet clutch faulty	Check magnet clutch referring to "Magnet Clutch Inspection: ".
	Compressor faulty	Check compressor.
	Air in A/C system	Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".
	Air leaking from HVAC unit or air duct	Repair as necessary.
	Heater and ventilation system faulty	Check HVAC unit.
	Blower motor faulty	Check blower motor referring to "Blower Motor Inspection: in Section 7A".
	Excessive compressor oil in A/C system	Drain excessive compressor oil from A/C system circuit and compressor.
Cool air does not come out only intermittently	Wiring connection faulty	Repair as necessary.
	Expansion valve faulty	Check expansion valve referring to "Expansion Valve Inspection: ".
	Excessive moisture in A/C system	Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".
	Magnet clutch faulty	Check magnet clutch referring to "Magnet Clutch Inspection: ".
	Excessive amount of refrigerant	Check the amount of refrigerant.
Cool air comes out only at high speed	Condenser clogged	Check condenser referring to "Condenser Assembly On-Vehicle Inspection: ".
	Insufficient charge of refrigerant	Check the amount of refrigerant and system for leaks.
	Air in A/C system	Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: ".
	Compressor drive belt loosened or broken	Adjust or replace drive belt.
	Compressor faulty	Check compressor.
Cool air does not come out only at high speed	Excessive amount of refrigerant	Check the amount of refrigerant.
	A/C evaporator frosted	Check A/C evaporator referring to "Evaporator Inspection: ".
Insufficient airflow of cooled air	A/C evaporator clogged or frosted	Check A/C evaporator referring to "Evaporator Inspection: ".
	Air leaking from HVAC unit or air duct	Repair as necessary.
	Blower motor faulty	Check blower motor referring to "Blower Motor Inspection: in Section 7A".
	Wiring or grounding faulty	Repair as necessary.

Abnormal Noise Symptom Diagnosis of A/C System**Abnormal Noise from Compressor**

Condition	Possible cause	Correction / Reference Item
<i>During compressor operation, a rumbling noise is heard proportional to engine revolutions</i>	Inadequate clearance in scroll area	<i>Replace compressor.</i>
<i>A loud noise is heard at a certain rpm, disproportionately to engine revolution</i>	Loose or faulty compressor drive belt	<i>Adjust drive belt tension or replace drive belt.</i>
	Loose compressor mounting bolts	<i>Retighten mounting bolts.</i>
<i>A loud rattle is heard at low engine rpm</i>	Loose compressor clutch plate nut	<i>Retighten clutch plate nut. Replace compressor if it was operated in this condition for a long time.</i>

Abnormal Noise from Magnetic Clutch

Condition	Possible cause	Correction / Reference Item
<i>A rumbling noise is heard when compressor is not in operation</i>	Worn or damaged bearings	<i>Replace compressor assembly.</i>
<i>A chattering noise is heard when compressor is in operation</i>	Faulty magnet clutch clearance (excessive clearance)	<i>Replace compressor assembly.</i>
	Worn magnet clutch friction surface	<i>Replace compressor assembly.</i>
	Compressor oil leaked from shaft seal, contaminating the friction surface	<i>Replace compressor assembly.</i>

Abnormal Noise from Tubing

Condition	Possible cause	Correction / Reference Item
<i>A droning noise is heard from inside of the vehicle, but not particularly noticeable in engine compartment</i>	Faulty tubing clamps	<i>Reposition clamps or increase the number of clamps.</i>
	Resonance caused by pulsation from variations in refrigerant pressure	<i>Attach a silencer to tubing, or modify its position and length.</i>

Abnormal Noise from Condenser Assembly

Condition	Possible cause	Correction / Reference Item
<i>Considerable vibration in condenser assembly</i>	Resonance from condenser assembly bracket and body	<i>Firmly insert a silencer between condenser assembly bracket and body.</i>

Abnormal Noise from Crankshaft Pulley

Condition	Possible cause	Correction / Reference Item
<i>A large rattling noise is heard at idle or sudden acceleration</i>	Loosen crankshaft pulley bolt	<i>Retighten bolt.</i>

Abnormal Noise from Tension Pulley

Condition	Possible cause	Correction / Reference Item
<i>Clattering noise is heard from pulley</i>	Worn or damaged bearing	<i>Replace tension pulley.</i>
<i>Pulley cranks upon contact</i>	Cracked or loose bracket	<i>Replace or retighten bracket.</i>

Abnormal Noise from A/C Evaporator

Condition	Possible cause	Correction / Reference Item
Whistling sound is heard from A/C evaporator	Depending on the combination of the interior / exterior temperatures, engine rpm and refrigerant pressure, the refrigerant flowing out of the expansion valve may, under certain conditions, make a whistling sound	<i>At times, slightly decreasing refrigerant volume may stop this noise. Inspect expansion valve and replace if faulty.</i>

Abnormal Noise from Blower Motor

Condition	Possible cause	Correction / Reference Item
Blower motor emits a chirping sound in proportion to its speed of rotation	Worn or damaged motor brushes or commutator	<i>Replace blower motor.</i>
Fluttering noise or large droning noise is heard from blower motor	Leaves or other debris introduced from fresh air inlet to blower motor	<i>Remove debris and make sure that the screen at fresh air inlet is intact.</i>

A/C System Performance Inspection

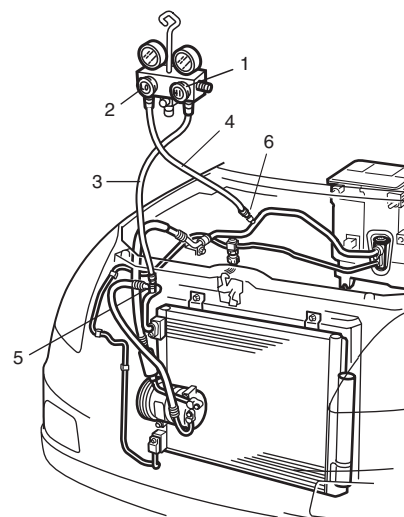
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- 1) Confirm that vehicle and environmental conditions are as follows.
 - Vehicle is put indoors.
 - Ambient temperature is within 25 – 35 °C (77 – 95 °F).
 - Relative humidity is within 30 – 70%.
 - There is no wind indoors.
 - HVAC unit is normal.
 - Blower motor is normal.
 - There is no air leakage from air ducts.
 - Condenser fins are clean.
 - Air filter in HVAC unit is not clogged with dirt and dust.
 - Battery voltage is about 12 V.
 - Radiator cooling fan operates normally.
- 2) Make sure that high pressure valve (1) and low pressure valve (2) of manifold gauge are firmly closed.
- 3) Connect high pressure charging hose (3) to high pressure service valve (5) on vehicle and low pressure charging hose (4) to low pressure service valve (6).

- 4) Bleed the air in charging hoses (3) and (4) by loosening their nuts respectively utilizing the refrigerant pressure. When a hissing sound is heard, immediately tighten nut.

⚠ CAUTION

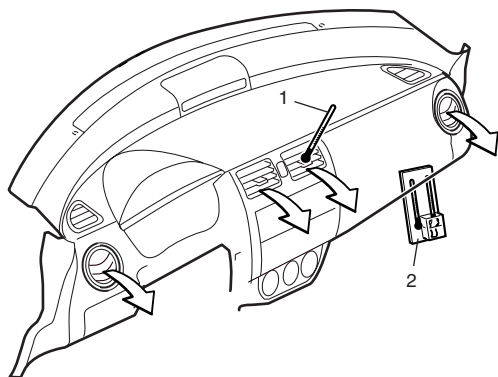
Do not connect high and low pressure charging hoses in reverse.



I5RS0B720003-01

7B-9 Air Conditioning System:

- 5) Warm up engine to the normal operating temperature and keep it at the specified idle speed.
- 6) Turn A/C switch ON, set blower speed selector at maximum speed position, temperature selector at maximum cold position, airflow selector at face position, and air intake switch at recirculation position. (Confirm that A/C compressor and condenser fans are working.)
- 7) Wait for ten minutes to stabilize the A/C operation.
- 8) Open front windows, front doors and engine hood.
- 9) With about 20 mm (0.8 in.) of dry bulb thermometer (1) put right in front of center ventilation louver and a wet and dry bulb thermometer (2) near air inlet of HVAC unit.



I4RS0B720004-01

- 10) Check for each pressure of low side and high side if it is within shaded range of graph. If each gauge reading is out of specified pressure, correct defective part referring to the following table.

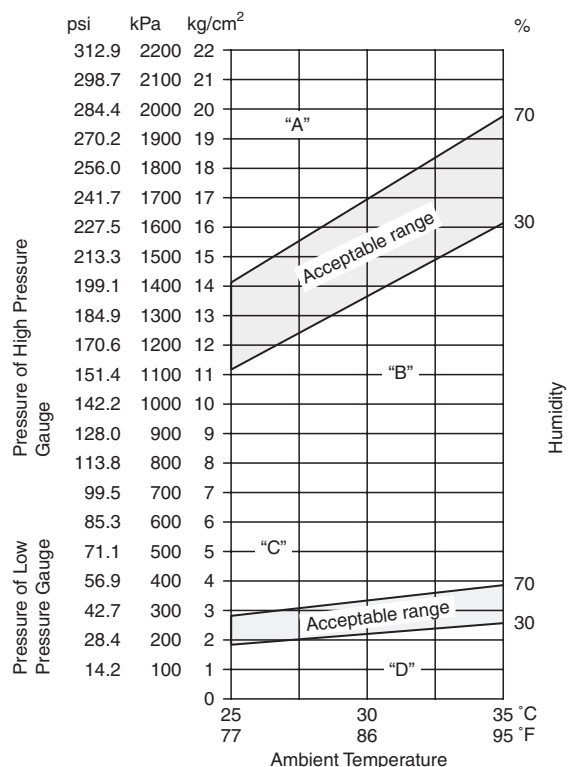
NOTE

Pressure registered on gauge varies with ambient temperature. Therefore, use the graphs when determining if pressures are normal or not.

Low side and high side pressure example,
Gauges should read as follows when ambient
temperature is 30 °C (86 °F)

Pressure on high pressure gauge (HI): 1370 – 1690 kPa (13.7 – 16.9 kg/cm²)

Pressure on low pressure gauge (LO): 230 – 340 kPa (2.3 – 3.4 kg/cm²)



I5RS0B720015-01

High pressure gauge

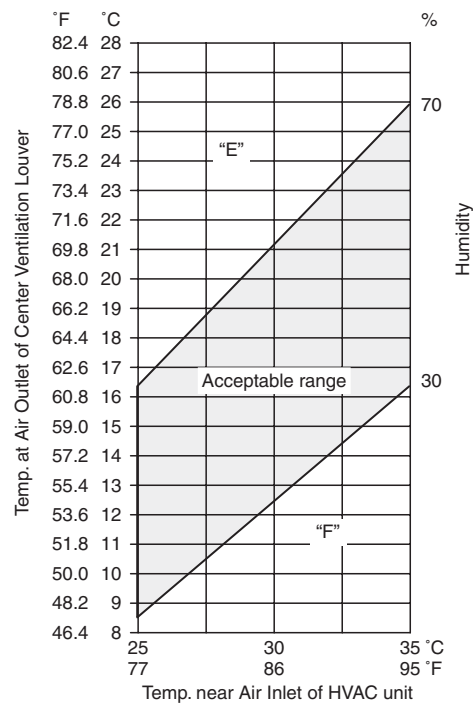
Condition	Possible cause	Correction
Pressure is higher than acceptable range ("A" area)	Refrigerant overcharged	Recharge.
	Expansion valve frozen or clogged	Check expansion valve.
	Clogged refrigerant passage of high pressure side	Clean or replace.
	Radiator cooling fan malfunction (Insufficient cooling of condenser)	Check radiator cooling fan.
	Dirty or bent condenser fins (Insufficient cooling of condenser)	Clean or repair.
	Compressor malfunction (Insufficient oil etc.)	Check compressor.
	Engine overheat	Check engine cooling system referring to "Engine Cooling Symptom Diagnosis: in Section 1F".
Pressure is lower than acceptable range ("B" area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check compressor.

Low pressure gauge

Condition	Possible cause	Correction
Pressure is higher than acceptable range ("C" area)	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check compressor.
Pressure is lower than acceptable range ("D" area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too narrow)	Check expansion valve.
	Clogged refrigerant passage (crashed pipe)	Repair or replace.

11) Check inlet port temperature-to-outlet port temperature relationship using the graph. For example, if temperature near air inlet of HVAC unit is 30 °C (86 °F) and the one at air outlet of center ventilation louver is 17 °C (62.6 °F), their crossing point is within acceptable range as shown in the graph. In this case, cooling performance is satisfactory and proper.

12) If crossing point is out of acceptable range, diagnose trouble referring to the following table.



I5RS0B720016-01

7B-11 Air Conditioning System:

Thermometer at center duct

Condition	Possible cause	Correction
Crossing point is higher than acceptable range ("E" area)	Insufficient or excessive charge of refrigerant	Check refrigerant pressure.
	Dirty or bent A/C evaporator fins	Clean or repair.
	Air leakage from cooling (heater) unit or air duct	Repair or replace.
	Malfunctioning, switch over function of door in cooling (heater) unit	Repair or replace.
	Compressor malfunction	Check compressor.
Crossing point is lower than acceptable range ("F" area)	Insufficient air volume from center duct (Heater blower malfunction)	Check blower motor and fan.
	Compressor malfunction	Check compressor.

NOTE

If ambient temperature is approximately 30 °C (86 °F), it is possible to diagnose A/C system in detail referring to the following table.

Condition		Detail	Possible cause	Correction
Manifold gauge	MPa (kg/cm ²) (psi)			
Lo	Hi			
0.23 – 0.34 (2.3 – 3.4) (34 – 49)	1.37 – 1.69 (13.7 – 16.9) (202 – 248)	Normal condition	—	—
Negative pressure	0.5 – 0.6 (5 – 6) (71.2 – 85.3)	The low pressure side reads a negative pressure, and the high pressure side reads an extremely low pressure. Presence of frost around tubing to and from desiccant and cap with filter and expansion valve.	Dust particles or water droplets are either stuck or frozen inside expansion valve, preventing the refrigerant from flowing.	Clean expansion valve. Replace it if it cannot be cleaned. Replace desiccant and cap with filter. Evacuate the A/C system and recharge with fresh refrigerant.
Normal: 0.23 – 0.34 (2.3 – 3.4) (34 – 49) ↑ ↓ Abnormal: Negative pressure	Normal: 1.37 – 1.69 (13.7 – 16.9) (202 – 248) ↑ ↓ Abnormal: 0.7 – 1.0 (7 – 10) (100 – 142)	During A/C operation, the low pressure side sometimes indicates negative pressure, and sometimes normal pressure. Also high pressure side reading fluctuates between the abnormal and normal pressure.	Expansion valve is frozen due to moisture in the system, and temporarily shuts off the refrigeration cycle.	Replace expansion valve. Replace desiccant and cap with filter. Evacuate A/C system and recharge with fresh refrigerant.
0.05 – 0.15 (0.5 – 1.5) (4.2 – 21.3)	0.7 – 1.0 (7 – 10) (100 – 142)	Both low and high pressure sides indicate low readings. Output air is slightly cold.	Insufficient refrigerant in system (Refrigerant leaking).	Using leak detector, check for leaks and repair as necessary. Recharge refrigerant to a specified amount. If the pressure reading is almost 0 when the manifold gauges are attached, check for any leaks, repair them, and evacuate the system.
0.4 – 0.6 (4 – 6) (56.9 – 85.3)		Pressure on low pressure side is high. Pressure on high pressure side is low. Both pressure becoming equal right after A/C is turned OFF.	Internal leak in compressor.	Inspect compressor and repair or replace as necessary.

Condition			Possible cause	Correction
Manifold gauge	MPa (kg/cm ²) (psi)	Detail		
Lo	Hi			
0.40 – 0.45 (4.0 – 4.5) (57 – 64)	2.0 – 2.5 (20 – 25) (285 – 355)	High pressure reading on both low and high pressure sides.	Overcharged A/C system. Faulty condenser cooling operation. Faulty radiator cooling fan operation.	Adjust refrigerant to specified amount. Clean condenser. Inspect and repair radiator cooling fan.
		High pressure reading on both low and high pressure sides. Low pressure side tubing is not cold when touched.	Presence of air in A/C system (Improperly evacuated).	Replace desiccant and cap with filter. Inspect quantity of compressor oil and presence of contaminants in oil. Evacuate system and recharge with fresh refrigerant.
0.45 – 0.55 (4.5 – 5.5) (64 – 78)		High pressure reading on both low and high pressure sides. Large amount of frost or dew on the low pressure side tubing.	Faulty expansion valve. Refrigerant flow is not regulated properly.	Replace expansion valve.

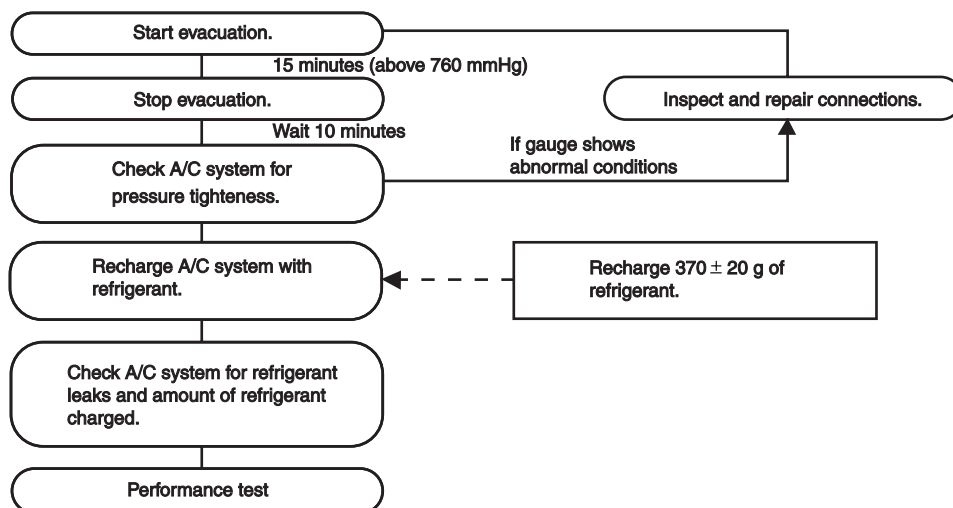
Repair Instructions

Operation Procedure for Refrigerant Charge

S5RS0B7206001

⚠ WARNING

- Your eyes should not be exposed to refrigerant (liquid). Any liquid HFC-134a (R-134a) escaping by accident shows a temperature as low as approximately -6°C (21.2°F) below freezing point. Should liquid HFC-134a (R-134a) be exposed to your eyes, it may cause a serious injury. To protect your eyes from such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) be exposed to your eyes, consult a doctor immediately.
 - Do not use your hand to rub the affected eye(s). Instead, use fresh cold water to splash it over the affected area to gradually raise temperature of such area above freezing point.
 - Obtain proper treatment as soon as possible from a doctor or eye specialist.
- Should the liquid refrigerant HFC-134a (R-134a) be exposed to your skin, the affected area should be treated in the same manner as when skin is frostbitten or frozen.
- Do not handle refrigerant near any place where welding or steam cleaning is performed.
- Refrigerant should be kept in a cold and dark place. It should never be stored in any place where temperature is high, e.g. where exposed to direct sun light, close to fire or inside vehicle (including trunk room).
- Avoid breathing fume produced when HFC-134a (R-134a) is burned. Such fume may be hazardous to your health.



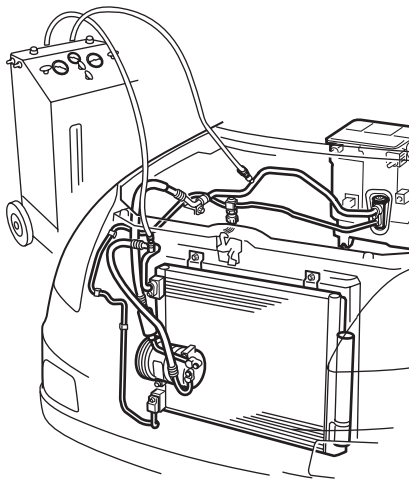
I4RS0B720006-01

Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

NOTE

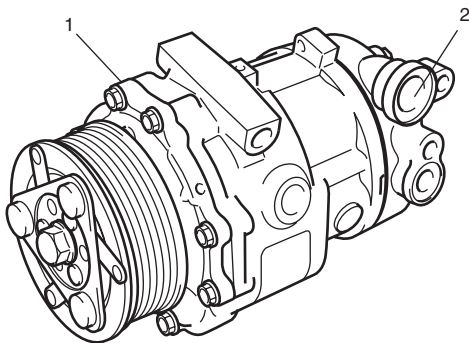
- After recovering refrigerant from system, the amount of removed compressor oil must be measured for replenishing compressor oil.
- When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.



I5RS0B720004-01

Replenishing Compressor Oil

It is necessary to replenish specified amount of compressor oil to compressor (1) from compressor suction side hole (2) before evacuating and charging refrigerant.



I5RS0B720005-01

When charging refrigerant only

When charging refrigerant without replacing any component, replenish the same amount of measured oil when recovering refrigerant (if not measure, replenish 30 cm³ (30 cc) oil).

When replacing compressor

⚠ CAUTION

Be sure to use specified compressor oil or an equivalent compressor oil.

Compressor oil is sealed in each new compressor by the amount required for A/C system. Therefore, when using a new compressor, drain the calculated amount of oil from it.

“C” = “A” – “B”

“C”: Amount of oil to be drained

“A”: Amount of oil in a new compressor

“B”: Amount of oil in removed compressor

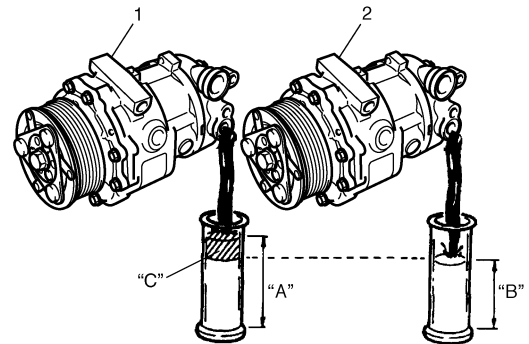
NOTE

Compressor assembly supplied from factory is filled up with the following amount of oil.

: Compressor oil 99000-990C5-00A (Compressor oil (SP10))

Oil amount in compressor

100 cm³ (100 cc, 6.1 in³)



I5RS0B720006-01

1. New compressor

2. Removed compressor

When replacing other parts

Replenish the following amount of oil to compressor.

Amount of compressor oil to be replenished

Evaporator: 25 cm³ (25 cc, 1.53 in³)

Condenser: 15 cm³ (15 cc, 0.92 in³)

Dryer: 20 cm³ (20 cc, 1.22 in³)

Hoses: 10 cm³ (10 cc, 0.61 in³) each

Pipes: 10 cm³ (10 cc, 0.61 in³) each

Evacuation

⚠ CAUTION

Do not evacuate before recovering refrigerant in A/C system.

NOTE

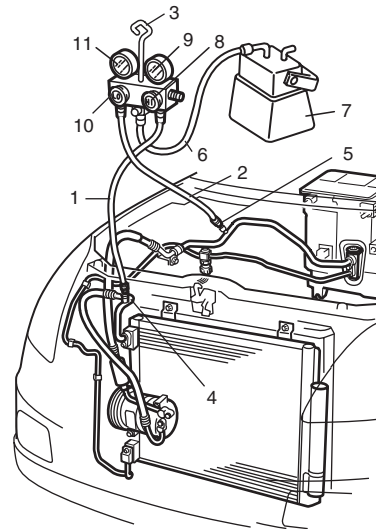
Once air conditioning system circuit is opened (exposed) to atmospheric air, system must be evacuated by using a vacuum pump. The A/C system should be attached with a manifold gauge set, and should be evacuated for approximately 15 minutes.

- 1) Connect high charging hose (1) and low charging hose (2) of manifold gauge set (3) respectively as follows:
High charging hose → High pressure charging valve (4) on condenser outlet pipe
Low charging hose → Low pressure charging valve (5) on suction pipe
- 2) Attach center charging hose (6) of manifold gauge set to vacuum pump (7).
- 3) Operate vacuum pump, and then open discharge side valve (Hi) (8) of manifold gauge set.
If there is no blockage in the system, there will be an indication on high pressure gauge (9).
In this case, open the other side valve (Lo) (10) of the set and repair the system.
- 4) Approximately 10 minutes later, low pressure gauge (11) should show a vacuum lower than -100 kPa (-1.0 kg/cm^2 , -760 mmHg , -14.7 psi) providing no leakage exists.

NOTE

- If the system does not show a vacuum below -100 kPa (-1.0 kg/cm^2 , -760 mmHg , -14.7 psi), close both valves, stop vacuum pump and watch movement of low pressure gauge.
- Increase in the gauge reading suggests existence of leakage. In this case, repair the system before continuing its evacuation.
- If the gauge shows a stable reading (suggesting no leakage), continue evacuation.

- 5) Evacuation should be carried out for a total of at least 15 minutes.
- 6) Continue evacuation until low pressure gauge indicates a vacuum less than -100 kPa (-1.0 kg/cm^2 , -760 mmHg , -14.7 psi), and then close both valves.
- 7) Stop vacuum pump. Disconnect center charging hose from pump inlet. Now, the system is ready for charging refrigerant.



15RS0B720007-01

Checking A/C System for Pressure Leaks

After completing the evacuation, close manifold gauge high pressure valve and low pressure valve and wait 10 minutes. Verify that low pressure gauge reading has not changed.

⚠ CAUTION

If the gauge reading moves closer to "0", there is a leak somewhere. Inspect the tubing connections and make necessary corrections. And then, evacuate system once again and make sure that there are no leaks.

Charge

⚠ CAUTION

- Because the sight glass is not used for this A/C system, do not perform an additional charge to the A/C system. To charge the proper amount of refrigerant, recover and evacuate the A/C system first. And then, charge the proper amount of refrigerant into the A/C system.
- Always charge refrigerant through low pressure side of A/C system after the initial charge is performed from the high pressure side with the engine stopped.
- Never charge refrigerant through high pressure side of A/C system with engine running.
- Do not charge refrigerant while compressor is hot.
- When installing tap valve to refrigerant container to make a hole there through, carefully follow directions given by manufacturer.
- A pressure gauge should always be used before and during refrigerant charge.
- The refrigerant container should be emptied of refrigerant when discarding it.
- The refrigerant container should not be heated up to 40 °C (104 °F) or over.
- Refrigerant container should not be reversed in direction during refrigerant charge. Reversing in direction causes liquid refrigerant to enter compressor, causing troubles, such as compression of liquid refrigerant and the like.

NOTE

The air conditioning system contains HFC-134a (R-134a).

Described here is a method to charge the air conditioning system with refrigerant from the refrigerant service container.

When charging refrigerant recovered by using the refrigerant and recycling equipment (when recycling refrigerant), follow the procedure described in the equipment manufacturer's instruction manual.

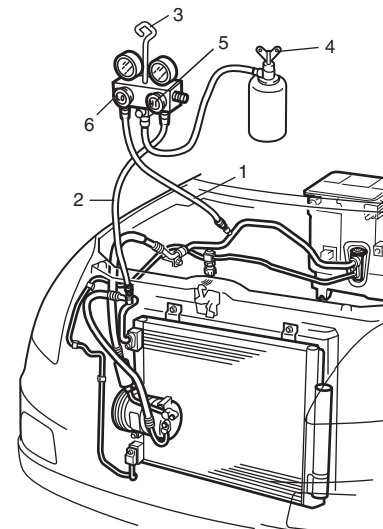
The initial charge of the A/C system is performed through the high pressure side with the engine stopped. And next, this method must be followed by charging from the low pressure side with the engine running.

- 1) Check if hoses are routed properly after evacuating the system.
- 2) Connect low charging hose (1) and high charging hose (2) of the manifold gauge set (3) in position. Then, open refrigerant container valve (4) to purge the charging line.
- 3) Open the high pressure side valve (5) and charge refrigerant to system.
- 4) After a while, open the low pressure side valve (6) and close the high pressure side valve.

⚠ WARNING

Make sure that high pressure side valve is closed securely.

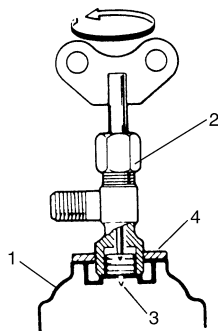
- 5) Start engine and keep engine speed at 1500 r/min, and then operate A/C system.
- 6) Charge A/C system with refrigerant in vapor state. At this time, refrigerant container should be held upright.



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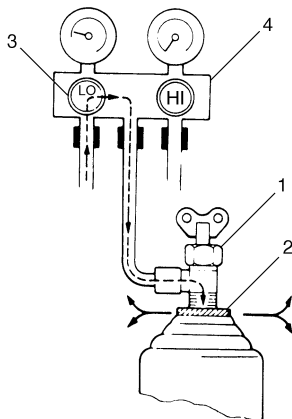
7B-17 Air Conditioning System:

- 7) When refrigerant container (1) is emptied, use the following procedure to replace it with a new refrigerant container.
- Close low pressure valve.
 - Replace empty container with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (2), use the following procedure for replacement.
 - Retract needle (3) and remove refrigerant container tap valve by loosening its plate nut (4).
 - Install the refrigerant container tap valve to a new refrigerant container.



I2RH01720018-01

- c) Purge any air existing in center charging hose. When using refrigerant container tap valve, use the following procedure to purge air.
- Once fully tighten refrigerant container tap valve (1), and then loosen (open) plate nut (2) slightly.
 - Open low pressure side valve (3) of manifold gauge set (4) a little.
 - As soon as refrigerant comes out with a "hiss" through a clearance between refrigerant container and tap valve, tighten plate nut as well as low pressure side valve.
 - Turn handle of tap valve clockwise so that its needle is screwed into the new container to make a hole for refrigerant flow.



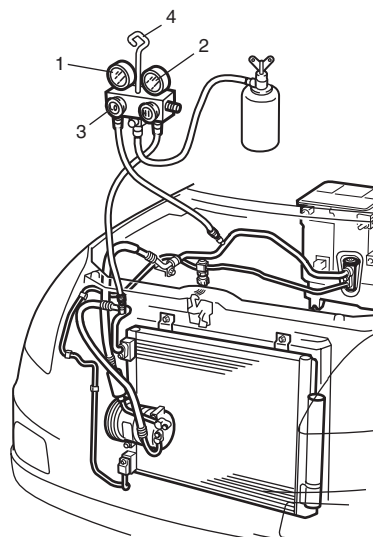
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- 8) After the system has been charged with specified amount (370 ± 20 g) of refrigerant or when low pressure gauge (1) and high pressure gauge (2) have indicated the following specified value, close low pressure side valve (3) on manifold gauge set (4).

Low side and high side pressure example

Gauges should read as follows when ambient temperature is 30 °C (86 °F).

Pressure on high pressure gauge	1370 – 1690 kPa 13.7 – 16.9 kg/cm ² 195 – 240 psi
Pressure on low pressure gauge	230 – 340 kPa 2.3 – 3.4 kg/cm ² 33 – 48 psi



I5RS0B720009-01

Removal of Manifold Gauge Set

⚠ WARNING

High pressure side is under high pressure. Therefore, be careful not to get injured especially on your eyes and skin.

For the A/C system charged with the specified amount of refrigerant, remove manifold gauge set as follows:

- Close low pressure side valve of manifold gauge set. (The high pressure side valve is closed continuously during the process of charging.)
- Close refrigerant container valve.
- Stop engine.
- Using shop rag, remove charging hoses from service valves. This operation must be performed quickly.
- Put caps on service valves.

Check A/C System for Refrigerant Leaks

Whenever a refrigerant leak is suspected in the system or any service operation has been performed which may result in malfunction of lines and connections, it is advisable to check for leaks.

Common sense should be used during refrigerant leak test, since the need and extent of any such test will, in general, depend upon the nature of a complaint and the type of a service performed on the system.

Liquid leak detector

⚠ WARNING

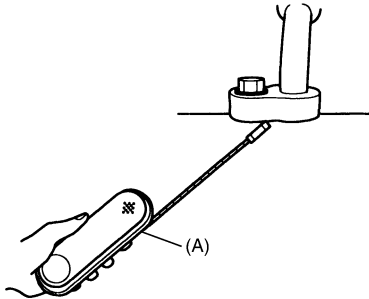
- To prevent explosions and fires, make sure that there are no flammables in the vicinity.
- When the refrigerant exposed to fire, it turns into a poisonous gas (phosgene). Do not inhale this gas.

There is a number of fittings and places throughout the A/C system where a liquid leak detector solution may be used to pinpoint refrigerant leaks.

By merely applying the solution to the area in question with a swab, such as attached to the cap of a vial, bubbles will form within seconds if there is a leak. For confined areas, such as sections of the evaporator and condenser, an electronic (refrigerant) leak detector is more practical for determining leaks.

Special tool

(A): 09990-86011



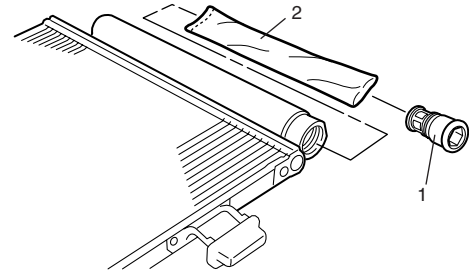
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Desiccant Removal and Installation

S5RS0B7206004

Removal

- 1) Remove condenser assembly referring to "Condenser Assembly Removal and Installation: ".
- 2) Remove cap with filter (1) from receiver/dryer (modulator) tank.
- 3) Remove desiccant (2) from receiver/dryer (modulator) tank.



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Installation

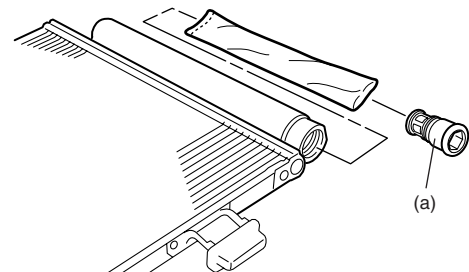
Reverse the removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to in "Operation Procedure for Refrigerant Charge: ".
- Do not remove desiccant from the plastic bag until just before inserting it into the receiver.
- Install the desiccant with its welded part downward.
- Apply compressor oil to cap's O-ring.
- Tighten cap to the specified torque.

Tightening torque

Cap with filter (a): 3.0 N·m (0.3 kgf-m, 2.5 lb-ft)

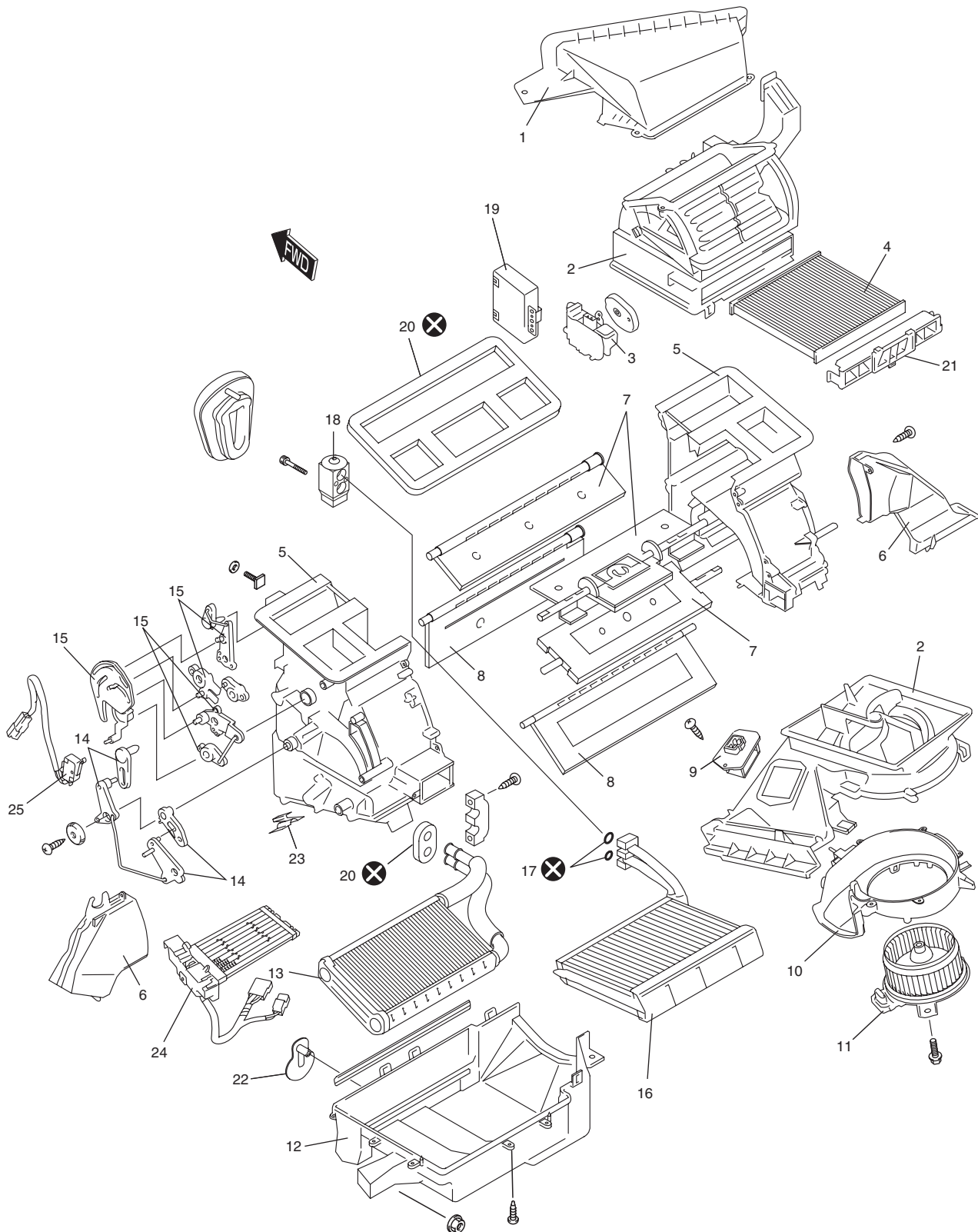
- Evacuate and charge the A/C system referring to "Evacuation" and "Charge" in "Operation Procedure for Refrigerant Charge: ".



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HVAC Unit Components

S5RS0B7206005



I5RS0B720010-01

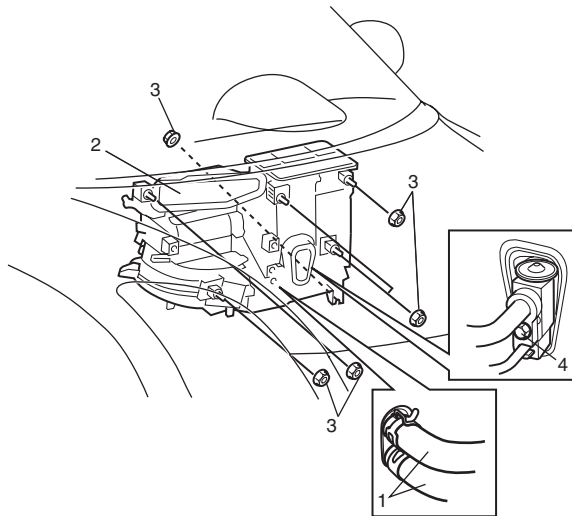
1. Fresh air inlet duct	8. Temperature control door assembly	15. Airflow control lever	22. Drain hose
2. Blower upper case	9. Blower motor resistor	16. Evaporator	23. Cable lock clamp
3. Air intake control actuator	10. Blower lower case	17. O-ring	24. Supplementary heater (if equipped)
4. Air filter (if equipped)	11. Blower motor	18. Expansion valve	25. Max hot switch (if equipped)
5. Heater unit upper case	12. Heater unit lower case	19. Supplementary heater controller (if equipped)	⊗ : Do not reuse.
6. Foot duct	13. Heater core	20. Packing	
7. Airflow control door assembly	14. Temperature control lever	21. Filter cover (if equipped)	

HVAC Unit Removal and Installation

S5RS0B7206006

Removal

- 1) Disconnect negative (–) cable from battery.
- 2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
- 3) Recover refrigerant from A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
- 4) Remove cowl top panel referring to “Cowl Top Components: in Section 9K”.
- 5) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
- 6) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation: in Section 9C”.
- 7) Loosen suction hose and liquid pipe bolt (4).
- 8) Remove nuts (3).
- 9) Remove HVAC unit from vehicle body.

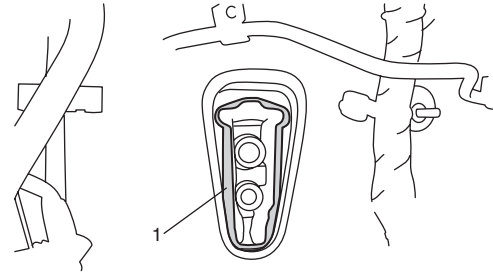


I4RS0B720009-01

Installation

Reverse removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Install the padding (1) to the installation hole uniformly.



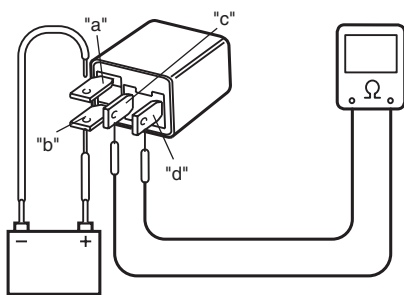
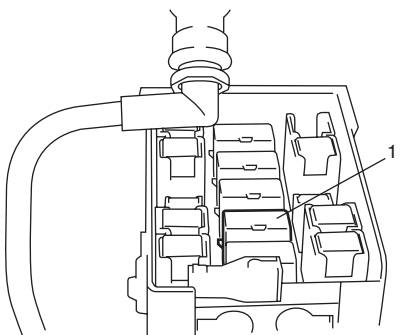
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- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.
- Adjust control cables referring to “HVAC Control Unit Removal and Installation: in Section 7A”.
- Enable air bag system referring to “Enabling Air Bag System: in Section 8B”.

Compressor Relay Inspection

S5RS0B7206015

- 1) Disconnect negative (–) cable from battery.
- 2) Remove compressor relay (1) from main fuse box.
- 3) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
- 4) Connect battery positive (+) terminal to terminal “b” of relay and battery negative (–) terminal to terminal “a” of relay, and then check continuity between terminal “c” and “d”. If there is no continuity, replace relay.



I5RS0B720014-01

Compressor Drive Belt Inspection and Adjustment

S5RS0B7206016

Refer to “Water Pump / Generator Drive Belt Tension Inspection: in Section 1F”.

Compressor Drive Belt Removal and Installation

S5RS0B7206017

Refer to “Water Pump / Generator Drive Belt Removal and Installation: in Section 1F”.

Compressor Assembly Removal and Installation

S5RS0B7206018

NOTE

Never disassemble compressor assembly. Disassembly will spoil its original performance. If faulty condition is found, replace compressor assembly.

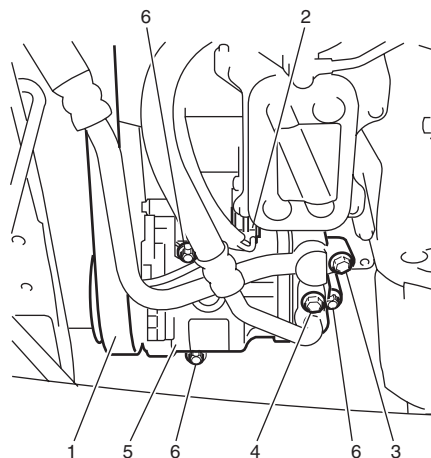
Removal

- 1) Run engine at idle speed with A/C ON for 10 minutes.
- 2) Stop the engine.
- 3) Disconnect negative (–) cable from battery.
- 4) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: ”.
- 5) Remove front bumper referring to “Front Bumper and Rear Bumper Components: in Section 9K”.
- 6) Remove intercooler referring to “Intercooler Removal and Installation: in Section 1D”.
- 7) Remove compressor drive belt (1) referring to “Compressor Drive Belt Removal and Installation: ”.
- 8) Remove right side engine under cover.
- 9) Disconnect magnet clutch lead wire coupler (2).
- 10) Disconnect discharge hose (4) and suction hose (3) from compressor (5).

NOTE

Cap open fittings immediately to keep moisture out of the system.

- 11) Remove compressor mounting bolts (6), and then remove compressor (5) from its bracket.



I5RS0B720011-01

Installation

Reverse removal procedure noting the following instructions.

- If compressor is replaced, pour new compressor oil referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: ”.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: ”.
- Adjust drive belt tension referring to “Compressor Drive Belt Inspection and Adjustment: ”.

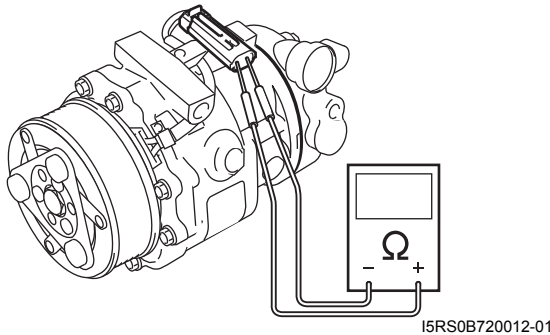
Magnet Clutch Inspection

S5RS0B7206020

- Check armature plate and magnet clutch pulley for wear and oil soak respectively.
- Check magnet clutch pulley bearing for noise, wear and grease leakage.
- Measure magnet clutch coil for resistance at 20 °C (68 °F). If the measured resistance does out of specification, replace compressor assembly.

Magnet clutch coil resistance

Standard: Approximately 3.7 Ω



Relief Valve Inspection

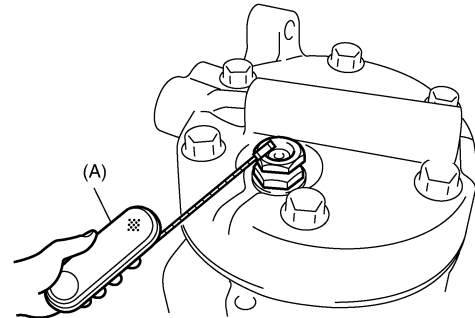
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By using special tool, check if there is refrigerant leakage.

If there is refrigerant leakage, replace the compressor assembly.

Special tool

(A) : 09990-86011



Specifications

Tightening Torque Specifications

S5RS0B7207001

Fastening part	Tightening torque			Note
	N·m	kgf·m	lb·ft	
Cap with filter	3.0	0.3	2.5	☞
Expansion valve mount bolt	3.5	0.35	2.5	☞
A/C refrigerant pressure sensor	11	1.1	8.0	☞

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information: in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S5RS0B7208001

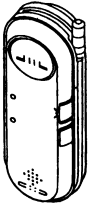
Material	SUZUKI recommended product or Specification		Note
Compressor oil	Compressor oil (SP10)	P/No.: 99000–990C5–00A	

NOTE

Required service material is also described in the following.
“Precautions on Servicing A/C System: ”

Special Tool

S5RS0B7208002

09990–86011 Gas leak detector 		
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Section 9

Body, Cab and Accessories

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Wiring Systems

Precautions

Cautions in Body Electrical System Servicing

S5RS0B9100001

When performing works related to electric systems, observe the cautions described in "Precautions for Electrical Circuit Service: in Section 00" for the purpose of protection of electrical parts and prevention of a fire from occurrence.

Precautions for Wiring System

S5RS0B9100002

⚠ WARNING

(For the vehicles with the Supplemental Restraint System (Air Bags) and/or the Seat Belt Pretensioner System)

Service on or around the air bag system / Seat belt pretensioner system components or their wiring must be performed only by an authorized SUZUKI dealer. Observe all the warnings of the "Air Bag System" and disable the systems before performing the service. Failure to follow the Warnings could result in unintended activation of the systems or could render the systems inoperative. Either of these two conditions may result in severe injury.

⚠ CAUTION

To prevent damage to the electrical/ electronic parts (especially computers or semi-conductors) or to prevent fire:

- When disconnecting the battery terminals, be sure to
1: turn off the ignition switch and all other switches,
2: disconnect the negative (–) terminal wire and then
3: disconnect the positive (+) terminal wire.
Connect the wires in the reverse order of disconnecting.
- When disconnecting the connectors, be sure to unlock the connector lock (if equipped) and then pull the connector shells to detach them. Do not pull the wires.
- Connect the connectors by holding the connector shells. Make sure they are securely locked.
- Install the wiring harness securely without any slack.
- When installing parts, make sure the wiring harness is not interfered with or pinched by them.
- Avoid routing the wiring harness near or around a sharp corner or edge of the vehicle body or parts as much as possible. If necessary, protect the wiring harness by winding tape or the like around on it.
- When replacing a fuse, make sure to use the specified capacity fuse. Using a fuse with a larger capacity can cause damage to the electrical parts or a fire.
- Do not handle electrical/ electronic parts (computer, relay, etc.) roughly or drop them.
- Do not expose electrical/ electronic parts to high temperature (Approximately 80 °C (176 °F) or higher) or water.
- Be sure to insert the tester probe (or, if necessary, an appropriate needle or wire designed for the inspection work) into the back side (wiring harness side) of the connector for inspection not to damage or deform the terminal of the connector.

General Description

Abbreviations

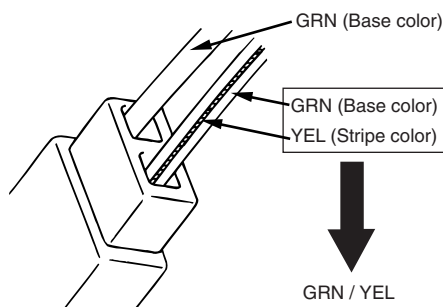
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Abbreviation	Full term	Abbreviation	Full term
2WD	2 wheel drive vehicles	ILL	Illumination
4WD	4 wheel drive vehicles	IND	Indicator
A/B	Air bag	INT	Intermittent
A/C	Air conditioning	ISC	Idle speed control
A/T	Automatic transaxle	J/B	Junction block
ACC	Accessory	J/C	Joint connector
BCM	Body control module	L	Left
CAN	Controller area network	LED	Light emitting diode
CKP	Crank shaft position	LHD	Left hand drive vehicle
CMP	Cam shaft position	LO	Low
COMB	Combination	MAP	Manifold absolute pressure
DLC	Data link connector	M/T	Manual transaxle
DRL	Daytime running light	O/D	Over drive
DSL	Diesel engine	P/N	Power/Normal
ECM	Engine control module	P/S	Power steering
ECT	Engine coolant temperature	PSP	Power steering pressure
EGR	Exhaust gas recirculation	R	Right
EVAP	Evaporative	RHD	Right hand drive vehicle
FWD	Forward	SDM	Sensing and diagnostic module
HI	High	ST	Starter
IAC	Idle air control	TCC	Torque converter clutch
IAT	Intake air temperature	TCM	Transmission control module
ICM	Immobilizer control module	VSS	Vehicle speed sensor
IF EQPD	If equipped	VSV	Vacuum switching valve
IG	Ignition	5 dr	5 door
IG COIL	Ignition coil		

Wire / Connector Color Symbols

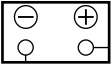
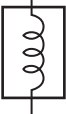
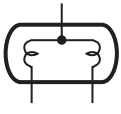
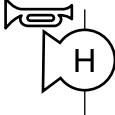
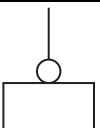
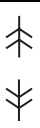
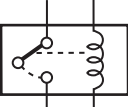
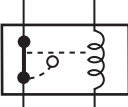
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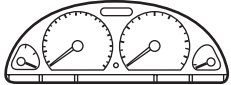
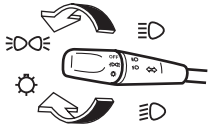
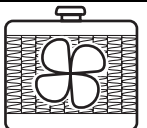
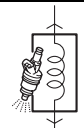
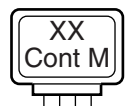
Symbol	Wire / connector Color	Symbol	Wire / connector Color
BLK	Black	ORN	Orange
BLU	Blue	RED	Red
BRN	Brown	WHT	White
GRN	Green	YEL	Yellow
GRY	Gray	PNK	Pink
LT BLU	Light blue	PPL	Purple
LT GRN	Light green	N	Natural



I2RH01910941-01

Symbols and Marks

Battery	Ground		Normal fuse	Slow blow fuse
 I2RH01910910-01	 IYSQ01910915-01	 IYSQ01910916-01	 IYSQ01910917-01	 IYSQ01910918-01
Circuit breaker	Coil, Solenoid	Heater	Bulb	
 IYSQ01910919-01	 IYSQ01910920-01	 IYSQ01910921-01	 IYSQ01910922-01	 IYSQ01910923-01
Cigarette lighter	Motor	Pump	Horn	Speaker
 IYSQ01910924-01	 IYSQ01910925-01	 IYSQ01910926-01	 I2RH01910911-01	 IYSQ01910928-01
Buzzer	Chime	Condenser	Thermistor	Reed switch
 IYSQ01910929-01	 IYSQ01910930-01	 IYSQ01910931-01	 IYSQ01910932-01	 IYSQ01910933-01
Resistance	Variable resistance		Transistor	
 IYSQ01910934-01	 IYSQ01910935-01	 IYSQ01910936-01	 IYSQ01910937-01 NPN	 IYSQ01910938-01 PNP
Photo transistor	Diode	Zener diode	Light emitting diode	Photo diode
 IYSQ01910939-01	 IYSQ01910940-01	 IYSQ01910941-01	 IYSQ01910942-01	 IYSQ01910943-01
Piezoelectric element	Harness		Ring terminal	Connector
 IYSQ01910944-01	 IYSQ01910945-01 Connected	 IYSQ01910946-01 Not connected	 IYSQ01910947-01	 IYSQ01910948-01
Relay		Switch		
 IYSQ01910949-01 Normal open	 IYSQ01910950-01 Normal closed	 IYSQ01910951-01 Open switch	 IYSQ01910952-01 Closed switch	

Ignition switch  I2RH01910912-01	Keyless entry  I3JA01910902-01	Immobilizer system  I5RH01910901-01	Combination meter  I2RH01910915-01	Lighting switch  I2RH01910916-01
Headlight leveling  I3JA01910904-01	Hazard warning light  I3JA01910905-01	Front fog light  I3JA01910906-01	Rear fog light  I3JA01910907-01	Spark plug  I2RH01910921-01
Radiator fan  I2RH01910922-01	Fuel pump  I3JA01910908-01	Injector  I2RH01910924-01	XX control module  I2RH01910925-01	Windshield wiper  I3JA01910909-01
Windshield washer  I3JA01910910-01	Rear wiper  I3JA01910911-01	Rear washer  I3JA01910912-01	Rear defogger  I2RH01910930-01	Power window  I3JA01910913-01
Power door lock  I3JA01910914-01	Power mirror  I3JA01910915-01	A/B  I3JA01910916-01	Pretensioner  I3JA01910917-01	Passenger side  I3JA01910918-01
Driver side  I3JA01910919-01	Seat heater  I2RH01910938-01	A/C  I3JA01910920-01	Power steering  I3JA01910921-01	Side air-bag (R)  I4JA01910901-01
Side air-bag (L)  I4JA01910902-01	Side curtain air-bag (R)  I5RS0A910958-01	Side curtain air-bag (L)  I5RS0A910959-01	Glow plug  I4JA01910903-01	

How to Read Connector Layout Diagram

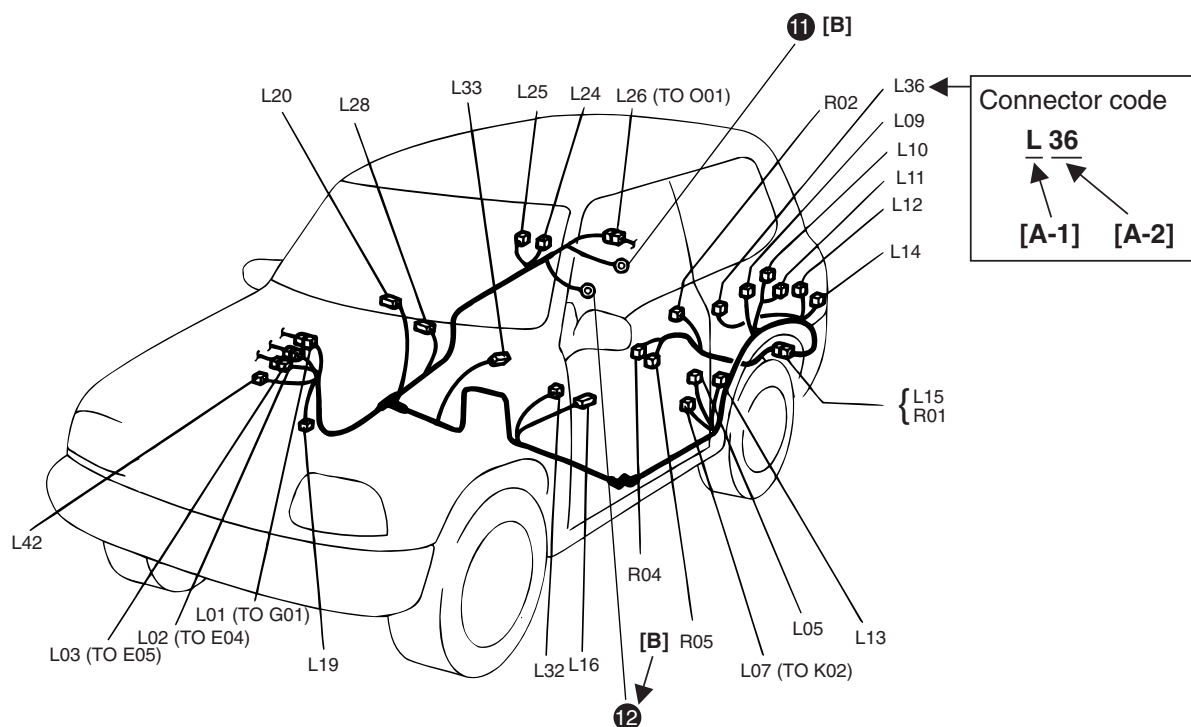
S5RS0B9101005

[A-1]: Harness symbol and corresponding harness name

- A: Battery harness
- B: A/C harness
- C: Engine harness
- D: Injector harness
- E: Main harness, Oil pressure switch wire, Console wire
- G: Instrument panel harness
- J: Side door wire (Power window)
- K: Interior light harness, Rear speaker wire, Roof wire
- L: Floor harness, G sensor wire (Fuel pump harness)
- M: Rear bumper harness
- O: Rear end door harness
- Q: Air bag/Pretensioner harness
- R: (Fuel pump wire)

[A-2]: Connector Number

[B]: Ground point No.



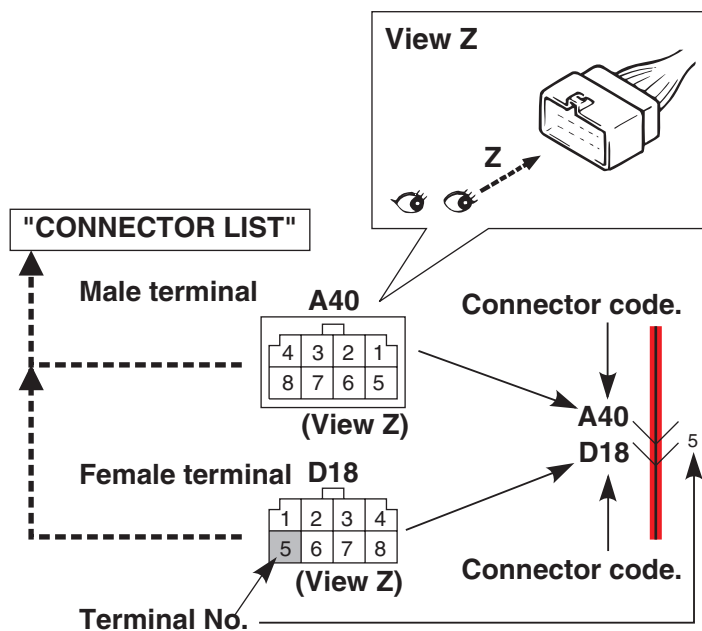
I2RH01910901-01

How to Read Connector Codes and Terminal Nos.

S5RS0B9101006

1) Connector code/Terminal No./Terminal layout

- The connector shape and terminal layout shown in this manual are those when viewed from “Z” in the illustration.
- Refer to “List of Connectors: ”.



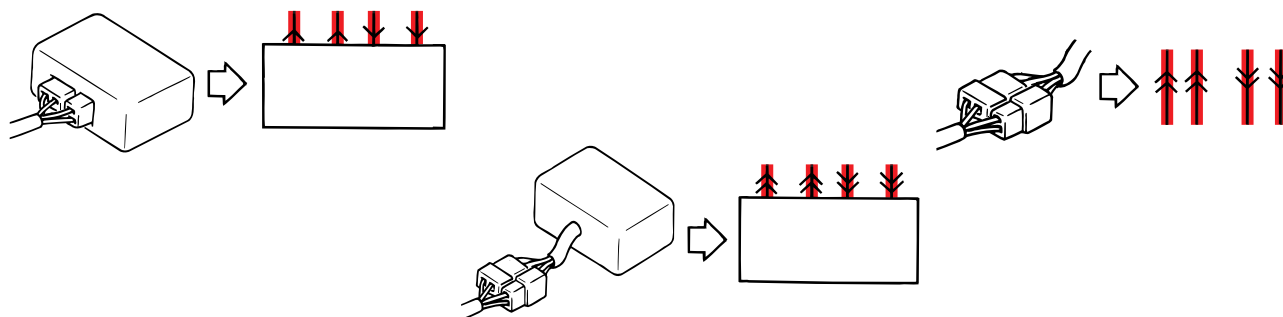
I5RS0A910901-01

NOTE

Molded terminal numbers that are different from the above can be found on some connectors in rare cases.

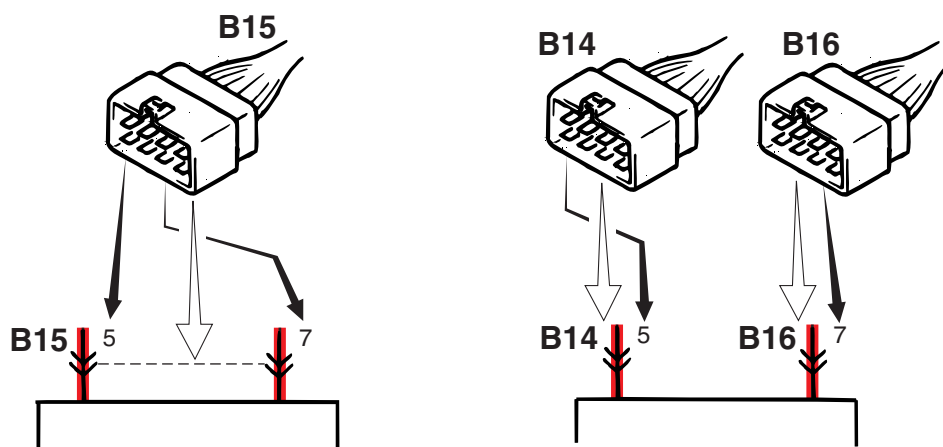
These molded numbers are not applied in this manual.

2) Connector type



I2RH01910903-01

3) Terminals in one connector (Broken line) (B15)/Terminals in different connectors (B14, B16)

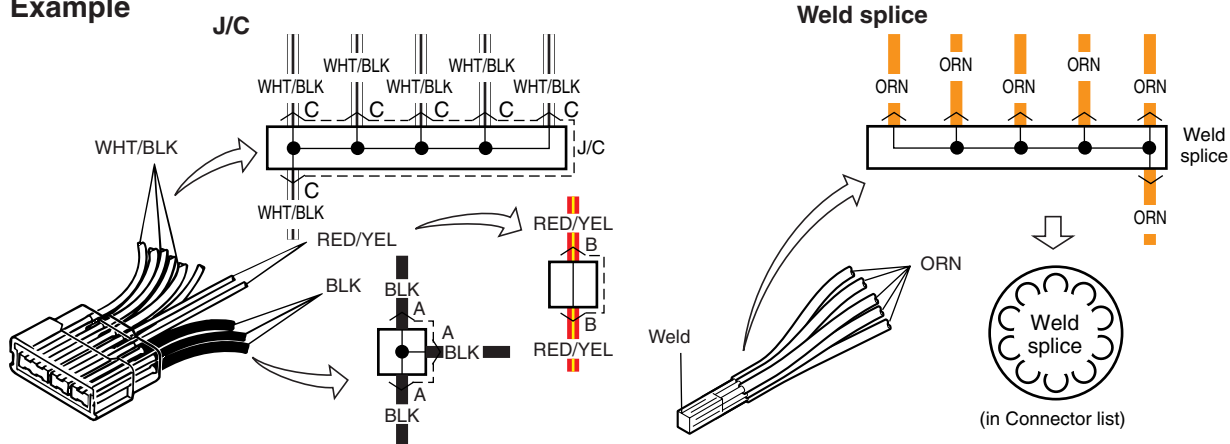


I2RH01910904-01

4) Joint connector (J/C)

- The joint connector (J/C) connects several different wires with the same wire color at one place instead of connecting them by welding or caulking one by one. It is not an ordinary connector but a part of the continuous wire in the harness.

Example

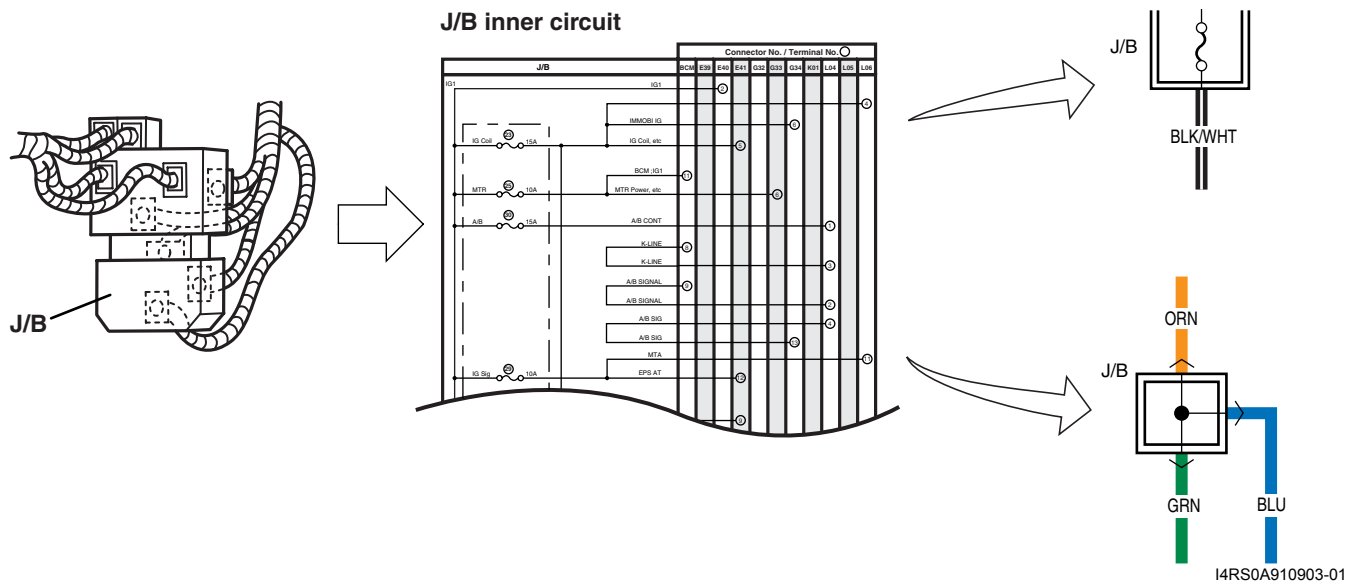


I4RS0A910902-01

9A-7 Wiring Systems:

5) Junction block (J/B)

Example

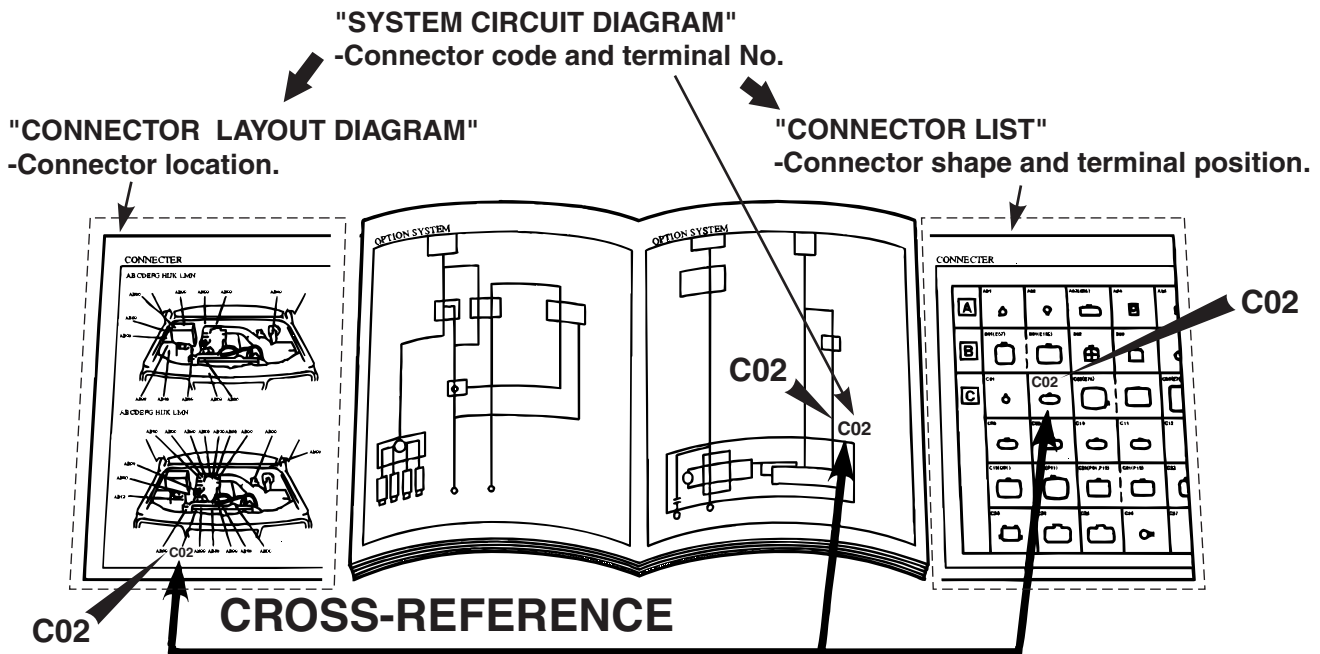


6) Connector location, shape and terminal No.

Refer to "Connector Layout Diagram: ".

Refer to "System Circuit Diagram: ".

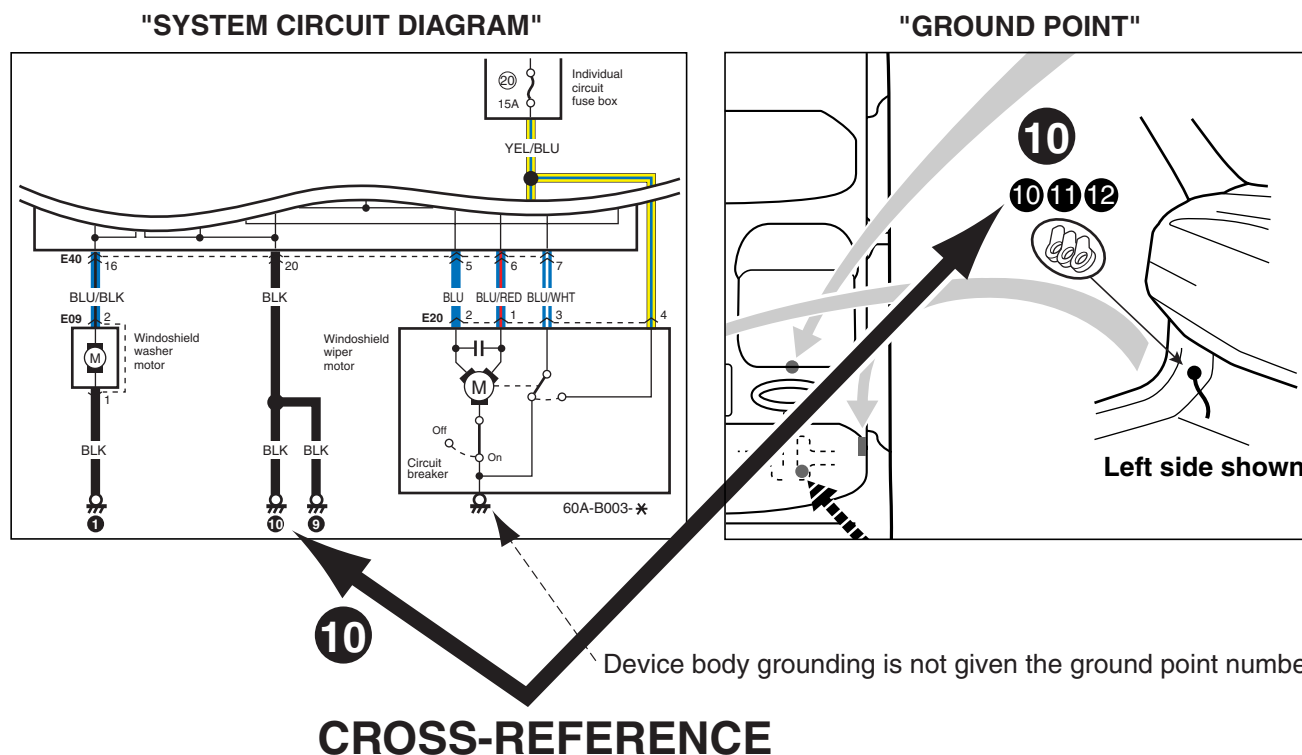
Refer to "List of Connectors: ".



How to Read Ground Point

Refer to "System Circuit Diagram: ".

Refer to "Ground (earth) Point: ".

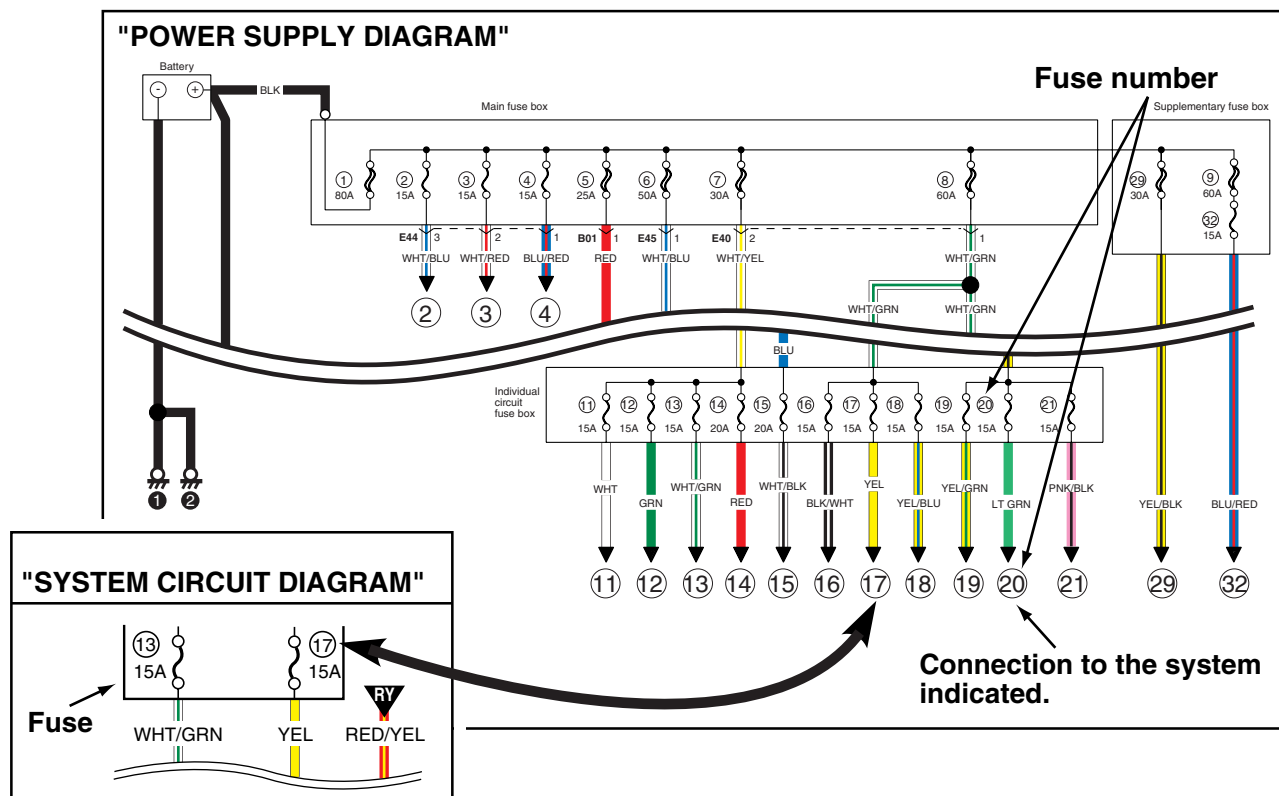


How to Read Power Supply Diagram

S5RS0B9101008

Refer to "Power Supply Diagram (Petrol)": .

Refer to "System Circuit Diagram": .



I4JA01910986-01

How to Read System Circuit Diagram

S5RS0B9101009

The circuit diagram is designed so the current flows from the top of the diagram (power source) to the bottom of the diagram (ground) as if giving an image of water flow.

[A]: Fuse No.

[B]: Circuit jumping page / direction

NOTE

This means "Jump to the page directed with the arrow(s) by their number.

(For example: "Two arrows directing left" means "Jump to two pages before".)

You will find the same symbol with the arrows directing opposite in the referenced page. The circuit continues between the symbols.

[C]: Circuit jumping point / direction

NOTE

The circuit continues to the same symbol with opposite direction within the page.

You will find the other symbol in the direction of the arrow.

[D]: Terminals-in-one-connector mark

[E]: Wire color

[F]: Shield wire

[G]: Ground point

[H]: "From" or "To" (With ID letter (s))

[I]: Specification variation

The white arrow between A and B means "or".

[J]: "From" (With ID letter (s))

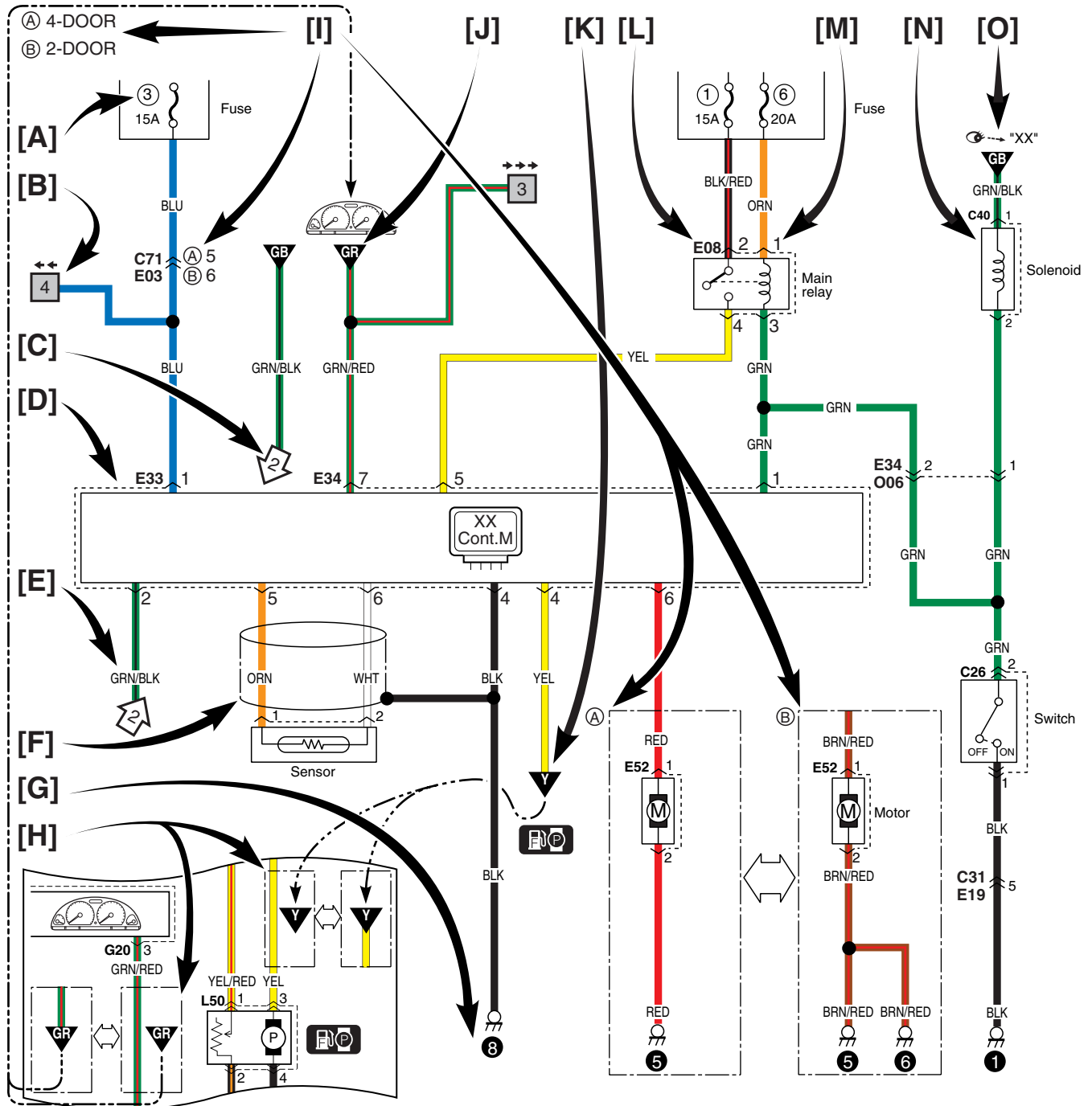
[K]: "To" (With ID letter (s))

[L]: Connector code

[M]: Terminal No.

[N]: Symbol mark

[O]: "SEE" mark



Harness Routing and Connector Layout Diagram

Connector Layout Diagram

S5RS0B910A001

Refer to "Engine Compartment: ".

Refer to "Instrument Panel: ".

Refer to "Door, Roof: ".

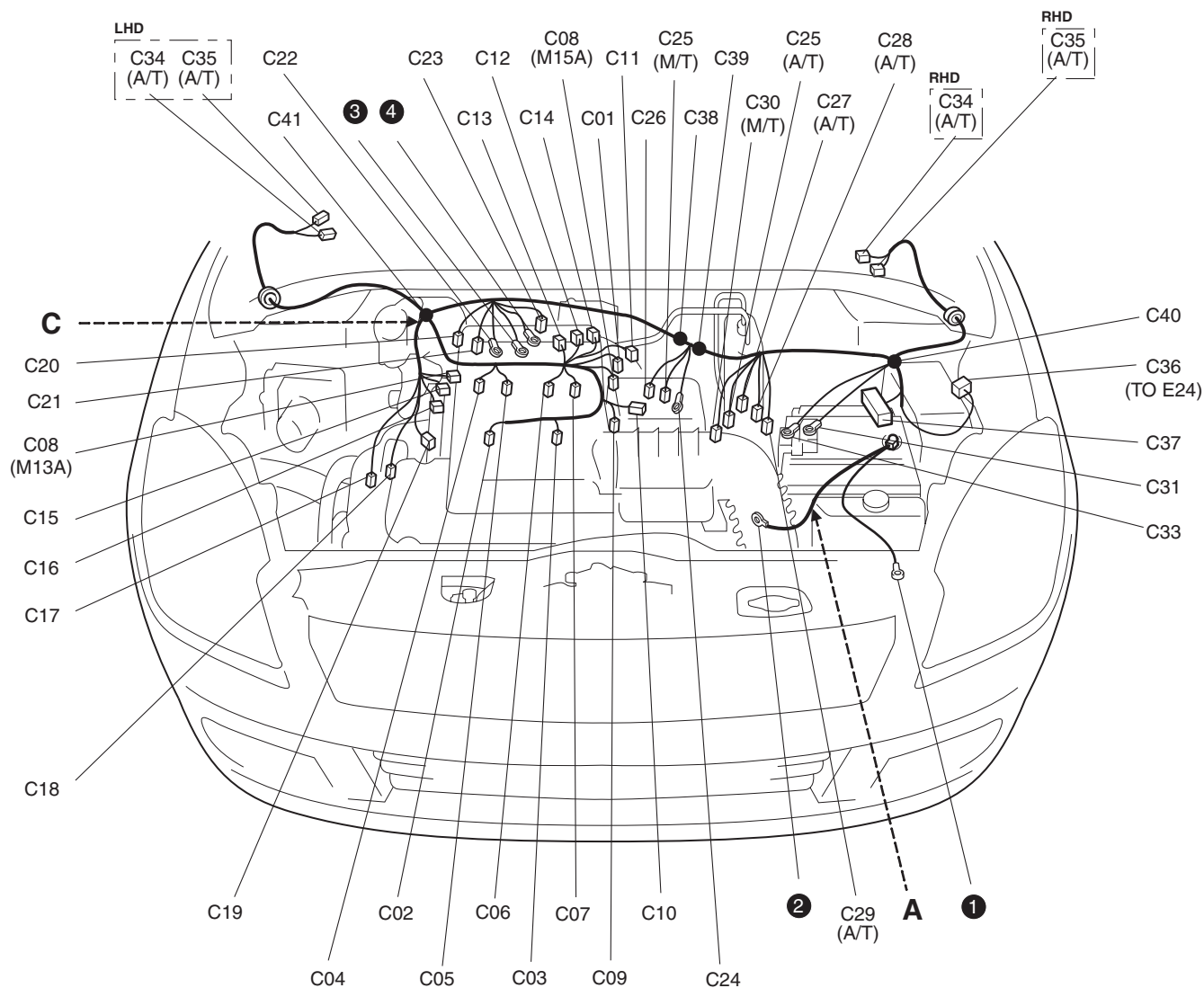
Refer to "Floor: ".

Refer to "Rear: ".

Engine Compartment

S5RS0B910A002

A: Battery cable / C: Engine harness (MT, AT)



I4RS0B910902-04

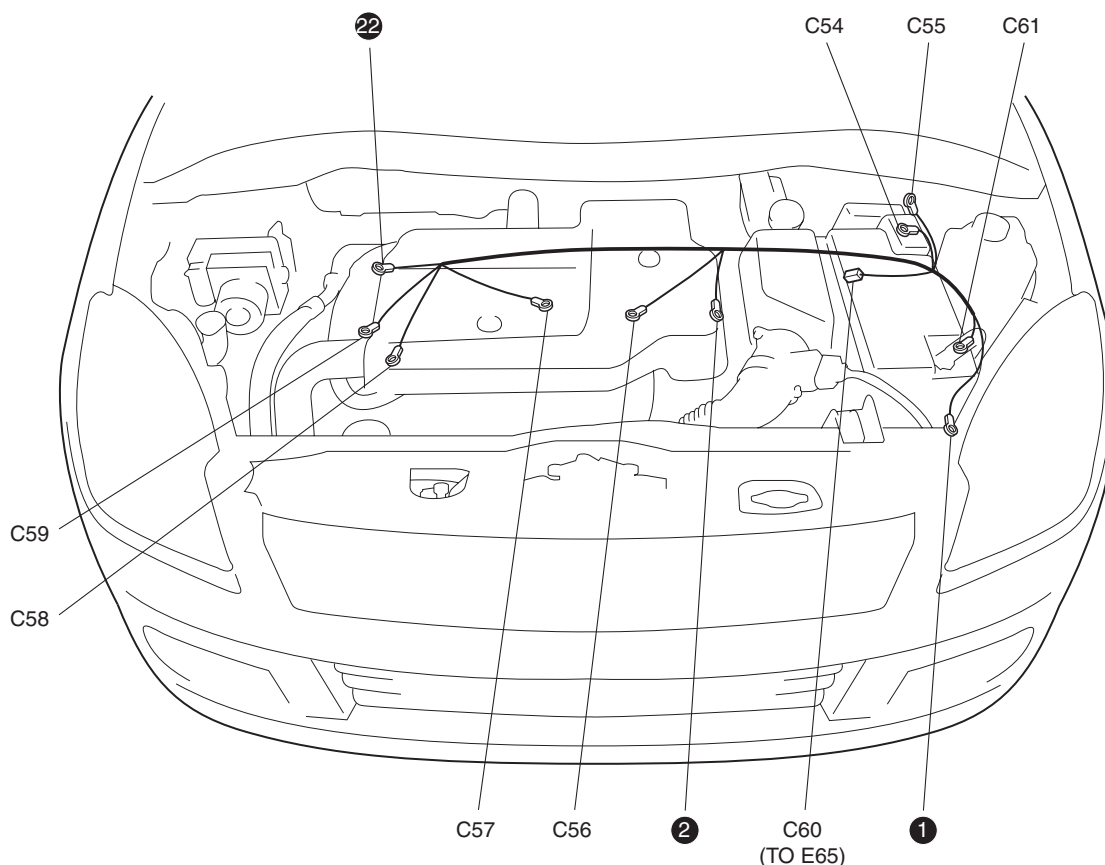
C: Engine harness

No./Color	Connective position	No./Color	Connective position
C01/GRY	IAC valve	C21/GRY	Generator #1
C02/GRY	IG Coil #1	C22/-	Generator #2
C03/GRY	IG Coil #2	C23/BLK	Starting motor #1
C04/GRY	Injector #1	C24/-	Starting motor #2
C05/GRY	Injector #2	C25/GRY	Vehicle speed sensor
C06/GRY	Injector #3	C26/GRY	Knock sensor
C07/GRY	Injector #4	C27/BLU (A/T)	Input sensor

9A-13 Wiring Systems:

No./Color	Connective position	No./Color	Connective position
C05/GRY	Injector #2	C33/-	Main fuse box
C06/GRY	Injector #3	C36/N	Main harness (To E24)
C07/GRY	Injector #4	C37/GRY	ECM
C08/GRY	CMP sensor	C38/-	Weld splice
C09/GRN	ECT sensor	C39/-	Weld splice
C10/GRY	EGR stepper motor	C40/-	Weld splice
C12/BLK	MAP sensor	C41/-	Weld splice
C13/BLK	MAF sensor	C42/BLK	Throttle position sensor
C14/BLK	EVAP canister vent valve	C43/BLK	Select stroke sensor
C15/GRY	Heated oxygen sensor #1	C44/BLK	Shift stroke sensor
C16/GRN	Heated oxygen sensor #2	C45/BLK	Clutch stroke sensor
C17/BLK	A/C compressor	C46/GRY	Clutch motor
C18/N	Oil pressure sensor	C47/GRY	Shift motor
C20/GRY	CKP sensor	C48/GRY	Select motor
C21/GRY	Generator #1	C49/BLK	Neutral switch
C22/-	Generator #2	C50/N	Rotation sensor
C23/BLK	Starting motor #1	C51/GRY	Automated Manual Transaxle control module
C24/-	Starting motor #2	C52/N	Automated Manual Transaxle control module
C25/GRY	Vehicle speed sensor	C53/N	Main harness (To E60)

C: Engine harness (DSL)

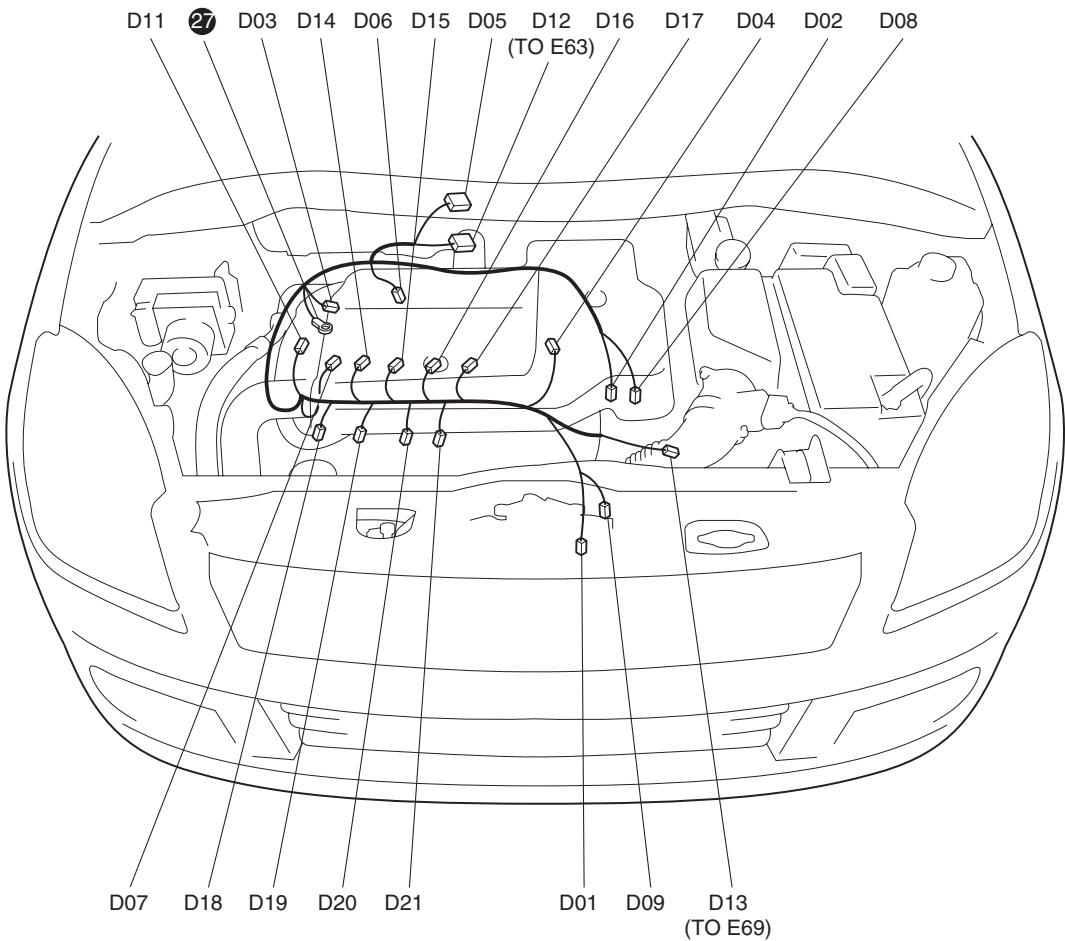


C: Engine harness

No./Color	Connective position	No./Color	Connective position
C54/-	Main fuse box	C58/-	Generator
C55/-	Main fuse box	C59/-	Generator
C56/-	Starting motor	C60/GRY	Main harness (To E65)
C57/-	Starting motor	C61/-	Battery (-)

I5RS0B910901-01

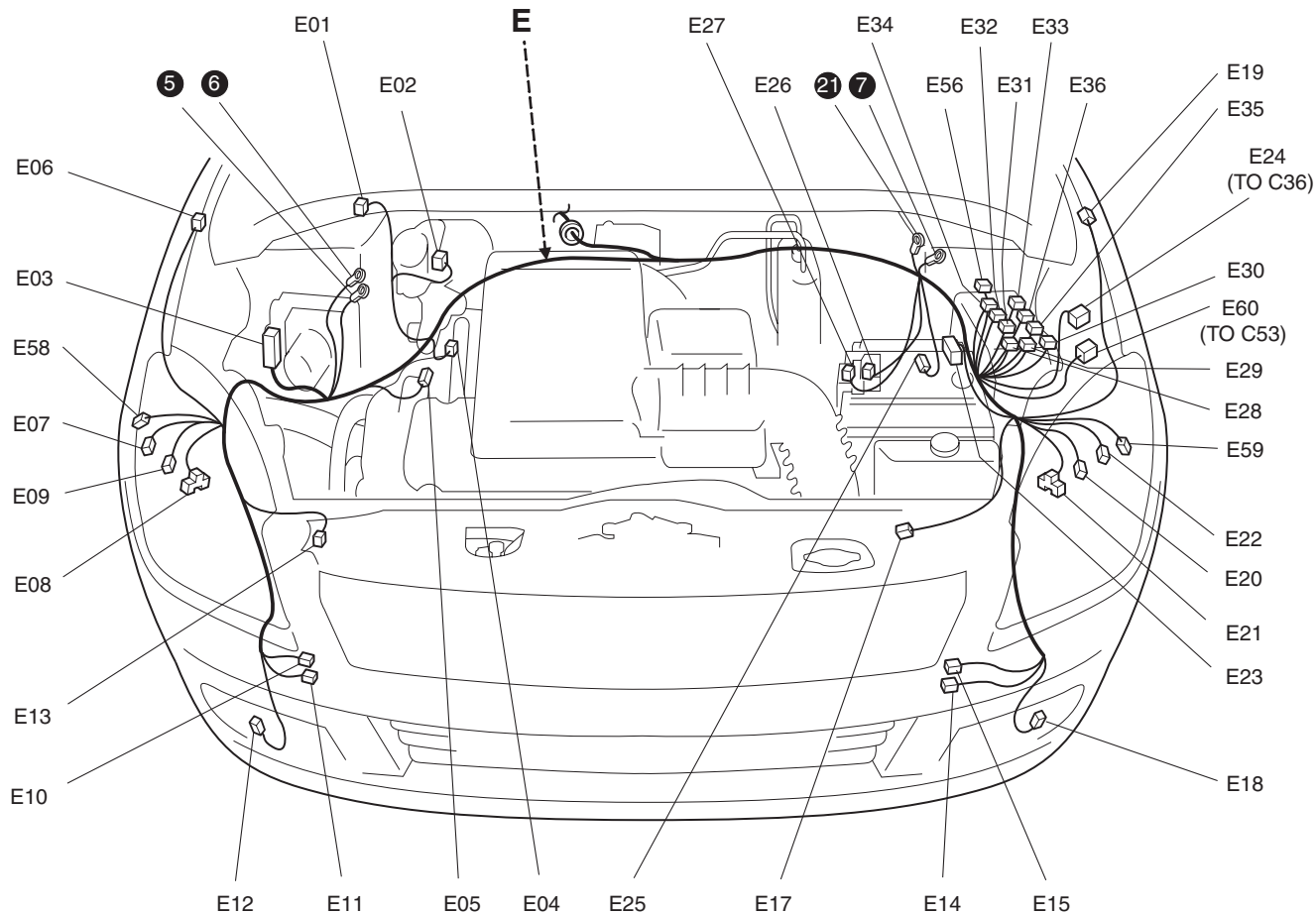
D: Injector harness (DSL)



I5RS0B910902-02

D: Injector harness

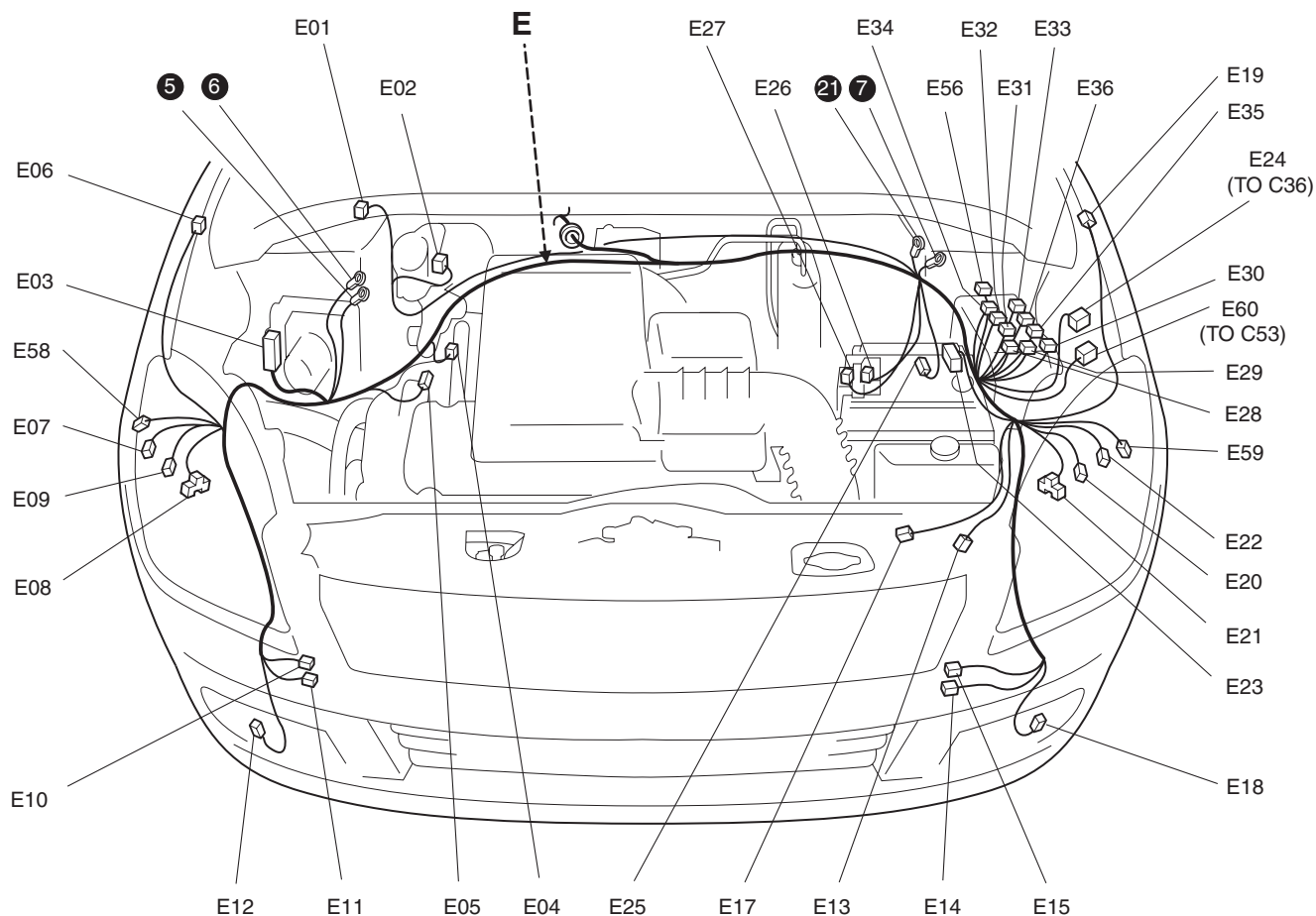
No./Color	Connective position	No./Color	Connective position
D01	ECT sensor	D12	Main harness (To E63)
D02	Fuel pressure regulator	D13	Main harness (To E69)
D03	Fuel pressure sensor	D14	Injector #1
D04	Oil level switch	D15	Injector #2
D05	ECM	D16	Injector #3
D06	Boost pressure sensor	D17	Injector #4
D07	CMP sensor	D18	Glow plug #1
D08	EGR valve	D19	Glow plug #2
D09	CKP sensor	D20	Glow plug #3
D11	Compressor	D21	Glow plug #4

E: Main harness (RHD) (Petrol)

I5RS0B910903-05

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E22/N	Front position light (L)
E02/BRN	Brake fluid level switch	E23/GRY	ECM
E03/BLK	ABS control module	E24/N	Engine Harness (To C36)
E04/BLK	A/C pressure sensor	E25/BLK	Wheel speed sensor (FL)
E05/BLK	Wheel speed sensor (FR)	E26/GRY	Main fuse box
E06/N	Side turn signal light (R)	E27/BRN	Main fuse box
E07/N	Front position light (R)	E28/BLK	Radiator fan relay #1
E08/BLK	Head light (R)	E29/BLK	Radiator fan relay #2
E09/GRY	Front turn signal light (R)	E30/BLK	Radiator fan relay #3
E10/GRN	Rear washer motor	E31/BLK	Starting motor relay
E11/BLU	Windshield washer motor	E32/BLK	Main relay
E12/BLK	Front fog light (R)	E33/BLK	A/T relay or Automated Manual Transaxle relay
E13/YEL	Forward sensor	E34/BLK	Front fog light relay
E14/BLK	Ambient temperature sensor	E35/BLK	Fuel pump relay
E15/BLK	Horn	E36/BLK	A/C compressor relay
E17/BLK	Radiator fan motor	E56/BLK	Throttle motor relay
E18/BLK	Front fog light (L)	E58/GRY	Headlight beam leveling actuator (L)
E19/N	Side turn signal light (L)	E59/GRY	Headlight beam leveling actuator (R)
E20/GRY	Front turn signal light (L)	E60/N	Engine harness (To C53)
E21/BLK	Headlight (R)		

E: Main harness (LHD) (Petrol)

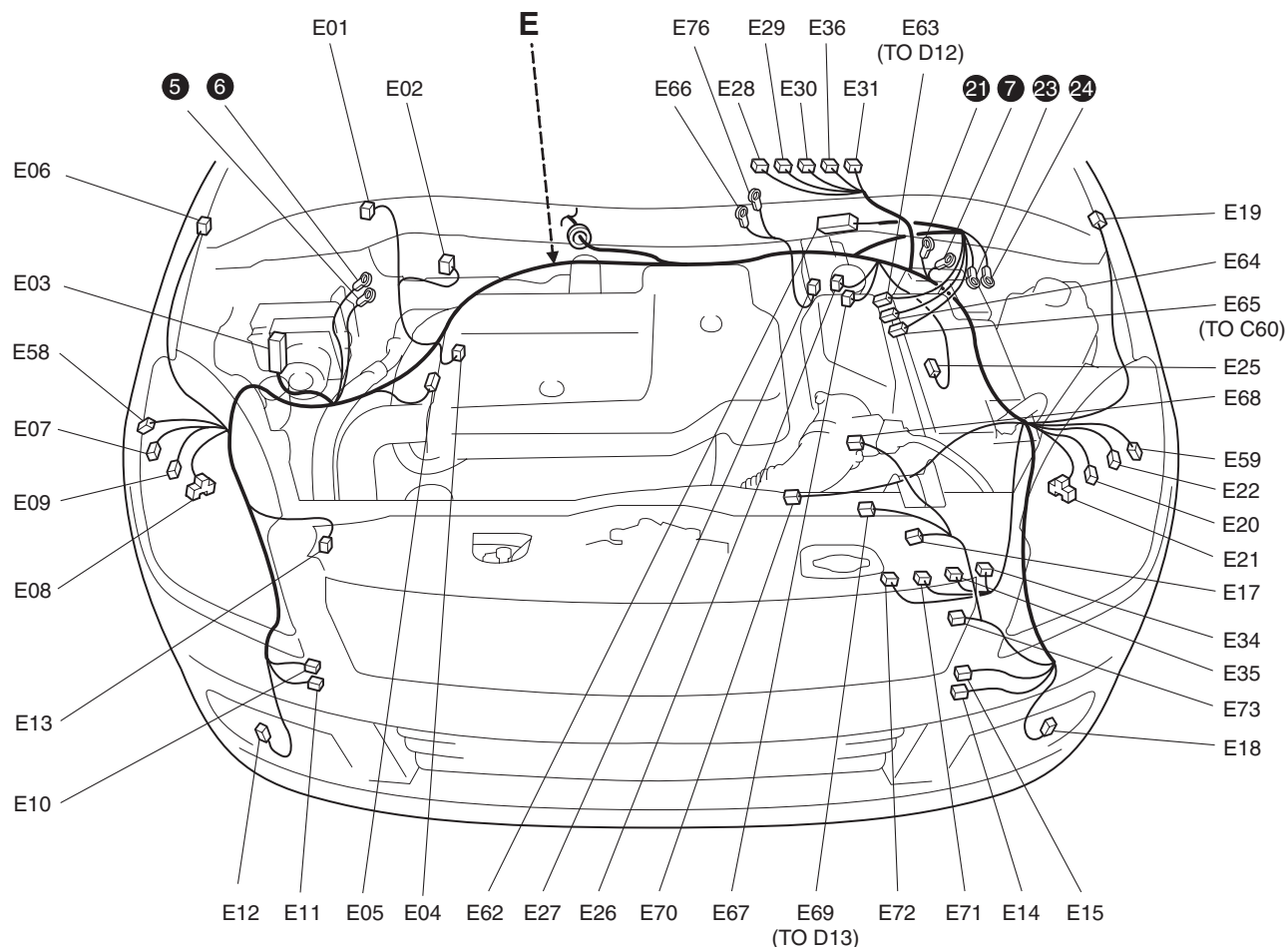
15RS0B910904-04

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E22/N	Front position light (L)
E02/BRN	Brake fluid level switch	E23/GRY	ECM
E03/BLK	ABS control module	E24/N	Engine Harness (To C36)
E04/BLK	A/C pressure sensor	E25/BLK	Wheel speed sensor (FL)
E05/BLK	Wheel speed sensor (FR)	E26/GRY	Main fuse box
E06/N	Side turn signal light (R)	E27/BRN	Main fuse box
E07/N	Front position light (R)	E28/BLK	Radiator fan relay #1
E08/BLK	Head light (R)	E29/BLK	Radiator fan relay #2
E09/GRY	Front turn signal light (R)	E30/BLK	Radiator fan relay #3
E10/GRN	Rear washer motor	E31/BLK	Starting motor relay
E11/BLU	Windshield washer motor	E32/BLK	Main relay
E12/BLK	Front fog light (R)	E33/BLK	A/T relay or Automated Manual Transaxle relay
E13/YEL	Forward sensor	E34/BLK	Front fog light relay
E14/BLK	Ambient temperature sensor	E35/BLK	Fuel pump relay
E15/BLK	Horn	E36/BLK	A/C compressor relay
E17/BLK	Radiator fan motor	E56/BLK	Throttle motor relay
E18/BLK	Front fog light (L)	E58/GRY	Headlight beam leveling actuator (L)
E19/N	Side turn signal light (L)	E59/GRY	Headlight beam leveling actuator (R)
E20/GRY	Front turn signal light (L)	E60/N	Engine harness (To C53)
E21/BLK	Headlight (R)		

E: Main harness (RHD) (DSL)

S5RS0B910A007



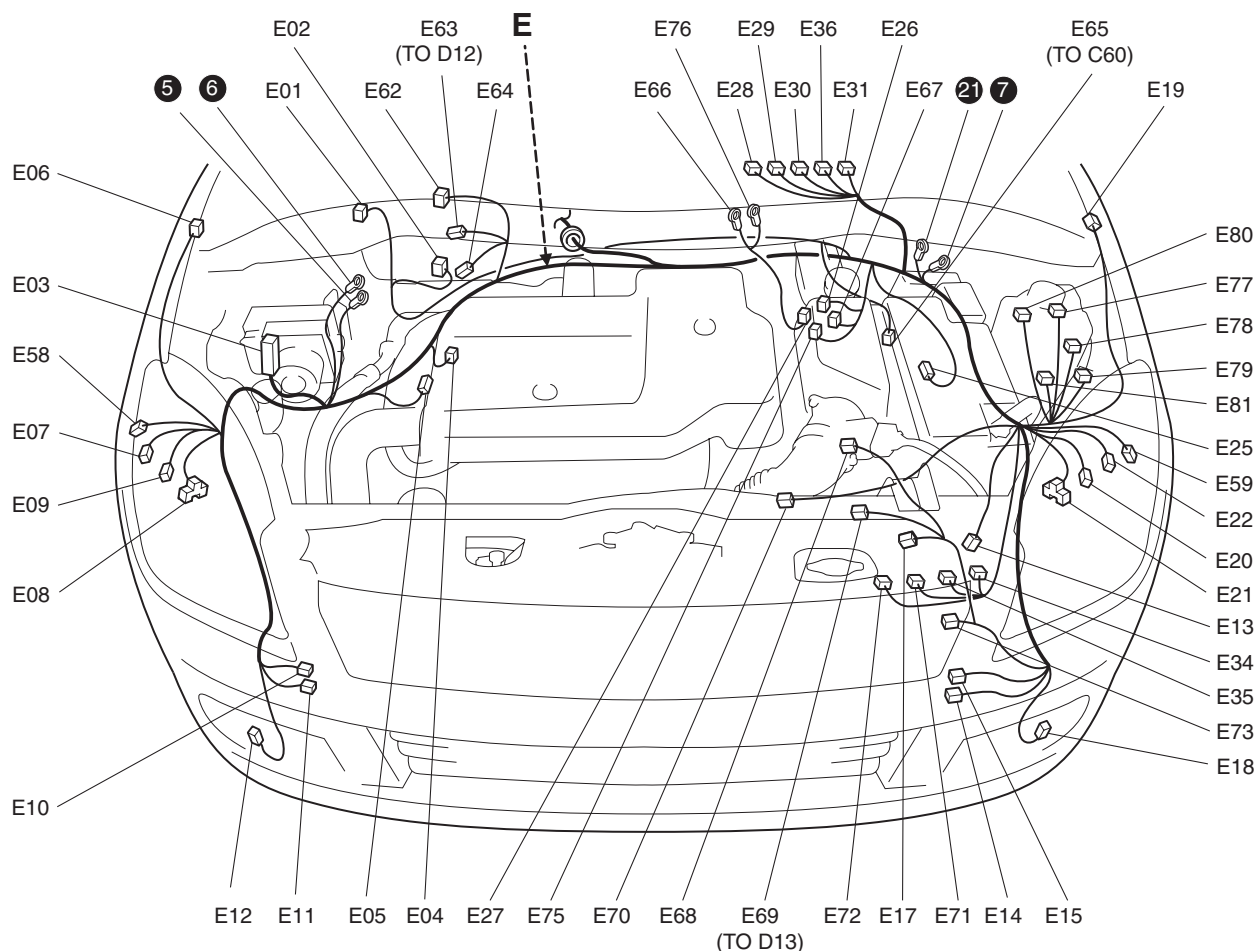
15RS0B910973-01

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E27/BRN	Main fuse box
E02/BRN	Brake fluid level switch	E28/BLK	Radiator fan relay #1
E03/BLK	ABS control module	E29/BLK	Radiator fan relay #2
E04/BLK	A/C pressure sensor	E30/BLK	Radiator fan relay #3
E05/BLK	Wheel speed sensor (FR)	E31/BLK	Starting motor relay
E06/N	Side turn signal light (R)	E34/BLK	Front fog light relay
E07/N	Front position light (R)	E35/BLK	Fuel pump relay
E08/BLK	Head light (R)	E36/BLK	A/C compressor relay
E09/GRY	Front turn signal light (R)	E58/GRY	Headlight beam leveling actuator (L)
E10/GRN	Rear washer motor	E59/GRY	Headlight beam leveling actuator (R)
E11/BLU	Windshield washer motor	E62/BLK	ECM
E12/BLK	Front fog light (R)	E63/BLK	Injector harness (To D12)
E13/YEL	Forward sensor	E64/GRN	Fuel temperature & Heater
E14/BLK	Ambient temperature sensor	E65/GRY	Engine harness (To C60)
E15/BLK	Horn	E66/-	Individual circuit fuse box
E17/BLK	Radiator fan motor	E67/GRY	Main fuse box
E18/BLK	Front fog light (L)	E68/BLK	Air flow meter
E19/N	Side turn signal light (L)	E69/BLK	Injector harness (To D13)
E20/GRY	Front turn signal light (L)	E70/BLK	Back-up light switch
E21/BLK	Headlight (R)	E71/BLK	Fuel heating relay
E22/N	Front position light (L)	E72/BLU	Main relay
E25/BLK	Wheel speed sensor (FL)	E73/BLK	Glow controller
E26/GRY	Main fuse box	E76/-	Individual circuit fuse box

E: Main harness (LHD) (DSL)

S5RS0B910A008



I5RS0B910972-02

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E30/BLK	Radiator fan relay #3
E02/BRN	Brake fluid level switch	E31/BLK	Starting motor relay
E03/BLK	ABS control module	E34/BLK	Front fog light relay
E04/BLK	A/C pressure sensor	E35/BLK	Fuel pump relay
E05/BLK	Wheel speed sensor (FR)	E36/BLK	A/C compressor relay
E06/N	Side turn signal light (R)	E58/GRY	Headlight beam leveling actuator (L)
E07/N	Front position light (R)	E59/GRY	Headlight beam leveling actuator (R)
E08/BLK	Head light (R)	E62/BLK	ECM
E09/GRY	Front turn signal light (R)	E63/BLK	Injector harness (To D12)
E10/GRN	Rear washer motor	E64/GRN	Fuel temperature & Heater
E11/BLU	Windshield washer motor	E65/GRY	Engine harness (To C60)
E12/BLK	Front fog light (R)	E66/-	Individual circuit fuse box
E13/YEL	Forward sensor	E67/GRY	Main fuse box
E14/BLK	Ambient temperature sensor	E68/BLK	Air flow meter
E15/BLK	Horn	E69/BLK	Injector harness (To D13)
E17/BLK	Radiator fan motor	E70/BLK	Back-up light switch
E18/BLK	Front fog light (L)	E71/BLK	Fuel heating relay
E19/N	Side turn signal light (L)	E72/BLU	Main relay
E20/GRY	Front turn signal light (L)	E73/BLK	Glow controller
E21/BLK	Headlight (R)	E75/GRY	Main fuse box
E22/N	Front position light (L)	E76/-	Individual circuit fuse box
E25/BLK	Wheel speed sensor (FL)	E77/BLK	PTC relay #1
E26/GRY	Main fuse box	E78/BLK	PTC relay #2
E27/BRN	Main fuse box	E79/BLK	PTC relay #3

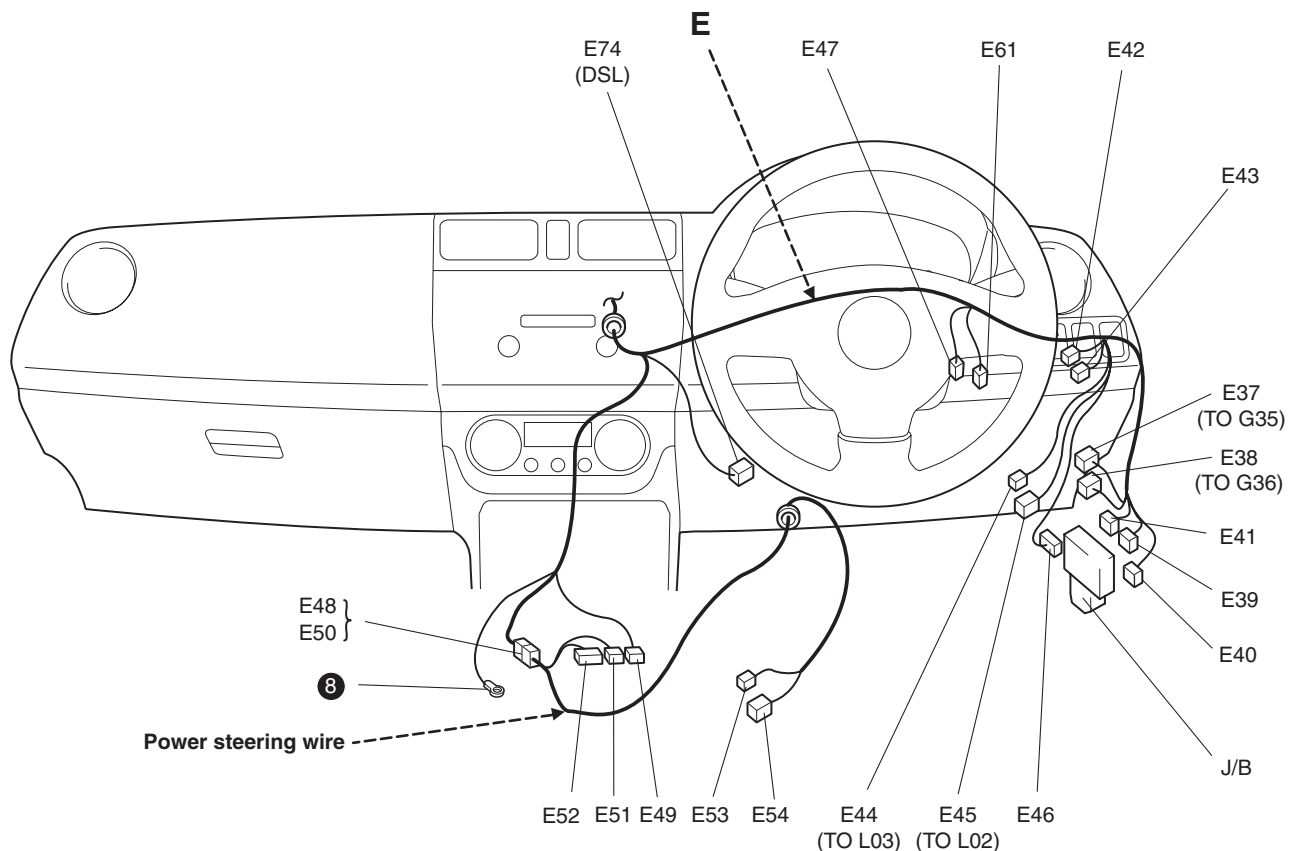
9A-19 Wiring Systems:

No./Color	Connective position	No./Color	Connective position
E28/BLK	Radiator fan relay #1	E80/-	BLANK
E29/BLK	Radiator fan relay #2	E81/-	BLANK

Instrument Panel

S5RS0B910A003

E: Main harness and power steering wire (RHD)



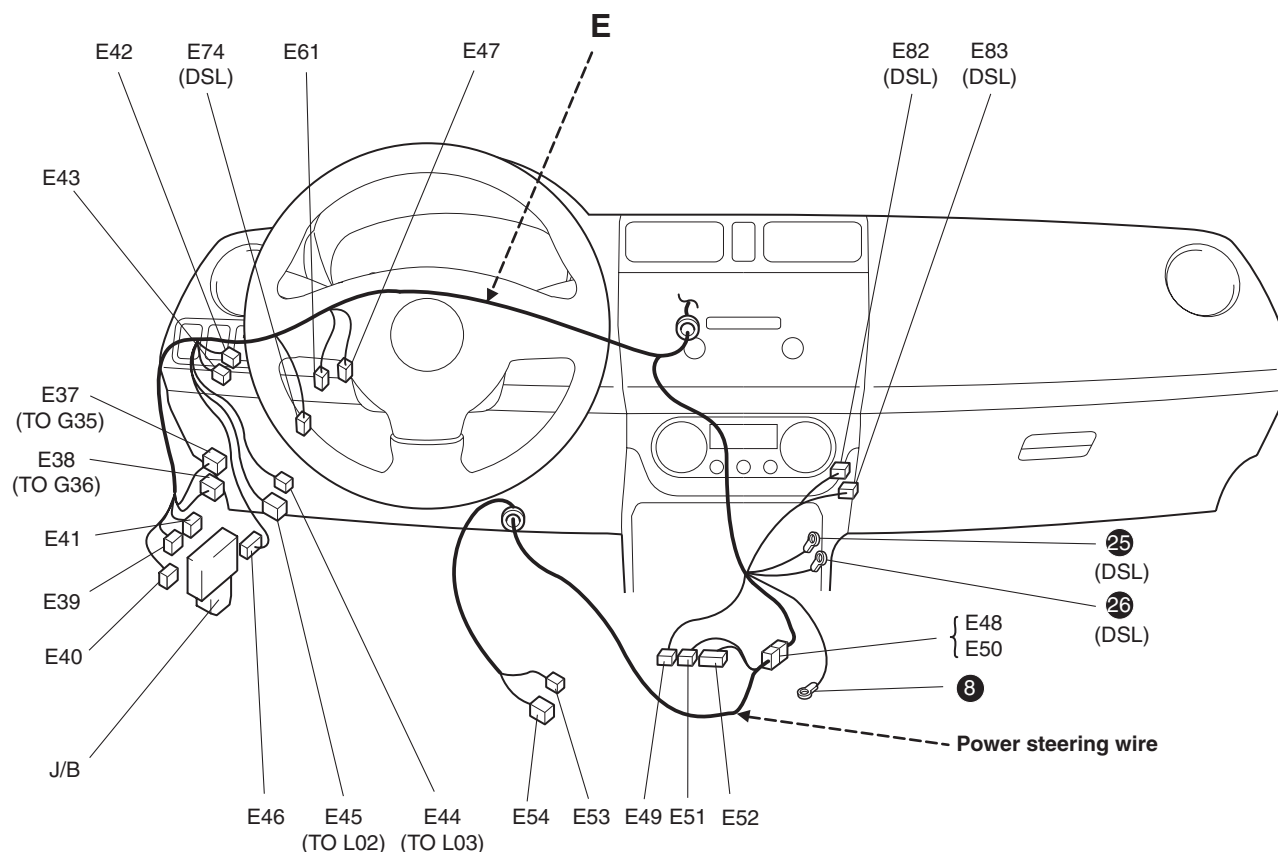
I5RS0B910905-03

E: Main harness

No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E45/N	Floor harness (To L02)
E38/N	Instrument panel harness (To G36)	E46/BLU	BCM
E39/BRN	J/B	E47/N	Brake lamp switch
E40/N	J/B	E48/BLU	Power steering wire (To E50)
E41/N	J/B	E49/BLK	P/S control module
E42/N	J/C	E61/BLK	Acceleration pedal sensor
E43/N	J/C	E74/BRN (DSL)	Clutch switch
E44/YEL	Floor harness (To L03)		

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

E: Main harness and power steering wire (LHD)

I5RS0B910906-01

E: Main harness

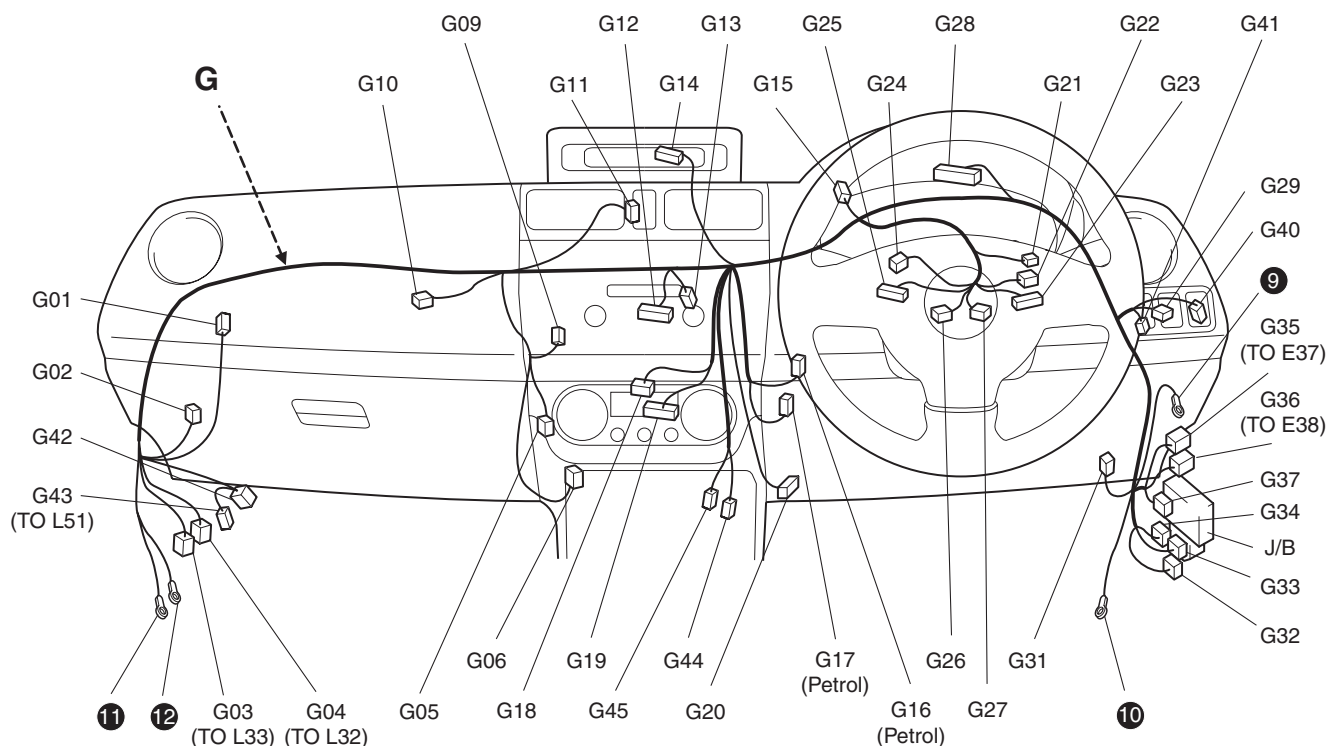
No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E46/BLU	BCM
E38/N	Instrument panel harness (To G36)	E47/N	Brake lamp switch
E39/BRN	J/B	E48/BLU	Power steering wire (To E50)
E40/N	J/B	E49/BLK	P/S control module
E41/N	J/B	E61/BLK	Acceleration pedal sensor
E42/N	J/C	E74/BRN (DSL)	Clutch switch
E43/N	J/C	E82/N (DSL)	PTC heater #1
E44/YEL	Floor harness (To L03)	E83/N (DSL)	PTC heater #2, 3
E45/N	Floor harness (To L02)		

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

9A-21 Wiring Systems:

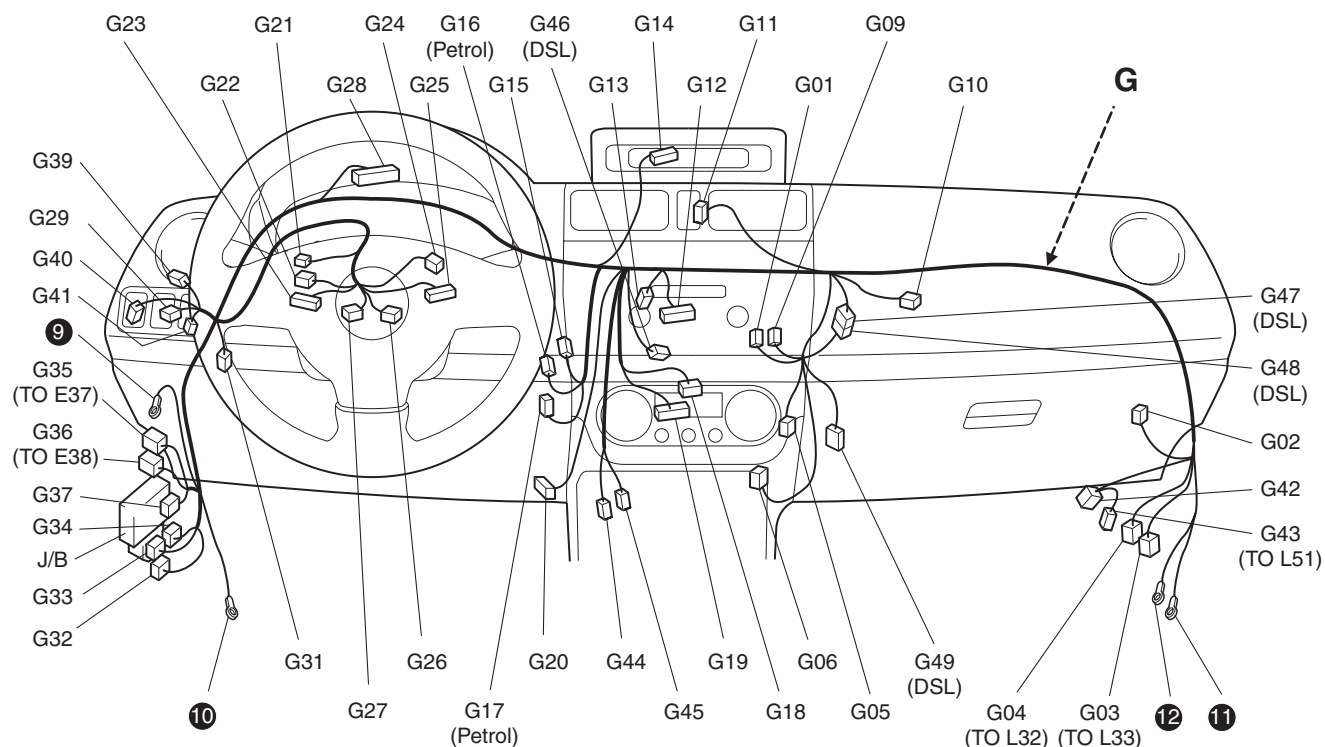
G: Instrument panel harness (RHD)



I5RS0B910907-04

G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/YEL	Fresh / Recircle actuator	G23/BLK	COMB switch
G02/N	Keyless receiver	G24/BLK	ICM
G03/N	Floor harness (To L33)	G25/N	COMB switch
G04/YEL	Floor harness (To L32)	G26/YEL	Driver inflator
G05/N	Blower fan motor	G27/N	COMB switch
G06/N	Heater resister	G28/GRY	COMB meter
G09/N	EVAP thermistor	G29/GRN	Front fog light switch
G10/BLK	Passenger inflator	G31/N	J/C
G11/N	Hazard switch	G32/N	J/B
G12/BLU	Audio	G33/N	J/B
G13/N	Navigation	G34/N	J/B
G14/GRN	Multi information display	G35/GRY	Main harness (To E37)
G15/GRY	J/C	G36/N	Main harness (To E38)
G16/BLU (Petrol)	J/C	G37/BLU	BCM
G17/N (Petrol)	J/C	G40/N	Headlight leveling switch
G18/GRN	Mode control switch	G41/GRY	ILL cancel switch
G19/BRN	Heater fan switch	G42/N	Smart ECM
G20/BLK	Data link connector	G43/GRY	Floor harness (To L51)
G21/N	IG switch	G44/BLK	Cigar lighter
G22/N	Main switch (Key switch)	G45/BLK	Cigar lighter ILL

G: Instrument panel harness (LHD)

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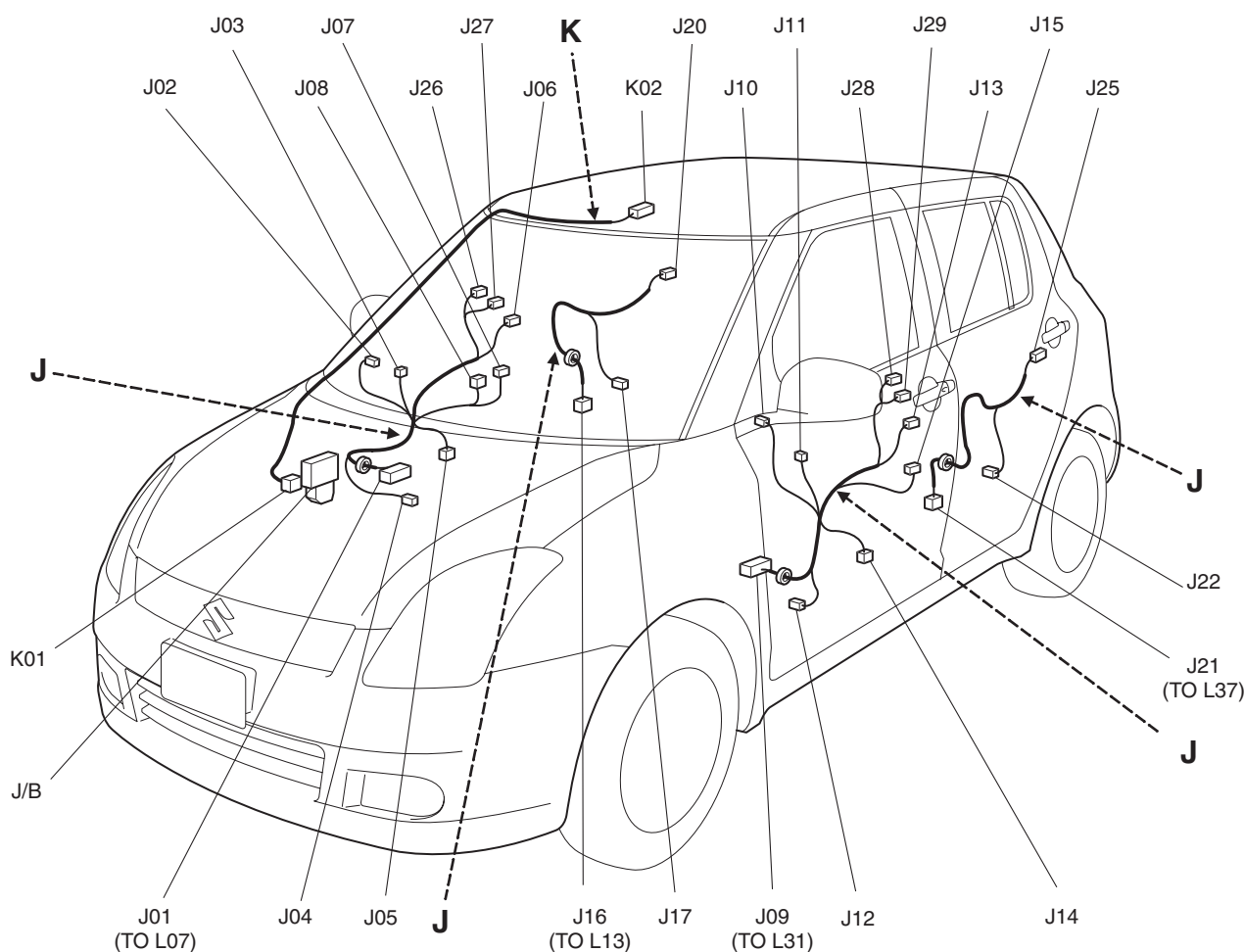
G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/YEL	Fresh / Recirculate actuator	G26/YEL	Driver inflator
G02/N	Keyless receiver	G27/N	COMB switch
G03/N	Floor harness (To L33)	G28/GRY	COMB meter
G04/YEL	Floor harness (To L32)	G29/GRN	Front fog light switch
G05/N	Blower fan motor	G31/N	J/C
G06/N	Heater resistor	G32/N	J/B
G09/N	EVAP thermistor	G33/N	J/B
G10/YEL	Passenger inflator	G34/N	J/B
G11/N	Hazard switch	G35/GRY	Main harness (To E37)
G12/BLU	Audio	G36/N	Main harness (To E38)
G13/N	Navigation	G37/BLU	BCM
G14/GRN	Multi information display	G39/N	DRL controller
G15/GRY	J/C	G40/N	Headlight leveling switch
G16/BLU (Petrol)	J/C	G41/GRY	ILL cancel switch
G17/N (Petrol)	J/C	G42/N	Smart ECM
G18/GRN	Mode control switch	G43/GRY	Floor harness (To L51)
G19/BRN	Heater fan switch	G44/BLK	Cigar lighter
G20/BLK	Data link connector	G45/BLK	Cigar lighter ILL
G21/N	IG switch	G46/N (DSL)	Max hot switch
G22/N	Main switch (Key switch)	G47/N (DSL)	Instrument panel harness (To G48)
G23/BLK	COMB switch	G48/N (DSL)	Instrument panel harness (To G47)
G24/BLK	ICM	G49/N (DSL)	PTC control module
G25/N	COMB switch		

Door, Roof

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J: Front and rear door wire and rear door joint wire / K: Roof wire (RHD)



I4RS0B910910-03

J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L07)	J06/N	Front door lock switch (Driver side)
J02/BLK	Tweeter (Driver side)	J07/N	Power mirror switch (Driver side)
J03/N	Power mirror motor (Driver side)	J08/BLU	Power window main switch
J04/N	Front speaker (Driver side)	J26/N	Door antenna (Driver side)
J05/GRY	Front power window motor (Driver side)	J27/N	Request switch (Driver side)

J: Front door wire (Passenger side)

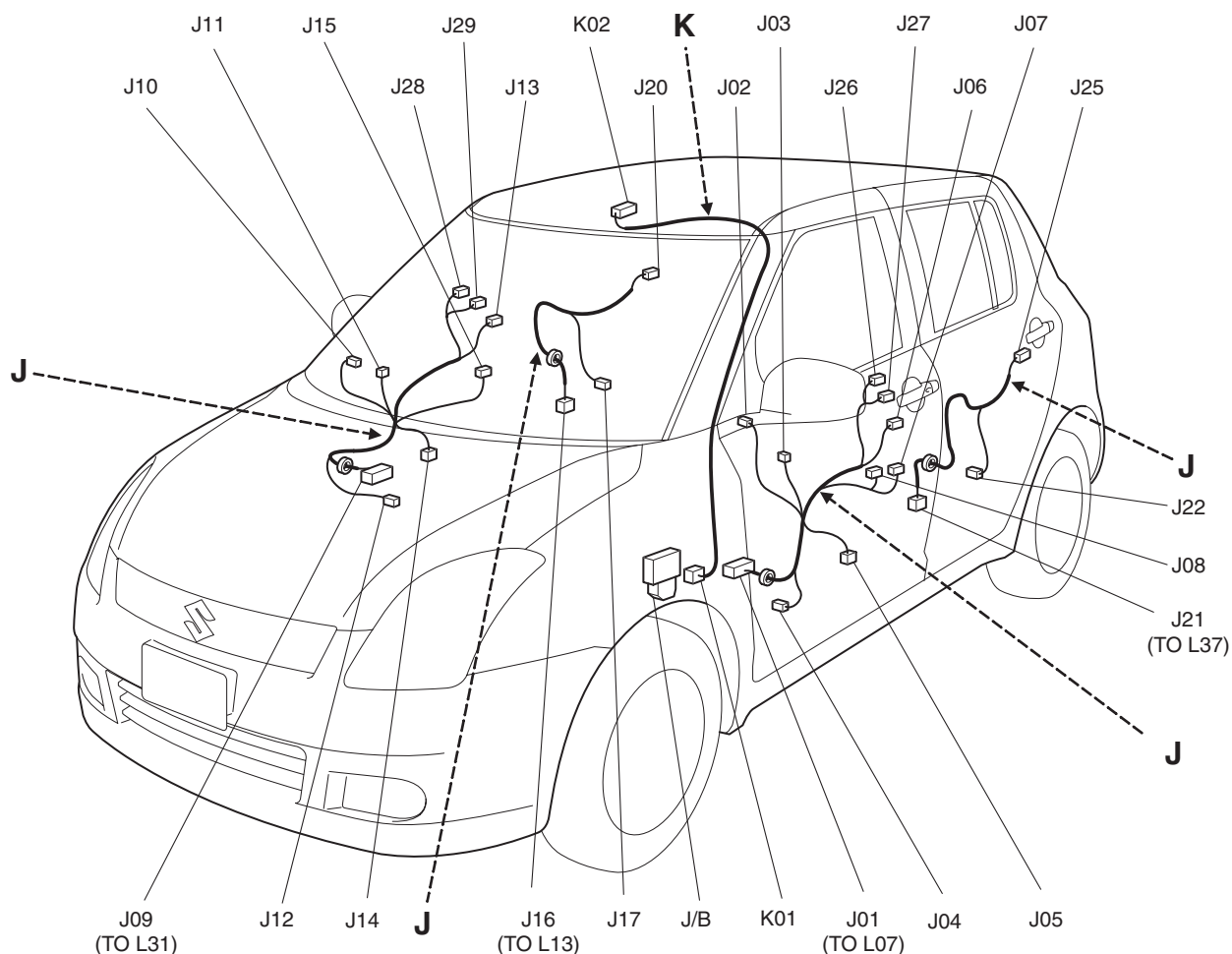
No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J14/GRY	Front power window motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J15/N	Power window sub switch
J11/N	Power mirror motor (Passenger side)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (Passenger side)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

J: Front and rear door wire and rear door joint wire / K: Roof wire (LHD)

I4RS0B910911-03

J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L07)	J06/N	Front door lock switch (Driver side)
J02/BLK	Tweeter (Driver side)	J07/N	Power mirror switch (Driver side)
J03/N	Power mirror motor (Driver side)	J08/BLU	Power window main switch
J04/N	Front speaker (Driver side)	J26/N	Door antenna (Driver side)
J05/GRY	Front power window motor (Driver side)	J27/N	Request switch (Driver side)

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J14/GRY	Front power window motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J15/N	Power window sub switch
J11/N	Power mirror motor (Passenger side)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (Passenger side)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

K: Roof wire

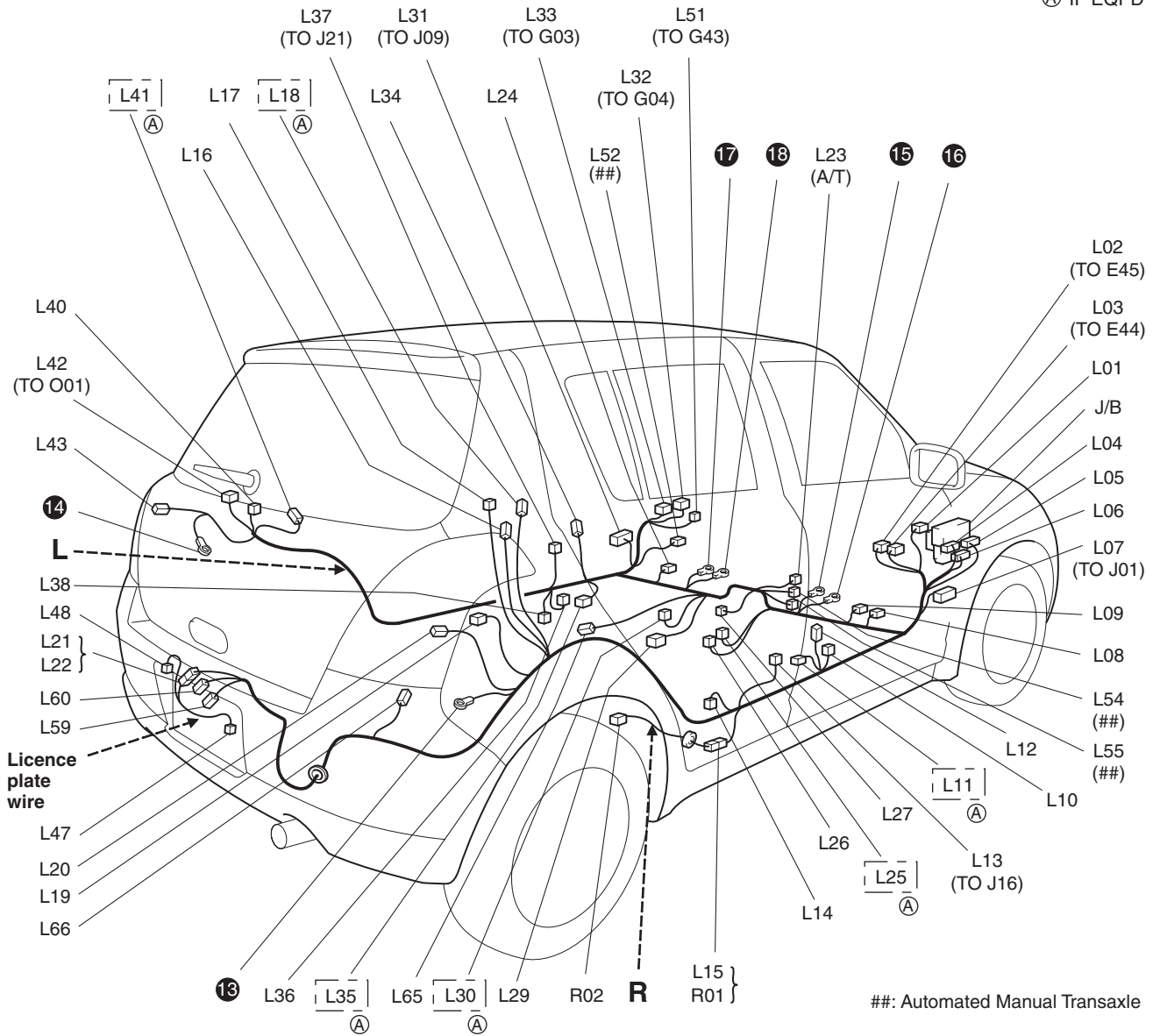
No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

Floor

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L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (RHD, 5dr)

Ⓐ IF EQPD



I5RS0B910909-03

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L27/BLK	Parking brake switch
L02/N	Main harness (To E45)	L29/PNK	A/B SDM
L03/YEL	Main harness (To E44)	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L04/YEL	J/B	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L05/N	J/B	L31/N	Front door wire (Passenger side) (To J09)
L06/N	J/B	L32/YEL	Instrument panel harness (To G04)
L07/N	Front door wire (Driver side) (To J01)	L33/N	Instrument panel harness (To G03)
L08/N	J/C	L34/N	Front door switch (Passenger side)
L09/N	J/C	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L10/BLK	Pretensioner (Driver side)	L36/BLK	Pretensioner (Passenger side)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L37/N	Rear door wire (L) (To J21)
L12/N	Front door switch (Driver side)	L38/N	Wheel speed sensor (RL)
L13/N	Rear door wire (R) (To J16)	L40/N	Rear door switch (L)
L14/N	Wheel speed sensor (RR)	L41/BLK (IF EQPD)	Side curtain air-bag (L)
L15/GRY	Fuel pump wire (To R01)	L42/N	Rear end door wire (To O01)
L16/N	Rear door switch (R)	L43/N	Rear combination lamp (L)
L17/N	High mounted stop lamp	L51/GRY	Instrument panel harness (To G43)
L18/BLK (IF EQPD)	Side curtain air-bag (R)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L19/GRY	Luggage compartment light	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L20/N	Rear combination lamp (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L21/N	License plate wire (To L22)	L59/GRY	Rear end antenna
L23/N (A/T)	A/T shift lever	L60/GRY	Rear fog light
L24/GRY	J/C	L65/BRN	Inside antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L66/BRN	Luggage antenna
L26/N	Seat belt switch		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

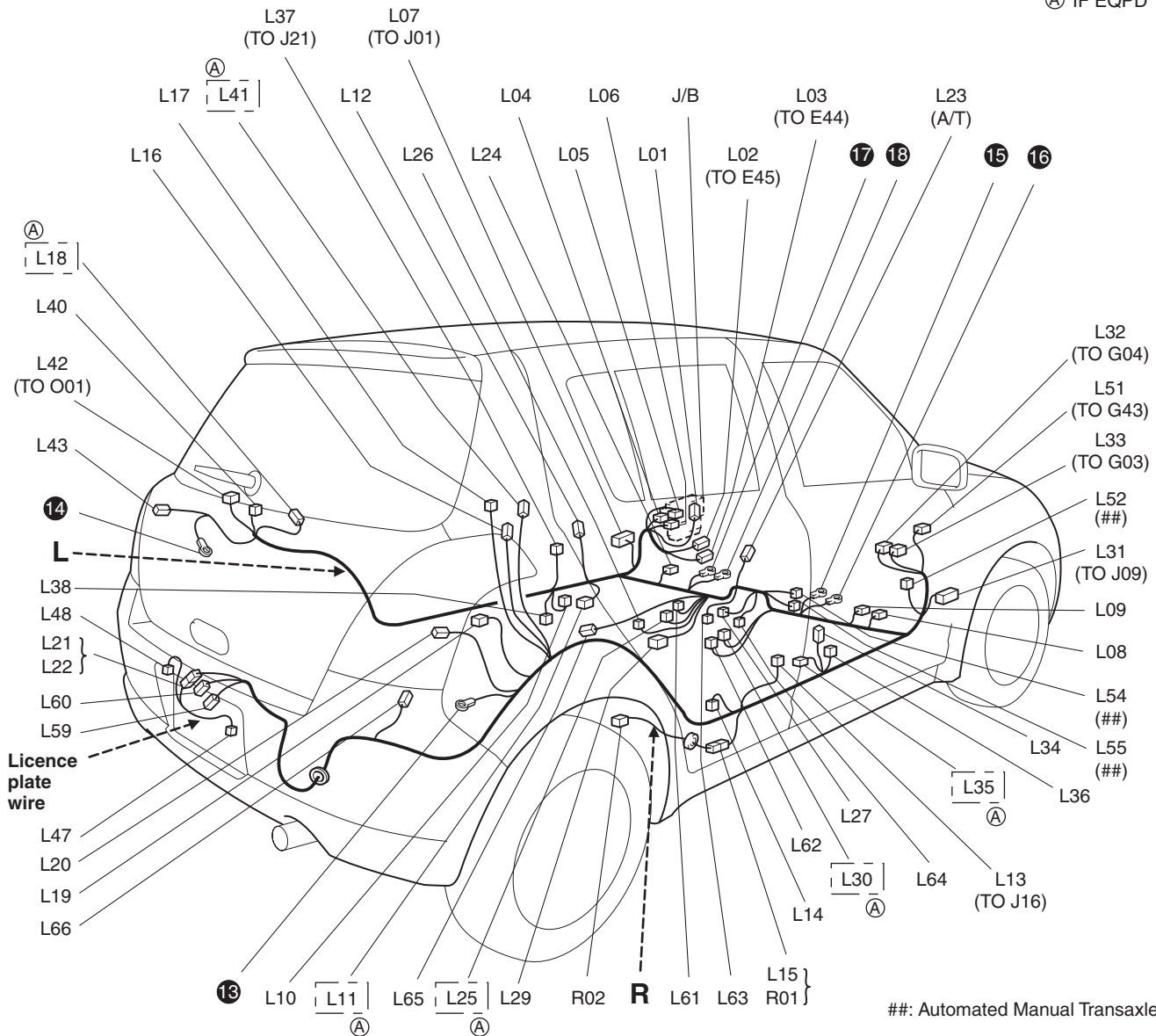
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

9A-27 Wiring Systems:

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (LHD, 5dr)

Ⓐ IF EQPD



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L02/N	Main harness (To E45)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L03/YEL	Main harness (To E44)	L31/N	Front door wire (Passenger side) (To J09)
L04/YEL	J/B	L32/YEL	Instrument panel harness (To G04)
L05/N	J/B	L33/N	Instrument panel harness (To G03)
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L08/N	J/C	L36/BLK	Pretensioner (Passenger side)
L09/N	J/C	L37/N	Rear door wire (L) (To J21)
L10/BLK	Pretensioner (Driver side)	L38/N	Wheel speed sensor (RL)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L40/N	Rear door switch (L)
L12/N	Front door switch (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (L)
L13/N	Rear door wire (R) (To J16)	L42/N	Rear end door wire (To O01)
L14/N	Wheel speed sensor (RR)	L43/N	Rear combination lamp (L)
L15/GRY	Fuel pump wire (To R01)	L51/GRY	Instrument panel harness (To G43)
L16/N	Rear door switch (R)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L17/N	High mounted stop lamp	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L18/BLK (IF EQPD)	Side curtain air-bag (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L19/GRY	Luggage compartment light	L59/GRY	Rear end antenna
L20/N	Rear combination lamp (R)	L60/GRY	Rear fog light
L21/N	License plate wire (To L22)	L61/N	Seat heater (Driver side) and seat belt switch
L23/N (A/T)	A/T shift lever	L62/N	Seat heater (Passenger side)
L24/GRY	J/C	L63/YEL	Seat heater switch (Driver side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L64/GRN	Seat heater switch (Passenger side)
L26/N	Seat belt switch	L65/BRN	Inside antenna
L27/BLK	Parking brake switch	L66/BRN	Luggage antenna
L29/PNK	A/B SDM		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/PNK	A/B SDM
L02/N	Main harness (To E45)	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L03/YEL	Main harness (To E44)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L04/YEL	J/B	L31/N	Front door wire (Passenger side) (To J09)
L05/N	J/B	L32/YEL	Instrument panel harness (To G04)
L06/N	J/B	L33/N	Instrument panel harness (To G03)
L07/N	Front door wire (Driver side) (To J01)	L34/N	Front door switch (Passenger side)
L08/N	J/C	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L09/N	J/C	L36/BLK	Pretensioner (Passenger side)
L10/BLK	Pretensioner (Driver side)	L38/N	Wheel speed sensor (RL)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L12/N	Front door switch (Driver side)	L42/N	Rear end door wire (To O01)
L14/N	Wheel speed sensor (RR)	L43/N	Rear combination lamp (L)
L15/GRY	Fuel pump wire (To R01)	L51/GRY	Instrument panel harness (To G43)
L17/N	High mounted stop lamp	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L19/GRY	Luggage compartment light	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L20/N	Rear combination lamp (R)	L59/GRY	Rear end antenna
L21/N	License plate wire (To L22)	L60/GRY	Rear fog light
L23/N (A/T)	A/T shift lever	L65/BRN	Inside antenna
L24/GRY	J/C	L66/BRN	Luggage antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L67/N	Rear speaker (R)
L26/N	Seat belt switch	L68/N	Rear speaker (L)
L27/BLK	Parking brake switch		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

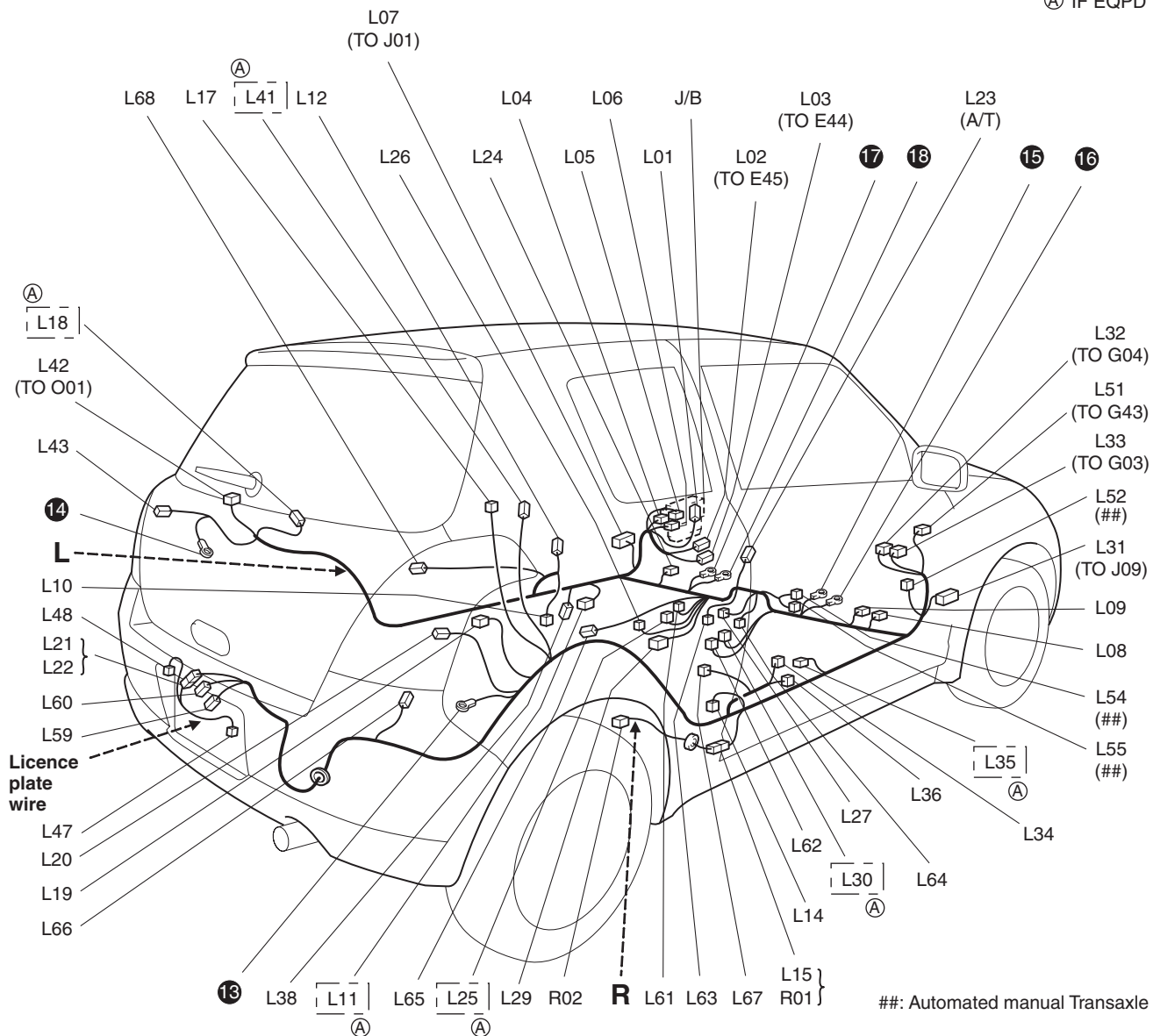
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

9A-31 Wiring Systems:

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (LHD, 3dr)

Ⓐ IF EQPD



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L02/N	Main harness (To E45)	L31/N	Front door wire (Passenger side) (To J09)
L03/YEL	Main harness (To E44)	L32/YEL	Instrument panel harness (To G04)
L04/YEL	J/B	L33/N	Instrument panel harness (To G03)
L05/N	J/B	L34/N	Front door switch (Passenger side)
L06/N	J/B	L35/N (IF EQPD)	Side air- bag sensor (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L36/BLK	Pretensioner (Passenger side)
L08/N	J/C	L38/N	Wheel speed sensor (RL)
L09/N	J/C	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L10/BLK	Pretensioner (Driver side)	L42/N	Rear end door wire (To O01)
L11/N (IF EQPD)	Side air-bag sensor (Driver side)	L43/N	Rear combination lamp (L)
L12/N	Front door switch (Driver side)	L51/GRY	Instrument panel harness (To G43)
L14/N	Wheel speed sensor (RR)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L15/GRY	Fuel pump wire (To R01)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L17/N	High mounted stop lamp	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L59/GRY	Rear end antenna
L19/GRY	Luggage compartment light	L60/GRY	Rear fog light
L20/N	Rear combination lamp (R)	L61/N	Seat heater (Driver side) and seat belt switch
L21/N	License plate wire (To L22)	L62/N	Seat heater (Passenger side)
L23/N (A/T)	A/T shift lever	L63/YEL	Seat heater switch (Driver side)
L24/GRY	J/C	L64/GRN	Seat heater switch (Passenger side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L65/BRN	Inside antenna
L26/N	Seat belt switch	L66/BRN	Luggage antenna
L27/BLK	Parking brake switch	L67/N	Rear speaker (R)
L29/PNK	A/B SDM	L68/N	Rear speaker (L)
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM		

L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

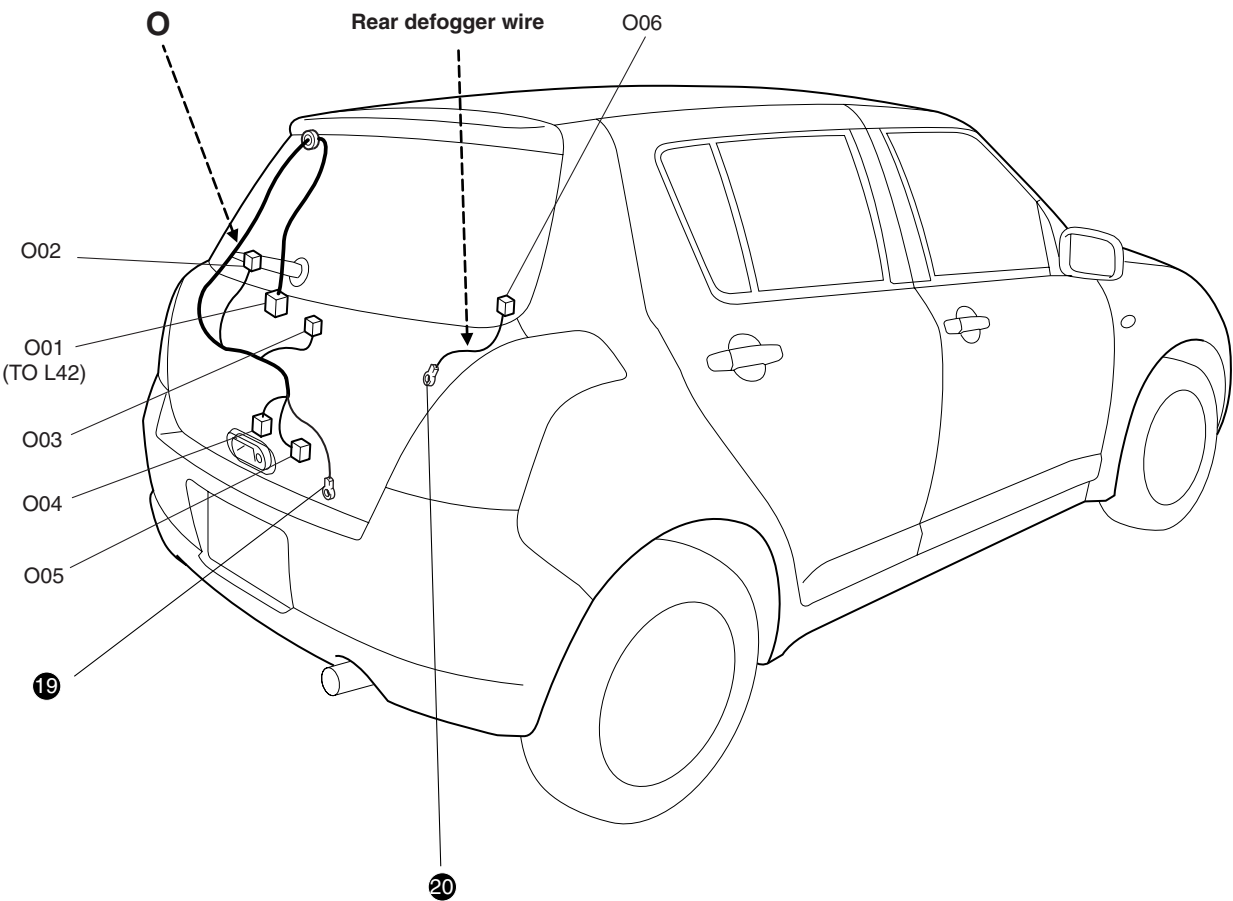
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

Rear

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O: Rear end door harness, Rear defogger wire



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O: Rear end door harness

No./Color	Connective position	No./Color	Connective position
O01/N	Floor harness (To L42)	O04/N	Rear end door lock solenoid
O02/BLK	Rear defogger (+)	O05/GRN	Rear end door lock switch
O03/N	Rear wiper motor		

O: Rear defogger wire

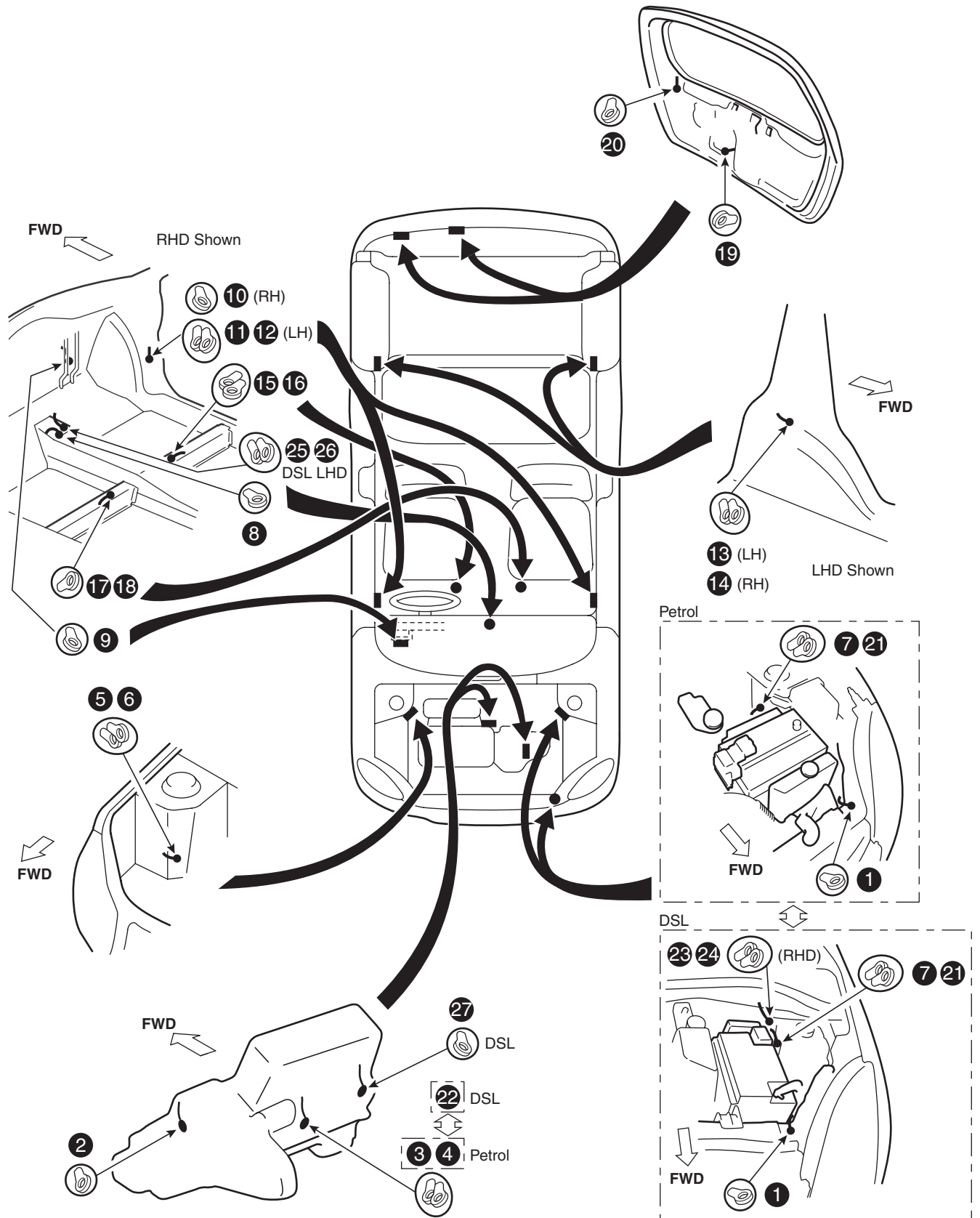
No./Color	Connective position	No./Color	Connective position
O06/BLK	Rear defogger (-)		

Ground Point

Ground (earth) Point

Refer to "Connector Layout Diagram: ".

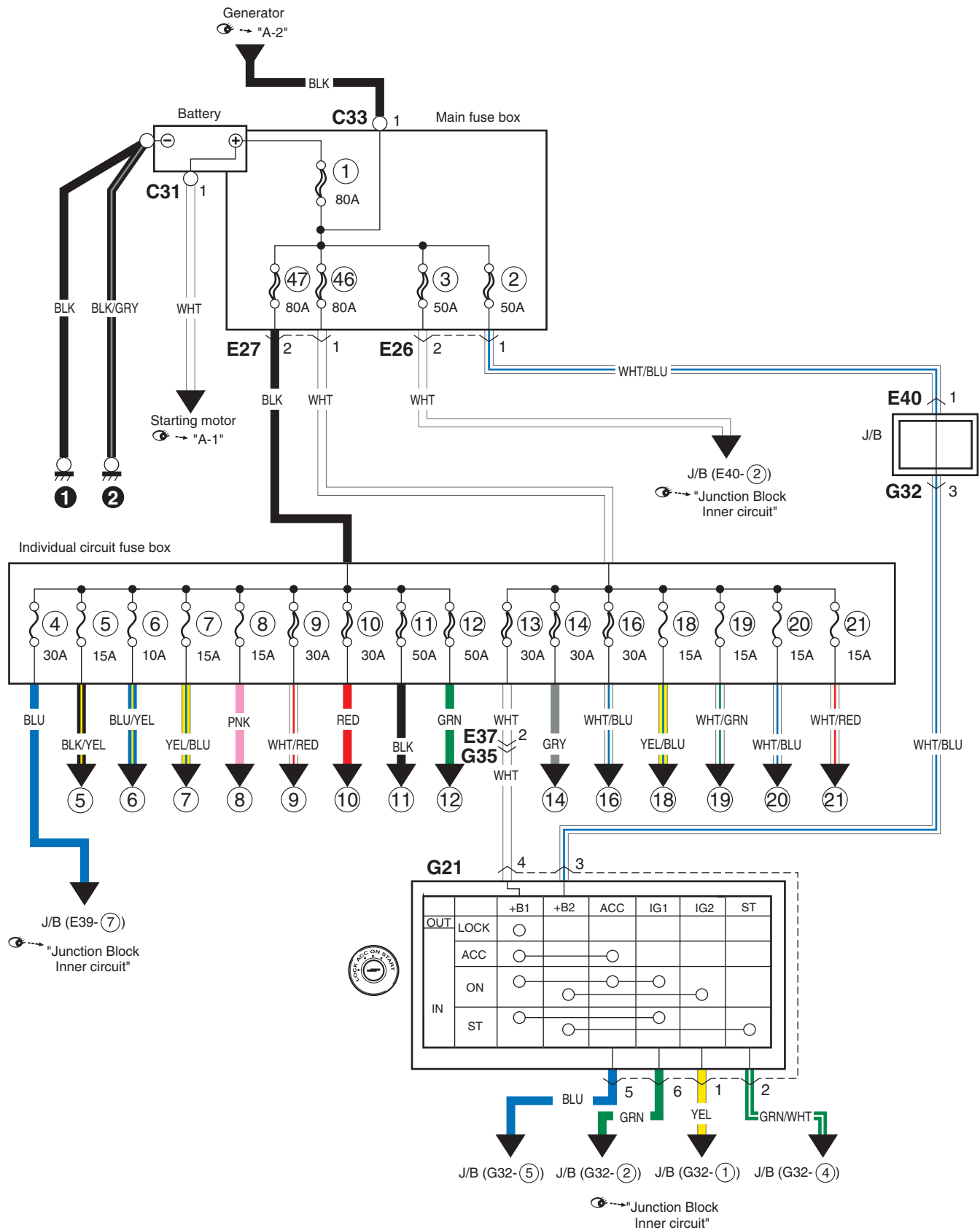
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Power Supply Diagram

Power Supply Diagram (Petrol)

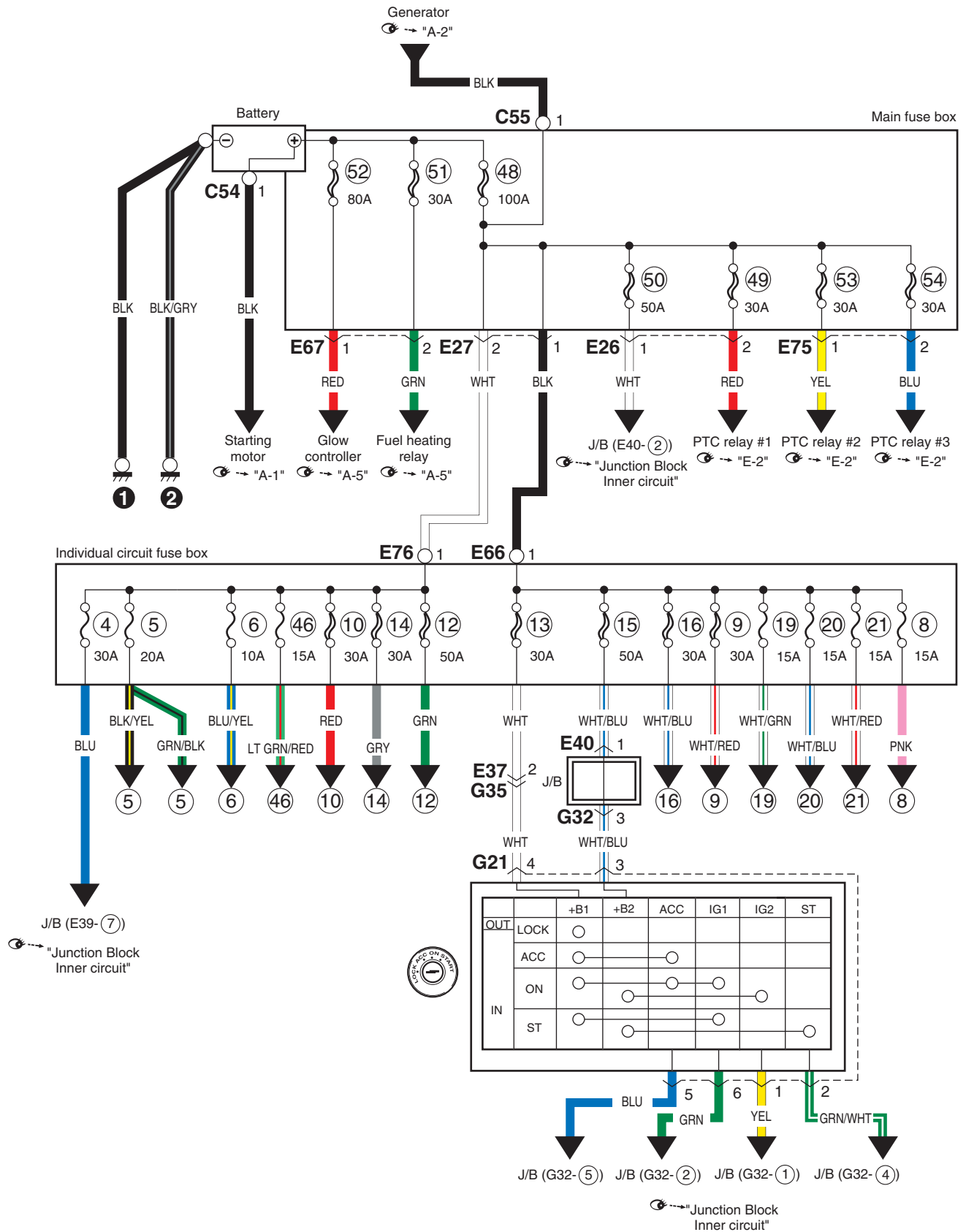
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Power Supply Diagram (DSL)

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I5RS0B910915-02

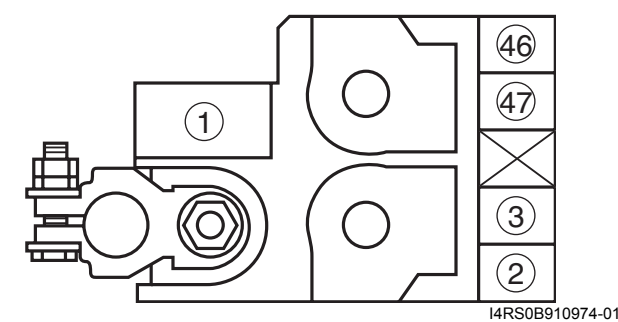
Fuses and the Protected Parts

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The chart below describes what parts each fuse protects.

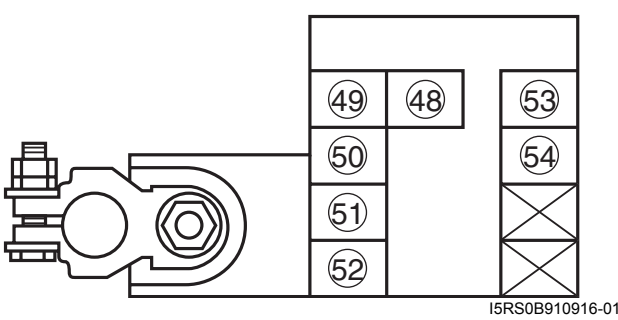
Fuses in Main Fuse Box (Petrol)

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Fuses in Main Fuse Box (DSL)

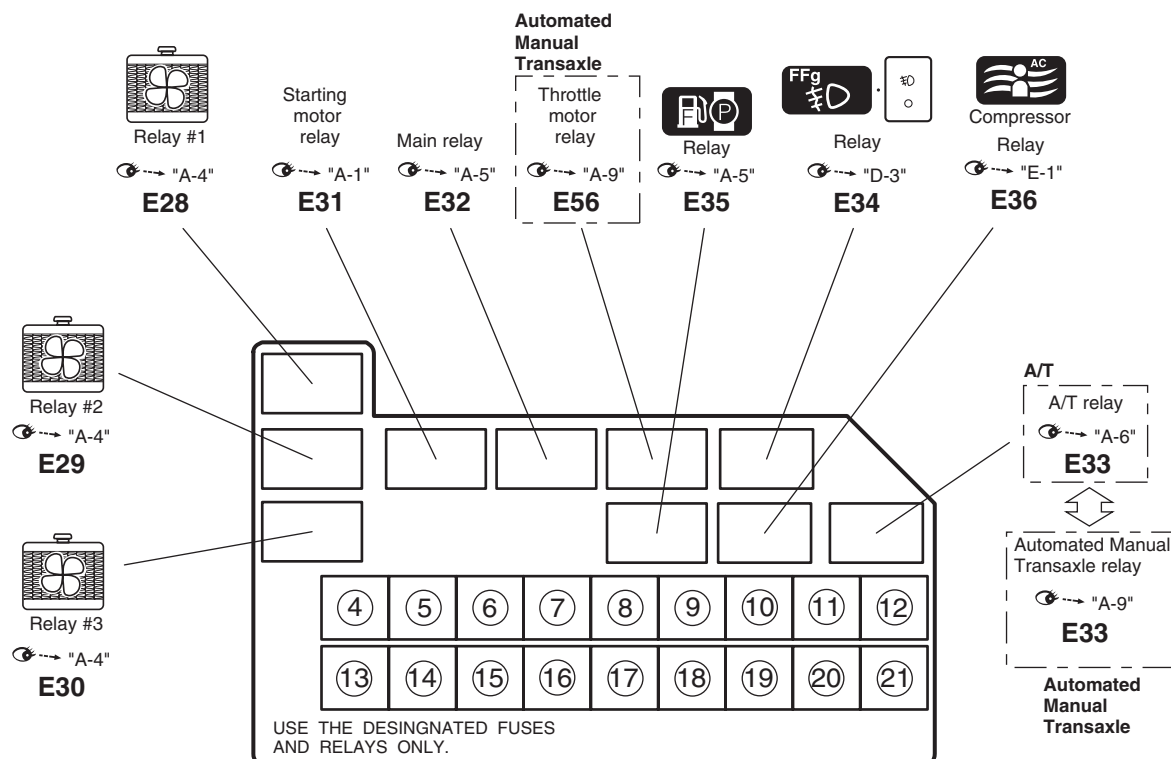
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No.	Fuse	Protected circuit
①	80 A	All electric circuit Battery Generator
②	50 A	LAMP
③	50 A	IG switch Supplementary fuse box No.2 (In J/B)
④⑥	80 A	Individual circuit fuse box
④⑦	80 A	Individual circuit fuse box
④⑧	100 A	All electric circuit Battery Generator
④⑨	30 A	PTC relay
⑤⑩	50 A	Supplementary fuse box No.2 (In J/B)
⑤⑪	30 A	Fuel heating relay
⑤⑫	80 A	Glow controller
⑤⑬	30 A	PTC relay
⑤⑭	30 A	PTC relay

Individual Circuit Fuse Box No. 1 (Petrol)

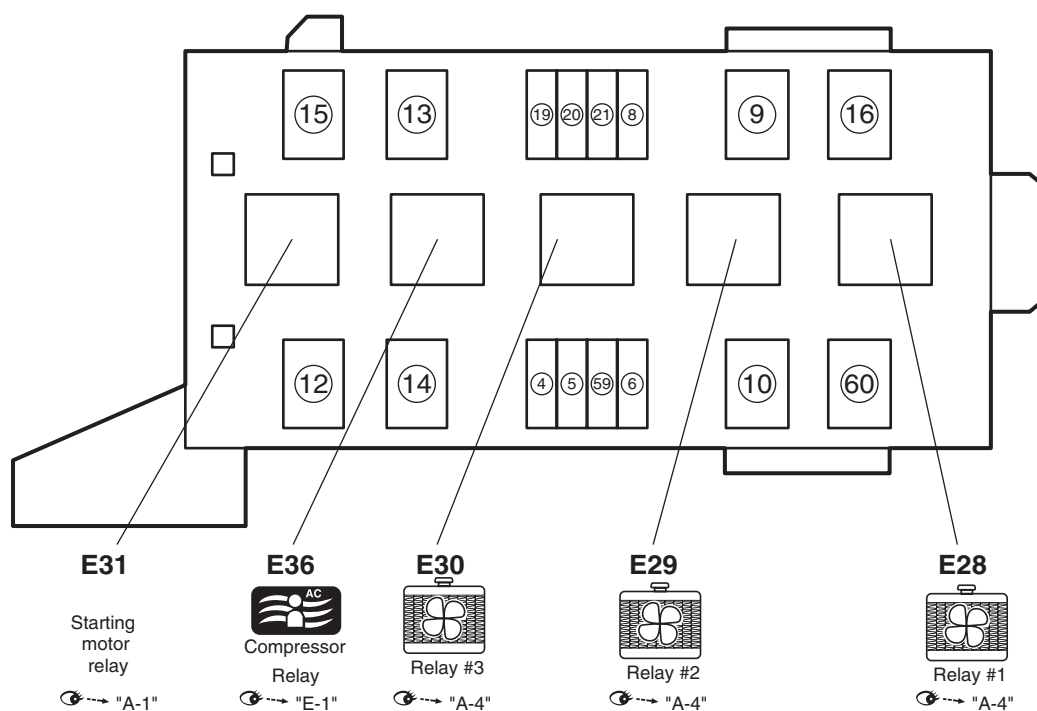
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Individual Circuit Fuse Box No. 1 (DSL)

S5RS0B910D011



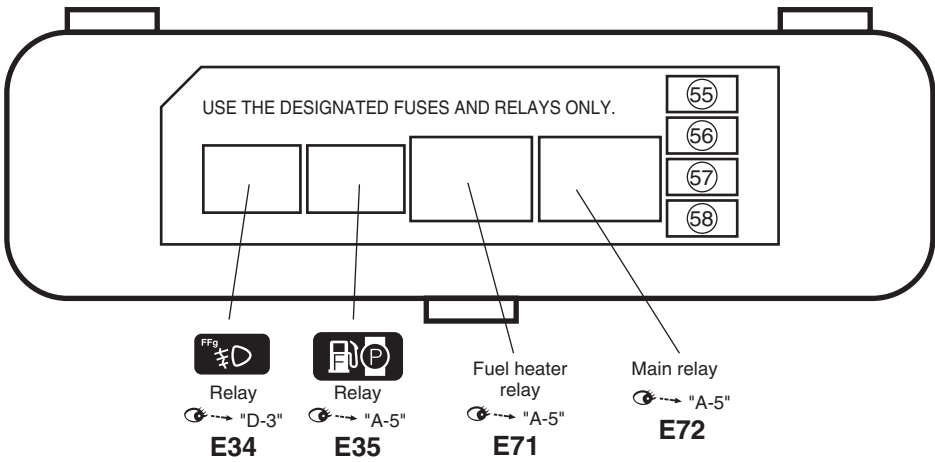
I5RS0B910917-02

No.	Fuse	Description on the cover	Protected circuit
④	30 A	HTR FAN	Heater relay
⑤	20 A	FI	Main relay
⑥	10 A	A/C CPRSR	A/C compressor relay
⑦	15 A	AT ETM	A/T relay
⑧	15 A	STOP LAMP	Brake light switch
⑨	30 A	ABS MOT	ABS control module
⑩	30 A	ST MOT	Starting motor relay
⑪	50 A	MTA	Automated Manual Transaxle relay
⑫	50 A	EPS	Power steering control module
⑬	30 A	IG ACC	IG switch
⑭	30 A	RDTR FAN	Radiator fan relay #1
			Radiator fan relay #2
			Radiator fan relay #3
⑮	50 A	IG	IG switch
⑯	30 A	ABS SOL	ABS control module
⑰	BLANK	BLANK	BLANK
⑱	15 A	THR MOT	Throttle motor relay
⑲	15 A	FR FOG	Front fog light relay
⑳	15 A	H/L L	Headlight (L)
㉑	15 A	H/L R	Headlight (R)
⑤⑨	15 A	FUEL PUMP	Fuel pump relay
⑥⑩	BLANK	BLANK	BLANK

“MTA” is shown on the fuse box cover for the Automated Manual Transaxle.

Individual Circuit Fuse Box No. 3 (DSL)

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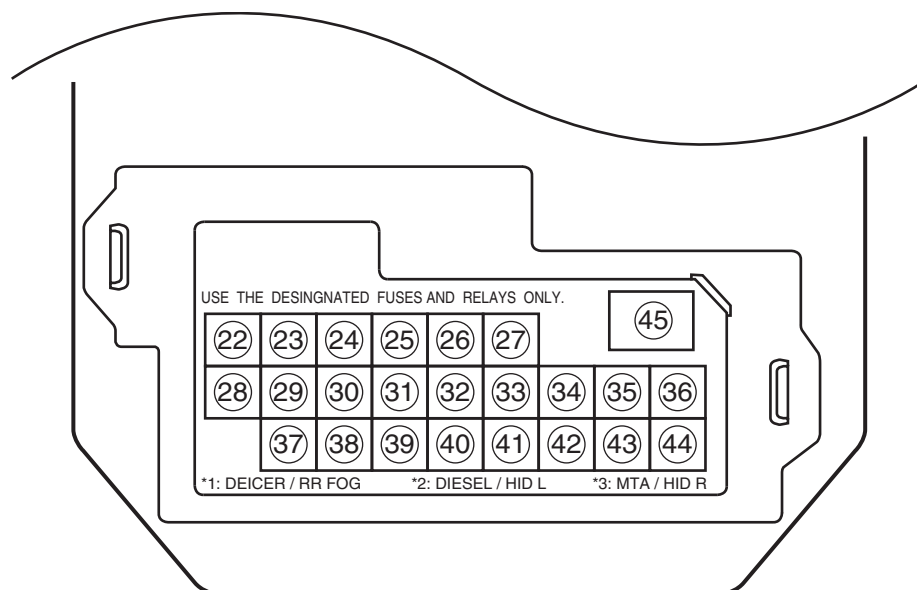


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No.	Fuse	Description on the cover	Protected circuit
⑤⑤	BLANK	BLANK	BLANK
⑤⑥	BLANK	BLANK	BLANK
⑤⑦	BLANK	BLANK	BLANK
⑤⑧	BLANK	BLANK	BLANK

Individual Circuit Fuse Box No. 2 (In J/B)

S5RS0B910D005



I5RS0B910919-02

No.	Fuse	Description on the cover	Protected circuit
②②	BLANK	BLANK	BLANK
②③	15 A	IG COIL	ECM Fuel pump relay Generator Heated oxygen relay #1 Heated oxygen relay #2 ICM IG coil #1 IG coil #2 Glow controller Fuel heating relay Clutch switch A/C compressor relay Air flow meter
②④	10 A	BACK	Back-up light switch (M/T) Fresh / Recirculate actuator Mode control switch A/C Panel (Auto / Manual) Transaxle range sensor (A/T) Headlight beam leveling actuator (L) Headlight beam leveling actuator (R) Headlight leveling switch Smart ECM PTC control module
②⑤	10 A	METER	BCM COMB meter Flasher relay
②⑥	15 A	ACC 1	BCM Power mirror
②⑦	15 A	ACC 2	Cigar lighter Audio Multi information display Smart ECM

9A-41 Wiring Systems:

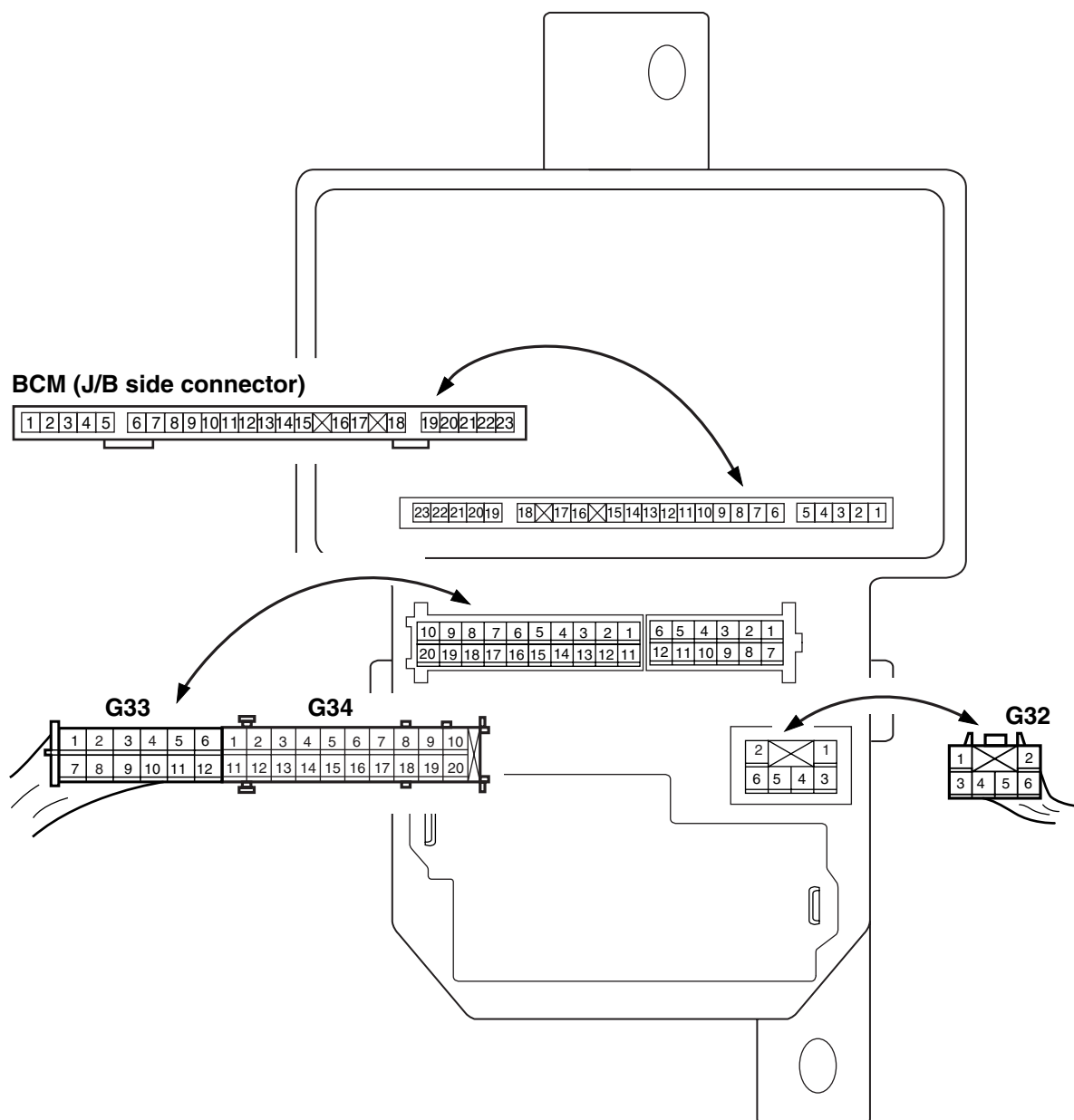
No.	Fuse	Description on the cover	Protected circuit
⑳	15 A	WIPER	COMB switch
			Rear washer motor
			Rear wiper motor
			Rear wiper relay
			Windshield washer motor
			Windshield wiper motor
			DRL controller
㉑	10 A	IG1 SIG	A/T relay (A/T)
			Power steering control module
			Automated Manual Transaxle control module
			Brake light switch
㉒	15 A	A/BAG	A/B SDM
㉓	10 A	ABS	ABS control module
㉔	10 A	TAIL	COMB switch
㉕	BLANK	BLANK	BLANK
㉖	20 A	D/L	BCM
㉗	10 A	(*2 DIESEL / HID L)	ECM
			ICM
㉘	10 A	ST SIG	Starting motor relay
			Neutral switch
㉙	15 A	SEAT HTR	Seat heater switch (Driver side)
			Seat heater switch (Passenger side)
㉚	10 A	IG2 SIG	Heater relay
㉛	15 A	(*1 DEICER / RR FOG)	Rear fog light switch
㉜	15 A	RADIO	Audio
			BCM
			COMB meter
			DLC
			ECM
			Interior light
			Luggage compartment light
			Main switch (Key switch)
			Multi information display
			TCM
			Smart ECM
			Rear defogger relay
			Horn relay
㉝	15 A	HAZ-HORN	Flasher relay
			Automated Manual Transaxle control module
㉞	10 A	(*3 MTA / HID R)	Automated Manual Transaxle shift lever switch
㉟	20 A	P/WT	BLANK
㊱	30 A	P/W	Front power window main switch
			Front power window sub switch
			Rear power window sub switch (R)
			Rear power window sub switch (L)

“MTA” is shown on the fuse box cover for the Automated Manual Transaxle.

Junction Block (J/B) Connector / Fuse Layout

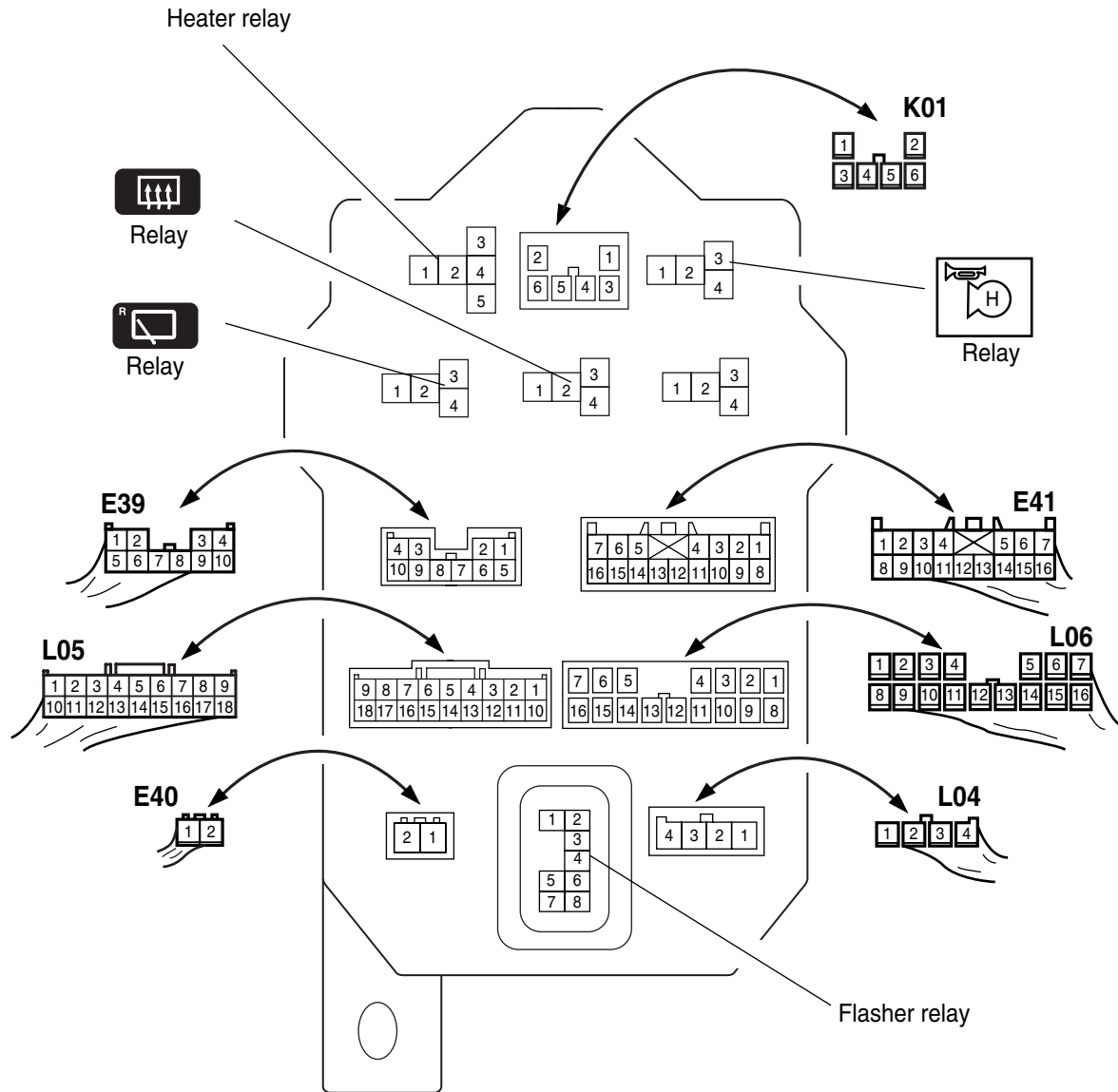
S5RS0B910D006

BCM side



I4RS0A910908-01

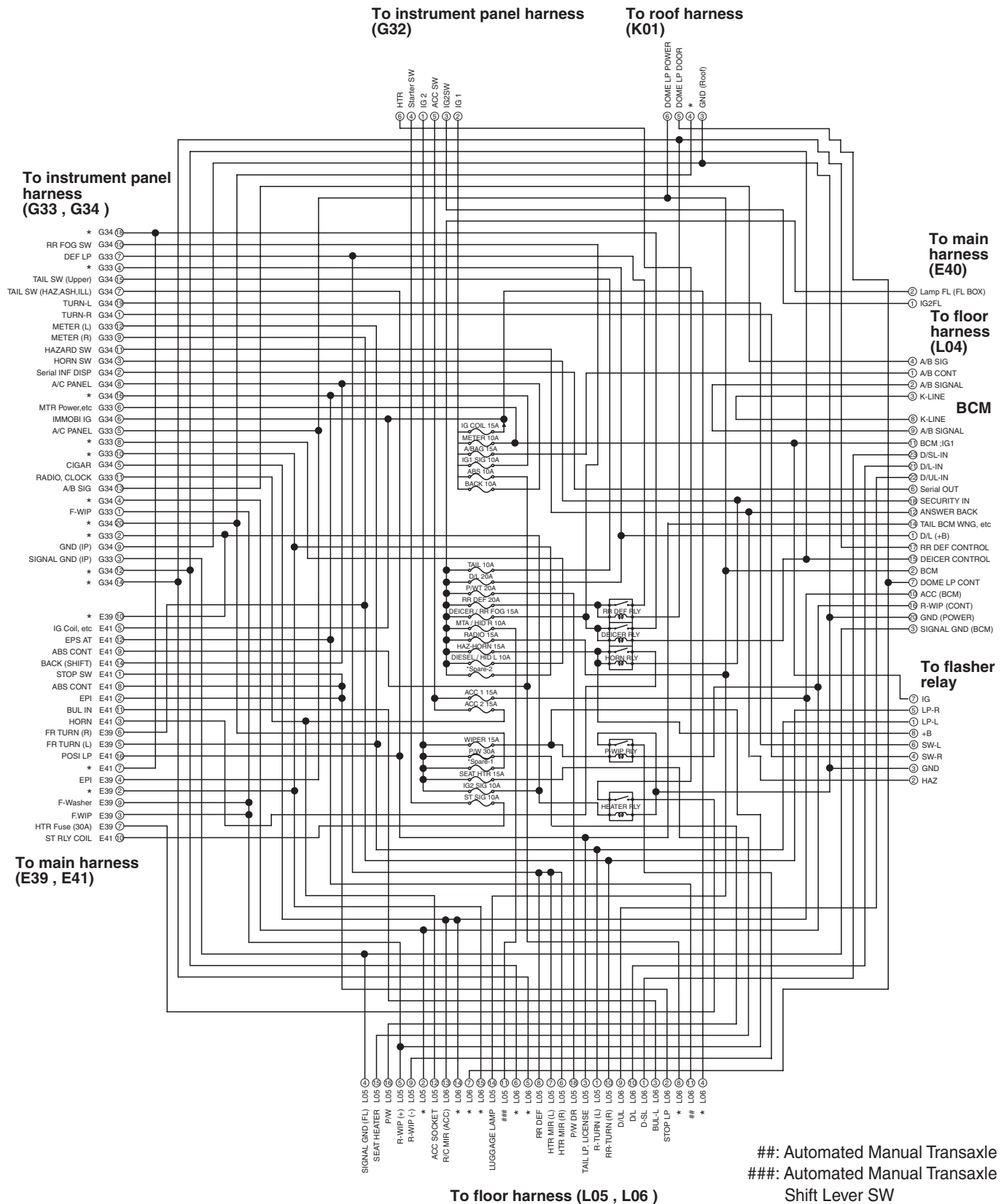
Fuse side



Junction Block Inner Circuit (Overview)

S5RS0B910D007

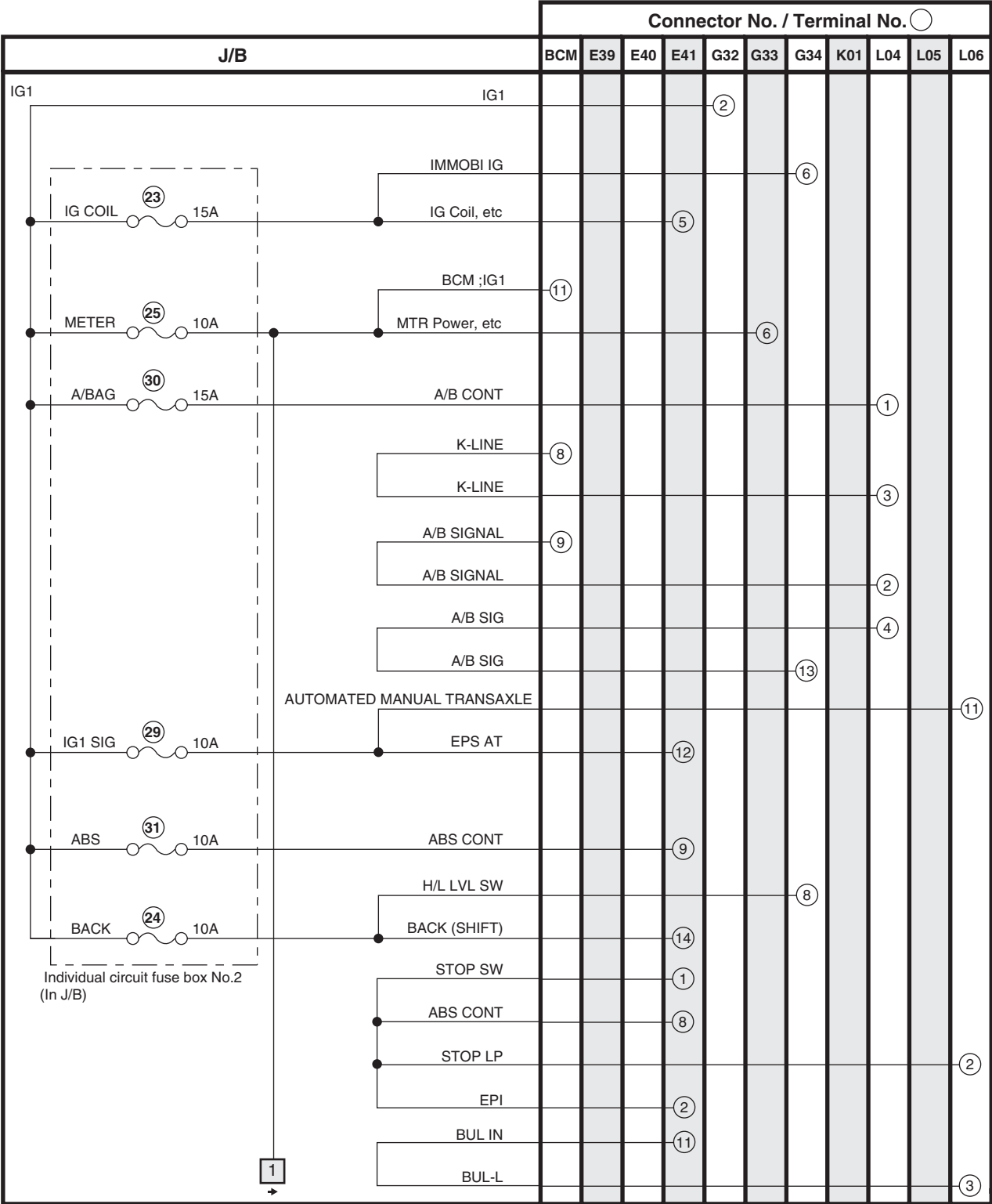
* : Not used



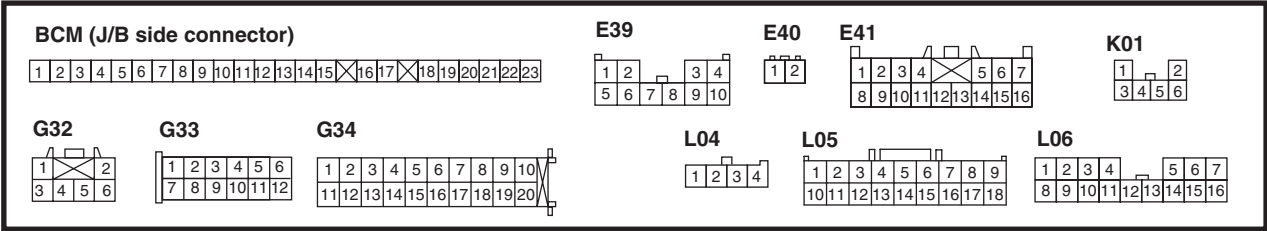
I5RS0B910962-04

Junction Block Inner Circuit (Detail)

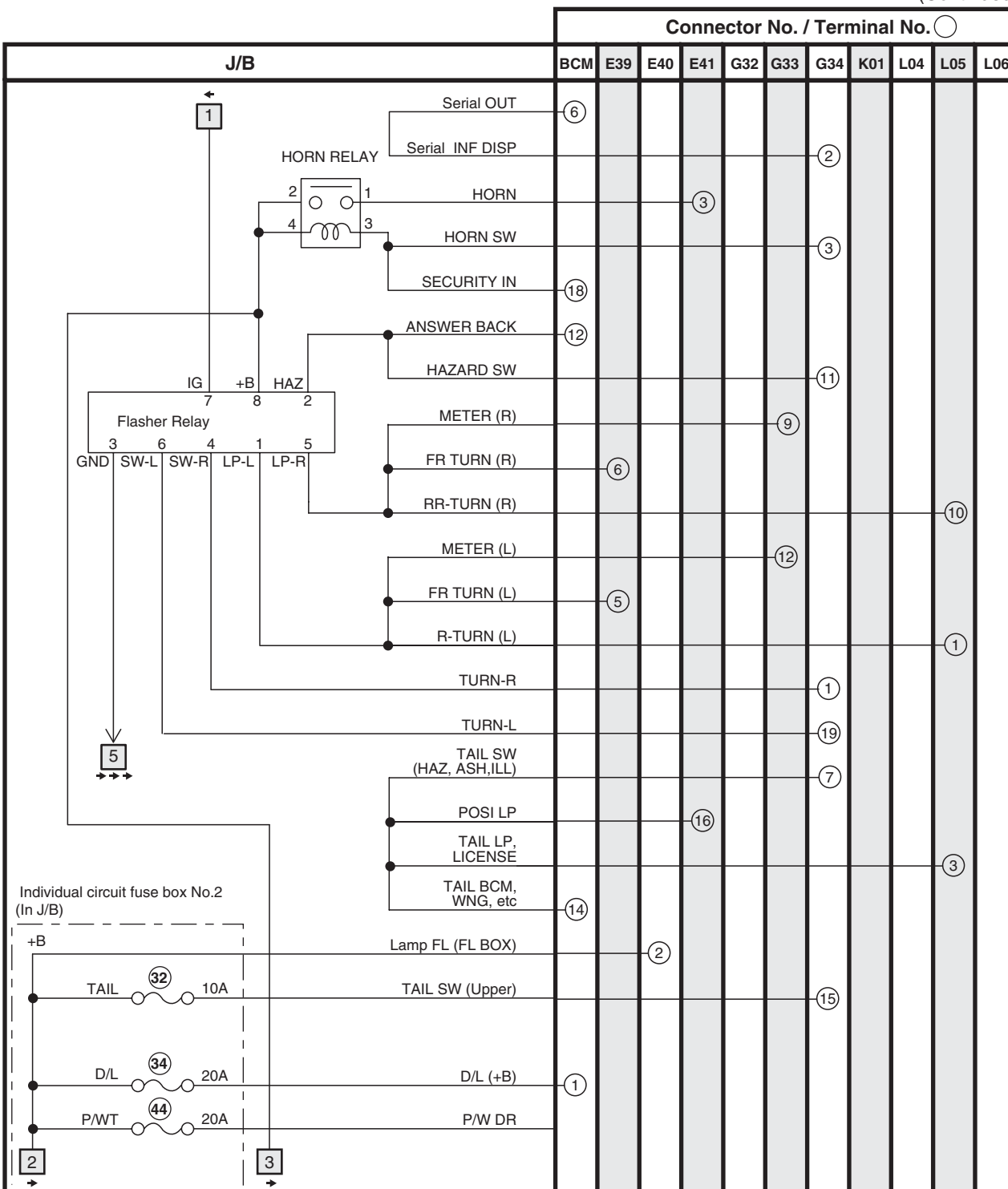
S5RS0B910D008



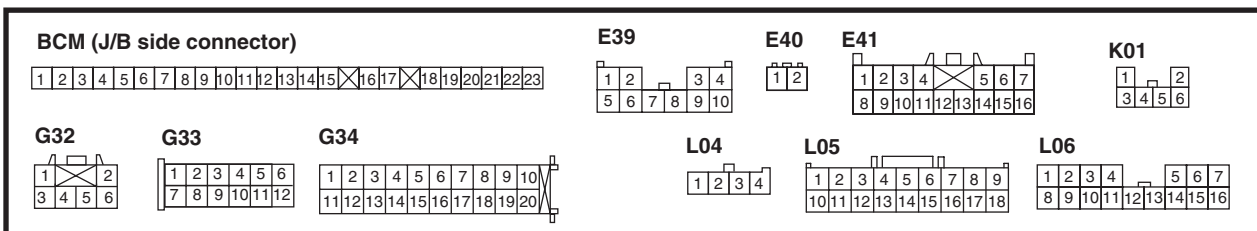
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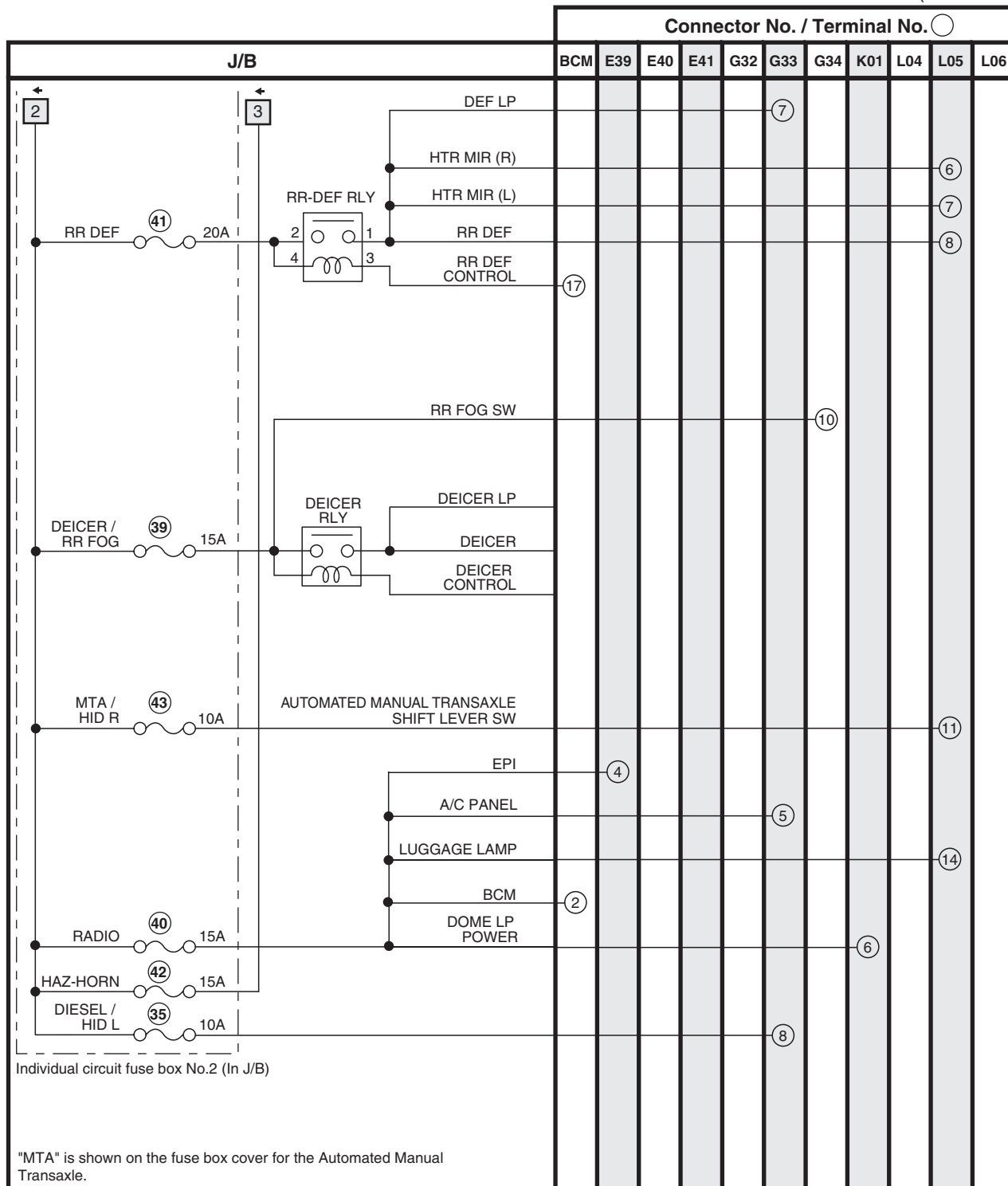
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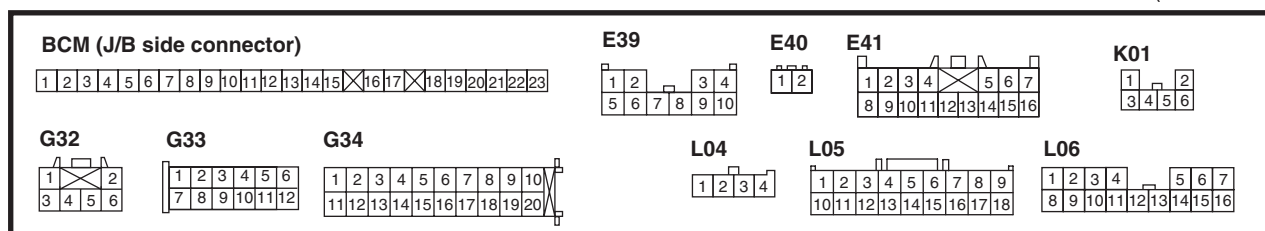
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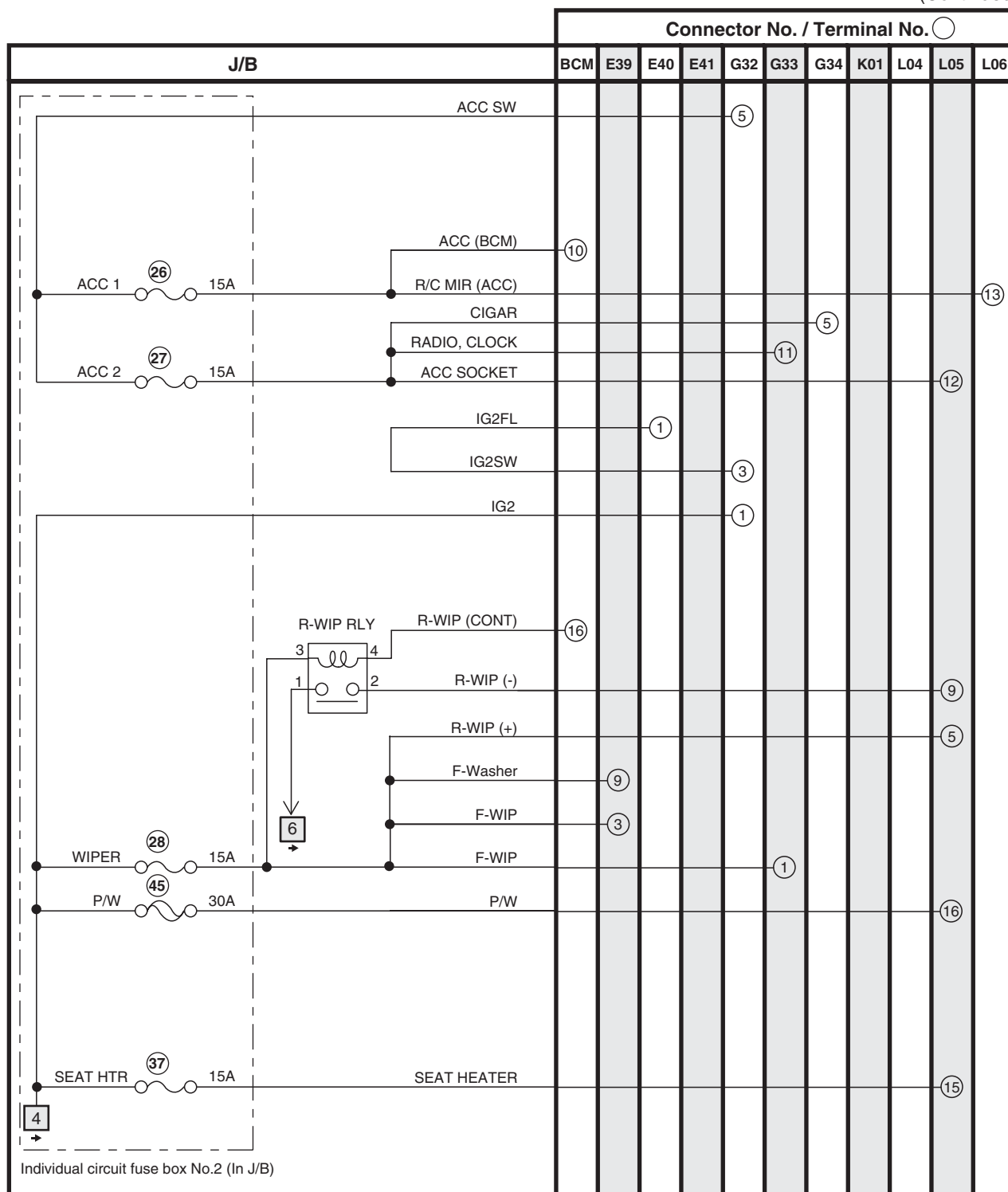
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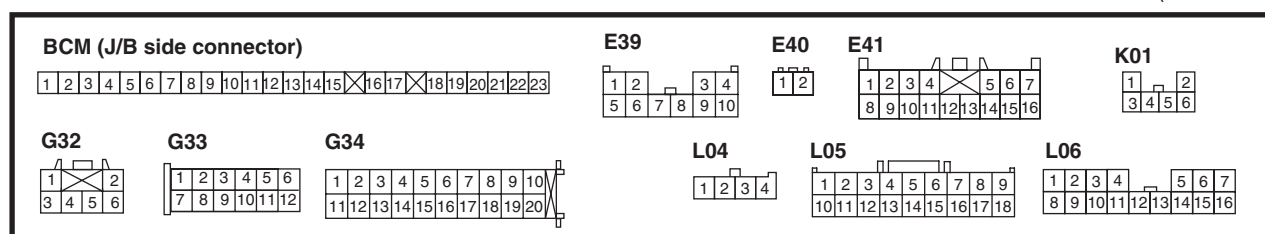
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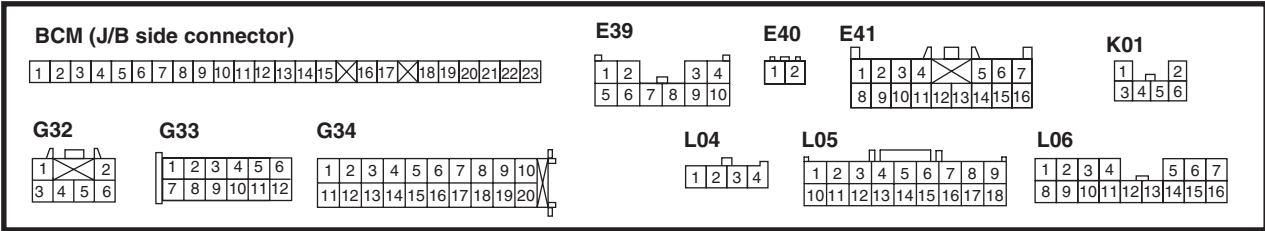
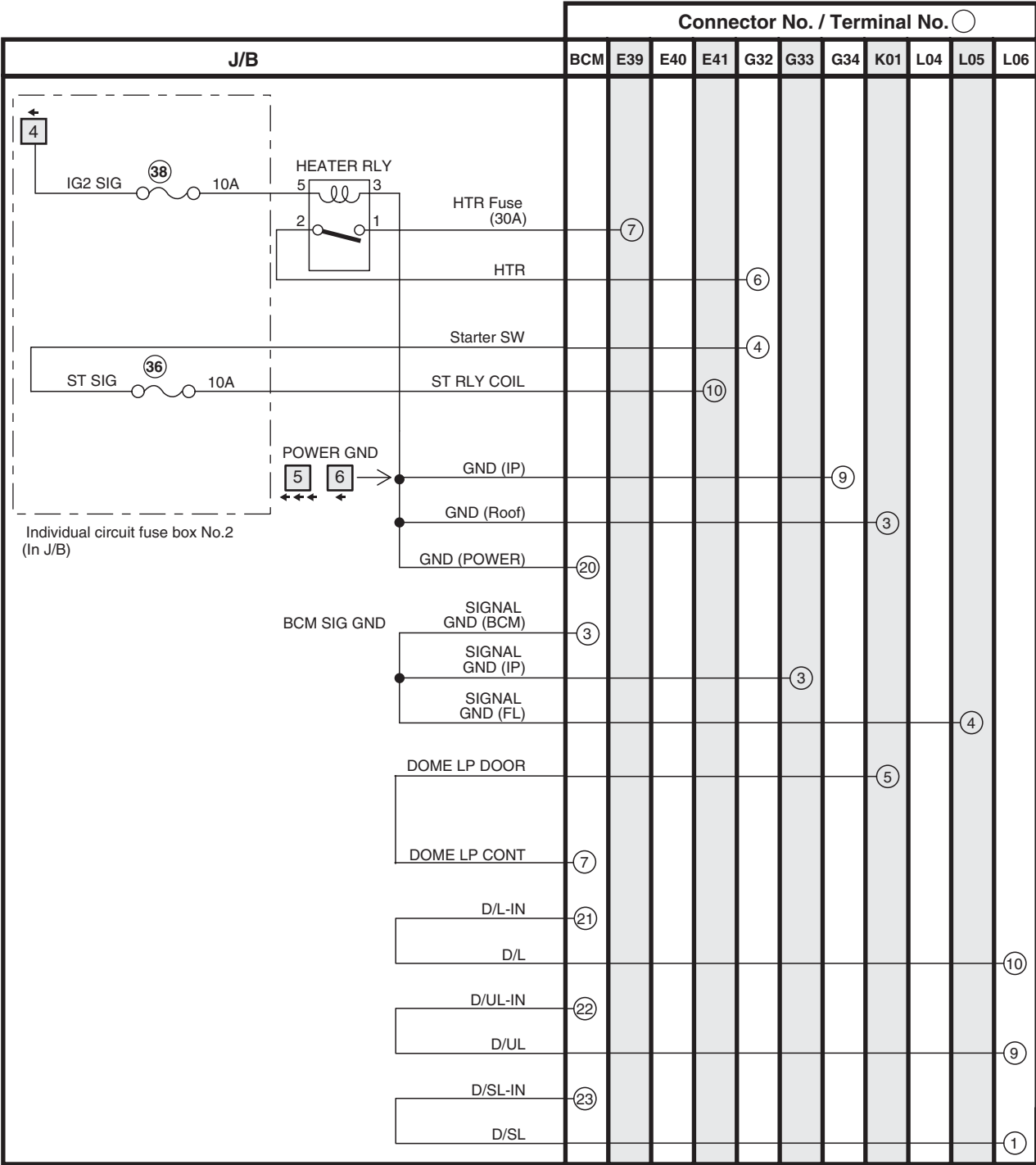
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(Continued)



(Continued)



System Circuit Diagram

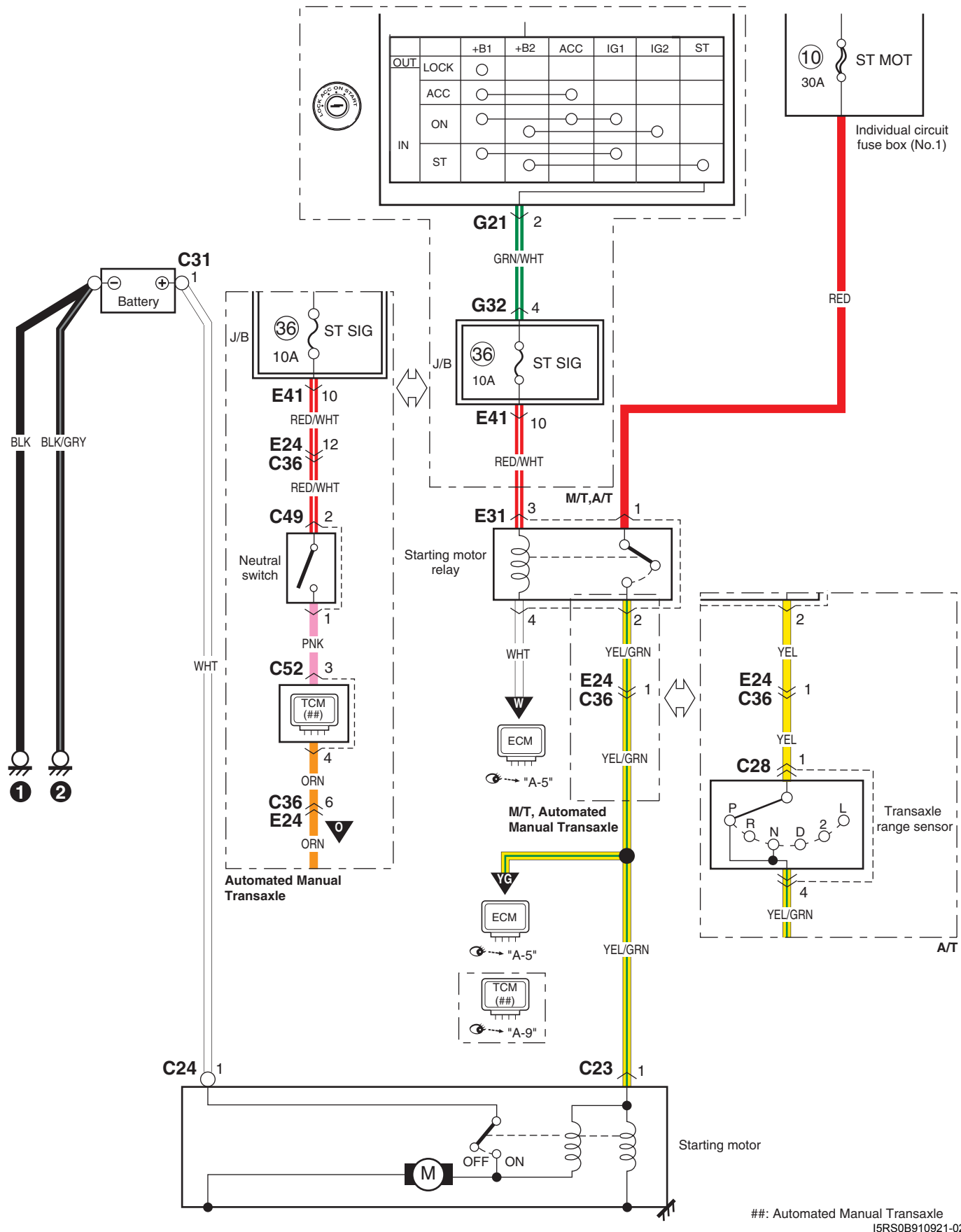
System Circuit Diagram

S5RS0B910E001

Refer to "A-1 Cranking System Circuit Diagram (Petrol): ".
Refer to "A-1 Cranking System Circuit Diagram (DSL): ".
Refer to "A-2 Charging System Circuit Diagram (Petrol): ".
Refer to "A-2 Charging System Circuit Diagram (DSL): ".
Refer to "A-3 Ignition System Circuit Diagram (Petrol): ".
Refer to "A-4 Cooling System Circuit Diagram (Petrol): ".
Refer to "A-4 Cooling System Circuit Diagram (DSL): ".
Refer to "A-5 Engine and A/C Control System Circuit Diagram (Petrol): ".
Refer to "A-5 Engine and A/C Control System (DSL): ".
Refer to "A-6 A/T Control System Circuit Diagram: ".
Refer to "A-7 Immobilizer System Circuit Diagram (Petrol): ".
Refer to "A-7 Immobilizer System Circuit Diagram (DSL): ".
Refer to "A-8 Body Control System Circuit Diagram: ".
Refer to "A-9 Automated Manual Transaxle Control System Circuit Diagram (Petrol): "
Refer to "B-1 Windshield Wiper and Washer Circuit Diagram: ".
Refer to "B-2 Rear Wiper and Washer Circuit Diagram: ".
Refer to "B-3 Rear Defogger Circuit Diagram: ".
Refer to "B-4 Power Window Circuit Diagram: ".
Refer to "B-5 Power Door Lock Circuit Diagram: ".
Refer to "B-6 Power Mirror Circuit Diagram: ".
Refer to "B-7 Horn Circuit Diagram: ".
Refer to "B-8 Seat Heater Circuit Diagram: "
Refer to "B-9 Smart Key System Circuit Diagram: "
Refer to "C-1 Combination Meter Circuit Diagram (Meter): ".
Refer to "C-2 Combination Meter Circuit Diagram (Indicator): ".
Refer to "C-3 Combination Meter Circuit Diagram (Warning Light): ".
Refer to "D-1 Headlight System Circuit Diagram: ".
Refer to "D-2 Position, Tail and Licence Plate Light System Circuit Diagram: ".
Refer to "D-3 Front Fog Light System Circuit Diagram: ".
Refer to "D-4 Illumination Light System Circuit Diagram: ".
Refer to "D-5 Interior Light System Circuit Diagram: ".
Refer to "D-6 Turn Signal and Hazard Warning Light System Circuit Diagram: ".
Refer to "D-7 Brake Light System Circuit Diagram: ".
Refer to "D-8 Back-Up Light System Circuit Diagram: ".
Refer to "D-9 Headlight Beam Leveling System Circuit Diagram: "
Refer to "D-10 Rear Fog Light Circuit Diagram: "
Refer to "E-1 Heater System Circuit Diagram: ".
Refer to "E-3 PTC Heater Circuit Diagram (DSL): ".
Refer to "F-1 Air-Bag System Circuit Diagram: ".
Refer to "F-2 Anti-Lock Brake System Circuit Diagram: ".
Refer to "F-3 Power Steering System Circuit Diagram: ".
Refer to "G-1 Audio System Circuit Diagram: ".
Refer to "G-2 Multi Information Display / Accessory Socket System Circuit Diagram: ".
Refer to "G-4 Navigation System Circuit Diagram: "

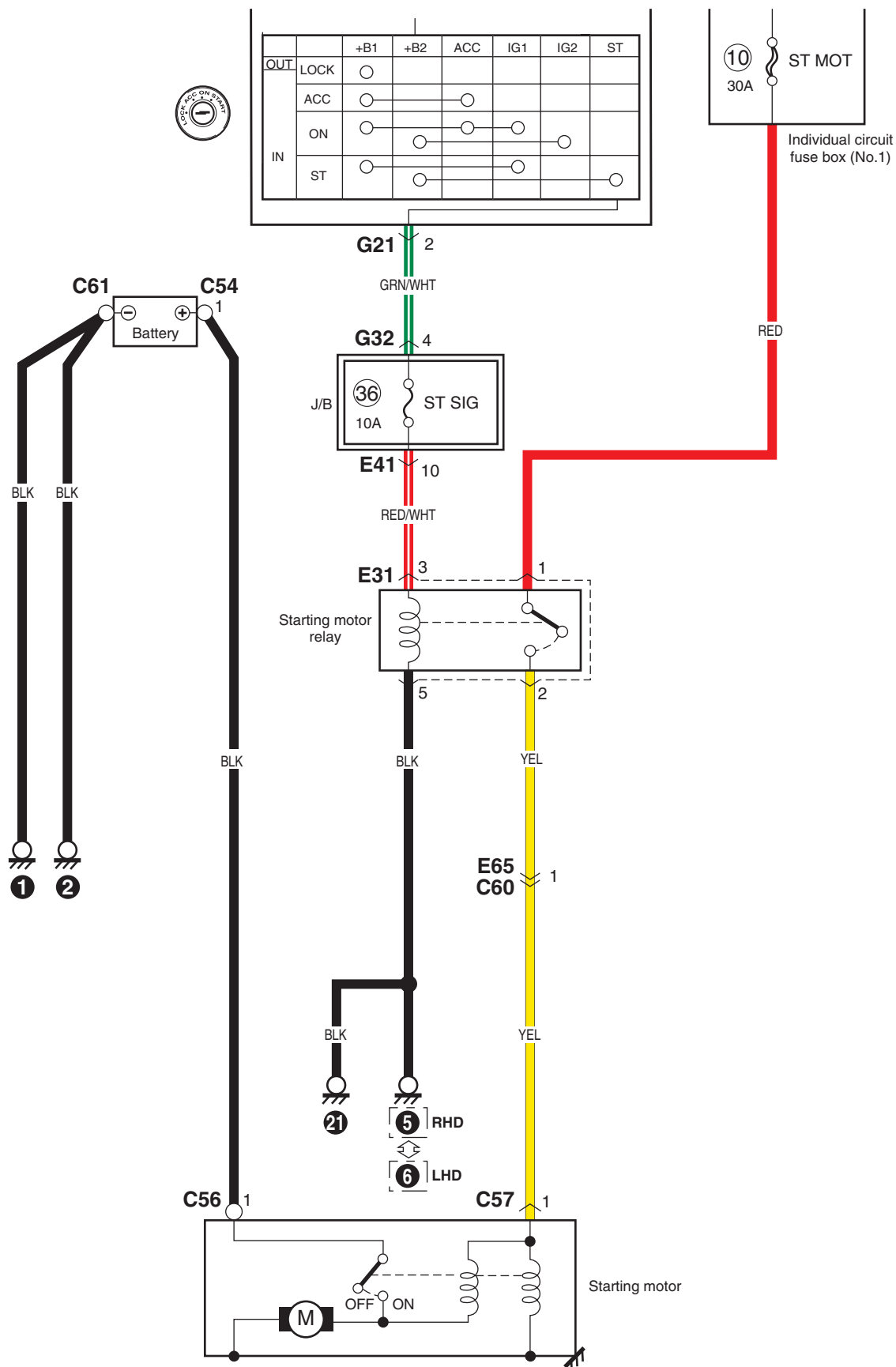
A-1 Cranking System Circuit Diagram (Petrol)

S5RS0B910E002



A-1 Cranking System Circuit Diagram (DSL)

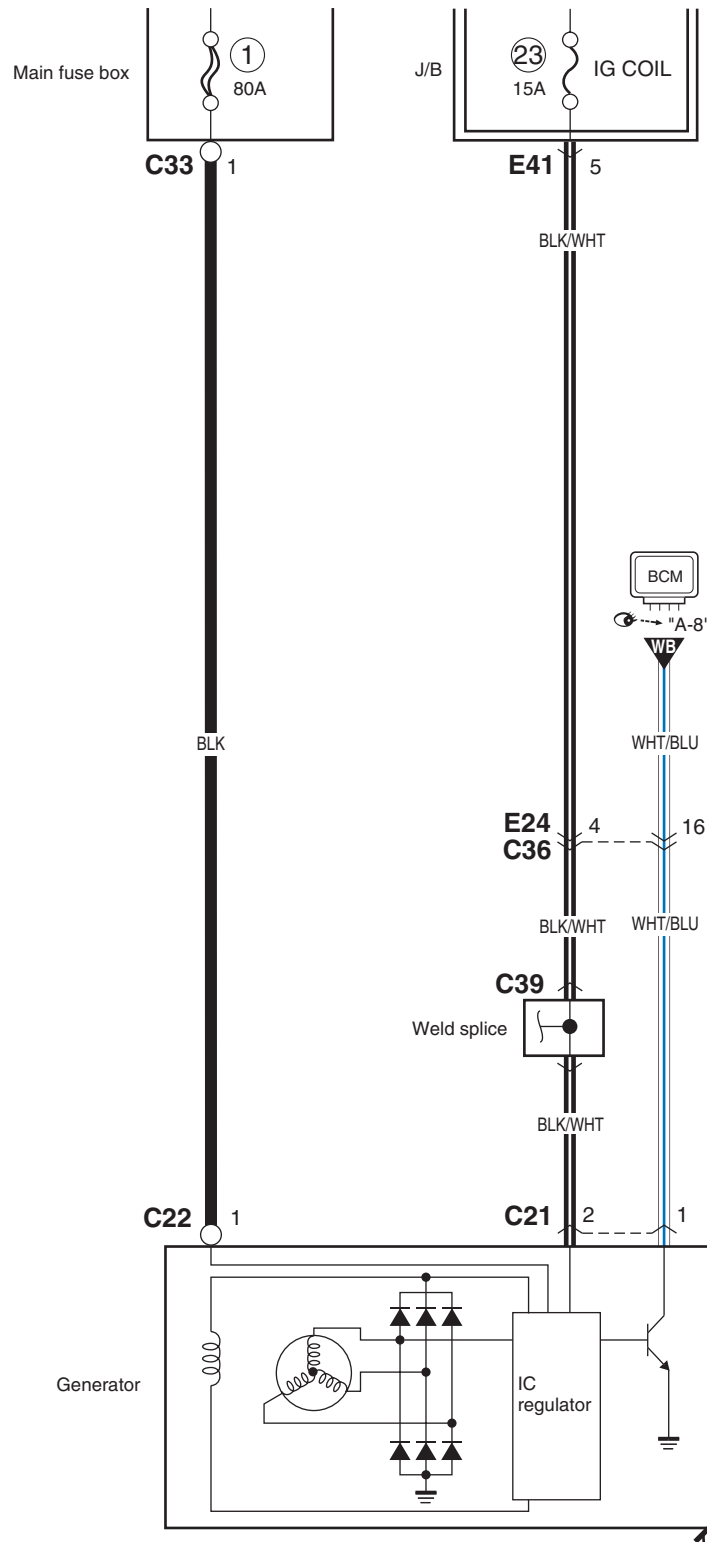
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I5RS0B910922-01

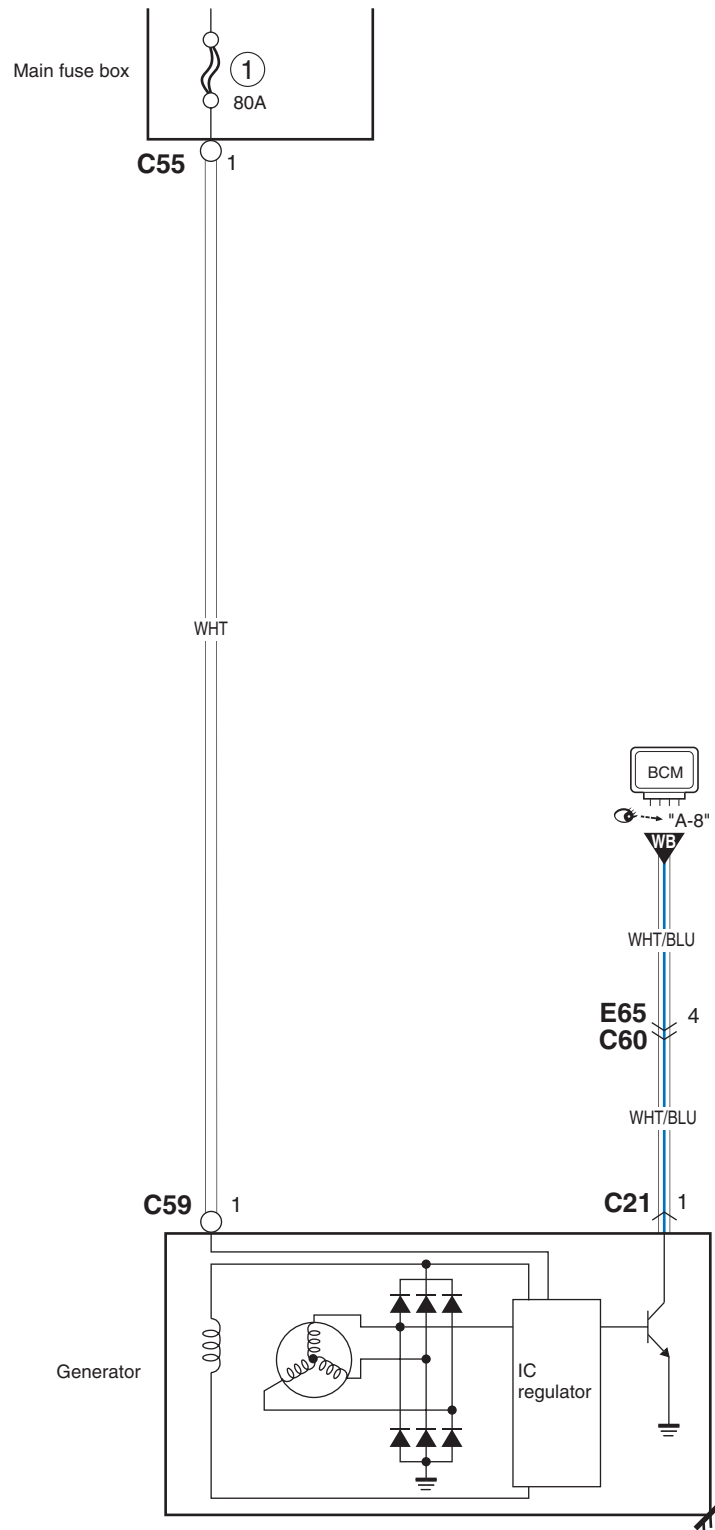
A-2 Charging System Circuit Diagram (Petrol)

S5RS0B910E003



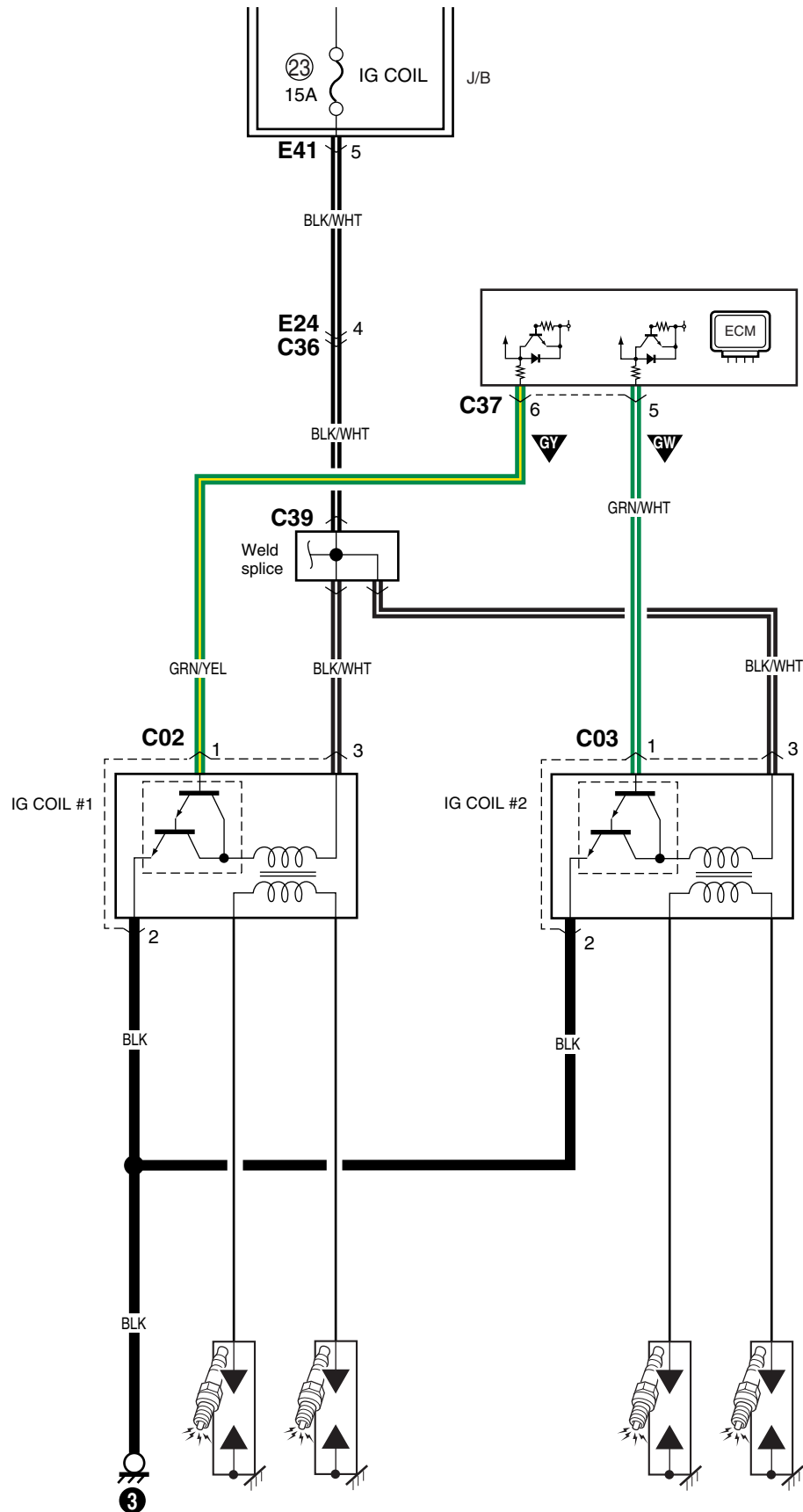
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I5RS0B910923-02



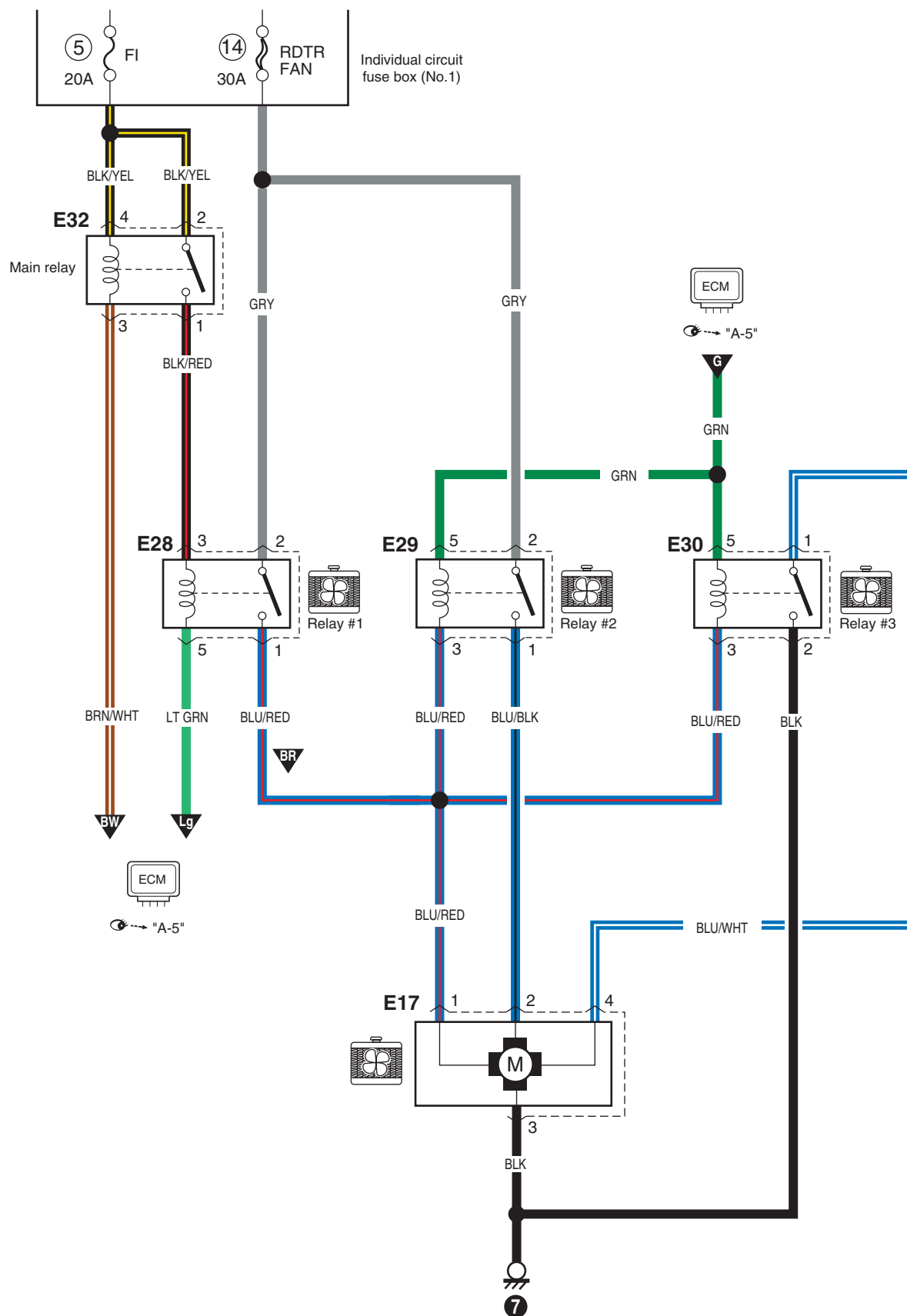
A-3 Ignition System Circuit Diagram (Petrol)

S5RS0B910E004



A-4 Cooling System Circuit Diagram (Petrol)

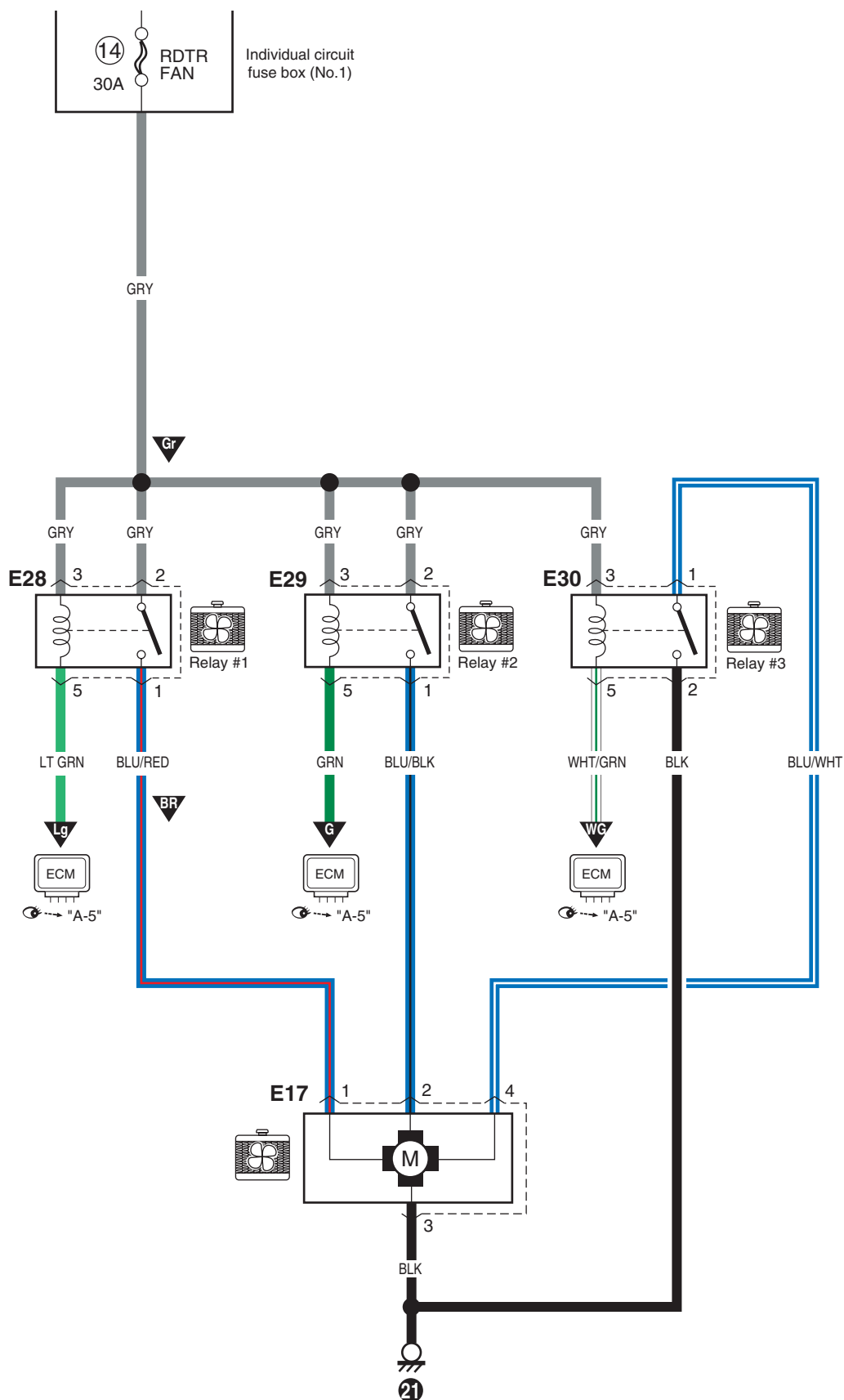
S5RS0B910E005



I5RS0B910924-02

A-4 Cooling System Circuit Diagram (DSL)

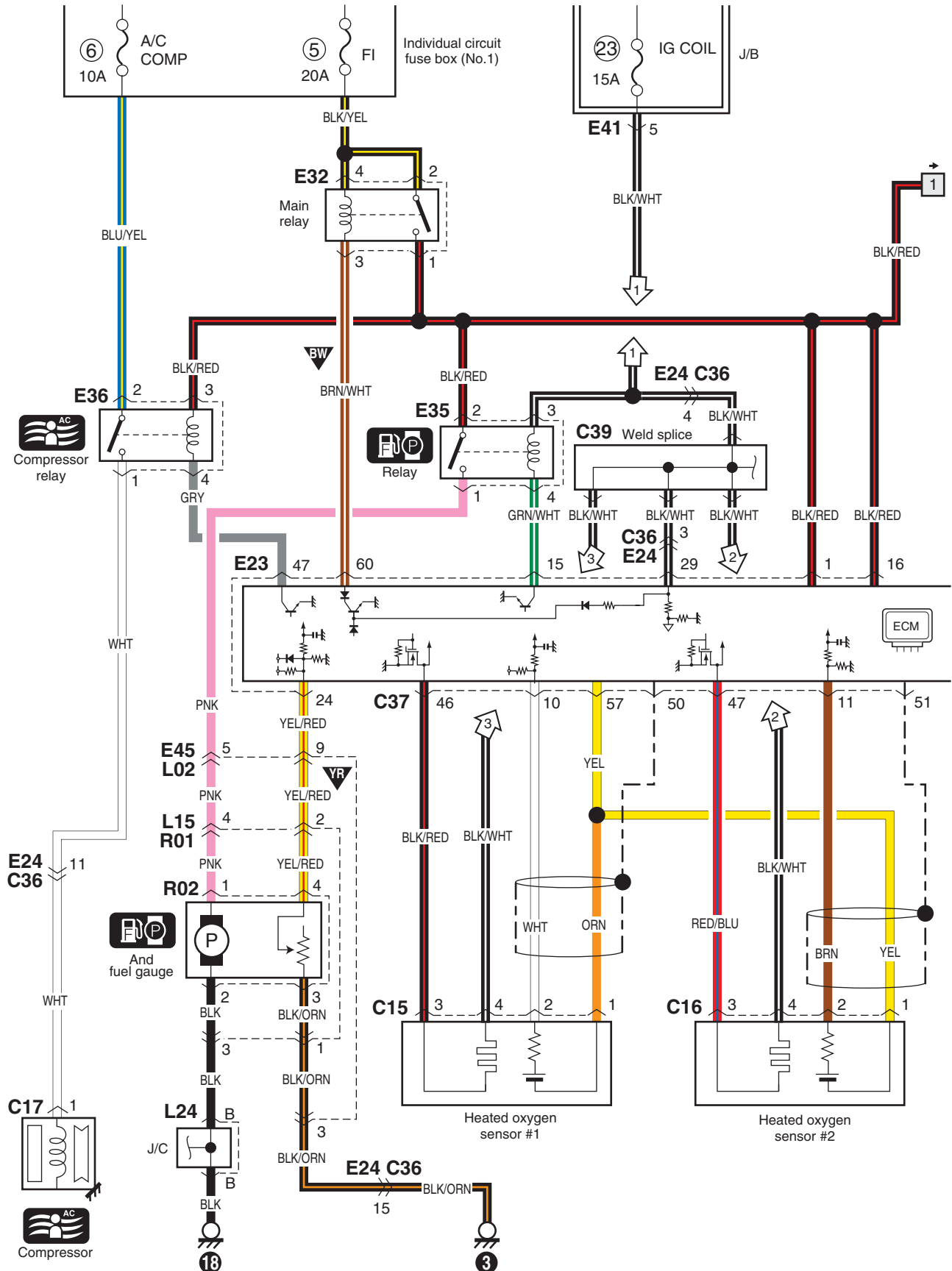
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I5RS0B910925-01

A-5 Engine and A/C Control System Circuit Diagram (Petrol)

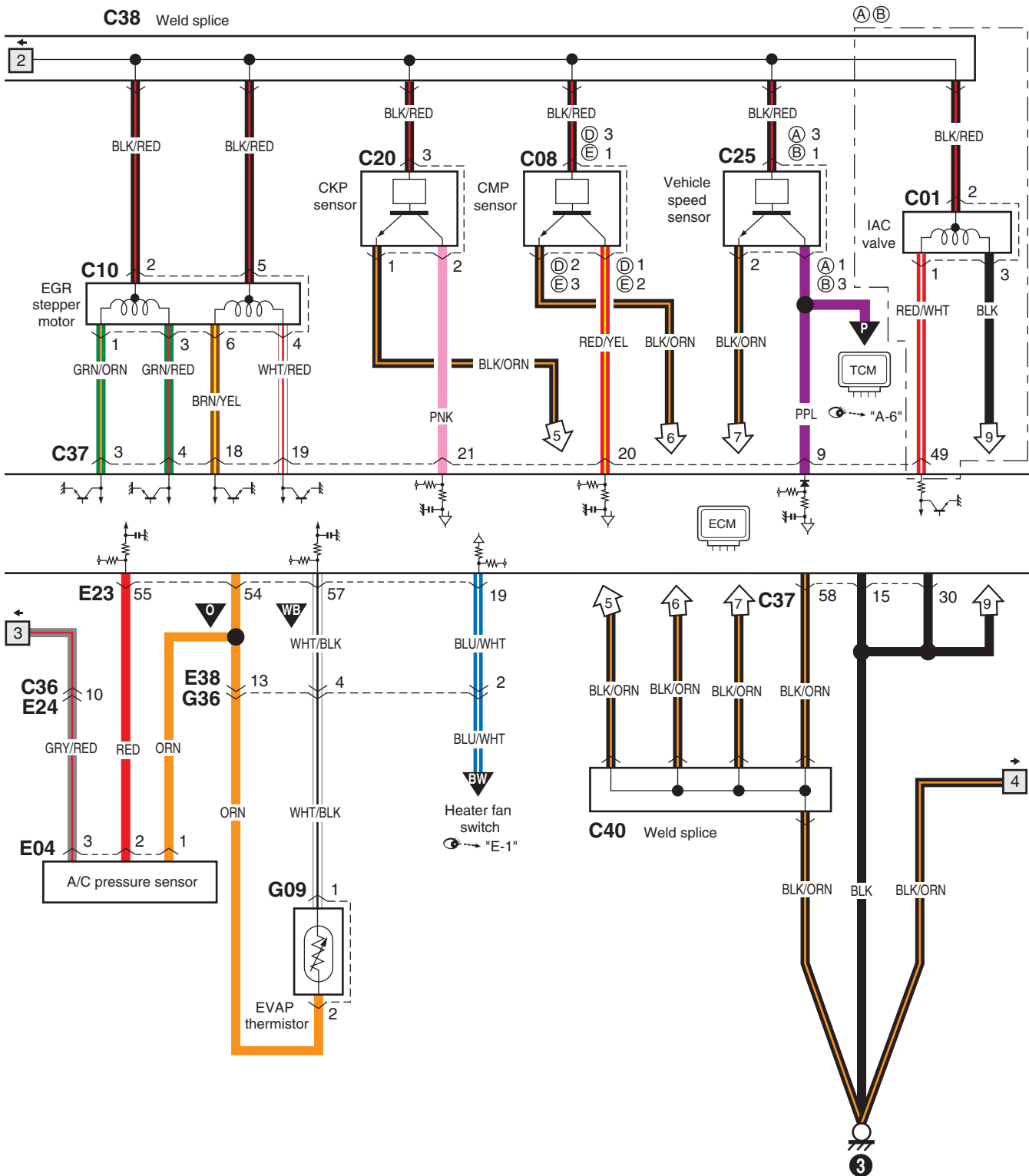
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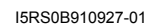


I5RS0B910974-01

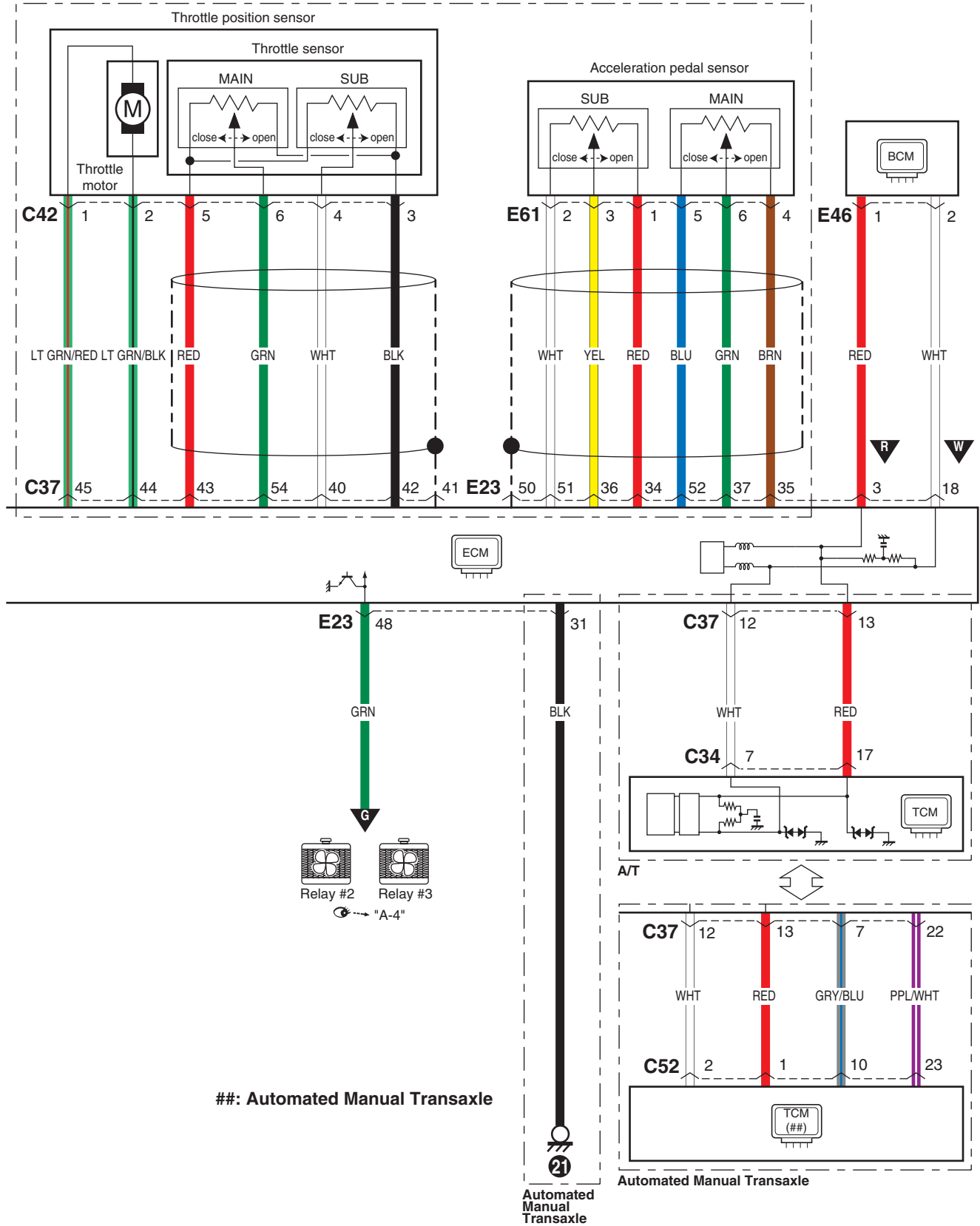


- ☐ (A) M/T
☐ (B) A/T
☐ (C) AMT
☐ (D) M13A
☐ (E) M15A



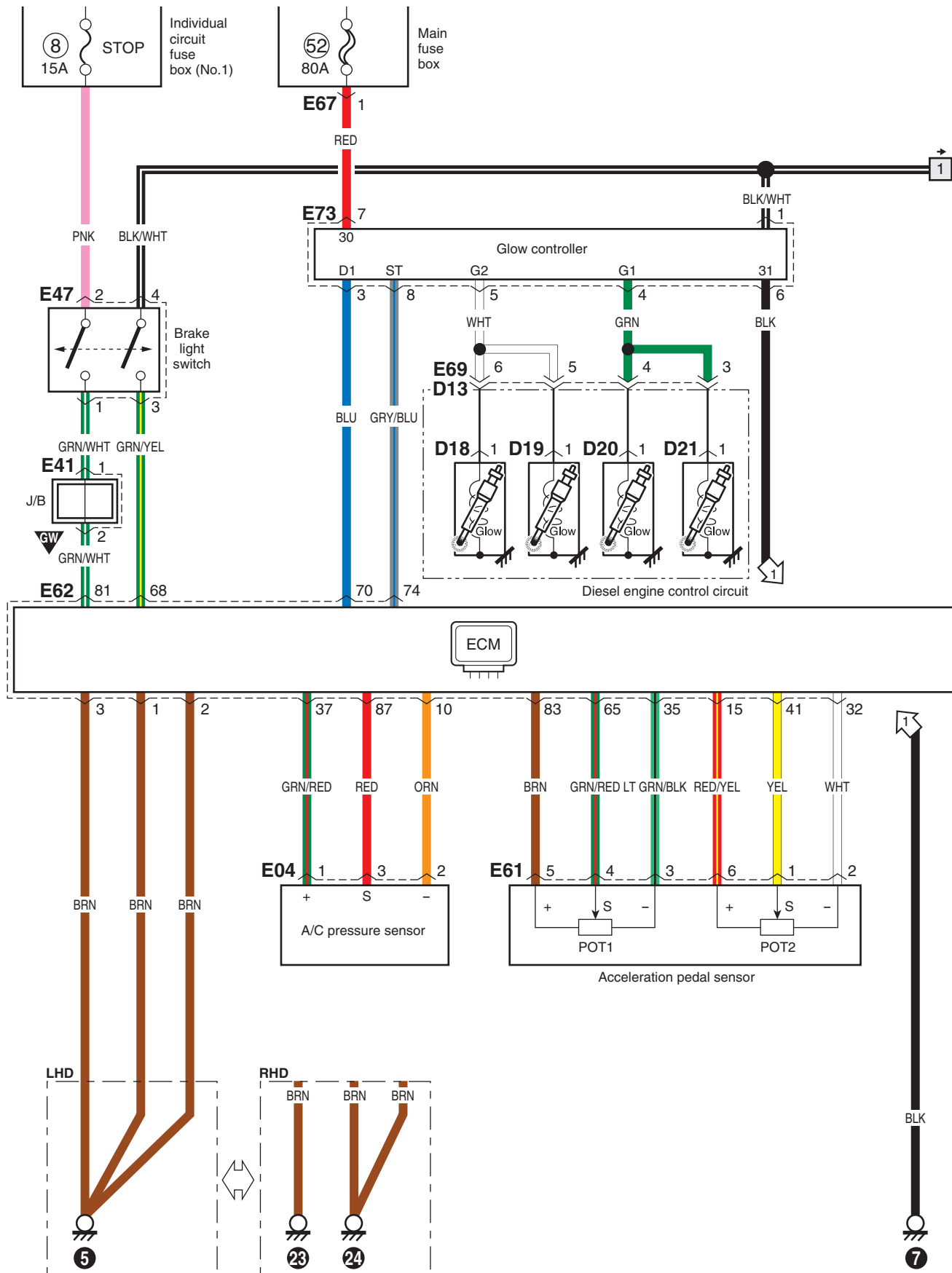


Automated Manual Transaxle

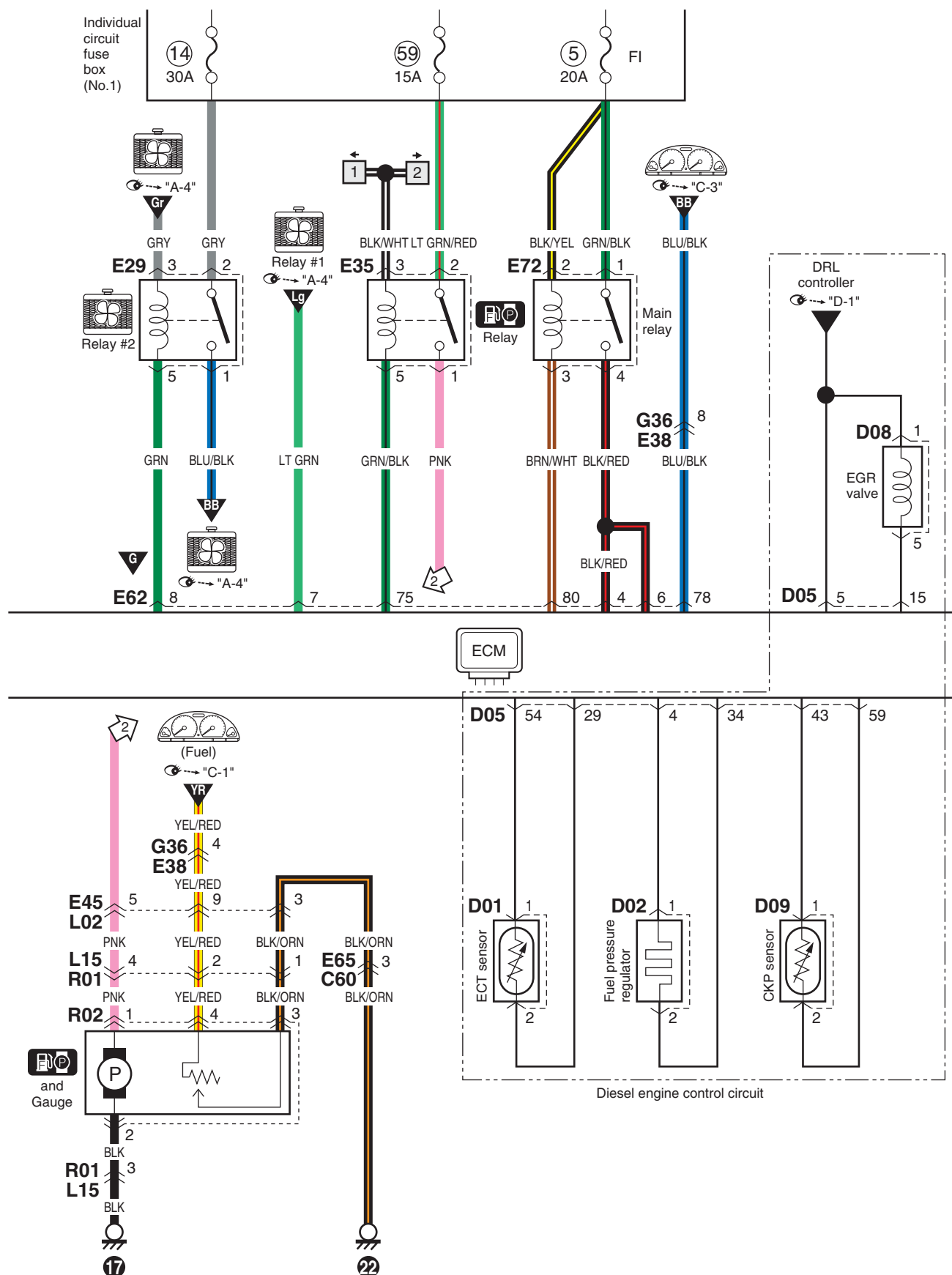


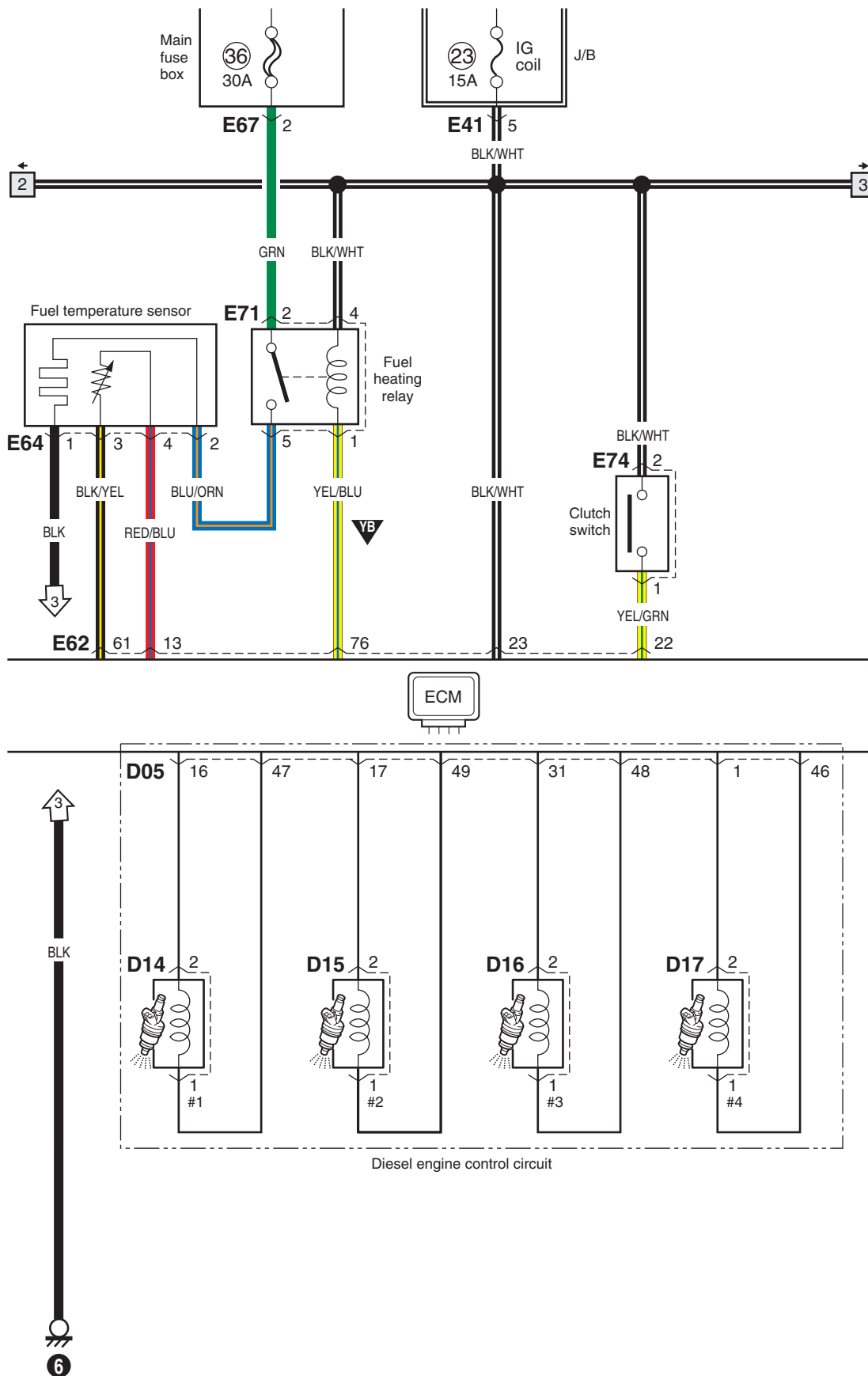
A-5 Engine and A/C Control System (DSL)

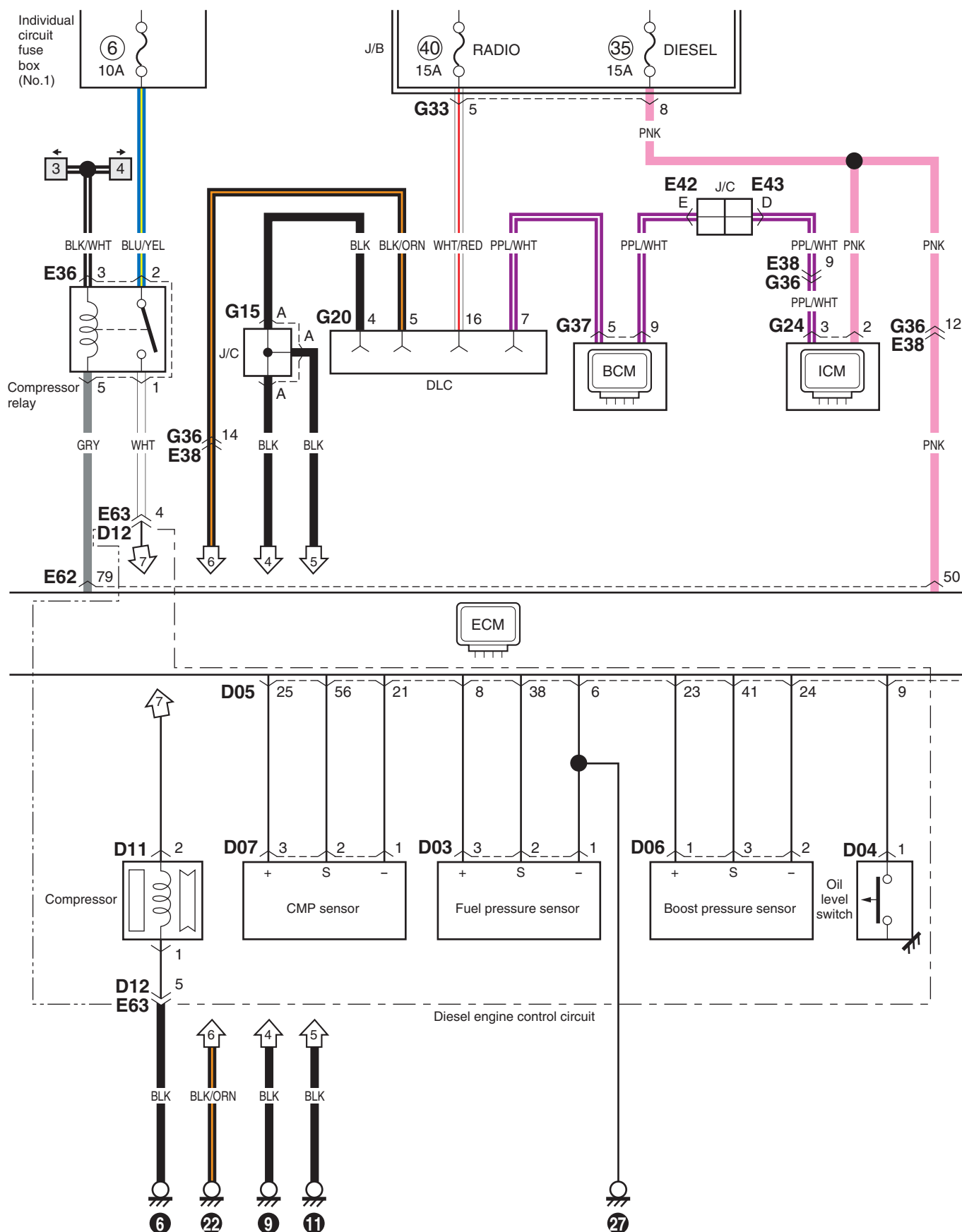
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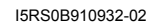


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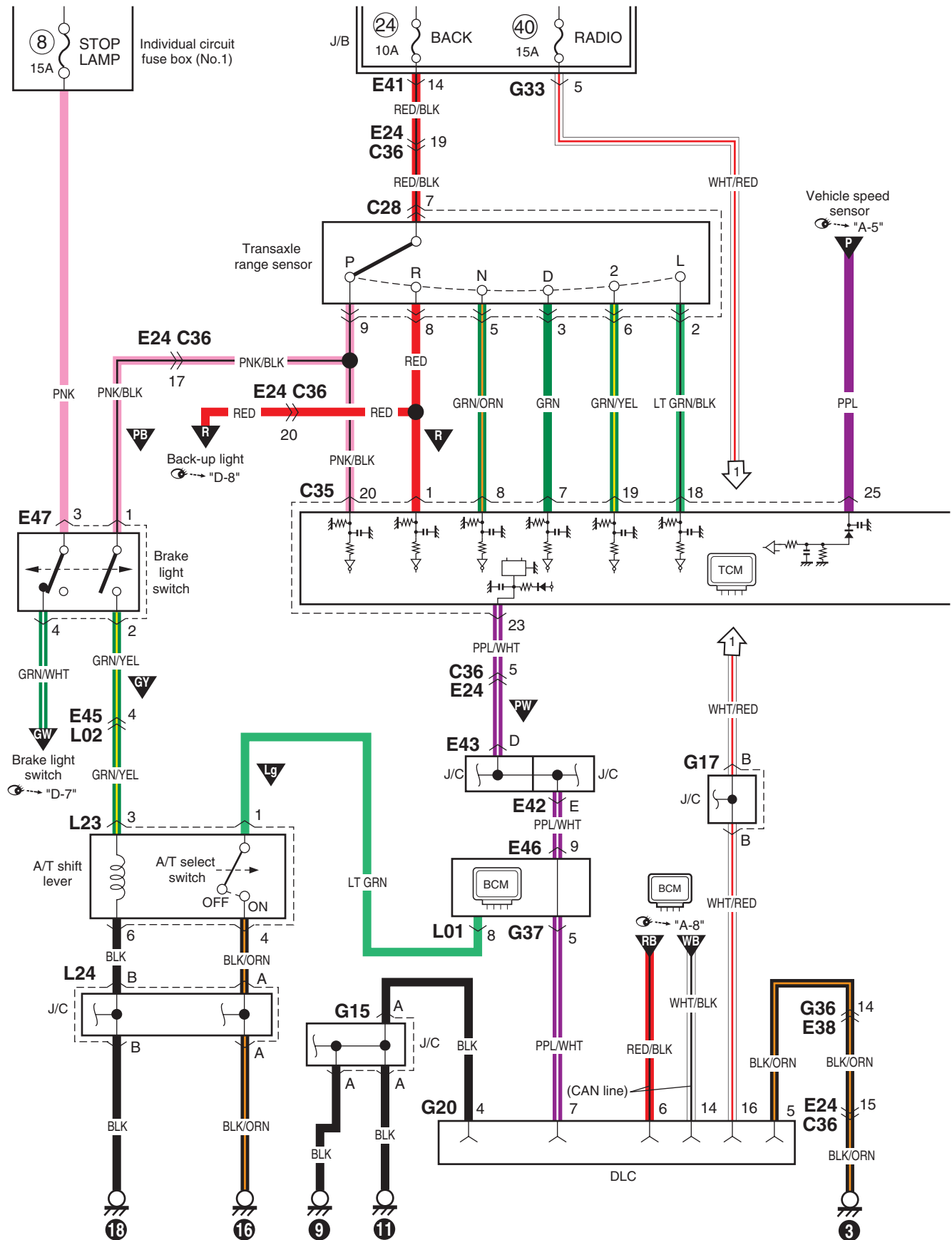




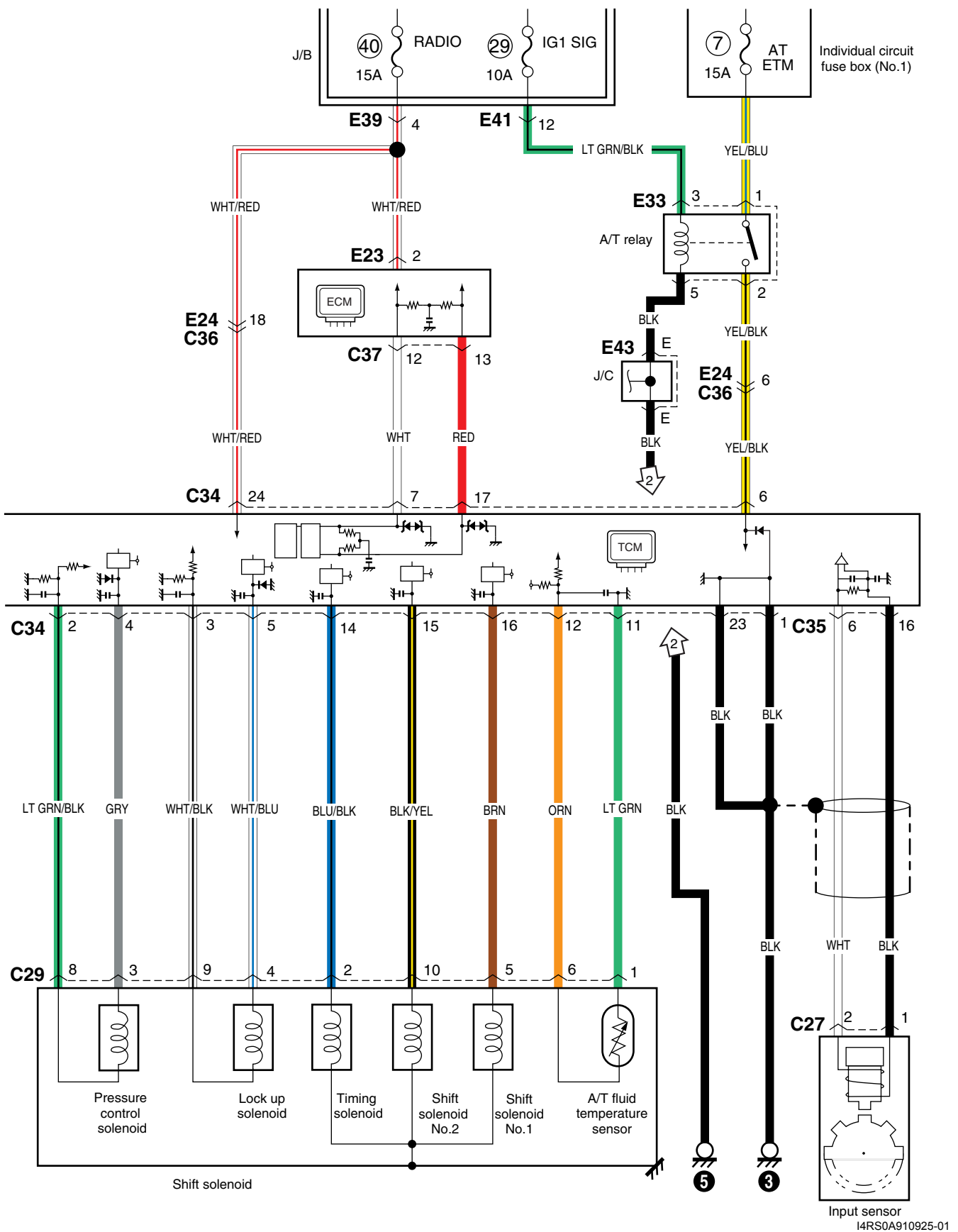


A-6 A/T Control System Circuit Diagram

S5RS0B910E007

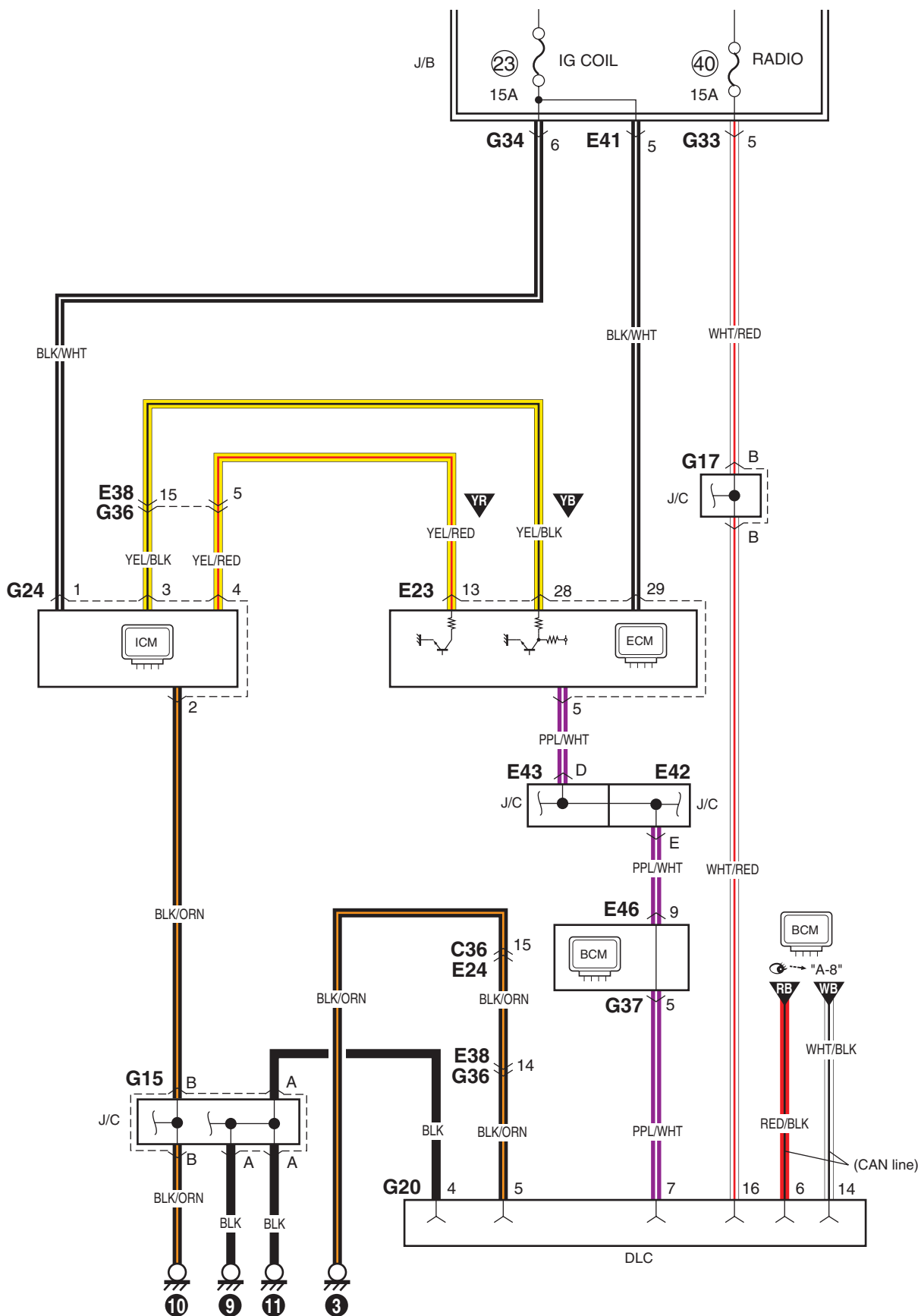


I5RS0B910933-02



A-7 Immobilizer System Circuit Diagram (Petrol)

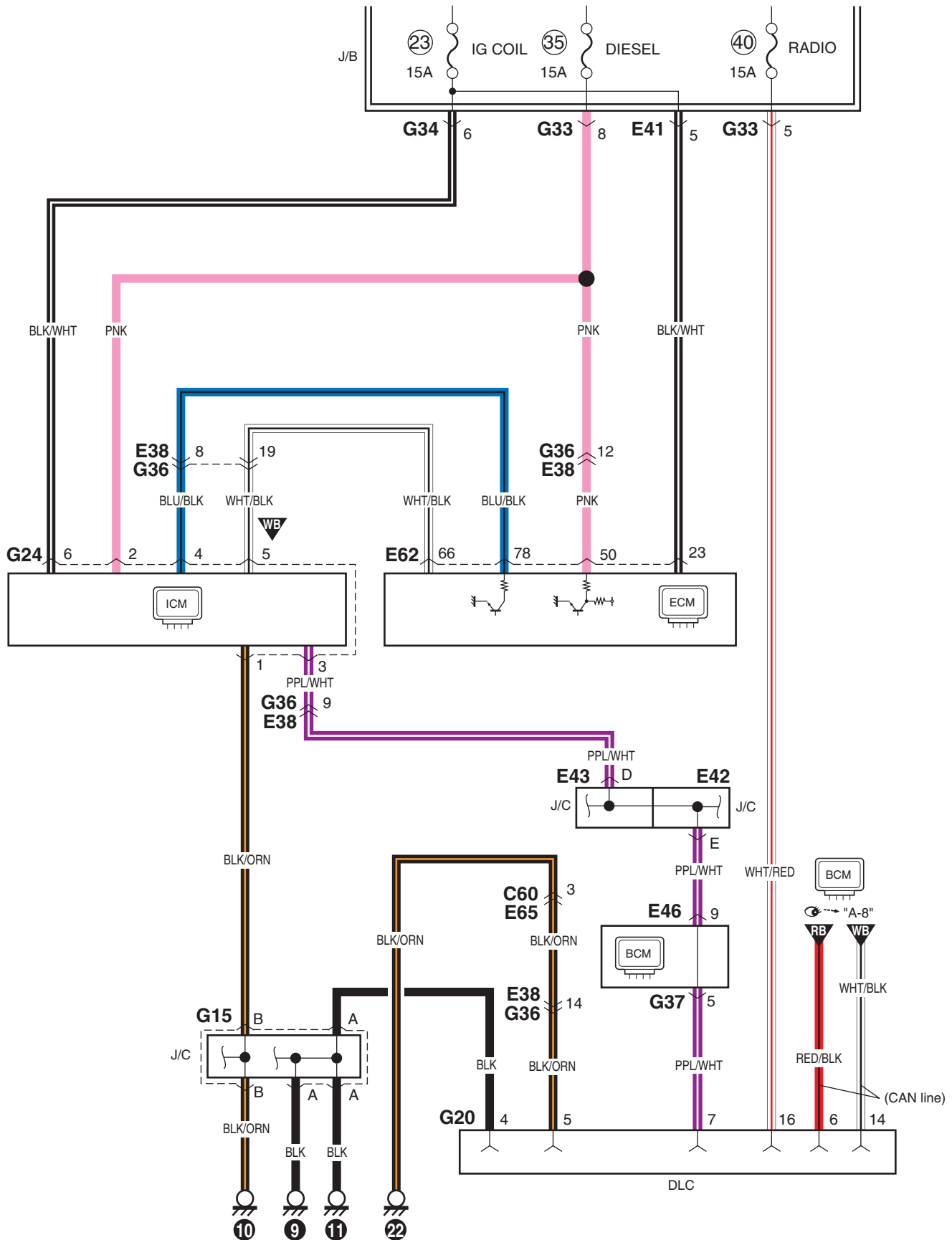
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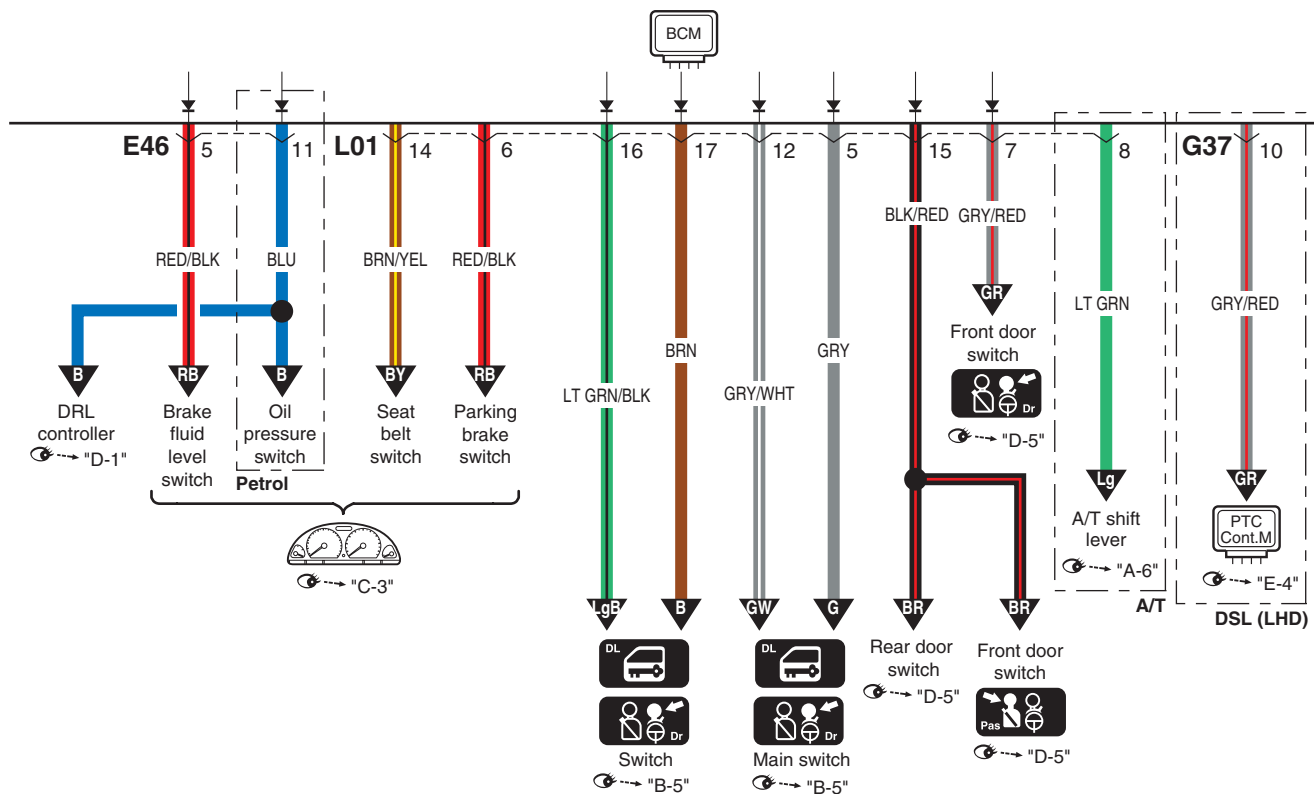
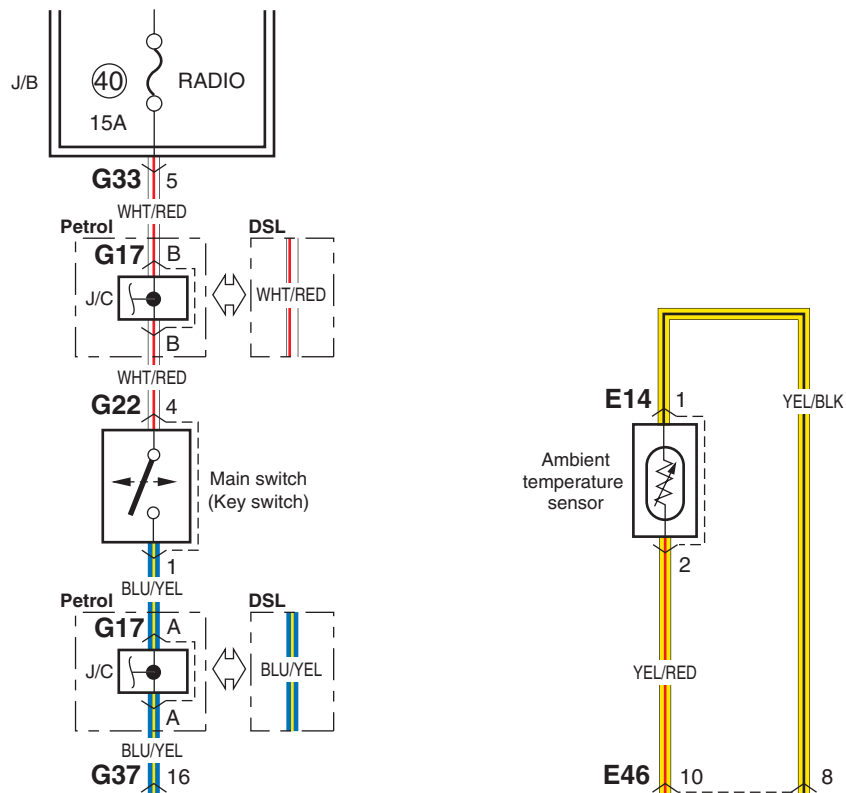
15RS0B910934-01

A-7 Immobilizer System Circuit Diagram (DSL)

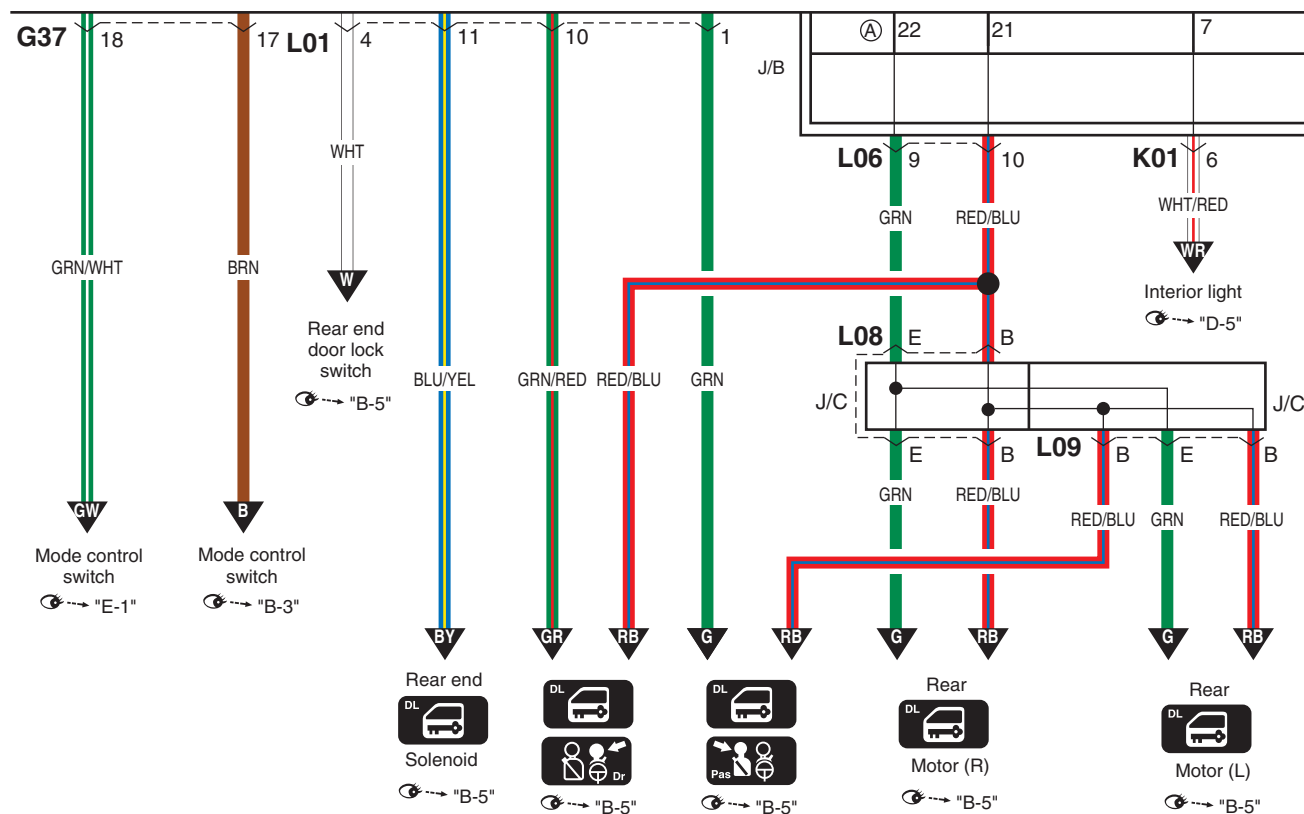
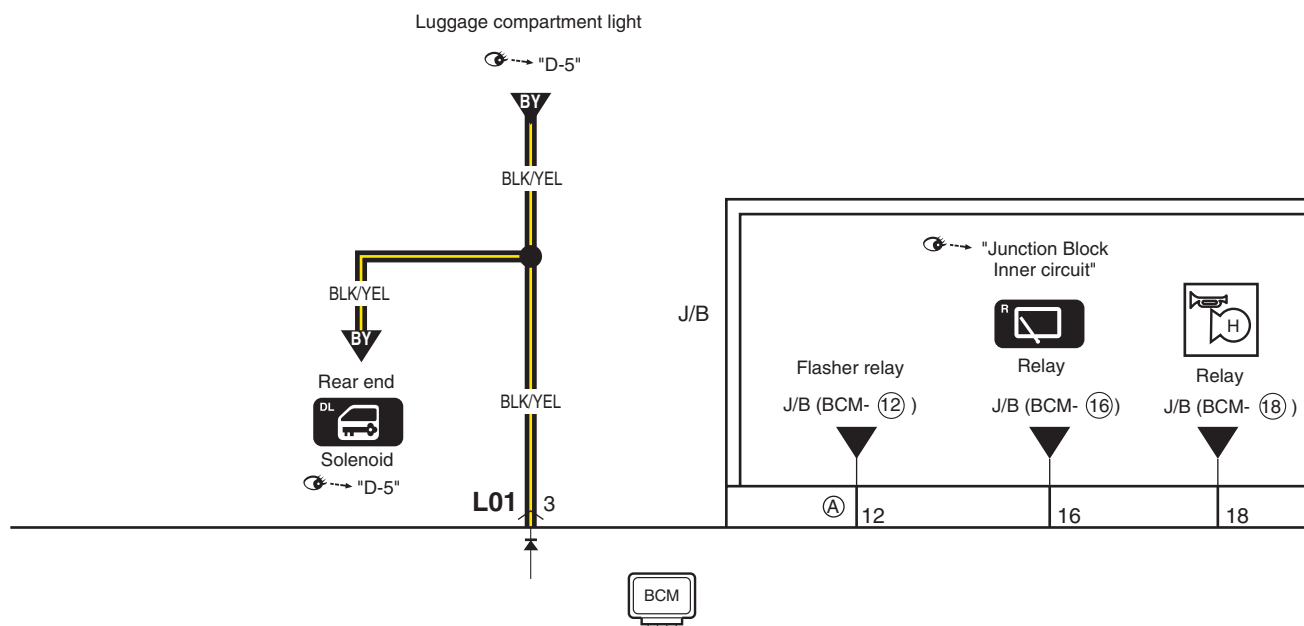
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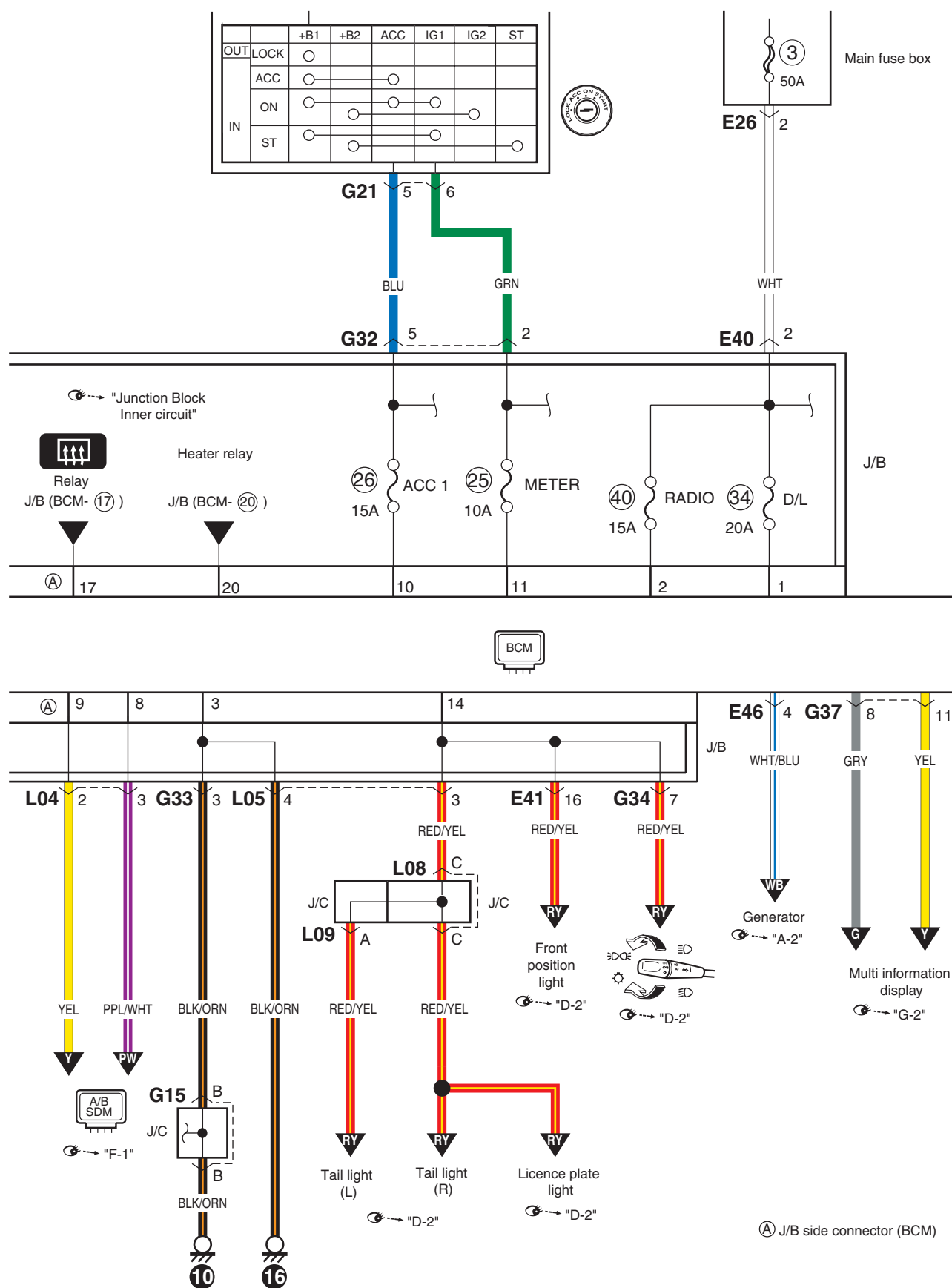


I5RS0B910935-03



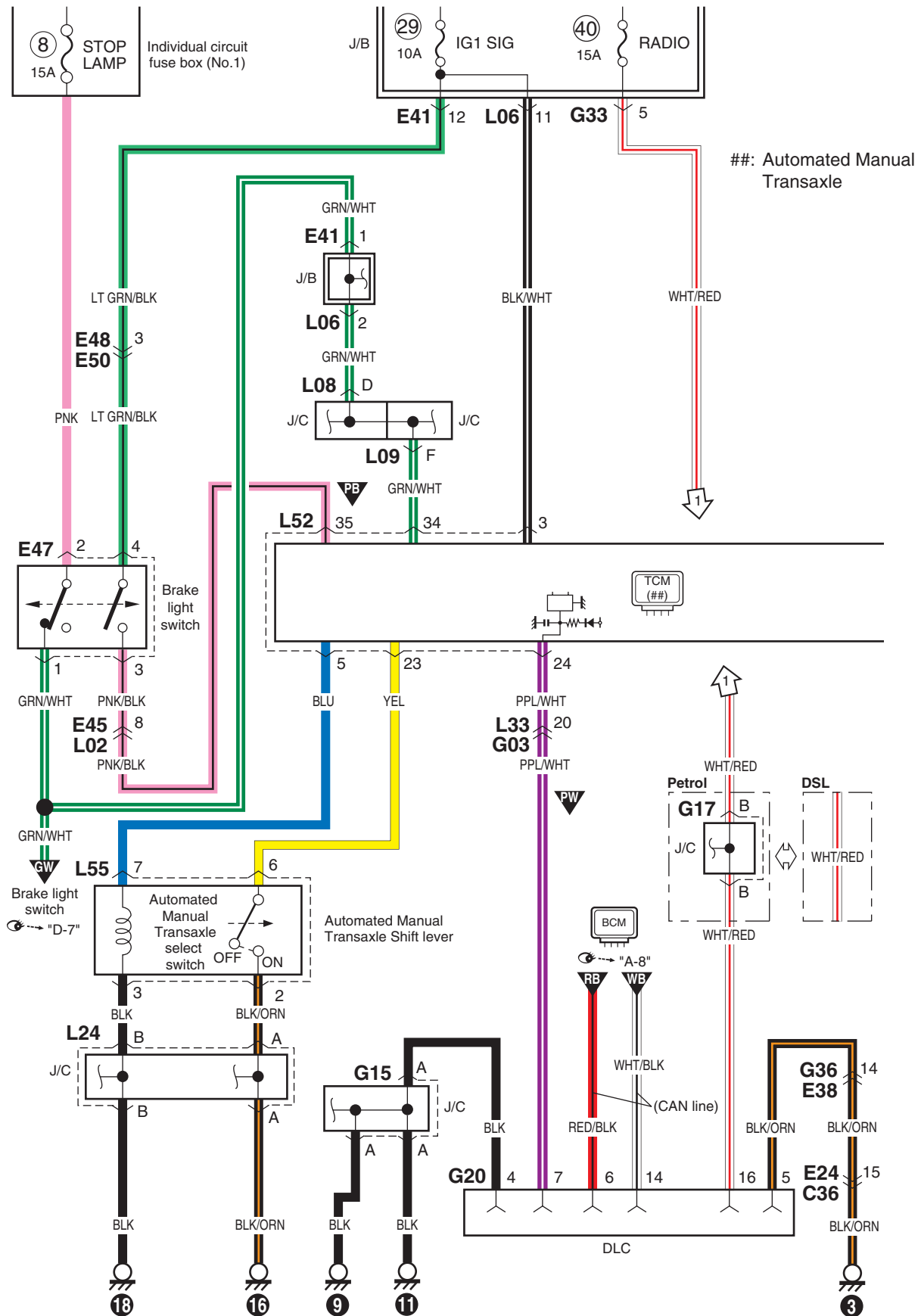
Ⓐ J/B side connector (BCM)



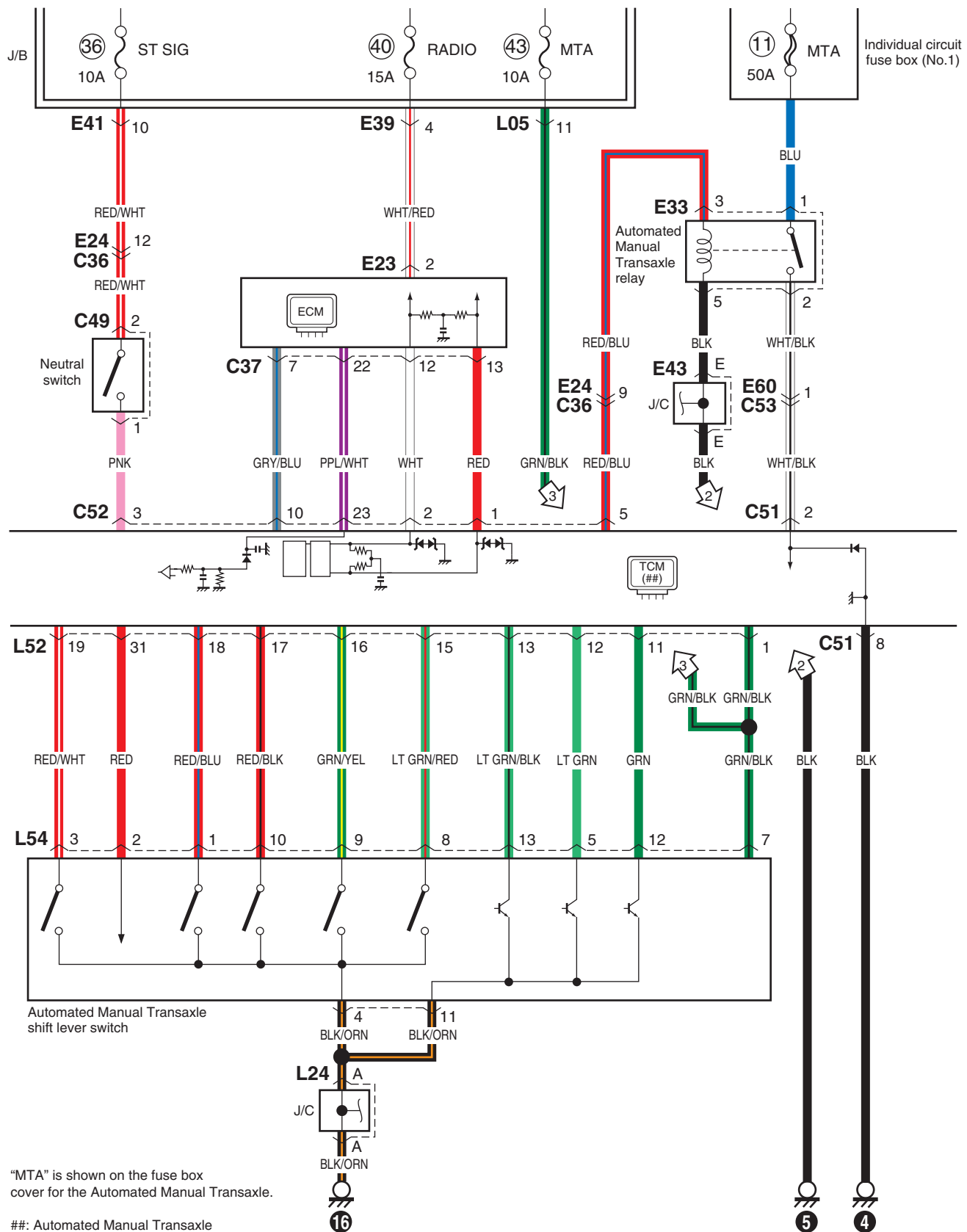


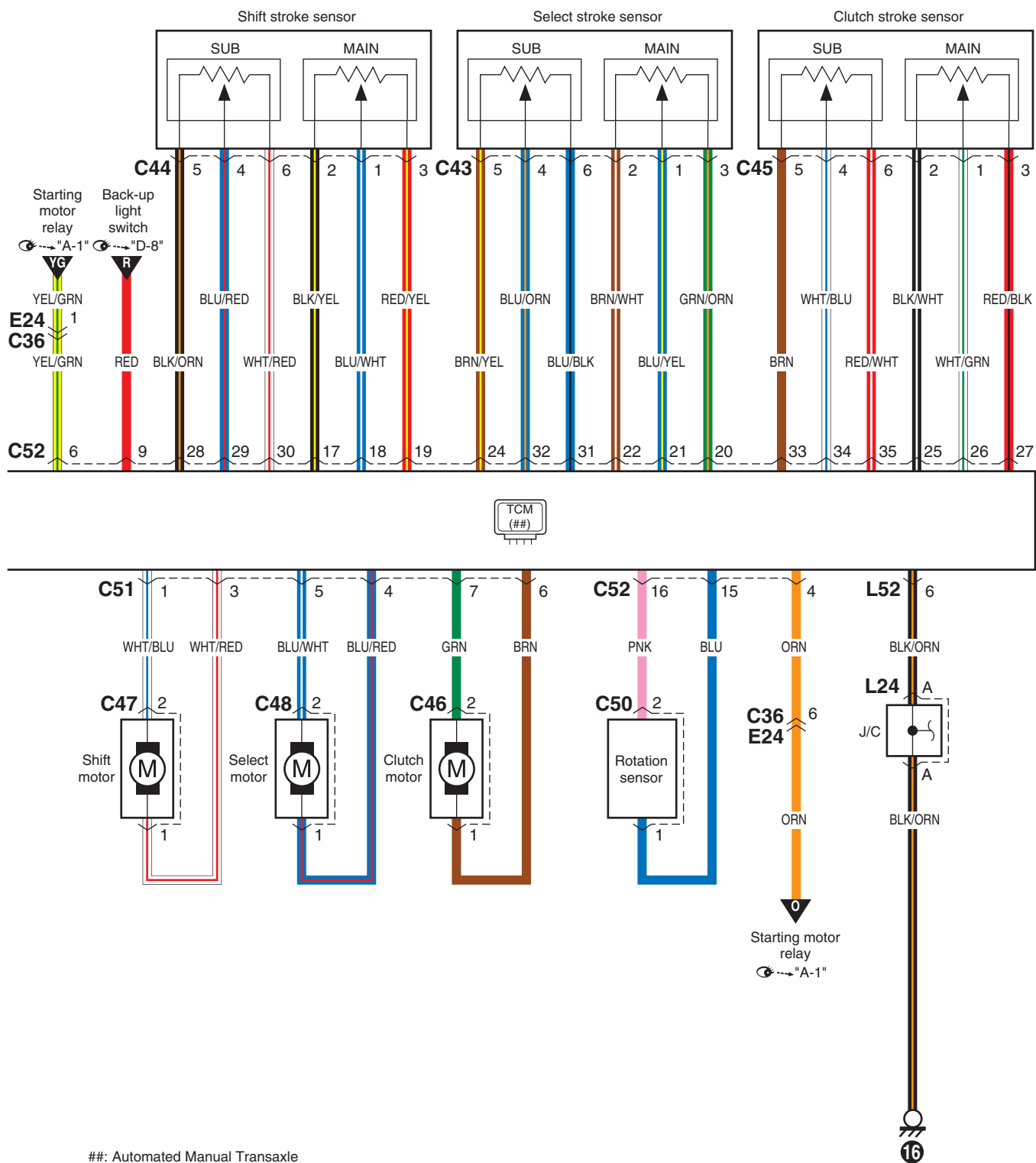
A-9 Automated Manual Transaxle Control System Circuit Diagram (Petrol)

S5RS0B910E010



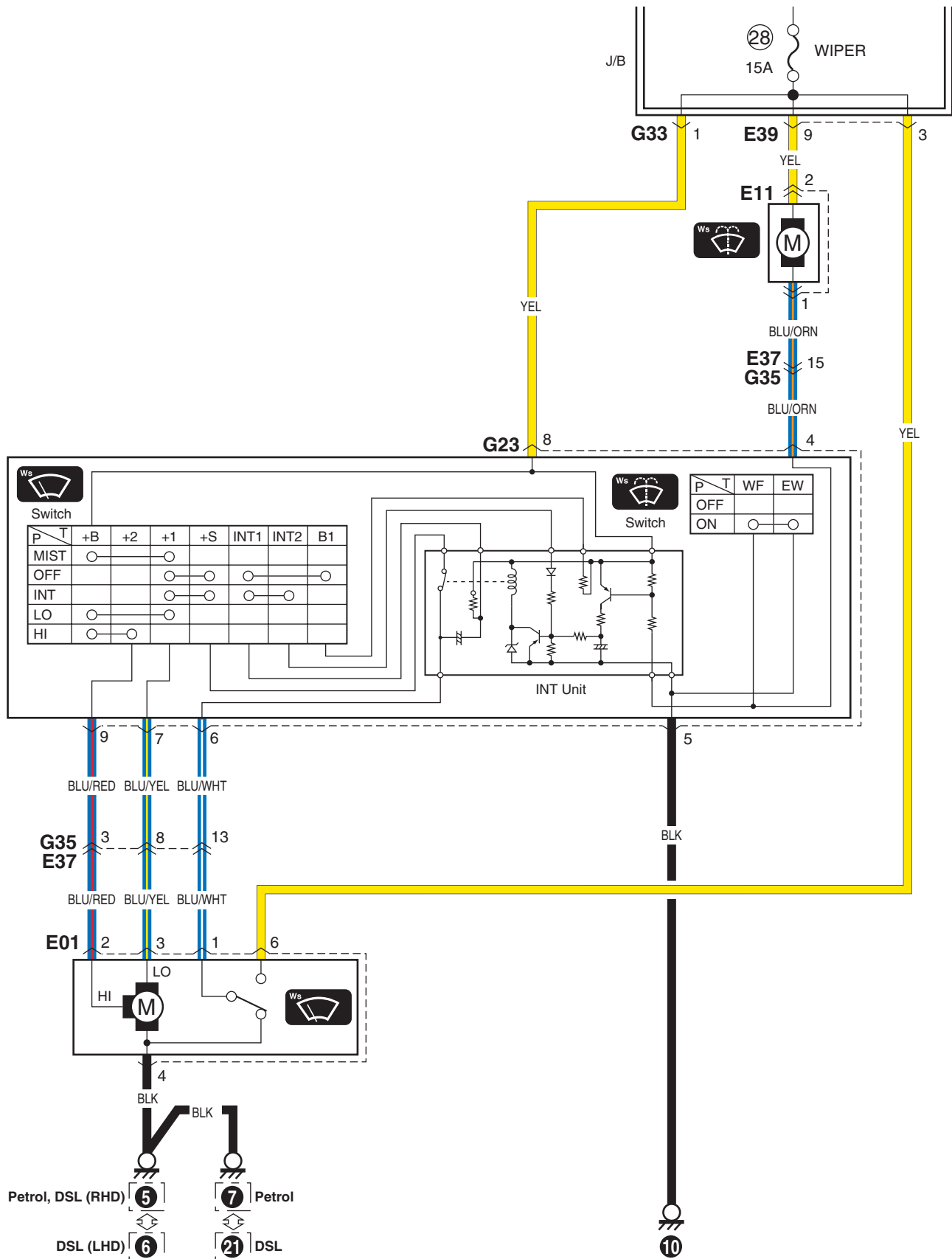
I5RS0B910938-02





B-1 Windshield Wiper and Washer Circuit Diagram

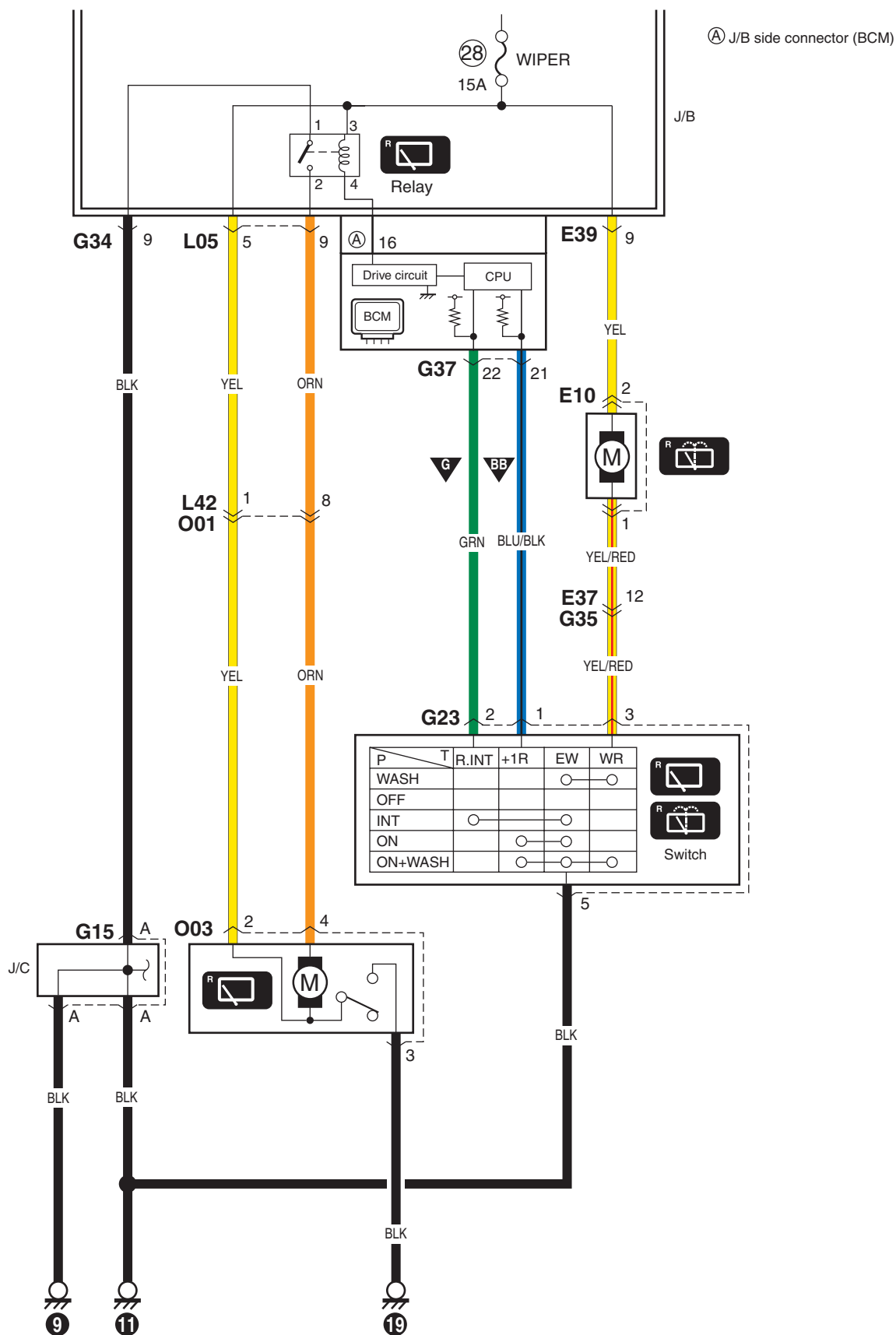
S5RS0B910E011



I5RS0B910939-01

B-2 Rear Wiper and Washer Circuit Diagram

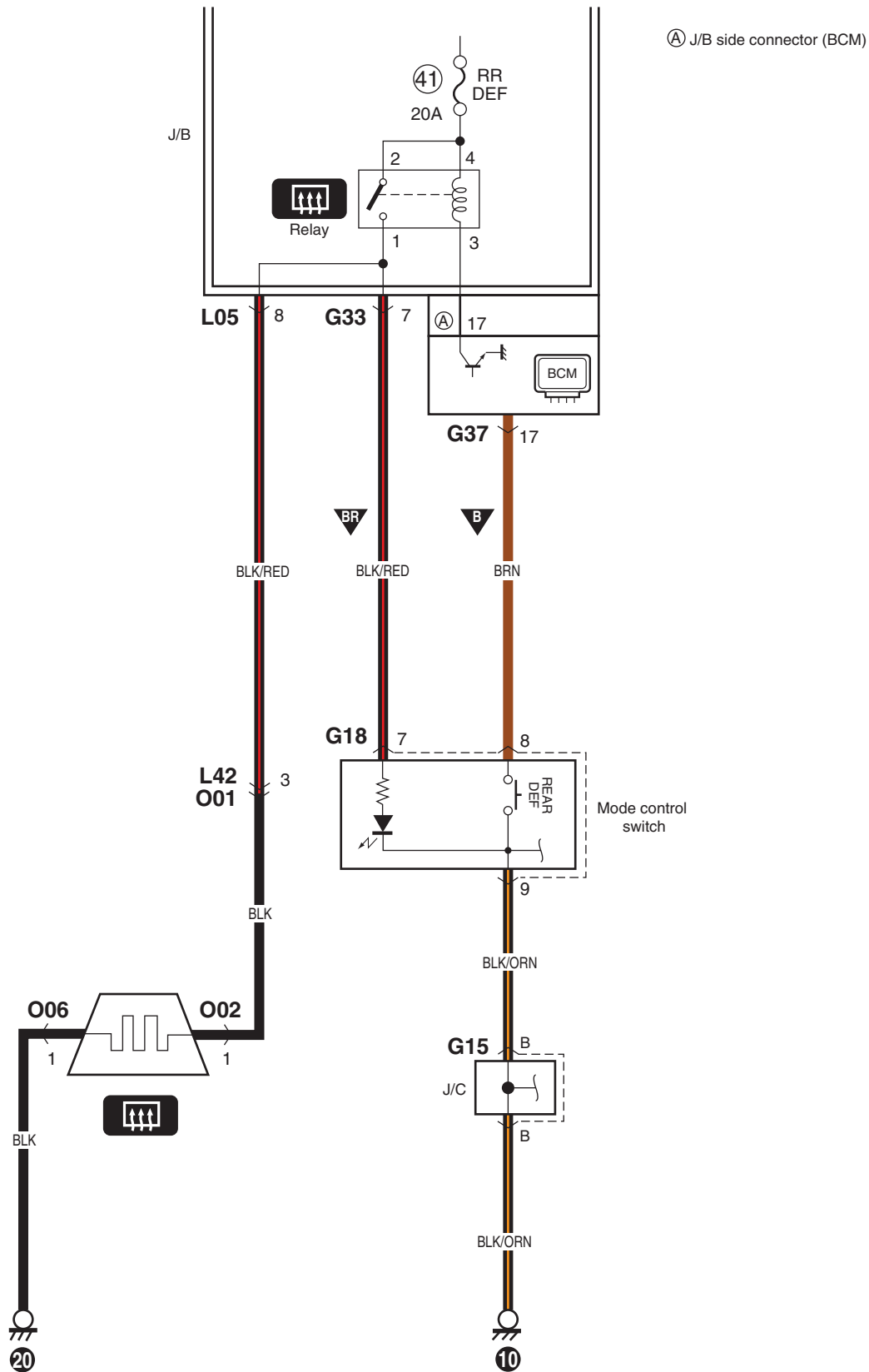
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14RS0B910939-02

B-3 Rear Defogger Circuit Diagram

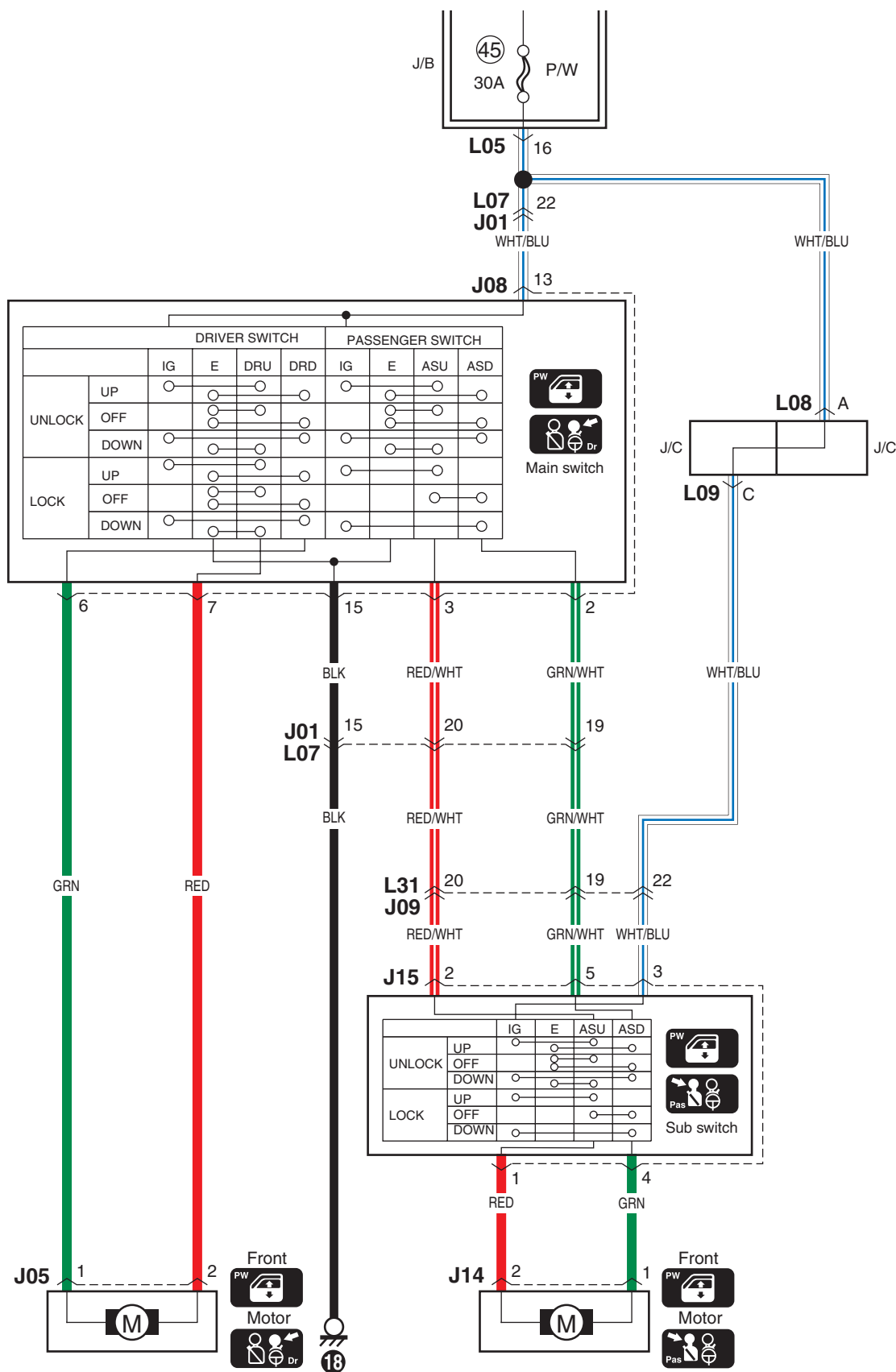
S5RS0B910E013



I5RS0B910940-01

B-4 Power Window Circuit Diagram

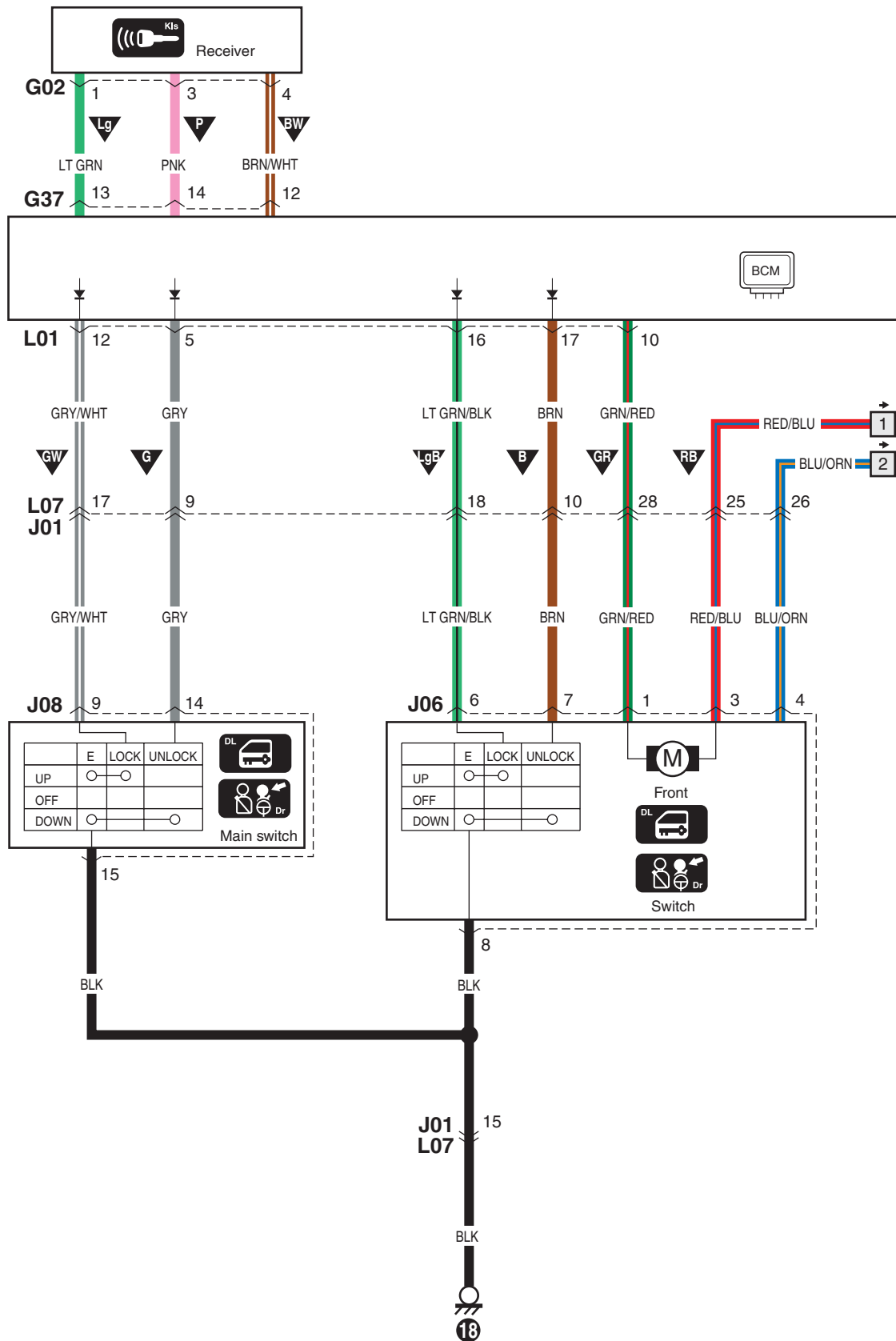
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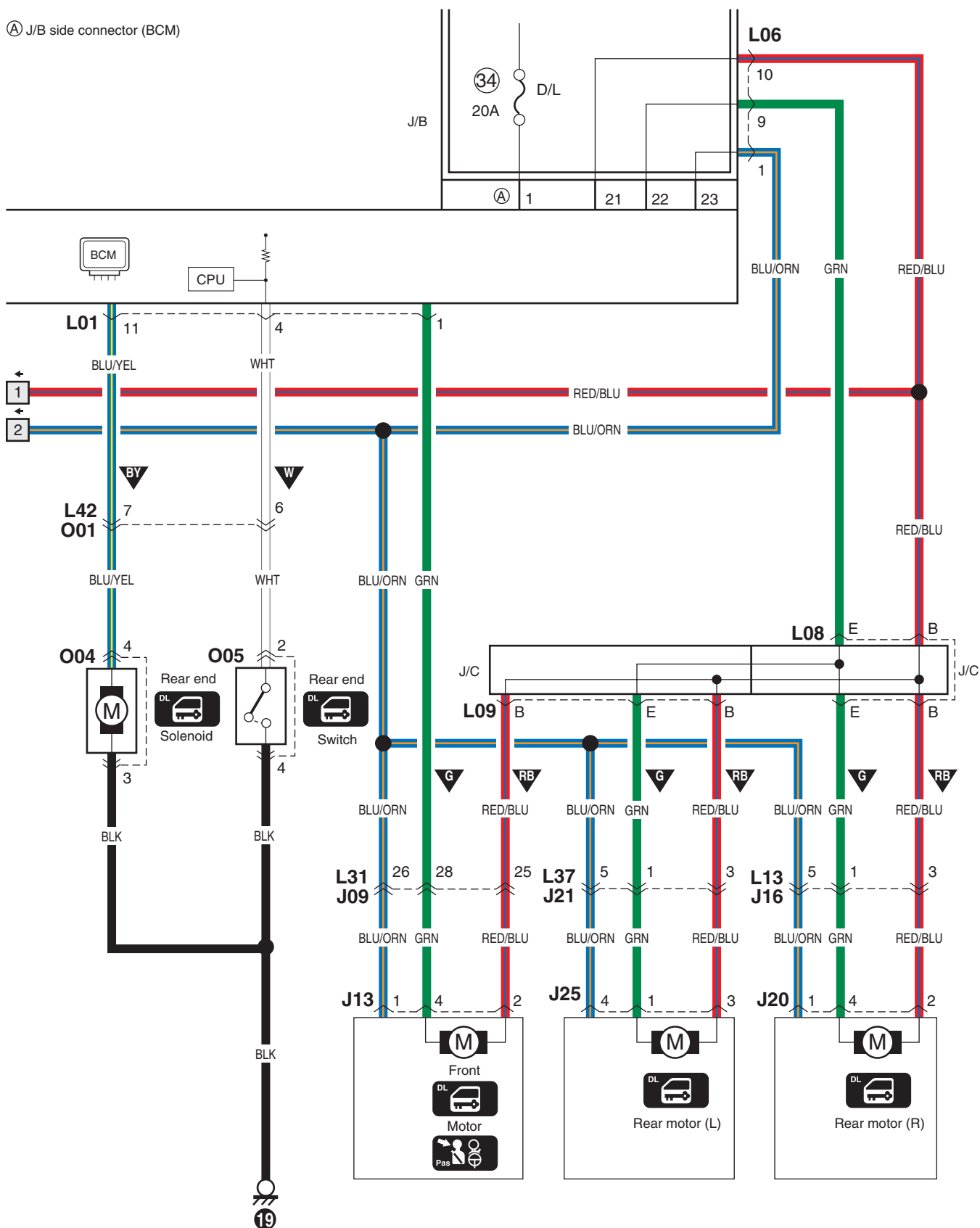
B-5 Power Door Lock Circuit Diagram

S5RS0B910E015



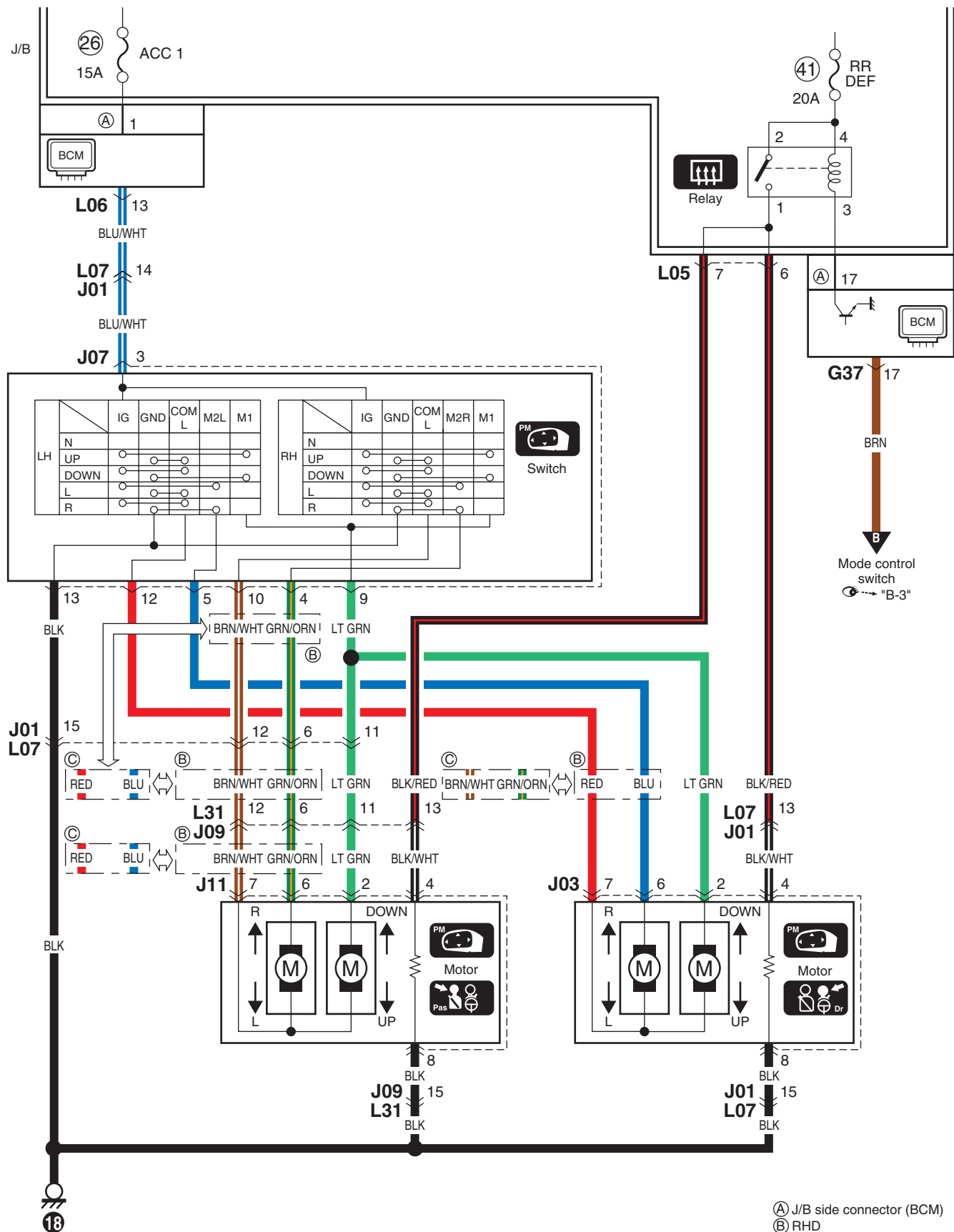
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Ⓐ J/B side connector (BCM)



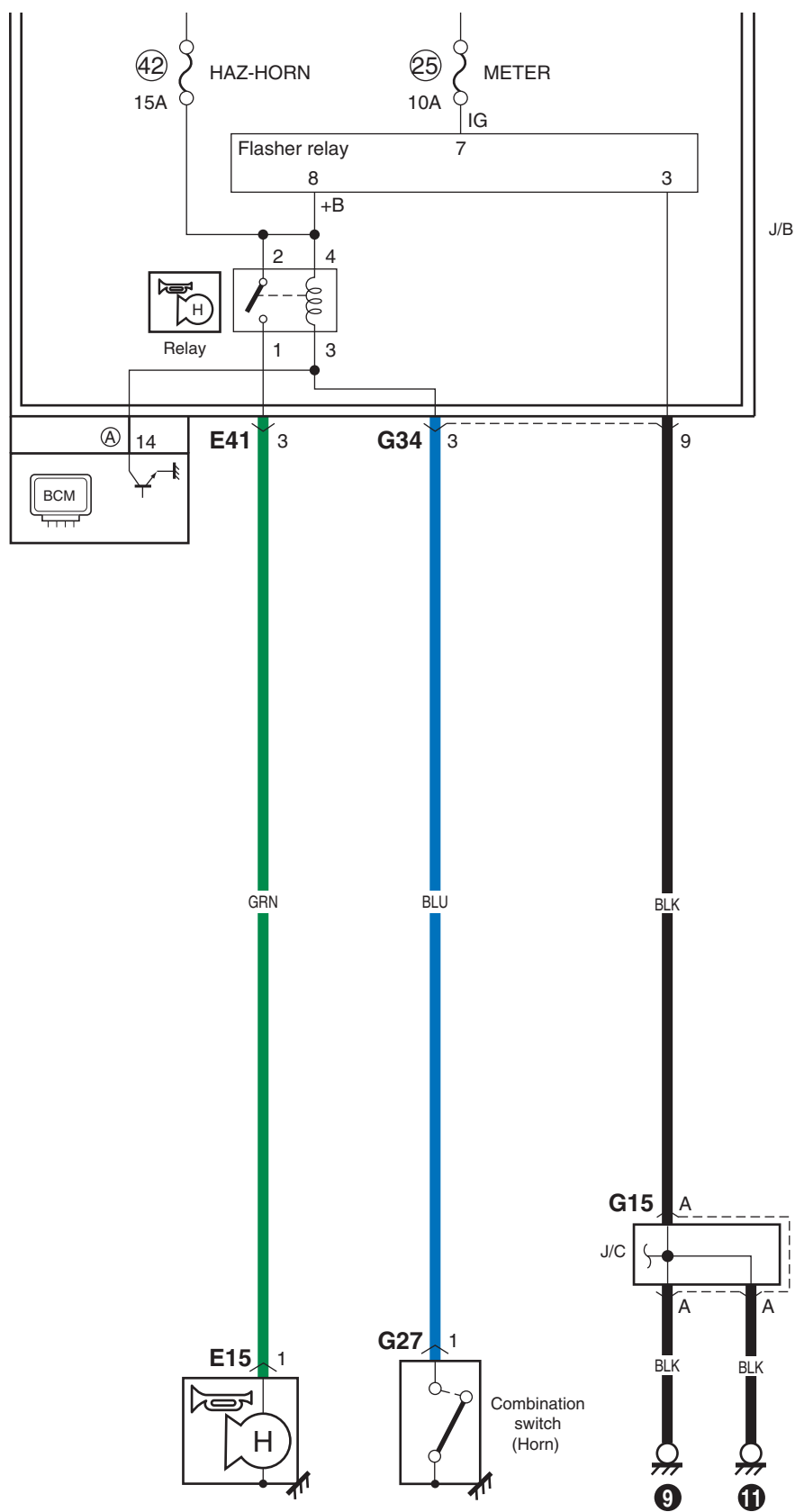
B-6 Power Mirror Circuit Diagram

S5RS0B910E016



B-7 Horn Circuit Diagram

S5RS0B910E017

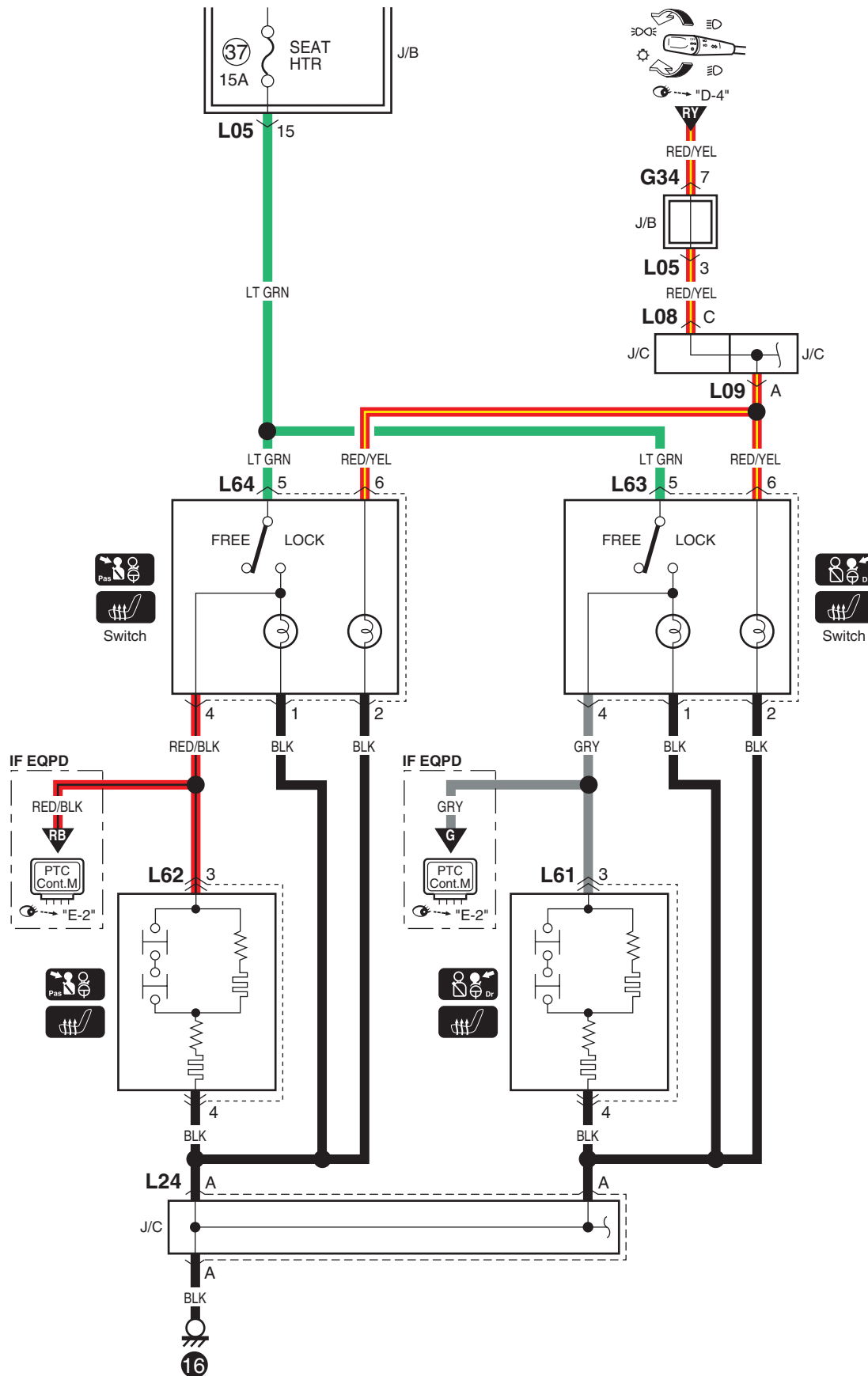


Ⓐ J/B side connector (BCM)

I4RS0B910973-01

B-8 Seat Heater Circuit Diagram

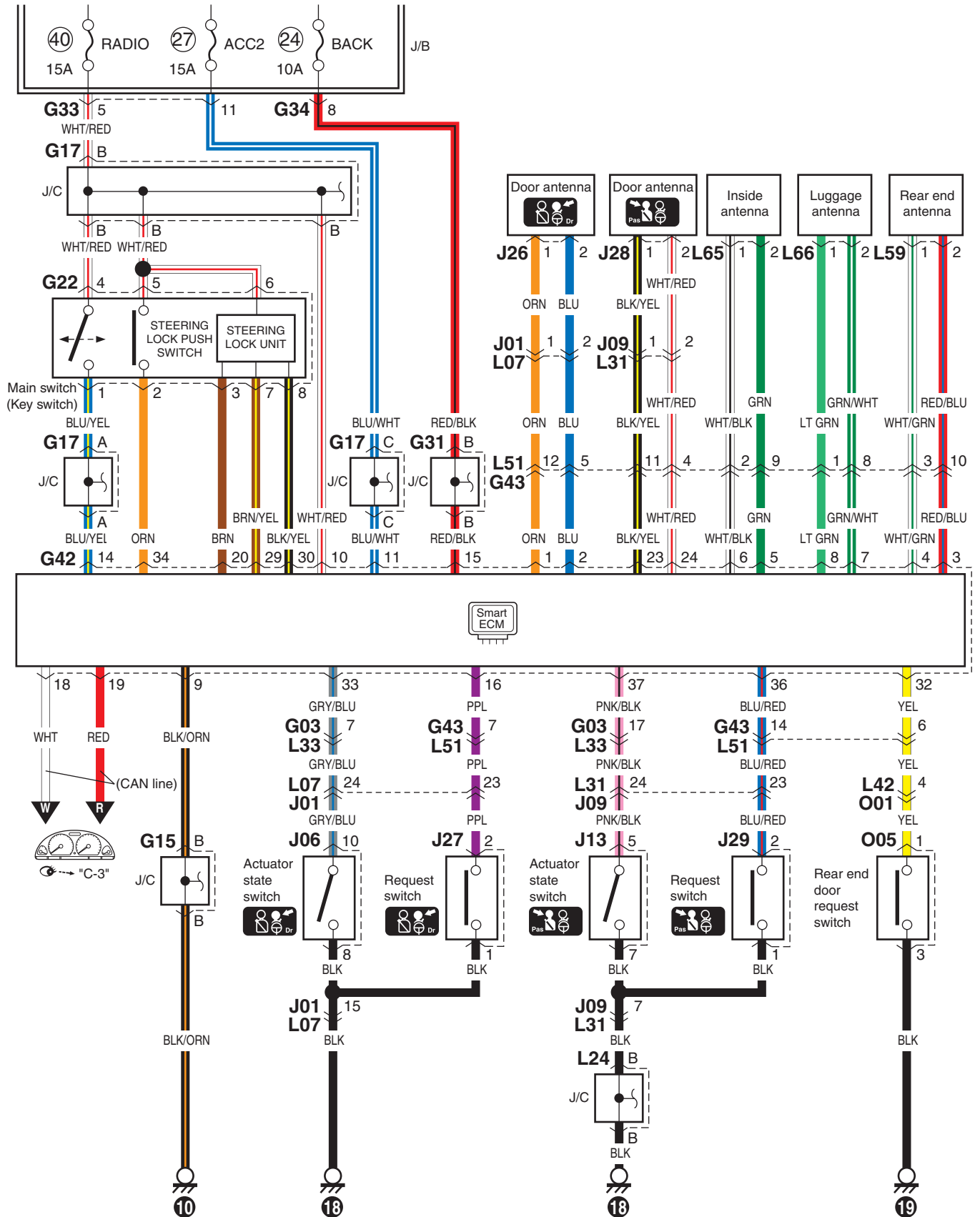
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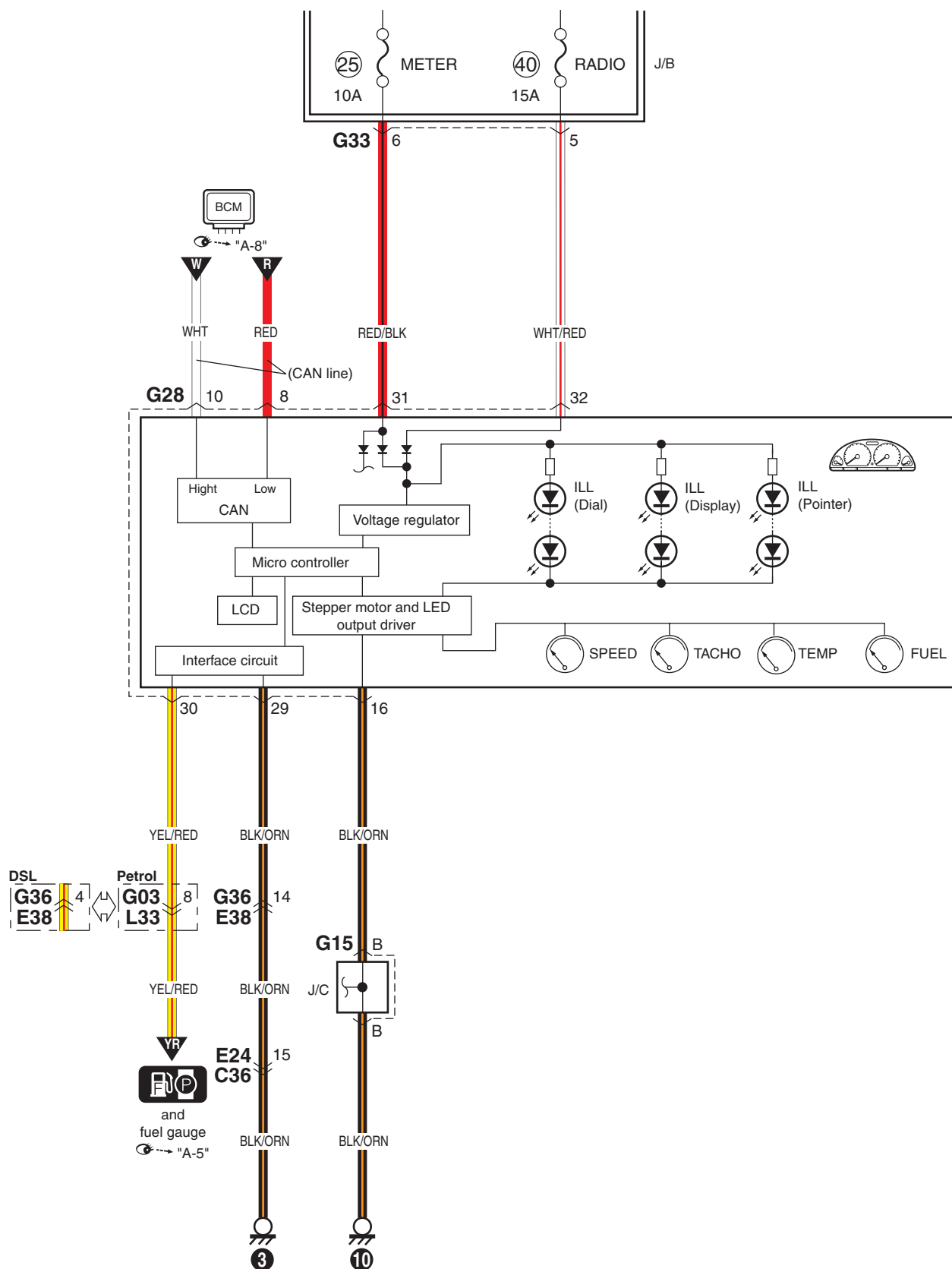
15RS0B910943-01

B-9 Smart Key System Circuit Diagram

S5RS0B910E019

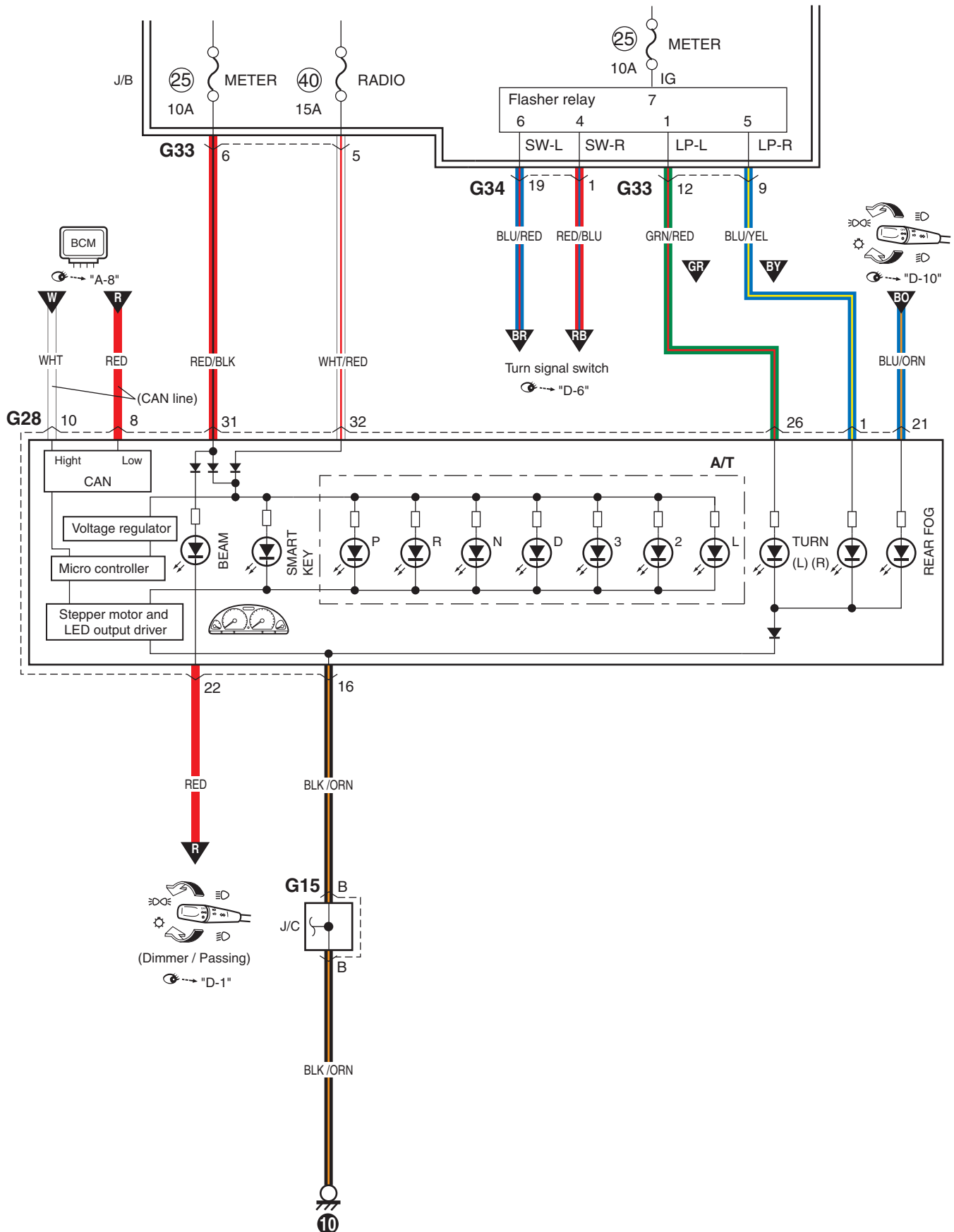


I5RS0B910944-01

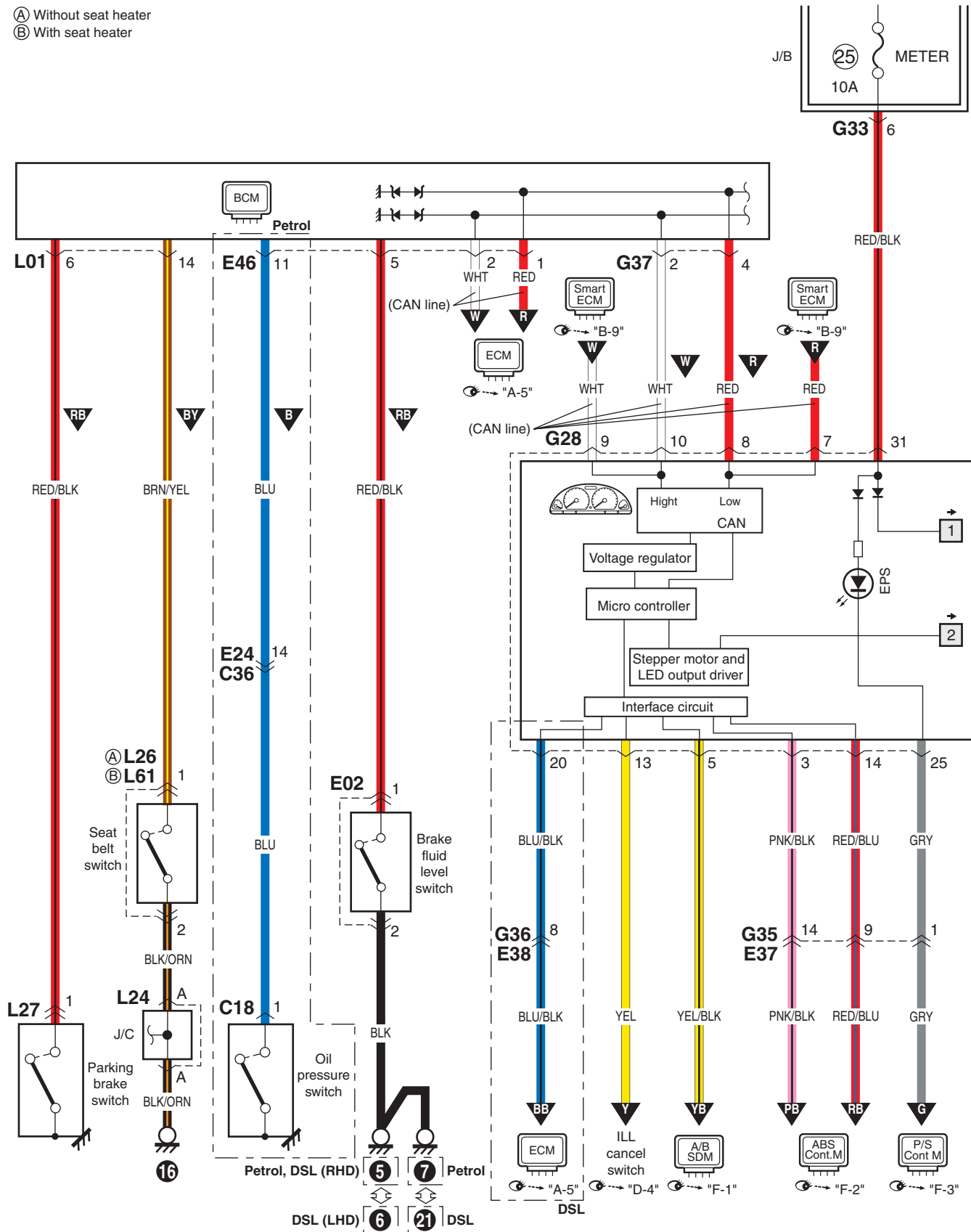


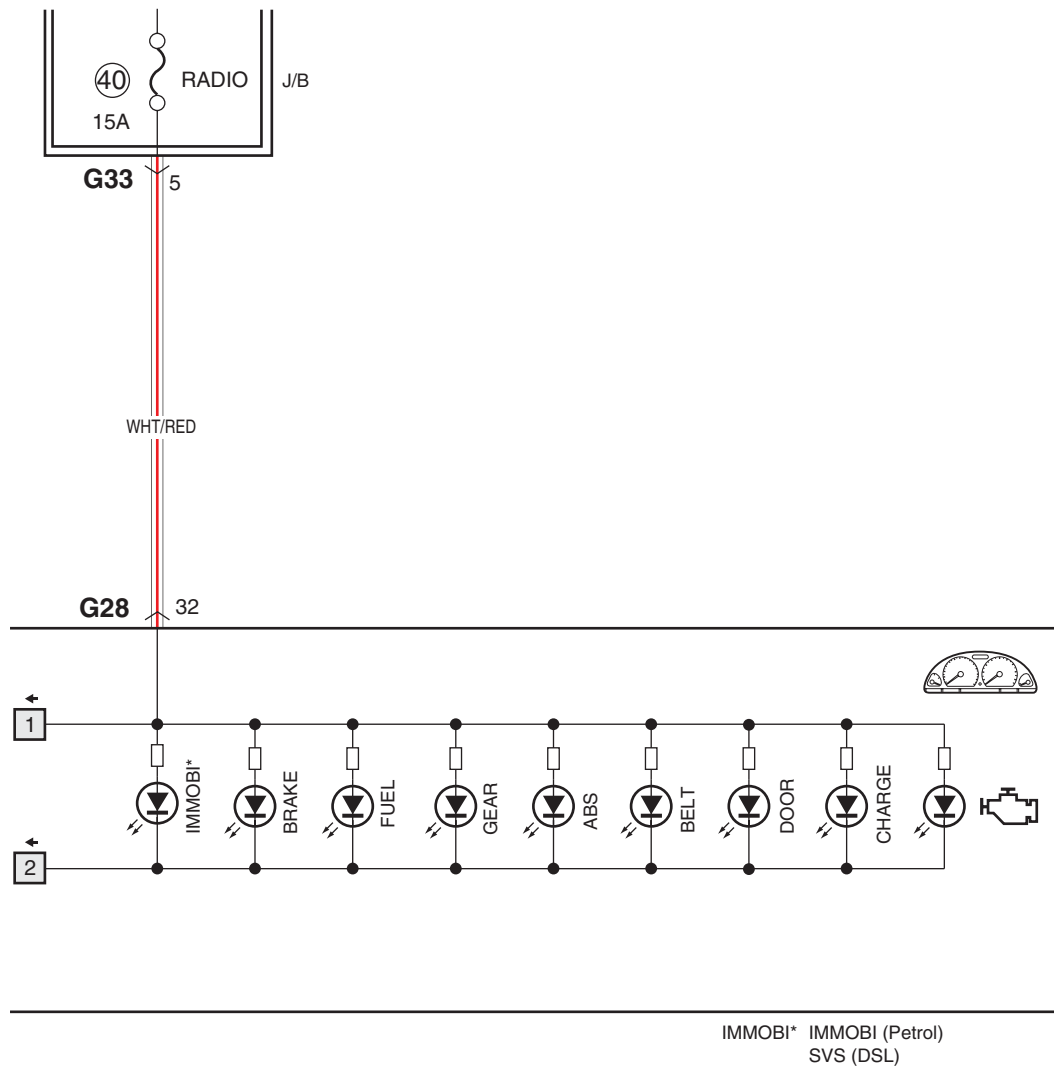
C-2 Combination Meter Circuit Diagram (Indicator)

S5RS0B910E021



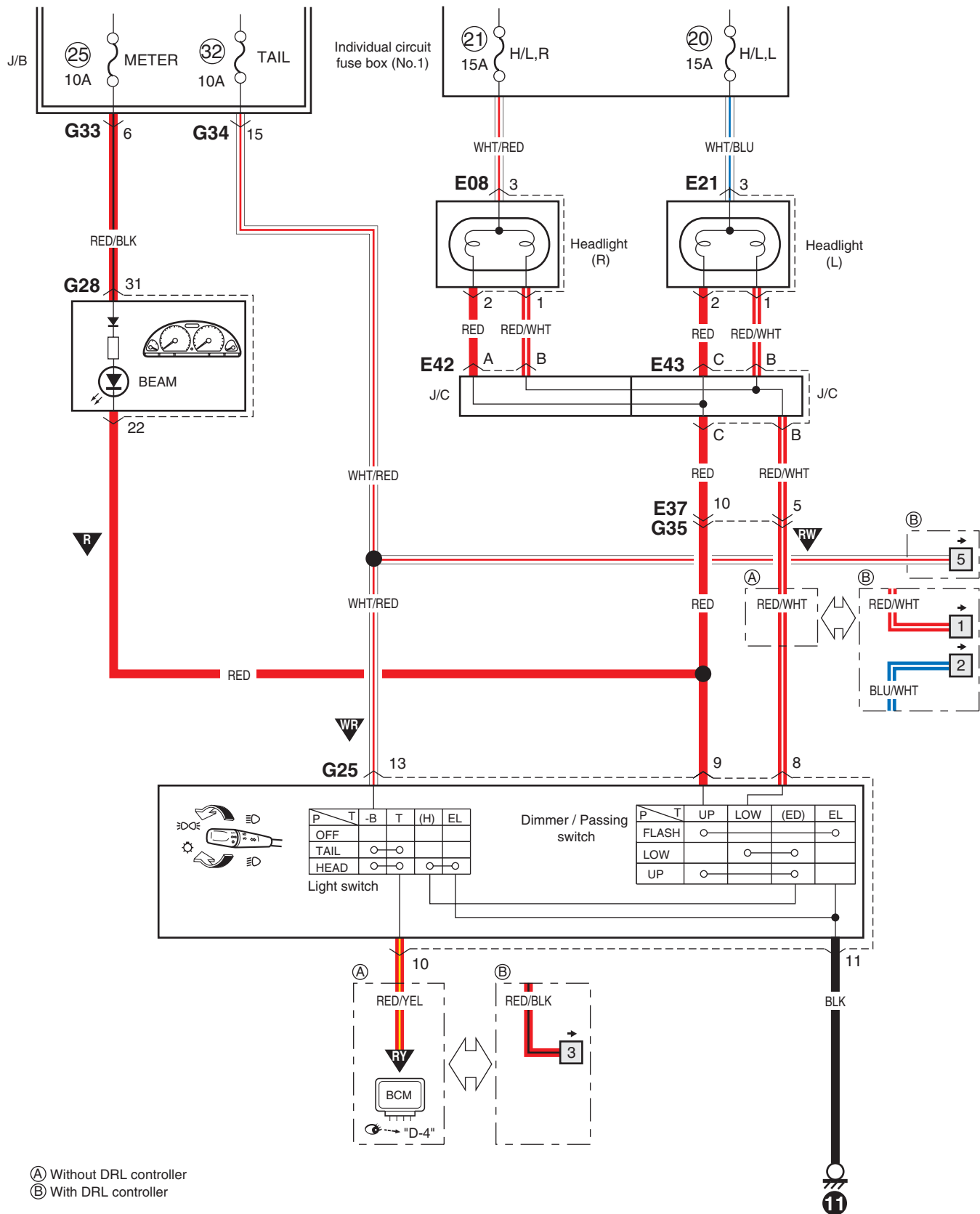
- ☐ (A) Without seat heater
☐ (B) With seat heater





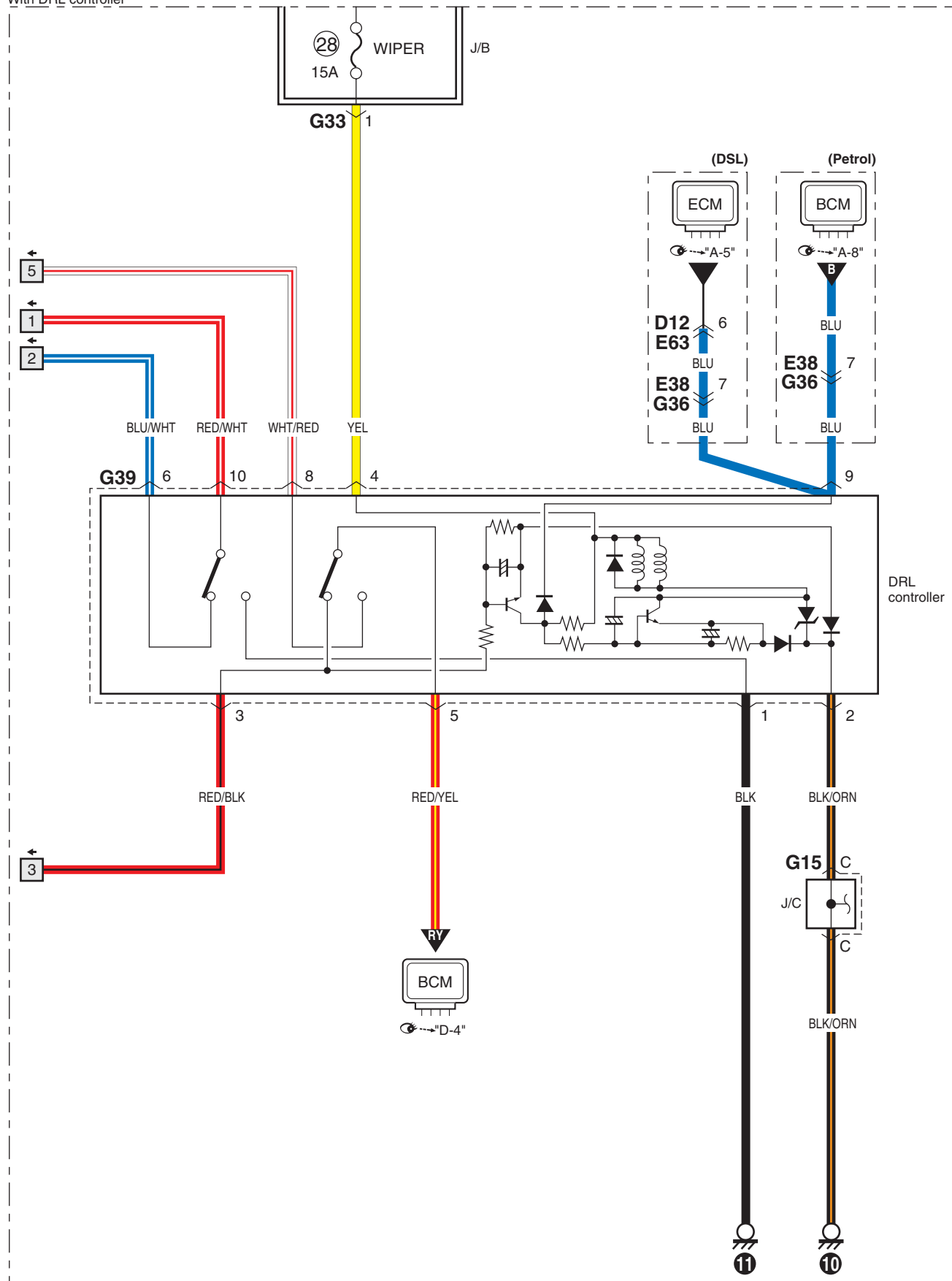
D-1 Headlight System Circuit Diagram

S5RS0B910E023



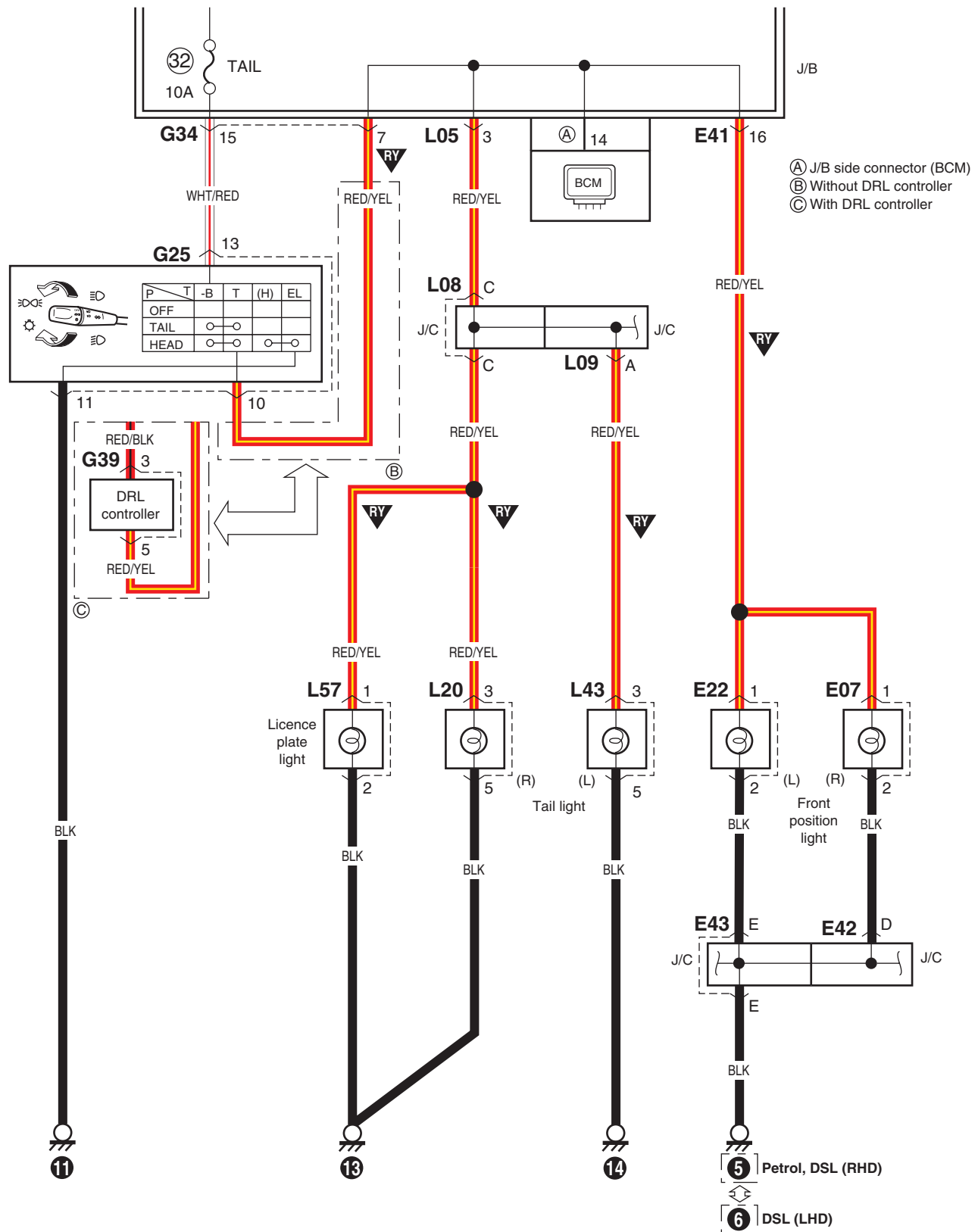
15RS0B910948-01

With DRL controller



D-2 Position, Tail and Licence Plate Light System Circuit Diagram

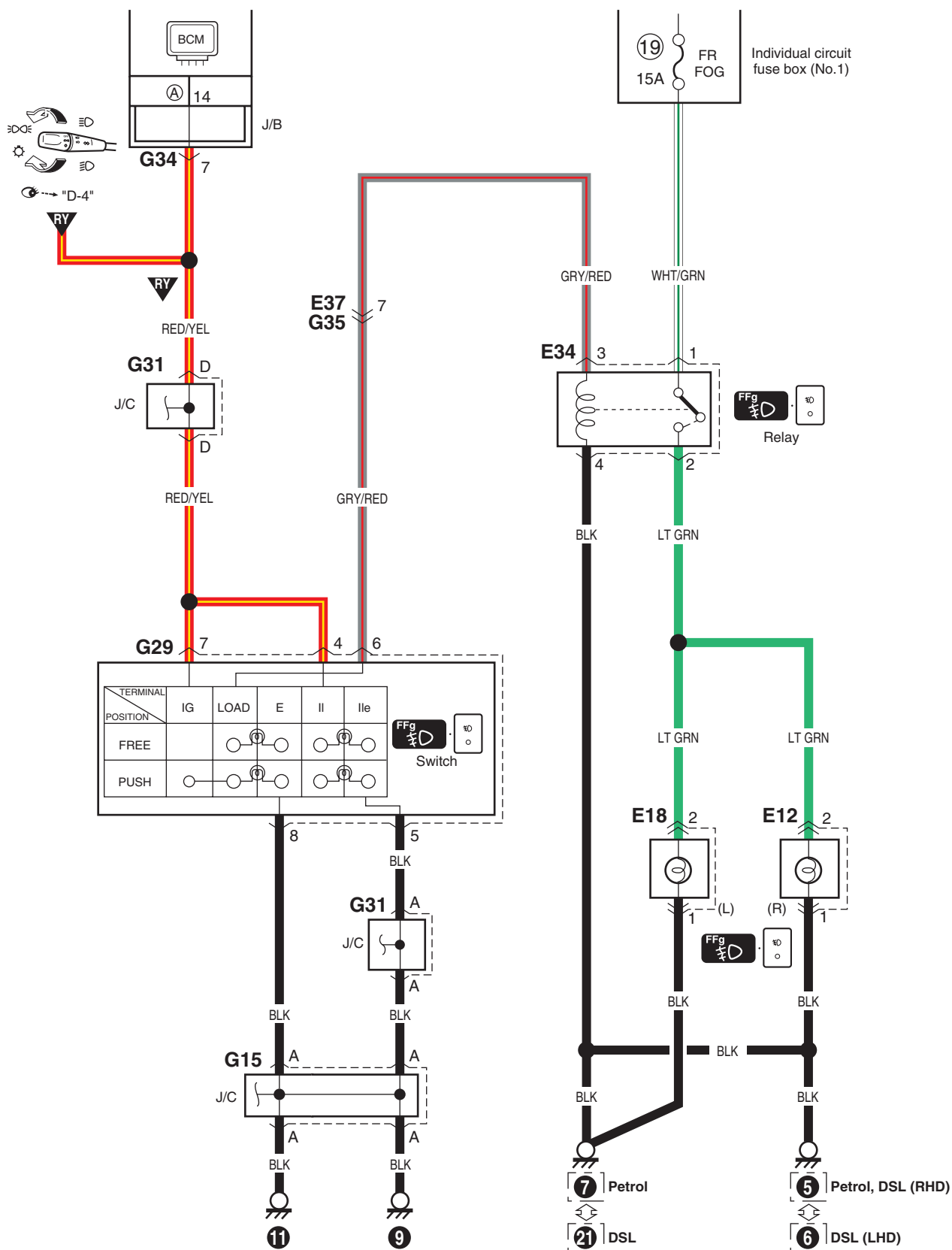
S5RS0B910E024



I5RS0B910950-01

D-3 Front Fog Light System Circuit Diagram

S5RS0B910E025

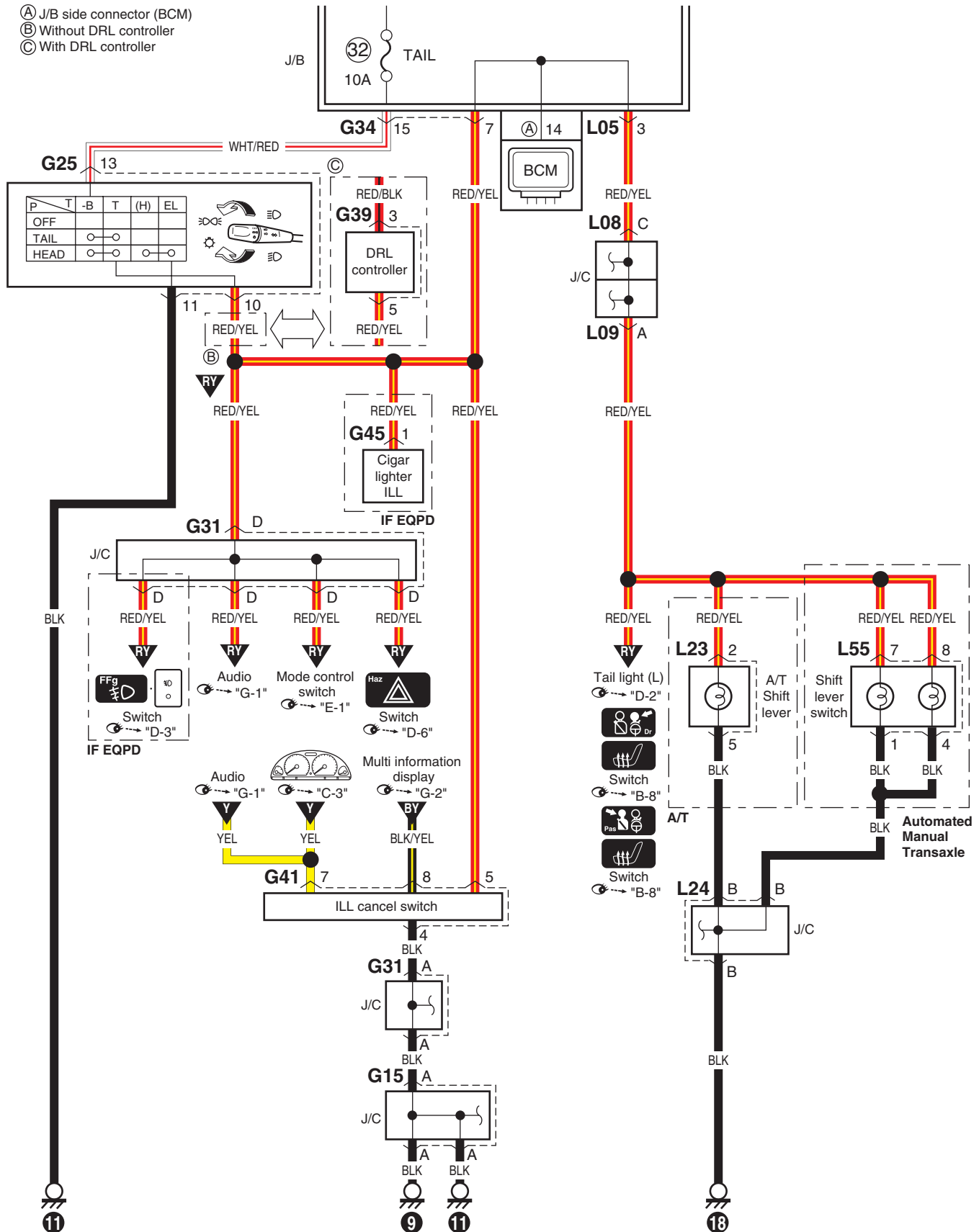


(A) J/B side connector (BCM)

15RS0B910951-01

D-4 Illumination Light System Circuit Diagram

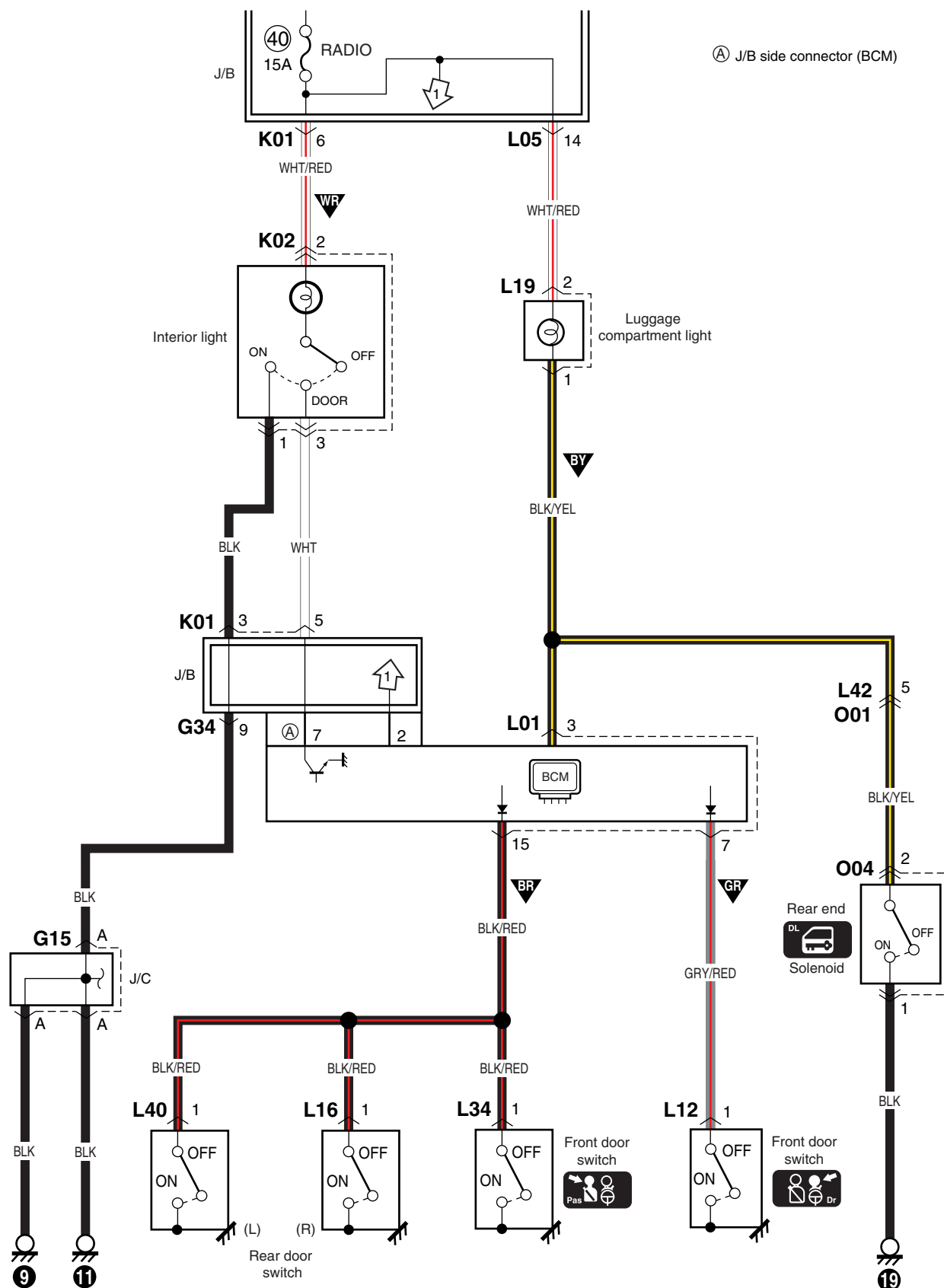
S5RS0B910E026



I5RS0B910952-01

D-5 Interior Light System Circuit Diagram

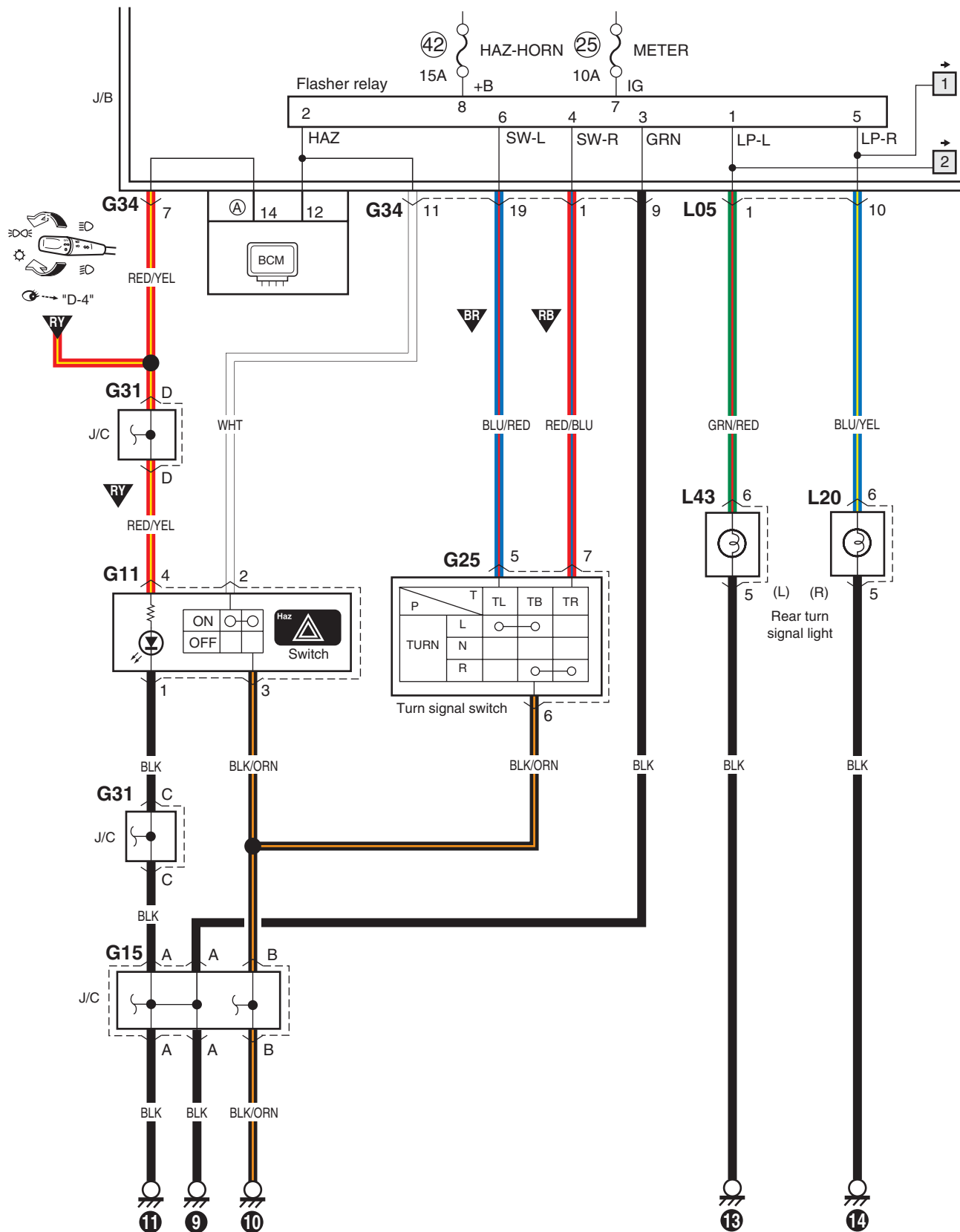
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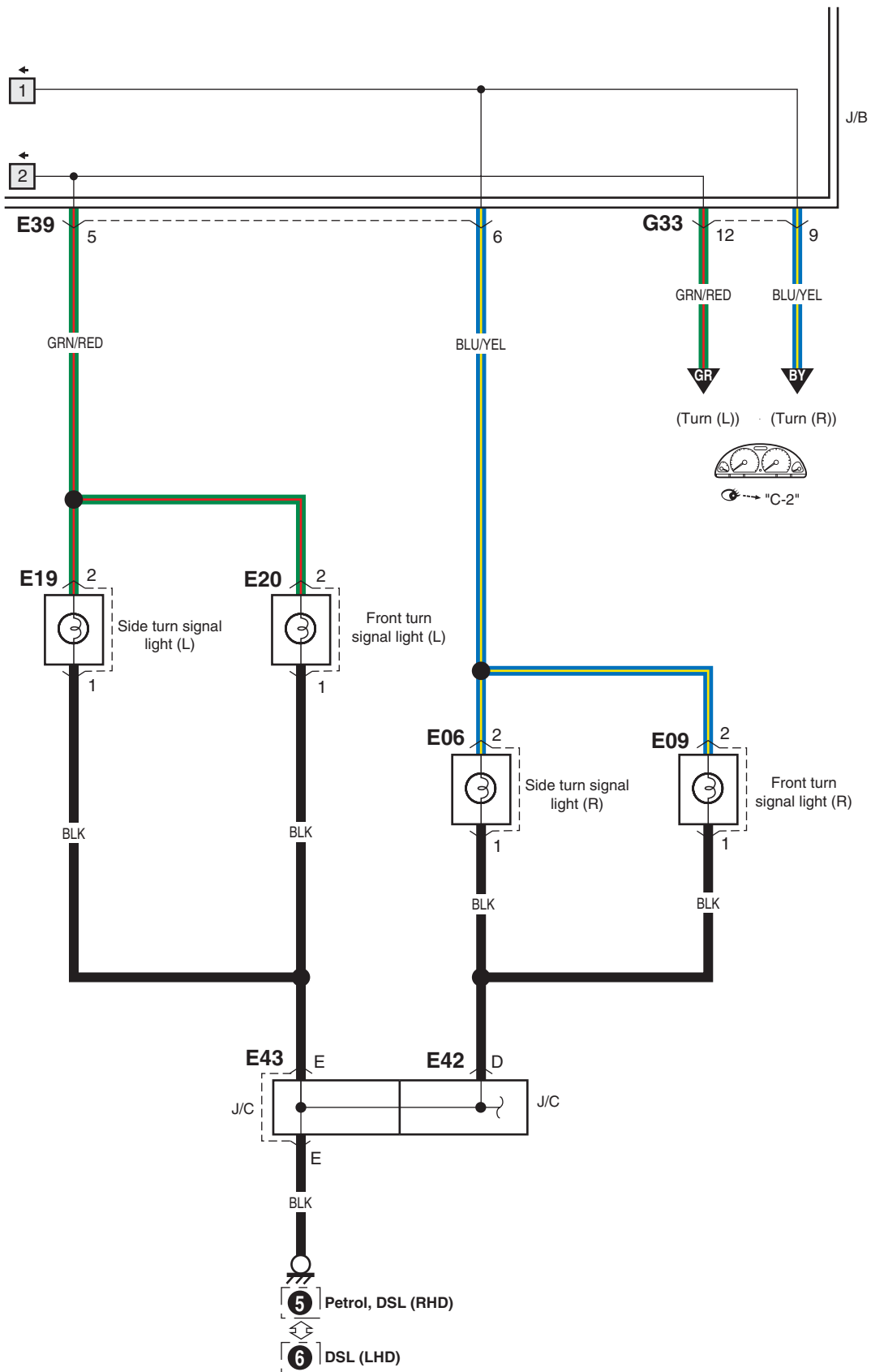
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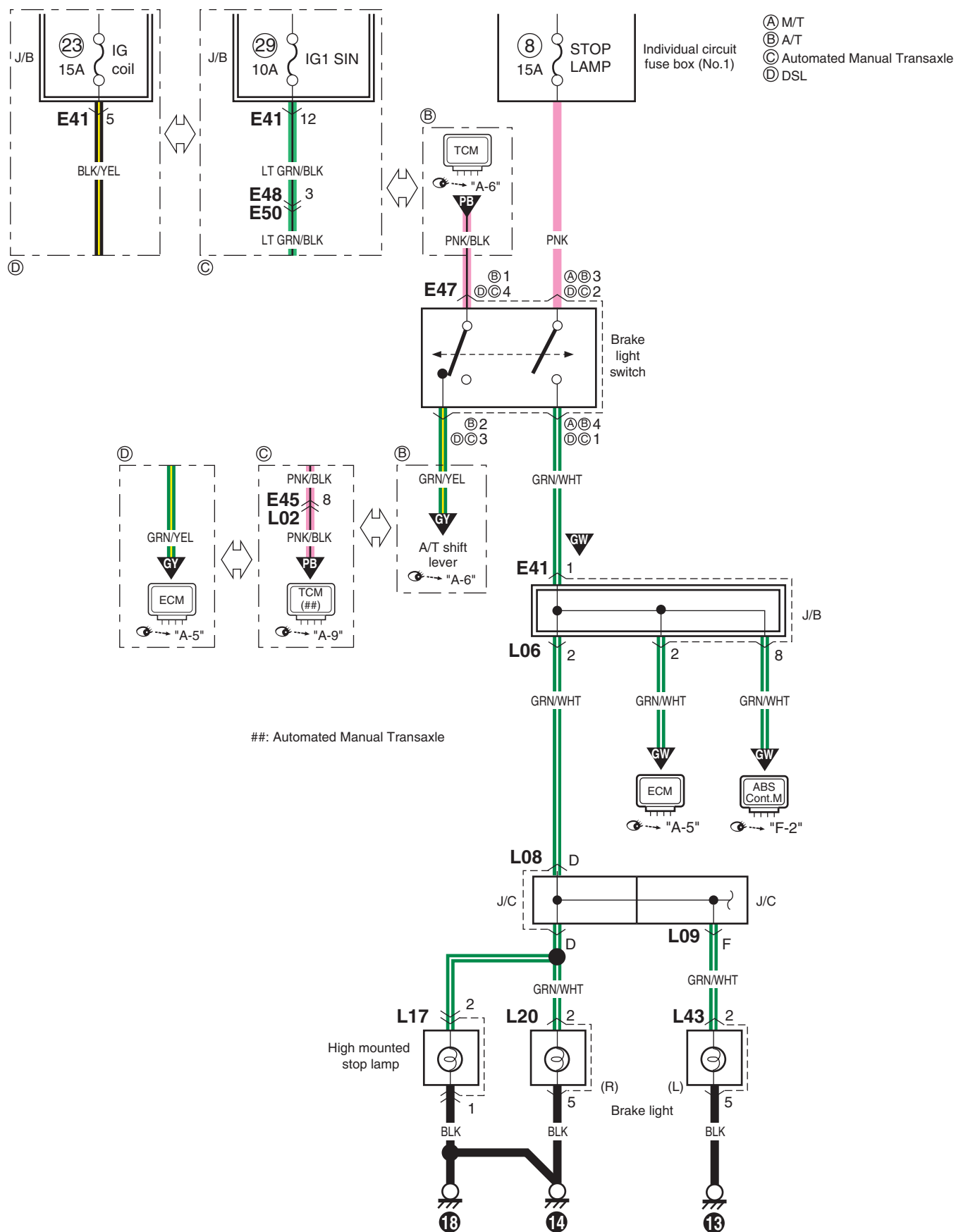
D-6 Turn Signal and Hazard Warning Light System Circuit Diagram

S5RS0B910E028



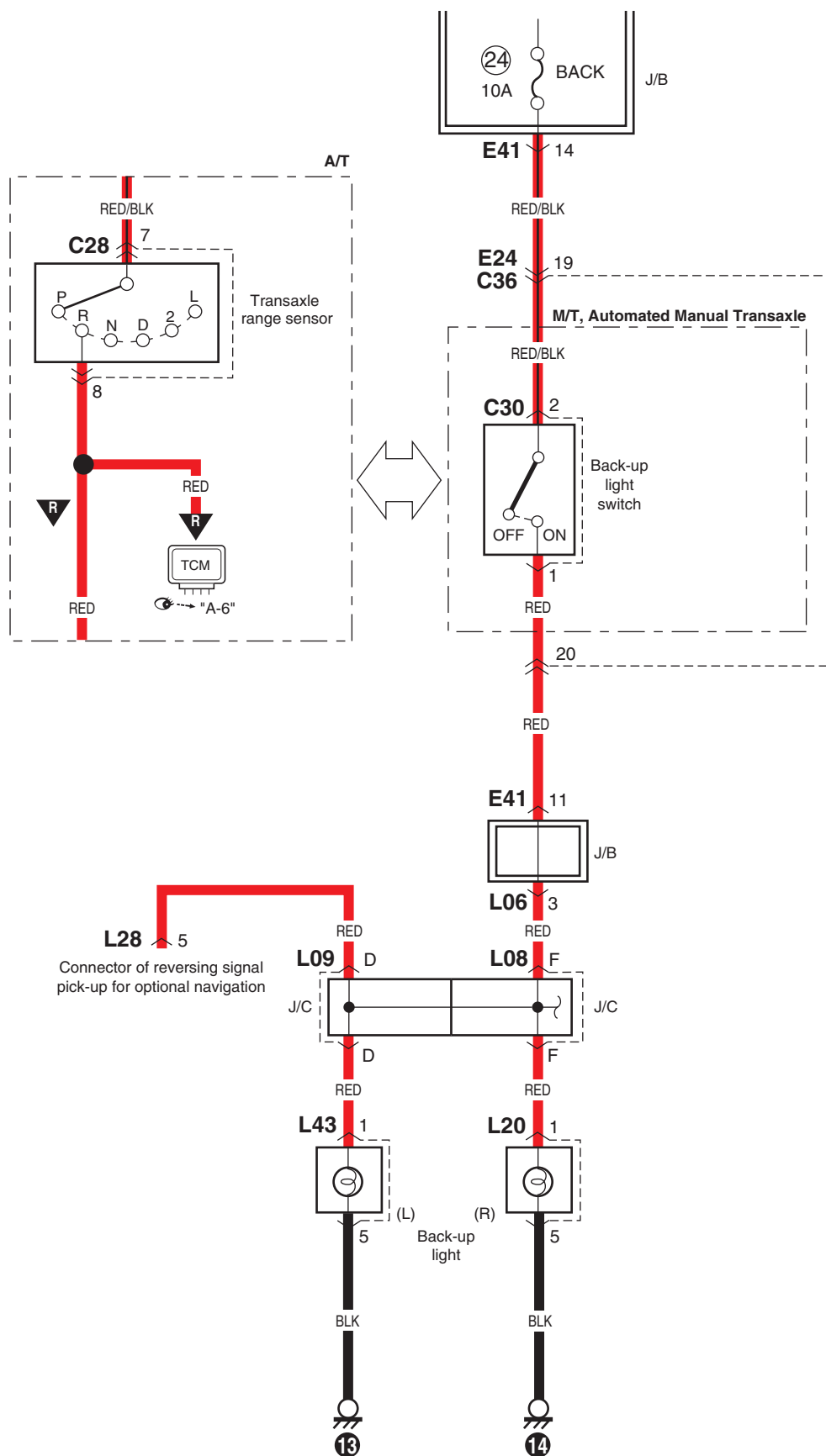
Ⓐ J/B side connector (BCM)
I4RS0B910955-02





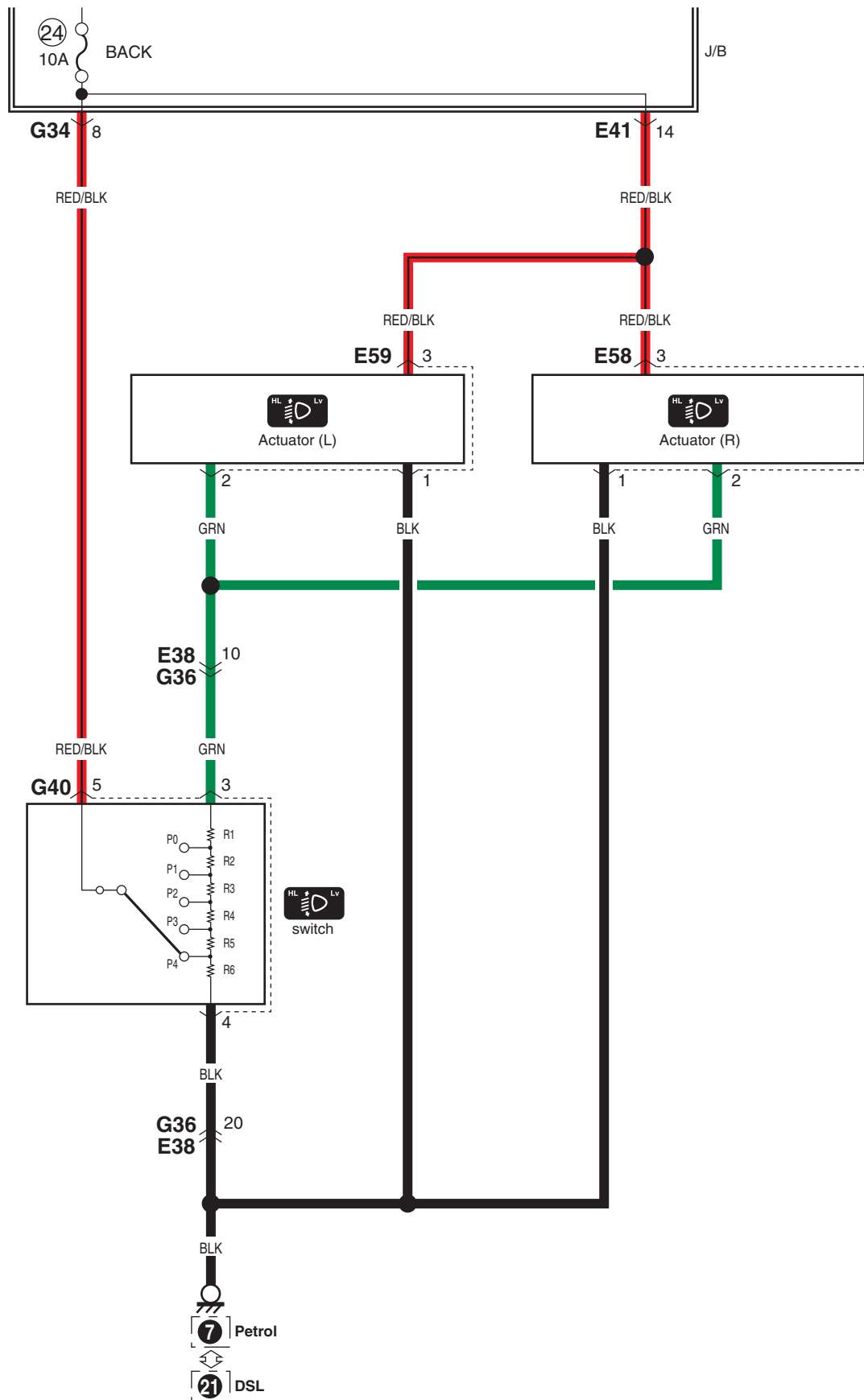
D-8 Back-Up Light System Circuit Diagram

S5RS0B910E030



D-9 Headlight Beam Leveling System Circuit Diagram

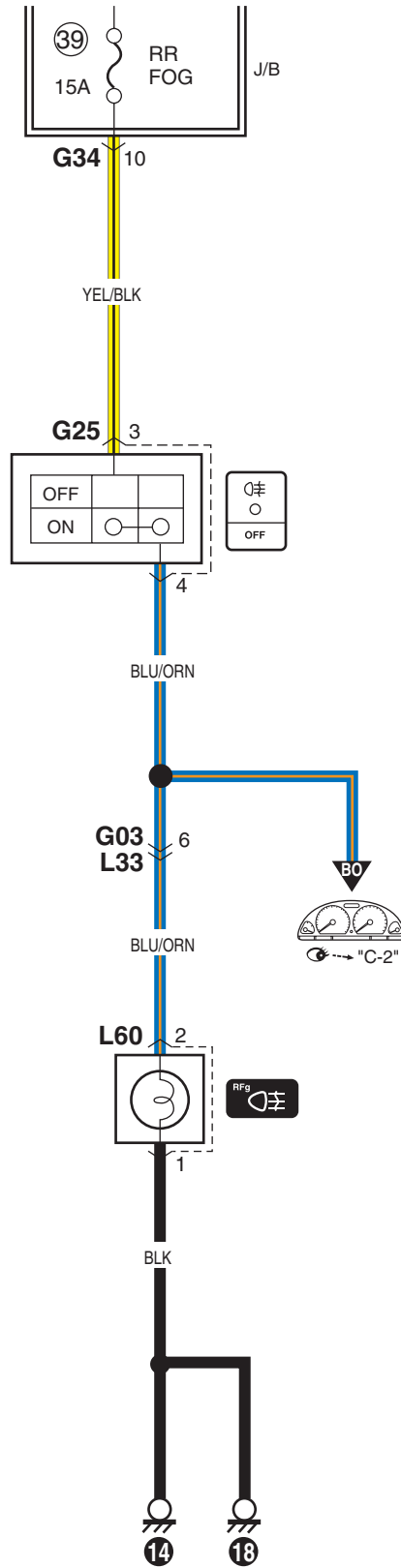
S5RS0B910E031



I5RS0B910954-01

D-10 Rear Fog Light Circuit Diagram

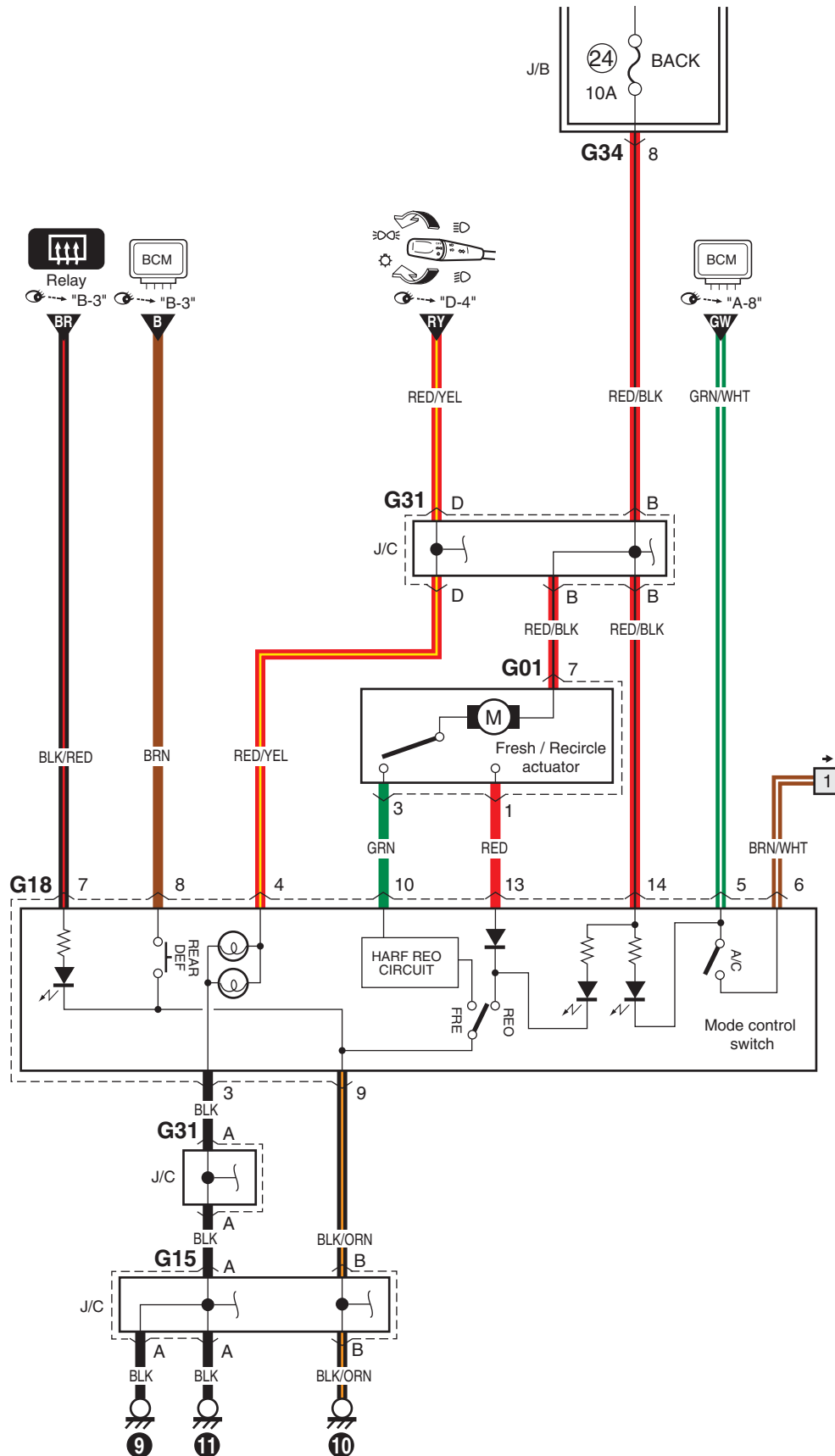
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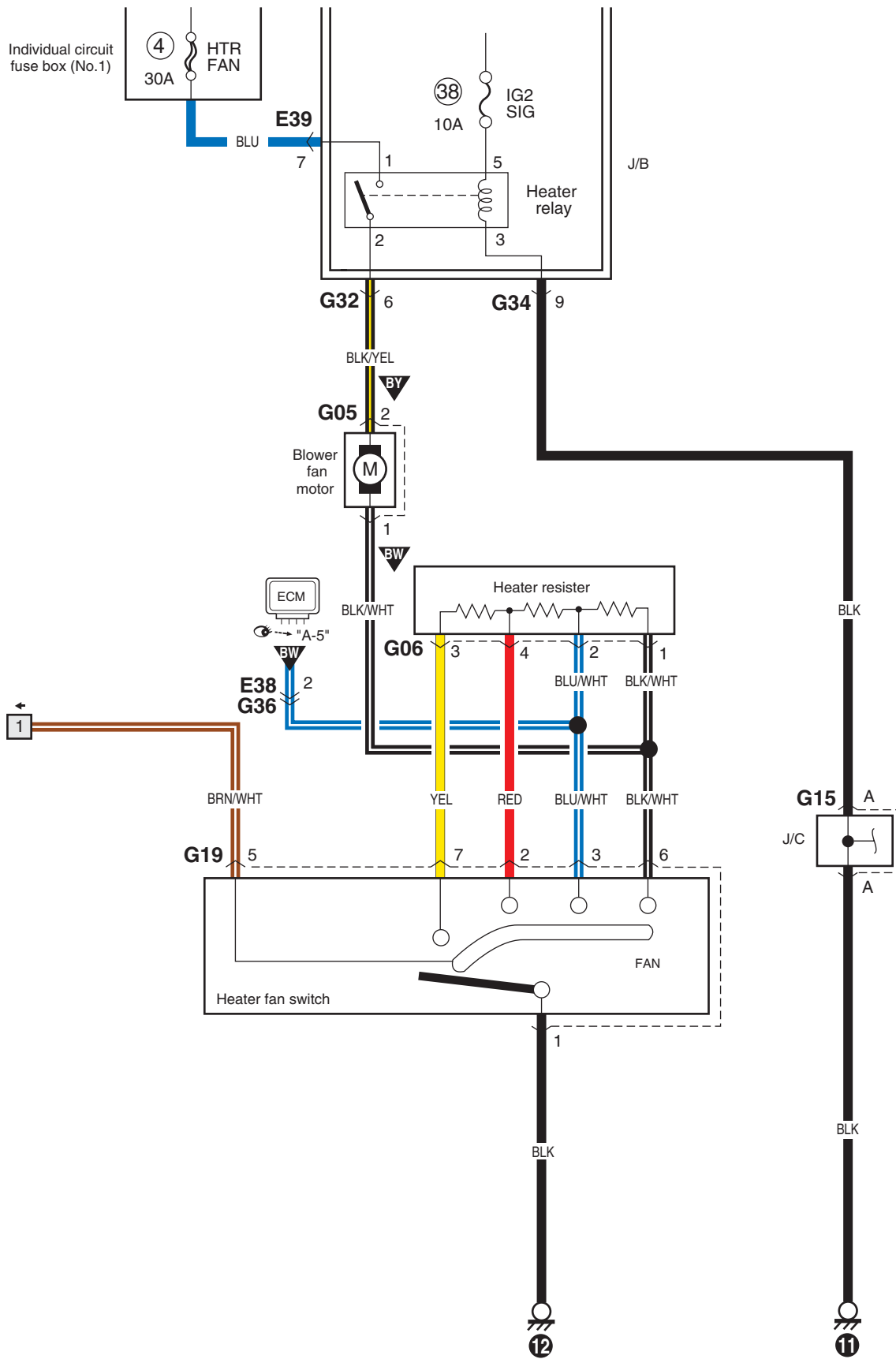
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E-1 Heater System Circuit Diagram

S5RS0B910E033

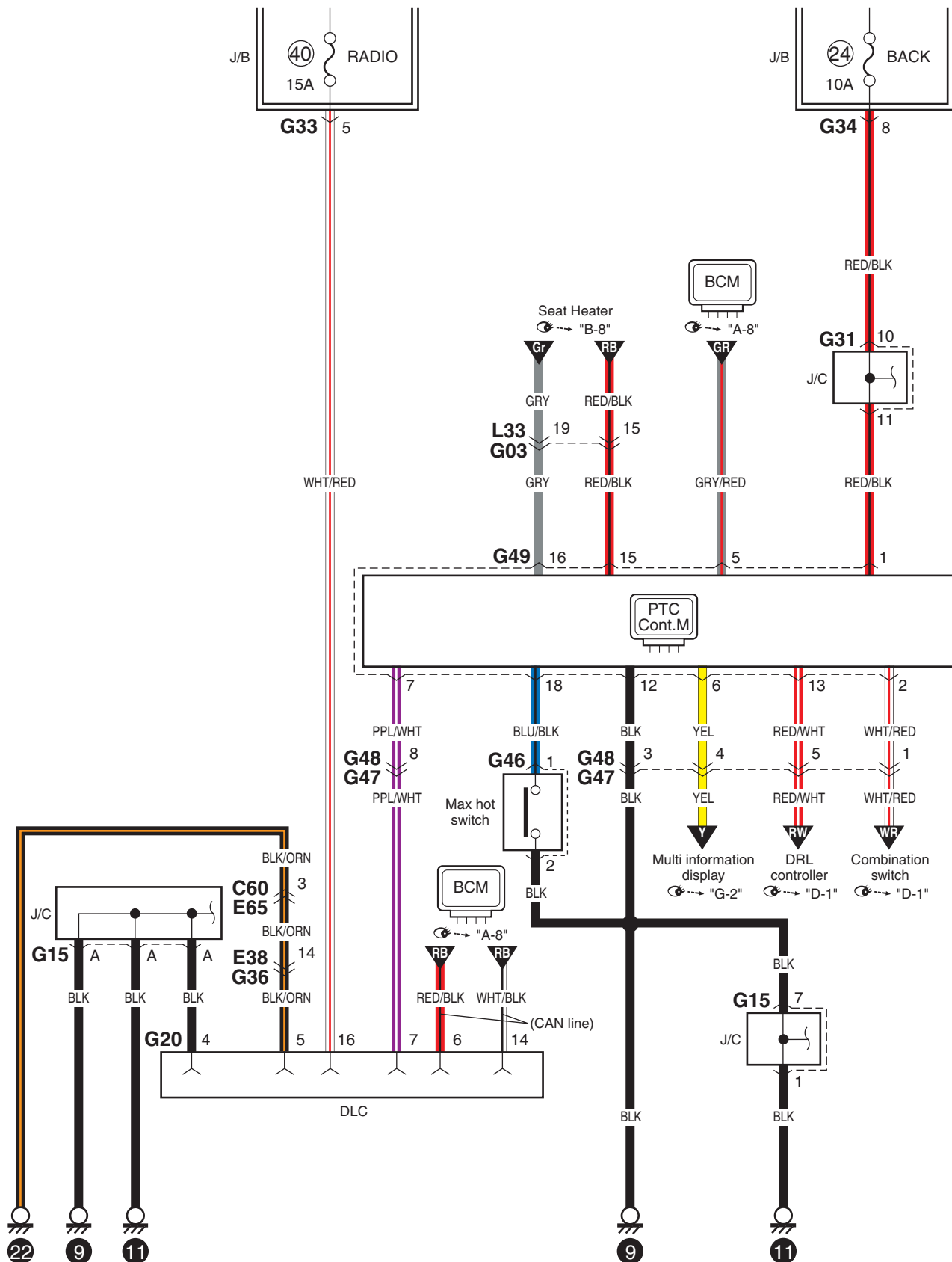


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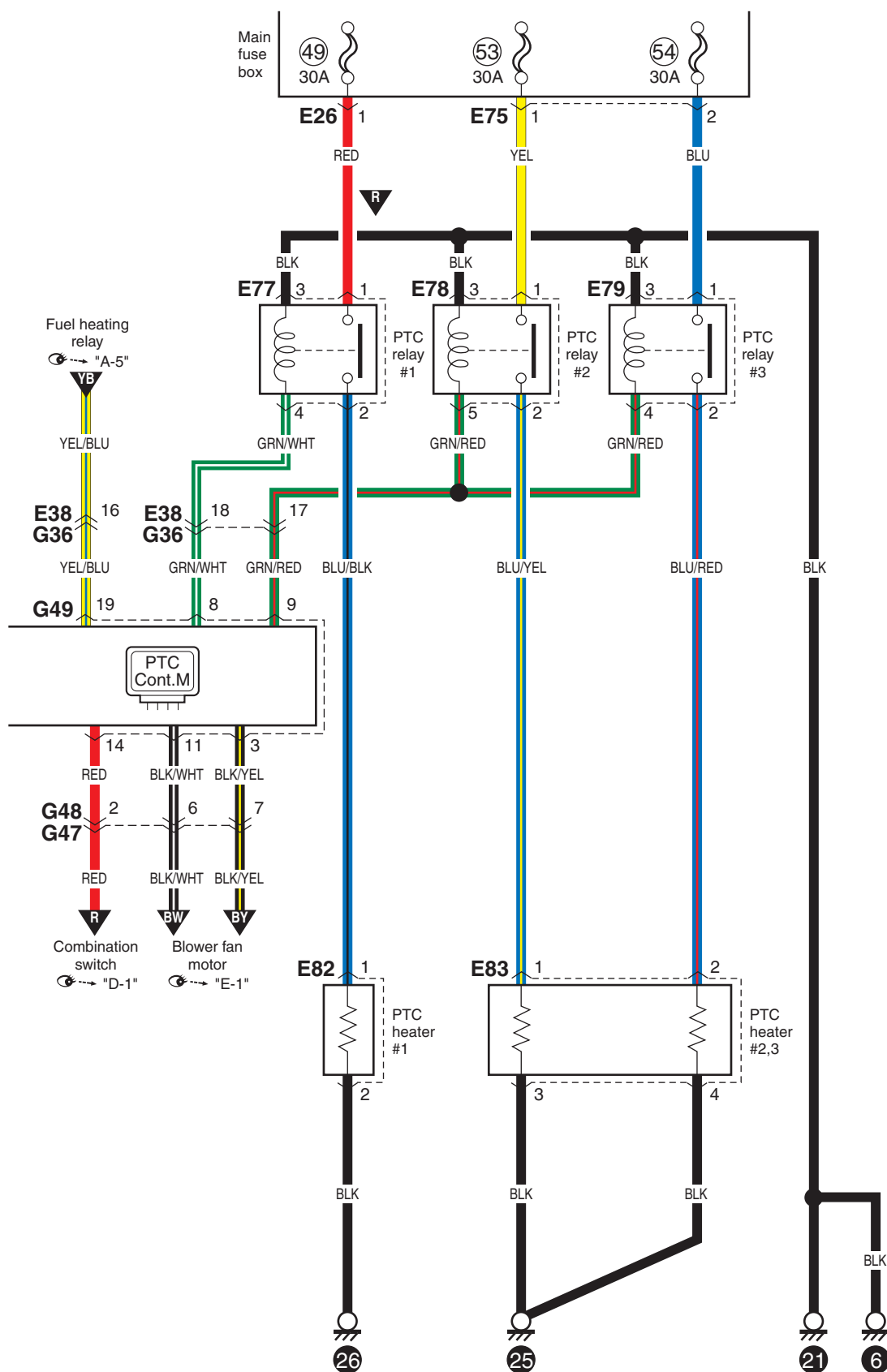


E-3 PTC Heater Circuit Diagram (DSL)

S5RS0B910E045

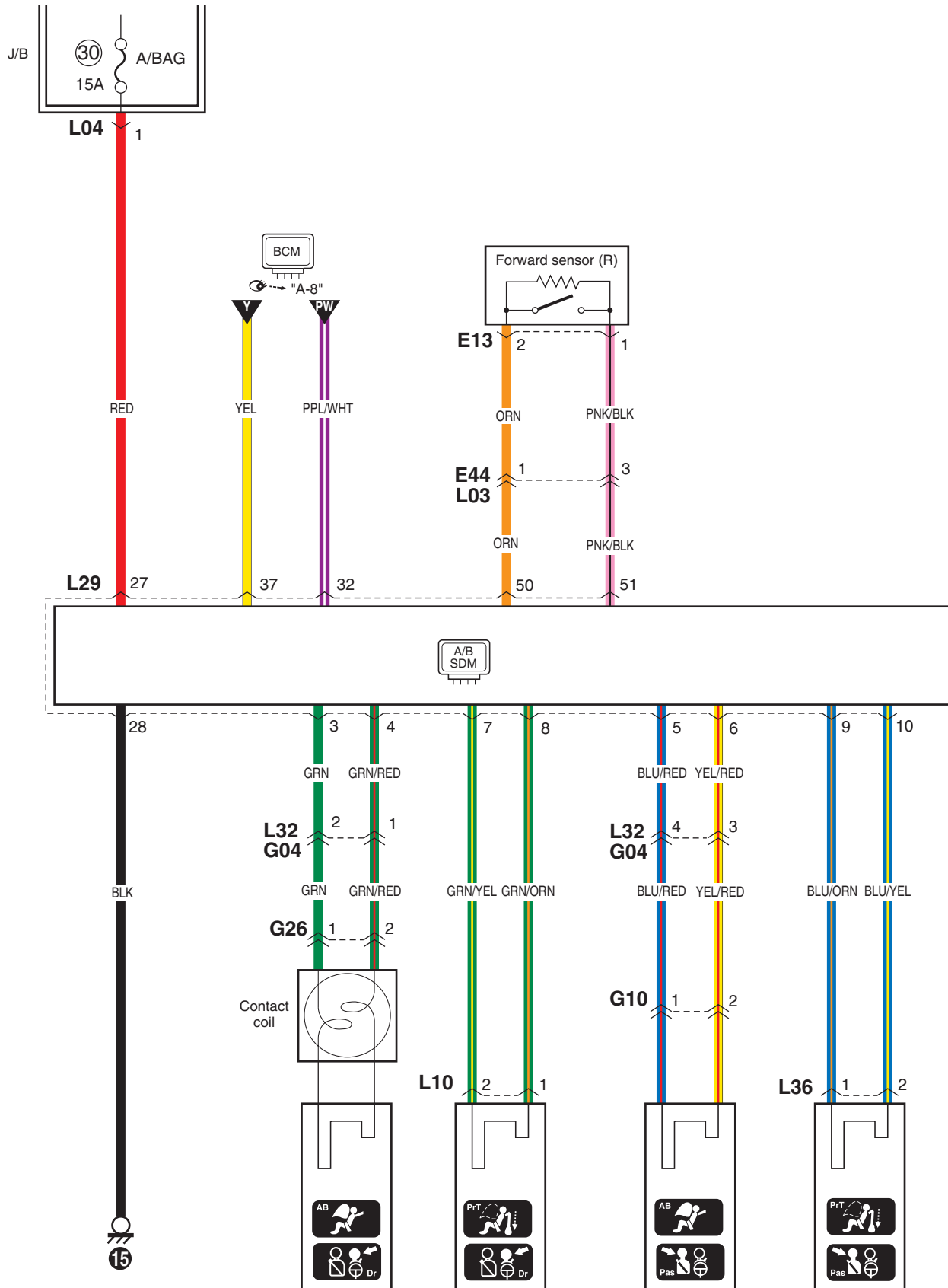


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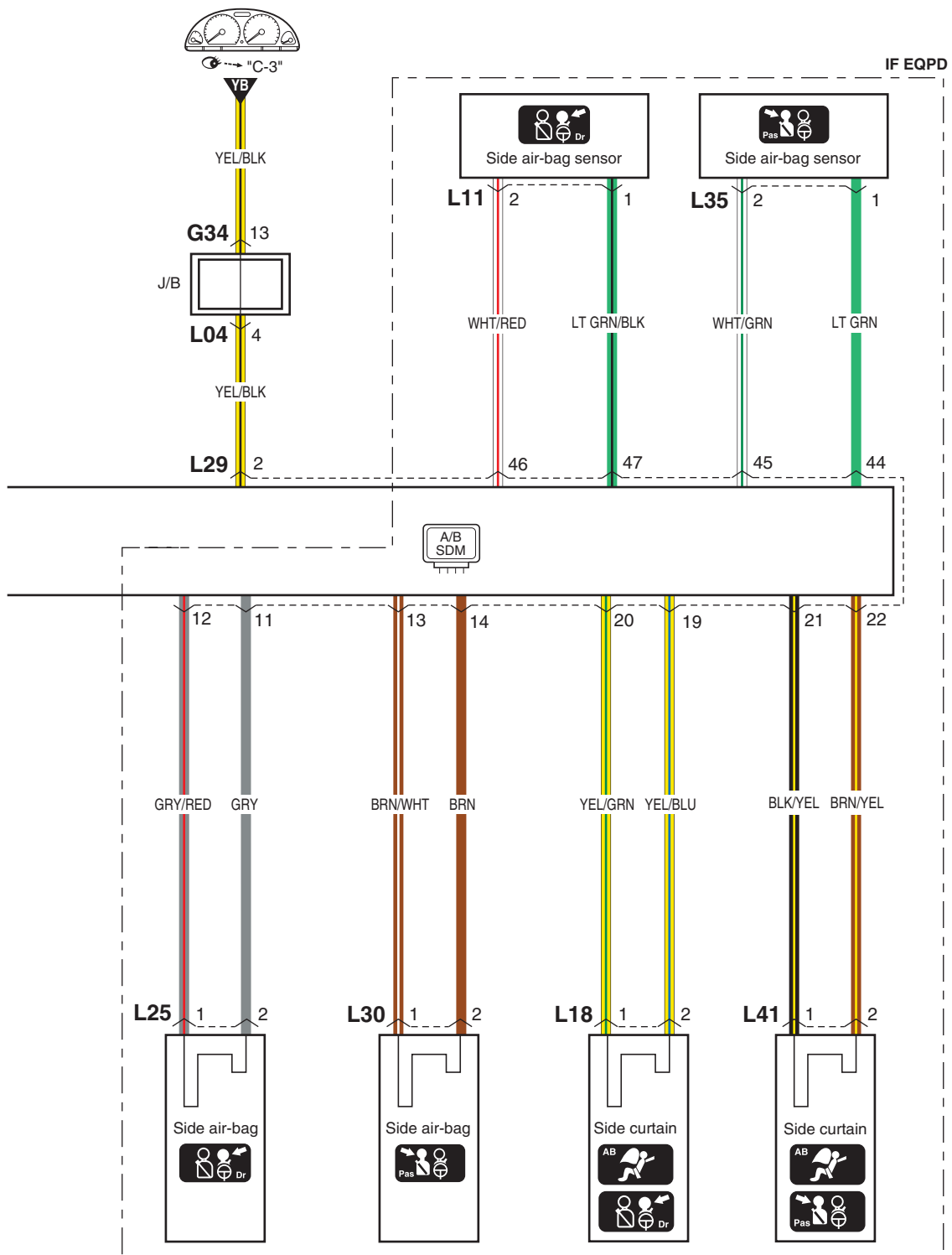


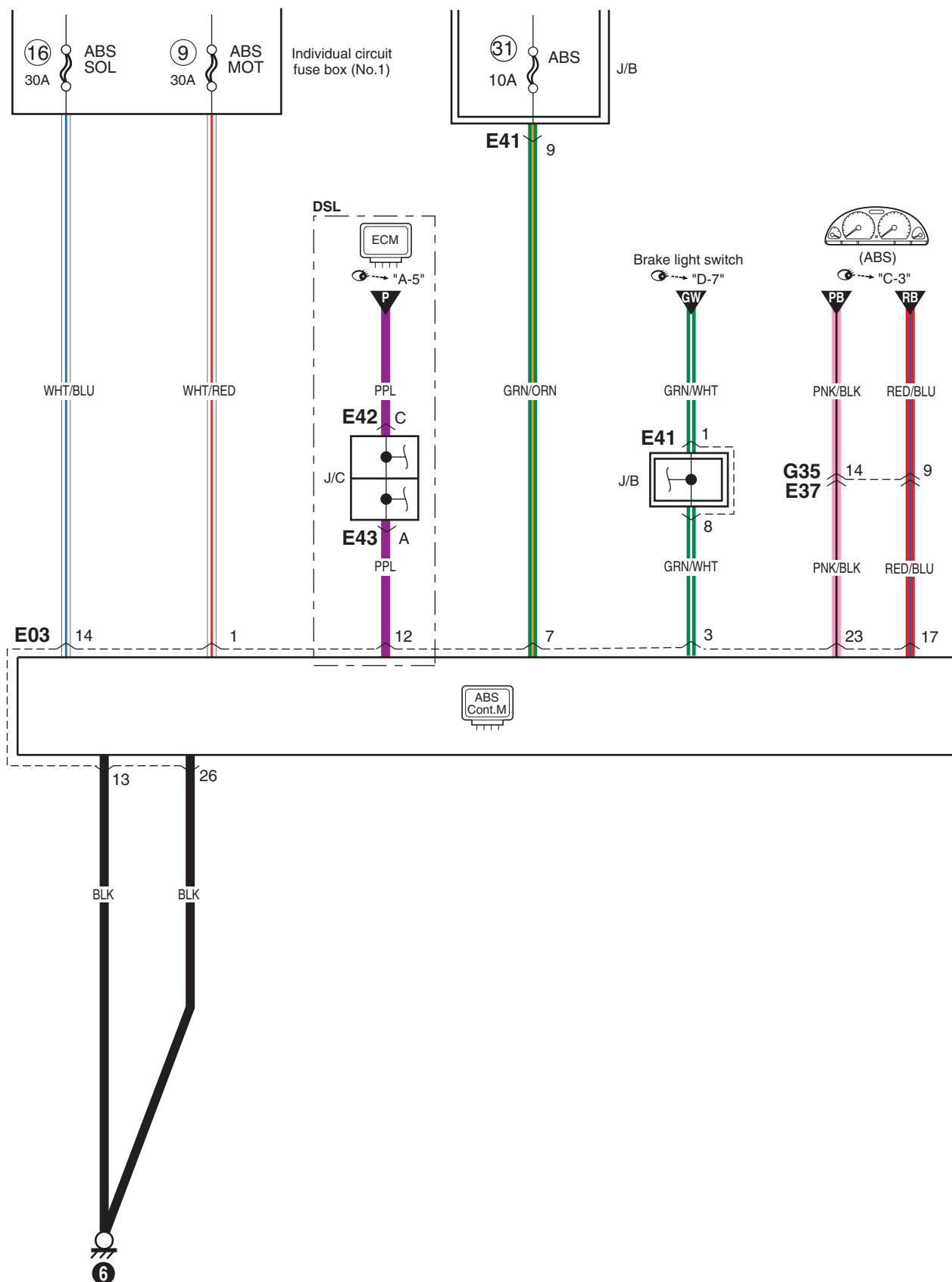
F-1 Air-Bag System Circuit Diagram

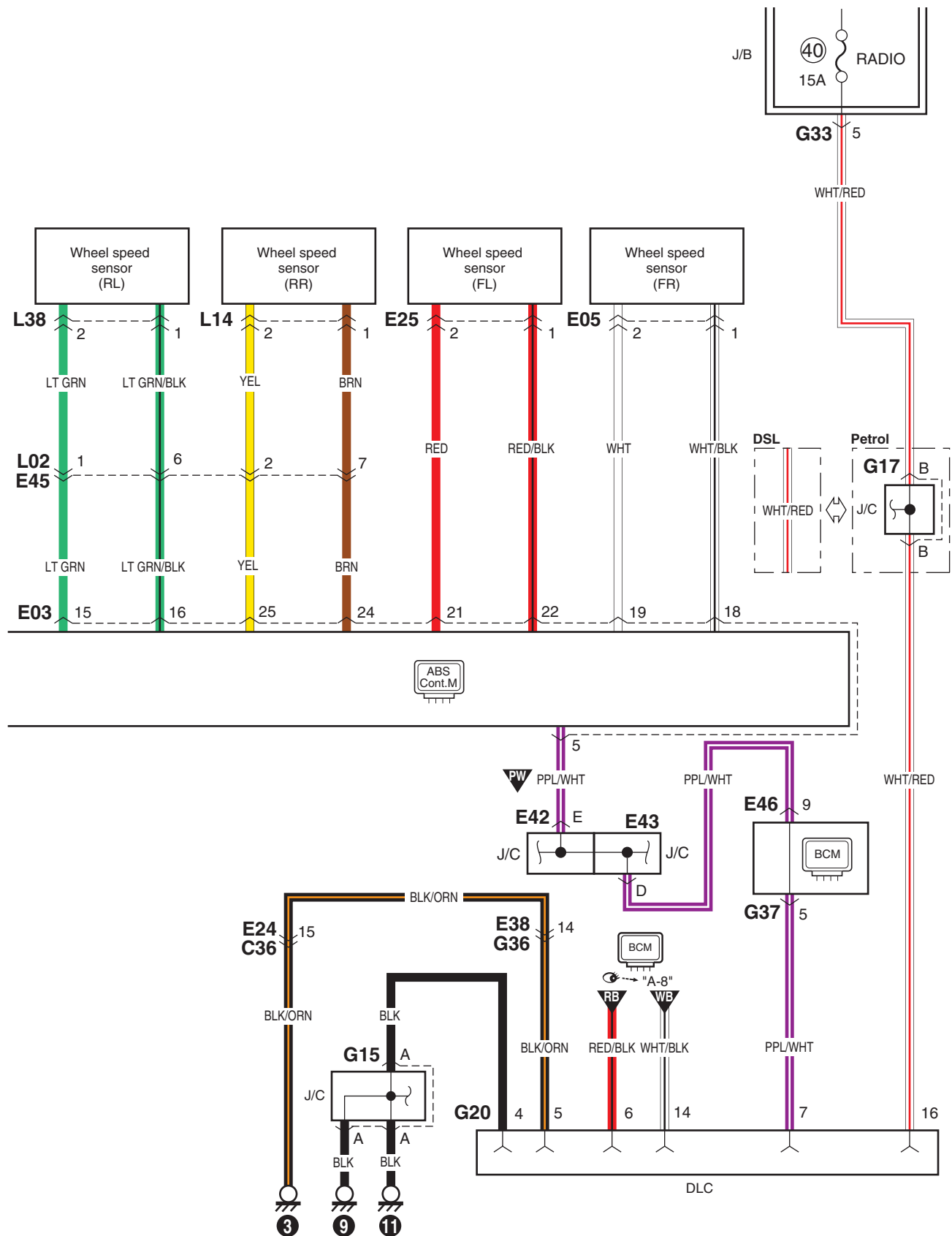
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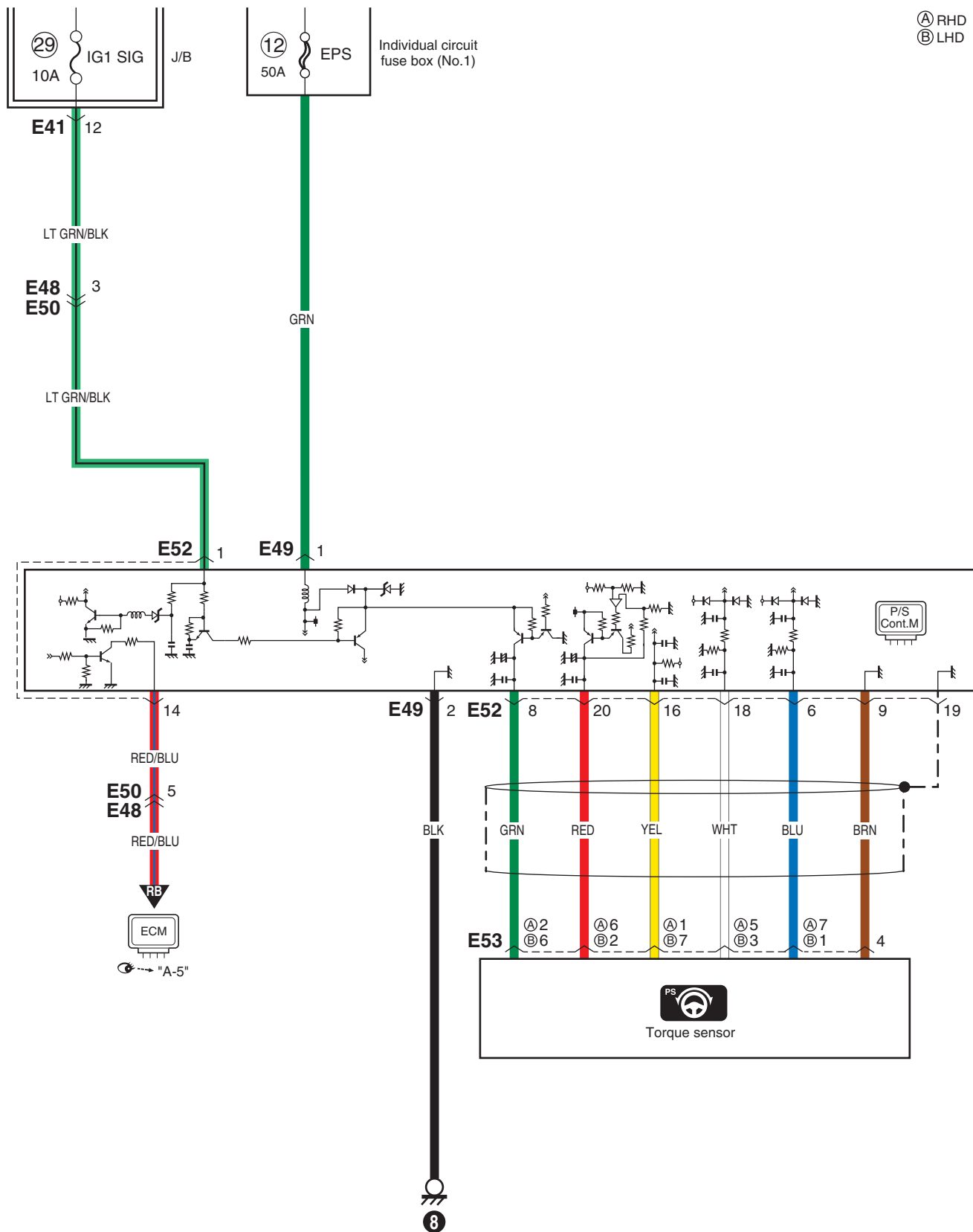




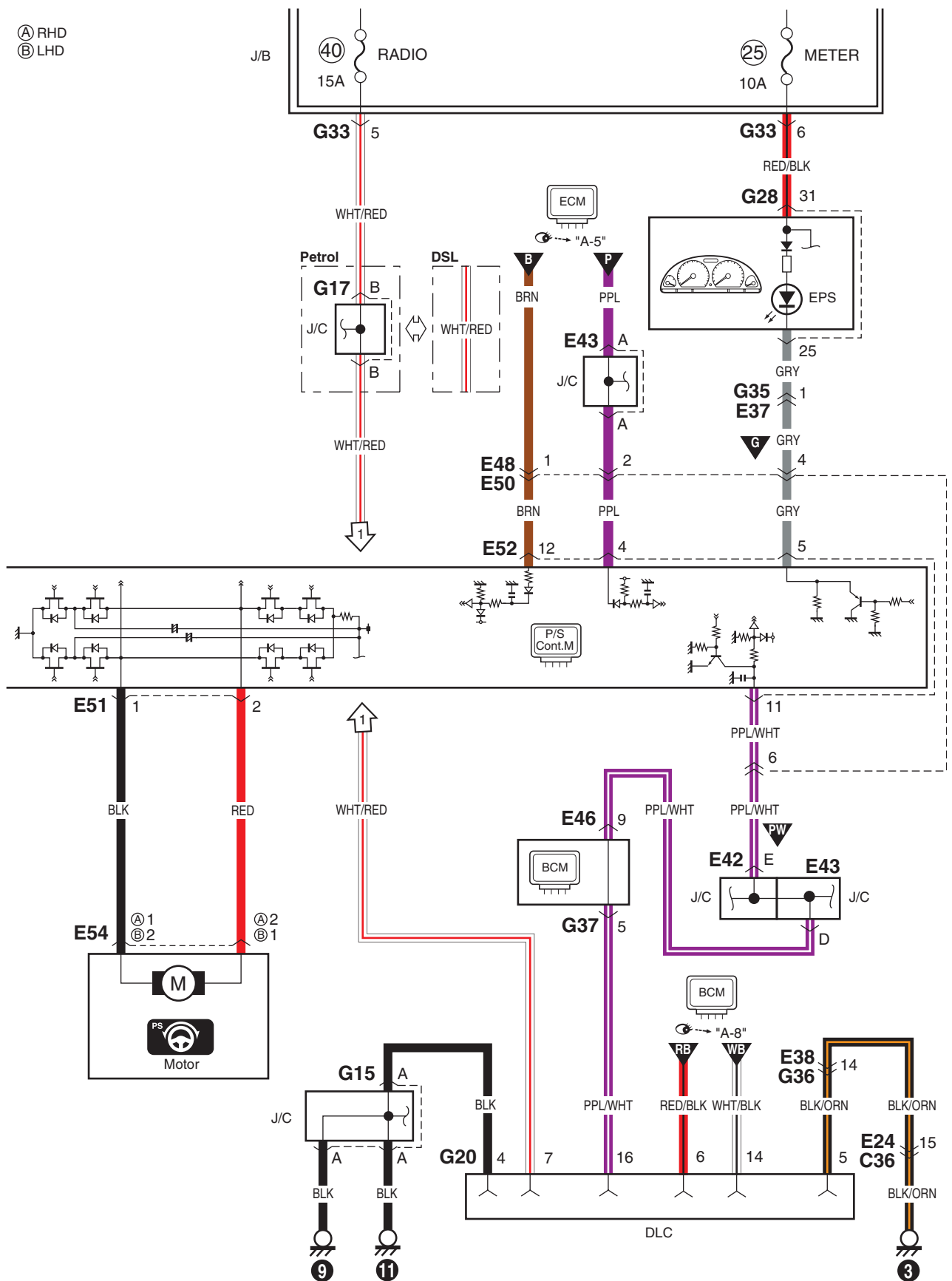


F-3 Power Steering System Circuit Diagram

S5RS0B910E036

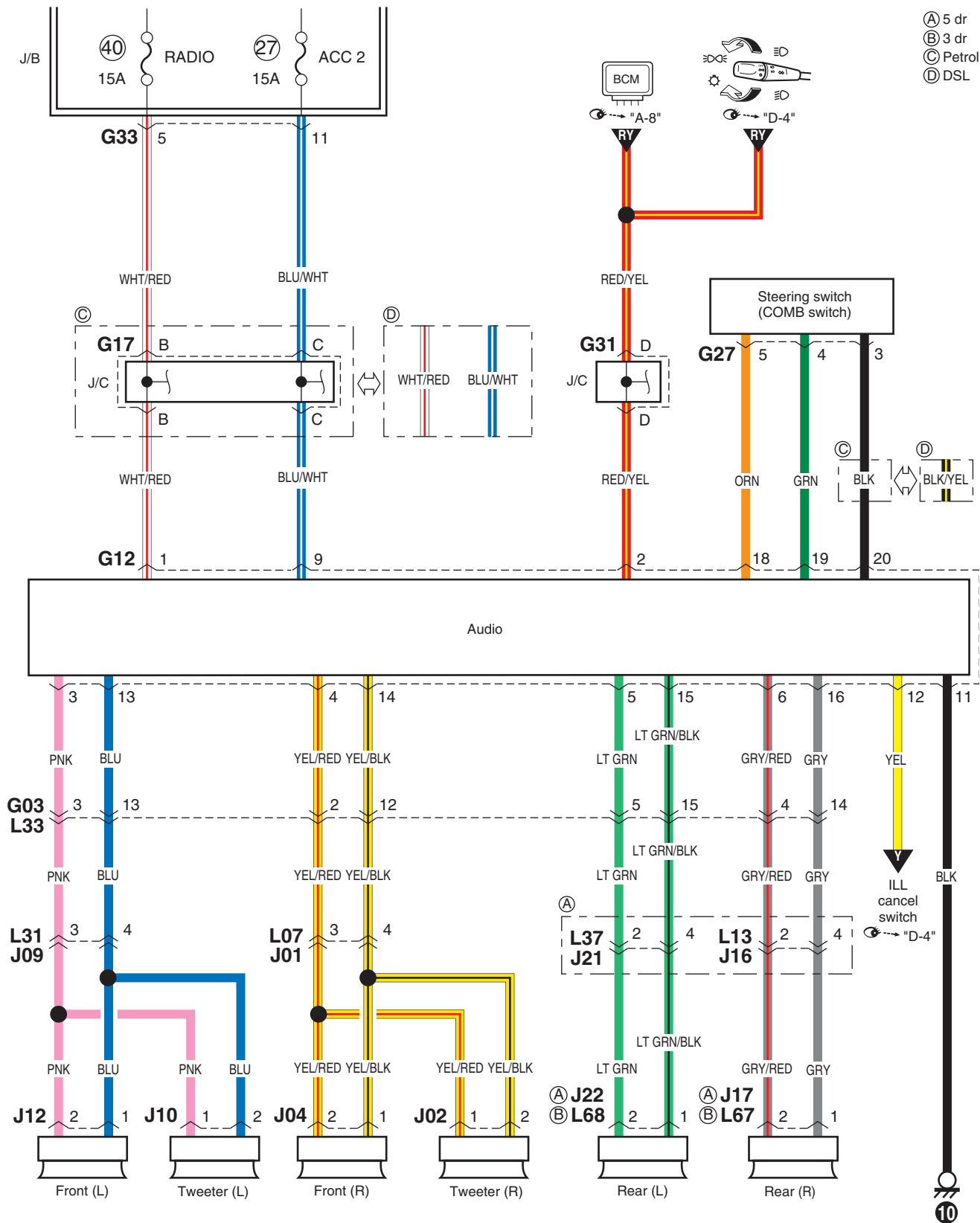


14RS0B910965-02



G-1 Audio System Circuit Diagram

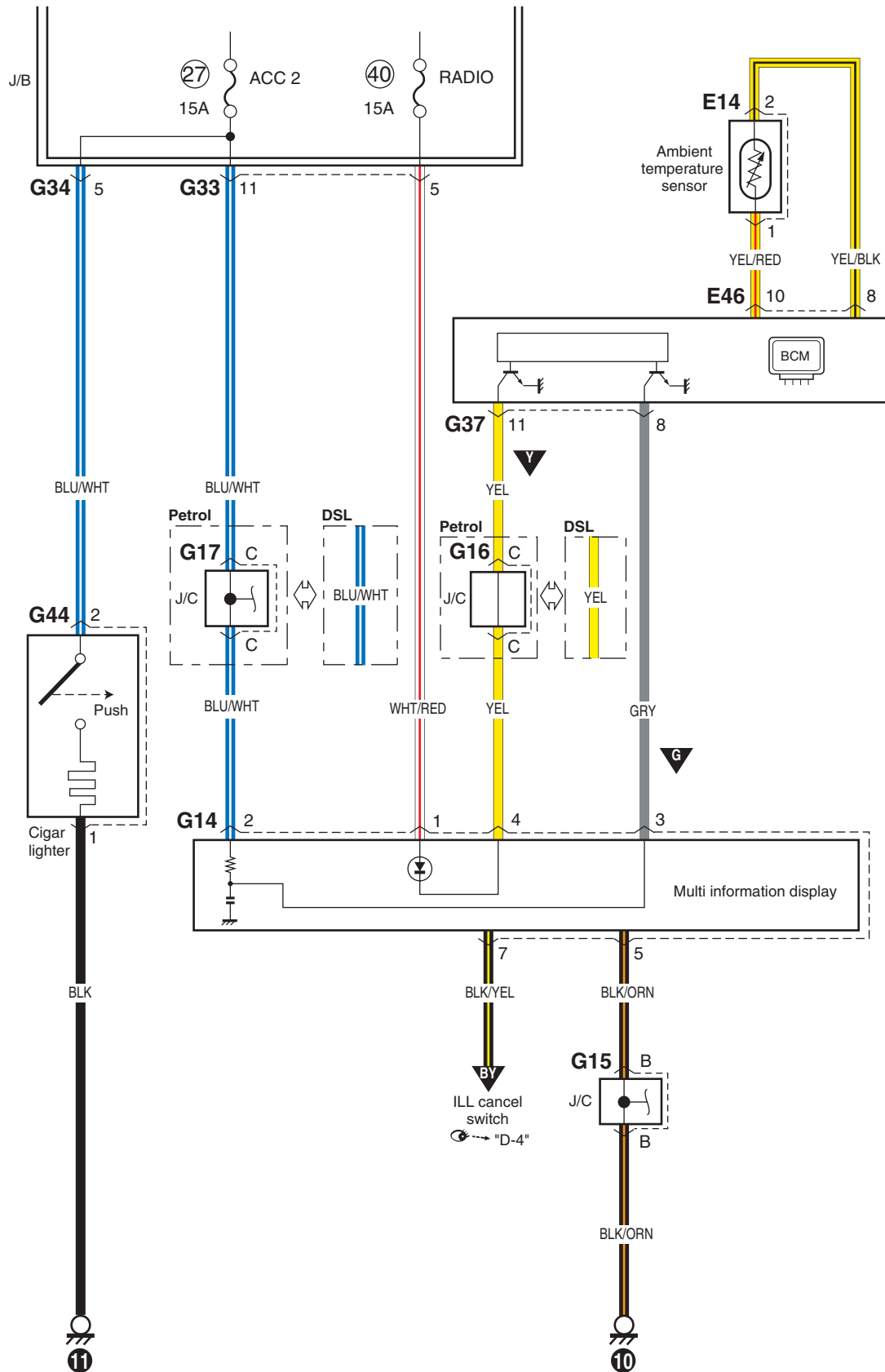
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15RS0B910959-02

G-2 Multi Information Display / Accessory Socket System Circuit Diagram

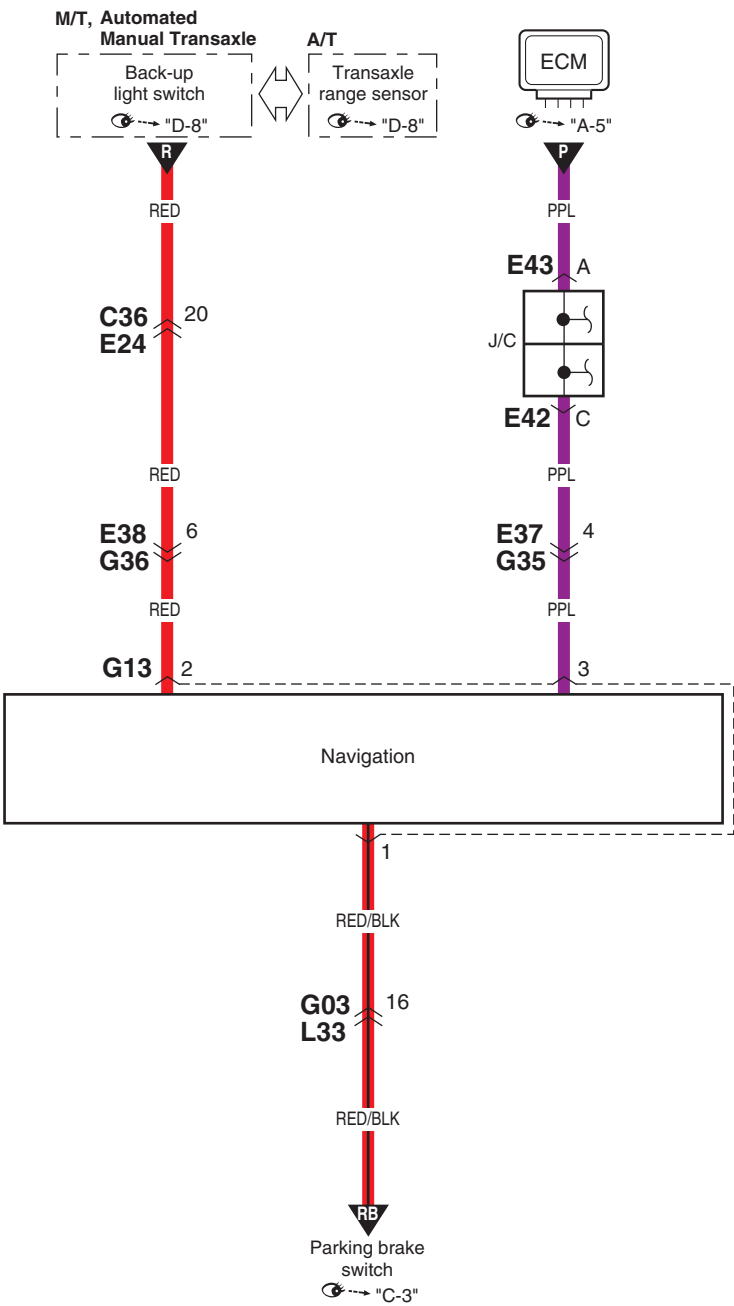
S5RS0B910E038



15RS0B910960-02

G-4 Navigation System Circuit Diagram

S5RS0B910E039



I4RS0B910969-03

List of Connectors

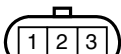
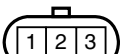
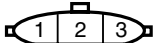
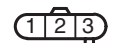
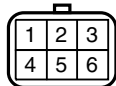
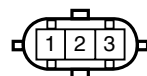
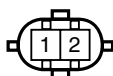
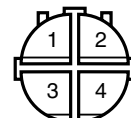
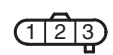
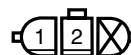
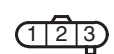
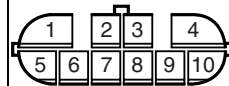
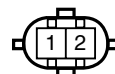
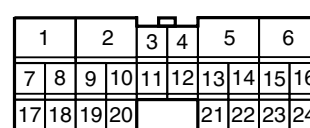
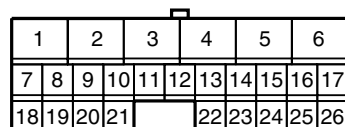
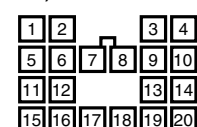
List of Connectors

S5RS0B910F001

Refer to "C Connector: ".
 Refer to "D Connector (DSL)": ".
 Refer to "E Connector: ".
 Refer to "G Connector: ".
 Refer to "J Connector: ".
 Refer to "K Connector: ".
 Refer to "L Connector: ".
 Refer to "O Connector: ".
 Refer to "R Connector: ".

C Connector

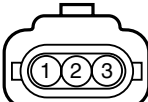
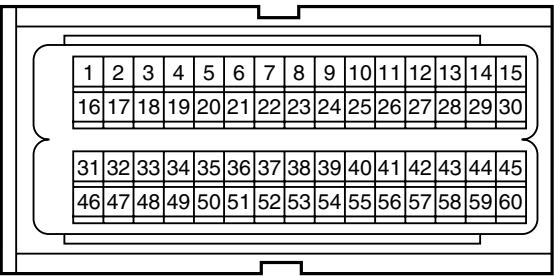
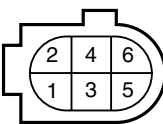
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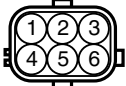
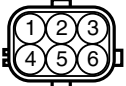
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C07  MCONF020065-01	C08  MCONF030016-01 M15A	C08  MCONF030052-01 M13A	C09  MCONF020057-01	C10  MCONF060018-01	C11  MCONF030062-01
C12  MCONF030084-01	C13  MCONF050025-01	C14  MCONF020156-01	C15  MCONF040008-01	C16  MCONF040024-01	C17  MCONF010076-01
C18  MCONF010027-01	C19  MCONM020042-01	C20  MCONF030052-01	C21  MCONF020194-01	C22  MCONF010057-01	C23  MCONF010019-01
C24  MCONF010077-01	C25  MCONF030052-01	C26  MCONF010054-01	C27  MCONF020064-01	C28  MCONF100053-01 A/T	C29  MCONF100048-01 A/T
C30  MCONF020156-01 M/T	C30  MCONF020186-01 Automated Manual Transaxle	C31  MCONF010078-01	C33  MCONF010047-01	C34  MCONF240011-01	
C35  MCONF260014-01		C36 (TO E24)  MCONF200011-01			

C37		C38	C39	C40
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 MCONF600002-01		</		

D Connector (DSL)

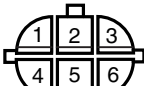
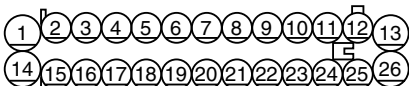
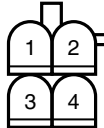
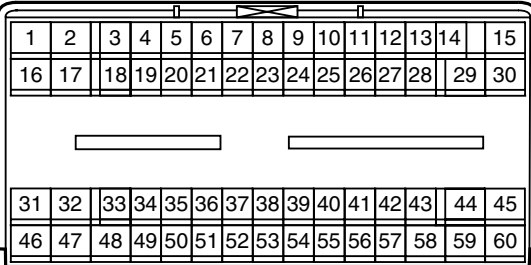
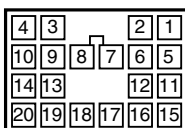
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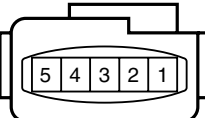
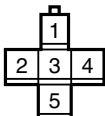
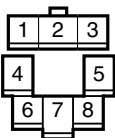
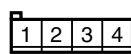
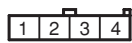
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D16  MCONF020174-01	D17  MCONF020174-01	D18  MCONM010029-01	D19  MCONM010029-01	D20  MCONM010029-01	D21  MCONM010029-01

E Connector

S5RS0B910F003

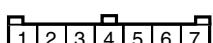
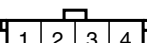
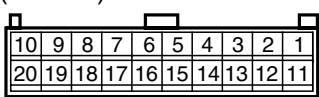
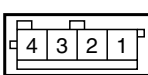
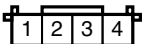
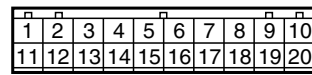
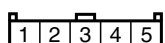
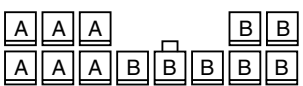
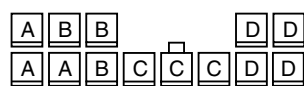
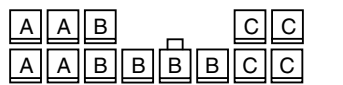
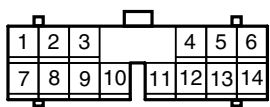
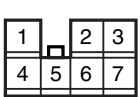
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E11  MCONF020008-01	E12  MCONF020198-01	E13  MCONF020199-01	E14  MCONF020200-01	E15  MCONF010079-01	E17  MCONF040094-01
E18  MCONF020198-01	E19  MCONF020196-01	E20  MCONF020197-01	E21  MCONF030101-01	E22  MCONF020013-01	
E23  MCONF600003-01 Petrol	E24 (TO C36)  MCONM200005-01 Petrol		E25  MCONM020043-01	E26  MCONF020170-01	
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E33 MCONF040004-01 Petrol	E34 MCONF040004-01	E35 MCONF040004-01	E36 MCONF040004-01	E37 (TO G35) MCONM150001-01	
E38 (TO G36) MCONM200008-01	E39 MCONF100003-01	E40 MCONF020202-01	E41 MCONF160034-01		
E42 MCONF120027-01	E43 MCONF120027-01	E44 (TO L03) MCONF040095-01			
E45 (TO L02) MCONF170005-01	E46 MCONF140012-01	E47 MCONF040016-01 M/T, A/T	E47 MCONF040045-01 Automated Manual Transaxle, DSL		
E48 (TO E50) MCONM080012-01	E49 MCONF020203-01	E50 (TO E48) MCONF080014-01	E51 MCONF020204-01	E52 MCONF200021-01	
E53 MCONF070015-01	E54 MCONF020205-01	E56 MCONF040004-01 Petrol	E57 MCONF060003-01	E58 MCONF030096-01	
E59 MCONF030096-01	E60 (TO C53) MCONM010032-02 Petrol	E61 MCONF060068-01 Petrol	E61 MCONF060057-01 DSL		
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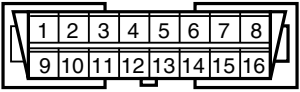
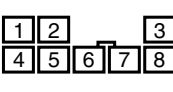
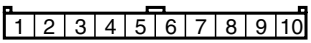
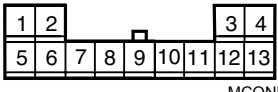
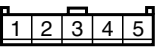
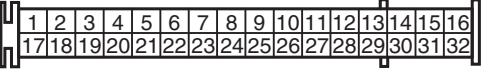
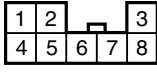
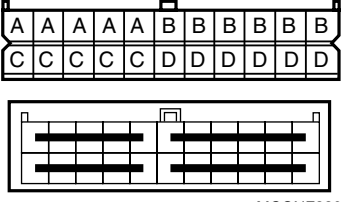
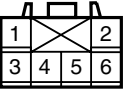
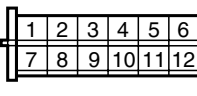
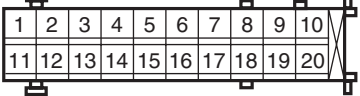
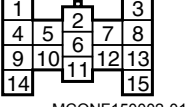
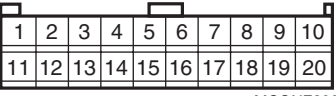
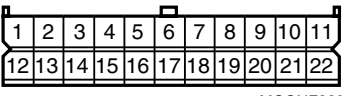
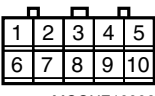
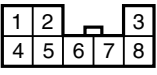
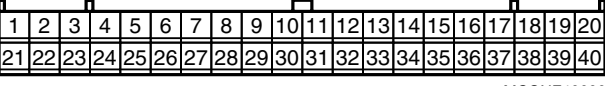
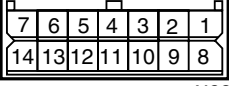
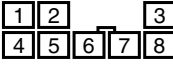
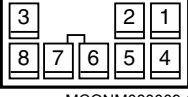
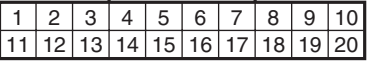
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E71  MCONF050029-01 DSL	E72  MCONF040007-01 DSL	E73  MCONF080023-01 DSL	E74  MCONF040084-01 DSL	E75  MCONF020148-01 DSL	E76  MCONF010074-01 DSL
E77  MCONF040004-01 DSL	E78  MCONF050015-01 DSL	E79  MCONF040004-01 DSL	E80  MCONF040004-01 DSL	E81  MCONF040004-01 DSL	E82  MCONF020189-01 DSL
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G Connector

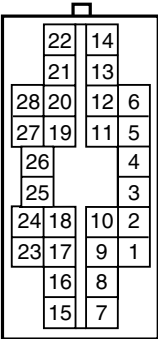
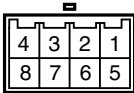
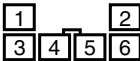
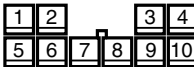
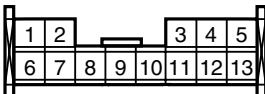
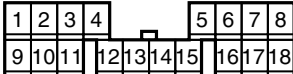
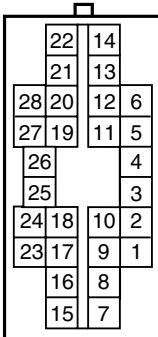
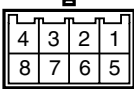
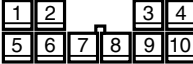
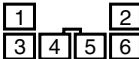
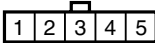
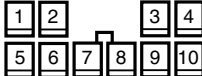
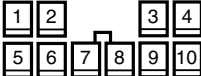
S5RS0B910F004

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G06  MCONF040097-01	G09  MCONF020112-01	G10  MCONF020212-01	G11  MCONF040098-01	G12  MCONF200014-01
G13  MCONF050021-01	G14  MCONF070004-01	G15  MCONF130007-01	G16  MCONF130008-01 Petrol	
G17  MCONF130009-01	G18  MCONF140018-01	G19  MCONF070016-01		

9A-123 Wiring Systems:

G20  MCONF160023-01	G21  MCONF060063-01	G22  MCONF080014-01	G23  MCONF100038-01
G24  MCONF120026-01	G25  MCONF130010-01	G26  MCONF020212-01	G27  MCONF050021-01
G28  MCONF320005-01		G29  MCONF080002-01	G31  MCONF220011-01
G32  MCONF060064-01	G33  MCONF120028-01	G34  MCONF200020-01	G35 (TO E37)  MCONF150002-01
G36 (TO E38)  MCONF200021-01		G37  MCONF220009-01	G39  MCONF100060-01
G41  MCONF080002-01	G42  MCONF400001-01		G43 (TO L51)  MCONM140005-02
G44  MCONF020005-01	G45  MCONF010060-01	G46  MCONF020151-01 DSL	G47 (TO G48)  MCONF080014-01 DSL
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J Connector

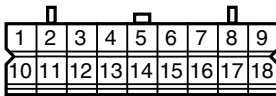
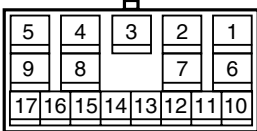
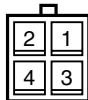
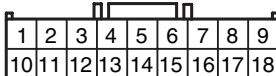
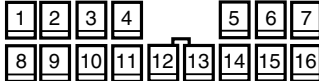
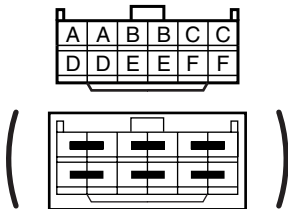
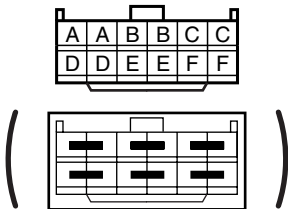
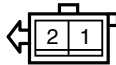
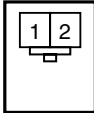
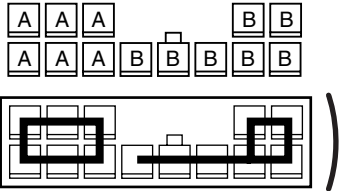
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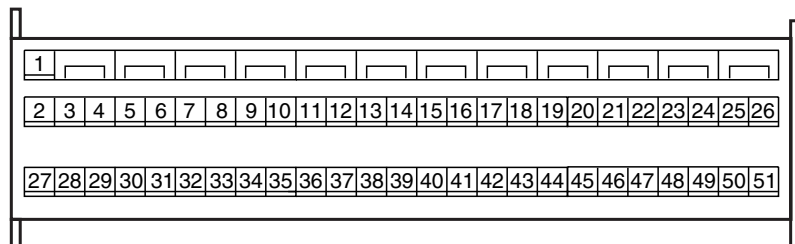
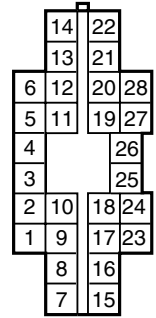
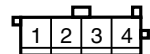
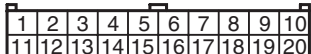
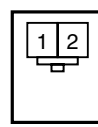
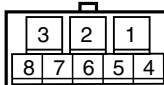
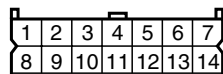
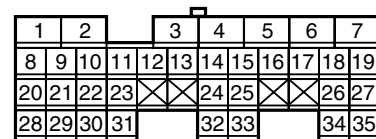
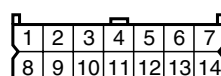
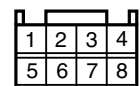
K Connector

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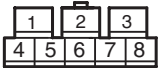
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MCONF180013-01					MCONF160014-01					MCONF280006-01													
L08						L09						L10											
MCONF120029-01					MCONF120029-01					MCONF020209-01													
L12			L13 (TO J16)			L14			L15 (TO R01)			L16			L17								
MCONF010060-01		MCONM060032-01		MCONM020044-01		MCONM040023-01		MCONF010060-01		MCONM020045-01													
L18			L19			L20			L21 (TO L22)			L22 (TO L21)			L23								
MCONF020207-01		MCONF020211-01		MCONF060044-01		MCONF020060-01		MCONM020043-01		MCONF060044-01													
IF EQPD										A/T													
L24						L25						L26						L27					
MCONF130007-01					MCONF020212-01					MCONF020151-01					MCONF010030-01								
					IF EQPD																		

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L32 (TO G04)  MCONF040099-01	L33 (TO G03)  MCONF200003-01	L34  MCONF010060-01	L35  MCONF020210-01 IF EQPD	L36  MCONF020209-01	
L37 (TO J21)  MCONM060032-01	L38  MCONM020044-01	L40  MCONF010060-01	L41  MCONF020207-01 IF EQPD	L42 (TO O01)  MCONM080013-01	L43  MCONF060044-01
L47  MCONF020013-01	L48  MCONF020013-01	L51 (TO G43)  MCONF140012-01		L52  MCONF350005-01 Automated Manual Transaxle	
L54  MCONF140012-01 Automated Manual Transaxle	L55  MCONF080035-01 Automated Manual Transaxle	L59  MCONF020197-01	L60  MCONF020060-01	L61  MCONF040095-01	
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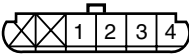
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S5RS0B910F008

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R Connector

S5RS0B910F009

R01 (TO L15)  MCONF040100-01	R02  MCONF040085-01
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Instrumentation / Driver Info. / Horn

General Description

CAN Communication Data of Combination Meter

S5RS0B9301001

Combination meter receives the following information from each control module.

For details of CAN communication, refer to "CAN Communication System Description: in Section 1A".

Data which combination meter receives from ECM

- Engine revolution speed signal
- Engine coolant temperature signal
- Vehicle speed signal
- Glow plug indicator lamp control signal
- Oil pressure warning lamp control signal
- Service vehicle soon (SVS) lamp control signal
- Immobilizer lamp control signal

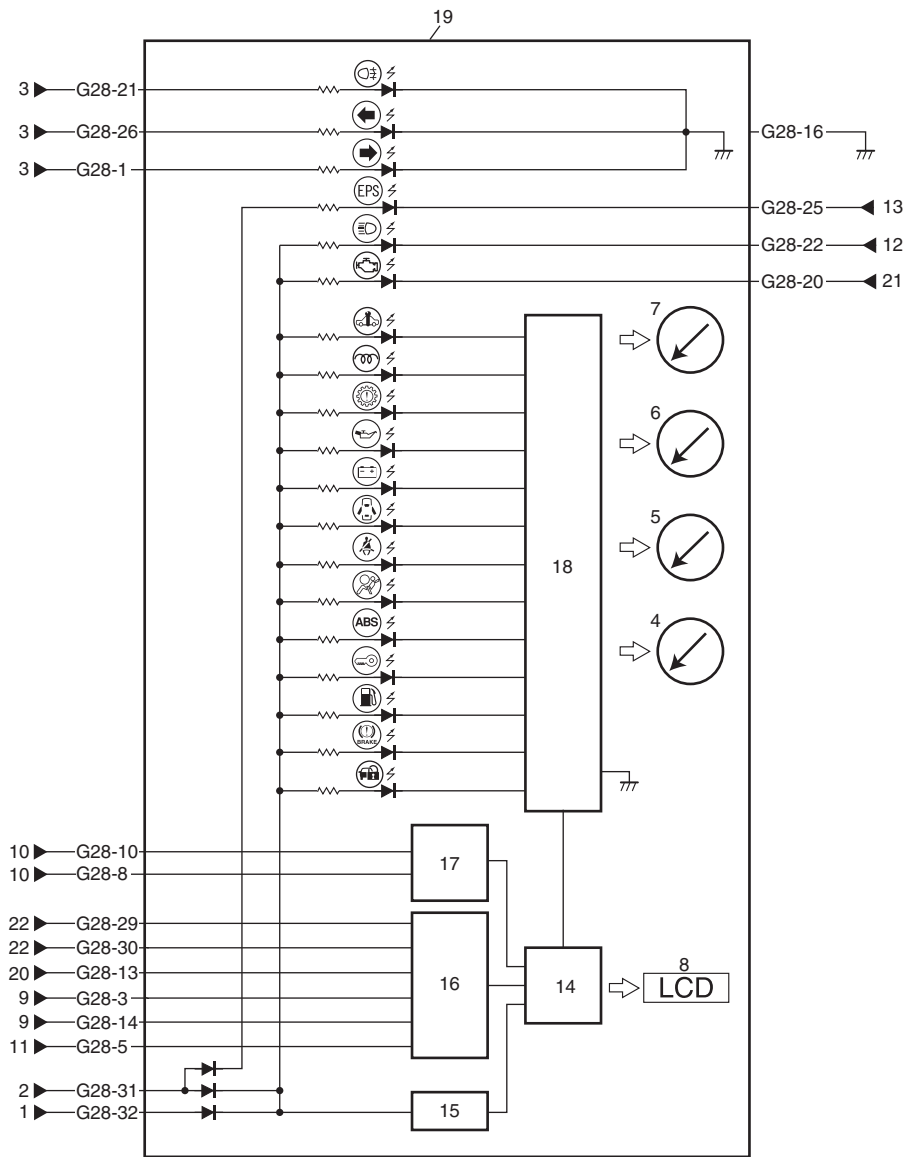
Data which combination meter receives from BCM

- Brake fluid level switch signal (brake warning light control signal)
- Parking brake switch signal (brake warning light control signal)
- Driver side seat belt buckle switch signal (Seat belt warning light control signal)
- Charging system warning lamp signal (Charge warning light control signal)
- Lighting switch signal
- Door switch signal (door ajar warning lamp)

Schematic and Routing Diagram

Combination Meter Circuit Diagram

S5RS0B9302001



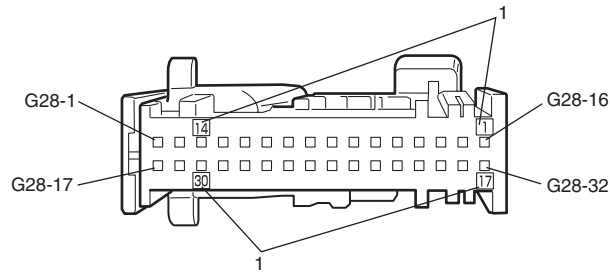
I5RS0B930001-02

1. Main fuse	7. ECT meter	13. EPS control module	19. Combination meter
2. METER fuse	8. Odometer	14. CPU	20. Illumination cancel switch (if equipped)
3. Combination switch	9. ABS control module	15. Power supply	21. ECM
4. Tacho meter	10. BCM	16. Interface circuit	22. Fuel level gauge
5. Speedometer	11. SDM	17. CAN driver	
6. Fuel meter	12. Combination switch (high beam)	18. Stepper motor and LED output driver	

Terminal arrangement of coupler viewed from combination meter side

NOTE

Molded numbers (1) have no relation to the terminal numbers.



I4RS0A930003-02

Terminal	Circuit	Terminal	Circuit
G28-1	To turn signal light switch (turn R)	G28-17	—
G28-2	—	G28-18	—
G28-3	To ABS control module (EBD warning lamp control signal)	G28-19	—
G28-4	—	G22-20	To ECM (MIL control signal)
G28-5	To SDM (air bag indicator control signal)	G28-21	To rear fog light switch
G28-6	—	G28-22	To lighting switch (high beam)
G28-7	—	G28-23	—
G28-8	CAN communication line (Active High Signal)	G28-24	—
G28-9	—	G28-25	To EPS control module (EPS indicator control signal)
G28-10	CAN communication line (Active Low Signal)	G28-26	To turn signal light switch (turn L)
G28-11	—	G28-27	—
G28-12	—	G28-28	—
G28-13	To illumination cancel switch	G28-29	To fuel level gauge
G28-14	To ABS control module (ABS warning lamp control signal)	G28-30	To fuel level gauge
G28-15	—	G28-31	To METER fuse
G28-16	GND	G28-32	To RADIO fuse

Diagnostic Information and Procedures

Speedometer and VSS Symptom Diagnosis

S5RS0B9304001

NOTE

Make sure that any DTC is not detected by both ECM and ABS hydraulic unit / control module assembly before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Speedometer shows no operation or incorrect operation	Circuit fuse blown	Replace fuse and check for short circuit.
	Wheel speed sensor (VSS) faulty	Check wheel speed sensor referring to "Front Wheel Speed Sensor On-Vehicle Inspection: in Section 4E".
	ABS hydraulic unit / control module assembly faulty	Check vehicle speed output signal referring to "Vehicle Speed Output Signal Inspection: in Section 4E".
	Wiring or ground faulty	Repair circuit.
	Combination meter faulty	Replace combination meter.

Information Display Symptom Diagnosis (If Equipped)

NOTE

This thermometer indicates the ambient temperature in back of front bumper member. Under any one of the following listed conditions, however, even when the ambient temperature goes up, the thermometer display does not rise so as to correct the rise of the ambient temperature caused by the radiant heat of the engine. When the ambient temperature drops, the thermometer reading follows the change in the temperature.

Be sure to bear this in mind when diagnosing trouble.

- The vehicle speed is 30 km/h (18 mph) or lower.
- VSS signal is faulty.
- The ignition switch is turned on again within 2 hours.

Condition	Possible cause	Correction / Reference Item
No displaying of information display	Circuit fuse Blown	Replace fuse and check for short circuit.
	Wiring and/or grounding faulty	Repair as necessary.
	Information display unit faulty	Replace unit.
Incorrect thermometer display	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)": "
	Wheel speed sensor (VSS) faulty	Check wheel speed sensor referring to "Front Wheel Speed Sensor On-Vehicle Inspection: in Section 4E".
	Wiring and/or grounding faulty	Repair as necessary.
	BCM faulty	Replace after making sure that none of above parts is faulty.
Display does not change at -30 °C	Outside air temperature is -30 °C (-22 °F) or less	—
	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)": "
	Outside air temperature sensor wiring circuit open circuit and/or short to power circuit	Repair as necessary.
	BCM faulty	Replace after making sure that none of above parts is faulty.
Display does not change at 50 °C	Outside air temperature is 50 °C (122 °F) or more	—
	Outside air temperature sensor faulty	Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)": "
	Outside air temperature sensor wiring circuit short to ground circuit	Repair as necessary.
	BCM faulty	Replace after making sure that none of above parts is faulty.

Repair Instructions

Oil Pressure Switch Removal and Installation

S5RS0B9306006

For removal and installation, refer to "Oil Pressure Check: in Section 1E".

Oil Pressure Switch Inspection

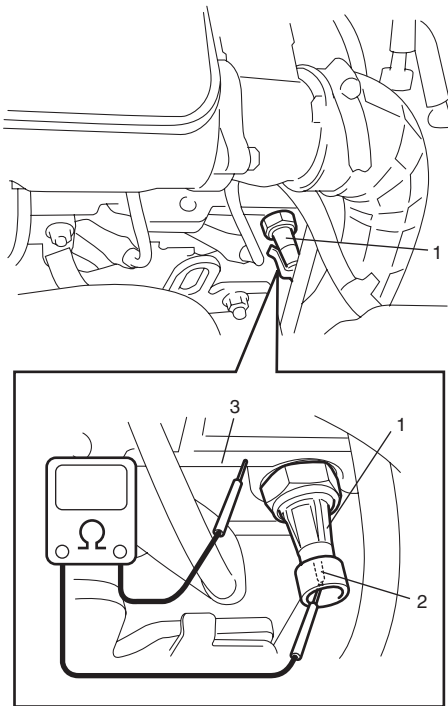
S5RS0B9306007

- 1) Disconnect oil pressure switch (1) lead wire.
- 2) Check for continuity between oil pressure switch terminal (2) and cylinder block (3) as shown. If check result is not as specified, replace oil pressure switch (1).

Oil pressure sensor specification

During engine running: No continuity

At engine stop: Continuity



I5RS0B930002-01

4. Engine oil filter

F: Front

VSS Removal and Installation

S5RS0B9306008

For removal and installation, refer to "Front Wheel Speed Sensor Removal and Installation: in Section 4E".

VSS Inspection

S5RS0B9306009

Refer to "Front Wheel Speed Sensor Inspection: in Section 4E".

Section 10

Control systems

CONTENTS

NOTE

For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the service manual mentioned in the "FOREWORD" of this service manual.

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Precautions.....	10B-*		
Precautions in Diagnosing Trouble	10B-*		
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BCM General Description	10B-*		
CAN Communication System Description.....	10B-1		
Schematic and Routing Diagram.....	10B-2		
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Circuit Diagram	10B-2		
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Junction Block Assembly	10B-*		
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BCM and Related System Component			
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BCM Self-Diagnosis Function	10B-6		
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Scan Tool Data	10B-7		
DTC Table.....	10B-9		
DTC Check	10B-*		
DTC Clearance	10B-*		
BCM Power Circuit and Ground Circuit			
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Body Electrical Control System

General Description

CAN Communication System Description

S5RS0BA201002

BCM communicates with each control module about the following information. For detail of CAN communication, refer to "CAN Communication System Description: in Section 1A".

Data which BCM transmits to ECM

- Air conditioning switch signal

Data which BCM receives from ECM

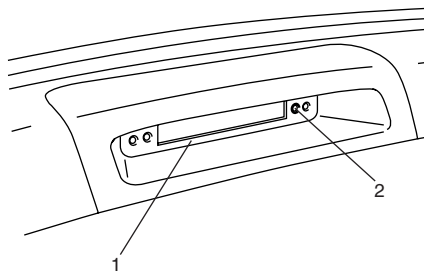
- Vehicle speed signal
- Engine coolant temperature signal
- Engine speed signal
- Distance kilometers per liter of fuel signal
- Stop (brake) lamp switch signal
- Fuel heater signal

Data which BCM transmits to combination meter

- Brake fluid level switch signal
- Parking brake switch signal
- Driver side seat belt buckle switch signal
- Charging system warning lamp signal
- Lighting switch signal
- Door switch signal

Alarm Indicator Lamp

The information display or clock (1) of this vehicle includes an alarm indicator lamp (2) for the theft preventive purpose. The BCM makes the alarm indicator lamp flash at certain intervals after the ignition switch is turned off until it is turned on again. Also, to check DTCs stored in BCM without using a SUZUKI scan tool when diagnosing troubles, it is possible to identify them by flashing patters of the alarm indicator lamp.



I4RS0AA20031-01

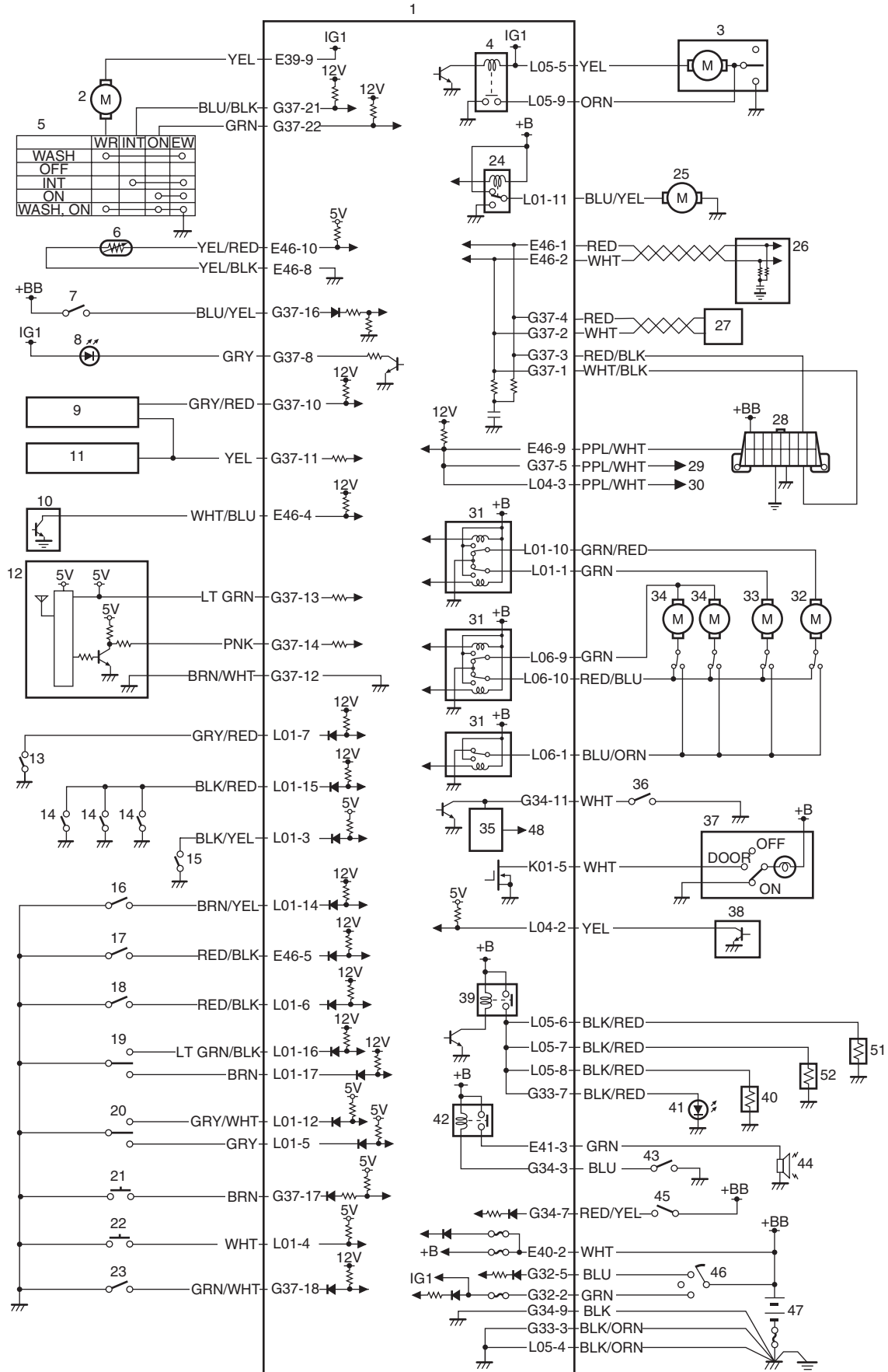
Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

S5RS0BA202001

NOTE

This wiring diagram shows circuits related to only BCM, not the entire circuits of BCM and junction block. Refer to “Power Supply Diagram (Petrol): in Section 9A” for wiring circuits other than the figure below.



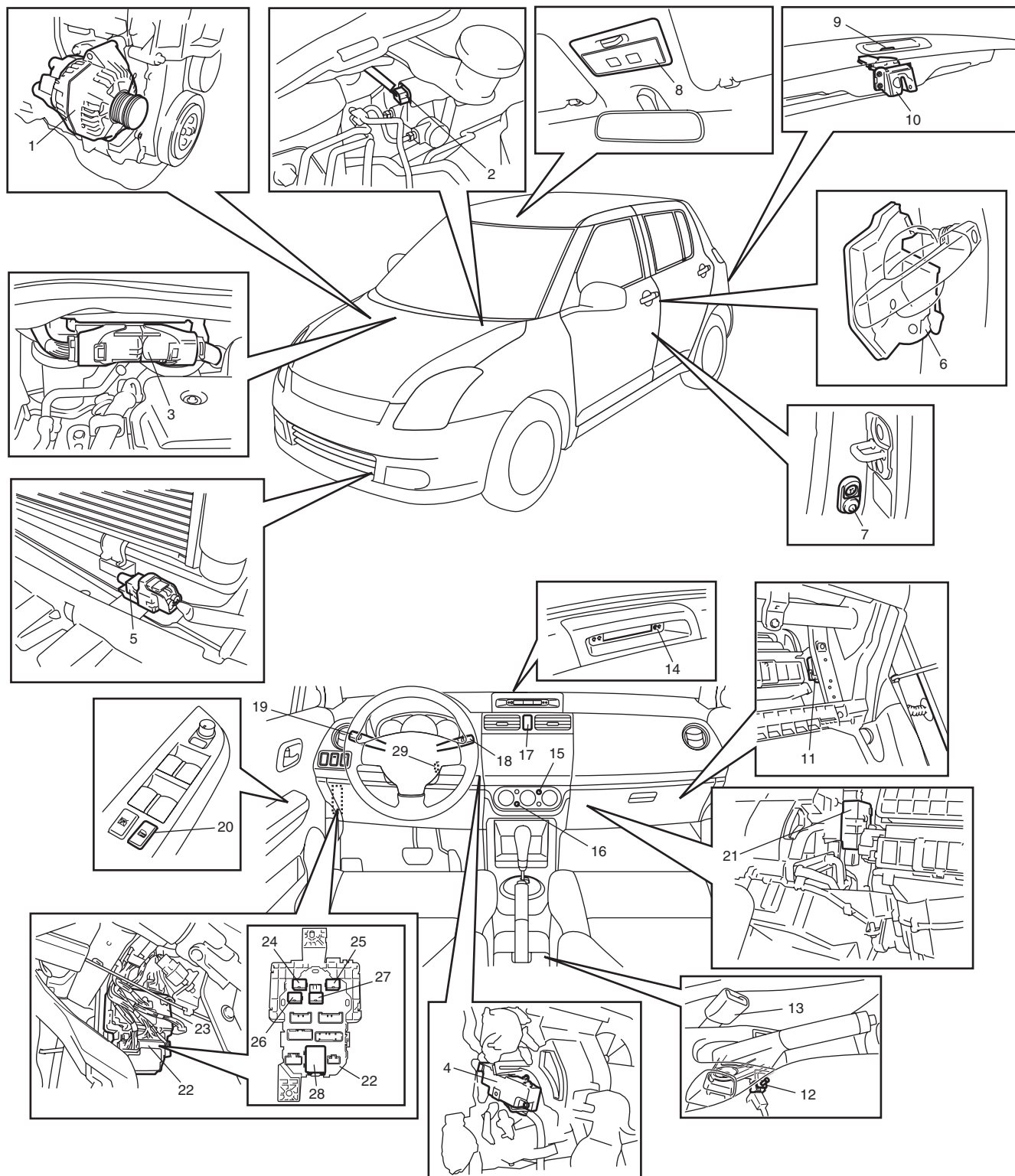
10B-4 Body Electrical Control System:

1. BCM (included in junction block assembly)	19. Door key cylinder switch (included in door lock actuator)	37. Interior light
2. Rear washer motor	20. Manual door lock switch	38. Air bag control module
3. Rear wiper motor	21. Rear end door window defogger switch	39. Rear window defogger relay
4. Rear wiper relay	22. Rear end door opener switch	40. Rear window defogger
5. Rear wiper and washer switch	23. A/C switch	41. Rear window defogger indicator lamp
6. Outside air temperature sensor	24. Rear end door opener relay	42. Horn relay
7. Ignition key switch	25. Rear end door opener actuator	43. Horn switch
8. Alarm indicator light	26. ECM	44. Horn
9. Supplementary heater controller (if equipped)	27. Combination meter	45. Lighting switch
10. Generator	28. Data link connector (DLC)	46. Ignition switch
11. Information display	29. To ECM	47. Battery
12. Keyless entry receiver	30. To SDM	48. To turn signal light
13. Driver side door switch	31. Door lock motor relay	49. Body ground
14. Other than driver side door switch	32. Driver side door lock actuator	50. Engine ground
15. Rear end door switch	33. Passenger side door lock actuator	51. Right side door mirror heater
16. Driver side seat belt switch	34. Rear door lock actuator	52. Left side door mirror heater
17. Brake fluid level switch	35. Turn signal and hazard warning relay	
18. Parking brake switch	36. Hazard warning switch	

Component Location

BCM and Related System Component Location

S5RS0BA203001



I5RS0BA20002-01

1. Generator	11. Keyless entry receiver	21. Supplementary heater controller (if equipped)
2. Brake fluid level switch	12. Parking brake switch	22. Junction block assembly
3. ECM	13. Seat belt buckle switch	23. BCM
4. Supplementary heater (if equipped)	14. Alarm indicator lamp	24. Heater relay
5. Outside air temperature sensor	15. Rear end door window defogger switch	25. Horn relay
6. Door lock actuator (incorporated in key cylinder switch)	16. A/C switch	26. Rear wiper relay

10B-6 Body Electrical Control System:

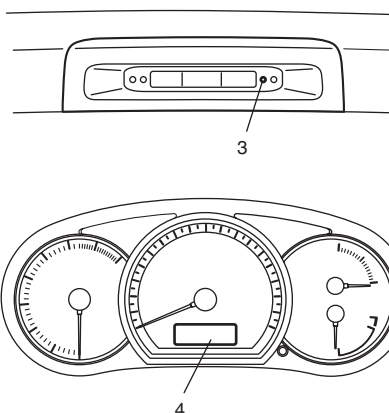
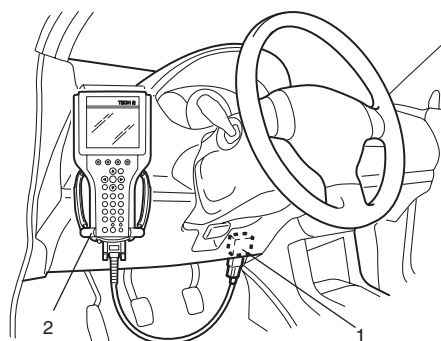
7. Door switch	17. Hazard warning switch	27. Rear end door window defogger relay
8. Interior light	18. Rear wiper switch	28. Turn signal and hazard warning relay
9. Rear end door opener switch	19. Lighting switch	29. Key reminder switch (included in ignition switch)
10. Rear end door lock actuator (incorporated in door switch)	20. Manual door lock switch	

Diagnostic Information and Procedures

BCM Self-Diagnosis Function

S5RS0BA204001

- BCM monitors conditions of the system components and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory of EEPROM in BCM.
- DTC can be checked in either one of following ways.
 - DTC can be checked by SUZUKI scan tool (2) connected to DTC (1).
 - DTC can be read from flashing pattern of alarm indicator lamp (3). Also, DTC is displayed on combinations meter (4) at the same time.



I4RS0BA20004-03

BCM input / output table

Control	Input	Output
Power door lock system	• Key cylinder switch • Manual door lock switch	• Driver side door lock actuator • Other than driver side door lock actuator
Keyless entry system	• Key reminder switch • Keyless entry receiver • Driver side door switch	• Driver side door lock actuator • Other than driver side door lock actuator • Turn signal and hazard warning relay • Interior light
Rear wiper	• Rear wiper INT switch • Rear wiper LO switch	• Rear wiper relay
Combination meter	• Tail light switch • Parking brake switch • Driver side seat belt switch • Brake fluid level switch • Generator • ECM (engine speed signal, vehicle speed signal, engine coolant temperature signal) • Seat belt reminder lamp signal	• Combination meter
Interior light	• Each door switch • Key reminder switch	• Interior light

Control	Input	Output
Warning buzzer	- Key reminder switch - Tail light switch - Driver side door switch	Warning buzzer (located in BCM)
Rear end door window defogger	- Rear end door window defogger switch - Generator	Rear end door window defogger relay
Rear end door opener	- Manual door lock switch (unlock signal) - Key cylinder switch (unlock signal) - Keyless entry transmitter (unlock signal) - Rear end door switch	Rear end door opener relay
Alarm indicator lamp	Key reminder switch	Alarm indicator lamp (located in information display or clock)

Scan Tool Data

S5RS0BA204003

Scan tool Data	Condition	Normal condition / reference value
Vehicle Speed	At stop with ignition switch turned ON	0 km/h
Outside air Temp	Reference value is relative to outside air temperature	-40 °C – 70 °C (-40 °F – 158 °F)
Battery Voltage	At specified idle speed after warming up	10 – 14 V
Coolant Temp	At specified idle speed after warming up	80 °C – 100 °C (176 °F – 212 °F)
Engine Speed	Engine idling with no load applied after warming up	Desired idle speed ± 50 rpm
Fuel Consumption	At specified idle speed after warming up	0.0 km/l
Key Reminder Sw	Ignition key inserted in ignition key cylinder	Key in
	Ignition key pulled out from ignition key cylinder	Pulled
Rear Wiper Sw	Rear wiper switch at ON position and ignition switch turned ON	ON
	Rear wiper switch at INT position and ignition switch turned ON	INT
	Rear wiper switch at OFF position and ignition switch turned ON	OFF
Door key Sw	Key cylinder switch of driver side door at lock position	LOCK
	Key cylinder switch of driver side door not turned	Neutral
	Key cylinder switch of driver side door at unlock position	Unlock
Door Lock Sw	Lock side of manual door lock switch pressed	LOCK
	Manual door lock switch not pressed	Neutral
	Unlock side of manual door lock switch pressed	Unlock
Driv Door Sw	Driver side door open	Open
	Driver side door closed	Close
Pass Door Sw	Doors other than driver side door open	Open
	Doors other than driver side door closed	Close
Brake Fluid Level	Brake fluid level at MIN level or higher	Normal
	Brake fluid level lower than MIN level	Low
Parking Brake Sw	Parking brake lever pulled	ON
	Parking brake lever released	OFF
Rear Defogger Sw	Rear end door window defogger switch turned ON with engine running	ON
	Rear end door window defogger switch turned OFF with engine running	OFF
Tail Light Sw	Lighting switch at HEAD or CLEARANCE position	ON
	Lighting switch at OFF position	OFF
Driv Seatbelt Sw	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Rear end door opener	Rear end door open	ON
	Rear end door closed	OFF
Charge Lamp	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF

10B-8 Body Electrical Control System:

Scan tool Data	Condition	Normal condition / reference value
A/C Switch	A/C and ignition switch turned ON	ON
	A/C switch turned OFF	OFF

Scan Tool Data Definitions

Vehicle Speed (km/h, mph): It is computed based on pulse signals from wheel speed sensor.

Outside air Temp (°C, °F): It is detected by outside air temperature sensor.

Battery Voltage (V): This parameter indicates battery positive voltage inputted to BCM.

Coolant Temp (Engine coolant temperature) (°C, °F): It is detected by engine coolant temperature sensor.

Engine Speed (RPM): It is computed by reference pulse signals from CMP sensor.

Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.

Key Reminder Sw (Key remainder switch) (Pulled / Key in): This parameter indicates the state of the key reminder switch.

Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.

Door key Sw (Door key cylinder switch) (Lock / Neutral / Unlock): This parameter indicates the state of the door key cylinder switch.

Door lock Sw (Manual door lock switch) (Lock / Neutral / Unlock): This parameter indicates the state of the manual door lock switch.

Driv Door Sw (Driver side door switch) (Open / Close): This parameter indicates the state of the driver side door switch.

Pass Door Sw (Other than driver side door switch) (Open / Close): This parameter indicates the state of the door switches other than driver side door switch.

Brake Fluid Level (Low / Normal): Low: Brake fluid level is lower than specified level.

Normal: Brake fluid level is higher than MIN level.

Parking Brake Sw (Parking brake switch) (ON / OFF): ON: Parking brake lever is pulled up.

OFF: Parking lever is released

Rear Defogger Sw (Rear end door window defogger switch) (ON / OFF): This parameter indicates the state of the rear end door window defogger switch.

Tail Light Sw (Lighting switch) (ON / OFF): This parameter indicates the state of the lighting switch.

Driv Seatbelt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.

Rear end Door Opener (Rear end door opener switch) (ON / OFF): This parameter indicates the state of the rear end door opener switch.

Charge lamp (ON / OFF): This parameter indicates the state of the charge system monitor switch.

A/C Switch (ON / OFF): This parameter indicates the state of the air conditioning switch.

Diagnosis Using Output Test Function of SUZUKI Scan Tool

SUZUKI scan tool has the output test function which can force operation of following actuators and relays of the system controlled by BCM. When a malfunction is found in the system controlled by BCM, execute the output test which enables easy judgment whether the malfunction is on the input side or output side of BCM. For detailed information on operation of SUZUKI scan tool, refer to "SUZUKI Scan Tool Operator's Manual".

Output Teat Item	Controlled Parts
Hazard Warning Light	Turn signal and hazard warning relay
Interior (Dome) Light	Interior (Dome) light (when interior light switch is at DOOR position)
Door	Each door lock actuator
Rear end door open	Rear end door opener relay
Dead Lock	Each door lock actuator
Warning buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Alarm indicator light (in information display or clock)
Rear defogger	Rear end door window defogger relay

DTC Table

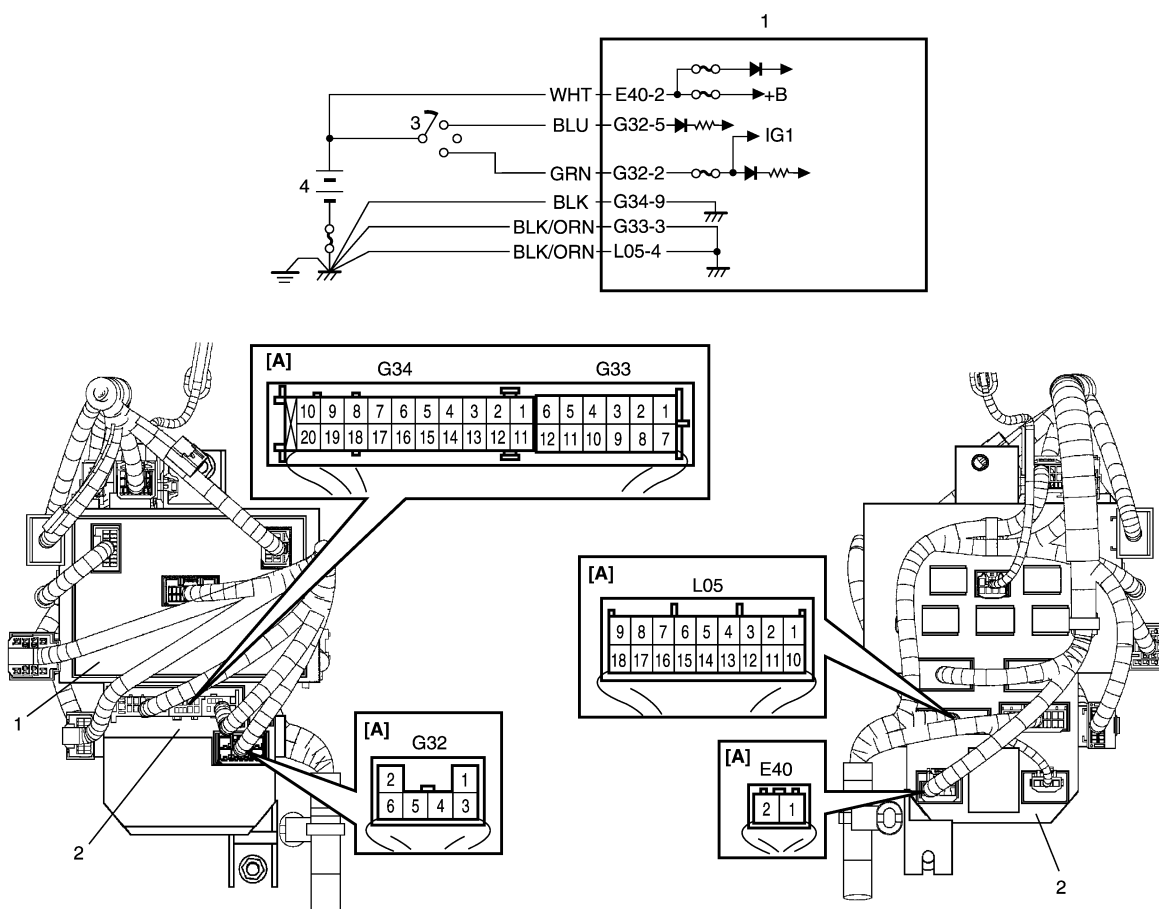
S5RS0BA204004

DTC (displayed on SUZUKI scan tool)	DTC (indicated by alarm indicator lamp)	DTC (displayed on odometer in combination meter)	Detected item	Detecting condition
NO DTC	0000	0000	—	No DTC detected
☞ B1133	1133	b1133	Battery voltage too high	Battery voltage too high
☞ B1141	1141	b1141	Outside air temperature (ambient temperature) sensor circuit open	Sensor output voltage too high
☞ B1142	1142	b1142	Outside air temperature (ambient temperature) sensor circuit short to ground	Sensor output voltage too low
☞ B1143	1143	b1143	Outside air temperature (ambient temperature) sensor malfunction	Sensor output voltage out of specification
☞ B1150	1150	b1150	Air bag communication circuit malfunction	Air bag communication circuit open or short to ground
☞ B1157	1157	b1157	Air bag deployment signal input	Air bag deployment signal inputted
☞ B1170	1170	b1170	EEPROM access error	Memory error
☞ U1001	1001	U1001	High speed CAN communication bus	Transmitting error of BCM for specified time continuously
☞ U1073	1073	U1073	Control module communication bus off	Transmitting and receiving error of BCM for specified time continuously
☞ U1100	1100	U1100	Lost communication with ECM	Receiving error of BCM from ECM for specified time continuously

DTC B1133 (DTC No. 1133): Battery Voltage Too High

S5RS0BA204008

Wiring Diagram



I4RS0AA20008-01

[A]: Junction block assembly connector viewed from harness side	3. Ignition switch
1. BCM	4. Battery
2. Junction block assembly	

DTC Detecting Condition and Possible cause

DTC detecting condition	Possible cause
Power voltage supplied from battery to BCM is higher than 16V.	- Charging system malfunction - BCM malfunction

Flow Test Description

Step 1: Check charging system

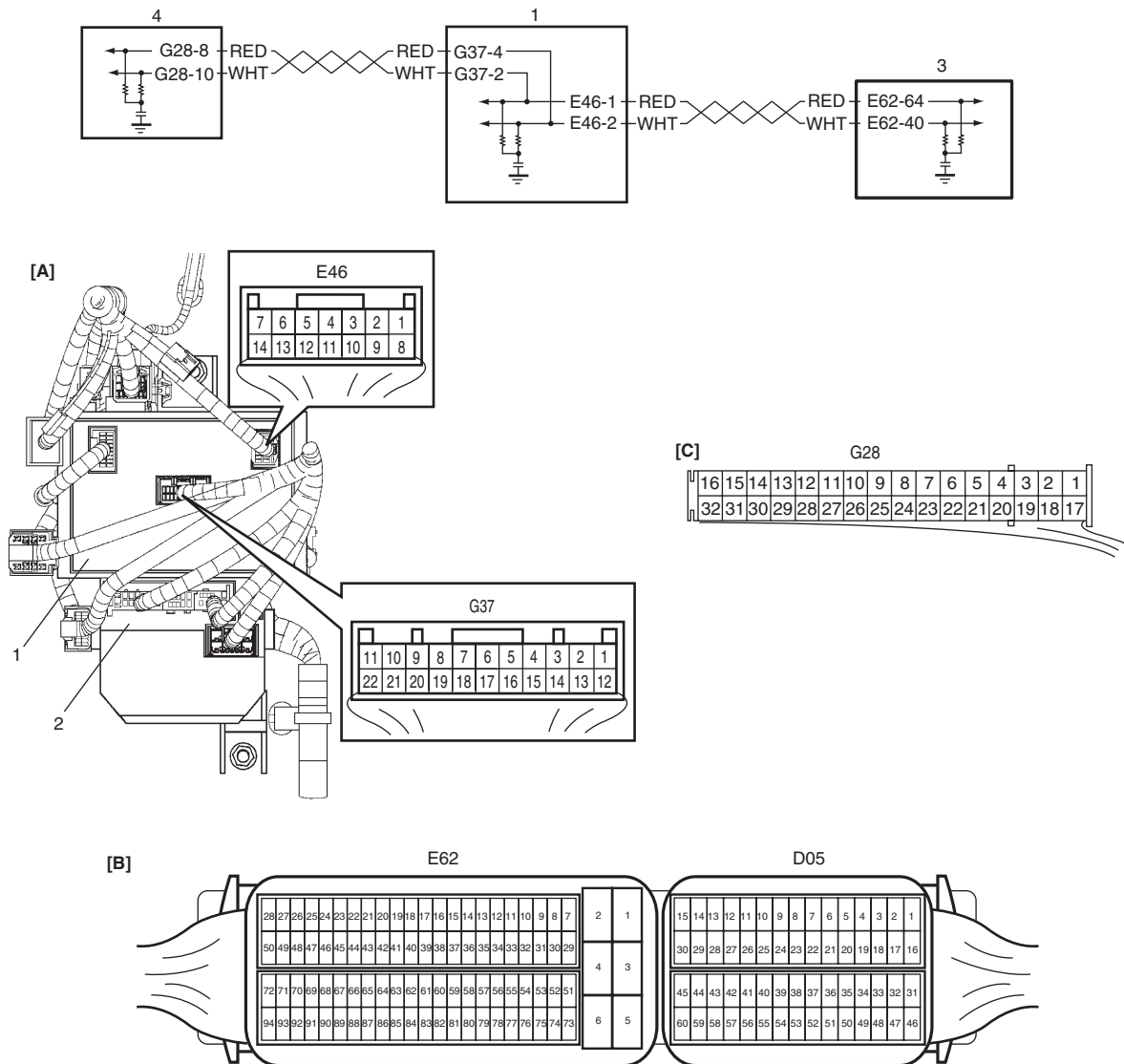
DTC troubleshooting

Step	Action	Yes	No
1	Charging system operation check 1) Measure generator "B" terminal voltage at engine 2000 rpm. <i>Is voltage lower than 16V?</i>	Substitute a known good BCM (included in junction block assembly) and recheck.	Repair charging system.

DTC U1001 (No. 1001): High Speed CAN Communication (Transmission Error)

S5RS0BA204013

Wiring Diagram



I5RS0BA20003-01

[A]: BCM connector (viewed from harness side)	2. Junction block assembly
[B]: ECM connector (viewed from harness side)	3. ECM
[C]: Combination meter connector (viewed from terminal side)	4. Combination meter
1. BCM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for BCM is detected for longer than specified time continuously.	- CAN communication circuit - Combination meter - BCM (included in junction block assembly) - ECM

10B-12 Body Electrical Control System:

DTC Confirmation Procedure

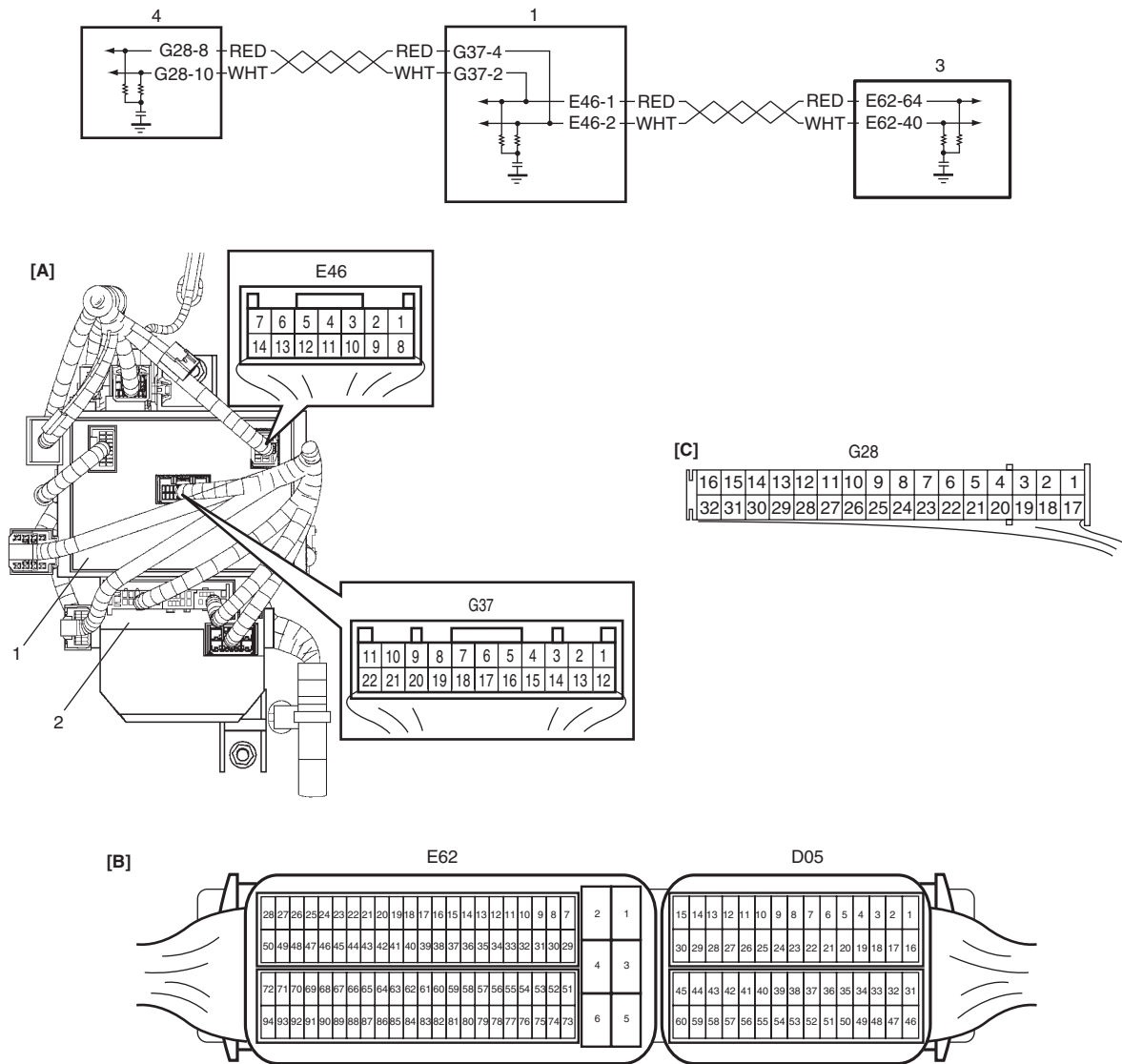
- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC.

Troubleshooting

Step	Action	Yes	No
1	Check DTC in BCM <i>Is DTC U1001 (No. 1001) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	Check each control module connectors 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1001 (No. 1001) detected?</i>	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
3	CAN communication circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 4.	Repair circuit.
4	Check DTC in ECM 1) Connect connectors to all control modules. 2) Check ECM for DTC. <i>Is DTC P2107 detected?</i>	Go to Step 5.	Substitute a known-good BCM (included in junction block assembly) and recheck.
5	Combination meter operation check 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) with ignition switch turned ON. <i>Are they OK?</i>	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC U1073 (No. 1073): Control Module Communication Bus Off

S5RS0BA204014

Wiring Diagram

I5RS0BA20003-01

[A]: BCM connector (viewed from harness side)	2. Junction block assembly
[B]: ECM connector (viewed from harness side)	3. ECM
[C]: Combination meter connector (viewed from terminal side)	4. Combination meter
1. BCM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	- CAN circuit - Combination meter - BCM - ECM

10B-14 Body Electrical Control System:

DTC Confirmation Procedure

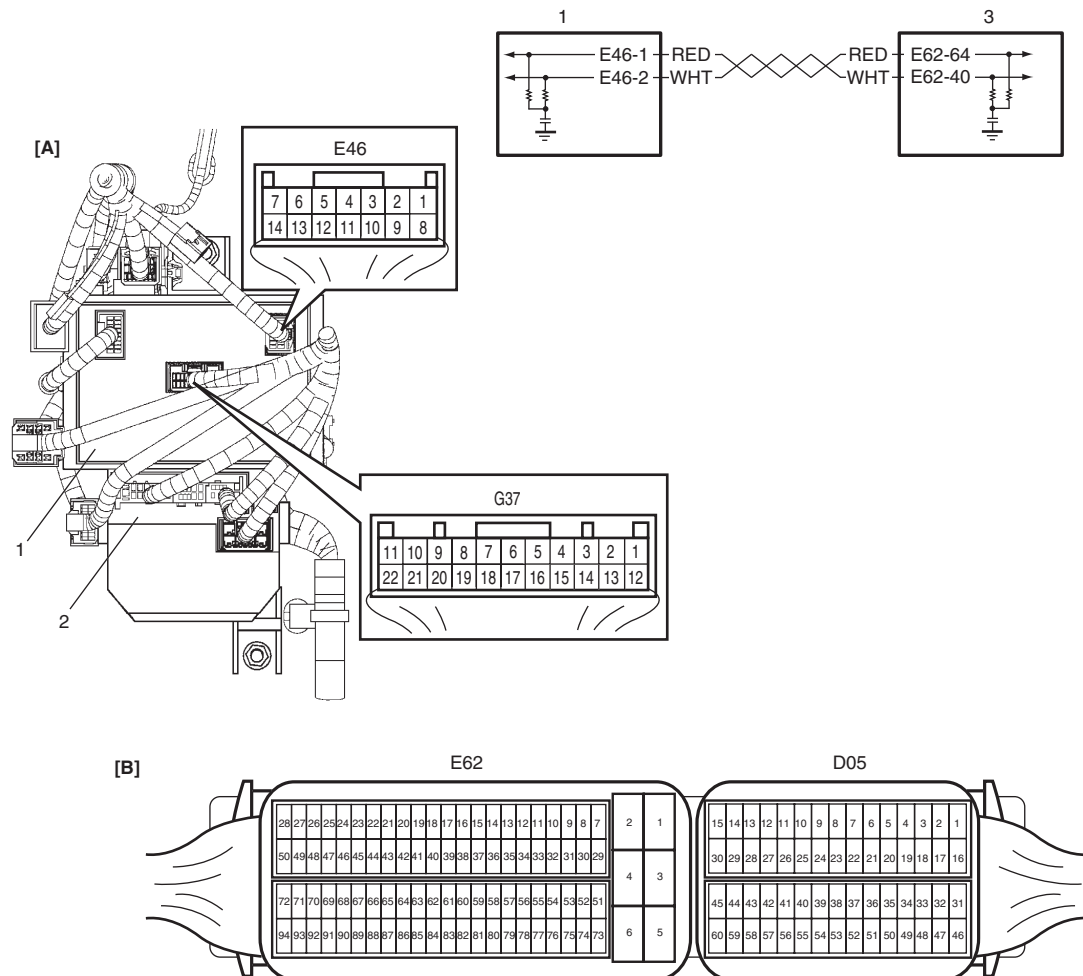
- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC and pending DTC.

Troubleshooting

Step	Action	Yes	No
1	Check each control unit connectors 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC. <i>Is DTC U1073 detected?</i>	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
2	CAN communication circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Go to Step 3.	Repair circuit.
3	Check DTC in BCM 1) Turn ignition switch to OFF position. 2) Connect connectors to combination meter and BCM. 3) Recheck BCM for DTC. <i>Is DTC U1073 detected?</i>	Go to Step 4.	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
4	Check DTC in BCM 1) Turn ignition switch to OFF position. 2) Disconnect connector from combination meter and connect connectors to ECM. 3) Recheck BCM for DTC. <i>Is DTC U1073 detected?</i>	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM (included in junction block assembly) and recheck.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.

DTC U1100 (No. 1100): Lost communication with ECM

S5RS0BA204015

Wiring Diagram

I5RS0BA20004-01

[A]: BCM connector (viewed from harness side)	1. BCM	3. ECM
[B]: ECM connector (viewed from harness side)	2. Junction block assembly	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	- CAN communication circuit - BCM (included in junction block assembly) - ECM

DTC Confirmation Procedure

- 1) Connect scan tool to DLC with ignition switch turned OFF.
- 2) Turn ON ignition switch and clear DTC by using scan tool.
- 3) Start engine and run it for 1 min. or more.
- 4) Check DTC.

Troubleshooting

Step	Action	Yes	No
1	Check DTC in BCM <i>Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?</i>	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off: ".	Go to Step 2.
2	Check DTC in ECM 1) Check ECM for DTC. <i>Is DTC P2107 detected?</i>	Go to applicable DTC diag. flow.	Go to Step 3.
3	Check each control module connectors 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. <i>Is DTC U1100 (No. 1100) detected?</i>	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection: in Section 00".
4	CAN communication circuit check 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. <i>Is each CAN communication circuit in good condition?</i>	Substitute a know-good BCM and recheck.	Repair circuit.

Inspection of BCM and its Circuits

S5RS0BA204018

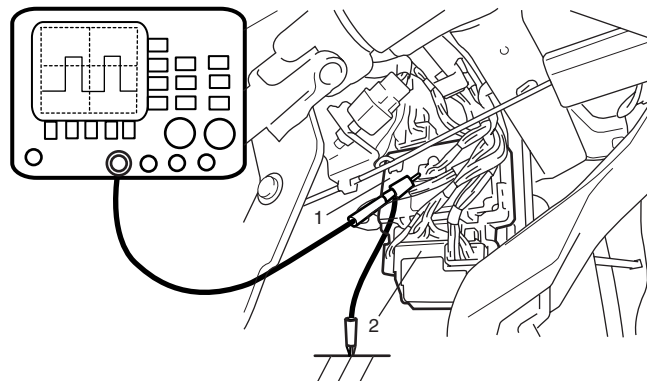
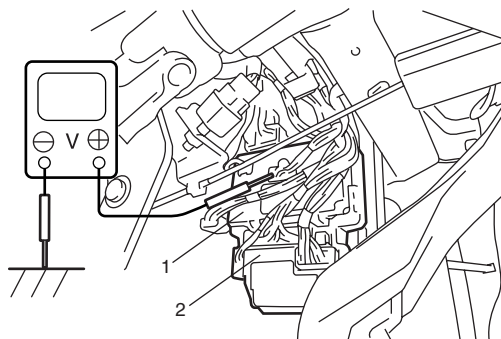
BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

⚠ CAUTION

BCM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to BCM with couplers disconnected from it.

Voltage Check

- 1) Disconnect negative cable (–) at battery.
- 2) Remove BCM (included in junction block assembly) referring to "BCM (Included in Junction Block Assembly) Removal and Installation: ".
- 3) Connect connectors to BCM (1) and junction block assembly (2).
- 4) Check voltage at each terminal number of couplers connected.
For connector and terminal number, refer to "Connector Layout Diagram of BCM and Junction Block Assembly: ".



I4RS0AA20030-01

NOTE

- As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.
- Voltage with asterisk (*) can not be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.

BCM connector "L01"

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-1	GRN	Passenger side door lock actuator control	10 – 14 V	Unlock signal is output for door lock actuators other than driver side door lock actuator.
			0 V	Unlock signal is not output for door lock actuators other than driver side door lock actuator.
L01-2	—	—	—	—
L01-3	BLK/YEL	Rear end door switch	4 – 6 V	Rear end door is closed
			0 V	Rear end door is opened
L01-4	WHT	Rear end door opener switch	4 – 6 V	Rear end door switch is not pushed
			0 V	Rear end door switch is pushed
L01-5	GRY	Manual door lock switch (Unlock)	4 – 6 V	Manual door lock switch is at any position other than unlock position
			0 V	Manual door lock switch is at unlock position
L01-6	RED/BLK	Parking brake switch	*0 – 3 V ↑↓ 10 – 14 V ("Reference waveform No. 1: ")	Ignition switch is at ON position and parking brake lever is released
			0 V	Ignition switch is at ON position and parking brake lever is pulled up
L01-7	GRY/RED	Driver side door switch	10 – 14 V	Driver side door is closed
			0 V	Driver side door is opened
L01-8	—	—	—	—
L01-9	—	—	—	—
L01-10	GRN/RED	Driver side door lock actuator control	10 – 14 V	Unlock signal is output for driver side door lock actuator.
			0 V	Unlock signal is not output for driver side door lock actuator.
L01-11	BLU/YEL	Rear end door actuator motor	0 V	Rear end door actuator motor is not in operation
			10 – 14 V	Rear end door actuator motor is in operation
L01-12	GRY/WHT	Manual door lock switch (Lock)	4 – 6 V	Manual door lock switch is at any position other than lock position
			0 V	Manual door lock switch is at lock position
L01-13	—	—	—	—
L01-14	BRN/YEL	Driver seat belt switch	*0 – 3 V ↑↓ 10 – 14 V ("Reference waveform No. 2: ")	Ignition switch is at ON position and driver side seat belt is fastened
			0 V	Ignition switch is at ON position and driver side seat belt is unfastened
L01-15	BLK/RED	Door switch (other than driver side door and rear end door)	10 – 14 V	Rear right and left side door and passenger side door are closed
			0 V	Any one of the door is opened (except driver side door and rear end door)
L01-16	LT GRN/BLK	Driver side door key cylinder switch (Lock)	10 – 14 V	Driver side door key cylinder switch is at any position other than lock position
			0 V	Driver side door key cylinder switch is at lock position

10B-18 Body Electrical Control System:

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-17	BRN	Driver side door key cylinder switch (Unlock)	10 – 14 V	Driver side door key cylinder switch is at any position other than unlock position
			0 V	Driver side door key cylinder switch is at unlock position
L01-18	—	—	—	—

BCM connector “E46”

Terminal	Wire color	Circuit	Normal voltage	Condition
E46-1	RED	CAN communication line (high) for ECM	*2.5 – 3.6 V ("Reference waveform No. 3: ")	Ignition switch is at ON position
E46-2	WHT	CAN communication line (low) for ECM	*1.6 – 2.5 V ("Reference waveform No. 3: ")	Ignition switch is at ON position
E46-3	—	—	—	—
E46-4	WHT/BLU	Generator “L” terminal	10 – 14 V	Engine is running
			0 V	Ignition switch is at ON position
E46-5	RED/BLK	Brake fluid level switch	*0 – 3 V ↑↓ 10 – 14 V ("Reference waveform No. 1: ")	Ignition switch is at ON position, parking brake lever is released and brake fluid level is at specified level
			0 V	Ignition switch is at ON position, parking brake lever is released and brake fluid level is lower than MIN level
E46-6	—	—	—	—
E46-7	—	—	—	—
E46-8	YEL/BLK	Sensor ground for outside air temperature sensor	0 V	—
E46-9	PPL/WHT	Serial communication line of data link connector	10 – 14 V	Ignition switch is at ON position
E46-10	YEL/RED	Outside air temperature sensor	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)
E46-11	—	—	—	—
E46-12	—	—	—	—
E46-13	—	—	—	—
E46-14	—	—	—	—

BCM connector “G37”

Terminal	Wire color	Circuit	Normal voltage	Condition
G37-1	WHT/BLK	CAN communication line (low) for DLC	*1.6 – 2.5 V ("Reference waveform No. 4: ")	Ignition switch is at ON position
G37-2	WHT	CAN communication line (low) for combination meter	*1.6 – 2.5 V ("Reference waveform No. 5: ")	Ignition switch is at ON position
G37-3	RED/BLK	CAN communication line (high) for DLC	*2.5 – 3.6 V ("Reference waveform No. 4: ")	Ignition switch is at ON position
G37-4	RED	CAN communication line (high) for combination meter	*2.5 – 3.6 V ("Reference waveform No. 5: ")	Ignition switch is at ON position
G37-5	PPL/WHT	Serial communication line of data link connector for SDM	10 – 14 V	Ignition switch is at ON position
G37-6	—	—	—	—
G37-7	—	—	—	—
G37-8	GRY	Alarm indicator light	10 – 14 V	Alarm indicator light is not lit up
			0 V	Alarm indicator light is lit up

Terminal	Wire color	Circuit	Normal voltage	Condition
G37-9	—	—	—	—
G37-10	GRY/RED	Serial communication line for supplementary heater controller	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 6: ")	Ignition switch is at ON position
G37-11	YEL	Serial communication line for information display	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 7: ")	Ignition switch is at ON position
G37-12	BRN/WHT	Ground for keyless receiver	0 V	—
G37-13	LT GRN	Power supply for keyless receiver	4 – 6 V	Ignition switch is at all positions
G37-14	PNK	Signal for keyless receiver	*0 – 1 V ↑↓ 4 – 6 V ("Reference waveform No. 8: ")	When pushing lock or unlock button of keyless entry transmitter
G37-15	—	—	—	—
G37-16	BLU/YEL	Key reminder switch	10 – 14 V	Ignition key is inserted to ignition key cylinder
			0 V	Ignition key is pulled out from ignition key cylinder
G37-17	BRN	Rear end door window defogger switch	0 V	Ignition switch is at ON position and rear end door window defogger switch is at ON position
			4 – 6 V	Ignition switch is at ON position and rear end door window defogger switch is at any position other than ON position
G37-18	GRY/WHT	A/C switch	*3 – 14 V ("Reference waveform No. 9: ")	Ignition switch is at ON position and A/C switch is at OFF position
			0 V	Ignition switch is at ON position, blower speed selector is at any position other than OFF position and A/C switch is at ON position
G37-19	—	—	—	—
G37-20	—	—	—	—
G37-21	BLU/BLK	Rear wiper INT switch	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 10: ")	Ignition switch is at ON position and rear wiper switch is at any position other than INT position
			0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G37-22	GRN	Rear wiper low switch	*0 – 1 V ↑↓ 10 – 14 V ("Reference waveform No. 11: ")	Ignition switch is at ON position and rear wiper switch is at any position other than LOW position
			0 V	Ignition switch is at ON position and rear wiper switch is at LOW position

Junction block connector "E40"

Terminal	Wire color	Circuit	Normal voltage	Condition
E40-2	WHT	Backup power source	10 – 14 V	Ignition switch is at all positions

10B-20 Body Electrical Control System:**Junction block connector "E41"**

Terminal	Wire color	Circuit	Normal voltage	Condition
E41-3	GRN	Horn	10 – 14 V	Horn switch is at ON position
			0 V	Horn switch is at OFF position

Junction block connector "G32"

Terminal	Wire color	Circuit	Normal voltage	Condition
G32-2	GRN	Power source (IG)	10 – 14 V	Ignition switch is at ON position
			0 V	Ignition switch is at any position other than ON position
G32-5	BLU	Power source (ACC)	10 – 14 V	Ignition switch is at ACC or ON position
			0 V	Ignition switch is at any position other than ACC or ON position

Junction block connector "G33"

Terminal	Wire color	Circuit	Normal voltage	Condition
G33-3	BLK/ORN	Ground for BCM	0 V	Ignition switch is at all positions
G33-7	BLK/RED	Rear end door window defogger switch indication	10 – 14 V	Engine is running and defogger switch indication is lit up
			0 V	Engine is running and defogger switch indication is not lit up

Junction block connector "G34"

Terminal	Wire color	Circuit	Normal voltage	Condition
G34-3	BLU	Horn switch	10 – 14 V	Horn switch is not pushed
			0 V	Horn switch is pushed
G34-7	RED/YEL	Lighting switch	10 – 14 V	Engine is running (equipped with DRL) or lighting switch is at any position other than OFF position
			0 V	Lighting switch is at OFF position
G34-9	BLK	Ground for BCM	0 V	Ignition switch is at all positions
G34-11	WHT	Hazard switch	0 V	Hazard switch is at ON position or lock or unlock button of key less entry transmitter (answer back control) is pushed
			10 – 14 V	Hazard switch is at OFF position

Junction block connector "K01"

Terminal	Wire color	Circuit	Normal voltage	Condition
K01-5	WHT	Interior light	10 – 14 V	Interior light switch is at DOOR position and interior light is not lit up
			0 V	Interior light switch is at DOOR position and interior light is lit up

Junction block connector "L04"

Terminal	Wire color	Circuit	Normal voltage	Condition
L04-2	YEL	Air bag communication line	*0 – 1 V ↑↓ 4 – 6 V ("Reference waveform No. 12: ")	Ignition switch is at ON position
L04-3	PPL/WHT	Serial communication line of data link connector	10 – 14 V	Ignition switch is at ON position

Junction block connector "L05"

Terminal	Wire color	Circuit	Normal voltage	Condition
L05-4	BLK/ORN	Ground for BCM	0 V	Ignition switch is at all positions
L05-5	YEL	Power supply for rear wiper motor	10 – 14 V	Ignition switch is at ON position

Terminal	Wire color	Circuit	Normal voltage	Condition
L05-6	BLK/RED	Right side door mirror heater	10 – 14 V	Engine is running and rear end door window defogger is in operation
			0 V	Engine is running and rear end door window defogger is not in operation
L05-7	BLK/RED	Left side door mirror heater	10 – 14 V	Engine is running and rear end door window defogger is in operation
			0 V	Engine is running and rear end door window defogger is not in operation
L05-8	BLK/RED	Rear end door window defogger wire	10 – 14 V	Engine is running and rear end door window defogger is in operation
			0 V	Engine is running and rear end door window defogger is not in operation
L05-9	ORN	Rear wiper control	10 – 14 V	Ignition switch is at ON position and rear wiper is not in operation
			0 V	Ignition switch is at ON position and rear wiper is in operation

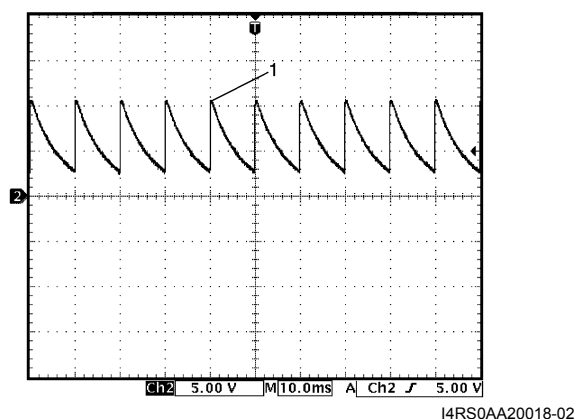
Junction block connector “L06”

Terminal	Wire color	Circuit	Normal voltage	Condition
L06-1	BLU/ORN	Door lock actuator motor control (Dead lock)	10 – 14 V	Driver side key cylinder is turned to lock twice with in 3 seconds.
			0 V	Manual door lock switch is at any position other than LOCK position and driver side door key cylinder switch is at any position other than LOCK position
L06-9	GRN	Rear right and left door lock actuator motor (Unlock)	10 – 14 V	Rear right and left door lock actuator motor is operated (Unlock)
			0 V	Rear right and left door lock actuator motor is not operated
L06-10	RED/BLU	Door lock actuator motor control (Lock)	10 – 14 V	Manual door lock switch is at LOCK position or driver side door key cylinder switch is at LOCK position
			0 V	Manual door lock switch is at any position other than LOCK position or driver side door key cylinder switch is at any position other than LOCK position

Reference waveform No. 1

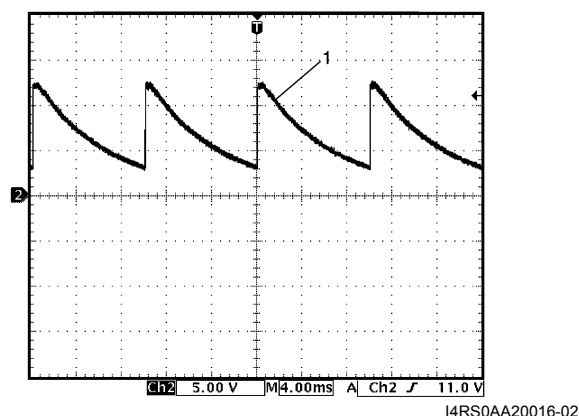
Parking brake or brake fluid level switch signal (1)

Measurement terminal	Parking brake switch CH2: "L01-6" to "G33-3" Brake fluid level switch CH2: "E46-5" to "G33-3"
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Parking brake switch: - Ignition switch is at ON position, parking brake lever is released Brake fluid level switch - Ignition switch is at ON position, brake fluid lever is in normal

**Reference waveform No. 2**

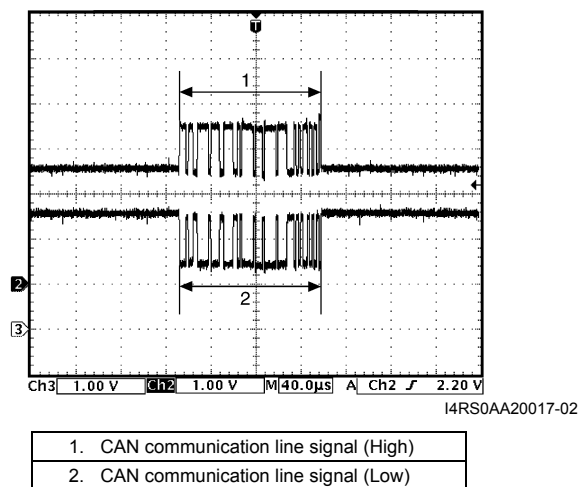
Driver seat belt switch signal (1)

Measurement terminal	CH2: "L01-14" to "G33-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 4 ms/DIV
Measurement condition	Ignition switch is at ON position and driver side seat belt is fastened

**Reference waveform No. 3**

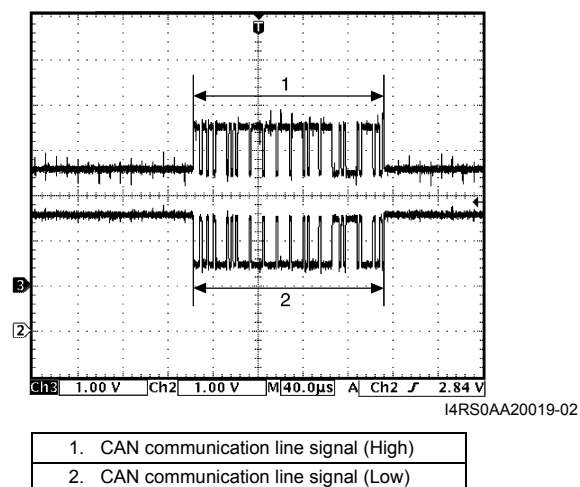
BCM – ECM CAN communication signal

Measurement terminal	CH2: "E46-1" to "G33-3" CH3: "E46-2" to "G33-3"
Oscilloscope setting	CH2: 1 V/DIV CH3: 1 V/DIV TIME: 40 μ s / DIV
Measurement condition	Ignition switch is at ON position

**Reference waveform No. 4**

BCM – DLC CAN communication signal

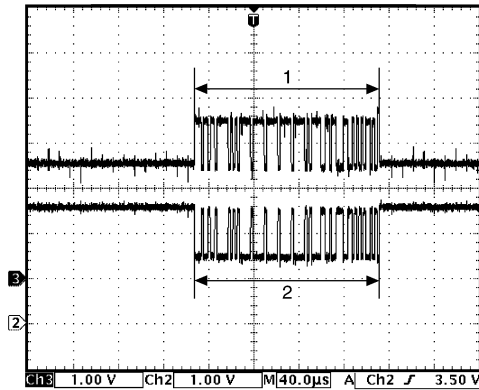
Measurement terminal	CH2: "G37-1" to "G33-3" CH3: "G37-3" to "G33-3"
Oscilloscope setting	CH2: 1 V / DIV CH3: 1 V / DIV TIME: 40 μ s / DIV
Measurement condition	Ignition switch is at ON position



Reference waveform No. 5

BCM – combination meter CAN communication signal

Measurement terminal	CH2: "G37-2" to "G33-3" CH3: "G37-4" to "G33-3"
Oscilloscope setting	CH2: 1 V / DIV CH3: 1 V / DIV TIME: 40 μ s / DIV
Measurement condition	Ignition switch is at ON position



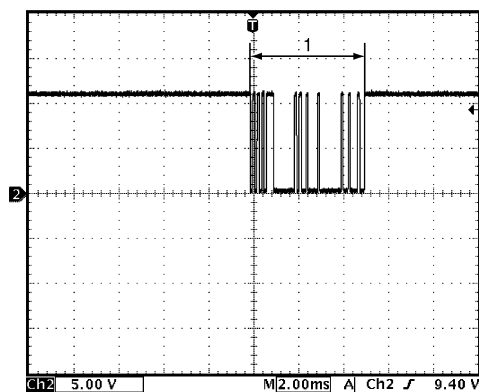
I4RS0AA20020-02

1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No. 6

Supplementary heater controller serial communication signal (1)

Measurement terminal	CH2: "G37-10" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

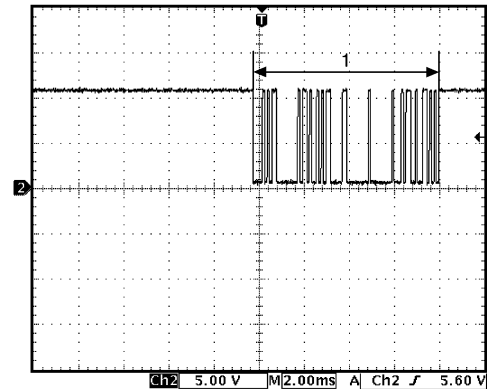


I5RS0BA20005-01

Reference waveform No. 7

Information display serial communication signal (1)

Measurement terminal	CH2: "G37-11" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

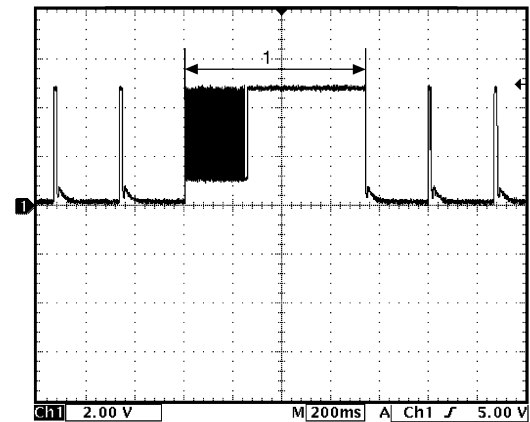


I4RS0AA20021-02

Reference waveform No. 8

Keyless entry receiver signal (1)

Measurement terminal	CH2: "G37-14" to "G33-3"
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of keyless entry transmitter is pushed

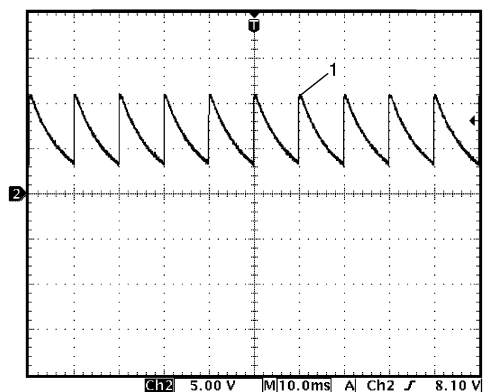


I4RS0AA20022-02

Reference waveform No. 9

A/C switch signal (1)

Measurement terminal	CH2: "G37-18" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and A/C switch is at ON position

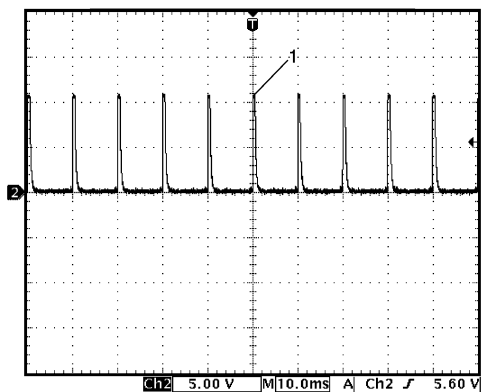


I4RS0AA20023-02

Reference waveform No. 10

Rear wiper INT signal (1)

Measurement terminal	CH2: "G37-21" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position and rear wiper switch is at any position other than INT position

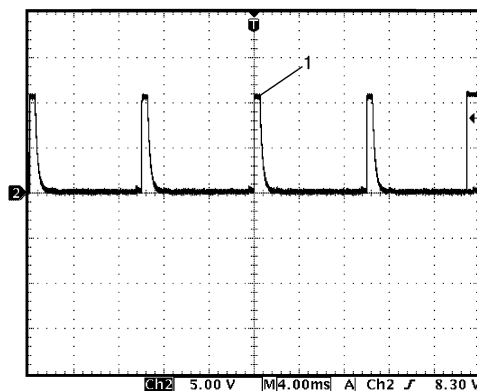


I4RS0AA20024-02

Reference waveform No. 11

Rear wiper LOW signal (1)

Measurement terminal	CH2: "G37-22" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 4 ms / DIV
Measurement condition	Ignition switch is at ON position and rear wiper switch is at any position other than LOW position

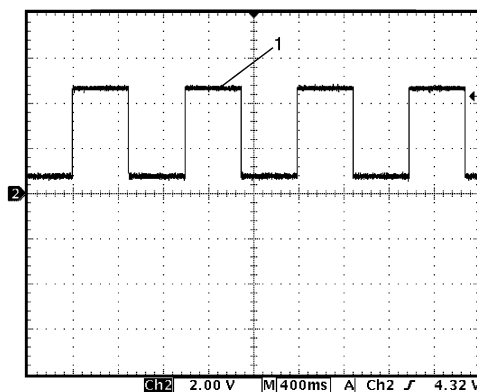


I4RS0AA20025-02

Reference waveform No. 12

SDM communication signal (1)

Measurement terminal	CH2: "L04-2" to "G33-3"
Oscilloscope setting	CH2: 2 V / DIV TIME: 400 ms / DIV
Measurement condition	Ignition switch is at ON position



I4RS0AA20026-02

Immobilizer Control System

Precautions

Precautions in Diagnosing Troubles

S5RS0BA300001

- Before confirming DTC, do not disconnect connector from ECM, battery cable from battery, ground wire harness or main fuse. Such disconnection will erase memorized information in ECM.
- DTC stored in Immobilizer Control Module memory can be cleared as well as checked by using SUZUKI 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 00" before inspection and observe what is written there.
- There are cases where service vehicle soon (SVS) lamp indicates that some trouble has occurred only temporarily and has gone. In such case, it may occur that good parts are replaced unnecessarily. To prevent such case, be sure to follow instructions when checking by using "Immobilizer Control System Check: ".
- When trouble can be identified, it is not an intermittent one: check ignition key, wires and each connector and if they are all in good condition, substitute a known-good ECM and recheck.

Precautions in Handling Immobilizer Control System

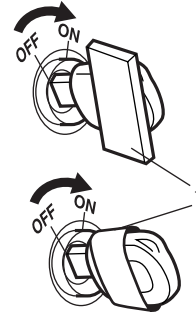
S5RS0BA300002

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



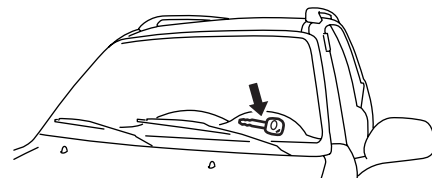
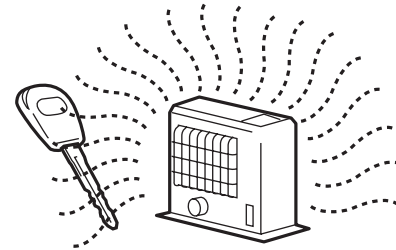
I3RH0AA30001-01

- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped its grip or in contact with it. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



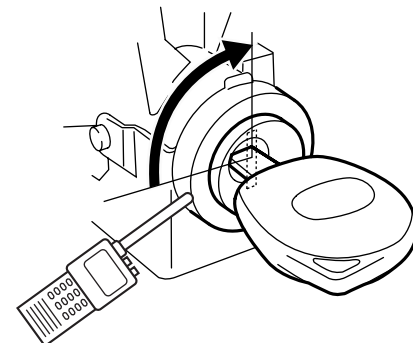
I3RH0AA30002-01

- Do not leave ignition key in a place where temperature is high. High temperature may cause damage to the transponder built in the ignition key.



I3RH0AA30003-01

- Do not turn ignition switch to ON position by bringing radio antenna close to coil antenna. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30004-01

General Description

Immobilizer Control System Operation Description

S5RS0BA301001

- 1) Each ignition key has its own FIX CODE stored in memory. When the ignition switch is turned to ON position Immobilizer Control Module reads the FIX CODE through its coil antenna from ignition key.
- 2) Immobilizer Control Module compares FIX CODE read in Step 1) and that registered in Immobilizer Control Module, and then checks if they match.
- 3) ECM sends variable (generated randomly) to transponder via Immobilizer Control Module, and then ECM calculates it with SECRET KEY CODE stored in its memory according to specified algorithm.
On the other hand, transponder also calculates received variable with SECRET KEY CODE stored in its memory by means of same algorithm and sends back to ECM.
- 4) Only when ECM/transponder calculated values match, ECM keeps running engine.
If two calculated values do not match, ECM stops operation of injectors and ignitor to stop engine after about 1.8 seconds at the first time. After the second time, ECM does not let engine start. And, so it does when FIX CODEs in Step 2) do not match.

Immobilizer Control System Components Description

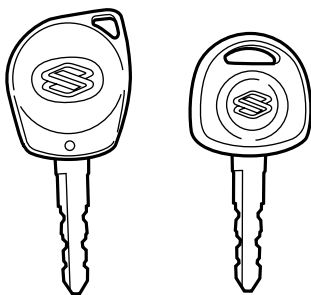
S5RS0BA301002

The immobilizer control system designed to prevent vehicle burglar and it consists of the following components.

- Engine Control Module (ECM)
- Immobilizer Control Module (with coil antenna)
- Ignition key (with built-in transponder)

Ignition Key (with Built-In Transponder)

Transponder is built-in an ignition key grip. Each transponder in the key has a FIX CODE and SECRET KEY CODE. The FIX CODE will be transmitted from the transponder via the coil antenna to Immobilizer Control Module when the ignition switch is turned to ON position. SECRET KEY CODE is used for calculation with variable sent from ECM. SECRET KEY CODE is preset (programmed) at factory shipment.

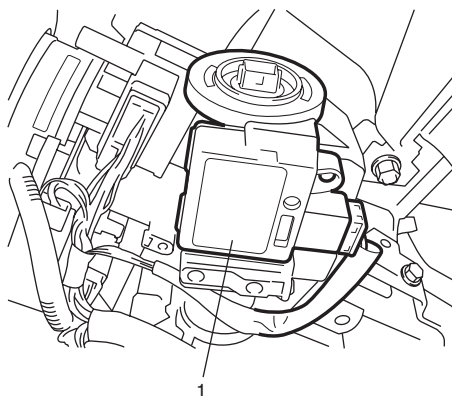


I3RM0AA30012-01

Immobilizer Control Module

Immobilizer Control Module (1) is installed to steering column beside ignition key switch. The coil antenna is installed to Immobilizer Control Module. It energizes transponder and transmits the FIX CODE and data between transponder and Immobilizer Control Module. As main function, Immobilizer Control Module checks if FIX CODE transmitted from transponder and that registered in Immobilizer Control Module (up to 5 different FIX CODE can be registered) match. Immobilizer Control Module controls serial communication between scan tool and ECM. Immobilizer Control Module has 3 different values as the follows.

- Password: for accessing to program by means of scan tool.
- SECRET KEY CODE: for ECM and transponder to calculate with.
- FIX CODE: for checking if transponder is the registered one.



I5RS0BA30001-01

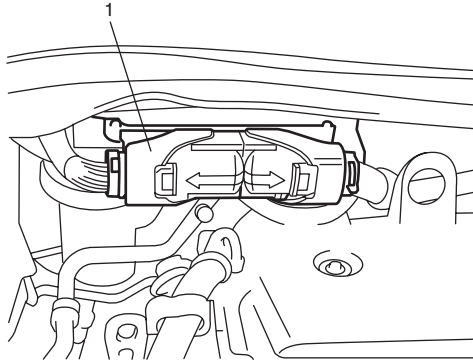
ECM

As main function other than engine control, ECM (1) sends randomized data to transponder and checks if a response from transponder and the value calculated in ECM match.

According to matching result, ECM decides to keep engine running or not.

ECM has 2 different values as follows.

- Password: for accessing to program immobilizer control system.
- SECRET KEY CODE: for calculating with this value for permission of engine start.

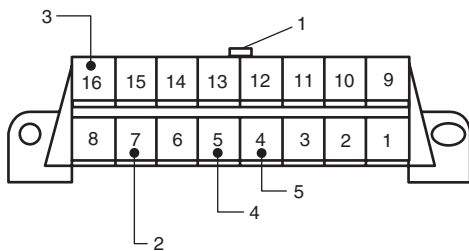


I5RS0BA30002-01

Data Link Connector (DLC)

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

OBD-II serial data line (K line of ISO 9141) (2) is used for SUZUKI scan tool to communicate with Immobilizer Control Module, Air bag SDM, ABS control module, etc.



I3RM0BA32004-01

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

On-Board Diagnostic System Description

S5RS0BA301003

Immobilizer Control Module and ECM diagnose troubles which may occur in the area including the following parts when the ignition switch is turned to ON position.

Immobilizer Control Module:

- W-line (communication line between ECM and Immobilizer Control Module)
- Password
- SVS lamp circuit
- Transponder (ignition key)
- FIX CODE

ECM:

- SECRET KEY CODE
- Password

When a trouble exists in the immobilizer control system (when Immobilizer Control Module or ECM detects a DTC), ECM stops operation of the injector and ignitor. With the ignition switch at ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether some trouble has occurred in the immobilizer control system or not by turning ON or flashing ON and OFF the SVS lamp (1).

SVS lamp is ON, and then OFF after 3 seconds:

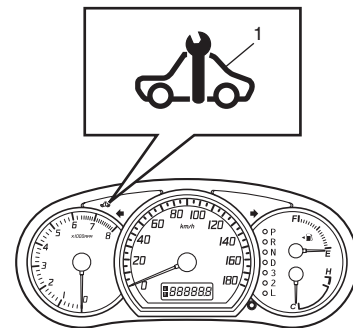
No trouble exists in the immobilizer control system.

SVS lamp flashes ON and OFF at 0.25 sec. intervals:

ECM or Immobilizer Control Module has detected some trouble in the immobilizer control system.

NOTE

As soon as the ignition switch is turned to ON position, ECM and Immobilizer Control Module diagnose if a trouble has occurred in the immobilizer control system in about 3 seconds at maximum. While the diagnosis is being made, the SVS lamp stays on and diagnosis result is "abnormal", it immediately starts flashing but if the result is "normal", it remains on.

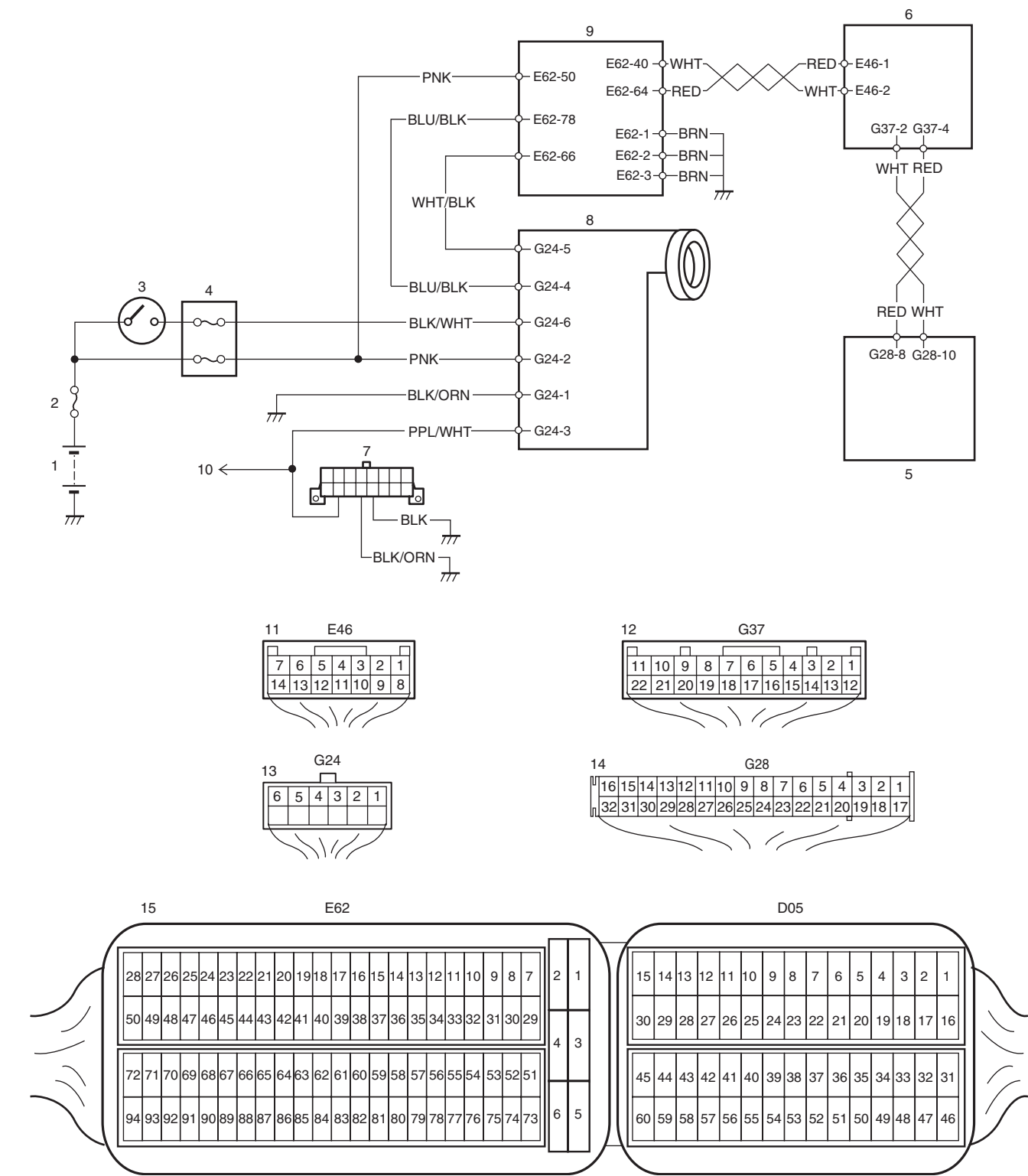


I5RS0BA30003-01

Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S5RS0BA302001



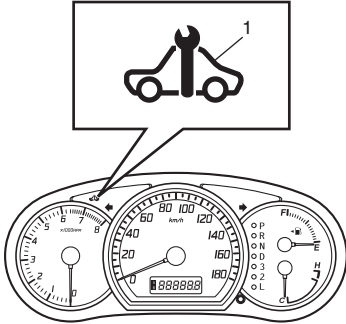
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1. Battery	6. BCM	11. BCM connector "E46" (harness side view)
2. Fuse	7. Data link connector (DLC)	12. BCM connector "G37" (harness side view)
3. Ignition switch	8. Immobilizer Control Module	13. Immobilizer control module connector "G24" (harness side view)
4. Junction block with BCM	9. ECM	14. Combination meter connector "G28" (harness side view)
5. Combination meter	10. To ECM, BCM etc.	15. ECM connector "E62" and "D05" (harness side view)

Diagnostic Information and Procedures

Immobilizer Control System Check

S5RS0BA304001

Step	Action	Yes	No
1	SVS Lamp Check 1) Turn ignition switch to ON position. 2) Check that SVS lamp (1) comes on for 5 seconds and then go off.  Does SVS lamp operate as specified?	Go to Step 2.	Go to Step 3.
2	Engine Start Check 1) Start engine. Does engine start?	Immobilizer system is good condition.	Go to "B-06, Complaint: Engine Start: in Section 1A".
3	System Check Does SVS lamp flash on and off continuously in Step 1?	Check DTC in immobilizer control module and/or ECM referring to "DTC Check: " and/or "DTC Check: in Section 1A".	Go to "SVS Lamp Does Not Come ON with Ignition Switch ON and Engine Stop: " or "SVS Lamp Remains On after Ignition Switch ON: ".

DTC Check

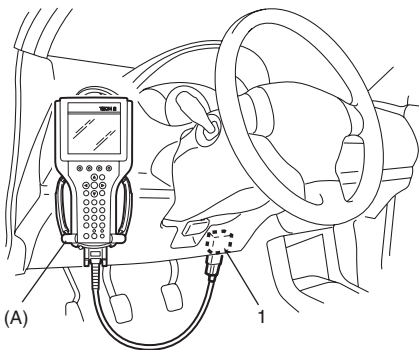
S5RS0BA304002

Immobilizer Control Module

- 1) Prepare SUZUKI scan tool.
- 2) With ignition switch OFF position, connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool

(A): SUZUKI scan tool



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- 3) Turn ignition switch to ON position.

- 4) Read DTC according to instructions displayed on SUZUKI scan tool referring to scan tool operator's manual for further details. If communication between scan tool and Immobilizer Control Module can not be established, check if SUZUKI scan tool is communicable by connecting it to immobilizer control system of another vehicle. If communication is possible in this case, SUZUKI scan tool is in good condition. Then, check data link connector and serial data line (circuit) in the vehicle with which communication can not be established.

NOTE

DTC No. B3040, B3042 and B3043 can not be confirmed by scan tool unless W-line circuit is in good condition.

- 5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC).

ECM

Refer to "DTC Check: in Section 1A".

10C-6 Immobilizer Control System:

DTC Clearance

S5RS0BA304003

Immobilizer Control Module

- 1) Connect SUZUKI scan tool to data link connector (DLC) located under instrument panel at driver's seat side.
- 2) Turn ignition switch to ON position.

- 3) Erase DTC according to instructions displayed on SUZUKI scan tool referring to scan tool operator's manual for further details.
- 4) After completing the clearance, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

ECM

Refer to "DTC Clearance: in Section 1A".

DTC Table

S5RS0BA304004

Immobilizer Control Module

DTC No.	Detected item	Detecting condition
B1000	Immobilizer Control Module internal failure	Immobilizer Control Module failure
B3040	W-line communication failure	Communication not finished correctly
B3042	W-line circuit malfunction shorted to ground	W-line circuit voltage low
B3043	W-line circuit malfunction shorted to battery	W-line circuit voltage high
B3055	No transponder	Ignition key without transponder is used.
B3056	No transponder registered	FIX CODE is not registered in Immobilizer Control Module.
B3057	No password registered	PWD is not registered in Immobilizer Control Module.
B3059	No request from ECM	ECM/Immobilizer Control Module line (SVS lamp) is open or shorted.
B3060	Incorrect transponder detected	Unregistered transponder is detected.
B3061	Transponder communication failure	Incorrect signal or no response from transponder
B3077	Read-only transponder detected	Transponder not for this system is detected.

ECM

DTC No.	Detected item	Detecting condition
Display on scan tool		
P1610	Secret key / password not programmed	SECRET KEY CODE and password are not registered in ECM.
P1611	Password is not matched	Stored password is incorrect.
P1612	No signal from immobilizer control module	Invalid signal from Immobilizer Control Module
P1613	Immobilizer system malfunction	Invalid signal from Immobilizer Control Module
P1614	Incorrect signal from immobilizer control module	Received response from transponder is incorrect.

NOTE

- DTC B3040, B3042 and B3043 not be confirmed by scan tool unless W-line circuit is in good condition.
- DTC B3059 is detected when ignition switch is turned to ON position within 5 seconds after ignition switch turned to ACC or OFF position from ON position.

Scan Tool Data

The normal condition below that can be checked by the scan tool are those detected by immobilizer control module.

Scan Tool Data	Vehicle Condition	Normal Condition
Ignition Switch	Ignition switch at ON position	ON
	Ignition switch at OFF position	OFF
Password	Ignition switch at ON position	PRGRMD
Transponder	Ignition switch at ON position	DETECTED
Fix Code (IGN key)	Ignition switch at ON position	REGISTERED
Number of Fix Code	Ignition switch at ON position	0 – 5 PCS
Trans Secret Key	Ignition switch at ON position	REGISTERED
Wait Loop	Ignition switch at ON position	INACTIVE
Wait Time	Ignition switch at ON position	0 SEC.

Scan Tool Data Definitions

Ignition Switch

Ignition key switch position

ON: Ignition switch at ON position

OFF: Ignition switch at OFF position

Password

PRGRMD: Password is registered in immobilizer control module.

NOT PRGRMD: Password is not registered. It is necessary to register password to set immobilizer control module in normal operation status.

Transponder

DETECTED: Transponder in ignition key is detected by immobilizer control module.

NOT DETECTED: Transponder in ignition key is not detected.

Fix Code (IGN key)

REGISTERED: The FIX CODE of ignition key which is inserted in key cylinder is registered in immobilizer control module.

NOT REGISTERED: The FIX CODE of ignition key which is inserted in key cylinder is not registered in immobilizer control module.

Number of Fix Code

0 – 5 PCS: The number of registered ignition key (FIX CODE).

Trans Secret Key

REGISTERED: Secret key is registered in ignition key with built-in transponder.

NOT REGISTERED: Secret key is not registered in ignition key with built-in transponder yet.

Wait Loop

INACTIVE: Security system is inactive. It is ready for password input on scan tool.

ACTIVE: Incorrect password was inputted and system is in wait-loop status. Inputting password is inhibited for the waiting time described below.

Wait Time

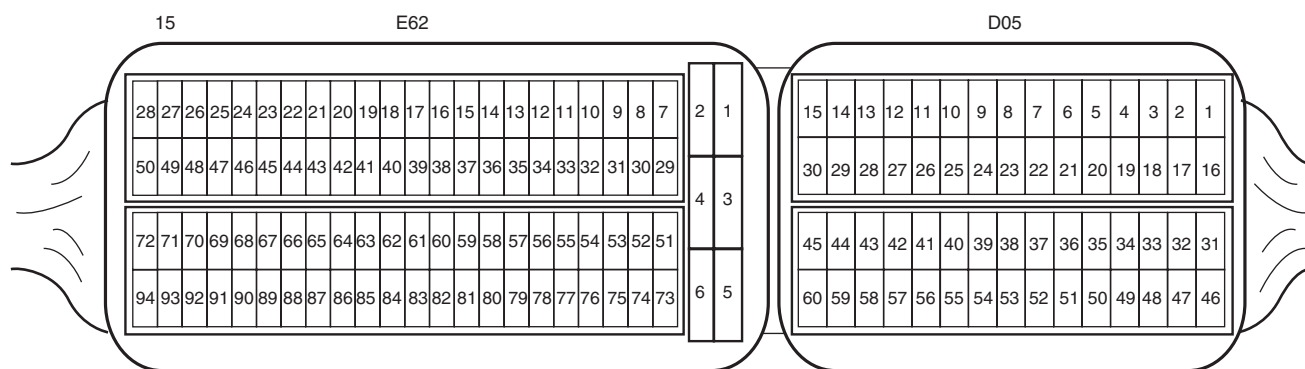
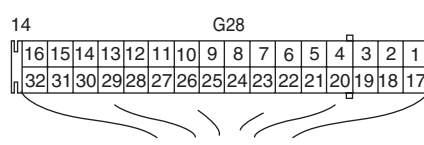
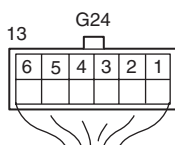
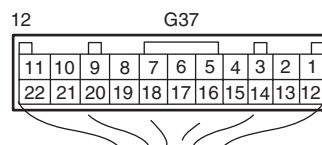
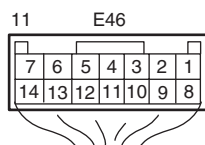
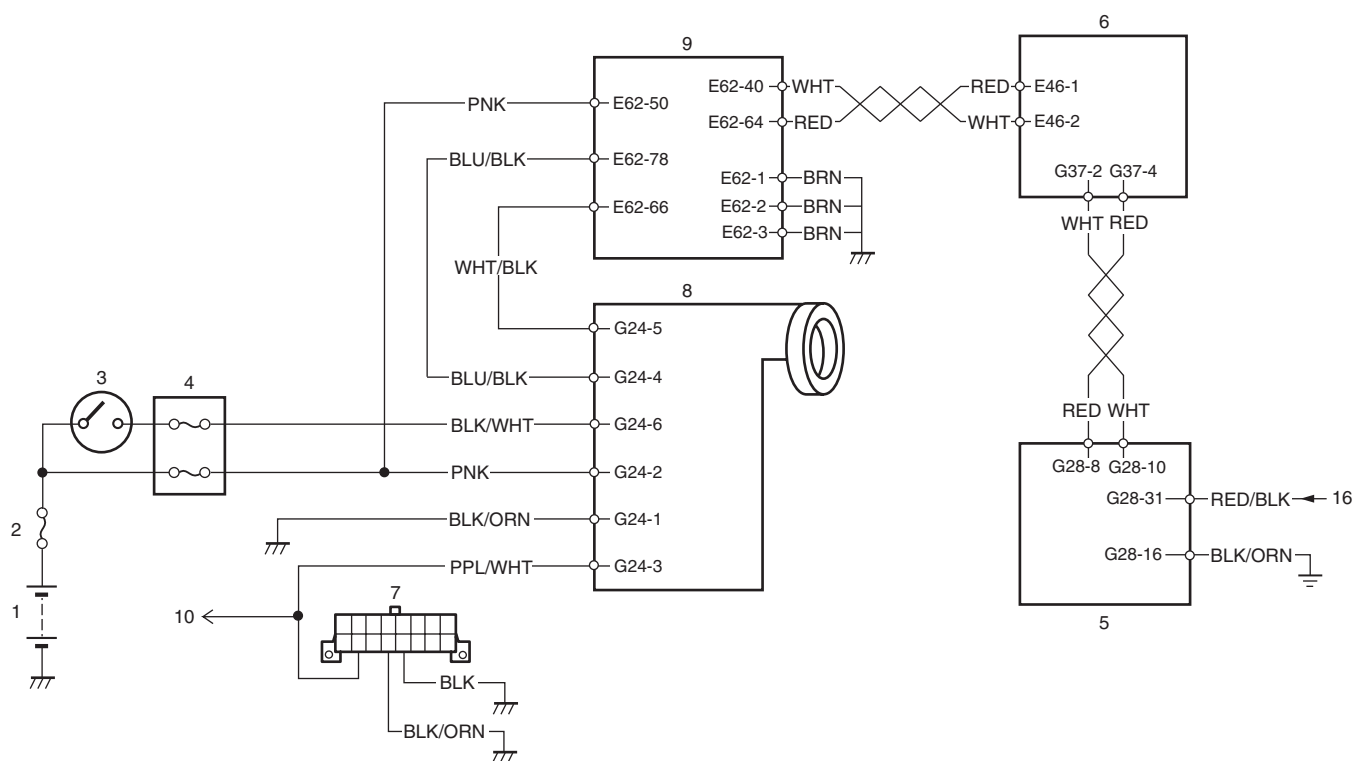
The time it must be waited for reinput password for programming SUZUKI scan tool indicates "0 SEC." when a correct password is input after wait time.

If failed to input correct password, it increase according to the times of misinput.

SVS Lamp Does Not Come ON with Ignition Switch ON and Engine Stop

S5RS0BA304023

Wiring Diagram



I5RS0BA30005-02

1. Battery	7. Data link connector (DLC)	13. Immobilizer control module connector "G24" (harness side view)
2. Fuse	8. Immobilizer control module	14. Combination meter connector "G28" (harness side view)
3. Ignition switch	9. ECM	15. ECM connector "E62" and "D05" (harness side view)
4. Junction block with BCM	10. To ECM, BCM etc.	16. From "METER" fuse
5. Combination meter	11. BCM connector "E46" (harness side view)	
6. BCM	12. BCM connector "G37" (harness side view)	

Circuit Description

When the ignition switch is turned ON, immobilizer control module read the code by the coil antenna from ignition key. Then if the code in transponder in the key match with the one registered with immobilizer control module and ECM, ECM transmits indication ON signal of SVS lamp to combination meter in order to turn SVS lamp on. And then, combination meter turns SVS lamp on. When the engine starts to run and no malfunction is detected in the system, ECM transmits SVS lamp indication OFF signal to combination meter in order to turn SVS lamp off. And then, combination meter turns SVS lamp off, but if a malfunction was or is detected, SVS lamp is flashes ON and OFF, when ignition switch turn to ON position.

Troubleshooting

Step	Action	Yes	No
1	SVS Lamp power supply check 1) Turn ignition switch to ON position. <i>Do other warning lights come ON?</i>	Go to Step 2.	Go to Step 3.
2	DTC check 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. <i>Is there any DTC(s)?</i>	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If SVS lamp still remains off, substitute a known-good ECM and recheck.
3	Fuse check 1) Turn ignition switch to OFF position. 2) Check for fuse blown at combination meter circuit fuse in junction block assembly. <i>Is fuse in good condition?</i>	Go to Step 4.	Replace fuse and check for short.
4	CAN communication line circuit check 1) Check CAN communication circuit between combination meter and ECM referring to "C-34, CAN Communication Circuit: in Section 1A". <i>Is circuit in good condition?</i>	Go to Step 5.	Repair or replace.
5	Combination meter power supply check 1) Remove combination meter referring to "Combination Meter Removal and Installation: in Section 9C". 2) Check for proper connection to combination meter connector at "G28-31" and "G28-16" terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at "G28-31" terminal and vehicle body ground. <i>Is it 10 – 14 V?</i>	Go to Step 6.	"RED/BLK" wire in open circuit.
6	Combination meter circuit check 1) Turn ignition switch OFF position. 2) Measure resistance between "G28-16" terminal of combination meter connector and vehicle body ground. <i>Is resistance 1 Ω or less?</i>	Substitute a known-good combination meter and recheck. If immobilizer indicator lamp still remains off, substitute a known-good ECM and recheck.	"BLK/ORN" wire circuit in open or high resistance circuit.

SVS Lamp Remains On after Ignition Switch ON

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When SVS lamp remains ON for more than 5 seconds after turning ignition switch to ON position, DTC is recorded to immobilizer control module and ECM.

After completion of immobilizer system repair, perform clearance of DTC.

DTC B3040: W-Line Communication Failure

S5RS0BA304007

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: ".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No response from ECM while Immobilizer Control Module requests signal	- W-line circuit - ECM power circuit

DTC Troubleshooting

Step	Action	Yes	No
1	1) Ignition switch at OFF position. 2) Disconnect connector from ECM. 3) Check for proper connection to ECM at "E62-66" terminal. <i>Is it in good condition?</i>	Go to Step 2.	Repair or replace.
2	1) Ignition switch at OFF position. 2) Disconnect connector from Immobilizer Control Module. 3) Check for proper connection to Immobilizer Control Module at "G24-5" terminal. <i>Is it in good condition?</i>	Go to Step 3.	Repair or replace.
3	1) With connectors connected, measure voltage between terminal "G24-5" and ground with ignition switch at ON position. <i>Is it 10 – 14 V?</i>	Go to Step 4.	W-line (WHT/BLK) circuit open.
4	1) With ignition switch at ON position, measure voltage between "E62-50" and ground. <i>Are they 10 – 14 V?</i>	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.	ECM power supply (PNK) circuit open.

DTC B3042: W-Line Circuit Malfunction Shorted to Ground

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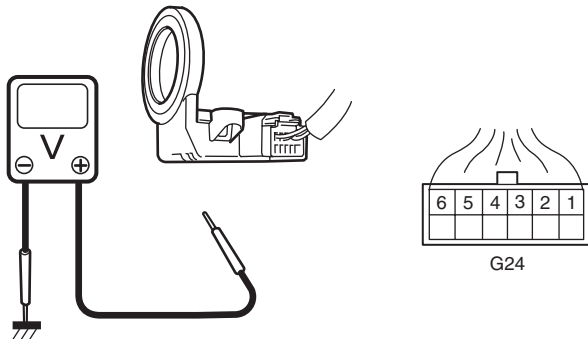
Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: ".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
W-line circuit voltage is low.	W-line circuit

DTC Troubleshooting

Step	Action	Yes	No
1	1) Ignition switch at OFF position. 2) Disconnect connector from ECM. 3) Check for proper connection to ECM at "E62-66" terminal. <i>Is it in good condition?</i>	Go to Step 2.	Repair or replace.
2	1) Connect connector to ECM. 2) Measure voltage between "G24-5" terminal of Immobilizer Control Module and body ground with ignition switch at ON position.  G24 I5RS0BA30006-01 <i>Is it 10 – 14 V?</i>	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.	W-line (WHT/BLK) is shorted to ground. Repair and recheck.

DTC B3043: W-Line Circuit Malfunction Shorted to Battery

S5RS0BA304009

Wiring Circuit

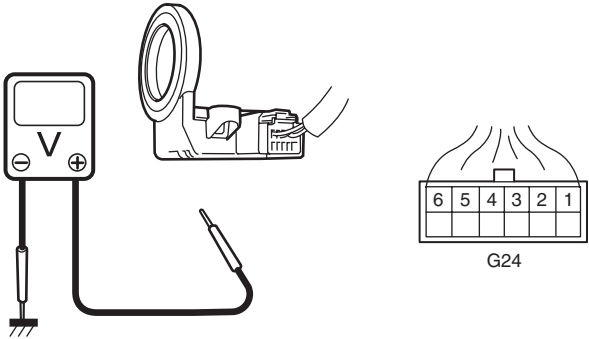
Refer to "Immobilizer Control System Wiring Circuit Diagram: ".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
W-line circuit voltage is high.	W-line circuit

10C-12 Immobilizer Control System:

DTC Troubleshooting

Step	Action	Yes	No
1	1) Ignition switch at OFF position. 2) Disconnect connector from ECM. 3) Check for proper connection to ECM at "E62-66" terminal. <i>Is it in good condition?</i>	Go to Step 2.	Repair or replace.
2	1) Connect connector to ECM. 2) Measure voltage between "G24-5" terminal of Immobilizer Control Module and body ground with ignition switch at OFF position and scan tool disconnected.  <i>Is it 0 – 1 V?</i>	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.	W-line (WHT/BLK) is shorted to power supply circuit. Repair and recheck.

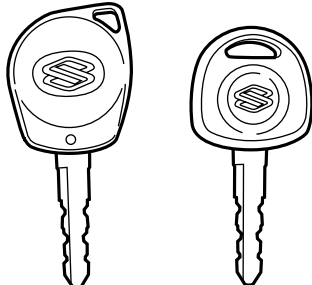
DTC B3055: No Transponder

S5RS0BA304010

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- No FIX CODE is transmitted from transponder. - FIX CODE transmission error.	Ignition key

DTC Troubleshooting

Step	Action	Yes	No
1	1) Ignition switch at OFF position and leave it for 5 seconds or more. 2) Pull out ignition key and reinsert it. 3) Turn ignition switch to run engine. <i>Does engine start?</i>	Temporal error in code reading. Immobilizer control system is in good condition.	Go to Step 2.
2	1) Check ignition key for shape.  <i>Is it the original one?</i>	Check ignition key referring to "Precautions in Handling Immobilizer Control System: " and repair or replace.	Ignition key with built-in transponder unusable. Replace, register it if necessary and recheck.

DTC B3056: No Fix Code Registered

S5RS0BA304011

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No transponder FIX CODE is registered in Immobilizer Control Module.	Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Check DATA LIST "Number of Fix Code". <i>Is it 0?</i>	Go to Step 2.	Substitute a known-good Immobilizer Control Module referring to "Procedure after Immobilizer Control Module Replacement: " and recheck.
2	<i>Is DTC B3057 also output?</i>	Proceed to "DTC B3057: No Password Registered: ". Then go to Step 3.	Go to Step 3.
3	1) Register ignition key(s) with built-in transponder referring to "How to Register Ignition Key: ". 2) Check SUZUKI scan tool DATA LIST "Number of Fix Code". <i>Is it 1 or more?</i>	Transponder FIX CODE(s) is registered.	Transponder registration procedure is not completed correctly. Register ignition key again.

DTC B3057: No Password Registered

S5RS0BA304012

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Password is not registered in Immobilizer Control Module.	Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Register password by using SUZUKI scan tool. Refer to "Procedure after ECM Replacement: ". 2) Confirm that password is registered correctly, referring to SUZUKI scan tool DATA LIST. <i>Is password PRGRMD message output?</i>	Password registration is completed.	Register password again and recheck.

10C-14 Immobilizer Control System:

DTC B3059: No Request from ECM

S5RS0BA304013

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: ".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- No request from ECM via SVS lamp circuit - Ignition switch is not reset correctly.	- SVS lamp circuit - Communication between ECM and Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch to ACC position or OFF position for more than 5 seconds, then turn ignition switch to ON position. 2) Recheck DTC. <i>Is DTC B3059 current?</i>	Go to Step 2.	Communication between ECM and Immobilizer Control Module was not finished correctly.
2	1) Check for proper connection to ECM at "E62-78" terminal. <i>Is it in good condition?</i>	Go to Step 3.	Repair or replace.
3	1) Check for proper connection to Immobilizer Control Module at "G24-4" terminal. <i>Is it in good condition?</i>	Go to Step 4.	Repair or replace.
4	1) Check "BLU/BLK" line for open or short. <i>Is it in good condition?</i>	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.	Repair or replace.

DTC B3060: Incorrect Transponder Detected

S5RS0BA304014

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- FIX CODE does not match with registered one. - FIX CODE is not registered in Immobilizer Control Module.	- Ignition key with built-in transponder - Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	<i>Is DTC B3056 also output?</i>	Proceed to "DTC B3056: No Fix Code Registered: ". Then, go to Step 2.	Go to Step 2.
2	1) Check DATA LIST "Number of Fix Code". <i>Is it 1 or more?</i>	Replace ignition key with built-in transponder. Then go to Step 3.	Go to Step 3.
3	1) Register transponder referring to "How to Register Ignition Key: ". 2) Check SUZUKI scan tool DATA LIST for "Fix Code (IGN key)". <i>Is it registered?</i>	Transponder FIX CODE is registered.	Transponder registration procedure is not completed correctly. Register ignition key again.

DTC B3061: Transponder Communication Failure

S5RS0BA304015

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
- No response from transponder - SECRET KEY CODE is not matched between ignition key (transponder). - FIX CODE does not match with registered one. - FIX CODE is not registered in Immobilizer Control Module.	- Ignition key with built-in transponder - SECRET KEY CODE is not registered in transponder. - SECRET KEY CODE is not registered in ECM. - SECRET KEY CODE is different between ECM and transponder. - Unregistered ignition key (FIX CODE) with built-in transponder is detected. - No FIX CODE in Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	Is DTC B3060 also output?	Proceed to "DTC B3060: Incorrect Transponder Detected: ". Then go to Step 2.	Go to Step 2.
2	Is DTC B3055 also output?	Proceed to "DTC B3055: No Transponder: ". Then go to Step 3.	Go to Step 3.
3	1) Check scan tool DATA LIST "Trans Secret Key". Is it REGISTERED?	Go to Step 5.	Go to Step 4.
4	1) Register SECRET KEY CODE by referring to "Procedure after Immobilizer Control Module Replacement: ". 2) Check DTC. Is DTC B3061 still output?	Go to Step 5.	Register SECRET KEY CODE and recheck.
5	1) Register SECRET KEY CODE and password to ECM by referring to "Procedure after ECM Replacement: ". 2) Check DTC. Is DTC B3061 still output?	Go to Step 6.	If there is other DTC, proceed to the DTC diag. flow.
6	1) Replace ignition key with new one and register it by referring to "How to Register Ignition Key: ". 2) Check DTC. Is DTC B3061 still output?	Substitute a known-good Immobilizer Control Module referring to "Procedure after Immobilizer Control Module Replacement: " and recheck.	If there is other DTC, proceed to DTC diag. flow.

DTC P1610: Secret Key / Password Not Programed

S5RS0BA304017

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
SECRET KEY CODE and password are not registered in ECM.	ECM

DTC Troubleshooting

Step	Action	Yes	No
1	1) Register SECRET KEY CODE and password by using SUZUKI scan tool. Refer to "Procedure after ECM Replacement: ". 2) Check DTC. Is DTC P1610 still output?	Perform registration procedure again and recheck.	ECM is registered correctly.

10C-16 Immobilizer Control System:**DTC P1611: Password Is Not Matched**

S5RS0BA304018

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Password registered in ECM is not correct.	ECM

DTC Troubleshooting

Step	Action	Yes	No
1	1) Register password and SECRET KEY CODE by referring to "Procedure after ECM Replacement: ". 2) Turn ignition switch to OFF position and leave it for 5 seconds or more. 3) Then turn ignition switch to ON position. <i>Is DTC P1611 still output?</i>	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.	ECM is in good condition.

DTC P1612 / P1613: No Signal from Immobilizer Control Module / Immobilizer System Malfunction

S5RS0BA304019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Signal from Immobilizer Control Module is not received correctly.	- W-line circuit - Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	<i>Is DTC B3040, B3042 or B3043 output at Immobilizer Control Module?</i>	W-line (WHT/BLK) failure. Proceed to each DTC diag. flow according to that DTC number. Check B3042 or B3043 first and then B3040 if two codes are output at the same time.	Go to Step 2.
2	1) Ignition switch at OFF position and leave it for 5 seconds or more. 2) Pull out ignition key and reinsert it. 3) Start engine. <i>Does engine start?</i>	Temporary error in reading. Immobilizer control system is in good condition.	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.

DTC P1614: Incorrect Signal from Immobilizer Control Module

S5RS0BA304020

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Signal from Immobilizer Control Module is not matched.	- Ignition key with built-in transponder internally faulty - SECRET KEY CODE is not registered in transponder. - SECRET KEY CODE is not registered in ECM. - SECRET KEY CODE is different between ECM and transponder. - Unregistered ignition key (FIX CODE) with built-in transponder is detected. - No FIX CODE in Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Proceed to "DTC B3061: Transponder Communication Failure: ". Recheck DTC. <i>Is DTC P1614 still output?</i>	Substitute a known-good ECM referring to "Procedure after ECM Replacement: " and recheck.	ECM and Immobilizer Control Module are programmed correctly.

Registration Procedure of Immobilizer Control System Components

S5RS0BA304021

When replacing any component of immobilizer control system, perform registration procedure according to the following flow.

NOTE

When replacing Immobilizer Control Module and ECM at the same time, the ignition key with built-in transponder that has been registered to the system (SECRET KEY CODE registered to transponder) can not be used. Prepare new ignition key with built-in transponder (SECRET KEY CODE unregistered to transponder), and perform Steps 1 to 4 as follows.

Step	Action	Yes	No
1	DTC check 1) Check for DTC referring to "DTC Check: ". <i>Are there DTC B1000, B3040, B3042, and/or B3043?</i>	Proceed to each diagnostic flow corresponding to that DTC(s).	Go to Step 2.
2	Confirmation of password (PWD) registration <i>Is there DTC B3057?</i>	Register PWD by referring to "Procedure after ECM Replacement: ". Then, go to Step 3.	Go to Step 3.
3	ECM replacement <i>Is ECM replaced?</i>	Proceed to "Procedure after ECM Replacement: ". Then, go to Step 4.	Go to Step 4.
4	Immobilizer Control Module replacement <i>Is Immobilizer Control Module replaced?</i>	Proceed to "Procedure after Immobilizer Control Module Replacement: ".	Go to Step 5.
5	Ignition key with built-in transponder registration <i>Is ignition key registered?</i>	Proceed to "How to Register Ignition Key: ".	End.

Inspection of Immobilizer Control Module and Its Circuit

S5RS0BA304022

Immobilizer Control Module can be checked at wiring connectors by measuring voltage.

⚠ CAUTION

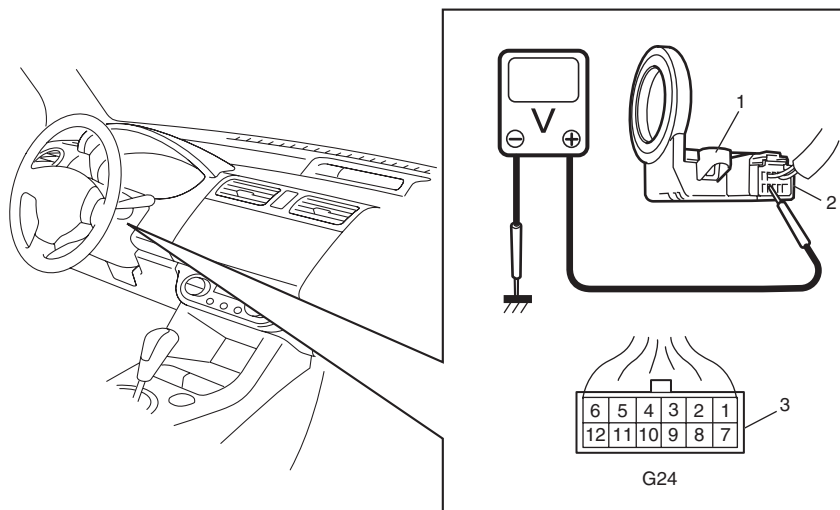
Immobilizer Control Module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to Immobilizer Control Module with coupler disconnected from it.

NOTE

As the battery voltage affects each terminal voltage, confirm that it is 11 V or more when ignition switch is turned to ON position.

Voltage Check

- 1) Remove immobilizer control module (1) from steering lock assembly or steering lock unit referring to “Immobilizer Control Module Removal and Installation: ”.
- 2) Connect immobilizer control module connector (2) to immobilizer control module.
- 3) Check voltage at each terminal.



3. Immobilizer control module connector (harness side view)

I5RS0BA30007-01

Connector	Terminal	Circuit	Normal voltage	Condition
G24	1	BLK/ORN	Ground	0 – 1 V
	2	PNK	Power supply	10 – 14 V
	3	PPL/WHT	Data link connector	10 – 14 V
				0 – 1 V
	4	BLU/BLK	SVS lamp and MIL	0 – 1 V
				10 – 14 V
	5	WHT/BLK	W-line	10 – 14 V
				0 – 1 V
	6	BLK/ WHT	Ignition switch signal	10 – 14 V
				0 – 1 V
	7	—	Not used	—
	8	—	Not used	—
	9	—	Not used	—
	10	—	Not used	—
	11	—	Not used	—
	12	—	Not used	—

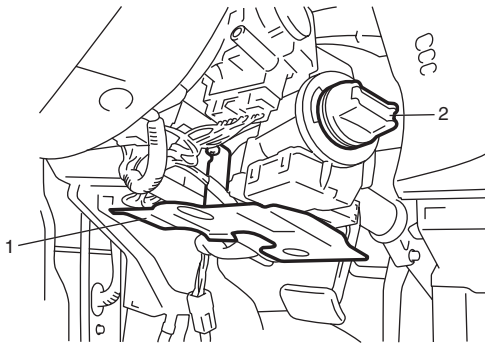
Repair Instructions

Immobilizer Control Module Removal and Installation

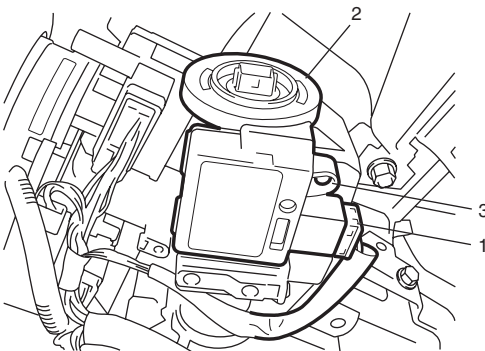
S5RS0BA306001

Removal

- 1) Disconnect negative (–) cable at battery.
- 2) Disable air bag system referring to “Disabling Air Bag System: in Section 8B”.
- 3) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation: in Section 8B”.
- 4) Remove steering wheel referring to “Steering Wheel Removal and Installation: in Section 6B”.
- 5) Remove steering column lower and upper covers.
- 6) Remove knee protector plate (1).
- 7) Remove engine start knob (2). (if equipped with keyless start system)



- 8) Disconnect connector (1) from immobilizer control module (2).
- 9) Remove a screw (3) from immobilizer control module.



- 10) Remove immobilizer control module from steering lock assembly or steering lock unit.

NOTE

Do not add or twist strong power to antenna part of immobilizer control module.

Installation

Reverse the removal procedure.

Procedure after Immobilizer Control Module Replacement

S5RS0BA306003

When Immobilizer Control Module must be replaced including when replaced because rechecking by using a known-good Immobilizer Control Module is necessary during trouble diagnosis, register FIX CODE and SECRET KEY CODE to Immobilizer Control Module by performing the following procedure. Perform “IMM Cont (Register Secret Key Code)” and “Register New IG Key (Fix Code)” modes by using SUZUKI scan tool. For your details, refer to “SUZUKI Tech2 Operator’s Manual”.

Procedure after ECM Replacement

S5RS0BA306004

When ECM is replaced including when replaced because rechecking by using a known-good ECM is necessary during trouble diagnosis, register password and SECRET KEY CODE to ECM by performing the following procedure. Refer to “ECM Registration: in Section 1C”.

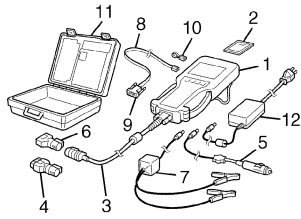
Special Tools and Equipment

Special Tool

S5RS0BA308001

SUZUKI scan tool

—
This kit includes 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 loop back connector, 11. Storage case, 12. Power supply



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